

MYO FINAL MONITORING REPORT

Cool Run Stream and Riparian Wetland Mitigation Site

Brunswick County, NC

Lumber River Basin

Cataloging Unit 03040207

DMS Project ID No. 100142

Full Delivery Contract No. 20190201-01

USACE Action ID No. SAW-2020-01428

DWR Project No. 20200712

RFP #16-20190201 (Issued: 7/16/2019)

Data Collection: April 24-26, 2023

Submission: August 2023



Prepared for:

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





CLEARWATER MITIGATION SOLUTIONS

August 28, 2023

Mr. Jeremiah Dow
NCDEQ Division of Mitigation Services
217 W. Jones Street, Suite 3000
Raleigh, NC 27603

**Re: Cool Run– MYO As-Built Report– Response to Comments (DMS Project No. 100142)
USACE Action ID No. SAW-2020-01428 / DWR Project No. 20200712**

Dear Mr. Dow,

Please find below the response to comments for the Cool Run MY0 As-Built Report provided on August 11, 2023:

Report Comments:

1. Table 1 – Stream mitigation credits were calculated from the as-built lengths. Please correct to calculate credits from mitigation plan lengths.

Re: Corrected.

2. Table 2 – The success criteria column in the first row states that you will “Document four overbank events in separate monitoring years for at least 30-consecutive days.” Please separate different success criteria and re-word. As discussed briefly at the site visit, since UT1 is classified in the mit plan as intermittent, there will be a flow monitoring requirement to demonstrate a minimum of 30 days consecutive flow (see DWR comment #14 from the final mitigation plan).

Re: Success criteria above differentiated and corrected.

3. Section 1.1 states that planting was completed on April 20th , but Section 2.0 and Table 11 state April 6. Please clarify.

Re: The Site planting was completed on April 6, 2023. Corrected.

4. Section 1.2 – Success Criteria table indicates that 12% of the growing season will be 36 days. Has the final growing season been established? If so, please provide the dates and how it was determined. Please note that any start date prior to 3/1 requires a discussion of bud burst of species observed (must be more than one) and supporting photo documentation, and similar for senescence to determine the end date.

Re: Planting for the Site was completed on April 6, 2023. Groundwater water gauges and soil temperature probes for the Site started collecting monitoring data on April 27, 2023. Growing season for MY1 is proposed to begin on April 27, 2023, the date groundwater gauges and soil probes began collecting data. The end of the MY1 growing season will be determined by photo documentation of >50% leaf fall of dominant tree species and recorded in combination with soil temperature probe data to document the end of growing season, up until November 30th with November 30th being the latest possible date for the end of the growing season. The documented ending date of the MY1 growing season will establish the end date of the growing season for the remainder of the monitoring period MY2-MY7. The start of the growing season for the Site will be established in 2024, utilizing recorded soil temperature, supplemental photographic evidence of above ground growth and development of vascular plants (i.e. emergence of herbaceous plants from the ground; appearance of new growth from vegetative crowns;

coleoptile/cotyledon emergence from seed; bud burst on woody plants (2 or more species); emergence or elongation of leaves of woody plants; or emergence or opening of flowers). The above metrics used to identify the start of the growing season will be collected starting February 1, 2024, with the start of the growing season to begin no earlier than February 1st. Similar to the identified ending date in 2023, the identified start date of the growing season established in 2024, will be utilized as the beginning date of the growing season for the remainder of the monitoring period MY2-MY7.

5. CCPV (Figure 1)
- Please color code all veg plots based on meeting (green) or not meeting (red) vegetative success criteria. Please do the same with wetland monitoring wells in MY1.
 - Recommend differentiating stream gauges based on their intent, i.e., to monitor overbank events, or flow, or both.
 - Recommend removing the old ditch labeling NS2, NS3, etc.
 - It may be helpful for reviewers to label UT1 and Cool Run's different reaches on the map.

Re: Corrected per recommendations.

6. Appendix C – As discussed at the site visit, please label XS1 as the riffle and XS2 as the pool. Recommend removing BHR calculation from pool cross sections here and in Table 10.

Re: Corrected per recommendations.

7. Tables 9A, B, & C – The MY0 BHR numbers appear to be incorrect. They are identical to the Max Depth numbers.

Re: Corrected.

Record Drawings Comments:

8. In the future include all surveyed in-stream structures from the as-built survey on the record drawing.

Re: Noted and will be included in the future.

9. Sheet AB-04D – recommend keeping the “Cross Vane Relocated” callout and in addition coloring the relocated cross vane red, or adding an arrow to draw attention to indicate that it is the structure that was moved.

Re: Corrected per recommendations.

10. To reduce confusion, our recommendation is to change the red text for “As-Built Centerline” in the longitudinal profile black since it is not a construction deviation.

Re: Corrected per recommendations.

Boundary Inspection Comments:

11. Recommend that each corner is witnessed on the State held CE side.

Re: Noted and will be corrected in future.

12. Recommend checking the line marking in all forested areas to ensure the marking is aligned with the surveyed CE line. In these areas, paint and signs posted on trees at intervals of 100 ft, less

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than the required 200 ft, will be helpful in reducing encroachments and allowing for ease of future boundary inspections.

Re: Our surveyor, K2 Design Group, will be further marking and correcting the CE boundary in the winter of 2024 per the recommendations.

13. Where the hunting stand was identified, the CE line should be accurately located by a surveyor and a determination regarding its proximity to the CE should be made. If it is located inside the CE, as it appeared using the Trimble R2 unit, the stand should be moved to outside of the CE area.

Re: Noted. this will be verified and corrected as needed. A CE witness post and sign will be installed near this location.

14. Speak with the farmer to ensure that there will be no further damage to the CE related to the corn planted inside the easement area. Monitor to ensure the expected density and species of trees remain viable in this corn planted area. If not, these impacted areas should be replanted.

Re: We have spoken with the farmer and land owner. There is to be no further damage associated with the planted corn and/or future agricultural activities adjacent to the CE.

15. Review included KML for reference and location details of action items.

Re: Thank you for the .KMZ file and documentation. This is very helpful in communicating the additional boundary marking needs and scope to us and the surveyor.

Please do not hesitate to contact me with questions at 919-624-6901.

Sincerely,



Kevin Yates

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Prepared By:



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604 Macon Place
Raleigh, North Carolina
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Davey Resource Group
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1.0 PROJECT SUMMARY

Clearwater Mitigation Services has established the North Carolina Division of Mitigation Services (NCDMS) Cool Run Stream & Wetland Mitigation Site (hereafter referred to as the “Site”). The Site encompasses 25.6 acres of floodplain forest and agricultural fields along Cool Run and an Unnamed Tributary (UT) to Cool Run located within the Carolina Flatwoods of the Middle Atlantic Coastal Plain Ecoregion (63h). The Site is located within a **Targeted Local Watershed** of the Upper Shallotte River 14-digit HUC (03040207020060) of the Lumber River basin. Stream and wetland mitigation areas are located along Cool Run and a UT to Cool Run within North Carolina Division of Water Resources [NCDWR] subbasin number 03-07-59. Site watersheds range from approximately 3.10 square miles (1,985 acres) along Cool Run to approximately 0.2 of a square mile (125 acres) along UT1.

1.1 Project Background, Components, and Structure

The Site is located in Brunswick County, approximately 5.5-miles West of Shallotte, NC. Restoration activities within the Site included the construction of meandering, E/C-type stream channel resulting in 2,028 linear feet of Priority I stream restoration, 592 linear feet of Priority II stream restoration, 14.108 acres of riparian wetland re-establishment, 1.433 acres of riparian wetland rehabilitation, 1.201 acre of riparian wetland enhancement, and 0.492 acre of riparian wetland preservation. The Site is expected to provide 2,422.00 warm water stream credits and 15.512 riparian wetland credits by closeout (Table 1). A conservation easement was granted to the State of North Carolina and recorded at the Brunswick County Register of Deeds on February 12, 2021.

Prior to Site construction, the Site was characterized by disturbed forest that has been in use for agriculture and silviculture since at least the 1950’s. Based on historical aerial photography, Cool Run appears to have been relocated and channelized in the late 1950’s, and UT 1 appears to have been channelized prior to 1956. The floodplain of Cool Run has been historically modified and logged over the last several decades. The site was last logged between 2016 and 2018. Site design was completed in June 2022. Construction started in December 2022, and ended with a final walkthrough on April 19, 2023. The Site was planted on April 6, 2023. Completed project activities, reporting history, completion dates, and project contacts are summarized in Tables 11-12 (Appendix E).

Table 1. Cool Run Restoration Site (ID-100142) Project Components and Mitigation Credits

Project Segment	Mitigation Plan Footage/Acreage	As-Built Footage/Acreage	Mitigation Category	Restoration Level	Mitigation Ratio	Mitigation Credits	Comment
Stream							
Cool Run Upstream 1	592	603	Warm	R*	1.500	394.667	
Cool Run Upstream 2	427	406	Warm	R	1.000	427.000	
Cool Run Downstream	1000	1008	Warm	R	1.000	1000.000	
UT 1	601	610	Warm	R	1.000	601.000	
					Total:	2,422.667	
Wetland							
Wetland Reestablish	14.108	14.108	NA	Reestablishment	1.000	14.108	
Wetland Rehabilitation	1.433	1.433	NA	Rehabilitation	1.500	0.955	
Wetland Enhancement	1.201	1.201	NA	Enhancement	3.000	0.400	
Wetland Preservation	0.492	0.492	NA	Preservation	10.000	0.049	
					Total:	15.512	

*Cool Run Upstream 1 is Restoration with an adjusted ratio (based on IRT comment and review)

Project Credits

	Stream			Riparian Wetland		Non-riparian wetland	Coastal Marsh
	Warm	Cool	Cold	Riverine	Nonriverine		
Restoration	2,422.667	--	--	--	--	--	--
Re-establishment	--	--	--	14.108	--	--	--
Rehabilitation	--	--	--	0.955	--	--	--
Enhancement	--	--	--	0.400	--	--	--
Enhancement I	--	--	--	--	--	--	--
Enhancement II	--	--	--	--	--	--	--
Enhancement II*	--	--	--	--	--	--	--
Preservation	--	--	--	0.049	--	--	--
Totals	2422.667	--	--	15.512	--	--	--

Table 2. Summary: Goals & Performance

Goals	Objectives	Success Criteria
(1) HYDROLOGY		
<ul style="list-style-type: none"> Minimize downstream flooding to the maximum extent possible. 	<ul style="list-style-type: none"> Construct new channel at historic floodplain elevation to restore overbank flows Plant woody riparian buffer Protect riparian buffers with a perpetual conservation easement Construct channels with proper pattern, dimension, and longitudinal profile 	<ul style="list-style-type: none"> BHR not to exceed 1.2 Document four overbank events in separate monitoring years Document a minimum of 30 consecutive days of flow each year on UT1 Attain Wetland Hydrology Success Criteria Attain Vegetation Success Criteria Conservation Easement recorded
<ul style="list-style-type: none"> Increase stream stability within the Site so that channels are neither aggrading nor degrading. 	<ul style="list-style-type: none"> Construct channels with proper pattern, dimension, and longitudinal profile Cease row crop production within and immediately adjacent to Site wetlands and streams Construct stable channels Stabilize stream banks Plant woody riparian buffer 	<ul style="list-style-type: none"> Cross-section measurements indicate a stable channel Visual documentation of stable channels and structures BHR not to exceed 1.2 < 10% change in BHR in any given year Attain Vegetation Success Criteria
(1) WATER QUALITY		
<ul style="list-style-type: none"> Remove direct nutrient and pollutant inputs from the Site and reduce contributions to downstream waters. 	<ul style="list-style-type: none"> Reduce agricultural land/inputs 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 	<ul style="list-style-type: none"> Attain Wetland Hydrology Success Criteria Attain Vegetation Success Criteria
(1) HABITAT		
<ul style="list-style-type: none"> Improve instream and stream-side habitat. 	<ul style="list-style-type: none"> 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 Protect riparian buffers with a perpetual conservation easement Restore/enhance jurisdictional wetlands adjacent to Site streams Stabilize stream banks Install in-stream structures 	<ul style="list-style-type: none"> Cross-section measurement indicate a stable channel Visual documentation of stable channels and in-stream structures. Attain Wetland Hydrology Success Criteria Attain Vegetation Success Criteria Conservation Easement recorded

Table 3. Project Attribute Table

Project Attribute Table			
Project Name	Cool Run Stream and Riparian Wetland Mitigation Site		
County	Brunswick County, North Carolina		
Project Area (acres)	25.6		
Project Coordinates (latitude and longitude decimal degrees)	33.970904, -78.472509		
Project Watershed Summary Information			
Physiographic Province	Middle Atlantic Coastal Plain		
River Basin	Lumber		
USGS Hydrologic Unit 14-digit	03040207020060		
DWR Sub-basin	03-07-59		
Project Drainage Area (acres)	1,074		
Project Drainage Area Percentage of Impervious Area	<2%		
Land Use Classification	87% forested; 11% agricultural; <2% residential		
Reach Summary Information			
Parameters	Cool Run Upstream of UT1 confluence	Cool Run Downstream of UT1 confluence	UT 1
Pre-project length (feet)	1158	776	335
Post-project (feet)	1009	1008	610
Valley confinement (Confined, Unconfined)	A, UC	A, UC	A, UC
Drainage area (acres)	911	1074	125
Perennial, Intermittent, Ephemeral	Per	Per	Int
NCDWR Water Quality Classification	C, Sw	C, Sw	C, SW
Dominant Stream Classification (existing)	E/G 5	Eg 5	Eg 5
Dominant Stream Classification (proposed)	C 5	C 5	C 5
Dominant Evolutionary class (Simon) if applicable	II	II	II
Wetland Summary Information			
Parameters	Wetlands		
Pre-project (acres)	3.33 acres		
Post-project (acres)	17.2 acres		
Wetland Type (non-riparian, riparian)	Riparian riverine		
Mapped Soil Series	Muckalee, Lynchburg, Baymeade, Goldsboro, Rains, Lumbee		
Soil Hydric Status	Non-hydric and Hydric		
Regulatory Considerations			
Parameters	Applicable?	Resolved?	Supporting Docs?
Water of the United States - Section 404	Yes	Yes	Section 404 Permit
Water of the United States - Section 401	Yes	Yes	Section 401 Permit
Endangered Species Act	Yes	Yes	CE Document
Historic Preservation Act	Yes	Yes	CE Document
Coastal Zone Management Act (CZMA or CAMA)	No	N/A	N/A
Essential Fisheries Habitat	No	N/A	N/A

1.2 Success Criteria

Monitoring and success criteria for stream restoration should relate to project goals and objectives identified from on-site NC SAM and NC WAM data collection in addition to guidelines set forth in the 2016 Mitigation Rule. 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 the Site success criteria developed for the project.

Success Criteria

Streams
<ul style="list-style-type: none">• 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.• BHR at any measure riffle cross-section should not change by more than 10% from baseline condition during any given monitoring period.• The stream project shall remain stable and all other performance standards shall be met through four separate bankfull events, occurring in separate years, during the monitoring years 1-7.
Wetland Hydrology
<ul style="list-style-type: none">• Saturation or inundation within the upper 12 inches of the soil surface for, at a minimum, 12 percent of the growing season, during normal climatic conditions.*
Vegetation
<ul style="list-style-type: none">• 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.• Any volunteer species on the approved planting list must be established for at least 2 years to count towards success and will be subject to the average height standard.

*See Section 1.3, below, for proposed MY1 growing season dates and establishment of MY2-MY7 growing season dates.

1.3 Growing Season

Planting for the Site was completed on April 6, 2023. Groundwater water gauges and soil temperature probes for the Site started collecting monitoring data on April 27, 2023. Growing season for MY1 is proposed to begin on April 27, 2023, the date groundwater gauges and soil probes began collecting data. The end of the MY1 growing season will be determined by photo documentation of >50% leaf fall of dominant tree species and recorded in combination with soil temperature probe data to document the end of growing season, up until November 30th with November 30th being the latest possible date for the end of the growing season. The documented ending date of the MY1 growing season will establish the end date of the growing season for the remainder of the monitoring period MY2-MY7. The start of the growing season for the Site will be established in 2024, utilizing recorded soil temperature, supplemental photographic evidence of above ground growth and development of vascular plants (i.e. emergence of herbaceous plants from the ground;

appearance of new growth from vegetative crowns; coleoptile/cotyledon emergence from seed; bud burst on woody plants (2 or more species); emergence or elongation of leaves of woody plants; or emergence or opening of flowers). The above metrics used to identify the start of the growing season will be collected starting February 1, 2024, with the start of the growing season to begin no earlier than February 1st. Similar to the identified ending date in 2023, the identified start date of the growing season established in 2024, will be utilized as the beginning date of the growing season for the remainder of the monitoring period MY2-MY7.

2.0 AS-BUILT CONDITION (BASELINE)

Construction started in December 2022 and ended with a final walkthrough on April 19, 2023. The Site was planted on April 6, 2023. As-built and MY0 data collection occurred between April and May 2023.

In general, no significant issues arose during the construction of the Site. A sealed half-size set of record drawings are provided in Appendix F, which includes the post-construction survey, alignments, structures, and monitoring features. These include redlines for any significant field adjustments made during construction that differ from the design plans. Upon completion of the as-built it was noted that a cross-vane was installed in a slightly different location than proposed in the construction plans. However, in consultation with the project engineer, it is unlikely that the installed location will affect the stability and success of the project. The proposed location of the structure and as-built location are currently stable. This location will be continued to be monitored and will be addressed in subsequent monitoring reports.

3.0 PROJECT MONITORING - METHODS

Monitoring will be conducted in accordance with 2016 NCIRT Guidelines. Monitoring will be conducted by Davey Resource Group, Inc based on the schedule below. A summary of monitoring is outlined in Section 3.1. Annual monitoring reports will be submitted to the NCDMS by Clearwater Mitigation Solutions no later than December 31 of each monitoring year data is collected.

Table 4 - Monitoring Schedule

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

3.1 Monitoring

The monitoring parameters are summarized in Table 5.

4.0 MONITORING YEAR 0 – DATA ASSESSMENT

Site visits were conducted between April and May 2023 to collect as-built and annual monitoring data for the project. Stream, wetland, and vegetation monitoring for the Site follow the approved success criteria presented in the Mitigation Plan and summarized in Section 1.3; monitoring methods are detailed in Section 3.0.

4.1 Stream Assessment

Geomorphology surveys for MY0 were conducted on April 30, 2023. All streams within the Site are stable and functioning as designed. Refer to Appendix A for the Visual Stream Morphology Stability Assessment Table. Refer to Appendix C for Stream Geomorphology Data. No stream areas of concern were identified during MY0.

Table 5. 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 10 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.
Bankfull Events	Continuous monitoring surface water gauges and/or trail camera	Continuous recording through monitoring period	1 stream gauge on Cool Run; 1 stream gauge on UT1	Surface water data for each monitoring period
	Visual/Physical Evidence	Continuous through monitoring period	Periodic Site visits throughout the year.	Visual evidence, photo documentation, and/or rain data.
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 ¹	17 gauges spread throughout restored wetlands; two reference gauges at reference wetland site	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	14 plots spread across the Site	Species, height, planted vs. volunteer, stems/acre
	Annual random vegetation plots, 0.0247 acre (100 square meters) in size	As-built, Years 1, 2, 3, 5, and 7	3 plots randomly selected each year	Species and height

¹*See Section 1.3 for proposed MY1 growing season dates and establishment of MY2-MY7 growing season dates.

Note: Photo stations will be taken at all cross sections and at vegetation plot origin points. In addition, photos will be collected across the Site to document a range of different areas.

4.2 Hydrology Assessment

Seventeen groundwater monitoring gauges were installed throughout the Site's wetlands. Hydrologic data will be collected and reported during MY1 (2023).

4.3 Vegetative Assessment

The MY0 vegetative survey was completed on April 26, 2023. Vegetation monitoring resulted in a sitewide stem density average of 712 planted stems per acre, above the interim requirement of 320 stems per acre required at MY3. All 14 fixed vegetation plots and 3 random plots met the interim success criteria. Please refer to Appendix A for Vegetation Plot Photographs and the Vegetation Condition Assessment Table, and Appendix B for Vegetation Plot Data. No vegetation areas of concern were identified during MY0.

4.4 Monitoring Year 0 Summary

In summary, the site streams are stable and performing as intended and vegetation establishment across the site appears to be on target to meet success criteria for permanent and random plots. Periodic monitoring will continue to be conducted to identify any areas of concern in the future.

5.0 REFERENCES

- Lee, M.T., R.K. Peet, S.D. Roberts, and T.R. Wentworth. 2008. CVS-EEP Protocol for Recording Vegetation. Version 4.2. North Carolina Department of Environment and Natural Resources, Ecosystem Enhancement Program. Raleigh, North Carolina.
- North Carolina Division of Mitigation Services (NCDMS). 2014. Stream and Wetland Mitigation Monitoring Guidelines. North Carolina Department of Environmental Quality, Raleigh, North Carolina.
- North Carolina Stream Functional Assessment Team. (NC SFAT 2015). N.C. Stream Assessment Method (NC SAM) User Manual. Version 2.1.
- North Carolina Wetland Functional Assessment Team. (NC WFAT 2010). N.C. Wetland Assessment Method (NC WAM) User Manual. Version 4.1.

APPENDIX A

Visual Assessment Data

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

Prepared for:

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 MITIGATION
 SOLUTIONS**

Project:

**COOL RUN
 MITIGATION SITE**

Brunswick County, NC

Title:

**Current Conditions
 Plan View Map
 (MY0)**

Drawn by:

WAF/SH

Date:

4/28/2023

Scale:

1:1800

Project No.:

DRGNCW20.248

**FIGURE
 1**

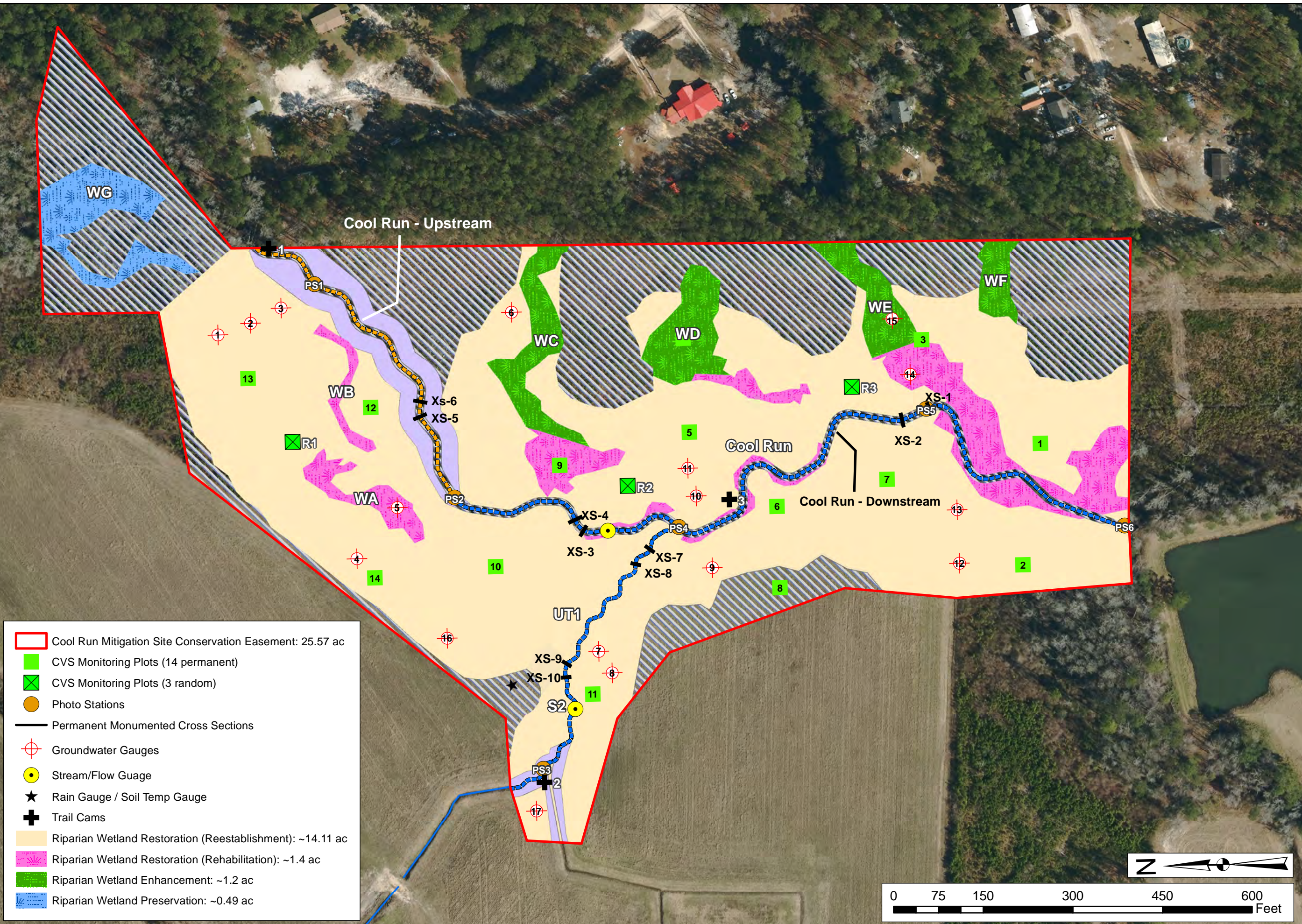


Table 4A. Visual Stream Stability Assessment

Reach: Cool Run
 Assessed Stream Length 2,019
 Assessed Bank Length 4,038

Survey Date: April 30, 2023

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 <u>not</u> exceed 15%. (See guidance for this table in DMS monitoring guidance document)	6	6		100%

Table 4B. Visual Stream Stability Assessment

Survey Date: April 30, 2023

Reach UT 1
 Assessed Stream Length 601
 Assessed Bank Length 1202

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 <u>NOT</u> 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.	13	13		100%
	Bank Protection	Bank erosion within the structures extent of influence does <u>not</u> exceed 15%. (See guidance for this table in DMS monitoring guidance document)	13	13		100%

Table 5. Visual Vegetation Assessment

Planted acreage

22.71

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.	0.10 acres	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

31.7

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	0 Encroachments noted	

APPENDIX A. VEG PLOT PHOTOS (MYO 2023)



(1) Plot 1



(2) Plot 2



(3) Plot 3



(4) Plot 4



(5) Plot 5



(6) Plot 6

APPENDIX A. VEG PLOT PHOTOS (MYO 2023)



(7) Plot 7



(8) Plot 8



(9) Plot 9



(10) Plot 10



(11) Plot 11



(12) Plot 12

APPENDIX A. VEG PLOT PHOTOS (MY0 2023)



(13) Plot 13



(14) Plot 14

APPENDIX A. SITE PHOTOS – EXISTING CONDITIONS (MYO – 2023)



(1) PS1 (looking southwest - downstream)



(2) PS1 (looking northeast towards CE boundary)



(3) PS2 (looking northeast along Cool Run)



(4) PS2 (looking west along Cool Run)



(5) PS3 (looking east along UT1)



(6) PS3 (looking west towards CE Boundary)

APPENDIX A. SITE PHOTOS – EXISTING CONDITIONS (MYO – 2023)



(7) PS4 (looking south at confluence Of Cool Run and UT1)



(8) PS4 (looking northwest)



(9) PS5 (looking south)



(10) PS5 (looking northwest)



(11) PS6 (looking north)



(12) PS6 (looking south towards CE Boundary)

Appendix B Vegetation Data

Table 6A. Planted Bare-Root Woody Vegetation

Table 6B. Permanent Seed Mix

Table 7. Vegetation Plot Counts and Densities

Table 8A-D. Vegetation Plot Data Table from Vegetation Data Entry
Tool

**Table 6A. Planted Bare Root Woody Vegetation
Cool Run Stream and Riparian Wetland Mitigation Site**

Vegetation Association	Wetland Indicator Status	Coastal Plain Small Stream Swamp* (Zone 1)		Coastal Plain Small Stream Swamp* (Zone 2)		Stream-side Assemblage**		TOTAL
Area (acres)		15.48		5.10		2.13		22.71
Species		# planted*	% of total	# planted*	% of total	# planted**	% of total	# planted
Tag alder (<i>Alnus serrulata</i>)	FACW		--		--	515	20	515
Black willow (<i>Salix nigra</i>)***	OBL		--		--	515	20	515
Ironwood (<i>Carpinus caroliniana</i>)	FAC	526	5		--	260	10	786
River birch (<i>Betula nigra</i>)	FACW		--	350	10	260	10	610
Silky dogwood (<i>Cornus amomum</i>)***	FACW		--		--	515	20	515
Atlantic white cedar (<i>Chamaecyparis thyoides</i>)	FACW		--	350	10		--	350
Sycamore (<i>Platanus occidentalis</i>)	FACW		--	695	20		--	695
Bald cypress (<i>Taxodium distichum</i>)	OBL	2,632	25		--	515	20	3,147
Swamp chestnut oak (<i>Quercus michauxii</i>)	FACW	1,580	15	695	20		--	2,275
Swamp tupelo (<i>Nyssa biflora</i>)	OBL	2,105	20		--		--	2,105
Laurel oak (<i>Quercus laurifolia</i>)	FACW	2,105	20	695	20		--	2,800
Overcup oak (<i>Quercus lyrata</i>)	OBL	1,055	10		--		--	1,055
American elm (<i>Ulmus americana</i>)	FAC		--	350	10		--	350
Water oak (<i>Quercus nigra</i>)	FACW	526	5	350	10		--	876
TOTAL		10,529	100	3,485	100	2,580	100	16,594

* Planted at a density of 680 stems/acre.

** Planted at a density of 1210 stems/acre.

*** Live Stake

Table 6B. Permanent Seed Mix
Cool Run Stream and Riparian Wetland Mitigation Site

March 1 – October 31						
Species	Common Name	Wetland Indicator Status	Unit Type	Stratum	% of Total	lbs per Acre
<i>Carex vulpinoidea</i>	Fox sedge	FACW	S	Herb	15	35
<i>Andropogon gerardii</i>	Big bluestem	FAC	S	Herb	15	35
<i>Elymus virgatum</i>	Virginia wildrye	FAC	S	Herb	15	35
<i>Panicum virgatum</i>	Switchgrass	FAC	S	Herb	15	35
<i>Juncus effusus</i>	Soft rush	OBL	S	Herb	20	35
<i>Dichanthelium clandestinum</i>	Deertongue	FACW	S	Herb	20	35
				Total	100	

**Table 7. Planted Vegetation Totals
Cool Run Stream and Riparian Wetland Mitigation Site**

Plot #	Planted Stems/Acre	Success Criteria Met?
1	607	Yes
2	769	Yes
3	607	Yes
4	769	Yes
5	729	Yes
6	1012	Yes
7	688	Yes
8	850	Yes
9	729	Yes
10	688	Yes
11	607	Yes
12	688	Yes
13	648	Yes
14	810	Yes
Random Plot (R1)	810	Yes
Random Plot (R2)	486	Yes
Random Plot (R3)	607	Yes
Average Planted Stems/Acre	712	Yes

Table 8A

Planted Acreage	22.71
Date of Initial Plant	2023-04-06
Date(s) of Supplemental Plant(s)	NA
Date(s) Mowing	NA
Date of Current Survey	2023-04-26
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	
					Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total
Species Included in Approved Mitigation Plan	<i>Alnus serrulata</i>	hazel alder	Tree	FACW										
	<i>Betula nigra</i>	river birch	Tree	FACW										
	<i>Carpinus caroliniana</i>	American hornbeam	Tree	FAC			1	1						
	<i>Chamaecyparis thyoides</i>	Atlantic white cedar	Tree	OBL							3	3		
	<i>Cornus amomum</i>	silky dogwood	Shrub	FACW										
	<i>Nyssa biflora</i>	swamp tupelo	Tree	OBL	3	3	3	3	3	3	2	2	1	1
	<i>Platanus occidentalis</i>	American sycamore	Tree	FACW							1	1		
	<i>Quercus laurifolia</i>	laurel oak	Tree	FACW	3	3	9	9	1	1	8	8	7	7
	<i>Quercus lyrata</i>	overcup oak	Tree	OBL										
	<i>Quercus michauxii</i>	swamp chestnut oak	Tree	FACW	4	4	3	3	2	2	2	2	4	4
	<i>Salix nigra</i>	black willow	Tree	OBL										
<i>Taxodium distichum</i>	bald cypress	Tree	OBL	5	5	3	3	13	13	3	3	6	6	
Sum	Performance Standard				15	15	19	19	19	19	19	19	18	18
Post Mitigation Plan Species	<i>Magnolia virginiana</i>	sweetbay	Tree	FACW										
Sum	Proposed Standard				15	15	19	19	19	19	19	19	18	18
Mitigation Plan Performance Standard	Current Year Stem Count					15		19		19		19		18
	Stems/Acre					607		769		607		769		729
	Species Count					4		5		4		6		4
	Dominant Species Composition (%)					33		47		68		42		39
	Average Plot Height (ft.)					2		2		2		1		2
	% Invasives					0		0		0		0		0
Post Mitigation Plan Performance Standard	Current Year Stem Count					15		19		19		19		18
	Stems/Acre					607		769		607		769		729
	Species Count					4		5		4		6		4
	Dominant Species Composition (%)					33		47		68		42		39
	Average Plot Height (ft.)					2		2		2		1		2
	% Invasives					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 8B

Planted Acreage	22.71
Date of Initial Plant	2023-04-06
Date(s) of Supplemental Plant(s)	NA
Date(s) Mowing	NA
Date of Current Survey	2023-04-26
Plot size (ACRES)	0.0247

	Scientific Name	Common Name	Tree/Shrub	Indicator Status	Veg Plot 6 F		Veg Plot 7 F		Veg Plot 8 F		Veg Plot 9 F		Veg Plot 10 F	
					Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total
Species Included in Approved Mitigation Plan	<i>Alnus serrulata</i>	hazel alder	Tree	FACW	6	6								
	<i>Betula nigra</i>	river birch	Tree	FACW	1	1								
	<i>Carpinus caroliniana</i>	American hornbeam	Tree	FAC	1	1							2	2
	<i>Chamaecyparis thyoides</i>	Atlantic white cedar	Tree	OBL					8	8				
	<i>Cornus amomum</i>	silky dogwood	Shrub	FACW	5	5								
	<i>Nyssa biflora</i>	swamp tupelo	Tree	OBL	4	4	4	4			8	8	1	1
	<i>Platanus occidentalis</i>	American sycamore	Tree	FACW					3	3			1	1
	<i>Quercus laurifolia</i>	laurel oak	Tree	FACW			3	4	3	3	5	5	6	6
	<i>Quercus lyrata</i>	overcup oak	Tree	OBL										
	<i>Quercus michauxii</i>	swamp chestnut oak	Tree	FACW					7	7				
	<i>Salix nigra</i>	black willow	Tree	OBL	4	4								
<i>Taxodium distichum</i>	bald cypress	Tree	OBL	4	4	10	10			5	5	7	7	
Sum	Performance Standard				25	25	17	18	21	21	18	18	17	17
Post Mitigation Plan Species	<i>Magnolia virginiana</i>	sweetbay	Tree	FACW				1						1
Sum	Proposed Standard				25	25	17	18	21	21	18	18	17	17
Mitigation Plan Performance Standard	Current Year Stem Count					25		18		21		18		17
	Stems/Acre					1012		688		850		729		688
	Species Count					7		3		4		3		5
	Dominant Species Composition (%)					24		53		38		44		39
	Average Plot Height (ft.)					2		2		1		2		2
	% Invasives					0		0		0		0		0
Post Mitigation Plan Performance Standard	Current Year Stem Count					25		18		21		18		17
	Stems/Acre					1012		688		850		729		688
	Species Count					7		3		4		3		5
	Dominant Species Composition (%)					24		53		38		44		39
	Average Plot Height (ft.)					2		2		1		2		2
	% Invasives					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 8C

Planted Acreage	22.71
Date of Initial Plant	2023-04-06
Date(s) of Supplemental Plant(s)	NA
Date(s) Mowing	NA
Date of Current Survey	2023-04-26
Plot size (ACRES)	0.0247

	Scientific Name	Common Name	Tree/S hrub	Indicator Status	Veg Plot 11 F		Veg Plot 12 F		Veg Plot 13 F		Veg Plot 14 F	
					Planted	Total	Planted	Total	Planted	Total	Planted	Total
Species Included in Approved Mitigation Plan	<i>Alnus serrulata</i>	hazel alder	Tree	FACW								
	<i>Betula nigra</i>	river birch	Tree	FACW								
	<i>Carpinus caroliniana</i>	American hornbeam	Tree	FAC	1	1						
	<i>Chamaecyparis thyoides</i>	Atlantic white cedar	Tree	OBL								
	<i>Cornus amomum</i>	silky dogwood	Shrub	FACW								
	<i>Nyssa biflora</i>	swamp tupelo	Tree	OBL	1	1	8	8			1	1
	<i>Platanus occidentalis</i>	American sycamore	Tree	FACW								
	<i>Quercus laurifolia</i>	laurel oak	Tree	FACW	7	7	5	5	7	7	3	3
	<i>Quercus lyrata</i>	overcup oak	Tree	OBL								
	<i>Quercus michauxii</i>	swamp chestnut oak	Tree	FACW			1	1	2	2	6	6
	<i>Salix nigra</i>	black willow	Tree	OBL								
<i>Taxodium distichum</i>	bald cypress	Tree	OBL	6	6	3	3	7	7	11	11	
Sum	Performance Standard				15	15	17	17	16	16	21	21
Post Mitigation Plan Species	<i>Magnolia virginiana</i>	sweetbay	Tree	FACW								
Sum	Proposed Standard				15	15	17	17	16	16	21	21
Mitigation Plan Performance Standard	Current Year Stem Count					15		17		16		21
	Stems/Acre					607		688		648		810
	Species Count					4		4		3		4
	Dominant Species Composition (%)					47		47		44		52
	Average Plot Height (ft.)					2		2		2		2
	% Invasives					0		0		0		0
Post Mitigation Plan Performance Standard	Current Year Stem Count					15		17		16		21
	Stems/Acre					607		688		648		810
	Species Count					4		4		3		4
	Dominant Species Composition (%)					47		47		44		52
	Average Plot Height (ft.)					2		2		2		2
	% Invasives					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 8D

Planted Acreage	22.71
Date of Initial Plant	2023-04-06
Date(s) of Supplemental Plant(s)	NA
Date(s) Mowing	NA
Date of Current Survey	2023-04-26
Plot size (ACRES)	0.0247

	Scientific Name	Common Name	Tree/S hrub	Indicator Status	Veg Plot 1 R	Veg Plot 2 R	Veg Plot 3 R
					Total	Total	Total
Species Included in Approved Mitigation Plan	<i>Alnus serrulata</i>	hazel alder	Tree	FACW			
	<i>Betula nigra</i>	river birch	Tree	FACW			
	<i>Carpinus caroliniana</i>	American hornbeam	Tree	FAC			
	<i>Chamaecyparis thyoides</i>	Atlantic white cedar	Tree	OBL			
	<i>Cornus amomum</i>	silky dogwood	Shrub	FACW			
	<i>Nyssa biflora</i>	swamp tupelo	Tree	OBL	4	10	10
	<i>Platanus occidentalis</i>	American sycamore	Tree	FACW		1	
	<i>Quercus laurifolia</i>	laurel oak	Tree	FACW	2	1	3
	<i>Quercus lyrata</i>	overcup oak	Tree	OBL	2		1
	<i>Quercus michauxii</i>	swamp chestnut oak	Tree	FACW	3	2	
	<i>Salix nigra</i>	black willow	Tree	OBL			
<i>Taxodium distichum</i>	bald cypress	Tree	OBL	9	1	3	
Sum	Performance Standard			20	15	17	
Post Mitigation Plan Species	<i>Magnolia virginiana</i>	sweetbay	Tree	FACW			
Sum	Proposed Standard			20	15	17	
Mitigation Plan Performance Standard	Current Year Stem Count				20	15	17
	Stems/Acre				810	486	607
	Species Count				5	5	4
	Dominant Species Composition (%)				45	67	59
	Average Plot Height (ft.)				2	2	2
	% Invasives				0	0	0
Post Mitigation Plan Performance Standard	Current Year Stem Count				20	15	17
	Stems/Acre				810	486	607
	Species Count				5	5	4
	Dominant Species Composition (%)				45	67	59
	Average Plot Height (ft.)				2	2	2
	% Invasives				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

Table 9A-C. Baseline Stream Data Summary Tables

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

**Table 9A. Baseline Stream Data Summary
Cool Run - Cool Run (Upstream)**

Parameter	Pre-Existing Condition (applicable)					Design		Monitoring Baseline (MY0)		
	Min	Mean	Med	Max	n	Min	Max	Min	Max	n
Riffle Only										
Bankfull Width (ft)	6.1	7		7.8		13.4	14.8	13.8	19.9	
Floodprone Width (ft)	11	12		12		50	150	100	100	
Bankfull Mean Depth (ft)	1.4	1.6		1.7		0.7	0.8	0.8	0.8	
Bankfull Max Depth (ft)	1.8	1.9		2		0.9	1.2	1.1	1.3	
Bankfull Cross Sectional Area (ft ²)	10.5	10.5		10.5		10.5	10.5	10.4	16.1	
Width/Depth Ratio	3.6	4.6		5.6		12	16	18.3	24.6	
Entrenchment Ratio	1.5	1.7		1.8		3.7	10.1	5.0	7.2	
Bank Height Ratio	1.8	1.8		1.9		1	1.1	1.0	1.0	
Max part size (mm) mobilized at bankfull										
Rosgen Classification	E/G 5					C5		C5		
Bankfull Discharge (cfs)	9.9					9.9		9.9		
Sinuosity (ft)	1.04					1.3		1.3		
Water Surface Slope (Channel) (ft/ft)	0.0025					0.002		0.002		
Other										

**Table 9B. Baseline Stream Data Summary
Cool Run - Cool Run (Downstream)**

Parameter	Pre-Existing Condition (applicable)					Design		Monitoring Baseline (MY0)		
	Min	Mean	Med	Max	n	Min	Max	Min	Max	n
Riffle Only										
Bankfull Width (ft)	9.5	10.2		10.8		14.2	15.8	16.0	19.9	
Floodprone Width (ft)	18	24		30		50	150	100	100	
Bankfull Mean Depth (ft)	1.1	1.2		1.3		0.8	0.8	0.8	1.5	
Bankfull Max Depth (ft)	1.7	1.7		1.7		0.9	1.3	1.1	3.1	
Bankfull Cross Sectional Area (ft ²)	11.9	11.9		11.9		11.9	11.9	16.1	24.0	
Width/Depth Ratio	7.3	8.9		9.8		17	21	10.7	24.6	
Entrenchment Ratio	1.7	2.4		3.2		3.5	9.5	6.2	7.2	
Bank Height Ratio	1.8	2.2		2.6		1	1.3	1.0	1.0	
Max part size (mm) mobilized at bankfull										
Rosgen Classification	Eg 5					C5		C5		
Bankfull Discharge (cfs)	11.2					11.2		11.2		
Sinuosity (ft)	1.02					1.3		1.3		
Water Surface Slope (Channel) (ft/ft)	0.003					0.0024		0.0024		
Other										

**Table 9C. Baseline Stream Data Summary
Cool Run - UT 1**

Parameter	Pre-Existing Condition (applicable)					Design		Monitoring Baseline		
	Min	Mean	Med	Max	n	Min	Max	Min	Max	n
Riffle Only										
Bankfull Width (ft)	3.1	3.2		3.9		5.4	6.2	6.3	6.8	
Floodprone Width (ft)	5	6		9		25	75	50.0	50.0	
Bankfull Mean Depth (ft)	0.6	0.8		0.8		0.4	0.4	0.4	0.6	
Bankfull Max Depth (ft)	0.8	1.1		1.2		0.5	0.7	0.8	0.9	
Bankfull Cross Sectional Area (ft ²)	2.4	2.4		2.4		2.4	2.4	2.8	3.9	
Width/Depth Ratio	3.9	4.3		6.5		12	16	10.3	16.6	
Entrenchment Ratio	1.3	1.9		2.7		4.7	12.1	7.4	7.9	
Bank Height Ratio	2.9	3.9		4.3		1	1.3	1.0	1.0	
Max part size (mm) mobilized at bankfull										
Rosgen Classification	Eg 5					C5		C5		
Bankfull Discharge (cfs)	2.2					2.2		2.2		
Sinuosity (ft)	1.02					1.2		1.2		
Water Surface Slope (Channel) (ft/ft)	0.0101					0.0086		0.0086		
Other										

Table 10A. Monitoring Data - Cross Section Morphology Monitoring Summary (Cool Run/ DMS:100142) Cool Run																																				
	Cool Run - Cross Section 1 (Pool)							Cool Run - Cross Section 2 (Riffle)							Cool Run - Cross Section 3 (Riffle)							Cool Run - Cross Section 4 (Pool)							Cool Run - 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 Area	40.73							40.87							42.09								42.07							43.14						
Bank Height Ratio_Based on AB Bankfull Area	1.00							1.00							1.00								1.00							1.00						
Thalweg Elevation	39.41							37.74							40.699								41.10							41.884						
LTOB ² Elevation	40.73							40.87							42.09								42.07							43.135						
LTOB ² Max Depth (ft)	1.32							3.12							1.39								0.97							1.25						
LTOB ² Cross Sectional Area (ft ²)	11.9							24.0							8.8								10.3							10.9						
Cool Run - Cross Section 6 (Pool)																																				
	MY0	MY1	MY2	MY3	MY5	MY7	MY+																													
Bankfull Elevation (ft) - Based on AB-Bankfull Area	43.47																																			
Bank Height Ratio_Based on AB Bankfull Area	1.00																																			
Thalweg Elevation	42.39																																			
LTOB ² Elevation	43.47																																			
LTOB ² Max Depth (ft)	1.08																																			
LTOB ² Cross Sectional Area (ft ²)	10.4																																			
								The above morphology parameters reflect the 2018 guidance that arose from the mitigation technical workgroup consisting of DMS, the IRT and industry mitigation providers/practitioners. The outcome resulted in the focus on three primary morphological parameters of interest for the purposes of tracking channel change moving forward. They are the bank height ratio using a constant As-built bankfull area and the cross sectional area and max depth based on each years low top of bank. These are calculated as follows:																												
Bankfull Elevation (ft) - Based on AB-Bankfull Area								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.																												
Bank Height Ratio_Based on AB Bankfull Area								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 recorded and tracked above as LTOB max depth.																												
Thalweg Elevation																																				
LTOB ² Elevation																																				
LTOB ² Max Depth (ft)																																				
LTOB ² Cross Sectional Area (ft ²)																																				

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 decreases. 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 (Cool Run/ DMS:100142) UT1																																				
	UT 1 - Cross Section 7 (Pool)							UT 1 - Cross Section 8 (Riffle)							UT 1 - Cross Section 9 (Pool)							UT 1 - Cross Section 10 (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 Area	41.89							42.44							43.02								43.56													
Bank Height Ratio_Based on AB Bankfull Area	1.00							1.00							1.00								1.00													
Thalweg Elevation	40.71							41.49							41.863								42.72													
LTOB ² Elevation	41.89							42.44							43.02								43.56													
LTOB ² Max Depth (ft)	1.18							0.95							1.16								0.85													
LTOB ² Cross Sectional Area (ft ²)	7.7							3.9							3.8								2.8													
UT 1 - Cross Section 11 (Pool)																																				
	MY0	MY1	MY2	MY3	MY5	MY7	MY+																													
Bankfull Elevation (ft) - Based on AB-Bankfull Area																																				
Bank Height Ratio_Based on AB Bankfull Area																																				
Thalweg Elevation																																				
LTOB ² Elevation																																				
LTOB ² Max Depth (ft)																																				
LTOB ² Cross Sectional Area (ft ²)																																				
								The above morphology parameters reflect the 2018 guidance that arose from the mitigation technical workgroup consisting of DMS, the IRT and industry mitigation providers/practitioners. The outcome resulted in the focus on three primary morphological parameters of interest for the purposes of tracking channel change moving forward. They are the bank height ratio using a constant As-built bankfull area and the cross sectional area and max depth based on each years low top of bank. These are calculated as follows:																												
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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 decreases. 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

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	Jul-20
Mitigation Plan Approved	NA	12-July-22
Construction (Grading) Completed	NA	06-Apr-23
Planting Completed	NA	06-Apr-23
As-built Survey Completed	May-23	Jun-23
MY-0 Baseline Report	June-23	Jun-23
MY1+ Monitoring Reports		
Remediation Items (e.g. beaver removal, supplements, repairs etc.)		
Encroachment		

Table 12. Project Contacts

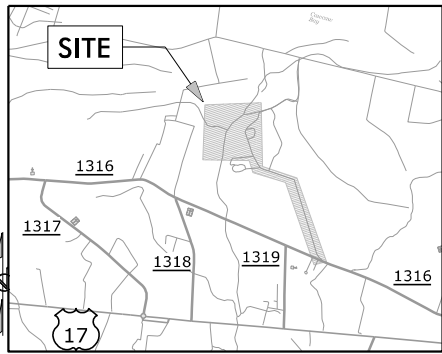
Cool Run Site/100142	
Provider	Clearwater Mitigation Solutions 604 Macon PL Raleigh, NC 27609
Mitigation Provider POC	Kevin Yates 919-624-6901
Stream Designer	Axiom Environmental, Inc. 218 Snow Ave Raleigh, NC 27603
Primary project design POC	Grant Lewis 919-215-1693
Wetland Designer	Davey Resource Group 3805 Wrightsville Avenue, Suite 15 Wilmington, NC 28403
Primary project design POC	Wes Fryar 910-471-0018
Monitoring Performers	Davey Resource Group 3805 Wrightsville Avenue, Suite 15 Wilmington, NC 28403
Stream Monitoring POC	Davey Resource Group 3805 Wrightsville Avenue, Suite 15 Wilmington, NC 28403 Wes Fryar (910) 471-0018
Vegetation Monitoring POC	Davey Resource Group 3805 Wrightsville Avenue, Suite 15 Wilmington, NC 28403 Wes Fryar (910) 471-0018

Appendix F
Record Drawings (As-Built Survey)

09.08/99

NC DEPARTMENT OF ENVIRONMENTAL QUALITY DIVISION OF MITIGATION SERVICES AS-BUILT PLANS COOL RUN SITE

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

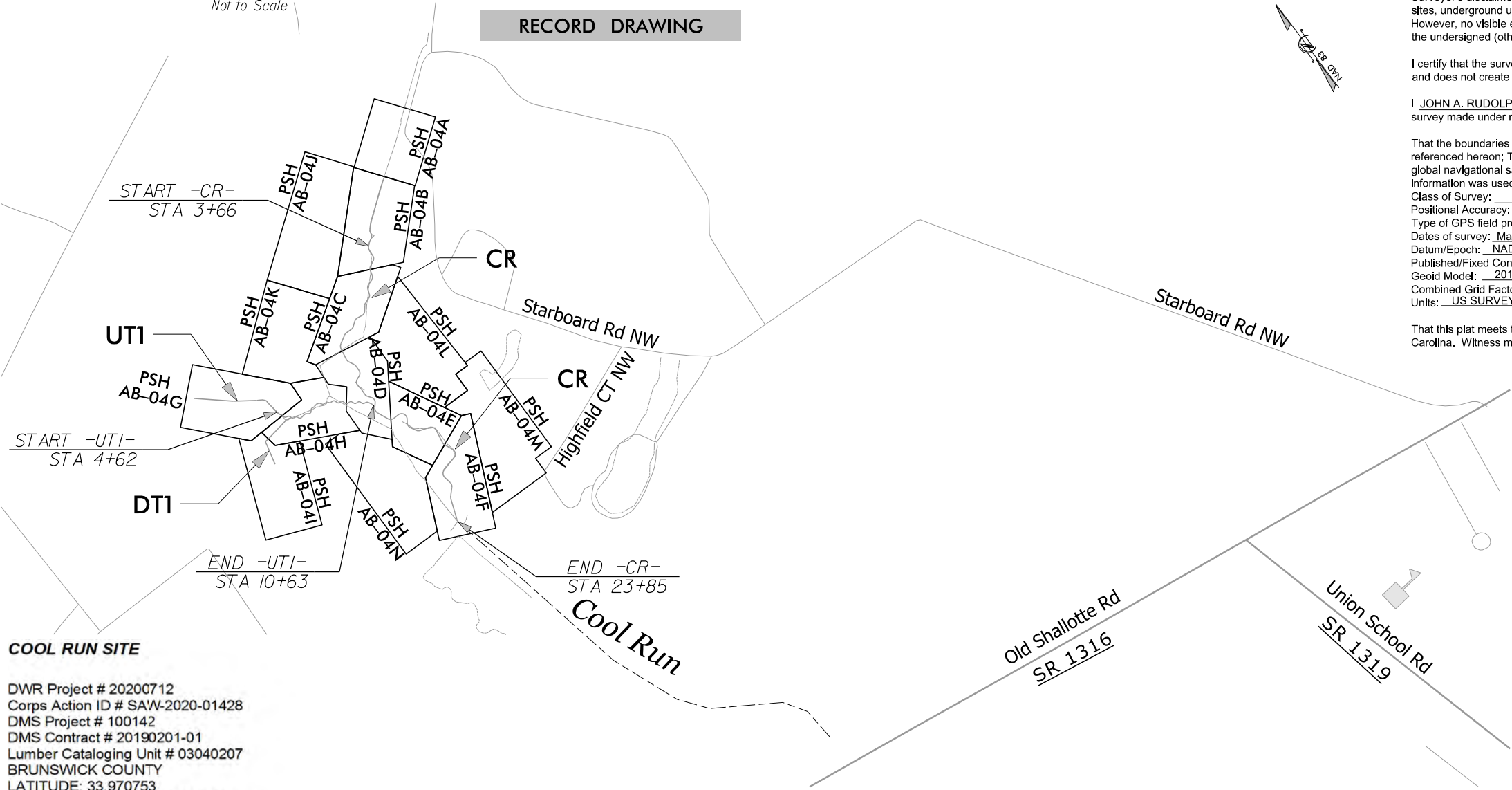


VICINITY MAP
Not to Scale

LOCATION: BRUNSWICK COUNTY, NORTH CAROLINA

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

RECORD DRAWING



COOL RUN SITE

DWR Project # 20200712
Corps Action ID # SA/W-2020-01428
DMS Project # 100142
DMS Contract # 20190201-01
Lumber Cataloging Unit # 03040207
BRUNSWICK COUNTY
LATITUDE: 33.970753
LONGITUDE: -78.471379 (WGS84)

INDEX OF SHEETS

SHEET NUMBER	SHEET
AB-01	Title Sheet
AB-02	Symbology
AB-03	Easement
AB-04A THRU AB-04N	As-Built Structures
AB-04O	As-Built Planting List

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 herein; That the ratio of precision as calculated was 1:7,500+ and that the global navigational satellite system (GNSS) was used to perform this survey and the following information was used:

Class of Survey:	CLASS B (HORIZONTAL) CLASS B (VERTICAL)
Positional Accuracy:	0.12 feet (HORIZONTAL)
Type of GPS field procedure:	RTK
Dates of survey:	May 2023
Datum/Epoch:	NAD 1983(2011)
Published/Fixed Control Use:	OPUS
Geoid Model:	2012B CONUS
Combined Grid Factor:	0.99990680 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 XX day of XXXX, 2023



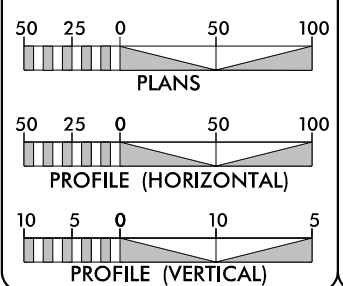
Professional Land Surveyor License Number L-4194

CONTRACT: COOL RUN SITE

LIMITS OF DISTURBANCE: 22.13 AC

DATE: 8/21/2023

GRAPHIC SCALES



As-Built LENGTH OF -CR- = 2017 As-Built LENGTH OF -UT 1- = 610			
TOTAL STREAM LENGTHS (LF) = 2627			
RESTORATION LEVEL	STREAM (linear footage)	RIPARIAN WETLAND (acreage)	NONRIPARIAN WETLAND (acreage)
RESTORATION (Ratio 1:1)	2024	14.108 (Reestablishment)	0.000
RESTORATION (Ratio 1.5:1)	603	1.433 (Rehabilitation)	0.000
ENHANCEMENT	0	1.201	0.000
PRESERVATION	0	0.492	
TOTALS	2627	17.234	0.000
MITIGATION UNITS	2426.000	SMU 15.512 RIPARIAN WMUs	NONRIPARIAN WMUs

Axiom Environmental
218 Snow Ave
Raleigh, NC 27603

GRANT LEWIS
PROJECT DESIGNER

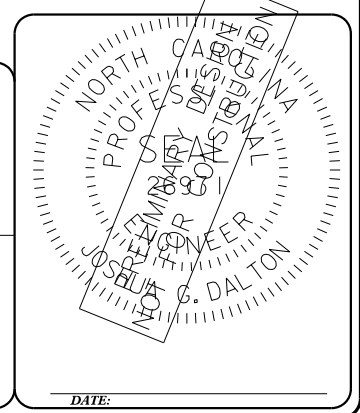
Clearwater Mitigation Solutions
604 Macon Place
Raleigh, NC 27609

KEVIN YATES
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



DATE:

8/21/2023
CoolRun_Rdy_psh-AB-01.dgn
jnarvey

CONVENTIONAL PLAN SHEET SYMBOLS

Note: Not to Scale

*S.U.E. = Subsurface Utility Engineering

RECORD DRAWING

BOUNDARIES AND PROPERTY:

State Line	-----
County Line	-----
Township Line	-----
City Line	-----
Reservation Line	-----
Property Line	-----
Existing Iron Pin	EP
Computed Property Corner	-----
Property Monument	EM
Parcel/Sequence Number	(23)
Existing Fence Line	-x-x-x-
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	○
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	W
Proposed Lateral, Tail, Head Ditch	-----

RIGHT OF WAY & PROJECT CONTROL:

Secondary Horiz and Vert Control Point	◆
Primary Horiz Control Point	○
Primary Horiz and Vert Control Point	●

Exist Permanent Easement 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	-----
New Right of Way Line with Pin and Cap	◇
New Right of Way Line with Concrete or Granite RW Marker	△
New Control of Access Line with Concrete CA Marker	⊠
Existing Control of Access	⊠
New Control of Access	⊠
Existing Easement Line	-----
New Conservation Easement	CE
New Temporary Drainage Easement	TDE
New Permanent Drainage Easement	PDE
New Permanent Drainage / Utility Easement	DUE
New Permanent Utility Easement	PUE
New Temporary Utility Easement	TUE
New Aerial Utility Easement	AUE

ROADS AND RELATED FEATURES:

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

VEGETATION:

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

EXISTING STRUCTURES:

MAJOR:	
Bridge, Tunnel or Box Culvert	CONC
Bridge Wing Wall, Head Wall and End Wall	CONC WW
MINOR:	
Head and End Wall	CONC HW

Pipe Culvert	-----
Footbridge	-----
Drainage Box: Catch Basin, DI or JB	CB
Paved Ditch Gutter	-----
Storm Sewer Manhole	⊕
Storm Sewer	S

UTILITIES:

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

TELEPHONE:

Existing Telephone Pole	●
-------------------------	---

WATER:

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

GAS:

Gas Valve	◇
Gas Meter	⊕
U/G Gas Line LOS B (S.U.E.*)	-----
U/G Gas Line LOS C (S.U.E.*)	-----
U/G Gas Line LOS D (S.U.E.*)	-----
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.*)	-----
SS Forced Main Line LOS C (S.U.E.*)	-----

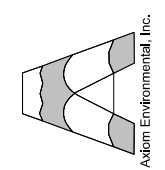
SS Forced Main Line LOS D (S.U.E.*)	FSS
MISCELLANEOUS:	
Utility Pole	●
Utility Pole with Base	□
Utility Located Object	○
Utility Traffic Signal Box	⊠
Utility Unknown U/G Line LOS B (S.U.E.*)	-----
U/G Tank; Water, Gas, Oil	UST
Underground Storage Tank, Approx. Loc.	UST
A/G Tank; Water, Gas, Oil	-----
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	-----
Stream Plug	-----
Floodplain Interceptor	-----
Proposed Fence	-----
Limits of Disturbance	LOD

AS-BUILT:

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

SUNGATE DESIGN GROUP, P.A.
 845 GILES FARM ROAD
 BRUNSWICK COUNTY, NC 27806
 TEL: (919) 855-2243
 ENG FIRM LICENSE NO. C-980



AKAM Environmental, Inc.

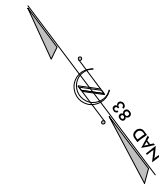
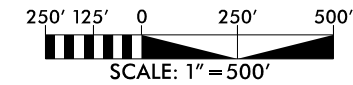
COOL RUN
 BRUNSWICK COUNTY, NC
 SYMBOLOGY

PROJECT #: 1221-21015
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 DATE: 8/21/2023
 DRAWN BY: JRH
 REVIEWED BY: JGD
 REVISIONS:
 SHEET NO. AB-02

8/21/2023
 Cool Run_Psh_PSH_AB-02.dgn
 jrh

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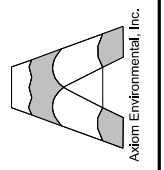
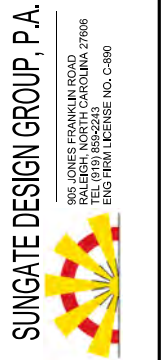
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EASEMENT PROVIDED BY:
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5688 U.S. HIGHWAY 70 EAST
GOLDSBORO, NC 27534



— CE — CONSERVATION EASEMENT
— PE — ACCESS EASEMENT



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VERTICAL DATUM: NAVD 1988

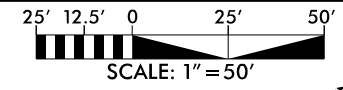


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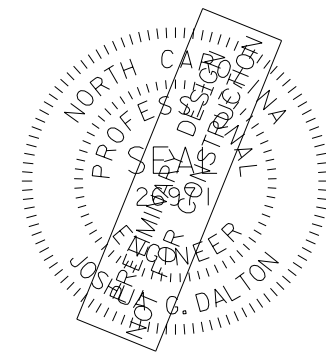
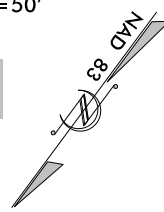
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8/21/2023
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JRH
REVIEWED BY:
JGD
REVISIONS:

PROJECT # :
1221-21015
DRAWING NAME:
COOL RUN PSH AB03
DATE:
8/21/2023
DRAWN BY:
JRH
REVIEWED BY:
JGD
REVISIONS:

SHEET NO.
AB-03

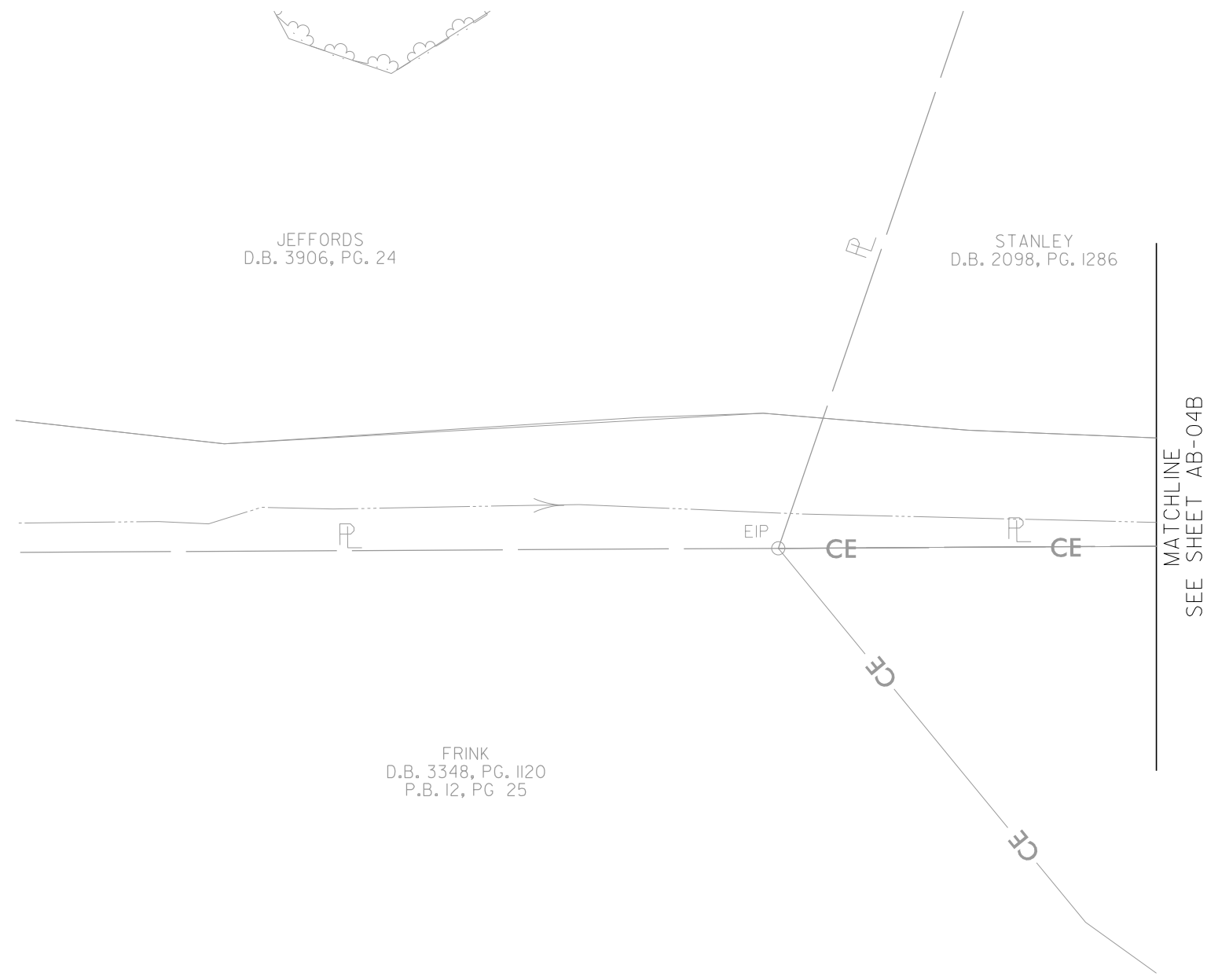


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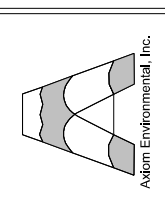


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HORIZONTAL DATUM: NAD 83 (2011)
VERTICAL DATUM: NAVD 1988



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 BRUNSWICK COUNTY, NC 27806
 TEL: (919) 855-2243
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COOL RUN
 BRUNSWICK COUNTY, NC

AS-BUILT STRUCTURES

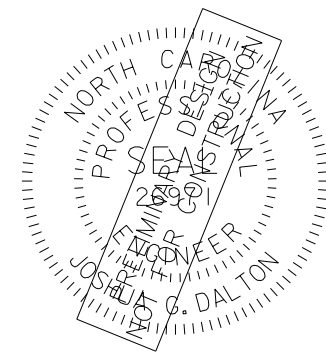
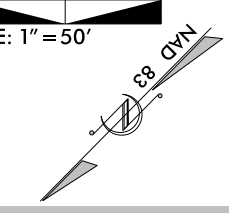
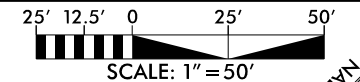
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 1221-21015
 DRAWING NAME:
 COOL RUN PSH AB04A
 DATE:
 8/21/2023
 DRAWN BY:
 JRH
 REVIEWED BY:
 JGD
 REVISIONS:

SHEET NO.
AB-04A

8/21/2023
 Cool Run_Psh_AB-04A.dgn
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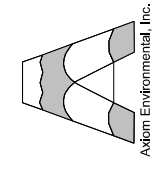
-CR- AS-BUILT STRUCTURE LOCATIONS				
STR. TYPE	NORTHING	EASTING	Prop Elevation	AB Survey Elevation
CROSS VANE	81,219.57	2,160,510.60	42.70	42.29



RECORD DRAWING

DATE: _____
 DOCUMENT NOT CONSIDERED FINAL
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 845 GILES FRANKLIN ROAD
 SUITE 200
 CHARLOTTE, NC 27866
 TEL: (919) 855-2243
 ENG FIRM LICENSE NO. C-980

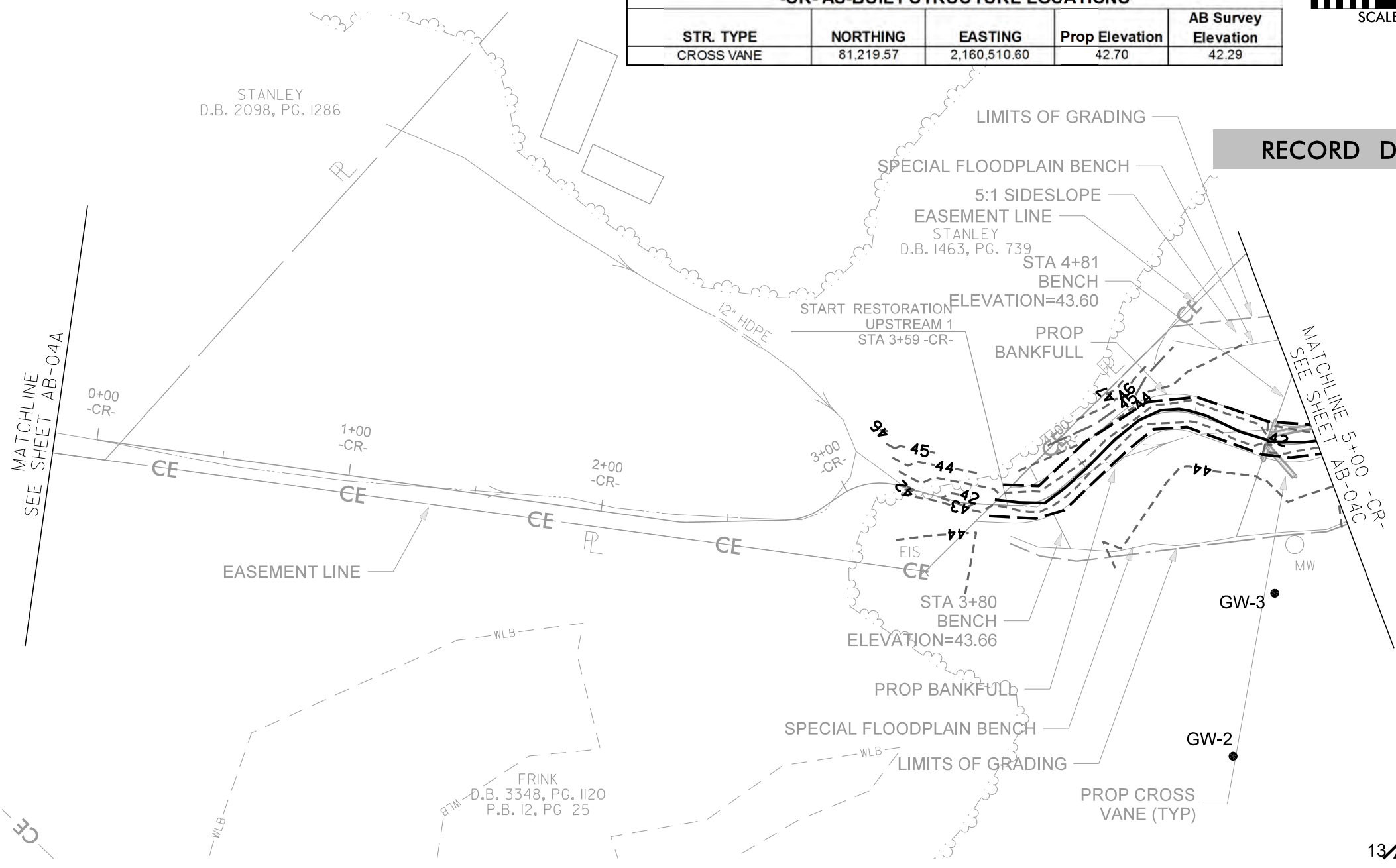


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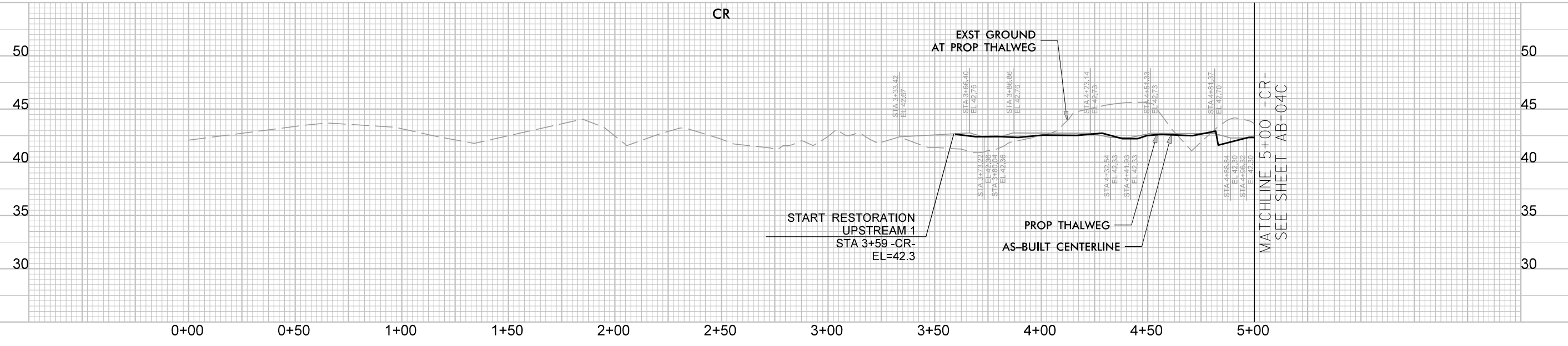
COOL RUN
 BRUNSWICK COUNTY, NC
AS-BUILT STRUCTURES

PROJECT #: 1221-21015
 DRAWING NAME: COOL RUN PSH AB04B
 DATE: 8/21/2023
 DRAWN BY: JRH
 REVIEWED BY: JGD
 REVISIONS:

SHEET NO.
AB-04B

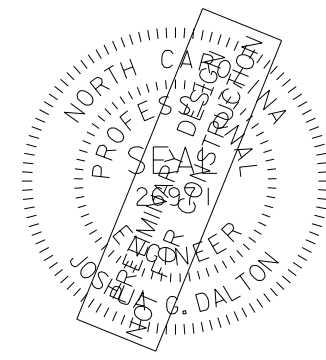
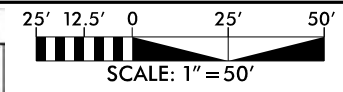


HORIZONTAL DATUM: NAD 83 (2011)
 VERTICAL DATUM: NAVD 1988

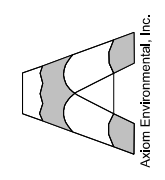


8/21/2023
 Cool Run_Psh_AB-04B.dgn
 JGD

-CR- AS-BUILT STRUCTURE LOCATIONS				
STR. TYPE	NORTHING	EASTING	Prop Elevation	AB Survey Elevation
CROSS VANE	81,105.83	2,160,417.05	42.61	42.80
CROSS VANE	81,049.16	2,160,343.57	42.51	42.52



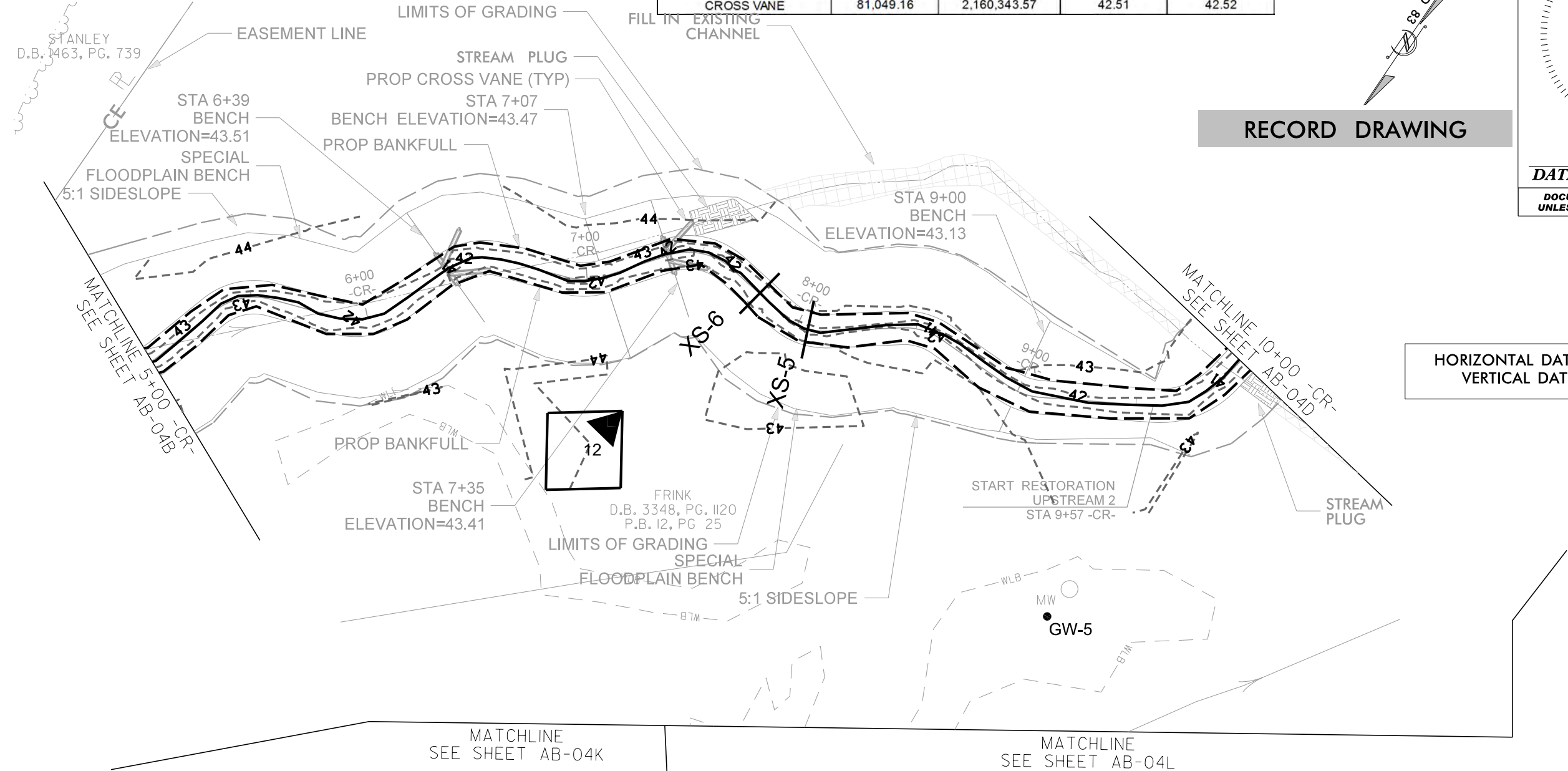
SUNGATE DESIGN GROUP, P.A.
 945 GILES FRANKLIN ROAD
 SUITE 200
 WELLSVILLE, NC 27884
 TEL: (919) 855-2243
 ENG FIRM LICENSE NO. C-980



COOL RUN
 BRUNSWICK COUNTY, NC

AS-BUILT STRUCTURES

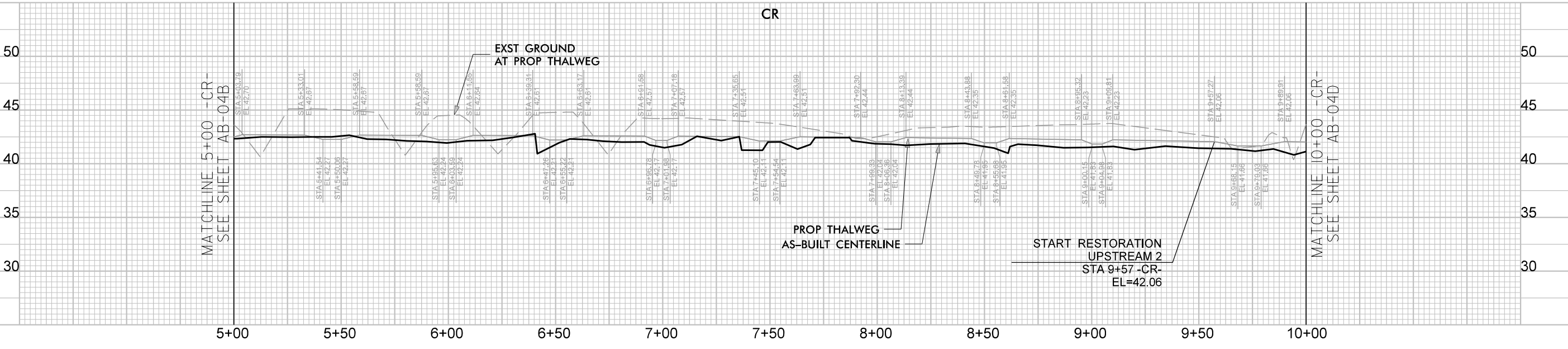
PROJECT # : 1221-21015
 DRAWING NAME: COOL RUN PSH AB04C
 DATE: 8/21/2023
 DRAWN BY: JRH
 REVIEWED BY: JGD
 REVISIONS:
 SHEET NO. **AB-04C**



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



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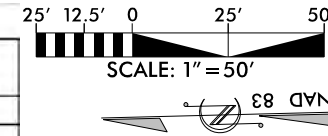
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-CR- AS-BUILT STRUCTURE LOCATIONS

STR. TYPE	NORTHING	EASTING	Prop Elevation	AB Survey Elevation
CROSS VANE	80,902.84	2,160,112.59	41.05	
CROSS VANE	80,856.92	2,160,129.34	41.97	
LOG VANE	80,817.46	2,160,131.07	41.55	41.73
CROSS VANE	80,608.66	2,160,078.76	41.02	41.16

-UT1- AS-BUILT STRUCTURE LOCATIONS

STR. TYPE	NORTHING	EASTING	Prop Elevation	AB Survey Elevation
CROSS VANE	80,714.46	2,159,990.89	41.96	42.10
CROSS VANE	80,695.83	2,160,005.23	41.77	42.20
CROSS VANE	80,669.00	2,160,040.08	41.61	41.93
CROSS VANE	80,639.68	2,160,076.23	41.34	41.42

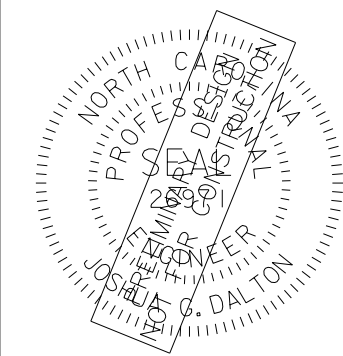


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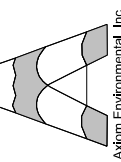
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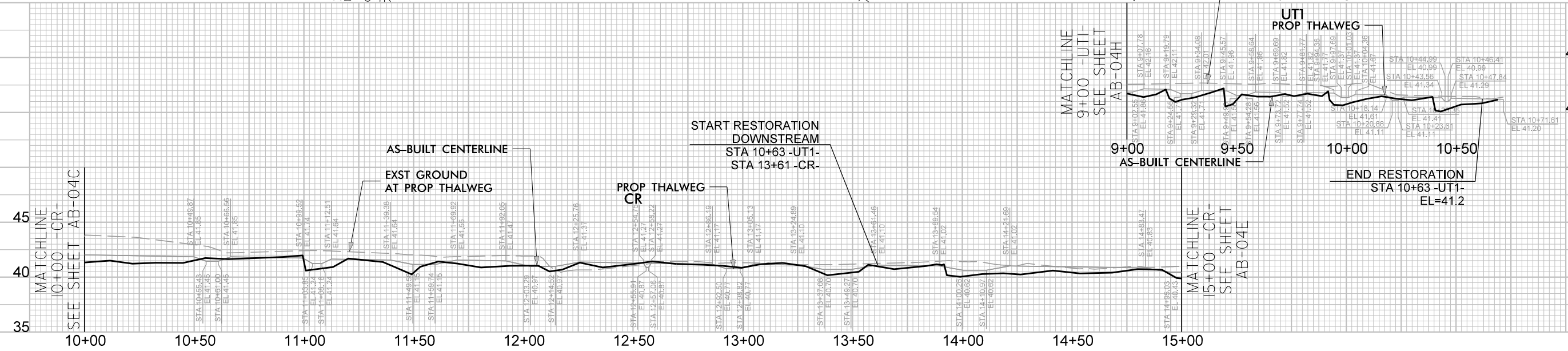
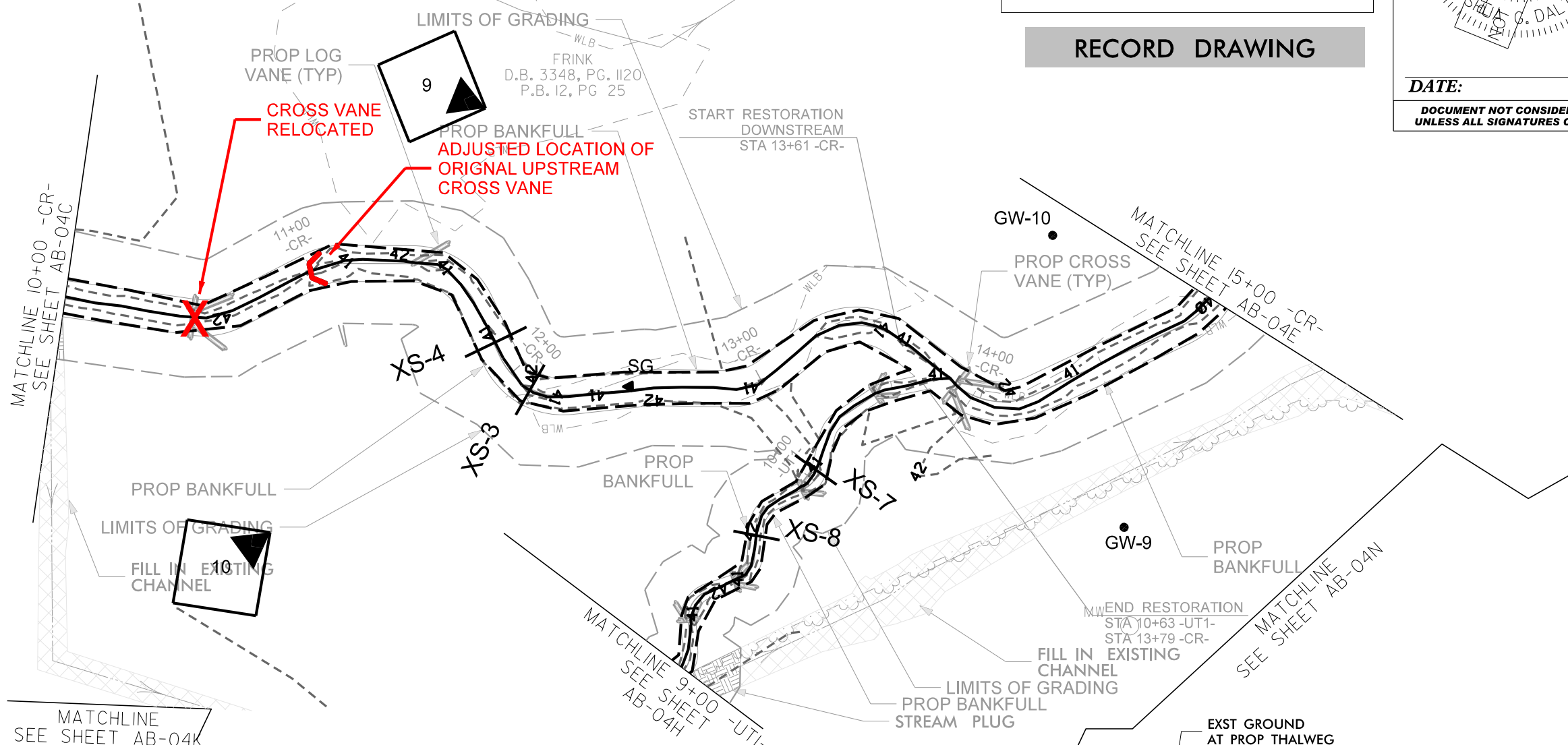
SUNGATE DESIGN GROUP, P.A.
934 GILES FRANKLIN ROAD
SUITE 200
CARY, NC 27513
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COOL RUN
BRUNSWICK COUNTY, NC
AS-BUILT STRUCTURES

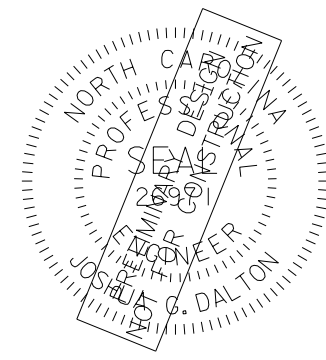
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DRAWING NAME: COOL RUN PSH AB04D
DATE: 8/21/2023
DRAWN BY: JRH
REVIEWED BY: JGD
REVISIONS:

SHEET NO.
AB-04D

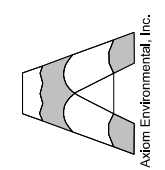


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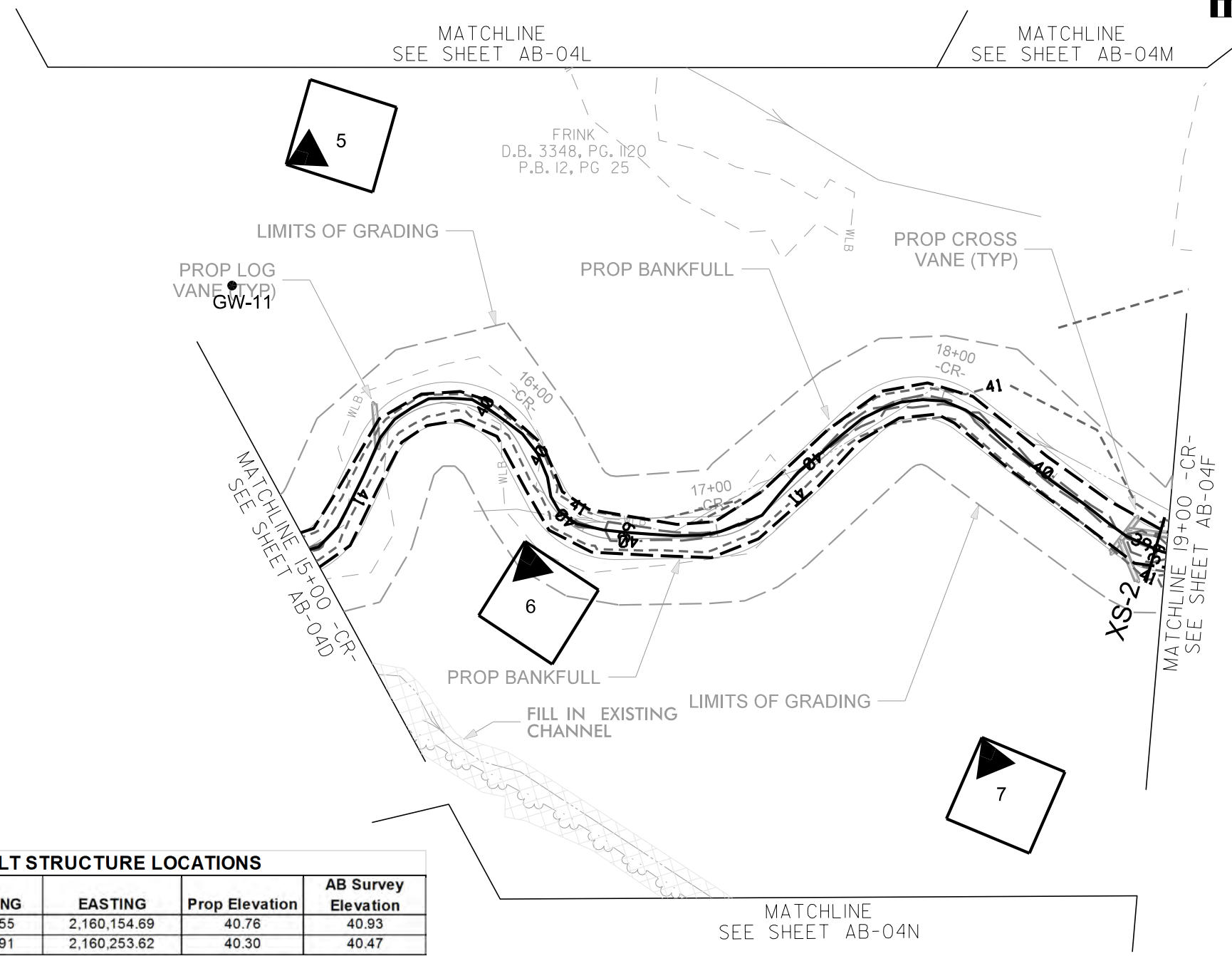
SUNGATE DESIGN GROUP, P.A.
 845 GILES FRANKLIN ROAD
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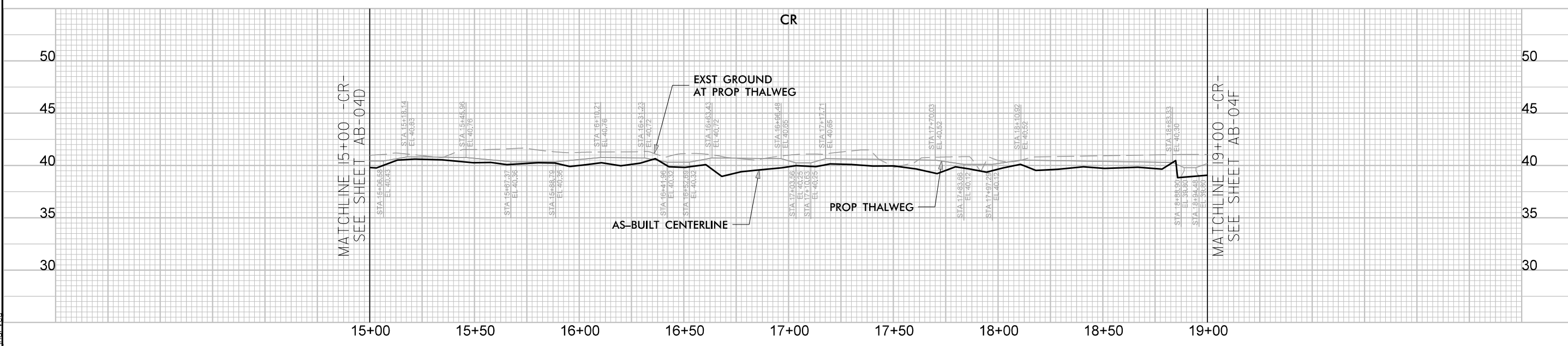
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**HORIZONTAL DATUM: NAD 83 (2011)
 VERTICAL DATUM: NAVD 1988**

RECORD DRAWING



-CR- AS-BUILT STRUCTURE LOCATIONS				
STR. TYPE	NORTHING	EASTING	Prop Elevation	AB Survey Elevation
LOG VANE	80,505.55	2,160,154.69	40.76	40.93
CROSS VANE	80,248.91	2,160,253.62	40.30	40.47



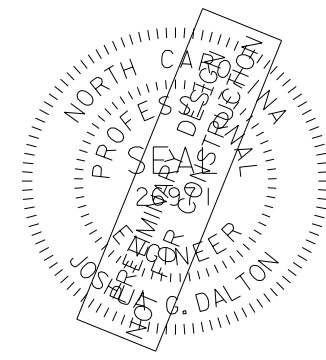
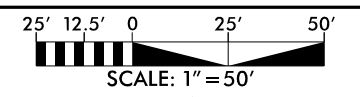
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COOL RUN
 BRUNSWICK COUNTY, NC
AS-BUILT STRUCTURES

PROJECT # : 1221-21015
 DRAWING NAME: COOL RUN PSH ABO4E
 DATE: 8/21/2023
 DRAWN BY: JRH
 REVIEWED BY: JGD
 REVISIONS:

SHEET NO.
AB-04E

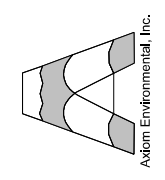


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PROJECT # :
 1221-21015

DRAWING NAME:
 COOL RUN PSH AB04G

DATE:
 8/21/2023

DRAWN BY:
 JRH

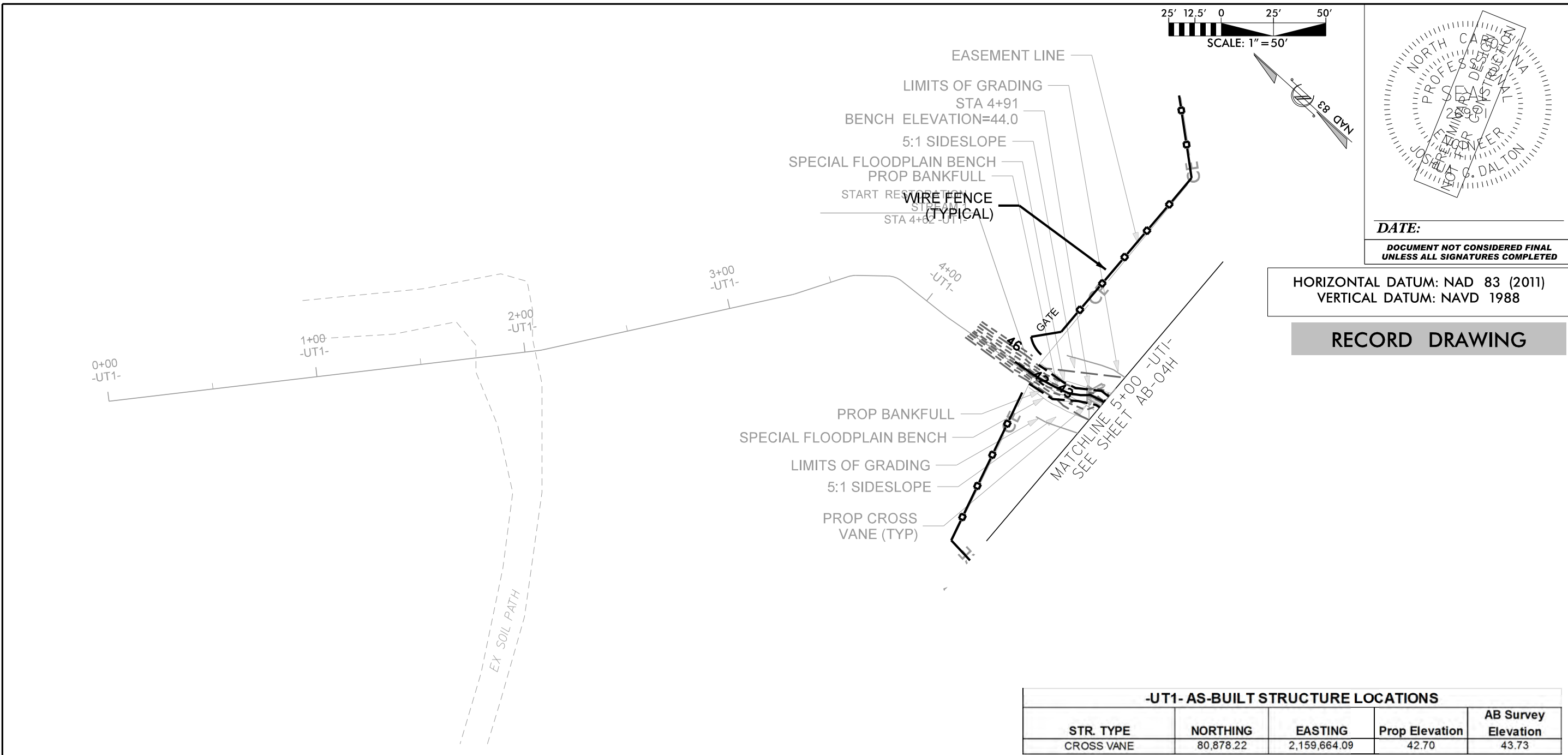
REVIEWED BY:
 JGD

REVISIONS:

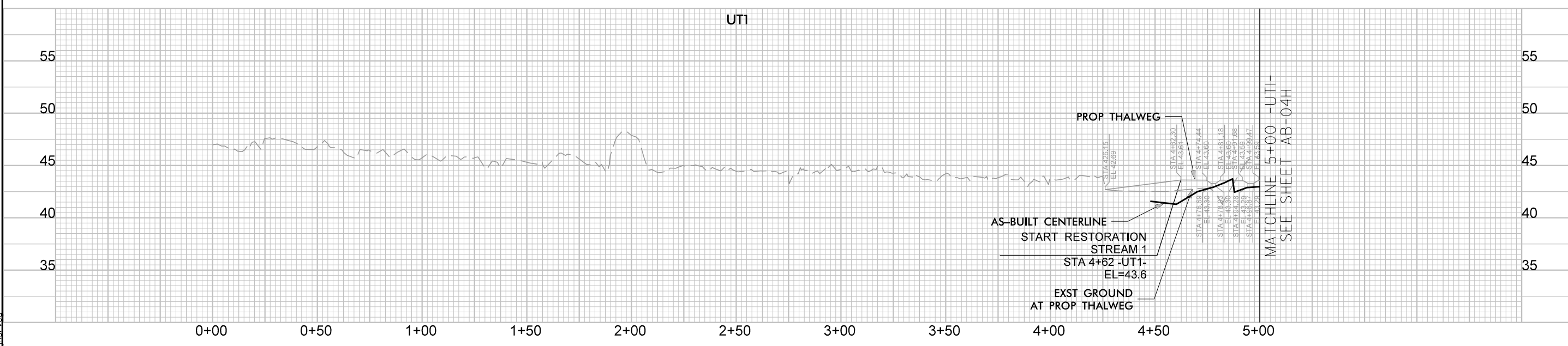
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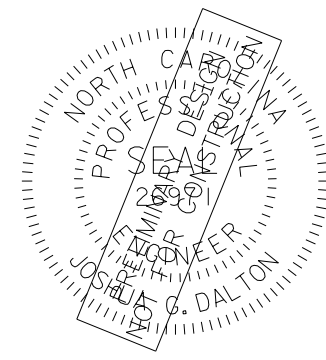
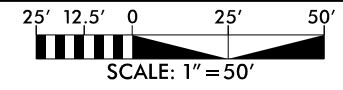
COOL RUN
 BRUNSWICK COUNTY, NC
AS-BUILT STRUCTURES



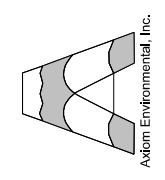
-UT1- AS-BUILT STRUCTURE LOCATIONS				
STR. TYPE	NORTHING	EASTING	Prop Elevation	AB Survey Elevation
CROSS VANE	80,878.22	2,159,664.09	42.70	43.73



8/21/2023
 Cool Run_Psh_AB-04G.dgn



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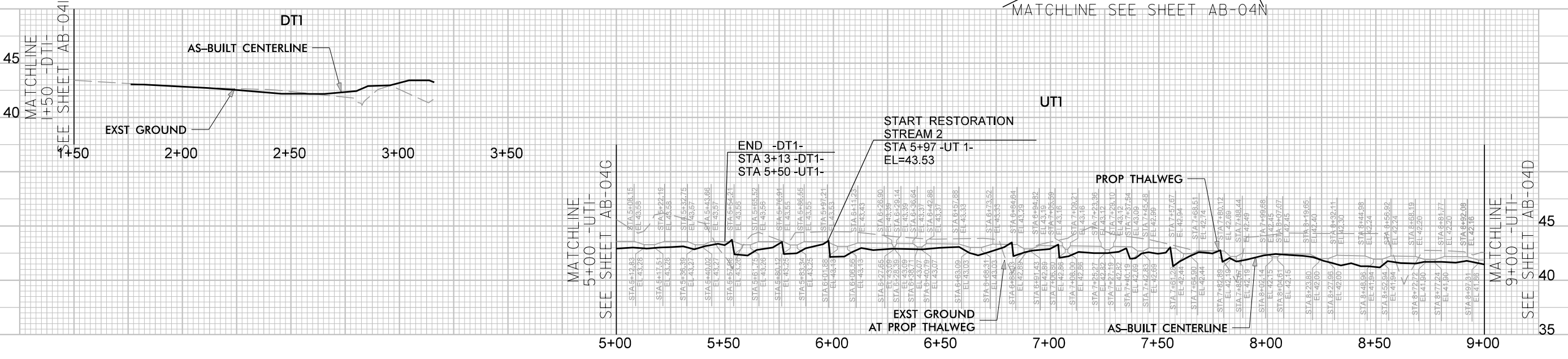
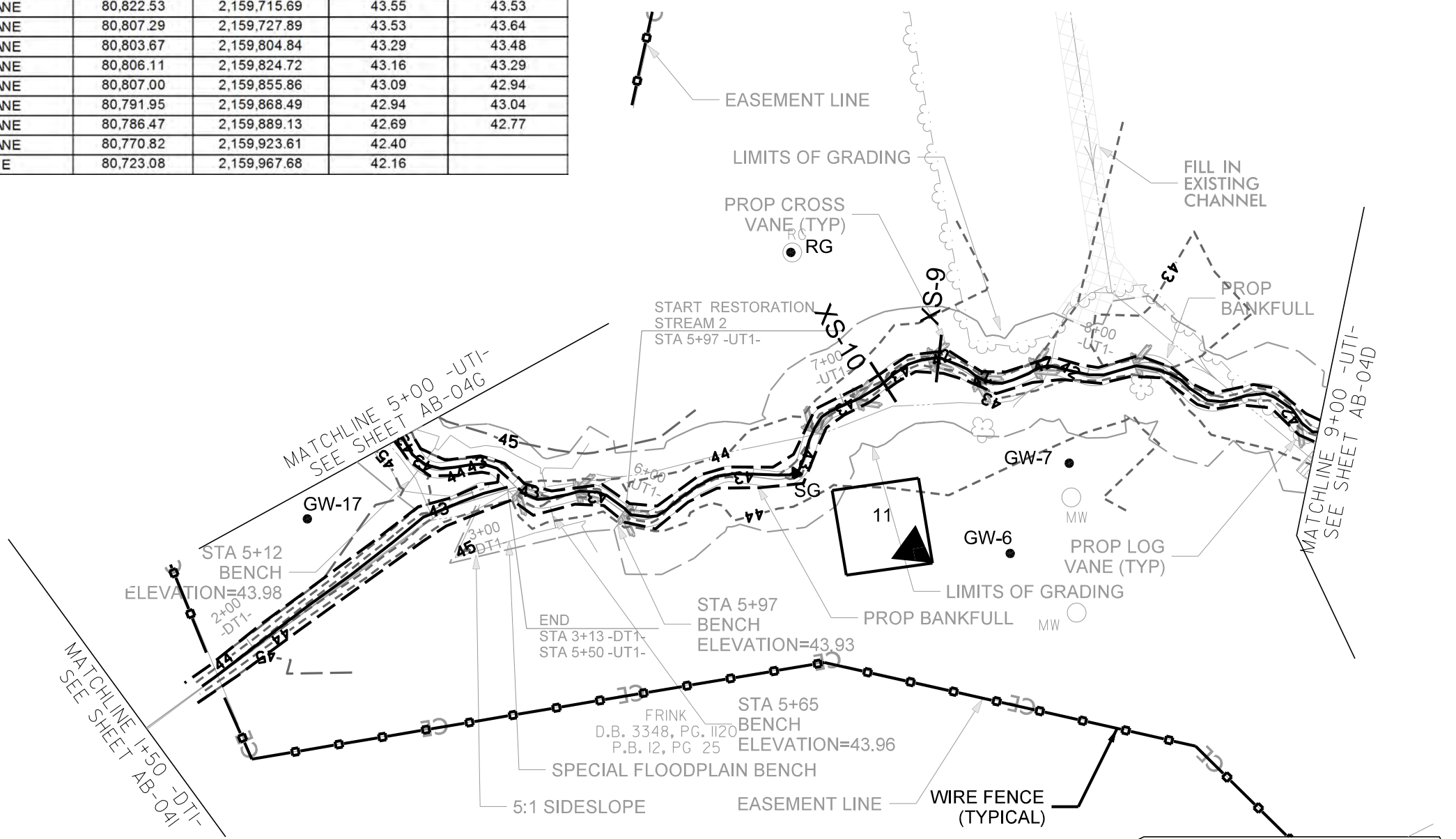


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HORIZONTAL DATUM: NAD 83 (2011)
VERTICAL DATUM: NAVD 1988

RECORD DRAWING

-UT1- AS-BUILT STRUCTURE LOCATIONS				
STR. TYPE	NORTHING	EASTING	Prop Elevation	AB Survey Elevation
CROSS VANE	80,832.33	2,159,696.58	43.56	43.73
CROSS VANE	80,822.53	2,159,715.69	43.55	43.53
CROSS VANE	80,807.29	2,159,727.89	43.53	43.64
CROSS VANE	80,803.67	2,159,804.84	43.29	43.48
CROSS VANE	80,806.11	2,159,824.72	43.16	43.29
CROSS VANE	80,807.00	2,159,855.86	43.09	42.94
CROSS VANE	80,791.95	2,159,868.49	42.94	43.04
CROSS VANE	80,786.47	2,159,889.13	42.69	42.77
CROSS VANE	80,770.82	2,159,923.61	42.40	
LOG VANE	80,723.08	2,159,967.68	42.16	



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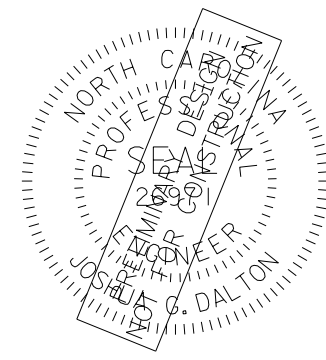
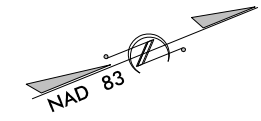
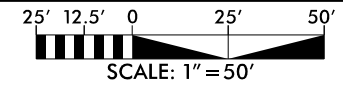
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PROJECT # : 1221-21015
DRAWING NAME: COOL RUN PSH AB04H
DATE: 8/21/2023
DRAWN BY: JRH
REVIEWED BY: JGD
REVISIONS:

PROJECT # : 1221-21015
DRAWING NAME: COOL RUN PSH AB04H
DATE: 8/21/2023
DRAWN BY: JRH
REVIEWED BY: JGD
REVISIONS:

SHEET NO.
AB-04H

COOL RUN
BRUNSWICK COUNTY, NC
AS-BUILT STRUCTURES

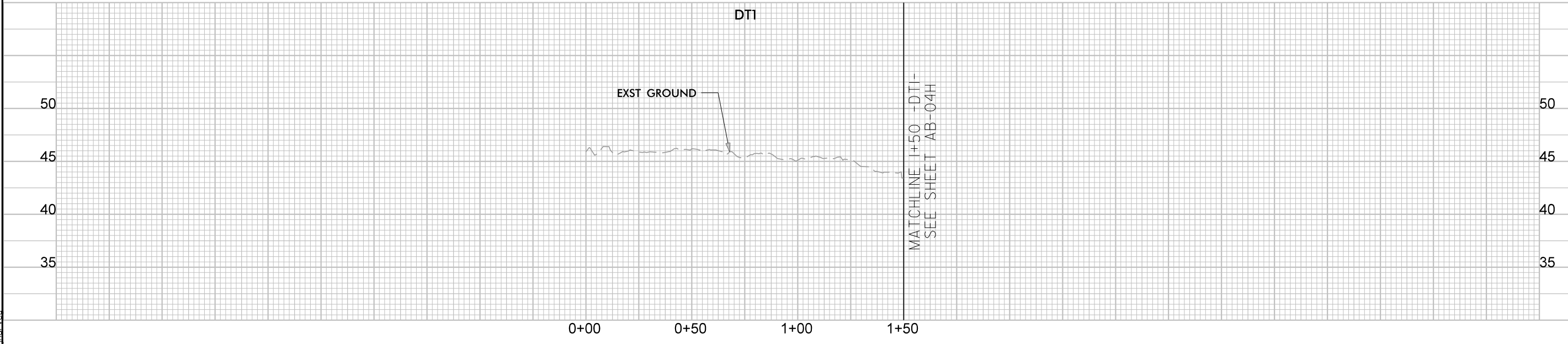
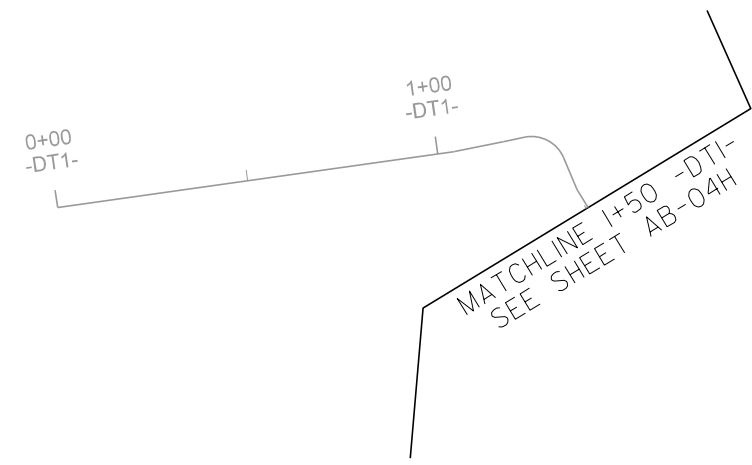


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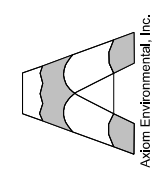
RECORD DRAWING

FRINK
 D.B. 3348, PG. 1120
 P.B. 12, PG 25



8/21/2023
 Cool Run_Psh_Ab-041.dgn
 jrd

SUNGATE DESIGN GROUP, P.A.
 850 GILES FRANKLIN ROAD
 SUITE 200
 TEL: (919) 855-2243
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COOL RUN
 BRUNSWICK COUNTY, NC
AS-BUILT STRUCTURES

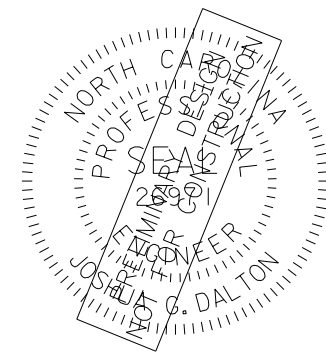
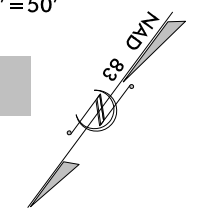
PROJECT # : 1221-21015
 DRAWING NAME: COOL RUN PSH AB041
 DATE: 8/21/2023
 DRAWN BY: JRH
 REVIEWED BY: JGD
 REVISIONS:

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AB-04I

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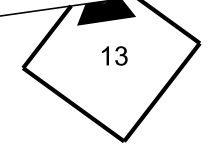
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MATCHLINE
 SEE SHEET AB-04C

MATCHLINE
 SEE SHEET AB-04B

MW ● GW-1



EASEMENT LINE

FRINK
 D.B. 3348, PG. 1120
 P.B. 12, PG 25

WIRE FENCE
 (TYPICAL)

MATCHLINE
 SEE SHEET AB-04K

8/21/2023
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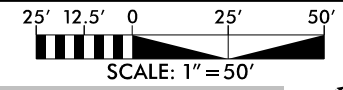
Axiom Environmental, Inc.

COOL RUN
 BRUNSWICK COUNTY, NC
AS-BUILT STRUCTURES

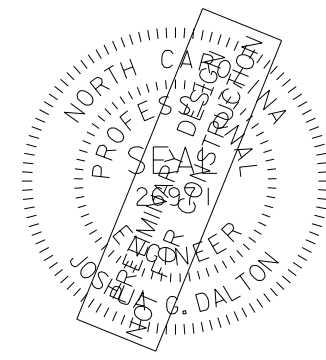
PROJECT # : 1221-21015
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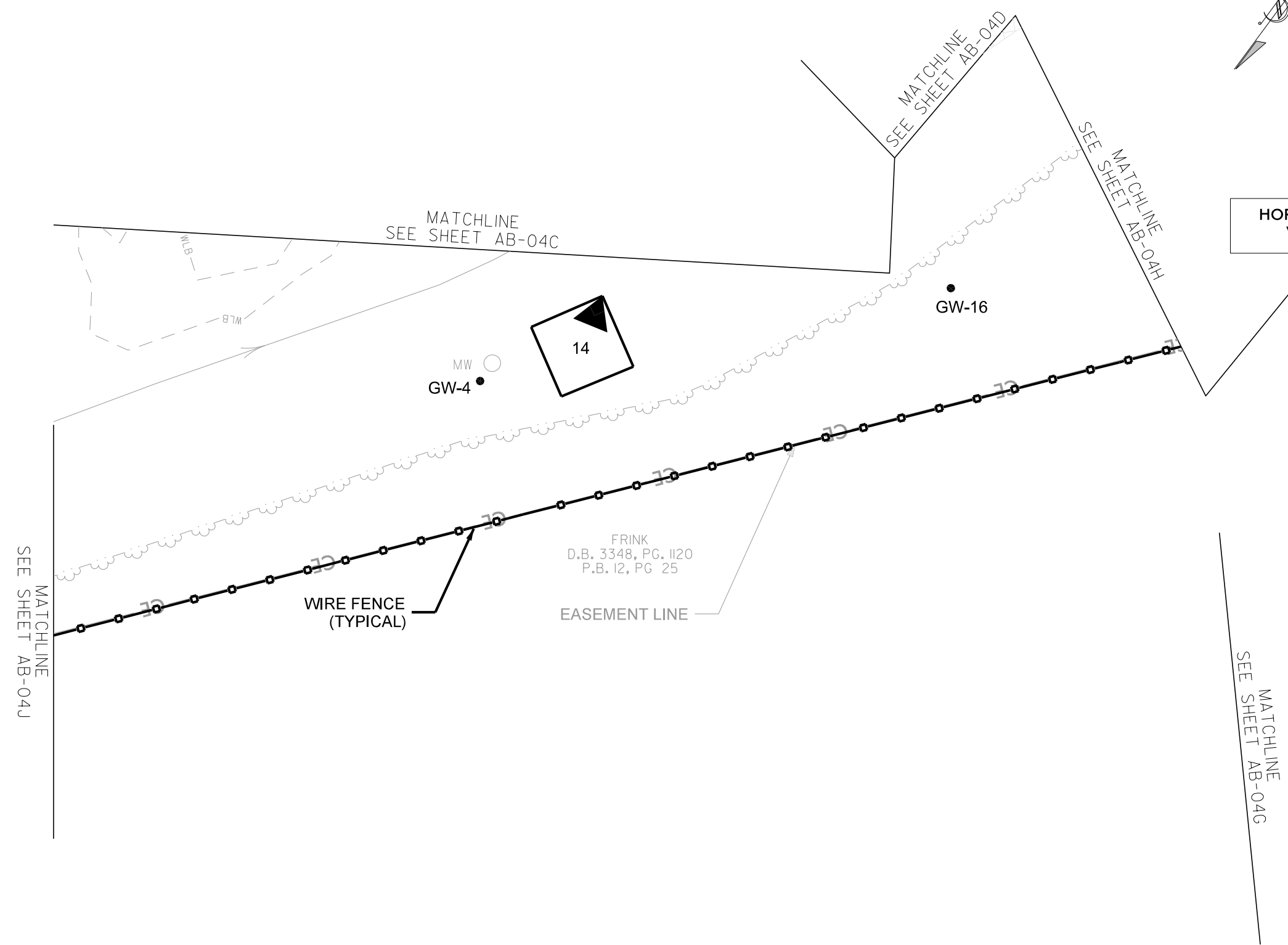


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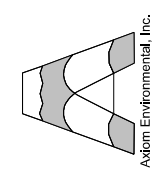


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PROJECT # :
 1221-21015

DRAWING NAME:
 COOL RUN PSH AB04K

DATE:
 8/21/2023

DRAWN BY:
 JRH

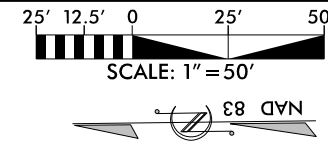
REVIEWED BY:
 JGD

REVISIONS:

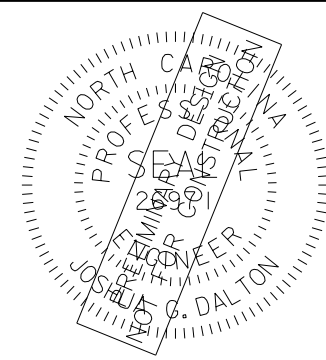
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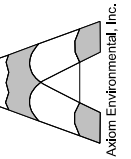


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SALISBURY, NORTH CAROLINA 27866
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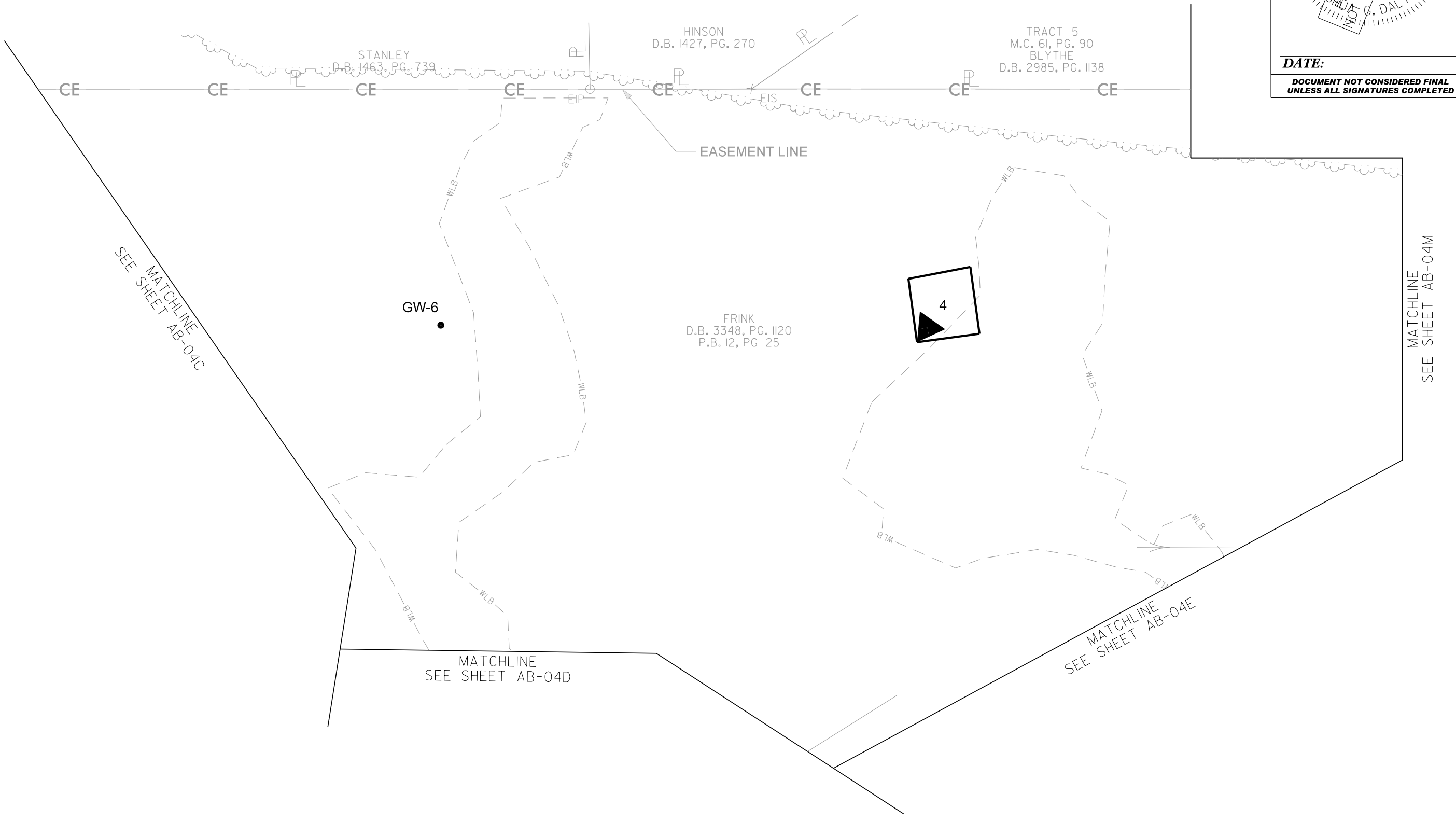
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COOL RUN
BRUNSWICK COUNTY, NC
AS-BUILT STRUCTURES

PROJECT # :
1221-21015
DRAWING NAME:
COOL RUN PSH AB04L
DATE:
8/21/2023
DRAWN BY:
JRH
REVIEWED BY:
JGD
REVISIONS:

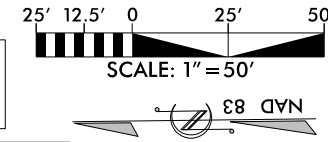
SHEET NO.
AB-04L

8/21/2023
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jrh

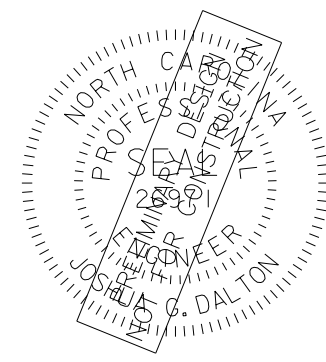


WETLAND ENHANCEMENT AREAS DERIVED FROM
APPROVED PRELIMINARY JURISDICTIONAL DELINEATION

HORIZONTAL DATUM: NAD 83 (2011)
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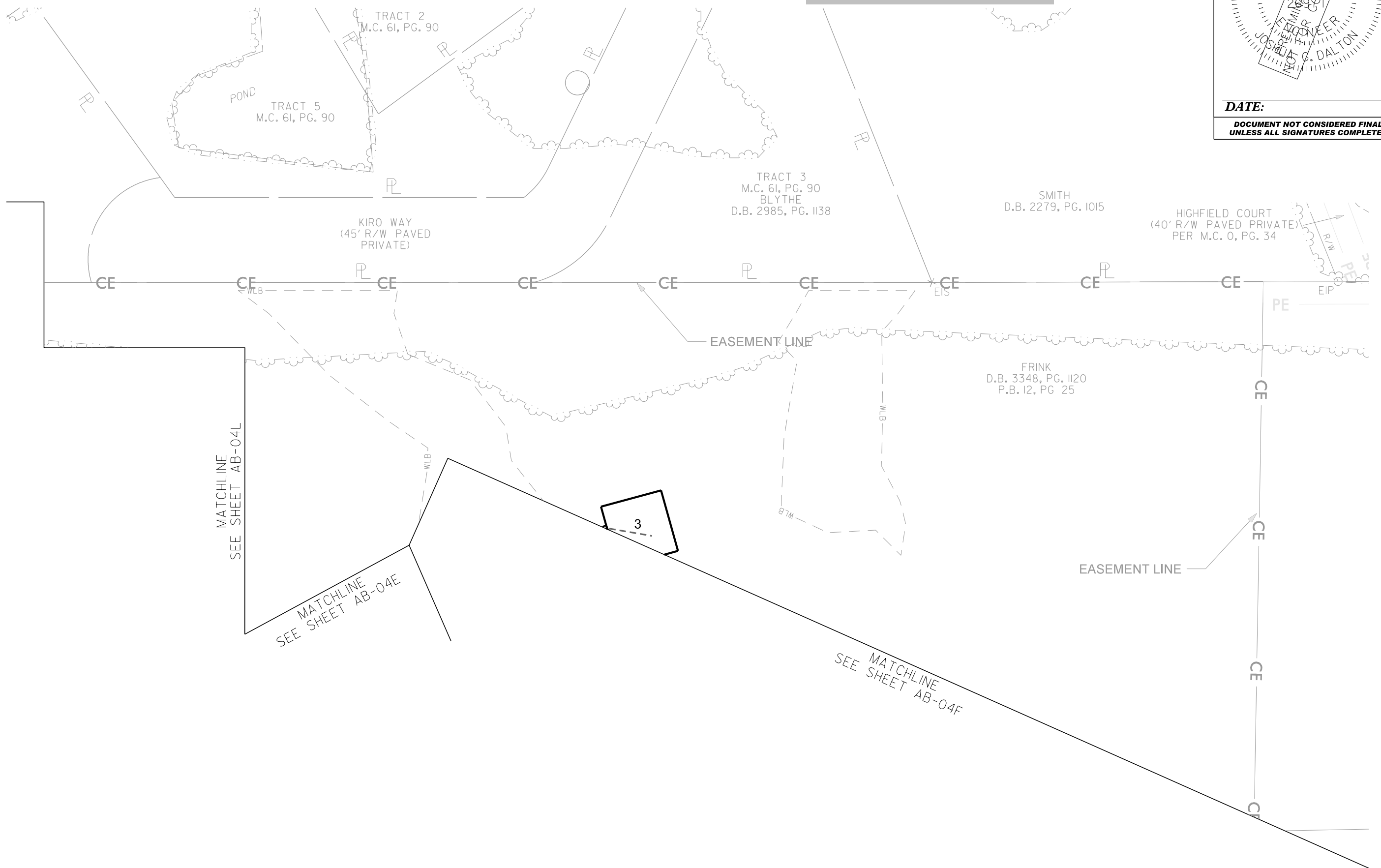
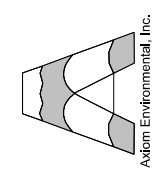


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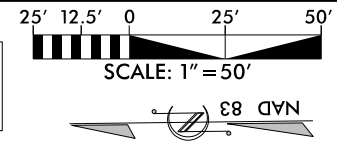


8/21/2023
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 jgd

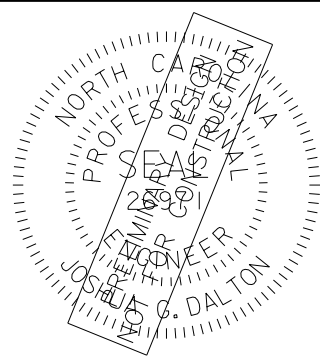
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COOL RUN	
BRUNSWICK COUNTY, NC	
AS-BUILT STRUCTURES	
PROJECT # :	1221-21015
DRAWING NAME:	COOL RUN PSH AB04M
DATE:	8/21/2023
DRAWN BY:	JRH
REVIEWED BY:	JGD
REVISIONS:	
SHEET NO.	AB-04M

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

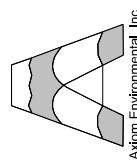


RECORD DRAWING



DATE: _____
 DOCUMENT NOT CONSIDERED FINAL
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SUNGATE DESIGN GROUP, P.A.
 841 GILES FARM ROAD
 BRUNSWICK COUNTY, NC 27806
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 ENG FIRM LICENSE NO. C-890

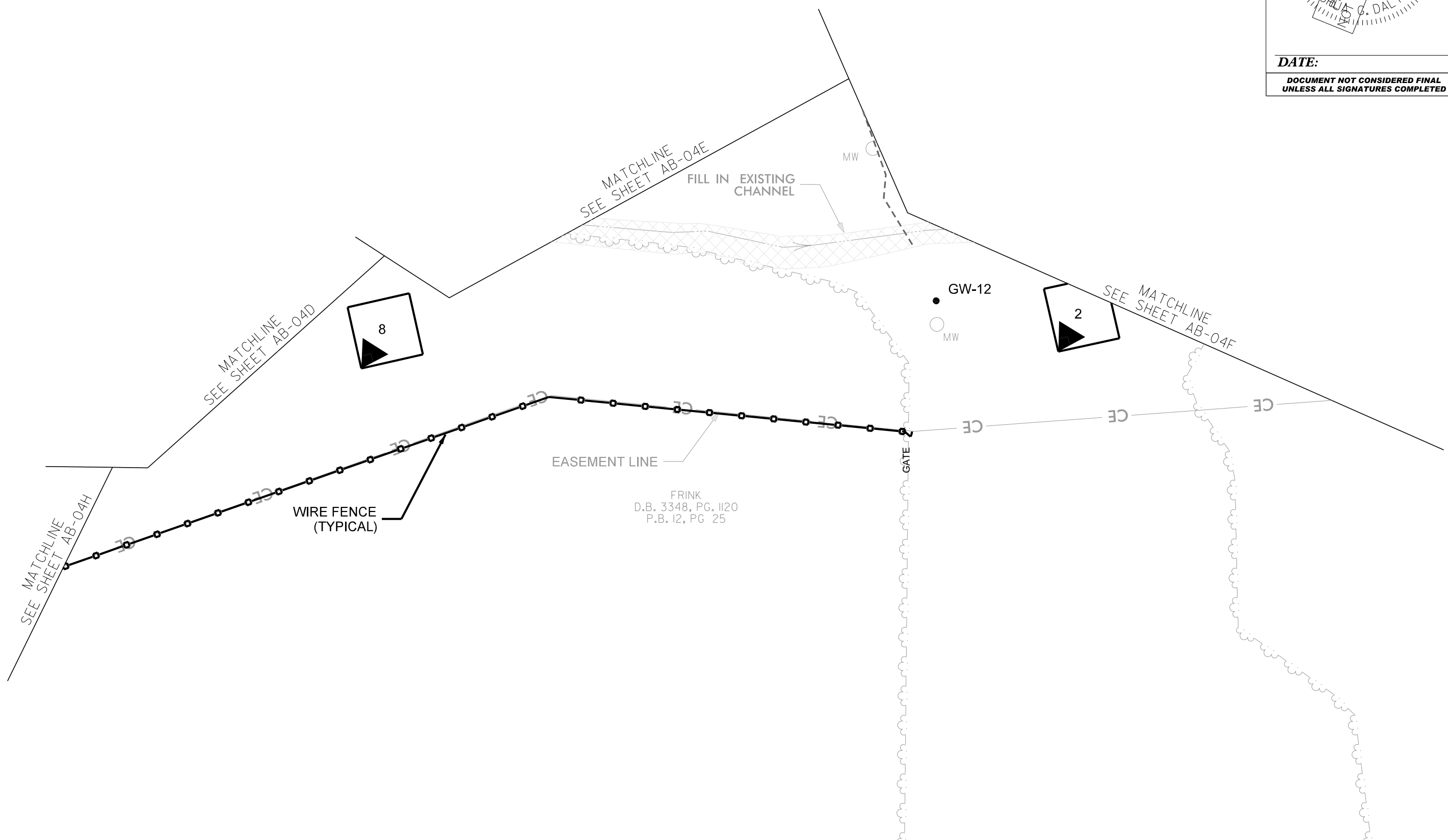


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COOL RUN
 BRUNSWICK COUNTY, NC
AS-BUILT STRUCTURES

PROJECT # : 1221-21015
 DRAWING NAME: COOL RUN PSH AB04N
 DATE: 8/21/2023
 DRAWN BY: JRH
 REVIEWED BY: JGD
 REVISIONS:

SHEET NO.
AB-04N



8/21/2023
 Cool Run_Psh_AB-04N.dgn
 jrh

DESIGN PLANT LIST

Vegetation Association	Wetland Indicator Status	Coastal Plain Small Stream Swamp* (Zone 1)		Coastal Plain Small Stream Swamp* (Zone 2)		Stream-side Assemblage**		TOTAL
		15.48		5.10		2.13		22.71
Area (acres)		# planted*	% of total	# planted*	% of total	# planted**	% of total	# planted
Tag alder (<i>Alnus serrulata</i>)	FACW		--		--	515	20	515
Black willow (<i>Salix nigra</i>)***	OBL		--		--	515	20	515
Ironwood (<i>Carpinus caroliniana</i>)	FAC	526	5		--	260	10	786
River birch (<i>Betula nigra</i>)	FACW		--	350	10	260	10	610
Silky dogwood (<i>Cornus amomum</i>)***	FACW		--		--	515	20	515
Atlantic white cedar (<i>Chamaecyparis thyoides</i>)	FACW		--	350	10		--	350
Sycamore (<i>Platanus occidentalis</i>)	FACW		--	695	20		--	695
Bald cypress (<i>Taxodium distichum</i>)	OBL	2,632	25		--	515	20	3,147
Swamp chestnut oak (<i>Quercus michauxii</i>)	FACW	1,580	15	695	20		--	2,275
Swamp tupelo (<i>Nyssa biflora</i>)	OBL	2,105	20		--		--	2,105
Laurel oak (<i>Quercus laurifolia</i>)	FACW	2,105	20	695	20		--	2,800
Overcup oak (<i>Quercus lyrata</i>)	OBL	1,055	10		--		--	1,055
American elm (<i>Ulmus americana</i>)	FAC		--	350	10		--	350
Water oak (<i>Quercus nigra</i>)	FACW	526	5	350	10		--	876
TOTAL		10,529	100	3,485	100	2,580	100	16,594

* Planted at a density of 680 stems/acre.
 ** Planted at a density of 1210 stems/acre.
 *** Live Stake

AS-BUILT PLANT LIST

Vegetation Association	Wetland Indicator Status	Coastal Plain Small Stream Swamp* (Zone 1)		Coastal Plain Small Stream Swamp* (Zone 2)		Stream-side Assemblage**		TOTAL
		15.48		5.10		2.13		22.71
Area (acres)		# planted*	% of total	# planted*	% of total	# planted**	% of total	# planted
Tag alder (<i>Alnus serrulata</i>)	FACW		--		--	515	20	515
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Ironwood (<i>Carpinus caroliniana</i>)	FAC	526	5		--	260	10	786
River birch (<i>Betula nigra</i>)	FACW		--	350	10	260	10	610
Silky dogwood (<i>Cornus amomum</i>)***	FACW		--		--	515	20	515
Atlantic white cedar (<i>Chamaecyparis thyoides</i>)	FACW		--	350	10		--	350
Sycamore (<i>Platanus occidentalis</i>)	FACW		--	695	20		--	695
Bald cypress (<i>Taxodium distichum</i>)	OBL	2,632	25		--	515	20	3,147
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Swamp tupelo (<i>Nyssa biflora</i>)	OBL	2,105	20		--		--	2,105
Laurel oak (<i>Quercus laurifolia</i>)	FACW	2,105	20	695	20		--	2,800
Overcup oak (<i>Quercus lyrata</i>)	OBL	1,055	10		--		--	1,055
American elm (<i>Ulmus americana</i>)	FAC		--	350	10		--	350
Water oak (<i>Quercus nigra</i>)	FACW	526	5	350	10		--	876
TOTAL		10,529	100	3,485	100	2,580	100	16,594