

# As-built Baseline Monitoring Report FINAL

## Blair Creek Mitigation Project



Clay County, North Carolina

Hiwassee River Basin: 06020002

DMS Project ID No. 100047

RFP# 16-007278 (Issued: June 21, 2017)

DEQ Contract No. 7415

USACE Action ID No. SAW-2018-00449

DWR# 2020-1094

Baseline Data Collection Period: Dec. 2021 to  
Feb. 2022

Submitted to/Prepared for:

NC Department of Environmental Quality  
Division of Mitigation Services (DMS)  
1652 Mail Service Center  
Raleigh, North Carolina 27699-1652

**Michael Baker**

**INTERNATIONAL**

Submission Date: May 2022



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May 16, 2022

Matthew Reid, PM  
NCDENR, Division of Mitigation Services  
5 Ravenscroft Dr. – Suite 102  
Asheville, NC 28801

**Subject:** Response to DMS Comments (dated 5/9/22) for Draft As-Built Baseline Monitoring Report  
Blair Creek Mitigation Project, Clay County  
Hiwassee River Basin: 06020002  
DMS Project #100047, DEQ Contract #7415

Mr. Reid:

Please find below our responses to the NC Division of Mitigation Services (DMS) review comments dated May 9, 2022 in reference to the Blair Creek Mitigation Project's As-Built Baseline Monitoring Report. We have revised the Draft document in response to the referenced review comments as outlined below.

Title Page:

- DWR# is incorrect. Should be 2020-1094.
- Please add RFP# 16-007278 (Date of Issue: June 21, 2017)
- Recommend organizing project information in a list similar to enclosed example for easier reading. Photo size may be reduced if necessary.

**Response: Changes to the Title Page were made as requested.**

1.4 Mitigation Component Summary:

- Please include a discussion for the Reestablishment, Rehabilitation and Enhancement wetland work conducted on the site. Currently there is no discussion involving the wetlands.

**Response: A thorough discussion of the three wetland mitigation components were added to this section.**

1.5 Project Timeline:

- Please add the following or something similar: The Blair Creek Mitigation Project was instituted in January 2018. The Mitigation plan was approved by the IRT in November 2020.

**Response: Those statements were added as requested.**

1.6 Design Change Deviations:

- Please include a brief explanation as to why structures were omitted or substituted. Was it due to having onsite availability to materials, design concerns, etc.?

**Response: There are a combination of explanations for the structure changes noted in the red-line plans. Material cost and availability were important factors, along with feedback from the IRT over the past few years that wooden structures are generally preferred to rock when practicable and appropriate. The design changes noted in the plans do not impact the stability**

or functional uplift of the restored stream channels. In fact, significantly more large woody material has been added to the system (replacing rock/boulders). Text has been added in this section to explain the changes as requested.

- Section states that “The original planting plan was used by the planting contractor for ordering resulting in a discrepancy...” This is unclear, please elaborate for clarification. Were there two planting plans?

**Response: The original planting plan was modified between the Draft and Final versions of the Mitigation plan based on IRT comments. The planted species table was correctly revised in the Final Mitigation Plan vegetation section as discussed in Baker’s IRT response to comments letter. However, the planted species table shown in the construction plans (Sheet 1-A) was unfortunately not revised accordingly. Thus, the contractor initially began planting the original version of the species list (which were ultimately derived from the draft mit plan). The error was noted prior to the completion of planting and the erroneous species were removed from planting at that point. The text has been revised in this section to clarify this issue.**

- The four oaks (*lyrata*, *phellos*, *pagoda*, *michauxii*) listed in the section as planted but not approved in the Mitigation Plan and therefore not counted to determine planted densities. These species were included on Sheet 1-A of the approved Mitigation Plan. Please review and make corrections as necessary. Table 5, CCPV call outs and report will need to be updated if vegetation stem/ac totals change.

**Response: Those four oaks were not actually approved in the final, revised Mitigation Plan planted species table, though they had been incorrectly shown on the construction plan sheet species table (as explained above). Thus, they were not considered as counting towards vegetative success. Table 5, the CCPV, and all numbers and references to vegetation in the report only include those species that were accepted in the final revised list of approved species from the Mitigation Plan. Notably, despite the loss of several planted species allowed to count towards success, all veg plots on site have high planted densities and are expected to perform well throughout the monitoring period.**

Photo Points:

- Please add date photos were taken to top of pages or include photo date stamp.  
**Response: Dates were added to the photo-log as requested.**

Table 2:

- Remove 404 permit date line.
- Add “Project Instituted Jan-18” as the first entry in the table.
- Please add two lines below As-Built Baseline Monitoring Report (MY0) entry: “Vegetation Monitoring” and “Stream Survey” and the dates that these activities were completed. Please include this information for future monitoring reports.  
**Response: Table 2 was revised as requested.**

Table 6:

- Please include grid lines in the final submittal.  
**Response: Grid lines were added to Table 6 as requested.**

DMS conducted a field visit on May 5, 2022. The following comments/observations are a result of that visit:

- Overall, site is performing very well.

**Response: Thank you. We are also pleased with the site performance thus far.**

- Two structures have scour behind vane arms; Reach 1 log cross vane, sta: 24+75, and Reach 2 log J-hook vane, sta: 23+75.

**Response: Yes, Baker is aware of the scour around these two structures. Winter storms prior to the establishment of vegetation caused the damage and we are currently discussing repair options with the contractor, which will be conducted this year and documented in the MY1 monitoring report.**

- Monitoring Well #1 is located in an area approximately 1' lower than surrounding wetland reestablishment area. Recommend adding an additional well to document hydrology throughout reestablishment area.

**Response: Well #1 was placed where it is simply because that's roughly where it was shown on the proposed monitoring figure in the mitigation plan. However, as noted, it is currently found within a lower-lying portion of a point bar, as compared to the rest of the left bank floodplain. As this portion of the point bar is much smaller (only about 1,500 ft<sup>2</sup> or 0.03 ac) and quite obviously wetter than the adjacent floodplain (and thus not truly representative of the restoration area as a whole), Baker would prefer to relocate this well about 15-20 ft farther away from the channel and into the middle of the floodplain where the bulk of the wetland reestablishment is found (see proposed map below).**



- Left floodplain is bare from approximately sta: 10+50 – 14+00 on R1. Same area as Monitoring Well #1. Recommend over seeding this spring and/or fall.  
**Response: Yes, we also noticed a comparative lack of herbaceous vegetation coming up this spring in that area as well. We will certainly reseed here this fall.**

Digital Deliverable Comments

- Please include existing JD wetland shapefile with final submittal.  
**Response: The existing JD wetland shapefile has been included with the e-files.**

As requested, one hardcopy of the revised Final As-Built Baseline Monitoring report has been included with this response. A full electronic copy with support files is also included on a USB drive. Please do not hesitate to contact me should you have any questions regarding our response submittal.

Sincerely,



Scott King, LSS, PWS  
Project Manager

# TABLE OF CONTENTS

<b>1.0</b>	<b>PROJECT SUMMARY.....</b>	<b>3</b>
1.1	PROJECT DESCRIPTION.....	3
1.2	GOALS AND OBJECTIVES .....	3
1.3	PROJECT SUCCESS CRITERIA.....	4
1.4	MITIGATION COMPONENT SUMMARY.....	4
1.5	PROJECT TIMELINE.....	5
1.6	DESIGN CHANGE DEVIATIONS .....	5
1.7	VICINITY MAP .....	6
1.8	TECHNICAL AND METHODOLOGICAL DESCRIPTIONS AND REFERENCES.....	7

## APPENDICES

<b>Appendix</b>	<b>A</b>	<i>Background Tables and Figures</i>
	Table 1	Project Components and Mitigation Credits
	Figure 2	Project Asset Map
	Table 2	Project Activity and Reporting History
	Table 3	Project Contacts
	Table 4	Project Attributes
<b>Appendix</b>	<b>B</b>	<i>Visual Assessment Data</i>
	Figure 3	Current Condition Plan View (CCPV) Map
		Stream Station Photo-Points
		Vegetation Plot Photographs
		Crest Gauge and Groundwater Well Photographs
<b>Appendix</b>	<b>C</b>	<i>Vegetation Plot Data</i>
	Table 5	Planted Stem Counts by Plot and Species
<b>Appendix</b>	<b>D</b>	<i>Stream Measurement and Geomorphology Data</i>
	Table 6	Baseline Stream Data Summary
	Table 7	Cross-Section Morphology Data Summary
	Figure 4	Longitudinal Profiles
	Figure 5	MY0 Cross-Sections
<b>Appendix</b>	<b>E</b>	<i>As-Built Plan Sheets</i>

## 1.0 PROJECT SUMMARY

### 1.1 Project Description

Michael Baker Engineering, Inc. (Michael Baker) restored approximately 4,293 linear feet of existing stream along both the North and South Forks of Blair Creek and below the confluence on Blair Creek itself and enhanced 177 linear feet of an unnamed tributary (UT) to the South Fork. Additionally, the project has restored-by-reestablishment, restored-by-rehabilitation, or enhanced approximately 6.095 total acres of riparian wetlands. The project is located in the Blue Ridge Physiographic Region, within the Broad Basins Level IV ecoregion. The project watershed drains into the Hiwassee River approximately 1.4 miles downstream, ultimately emptying into the Tennessee River. Blair Creek and its tributaries are classified by NCDWR as Class “WS-IV” waters (NCDWR, 2016).

The Blair Creek Mitigation Project (project) is located on five abutting parcels of an active farm in Clay County, North Carolina, approximately 1.5 miles south of the Town of Hayesville as shown on the Project Vicinity Map (Figure 1). Historic agricultural use on the project site has predominantly been for a dairy operation and is currently utilized for row crop and hay production. These activities have negatively impacted both water quality and streambank stability along the project streams. The resulting observed stressors include streambank erosion, sedimentation, excess nutrient input, channel modification, wetland drainage, and the loss of riparian buffers.

The project is being conducted as part of the NCDMS Full Delivery In-Lieu Fee Program and is anticipated to generate a total of 4,363.37 cold stream mitigation credits and 5.772 wetland mitigation credits and will be protected by a 10.02-acre permanent conservation easement (Appendix B).

### 1.2 Goals and Objectives

The goals of this project are identified below:

- Establishment of geomorphically stable conditions along all project reaches,
- Improvement of water quality by reducing nutrient and sediment inputs,
- Restoration of natural stream and floodplain interactions,
- Restoration and enhancement of riparian wetland functions,
- Restoration and protection of riparian buffer functions and corridor habitat,
- Improvement of in-stream aquatic habitat, and
- Establishment of a permanent conservation easement on the entire project.

To accomplish these goals, the following objectives were identified:

- To restore appropriate bankfull dimensions, remove spoil berms, and/or raise channel beds, by utilizing either a Priority I Restoration approach or an Enhancement Level I approach.
- To construct streams of appropriate dimensions, pattern, and profile in restored reaches, slope stream banks and provide bankfull benches on enhanced streams and utilize bio-engineering to provide long-term stability.
- Construct the correct channel morphology along all stream channels, increasing the number and depth of pools utilizing structures including geo-lifts with brush toe, log vanes/weirs, root wads, and/or J-hooks.

- Raise ground water tables within the buffer through the implementation of Priority I restoration. Wetland vegetation will also be planted.
- Establish riparian buffers at a 30 foot minimum width along all stream reaches, planted with native tree and shrub species.
- Establish a permanent conservation easement restricting land use in perpetuity. This will prevent site disturbance and allow the project to mature and stabilize.

### 1.3 Project Success Criteria

The success criteria and performance standards for the project will follow the NCDMS's templates As-Built Baseline Monitoring Report Format, Data Requirements, and Content Guidance (June 2017), and the Annual Monitoring Report Format, Data Requirements, and Content Guidance (June 2017), and as described in Section 7 of the approved Mitigation Plan. All specific monitoring activities will follow those outlined in detail in Section 8 of the approved Mitigation Plan and will be conducted for a period of 7 years unless otherwise noted.

### 1.4 Mitigation Component Summary

The project involved the restoration or enhancement of four reaches, including the unnamed tributary, Reach 1 is on the North Fork of Blair Creek and has been historically impacted and altered through straightening and the removal of riparian vegetation and agricultural activities. As a result, it was an incised B to E4 stream type with bank scour occurring throughout the reach. A Priority Level I restoration approach was selected for R1 to fully restore stream and associated buffer functions. The channel will be raised to reconnect the stream to its historic floodplain. This will promote more frequent over bank flooding thus reducing erosive stream energies during storm events greater than the bankfull discharge and will improve adjacent groundwater hydrology. The restored channel was designed as a C4 stream type. The abandoned channel was filled.

Reach R2 is on the South Fork of Blair Creek and was improved using a Restoration approach. This reach flows northeast to the confluence with the North Fork of Blair Creek. It has been historically impacted and altered through straightening and the removal of riparian vegetation and agricultural activities. Like R1 the R2 channel was very incised with an average BHR of at least 2.0 on most of the channel. The restored channel was designed as a C4 stream type and was restored using a Priority Level I restoration approach with meandering riffle-pool morphology.

Reach 3 begins at the confluence of Reaches 1 and 2 (the North and South Forks of Blair Creek respectively) and flows east for approximately 185 feet, ending at a right-of-way for an overhead utility line. Reach 3 was improved using a restoration approach. A new stream channel alignment was built with appropriate dimensions and vertical eroding banks were stabilized and sloped back to allow access to the floodplain.

Reach UT1 was improved using an Enhancement Level II approach. This reach flows north to the confluence with the right bank of R2. Work along UT1 involved common Enhancement Level II practices to re-establish a woody buffer and to maintain the stability of the channel. Several in-stream structures were installed to improve bedform diversity and stabilize the channel as it drops down slope. A few areas of steep and eroding stream bank were sloped back, matted, and live-staked. The outfall of the culvert under Cherry Road was stabilized, though it is located just outside of the easement. And finally, the riparian buffers in excess of 30 feet were seeded and planted with woody species and protected along all reaches.

Additionally, the project involved a wetland mitigation component consisting of three separate approaches: restoration by re-establishment, restoration by rehabilitation, and wetland enhancement. The wetland re-establishment on site involved the restoration of appropriate wetland hydrology to hydric soils



not previously located within an existing jurisdictional wetland. This was accomplished by: connecting adjacent stream channels to their relic floodplains through Priority I stream restoration, planting a native wetland vegetation community, removing invasive species, removing dredge spoil berms located along stream banks, and the removal of subsurface drain pipes from wetland areas along Reach R1.

Wetland rehabilitation was accomplished by restoring most of the historic natural functions to heavily degraded, but still existing jurisdictional wetlands. The degradation consisted of clear impacts to both the hydrology and vegetation functions. The wetlands were adjacent to incised streams, had drain swales and sub-surface drain pipes present, and had their entire natural vegetation removed with no trees present. By correcting these impacts, the rehabilitation approach will result in significant improvements to both the wetland hydrology and vegetation functions within the existing wetland, but will not result in a gain in wetland resource area.

Wetland enhancement was accomplished by improving a specific degraded wetland function within an existing jurisdictional wetland, specifically to the vegetation function for this site. Enhancement of the existing wetlands on the project primarily involved an improvement to their vegetation community, supplementing with appropriate wetland community species, along with treatment or removal of all invasive vegetation present. Thus, this enhancement approach will primarily result in a minor improvement to the wetland vegetation function, but will not result in any gain in wetland resource area.

## 1.5 Project Timeline

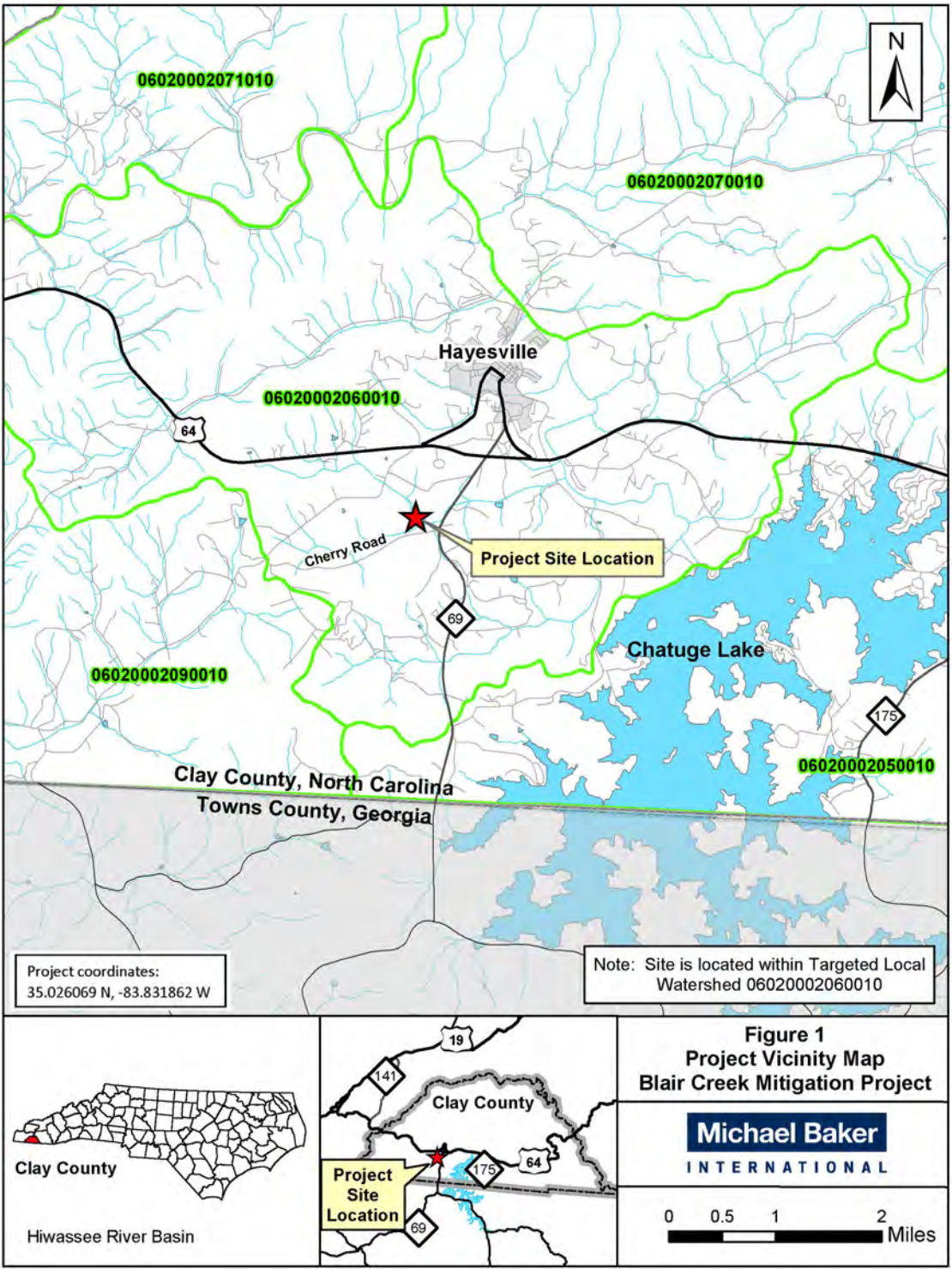
The Blair Creek Mitigation Project was instituted in January 2018. The Mitigation Plan was approved by the IRT in November of 2020. Project construction was initiated in July 2021 and completed in December 2021. Planting of live stakes and bareroot stems was completed in February 2022 and Monitoring Year 1 is on schedule for 2022 as shown in Table 2. The As-Built survey was completed in January of 2022. All 15 cross-sections and 3 crest gauges and 10 groundwater wells were installed in November 2021. The vegetation plots were installed in January of 2022. All wells, crest gauges, and the flow gauges are continuous logging Van Essen DIVER gauges. CE pins were located and the CE boundary was marked in March 2022.

## 1.6 Design Change Deviations

During project construction, there were a few, relatively minor deviations from the original design plans as marked in red in the as-built plans (Appendix E). Primarily these were substitutions made on in-stream structures replacing boulder structures with log structures. In some cases, a log vane was omitted and in three locations a constructed riffle replaced a grade control log jam. These changes were made due to material costs and availability at the time of construction, along with feedback from the IRT over the past few years that wooden structures are generally preferred to rock when practicable and appropriate. Significantly more large woody material has been added to the system (to replace rock/boulders). These design changes in no way impact the stability or functional uplift of the restored stream channels.

Additionally, there were minor deviations from the final, approved planting plan, which had been modified between the draft and final versions of the mitigation plan based on IRT comments. However, the revised species table was not incorporated as part of the final construction plan sheets used by the planting contractor, thus they used the older, outdated table for their bareroot orders. This error was discovered prior to the completion of planting however, and the erroneous species were removed from planting at that point. For this reason, some species were planted in different densities or were omitted. Four *Quercus* species (*lyrata*, *phellos*, *pagoda*, *michauxii*) were planted that were not approved in the final mitigation plan. However, only species that had been approved for planting in the final mitigation plan were used to determine the reported vegetation plot planted densities (in Table 5, the CCPV, etc). Likewise, only the approved species will be used for the determination of vegetation criteria success throughout the monitoring phase of the project.

1.7 Vicinity Map



## 1.8 Technical and Methodological Descriptions and References

Stream survey data was collected to a minimum of Class C Vertical and Class A Horizontal Accuracy using a Leica TS06 Total Station and was georeferenced to the NAD83 State Plane Coordinate System, FIPS3200 in US Survey Feet, which was derived from the As-built Survey. The survey data from the permanent project cross-sections were collected and classified using the Rosgen Stream Classification System to confirm design stream type (Rosgen 1994).

The six vegetation-monitoring quadrants (plots) were installed across the site in accordance with the CVS-DMS Protocol for Recording Vegetation, Version 4.1 (Lee 2007) and the data collected from each was input into the DMS Veg Table Production Tool (2021).

Ten automated groundwater monitoring wells were installed in the floodplain following USACE protocols (USACE 2005). The gauges themselves, both flow and groundwater gauges, are all Van Essen brand Baro-Diver data loggers.

### References:

- Carolina Vegetation Survey (CVS) and NC Division of Mitigation Services (DMS). CVS-DMS Data Entry Tool v. 2.3.1. University of North Carolina, Raleigh, NC. 2012.
- Lee, M., Peet R., Roberts, S., Wentworth, T. 2007. CVS-DMS Protocol for Recording Vegetation, Version 4.1.
- North Carolina Division of Water Resources (DWR). 2012. Hiwassee River Basinwide Water Quality Plan, North Carolina Department of Environmental Quality, Raleigh, NC. Available at URL: <https://deq.nc.gov/about/divisions/water-resources/planning/basin-planning/water-resource-plans/hiawasee-2012>
- North Carolina Division of Water Resources. 2016. Hiwassee River Basin Classification Schedule. Updated 2016. NC Department of Environmental Quality. Raleigh, NC. Available at: <https://deq.nc.gov/river-basin-classification-schedule>
- North Carolina Division of Mitigation Services. 2008. Hiwassee River Basin Restoration Priorities (Amended 2018). NC Department of Environmental Quality. Raleigh, NC.
- North Carolina Interagency Review Team (NCIRT). 2016. Guidance document “*Wilmington District Stream and Wetland Compensatory Mitigation Update*”. October 24, 2016
- Rosgen, D.L. 1994. A Classification of Natural Rivers. *Catena* 22:169-199.
- Rosgen, D.L. 1996. Applied River Morphology. Wildlands Hydrology. Pagosa Springs, CO.
- United States Army Corps of Engineers (USACE). 2005. “Technical Standard for Water-Table Monitoring of Potential Wetland Sites,” WRAP Technical Notes Collection (ERDC TN-WRAP-05-2), U.S. Army Engineer Research and Development Center. Vicksburg, MS.

# **APPENDIX A**

## Background Tables and Figures

**Table 1. Project Mitigation Assets and Components**  
**Blair Creek Stream Mitigation Project - NCDMS Project No. 100047**

Project Component (reach ID, etc.)	Wetland Position and HydroType	Existing Footage or Acreage	Stationing	Mitigation Plan Footage or Acreage	As-Built Footage <sup>1</sup> or Acreage	Restoration Level	Approach Priority Level	Mitigation Ratio (X:1)	Mitigation Plan Credits <sup>2</sup>
Reach 1		2,399	10+00 - 2501.60, 2531.66 - 3771.92	2,699.76	2,741.86	R	P1	1.0	2,699.760
Reach 2		1,468	09+99.88 - 13+72.39, 14+20.16 - 2555.18	1,473.91	1,507.53	R	P1	1.0	1,473.910
Reach 3		185	25+55.18 - 26+88.82	118.94	133.64	R	P1	1.0	118.940
Reach UT1		195	10+14.97 - 11+88.00	176.9	173.03	EII	-	2.5	70.760
Wetland 1		5.218		5.218	5.217	R	Re-establishment	1.0	5.218
Wetland 2		0.693		0.693	0.691	R	Rehabilitation	1.5	0.462
Wetland 3		0.184		0.184	0.179	E	Enhancement	2.0	0.092

1 All stream stationing and restored footage numbers reported here and shown in the as-built plan sheets use thalweg survey values and have had easement breaks removed.

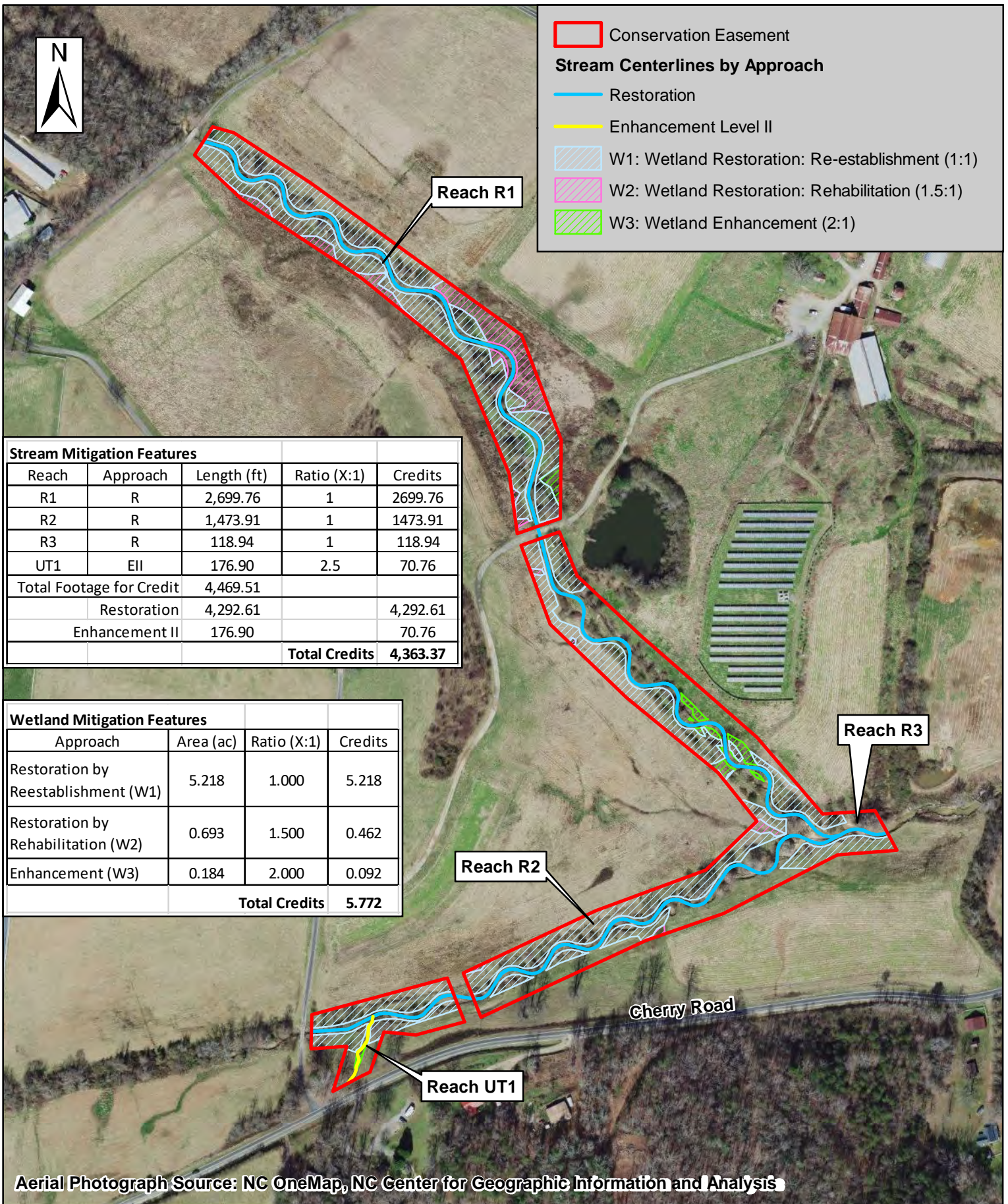
2 Credits reported here are derived from the design lengths and taken from the approved mitigation plan Table 11.1

**As-Built Centerline Length and Area Summations by Mitigation Category**

Restoration Level	Stream (linear feet)	Riparian Wetland (acres)		Non-riparian Wetland (acres)	Credited Buffer (square feet)
		Riverine	Non-Riverine		
Restoration	4,383				
Enhancement I					
Enhancement II	173				
Re-establishment		5.217			
Rehabilitation		0.691			
Wetland		0.179			
Creation					
Preservation					
High Quality Pres.					

**Overall Assets Summary**

Asset Category	Overall Credits
Stream	<b>4,363.370</b>
RP Wetland	<b>5.772</b>
NR Wetland	
Buffer	



**Conservation Easement**

**Stream Centerlines by Approach**

- Restoration
- Enhancement Level II
- W1: Wetland Restoration: Re-establishment (1:1)
- W2: Wetland Restoration: Rehabilitation (1.5:1)
- W3: Wetland Enhancement (2:1)

Stream Mitigation Features				
Reach	Approach	Length (ft)	Ratio (X:1)	Credits
R1	R	2,699.76	1	2699.76
R2	R	1,473.91	1	1473.91
R3	R	118.94	1	118.94
UT1	EII	176.90	2.5	70.76
Total Footage for Credit		4,469.51		
Restoration		4,292.61		4,292.61
Enhancement II		176.90		70.76
			<b>Total Credits</b>	<b>4,363.37</b>

Wetland Mitigation Features			
Approach	Area (ac)	Ratio (X:1)	Credits
Restoration by Reestablishment (W1)	5.218	1.000	5.218
Restoration by Rehabilitation (W2)	0.693	1.500	0.462
Enhancement (W3)	0.184	2.000	0.092
<b>Total Credits</b>			<b>5.772</b>

Aerial Photograph Source: NC OneMap, NC Center for Geographic Information and Analysis

	<p>North Carolina Division of Mitigation Services DMS Proj. No. 100047</p>		<p><b>Figure 2: Project Asset and Credit Map</b> Blair Creek Mitigation Project Clay County, NC</p>
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**Table 2. Project Activity and Reporting History**  
**Blair Creek Stream Mitigation Project - NCDMS Project No. 100047**

<b>Elapsed Time Since grading complete:</b>		<b>4 months</b>
<b>Elapsed Time Since planting complete:</b>		<b>3 months</b>
<b>Number of Reporting Years<sup>1</sup>:</b>		<b>0</b>
<b>Activity or Deliverable</b>	<b>Data Collection Complete</b>	<b>Completion or Delivery</b>
Project Instituted	N/A	18-Jan
Mitigation Plan	N/A	Jan-21
Final Design – Construction Plans	N/A	May-21
Construction Grading Completed	N/A	Dec-21
As-Built Survey	Jan-22	Jan-22
<i>Stream Survey</i>	Jan-22	Jan-22
<i>Vegetation Monitoring</i>	Feb-22	Feb-22
Livestake and Bareroot Planting Completed	Feb-22	Feb-22
As-Built Baseline Monitoring Report (MY0)	Mar-22	Apr-22
Year 1 Monitoring	-----	-----
Year 2 Monitoring	-----	-----
Year 3 Monitoring	-----	-----
Year 4 Monitoring	-----	-----
Year 5 Monitoring	-----	-----
Year 6 Monitoring	-----	-----
Year 7 Monitoring	-----	-----

<sup>1</sup> = The number of monitoring reports excluding the as-built/baseline report

**Table 3. Project Contacts**  
**Blair Creek Stream Mitigation Project - NCDMS Project No.**

<b>Designer</b>	
<b>Michael Baker Engineering, Inc.</b>	8000 Regency Parkway, Suite 600 Cary, NC 27518 Contact: Katie McKeithan, Tel. 919-481-5703
<b>Construction Contractor</b>	
<b>KBS Earthworks, Inc.</b>	5616 Coble Church Rd Julian, NC 27283 Contact: Kory Strader, Tel. 336-362-0289
<b>Survey Contractor</b>	
<b>Kee Mapping and Surveying</b>	88 Central Avenue Asheville, NC 28801 Contact: Brad Kee, Tel. 828-575-9021
<b>Planting Contractor</b>	
<b>Ripple EcoSolutions</b>	215 Moonridge Road Chapel Hill, NC 27516 Contact: George Morris, Tel. 919-818-3984
<b>Seeding Contractor</b>	
<b>KBS Earthworks, Inc.</b>	5616 Coble Church Rd Julian, NC 27283 Contact: Kory Strader, Tel. 336-362-0289
<b>Seed Mix Sources</b>	
<b>Green Resources</b>	5204 Highgreen Court, Colfax, NC 27235 Telephone: 336-855-6363
<b>Nursery Stock Suppliers</b>	
Dykes and Son Nursery	825 Maude Etter Road, McMinnville, TN 37110 Telephone: 919-742-1200
Native Forest Nursery	11306 US-441, Chatswort, GA 30705 Telephone: 336-855-6363
<b>Monitoring Performers</b>	
<b>Michael Baker Engineering, Inc.</b>	8000 Regency Parkway, Suite 600 Cary, NC 27518
Stream Monitoring POC	Katie McKeithan, Tel. 919-481-5703
Vegetation Monitoring POC	Katie McKeithan, Tel. 919-481-5703



**Table 4. Project Baseline Information and Attributes**  
**Blair Creek Stream Mitigation Project - NCDMS Project No. 100047**

<b>Table 4. Project Background Information</b>				
Project Name		Blair Creek Stream Mitigation Project		
County		Clay County		
Project Area (acres)		10.02		
Project Coordinates (latitude and longitude)		35.026069 N, -83.831862 W		
Planted Acreage (Acres of Woody Stems Planted)		8.3		
<b>Project Watershed Summary Information</b>				
Physiographic Province		Level III Blue Ridge, Level IV; Broad Basins		
River Basin		Hiawassee		
USGS Hydrologic Unit 8-digit	6020002	USGS Hydrologic Unit 14-digit	06020002-060010	
DWR Sub-basin		04-05-01		
Project Drainage Area (Acres and Square Miles)		1,862 acres / 2.94 square miles (at confluence in Blair Creek)		
Project Drainage Area Percentage of Impervious Area		1.7% impervious area		
CGIA Land Use Classification		12.6% developed (predominantly rural residential), 55.7% forested, 29.8% cultivated crops and pasture/hay, 1.2% shrub/scrub, and 0.7% herbaceous.		
<b>Reach Summary Information</b>				
Parameters	Reach R1 (North Fork)	Reach R2 (South Fork)	Reach 3 (Blair Creek)	UT1
Length of reach (linear feet)	2,399	1,468	185	195
Valley confinement (Confined, moderately confined, unconfined)	Unconfined	Moderately Confined	Moderately Confined	Moderately Confined
Drainage area (Acres)	983	880	1,864	22
Perennial, Intermittent, Ephemeral	Perennial	Perennial	Perennial	Intermittent
NCDWR Water Quality Classification	WS-IV	WS-IV	WS-IV	N/A
Stream Classification (existing)	B-E4	E4	F4	B
Stream Classification (proposed)	C4	C4	C4	B
Evolutionary trend (Simon)	IV – Degradation and Widening	III – Degradation	V – Aggradation and Widening	III – Degradation
FEMA classification	Zone X	Zone X	Zone AE	Zone X
<b>Wetland Summary Information</b>				
Parameter	W-B	W-C	W-D	W-E
Size of Wetland within CE (acres)	0.512	0.051	0.153	0.024
Wetland Type	Riparian	Riparian	Riparian	Riparian
Mapped Soil Series	Arkaqua <sup>2</sup>	Arkaqua	Arkaqua	Arkaqua
Drainage Class	SPD	SPD	SPD	SPD
Soil Hydric Status	Yes	Yes	Yes	Yes
Source of Hydrology	Groundwater	Groundwater	Groundwater	Groundwater
Restoration or Enhancement Method	Vegetation	Vegetation	Vegetation	Vegetation

Table 4. Continued

Parameter	W-F	W-K	W-L	W-M
Size of Wetland within CE (acres)	0.010	0.035	0.059	0.014
Wetland Type	Riparian	Riparian	Riparian	Riparian
Mapped Soil Series	Arkaqua	Arkaqua	Arkaqua	Arkaqua
Drainage Class	SPD	SPD	SPD	SPD
Soil Hydric Status	Yes	Yes	Yes	Yes
Source of Hydrology	Groundwater	Groundwater	Groundwater	Groundwater
Restoration or Enhancement Method	Vegetation	Vegetation	Vegetation	Vegetation
Parameter	W-N	W-O	W-P	W-S
Size of Wetland within CE (acres)	0.009	0.004	0.132	0.013
Wetland Type	Riparian	Riparian	Riparian	Riparian
Mapped Soil Series	Arkaqua	Arkaqua	Arkaqua	Arkaqua
Drainage Class	SPD	SPD	SPD	SPD
Soil Hydric Status	Yes	Yes	Yes	Yes
Source of Hydrology	Groundwater	Groundwater	Groundwater	Groundwater
Restoration or Enhancement Method	Vegetation	Vegetation	Vegetation	Vegetation
Parameter	W-T			
Size of Wetland within CE (acres)	0.015			
Wetland Type	Riparian			
Mapped Soil Series	Arkaqua			
Drainage Class	SPD			
Soil Hydric Status	Yes			
Source of Hydrology	Groundwater			
Restoration or Enhancement Method	Vegetation			
Regulatory Considerations				
Parameters	Applicable?	Resolved?	Supporting Docs?	
Water of the United States - Section 404	Yes	Yes	PCN	
Water of the United States - Section 401	Yes	Yes	PCN	
Endangered Species Act	Yes	Yes	Categorical Exclusion	
Historic Preservation Act	Yes	Yes	Categorical Exclusion	
Coastal Zone Management Act (CZMA or CAMA)	No	N/A	N/A	
FEMA Floodplain Compliance	No	N/A	N/A	
Essential Fisheries Habitat	No	N/A	N/A	
Notes:				
<sup>1</sup> Source: USGS National Land Cover Database (NLCD) for 2016 <sup>2</sup> Arkaqua loam (0-2% slopes, frequently flooded)				

# **APPENDIX B**

## Visual Assessment Data



Fig. 3A

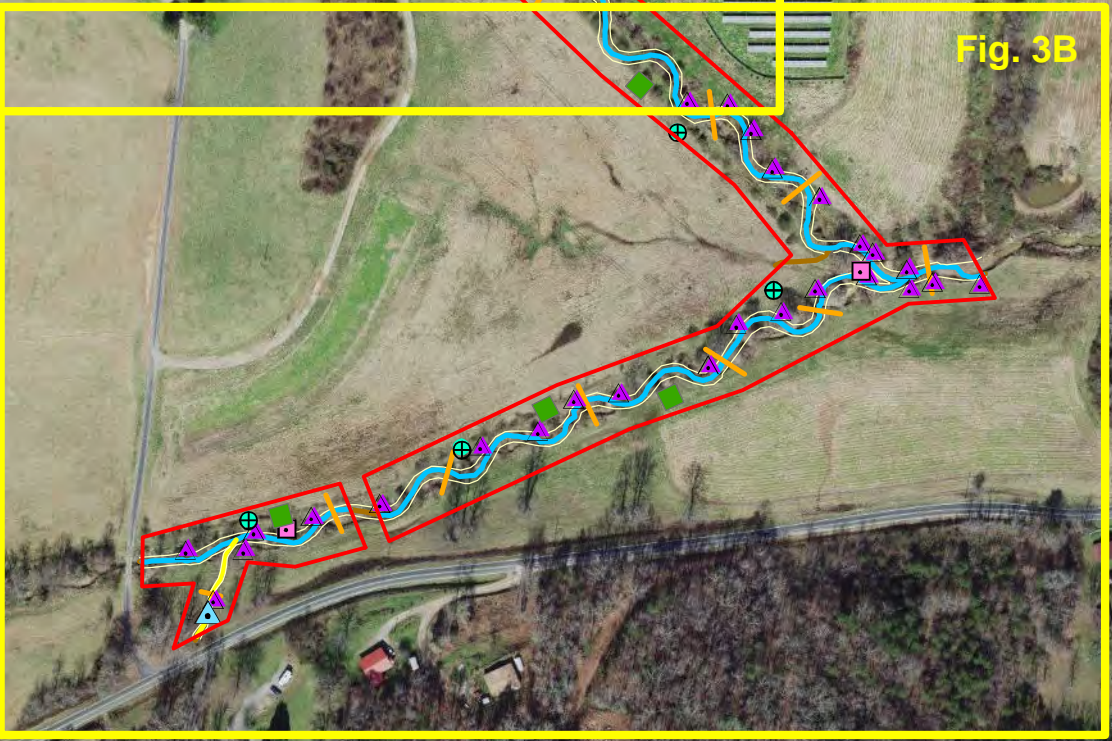
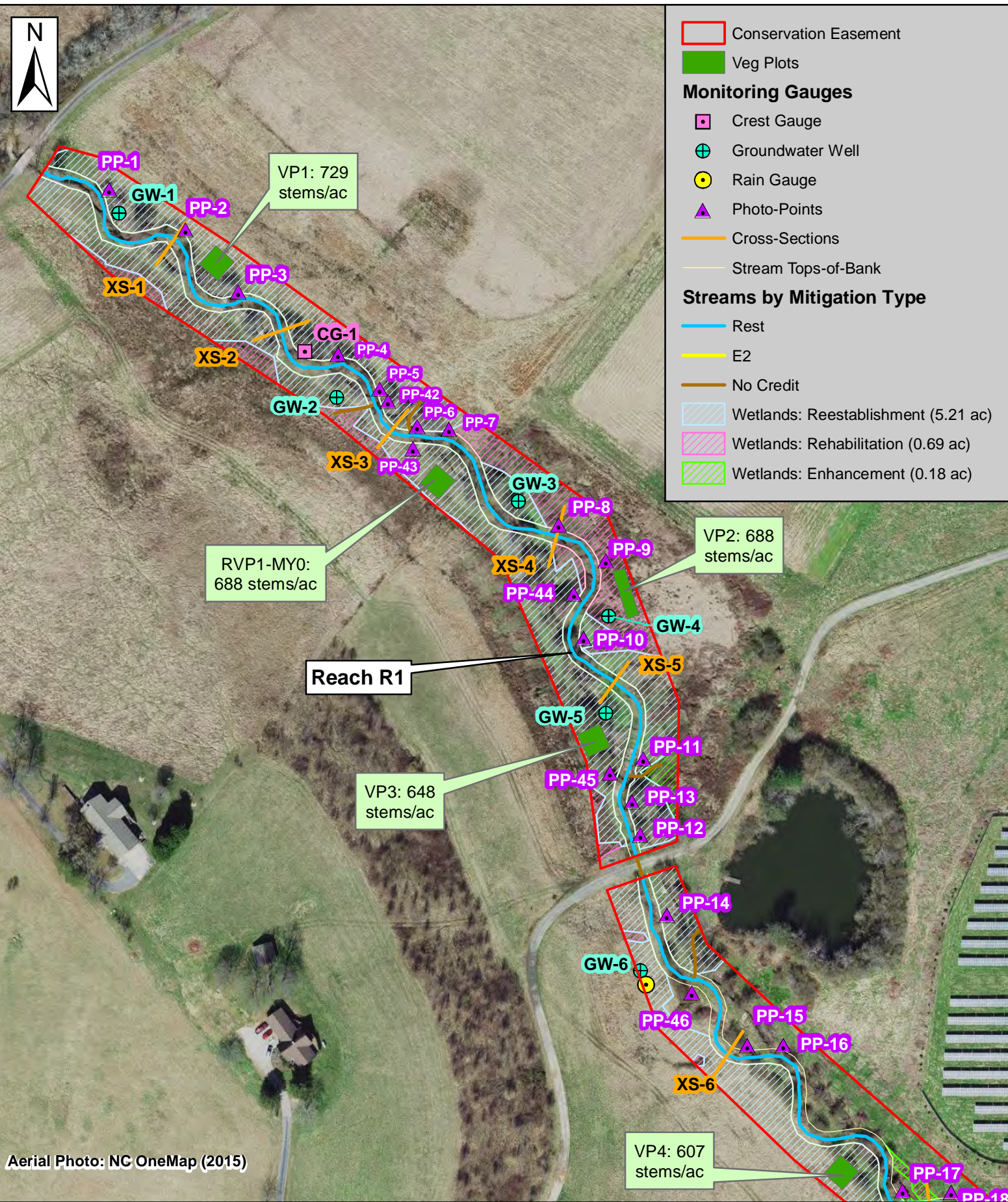


Fig. 3B



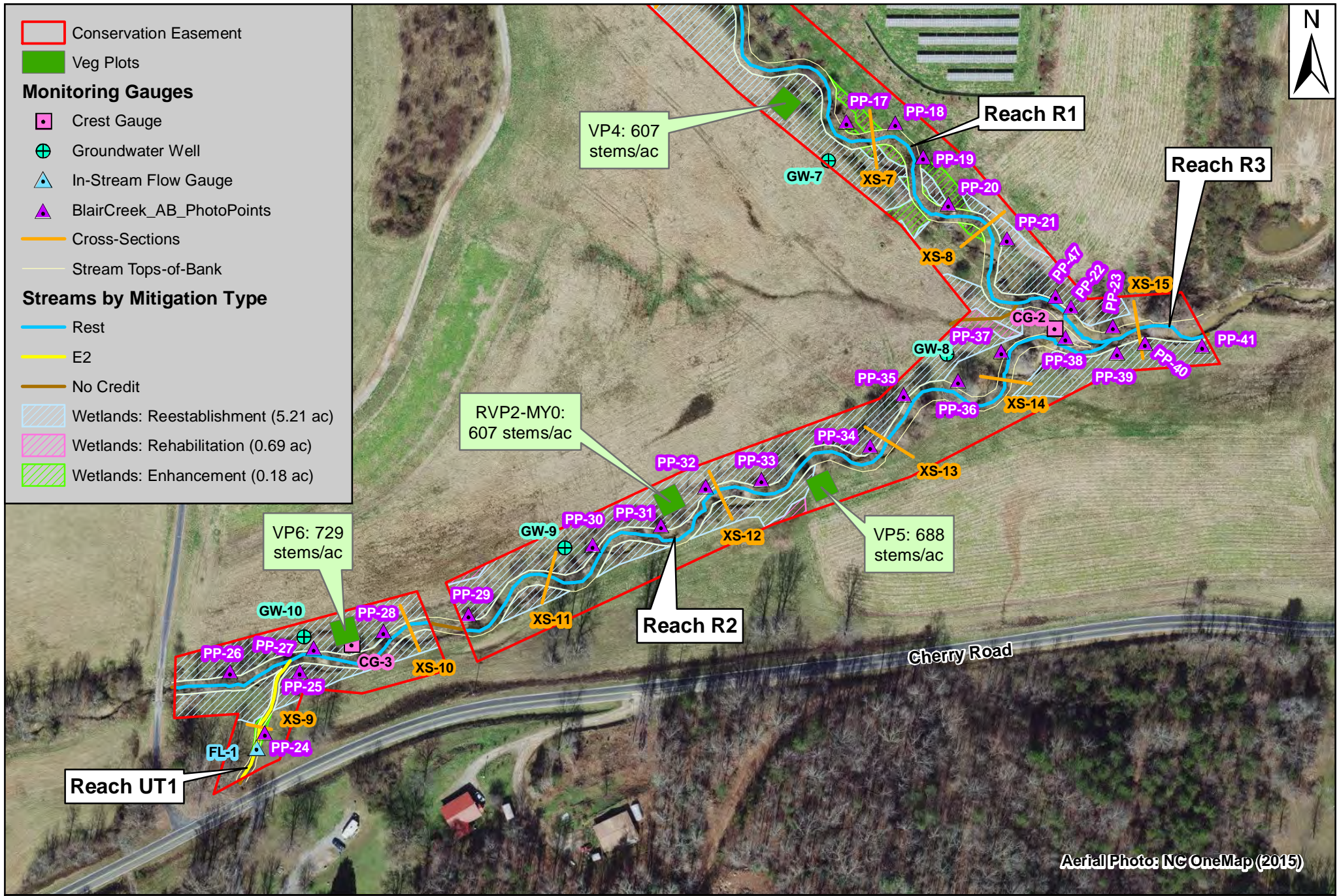
- Conservation Easement
- Veg Plots
- Monitoring Gauges**
  - Crest Gauge
  - Groundwater Well
  - Rain Gauge
  - Photo-Points
  - Cross-Sections
  - Stream Tops-of-Bank
- Streams by Mitigation Type**
  - Rest
  - E2
  - No Credit
  - Wetlands: Reestablishment (5.21 ac)
  - Wetlands: Rehabilitation (0.69 ac)
  - Wetlands: Enhancement (0.18 ac)



Aerial Photo: NC OneMap (2015)

**Figure 3A. Current Condition Plan View (CCPV)**  
**Blair Creek Mitigation Project**  
**Clay County, NC**

- Conservation Easement
- Veg Plots
- Monitoring Gauges**
- Crest Gauge
- Groundwater Well
- In-Stream Flow Gauge
- BlairCreek\_AB\_PhotoPoints
- Cross-Sections
- Stream Tops-of-Bank
- Streams by Mitigation Type**
- Rest
- E2
- No Credit
- Wetlands: Reestablishment (5.21 ac)
- Wetlands: Rehabilitation (0.69 ac)
- Wetlands: Enhancement (0.18 ac)



Aerial Photo: NC OneMap (2015)

**Blair Creek: MY0 As-Built Stream Station Photo-Points**  
**NCDMS Project No. #100047 – Photos taken 1 December 2021 unless noted differently.**



PP-1: R1 Upstream, Station 10+75-  
Begin R1



PP-2: R1, Upstream, Station 12+25



PP-3: R1, Upstream, Station 13+50



PP-4: R1, Upstream, Station 15+50



PP-5: R1, Upstream, Station 16+00



PP-6: R1, Upstream, Station 17+00

**Blair Creek: MY0 As-Built Stream Station Photo-Points**  
**NCDMS Project No. #100047 – Photos taken 1 December 2021 unless noted differently.**



PP-7: R1 Upstream, Station 17+40



PP-8: R1, Upstream, Station 19+50



PP-9: R1, Upstream, Station 20+20



PP-10: R1, Upstream, Station  
21+75



PP-11: R1, Upstream Station  
23+75



PP-12: R1, Upstream, Station  
24+60



**Blair Creek: MY0 As-Built Stream Station Photo-Points**  
**NCDMS Project No. #100047 – Photos taken 1 December 2021 unless noted differently.**



PP-13: R1, Downstream, Station  
24+25- Culvert



PP-14: R1, Upstream, Station  
25+60- Culvert



PP-15: R1, Upstream, Station  
28+00



PP-16: R1, Upstream, Station  
28+60



PP-17: R1, Upstream, Station  
31+75

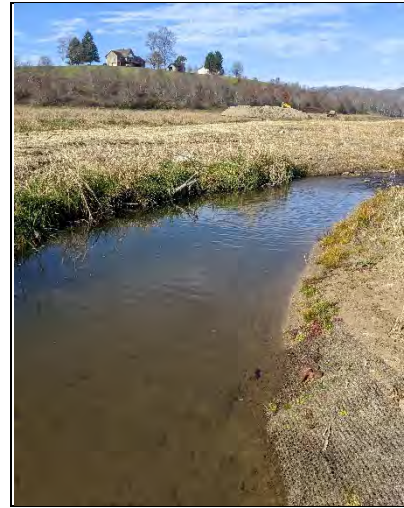


PP-18: R1, Upstream, Station  
32+25

**Blair Creek: MY0 As-Built Stream Station Photo-Points**  
**NCDMS Project No. #100047 – Photos taken 1 December 2021 unless noted differently.**



PP-19: R1, Upstream, Station  
32+75



PP-20: R1, Upstream, Station 33+75



PP-21: R1, Upstream, Station  
34+65



PP-22: R1, Upstream, Station 36+75



PP-23: R1, Upstream, Station  
37+00 – End R1



PP-24: UT1, Upstream, Station  
10+60

**Blair Creek: MY0 As-Built Stream Station Photo-Points**  
**NCDMS Project No. #100047 – Photos taken 1 December 2021 unless noted differently.**



PP-25: UT1, Upstream, Station  
11+85- Confluence with R2



PP-26: R2, Upstream, Station  
10+50- Begin R2



PP-27: R2, Upstream, Station  
11+60



PP-28: R2, Upstream, Station  
13+51



PP-29: R2, Upstream, Station  
12+25



PP-30: R2, Upstream, Station  
16+50

**Blair Creek: MY0 As-Built Stream Station Photo-Points**  
**NCDMS Project No. #100047 – Photos taken 1 December 2021 unless noted differently.**



PP-31: R2, Upstream, Station 17+40



PP-32: R2, Upstream, Station 18+40



PP-33: R2, Upstream, Station 19+15



PP-34: R2, Upstream at Station 20+80



PP-35: R2, Upstream, Station 21+75



PP-36: R2, Upstream, Station 22+30

**Blair Creek: MY0 As-Built Stream Station Photo-Points**  
**NCDMS Project No. #100047 – Photos taken 1 December 2021 unless noted differently.**



PP-37: R2, Upstream, Station  
23+50



PP-38: R2, Upstream, Station  
24+60



PP-39: R2, Upstream, Station  
25+20- Confluence with R1



PP-40: R3, Upstream, Station  
25+50- Begin R3



PP-41: R3, view upstream at  
Station 10+80- End R3

---

**Blair Creek: MY0 As-Built Stream Station Photo-Points**  
**NCDMS Project No. #100047 – Photos taken 1 December 2021 unless noted differently.**



PP-42: R1, Swale on Right  
Floodplain, Station 16+25



PP-43: R1, Swale on Left  
Floodplain, Station 17+00



PP-44: R1, Swale on Left  
Floodplain, Station 20+70



PP-45: R1, Swale on Left  
Floodplain, Station 24+00



PP-46: R1, Overflow Channel on  
Left Floodplain, Station 26+75



PP-47: R1, Swale on Right  
Floodplain, Station 36+40

**Blair Creek: MY0 As-Built Vegetation Photo Log**  
**NCDMS Project No. 100047 – Photos taken 27 January 2022**



Vegetation Plot #1



Vegetation Plot #2



Vegetation Plot #3



Vegetation Plot #4



Vegetation Plot #5



Vegetation Plot #6

**Blair Creek: MY0 As-Built Vegetation Photo Log**  
**NCDMS Project No. 100047 – Photos taken 27 January 2022**



Random Vegetation Plot #1

---



Random Vegetation Plot #2

---



**Blair Creek: MY0 As-Built Monitoring Device Photo Log –**



Groundwater Well #1. Photo taken  
7 April 2022



Groundwater Well #2: 12-1-21



Groundwater Well #3: 12-1-21



Groundwater Well #4: 12-1-21



Groundwater Well #5: 12-1-21



Groundwater Well #6: 12-1-21

Blair Creek: MY0 As-Built Monitoring Device Photo Log –



Groundwater Well #7: 12-1-21



Groundwater Well #8: 1-4-2022



Groundwater Well #9: 12-1-21



Groundwater Well #10: 1-4-2022



Crest Gauge 1: R1: 1-27-2022



Crest Gauge 2: R2: 1-27-2022

**Blair Creek: MY0 As-Built Monitoring Device Photo Log –**



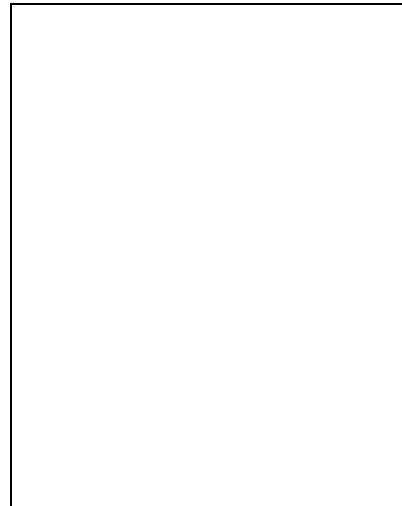
Crest Gauge 3: 1-4-2022



Flow Gauge 1: UT1: 1-4-2022



Rain Gauge: 1-4-2022



# **APPENDIX C**

## Vegetation Plot Data

TABLE 5 PLANTED STEM COUNTS BY PLOT AND SPECIES

Planted Acreage	8.3
Date of Initial Plant	2022-02-02
Date(s) of Supplemental Plant(s)	
Date(s) Mowing	
Date of Current Survey	2022-03-08
Plot size (ACRES)	0.0247

	Scientific Name	Common Name	Tree/S hrub	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 1 R	Veg Plot 2 R	
					Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Total
Species Included in Approved Mitigation Plan	<i>Acer negundo</i>	boxelder	Tree	FAC					2	2							2		
	<i>Acer saccharinum</i>	silver maple	Tree	FACW	1	1	1	1	3	3	1	1						1	
	<i>Alnus serrulata</i>	hazel alder	Tree	OBL			1	1	1	1									
	<i>Amelanchier canadensis</i>	Canadian serviceberry	Tree	FAC			3	3											
	<i>Aronia arbutifolia</i>	red chokeberry	Shrub	FACW					2	2	1	1					2	1	
	<i>Betula alleghaniensis</i>	yellow birch	Tree	FAC									3	3					
	<i>Betula nigra</i>	river birch	Tree	FACW	3	3	2	2			4	4	3	3					
	<i>Carpinus caroliniana</i>	American hornbeam	Tree	FAC	3	3	1	1	1	1			3	3	2	2	3	1	
	<i>Cephalanthus occidentalis</i>	common buttonbush	Shrub	OBL			3	3											
	<i>Cornus amomum</i>	silky dogwood	Shrub	FACW	3	3	2	2	1	1			2	2	3	3	1	1	
	<i>Diospyros virginiana</i>	common persimmon	Tree	FAC			1	1	2	2			1	1			2	1	
	<i>Fraxinus pennsylvanica</i>	green ash	Tree	FACW	1	1			1	1	1	1						1	
	<i>Ilex verticillata</i>	common winterberry	Tree	FACW			1	1	1	1	1	1	1	1	2	2	1		
	<i>Lindera benzoin</i>	northern spicebush	Tree	FAC											1	1			
	<i>Liriodendron tulipifera</i>	tuliptree	Tree	FACU									1	1					
	<i>Platanus occidentalis</i>	American sycamore	Tree	FACW	4	4	2	2			3	3			3	3	2	3	
	<i>Quercus imbricaria</i>	shingle oak	Tree	FAC	1	1			1	1	2	2	1	1				2	
	<i>Sambucus canadensis</i>	American black elderberry	Tree	FAC														1	
	<i>Ulmus americana</i>	American elm	Tree	FACW	2	2			1	1	2	2	2	2	2	2	2	2	3
	<i>Xanthorhiza simplicissima</i>	yellowroot	Shrub	FACW														1	
Sum	Performance Standard				18	18	17	17	16	16	15	15	17	17	18	18	17	15	
Post Mitigation Plan Species	<i>Quercus lyrata</i>	overcup oak	Tree	OBL			1	1			1	1	1	1				2	
	<i>Quercus michauxii</i>	swamp chestnut oak	Tree	FACW	1	1	1	1	2	2	1	1	1	1			1		
	<i>Quercus pagoda</i>	cherrybark oak	Tree	FACW							2	2							
	<i>Quercus phellos</i>	willow oak	Tree	FAC	1	1			1	1	1	1						1	
	Sum	Proposed Standard				18	18	17	17	16	16	15	15	17	17	18	18	17	15
Mitigation Plan Performance Standard	Current Year Stem Count				18		17		16		15		17		18		17	15	
	Stems/Acre				729		688		648		607		688		729		688	607	
	Species Count				8		10		11		8		9		7		10	10	
	Dominant Species Composition (%)				20		16		16		20		16		28		17	17	
	Average Plot Height (ft.)				2		2		2		2		2		2		2	2	
	% Invasives				0		0		0		0		0		0		0	0	
Post Mitigation Plan Performance Standard	Current Year Stem Count				18		17		16		15		17		18		17	15	
	Stems/Acre				729		688		648		607		688		729		688	607	
	Species Count				8		10		11		8		9		7		10	10	
	Dominant Species Composition (%)				20		16		16		20		16		28		17	17	
	Average Plot Height (ft.)				2		2		2		2		2		2		2	2	
	% Invasives				0		0		0		0		0		0		0	0	

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

Vegetation Performance Standards Summary Table													
	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													
Monitoring Year 0	729	2	8	0	688	2	10	0	648	2	11	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													
Monitoring Year 0	607	2	8	0	688	2	9	0	729	2	7	0	
	Veg Plot Group 1 R				Veg Plot Group 2 R								
	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													
Monitoring Year 0	688	2	10	0	607	2	10	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.

# **APPENDIX D**

## Stream Measurement and Geomorphology Data

**Table 6. Baseline Stream Data Summary**

**Blair Creek Stream Mitigation Project: DMS Project No ID. 100047**

**Reach 1 (North Fork)**

Parameter	Pre-Existing Condition				Reference Reach(es) Data Composite				Design (Upper - Lower)				As-built			
	Min	Mean	Med	Max	Min	Mean	Med	Max	Min	Mean	Med	Max	Min	Mean	Med	Max
<b>Dimension and Substrate - Riffle</b>																
BF Width (ft)	----	8.57 - 8.59	----	----	----	----	----	----	----	16.5 - 17.0	----	----	16.48	16.60	16.70	17.22
Floodprone Width (ft)	----	12.9 - 34.7	----	----	----	----	----	----	----	60.00	----	----	66.46	67.31	69.89	76.70
BF Mean Depth (ft)	----	1.43 - 1.48	----	----	----	----	----	----	----	1.2	----	----	1.09	1.24	1.42	1.32
BF Max Depth (ft)	----	2.77	----	----	----	----	----	----	----	1.3 - 1.4	----	----	1.55	1.84	1.85	2.11
BF Cross-sectional Area (ft <sup>2</sup> )	----	12.3 - 12.7	----	----	----	----	----	----	----	18.2 - 20.4	----	----	17.91	20.58	21.26	21.91
Width/Depth Ratio	----	6.01 - 5.79	----	----	10.00	12.50	----	15.00	----	14.2 - 15	----	----	11.95	12.58	13.35	15.10
Entrenchment Ratio	----	1.5 - 4.05	----	----	----	----	----	----	----	3.50	----	----	3.93	4.04	4.19	4.46
Bank Height Ratio	----	2.7 - 1.8	----	----	1.00	1.05	----	1.10	----	1.00	----	----	1.00	1.00	1.00	1.00
d50 (mm)	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
<b>Pattern</b>																
Channel Beltwidth (ft)	----	N/A	----	----	----	----	----	----	----	N/A	----	----	53.00	67.00	----	92.00
Radius of Curvature (ft)	----	N/A	----	----	----	----	----	----	----	N/A	----	----	33.00	45.00	----	61.00
Rc/Bankfull width (ft/ft)	----	N/A	----	----	2.00	2.5000	----	3.00	----	N/A	----	----	1.90	2.70	----	3.70
Meander Wavelength (ft)	----	N/A	----	----	----	----	----	----	----	N/A	----	----	134.00	163.00	----	229.00
Meander Width Ratio	----	N/A	----	----	3.50	5.7500	----	8.00	----	N/A	----	----	3.10	4.00	----	5.60
<b>Profile</b>																
Riffle Length (ft)	----	----	----	----	----	----	----	----	----	----	----	----	6.10	33.54	36.04	87.52
Riffle Slope (ft/ft)	0.0260	0.0345	----	0.0430	----	----	----	----	0.0060	0.0080	----	0.0100	-0.018	0.011	0.0031	0.085
Pool Length (ft)	----	----	----	----	----	----	----	----	----	----	----	----	11.00	42.00	44.00	70.00
Pool to Pool Spacing (ft)	35.00	57.50	----	80.00	----	----	----	----	58.00	88.50	----	119.00	30.00	80.19	90.00	135.00
Pool Max Depth (ft)	1.14	1.9600	----	2.77	----	----	----	----	1.8000	3.00	----	4.2000	2.98	3.72	3.43	5.04
<b>Substrate and Transport Parameters</b>																
SC% / Sa% / G% / C% / Bo%	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
d16 / d35 / d50 / d84 / d95	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
<b>Additional Reach Parameters</b>																
Drainage Area (SM)	----	1.38 - 1.53	----	----	----	----	----	----	----	1.38	----	----	----	1.38	----	----
Impervious cover estimate (%)	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Rosgen Classification	----	B - E	----	----	----	C4	----	----	----	C4	----	----	----	C4	----	----
BF Velocity (fps)	----	3.15 - 3.20	----	----	3.50	4.25	----	5.00	----	3.00	----	----	----	----	----	----
BF Discharge (cfs)	----	38.7 - 40.7	----	----	----	----	----	----	----	61.85	----	----	----	----	----	----
Valley Length	----	----	----	----	----	----	----	----	----	----	----	----	----	2,280.00	----	----
Channel Length (ft)	----	2,399	----	----	----	----	----	----	----	2,730	----	----	----	2,771.90	----	----
Sinuosity	----	1.06	----	----	1.20	1.30	----	1.40	----	1.22	----	----	----	1.22	----	----

Table 6. Baseline Stream Data Summary																
Blair Creek Stream Mitigation Project: DMS Project No ID. 100047																
Reach 2 (South Fork)																
Parameter	Pre-Existing Condition				Reference Reach(es) Data Composite				Design				As-built			
	Min	Mean	Med	Max	Min	Mean	Med	Max	Min	Mean	Med	Max	Min	Mean	Med	Max
<b>Dimension and Substrate - Riffle</b>																
BF Width (ft)	-----	9.82 - 11.26	-----	-----	-----	-----	-----	-----	-----	17.00	-----	-----	19.30	21.34	21.02	23.69
Floodprone Width (ft)	-----	25.66 - 26.55	-----	-----	-----	-----	-----	-----	-----	60.00	-----	-----	67.67	70.39	70.00	73.49
BF Mean Depth (ft)	-----	1.54 - 1.33	-----	-----	-----	-----	-----	-----	-----	1.2	-----	-----	0.89	0.94	0.92	1.00
BF Max Depth (ft)	-----	2.77	-----	-----	-----	-----	-----	-----	-----	1.40	-----	-----	1.42	1.73	1.70	2.06
BF Cross-sectional Area (ft <sup>2</sup> )	-----	15.16 - 15.01	-----	-----	-----	-----	-----	-----	-----	20.4	-----	-----	18.86	19.76	19.29	21.13
Width/Depth Ratio	-----	6.38 - 8.47	-----	-----	10.00	12.50	-----	15.00	-----	14.20	-----	-----	19.69	23.05	22.85	26.62
Entrenchment Ratio	-----	2.61 - 2.36	-----	-----	-----	-----	-----	-----	-----	3.50	-----	-----	3.10	3.31	3.33	3.51
Bank Height Ratio	-----	1.96 - 1.54	-----	-----	1.00	1.05	-----	1.10	-----	1.10	-----	-----	1.00	1.00	1.00	1.00
d50 (mm)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
<b>Pattern</b>																
Channel Beltwidth (ft)	-----	N/A	-----	-----	-----	-----	-----	-----	-----	N/A	-----	-----	47.00	56.00	-----	72.00
Radius of Curvature (ft)	-----	N/A	-----	-----	-----	-----	-----	-----	-----	N/A	-----	-----	31.00	43.00	-----	48.00
Rc/Bankfull width (ft/ft)	-----	N/A	-----	-----	2.00	2.50	-----	3.00	-----	N/A	-----	-----	1.80	2.50	-----	2.80
Meander Wavelength (ft)	-----	N/A	-----	-----	-----	-----	-----	-----	-----	N/A	-----	-----	129.00	149.00	-----	174.00
Meander Width Ratio	-----	N/A	-----	-----	3.50	5.75	-----	8.00	-----	N/A	-----	-----	2.80	3.30	-----	4.20
<b>Profile</b>																
Riffle Length (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	6.71	34.705	31.77	64.44
Riffle Slope (ft/ft)	0.0260	0.0345	-----	0.0430	-----	-----	-----	-----	0.0075	0.0084	-----	0.0093	-0.0460	0.0010	0.0000	0.1070
Pool Length (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	10.00	37.00	39.50	70.00
Pool to Pool Spacing (ft)	35.00	57.50	-----	80.00	-----	-----	-----	-----	60.00	89.00	-----	118.00	30.00	72.40	75.00	105.00
Pool Max Depth (ft)	1.14	1.96	-----	2.77	-----	-----	-----	-----	1.8000	3.00	-----	4.2000	3.43	3.50	3.50	3.57
<b>Substrate and Transport Parameters</b>																
SC% / Sa% / G% / C% / Bo%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
d16 / d35 / d50 / d84 / d95	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
<b>Additional Reach Parameters</b>																
Drainage Area (SM)	-----	1.29 - 1.37	-----	-----	-----	-----	-----	-----	-----	1.53	-----	-----	-----	-----	-----	-----
Impervious cover estimate (%)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Rosgen Classification	-----	E - low sinuosity	-----	-----	-----	C4	-----	-----	-----	C4	-----	-----	-----	C4	-----	-----
BF Velocity (fps)	-----	3.21 - 3.03	-----	-----	3.50	4.25	-----	5.00	-----	3.00	-----	-----	-----	-----	-----	-----
BF Discharge (cfs)	-----	48.68 - 45.51	-----	-----	-----	-----	-----	-----	-----	61.85	-----	-----	-----	-----	-----	-----
Valley Length	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	1,310	-----	-----
Channel Length (ft)	-----	1,468	-----	-----	-----	-----	-----	-----	-----	1,520	-----	-----	-----	1,555	-----	-----
Sinuosity	-----	1.12	-----	-----	1.20	1.30	-----	1.40	-----	1.14	-----	-----	-----	1.14	-----	-----



Table 6. Baseline Stream Data Summary																
Blair Creek Stream Mitigation Project: DMS Project No ID. 100047																
Reach 3 (Downstream of Confluence)																
Parameter	Pre-Existing Condition				Reference Reach(es) Data Composite				Design				As-built			
	Min	Mean	Med	Max	Min	Mean	Med	Max	Min	Mean	Med	Max	Min	Mean	Med	Max
<b>Dimension and Substrate - Riffle</b>																
BF Width (ft)	----	19.20	----	----	----	----	----	----	----	22.50	----	----	----	30.40	----	----
Floodprone Width (ft)	----	----	----	----	----	----	----	----	----	60.00	----	----	----	58.48	----	----
BF Mean Depth (ft)	----	1.33	----	----	----	----	----	----	----	----	----	----	----	1.10	----	----
BF Max Depth (ft)	----	----	----	----	----	----	----	----	----	1.80	----	----	----	2.14	----	----
BF Cross-sectional Area (ft <sup>2</sup> )	----	25.6	----	----	----	----	----	----	----	33.8	----	----	----	33.01	----	----
Width/Depth Ratio	----	14.44	----	----	10.00	12.50	----	15.00	----	15.00	----	----	----	27.80	----	----
Entrenchment Ratio	----	----	----	----	----	----	----	----	----	----	----	----	----	--	----	----
Bank Height Ratio	----	2.00	----	----	1.00	1.05	----	1.10	----	----	----	----	----	--	----	----
d50 (mm)	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
<b>Pattern</b>																
Channel Beltwidth (ft)	----	N/A	----	----	----	----	----	----	----	N/A	----	----	43.00	46.00	----	50.00
Radius of Curvature (ft)	----	N/A	----	----	----	----	----	----	----	N/A	----	----	33.00	40.00	----	46.00
Rc/Bankfull width (ft/ft)	----	N/A	----	----	2.00	2.50	----	3.00	----	N/A	----	----	1.40	1.60	----	1.90
Meander Wavelength (ft)	----	N/A	----	----	----	----	----	----	----	N/A	----	----	131.00	134.00	----	136.00
Meander Width Ratio	----	N/A	----	----	3.50	5.75	----	8.00	----	N/A	----	----	1.80	1.90	----	2.10
<b>Profile</b>																
Riffle Length (ft)	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Riffle Slope (ft/ft)	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Pool Length (ft)	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Pool to Pool Spacing (ft)	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Pool Max Depth (ft)	----	----	----	----	----	----	----	----	2.2500	3.75	----	5.2500	----	----	----	----
<b>Substrate and Transport Parameters</b>																
SC% / Sa% / G% / C% / Bo%	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
d16 / d35 / d50 / d84 / d95	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
<b>Additional Reach Parameters</b>																
Drainage Area (SM)	----	2.91	----	----	----	----	----	----	----	2.91	----	----	----	----	----	----
Impervious cover estimate (%)	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Rosgen Classification	----	F4	----	----	----	C4	----	----	----	C4	----	----	----	C4	----	----
BF Velocity (fps)	----	----	----	----	3.50	4.25	----	5.00	----	3.76	----	----	----	----	----	----
BF Discharge (cfs)	----	----	----	----	----	----	----	----	----	128.00	----	----	----	----	----	----
Valley Length	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Channel Length (ft)	----	185	----	----	----	----	----	----	----	185	----	----	----	133.6	----	----
Sinuosity	----	1.07	----	----	1.20	1.30	----	1.40	----	----	----	----	----	1.09	----	----

**Table 6. Baseline Stream Data Summary**

**Blair Creek Stream Mitigation Project: DMS Project No ID. 100047**

**UT1 - \*As Built data from pool XS**

Parameter	Pre-Existing Condition				Reference Reach(es) Data Composite				Design				As-built			
	Min	Mean	Med	Max	Min	Mean	Med	Max	Min	Mean	Med	Max	Min	Mean	Med	Max
<b>Dimension and Substrate - Riffle</b>																
BF Width (ft)	----	----	----	----	----	----	----	----	----	7.25	----	----	----	10.14	----	----
Floodprone Width (ft)	----	----	----	----	----	----	----	----	----	----	----	----	----	34.30	----	----
BF Mean Depth (ft)	----	----	----	----	----	----	----	----	----	----	----	----	----	0.81	----	----
BF Max Depth (ft)	----	----	----	----	----	----	----	----	----	1.00	----	----	----	1.53	----	----
BF Cross-sectional Area (ft <sup>2</sup> )	----	----	----	----	----	----	----	----	----	4.30	----	----	----	8.18	----	----
Width/Depth Ratio	----	----	----	----	----	----	----	----	----	12.40	----	----	----	----	----	----
Entrenchment Ratio	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Bank Height Ratio	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
d50 (mm)	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
<b>Pattern</b>	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Channel Beltwidth (ft)	----	N/A	----	----	----	----	----	----	----	N/A	----	----	15.00	17.00	----	18.00
Radius of Curvature (ft)	----	N/A	----	----	----	----	----	----	----	N/A	----	----	----	----	----	----
Rc/Bankfull width (ft/ft)	----	N/A	----	----	----	----	----	----	----	N/A	----	----	3.20	3.50	----	3.80
Meander Wavelength (ft)	----	N/A	----	----	----	----	----	----	----	N/A	----	----	67.00	70.00	----	72.00
Meander Width Ratio	----	N/A	----	----	----	----	----	----	----	N/A	----	----	3.20	3.50	----	3.80
<b>Profile</b>	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Riffle Length (ft)	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Riffle Slope (ft/ft)	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Pool Length (ft)	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Pool to Pool Spacing (ft)	----	----	----	----	----	----	----	----	----	----	----	----	16.00	22.10	22.00	29.50
Pool Max Depth (ft)	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
<b>Substrate and Transport Parameters</b>	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
SC% / Sa% / G% / C% / Bo%	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
d16 / d35 / d50 / d84 / d95	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
<b>Additional Reach Parameters</b>	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Drainage Area (SM)	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Impervious cover estimate (%)	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Rosgen Classification	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
BF Velocity (fps)	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
BF Discharge (cfs)	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Valley Length	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Channel Length (ft)	----	----	----	----	----	----	----	----	----	----	----	----	----	173	----	----
Sinuosity	----	----	----	----	----	----	----	----	----	----	----	----	----	1.02	----	----

Table 7. Cross-Section Morphology Data Summary																													
Blair Creek Restoration Project: DMS Project No ID. 100047																													
Stream Reach		Reach 1																											
Dimension and substrate		Cross-section X-1 (Pool)						Cross-section X-2 (Riffle)						Cross-section X-3 (Pool)						Cross-section X-4 (Riffle)									
Based on fixed baseline bankfull elevation		Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
BF Width (ft)		20.00							15.78							24.54							16.48						
BF Mean Depth (ft)		1.27							1.32							1.56							1.09						
Width/Depth Ratio		15.75							11.95							9.40							15.10						
BF Cross-sectional Area (ft²)		25.48							20.85							38.37							17.91						
BF Max Depth (ft)		2.98							2.11							3.63							1.55						
Width of Floodprone Area (ft)		68.00							52.74							64.70							73.32						
Entrenchment Ratio		--							3.30							--							4.45						
Bank Height Ratio		--							1.00							--							1.00						
Wetted Perimeter (ft)		22.07							17.18							27.06							17.03						
Hydraulic Radius (ft)		1.15							1.21							1.42							1.05						
d50 (mm)																							37.3						
Stream Reach		Reach 1																											
Dimension and substrate		Cross-section X-5 (Riffle)						Cross-section X-6 (Pool)						Cross-section X-7 (Riffle)						Cross-section X-8 (Pool)									
Based on fixed baseline bankfull elevation		Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
BF Width (ft)		16.92							18.75							17.22							14.76						
BF Mean Depth (ft)		1.30							1.79							1.26							3.22						
Width/Depth Ratio		13.02							10.47							13.67							4.58						
BF Cross-sectional Area (ft²)		21.91							33.50							21.66							47.58						
BF Max Depth (ft)		1.80							3.23							1.90							5.04						
Width of Floodprone Area (ft)		66.46							72.70							76.70							74.50						
Entrenchment Ratio		3.93							--							4.46							--						
Bank Height Ratio		1.00							--							1.00							--						
Wetted Perimeter (ft)		17.61							20.98							18.28							19.35						
Hydraulic Radius (ft)		1.24							1.60							1.19							2.46						
d50 (mm)																													
Stream Reach		UT-1						Reach 2																					
Dimension and substrate		Cross-section X-9 (Pool)						Cross-section X-10 (Pool)						Cross-section X-11 (Riffle)						Cross-section X-12 (Pool)									
Based on fixed baseline bankfull elevation		Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
BF Width (ft)		10.14							33.27							21.02							22.73						
BF Mean Depth (ft)		0.81							1.11							0.92							1.61						
Width/Depth Ratio		12.52							29.97							22.85							14.12						
BF Cross-sectional Area (ft²)		8.18							36.81							19.29							36.69						
BF Max Depth (ft)		1.53							3.57							2.06							3.43						
Width of Floodprone Area (ft)		34.30							65.00							70.00							70.00						
Entrenchment Ratio		--							--							3.33							--						
Bank Height Ratio		--							--							1.00							--						
Wetted Perimeter (ft)		10.77							35.82							21.81							24.49						
Hydraulic Radius (ft)		0.76							1.03							0.88							1.50						
d50 (mm)																													

Table 7. Cross-Section Morphology Data Summary																										
Blair Creek Restoration Project: DMS Project No ID. 100047																										
Stream Reach		Reach 2												Reach 3												
Dimension and substrate		Cross-section X-13 (Riffle)						Cross-section X-14 (Riffle)						Cross-section X-15 (Riffle)												
Based on fixed baseline bankfull elevation		Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+				
BF Width (ft)		23.69							19.30							30.40										
BF Mean Depth (ft)		0.89							1.00							1.10										
Width/Depth Ratio		26.62							19.69							27.80										
BF Cross-sectional Area (ft²)		21.13							18.86							33.01										
BF Max Depth (ft)		1.70							1.42							2.14										
Width of Floodprone Area (ft)		73.49							67.67							58.48										
Entrenchment Ratio		3.10							3.51							--										
Bank Height Ratio		1.00							1.00							--										
Wetted Perimeter (ft)		24.19							20.06							31.08										
Hydraulic Radius (ft)		0.87							0.94							1.06										
d50 (mm)		18.3																								

Figure 4 - Longitudinal Profiles

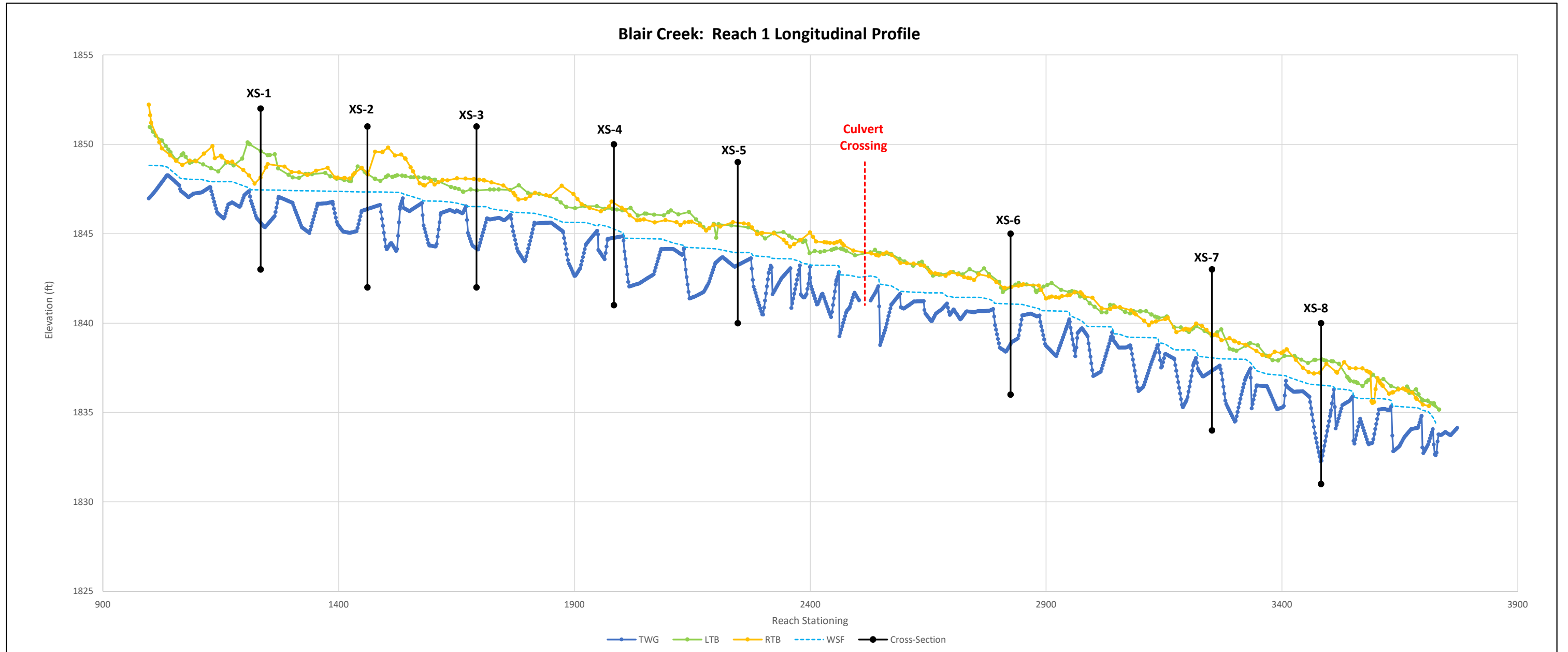


Figure 4 - Longitudinal Profiles

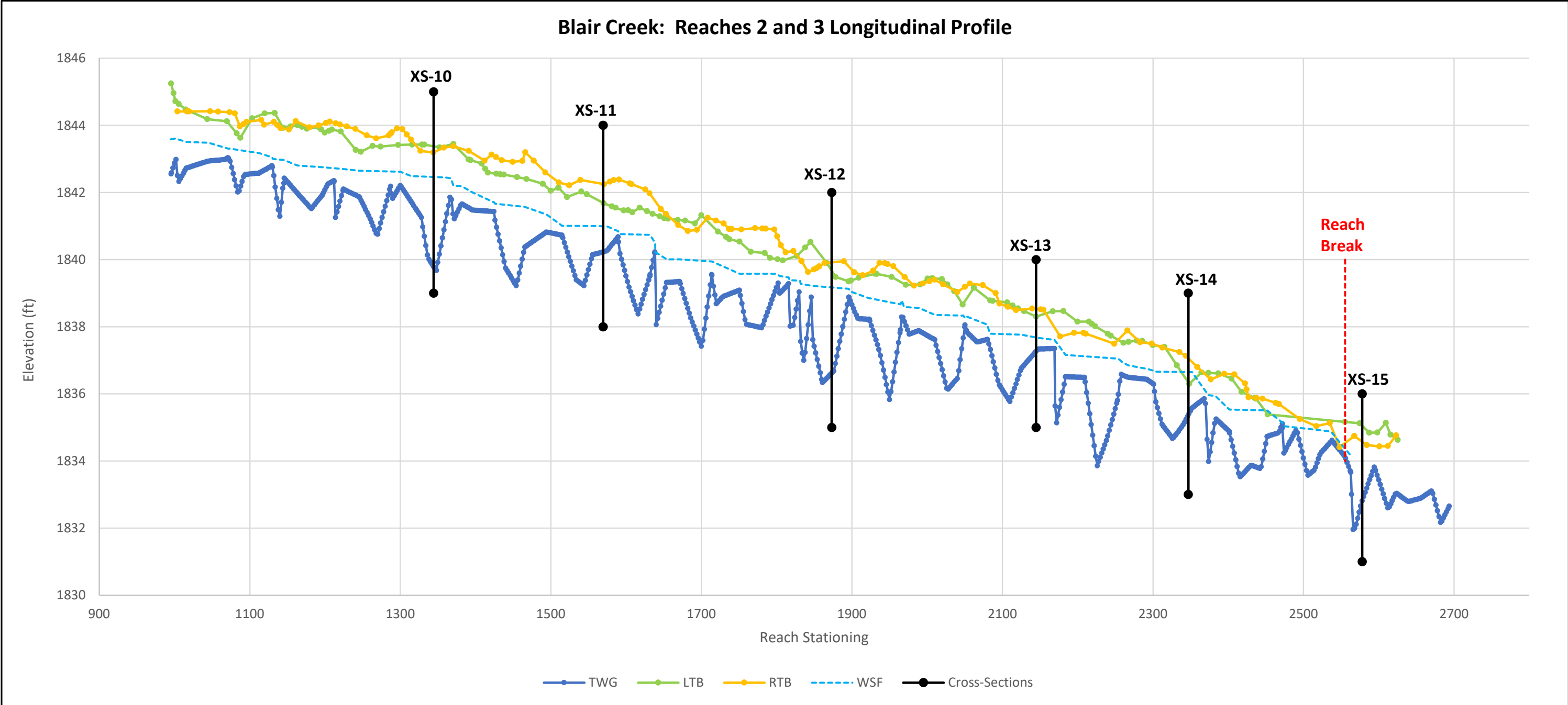
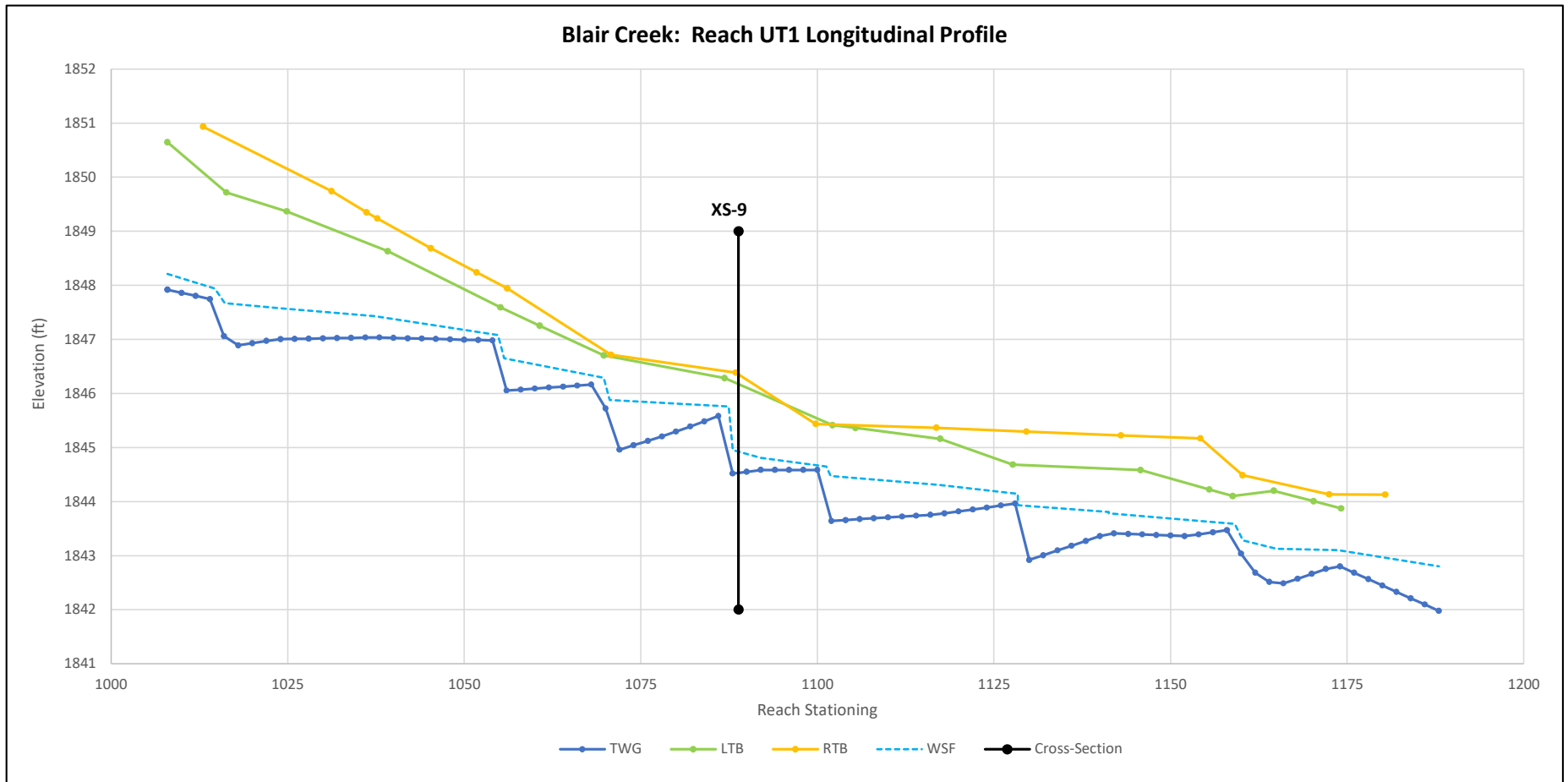


Figure 4 - Longitudinal Profiles



**Permanent Cross-Section 1**  
 (As-built Survey Data Collected: January 2022)  
 Restoration

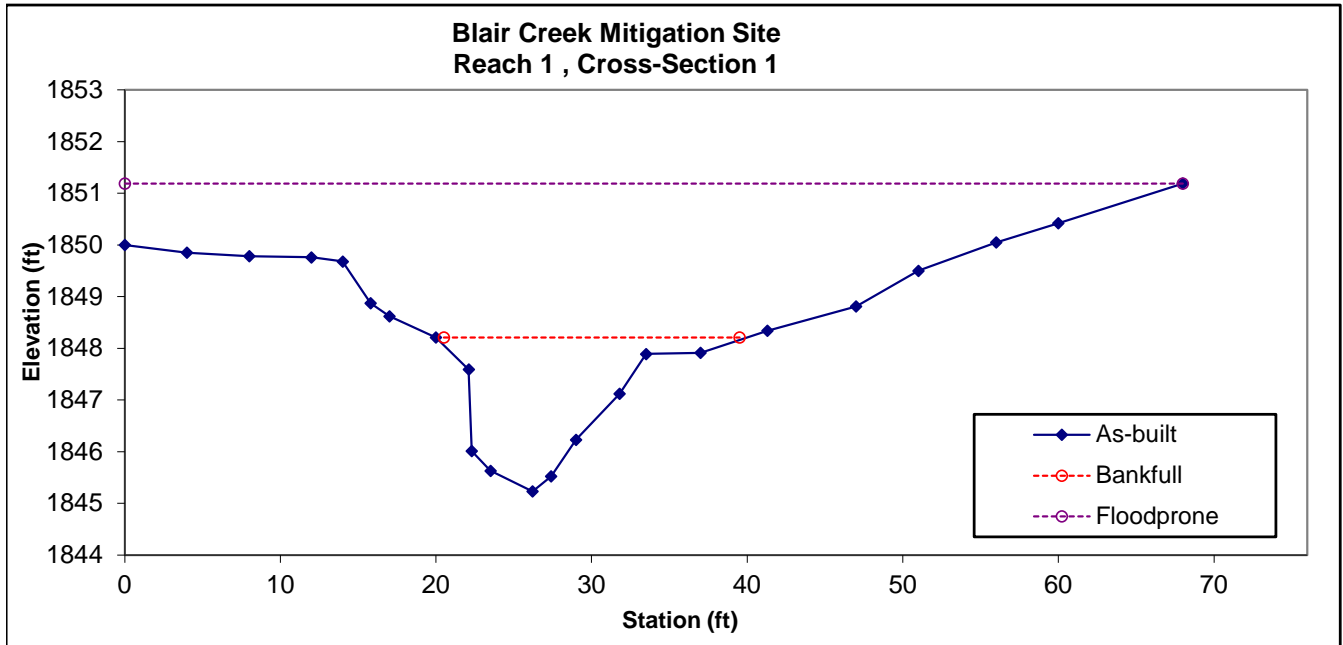


**Looking at the Right Bank**



**Looking at the Left Bank**

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Pool	--	25.48	20.00	1.27	2.98	15.75	--	--	1848.21	1848.21



**Permanent Cross-Section 2**  
 (As-built Survey Data Collected: December 2021)  
 Restoration

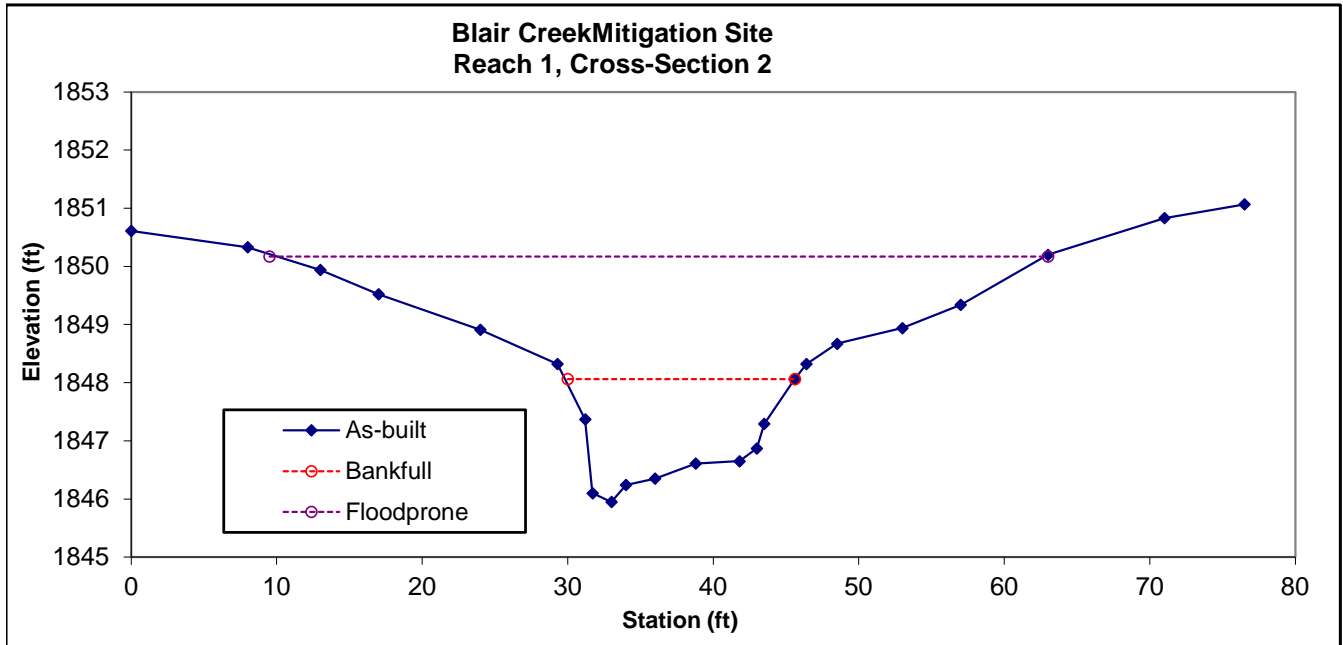


Looking at the Left Bank



Looking at the Right Bank

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Riffle	E	20.85	15.78	1.32	2.11	11.95	1.0	3.3	1848.06	1848.06





**Permanent Cross-Section 3**  
 (As-built Survey Data Collected: December 2021)  
 Restoration

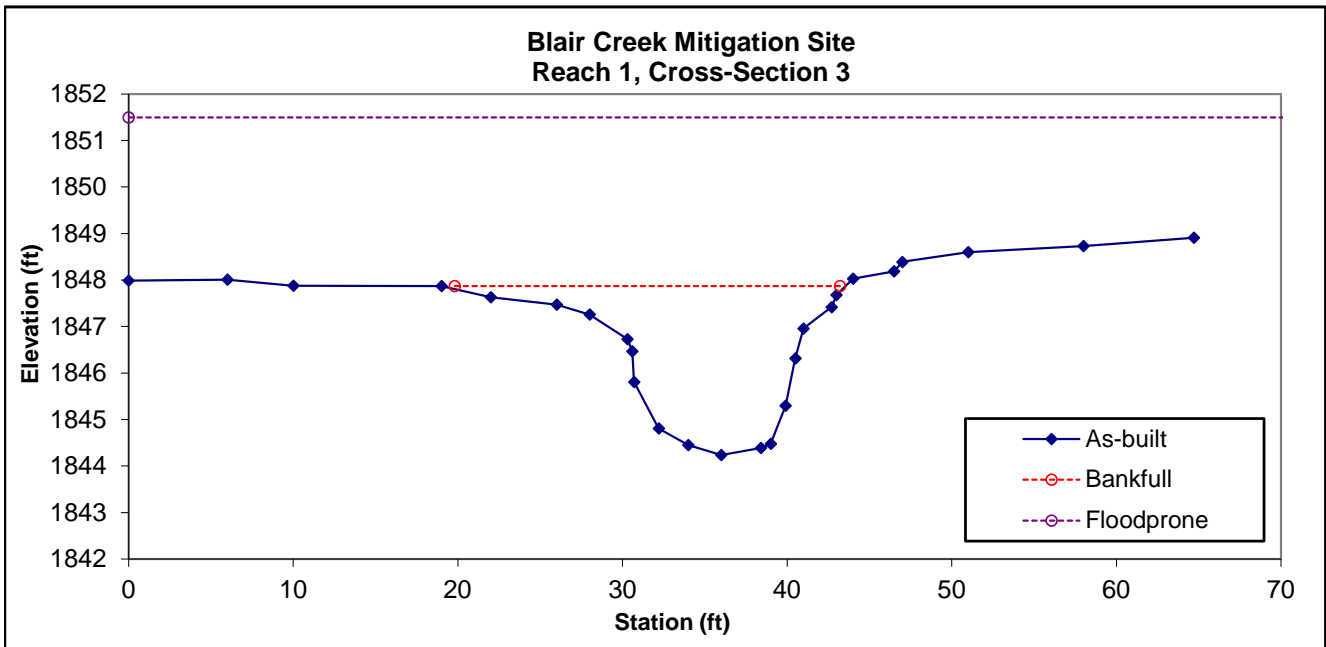


Looking at the Left Bank



Looking at the Right Bank

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Pool	--	38.37	24.54	1.56	3.63	9.4	--	--	1847.87	1847.87



**Permanent Cross-Section 4**  
 (As-built Survey Data Collected: December 2021)  
 Restoration

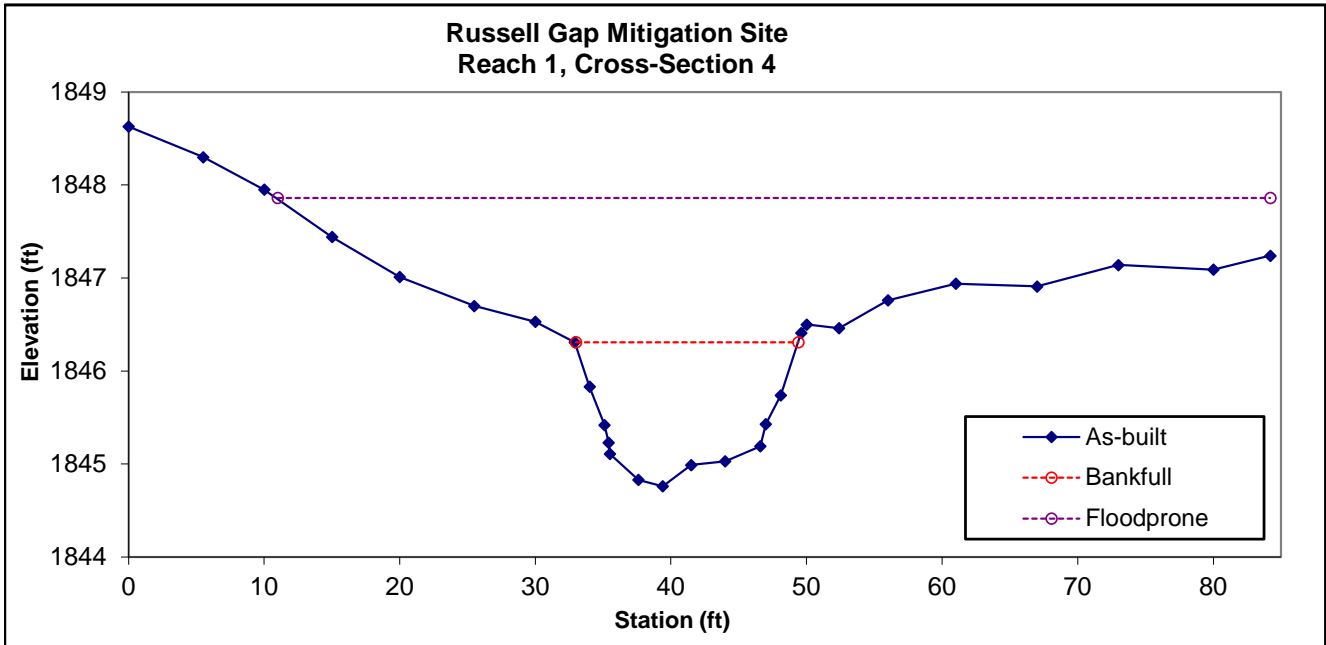


Looking at the Left Bank



Looking at the Right Bank

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Riffle	C	17.9	16.5	1.1	1.6	15.1	1.0	4.5	1846.31	1846.31



**Permanent Cross-Section 5**  
 (As-built Survey Data Collected: December 2021)  
 Restoration

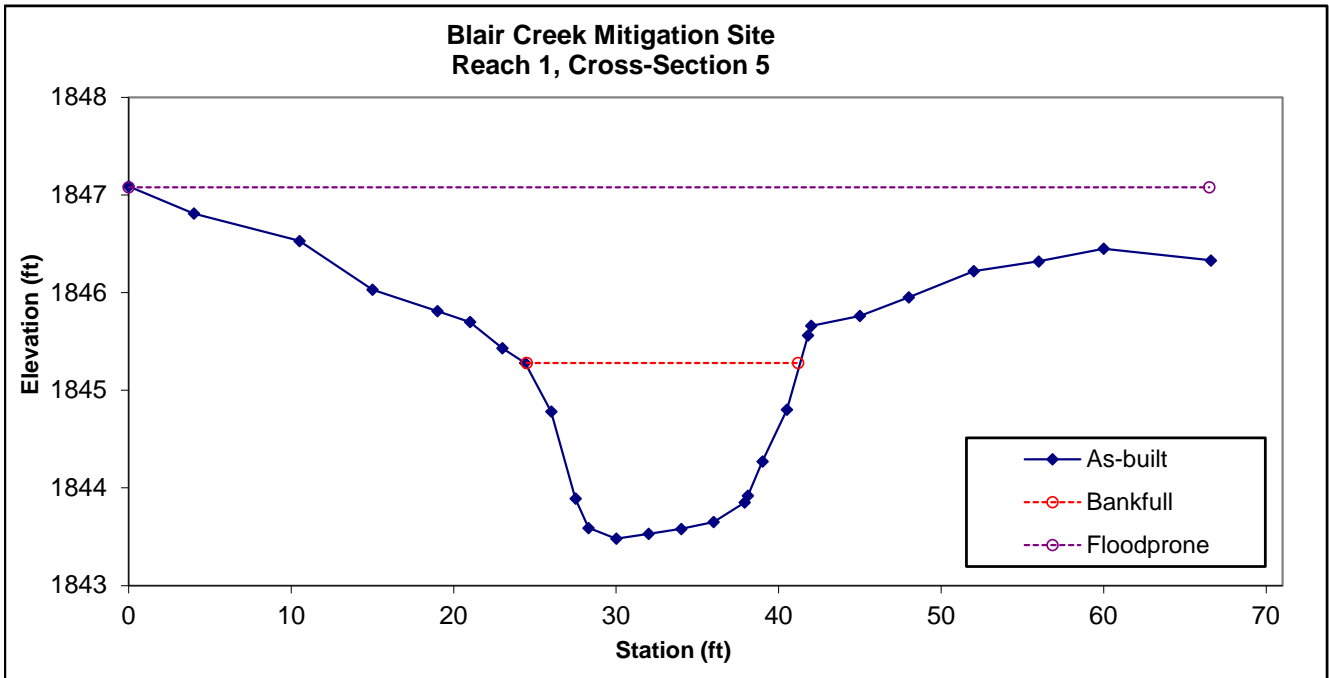


Looking at the Left Bank



Looking at the Right Bank

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Riffle	C	21.9	16.9	1.3	1.8	13.0	1.0	3.9	1845.28	1845.28



**Permanent Cross-Section 6**  
 (As-built Survey Data Collected: December 2021)  
 Restoration

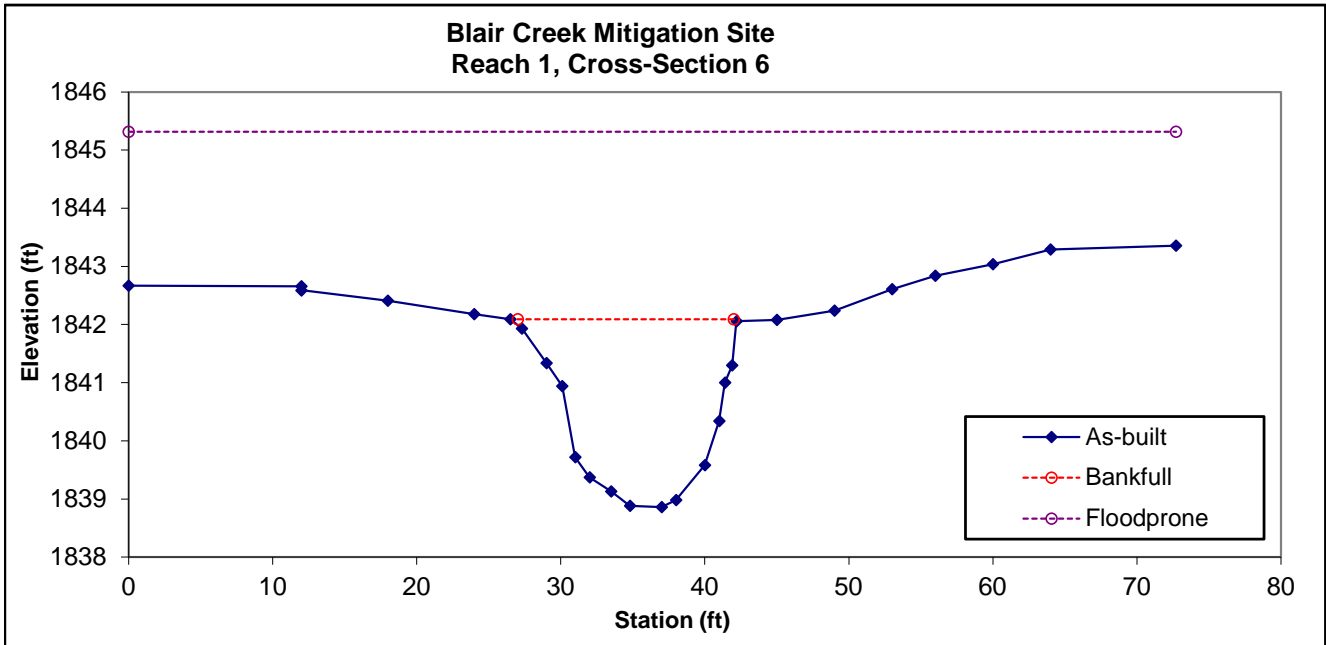


Looking at the Left Bank



Looking at the Right Bank

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Pool	--	33.5	18.8	1.8	3.2	10.5	--	--	1842.09	1842.09



**Permanent Cross-Section 7**  
 (As-built Survey Data Collected: December 2021)  
 Restoration

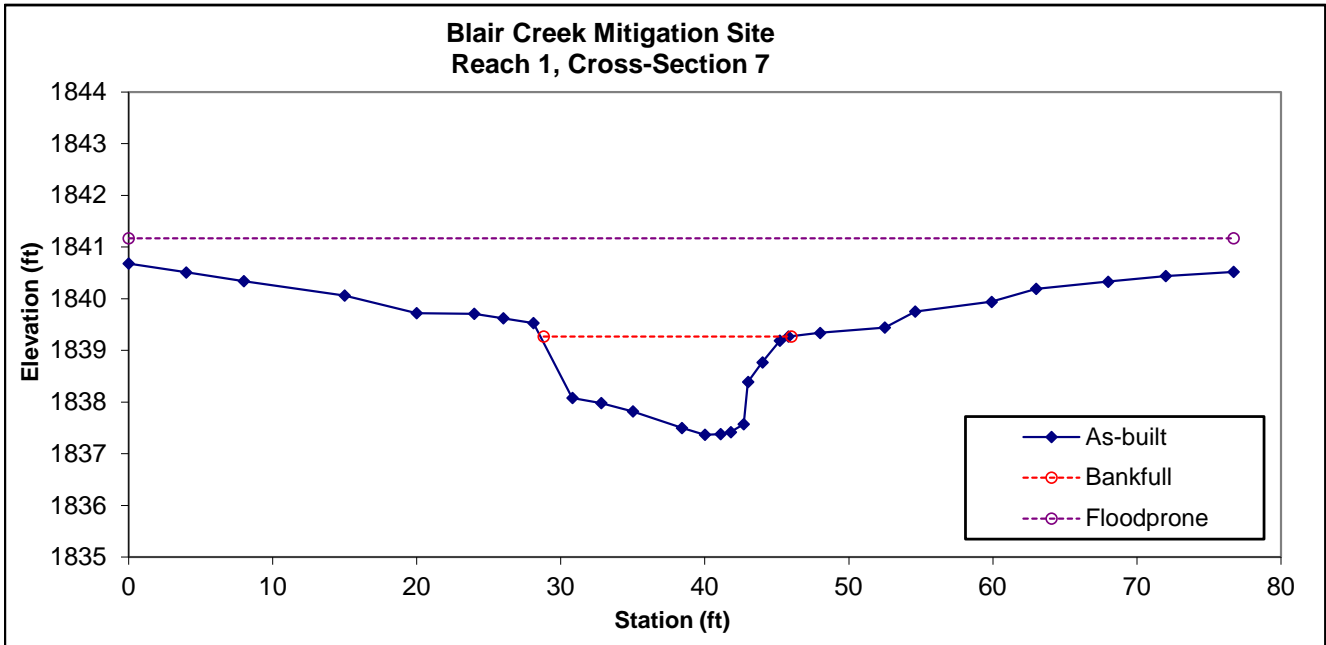


Looking at the Left Bank



Looking at the Right Bank

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Riffle	C	21.7	17.2	1.3	1.9	13.7	1.0	4.5	1839.27	1839.27



**Permanent Cross-Section 8**  
 (As-built Survey Data Collected: December 2021)  
 Restoration

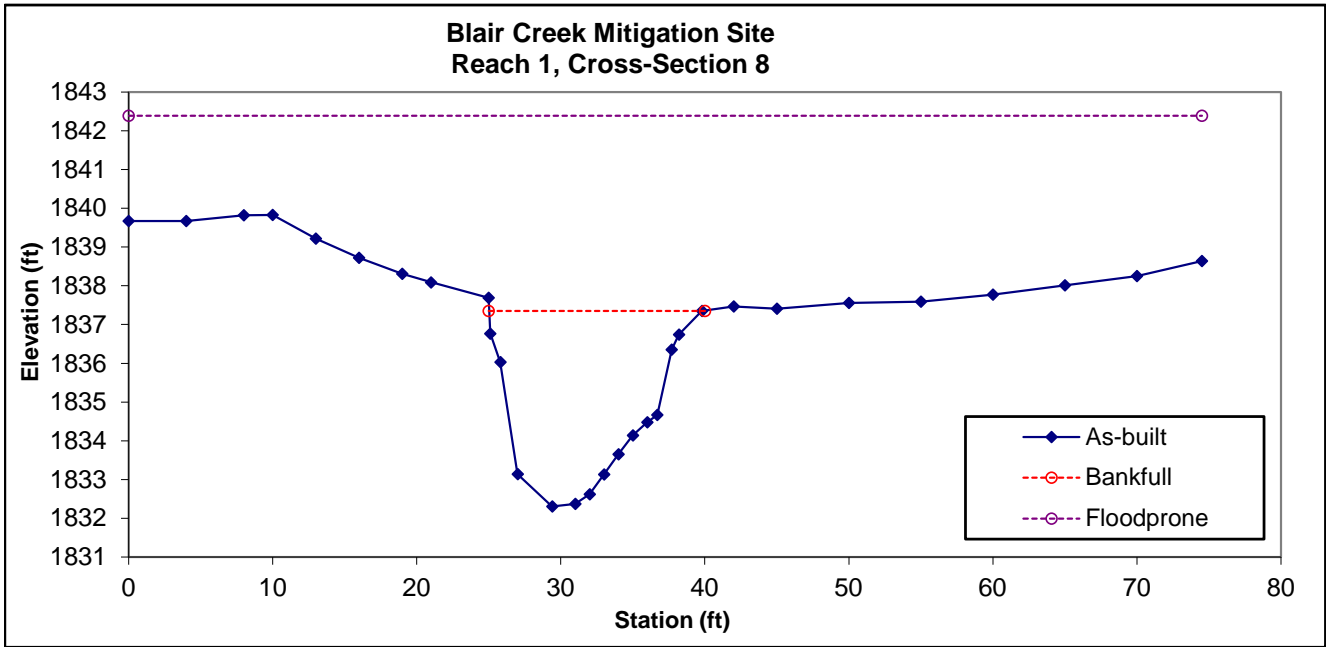


**Looking at the Left Bank**



**Looking at the Right Bank**

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Pool	--	47.58	14.76	3.22	5.04	4.58	--	--	1837.35	1837.35



**Permanent Cross-Section 9**  
 (As-built Survey Data Collected: December 2021)  
 Enhancement 2

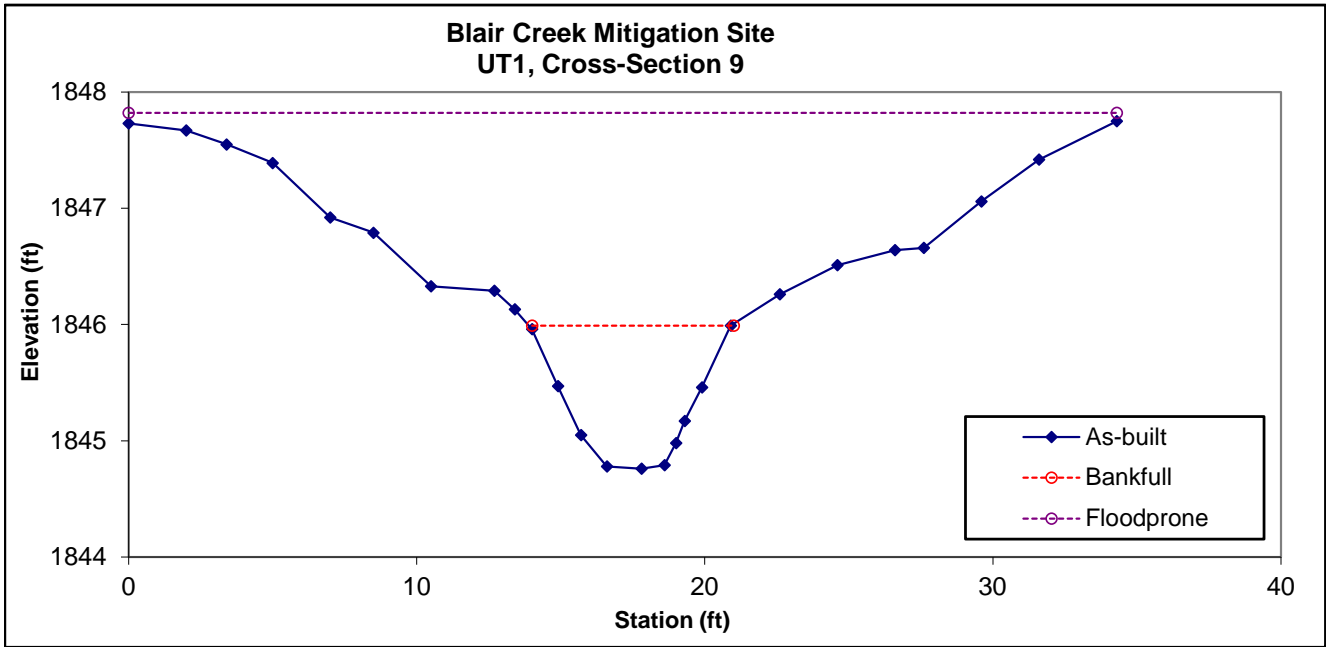


Looking at the Left Bank



Looking at the Right Bank

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Pool	--	5.6	7.0	0.8	1.2	8.8	--	--	1845.99	1845.99



**Permanent Cross-Section 10**  
 (As-built Survey Data Collected: December 2021)  
 Restoration

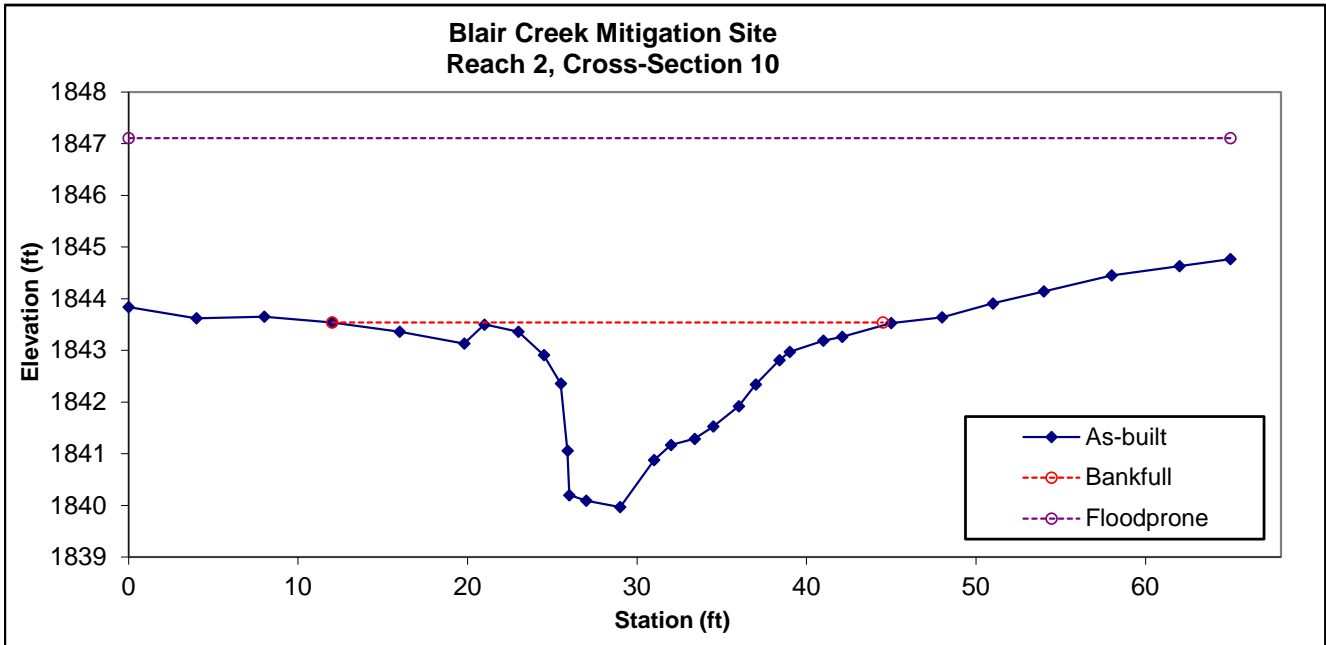


Looking at the Left Bank



Looking at the Right Bank

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Pool	--	36.81	33.27	1.11	3.57	29.97	--	--	1843.54	1843.54





**Permanent Cross-Section 11**  
 (As-built Survey Data Collected: December 2021)  
 Restoration

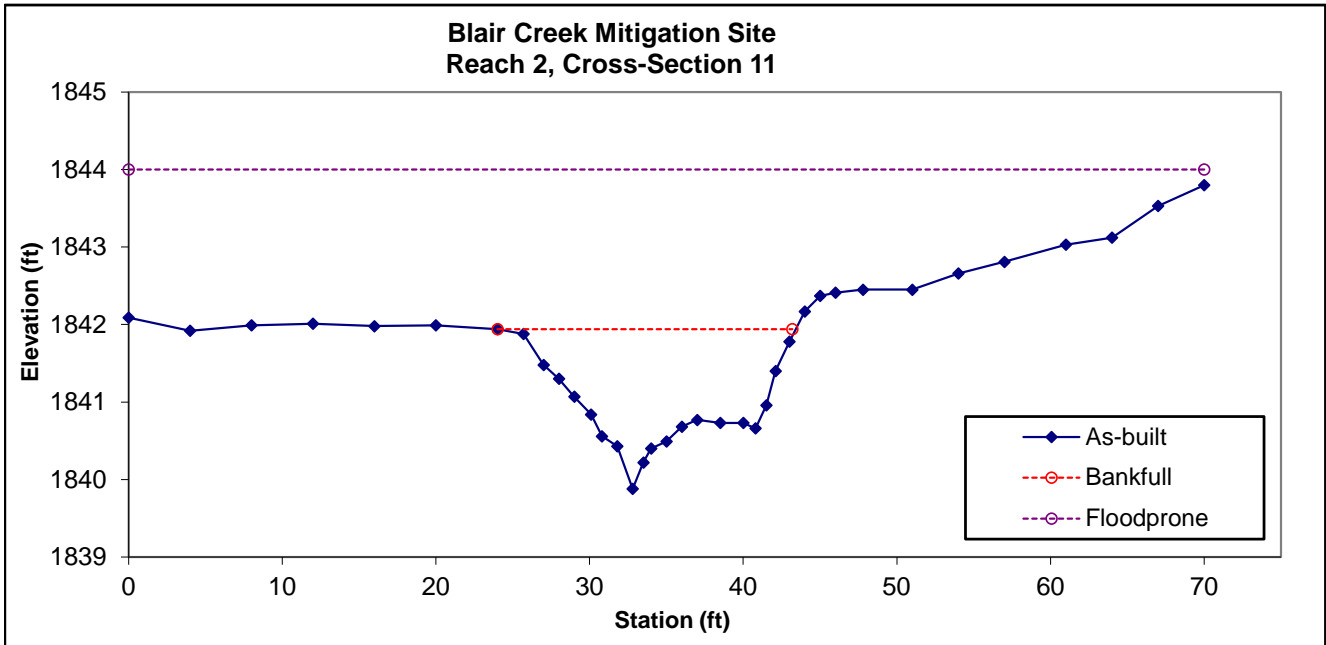


Looking at the Left Bank



Looking at the Right Bank

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Riffle	C	19.29	21.02	0.92	2.06	22.85	1.0	3.33	1841.94	1841.94



**Permanent Cross-Section 12**  
 (As-built Survey Data Collected: December 2021)  
 Restoration

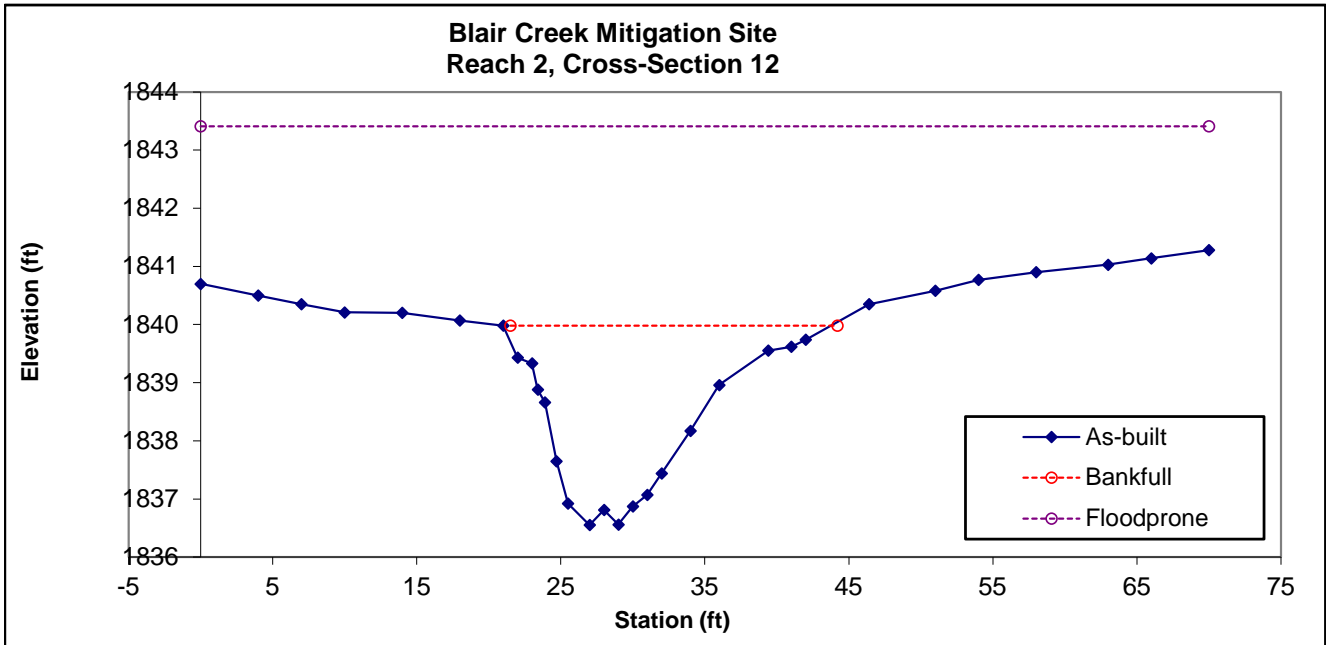


**Looking at the Left Bank**



**Looking at the Right Bank**

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Pool	--	36.69	22.73	1.61	3.43	14.12	--	--	1839.98	1839.98



**Permanent Cross-Section 13**  
 (As-built Survey Data Collected: December 2021)  
 Restoration

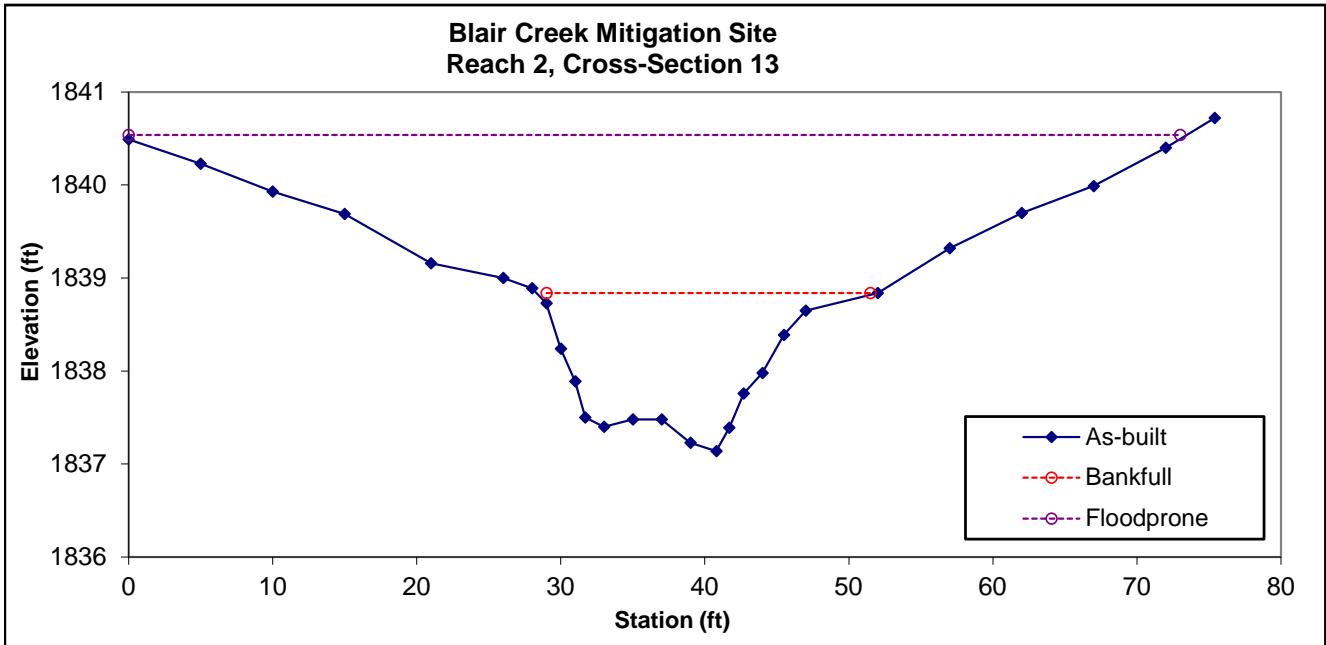


Looking at the Left Bank



Looking at the Right Bank

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Riffle	C	21.13	23.69	0.89	1.7	26.62	1.0	3.1	1838.84	1838.84



**Permanent Cross-Section 14**  
 (As-built Survey Data Collected: December 2021)  
 Restoration

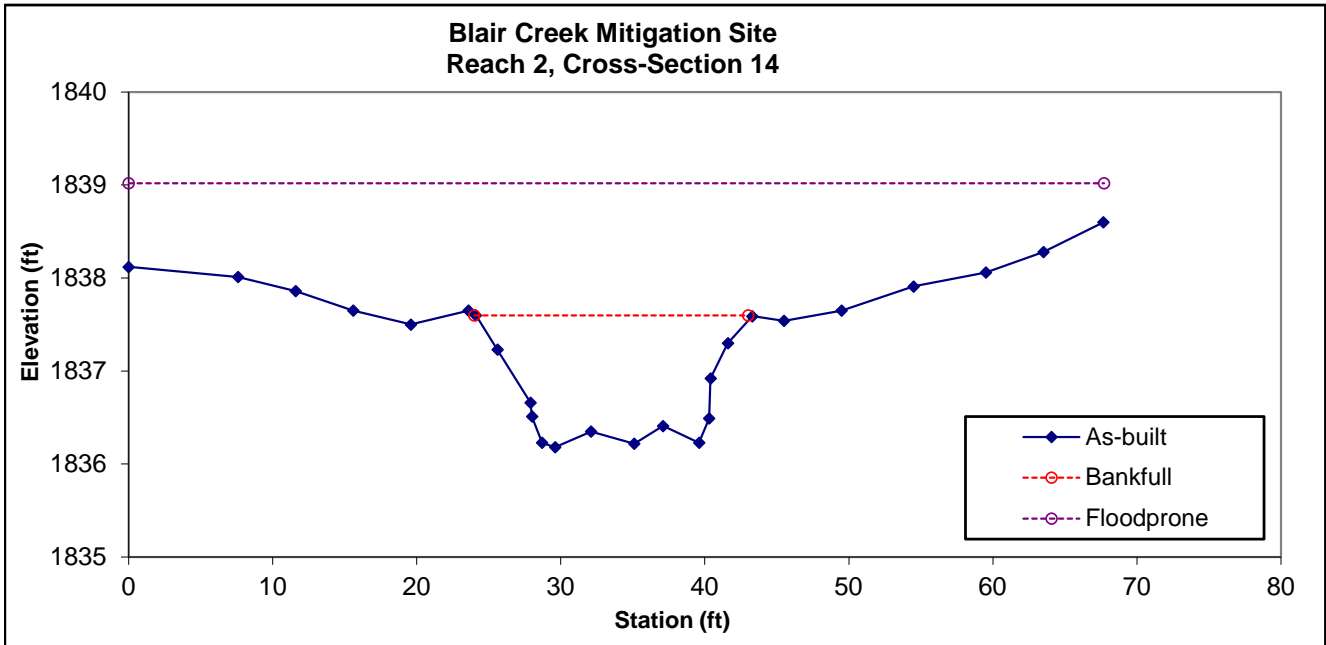


Looking at the Left Bank



Looking at the Right Bank

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Riffle	C	18.9	19.3	1.0	1.4	19.7	1.0	3.5	1837.60	1837.60



**Permanent Cross-Section 15**  
 (As-built Survey Data Collected: December 2021)  
 Restoration

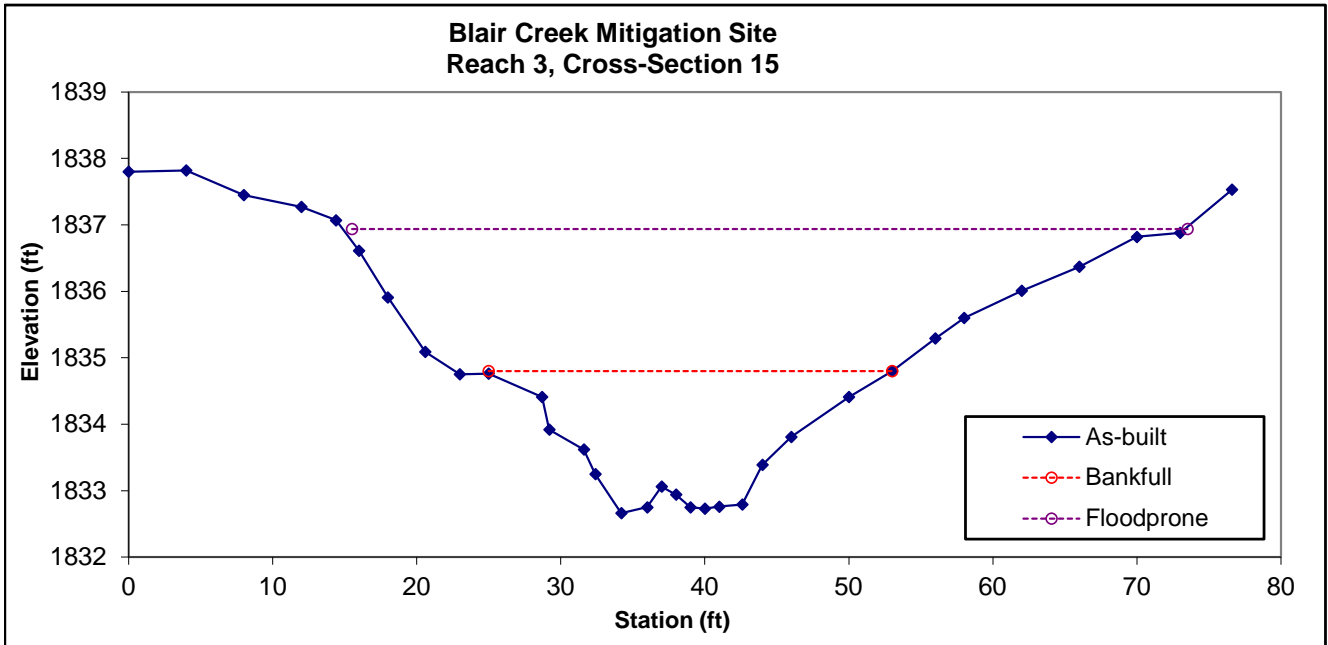


Looking at the Left Bank



Looking at the Right Bank

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Riffle	B	33.01	30.4	1.1	2.14	27.8	1	1.93	1834.8	1834.8



# **APPENDIX E**

## *As-Built Plan Sheets*

# BLAIR CREEK

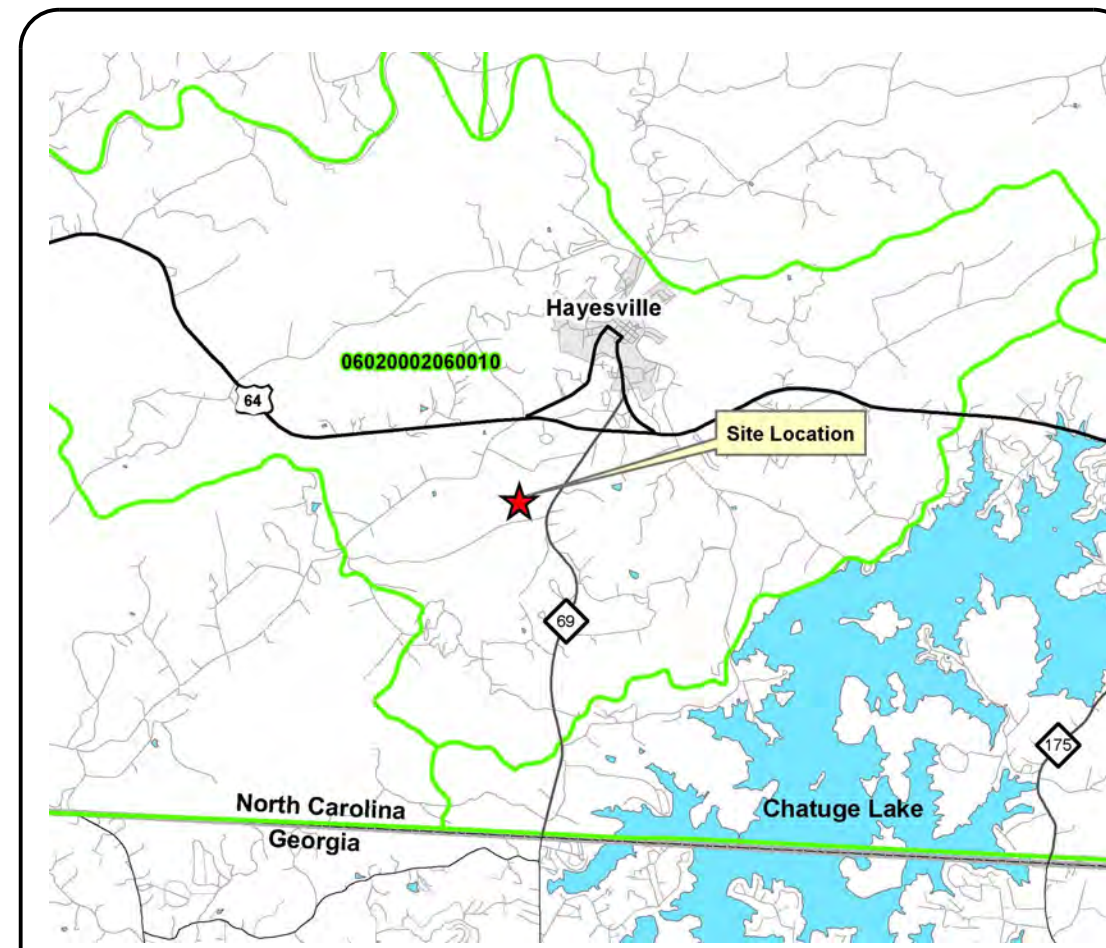
## PROJECT: 166274

**NORTH CAROLINA  
DIVISION OF MITIGATION SERVICES**

---

# CLAY COUNTY

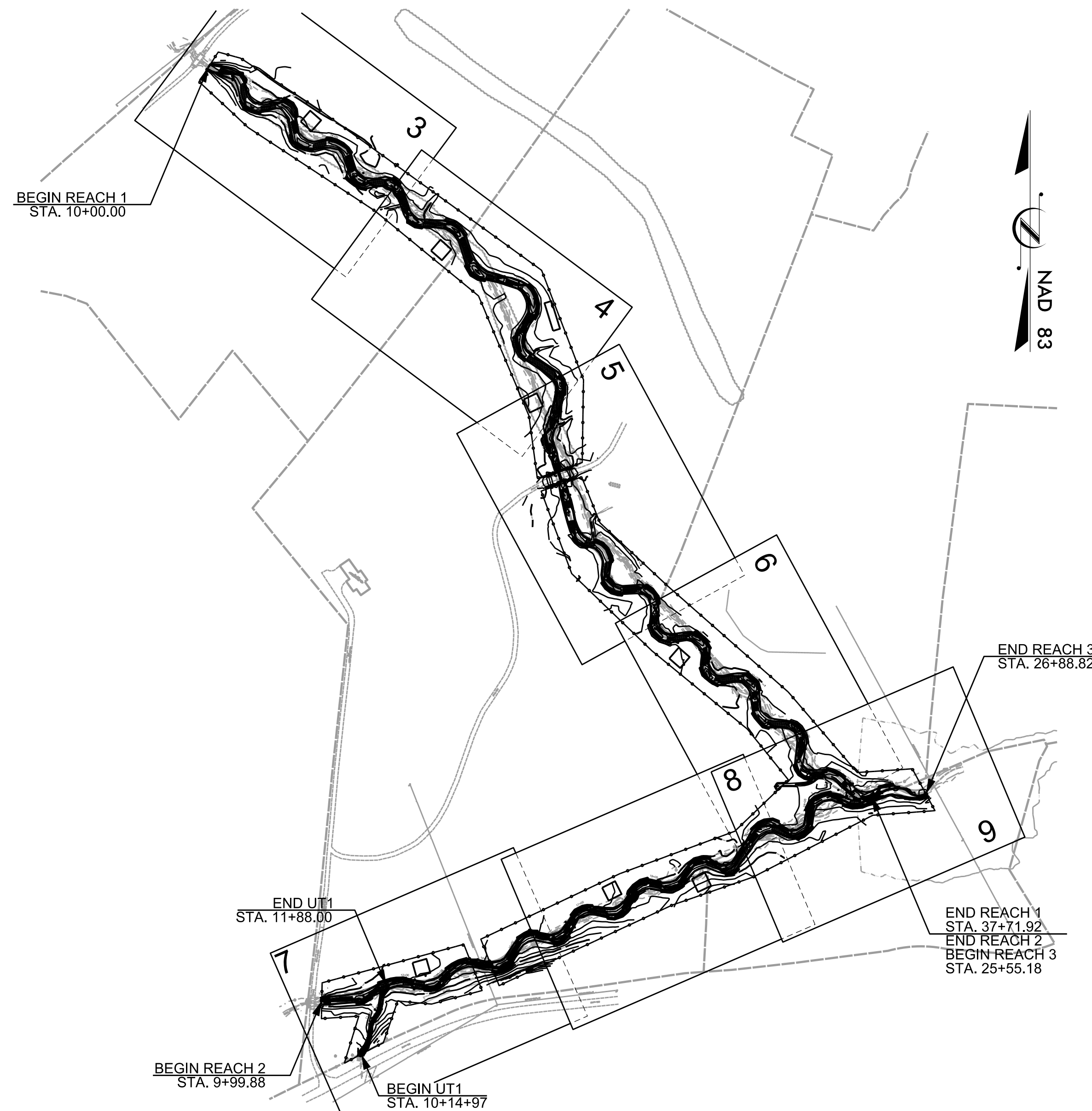
STATE	BAKER PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
NC	166274	1	21



**VICINITY MAP**

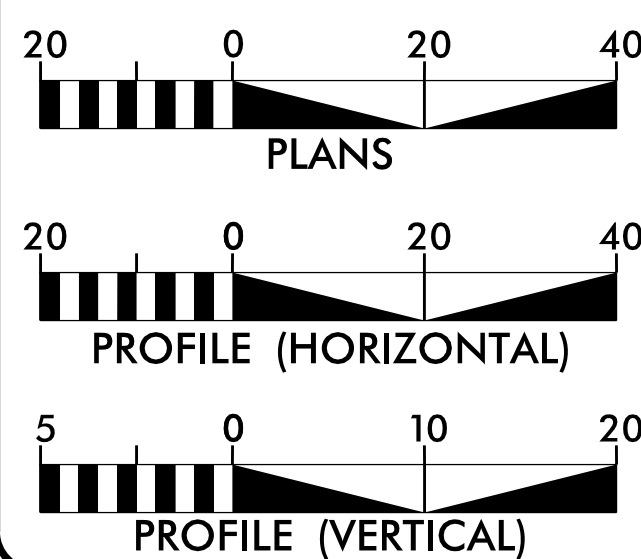
**INDEX OF SHEETS**

- 1 ..... TITLE SHEET
- 1-A ..... STREAM CONVENTIONAL SYMBOLS  
GENERAL NOTES  
STANDARD SPECIFICATIONS  
VEGETATION SELECTION
- 1-B ..... NCDOT CONVENTIONAL SYMBOLS
- 2 - 2F ..... DETAILS
- 3 - 9 ..... PLAN VIEW
- 10 - 13 ..... PROFILES



NCDMS ID NO. 100047

**GRAPHIC SCALES**



**MITIGATION SUMMARY**

STREAMS: REACH	STREAM	
	RESTORATION (lf)	ENHANCEMENT (lf)
Reach 1	2741.86	-
Reach 2	1507.53	-
Reach 3	133.64	-
UT 1	-	173.03
<b>TOTAL</b>	<b>4383.03(lf)</b>	<b>173.03(lf)</b>

WETLANDS: APPROACH	AREA (ac)	
	Restoration by Reestablishment	5.217
Restoration by Rehabilitation	0.691	
Enhancement	0.178	
<b>TOTAL</b>	<b>6.086(ac)</b>	

**PREPARED FOR THE OFFICE OF:**

NCDEQ  
DIVISION OF MITIGATION SERVICES  
1652 MAIL SERVICE CENTER  
RALEIGH, NC 27699-1652

**CONTACT:** \_\_\_\_\_  
MATTHEW REID  
PROJECT MANAGER

**Michael Baker Engineering Inc.**  
8000 Regency Parkway, Suite 600  
Cary, NORTH CAROLINA 27518  
Phone: 919.463.5488  
Fax: 919.463.5490  
License #: F-1084

INTERNATIONAL

**KATHLEEN M. MCKEITHAN, PE**  
PROJECT ENGINEER

**PROJECT ENGINEER**



4/13/2022

DocuSigned by:  
*Kathleen M. McKeithan*  
21E946E4181473  
SIGNATURE: \_\_\_\_\_ P.E.

## STREAM CONVENTIONAL SYMBOLS SUPERCEDES SHEET 1-B

J-HOOK VANE GRADE CONTROL J-HOOK VANE ROCK VANE OUTLET PROTECTION ROCK CROSS VANE DOUBLE DROP ROCK CROSS VANE LOG AND ROCK STEP / POOL TEMPORARY ROCK DAM ROOT WAD LOG J-HOOK VANE GRADE CONTROL LOG J-HOOK VANE LOG VANE LOG STEP LOG CROSS VANE LOG ROLLER CONSTRUCTED RIFFLE BOULDER CLUSTER BOULDER STEP SAFETY FENCE TAPE FENCE JURISDICTIONAL WETLAND BOUNDARY	100 YEAR FLOOD PLAIN CONSERVATION EASEMENT EXISTING MAJOR CONTOUR EXISTING MINOR CONTOUR LIMITS OF DISTURBANCE PROPERTY LINE FOOT BRIDGE TEMPORARY STREAM CROSSING PERMANENT STREAM CROSSING TRANSPLANTED VEGETATION TREE REMOVAL TREE PROTECTION DITCH PLUG CHANNEL FILL SOD MAT WITH WOOD TOE GEOLIFT WITH BRUSH TOE ROOT WAD REVETMENT WITH LIVE BRUSH BOULDER TOE PROTECTION PROPOSED WETLAND RE-ESTABLISHMENT PROPOSED WETLAND ENHANCEMENT PROPOSED WETLAND REHABILITATION	MONITORING WELL RAIN GAUGE CREST GAUGE IN STREAM FLOW GAUGE
--	---	--

\*\*NOTE: ALL ITEMS ABOVE MAY NOT BE USED ON THIS PROJECT

## STANDARD SPECIFICATIONS

### NORTH CAROLINA EROSION AND SEDIMENT CONTROL PLANNING AND DESIGN MANUAL MARCH 2009 (REV 2013)

- 6.06 TEMPORARY GRAVEL CONSTRUCTION ENTRANCE
- 6.24 RIPARIAN AREA SEEDING
- 6.60 TEMPORARY SEDIMENT TRAP
- 6.62 TEMPORARY SILT FENCE
- 6.63 TEMPORARY ROCK DAM
- 6.70 TEMPORARY STREAM CROSSING

PROJECT REFERENCE NO. <b>166274</b>	SHEET NO. <b>1-A</b>
PROJECT ENGINEER	
DocuSigned by: <b>Kathleen M. McKisken</b> APPROVED BY: 4/13/2022 DATE:	
<b>Michael Baker International</b> Michael Baker Engineering Inc. 8000 Regency Parkway, Suite 600 Cary, NORTH CAROLINA 27518 Phone: 919.463.5498 Fax: 919.463.5490 License #: F-1084	
NCDMS ID NO. 100047	

## GENERAL NOTES

1. THE CONTRACTOR IS REQUIRED TO INSTALL IN-STREAM STRUCTURES USING A TRACK HOE WITH A HYDRAULIC THUMB OF SUFFICIENT SIZE TO PLACE BOULDERS (3'x2'x2'), LOGS AND ROOTWADS.
2. WORK IS BEING PERFORMED AS AN ENVIRONMENTAL RESTORATION PLAN. THE CONTRACTOR SHOULD MAKE ALL REASONABLE EFFORTS TO REDUCE SEDIMENT LOSS AND MINIMIZE DISTURBANCE OF THE SITE WHILE PERFORMING THE CONSTRUCTION WORK.
3. CONSTRUCTION IS SCHEDULED FOR THE SPRING OF 2021.
4. CONTRACTOR SHOULD CALL NORTH CAROLINA "ONE-CALL" BEFORE EXCAVATION STARTS. (1-800-632-4949)
5. BOULDER SIZES FOR IN-STREAM STRUCTURES SHALL BE A MINIMUM OF 3'x2'x1' AND CAN BE CHANGED PER STRUCTURE OR THE DIRECTION OF THE ENGINEER.
6. ALL ON-SITE ALLUVIUM SHALL BE HARVESTED AND STOCKPILED PRIOR TO FILLING ABANDONED CHANNELS.
7. TOPSOIL SHALL BE EXCAVATED TO A DEPTH OF 8" AND STOCKPILED SEPARATELY FROM UNDERCUT SOIL. 6" OF TOPSOIL SHALL BE PLACED ON ALL BANKFULL BENCHES AND AS DIRECTED BY THE ENGINEER.
8. ALL DISTURBED EMBANKMENTS SHALL BE MATTED WITH COIR FIBER MATTING OR AS DIRECTED BY THE ENGINEER.
9. ALL STREAM BANKS SHALL BE LIVE STAKED.
10. UNLESS THE ALIGNMENT IS BEING ALTERED, THE EXISTING CHANNEL DIMENSIONS ARE TO REMAIN UNLESS OTHERWISE NOTED.
11. CONTRACTOR WILL ENSURE THAT FENCING IS INSTALLED ON OR OUTSIDE THE CONSERVATION EASEMENT AS SHOWN ON THE PLANS BUT NO MORE THAN 1' OUTSIDE.
12. WHERE PROPOSED FENCE CROSSES EXISTING STREAMS, THE CONTRACTOR SHALL UTILIZE A SECTION OF BREAK AWAY FENCE, A FLOOD GATE, OR ELECTRIFIED CHAINS AS DIRECTED BY THE ENGINEER.

## VEGETATION SELECTION

Proposed Bare-Root and Live Stake Species			
Botanical Name	Common Name	% Planted by Species	Wetland Tolerance
<b>All Buffer Plantings at 680 stems/acre using 8' X 8' spacing</b>			
<b>General Riparian Zone – Overstory/Canopy Species</b>			
<i>Betula nigra</i>	River Birch	10%	FACW
<i>Platanus occidentalis</i>	Sycamore	10%	FACW
<i>Liriodendron tulipifera</i>	Tulip Poplar	15%	FACU
<i>Betula alleghaniensis</i>	Yellow Birch	15%	FAC
<i>Quercus imbricaria</i>	Shingle Oak	10%	FAC
<i>Quercus lyrata</i>	Overcup Oak	10%	OBL
<i>Quercus phellos</i>	Willow Oak	2.5%	FAC
<i>Fraxinus pennsylvanica</i>	Green Ash	5%	FACW
<i>Diospyros virginiana</i>	Persimmon	2.5%	FAC
<i>Ulmus americana</i>	American Elm	5%	FACW
<b>General Riparian Zone – Understory/Shrub Species</b>			
<i>Rhododendron maximum</i>	Rosebay	0%	FAC
<i>Lindera benzoin</i>	Spicebush	5%	FAC
<i>Halesia carolina</i>	Carolina Silverbell	2.5%	FAC
<i>Ilex verticillata</i>	Winterberry	2.5%	FACW
<i>Carpinus caroliniana</i>	American Hornbeam	2.5%	FAC
<i>Sambucus canadensis</i>	Elderberry	2.5%	FAC
<i>Magnolia tripetala</i>	Umbrella Tree	0.0%	FACU

Proposed Bare-Root and Live Stake Species			
Botanical Name	Common Name	% Planted by Species	Wetland Tolerance
<b>All Buffer Plantings at 680 stems/acre using 8' X 8' spacing</b>			
<b>Wetland Zone – Overstory/Canopy Species</b>			
<i>Betula nigra</i>	River Birch	15%	FACW
<i>Platanus occidentalis</i>	Sycamore	15%	FACW
<i>Quercus lyrata</i>	Overcup Oak	7.5%	OBL
<i>Quercus pagoda</i>	Cherrybark Oak	7.5%	FACW
<i>Quercus machauxii</i>	Swamp Chestnut Oak	5%	FACW
<i>Acer saccharinum</i>	Silver Maple	7.5%	FACW
<i>Fraxinus pennsylvanica</i>	Green Ash	5%	FACW
<i>Ulmus americana</i>	American Elm	7.5%	FACW
<b>Wetland Zone – Understory/Shrub Species</b>			
<i>Alnus serrulata</i>	Tag Alder	7.5%	OBL
<i>Ilex verticillata</i>	Winterberry	5%	FACW
<i>Acer negundo</i>	Box Elder	5%	FAC
<i>Cephalanthus occidentalis</i>	Buttonbush	2.5%	OBL
<i>Cornus amomum</i>	Silky Dogwood	5.0%	FACW
<i>Xanthorhiza simplicissima</i>	Yellow-root	2.5%	FACW
<i>Aronia arbutifolia</i>	Red Chokeberry	2.5%	FACW
<b>Streambank Live Stake Plantings</b>			
<i>Salix sericea</i>	Silky Willow	25%	OBL
<i>Sambucus canadensis</i>	Elderberry	20%	FACW
<i>Cephalanthus occidentalis</i>	Buttonbush	10%	OBL
<i>Cornus amomum</i>	Silky Dogwood	25%	FACW
<i>Salix nigra</i>	Black Willow	20%	OBL

Proposed Permanent Seed Mixture				
Botanical Name	Common Name	% Planted by Species	Density (lbs/ac)	Wetland Tolerance
<i>Agrostis perennans</i>	Autumn Bentgrass	10%	1.5	FACU
<i>Elymus virginicus</i>	Virginia Wildrye	15%	2.25	FACW
<i>Panicum virgatum</i>	Switchgrass	15%	2.25	FAC
<i>Tripsacum dactyloides</i>	Eastern Gamma Grass	5%	0.75	FACW
<i>Polygonum pennsylvanicum</i>	Pennsylvania Smartweed	5%	0.75	FACW
<i>Schizachyrium scoparium</i>	Little Blue Stem	5%	0.75	FACU
<i>Juncus effusus</i>	Soft Rush	5%	0.75	FACW
<i>Bidens frondosa (or aristosa)</i>	Beggars Tick	5%	0.75	FACW
<i>Coreopsis lanceolata</i>	Lance-Leaved Tick Seed	10%	1.5	FACU
<i>Dichanthelium clandestinum</i>	Tioga Deer Tongue	15%	2.25	FAC
<i>Andropogon gerardii</i>	Big Blue Stem	5%	0.75	FAC
<i>Sorghastrum nutans</i>	Indian Grass	5%	0.75	FACU
<b>Total</b>		<b>100%</b>	<b>15</b>	

VEGETATION SELECTION ITEMS SHOWN IN RED REPRESENT AS-BUILT ADJUSTMENTS IN PLANTING



STATE OF NORTH CAROLINA  
DIVISION OF HIGHWAYS

# CONVENTIONAL SYMBOLS

\*S.U.E = SUBSURFACE UTILITY ENGINEER

Seal of Kathleen M. McKelhan, Professional Engineer, Seal No. 028432.

APPROVED BY: \_\_\_\_\_  
DATE: 4/13/2022

### BOUNDARIES AND PROPERTY:

State Line	-----
County Line	-----
Township Line	-----
City Line	-----
Reservation Line	-----
Property Line	-----
Existing Iron Pin	○ EP
Property Corner	-----
Property Monument	□ ECM
Parcel/Sequence Number	②③
Existing Fence Line	-x-x-x-
Proposed Woven Wire Fence	○
Proposed Chain Link Fence	□
Proposed Barbed Wire Fence	◇
Existing Wetland Boundary	-WLB-
Proposed Wetland Boundary	-WLB-
Existing Endangered Animal Boundary	-EAB-
Existing Endangered Plant Boundary	-EPB-

### BUILDINGS AND OTHER CULTURE:

Gas Pump Vent or U/G Tank Cap	○
Sign	○ S
Well	○ W
Small Mine	⊗
Foundation	□
Area Outline	□
Cemetery	□ †
Building	□
School	□
Church	□
Dam	□

### HYDROLOGY:

Stream or Body of Water	-----
Hydro, Pool or Reservoir	□
Jurisdictional Stream	-JS-
Buffer Zone 1	-BZ 1-
Buffer Zone 2	-BZ 2-
Flow Arrow	←
Disappearing Stream	-----
Spring	○
Wetland	-----
Proposed Lateral, Tail, Head Ditch	-----
False Sump	▽

### RAILROADS:

Standard Gauge	-----
RR Signal Milepost	○ MILEPOST 35
Switch	□ SWITCH
RR Abandoned	-----
RR Dismantled	-----

### RIGHT OF WAY:

Baseline Control Point	◆
Existing Right of Way Marker	△
Existing Right of Way Line	-----
Proposed Right of Way Line	-----
Proposed Right of Way Line with Iron Pin and Cap Marker	○ R W
Proposed Right of Way Line with Concrete or Granite Marker	○ R W
Existing Control of Access	○ C A
Proposed Control of Access	○ C A
Existing Easement Line	-E-
Proposed Temporary Construction Easement	-E-
Proposed Temporary Drainage Easement	-TDE-
Proposed Permanent Drainage Easement	-PDE-
Proposed Permanent Utility Easement	-PUE-
Proposed Temporary Utility Easement	-TUE-
Proposed Permanent Easement with Iron Pin and Cap Marker	◆

### ROADS AND RELATED FEATURES:

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

### VEGETATION:

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

### EXISTING STRUCTURES:

MAJOR:	
Bridge, Tunnel or Box Culvert	□ CONC
Bridge Wing Wall, Head Wall and End Wall	} CONC WW {
MINOR:	
Head and End Wall	□ CONC HW
Pipe Culvert	-----
Footbridge	-----
Drainage Box: Catch Basin, DI or JB	□ CB
Paved Ditch Gutter	-----
Storm Sewer Manhole	○ S
Storm Sewer	-S-

### UTILITIES:

POWER:	
Existing Power Pole	●
Proposed Power Pole	○
Existing Joint Use Pole	●
Proposed Joint Use Pole	○
Power Manhole	○ P
Power Line Tower	□
Power Transformer	□
U/G Power Cable Hand Hole	□ PH
H-Frame Pole	●
Recorded U/G Power Line	-P-
Designated U/G Power Line (S.U.E.*)	-P-

### TELEPHONE:

Existing Telephone Pole	●
Proposed Telephone Pole	○
Telephone Manhole	○ T
Telephone Booth	□
Telephone Pedestal	□
Telephone Cell Tower	□
U/G Telephone Cable Hand Hole	□ PH
Recorded U/G Telephone Cable	-T-
Designated U/G Telephone Cable (S.U.E.*)	-T-
Recorded U/G Telephone Conduit	-TC-
Designated U/G Telephone Conduit (S.U.E.*)	-TC-
Recorded U/G Fiber Optics Cable	-T FO-
Designated U/G Fiber Optics Cable (S.U.E.*)	-T FO-

### WATER:

Water Manhole	○ W
Water Meter	○
Water Valve	⊗
Water Hydrant	○
Recorded U/G Water Line	-----
Designated U/G Water Line (S.U.E.*)	-----
Above Ground Water Line	-A/G Water-

### TV:

TV Satellite Dish	□
TV Pedestal	□
TV Tower	⊗
U/G TV Cable Hand Hole	□ PH
Recorded U/G TV Cable	-TV-
Designated U/G TV Cable (S.U.E.*)	-TV-
Recorded U/G Fiber Optic Cable	-TV FO-
Designated U/G Fiber Optic Cable (S.U.E.*)	-TV FO-

### GAS:

Gas Valve	◇
Gas Meter	◇
Recorded U/G Gas Line	-G-
Designated U/G Gas Line (S.U.E.*)	-G-
Above Ground Gas Line	-A/G Gas-

### SANITARY SEWER:

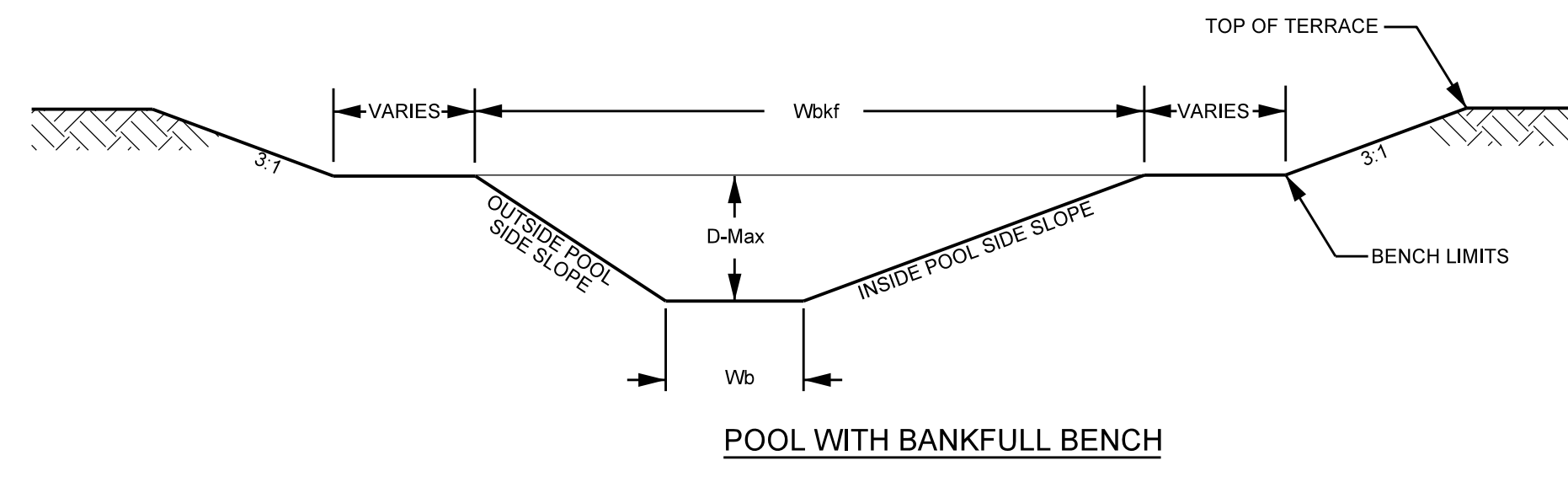
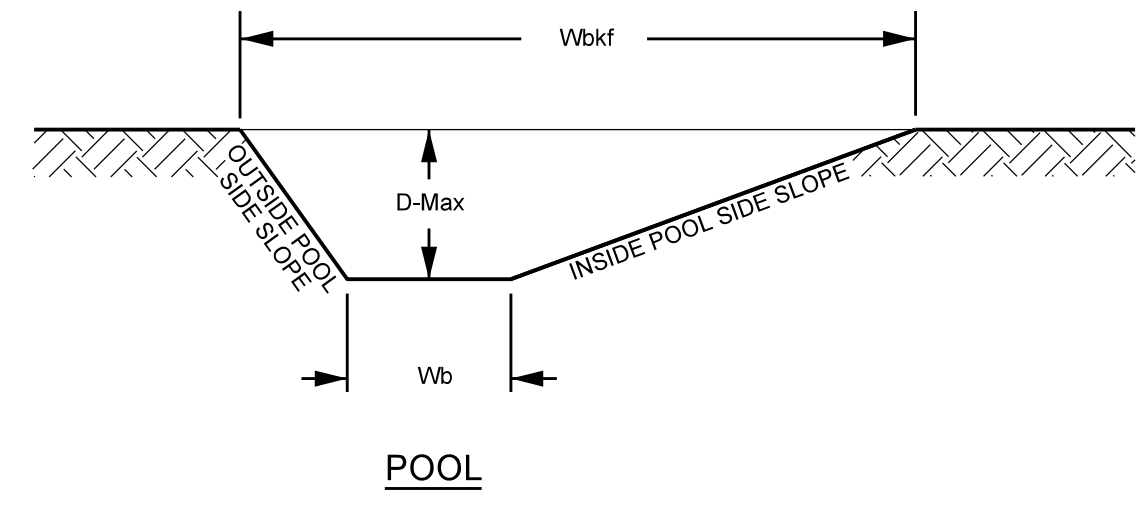
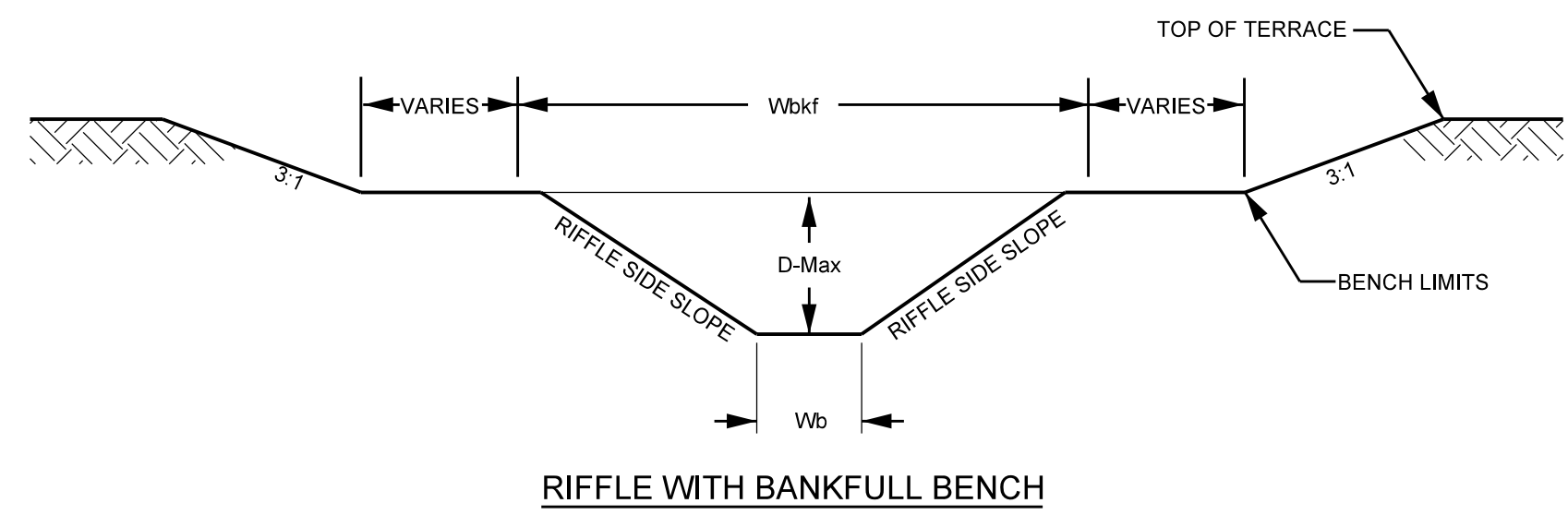
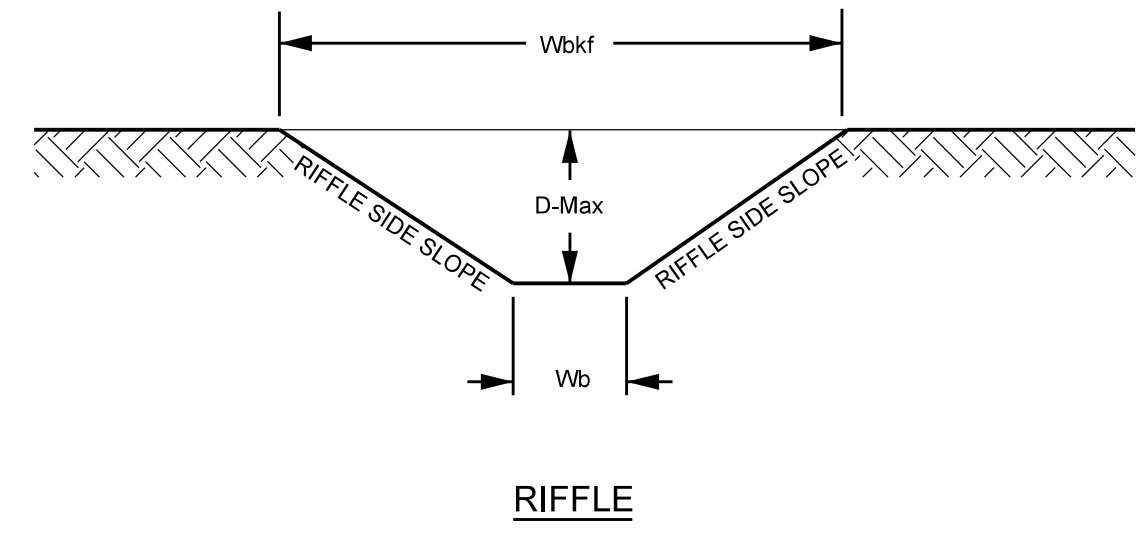
Sanitary Sewer Manhole	○ SS
Sanitary Sewer Cleanout	○
U/G Sanitary Sewer Line	-SS-
Above Ground Sanitary Sewer	-A/G Sanitary Sewer-
Recorded SS Forced Main Line	-FSS-
Designated SS Forced Main Line (S.U.E.*)	-FSS-

### MISCELLANEOUS:

Utility Pole	●
Utility Pole with Base	□
Utility Located Object	○
Utility Traffic Signal Box	□
Utility Unknown U/G Line	-TUTL-
U/G Tank; Water, Gas, Oil	□
A/G Tank; Water, Gas, Oil	□
U/G Test Hole (S.U.E.*)	○
Abandoned According to Utility Records	AATUR
End of Information	E.O.I.

2/26/2022

### TYPICAL RIFFLE, POOL, AND BANKFULL BENCH CROSS SECTIONS



	North Fork Blair REACH 1 Upstream of Farm Road		North Fork Blair REACH 1 Downstream of Farm Road		South Fork Blair REACH 2		Blair Creek REACH 3		UT1	
	RIFFLE	POOL	RIFFLE	POOL	RIFFLE	POOL	RIFFLE	POOL	RIFFLE	POOL
WIDTH OF BANKFULL (Wbkf)	16.5	23.0	17.0	24.0	17.0	23.0	22.5	32.0	4.7	7.25
MAXIMUM DEPTH (Dmax)	1.3	2.5	1.4	2.5	1.4	2.5	1.8	4.0	0.5	1.0
W/D (Wbkf/Dmax)	15.0	14.2	14.2	14.5	14.2	14.2	15.0	13.5	12.5	12.4
BANKFULL AREA (Abkf)	18.2	37.2	20.4	39.7	20.4	37.2	33.8	75.0	1.8	4.3
BOTTOM WIDTH (Wb)	11.3	6.8	11.2	7.8	11.2	6.8	15.4	6.0	2.8	1.3
RIFFLE SIDE SLOPE (X:1)	2.0	-	2.0	-	2.0	-	2.0	-	2.0	-
INSIDE POOL SIDE SLOPE	5.0	-	5.0	-	5.0	-	5.0	-	3.0	-
OUTSIDE POOL SIDE SLOPE	1.5	-	1.5	-	1.5	-	1.5	-	3.0	-

PROJECT REFERENCE NO. **166274** SHEET NO. **2**

PROJECT ENGINEER

Designed by: **Kathleen M. McKeithan**

APPROVED BY:

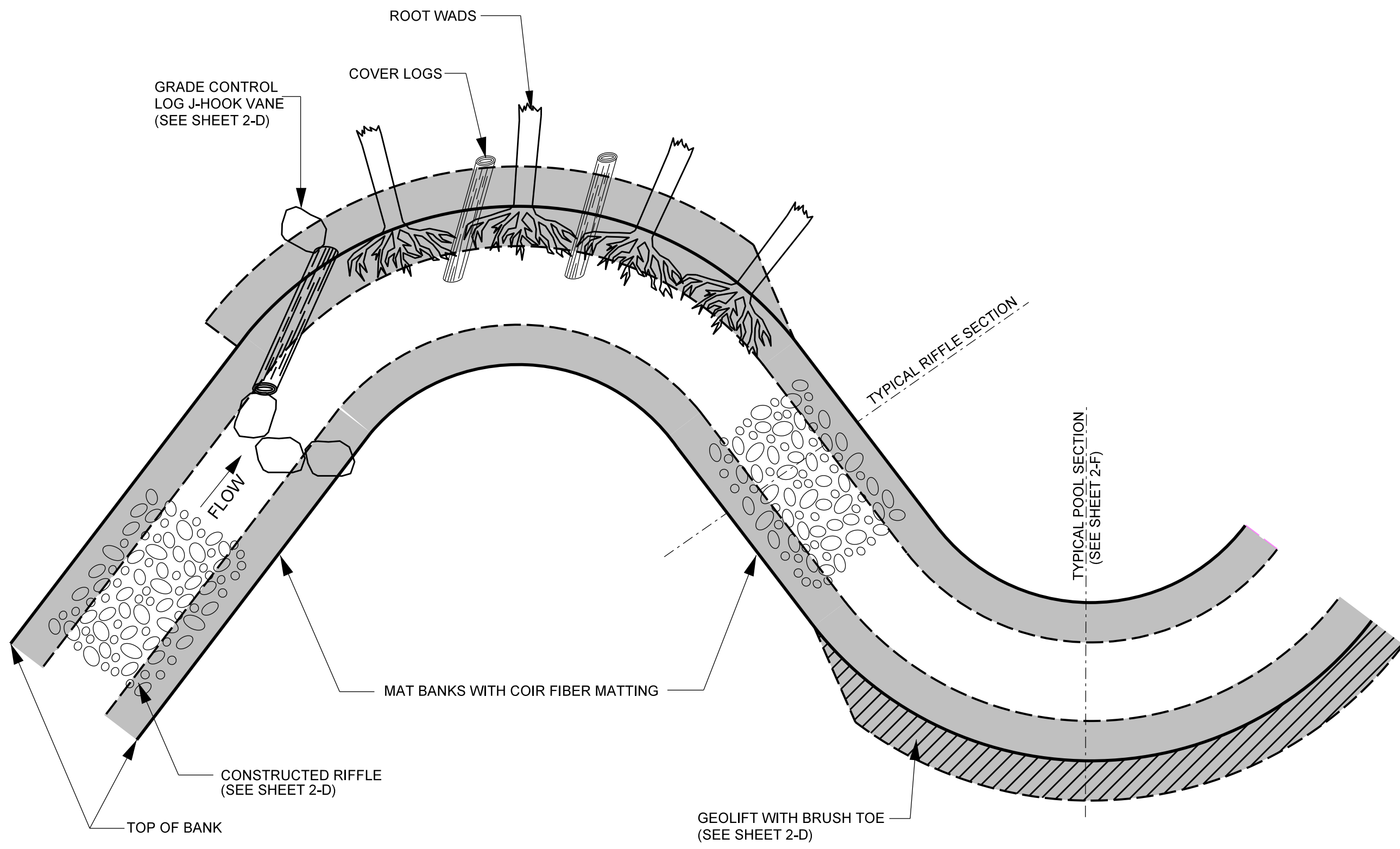
4/13/2022

DATE:

**Michael Baker International** Michael Baker Engineering Inc.  
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Fax: 919.463.5490  
License #: F-1084

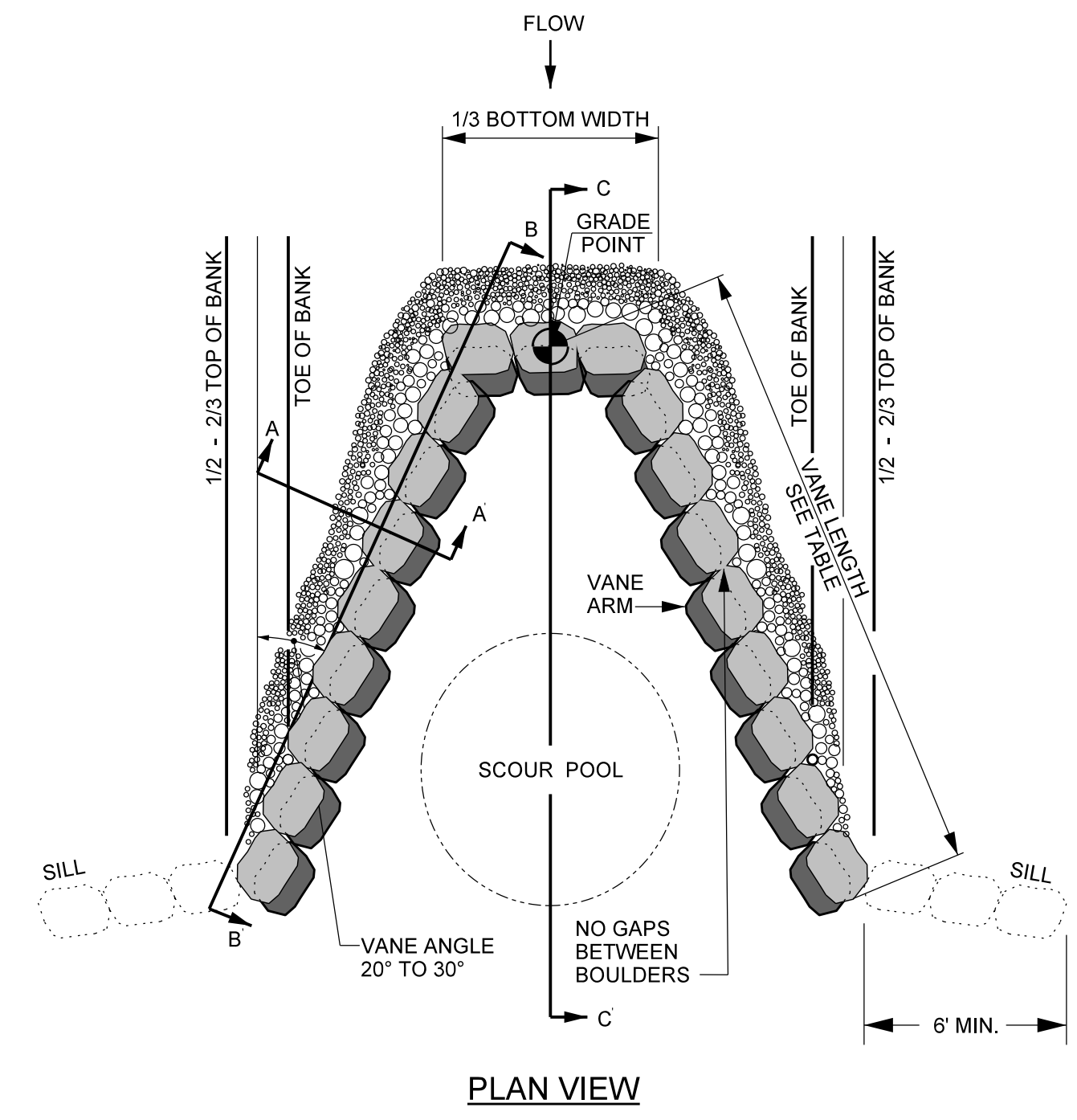
**NCDSM ID NO. 100047**

### TYPICAL STRUCTURE PLACEMENT



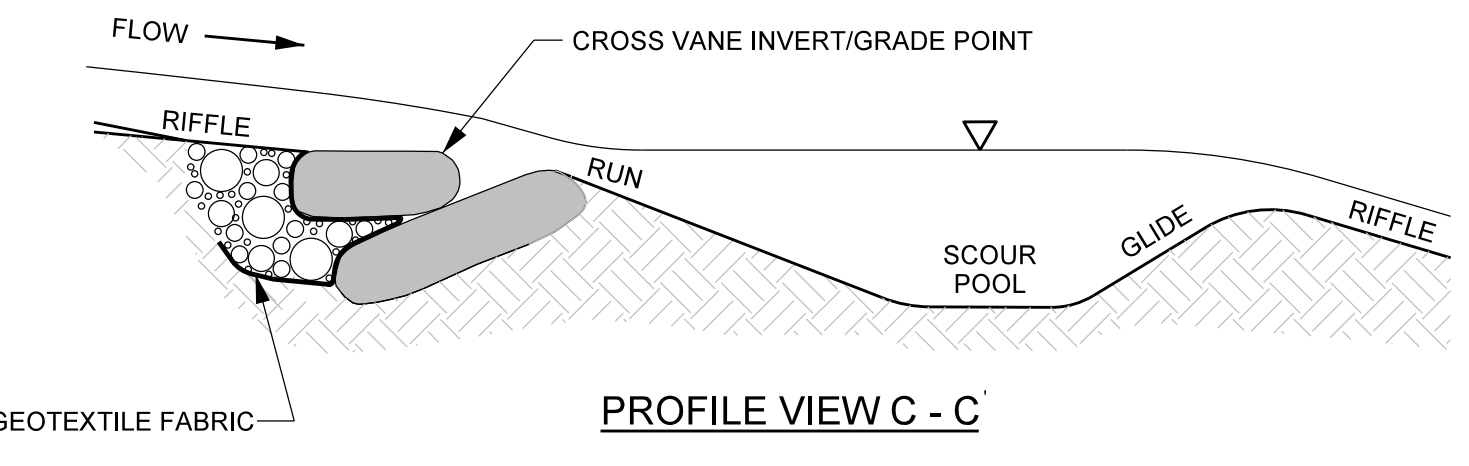
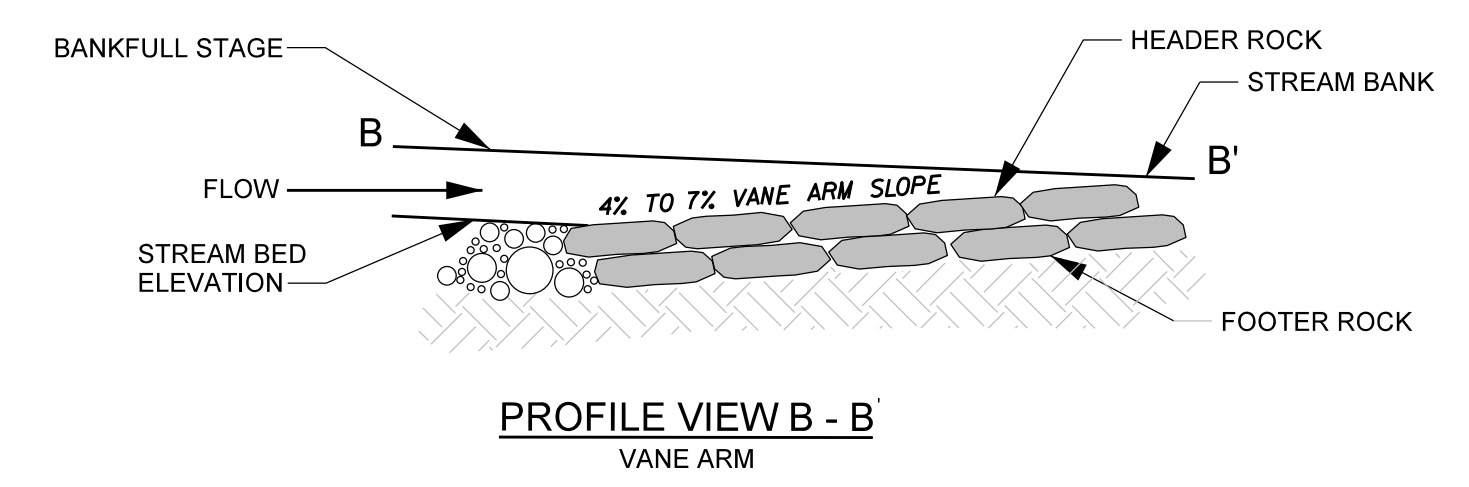
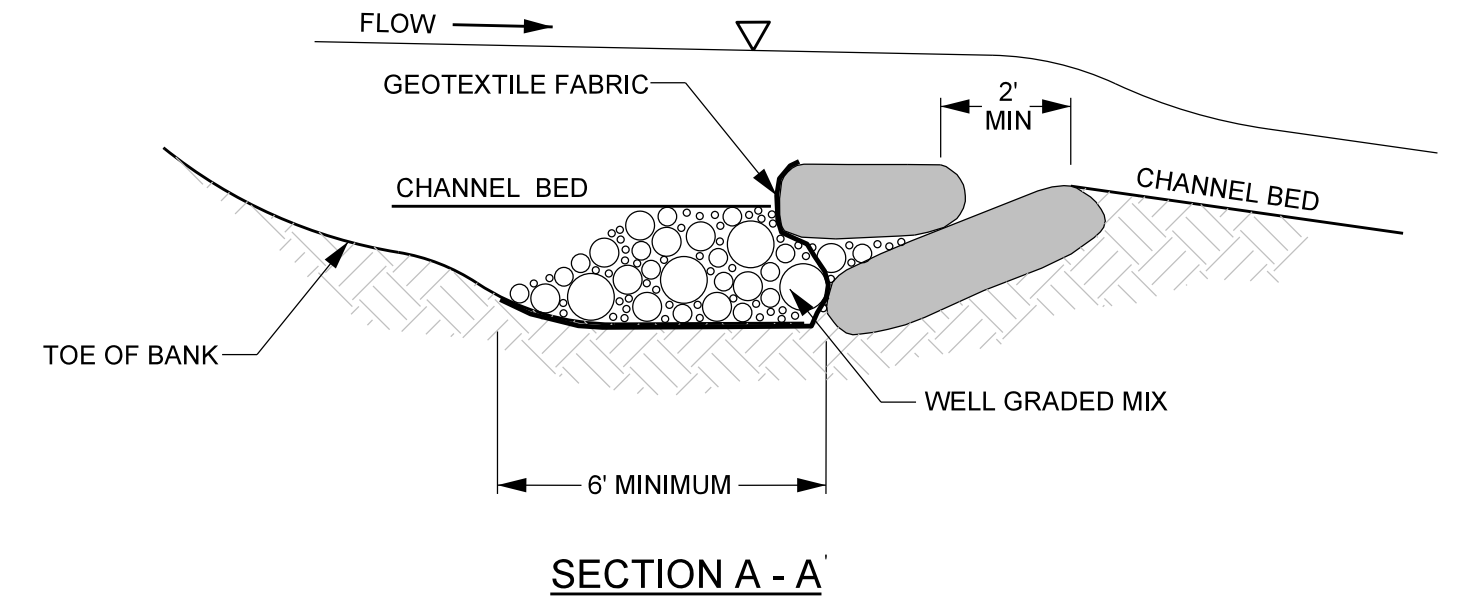
- STRUCTURE NOTES:**
- GENERALLY CONSTRUCTED RIFFLES, ROOT WADS, LOG VANES AND COIR FIBER MATTING WILL BE INSTALLED IN THE LOCATION AND SEQUENCE AS SHOWN.
  - ANY CHANGES TO NUMBER OR LOCATION OF STRUCTURES DURING CONSTRUCTION MUST BE APPROVED BY THE DESIGN ENGINEER.
  - COIR FIBER MATTING TO BE INSTALLED ON ALL RESTORED STREAMBANKS, FLOODPLAIN BENCHING, AND TERRACE SLOPES AS DESCRIBED IN THE TECHNICAL SPECIFICATIONS.
  - ROOTWADS MAY BE REPLACED WITH GEOLIFT.

### ROCK CROSS VANE



REACH	VANE LENGTH	BOULDER SIZE
REACH 1	15'	2'x3'x4'
REACH 2	15'	2'x3'x4'
REACH 3	21'	2'x3'x4'

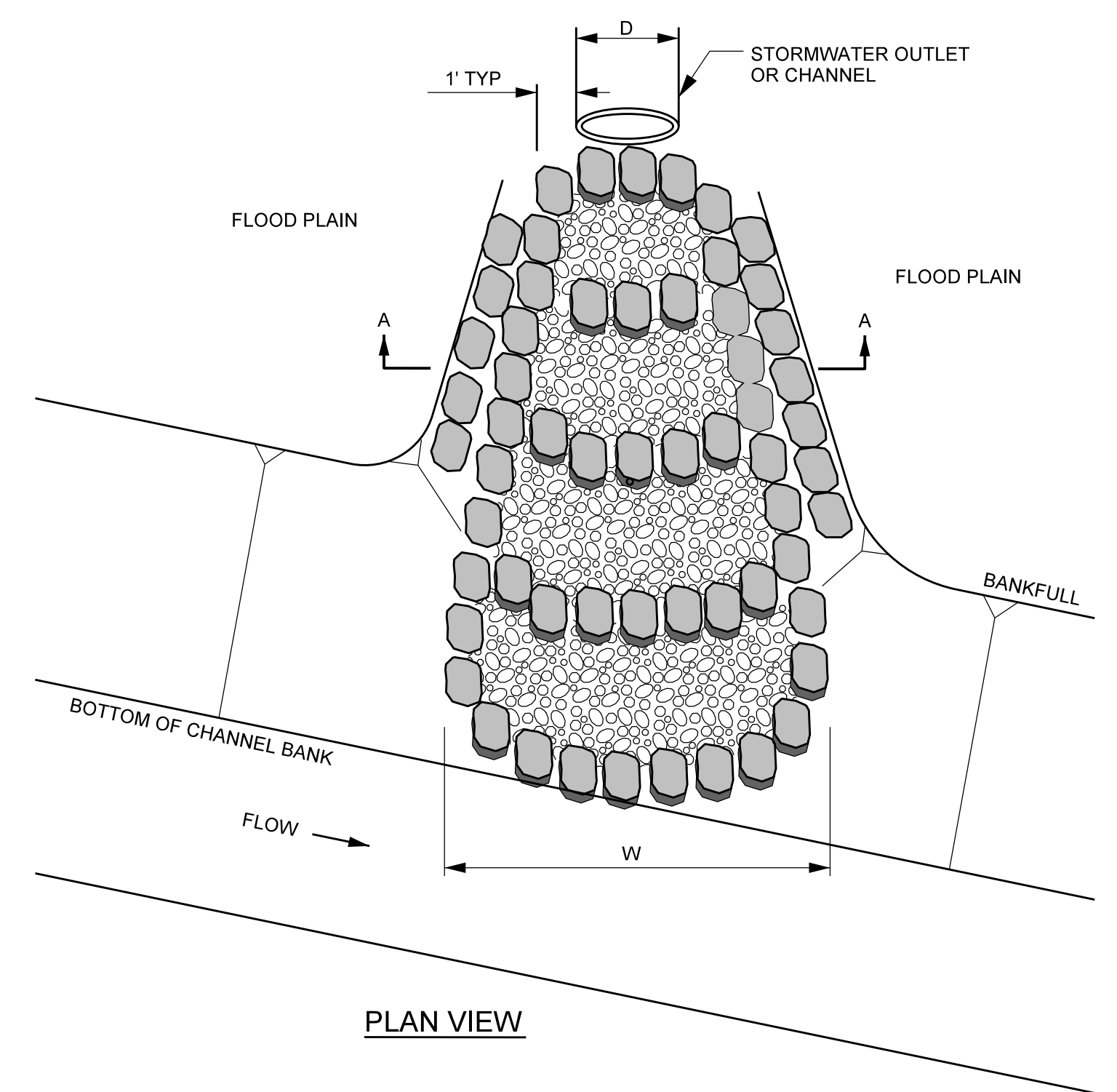
- NOTES FOR ALL VANE STRUCTURES:**
- INSTALL FILTER FABRIC FOR DRAINAGE BEGINNING AT THE MIDDLE OF THE HEADER ROCKS AND EXTEND DOWNWARD TO THE DEPTH OF THE BOTTOM FOOTER ROCK, AND THEN UPSTREAM TO A MINIMUM OF SIX FEET.
  - DIG A TRENCH BELOW THE BED FOR FOOTER ROCKS AND PLACE FILL ON UPSTREAM SIDE OF VANE ARM, BETWEEN THE ARM AND STREAMBANK.
  - CONSTRUCT ANGLE AND SLOPE SPECIFICATIONS AS SHOWN.
  - BACKFILL VANE ARMS AND INVERT WITH A WELL GRADED MIX OF CLASS B, A, AND #57 STONE.
  - ON-SITE ALLUVIUM SHALL BE INCORPORATED INTO THE STONE BACKFILL WHERE AVAILABLE.
  - BOULDER SILL MUST BE A MINIMUM OF 6' AND WILL INCLUDE FOOTER ROCKS.



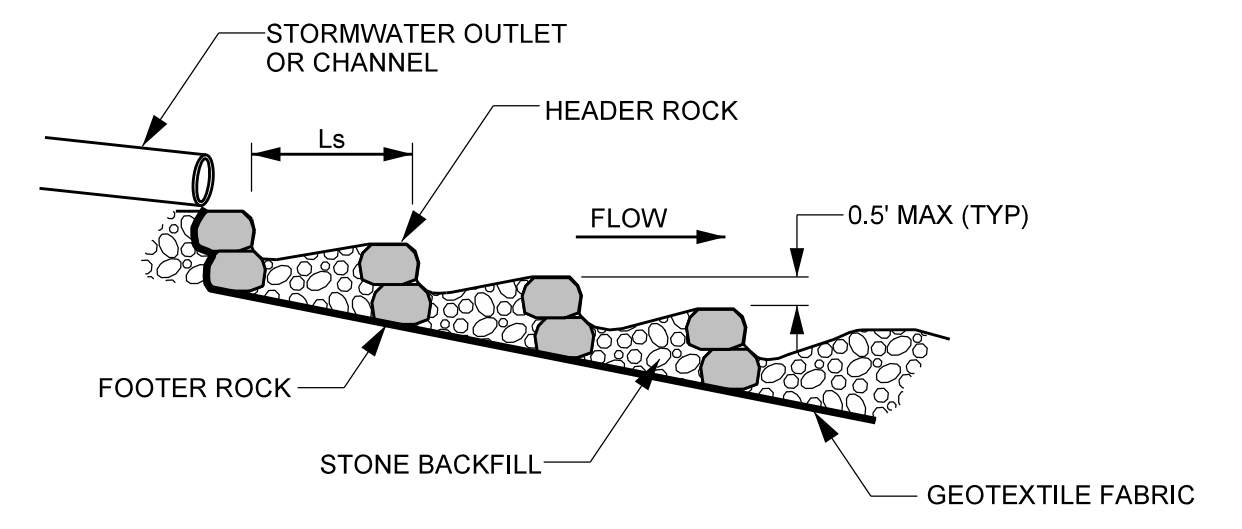
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2/26/2023

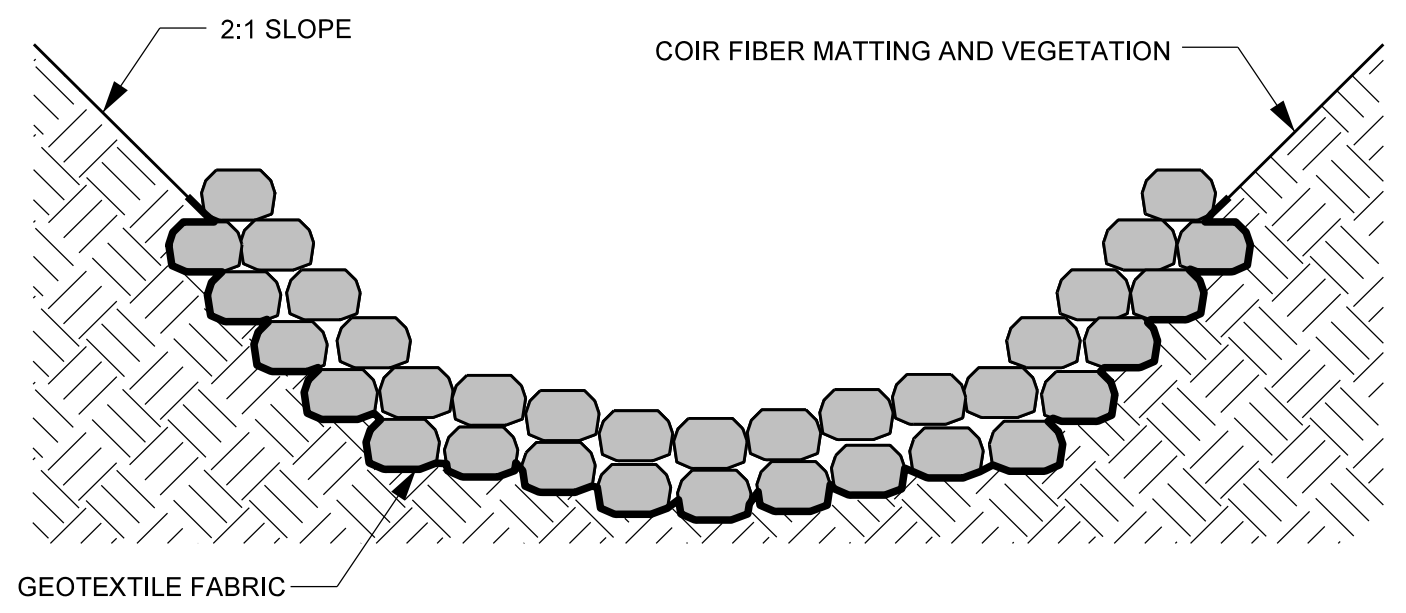
### OUTLET PROTECTION



PLAN VIEW

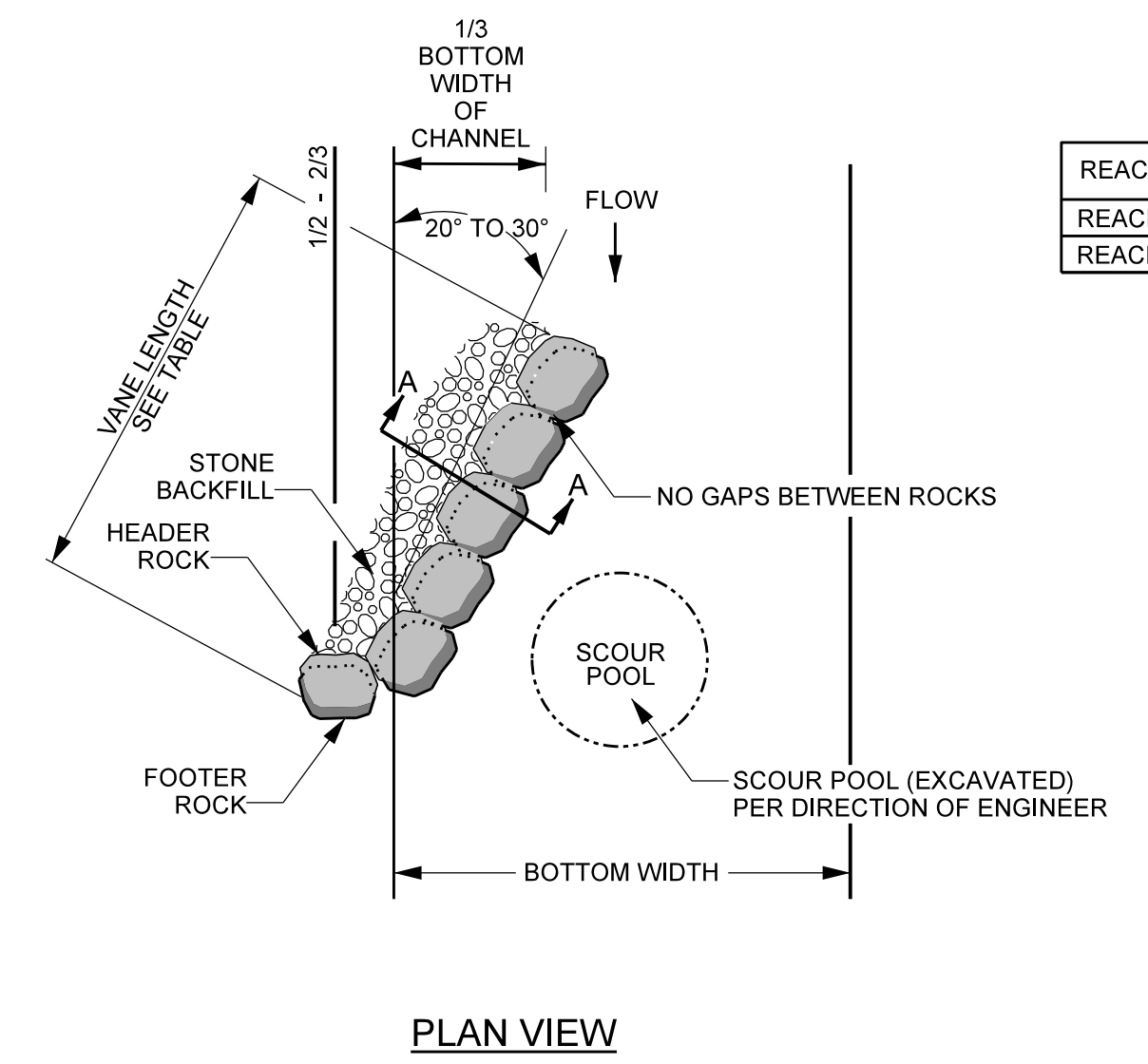


PROFILE VIEW



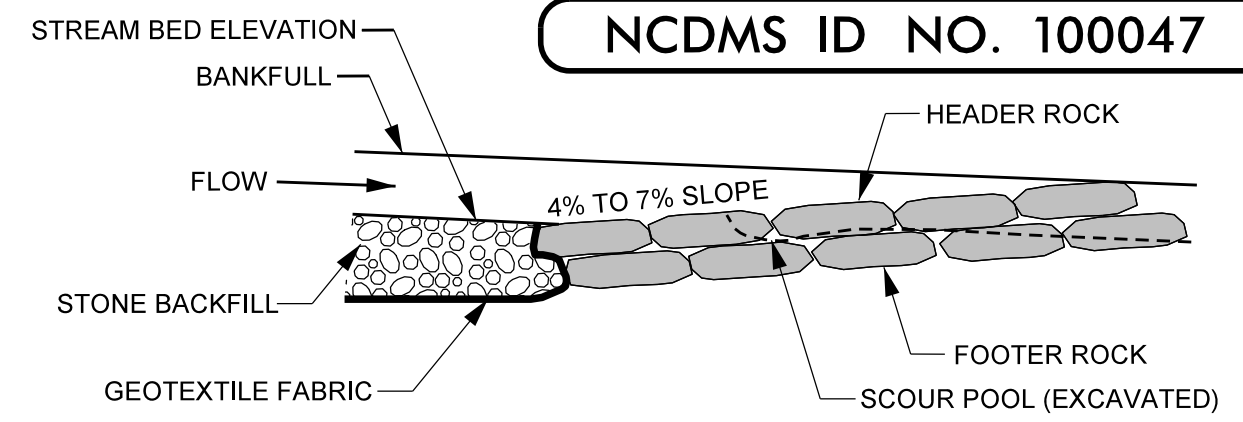
CROSS SECTION A - A

### ROCK VANE

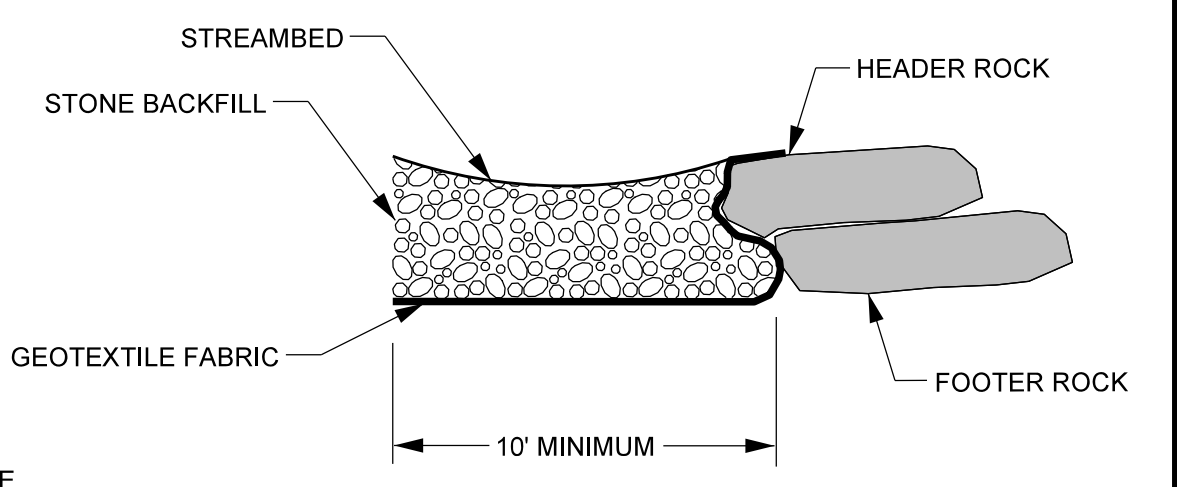


PLAN VIEW

REACH	VANE LENGTH	BOULDER SIZE
REACH 1	15'	2'x3'x4'
REACH 2	15'	2'x3'x4'



PROFILE VIEW

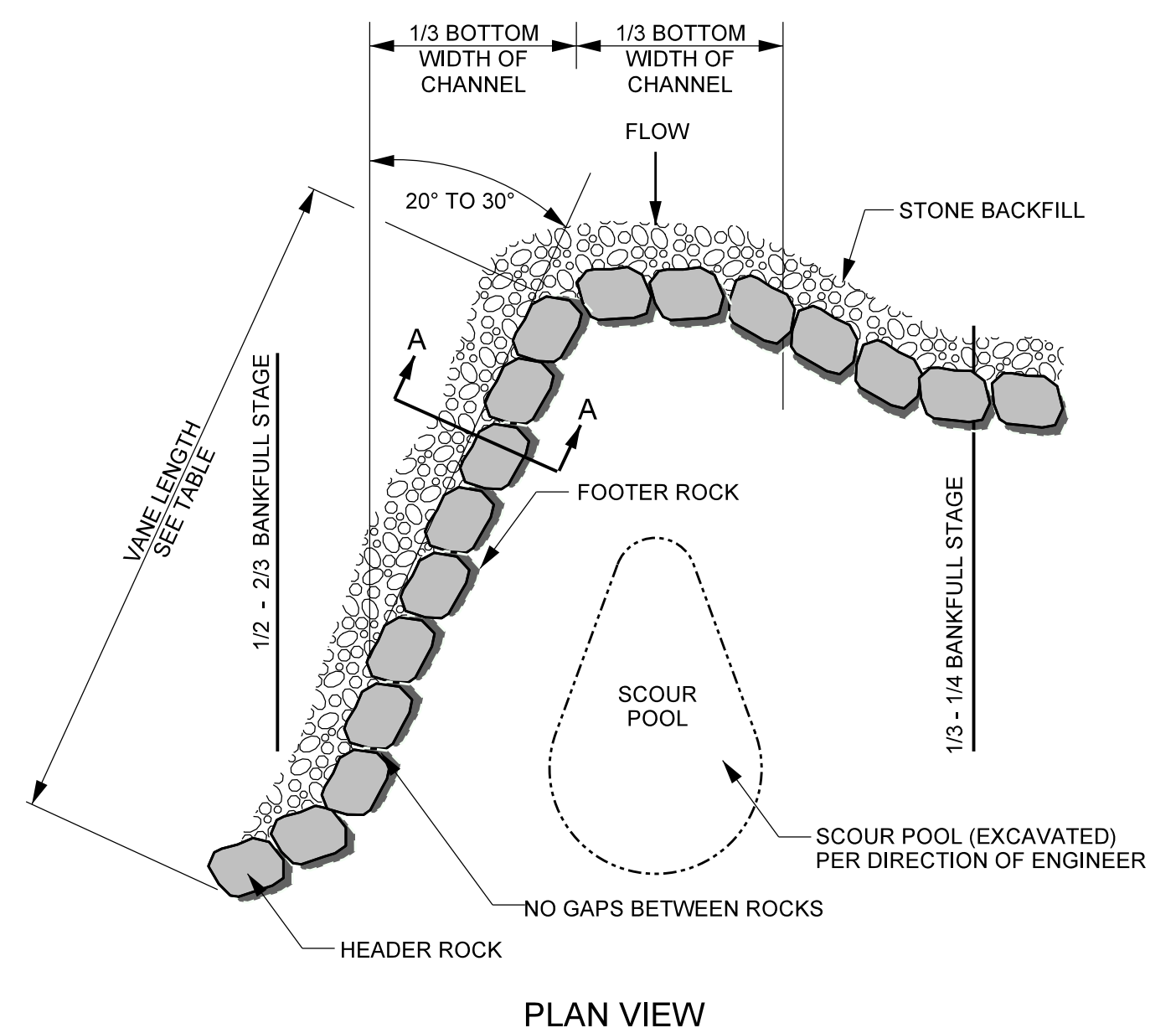


SECTION A - A

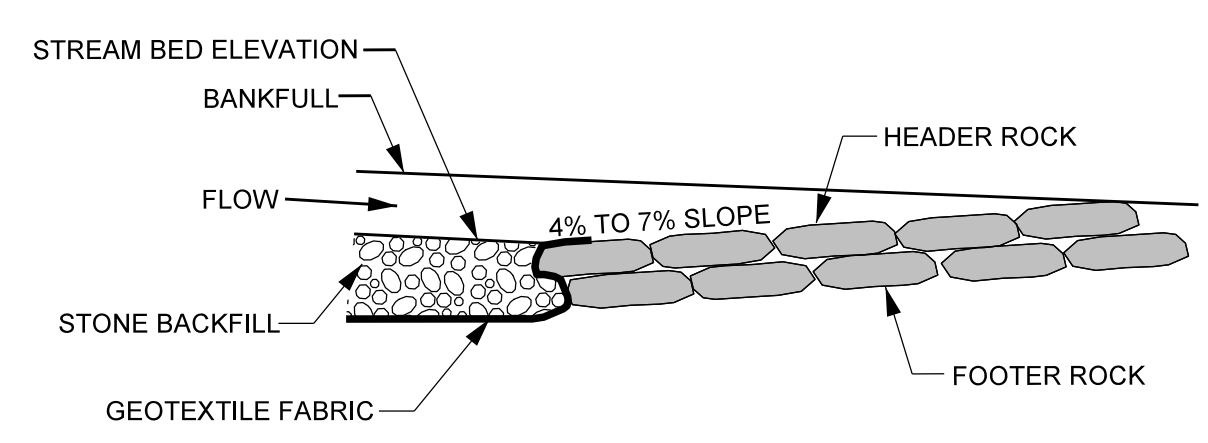
- NOTES FOR ALL VANE STRUCTURES:**
1. INSTALL GEOTEXTILE FABRIC BEGINNING AT THE TOP OF THE HEADER ROCKS AND EXTEND DOWNWARD TO THE DEPTH OF THE BOTTOM FOOTER ROCK, AND THEN UPSTREAM TO A MINIMUM OF TEN FEET.
  2. DIG A TRENCH BELOW THE BED FOR FOOTER ROCKS AND PLACE FILL ON UPSTREAM SIDE OF VANE ARM, BETWEEN THE ARM AND STREAMBANK.
  3. START AT BANK AND PLACE FOOTER ROCKS FIRST AND THEN HEADER (TOP) ROCK.
  4. CONTINUE WITH STRUCTURE, FOLLOWING ANGLE AND SLOPE SPECIFICATIONS.
  5. AN EXTRA ROCK CAN BE PLACED IN SCOUR POOL FOR HABITAT IMPROVEMENT.
  6. USE HAND PLACED STONE TO FILL GAPS ON UPSTREAM SIDE OF HEADER AND FOOTER ROCKS.
  7. AFTER ALL STONE BACKFILL HAS BEEN PLACED, FILL IN THE UPSTREAM SIDE OF THE STRUCTURE WITH WELL GRADED MIX OF CLASS B, CLASS A, & #57 STONE TO THE ELEVATION OF THE TOP OF THE HEADER ROCK. INCORPORATE ON-SITE ALLUVIUM WHERE AVAILABLE.
  8. START SLOPE AT 2/3 TO 3/4 TIMES THE BANKFULL STAGE.

PROJECT REFERENCE NO. <b>166274</b>	SHEET NO. <b>2A</b>
PROJECT ENGINEER <b>Michael Baker Engineering Inc.</b>	
APPROVED BY: <b>Kathleen M. McKeithan</b>	
DATE: <b>4/13/2022</b>	
<b>NCDMS ID NO. 100047</b>	

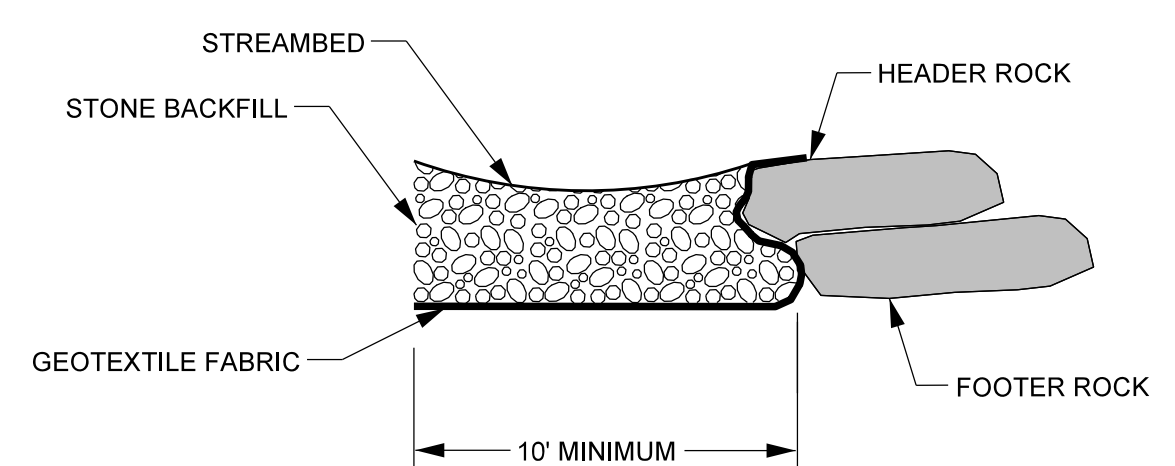
### GRADE CONTROL J-HOOK VANE



PLAN VIEW



PROFILE VIEW

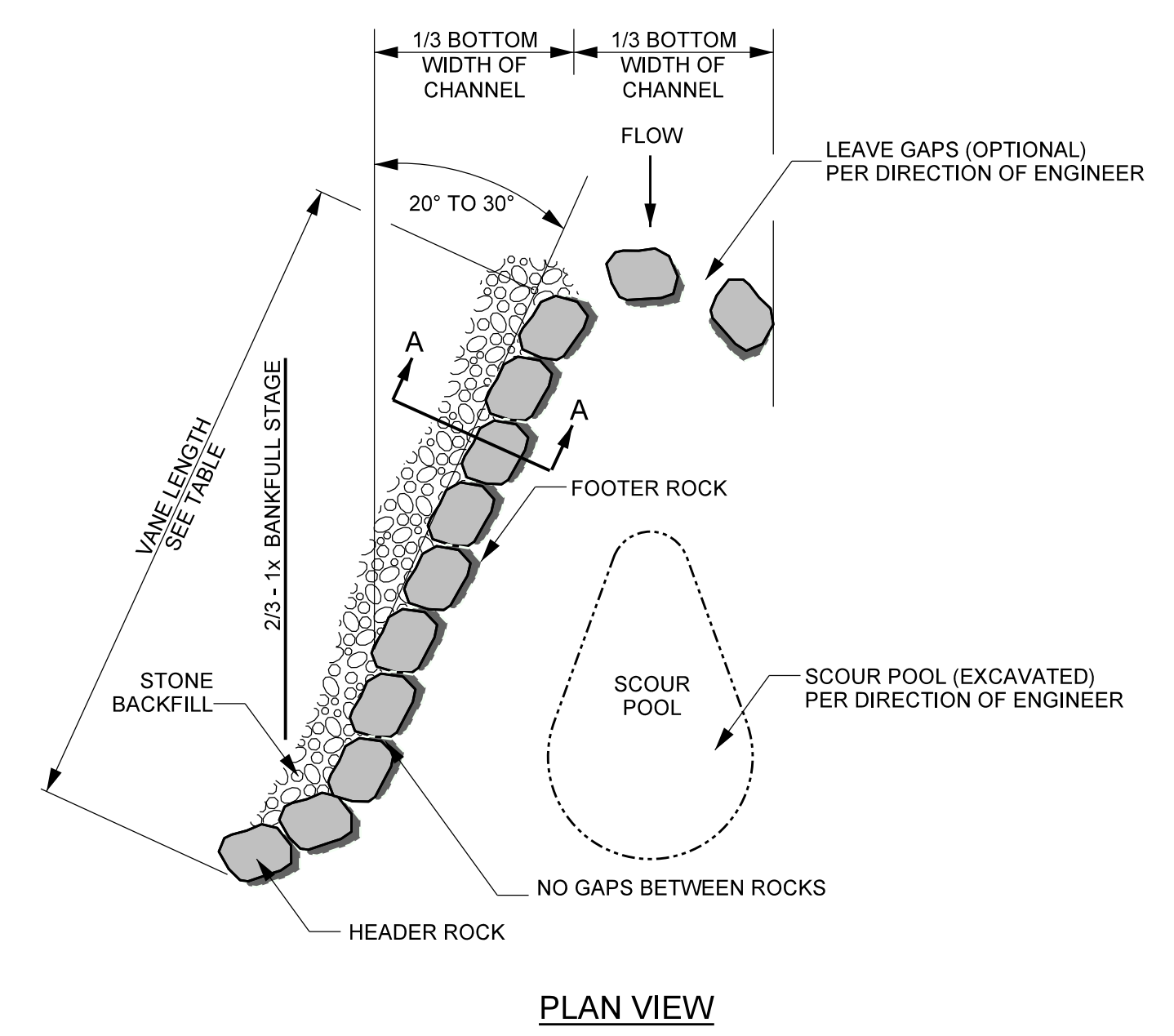


SECTION A - A

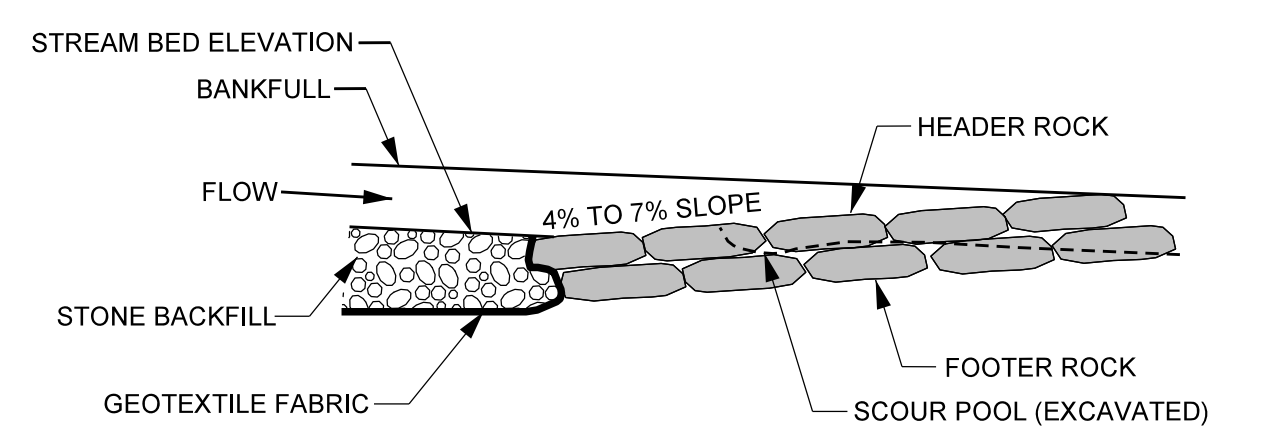
REACH	VANE LENGTH	BOULDER SIZE
REACH 1	15'	2'x3'x4'
REACH 2	15'	2'x3'x4'

- NOTES FOR ALL VANE STRUCTURES:**
1. INSTALL FILTER FABRIC FOR DRAINAGE BEGINNING AT THE MIDDLE OF THE HEADER ROCKS AND EXTEND DOWNWARD TO THE DEPTH OF THE BOTTOM FOOTER ROCK, AND THEN UPSTREAM TO A MINIMUM OF SIX FEET.
  2. DIG A TRENCH BELOW THE BED FOR FOOTER ROCKS AND PLACE FILL ON UPSTREAM SIDE OF VANE ARM, BETWEEN THE ARM AND STREAMBANK.
  3. CONSTRUCT ANGLE AND SLOPE SPECIFICATIONS AS SHOWN.
  4. BACKFILL VANE ARMS AND INVERT WITH A WELL GRADED MIX OF CLASS B, A, AND #57 STONE.
  5. ON-SITE ALLUVIUM SHALL BE INCORPORATED INTO THE STONE BACKFILL WHERE AVAILABLE.
  6. BOULDER SILL MUST BE A MINIMUM OF 6'.

### J-HOOK VANE

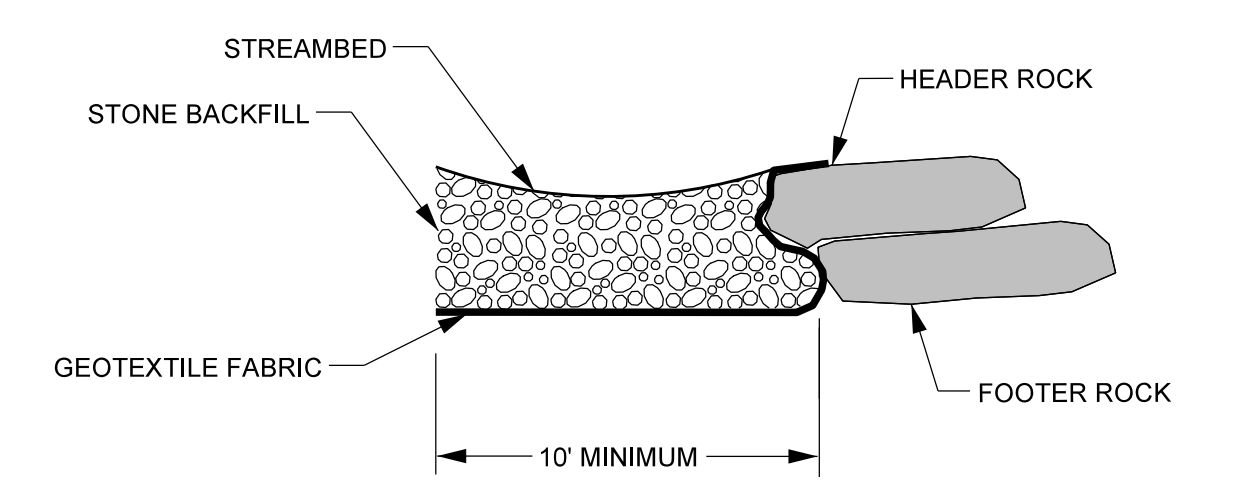


PLAN VIEW



PROFILE VIEW

REACH	VANE LENGTH	BOULDER SIZE
REACH 1	15'	2'x3'x4'
REACH 2	15'	2'x3'x4'



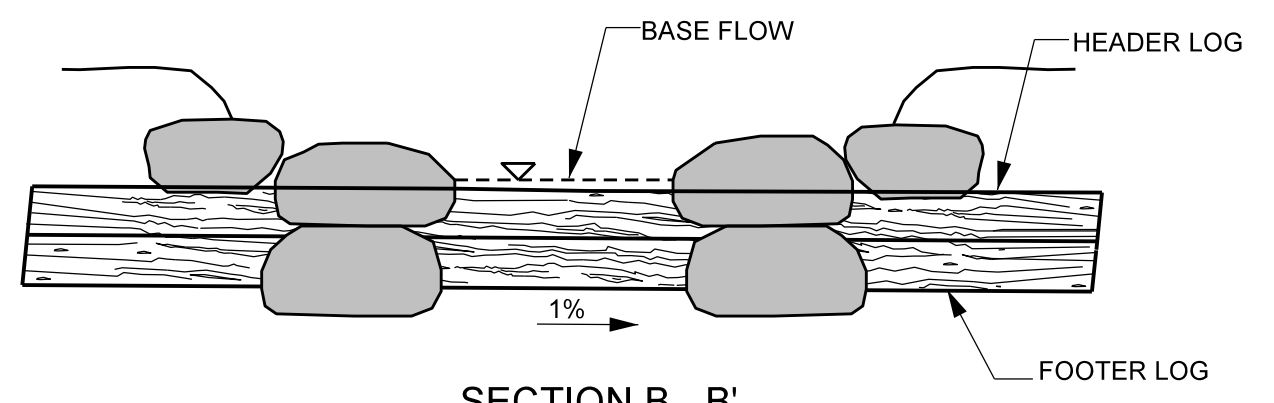
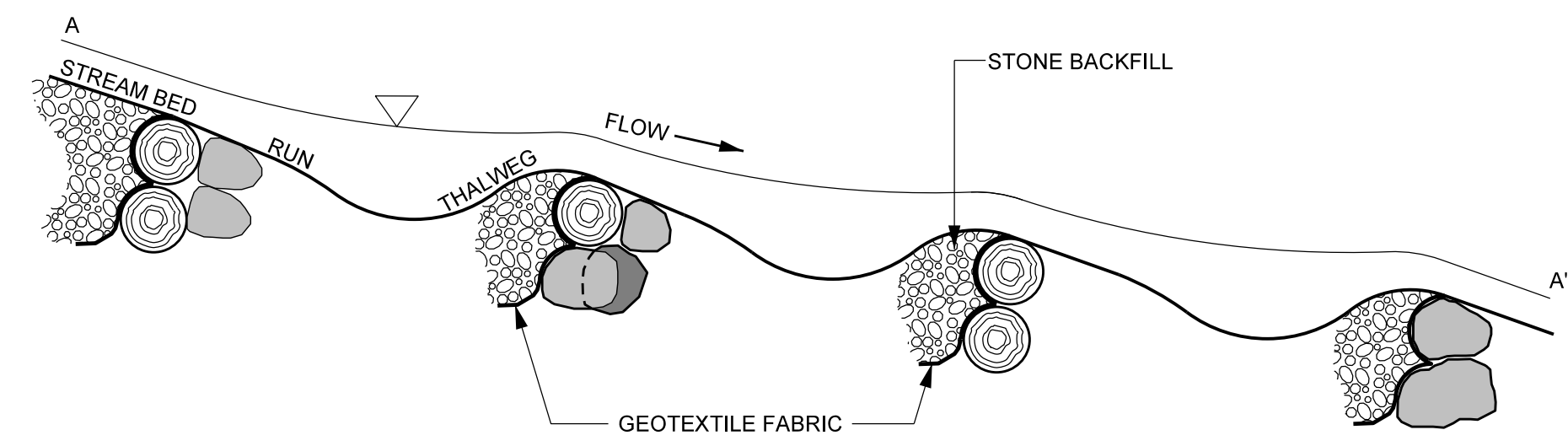
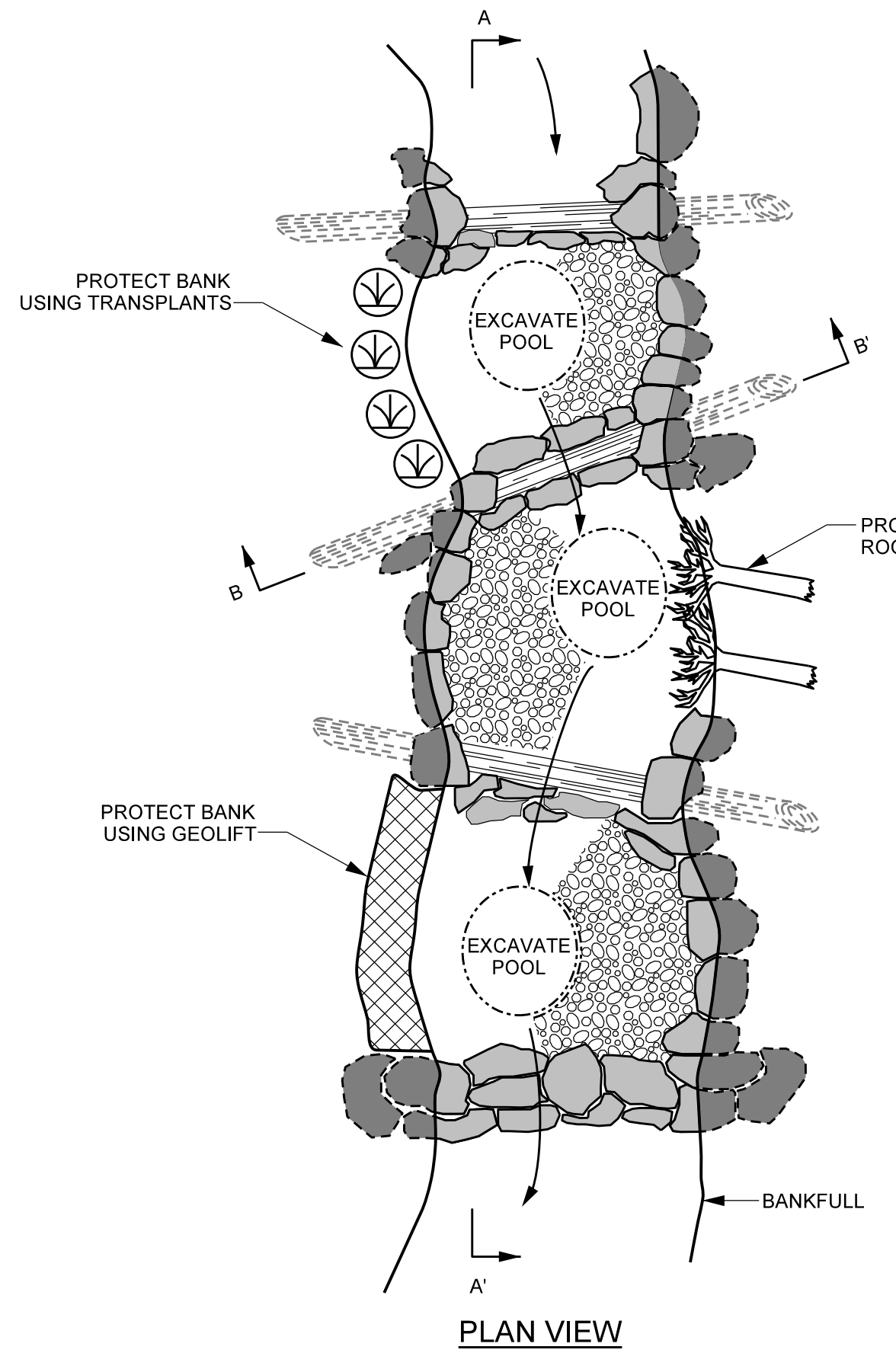
SECTION A - A

- NOTES FOR ALL VANE STRUCTURES:**
1. INSTALL GEOTEXTILE FABRIC BEGINNING AT THE TOP OF THE HEADER ROCKS AND EXTEND DOWNWARD TO THE DEPTH OF THE BOTTOM FOOTER ROCK, AND THEN UPSTREAM TO A MINIMUM OF TEN FEET.
  2. DIG A TRENCH BELOW THE BED FOR FOOTER ROCKS AND PLACE FILL ON UPSTREAM SIDE OF VANE ARM, BETWEEN THE ARM AND STREAMBANK.
  3. START AT BANK AND PLACE FOOTER ROCKS FIRST AND THEN HEADER (TOP) ROCK.
  4. CONTINUE WITH STRUCTURE, FOLLOWING ANGLE AND SLOPE SPECIFICATIONS.
  5. AN EXTRA ROCK CAN BE PLACED IN SCOUR POOL FOR HABITAT IMPROVEMENT.
  6. USE HAND PLACED STONE TO FILL GAPS ON UPSTREAM SIDE OF HEADER AND FOOTER ROCKS.
  7. AFTER ALL STONE BACKFILL HAS BEEN PLACED, FILL IN THE UPSTREAM SIDE OF THE STRUCTURE WITH ON-SITE ALLUVIUM TO THE ELEVATION OF THE TOP OF THE HEADER ROCK.

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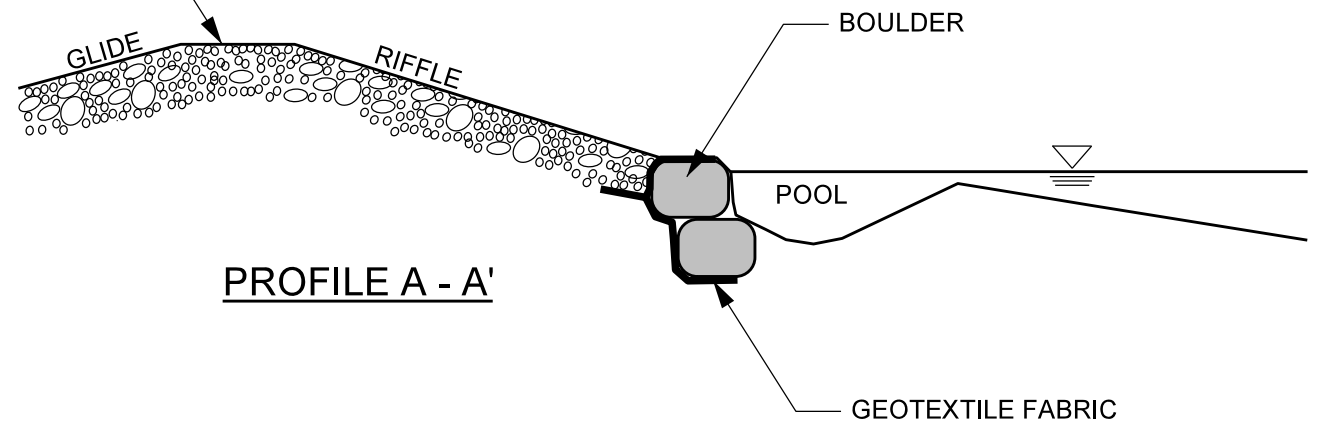
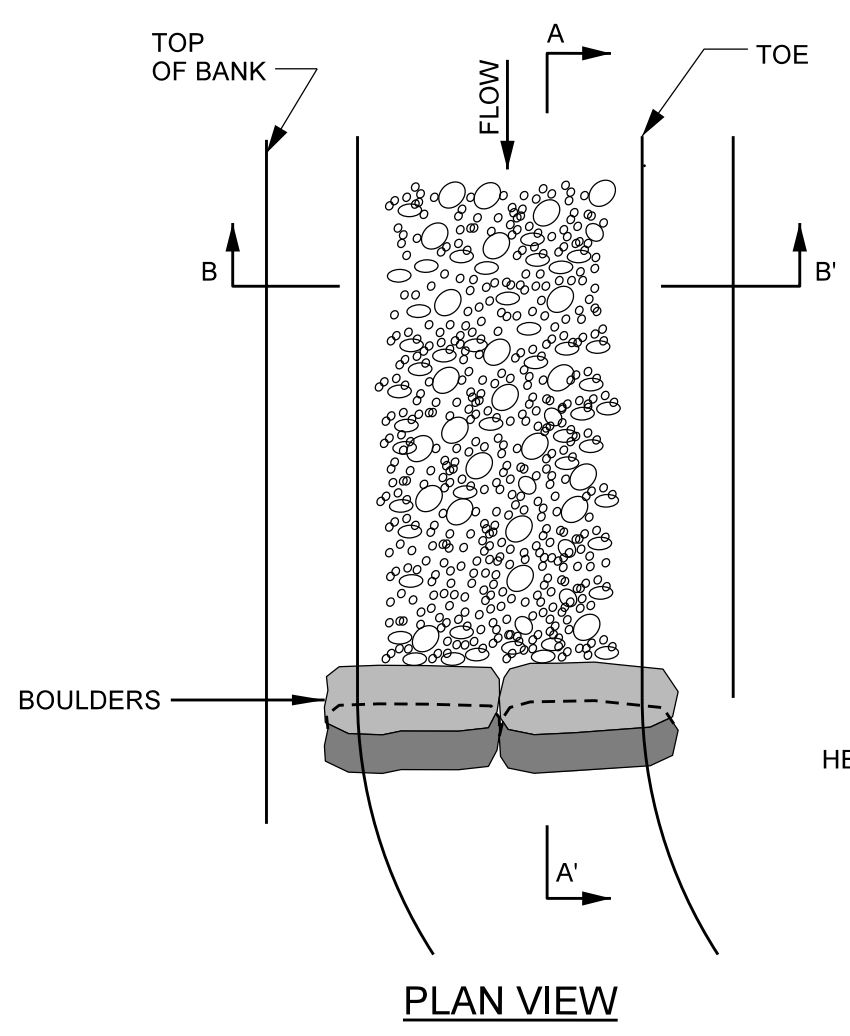
### LOG AND ROCK STEP / POOL



REACH	BOULDER SIZE
REACH 1	2'x3'x4'
REACH 2	2'x3'x4'

- NOTES:**
- LOGS SHOULD BE AT LEAST 10" IN DIAMETER, RELATIVELY STRAIGHT, HARDWOOD, AND RECENTLY HARVESTED AND EXTENDING INTO THE BANK 5' ON EACH SIDE.
  - SOIL SHOULD BE COMPACTED WELL AROUND BURIED PORTIONS OF LOG.
  - GEOTEXTILE FABRIC SHOULD BE NAILED TO THE LOG BELOW THE BACKFILL.
  - BOULDERS SHOULD BE PLACED ON TOP OF HEADER LOG FOR ANCHORING.
  - TRANSPLANTS CAN BE USED INSTEAD OF BOULDERS, PER DIRECTION OF ENGINEER.
  - AFTER ALL STONE BACKFILL HAS BEEN PLACED, FILL IN THE UPSTREAM SIDE OF THE STRUCTURE WITH WELL GRADED MIX OF CLASS B, CLASS A, & #57 STONE TO THE ELEVATION OF THE TOP OF THE HEADER ROCK. INCORPORATE ON-SITE ALLUVIUM WHERE AVAILABLE.

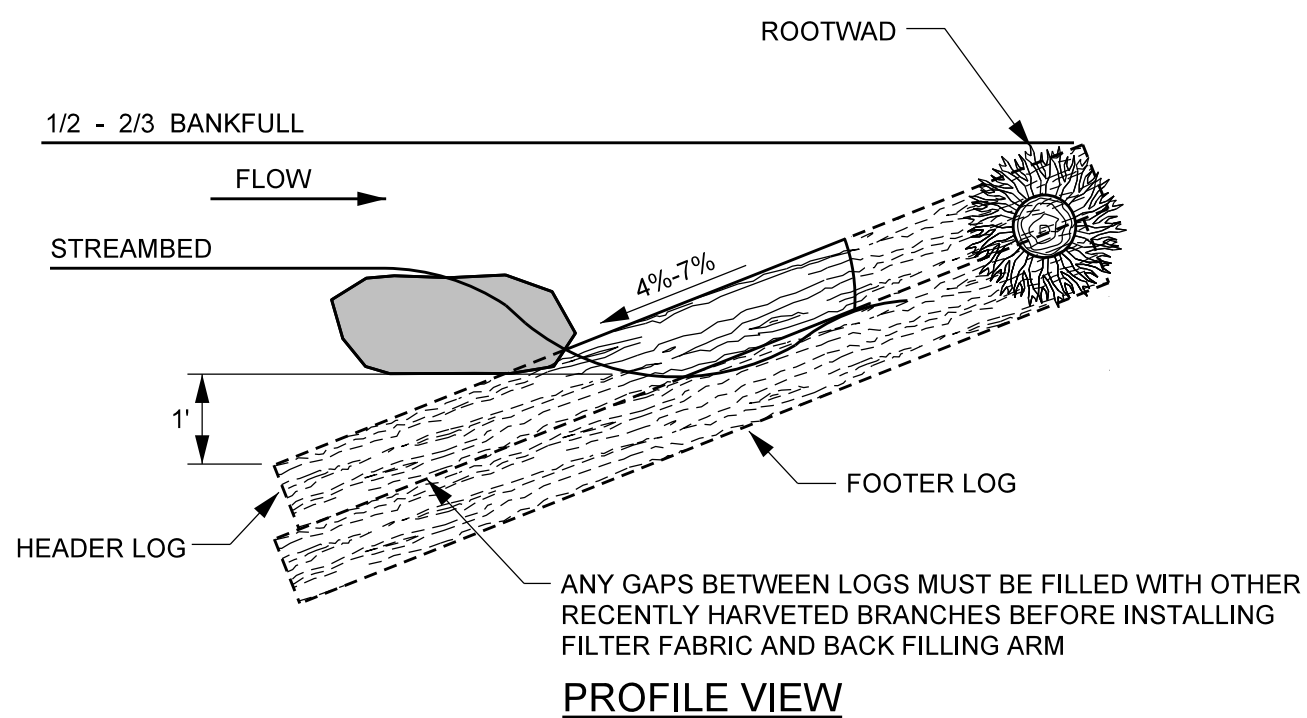
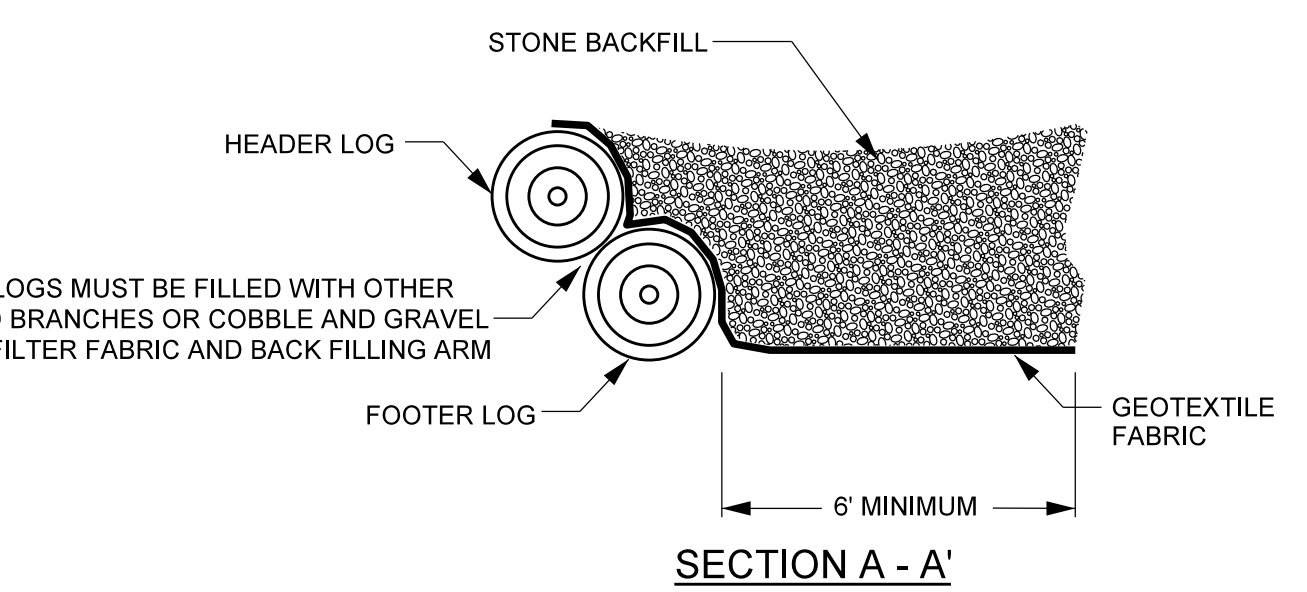
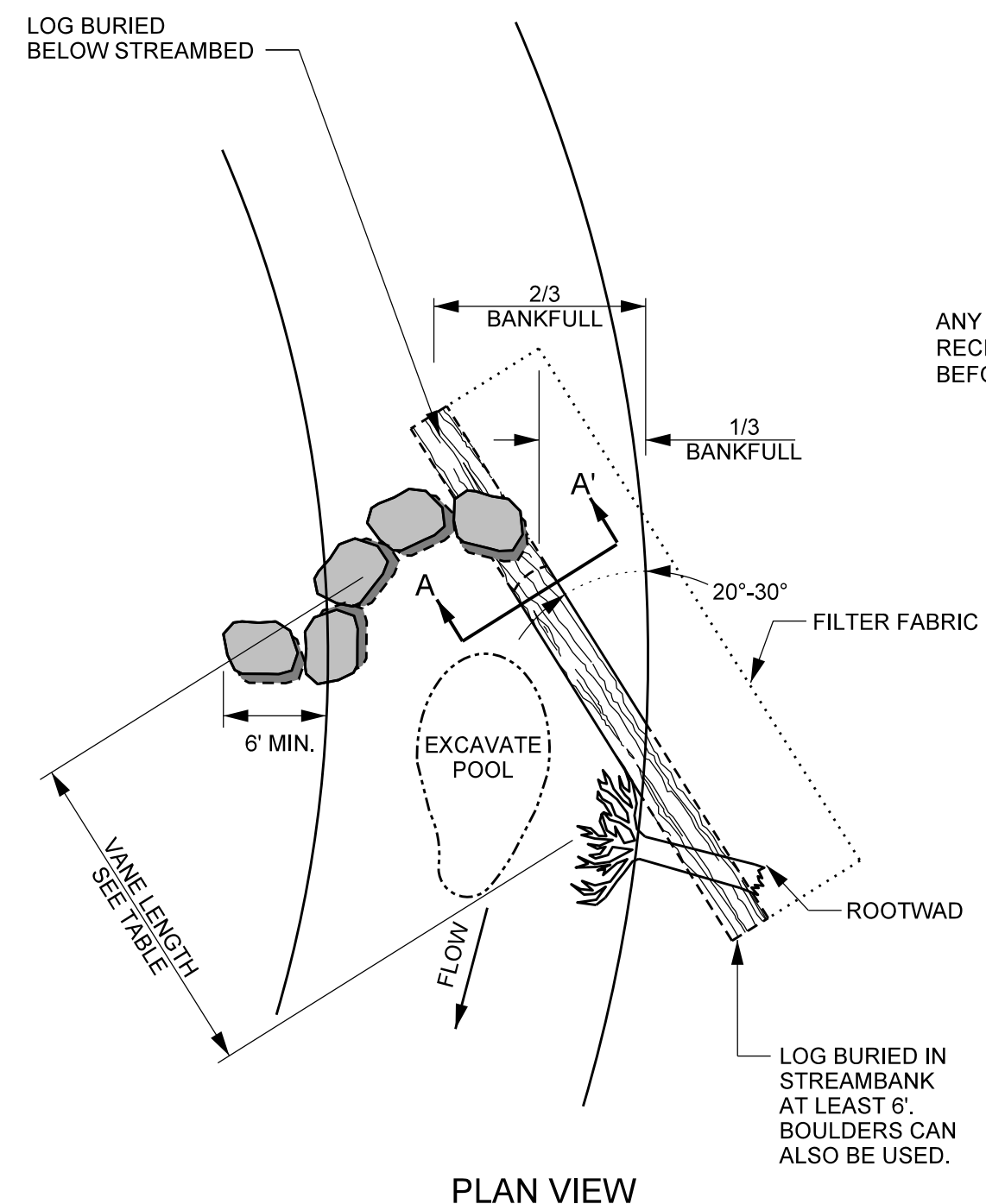
### BOULDER STEP



REACH	BOULDER SIZE
REACH 1	2'x3'x4'
REACH 2	2'x3'x4'
UT 1	1'x2'x3'

- NOTES:**
- FOOTERS SHALL BE INSTALLED SUCH THAT 1/4 TO 1/3 OF THE LENGTH IS DOWNSTREAM OF THE HEADER.
  - SOIL SHALL BE WELL COMPACTED AROUND BURIED PORTION OF FOOTERS WITH THE BUCKET OF EXCAVATOR.
  - INSTALL NON-WOVEN FILTER FABRIC UNDERNEATH FOOTER BOULDERS.
  - UNDERCUT THE RIFFLE ELEVATION 12 INCHES TO ALLOW FOR A LAYER OF STONE.
  - INSTALL EROSION CONTROL MATTING ALONG COMPLETED BANKS SUCH THAT THE EROSION CONTROL MATTING AT THE TOE OF THE BANK EXTENDS DOWN TO THE UNDERCUT ELEVATION.
  - FILL TRENCH WITH GRADED MIX OF CLASS A, CLASS B, AND #57 STONE TO THE BED ELEVATION OF THE CHANNEL.
  - BOULDER STEPS MUST BE EXTENDED TO A MINIMUM OF 2' INTO THE BANK. USE SILL BOULDERS IF NECESSARY.
  - THALWEG AND STEP INVERT WILL BE CONCAVE AND SHAPED PER DIRECTION OF THE DESIGNER.

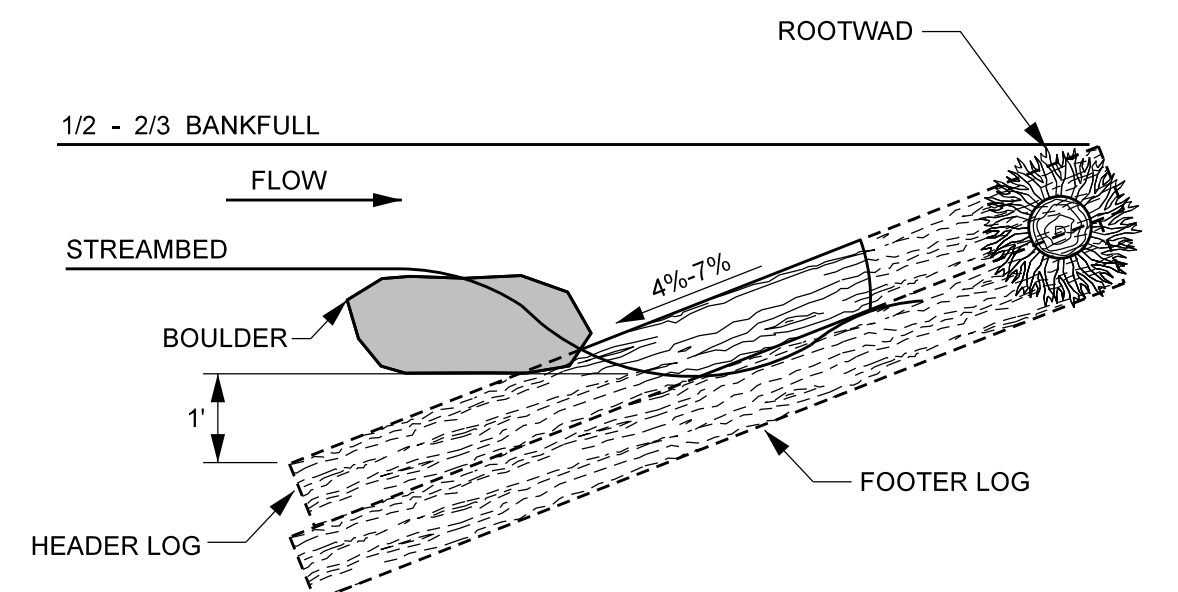
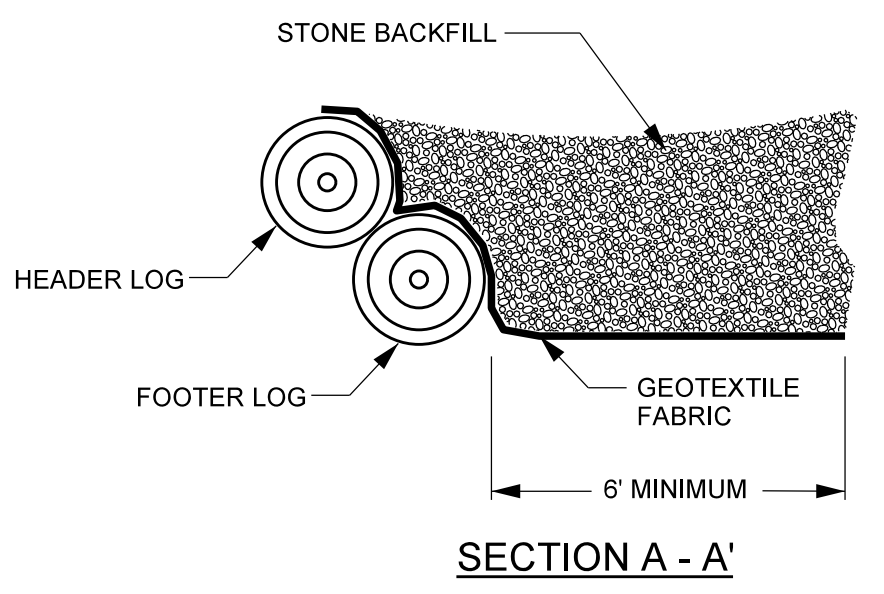
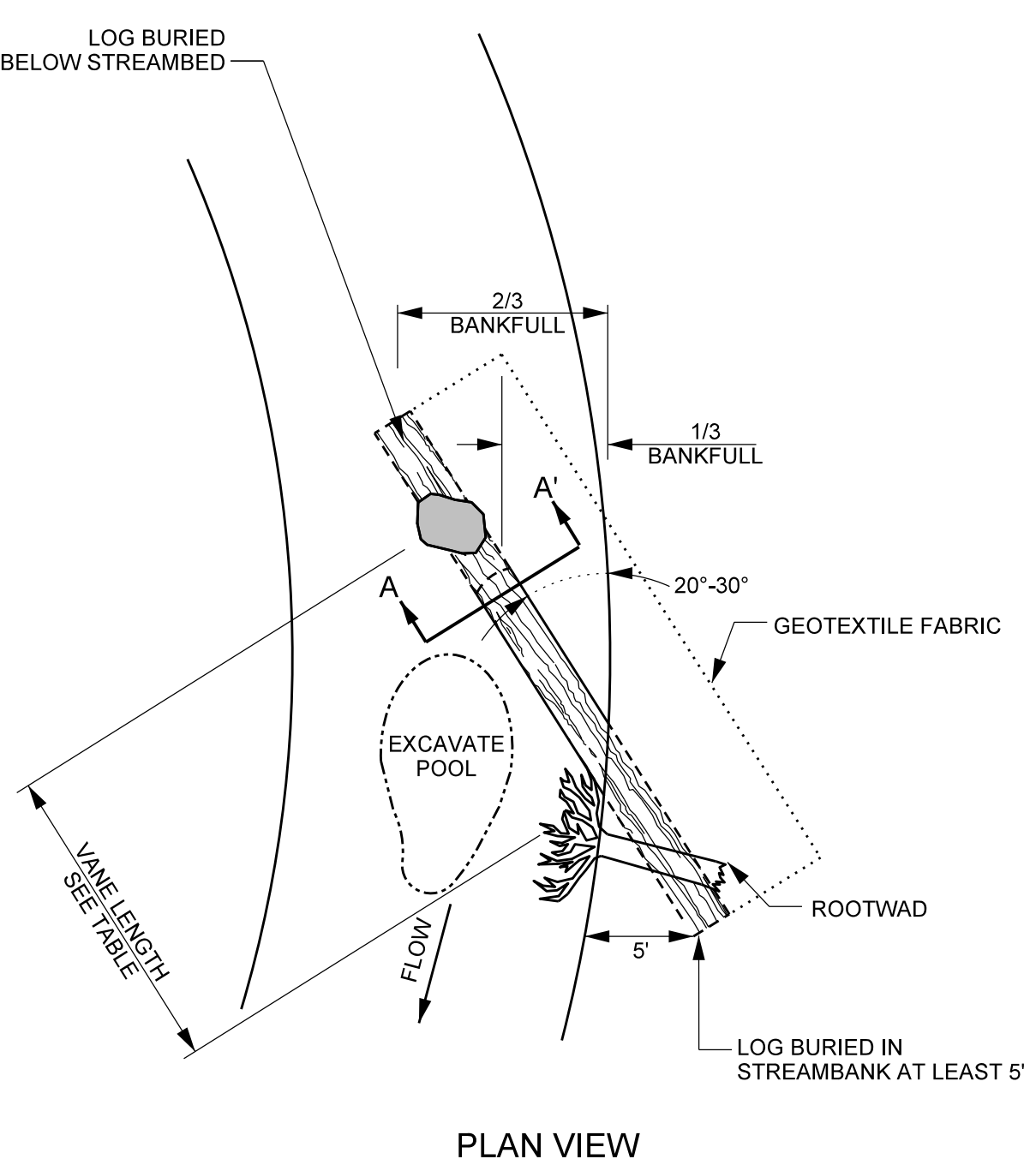
### GRADE CONTROL LOG J-HOOK VANE



REACH	VANE LENGTH	BOULDER SIZE
REACH 1	15'	2'x3'x4'
REACH 2	15'	2'x3'x4'

- NOTES:**
- LOGS SHOULD BE AT LEAST 10" IN DIAMETER, RELATIVELY STRAIGHT, HARDWOOD, RECENTLY HARVESTED, AND FOOTERED.
  - BOULDERS MUST BE OF SUFFICIENT SIZE TO ANCHOR LOGS.
  - SOIL SHOULD BE COMPACTED WELL AROUND BURIED PORTIONS OF LOG.
  - ROOTWADS SHOULD BE PLACED BENEATH THE HEADER LOG AND PLACED SO THAT IT LOCKS THE HEADER LOG INTO THE BANK. SEE ROOTWAD DETAIL.
  - BOULDERS SHOULD BE PLACED ON TOP OF HEADER LOG FOR ANCHORING.
  - HEADER BOULDERS TO BE PLACED 0.5 TO 0.75 FEET APART.
  - FILTER FABRIC SHOULD BE NAILED TO THE LOG BELOW THE BACKFILL.
  - TRANSPLANTS OR BOULDERS CAN BE USED INSTEAD OF ROOTWADS, PER DIRECTION OF ENGINEER.
  - BOULDER SILL MUST BE A MINIMUM OF 6'.
  - AFTER ALL STONE BACKFILL HAS BEEN PLACED, FILL IN THE UPSTREAM SIDE OF THE STRUCTURE WITH WELL GRADED MIX OF CLASS B, CLASS A, & #57 STONE TO THE ELEVATION OF THE TOP OF THE HEADER ROCK. INCORPORATE ON-SITE ALLUVIUM WHERE AVAILABLE.

### LOG VANE



REACH	VANE LENGTH	BOULDER SIZE
REACH 1	15'	2'x3'x4'
REACH 2	15'	2'x3'x4'

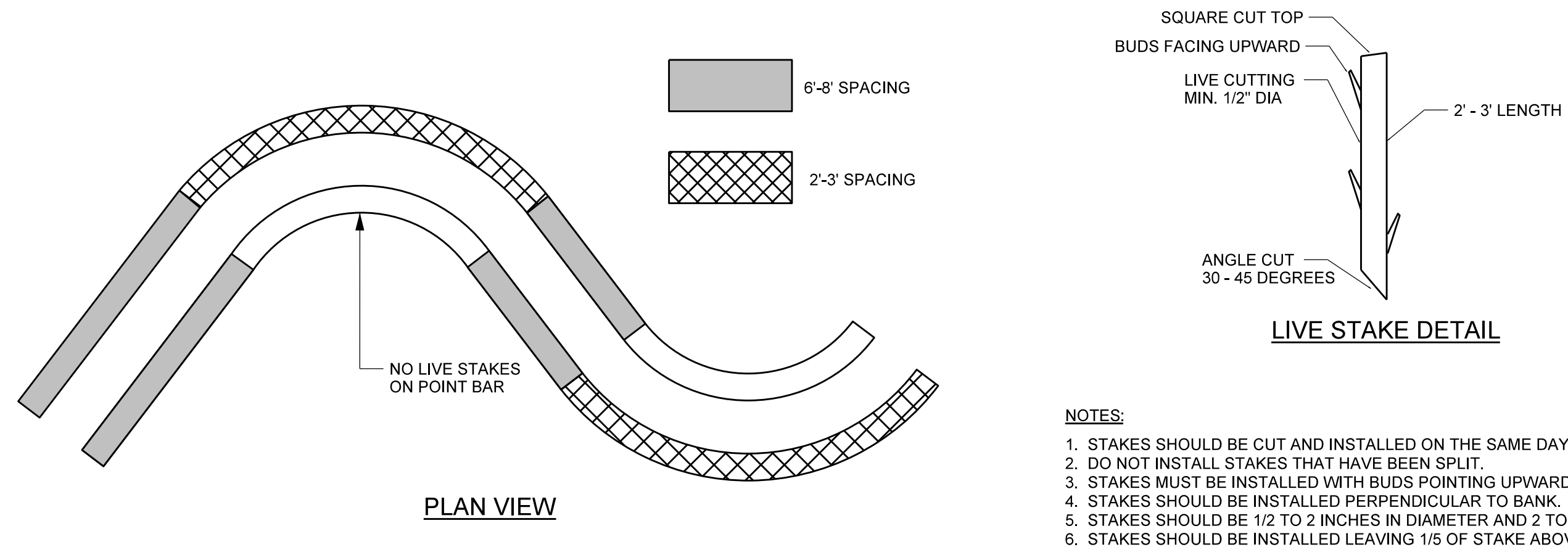
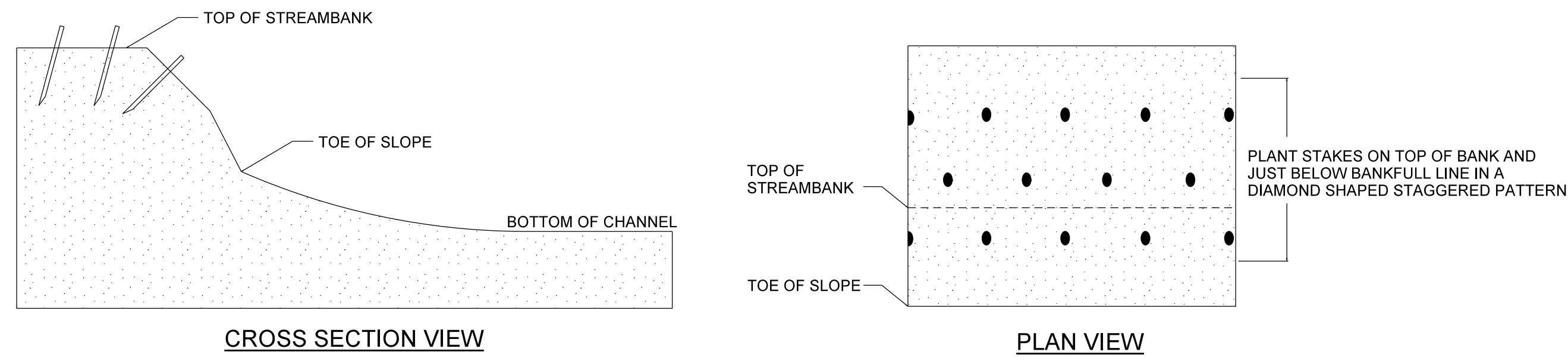
- NOTES:**
- LOGS SHOULD BE AT LEAST 10" IN DIAMETER, RELATIVELY STRAIGHT, HARDWOOD, AND RECENTLY HARVESTED.
  - BOULDERS MUST BE OF SUFFICIENT SIZE TO ANCHOR LOGS.
  - SOIL SHOULD BE COMPACTED WELL AROUND BURIED PORTIONS OF LOGS.
  - ROOTWADS SHOULD BE PLACED BENEATH THE HEADER LOG AND PLACED SO THAT IT LOCKS THE HEADER LOG INTO THE BANK. SEE ROOTWAD DETAIL.
  - BOULDER SHOULD BE PLACED ON TOP OF HEADER LOG FOR ANCHORING.
  - GEOTEXTILE FABRIC SHOULD BE NAILED TO THE LOG BELOW THE BACKFILL.
  - TRANSPLANTS CAN BE USED INSTEAD OF ROOTWADS, PER DIRECTION OF ENGINEER.
  - AFTER ALL STONE BACKFILL HAS BEEN PLACED, FILL IN THE UPSTREAM SIDE OF THE STRUCTURE WITH WELL GRADED MIX OF CLASS B, CLASS A, & #57 STONE TO THE ELEVATION OF THE TOP OF THE HEADER ROCK. INCORPORATE ON-SITE ALLUVIUM WHERE AVAILABLE.

PROJECT REFERENCE NO. <b>166274</b>	SHEET NO. <b>2B</b>
PROJECT ENGINEER	
Design by: <b>Kathleen M. McKeithen</b> APPROVED BY:  DATE: 4/13/2022	
<b>Michael Baker International</b>	
Michael Baker Engineering Inc. 8000 Regency Parkway, Suite 600 Cary, NORTH CAROLINA 27518 Phone: 919.463.5488 Fax: 919.463.5490 License #: F-1084	
<b>NC DMS ID NO. 100047</b>	

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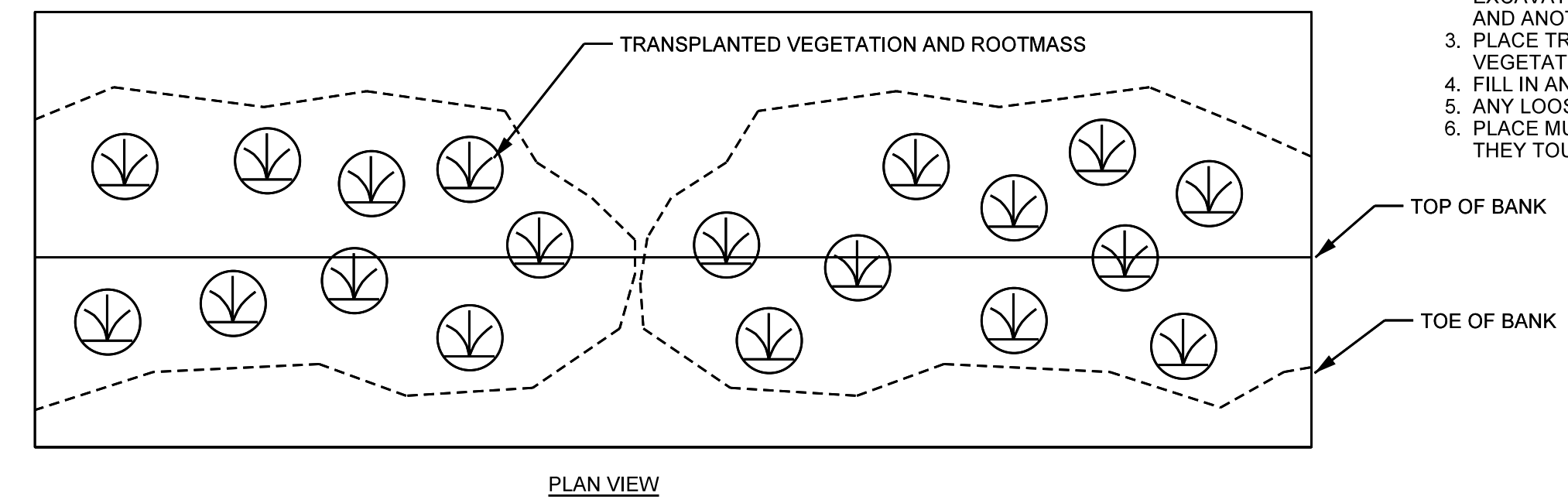
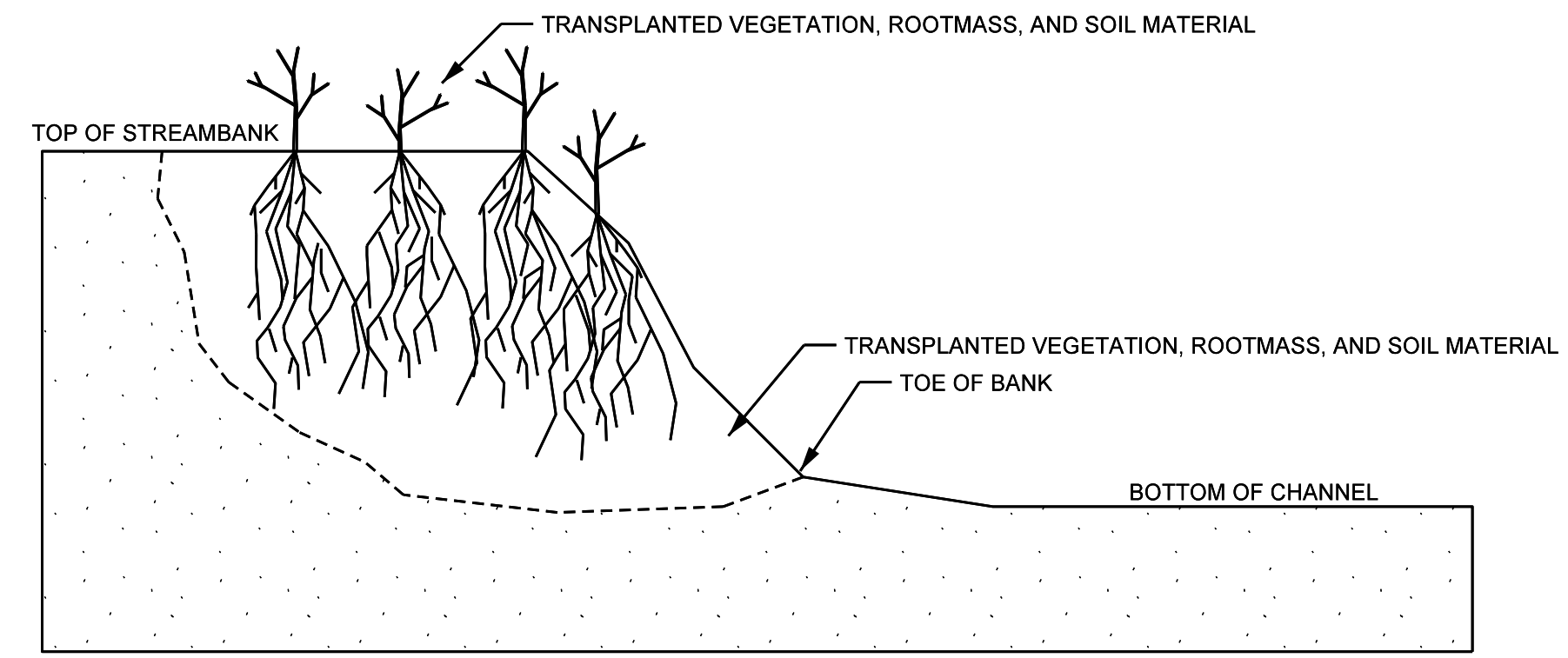
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### LIVE STAKING



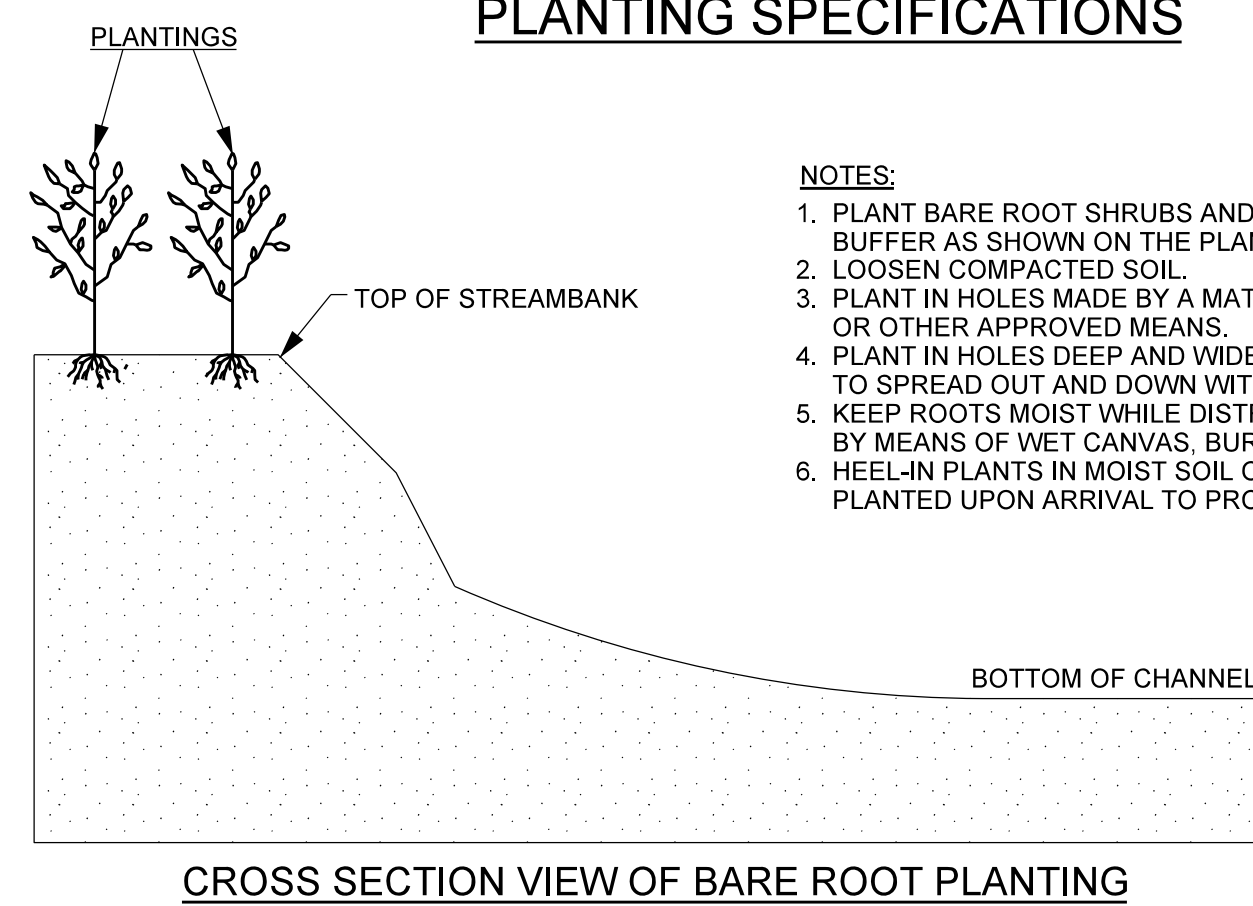
- NOTES:**
1. STAKES SHOULD BE CUT AND INSTALLED ON THE SAME DAY.
  2. DO NOT INSTALL STAKES THAT HAVE BEEN SPLIT.
  3. STAKES MUST BE INSTALLED WITH BUDS POINTING UPWARDS.
  4. STAKES SHOULD BE INSTALLED PERPENDICULAR TO BANK.
  5. STAKES SHOULD BE 1/2 TO 2 INCHES IN DIAMETER AND 2 TO 3 FT LONG.
  6. STAKES SHOULD BE INSTALLED LEAVING 1/5 OF STAKE ABOVE GROUND.

### TRANSPLANTED VEGETATION

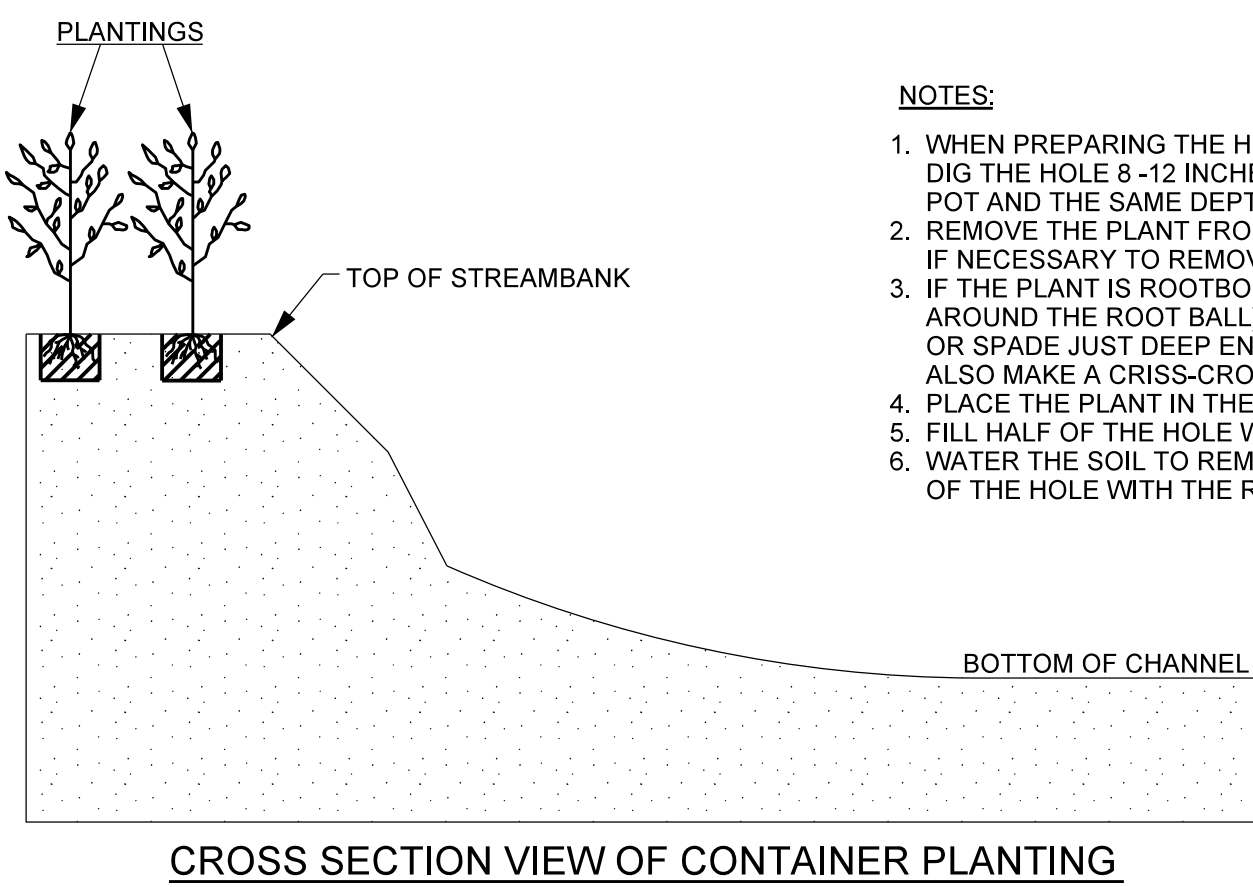


- NOTES:**
1. EXCAVATE A HOLE IN THE BANK TO BE STABILIZED THAT WILL ACCOMMODATE THE SIZE OF TRANSPLANT TO BE PLACED. BEGIN EXCAVATION AT THE TOE OF THE BANK.
  2. EXCAVATE TRANSPLANT USING A FRONT END LOADER. EXCAVATE THE ENTIRE ROOT MASS AND AS MUCH ADDITIONAL SOIL MATERIAL AS POSSIBLE. IF ENTIRE ROOT MASS CAN NOT BE EXCAVATED IN ONE BUCKET LOAD, THE TRANSPLANT IS TOO LARGE AND ANOTHER SHOULD BE SELECTED.
  3. PLACE TRANSPLANT IN THE BANK TO BE STABILIZED SO THAT VEGETATION IS ORIENTATED VERTICALLY.
  4. FILL IN ANY HOLES AROUND THE TRANSPLANT AND COMPACT.
  5. ANY LOOSE SOIL LEFT IN THE STREAM SHOULD BE REMOVED.
  6. PLACE MULTIPLE TRANSPLANTS CLOSE TOGETHER SUCH THAT THEY TOUCH.

### PLANTING SPECIFICATIONS

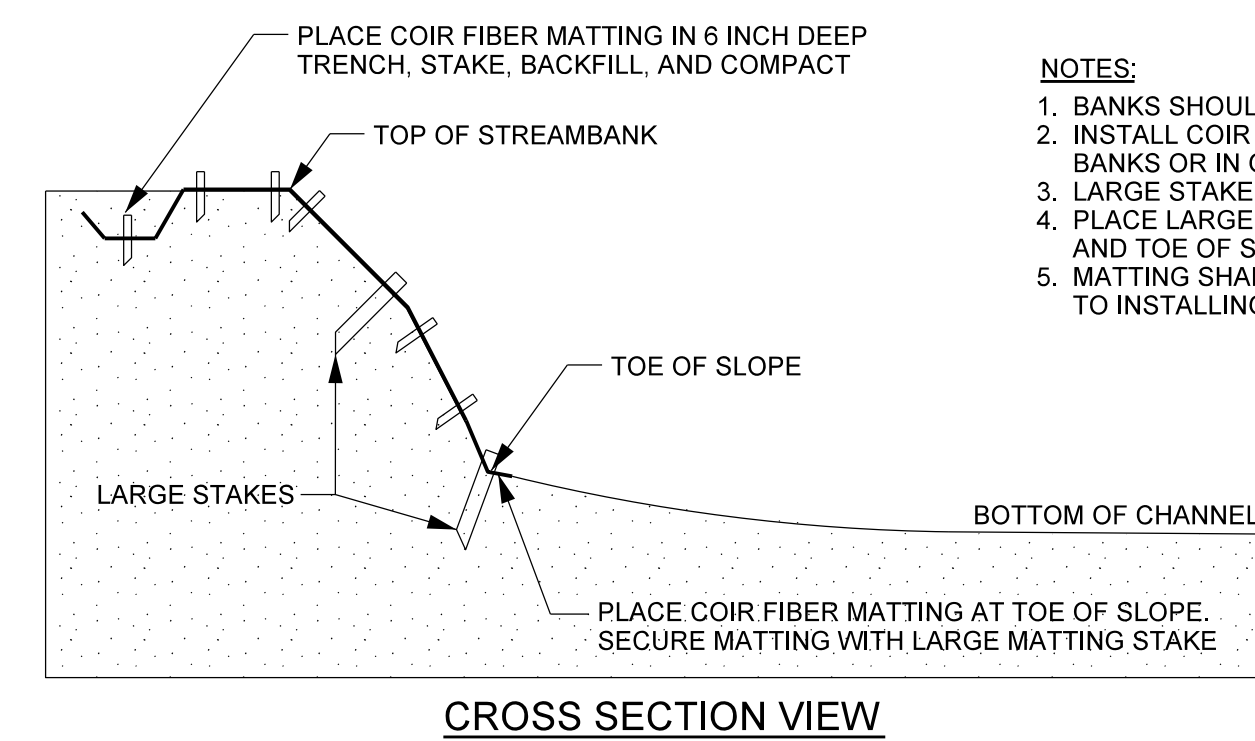


- NOTES:**
1. PLANT BARE ROOT SHRUBS AND TREES TO THE WIDTH OF THE BUFFER AS SHOWN ON THE PLANS.
  2. LOOSEN COMPACTED SOIL.
  3. PLANT IN HOLES MADE BY A MATTOCK, DIBBLE, PLANTING BAR, OR OTHER APPROVED MEANS.
  4. PLANT IN HOLES DEEP AND WIDE ENOUGH TO ALLOW THE ROOTS TO SPREAD OUT AND DOWN WITHOUT J-ROOTING.
  5. KEEP ROOTS MOIST WHILE DISTRIBUTING OR WAITING TO PLANT BY MEANS OF WET CANVAS, BURLAP, OR STRAW.
  6. HEEL-IN PLANTS IN MOIST SOIL OR SAWDUST IF NOT PROMPTLY PLANTED UPON ARRIVAL TO PROJECT SITE.

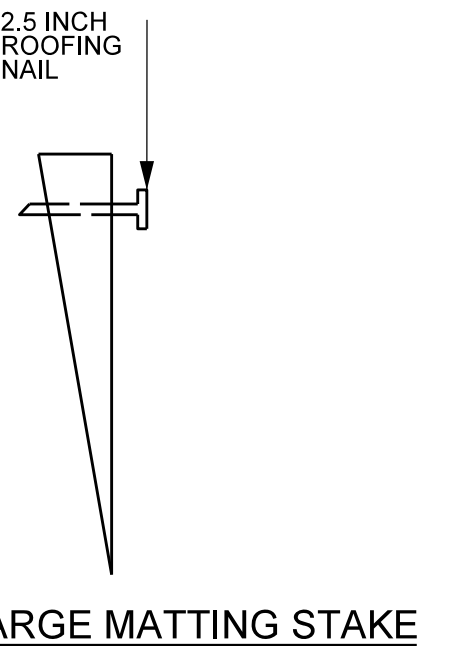


- NOTES:**
1. WHEN PREPARING THE HOLE FOR A POTTED PLANT OR SHRUB DIG THE HOLE 8 - 12 INCHES LARGER THAN THE DIAMETER OF THE POT AND THE SAME DEPTH AS THE POT.
  2. REMOVE THE PLANT FROM THE POT. LAY THE PLANT ON ITS SIDE IF NECESSARY TO REMOVE THE POT.
  3. IF THE PLANT IS ROOTBOUND (ROOTS GROWING IN A SPIRAL AROUND THE ROOT BALL), MAKE VERTICAL CUTS WITH A KNIFE OR SPADE JUST DEEP ENOUGH TO CUT THE NET OF ROOTS. ALSO MAKE A CRISS-CROSS CUT ACROSS THE BOTTOM OF THE BALL.
  4. PLACE THE PLANT IN THE HOLE.
  5. FILL HALF OF THE HOLE WITH SOIL (SAME SOIL REMOVED FOR BACKFILL).
  6. WATER THE SOIL TO REMOVE AIR POCKETS AND FILL THE REST OF THE HOLE WITH THE REMAINING SOIL.

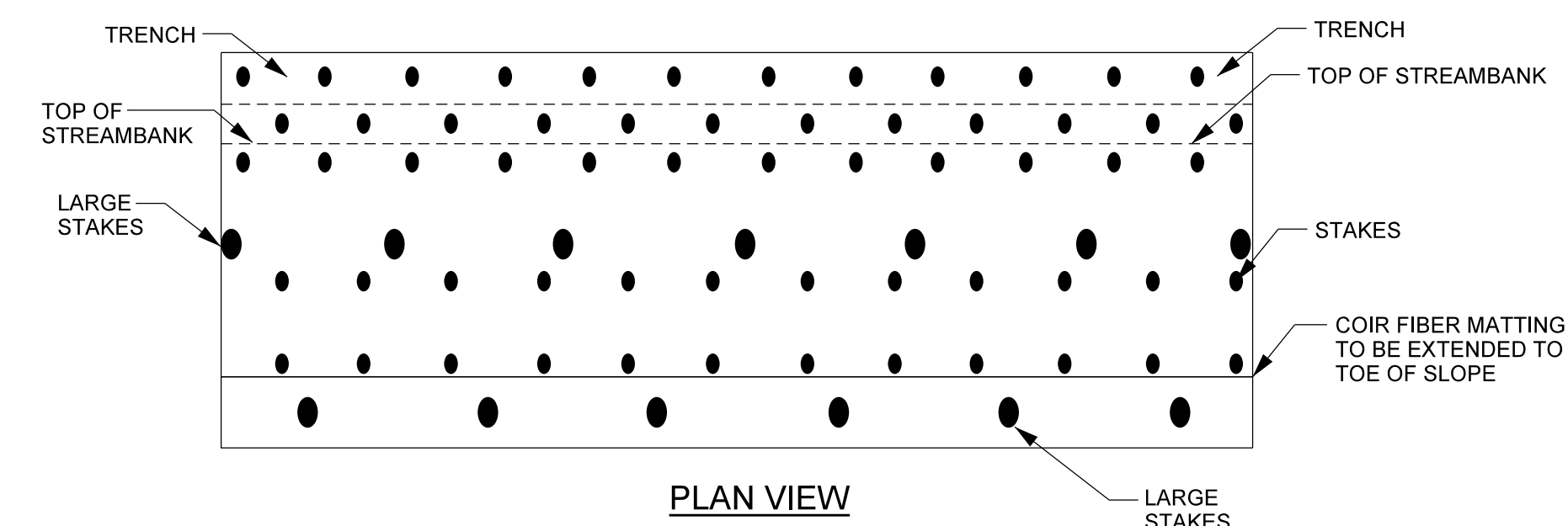
### COIR FIBER MATTING



- NOTES:**
1. BANKS SHOULD BE SEEDED PRIOR TO PLACEMENT OF MATTING.
  2. INSTALL COIR FIBER MATTING PER SPECIFICATIONS ALONG STREAM BANKS OR IN OTHERS LOCATIONS SPECIFIED BY ENGINEER.
  3. LARGE STAKES SHOULD NOT BE SPACED FURTHER THAN 36" APART.
  4. PLACE LARGE STAKES ALONG ALL SEAMS, IN THE CENTER OF BANK, AND TOE OF SLOPE.
  5. MATTING SHALL BE PLACED ON BANKS, STAKED, AND TRENCHED PRIOR TO INSTALLING CONSTRUCTED RIFFLE MATERIAL.



LEG LENGTH	17.00 IN (43.18 CM) (TAPERED TO POINT)
WIDTH	1.5 IN (3.81 CM)
THICKNESS	1.5 IN (3.81 CM)

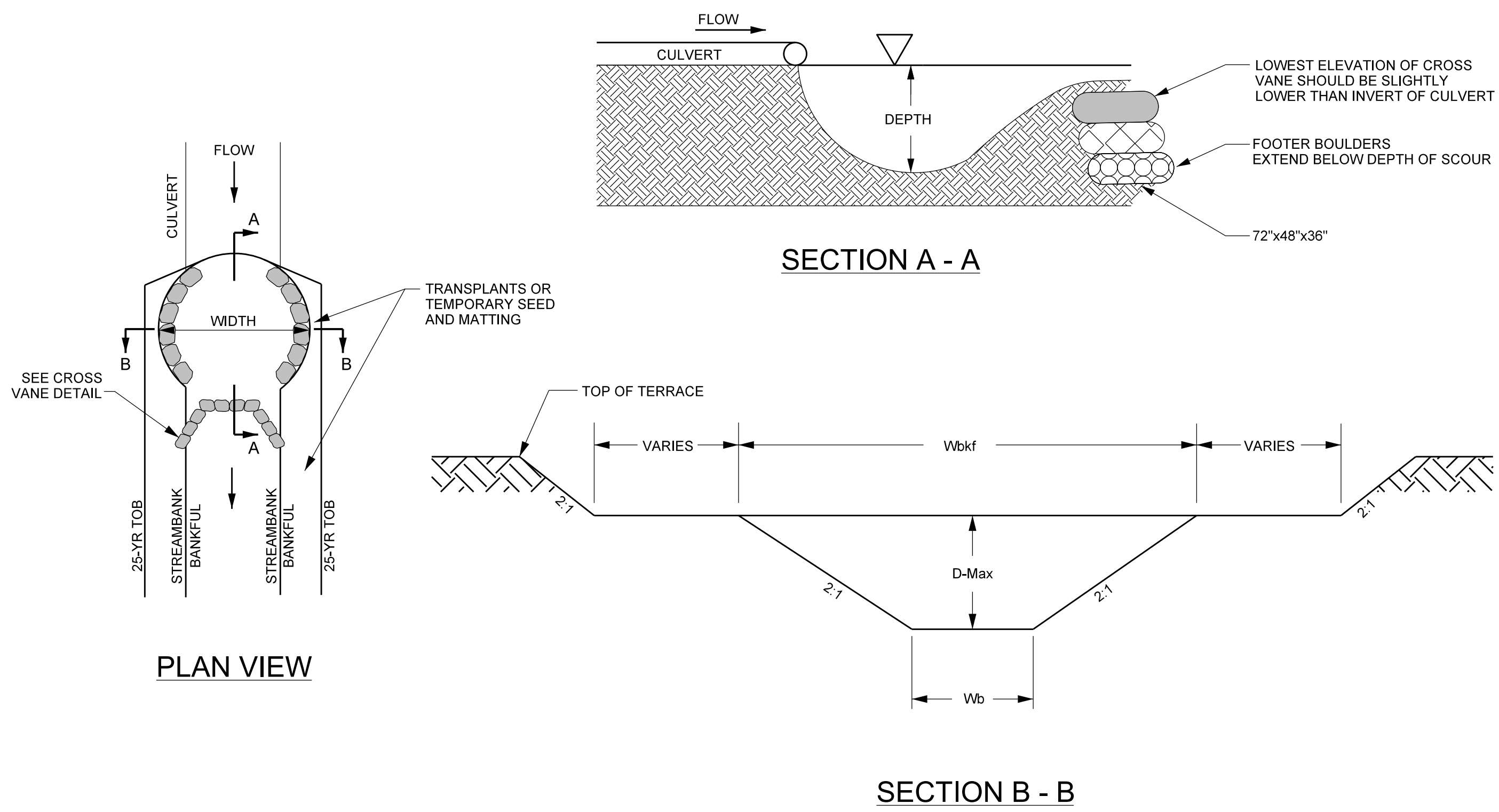


LEG LENGTH	11.00 IN (27.94 CM)
HEAD WIDTH	1.25 IN (3.18 CM)
HEAD THICKNESS	0.40 IN (1.02 CM)
LEG WIDTH	0.60 IN (1.52 CM) (TAPERED TO POINT)
LEG THICKNESS	0.40 IN (1.02 CM)
TOTAL LENGTH	12.00 IN (30.48 CM)

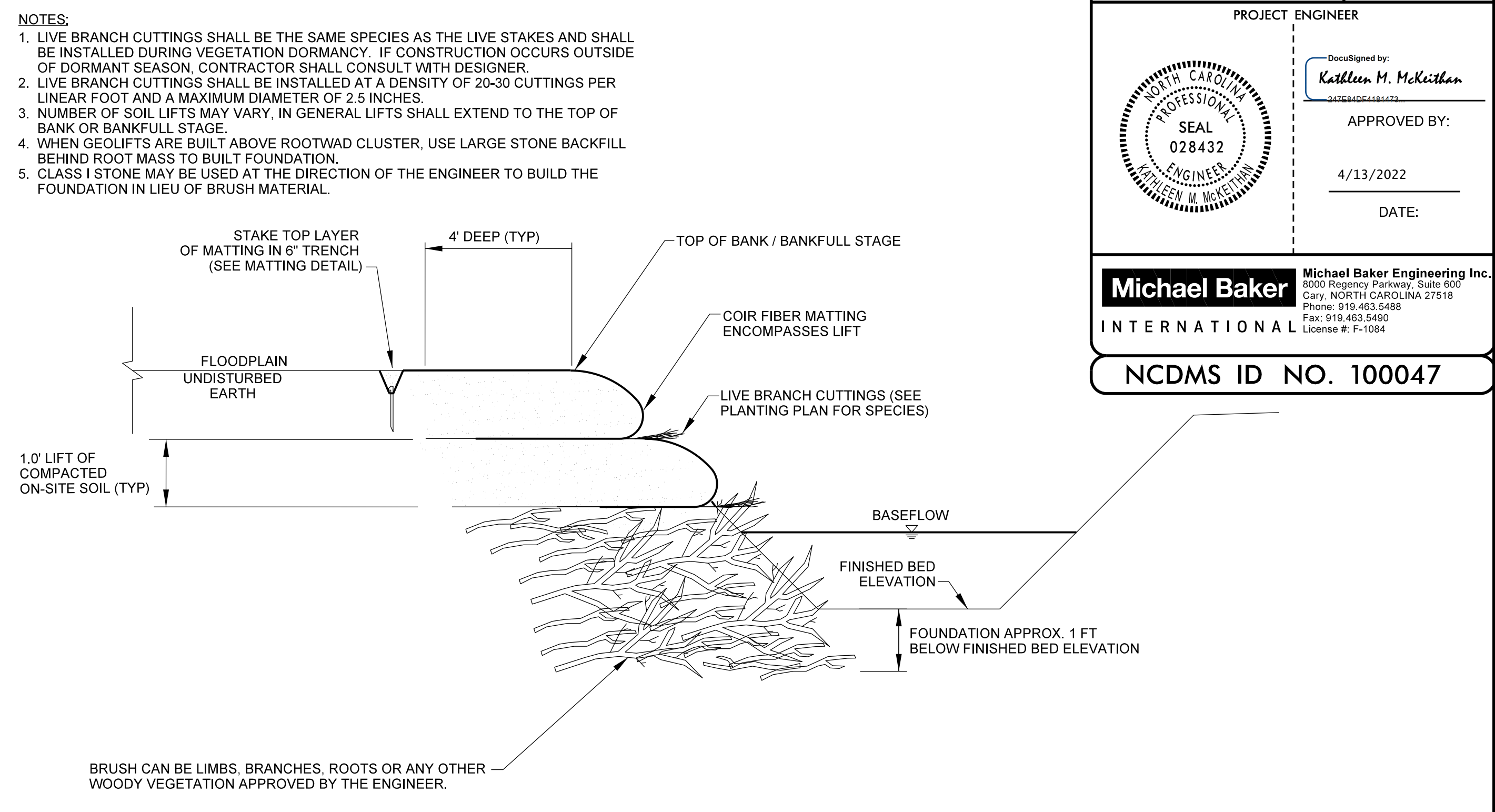
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2/26/2023

**PLUNGE POOL**

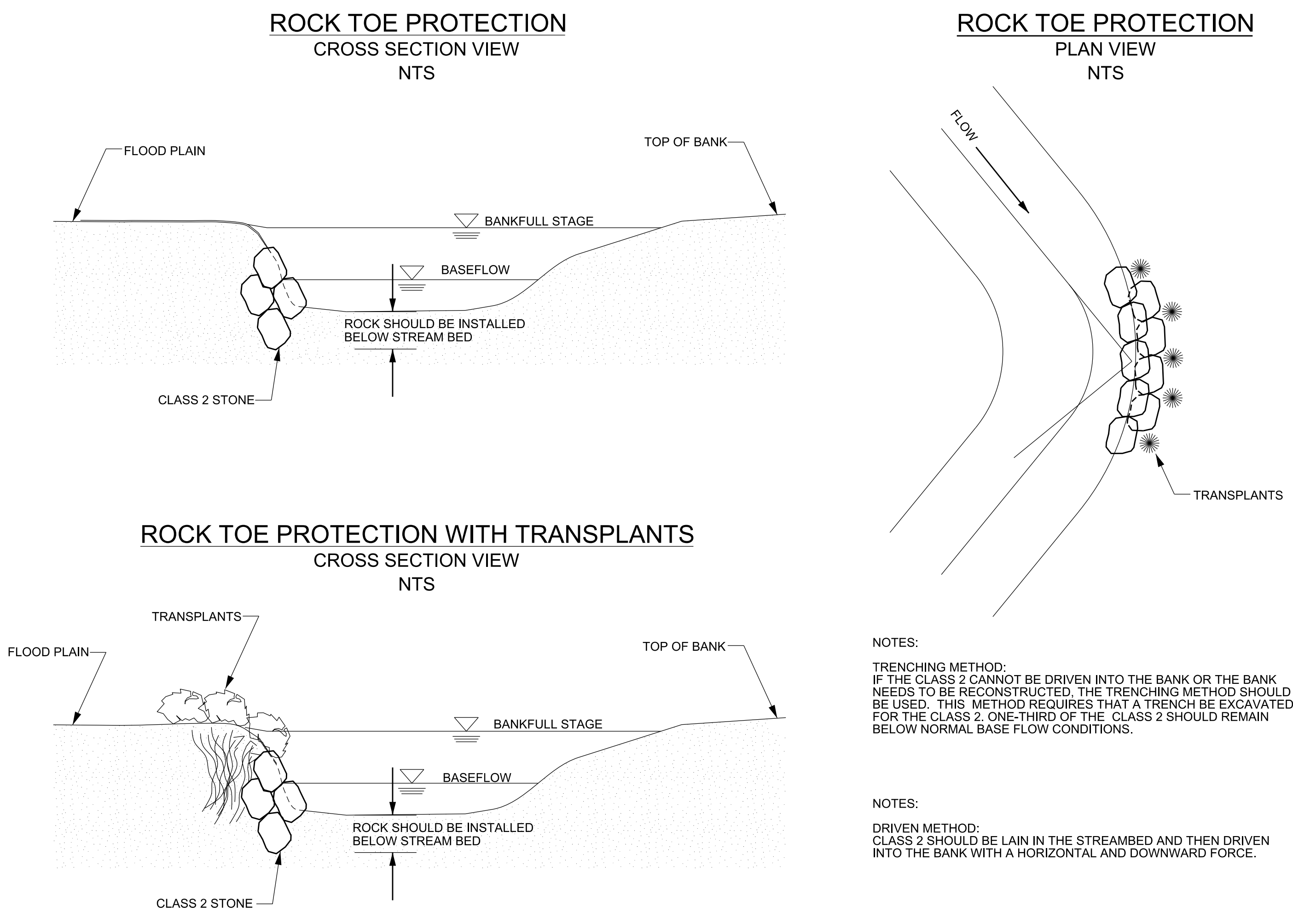


**GEOLIFT WITH BRUSH TOE**

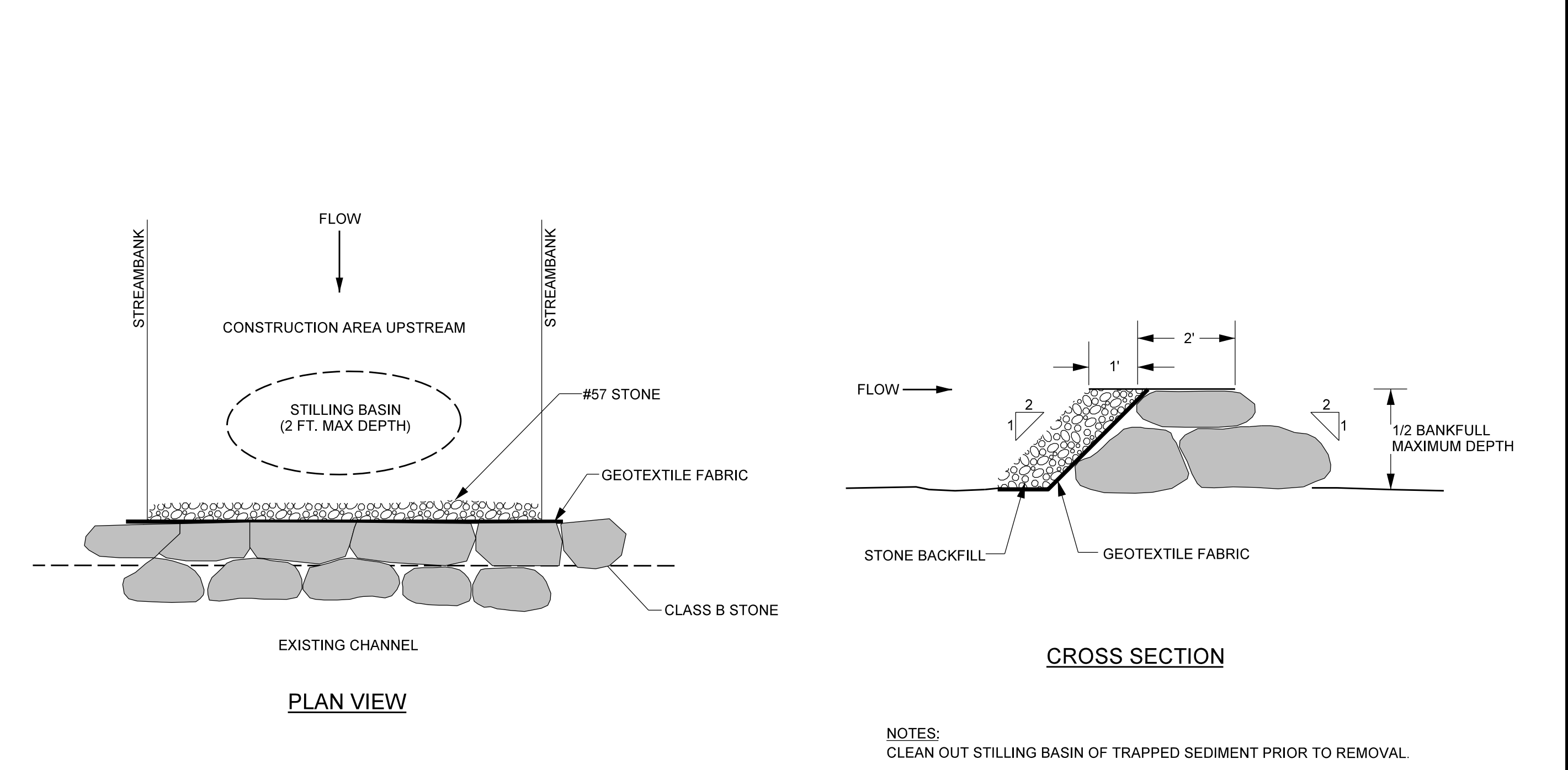


PROJECT REFERENCE NO. <b>166274</b>	SHEET NO. <b>2D</b>
PROJECT ENGINEER	
Designated by: <b>Kathleen M. McKeithan</b> 3/25/2023	
APPROVED BY:	
4/13/2022	
DATE:	
<b>Michael Baker International</b> Michael Baker Engineering Inc. 8000 Regency Parkway, Suite 600 Cary, NORTH CAROLINA 27518 Phone: 919.463.5486 Fax: 919.463.5490 License #: F-1084	
<b>NCDMS ID NO. 100047</b>	

**ROCK TOE PROTECTION**



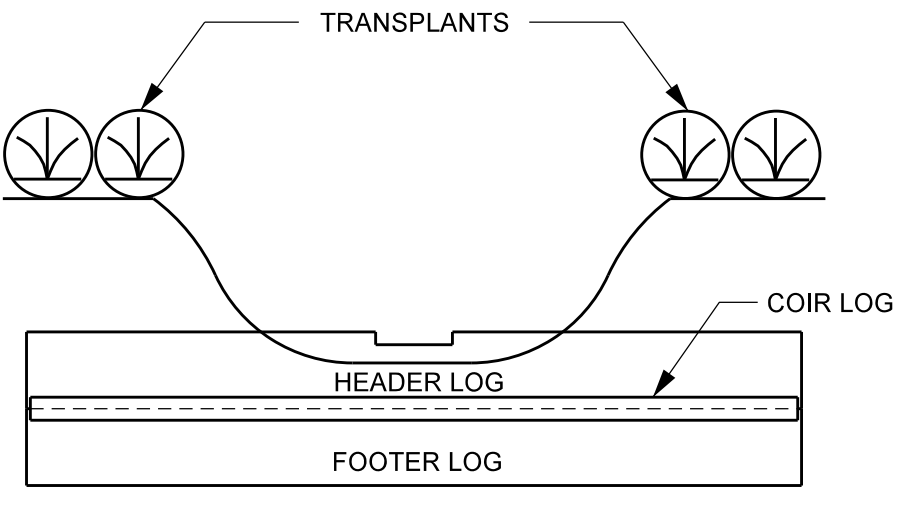
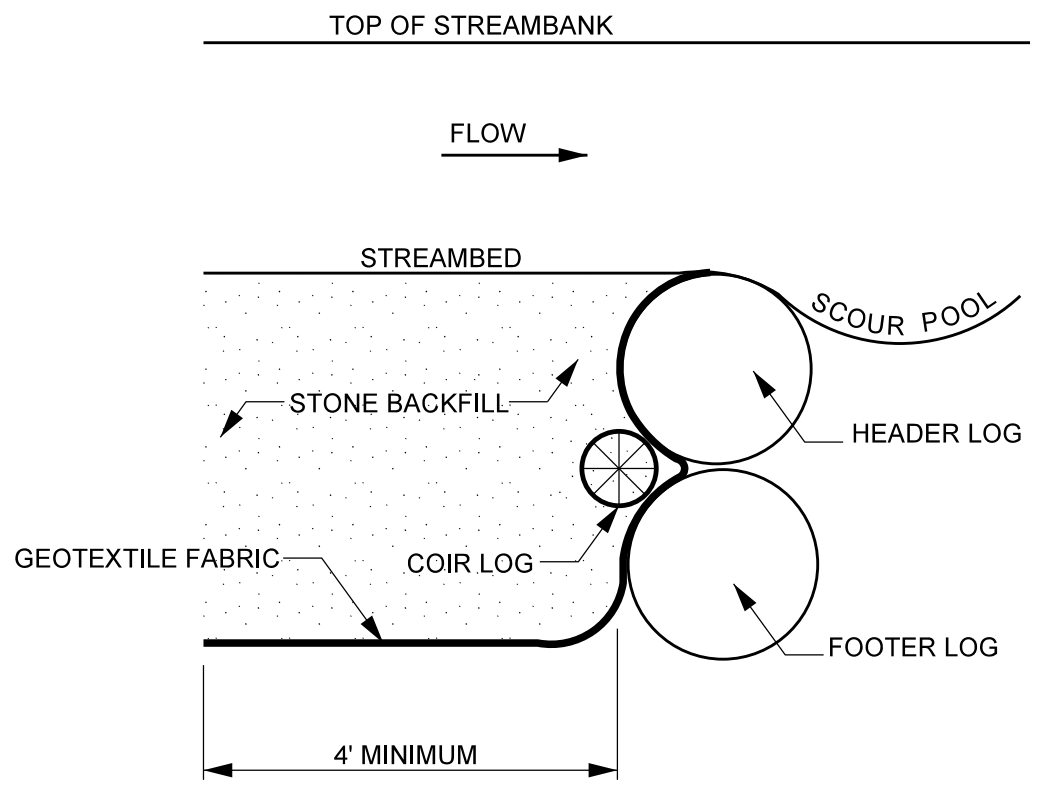
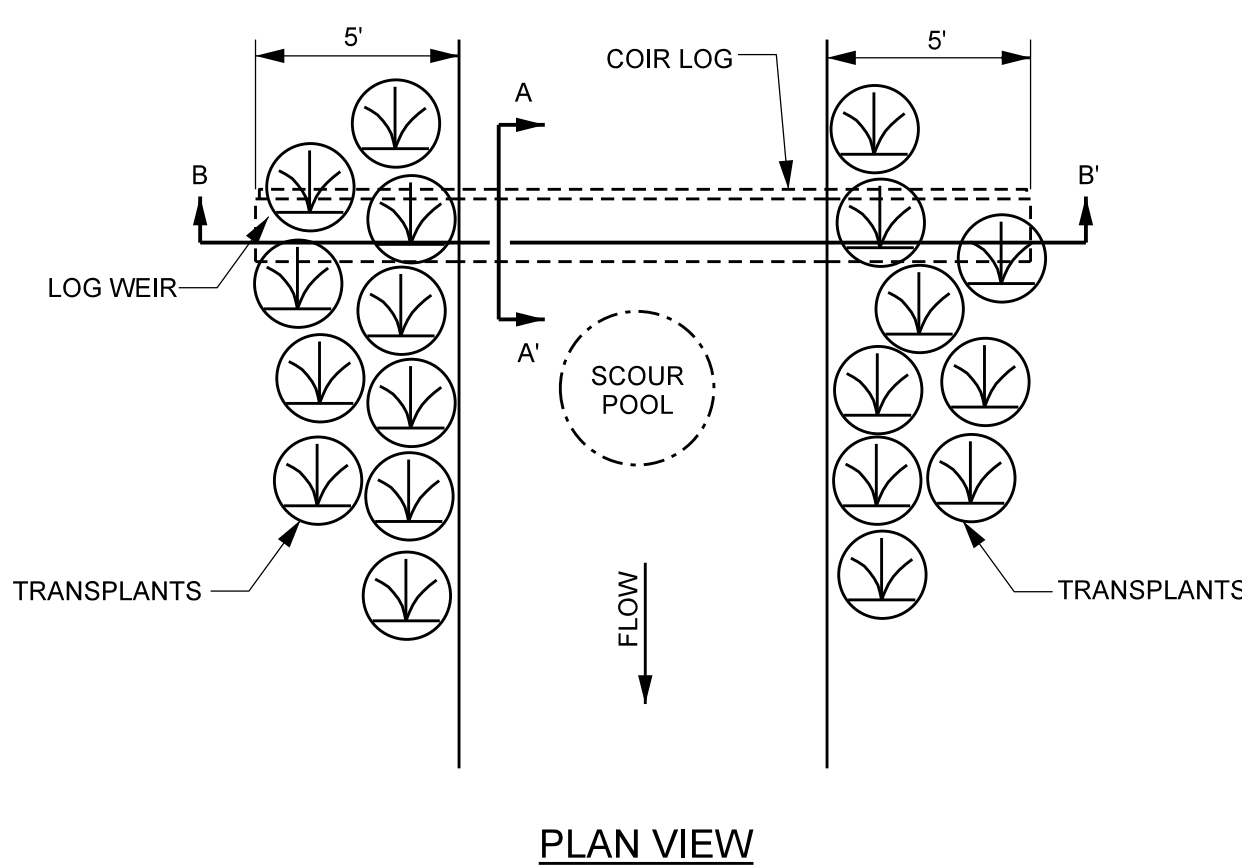
**ROCK DAM**



4/13/2022  
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 Michael Baker International

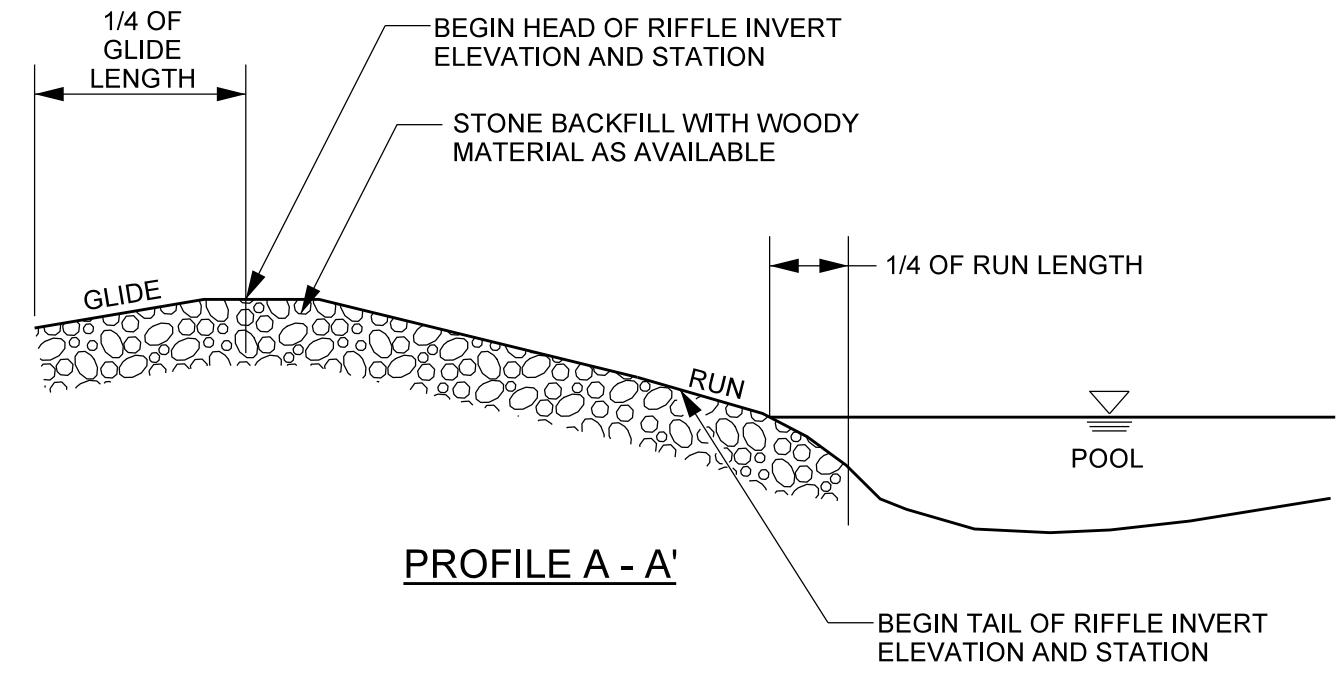
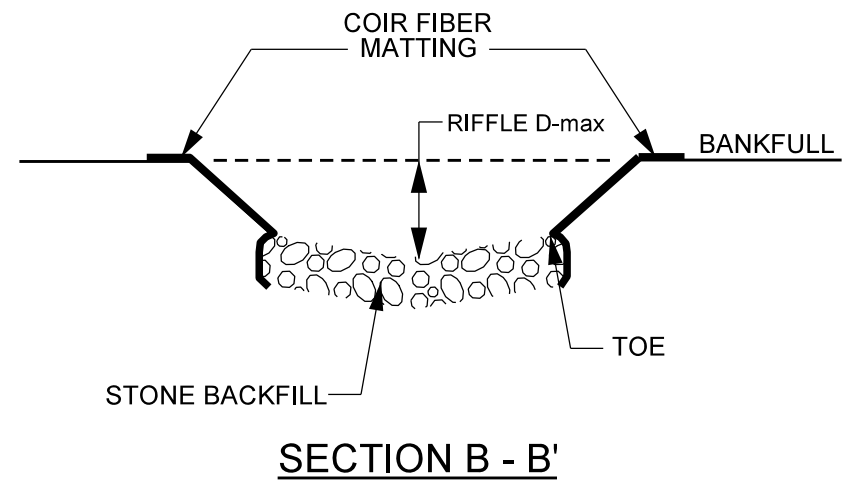
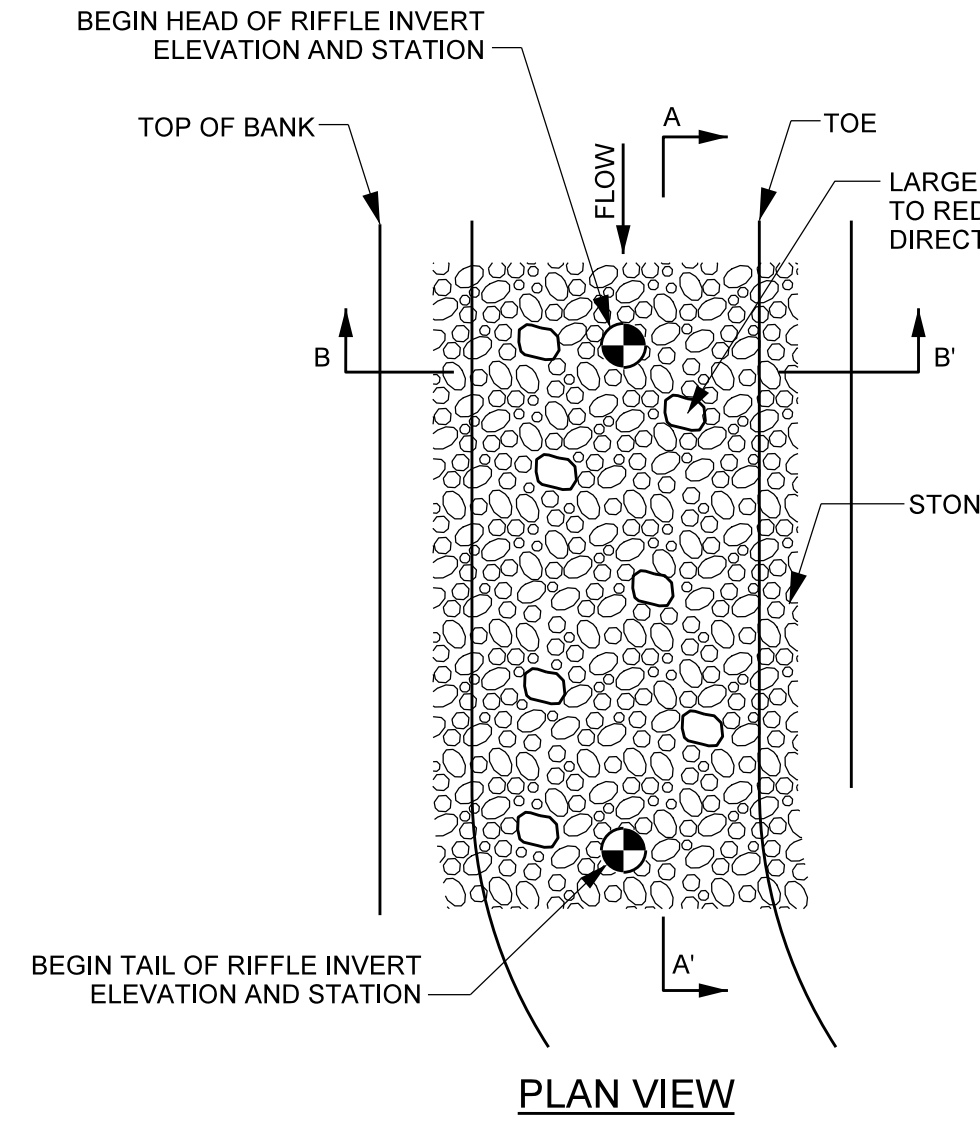
2/26/2022

**LOG STEP**



- NOTES:**
- LOGS SHOULD BE AT LEAST 10 INCHES IN DIAMETER, RELATIVELY STRAIGHT, HARDWOOD, AND RECENTLY HARVESTED.
  - TOP OF HEADER LOG SHOULD BE SET AT SAME ELEVATION AS THE STREAMBED.
  - DIAMETER OF COIR LOG SHOULD BE APPROXIMATELY 1/2 DIAMETER OF LOGS.
  - USE GEOTEXTILE FABRIC WITH COIR LOGS TO SEAL GAPS BETWEEN LOGS.
  - PLACE TRANSPLANTS ALONG BANKS TO PROTECT AGAINST BANK EROSION.
  - THE HEADER LOG SHOULD BE NOTCHED 2 - 3 INCHES DEEP IN THE CENTER AND FOR 20 - 30% OF THE CHANNEL WIDTH.

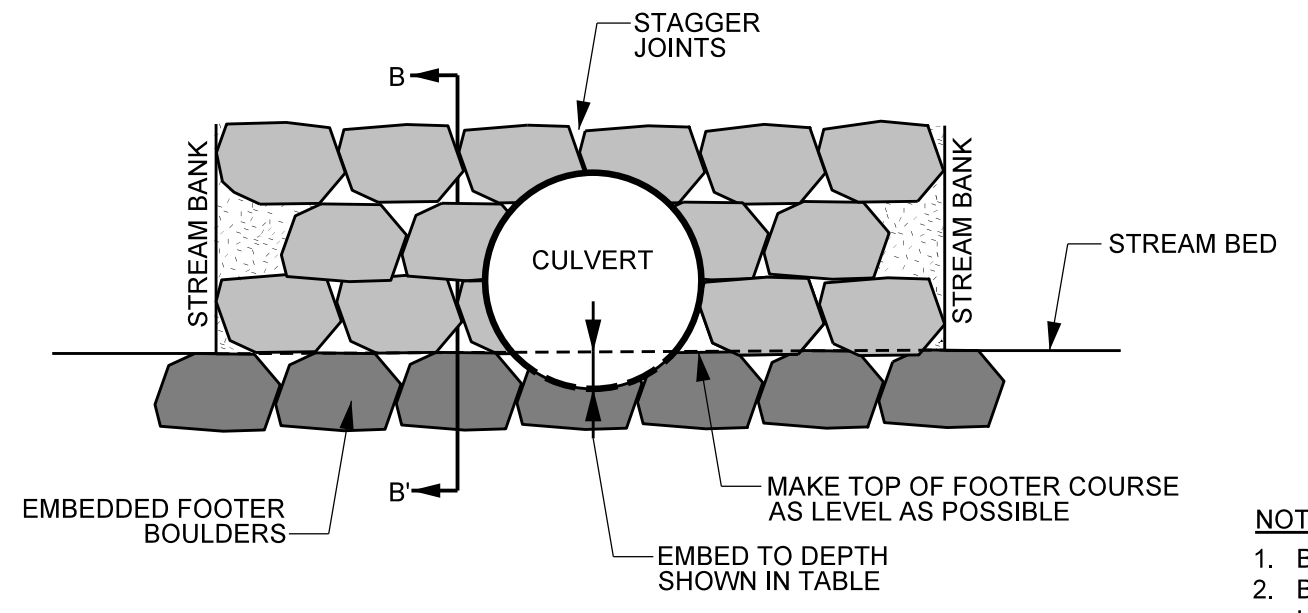
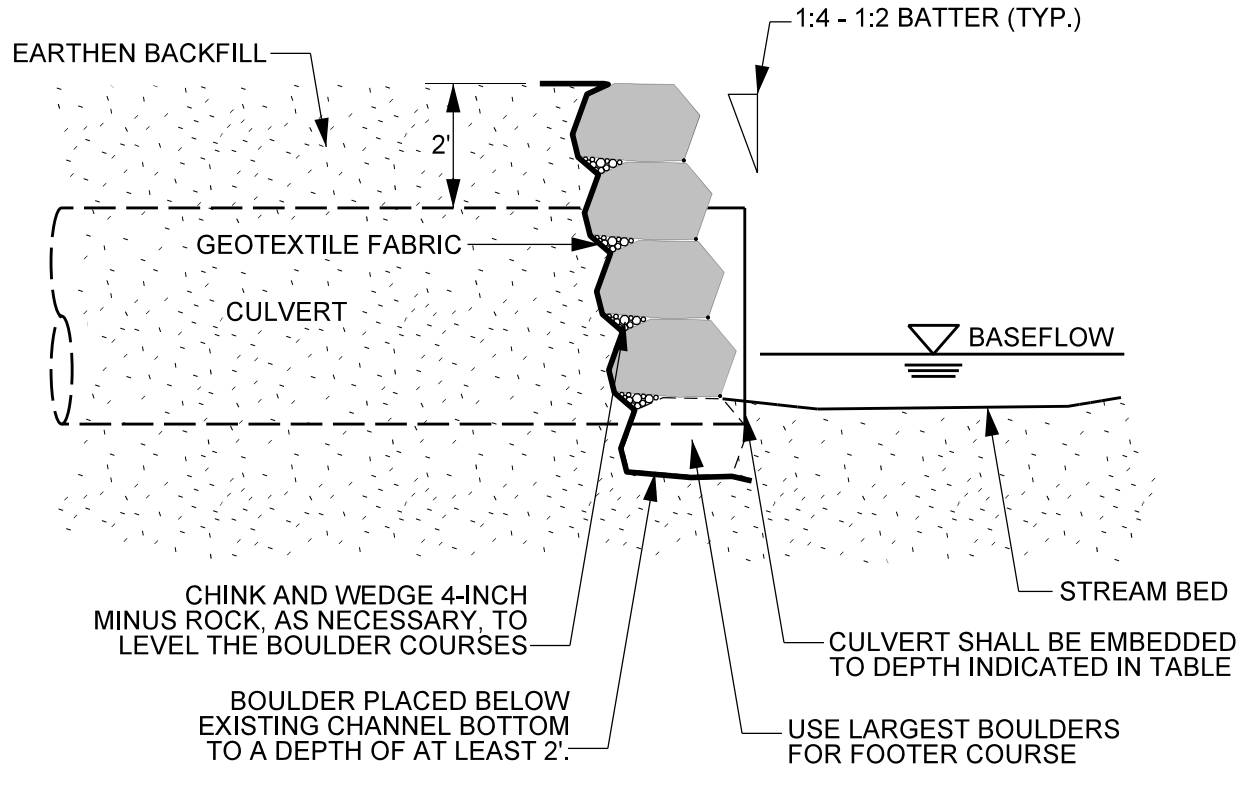
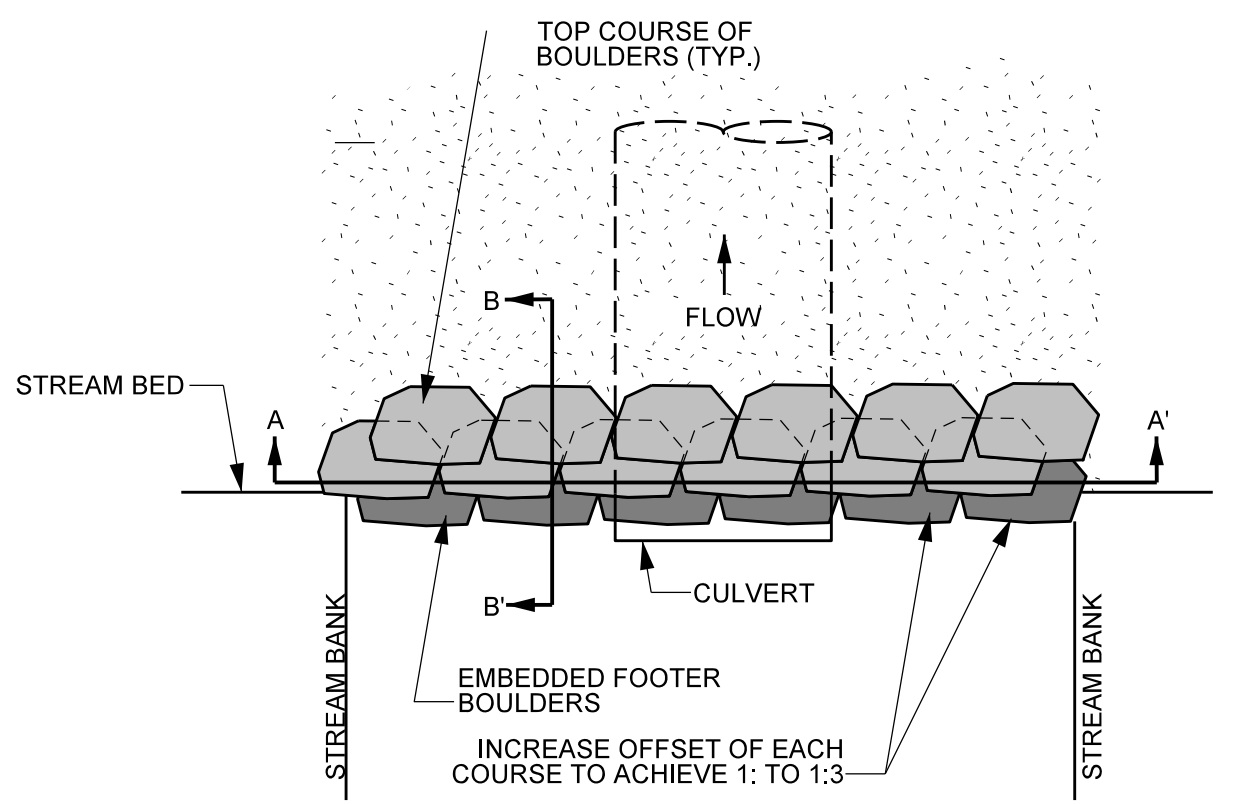
**CONSTRUCTED RIFFLE**



- NOTES: NATURAL ALLUVIUM RIFFLE**
- STOCK PILE NATURAL ALLUVIUM FROM SECTIONS OF CHANNEL THAT ARE BEING ABANDONED AND FILLED.
  - APPLY NATURAL ALLUVIUM BED MATERIAL IN THOSE RIFFLES WHERE STONE IS NOT INDICATED.
  - ANY WATER LOGGED WOODY MATERIAL COLLECTED SHOULD BE INSTALLED WITH BED MATERIAL.
- NOTES: STONE CONSTRUCTED RIFFLE**
- UNDERCUT CHANNEL BED ELEVATION AS NEEDED TO ALLOW FOR LAYERS OF STONE TO ACHIEVE FINAL GRADE.
  - INSTALL COIR FIBER MATTING ALONG COMPLETED BANKS SUCH THAT THE EROSION CONTROL MATTING AT THE TOE OF THE BANK EXTENDS DOWN TO THE UNDERCUT ELEVATION.
  - INSTALL STONE BACKFILL, COMPACTED TO GRADE.
  - FINAL CHANNEL BED SHAPE SHOULD BE ROUNDED, SMOOTH, AND CONCAVE, WITH THE ELEVATION OF THE BED 0.2 FT DEEPER IN THE CENTER THAN AT THE EDGES.
  - CONSTRUCTED RIFFLES SHALL BE 12" THICK.
  - CHANNEL BED SHALL INCLUDE WOODY MATERIAL AS AVAILABLE ON-SITE LAYERED IN WITH STONE BACKFILL.

REACH	STONE BACKFILL MIX
APPLIES TO ALL REACHES	10% CLASS I RIPRAP 20% CLASS B RIPRAP 40% CLASS A RIPRAP 30% ON-SITE ALLUVIUM

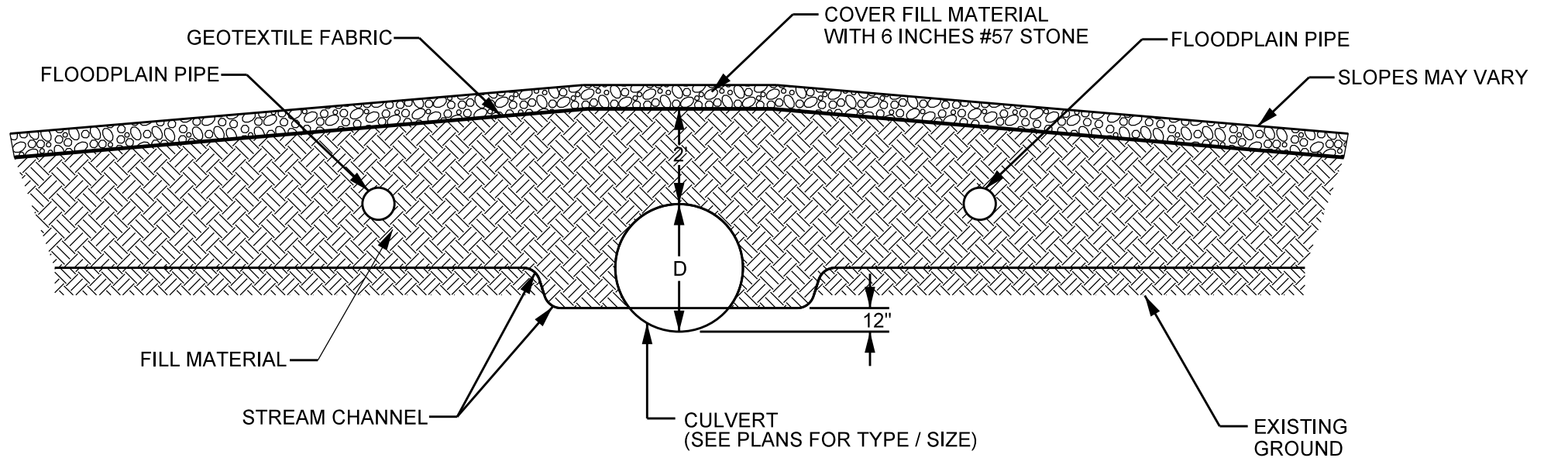
**BOULDER HEADWALL / ENDWALL**



REACH	BOULDER SIZE	CULVERT SIZE	EMBEDMENT
REACH 1	2'x3'x4'	24 LF x 79" x 117" CMP (*SEE BELOW)	12"

- NOTES:**
- BOULDERS SHALL BE TOUCHING SO THAT VOID SPACE IS MINIMAL.
  - BOULDERS SHOULD EXTEND BELOW SCOUR DEPTH. FOOTER BOULDERS SHALL BE AT LEAST 2' BELOW THE EXISTING BED
  - GEOTEXTILE MATTING SHOULD BE PLACED BETWEEN BOULDERS AND SOIL.
  - BOULDERS SHOULD BE BACKFILLED AND COMPACTED. VOID SPACE BETWEEN FABRIC AND BOULDER OR ROCK FILL MATERIAL, SHOULD BE MINIMIZED.
  - BOULDERS SHOULD NOT BE HIGHER THAN THE TOP OF CROSSING ELEVATION.
  - FILTER FABRIC SHOULD BE PLACED BEHIND BOULDERS, BURIED BELOW BOULDER DEPTH, AND EXTEND INTO THE BANK.

**PERMANENT STREAM CROSSING**



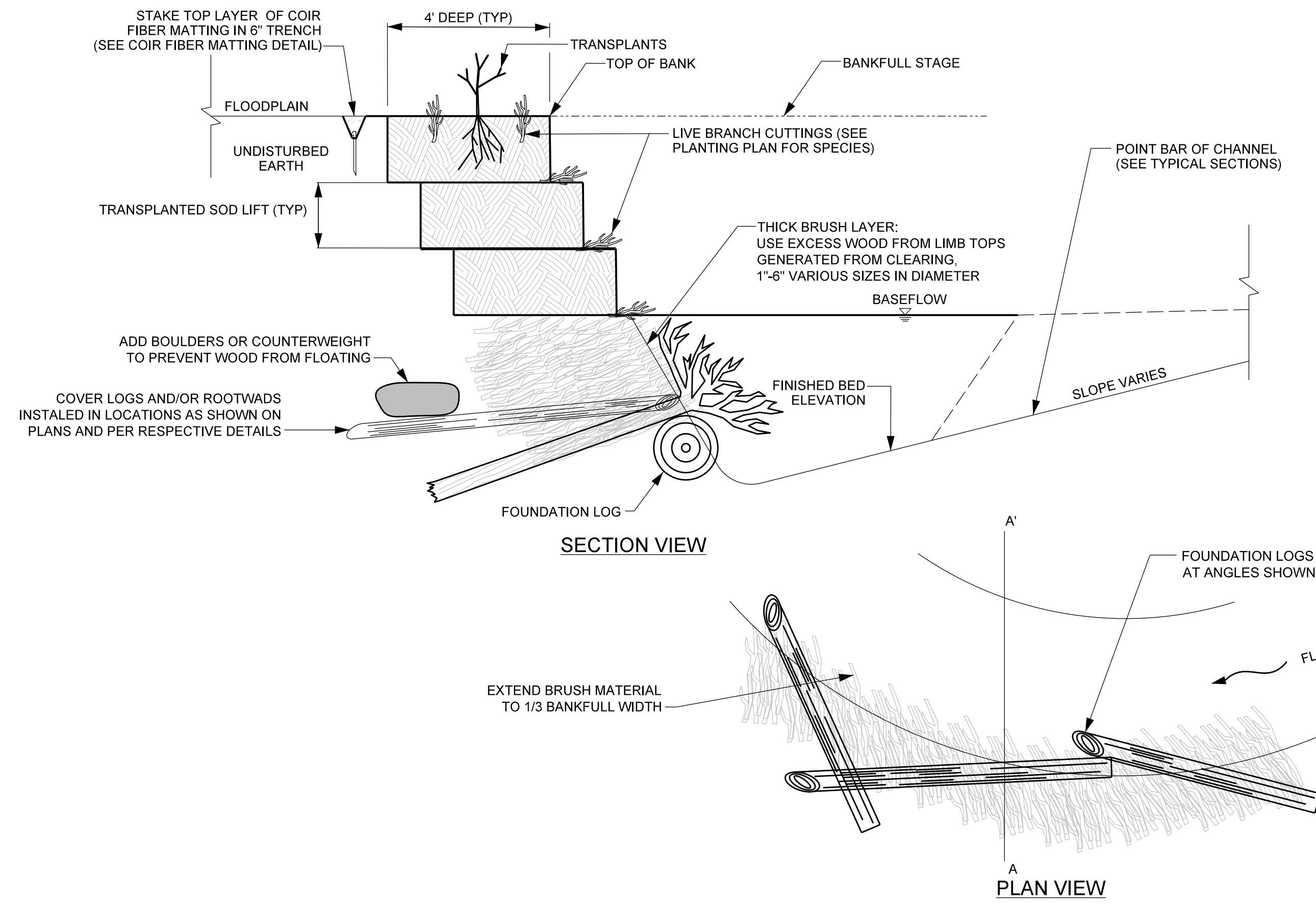
- NOTES:**
- SIZE DIMENSIONS SHOWN ON PLANS.
  - APPLY SUFFICIENT FILL (2' MIN) OVER CULVERT TO PREVENT COLLAPSE.
  - STABILIZE SIDE SLOPES WITH EROSION CONTROL MATTING AND FILL AROUND CULVERTS WITH CLASS II STONE.
  - INSTALL HEADWALLS AND ENDWALLS AS SHOWN ON THE PLANS.

PROJECT REFERENCE NO. <b>162039</b>	SHEET NO. <b>2E</b>
PROJECT ENGINEER	
DocuSigned by: <b>Kathleen M. McKelthen</b> APPROVED BY: DATE: 4/13/2022	
<b>Michael Baker International</b> Michael Baker Engineering Inc. 8000 Regency Parkway, Suite 600 Cary, NORTH CAROLINA 27518 Phone: 919.463.5486 Fax: 919.463.5490 License #: F-1084	
<b>NC DMS ID NO. 100020</b>	

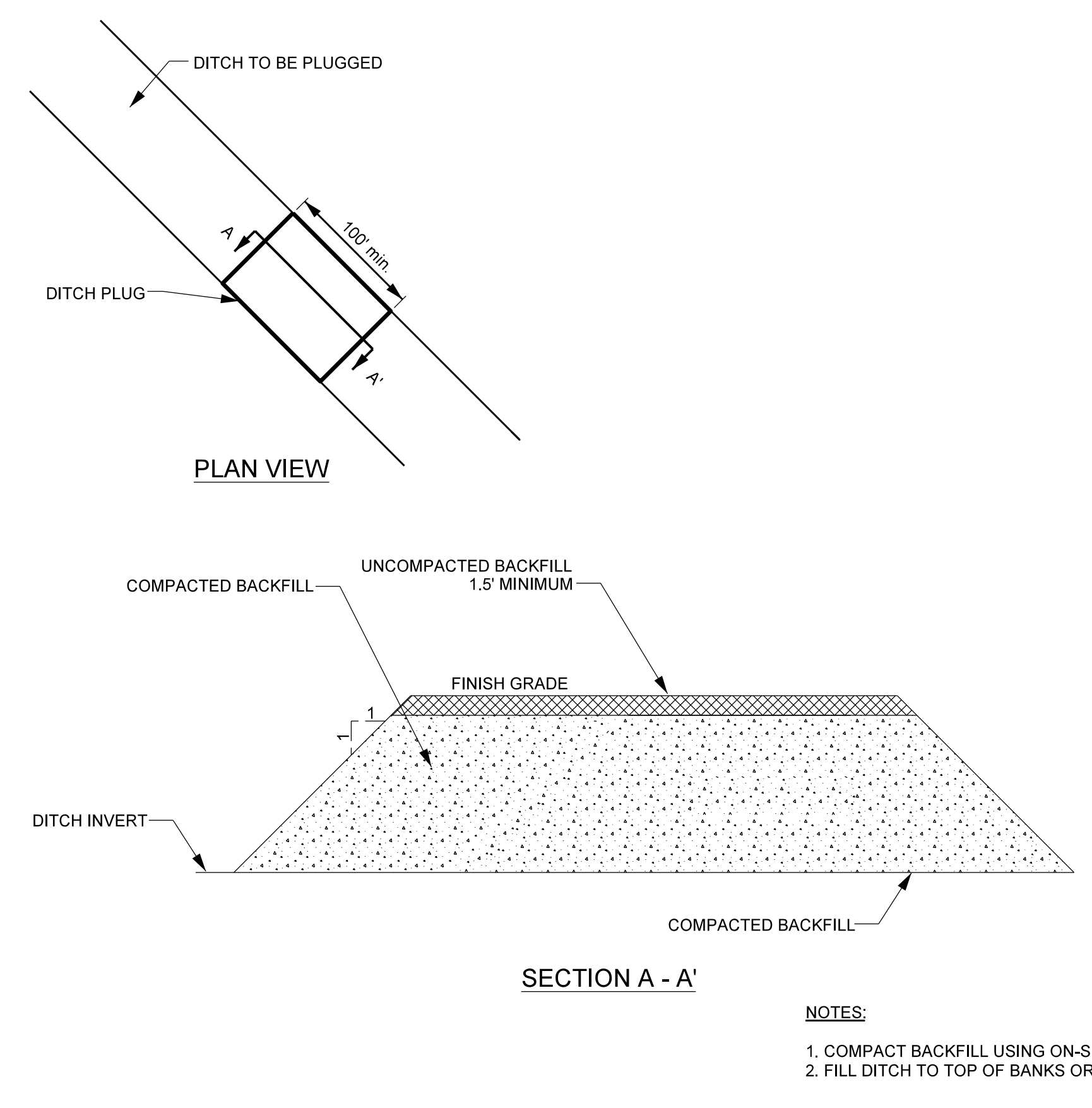
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### SOD MAT WITH WOOD TOE

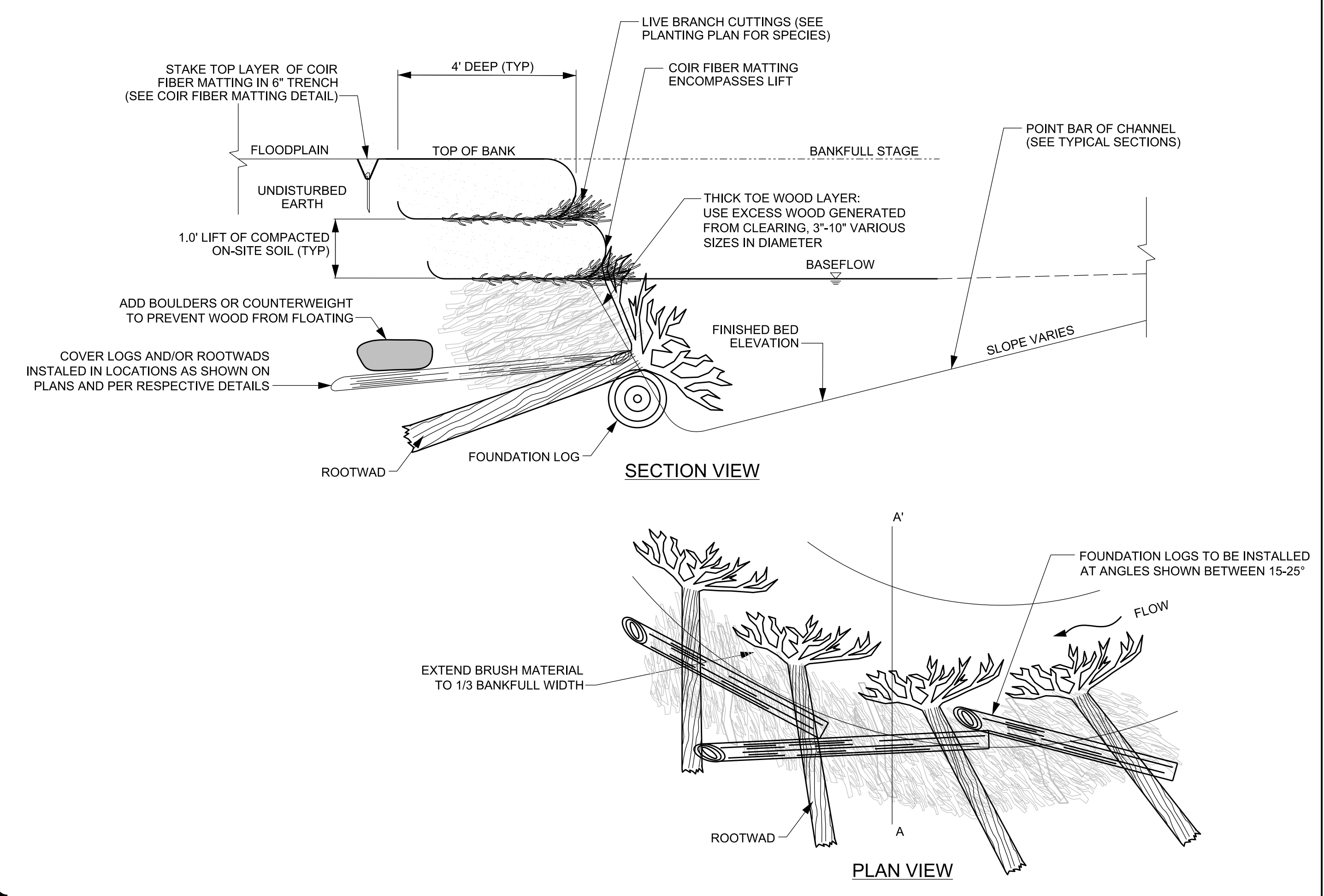


### DITCH PLUG

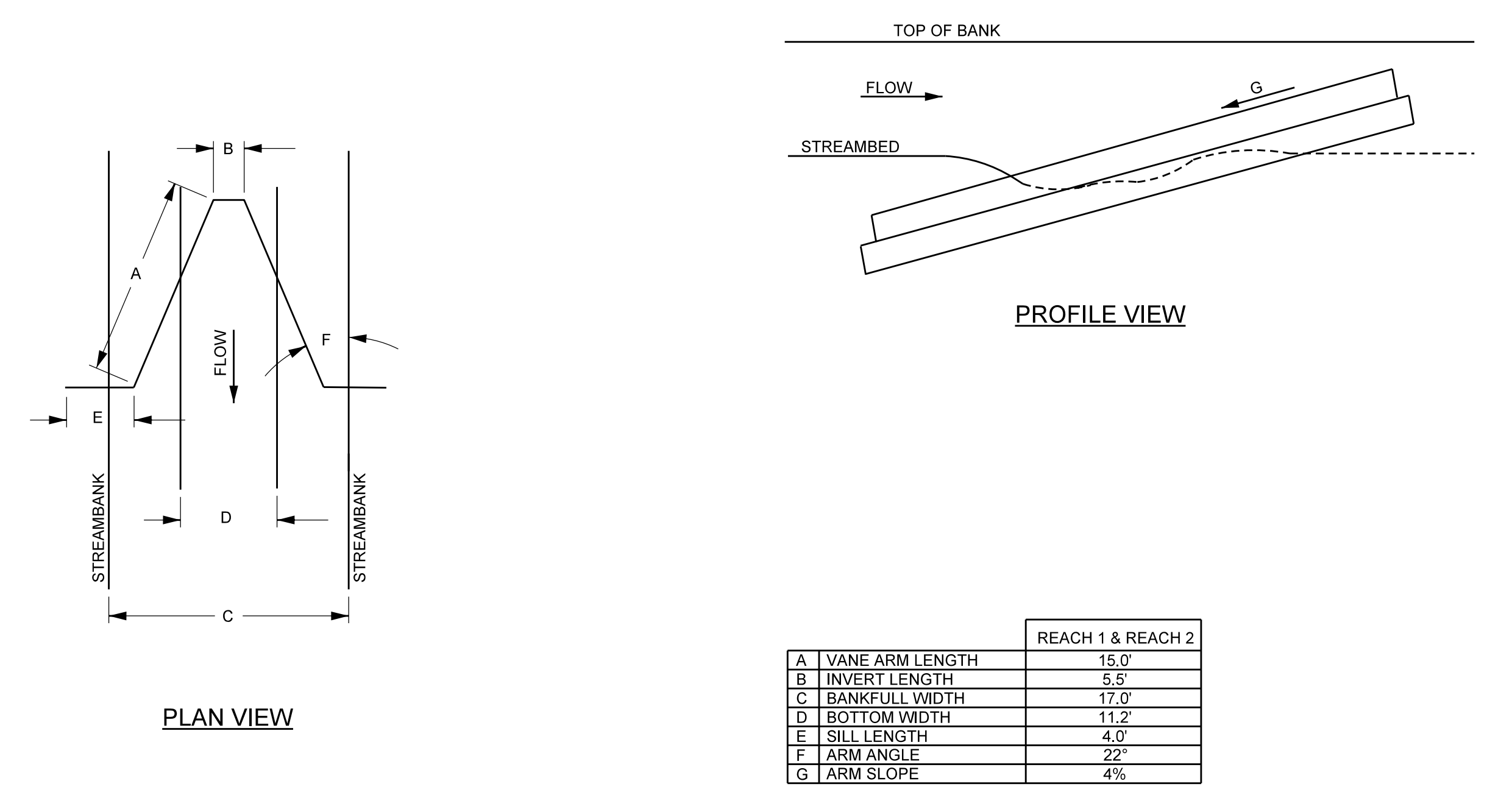


PROJECT REFERENCE NO. <b>162039</b>	SHEET NO. <b>2F</b>
PROJECT ENGINEER	
DocuSigned by: <i>Kathleen M. McKeithen</i> SAFERAGE1818474	
APPROVED BY:	
4/13/2022	
DATE:	
<b>Michael Baker International</b> Michael Baker Engineering Inc. 8000 Regency Parkway, Suite 600 Cary, NORTH CAROLINA 27518 Phone: 919.463.5485 Fax: 919.463.5490 License #: F-1084	
NCDMS ID NO. 100020	

### ROOTWAD REVETMENT WITH LIVE BRUSH



### LOG CROSS VANE TYPICAL



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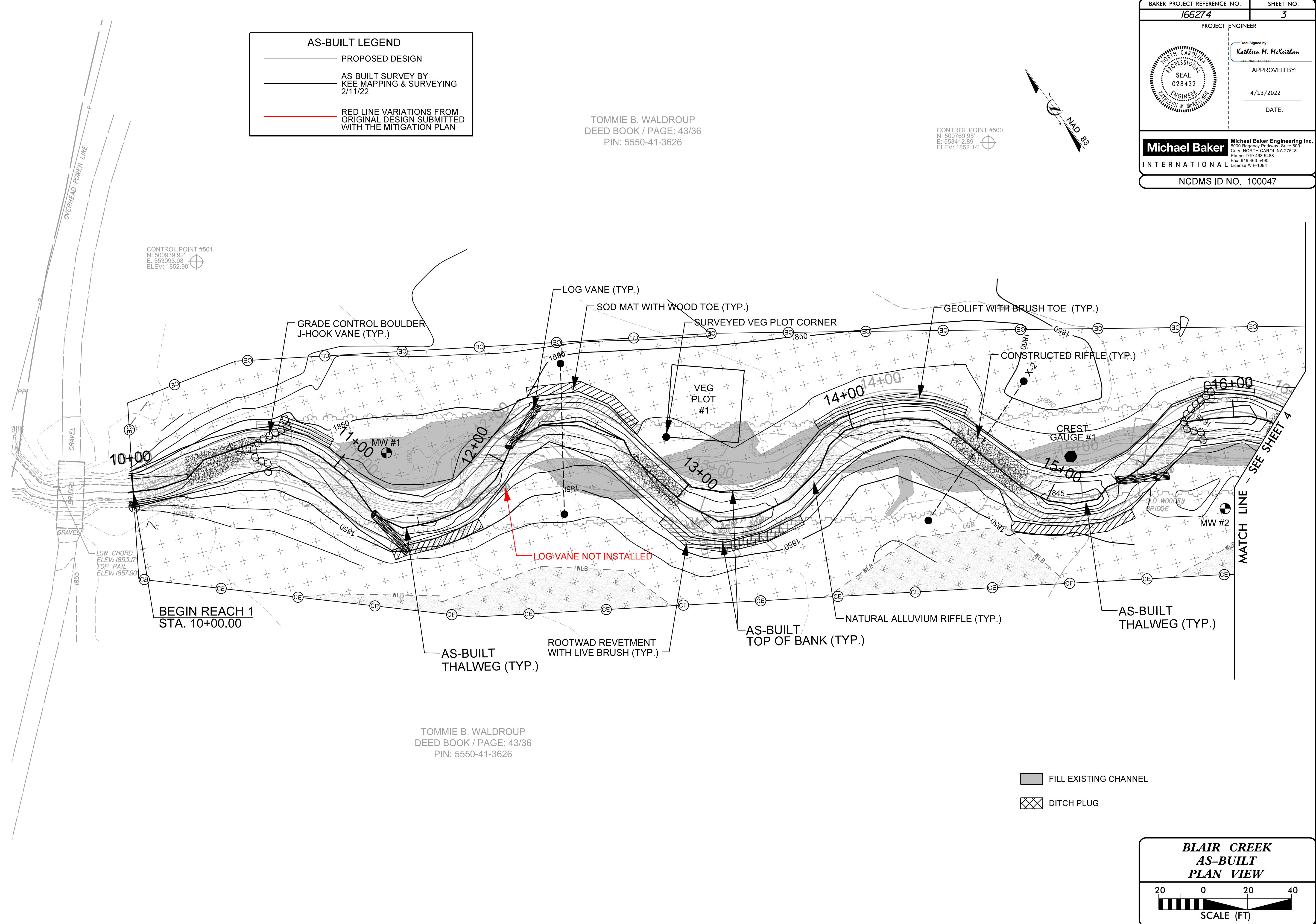
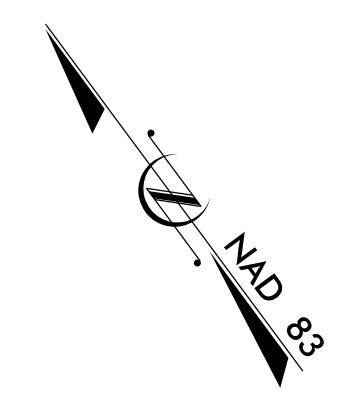
BAKER PROJECT REFERENCE NO. <b>166274</b>	SHEET NO. <b>3</b>
PROJECT ENGINEER <i>Kathleen M. McKeithan</i>	
	
APPROVED BY:  4/13/2022	
DATE:	
<b>Michael Baker International</b> Michael Baker Engineering Inc. <small>5000 Regency Parkway, Suite 500 Cary, NORTH CAROLINA 27518 Phone: 919.453.5488 Fax: 919.453.5490 License #: F-1084</small>	
NCDMS ID NO. 100047	

**AS-BUILT LEGEND**

- PROPOSED DESIGN
- AS-BUILT SURVEY BY KEE MAPPING & SURVEYING 2/11/22
- RED LINE VARIATIONS FROM ORIGINAL DESIGN SUBMITTED WITH THE MITIGATION PLAN

TOMMIE B. WALDROUP  
DEED BOOK / PAGE: 43/36  
PIN: 5550-41-3626

CONTROL POINT #500  
N: 500769.95'  
E: 553412.89'  
ELEV: 1852.14'



TOMMIE B. WALDROUP  
DEED BOOK / PAGE: 43/36  
PIN: 5550-41-3626

**BLAIR CREEK  
AS-BUILT  
PLAN VIEW**

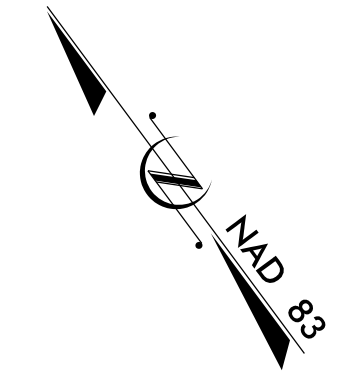
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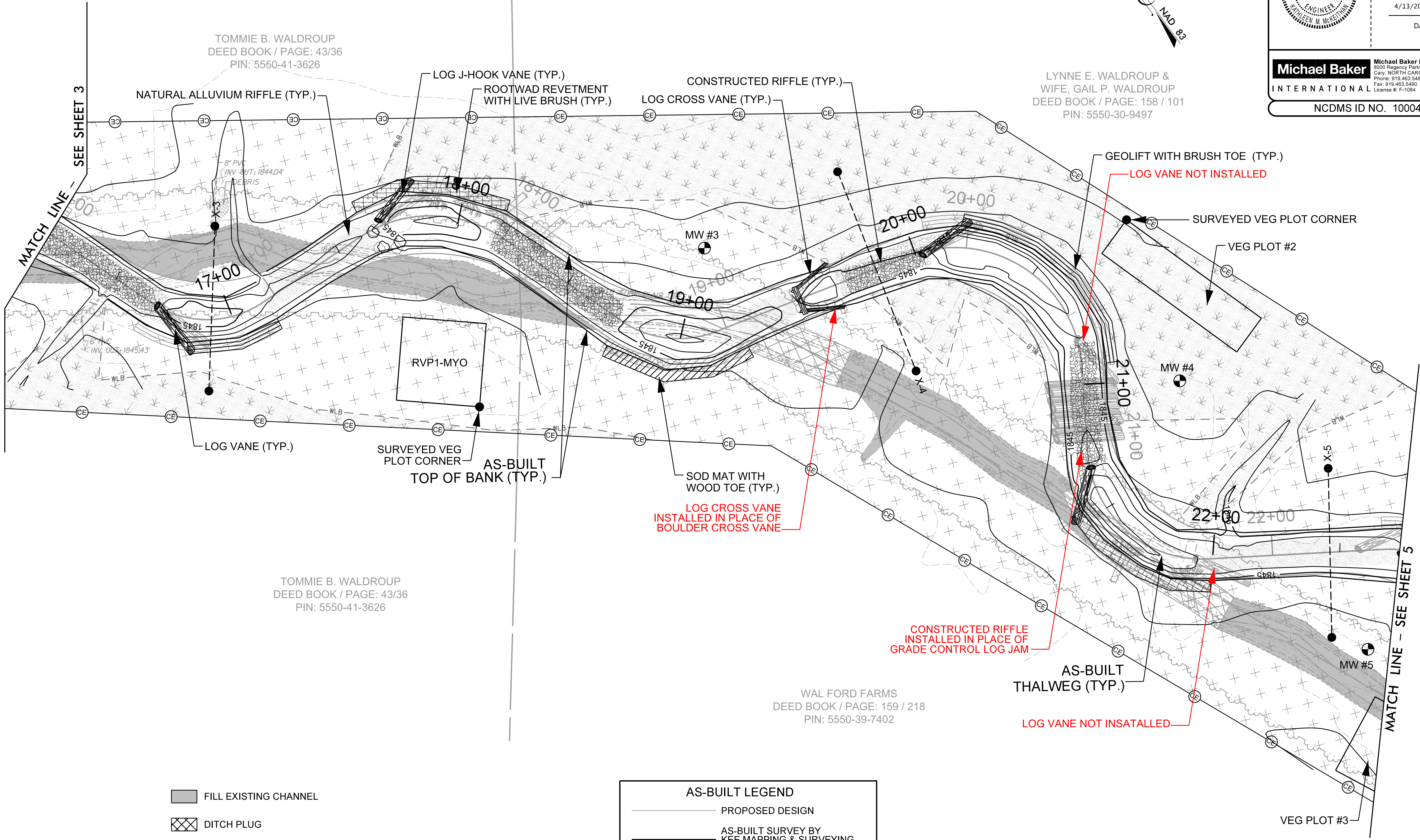
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BAKER PROJECT REFERENCE NO. <b>166274</b>	SHEET NO. <b>4</b>
PROJECT ENGINEER Kathleen M. McKeithen APPROVED BY: 4/13/2022 DATE:	
	
<b>Michael Baker International</b> Michael Baker Engineering Inc. <small>5000 Regency Parkway, Suite 800 Cary, NORTH CAROLINA 27518 Phone: 919.453.5488 Fax: 919.453.5490 License #: F-1084</small>	
NCDMS ID NO. 100047	

CONTROL POINT #307  
 N: 500320.88'  
 E: 553376.86'  
 ELEV: 1861.59'








LYNNE E. WALDROUP &  
 WIFE, GAIL P. WALDROUP  
 DEED BOOK / PAGE: 158 / 101  
 PIN: 5550-30-9497



TOMMIE B. WALDROUP  
 DEED BOOK / PAGE: 43/36  
 PIN: 5550-41-3626


WAL FORD FARMS  
 DEED BOOK / PAGE: 159 / 218  
 PIN: 5550-39-7402

-  FILL EXISTING CHANNEL
-  DITCH PLUG

- AS-BUILT LEGEND**
-  PROPOSED DESIGN
  -  AS-BUILT SURVEY BY  
KEE MAPPING & SURVEYING  
2/11/22
  -  RED LINE VARIATIONS FROM  
ORIGINAL DESIGN SUBMITTED  
WITH THE MITIGATION PLAN

CONTROL POINT #307  
 N: 500320.88'  
 E: 553376.86'  
 ELEV: 1861.59'

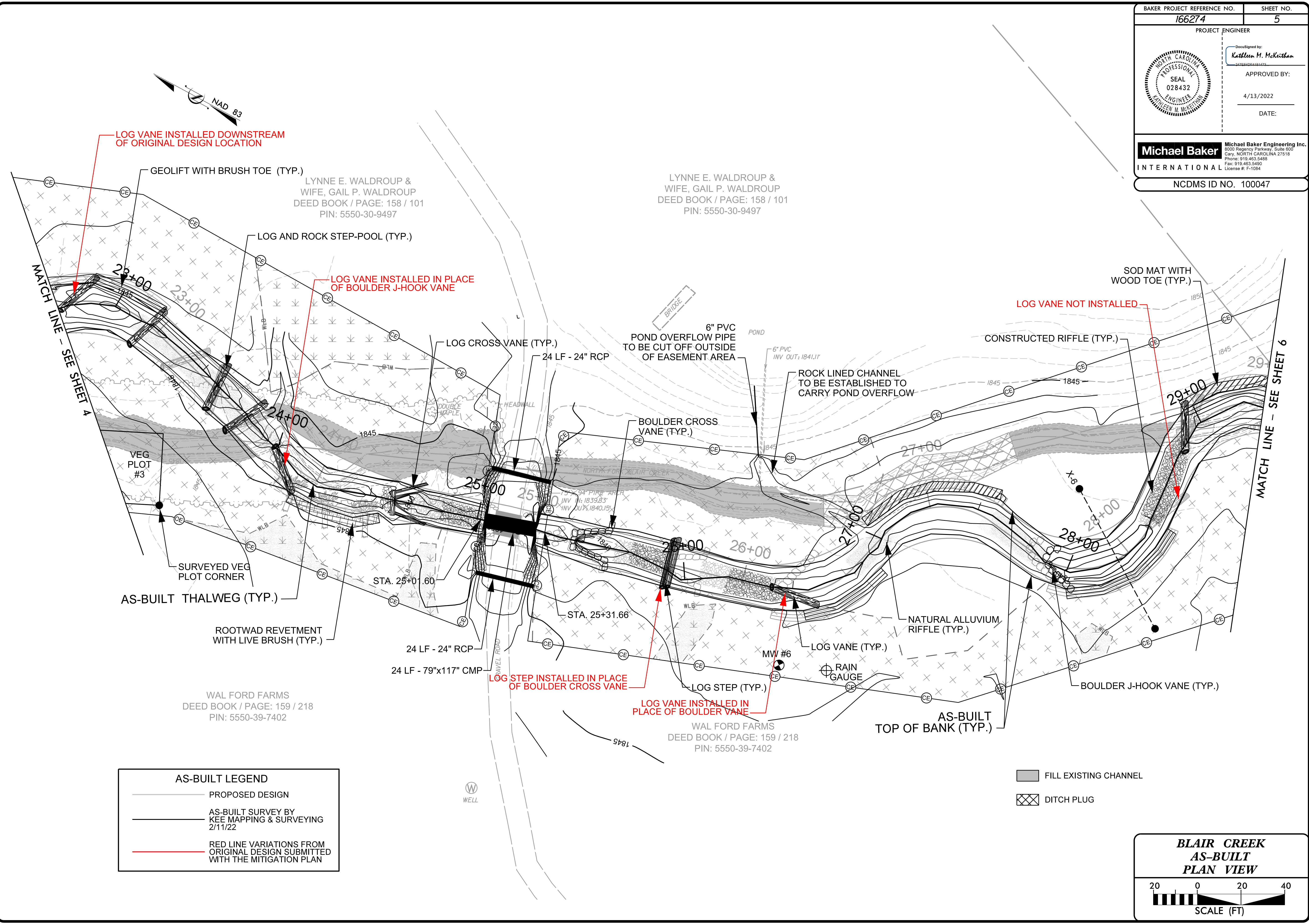
**BLAIR CREEK  
 AS-BUILT  
 PLAN VIEW**



SCALE (FT)

4/17/2022  
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 Michael Baker International

BAKER PROJECT REFERENCE NO. <b>166274</b>	SHEET NO. <b>5</b>
PROJECT ENGINEER	
DocuSigned by:  <b>Kathleen M. McKeithen</b> PROFESSIONAL ENGINEER STATE OF NORTH CAROLINA License No. 028432	
APPROVED BY:	
4/13/2022	
DATE:	
<b>Michael Baker International</b> Michael Baker Engineering Inc. 5000 Regency Parkway, Suite 600 Cary, NORTH CAROLINA 27518 Phone: 919.453.5488 Fax: 919.453.5490 License #: F-1084	
NCDMS ID NO. 100047	

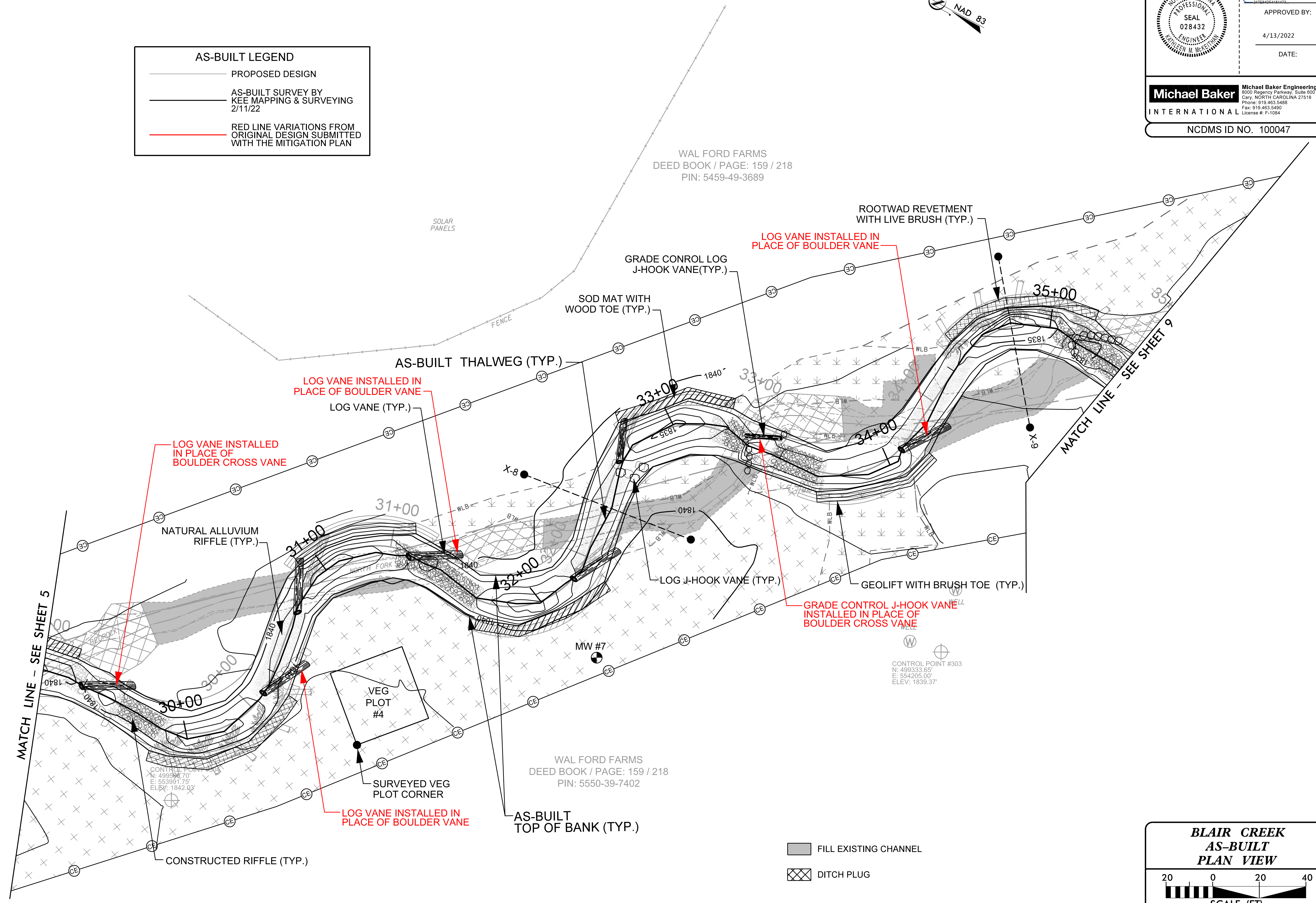
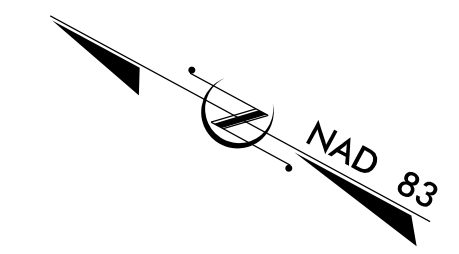


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BAKER PROJECT REFERENCE NO. <b>166274</b>	SHEET NO. <b>6</b>
PROJECT ENGINEER	
DocuSigned by: <i>Kaitleen M. McKeithen</i> 2426240484843	
APPROVED BY:  4/13/2022	
DATE:	
	
<b>Michael Baker International</b> Michael Baker Engineering Inc. 5000 Regency Parkway, Suite 800 Cary, NORTH CAROLINA 27518 Phone: 919.453.5488 Fax: 919.453.5490 License #: F-1084	
NCDMS ID NO. 100047	

**AS-BUILT LEGEND**

- PROPOSED DESIGN
- AS-BUILT SURVEY BY KEE MAPPING & SURVEYING 2/11/22
- RED LINE VARIATIONS FROM ORIGINAL DESIGN SUBMITTED WITH THE MITIGATION PLAN



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**BLAIR CREEK AS-BUILT PLAN VIEW**

SCALE (FT)

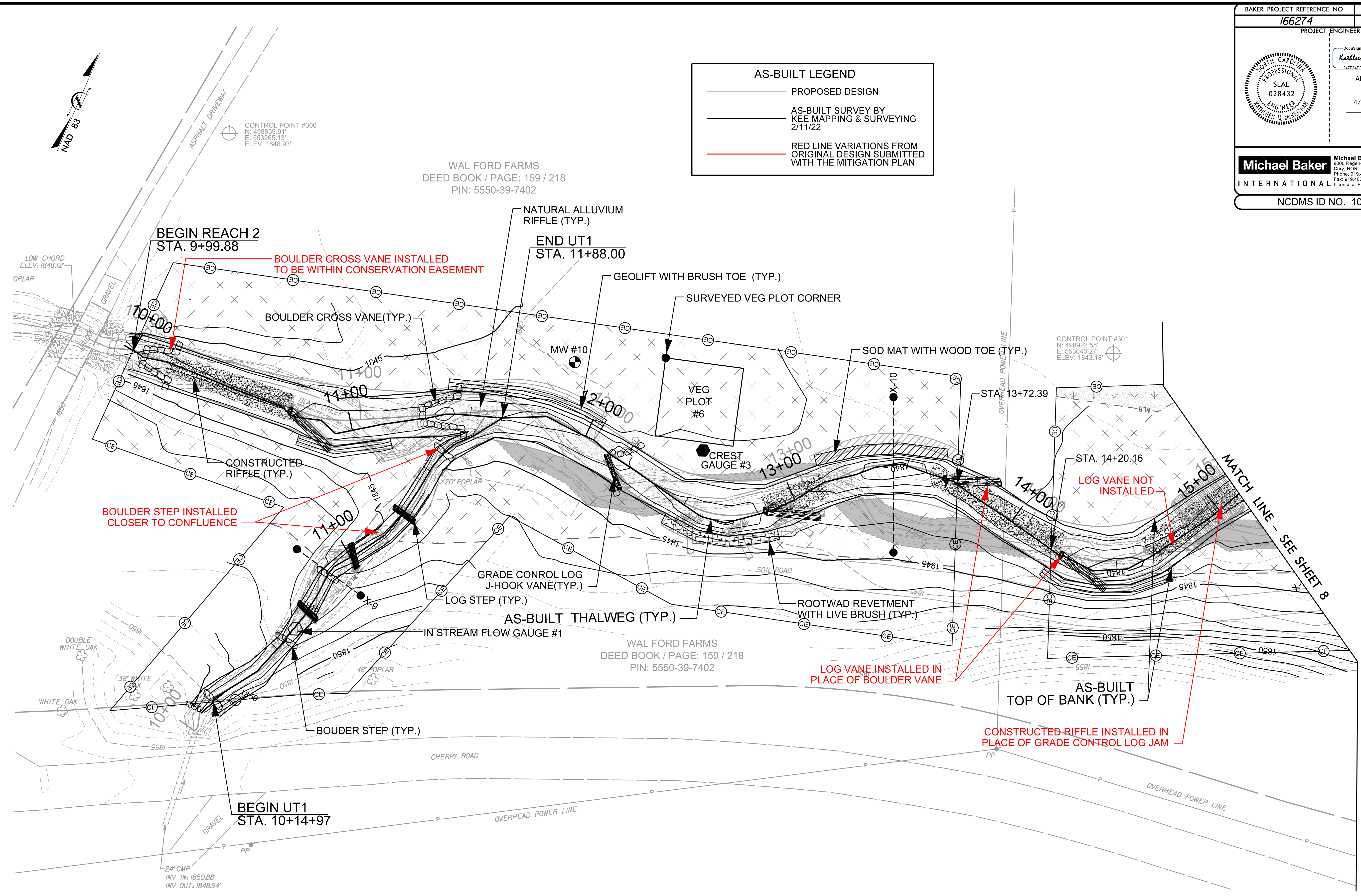
- FILL EXISTING CHANNEL
- DITCH PLUG

2/26/2023

BAKER PROJECT REFERENCE NO. <b>166274</b>	SHEET NO. <b>7</b>
PROJECT ENGINEER Kathleen M. McKeithan PROFESSIONAL SEAL 028432 NORTH CAROLINA ENGINEER KATHLEEN M. MCKEITHAN	
APPROVED BY:  DATE: 4/13/2022	
<b>Michael Baker International</b> Michael Baker Engineering Inc. 5000 Regency Parkway, Suite 500 Cary, NORTH CAROLINA 27518 Phone: 919.453.5488 Fax: 919.453.5490 License #: F-1084	
NCDMS ID NO. 100047	

**AS-BUILT LEGEND**

- PROPOSED DESIGN
- AS-BUILT SURVEY BY  
KEE MAPPING & SURVEYING  
2/11/22
- RED LINE VARIATIONS FROM  
ORIGINAL DESIGN SUBMITTED  
WITH THE MITIGATION PLAN



- FILL EXISTING CHANNEL
- DITCH PLUG

**BLAIR CREEK  
AS-BUILT  
PLAN VIEW**

SCALE (FT)

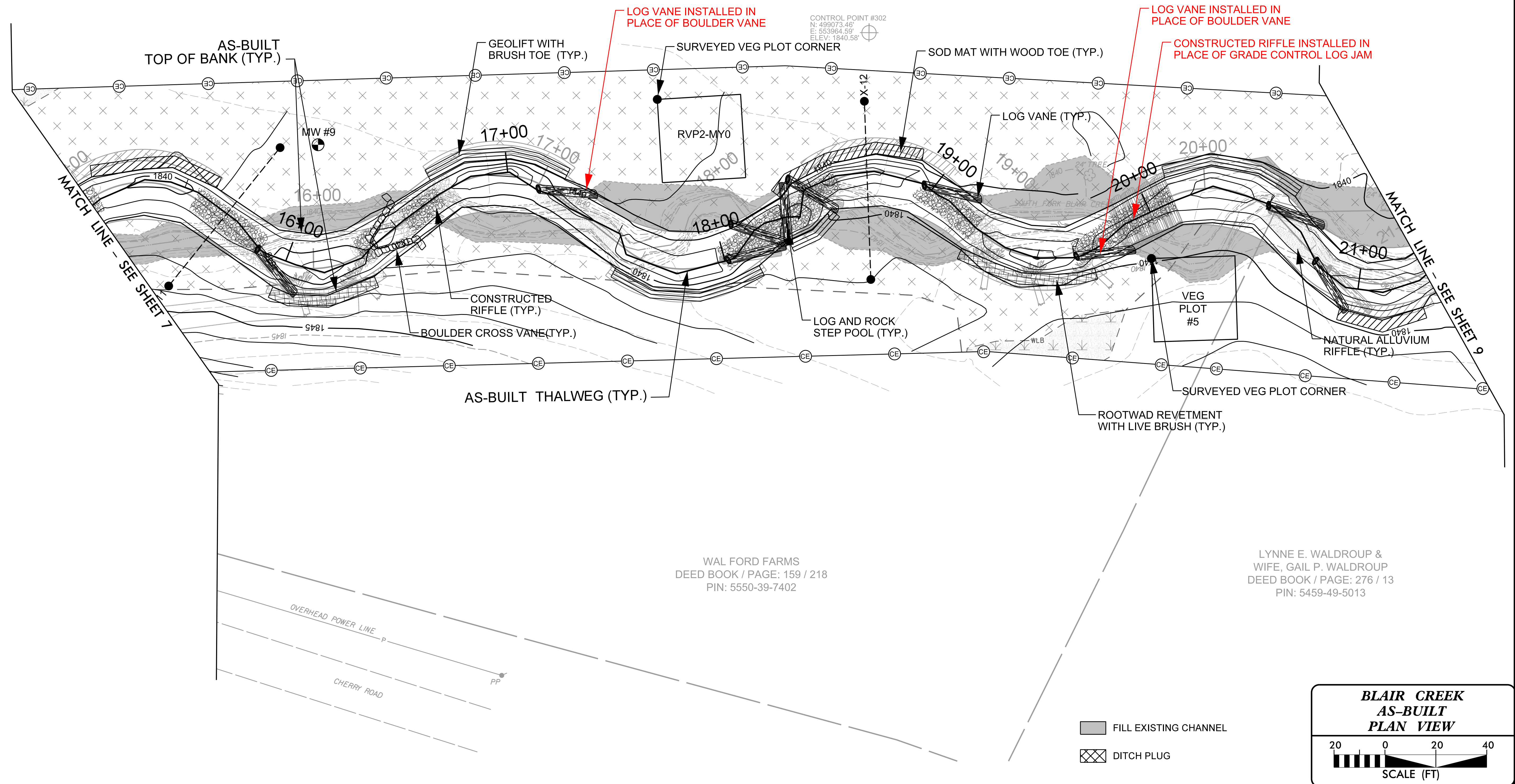
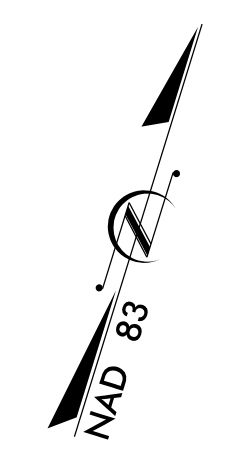
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2/26/2023

BAKER PROJECT REFERENCE NO. <b>166274</b>	SHEET NO. <b>8</b>
PROJECT ENGINEER	
DocuSigned by: <i>Kathleen M. McKelthan</i> <small>WATER/DEVELOPMENT</small>	
APPROVED BY:	
4/13/2022	
DATE:	
	
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NCDMS ID NO. 100047	

**AS-BUILT LEGEND**

- PROPOSED DESIGN
- AS-BUILT SURVEY BY KEE MAPPING & SURVEYING 2/11/22
- RED LINE VARIATIONS FROM ORIGINAL DESIGN SUBMITTED WITH THE MITIGATION PLAN



WAL FORD FARMS  
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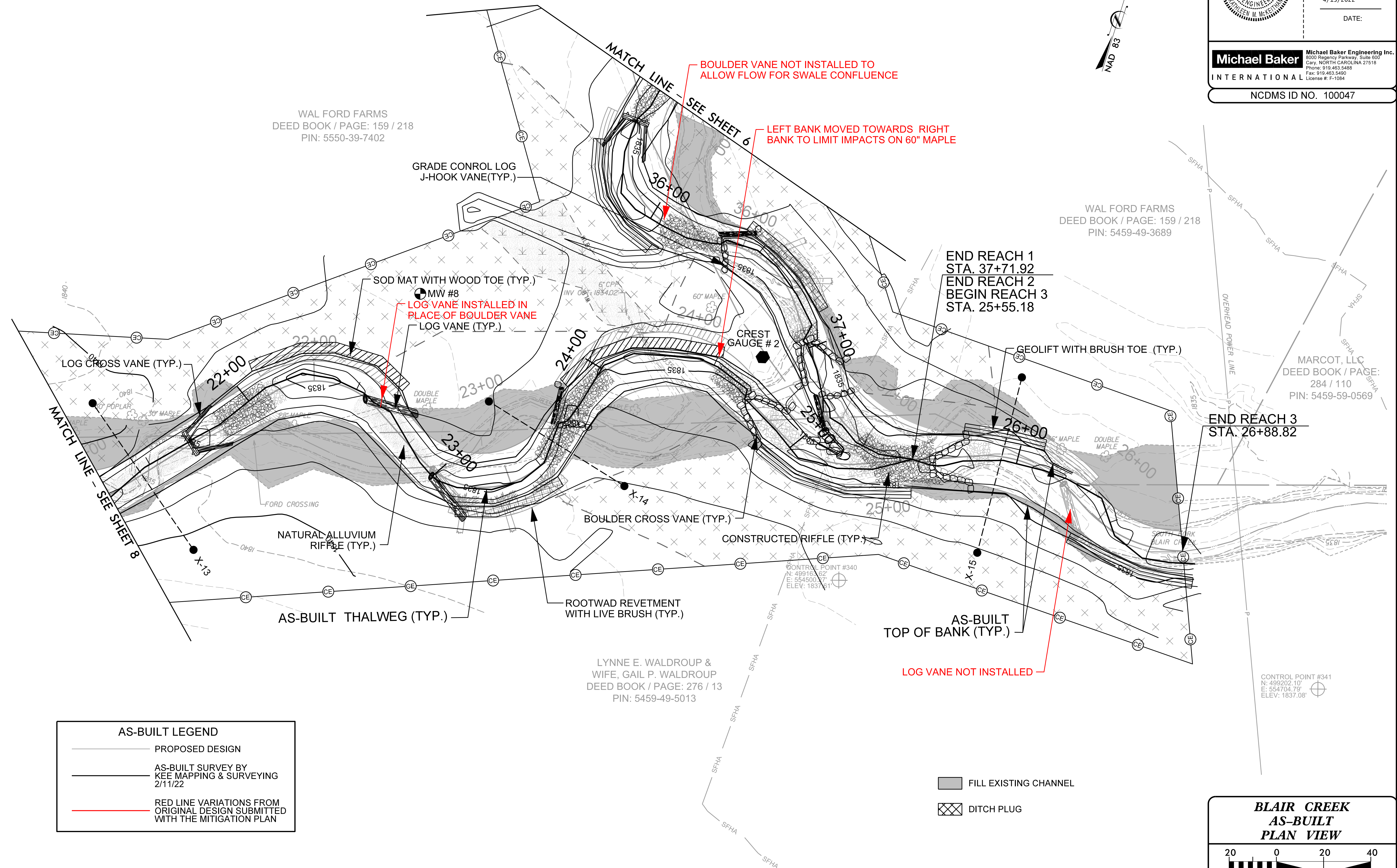
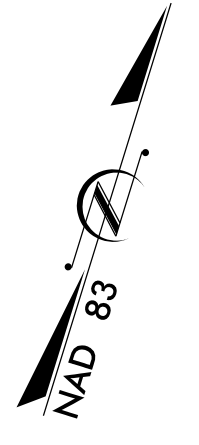
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 WIFE, GAIL P. WALDROUP  
 DEED BOOK / PAGE: 276 / 13  
 PIN: 5459-49-5013




**BLAIR CREEK  
 AS-BUILT  
 PLAN VIEW**



SCALE (FT)

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BAKER PROJECT REFERENCE NO. <b>166274</b>	SHEET NO. <b>9</b>
PROJECT ENGINEER	
DocuSigned by:  <b>Kathleen M. McKeithan</b> APPROVED BY: 4/13/2022 DATE:	
	
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NCDMS ID NO. 100047	



AS-BUILT LEGEND	
	PROPOSED DESIGN
	AS-BUILT SURVEY BY KEE MAPPING & SURVEYING 2/11/22
	RED LINE VARIATIONS FROM ORIGINAL DESIGN SUBMITTED WITH THE MITIGATION PLAN

-  FILL EXISTING CHANNEL
-  DITCH PLUG

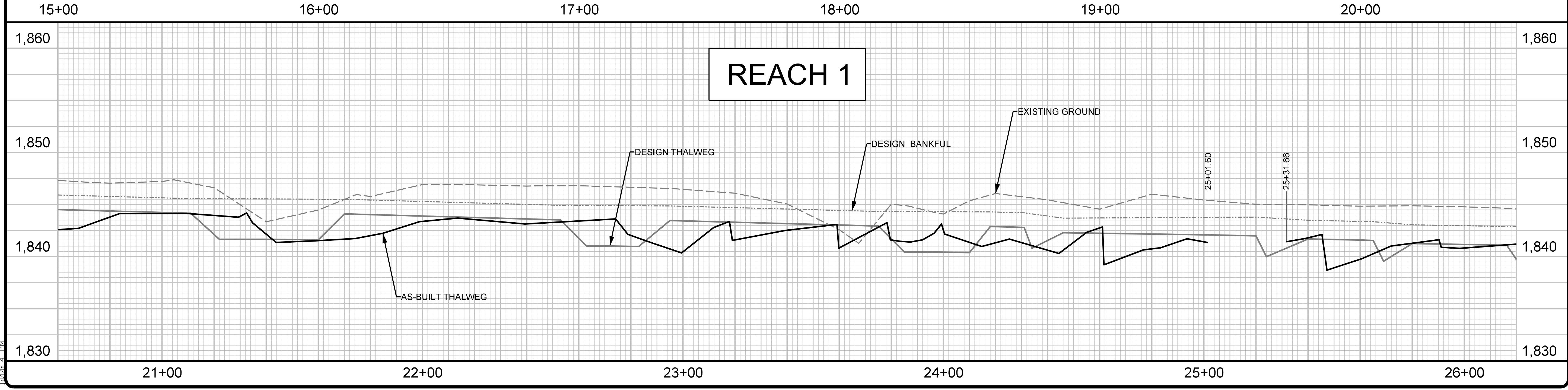
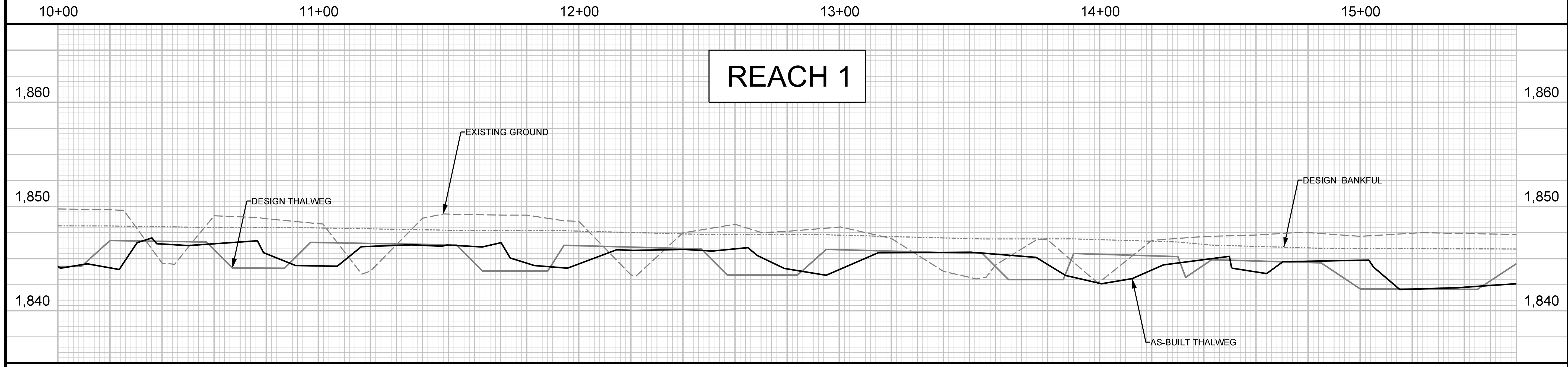
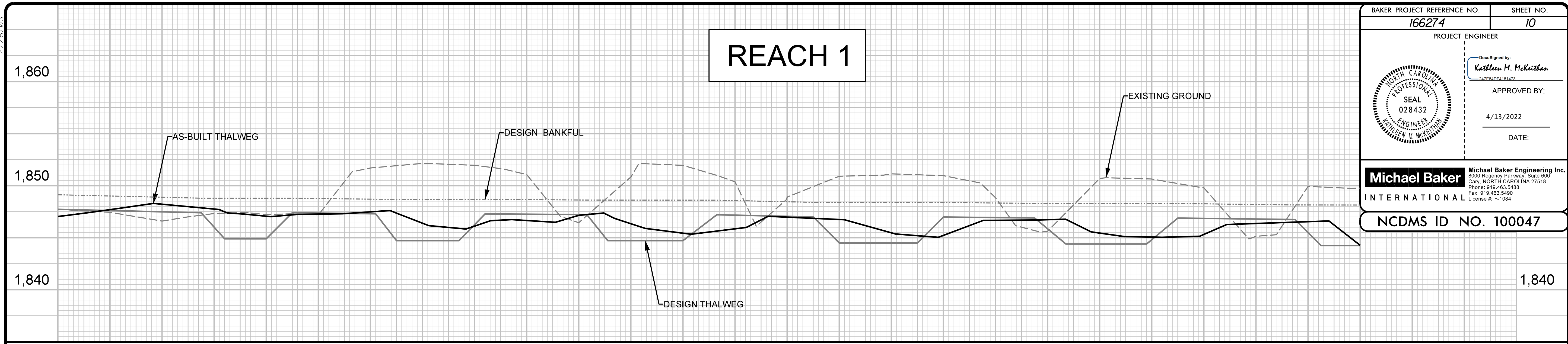
**BLAIR CREEK  
AS-BUILT  
PLAN VIEW**



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BAKER PROJECT REFERENCE NO. <b>166274</b>	SHEET NO. <b>10</b>
PROJECT ENGINEER	
DocuSigned by: <i>Kathleen M. McKeithen</i> <small>SAFEBRANDS</small>	
APPROVED BY:	
4/13/2022	
DATE:	
	
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NCDMS ID NO. 100047	

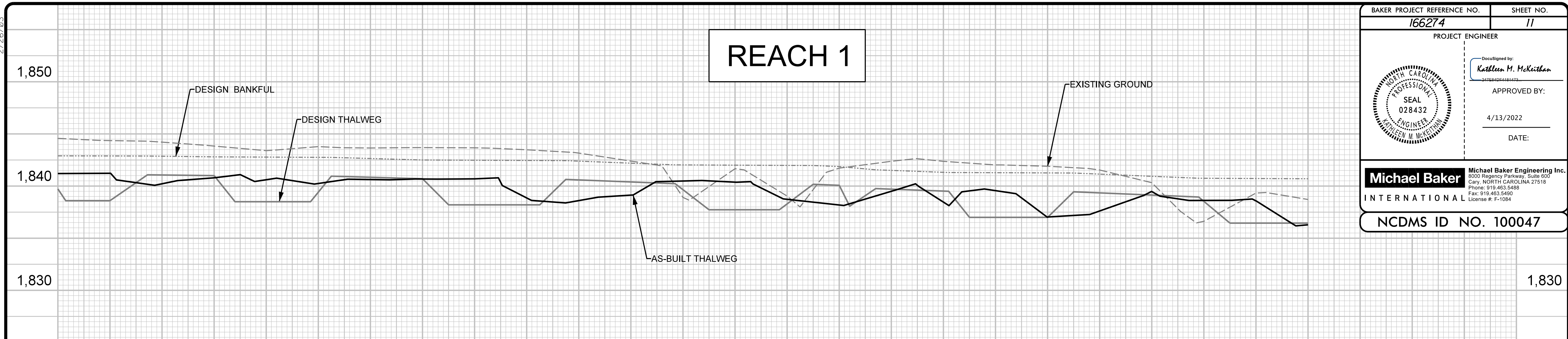


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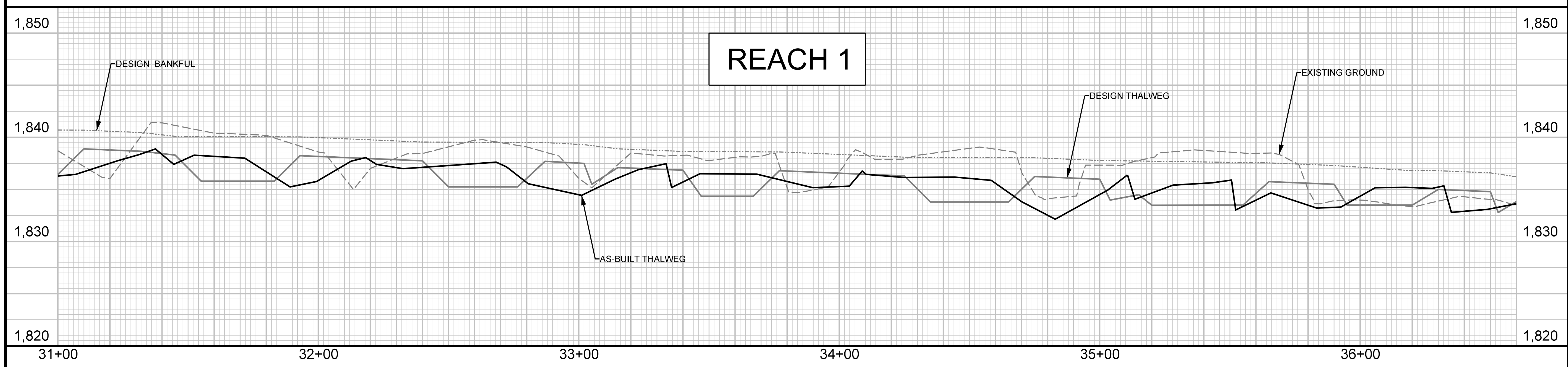


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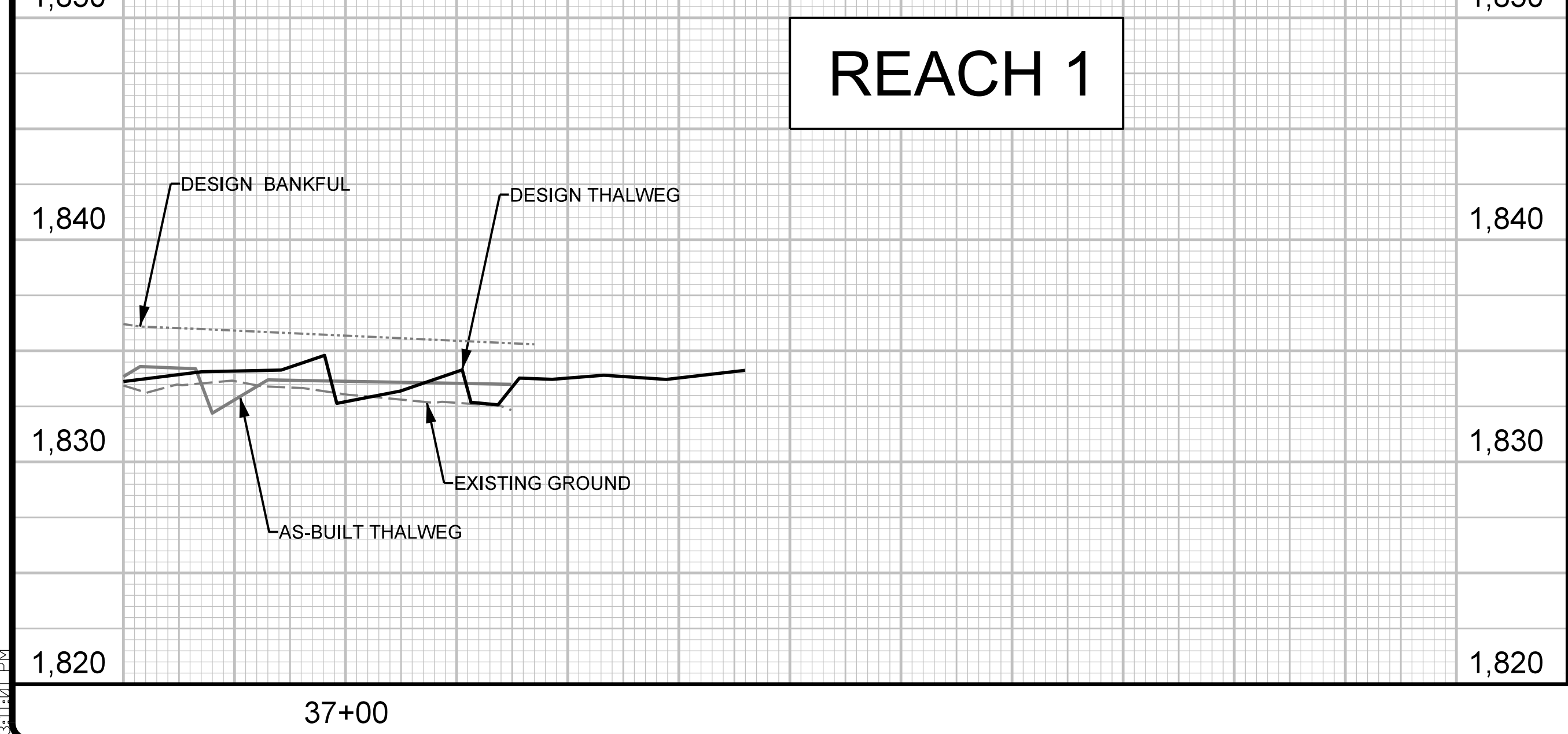
BAKER PROJECT REFERENCE NO. <b>166274</b>	SHEET NO. <b>11</b>
PROJECT ENGINEER	
Designed by: <i>Kathleen M. McKeithan</i> <small>30264048423</small>	
APPROVED BY:	
4/13/2022	
DATE:	
	
<b>Michael Baker International</b> Michael Baker Engineering Inc. <small>3000 Regency Parkway, Suite 500          Cary, NORTH CAROLINA 27518          Phone: 919.463.5488          Fax: 919.463.5480          License #: F-1084</small>	
NCDMS ID NO. 100047	



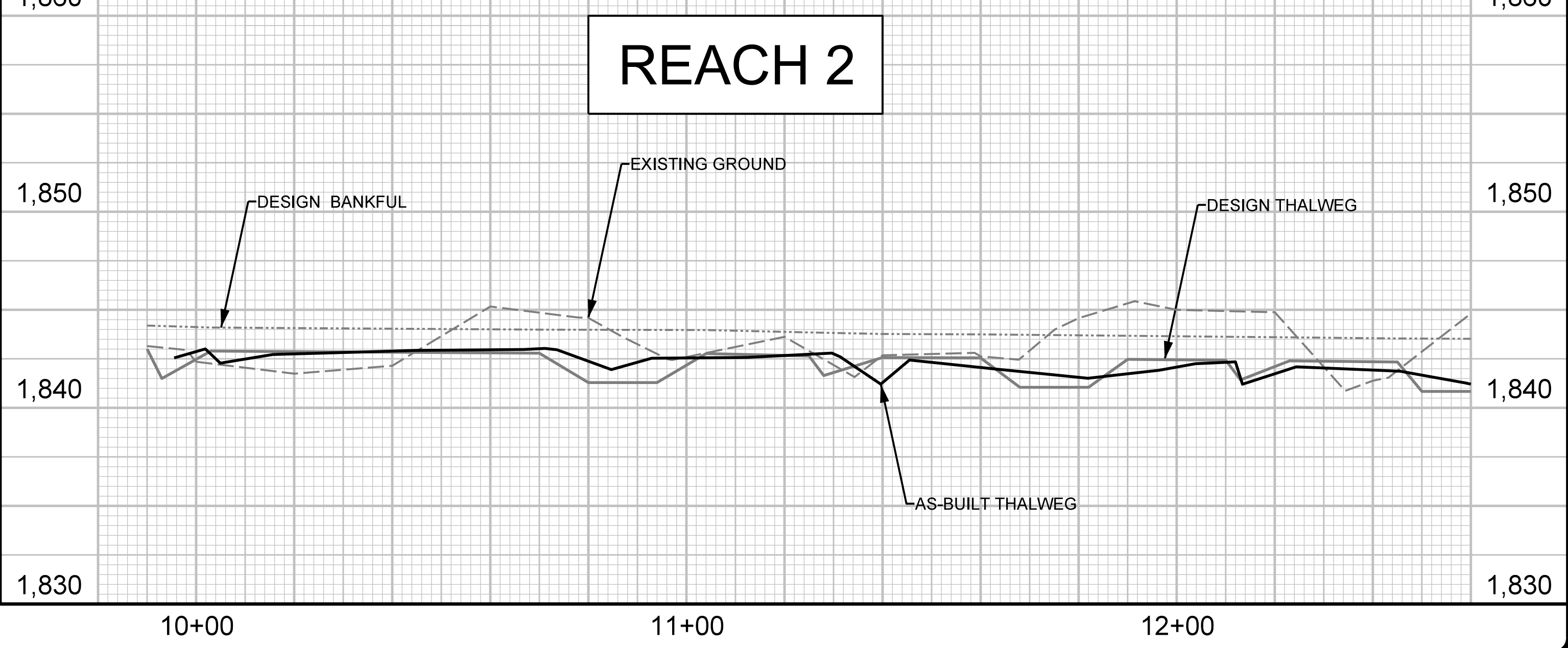
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31+00 32+00 33+00 34+00 35+00 36+00



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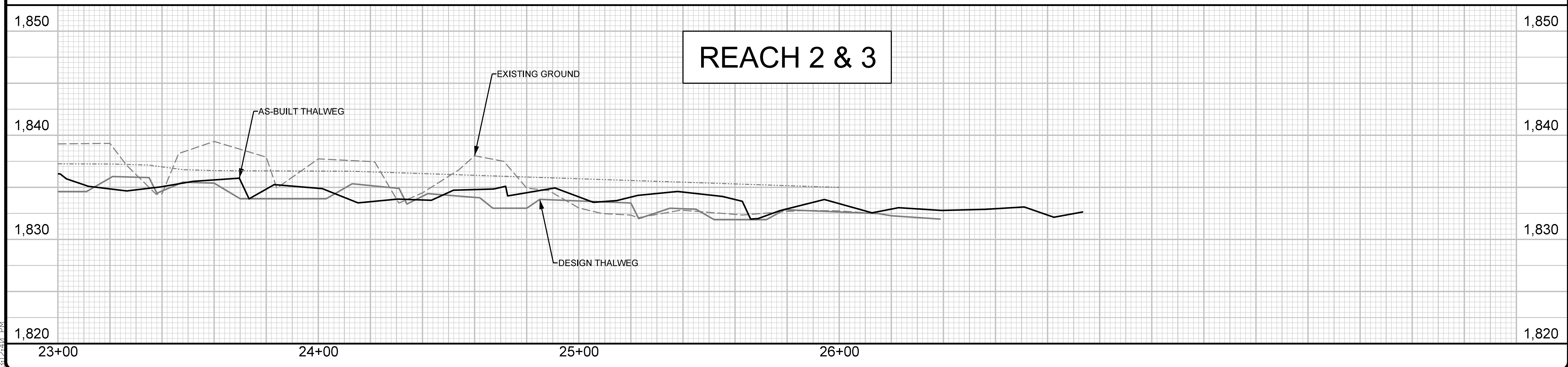
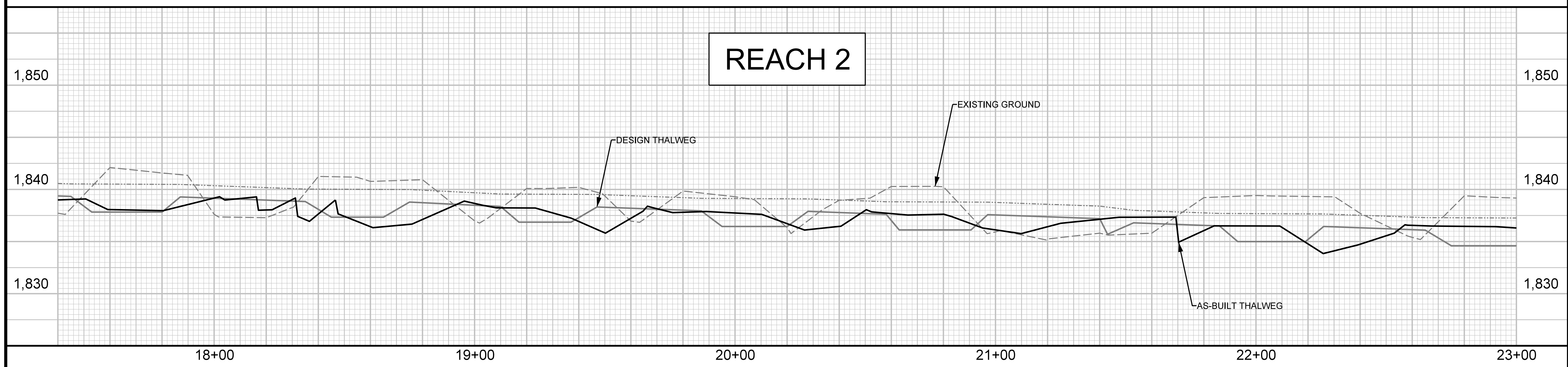
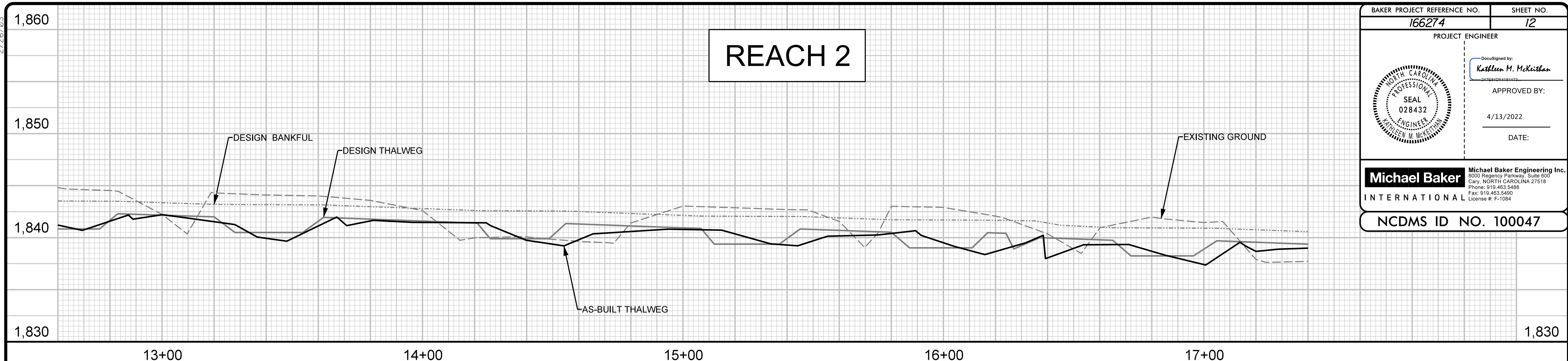


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2/26/03

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PROJECT ENGINEER	
	
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<b>NCDMS ID NO. 100047</b>	

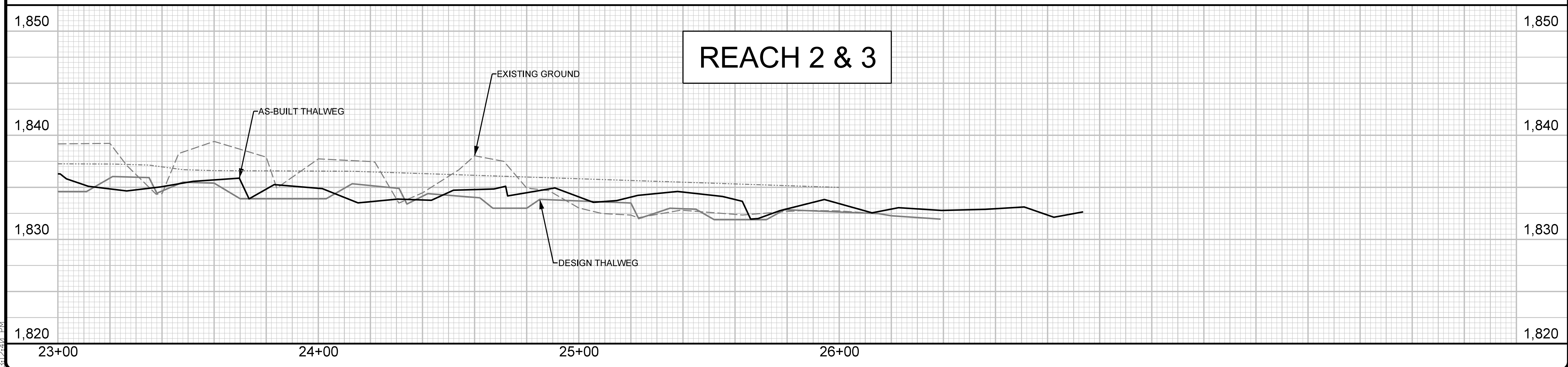
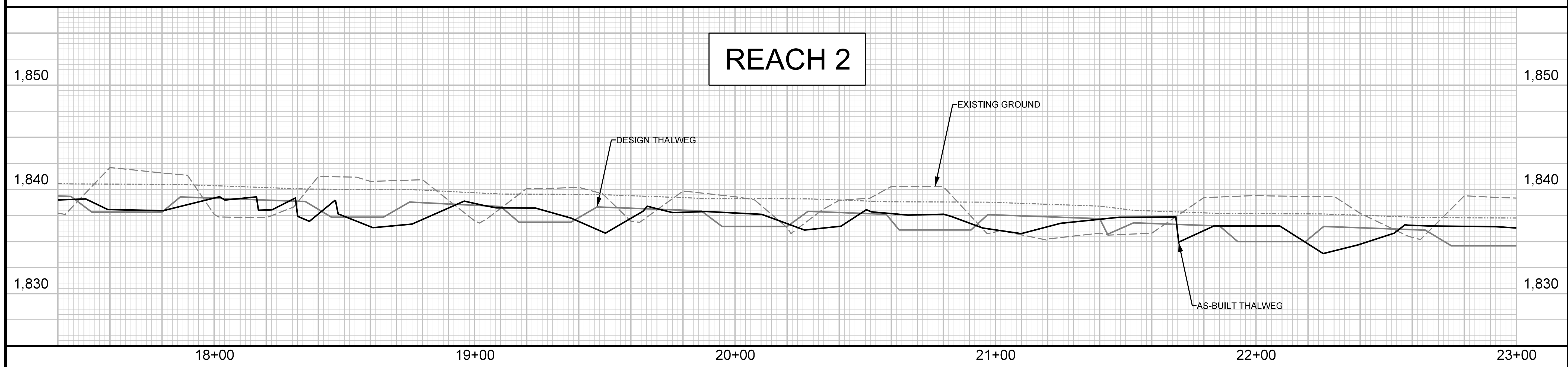
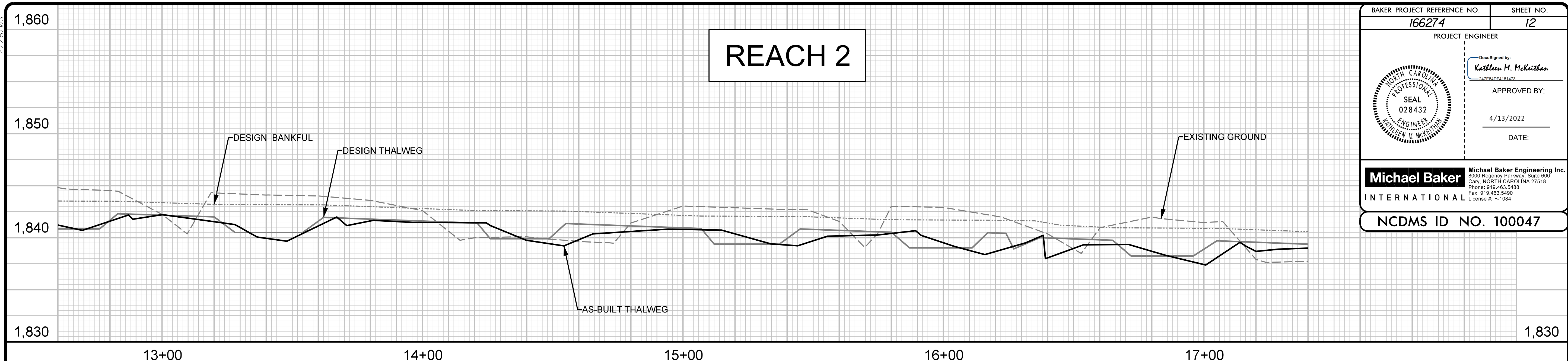


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