MY0 FINAL MONITORING REPORT

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

DMS Project No. 100092
Full Delivery Contract No. 7743
DMS RFP No. 16-007571
USACE Action ID No. SAW-2019-00126
DWR Project No. 20190158

Data Collection: December 2020-January 2021
Submission: April 2021

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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Prepared by:

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And

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

April 9, 2021

Ms. Lindsay Crocker
NC DEQ – Division of Mitigation Services
1652 Mail Service Center
Raleigh, North Carolina
27699-1652

Subject: Brahma Stream and Wetland Mitigation Site: As-Built Comment Responses
NC DMS Contract # 7743 RFP # 16-007571 DMS Project No. 100092

Dear Ms. Crocker,

Restoration Systems is pleased to provide you with the Final As-Built Baseline Monitoring Report (MY0) for the Brahma Stream and Wetland Mitigation Site. We have addressed your comments as follows.

1. Table 1. Check UT2A and UT2. It appears that the lengths may have been swapped/typo.
   This typo was corrected for this submittal.

2. CCPV shows a gray line for 'no credit' stream. Clarify if there are any areas of "no stream credit" on this project.
   "No stream credit" areas include crossings at easement breaks.

3. Soil boring logs. Double check log for gauge 11. May be a typo (gauge 10 listed two times).
   This typo was corrected for this submittal.

4. There appear to be additional tree species planted. The selected species are desirable diversity, but please confirm that they meet the target community as described in Mitigation Plan. Add a sentence in the baseline report to describe these changes.
   A sentence was added in the discussion of deviations from the construction plans explaining that the additional species are typical for the target community type.

5. Include information on permanent and/or temporary seed mix and any soil amendments if utilized.
   Permanent/temporary seed mix and soil amendment info was added to the report.

6. Provide a map or show on CCPV location of benthic sampling. The Mitigation Plan states that location of benthics will be established at the time of pre-construction benthic monitoring.
   Benthic sampling locations were added to the CCPV.

7. There was proposed fencing plan in the construction drawings. Was fencing installed as constructed? If there were changes, please show them in the drawings or add that page into the as-built.
   "Figure F-1. Asbuilt Fencing" was added into Appendix F.

8. In the field, there were discussions that this site has had numerous large storm events since construction. It may be beneficial to describe those in the report text relation to stream stability.
   A brief discussion of the numerous rain events was added to Section 1.1.

9. Include any pictures and/or videos to assist IRT in visualizing.
   A link to a drone video of the site is provided at the end of the "Project Summary" section.

Electronic comments:

1. The feature for UT-2 has a length of 1359.76 ft vs the 1392 ft reported in Table 1. Please review and revise either the feature or Table 1.
   The as-built length of UT-2 was revised in Table 1 to match the length of the feature in the surveyed as-built centerline.

2. Please attribute the stream gauge features with the unique ID's that will be used to associate these points with stream gauge figures.
   The features in the stream gauges shapefile were attributed properly.

3. Submit existing stream and wetland features or confirm if these were transmitted during 401/401 process.
   The preconstruction stream and wetland shapefiles have been included in the digital submittal.

Requests:

4. Submit a dwg file that includes the layers used in the as-built drawings.
   We do not use AutoCAD and therefore do not have .dwg files for as-built drawings.

5. Submit a shapefile containing stream structures as point features.
   A stream structures point file is included in the digital submittal.

6. Submit transect features as polygons.
   A transect polygon file is included in the digital submittal.

7. Remove elevation tables from behind profile figures (pages 44-49) for future submittals.
   Elevation tables will be removed from profile figures for future submittals.

Sincerely,

Worth Creech
Restoration Systems, LLC

TABLE OF CONTENTS

APPENDICES

1.0 PROJECT SUMMARY

Restoration Systems, LLC has established the North Carolina Division of Mitigation Services (NCDMS) Brahma Site (Site).

1.1 Project Background, Components, and Structure

The Brahma Site (hereafter referred to as the "Site") encompasses 22.7 acres of disturbed forest and livestock pasture along unnamed tributaries to Reedy Branch (warm water streams in the Jordan Lake watershed). The Site is located approximately 2 miles south of Snow Camp, NC, 5 miles northeast of Silk Hope, NC, and southwest of Clark Road (SR 2352) in southern Alamance County.

Prior to construction, land use at the Site is characterized by disturbed forest and livestock pasture. Riparian zones are primarily composed of herbaceous vegetation that is sparse and disturbed due to livestock grazing, bush hogging, and regular land-management activities.

During mitigation plan preparation, two Pilgrim's Pride chicken houses were being constructed on the property adjacent to the southeast portion of UT 1. The chicken houses were constructed on pads that have a groundwater drainage network leading to two pipes that discharge adjacent to the easement. The pipes do not drain effluent from the chicken houses and discharge clean water. Most drainage from the chicken house facilities drains through a draw that is treated at the easement boundary and then discharged in wetlands prior to entering Site tributaries.

Chicken waste management is being managed through a Joint Responsibility – Producer/Third-Party Applicator agreement in a manner consistent with requirements set forth by the State of North Carolina in 15A NCAC 02T Section 1400 (Manure Hauler Regulations) and NRCS standard 633 (Waste Utilization). Documentation of the agreement is available upon request. Under the agreement the producer maintains the responsibility for keeping records on the amount of waste generated by the operation and providing the responsible third party with waste analysis records. The third-party applicator is responsible for applying materials at agronomic rates, soil testing, field evaluation, etc.

At present, no waste is to be discharged onto the property adjacent to the Site easement. If waste management changes at the property, there are minimum setbacks for waste management that include 100 feet from perennial waters.

Since construction was completed, the Site has endured multiple large storm events and well above average rainfall. All Site stream reaches have remained remarkably stable with no significant change from as-built conditions.

Proposed Site restoration activities generated 3881.066 Stream Mitigation Units (SMUs) and 6.655 Riparian Wetland Mitigation Units (WMUs) as described in Table 1.

Additional activities that occurred at the Site included the following.

- Planting 17.7 acres of the Site with 20,200 stems (planted species are included in Table 6 [Appendix B]).
- Treating fescue with mowing and glyphosate prior to planting.

- Applying a Site-wide temporary cover of winter rye (*Secale cereale*) as well as a 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*) at a rate of 13 lbs per acre in areas of cut or high compaction.
- Applying a permanent seed mix at 2 lbs per acre across the Site. A species list is included in Table 6B (Appendix B).
- Fencing the entire conservation easement.

Deviations from the construction plans are summarized in the following table.

Location	Deviation	Explanation
UT-1 sta. 2+65	Vane arm not constructed	Limits of disturbance
UT-1 sta. 3+05	Vane arm not constructed	Field conditions
UT-1 sta. 6+70	(2) 18-inch pipes not constructed	Existing floodplain elevation same as proposed pipe invert
UT-1 sta. 9+20	Log vane structure not constructed	Existing mature tree
UT-1 sta. 10+60	Log vane structure relocated	Bedrock contact
UT-1 sta. 13+90	Log cross vane replaced with boulder sill	Mature tree with root mass
UT-1 sta. 15+15	Log vane structure replaced with log sill	
UT-1 sta. 15+35	Log vane structure replaced with boulder toe	Bedrock contact
UT-1 sta. 16+10	Log vane structure not constructed	Mature tree with root mass
UT-1 sta. 18+00	Log cross vane replaced by stone cross vane	Existing mature trees
UT-1 sta. 18+50	Log cross vane replaced by stone cross vane	
UT-1 sta. 19+20	Log cross vane structure replaced with (2) log sills	Bedrock contact
UT-1 sta. 27+90	(2) 18-inch pipes not constructed	Floodplain elevations the same as proposed pipe inverts
UT-1 sta. 29+05	Log cross vane structure replaced with stone boulder sill	Mature tree with root mass
UT-1 sta. 29+35 to 29+80	Alignment change	Bedrock
UT-1 sta. 31+05	Log cross vane structure replaced with boulder sill	Mature tree with root mass
UT-1 sta. 31+90	Log cross vane structure replaced with boulder cross vane	Bedrock contact
UT-1 sta. 33+50	Log sill added	To maintain grade above crossing
UT-1 sta. 33+95	Log vane structure replaced with log sill	Bedrock contact
UT-1 sta. 34+05	Log cross vane structure replaced with log sill	
UT-2 sta. 12+20	Log cross vane structure replaced with log sill	Floodplain elevations causing arms to sit on top of existing grade
UT-2 sta. 12+50	Log cross vane structure replaced with log sill	
UT-2 sta. 13+00	(2) 18-inch pipes not constructed	Floodplain elevations the same as proposed pipe inverts
UT-6 sta. 2+25	Log cross vane structure not constructed	Mature tree with root mass
UT-6 sta. 3+00	Log cross vane structure replaced with stone cross vane	Mature trees, roots, and bedrock
UT-6 sta. 3+85	Log cross vane structure replaced with stone cross vane	
UT-6 sta. 4+00	Log cross vane structure replaced with stone cross vane	
UT-6 sta. 4+30	Log cross vane structure replaced with stone cross vane	Bedrock contact

Additionally, several species were added to the Site planting list that were not included in the mitigation plan planting list (Table 6, Appendix B); however, these are typical species for a piedmont alluvial forest, the target natural community type, and they are expected to thrive.

No other deviations of significance occurred between construction plans and the as-built condition. In addition, no issues have arisen since construction occurred.

A reach-by-reach drone video of the Site can be viewed at the following link:
https://youtu.be/OeoAZUN09ww

Table 1. Brahma (ID-100092) 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								
UT-1A	3034	3121	Warm	EI	1.50000	2,022.667		
UT-1B	192	191	Warm	EII	2.50000	76.800		
UT-1C	911	911	Warm	P	10.00000	91.100		
UT-2	1354	1360	Warm	EII	2.50000	541.600		
UT-2A	30	30	Warm	EII	2.50000	12.000		
UT-3	239	245	Warm	R	1.00000	239.000		
UT-4	129	135	Warm	EII	2.50000	51.600		
UT-5	626	631	Warm	EII	2.50000	250.400		
UT-6	501	511	Warm	R	1.00000	501.000		
UT-7	47	48	Warm	EII	2.50000	18.800		
					Total:	**3,804.967**		
Wetland								
Wetland Reestablish	4.740	4.736	R	REE	1.00000	4.740		
Wetland Enhancement	3.709	3.708	R	E	2.00000	1.855		
Wetland Preservation	0.601	0.601	R	P	10.00000	0.060		
					Total:	**6.655**		

Project Credits

	Stream			Riparian	Non-Rip	Coastal
Restoration Level	Warm	Cool	Cold	Wetland	Wetland	Marsh
Restoration	740.000			0.000	0.000	0.000
Re-establishment	0.000			4.740	0.000	0.000
Rehabilitation	0.000			0.000	0.000	0.000
Enhancement	0.000			1.855	0.000	0.000
Enhancement I	2,022.667	0.000	0.000			
Enhancement II	951.200	0.000	0.000			
Creation				0.000	0.000	0.000
Preservation	91.100	0.000	0.000	0.060	0.000	
Benthics 2%	76.099	0.000	0.000	0.000	0.000	
Totals	**3,881.066**	**0.000**	**0.000**	**6.655**	**0.000**	**0.000**

Total Stream Credit **3,881.066**
Total Wetland Credit **6.655**

Site design was completed in August 2020. Construction started on September 15, 2020 and ended within a final walkthrough on December 9, 2020. The Site was planted on January 12, 2021. Completed project activities, reporting history, completion dates, and project contacts are summarized in Tables 11-12 (Appendix E).

1.2 Project Goals and Objectives

Project goals are based on the *Cape Fear River Basin Restoration Priorities* (RBRP) report (NCEEP 2009) and on-site data collection of channel morphology and function observed during field investigations. The Site is located within **Targeted Local Watershed (TLW) 03030002050050**. The RBRP report documents benthic ratings vary between "Fair" and "Good-Fair" possibly due to cattle, dairy, and poultry operations. The project is not located in a Regional or Local Watershed Planning Area; however, RBRP goals are addressed by project activities as follows with Site specific information following the RBRP goals in parenthesis.

1. Reduce and control sediment inputs – reduction of 8.0 tons/year after mitigation is complete);
2. Reduce and manage nutrient inputs - livestock removed from streams resulting in a direct reduction of 1020.8 pounds of nitrogen, 84.6 pounds of phosphorus per year, and 11.2 x 10^{11} colonies of fecal coliform; fertilizer application has been eliminated; and marsh treatment areas were installed);
3. Protect and augment designated natural heritage areas (NA).

Site specific mitigation goals and objectives were developed through the use of North Carolina Stream Assessment Method (NC SAM) and North Carolina Wetland Assessment Method (NC WAM) analyses of preconstruction and reference stream systems at the Site (NC SFAT 2015 and NC WFAT 2010) (see table below).

Table 2. Summary: Goals, Performance, and Results

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

1.3 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.

Success Criteria

Streams
• All streams must maintain an Ordinary High-Water Mark (OHWM), per RGL 05-05. • 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. • Entrenchment ratio (ER) must be no less than 2.2 at any measured riffle cross-section. • BHR and ER 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 separate years, during the monitoring years 1-7.
Wetland Hydrology
• Saturation or inundation within the upper 12 inches of the soil surface for, at a minimum, 12 percent of the growing season, during average climatic conditions.
Vegetation
• Within planted portions of the site, a minimum of 320 stems per acre must be present at year 3; a minimum of 260 stems per acre must be present at year 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.

2.0 METHODS

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

Monitoring Schedule

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

2.1 Monitoring

The monitoring parameters are summarized in the following table.

Monitoring Summary

Stream Parameters				
Parameter	**Method**	**Schedule/Frequency**	**Number/Extent**	**Data Collected/Reported**
Stream Profile	Full longitudinal survey	As-built (unless otherwise required)	All restored stream channels	Graphic and tabular data.
Stream Dimension	Cross-sections	Years 1, 2, 3, 5, and 7	Total of 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 photograph of the area included in the report.
	Additional Cross-sections	Yearly	Only if instability is documented during monitoring	Graphic and tabular data.
Stream Hydrology	Continuous monitoring surface water gauges and/or trail camera	Continuous recording through monitoring period	3 surface water gauges on UT 3, 5, and 6	Surface water data for each monitoring period
Bankfull Events	Continuous monitoring surface water gauges and/or trail camera	Continuous recording through monitoring period	3 surface water gauges on UT 3, 5, and 6	Surface water data for each monitoring period
	Visual/Physical Evidence	Continuous through monitoring period	1 crest gauge on UT 1	Visual evidence, photo documentation, and/or rain data.
Benthic Macroinvertebrates	"Qual 4" method described in *Standard Operating Procedures for Collection and Analysis of Benthic Macroinvertebrates, Version 5.0* (NCDWR 2016)	Pre-construction, Years 3, 5, and 7 during the "index period" referenced in *Small Streams Biocriteria Development* (NCDWQ 2009)	2 stations (on UT 1 upstream and UT 1 downstream); however, the exact locations will be determined at the time pre-construction benthics are collected	Results* will be presented on a site-by-site basis and will include a list of taxa collected, an enumeration of *Ephemeroptera, Plecoptera,* and *Tricopetera* taxa as well as Biotic Index values.
Wetland Parameters				
Parameter	**Method**	**Schedule/Frequency**	**Number/Extent**	**Data Collected/Reported**
Wetland Restoration	Groundwater gauges	Years 1, 2, 3, 4, 5, 6, and 7 throughout the year with the growing season defined as March 1-October 22	10 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	19 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	4 plots randomly selected each year	Species and height

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

Table 3. Project Attribute Table								
Project Name	Brahma Site							
County	Alamance County, North Carolina							
Project Area (acres)	22.7							
Project Coordinates (latitude and longitude decimal degrees)	35.8540ºN, 79.4106ºW							
Project Watershed Summary Information								
Physiographic Province	Piedmont							
River Basin	Cape Fear							
USGS Hydrologic Unit 8-digit	3030002050050							
DWR Sub-basin	03-06-04							
Project Drainage Area (acres)	231							
Project Drainage Area Percentage of Impervious Area	<2%							
Land Use Classification	Managed Herbaceous Cover & Hardwood Swamps							
Reach Summary Information								
Parameters	**UT 1 (upstream of confluence with UT2)**	**UT 1 (downstream of confluence with UT2)**	**UT 2**	**UT 3**	**UT4**	**UT5**	**UT6**	**UT7**
Pre-project length (feet)	1071	3227	1384	239	129	657	501	47
Post-project (feet)	1072	3312	1390	245	135	662	511	48
Valley confinement (Confined, moderately confined, unconfined)	Alluvial, confined - moderately confined							
Drainage area (acres)	149.3	230.8	57.3	14.6	1.6	26.2	12.3	2.9
Perennial, Intermittent, Ephemeral	Per	Per	Int/Per	Int	Int	Int/Per	Int	Int
NCDWR Water Quality Classification	C, NSW							
Dominant Stream Classification (existing)	G5	Cg 4/5	G4/5	G5	F6	G/F4/5	F5	G5
Dominant Stream Classification (proposed)	C/E 4	C/E 4	G4/5	C/E 4	F6	C/F4/5	C/E 4	G5
Dominant Evolutionary class (Simon) if applicable	III/IV	III/IV	III	III	V	IV	III/IV	IV
Wetland Summary Information								
Parameters	**Wetlands**							
Pre-project (acres)	5.157 acres drained & 4.427 acres degraded							
Post-project (acres)	4.736 acres restored & 4.309 acres enhanced/preserved							
Wetland Type (non-riparian, riparian)	Riparian riverine							
Mapped Soil Series	Wehadkee							
Soil Hydric Status	Hydric							
Regulatory Considerations								
Parameters	**Applicable?**		**Resolved?**			**Supporting Docs?**		
Water of the United States - Section 404	Yes		Yes			401 Permit		
Water of the United States - Section 401	Yes		Yes			404 Certification		
Endangered Species Act	Yes		Yes			CE Document		
Historic Preservation Act	Yes		Yes			CE Document		
Coastal Zone Management Act (CZMA or CAMA)	NA		NA			NA		
Essential Fisheries Habitat	NA		NA			NA		

3.0 REFERENCES

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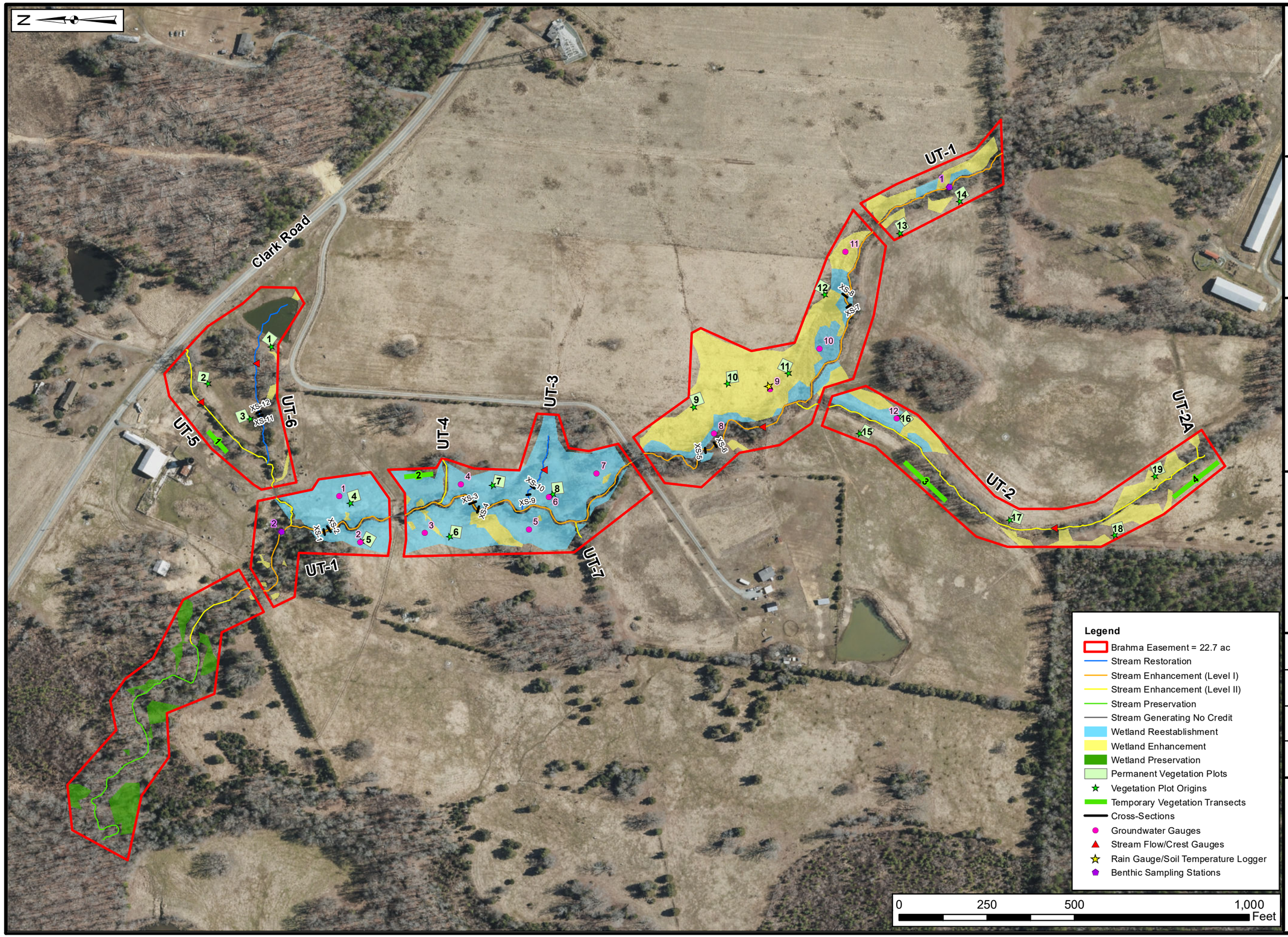
Appendix A
Visual Assessment Data

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



Axiom Environmental, Inc.

Prepared for:

RESTORATION SYSTEMS | LLC

Project:

BRAHMA SITE

Alamance County, NC

Title:

CURRENT CONDITIONS PLAN VIEW

Drawn by: KRJ

Date: APR 2021

Scale: 1:3100

Project No.: 19-006

FIGURE

1

Table 4A. Visual Stream Stability Assessment

Reach UT 1
Assessed Stream Length 3312
Assessed Bank Length 6624

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.	33	33		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)	33	33		100%

Table 4B. Visual Stream Stability Assessment

Reach UT 2
Assessed Stream Length 1390
Assessed Bank Length 2780

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.	8	8		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)	8	8		100%

Table 4C. Visual Stream Stability Assessment

Reach UT 3
Assessed Stream Length 245
Assessed Bank Length 490

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.	6	6		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)	6	6		100%

Table 4D. Visual Stream Stability Assessment

Reach	UT 4
Assessed Stream Length	135
Assessed Bank Length	270

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.	0	0		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)	0	0		100%

Table 4E. Visual Stream Stability Assessment

Reach UT 5
Assessed Stream Length 662
Assessed Bank Length 1324

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.	0	0		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)	0	0		100%

Table 4F. Visual Stream Stability Assessment

Reach UT 6
Assessed Stream Length 511
Assessed Bank Length 1022

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.	19	19		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)	19	19		100%

Table 5. Visual Vegetation Assessment

Planted acreage **17.7**

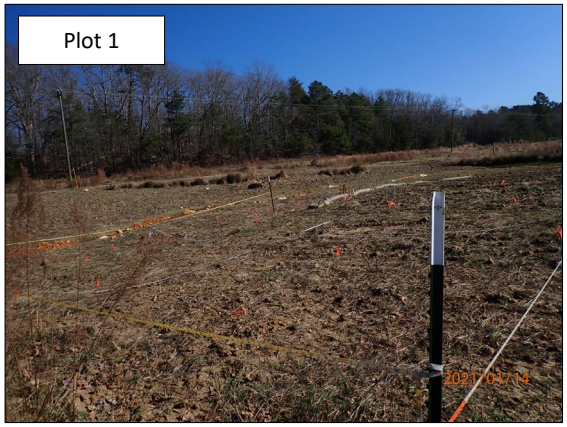
Vegetation Category	Definitions	Mapping Threshold	Combined Acreage	% of Planted Acreage
Bare Areas	Very limited cover of both woody and herbaceous material.	0.10 acres	0.00	0.0%
Low Stem Density Areas	Woody stem densities clearly below target levels based on current MY stem count criteria.	0.10acres	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%

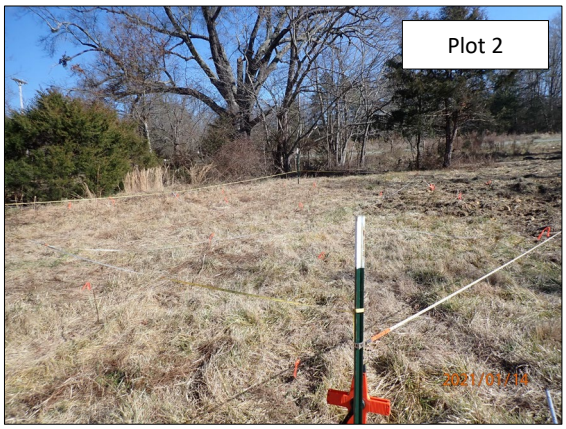
Easement Acreage **22.7**

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	# Encroachments noted	

Brahma Site

MY0 (2021) Vegetation Monitoring Photographs (taken January 14-15, 2021)

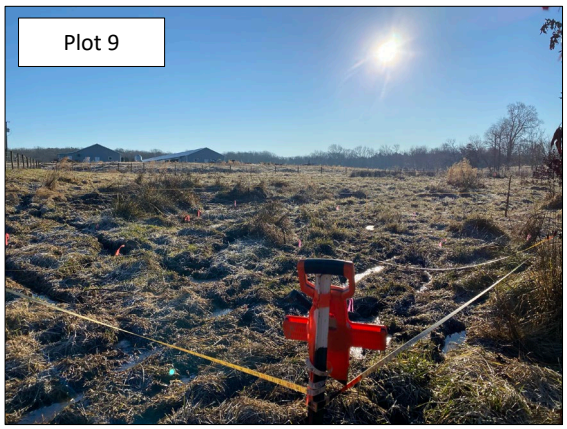




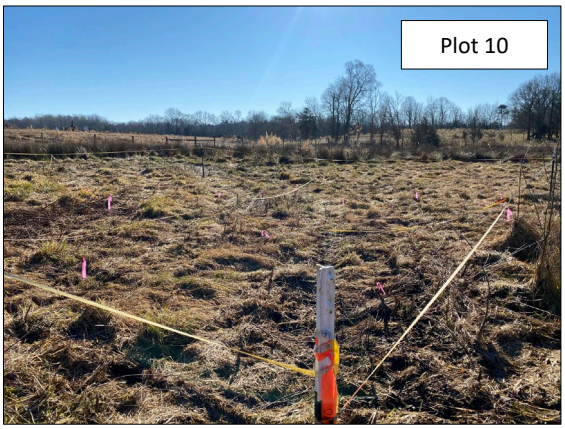
Brahma Site

MY0 (2021) Vegetation Monitoring Photographs (taken January 14-15, 2021)

Plot 9



Plot 10



Plot 11

Plot 12

Plot 13

Plot 14

Plot 15

Plot 16

Brahma Site

MY0 (2021) Vegetation Monitoring Photographs (taken January 14-15, 2021)

Appendix B
Vegetation Data

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

Table 6A. Planted Bare Root Woody Vegetation
Brahma Site

Species	Total
Acres	**17.7**
Asimina triloba	200
Betula nigra	1500
Celtis occidentalis	500
Cephalanthus occidentalis	600
Cornus amomum	2700
Diospyros virginiana	500
Fraxinus pennsylvanica	900
Liriodendron tulipifera	1000
Morus rubra	600
Nyssa sylvatica	1000
Platanus occidentalis	2700
Quercus alba	1000
Quercus lyrata	500
Quercus nigra	2000
Quercus pagoda	1000
Quercus phellos	2000
Quercus shumardii	1000
Ulmus americana	500
TOTALS	**20,200**
Average Stems/Acre	**1141**

Table 6B. Permanent Seed Mix
Brahma Site

Species*	Percentage	Species*	Percentage
Achillea millefolium	0.8	*Eupatorium coelestinum*	0.5
Agrostis gigantea	15	*Eupatorium perfoliatum*	0.5
Agrostis hyemalis	5	*Gaillardia perennial*	2
Agrostis perennans	5	*Helianthus angustifolius*	1
Agrostis stolonifera	2	*Heliopsis helianthoides*	1
Baptisia australis	2	*Hibiscus moscheutos*	0.5
Carex vulpinoidea	1	*Juncus tenuis*	0.5
Chamaecrista fasciculata	1	*Lespedeza capitata*	0.5
Chamaecrista nictitans	1	*Liatris spicata*	0.5
Chrysanthemum leucanthemum	4.5	*Monarda fistulosa*	0.5
Chrysanthemum x superbum	3	*Panicum anceps*	0.5
Coreopsis lanceolata	4	*Panicum clandestinum*	5
Coreopsis tinctoria	4	*Penstemon digitalis*	1
Cosmos bipinnatus	1	*Rudbeckia amplexicaulis*	1
Consolida ajacis	2	*Rudbeckia hirta*	3
Desmodium canadense	1	*Senna hebecarpa*	0.5
Echinacea purpurea	5	*Tridens flavus*	18
Elymus virginicus	5	*Verbena hastata*	1
		Total	**100**

* This seed mix was applied at 2 lbs per acre sitewide; however, in streamside areas, an additional 5 lbs each *Carex vulpinoidea* and *Juncus effusus* were added to the mix.

Table 7. Planted Vegetation Totals
Brahma Site

Plot #	Planted Stems/Acre	Success Criteria Met?
1	931	Yes
2	769	Yes
3	648	Yes
4	607	Yes
5	607	Yes
6	729	Yes
7	688	Yes
8	567	Yes
9	607	Yes
10	688	Yes
11	729	Yes
12	688	Yes
13	931	Yes
14	729	Yes
15	810	Yes
16	648	Yes
17	850	Yes
18	607	Yes
19	729	Yes
R-20	810	Yes
R-21	769	Yes
R-22	729	Yes
R-23	648	Yes
Average Planted Stems/Acre	**718**	**Yes**

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

Planted Acreage	17.7
Date of Initial Plant	2021-01-12
Date(s) of Supplemental Plant(s)	#N/A
Date(s) Mowing	#N/A
Date of Current Survey	2021-01-15
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		Veg Plot 9 F		Veg Plot 10 F		Veg Plot 11 F	
					Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total
Species Included in Approved Mitigation Plan	Asimina triloba	pawpaw	Tree	FAC															2	2			4	4	3	3
	Betula nigra	river birch	Tree	FACW			5	5	4	4															1	1
	Celtis occidentalis	common hackberry	Tree	FACU													4	4								
	Cornus amomum	silky dogwood	Shrub	FACW	7	7																				
	Diospyros virginiana	common persimmon	Tree	FAC			7	7	1	1					2	2					1	1				
	Fraxinus pennsylvanica	green ash	Tree	FACW			3	3																		
	Liriodendron tulipifera	tuliptree	Tree	FACU	5	5					3	3														
	Morus rubra	red mulberry	Tree	FACU	1	1																				
	Nyssa sylvatica	blackgum	Tree	FAC					2	2															2	2
	other								1	1											2	2			3	3
	Platanus occidentalis	American sycamore	Tree	FACW	3	3	1	1	2	2	1	1	2	2	1	1			1	1	6	6	4	4		
	Quercus alba	white oak	Tree	FACU	1	1			1	1			1	1					1	1					1	1
	Quercus lyrata	overcup oak	Tree	OBL									1	1			2	2			1	1				
	Quercus nigra	water oak	Tree	FAC											1	1					2	2	1	1		
	Quercus pagoda	cherrybark oak	Tree	FACW	2	2					4	4	2	2	1	1	1	1	3	3						
	Quercus phellos	willow oak	Tree	FAC									3	3			1	1								
	Quercus shumardii	Shumard's oak	Tree	FAC											1	1										
	Quercus sp.				4	4	2	2	5	5	3	3	6	6	11	11	6	6	7	7	3	3	8	8	8	8
	Ulmus americana	American elm	Tree	FACW			1	1			4	4			1	1	3	3								
Sum	Performance Standard				23	23	19	19	16	16	15	15	15	15	18	18	17	17	14	14	15	15	17	17	18	18
Mitigation Plan Performance Standard	Current Year Stem Count					23		19		16		15		15		18		17		14		15		17		18
	Stems/Acre					931		769		648		607		607		729		688		567		607		688		729
	Species Count					7		6		7		5		6		7		6		5		6		4		6
	Dominant Species Composition (%)					30		37		31		27		40		61		35		50		40		47		44
	Average Plot Height					2		2		2		2		2		2		2		1		2		1		2
	% Invasives					0		0		0		0		0		0		0		0		0		0		0
Post Mitigation Plan Performance Standard	Current Year Stem Count					23		19		16		15		15		18		17		14		15		17		18
	Stems/Acre					931		769		648		607		607		729		688		567		607		688		729
	Species Count					7		6		7		5		6		7		6		5		6		4		6
	Dominant Species Composition (%)					30		37		31		27		40		61		35		50		40		47		44
	Average Plot Height					2		2		2		2		2		2		2		1		2		1		2
	% Invasives					0		0		0		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	17.7
Date of Initial Plant	2021-01-12
Date(s) of Supplemental Plant(s)	#N/A
Date(s) Mowing	#N/A
Date of Current Survey	2021-01-15
Plot size (ACRES)	0.0247

	Scientific Name	Common Name	Tree/ Shrub	Indicator Status	Veg Plot 12 F		Veg Plot 13 F		Veg Plot 14 F		Veg Plot 15 F		Veg Plot 16 F		Veg Plot 17 F		Veg Plot 18 F		Veg Plot 19 F		Veg Plot 20 R	Veg Plot 21 R	Veg Plot 22 R	Veg Plot 23 R
					Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Total	Total	Total	Total
Species Included in Approved Mitigation Plan	Asimina triloba	pawpaw	Tree	FAC					1	1			1	1			3	3	1	1				
	Betula nigra	river birch	Tree	FACW																				
	Celtis occidentalis	common hackberry	Tree	FACU	3	3	1	1	1	1												9		
	Cornus amomum	silky dogwood	Shrub	FACW															1	1				
	Diospyros virginiana	common persimmon	Tree	FAC	2	2			1	1	1	1	2	2					1	1		2	1	
	Fraxinus pennsylvanica	green ash	Tree	FACW							3	3			2	2	1	1	1	1	12			
	Liriodendron tulipifera	tuliptree	Tree	FACU											2	2	3	3	4	4			2	
	Morus rubra	red mulberry	Tree	FACU			4	4	3	3			1	1	3	3	1	1					1	
	Nyssa sylvatica	blackgum	Tree	FAC											1	1						2	2	
	other				1	1	5	5	1	1	3	3												
	Platanus occidentalis	American sycamore	Tree	FACW			2	2	1	1			9	9	3	3	3	3					3	
	Quercus alba	white oak	Tree	FACU																				3
	Quercus lyrata	overcup oak	Tree	OBL													1	1			1	1	1	
	Quercus nigra	water oak	Tree	FAC	1	1													2	2				
	Quercus pagoda	cherrybark oak	Tree	FACW			2	2	1	1											3	1	3	2
	Quercus phellos	willow oak	Tree	FAC	6	6			2	2					4	4			5	5	1	2	3	6
	Quercus shumardii	Shumard's oak	Tree	FAC																				1
	Quercus sp.				4	4	9	9	7	7	13	13	3	3	6	6	3	3	3	3	1		2	4
	Ulmus americana	American elm	Tree	FACW																	2	2		
Sum	Performance Standard				17	17	23	23	18	18	20	20	16	16	21	21	15	15	18	18	20	19	18	16
Mitigation Plan Performance Standard	Current Year Stem Count					17		23		18		20		16		21		15		18	20	19	18	16
	Stems/Acre					688		931		729		810		648		850		607		729	810	769	729	648
	Species Count					6		6		9		4		5		7		7		8	6	7	9	5
	Dominant Species Composition (%)					35		39		39		65		56		29		20		28	60	47	17	38
	Average Plot Height					2		2		2		1		2		2		2		2	1	2	2	2
	% Invasives					0		0		0		0		0		0		0		0	0	0	0	0
Post Mitigation Plan Performance Standard	Current Year Stem Count					17		23		18		20		16		21		15		18	20	19	18	16
	Stems/Acre					688		931		729		810		648		850		607		729	810	769	729	648
	Species Count					6		6		9		4		5		7		7		8	6	7	9	5
	Dominant Species Composition (%)					35		39		39		65		56		29		20		28	60	47	17	38
	Average Plot Height					2		2		2		1		2		2		2		2	1	2	2	2
	% Invasives					0		0		0		0		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

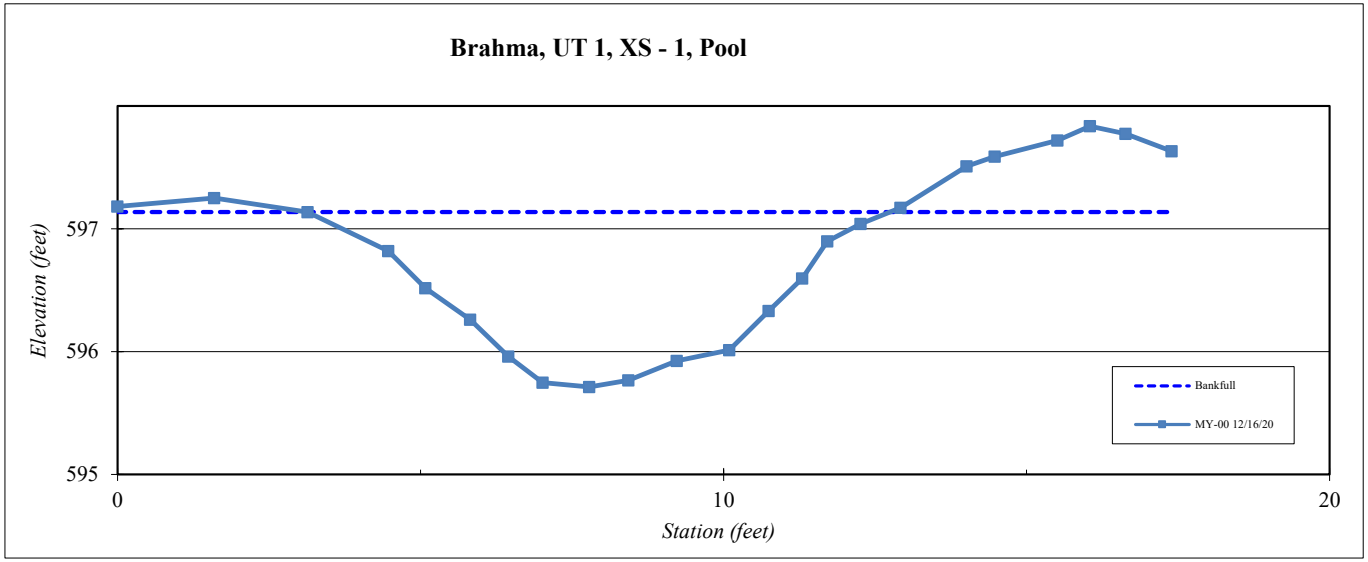
Cross-Sections with Annual Overlays
Longitudinal Profile
Table 9A-D. Baseline Stream Data Summary Tables
Table 10A-B. Cross-Section Morphology Monitoring Summary

Site	Brahma Site
Watershed:	Cape Fear River Basin, 03030002
XS ID	UT1, XS -1, Pool
Feature	Pool
Date:	1/15/2021
Field Crew:	Perkinson, D. Lewis

Station	Elevation
0.0	597.2
1.6	597.2
3.1	597.1
4.5	596.8
5.1	596.4
5.8	596.1
6.4	595.8
7.0	595.5
7.8	595.5
8.4	595.6
9.2	595.7
10.1	595.8
10.7	596.2
11.3	596.5
11.7	596.8
12.3	597.0
12.9	597.2
14.0	597.5
14.5	597.6
15.5	597.8
16.0	597.90
16.6	597.8
17.4	597.7

SUMMARY DATA	
Bankfull Elevation:	597.1
Bank Hieght Ratio:	1.0
Thalweg Elevation:	595.5
LTOB Elevation:	597.1
LTOB Max Depth:	1.6
LTOB Cross Sectional Area:	8.7

Stream Type	E/C 5

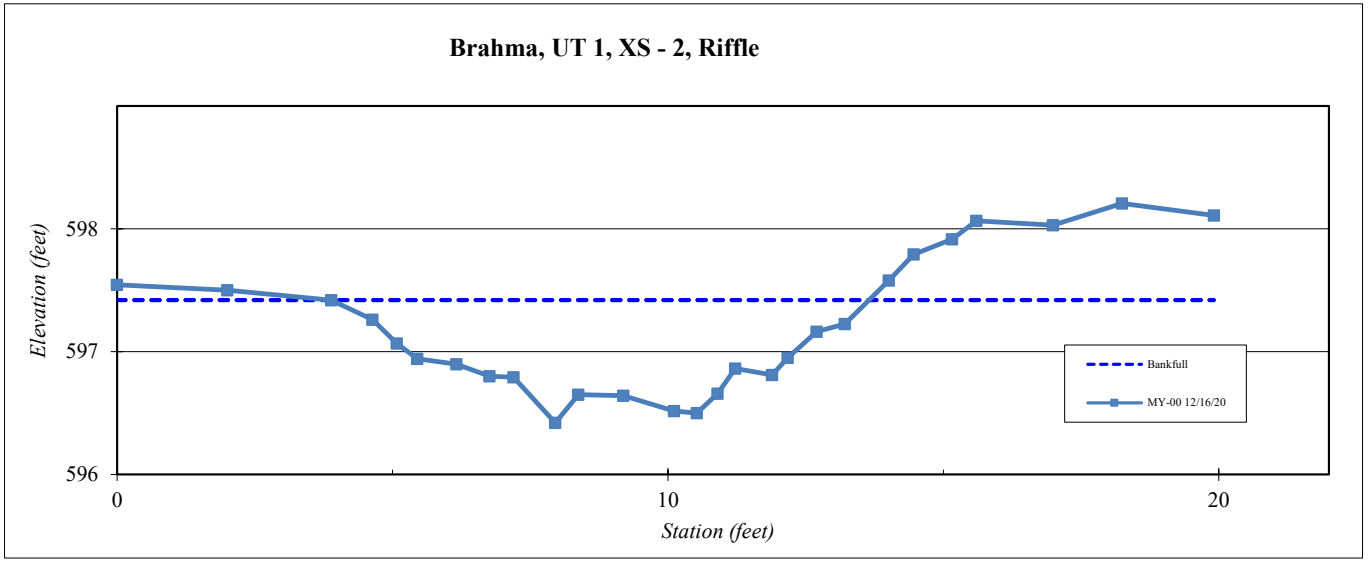


Site	Brahma Site
Watershed:	Cape Fear River Basin, 03030002
XS ID	UT1, XS -2, Riffle
Feature	Pool
Date:	1/15/2021
Field Crew:	Perkinson, D. Lewis

Station	Elevation
0.0	597.6
2.0	597.5
3.9	597.4
4.6	597.3
5.1	597.0
5.5	596.9
6.2	596.8
6.8	596.7
7.2	596.7
8.0	596.3
8.4	596.6
9.2	596.6
10.1	596.4
10.5	596.4
10.9	596.6
11.2	596.8
11.9	596.7
12.2	596.9
12.7	597.1
13.2	597.2
14.0	597.61
14.5	597.9
15.2	598.0
15.6	598.2
17.0	598.1
18.2	598.3
19.9	598.2

SUMMARY DATA	
Bankfull Elevation:	597.4
Bank Hieght Ratio:	1.0
Thalweg Elevation:	596.4
LTOB Elevation:	597.4
LTOB Max Depth:	1.0
LTOB Cross Sectional Area:	6.0

Stream Type	E/C 5

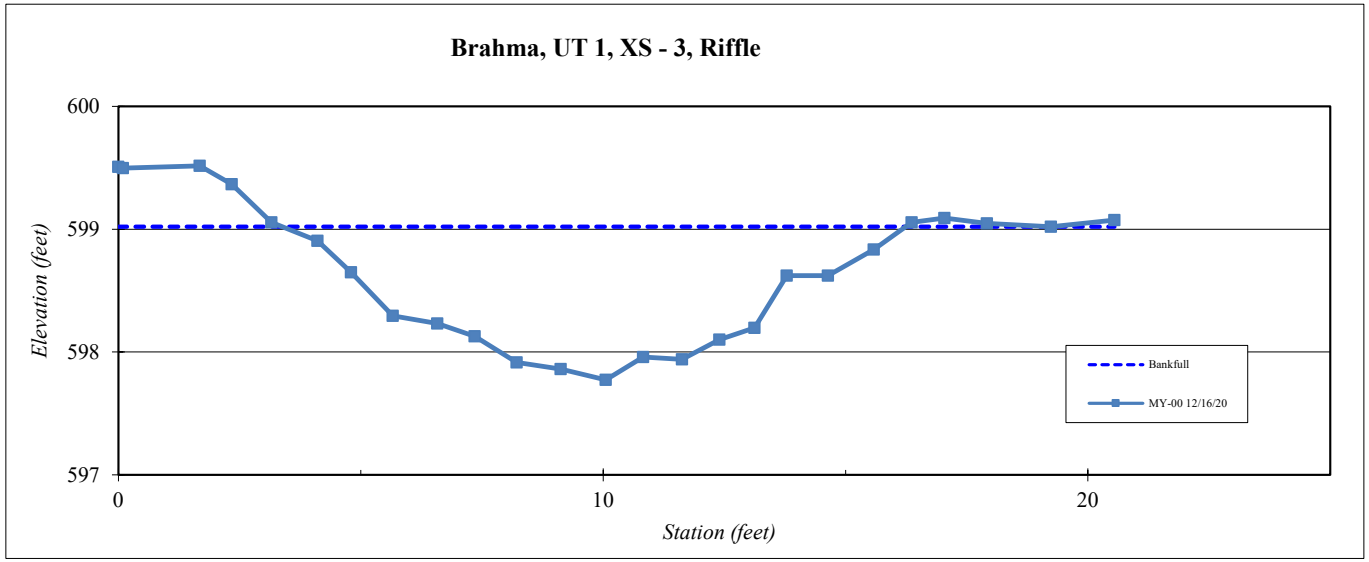


Site	Brahma Site
Watershed:	Cape Fear River Basin, 03030002
XS ID	UT1, XS -3, Riffle
Feature	Riffle
Date:	1/15/2021
Field Crew:	Perkinson, D. Lewis

Station	Elevation
0.0	599.8
0.1	599.8
1.7	599.8
2.3	599.6
3.2	599.3
4.1	599.1
4.8	598.8
5.7	598.4
6.6	598.4
7.4	598.2
8.2	598.0
9.1	597.9
10.1	597.8
10.8	598.0
11.6	598.0
12.4	598.2
13.1	598.3
13.8	598.8
14.6	598.8
15.6	599.0
16.4	599.28
17.0	599.3
17.9	599.3
19.2	599.2
20.5	599.3

SUMMARY DATA	
Bankfull Elevation:	599.2
Bank Hieght Ratio:	1.0
Thalweg Elevation:	597.8
LTOB Elevation:	599.2
LTOB Max Depth:	1.4
LTOB Cross Sectional Area:	10.5

Stream Type	E/C 5

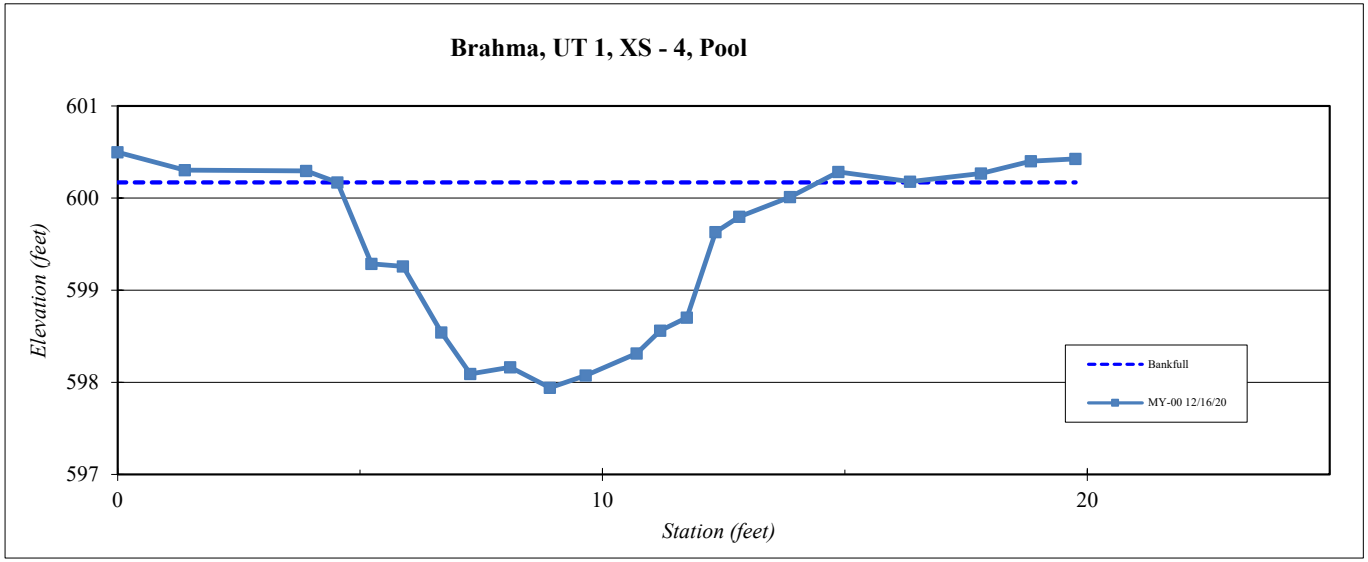


Site	Brahma Site
Watershed:	Cape Fear River Basin, 03030002
XS ID	UT1, XS -4, Pool
Feature	Pool
Date:	1/15/2021
Field Crew:	Perkinson, D. Lewis

Station	Elevation
0.0	600.9
1.4	600.7
3.9	600.7
4.5	600.5
5.2	599.5
5.9	599.5
6.7	598.7
7.3	598.2
8.1	598.3
8.9	598.0
9.7	598.2
10.7	598.4
11.2	598.7
11.7	598.9
12.3	599.9
12.8	600.1
13.9	600.4
14.9	600.7
16.3	600.6
17.8	600.7
18.8	600.80
19.8	600.8

SUMMARY DATA	
Bankfull Elevation:	600.5
Bank Hieght Ratio:	1.0
Thalweg Elevation:	598.0
LTOB Elevation:	600.5
LTOB Max Depth:	2.5
LTOB Cross Sectional Area:	14.6

Stream Type	E/C 5

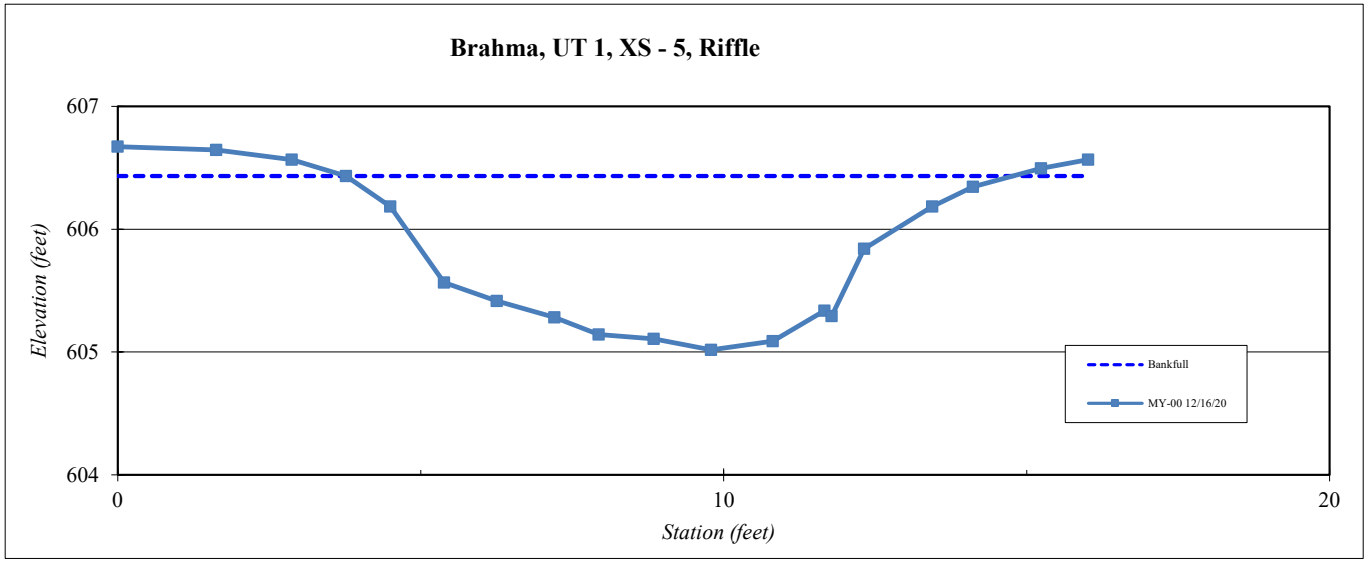


Site	Brahma Site
Watershed:	Cape Fear River Basin, 03030002
XS ID	UT1, XS - 5, Riffle
Feature	Riffle
Date:	1/15/2021
Field Crew:	Perkinson, D. Lewis

Station	Elevation
0.0	606.8
1.6	606.7
2.9	606.6
3.8	606.5
4.5	606.2
5.4	605.5
6.3	605.3
7.2	605.2
7.9	605.0
8.8	605.0
9.8	604.9
10.8	605.0
11.7	605.3
11.8	605.2
12.3	605.8
13.4	606.2
14.1	606.4
15.2	606.6
16.0	606.6

SUMMARY DATA	
Bankfull Elevation:	606.5
Bank Hieght Ratio:	1.0
Thalweg Elevation:	604.9
LTOB Elevation:	606.5
LTOB Max Depth:	1.6
LTOB Cross Sectional Area:	10.7

Stream Type	E/C 5

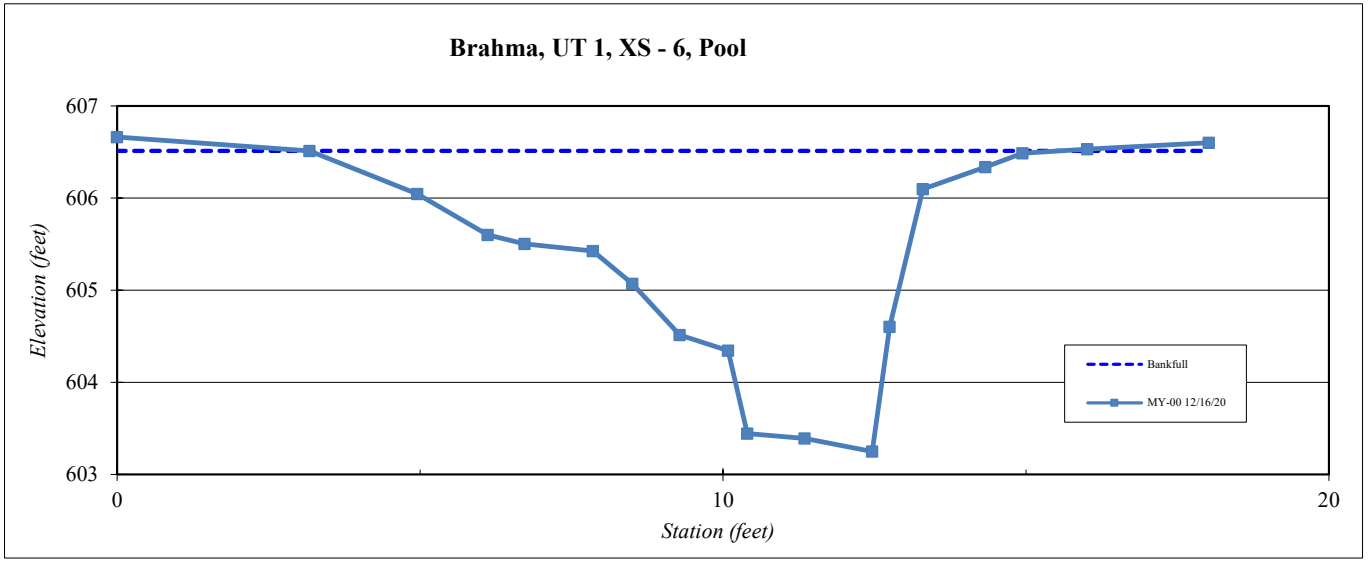


Site	Brahma Site
Watershed:	Cape Fear River Basin, 03030002
XS ID	UT1, XS - 6, Pool
Feature	Pool
Date:	1/15/2021
Field Crew:	Perkinson, D. Lewis

Station	Elevation
0.0	606.8
3.2	606.6
5.0	606.1
6.1	605.6
6.7	605.4
7.9	605.4
8.5	605.0
9.3	604.3
10.1	604.1
10.4	603.1
11.3	603.1
12.5	602.9
12.8	604.4
13.3	606.1
14.3	606.4
14.9	606.6
16.0	606.6
18.0	606.7

SUMMARY DATA	
Bankfull Elevation:	606.6
Bank Hieght Ratio:	1.0
Thalweg Elevation:	602.9
LTOB Elevation:	606.6
LTOB Max Depth:	3.7
LTOB Cross Sectional Area:	18.0

Stream Type	E/C 5

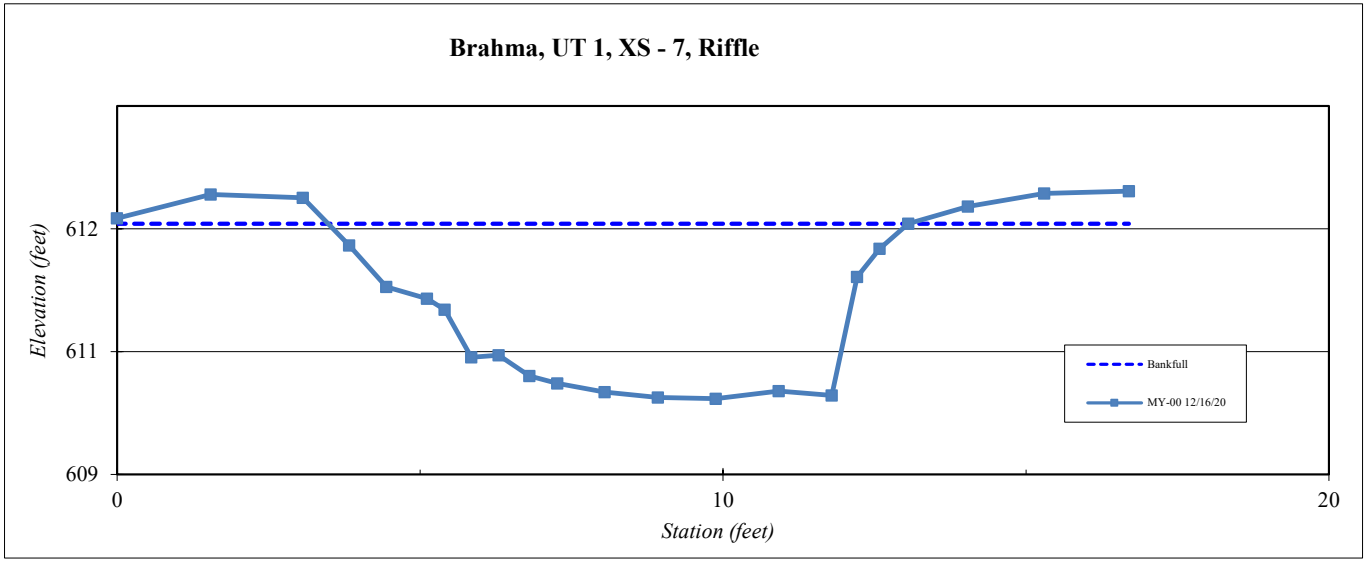


Site	Brahma Site
Watershed:	Cape Fear River Basin, 03030002
XS ID	UT1, XS - 7, Riffle
Feature	Riffle
Date:	1/15/2021
Field Crew:	Perkinson, D. Lewis

Station	Elevation
0.0	611.8
1.5	612.0
3.1	611.9
3.8	611.5
4.4	611.1
5.1	611.0
5.4	610.9
5.8	610.5
6.3	610.5
6.8	610.3
7.3	610.2
8.0	610.2
8.9	610.1
9.9	610.1
10.9	610.2
11.8	610.1
12.2	611.2
12.6	611.5
13.1	611.7
14.0	611.9
15.3	611.98
16.7	612.0

SUMMARY DATA	
Bankfull Elevation:	611.7
Bank Hieght Ratio:	1.0
Thalweg Elevation:	610.1
LTOB Elevation:	611.7
LTOB Max Depth:	1.6
LTOB Cross Sectional Area:	11.0

Stream Type	E/C 5

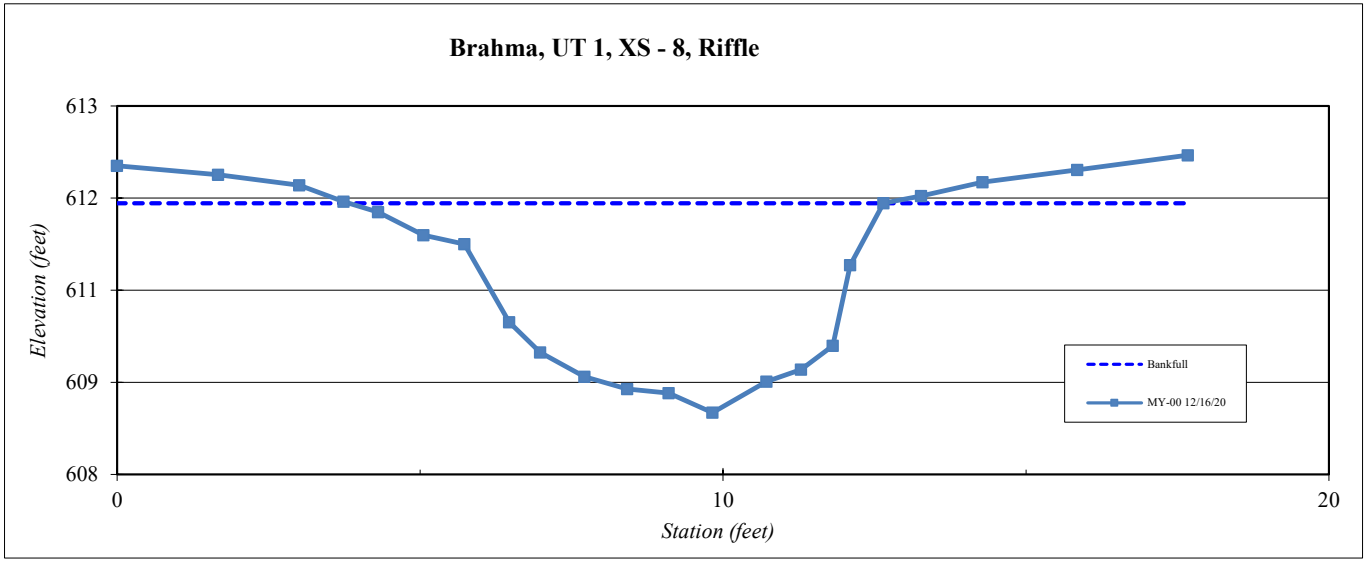


Site	Brahma Site
Watershed:	Cape Fear River Basin, 03030002
XS ID	UT1, XS - 8, Riffle
Feature	Riffle
Date:	1/15/2021
Field Crew:	Perkinson, D. Lewis

Station	Elevation
0.0	612.1
1.7	611.9
3.0	611.8
3.7	611.6
4.3	611.5
5.1	611.2
5.7	611.1
6.5	610.1
7.0	609.8
7.7	609.5
8.4	609.3
9.1	609.3
9.8	609.0
10.7	609.4
11.3	609.6
11.8	609.8
12.1	610.8
12.6	611.6
13.3	611.7
14.3	611.9
15.8	612.00
17.7	612.2

SUMMARY DATA	
Bankfull Elevation:	611.6
Bank Hieght Ratio:	1.0
Thalweg Elevation:	609.0
LTOB Elevation:	611.6
LTOB Max Depth:	2.6
LTOB Cross Sectional Area:	13.3

Stream Type	E/C 5

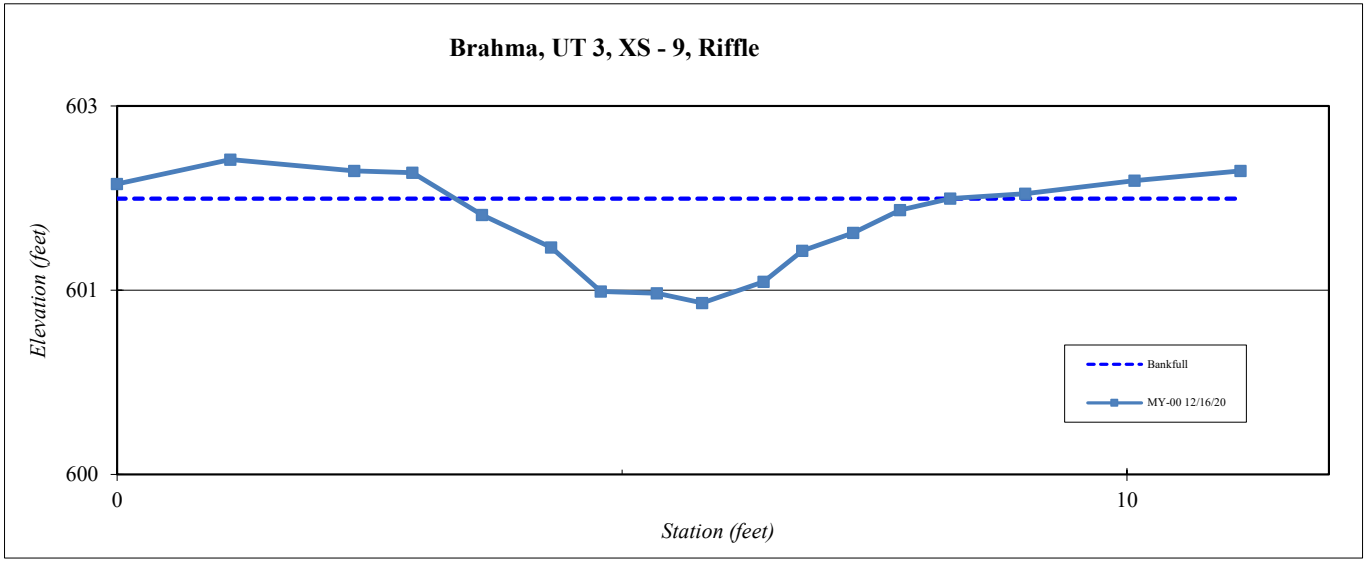


Site	Brahma Site
Watershed:	Cape Fear River Basin, 03030002
XS ID	UT3, XS - 9, Riffle
Feature	Riffle
Date:	1/15/2021
Field Crew:	Perkinson, D. Lewis

Station	Elevation
0.0	602.1
1.1	602.3
2.3	602.2
2.9	602.2
3.6	601.9
4.3	601.7
4.8	601.5
5.3	601.5
5.8	601.4
6.4	601.5
6.8	601.7
7.3	601.8
7.8	602.0
8.2	602.0
9.0	602.1
10.1	602.2
11.1	602.2

SUMMARY DATA	
Bankfull Elevation:	602.0
Bank Hieght Ratio:	1.0
Thalweg Elevation:	601.4
LTOB Elevation:	602.0
LTOB Max Depth:	0.6
LTOB Cross Sectional Area:	1.7

Stream Type	E/C 5

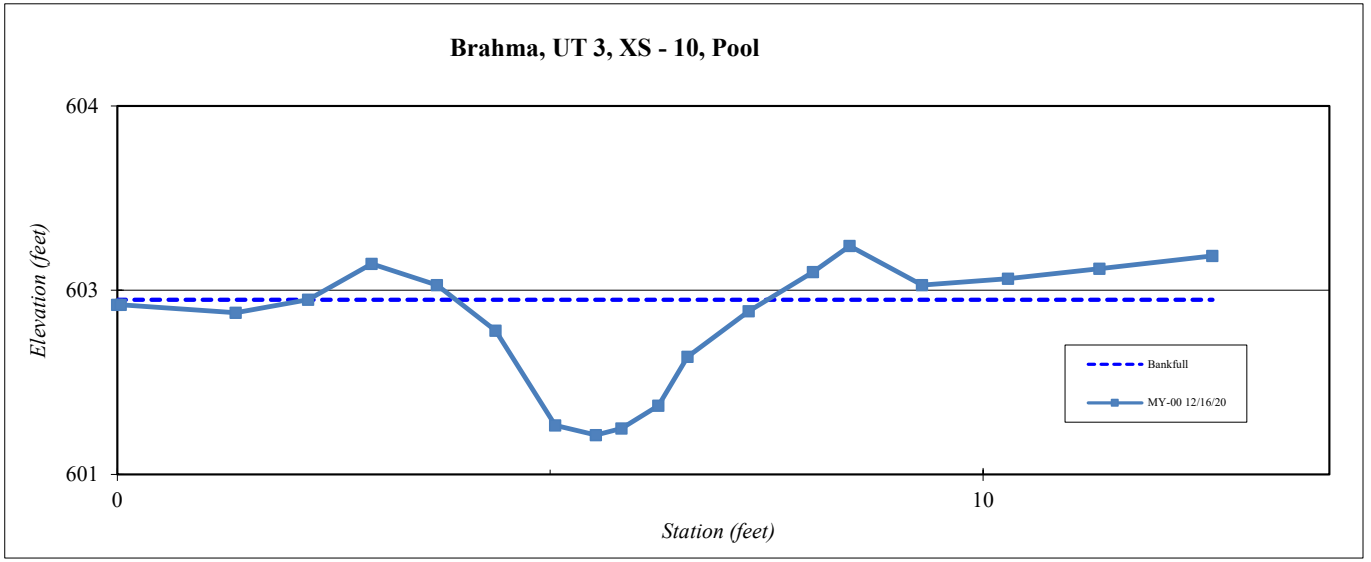


Site	Brahma Site
Watershed:	Cape Fear River Basin, 03030002
XS ID	UT3, XS - 10, Pool
Feature	Pool
Date:	1/15/2021
Field Crew:	Perkinson, D. Lewis

Station	Elevation
0.0	602.5
0.0	602.5
1.4	602.5
2.2	602.6
2.9	602.8
3.7	602.6
4.4	602.4
5.1	601.8
5.5	601.7
5.8	601.8
6.3	601.9
6.6	602.2
7.3	602.5
8.0	602.7
8.5	602.9
9.3	602.6
10.3	602.7
11.3	602.7
12.6	602.8

SUMMARY DATA	
Bankfull Elevation:	602.6
Bank Hieght Ratio:	1.0
Thalweg Elevation:	601.7
LTOB Elevation:	602.6
LTOB Max Depth:	0.8
LTOB Cross Sectional Area:	1.6

Stream Type	E/C 5

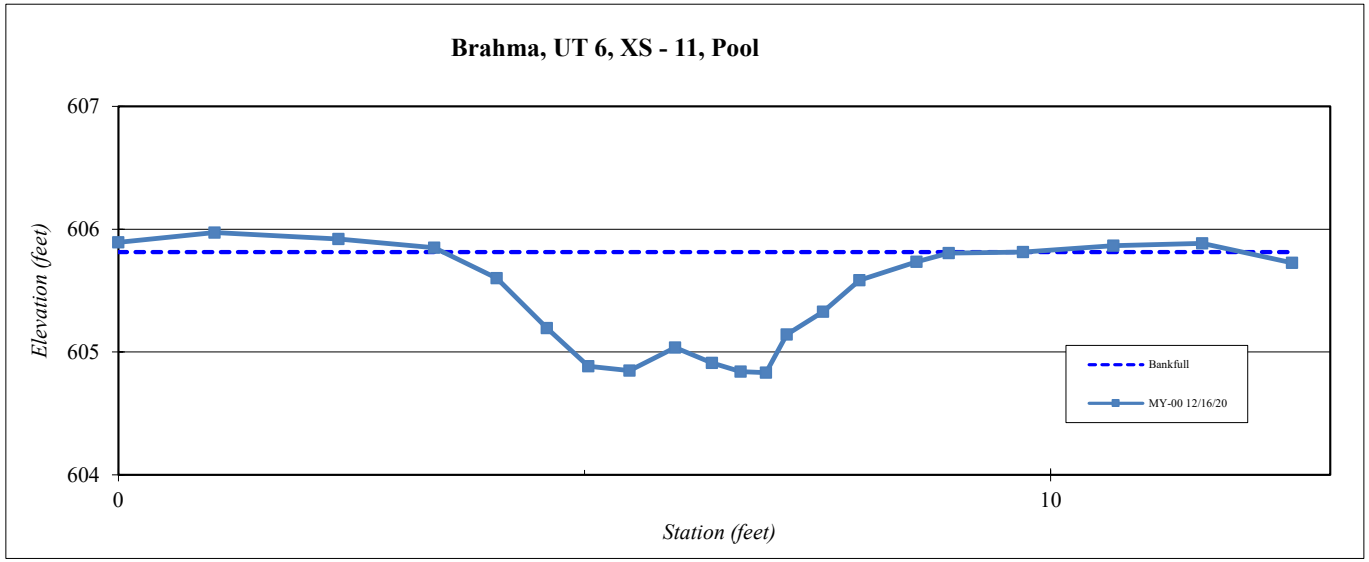


Site	Brahma Site
Watershed:	Cape Fear River Basin, 03030002
XS ID	UT6, XS - 11, Pool
Feature	Pool
Date:	1/15/2021
Field Crew:	Perkinson, D. Lewis

Station	Elevation
0.0	605.9
1.0	606.0
2.4	605.9
3.4	605.8
4.1	605.6
4.6	605.1
5.0	604.7
5.5	604.7
6.0	604.9
6.4	604.8
6.7	604.7
6.9	604.7
7.2	605.0
7.6	605.2
7.9	605.5
8.6	605.7
8.9	605.8
9.7	605.8
10.7	605.9
11.6	605.9
12.6	605.69

SUMMARY DATA	
Bankfull Elevation:	605.8
Bank Hieght Ratio:	1.0
Thalweg Elevation:	604.7
LTOB Elevation:	605.8
LTOB Max Depth:	1.1
LTOB Cross Sectional Area:	3.4

Stream Type	E/C 5

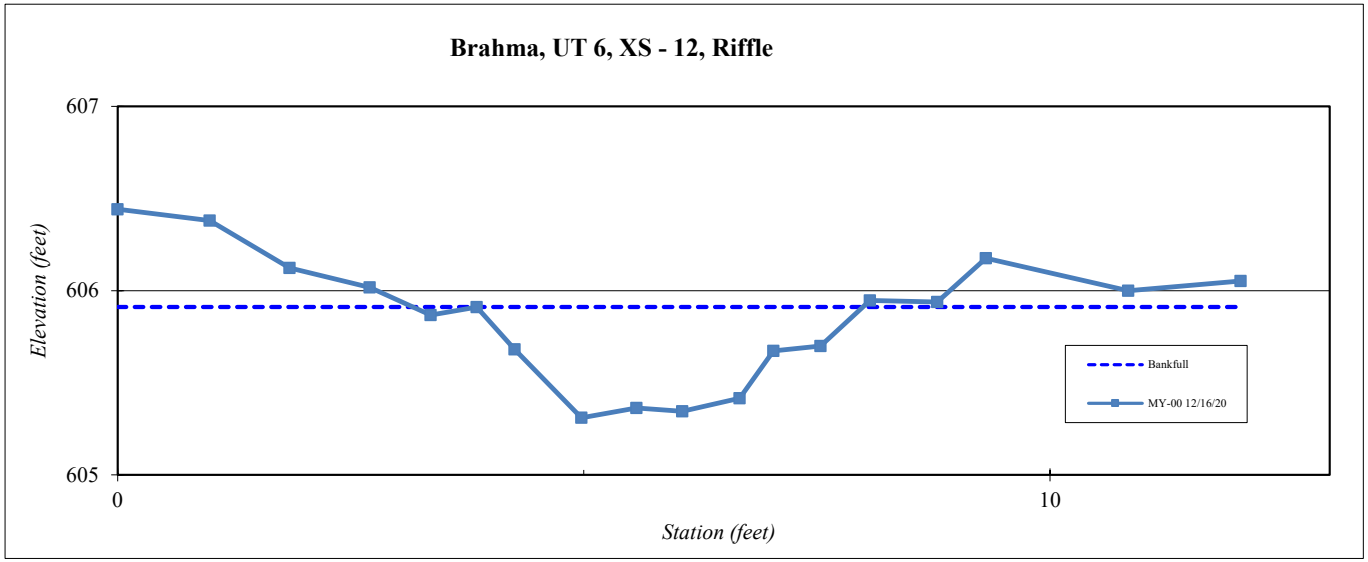


Site	Brahma Site
Watershed:	Cape Fear River Basin, 03030002
XS ID	UT6, XS - 12, Riffle
Feature	Riffle
Date:	1/15/2021
Field Crew:	Perkinson, D. Lewis

Station	Elevation
0.0	606.5
1.0	606.4
1.8	606.1
2.7	606.0
3.4	605.9
3.9	605.9
4.3	605.6
5.0	605.2
5.6	605.3
6.1	605.3
6.7	605.3
7.0	605.6
7.5	605.7
8.1	605.9
8.8	605.9
9.3	606.2
10.8	606.0
12.0	606.1

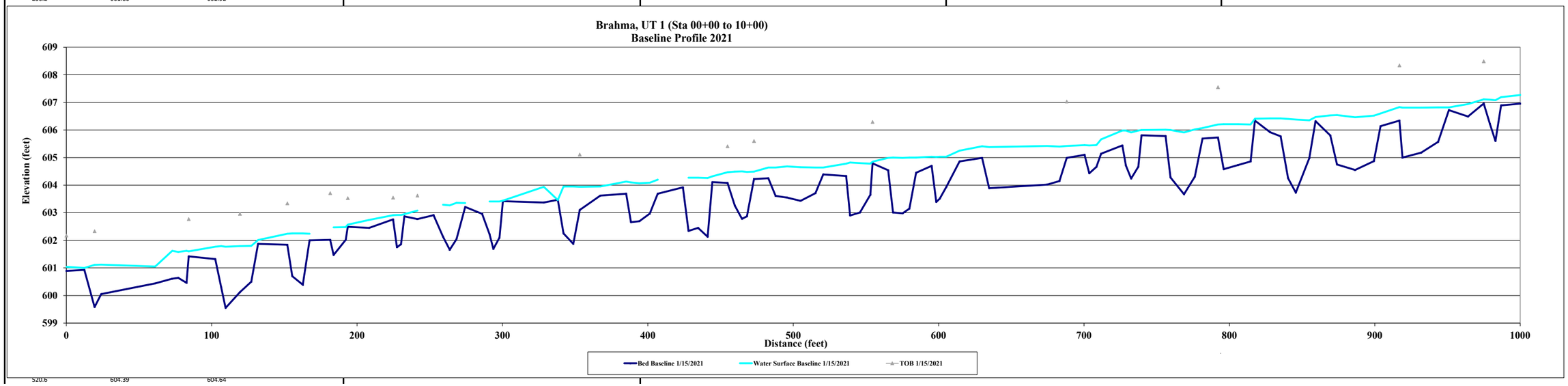
SUMMARY DATA	
Bankfull Elevation:	605.9
Bank Hieght Ratio:	1.0
Thalweg Elevation:	605.3
LTOB Elevation:	605.9
LTOB Max Depth:	0.6
LTOB Cross Sectional Area:	1.6

Stream Type	E/C 5



Project Name	Brahma - Baseline (2021) Profile
Reach	UT 1 (Sta 00+00 to 10+00)
Feature	Profile
Date	1/15/21
Crew	Perkinson

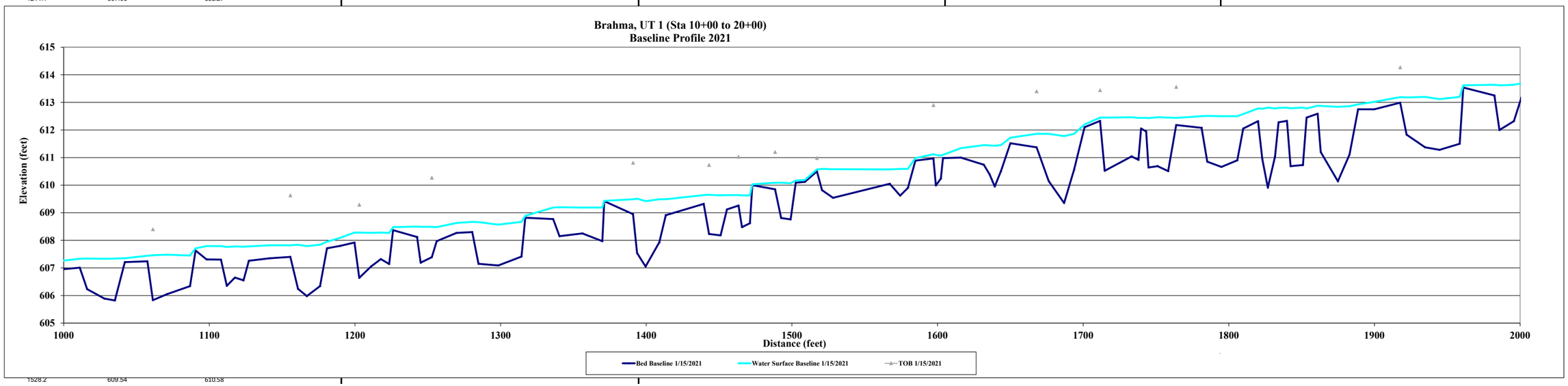
2021 Baseline Survey				As needed				As needed				As needed			
Station	**Bed Elevation**	**Water Elevation**	**TOB**	**Station**	**Bed Elevation**	**Water Elevation**	**TOB**	**Station**	**Bed Elevation**	**Water Elevation**	**TOB**	**Station**	**Bed Elevation**	**Water Elevation**	**TOB**
0.0	600.89	601.04	602.17												
12.4	600.93	601.00													
19.4	599.58	601.11	602.33												
24.0	600.05	601.12													
61.1	600.44	601.05													
72.8	600.61	601.62													
77.0	600.64	601.58													
82.7	600.46	601.62													
84.2	601.42	601.60	602.77												
102.5	601.32	601.77													
106.5	600.30	601.79													
109.5	599.55	601.77													
119.4	600.12	601.79	602.96												
127.2	600.50	601.80													
131.8	601.87	602.01													
152.0	601.84	602.24	603.34												
155.4	600.70	602.25													
162.7	600.39	602.25													
167.3	602.00	602.24													
181.5	602.02		603.71												
183.8	601.47	602.47													
192.2	602.02	602.48													
193.6	602.49	602.57	603.53												
208.3	602.45	602.74													
224.7	602.76	602.91	603.55												
227.4	601.75	602.92													
230.2	601.86	602.92													



520.6 604.39 604.64

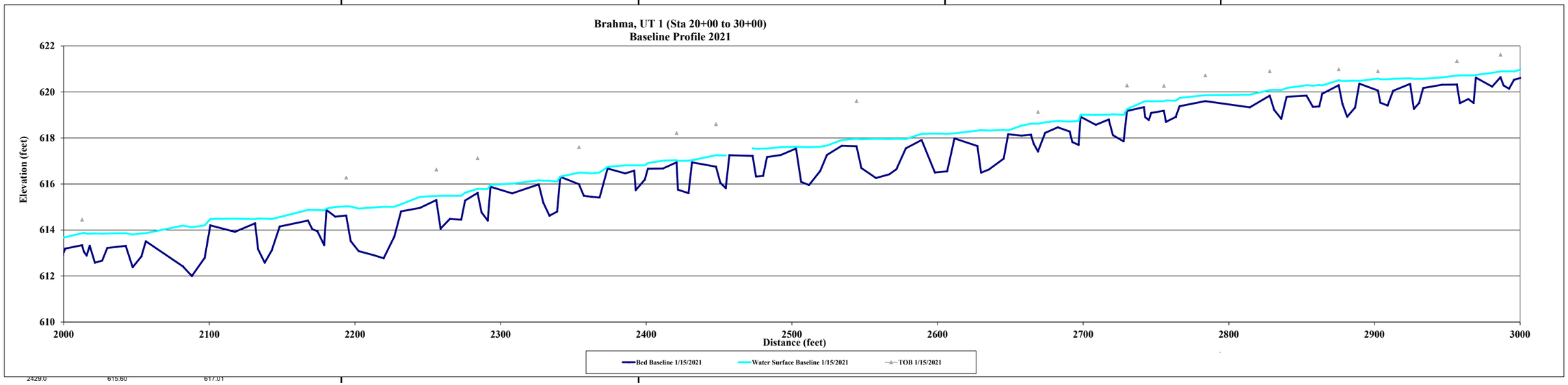
Project Name	Brahma - Baseline (2021) Profile
Reach	UT 1 (Sta 10+00 to 20+00)
Feature	Profile
Date	1/15/21
Crew	Perkinson

2021 Baseline Survey				As needed				As needed				As needed			
Station	**Bed Elevation**	**Water Elevation**	**TOB**	**Station**	**Bed Elevation**	**Water Elevation**	**TOB**	**Station**	**Bed Elevation**	**Water Elevation**	**TOB**	**Station**	**Bed Elevation**	**Water Elevation**	**TOB**
986.9	606.89	607.19													
1011.0	607.01	607.33													
1016.1	606.23	607.34													
1027.9	605.89	607.33													
1035.1	605.82	607.34													
1042.0	607.21	607.35													
1057.4	607.24	607.44													
1061.2	605.83	607.46	608.40												
1071.1	606.05	607.48													
1086.7	606.34	607.45													
1090.5	607.63	607.71													
1098.0	607.31	607.79													
1107.9	607.30	607.79													
1112.0	606.35	607.76													
1117.6	606.65	607.78													
1123.4	606.55	607.77													
1127.1	607.26	607.78													
1141.6	607.35	607.82													
1155.6	607.40	607.82	609.63												
1160.9	606.24	607.84													
1166.9	605.98	607.79													
1176.0	606.34	607.84													
1180.8	607.71	607.95													
1189.8	607.80	608.09													
1199.6	607.92	608.28													
1202.9	606.64	608.28	609.29												
1211.1	607.06	608.27													
1528.2	609.54	610.58													



Project Name	Brahma - Baseline (2021) Profile
Reach	UT 1 (Sta 20+00 to 30+00)
Feature	Profile
Date	1/15/21
Crew	Perkinson

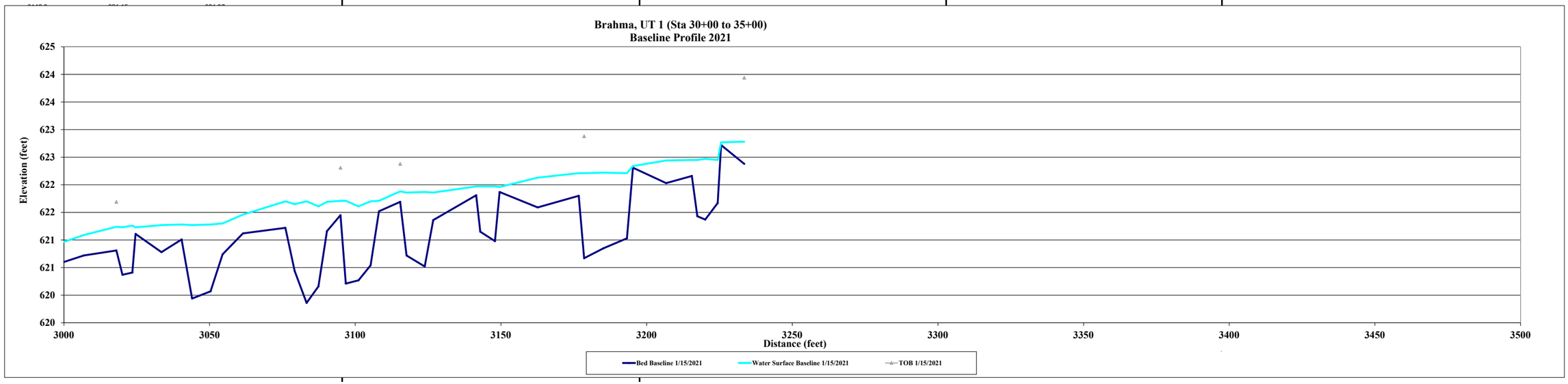
2021 Baseline Survey				As needed				As needed				As needed			
Station	**Bed Elevation**	**Water Elevation**	**TOB**	**Station**	**Bed Elevation**	**Water Elevation**	**TOB**	**Station**	**Bed Elevation**	**Water Elevation**	**TOB**	**Station**	**Bed Elevation**	**Water Elevation**	**TOB**
1995.7	612.32	613.64													
2001.0	613.19	613.69													
2012.6	613.34	613.86	614.45												
2013.9	613.05	613.88													
2015.7	612.89	613.84													
2017.9	613.32	613.84													
2021.4	612.58	613.85													
2026.4	612.67	613.84													
2029.9	613.22	613.85													
2042.6	613.31	613.86													
2047.3	612.38	613.80													
2053.3	612.85	613.85													
2056.4	613.51	613.86													
2081.8	612.42	614.19													
2088.0	612.00	614.12													
2096.8	612.79	614.20													
2100.7	614.20	614.48													
2117.5	613.92	614.49													
2131.4	614.29	614.47													
2133.5	613.16	614.50													
2138.0	612.58	614.49													
2142.8	613.11	614.48													
2148.3	614.15	614.56													
2167.7	614.41	614.87													
2170.7	614.03	614.87													
2174.2	613.95	614.87													
2178.8	613.34	614.85													



2429.0	615.60	617.01	

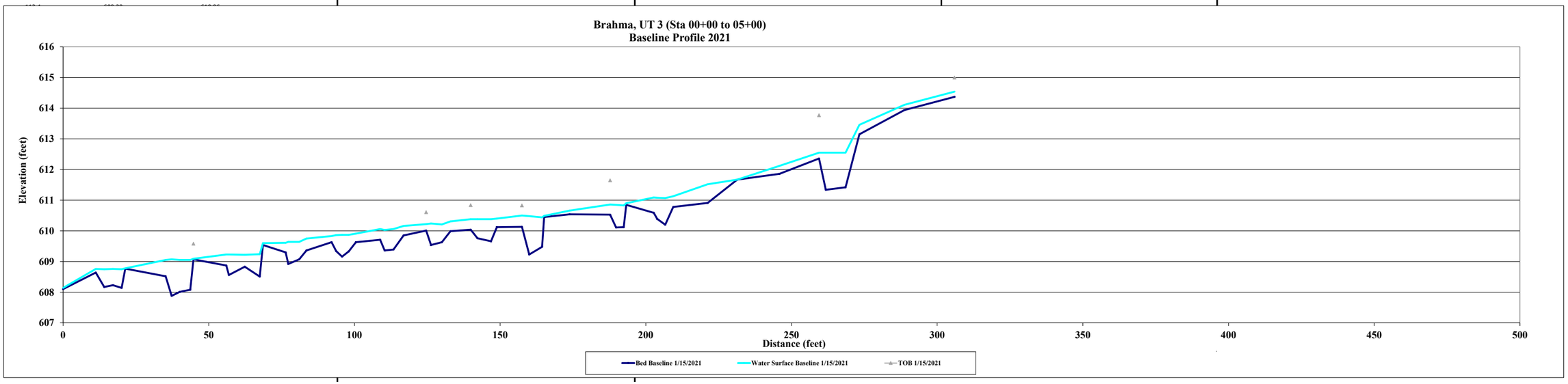
Project Name	Brahma - Baseline (2021) Profile
Reach	UT 1 (Sta 30+00 to 35+00)
Feature	Profile
Date	1/15/21
Crew	Perkinson

2021 Baseline Survey				As needed				As needed				As needed			
Station	**Bed Elevation**	**Water Elevation**	**TOB**	**Station**	**Bed Elevation**	**Water Elevation**	**TOB**	**Station**	**Bed Elevation**	**Water Elevation**	**TOB**	**Station**	**Bed Elevation**	**Water Elevation**	**TOB**
2995.8	620.53	620.89													
3006.8	620.72	621.09													
3018.0	620.81	621.24	621.69												
3020.1	620.37	621.23													
3023.5	620.41	621.26													
3024.6	621.11	621.23													
3033.5	620.78	621.27													
3040.4	621.01	621.28													
3044.0	619.94	621.27													
3050.3	620.07	621.28													
3054.5	620.74	621.30													
3061.4	621.12	621.46													
3076.0	621.22	621.70													
3079.2	620.44	621.65													
3083.3	619.86	621.70													
3087.4	620.16	621.61													
3090.3	621.16	621.69													
3094.9	621.45	621.71	622.31												
3096.8	620.21	621.71													
3101.1	620.27	621.61													
3105.2	620.54	621.70													
3108.1	621.52	621.71													
3115.4	621.69	621.88	622.38												
3117.6	620.72	621.86													
3123.8	620.52	621.87													
3126.8	621.36	621.86													
3141.5	621.81	621.97													



Project Name	Brahma - Baseline (2021) Profile
Reach	UT 3 (Sta 00+00 to 05+00)
Feature	Profile
Date	1/15/21
Crew	Perkinson

2021 Baseline Survey				As needed				As needed				As needed			
Station	**Bed Elevation**	**Water Elevation**	**TOB**	**Station**	**Bed Elevation**	**Water Elevation**	**TOB**	**Station**	**Bed Elevation**	**Water Elevation**	**TOB**	**Station**	**Bed Elevation**	**Water Elevation**	**TOB**
0.0	608.10	608.14													
11.2	608.64	608.76													
14.1	608.17	608.75													
17.1	608.23	608.76													
20.1	608.14	608.75													
21.3	608.77	608.78													
35.2	608.52	609.05													
37.3	607.88	609.07													
40.1	608.01	609.05													
43.6	608.08	609.05													
44.7	609.07	609.09	609.58												
56.0	608.87	609.23													
56.9	608.56	609.23													
62.3	608.83	609.22													
67.5	608.51	609.24													
68.6	609.54	609.60													
76.4	609.30	609.61													
77.3	608.92	609.64													
81.0	609.07	609.64													
83.5	609.36	609.75													
92.2	609.63	609.83													
93.7	609.34	609.86													
95.8	609.16	609.87													
98.0	609.33	609.87													
100.5	609.63	609.91													
108.8	609.71	610.06													
110.4	609.36	610.03													



Project Name	Brahma - Baseline (2021) Profile
Reach	UT 6 (Sta 00+00 to 06+00)
Feature	Profile
Date	1/15/21
Crew	Perkinson

2021 Baseline Survey				As needed				As needed				As needed			
Station	**Bed Elevation**	**Water Elevation**	**TOB**	**Station**	**Bed Elevation**	**Water Elevation**	**TOB**	**Station**	**Bed Elevation**	**Water Elevation**	**TOB**	**Station**	**Bed Elevation**	**Water Elevation**	**TOB**
0.0	606.92	607.40	608.55												
7.6	608.02	608.09													
16.3	608.40	608.66													
16.9	608.34	608.60													
18.1	608.07	608.65													
19.4	608.84	609.03													
30.8	609.60	609.64													
41.4	609.87	610.00	610.52												
43.6	609.20	610.01													
47.9	609.13	610.01													
50.7	609.67	610.02													
59.3	609.86	610.17													
61.1	609.60	610.17													
63.6	609.55	610.18													
66.4	610.29	610.30													
77.5	610.74	610.82													
84.6	610.81	611.10													
85.5	610.46	611.11													
88.8	610.55	611.11													
90.6	611.00	611.17													
99.5	611.10	611.39	611.96												
100.7	610.69	611.39													
102.5	610.90	611.39													
106.3	610.92	611.38													
110.2	611.37	611.56													
118.5	611.88	612.10													
119.7	611.40	612.10													
288.7	616.75	616.79													

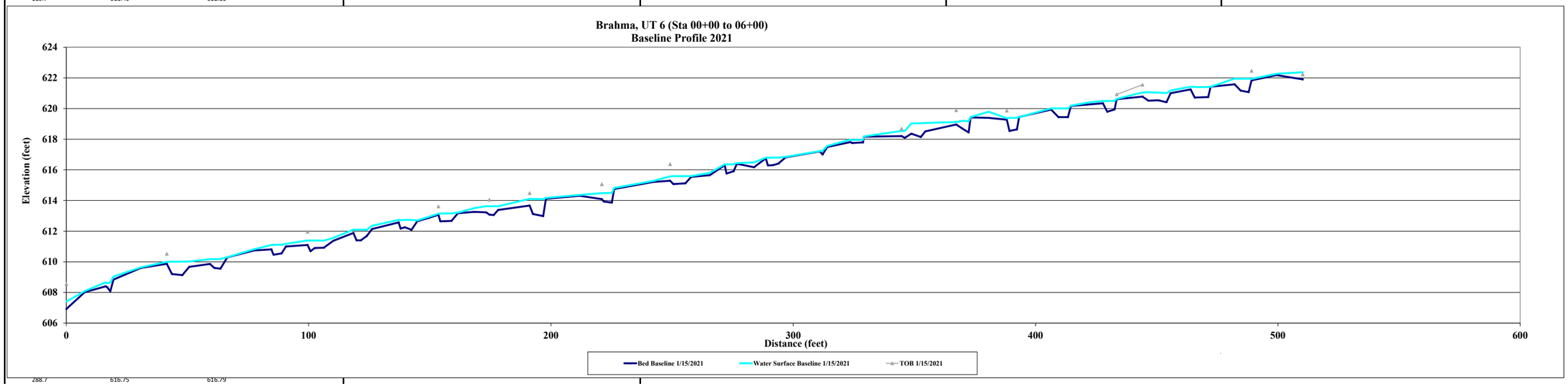


Table 9A. Baseline Stream Data Summary Brahma - UT 1 (Upstream)										
Parameter	**Pre-Existing Condition (applicaple)**					**Design**		**Monitoring Baseline (MY0)**		
Riffle Only	Min	Mean	Med	Max	n	Min	Max	Min	Max	n
Bankfull Width (ft)	5.8	8		16		9.4	10.8	9.8	12.9	3
Floodprone Width (ft)	6	8		14		40	100	100	100	3
Bankfull Mean Depth (ft)	0.5	0.9		1.3		0.7	0.8	0.6	1.0	3
Bankfull Max Depth (ft)	1	1.5		1.8		0.9	1.2	1.1	1.6	3
Bankfull Cross Sectional Area (ft^2)	7.3	7.3		7.3		7.3	7.3	6.2	10.7	3
Width/Depth Ratio	4.5	9.1		32		12	16	11.3	15.8	3
Entrenchment Ratio	0.9	1		1		4.3	9.3	7.8	10.2	3
Bank Height Ratio	**1.1**	**1.5**		**1.9**		**1**	**1.3**	**1.0**	**1.0**	3
Max part size (mm) mobilized at bankfull										
Rosgen Classification	G5					E/C 4		E/C 4		
Bankfull Discharge (cfs)	28.2					28.2		28.2		
Sinuosity (ft)	1.1					1.12		1.12		
Water Surface Slope (Channel) (ft/ft)	0.0076					0.0075		0.0073		
Other										

Table 9B. Baseline Stream Data Summary Brahma - UT 1 (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)	5.4	8.2		16.9		10.2	11.8	9.6	9.6	1
Floodprone Width (ft)	14	19		100		50	150	75.0	75.0	1
Bankfull Mean Depth (ft)	0.5	1.1		1.6		0.7	0.9	1.1	1.1	1
Bankfull Max Depth (ft)	0.8	1.6		2.7		0.9	1.3	1.6	1.6	1
Bankfull Cross Sectional Area (ft^2)	8.7	8.7		8.7		8.7	8.7	11.0	11.0	1
Width/Depth Ratio	3.4	7.8		33.8		12	16	8.4	8.4	1
Entrenchment Ratio	1.3	2.4		13.3		4.9	12.7	7.8	7.8	1
Bank Height Ratio	**1.2**	**2.1**		**2.9**		**1**	**1.3**	**1.0**	**1.0**	1
Max part size (mm) mobilized at bankfull										
Rosgen Classification	Gg 4/5					E/C 4		E 4		
Bankfull Discharge (cfs)	34.4					34.4		34.4		
Sinuosity (ft)	1.33					1.33		1.33		
Water Surface Slope (Channel) (ft/ft)	0.0052					0.0052		0.0064		
Other										

Table 9C. Baseline Stream Data Summary Brahma - UT 3										
Parameter	**Pre-Existing Condition (applicaple)**					**Design**		**Monitoring Baseline (MY0)**		
Riffle Only	Min	Mean	Med	Max	n	Min	Max	Min	Max	n
Bankfull Width (ft)	3.1	3.8		5.9		4.1	4.7	4.9	4.9	1
Floodprone Width (ft)	3	5		8		25	75	50.0	50.0	1
Bankfull Mean Depth (ft)	0.3	0.4		0.5		0.3	0.4	0.3	0.3	1
Bankfull Max Depth (ft)	0.4	0.6		0.7		0.4	0.5	0.6	0.6	1
Bankfull Cross Sectional Area (ft^2)	1.5	1.5		1.5		1.5	1.5	1.7	1.7	1
Width/Depth Ratio	6.2	9.5		19.7		12	16	14.3	14.3	1
Entrenchment Ratio	0.8	1.4		1.6		6.1	15.8	10.2	10.2	1
Bank Height Ratio	**2.3**	**3.2**		**4**		**1**	**1.3**	**1.0**	**1.0**	1
Max part size (mm) mobilized at bankfull										
Rosgen Classification	G 5					E/C 4		E/C 4		
Bankfull Discharge (cfs)	5.4					5.4		5.4		
Sinuosity (ft)	1.08					1.12		1.12		
Water Surface Slope (Channel) (ft/ft)	0.017					0.0173		0.0195		
Other										

Table 9D. Baseline Stream Data Summary Brahma - UT 6										
Parameter	**Pre-Existing Condition (applicaple)**					**Design**		**Monitoring Baseline (MY0)**		
Riffle Only	Min	Mean	Med	Max	n	Min	Max	Min	Max	n
Bankfull Width (ft)	3.3	6.5		16.3		4.1	4.7	4.1	4.1	1
Floodprone Width (ft)	5	13		23		25	75	50.0	50.0	1
Bankfull Mean Depth (ft)	0.1	0.2		0.4		0.3	0.4	0.4	0.4	1
Bankfull Max Depth (ft)	0.2	0.4		0.7		0.4	0.5	0.7	0.7	1
Bankfull Cross Sectional Area (ft^2)	1.4	1.4		1.4		1.4	1.4	1.8	1.8	1
Width/Depth Ratio	3.6	32.5		163		12	16	9.6	9.6	1
Entrenchment Ratio	1.2	1.5		2.7		6.1	15.8	12.1	12.1	1
Bank Height Ratio	**1**	**3.1**		**5**		**1**	**1.3**	**1.0**	**1.0**	1
Max part size (mm) mobilized at bankfull										
Rosgen Classification	F 5					E/C 4		E 4		
Bankfull Discharge (cfs)	4.8					4.8		4.8		
Sinuosity (ft)	1.02					1.12		1.12		
Water Surface Slope (Channel) (ft/ft)	0.0203					0.0173		0.0297		
Other										

Table 10A. Monitoring Data - Cross Section Morphology Monitoring Summary
(Brahma/ DMS:100092) UT 1

	UT 1 - Cross Section 1 (Pool)							UT 1 - Cross Section 2 (Riffle)							UT 1 - Cross Section 3 (Riffle)							UT 1 - Cross Section 4 (Pool)							UT 1 - Cross Section 5 (Riffle)						
	MY0	MY1	MY2	MY3	MY5	MY7	MY+	MY0	MY1	MY2	MY3	MY5	MY7	MY+	MY0	MY1	MY2	MY3	MY5	MY7	MY+	MY0	MY1	MY2	MY3	MY5	MY7	MY+	MY0	MY1	MY2	MY3	MY5	MY7	MY+
Bankfull Elevation (ft) - Based on AB-Bankfull[1] Area	597.11							597.43							599.24							600.54							606.49						
Bank Height Ratio_Based on AB Bankfull[1] Area	1.00							1.00							1.00							1.00							1.00						
Thalweg Elevation	595.50							596.4							597.83							598.02							604.89						
LTOB[2] Elevation	597.11							597.4							599.24							600.54							606.49						
LTOB[2] Max Depth (ft)	1.61							1.04							1.41							2.52							1.60						
LTOB[2] Cross Sectional Area (ft^2)	8.7							6.0							10.5							14.6							10.7						
	UT 1 - Cross Section 6 (Pool)							**UT 1 - Cross Section 7 (Riffle)**							**UT 1 - Cross Section 8 (Riffle)**																					
	MY0	MY1	MY2	MY3	MY5	MY7	MY+	MY0	MY1	MY2	MY3	MY5	MY7	MY+	MY0	MY1	MY2	MY3	MY5	MY7	MY+															
Bankfull Elevation (ft) - Based on AB-Bankfull[1] Area	606.58							611.70							611.59																					
Bank Height Ratio_Based on AB Bankfull[1] Area	1.00							1.00							1.00																					
Thalweg Elevation	602.89							610.1							609.02																					
LTOB[2] Elevation	606.58							611.7							611.59																					
LTOB[2] Max Depth (ft)	3.69							1.61							2.57																					
LTOB[2] Cross Sectional Area (ft^2)	18.0							11.0							13.3																					

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)							

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

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

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

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

Table 10B. Monitoring Data - Cross Section Morphology Monitoring Summary
(Brahma/ DMS:100092) UT 3 and UT 6

	UT 3 - Cross Section 9 (Riffle)							UT 3 - Cross Section 10 (Pool)							UT 6 - Cross Section 11 (Pool)							UT 6 - Cross Section 12 (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	602.04							602.55							605.79							605.90													
Bank Height Ratio_Based on AB Bankfull[1] Area	1.00							1.00							1.00							1.00													
Thalweg Elevation	601.40							601.7							604.69							605.26													
LTOB[2] Elevation	602.04							602.6							605.79							605.90													
LTOB[2] Max Depth (ft)	0.64							0.83							1.10							0.64													
LTOB[2] Cross Sectional Area (ft^2)	1.7							1.6							3.4							1.6													

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

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

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

Appendix D
Hydrologic Data

Groundwater Gauge Soil Profiles

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

Axiom Environmental, Inc.

SOIL BORING LOG

Project/Site: Brahma Site

County, State: Alamance, NC

Sampling Point/
Coordinates: GW1 / 35.85676, -79.411422

Investigator: Lewis

Notes:

Depth (inches)	Matrix		Mottling		Texture
	Color	%	Color	%	
0-4	10YR 5/2	100	-	-	Loam
4-12	10YR 7/2	95	10 YR 6/1	3	Fine Sandy Loam
			10 YR 6/4	2	
12+	10YR 7/2	50	10 YR 5/6	4	Sandy Clay
	10YR 6/6	46			

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

Project/Site: Brahma Site

County, State: Alamance, NC

Sampling Point/
Coordinates: GW2 / 35.856591, -79.411864

Investigator: Lewis

Notes:

Depth (inches)	Matrix		Mottling		Texture
	Color	%	Color	%	
0-3	10YR 5/2	98	10 YR 4/4	2	Loam
3-8	10YR 7/2	97	10 YR 4/6	2	Fine Sandy Loam
			10 YR 3/1	1	
8+	10YR 7/4	98	10 YR 6/2	2	Fine Sandy Loam

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

Project/Site: Brahma Site

County, State: Alamance, NC

Sampling Point/
Coordinates: GW3 / 35.856085, -79.411777

Investigator: Lewis

Notes:

Depth (inches)	Matrix		Mottling		Texture
	Color	%	Color	%	
0-2	10YR 5/3	95	10YR 3/4	5	Loam
2-6	10YR 6/2	97	10YR 4/6	2	Fine Sandy Loam
			10YR 3/1	1	
6+	10YR 6/2	80	10YR 6/6	20	Fine Sandy Loam

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Name/Print: W. Grant Lewis

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

Axiom Environmental, Inc.

SOIL BORING LOG

Project/Site: Brahma Site

County, State: Alamance, NC

Sampling Point/
Coordinates: GW4 / 35.855802, -79.411305

Investigator: Lewis

Notes:

Depth (inches)	Matrix		Mottling		Texture
	Color	%	Color	%	
0-2	10YR 6/2	95	10YR 4/4	5	Sandy Loam
2-9	10YR 7/1	85	10YR 6/1	10	Fine Sandy Loam
			10YR 5/6	5	
9+	10YR 7/1	97	10YR 6/6	3	Fine Sandy Loam

North Carolina Licensed Soil Scientist

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Name/Print: W. Grant Lewis

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

Axiom Environmental, Inc.

SOIL BORING LOG

Project/Site: Brahma Site

County, State: Alamance, NC

Sampling Point/
Coordinates: GW5 / 35.855268, -79.411734

Investigator: Lewis

Notes:

Depth (inches)	Matrix		Mottling		Texture
	Color	%	Color	%	
0-2	10YR 6/2	95	10YR 5/6	5	Sandy Loam
2-11	10YR 7/2	75	2.5Y 7/4	20	Fine Sandy Loam
			10YR 6/6	5	
11+	10YR 6/6	80	10YR 7/2	20	Sandy Clay Loam

North Carolina Licensed Soil Scientist

Number: 1233

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Name/Print: W. Grant Lewis

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

Axiom Environmental, Inc.

SOIL BORING LOG

Project/Site: Brahma Site

County, State: Alamance, NC

Sampling Point/
Coordinates: GW6 / 35.855112, -79.411422

Investigator: Lewis

Notes:

Depth (inches)	Matrix		Mottling		Texture
	Color	%	Color	%	
0-4	10YR 4/1	97	10YR 4/4	3	Fine Sandy Loam
4-9	10YR 6/2	95	10YR 4/4	5	Fine Sandy Loam
9+	10YR 7/1	70	10YR 6/6	30	Fine Sandy Loam

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

Project/Site: Brahma Site

County, State: Alamance, NC

Sampling Point/
Coordinates: GW7 / 35.854738, -79.411192

Investigator: Lewis

Notes:

Depth (inches)	Matrix		Mottling		Texture
	Color	%	Color	%	
0-1	10YR 5/2	97	10yr 5/6	3	Fine Sandy Loam
1-10	10YR 6/2	95	10yr 5/6	2	Fine Sandy Loam
			10YR 6/4	3	
10+	10YR 6/2	80	10YR 6/6	20	Clay Loam

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

Project/Site: Brahma Site

County, State: Alamance, NC

Sampling Point/
Coordinates: GW8 / 35.853817, -79.410806

Investigator: Lewis

Notes:

Depth (inches)	Matrix		Mottling		Texture
	Color	%	Color	%	
0-3	10YR 4/3	100	-	-	Loam
3-12	10YR 6/3	50	10YR 5/6	5	Sandy Clay Loam
	10YR 6/1	45			
12+	10YR 6/1	90	10YR 6/2	7	Sandy Clay Loam
			10YR 5/6	3	

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

Project/Site: Brahma Site

County, State: Alamance, NC

Sampling Point/
Coordinates: GW9 / 35.853378, -79.410372

Investigator: Lewis

Notes:

Depth (inches)	Matrix		Mottling		Texture
	Color	%	Color	%	
0-2	10YR 6/2	95	10YR 4/4	5	Loam
2-9	10YR 6/2	60	10YR 6/1	35	Clay Loam
			10YR 5/6	5	
9+	10YR 6/2	40	10YR 5/6	20	Silt Loam
	10YR 7/1	40			

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

Project/Site: Brahma Site

County, State: Alamance, NC

Sampling Point/
Coordinates: GW10 / 35.852992, -79.409984

Investigator: Lewis

Notes:

Depth (inches)	Matrix		Mottling		Texture
	Color	%	Color	%	
0-2	10YR 4/2	80	10YR 5/1	15	Loamy Clay
			10YR 4/6	5	
2-10	10YR 6/2	95	10YR 5/6	5	Sandy Clay Loam
10+	10YR 6/1	85	10YR 5/6	10	Fine Sandy Loam
			10YR 5/8	5	

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

Project/Site: Brahma Site

County, State: Alamance, NC

Sampling Point/
Coordinates: GW11 / 35.852792, -79.409045

Investigator: Lewis

Notes:

Depth (inches)	Matrix		Mottling		Texture
	Color	%	Color	%	
0-3	10YR 5/2	40	10YR 4/6	10	Loam
	10YR 5/1	40	10YR 5/6	10	
3-11	10YR 6/2	95	10YR 6/6	5	Fine Sandy Loam
11+	10YR 6/2	60	10YR 6/8	37	Fine Sandy Loam
			10YR 5/8	3	

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

Project/Site: Brahma Site

County, State: Alamance, NC

Sampling Point/
Coordinates: GW12 / 35.852387, -79.410655

Investigator: Lewis

Notes:

Depth (inches)	Matrix		Mottling		Texture
	Color	%	Color	%	
0-2	10YR 3/3	90	10YR 6/1	10	Loam
2-13	10YR 6/2	95	10YR 4/6	5	Sandy Clay Loam
13+	10YR 6/1	80	10YR 5/3	15	Fine Sandy Loam
			10YR 4/6	5	

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	Dec-18
Mitigation Plan Approved	NA	8-Jul-20
Construction (Grading) Completed	NA	9-Dec-21
Planting Completed	NA	12-Jan-21
As-built Survey Completed	NA	Feb-21
MY-0 Baseline Report	Jan-21	Apr-21
MY1+ Monitoring Reports		

Table 12. Project Contacts

Brahma Site/100092	
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
Figure F-1. Asbuilt Fencing

PAI ID NO			52714	52715
STATION			UT-1-US	UT-1-DS
DATE			7/1/2019	7/1/2019
SPECIES	T.V.	F.F.G.		
MOLLUSCA				
Gastropoda				
Basommatophora				
Physidae				
Physella sp.	8.7	CG	2	1
ANNELIDA				
Clitellata				
Hirudinea		P		
Rhynchobdellida				
Batrachobdella phalera		P	2	
Helobdella triserialis	9.3	P		1
ARTHROPODA				
Crustacea				
Isopoda				
Asellidae		SH		
Lirceus sp.	7.4	CG	1	
Insecta				
Odonata				
Aeshnidae		P		
Aeshna sp.		P		1
Coenagrionidae		P		
Ischnura sp.	9.5		1	3
Hemiptera				
Corixidae		PI	1	
Megaloptera				
Corydalidae		P		
Chauliodes pectinicornis			2	
Coleoptera				
Scirtidae		SC		
Scirtes sp.			8	
Diptera				
Chironomidae				
Psectrotanypus dyari	*10*	P	3	1
Culicidae		FC		
Anopheles sp.	*8.6*	FC		1
Culex sp.		FC	1	
TOTAL NO. OF ORGANISMS			21	8
TOTAL NO. OF TAXA			9	6
EPT TAXA			0	0
BIOTIC INDEX ASSIGNED VALUES			9.27	9.30

3/06 Revision 6

Brahma Util US

Habitat Assessment Field Data Sheet
Mountain/ Piedmont Streams

53

Biological Assessment Unit, DWQ **TOTAL SCORE**

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 Brahma Util US Location/road: SnowCamp NC (Road Name Clark) County Alamance

Date 190701 **CC#** 03030002 Basin Cape Fear Subbasin 03-06-04

Observer(s) P.P.D.C Type of Study: ☐ Fish ☑ Benthos ☐ Basinwide ☐ Special Study (Describe) _____

Latitude 35.852042 Longitude -79.408454 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 80 %Active Pasture _____ % Active Crops
_____ %Fallow Fields _____ % Commercial _____ %Industrial _____ %Other - Describe: _____

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

Width: (meters) Stream 1.5 Channel (at top of bank) _____ **Stream Depth:** (m) Avg .1 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** _____

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: hot - dry **Photos:** ☐ N ☒ Y ☐ Digital ☐ 35mm

Remarks: Proposed stream and wetland mitigation site. Livestock has unrestricted access to entire stream

Brahma UL 145

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 3

Remarks _____ Subtotal ___

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** _X_**Sticks and leafpacks** ____**Snags and logs** ____**Undercut banks or root mats**

AMOUNT OF REACH FAVORABLE FOR COLONIZATION OR COVER

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

☐ No woody vegetation in riparian zone Remarks _____ Subtotal 9

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 Riffles are sand/gravel Subtotal 4

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

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

Subtotal 8

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

Remarks _____

Page Total 25

Brahma_47.1-45

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 3

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 10

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 7

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

Remarks Mixed successional forest, minimal invasive species Total 8

Page Total 28

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

Brahma UT1_DS

3/06 Revision 6

Habitat Assessment Field Data Sheet
Mountain/ Piedmont Streams

Biological Assessment Unit, DWQ **TOTAL SCORE**

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 Brahma UT-1 DS Location/road: Snow Camp NC (Road Name Clark) County Alamance

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

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

Latitude 35.857212 Longitude -79.411824 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 80 %Active Pasture _____ % 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) 2 **Stream Depth:** (m) Avg .1 Max .3
☐ Width variable ☐ Large river >25m wide
Bank Height (from deepest part of riffle to top of bank-first flat surface you stand on): (m) 1.5

Bank Angle: 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** _____

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: Dry **Photos:** ☐ N ☒ Y ☒ Digital ☐ 35mm

Remarks: Livestock have unrestricted access to entire stream

Brahma MT-1 DS

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 good slow velocity, but w/cover Subtotal 5

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** X **Sticks and leafpacks** ____**Snags and logs** X **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 10

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 11

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

A. Pools present Score

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

B. Pools absent..... 0

Subtotal 8

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

Remarks

Page Total 34

Brahma UT-1 DS

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 10

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

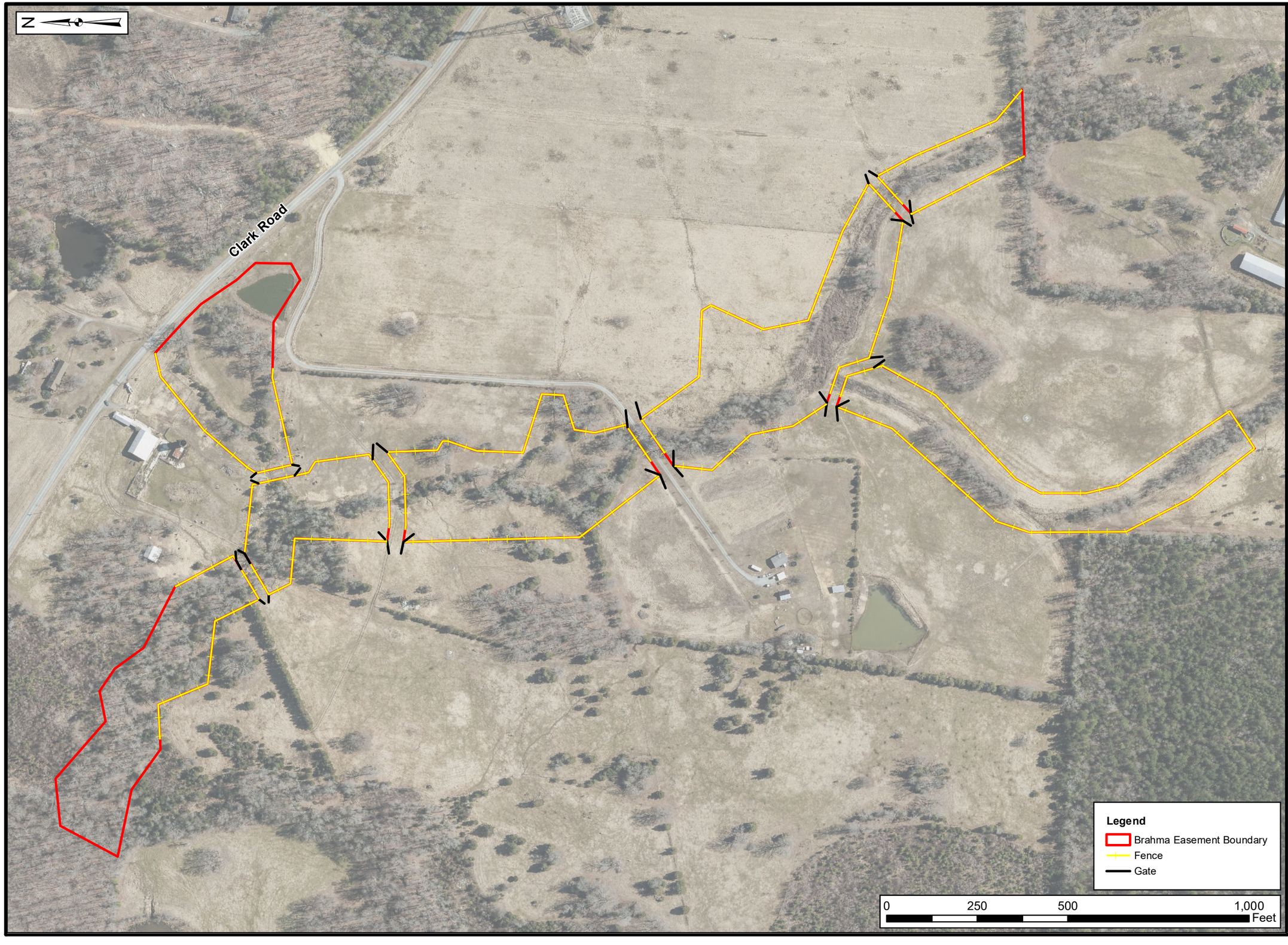
Definition: Riparian zone for this form is area of natural vegetation adjacent to stream (can go beyond floodplain). Definition: A break in the riparian zone is any place on the stream banks which allows sediment or pollutants to directly enter the stream, such as paths down to stream, storm drains,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

Remarks _____ Total 8

Page Total 42

☐ Disclaimer-form filled out, but score doesn't match subjective opinion-atypical stream. **TOTAL SCORE** 74



Axiom Environmental, Inc.

Prepared for:

RESTORATION SYSTEMS | LLC

Project:

BRAHMA MITIGATION SITE

Alamance County, NC

Title:

ASBUILT FENCING

Drawn by: KRJ

Date: APR 2021

Scale: 1:3000

Project No.: 19-006

FIGURE

F-1

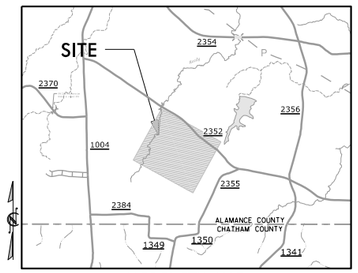
09/06/69

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

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

LOCATION: ALAMANCE COUNTY, NORTH CAROLINA

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

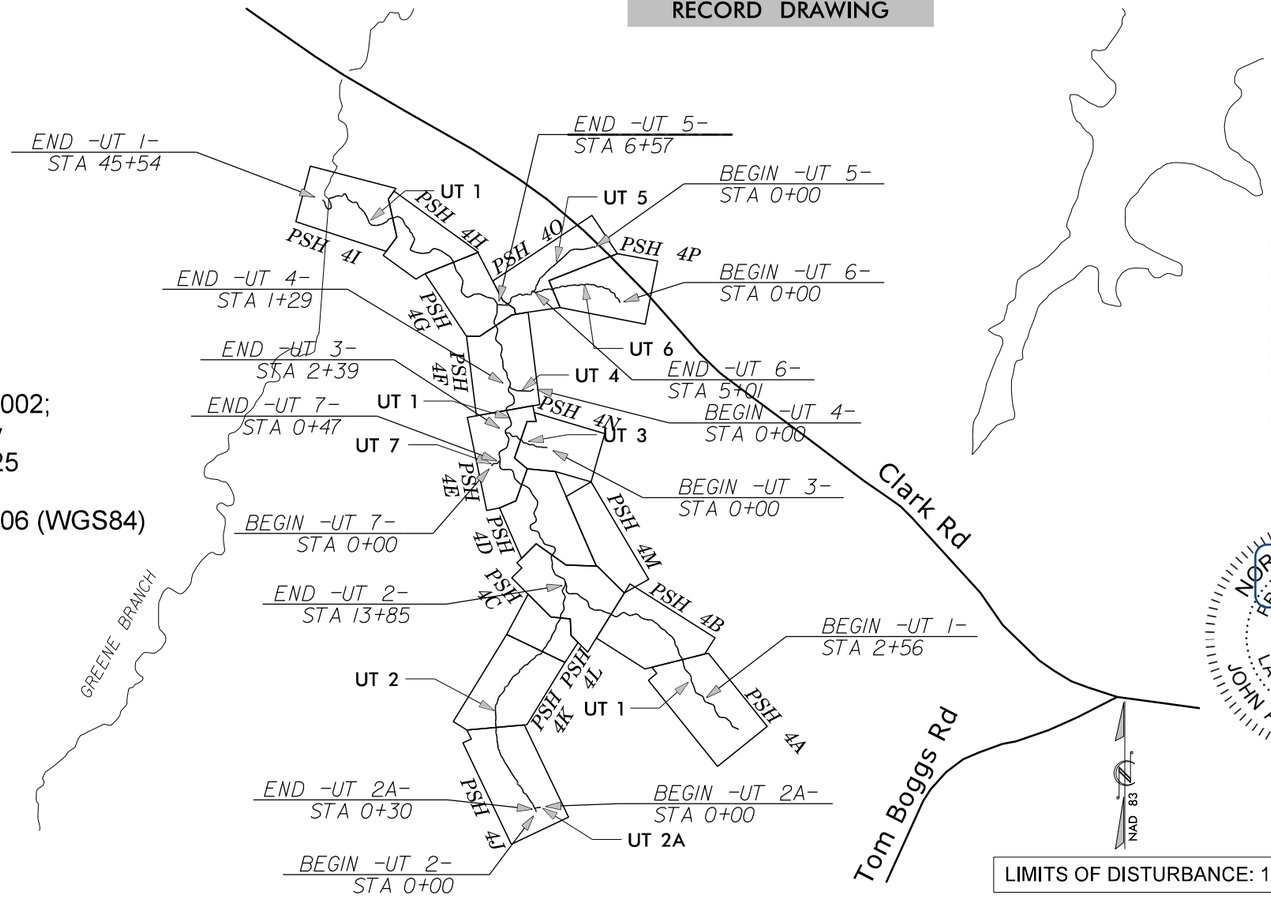


VICINITY MAP
Not to Scale

INDEX OF SHEETS

SHEET NUMBER	SHEET
01	Title Sheet
02	Symbology
03	Easement
04A THRU 04P	As-Built Structures
04Q	As-Built Planting Table

RECORD DRAWING



Brahma Site
Site #100058
Cape Fear 03030002;
Alamance County
Contract #0007525
Latitude: 35.8540
Longitude: -79.4106 (WGS84)

LIMITS OF DISTURBANCE: 15.96 AC

SURVEYORS CERTIFICATION(S)

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

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

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

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

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

SEAL OR STAMP

DocuSigned by:
John A. Rudolph
A71BB30246D34EC...

NORTH CAROLINA PROFESSIONAL SEAL L-4194 LAND SURVEYOR JOHN ASHLEY RUDOLPH

3/24/2021

L-4194
Professional Land Surveyor — License Number

CONTRACT: BRAHMA SITE

GRAPHIC SCALES

50 25 0 50 100
PLANS

50 25 0 50 100
PROFILE (HORIZONTAL)

10 5 0 10 5
PROFILE (VERTICAL)

PROPOSED LENGTH OF -UT 1- = 4298	PROPOSED LENGTH OF -UT 4- = 129
PROPOSED LENGTH OF -UT 2- = 1385	PROPOSED LENGTH OF -UT 5- = 657
PROPOSED LENGTH OF -UT 2A- = 30	PROPOSED LENGTH OF -UT 6- = 501
PROPOSED LENGTH OF -UT 3- = 239	PROPOSED LENGTH OF -UT 7- = 47

TOTAL STREAM LENGTHS (LF) = 7286

RESTORATION LEVEL	STREAM (linear footage)	RIPARIAN WETLAND (acreage)	NONRIPARIAN WETLAND (acreage)
RESTORATION	740	4.740	0.000
ENHANCEMENT I	3034	3.709	0.000
ENHANCEMENT II	2378	0.000	0.000
PRESERVATION	911	0.601	0.000
TOTALS	7063	9.050	0.000
MITIGATION UNITS	3881.066 SMUs	6.655 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:
Joshua G. Dalton
1089AD8C14994C3...

NORTH CAROLINA PROFESSIONAL SEAL 26971 ENGINEER JOSHUA G. DALTON

3/24/2021
DATE:

3/24/2021
Brahma_Rdy_PSH_AB_01.dgn
jharvey

RECORD DRAWING

CONVENTIONAL PLAN SHEET SYMBOLS

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

SHEET NAME	SHEET NUMBER
SYMBOLOGY	2
PROJECT NAME: BRAHMA SITE	
COUNTY: ALAMANCE	DATE: 2021

Axiom Environmental, Inc.
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BOUNDARIES AND PROPERTY:

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

BUILDINGS AND OTHER CULTURE:

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

HYDROLOGY:

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

RIGHT OF WAY & PROJECT CONTROL:

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

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

ROADS AND RELATED FEATURES:

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

VEGETATION:

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

EXISTING STRUCTURES:

MAJOR:

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

MINOR:

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

UTILITIES:

POWER:

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

TELEPHONE:

- Existing Telephone Pole

WATER:

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

GAS:

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

SANITARY SEWER:

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

MISCELLANEOUS:

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

AS-BUILT:

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

RECORD DRAWING

400′ 200′ 0 400′ 800′

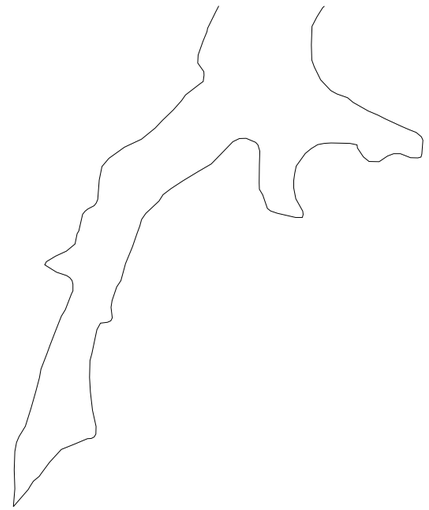
SCALE: 1″ = 400′

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

SHEET NAME		SHEET NUMBER
EASEMENT		3
PROJECT NAME: BRAHMA SITE		
	COUNTY: ALAMANCE	DATE: 2021

Axiom Environmental, Inc.

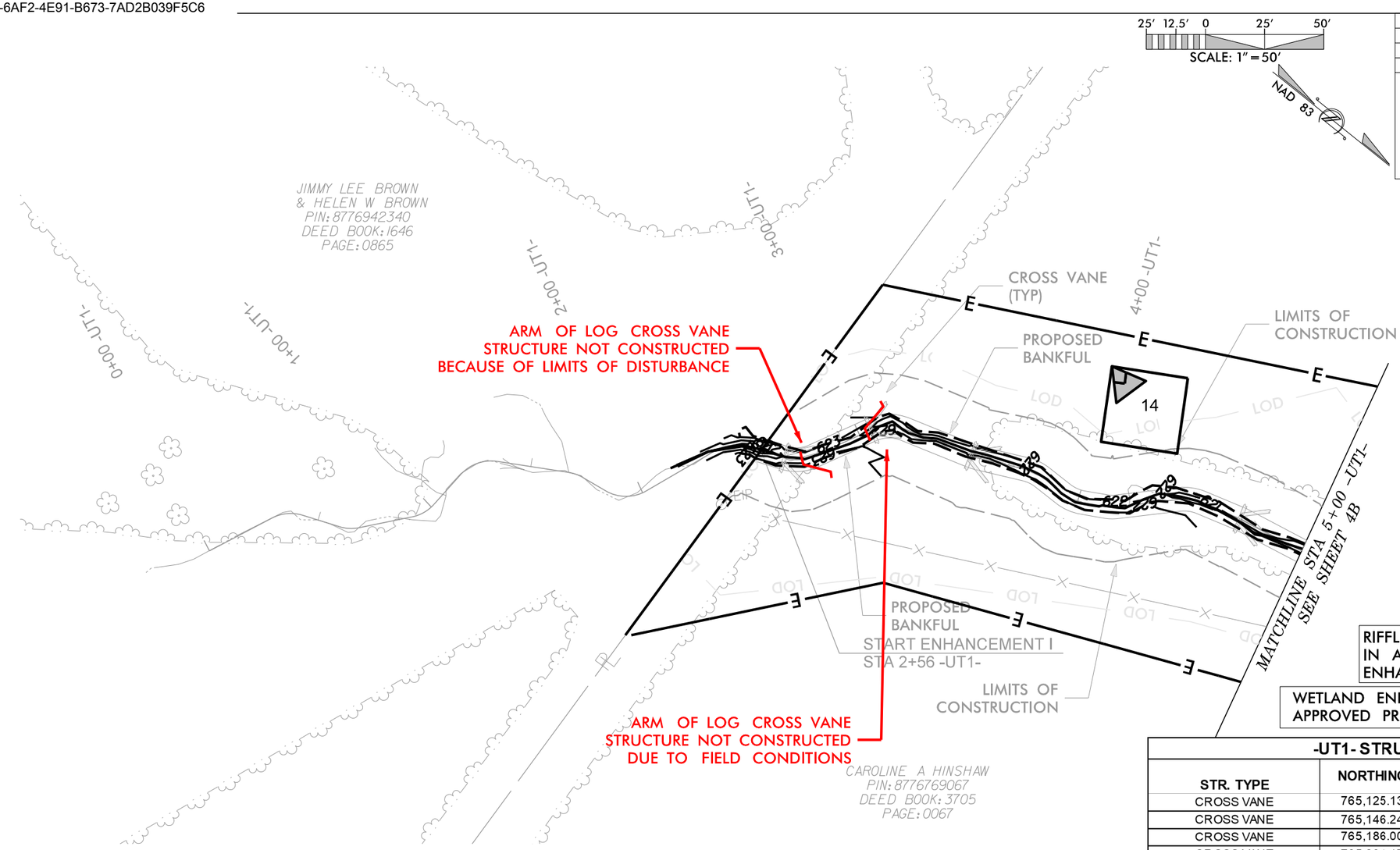
SUNGATE DESIGN GROUP, P.A.
905 JONES FRANKLIN ROAD
RALEIGH, NORTH CAROLINA 27606
TEL (919) 859-2243
ENG FIRM LICENSE NO. C-890



UT 1
UT 5
UT 6
UT 4
UT 1
UT 7
UT 3
UT 2
UT 1
UT 2A
GREENE BRANCH
Clark Rd
Tom Boggs Rd

E

3/24/2021
BY:ahar
J:\Projects\Brahma\Rdy_PSH_AB_03.dgn
jhar-v8i



SHEET NAME	SHEET NUMBER
AS-BUILT STRUCTURES	4A
PROJECT NAME: BRAHMA SITE	
COUNTY: ALAMANCE	DATE: 2021

Axiom Environmental, Inc.

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DocuSigned by:
Joshua G Dalton
1089AD8C14994C3...

NORTH CAROLINA PROFESSIONAL SEAL 26971 ENGINEER JOSHUA G. DALTON

3/24/2021
DATE:

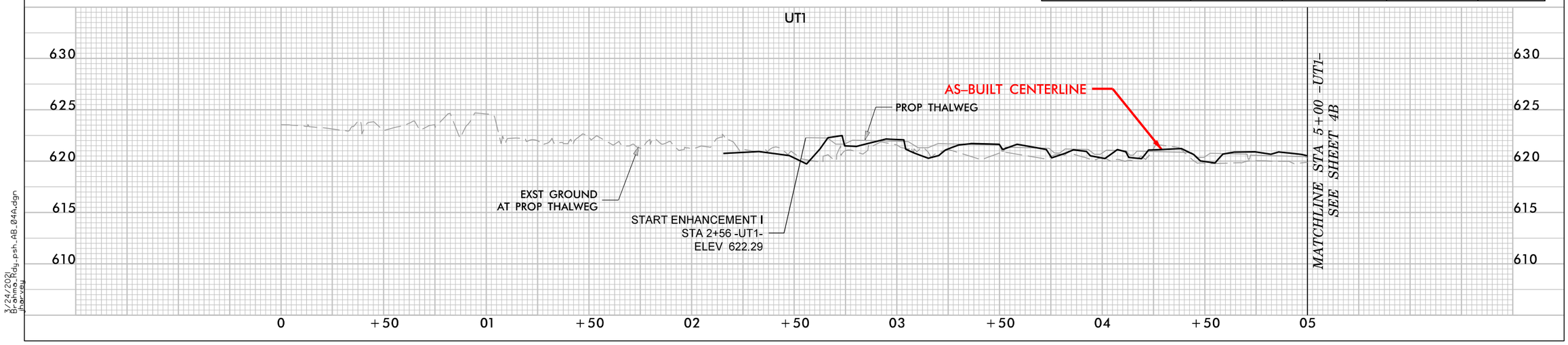
RECORD DRAWING

RIFFLE BED MATERIAL IS REQUIRED IN ALL RESTORATION AND ENHANCEMENT (LEVEL I) REACHES

WETLAND ENHANCEMENT AREAS DERIVED FROM APPROVED PRELIMINARY JURISDICTIONAL DELINEATION

-UT1- STRUCTURE LOCATIONS

STR. TYPE	NORTHING	EASTING	Prop Elevation	AB Survey Elevation
CROSS VANE	765,125.13	1,879,060.30	622.25	624.54
CROSS VANE	765,146.24	1,879,028.05	621.91	624.11
CROSS VANE	765,186.00	1,879,010.22	621.56	623.69
CROSS VANE	765,291.17	1,878,959.69	620.68	620.90



3/24/2021
BGrimm
Brahma_psh_AB_04A.dgn
jhorvey

-UT1- STRUCTURE LOCATIONS

STR. TYPE	NORTHING	EASTING	Prop Elevation	AB Survey Elevation
CROSS VANE	765,434.95	1,878,901.31	619.68	619.87
CROSS VANE	765,520.25	1,878,800.61	618.77	618.94
CROSS VANE	765,525.86	1,878,768.87	618.47	618.70
~~LOG VANE~~	~~765,558.89~~	~~1,878,661.02~~	~~617.62~~	
LOG VANE	765,544.83	1,878,622.48	617.37	617.52

RECORD DRAWING

SHEET NAME	SHEET NUMBER
AS-BUILT STRUCTURES	4B
PROJECT NAME: BRAHMA SITE	
COUNTY: ALAMANCE	DATE: 2021

Axiom Environmental, Inc.

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DocuSigned by: Joshua G. Dalton
1089A58C14994C3...

NORTH CAROLINA PROFESSIONAL SEAL 26971 ENGINEER JOSHUA G. DALTON

3/24/2021
DATE:

NAD 83

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

CAROLINE A HINSHAW
PIN: 8776769067
DEED BOOK: 3705
PAGE: 0067

MATCHLINE STA 5+00 -UT1- SEE SHEET 4A

MATCHLINE STA 10+00 -UT1- SEE SHEET 4C

GATE

PERMANENT CROSSING
1@66"x51" CSPA
1@18" CSP FLOODPLAIN PIPE EACH SIDE
16' TOP WIDTH (TYP)

LOG VANE (TYP)

PROPOSED BANKFUL

LIMITS OF CONSTRUCTION

CROSS VANE (TYP)

XS-7

XS-8

MW-11 LOG VANE STRUCTURE NOT CONSTRUCTED DUE TO EXISTING MATURE TREE

(2) 18" PIPES NOT CONSTRUCTED DUE TO EXISTING FLOODPLAIN ELEVATION SAME AS PROPOSED PIPE INVERT

MARSH TREATMENT AREA

RIFFLE BED MATERIAL IS REQUIRED IN ALL RESTORATION AND ENHANCEMENT (LEVEL I) REACHES

WETLAND ENHANCEMENT AREAS DERIVED FROM APPROVED PRELIMINARY JURISDICTIONAL DELINEATION

UT1

AS-BUILT CENTERLINE

EXST GROUND AT PROP THALWEG

PROP THALWEG

630 625 620 615 610

05 +50 06 +50 07 +50 08 +50 09 +50 10

Permanent Pipe Crossings

Centerline Station	Pipe Size	Pipe Length (feet)	Pipe Invert In (feet)	Pipe Invert Out (feet)	Bury Depth (feet)
6+93 -UT1-	1 at 66"x51" CSPA	39	618.3	618.1	1.0

3/24/2021
BY: JOSHUA DALTON
Brahma_psh_AB_04B.dgn

RECORD DRAWINGS

SHEET NAME	SHEET NUMBER
AS-BUILT STRUCTURES	4C
PROJECT NAME: BRAHMA SITE	
COUNTY: ALAMANCE	DATE: 2021

Axiom Environmental, Inc.
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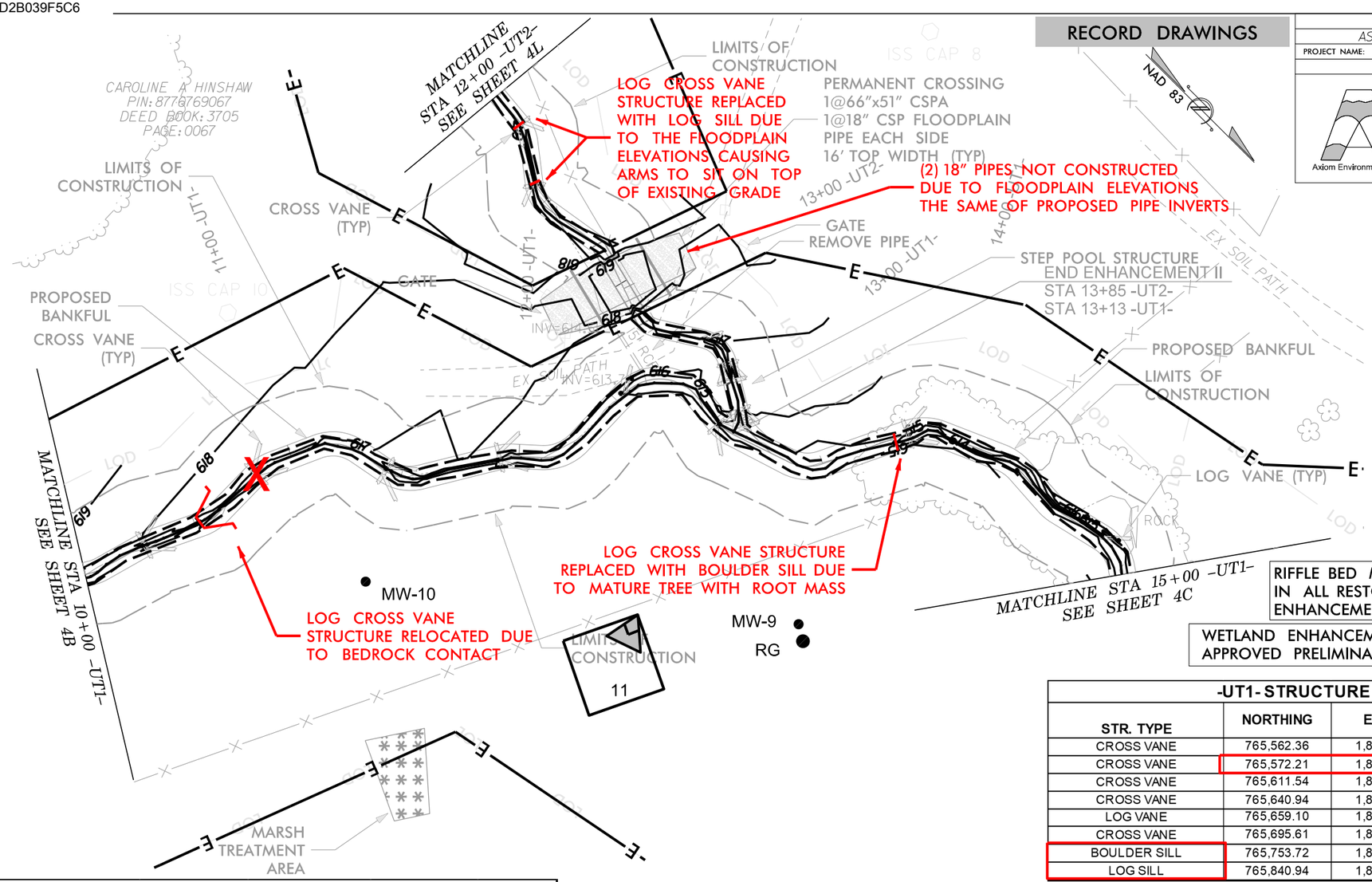
Joshua G Dalton
1089AD8C14994C3...

NORTH CAROLINA PROFESSIONAL SEAL 26971 ENGINEER JOSHUA G. DALTON

3/24/2021

DATE:



25' 12.5' 0 25' 50'

SCALE: 1" = 50'

RIFFLE BED MATERIAL IS REQUIRED IN ALL RESTORATION AND ENHANCEMENT (LEVEL I) REACHES

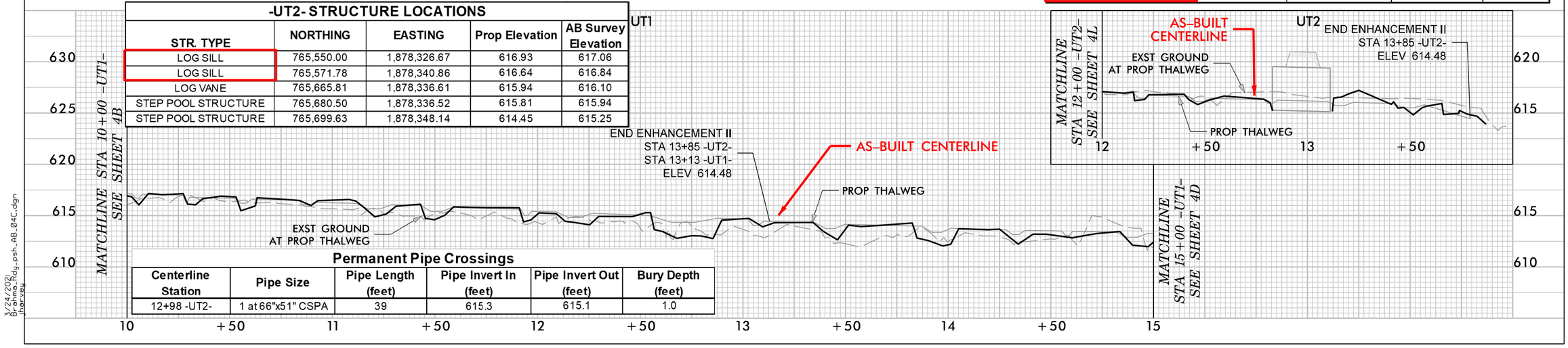
WETLAND ENHANCEMENT AREAS DERIVED FROM APPROVED PRELIMINARY JURISDICTIONAL DELINEATION

-UT1- STRUCTURE LOCATIONS

STR. TYPE	NORTHING	EASTING	Prop Elevation	AB Survey Elevation
CROSS VANE	765,562.36	1,878,560.27	616.99	617.14
CROSS VANE	765,572.21	1,878,537.31	616.50	616.82
CROSS VANE	765,611.54	1,878,467.91	615.99	616.11
CROSS VANE	765,640.94	1,878,430.75	615.62	615.77
LOG VANE	765,659.10	1,878,375.67	615.03	615.13
CROSS VANE	765,695.61	1,878,356.54	614.65	614.73
BOULDER SILL	765,753.72	1,878,304.49	613.97	614.28
LOG SILL	765,840.94	1,878,278.34	613.40	613.48

-UT2- STRUCTURE LOCATIONS

STR. TYPE	NORTHING	EASTING	Prop Elevation	AB Survey Elevation
LOG SILL	765,550.00	1,878,326.67	616.93	617.06
LOG SILL	765,571.78	1,878,340.86	616.64	616.84
LOG VANE	765,665.81	1,878,336.61	615.94	616.10
STEP POOL STRUCTURE	765,680.50	1,878,336.52	615.81	615.94
STEP POOL STRUCTURE	765,699.63	1,878,348.14	614.45	615.25



Permanent Pipe Crossings

Centerline Station	Pipe Size	Pipe Length (feet)	Pipe Invert In (feet)	Pipe Invert Out (feet)	Bury Depth (feet)
12+98 -UT2-	1 at 66"x51" CSPA	39	615.3	615.1	1.0

3/24/2021
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jharvey
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-UT1- STRUCTURE LOCATIONS

STR. TYPE	NORTHING	EASTING	Prop Elevation	AB Survey Elevation
LOG SILL	765,874.84	1,878,294.90	613.20	613.40
~~CROSS VANE~~	~~765,933.42~~	~~1,878,233.50~~	~~612.64~~	
DOUBLE LOG VANE	765,984.44	1,878,183.88	612.21	612.34
LOG VANE	766,025.11	1,878,191.51	611.81	612.03
CROSS VANE	766,064.97	1,878,190.82	611.49	611.51
CROSS VANE	766,104.78	1,878,203.19	611.16	611.09
CROSS VANE	766,124.29	1,878,207.68	610.86	610.78
~~CROSS VANE~~	~~766,171.21~~	~~1,878,180.66~~	~~610.39~~	
LOG SILL	766,183.72	1,878,176.23		610.43
LOG SILL	766,190.94	1,878,172.45		610.02
CROSS VANE	766,196.43	1,878,167.93	610.02	610.01
CROSS VANE	766,214.01	1,878,145.05	609.69	609.90

WETLAND ENHANCEMENT AREAS DERIVED FROM APPROVED PRELIMINARY JURISDICTIONAL DELINEATION

RIFFLE BED MATERIAL IS REQUIRED IN ALL RESTORATION AND ENHANCEMENT (LEVEL I) REACHES

RECORD DRAWING

SHEET NAME	SHEET NUMBER
AS-BUILT STRUCTURES	4D
PROJECT NAME: BRAHMA SITE	
COUNTY: ALAMANCE	DATE: 2021

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

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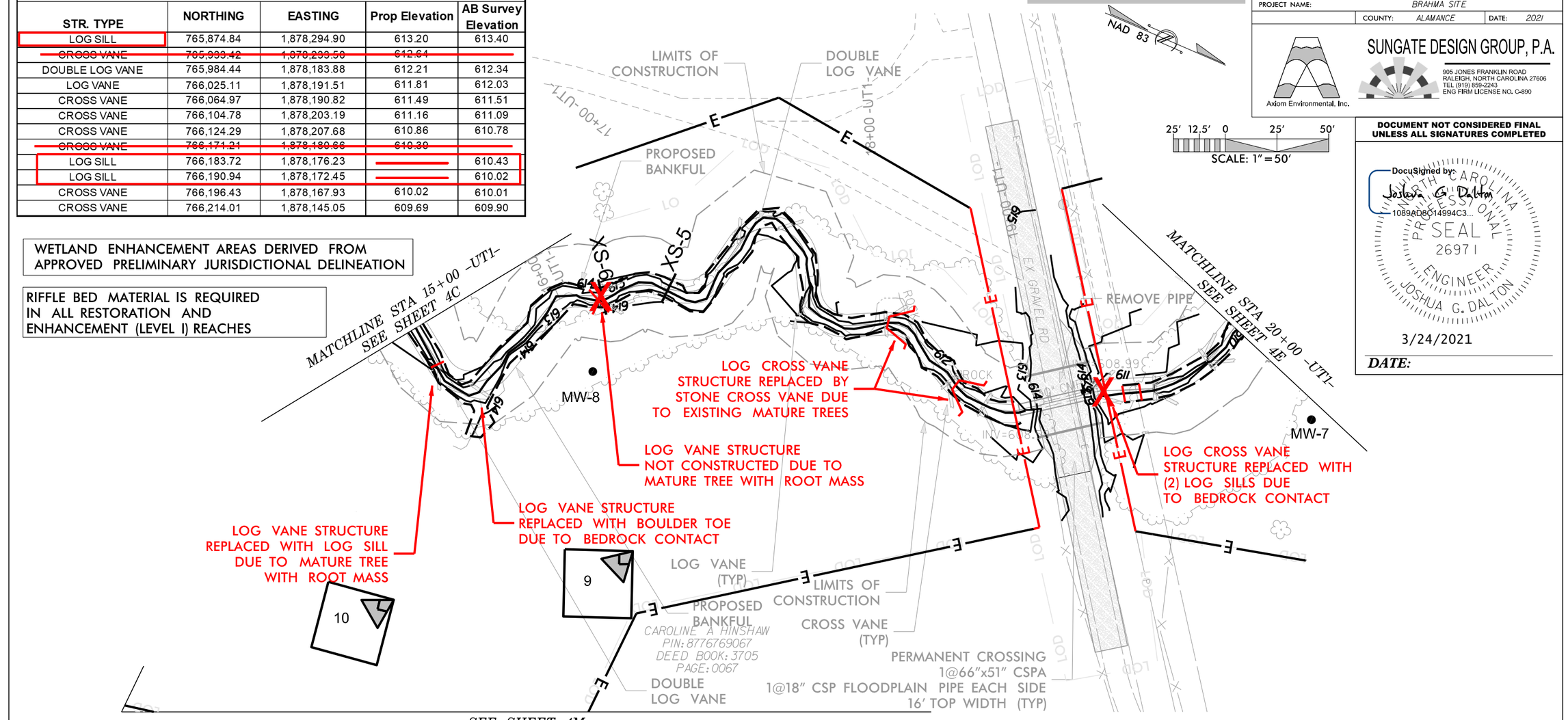
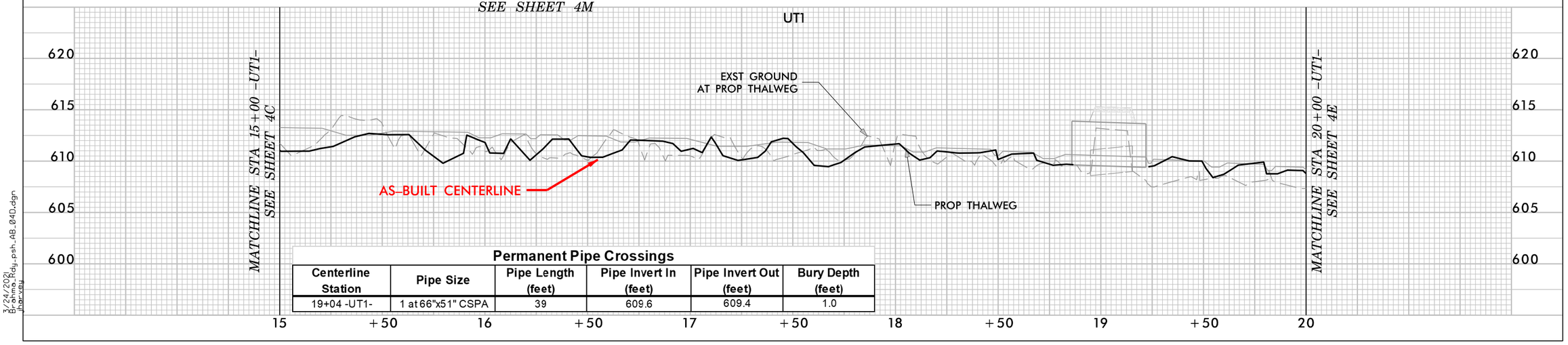
DocuSigned by: Joshua G. Dalton 1089AD8C14994C3...

NORTH CAROLINA PROFESSIONAL SEAL 26971 ENGINEER JOSHUA G. DALTON

3/24/2021

DATE:





Permanent Pipe Crossings

Centerline Station	Pipe Size	Pipe Length (feet)	Pipe Invert In (feet)	Pipe Invert Out (feet)	Bury Depth (feet)
19+04 -UT1-	1 at 66"x51" CSPA	39	609.6	609.4	1.0

3/24/2021
By: dgrady
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Anchorage

RECORD DRAWING

SHEET NAME	SHEET NUMBER
AS-BUILT STRUCTURES	4E
PROJECT NAME: BRAHMA SITE	
COUNTY: ALAMANCE	DATE: 2021

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

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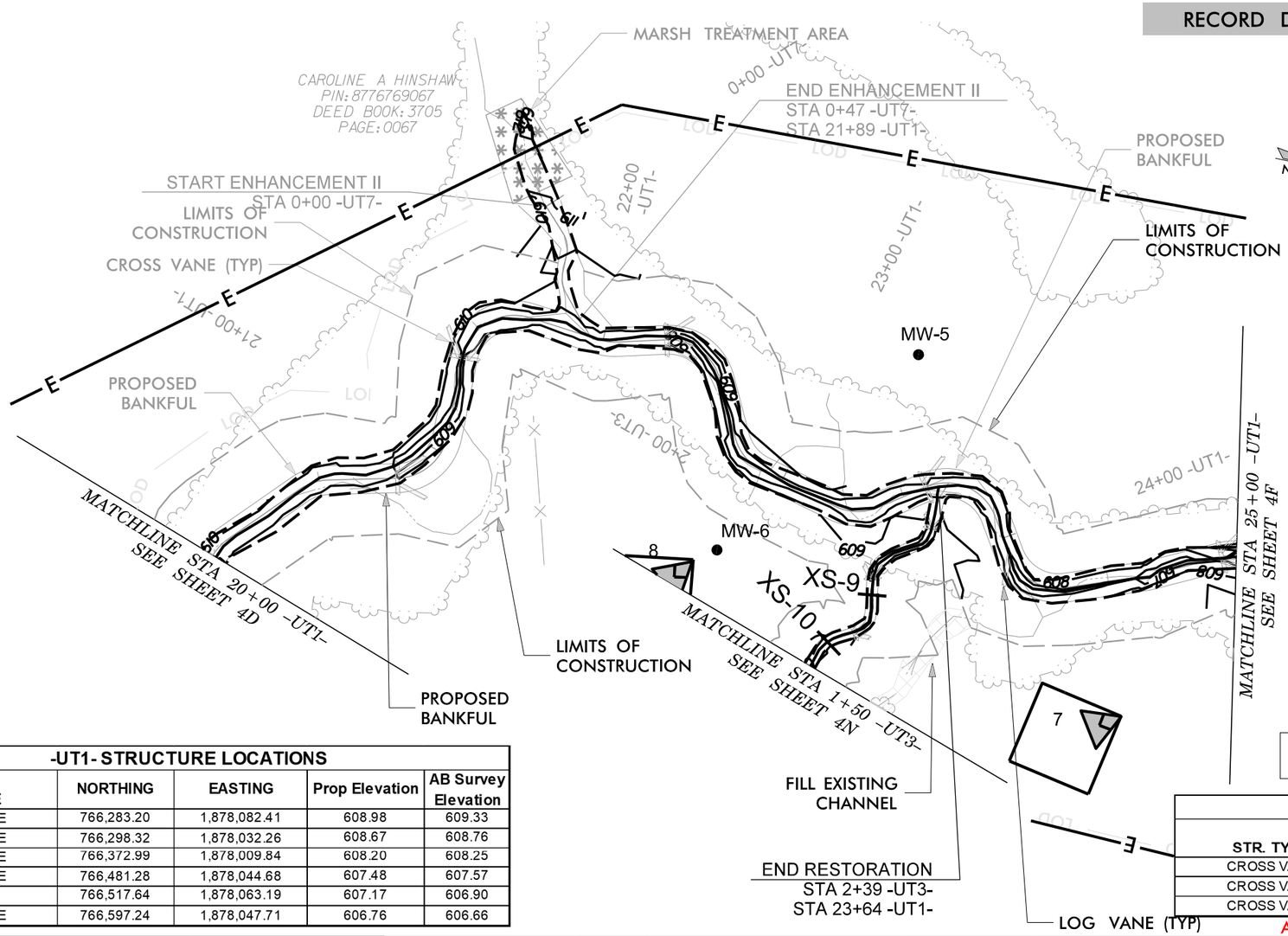
DocuSigned by: Joshua G Dalton 1089AD6C14994C3...

NORTH CAROLINA PROFESSIONAL SEAL 26971 ENGINEER JOSHUA G. DALTON

3/24/2021

DATE:



RIFFLE BED MATERIAL IS REQUIRED IN ALL RESTORATION AND ENHANCEMENT (LEVEL I) REACHES

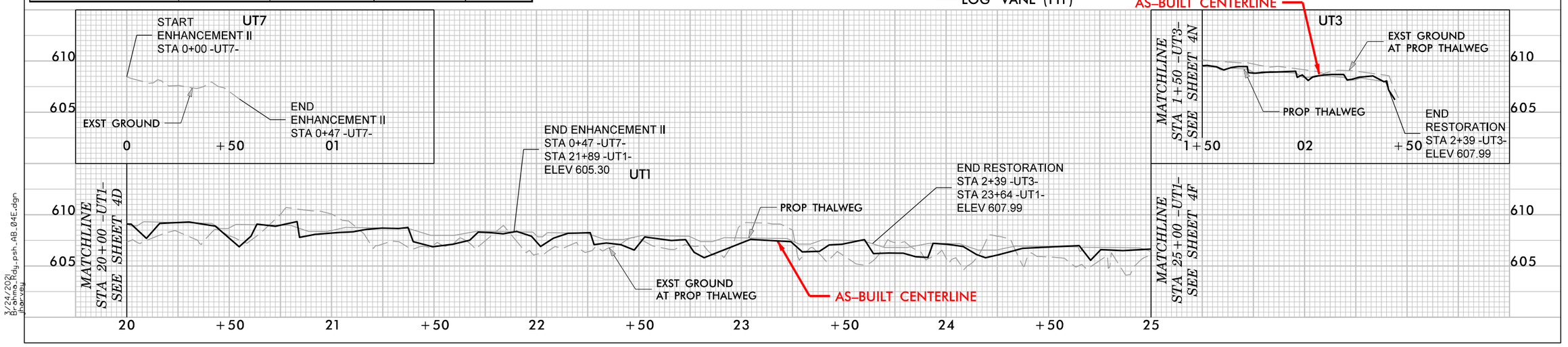
WETLAND ENHANCEMENT AREAS DERIVED FROM APPROVED PRELIMINARY JURISDICTIONAL DELINEATION

-UT1- STRUCTURE LOCATIONS

STR. TYPE	NORTHING	EASTING	Prop Elevation	AB Survey Elevation
CROSS VANE	766,283.20	1,878,082.41	608.98	609.33
CROSS VANE	766,298.32	1,878,032.26	608.67	608.76
CROSS VANE	766,372.99	1,878,009.84	608.20	608.25
CROSS VANE	766,481.28	1,878,044.68	607.48	607.57
LOG VANE	766,517.64	1,878,063.19	607.17	606.90
CROSS VANE	766,597.24	1,878,047.71	606.76	606.66

-UT3- STRUCTURE LOCATIONS

STR. TYPE	NORTHING	EASTING	Prop Elevation	AB Survey Elevation
CROSS VANE	766,465.95	1,878,104.62	609.20	609.47
CROSS VANE	766,468.51	1,878,082.92	608.81	609.00
CROSS VANE	766,486.64	1,878,059.38	608.34	608.69



3/24/2021
BY:Steve Kirby psh_AB_04E.dgn
jharvey

RECORD DRAWING

SHEET NAME	SHEET NUMBER
AS-BUILT STRUCTURES	4F
PROJECT NAME: BRAHMA SITE	
COUNTY: ALAMANCE	DATE: 2021

Axiom Environmental, Inc.

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

NAD 83

25′ 12.5′ 0 25′ 50′
SCALE: 1″=50′

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Joshua G. Dalton
1089AD8C14994C3...

NORTH CAROLINA PROFESSIONAL SEAL 26971 ENGINEER JOSHUA G. DALTON

3/24/2021
DATE:

CROSS VANE (TYP)
MARSH TREATMENT AREA
PERMANENT CROSSING 1@81″x59″ CSPA 1@18″ CSP FLOODPLAIN PIPE EACH SIDE 16′ TOP WIDTH (TYP)
CAROLINE A HINSHAW PIN: 8776769067 DEED BOOK: 3705 PAGE: 0067
LIMITS OF CONSTRUCTION
GATE
PROPOSED BANKFUL
MW-3
MW-2
MW-4
MW-1
MATCHLINE STA 25+00 -UT1- SEE SHEET 4E
MATCHLINE STA 30+00 -UT1- SEE SHEET 4G
XS-4
XS-3
XS-2
28+00 -UT1-
29+00 -UT1-
26+00 -UT1-
21+00 -UT1-
1+00 -UT4-
LOG CROSS VANE STRUCTURE REPLACED WITH BOULDER SILL DUE TO MATURE TREE WITH ROOT MASS
(2) 18″ PIPES NOT CONSTRUCTED DUE TO FLOODPLAIN ELEVATIONS THE SAME AS PROPOSED PIPE INVERTS
ALIGNMENT CHANGE DUE TO BEDROCK
RIFFLE BED MATERIAL IS REQUIRED IN ALL RESTORATION AND ENHANCEMENT (LEVEL I) REACHES
WETLAND ENHANCEMENT AREAS DERIVED FROM APPROVED PRELIMINARY JURISDICTIONAL DELINEATION

PROPOSED BANKFUL
LIMITS OF CONSTRUCTION
START ENHANCEMENT II STA 0+00 -UT4-
END ENHANCEMENT II STA 1+29 -UT4- STA 26+54 -UT1-

-UT1- STRUCTURE LOCATIONS

STR. TYPE	NORTHING	EASTING	Prop Elevation	AB Survey Elevation
CROSS VANE	766,693.96	1,878,064.03	606.00	608.30
CROSS VANE	766,767.07	1,878,054.30	605.53	605.77
CROSS VANE	766,932.52	1,878,022.04	604.57	604.72
BOULDER SILL	766,957.00	1,877,999.19	604.31	604.40

Permanent Pipe Crossings

Centerline Station	Pipe Size	Pipe Length (feet)	Pipe Invert In (feet)	Pipe Invert Out (feet)	Bury Depth (feet)
27+85 -UT1-	1 at 81"x59" CSPA	42	604.1	603.9	1.0

UT1
END ENHANCEMENT II STA 1+29 -UT4- STA 26+54 -UT1- ELEV 605.78
PROP THALWEG
EXST GROUND AT PROP THALWEG
AS-BUILT CENTERLINE
AS-BUILT CENTERLINE
MATCHLINE STA 25+00 -UT1- SEE SHEET 4E
MATCHLINE STA 30+00 -UT1- SEE SHEET 4G
610
605
600
25 +50 26 +50 27 +50 28 +50 29 +50 30

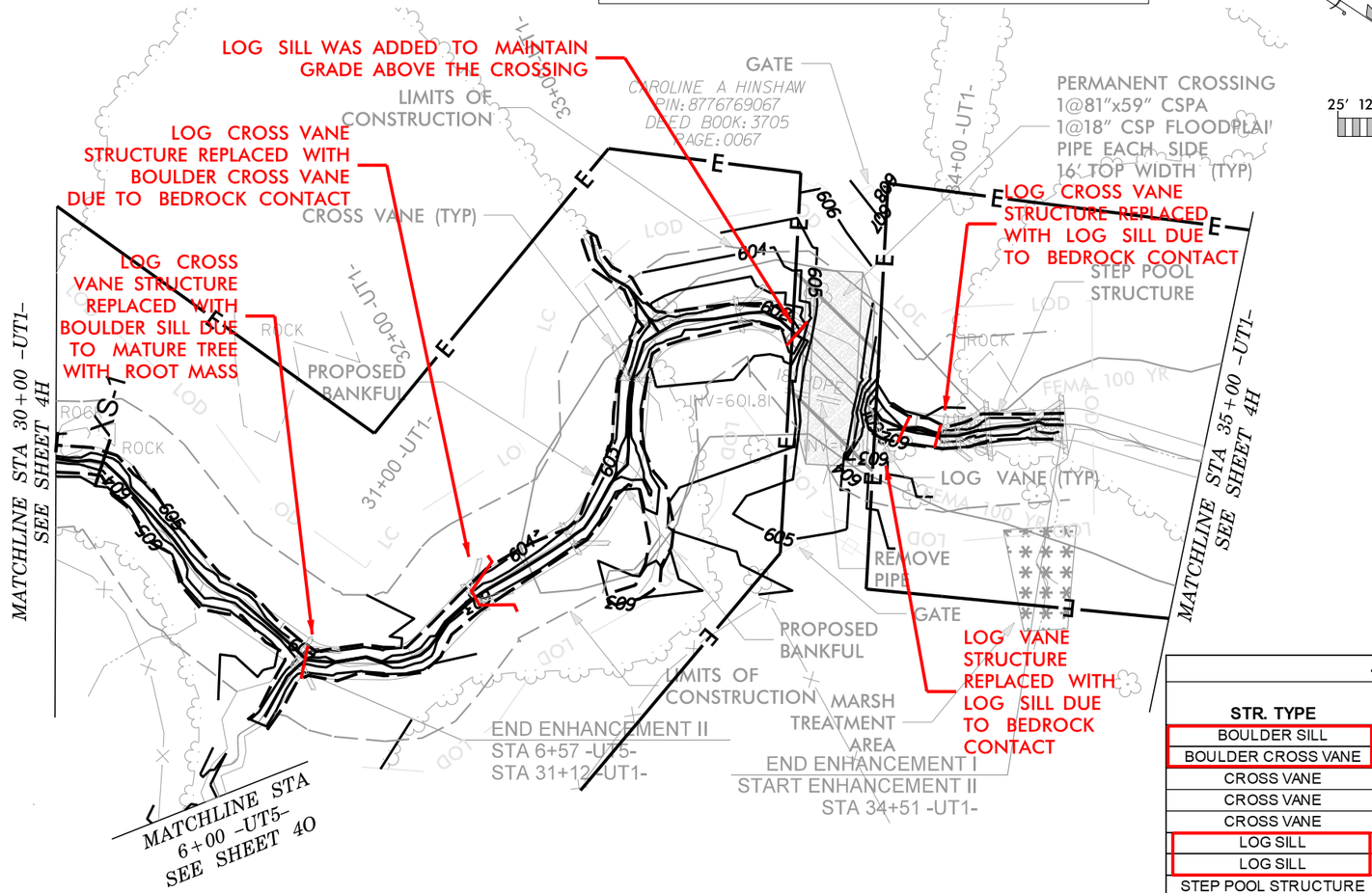
UT4
START ENHANCEMENT II STA 0+00 -UT4-
END ENHANCEMENT II STA 1+29 -UT4-
EXST GROUND
0 +50 01 +50
610
605

3/24/2021
BY: JOSHUA DALTON
Rdy_psh_AB_04F.dgn
jhorvat

RIFFLE BED MATERIAL IS REQUIRED IN ALL RESTORATION AND ENHANCEMENT (LEVEL I) REACHES

WETLAND ENHANCEMENT AREAS DERIVED FROM APPROVED PRELIMINARY JURISDICTIONAL DELINEATION

RECORD DRAWING



SHEET NAME	SHEET NUMBER
AS-BUILT STRUCTURES	4G
PROJECT NAME: BRAHMA SITE	
COUNTY: ALAMANCE	DATE: 2021

Axiom Environmental, Inc.

SUNGATE DESIGN GROUP, P.A.
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RALEIGH, NORTH CAROLINA 27606
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ENG FIRM LICENSE NO. C-890

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Joshua G. Dalton
1089AB8C14994C3...

NORTH CAROLINA PROFESSIONAL SEAL 26971 ENGINEER JOSHUA G. DALTON

3/24/2021

DATE:

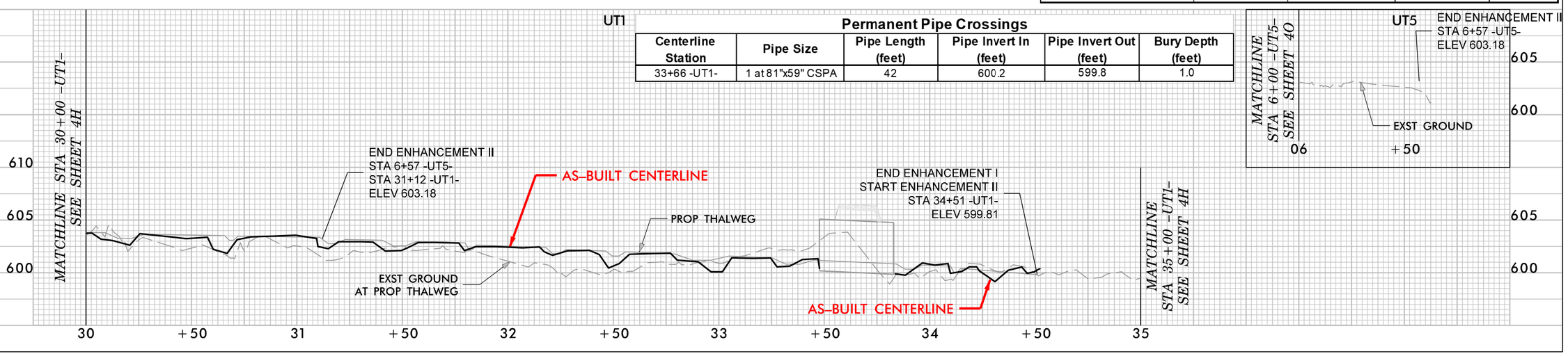
-UT1- STRUCTURE LOCATIONS

STR. TYPE	NORTHING	EASTING	Prop Elevation	AB Survey Elevation
BOULDER SILL	767,145.52	1,877,999.38	603.36	602.49
BOULDER CROSS VANE	767,184.57	1,877,950.80	602.83	602.82
CROSS VANE	767,200.70	1,877,916.10	602.40	602.45
CROSS VANE	767,188.59	1,877,858.56	601.78	601.86
CROSS VANE	767,206.36	1,877,820.32	601.40	601.41
LOG SILL	767,262.89	1,877,822.30	600.84	600.93
LOG SILL	767,287.08	1,877,815.34	600.62	600.87
STEP POOL STRUCTURE	767,291.13	1,877,812.86	600.42	600.55
STEP POOL STRUCTURE	767,319.65	1,877,790.33	599.81	600.54

UT1

Permanent Pipe Crossings

Centerline Station	Pipe Size	Pipe Length (feet)	Pipe Invert In (feet)	Pipe Invert Out (feet)	Bury Depth (feet)
33+66 -UT1-	1 at 81"x59" CSPA	42	600.2	599.8	1.0



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jharvey

RECORD DRAWING

SHEET NAME	SHEET NUMBER
AS-BUILT STRUCTURES	4H
PROJECT NAME: BRAHMA SITE	
COUNTY: ALAMANCE	DATE: 2021

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NAD 83

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

RIFFLE BED MATERIAL IS REQUIRED IN ALL RESTORATION AND ENHANCEMENT (LEVEL I) REACHES

WETLAND ENHANCEMENT AREAS DERIVED FROM APPROVED PRELIMINARY JURISDICTIONAL DELINEATION

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Joshua G Dalton
1089AD8C14994C3...

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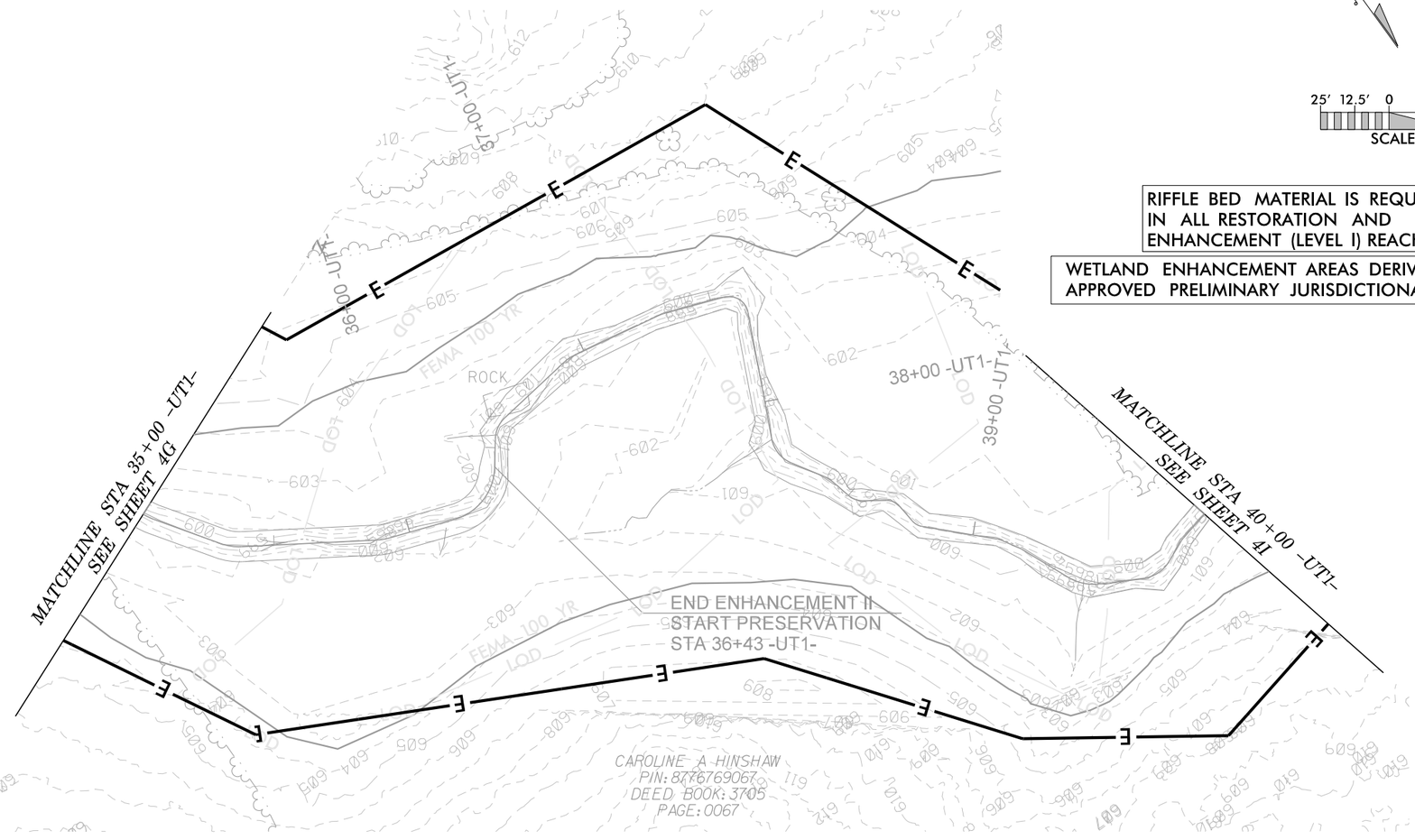
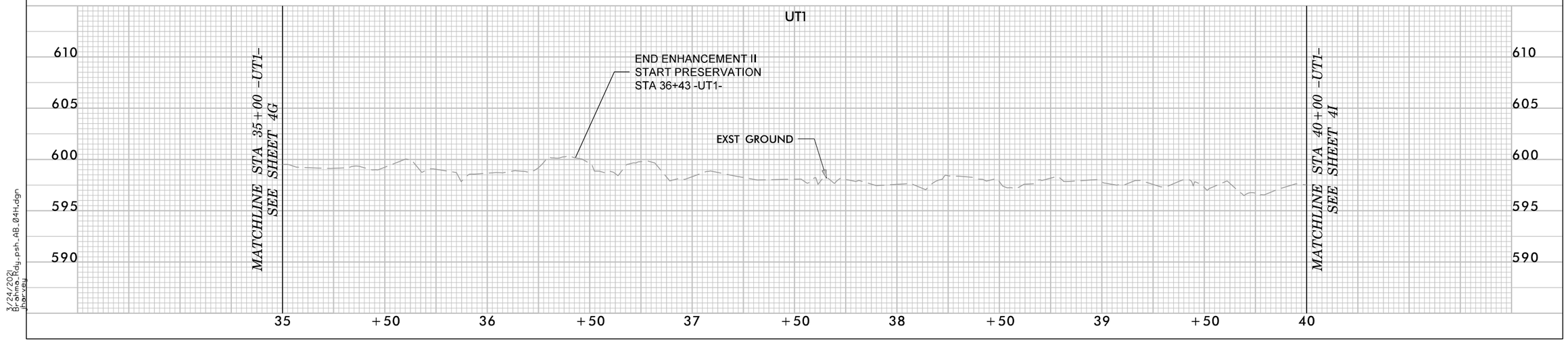
3/24/2021
DATE:





3/24/2021
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jharvey

RECORD DRAWING

SHEET NAME	SHEET NUMBER
AS-BUILT STRUCTURES	41
PROJECT NAME: BRAHMA SITE	
COUNTY: ALAMANCE	DATE: 2021

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1089AD8C14994C3...

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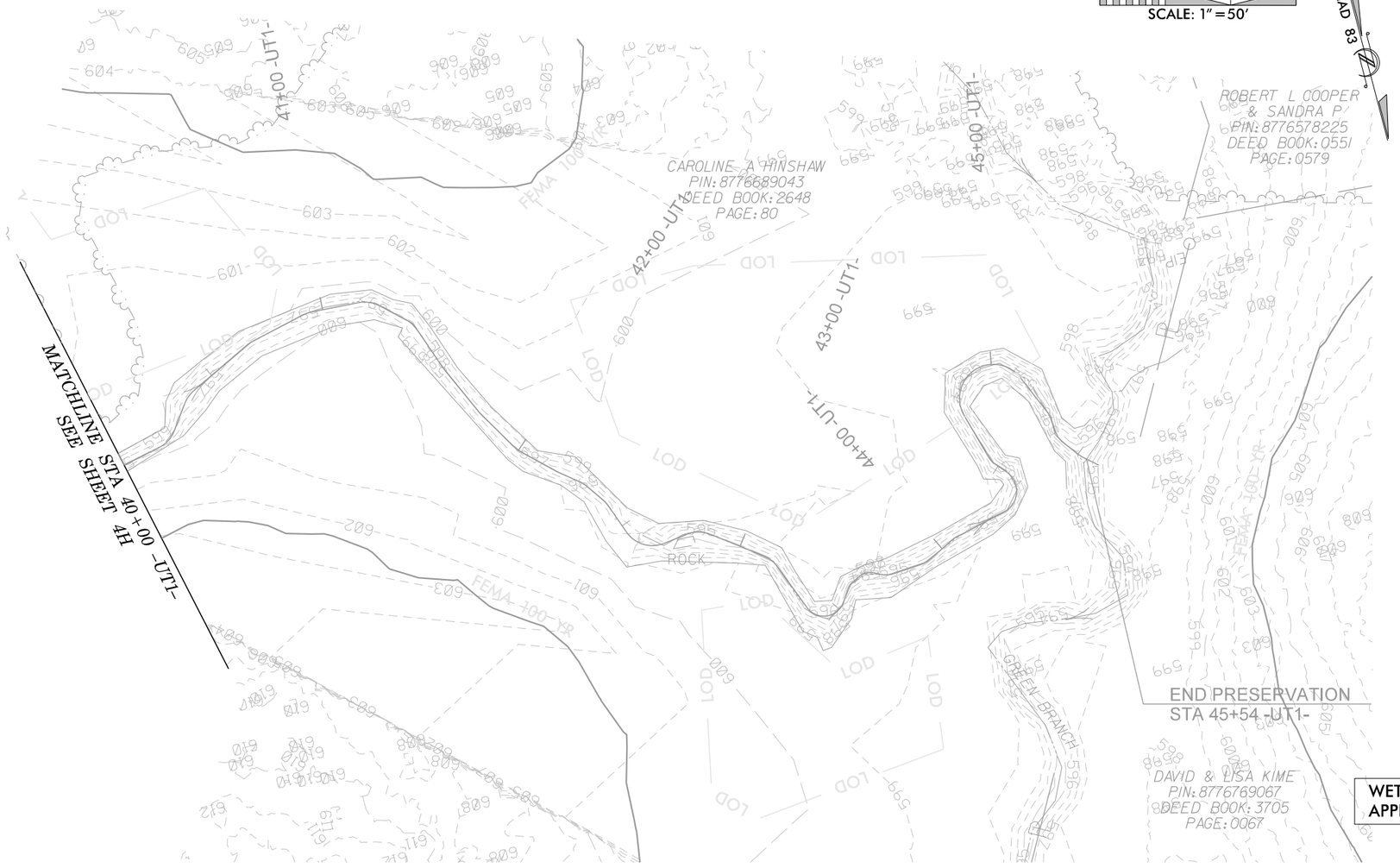
3/24/2021
DATE:

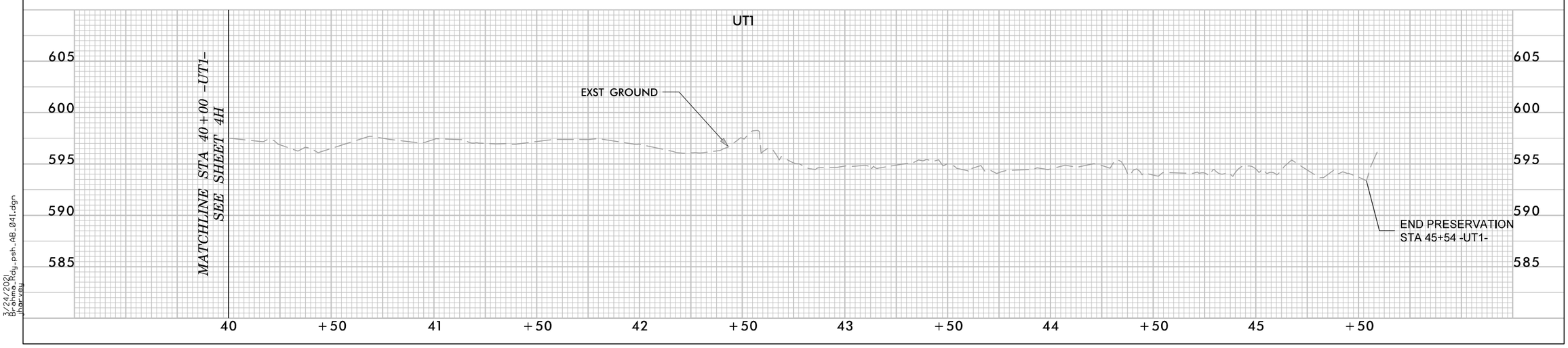
25' 12.5' 0 25' 50'
SCALE: 1" = 50'

NAD 83



RIFFLE BED MATERIAL IS REQUIRED IN ALL RESTORATION AND ENHANCEMENT (LEVEL I) REACHES

WETLAND ENHANCEMENT AREAS DERIVED FROM APPROVED PRELIMINARY JURISDICTIONAL DELINEATION



3/24/2021
Brahma_Rdy_psh_AB_041.dgn
jharvey

RECORD DRAWINGS

25' 12.5' 0 25' 50'
SCALE: 1" = 50'
NAD 83

SHEET NAME		SHEET NUMBER
AS-BUILT STRUCTURES		4J
PROJECT NAME: BRAHMA SITE		
	COUNTY: ALAMANCE	DATE: 2021

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NORTH CAROLINA PROFESSIONAL SEAL 26971 ENGINEER JOSHUA G. DALTON

DocuSigned by:
Joshua G Dalton
1089AD8C14994C3...

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DATE:

ISLEY L SHOFFNER
PIN: 8776648106
DEED BOOK: 1162
PAGE: 0307

CAROLINE A HINSHAW
PIN: 8776769067
DEED BOOK: 3705
PAGE: 0067

MARSH TREATMENT AREA
START ENHANCEMENT II
STA 0+00 -UT2-
0+00 -UT2-
1+00 -UT2-
2+00 -UT2-
3+00 -UT2-
4+00 -UT2-
LIMITS OF CONSTRUCTION
PROPOSED BANKFUL
EX SOIL PATH
LOD
18
19
SG
END ENHANCEMENT II
STA 0+30 -UT2A-
STA 0+20 -UT2-
START ENHANCEMENT II
STA 0+00 -UT2A-
MARSH TREATMENT AREA
BEGIN CHANNEL ENHANCEMENT
STA 4+73 -UT2-
PROPOSED BANKFUL
LIMITS OF CONSTRUCTION
MATCHLINE STA 5+00 -UT2-
SEE SHEET 4K

RIFFLE BED MATERIAL IS REQUIRED IN ALL RESTORATION AND ENHANCEMENT (LEVEL I) REACHES

WETLAND ENHANCEMENT AREAS DERIVED FROM APPROVED PRELIMINARY JURISDICTIONAL DELINEATION

UT2A
END ENHANCEMENT II
STA 0+30 -UT2-
START ENHANCEMENT II
STA 0+00 -UT2A-
630
625
0
+50

UT2
635
630
625
620
615
START ENHANCEMENT II
STA 0+00 -UT2-
EXST GROUND AT PROP THALWEG
AS-BUILT CENTERLINE
BEGIN CHANNEL ENHANCEMENT
STA 4+73 -UT2-
ELEV 623.56
PROP THALWEG
MATCHLINE STA 5+00 -UT2-
SEE SHEET 4K
0
+50
01
+50
02
+50
03
+50
04
+50
05

3/24/2021
BGrimes
Body_psh_AB_04J.dgn
jharvey

SHEET NAME	SHEET NUMBER
AS-BUILT STRUCTURES	4K
PROJECT NAME: BRAHMA SITE	
COUNTY: ALAMANCE	DATE: 2021

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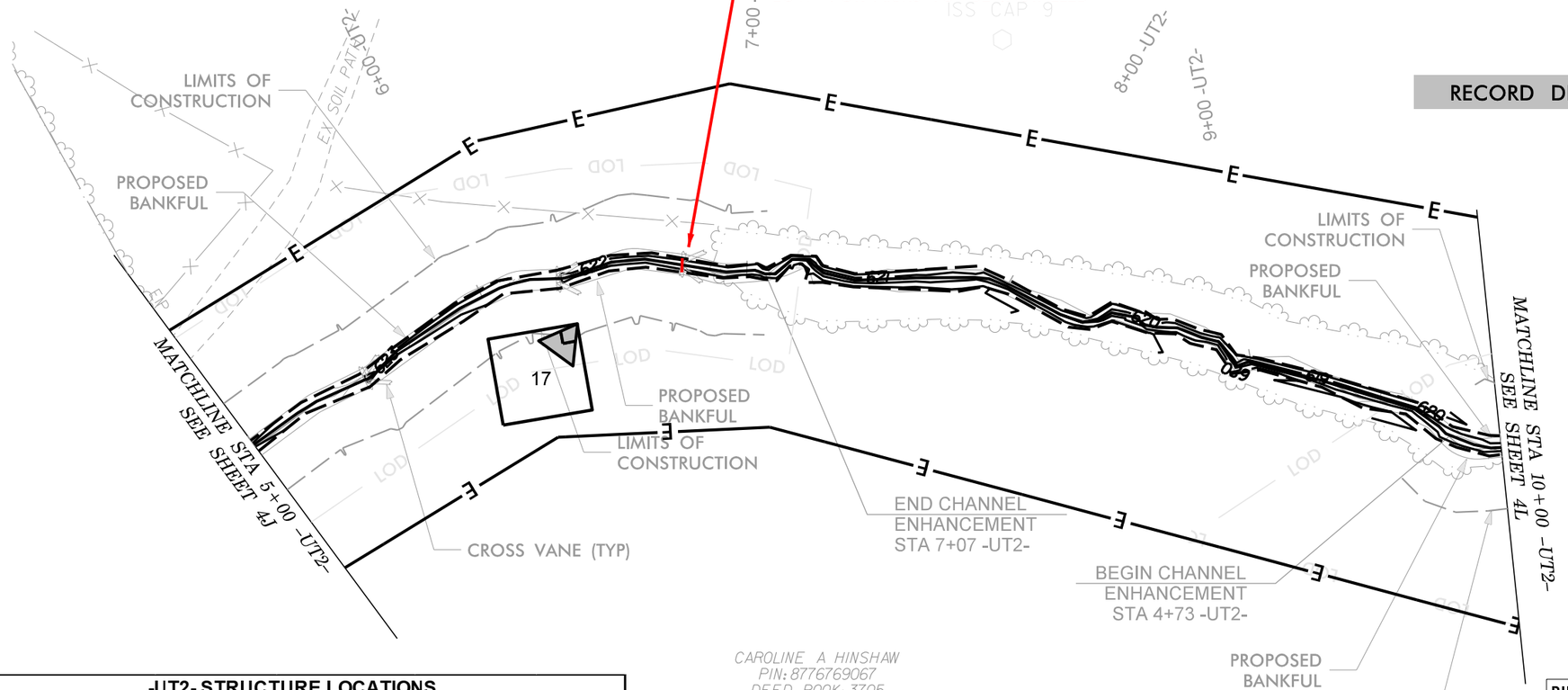
3/24/2021
DATE:

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

NAD 83

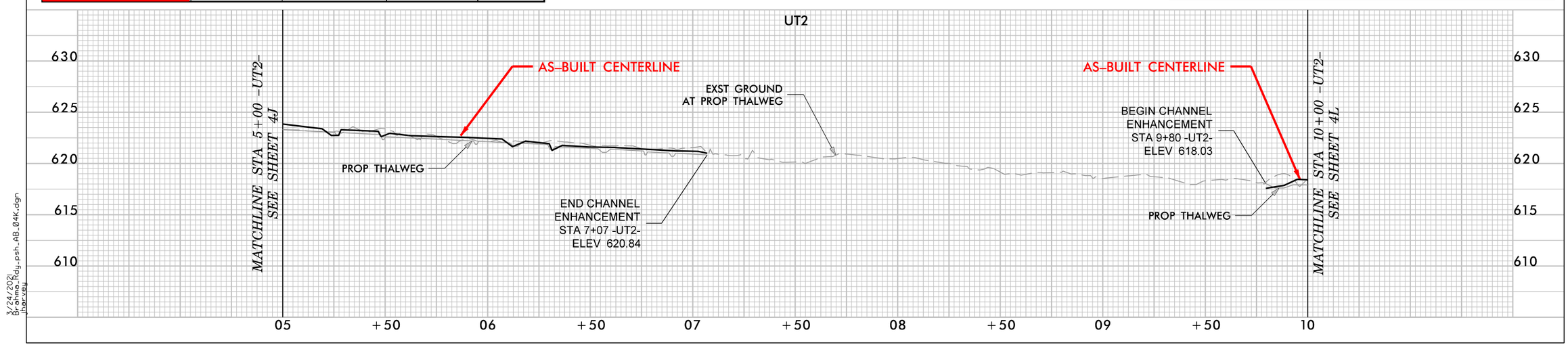
RECORD DRAWINGS



-UT2- STRUCTURE LOCATIONS				
STR. TYPE	NORTHING	EASTING	Prop Elevation	AB Survey Elevation
CROSS VANE	765,018.52	1,877,992.78	622.82	623.15
CROSS VANE	765,097.82	1,877,998.75	621.85	621.93
LOG SILL	765,139.58	1,878,017.91	621.23	

RIFFLE BED MATERIAL IS REQUIRED IN ALL RESTORATION AND ENHANCEMENT (LEVEL I) REACHES

WETLAND ENHANCEMENT AREAS DERIVED FROM APPROVED PRELIMINARY JURISDICTIONAL DELINEATION



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BSmith
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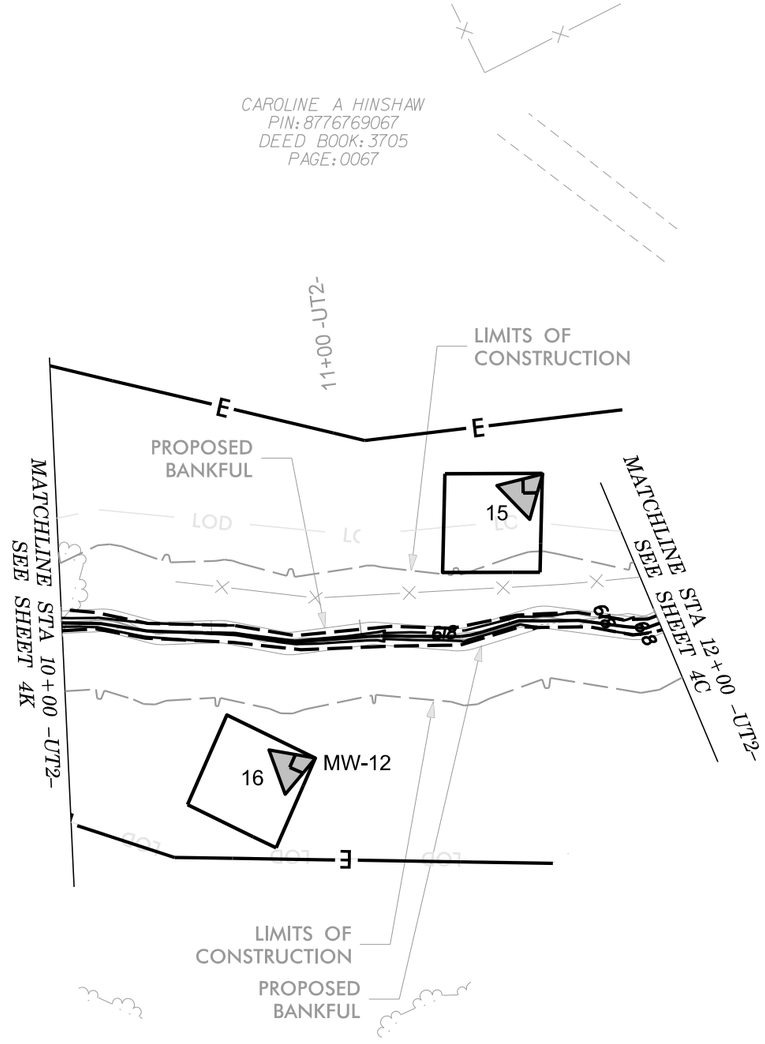
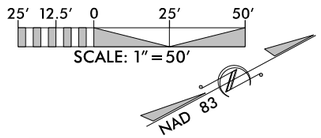
jharvey





RECORD DRAWINGS

SHEET NAME	SHEET NUMBER
AS-BUILT STRUCTURES	4L
PROJECT NAME: BRAHMA SITE	
COUNTY: ALAMANCE	DATE: 2021

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DATE:

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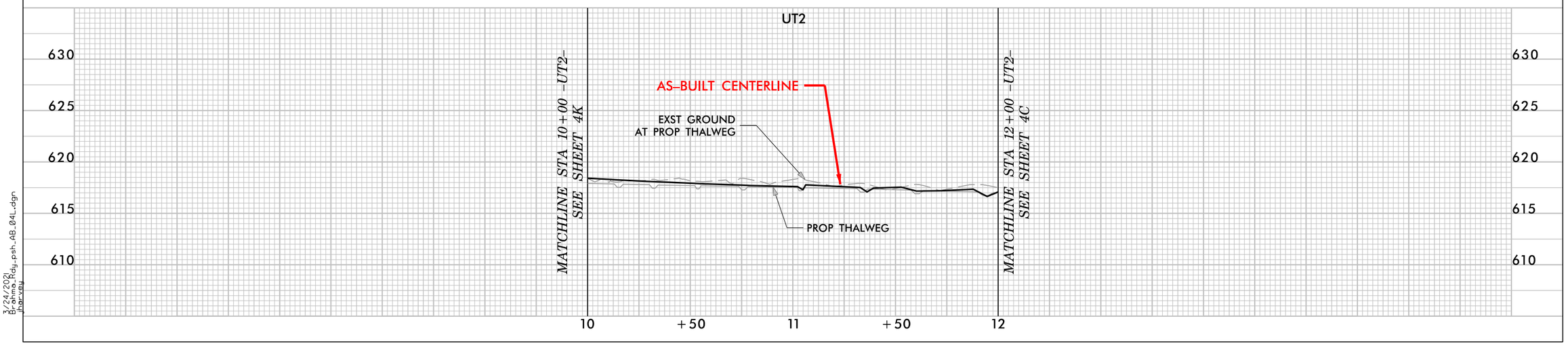
WETLAND ENHANCEMENT AREAS DERIVED FROM APPROVED PRELIMINARY JURISDICTIONAL DELINEATION



3/24/2021
By: Gavin Reddy, psh_AB_04L.dgn
jhar-veu

RECORD DRAWINGS

NAD 83

25′ 12.5′ 0 25′ 50′

SCALE: 1″ = 50′

SHEET NAME	SHEET NUMBER
AS-BUILT STRUCTURES	4M
PROJECT NAME: BRAHMA SITE	
COUNTY: ALAMANCE	DATE: 2021

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3/24/2021

DATE:

SEE SHEET 4C

SEE SHEET 4D

CAROLINE A HINSHAW
PIN: 8776769067
DEED BOOK: 3705
PAGE: 0067

MARSH TREATMENT AREA

WETLAND ENHANCEMENT AREAS DERIVED FROM APPROVED PRELIMINARY JURISDICTIONAL DELINEATION

3/24/2021
Brahma Rdy_psh_AB_04M.dgn
jharvey

25′ 12.5′ 0 25′ 50′
SCALE: 1″ = 50′

NAD 83

SHEET NAME		SHEET NUMBER
AS-BUILT STRUCTURES		4N
PROJECT NAME: BRAHMA SITE		
	COUNTY: ALAMANCE	DATE: 2021

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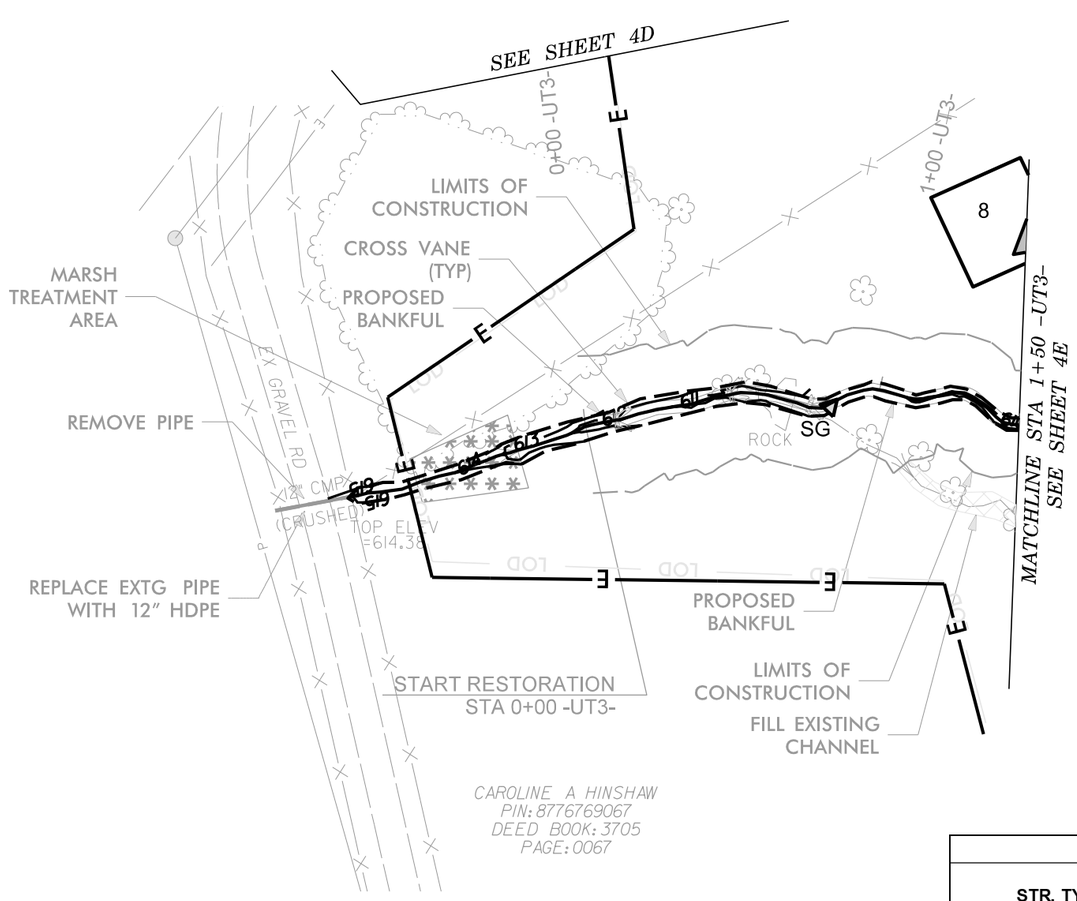
DATE:

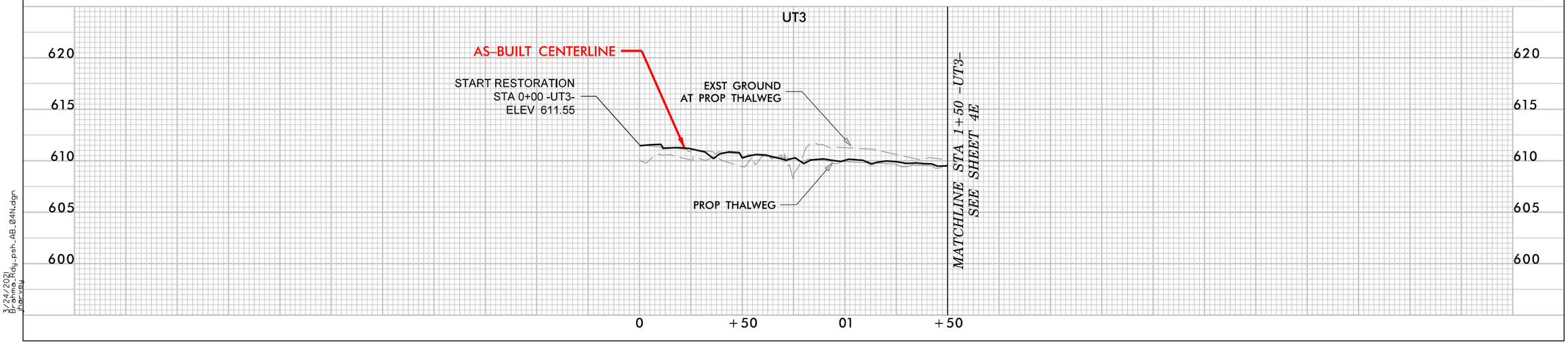


RIFFLE BED MATERIAL IS REQUIRED IN ALL RESTORATION AND ENHANCEMENT (LEVEL I) REACHES

WETLAND ENHANCEMENT AREAS DERIVED FROM APPROVED PRELIMINARY JURISDICTIONAL DELINEATION

-UT3- STRUCTURE LOCATIONS

STR. TYPE	NORTHING	EASTING	Prop Elevation	AB Survey Elevation
CROSS VANE	766,412.52	1,878,247.26	611.34	611.60
CROSS VANE	766,414.63	1,878,208.85	610.64	610.79
CROSS VANE	766,425.85	1,878,184.62	610.19	610.58



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jharvey

-UT6- STRUCTURE LOCATIONS

STR. TYPE	NORTHING	EASTING	Prop Elevation	AB Survey Elevation
STONE CROSS VANE	767,226.16	1,878,256.47	610.76	610.69
STEP POOL STRUCTURE	767,211.32	1,878,196.28	609.17	608.11
STEP POOL STRUCTURE	767,214.52	1,878,177.81	606.71	607.01

RIFFLE BED MATERIAL IS REQUIRED IN ALL RESTORATION AND ENHANCEMENT (LEVEL I) REACHES

WETLAND ENHANCEMENT AREAS DERIVED FROM APPROVED PRELIMINARY JURISDICTIONAL DELINEATION

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

NAD 83

SHEET NAME	SHEET NUMBER
PLAN AND PROFILE	4O
PROJECT NAME: BRAHMA SITE	
COUNTY: ALAMANCE	DATE: 2020

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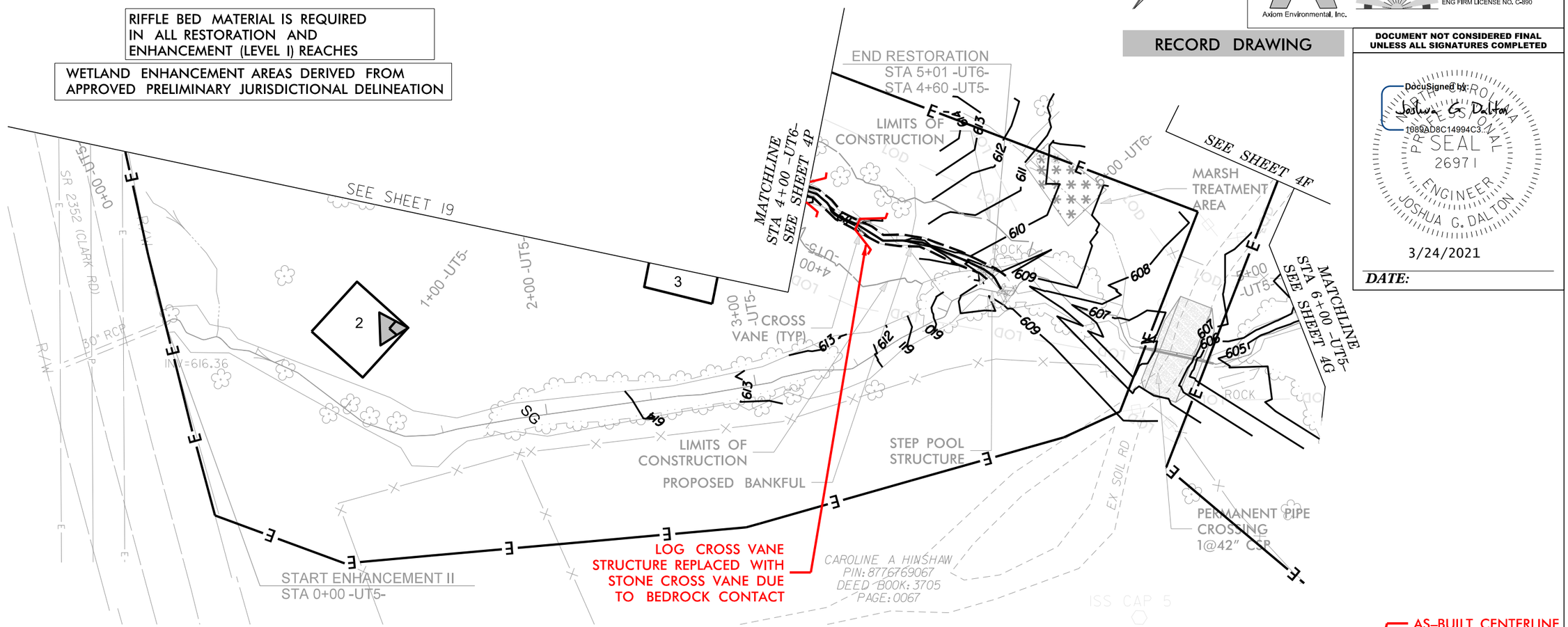
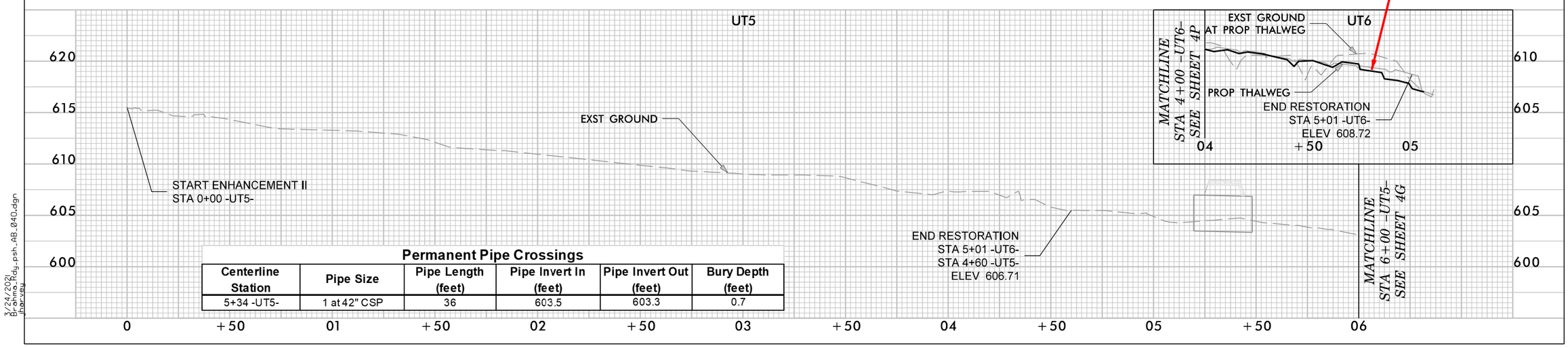
3/24/2021

DATE:





Permanent Pipe Crossings

Centerline Station	Pipe Size	Pipe Length (feet)	Pipe Invert In (feet)	Pipe Invert Out (feet)	Bury Depth (feet)
5+34 -UT5-	1 at 42" CSP	36	603.5	603.3	0.7

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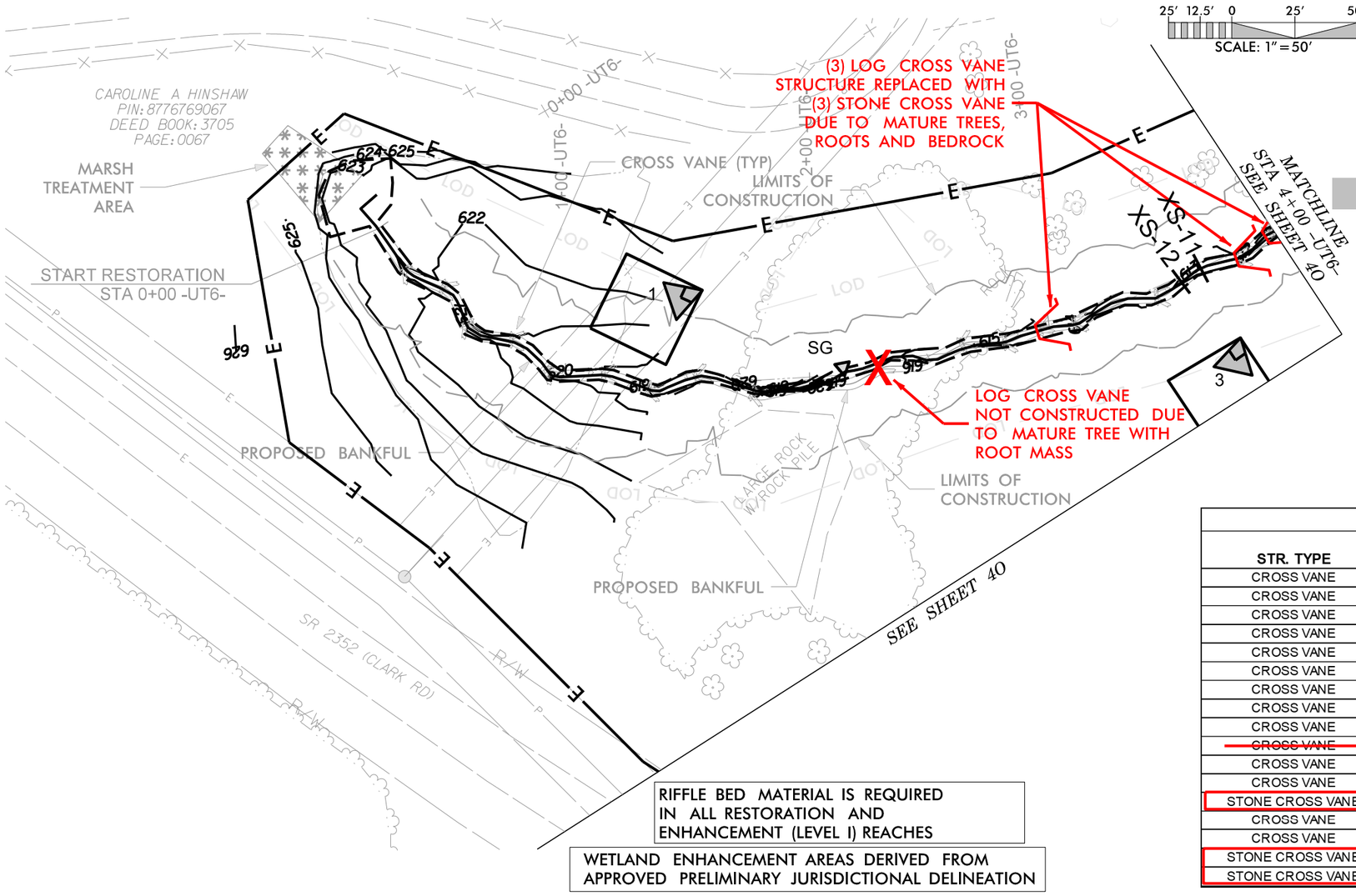
jharvey



RIFFLE BED MATERIAL IS REQUIRED IN ALL RESTORATION AND ENHANCEMENT (LEVEL I) REACHES

WETLAND ENHANCEMENT AREAS DERIVED FROM APPROVED PRELIMINARY JURISDICTIONAL DELINEATION

SHEET NAME	SHEET NUMBER
AS-BUILT STRUCTURES	4P
PROJECT NAME: BRAHMA SITE	
COUNTY: ALAMANCE	DATE: 2021

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RALEIGH, NORTH CAROLINA 27606
TEL (919) 859-2243
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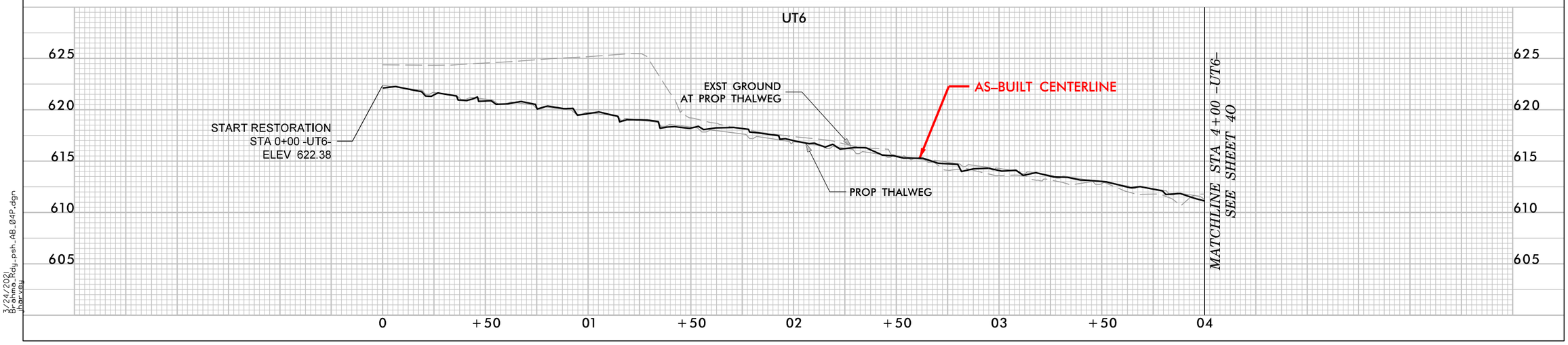
1089AD8C14994C3...

NORTH CAROLINA PROFESSIONAL SEAL 26971 ENGINEER JOSHUA G. DALTON

3/24/2021
DATE:

-UT6- STRUCTURE LOCATIONS

STR. TYPE	NORTHING	EASTING	Prop Elevation	AB Survey Elevation
CROSS VANE	767,174.58	1,878,624.76	621.90	621.76
CROSS VANE	767,184.61	1,878,611.75	621.41	621.34
CROSS VANE	767,200.41	1,878,605.30	620.95	620.88
CROSS VANE	767,210.24	1,878,589.25	620.48	620.53
CROSS VANE	767,224.38	1,878,577.54	619.96	620.14
CROSS VANE	767,230.86	1,878,556.18	619.37	619.36
CROSS VANE	767,239.65	1,878,539.53	618.78	618.85
CROSS VANE	767,238.75	1,878,520.34	618.24	618.40
CROSS VANE	767,249.22	1,878,499.62	617.60	618.10
~~CROSS VANE~~	~~767,249.58~~	~~1,878,448.52~~	~~616.13~~	
CROSS VANE	767,246.33	1,878,414.57	615.11	615.28
CROSS VANE	767,248.68	1,878,397.88	614.71	614.68
STONE CROSS VANE	767,246.05	1,878,383.56	614.35	614.31
CROSS VANE	767,246.46	1,878,369.40	613.99	614.11
CROSS VANE	767,242.71	1,878,335.38	613.12	613.12
STONE CROSS VANE	767,234.16	1,878,301.06	612.11	612.10
STONE CROSS VANE	767,225.97	1,878,287.00	611.57	611.36



3/24/2021
BY: mmo
R:\dgn\dy_psh_AB_04P.dgn
hor-vey

RECORD DRAWING

SHEET NAME		SHEET NUMBER
AS-BUILT PLANTING		4Q
PROJECT NAME: BRAHMA SITE		
	COUNTY: ALAMANCE	DATE: 2021

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RALEIGH, NORTH CAROLINA 27606
TEL (919) 859-2243
ENG FIRM LICENSE NO. C-890

Vegetation Association	**Piedmont/Low Mountain Alluvial Forest***		**Stream-side Assemblage****		**TOTAL**
Area (acres)	**13.7**		**4.2**		**17.9**
Species	**# planted***	**% of total**	**# planted****	**% of total**	**# planted**
Tag alder (*Alnus serrulata*)	--	--	571	5	571
River birch (*Betula nigra*)	932	10	571	5	1503
Silky dogwood (*Cornus amomum*)	932	10	2285	20	3216
Green ash (*Fraxinus pennsylvanica*)	932	10	2285	20	3216
Tulip poplar (*Liriodendron tulipifera*)	932	10	--	--	932
Sycamore (*Platanus occidentalis*)	1863	20	2285	20	4148
Black gum (*Nyssa sylvatica*)	932	10	--	--	932
Water oak (*Quercus nigra*)	1397	15	1142	10	2540
Willow oak (*Quercus phellos*)	1397	15	1142	10	2540
Black willow (*Salix nigra*)	--	--	1142	10	1142
TOTAL	**9316**	**100**	**11424**	**100**	**20740**

* Planted at a density of 680 stems/acre.

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

Area (acres)	**17.7**
Species	**Total**
Tag alder (*Alnus serrulata*)	—
River birch (*Betula nigra*)	1500
Silky dogwood (*Cornus amomum*)	2700
Green ash (*Fraxinus pennsylvanica*)	900
Tulip poplar (*Liriodendron tulipifera*)	1000
Sycamore (*Platanus occidentalis*)	2700
Black gum (*Nyssa sylvatica*)	1000
Water oak (*Quercus nigra*)	2000
Willow oak (*Quercus phellos*)	2000
Black willow (*Salix nigra*)	—
Pawpaw *(Asimina triloba)*	200
Hackberry *(Celtis occidentalis)*	500
Buttonbush *(Cephalanthus occidentalis)*	600
Common Persimmon *(Diospyros virginiana)*	500
Red Mulberry *(Morus rubra)*	600
White oak (*Quercus alba*)	1000
Overcup oak (*Quercus lyrate*)	500
Cherry bark oak (*Quercus pagoda*)	1000
Shumard oak (*Quercus shumardii*)	1000
American elm (*Ulmus americana*)	500
TOTAL	20200
Average Stems/Acre	1141