FINAL-MY1 Monitoring Report
Seniard Creek Mitigation Site

Henderson County
French Broad River Basin
Cataloging Unit # 06010105

NCDMS Project No. 100017
NCDMS Contract No. 7189
DMS RFP No. 16-006991
USACE Action ID: SAW-2017-01571 **DWR#** 20171160
Data Collected: April-November 2021

Prepared for:

North Carolina Department of Environmental Quality
Division of Mitigation Services
1652 Mail Service Center
Raleigh N C 27699-1652

Mitigation Services
ENVIRONMENTAL QUALITY

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EQUINOX
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February 3, 2022

Harry Tsomides, Project Manager
NCDEQ – Division of Mitigation Services
5 Ravenscroft Drive, Suite 102
Asheville, NC 28801

Subject: Draft MY1 Monitoring Report
Seniard Creek Site, Henderson County
French Broad River CU 06010105
DMS Project ID No. 100017 / DEQ Contract #7189

Dear Mr. Tsomides,

EWS has completed the review of the Seniard Creek Site Draft MY1 Monitoring Report comments. The following are the comments and questions followed by EWS responses in Red.

- During a recent site visit (Nov. 2021) by DMS there were a couple areas of low stem density and easement mowing/scalloping not showing on the CCPVs; please see PDF map attached to this email, acknowledge, and take these areas into consideration during the 2022 (MY2) assessment. There are also other boundary item comments and concerns noted that I would like your feedback on during the upcoming monitoring year. We have reviewed the areas mentioned and will reassess them during MY2 monitoring. We will continue to address all boundary item comments and concerns.

- Please briefly mention the power line r.o.w. issue on Whitaker Branch currently in discussion between DMS/EWS/State Property, and note that a resolution is currently being determined. Text added

- Vegetation plots not meeting criteria (VPs 8 and 9) should be coded a different color (typically orange or red) than those meeting (green) on the CCPVs. Coding added.

- Please explain in the narrative why the record drawings and MY0 IRT comments are included in an Appendix. Text added and referenced to Appendix F within both the vegetation and Hydrology sections.

- Please briefly discuss and summarize the fish sampling (included in an Appendix) in the narrative; what does the data suggest about the site, if anything? Brief discussion and reference to Appendix F added within the hydrology section.

- On the groundwater gage summary table, please list the number of consecutive days met as well as the percent for each gage, and also provide a footnote indicating the hydroperiod (% and days)

being used as the success criterion. Please note that wetland credits are not part of the project and that the 12% is just a typical performance criteria being used. Please explain briefly in the narrative why gage data are being collected, and what the results suggest (if anything yet) with regard to no net wetland losses over time. Consecutive days added to summary table. Text added discussing groundwater wells.

- Where continuous stage recorders are being used to monitor consecutive days of stream flow, such as David Branch, please provide the maximum number of consecutive days where surface flow was present. Maximum number of consecutive days where surface flow was present have been included for David Branch 1B, David Branch 1C, and Lee Branch. Limitations on the accuracy of this data have been detailed in the report.

- Please include dates for the reach assessments (Table 5) and the vegetation visual assessment (Table 6), in the tables. Dates Added.

- The project credits discussed in the project quantities and credits section do not match up with the asset table (minor discrepancy); please clarify or correct. Corrected total credits within the text.

DIGITAL SUPPORT FILES

In the interest of time, the digitals comments will be forwarded to you as soon as they are ready; they will need to be addressed before this deliverable is final-approved.

Digital comment received via email on January 19, 2022.

Seniard

- Please include the groundwater gauge, daily precipitation, and 30-70 data in the digital submittal.

- Please confirm that the features described in the CCPV as crest gauges are cork crest gauges and not data loggers. Confirmed, "crest gauges" depicted in the CCPV are cork crest gages.

- Note that the 30-70 figure appears to incorrectly display the growing season dates. The date range is correct. The axis scaling was adjusted to more clearly depict the growing season.

- Please do not change the color coding of the veg table tool output – the orange indicates that a metric is not meeting success criteria. Additional color coding was retained for the report body. A separate raw output and raw input data file has been included in Support Files.

- Please briefly explain the changes to MY0 XS metrics in the report. Clarifying text added.

- Shouldn't BHR=1 in MY0? why do bankfull and low bank height differ? The initial calculations were based upon field identified Top-of-Bank. These field identified Top-of-Bank points were replaced with the constructed Top-of-Bank which represent a BHR of 1.

Please submit two final hard copies, in addition to a flash drive or CD with a PDF of the report and all digital support files (addressing any comments) in the correct file structure. Please include a copy of your response letter, inserted inside the front cover of each hard copy report (and included in the final PDF).
Two final hard copies and a flash drive with digital support files have been submitted.

Sincerely,

Danvey Walsh
Equinox Monitoring Manager

Prepared for:

EW SOLUTIONS

37 Haywood Street, Suite 100
Asheville, NC 28801

Prepared by:

EQUINOX

balance through proper planning

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1.0 PROJECT SUMMARY

1.1. Project Setting and Background

The Seniard Creek Mitigation Site (Seniard Mitigation Site) is located in the French Broad River Basin (CU 06010105). The Seniard Mitigation Site also lies within the North Fork Mills River Watershed (HUC 060101050403) which is identified as a Targeted Local Watershed (TLW) according to the 2009 French Broad River Basin Restoration Priorities (RBRP) Plan. Project work at the Seniard Site was completed in late February 2021 including construction and monitoring feature installation; bare root and live stake installation was completed in February 2021.

Historic land use at the Seniard Mitigation Site consisted of forestry and agricultural use for at least 65 years, according to historic aerial photos. Historic agricultural practices, relocation of the Seniard and Sitton Creeks had functionally removed the streams' connectivity with the floodplain. One poorly functioning culvert on Seniard Creek has degraded the ecological connectivity of the stream at the head of the Seniard Mitigation Site. The lack of deep-rooted vegetation and unstable channel characteristics have contributed to the degradation of the streambanks on both sides of the project. Ecological function has been restored to the existing streams, wetlands, and riparian corridor by returning the stream channels to a stable condition. The relocation of Seniard and Sitton Creeks to the historic floodplain has restored proper floodplain connectivity. The restoration of the upper Seniard Creek reach addressed a perched culvert by raising the bed elevation. In the mid and downstream reaches of Seniard Creek, the profile of the channel was raised, shifted, and proper channel dimensions were restored. The restoration of the upper Sitton Creek reach focused on realigning the channel, reestablishing dimension, and floodplain connectivity. Additional measures that promoted functional uplift included stabilizing and revegetating disturbed areas, restoring floodplain connectivity and wetland hydrology, reestablishing wooded riparian areas. These measures contribute to reduced downstream sediment and nutrient loads, as well as improving aquatic and terrestrial habitat.

This project is protected by an 11.68-acre conservation easement and is located approximately 3.7 miles northwest of Mills River, NC in Henderson County at 35.409056° N, -82.627667° W. The Seniard Mitigation Site is bounded by agricultural and residential properties.

1.2. Project Quantities and Credits

The Seniard Mitigation Site has restored a total of 3,637, enhanced 1,462 and preserved 128 linear feet of stream. The project is expected to generate a total of 3,645.949 SMU's (Seniard Stream and Wetland Mitigation Plan - May 27, 2020). Refer to Table 1 for the project components and mitigation credit information and Figure 1 for the Project Asset Map.

1.3. Monitoring Plan Components

A total of sixteen (16) cross-sections, three (3) groundwater monitoring gages, five (5) continuous stage recorders, and two (2) crest gages were installed within the restoration site to evaluate the stream and wetland components. Ten (10) permanent vegetation plots were installed to evaluate the planted areas within the site. Twelve (12) photo stations were established for visual representation of the site. An additional seven (7) photo stations were added in MY1 at the request of the NC Interagency Review Team.

Table 1. Seniard Creek Mitigation Site (100017) Project Mitigation Quantities and Credits.							
Component (Reach ID)	Mitgation Plan Footage (ft)	As-Built (ft)	Mitigation Category	Restoration Level	Mitigation Ration (X:1)	Mitigation Plan Credits	+Comments
Seniard Creek 1A	376	376.509	Cold	R	1:1	376.000	
*Seniard Creek 1B	1213	1198.706	Cold	R	1:1	1213.000	Confluence with Sitton farther upstream than design
*Seniard Creek 2	176	187.521	Cold	R	1:1	176.000	Confluence with Sitton farther upstream than design
*Sitton Creek 1	1095	1070.019	Cold	R	1:1	1095.000	Confluence with Seniard farther upstream than design
*Lee Branch	212	209.48	Cold	R	1:1	212.000	Reduced sinuosity compared to design
David Branch 1A	132	128.298	Cold	P	10:1	13.200	Restoration on David 1B begins upstream compared to design
David Branch 1B	296	296.779	Cold	R	1:1	296.000	
David Branch 1C	226	220.522	Cold	R	1:1	226.000	Longer Non-Creditable section for culvert outfall
Whitaker Branch	416	415.749	Cold	EII	8:1	52.000	
Redmond Branch 1A	1046	1046.569	Cold	EII	7:1	149.429	
Redmond Branch 1B	76	78.036	Cold	R	1:1	76.000	Shorter Non-Creditable section for culvert outfall

*Deviations in As-Built vs. Design footage relate directly to reduction in sinuosity when calculated using As-Built centerline derived from surveyed top of bank.

+ No redlines were displayed on the As-built record drawing due to no significant deviations from the design (<1%).

Project Credits

Restoration Level	Stream (ft)			Wetlands (ac)		
	Warm	Cool	Cold	Riparian	Non-Riparian	Coastal
Restoration			3670.000			
Re-establishment						
Rehabilitation						
Enhancement						
Enhancement I						
Enhancement II			201.429			
Creation						
Preservation			13.200			
Totals^	0	0	3884.629	0	0	0

Stream Credits						
Total Baseline Credit			3884.629			
Credit Loss in Required Buffer			-441.360			
Credit Gained for Additional Buffer			202.680			
Net Change in Credit from Buffers			-238.680			
Total Project Credits^			3645.949			

Overall Asset Summary	
Total Stream Credit	**3,645.949**
Total Wetland Credit	**0.000**

^These numbers are 2.701 SMUs less than the the corresponding numbers in the Project Assets (Table 18A) of the approved mitigation plan. This is the result of an error in the approved mitigation plan table. The credit sums in this table are correct.

Wetland Mitigation Category

CM	Coastal Marsh
R	Riparian
NR	Non-Riparian

Restoration Level

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

1.4. Project Performance Standards

The stream restoration performance standards for the project will follow accepted and approved criteria in Table 2 and based on the Final Mitigation Plan - Seniard Creek Mitigation Site (May 27, 2020). Annual monitoring reports will follow the DMS Stream and Wetland Mitigation Plan Template and Guidance (October 2020). Performance criteria will be evaluated throughout the seven-year monitoring period.

Table 2. Seniard Creek Mitigation Site (100017) Summary Goals, Performance, and Results.					
Goal	**Objective/Treatment**	**Likely Functional Uplift**	**Performance Standard**	**Measurement**	**Cumulative Monitoring Results**
Provide a stream with natural, stabe forms that supports proper stream function.	Construct stream channels that will maintain proper dimension, pattern and profile.	Reduced erosion, increased habitat heterogeneity, and floodplain connection	□ Riffle section W/D ratios should remain within the range of the appropriate stream type. □ BHR should not exceed 1.2. BHR should not change more than 10% in any given monitoring interval. Changes that do occur should indicate a trend toward stability. □ Entrenchment Ratios should be ≥2.2 for C/E channels and ≥ 1.4 for B Channels. □ Document nearly continuous surface flow.	10-Cross sections, visual assessment and 5-continuous stage recorders.	Width-Depth ratios within specifications or have not changed from As-Built. Entrenchment ratios within spec for all constructed channels. Surface flow present year-round in MY1.
Improve groundwater hydrology to support recovery of native riparian vegetation.	Construct streams with proper bankfull to floodplain relationship.	Increased landscape connectivity, water transport and storage.	Four bankfull events or greater, in separate years, will be documented during the monitoring period.	2-Crest gauges, 5-continuous stage recorders, and debris lines.	Two bankful events documented within Sitton and Seniard Creeks during MY1 monitoring interval.
Reduce sediment inputs from eroding stream banks to reduce fine sediment loads and percentage fo fines in the bed-material load.	Construct streams that provide naturally stable dimensions and stabilize constructed banks with appropriate bioengineering.	Reduced eroson, increased sediment transport and storage.	Channel banks should generally remain stable. Where bank migration does occur, it should not exceed 10% of the previous monitored bankfull width and 20% of the original design bankfull width.	Visual assessment and bank pin monitoring as necessary.	
Restore proper sediment transport to support channel stability and bedform diversity.	Construct streams that maintain an appropriate sediment transport balance with the sediment that is supplied by the watershed so that the overall stream profile neither aggrades nor degrades over time.	Reduced eroson, increased sediment transport and storage.	Profile adjustments should not indicate significant aggradation or degradation. BHR requirements as stated above.	Longitudinal profile if visual assessment indicates potential instability.	
	Create and improve stream bedform diversity by constructing pools of varied depths and riffles of varied slopes.		Profile should maintain a diversity of depths expressed in riffle/pool forms.	Visual assessment	
Improve substrate quality to facilitate hyporheic flow and support aquatic communities.	Construct stable riffles that provide an improved diversity of bed material clast and a reduction in fines relative to existing conditions.		Substrate material should progress towards or maintain coarser material in riffles and runs with finer material present in pools and glides.	8-Pebble counts at established cross-sections.	Coarsening substrate observed at 6 of 8 riffle cross-sections.
Improve quantity, quality, and diversity of habitats to support healthy aquatic communities.	Construct in-stream habitat features from native material to provide a diversity of habitats.	Improved natural communities and landscape connectivity.	In-stream habitat structures should remain intact and functional.	Visual assessment	
Restore continuity of the stream channel by removing barriers to migration.	Provide improved fish passage through previous upstream impediments.	Increased genetic transfer and species distribution.	No standards have been set, but results should present trends in increased fish passage.	Annual electrofishing surveys	Increased relative abundance in MY1 compared to pre-construction.
Reduce pollutant in puts to the project stream (nitrogen, phosphorus) to restore a balance to proper nutrient cycles.	Provide a buffer from agricultural activities and row crops.	Reduced sediment and chemical inputs.	Record conservation easement prior to implementation.	Conservation Easement Compliance	
Improve riparian vegetation community to provide temperature regulation of the streams, provide a future source of organic inputs, and aid in long-term channel bank stability.	Plant native climax tree species and understory species in the riparian zone.	Improved natural communities and landscape connectivity.	At project initiation, a minimum of 680 stems/ac are to be planted. Minimum of 320 stems/ac present at MY-3. Minimum of 260 stems/ac present, measuring 6ft at MY-5. Minimum of 210 stems/ac present, measuring 8ft at MY-7.	10-Vegetation plots	8 of 10 Permanent Vegetation plots meeting or exceeding criteria.

Table 2. Seniard Creek Mitigation Site (100017) Summary Goals, Performance, and Results.					
Goal	**Objective/Treatment**	**Likely Functional Uplift**	**Performance Standard**	**Measurement**	**Cumulative Monitoring Results**
Restore former riparian areas so that the hydrology and soils will support native vegetative communities and wildlife.	Reconstruct stream channels that are properly connected to the riparian areas.	Increased water, sediment, and organic material transport and storage.	Bankfull elevations and profile should be consistent with valley grade.	Visual assessment	
	Re-grade topography to eliminate ditches and drainage features.	Increased water, sediment, transport and storage.	Floodplain topography should no longer contain lateral ditches or drainage features.	Visual assessment	
	Plant native wetland tree and shrub species.	Improved natural communities and landscape connectivity.	At project initiation, a minimum of 680 stems/ac are to be planted. Minimum of 320 stems/ac present at MY-3. Minimum of 260 stems/ac present, measuring 6ft at MY-5. Minimum of 210 stems/ac present, measuring 8ft at MY-7.	10-Vegetation plots	8 of 10 Permanent Vegetation plots meeting or exceeding criteria.
Improve landscape connectivity that allows space for biotic and abiotic process and provides a source and sink for natural populations.	Establish a conservation easement that provides a minimum buffer from future activities in the adjacent watershed.	Improved natural communities and landscape connectivity.	Record conservation easement prior to implementation.	Conservation Easement Compliance	
Prevent future impacts to the site from development and agricultural uses.					

1.5. Restoration Type and Approach

In restoration reaches activities included excavation of the proposed channels, partial or complete backfilling of existing channels, and removal of spoil berms. Grading was designed to restore floodplain access and mimic natural contours.

In enhancement reaches, no in-channel work was performed. Invasive species were mechanically removed, or chemically treated, and woody stems and live stakes were planted to augment the existing vegetation structure.

1.6. Project Performance

1.6.1 Geomorphology

Visual assessment of the stream channel was performed to document signs of instability, such as eroding banks, structural instability, or excessive sedimentation. Sitton Creek and Lee Branch experienced some impacts due to a high flow event on August 17, 2021. The first area is located on Lee Branch at Station 300+25. In this area, fine sediment from off site has washed into the reach from an upstream construction site (Appendix A, Photos, Appendix C, Cross-section 9, and pebble counts). The construction site has since been stabilized and is not likely to contribute more fine sediments to the reach. The second area is located near the confluence with Seniard Creek at Station 211+25. In this area high flows are being directed at the left descending bank and have resulted in some erosion along the bankfull bench. (Photos, Table 4 and CCPV, Appendix A).

Geomorphic data for MY1 was collected during October 2021. Summary tables and cross-section data plots related to stream morphology are located in Appendix C.

During MY1 data processing a hidden cell formula error was discovered within the Cross-Section Dimensions Analysis Spreadsheet which resulted in incorrect stationing and dimensions being applied to

the MY0 cross-sections. These errors were corrected in the MY1 monitoring report and supporting data. Deviations between the cross-section dimensions reported in the As-built and MY1 report are a result of the corrected stationing.

Cross-sectional dimensions remained relatively stable between baseline conditions and MY1 monitoring efforts (Table 8, Cross-Section overlays, Appendix C). The site will continue to be monitored for signs of instability. The next site visit is planned for spring 2022.

Pebble counts were conducted at eight riffle cross-sections during MY1. Results indicate that substrate particle size trending towards coarser bed materials except for Cross-sections 1 and 9. Both cross-sections 1 and 9 are located near the upper extents of the project and receive the initial inputs from off-site sources. Cross-section 1 had a slightly higher percentage of fines when compared to baseline. This is common and will be monitored in future monitoring years. Cross-section 9 received a pulse of fine sediments during the August 17th, 2021, storm event originating from a residential construction site located further up Whitaker Cove Rd (Photos and Table 5, Appendix A, and Pebble counts and cross-sections, Appendix C). Earthmoving activity has concluded at the construction site and is not anticipated to contribute additional fine sediments to the project area. Variations in particle size distribution will continue to be monitoring throughout the life of the project.

Table 3. Seniard Creek Mitigation Site Attribute Table				
Project Name		Seniard Creek Mitigation Site		
County		Henderson		
Project Area (acres)		11.68		
Project Coordinates (latitude and longitude decimal		35.409056° N, -82.627667° W		
Project Watershed Summary Information				
Physiographic Province		Blue Ridge Mountains		
River Basin		French Broad		
USGS Hydrologic Unit 8-digit	06010105	060101050403		
DWR Sub-basin		04-03-03		
Project Drainage Area (acres)		2310		
Project Drainage Area Percentage of Impervious Area		<1		
Land Use Classification		Cropland (Hayland)		
Reach Summary Information				
Parameters		**Seniard Reach 1A**	**Seniard Reach 1B**	**Seniard Reach 2**
Pre-project length (feet)		443	1272	422
Post-project (feet)		396	1274	176
Valley confinement (Confined, moderately confined,		Moderately Confined	Moderately Confined	Moderately Confined
Drainage area (acres)		826	858	1574
Perennial, Intermittent, Ephemeral		Perennial	Perennial	Perennial
NCDWR Water Quality Classification		WSII, TR, HQW	WSII, TR, HQW	WSII, TR, HQW
Dominant Stream Classification (existing)		G/F	G	G
Dominant Stream Classification (proposed)		B	B	B
Dominant Evolutionary class (Simon) if applicable		N/A	N/A	N/A
Wetland Summary Information				
Parameters		**Wetland 1**	**Wetland 2**	**Wetland 3**
Pre-project (acres)		N/A	N/A	N/A
Post-project (acres)		N/A	N/A	N/A
Wetland Type (non-riparian, riparian)		N/A	N/A	N/A
Mapped Soil Series		N/A	N/A	N/A
Soil Hydric Status		N/A	N/A	N/A
Regulatory Considerations				
Parameters		**Applicable?**	**Resolved?**	**Supporting Docs?**
Water of the United States - Section 404		Yes	Yes	SAW-2017-01571
Water of the United States - Section 401		Yes	Yes	DWR # 17-1160
Endangered Species Act		Yes	Yes	04EN1000-2017-SLI-0139
Historic Preservation Act		Yes	Yes	ER 17-1172
Coastal Zone Management Act (CZMA or CAMA)		No	N/A	N/A
Essential Fisheries Habitat		No	N/A	N/A

Table 3 cont. Seniard Creek Mitigation Site Attribute Table				
Project Name		Seniard Creek Mitigation Site		
County		Henderson		
Project Area (acres)		11.68		
Project Coordinates (latitude and longitude decimal		35.409056° N, -82.627667° W		
Project Watershed Summary Information				
Physiographic Province		Blue Ridge Mountains		
River Basin		French Broad		
USGS Hydrologic Unit 8-digit	06010105	060101050403		
DWR Sub-basin		04-03-03		
Project Drainage Area (acres)		2310		
Project Drainage Area Percentage of Impervious Area		<1		
Land Use Classification		Cropland (Hayland)		
Reach Summary Information				
Parameters		**Sitton Creek Reach 1**	**Lee Branch Reach 1**	**Whitaker Branch Reach 1**
Pre-project length (feet)		1105	129	426
Post-project (feet)		1236	226	426
Valley confinement (Confined, moderately confined,		Moderately Confined	Moderately Confined	Moderately Confined
Drainage area (acres)		633	13	26
Perennial, Intermittent, Ephemeral		Perennial	Perennial	Perennial
NCDWR Water Quality Classification		WSII, TR, HQW	WSII, TR, HQW	WSII, TR, HQW
Dominant Stream Classification (existing)		G	G	B
Dominant Stream Classification (proposed)		B	B	B
Dominant Evolutionary class (Simon) if applicable		N/A	N/A	N/A
Wetland Summary Information				
Parameters		**Wetland 1**	**Wetland 2**	**Wetland 3**
Pre-project (acres)		N/A	N/A	N/A
Post-project (acres)		N/A	N/A	N/A
Wetland Type (non-riparian, riparian)		N/A	N/A	N/A
Mapped Soil Series		N/A	N/A	N/A
Soil Hydric Status		N/A	N/A	N/A
Regulatory Considerations				
Parameters		**Applicable?**	**Resolved?**	**Supporting Docs?**
Water of the United States - Section 404		Yes	Yes	SAW-2017-01571
Water of the United States - Section 401		Yes	Yes	DWR # 17-1160
Endangered Species Act		Yes	Yes	04EN1000-2017-SLI-0139
Historic Preservation Act		Yes	Yes	ER 17-1172
Coastal Zone Management Act (CZMA or CAMA)		No	N/A	N/A
Essential Fisheries Habitat		No	N/A	N/A

Table 3 cont. Seniard Creek Mitigation Site Attribute Table				
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Project Watershed Summary Information				
Physiographic Province		Blue Ridge Mountains		
River Basin		French Broad		
USGS Hydrologic Unit 8-digit	06010105	060101050403		
DWR Sub-basin		04-03-03		
Project Drainage Area (acres)		2310		
Project Drainage Area Percentage of Impervious Area		<1		
Land Use Classification		Cropland (Hayland)		
Reach Summary Information				
Parameters		**David Branch 1A**	**David Branch 1B**	**David Branch 1C**
Pre-project length (feet)		132	224	165
Post-project (feet)		132	335	273
Valley confinement (Confined, moderately confined,		Moderately Confined	Moderately Confined	Moderately Confined
Drainage area (acres)		6	6	26
Perennial, Intermittent, Ephemeral		Perennial	Perennial	Perennial
NCDWR Water Quality Classification		WSII, TR, HQW	WSII, TR, HQW	WSII, TR, HQW
Dominant Stream Classification (existing)		B	G	G
Dominant Stream Classification (proposed)		B	B	B
Dominant Evolutionary class (Simon) if applicable		N/A	N/A	N/A
Wetland Summary Information				
Parameters		**Wetland 1**	**Wetland 2**	**Wetland 3**
Pre-project (acres)		N/A	N/A	N/A
Post-project (acres)		N/A	N/A	N/A
Wetland Type (non-riparian, riparian)		N/A	N/A	N/A
Mapped Soil Series		N/A	N/A	N/A
Soil Hydric Status		N/A	N/A	N/A
Regulatory Considerations				
Parameters		**Applicable?**	**Resolved?**	**Supporting Docs?**
Water of the United States - Section 404		Yes	Yes	SAW-2017-01571
Water of the United States - Section 401		Yes	Yes	DWR # 17-1160
Endangered Species Act		Yes	Yes	04EN1000-2017-SLI-0139
Historic Preservation Act		Yes	Yes	ER 17-1172
Coastal Zone Management Act (CZMA or CAMA)		No	N/A	N/A
Essential Fisheries Habitat		No	N/A	N/A

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Physiographic Province		Blue Ridge Mountains		
River Basin		French Broad		
USGS Hydrologic Unit 8-digit	06010105	060101050403		
DWR Sub-basin		04-03-03		
Project Drainage Area (acres)		2310		
Project Drainage Area Percentage of Impervious Area		<1		
Land Use Classification		Cropland (Hayland)		
Reach Summary Information				
Parameters		**Redmond Branch 1A**	**Redmond Branch 1B**	
Pre-project length (feet)		1066	40	
Post-project (feet)		1054	94	
Valley confinement (Confined, moderately confined,		Moderately Confined	Moderately Confined	
Drainage area (acres)		45	45	
Perennial, Intermittent, Ephemeral		Perennial	Perennial	
NCDWR Water Quality Classification		WSII, TR, HQW	WSII, TR, HQW	
Dominant Stream Classification (existing)		B	G	
Dominant Stream Classification (proposed)		N/A	B	
Dominant Evolutionary class (Simon) if applicable		N/A	N/A	
Wetland Summary Information				
Parameters		**Wetland 1**	**Wetland 2**	**Wetland 3**
Pre-project (acres)		N/A	N/A	N/A
Post-project (acres)		N/A	N/A	N/A
Wetland Type (non-riparian, riparian)		N/A	N/A	N/A
Mapped Soil Series		N/A	N/A	N/A
Soil Hydric Status		N/A	N/A	N/A
Regulatory Considerations				
Parameters		**Applicable**	**Resolved?**	**Supporting Docs?**
Water of the United States - Section 404		Yes	Yes	SAW-2017-01571
Water of the United States - Section 401		Yes	Yes	DWR # 17-1160
Endangered Species Act		Yes	Yes	04EN1000-2017-SLI-0139
Historic Preservation Act		Yes	Yes	ER 17-1172
Coastal Zone Management Act (CZMA or CAMA)		No	N/A	N/A
Essential Fisheries Habitat		No	N/A	N/A

1.6.2 **Vegetation**

Visual assessment of vegetation indicates that the herbaceous vegetation is well established throughout the project. Monitoring of permanent (n=10) was completed in November 2021. MY1 stems/acre and ranged from 162 to 526 planted stems per acre. Eighteen species were documented within the vegetation monitoring plots. Summary tables and photographs associated with MY1 vegetation monitoring are located in Appendix B and Appendix C. MY1 monitoring data indicates that all but two permanent vegetation plots were meeting the MY3 interim success criteria of 320 planted stems per acre (Table 7 and 8, Appendix C). Of the two vegetation plots not meeting criteria, VP9 was impacted by an easement encroachment (Mowing), the second (VP8) is located in a wetland area with vigorous herbaceous growth. Vegetation plots will continue to be monitored for stem survival and growth throughout the life of the project.

A deviation from the planting design which was not submitted as part of the redline package was identified in the MY0 report. This deviation consisted of the addition of three species of tree *Cary glabra*, *Carya tomemtosa*, *Quercus imbricaria*; and the redaction of *Fraxinus pennsylvanica*. This updated redline drawing is located in Appendix F.

Areas of exotic vegetation are depicted within the CCPV, Appendix A. Multiflora rose (*Rosa multiflora*), Oriental bittersweet (*Celastrus orbiculatus*) and English Ivy (*Hedera helix*) were the dominant observed species. Invasive vegetation was identified in moderate density along Seniard Creek 1A and low density in limited areas scattered throughout the site. The majority of Sitton Creek has few invasives. One stand of Cattail (*Typha latifolia*) was identified in moderate density in and around VP6 extending downstream and south-southeast. Three treatments were conducted MY1 and targeted the densest or established invasive populations. Beginning in January 2021 mature Privet and bittersweet were removed from both enhancement reaches prior to the planting of woody stems. Additional chemical treatments of invasive vegetation were conducted in April and June of 2021. Location and general densities of invasive vegetation can be found in Table 5 and the CCPV, Appendix A.

Four areas of easement encroachment were documented during MY1. Three of those areas were the direct result of mowing. One area of mowing encroachment directly impacted Veg Plot 9, resulting in the loss of stems, and leading to the failure to meet performance standards. The second area is located at the upper limits of Sitton Creek along the right descending bank where a portion of easement was mowed. Two additional areas of scalloping were located along the easement boundary of Sitton and Seniard Creeks. Additional signage has been installed along the easement boundary to curtail future encroachment. A supplemental planting is planned for the winter of 2021/22 to address areas of poor stem survival and mowing damage. The final area of encroachment is an overhead wire located on the lower section of Whitaker Branch (Table 6 and CCPV, Appendix B). This encroachment is currently being discussed between DMS, EWS, and State Property. A resolution is being determined.

1.6.3 **Hydrology**

The area between Stations 205+00 and 210+00 along Sitton Creek has been monitored for an increased hydrological influence since construction. This area was anticipated to form riparian wetland, thereby providing functional uplift. Of the three gages (GG1, GG2 and GG3) installed in this area, GG2 is currently exceeding the typical performance criteria of 12% (Groundwater gauges, Appendix D). One additional area of hydrological uplift was created between Lee Branch and Sitton Creek (Photo Stations and CCPV, Appendix A, IRT MY0 Comment Responses Appendix F). These areas will continue to be monitored through photographic documentation and existing groundwater wells.

Three reaches, Lee, David 1B, and David 1C are being monitored for continuous surface flow using Onset Hobo water level loggers. The minimum detection depth for the pressure transducers deployed on site is 0.81 inches. Both David Branch 1B and Lee Branch maintained a measurable surface flow for 54 consecutive days and 63 consecutive days, respectively. David Branch 1C recorded flow for the entire deployment (n=191 days).

Additionally, the project sought to improve connectivity and aquatic organism passage through the culvert at the upper extent of the Seniard Creek Reach. In order to measure this objective electrofishing surveys were conducted above and below this previously perched culvert. The MY1 survey resulted in an increase in numbers of fishes observed overall with an increase in fisheries diversity above the culvert. A more detailed report on the MY1 fisheries survey is available in Appendix F.

Since project completion in early 2021, two bankfull events have been documented at the Seniard Creek Site. Based on precipitation and stage recorder data the events were recorded over 3 days; March 25, August 17th, and October 6 (Table 12, Appendix D). One event was documented on Seniard, one on Sitton Creek, and at least three events on both Lee Branch and David Branch. No bankfull events were recorded on Redmond and Whitaker during MY1.

2.0 REFERENCES

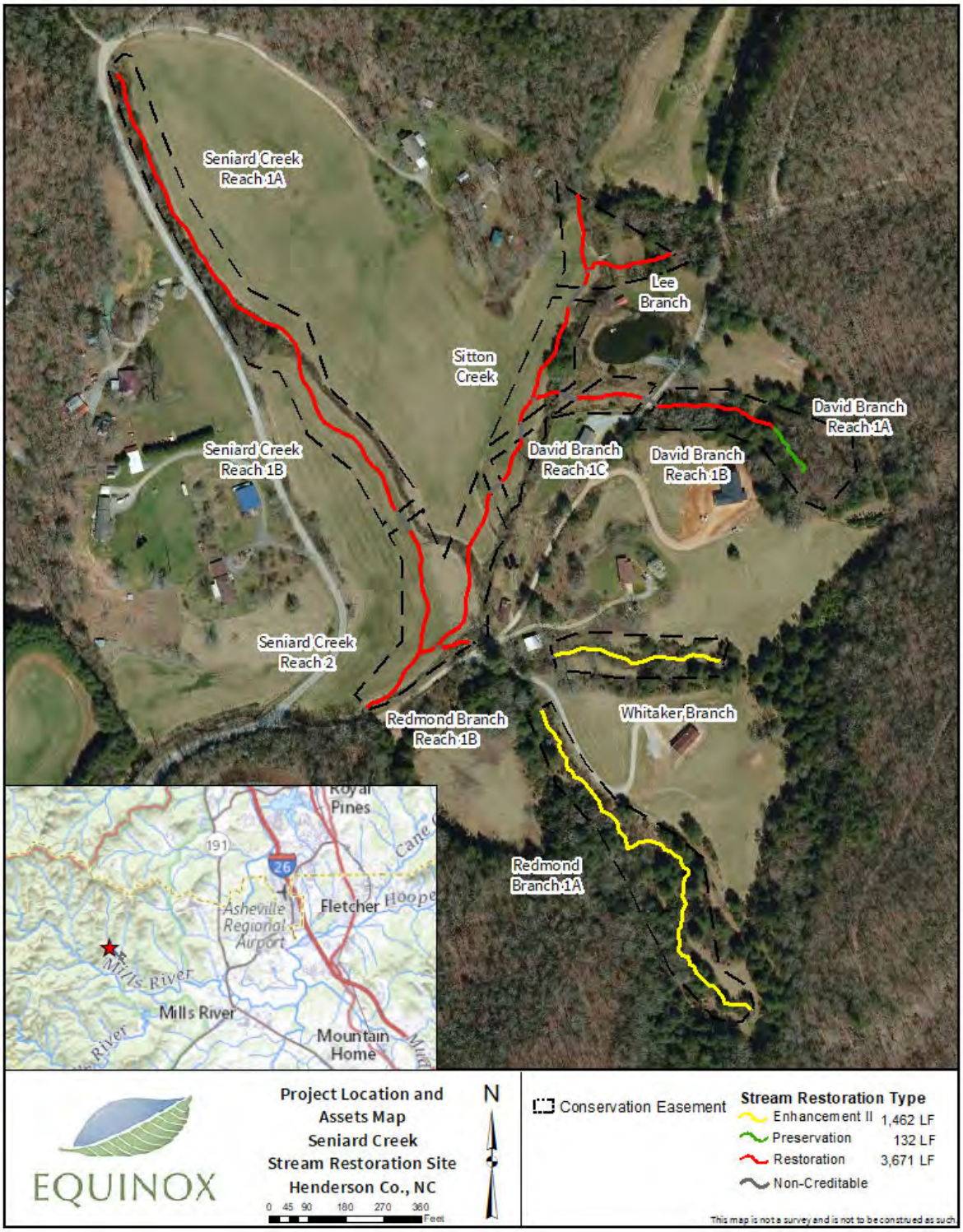
Lee, Michael T., R.K. Peet, S.D. Roberts, and T.R. Wentworth. 2008. CVS-EEP Protocol for Recording Vegetation, Version 4.2 (http://cvs.bio.unc.edu/methods.htm).

NCDMS Stream and Wetland Mitigation Annual Monitoring Template (October 2020).

NCDMS Veg Table Production Tool, Version (8/23/2021). https://ncdms.shinyapps.io/Veg_Table_Tool/

Stantec Consulting, Inc. 2020. Final Mitigation Plan – Seniard Mitigation Site (May 27, 2020). Prepared for North Carolina Department of Environmental Quality, Division of Mitigation Services. DMS Project No. 100017.

3.0 FIGURE 2. PROJECT LOCATION AND ASSETS MAP



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EQUINOX

Sheet Key
Seniard Creek
Stream Restoration Site
Henderson Co., NC

As-Built Centerline

Restoration Type
- Enhancement II
- Preservation
- Restoration
- NC

Reach Breaks

Utility Easement

Top of Bank
- Top of Bank

Conservation Easement

N

0 65 130 260 390 520 Feet

This map is not a survey and is not to be construed as such.

CCPV MY1
Sheet 1
Seniard Creek Stream Restoration Site
Henderson Co., NC
November 2021

EQUINOX

- Reach Breaks
- Utility Easement

BankErosion
- Scour/Eroding
- Invasive Vegetation
- Encroachment
- Centerline_Stationing
- Photo Stations

- Crest Gauge
- Continuous Stage Recorder
- Groundwater Gauge
- Rain Gauge
- Cross Section

Vegetation Plot
Meeting
- Meeting >10%

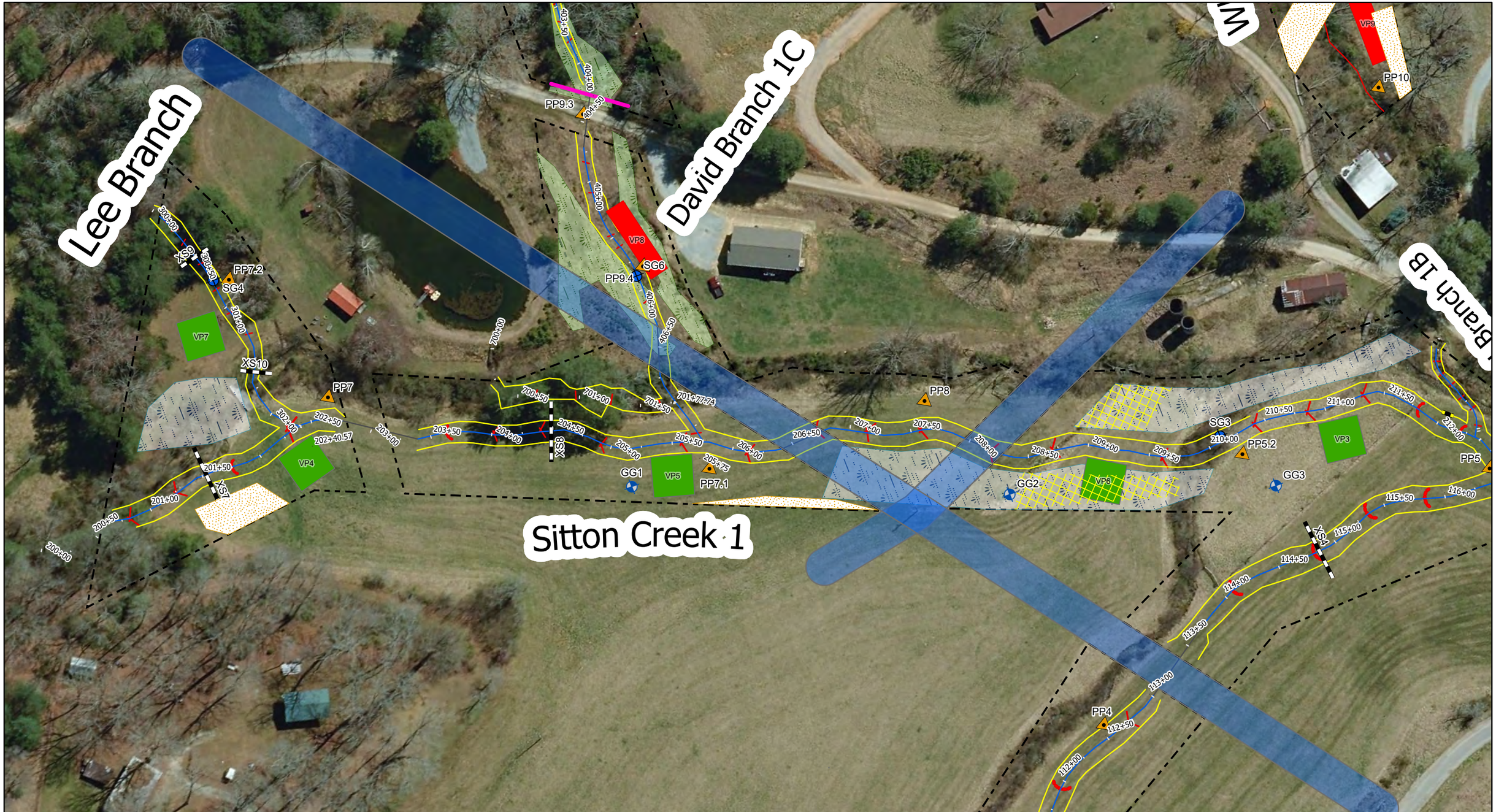
As-Built Centerline
Restoration Type
- Enhancement II
- Preservation
- Restoration
- No Credit
- Top of Bank
- In-Stream Structures

- Preexisting Jurisdictionally Determined Wetlands
- Potential Non-Creditable Wetland Restoration Areas
- Conservation Easement

N

0 40 80 160 240 320 Feet

This map is not a survey and is not to be construed as such.



CCPV MY1
Sheet 2
Seniard Creek Stream Restoration Site
Henderson Co., NC
November 2021

EQUINOX

- Reach Breaks
- Utility Easement

BankErosion
- Scour/Eroding
- Invasive Vegetation
- Encroachment
- Centerline_Stationing
- Photo Stations
- Crest Gauge

- Continuous Stage Recorder
- Groundwater Gauge
- Rain Gauge
- Cross Section

Vegetation Plot
Meeting
- Failing >10%
- Meeting >10%

As-Built Centerline
Restoration Type
- Enhancement II
- Preservation
- Restoration
- No Credit
- Top of Bank
- In-Stream Structures

- Preexisting Jurisdictionally Determined Wetlands
- Potential Non-Creditable Wetland Restoration Areas
- Conservation Easement

N

0 25 50 100 150 200 Feet

This map is not a survey and is not to be construed as such.

EQUINOX

CCPV MY1
Sheet 3
Seniard Creek Stream Restoration Site
Henderson Co., NC
November 2021

- Reach Breaks
- Utility Easement
- Invasive Vegetation
- Encroachment
- Centerline_Stationing
- Photo Stations
- Crest Gauge
- Continuous Stage Recorder
- Groundwater Gauge
- Rain Gauge
- Cross Section

Vegetation Plot Meeting
- Failing >10%
- Meeting >10%

As-Built Centerline
Restoration Type
- Enhancement II
- Preservation
- Restoration
- No Credit
- Top of Bank
- In-Stream Structures

- Preexisting Jurisdictionally Determined Wetlands
- Potential Non-Creditable Wetland Restoration Areas
- Conservation Easement

N

0 20 40 80 120 160 Feet

This map is not a survey and is not to be construed as such.

EQUINOX

CCPV MY1
Sheet 4
Seniard Creek Stream Restoration Site
Henderson Co., NC
November 2021

- Reach Breaks
- Utility Easement
- Invasive Vegetation
- Encroachment
- Centerline_Stationing
- Photo Stations
- Crest Gauge
- Continuous Stage Recorder
- Groundwater Gauge
- Rain Gauge
- Cross Section

Vegetation Plot
Meeting
- Failing >10%
- Meeting >10%

As-Built Centerline
Restoration Type
- Enhancement II
- Preservation
- Restoration
- No Credit
- Top of Bank
- In-Stream Structures

- Preexisting Jurisdictionally Determined Wetlands
- Potential Non-Creditable Wetland Restoration Areas
- Conservation Easement

N

0 25 50 100 150 200 Feet

This map is not a survey and is not to be construed as such.

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Appendix A
Visual Assessment Data

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Visual Stream Morphology Stability Assessment
Table 4. Seniard Mitigation Site - Seniard Reach 1A - Restoration PII
Assessed Length 396 feet (Oct 21, 2021)

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjusted % for Stabilizing Woody Vegetation
1. Bank	1. Scoured / Eroding	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion.			0	0	100%	0	0	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%	N/A	N/A	N/A
	3. Mass Wasting	Bank slumping, calving, or collapse.			0	0	100%	N/A	N/A	N/A
				Totals	0	0	100%	N/A	N/A	N/A
3. Engineered Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	4	4			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	4	4			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	4	4			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does NOT exceed 15%.	4	4			100%			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth Ratio ≥ 1.6. Rootwads/logs providing some cover at base-flow.	4	4			100%			

N/A - Item does not apply.

Table 4 cont. Visual Stream Morphology Stability Assessment
Seniard Mitigation Site - Seniard Reach 1B - Restoration PI
Assessed Length 1274 feet (Oct 21, 2021)

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjusted % for Stabilizing Woody Vegetation
1. Bank	1. Scoured / Eroding	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion.			0	0	100%	0	0	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%	N/A	N/A	N/A
	3. Mass Wasting	Bank slumping, calving, or collapse.			0	0	100%	N/A	N/A	N/A
				Totals	0	0	100%	N/A	N/A	N/A
2. Engineered Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	19	19			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	19	19			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	19	19			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does NOT exceed 15%.	19	19			100%			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth Ratio ≥ 1.6. Rootwads/logs providing some cover at base-flow.	19	19			100%			

N/A - Item does not apply.

Table 4 cont. Visual Stream Morphology Stability Assessment
Seniard Mitigation Site - Seniard Reach 2 - Restoration PI
Assessed Length 176 feet (Oct 21, 2021)

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjusted % for Stabilizing Woody Vegetation
1. Bank	1. Scoured / Eroding	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion.			0	0	100%	0	0	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%	N/A	N/A	N/A
	3. Mass Wasting	Bank slumping, calving, or collapse.			0	0	100%	N/A	N/A	N/A
				Totals	0	0	100%	N/A	N/A	N/A
2. Engineered Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	3	3			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	3	3			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	3	3			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does NOT exceed 15%.	3	3			100%			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth Ratio ≥ 1.6. Rootwads/logs providing some cover at base-flow.	3	3			100%			

N/A - Item does not apply.

Table 4 cont. Visual Stream Morphology Stability Assessment
Seniard Mitigation Site - Sitton Reach 1 - Restoration PI
Assessed Length 1236 feet (Oct 21, 2021)

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjusted % for Stabilizing Woody Vegetation
1. Bank	1. Scoured / Eroding	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion.			1	10	96%	0	0	99%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%	N/A	N/A	100%
	3. Mass Wasting	Bank slumping, calving, or collapse.			0	0	100%	N/A	N/A	96%
				Totals	1	10	96%	N/A	N/A	96%
2. Engineered Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	22	22			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	22	22			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	22	22			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does NOT exceed 15%.	22	22			100%			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth Ratio ≥ 1.6. Rootwads/logs providing some cover at base-flow.	22	22			100%			

N/A - Item does not apply.

Table 4 cont. Visual Stream Morphology Stability Assessment Seniard Mitigation Site - Lee Reach 1 - Restoration PII Assessed Length 226 feet (Oct 21, 2021)										
Major Channel Category	**Channel Sub-Category**	**Metric**	**Number Stable, Performing as Intended**	**Total Number in As-built**	**Number of Unstable Segments**	**Amount of Unstable Footage**	**% Stable, Performing as Intended**	**Number with Stabilizing Woody Vegetation**	**Footage with Stabilizing Woody Vegetation**	**Adjusted % for Stabilizing Woody Vegetation**
1. Bank	**1. Scoured / Eroding**	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion.			0	0	100%	0	0	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%	N/A	N/A	N/A
	3. Mass Wasting	Bank slumping, calving, or collapse.			0	0	100%	N/A	N/A	N/A
				Totals	0	0	100%	N/A	N/A	N/A
3. Engineered Structures	**1. Overall Integrity**	Structures physically intact with no dislodged boulders or logs.	8	8			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	8	8			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	8	8			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does NOT exceed 15%.	8	8			100%			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth Ratio ≥ 1.6. Rootwads/logs providing some cover at base-flow.	8	8			100%			

N/A - Item does not apply.

Table 4 cont. Visual Stream Morphology Stability Assessment Seniard Mitigation Site - David Reach 1A - Preservation Assessed Length 132 feet (Oct 21, 2021)										
Major Channel Category	**Channel Sub-Category**	**Metric**	**Number Stable, Performing as Intended**	**Total Number in As-built**	**Number of Unstable Segments**	**Amount of Unstable Footage**	**% Stable, Performing as Intended**	**Number with Stabilizing Woody Vegetation**	**Footage with Stabilizing Woody Vegetation**	**Adjusted % for Stabilizing Woody Vegetation**
1. Bank	**1. Scoured / Eroding**	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion.			0	0	100%	0	0	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%	N/A	N/A	N/A
	3. Mass Wasting	Bank slumping, calving, or collapse.			0	0	100%	N/A	N/A	N/A
				Totals	0	0	100%	N/A	N/A	N/A
2. Engineered Structures	**1. Overall Integrity**	Structures physically intact with no dislodged boulders or logs.					N/A			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.					N/A			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.					N/A			
	3. Bank Protection	Bank erosion within the structures extent of influence does NOT exceed 15%.					N/A			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth Ratio ≥ 1.6. Rootwads/logs providing some cover at base-flow.					N/A			

N/A - Item does not apply.

Table 4 cont. Visual Stream Morphology Stability Assessment
Seniard Mitigation Site - David Reach 1B - Restoration PI&II
Assessed Length 335 feet (Oct 21, 2021)

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjusted % for Stabilizing Woody Vegetation
1. Bank	1. Scoured / Eroding	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion.			0	0	100%	0	0	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%	N/A	N/A	N/A
	3. Mass Wasting	Bank slumping, calving, or collapse.			0	0	100%	N/A	N/A	N/A
				Totals	0	0	100%	N/A	N/A	N/A
2. Engineered Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	16	16			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	16	16			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	16	16			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does NOT exceed 15%.	16	16			100%			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth Ratio ≥ 1.6. Rootwads/logs providing some cover at base-flow.	16	16			100%			

N/A - Item does not apply.

Table 4 cont. Visual Stream Morphology Stability Assessment
Seniard Mitigation Site - David Reach 1C - Restoration PI
Assessed Length 273 feet (Oct 21, 2021)

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjusted % for Stabilizing Woody Vegetation
1. Bank	1. Scoured / Eroding	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion.			0	0	100%	0	0	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%	N/A	N/A	N/A
	3. Mass Wasting	Bank slumping, calving, or collapse.			0	0	100%	N/A	N/A	N/A
				Totals	0	0	100%	N/A	N/A	N/A
2. Engineered Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	7	7			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	7	7			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	7	7			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does NOT exceed 15%.	7	7			100%			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth Ratio ≥ 1.6. Rootwads/logs providing some cover at base-flow.	7	7			100%			

N/A - Item does not apply.

Table 4 cont. Visual Stream Morphology Stability Assessment
Seniard Mitigation Site - Whitaker Reach 1 - Enhancement II
Assessed Length 426 feet (Oct 21, 2021)

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjusted % for Stabilizing Woody Vegetation
1. Bank	1. Scoured / Eroding	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion.			0	0	100%	0	0	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%	N/A	N/A	N/A
	3. Mass Wasting	Bank slumping, calving, or collapse.			0	0	100%	N/A	N/A	N/A
				Totals	0	0	100%	N/A	N/A	N/A
2. Engineered Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.					N/A			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.					N/A			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.					N/A			
	3. Bank Protection	Bank erosion within the structures extent of influence does NOT exceed 15%.					N/A			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth Ratio ≥ 1.6. Rootwads/logs providing some cover at base-flow.					N/A			

N/A - Item does not apply.

Table 4 cont. Visual Stream Morphology Stability Assessment
Seniard Mitigation Site - Redmond Reach 1A - Enhancement II
Assessed Length 1054 feet (Oct 21, 2021)

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjusted % for Stabilizing Woody Vegetation
1. Bank	1. Scoured / Eroding	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion.			0	0	100%	0	0	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%	N/A	N/A	N/A
	3. Mass Wasting	Bank slumping, calving, or collapse.			0	0	100%	N/A	N/A	N/A
				Totals	0	0	100%	N/A	N/A	N/A
2. Engineered Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.					N/A			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.					N/A			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.					N/A			
	3. Bank Protection	Bank erosion within the structures extent of influence does NOT exceed 15%.					N/A			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth Ratio ≥ 1.6. Rootwads/logs providing some cover at base-flow.					N/A			

N/A - Item does not apply.

Table 4 cont. Visual Stream Morphology Stability Assessment
Seniard Mitigation Site - Redmond Reach 1B - Restoration PI
Assessed Length 94 feet (Oct 21, 2021)

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjusted % for Stabilizing Woody Vegetation
1. Bank	**1. Scoured / Eroding**	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion.			0	0	100%	0	0	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%	N/A	N/A	N/A
	3. Mass Wasting	Bank slumping, calving, or collapse.			0	0	100%	N/A	N/A	N/A
				Totals	0	0	100%	N/A	N/A	N/A
2. Engineered Structures	**1. Overall Integrity**	Structures physically intact with no dislodged boulders or logs.	6	6			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	6	6			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	6	6			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does NOT exceed 15%.	6	6			100%			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth Ratio ≥ 1.6. Rootwads/logs providing some cover at base-flow.	6	6			100%			

N/A - Item does not apply.

Table 5. Vegetation Condition Assessment Seniard Mitigation Site						
Planted Acreage: 7.4 (Assessed October 21, 2021)						
Vegetation Category	**Definitions**	**Mapping Threshold**	**CCPV Depiction**	**Number of Polygons**	**Combined Acreage**	**% of Planted Acreage**
1. Bare Areas	Very limited cover of both woody and herbaceous material.	0.1 acres	n/a	0	0	0.00%
2. Low Stem Density Areas	Woody stem densities clearly below target levels based on MY3, 4, or 5 stem count criteria.	0.1 acres		0	0	0.00%
			Total	0	0	0.00%
3. Areas of Poor Growth Rates or Vigor	Areas with woody stems of a size class that are obviously small given the monitoring year.	0.25 acres	n/a	0	0	0.00%
			Cumulative Total	0	0	0.00%
Easement Acreage:	**11.8**					
Vegetation Category	**Definitions**	**Mapping Threshold**	**CCPV Depiction**	**Number of Polygons**	**Combined Acreage**	**% of Easement Acreage**
4. Invasive Areas of Concern	Areas or points (if too small to render as polygons at map scale). High Density	1000 SF		0	0	0.00%
	Areas or points (if too small to render as polygons at map scale). Low Density	1000 SF		3	0.22	1.86%
***5. Easement Encroachment Areas**	Areas or points (if too small to render as polygons at map scale).	none		5	0.19	1.61%

* Easement Encroachment Areas were not duplicated in the Low Stem Density Areas category.

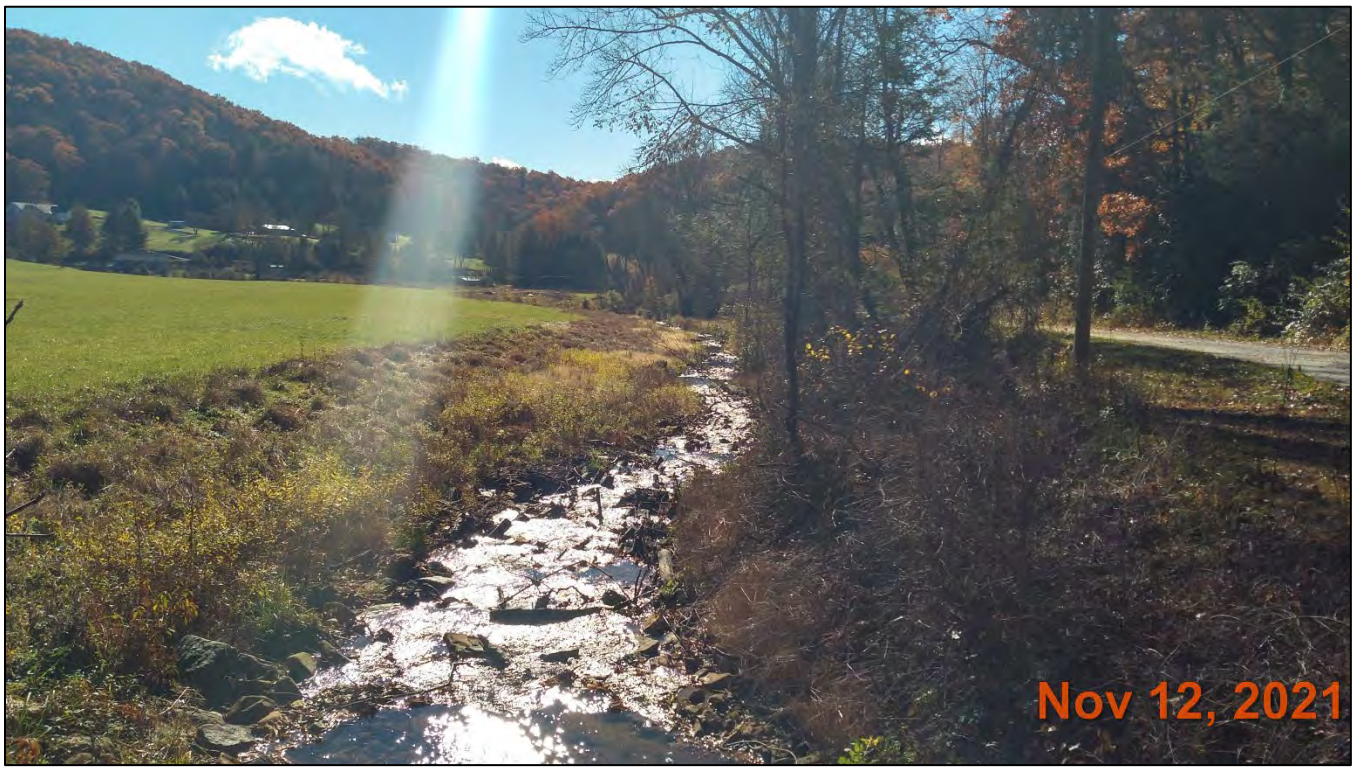

Photo Point 1. Facing downstream

Photo Point 2. Facing downstream

Photo Point 2. Facing upstream

Photo Point 2.1 Seniard Creek Reach 1 Stage Recorder and Pre-existing Wetland.

Photo Point 3. Facing downstream

Photo Point 3. Facing upstream showing Stream Gage #1.

Photo Point 4. Facing downstream

Photo Point 4. Facing upstream.

Photo Point 5. Facing downstream

Photo Point 5. Facing upstream Seniard Creek

Photo Point 5. Facing upstream Sitton Creek and Redmond Br.

Photo Point 6. Facing downstream

Photo Point 6. Facing upstream

Photo Point 7. Facing upstream Lee Branch

Photo Point 7. Facing upstream Sitton Creek

Photo Point 7.1 Facing upstream David Branch.

Photo Point 7.2 Facing downstream Lee Branch.

Photo Point 7.2 Stage Recorder Lee Branch.

Photo Point 8. Facing downstream

Photo Point 8. Facing upstream

Photo Point 9. Facing downstream

Photo Point 9.1 David Branch 1B Stage Recorder.

Photo Point 9.4 Facing downstream, David Branch 1C Stage Recorder.

Photo Point 10. Facing downstream

Photo Point 10. Facing upstream

Photo Point 11. Facing downstream

Photo Point 12. Facing downstream

Photo Point 12. Facing upstream

Cross Section 1, Left descending bank


Cross Section 1, Right descending bank

Cross Section 2, Left descending bank.


Cross Section 2, Right descending bank.

Cross Section 3, Left descending bank.


Cross Section 3, Right descending bank.

Cross Section 4, Left descending bank.

Cross Section 4, Right descending bank.

Cross Section 5 and 6, Left descending bank.

Cross Section 5 and 6, Right descending bank.

Cross Section 7, Left descending bank.

Cross Section 7, Right descending bank.

Cross Section 8, Left descending bank.

Cross Section 8, Right descending bank.

Cross Section 9, Left descending bank.

Cross Section 9, Right descending bank.

Cross Section 10, Left descending bank.

Cross Section 10, Right descending bank.

Cross Section 11, Left descending bank.

Cross Section 11, Right descending bank.

Cross Section 12, Left descending bank.

Cross Section 12, Right descending bank.

Cross Section 13, Left descending bank.

Cross Section 13, Right descending bank.

Cross Section 14, Left descending bank.

Cross Section 14, Right descending bank.

Cross Section 15, Left descending bank.

Cross Section 15, Right descending bank.

Cross Section 16, Left descending bank.

Cross Section 16, Right descending bank.

Appendix B
Vegetation Plot Data

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https://ncdms.shinyapps.io/Veg_Table_Tool/

Planted Acreage	7.4
Date of Initial Plant	2021-02-26
Date(s) of Supplemental Plant(s)	#N/A
Date(s) Mowing	#N/A
Date of Current Survey	2021-11-15
Plot size (ACRES)	0.0247

Table 6. Vegetaion Plot Data
Seniard Creek Mitigation Site MY1 (2021)

	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	
					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	Alnus serrulata	hazel alder	Tree	OBL	1	1	2	2	2	2	3	3	3	3					3	3			2	4
	Betula nigra	river birch	Tree	FACW	1	1	1	1			3	3			1	1							1	1
	Carpinus caroliniana	American hornbeam	Tree	FAC			2	2	1	1			1	1									1	1
	Cornus amomum	silky dogwood	Shrub	FACW											2	2			2	2			1	1
	Diospyros virginiana	common persimmon	Tree	FAC	1	1											2	2					1	1
	Hamamelis virginiana	American witchhazel	Tree	FACU	3	3	1	1					1	1										
	Ilex opaca	American holly	Tree	FACU																	1	1		
	Ilex verticillata	common winterberry	Tree	FACW			1	1	1	1	2	2					1	1	1	1				
	Lindera benzoin	northern spicebush	Tree	FAC									1	1										
	Liriodendron tulipifera	tuliptree	Tree	FACU							2	2	1	1			4	7			1	1		
	Nyssa sylvatica	blackgum	Tree	FAC													2	2						
	Platanus occidentalis	American sycamore	Tree	FACW	5	5	1	1	2	2			1	1										
	Quercus rubra	northern red oak	Tree	FACU													1	1			2	2		
	Quercus sp.				1	1			1	1			1	1										
	Salix nigra	black willow	Tree	OBL	1	1					1	1			1	9								
	Salix sericea	silky willow	Shrub	OBL			1	1	2	2	2	2	3	3									2	2
	Salix sp.															1								
Sum	Performance Standard				13	13	9	9	9	9	13	13	12	12	4	13	10	13	6	6	4	4	8	10
Post Mitigation Plan Species	*Acer rubrum*	*red maple*	*Tree*	*FAC*																*2*		*1*		*1*
	Carya tomentosa	mockernut hickory	Tree														1	1						
	Quercus imbricaria	shingle oak	Tree	FAC			2	2					1	1										
Sum	Proposed Standard				13	13	11	11	9	9	13	13	13	13	4	13	11	14	6	6	4	4	8	10
Mitigation Plan Performance Standard	*Current Year Stem Count*					*13*		*9*		*9*		*13*		*12*		*13*		*13*		*6*		*4*		*10*
	Stems/Acre					526		364		364		526		486		526		526		243		162		405
	Species Count					7		7		6		6		8		4		5		3		3		6
	Dominant Species Composition (%)					38		18		22		23		23		69		50		38		40		36
	Average Plot Height					1		1		1		1		1		2		1		2		1		1
	% Invasives					0		0		0		0		0		0		0		0		0		0
Post Mitigation Plan Performance Standard	Current Year Stem Count					13		11		9		13		13		13		14		6		4		10
	Stems/Acre					526		445		364		526		526		526		567		243		162		405
	Species Count					7		8		6		6		9		4		6		3		3		6
	Dominant Species Composition (%)					38		18		22		23		23		69		50		38		40		36
	Average Plot Height					1		1		1		1		1		2		1		2		1		1
	% Invasives					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.

+ Easement encroachment impacted vegetation plot.

Table 7. Vegetation Performance Standards Summary Table
Seniard Creek Mitigation Site MY1 (2021)

	Veg Plot 1 F				Veg Plot 2 F				Veg Plot 3 F			
	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives
Monitoring Year 7												
Monitoring Year 5												
Monitoring Year 3												
Monitoring Year 2												
Monitoring Year 1	526		7	0	364		7	0	364		6	0
Monitoring Year 0	607		9	0	567		9	0	648		9	0
	Veg Plot 4 F				Veg Plot 5 F				Veg Plot 6 F			
	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives
Monitoring Year 7												
Monitoring Year 5												
Monitoring Year 3												
Monitoring Year 2												
Monitoring Year 1	526		6	0	486		8	0	526		4	0
Monitoring Year 0	526		7	0	688		9	0	567		5	0
	Veg Plot 7 F				Veg Plot 8 F				+Veg Plot 9 F			
	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives
Monitoring Year 7												
Monitoring Year 5												
Monitoring Year 3												
Monitoring Year 2												
Monitoring Year 1	526		5	0	243		3	0	162		3	0
Monitoring Year 0	445		5	0	648		6	0	364		5	0
	Veg Plot 10 F											
	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives								
Monitoring Year 7												
Monitoring Year 5												
Monitoring Year 3												
Monitoring Year 2												
Monitoring Year 1	405		6	0								
Monitoring Year 0	405		6	0								

*Each monitoring year represents a different plot for the random vegetation plot "groups". Random plots are denoted with an R, and fixed plots with an F.
+ Easement encroachment impacted vegetation plot.

Seniard Creek Mitigation Site
Bare Root Stem Counts and Percentages

Species	Quantity	%
Alnus serrulata	500	7.1
Amelanchier canadensis	250	3.6
Aronia melanocarpa	250	3.6
Betula nigra	500	7.1
Carpinus caroliniana	500	7.1
Carya glabra	250	3.6
Carya tomentosa	250	3.6
Cornus amomum	350	5.0
Diospyrus virginiana	250	3.6
Hamamelis virginiana	250	3.6
Ilex opaca	300	4.3
Ilex verticillata	250	3.6
Liriodendron tulipifera	500	7.1
Nyssa sylvatica	250	3.6
Platanus occidentalis	500	7.1
Quercus imbricaria	250	3.6
Quercus rubra	500	7.1
Salix nigra	500	7.1
Sambucus canadensis	350	5.0
Sassafras albidum	250	3.6
Sum	**7000**	

Vegetation Plot Photos

Vegetation Monitoring Plot 1

Vegetation Monitoring Plot 2

Vegetation Monitoring Plot 3

Vegetation Monitoring Plot 4

Vegetation Monitoring Plot 5

Vegetation Monitoring Plot 6

Vegetation Monitoring Plot 7

Vegetation Monitoring Plot 8

Vegetation Monitoring Plot 9

Vegetation Monitoring Plot 10

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Appendix C
Stream Geomorphology Data

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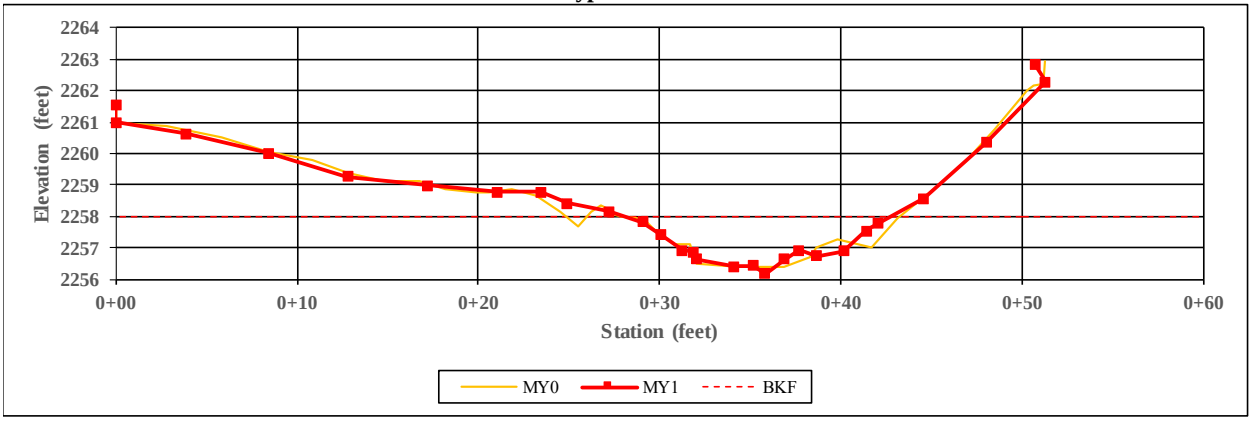
Project Name: Seniard **XS Number:** 1 **Station:** 100+32

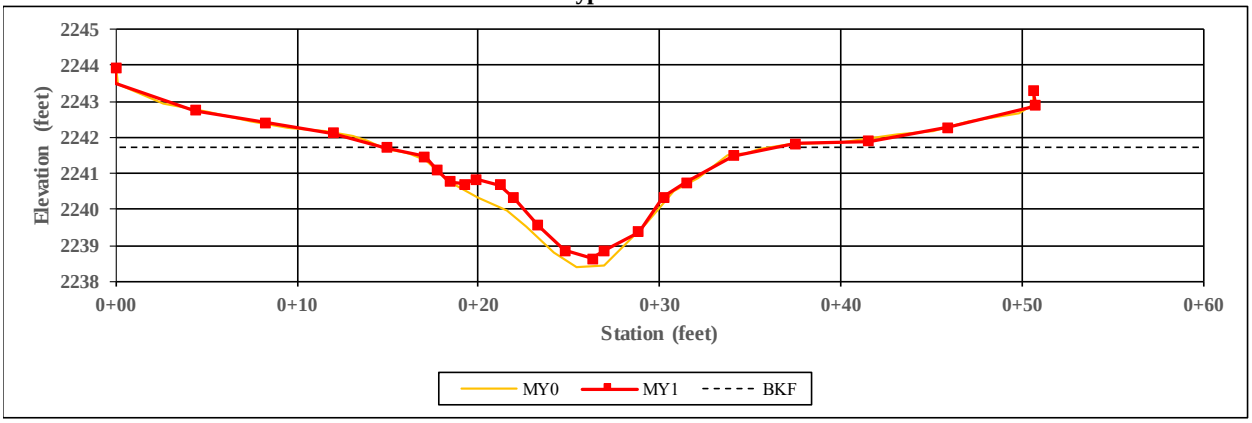
Reach Name: Seniard Creek 1A **XS Type:** Riffle



CHANNEL DIMENSIONS SUMMARY	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankful Width (ft)	14.2	12.9	-	-	-	-	-	-
Floodprone Width (ft)	50.0	50.0	-	-	-	-	-	-
Bankfull Mean Depth (ft)	1.0	1.1	-	-	-	-	-	-
Bankfull Max Depth (ft)	1.5	1.8	-	-	-	-	-	-
Bankfull Cross-Sectional Area (ft^2)	14.6	14.6	-	-	-	-	-	-
Width/Depth Ratio	13.8	11.5	-	-	-	-	-	-
Entrenchment Ratio	3.5	3.9	-	-	-	-	-	-
Bank Height Ratio	1.0	0.9	-	-	-	-	-	-

Project Name: Seniard **XS Number:** 2 **Station:** 107+60

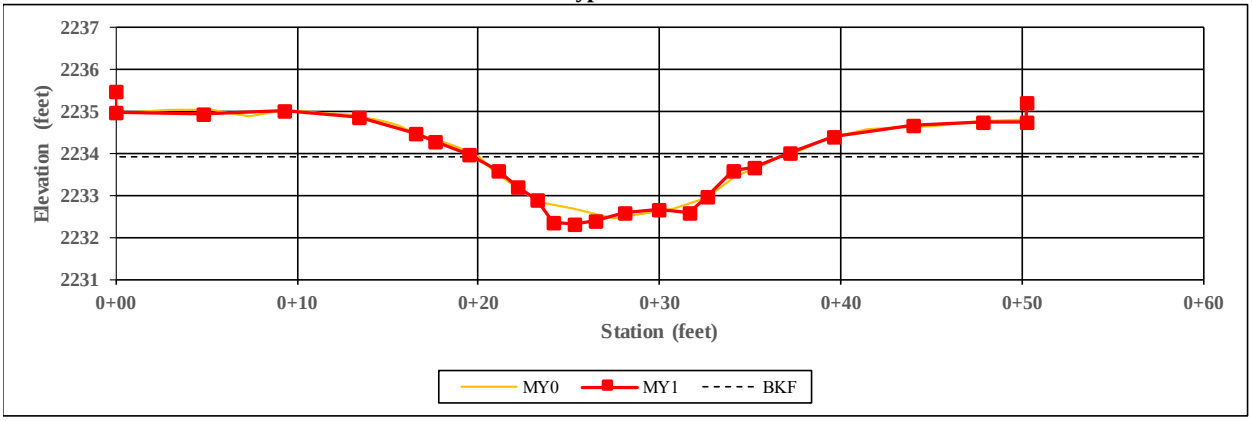
Reach Name: Seniard Creek 1B **XS Type:** Pool



CHANNEL DIMENSIONS SUMMARY	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankful Width (ft)	17.0	17.0	-	-	-	-	-	-
Floodprone Width (ft)	50.0	50.0	-	-	-	-	-	-
Bankfull Mean Depth (ft)	1.6	1.6	-	-	-	-	-	-
Bankfull Max Depth (ft)	3.1	3.1	-	-	-	-	-	-
Bankfull Cross-Sectional Area (ft^2)	27.6	27.6	-	-	-	-	-	-
Width/Depth Ratio	10.5	10.5	-	-	-	-	-	-
Entrenchment Ratio	2.9	2.9	-	-	-	-	-	-
Bank Height Ratio	1.0	0.9	-	-	-	-	-	-

Project Name: Seniard **XS Number:** 3 **Station:** 111+23

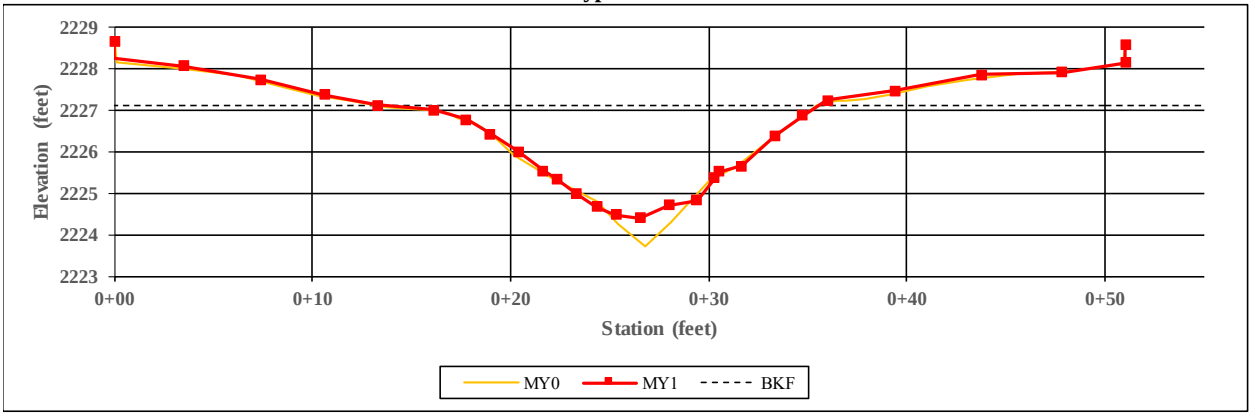
Reach Name: Seniard Creek 1B **XS Type:** Riffle



CHANNEL DIMENSIONS SUMMARY	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankful Width (ft)	16.8	17.0	-	-	-	-	-	-
Floodprone Width (ft)	50.0	50.0	-	-	-	-	-	-
Bankfull Mean Depth (ft)	1.0	0.9	-	-	-	-	-	-
Bankfull Max Depth (ft)	1.5	1.6	-	-	-	-	-	-
Bankfull Cross-Sectional Area (ft^2)	16.0	16.0	-	-	-	-	-	-
Width/Depth Ratio	17.6	18.0	-	-	-	-	-	-
Entrenchment Ratio	3.0	2.9	-	-	-	-	-	-
Bank Height Ratio	1.0	1.0	-	-	-	-	-	-

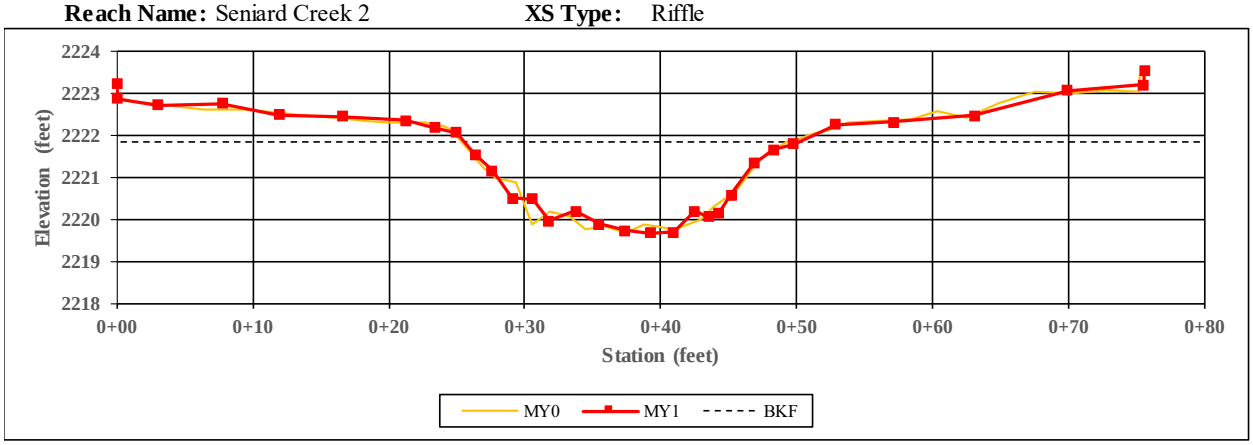
Seniard **XS Number:** 4 **Station:** 114+85

Reach Name: Seniard Creek 1B **XS Type:** Pool



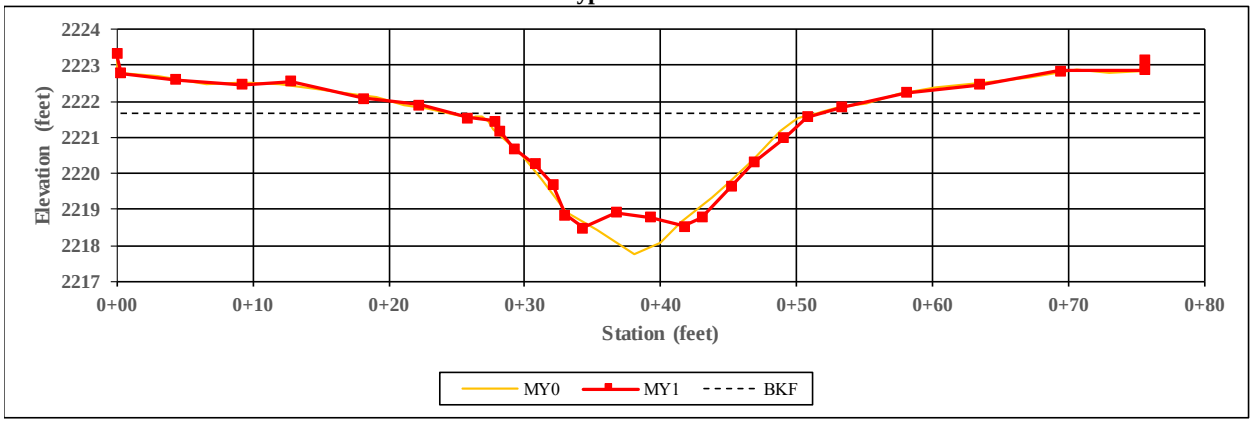
CHANNEL DIMENSIONS SUMMARY	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankful Width (ft)	18.6	18.6	-	-	-	-	-	-
Floodprone Width (ft)	50.0	50.0	-	-	-	-	-	-
Bankfull Mean Depth (ft)	1.5	1.5	-	-	-	-	-	-
Bankfull Max Depth (ft)	3.3	2.7	-	-	-	-	-	-
Bankfull Cross-Sectional Area (ft^2)	28.2	28.2	-	-	-	-	-	-
Width/Depth Ratio	12.3	12.3	-	-	-	-	-	-
Entrenchment Ratio	2.7	2.7	-	-	-	-	-	-
Bank Height Ratio	1.0	1.0	-	-	-	-	-	-

Project Name: Seniard **XS Number:** 5 **Station:** 116+93
Reach Name: Seniard Creek 2 **XS Type:** Riffle



CHANNEL DIMENSIONS SUMMARY	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankful Width (ft)	23.5	24.2	-	-	-	-	-	-
Floodprone Width (ft)	100.0	100.0	-	-	-	-	-	-
Bankfull Mean Depth (ft)	1.4	1.4	-	-	-	-	-	-
Bankfull Max Depth (ft)	2.1	2.2	-	-	-	-	-	-
Bankfull Cross-Sectional Area (ft^2)	34.0	34.0	-	-	-	-	-	-
Width/Depth Ratio	16.2	17.2	-	-	-	-	-	-
Entrenchment Ratio	4.3	4.1	-	-	-	-	-	-
Bank Height Ratio	1.0	1.0	-	-	-	-	-	-

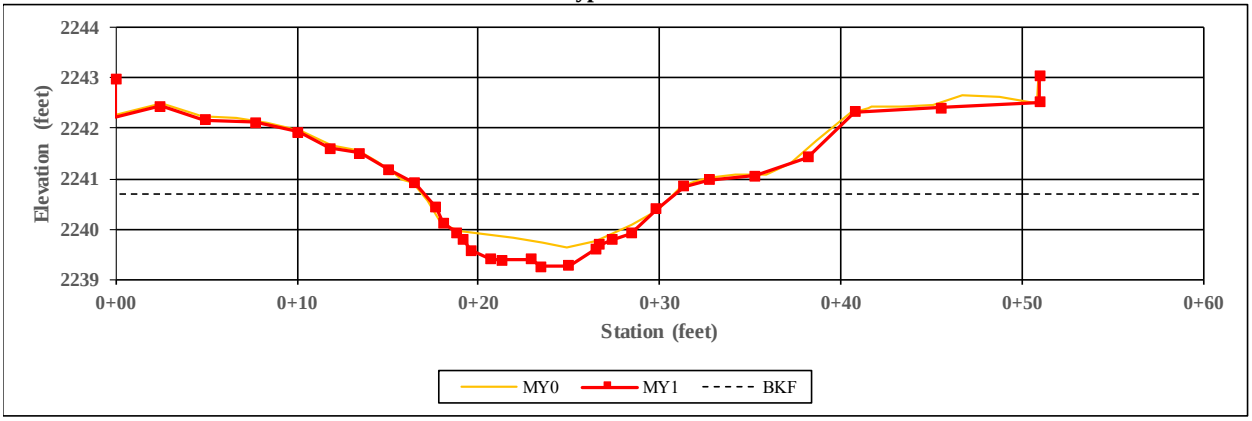
Project Name: Seniard **XS Number:** 6 **Station:** 117+09
Reach Name: Seniard Creek 2 **XS Type:** Pool



CHANNEL DIMENSIONS SUMMARY	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankful Width (ft)	22.8	21.3	-	-	-	-	-	-
Floodprone Width (ft)	100.0	100.0	-	-	-	-	-	-
Bankfull Mean Depth (ft)	2.1	2.2	-	-	-	-	-	-
Bankfull Max Depth (ft)	3.8	3.2	-	-	-	-	-	-
Bankfull Cross-Sectional Area (ft^2)	47.4	47.4	-	-	-	-	-	-
Width/Depth Ratio	10.9	9.6	-	-	-	-	-	-
Entrenchment Ratio	4.4	4.7	-	-	-	-	-	-
Bank Height Ratio	1.0	0.9	-	-	-	-	-	-

Project Name: Seniard **XS Number:** 7 **Station:** 201+53

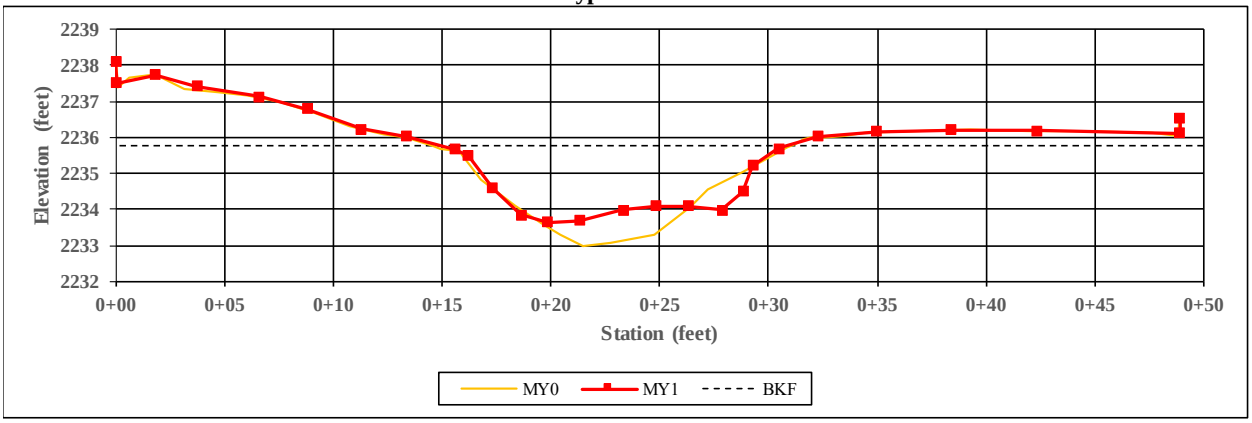
Reach Name: Sitton Creek 1 **XS Type:** Riffle



CHANNEL DIMENSIONS SUMMARY	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankful Width (ft)	15.1	13.2	-	-	-	-	-	-
Floodprone Width (ft)	50.0	50.0	-	-	-	-	-	-
Bankfull Mean Depth (ft)	0.9	1.0	-	-	-	-	-	-
Bankfull Max Depth (ft)	1.3	1.4	-	-	-	-	-	-
Bankfull Cross-Sectional Area (ft^2)	13.1	13.1	-	-	-	-	-	-
Width/Depth Ratio	17.3	13.3	-	-	-	-	-	-
Entrenchment Ratio	3.3	3.8	-	-	-	-	-	-
Bank Height Ratio	1.0	1.1	-	-	-	-	-	-

Project Name: Seniard **XS Number:** 8 **Station:** 204+48

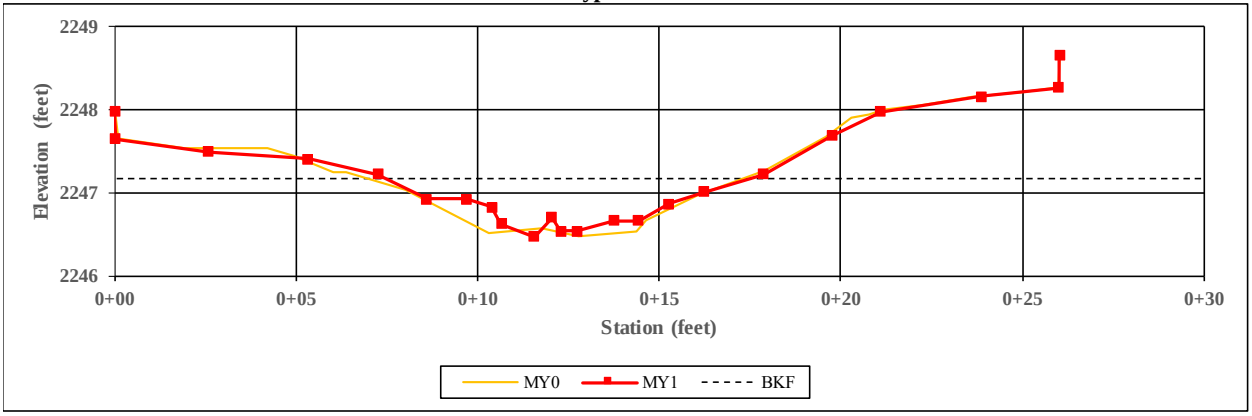
Reach Name: Sitton Creek 1 **XS Type:** Pool



CHANNEL DIMENSIONS SUMMARY	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankful Width (ft)	13.0	13.7	-	-	-	-	-	-
Floodprone Width (ft)	50.0	50.0	-	-	-	-	-	-
Bankfull Mean Depth (ft)	1.7	1.6	-	-	-	-	-	-
Bankfull Max Depth (ft)	2.6	2.1	-	-	-	-	-	-
Bankfull Cross-Sectional Area (ft^2)	22.3	22.3	-	-	-	-	-	-
Width/Depth Ratio	7.6	8.4	-	-	-	-	-	-
Entrenchment Ratio	3.8	3.7	-	-	-	-	-	-
Bank Height Ratio	1.0	0.9	-	-	-	-	-	-

Project Name: Seniard **XS Number:** 9 **Station:** 300+51

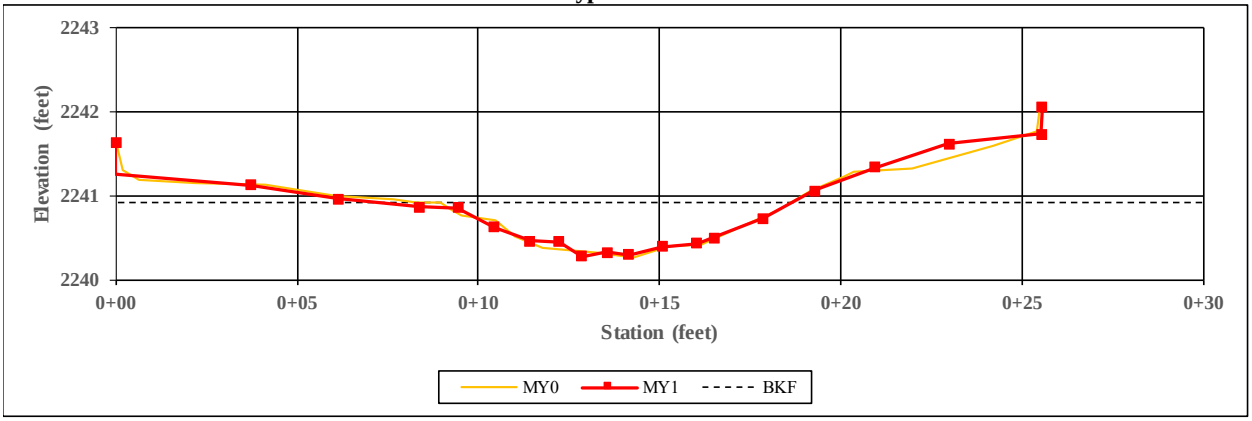
Reach Name: Lee Branch 1 **XS Type:** Riffle



CHANNEL DIMENSIONS SUMMARY	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankful Width (ft)	8.1	6.7	-	-	-	-	-	-
Floodprone Width (ft)	25.0	25.0	-	-	-	-	-	-
Bankfull Mean Depth (ft)	0.4	0.5	-	-	-	-	-	-
Bankfull Max Depth (ft)	0.6	0.5	-	-	-	-	-	-
Bankfull Cross-Sectional Area (ft^2)	3.1	3.1	-	-	-	-	-	-
Width/Depth Ratio	21.3	14.4	-	-	-	-	-	-
Entrenchment Ratio	3.1	3.7	-	-	-	-	-	-
Bank Height Ratio	1.0	0.7	-	-	-	-	-	-

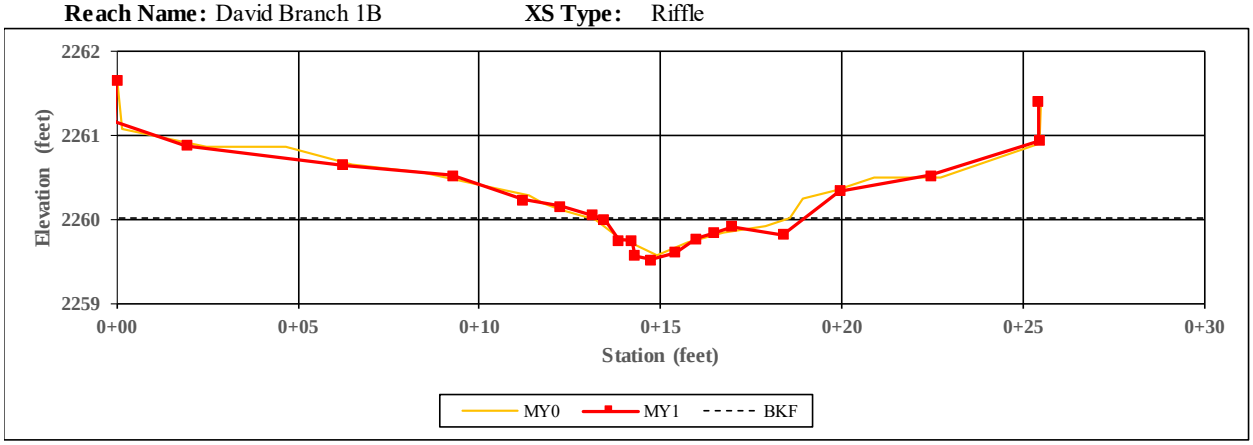
Project Name: Seniard **XS Number:** 10 **Station:** 301+61

Reach Name: Lee Branch 1 **XS Type:** Pool



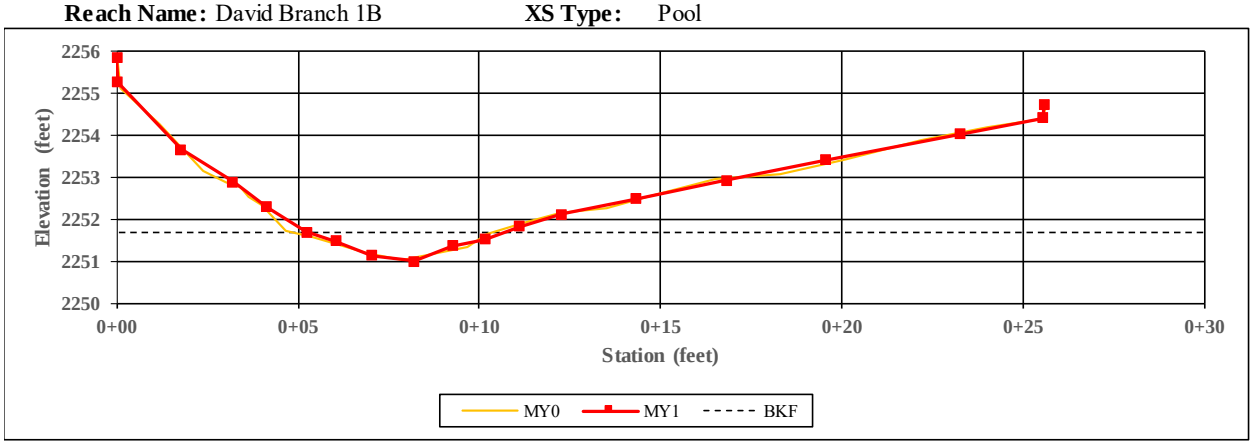
CHANNEL DIMENSIONS SUMMARY	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankful Width (ft)	9.3	9.5	-	-	-	-	-	-
Floodprone Width (ft)	25.0	25.0	-	-	-	-	-	-
Bankfull Mean Depth (ft)	0.4	0.4	-	-	-	-	-	-
Bankfull Max Depth (ft)	0.7	0.6	-	-	-	-	-	-
Bankfull Cross-Sectional Area (ft^2)	3.9	3.9	-	-	-	-	-	-
Width/Depth Ratio	21.8	23.5	-	-	-	-	-	-
Entrenchment Ratio	2.7	2.6	-	-	-	-	-	-
Bank Height Ratio	1.0	0.9	-	-	-	-	-	-

Project Name: Seniard **XS Number:** 11 **Station:** 402+31
Reach Name: David Branch 1B **XS Type:** Riffle



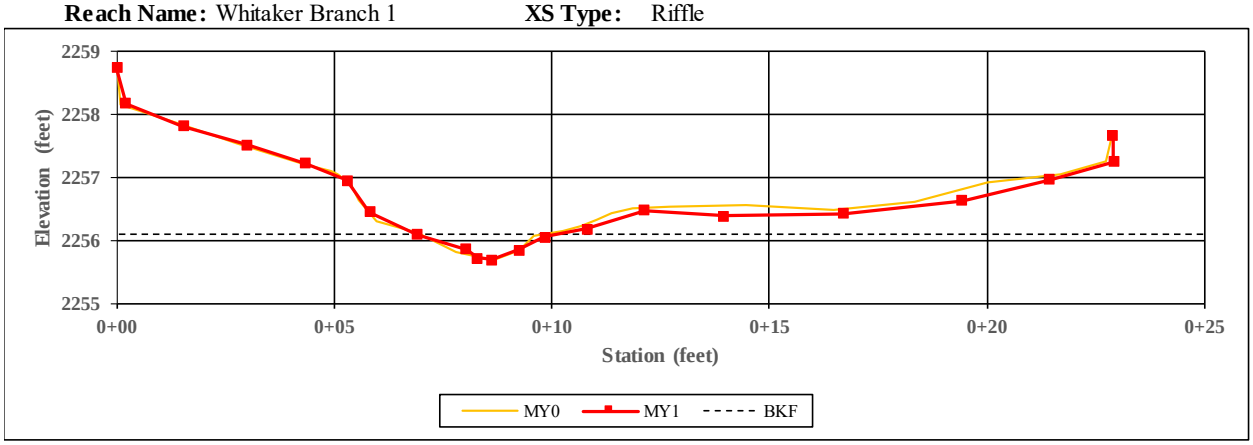
CHANNEL DIMENSIONS SUMMARY	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankful Width (ft)	4.7	3.0	-	-	-	-	-	-
Floodprone Width (ft)	10.0	10.0	-	-	-	-	-	-
Bankfull Mean Depth (ft)	0.2	0.3	-	-	-	-	-	-
Bankfull Max Depth (ft)	0.4	0.5	-	-	-	-	-	-
Bankfull Cross-Sectional Area (ft^2)	1.0	1.0	-	-	-	-	-	-
Width/Depth Ratio	22.2	9.1	-	-	-	-	-	-
Entrenchment Ratio	2.1	3.3	-	-	-	-	-	-
Bank Height Ratio	1.0	1.0	-	-	-	-	-	-

Project Name: Seniard **XS Number:** 12 **Station:** 403+24
Reach Name: David Branch 1B **XS Type:** Pool



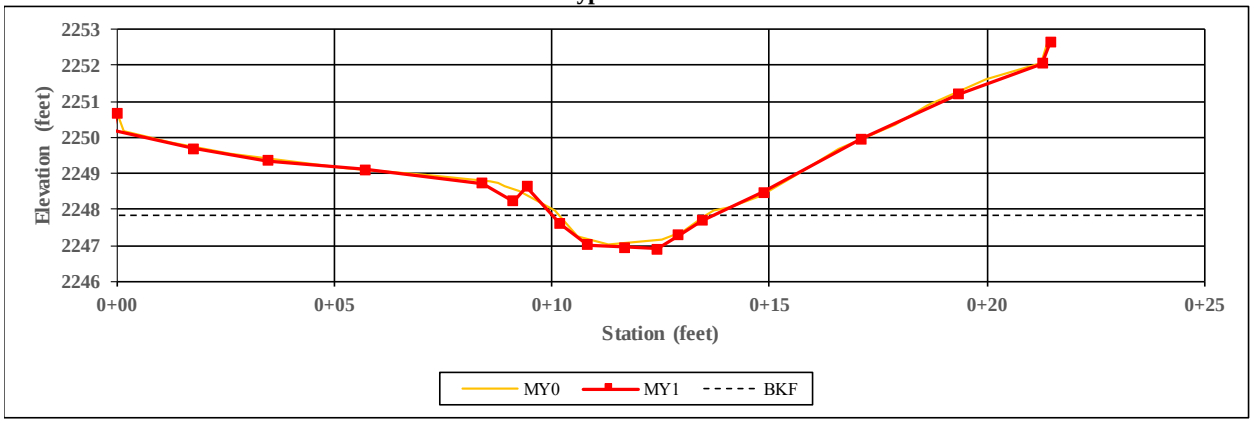
CHANNEL DIMENSIONS SUMMARY	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankful Width (ft)	4.8	4.1	-	-	-	-	-	-
Floodprone Width (ft)	10.0	10.0	-	-	-	-	-	-
Bankfull Mean Depth (ft)	0.4	0.5	-	-	-	-	-	-
Bankfull Max Depth (ft)	0.6	0.7	-	-	-	-	-	-
Bankfull Cross-Sectional Area (ft^2)	1.9	1.9	-	-	-	-	-	-
Width/Depth Ratio	12.3	9.0	-	-	-	-	-	-
Entrenchment Ratio	2.1	2.4	-	-	-	-	-	-
Bank Height Ratio	1.0	1.0	-	-	-	-	-	-

Project Name: Seniard **XS Number:** 13 **Station:** 601+41
Reach Name: Whitaker Branch 1 **XS Type:** Riffle



CHANNEL DIMENSIONS SUMMARY	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankful Width (ft)	1.8	1.8	-	-	-	-	-	-
Floodprone Width (ft)	10.0	10.0	-	-	-	-	-	-
Bankfull Mean Depth (ft)	0.3	0.3	-	-	-	-	-	-
Bankfull Max Depth (ft)	0.4	0.4	-	-	-	-	-	-
Bankfull Cross-Sectional Area (ft^2)	0.5	0.5	-	-	-	-	-	-
Width/Depth Ratio	6.1	6.7	-	-	-	-	-	-
Entrenchment Ratio	5.6	5.5	-	-	-	-	-	-
Bank Height Ratio	1.0	0.9	-	-	-	-	-	-

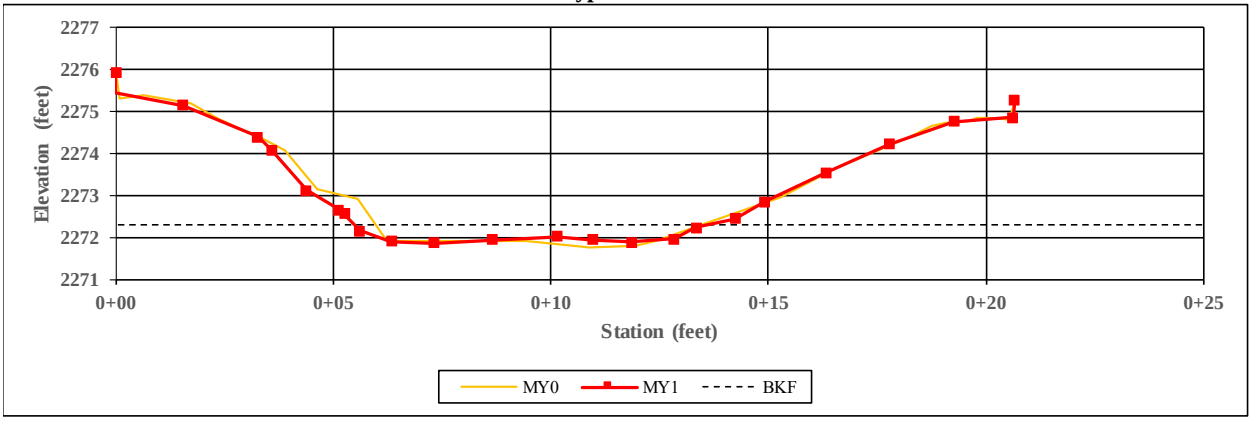
Project Name: Seniard **XS Number:** 14 **Station:** 602+64
Reach Name: Whitaker Branch 1 **XS Type:** Pool



CHANNEL DIMENSIONS SUMMARY	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankful Width (ft)	3.5	3.3	-	-	-	-	-	-
Floodprone Width (ft)	10.0	10.0	-	-	-	-	-	-
Bankfull Mean Depth (ft)	0.7	0.7	-	-	-	-	-	-
Bankfull Max Depth (ft)	0.9	0.9	-	-	-	-	-	-
Bankfull Cross-Sectional Area (ft^2)	2.3	2.3	-	-	-	-	-	-
Width/Depth Ratio	5.2	4.5	-	-	-	-	-	-
Entrenchment Ratio	2.9	3.1	-	-	-	-	-	-
Bank Height Ratio	1.0	0.8	-	-	-	-	-	-

Project Name: Seniard **XS Number:** 15 **Station:** 702+67

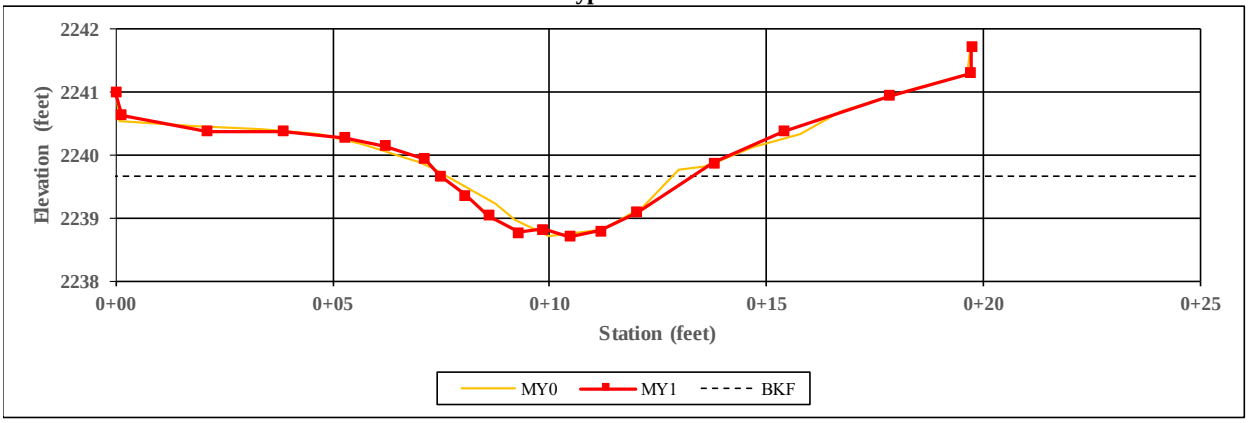
Reach Name: Redmond Branch 1A **XS Type:** Riffle



CHANNEL DIMENSIONS SUMMARY	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankful Width (ft)	7.2	7.7	-	-	-	-	-	-
Floodprone Width (ft)	10.0	10.0	-	-	-	-	-	-
Bankfull Mean Depth (ft)	0.4	0.4	-	-	-	-	-	-
Bankfull Max Depth (ft)	0.5	0.4	-	-	-	-	-	-
Bankfull Cross-Sectional Area (ft^2)	2.8	2.8	-	-	-	-	-	-
Width/Depth Ratio	18.7	21.4	-	-	-	-	-	-
Entrenchment Ratio	1.4	1.3	-	-	-	-	-	-
Bank Height Ratio	1.0	0.8	-	-	-	-	-	-

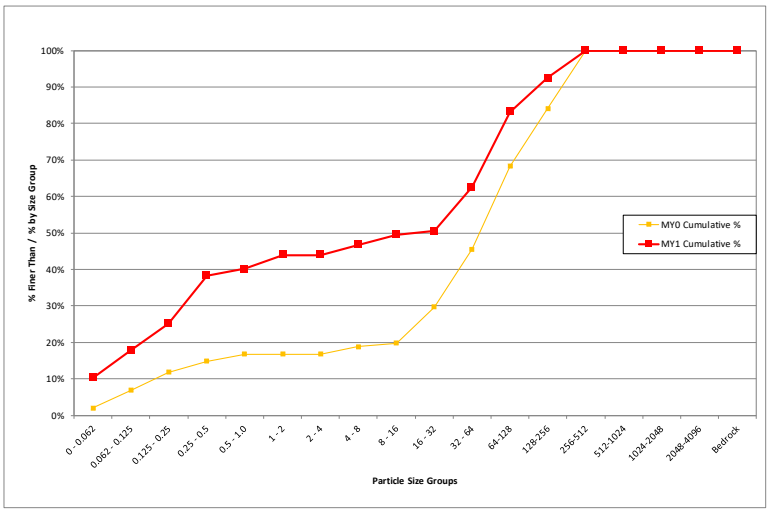
Project Name: Seniard **XS Number:** 16 **Station:** 709+81

Reach Name: Redmond Branch 1A **XS Type:** Pool

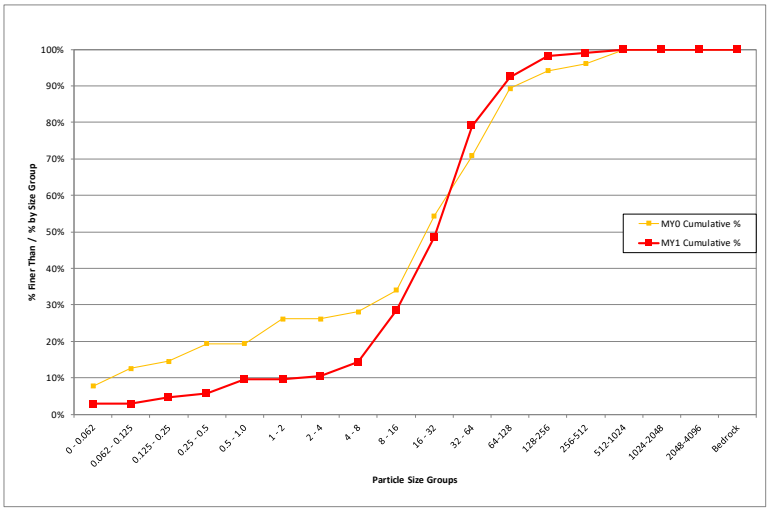


CHANNEL DIMENSIONS SUMMARY	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankful Width (ft)	4.2	4.5	-	-	-	-	-	-
Floodprone Width (ft)	10.0	10.0	-	-	-	-	-	-
Bankfull Mean Depth (ft)	0.8	0.7	-	-	-	-	-	-
Bankfull Max Depth (ft)	1.1	1.0	-	-	-	-	-	-
Bankfull Cross-Sectional Area (ft^2)	3.2	3.2	-	-	-	-	-	-
Width/Depth Ratio	5.5	6.5	-	-	-	-	-	-
Entrenchment Ratio	2.4	2.2	-	-	-	-	-	-
Bank Height Ratio	1.0	1.1	-	-	-	-	-	-

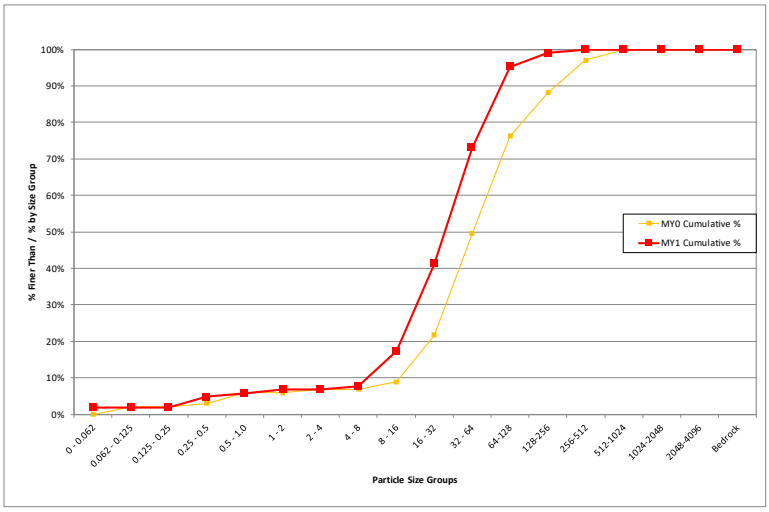
Seniard Creek			
Cross Section 1 - Riffle			
Monitoring Year - 2021; MY1			
Bed Surface Material Particle Size Class (mm)	Number	% Individual	% Cumulative
0 - 0.062	11	10.3%	10%
0.062 - 0.125	8	7.5%	18%
0.125 - 0.25	8	7.5%	25%
0.25 - 0.5	14	13.1%	38%
0.5 - 1.0	2	1.9%	40%
1 - 2	4	3.7%	44%
2 - 4	0	0.0%	44%
4 - 8	3	2.8%	47%
8 - 16	3	2.8%	50%
16 - 32	1	0.9%	50%
32 - 64	13	12.1%	63%
64-128	22	20.6%	83%
128-256	10	9.3%	93%
256-512	8	7.5%	100%
512-1024	0	0.0%	100%
1024-2048	0	0.0%	100%
2048-4096	0	0.0%	100%
Bedrock	0	0.0%	100%
Total	**107**	**100%**	**100%**
		Summary Data	
		D50	**27**
		D84	**140**
		D95	**290**



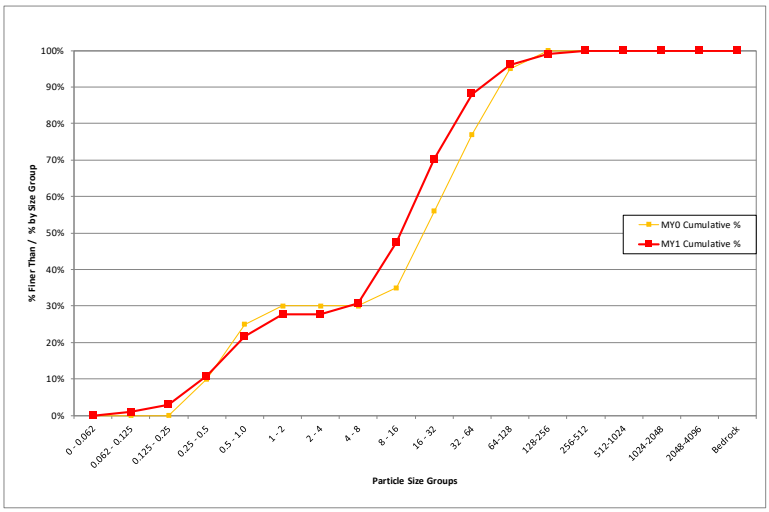
Seniard Creek			
Cross Section 3 - Riffle			
Monitoring Year - 2021; MY1			
Bed Surface Material Particle Size Class (mm)	Number	% Individual	% Cumulative
0 - 0.062	3	2.9%	3%
0.062 - 0.125	0	0.0%	3%
0.125 - 0.25	2	1.9%	5%
0.25 - 0.5	1	1.0%	6%
0.5 - 1.0	4	3.8%	10%
1 - 2	0	0.0%	10%
2 - 4	1	1.0%	10%
4 - 8	4	3.8%	14%
8 - 16	15	14.3%	29%
16 - 32	21	20.0%	49%
32 - 64	32	30.5%	79%
64-128	14	13.3%	92%
128-256	6	5.7%	98%
256-512	1	1.0%	99%
512-1024	1	1.0%	100%
1024-2048	0	0.0%	100%
2048-4096	0	0.0%	100%
Bedrock	0	0.0%	100%
Total	**105**	**100%**	**100%**
		Summary Data	
		D50	**33**
		D84	**80**
		D95	**150**



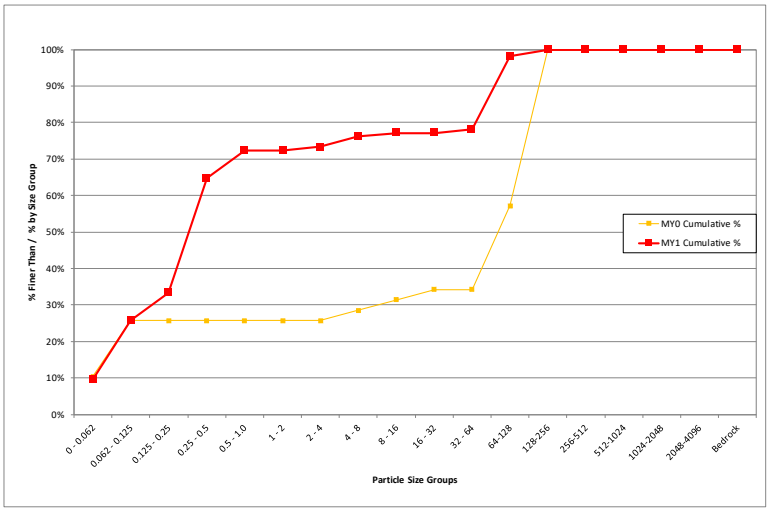
Seniard Creek			
Cross Section 5 - Riffle			
Monitoring Year - 2021; MY1			
Bed Surface Material Particle Size Class (mm)	Number	% Individual	% Cumulative
0 - 0.062	2	1.9%	2%
0.062 - 0.125	0	0.0%	2%
0.125 - 0.25	0	0.0%	2%
0.25 - 0.5	3	2.9%	5%
0.5 - 1.0	1	1.0%	6%
1 - 2	1	1.0%	7%
2 - 4	0	0.0%	7%
4 - 8	1	1.0%	8%
8 - 16	10	9.6%	17%
16 - 32	25	24.0%	41%
32 - 64	33	31.7%	73%
64-128	23	22.1%	95%
128-256	4	3.8%	99%
256-512	1	1.0%	100%
512-1024	0	0.0%	100%
1024-2048	0	0.0%	100%
2048-4096	0	0.0%	100%
Bedrock	0	0.0%	100%
Total	**104**	**100%**	**100%**
		Summary Data	
		D50	**38**
		D84	**91**
		D95	**130**



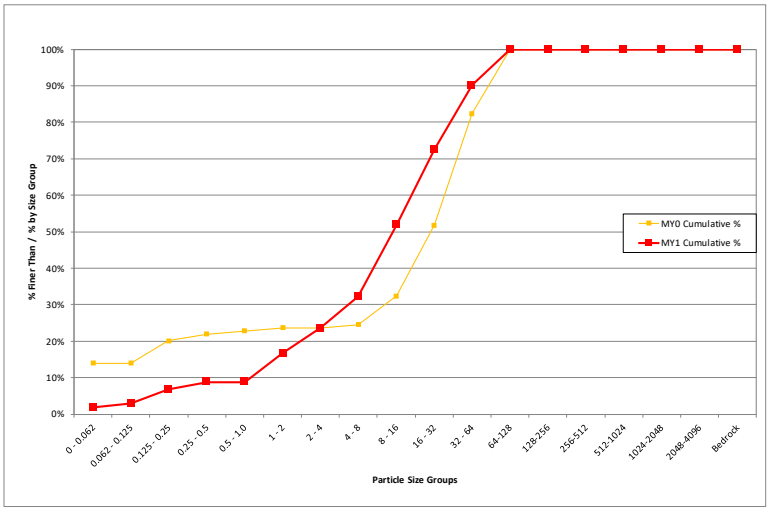
Seniard Creek			
Cross Section 7 - Riffle			
Monitoring Year - 2021; MY1			
Bed Surface Material Particle Size Class (mm)	Number	% Individual	% Cumulative
0 - 0.062	0	0.0%	0%
0.062 - 0.125	1	1.0%	1%
0.125 - 0.25	2	2.0%	3%
0.25 - 0.5	8	7.9%	11%
0.5 - 1.0	11	10.9%	22%
1 - 2	6	5.9%	28%
2 - 4	0	0.0%	28%
4 - 8	3	3.0%	31%
8 - 16	17	16.8%	48%
16 - 32	23	22.8%	70%
32 - 64	18	17.8%	88%
64-128	8	7.9%	96%
128-256	3	3.0%	99%
256-512	1	1.0%	100%
512-1024	0	0.0%	100%
1024-2048	0	0.0%	100%
2048-4096	0	0.0%	100%
Bedrock	0	0.0%	100%
Total	**101**	**100%**	**100%**
		Summary Data	
		D50	**17**
		D84	**55**
		D95	**110**



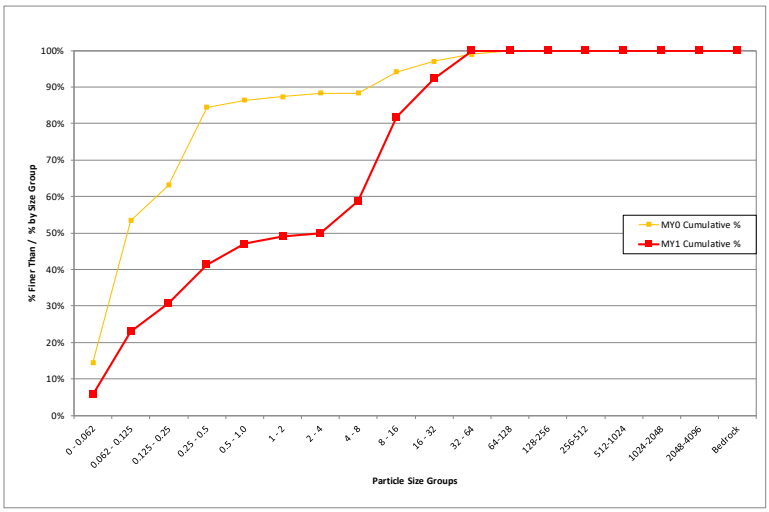
Seniard Creek			
Cross Section 9 - Riffle			
Monitoring Year - 2021; MY1			
Bed Surface Material Particle Size Class (mm)	Number	% Individual	% Cumulative
0 - 0.062	10	9.5%	10%
0.062 - 0.125	17	16.2%	26%
0.125 - 0.25	8	7.6%	33%
0.25 - 0.5	33	31.4%	65%
0.5 - 1.0	8	7.6%	72%
1 - 2	0	0.0%	72%
2 - 4	1	1.0%	73%
4 - 8	3	2.9%	76%
8 - 16	1	1.0%	77%
16 - 32	0	0.0%	77%
32 - 64	1	1.0%	78%
64-128	21	20.0%	98%
128-256	2	1.9%	100%
256-512	0	0.0%	100%
512-1024	0	0.0%	100%
1024-2048	0	0.0%	100%
2048-4096	0	0.0%	100%
Bedrock	0	0.0%	100%
Total	**105**	**100%**	**100%**
		Summary Data	
		D50	**0.36**
		D84	**94**
		D95	**120**



Seniard Creek			
Cross Section 11 - Riffle			
Monitoring Year - 2021; MY1			
Bed Surface Material Particle Size Class (mm)	Number	% Individual	% Cumulative
0 - 0.062	2	2.0%	2%
0.062 - 0.125	1	1.0%	3%
0.125 - 0.25	4	3.9%	7%
0.25 - 0.5	2	2.0%	9%
0.5 - 1.0	0	0.0%	9%
1 - 2	8	7.8%	17%
2 - 4	7	6.9%	24%
4 - 8	9	8.8%	32%
8 - 16	20	19.6%	52%
16 - 32	21	20.6%	73%
32 - 64	18	17.6%	90%
64-128	10	9.8%	100%
128-256	0	0.0%	100%
256-512	0	0.0%	100%
512-1024	0	0.0%	100%
1024-2048	0	0.0%	100%
2048-4096	0	0.0%	100%
Bedrock	0	0.0%	100%
Total	**102**	**100%**	**100%**
		Summary Data	
		D50	**15**
		D84	**48**
		D95	**85**



Seniard Creek			
Cross Section 13 - Riffle			
Monitoring Year - 2021; MY1			
Bed Surface Material Particle Size Class (mm)	Number	% Individual	% Cumulative
0 - 0.062	6	5.8%	6%
0.062 - 0.125	18	17.3%	23%
0.125 - 0.25	8	7.7%	31%
0.25 - 0.5	11	10.6%	41%
0.5 - 1.0	6	5.8%	47%
1 - 2	2	1.9%	49%
2 - 4	1	1.0%	50%
4 - 8	9	8.7%	59%
8 - 16	24	23.1%	82%
16 - 32	11	10.6%	92%
32 - 64	8	7.7%	100%
64-128	0	0.0%	100%
128-256	0	0.0%	100%
256-512	0	0.0%	100%
512-1024	0	0.0%	100%
1024-2048	0	0.0%	100%
2048-4096	0	0.0%	100%
Bedrock	0	0.0%	100%
Total	**104**	**100%**	**100%**
		Summary Data	
		D50	**4**
		D84	**18**
		D95	**39**



Seniard Creek			
Cross Section 15 - Riffle			
Monitoring Year - 2021; MY1			
Bed Surface Material Particle Size Class (mm)	Number	% Individual	% Cumulative
0 - 0.062	3	2.6%	3%
0.062 - 0.125	0	0.0%	3%
0.125 - 0.25	2	1.7%	4%
0.25 - 0.5	12	10.3%	15%
0.5 - 1.0	9	7.7%	22%
1 - 2	2	1.7%	24%
2 - 4	8	6.8%	31%
4 - 8	21	17.9%	49%
8 - 16	44	37.6%	86%
16 - 32	12	10.3%	97%
32 - 64	2	1.7%	98%
64-128	2	1.7%	100%
128-256	0	0.0%	100%
256-512	0	0.0%	100%
512-1024	0	0.0%	100%
1024-2048	0	0.0%	100%
2048-4096	0	0.0%	100%
Bedrock	0	0.0%	100%
Total	**117**	**100%**	**100%**
		Summary Data	
		D50	**8.1**
		D84	**15**
		D95	**27**

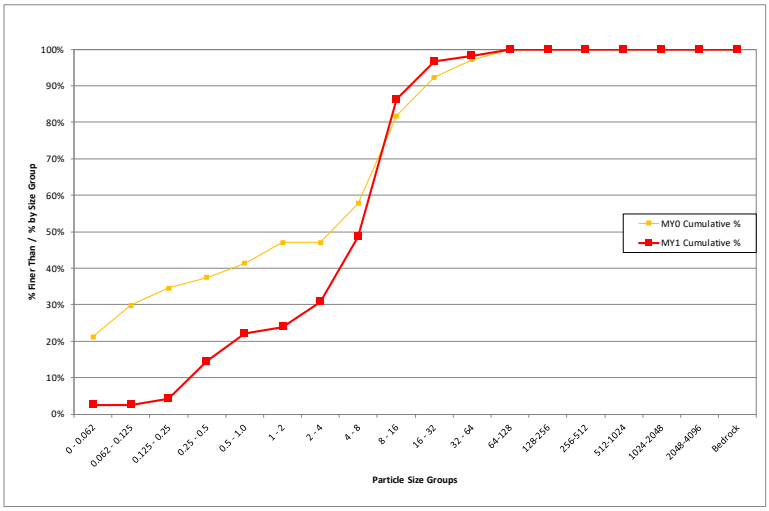


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Table 8. Baseline Monitoring Data - Dimensional Morphology Summary (Dimensional Parameters – Cross Sections)
Seniard Mitigation Site

	Cross Section 1 (Riffle) Seniard Creek Reach 1A								Cross Section 2 (Pool) Seniard Creek Reach 1B								Cross Section 3 (Riffle) Seniard Creek Reach 1B								Cross Section 4 (Pool) Seniard Creek Reach 1B							
Dimension	***Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**	***Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**	***Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**	***Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**
Record Elevation (datum) Used	2257.9	2258.0							2241.5	2241.7							2234.0	2233.9							2227.0	2227.1						
Low Bank Height Elevation (datum) Used	2257.9	2257.8							2241.5	2241.5							2234.0	2234.0							2227.0	2227.0						
Bankfull Width (ft)	14.2	12.9							17.0	17.0							16.8	17.0							18.6	18.6						
Floodprone Width (ft)	50.0	50.0							50.0	50.0							50.0	50.0							50.0	50.0						
Bankfull Mean Depth (ft)	1.0	1.1							1.6	1.6							1.0	0.9							1.5	1.5						
Bankfull Max Depth (ft)	1.5	1.8							3.1	3.1							1.5	1.6							3.3	2.7						
Bankfull Cross Sectional Area (ft^2)	14.6	14.6							27.6	27.6							16.0	16.0							28.2	28.2						
Bankfull Width/Depth Ratio	13.8	11.5							10.5	10.5							17.6	18.0							12.3	12.3						
Bankfull Entrenchment Ratio	3.5	3.9							2.9	2.9							3.0	2.9							2.7	2.7						
Bankfull Bank Height Ratio	1.0	0.9							1.0	0.9							1.0	1.0							1.0	1.0						
Low Top of Bank Depth (ft)	1.5	1.6							3.1	2.9							1.5	1.7							3.3	2.6						

	Cross Section 5 (Riffle) Seniard Reach 2								Cross Section 6 (Pool) Seniard Reach 2								Cross Section 7 (Riffle) Sitton Reach 1								Cross Section 8 (Pool) Sitton Reach 1							
Dimension	***Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**	***Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**	***Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**	***Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**
Record Elevation (datum) Used	2221.8	2221.9							2221.5	2221.7							2240.9	2240.7							2235.6	2235.8						
Low Bank Height Elevation (datum) Used	2221.8	2221.8							2221.5	2221.4							2240.9	2240.8							2235.6	2235.7						
Bankfull Width (ft)	23.5	24.2							22.8	21.3							15.1	13.2							13.0	13.7						
Floodprone Width (ft)	100.0	100.0							100.0	100.0							50.0	50.0							50.0	50.0						
Bankfull Mean Depth (ft)	1.4	1.4							2.1	2.2							0.9	1.0							1.7	1.6						
Bankfull Max Depth (ft)	2.1	2.2							3.8	3.2							1.3	1.4							2.6	2.1						
Bankfull Cross Sectional Area (ft^2)	34.0	34.0							47.4	47.4							13.1	13.0							22.3	22.3						
Bankfull Width/Depth Ratio	16.2	17.2							10.9	9.6							17.3	13.3							7.6	8.4						
Bankfull Entrenchment Ratio	4.3	4.1							4.4	4.7							3.3	3.8							3.8	3.7						
Bankfull Bank Height Ratio	1.0	1.0							1.0	0.9							1.0	1.1							1.0	0.9						
Low Top of Bank Depth (ft)	2.1	2.1							3.8	2.9							1.3	1.6							2.6	2.0						

	Cross Section 9 (Riffle) Lee Branch Reach 1								Cross Section 10 (Pool) Lee Branch Reach 1								Cross Section 11 (Riffle) David Branch Reach 1B								Cross Section 12 (Pool) David Branch Reach 1B							
Dimension	***Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**	***Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**	***Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**	***Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**
Record Elevation (datum) Used	2247.0	2247.2							2240.9	2240.9							2260.0	2260.0							2251.7	2251.7						
Low Bank Height Elevation (datum) Used	2247.0	2246.9							2240.9	2240.9							2260.0	2260.0							2251.7	2251.7						
Bankfull Width (ft)	8.1	6.7							9.3	9.5							4.7	3.0							4.8	4.1						
Floodprone Width (ft)	25.0	25.0							25.0	25.0							10.0	10.0							10.0	10.0						
Bankfull Mean Depth (ft)	0.4	0.5							0.4	0.4							0.2	0.3							0.4	0.5						
Bankfull Max Depth (ft)	0.6	0.5							0.7	0.6							0.4	0.5							0.6	0.7						
Bankfull Cross Sectional Area (ft^2)	3.1	3.1							3.9	3.9							1.0	1.0							1.9	1.9						
Bankfull Width/Depth Ratio	21.3	14.4							21.8	23.5							22.2	9.1							12.3	9.0						
Bankfull Entrenchment Ratio	3.1	3.7							2.7	2.6							2.1	3.3							2.1	2.4						
Bankfull Bank Height Ratio	1.0	0.7							1.0	0.9							1.0	1.0							1.0	1.0						
Low Top of Bank Depth (ft)	0.6	0.5							0.7	0.6							0.4	0.5							0.6	0.7						

	Cross Section 13 (Riffle) Whitaker Branch Reach 1								Cross Section 14 (Pool) Whitaker Branch Reach 1								Cross Section 15 (Riffle) Redmond Branch Reach 1								Cross Section 16 (Pool) Redmond Branch Reach 1							
Dimension	***Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**	***Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**	***Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**	***Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**
Record Elevation (datum) Used	2256.1	2256.1							2248.0	2247.9							2272.3	2272.3							2239.8	2239.7						
Low Bank Height Elevation (datum) Used	2256.1	2256.1							2248.0	2247.7							2272.3	2272.2							2239.8	2239.8						
Bankfull Width (ft)	1.8	1.8							3.5	3.3							7.2	7.7							4.2	4.5						
Floodprone Width (ft)	10.0	10.0							10.0	10.0							10.0	10.0							10.0	10.0						
Bankfull Mean Depth (ft)	0.3	0.3							0.7	0.7							0.4	0.4							0.8	0.7						
Bankfull Max Depth (ft)	0.4	0.4							0.9	0.9							0.5	0.4							1.1	1.0						
Bankfull Cross Sectional Area (ft^2)	0.5	0.5							2.3	2.3							2.8	2.8							3.2	3.2						
Bankfull Width/Depth Ratio	6.1	6.7							5.2	4.5							18.7	21.4							5.5	6.5						
Bankfull Entrenchment Ratio	5.6	5.5							2.9	3.1							1.4	1.3							2.4	2.2						
Bankfull Bank Height Ratio	1.0	0.9							1.0	0.8							1.0	0.8							1.0	1.1						
Low Top of Bank Depth (ft)	0.4	0.4							0.9	0.8							0.5	0.4							1.1	1.1						

*A hidden cell formula error was discovered during data processing of MY1 Data. This error resulted in incorrect stationing being assigned to the MY0 Cross-sections and dimensioning calculations. The above data is reflective of the corrected stationing.

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Table 9. Baseline Stream Data Summary Seniard Creek - Seniard Creek Reach 1A							
Parameter	**Pre-Existing Condition (if applicable)**					**Design**	***Monitoring Baseline (MY0)**
Riffle Only	Min	Mean	Med	Max	n		
*Bankfull Width (ft)	10.7	-	-	13	-	17.4	14.2
*Floodprone Width (ft)	-	-	-	-	-	-	50.0
*Bankfull Mean Depth (ft)	0.8	-	-	1.2	-	1.1	1.0
*Bankfull Max Depth (ft)	-	-	-	-	-	1.4	1.5
*Bankfull Cross Sectional Area (ft^2)	8.3	-	-	15.3	-	18.3	14.6
*Width/Depth Ratio	11.1	-	-	13.8	-	16.5	13.8
*Entrenchment Ratio	1.1	-	-	1.3	-	1.4	3.5
*Bank Height Ratio	-	-	-	-	-	-	1.0
Max part size (mm) mobilized at bankfull	-					-	-
Rosgen Classification	G/F					B	B
Bankfull Discharge (cfs)	68					-	-
Sinuosity (ft)	1.03					0.01	1.03
Water Surface Slope (Channel) (ft/ft)	0.04					0.025	0.040
Other	-					-	-

" - " denotes information is either not available or not applicable

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Table 9 cont. Baseline Stream Data Summary Seniard Creek - Seniard Creek Reach 1B							
Parameter	**Pre-Existing Condition (if applicable)**					**Design**	***Monitoring Baseline (MY0)**
Riffle Only	Min	Mean	Med	Max	n		
*Bankfull Width (ft)	8.0	-	-	11.4	-	17.6	16.8
*Floodprone Width (ft)	-	-	-	-	-	-	50.0
*Bankfull Mean Depth (ft)	1.0	-	-	1.3	-	1.1	1.0
*Bankfull Max Depth (ft)	-	-	-	-	-	1.4	1.5
*Bankfull Cross Sectional Area (ft^2)	8.7	-	-	13.7	-	18.7	16.0
*Width/Depth Ratio	6.0	-	-	9.8	-	16.6	17.6
*Entrenchment Ratio	1.0	-	-	1.8	-	1.4	3.0
*Bank Height Ratio	-	-	-	-	-	-	1.0
Max part size (mm) mobilized at bankfull	-					-	-
Rosgen Classification	G					B	B
Bankfull Discharge (cfs)	70					-	-
Sinuosity (ft)	1.08					1.00	1.07
Water Surface Slope (Channel) (ft/ft)	0.022					0.02	0.021
Other	-					-	-

" - " denotes information is either not available or not applicable

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Table 9 cont. Baseline Stream Data Summary Seinard Creek - Seniard Creek Reach 2							
Parameter	**Pre-Existing Condition (if applicable)**					**Design**	***Monitoring Baseline (MY0)**
Riffle Only	Min	Mean	Med	Max	n		
*Bankfull Width (ft)	10.0	-	-	10.2	-	22.5	24.2
*Floodprone Width (ft)	-	-	-	-	-	-	100.0
*Bankfull Mean Depth (ft)	1.0	-	-	1.3	-	1.3	1.4
*Bankfull Max Depth (ft)	-	-	-	-	-	1.6	2.2
*Bankfull Cross Sectional Area (ft^2)	10.6	-	-	13.1	-	28.2	34.0
*Width/Depth Ratio	7.6	-	-	9.8	-	17.9	17.2
*Entrenchment Ratio	1.4	-	-	1.6	-	1.1	4.1
*Bank Height Ratio	-	-	-	-	-	-	1.0
Max part size (mm) mobilized at bankfull	-					-	-
Rosgen Classification	G					B	B
Bankfull Discharge (cfs)	113					-	-
Sinuosity (ft)	1.13					1.03	1.03
Water Surface Slope (Channel) (ft/ft)	0.017					0.013	0.014
Other	-					-	-

" - " denotes information is either not available or not applicable

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Table 9 cont. Baseline Stream Data Summary Seinard Creek - Sitton Creek Reach							
Parameter	**Pre-Existing Condition (if applicable)**					**Design**	***Monitoring Baseline (MY0)**
Riffle Only	Min	Mean	Med	Max	n		
*Bankfull Width (ft)	6.4	-	-	11.4	2	15.6	15.1
*Floodprone Width (ft)	11	-	-	21	2	-	50.0
*Bankfull Mean Depth (ft)	0.8	-	-	1.1	2	1.0	0.9
*Bankfull Max Depth (ft)	0.7	-	-	1.2	2	1.3	1.3
*Bankfull Cross Sectional Area (ft^2)	7.2	-	-	8.9	2	15.3	13.1
*Width/Depth Ratio	5.7	-	-	14.6	2	16.0	17.3
*Entrenchment Ratio	1.7	-	-	1.8	2	2.0	3.3
*Bank Height Ratio	3.6	-	-	5.9	2	-	1.0
Max part size (mm) mobilized at bankfull	-					-	-
Rosgen Classification	G					B	B
Bankfull Discharge (cfs)	55					-	-
Sinuosity (ft)	1.09					1.06	1.07
Water Surface Slope (Channel) (ft/ft)	0.018					0.015	0.016
Other	-					-	-

" - " denotes information is either not available or not applicable

*A hidden cell formula error was discovered during data processing of MY1 Data. This error resulted in incorrect stationing being assigned to the MY0 Cross-sections and dimensioning calculations. The above data is reflective of the corrected stationing.

Table 9 cont. Baseline Stream Data Summary Seinard Creek - Lee Branch Reach							
Parameter	**Pre-Existing Condition (if applicable)**					**Design**	***Monitoring Baseline (MY0)**
Riffle Only	Min	Mean	Med	Max	n		
*Bankfull Width (ft)	1.8	-	-	1.8	-	7.8	8.1
*Floodprone Width (ft)	-	-	-	-	-	-	25.0
*Bankfull Mean Depth (ft)	0.8	-	-	0.8	-	0.3	0.4
*Bankfull Max Depth (ft)	-	-	-	-	-	0.5	0.6
*Bankfull Cross Sectional Area (ft^2)	1.3	-	-	1.3	-	2.4	3.1
*Width/Depth Ratio	2.5	-	-	2.5	-	25.8	21.3
*Entrenchment Ratio	1.8	-	-	1.8	-	1.5	3.1
*Bank Height Ratio	-	-	-	-	-	-	1.0
Max part size (mm) mobilized at bankfull	-					-	-
Rosgen Classification	G					B	B
Bankfull Discharge (cfs)	3					-	-
Sinuosity (ft)	1.04					1.06	1.07
Water Surface Slope (Channel) (ft/ft)	0.048					0.029	0.056
Other	-					-	-

" - " denotes information is either not available or not applicable

*A hidden cell formula error was discovered during data processing of MY1 Data. This error resulted in incorrect stationing being assigned to the MY0 Cross-sections and dimensioning calculations. The above data is reflective of the corrected stationing.

Table 9 cont. Baseline Stream Data Summary Seinard Creek - David Branch Reach 1A							
Parameter	**Pre-Existing Condition (if applicable)**					**Design**	**Monitoring Baseline (MY0)**
Riffle Only	Min	Mean	Med	Max	n		
Bankfull Width (ft)	-	-	-	-	-	7.8	-
Floodprone Width (ft)	-	-	-	-	-	-	-
Bankfull Mean Depth (ft)	-	-	-	-	-	0.3	-
Bankfull Max Depth (ft)	-	-	-	-	-	0.5	-
Bankfull Cross Sectional Area (ft^2)	-	-	-	-	-	2.4	-
Width/Depth Ratio	-	-	-	-	-	25.8	-
Entrenchment Ratio	-	-	-	-	-	1.9	-
Bank Height Ratio	-	-	-	-	-	-	-
Max part size (mm) mobilized at bankfull	-					-	-
Rosgen Classification	-					B	-
Bankfull Discharge (cfs)	-					-	-
Sinuosity (ft)	-					1.08	1.08
Water Surface Slope (Channel) (ft/ft)	-					0.135	-
Other	-					-	-

" - " denotes information is either not available or not applicable

Table 9 cont. Baseline Stream Data Summary Seinard Creek - David Branch Reach 1B							
Parameter	**Pre-Existing Condition (if applicable)**					**Design**	***Monitoring Baseline (MY0)**
Riffle Only	Min	Mean	Med	Max	n		
*Bankfull Width (ft)	6	-	-	8.4	-	7.8	4.7
*Floodprone Width (ft)	-	-	-	-	-	-	10.0
*Bankfull Mean Depth (ft)	0.5	-	-	0.6	-	0.3	0.2
*Bankfull Max Depth (ft)	-	-	-	-	-	0.5	0.4
*Bankfull Cross Sectional Area (ft^2)	2.9	-	-	4.7	-	2.4	1.0
*Width/Depth Ratio	12.6	-	-	15.2	-	25.8	22.2
*Entrenchment Ratio	1.8	-	-	2.0	-	1.9	2.1
*Bank Height Ratio	-	-	-	-	-	-	1.0
Max part size (mm) mobilized at bankfull						-	-
Rosgen Classification			G			B	B
Bankfull Discharge (cfs)			1			-	-
Sinuosity (ft)			1.04			1.03	1.02
Water Surface Slope (Channel) (ft/ft)			0.05			0.07	0.08
Other			-			-	-

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Table 9 cont. Baseline Stream Data Summary Seinard Creek - David Branch Reach 1C							
Parameter	**Pre-Existing Condition (if applicable)**					**Design**	**Monitoring Baseline (MY0)**
Riffle Only	Min	Mean	Med	Max	n		
Bankfull Width (ft)	7.8	-	-	7.8	-	7.8	-
Floodprone Width (ft)	-	-	-	-	-	-	-
Bankfull Mean Depth (ft)	0.3	-	-	0.3	-	0.3	-
Bankfull Max Depth (ft)	-	-	-	-	-	0.5	-
Bankfull Cross Sectional Area (ft^2)	2.6	-	-	2.6	-	2.4	-
Width/Depth Ratio	23.3	-	-	23.3	-	25.8	-
Entrenchment Ratio	1.3	-	-	1.3	-	1.9	-
Bank Height Ratio	-	-	-	-	-	-	-
Max part size (mm) mobilized at bankfull						-	-
Rosgen Classification			G			B	B
Bankfull Discharge (cfs)			4			-	-
Sinuosity (ft)			1.03			1.1	1.05
Water Surface Slope (Channel) (ft/ft)			0.058			0.051	0.052
Other			-			-	-

" - " denotes information is either not available or not applicable

Table 9 cont. Baseline Stream Data Summary Seinard Creek - Whitaker Branch Reach 1A							
Parameter	**Pre-Existing Condition (if applicable)**					**Design**	***Monitoring Baseline (MY0)**
Riffle Only	Min	Mean	Med	Max	n		
*Bankfull Width (ft)	-	-	-	-	-	7.8	1.8
*Floodprone Width (ft)	-	-	-	-	-	-	10.0
*Bankfull Mean Depth (ft)	-	-	-	-	-	0.3	0.3
*Bankfull Max Depth (ft)	-	-	-	-	-	0.5	0.4
*Bankfull Cross Sectional Area (ft^2)	-	-	-	-	-	2.4	0.5
*Width/Depth Ratio	-	-	-	-	-	25.8	6.1
*Entrenchment Ratio	-	-	-	-	-	1.5	5.6
*Bank Height Ratio	-	-	-	-	-	-	1.0
Max part size (mm) mobilized at bankfull						-	-
Rosgen Classification			-			B	B
Bankfull Discharge (cfs)			-			-	-
Sinuosity (ft)			-			1.0	1.05
Water Surface Slope (Channel) (ft/ft)			-			0.082	
Other			-			-	-

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Table 9 cont. Baseline Stream Data Summary Seinard Creek - Redmond Branch Reach 1A							
Parameter	**Pre-Existing Condition (if applicable)**					**Design**	***Monitoring Baseline (MY0)**
Riffle Only	Min	Mean	Med	Max	n		
*Bankfull Width (ft)	-	-	-	-	-	7.8	7.2
*Floodprone Width (ft)	-	-	-	-	-	-	10.0
*Bankfull Mean Depth (ft)	-	-	-	-	-	0.3	0.4
*Bankfull Max Depth (ft)	-	-	-	-	-	0.5	0.5
*Bankfull Cross Sectional Area (ft^2)	-	-	-	-	-	2.4	2.8
*Width/Depth Ratio	-	-	-	-	-	25.8	18.7
*Entrenchment Ratio	-	-	-	-	-	2.6	1.4
*Bank Height Ratio	-	-	-	-	-	-	1.0
Max part size (mm) mobilized at bankfull	-					-	-
Rosgen Classification	-					B	B
Bankfull Discharge (cfs)	-					-	-
Sinuosity (ft)	-					1.2	1.2
Water Surface Slope (Channel) (ft/ft)	-					0.05	
Other	-					-	-

" - " denotes information is either not available or not applicable

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Table 9 cont. Baseline Stream Data Summary Seinard Creek - Redmond Branch Reach 1B							
Parameter	**Pre-Existing Condition (if applicable)**					**Design**	**Monitoring Baseline (MY0)**
Riffle Only	Min	Mean	Med	Max	n		
Bankfull Width (ft)	-	-	-	-	-	6.8	-
Floodprone Width (ft)	-	-	-	-	-	-	-
Bankfull Mean Depth (ft)	-	-	-	-	-	0.5	-
Bankfull Max Depth (ft)	-	-	-	-	-	0.8	-
Bankfull Cross Sectional Area (ft^2)	-	-	-	-	-	3.6	-
Width/Depth Ratio	-	-	-	-	-	12.8	-
Entrenchment Ratio	-	-	-	-	-	2.9	-
Bank Height Ratio	-	-	-	-	-	-	-
Max part size (mm) mobilized at bankfull	-					-	-
Rosgen Classification	-					B	-
Bankfull Discharge (cfs)	-					-	-
Sinuosity (ft)	-					1.06	1.08
Water Surface Slope (Channel) (ft/ft)	-					0.05	0.040
Other	-					-	-

" - " denotes information is either not available or not applicable

Appendix D
Hydrologic Data

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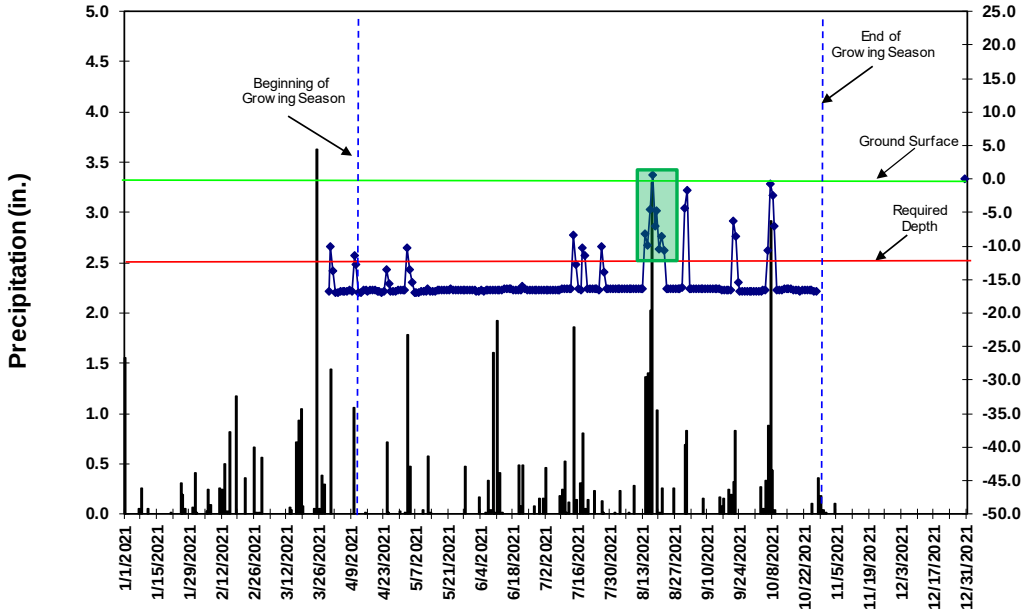
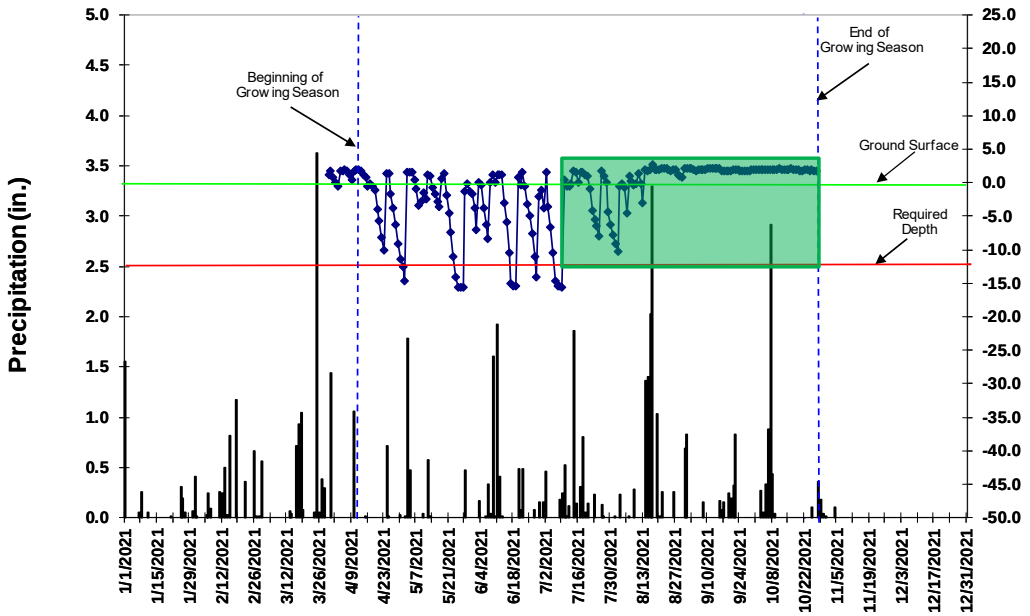
Gauge ID: **GG1** Reported Growing Season Days: 201 Dates:
Total Number of Consecutive Days Water Table within 12 inches of Soil Surface: **9** **08/14-08/22**
Percentage of Growing Season Water Table within 12 inches of Soil Surface: **4%**



Gauge ID: **GG2** Reported Growing Season Days: 201 Dates:
Total Number of Consecutive Days Water Table within 12 inches of Soil Surface: **110** **07/10-10/26**
Percentage of Growing Season Water Table within 12 inches of Soil Surface: **55%**



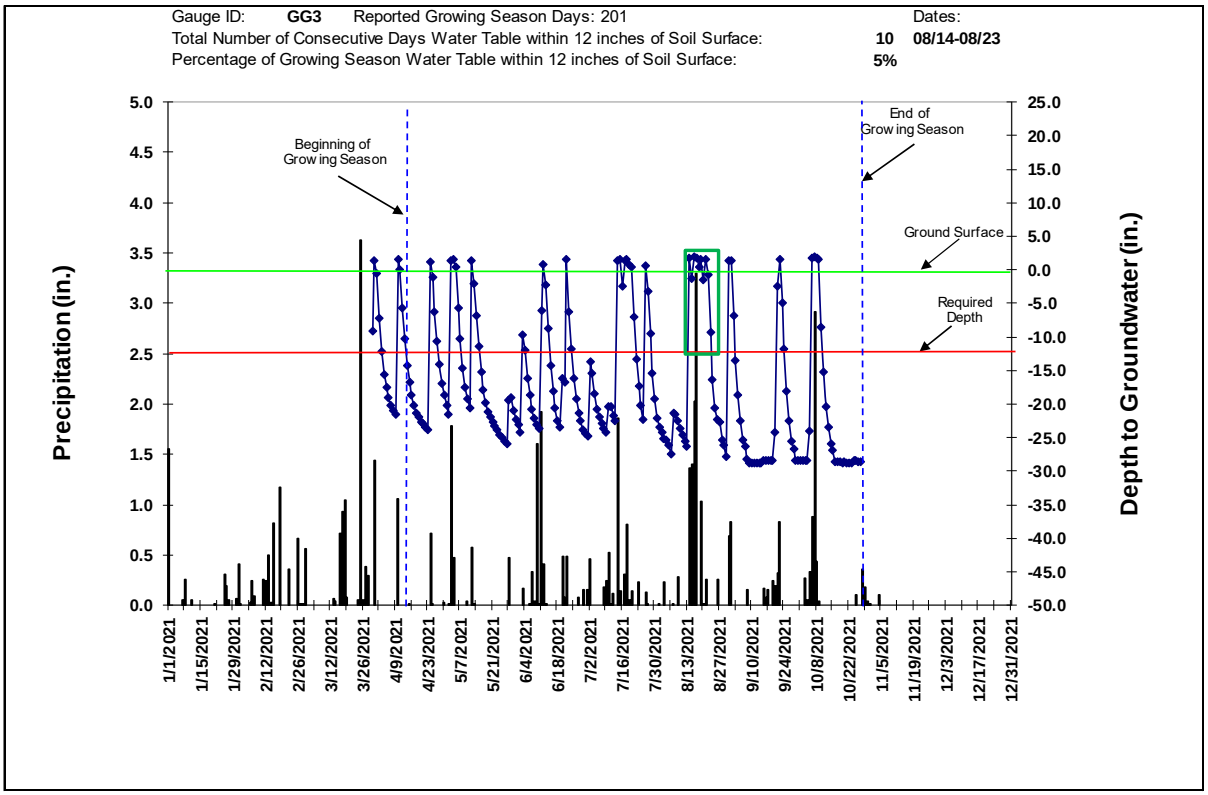
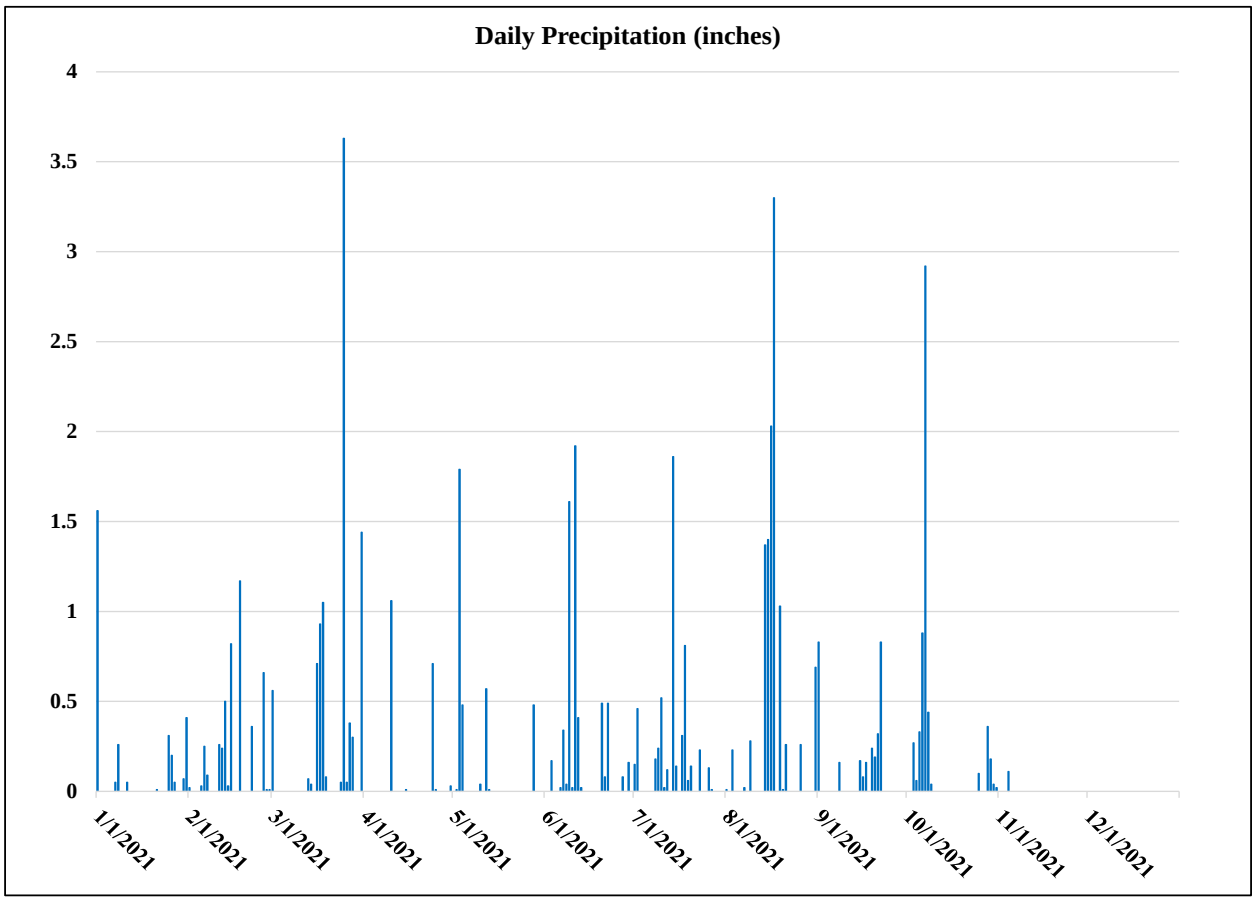


Table 10. Groundwater Gage Summary Table.

Monitoring Gauge	Typical Performance Standard: 12 % WETS Station: Asheville 13S Growing Season: 4/9 to 10/26 (201 days) Max. Consecutive Hydroperiod (%) and number of consecutive days (n)													
	MY-1 (2021)		MY-2 (2022)		MY-3 (2023)		MY-4 (2024)		MY-5 (2025)		MY-6 (2026)		MY-7 (2027)	
	%	n	%	n	%	n	%	n	%	n	%	n	%	n
GG-1	4	9	-	-	-	-	-	-	-	-	-	-	-	-
GG-2	55	110	-	-	-	-	-	-	-	-	-	-	-	-
GG-3	5	10	-	-	-	-	-	-	-	-	-	-	-	-

* Typcial performace standard for groundwater gauges is 12 percent (24 days), however wetland credits are not a part of this project.

Exceeds requirements by 10%	Fails to meet requirements, by less than 10%
Exceeds requirements, but by less than 10%	Fails to meet requirements by more than 10%


Daily Precipitation (inches)
4
3.5
3
2.5
2
1.5
1
0.5
0
1/1/2021
2/1/2021
3/1/2021
4/1/2021
5/1/2021
6/1/2021
7/1/2021
8/1/2021
9/1/2021
10/1/2021
11/1/2021
12/1/2021

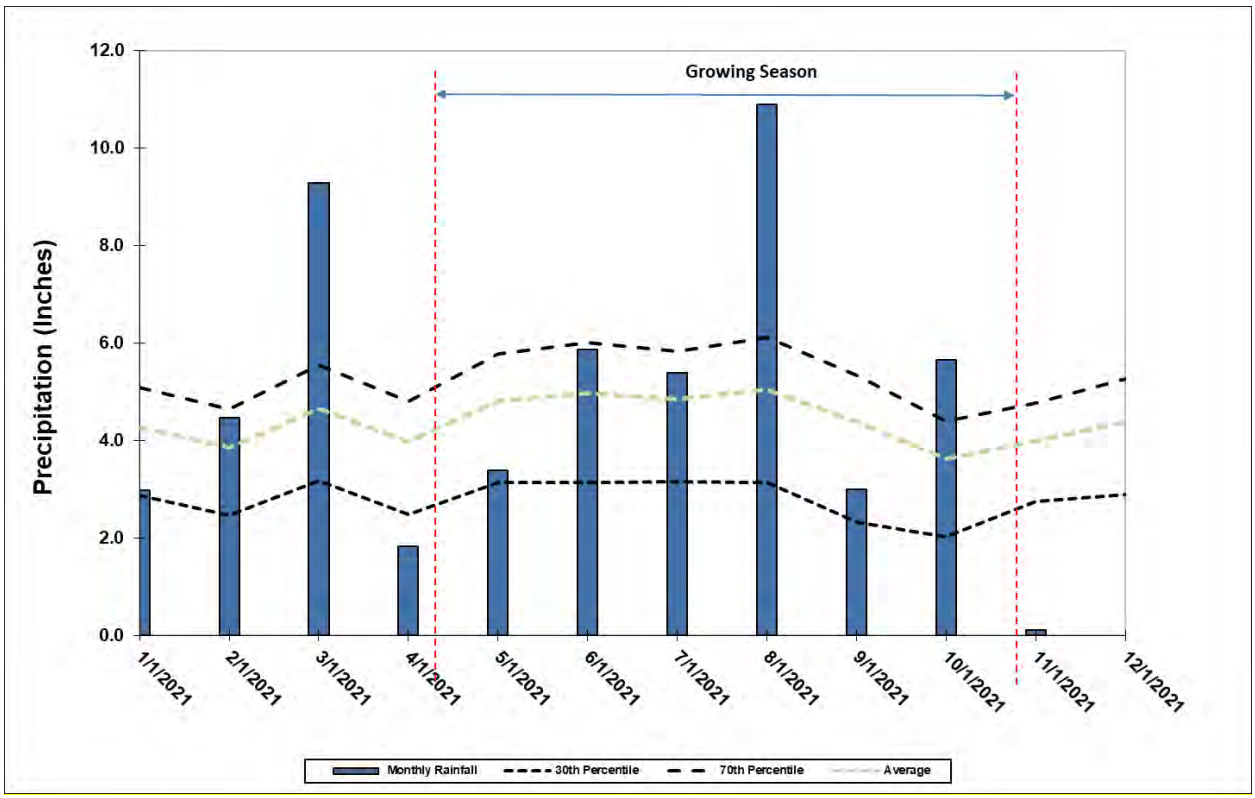
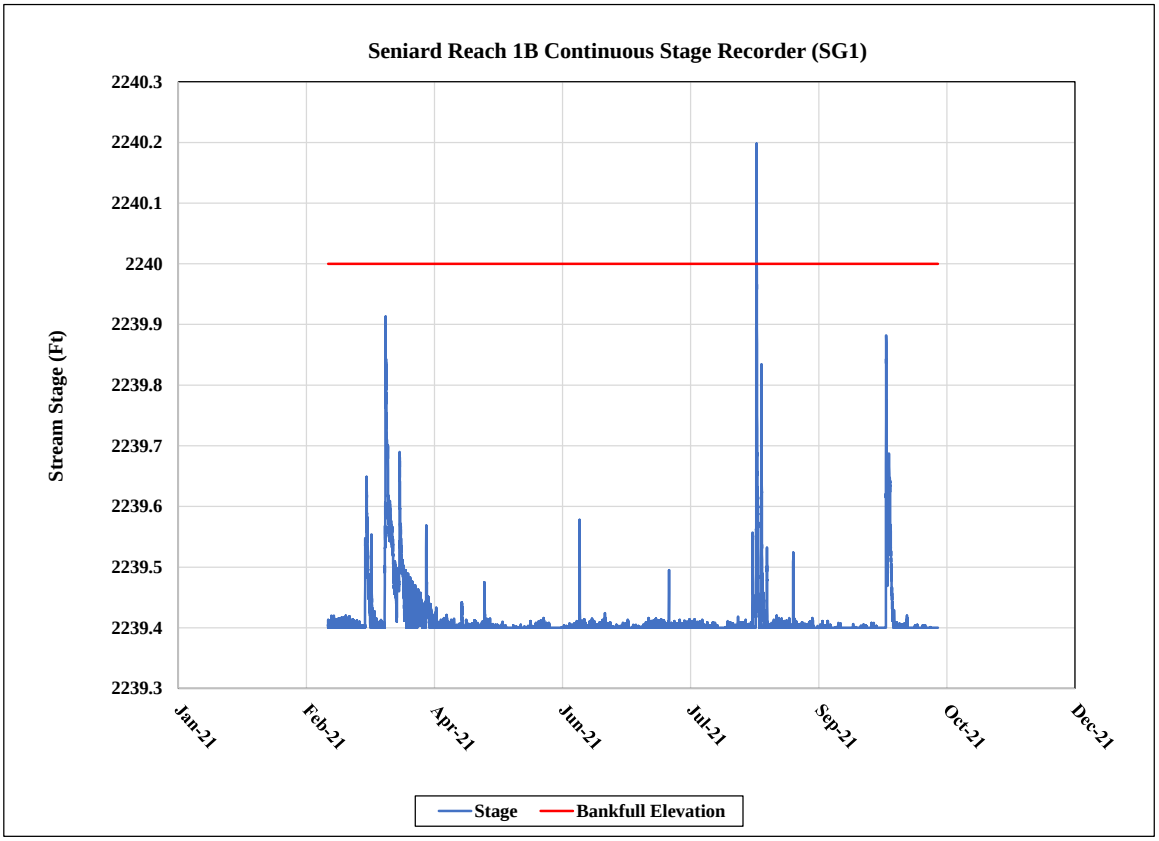
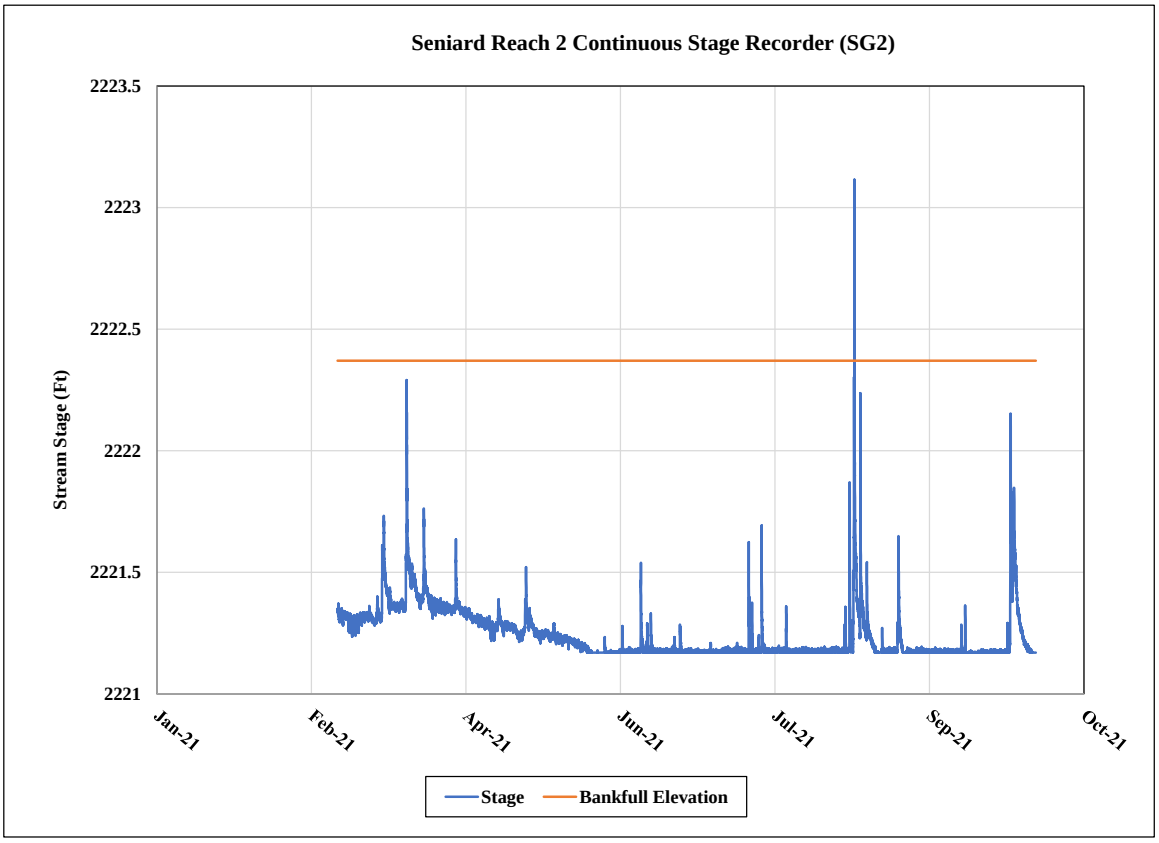
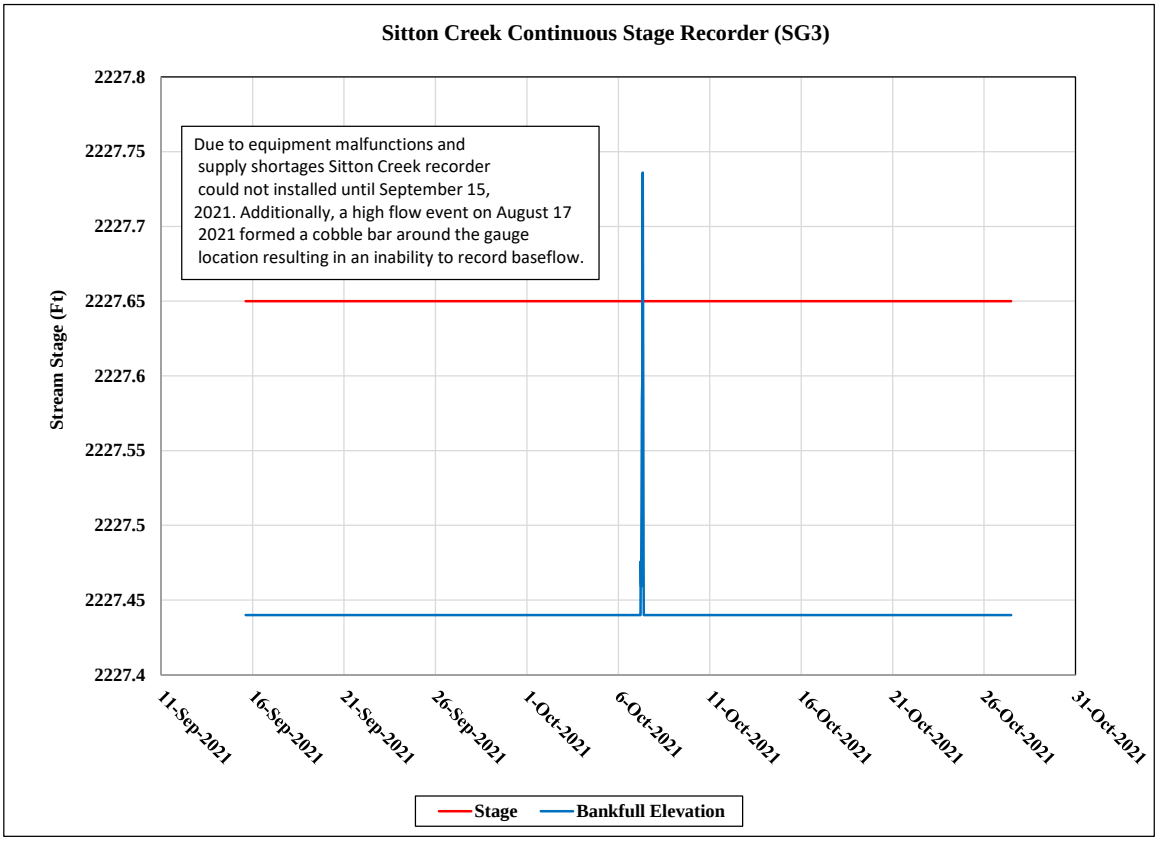
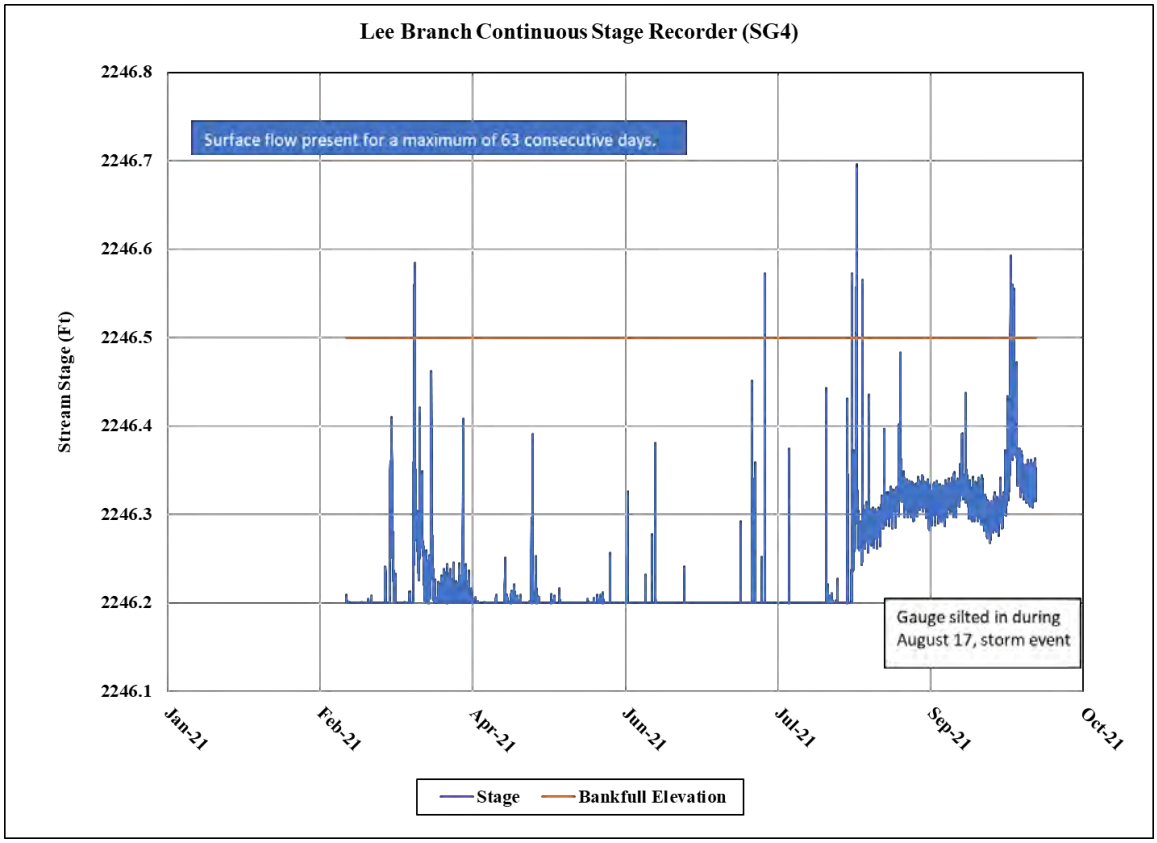

Growing Season
Precipitation (Inches)
12.0
10.0
8.0
6.0
4.0
2.0
0.0
1/1/2021
2/1/2021
3/1/2021
4/1/2021
5/1/2021
6/1/2021
7/1/2021
8/1/2021
9/1/2021
10/1/2021
11/1/2021
12/1/2021
Monthly Rainfall
30th Percentile
70th Percentile
Average

Table 11. Verification of Bankfull Events Seniard Creek Mitigation Project				
Date of Data Collection	**Date of Occurrence**	**Measurement location or Gage ID**	**Feet Above Bankfull Elevation**	**Photo # (if available)**
Seniard Reach 1B				
10/27/2022	8/17/2021	Stage Recorder (SG1)	0.19	n/a
Seniard Reach 2				
10/27/2022	8/17/2021	Stage Recorder (SG2)	0.75	n/a
Sitton Reach				
10/27/2022	8/17/2021	Wrack Lines	Unknown	1 & 2
10/27/2023	10/7/2021	Stage Recorder (SG3)	0.09	n/a
Lee Branch Reach				
10/27/2021	3/25/2021	Stage Recorder (SG4)	0.09	n/a
10/27/2021	7/18/2021	Stage Recorder (SG4)	0.07	n/a
10/27/2022	8/17/2021	Stage Recorder (SG4)	0.20	n/a
10/27/2023	10/7/2021	Stage Recorder (SG4)	0.09	n/a
David Branch Reach 1B				
10/27/2021	3/25/2021	Stage Recorder (SG5)	0.05	n/a
10/27/2022	8/17/2021	Stage Recorder (SG5)	0.16	n/a
10/27/2023	10/7/2021	Stage Recorder (SG5)	0.06	n/a
David Branch Reach 1C				
10/27/2021	3/25/2021	Stage Recorder (SG6)	0.09	n/a
10/27/2021	7/18/2021	Stage Recorder (SG6)	0.05	n/a
10/27/2022	8/17/2021	Stage Recorder (SG6)	0.31	n/a
10/27/2023	10/7/2021	Stage Recorder (SG6)	0.04	n/a
Whitaker Branch Reach				
Redmond Branch Reach				

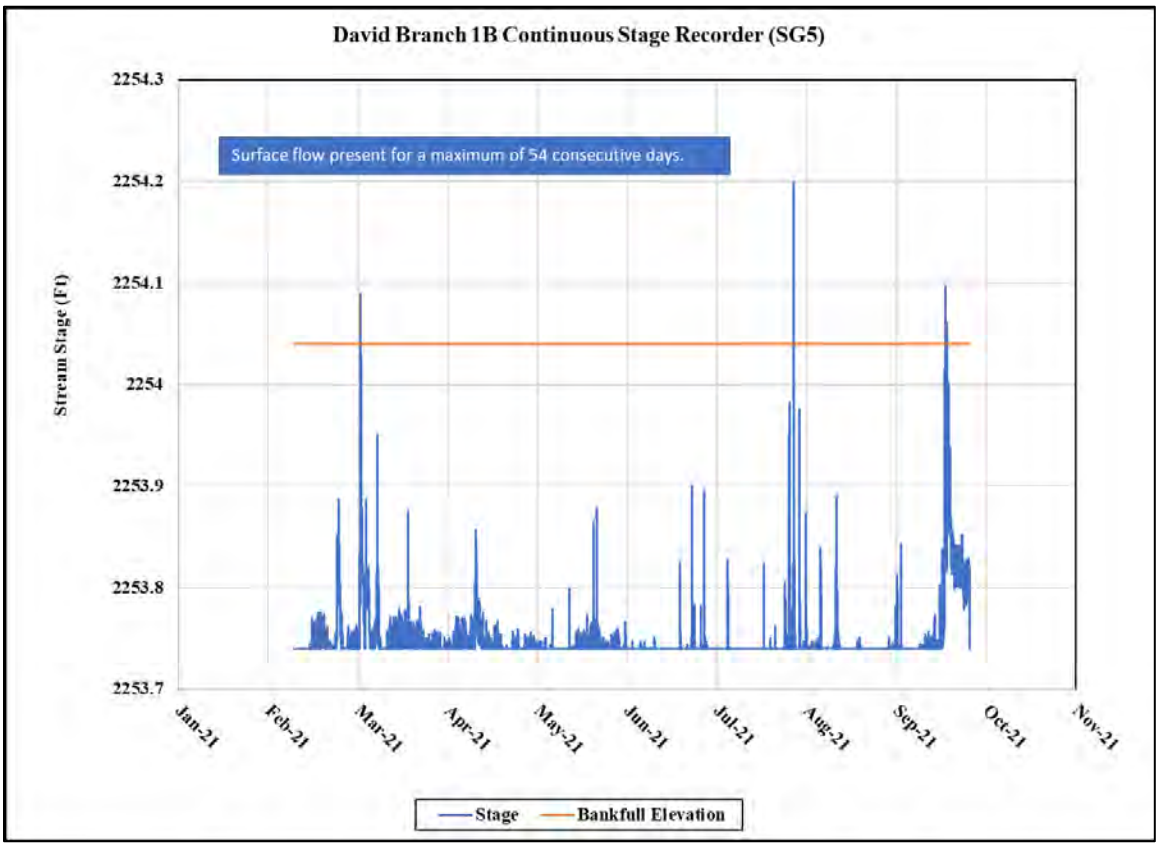

Seniard Reach 1B Continuous Stage Recorder (SG1)
Stream Stage (Ft)
2240.3
2240.2
2240.1
2240
2239.9
2239.8
2239.7
2239.6
2239.5
2239.4
2239.3
Jan-21
Feb-21
Apr-21
Jun-21
Jul-21
Sep-21
Oct-21
Dec-21
Stage
Bankfull Elevation


Seniard Reach 2 Continuous Stage Recorder (SG2)
Stream Stage (Ft)
2223.5
2223
2222.5
2222
2221.5
2221
Jan-21
Feb-21
Apr-21
Jun-21
Jul-21
Sep-21
Oct-21
Stage
Bankfull Elevation

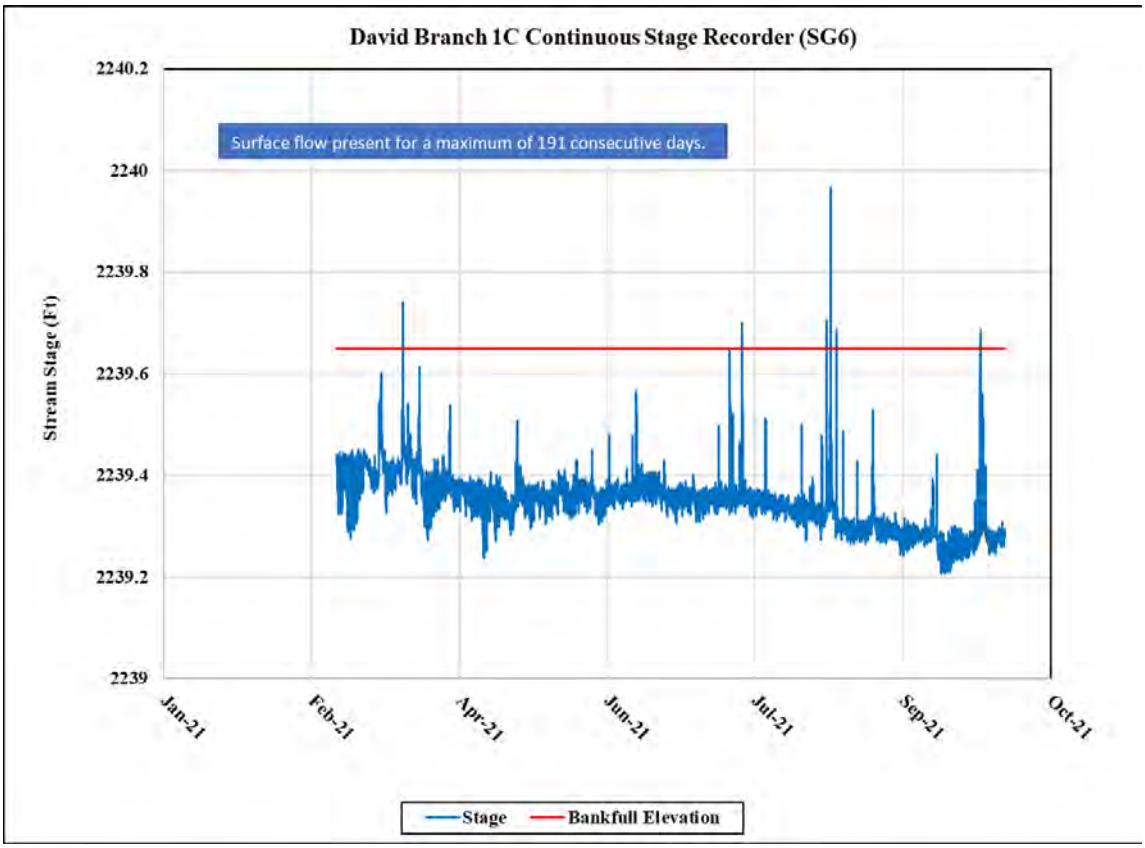




Minimum detectability = 0.81 inch



Minimum detectability = 0.81 inch



Minimum detectability = 0.81 inch

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Appendix E
Project Timeline and Contact Info

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Table 12. Project Activity and Timeline Seniard Creek Mitigation Site		
Activity or Report	**Data Collection Complete**	**Completion or Delivery**
Mitigation Plan	Dec - 2019	May - 2020
Mitigation Plan Addendum	-	-
Final Design - Construction Plans	-	Dec - 2020
Construction	-	Dec 5, 2020
Temporary S&E Mix Applied	-	Dec 5, 2020
Permanent Seed Mix Applied	-	Dec 5, 2020
Bare Root and Live Stake Plantings	-	Feb 25, 2021
Baseline Monitoring Document (Year 0 Monitoring - Baseline)		July - 2021
Stream Assessment	April 2, 2021	-
Vegetation Assessment	March 30, 2021	-
Invasive Vegetation Treatment	-	Jan - 2021
Year 1 Monitoring	-	Dec - 2021
Stream Assessment	October - 2021	-
Vegetation Assessment	November - 2021	-
Invasive Vegetation Treatment	-	June - 2021

Table 12 cont. Project Contacts Seniard Mitigation Site	
Prime Contractor David Tuch (828) 253-6856	EW Solutions 37 Haywood Street, Suite 100 Asheville, NC 28801
Designer Grant Ginn (828) 449-1930	Stantec Consulting, Inc 56 College Street, Sute 201 Asheville NC, 28801
Construction Contractor Charles Baker (828) 668-5060	Baker Construction 1000 Bat Cave Rd, Old Fort NC 28762
Seeding Contractor Charles Baker (828) 668-5060	Baker Construction 1000 Bat Cave Rd, Old Fort NC 28762
Planting Contractor Owen Carson (828) 253-6856	Equinox Environmental 37 Haywood Street, Suite 100 Asheville, NC 28801
As-built Surveys Brad Kee (828) 575-9021	Kee Mapping 88 Central Ave Asheville, NC 28801
Seeding Mix Source (800) 873-3321	Ernst Conservation Seeds 8884 Mercer Pike Meadsville, PA 16335
Woody Stem Source Cole Williams (706) 483-3397	Native Forest Nursery 11306 Hwy 411 S Chatsworth, Ga 30705
Live Stakes Carla Scholl (919) 742-1200	Mellow Marsh Farms 1312 Woody Store Rd Siler City, NC 27344
Monitoring Performers (MY0-MY7)- 2021-27 Danvey Walsh (828) 253-6856 ext 201	Equinox Environmental 37 Haywood Street, Suite 100 Asheville, NC 28801

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Appendix F
Other Data

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On June 16, 2021, a single pass electrofishing survey was conducted on Seniard Creek to monitor relative abundance of fish species upstream and downstream of the culvert at the project boundary. A total of 18 fish were collected from Seniard Creek on the downstream side of the culvert, representing five species. Numerous young-of-year were observed across two species: sculpin and rainbow trout.

Upstream of the previously hanging culvert, five fishes were collected within this reach, representing three species. Two young-of-year were collected, both were rainbow trout.

Five fish species were collected in both the pre-construction and MY1 surveys. The MY1 survey is representative of a significantly different channel and level of habitat heterogeneity when compared to pre-construction condition. River chub and rosyside dace (likely misidentified saffron shiner) were not represented in the MY1 survey. Similarly, blacknose dace and brown trout collected during MY1 were absent from the pre-construction data. Future surveys will provide a more comprehensive species list and distributional data.

Seniard Creek fish sampling summary							
		Pre Construction			MY1		
Downstream of culvert							
Common Name	Binomial Name	YOY	J	A	YOY	J	A
River Chub	*Nocomis micropogon*			1			
Central Stoneroller	*Campostoma anomalum*			1		1	
Mottled Sculpin	*Cottus bairdii*			2	2		2
Rosyside Dace	*Clinostomus funduloides*			1			
Blacknose dace	*Rhinichthys atratulus*				1		
Rainbow Trout	*Oncorhynchus mykiss*	1			5	4	1
Brown Trout	*Salmo trutta*					2	
	Sum	6			18		
Upstream of culvert							
Rainbow Trout	*Oncorhynchus mykiss*				2		1
Brown Trout	*Salmo trutta*						1
Mottled Sculpin	*Cottus bairdii*			1		1	
	Sum	1			5		

YOY - young of year, J - Juvenile, A - Adult

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USACE Comments, Kim Browning:

1. In future monitoring reports, please document visual observations of wetlands that were re-established as a result of priority 1 stream restoration; particularly, the riparian wetlands along Sitton Creek since the main justification for P1 stream restoration (versus an enhancement I approach) was to provide floodplain access and enhance riparian wetlands. Additional photos have been taken of the reaches where wetland was created and will be submitted with the MY1 and subsequent reports.
2. Please include the wetland indicator status in the design sheet planting tables on future projects. Will be included in future design sheet planting tables.
3. The mitigation plan identified target community types to be Montane Alluvial Forest and Swamp Forest Bog; however, the substitution species shagbark hickory and mockernut hickory that were planted are not listed as species commonly found in those communities (Schafale 4th Approximation Guide, 2012), and shingle oak is rarely or never found in small river systems. Upon review of the raw data, it appears that stems of mockernut and pignut hickory were incorrectly entered into the database as shagbark hickory. Both mockernut and pignut hickory are components of the upland ecosystems bordering the site and are specifically planted in the most upland areas throughout the site rather than in the wetlands or immediate riparian areas. According to Schafale 2012, shingle oak is, in general, rarely found in small river alluvial systems, however it is an existing component of the surrounding forest at the project site as well as several other sites in the Mills River Area, including the EWS Fletcher site. It was historically removed from small and large river floodplains to be used for building, and only remnants remain. As such, we saw and took an opportunity to reestablish an historic ecological and cultural component by planting this species..
4. The planting table in the MY0 report lists "other" and "Quercus sp." Please explain. The reference to "Other" and "Quercus sp." were in specific reference to a small number of stems which were either damaged or dormant beyond the ability to verify ID during MY0. These stems will be reevaluated during subsequent monitoring years. ID errors or mortalities will be documented in MY1 and moving forward.

USACE Comments, Casey Haywood:

1. The redline drawings show no deviations in location or material/type of streambed/bank structures installed compared to the final mitigation design plans. Please confirm. Confirmed. There were no significant departures from the structural design.
2. Vegetation:
   a. Per the 2016 IRT Guidance please include the total number of planted stems for each species planted to include planted percentages. Total number of planted stems and percentages will be included in future monitoring reports.
   b. It appears that shagbark hickory, mockernut hickory, and shingle oak were not part of the original approved mit plan plant list; however, the redline did not reflect any changes in the species/quantities; it is understood that these will be part of a mitigation plan addendum but because they have already been planted they should be annotated on the redline. Where were these species planted? Throughout the entire site? They only appear in veg plot 7. The topography of the project area required those more upland species to be planted along the fringe of the easement including Veg Plot 7. A redline document indicating modifications to the plan will be included as an

attachment to the MY1 report.

c. We appreciate green ash being removed from the planting plan. Andrea Leslie also provided feedback on the planting plan stating that river birch is only appropriate on larger systems in the mountains, and requested it to be removed. If you have a good ecological reason to plant river birch on the site, please provide that justification. In general, river birch is a more dominant species on larger river alluvial systems; however, it is a significant existing riparian component within the North Mills River and the surrounding project area. As such, it was included in the plantings.

3. In future reports please include photo documentation of all monitoring devices per the 2016 Guidance. Additional photo stations will be added to capture those devices not currently covered by the established photopoints.

4. Section 1.7.3 "Changes in this land use may require further steps to ensure the protection of the easement." Is this statement referring to maintenance of the utility crossings or have there been changes to the anticipated land use surrounding to project? In the MP it stated that land use changes were not anticipated and development pressure was low with the exception of the utility. Please clarify. Land use is not anticipated to change in the foreseeable future. The statement refers to the provider having acknowledged that any changes in land use (grazing, row crops, additional homesites) which may affect the project will require additional actions beyond what has currently been implemented (Fencing, additional signage, stormwater control, etc).

5. Section 1.7 Restoration Type and Approach- Despite not having instream work, it is still important to discuss work that was done on the EII reaches to justify credit ratios. Please include more detailed descriptions of all reaches in future reports. Additional reach descriptions and methods will be discussed in future reports.

6. It is understood that there are no wetland credits associated with this project; however, recommend adding existing wetlands to all future monitoring maps to help with review.

a. How deep are the wetland pockets/depressional features? Are they meant to dry seasonally? In future reports it is encouraged to add a grading map. The created wetlands at the pond outfall are fed by pond discharge and are not anticipated to dry up seasonally. The small depressions (8-10" in depth) associated with simulated tip-ups (woody debris placed in floodplain) will have seasonally fluctuating water surface elevations.

7. It doesn't appear that any wetland gauges were installed in existing wetlands. Please note that you may be expected to reverify the extent of jurisdiction at the end of monitoring to ensure there was no net loss of wetlands as a result of the stream restoration. It is understood that there is an expectation of no-net-loss of wetlands and EWS is prepared to re-evaluate the extent of jurisdiction prior to project closeout.

8. Appreciate the addition of a stage recorder on David Branch Reach 1C. There remains concern of the probable transition of this trending towards becoming a linear wetland- it is recommended to add a photo point to help show evidence of channel features. An additional photo point will be added along David Branch and Included in future monitoring reports.

<u>DWR Comments, Erin Davis:</u>

1. Concur with USACE comments.
2. Existing wetland areas should be shown on the CCPV figures on future monitoring reports. A layer of existing wetlands will be added to the CCPV going forward.

NC DMS PROJECT #100017

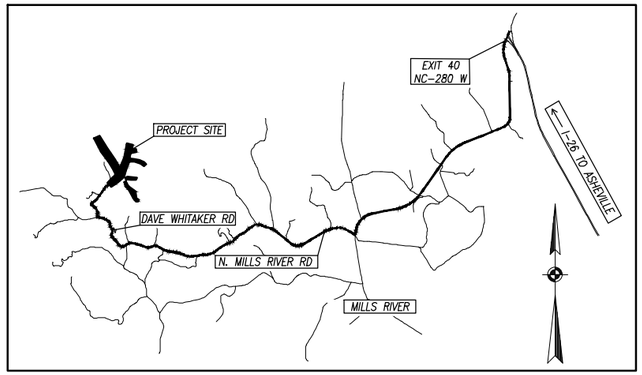
EW SOLUTIONS, LLC

STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS
NC	172621103	AB-1	17

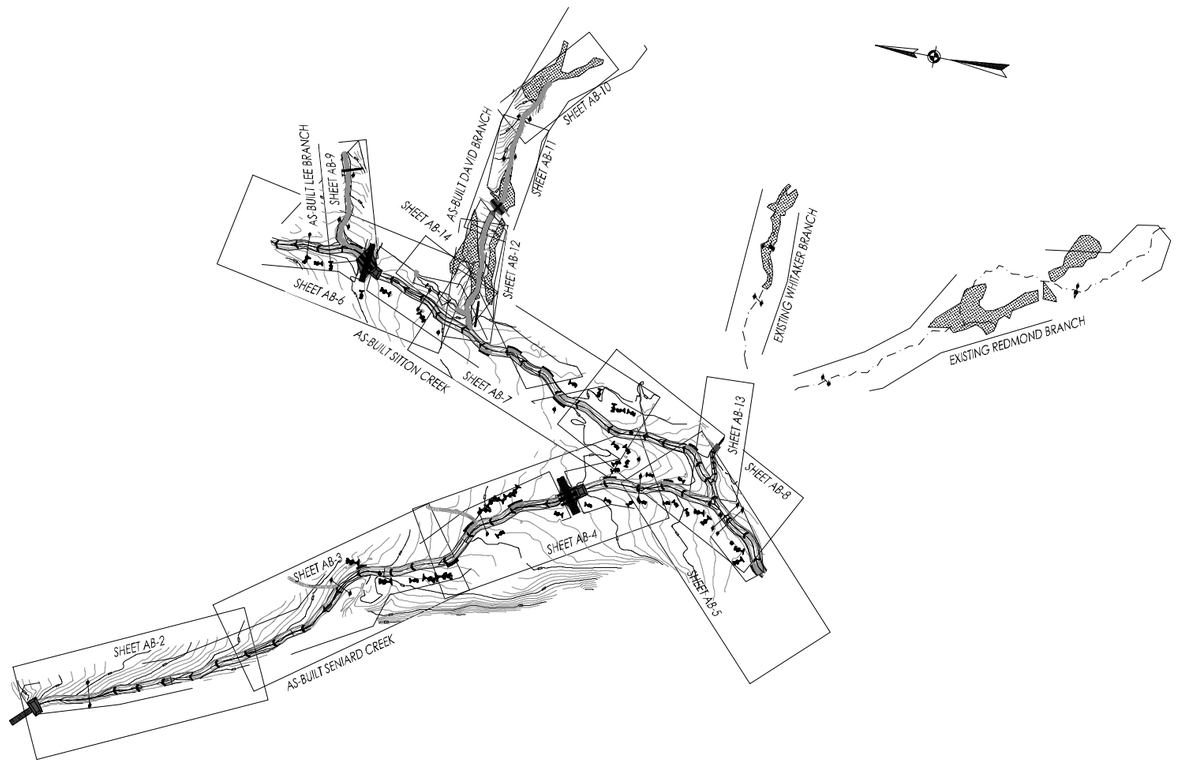
	FINAL PLANS	5/22/20	CME
1	SHEETS 1, EC-1, EC-2A	5/29/20	CME
2	SHEETS 1, 2, 3, 4, 6-11, 14-16, P-1, P-2, EC-1, EC-2, EC-4	7/14/20	CME
3	SHEETS 1, EC-1, EC-4	8/10/20	CME
	AS - BUILT PLANS - RECORD SET	4/02/21	CME
1	SHEETS 1, 1A, 4-14, P-1, P-2	5/17/21	CME
2	SHEETS 1 AND P-2	10/14/21	CME
STR.	DESCRIPTION	DATE	APPROVED
REVISIONS			

SENIARD CREEK MITIGATION PROJECT

SENIARD CREEK
HENDERSON COUNTY, NORTH CAROLINA



VICINITY MAP
NOT TO SCALE



SHEET INDEX

NO SIGNIFICANT DEVIATIONS FROM DESIGN
AS-BUILT PLANS

GRAPHIC SCALES (SCALE IN FEET)

20 0 20 60
PLAN & HORIZONTAL PROFILE - SHEETS 4-10

10 0 10 30
PLAN & HORIZONTAL PROFILE - SHEETS 11-16

2 0 2 6
VERTICAL PROFILE - SHEETS 4-10

1 0 1 3
VERTICAL PROFILE - SHEETS 11-16

30 0 100 300
PLAN - SHEET 1A AND P-2

PROJECT LENGTHS

AS-BUILT RESTORATION:		
	SENIARD CREEK	= 1,783 FT
	SITTON CREEK	= 1,079 FT
	DAVID BRANCH	= 524 FT
	LEE BRANCH	= 215 FT
	REDMOND BRANCH	= 83 FT
AS-BUILT ENHANCEMENT:		
	WHITAKER BRANCH	= 426 FT
	REDMOND BRANCH	= 1,054 FT
AS-BUILT PRESERVATION:		
	DAVID BRANCH	= 132 FT
	TOTAL LENGTH	= 5,265 FT

Prepared by:

Stantec

Stantec Consulting Services Inc.
56 College Street, Suite 201
Asheville, North Carolina 28801
www.stantec.com

NORTH CAROLINA PROFESSIONAL SEAL 038595 ENGINEER CHRISTOPHER M. EAGLE

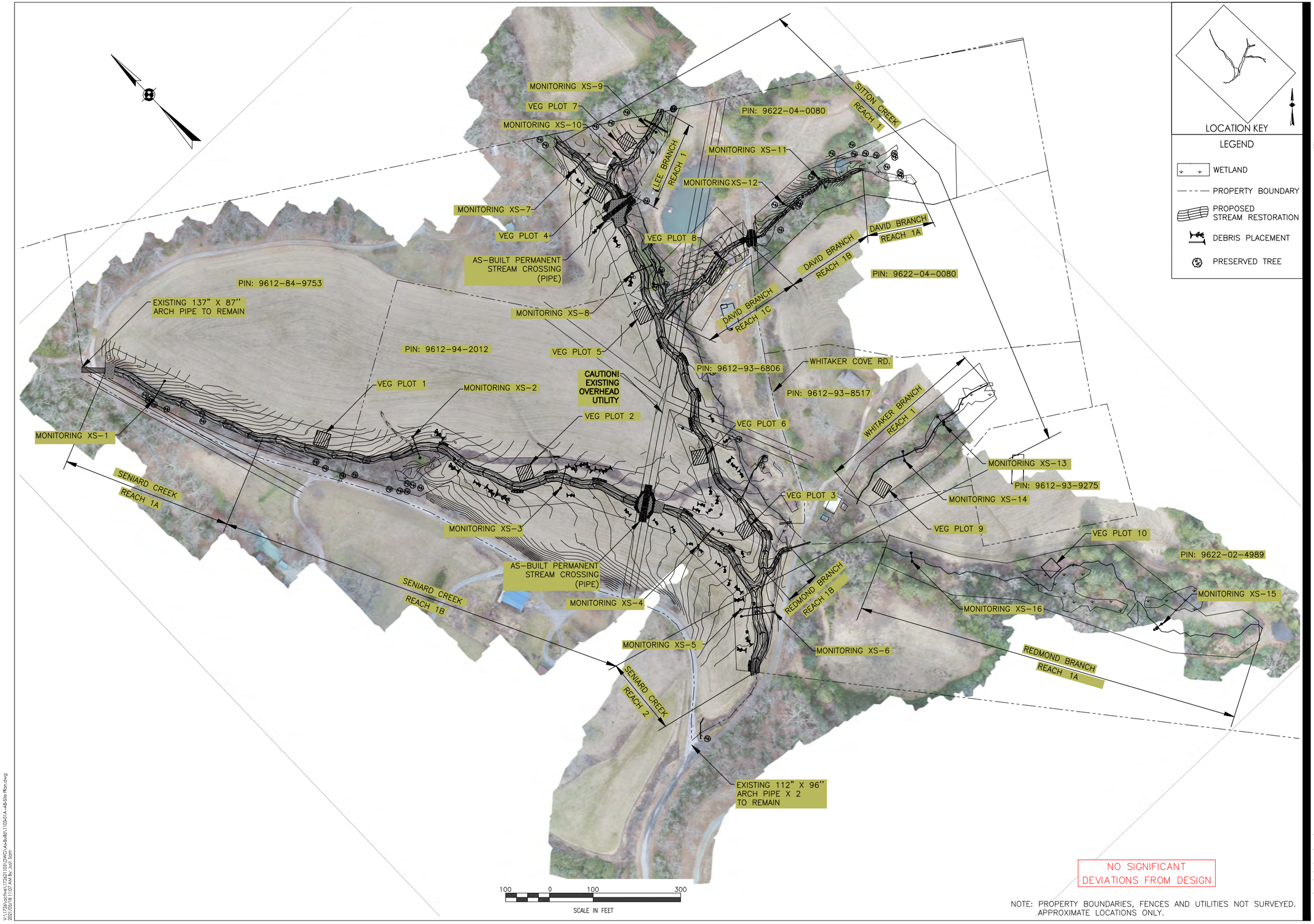
10/15/21

PROJECT ENGINEER

Prepared for:

NC DMS

HARRY TSOMIDES
PROJECT MANAGER



LOCATION KEY

LEGEND

- WETLAND
- PROPERTY BOUNDARY
- PROPOSED STREAM RESTORATION
- DEBRIS PLACEMENT
- PRESERVED TREE

NO SIGNIFICANT DEVIATIONS FROM DESIGN

NOTE: PROPERTY BOUNDARIES, FENCES AND UTILITIES NOT SURVEYED. APPROXIMATE LOCATIONS ONLY.

Stantec
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ASHEVILLE, NC 28801
www.stantec.com

Issued	By	Appd.	YY.MM.DD
AS-BUILT REV-1 - NO DEVIATIONS NOTE	CME	CME	21.05.17
Revision	By	Appd.	YY.MM.DD

Client/Project
EW SOLUTIONS
SENIARD CREEK MITIGATION SITE
HENDERSON COUNTY, NORTH CAROLINA
Title
SITE PLAN - AS-BUILT

Permit-Seal

NORTH CAROLINA PROFESSIONAL SEAL 038595 ENGINEER CHRISTOPHER M. ENGEL
5/26/21

Project Number: 172621103

CEG	SGG	CME	21.03.31
Dwn.	Chkd.	Dsgn.	YY.MM.DD

Revision 0
Sheet AB-1A

V:\172\active\172621103\DWG\As-Built\1103-01 A-AB-Site Plan.dwg
2021/05/18 11:07 AM By: Justi Som

REACH 1A

101+00

102+00

103+00

REACH 1A REACH 1B

CHANNEL & STRUCTURE DIMENSIONS CHANGE

104+00

EXISTING
137" x 87" ARCH PIPE
TO REMAIN
INV IN: 2265.50'
INV OUT: 2263.29'

AS-BUILT RIPRAP
OUTLET PROTECTION

MONITORING XS-1

CONSERVATION
EASEMENT BOUNDARY

AS-BUILT SENIARD CREEK

2270
2265
2260
2255
2250

MATCH LINE STA 105+00

CAUTION
EXISTING UTILITY
POLE AND GUY WIRE

DAVE WHITAKER RD.

EXISTING 18" CMP
TO REMAIN

BOULDER BRUSH RUN
STA 101+88.8 EL 2253.12

BOULDER BRUSH RUN
STA 102+41.3 EL 2251.14

EXISTING UTILITY
EASEMENT

BOULDER BRUSH RUN
STA 102+98.9 EL 2249.23

CAUTION!
EXISTING
OVERHEAD
UTILITY

BRUSH RUN - LARGE
STA 103+58.9 EL 2248.10

BOULDER BRUSH RUN
STA 104+26.4 EL 2246.48

BOULDER BRUSH RUN
STA 104+96.0 EL 2244.59

NO SIGNIFICANT
DEVIATIONS FROM DESIGN

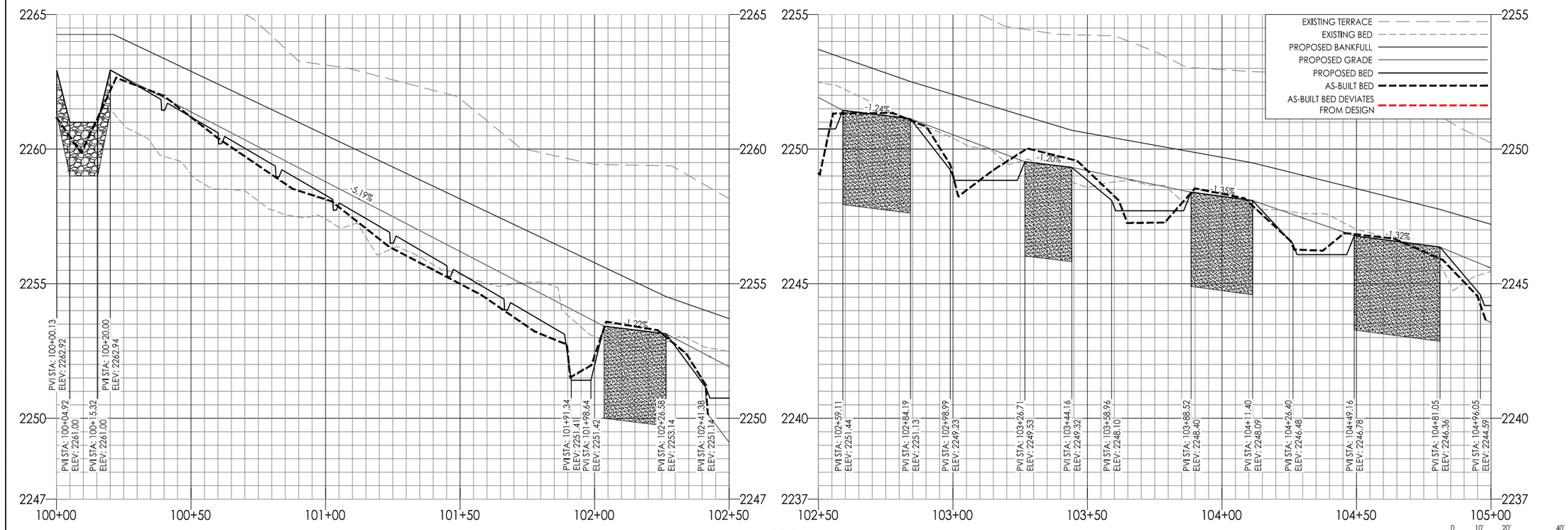
LOCATION KEY

LEGEND

- PROPOSED STREAM RESTORATION
- PROPOSED RIPRAP
- PROPOSED BRUSH ENHANCED RIFFLE
- EXISTING WETLAND

AS-BUILT LEGEND

- TOP OF BANK
- TOP OF BANK DEVIATIONS
- THALWEG
- THALWEG DEVIATIONS
- PRESERVED TREE
- DEBRIS PLACEMENT
- BRUSH TOE
- BOULDER BRUSH RUN
- BRUSH RUN – LARGE



SENIARD CREEK

1"=20' 0 10' 20' 40'

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Asheville, North Carolina
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Issued	By	Appd.	YY.MM.DD
Revision	CME	CME	20.07.14
REV-2 - UNEWEIGHT AS-BUILT REV-1 - NO DEVIATIONS NOTE	CME	CME	21.05.18

Client/Project
EW SOLUTIONS, LLC

SENIARD CREEK MITIGATION SITE

HENDERSON COUNTY, NC

Title
SENIARD CREEK - PLAN & PROFILE - AS-BUILT
STA 100+00 - 105+00

Permit-Seal

NORTH CAROLINA PROFESSIONAL SEAL 038595 ENGINEER CHRISTOPHER M ENGE
5/26/21

Project Number: 172621103

File Name: 1103-04-AB-Seniard PLANPRO.dwg

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Dwn.	Chkd.	Dsgn.	YY.MM.DD

Drawing No.

Revision	Sheet
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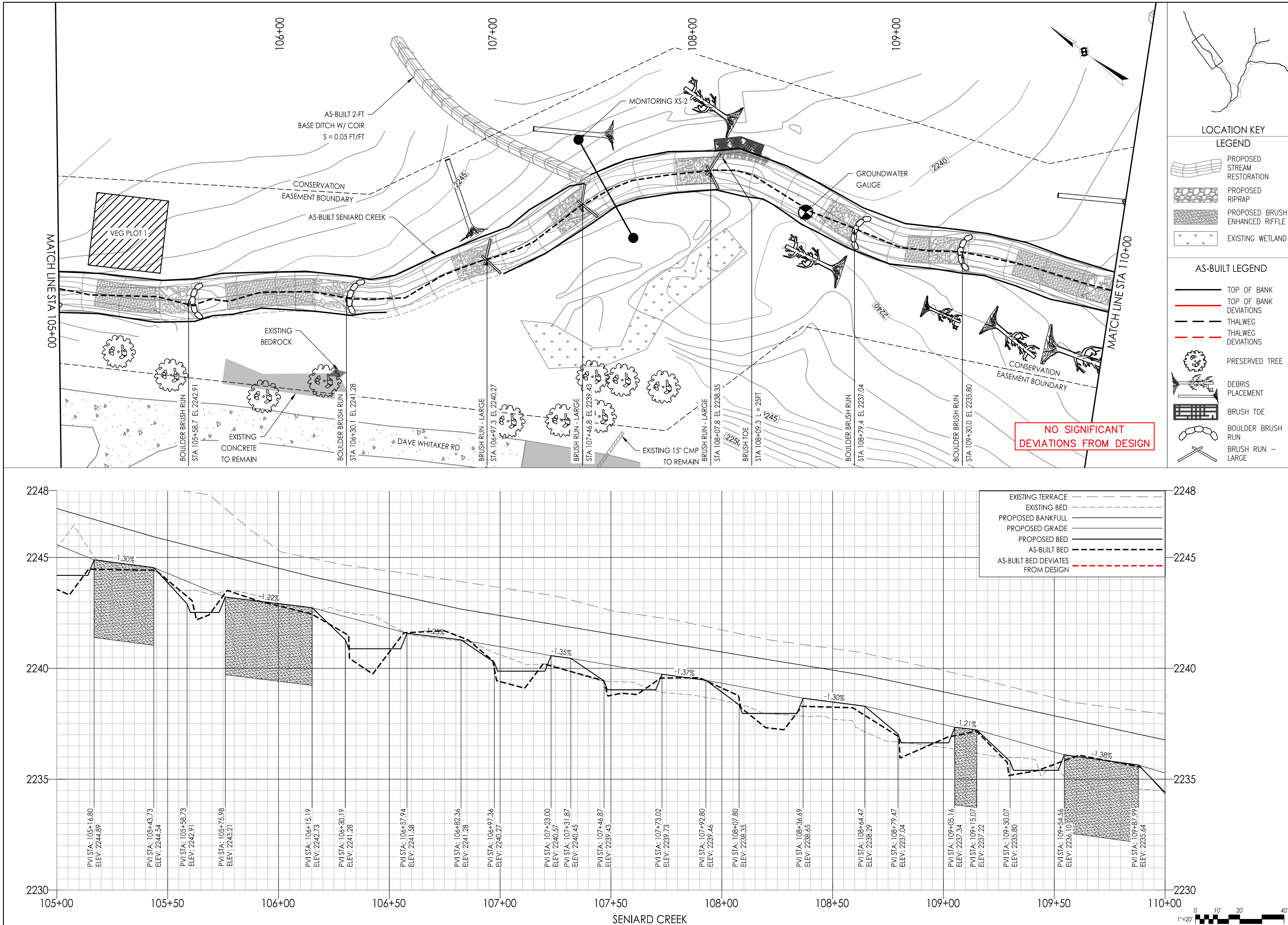

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Revision	By	Appd.	YY.MM.DD
AS-BUILT REV-1 - NO DEVIATIONS NOTE	CME	CME	21.05.17

Issued	By	Appd.	YY.MM.DD

Client/Project
EW SOLUTIONS, LLC

SENIARD CREEK MITIGATION SITE

HENDERSON COUNTY, NC

Title
SENIARD CREEK - PLAN & PROFILE - AS-BUILT
STA 105+00 - 110+00

Permit-Seal

NORTH CAROLINA PROFESSIONAL SEAL 038595 ENGINEER CHRISTOPHER M. ENGLE 5/26/21

Project Number: 172621103

File Name: 1103-04-AB-Seniard PLANPRO.dwg

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Dwn.	Chkd.	Dsgn.	YY.MM.DD

Drawing No.

Revision	Sheet
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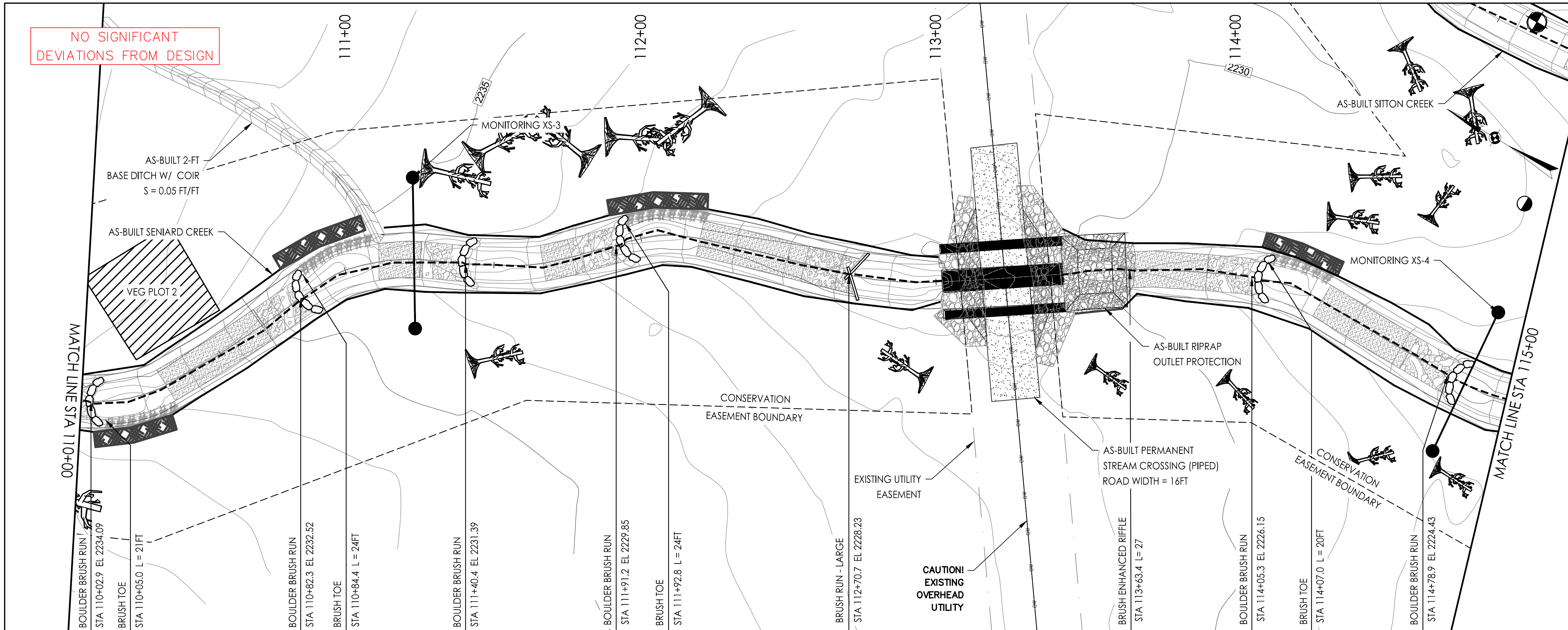


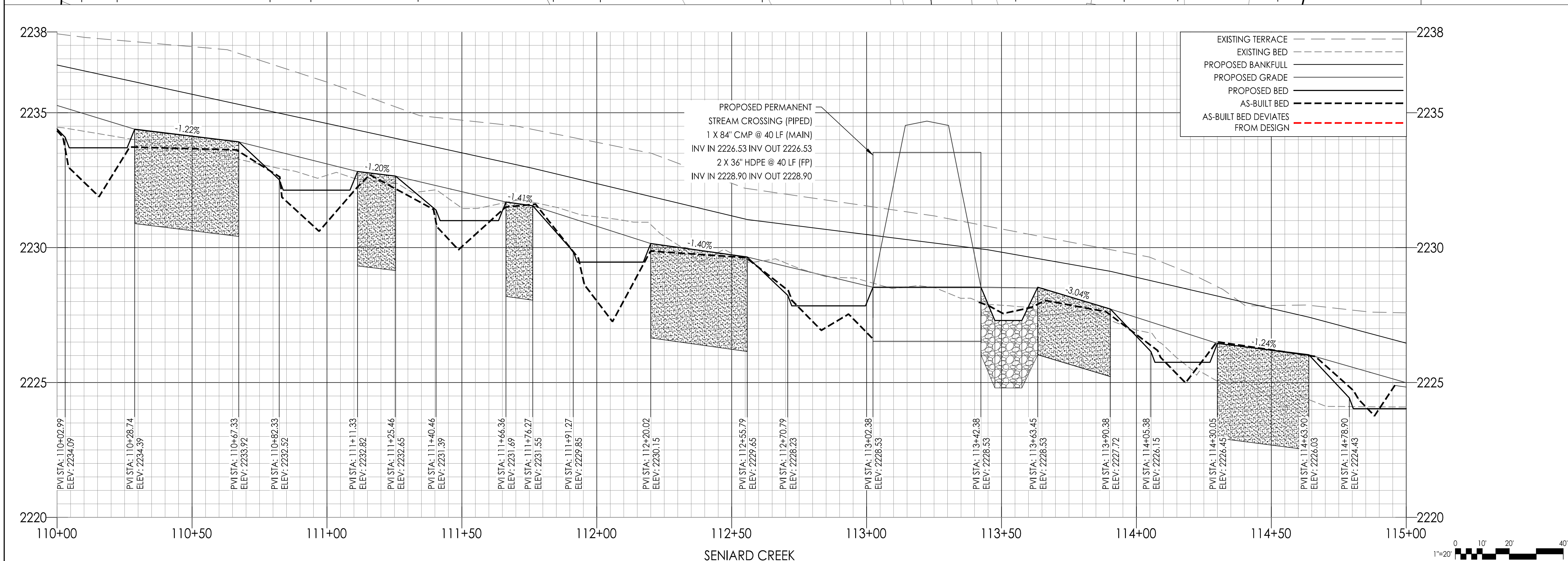
LOCATION KEY

LEGEND

- PROPOSED STREAM RESTORATION
- PROPOSED RIPRAP
- PROPOSED BRUSH ENHANCED RIFFLE
- EXISTING WETLAND

AS-BUILT LEGEND

- TOP OF BANK
- TOP OF BANK DEVIATIONS
- THALWEG
- THALWEG DEVIATIONS
- PRESERVED TREE
- DEBRIS PLACEMENT
- BRUSH TOE
- BOULDER BRUSH RUN
- BRUSH RUN – LARGE



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Revision	By	Appd.	YY.MM.DD
REV-2 - PIPED CROSSING	CME	CME	20.07.14
AS-BUILT REV-1 - NO DEVIATIONS NOTE	CME	CME	21.05.17

Issued | By | Appd. | YY.MM.DD

Client/Project
EW SOLUTIONS, LLC
SENIARD CREEK MITIGATION SITE
HENDERSON COUNTY, NC

Title
SENIARD CREEK - PLAN & PROFILE - AS-BUILT
STA 110+00 - 115+00

Permit-Seal

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 038595 CHRISTOPHER M. ENGLE 5/26/21

Project Number: 172621103

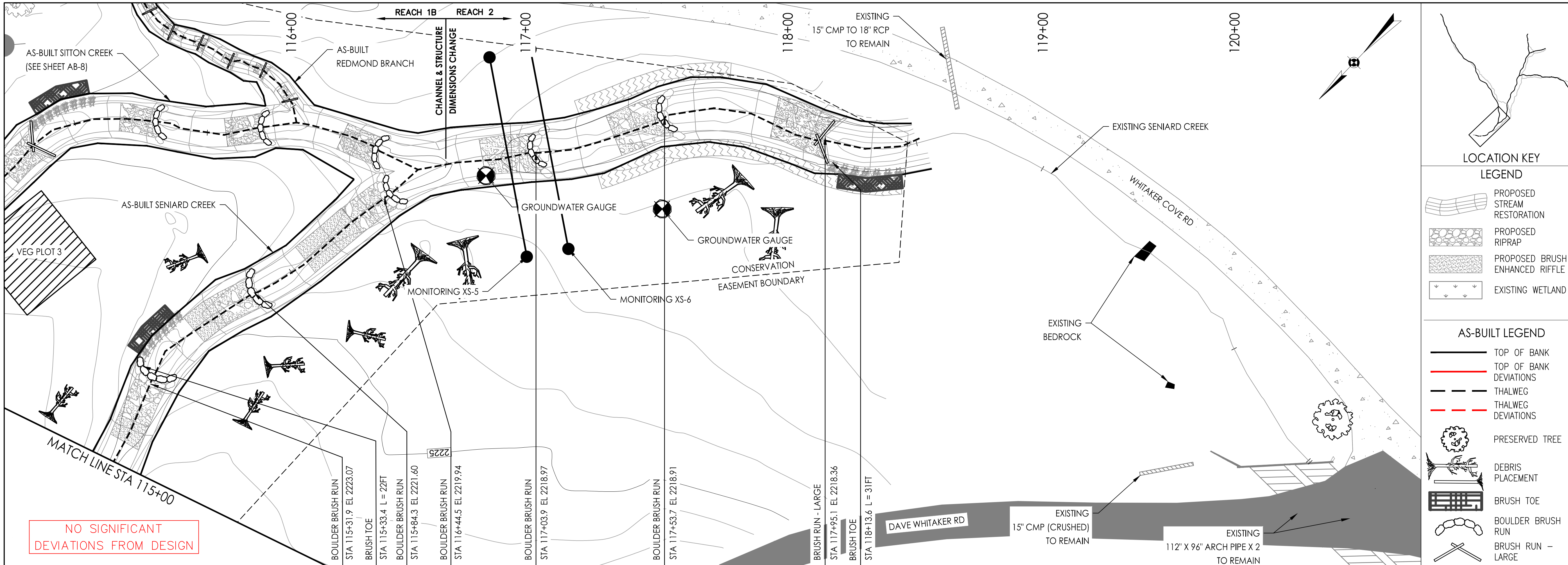
File Name: 1103-04-AB-Seniard PLANPRO.dwg

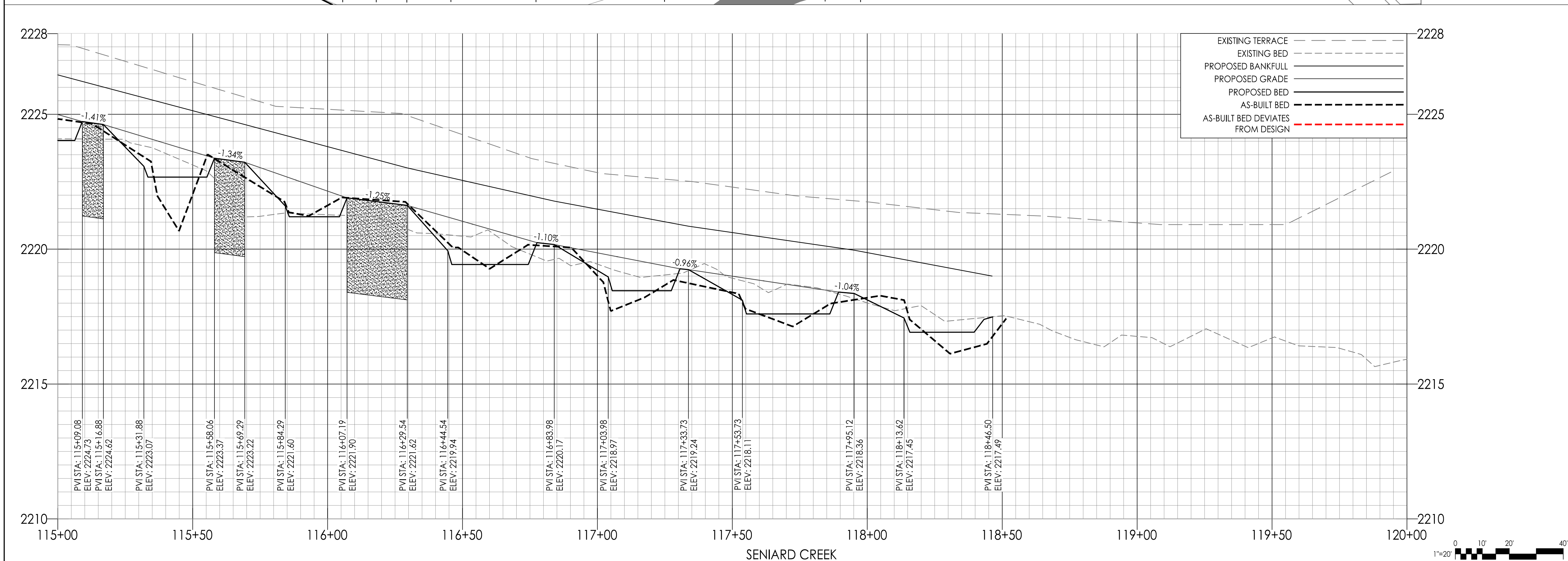
CEG	SGG	CME	21.03.31
Dwn.	Chkd.	Dsgn.	YY.MM.DD

Drawing No.

Revision 2 | Sheet AB-4

SaveDate: 2021/05/17 1:39 PM Login: Just, Sam





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Revision	By	Appd.	YY.MM.DD
AS-BUILT REV-1 - NO DEVIATIONS NOTE	CME	CME	21.05.17
REV-2 - BRENCH PROTECTION	CME	CME	20.07.14

Issued | By | Appd. | YY.MM.DD

Permit-Seal

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 038595 CHRISTOPHER M. ENGLE 5/26/21

Client/Project
EW SOLUTIONS, LLC
SENIARD CREEK MITIGATION SITE
HENDERSON COUNTY, NC

Title
SENIARD CREEK - PLAN & PROFILE - AS-BUILT
STA 115+00 - 120+00

Project Number: 172621103
File Name: 1103-04-AB-Seniard PLANPRO.dwg

CEG	SGG	CME	21.03.31
Dwn.	Chkd.	Dsgn.	YY.MM.DD

Drawing No.
Revision 2
Sheet AB-5

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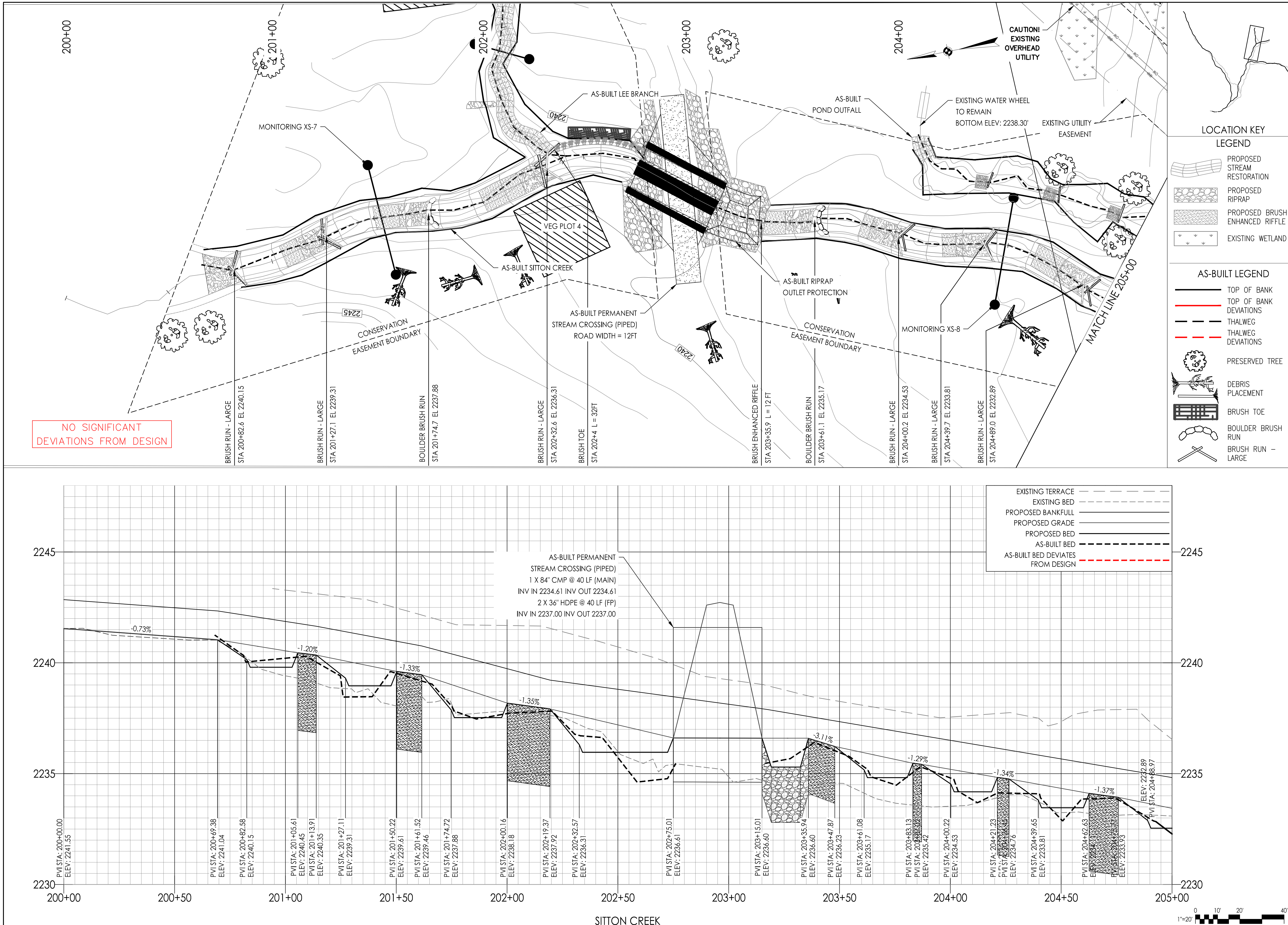

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Revision	By	Appd.	YY.MM.DD
REV-2 - PIPED CROSSING	CME	CME	21.05.17
AS-BUILT REV-1 - NO DEVIATIONS NOTE	CME	CME	20.07.14

Issued | By | Appd. | YY.MM.DD

Client/Project
EW SOLUTIONS, LLC
SENIARD CREEK MITIGATION SITE
HENDERSON COUNTY, NC

Title
SITTON CREEK - PLAN & PROFILE - AS-BUILT
STA 200+00 - 205+00

Permit-Seal

NORTH CAROLINA PROFESSIONAL SEAL 038595 ENGINEER CHRISTOPHER M. ENGLE
5/26/21

Project Number: 172621103
File Name: 1103-05-AS-Sitton PLANPRO-REV.dwg

CEG	SGG	CME	21.03.31
Dwn.	Chkd.	Dsgn.	YY.MM.DD

Drawing No.
Revision 2
Sheet AB-6

NO SIGNIFICANT DEVIATIONS FROM DESIGN

206+00 207+00 208+00 209+00

MATCH LINE 205+00

MATCH LINE 210+00

AS-BUILT POND OUTFALL

AS-BUILT GROUNDWATER CURTAIN

AS-BUILT DAVID BRANCH

AS-BUILT SITTON CREEK

CONSERVATION EASEMENT BOUNDARY

CONSERVATION EASEMENT BOUNDARY

CONSERVATION EASEMENT BOUNDARY

2235

2230

VEG PLOT 5

VEG PLOT 6

CAUTION! EXISTING OVERHEAD UTILITY

EXISTING UTILITY POLE TO REMAIN

EXISTING UTILITY EASEMENT

BRUSH RUN - LARGE STA 205+57.7 EL. 2231.78

BRUSH RUN - LARGE STA 206+12.1 EL. 2230.81

BRUSH TOE STA 206+13.7 L = 23FT

BRUSH RUN - LARGE STA 206+70.9 EL. 2229.93

BRUSH TOE STA 206+72.4 L = 20FT

BRUSH RUN - LARGE STA 207+12.9 EL. 2229.42

BRUSH RUN - LARGE STA 207+56.4 EL. 2228.93

BRUSH TOE STA 207+58.0 L = 22FT

BRUSH RUN - LARGE STA 208+18.3 EL. 2228.24

BRUSH TOE STA 208+19.8 L = 23FT

BRUSH RUN - LARGE STA 208+71.6 EL. 2227.78

BRUSH RUN - LARGE STA 209+63.4 EL. 2225.97

LOCATION KEY

LEGEND

- PROPOSED STREAM RESTORATION
- PROPOSED RIPRAP
- PROPOSED BRUSH ENHANCED RIFFLE
- EXISTING WETLAND

AS-BUILT LEGEND

- TOP OF BANK
- TOP OF BANK DEVIATIONS
- THALWEG
- THALWEG DEVIATIONS
- PRESERVED TREE
- DEBRIS PLACEMENT
- BRUSH TOE
- BOULDER BRUSH RUN
- BRUSH RUN – LARGE

EXISTING TERRACE
EXISTING BED
PROPOSED BANKFULL
PROPOSED GRADE
PROPOSED BED
AS-BUILT BED
AS-BUILT BED DEVIATES FROM DESIGN

-1.27% -1.34% -1.23% -1.36% -1.29% -1.18% -1.26% -1.33%

2235 2230 2225 2220

PVI STA: 205+12.10 ELEV: 2233.19
PVI STA: 205+44.47 ELEV: 2232.78
PVI STA: 205+57.67 ELEV: 2231.78
PVI STA: 205+82.48 ELEV: 2232.08
PVI STA: 205+98.92 ELEV: 2231.86
PVI STA: 206+12.12 ELEV: 2230.81
PVI STA: 206+38.95 ELEV: 2231.11
PVI STA: 206+57.69 ELEV: 2230.88
PVI STA: 206+70.89 ELEV: 2229.93
PVI STA: 206+95.32 ELEV: 2230.17
PVI STA: 206+99.72 ELEV: 2230.17
PVI STA: 207+12.92 ELEV: 2229.42
PVI STA: 207+37.06 ELEV: 2229.72
PVI STA: 207+43.25 ELEV: 2229.64
PVI STA: 207+56.45 ELEV: 2228.93
PVI STA: 207+82.31 ELEV: 2229.23
PVI STA: 208+05.11 ELEV: 2228.96
PVI STA: 208+18.31 ELEV: 2228.24
PVI STA: 208+45.71 ELEV: 2228.54
PVI STA: 208+58.41 ELEV: 2228.38
PVI STA: 208+71.61 ELEV: 2227.78
PVI STA: 208+97.37 ELEV: 2228.08
PVI STA: 209+50.19 ELEV: 2227.38
PVI STA: 209+63.39 ELEV: 2225.97
PVI STA: 209+92.09 ELEV: 2226.27

205+00 205+50 206+00 206+50 207+00 207+50 208+00 208+50 209+00 209+50 210+00

SITTON CREEK

1"=20' 0 10' 20' 40'

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Revision	By	Appd.	YY.MM.DD
REV-2 - LEGEND	CME	CME	20.07.14
AS-BUILT REV-1 - NO DEVIATIONS NOTE	CME	CME	21.05.17
Issued	CME	CME	21.03.31

Client/Project
EW SOLUTIONS, LLC

SENIARD CREEK MITIGATION SITE

HENDERSON COUNTY, NC

Title
SITTON CREEK - PLAN & PROFILE - AS-BUILT
205+00 - 210+00

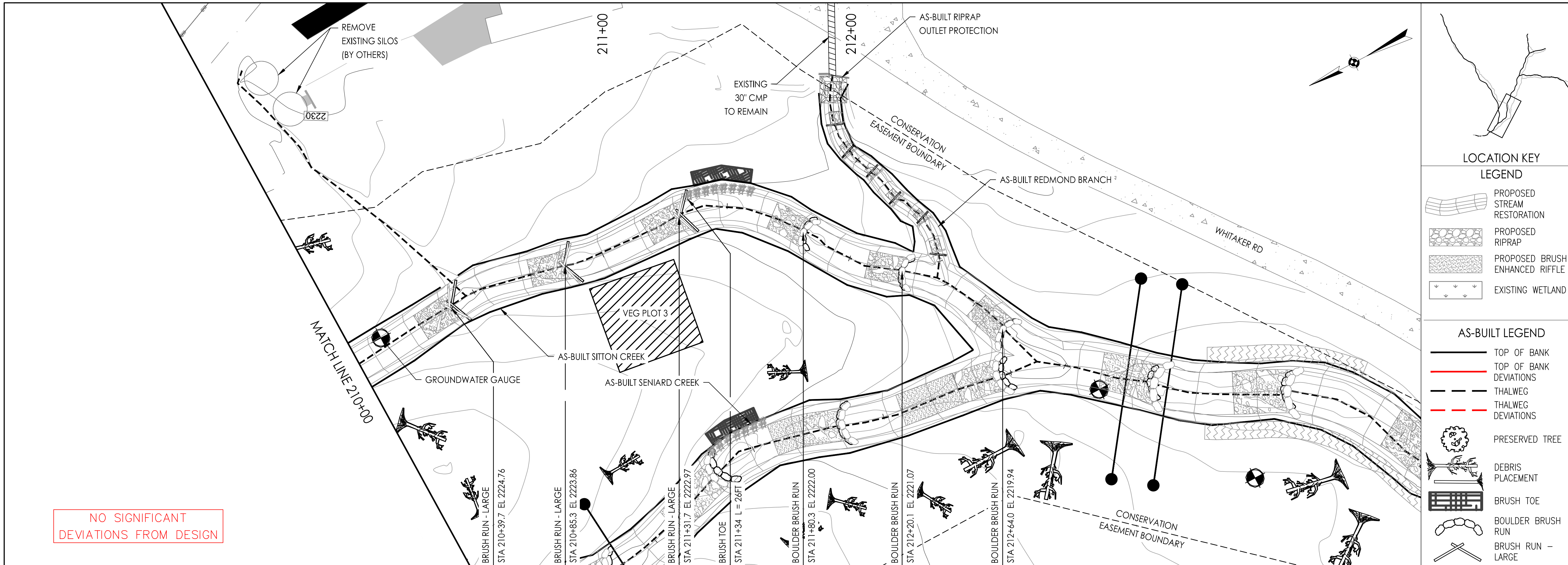
Permit-Seal

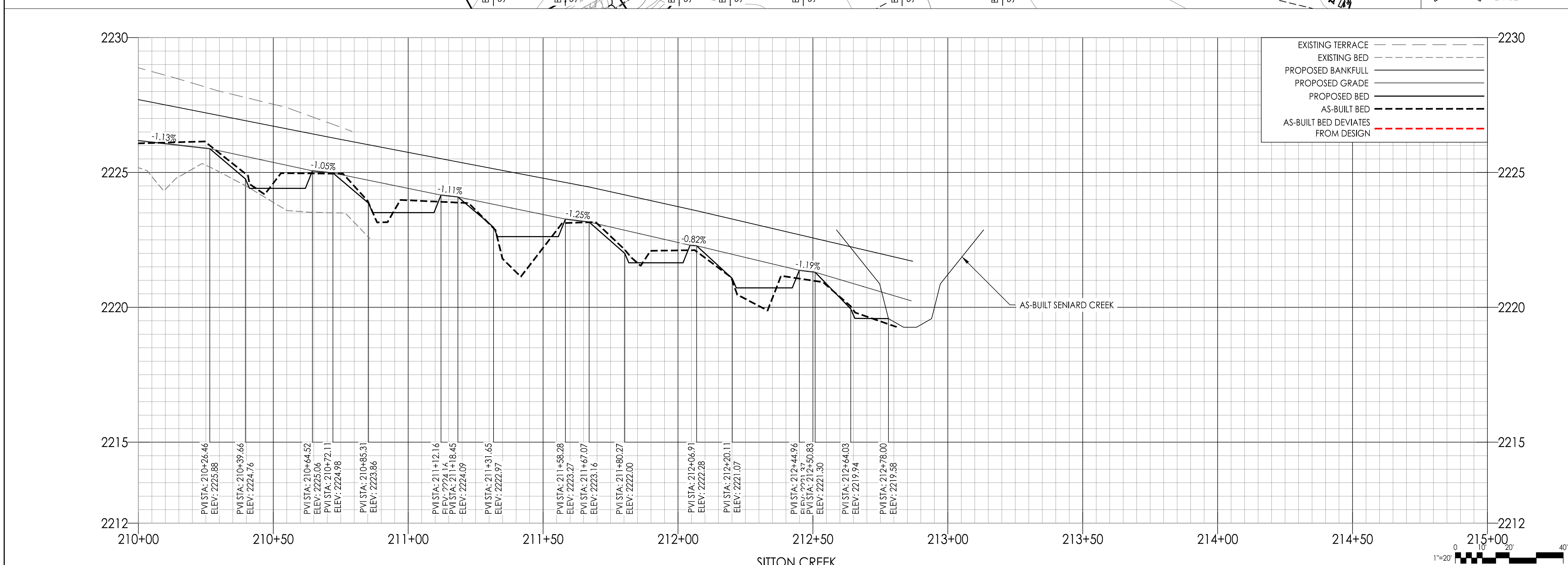
NORTH CAROLINA PROFESSIONAL SEAL 038595 ENGINEER CHRISTOPHER M. ENGLE 12/26/21

Project Number: 172621103
110505-AB-Sitton
File Name: PLANPRO-REV.dwg

CEG	SGG	CME	21.03.31
Dwn.	Chkd.	Dsgn.	YY.MM.DD

Drawing No.
Revision 2
Sheet AB-7





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Revision	By	Appd.	YY.MM.DD
AS-BUILT REV-1 - NO DEVIATIONS NOTE	CME	CME	21.05.17
REV-2 - LABELS	CME	CME	20.07.14

Issued

Client/Project
EW SOLUTIONS, LLC
SENIARD CREEK MITIGATION SITE
HENDERSON COUNTY, NC

Title
SITTON CREEK - PLAN & PROFILE - AS-BUILT
STA 210+00 - 215+00

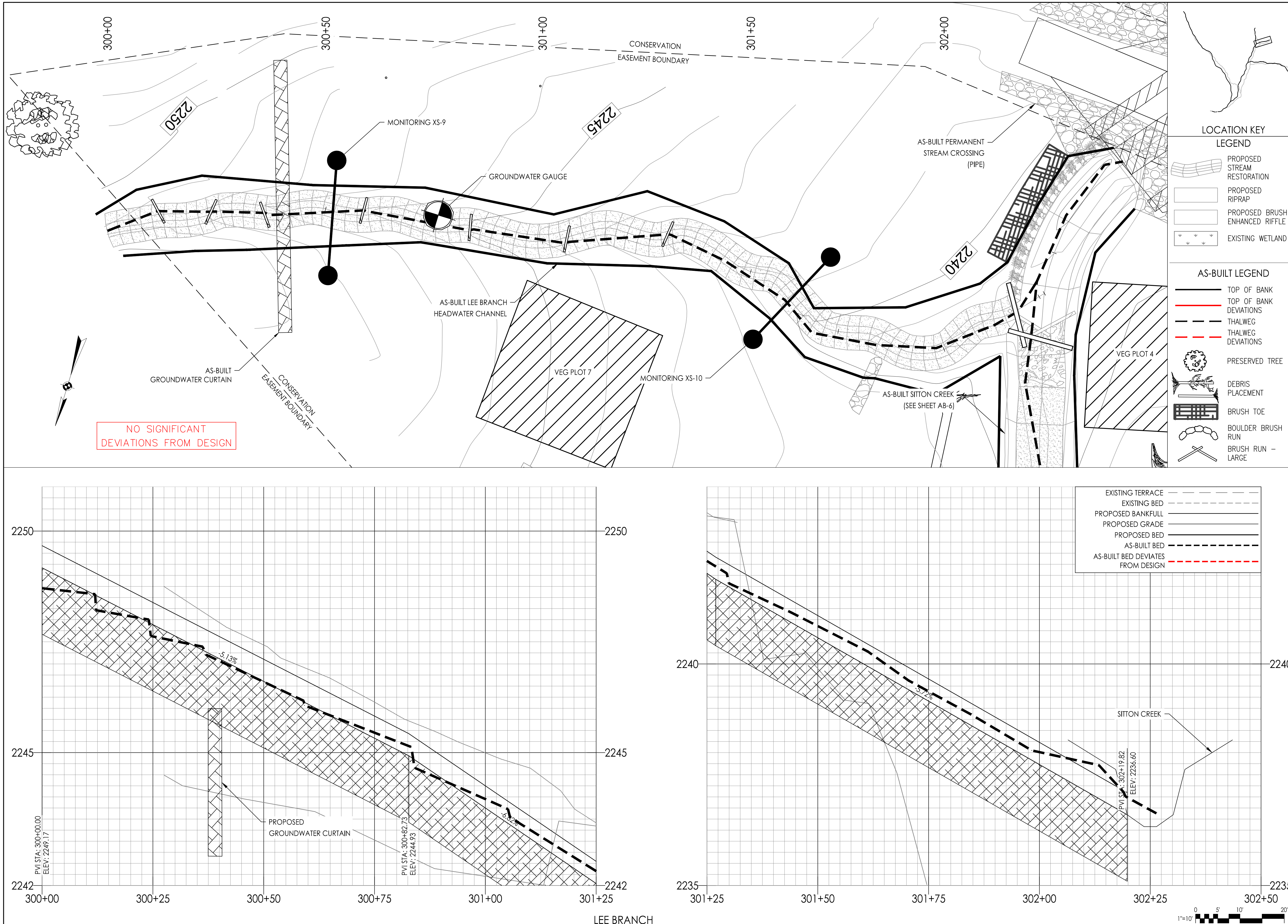
Permit-Seal
NORTH CAROLINA PROFESSIONAL SEAL 038595 ENGINEER CHRISTOPHER M. ENGLE
5/26/21

Project Number: 172621103
~~1103-05-AB-Sitton~~
File Name: PLANPRO-REV.dwg

CEG	SGG	CME	21.03.31
Dwn.	Chkd.	Dsgn.	YY.MM.DD

Drawing No.

Revision 2
Sheet AB-8



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Revision	By	Appd.	YY.MM.DD
REV-2 - LABELS	CME	CME	20.07.14
AS-BUILT REV-1 - NO DEVIATIONS NOTE	CME	CME	21.05.17
20.07.14	CME		

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Client/Project
EW SOLUTIONS, LLC

SENIARD CREEK MITIGATION SITE

HENDERSON COUNTY, NC

Title
LEE BRANCH - PLAN & PROFILE - AS-BUILT
STA 300+00 -302+50

Permit-Seal

NORTH CAROLINA PROFESSIONAL SEAL 038595 ENGINEER CHRISTOPHER M. ENGLE
5/26/21

Project Number: 172621103

File Name: 1103-06-AB-Lee PLANPRO.dwg

CEG	SGG	CME	21.03.31
Dwn.	Chkd.	Dsgn.	YY.MM.DD

Drawing No. LEE - (1)

Revision 2 | Sheet AB-9

400+00
400+50
401+00
401+50
402+00
CONSERVATION EASEMENT BOUNDARY
REACH 1A
REACH 1B
CHANNEL & STRUCTURE DIMENSIONS CHANGE
MONITORING XS-11
MATCH LINE STA 402+50
EXISTING DAVID BRANCH
AS-BUILT DAVID BRANCH HEADWATER CHANNEL
2265
CONSERVATION EASEMENT BOUNDARY
NO SIGNIFICANT DEVIATIONS FROM DESIGN

LOCATION KEY

LEGEND
- PROPOSED STREAM RESTORATION
- PROPOSED RIPRAP
- PROPOSED BRUSH ENHANCED RIFFLE
- EXISTING WETLAND

AS-BUILT LEGEND
- TOP OF BANK
- TOP OF BANK DEVIATIONS
- THALWEG
- THALWEG DEVIATIONS
- PRESERVED TREE
- DEBRIS PLACEMENT
- BRUSH TOE
- BOULDER BRUSH RUN
- BRUSH RUN – LARGE

EXISTING TERRACE
EXISTING BED
PROPOSED BANKFULL
PROPOSED GRADE
PROPOSED BED
AS-BUILT BED
AS-BUILT BED DEVIATES FROM DESIGN

-5.59%
-10.12%
PVI STA: 401+31.50
ELEV: 2266.95
PVI STA: 401+95.00
ELEV: 2263.40

2274 2272 2270 2268 2266 2264 2262 2260 2258 2256 2254 2252 2250 2248 2246 2244 2242 2240 2238 2236 2234 2232 2230 2228 2226 2224 2222 2220 2218 2216 2214 2212 2210 2208 2206 2204 2202 2200 2198 2196 2194 2192 2190 2188 2186 2184 2182 2180 2178 2176 2174 2172 2170 2168 2166 2164 2162 2160 2158 2156 2154 2152 2150 2148 2146 2144 2142 2140 2138 2136 2134 2132 2130 2128 2126 2124 2122 2120 2118 2116 2114 2112 2110 2108 2106 2104 2102 2100 2098 2096 2094 2092 2090 2088 2086 2084 2082 2080 2078 2076 2074 2072 2070 2068 2066 2064 2062 2060 2058 2056 2054 2052 2050 2048 2046 2044 2042 2040 2038 2036 2034 2032 2030 2028 2026 2024 2022 2020 2018 2016 2014 2012 2010 2008 2006 2004 2002 2000 1998 1996 1994 1992 1990 1988 1986 1984 1982 1980 1978 1976 1974 1972 1970 1968 1966 1964 1962 1960 1958 1956 1954 1952 1950 1948 1946 1944 1942 1940 1938 1936 1934 1932 1930 1928 1926 1924 1922 1920 1918 1916 1914 1912 1910 1908 1906 1904 1902 1900 1898 1896 1894 1892 1890 1888 1886 1884 1882 1880 1878 1876 1874 1872 1870 1868 1866 1864 1862 1860 1858 1856 1854 1852 1850 1848 1846 1844 1842 1840 1838 1836 1834 1832 1830 1828 1826 1824 1822 1820 1818 1816 1814 1812 1810 1808 1806 1804 1802 1800 1798 1796 1794 1792 1790 1788 1786 1784 1782 1780 1778 1776 1774 1772 1770 1768 1766 1764 1762 1760 1758 1756 1754 1752 1750 1748 1746 1744 1742 1740 1738 1736 1734 1732 1730 1728 1726 1724 1722 1720 1718 1716 1714 1712 1710 1708 1706 1704 1702 1700 1698 1696 1694 1692 1690 1688 1686 1684 1682 1680 1678 1676 1674 1672 1670 1668 1666 1664 1662 1660 1658 1656 1654 1652 1650 1648 1646 1644 1642 1640 1638 1636 1634 1632 1630 1628 1626 1624 1622 1620 1618 1616 1614 1612 1610 1608 1606 1604 1602 1600 1598 1596 1594 1592 1590 1588 1586 1584 1582 1580 1578 1576 1574 1572 1570 1568 1566 1564 1562 1560 1558 1556 1554 1552 1550 1548 1546 1544 1542 1540 1538 1536 1534 1532 1530 1528 1526 1524 1522 1520 1518 1516 1514 1512 1510 1508 1506 1504 1502 1500 1498 1496 1494 1492 1490 1488 1486 1484 1482 1480 1478 1476 1474 1472 1470 1468 1466 1464 1462 1460 1458 1456 1454 1452 1450 1448 1446 1444 1442 1440 1438 1436 1434 1432 1430 1428 1426 1424 1422 1420 1418 1416 1414 1412 1410 1408 1406 1404 1402 1400 1398 1396 1394 1392 1390 1388 1386 1384 1382 1380 1378 1376 1374 1372 1370 1368 1366 1364 1362 1360 1358 1356 1354 1352 1350 1348 1346 1344 1342 1340 1338 1336 1334 1332 1330 1328 1326 1324 1322 1320 1318 1316 1314 1312 1310 1308 1306 1304 1302 1300 1298 1296 1294 1292 1290 1288 1286 1284 1282 1280 1278 1276 1274 1272 1270 1268 1266 1264 1262 1260 1258 1256 1254 1252 1250 1248 1246 1244 1242 1240 1238 1236 1234 1232 1230 1228 1226 1224 1222 1220 1218 1216 1214 1212 1210 1208 1206 1204 1202 1200 1198 1196 1194 1192 1190 1188 1186 1184 1182 1180 1178 1176 1174 1172 1170 1168 1166 1164 1162 1160 1158 1156 1154 1152 1150 1148 1146 1144 1142 1140 1138 1136 1134 1132 1130 1128 1126 1124 1122 1120 1118 1116 1114 1112 1110 1108 1106 1104 1102 1100 1098 1096 1094 1092 1090 1088 1086 1084 1082 1080 1078 1076 1074 1072 1070 1068 1066 1064 1062 1060 1058 1056 1054 1052 1050 1048 1046 1044 1042 1040 1038 1036 1034 1032 1030 1028 1026 1024 1022 1020 1018 1016 1014 1012 1010 1008 1006 1004 1002 1000 998 996 994 992 990 988 986 984 982 980 978 976 974 972 970 968 966 964 962 960 958 956 954 952 950 948 946 944 942 940 938 936 934 932 930 928 926 924 922 920 918 916 914 912 910 908 906 904 902 900 898 896 894 892 890 888 886 884 882 880 878 876 874 872 870 868 866 864 862 860 858 856 854 852 850 848 846 844 842 840 838 836 834 832 830 828 826 824 822 820 818 816 814 812 810 808 806 804 802 800 798 796 794 792 790 788 786 784 782 780 778 776 774 772 770 768 766 764 762 760 758 756 754 752 750 748 746 744 742 740 738 736 734 732 730 728 726 724 722 720 718 716 714 712 710 708 706 704 702 700 698 696 694 692 690 688 686 684 682 680 678 676 674 672 670 668 666 664 662 660 658 656 654 652 650 648 646 644 642 640 638 636 634 632 630 628 626 624 622 620 618 616 614 612 610 608 606 604 602 600 598 596 594 592 590 588 586 584 582 580 578 576 574 572 570 568 566 564 562 560 558 556 554 552 550 548 546 544 542 540 538 536 534 532 530 528 526 524 522 520 518 516 514 512 510 508 506 504 502 500 498 496 494 492 490 488 486 484 482 480 478 476 474 472 470 468 466 464 462 460 458 456 454 452 450 448 446 444 442 440 438 436 434 432 430 428 426 424 422 420 418 416 414 412 410 408 406 404 402 400 398 396 394 392 390 388 386 384 382 380 378 376 374 372 370 368 366 364 362 360 358 356 354 352 350 348 346 344 342 340 338 336 334 332 330 328 326 324 322 320 318 316 314 312 310 308 306 304 302 300 298 296 294 292 290 288 286 284 282 280 278 276 274 272 270 268 266 264 262 260 258 256 254 252 250 248 246 244 242 240 238 236 234 232 230 228 226 224 222 220 218 216 214 212 210 208 206 204 202 200 198 196 194 192 190 188 186 184 182 180 178 176 174 172 170 168 166 164 162 160 158 156 154 152 150 148 146 144 142 140 138 136 134 132 130 128 126 124 122 120 118 116 114 112 110 108 106 104 102 100 98 96 94 92 90 88 86 84 82 80 78 76 74 72 70 68 66 64 62 60 58 56 54 52 50 48 46 44 42 40 38 36 34 32 30 28 26 24 22 20 18 16 14 12 10 8 6 4 2 0

400+00 400+25 400+50 400+75 401+00 401+25 401+50 401+75 402+00 402+25 402+50

DAVID BRANCH

1"=10' 0 5' 10' 20'

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Issued	Revision	By	Appd.	YY.MM.DD
AS-BUILT REV-1 - NO DEVIATIONS NOTE		CME	CME	21.05.17

Client/Project
EW SOLUTIONS, LLC

SENIARD CREEK MITIGATION SITE

HENDERSON COUNTY, NC

Title
DAVID BRANCH - PLAN & PROFILE - AS-BUILT
STA 400+00 - 402+50

Permit-Seal

NORTH CAROLINA PROFESSIONAL SEAL 038595 ENGINEER CHRISTOPHER M ENGLE
5/26/21

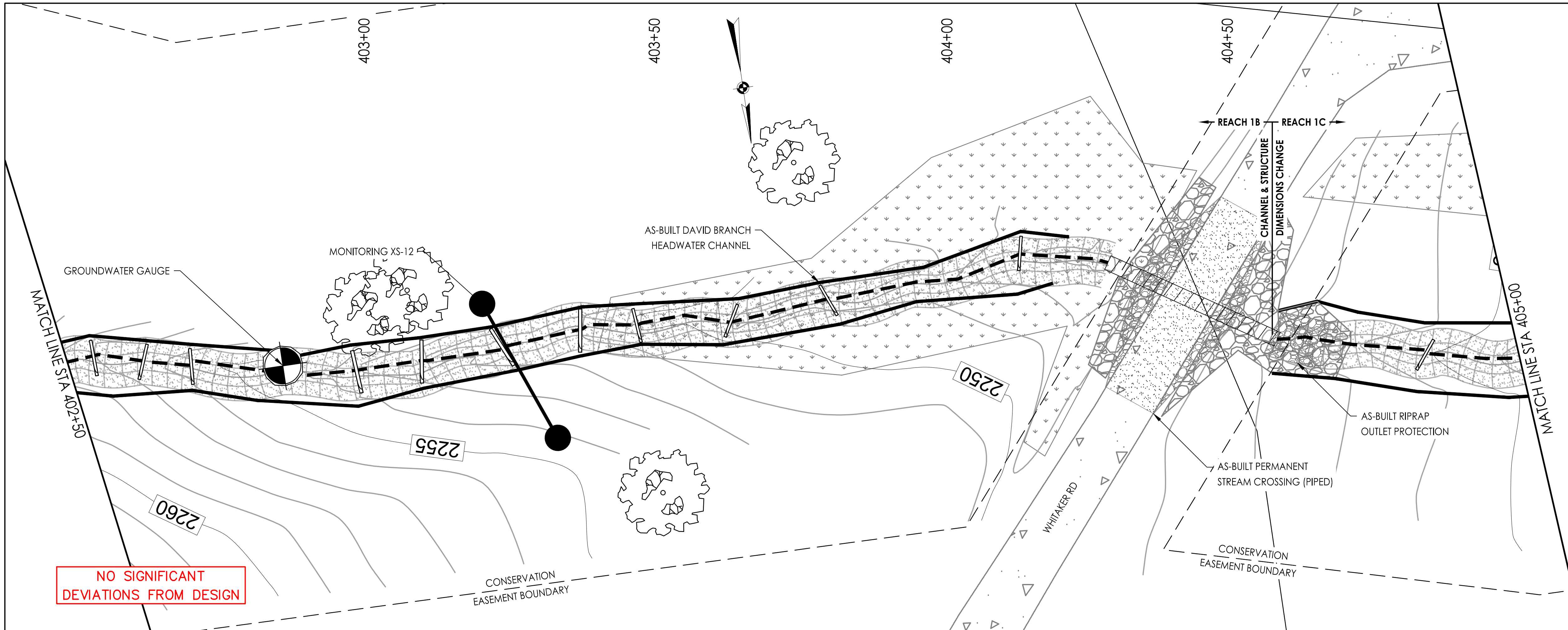
Project Number: 1726211103

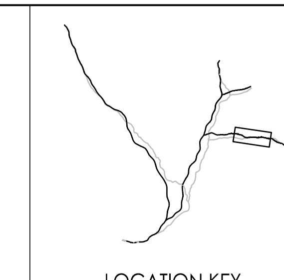
File Name: 1103-07-AB-David PLANPRO.dwg

CEG	SGG	CME	21.03.31
Dwn.	Chkd.	Dsgn.	YY.MM.DD

Drawing No. DAVID - (1)

Revision	Sheet
0	AB-10



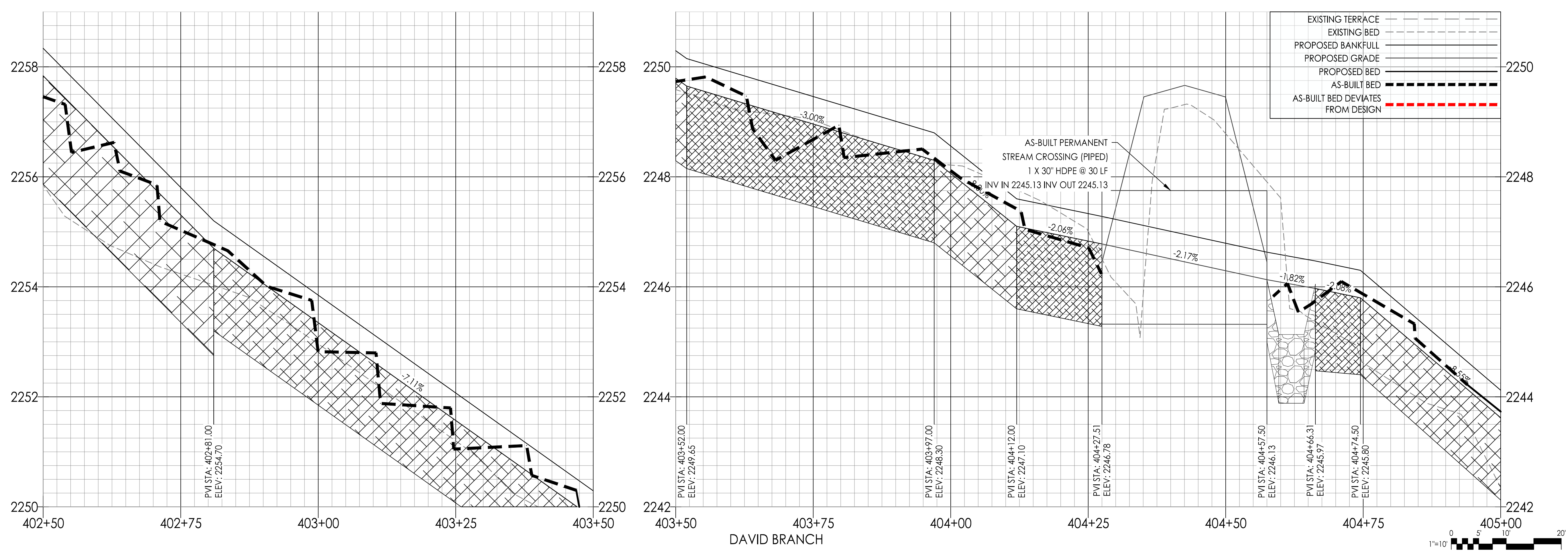


LEGEND

- PROPOSED STREAM RESTORATION
- PROPOSED RIPRAP
- PROPOSED BRUSH ENHANCED RIFFLE
- EXISTING WETLAND

AS-BUILT LEGEND

- TOP OF BANK
- TOP OF BANK DEVIATIONS
- THALWEG
- THALWEG DEVIATIONS
- PRESERVED TREE
- DEBRIS PLACEMENT
- BRUSH TOE
- BOULDER BRUSH RUN
- BRUSH RUN – LARGE



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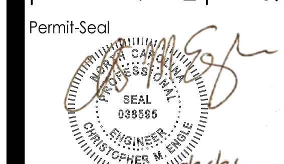
Revision	By	Appd.	YY.MM.DD
AS-BUILT REV-1 - NO DEVIATIONS NOTE	CME	CME	21.05.17

Issued	By	Appd.	YY.MM.DD

Client/Project
EW SOLUTIONS, LLC
SENIARD CREEK MITIGATION SITE
HENDERSON COUNTY, NC

Title
DAVID BRANCH - PLAN & PROFILE - AS-BUILT
STA 402+50 - 405+00

Permit-Seal



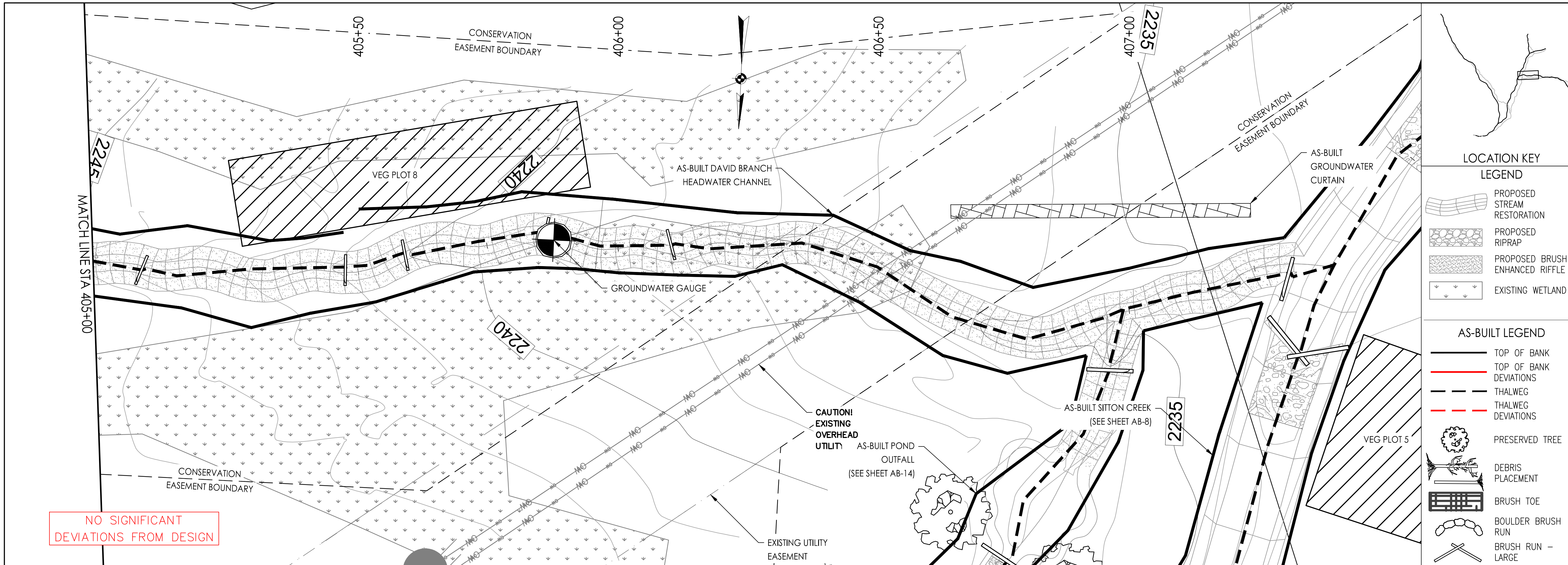
Project Number: 172621103

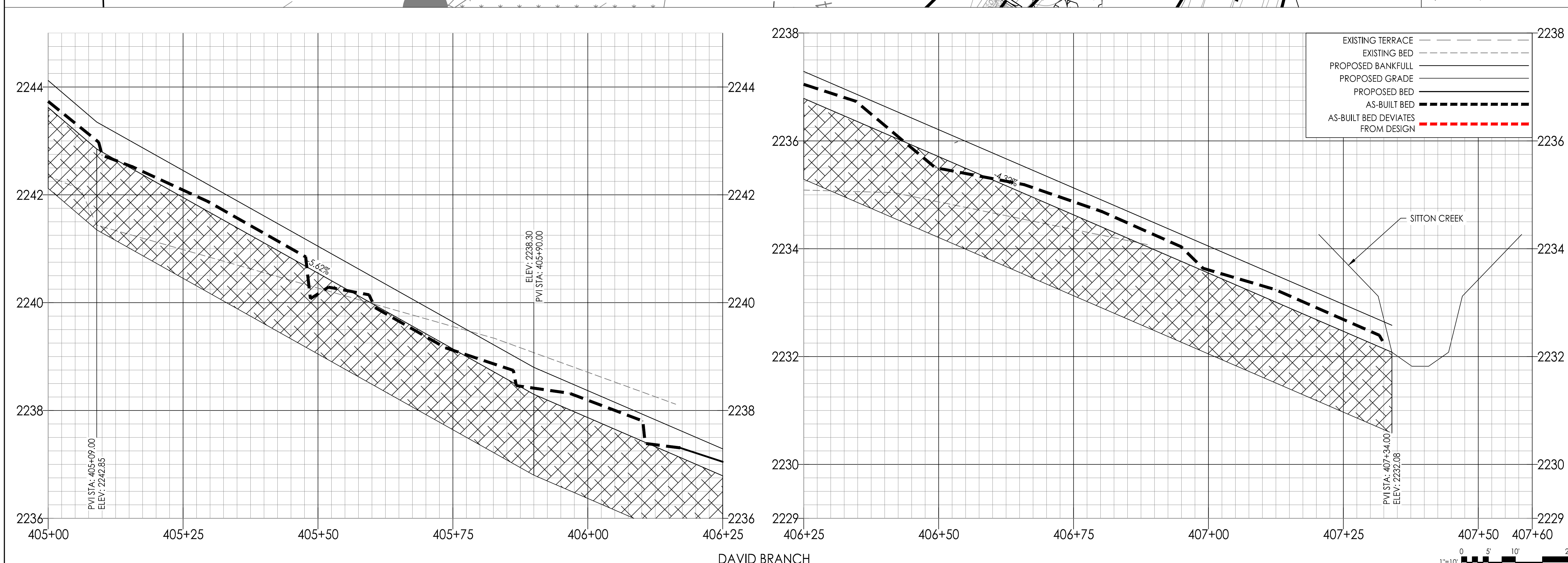
File Name: 1103-07-AB-David PLANPRO.dwg

CEG	SGG	CME	21.03.31
Dwn.	Chkd.	Dsgn.	YY.MM.DD

Drawing No. DAVID - (2)

Revision	Sheet
0	AB-11





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Revision	By	Appd.	YY.MM.DD
REV-2 - LABELS	CME	CME	20.07.14
AS-BUILT REV-1 - NO DEVIATIONS NOTE	CME	CME	21.05.17

Issued

Client/Project
EW SOLUTIONS, LLC
SENIARD CREEK MITIGATION SITE
HENDERSON COUNTY, NC

Title
DAVID BRANCH - PLAN & PROFILE - AS-BUILT
STA 405+00 - 407+50

Permit-Seal

NORTH CAROLINA PROFESSIONAL SEAL 038595 ENGINEER CHRISTOPHER M. ENGLE 5/26/21

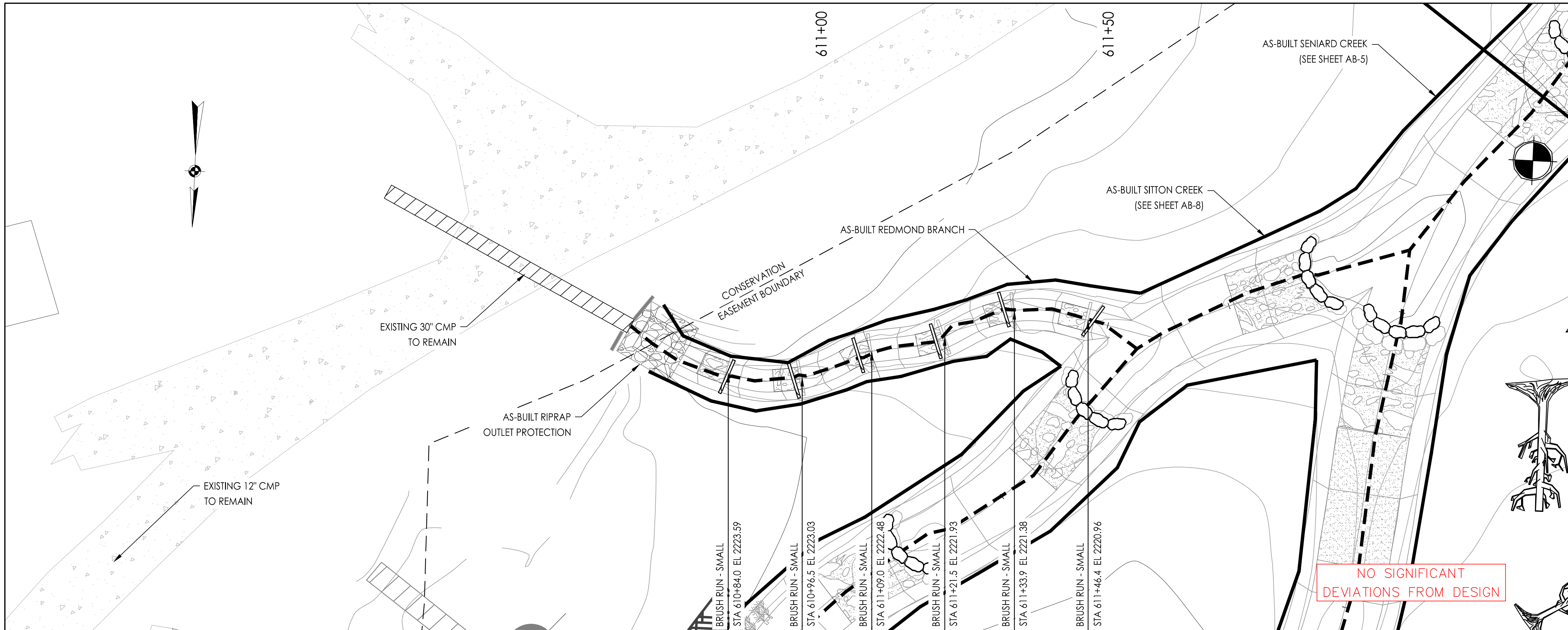
Project Number: 172621103

File Name: 1103-07-AB-David PLANPRO.dwg

CEG	SGG	CME	21.03.31
Dwn.	Chkd.	Dsgn.	YY.MM.DD

Drawing No. DAVID - (3)

Revision 2 Sheet AB-12



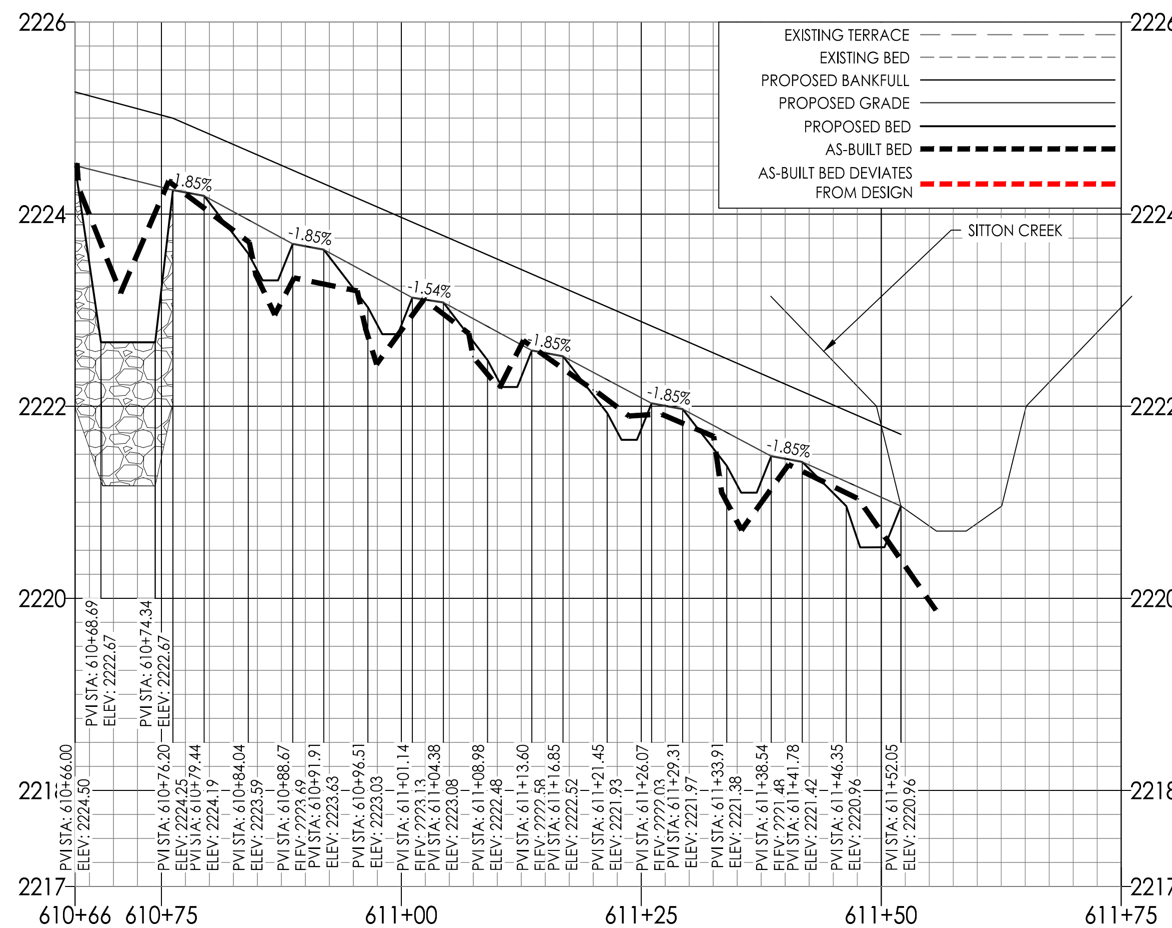
LOCATION KEY

LEGEND

- PROPOSED STREAM RESTORATION
- PROPOSED RIPRAP
- PROPOSED BRUSH ENHANCED RIFFLE
- EXISTING WETLAND

AS-BUILT LEGEND

- TOP OF BANK
- TOP OF BANK DEVIATIONS
- THALWEG
- THALWEG DEVIATIONS
- PRESERVED TREE
- DEBRIS PLACEMENT
- BRUSH TOE
- BOULDER BRUSH RUN
- BRUSH RUN – LARGE



REDMOND BRANCH

1"=10' 0 5' 10' 20'

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Revision	By	Appd.	YY.MM.DD
REV-2 - OUTLET PROTECT AND LABELS	CME	CME	21.05.17
AS-BUILT REV-1 - NO DEVIATIONS NOTE	CME	CME	20.07.14

Issued

Client/Project
EW SOLUTIONS, LLC

SENIARD CREEK MITIGATION SITE

HENDERSON COUNTY, NC

Title
REDMOND BRANCH - PLAN & PROFILE - AS-BUILT
STA 405+00 - 407+50

Permit-Seal

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 038595 CHRISTOPHER M. ENGLE 5/26/21

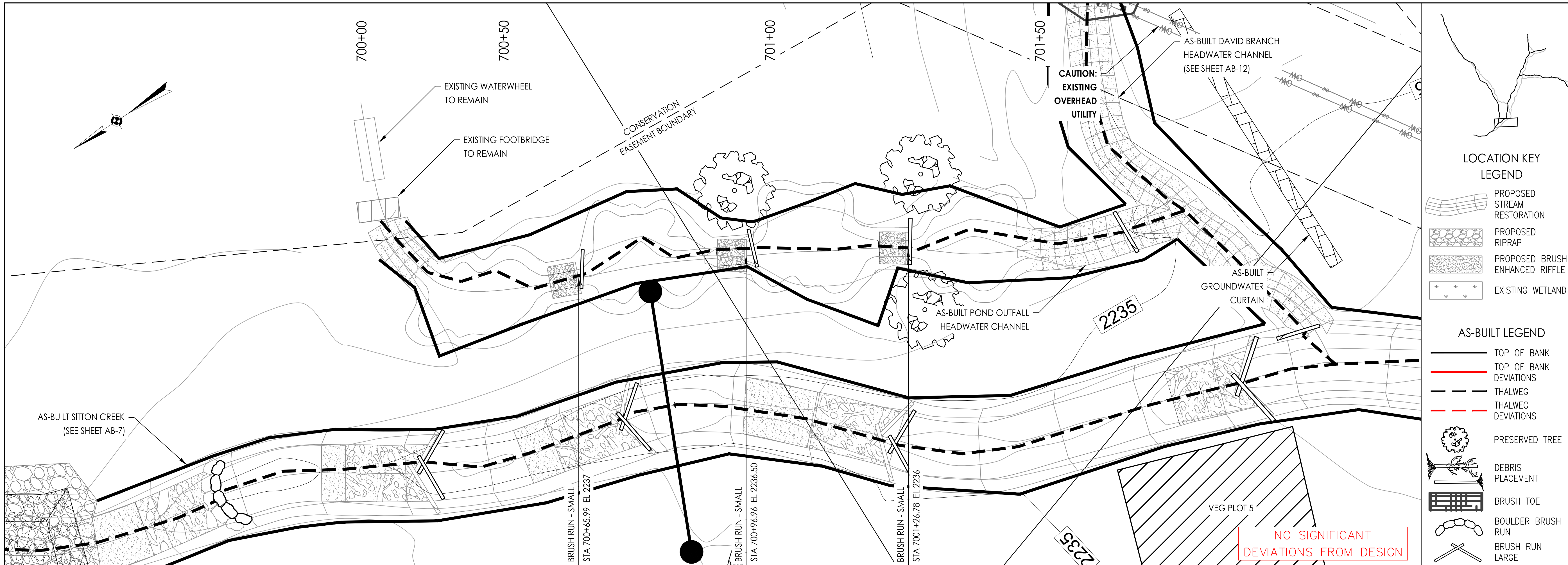
Project Number: 172621103

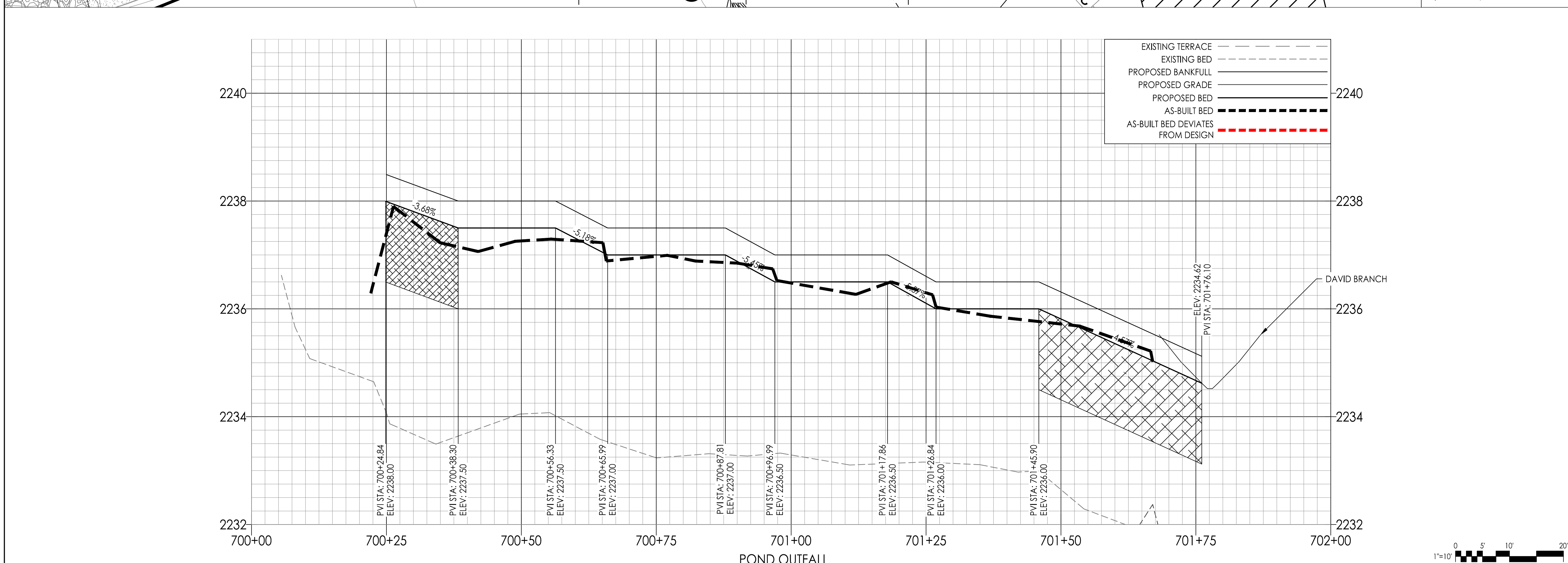
File Name: 1103-07-AB-David PLANPRO.dwg

CEG	SGG	CME	21.03.31
Dwn.	Chkd.	Dsgn.	YY.MM.DD

Drawing No. REDMOND (1)

Revision 2 Sheet AB-13





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Revision	By	Appd.	YY.MM.DD
REV-2 - LABELS	CME	CME	20.07.14
AS-BUILT REV-1 - NO DEVIATIONS NOTE	CME	CME	21.05.17

Issued

Client/Project
EW SOLUTIONS, LLC
SENIARD CREEK MITIGATION SITE
HENDERSON COUNTY, NC

Title
DAVID BRANCH - PLAN & PROFILE
STA 405+00 - 407+50

Permit-Seal
NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 038595 CHRISTOPHER M. ENGLE 5/26/21

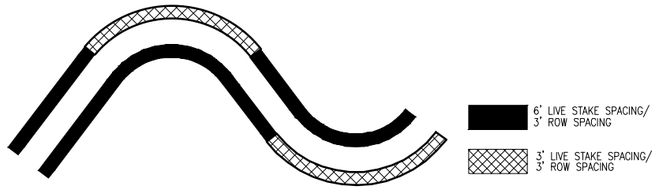
Project Number: 172621103

File Name: 1103-07-AB-David PLANPRO.dwg

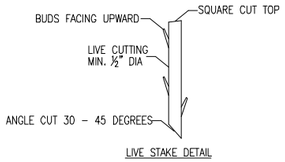
CEG	SGG	CME	21.03.31
Dwn.	Chkd.	Dsgn.	YY.MM.DD

Drawing No. POND OUTFALL

Revision 2 Sheet AB-14



PLAN VIEW



LIVE STAKE DETAIL

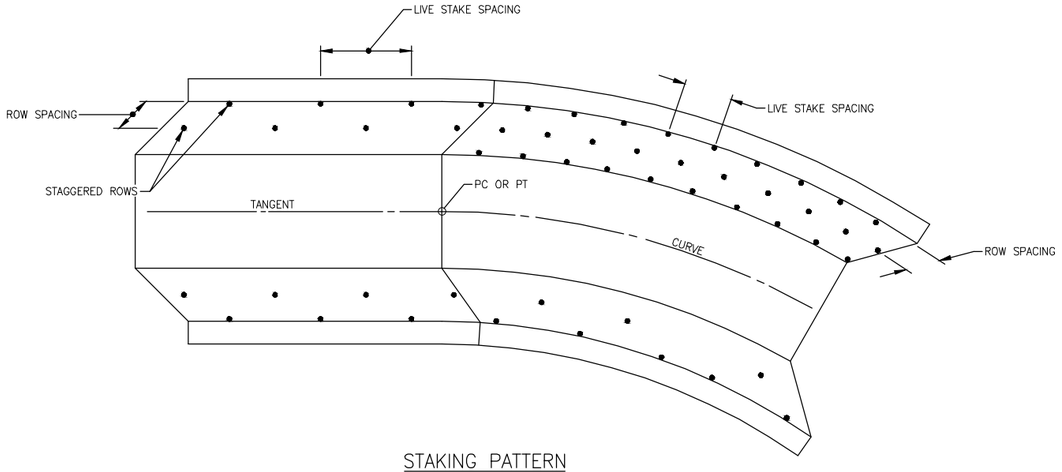
NUMBER OF LIVE STAKE ROWS			
CHANNEL DEPTH (FT)	INSIDE OF BEND	TANGENT	OUTSIDE OF BEND
0 - 1.5	1	1	2
1.5 - 2.5	2	2	3
2.5 - 3.5	3	3	4

PLANTING NOTES:

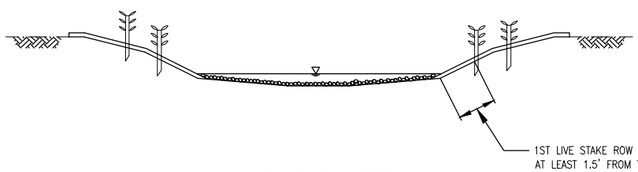
TEMPORARY AND PERMANENT SEED
1. ALL DISTURBED AREAS WILL BE STABILIZED USING MULCH AND TEMPORARY SEED TO PROVIDE ADEQUATE GROUND COVER AND CONDITION THE SOIL.
2. MULCH MUST BE ADDED TO ACHIEVE 95% COVERAGE (ROUGHLY 4 TONS/ACRE FOR WHEAT STRAW)
3. A FERTILITY SOIL TEST SHALL BE USED TO DETERMINE FERTILIZER AMOUNTS OR, IF NO SOIL TEST IS AVAILABLE, A STANDARD MIXTURE SHALL BE APPLIED OF 2 TONS OF LIME PER ACRE AND 700-1000 LBS OF 10-10-10 FERTILIZER PER ACRE.

BARE ROOT PLANTINGS
1. PLANT BARE ROOT SHRUBS AND TREES IN AREAS AS INDICATED ON THE PLANS.
2. PROVIDE 8 FT OF SPACING BETWEEN INSTALLED PLANTS YIELDING A DENSITY OF 680 STEMS/AC, DIVIDED EQUALLY BETWEEN AVAILABLE SPECIES.
3. LOOSEN COMPACTED SOIL AND PLANT IN HOLES FORMED WITH A MATTOCK, DIBBLE BAR OR EQUAL.
4. PROVIDE PLANTING HOLE SUFFICIENT IN SIZE AND DEPTH TO PREVENT CROWDING OF ROOTS.
5. ROOTS SHALL BE KEPT MOIST DURING TRANSPORTATION, DISTRIBUTION, AND INSTALLATION.
6. PLANTS SHALL BE HEELED-IN INTO MOIST SOIL IF NOT PROMPTLY PLANTED AFTER DELIVERY TO THE PROJECT SITE.

LIVE STAKES:
1. STAKES SHOULD BE SPACED ACCORDING TO PLAN VIEW DETAIL AND DIVIDED EQUALLY BETWEEN THE AVAILABLE SPECIES.
2. STAKES SHOULD BE CUT AND INSTALLED ON THE SAME DAY.
3. STAKES THAT ARE SPLIT SHALL NOT BE INSTALLED.
4. STAKES SHALL BE INSTALLED ORTHOGONAL TO THE BANK AND WITH BUDS POINTING UPWARDS.
5. STAKES SHALL BE ½ TO 2 INCHES IN DIAMETER AND 2 TO 3 FEET IN LENGTH.
6. AFTER INSTALLATION, THE TOP PORTION OF STAKES SHALL BE PRUNED WITH A SQUARE CUT LEAVING NO LESS THAN 3 INCHES AND NO MORE THAN 6 INCHES ABOVE THE GROUND.



STAKING PATTERN
NOT TO SCALE



RIFFLE SECTION
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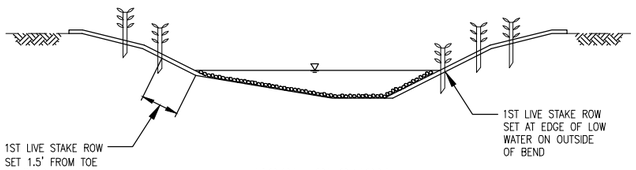

POOL SECTION
NOT TO SCALE

RIPARIAN & WETLAND PLANTINGS - BY STREAM

	Seniard Creek			Sitton Creek			Lee Branch		
	RIPARIAN AREA = 3.07 AC	WETLAND AREA = 0.04 AC	Setting RIP - RIPARIAN WET -	RIPARIAN AREA = 0.79 AC	WETLAND AREA = 1.07AC	Setting RIP - RIPARIAN WET -	RIPARIAN AREA = 0.45 AC	WETLAND AREA = 0.0 AC	Setting RIP - RIPARIAN WET - WETLAND
	COMMON NAME	SCIENTIFIC NAME		COMMON NAME	SCIENTIFIC NAME		COMMON NAME	SCIENTIFIC NAME	
TREES	River Birch	*Betula nigra*	RIP	River Birch	*Betula nigra*	RIP	Serviceberry	*Amelanchier arborea*	RIP
	Tulip poplar	*Liriodendron tulipifera*	RIP	Tulip poplar	*Liriodendron tulipifera*	RIP	Northern Red Oak	*Quercus rubra*	RIP
	Black Tupelo	*Nyssa sylvatica*	RIP	Black Tupelo	*Nyssa sylvatica*	RIP	American Beech	*Fagus grandifolia*	RIP
	Black Willow	*Salix nigra*	RIP / WET	American Holly	*Ilex opaca*	RIP	Black Tupelo	*Nyssa sylvatica*	RIP
	~~Green Ash~~	~~*Fraxinus Pennsylvanica*~~	~~RIP /WET~~	Black Willow	*Salix nigra*	RIP / WET	American Holly	*Ilex opaca*	RIP
	American Sycamore	*Platanus occidentalis*	RIP / WET	American Sycamore	*Platanus occidentalis*	RIP / WET	American Hornbeam	*Carpinus caroliniana*	RIP
	Pignut Hickory	*Carya Glabra*	RIP	Pignut Hickory	*Carya Glabra*	RIP	Pignut Hickory	*Carya Glabra*	RIP
	Mockernut Hickory	*Carya Tomentosa*	RIP	Mockernut Hickory	*Carya Tomentosa*	RIP	Mockernut Hickory	*Carya Tomentosa*	RIP
	Shingle Oak	*Quericus Inpricaria*	RIP	Shingle Oak	*Quericus Inpricaria*	RIP	Shingle Oak	*Quericus Inpricaria*	RIP
SHRUBS	Smooth Alder	*Alnus serrulata*	WET	Smooth Alder	*Alnus serrulata*	WET	American Witch-Hazel	*Hamamelis virginiana*	RIP
	Red Chokeberry	*Aronia arbutifolia*	WET	Red Chokeberry	*Aronia arbutifolia*	WET	Highbush Blueberry	*Vaccinium corymbosum*	RIP
	Winterberry	*Ilex verticillata*	WET	Winterberry	*Ilex verticillata*	WET	Sweet Pepperbush	*Clethra alnifolia*	RIP
	Black Elderberry	*Sambucus canadensis*	WET	Black Elderberry	*Sambucus canadensis*	WET	Smooth Alder	*Alnus serrulata*	WET
							Winterberry	*Ilex verticillata*	WET
							Black Elderberry	*Sambucus canadensis*	WET
							Red Chokeberry	*Aronia arbutifolia*	WET
LIVE STAKES	Silky dogwood	*Cornus amomum*		Silky dogwood	*Cornus amomum*		Silky dogwood	*Cornus amomum*	
	Elderberry	*Sambucus canadensis*		Elderberry	*Sambucus canadensis*		Elderberry	*Sambucus canadensis*	
	Black Willow	*Salix nigra*		Black Willow	*Salix nigra*				

RIPARIAN & WETLAND PLANTINGS - BY STREAM

	David Branch			Whitaker Branch			Redmond Branch		
	RIPARIAN AREA = 1.42 AC	WETLAND AREA = 0.28 AC	Setting RIP - RIPARIAN WET - WETLAND	RIPARIAN AREA = 0.76 AC	WETLAND AREA = 0.11 AC	Setting RIP - RIPARIAN WET - WETLAND	RIPARIAN AREA = 2.16 AC	WETLAND AREA = 0.35 AC	Setting RIP - RIPARIAN WET - WETLAND
	COMMON NAME	SCIENTIFIC NAME		COMMON NAME	SCIENTIFIC NAME		COMMON NAME	SCIENTIFIC NAME	
TREES	Serviceberry	*Amelanchier arborea*	RIP	Serviceberry	*Amelanchier arborea*	RIP	Serviceberry	*Amelanchier arborea*	RIP
	Northern Red Oak	*Quercus rubra*	RIP	Northern Red Oak	*Quercus rubra*	RIP	Northern Red Oak	*Quercus rubra*	RIP
	Sassafras	*Sassafras albidum*	RIP	Sassafras	*Sassafras albidum*	RIP	Sassafras	*Sassafras albidum*	RIP
	Sourwood	*Oxydendrum arboreum*	RIP	Sourwood	*Oxydendrum arboreum*	RIP	Sourwood	*Oxydendrum arboreum*	RIP
	American Holly	*Ilex opaca*	RIP	American Holly	*Ilex opaca*	RIP	American Holly	*Ilex opaca*	RIP
	American Hornbeam	*Carpinus caroliniana*	RIP	American Hornbeam	*Carpinus caroliniana*	RIP	American Hornbeam	*Carpinus caroliniana*	RIP
SHRUBS	American Witch-Hazel	*Hamamelis virginiana*	RIP	American Witch-Hazel	*Hamamelis virginiana*	RIP	American Witch-Hazel	*Hamamelis virginiana*	RIP
	Highbush Blueberry	*Vaccinium corymbosum*	RIP	Highbush Blueberry	*Vaccinium corymbosum*	RIP	Highbush Blueberry	*Vaccinium corymbosum*	RIP
	Sweet Pepperbush	*Clethra alnifolia*	RIP	Sweet Pepperbush	*Clethra alnifolia*	RIP	Sweet Pepperbush	*Clethra alnifolia*	RIP
	Smooth Alder	*Alnus serrulata*	WET	Smooth Alder	*Alnus serrulata*	WET	Smooth Alder	*Alnus serrulata*	WET
	Winterberry	*Ilex verticillata*	WET	Winterberry	*Ilex verticillata*	WET	Winterberry	*Ilex verticillata*	WET
	Black Elderberry	*Sambucus canadensis*	WET	Black Elderberry	*Sambucus canadensis*	WET	Black Elderberry	*Sambucus canadensis*	WET
	Red Chokeberry	*Aronia arbutifolia*	WET	Red Chokeberry	*Aronia arbutifolia*	WET	Red Chokeberry	*Aronia arbutifolia*	WET
				Smooth Witherod	*Viburnum nudum*	WET	Smooth Witherod	*Viburnum nudum*	WET
LIVE STAKES	Silky dogwood	*Cornus amomum*		Silky dogwood	*Cornus amomum*		Silky dogwood	*Cornus amomum*	
	Elderberry	*Sambucus canadensis*		Elderberry	*Sambucus canadensis*		Elderberry	*Sambucus canadensis*	

NOTE: PLANT SPECIES TO BE INSTALLED SHALL BE DEPENDENT ON SPECIES AVAILABILITY. CONTRACTOR MAY MODIFY COMPOSITION AS APPROVED BY ENGINEER.

PERMANENT RIPARIAN MIX		
Riparian Buffer Mix (Mellow Marsh Farm)		
COMMON NAME	SCIENTIFIC NAME	% MIX
Autumn bentgrass	*Agrostis perennans*	15
Big bluestem	*Andropogon gerardii*	10
Lanceleaf coreopsis	*Coreopsis lanceolata*	10
Virginia wild rye	*Elymus virginicus*	20
Soft rush	*Juncus effusus*	5
Switchgrass	*Panicum virgatum*	15
Black-eyed susan	*Rudbeckia hirta*	10
Little bluestem	*Schizachyrium scoparium*	5
Indian grass	*Sorghastrum nutans*	5
Eastern gamagrass	*Tripsacum dactyloides*	5
Recommended application rate 20-25 lbs. per acre		

PERMANENT WETLAND MIX		
Wetland Seed Mix (Mellow Marsh)		
COMMON NAME	SCIENTIFIC NAME	% MIX
Showy tickseed sunflower	*Bidens aristosa*	7
Fox sedge	*Carex vulpinoidea*	12
Deer tongue	*Dichanthelium clandestinum*	8
Riverbank wildrye	*Elymus riparius*	20
Soft rush	*Juncus effusus, NC Ecotype*	4
Smooth panicgrass	*Panicum dichotomiflorum*	14
Redtop panicgrass	*Panicum rigidulum*	8
Switchgrass	*Panicum virgatum*	23
Pennsylvania smartweed	*Polygonum pensylvanicum*	2
Eastern bur reed	*Sparganium americanum*	2
Recommended application rate 20-25 lbs. per acre		

NOTE: PERMANENT WETLAND MIX SHALL BE APPLIED TO ALL EXISTING AND PROPOSED WETLAND AREAS. PERMANENT RIPARIAN MIX SHALL BE APPLIED TO ALL OTHER AREAS INSIDE CONSERVATION EASEMENT.

COMMON NAME	SCIENTIFIC NAME	SEEDING DENSITY (lbs/acre)	SEEDING DATES
Temporary Seeding			
Partridge Pea	*Chamaecrista fasciculata*	8	MAR 15 - OCT 15
Daikon Radish	*Paphanussativus var. longipinnatus*	8	MAR 15 - OCT 15
Browntop Millet	*Echinochloa esculenta*	8	MAR 15 - OCT 15
Buckwheat	Fagopyrum esculentum	10	MAR 15 - OCT 15
Cereal Rye	Secale cereal	26	OCT 15 - MAR 15

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Revision	By	Appd.	YY.MM.DD
REV 2 - PLANTING TABLES	CME	CME	20.07.14
AS-BUILT REV-2 - PLANTING TABLE	CME	CME	21.10.14

Issued

Client/Project
EW SOLUTIONS, LLC
SENIARD CREEK MITIGATION SITE
HENDERSON COUNTY, NC

Title
PLANTING DETAILS - AS-BUILT

Permit-Seal

NORTH CAROLINA PROFESSIONAL SEAL 036595 ENGINEER CHRISTOPHER W. ENGLE
10/15/21

Project Number: 172621103

CEG	SGG	CME	21.05.17
Dwn.	Chkd.	Dsgn.	YY.MM.DD

Revision 0
Sheet AB - P-1

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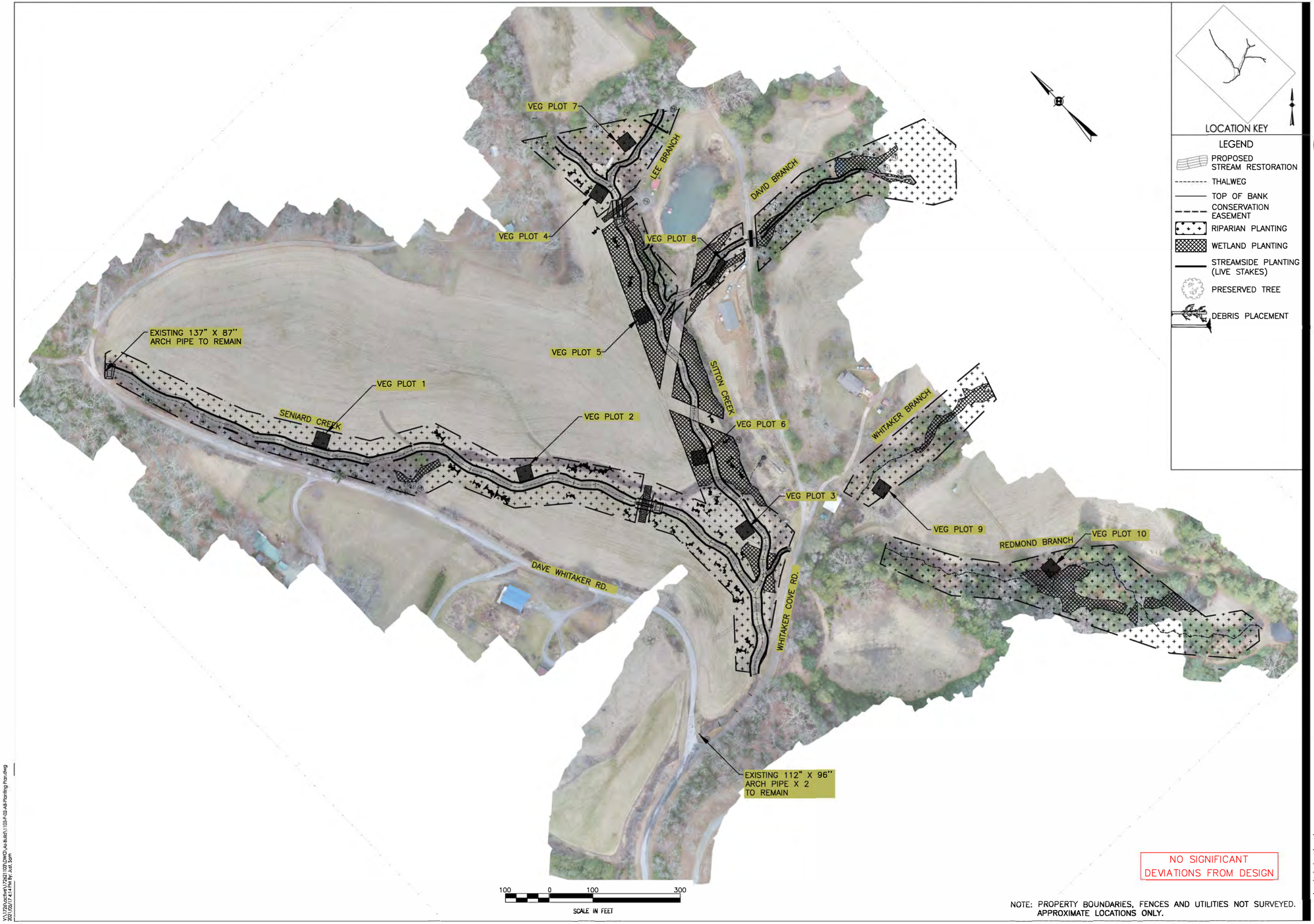

LOCATION KEY

LEGEND

- PROPOSED STREAM RESTORATION
- THALWEG
- TOP OF BANK
- CONSERVATION EASEMENT
- RIPARIAN PLANTING
- WETLAND PLANTING
- STREAMSIDE PLANTING (LIVE STAKES)
- PRESERVED TREE
- DEBRIS PLACEMENT

NO SIGNIFICANT DEVIATIONS FROM DESIGN

NOTE: PROPERTY BOUNDARIES, FENCES AND UTILITIES NOT SURVEYED. APPROXIMATE LOCATIONS ONLY.

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Revision	By	Appd.	Issued
REV 2 - LINE WEIGHTS	CME	CME	20.07.14
AS-BUILT REV-2 - SIGNATURE	CME	CME	21.10.14

Client/Project
EW SOLUTIONS
SENIARD CREEK MITIGATION SITE
HENDERSON COUNTY, NORTH CAROLINA

Title
PLANTING PLAN - AS-BUILT

Permit-Seal

NORTH CAROLINA PROFESSIONAL SEAL 038595 ENGINEER CHRISTOPHER M. ENGEL
10/15/21

Project Number: 172621103

CEG	SGG	CME	21.05.17
Dwn.	Chkd.	Dsgn.	YY.MM.DD

Revision 0
Sheet AB-P-2

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