As-Built Baseline Monitoring Report

FINAL

CATBIRD SITE

NCDMS Project #100022 (Contract #7186)
USACE Action ID: SAW-2017-01506
DWR Project #20171039

Davie County, North Carolina
Yadkin River Basin
HUC 03040101

Provided by:

Resource Environmental Solutions, LLC
For Environmental Banc & Exchange, LLC

Provided for:
NC Department of Environmental Quality
Division of Mitigation Services

July 2020

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July 10, 2020

Harry Tsomides
NC DEQ Division of Mitigation Services
5 Ravenscroft Drive, Suite 102
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RE: Catbird Site: Baseline Report and As-Built Drawings (NCDMS ID 100022)

Listed below are comments provided by DMS on July 9, 2020 regarding the Catbird Site: Baseline Report and As-Built Drawings and RES' responses.

Appendix F Detailed Easement/Asset Figure
Uncredited reach is shown as white against a white background in the legend. Please use a color/pattern that is visible.
Done.

Please modify figure and report tables as discussed, to reflect accurate crediting and discussion of easement adjustment vs. mitigation plan, at upper limit of DS2-A. Please provide the resulting final digital support files for review.
Done.

Vegetation Tables
Table 9a needs to reflect the random plots; Please incorporate table 9b (random) into 9a (fixed) ad calculate/report site wide average accordingly. DMS can provide examples.
Table 9a and Table 9b have been combined into Table 9. Table 8 has also been updated to include Random Plot data for consistency.

As built planted numbers for green ash exceed the mitigation plan target of 10%, including representing 40% of the planted species in Plot 1. It is now standard practice to minimize the green ash percentage planted from zero, to 5% maximum, due to the emerald ash borer (*Agrilus planipennis*) threatening the longer-term viability of the riparian plantings. Please make note for future plans and as-built planting efforts that green ash should be minimal (5% or less) or absent from the project.
Noted.

Record Drawings
Record Drawings need to include the planting plan from the mitigation plan (sheet P1), to make clear the actual planting zones with stem counts and species and if/how any changes were made from the mitigation plan (shown in red).
Done.

Other
Table 9a Please provide all the updated final digitals and digital support files for review.
Done.

Table of Contents

1.0 Project Summary

1.1 Project Location and Description

The Catbird Site (the "Project") is located in Davie County, North Carolina, approximately eight miles west of Clemmons and five miles northwest of Bermuda Run. Water quality stressors affecting the Project included livestock production, agricultural production, and lack of riparian buffer. The Project presents stream restoration and enhancement generating 2,080.8 Warm Stream Mitigation Units (SMU).

The Project's total easement area is 6.33 acres within the overall drainage area of 53 acres. Grazing livestock historically had access to all the stream reaches within the Project. The lack of riparian buffer vegetation, deep-rooted vegetation, and unstable channel characteristics contributed to the degradation of stream banks throughout the Project area.

The stream design approach for the Project was to combine the analog method of natural channel design with analytical methods to evaluate stream flows and hydraulic performance of the channel and floodplain. The analog method involved the use of a reference reach, or "template" stream, adjacent to, nearby, or previously in the same location as the design reach. The template parameters of the analog reach were replicated to create the features of the design reach. The analog approach is useful when watershed and boundary conditions are similar between the design and analog reaches. Hydraulic geometry was developed using analytical methods to identify the design discharge.

The Project has been constructed and planted and will be monitored on a regular basis throughout the seven-year post-construction monitoring period, or until performance standards are met. The Project will be transferred to the NCDEQ Stewardship Program. This party shall serve as conservation easement holder and long-term steward for the property and will conduct periodic inspection of the site to ensure that restrictions required in the conservation easement are upheld. Funding will be supplied by the responsible party on a yearly basis until such time an endowment is established.

1.2 Project Goals and Objectives

Through the comprehensive analysis of the Project's maximum functional uplift using the Stream Functions Pyramid Framework, specific, attainable goals and objectives were realized by the Project. These goals clearly address the degraded water quality and nutrient input from farming that were identified as major watershed stressors in the 2009 Upper Yadkin Pee-Dee River RBRP. These goals also reflect the goals and objectives as stated in the Catbird Site Final Mitigation Plan.

The Project goals are:

- Improve water transport from watershed to the channel in a non-erosive manner in a stable channel;
- Improve flood flow attenuation on site and downstream by allowing for overbank flows and connection to the floodplain;
- Improve instream habitat;
- Reduce sediment, nutrient and fecal coliform inputs into stream system;
- Restore and enhance native floodplain vegetation;
- Indirectly support the goals of the 2009 Upper Yadkin Pee-Dee RBRP to improve water quality and to reduce sediment and nutrient loads; and
- Protect Water Supply Watersheds (WSW).

The Project objectives to address the goals are:

- Design and reconstruct stream channels sized to convey bankfull flows that will maintain a stable dimension, profile, and planform;
- Add in-stream structures and bank stabilization measures to protect restored streams;
- Install habitat features such as brush toes, constructed riffles, woody materials, and pools of varying depths to restored streams;
- Increase forested riparian buffers to at least 50 feet on both sides of the channel along the Project reaches with a hardwood riparian plant community;
- Install approximately 4,200 linear feet of livestock exclusion fencing along the easement boundary to ensure livestock will no longer have stream access;
- Implement one agricultural BMP structure in order to limit inputs of sediment, nutrients, and fecal coliform to streams from surrounding farming operations;
- Treat exotic invasive species; and
- Establish a permanent conservation easement on the Project that will exclude future livestock from stream channels and their associated buffers.

Functional uplift, benefits, and improvements within the Project area, as based on the Function Based Framework, are outlined in the Mitigation Plan**.**

1.3 Project Success Criteria

The success criteria for the Project follows the 2016 USACE Wilmington District Stream and Wetland Compensatory Mitigation Update, the Catbird Site Final Mitigation Plan, and subsequent agency guidance. Cross section and vegetation plot monitoring takes place in Years 0, 1, 2, 3, 5, and 7. Stream hydrology and visual monitoring takes place annually. Specific success criteria components are presented below.

Stream Restoration Success Criteria

Four bankfull flow events must be documented within the seven-year monitoring period. The bankfull events must occur in separate years. Otherwise, the stream monitoring will continue until four bankfull events have been documented in separate years. Stage recorders were installed on DS1 and DS2-B to document bankfull events.

There should be little change in as-built cross sections. If changes do take place, they should be evaluated to determine if they represent a movement toward a less stable condition (for example down-cutting or erosion) or are minor changes that represent an increase in stability (for example settling, vegetative changes, deposition along the banks, or decrease in width/depth ratio). Cross sections shall be classified using the Rosgen stream classification method, and all monitored cross sections should fall within the quantitative parameters defined for channels of the design stream type. Bank height ratio shall not exceed 1.2, and the entrenchment ratio shall be above 2.2 within restored riffle cross sections (for C and E streams). Channel stability should be demonstrated through a minimum of four bankfull events documented in the seven-year monitoring period.

Digital images are used to subjectively evaluate channel aggradation or degradation, bank erosion, success of riparian vegetation, and effectiveness of erosion control measures. Longitudinal images should not indicate the absence of developing bars within the channel or an excessive increase in channel depth. Lateral images should not indicate excessive erosion or continuing degradation of the banks over time. A series of images over time should indicate successional maturation of riparian vegetation.

Stream restoration reaches will be monitored to document intermittent or seasonal surface flow. This will be accomplished through direct observation and the use of hydraulic pressure transducers with data loggers.

Intermittent reaches must demonstrate a minimum of 30 consecutive days of flow. A flow gauge was installed in the upper portion of DS1.

Vegetation Success Criteria

Specific and measurable success criteria for plant density within the riparian buffers on the Project follow IRT Guidance. The interim measures of vegetative success for the Project is the survival of at least 320 planted three-year old trees per acre at the end of Year 3, 260 trees per acre with an average height of seven feet at the end of Year 5, and the final vegetative success criteria is 210 trees per acre with an average height of ten feet at the end of Year 7. Volunteer trees are counted, identified to species, and included in the yearly monitoring reports, but are not be counted towards the success criteria of total planted stems. Moreover, any single species can only account for up to 50 percent of the required number of stems within any vegetation plot. Any stems in excess of 50 percent will be shown in the monitoring table but will not be used to demonstrate success.

Level	Treatment	Objective	Monitoring Metric	Performance Standard
1 *Hydrology*	Converted land-use of Project reaches from pasture to riparian forest Installed one agricultural sediment load attenuation structure to limit inputs of sediment from surrounding farming operations coming into the reach (DS1)	Improve the transport of water from the watershed to the Project reaches in a non-erosive way	NA	NA
			Visually monitor integrity of runoff attenuation structure: Performed semiannually (*indirect measurement*)	Identify and document instability and/or flaws to the structure
2 *Hydraulic*	Reduced bank height ratios and increased entrenchment ratios by reconstructing channels to mimic reference reach conditions	Improve flood bank connectivity by reducing bank height ratios and increase entrenchment ratios	Stage recorders and flow gauges: Inspected semiannually	Four bankfull events occurring in separate years
				At least 30 days of continuous flow each year
			Cross sections: Surveyed in Years 1, 2, 3, 5 and 7	Entrenchment ratio shall be above 2.2 within restored reaches (C and E)
				Bank height ratio shall not exceed 1.2
3 *Geomorphology*	Established a riparian buffer to reduce erosion and sediment transport into project streams. Established stable banks with livestakes, erosion control matting, and other in stream structures.	Reduce erosion rates and channel stability to reference reach conditions Improve bedform diversity (pool spacing, percent riffles, etc. Increase buffer width to 50 feet	As-built stream profile	NA
			Cross sections: Surveyed in Years 1, 2, 3, 5 and 7	Entrenchment ratio shall be no less than 2.2 within restored reaches
			Visual monitoring	Bank height ratio shall not exceed 1.2
			Visual monitoring: Performed at least semiannually	Identify and document significant stream problem areas; i.e. erosion, degradation, aggradation, etc.
			Vegetation plots: Surveyed in Years 1, 2, 3, 5 and 7	MY 1-3: 320 trees/acre MY 5: 260 trees/acre (7 ft. tall) MY 7: 210 trees/acre (10 ft. tall)
4 *Physicochemical*	Excluded livestock from riparian areas with exclusion fence and conservation easement, and planted a riparian buffer	*Unmeasurable Objective/Expected Benefit* Establish native hardwood riparian buffer and exclude livestock.	Vegetation plots: Surveyed in Years 1, 2, 3, 5 and 7 (*indirect measurement*)	MY 1-3: 320 trees/acre MY 5: 260 trees/acre (7 ft. tall) MY 7: 210 trees/acre (10 ft. tall)
			Visual assessment of established fencing and conservation signage: Performed at least semiannually (*indirect measurement*)	Inspect fencing and signage. Identify and document any damaged or missing fencing and/or signs

1.4 Project Components

The restoration reaches were significantly impacted by livestock production, agricultural practices, and a lack of riparian buffer. Improvements to the Project help meet the river basin needs expressed in the 2009 Upper Yadkin Pee-Dee River Basin Restoration Priorities (RBRP) as well as ecological improvements to the riparian corridor within the easement.

Through stream restoration and enhancement, the Project presents 2,223 LF of stream, generating 2,080.8 Warm Stream Mitigation Units (SMU) (**Table 1**). This 14.2 SMU below the contract amount (2,095 SMU).

Mitigation Approach	Linear Feet	Ratio	Warm SMU
Restoration	1,986	1	1,986
Enhancement II	237	2.5	94.8
Total	**2,223**		**2,080.8**

1.5 Stream Design/Approach

The Project includes Priority I and II Restoration and Enhancement Level II. Stream restoration incorporates the design of a single-thread meandering channel, with parameters based on data taken from reference sites, published empirical relationships, regional curves developed from existing project streams, and NC Regional Curves. Analytical design techniques were also a crucial element of the project and were used to determine the design discharge and to verify the design as a whole.

The Project is broken into the following reaches:

Reach DS1– Priority I and II Restoration was used for Reach DS1. The upstream portion of this reach required Priority II floodplain excavation as the profile transitions from the existing entrenched channel to the Priority I channel at the downstream end. To prevent any hydrology loss, the transition from Priority II to Priority I takes place over several hundred feet and includes multiple channel plugs. Both in-line and offline restoration was used, and locations were driven by valley constraints. In-stream structures such as rock sills, log sills and cross vanes were installed for vertical stability and to improve bedform diversity. The restoration of the riparian areas included planting wider riparian buffers and excluding cattle. A self-maintaining sediment pack was installed at the upper end of the reach to provide sediment load attenuation from the adjacent pasture.

Reach DS2-A – Enhancement Level II was used for Reach DS2-A. Enhancement activities included livestock exclusion and riparian buffer plantings. Livestock fencing follows current NRCS specifications.

Reach DS2-B – A combination of Priority I Restoration and Enhancement Level II was used for Reach DS2-B. Restoration activities realigned the existing channel to improve stability and floodplain connection. Rock and log structures were used to provide vertical stability and improve bedform diversity. Log toe structures were installed on the outside of certain meander bends to provide bank stability. The restoration of the riparian areas included planting wider riparian buffers and excluding cattle. The Enhancement Level II portion of the reach contains a diverse channel bed profile, and this portion of the reach does contain localized areas of bank erosion caused by hoof shear. The Enhancement of this reach involved livestock exclusion and buffer planting.

1.6 Construction and As-Built Conditions

Stream construction and planting was completed in March 2020. The Catbird Site was built to design plans and guidelines. Two structures were identified as needing repair during the initial post-construction site visit with DMS. The first was located at the top of DS-B (Lower) and included resetting a rock sill. The second was on the bottom of DS2-B (Lower) (below the confluence with DS-1) where a rock drop structure was repaired, and the left bank was graded to alleviate shear stress. The first area was repaired in April 2020 and the second was repaired in June 2020. The as-built survey (including a redlined version) is included in **Appendix E**.

Following Mitigation Plan approval, RES adjusted the easement to allow for an existing farm path (per landowner request). This 0.19-acre reduction only affected ephemeral stream channel therefore there was no change in credits (**Appendix F**).

Planting plan changes included removing black gum (*Nyssa sylvatica*) and adding crab apple (*Malus angustifolia*), silky dogwood (*Cornus amomum*), sugarberry (*Celtis laevigata*), black walnut (*Juglans nigra*), elderberry (*Sambucus canadensis*), and eastern redbud (*Cercis canadensis*). Planting plan changes were based on bare root availability. Minor monitoring device location changes were made during as-built installation, however, the quantities remained as proposed in the Mitigation Plan.

1.7 Baseline Monitoring Performance (MY0)

The Catbird Baseline Monitoring activities were performed in March 2020. All Baseline Monitoring data is present below and in the appendices. The Site is on track to meeting vegetation and stream interim success criteria.

Vegetation

Setup and monitoring of the four permanent vegetation plots and one random vegetation plot was completed after planting and stream construction on March 4, 2020. Vegetation data are in **Appendix C**, associated photos are in **Appendix B,** and plot locations are in **Appendix B**. MY0 monitoring data indicates that all plots are exceeding the interim success criteria of 320 planted stems per acre. Planted stem densities ranged from 1,133 to 1,740 planted stems per acre with a mean of 1,356 planted stems per acre across the permanent plots. A total of 13 species were documented within the plots. Volunteer species were not noted at baseline monitoring but are expected to establish in upcoming years. The average stem height in the permanent vegetation plots was 1.6 feet. The stem density in the random plot was 1,174 with an average height of 1.5 feet.

Visual assessment of vegetation outside of the monitoring plots indicates that the herbaceous vegetation is becoming well established throughout the project.

Stream Geomorphology

Cross section setup and geomorphology data collection for MY0 was collected on March 4, 2020. Summary tables and cross section plots are in **Appendix D**. Overall the baseline cross sections and profile relatively match the proposed design. The as-built conditions show that shear stress and velocities have been reduced for all restoration/enhancement reaches. All reaches were designed as gravel bed channels and remain classified as gravel bed channels post-construction.

Visual assessment of the stream channel was performed to document signs of instability, such as eroding banks, structural instability, or excessive sedimentation. The channel is transporting sediment as designed and will continue to be monitored for aggradation and degradation.

Stream Hydrology

Two stage recorders and one flow gauge were installed on March 4, 2020: one stage recorder on DS1 (Lower), one stage recorder on DS2-B (Lower) and one flow gauge on DS1 (Upper). The stage recorders are in place to document bankfull events and the flow gauge to document at least intermittent flow. Stream hydrology data will be included in the Monitoring Year 1 Report in this section and in the appendices. Gauge locations can be found on Figure 2 and photos are in **Appendix B**.

2.0 Methods

Stream monitoring was conducted using a Topcon GTS-312 Total Station. Three-dimensional coordinates associated with cross-section data were collected in the field (NAD83 State Plane feet FIPS 3200). Morphological data were collected at 12 cross-sections. Survey data were imported into CAD, ArcGIS®, and Microsoft Excel® for data processing and analysis. The stage recorders include an automatic pressure transducer placed in PVC casing in a pool. The elevation of the bed and top of bank at each stage recorder are used to detect bankfull events. The flow gauge was also installed in a pool and records flow conditions at an hourly interval. Water level data from the flow gauge is corrected using the height of the downstream riffle to detect stream flow events.

Vegetation success is being monitored at four permanent monitoring plots and one random monitoring plot. Vegetation plot monitoring follows the CVS-EEP Level 2 Protocol for Recording Vegetation, version 4.2 (Lee et al. 2008) and includes analysis of species composition and density of planted species. Data are processed using the CVS data entry tool. In the field, the four corners of each plot were permanently marked with PVC at the origin and metal conduit at the other corners. Photos of each plot are to be taken from the origin each monitoring year. The random plots are to be collected in locations where there are no permanent vegetation plots. Random plots will most likely be collected in the form of 100 square meter belt transects with variable dimensions. Tree species and height will be recorded for each planted stem and the transects will be mapped and new locations will be monitored in subsequent years.

3.0 References

Griffith, G.E., J.M.Omernik, J.A. Comstock, M.P. Schafale, W.H.McNab, D.R.Lenat, T.F.MacPherson, J.B. Glover, and V.B. Shelburne. (2002). Ecoregions of North Carolina and South Carolina, (color Poster with map, descriptive text, summary tables, and photographs): Reston, Virginia, U.S. Geological Survey (map scale 1:1,500,000).

Lee Michael T., Peet Robert K., Roberts Steven D., and Wentworth Thomas R., 2008. *CVS-EEP Protocol for Recording Vegetation Level*. Version 4.2

Peet, R.K., Wentworth, T.S., and White, P.S. (1998), *A flexible, multipurpose method for recording vegetation composition and structure*. Castanea 63:262-274

Resource Environmental Solutions (2019). Catbird Site Final Mitigation Plan.

Schafale, M.P. 2012. Classification of the Natural Communities of North Carolina, Third Approximation. North Carolina Natural Heritage Program, Division of Parks and Recreation, NCDENR, Raleigh, NC.

USACE. (2016). Wilmington District Stream and Wetland Compensatory Mitigation Update. NC: Interagency Review Team (IRT).

Appendix A

Background Tables

Table 1. Catbird (100022) - Mitigation Assets and Components

Project Segment	Existing Footage or Acreage	Mitigation Plan Footage or Acreage	Mitigation Category	Restoration Level	Priority Level	Mitigation Ratio (X:1)	Mitigation Plan Credits		As-Built Footage or Acreage	Comments
DS1 (Upper)	300	288	Warm	R	2	1.00000	288.00000		288	Channel restoration, planting, livestock exclusion
DS1 (Lower)	668	661	Warm	R	1 & 2	1.00000	661.00000		661	Channel restoration, planting, livestock exclusion
DS2-A	78	78	Warm	EII	N/A	2.50000	31.20000		78	Planting, livestock exclusion
DS2-B (Upper)	515	526	Warm	R	1 & 2	1.00000	526.00000		526	Channel restoration, planting, livestock exclusion
DS2-B (Middle)	181	159	Warm	EII	N/A	2.50000	63.60000		159	Planting, livestock exclusion
DS2-B (Lower)	522	511	Warm	R	1	1.00000	511.00000		511	Channel restoration, planting, livestock exclusion

Project Credits

Restoration Level	Stream			Riparian Wetland		Non-Rip Wetland	Coastal Marsh
	Warm	Cool	Cold	Riverine	Non-Riv		
Restoration	**1986.000**						
Re-establishment							
Rehabilitation							
Enhancement							
Enhancement I							
Enhancement II	**94.800**						
Creation							
Preservation							
Total	**2080.800**						

Table 2. Project Activity and Reporting History
Catbird Mitigation Site

Elapsed Time Since grading complete: **6 months**
Elapsed Time Since planting complete: **4 months**
Number of reporting Years[1]: **0**

Activity or Deliverable	Data Collection Complete	Completion or Delivery
Restoration Plan	NA	Jan-19
Final Design – Construction Plans	NA	Oct-19
Stream Construction	NA	Jan-20
Site Planting	NA	Feb-20
DS2-B Structure Repair 1	NA	Apr-20
DS2-B Structure Repair 2	NA	Jun-20
As-built (Year 0 Monitoring – baseline)	Mar-20	Jul-20
Year 1 Monitoring		
Year 2 Monitoring		
Year 3 Monitoring		
Year 4 Monitoring		
Year 5 Monitoring		
Year 6 Monitoring		
Year 7 Monitoring		

1 = The number of reports or data points produced excluding the baseline

Table 3. Project Contacts Table Catbird Mitigation Site	
Designer Primary project design POC	RES / 3600 Glenwood Ave., Suite 100, Raleigh, NC 27612 Ben Carroll
Construction Contractor Construction contractor POC	KBS Earthwork Inc. / 5616 Coble Church Rd., Julian, NC 27283 Kory Strader
Survey Contractor Survey contractor POC	Matrix East, PLLC / 906 N. Queen St., Suite A, Kinston, NC 28501 Chris Paderick, PLS
Planting Contractor Planting contractor POC	H&J Forestry Matt Hitch
Monitoring Performers	RES / 3600 Glenwood Ave, Suite 100, Raleigh, NC 27612
Stream Monitoring POC	Ryan Medric (919) 741-6268
Vegetation Monitoring POC	Ryan Medric (919) 741-6268

Table 4. Project Background Information			
Project Name	Catbird		
County	Davie		
Project Area (acres)	6.33		
Project Coordinates (latitude and longitude)	Latitude: 36.030644 Longitude: -80.500865		
Planted Acreage (Acres of Woody Stems Planted)	5.26		
Project Watershed Summary Information			
Physiographic Province	Southern Outer Piedmont		
River Basin	Yadkin Pee-Dee		
USGS Hydrologic Unit 8-digit	03040101	USGS Hydrologic Unit 14-digit	03040101160010
DWR Sub-basin	3/7/2002		
Project Drainage Area (Acres and Square Miles)	53 ac (0.083 sqmi)		
Project Drainage Area Percentage of Impervious Area	4%		
CGIA Land Use Classification	Managed Herbaceous Cover and Mixed Upland Hardwoods		

Reach Summary Information			
Parameters	**DS1**	**DS2-A**	**DS2-B**
Length of reach (linear feet)	968	78	1218
Valley confinement (Confined, moderately confined, unconfined)	mod. confined	mod. unconfined	confined
Drainage area (Acres and Square Miles)	26 (0.041)	12 (0.019)	27 (0.042)
Perennial, Intermittent, Ephemeral	Intermittent	Intermittent	Perennial
NCDWR Water Quality Classification	C, WS-IV	C, WS-IV	C, WS-IV
Stream Classification (existing)	G4	F5b	G5
Stream Classification (proposed)	E4	F5b	E4
Evolutionary trend (Simon)	III/IV	III/IV	III/IV
FEMA classification	N/A	N/A	N/A

Regulatory Considerations			
Parameters	**Applicable?**	**Resolved?**	**Supporting Docs?**
Water of the United States - Section 404	Yes	Yes	SAW-2017-01506
Water of the United States - Section 401	Yes	Yes	DWR # 17-1039
Endangered Species Act	Yes	Yes	Mit Plan
Historic Preservation Act	Yes	Yes	Mit Plan
Coastal Zone Management Act (CZMA or CAMA)	No	N/A	N/A
FEMA Floodplain Compliance	Yes	Yes	N/A
Essential Fisheries Habitat	No	N/A	N/A

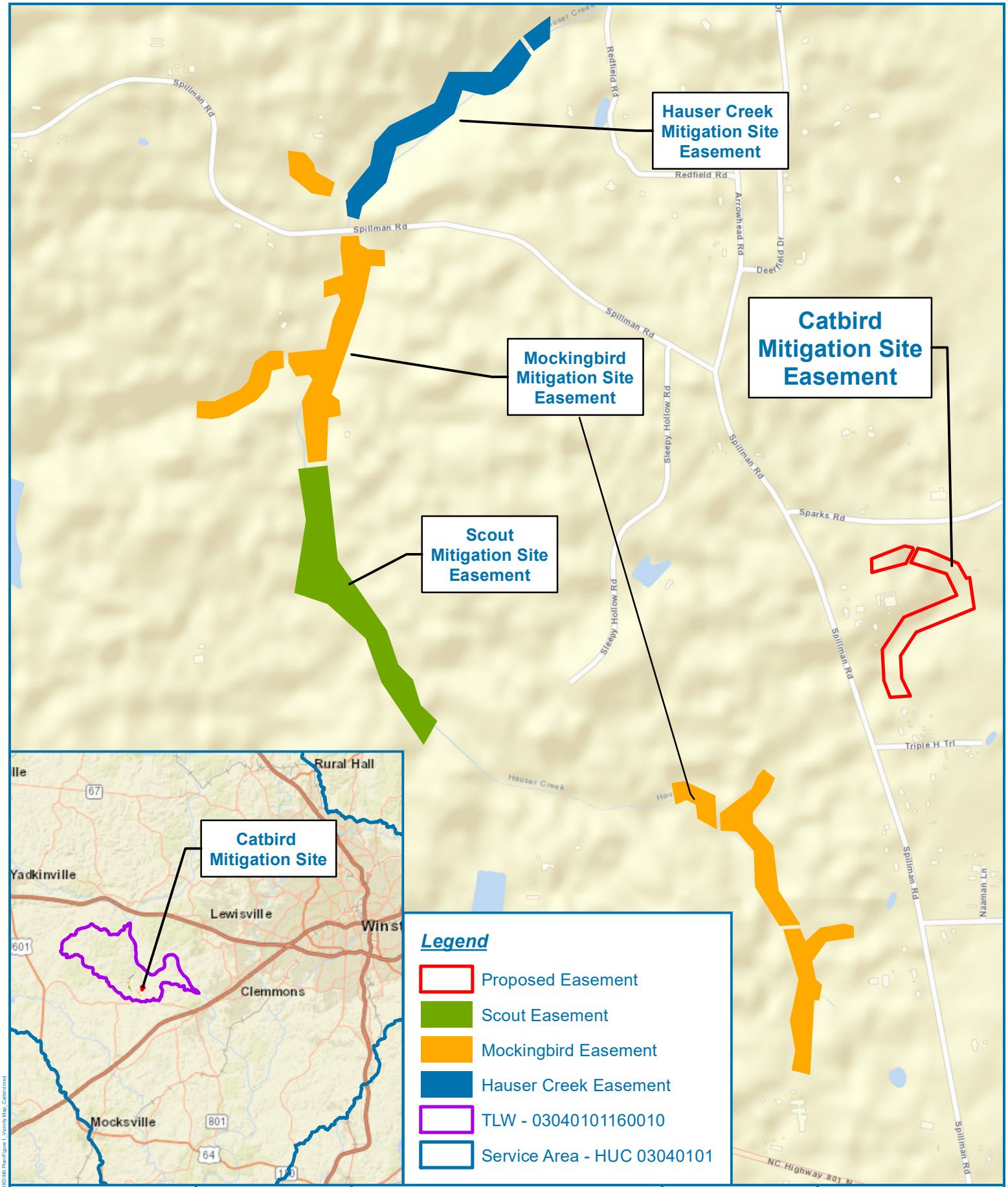


Figure 1 - Site Location Map

Catbird Mitigation Site

Davie County, North Carolina

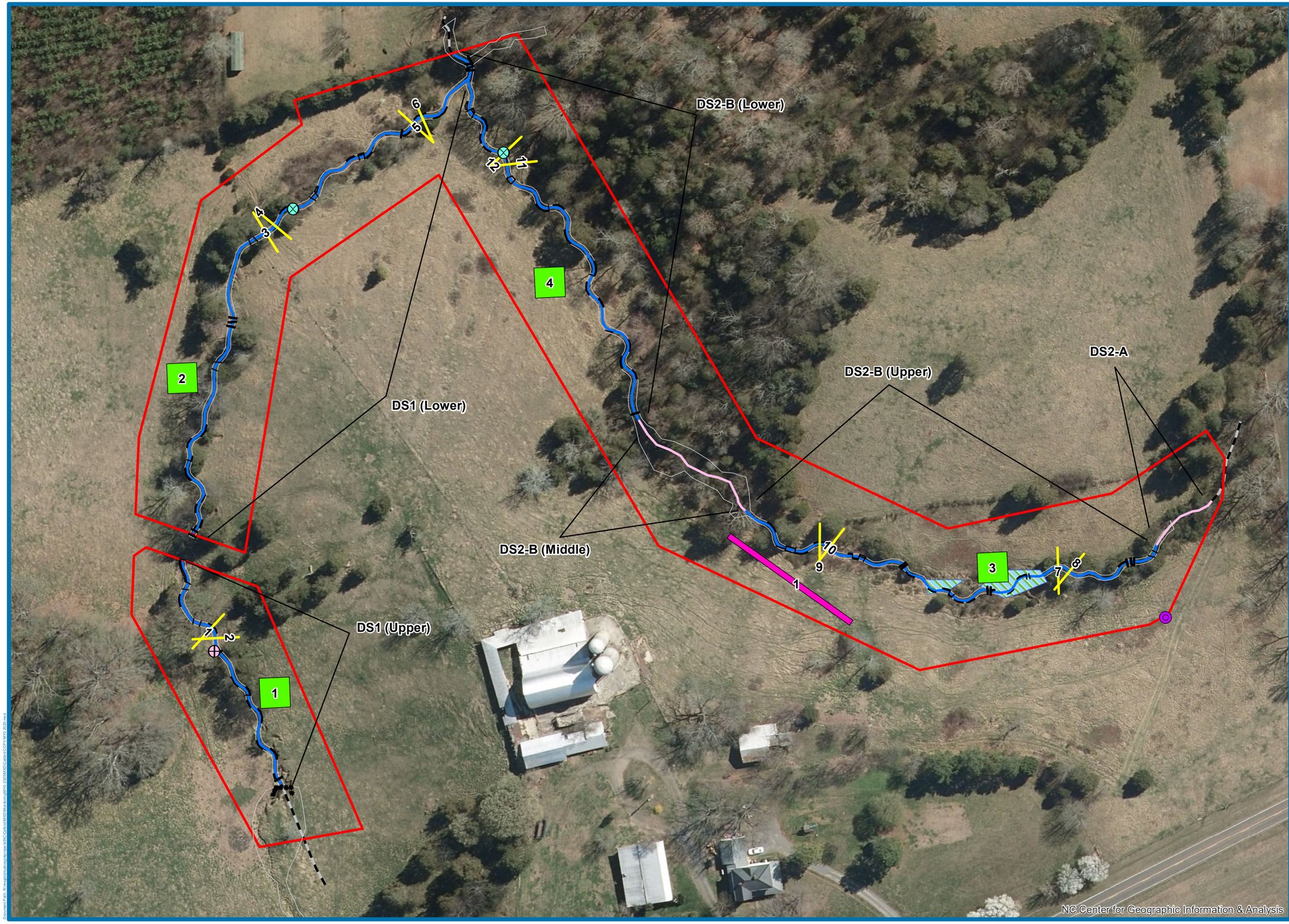
Date:	12/14/2018
Drawn by:	SCF
Checked by:	MDE
	1 inch = 1,000 feet

res

Document Path: S:\@RES GIS\Projects\NC\Catbird\MXD\Mit Plan\Figure 1_Vicinity Map_Catbird.mxd

Appendix B

Visual Assessment Data



res

N E S W

0 50 100
Feet

Figure 2

Current Conditions
Plan View

MY0 2020

Catbird
Mitigation Site

Davie County, NC

Date: 7/8/2020	Drawn by: RTM
Lat: 35.381042	Long: -78.420862

LEGEND

- Conservation Easement
- Veg Plots Catbird
- Random VP MY0 Catbird
- Existing Wetland
- Top of Bank
- Flow Gauge
- Stage Recorder
- Rain Gauge/Ambient

Mitigation Approach

- Restoration
- Enhancement II
- No Credit
- Structure
- Cross Section

Vegetation Condition Assessment

Invasive Species	Target Community: Present	Marginal	Absent
Absent	No Fill		
Present			

Table 5. Visual Stream Morphology Stability Assessment
Catbird Site - DS1
Assessed Length 949 feet

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjusted % for Stabilizing Woody Vegetation
1. Bed	**1. Vertical Stability** (Riffle and Run Units)	1. Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars).			0	0	100%			
		2. Degradation - Evidence of downcutting.			0	0	100%			
	2. Riffle Condition	1. Texture/Substrate - Riffle maintains coarser substrate.	35	35			100%			
	3. Meander Pool Condition	1. Depth Sufficient (Max Pool Depth : Mean Bankfull Depth≥ 1.6).	38	38			100%			
		2. Length appropriate (>30% of centerline distance between tail of upstream riffle and head of downstream riffle).	38	38			100%			
2. Bank	**1. Scoured / Eroding**	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion.			0	0	100%	0	0	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%	0	0	100%
	3. Mass Wasting	Bank slumping, calving, or collapse.			0	0	100%	0	0	100%
				Totals	0	0	100%	0	0	100%
3. Engineered Structures	**1. Overall Integrity**	Structures physically intact with no dislodged boulders or logs.	21	21			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	21	21			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	21	21			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does NOT exceed 15%.	21	21			100%			
	4. Habitat	Pool forming structures maintaining~ Max Pool Depth : Mean Bankfull Depth Ratio ≥ 1.6. Rootwads/logs providing some cover at base-flow.	21	21			100%			

Table 5 Cont'd. Visual Stream Morphology Stability Assessment
Catbird Site - DS2
Assessed Length 1,037 feet

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjusted % for Stabilizing Woody Vegetation
1. Bed	**1. Vertical Stability** (Riffle and Run Units)	1. Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars).			0	0	100%			
		2. Degradation - Evidence of downcutting.			0	0	100%			
	2. Riffle Condition	1. Texture/Substrate - Riffle maintains coarser substrate.	44	44			100%			
	3. Meander Pool Condition	1. Depth Sufficient (Max Pool Depth : Mean Bankfull Depth≥ 1.6).	50	50			100%			
		2. Length appropriate (>30% of centerline distance between tail of upstream riffle and head of downstream riffle).	50	50			100%			
2. Bank	**1. Scoured / Eroding**	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion.			0	0	100%	0	0	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%	0	0	100%
	3. Mass Wasting	Bank slumping, calving, or collapse.			0	0	100%	0	0	100%
				Totals	0	0	100%	0	0	100%
3. Engineered Structures	**1. Overall Integrity**	Structures physically intact with no dislodged boulders or logs.	25	25			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	25	25			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	25	25			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence doesNOT exceed 15%.	25	25			100%			
	4. Habitat	Pool forming structures maintaining~ Max Pool Depth : Mean Bankfull Depth Ratio ≥ 1.6. Rootwads/logs providing some cover at base-flow.	25	25			100%			

Table 6 Vegetation Condition Assessment

Planted Acreage[1] 5.76

Vegetation Category	Definitions	Mapping Threshold	CCPV Depiction	Number of Polygons	Combined Acreage	% of Planted Acreage
1. Bare Areas	Very limited cover of both woody and herbaceous material.	0.1 acres	Red Simple Hatch	0	0.00	0.0%
2. Low Stem Density Areas	Woody stem densities clearly below target levels based on MY3, 4, or 5 stem count criteria.	0.1 acres	Orange Simple Hatch	0	0.00	0.0%
			Total			0.0%
3. Areas of Poor Growth Rates or Vigor	Areas with woody stems of a size class that are obviously small given the monitoring year.	0.25 acres	Orange Simple Hatch	0	0.00	0.0%
			Cumulative Total			0.0%

Easement Acreage[2] 6.33

Vegetation Category	Definitions	Mapping Threshold	CCPV Depiction	Number of Polygons	Combined Acreage	% of Easement Acreage
4. Invasive Areas of Concern[4]	Areas or points (if too small to render as polygons at map scale).	1000 SF	Yellow Crosshatch	0	0.00	0.0%
5. Easement Encroachment Areas[3]	Areas or points (if too small to render as polygons at map scale).	none	Red Simple Hatch	0	0.00	0.0%

1 = Enter the planted acreage within the easement. This number is calculated as the easement acreage minus any existing mature tree stands that were not subject to supplemental planting of the understory, the channel acreage, crossings or any other elements not directly planted as part of the project effort.

2 = The acreage within the easement boundaries.

3 = Encroachment may occur within or outside of planted areas and will therefore be calculated against the overall easement acreage. In the event a polygon is cataloged into items 1, 2 or 3 in the table and is the result of encroachment, the associated acreage should be tallied in the relevant item (i.e., item 1,2 or 3) as well as a parallel tally in item 5.

4 = Invasives may occur in or out of planted areas, but still within the easement and will therefore be calculated against the overall easement acreage. Invasives of concern/interest are listed below. The list of high concern spcies are those with the potential to directly outcompete native, young, woody stems in the short-term (e.g. monitoring period or shortly thereafter) or affect the community structure for existing, more established tree/shrub stands over timeframes that are slightly longer (e.g. 1-2 decades). The low/moderate concern group are those species that generally do not have this capacity over the timeframes discussed and therefore are not expected to be mapped with regularity, but can be mapped, if in the judgement of the observer their coverage, density or distribution is suppressing the viability, density, or growth of planted woody stems. Decisions as to whether remediation will be needed are based on the integration of risk factors by EEP such as species present, their coverage, distribution relative to native biomass, and the practicality of treatment. For example, even modest amounts of Kudzu or Japanese Knotweed early in the projects history will warrant control, but potentially large coverages of Microstegium in the herb layer will not likley trigger control because of the limited capacities to impact tree/shrub layers within the timeframes discussed and the potential impacts of treating extensive amounts of ground cover. Those species with the "watch list" designator in gray shade are of interest as well, but have yet to be observed across the state with any frequency. Those in *red italics* are of particular interest given their extreme risk/threat level for mapping as points where isolated specimens are found, particularly ealry in a projects monitoring history. However, areas of discreet, dense patches will of course be mapped as polygons. The symbology scheme below was one that was found to be helpful for symbolzing invasives polygons, particulalry for situations where the conditon for an area is somewhere between isolated specimens and dense, discreet patches. In any case, the point or polygon/area feature can be symbolized to describe things like high or low concern and species can be listed as a map inset, in legend items if the number of species are limited or in the narrative section of the executive summary.

Catbird MY0 Vegetation Monitoring Plot Photos

Vegetation Plot 1 (3/4/2020)

Vegetation Plot 2 (3/4/2020)

Vegetation Plot 3 (3/4/2020)

Vegetation Plot 4 (3/4/2020)

Catbird MY0 Random Vegetation Monitoring Plot Photo

Random Vegetation Plot 1 (3/4/2020)

Catbird Monitoring Device Photos

Stage Recorder DS1

Flow Gauge DS1

Stage Recorder DS2

Appendix C

Vegetation Plot Data

Table 7. Planted Species Summary

Common Name	Scientific Name	Total Stems Planted
Persimmon	*Diospyros virginiana*	1,100
Water Oak	*Quercus nigra*	800
Willow Oak	*Quercus phellos*	800
River Birch	*Betula nigra*	800
Sycamore	*Platanus occidentalis*	800
Crab Apple	*Malus angustifolia*	800
Green Ash	*Fraxinus pennyslvanica*	600
Northern Red Oak	*Quercus rubra*	600
Yellow Poplar	*Liriodendron tulipifera*	600
Silky Dogwood	*Cornus amomum*	400
Sugarberry	*Celtis laevigata*	350
Black Walnut	*Juglans nigra*	300
Elderberry	*Sambucus canadensis*	300
Eastern Redbud	*Cercis canadensis*	300
	Total	8,550
	Planted Area	5.26
	As-built Planted Stems/Acre	1,625

Table 8. Vegetation Plot Mitigation Success Summary

Plot #	Planted Stems/Acre	Volunteer Stems/Acre	Total Stems/Acre	Success Criteria Met?	Averaged Planted Stem Height (ft)
1	1133	0	1133	Yes	1.5
2	1295	0	1295	Yes	1.6
3	1740	0	1740	Yes	1.8
4	1255	0	1255	Yes	1.6
R1	1174	0	1174	Yes	1.5
Project Avg	**1649**	**0**	**1649**	**Yes**	**1.6**

Table 9. Stem Count Total and Planted by Plot Species

Catbird			Current Plot Data (MY0 2020)															Annual Means		
			100022-01-0001			100022-01-0002			100022-01-0003			100022-01-0004			100022-01-R1			MY0 (2020)		
Scientific Name	Common Name	Species Type	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T
Betula nigra	river birch	Tree				6	6	6	6	6	6	5	5	5				17	17	17
Celtis laevigata	sugarberry	Tree				1	1	1							1	1	1	2	2	2
Cercis canadensis	eastern redbud	Tree				1	1	1				3	3	3				4	4	4
Cornus amomum	silky dogwood	Shrub	3	3	3	1	1	1							4	4	4	8	8	8
Diospyros virginiana	common persimmon	Tree	3	3	3	10	10	10				2	2	2	15	15	15	30	30	30
Fraxinus pennsylvanica	green ash	Tree	11	11	11	2	2	2	5	5	5							18	18	18
Juglans nigra	black walnut	Tree				3	3	3				1	1	1				4	4	4
Liriodendron tulipifera	tuliptree	Tree							6	6	6	2	2	2	4	4	4	12	12	12
Malus angustifolia	southern crabapple	Tree										3	3	3				3	3	3
Platanus occidentalis	American sycamore	Tree				1	1	1	6	6	6	1	1	1				8	8	8
Quercus	oak	Tree	7	7	7	6	6	6	13	13	13	5	5	5	1	1	1	32	32	32
Quercus nigra	water oak	Tree	3	3	3							2	2	2				5	5	5
Quercus phellos	willow oak	Tree	1	1	1	1	1	1	4	4	4	3	3	3	4	4	4	13	13	13
Quercus rubra	northern red oak	Tree							3	3	3	4	4	4				7	7	7
		Stem count	28	28	28	32	32	32	43	43	43	31	31	31	29	29	29	163	163	163
		size (ares)	1			1			1			1			1			4		
		size (ACRES)	0.02			0.02			0.02			0.02			0.02			0.10		
		Species count	6	6	6	10	10	10	7	7	7	11	11	11	6	6	6	14	14	14
		Stems per ACRE	1133	1133	1133	1295	1295	1295	1740	1740	1740	1255	1255	1255	1174	1174	1174	1649	1649	1649

Appendix D

Stream Measurement and

Geomorphology Data

Table 10. Baseline Stream Data Summary
Catbird Mitigation Site - Reach DS1

Parameter	Gauge[2]	Regional Curve			Pre-Existing Condition						Reference Reach(es) Data						Design			Monitoring Baseline					
		LL	UL	Eq.	Min	Mean	Med	Max	SD[5]	n	Min	Mean	Med	Max	SD[5]	n	Min	Med	Max	Min	Mean	Med	Max	SD[5]	n
Dimension and Substrate - Riffle Only																									
Bankfull Width (ft)		---	---	---	3.0	---	5.4	7.4	---	3	4.4	---	---	6.6	---	2	---	4.5	---	5.1	6.0	5.6	7.3	1.2	3
Floodprone Width (ft)					5.4	---	6.8	10.0	---	3	10.0	---	---	15.0	---	2	---	30.0	---	50.0	50.0	50.0	50.0	0.1	3
Bankfull Mean Depth (ft)		---	---	---	0.5	---	0.7	0.8	---	3	0.6	---	---	0.6	---	2	---	0.5	---	---	---	---	---	---	---
[1]Bankfull Max Depth (ft)					0.8	---	1.1	1.1	---	3	0.9	---	---	1.2	---	2	---	0.7	---	0.7	1.0	0.9	1.3	0.3	3
Bankfull Cross Sectional Area (ft^2)		---	---	---	2.3	---	3.4	3.7	---	3	2.8	---	---	3.9	---	2	---	2.1	---	1.9	2.8	3.1	3.5	0.8	3
Width/Depth Ratio					3.9	---	7.8	16.1	---	3	6.9	---	---	10.9	---	2	---	9.7	---	---	---	---	---	---	---
Entrenchment Ratio					1.3	---	1.4	1.8	---	3	2.2	---	---	2.2	---	2	---	6.7	---	6.9	8.6	9.0	9.9	1.5	3
[1]Bank Height Ratio					1.0	---	1.8	2.5	---	3	1.0	---	---	1.2	---	2	---	1.0	---	1.0	1.0	1.0	1.0	0.0	3
Profile																									
Riffle Length (ft)					---	---	---	---	---	---	4	---	---	18	---	---	3	---	15	2.2	8.7	7.2	17.9	4.3	35
Riffle Slope (ft/ft)					---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	0.4	2.5	1.7	8.0	1.8	35
Pool Length (ft)					---	---	---	---	---	---	3	---	---	10	---	---	3	---	7	2.1	6.4	6.0	17.1	2.5	38
Pool Max depth (ft)					---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Pool Spacing (ft)					---	---	---	---	---	---	12	---	---	35	---	---	10	---	30	5.9	25.6	20.9	75.2	16.4	37
Pattern																									
Channel Beltwidth (ft)					---	---	---	---	---	---	18	---	---	35	---	---	13	---	30	---	---	---	---	---	---
Radius of Curvature (ft)					---	---	---	---	---	---	7	---	---	19	---	---	5	---	15	---	---	---	---	---	---
Rc:Bankfull width (ft/ft)					---	---	---	---	---	---	1.6	---	---	4.3	---	---	1.1	---	3.3	---	---	---	---	---	---
Meander Wavelength (ft)					---	---	---	---	---	---	30	---	---	44	---	---	20	---	37	---	---	---	---	---	---
Meander Width Ratio					---	---	---	---	---	---	4.1	---	---	8	---	---	2.9	---	6.7	---	---	---	---	---	---
Transport parameters																									
Reach Shear Stress (competency) lb/f^2					---												---			---					
Max part size (mm) mobilized at bankfull					---												---			---					
Stream Power (transport capacity) W/m^2					---												---			---					
Additional Reach Parameters																									
Rosgen Classification					G4						E4						E4			E4					
Bankfull Velocity (fps)		---	---	---	---						---						---			---					
Bankfull Discharge (cfs)		---	---	---	---												---								
Valley length (ft)					1136						146						924			---					
Channel Thalweg length (ft)					1179						185						1211			1211					
Sinuosity (ft)					1.04						1.27						1.31			---					
Water Surface Slope (Channel) (ft/ft)					---						---						---			---					
Channel slope (ft/ft)					0.0305						0.013						0.017			---					
[3]Bankfull Floodplain Area (acres)					---						---						---			---					
[4]% of Reach with Eroding Banks					---						---														
Channel Stability or Habitat Metric					---						---														
Biological or Other					---						---														

Shaded cells indicate that these will typically not be filled in.

1 = The distributions for these parameters can include information from both the cross-section measurements and the longitudinal profile. 2 = For projects with a proximal USGS gauge in-line with the project reach (added bankfull verification - rare).

3. Utilizing XS measurement data produce an estimate of the bankfull floodplain area in acres, which should be the area from the top of bank to the toe of the terrace riser/slope.

4 = Proportion of reach exhibiting banks that are eroding based on the visual survey for comparison to monitoring data; 5. Of value/needed only if the n exceeds 3

Table 10. Baseline Stream Data Summary (continued)
Catbird Mitigation Site - Reach DS2-B (Upper)

Parameter	Gauge[2]	Regional Curve			Pre-Existing Condition						Reference Reach(es) Data						Design			Monitoring Baseline					
		LL	UL	Eq.	Min	Mean	Med	Max	SD[5]	n	Min	Mean	Med	Max	SD[5]	n	Min	Med	Max	Min	Mean	Med	Max	SD[5]	n
Dimension and Substrate - Riffle Only																									
Bankfull Width (ft)		---	---	---	4.3	---	---	4.8	---	2	4.4	---	---	6.6	---	2	---	4.5	---	4.2	4.9	4.9	5.6	1.0	2
Floodprone Width (ft)					5.6	---	---	7.6	---	2	10.0	---	---	15.0	---	2	---	30.0	---	50.0	50.0	50.0	50.0	0.1	2
Bankfull Mean Depth (ft)		---	---	---	0.5	---	---	0.7	---	2	0.6	---	---	0.6	---	2	---	0.5	---	---	---	---	---	---	---
[1]Bankfull Max Depth (ft)					0.7	---	---	1.2	---	2	0.9	---	---	1.2	---	2	---	0.7	---	0.8	0.8	0.8	0.8	0.0	2
Bankfull Cross Sectional Area (ft^2)		---	---	---	2.1	---	---	3.1	---	2	2.8	---	---	3.9	---	2	---	2.2	---	2.2	2.4	2.4	2.6	0.3	2
Width/Depth Ratio					7.3	---	---	9.0	---	2	6.9	---	---	10.9	---	2	---	9.3	---	---	---	---	---	---	---
Entrenchment Ratio					1.3	---	---	1.6	---	2	2.2	---	---	2.2	---	2	---	6.7	---	8.8	10.3	10.3	11.8	2.1	2
[1]Bank Height Ratio					0.8	---	---	8.4	---	2	1.0	---	---	1.2	---	2	---	1.0	---	1.0	1.0	1.0	1.0	0.0	2
Profile																									
Riffle Length (ft)					---	---	---	---	---	---		---	---		---	---		---		2.4	6.6	5.8	18.2	3.2	44
Riffle Slope (ft/ft)					---	---	---	---	---	---		---	---		---	---		---		0.3	4.1	3.7	14.8	3.1	45
Pool Length (ft)					---	---	---	---	---	---		---	---		---	---		---		1.1	5.1	5.0	13.7	2.4	50
Pool Max depth (ft)					---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Pool Spacing (ft)					---	---	---	---	---	---		---	---		---	---		---		3.1	19.2	19.1	40.5	7.5	48
Pattern																									
Channel Beltwidth (ft)					---	---	---	---	---	---	18	---	---	35	---	---	13	---	30		---		---	---	---
Radius of Curvature (ft)					---	---	---	---	---	---	7	---	---	19	---	---	5	---	15		---		---	---	---
Rc:Bankfull width (ft/ft)					---	---	---	---	---	---	1.6	---	---	4.3	---	---	1.1	---	3.3		---		---	---	---
Meander Wavelength (ft)					---	---	---	---	---	---	30	---	---	44	---	---	20	---	37		---		---	---	---
Meander Width Ratio					---	---	---	---	---	---	4.1	---	---	8	---	---	2.9	---	6.7		---		---	---	---
Transport parameters																									
Reach Shear Stress (competency) lb/f^2					---												---			---					
Max part size (mm) mobilized at bankfull					---												---			---					
Stream Power (transport capacity) W/m^2					---												---			---					
Additional Reach Parameters																									
Rosgen Classification					G5						E4						E4			E4					
Bankfull Velocity (fps)		---	---	---	---						---						---			---					
Bankfull Discharge (cfs)		---	---	---	---												---								
Valley length (ft)					990						146						482			---					
Channel Thalweg length (ft)					1051						185						526			526					
Sinuosity (ft)					1.06						1.27						1.09			---					
Water Surface Slope (Channel) (ft/ft)					---						---						---			---					
Channel slope (ft/ft)					0.0383						0.013						0.02			---					
[3]Bankfull Floodplain Area (acres)					---						---						---			---					
[4]% of Reach with Eroding Banks					---						---														
Channel Stability or Habitat Metric					---						---														
Biological or Other					---						---														

Shaded cells indicate that these will typically not be filled in.

1 = The distributions for these parameters can include information from both the cross-section measurements and the longitudinal profile. 2 = For projects with a proximal USGS gauge in-line with the project reach (added bankfull verification - rare).

3. Utilizing XS measurement data produce an estimate of the bankfull floodplain area in acres, which should be the area from the top of bank to the toe of the terrace riser/slope.

4 = Proportion of reach exhibiting banks that are eroding based on the visual survey for comparison to monitoring data; 5. Of value/needed only if the n exceeds 3

Table 10. Baseline Stream Data Summary (continued)
Catbird Mitigation Site - Reach DS2-B (Lower)

Parameter	Gauge[2]	Regional Curve			Pre-Existing Condition						Reference Reach(es) Data						Design			Monitoring Baseline					
		LL	UL	Eq.	Min	Mean	Med	Max	SD[5]	n	Min	Mean	Med	Max	SD[5]	n	Min	Med	Max	Min	Mean	Med	Max	SD[5]	n
Dimension and Substrate - Riffle Only																									
Bankfull Width (ft)		---	---	---	4.3	---	---	4.8	---	2	4.4	---	---	6.6	---	2	---	5.2	---	---	---	5.7	---	---	---
Floodprone Width (ft)					5.6	---	---	7.6	---	2	10.0	---	---	15.0	---	2	---	30.0	---	---	---	50.0	---	---	---
Bankfull Mean Depth (ft)		---	---	---	0.5	---	---	0.7	---	2	0.6	---	---	0.6	---	2	---	0.5	---	---	---	---	---	---	---
[1]Bankfull Max Depth (ft)					0.7	---	---	1.2	---	2	0.9	---	---	1.2	---	2	---	0.8	---	---	---	0.8	---	---	---
Bankfull Cross Sectional Area (ft^2)		---	---	---	2.1	---	---	3.1	---	2	2.8	---	---	3.9	---	2	---	2.8	---	---	---	2.9	---	---	---
Width/Depth Ratio					7.3	---	---	9.0	---	2	6.9	---	---	10.9	---	2	---	9.7	---	---	---	---	---	---	---
Entrenchment Ratio					1.3	---	---	1.6	---	2	2.2	---	---	2.2	---	2	---	5.8	---	---	---	8.7	---	---	---
[1]Bank Height Ratio					0.8	---	---	8.4	---	2	1.0	---	---	1.2	---	2	---	1.0	---	---	---	1.0	---	---	---
Profile																									
Riffle Length (ft)					---	---	---	---	---	---		---	---		---	---		---		2.4	6.6	5.8	18.2	3.2	44
Riffle Slope (ft/ft)					---	---	---	---	---	---		---	---		---	---		---		0.3	4.1	3.7	14.8	3.1	45
Pool Length (ft)					---	---	---	---	---	---		---	---		---	---		---		1.1	5.1	5.0	13.7	2.4	50
Pool Max depth (ft)					---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Pool Spacing (ft)					---	---	---	---	---	---		---	---		---	---		---		3.1	19.2	19.1	40.5	7.5	48
Pattern																									
Channel Beltwidth (ft)					---	---	---	---	---	---	18	---	---	35	---	---	13	---	30		---		---	---	---
Radius of Curvature (ft)					---	---	---	---	---	---	7	---	---	19	---	---	5	---	15		---		---	---	---
Rc:Bankfull width (ft/ft)					---	---	---	---	---	---	1.6	---	---	4.3	---	---	1.1	---	3.3		---		---	---	---
Meander Wavelength (ft)					---	---	---	---	---	---	30	---	---	44	---	---	20	---	37		---		---	---	---
Meander Width Ratio					---	---	---	---	---	---	4.1	---	---	8	---	---	2.9	---	6.7		---		---	---	---
Transport parameters																									
Reach Shear Stress (competency) lb/f^2					---												---			---					
Max part size (mm) mobilized at bankfull					---												---			---					
Stream Power (transport capacity) W/m^2					---												---			---					
Additional Reach Parameters																									
Rosgen Classification					G5						E4						E4			E4					
Bankfull Velocity (fps)		---	---	---	---						---						---			---					
Bankfull Discharge (cfs)		---	---	---	---												---								
Valley length (ft)					990						146						450			---					
Channel Thalweg length (ft)					1051						185						512			512					
Sinuosity (ft)					1.06						1.27						1.14			---					
Water Surface Slope (Channel) (ft/ft)					---						---						---			---					
Channel slope (ft/ft)					0.0383						0.013						0.0175			---					
[3]Bankfull Floodplain Area (acres)					---						---						---			---					
[4]% of Reach with Eroding Banks					---						---														
Channel Stability or Habitat Metric					---						---														
Biological or Other					---						---														

Shaded cells indicate that these will typically not be filled in.

1 = The distributions for these parameters can include information from both the cross-section measurements and the longitudinal profile. 2 = For projects with a proximal USGS gauge in-line with the project reach (added bankfull verification - rare).

3. Utilizing XS measurement data produce an estimate of the bankfull floodplain area in acres, which should be the area from the top of bank to the toe of the terrace riser/slope.

4 = Proportion of reach exhibiting banks that are eroding based on the visual survey for comparison to monitoring data; 5. Of value/needed only if the n exceeds 3

Appendix D. Table 11 - Monitoring Data - Dimensional Morphology Summary (Dimensional Parameters – Cross Sections)

Project Name/Number: Catbird #100022

	Cross Section 1 (Pool)							Cross Section 2 (Riffle)							Cross Section 3 (Riffle)							Cross Section 4 (Pool)							Cross Section 5 (Riffle)						
	Base	MY1	MY2	MY3	MY5	MY7	MY+	Base	MY1	MY2	MY3	MY5	MY7	MY+	Base	MY1	MY2	MY3	MY5	MY7	MY+	Base	MY1	MY2	MY3	MY5	MY7	MY+	Base	MY1	MY2	MY3	MY5	MY7	MY+
Bankfull Elevation (ft) - Based on AB-XSA[1]	756.5							756.6							741.6							741.0							735.7						
Bankfull Width (ft)[1]	-							7.3							5.1							-							5.6						
Floodprone Width (ft)[1]	-							>50							50							-							50						
Bankfull Max Depth (ft)[2]	1.6							0.7							1.3							1.5							0.9						
Low Bank Elevation (ft)	-							756.6							741.6							-							735.7						
Bankfull Cross Sectional Area (ft^2)[2]	3.9							1.9							3.5							4.6							3.1						
Bankfull Entrenchment Ratio[1]	-							>6.9							9.9							-							9.0						
Bankfull Bank Height Ratio[1]	-							1.0							1.0							-							1.0						

	Cross Section 6 (Pool)							Cross Section 7 (Pool)							Cross Section 8 (Riffle)							Cross Section 9 (Pool)							Cross Section 10 (Riffle)						
	Base	MY1	MY2	MY3	MY5	MY7	MY+	Base	MY1	MY2	MY3	MY5	MY7	MY+	Base	MY1	MY2	MY3	MY5	MY7	MY+	Base	MY1	MY2	MY3	MY5	MY7	MY+	Base	MY1	MY2	MY3	MY5	MY7	MY+
Bankfull Elevation (ft) - Based on AB-XSA[1]	735.5							774.5							774.8							763.4							763.7						
Bankfull Width (ft)[1]	-							-							5.6							-							4.2						
Floodprone Width (ft)[1]	-							-							50							-							50						
Bankfull Max Depth (ft)[2]	1.7							1.3							0.8							1.1							0.8						
Low Bank Elevation (ft)	-							-							774.8							-							763.73						
Bankfull Cross Sectional Area (ft^2)[2]	5.1							3.1							2.6							2.7							2.2						
Bankfull Entrenchment Ratio[1]	-							-							8.8							-							11.8						
Bankfull Bank Height Ratio[1]	-							-							1.0							-							1.0						

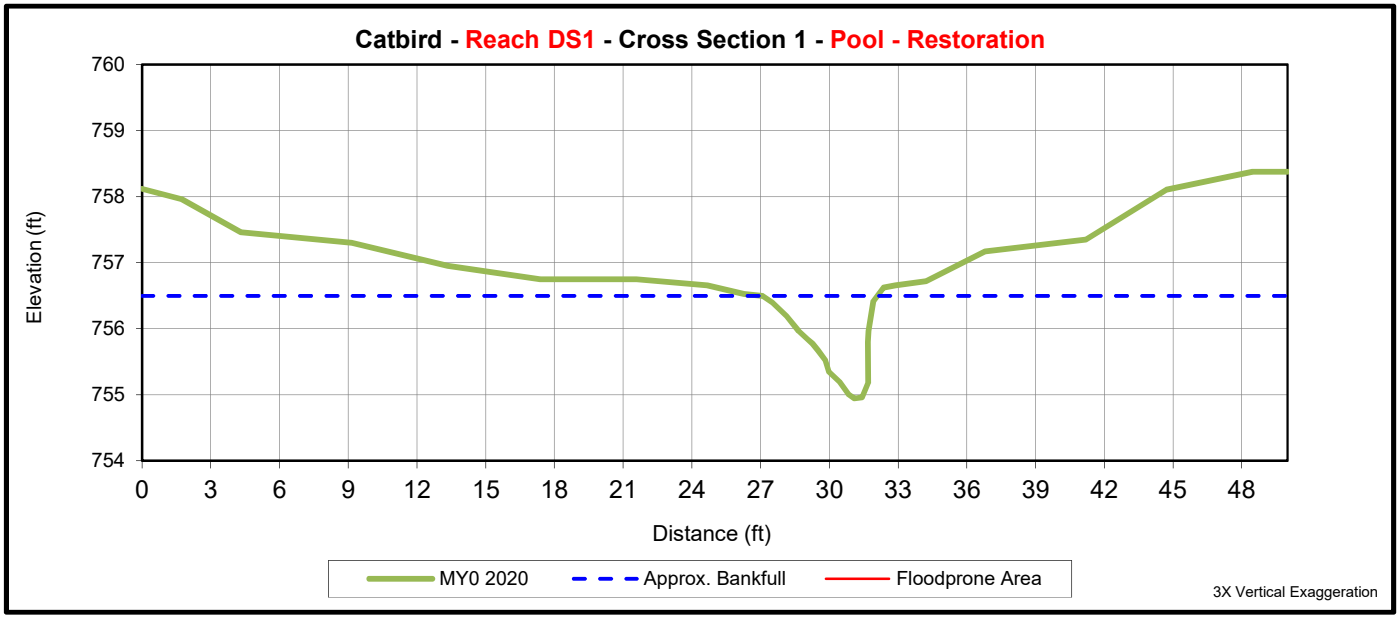
	Cross Section 11 (Riffle)							Cross Section 12 (Pool)						
	Base	MY1	MY2	MY3	MY5	MY7	MY+	Base	MY1	MY2	MY3	MY5	MY7	MY+
Bankfull Elevation (ft) - Based on AB-XSA[1]	737.5							737.3						
Bankfull Width (ft)[1]	5.7							-						
Floodprone Width (ft)[1]	>50							-						
Bankfull Max Depth (ft)[2]	0.8							1.2						
Low Bank Elevation (ft)	737.51							-						
Bankfull Cross Sectional Area (ft^2)[2]	2.9							3.1						
Bankfull Entrenchment Ratio[1]	>8.7							-						
Bankfull Bank Height Ratio[1]	1.0							-						

1 - Uses the as-built cross sectional area as the basis for adjusting each subsequent years bankfull elevation

2 - Uses the current years low top of bank as the basis for adjusting each subsequent years bankfull elevation

Upstream

Downstream

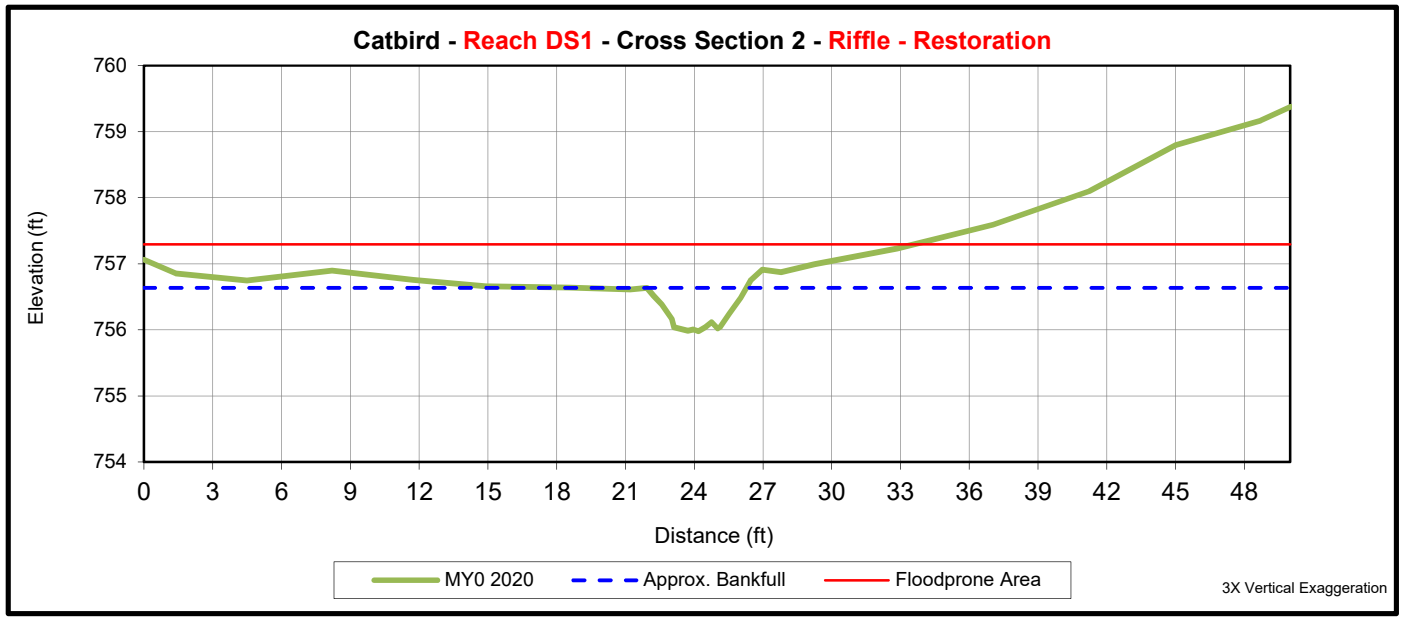


	Cross Section 1 (Pool)						
	MY0	MY1	MY2	MY3	MY5	MY7	MY+
Bankfull Elevation (ft) - Based on AB-XSA[1]	756.50						
Bankfull Width (ft)[1]	-						
Floodprone Width (ft)[1]	-						
Bankfull Max Depth (ft)[2]	1.6						
Low Bank Elevation (ft)	-						
Bankfull Cross Sectional Area (ft^2)[2]	3.9						
Bankfull Entrenchment Ratio[1]	-						
Bankfull Bank Height Ratio[1]	-						

1 - Uses the as-built cross sectional area as the basis for adjusting each subsequent years bankfull elevation
2 - Uses the current years low top of bank as the basis for adjusting each subsequent years bankfull elevation

Upstream

Downstream

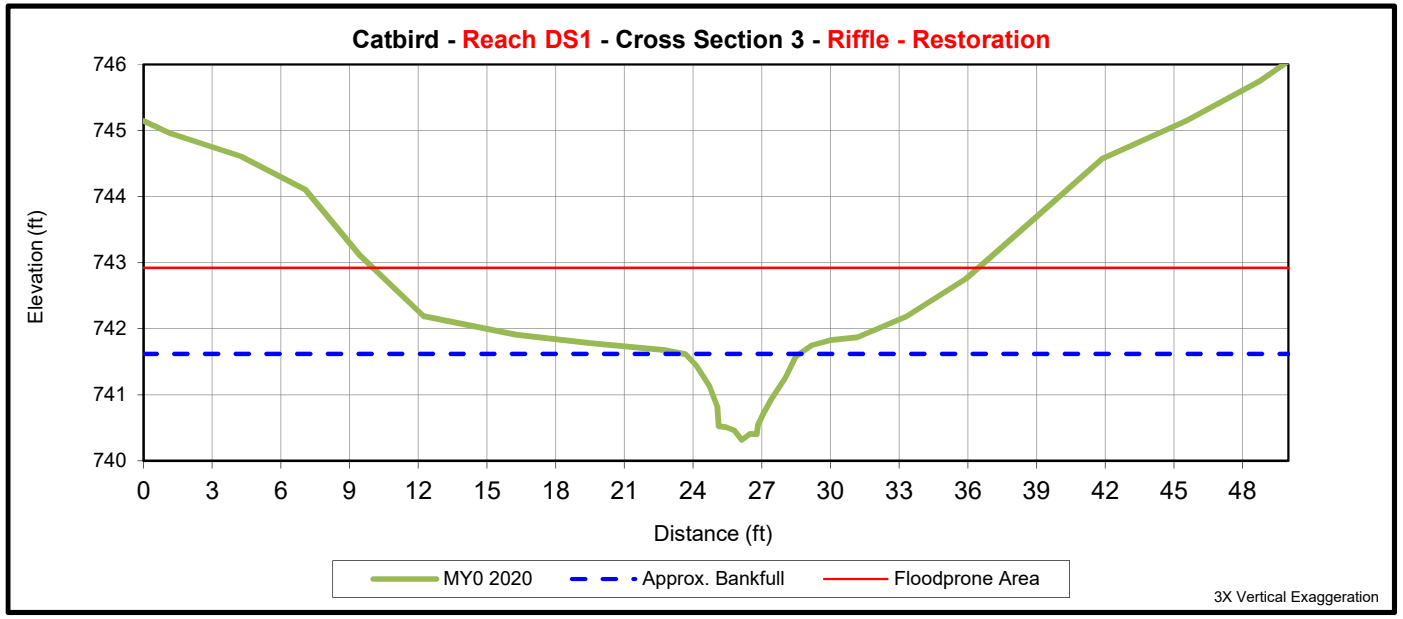


	Cross Section 2 (Riffle)						
	MY0	MY1	MY2	MY3	MY5	MY7	MY+
Bankfull Elevation (ft) - Based on AB-XSA[1]	756.64						
Bankfull Width (ft)[1]	7.3						
Floodprone Width (ft)[1]	>50						
Bankfull Max Depth (ft)[2]	0.7						
Low Bank Elevation (ft)	756.64						
Bankfull Cross Sectional Area (ft^2)[2]	1.9						
Bankfull Entrenchment Ratio[1]	>6.9						
Bankfull Bank Height Ratio[1]	1.0						

1 - Uses the as-built cross sectional area as the basis for adjusting each subsequent years bankfull elevation
2 - Uses the current years low top of bank as the basis for adjusting each subsequent years bankfull elevation

Upstream

Downstream

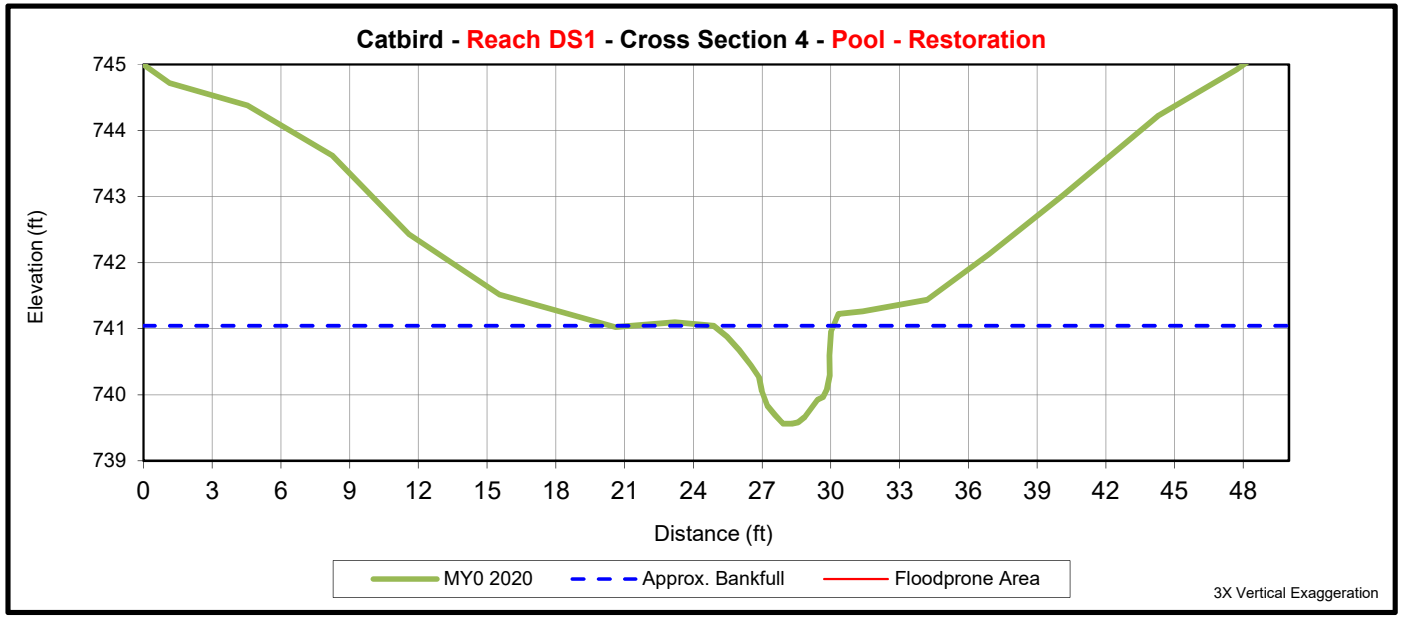


	Cross Section 3 (Riffle)						
	MY0	MY1	MY2	MY3	MY5	MY7	MY+
Bankfull Elevation (ft) - Based on AB-XSA[1]	741.62						
Bankfull Width (ft)[1]	5.1						
Floodprone Width (ft)[1]	50						
Bankfull Max Depth (ft)[2]	1.3						
Low Bank Elevation (ft)	741.62						
Bankfull Cross Sectional Area (ft^2)[2]	3.5						
Bankfull Entrenchment Ratio[1]	9.9						
Bankfull Bank Height Ratio[1]	1.0						

1 - Uses the as-built cross sectional area as the basis for adjusting each subsequent years bankfull elevation
2 - Uses the current years low top of bank as the basis for adjusting each subsequent years bankfull elevation

Upstream

Downstream

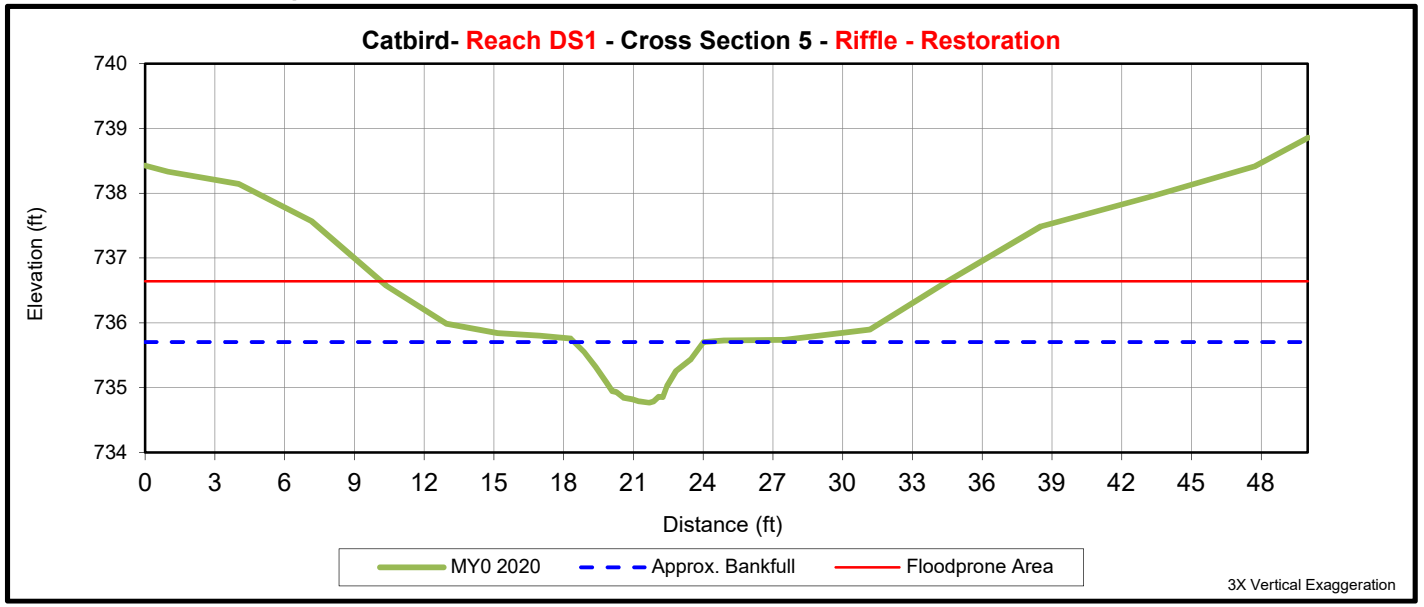


	Cross Section 4 (Pool)						
	MY0	MY1	MY2	MY3	MY5	MY7	MY+
Bankfull Elevation (ft) - Based on AB-XSA[1]	741.04						
Bankfull Width (ft)[1]	-						
Floodprone Width (ft)[1]	-						
Bankfull Max Depth (ft)[2]	1.5						
Low Bank Elevation (ft)	-						
Bankfull Cross Sectional Area (ft^2)[2]	4.6						
Bankfull Entrenchment Ratio[1]	-						
Bankfull Bank Height Ratio[1]	-						

1 - Uses the as-built cross sectional area as the basis for adjusting each subsequent years bankfull elevation
2 - Uses the current years low top of bank as the basis for adjusting each subsequent years bankfull elevation

Upstream

Downstream

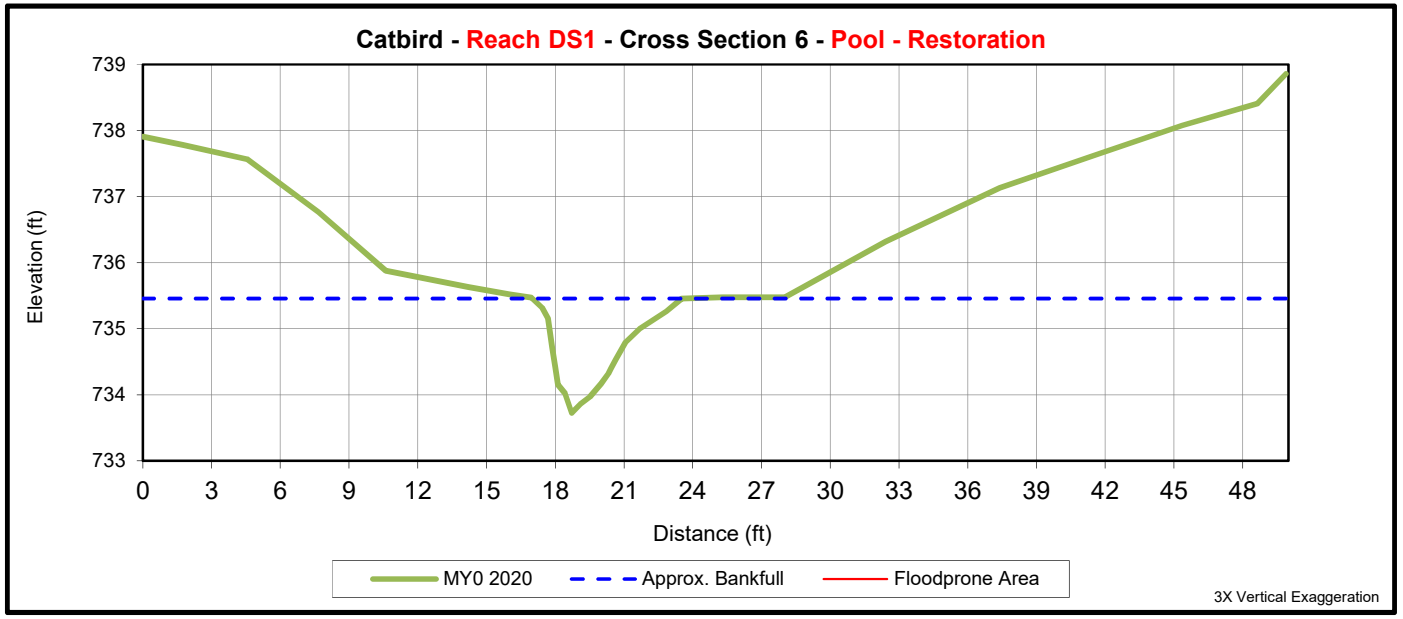


	Cross Section 5 (Riffle)						
	MY0	MY1	MY2	MY3	MY5	MY7	MY+
Bankfull Elevation (ft) - Based on AB-XSA[1]	735.70						
Bankfull Width (ft)[1]	5.6						
Floodprone Width (ft)[1]	50						
Bankfull Max Depth (ft)[2]	0.9						
Low Bank Elevation (ft)	735.70						
Bankfull Cross Sectional Area (ft^2)[2]	3.1						
Bankfull Entrenchment Ratio[1]	9.0						
Bankfull Bank Height Ratio[1]	1.0						

1 - Uses the as-built cross sectional area as the basis for adjusting each subsequent years bankfull elevation
2 - Uses the current years low top of bank as the basis for adjusting each subsequent years bankfull elevation

Upstream

Downstream

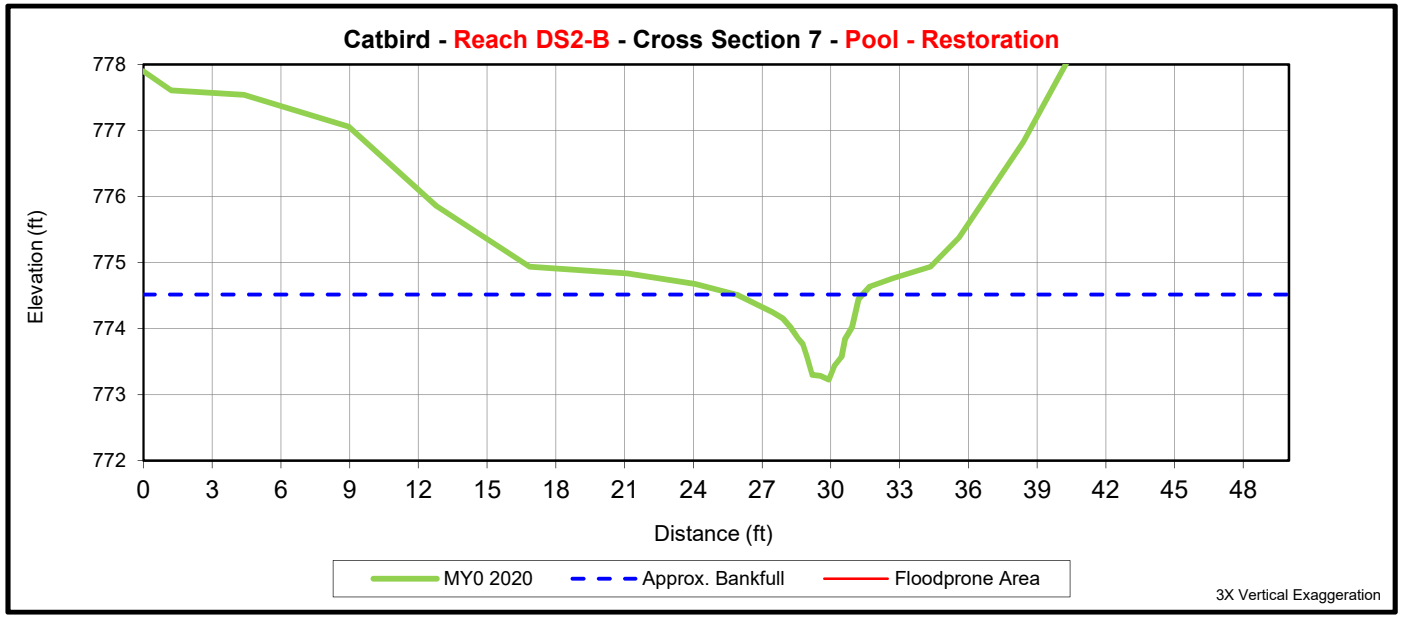


	Cross Section 6 (Pool)						
	MY0	MY1	MY2	MY3	MY5	MY7	MY+
Bankfull Elevation (ft) - Based on AB-XSA[1]	735.46						
Bankfull Width (ft)[1]	-						
Floodprone Width (ft)[1]	-						
Bankfull Max Depth (ft)[2]	1.7						
Low Bank Elevation (ft)	-						
Bankfull Cross Sectional Area (ft^2)[2]	5.1						
Bankfull Entrenchment Ratio[1]	-						
Bankfull Bank Height Ratio[1]	-						

1 - Uses the as-built cross sectional area as the basis for adjusting each subsequent years bankfull elevation
2 - Uses the current years low top of bank as the basis for adjusting each subsequent years bankfull elevation

Upstream

Downstream

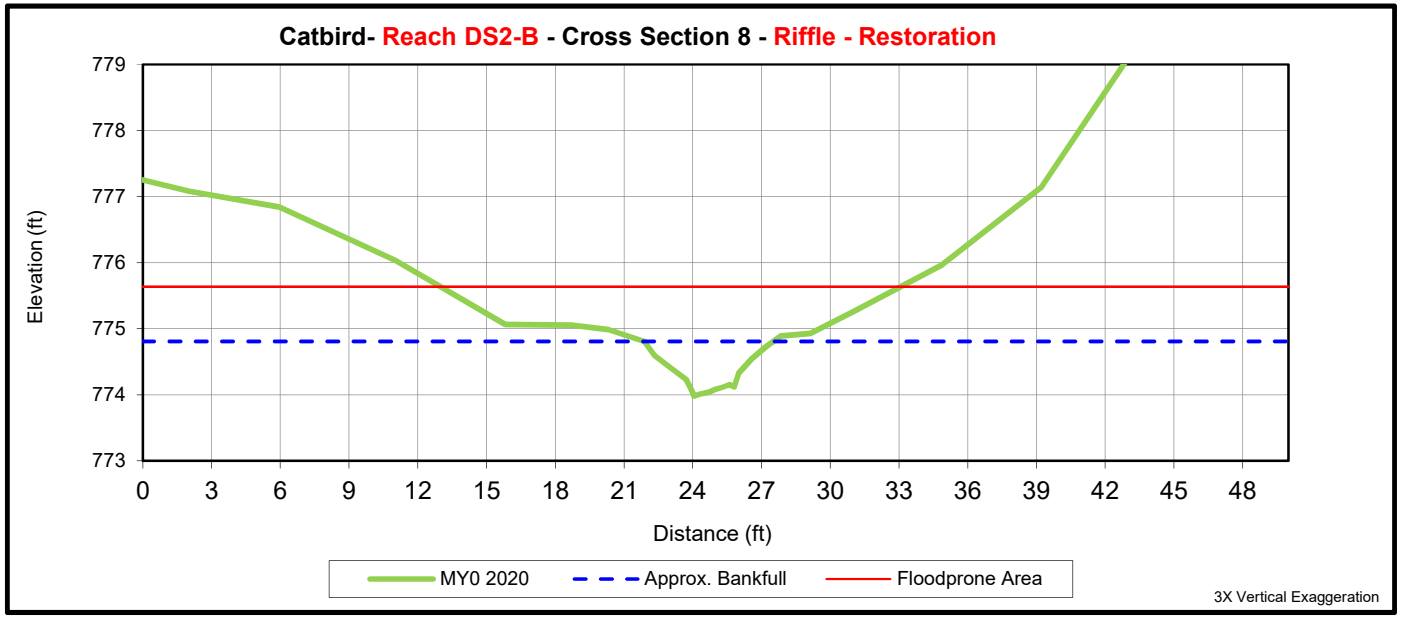


	Cross Section 7 (Pool)						
	MY0	MY1	MY2	MY3	MY5	MY7	MY+
Bankfull Elevation (ft) - Based on AB-XSA[1]	774.52						
Bankfull Width (ft)[1]	-						
Floodprone Width (ft)[1]	-						
Bankfull Max Depth (ft)[2]	1.3						
Low Bank Elevation (ft)	-						
Bankfull Cross Sectional Area (ft^2)[2]	3.1						
Bankfull Entrenchment Ratio[1]	-						
Bankfull Bank Height Ratio[1]	-						

1 - Uses the as-built cross sectional area as the basis for adjusting each subsequent years bankfull elevation
2 - Uses the current years low top of bank as the basis for adjusting each subsequent years bankfull elevation

Upstream

Downstream

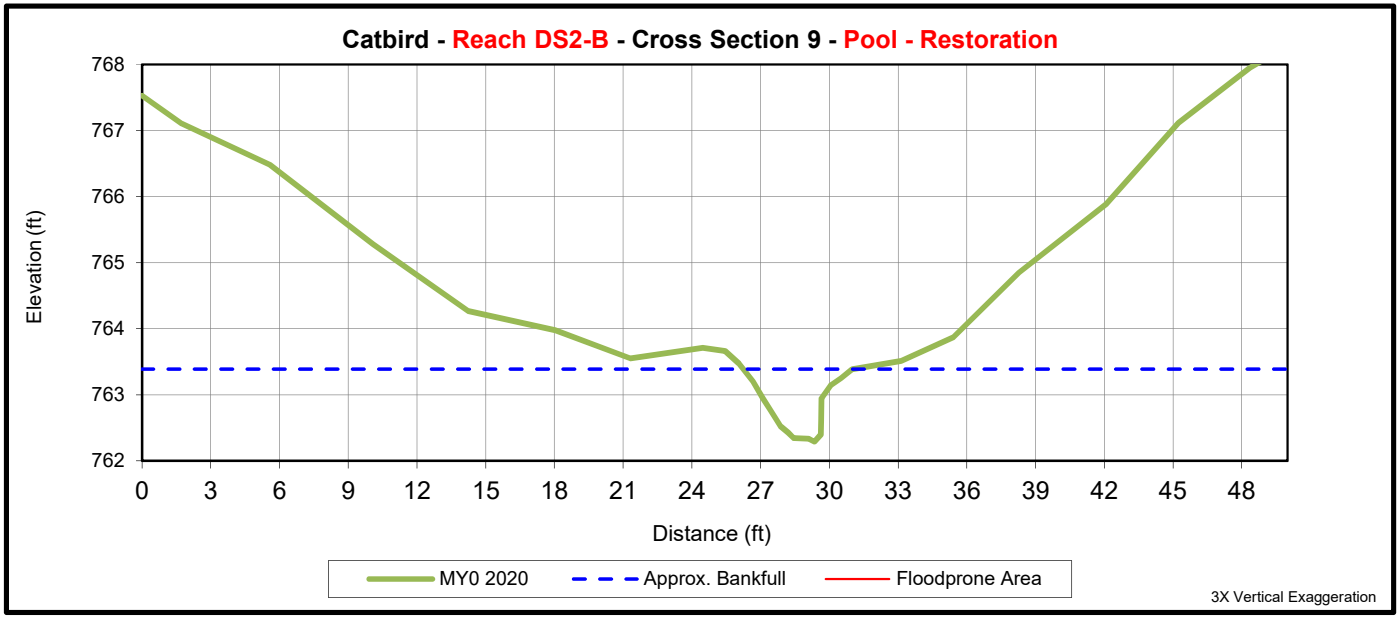


	Cross Section 8 (Riffle)						
	MY0	MY1	MY2	MY3	MY5	MY7	MY+
Bankfull Elevation (ft) - Based on AB-XSA[1]	774.81						
Bankfull Width (ft)[1]	5.6						
Floodprone Width (ft)[1]	50						
Bankfull Max Depth (ft)[2]	0.8						
Low Bank Elevation (ft)	774.81						
Bankfull Cross Sectional Area (ft^2)[2]	2.6						
Bankfull Entrenchment Ratio[1]	8.8						
Bankfull Bank Height Ratio[1]	1.0						

1 - Uses the as-built cross sectional area as the basis for adjusting each subsequent years bankfull elevation
2 - Uses the current years low top of bank as the basis for adjusting each subsequent years bankfull elevation

Upstream

Downstream

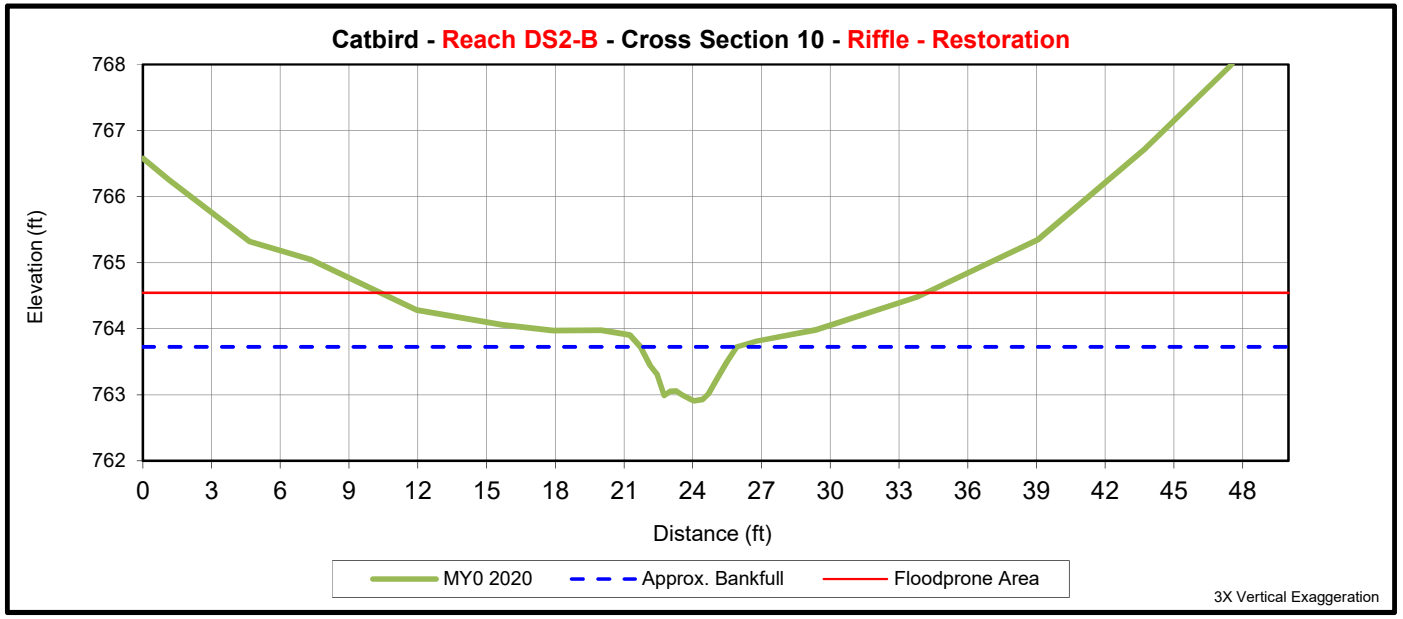


	Cross Section 9 (Pool)						
	MY0	MY1	MY2	MY3	MY5	MY7	MY+
Bankfull Elevation (ft) - Based on AB-XSA[1]	763.39						
Bankfull Width (ft)[1]	-						
Floodprone Width (ft)[1]	-						
Bankfull Max Depth (ft)[2]	1.1						
Low Bank Elevation (ft)	-						
Bankfull Cross Sectional Area (ft^2)[2]	2.7						
Bankfull Entrenchment Ratio[1]	-						
Bankfull Bank Height Ratio[1]	-						

1 - Uses the as-built cross sectional area as the basis for adjusting each subsequent years bankfull elevation
2 - Uses the current years low top of bank as the basis for adjusting each subsequent years bankfull elevation

Upstream

Downstream

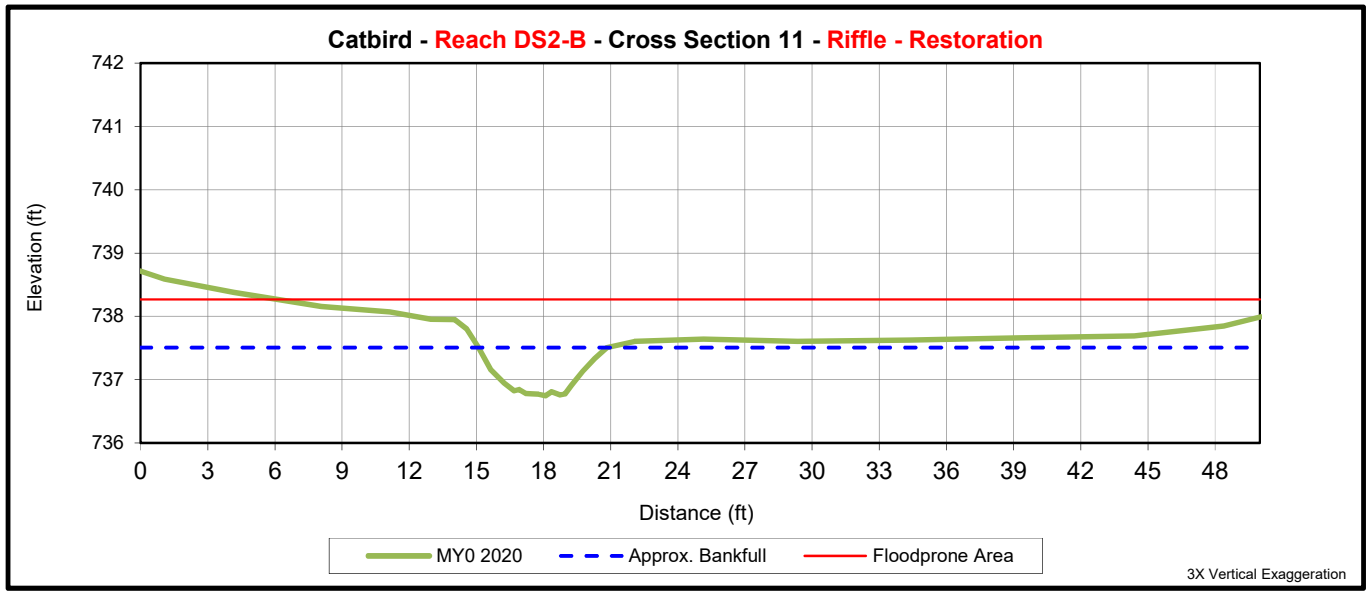


	Cross Section 10 (Riffle)						
	MY0	MY1	MY2	MY3	MY5	MY7	MY+
Bankfull Elevation (ft) - Based on AB-XSA[1]	763.73						
Bankfull Width (ft)[1]	4.2						
Floodprone Width (ft)[1]	50						
Bankfull Max Depth (ft)[2]	0.8						
Low Bank Elevation (ft)	763.73						
Bankfull Cross Sectional Area (ft^2)[2]	2.2						
Bankfull Entrenchment Ratio[1]	11.8						
Bankfull Bank Height Ratio[1]	1.0						

1 - Uses the as-built cross sectional area as the basis for adjusting each subsequent years bankfull elevation
2 - Uses the current years low top of bank as the basis for adjusting each subsequent years bankfull elevation

Upstream

Downstream

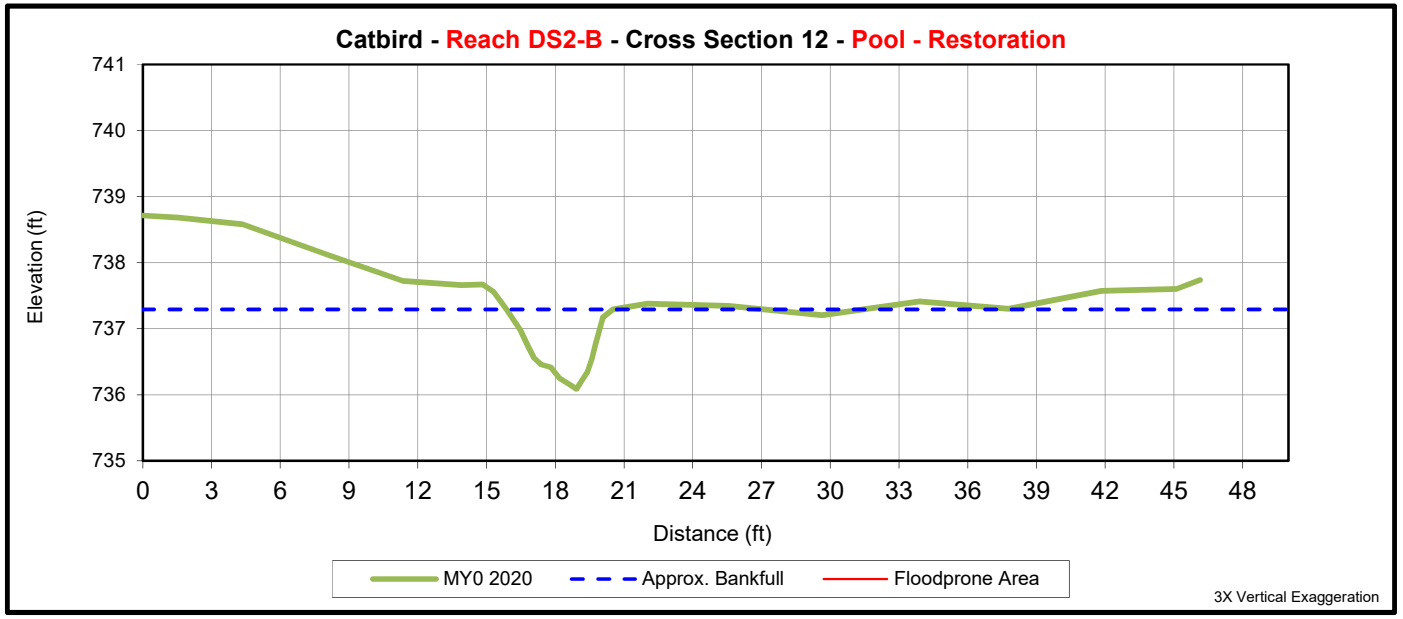


	Cross Section 11 (Riffle)						
	MY0	MY1	MY2	MY3	MY5	MY7	MY+
Bankfull Elevation (ft) - Based on AB-XSA[1]	737.51						
Bankfull Width (ft)[1]	5.7						
Floodprone Width (ft)[1]	>50						
Bankfull Max Depth (ft)[2]	0.8						
Low Bank Elevation (ft)	737.51						
Bankfull Cross Sectional Area (ft^2)[2]	2.9						
Bankfull Entrenchment Ratio[1]	>8.7						
Bankfull Bank Height Ratio[1]	1.0						

1 - Uses the as-built cross sectional area as the basis for adjusting each subsequent years bankfull elevation
2 - Uses the current years low top of bank as the basis for adjusting each subsequent years bankfull elevation

Upstream

Downstream



	Cross Section 12 (Pool)						
	MY0	MY1	MY2	MY3	MY5	MY7	MY+
Bankfull Elevation (ft) - Based on AB-XSA[1]	737.29						
Bankfull Width (ft)[1]	-						
Floodprone Width (ft)[1]	-						
Bankfull Max Depth (ft)[2]	1.2						
Low Bank Elevation (ft)	-						
Bankfull Cross Sectional Area (ft^2)[2]	3.1						
Bankfull Entrenchment Ratio[1]	-						
Bankfull Bank Height Ratio[1]	-						

1 - Uses the as-built cross sectional area as the basis for adjusting each subsequent years bankfull elevation
2 - Uses the current years low top of bank as the basis for adjusting each subsequent years bankfull elevation

Appendix E

Record Drawings

CATBIRD RECORD DRAWINGS

DAVIE COUNTY, NORTH CAROLINA

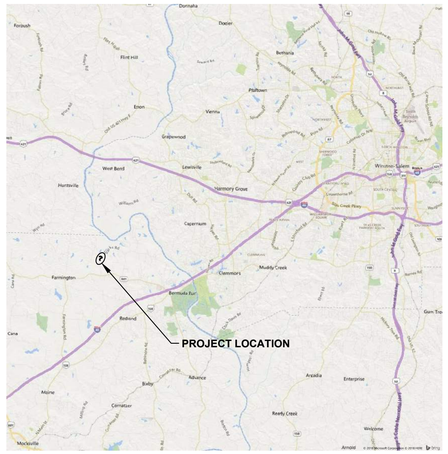
YADKIN 01 RIVER BASIN: HUC 03040101

JULY 2020

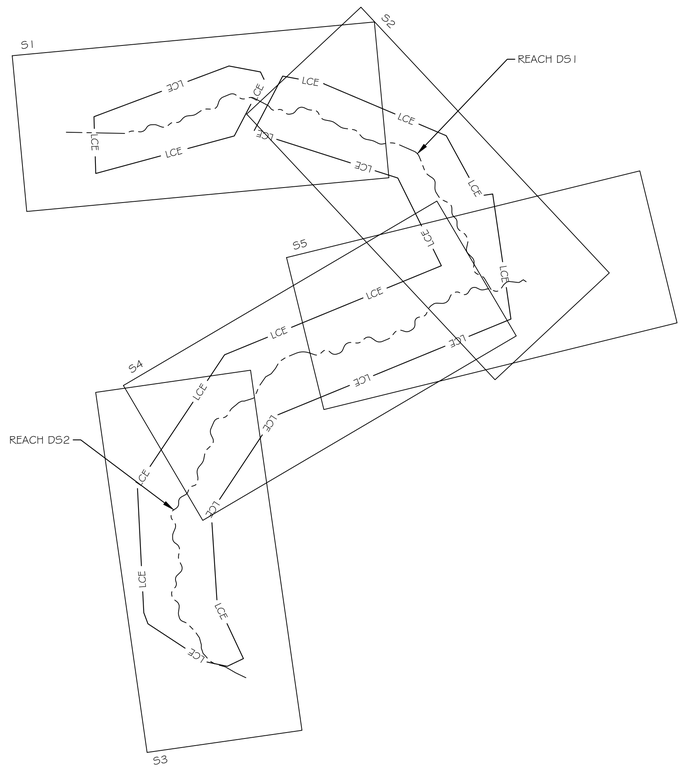
RESOURCE ENVIRONMENTAL SOLUTIONS, LLC

3600 GLENWOOD AVE, SUITE 100

RALEIGH, NC 27612



VICINITY MAP
NTS



SITE MAP
NTS

Sheet List Table

Sheet Number	Sheet Title
-	COVER
S1	REACH DS1
S2	REACH DS1
S3	REACH DS2
S4	REACH DS2
S5	REACH DS2
P1	PLANTING PLAN

PROJECT DIRECTORY

DESIGNED BY:
RESOURCE ENVIRONMENTAL SOLUTIONS, LLC
3600 GLENWOOD AVE, SUITE 100
RALEIGH, NC 27612

DESIGNED FOR:
HARRY TSOMIDES
NC DEPARTMENT OF ENVIRONMENTAL QUALITY
DIVISION OF MITIGATION SERVICES
217 W. JONES ST. #3000A
RALEIGH, NC 27603

SURVEYED BY:
MATRIX EAST, PLLC.
906 N. QUEEN ST., SUITE A
KINSTON, NC 28501

DMS PROJECT #: 100022
CONTRACT #: 7186
USACE ACTION ID #: SAW-2017-01506
RFP #: 16-006993

PROJECT TOPOGRAPHY AND AS-BUILT PLANIMETRICS SURVEY WAS PROVIDED BY MATRIX EAST, PLLC. (NC FIRM LICENSE NUMBER P-0221, JAMES R. WATSON, NC PLS L-4712), DATED APRIL 29, 2020

res
3600 Glenwood Ave, Suite 100
Raleigh, NC 27612
Main: 919.829.9909
www.res.us

Engineering Services Provided By:
Angler Environmental LLC
License: F-1428

SEAL

REVISIONS:

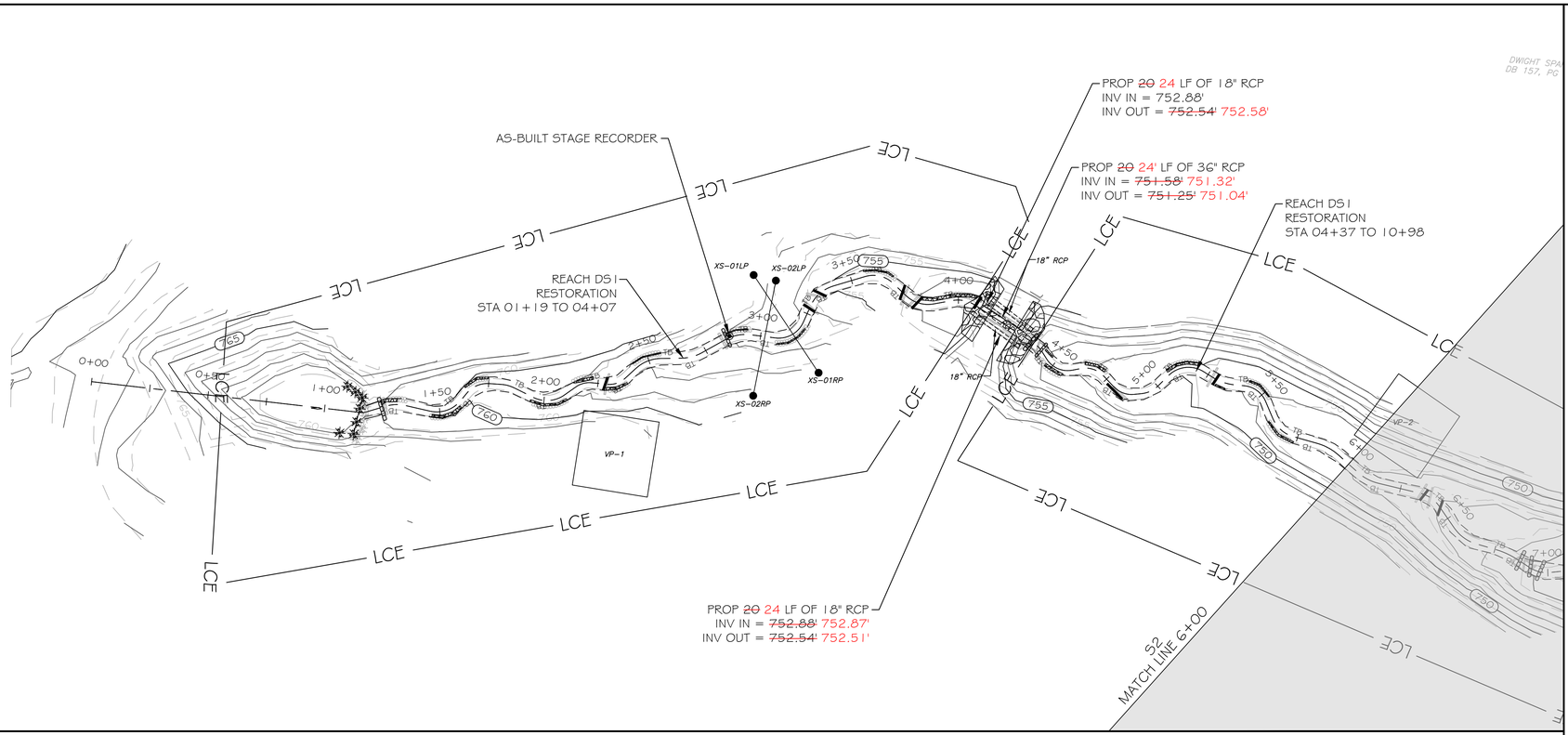
RELEASED FOR:
RECORD DRAWINGS

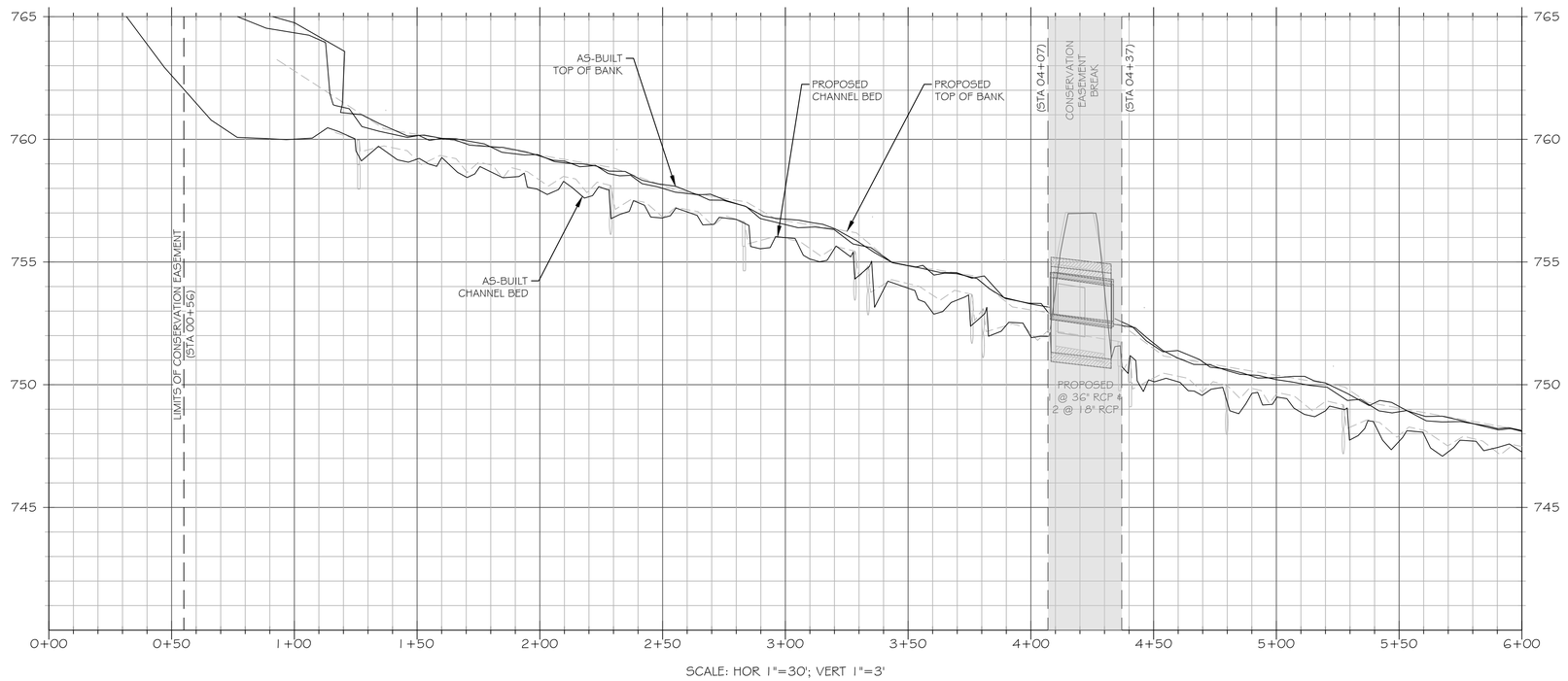
PLOT DATE:
4/30/2020

PROJECT NUMBER:	0386
PROJECT MANAGER:	BPB
DESIGNED:	BRC
DRAWN:	TRS
CHECKED:	AFM

SHEET NUMBER:

-





SCALE: HOR 1"=30'; VERT 1"=3'

LEGEND

- EXISTING WETLAND
- EXISTING OVERHEAD ELECTRIC UTILITY LINE (OHE Ø)
- PROPERTY LINE
- PROPOSED CONTOUR MAJOR (50)
- PROPOSED CONTOUR MINOR
- PROPOSED TOP OF BANK
- PROPOSED CHANNEL CENTERLINE
- AS-BUILT CONTOUR MAJOR (50)
- AS-BUILT CONTOUR MINOR
- AS-BUILT TOP OF BANK (TB)
- AS-BUILT CHANNEL CENTERLINE
- BRUSH TOE PROTECTION
- LOG SILL
- LOG VANE
- ROCK SILL
- STEP POOL
- RIFFLE GRADE CONTROL
- SEDIMENT TRAP
- AS-BUILT BRUSH TOE
- AS-BUILT LOG STRUCTURE
- AS-BUILT ROCK STRUCTURE
- AS-BUILT RIFFLE GRADE CONTROL
- AS-BUILT SEDIMENT TRAP
- AS-BUILT CROSS-SECTION
- AS-BUILT STAGE RECORDER
- AS-BUILT FLOW GAUGE
- AS-BUILT VEGETATION MONITORING PLOT (VP-#)
- LIMITS OF PROPOSED CONSERVATION EASEMENT (LCE)

NOTE: ALL SIGNIFICANT CHANGES FROM THE DESIGN ARE SHOWN IN RED

res
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Raleigh, NC 27612
Main: 919.829.9909
www.res.us

Engineering Services Provided By:
Angler Environmental, LLC
License: F-1428

SEAL

NORTH CAROLINA PROFESSIONAL SEAL 042580 ENGINEER BENTON R. CARROLL

FULL SCALE: 1"=30

0 30 60

2" = FULL SCALE
1" = HALF SCALE

PLOT DATE: 7/1/2020

REVISIONS:

RELEASED FOR: RECORD DRAWINGS

PROJECT NAME: CATBIRD RECORD DRAWINGS
DAVIE COUNTY, NORTH CAROLINA

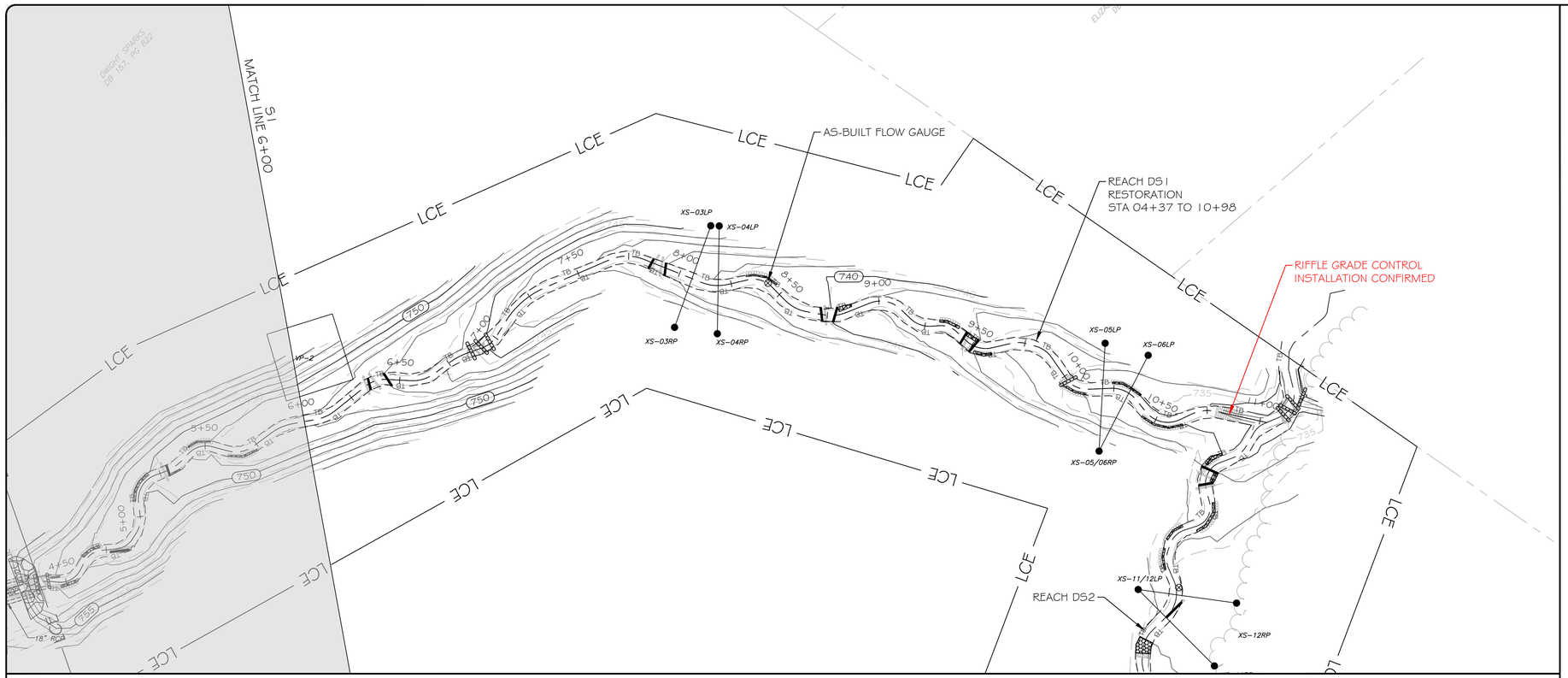
DRAWING TITLE: REACH DS1

PROJECT NUMBER:	0386
PROJECT MANAGER:	BPB
DESIGNED:	BRC
DRAWN:	TRS
CHECKED:	AFM

SHEET NUMBER:

S1

FILE NAME:R:\Regis\dropboxgis\projects\NC\Catbird\CAD\ABRL\0386_ABRL_DS1.dwg SAVED BY: Staaking



SCALE: HOR 1"=30'; VERT 1"=3'

LEGEND

- EXISTING WETLAND
- EXISTING OVERHEAD ELECTRIC UTILITY LINE (OHE Ø)
- PROPERTY LINE
- PROPOSED CONTOUR MAJOR (50)
- PROPOSED CONTOUR MINOR
- PROPOSED TOP OF BANK
- PROPOSED CHANNEL CENTERLINE
- AS-BUILT CONTOUR MAJOR (50)
- AS-BUILT CONTOUR MINOR
- AS-BUILT TOP OF BANK (TB)
- AS-BUILT CHANNEL CENTERLINE
- BRUSH TOE PROTECTION
- LOG SILL
- LOG VANE
- ROCK SILL
- STEP POOL
- RIFFLE GRADE CONTROL
- SEDIMENT TRAP
- AS-BUILT BRUSH TOE
- AS-BUILT LOG STRUCTURE
- AS-BUILT ROCK STRUCTURE
- AS-BUILT RIFFLE GRADE CONTROL
- AS-BUILT SEDIMENT TRAP
- AS-BUILT CROSS-SECTION
- AS-BUILT STAGE RECORDER
- AS-BUILT FLOW GAUGE
- AS-BUILT VEGETATION MONITORING PLOT (VP-#)
- LIMITS OF PROPOSED CONSERVATION EASEMENT (LCE)

NOTE: ALL SIGNIFICANT CHANGES FROM THE DESIGN ARE SHOWN IN RED

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3600 Glenwood Ave, Suite 100
Raleigh, NC 27612
Main: 919.829.9909
www.res.us

Engineering Services Provided By:
Angler Environmental, LLC
License: F-1428

SEAL

NORTH CAROLINA PROFESSIONAL SEAL 042580 ENGINEER BENTON R. CARROLL

FULL SCALE: 1"=30

0 30 60

2" = FULL SCALE
1" = HALF SCALE

PLOT DATE: 7/1/2020

REVISIONS:

RELEASED FOR: RECORD DRAWINGS

PROJECT NAME:
CATBIRD RECORD DRAWINGS
DAVIE COUNTY, NORTH CAROLINA

DRAWING TITLE:
REACH DS1

PROJECT NUMBER:	0386
PROJECT MANAGER:	BPB
DESIGNED:	BRC
DRAWN:	TRS
CHECKED:	AFM

SHEET NUMBER:

S2

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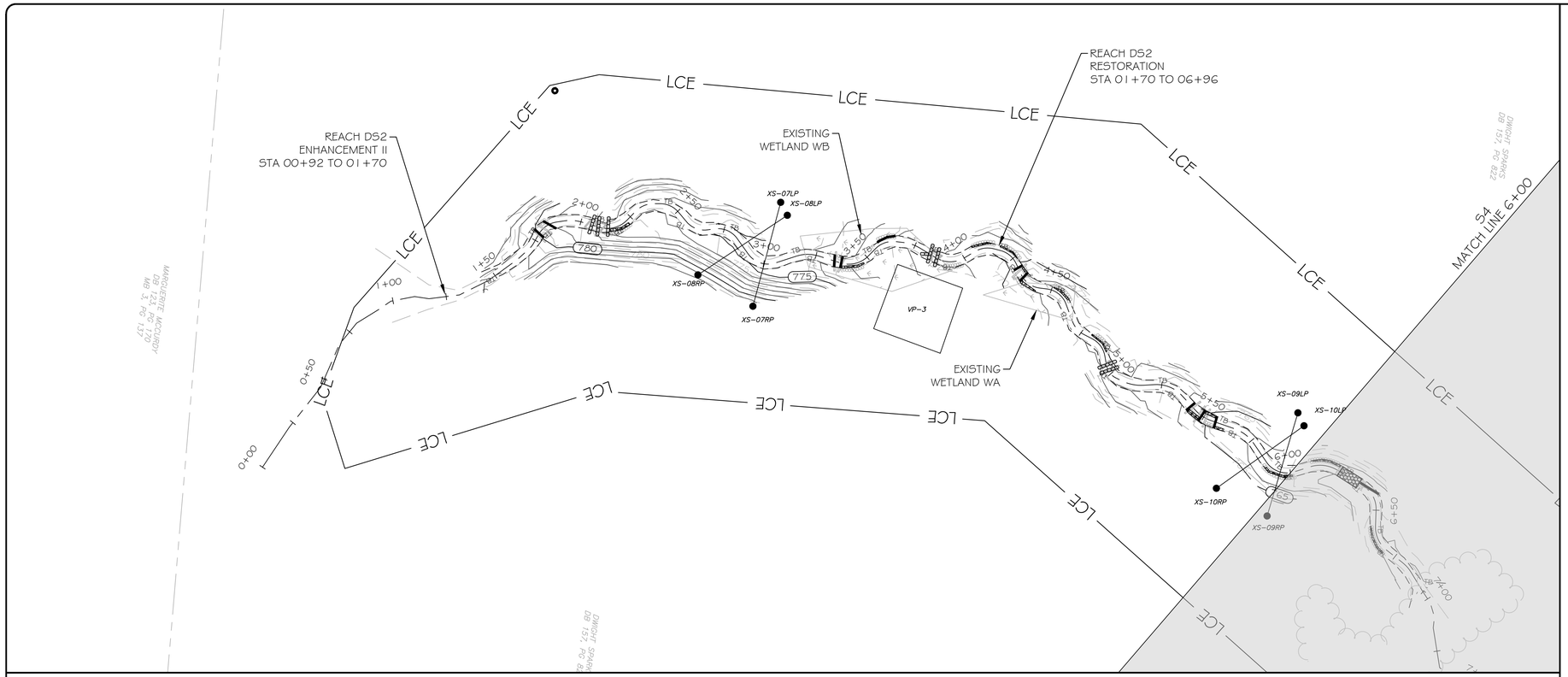

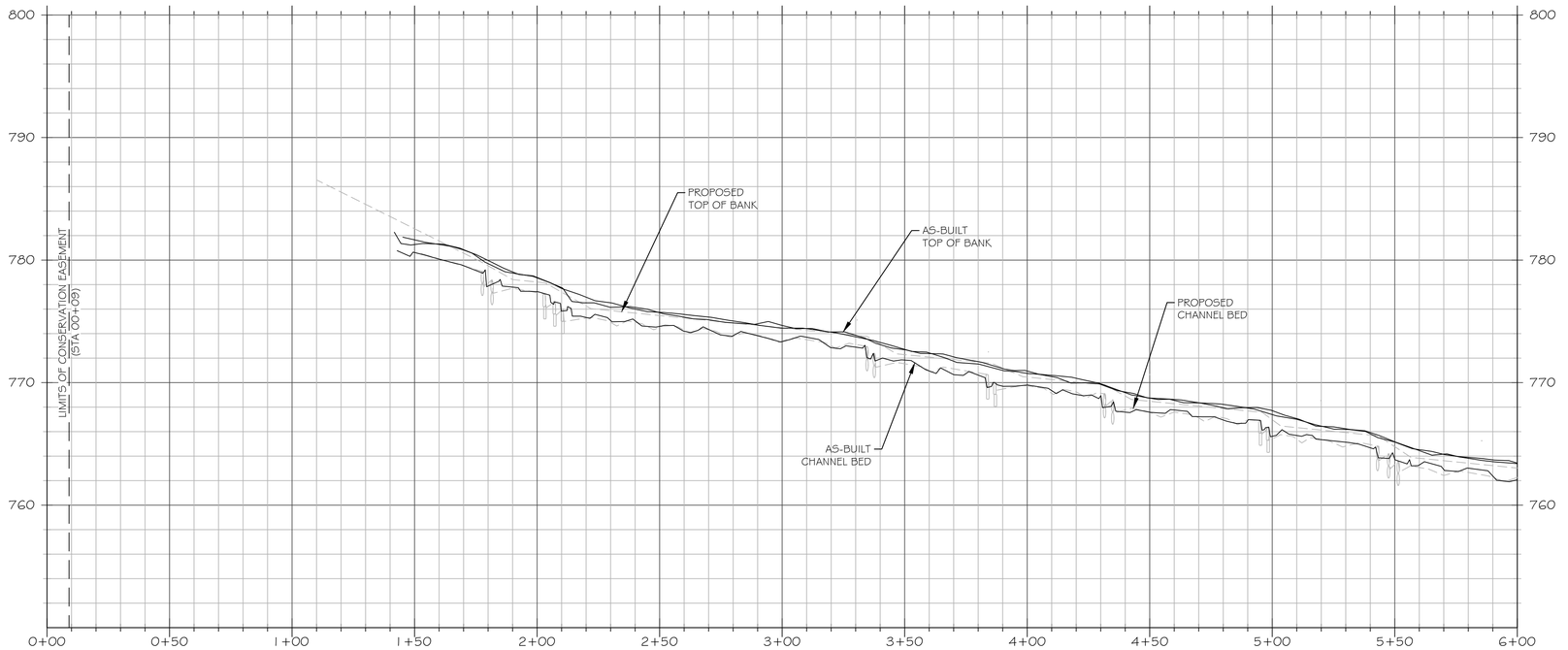

SCALE: HOR 1"=30'; VERT 1"=6'

LEGEND

- EXISTING WETLAND
- EXISTING OVERHEAD ELECTRIC UTILITY LINE (OHE Ø)
- PROPERTY LINE
- PROPOSED CONTOUR MAJOR (50)
- PROPOSED CONTOUR MINOR
- PROPOSED TOP OF BANK
- PROPOSED CHANNEL CENTERLINE
- AS-BUILT CONTOUR MAJOR (50)
- AS-BUILT CONTOUR MINOR
- AS-BUILT TOP OF BANK (TB)
- AS-BUILT CHANNEL CENTERLINE
- BRUSH TOE PROTECTION
- LOG SILL
- LOG VANE
- ROCK SILL
- STEP POOL
- RIFFLE GRADE CONTROL
- SEDIMENT TRAP
- AS-BUILT BRUSH TOE
- AS-BUILT LOG STRUCTURE
- AS-BUILT ROCK STRUCTURE
- AS-BUILT RIFFLE GRADE CONTROL
- AS-BUILT SEDIMENT TRAP
- AS-BUILT CROSS-SECTION
- AS-BUILT STAGE RECORDER
- AS-BUILT FLOW GAUGE
- AS-BUILT VEGETATION MONITORING PLOT (VP-#)
- LIMITS OF PROPOSED CONSERVATION EASEMENT (LCE)

NOTE: ALL SIGNIFICANT CHANGES FROM THE DESIGN ARE SHOWN IN RED

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www.res.us

Engineering Services Provided By:
Angler Environmental, LLC
License: F-1428

SEAL

NORTH CAROLINA PROFESSIONAL SEAL 042580 ENGINEER BENTON R. CARROLL

FULL SCALE: 1"=30

0 30 60

2" = FULL SCALE
1" = HALF SCALE

PLOT DATE: 7/1/2020

REVISIONS:

RELEASED FOR: RECORD DRAWINGS

PROJECT NAME:
CATBIRD RECORD DRAWINGS
DAVIE COUNTY, NORTH CAROLINA

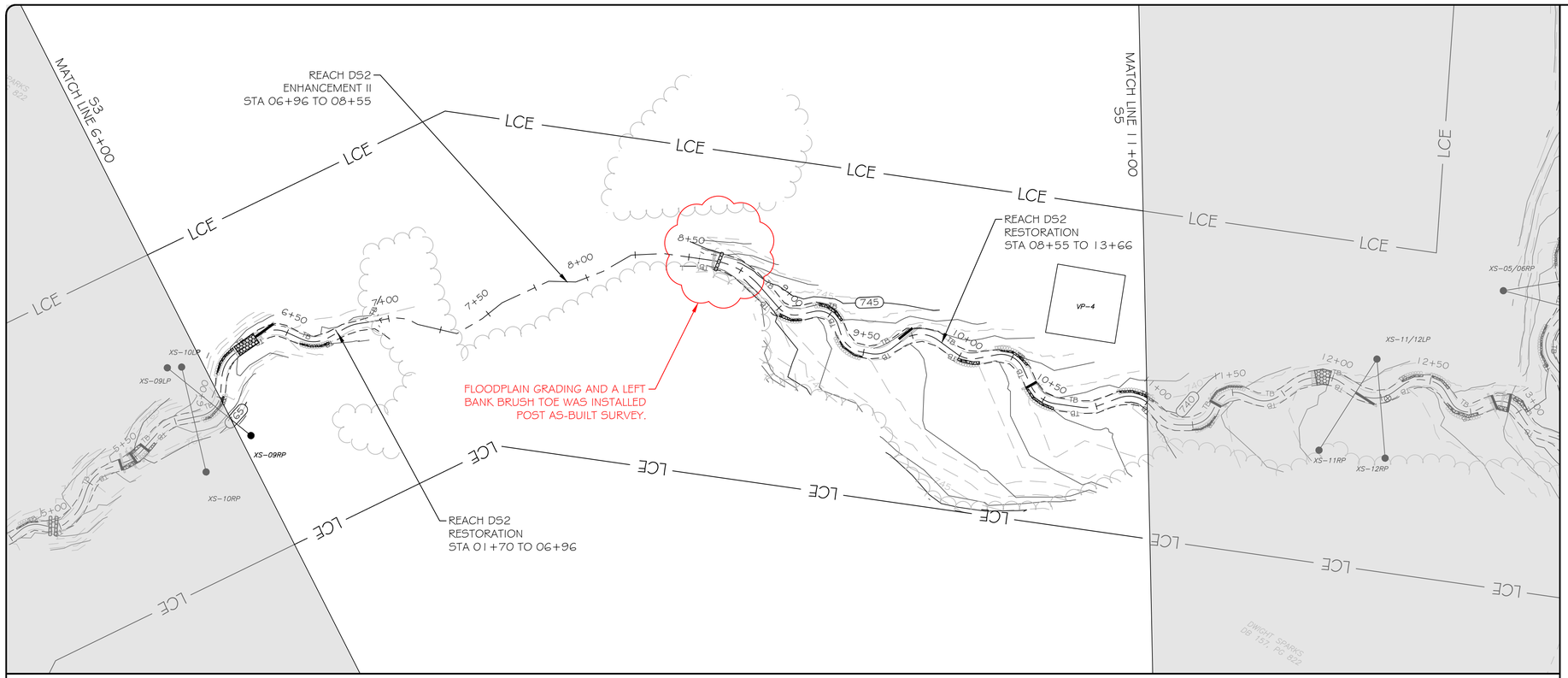
DRAWING TITLE:
REACH DS2

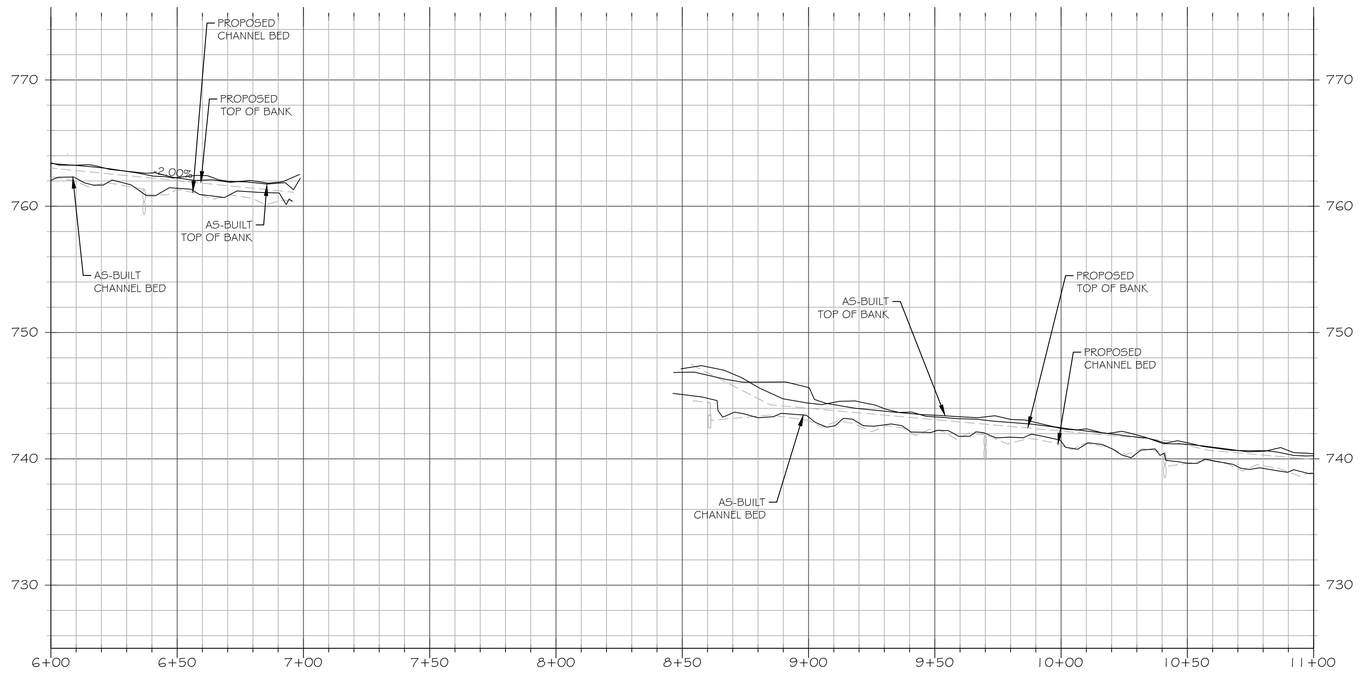
PROJECT NUMBER:	0386
PROJECT MANAGER:	BPB
DESIGNED:	BRC
DRAWN:	TRS
CHECKED:	AFM

SHEET NUMBER:

S3

FILE NAME:R:\Regis\dropboxgis\projects\NC\Catbird\CAD\ABRL\0386_ABRL_DS2.dwg SAVED BY: Stasking





SCALE: HOR 1"=30'; VERT 1"=6'

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SEAL

NORTH CAROLINA PROFESSIONAL SEAL 042580 ENGINEER BENTON R. CARROLL

FULL SCALE: 1"=30

0 30 60

2" = FULL SCALE
1" = HALF SCALE

PLOT DATE: 7/1/2020

REVISIONS:

RELEASED FOR: RECORD DRAWINGS

PROJECT NAME: CATBIRD RECORD DRAWINGS
DAVIE COUNTY, NORTH CAROLINA

DRAWING TITLE: REACH DS2

PROJECT NUMBER:	0386
PROJECT MANAGER:	BPB
DESIGNED:	BRC
DRAWN:	TRS
CHECKED:	AFM

SHEET NUMBER: S4

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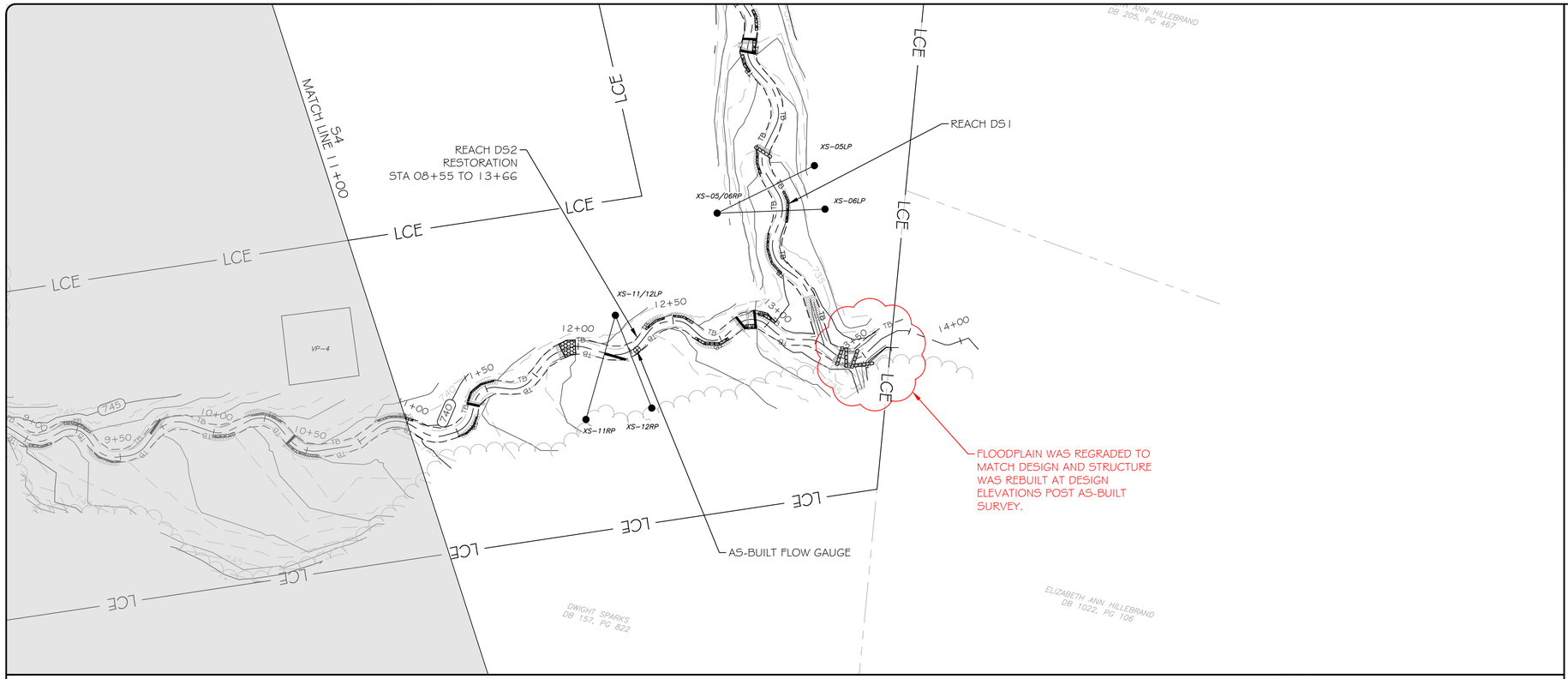

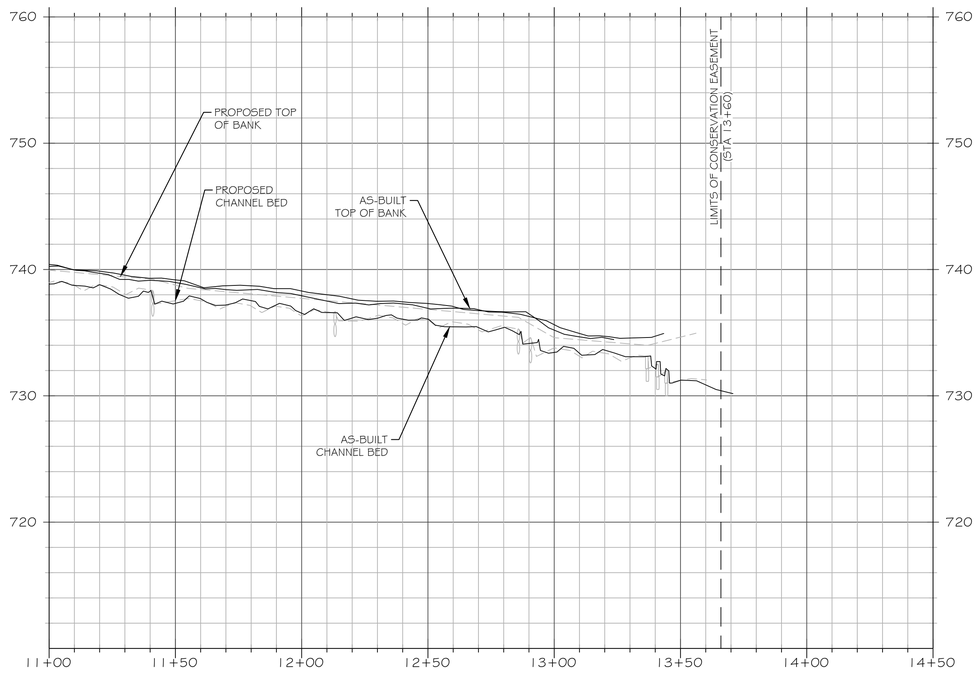

SCALE: HOR 1"=30'; VERT 1"=6'

LEGEND

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SEAL

NORTH CAROLINA PROFESSIONAL SEAL 042580 ENGINEER BENTON R. CARROLL

FULL SCALE: 1"=30

0 30 60

2" = FULL SCALE
1" = HALF SCALE

PLOT DATE: 7/1/2020

REVISIONS:

RELEASED FOR: RECORD DRAWINGS

PROJECT NAME: CATBIRD RECORD DRAWINGS
DAVIE COUNTY, NORTH CAROLINA

DRAWING TITLE: REACH DS2

PROJECT NUMBER:	0386
PROJECT MANAGER:	BPB
DESIGNED:	BRC
DRAWN:	TRS
CHECKED:	AFM

SHEET NUMBER:

S5

FILE NAME:R:\Regis\dropboxgis\projects\NC\Catbird\CAD\ABRL\0386_ABRL_DS2.dwg SAVED BY: Stasking

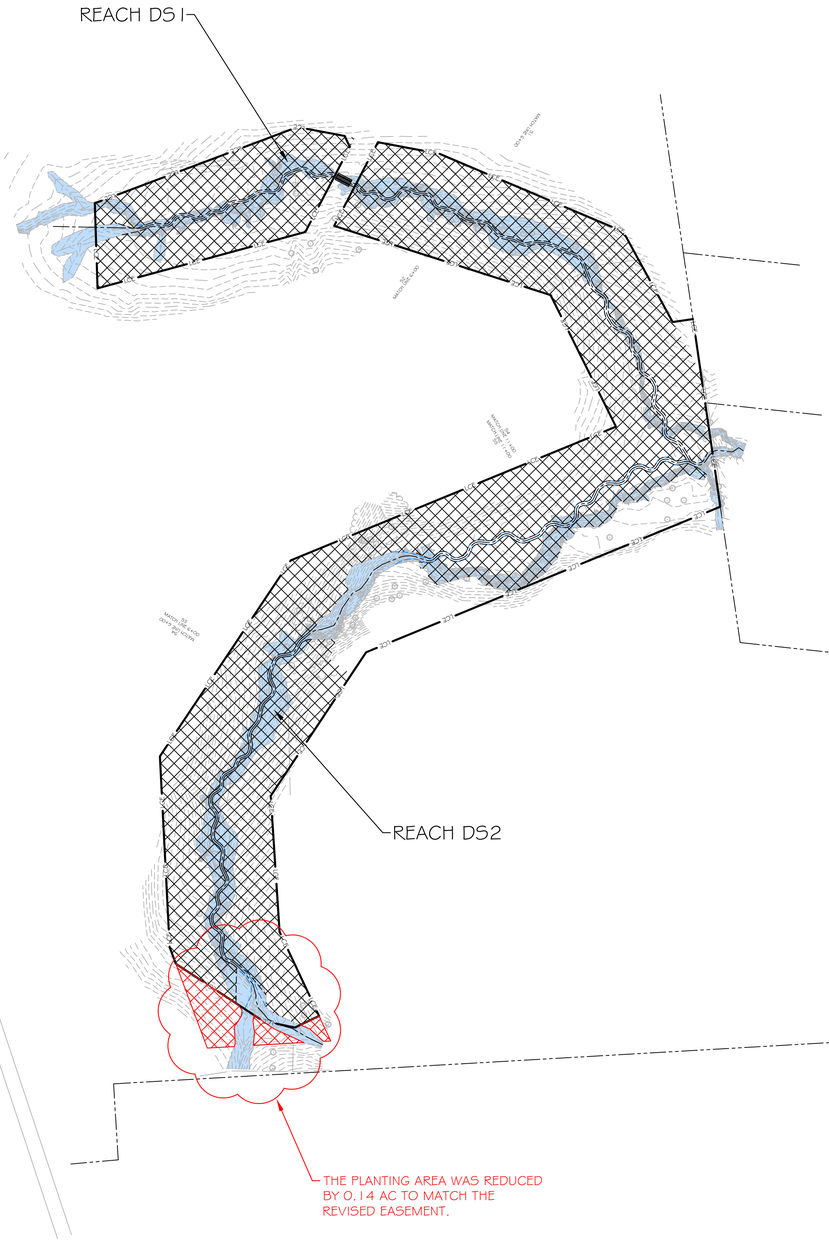
PLANTING LEGEND

LIMITS OF CONSERVATION EASEMENT — LCE

EXISTING TREELINE

PROPERTY LINE

RIPARIAN PLANTING (TOTAL AREA: ~~5.4~~ AC) 5.26



PLANTING TABLE

Permanent Riparian Seed Mix		
Common Name	Scientific Name	Percent Composition
Virginia Wildrye	*Elymus virginicus*	25%
Indian Grass	*Sorghastrum nutans*	25%
Little Blue Stem	*Schizachyrnum scoparium*	10%
Soft Rush	*Juncus effusus*	10%
Blackeyed susan	*Rudbeckia hirta*	10%
Deertongue	*Dichanthelium clandestinum*	10%
Common Milkweed	*Asclepias syriaca*	5%
Showy Goldenrod	*Solidago erecta*	5%

Live Staking and Live Cuttings Bundle Tree Species		
Common Name	Scientific Name	Percent Composition
Silky dogwood	*Cornus amomum*	40%
Black willow	*Salix nigra*	60%

Bare Root Planting Tree Species		
Common Name	Scientific Name	Percent Composition
Water Oak	*Quercus nigra*	~~15%~~ 9%
Willow Oak	*Quercus phellos*	~~15%~~ 9%
River Birch	*Betula nigra*	~~15%~~ 9%
American Sycamore	*Platanus occidentalis*	~~15%~~ 9%
Northern Red Oak	*Quercus rubra*	~~10%~~ 7%
Green Ash	*Fraxinus pennsylvanica*	~~10%~~ 7%
Yellow Poplar	*Linodendron tulipifera*	~~10%~~ 7%
Persimmon	*Diospyros virginiana*	~~5%~~ 13%
~~Black Gum~~	~~*Nyssa biflora*~~	~~5%~~
Crab Apple	*Malus angustifolia*	9%
Silky Dogwood	*Cornus amomum*	5%
Sugar Berry	*Celtis laevigata*	4%
Black Walnut	*Juglans nigra*	4%
Elderberry	*Sambucus canadensis*	4%
Eastern Redbud	*Cercis canadensis*	4%

PLANTING NOTES

ALL PLANTING AREAS

1. EROSION CONTROL MEASURES SHALL BE PROPERLY MAINTAINED UNTIL PERMANENT VEGETATION IS ESTABLISHED AND FINAL APPROVAL HAS BEEN ISSUED. THE CONTRACTOR SHALL INSPECT EROSION CONTROL MEASURES AT THE END OF EACH WORKING DAY TO ENSURE MEASURES ARE FUNCTIONING PROPERLY.
2. DISTURBED AREAS NOT AT FINAL GRADE SHALL BE TEMPORARILY VEGETATED WITHIN 10 WORKING DAYS. UPON COMPLETION OF FINAL GRADING, PERMANENT VEGETATION SHALL BE ESTABLISHED FOR ALL DISTURBED AREAS WITHIN 10 WORKING DAYS. SEEDING SHALL BE IN ACCORDANCE WITH EROSION CONTROL PLAN.
3. ALL DISTURBED AREAS SHALL BE PREPARED PRIOR TO PLANTING BY DISC OR SPRING-TOOTH CHISEL PLOW TO MINIMUM DEPTH OF 12 INCHES. MULTIPLE PASSES SHALL BE MADE ACROSS PLANTING AREAS WITH THE IMPLEMENT AND THE FINAL PASS SHALL FOLLOW TOPOGRAPHIC CONTOURS.
4. BARE ROOT PLANTINGS SHALL BE PLANTED ACCORDING TO DETAIL SHOWN ON SHEET D2. LIVE STAKES SHALL BE PLANTED ACCORDING TO DETAIL SHOWN ON SHEET D2.
5. TREATMENT/REMOVAL OF INVASIVE SPECIES, PINES AND SWEET GUMS LESS THAN 6" DBH SHALL BE PERFORMED THROUGHOUT THE PLANTED AREA.
6. SPECIES SHALL BE DISTRIBUTED SUCH THAT 3 TO 6 PLANTS OF THE SAME SPECIES ARE GROUPED TOGETHER.
7. BARE ROOT PLANTING DENSITY IS APPROXIMATELY 800 STEMS PER ACRE.
8. LIVE STAKES ARE PROPOSED ALONG THE OUTSIDE OF MEANDER BENDS AND ALONG BOTH BANKS OF STRAIGHT REACHES ADJACENT TO POOLS.
9. TEMPORARY SEED MIX SHALL BE APPLIED AT A RATE OF 150 LBS/ACRE TO ALL DISTURBED AREAS WITH SLOPES EQUAL TO OR STEEPER THAN 3:1.
10. PERMANENT RIPARIAN SEED MIX SHALL BE APPLIED TO ALL DISTURBED AREAS WITHIN THE CONSERVATION EASEMENT AT A RATE OF 15 LBS/ACRE.
11. PERMANENT HERB SEED MIX SHALL BE APPLIED TO ALL DISTURBED AREAS WITHIN THE CONSERVATION EASEMENT BREAKS AT A RATE OF 15 LBS/ACRE.
12. BARE ROOT SPECIES AND PERCENT COMPOSITION MAY BE ADJUSTED DUE TO COMMERCIAL AVAILABILITY PER APPROVAL FROM THE ENGINEER. REPLACEMENT SPECIES MUST NOT INCLUDE HACKBERRY (*Celtis occidentalis*) OR SUGARBERRY (*Celtis laevigata*).

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SEAL

NORTH CAROLINA PROFESSIONAL SEAL 042580 ENGINEER BENJAMIN R. CARROLL 7/10/2020

FULL SCALE: 1"=100

0 100 200

2" = FULL SCALE
1" = HALF SCALE

PLOT DATE: 07/10/2020

MARK	DATE	DESCRIPTION
REVISIONS:		
RELEASED FOR:		
RECORD DRAWINGS		

PROJECT NAME:
CATBIRD RECORD DRAWINGS
DAVIE COUNTY, NORTH CAROLINA

DRAWING TITLE:
PLANTING PLAN

PROJECT NUMBER:	0386
PROJECT MANAGER:	BPB
DESIGNED:	BRC
DRAWN:	TRS
CHECKED:	AFM

SHEET NUMBER:

P1

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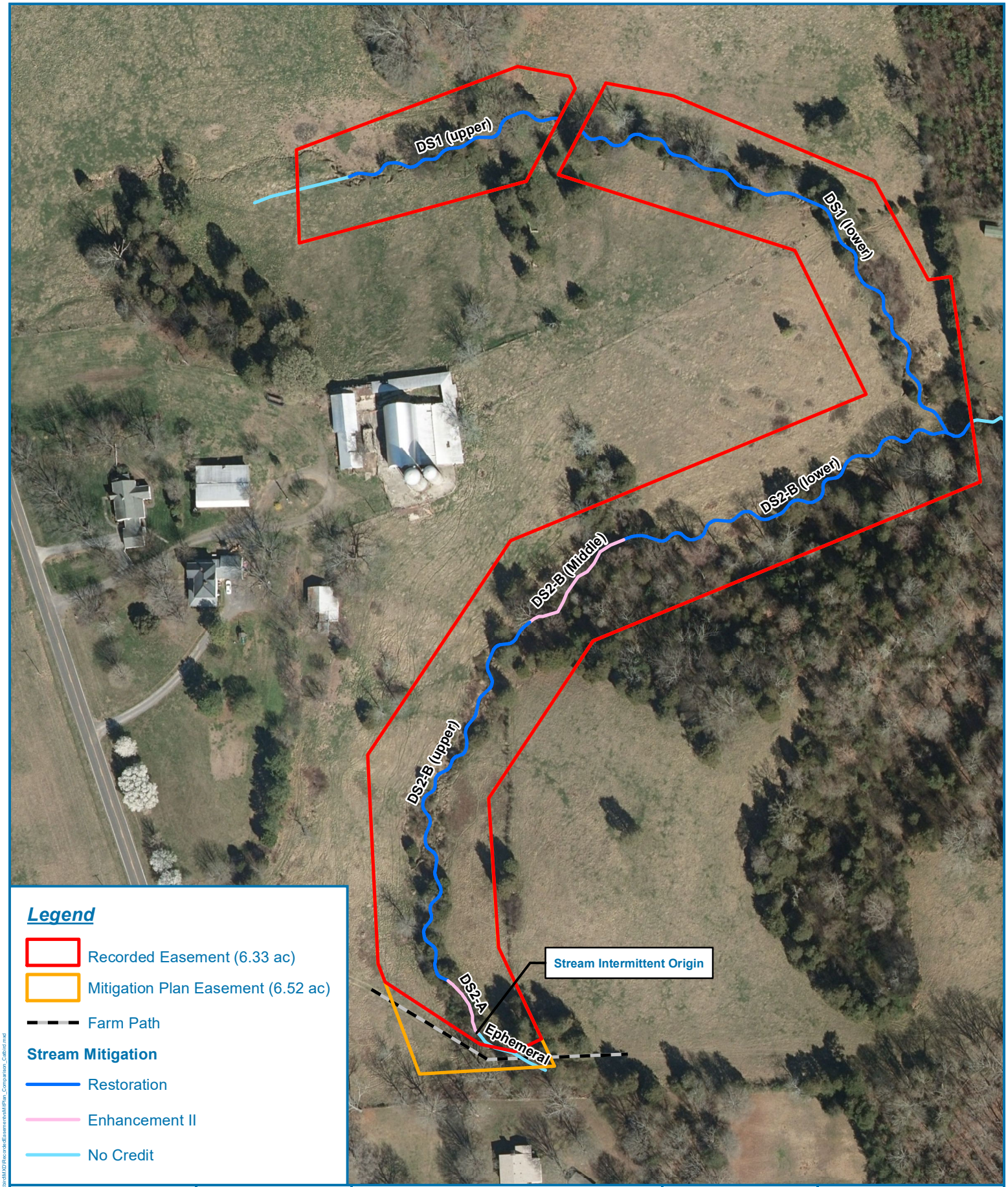
Appendix F

Easement Comparison Map

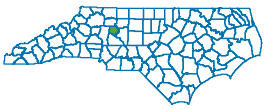


Legend

- Recorded Easement (6.33 ac)
- Mitigation Plan Easement (6.52 ac)
- Farm Path

Stream Mitigation

- Restoration
- Enhancement II
- No Credit



N
W E
S
0 75 150
Feet

Easement Comparison Map

Catbird Mitigation Site

Davie County, North Carolina

Date: 7/10/2020

Drawn by: RTM

Checked by: BPB

1 inch = 150 feet

res

Document Path: R:\resgis\dms\projects\NC\Catbird\MXD\RecordedEasementsMitPlan_Comparison_Catbird.mxd