Mitigation Project Name	UT to Millers Creek	County	Duplin	USACE Action ID	2013-00386
DMS ID	95719	Date Project Instituted	12/12/2021	NCDWR Permit No	2013-0187
River Basin	Cape Fear	Date Prepared	5/22/2018		
Cataloging Unit	03030006				

Credit Release Milestone	Stream Credits						Wetland Credits							
	Scheduled Releases (Stream)	Warm	Cool	Cold	Anticipated Release Year (Stream)	Actual Release Date (Stream)	Scheduled Releases (Forested)	Riparian Riverine	Riparian Non-riverine	Non-riparian	Scheduled Releases (Coastal)	Coastal	Anticipated Release Year (Wetland)	Actual Release Date (Wetland)
Potential Credits (Mitigation Plan)		2,679.000						8.200						
Potential Credits (As-Built Survey)		2,709.000						8.000						
1 (Site Establishment)	N/A				N/A	N/A	N/A				N/A		N/A	N/A
2 (Year 0 / As-Built)	30%	812.700			2016	3/31/2016	30%	2.400			30%		2016	3/31/2016
3 (Year 1 Monitoring)	10%	270.900			2016	4/26/2016	10%	0.800			10%		2016	4/26/2016
4 (Year 2 Monitoring)	10%	270.900			2017	4/3/2017	10%	0.800			15%		2017	4/3/2017
5 (Year 3 Monitoring)	10%	270.900			2018	4/25/2018	15%	1.200			20%		2018	4/25/2018
6 (Year 4 Monitoring)	5%				2019		5%				10%		2019	
7 (Year 5 Monitoring)	10%				2020		15%				15%		2020	
8 (Year 6 Monitoring)	5%				2021		5%				N/A		2021	
9 (Year 7 Monitoring)	10%				2022		10%				N/A		2022	
Stream Bankfull Standard	10%	270.900			2017	4/3/2017	N/A				N/A			
Total Credits Released to Date		1,896.300						5.200						

DEBITS (released credits only)

Ratios			1	1.5	2.5	5	1.09625	3	2	5	1	3	2	5	1	3	2	5
			Stream Restoration	Stream Enhancement I	Stream Enhancement II	Stream Preservation	Riparian Restoration	Riparian Creation	Riparian Enhancement	Riparian Preservation	Nonriparian Restoration	Nonriparian Creation	Nonriparian Enhancement	Nonriparian Preservation	Coastal Marsh Restoration	Coastal Marsh Creation	Coastal Marsh Enhancement	Coastal Marsh Preservation
As-Built Amounts (feet and acres)			2,709.000				8.770											
As-Built Amounts (mitigation credits)			2,709.000				8.000											
Percentage Released			70%				65%											
Released Amounts (feet / acres)			1,896.30				5.701											
Released Amounts (credits)			1,896.30				5.200											
NCDWR Permit	USACE Action ID	Project Name																
	2001-01309	NCDOT TIP B-3906 - Bridges over Six Runs Cr, Sampson Co					0.121											
	2003-00152	NCDOT TIP B-3654 - Bridges on NC 55, Harnett & Sampson Co					0.504											
	2000-01472	NCDOT TIP B-3152 - Bridge on NC 242, Sampson & Cumberland Co					0.274											
	2010-00123	NCDOT TIP B-5116 - Bridge on SR 1502, Bladen Co					0.219											
2012-0219	2010-00334	NCDOT TIP B-4543 - Bridge on SR 1558, Harnett Co					0.329											
	2009-00859	NCDOT TIP B-5143 - Bridge on SR 1105, Duplin Co					0.142											
	2014-00131	NCDOT TIP R-5526 - SR 1841 Improvements - Division 6, Harnett Co					0.515											
	2013-02241	NCDOT TIP B-5117 - Bridge on NC 210, Bladen Co					0.230											
	2010-00917	The Pork Company S&J Villari Livestock	110.000															
2012-0240	1992-03237	NCDOT TIP R-2303C - NC 24, Sampson County	702.700				0.301											
2012-0240	1992-03237	NCDOT TIP R-2303C - NC 24, Sampson County	270.900				0.877											
2012-0240	1992-03237	NCDOT TIP R-2303D - NC 24, Sampson County	541.800															
Remaining Amounts (feet / acres)			270.900				2.189											
Remaining Amounts (credits)			270.900				1.996											

UT Millers Creek

Contingencies (if any): None

Signature of Wilmington District Official Approving Credit Release

9/6/18
Date

1 - For NCEEP, no credits are released during the first milestone
2 - For NCEEP projects, the second credit release milestone occurs automatically when the as-built report (baseline monitoring report) has been made available to the NCIRT by posting it to the NCEEP Portal, provided the following criteria have been met:

1) Approval of the final Mitigation Plan
2) Recordation of the preservation mechanism, as well as a title opinion acceptable to the USACE covering the property
3) Completion of all physical and biological improvements to the mitigation site pursuant to the mitigation plan
4) Reciept of necessary DA permit authorization or written DA approval for porjects where DA permit issuance is not required

3 - A 10% reserve of credits is to be held back until the bankfull event performance standard has been met

YEAR 4 MONITORING REPORT

UT MILLERS CREEK
Duplin County, North Carolina
DMS Project ID No. 95719, Contract No. 5000, USACE Action ID No. SAW-2013-00386
DWR Project No. 13-0187

Prepared for:

NCDEQ Division of Mitigation Services (DMS)
217 West Jones St., Suite 3000A
Raleigh, North Carolina 27603

Construction Completed: February 2015
Visual Assessment Data Collected: March, July, September, December 2018
Submitted: January 10, 2018

January 10, 2019

Lindsay Crocker
Project Manager
NCDEQ Division of Mitigation Services
217 West Jones Street, Suite 3000A
Raleigh, North Carolina 27603

Re: NCDEQ – Division of Mitigation Services
UT Millers MY 4 Monitoring Report
UT to Millers Creek Draft Year 4 Monitoring Report
Cape Fear River Basin, CU 03030006, Duplin County, DMS Project No. 95719

Ms. Crocker,

As per your email dated November 11, 2018, we have reviewed and addressed DMS review comments as follows:

General:

1. *Update hydrographs and Table 8 with data though the growing season (at least through 11/11). It is possible that the two gauges not meeting may achieve success during this time.*
   Response:
   The hydrographs have been updated through the entire year. All of the gauge locations are meeting success criteria.

2. *CCPV, replace the pages 16-22 with a GIS rendered CCPV. It does not need to include engineering features. The gauges, vegetation plots, cross sections, and other monitoring features should be labeled and visible. Also, the assets should be apparent, along with any areas of concern (bank erosion, low vigor, etc areas). This should be a one-page map that is easy to understand similar to the one the IRT requested at credit release (I'm attaching it). Make sure that the headwater wetland is depicted separately on this map.*
   Response:
   The CCPV has been rendered in GIS. The assets have been included on this map and the figure for the asset map has been removed from the document.

3. *All support files should be in their native file type (i.e. excel, not PDF)*
   Response:
   All support files have been resubmitted in their native file type.

Specific:

4. *Page 3, Visual Vegetation Assessment- this section describes a lot of low stem density and bare areas that were not called out on previous reports, what has changed? During our site walk, I did not notice this extent of vegetative concern. Additionally, there is a successful vegetation plot in the middle of one section which does not make sense (VP6). Please*

evaluate if this shape matches the area on the ground of low stem density and revise CCPV, and table 6 accordingly.

Response:

The low stem density areas were reviewed and the CCPV was revised to show only one area of low stem density that meets the mapping threshold. Table 6 was also updated to reflect the revision.

5. *Page 3, Visual Stream Assessment- the next paragraph describes "holes" near the soil lifts? Would these features be better described as surficial scour, eroded depressions, or do they actually tunnel through? If these are just storm flow features where water is moving around roots, they may not be valuable to mention. The cataloging threshold for a channel the size of UT Miller (<3' bank height) is 10' of bank scour, slumping, or collapse. Do these areas meet this threshold? If not, remove and update table 5 accordingly.*

   Response:

   The areas of erosion have been reviewed and it was determined that only two areas of bank erosion meet the mapping threshold of over 10'. The CCPV was updated to reflect these areas, as well as the narrative and Table 5.

6. *Page 4, Methodology- this section describes 9 gauges, which would be an increase from 6 from previous years. I understand the IRT requested additional gauges. Do you have and can you provide the additional data and gauge locations on the CCPV? If not, ok.*

   Response:

   The Methodology section was revised from 9 to 6 based on DMS's rejection of a supplemental request for additional groundwater gauges dated August 16, 2018.

7. *Asset map- Figure 2- show the headwater area as separate on this map OR merge this with CCPV and delete it.*

   Response:

   The headwater area has been defined and is shown on the CCPV. The asset map has been deleted.

8. *Table 1- break out the headwater wetland area as a separate row on the table.*

   Response:

   The headwater wetland area is now shown separately in Table 1.

9. *Page 24, Table 7. Update this table to include all bankfull events (see MY3 report).*

   Response:

   The table has been updated to include all bankfull events.

10. *Table 12. I understand that HDR listed the growing season as 2/1-11/30 in the Mitigation Plan and plan to stick with this timeline. DMS will support this because it was described at the project inception and approved at that time. Please provide the excel file from hydrology for all previous years so DMS might have additional date to satiate IRT if needed.*

    Response:

    The excel files for hydrology have been provided for all the previous years.

If you have any questions or need additional information, please do not hesitate to give me a call (919.232.6600, ext. 1645).

Prepared by:

HDR Engineering
555 Fayetteville Street, Suite 900
Raleigh, North Carolina 27601
919.232.6600
919.232.6642 (fax)

I HEREBY CERTIFY THAT THE DOCUMENT CONTAINED HEREIN, UT MILLERS CREEK YEAR 4 MONITORING REPORT WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION.

SIGNED SEALED, AND DATED THIS 10TH DAY OF JANUARY 2019.

Chris L. Smith, PE

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1.0 PROJECT SUMMARY

The following report summarizes the vegetation establishment, stream stability, and wetland hydrology for Year 4 monitoring for the UT Millers Creek Site (hereafter referred to as the "Site") in Duplin County, North Carolina.

1.1 Goals and Objectives

The primary goals of the UT Millers Creek stream and wetland mitigation project focus on:

- Reducing stressors to water quality
- Providing and enhancing flood attenuation
- Restoring and enhancing aquatic, semi-aquatic and riparian habitat, and
- Restoring and enhancing habitat connectivity with adjacent natural habitats.

The following objectives accomplish the goals listed above:

1. Removing stressors to water quality and increasing attenuation is directly tied to:
    a. Restoration of the formerly deeply incised and entrenched UT as a Priority I (PI) restoration where bankfull and larger flows access the historic floodplain allowing nutrients, sedimentation, trash and debris from upstream urban runoff to settle from floodwaters.
    b. Restoration of the UT as PI restoration allows the Site to mitigate flood flows by reconnecting bankfull and higher flows to its historic floodplain.
    c. Restoration of the riparian buffers and wetlands adjacent to the UT (i.e. restoration of an existing pond and ditch back to riparian wetlands) allows floodwaters to attenuate, in turn reducing stressors from upstream impacts.
    d. Restoration of wetland hydrology within the riparian buffer supports hydrophytic vegetation, which assists in the uptake, storage and fixation of nutrients and sedimentation from overbank flows. Adjacent low quality pine plantations were removed and planted with native hydrophytic vegetation.
2. Restoring and enhancing aquatic, semi-aquatic and terrestrial habitat is directly tied to:
    a. Introduction of woody materials such as planted vegetation, log sills, soil lifts and toe wood to the restored channel. Woody materials will promote shading, bed form diversity and foraging opportunities for aquatic organisms, benthic macroinvertebrates, and fish.
    b. Restoration of native vegetation to the stream channel banks and the adjacent riparian corridor has diversified flora and provides an abundance of available foraging and cover habitat for amphibians, reptiles, mammals and birds.
    c. Restoration of wetland hydrology and introducing floodwaters back to the historic floodplain provides a diversity of habitats for semi-aquatic flora and fauna that may have not been seen on the Site since before anthropogenic disturbances.
3. Habitat restoration and connectivity can be directly tied to:
    a. The removal of existing pine plantations and replanting of native vegetation.
    b. The restored community ensures a protected habitat corridor between the Site and the downstream mature riparian buffers and upland habitats.

1.2 Success Criteria

Monitoring of restoration efforts will be performed until success criteria are fulfilled. Monitoring includes stream channel/hydraulics, wetland hydrology, and vegetation. Year 4 Monitoring consists of hydrology monitoring, stream and wetland visual monitoring and vegetation visual

monitoring. In general, the restoration success criteria, and required remediation actions, are based on the Stream Mitigation Guidelines (USACE et al. 2003) and the Ecosystem Enhancement Program Monitoring Requirements and Performance Standards for stream and/or Wetland Mitigation (NCEEP 2011). Project success criteria are further detailed in the Baseline Monitoring Document & As-Built Baseline Report (ICA 2015).

1.3 Background Summary

The North Carolina Department of Environmental and Natural Resources Department of Mitigation Services (DMS) contracted ICA Engineering, Inc. (ICA) to restore 2,625 linear feet of the Unnamed Tributary to Millers Creek (UT) and 4.5 acres of riparian wetlands within the Site to assist in fulfilling stream mitigation goals in the watershed (Table 1 and Table 4). The Site is located approximately one-half (0.5) mile west of Magnolia in Duplin County, North Carolina and contains an unnamed tributary to Millers Creek and associated restored riparian wetlands (Figure 1). The Site is located within DMS Targeted Local Watershed Catalogue Unit (CU) 03030006. The Site is comprised of one property owned by William Jeffrey Hatcher and wife Susan King Hatcher (PIN # 247100987405). Additional information concerning project history is presented in Table 2.

1.4 Visual Vegetation Assessment

Visual assessment of on-site vegetation suggests that planted stems are becoming well established and volunteer stems are becoming more evident. The herbaceous vegetation is also becoming better established as previously noted bare areas are starting to show a dense community of annual and perennial species. No exotic or nuisance species were observed during Year 4.

One area of low stem density remain present on-site. The total acreage of low stem density areas is 0.12 acres (approximately 1% of planted acreage). Low stem density has been noted from station 33+60 – 36+00. It is expected that volunteer species will establish in this area in future years. Photos of this area are presented in Figures 3.1-3.3.

1.5 Visual Stream Assessment

UT Millers Creek remains stable and functioning as designed. Channel bank stability continues to benefit from the maturation of vegetation along the channel toes and bank. During Year 4, two areas of minor or moderate erosion were noted. It is expected that these areas will fill with vegetation and no remedial action is recommended at this time. Photos of these areas are presented in Figures 3.1-3.3.

1.6 Surface Water and Groundwater Hydrology

The site has experienced several bankfull flows throughout the monitoring period. Bankfull event documentation can be found in Appendix C.

Based upon the Final Mitigation Plan, the hydrologic criteria for restored wetlands at the Site are as follows (based upon the corresponding landscape position and wetland community type):

a. For the **riparian bottomland hardwood forest community**, the hydrologic criterion will be the establishment of a static water table at, or within, 12 inches of the soil

surface for a minimum of 12.5 percent of the growing season, equivalent to 38 days based upon hydrologic monitoring undertaken from Feb 1st through Nov 30th of each monitoring year.

b. For the **headwater riparian community (zero-order geomorphic position)**, the hydrologic criterion will be the establishment of a static water table at, or within, 12 inches of the soil surface for a minimum of 10 percent of the growing season, equivalent to 30 days based upon hydrologic monitoring undertaken from Feb 1st through Nov 30th of each monitoring year.

The UT Millers site exhibits a range of hydrologic conditions characteristic of small stream swamp wetland community types of the inner Coastal Plain of North Carolina. Several of the groundwater gauges documented elevated groundwater levels at or near the soil surface for extended periods of time during the growing season. In addition, portions of the site exhibited intermittent to prolonged periods of surface inundation. Refer to the attached gauge hydrographs depicting recorded groundwater and surface water levels from February 1 through November 30.

All of the groundwater gauges located on the mitigation site exhibit hydrology indicative of jurisdictional wetlands (i.e. hydroperiods greater than 5% of the growing season), and all six gauges exceeded the minimum success criteria as outlined above. While the specific durations of wetland hydrology at each gauge varied across the site, each gauge also displayed prolonged wetland hydroperiods during normal rainfall conditions.

The summary of hydroperiods for each gauge is presented in Table 8 and gauge locations are depicted in Figure 2.1.

2.0 METHODOLOGY

Groundwater hydrology was monitored using six automated gauges (RDS, Inc. WM-20s) located within the riparian wetland restoration areas. Two reference gauges were installed; one in a Headwater Riparian Wetland and one in a Bottomland Hardwood Wetland. Gauges were installed in accordance with installation methods outlined in the Wetlands Regulatory Assistance Program (WRAP) Technical Note 00-02 (Sprecher, 2000). Water levels were recorded once daily and the data was downloaded every two months.

3.0 REFERENCES

ICA Engineering, Inc. As-Built Monitoring Document & As-Built Baseline Report for UT Millers Creek Full Delivery Site. 2015.

Lee, Michael T., R. K. Peet, S. D. Roberts, and T. R. Wentworth. 2006. CVS-EEP Protocol for Recording Vegetation, Version 4.0 (http://cvs.bio.unc.edu/methods.htm).

NCEEP. Ecosystem Enhancement Program Monitoring Requirements and Performance Standards for stream and/or Wetland Mitigation. 2011.

Sprecher, S. W. (2000). "Installing Monitoring Wells/Piezometers in Wetlands," ERDC TN-WRAP-00-02, U.S. Army Research and Development Center, Vicksburg, MS.

US Army Corps of Engineers Wilmington District. Stream Mitigation Guidelines. 2003

Weakley, Alan S. 2011. Flora of the Southern and Mid-Atlantic States (online). Available: http://www.herbarium.unc.edu/FloraArchives/WeakleyFlora_2011-May-nav.pdf [May 15, 2011]. University of North Carolina Herbarium, North Carolina Botanical Garden, University of North Carolina, Chapel Hill, North Carolina.

APPENDICES

Appendix A. Project Vicinity Map and Background Tables

HDR | ICA

Vicinity Map

UT to Millers Creek Mitigation Site, Duplin County, NC

0 750 1,500 3,000 4,500 6,000 Feet

1 inch = 2,000 feet

NC

Figure 1

Table 1. Project Components and Mitigation Credits
UT to the Millers Creek, Duplin County
DMS Project ID No. 95719

Mitigation Credits									
	Stream (SMU)		Riparian Wetland (WMU)		Non-riparian Wetland		Buffer	Nitrogen Nutrient Offset	Phosphorous Nutrient Offset
Type	R	RE	R	RE	R	RE	--	--	--
Totals	2,709		8.00						

Project Components							
Project Component or Reach ID	Stationing/ Location	Existing Footage/ Acreage	Approach (PI, PII, etc.)	Restoration or Restoration Equivalent	Restoration Footage or Acreage	Mitigation Ratio	SMU or WMU
UT Millers Creek	10+13 – 37+22	2,100	PI	Restoration	2,709	1:1	2,709
Drained Wetland (Headwater)	NA	1.22	NA	Restoration	1.22	1:1	1.22
Drained Wetland (Pines)	NA	3.78	NA	Restoration	3.78	1:1	3.78
Drained Wetland (Mature Woods)	NA	2.55	NA	Restoration	2.55	1.25:1	2.04
Drained Wetland (Berm/Spoil Along UT)	NA	0.45	NA	Restoration	0.45	1:1	0.45
Pond	NA	0.77	NA	Restoration	0.77	1.5:1	0.51
TOTAL	NA	2,100/8.77	PI/NA	Restoration	2,709/8.77	1 – 1.5:1	2,709/8.00

Component Summation						
Restoration Level	Stream (linear feet)	Riparian Wetland (acres)		Non-Riparian Wetland (acres)	Buffer (square feet)	Upland (acres)
		Riverine	Non-Riverine			
Restoration	2,709	8.77				

BMP Elements			
Element	Location	Purpose/Function	Notes
Forested Buffer	UT Millers buffer	Buffer to protect stream	Filter nutrients and provide cover, foraging areas, habitat, woody debris, and wildlife

Table 2. Project Activity and Reporting History UT to Millers Creek (DMS Project ID No. 95719)		
Activity or Report	**Data Collection Complete**	**Completion or Delivery**
Restoration Plan	Aug-13	Sep-14
Final Design – Construction Plans	Sep-14	Sep-14
Construction	3-Nov-14	23-Jan-15
Temporary S&E Mix Applied to Entire Project Area	---	23-Jan-15
Permanent Seed Mix Applied to Entire Project Area	---	23-Jan-15
Bare Root, Containerized, and B&B plantings for Entire Project Area	---	10-Mar-15
Mitigation Plan/As-built (Year 0 Monitoring-Baseline)	Mar-15	Apr-15
Year 1 Monitoring	Oct-15	Dec-15
Year 2 Monitoring	Nov-16	Feb-17
Year 3 Monitoring	Nov-17	Jan-18
Year 4 Monitoring	Dec-18	Jan-19
Year 5 Monitoring		
Year 6 Monitoring		
Year 7 Monitoring		

Table 3. Project Contacts Table UT to Millers Creek (DMS Project ID No. 95719)	
Designer Primary project design POC	HDR | ICA Engineering 555 Fayetteville Street, Suite 900 Raleigh, North Carolina 27601 Kevin Williams (919) 851-6066
Construction Contractor Construction Contractor POC	Land Mechanic Designs, Inc. 126 Circle G Lane Willow Spring, NC 27592 Lloyd Glover (919) 639-6132
Planting Contractor Planting Contractor POC	River Works, Inc. 6105 Chapel Hill Road Raleigh, NC 27607 Phillip Todd (919) 582-3574
Seeding Contractor Seeding Contractor POC	Land Mechanic Designs, Inc. 126 Circle G Lane Willow Spring, NC 27592 Lloyd Glover (919) 639-6132
Seed Mix Sources	Green Resources – Triangle Office
Nursery Stock Suppliers	1) ArborGen 2) Mellow Marsh Farm, Inc. 3) Foggy Mountain Nursery (live stakes)
Monitoring Performers	HDR | ICA Engineering 555 Fayetteville Street, Suite 900 Raleigh, North Carolina 27601 Alex DiGeronimo (919) 900-1645
Stream Monitoring POC	HDR | ICA Engineering 555 Fayetteville Street, Suite 900 Raleigh, North Carolina 27601 Alex DiGeronimo (919) 900-1645
Vegetation Monitoring POC	Land Management Group, Inc 3805 Wrightsville Avenue, Suite 15 Wilmington, NC 28403 Kim Williams (910) 452-0001 x 1908

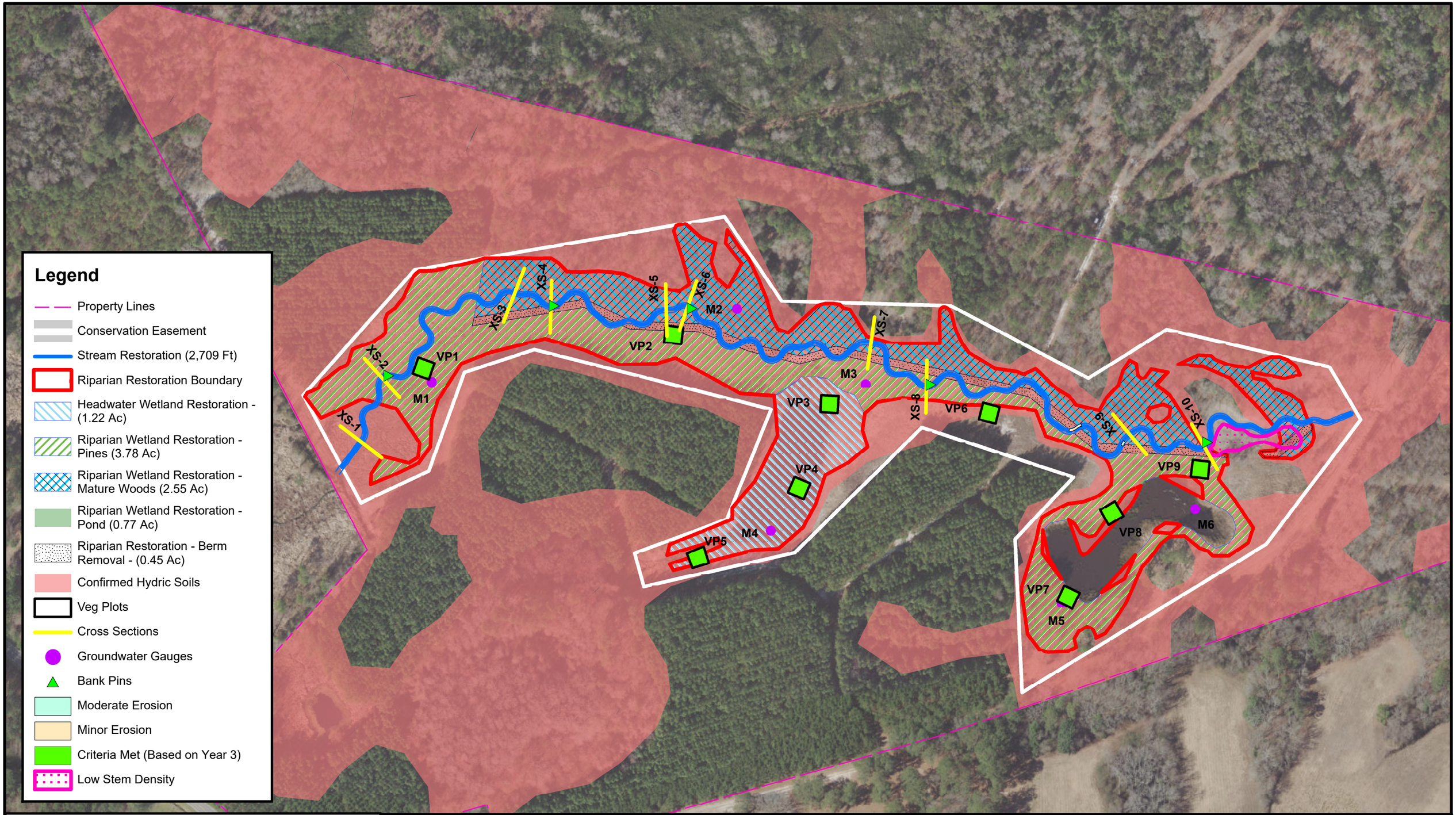
Table 4. Project Information UT to Millers Creek (DMS Project ID No. 95719)	
Project Information	
Project Name	UT to Millers Creek Stream and Wetland Mitigation Site
Project County	Duplin
Project Area (acres)	15.944 AC
Project Coordinates	34.894467,-78.067625
Project Watershed Summary Information	
Physiographic Region	Coastal Plain
Ecoregion	Southeastern Plains
Project River Basin	Cape Fear
USGS 8-digit HUC	3030006
USGS 14-digit HUC	3030006110040
NCDWQ Subbasin	03-06-19
Project Drainage Area	250 AC
Watershed Land Use	Cultivated, Southern Yellow Pine, Bottomland Forest / Hardwood Swamps

Reach Summary Information	
Parameters	**UT to Millers Creek**
Restored length	2,709 linear feet
Drainage Area	250 AC.
NCDWQ Index Number	36
NCDWQ Classification	C, Sw
Valley Type/Morphological Description	X/Existing G/5/Restored E5
Dominant Soil Series	Bibb sandy loam and Torhunta fine sandy loam (USDA/NRCS records). Cape Fear, Rains, Plummer, Rutlege and Lynn Haven Soil series (additional series mapped by LMG)
Drainage Class	Poorly and very poorly
Soil Hydric Status	Bibb sandy loam (hydric) Torhunta mucky fine sandy loam (hydric)
Slope	0.0016
FEMA Classification	Zone X
Native Vegetation Community	Mixed stand of hardwoods and pine
Percent Composition of Exotic Invasives	<5%

Wetland Summary Information			
Parameters	**Wetland 1**	**Wetland 2**	**Wetland 3**
Size of Wetland (acres)	0.21	0.12	0.59
Wetland Type (non-riparian riverine or riparian non-riverine	Riparian Non-Riverine	Riparian Non-Riverine	Riparian Non-Riverine
Mapped Soil Series	BbA	ToA	BnB
Drainage class	Poorly Drained	Very Poorly Drained	Moderately Well Drained
Soil Hydric Status	Hydric	Hydric	Partially Hydric
Source of Hydrology	Groundwater	Groundwater	Groundwater
Hydrologic Impairment	Stream Incision	Stream Incision	Stream Incision/Beavers
Native vegetation community	Forested	Forested	Emergent
Percent composition of exotic invasion vegetation	0	0	0

Regulatory Considerations			
Regulation	**Applicable**	**Resolved**	**Supporting Documentation**
Waters of the U.S. –Sections 404 and 401	Yes	Yes	Restoration Plan/NW 27
Endangered Species Act	No	Yes	NCNHP/USFWS
Historic Preservation Act	No	Yes	NCSHPO
CZMA/CAMA	No	Yes	--
FEMA Floodplain Compliance	Yes	Yes	HECRAS
Essential Fisheries Habitat	No	N/A	--

Appendix B. Visual Assessment Data



HDR | ICA

Current Condition Plan View - Year 4

UT Millers Creek, Duplin County, North Carolina

0 87.5 175 350 525 700 Feet

NC Environmental Quality

N W E S

Figure 2.1

Table 5: Visual Stream Morphology Stability Assessment
Reach ID: UT Millers Creek
Assessed Length: 2,709 FT

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	N/A	N/A			100%			
	3. Meander Pool Condition	1. Depth Sufficient (Max Pool Depth : Mean Bankfull Depth ≥ 1.6)	5	5			100%			
		2. Length appropriate (>30% of centerline distance between tail of upstream riffle and head of downstrem riffle)	61	61			100%			
	4.**Thalweg Position**	1. Thalweg centering at upstream of meander bend (Run)	57	57			100%			
		2. Thalweg centering at downstream of meander (Glide)	57	57			100%			
2. Bank	**1. Scoured/Eroding**	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			2	30	98.9%	N/A	N/A	N/A
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%	N/A	N/A	N/A
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	N/A	N/A	N/A
				Totals	2	30	98.9%	N/A	N/A	N/A
3. Engineered Structures	**1. Overall Integrity**	Structures physically intact with no dislodged boulders or logs.	12	12			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	12	12			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	12	12			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%. (See guidance for this table in EEP monitoring guidance document)	12	12			100%			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth ratio ≥ 1.6 Rootwads/logs providing some cover at base-flow.	12	12			100%			

Table 6 Vegetation Condition Assessment

Planted Acreage **12.35**

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.	0.05 acres	polygons filled with orange dots and x's	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.	.1 acres	Pink dots	1	0.1	1.0%
			Total			
3. Areas of Poor Growth Rates or Vigor	Areas with woody stems of a size class that are obviously small given the monitoring year.	.1 acres	Pattern and Color	0	0.0	0.0%
			Cumulative Total			

Easement Acreage **15.94**

Vegetation Category	Definitions	Mapping Threshold	CCPV Depiction	Number of Polygons	Combined Acreage	% of Easement Acreage
4. Invasive Areas of Concern	Areas or points (if too small to render as polygons at map scale).	1000 SF	Pattern and Color	N/A	N/A	N/A
5. Easement Encroachment Areas	Areas or points (if too small to render as polygons at map scale).	none	Pattern and Color	N/A	N/A	N/A

Figures 3.1 - 3.3. Problem Areas

3.1 Erosion at 30+00

3.2 Erosion at 31+50

3.3 Low stem density near STA 35+00

Appendix C. Hydrologic Data

Table 7. Verification of Bankfull Events

Date	Crest Gauge Info		Gauge Reading (ft)	Gauge Elevation (ft)	Crest Elevation (ft)	Bankfull Elevation (ft)	Height above Bankfull (ft)
	Site	Sta.					
7/14/2015	2	37+03	2.29	107.16	109.45	107.71	1.74
10/19/2015	1	10+62	1.50	111.46	112.96	112.07	0.89
4/27/2016	1	10+62	1.88	111.46	113.34	112.07	1.26
4/27/2016	2	37+03	3.70	107.16	110.87	107.71	3.15
10/10/2016	1	10+62	2.79	111.46	114.25	112.07	2.18
10/10/2016	2	37+03	3.43	107.16	110.59	107.71	2.88
10/10/2016	N/A	Approx. 20+00	Visual	Visual	Visual	Visual	Visual
1/17/2017	1	10+62	2.29	111.46	113.75	112.07	1.68
1/17/2017	2	37+03	3.13	107.16	110.29	107.71	2.58
4/26/2017	1	10+62	2.00	111.46	113.46	112.07	1.39
4/26/2017	2	37+03	4.06	107.16	111.22	107.71	3.51
3/13/2018	1	10+62	3.58	111.46	115.04	112.07	2.97
3/13/2018	2	37+03	3.58	107.16	110.74	107.71	3.03
9/12/2018	1	10+62	4.5	111.46	115.96	112.07	3.89
9/12/2018	2	37+03	4.0	107.16	111.16	107.71	3.45

Figures 4.1 - 4.3 Crest Gauge Photos

4.1 Crest Gauge 1 (3/13/2018)

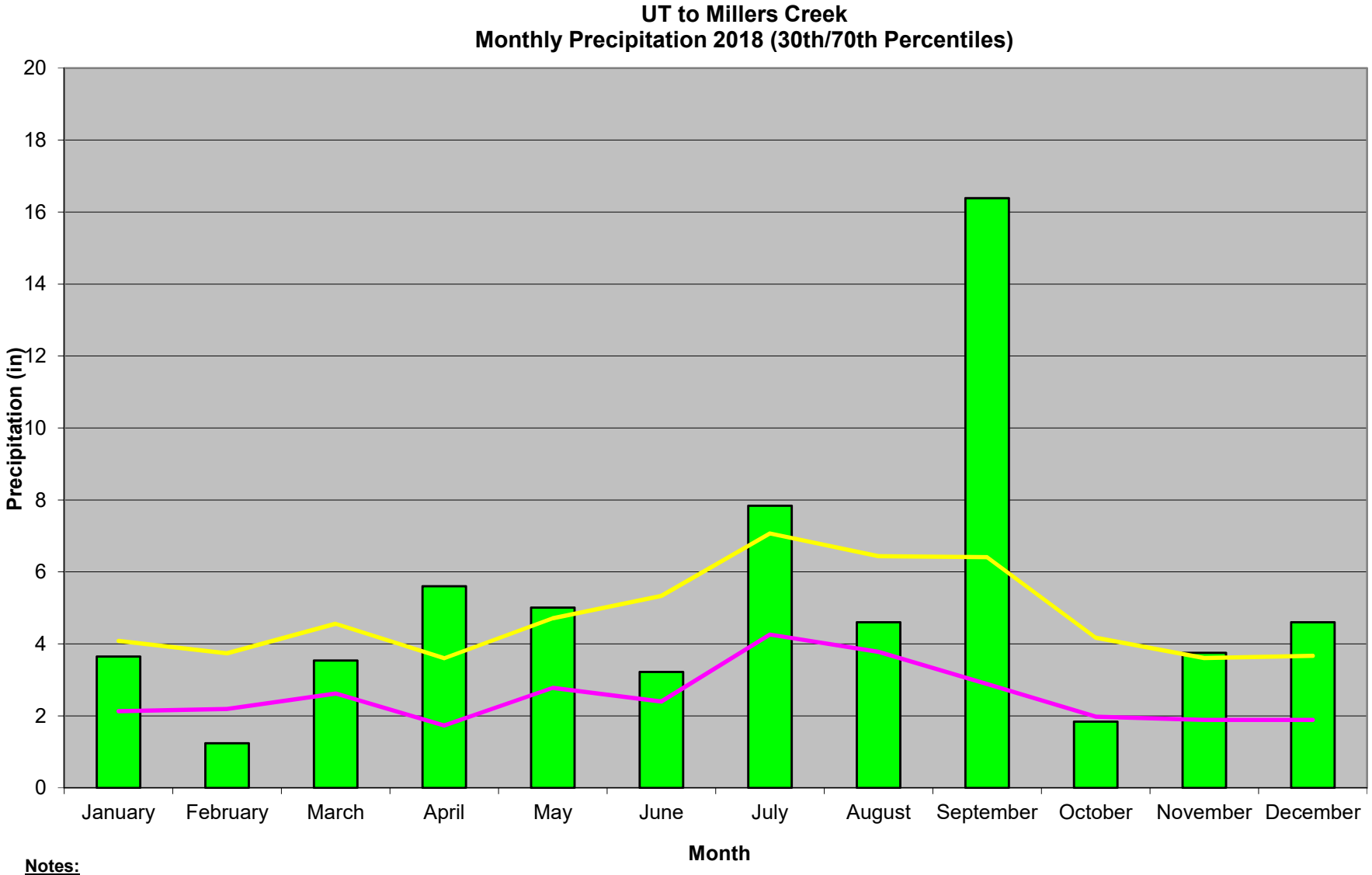
4.2 Crest Gauge 2 (3/13/2018)

4.3 Crest Gauge 1 (9/12/2018)

Table 8. Summary of Gauge Hydrologic Data

Gauge Number	Wetland Community Type	Target Hydroperiod	Percentage of Growing Season Year 1	Longest Number Of Consecutive Days Meeting Wetland Hydrology Criteria During Year 1 Growing Season	Percentage of Growing Season Year 2	Longest Number Of Consecutive Days Meeting Wetland Hydrology Criteria During Year 2 Growing Season	Percentage of Growing Season Year 3	Longest Number Of Consecutive Days Meeting Wetland Hydrology Criteria During Year 3 Growing Season	Percentage of Growing Season Year 4	Longest Number Of Consecutive Days Meeting Wetland Hydrology Criteria During Year 4 Growing Season
1	Riparian Bottomland Hardwood	12.5%	43	130	23	69	7.6	23	13	40
2	Riparian Bottomland Hardwood	12.5%	53	161	49	149	43.6	132	52	155
3	Riparian Bottomland Hardwood	12.5%	10	30	21	65	5.6	17	12.5	38
4	Headwater Riparian (Zero Order)	10%	70	212	100	304	52.5	159	54	162
5	Riparian Bottomland Hardwood	12.5%	32	97	49	149	49.2	149	52	155
6	Riparian Bottomland Hardwood	12.5%	52	158	48	146	51.5	156	54	162
Reference	Headwater Riparian (Zero Order)	10%	39	118	46	141	17.8	54	47	142
Reference	Riparian Bottomland Hardwood	12.5%	36	108	26	79	26.1	79	35	106

Figure 5.0 Monthly Precipitation



Notes:

1. Precipitation data obtained from on-site rain gauge (collected through December 17).

2. 30th and 70th percentiles calculated from long-term climatic data 1984-2013 (www.wcc.nrcs.usda.gov)

Figure 6.1 Zero-Order Wetland Gauge

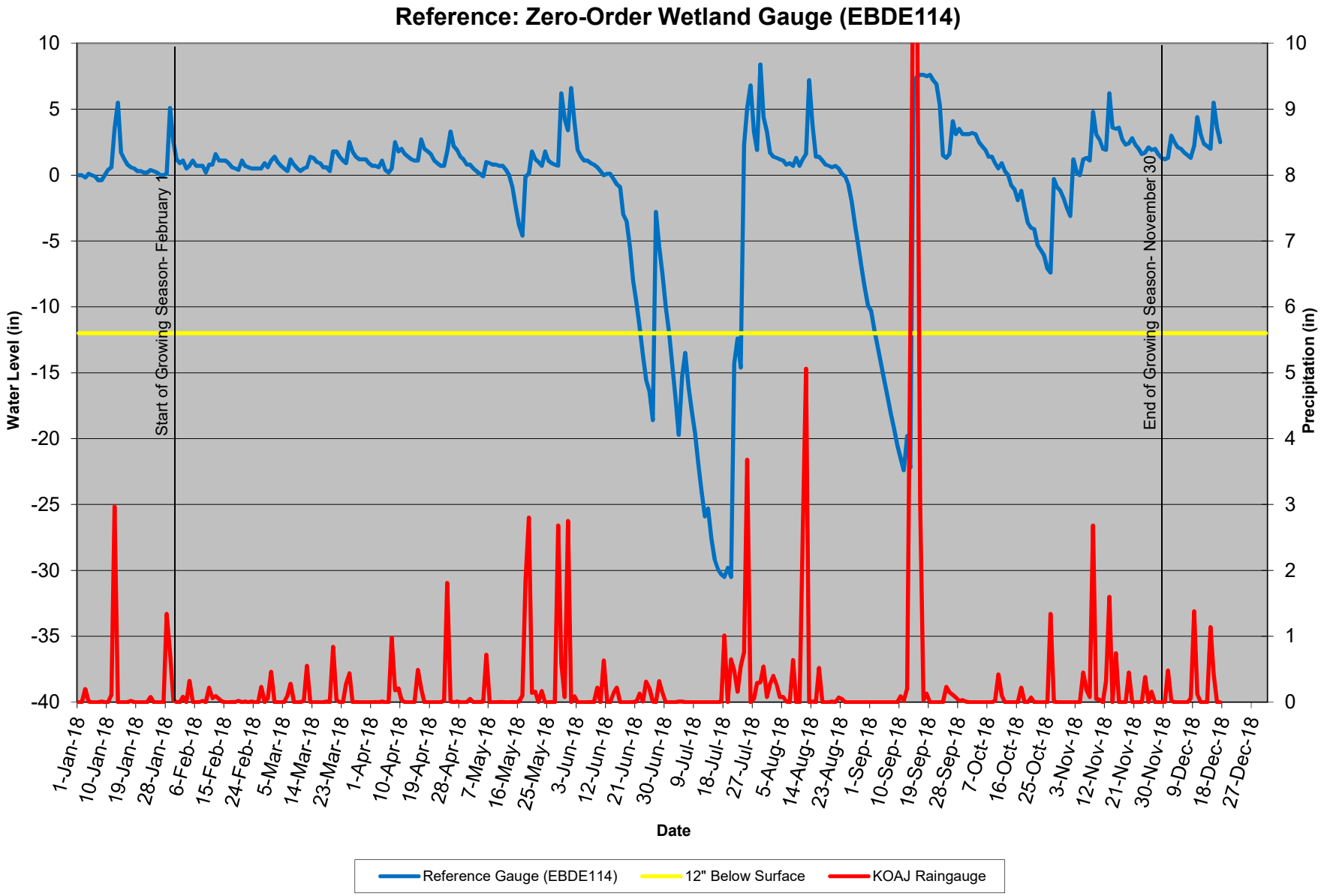


Figure 6.2 Second-Order Wetland Gauge

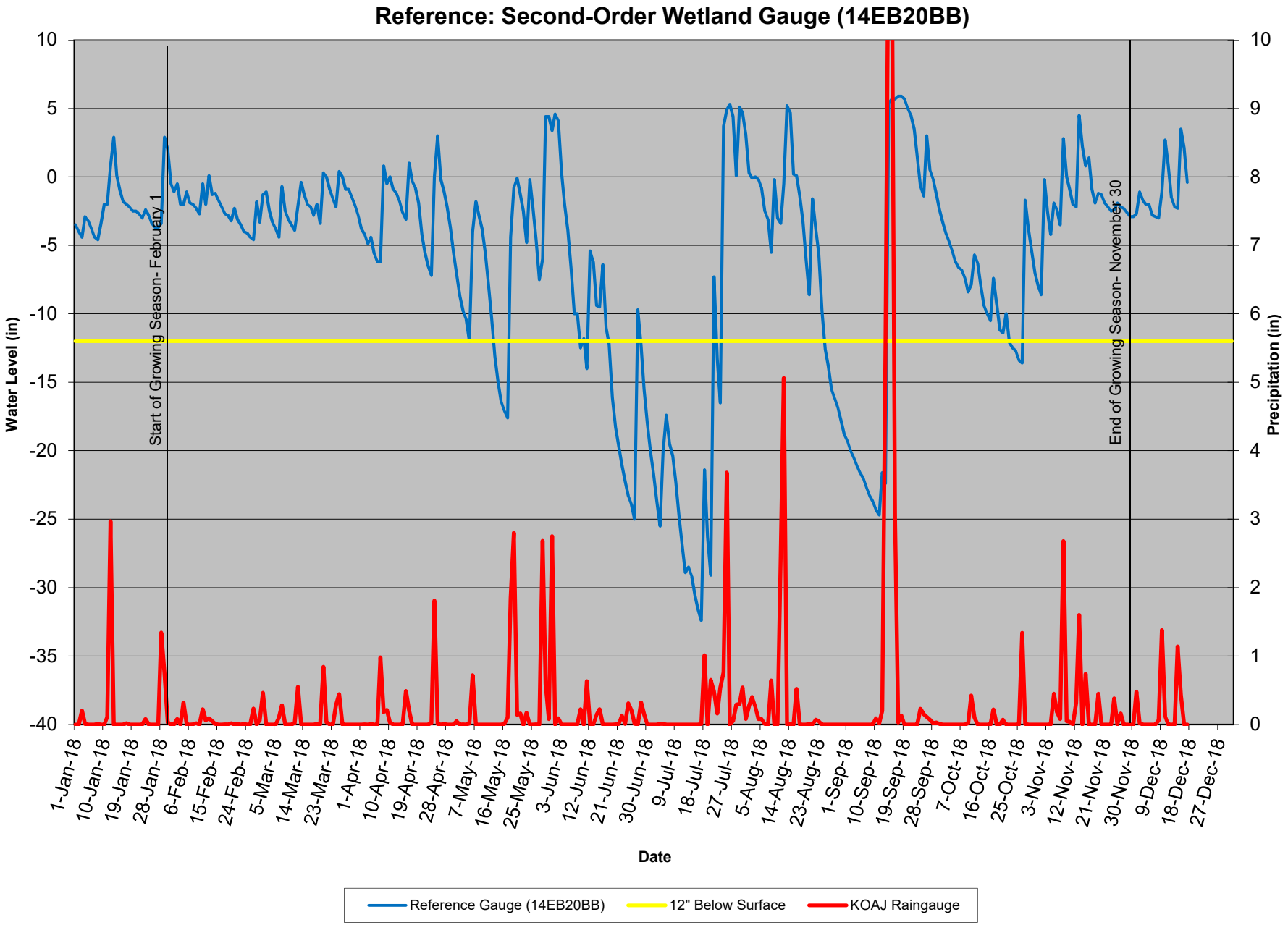


Figure 6.3 Wetland Gauge 1

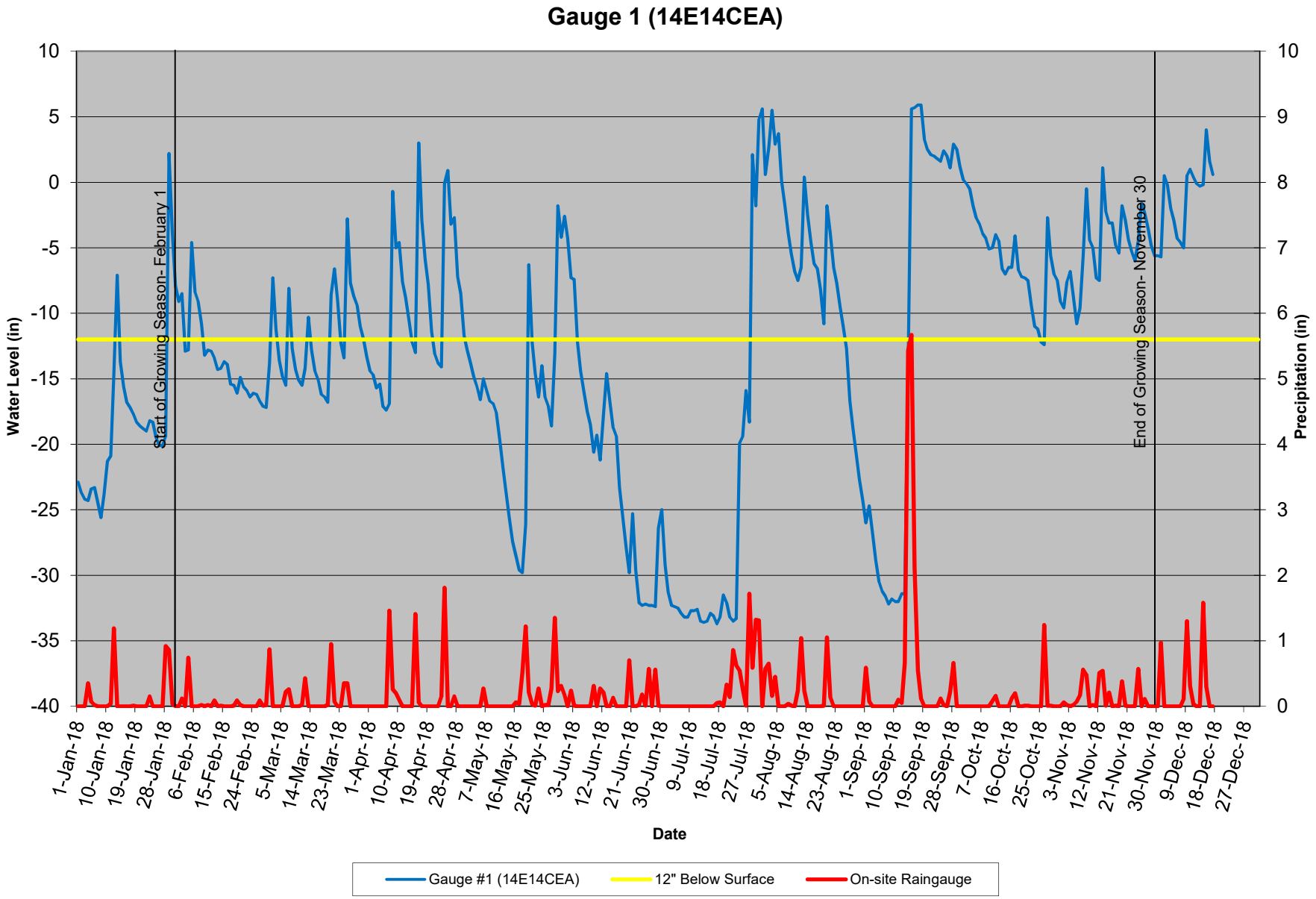


Figure 6.4 Wetland Gauge 2

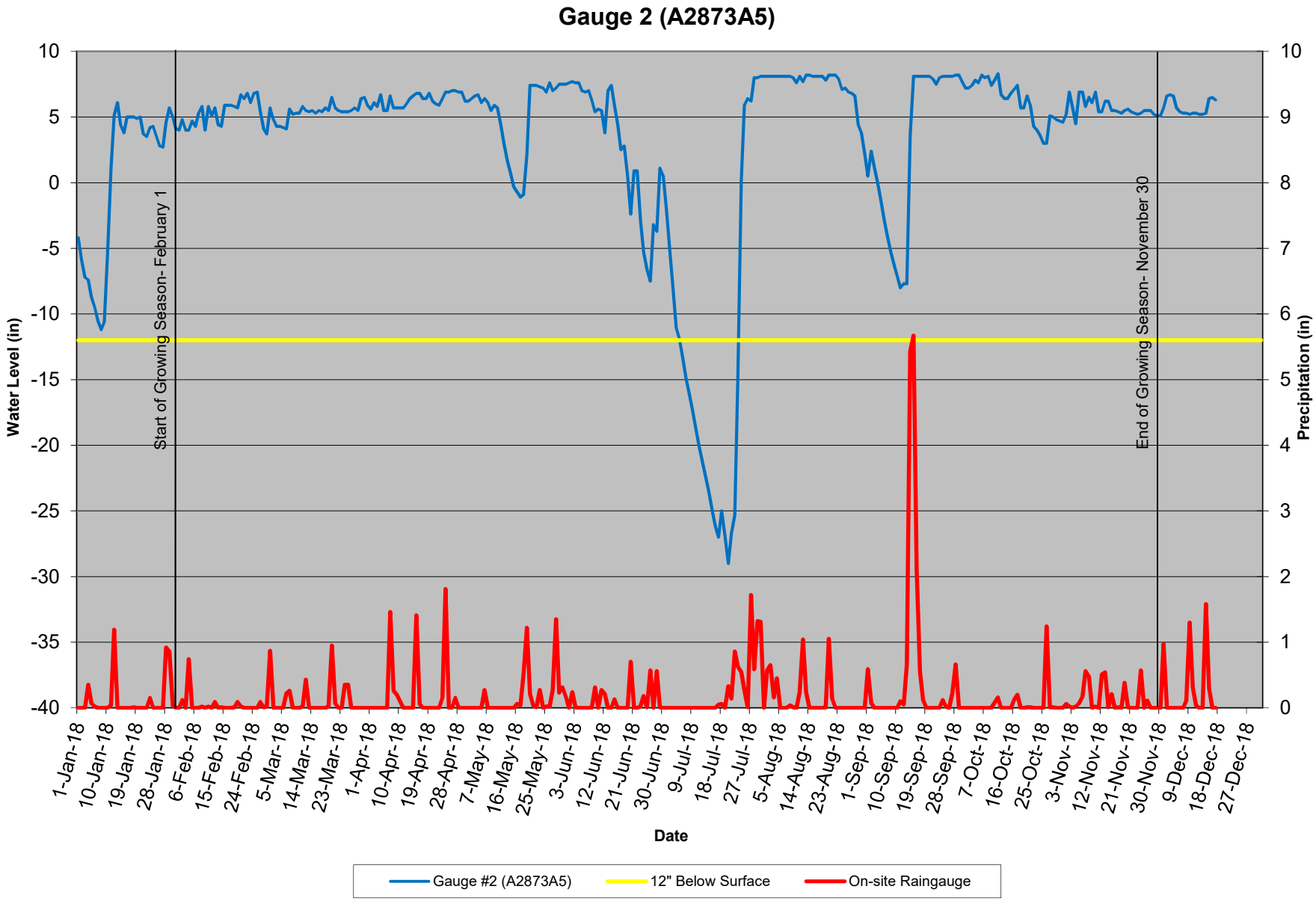


Figure 6.5 Wetland Gauge 3

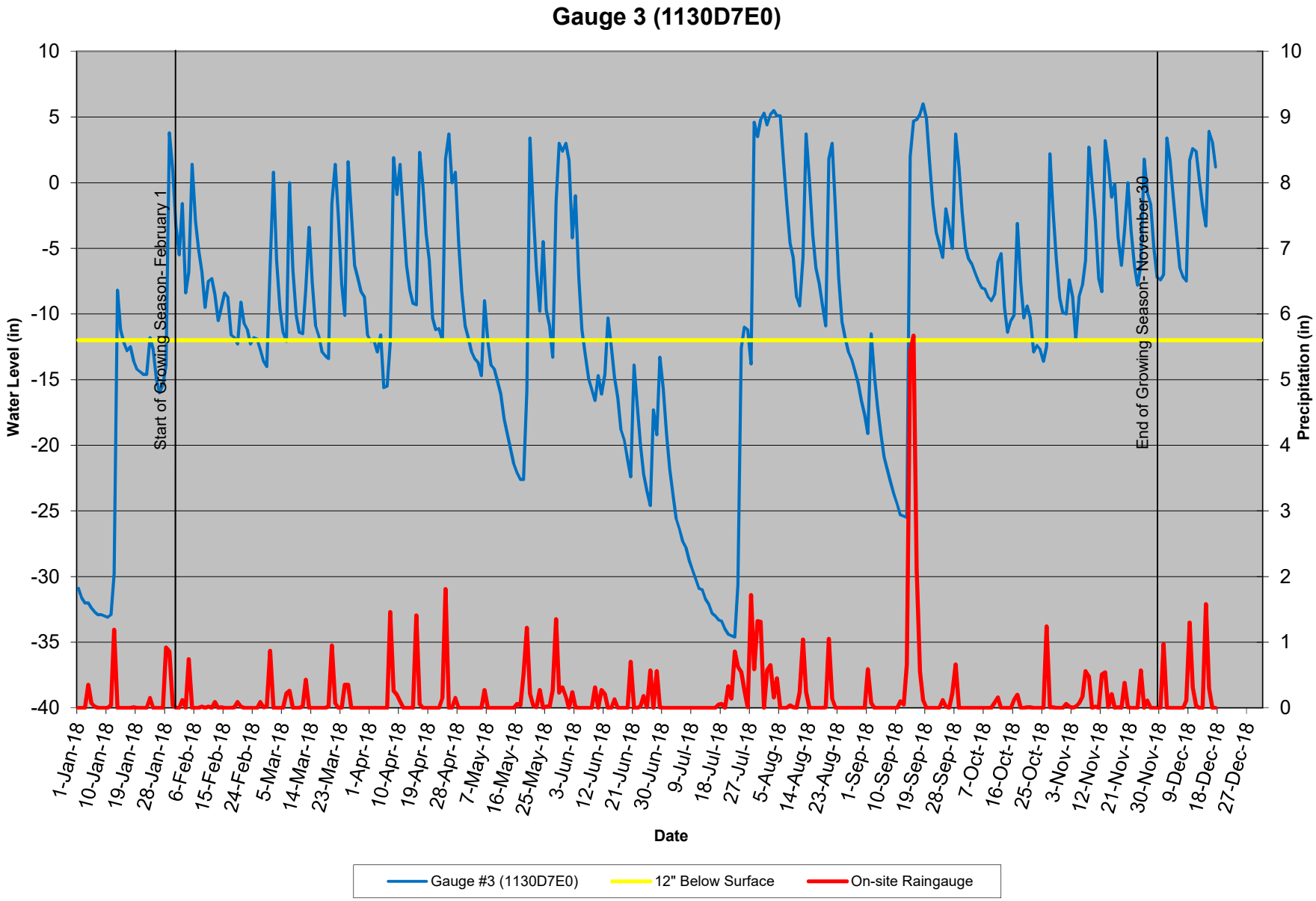


Figure 6.6 Wetland Gauge 4

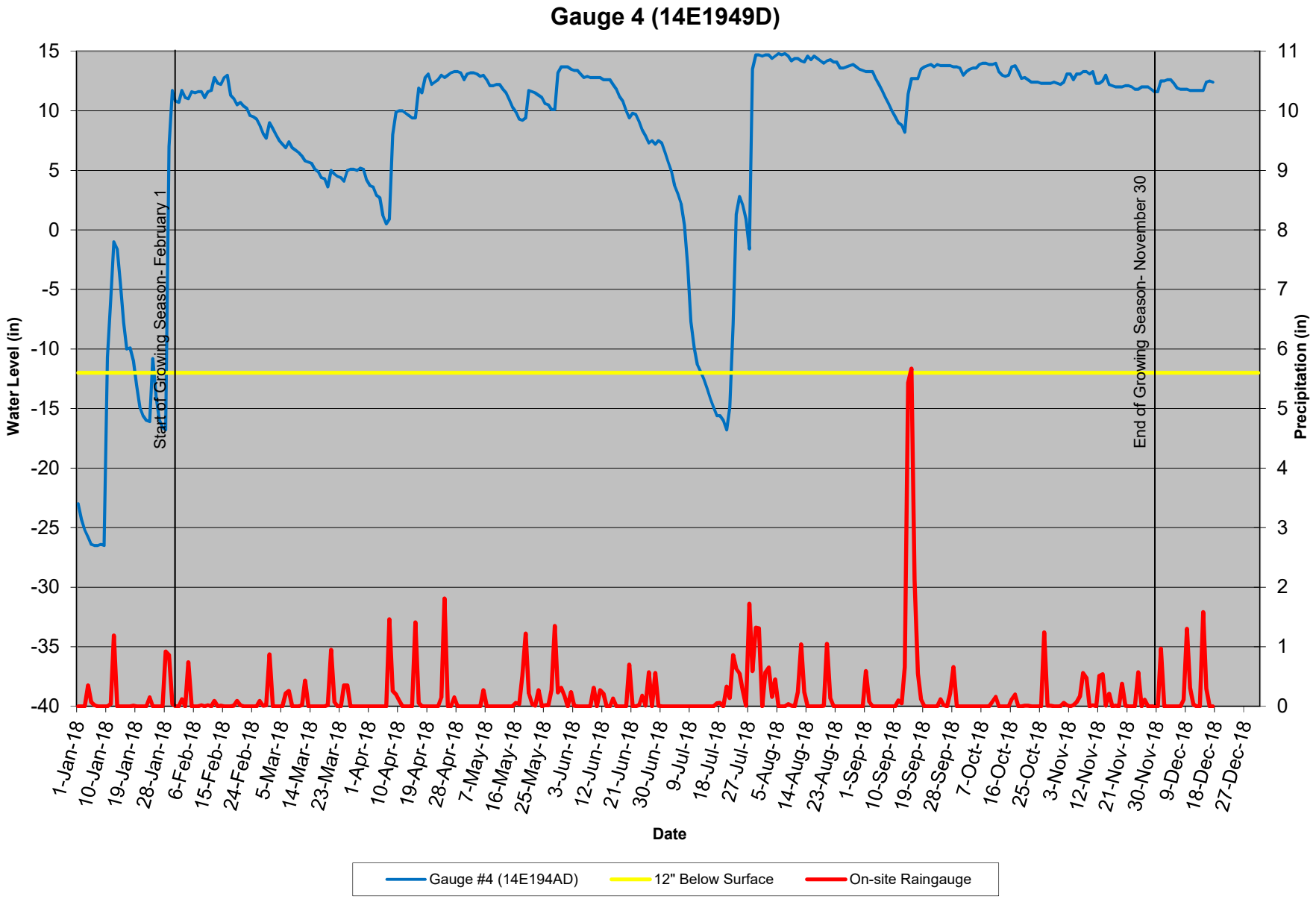


Figure 6.7 Wetland Gauge 5

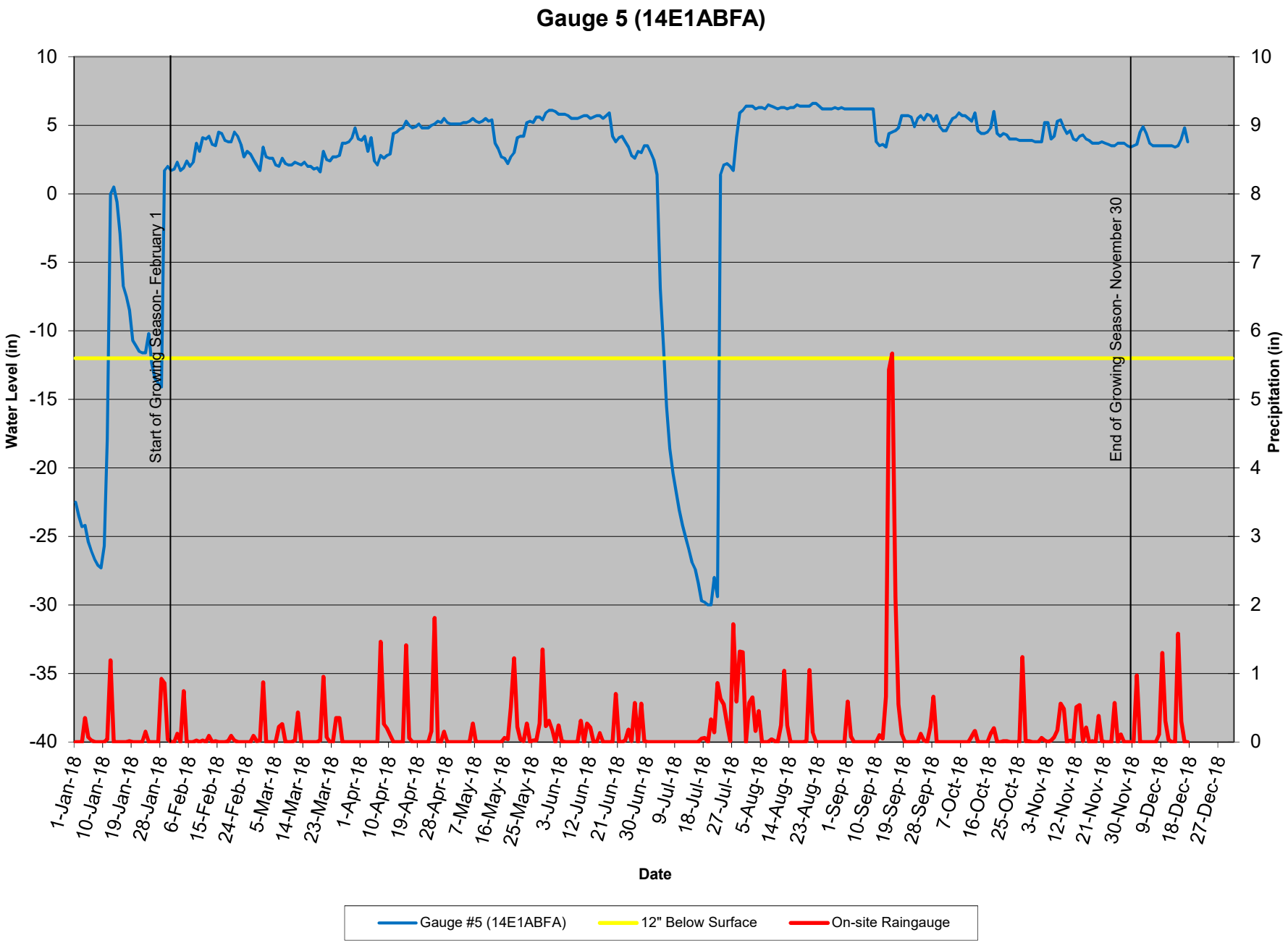
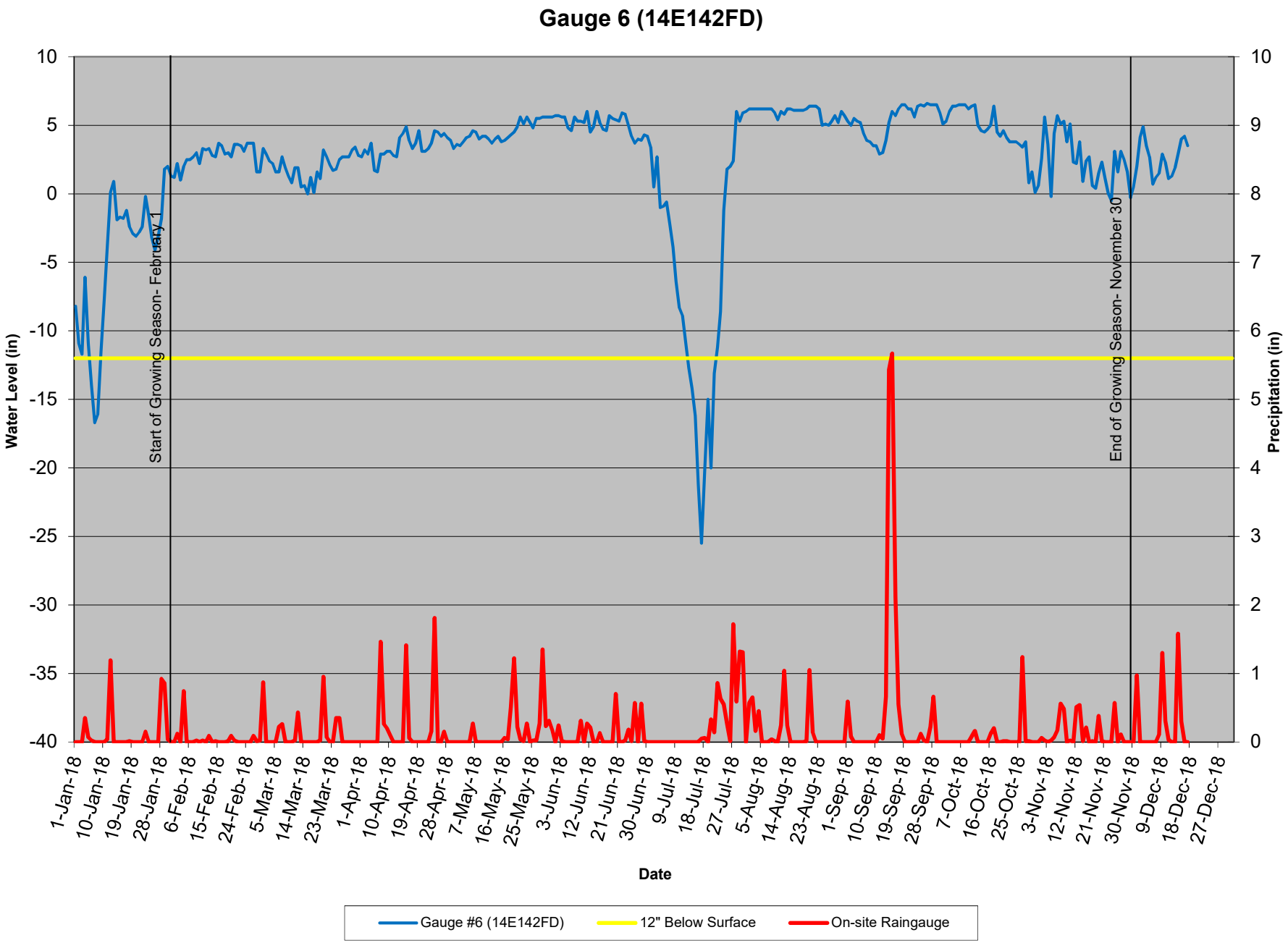


Figure 6.8 Wetland Gauge 6



Supplement Hydrology Table Provided by DMS: UT to Millers Creek #95719

These tables are provided for the IRT and to illustrate differences in growing season day methods in relation to project success criteria

Approved Mitigation Plan lists 2/1-11/30 for documenting project success.

Gauge Number	Success Hydroperiod	USED FOR MY4--2/1/-11/30 303 days		3/1/-11/11 255 days		3/19/-11/11 303 days	
	%	Consecutive Days	% of growing season	Consecutive Days	% of growing season	Consecutive Days	% of growing season
1	12.5	40	13%	40	16%	27	11%
2	12.5	155	51%	127	50%	108	46%
3	12.5	38	13%	38	15%	20	8%
4	10	162	53%	133	52%	114	48%
5	12.5	155	51%	127	50%	108	46%
6	12.5	162	53%	134	53%	115	49%

Gauge Number	Success Hydroperiod	USED FOR MY3--2/1/-11/30 303 days		3/1/-11/11 255 days		3/19/-11/11 303 days	
	%	Consecutive Days	% of growing season	Consecutive Days	% of growing season	Consecutive Days	% of growing season
1	12.5	23	8%	23	9%	23	10%
2	12.5	135	45%	107	42%	88	37%
3	12.5	17	6%	17	7%	17	7%
4	10	159	52%	131	51%	112	47%
5	12.5	149	49%	121	47%	102	43%
6	12.5	156	51%	128	50%	109	46%

Gauge Number	Success Hydroperiod	USED FOR MY2--2/1/-11/30 303 days		3/1/-11/11 255 days		3/19/-11/11 303 days	
	%	Consecutive Days	% of growing season	Consecutive Days	% of growing season	Consecutive Days	% of growing season
1	12.5	69	23%	50	20%	50	21%
2	12.5	149	49%	149	58%	149	63%
3	12.5	65	21%	37	15%	18	8%
4	10	304	100%	255	100%	237	100%
5	12.5	149	49%	130	51%	130	55%
6	12.5	146	48%	131	51%	131	55%

Gauge Number	Success Hydroperiod	USED FOR MY1--2/1/-11/30 303 days		3/1/-11/11 255 days		3/19/-11/11 303 days	
	%	Consecutive Days	% of growing season	Consecutive Days	% of growing season	Consecutive Days	% of growing season
1	12.5	130	43%	102	40%	83	35%
2	12.5	161	53%	133	52%	114	48%
3	12.5	30	10%	17	7%	17	7%
4	10	212	70%	184	72%	165	70%
5	12.5	97	32%	78	31%	78	33%
6	12.5	158	52%	130	51%	111	47%

Meeting success criteria

Not meeting success criteria