MONITORING YEAR 1 ANNUAL REPORT
FINAL

January 2023

CARPENTER BOTTOM MITIGATION SITE
Gaston County, NC
Catawba River Basin
HUC 03050102
(03050103 Expanded Service Area)

DMS Project No. 100090
NC DEQ Contract No. 7731
DMS RFQ No. 16-007133-CT03
Date of Issue: April 24, 2017
USACE Action ID No. SAW-2018-02062
DWR Project No. 2019-0049
Data Collection Dates: March – November 2022

PREPARED FOR:

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January 27, 2023

Mr. Matthew Reid
Project Manager
NCDEQ – Division of Mitigation Services
5 Ravenscroft Drive, Suite 102
Asheville, NC 28801

RE: Carpenter Bottom Draft MY0 Report Review
Catawba River Basin - HUC 03050102 (03050103 Expanded Service Area)
Gaston County
DMS Project ID No. 100090
Contract #7731

Dear Mr. Reid:

Wildlands Engineering, Inc. (Wildlands) has reviewed the Division of Mitigation Services (DMS) comments from the Draft Year 1 Monitoring Report for the Carpenter Bottom Mitigation Site that were received on January 3, 2023. The report has been updated to reflect those comments. The Final MY1 Report is included. DMS' comments are listed below in **bold**. Wildlands' responses to DMS' comments are noted in *italics*.

DMS' Comment: Title Page: HUC is incorrectly shown on draft. Please update to how it is shown on the Mitigation Plan and MY0 final reports:
HUC 03050102
(03050103 Expanded Service Area)

Wildlands' response: The HUC was updated to correctly match the mitigation plan and MY0 final reports.

DMS' Comment: In an effort to identify and resolve property issues, please verify the conservation easement has been inspected, marking is up to date, fencing is intact, and no encroachments have been identified.

Wildlands' response: A site walk was conducted in November to identify any easement and/or encroachments issues. No issues were found, and all easement signs/markings are intact.

DMS' Comment: Please change RFP to RFQ. This projected was a small needs contract and not contracted under the Full Delivery RFP method.

Wildlands' response: RFP was changed to RFQ throughout the report and appendices.

DMS' Comment: 2.5 Stream Hydrology Assessment: Recommend specifying CG5 when discussing the gage that was replaced on Carpenter Branch since two gages are installed on this reach.

Wildlands' response: CG5 is the correct crest gage that was replaced during MY1. This clarification has been updated in the report.

DMS' Comment: 2.5 Stream Hydrology Assessment: Consecutive number of baseflow days are included for Carpenter Branch R1 and UT3. Recommend including the baseflow consecutive days when discussing UT1 and UT2 (3 and 21 respectively).

Wildlands' response: The consecutive number of days of baseflow of 3 days for UT1 (SG2) and 21 days for UT2 (SG3) has been included in Section 2.5.

DMS' Comment: If available, can WEI include photos of the three Stream Gauges and one Crest Gauge in the gage photograph section? Three days of consecutive flow for UT1 is concerning and questions regarding the location and installation of the gages may be alleviated by including pictures.

Wildlands' response: A photolog with the stream and crest gages has been included in Appendix A. Individual photos of the gages has also been added to the digital submittal data.

DMS' Comment: 2.6 Wetland Hydrology Assessment: Section states that GWG 6, 8 and 9 failed to meet success criteria with a range of 8-14 consecutive days. Groundwater gage plots show 14, 8 and 15 days respectively. Please review and revise as necessary.

Wildlands' response: The number of consecutive days meeting the success criteria for GWG 6, 8, and 9 has been updated to correctly reflect groundwater gage plot data.

Digital Deliverable Comments

The submission is missing the following required component. Please submit with the final deliverables.

- **Vegetation plot data**
- **Visual vegetation table and spatial file for the invasive areas of concern identified in the table in the report.**
- **All photo points included in the report.**

Wildlands' response: The vegetation plot data, the visual vegetation data and spatial file for the invasive areas of concern, and all photo points are included in the report.

As requested, Wildlands has included two (2) hard copies of the final report and a full final electronic submittal of the support files on USB. A copy of our responses to the DMS' comment letter has been included inside the cover of the report, as well. Please let me know if you have any questions.

Sincerely,

Kristi Suggs
Senior Environmental Scientist
ksuggs@wildlandseng.com

CARPENTER BOTTOM MITIGATION SITE

Monitoring Year 1 Annual Report

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Section 1: PROJECT OVERVIEW

The Carpenter Bottom Mitigation Site (Site) is located in Gaston County, NC approximately 4.1 miles south of the City of Lincolnton and just south of the Gaston County/Lincoln County border. The Site drains to Beaverdam Creek, which drains to the Catawba River. The Site is located within the South Fork Catawba River (High Shoals) WS-IV water supply watershed and is located just outside the Indian Creek Targeted Local Watershed (TLW). Table 3 presents information related to the project attributes.

1.1 Project Quantities and Credits

Mitigation work within the Site included the restoration and enhancement of perennial and intermittent stream channels and the rehabilitation and re-establishment of historically altered wetlands. Table 1 below shows stream and wetland credits by reach and the total amount of credits expected at closeout.

1.2 Project Goals and Objectives

The project is intended to provide numerous ecological benefits. Table 2 below describes expected outcomes to water quality and ecological processes and provides project goals and objectives.

1.3 Project Attributes

The project includes the headwaters of a tributary to Beaverdam Creek and occurs on adjacent properties that have a history of agricultural use. The Site has been ditched and maintained as an active cattle and hay pasture as far back as 1950; however, a small, forested area within the proposed wetland restoration area was allowed to reforest starting around 1973. In 2014, approximately 2.4 acres was deforested to provide additional pasture. Table 3 below and Table 8 in Appendix C present additional information on pre-restoration conditions.

Table 1. Mitigation Assets and Components

Carpenter Bottom Mitigation Site
DMS Project No. 100090
Monitoring Year 1 - 2022

PROJECT MITIGATION QUANTITIES										
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**
Stream										
Carpenter Branch - Reach 1	2,564	2,249.689	Warm	R	P1, P2	1.0	2,249.689		2,243.000	Full channel restoration, riparian planting, livestock exclusion, invasive species treatment, permanent conservation easement; culvert crossing
Carpenter Branch - Reach 2		353.080	Warm	EIII	--	8.0	44.135		353.000	Invasive species treatment, permanent conservation easement
Carpenter Branch - Reach 2 - No Credit		124.000	--	--	--	0.0	0.000		124.000	Invasive species treatment, permanent conservation easement
UT1	123	174.819	Warm	R	P1, P2	1.0	174.819		175.000	Full channel restoration, stormwater BMP implementation, riparian planting, livestock exclusion, permanent conservation easement
UT2	245	178.196	Warm	R	P1	1.0	178.196		178.000	Full channel restoration, riparian planting, invasive species treatment, livestock exclusion, permanent conservation easement
UT3	387	384.661	Warm	R	P1	1.0	384.661		385.000	Full channel restoration, riparian planting, livestock exclusion, invasive species treatment, permanent conservation easement
UT4	50	36.349	Warm	R	P1	1.0	36.349		36.000	Daylighting stream and restoration of natural channel fetaures, riparian planting, permanent conservation easement
Wetland										
Wetland Re-establishment	0.000	5.714	RR	RE	--	1.0	5.714		5.714	Re-establish hydrology via the plugging/filling of drainage features, wetland planting, invasive species treatment, livestock exclusion, permanent conservation easement
Wetland Rehabilitation	4.130	3.947	RR	RH	--	1.5	2.631		3.947	Improve hydrology via the plugging/filling of drainage features, wetland planting, invasive species treatment, livestock exclusion, permanent conservation easement

Restoration Level	**Stream**			**Riparian Wetland**	**Non-rip Wetland**	**Coastal Marsh**
	Warm	**Cool**	**Cold**			
Restoration	3,023.714					
Enhancement III	44.135					
Re-esablishment				5.714		
Rehabilitation				2.631		
Totals	**3,067.849**			**8.345**		

Table 2a: Goals, Performance Criteria, and Functional Improvements

Carpenter Bottom Mitigation Site
DMS Project No. 100090
Monitoring Year 1 - 2022

Goal	Objective/ Treatment	Likely Functional Uplift	Performance Criteria	Measurement	Cumulative Monitoring Results
Exclude livestock from stream channels and wetlands.	Decommission pastures on Site and exclude livestock via the removal from stream channels, wetlands, and riparian areas.	Reduce direct fecal coliform and nutrient inputs to the Site streams. Reduce sediment inputs from bank erosion. Reduce shear stress on channel boundary. Eliminate cattle trampling of wetlands.	There is no required performance standard for this metric.	Visual annual assessments.	No cattle within easement
Improve the stability of stream channels.	Reconstruct stream channels with stable dimension, pattern, and profile. Reconnect streams to existing floodplain. Add bank revetments and in-stream structures to protect restored streams.	Reduce sediment inputs from bank erosion. Reduce shear stress on channel boundary. Increase floodplain engagement.	ER stays over 2.2 and BHR below 1.2 with visual assessments showing progression towards stability.	Cross-section monitoring (8 riffles & 6 pools) will be conducted during MY1, MY2, MY3, MY5 & MY7. 12 reference photo points were established throughout the Site. Upstream and downstream photos will be taken at each point on an annual basis during visual site inspections.	Streams and structures are stable. In MY1, Ers are >2.2, and BHRs are between 0.9-1.0.
Improve instream habitat.	Install habitat features such as constructed steps, constructed riffles, and brush toe on restored reaches. Add woody materials to channel beds. Construct pools of varying depth.	Increase and diversify available habitats for macroinvertebrates, fish, and amphibians. Promote aquatic species migration and recolonization and increase in biodiversity over time. Add complexity including LWD to the streams.	There is no required performance standard for this metric.	Visual annual assessments.	N/A

Table 2b: Goals, Performance Criteria, and Functional Improvements

Carpenter Bottom Mitigation Site
DMS Project No. 100090
Monitoring Year 1 - 2022

Goal	Objective/ Treatment	Likely Functional Uplift	Performance Criteria	Measurement	Cumulative Monitoring Results
Reconnect channels with floodplains and to allow a natural flooding regime.	Reconstruct stream channels with designed bankfull dimensions and depth based on reference reach data.	Allow more frequent flood flows to disperse on the floodplain.	Four bankfull events on restored channels in separate years within monitoring period. At least 30 consecutive days of flow for Carpenter Branch R1, UT1, UT2, and UT3.	Five automated transducers were installed throughout the Site. One transducer (SG1) will be recording days of consecutive stream flow. Another (CG5) will be recording bankfull events. The remaining three (SG2, SG3, & SG4) will be recording consecutive days of stream flow and bankfull events.	Bankfull events (MY1): UT1 and UT2 recorded at least 1 bankfull event; Carpenter Branch and UT3 did not record a bankfull event. Flow criteria (MY1): Carpenter Branch and UT3 met the criteria; UT1 and UT2 did not meet criteria.
Restore wetland function and hydrology.	Restore wetlands through re-establishment of hydrology. Remove the drainage effects of agricultural ditching and maintenance.	Raise water table and hydrate riparian wetlands.	Free groundwater surface within 12 inches of the ground surface for a minimum of 12% (30 consecutive days) of the growing season for Gaston County.	11 groundwater gages were installed in wetland re-establishment and rehabilitation areas and will be monitored annually.	In MY1, 8 of the 11 gages met the criteria (1-5, 7, 10, 11); 3 gages did not meet criteria (6, 8, 9)
Restore and enhance native floodplain and wetland vegetation.	Plant native tree, shrub, and understory species in riparian and proposed wetland restoration zones.	Reduce sediment inputs from bank erosion and runoff. Increase nutrient cycling and storage in floodplain. Provide riparian and wetland habitat. Add a source of LWD and organic material to Site streams. Support all stream functions.	Survival rate of 320 stems per acre at MY3, 260 planted stems per acre at MY5, and 210 stems per acre at MY7. 7 feet average height at MY5, and 10 feet at MY7.	9 permanent and 4 mobile 100 square meter vegetation plots were installed within 2% of the open planted areas and will be assessed in MY1, MY2, MY3, MY5 and MY7. Shaded planted areas will be visually assessed.	Vegetation plots meeting criteria: MY0 - 13/13 plots MY1 - 13/13 plots (stem density of 364-567 stems per acre)
Permanently protect the project site from harmful uses.	Establish conservation easements on the Site.	Protect Site from encroachment on the riparian corridor and direct impact to streams and wetlands. Support all stream functions.	Prevent easement encroachment.	Visually inspect the perimeter of the Site to ensure no easement encroachment is occurring.	No easement encroachments.

Table 3a: Project Attributes

Carpenter Bottom Mitigation Site
DMS Project No. 100090
Monitoring Year 1 - 2022

PROJECT INFORMATION			
Project Name	Carpenter Bottom Mitigation Site	County	Gaston County
Project Area (acres)	18.0	Project Coordinates	35.410725, -81.260717
PROJECT WATERSHED SUMMARY INFORMATION			
Physiographic Province	Piedmont	River Basin	Catawba River
USGS HUC 8-digit[1]	03050102	USGS HUC 14-digit	03050102050020
DWR Sub-basin	03-08-35	Land Use Classification	43% forest, 43% agricultural row crops and hay, 8% grassland/herbaceous, <1% shrubland, 5% urban, <1% impervious
Project Drainage Area (acres)	180	Percentage of Impervious Area	0.65%

RESTORATION TRIBUTARY SUMMARY INFORMATION						
Parameters	**Carpenter Branch - Reach 1**	**Carpenter Branch - Reach 2**	**UT1**	**UT2**	**UT3**	**UT4**
Pre-project length (feet)	2,087	477	123	245	387	50
Post-project (feet)	2,243	353	175	178	385	36
Valley confinement (Confined, moderately confined, unconfined)	Moderately confined	Confined	Confined	Moderately confined	Moderately confined	Confined
Drainage area (acres)	48 / 180		20	39	17	23
Perennial, Intermittent, Ephemeral	I / P	P	I	P	I	P
DWR Water Quality Classification	WS-IV	WS-IV	WS-IV	WS-IV	WS-IV	WS-IV
Dominant Stream Classification (existing)[2]	G4	--	G4/5	G4/5	G4/5	--
Dominant Stream Classification (proposed)[2]	C4	--	C4	C4	C4b	C4
Dominant Evolutionary class (Simon) if applicable	III / IV	V	III	III	III	I

REGULATORY CONSIDERATIONS			
Parameters	**Applicable?**	**Resolved?**	**Supporting Documentation**
Water of the United States - Section 404	Yes	Yes	USACE Action ID No. SAW-2018-02062
Water of the United States - Section 401	Yes	Yes	DWR # 2019-0049
Endangered Species Act	Yes	Yes	Categorical Exclusion in Mitigation Plan (Wildlands, 2020)
Historic Preservation Act	Yes	Yes	
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

1 - Expanded Service Area 03050103

2 - The Rosgen classification system (Rosgen, 1994) and Simon Channel Evolution Model (Simon, 1989) are for natural streams. These channels have been heavily manipulated by man and therefore may not fit the classification category or channel evolution as described by these models. Results of the classification and model are provided for illustrative purposes only.

Table 3b: Project Attributes

Carpenter Bottom Mitigation Site
DMS Project No. 100090
Monitoring Year 1 - 2022

WETLAND SUMMARY INFORMATION							
Parameters	**Wetland A**	**Wetland B**	**Wetland C**	**Wetland D**	**Wetland E**	**Wetland F**	**Wetland G**
Size of Wetland (acres)	0.07	0.01	0.01	0.01	<0.01	0.07	<0.01
Wetland Type (non-riparian, riparian riverine, or riparian non-riverine)	Riparian Riverine						
Mapped Soil Series	Pacolet	Worsham	Pacolet	Pacolet	Worsham	Worsham	Worsham
Drainage Class	Well drained	Poorly drained	Well drained	Well drained	Poorly drained	Poorly drained	Poorly drained
Soil Hydric Status (field/mapping)	No	Yes	No	No	Yes	Yes	Yes
Souce of Hydrology	Groundwater & overbank flooding	Groundwater & overbank flooding	Groundwater & overbank flooding	Groundwater	Groundwater & overbank flooding	Groundwater & overbank flooding	Groundwater & overbank flooding
Restoration or enhancement method (hydrologic, vegetative, etc.)	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Parameters	**Wetland H**	**Wetland I**	**Wetland J**	**Wetland K**	**Wetland L**	**Wetland M**	**Wetland N**
Size of Wetland (acres)	0.39	0.36	0.01	<0.01	0.02	1.02	2.35
Wetland Type (non-riparian, riparian riverine, or riparian non-riverine)	Riparian Riverine						
Mapped Soil Series	Worsham	Worsham/ Winnsboro	Worsham/ Winnsboro	Winnsboro	Winnsboro	Worsham	Worsham
Drainage Class	Poorly drained	Poorly drained/Well drained	Poorly drained/Well drained	Well drained	Well drained	Poorly drained	Poorly drained
Soil Hydric Status (field/mapping)	Yes	Yes/No	Yes/No	No	No	Yes	Yes
Souce of Hydrology	Groundwater	Groundwater	Groundwater & overbank flooding	Groundwater & overbank flooding	Groundwater	Groundwater	Groundwater
Restoration or enhancement method (hydrologic, vegetative, etc.)	Hydrologic, Vegetative	Hydrologic, Vegetative	N/A	N/A	N/A	Hydrologic, Vegetative	Hydrologic, Vegetative

Section 2: Monitoring Year 1 Data Assessment

Annual monitoring and site visits were conducted during Monitoring Year 1 (MY1) to assess the condition of the project. The vegetation, stream, and hydrologic success criteria for the Site follow the approved success criteria presented in the Mitigation Plan (Wildlands, 2020), the performance criteria are located in Section 1.2 Tables 3a-b: Goals, Performance Criteria, and Functional Improvements. Methodology for annual monitoring is presented in the MY0 Annual Report (Wildlands, 2022).

2.1 Vegetative Assessment

The MY1 vegetative survey was completed in August 2022. Vegetation monitoring resulted in a stem density range of 364 to 567 planted stems per acre. All thirteen vegetation plots are meeting the interim requirement of 320 stems per acre required at MY3. The locations of the mobile plots did not change from MY0 to better capture the survival rate of the planted stems. Beginning in MY2, the four mobile plots will move to a new location every year to capture a random sampling of the Site; some of these plots will be relocated to capture portions of the wetland rehabilitation areas, as requested by the NC Interagency Review Team (IRT) as part of their comments from the MY0 Baseline Report (Appendix F). Herbaceous vegetation is also abundant across the Site and includes native pollinator species indicating a healthy riparian habitat. The riparian habitat is helping to reduce nutrient runoff from the agricultural fields outside the easement and stabilize the stream banks. Refer to Appendix A for Vegetation Plot Photographs and the Vegetation Condition Assessment Table and Appendix B for Vegetation Plot Data.

2.2 Vegetation Areas of Concern and Management Activities

The MY1 assessment indicated that the surviving stems are at a density above the MY3 interim criteria. The visual assessment across the Site found that the herbaceous cover is also well established throughout the floodplain. A Site walk was conducted in November 2022 to assess the easement boundary. No issues of encroachment were found, and all easement signs/markings were intact.

Hardy orange (*Citrus trifoliata*) and Chinese privet (*Ligustrum sinense*) were treated prior to completion of the project. There are some small areas of resprouts that will continue to be monitored. There is one area of *C. trifoliata* in the northwest portion of the project that is 0.16 acres in size; at 1% of the Site's acreage, it is only a minor concern. Nevertheless, hardy orange and Chinese privet were treated in July and November 2022. Depending on the treatment's effectiveness, additional chemical treatments may be needed in the following years. Small areas of in-stream vegetation (*Ludwigia palustris* and *Murdannia keisak*) were also treated in July of 2022. Ninety-nine percent of the Site is free of invasive species and shows strong vegetative growth. Wildlands will continue to monitor for the reemergence of any invasive populations which threaten the success of the project.

2.3 Stream Assessment

Morphological surveys for MY1 were conducted in August of 2022. All streams within the Site are stable and functioning as designed. All 14 cross-sections at the Site show little to no change in the bankfull areas and the width-to-depth ratios, entrenchment ratios (ERs), and the bank height ratios (BHRs) are less than 1.2. As discussed in the MY0 report (Wildlands, 2022), pebble count data is no longer required; therefore, it is not included in this report. Refer to Appendix A for the Visual Stream Morphology Stability Assessment Table and Stream Photographs and Appendix C for Stream Geomorphology Data.

2.4 Stream Areas of Concern

A site assessment last conducted in November 2022 found that there were no stream areas of concern across the project. The banks all appear stable and are well covered by newly established vegetation.

2.5 Stream Hydrology Assessment

In MY1, bankfull events were recorded on UT1 and UT2. Carpenter Branch and UT3 did not record a bankfull event and there were no visual indicators of bankfull events occurring on these reaches. The automated crest gage (CG #5) on Carpenter Branch was replaced in May 2022. The new probe is working, and data was successfully downloaded in September 2022. While only two channels had a bankfull event in MY1, it is expected that the hydrologic success criteria for bankfull events will be met for all streams.

In addition, the presence of baseflow must be documented on intermittent or low flow reaches (Carpenter Branch Reach 1, UT1, UT2, and UT3) for a minimum of 30 consecutive days during a normal precipitation year. Carpenter Branch Reach 1 and UT3 maintained baseflow for 103 and 100 consecutive days, respectively; however, UT1 and UT2 did not meet the minimum requirement in MY1 with 3 and 21 days, respectively. It is expected that baseflow duration will increase as rainfall restores groundwater levels.

The stream gage on UT1 showed several water level spikes from January 12-31, 2022. These readings do not appear to correspond with rainfall events, but there is a correlation between the spikes and freezing temperatures. Wildlands previously contacted In-Situ on 11/18/2021 to confirm the findings. Based on the discussion with In-situ, it is likely that these are the result of ice forming on the probes leading the false pressure readings during these times (Haynes 2021). Therefore, the spikes during these times are not counted towards a bankfull event. The stream gages' calibrations were checked in November 2022 and were functioning correctly.

The NC IRT expressed concern in the MY0 report comments (Appendix F) about whether the riffles were constructed too high to allow the streams to function. However, riffle height is not a concern. The photo point log shows water in most of Carpenter Branch. Water staining on the riffle material is evident as you move downstream. Standing water is shown in the November photos of UT3 and it met the 30-day consecutive flow criteria for an intermittent channel. While UT1 and UT2 were dry during the summer and did not meet the flow criteria for the year, it is expected that they will recharge with the winter rains as the groundwater level rises. This is supported by the stream and gage photos, PP9A and PP10 and SG2 and SG3 respectively, which were retaken in November and show more water in the channel. Photologs are included Appendix A, and hydrology data is presented in Appendix D.

2.6 Wetland Hydrology Assessment

Eleven groundwater gages (GWG) were initially installed during baseline monitoring to record the groundwater level across the Site. Out of the eleven gages, eight met the success criteria in MY1 (GWG1, 2, 3, 4, 5, 7, 10, and 11) for 34-59 consecutive days of the growing season. Three gages (GWG 6, 8, and 9) did not meet the success criteria this year with 14, 8, and 15 consecutive days of the growing season, respectively. It is expected that all gages will be meeting the criteria over time as groundwater continues to recharge across the site. Annual inspections of the bentonite seals around the groundwater gages are a regular part of Wildlands' protocol; bentonite was added in 2022 to the seals around GWG 6, 10, and 11, and is visible in the groundwater gage photolog. Refer to Appendix D Table 12 for the wetland hydrology data.

The NC IRT expressed concern in the MY0 report comments that the floodplain pools are too deep to dry seasonally and will prevent herbaceous and woody vegetation establishment (Appendix F). The floodplain pools were designed with a maximum depth of 2.0 feet and were intended to draw down seasonally. When the site was assessed on September 1, 2022, floodplain pool 1 was greatly reduced in size and had only a small area of standing water approximately 0.5 feet deep, and the others were dry. All of the floodplain pools are covered with herbaceous vegetation; with an average width of

approximately 27-feet, they are small enough that the targeted forest community can easily provide a closed canopy over these areas. Additionally, floodplain pools 3 and 4 were delineated as Wetlands D and B, respectively, and were protected during construction; the vegetative and hydrologic conditions of these two pools should not pose a concern—even if they were to have some surface water—as their hydrologic functionality and their vegetation communities are assumed to be comparable to the existing conditions. Refer to the CCPV figures for the locations of the floodplain pools. A photo log is included in Appendix A to show the conditions of each of these pools, but because they do not pose a concern, the photo log will not be included in subsequent monitoring years.

2.7 Monitoring Year 1 Summary

All 13 vegetation plots are exceeding the MY3 interim requirement of 320 planted stems per acre. All streams across the Site are stable and the cross sections show little dimensional change since the as-built survey. UT1 and UT2 exhibited at least one bankfull event and are on track to meet the bankfull hydrologic criteria but did not meet the minimum baseflow criteria. However, UT3 and Carpenter Bottom Reach 1 met baseflow criteria in MY1, but neither experienced a bankfull event in MY1. Eight of the eleven groundwater gages met or exceeded the hydrologic success criteria for MY1. Invasive species were treated prior to construction of the project and will continue to be monitored as there are small patches of Chinese privet and hardy orange that have reappeared. Overall, the Site is on track to meet its goals and is preventing excess nutrients and sediment from entering the Catawba River tributaries.

Summary information and data related to the performance of various project and monitoring elements can be found in the tables and figures in the report appendices. All raw data supporting the tables and figures in the appendices are available from DMS upon request.

Section 3: REFERENCES

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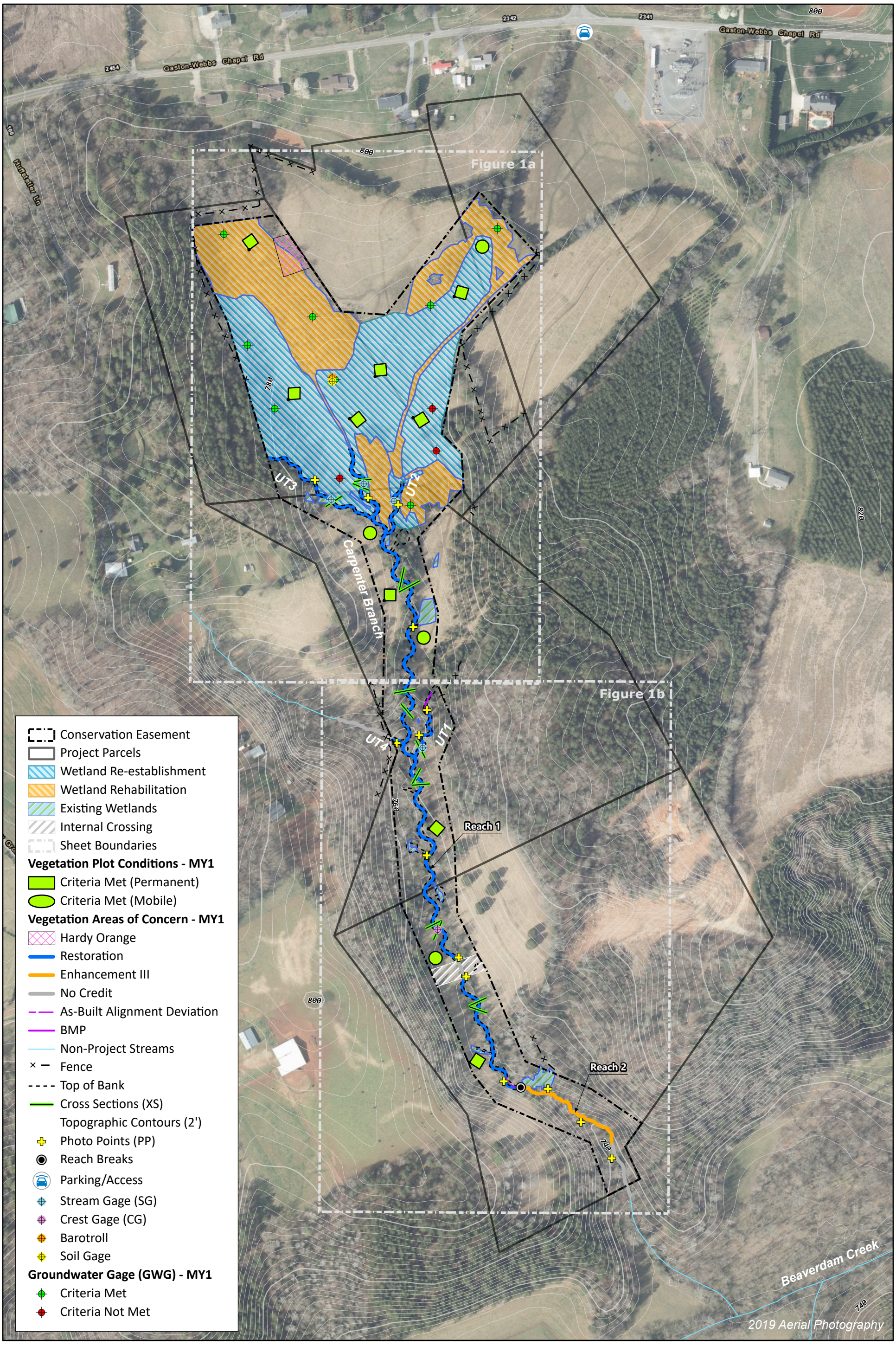
FIGURES



WILDLANDS ENGINEERING

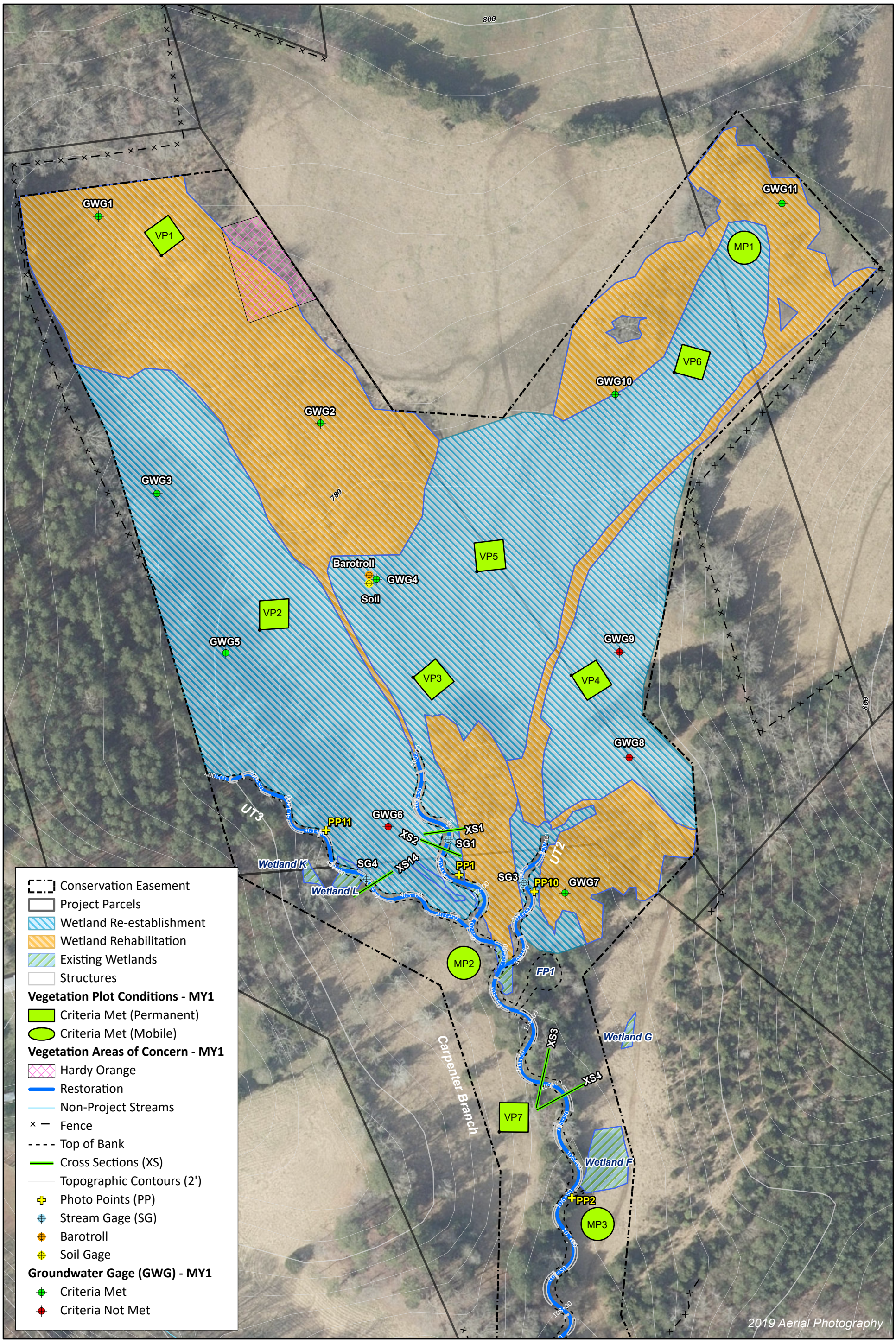
Environmental Quality

0 250 500 Feet

N

Figure 1. Current Condition Plan View (Key)
Carpenter Bottom Mitigation Site
DMS Project No. 100090
Monitoring Year 1 - 2022

Gaston County, NC



WILDLANDS ENGINEERING

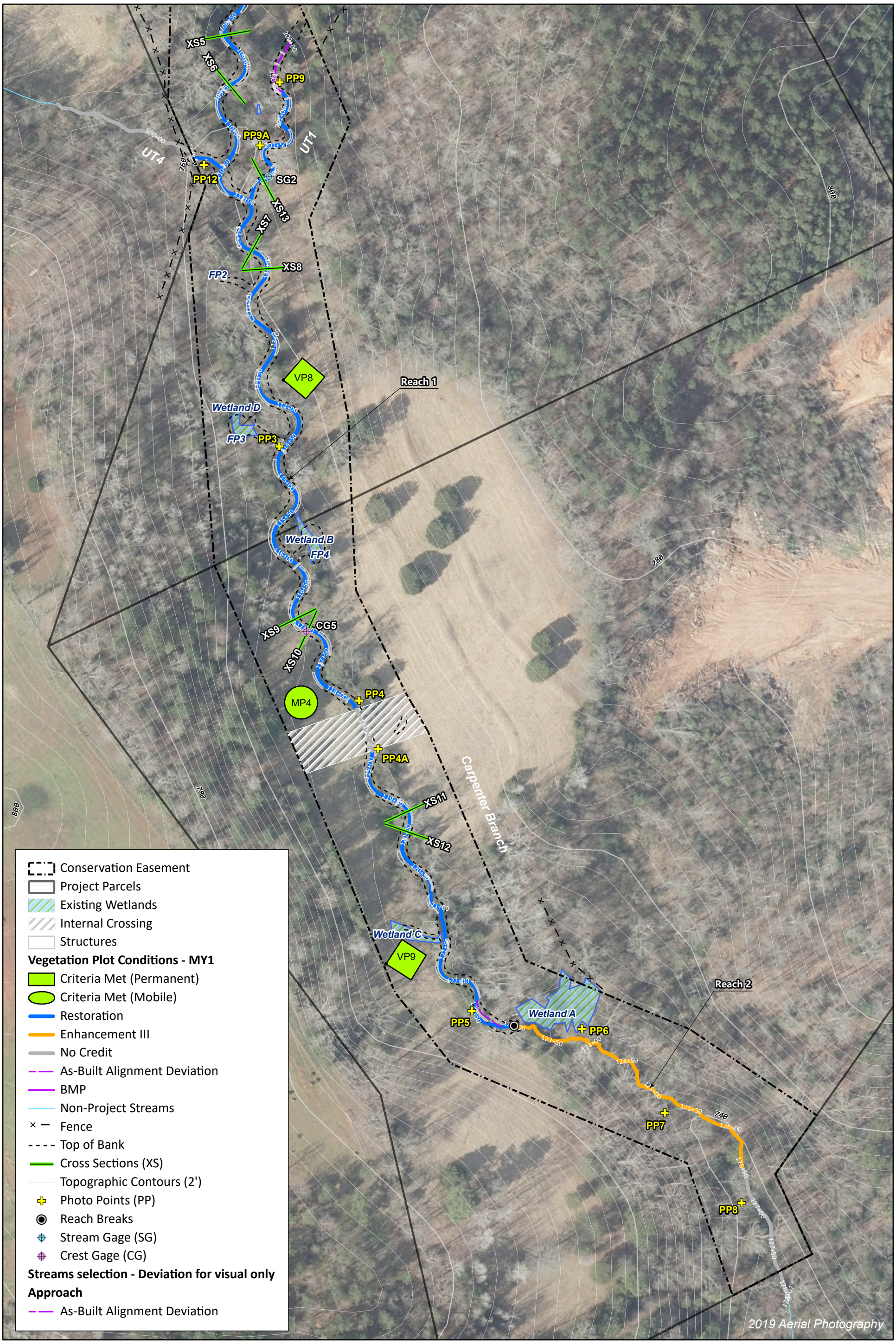
Environmental Quality

0 100 200 Feet

N

Figure 1a. Current Condition Plan View
Carpenter Bottom Mitigation Site
DMS Project No. 100090
Monitoring Year 1 - 2022

Gaston County, NC



WILDLANDS ENGINEERING

Environmental Quality

0 100 200 Feet

N

Figure 1b. Current Condition Plan View
Carpenter Bottom Mitigation Site
DMS Project No. 100090
Monitoring Year 1 - 2022

Gaston County, NC

APPENDIX A. Visual Assessment Data

Table 4a. Visual Stream Morphology Stability Assessment Table

Carpenter Bottom Mitigation Site
DMS Project No. 100090
Monitoring Year 1 - 2022

Carpenter Branch Reach 1 Date Last Assessed: 11/16/2022

Major Channel Category		Metric	Number Stable, Performing as Intended	Total Number in As-built	Amount of Unstable Footage	% Stable, Performing as Intended
					Assessed Stream Length	2,243
					Assessed Bank Length	4,486
Bank	Surface Scour/ Bare Bank	Bank lacking vegetative cover resulting simply from poor growth and/or surface scour.			0	100%
	Toe Erosion	Bank toe eroding to the extent that bank failure appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	100%
	Bank Failure	Fluvial and geotechnical - rotational, slumping, calving, or collapse.			0	100%
				Totals:	0	100%
Structure	Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	31	31		100%
	Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	45	45		100%

UT1 Date Last Assessed: 11/16/2022

Major Channel Category		Metric	Number Stable, Performing as Intended	Total Number in As-built	Amount of Unstable Footage	% Stable, Performing as Intended
					Assessed Stream Length	175
					Assessed Bank Length	350
Bank	Surface Scour/ Bare Bank	Bank lacking vegetative cover resulting simply from poor growth and/or surface scour.			0	100%
	Toe Erosion	Bank toe eroding to the extent that bank failure appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	100%
	Bank Failure	Fluvial and geotechnical - rotational, slumping, calving, or collapse.			0	100%
				Totals:	0	100%
Structure	Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	6	6		100%
	Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	6	6		100%

Table 4b. Visual Stream Morphology Stability Assessment Table

Carpenter Bottom Mitigation Site

DMS Project No. 100090

Monitoring Year 1 - 2022

UT2 Date Last Assessed: 11/16/2022

Major Channel Category		Metric	Number Stable, Performing as Intended	Total Number in As-built	Amount of Unstable Footage	% Stable, Performing as Intended
					Assessed Stream Length	178
					Assessed Bank Length	356
Bank	**Surface Scour/ Bare Bank**	Bank lacking vegetative cover resulting simply from poor growth and/or surface scour.			0	100%
	Toe Erosion	Bank toe eroding to the extent that bank failure appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	100%
	Bank Failure	Fluvial and geotechnical - rotational, slumping, calving, or collapse.			0	100%
				Totals:	**0**	**100%**
Structure	**Grade Control**	Grade control structures exhibiting maintenance of grade across the sill.	4	4		100%
	Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	5	5		100%

UT3 Date Last Assessed: 11/16/2022

Major Channel Category		Metric	Number Stable, Performing as Intended	Total Number in As-built	Amount of Unstable Footage	% Stable, Performing as Intended
					Assessed Stream Length	385
					Assessed Bank Length	770
Bank	**Surface Scour/ Bare Bank**	Bank lacking vegetative cover resulting simply from poor growth and/or surface scour.			0	100%
	Toe Erosion	Bank toe eroding to the extent that bank failure appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	100%
	Bank Failure	Fluvial and geotechnical - rotational, slumping, calving, or collapse.			0	100%
				Totals:	**0**	**100%**
Structure	**Grade Control**	Grade control structures exhibiting maintenance of grade across the sill.	9	9		100%
	Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	12	12		100%

Table 4c. Visual Stream Morphology Stability Assessment Table

Carpenter Bottom Mitigation Site
DMS Project No. 100090
Monitoring Year 1 - 2022

UT3 Date Last Assessed: 11/16/2022

Major Channel Category		Metric	Number Stable, Performing as Intended	Total Number in As-built	Amount of Unstable Footage	% Stable, Performing as Intended
					Assessed Stream Length	36
					Assessed Bank Length	72
Bank	**Surface Scour/ Bare Bank**	Bank lacking vegetative cover resulting simply from poor growth and/or surface scour.			0	100%
	Toe Erosion	Bank toe eroding to the extent that bank failure appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	100%
	Bank Failure	Fluvial and geotechnical - rotational, slumping, calving, or collapse.			0	100%
				Totals:	**0**	**100%**
Structure	**Grade Control**	Grade control structures exhibiting maintenance of grade across the sill.	1	1		100%
	Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	0	0		N/A

Table 5. Vegetation Condition Assessment Table
Carpenter Bottom Mitigation Site
DMS Project No. 100090
Monitoring Year 1 - 2022

Date Last Assessed: 11/16/2022
Planted Acreage **15.94**

Vegetation Category	Definitions	Mapping Threshold (ac)	Combined Acreage	% of Planted Acreage
Bare Areas	Very limited cover of both woody and herbaceous material.	0.10	0	0%
Low Stem Density Areas	Woody stem densities clearly below target levels based on current MY stem count criteria.	0.10	0	0%
		Total	**0**	**0%**
Areas of Poor Growth Rates	Planted areas where average height is not meeting current MY Performance Standard.	0.10	0	0%
		Cumulative Total	**0.0**	**0%**

Easement Acreage **18.00**

Vegetation Category	Definitions	Mapping Threshold (ac)	Combined Acreage	% of Easement Acreage
Invasive Areas of Concern	Invasives may occur outside of planted areas and within the easement and will therefore be calculated against the total easement acreage. Include species with the potential to directly outcompete native, young, woody stems in the short-term or community structure for existing communities. Invasive species included in summation above should be identified in report summary.	0.10	0.16	1%
Easement Encroachment Areas	Encroachment may be point, line, or polygon. Encroachment to be mapped consists of any violation of restrictions specified in the conservation easement. Common encroachments are mowing, cattle access, vehicular access. Encroachment has no threshold value as will need to be addressed regardless of impact area.	none	0 Encroachments Noted / 0 ac	

STREAM PHOTOGRAPHS

	
PHOTO POINT 1 - Carpenter Bottom R1 - upstream (11/16/2022)	**PHOTO POINT 1** - Carpenter Bottom R1 - downstream (11/16/2022)
	
PHOTO POINT 2 - Carpenter Bottom R1 - upstream (11/16/2022)	**PHOTO POINT 2** - Carpenter Bottom R1 - downstream (11/16/2022)
	
PHOTO POINT 3 - Carpenter Bottom R1 - upstream (11/16/2022)	**PHOTO POINT 3** - Carpenter Bottom R1 - downstream (11/16/2022)

PHOTO POINT 3 - Carpenter Bottom R1 - Floodplain Pool (8/31/2022)

PHOTO POINT 4 - Carpenter Bottom R1 - upstream (8/31/2022)

PHOTO POINT 4 - Carpenter Bottom R1 - downstream (8/31/2022)

PHOTO POINT 4A - Carpenter Bottom R1 - upstream (8/31/2022)

PHOTO POINT 4A - Carpenter Bottom R1 - downstream (8/31/2022)

	
PHOTO POINT 5 - Carpenter Bottom R1 - upstream (8/31/2022)	**PHOTO POINT 5 -** Carpenter Bottom R1 - downstream (8/31/2022)
	
PHOTO POINT 6 - Carpenter Bottom R1 - upstream (8/31/2022)	**PHOTO POINT 6** - Carpenter Bottom R1 - downstream (8/31/2022)
	
PHOTO POINT 7 - Carpenter Bottom R1 - upstream (8/31/2022)	**PHOTO POINT 7** - Carpenter Bottom R1 - downstream (8/31/2022)

	
PHOTO POINT 8 - Carpenter Bottom R1 - upstream (8/31/2022)	**PHOTO POINT 8** - Carpenter Bottom R1 - downstream (8/31/2022)
	
PHOTO POINT 9 - UT1 - upstream (8/31/2022)	**PHOTO POINT 9** - UT1 - downstream (8/31/2022)
	
PHOTO POINT 9A - UT1 - upstream (11/16/2022)	**PHOTO POINT 9A -** UT1 - downstream (11/16/2022)

	
PHOTO POINT 10 - UT2 - upstream (11/16/2022)	**PHOTO POINT 10 -** UT2 - downstream (11/16/2022)
	
PHOTO POINT 11 - UT3 - upstream (11/16/2022)	**PHOTO POINT 11 -** UT3 - downstream (11/16/2022)
	
PHOTO POINT 12 - UT4 - upstream (8/31/2022)	**PHOTO POINT 12** - UT4 - downstream - (8/31/2022)

VEGETATION PLOT PHOTOGRAPHS

	
PERMANENT VEG PLOT 1 (8/30/2022)	**PERMANENT VEG PLOT 2** (8/30/2022)
	
PERMANENT VEG PLOT 3 (8/30/2022)	**PERMANENT VEG PLOT 4** (8/30/2022)
	
PERMANENT VEG PLOT 5 (8/30/2022)	**PERMANENT VEG PLOT 6** (8/30/2022)

PERMANENT VEG PLOT 7 (8/30/2022)

PERMANENT VEG PLOT 8 (8/31/2022)

PERMANENT VEG PLOT 9 (8/31/2022)

MOBILE VEG PLOT 1 (8/30/2022)

MOBILE VEG PLOT 2 (8/30/2022)

	
MOBILE VEG PLOT 3 (8/30/2022)	**MOBILE VEG PLOT 4** (8/31/2022)

GROUNDWATER GAGE PHOTOGRAPHS

	
GROUNDWATER GAGE 1 (8/31/2022)	**GROUNDWATER GAGE 2** (8/30/2022)
	
GROUNDWATER GAGE 3 (8/31/2022)	**GROUNDWATER GAGE 4** (8/31/2022)
	
GROUNDWATER GAGE 5 (8/31/2022)	**GROUNDWATER GAGE 6** (8/31/2022)

GROUNDWATER GAGE 7 (8/30/2022)

GROUNDWATER GAGE 8 (8/30/2022)

GROUNDWATER GAGE 9 (8/30/2022)

GROUNDWATER GAGE 10 (8/31/2022)

GROUNDWATER GAGE 11 (8/31/2022)

FLOODPLAIN POOL PHOTOGRAPHS

	
FLOODPLAIN POOL 1 (FP1): **Maximum water depth:** 0.50 feet. (8/31/2022)	**FLOODPLAIN POOL 2 (FP2):** **Maximum water depth:** 0.00 feet (i.e., dry). (8/31/2022)
	
FLOODPLAIN POOL 3 (FP3): **Maximum water depth:** 0.00 feet (i.e., dry). (8/31/2022)	**FLOODPLAIN POOL 4 (FP4):** **Maximum water depth:** 0.00 feet (i.e., dry). (8/31/2022)

STREAM GAGE PHOTOGRAPHS

STREAM GAGE 1 (11/16/2022)

STREAM GAGE 2 (11/16/2022)

STREAM GAGE 3 (11/16/2022)

STREAM GAGE 4 (11/16/2022)

CREST GAGE 5 (8/29/2022)

APPENDIX B. Vegetation Plot Data

Table 6a. Vegetation Plot Data
Carpenter Bottom Mitigation Site
DMS Project No. 100090
Monitoring Year 1 - 2022

Planted Acreage	15.938
Date of Initial Plant	2022-02-02
Date(s) of Supplemental Plant(s)	NA
Date(s) Mowing	NA
Date of Current Survey	2022-08-31
Plot size (ACRES)	0.0247

	Scientific Name	Common Name	Tree/ Shrub	Indicator Status	Veg Plot 1 F		Veg Plot 2 F [4]		Veg Plot 3 F [5]		Veg Plot 4 F [4]		Veg Plot 5 F		Veg Plot 6 F		Veg Plot 7 F		Veg Plot 8 F		Veg Plot 9 F	
					Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total
Species Included in Approved Mitigation Plan	Acer negundo	boxelder	Tree	FAC	2	2							1	1			1	1	1	1	1	1
	Alnus serrulata	hazel alder	Tree	OBL	3	3											2	2				
	Amelanchier arborea	common serviceberry	Tree	FAC													2	2				
	Betula nigra	river birch	Tree	FACW			2	2	1	1	1	1	3	3	2	2	1	1				
	Celtis laevigata	sugarberry	Tree	FACW					1	1												
	Cephalanthus occidentalis	common buttonbush	Shrub	OBL	2	2									1	1						
	Cornus amomum	silky dogwood	Shrub	FACW													1	1				
	Diospyros virginiana	common persimmon	Tree	FAC																1	1	1
	Fagus grandifolia	American beech	Tree	FACU															2	2	2	2
	Lindera benzoin	northern spicebush	Tree	FAC											1	1	1	1				
	Liriodendron tulipifera	tuliptree	Tree	FACU													2	2	1	1		
	Nyssa sylvatica	blackgum	Tree	FAC			1	1							1	1						
	Platanus occidentalis	American sycamore	Tree	FACW	3	3	2	2	4	4	4	4	2	2	1	1	1	1	3	3	5	5
	Populus deltoides	eastern cottonwood	Tree	FAC													1	1	2	2	3	3
	Quercus michauxii	swamp chestnut oak	Tree	FACW	2	2	1	1	1	1	1	1	1	1	1	1						
	Quercus pagoda	cherrybark oak	Tree	FACW			4	4	2	2	3	3	1	1	1	1						
	Quercus phellos	willow oak	Tree	FAC					1	1			1	1			1	1	1	1		
	Sambucus canadensis	American black elderberry	Tree	FAC									1	1								
	Ulmus americana	American elm	Tree	FACW	1	1	1	1	2	2					6	6						
Sum	Performance Standard				13	13	11	11	12	12	9	9	10	10	14	14	13	13	10	11	12	12
Post Mitigation Plan Species	*Fraxinus pennsylvanica*	*green ash*	*Tree*	*FACW*								*1*										
Sum	Proposed Standard				13	13	11	11	12	12	9	9	10	10	14	14	13	13	10	11	12	12
Mitigation Plan Performance Standard	Current Year Stem Count					13		11		12		9		10		14		13		11		12
	Stems/Acre					526		445		486		364		405		567		526		445		486
	Species Count					6		6		7		4		7		8		10		7		5
	Dominant Species Composition (%)					23		36		33		40		30		43		15		27		42
	Average Plot Height (ft.)					2		2		2		2		2		2		2		2		3
	% Invasives					0		0		0		0		0		0		0		0		0
Post Mitigation Plan Performance Standard	Current Year Stem Count					13		11		12		9		10		14		13		11		12
	Stems/Acre					526		445		486		364		405		567		526		445		486
	Species Count					6		6		7		4		7		8		10		7		5
	Dominant Species Composition (%)					23		36		33		40		30		43		15		27		42
	Average Plot Height (ft.)					2		2		2		2		2		2		2		2		3
	% Invasives					0		0		0		0		0		0		0		0		0

1). Bolded species are proposed for the current monitoring year, italicized species are not approved, and a regular font indicates that the species has been approved.
2). The "Species Included in Approved Mitigation Plan" section contains only those species that were included in the original approved mitigation plan. The "Post Mitigation Plan Species" section includes species that are being proposed through a mitigation plan addendum for the current monitoring year (bolded) , species that have been approved in prior monitoring years through a mitigation plan addendum (regular font), and species that are not approved (italicized).
3). The "Mitigation Plan Performance Standard" section is derived only from stems included in the original mitigation plan, whereas the "Post Mitigation Plan Performance Standard" includes data from mitigation plan approved, post mitigation plan approved, and proposed stems.
4). Species identifications were corrected from the previous monitoring year.
5). One planted stem was missed during MY0 but was counted during MY1.

Table 6b. Vegetation Plot Data

Carpenter Bottom Mitigation Site
DMS Project No. 100090
Monitoring Year 1 - 2022

Planted Acreage	15.938
Date of Initial Plant	2022-02-02
Date(s) of Supplemental Plant(s)	NA
Date(s) Mowing	NA
Date of Current Survey	2022-08-31
Plot size (ACRES)	0.0247

	Scientific Name	Common Name	Tree/ Shrub	Indicator Status	Veg Plot 1 R [4] Total	Veg Plot 2 R [4] Total	Veg Plot 3 R Total	Veg Plot 4 R Total
Species Included in Approved Mitigation Plan	Acer negundo	boxelder	Tree	FAC	2	2	1	3
	Alnus serrulata	hazel alder	Tree	OBL	1		1	
	Amelanchier arborea	common serviceberry	Tree	FAC		1		
	Betula nigra	river birch	Tree	FACW	4	1	2	
	Celtis laevigata	sugarberry	Tree	FACW				
	Cephalanthus occidentalis	common buttonbush	Shrub	OBL	1	1		
	Cornus amomum	silky dogwood	Shrub	FACW				
	Diospyros virginiana	common persimmon	Tree	FAC		2		
	Fagus grandifolia	American beech	Tree	FACU				2
	Lindera benzoin	northern spicebush	Tree	FAC	1	1		1
	Liriodendron tulipifera	tuliptree	Tree	FACU		1	1	1
	Nyssa sylvatica	blackgum	Tree	FAC				
	Platanus occidentalis	American sycamore	Tree	FACW	1		2	3
	Populus deltoides	eastern cottonwood	Tree	FAC			4	1
	Quercus michauxii	swamp chestnut oak	Tree	FACW				
	Quercus pagoda	cherrybark oak	Tree	FACW	1			
	Quercus phellos	willow oak	Tree	FAC	1	1		
	Sambucus canadensis	American black elderberry	Tree	FAC				
	Ulmus americana	American elm	Tree	FACW				
Sum	Performance Standard				12	10	11	11
Post Mitigation Plan Species	*Fraxinus pennsylvanica*	*green ash*	*Tree*	*FACW*				
Sum	*Proposed Standard*				12	10	11	11
Mitigation Plan Performance Standard	Current Year Stem Count				12	10	11	11
	Stems/Acre				486	405	445	445
	Species Count				8	8	6	6
	Dominant Species Composition (%)				33	20	36	27
	Average Plot Height (ft.)				2	2	2	2
	% Invasives				0	0	0	0
Post Mitigation Plan Performance Standard	Current Year Stem Count				12	10	11	11
	Stems/Acre				486	405	445	445
	Species Count				8	8	6	6
	Dominant Species Composition (%)				33	20	36	27
	Average Plot Height (ft.)				2	2	2	2
	% Invasives				0	0	0	0

1). Bolded species are proposed for the current monitoring year, italicized species are not approved, and a regular font indicates that the species has been approved.
2). The "Species Included in Approved Mitigation Plan" section contains only those species that were included in the original approved mitigation plan. The "Post Mitigation Plan Species" section includes species that are being proposed through a mitigation plan addendum for the current monitoring year (bolded) , species that have been approved in prior monitoring years through a mitigation plan addendum (regular font), and species that are not approved (italicized).
3). The "Mitigation Plan Performance Standard" section is derived only from stems included in the original mitigation plan, whereas the "Post Mitigation Plan Performance Standard" includes data from mitigation plan approved, post mitigation plan approved, and proposed stems.
4). Species identifications were corrected from the previous monitoring year.
5). One planted stem was missed during MY0 but was counted during MY1.

Table 7. Vegetation Performance Standards Summary Table

Carpenter Bottom Mitigation Site
DMS Project No. 100090
Monitoring Year 1 - 2022

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

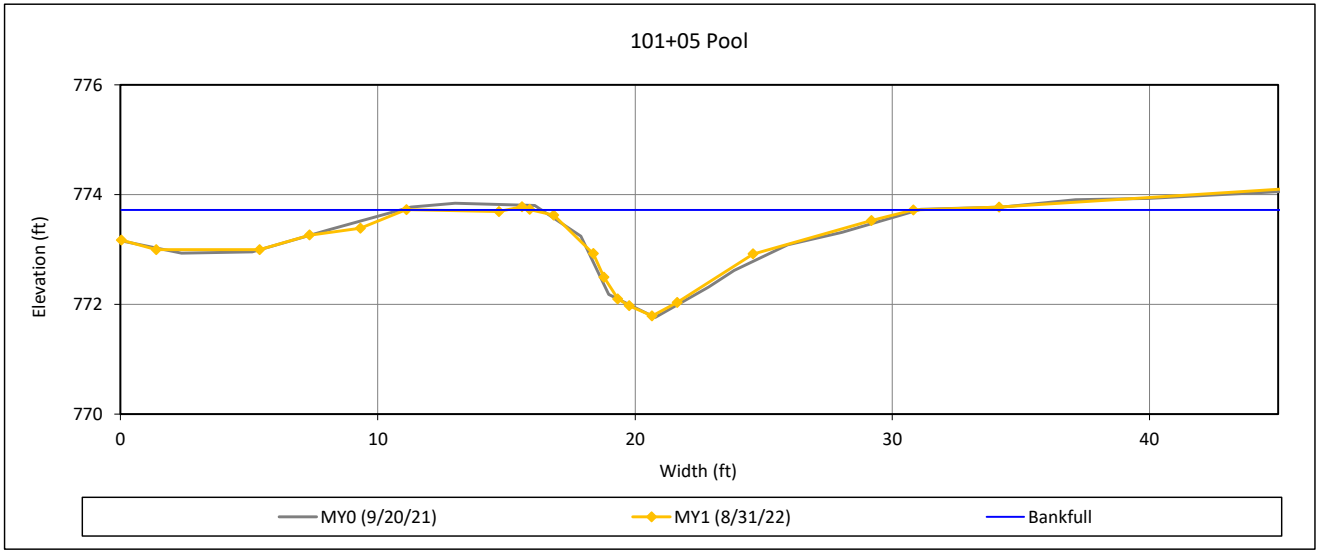
*Each monitoring year represents a different plot for the random vegetation plot "groups". Random plots are denoted with an R, and fixed plots with an F.

APPENDIX C. Stream Geomorphology Data

Cross-Section Plots

Carpenter Bottom Mitigation Site
DMS Project No. 100090
Monitoring Year 1 - 2022

Cross-Section 1 - Carpenter Branch Reach 1



Bankfull Dimensions	
12.2	x-section area (ft.sq.)
14.8	width (ft)
0.8	mean depth (ft)
1.9	max depth (ft)
15.5	wetted perimeter (ft)
0.8	hydraulic radius (ft)
18.1	width-depth ratio

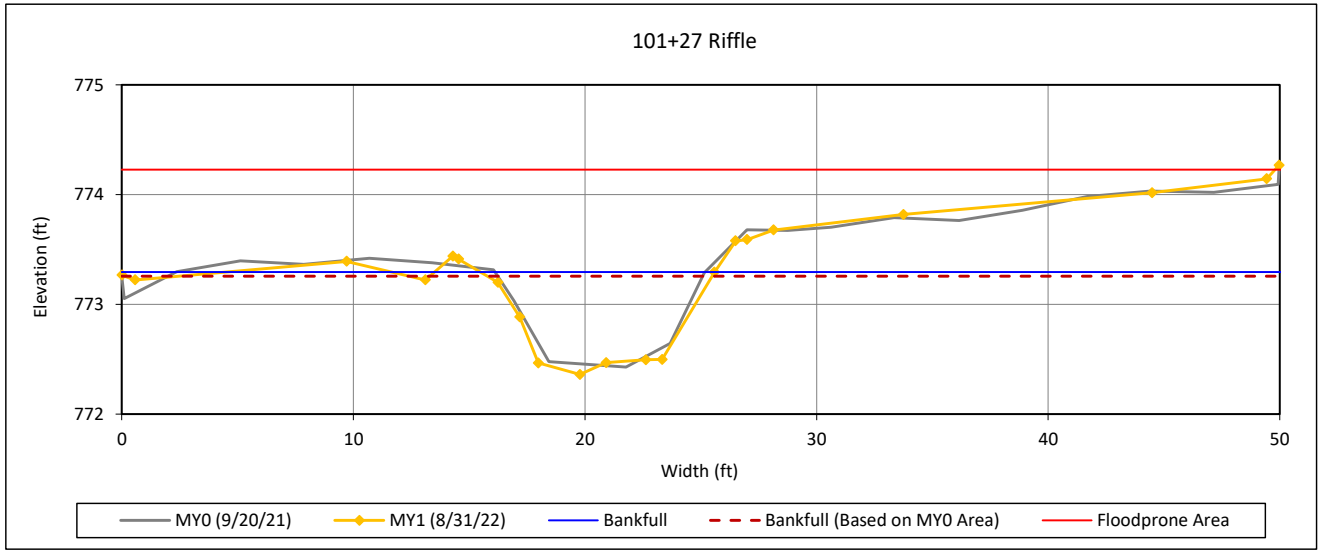
Survey Date: 8/31/22
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Carpenter Bottom Mitigation Site
DMS Project No. 100090
Monitoring Year 1 - 2022

Cross-Section 2 - Carpenter Branch Reach 1



Bankfull Dimensions	
6.2	x-section area (ft.sq.)
10.1	width (ft)
0.6	mean depth (ft)
0.9	max depth (ft)
10.4	wetted perimeter (ft)
0.6	hydraulic radius (ft)
16.4	width-depth ratio
49.8	W flood prone area (ft)
4.9	entrenchment ratio
1.0	low bank height ratio

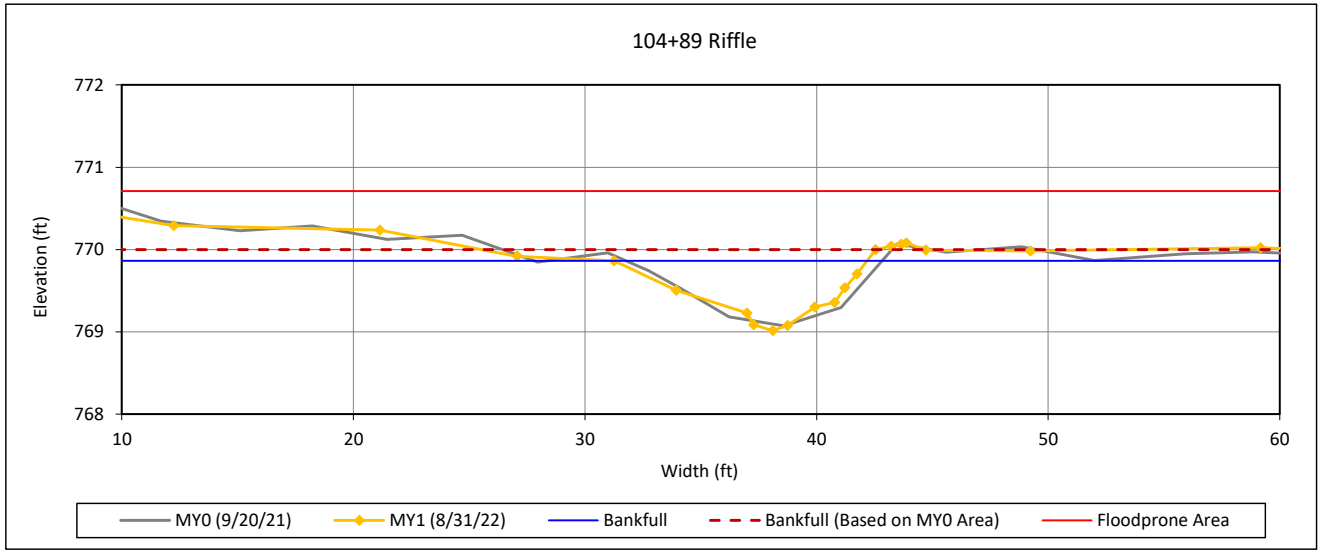
Survey Date: 8/31/22
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Carpenter Bottom Mitigation Site
DMS Project No. 100090
Monitoring Year 1 - 2022

Cross-Section 3 - Carpenter Branch Reach 1



Bankfull Dimensions	
5.0	x-section area (ft.sq.)
10.9	width (ft)
0.5	mean depth (ft)
0.8	max depth (ft)
11.1	wetted perimeter (ft)
0.4	hydraulic radius (ft)
23.9	width-depth ratio
65.4	W flood prone area (ft)
6.0	entrenchment ratio
0.9	low bank height ratio

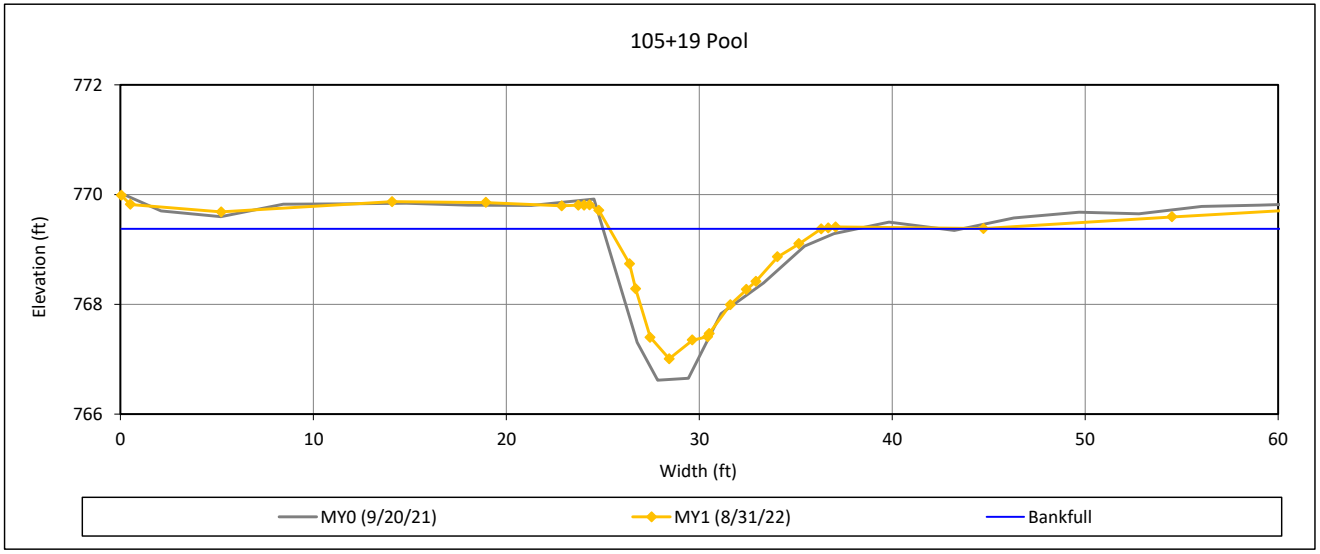
Survey Date: 8/31/22
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Carpenter Bottom Mitigation Site
DMS Project No. 100090
Monitoring Year 1 - 2022

Cross-Section 4 - Carpenter Branch Reach 1



Bankfull Dimensions	
13.0	x-section area (ft.sq.)
11.0	width (ft)
1.2	mean depth (ft)
2.4	max depth (ft)
12.3	wetted perimeter (ft)
1.1	hydraulic radius (ft)
9.2	width-depth ratio

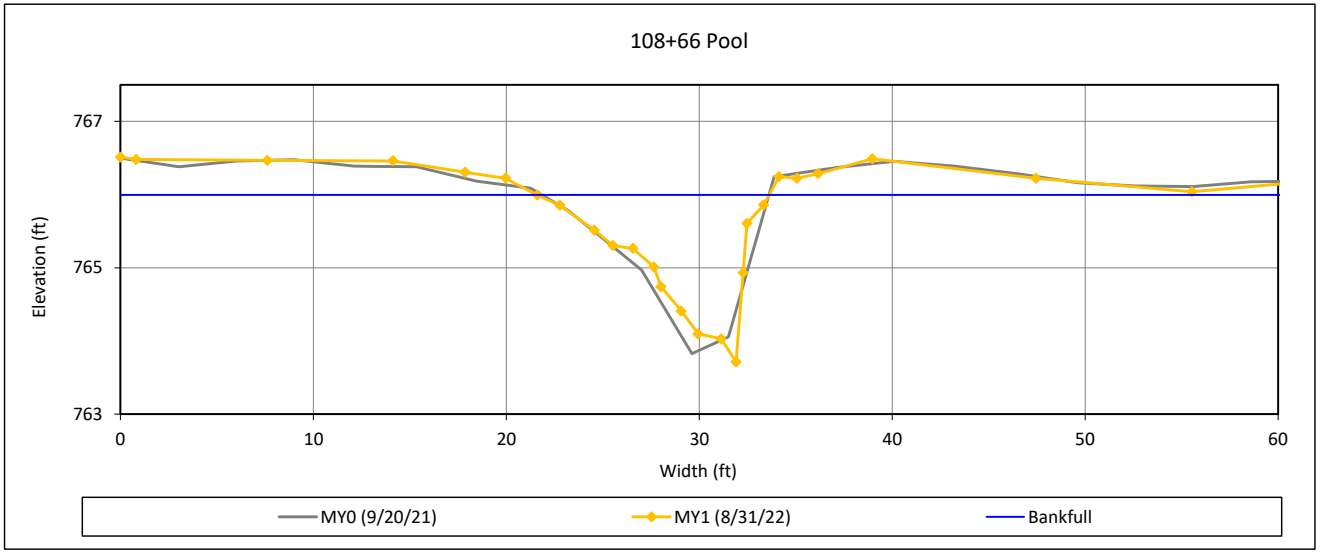
Survey Date: 8/31/22
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Carpenter Bottom Mitigation Site
DMS Project No. 100090
Monitoring Year 1 - 2022

Cross-Section 5 - Carpenter Branch Reach 1



Bankfull Dimensions	
11.2	x-section area (ft.sq.)
12.0	width (ft)
0.9	mean depth (ft)
2.3	max depth (ft)
13.8	wetted perimeter (ft)
0.8	hydraulic radius (ft)
12.8	width-depth ratio

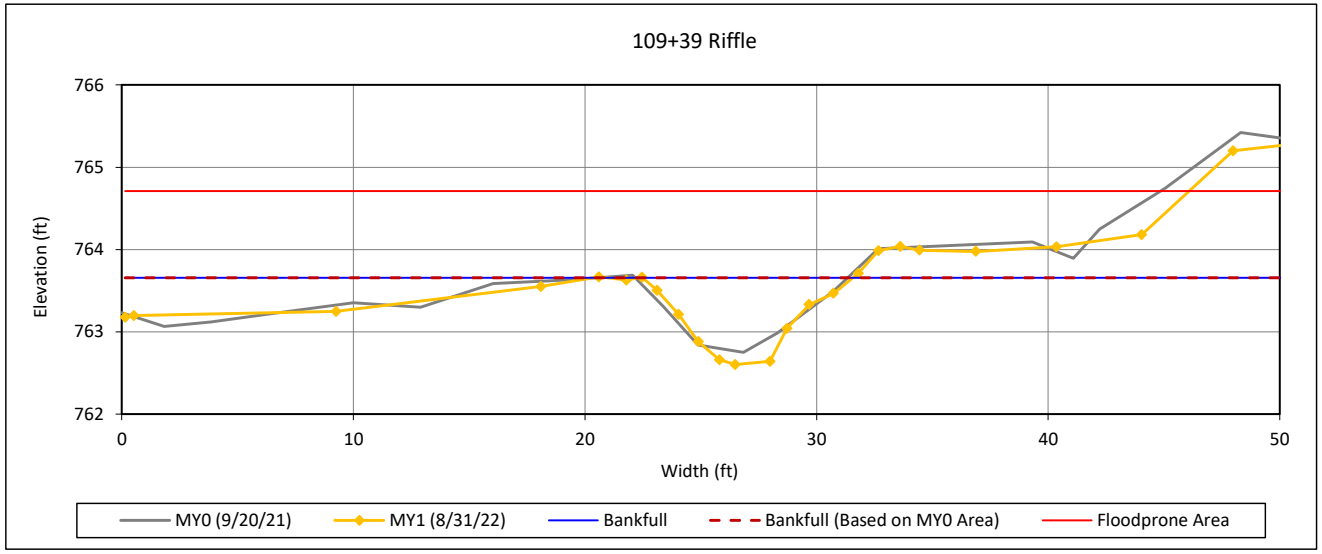
Survey Date: 8/31/22
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Carpenter Bottom Mitigation Site
DMS Project No. 100090
Monitoring Year 1 - 2022

Cross-Section 6 - Carpenter Branch Reach 1



Bankfull Dimensions	
5.3	x-section area (ft.sq.)
9.1	width (ft)
0.6	mean depth (ft)
1.1	max depth (ft)
9.4	wetted perimeter (ft)
0.6	hydraulic radius (ft)
15.5	width-depth ratio
46.0	W flood prone area (ft)
5.1	entrenchment ratio
1.0	low bank height ratio

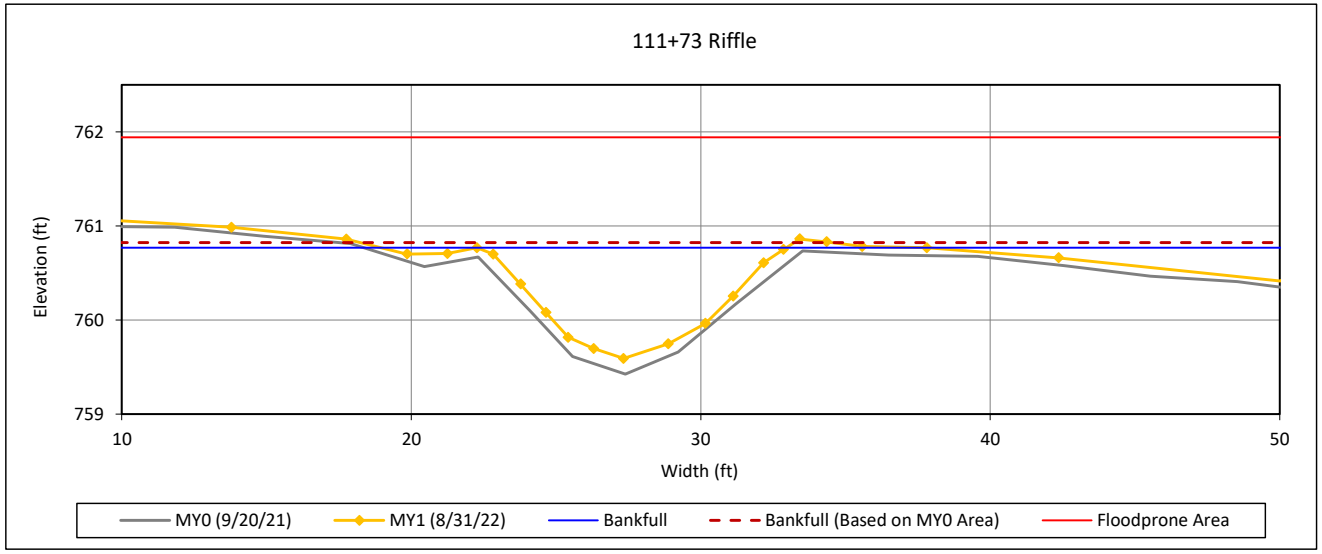
Survey Date: 8/31/22
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Carpenter Bottom Mitigation Site
DMS Project No. 100090
Monitoring Year 1 - 2022

Cross-Section 7 - Carpenter Branch Reach 1



Bankfull Dimensions	
7.3	x-section area (ft.sq.)
10.7	width (ft)
0.7	mean depth (ft)
1.2	max depth (ft)
11.0	wetted perimeter (ft)
0.7	hydraulic radius (ft)
15.6	width-depth ratio
50.7	W flood prone area (ft)
4.8	entrenchment ratio
1.0	low bank height ratio

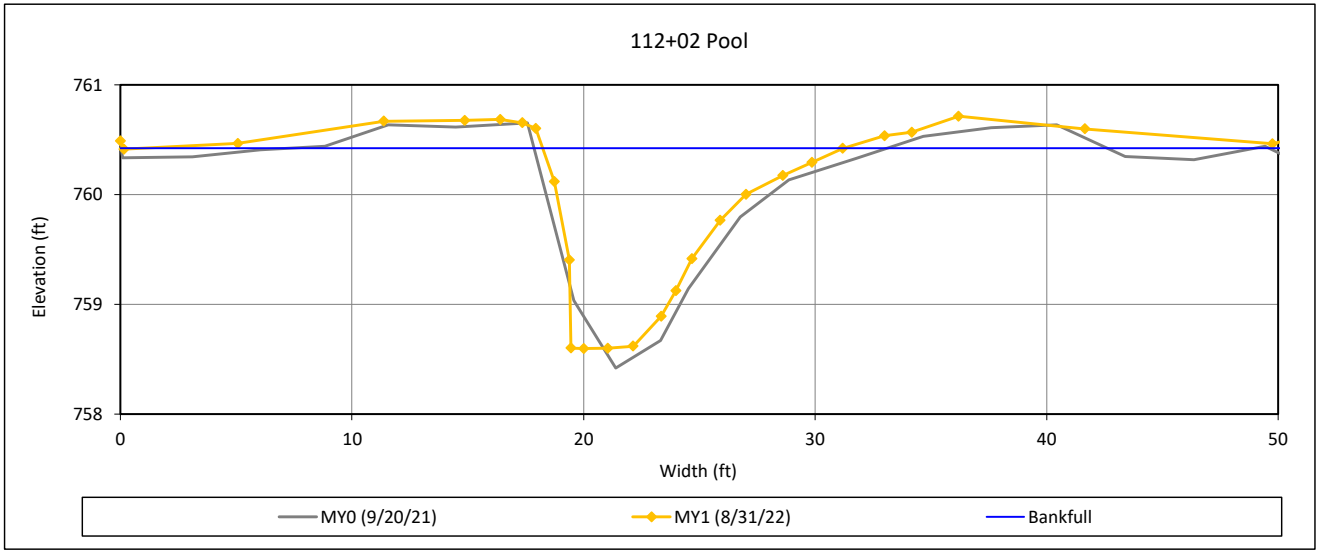
Survey Date: 8/31/22
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Carpenter Bottom Mitigation Site
DMS Project No. 100090
Monitoring Year 1 - 2022

Cross-Section 8 - Carpenter Branch Reach 1



Bankfull Dimensions	
11.7	x-section area (ft.sq.)
12.9	width (ft)
0.9	mean depth (ft)
1.8	max depth (ft)
14.3	wetted perimeter (ft)
0.8	hydraulic radius (ft)
14.4	width-depth ratio

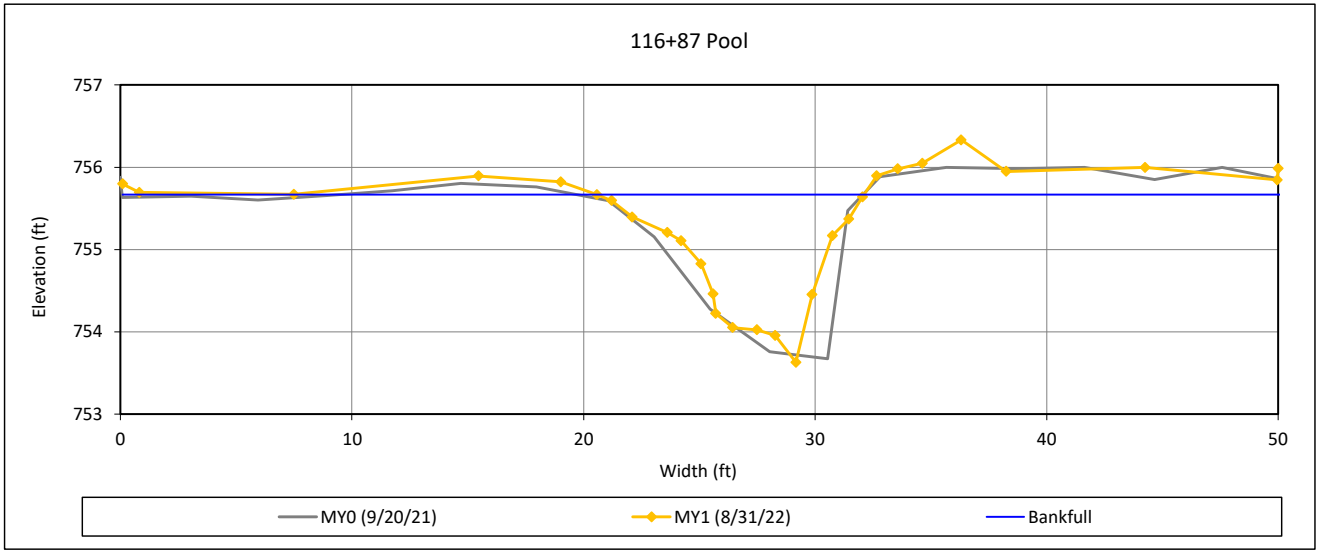
Survey Date: 8/31/22
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Carpenter Bottom Mitigation Site
DMS Project No. 100090
Monitoring Year 1 - 2022

Cross-Section 9 - Carpenter Branch Reach 1



Bankfull Dimensions	
10.4	x-section area (ft.sq.)
11.5	width (ft)
0.9	mean depth (ft)
2.0	max depth (ft)
12.7	wetted perimeter (ft)
0.8	hydraulic radius (ft)
12.8	width-depth ratio

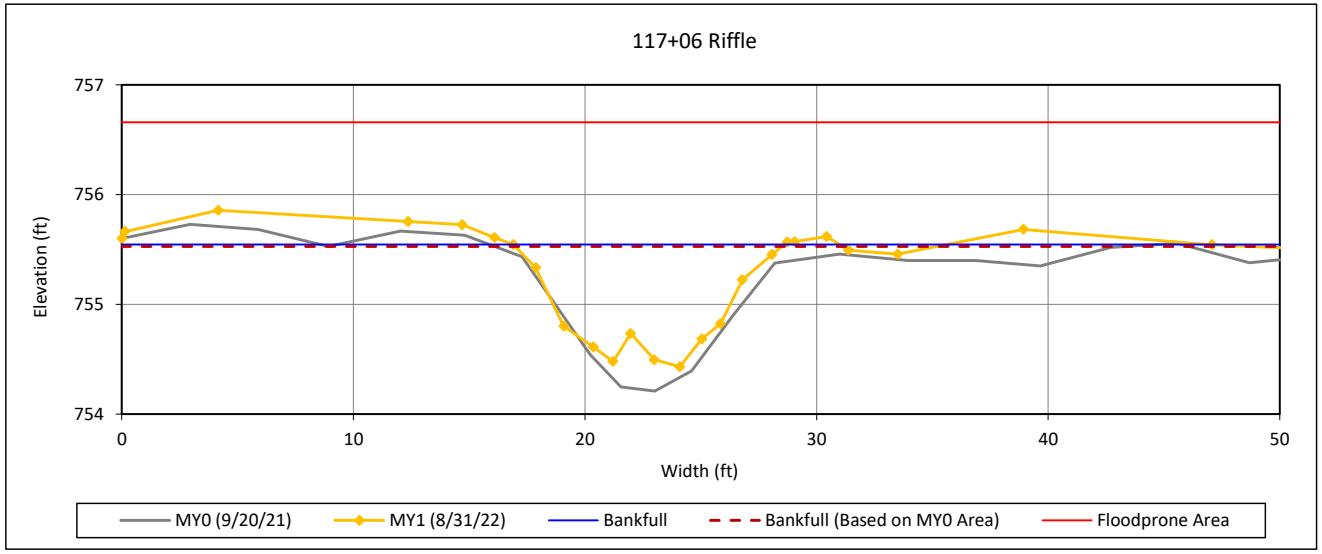
Survey Date: 8/31/22
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Carpenter Bottom Mitigation Site
DMS Project No. 100090
Monitoring Year 1 - 2022

Cross-Section 10 - Carpenter Branch Reach 1



Bankfull Dimensions	
7.8	x-section area (ft.sq.)
11.7	width (ft)
0.7	mean depth (ft)
1.1	max depth (ft)
12.1	wetted perimeter (ft)
0.6	hydraulic radius (ft)
17.5	width-depth ratio
55.8	W flood prone area (ft)
4.8	entrenchment ratio
1.0	low bank height ratio

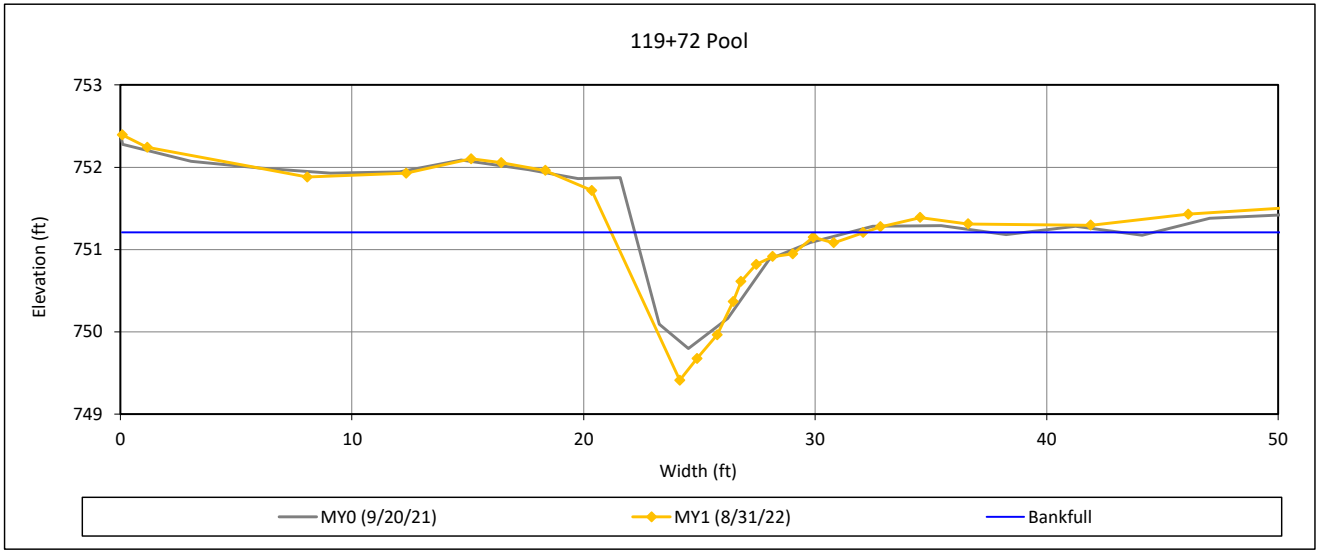
Survey Date: 8/31/22
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Carpenter Bottom Mitigation Site
DMS Project No. 100090
Monitoring Year 1 - 2022

Cross-Section 11 - Carpenter Branch Reach 1



Bankfull Dimensions	
7.2	x-section area (ft.sq.)
10.9	width (ft)
0.7	mean depth (ft)
1.8	max depth (ft)
11.7	wetted perimeter (ft)
0.6	hydraulic radius (ft)
16.5	width-depth ratio

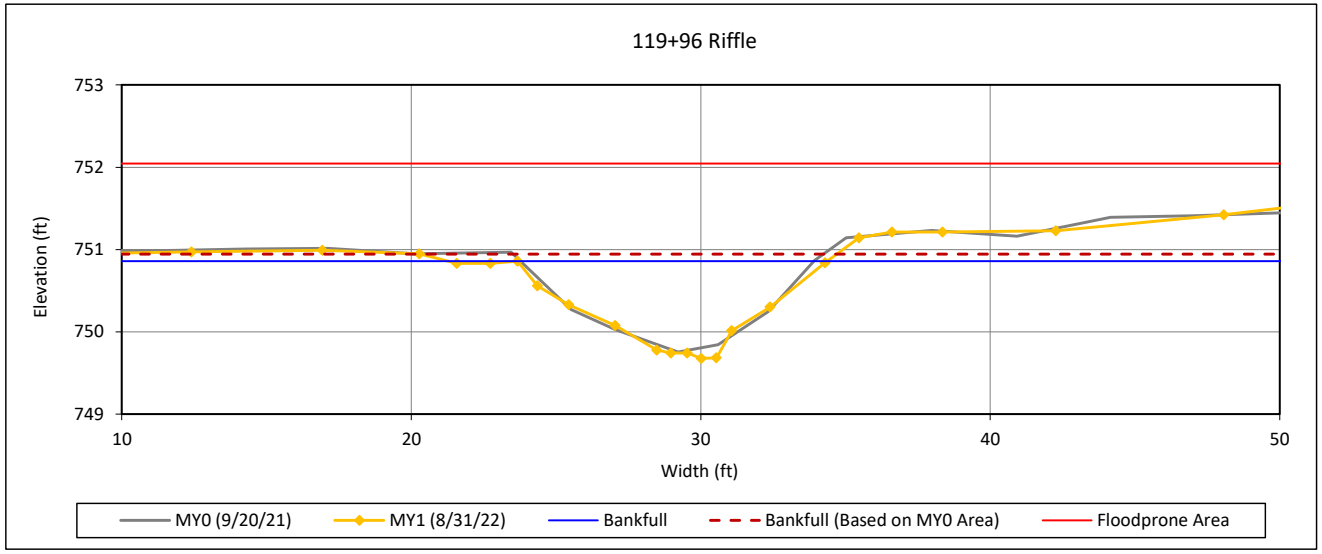
Survey Date: 8/31/22
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Carpenter Bottom Mitigation Site
DMS Project No. 100090
Monitoring Year 1 - 2022

Cross-Section 12 - Carpenter Branch Reach 1



Bankfull Dimensions	
7.3	x-section area (ft.sq.)
10.7	width (ft)
0.7	mean depth (ft)
1.2	max depth (ft)
11.0	wetted perimeter (ft)
0.7	hydraulic radius (ft)
15.7	width-depth ratio
53.9	W flood prone area (ft)
5.0	entrenchment ratio
0.9	low bank height ratio

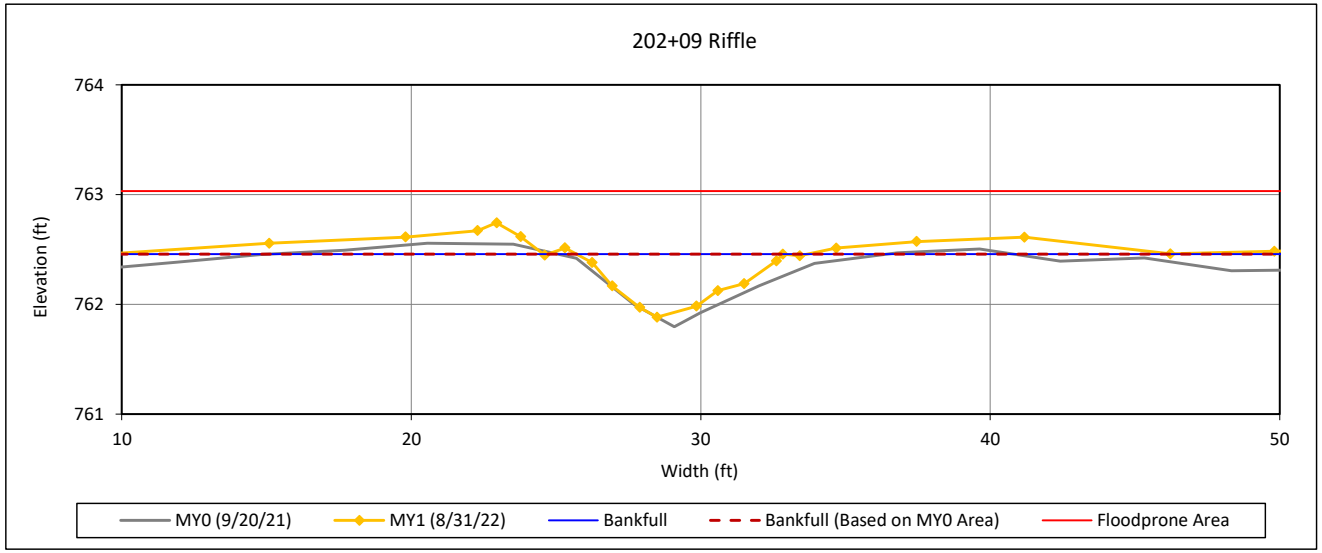
Survey Date: 8/31/22
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Carpenter Bottom Mitigation Site
DMS Project No. 100090
Monitoring Year 1 - 2022

Cross-Section 13 - UT1



Bankfull Dimensions	
2.3	x-section area (ft.sq.)
7.2	width (ft)
0.3	mean depth (ft)
0.6	max depth (ft)
7.3	wetted perimeter (ft)
0.3	hydraulic radius (ft)
22.7	width-depth ratio
55.5	W flood prone area (ft)
7.7	entrenchment ratio
1.0	low bank height ratio

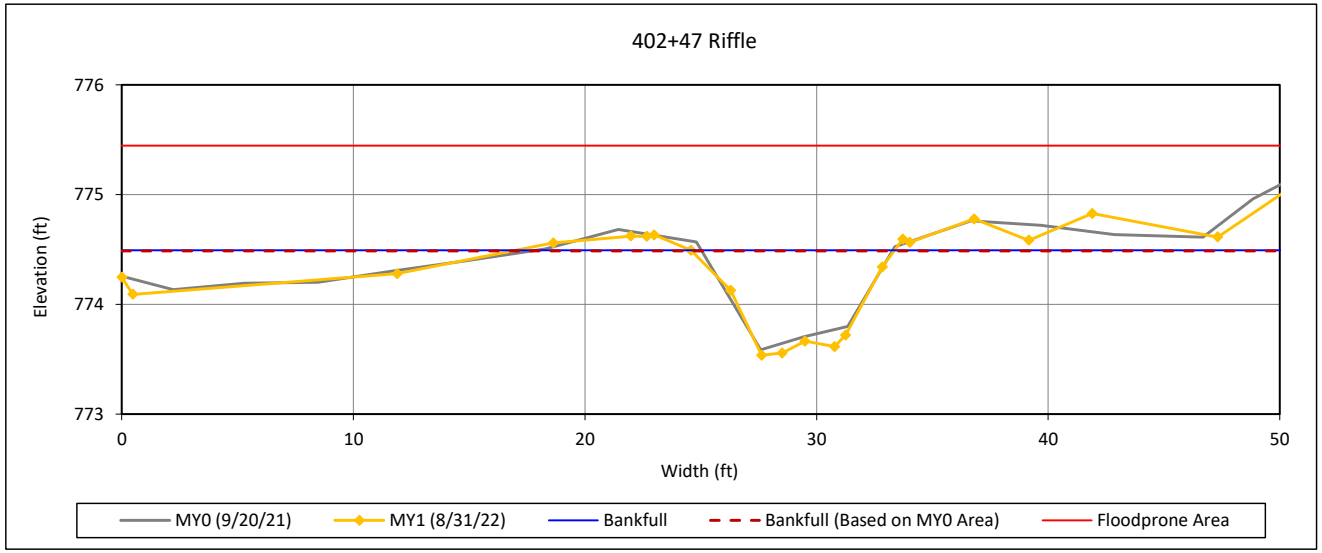
Survey Date: 8/31/22
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Carpenter Bottom Mitigation Site
DMS Project No. 100090
Monitoring Year 1 - 2022

Cross-Section 14 - UT3



Bankfull Dimensions	
5.2	x-section area (ft.sq.)
8.8	width (ft)
0.6	mean depth (ft)
1.0	max depth (ft)
9.1	wetted perimeter (ft)
0.6	hydraulic radius (ft)
15.0	width-depth ratio
52.5	W flood prone area (ft)
6.0	entrenchment ratio
1.0	low bank height ratio

Survey Date: 8/31/22
Field Crew: Wildlands Engineering

View Downstream

Table 8a. Baseline Stream Data Summary

Carpenter Bottom Mitigation Site
DMS Project No. 100090
Monitoring Year 1 - 2022

	PRE-EXISTING CONDITIONS			DESIGN		MONITORING BASELINE (MY0)		
Parameter	**Carpenter Branch R1**							
Riffle Only	**Min**	**Max**	**n**	**Min**	**Max**	**Min**	**Max**	**n**
Bankfull Width (ft)	10.2		1	7.5		9.2	12.2	6
Floodprone Width (ft)	14.2		1	17.0	26.0	44.4	68.1	6
Bankfull Mean Depth	0.7		1	0.6		0.5	0.8	6
Bankfull Max Depth	1.2		1	0.7	0.9	0.9	1.2	6
Bankfull Cross Sectional Area (ft^2)	7.0		1	4.4		5.3	8.2	6
Width/Depth Ratio	14.9		1	12.5		14.4	22.7	6
Entrenchment Ratio	1.4		1	2.2	3.5	4.6	5.6	6
Bank Height Ratio	3.4		1	1.0	1.1	1.0	1.0	6
Max part size (mm) mobilized at bankfull	37 / 90			32 / 81		46	61	6
Rosgen Classification	G4			C4		C4		
Bankfull Discharge (cfs)	14.0			14.0		14.0		
Sinuosity	1.1			1.2		1.2		
Water Surface Slope ($ft/ft)^2$	0.0130			0.0120		0.0109		
Other	--			--		--		
Parameter	**UT1**							
Riffle Only	**Min**	**Max**	**n**	**Min**	**Max**	**Min**	**Max**	**n**
Bankfull Width (ft)	3.1		1	5.0		8.0		1
Floodprone Width (ft)	4.2		1	11.0	18.0	55.5		1
Bankfull Mean Depth	0.6		1	0.4		0.3		1
Bankfull Max Depth	0.8		1	0.5	0.6	0.6		1
Bankfull Cross Sectional Area (ft^2)	1.8		1	1.9		2.3		1
Width/Depth Ratio	5.2		1	12.5		27.6		1
Entrenchment Ratio	1.4		1	2.2	3.5	6.9		1
Bank Height Ratio	6.1		1	1.0	1.1	1.0		1
Max part size (mm) mobilized at bankfull	--			--		41		1
Rosgen Classification	G4/5			C4		C4		
Bankfull Discharge (cfs)	6.8			6.0		6.0		
Sinuosity	1.1			1.3		1.2		
Water Surface Slope ($ft/ft)^2$	0.0258			0.0200		0.0153		
Other	--			--		--		

1. ER for the baseline/monitoring parameters are based on the width of the cross-section, in lieu of assuming the width across the floodplain.
2. Channel slope is calculated from the surface of the channel bed rather than water surface.
(---): Data was not provided, N/A: Not Applicable

Table 8b. Baseline Stream Data Summary

Carpenter Bottom Mitigation Site

DMS Project No. 100090

Monitoring Year 1 - 2022

	PRE-EXISTING CONDITIONS			DESIGN		MONITORING BASELINE (MY0)		
Parameter	**UT3**							
Riffle Only	**Min**	**Max**	**n**	**Min**	**Max**	**Min**	**Max**	**n**
Bankfull Width (ft)	9.5		1	6.0		8.4		1
Floodprone Width (ft)	N/A		1	13.0	21.0	52.6		1
Bankfull Mean Depth	0.3		1	0.5		0.6		1
Bankfull Max Depth	0.7		1	0.6	0.8	0.9		1
Bankfull Cross Sectional Area (ft^2)	2.8		1	2.9		5.1		1
Width/Depth Ratio	31.9		1	12.0		14.0		1
Entrenchment Ratio	N/A		1	2.2	3.5	6.2		1
Bank Height Ratio	1.3		1	1.0	1.1	1.0		1
Max part size (mm) mobilized at bankfull	--			--		48		1
Rosgen Classification	G4/5			C4b		C4b		
Bankfull Discharge (cfs)	6.2			8.0		8.0		
Sinuosity	1.0			1.2		1.1		
Water Surface Slope ($ft/ft)^2$	0.0260			0.0230		0.0237		
Other	---			---		---		

1. ER for the baseline/monitoring parameters are based on the width of the cross-section, in lieu of assuming the width across the floodplain.

2. Channel slope is calculated from the surface of the channel bed rather than water surface.

(---): Data was not provided, N/A: Not Applicable

Table 9. Cross-Section Morphology Monitoring Summary

Carpenter Bottom Mitigation Site

DMS Project No. 100090

Monitoring Year 1 - 2022

	Carpenter Branch Reach 1																							
	Cross-Section 1 (Pool)						Cross-Section 2 (Riffle)						Cross-Section 3 (Riffle)						Cross-Section 4 (Pool)					
	MY0	MY1	MY2	MY3	MY5	MY7	MY0	MY1	MY2	MY3	MY5	MY7	MY0	MY1	MY2	MY3	MY5	MY7	MY0	MY1	MY2	MY3	MY5	MY7
Bankfull Elevation (ft) - Based on AB-Bankfull[1] Area	--	--					773.32	773.26					769.96	770.00					--	--				
Bank Height Ratio - Based on AB Bankfull[1] Area	--	--					1.0	1.0					1.0	0.9					--	--				
Thalweg Elevation	771.76	771.79					772.43	772.36					769.07	769.02					766.62	767.01				
LTOB[2] Elevation	773.74	773.72					773.32	773.30					769.96	769.86					769.29	769.38				
LTOB[2] Max Depth (ft)	2.0	1.9					0.9	0.9					0.9	0.8					2.7	2.4				
LTOB[2] Cross Sectional Area (ft^2)	13.1	12.2					5.8	6.2					6.5	5.0					15.8	13.0				

	Carpenter Branch Reach 1																							
	Cross-Section 5 (Pool)						Cross-Section 6 (Riffle)						Cross-Section 7 (Riffle)						Cross-Section 8 (Pool)					
	MY0	MY1	MY2	MY3	MY5	MY7	MY0	MY1	MY2	MY3	MY5	MY7	MY0	MY1	MY2	MY3	MY5	MY7	MY0	MY1	MY2	MY3	MY5	MY7
Bankfull Elevation (ft) - Based on AB-Bankfull[1] Area	--	--					763.69	763.65					760.67	760.82					--	--				
Bank Height Ratio - Based on AB Bankfull[1] Area	--	--					1.0	1.0					1.0	1.0					--	--				
Thalweg Elevation	763.33	763.21					762.75	762.60					759.43	759.59					758.42	758.60				
LTOB[2] Elevation	765.59	765.49					763.69	763.66					760.67	760.77					760.33	760.42				
LTOB[2] Max Depth (ft)	2.3	2.3					0.9	1.1					1.2	1.2					1.9	1.8				
LTOB[2] Cross Sectional Area (ft^2)	13.7	11.2					5.3	5.4					7.9	7.3					12.1	11.7				

	Carpenter Branch Reach 1																							
	Cross-Section 9 (Pool)						Cross-Section 10 (Riffle)						Cross-Section 11 (Pool)						Cross-Section 12 (Riffle)					
	MY0	MY1	MY2	MY3	MY5	MY7	MY0	MY1	MY2	MY3	MY5	MY7	MY0	MY1	MY2	MY3	MY5	MY7	MY0	MY1	MY2	MY3	MY5	MY7
Bankfull Elevation (ft) - Based on AB-Bankfull[1] Area	--	--					755.38	755.53					--	--					750.97	750.96				
Bank Height Ratio - Based on AB Bankfull[1] Area	--	--					1.0	1.0					--	--					1.0	0.9				
Thalweg Elevation	753.67	753.63					754.21	754.43					749.80	749.41					749.75	749.74				
LTOB[2] Elevation	755.60	755.67					755.38	755.55					751.28	751.21					750.97	750.86				
LTOB[2] Max Depth (ft)	1.9	2.0					1.2	1.1					1.5	1.8					1.2	1.1				
LTOB[2] Cross Sectional Area (ft^2)	12.2	10.4					7.6	7.8					6.7	7.2					8.2	7.1				

	UT1						UT3					
	Cross-Section 13 (Riffle)						Cross-Section 14 (Riffle)					
	MY0	MY1	MY2	MY3	MY5	MY7	MY0	MY1	MY2	MY3	MY5	MY7
Bankfull Elevation (ft) - Based on AB-Bankfull[1] Area	761.87	761.96					774.53	774.49				
Bank Height Ratio - Based on AB Bankfull[1] Area	1.0	1.0					1.0	1.0				
Thalweg Elevation	761.30	761.38					773.59	773.54				
LTOB[2] Elevation	761.87	761.96					774.53	774.49				
LTOB[2] Max Depth (ft)	0.6	0.6					0.9	1.0				
LTOB[2] Cross Sectional Area (ft^2)	2.3	2.3					5.1	5.2				

[1]Bank Height Ratio (BHR) takes the As-built bankful area as the basis for adjusting each subsequent years bankfull elevation.

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

APPENDIX D. Hydrology Data

Table 10. Bankfull Events

Carpenter Bottom Mitigation Site
DMS Project No. 100090
Monitoring Year 1 - 2022

Reach	MY1 (2022)	MY2 (2023)	MY3 (2024)	MY4 (2025)	MY5 (2026)	MY6 (2027)	MY7 (2028)
UT1 (SG2)	3/12/2022						
UT2 (SG3)	01/03/2022 03/12/2022						
UT3 (SG4)	None						
Carpenter Branch Reach 1 (CG5)	None						

Table 11. Rainfall Summary

Carpenter Bottom Mitigation Site
DMS Project No. 100090
Monitoring Year 1 - 2022

	MY1 (2022)	MY2 (2023)	MY3 (2024)	MY4 (2025)	MY5 (2026)	MY6 (2027)	MY7 (2028)
Annual Precip Total	47.01[1]						
WETS 30th Percentile	42.98						
WETS 70th Percentile	54.38						
Normal	--[1]						

WETS Station: LINCOLNTON 4W (37109) <http://agacis.rcc-acis.org/?fips=37109>

WETS Percentiles are recalculated each year based on the most recent 30-yr time period.

1 - Annual precipitation total was collected up until 11/16/2022. Data will be updated in MY2.

Table 12. Wetland Gauge Summary

Carpenter Bottom Mitigation Site
DMS Project No. 100090
Monitoring Year 1 - 2022

Gauge	Max. Consecutive Hydroperiod (Percentage)						
	MY1 (2022)	MY2 (2023)	MY3 (2024)	MY5 (2025)	MY5 (2026)	MY6 (2027)	MY7 (2028)
1	59 Days (24.1%)						
2	45 Days (18.4%)						
3	34 Days (13.9%)						
4	48 Days (19.6%)						
5	45 Days (18.4%)						
6	14 Days (5.7%)						
7	48 Days (19.6%)						
8	8 Days (3.3%)						
9	15 Days (6.1%)						
10	42 Days (17.1%)						
11	51 Days (20.8%)						

Performance Standard: 30 Days (12%)
WETS Station: LINCOLNTON 4W (37109) <http://agacis.rcc-acis.org/?fips=37109>
Growing Season: 03/15/2022 to 11/14/2022 (245 Days)

Table 13. Recorded In-Stream Flow Events Summary

Carpenter Bottom Mitigation Site
DMS Project No. 100090
Monitoring Year 1 - 2022

Reach	Max Consecutive Days/Total Days Meeting Success Criteria[1]						
	MY1 (2022)[2]	MY2 (2023)	MY3 (2024)	MY5 (2025)	MY5 (2026)	MY6 (2027)	MY7 (2028)
Carpenter Branch Reach 1 (SG1)	103 Days/ 112 Days						
UT1 (SG2)	3 Days/ 24 Days						
UT2 (SG3)	21 Days/ 131 Days						
UT3 (SG4)	100 Days/ 111 Days						

1 - Success criteria is 30 consecutive days of flow.

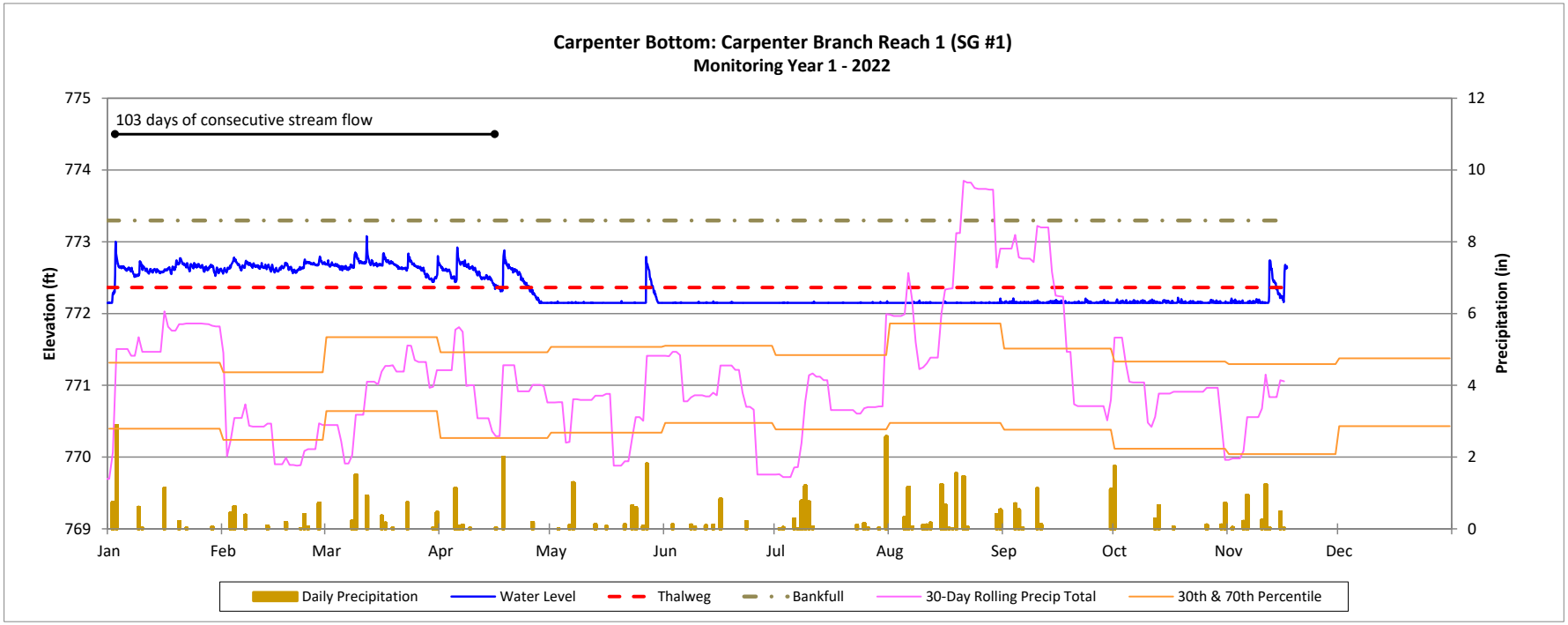
2 - Data colleted through 11/16/2022.

Recorded In-Stream Flow Events Plot

Carpenter Bottom Mitigation Site

DMS Project No. 100090

Monitoring Year 1 - 2022

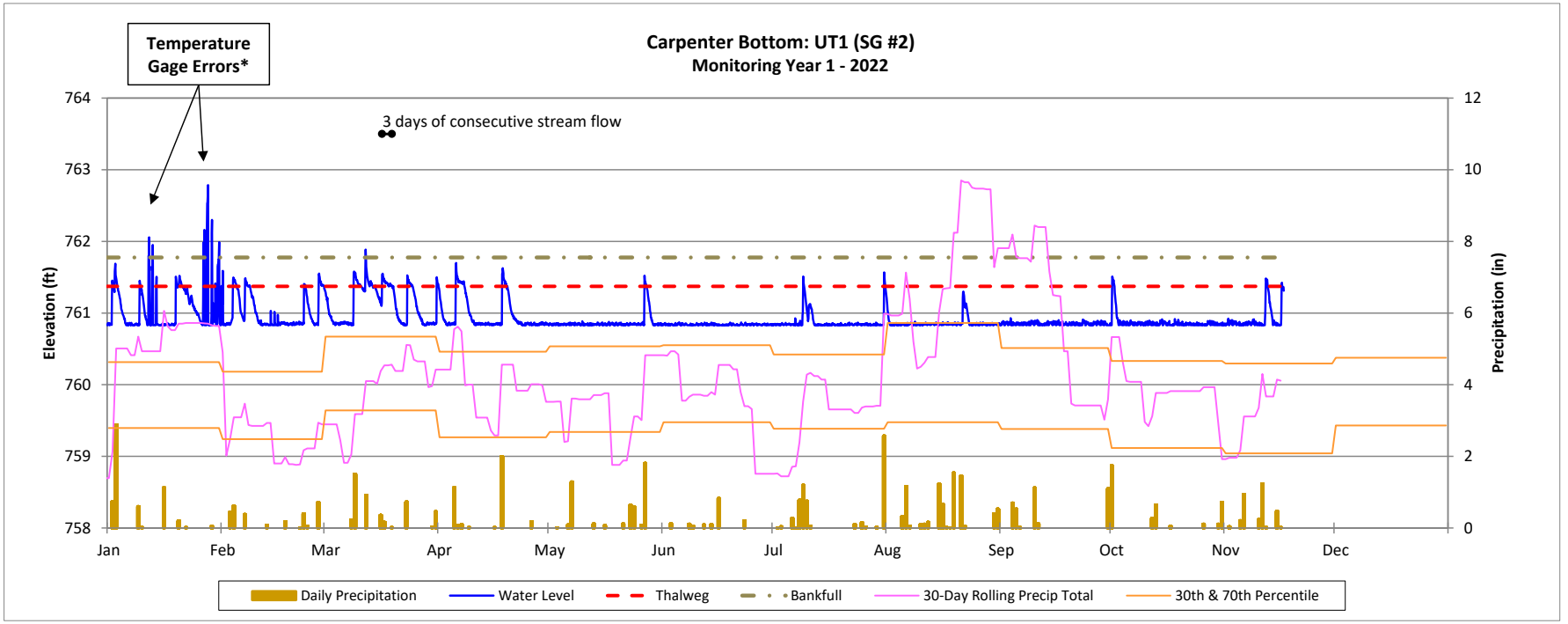


Recorded In-Stream Flow Events Plot

Carpenter Bottom Mitigation Site

DMS Project No. 100090

Monitoring Year 1 - 2022



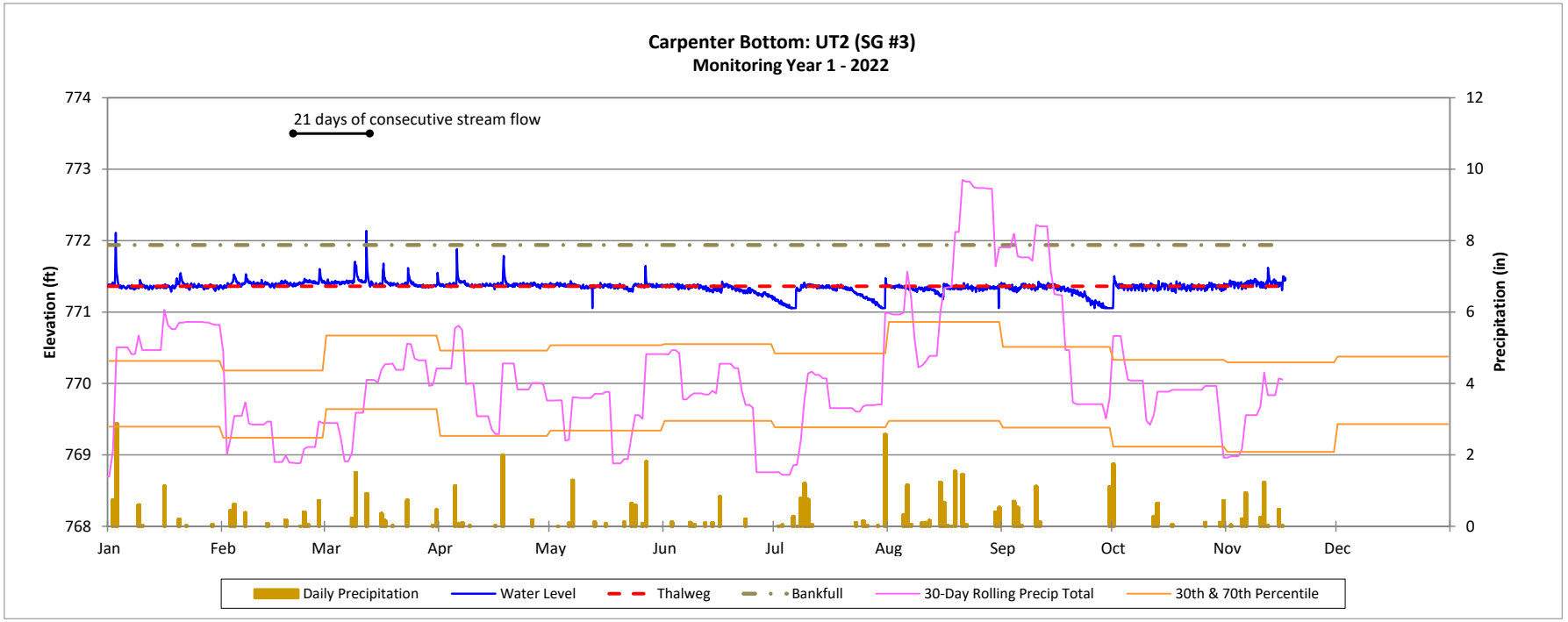
* - Probe recorded false readings, likely due to sub-freezing temperatures. 1/12 - 1/31/2022. Bankfull events during this timeframe don't count towards performace criteria.

Recorded In-Stream Flow Events Plot

Carpenter Bottom Mitigation Site

DMS Project No. 100090

Monitoring Year 1 - 2022

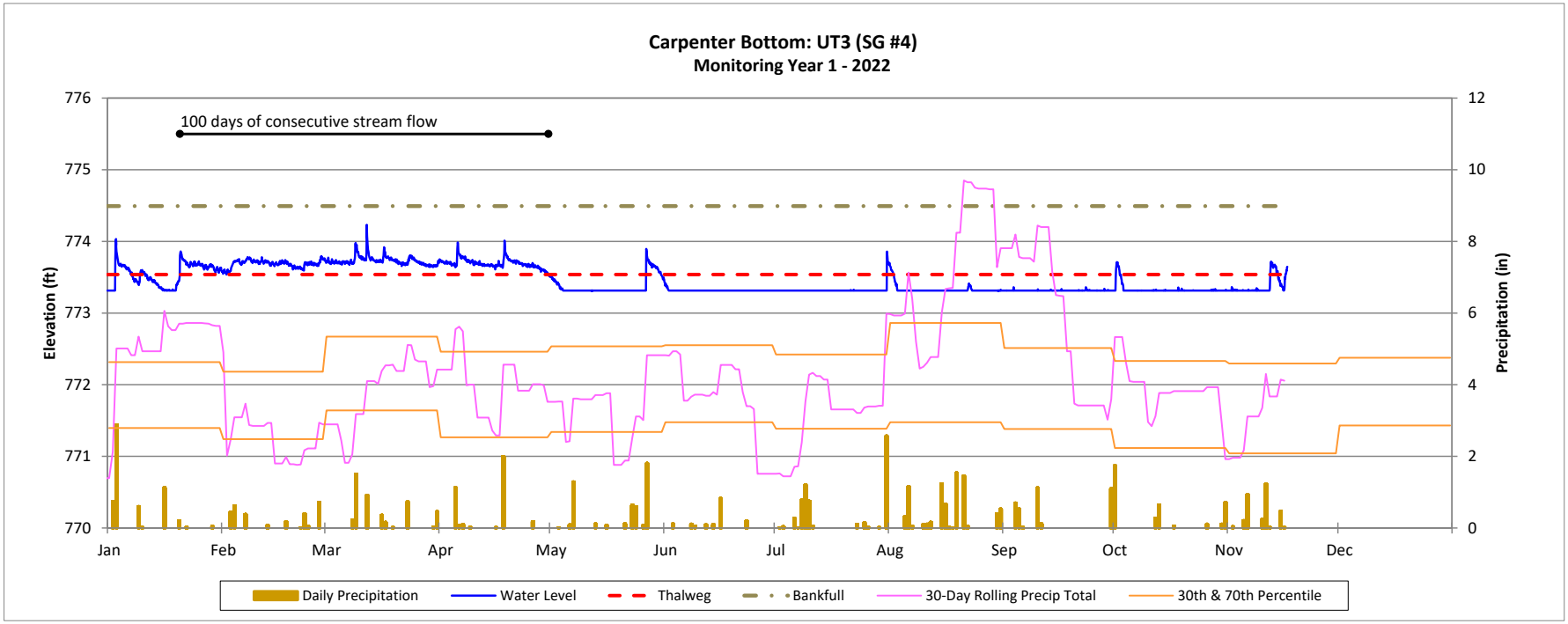


Recorded In-Stream Flow Events Plot

Carpenter Bottom Mitigation Site

DMS Project No. 100090

Monitoring Year 1 - 2022

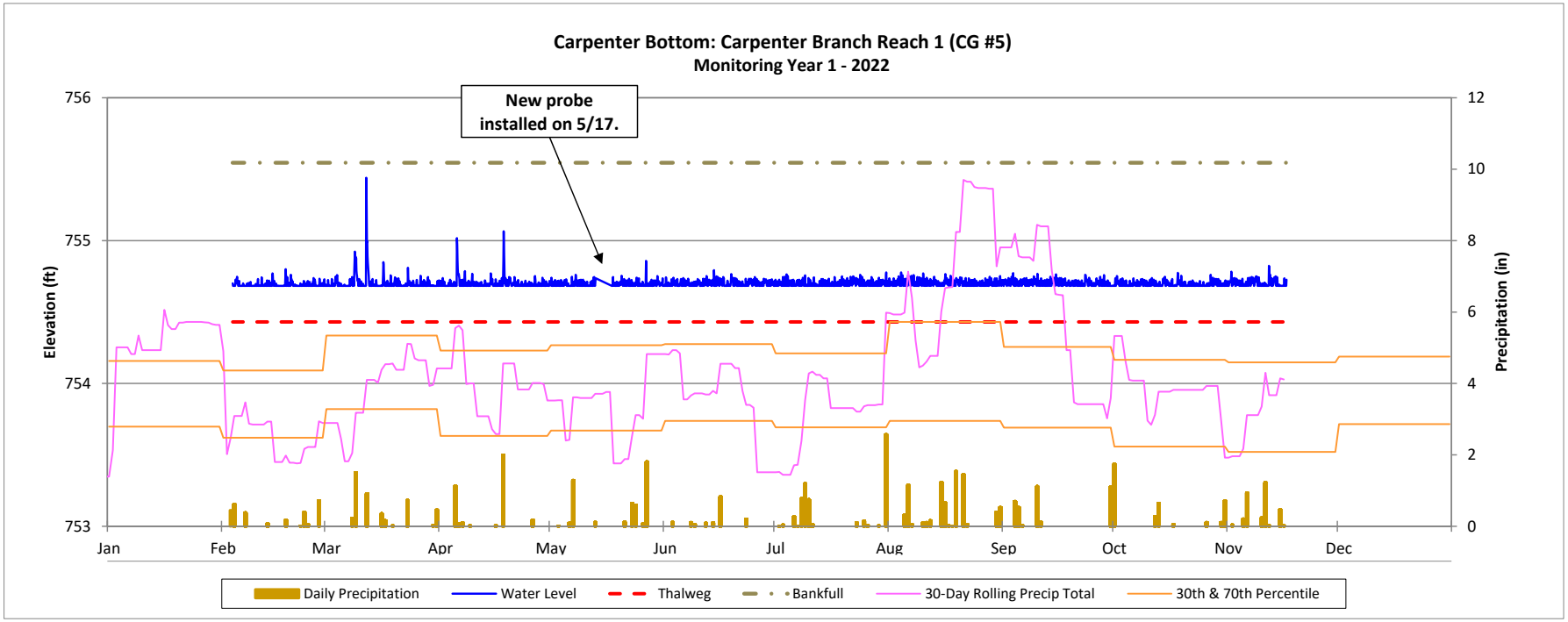


Recorded In-Stream Flow Events Plot

Carpenter Bottom Mitigation Site

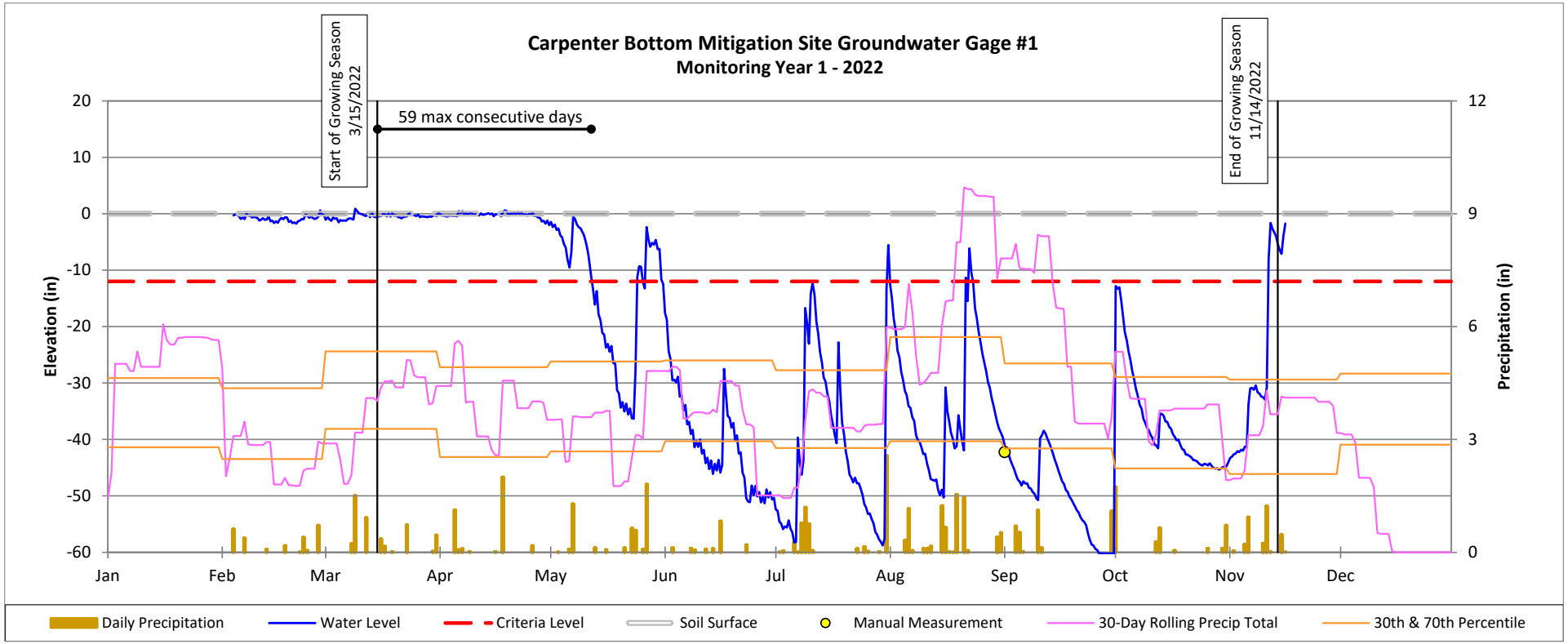
DMS Project No. 100090

Monitoring Year 1 - 2022



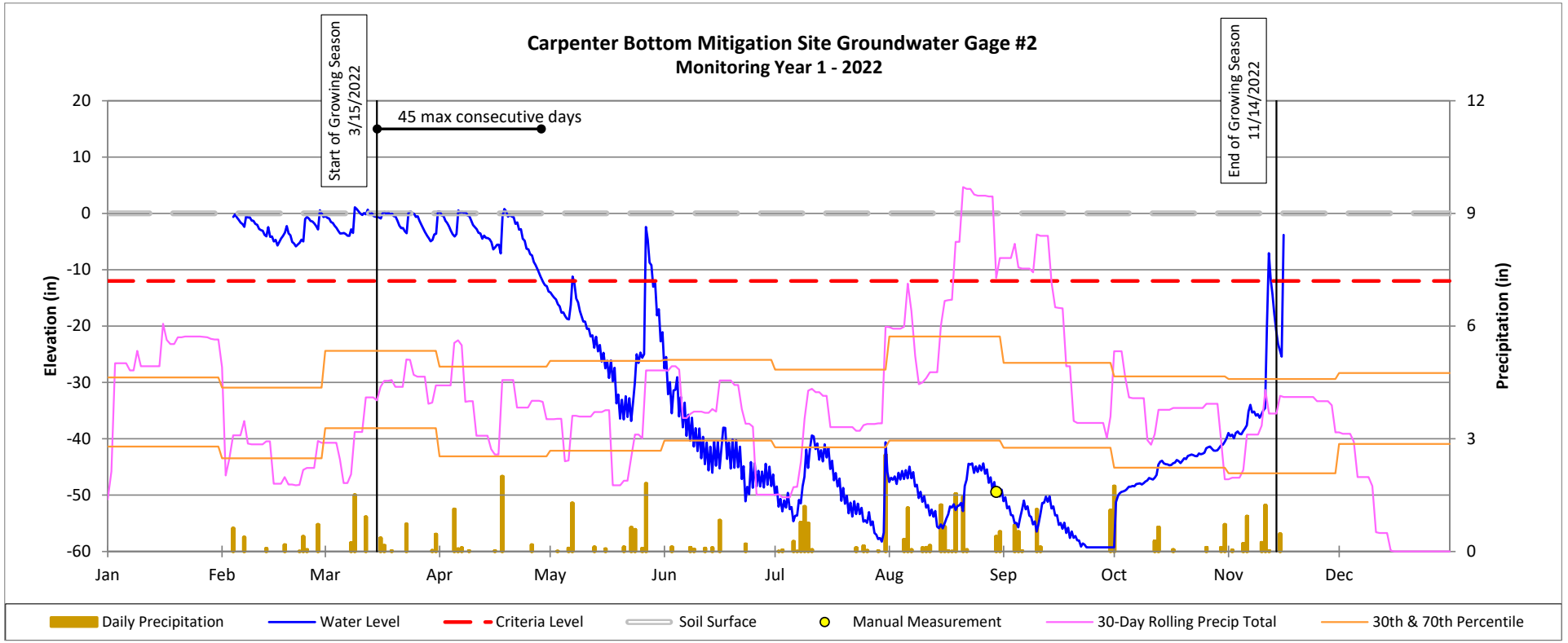
Groundwater Gage Plot

Carpenter Bottom Mitigation Site
DMS Project No. 100090
Monitoring Year 1 - 2022
Wetland Rehabilitation



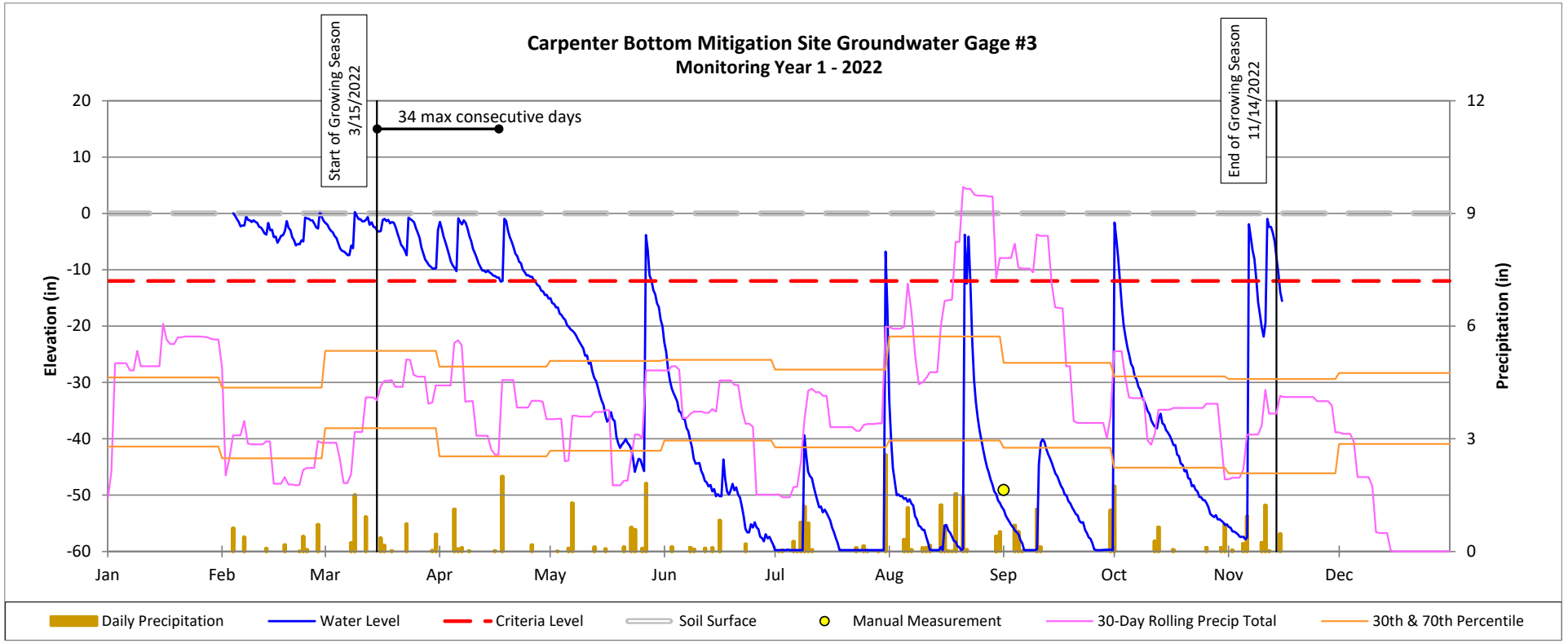
Groundwater Gage Plot

Carpenter Bottom Mitigation Site
DMS Project No. 100090
Monitoring Year 1 - 2022
Wetland Rehabilitation



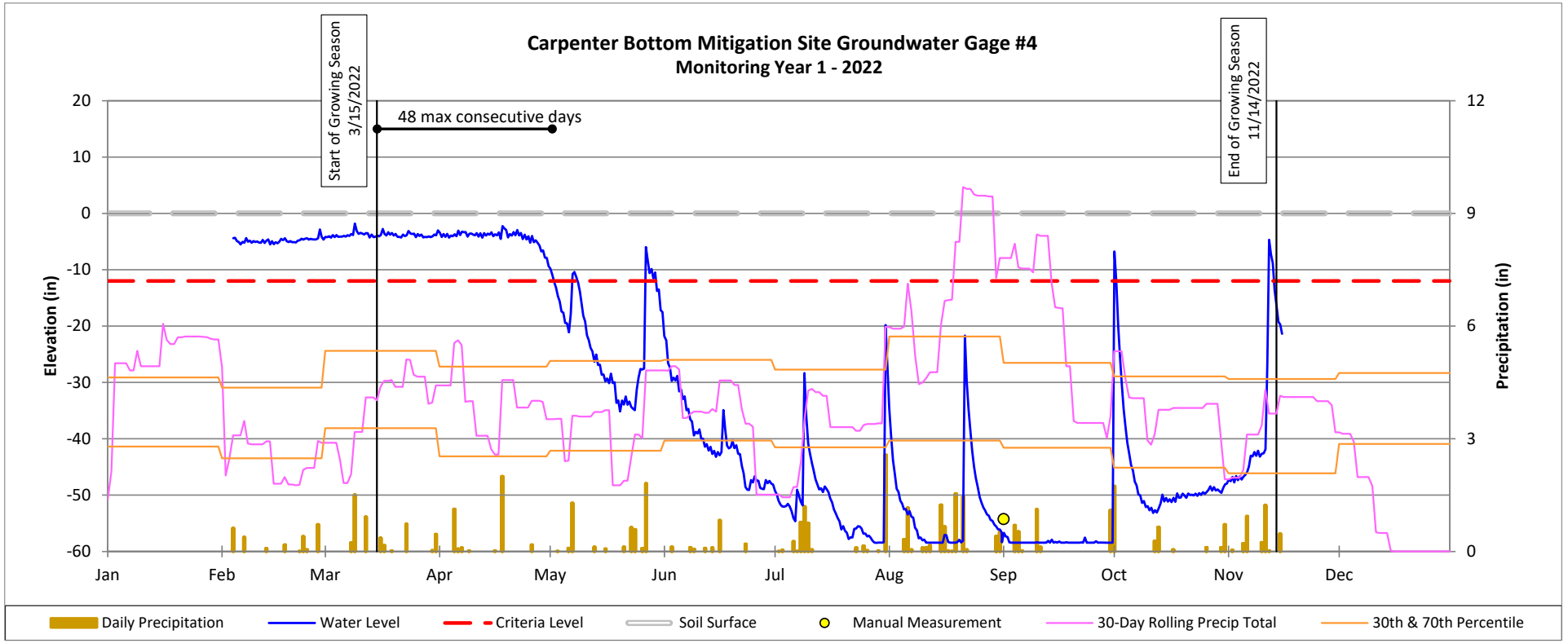
Groundwater Gage Plot

Carpenter Bottom Mitigation Site
DMS Project No. 100090
Monitoring Year 1 - 2022
Wetland Re-Establishment



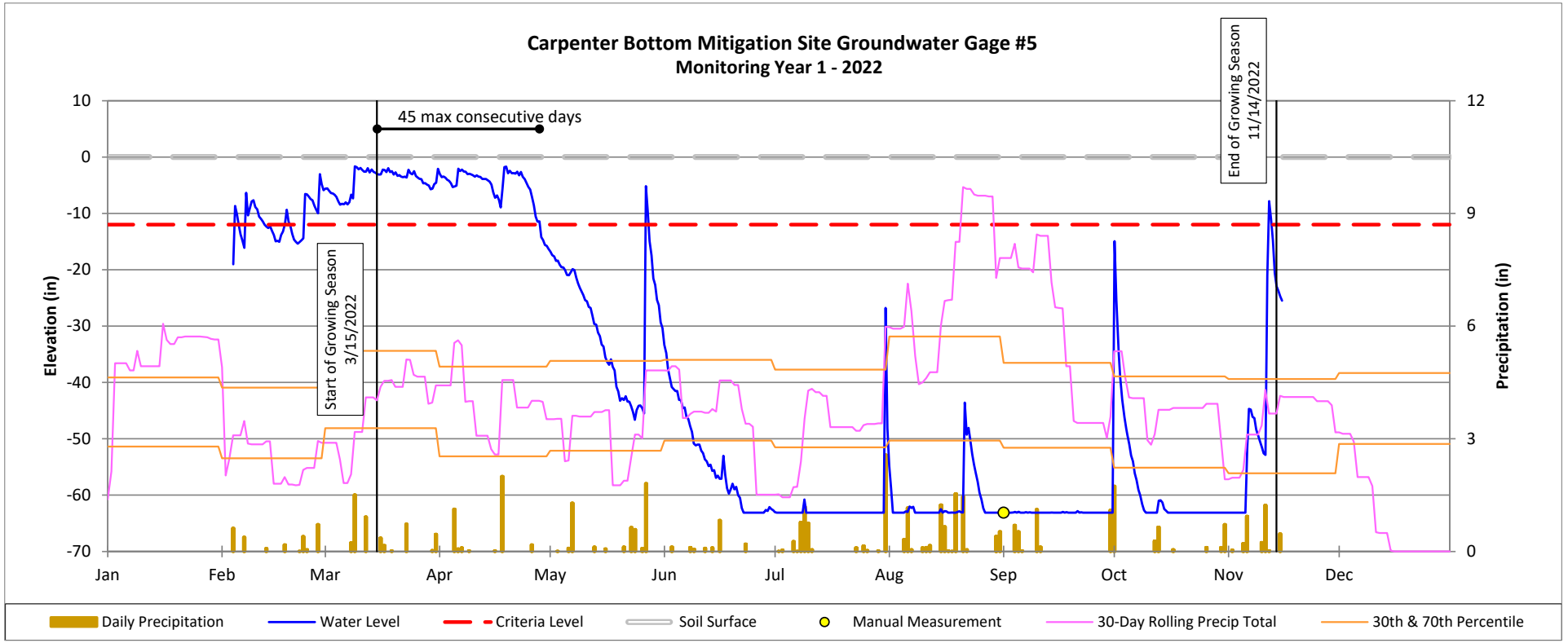
Groundwater Gage Plot

Carpenter Bottom Mitigation Site
DMS Project No. 100090
Monitoring Year 1 - 2022
Wetland Re-Establishment



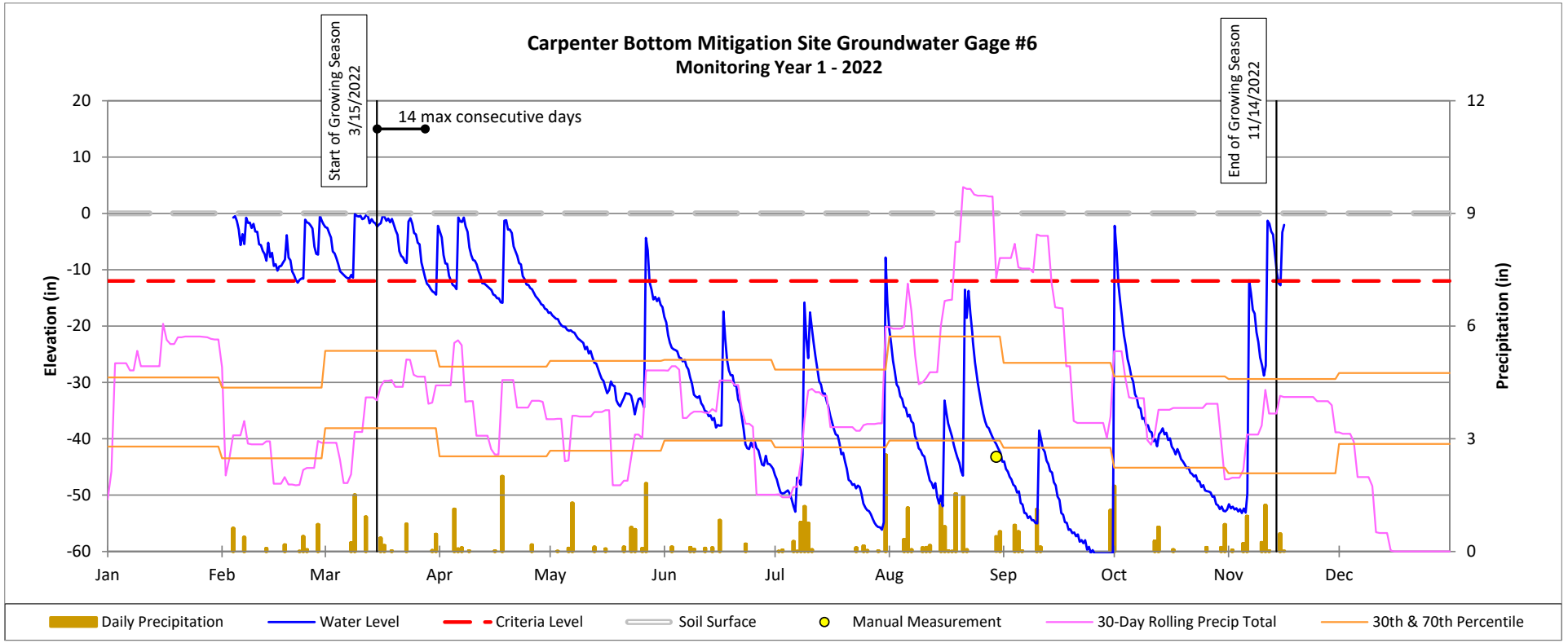
Groundwater Gage Plot

Carpenter Bottom Mitigation Site
DMS Project No. 100090
Monitoring Year 1 - 2022
Wetland Re-Establishment



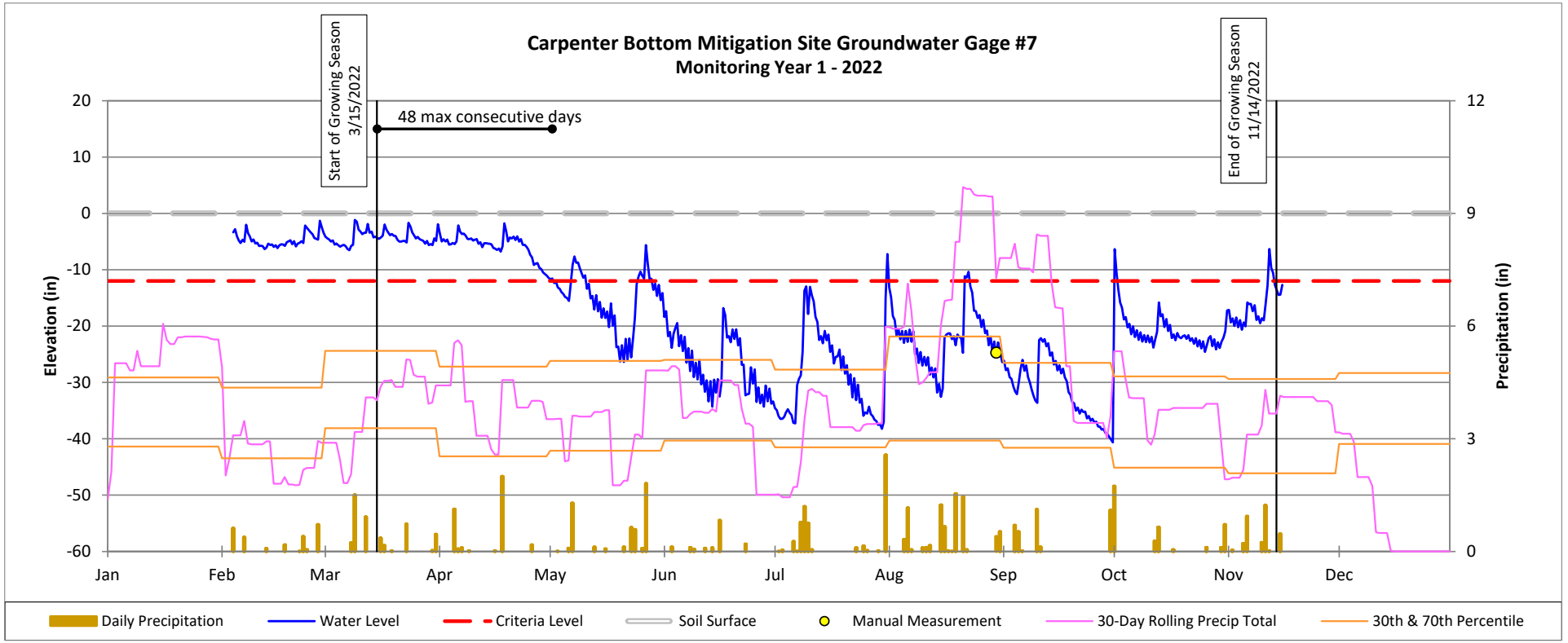
Groundwater Gage Plot

Carpenter Bottom Mitigation Site
DMS Project No. 100090
Monitoring Year 1 - 2022
Wetland Re-Establishment



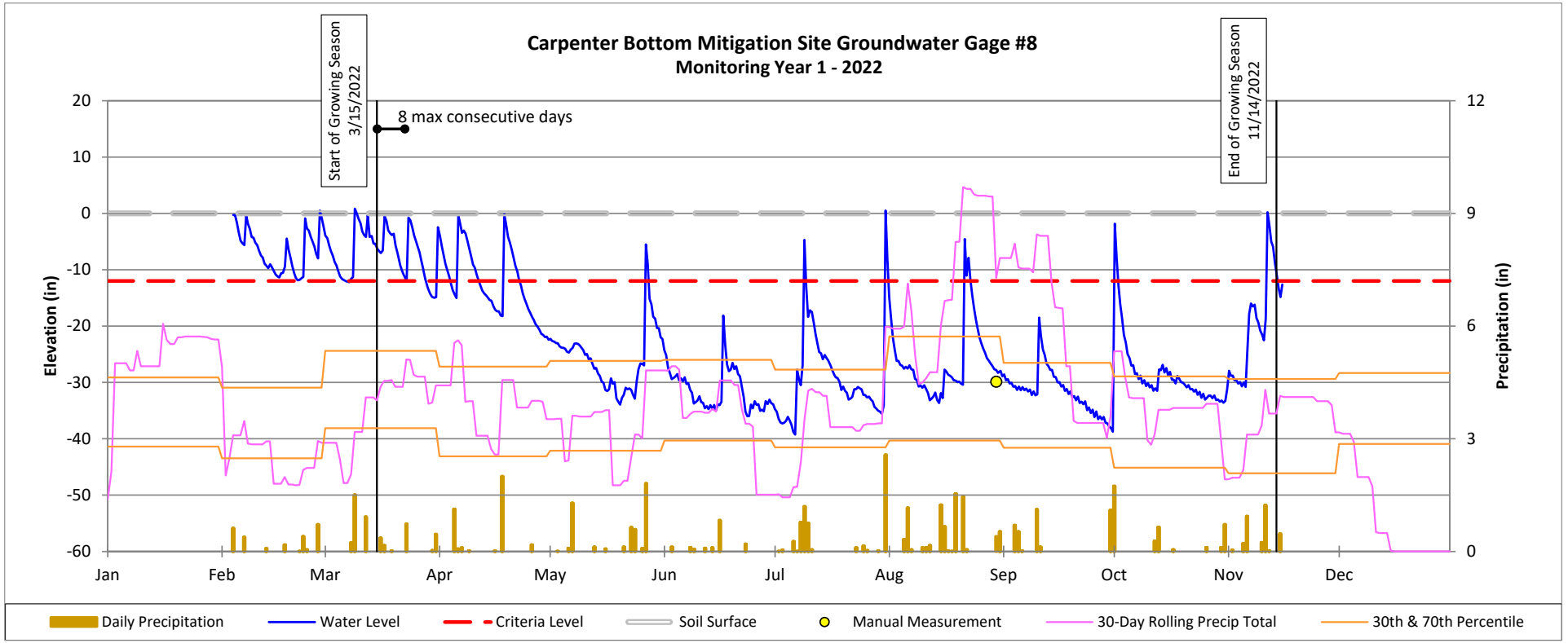
Groundwater Gage Plot

Carpenter Bottom Mitigation Site
DMS Project No. 100090
Monitoring Year 1 - 2022
Wetland Rehabilitation



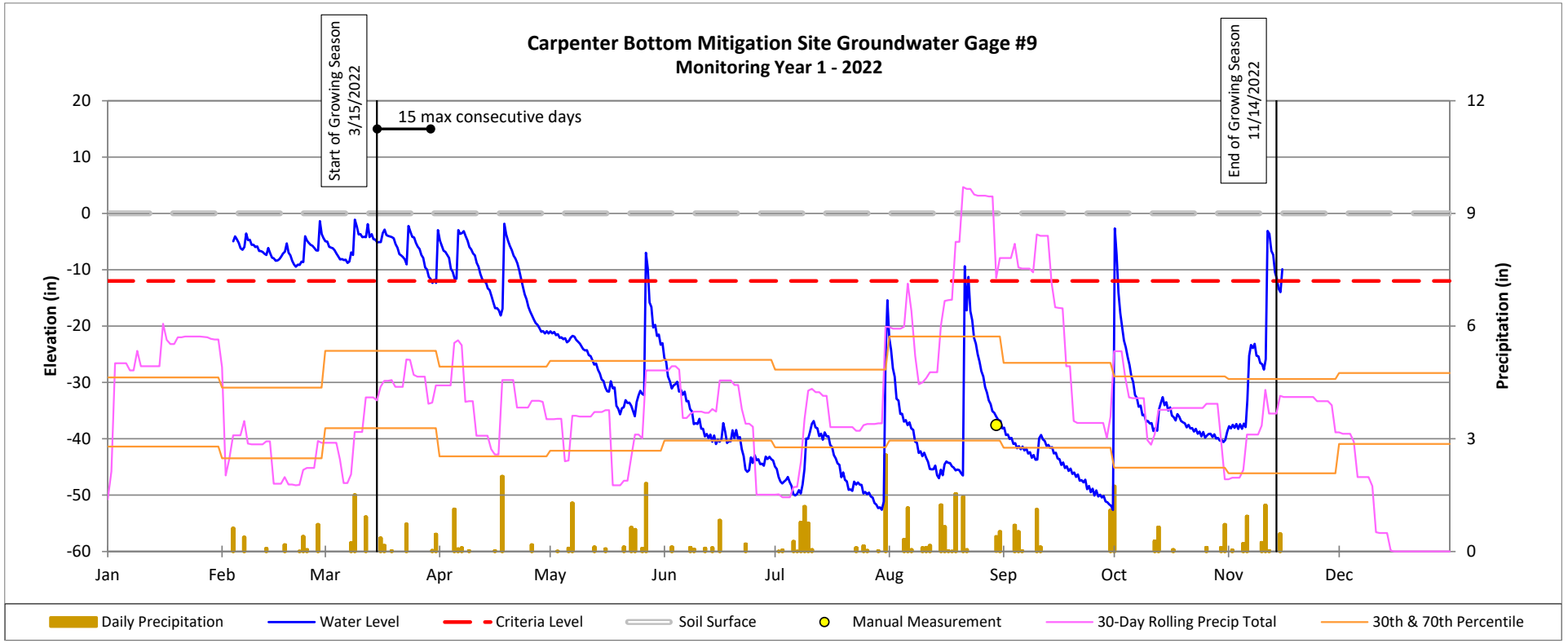
Groundwater Gage Plot

Carpenter Bottom Mitigation Site
DMS Project No. 100090
Monitoring Year 1 - 2022
Wetland Re-Establishment



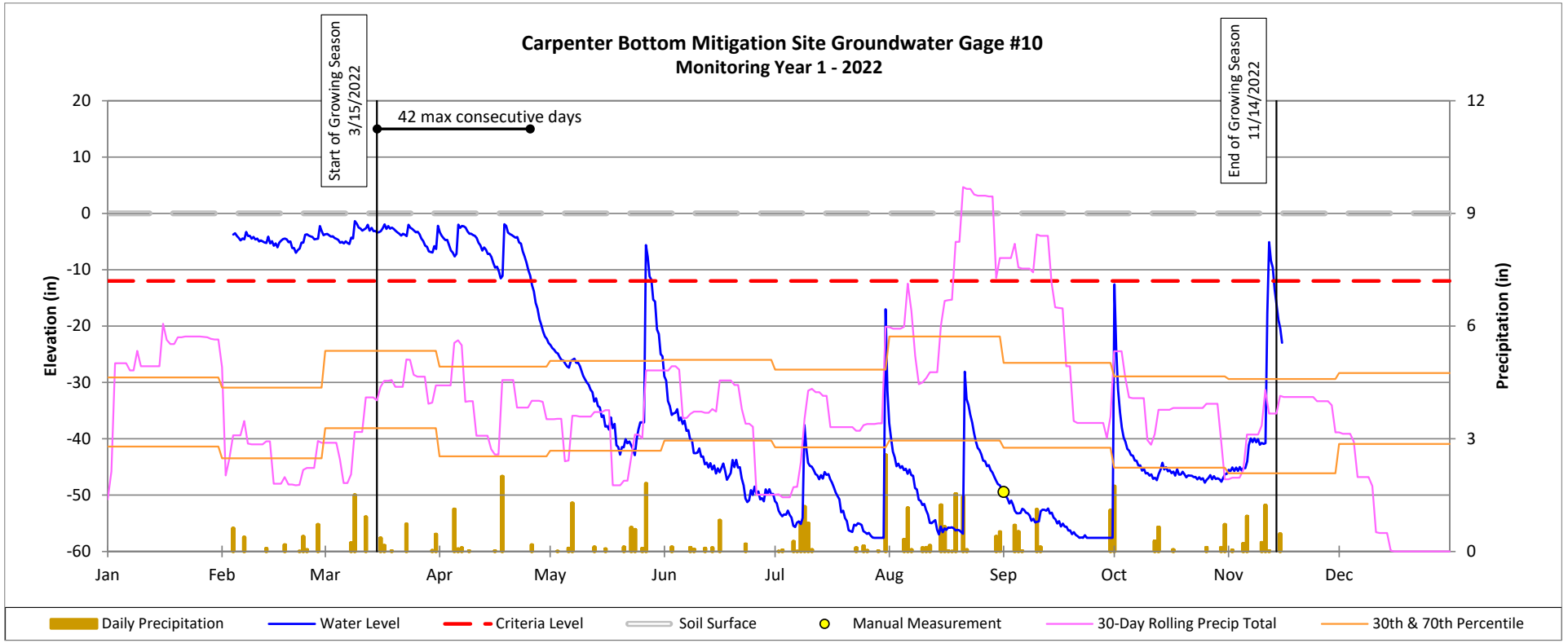
Groundwater Gage Plot

Carpenter Bottom Mitigation Site
DMS Project No. 100090
Monitoring Year 1 - 2022
Wetland Re-Establishment



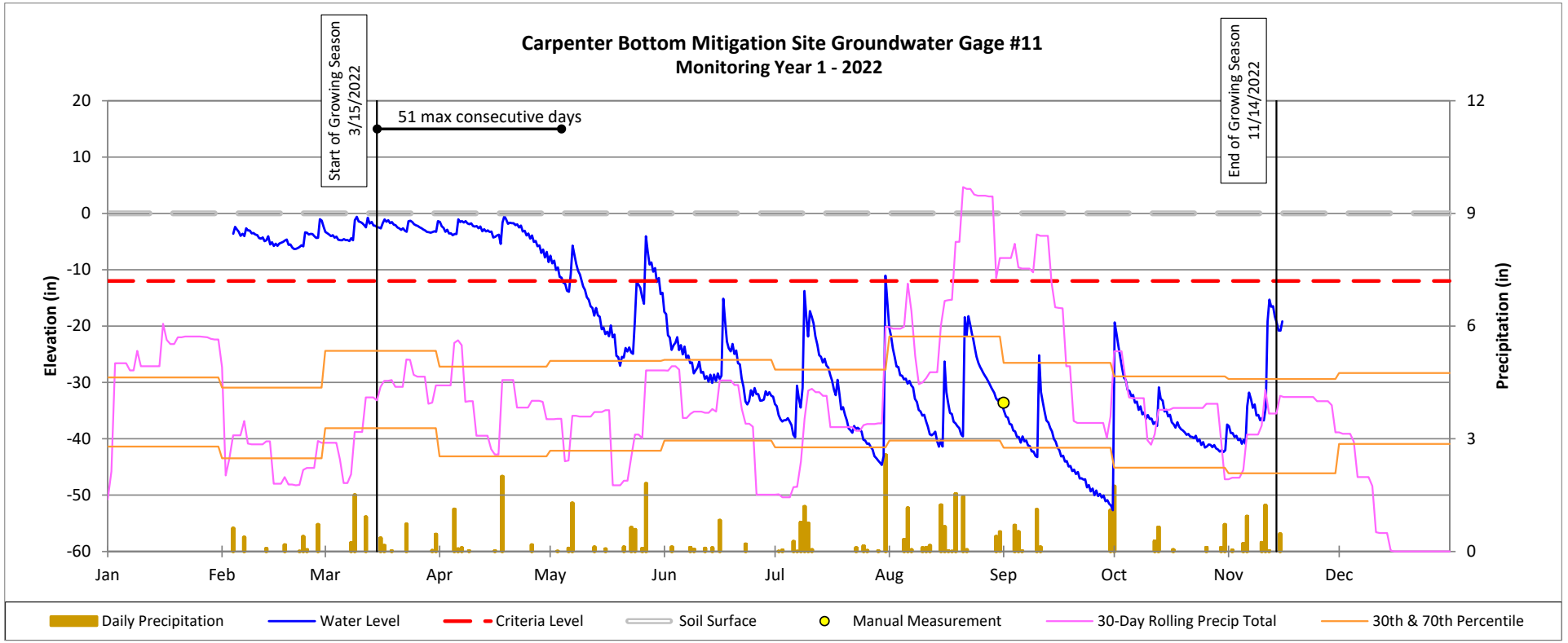
Groundwater Gage Plot

Carpenter Bottom Mitigation Site
DMS Project No. 100090
Monitoring Year 1 - 2022
Wetland Re-Establishment



Groundwater Gage Plot

Carpenter Bottom Mitigation Site
DMS Project No. 100090
Monitoring Year 1 - 2022
Wetland Rehabilitation



APPENDIX E. Project Timeline and Contact Info

Table 14. Project Activity and Reporting History

Carpenter Bottom Mitigation Site
DMS Project No. 100090
Monitoring Year 1 - 2022

Activity or Deliverable		Data Collection Complete	Task Completion or Deliverable Submission
Project Instituted		N/A	October 9, 2018
Mitigation Plan Approved		December 2020	December 2020
Construction (Grading) Completed		N/A	July 2021
As-Built Survey Completed		August-September 2021	September 2021
Planting Completed		N/A	February 2022
Baseline Monitoring Document (Year 0)	Stream Survey	August-September 2021	April 2022
	Vegetation Survey	February 2022	
Invasive Treatment		July, November 2022	
Year 1 Monitoring	Stream Survey	August 2022	November 2022
	Vegetation Survey		
Year 2 Monitoring	Stream Survey		
	Vegetation Survey		
Year 3 Monitoring	Stream Survey		
	Vegetation Survey		
Year 4 Monitoring			
Year 5 Monitoring	Stream Survey		
	Vegetation Survey		
Year 6 Monitoring			
Year 7 Monitoring	Stream Survey		
	Vegetation Survey		

Table 15. Project Contact Table

Carpenter Bottom Mitigation Site
DMS Project No. 100090
Monitoring Year 1 - 2022

Designer Eric Neuhaus, PE	**Wildlands Engineering, Inc.** 167-B Haywood Rd Asheville, NC 28806 828.774.5547
Construction Contractor	**Wildlands Construction, Inc.** 1430 S. Mint St., Suite 104 Charlotte, NC 28203
Planting Contractor	**Bruton Natural Systems, Inc.** PO Box 1197 Fremont, NC 27830
Seeding Contractor	**Canady's Landscape & Erosion Control, LLC.**
Nursery Stock Supplies	**Bruton Natural Systems, Inc.**
Herbaceous Plugs	**Wetland Plants, Inc.**
Monitoring Performers Monitoring, POC	**Wildlands Engineering, Inc.** Kristi Suggs 704.332.7754

APPENDIX F. Additional Documentation

May 27, 2022

Mr. Matthew Reid
Project Manager
NCDEQ – Division of Mitigation Services
5 Ravenscroft Drive, Suite 102
Asheville, NC 28801

RE: Carpenter Bottom Draft MY0 Report Review
Catawba River Basin - CU# 03050102
Gaston County
DMS Project ID No. 100090
Contract #7731

Dear Mr. Reid:

Wildlands Engineering, Inc. (Wildlands) has reviewed the Division of Mitigation Services (DMS) comments from the Draft Year 0 Monitoring Report for the Carpenter Bottom Mitigation Site that were received on May 4, 2022. The report has been updated to reflect those comments. The Final MY0 Report is included. DMS' comments are listed below in **bold**. Wildlands' responses to DMS' comments are noted in *italics*.

DMS' Comment: Please add "Date of Issue: April 24, 2017" following RFP number on title page.

Wildlands' response: The RFP issuance date of April 24, 2017 has been added to the title page.

DMS' Comment: Table 2a: Recommend including the Monitoring Table Components from mitigation plan in the MY0 report, or list the number of monitoring stations for each metric in the measurement column of Table 2a.

Wildlands' response: The measurement column of Table 2a was updated to include the quantity of monitoring components for each goal/performance criteria.

DMS' Comment: Table 3a: There is a discrepancy between the Restoration Tributary Summary Information for Carpenter Branch R1 and R2 lengths when compared to Table 5 in the Mitigation Plan. Please revise or explain the discrepancy in existing lengths.

Wildlands' response: Table 3. The pre-project stream length for Carpenter Branch Reach 1 and 2 was corrected to match the mitigation plan and also what is reported in Table 1.

DMS' Comment: Section 2.1: There were a significant number of additional brush toes added during construction. While DMS agrees the addition of wood and increase bank stability will be beneficial, can WEI please add an explanation as to why this change was made during construction? Did a storm event reveal a need for additional bank protection, was their extra material on site, etc.?

Wildlands' response: Additional brush material was available on site based on the limits of clearing during design and construction. A portion of the additional brush was able to be burned, however utilizing additional brush material as habitat in the small headwater channels was determined a better use of the material. Brush toes were installed for habitat, not for additional stability, in this instance.

DMS' Comment: Floodplain pool on right floodplain near sta: 112+25 should be included as a red line change. This feature was not in the original design.

Wildlands' response: The floodplain pool on the right floodplain near STA 112+25 has been corrected and included as a red line change. The following text was also added to section 2.1.1 of the report: "Floodplain pool - Pool added to preserve relic channel meander feature with existing mature vegetation."

DMS' Comment: Sta: 122+39 – 122+84 note specifies 38 linear feet are realigned. Redline drawing says 44'. Please review and update as necessary for consistency.

Wildlands' response: The STA 122+39 – 122+84 note was revised, in the report and on the record drawings, for clarification. The stationing listed represents where the channel realignment deviates from the design; however, the actual channel realignment resulted in 38 linear feet, for a loss of 6 linear feet.

DMS' Comment: 3.6 Wetland Hydrology: Section 8.3 of the approved Mitigation Plan defines the growing season based on the Gaston County, NC WETS table as March 15th to November 14th representing a 250 day growing season. Wildlands proposed a 12% growing season of 30 consecutive days based on this data which was approved by the IRT. Confirming season dates with a soil temperature probe is appreciated, but please continue to use the success criteria approved in the Mitigation Plan. Please update section to reflect the Mitigation Plan.

Wildlands' response: As requested the text has been revised to better reflect the growing season limits defined in the Site's Mitigation Plan.

DMS' Comment: Table 4c: Calculation for Bank Protection under the Structure category is displaying a formula error due to having a 0 value in the formula. Recommend manually changing to 100% or NA for final.

Wildlands' response: Table 4c. Since there are no bank protection structures on the reach, the total performing percentage is not applicable and was updated to N/A.

DMS' Comment: Groundwater gage 7 and gage 8 photos: Gage photos appear to show a minimal amount of bentonite surrounding the wells when compared to other gages. The bentonite cap may just be hard to see in the photos. As regular maintenance, please inspect and add bentonite as necessary.

Wildlands' response: Wildlands mixes some of the surrounding soil with the bentonite and dampens the mixture which provides a better seal around the pipe collar. However, this can alter the pellet-like texture and the appearance of the bentonite cap. Wildlands will continue to monitor, inspect, refurbish the bentonite surrounding the wells on a regular basis. The bentonite seals on gages 7 and 8 are not a concern at this time.

DMS' Comment: Monitoring gage installation data sheets are a welcome addition to the report. Thanks for including.

Wildlands' response: Thank you for the comment.

DMS' Comment: XS 2,3 and 6 photos appear to show riffles with very little to no flow on the surface. Does WEI have concerns regarding the depth of riffle material and the ability to achieve surface flow over these areas?

Wildlands' response: Wildlands does not have concerns about the stream's ability to achieve surface flow over the upstream extent of Carpenter Branch Reach 1. Cross section 2 is on an intermittent reach, so it is not surprising that the reach is dry in the September photos. Cross sections 3 and 6 both show some staining on the rocks indicating that flow has occurred over the riffles. It is expected that once the stream

has time to stabilize and the riffle material settles, winter rain will recharge the streams and flow will return as shown in the photos taken in February at PP1 and PP2.

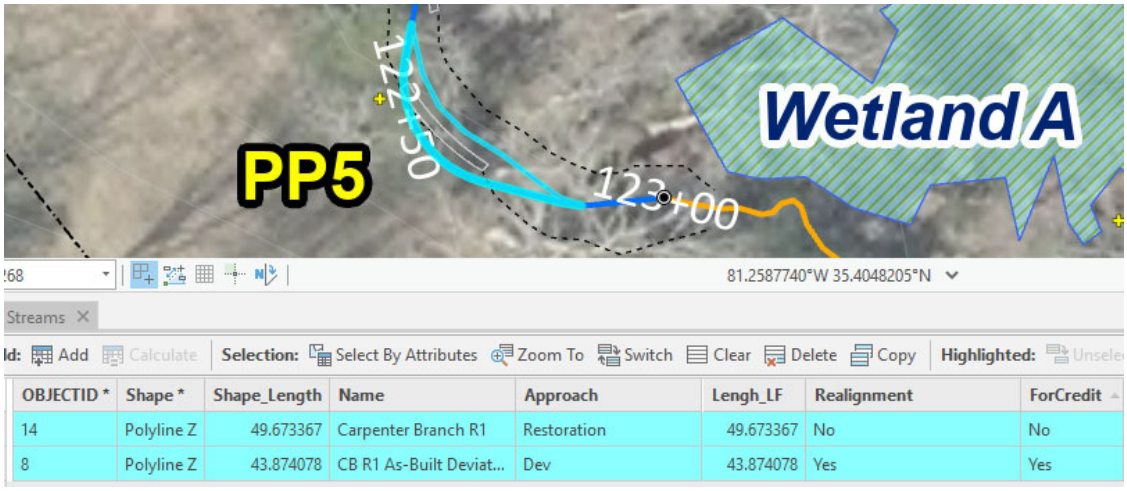
DMS' Comment: Table 10: Please change the Project Instituted date to October 9, 2018.

Wildlands' response: In Table 10, the Project Instituted date was changed from July 6, 2017 (the date of Wildland's contract with NCDEQ, #7244) to October 9, 2018 (the date of the fully executed original contract with the NCDEQ, #7731).

Digital Deliverable Comments:

DMS' Comment: There are two depictions of what appears to be an outer meander bend on centerline for Carpenter Branch R1; one is labeled as such and lists the length as 49.673, the other is labeled as CB R1 As-built Deviation and lists length as 43.874. Please verify the submission of all centerlines (feature class = Streams_PH) are sourced from the As-built survey.

Wildlands' response: The feature class "Streams_PH" was renamed to "Streams" and the attribute table was modified for clarity. A credit/no credit column was added, and the realignment attribute of OID#14 was changed to "No". There are two lines shown in the map because one line represents the proposed stream alignment, and the other is the deviation. The lines match what is used and shown in the CAD plan set (Sheet 1.1.6); the deviation line in GIS matches the red line in CAD. The longer segment (OID#14) is the proposed centerline, and the shorter segment (OID#8) is the deviation. The deviation length was used when calculating the as-built creditable stream length.



OBJECTID *	Shape *	Shape_Length	Name	Approach	Lengh_LF	Realignment	ForCredit
14	Polyline Z	49.673367	Carpenter Branch R1	Restoration	49.673367	No	No
8	Polyline Z	43.874078	CB R1 As-Built Deviat...	Dev	43.874078	Yes	Yes

As requested, Wildlands has included one (1) hard copy of the final report and a full final electronic submittal of the support files on USB. A copy of the DMS comment letter and our response letter have been included inside the front cover of the report's hard copy, as well. Please let me know if you have any questions.

Sincerely,

Kristi Suggs
Senior Environmental Scientist
ksuggs@wildlandseng.com

WILDLANDS
ENGINEERING

July 26, 2022

ATTN: Ms. Kim Isenhour
Mitigation Project Manager, Regulatory Division
U.S. Army Corps of Engineers
69 Darlington Avenue
Wilmington, NC 28403-1343

RE: Carpenter Bottom Mitigation Site - MY0 Report Comments
Catawba River Basin – CU# 03040101, Gaston County
USACE Action ID No. SAW-2018-02062
NCDWR Project No. 20190049
DMS Project ID No. 100090, Contract # 7731

Dear Ms. Kim Isenhour,

Thank you for your comments in the email dated July 7, 2022 referencing the Carpenter Bottom Mitigation Site Monitoring Year 0 (MY0) Report. Wildlands Engineering, Inc. (Wildlands) has reviewed these comments and our responses are noted below.

Kim Isenhour, USACE:

1. *How deep are the floodplain pools where the relic channel meander features were located? On recent site visits, we've noted several instances of floodplain pools being left as open water in areas where the mitigation plans calls for planted buffers. The majority of these pools have been deep enough that they will not dry seasonally and allow for herbaceous or woody vegetation establishment.*

   Wildlands Response: At the location of the relic channel meander features, the floodplain pool is around 1.5' deep. The floodplain pools were designed with a max depth of 2.0' and were intended to draw down seasonally. Vegetation growth will be monitored in floodplain pools and reported on in the MY1 report.

   Kim Isenhour, USACE response (July 28, 2022): *These features should be no more than 18-inches deep and should dry seasonally (ideally toward the end of spring), not draw down. The idea is that the pools will have dry periods that prevent predator species from surviving. The size of constructed ephemeral pools should be limited to prevent the formation of gaps within the tree canopy and minimize the risk of invasive plant colonization. You should also take into account the target vegetation community for the project. For example, ephemeral pools may develop herbaceous vegetative growth that may persist for a long period rather than the targeted forested community.*

   Wildlands Response: The condition of the floodplain pools is discussed in more detail in section 2.6 – Wetland Hydrology Assessment of the MY1 report. Two of the four floodplain pools were existing wetland areas protected during construction, so their hydrologic functionality and their vegetation communities are assumed to be comparable to the existing conditions. When the Site was assessed on September 1,

2022, three of the pools had dried up completely and only the most upstream pool had a small area of standing water approximately 0.5 feet deep. The targeted forested community can still develop an enclosed canopy over and around these floodplain pools as they are only 27-feet wide. Consequently, these four pools are not a concern for the success and functionality of the completed project. See the MY1 report for photo documentation of the floodplain pools.

2. *In future monitoring years, please capture some of the wetland rehabilitation areas with mobile veg plots.*

   Wildlands Response: Mobile veg plots will be positioned to capture wetland rehabilitation areas starting in MY2 as mobile vegetation plots are typically stationary between MY0 and MY1.

3. *Thank you for including the soil profile descriptions at each groundwater gauge. It would have been helpful to include a table with the pre-construction gauge data.*

   Wildlands Response: A summary table of pre-construction gage data will be included in future as-built monitoring reports.

4. *Pebble counts were included in the data. Do you plan to keep this as a performance standard through monitoring?*

   Wildlands Response: Pebble counts were included in the MY0 report as part of the baseline data collection as described in the Mitigation Plan. However, pebble counts will not be collected for the MY1-MY7 reports, unless requested by the IRT or deemed necessary based on best professional judgement. This is documented in Section 3.3 (Stream Assessment) of the MY0 report.

5. *Photo Point 12, outside the easement, appears to be a source of offsite sediment/nutrients.*

   Wildlands Response: Sediment in photo point 12 is from recent fencing work at the Site. Upstream of UT4 is wooded and stable.

Erin Davis, NCDWR:

1. *DWR would like to reiterate DMS' comments/questions on the high riffles and gauge bentonite seals. WEI's responses were fine, but please closely observe these areas during MY1 and address as needed.*

   Wildlands Response: These items/concerns will be noted in future monitoring reports.

2. *What are the max. depths of the floodplain pools? (may include response in MY1 report)*

   Wildlands Response: The floodplain pools were designed with a max depth of 2.0' and were intended to draw down seasonally. Vegetation growth will be monitored in floodplain pools and reported on in the MY1 report.

3. *DWR appreciated that invasives were inventoried and treated pre-construction. And we were glad to see woody debris was added to the floodplain pools. DWR is ok with the proposed credit release. No site visit requested.*

   Wildlands Response: Thank you for your comments.

Todd Bowers, USEPA:

1. *All 13 vegetation plots met the interim success criteria and are on track to meet the final success criteria required for MY7, and no species dominance per plot was greater than 50%. Morphological*

surveys conducted throughout the Site show all streams as stable and functioning as designed. Eleven groundwater wells were established at baseline conditions to monitor wetland hydrology within both wetland re-establishment and rehabilitation areas. Wetland hydrologic data will be collected and reported during MY1. No adaptive management plan needed at this time. No issues of conservation easement encroachment.

Wildlands Response: Thank you, we acknowledge the comments.

2. *Table 2a: I recommend adding a visual confirmation that the objective of excluding livestock from the conservation easement is being met. Visual confirmation can include no sign of hoof shear or cattle excrement within the project boundaries. Trampled streams and vegetation, broken fence, destroyed banks from hooves and excrement would be positive indications of that objective not meeting standards.*

   Wildlands Response: A visual confirmation of cattle exclusion will be added to Table 2A in the MY1 report.

3. *Overall, I am very satisfied with the report and the work that Wildlands has completed at the site. Having not been able to visit this location, I really appreciated the detailed ground-level stream and veg plot photos to illustrate the amount of work implemented. I recommend the appropriate credit release (Milestone 2) for warm stream and riparian wetland mitigation units for this monitoring milestone. I have no other substantial comments at this time.*

   Wildlands Response: Thank you, we acknowledge the comments.

As requested, Wildlands has addressed these comments and the updates are included in the MY1 Report. A copy of this comment/response letter will be included in the Appendix of the MY1 Report. If you have any questions, please feel free to contact me. Thank you!

Sincerely,

Eric Neuhaus

Senior Environmental Scientist
ksuggs@wildlandseng.com