FINAL MONITORING REPORT
2022 (Year 4)

HERON STREAM AND WETLAND MITIGATION SITE

Alamance County, North Carolina

DMS Project ID No. 100014
Full Delivery Contract No. 7192
USACE Action ID No. SAW-2017-01471
DWR No. 17-0920
RFP No. 16-006990

Cape Fear River Basin
Cataloging Unit 03030002

Data Collection: January 2021 – October 2022
Submission: February 2023

Prepared for:

NORTH CAROLINA DEPARTMENT OF ENVIRONMENTAL QUALITY
DIVISION OF MITIGATION SERVICES
1652 MAIL SERVICE CENTER
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February 2023

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Response to Monitoring Year 3 (2023) DMS Comments
Heron Stream and Wetland Mitigation Site (DMS #100014)
Cape Fear River Basin 03030002, Alamance County
Contract No. 7192

Comments Received (Black Text) & Responses (Blue Text)

General:

1. Page 9, Vegetation Summary states that the supplemental planted areas are shown on Figures 2A-C, but those do not appear. Remove from narrative (since they were in previous report) or show on CCPV.
   Response: The supplemental planting narrative, describing the effort completed in 2021, was removed from the report.

2. Label flow gages on CCPV?
   Response: Flow gauges have been labeled on Figures 2A-D.

3. Table 2. Show supplemental plant and invasive treatment dates on this table.
   Response: Supplemental planting and invasive treatment dates were added to Table 2.

4. Appendix G. can be removed from report. This data was included in previous monitoring report.
   Response: There was no mention of Appendix G in the report, nor was an Appendix G submitted with the draft report.

5. Table 14. Confirm that bankfull events that occurred on this table were systemic.
   Response: Bankfull events listed in Table 14 are systemic. Often, physical documentation of bankfull events occurs on one or several Site tributaries due to time-lapse camera settings and/or the amount of time between the event and the site visit, but all bankfull events are supported by a site-wide spike in stream flow gauge data.

Digital Review:

1. Please provide all wetland gage, flow gage, rainfall and other tables:
   Response: All relevant data (groundwater gauge, flow gauge, rainfall, etc.) is included the digital submittal.

Heron Year 4, 2022 Executive Summary

General Notes

- No encroachment was identified in Year 4
- No evidence of nuisance animal activity (i.e., beaver, heavy deer browsing, etc.) was observed.

Site Maintenance Report (2022)

Invasive Species Work	Maintenance work
06/15/2022 Cattail, Privet, Johnson Grass, Multiflora Rose, Sweetgum, Tree-of-Heaven, Princess Tree 08/29/2022 Japanese Knotweed (UT8), Tree-of-Heaven, Privet, Multiflora rose	None

Streams

- Stream measurements were not performed in year 4 (2022), in accordance with the monitoring schedule.

- A visual assessment indicates that across the Site, all in-stream structures are intact and functioning as designed and that channel geometry compares favorably with the proposed conditions outlined in the Detailed Restoration Plan and as constructed. No stream areas of concern were identified during year 4 (2022) monitoring. Tables for year 3 (2021) data and annual quantitative assessments are included in Appendix D.

- One bankfull event was documented during year 4 (2022) monitoring for a total of 8 bankfull events to-date during the monitoring period (Table 14, Appendix E).

- Channel formation was evident in all site tributaries during year 4 (2022). The UT1 streamflow gauge malfunctioned twice during MY4 (2022) before being replaced and capturing 89 days of consecutive flow. The UT2 and UT3 stream gauges captured 61 days and 131 days respectively. The UT5 upstream and downstream gauges captured 201 and 130 days respectively. UT6 exhibited 118 consecutive days of flow prior to its failure in July. The upstream and downstream gauges on UT7 both failed resulting in data loss between April and July; however, they captured 36 days and 59 days respectively prior to the failures, and the UT7 middle gauge captured 209 days of flow. The UT8 gauge also malfunctioned between April and July, but it captured 108 consecutive days of flow prior to its failure. All stream gauges were replaced with Onset U-20 gauges, and no additional malfunctions or failures are anticipated. Channel formation tables and graphs are in Appendix E.

Wetlands

- Five of six groundwater gauges met success for the Year 4 (2022) monitoring period. Gauge 6 malfunctioned on March 22. It was relaunched on April 20; however, it failed immediately after relaunch which resulted in the loss of data during this time-period. Based on precipitation data and groundwater data from nearby gauges 4 and 5, it is expected that gauge 6 would have met success criteria during the time of the malfunction. All gauges were replaced with new Onset U-20 gauges on July 29, and no further gauge failures are anticipated. Wetland hydrology data are in Appendix E.

Summary of Monitoring Period/Hydrology Success Criteria by Year

Year	Soil Temperatures/Date Bud Burst Documented	Monitoring Period Used for Determining Success	10 Percent of Monitoring Period
2019 (Year 1)	March 28, 2019*	March 28-October 22 (209 days)	21 days
2020 (Year 2)	March 2, 2020#	March 2-October 22 (235 days)	23 days
2021 (Year 3)	March 1, 2021^	March 1-October 22 (236 days)	24 days
2022 (Year 4)	March 1, 2022%	March 1-October 22 (236 days)	24 days

*Based on documented bud burst and soil temperature of 50.06°F on March 28, 2019.

Based on bud burst documented March 2, 2020 and soil temperature of 46.82°F on March 1, 2020.

^Based on bud burst documented on March 1, 2021. The soil temperature logger was damaged and stopped recording February 16, 2021, however at the time of the failure, the soil temperature had dropped below 41°F just twice in 2021 (January 5th and 31st) and exceeded thereafter.

%Based on bud burst documented February 28, 2022 and soil temperature of 45.97°F on March 1, 2022.

Groundwater Hydrology Data

Gauge	Success Criteria Achieved/Max Consecutive Days During Growing Season (Percentage)						
	Year 1 (2019)	Year 2 (2020)	Year 3 (2021)	Year 4 (2022)	Year 5 (2023)	Year 6 (2024)	Year 7 (2025)
1	Yes/33 days (15.8%)	Yes/23 days (9.8%)	Yes /46 days (19.5%)	Yes /45 days (19.1%)			
2	Yes/26 days (12.4%)	Yes/27 days (11.5%)	Yes/47 days (19.9%)	Yes/66 days (28.1%)			
3	Yes/35 days (16.7%)	Yes/28 days (12.0%)	Yes/36 days (15.2%)	Yes/66 days (28.1%)			
4	Yes/69 days (33.0%)	Yes/51 days (21.8%)	Yes/60 days (25.4%)	Yes/56 days (23.8%)			
5	Yes/52 days (24.9%)	Yes/45 days (19.2%)	Yes/50 days (21.2%)	Yes/52 days (22.1%)			
6	Yes/54 days (25.8%)	Yes/46 days (19.7%)	Yes/52 days (22.0%)	No*/13 days (5.5%)			

* Gauge 6 malfunctioned 3/22/22, was relaunched on 4/20/22, and failed immediately after. This resulted in data loss during this time-period. It is expected that gauge 6 would have met success criteria during the time of the data loss. All gauges were replaced with new Onset U-20 gauges on 7/29/22.

Vegetation Summary

- In accordance with the monitoring schedule, vegetation plot monitoring was not performed in Year 4 (2022); however, 6 temporary vegetation plots were catalogued yielding an average stem density of 486 stems per acre. Additionally, each individual plot met MY3 success criteria. Temporary plot data is in Table 8 (Appendix C). Visual assessment indicates that vegetation on the Site is vigorous.

Site Permitting/Monitoring Activity and Reporting History

Activity or Deliverable	Data Collection Complete	Completion or Delivery
Technical Proposal (RFP No. 16-006990)	January 11, 2017	January 11, 2017
Institution Date (NCDMS Contract No. 100014)	--	May 22, 2017
404 Permit	--	October 10, 2018
Mitigation Plan	--	July 2018
Construction Plans	--	July 17, 2018
Site Construction	--	November 27, 2018-February 11, 2019
Planting	--	February 21, 2019
As-built Baseline Stream Data Collection	February 25-26, 2019	--
As-built Baseline Vegetation Data Collection	February 25, 2019	--
As-built Baseline Monitoring (MY0)	February-March 2019	May 2019
Monitoring Year 1 (2019) Stream Data Collection	August 13-14, 2019	--
Monitoring Year 1 (2019) Vegetation Data Collection	September 30, 2019	--
Monitoring Year 1 (MY1)	March-October 2019	November 2019
Invasive Species Treatment - Privet, Rose, Tree-of-Heaven, Microstegium, Johnson Grass	NA	June 12, 2020
Monitoring Year 2 (2020) Stream Data Collection	May 16-24, 2020	--
Monitoring Year 2 (2020) Vegetation Data Collection	July 1-6, 2020	--
Monitoring Year 2 (MY2)	March-October 2020	January 2021
Supplemental Planting	NA	April 8, 2021
Invasive Species Treatment - Johnson Grass, Privet, Tree-of-Heaven, Multi-flora Rose, Japanese Knotweed, Catttail and Fescue	NA	September 7 - October 7, 2021
Monitoring Year 3 (2021) Stream Data Collection	February 16, 2021	--
Monitoring Year 3 (2021) Vegetation Data Collection	July - October, 2021	--
Monitoring Year 3 (MY3)	January - October 2021	December 2021
Invasive Species Treatment - Cattail, Privet, Johnson Grass, Multiflora Rose, Sweetgum, Tree-of-Heaven, Princess Tree	NA	June 15, 2022
Invasive Species Treatment - Japanese Knotweed (UT8), Tree-of-Heaven, Privet, Multiflora rose	NA	August 29, 2022
Monitoring Year 4 (2022) Stream Data Collection	NA	--
Monitoring Year 4 (2022) Vegetation Data Collection	NA	--
Monitoring Year 4 (MY4)	January - October 2022	January 2023

DRAFT MONITORING REPORT
2022 (Year 4)

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Alamance County, North Carolina

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February 2023

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APPENDICES

1.0 PROJECT SUMMARY

Restoration Systems, LLC has established the North Carolina Division of Mitigation Services (NCDMS) Heron Stream and Wetland Restoration Site (Site).

1.1 Project Goals & Objectives

Project goals were based on the *Cape Fear River Basin Restoration Priorities* (RBRP) report (NCEEP 2009) and on-site preconstruction data collection of channel morphology and function observed during field investigations. The Site is located within Targeted Local Watershed (TLW) 03030002050050. The RBRP report documents benthic ratings vary between "Fair" and "Good-Fair" possibly due to cattle, dairy, and poultry operations. The project is not located in a Regional or Local Watershed Planning Area; however, RBRP goals addressed by project activities are as follows with Site specific information following the RBRP goals in parenthesis.

1. Reduce and control sediment inputs (sediment input reduction of 67.3 tons/year);
2. Reduce and manage nutrient inputs (livestock removed from streams, elimination of fertilizer application, installation of marsh treatment areas; and a direct reduction of 893.2 pounds of nitrogen and 47.0 pounds of phosphorus per year);

Site specific mitigation goals and objectives were developed through the use of North Carolina Stream Assessment Method (NC SAM) and North Carolina Wetland Assessment Method (NC WAM) analyses of preconstruction and reference stream systems at the Site (NC SFAT 2015 and NC WFAT 2010) (see Table 1).

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Stream/Wetland Targeted Functions, Goals, and Objectives

Targeted Functions	Goals	Objectives	Compatibility of Success Criteria
(1) HYDROLOGY			
(2) Flood Flow (Floodplain Access) (3) Streamside Area Attenuation (4) Floodplain Access (4) Wooded Riparian Buffer (4) Microtopography	• Attenuate flood flow across the Site. • Minimize downstream flooding to the maximum extent possible. • Connect streams to functioning wetland systems.	• Construct new channel at historic floodplain elevation to restore overbank flows and restore jurisdictional wetlands • Plant woody riparian buffer • Remove livestock • Deep rip floodplain soils to reduce compaction and increase soil surface roughness • Protect riparian buffers with a perpetual conservation easement	• BHR not to exceed 1.2 • Document four overbank events in separate monitoring years • Livestock excluded from the easement • Attain Wetland Hydrology Success Criteria • Attain Vegetation Success Criteria • Conservation Easement recorded
(3) Stream Stability (4) Channel Stability (4) Sediment Transport	• Increase stream stability within the Site so that channels are neither aggrading nor degrading.	• Construct channels with proper pattern, dimension, and longitudinal profile • Remove livestock • Construct stable channels with cobble/gravel substrate • Plant woody riparian buffer •	• Cross-section measurements indicate a stable channel with cobble/gravel substrate • Visual documentation of stable channels and structures • BHR not to exceed 1.2 • ER of 1.4 or greater • < 10% change in BHR and ER in any given year • Livestock excluded from the easement • Attain Vegetation Success Criteria
(1) WATER QUALITY			
(2) Streamside Area Vegetation (3) Upland Pollutant Filtration (3) Thermoregulation (2) Indicators of Stressors Wetland Particulate Change Wetland Physical Change	• Remove direct nutrient and pollutant inputs from the Site and reduce contributions to downstream waters.	• Remove livestock and reduce agricultural land/inputs • Install marsh treatment areas • Plant woody riparian buffer • Restore/enhance jurisdictional wetlands adjacent to Site streams • Provide surface roughness through deep ripping/plowing • Restore overbank flooding by establishing proper channel dynamics • Cessation of municipal land application	• Livestock excluded from the easement • Attain Wetland Hydrology Success Criteria • Attain Vegetation Success Criteria

Stream/Wetland Targeted Functions, Goals, and Objectives (Continued)

(1) HABITAT			
(2) In-stream Habitat (3) Substrate (3) Stream Stability (3) In-Stream Habitat (2) Stream-side Habitat (3) Stream-side Habitat (3) Thermoregulation Wetland Landscape Patch Structure Wetland Vegetation Composition	• Improve instream and stream-side habitat.	• Construct stable channels with cobble/gravel substrate • Plant woody riparian buffer to provide organic matter and shade • Construct new channel at historic floodplain elevation to restore overbank flows and plant woody riparian buffer • Protect riparian buffers with a perpetual conservation easement • Restore/enhance jurisdictional wetlands adjacent to Site streams	• Cross-section measurement indicate a stable channel with cobble/gravel substrate • Visual documentation of stable channels and in-stream structures. • Attain Wetland Hydrology Success Criteria • Attain Vegetation Success Criteria • Conservation Easement recorded

1.2 Project Background

The Heron Stream and Wetland Mitigation Site (hereafter referred to as the "Site") encompasses a 17.64-acre easement along warm water, unnamed tributaries to Pine Hill Branch and unnamed tributaries to South Fork Cane Creek. The Site is located approximately 4 miles southeast of Snow Camp and 4.5 miles north of Silk Hope in southern Alamance County near the Chatham County line (Figure 1, Appendix A).

Prior to construction, Site land use consisted of disturbed forest and agricultural land used for livestock grazing and hay production. Livestock had unrestricted access to Site streams, which had been cleared, dredged of cobble substrate, straightened, trampled by livestock, eroded vertically and laterally, and received extensive sediment and nutrient inputs from stream banks and adjacent pastures. Approximately 62 percent of the stream channel had been degraded contributing to sediment export from the Site resulting from mechanical processes such as livestock hoof shear. In addition, streamside wetlands were cleared and drained by channel downcutting and land uses. Preconstruction Site conditions resulted in degraded water quality, a loss of aquatic habitat, reduced nutrient and sediment retention, and unstable channel characteristics (loss of horizontal flow vectors that maintain pools and an increase in erosive forces to channel bed and banks). Site restoration activities restored riffle-pool morphology, aided in energy dissipation, increased aquatic habitat, stabilized channel banks, and greatly reduced sediment loss from channel banks.

1.3 Project Components and Structure

Proposed Site restoration activities generated 5293 Stream Mitigation Units (SMUs) and 0.66 Wetland Mitigation Units (WMUs) as the result of the following.

- 4068 linear feet of Priority I stream restoration
- 1184 linear feet of stream enhancement (Level I)
- 1090 linear feet of stream enhancement (Level II)
- 0.35 acre of riparian wetland restoration
- 0.61 acre of riparian wetland enhancement

Additional activities that occurred at the Site included the following.

- Installation of six marsh treatment areas throughout the Site.
- Fencing the entire conservation easement by leaving some pre-existing fencing, removing fencing, and installing additional fencing.
- Planting 12.05 acres of the Site with 15,625 stems (planted species and densities by zone are included in Table 7 [Appendix C]).

Deviations from the construction plans included realignment of UT 1B (adding 20 linear feet to the alignment) due to conflicts with a gas line crossing. The realignment resulted in the reduction of a log vane and alterations to pipe configurations within the crossing. Gas line realignment also affected the length of UT 2 in its lower reaches (shortening the Restoration reach). UT 2 also has minor deviations in the enhancement II reach due to profile elevation alterations to tie to the invert of UT 1B. These profile alterations were included in construction plans, but not included in table updates of the detailed plan. Profile alterations resulted in the Enhancement (level II)/Restoration initiation point migrating upstream, and thus the length of the Enhancement (Level II) reach (UT 2A) decreased by 39 feet, and the length of the restoration reach (UT 2B) increased by 17 feet.

Minor easement deviations after construction plan development resulted in some stationing changes, most notable at the upper reaches of UT 1A (adding 5 linear feet to the alignment) and UT 8A & UT 8B (reducing the alignments by a total of 4 linear feet). The easement variations also affected channel lengths across gas lines, which do not generate mitigation credit. Eight log cross-vanes were not constructed due to contact with bed rock, or conflicts with the gas line. In addition, a marsh treatment area was added to the right bank of UT 6 at a draw that was concentrating surface drainage and scouring the valley walls. No other deviations of significance occurred between construction plans and the as-built condition. In addition, no issues have arisen since construction occurred.

Site design was completed in July 2018. Construction started on November 27, 2018 and ended within a final walkthrough on February 11, 2019. The Site was planted on February 21, 2019. Completed project activities, reporting history, completion dates, project contacts, and background information are summarized in Tables 1-4 (Appendix A).

1.4 Success Criteria

Project success criteria have been established per the October 24, 2016 NC Interagency Review Team *Wilmington District Stream and Wetland Compensatory Mitigation Update*. Monitoring and success criteria relate to project goals and objectives. From a mitigation perspective, several of the goals and objectives are assumed to be functionally elevated by restoration activities without direct measurement. Other goals and objectives will be considered successful upon achieving success criteria. The following table summarizes Site success criteria.

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Success Criteria

Streams
• All streams must maintain an Ordinary High-Water Mark (OHWM), per RGL 05-05. • Continuous surface flow must be documented each year for at least 30 consecutive days. Surface water monitoring gauges will be installed in the upper third of all intermittent channels, unless otherwise requested by the IRT. • Bank height ratio (BHR) cannot exceed 1.2 at any measured cross-section. • Entrenchment ratio (ER) must be no less than 2.2 for E- and C-type channels at any measured riffle cross-section. Note: B-type channels may have an ER less than 1.4. • BHR and ER at any measure riffle cross-section should not change by more than 10% from baseline condition during any given monitoring period. • The stream project shall remain stable and all other performance standards shall be met through four separate bankfull events, occurring in separate years, during the monitoring years 1-7.
Wetland Hydrology
• Saturation or inundation within the upper 12 inches of the soil surface for, at a minimum, 10 percent of the growing season, during average climatic conditions. Note: Soil temperature for growing season establishment will be measured daily utilizing a continuous monitoring soil probe. Soil temperature will be measured from mid-February through the end of April (at a minimum).
Vegetation
• Within planted portions of the site, a minimum of 320 stems per acre must be present at year 3; a minimum of 260 stems per acre must be present at year 5; and a minimum of 210 stems per acre must be present at year 7. • Trees must average 7 feet in height at year 5, and 10 feet in height at year 7 in each plot. • Planted and volunteer stems are counted, provided they are included in the approved planting list for the site; natural recruits not on the planting list may be considered by the IRT on a case-by-case basis.

2.0 METHODS

Monitoring requirements and success criteria outlined in this plan follow the October 24, 2016 NC Interagency Review Team *Wilmington District Stream and Wetland Compensatory Mitigation Update*. Monitoring will be conducted by Axiom Environmental, Inc. Annual monitoring reports of the data collected will be submitted to the NCDMS by Restoration Systems no later than December 31 of each monitoring year data is collected. The monitoring schedule is summarized in the following table.

Monitoring Schedule

Resource	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7
Streams	X	X	X		X		X
Wetlands	X	X	X	X	X	X	X
Vegetation	X	X	X		X		X
Macroinvertebrates			X		X		X
Visual Assessment	X	X	X	X	X	X	X
Report Submittal	X	X	X	X	X	X	X

2.1 Monitoring

The monitoring parameters are summarized in the following table.

Monitoring Summary

Stream Parameters				
Parameter	**Method**	**Schedule/Frequency**	**Number/Extent**	**Data Collected/Reported**
Stream Profile	Full longitudinal survey	As-built (unless otherwise required)	All restored stream channels	Graphic and tabular data.
Stream Dimension	Cross-sections	Years 1, 2, 3, 5, and 7	Total of 37 cross-sections on restored channels	Graphic and tabular data.
Channel Stability	Visual Assessments	Yearly	All restored stream channels	Areas of concern to be depicted on a plan view figure with a written assessment and photograph of the area included in the report.
	Additional Cross-sections	Yearly	Only if instability is documented during monitoring	Graphic and tabular data.
Stream Hydrology	Continuous monitoring surface water gauges and/or trail camera	Continuous recording through monitoring period	Total of 10 surface water gauges	Surface water data for each monitoring period as depicted in Figures 10A-10D.
Bankfull Events	Continuous monitoring surface water gauges and/or trail camera	Continuous recording through monitoring period	Total of 10 surface water gauges: One gauge on UT1, 2, 3, 6 and 8. Two gauges on UT 5. Three gauges on UT 7	Surface water data for each monitoring period
	Visual/Physical Evidence	Continuous through monitoring period	All restored stream channels	Visual evidence, photo documentation, and/or rain data.
Benthic Macroinvertebrates	"Qual 4" method described in *Standard Operating Procedures for Collection and Analysis of Benthic Macroinvertebrates, Version 5.0* (NCDWR 2016)	Pre-construction, Years 3, 5, and 7 during the "index period" referenced in *Small Streams Biocriteria Development* (NCDWQ 2009)	2 stations (one at the lower end of UT1 and one at the lower end of UT5)	Results* will be presented on a site-by-site basis and to include a list of taxa collected, an enumeration of *Ephemeroptera, Plecoptera,* and *Trichoptera* taxa as well as Biotic Index.
Wetland Parameters				
Parameter	**Method**	**Schedule/Frequency**	**Number/Extent**	**Data Collected/Reported**
Wetland Restoration	Groundwater gauges	As-built, Years 1, 2, 3, 4, 5, 6, and 7 throughout the year with the growing season defined as March 1-October 22	6 gauges spread throughout restored wetlands	Soil temperature at the beginning of each monitoring period to verify the start of the growing season, groundwater and rain data for each monitoring period

Monitoring Summary (Continued)

Vegetation Parameters				
Parameter	**Method**	**Schedule/Frequency**	**Number/Extent**	**Data Collected/Reported**
Vegetation establishment and vigor	Permanent vegetation plots 0.0247 acre (100 square meters) in size; CVS-EEP Protocol for Recording Vegetation, Version 4.2 (Lee et al. 2008)	As-built, Years 1, 2, 3, 5, and 7	14 plots spread across the Site	Species, height, planted vs. volunteer, stems/acre
	Annual random vegetation plots, 0.0247 acre (100 square meters) in size	As-built, Years 1, 2, 3, 5, and 7	4 plots randomly selected each year	Species and height

*Benthic Macroinvertebrate sampling data will not be tied to success criteria; however, the data may be used as a tool to observe positive gains to in-stream habitat

Stream Summary

Stream measurements were not performed in year 4 (2022), in accordance with the monitoring schedule. A visual assessment indicates that across the Site, all in-stream structures are intact and functioning as designed and that channel geometry compares favorably with the proposed conditions outlined in the Detailed Restoration Plan and as constructed. No stream areas of concern were identified during year 4 (2022) monitoring. Tables for year 3 (2021) data and annual quantitative assessments are included in Appendix C.

One bankfull event was documented during year 4 (2022) monitoring for a total of 8 bankfull events to-date during the monitoring period (Table 14, Appendix E).

Channel formation was evident in all site tributaries during year 4 (2022). The UT1 streamflow gauge malfunctioned twice during MY4 (2022). After it was replaced in July, it captured 89 days of consecutive flow. The UT2 and UT3 stream gauges captured 61 days and 131 days respectively. The UT5 upstream and downstream gauges captured 201 and 130 days respectively. UT6 exhibited 118 consecutive days of flow prior to its failure in July. The upstream and downstream gauges on UT7 both failed resulting in data loss between April and July; however, they captured 36 days and 59 days respectively prior to the failures. The UT7 middle gauge captured 209 days of flow. The UT8 gauge also malfunctioned between April and July, but it captured 108 consecutive days of flow prior to its failure. All stream gauges were replaced with Onset U-20 gauges in July, and no additional malfunctions or failures are anticipated. Channel formation tables and graphs are in Appendix E.

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Supplemental planting of 3.87 acres was conducted in 2021 in previously identified areas of poor growth rates or vigor using 1,290 plants to improve the Site's overall stem density. These areas are identified on Figures 2A, 2B, and 2C (Appendix B) and are outside vegetation plots. Planting occurred at a rate of approximately 330 bare root stems per acre of the following species: river birch (*Betula nigra*), green ash (*Fraxinus pennsylvanica*), tulip poplar (*Liriodendron tulipifera*), red bud (*Cercis canadensis*), sycamore (*Platanus occidentalis*), white oak (*Quercus alba*), water oak (*Quercus nigra*), willow oak (*Quercus phellos*), and red oak (*Quercus rubra*).

3.0 REFERENCES

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Appendix A
Background Tables

Table 1. Project Components and Mitigation Units
Table 2. Project Activity and Reporting History
Table 3. Project Contacts Table
Table 4. Project Attributes Table

Table 1. Project Components and Mitigation Credits: Heron Site

Reach ID	Stream Stationing/ Wetland Type	Existing Footage/ Acreage	Mitigation Plan Footage/ Acreage	Restoration Footage/ Acreage	Restoration Level	Restoration or Restoration Equivalent	Mitigation Ratio	Mitigation Credits	Comment
UT 1A	(-)0+05 to 04+70	475	470	475	Enhancement (Level I)	475	1.5:1	317	
UT 1B	04+70 to 13+26	753	836	856	Restoration	856-57= 799	1:1	799	57 lf of UT1 is located outside of the conservation easement and therefore is not generating credit
UT 2A	00+00 to 03+04	304	343	304	Enhancement (Level II)	304	2.5:1	122	
UT 2B	03+04 to 03+67	19	46	63	Restoration	63	1:1	63	
UT 3	00+00 to 02+79	269	279	279	Restoration	279	1:1	279	
UT 4	00+00 to 04+50	485	450	450	Restoration	450	1:1	450	
UT 5A	00+00 to 09+52	422	952	952	Restoration	952-52= 900	1:1	900	52 lf of UT5 is located outside of the conservation easement and therefore is not generating credit
UT 5B	09+52 to 14+90	538	538	538	Enhancement (Level II)	538	2.5:1	215	
UT 6	00+00 to 07+81	683	781	781	Restoration	781	1:1	781	
UT 7A	00+00 to 02+32	0	232	232	Restoration	232-41= 191	1:1	191	41 lf of the UT7 restoration reach is located outside of the conservation easement and therefore is not generating credit
UT 7B	02+32 to 09+96	764	764	764	Enhancement (Level I)	764-55= 709	1.5:1	473	55 lf of the UT7 enhancement reach is located outside of the conservation easement and therefore is not generating credit
UT8A	00+04 to 06+09	549	607	605	Restoration	605	1:1	605	
UT 8B	06+09 to 08+57	248	250	248	Enhancement (Level II)	248	2.5:1	99	
Wetland R	Riparian Riverine	--	0.35	0.35	Restoration	0.35	1:1	0.35	Wetland Restoration
Wetland E	Riparian Riverine	0.61	0.61	0.61	Enhancement	0.61	2:1	0.31	Wetland Enhancement

Table 1. Project Components and Mitigation Credits: Heron Site (continued)

Length & Area Summations by Mitigation Category		
Restoration Level	**Stream (linear footage)**	**Riparian Wetland (acreage)**
Restoration	4068*	0.35
Enhancement (Level I)	1184**	--
Enhancement (Level II)	1090	--
Enhancement	--	0.61

*An additional 150 linear feet of stream restoration is located outside of the conservation easement and is therefore not included in this total or in mitigation credit calculations.

**An additional 55 linear feet of stream enhancement (level I) is located outside of the conservation easement and is therefore not included in this total or in mitigation credit calculations.

Overall Assets Summary	
Asset Category	**Overall Credits**
Stream	5293.334
Riparian Riverine Wetland	0.655

Table 2. Project Activity and Reporting History: Heron Site

Activity or Deliverable	Data Collection Complete	Completion or Delivery
Technical Proposal (RFP No. 16-006990)	January 11, 2017	January 11, 2017
Institution Date (NCDMS Contract No. 100014)	--	May 22, 2017
404 Permit	--	October 10, 2018
Mitigation Plan	--	July 2018
Construction Plans	--	July 17, 2018
Site Construction	--	November 27, 2018-February 11, 2019
Planting	--	February 21, 2019
As-built Baseline Stream Data Collection	February 25-26, 2019	--
As-built Baseline Vegetation Data Collection	February 25, 2019	--
As-built Baseline Monitoring (MY0)	February-March 2019	May 2019
Monitoring Year 1 (2019) Stream Data Collection	August 13-14, 2019	--
Monitoring Year 1 (2019) Vegetation Data Collection	September 30, 2019	--
Monitoring Year 1 (MY1)	March-October 2019	November 2019
Invasive Species Treatment - Privet, Rose, Tree-of-Heaven, Microstegium, Johnson Grass	NA	June 12, 2020
Monitoring Year 2 (2020) Stream Data Collection	May 16-24, 2020	--
Monitoring Year 2 (2020) Vegetation Data Collection	July 1-6, 2020	--
Monitoring Year 2 (MY2)	March-October 2020	January 2021
Supplemental Planting	NA	April 8, 2021
Invasive Species Treatment - Johnson Grass, Privet, Tree-of-Heaven, Multi-flora Rose, Japanese Knotweed, Catttail and Fescue	NA	September 7 - October 7, 2021
Monitoring Year 3 (2021) Stream Data Collection	February 16, 2021	--
Monitoring Year 3 (2021) Vegetation Data Collection	July - October, 2021	--
Monitoring Year 3 (MY3)	January - October 2021	December 2021
Invasive Species Treatment - Cattail, Privet, Johnson Grass, Multiflora Rose, Sweetgum, Tree-of-Heaven, Princess Tree	NA	June 15, 2022
Invasive Species Treatment - Japanese Knotweed (UT8), Tree-of-Heaven, Privet, Multiflora rose	NA	August 29, 2022
Monitoring Year 4 (2022) Stream Data Collection	NA	--
Monitoring Year 4 (2022) Vegetation Data Collection	NA	--
Monitoring Year 4 (MY4)	January - October 2022	February 2023

Table 3. Project Contacts Table: Heron Site

Full Delivery Provider Restoration Systems 1101 Haynes Street, Suite 211 Raleigh, North Carolina 27604 Worth Creech 919-755-9490	**Construction Contractor** Land Mechanic Designs 780 Landmark Road Willow Spring, NC 27592 Lloyd Glover 919-639-6132
Designer Axiom Environmental, Inc. 218 Snow Avenue Raleigh, NC 27603 Grant Lewis 919-215-1693	**Planting Contractor** Carolina Silvics, Inc. 908 Indian Trail Road Edenton, NC 27932 Mary-Margaret McKinney 252-482-8491
Construction Plans and Sediment and Erosion Control Plans Sungate Design Group, PA 915 Jones Franklin Road Raleigh, NC 27606 Joshua G. Dalton, PE 919-859-2243	**As-built Surveyor** K2 Design Group 5688 US Highway 70 East Goldsboro, NC 27534 John Rudolph 919-751-0075
	Baseline & Monitoring Data Collection Axiom Environmental, Inc. 218 Snow Avenue Raleigh, NC 27603 Grant Lewis 919-215-1693

Table 4. Project Attribute Table: Heron Site

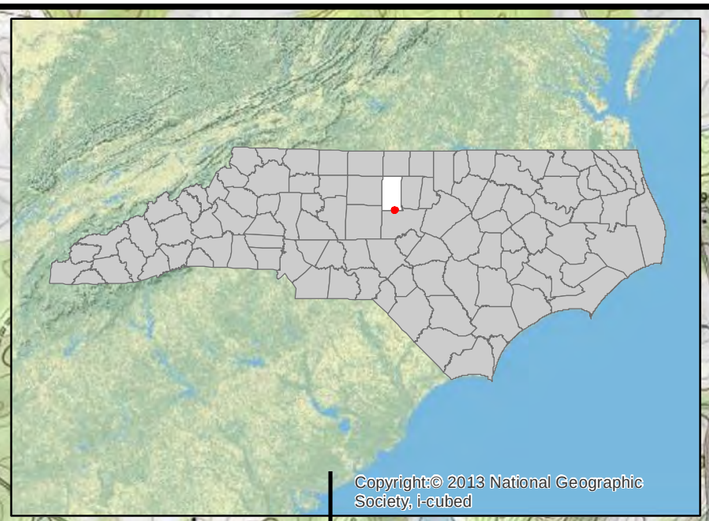
Project Information	
Project Name	Heron Stream and Wetland Mitigation Site
Project County	Alamance County, North Carolina
Project Area (acres)	17.64
Project Coordinates (latitude & latitude)	35.853955ºN, -79.363458ºW
Planted Area (acres)	12.05
Project Watershed Summary Information	
Physiographic Province	Piedmont
Project River Basin	Cape Fear
USGS HUC for Project (14-digit)	03030002050050
NCDWR Sub-basin for Project	03-06-04
Project Drainage Area (acres)	14 to 96
Percentage of Project Drainage Area that is Impervious	<2%
CGIA Land Use Classification	Managed Herbaceous Cover & Mixed Upland Hardwoods

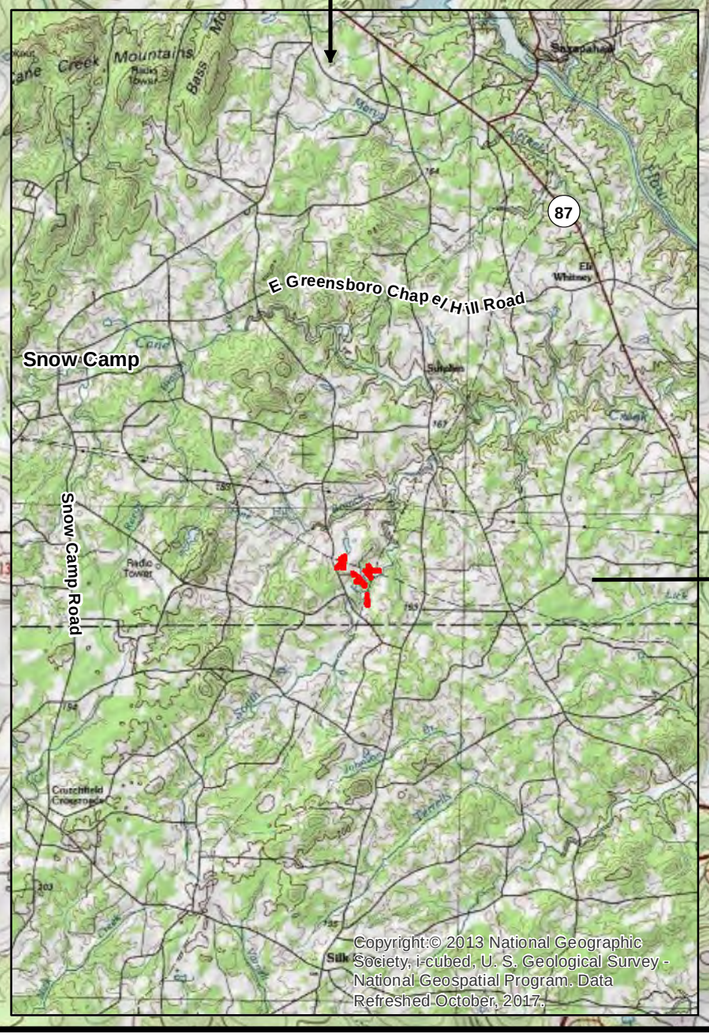
Table 4. Project Attribute Table: Heron Site (Continued)

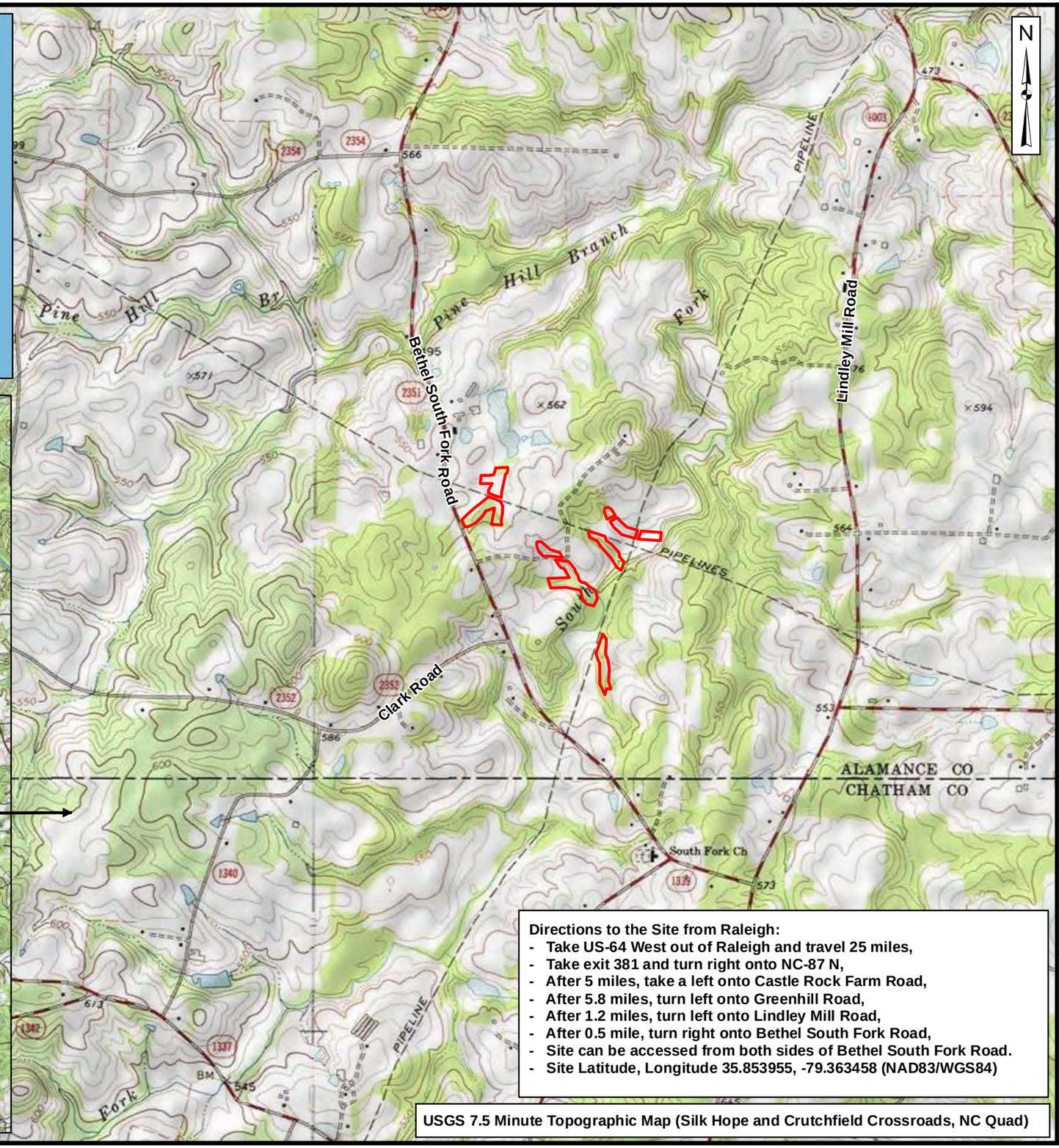
Reach Summary Information								
Parameters	**UT1**	**UT2**	**UT 3**	**UT4**	**UT 5**	**UT6**	**UT 7**	**UT 8**
Length of reach (linear feet)	1155	363	269	485	907	683	202	1221
Valley Classification & Confinement	Alluvial, confined							
Drainage Area (acres)	96.4	7.1	11.7	17.2	38.1	14.1	20.9	30.8
NCDWR Stream ID Score	30.5	22.5	28.5	33.5	27.5	23.5	24.5	27.5
Perennial, Intermittent, Ephemeral	Perennial	Intermittent	Perennial/ Intermittent	Perennial	Perennial/ Intermittent	Perennial/ Intermittent	Intermittent	Perennial
NCDWR Water Quality Classification	WS-V, NSW							
Existing Morphological Description (Rosgen 1996)	Cg5	Gf5	Cg5	Eg5	Eg5	Cg5	Cg5	Eg5
Proposed Stream Classification (Rosgen 1996)	C/E 4	Gf 5	C/E 4	C/E 4	C/E 4	C/E 4	Eb4	C/E 4
Existing Evolutionary Stage (Simon and Hupp 1986)	III/IV	I/III/IV	III/IV	II/III	II/III	III/IV	III/IV	II/III
Underlying Mapped Soils	Alamance silt loam, Georgeville silt loam, Goldston slaty silt loam, Herndon silt loam, Orange silt loam, Worsham sandy loam, Local Alluvial Land,							
Drainage Class	Well-drained, well-drained, well-drained, well-drained, well drained, poorly-drained, poorly-drained							
Hydric Soil Status	Nonhydric, nonhydric, nonhydric, nonhydric, nonhydric, hydric, hydric, respectively							
Valley Slope	0.0074	0.0270	0.0222	0.0244	0.0358	0.0300	0.0255	0.0218
FEMA Classification	NA							
Native Vegetation Community	Piedmont Alluvial Forest/Dry-Mesic Oak-Hickory Forest							
Watershed Land Use/Land Cover (Site)	43% forest,55% agricultural land, <2% low density residential/impervious surface							
Watershed Land Use/Land Cover (Cedarock Reference Channel)	65% forest, 30% agricultural land, <5% low density residential/impervious surface							
Percent Composition of Exotic Invasive Vegetation	<5%							

Appendix B
Visual Assessment Data

Figure 1. Project Location
Figure 2, 2A-D. Current Conditions Plan View
Tables 5A-5H. Visual Stream Morphology Stability Assessment
Table 6. Vegetation Condition Assessment







Directions to the Site from Raleigh:
- **Take US-64 West out of Raleigh and travel 25 miles,**
- **Take exit 381 and turn right onto NC-87 N,**
- **After 5 miles, take a left onto Castle Rock Farm Road,**
- **After 5.8 miles, turn left onto Greenhill Road,**
- **After 1.2 miles, turn left onto Lindley Mill Road,**
- **After 0.5 mile, turn right onto Bethel South Fork Road,**
- **Site can be accessed from both sides of Bethel South Fork Road.**
- **Site Latitude, Longitude 35.853955, -79.363458 (NAD83/WGS84)**

USGS 7.5 Minute Topographic Map (Silk Hope and Crutchfield Crossroads, NC Quad)

Axiom Environmental, Inc.

Prepared for:

RESTORATION SYSTEMS | LLC

Project:

HERON STREAM AND WETLAND MITIGATION SITE

Alamance County, NC

Title:

PROJECT LOCATION

Drawn by: KRJ

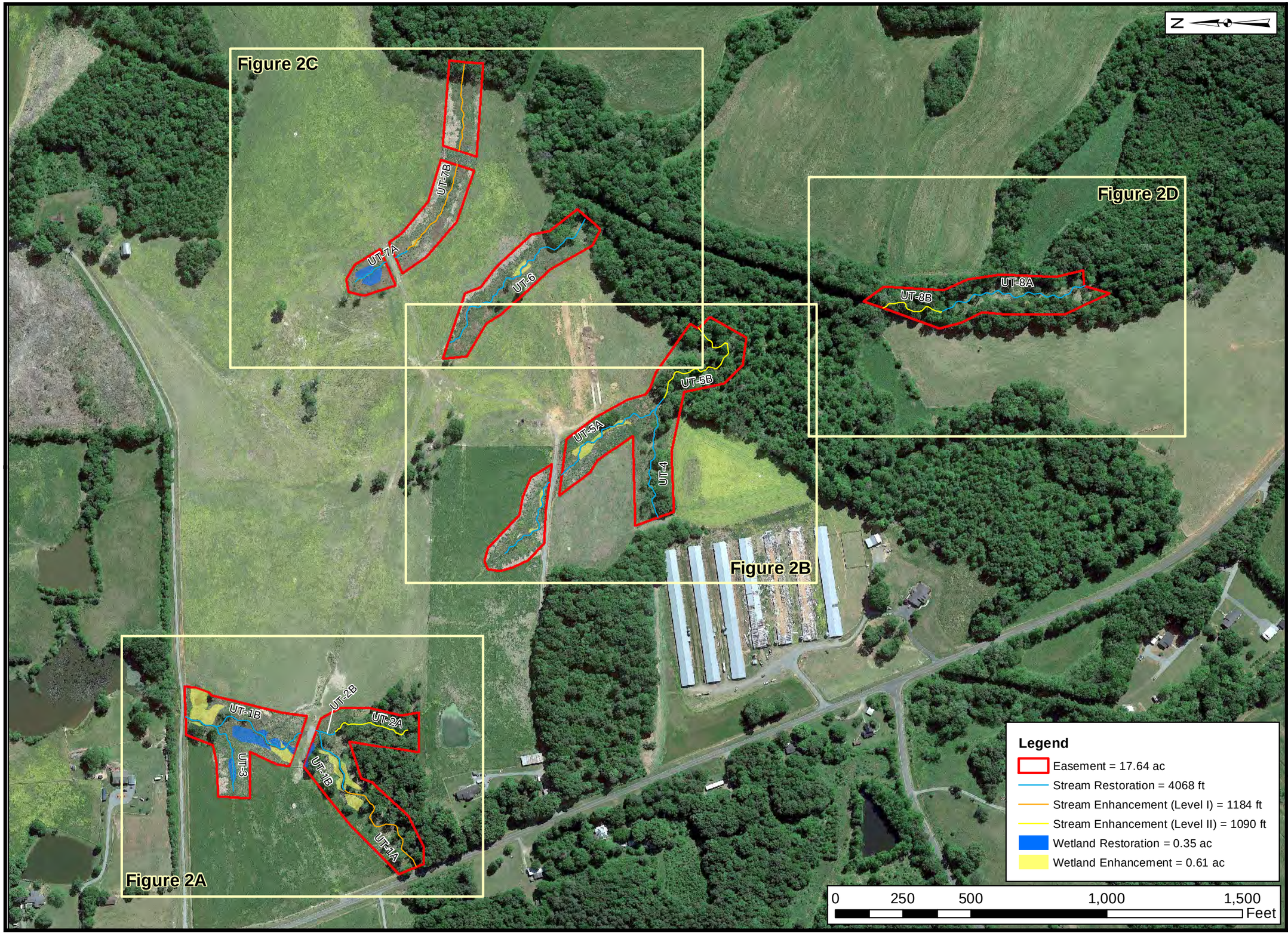
Date: DEC 2017

Scale: 1:20000

Project No.: 17-008

FIGURE

1



Axiom Environmental, Inc.

Prepared for:

RESTORATION SYSTEMS | LLC

Project:

HERON STREAM AND WETLAND MITIGATION SITE

Alamance County, NC

Title:

CURRENT CONDITIONS PLAN VIEW

Drawn by: KRJ

Date: NOV 2022

Scale: 1:4000

Project No.: 17-008

FIGURE

2

Axiom Environmental, Inc.

Prepared for:

RESTORATION SYSTEMS | LLC

Project:

HERON STREAM AND WETLAND MITIGATION SITE

Alamance County, NC

Title:

CURRENT CONDITIONS PLAN VIEW

Drawn by: KRJ

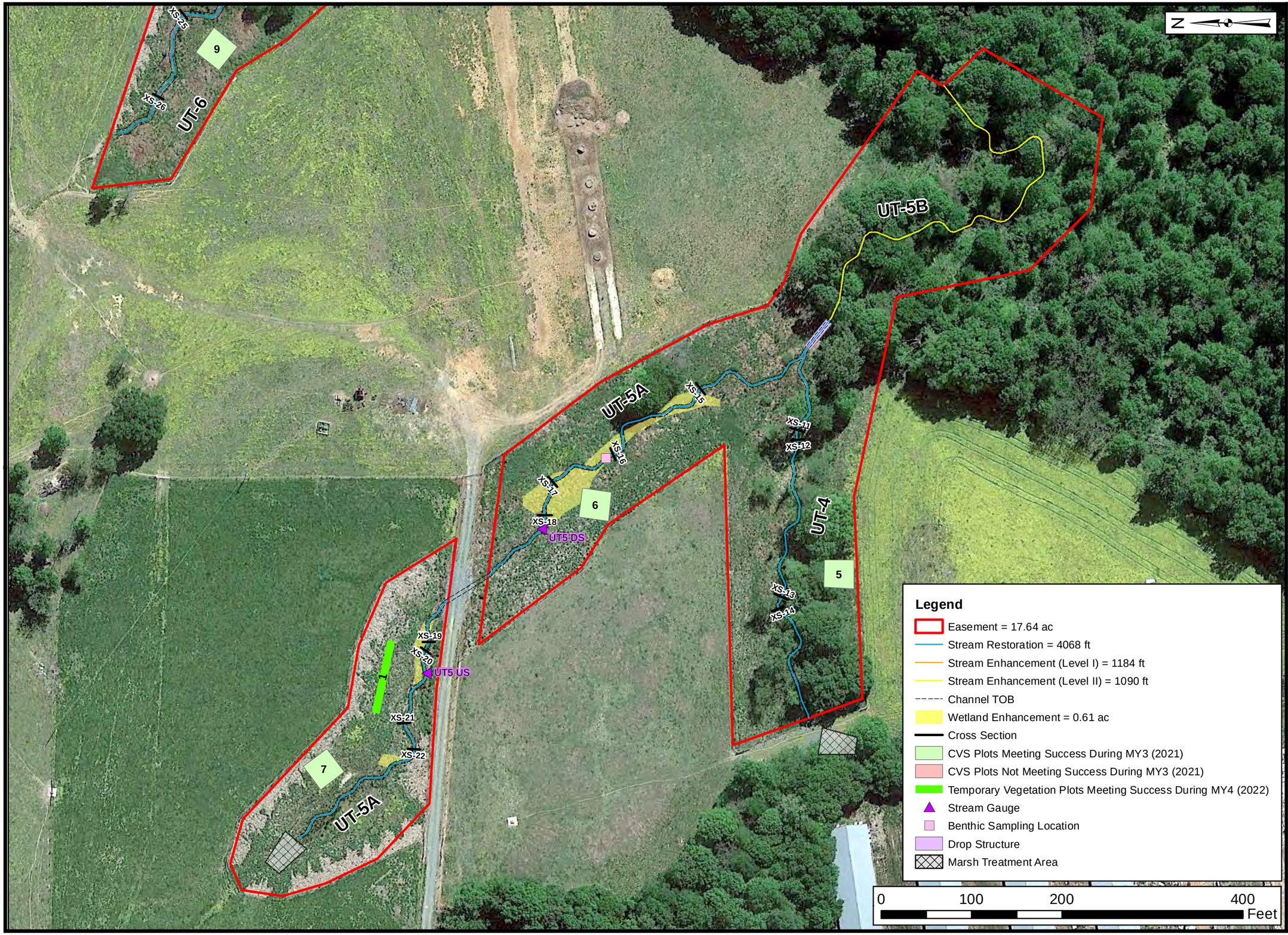
Date: NOV 2022

Scale: 1:1200

Project No.: 17-008

FIGURE

2A



Axiom Environmental, Inc.

Prepared for:

RESTORATION SYSTEMS | LLC

Project:

HERON STREAM AND WETLAND MITIGATION SITE

Alamance County, NC

Title:

CURRENT CONDITIONS PLAN VIEW

Drawn by: KRJ

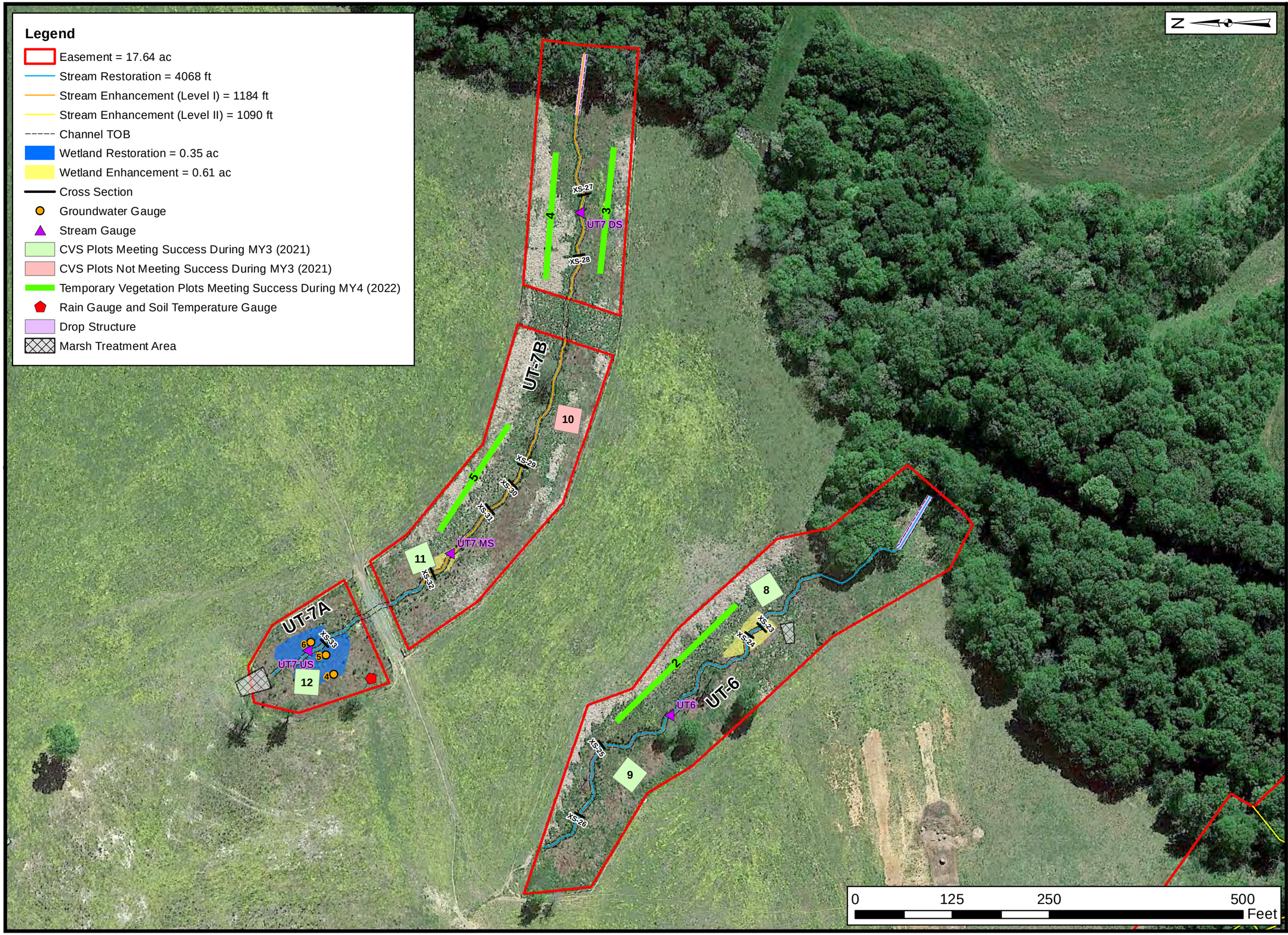
Date: NOV 2022

Scale: 1:1200

Project No.: 17-008

FIGURE

2B



Axiom Environmental, Inc.

Prepared for:

RESTORATION SYSTEMS | LLC

Project:

HERON STREAM AND WETLAND MITIGATION SITE

Alamance County, NC

Title:

CURRENT CONDITIONS PLAN VIEW

Drawn by: KRJ

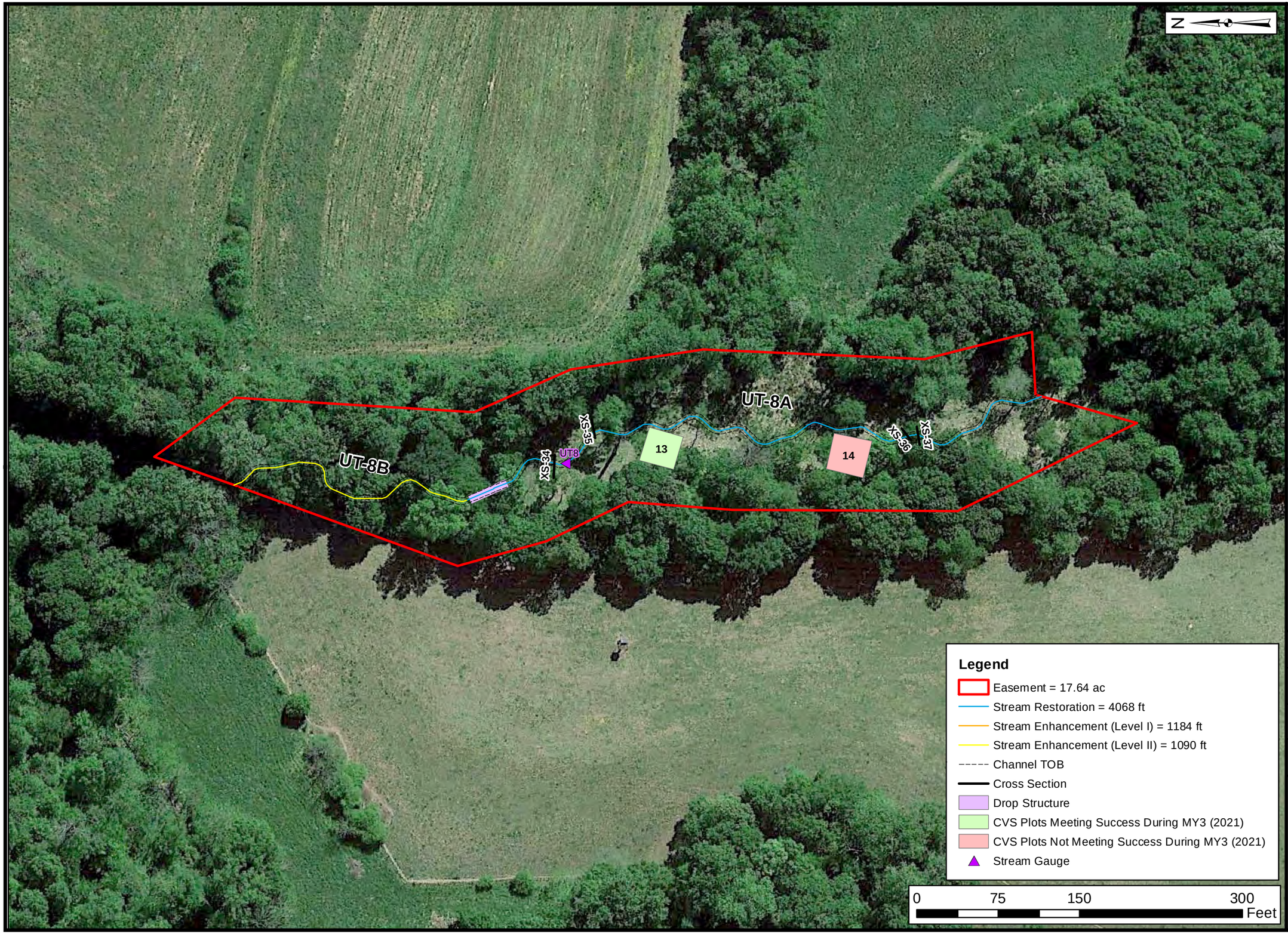
Date: NOV 2022

Scale: 1:1400

Project No.: 17-008

FIGURE

2C



Axiom Environmental, Inc.

Prepared for:

RESTORATION SYSTEMS | LLC

Project:

HERON STREAM AND WETLAND MITIGATION SITE

Alamance County, NC

Title:

CURRENT CONDITIONS PLAN VIEW

Drawn by: KRJ

Date: NOV 2022

Scale: 1:1000

Project No.: 17-008

FIGURE

2D

Table 5A **Visual Stream Morphology Stability Assessment**
Reach ID **Heron UT-1**
Assessed Length **1331**

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjusted % for Stabilizing Woody Vegetation
1. Bed	1. **Vertical Stability** (Riffle and Run units)	1. Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)			0	0	100%			
		2. Degradation - Evidence of downcutting			0	0	100%			
	2. Riffle Condition	1. Texture/Substrate - Riffle maintains coarser substrate	35	35			100%			
	3. Meander Pool Condition	1. Depth Sufficient (Max Pool Depth : Mean Bankfull Depth ≥ 1.6)	34	34			100%			
		2. Length appropriate (>30% of centerline distance between tail of upstream riffle and head of downstrem riffle)	34	34			100%			
	4.**Thalweg Position**	1. Thalweg centering at upstream of meander bend (Run)	34	34			100%			
		2. Thalweg centering at downstream of meander (Glide)	34	34			100%			
2. Bank	**1. Scoured/Eroding**	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%			100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%			100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%			100%
				Totals	0	0	100%	0	0	100%
3. Engineered Structures	**1. Overall Integrity**	Structures physically intact with no dislodged boulders or logs.	15	15			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	15	15			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	15	15			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)	15	15			100%			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth ratio ≥ 1.6 Rootwads/logs providing some cover at base-flow.	15	15			100%			

Table 5B **Visual Stream Morphology Stability Assessment**
Reach ID **Heron UT-2**
Assessed Length **63**

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

Table 5C **Visual Stream Morphology Stability Assessment**
Reach ID **Heron UT-3**
Assessed Length **279**

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	14	14			100%			
	3. Meander Pool Condition	1. Depth Sufficient (Max Pool Depth : Mean Bankfull Depth ≥ 1.6)	13	13			100%			
		2. Length appropriate (>30% of centerline distance between tail of upstream riffle and head of downstrem riffle)	13	13			100%			
	4.**Thalweg Position**	1. Thalweg centering at upstream of meander bend (Run)	13	13			100%			
		2. Thalweg centering at downstream of meander (Glide)	13	13			100%			
2. Bank	**1. Scoured/Eroding**	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%			100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%			100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%			100%
				Totals	0	0	100%	0	0	100%
3. Engineered Structures	**1. Overall Integrity**	Structures physically intact with no dislodged boulders or logs.	5	5			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	5	5			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	5	5			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)	5	5			100%			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth ratio ≥ 1.6 Rootwads/logs providing some cover at base-flow.	5	5			100%			

Table 5D **Visual Stream Morphology Stability Assessment**
Reach ID **Heron UT-4**
Assessed Length **450**

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	22	22			100%			
	3. Meander Pool Condition	1. Depth Sufficient (Max Pool Depth : Mean Bankfull Depth ≥ 1.6)	21	21			100%			
		2. Length appropriate (>30% of centerline distance between tail of upstream riffle and head of downstrem riffle)	21	21			100%			
	4.**Thalweg Position**	1. Thalweg centering at upstream of meander bend (Run)	21	21			100%			
		2. Thalweg centering at downstream of meander (Glide)	21	21			100%			
2. Bank	**1. Scoured/Eroding**	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%			100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%			100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%			100%
				Totals	0	0	100%	0	0	100%
3. Engineered Structures	**1. Overall Integrity**	Structures physically intact with no dislodged boulders or logs.	10	10			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	10	10			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	10	10			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)	10	10			100%			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth ratio ≥ 1.6 Rootwads/logs providing some cover at base-flow.	10	10			100%			

Table 5E **Visual Stream Morphology Stability Assessment**
Reach ID **Heron UT-5**
Assessed Length **952**

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjusted % for Stabilizing Woody Vegetation
1. Bed	1. **Vertical Stability** (Riffle and Run units)	1. Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)			0	0	100%			
		2. Degradation - Evidence of downcutting			0	0	100%			
	2. Riffle Condition	1. Texture/Substrate - Riffle maintains coarser substrate	44	44			100%			
	3. Meander Pool Condition	1. Depth Sufficient (Max Pool Depth : Mean Bankfull Depth ≥ 1.6)	43	43			100%			
		2. Length appropriate (>30% of centerline distance between tail of upstream riffle and head of downstrem riffle)	43	43			100%			
	4.**Thalweg Position**	1. Thalweg centering at upstream of meander bend (Run)	43	43			100%			
		2. Thalweg centering at downstream of meander (Glide)	43	43			100%			
2. Bank	**1. Scoured/Eroding**	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%			100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%			100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%			100%
				Totals	0	0	100%	0	0	100%
3. Engineered Structures	**1. Overall Integrity**	Structures physically intact with no dislodged boulders or logs.	25	25			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	25	25			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	25	25			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%. (See guidance for this table in EEP monitoring guidance document)	25	25			100%			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth ratio ≥ 1.6 Rootwads/logs providing some cover at base-flow.	25	25			100%			

Table 5F **Visual Stream Morphology Stability Assessment**
Reach ID **Heron UT-6**
Assessed Length **781**

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	34	34			100%			
	3. Meander Pool Condition	1. Depth Sufficient (Max Pool Depth : Mean Bankfull Depth ≥ 1.6)	33	33			100%			
		2. Length appropriate (>30% of centerline distance between tail of upstream riffle and head of downstrem riffle)	33	33			100%			
	4.**Thalweg Position**	1. Thalweg centering at upstream of meander bend (Run)	33	33			100%			
		2. Thalweg centering at downstream of meander (Glide)	33	33			100%			
2. Bank	**1. Scoured/Eroding**	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%			100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%			100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%			100%
				Totals	0	0	100%	0	0	100%
3. Engineered Structures	**1. Overall Integrity**	Structures physically intact with no dislodged boulders or logs.	8	8			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	8	8			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	8	8			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%. (See guidance for this table in EEP monitoring guidance document)	8	8			100%			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth ratio ≥ 1.6 Rootwads/logs providing some cover at base-flow.	8	8			100%			

Table 5G **Visual Stream Morphology Stability Assessment**
Reach ID **Heron UT-7**
Assessed Length **996**

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjusted % for Stabilizing Woody Vegetation
1. Bed	1. **Vertical Stability** (Riffle and Run units)	1. Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)			0	0	100%			
		2. Degradation - Evidence of downcutting			0	0	100%			
	2. Riffle Condition	1. Texture/Substrate - Riffle maintains coarser substrate	44	44			100%			
	3. Meander Pool Condition	1. Depth Sufficient (Max Pool Depth : Mean Bankfull Depth ≥ 1.6)	44	44			100%			
		2. Length appropriate (>30% of centerline distance between tail of upstream riffle and head of downstrem riffle)	44	44			100%			
	4.**Thalweg Position**	1. Thalweg centering at upstream of meander bend (Run)	44	44			100%			
		2. Thalweg centering at downstream of meander (Glide)	44	44			100%			
2. Bank	**1. Scoured/Eroding**	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%			100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%			100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%			100%
				Totals	0	0	100%	0	0	100%
3. Engineered Structures	**1. Overall Integrity**	Structures physically intact with no dislodged boulders or logs.	19	19			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	19	19			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	19	19			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%. (See guidance for this table in EEP monitoring guidance document)	19	19			100%			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth ratio ≥ 1.6 Rootwads/logs providing some cover at base-flow.	19	19			100%			

Table 5H **Visual Stream Morphology Stability Assessment**
Reach ID **Heron UT-8**
Assessed Length **605**

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	24	24			100%			
	3. Meander Pool Condition	1. Depth Sufficient (Max Pool Depth : Mean Bankfull Depth ≥ 1.6)	23	23			100%			
		2. Length appropriate (>30% of centerline distance between tail of upstream riffle and head of downstrem riffle)	23	23			100%			
	4.**Thalweg Position**	1. Thalweg centering at upstream of meander bend (Run)	23	23			100%			
		2. Thalweg centering at downstream of meander (Glide)	23	23			100%			
2. Bank	**1. Scoured/Eroding**	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%			100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%			100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%			100%
				Totals	0	0	100%	0	0	100%
3. Engineered Structures	**1. Overall Integrity**	Structures physically intact with no dislodged boulders or logs.	9	9			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	9	9			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	9	9			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)	9	9			100%			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth ratio ≥ 1.6 Rootwads/logs providing some cover at base-flow.	9	9			100%			

Table 6 Vegetation Condition Assessment

Heron

Planted Acreage[1] **12.05**

Vegetation Category	Definitions	Mapping Threshold	CCPV Depiction	Number of Polygons	Combined Acreage	% of Planted Acreage
1. Bare Areas	None	0.1 acres	none	0	0.00	0.0%
2. Low Stem Density Areas	None	0.1 acres	none	0	0.00	0.0%
2B. Low Planted Stem Density Areas	None	0.1 acres	none	0	0.00	0.0%
			Total	0	0.00	0.0%
3. Areas of Poor Growth Rates or Vigor		0 acres	none	0	0.00	0.0%
			Cumulative Total	0	0.00	0.0%

Easement Acreage[2] **17.64**

Vegetation Category	Definitions	Mapping Threshold	CCPV Depiction	Number of Polygons	Combined Acreage	% of Easement Acreage
4. Invasive Areas of Concern[4]	None	1000 SF	none	0	0.00	0.0%
5. Easement Encroachment Areas[3]	None	none	none	0	0.00	0.0%

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

2 = The acreage within the easement boundaries.

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

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

Appendix C
Vegetation Data

Table 7. Planted Bare Root Woody Vegetation
Table 8. Temporary Vegetation Plot Data

Table 7. Planted Bare Root Woody Vegetation: Heron Site

Species	Total*
Acres	**12.05**
Alnus serrulata	500
Asimina triloba	100
Betula nigra	400
Carpinus caroliniana	800
Cephalanthus occidentalis	25
Cercis canadensis	500
Cornus amomum	2500
Diospyros virginiana	350
Fraxinus americana	100
Fraxinus pennsylvanica	2500
Liriodendron tulipifera	125
Nyssa sylvatica	500
Platanus occidentalis	2400
Quercus lyrata	900
Quercus nigra	2000
Quercus phellos	1900
Sambucus canadensis	25
TOTALS	**15,625***
Average Stems/Acre	**1297**

*Live stakes of *Salix nigra* were planted, but are not included in this table.

Table 8. Temporary Vegetation Plot Data: Heron Site

Species	50m x 2m Temporary Plot (Bearing)					
	T-1 (130°)	T-2 (319°)	T-3 (319°)	T-4 (285°)	T-5 (10°)	T-6 (344°)
Carpinus caroliniana	4	1			2	4
Cercis canadensis	3					
Cornus ammomum			1			
Diospyros virginiana		2	2	2		
Fraxinus pennsylvanica		2	3	4	6	
Platanus occidentalis	3	3		2	8	3
Quercus lyrata			1			
Quercus rubra			2			
Quercus phellos	2	1		3		3
Quercus alba	2	3				
Total Stems	**14**	**12**	**9**	**11**	**16**	**10**
Total Stems/Acre	**567**	**486**	**364**	**445**	**648**	**405**

MY-04 HEIGHT DATA: Stems ranged in height from 100 cm to 375 cm.

Appendix D
Stream Geomorphology Data

Tables 9A-G. Baseline Stream Data Summary
Tables 10A-G. Baseline Stream Data Summary (Substrate, Bed, Bank, and Hydrologic Containment Parameter Distributions)
Table 11A-G. MY3 Monitoring Data - Dimensional Morphology Summary (Dimensional Parameters – Cross Sections)
Table 12A-G. MY3 Monitoring Data - Stream Reach Data Summary

Table9a. Baseline Stream Data Summary
Project Name/Number (Heron/100014) - Segment/Reach: UT 1 (856 feet)

Parameter	Gauge[2]	Regional Curve			Pre-Existing Condition						Cedarock Park Ref			Causey Ref			Design			Monitoring Baseline					
Dimension and Substrate - Riffle Only		LL	UL	Eq.	Min	Mean	Med	Max	SD[5]	n	Min	Mean	Max	Min	Mean	Max	Min	Med	Max	Min	Mean	Med	Max	SD[5]	n
Bankfull Width (ft)					4.7	8.5		11.1			8	8.1	12.1	10.7	11	11.3	7.8	8.4	9	8.3	11		13		4
Floodprone Width (ft)					13	20		30			15	18	25	122	131	140	10	75	100	25	100		100		4
Bankfull Mean Depth (ft)					0.5	0.7		1.1			0.8	0.8	1	1.3	1.4	1.4	0.6	0.6	0.7	0.4	0.5		0.6		4
[1]Bankfull Max Depth (ft)					0.8	1.1		2			1.1	1.4	1.4	1.9	2	2	0.7	0.8	1	0.6	0.8		1.1		4
Bankfull Cross Sectional Area (ft^2)						5.1						8			14.7		5.1	5.1	5.1	3.7	5.4		7.2		4
Width/Depth Ratio					4.3	14.6		22			8	10.1	15.1	8	9	9	12	14	16	17.4	18.7		36.7		4
Entrenchment Ratio					1.6	2.5		4.3			1.9	2.1	2.2	11	12	13	5.1	8.9	11.1	3	8.3		9.3		4
[1]Bank Height Ratio					1.4	1.9		2.5			1.0	1.8			1.4		1.0	1.0	1.3	1.0	1.0		1.0		4
Profile																									
Riffle Length (ft)					No distinct repetitive pattern of riffles and pools due to straightening activities.															2.7	19	16	53	11	31
Riffle Slope (ft/ft)											0.01	0.0316	0.0576	0.002	0.01	0.012	0.007	0.009	0.01	0	0.013	0.012	0.048	0.01	31
Pool Length (ft)																				6	23	20	80	12.9	34
Pool Max depth (ft)											1.5	1.8	2.1		2.7		0.8	1.1	1.3	1.5	1.6		2.1		4
Pool Spacing (ft)											25	37	69	22	44	81	25	34	68	25	34		68		34
Pattern																									
Channel Beltwidth (ft)					No distinct repetitive pattern of riffles and pools due to straightening activities.						20	23	38	17	30	36	25	34	68	25	34		68		
Radius of Curvature (ft)											11	16	27	9	31	113	17	25	85	17	25		85		
Rc:Bankfull width (ft/ft)											1.4	2	3.3	0.8	2.8	10.3	2	3	10	2	3		10		
Meander Wavelength (ft)											44	68	116	10	63	91	51	72	101	51	72		101		
Meander Width Ratio											2.4	2.8	4.7	1.5	2.7	3.5	3	4	6	3	4		6		
Transport parameters																									
Reach Shear Stress (competency) lb/f^2					0.61												0.19			0.24					
Max part size (mm) mobilized at bankfull																									
Stream Power (transport capacity) W/m^2																									
Additional Reach Parameters																									
Rosgen Classification					Cg 5						Eb 4			E5			E/C 4			C 4					
Bankfull Velocity (fps)					3.8												3.8			3.6					
Bankfull Discharge (cfs)					19.3																				
Valley length (ft)					1067																				
Channel Thalweg length (ft)					1433												856			856					
Sinuosity (ft)					1.3						1.2			1.46			1.3			1.3					
Water Surface Slope (Channel) (ft/ft)					0.0057						0.0258			0.0053			0.0057			0.0087					
BF slope (ft/ft)																									
[3]Bankfull Floodplain Area (acres)																									
[4]% of Reach with Eroding Banks					61						0			0											
Channel Stability or Habitat Metric																									
Biological or Other																									

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

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

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

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

Table 9b. Baseline Stream Data Summary
Project Name/Number (Heron/100014) - Segment/Reach: UT 3 (279 feet)

Parameter	Gauge[2]	Regional Curve			Pre-Existing Condition						Cedarock Park Ref			Causey Ref			Design			Monitoring Baseline					
Dimension and Substrate - Riffle Only		LL	UL	Eq.	Min	Mean	Med	Max	SD[5]	n	Min	Mean	Max	Min	Mean	Max	Min	Med	Max	Min	Mean	Med	Max	SD[5]	n
Bankfull Width (ft)					3.2	4.5		5.9			8	8.1	12.1	10.7	11	11.3	4.1	4.4	4.7	7.7	7.7		7.7		1
Floodprone Width (ft)					9	14		21			15	18	25	122	131	140	20	40	60	18	18		18		1
Bankfull Mean Depth (ft)					0.2	0.3		0.4			0.8	0.8	1	1.3	1.4	1.4	0.3	0.3	0.3	0.6	0.6		0.6		1
[1]Bankfull Max Depth (ft)					0.5	0.6		0.7			1.1	1.4	1.4	1.9	2	2	0.4	0.4	0.5	1	1		1		1
Bankfull Cross Sectional Area (ft^2)						1.4						8			14.7		1.4	1.4	1.4	4.5	4.5		4.5		1
Width/Depth Ratio					8	17.4		29.5			8	10.1	15.1	8	9	9	12	14	16	13.2	13.2		13.2		1
Entrenchment Ratio					1.4	2.2		3.8			1.9	2.1	2.2	11	12	13	4.9	9	12.7	2.3	2.3		2.3		1
[1]Bank Height Ratio					1.7	2.2		2.4			1.0	1.8			1.4		1.0	1.0	1.3	1.0	1.0		1.0		1
Profile																									
Riffle Length (ft)					No distinct repetitive pattern of riffles and pools due to straightening activities.															4	11	10	19	4.3	14
Riffle Slope (ft/ft)											0.01	0.0316	0.0576	0.002	0.01	0.012	0.023	0.031	0.035	0.011	0.029	0.027	0.736	0.017	14
Pool Length (ft)																				4	9	8	21	4.9	13
Pool Max depth (ft)											1.5	1.8	2.1		2.7		0.4	0.6	0.7	1	1	1	1	0	1
Pool Spacing (ft)											25	37	69	22	44	81	13	18	35	13	18		35		14
Pattern																									
Channel Beltwidth (ft)					No distinct repetitive pattern of riffles and pools due to straightening activities.						20	23	38	17	30	36	13	18	27	13	18		27		
Radius of Curvature (ft)											11	16	27	9	31	113	9	13	44	9	13		44		
Rc:Bankfull width (ft/ft)											1.4	2	3.3	0.8	2.8	10.3	2	3	10	2	3		10		
Meander Wavelength (ft)											44	68	116	10	63	91	26	37	53	26	37		53		
Meander Width Ratio											2.4	2.8	4.7	1.5	2.7	3.5	3	4	6	3	4		6		
Transport parameters																									
Reach Shear Stress (competency) lb/f^2					1.42												0.34			0.56					
Max part size (mm) mobilized at bankfull																									
Stream Power (transport capacity) W/m^2																									
Additional Reach Parameters																									
Rosgen Classification					Cg 5						Eb 4			E5			E/C 4			C 4					
Bankfull Velocity (fps)					3.6												3.6			1.1					
Bankfull Discharge (cfs)					5																				
Valley length (ft)					229																				
Channel Thalweg length (ft)					247												279			279					
Sinuosity (ft)					1.07						1.2			1.46			1.15			1.15					
Water Surface Slope (Channel) (ft/ft)					0.0207						0.0258			0.0053			0.0193			0.0176					
BF slope (ft/ft)																									
[3]Bankfull Floodplain Area (acres)																									
[4]% of Reach with Eroding Banks					100						0			0											
Channel Stability or Habitat Metric																									
Biological or Other																									

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

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

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

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

Table 9c. Baseline Stream Data Summary
Project Name/Number (Heron/100014) - Segment/Reach: UT 4 (450 feet)

Parameter	Gauge[2]	Regional Curve			Pre-Existing Condition						Cedarock Park Ref			Causey Ref			Design			Monitoring Baseline					
Dimension and Substrate - Riffle Only		LL	UL	Eq.	Min	Mean	Med	Max	SD[5]	n	Min	Mean	Max	Min	Mean	Max	Min	Med	Max	Min	Mean	Med	Max	SD[5]	n
Bankfull Width (ft)					3.1	3.8		4.9			8	8.1	12.1	10.7	11	11.3	4.6	5	5.4	6.5	7.3		8		2
Floodprone Width (ft)					6	15		30			15	18	25	122	131	140	25	50	75	40	40		40		2
Bankfull Mean Depth (ft)					0.4	0.5		0.6			0.8	0.8	1	1.3	1.4	1.4	0.3	0.4	0.4	0.3	0.4		0.5		2
[1]Bankfull Max Depth (ft)					0.7	0.8		0.9			1.1	1.4	1.4	1.9	2	2	0.4	0.5	0.6	0.5	0.7		0.8		2
Bankfull Cross Sectional Area (ft^2)						2						8			14.7		1.8	1.8	1.8	2.2	3		3.7		2
Width/Depth Ratio					5.2	7.7		12.3			8	10.1	15.1	8	9	9	12	14	16	17.3	18.3		19.2		2
Entrenchment Ratio					1.3	3.9		6.1			1.9	2.1	2.2	11	12	13	5.4	10	14	5	5.6		6.2		2
[1]Bank Height Ratio					1.3	2.3		4.0			1.0	1.8			1.4		1.0	1.0	1.3	1.0	1.0		1.0		2
Profile																									
Riffle Length (ft)					No distinct repetitive pattern of riffles and pools due to straightening activities.															4	9	9	20	3.5	23
Riffle Slope (ft/ft)											0.01	0.0316	0.0576	0.002	0.01	0.012	0.037	0.05	0.056	0	0.021	0.017	0.061	0.014	23
Pool Length (ft)																				4	10	10	18	3.5	22
Pool Max depth (ft)											1.5	1.8	2.1		2.7		0.5	0.7	0.8	1.1	1.3		1.4		2
Pool Spacing (ft)											25	37	69	22	44	81	15	20	40	15	20		40		22
Pattern																									
Channel Beltwidth (ft)					No distinct repetitive pattern of riffles and pools due to straightening activities.						20	23	38	17	30	36	15	20	30	15	20		30		
Radius of Curvature (ft)											11	16	27	9	31	113	10	15	50	10	15		50		
Rc:Bankfull width (ft/ft)											1.4	2	3.3	0.8	2.8	10.3	2	3	10	2	3		10		
Meander Wavelength (ft)											44	68	116	10	63	91	30	43	60	30	43		60		
Meander Width Ratio											2.4	2.8	4.7	1.5	2.7	3.5	3	4	6	3	4		6		
Transport parameters																									
Reach Shear Stress (competency) lb/f^2					2.79												0.6			0.59					
Max part size (mm) mobilized at bankfull																									
Stream Power (transport capacity) W/m^2																									
Additional Reach Parameters																									
Rosgen Classification					Eg 5						Eb 4			E5			E/C 4			C 4					
Bankfull Velocity (fps)					3.7												4			2.4					
Bankfull Discharge (cfs)					7.3																				
Valley length (ft)					391																				
Channel Thalweg length (ft)					428												450			450					
Sinuosity (ft)					1.09						1.2			1.46			1.15			1.15					
Water Surface Slope (Channel) (ft/ft)					0.0283						0.0258			0.0053			0.3111			0.0254					
BF slope (ft/ft)																									
[3]Bankfull Floodplain Area (acres)																									
[4]% of Reach with Eroding Banks					56						0			0											
Channel Stability or Habitat Metric																									
Biological or Other																									

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

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

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

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

Table 9d. Baseline Stream Data Summary
Project Name/Number (Heron/100014) - Segment/Reach: UT 5 (952 feet)

Parameter	Gauge[2]	Regional Curve			Pre-Existing Condition						Cedarock Park Ref			Causey Ref			Design			Monitoring Baseline					
Dimension and Substrate - Riffle Only		LL	UL	Eq.	Min	Mean	Med	Max	SD[5]	n	Min	Mean	Max	Min	Mean	Max	Min	Med	Max	Min	Mean	Med	Max	SD[5]	n
Bankfull Width (ft)					2.5	3.7		6			8	8.1	12.1	10.7	11	11.3	4.6	5	5.4	4.9	6.9		8.1		4
Floodprone Width (ft)					4	12		30			15	18	25	122	131	140	25	50	75	40	40		40		4
Bankfull Mean Depth (ft)					0.3	0.5		0.6			0.8	0.8	1	1.3	1.4	1.4	0.3	0.4	0.4	0.3	0.4		0.5		4
[1]Bankfull Max Depth (ft)					0.5	0.8		0.9			1.1	1.4	1.4	1.9	2	2	0.4	0.5	0.6	0.5	0.7		0.8		4
Bankfull Cross Sectional Area (ft^2)						1.6						8			14.7		1.8	1.8	1.8	1.9	2.4		3.7		4
Width/Depth Ratio					3.6	8.8		20			8	10.1	15.1	8	9	9	12	14	16	12.6	18.3		20.9		4
Entrenchment Ratio					1.4	3.1		7.3			1.9	2.1	2.2	11	12	13	5.4	10	14	4.9	5.9		8.2		4
[1]Bank Height Ratio					1.3	1.5		2.0			1.0	1.8			1.4		1.0	1.0	1.3	1.0	1.0		1.0		4
Profile																									
Riffle Length (ft)					No distinct repetitive pattern of riffles and pools due to straightening activities.															3	11	9	49	8.4	41
Riffle Slope (ft/ft)											0.01	0.0316	0.0576	0.002	0.01	0.012	0.037	0.05	0.056	0.004	0.028	0.027	0.051	0.01	41
Pool Length (ft)																				4	12	10	59	8.5	41
Pool Max depth (ft)											1.5	1.8	2.1		2.7		0.5	0.7	0.8	0.8	1		1.1		4
Pool Spacing (ft)											25	37	69	22	44	81	15	20	40	15	20		40		41
Pattern																									
Channel Beltwidth (ft)					No distinct repetitive pattern of riffles and pools due to straightening activities.						20	23	38	17	30	36	15	20	30	15	20		30		
Radius of Curvature (ft)											11	16	27	9	31	113	10	15	50	10	15		50		
Rc:Bankfull width (ft/ft)											1.4	2	3.3	0.8	2.8	10.3	2	3	10	2	3		10		
Meander Wavelength (ft)											44	68	116	10	63	91	30	43	60	30	43		60		
Meander Width Ratio											2.4	2.8	4.7	1.5	2.7	3.5	3	4	6	3	4		6		
Transport parameters																									
Reach Shear Stress (competency) lb/f^2					2.79												0.6			0.5					
Max part size (mm) mobilized at bankfull																									
Stream Power (transport capacity) W/m^2																									
Additional Reach Parameters																									
Rosgen Classification					Eg 5						Eb 4			E5			E/C 4			E/C 4					
Bankfull Velocity (fps)					3.9												4			2.3					
Bankfull Discharge (cfs)					5.5																				
Valley length (ft)					579																				
Channel Thalweg length (ft)					605												952			952					
Sinuosity (ft)					1.04						1.2			1.46			1.15			1.15					
Water Surface Slope (Channel) (ft/ft)					0.0372						0.0258			0.0053			0.3111			0.0256					
BF slope (ft/ft)																									
[3]Bankfull Floodplain Area (acres)																									
[4]% of Reach with Eroding Banks					50						0			0											
Channel Stability or Habitat Metric																									
Biological or Other																									

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

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

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

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

Table 9e. Baseline Stream Data Summary
Project Name/Number (Heron/100014) - Segment/Reach: UT 6 (781 feet)

Parameter	Gauge[2]	Regional Curve			Pre-Existing Condition						Cedarock Park Ref			Causey Ref			Design			Monitoring Baseline					
Dimension and Substrate - Riffle Only		LL	UL	Eq.	Min	Mean	Med	Max	SD[5]	n	Min	Mean	Max	Min	Mean	Max	Min	Med	Max	Min	Mean	Med	Max	SD[5]	n
Bankfull Width (ft)					4.6	6.4		9.6			8	8.1	12.1	10.7	11	11.3	4.2	4.6	4.9	6.1	6.5		6.8		2
Floodprone Width (ft)					7	16		46			15	18	25	122	131	140	25	50	75	40	40		40		2
Bankfull Mean Depth (ft)					0.2	0.3		0.3			0.8	0.8	1	1.3	1.4	1.4	0.3	0.3	0.4	0.4	0.4		0.5		2
[1]Bankfull Max Depth (ft)					0.4	0.5		0.8			1.1	1.4	1.4	1.9	2	2	0.4	0.5	0.5	0.6	0.8		0.9		2
Bankfull Cross Sectional Area (ft^2)						1.5						8			14.7		1.5	1.5	1.5	2.2	2.9		3.5		2
Width/Depth Ratio					15.3	26.7		48			8	10.1	15.1	8	9	9	12	14	16	13.2	15.1		16.9		2
Entrenchment Ratio					1.1	2.4		4.8			1.9	2.1	2.2	11	12	13	5.9	10.9	15.3	5.9	6.2		6.6		2
[1]Bank Height Ratio					3.7	5.0		7.5			1.0	1.8			1.4		1.0	1.0	1.3	1.0	1.0		1.0		2
Profile																									
Riffle Length (ft)					No distinct repetitive pattern of riffles and pools due to straightening activities.															2	10	7	47	8.8	33
Riffle Slope (ft/ft)											0.01	0.0316	0.0576	0.002	0.01	0.012	0.031	0.042	0.047	0.001	0.028	0.024	0.126	0.021	33
Pool Length (ft)																				4	12	12	18	3.7	33
Pool Max depth (ft)											1.5	1.8	2.1		2.7		0.4	0.6	0.7	1	1.2		1.3		2
Pool Spacing (ft)											25	37	69	22	44	81	13.7	18.3	36.7	14	18		37		33
Pattern																									
Channel Beltwidth (ft)					No distinct repetitive pattern of riffles and pools due to straightening activities.						20	23	38	17	30	36	13.7	18.3	36.7	14	18		37		
Radius of Curvature (ft)											11	16	27	9	31	113	9	14	46	9	14		46		
Rc:Bankfull width (ft/ft)											1.4	2	3.3	0.8	2.8	10.3	2	3	10	2	3		10		
Meander Wavelength (ft)											44	68	116	10	63	91	27	39	55	27	39		55		
Meander Width Ratio											2.4	2.8	4.7	1.5	2.7	3.5	3	4	6	3	4		6		
Transport parameters																									
Reach Shear Stress (competency) lb/f^2					14.18												0.47			0.56					
Max part size (mm) mobilized at bankfull																									
Stream Power (transport capacity) W/m^2																									
Additional Reach Parameters																									
Rosgen Classification					Cg 5						Eb 4			E5			E/C 4			C 4					
Bankfull Velocity (fps)					3.5												3.5			1.8					
Bankfull Discharge (cfs)					5.2																				
Valley length (ft)					486																				
Channel Thalweg length (ft)					522												781			781					
Sinuosity (ft)					1.07						1.2			1.46			1.15			1.15					
Water Surface Slope (Channel) (ft/ft)					0.028						0.0258			0.0053			0.0261			0.0225					
BF slope (ft/ft)																									
[3]Bankfull Floodplain Area (acres)																									
[4]% of Reach with Eroding Banks					68						0			0											
Channel Stability or Habitat Metric																									
Biological or Other																									

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

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

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

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

Table 9f. Baseline Stream Data Summary
Project Name/Number (Heron/100014) - Segment/Reach: UT 7 (232 feet)

Parameter	Gauge[2]	Regional Curve			Pre-Existing Condition						Cedarock Park Ref			Causey Ref			Design			Monitoring Baseline					
Dimension and Substrate - Riffle Only		LL	UL	Eq.	Min	Mean	Med	Max	SD[5]	n	Min	Mean	Max	Min	Mean	Max	Min	Med	Max	Min	Mean	Med	Max	SD[5]	n
Bankfull Width (ft)					4.1	5.3		6.7			8	8.1	12.1	10.7	11	11.3	4.9	5.3	5.7	6.2	6.6		7.8		4
Floodprone Width (ft)					7	13		29			15	18	25	122	131	140	25	50	75	10	20		20		4
Bankfull Mean Depth (ft)					0.3	0.4		0.5			0.8	0.8	1	1.3	1.4	1.4	0.4	0.4	0.4	0.3	0.4		0.5		4
[1]Bankfull Max Depth (ft)					0.4	0.6		0.8			1.1	1.4	1.4	1.9	2	2	0.5	0.5	0.6	0.5	0.6		0.7		4
Bankfull Cross Sectional Area (ft^2)						2						8			14.7		2	2	2	1.8	2.7		3.3		4
Width/Depth Ratio					8.2	14.5		22.3			8	10.1	15.1	8	9	9	12	14	16	12.8	18.5		24.2		4
Entrenchment Ratio					1.7	2.4		5.2			1.9	2.1	2.2	11	12	13	5	9	13	1.6	2.8		3.1		4
[1]Bank Height Ratio					1.8	2.5		4.1			1.0	1.8			1.4		1.0	1.0	1.3	1.0	1.0		1.0		4
Profile																									
Riffle Length (ft)					No distinct repetitive pattern of riffles and pools due to straightening activities.															3	13	10	75	13	42
Riffle Slope (ft/ft)											0.01	0.0316	0.0576	0.002	0.01	0.012	0.027	0.036	0.04	0.006	0.029	0.029	0.056	0.011	42
Pool Length (ft)																				3	9	9	14	2.6	41
Pool Max depth (ft)											1.5	1.8	2.1		2.7		1.3	1.9	2.1	1	1.1		1.5		3
Pool Spacing (ft)											25	37	69	22	44	81	16	21	42	16	21		42		42
Pattern																									
Channel Beltwidth (ft)					No distinct repetitive pattern of riffles and pools due to straightening activities.						20	23	38	17	30	36	16	21	32	16	21		32		
Radius of Curvature (ft)											11	16	27	9	31	113	10	16	53	10	16		53		
Rc:Bankfull width (ft/ft)											1.4	2	3.3	0.8	2.8	10.3	2	3	10	2	3		10		
Meander Wavelength (ft)											44	68	116	10	63	91	31	45	64	31	45		64		
Meander Width Ratio											2.4	2.8	4.7	1.5	2.7	3.5	3	4	6	3	4		6		
Transport parameters																									
Reach Shear Stress (competency) lb/f^2					2.36												0.45			0.61					
Max part size (mm) mobilized at bankfull																									
Stream Power (transport capacity) W/m^2																									
Additional Reach Parameters																									
Rosgen Classification					Cg 5						Eb 4			E5			Eb 4			Cb 4					
Bankfull Velocity (fps)					3.5												3.5			2.6					
Bankfull Discharge (cfs)					7																				
Valley length (ft)					755																				
Channel Thalweg length (ft)					778												232			232					
Sinuosity (ft)					1.03						1.2			1.46			1.15			1.15					
Water Surface Slope (Channel) (ft/ft)					0.0248						0.0258			0.0053			0.0222			0.0268					
BF slope (ft/ft)																									
[3]Bankfull Floodplain Area (acres)																									
[4]% of Reach with Eroding Banks					76						0			0											
Channel Stability or Habitat Metric																									
Biological or Other																									

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

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

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

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

Table 9g. Baseline Stream Data Summary
Project Name/Number (Heron/100014) - Segment/Reach: UT 8 (605 feet)

Parameter	Gauge[2]	Regional Curve			Pre-Existing Condition						Cedarock Park Ref			Causey Ref			Design			Monitoring Baseline					
Dimension and Substrate - Riffle Only		LL	UL	Eq.	Min	Mean	Med	Max	SD[5]	n	Min	Mean	Max	Min	Mean	Max	Min	Med	Max	Min	Mean	Med	Max	SD[5]	n
Bankfull Width (ft)					4.2	5.1		6.1			8	8.1	12.1	10.7	11	11.3	5.5	5.9	6.3	6.5	7.9		9.3		2
Floodprone Width (ft)					5	15		30			15	18	25	122	131	140	25	50	75	20	30		40		2
Bankfull Mean Depth (ft)					0.4	0.5		0.6			0.8	0.8	1	1.3	1.4	1.4	0.4	0.4	0.5	0.4	0.4		0.4		2
[1]Bankfull Max Depth (ft)					0.6	0.8		1			1.1	1.4	1.4	1.9	2	2	0.5	0.6	0.7	0.7	0.7		0.7		2
Bankfull Cross Sectional Area (ft^2)						2.5						8			14.7		2.5	2.5	2.5	2.6	3.2		3.7		2
Width/Depth Ratio					7	11.3		15.3			8	10.1	15.1	8	9	9	12	14	16	16.3	19.8		23.4		2
Entrenchment Ratio					1.1	2.7		4.9			1.9	2.1	2.2	11	12	13	4.6	8.5	11.9	2.2	4.2		6.2		2
[1]Bank Height Ratio					1.4	2.3		3.7			1.0	1.8			1.4		1.0	1.0	1.3	1.0	1.0		1.0		2
Profile																									
Riffle Length (ft)					No distinct repetitive pattern of riffles and pools due to straightening activities.															5	11	11	19	3.4	23
Riffle Slope (ft/ft)											0.01	0.0316	0.0576	0.002	0.01	0.012	0.023	0.03	0.034	0.007	0.02	0.017	0.041	0.009	23
Pool Length (ft)																				6	15	15	24	4.8	23
Pool Max depth (ft)											1.5	1.8	2.1		2.7		0.5	0.8	0.9	0.9	1.3		1.6		2
Pool Spacing (ft)											25	37	69	22	44	81	17	24	47	17	24		47		23
Pattern																									
Channel Beltwidth (ft)					No distinct repetitive pattern of riffles and pools due to straightening activities.						20	23	38	17	30	36	17	24	36	17	24		36		
Radius of Curvature (ft)											11	16	27	9	31	113	11	18	59	11	18		59		
Rc:Bankfull width (ft/ft)											1.4	2	3.3	0.8	2.8	10.3	2	3	10	2	3		10		
Meander Wavelength (ft)											44	68	116	10	63	91	35	50	71	35	50		71		
Meander Width Ratio											2.4	2.8	4.7	1.5	2.7	3.5	3	4	6	3	4		6		
Transport parameters																									
Reach Shear Stress (competency) lb/f^2					1.85												0.44			0.32					
Max part size (mm) mobilized at bankfull																									
Stream Power (transport capacity) W/m^2																									
Additional Reach Parameters																									
Rosgen Classification					Eg 5						Eb 4			E5			E/C 4			C 4					
Bankfull Velocity (fps)					3.6												3.6			2.8					
Bankfull Discharge (cfs)					9.1																				
Valley length (ft)					520																				
Channel Thalweg length (ft)					543												605			605					
Sinuosity (ft)					1.04						1.2			1.46			1.15			1.15					
Water Surface Slope (Channel) (ft/ft)					0.0218						0.0258			0.0053			0.019			0.0138					
BF slope (ft/ft)																									
[3]Bankfull Floodplain Area (acres)																									
[4]% of Reach with Eroding Banks					80						0			0											
Channel Stability or Habitat Metric																									
Biological or Other																									

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

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

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

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

Table 10a. Baseline Stream Data Summary (Substrate, Bed, Bank, and Hydrologic Containment Parameter Distributions) Project Name/Number (Heron/100014) - Segment/Reach: UT 1 (856 feet)

Parameter	Pre-Existing Condition							Cedarock Reference Reach Data							Causey Reference Reach Data							Design							As-built/Baseline						
[1]Ri% / Ru% / P% / G% / S%																						60	13	14	13				43	19	19	19			
[1]SC% / Sa% / G% / C% / B% / Be%								9	22	39	18	11			4	54	28	11	1	2															
[1]d16 / d35 / d50 / d84 / d95 / di^{p} / di^{sp} (mm)								0.116	4.1	9.8	161	2568			0.318	0.5	0.9	24	116																
[2]Entrenchment Class <1.5 / 1.5-1.99 / 2.0-4.9 / 5.0-9.9 / >10		29	71						33			66						50	50													25	75			
[3]Incision Class <1.2 / 1.2-1.49 / 1.5-1.99 / >2.0		14	43	43				66		33						100													100						

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

1 = Riffle, Run, Pool, Glide, Step; Silt/Clay, Sand, Gravel, Cobble, Boulder, Bedrock; dip = max pave, disp = max subpave

2 = Entrenchment Class - Assign/bin the reach footage into the classes indicated and provide the percentage of the total reach footage in each class in the table. This will result from the measured cross-sections as well as visual estimates

3 = Assign/bin the reach footage into the classes indicated and provide the percentage of the total reach footage in each class in the table. This will result from the measured cross-sections as well as the longitudinal profile

Footnotes 2,3 - These classes are loosley built around the Rosgen classification and hazard ranking breaks, but were adjusted slightly to make for easier assignment to somewhat coarser bins based on visual estimates in the field such that measurement of every segment for ER would not be necessary.

The intent here is to provide the reader/consumer of design and monitoring information with a good general sense of the extent of hydrologic containment in the pre-existing and the rehabilitated states as well as comparisons to the reference distributions.

ER and BHR have been addressed in prior submissions as a subsample (cross-sections as part of the design measurements), however, these subsamples have often focused entirely on facilitating design without providing a thorough pre-construtions distribution of these parameters, leaving the reader/consumer with a sample that is weighted heavily on the stable sections of the reach. This means that the distributions for these parameters should include data from both the cross-section measurements and the longitudinal profile and in the case of ER, visual estimates. For example, the typical longitudinal profile permits sampling of the BHR at riffles beyond those subject to cross-sections and therefore can be readily integrated and provide a more complete sample distribution for these parameters, thereby providing the distribution/coverage necessary to provide meaningful comparisons.

Table 10b. Baseline Stream Data Summary (Substrate, Bed, Bank, and Hydrologic Containment Parameter Distributions) Project Name/Number (Heron/100014) - Segment/Reach: UT 3 (279 feet)

Parameter	Pre-Existing Condition							Cedarock Reference Reach Data							Causey Reference Reach Data							Design							As-built/Baseline						
[1]Ri% / Ru% / P% / G% / S%																						74	8	9	8				55	15	15	15			
[1]SC% / Sa% / G% / C% / B% / Be%								9	22	39	18	11			4	54	28	11	1	2															
[1]d16 / d35 / d50 / d84 / d95 / di^{p} / di^{sp} (mm)								0.116	4.1	9.8	161	2568			0.318	0.5	0.9	24	116																
[2]Entrenchment Class <1.5 / 1.5-1.99 / 2.0-4.9 / 5.0-9.9 / >10	33	33	33						33			66						50	50													100				
[3]Incision Class <1.2 / 1.2-1.49 / 1.5-1.99 / >2.0			33	66				66		33						100													100						

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

1 = Riffle, Run, Pool, Glide, Step; Silt/Clay, Sand, Gravel, Cobble, Boulder, Bedrock; dip = max pave, disp = max subpave

2 = Entrenchment Class - Assign/bin the reach footage into the classes indicated and provide the percentage of the total reach footage in each class in the table. This will result from the measured cross-sections as well as visual estimates

3 = Assign/bin the reach footage into the classes indicated and provide the percentage of the total reach footage in each class in the table. This will result from the measured cross-sections as well as the longitudinal profile

Footnotes 2,3 - These classes are loosley built around the Rosgen classification and hazard ranking breaks, but were adjusted slightly to make for easier assignment to somewhat coarser bins based on visual estimates in the field such that measurement of every segment for ER would not be necessary.

The intent here is to provide the reader/consumer of design and monitoring information with a good general sense of the extent of hydrologic containment in the pre-existing and the rehabilitated states as well as comparisons to the reference distributions.

ER and BHR have been addressed in prior submissions as a subsample (cross-sections as part of the design measurements), however, these subsamples have often focused entirely on facilitating design without providing a thorough pre-construtions distribution of these parameters, leaving the reader/consumer with a sample that is weighted heavily on the stable sections of the reach. This means that the distributions for these parameters should include data from both the cross-section measurements and the longitudinal profile and in the case of ER, visual estimates. For example, the typical longitudinal profile permits sampling of the BHR at riffles beyond those subject to cross-sections and therefore can be readily integrated and provide a more complete sample distribution for these parameters, thereby providing the distribution/coverage necessary to provide meaningful comparisons.

Table 10c. Baseline Stream Data Summary (Substrate, Bed, Bank, and Hydrologic Containment Parameter Distributions) Project Name/Number (Heron/100014) - Segment/Reach: UT 4 (450 feet)

Parameter	Pre-Existing Condition							Cedarock Reference Reach Data							Causey Reference Reach Data							Design							As-built/Baseline						
[1]Ri% / Ru% / P% / G% / S%																						63	12	13	12				48	17	18	17			
[1]SC% / Sa% / G% / C% / B% / Be%								9	22	39	18	11			4	54	28	11	1	2															
[1]d16 / d35 / d50 / d84 / d95 / di^{p} / di^{sp} (mm)								0.116	4.1	9.8	161	2568			0.318	0.5	0.9	24	116																
[2]Entrenchment Class <1.5 / 1.5-1.99 / 2.0-4.9 / 5.0-9.9 / >10		25	25	50					33			66						50	50													100				
[3]Incision Class <1.2 / 1.2-1.49 / 1.5-1.99 / >2.0		25	25	50				66		33						100													100						

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

1 = Riffle, Run, Pool, Glide, Step; Silt/Clay, Sand, Gravel, Cobble, Boulder, Bedrock; dip = max pave, disp = max subpave

2 = Entrenchment Class - Assign/bin the reach footage into the classes indicated and provide the percentage of the total reach footage in each class in the table. This will result from the measured cross-sections as well as visual estimates

3 = Assign/bin the reach footage into the classes indicated and provide the percentage of the total reach footage in each class in the table. This will result from the measured cross-sections as well as the longitudinal profile

Footnotes 2,3 - These classes are loosley built around the Rosgen classification and hazard ranking breaks, but were adjusted slightly to make for easier assignment to somewhat coarser bins based on visual estimates in the field such that measurement of every segment for ER would not be necessary.

The intent here is to provide the reader/consumer of design and monitoring information with a good general sense of the extent of hydrologic containment in the pre-existing and the rehabilitated states as well as comparisons to the reference distributions.

ER and BHR have been addressed in prior submissions as a subsample (cross-sections as part of the design measurements), however, these subsamples have often focused entirely on facilitating design without providing a thorough pre-construtions distribution of these parameters, leaving the reader/consumer with a sample that is weighted heavily on the stable sections of the reach. This means that the distributions for these parameters should include data from both the cross-section measurements and the longitudinal profile and in the case of ER, visual estimates. For example, the typical longitudinal profile permits sampling of the BHR at riffles beyond those subject to cross-sections and therefore can be readily integrated and provide a more complete sample distribution for these parameters, thereby providing the distribution/coverage necessary to provide meaningful comparisons.

Table 10d. Baseline Stream Data Summary (Substrate, Bed, Bank, and Hydrologic Containment Parameter Distributions) Project Name/Number (Heron/100014) - Segment/Reach: UT 5 (952 feet)

Parameter	Pre-Existing Condition							Cedarock Reference Reach Data							Causey Reference Reach Data							Design							As-built/Baseline						
[1]Ri% / Ru% / P% / G% / S%																						58	14	14	14				50	17	17	16			
[1]SC% / Sa% / G% / C% / B% / Be%								9	22	39	18	11			4	54	28	11	1	2															
[1]d16 / d35 / d50 / d84 / d95 / di^{p} / di^{sp} (mm)								0.116	4.1	9.8	161	2568			0.318	0.5	0.9	24	116																
[2]Entrenchment Class <1.5 / 1.5-1.99 / 2.0-4.9 / 5.0-9.9 / >10	20	20	40	20					33			66						50	50													100			
[3]Incision Class <1.2 / 1.2-1.49 / 1.5-1.99 / >2.0		20	20	60				66		33						100													100					

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

1 = Riffle, Run, Pool, Glide, Step; Silt/Clay, Sand, Gravel, Cobble, Boulder, Bedrock; dip = max pave, disp = max subpave

2 = Entrenchment Class - Assign/bin the reach footage into the classes indicated and provide the percentage of the total reach footage in each class in the table. This will result from the measured cross-sections as well as visual estimates

3 = Assign/bin the reach footage into the classes indicated and provide the percentage of the total reach footage in each class in the table. This will result from the measured cross-sections as well as the longitudinal profile

Footnotes 2,3 - These classes are loosley built around the Rosgen classification and hazard ranking breaks, but were adjusted slightly to make for easier assignment to somewhat coarser bins based on visual estimates in the field such that measurement of every segment for ER would not be necessary.

The intent here is to provide the reader/consumer of design and monitoring information with a good general sense of the extent of hydrologic containment in the pre-existing and the rehabilitated states as well as comparisons to the reference distributions.

ER and BHR have been addressed in prior submissions as a subsample (cross-sections as part of the design measurements), however, these subsamples have often focused entirely on facilitating design without providing a thorough pre-constrution distribution of these parameters, leaving the reader/consumer with a sample that is weighted heavily on the stable sections of the reach. This means that the distributions for these parameters should include data from both the cross-section measurements and the longitudinal profile and in the case of ER, visual estimates. For example, the typical longitudinal profile permits sampling of the BHR at riffles beyond those subject to cross-sections and therefore can be readily integrated and provide a more complete sample distribution for these parameters, thereby providing the distribution/coverage necessary to provide meaningful comparisons.

Table 10e. Baseline Stream Data Summary (Substrate, Bed, Bank, and Hydrologic Containment Parameter Distributions) Project Name/Number (Heron/100014) - Segment/Reach: UT 6 (781 feet)

Parameter	Pre-Existing Condition							Cedarock Reference Reach Data							Causey Reference Reach Data							Design							As-built/Baseline						
[1]Ri% / Ru% / P% / G% / S%																						64	12	12	12				46	18	18	18			
[1]SC% / Sa% / G% / C% / B% / Be%								9	22	39	18	11			4	54	28	11	1	2															
[1]d16 / d35 / d50 / d84 / d95 / di^{p} / di^{sp} (mm)								0.116	4.1	9.8	161	2568			0.318	0.5	0.9	24	116																
[2]Entrenchment Class <1.5 / 1.5-1.99 / 2.0-4.9 / 5.0-9.9 / >10	40	20	20	20					33			66						50	50													100			
[3]Incision Class <1.2 / 1.2-1.49 / 1.5-1.99 / >2.0				100				66		33						100													100					

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

1 = Riffle, Run, Pool, Glide, Step; Silt/Clay, Sand, Gravel, Cobble, Boulder, Bedrock; dip = max pave, disp = max subpave

2 = Entrenchment Class - Assign/bin the reach footage into the classes indicated and provide the percentage of the total reach footage in each class in the table. This will result from the measured cross-sections as well as visual estimates

3 = Assign/bin the reach footage into the classes indicated and provide the percentage of the total reach footage in each class in the table. This will result from the measured cross-sections as well as the longitudinal profile

Footnotes 2,3 - These classes are loosley built around the Rosgen classification and hazard ranking breaks, but were adjusted slightly to make for easier assignment to somewhat coarser bins based on visual estimates in the field such that measurement of every segment for ER would not be necessary.

The intent here is to provide the reader/consumer of design and monitoring information with a good general sense of the extent of hydrologic containment in the pre-existing and the rehabilitated states as well as comparisons to the reference distributions.

ER and BHR have been addressed in prior submissions as a subsample (cross-sections as part of the design measurements), however, these subsamples have often focused entirely on facilitating design without providing a thorough pre-constrution distribution of these parameters, leaving the reader/consumer with a sample that is weighted heavily on the stable sections of the reach. This means that the distributions for these parameters should include data from both the cross-section measurements and the longitudinal profile and in the case of ER, visual estimates. For example, the typical longitudinal profile permits sampling of the BHR at riffles beyond those subject to cross-sections and therefore can be readily integrated and provide a more complete sample distribution for these parameters, thereby providing the distribution/coverage necessary to provide meaningful comparisons.

Table 10f. Baseline Stream Data Summary (Substrate, Bed, Bank, and Hydrologic Containment Parameter Distributions) Project Name/Number (Heron/100014) - Segment/Reach: UT 7 (232 feet)

Parameter	Pre-Existing Condition							Cedarock Reference Reach Data							Causey Reference Reach Data							Design							As-built/Baseline						
[1]Ri% / Ru% / P% / G% / S%																						76	7	8	7				60	13	14	13			
[1]SC% / Sa% / G% / C% / B% / Be%								9	22	39	18	11			4	54	28	11	1	2															
[1]d16 / d35 / d50 / d84 / d95 / di^{p} / di^{sp} (mm)								0.116	4.1	9.8	161	2568			0.318	0.5	0.9	24	116																
[2]Entrenchment Class <1.5 / 1.5-1.99 / 2.0-4.9 / 5.0-9.9 / >10		57	29	14					33			66						50	50												25	75			
[3]Incision Class <1.2 / 1.2-1.49 / 1.5-1.99 / >2.0			29	71				66		33						100													100					

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

1 = Riffle, Run, Pool, Glide, Step; Silt/Clay, Sand, Gravel, Cobble, Boulder, Bedrock; dip = max pave, disp = max subpave

2 = Entrenchment Class - Assign/bin the reach footage into the classes indicated and provide the percentage of the total reach footage in each class in the table. This will result from the measured cross-sections as well as visual estimates

3 = Assign/bin the reach footage into the classes indicated and provide the percentage of the total reach footage in each class in the table. This will result from the measured cross-sections as well as the longitudinal profile

Footnotes 2,3 - These classes are loosley built around the Rosgen classification and hazard ranking breaks, but were adjusted slightly to make for easier assignment to somewhat coarser bins based on visual estimates in the field such that measurement of every segment for ER would not be necessary.

The intent here is to provide the reader/consumer of design and monitoring information with a good general sense of the extent of hydrologic containment in the pre-existing and the rehabilitated states as well as comparisons to the reference distributions.

ER and BHR have been addressed in prior submissions as a subsample (cross-sections as part of the design measurements), however, these subsamples have often focused entirely on facilitating design without providing a thorough pre-constrution distribution of these parameters, leaving the reader/consumer with a sample that is weighted heavily on the stable sections of the reach. This means that the distributions for these parameters should include data from both the cross-section measurements and the longitudinal profile and in the case of ER, visual estimates. For example, the typical longitudinal profile permits sampling of the BHR at riffles beyond those subject to cross-sections and therefore can be readily integrated and provide a more complete sample distribution for these parameters, thereby providing the distribution/coverage necessary to provide meaningful comparisons.

Table 10g. Baseline Stream Data Summary (Substrate, Bed, Bank, and Hydrologic Containment Parameter Distributions) Project Name/Number (Heron/100014) - Segment/Reach: UT 8 (605 feet)

Parameter	Pre-Existing Condition							Cedarock Reference Reach Data							Causey Reference Reach Data							Design							As-built/Baseline						
[1]Ri% / Ru% / P% / G% / S%																						60	13	14	13				41	20	20	19			
[1]SC% / Sa% / G% / C% / B% / Be%								9	22	39	18	11			4	54	28	11	1	2															
[1]d16 / d35 / d50 / d84 / d95 / di^{p} / di^{sp} (mm)								0.116	4.1	9.8	161	2568			0.318	0.5	0.9	24	116																
[2]Entrenchment Class <1.5 / 1.5-1.99 / 2.0-4.9 / 5.0-9.9 / >10	25	25	50						33			66						50	50													50	50			
[3]Incision Class <1.2 / 1.2-1.49 / 1.5-1.99 / >2.0		50		50				66		33						100													100						

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

1 = Riffle, Run, Pool, Glide, Step; Silt/Clay, Sand, Gravel, Cobble, Boulder, Bedrock; dip = max pave, disp = max subpave

2 = Entrenchment Class - Assign/bin the reach footage into the classes indicated and provide the percentage of the total reach footage in each class in the table. This will result from the measured cross-sections as well as visual estimates

3 = Assign/bin the reach footage into the classes indicated and provide the percentage of the total reach footage in each class in the table. This will result from the measured cross-sections as well as the longitudinal profile

Footnotes 2,3 - These classes are loosley built around the Rosgen classification and hazard ranking breaks, but were adjusted slightly to make for easier assignment to somewhat coarser bins based on visual estimates in the field such that measurement of every segment for ER would not be necessary.

The intent here is to provide the reader/consumer of design and monitoring information with a good general sense of the extent of hydrologic containment in the pre-existing and the rehabilitated states as well as comparisons to the reference distributions.

ER and BHR have been addressed in prior submissions as a subsample (cross-sections as part of the design measurements), however, these subsamples have often focused entirely on facilitating design without providing a thorough pre-constrution distribution of these parameters, leaving the reader/consumer with a sample that is weighted heavily on the stable sections of the reach. This means that the distributions for these parameters should include data from both the cross-section measurements and the longitudinal profile and in the case of ER, visual estimates. For example, the typical longitudinal profile permits sampling of the BHR at riffles beyond those subject to cross-sections and therefore can be readily integrated and provide a more complete sample distribution for these parameters, thereby providing the distribution/coverage necessary to provide meaningful comparisons.

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

Project Name/Number (Heron/100014) Segment/Reach: UT 1 (856 feet)

	Cross Section 1 (Pool)							Cross Section 2 (Riffle)							Cross Section 3 (Riffle)							Cross Section 4 (Pool)							Cross Section 5 (Riffle)						
Based on fixed baseline bankfull elevation[1]	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Record elevation (datum) used																																			
Bankfull Width (ft)	9.2	8.5	8.5	11.5				10.7	14.7	15.3	16.0				13.0	14.4	17.7	13.0				8.9	9.7	9.1	10.0				8.3	9.0	10.7	12.4			
Floodprone Width (ft)	NA	NA	NA	NA				100	100	100	100				100	100	100	100				NA	NA	NA	NA				25	25	25	25			
Bankfull Mean Depth (ft)	1.1	1.2	1.2	0.9				0.6	0.4	0.4	0.4				0.4	0.3	0.3	0.4				0.8	0.7	0.7	0.7				0.4	0.4	0.3	0.3			
Bankfull Max Depth (ft)	2.1	2.2	2.2	2.3				0.9	0.8	0.9	1.0				0.7	0.7	0.7	0.6				1.6	1.6	1.5	1.6				0.6	0.6	0.7	0.6			
Bankfull Cross Sectional Area (ft^2)	10.5	10.5	10.5	10.5				6.1	6.1	6.1	6.1				4.6	4.6	4.6	4.6				6.8	6.8	6.8	6.8				3.7	3.7	3.7	3.7			
Bankfull Width/Depth Ratio	NA	NA	NA	NA				18.8	35.4	38.4	40.0				36.7	45.1	68.1	36.8				NA	NA	NA	NA				18.6	21.9	30.9	41.9			
Bankfull Entrenchment Ratio	NA	NA	NA	NA				9.3	6.8	6.5	6.3				7.7	6.9	5.6	7.7				NA	NA	NA	NA				3.0	2.8	2.3	2.0			
Low Bank Height (ft)	2.1	2.2	2.1	2.2				0.9	0.7	0.9	1.0				0.7	0.7	0.7	0.6				1.6	1.6	1.5	1.6				0.6	0.6	0.7	0.6			
Bankfull Bank Height Ratio*	1.00	1.00	0.95	0.96				1.00	0.88	1.00	1.00				1.00	1.00	1.00	1.00				1.00	1.00	1.00	1.00				1.00	1.00	1.00	0.96			
Cross Sectional Area between end pins (ft^2)																																			
d50 (mm)																																			

	Cross Section 6 (Pool)							Cross Section 7 (Pool)							Cross Section 8 (Riffle)						
Based on fixed baseline bankfull elevation[1]	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Record elevation (datum) used																					
Bankfull Width (ft)	12.8	13.2	15.7	13.1				9.6	10.4	10.5	15.4				11.2	12.0	11.4	13.8			
Floodprone Width (ft)	NA	NA	NA	NA				NA	NA	NA	NA				100	100	100	100			
Bankfull Mean Depth (ft)	0.7	0.7	0.6	0.7				0.8	0.8	0.8	0.5				0.6	0.6	0.6	0.5			
Bankfull Max Depth (ft)	1.6	1.7	1.6	1.7				1.5	1.7	1.5	1.6				1.1	1.0	1.1	1			
Bankfull Cross Sectional Area (ft^2)	9.4	9.4	9.4	9.4				8.0	8.0	8.0	8				7.2	7.2	7.2	7.2			
Bankfull Width/Depth Ratio	NA	NA	NA	NA				NA	NA	NA	NA				17.4	20.0	18.1	26.45			
Bankfull Entrenchment Ratio	NA	NA	NA	NA				NA	NA	NA	NA				8.9	8.3	8.8	7.25			
Low Bank Height (ft)	1.6	1.7	1.6	1.7				1.5	1.7	1.5	1.6				1.1	1.0	1.1	1.1			
Bankfull Bank Height Ratio*	1.00	1.00	1.00	1.00				1.00	1.00	1.00	1.00				1.00	1.00	1.00	1.10			
Cross Sectional Area between end pins (ft^2)																					
d50 (mm)																					

1 = Widths and depths for annual measurements will be based on the baseline bankfull datum regardless of dimensional/depositional development. Input the elevation used as the datum, which should be consistent and based on the baseline datum established. If the performer has inherited the project and cannot acquire the datum used for prior years this must be discussed with EEP. If this cannot be resolved in time for a given years report submission a footnote in this should be included that states: "It is uncertain if the monitoring datum has been consistent over the monitoring history, which may influence calculated values. Additional data from a prior performer is being acquired to provide confirmation. Values will be recalculated in a future submission based on a consistent datum if determined to be necessary."

*Bank Height Ratio is calculated based on the As-built (MY0) cross-sectional area as described in the Standard Measurement of the BHR Monitoring Parameter document produced by the technical industry work group consisting of the NCIRT, NCDMS, and Industry Practitioners in NC (9/2018).

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

Project Name/Number (Heron/100014) Segment/Reach: UT 3 (279 feet)

	Cross Section 9 (Pool)							Cross Section 10 (Riffle)						
Based on fixed baseline bankfull elevation[1]	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Record elevation (datum) used														
Bankfull Width (ft)	4.2	5.6	5.8	5.8				7.7	7.0	7.0	7.4			
Floodprone Width (ft)	NA	NA	NA	NA				18	18	18	18			
Bankfull Mean Depth (ft)	0.7	0.5	0.5	0.5				0.6	0.6	0.6	0.6			
Bankfull Max Depth (ft)	1.0	0.8	0.8	0.7				1.0	1.1	1.0	1.0			
Bankfull Cross Sectional Area (ft^2)	2.9	2.9	2.9	2.9				4.5	4.5	4.5	4.5			
Bankfull Width/Depth Ratio	NA	NA	NA	NA				13.2	10.9	10.9	12.3			
Bankfull Entrenchment Ratio	NA	NA	NA	NA				2.3	2.6	2.6	2.4			
Low Bank Height (ft)	1.0	0.3	0.8	0.5				1.0	1.1	1.0	1.1			
Bankfull Bank Height Ratio*	1.00	0.38	1.00	0.79				1.00	1.00	1.00	1.10			
Cross Sectional Area between end pins (ft^2)														
d50 (mm)														

Based on fixed baseline bankfull elevation[1]														
Record elevation (datum) used														
Bankfull Width (ft)														
Floodprone Width (ft)														
Bankfull Mean Depth (ft)														
Bankfull Max Depth (ft)														
Bankfull Cross Sectional Area (ft^2)														
Bankfull Width/Depth Ratio														
Bankfull Entrenchment Ratio														
Low Bank Height (ft)														
Bankfull Bank Height Ratio*														
Cross Sectional Area between end pins (ft^2)														
d50 (mm)														

1 = Widths and depths for annual measurements will be based on the baseline bankfull datum regardless of dimensional/depositional development. Input the elevation used as the datum, which should be consistent and based on the baseline datum established. If the performer has inherited the project and cannot acquire the datum used for prior years this must be discussed with EEP. If this cannot be resolved in time for a given years report submission a footnote in this should be included that states: "It is uncertain if the monitoring datum has been consistent over the monitoring history, which may influence calculated values. Additional data from a prior performer is being acquired to provide confirmation. Values will be recalculated in a future submission based on a consistent datum if determined to be necessary."

*Bank Height Ratio is calculated based on the As-built (MY0) cross-sectional area as described in the Standard Measurement of the BHR Monitoring Parameter document produced by the technical industry work group consisting of the NCIRT, NCDMS, and Industry Practitioners in NC (9/2018).

Table 11c. Monitoring Data - Dimensional Morphology Summary (Dimensional Parameters – Cross Sections)
Project Name/Number (Heron/100014) Segment/Reach: UT 4 (450 feet)

	Cross Section 11 (Pool)							Cross Section 12 (Riffle)							Cross Section 13 (Riffle)							Cross Section 14 (Pool)						
Based on fixed baseline bankfull elevation[1]	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Record elevation (datum) used																												
Bankfull Width (ft)	6.0	7.9	9.4	9.6				6.5	7.4	10.6	11.2				8.0	7.9	11.3	7.8				9.1	11.0	10.9	11.3			
Floodprone Width (ft)	NA	NA	NA	NA				40	40	40	40				40	40	40	40				NA	NA	NA	NA			
Bankfull Mean Depth (ft)	0.8	0.6	0.5	0.5				0.3	0.3	0.2	0.2				0.5	0.4	0.3	0.4				0.7	0.6	0.6	0.6			
Bankfull Max Depth (ft)	1.1	1.1	1.3	1.2				0.5	0.6	0.5	0.5				0.8	0.8	0.8	0.8				1.4	1.4	1.4	1.4			
Bankfull Cross Sectional Area (ft^2)	4.8	4.8	4.8	4.8				2.2	2.2	2.2	2.2				3.7	3.5	3.5	3.5				6.8	6.8	6.8	6.8			
Bankfull Width/Depth Ratio	NA	NA	NA	NA				19.2	24.9	51.1	55.8				17.3	17.8	36.5	17.7				NA	NA	NA	NA			
Bankfull Entrenchment Ratio	NA	NA	NA	NA				6.2	5.4	3.8	3.6				5.0	5.1	3.5	5.1				NA	NA	NA	NA			
Low Bank Height (ft)	1.1	0.9	1.3	1.2				0.5	0.5	0.5	0.5				0.8	0.8	0.8	0.7				1.4	1.4	1.4	1.4			
Bankfull Bank Height Ratio*	1.00	0.82	1.00	1.00				1.00	0.83	1.00	1.00				1.00	1.00	1.00	0.88				1.00	1.00	1.00	1.00			
Cross Sectional Area between end pins (ft^2)																												
d50 (mm)																												
Based on fixed baseline bankfull elevation[1]																												
Record elevation (datum) used																												
Bankfull Width (ft)																												
Floodprone Width (ft)																												
Bankfull Mean Depth (ft)																												
Bankfull Max Depth (ft)																												
Bankfull Cross Sectional Area (ft^2)																												
Bankfull Width/Depth Ratio																												
Bankfull Entrenchment Ratio																												
Low Bank Height (ft)																												
Bankfull Bank Height Ratio*																												
Cross Sectional Area between end pins (ft^2)																												
d50 (mm)																												

1 = Widths and depths for annual measurements will be based on the baseline bankfull datum regardless of dimensional/depositional development. Input the elevation used as the datum, which should be consistent and based on the baseline datum established. If the performer has inherited the project and cannot acquire the datum used for prior years this must be discussed with EEP. If this cannot be resolved in time for a given years report submission a footnote in this should be included that states: "It is uncertain if the monitoring datum has been consistent over the monitoring history, which may influence calculated values. Additional data from a prior performer is being acquired to provide confirmation. Values will be recalculated in a future submission based on a consistent datum if determined to be necessary."

*Bank Height Ratio is calculated based on the As-built (MY0) cross-sectional area as described in the Standard Measurement of the BHR Monitoring Parameter document produced by the technical industry work group consisting of the NCIRT, NCDMS, and Industry Practitioners in NC (9/2018).

Table 11d. Monitoring Data - Dimensional Morphology Summary (Dimensional Parameters – Cross Sections)
Project Name/Number (Heron/100014) Segment/Reach: UT 5 (952 feet)

	Cross Section 15 (Pool)							Cross Section 16 (Riffle)							Cross Section 17 (Pool)							Cross Section 18 (Riffle)							Cross Section 19 (Pool)						
Based on fixed baseline bankfull elevation[1]	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Record elevation (datum) used																																			
Bankfull Width (ft)	4.7	9.4	8.7	10.4				6.3	5.7	9.4	11.0				5.4	5.7	5.9	5.9				8.1	9.2	12.2	12.7				7.8	8.7	11.4	14.2			
Floodprone Width (ft)	NA	NA	NA	NA				40	40	40	40				NA	NA	NA	NA				40	40	40	40				NA	NA	NA	NA			
Bankfull Mean Depth (ft)	0.5	0.3	0.3	0.2				0.3	0.3	0.2	0.2				0.6	0.6	0.6	0.6				0.5	0.4	0.3	0.3				0.4	0.4	0.3	0.2			
Bankfull Max Depth (ft)	0.8	0.5	0.6	0.7				0.5	0.6	0.6	0.6				1.1	1.2	1.3	1.3				0.8	0.7	0.8	0.8				0.9	0.8	0.7	0.7			
Bankfull Cross Sectional Area (ft^2)	2.4	2.4	2.4	2.4				1.9	1.9	1.9	1.9				3.4	3.4	3.4	3.4				3.7	3.7	3.7	3.7				3.3	3.3	3.3	3.3			
Bankfull Width/Depth Ratio	NA	NA	NA	NA				20.9	17.1	46.5	64.7				NA	NA	NA	NA				17.7	22.9	40.2	43.2				NA	NA	NA	NA			
Bankfull Entrenchment Ratio	NA	NA	NA	NA				6.3	7.0	4.3	3.7				NA	NA	NA	NA				4.9	4.3	3.3	3.2				NA	NA	NA	NA			
Low Bank Height (ft)	0.8	0.5	0.6	0.6				0.5	0.6	0.6	0.6				1.1	1.2	1.3	1.4				0.8	0.6	0.8	0.7				0.9	0.8	0.7	0.7			
Bankfull Bank Height Ratio*	1.00	1.00	1.00	0.86				1.00	1.00	1.00	1.00				1.00	1.00	1.00	1.07				1.00	0.86	1.00	0.88				1.00	1.00	1.00	1.00			
Cross Sectional Area between end pins (ft^2)																																			
d50 (mm)																																			
	Cross Section 20 (Riffle)							Cross Section 21 (Pool)							Cross Section 22 (Riffle)																							
Based on fixed baseline bankfull elevation[1]	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+															
Record elevation (datum) used																																			
Bankfull Width (ft)	4.9	6.2	5.3	5.9				5.0	5.8	5.8	5.3				7.4	7.2	8.5	7.7																	
Floodprone Width (ft)	40	40	40	40				NA	NA	NA	NA				40	40	40	40																	
Bankfull Mean Depth (ft)	0.4	0.3	0.4	0.3				0.6	0.5	0.5	0.6				0.4	0.4	0.3	0.4																	
Bankfull Max Depth (ft)	0.6	0.6	0.6	0.6				1.1	1.0	1.1	1.1				0.7	0.8	0.7	0.8																	
Bankfull Cross Sectional Area (ft^2)	1.9	1.9	1.9	1.9				3.1	3.1	3.1	3.1				2.9	2.9	2.9	2.9																	
Bankfull Width/Depth Ratio	12.6	20.2	14.8	18.5				NA	NA	NA	NA				18.9	17.9	24.9	20.7																	
Bankfull Entrenchment Ratio	8.2	6.5	7.5	6.8				NA	NA	NA	NA				5.4	5.6	4.7	5.2																	
Low Bank Height (ft)	0.6	0.6	0.6	0.6				1.1	1.0	1.1	1.2				0.7	0.8	0.7	0.7																	
Bankfull Bank Height Ratio*	1.00	1.00	1.00	1.11				1.00	1.00	1.00	1.09				1.00	1.00	1.00	0.88																	
Cross Sectional Area between end pins (ft^2)																																			
d50 (mm)																																			

1 = Widths and depths for annual measurements will be based on the baseline bankfull datum regardless of dimensional/depositional development. Input the elevation used as the datum, which should be consistent and based on the baseline datum established. If the performer has inherited the project and cannot acquire the datum used for prior years this must be discussed with EEP. If this cannot be resolved in time for a given years report submission a footnote in this should be included that states: "It is uncertain if the monitoring datum has been consistent over the monitoring history, which may influence calculated values. Additional data from a prior performer is being acquired to provide confirmation. Values will be recalculated in a future submission based on a consistent datum if determined to be necessary."

*Bank Height Ratio is calculated based on the As-built (MY0) cross-sectional area as described in the Standard Measurement of the BHR Monitoring Parameter document produced by the technical industry work group consisting of the NCIRT, NCDMS, and Industry Practitioners in NC (9/2018).

Table 11e. Monitoring Data - Dimensional Morphology Summary (Dimensional Parameters – Cross Sections)
Project Name/Number (Heron/100014) Segment/Reach: UT 6 (781 feet)

	Cross Section 23 (Pool)							Cross Section 24 (Riffle)							Cross Section 25 (Pool)							Cross Section 26 (Riffle)						
Based on fixed baseline bankfull elevation[1]	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Record elevation (datum) used																												
Bankfull Width (ft)	5.6	5.7	6.4	8.8				6.1	5.8	5.7	5.4				5.2	10.0	10.3	10.8				6.8	4.7	4.8	4.3			
Floodprone Width (ft)	NA	NA	NA	NA				40	40	40	40				NA	NA	NA	NA				40	40	40	40			
Bankfull Mean Depth (ft)	0.6	0.6	0.6	0.4				0.4	0.4	0.4	0.4				0.6	0.3	0.3	0.3				0.5	0.7	0.7	0.8			
Bankfull Max Depth (ft)	1.0	0.9	1.0	1.0				0.6	0.5	0.6	0.6				1.3	0.8	0.8	0.7				0.9	1.0	1.2	1.2			
Bankfull Cross Sectional Area (ft^2)	3.6	3.6	3.6	3.6				2.2	2.2	2.2	2.2				3.2	3.2	3.2	3.2				3.5	3.5	3.5	3.5			
Bankfull Width/Depth Ratio	NA	NA	NA	NA				16.9	15.3	14.8	13.4				NA	NA	NA	NA				13.2	6.3	6.6	5.3			
Bankfull Entrenchment Ratio	NA	NA	NA	NA				6.6	6.9	7.0	7.5				NA	NA	NA	NA				5.9	8.5	8.3	9.3			
Low Bank Height (ft)	1.0	0.9	1.0	1.1				0.6	0.7	0.6	0.6				1.3	0.6	0.7	0.6				0.9	1.4	1.5	1.2			
Bankfull Bank Height Ratio*	1.00	1.00	1.00	1.10				1.00	1.40	1.00	1.07				1.00	0.75	0.88	0.86				1.00	1.40	1.25	1.02			
Cross Sectional Area between end pins (ft^2)																												
d50 (mm)																												
Based on fixed baseline bankfull elevation[1]																												
Record elevation (datum) used																												
Bankfull Width (ft)																												
Floodprone Width (ft)																												
Bankfull Mean Depth (ft)																												
Bankfull Max Depth (ft)																												
Bankfull Cross Sectional Area (ft^2)																												
Bankfull Width/Depth Ratio																												
Bankfull Entrenchment Ratio																												
Low Bank Height (ft)																												
Bankfull Bank Height Ratio*																												
Cross Sectional Area between end pins (ft^2)																												
d50 (mm)																												

1 = Widths and depths for annual measurements will be based on the baseline bankfull datum regardless of dimensional/depositional development. Input the elevation used as the datum, which should be consistent and based on the baseline datum established. If the performer has inherited the project and cannot acquire the datum used for prior years this must be discussed with EEP. If this cannot be resolved in time for a given years report submission a footnote in this should be included that states: "It is uncertain if the monitoring datum has been consistent over the monitoring history, which may influence calculated values. Additional data from a prior performer is being acquired to provide confirmation. Values will be recalculated in a future submission based on a consistent datum if determined to be necessary."

*Bank Height Ratio is calculated based on the As-built (MY0) cross-sectional area as described in the Standard Measurement of the BHR Monitoring Parameter document produced by the technical industry work group consisting of the NCIRT, NCDMS, and Industry Practitioners in NC (9/2018).

Table 11f. Monitoring Data - Dimensional Morphology Summary (Dimensional Parameters – Cross Sections)
Project Name/Number (Heron/100014) Segment/Reach: UT 7 (232 feet)

	Cross Section 27 (Pool)							Cross Section 28 (Riffle)							Cross Section 29 (Pool)							Cross Section 30 (Riffle)							Cross Section 31 (Pool)						
Based on fixed baseline bankfull elevation[1]	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Record elevation (datum) used																																			
Bankfull Width (ft)	7.1	11.4	12.4	12.5				7.8	6.9	7.5	7.0				4.1	4.1	4.1	4.1				6.2	5.6	6.3	6.2				5.3	6.1	5.8	5.8			
Floodprone Width (ft)	NA	NA	NA	NA				20	20	20	20				NA	NA	NA	NA				10	11	11	11				NA	NA	NA	NA			
Bankfull Mean Depth (ft)	0.9	0.6	0.5	0.5				0.4	0.4	0.4	0.4				0.8	0.8	0.8	0.8				0.4	0.4	0.4	0.4				0.6	0.5	0.5	0.5			
Bankfull Max Depth (ft)	1.5	1.1	0.9	1.0				0.6	1.1	0.9	1.1				1.1	1.3	1.2	1.2				0.5	0.5	0.5	0.6				1.0	0.7	0.7	0.7			
Bankfull Cross Sectional Area (ft^2)	6.3	6.3	6.3	6.3				3.0	3.0	3.0	3.0				3.4	3.4	3.4	3.4				2.3	2.3	2.3	2.3				3.0	3.0	3.0	3.0			
Bankfull Width/Depth Ratio	NA	NA	NA	NA				20.3	15.9	18.8	16.3				NA	NA	NA	NA				16.7	13.6	17.3	16.7				NA	NA	NA	NA			
Bankfull Entrenchment Ratio	NA	NA	NA	NA				2.6	2.9	2.7	2.9				NA	NA	NA	NA				1.6	2.0	1.7	1.8				NA	NA	NA	NA			
Low Bank Height (ft)	1.5	0.8	0.8	0.9				0.6	1.1	0.9	1.1				1.1	1.2	1.2	1.3				0.5	0.5	0.5	0.6				1.0	0.6	0.8	0.8			
Bankfull Bank Height Ratio*	1.00	0.73	0.89	0.90				1.00	1.00	1.00	1.00				1.00	0.92	1.00	1.08				1.00	1.00	1.00	1.04				1.00	0.86	1.14	1.01			
Cross Sectional Area between end pins (ft^2)																																			
d50 (mm)																																			
	Cross Section 32 (Riffle)							Cross Section 33 (Riffle)																													
Based on fixed baseline bankfull elevation[1]	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+																					
Record elevation (datum) used																																			
Bankfull Width (ft)	6.5	7.6	7.9	8.1				6.6	5.8	6.2	7.4																								
Floodprone Width (ft)	20	20	20	20				20	20	20	20																								
Bankfull Mean Depth (ft)	0.5	0.4	0.4	0.4				0.3	0.3	0.3	0.2																								
Bankfull Max Depth (ft)	0.7	0.8	0.8	0.9				0.5	0.6	0.6	0.6																								
Bankfull Cross Sectional Area (ft^2)	3.3	3.3	3.3	3.3				1.8	1.8	1.8	1.8																								
Bankfull Width/Depth Ratio	12.8	17.5	18.9	19.8				24.2	18.7	21.4	30.7																								
Bankfull Entrenchment Ratio	3.1	2.6	2.5	2.5				3.0	3.4	3.2	2.7																								
Low Bank Height (ft)	0.7	0.8	0.8	0.9				0.5	0.5	0.7	0.5																								
Bankfull Bank Height Ratio*	1.00	1.00	1.00	1.00				1.00	0.83	1.17	0.90																								
Cross Sectional Area between end pins (ft^2)																																			
d50 (mm)																																			

1 = Widths and depths for annual measurements will be based on the baseline bankfull datum regardless of dimensional/depositional development. Input the elevation used as the datum, which should be consistent and based on the baseline datum established. If the performer has inherited the project and cannot acquire the datum used for prior years this must be discussed with EEP. If this cannot be resolved in time for a given years report submission a footnote in this should be included that states: "It is uncertain if the monitoring datum has been consistent over the monitoring history, which may influence calculated values. Additional data from a prior performer is being acquired to provide confirmation. Values will be recalculated in a future submission based on a consistent datum if determined to be necessary."

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Table11g. Monitoring Data - Dimensional Morphology Summary (Dimensional Parameters – Cross Sections)
Project Name/Number (Heron/100014) Segment/Reach: UT 8 (605 feet)

	Cross Section 34 (Riffle)							Cross Section 35 (Pool)							Cross Section 36 (Riffle)							Cross Section 37 (Pool)						
Based on fixed baseline bankfull elevation[1]	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Record elevation (datum) used																												
Bankfull Width (ft)	6.5	5.2	4.8	5.3				7.5	6.9	7.1	6.4				9.3	9.0	9.3	9.7				9.5	8.7	10.5	8.6			
Floodprone Width (ft)	40	40	40	40				NA	NA	NA	NA				20	20	20	20				NA	NA	NA	NA			
Bankfull Mean Depth (ft)	0.4	0.5	0.5	0.5				0.5	0.6	0.6	0.6				0.4	0.4	0.4	0.4				0.8	0.8	0.7	0.8			
Bankfull Max Depth (ft)	0.7	0.7	0.8	0.7				0.9	1.0	0.9	0.9				0.7	0.7	0.8	0.8				1.6	1.6	1.6	1.6			
Bankfull Cross Sectional Area (ft^2)	2.6	2.6	2.6	2.6				4.1	4.1	4.1	4.1				3.7	3.7	3.7	3.7				7.2	7.2	7.2	7.2			
Bankfull Width/Depth Ratio	16.3	10.4	8.9	10.7				NA	NA	NA	NA				23.4	21.9	23.4	25.5				NA	NA	NA	NA			
Bankfull Entrenchment Ratio	6.2	7.7	8.3	7.6				NA	NA	NA	NA				2.2	2.2	2.2	2.1				NA	NA	NA	NA			
Low Bank Height (ft)	0.7	0.8	0.8	0.8				0.9	1.0	0.9	0.9				0.7	0.7	0.8	0.8				1.6	1.6	1.6	1.5			
Bankfull Bank Height Ratio*	1.00	1.14	1.00	1.14				1.00	1.00	1.00	1.01				1.00	1.00	1.00	1.07				1.00	1.00	1.00	0.94			
Cross Sectional Area between end pins (ft^2)																												
d50 (mm)																												
Based on fixed baseline bankfull elevation[1]																												
Record elevation (datum) used																												
Bankfull Width (ft)																												
Floodprone Width (ft)																												
Bankfull Mean Depth (ft)																												
Bankfull Max Depth (ft)																												
Bankfull Cross Sectional Area (ft^2)																												
Bankfull Width/Depth Ratio																												
Bankfull Entrenchment Ratio																												
Low Bank Height (ft)																												
Bankfull Bank Height Ratio*																												
Cross Sectional Area between end pins (ft^2)																												
d50 (mm)																												

1 = Widths and depths for annual measurements will be based on the baseline bankfull datum regardless of dimensional/depositional development. Input the elevation used as the datum, which should be consistent and based on the baseline datum established. If the performer has inherited the project and cannot acquire the datum used for prior years this must be discussed with EEP. If this cannot be resolved in time for a given years report submission a footnote in this should be included that states: "It is uncertain if the monitoring datum has been consistent over the monitoring history, which may influence calculated values. Additional data from a prior performer is being acquired to provide confirmation. Values will be recalculated in a future submission based on a consistent datum if determined to be necessary."

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Exhibit Table 12a. Monitoring Data - Stream Reach Data Summary
Project Name/Number (Heron/100014) - Segment/Reach: UT 1 (856 feet)

Parameter	Baseline						MY-1						MY-2						MY- 3						MY- 4						MY- 5					
Dimension and Substrate - Riffle only	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n
Bankfull Width (ft)	8.3	11		13		4	9	13.2		14.7		4	10.7	13.4		17.7		4	12.4		13.4	16		4												
Floodprone Width (ft)	25	100		100		4	25	100		100		4	25	100		100		4	25		100	100		4												
Bankfull Mean Depth (ft)	0.4	0.5		0.6		4	0.3	0.4		0.6		4	0.26	0.37		0.63		4	0.30		0.41	0.52		4												
[1]Bankfull Max Depth (ft)	0.6	0.8		1.1		4	0.6	0.8		1		4	0.7	0.8		1.1		4	0.62		0.82	1.04		4												
Bankfull Cross Sectional Area (ft^2)	3.7	5.4		7.2		4	3.7	5.4		7.2		4	3.7	5.4		7.2		4	3.7		5.4	7.2		4												
Width/Depth Ratio	17.4	18.7		36.7		4	20	28.7		45.1		4	18.1	34.7		68.1		4	26.7		39.3	41.9		4												
Entrenchment Ratio	3	8.3		9.3		4	2.8	6.9		8.3		4	2.34	6.09		8.77		4	2.01		6.74	7.68		4												
Low Bank Height (ft)	0.6	0.8		1.1		4	0.6	0.7		1		4	0.7	0.8		1.1		4	0.62		0.82	1.04		4												
[1]Bank Height Ratio	1.0	1.0		1.0		4	0.9	1		1		4	1.0	1.0		1.0		4	**0.9**		**0.9**	**1.0**		4												
Profile																																				
Riffle Length (ft)	2.7	19	16	53	11	31																														
Riffle Slope (ft/ft)	0	0.01	0.01	0.05	0.01	31																														
Pool Length (ft)	6	23	20	80	12.9	34																														
Pool Max depth (ft)	1.5	1.6		2.1		4																														
Pool Spacing (ft)	25	34		68		34																														
Pattern																																				
Channel Beltwidth (ft)	25	34		68																																
Radius of Curvature (ft)	17	25		85																																
Rc:Bankfull width (ft/ft)	2	3		10																																
Meander Wavelength (ft)	51	72		101																																
Meander Width Ratio	3	4		6																																
Additional Reach Parameters																																				
Rosgen Classification	C 4																																			
Channel Thalweg length (ft)	856																																			
Sinuosity (ft)	1.3																																			
Water Surface Slope (Channel) (ft/ft)	0.0087																																			
BF slope (ft/ft)																																				
[3]Ri% / Ru% / P% / G% / S%	43	19	19	19																																
[3]SC% / Sa% / G% / C% / B% / Be%																																				
[3]d16 / d35 / d50 / d84 / d95 /																																				
[2]% of Reach with Eroding Banks	0																																			
Channel Stability or Habitat Metric																																				
Biological or Other																																				

Pattern data will not typically be collected unless visual data, dimensional data or profile data indicate significant shifts from baseline

Shaded cells indicate that these will typically not be filled in.
1 = The distributions for these parameters can include information from both the cross-section measurements and the longitudinal profile.
2 = Proportion of reach exhibiting banks that are eroding based on the visual survey from visual assessment table
3 = Riffle, Run, Pool, Glide, Step; Silt/Clay, Sand, Gravel, Cobble, Boulder, Bedrock; dip = max pave, disp = max subpave
4. = Of value/needed only if the n exceeds 3

Exhibit Table 12b. Monitoring Data - Stream Reach Data Summary
Project Name/Number (Heron/100014) - Segment/Reach: UT 3 (279 feet)

Parameter	Baseline						MY-1						MY-2						MY- 3						MY- 4						MY- 5					
Dimension and Substrate - Riffle only	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n
Bankfull Width (ft)	7.7	7.7		7.7		1	7	7		7		1	7	7		7		1	7.4		7.4	7.4														
Floodprone Width (ft)	18	18		18		1	18	18		18		1	18	18		18		1	18		18	18														
Bankfull Mean Depth (ft)	0.6	0.6		0.6		1	0.6	0.6		0.6		1	0.6	0.6		0.6		1	0.6		0.6	0.6														
[1]Bankfull Max Depth (ft)	1	1		1		1	1.1	1.1		1.1		1	1	1		1		1	1.1		1.1	1.1														
Bankfull Cross Sectional Area (ft^2)	4.5	4.5		4.5		1	4.5	4.5		4.5		1	4.5	4.5		4.5		1	4.5		4.5	4.5														
Width/Depth Ratio	13.2	13.2		13.2		1	10.9	10.9		10.9		1	10.9	10.9		10.9		1	12.3		12.3	12.3														
Entrenchment Ratio	2.3	2.3		2.3		1	2.6	2.6		2.6		1	2.6		2.6			1	2.4		2.4	2.4														
Low Bank Height (ft)	1	1		1		1	1.1	1.1		1.1		1	1	1		1		1	1.1		1.1	1.1														
[1]Bank Height Ratio	1.0	1.0		1.0		1	1	1.0		1.0		1	1	1.0		1.0		1	**1.1**		**1.1**	**1.1**														
Profile																																				
Riffle Length (ft)	4	11	10	19	4.3	14																														
Riffle Slope (ft/ft)	0.01	0.03	0.03	0.74	0.02	14																														
Pool Length (ft)	4	9	8	21	4.9	13																														
Pool Max depth (ft)	1	1	1	1	0	1																														
Pool Spacing (ft)	13	18		35		14																														
Pattern																																				
Channel Beltwidth (ft)	13	18		27																																
Radius of Curvature (ft)	9	13		44																																
Rc:Bankfull width (ft/ft)	2	3		10																																
Meander Wavelength (ft)	26	37		53																																
Meander Width Ratio	3	4		6																																
Additional Reach Parameters																																				
Rosgen Classification	C 4																																			
Channel Thalweg length (ft)	279																																			
Sinuosity (ft)	1.15																																			
Water Surface Slope (Channel) (ft/ft)	0.0176																																			
BF slope (ft/ft)																																				
[3]Ri% / Ru% / P% / G% / S%	55	15	15	15																																
[3]SC% / Sa% / G% / C% / B% / Be%																																				
[3]d16 / d35 / d50 / d84 / d95 /																																				
[2]% of Reach with Eroding Banks	**0**																																			
Channel Stability or Habitat Metric																																				
Biological or Other																																				

Pattern data will not typically be collected unless visual data, dimensional data or profile data indicate significant shifts from baseline

Shaded cells indicate that these will typically not be filled in.
1 = The distributions for these parameters can include information from both the cross-section measurements and the longitudinal profile.
2 = Proportion of reach exhibiting banks that are eroding based on the visual survey from visual assessment table
3 = Riffle, Run, Pool, Glide, Step; Silt/Clay, Sand, Gravel, Cobble, Boulder, Bedrock; dip = max pave, disp = max subpave
4. = Of value/needed only if the n exceeds 3

Exhibit Table 12c. Monitoring Data - Stream Reach Data Summary
Project Name/Number (Heron/100014) - Segment/Reach: UT 4 (450 feet)

Parameter	Baseline						MY-1						MY-2						MY- 3						MY- 4						MY- 5					
Dimension and Substrate - Riffle only	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n
Bankfull Width (ft)	6.5	7.3		8		2	7.4	7.7		7.9		2	10.6	11		11.3		2	7.8		7.9	7.9														
Floodprone Width (ft)	40	40		40		2	40	40		40		2	40	40		40		2	40		40	40														
Bankfull Mean Depth (ft)	0.3	0.4		0.5		2	0.3	0.4		0.4		2	0.2	0.3		0.3		2	0.3		0.4	0.4														
[1]Bankfull Max Depth (ft)	0.5	0.7		0.8		2	0.6	0.7		0.8		2	0.5	0.7		0.8		2	0.5		0.7	0.8														
Bankfull Cross Sectional Area (ft^2)	2.2	3		3.7		2	2.2	2.9		3.5		2	2.2	2.9		3.5		2	2.2		2.9	3.5														
Width/Depth Ratio	17.3	18.3		19.2		2	17.8	21.4		24.9		2	36.5	43.8		51.1		2	17.7		23.2	28.7														
Entrenchment Ratio	5	5.6		6.2		2	5.1	5.2		5.4		2	3.5	3.7		3.8		2	5		5.1	5.1														
Low Bank Height (ft)	0.5	0.7		0.8		2	0.5	0.7		0.8		2	0.5	0.7		0.8		2	0.5		0.6	0.7														
[1]Bank Height Ratio	1.0	1.0		1.0		2	0.8	0.9		1		2	1.0	1.0		1.0		2	**0.9**		**0.9**	**1**														
Profile																																				
Riffle Length (ft)	4	9	9	20	3.5	23																														
Riffle Slope (ft/ft)	0	0.02	0.02	0.06	0.01	23																														
Pool Length (ft)	4	10	10	18	3.5	22																														
Pool Max depth (ft)	1.1	1.3		1.4		2																														
Pool Spacing (ft)	15	20		40		22																														
Pattern																																				
Channel Beltwidth (ft)	15	20		30																																
Radius of Curvature (ft)	10	15		50																																
Rc:Bankfull width (ft/ft)	2	3		10																																
Meander Wavelength (ft)	30	43		60																																
Meander Width Ratio	3	4		6																																

Pattern data will not typically be collected unless visual data, dimensional data or profile data indicate significant shifts from baseline

Additional Reach Parameters																																				
Rosgen Classification	C 4																																			
Channel Thalweg length (ft)	450																																			
Sinuosity (ft)	1.15																																			
Water Surface Slope (Channel) (ft/ft)	0.0195																																			
BF slope (ft/ft)																																				
[3]Ri% / Ru% / P% / G% / S%	48	17	18	17																																
[3]SC% / Sa% / G% / C% / B% / Be%																																				
[3]d16 / d35 / d50 / d84 / d95 /																																				
[2]% of Reach with Eroding Banks	**0**																																			
Channel Stability or Habitat Metric																																				
Biological or Other																																				

Shaded cells indicate that these will typically not be filled in.
1 = The distributions for these parameters can include information from both the cross-section measurements and the longitudinal profile.
2 = Proportion of reach exhibiting banks that are eroding based on the visual survey from visual assessment table
3 = Riffle, Run, Pool, Glide, Step; Silt/Clay, Sand, Gravel, Cobble, Boulder, Bedrock; dip = max pave, disp = max subpave
4. = Of value/needed only if the n exceeds 3

Exhibit Table 12d. Monitoring Data - Stream Reach Data Summary
Project Name/Number (Heron/100014) - Segment/Reach: UT 5 (952 feet)

Parameter	Baseline						MY-1						MY-2						MY- 3						MY- 4						MY- 5					
Dimension and Substrate - Riffle only	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n
Bankfull Width (ft)	4.9	6.9		8.1		4	5.7	6.7		9.2		4	5.3	9		12.2		4	5.9		7.5	12.7														
Floodprone Width (ft)	40	40		40		4	40	40		40		4	40	40		40		4	40		40	40														
Bankfull Mean Depth (ft)	0.3	0.4		0.5		4	0.3	0.4		0.4		4	0.2	0.3		0.4		4	0.3		0.3	0.4														
[1]Bankfull Max Depth (ft)	0.5	0.7		0.8		4	0.6	0.7		0.8		4	0.6	0.7		0.8		4	0.6		0.7	0.8														
Bankfull Cross Sectional Area (ft^2)	1.9	2.4		3.7		4	1.9	2.4		3.7		4	1.9	2.4		3.7		4	1.9		2.4	3.7														
Width/Depth Ratio	12.6	18.3		20.9		4	17.1	19.1		22.9		4	14.8	32.6		46.5		4	18.5		24.6	43.2														
Entrenchment Ratio	4.9	5.9		8.2		4	4.3	6.0		7.0		4	3.3	4.5		7.5		4	3.2		5.4	6.8														
Low Bank Height (ft)	0.5	0.7		0.8		4	0.6	0.6		0.8		4	0.6	0.6		0.7		4	0.6		0.7	0.7														
[1]Bank Height Ratio	1.0	1.0		1.0		4	0.9	1.0		1.0		4	1	0.8		1		4	**1**		**1**	**1.2**														
Profile																																				
Riffle Length (ft)	3	11	9	49	8.4	41																														
Riffle Slope (ft/ft)	0	0.03	0.03	0.05	0.01	41																														
Pool Length (ft)	4	12	10	59	8.5	41																														
Pool Max depth (ft)	0.8	1		1.1		4																														
Pool Spacing (ft)	15	20		40		41																														
Pattern																																				
Channel Beltwidth (ft)	15	20		30																																
Radius of Curvature (ft)	10	15		50																																
Rc:Bankfull width (ft/ft)	2	3		10																																
Meander Wavelength (ft)	30	43		60																																
Meander Width Ratio	3	4		6																																
Additional Reach Parameters																																				
Rosgen Classification	E/C 4																																			
Channel Thalweg length (ft)	952																																			
Sinuosity (ft)	1.15																																			
Water Surface Slope (Channel) (ft/ft)	0.0256																																			
BF slope (ft/ft)																																				
[3]Ri% / Ru% / P% / G% / S%	50	17	17	16																																
[3]SC% / Sa% / G% / C% / B% / Be%																																				
[3]d16 / d35 / d50 / d84 / d95 /																																				
[2]% of Reach with Eroding Banks	**0**																																			
Channel Stability or Habitat Metric																																				
Biological or Other																																				

Pattern data will not typically be collected unless visual data, dimensional data or profile data indicate significant shifts from baseline

Shaded cells indicate that these will typically not be filled in.
1 = The distributions for these parameters can include information from both the cross-section measurements and the longitudinal profile.
2 = Proportion of reach exhibiting banks that are eroding based on the visual survey from visual assessment table
3 = Riffle, Run, Pool, Glide, Step; Silt/Clay, Sand, Gravel, Cobble, Boulder, Bedrock; dip = max pave, disp = max subpave
4. = Of value/needed only if the n exceeds 3

Exhibit Table 12e. Monitoring Data - Stream Reach Data Summary
Project Name/Number (Heron/100014) - Segment/Reach: UT 6 (781 feet)

Parameter	Baseline						MY-1						MY-2						MY- 3						MY- 4						MY- 5					
Dimension and Substrate - Riffle only	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n
Bankfull Width (ft)	6.1	6.5		6.8		2	4.7	5.3		5.8		2	4.8	5.3		5.7		2	4.3		4.8	5.4														
Floodprone Width (ft)	40	40		40		2	40	40		40		2	40	40		40		2	40		40	40														
Bankfull Mean Depth (ft)	0.4	0.4		0.5		2	0.4	0.6		0.7		2	0.4	0.6		0.7		2	0.4		0.6	0.8														
[1]Bankfull Max Depth (ft)	0.6	0.8		0.9		2	0.5	0.8		1		2	0.6	0.9		1.2		2	0.6		0.9	1.2														
Bankfull Cross Sectional Area (ft^2)	2.2	2.9		3.5		2	2.2	2.9		3.5		2	2.2	2.9		3.5		2	2.2		2.9	3.5														
Width/Depth Ratio	13.2	15.1		16.9		2	6.3	10.8		15.3		2	6.6	10.7		14.8		2	5.3		9.4	13.4														
Entrenchment Ratio	5.9	6.2		6.6		2	6.9	7.7		8.5		2	7	7.7		8.3		2	7.4		8.4	9.3														
Low Bank Height (ft)	0.6	0.8		0.9		2	0.7	1.1		1.4		2	0.7	1.1		1.5		2	0.6		0.9	1.2														
[1]Bank Height Ratio	1.0	1.0		1.0		2	1.4	1.4		1.4		2	1.1	1.2		1.3		2	**1.0**		**1.0**	**1.1**														
Profile																																				
Riffle Length (ft)	2	10	7	47	8.8	33																														
Riffle Slope (ft/ft)	0	0.03	0.02	0.13	0.02	33																														
Pool Length (ft)	4	12	12	18	3.7	33																														
Pool Max depth (ft)	1	1.2		1.3		2																														
Pool Spacing (ft)	14	18		37		33																														
Pattern																																				
Channel Beltwidth (ft)	14	18		37																																
Radius of Curvature (ft)	9	14		46																																
Rc:Bankfull width (ft/ft)	2	3		10																																
Meander Wavelength (ft)	27	39		55																																
Meander Width Ratio	3	4		6																																
Additional Reach Parameters																																				
Rosgen Classification	C 4																																			
Channel Thalweg length (ft)	781																																			
Sinuosity (ft)	1.15																																			
Water Surface Slope (Channel) (ft/ft)	0.0225																																			
BF slope (ft/ft)																																				
[3]Ri% / Ru% / P% / G% / S%	46	18	18	18																																
[3]SC% / Sa% / G% / C% / B% / Be%																																				
[3]d16 / d35 / d50 / d84 / d95 /																																				
[2]% of Reach with Eroding Banks	**0**																																			
Channel Stability or Habitat Metric																																				
Biological or Other																																				

Pattern data will not typically be collected unless visual data, dimensional data or profile data indicate significant shifts from baseline

Shaded cells indicate that these will typically not be filled in.
1 = The distributions for these parameters can include information from both the cross-section measurements and the longitudinal profile.
2 = Proportion of reach exhibiting banks that are eroding based on the visual survey from visual assessment table
3 = Riffle, Run, Pool, Glide, Step; Silt/Clay, Sand, Gravel, Cobble, Boulder, Bedrock; dip = max pave, disp = max subpave
4. = Of value/needed only if the n exceeds 3

Exhibit Table 12f. Monitoring Data - Stream Reach Data Summary
Project Name/Number (Heron/100014) - Segment/Reach: UT 7 (232 feet)

Parameter	Baseline						MY-1						MY-2						MY- 3						MY- 4						MY- 5					
Dimension and Substrate - Riffle only	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n
Bankfull Width (ft)	6.2	6.6		7.8		4	5.6	6.4		7.6		4	6.2	6.9		7.9		4	6.2		7.5	9.2														
Floodprone Width (ft)	10	20		20		4	11	20		20		4	11	20		20		4	11		20	20														
Bankfull Mean Depth (ft)	0.3	0.4		0.5		4	0.3	0.4		0.4		4	0.3	0.4		0.4		4	0.2		0.4	0.4														
[1]Bankfull Max Depth (ft)	0.5	0.6		0.7		4	0.5	0.7		1.1		4	0.5	0.7		0.9		4	0.6		0.8	1.1														
Bankfull Cross Sectional Area (ft^2)	1.8	2.7		3.3		4	1.8	2.7		3.3		4	1.8	2.7		3.3		4	1.8		2.7	3.3														
Width/Depth Ratio	12.8	18.5		24.2		4	13.6	16.7		18.7		4	17.3	18.8		21.4		4	16.3		18.3	46.4														
Entrenchment Ratio	1.6	2.8		3.1		4	2	2.8		3.4		4	1.7	2.6		3.2		4	1.8		2.3	2.9														
Low Bank Height (ft)	0.5	0.6		0.7		4	0.5	0.7		1.1		4	0.5	0.7		0.9		4	0.5		0.8	1.1														
[1]Bank Height Ratio	1.0	1.0		1.0		4	0.8	1		1		4	1.0	1.0		1.0		4	**0.9**		**1**	**1.1**														
Profile																																				
Riffle Length (ft)	3	13	10	75	13	42																														
Riffle Slope (ft/ft)	0.01	0.03	0.03	0.06	0.01	42																														
Pool Length (ft)	3	9	9	14	2.6	41																														
Pool Max depth (ft)	1	1.1		1.5		3																														
Pool Spacing (ft)	16	21		42		42																														
Pattern																																				
Channel Beltwidth (ft)	16	21		32																																
Radius of Curvature (ft)	10	16		53																																
Rc:Bankfull width (ft/ft)	2	3		10																																
Meander Wavelength (ft)	31	45		64																																
Meander Width Ratio	3	4		6																																
Additional Reach Parameters																																				
Rosgen Classification	Cb 4																																			
Channel Thalweg length (ft)	232																																			
Sinuosity (ft)	1.15																																			
Water Surface Slope (Channel) (ft/ft)	0.0268																																			
BF slope (ft/ft)																																				
[3]Ri% / Ru% / P% / G% / S%	60	13	14	13																																
[3]SC% / Sa% / G% / C% / B% / Be%																																				
[3]d16 / d35 / d50 / d84 / d95 /																																				
[2]% of Reach with Eroding Banks	**0**																																			
Channel Stability or Habitat Metric																																				
Biological or Other																																				

Pattern data will not typically be collected unless visual data, dimensional data or profile data indicate significant shifts from baseline

Shaded cells indicate that these will typically not be filled in.
1 = The distributions for these parameters can include information from both the cross-section measurements and the longitudinal profile.
2 = Proportion of reach exhibiting banks that are eroding based on the visual survey from visual assessment table
3 = Riffle, Run, Pool, Glide, Step; Silt/Clay, Sand, Gravel, Cobble, Boulder, Bedrock; dip = max pave, disp = max subpave
4. = Of value/needed only if the n exceeds 3

Exhibit Table 12g. Monitoring Data - Stream Reach Data Summary
Project Name/Number (Heron/100014) - Segment/Reach: UT 8 (605 feet)

Parameter	Baseline						MY-1						MY-2						MY- 3						MY- 4						MY- 5					
Dimension and Substrate - Riffle only	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n
Bankfull Width (ft)	6.5	7.9		9.3		2	5.2	7.1		9		2	4.8	7.1		9.3		2	5.3		7.5	9.7														
Floodprone Width (ft)	20	30		40		2	20	30		40		2	20	30		40		2	20		30	40														
Bankfull Mean Depth (ft)	0.4	0.4		0.4		2	0.4	0.5		0.5		2	0.4	0.5		0.5		2	0.4		0.4	0.5														
[1]Bankfull Max Depth (ft)	0.7	0.7		0.7		2	0.7	0.7		0.7		2	0.8	0.8		0.8		2	0.7		0.7	0.8														
Bankfull Cross Sectional Area (ft^2)	2.6	3.2		3.7		2	2.6	3.2		3.7		2	2.6	3.2		3.7		2	2.6		3.2	3.7														
Width/Depth Ratio	16.3	19.8		23.4		2	10.4	16.1		21.9		2	8.9	16.1		23.4		2	10.7		18.1	25.5														
Entrenchment Ratio	2.2	4.2		6.2		2	2.2	5		7.7		2	2.2	5.2		8.3		2	2.1		4.8	7.5														
Low Bank Height (ft)	0.7	0.7		0.7		2	0.7	0.8		0.8		2	0.8	0.8		0.8		2	0.8		0.8	0.8														
[1]Bank Height Ratio	1.0	1.0		1.0		2	1	1.1		1.1		2	1.0	1.0		1.0		2	**1.1**		**1.1**	**1.1**														
Profile																																				
Riffle Length (ft)	5	11	11	19	3.4	23																														
Riffle Slope (ft/ft)	0.01	0.02	0.02	0.04	0.01	23																														
Pool Length (ft)	6	15	15	24	4.8	23																														
Pool Max depth (ft)	0.9	1.3		1.6		2																														
Pool Spacing (ft)	17	24		47		23																														
Pattern																																				
Channel Beltwidth (ft)	17	24		36																																
Radius of Curvature (ft)	11	18		59																																
Rc:Bankfull width (ft/ft)	2	3		10																																
Meander Wavelength (ft)	35	50		71																																
Meander Width Ratio	3	4		6																																
Additional Reach Parameters																																				
Rosgen Classification	C 4																																			
Channel Thalweg length (ft)	605																																			
Sinuosity (ft)	1.15																																			
Water Surface Slope (Channel) (ft/ft)	0.0138																																			
BF slope (ft/ft)																																				
[3]Ri% / Ru% / P% / G% / S%	41	20	20	19																																
[3]SC% / Sa% / G% / C% / B% / Be%																																				
[3]d16 / d35 / d50 / d84 / d95 /																																				
[2]% of Reach with Eroding Banks	**0**																																			
Channel Stability or Habitat Metric																																				
Biological or Other																																				

Pattern data will not typically be collected unless visual data, dimensional data or profile data indicate significant shifts from baseline

Shaded cells indicate that these will typically not be filled in.
1 = The distributions for these parameters can include information from both the cross-section measurements and the longitudinal profile.
2 = Proportion of reach exhibiting banks that are eroding based on the visual survey from visual assessment table
3 = Riffle, Run, Pool, Glide, Step; Silt/Clay, Sand, Gravel, Cobble, Boulder, Bedrock; dip = max pave, disp = max subpave
4. = Of value/needed only if the n exceeds 3

Appendix E.
Hydrology Data

Table 13A.-11J. Channel Evidence
Stream Gauge Graphs
Table 14. Verification of Bankfull Events
Table 15. Groundwater Hydrology Data
Groundwater Gauge Graphs
Soil Temperature
Figure D-1. 30-70 Percentile Graph for Rainfall

Table 13A. UT1 Channel Evidence

UT1 Channel Evidence	Year 1 (2019)	Year 2 (2020)	Year 3 (2021)	Year 4 (2022)
Max consecutive days channel flow	103	162	289	89
Presence of litter and debris (wracking)	Yes	Yes	Yes	Yes
Leaf litter disturbed or washed away	Yes	Yes	Yes	Yes
Matted, bent, or absence of vegetation (herbaceous or otherwise)	Yes	Yes	Yes	Yes
Sediment deposition and/or scour indicating sediment transport	Yes	Yes	Yes	Yes
Water staining due to continual presence of water	Yes	Yes	Yes	Yes
Formation of channel bed and banks	Yes	Yes	Yes	Yes
Sediment sorting within the primary path of flow	Yes	Yes	Yes	Yes
Sediment shelving or a natural line impressed on the banks	Yes	Yes	Yes	Yes
Change in plant community (absence or destruction of terrestrial vegetation and/or transition to species adapted for flow or inundation for a long duration, including hydrophytes)	Yes	Yes	Yes	Yes
Development of channel pattern (meander bends and/or channel braiding) at natural topographic breaks, woody debris piles, or plant root systems	Yes	Yes	Yes	Yes
Exposure of woody plant roots within the primary path of flow	No	No	No	No
Other:				

Table 13B. UT2 Channel Evidence

UT2 Channel Evidence	Year 1 (2019)	Year 2 (2020)	Year 3 (2021)	Year 4 (2022)
Max consecutive days channel flow	85	126	116	61
Presence of litter and debris (wracking)	Yes	Yes	Yes	Yes
Leaf litter disturbed or washed away	Yes	Yes	Yes	Yes
Matted, bent, or absence of vegetation (herbaceous or otherwise)	Yes	Yes	Yes	Yes
Sediment deposition and/or scour indicating sediment transport	Yes	Yes	Yes	Yes
Water staining due to continual presence of water	Yes	Yes	Yes	Yes
Formation of channel bed and banks	Yes	Yes	Yes	Yes
Sediment sorting within the primary path of flow	Yes	Yes	Yes	Yes
Sediment shelving or a natural line impressed on the banks	Yes	Yes	Yes	Yes
Change in plant community (absence or destruction of terrestrial vegetation and/or transition to species adapted for flow or inundation for a long duration, including hydrophytes)	Yes	Yes	Yes	Yes
Development of channel pattern (meander bends and/or channel braiding) at natural topographic breaks, woody debris piles, or plant root systems	Yes	Yes	Yes	Yes
Exposure of woody plant roots within the primary path of flow	No	No	No	No
Other:				

Table 13C. UT3 Channel Evidence

UT3 Channel Evidence	Year 1 (2019)	Year 2 (2020)	Year 3 (2021)	Year 4 (2022)
Max consecutive days channel flow	142	166	120	131
Presence of litter and debris (wracking)	Yes	Yes	Yes	Yes
Leaf litter disturbed or washed away	Yes	Yes	Yes	Yes
Matted, bent, or absence of vegetation (herbaceous or otherwise)	Yes	Yes	Yes	Yes
Sediment deposition and/or scour indicating sediment transport	Yes	Yes	Yes	Yes
Water staining due to continual presence of water	Yes	Yes	Yes	Yes
Formation of channel bed and banks	Yes	Yes	Yes	Yes
Sediment sorting within the primary path of flow	Yes	Yes	Yes	Yes
Sediment shelving or a natural line impressed on the banks	Yes	Yes	Yes	Yes
Change in plant community (absence or destruction of terrestrial vegetation and/or transition to species adapted for flow or inundation for a long duration, including hydrophytes)	Yes	Yes	Yes	Yes
Development of channel pattern (meander bends and/or channel braiding) at natural topographic breaks, woody debris piles, or plant root systems	Yes	Yes	Yes	Yes
Exposure of woody plant roots within the primary path of flow	No	No	No	No
Other:				

Table 13D. UT5 Downstream Channel Evidence

UT5 Downstream Channel Evidence	Year 1 (2019)	Year 2 (2020)	Year 3 (2021)	Year 4 (2022)
Max consecutive days channel flow	134	152	135	130
Presence of litter and debris (wracking)	Yes	Yes	Yes	Yes
Leaf litter disturbed or washed away	Yes	Yes	Yes	Yes
Matted, bent, or absence of vegetation (herbaceous or otherwise)	Yes	Yes	Yes	Yes
Sediment deposition and/or scour indicating sediment transport	Yes	Yes	Yes	Yes
Water staining due to continual presence of water	Yes	Yes	Yes	Yes
Formation of channel bed and banks	Yes	Yes	Yes	Yes
Sediment sorting within the primary path of flow	Yes	Yes	Yes	Yes
Sediment shelving or a natural line impressed on the banks	Yes	Yes	Yes	Yes
Change in plant community (absence or destruction of terrestrial vegetation and/or transition to species adapted for flow or inundation for a long duration, including hydrophytes)	Yes	Yes	Yes	Yes
Development of channel pattern (meander bends and/or channel braiding) at natural topographic breaks, woody debris piles, or plant root systems	Yes	Yes	Yes	Yes
Exposure of woody plant roots within the primary path of flow	No	No	No	No
Other:				

Table 13E. UT5 Upstream Channel Evidence

UT5 Upstream Channel Evidence	Year 1 (2019)	Year 2 (2020)	Year 3 (2021)	Year 4 (2022)
Max consecutive days channel flow	167	158	60	201
Presence of litter and debris (wracking)	Yes	Yes	Yes	Yes
Leaf litter disturbed or washed away	Yes	Yes	Yes	Yes
Matted, bent, or absence of vegetation (herbaceous or otherwise)	Yes	Yes	Yes	Yes
Sediment deposition and/or scour indicating sediment transport	Yes	Yes	Yes	Yes
Water staining due to continual presence of water	Yes	Yes	Yes	Yes
Formation of channel bed and banks	Yes	Yes	Yes	Yes
Sediment sorting within the primary path of flow	Yes	Yes	Yes	Yes
Sediment shelving or a natural line impressed on the banks	Yes	Yes	Yes	Yes
Change in plant community (absence or destruction of terrestrial vegetation and/or transition to species adapted for flow or inundation for a long duration, including hydrophytes)	Yes	Yes	Yes	Yes
Development of channel pattern (meander bends and/or channel braiding) at natural topographic breaks, woody debris piles, or plant root systems	Yes	Yes	Yes	Yes
Exposure of woody plant roots within the primary path of flow	No	No	No	No
Other:				

Table 13F. UT6 Channel Evidence

UT6 Channel Evidence	Year 1 (2019)	Year 2 (2020)	Year 3 (2021)	Year 4 (2022)
Max consecutive days channel flow	131	187	288	118
Presence of litter and debris (wracking)	Yes	Yes	Yes	Yes
Leaf litter disturbed or washed away	Yes	Yes	Yes	Yes
Matted, bent, or absence of vegetation (herbaceous or otherwise)	Yes	Yes	Yes	Yes
Sediment deposition and/or scour indicating sediment transport	Yes	Yes	Yes	Yes
Water staining due to continual presence of water	Yes	Yes	Yes	Yes
Formation of channel bed and banks	Yes	Yes	Yes	Yes
Sediment sorting within the primary path of flow	Yes	Yes	Yes	Yes
Sediment shelving or a natural line impressed on the banks	Yes	Yes	Yes	Yes
Change in plant community (absence or destruction of terrestrial vegetation and/or transition to species adapted for flow or inundation for a long duration, including hydrophytes)	Yes	Yes	Yes	Yes
Development of channel pattern (meander bends and/or channel braiding) at natural topographic breaks, woody debris piles, or plant root systems	Yes	Yes	Yes	Yes
Exposure of woody plant roots within the primary path of flow	No	No	No	No
Other:				

Table 13G. UT7 Downstream Channel Evidence

UT7 Downstream Channel Evidence	Year 1 (2019)	Year 2 (2020)	Year 3 (2021)	Year 4 (2022)
Max consecutive days channel flow	237	68	144	59
Presence of litter and debris (wracking)	Yes	Yes	Yes	Yes
Leaf litter disturbed or washed away	Yes	Yes	Yes	Yes
Matted, bent, or absence of vegetation (herbaceous or otherwise)	Yes	Yes	Yes	Yes
Sediment deposition and/or scour indicating sediment transport	Yes	Yes	Yes	Yes
Water staining due to continual presence of water	Yes	Yes	Yes	Yes
Formation of channel bed and banks	Yes	Yes	Yes	Yes
Sediment sorting within the primary path of flow	Yes	Yes	Yes	Yes
Sediment shelving or a natural line impressed on the banks	Yes	Yes	Yes	Yes
Change in plant community (absence or destruction of terrestrial vegetation and/or transition to species adapted for flow or inundation for a long duration, including hydrophytes)	Yes	Yes	Yes	Yes
Development of channel pattern (meander bends and/or channel braiding) at natural topographic breaks, woody debris piles, or plant root systems	Yes	Yes	Yes	Yes
Exposure of woody plant roots within the primary path of flow	No	No	No	No
Other:				

Table 13H. UT7 Middle Channel Evidence

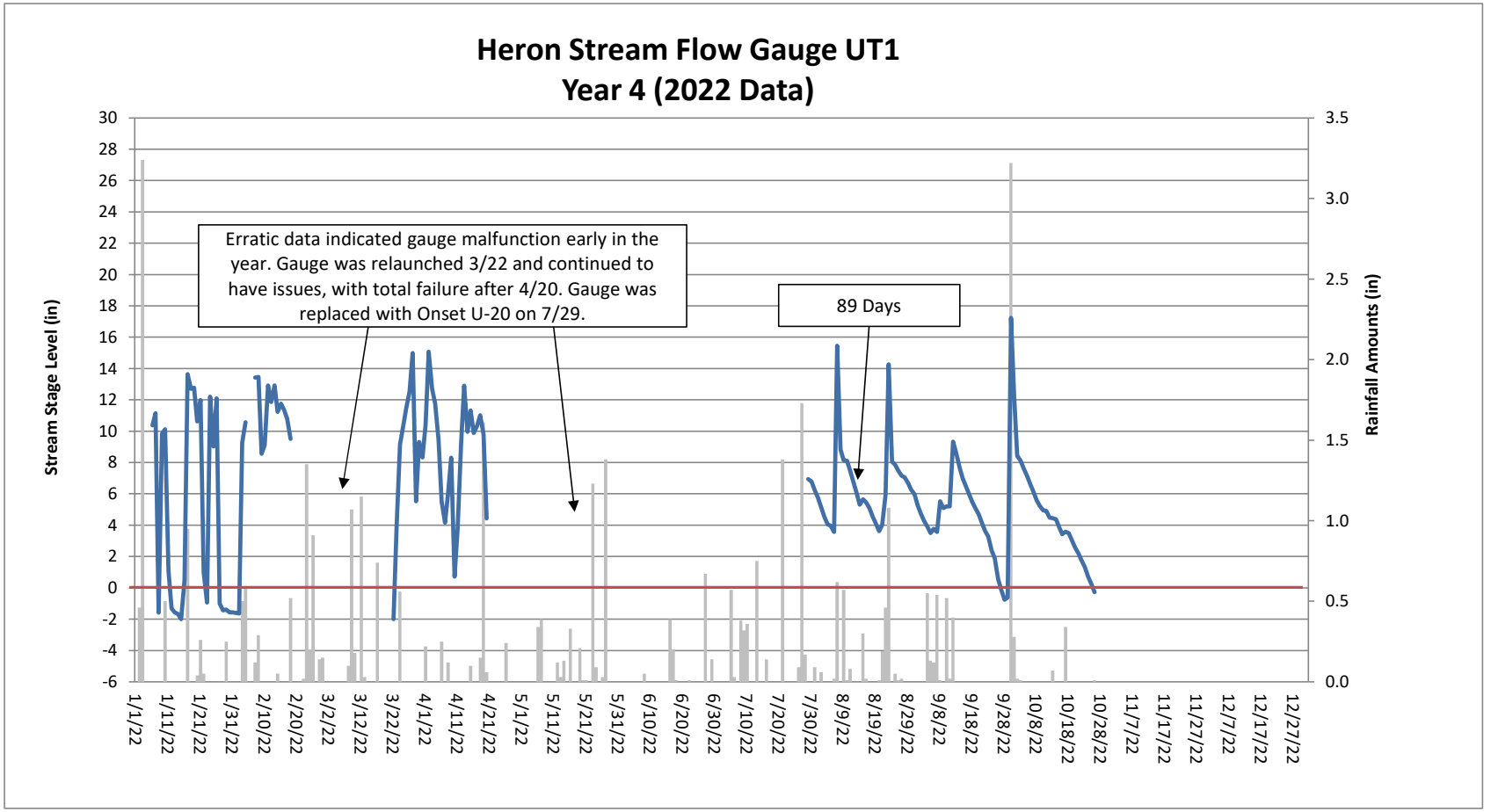
UT7 Middle Channel Evidence	Year 1 (2019)	Year 2 (2020)	Year 3 (2021)	Year 4 (2022)
Max consecutive days channel flow	151	106	157	209
Presence of litter and debris (wracking)	Yes	Yes	Yes	Yes
Leaf litter disturbed or washed away	Yes	Yes	Yes	Yes
Matted, bent, or absence of vegetation (herbaceous or otherwise)	Yes	Yes	Yes	Yes
Sediment deposition and/or scour indicating sediment transport	Yes	Yes	Yes	Yes
Water staining due to continual presence of water	Yes	Yes	Yes	Yes
Formation of channel bed and banks	Yes	Yes	Yes	Yes
Sediment sorting within the primary path of flow	Yes	Yes	Yes	Yes
Sediment shelving or a natural line impressed on the banks	Yes	Yes	Yes	Yes
Change in plant community (absence or destruction of terrestrial vegetation and/or transition to species adapted for flow or inundation for a long duration, including hydrophytes)	Yes	Yes	Yes	Yes
Development of channel pattern (meander bends and/or channel braiding) at natural topographic breaks, woody debris piles, or plant root systems	Yes	Yes	Yes	Yes
Exposure of woody plant roots within the primary path of flow	No	No	No	No
Other:				

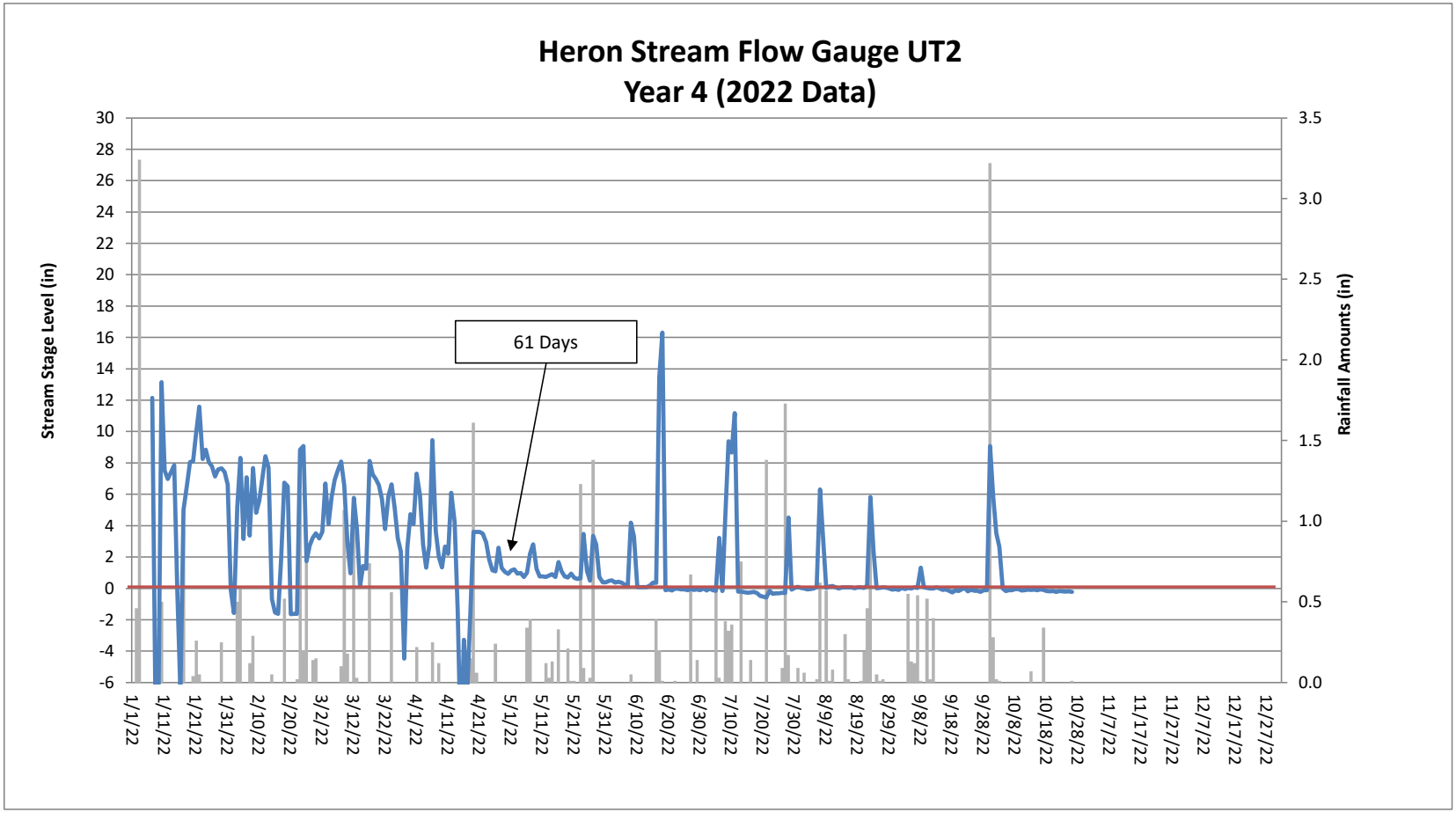
Table 13I. UT7 Upstream Channel Evidence

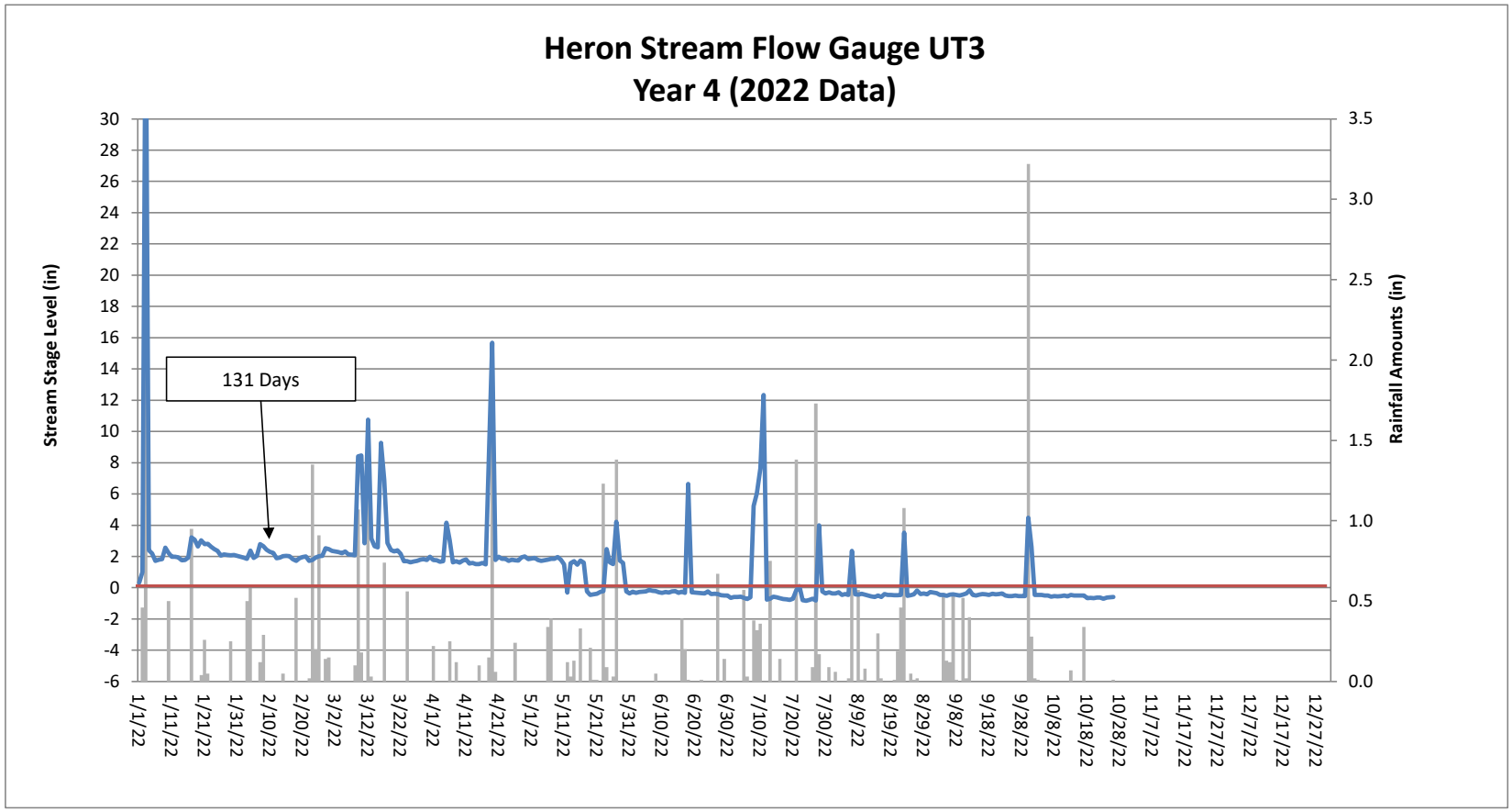
UT7 Upstream Channel Evidence	Year 1 (2019)	Year 2 (2020)	Year 3 (2021)	Year 4 (2022)
Max consecutive days channel flow	237	248	107	36
Presence of litter and debris (wracking)	Yes	Yes	Yes	Yes
Leaf litter disturbed or washed away	Yes	Yes	Yes	Yes
Matted, bent, or absence of vegetation (herbaceous or otherwise)	Yes	Yes	Yes	Yes
Sediment deposition and/or scour indicating sediment transport	Yes	Yes	Yes	Yes
Water staining due to continual presence of water	Yes	Yes	Yes	Yes
Formation of channel bed and banks	Yes	Yes	Yes	Yes
Sediment sorting within the primary path of flow	Yes	Yes	Yes	Yes
Sediment shelving or a natural line impressed on the banks	Yes	Yes	Yes	Yes
Change in plant community (absence or destruction of terrestrial vegetation and/or transition to species adapted for flow or inundation for a long duration, including hydrophytes)	Yes	Yes	Yes	Yes
Development of channel pattern (meander bends and/or channel braiding) at natural topographic breaks, woody debris piles, or plant root systems	Yes	Yes	Yes	Yes
Exposure of woody plant roots within the primary path of flow	No	No	No	No
Other:				

Table 13J. UT8 Channel Evidence

UT8 Downstream Channel Evidence	Year 1 (2019)	Year 2 (2020)	Year 3 (2021)	Year 4 (2022)
Max consecutive days channel flow	49	89	69	108
Presence of litter and debris (wracking)	Yes	Yes	Yes	Yes
Leaf litter disturbed or washed away	Yes	Yes	Yes	Yes
Matted, bent, or absence of vegetation (herbaceous or otherwise)	Yes	Yes	Yes	Yes
Sediment deposition and/or scour indicating sediment transport	Yes	Yes	Yes	Yes
Water staining due to continual presence of water	Yes	Yes	Yes	Yes
Formation of channel bed and banks	Yes	Yes	Yes	Yes
Sediment sorting within the primary path of flow	Yes	Yes	Yes	Yes
Sediment shelving or a natural line impressed on the banks	Yes	Yes	Yes	Yes
Change in plant community (absence or destruction of terrestrial vegetation and/or transition to species adapted for flow or inundation for a long duration, including hydrophytes)	Yes	Yes	Yes	Yes
Development of channel pattern (meander bends and/or channel braiding) at natural topographic breaks, woody debris piles, or plant root systems	Yes	Yes	Yes	Yes
Exposure of woody plant roots within the primary path of flow	No	No	No	No
Other:				


Heron Stream Flow Gauge UT1
Year 4 (2022 Data)
Stream Stage Level (in)
Rainfall Amounts (in)
Erratic data indicated gauge malfunction early in the year. Gauge was relaunched 3/22 and continued to have issues, with total failure after 4/20. Gauge was replaced with Onset U-20 on 7/29.
89 Days
30
28
26
24
22
20
18
16
14
12
10
8
6
4
2
0
-2
-4
-6
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
1/1/22
1/11/22
1/21/22
1/31/22
2/10/22
2/20/22
3/2/22
3/12/22
3/22/22
4/1/22
4/11/22
4/21/22
5/1/22
5/11/22
5/21/22
5/31/22
6/10/22
6/20/22
6/30/22
7/10/22
7/20/22
7/30/22
8/9/22
8/19/22
8/29/22
9/8/22
9/18/22
9/28/22
10/8/22
10/18/22
10/28/22
11/7/22
11/17/22
11/27/22
12/7/22
12/17/22
12/27/22


Heron Stream Flow Gauge UT2
Year 4 (2022 Data)
Stream Stage Level (in)
Rainfall Amounts (in)
61 Days
30
28
26
24
22
20
18
16
14
12
10
8
6
4
2
0
-2
-4
-6
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
1/1/22
1/11/22
1/21/22
1/31/22
2/10/22
2/20/22
3/2/22
3/12/22
3/22/22
4/1/22
4/11/22
4/21/22
5/1/22
5/11/22
5/21/22
5/31/22
6/10/22
6/20/22
6/30/22
7/10/22
7/20/22
7/30/22
8/9/22
8/19/22
8/29/22
9/8/22
9/18/22
9/28/22
10/8/22
10/18/22
10/28/22
11/7/22
11/17/22
11/27/22
12/7/22
12/17/22
12/27/22


Heron Stream Flow Gauge UT3
Year 4 (2022 Data)
Stream Stage Level (in)
Rainfall Amounts (in)
131 Days
30
28
26
24
22
20
18
16
14
12
10
8
6
4
2
0
-2
-4
-6
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
1/1/22
1/11/22
1/21/22
1/31/22
2/10/22
2/20/22
3/2/22
3/12/22
3/22/22
4/1/22
4/11/22
4/21/22
5/1/22
5/11/22
5/21/22
5/31/22
6/10/22
6/20/22
6/30/22
7/10/22
7/20/22
7/30/22
8/9/22
8/19/22
8/29/22
9/8/22
9/18/22
9/28/22
10/8/22
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10/28/22
11/7/22
11/17/22
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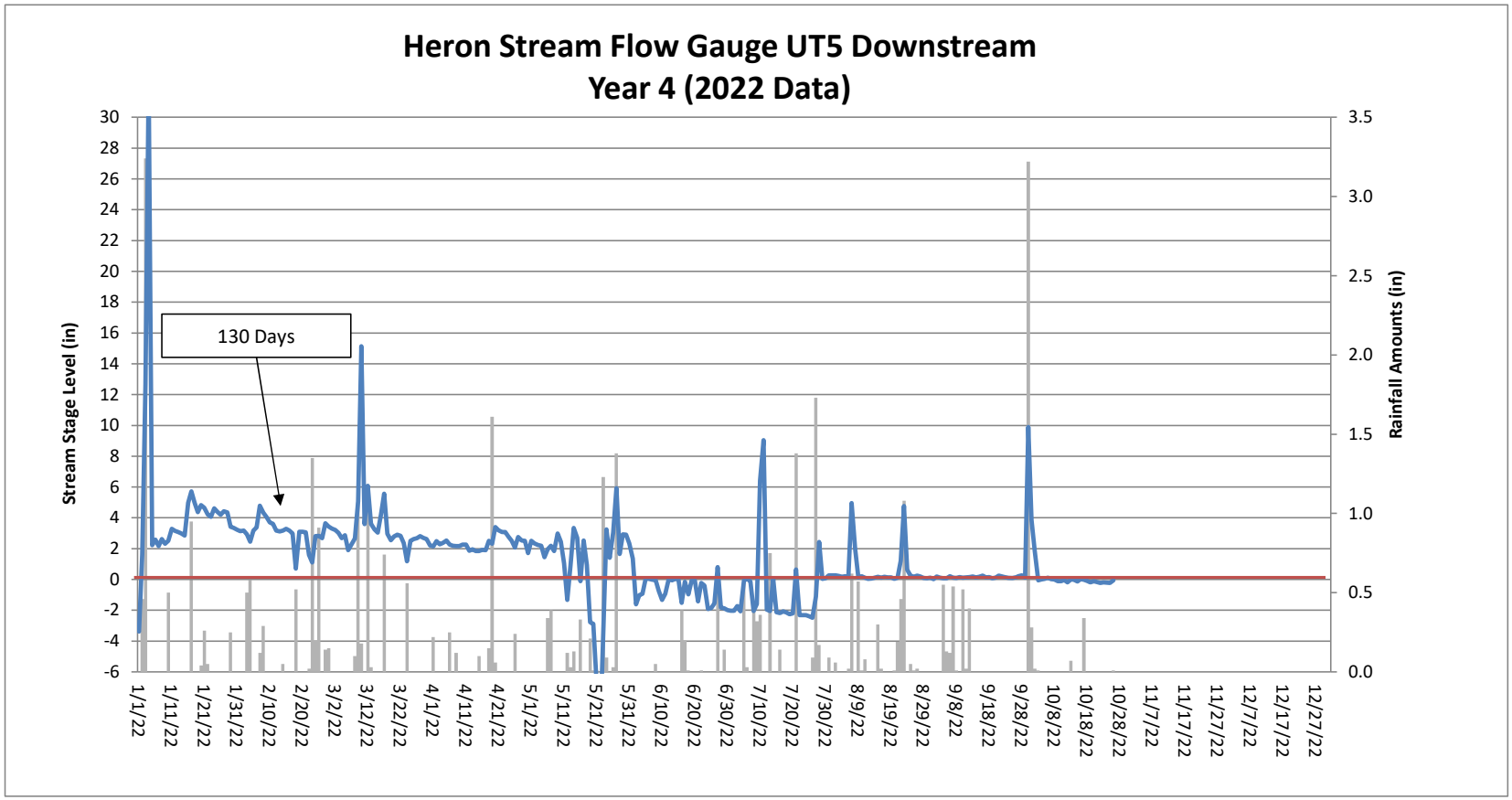
12/7/22
12/17/22
12/27/22


Heron Stream Flow Gauge UT5 Downstream
Year 4 (2022 Data)
Stream Stage Level (in)
Rainfall Amounts (in)
130 Days
30
28
26
24
22
20
18
16
14
12
10
8
6
4
2
0
-2
-4
-6
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
1/1/22
1/11/22
1/21/22
1/31/22
2/10/22
2/20/22
3/2/22
3/12/22
3/22/22
4/1/22
4/11/22
4/21/22
5/1/22
5/11/22
5/21/22
5/31/22
6/10/22
6/20/22
6/30/22
7/10/22
7/20/22
7/30/22
8/9/22
8/19/22
8/29/22
9/8/22
9/18/22
9/28/22
10/8/22
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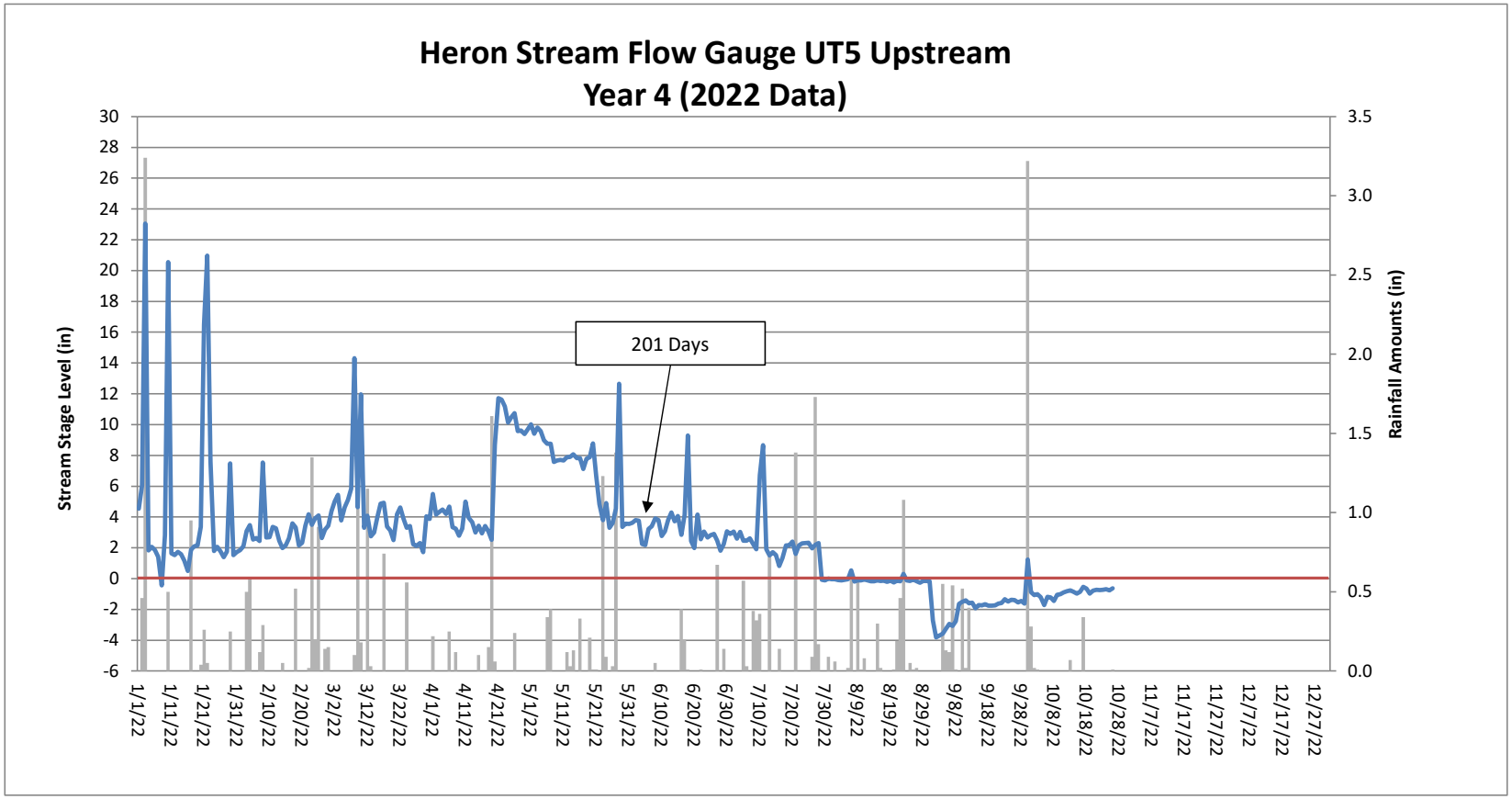
12/7/22
12/17/22
12/27/22


Heron Stream Flow Gauge UT5 Upstream
Year 4 (2022 Data)
Stream Stage Level (in)
Rainfall Amounts (in)
201 Days
30
28
26
24
22
20
18
16
14
12
10
8
6
4
2
0
-2
-4
-6
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
1/1/22
1/11/22
1/21/22
1/31/22
2/10/22
2/20/22
3/2/22
3/12/22
3/22/22
4/1/22
4/11/22
4/21/22
5/1/22
5/11/22
5/21/22
5/31/22
6/10/22
6/20/22
6/30/22
7/10/22
7/20/22
7/30/22
8/9/22
8/19/22
8/29/22
9/8/22
9/18/22
9/28/22
10/8/22
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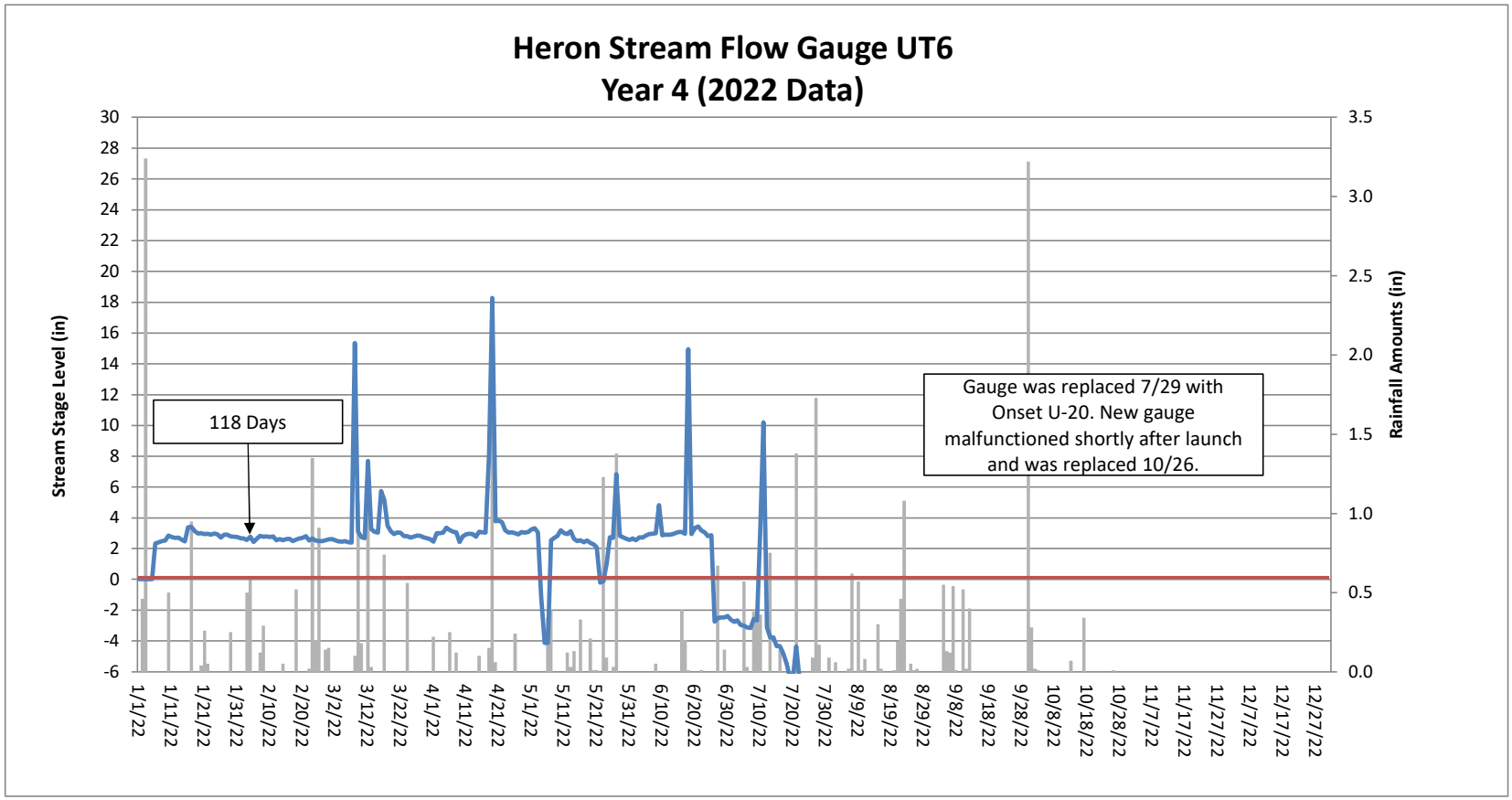
12/7/22
12/17/22
12/27/22


Heron Stream Flow Gauge UT6
Year 4 (2022 Data)
Stream Stage Level (in)
Rainfall Amounts (in)
30
28
26
24
22
20
18
16
14
12
10
8
6
4
2
0
-2
-4
-6
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
118 Days
Gauge was replaced 7/29 with Onset U-20. New gauge malfunctioned shortly after launch and was replaced 10/26.
1/1/22
1/11/22
1/21/22
1/31/22
2/10/22
2/20/22
3/2/22
3/12/22
3/22/22
4/1/22
4/11/22
4/21/22
5/1/22
5/11/22
5/21/22
5/31/22
6/10/22
6/20/22
6/30/22
7/10/22
7/20/22
7/30/22
8/9/22
8/19/22
8/29/22
9/8/22
9/18/22
9/28/22
10/8/22
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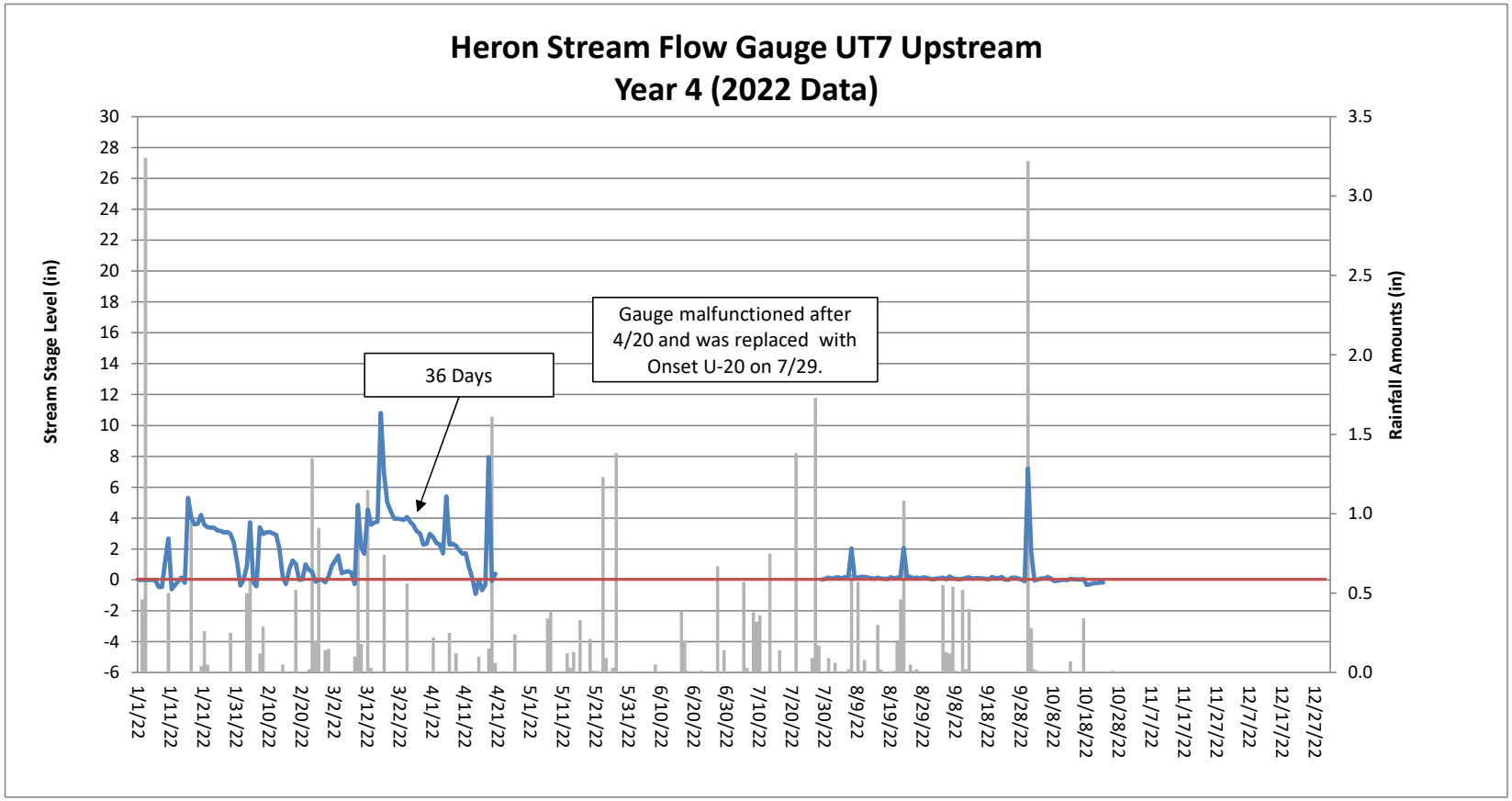
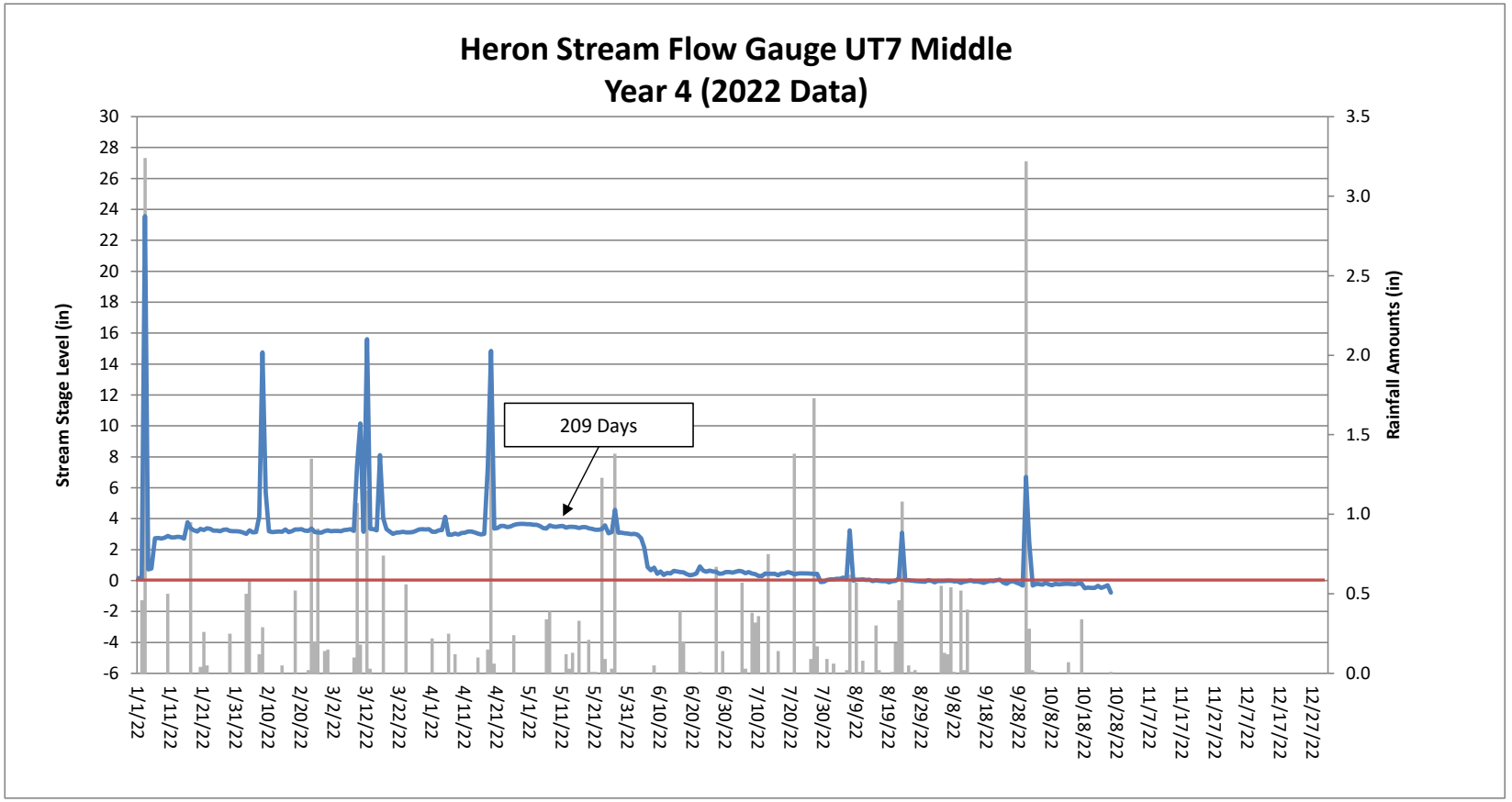
11/27/22
12/7/22
12/17/22
12/27/22


Heron Stream Flow Gauge UT7 Upstream
Year 4 (2022 Data)
Stream Stage Level (in)
Rainfall Amounts (in)
30
28
26
24
22
20
18
16
14
12
10
8
6
4
2
0
-2
-4
-6
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
36 Days
Gauge malfunctioned after 4/20 and was replaced with Onset U-20 on 7/29.
1/1/22
1/11/22
1/21/22
1/31/22
2/10/22
2/20/22
3/2/22
3/12/22
3/22/22
4/1/22
4/11/22
4/21/22
5/1/22
5/11/22
5/21/22
5/31/22
6/10/22
6/20/22
6/30/22
7/10/22
7/20/22
7/30/22
8/9/22
8/19/22
8/29/22
9/8/22
9/18/22
9/28/22
10/8/22
10/18/22
10/28/22
11/7/22
11/17/22
11/27/22
12/7/22
12/17/22
12/27/22


Heron Stream Flow Gauge UT7 Middle
Year 4 (2022 Data)
Stream Stage Level (in)
Rainfall Amounts (in)
209 Days
30
28
26
24
22
20
18
16
14
12
10
8
6
4
2
0
-2
-4
-6
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
1/1/22
1/11/22
1/21/22
1/31/22
2/10/22
2/20/22
3/2/22
3/12/22
3/22/22
4/1/22
4/11/22
4/21/22
5/1/22
5/11/22
5/21/22
5/31/22
6/10/22
6/20/22
6/30/22
7/10/22
7/20/22
7/30/22
8/9/22
8/19/22
8/29/22
9/8/22
9/18/22
9/28/22
10/8/22
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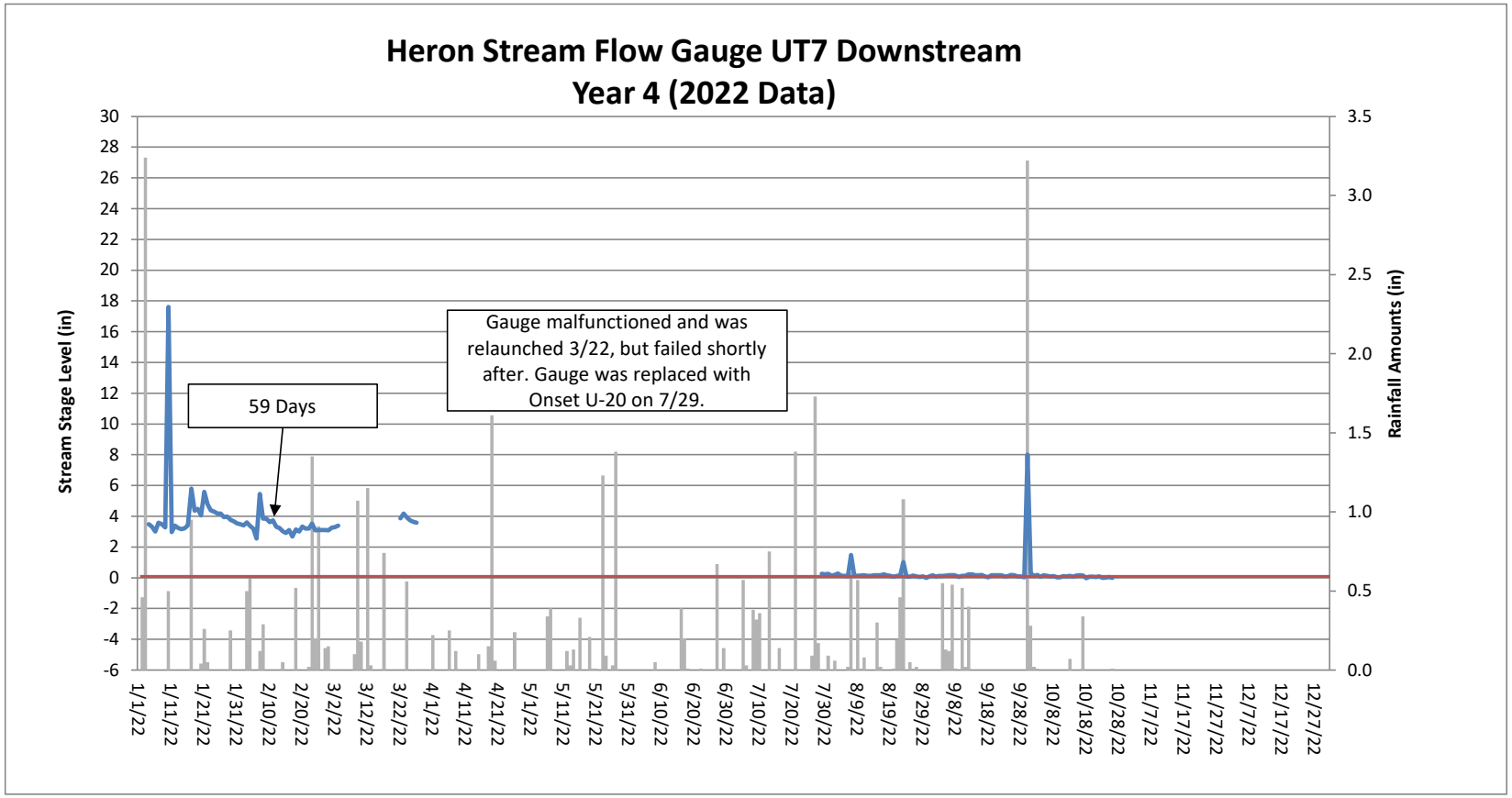
11/17/22
11/27/22
12/7/22
12/17/22
12/27/22


Heron Stream Flow Gauge UT7 Downstream
Year 4 (2022 Data)
Stream Stage Level (in)
Rainfall Amounts (in)
30
28
26
24
22
20
18
16
14
12
10
8
6
4
2
0
-2
-4
-6
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
59 Days
Gauge malfunctioned and was relaunched 3/22, but failed shortly after. Gauge was replaced with Onset U-20 on 7/29.
1/1/22
1/11/22
1/21/22
1/31/22
2/10/22
2/20/22
3/2/22
3/12/22
3/22/22
4/1/22
4/11/22
4/21/22
5/1/22
5/11/22
5/21/22
5/31/22
6/10/22
6/20/22
6/30/22
7/10/22
7/20/22
7/30/22
8/9/22
8/19/22
8/29/22
9/8/22
9/18/22
9/28/22
10/8/22
10/18/22
10/28/22
11/7/22
11/17/22
11/27/22
12/7/22
12/17/22
12/27/22

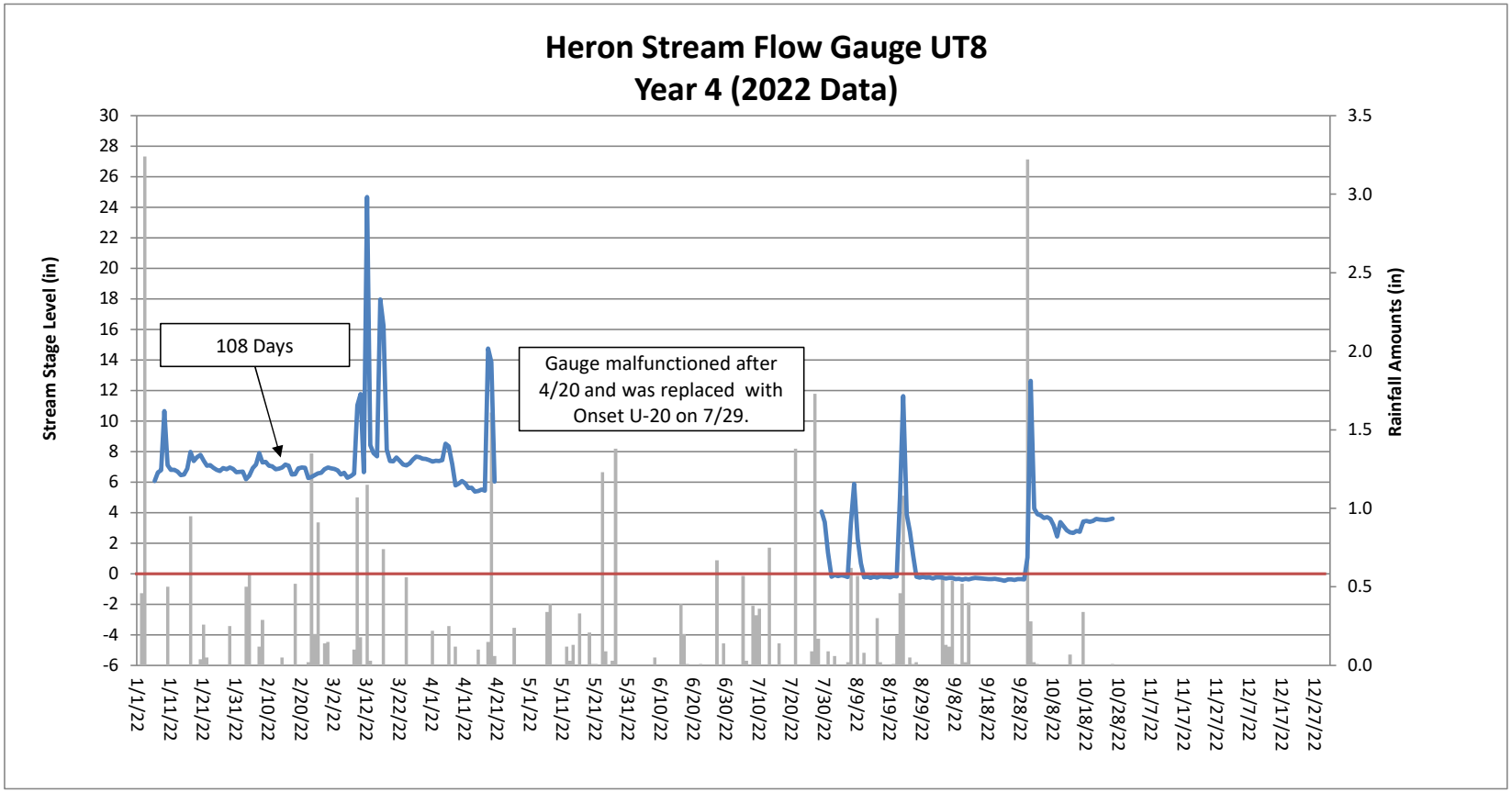

Heron Stream Flow Gauge UT8
Year 4 (2022 Data)
Stream Stage Level (in)
Rainfall Amounts (in)
108 Days
Gauge malfunctioned after 4/20 and was replaced with Onset U-20 on 7/29.
30
28
26
24
22
20
18
16
14
12
10
8
6
4
2
0
-2
-4
-6
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
1/1/22
1/11/22
1/21/22
1/31/22
2/10/22
2/20/22
3/2/22
3/12/22
3/22/22
4/1/22
4/11/22
4/21/22
5/1/22
5/11/22
5/21/22
5/31/22
6/10/22
6/20/22
6/30/22
7/10/22
7/20/22
7/30/22
8/9/22
8/19/22
8/29/22
9/8/22
9/18/22
9/28/22
10/8/22
10/18/22
10/28/22
11/7/22
11/17/22
11/27/22
12/7/22
12/17/22
12/27/22

Table 14. Verification of Bankfull Events

Date of Data Collection	Date of Occurrence	Method	Photo (if available)
August 26, 2019	July 7, 2019	Stream gauge data indicates a bankfull event occurred after 4.06 inches of rain was documented on July 7, 2019 at an onsite rain gauge	--
August 26, 2019	August 22, 2019	A bankfull event likely occurred after 7.16 inches of rain was documented between August 20-22, 2019 at an onsite rain gauge	--
July 1, 2020	May 21, 2020	Wrack and laid-back vegetation were observed on the TOB of UT4 after 3.03 inches of rain was documented between May 19 and 21, 2020 at an onsite rain gauge.	1
November 16, 2020	November 12, 2020	Wrack and laid-back vegetation were observed on the TOB of UT1 after 3.13 inches of rain was documented between November 11 and 12, 2020 at an onsite rain gauge.	2
December 14, 2020	December 14, 2020	A bankfull event was documented on UT8 by trail camera and stream gauge evidence after 0.82 inches of rain were captured at an onsite rain gauge.	3
January 31. 2021	January 31. 2021	A bankfull was documented on UT3 by trail camera and stream gauge evidence after 0.56 inches of rain were captured by an onsite rain gauge between January 25-28.	4
February 16, 2021	February 13-16, 2021	A bankfull event was documented on UT1B during a site visit after 1.38 inches of rain were captured by an onsite rain gauge between February 13-16, 2021.	5
April 20, 2022	April 19, 2022	A bankfull event was documented during a site visit after 1.76 inches of rain were captured by an onsite rain gauge on April 18-19, 2022.	6-10

Photo 1: Wrack and laid-back vegetation along the TOB of UT4 after a bankfull event.

Photo 2: Wrack and laid-back vegetation along the TOB of UT1 after a bankfull event.

Photo 3: UT8 bankfull event documented on December 14, 2020 after 0.82 inches of rain.

Photo 4: UT3 bankfull event documented on January 31, 2020 after 0.56 inches of rain.

Photo 5: Bankfull event on UT1B on February 16 after 1.38 inches fell between February 13 – 16, 2021.

Photo 6: Bankfull event on UT5 during 1.76 inch rain event on April 18-19, 2022.

Photo 7: Wrack after a bankfull event on UT1 following 1.76 inch rain event on April 18-19, 2022.

Photo 8: Wrack after a bankfull event on UT4 following 1.76 inch rain event on April 18-19, 2022.

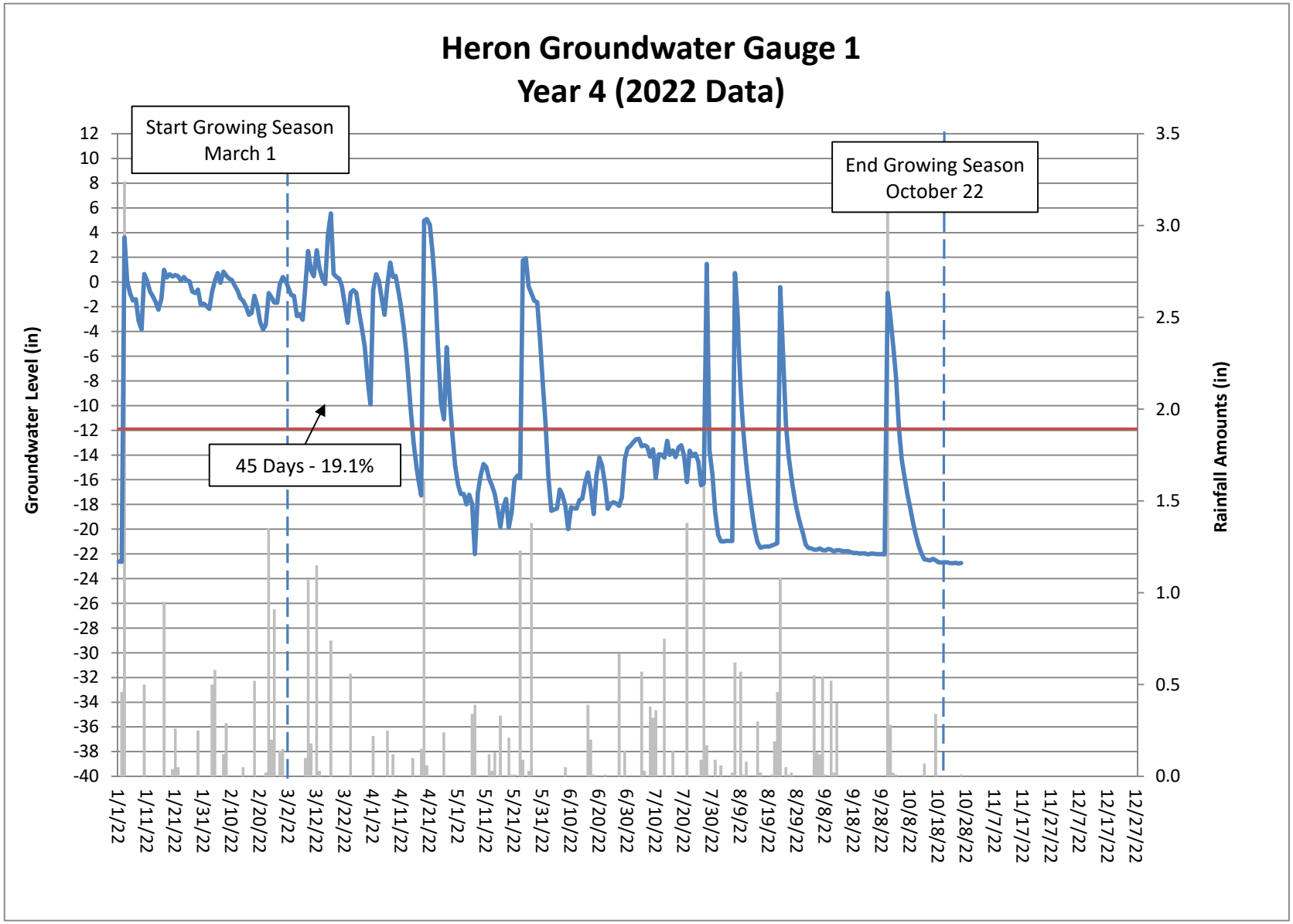
Photo 9: Wrack after a bankfull event on UT7 following 1.76 inch rain event on April 18-19, 2022.

Photo 10: Wrack after a bankfull event on UT8 following 1.76 inch rain event on April 18-19, 2022.

Table 15. Groundwater Hydrology Data

Gauge	Success Criteria Achieved/Max Consecutive Days During Growing Season (Percentage)						
	Year 1 (2019)	Year 2 (2020)	Year 3 (2021)	Year 4 (2022)	Year 5 (2023)	Year 6 (2024)	Year 7 (2025)
1	Yes/33 days (15.8%)	Yes/23 days (9.8%)	Yes /46 days (19.5%)	Yes /45 days (19.1%)			
2	Yes/26 days (12.4%)	Yes/27 days (11.5%)	Yes/47 days (19.9%)	Yes/66 days (28.1%)			
3	Yes/35 days (16.7%)	Yes/28 days (12.0%)	Yes/36 days (15.2%)	Yes/66 days (28.1%)			
4	Yes/69 days (33.0%)	Yes/51 days (21.8%)	Yes/60 days (25.4%)	Yes/56 days (23.8%)			
5	Yes/52 days (24.9%)	Yes/45 days (19.2%)	Yes/50 days (21.2%)	Yes/52 days (22.1%)			
6	Yes/54 days (25.8%)	Yes/46 days (19.7%)	Yes/52 days (22.0%)	No*/13 days (5.5%)			

* Gauge 6 malfunctioned 3/22/22, was relaunched on 4/20/22, and failed immediately after. This resulted in data loss during this time-period. It is expected that gauge 6 would have met success criteria during the time of the data loss. All gauges were replaced with new Onset U-20 gauges on 7/29/22.


Heron Groundwater Gauge 1
Year 4 (2022 Data)
Start Growing Season
March 1
End Growing Season
October 22
45 Days - 19.1%
Groundwater Level (in)
Rainfall Amounts (in)
12
10
8
6
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
-24
-26
-28
-30
-32
-34
-36
-38
-40
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
1/1/22
1/11/22
1/21/22
1/31/22
2/10/22
2/20/22
3/2/22
3/12/22
3/22/22
4/1/22
4/11/22
4/21/22
5/1/22
5/11/22
5/21/22
5/31/22
6/10/22
6/20/22
6/30/22
7/10/22
7/20/22
7/30/22
8/9/22
8/19/22
8/29/22
9/8/22
9/18/22
9/28/22
10/8/22
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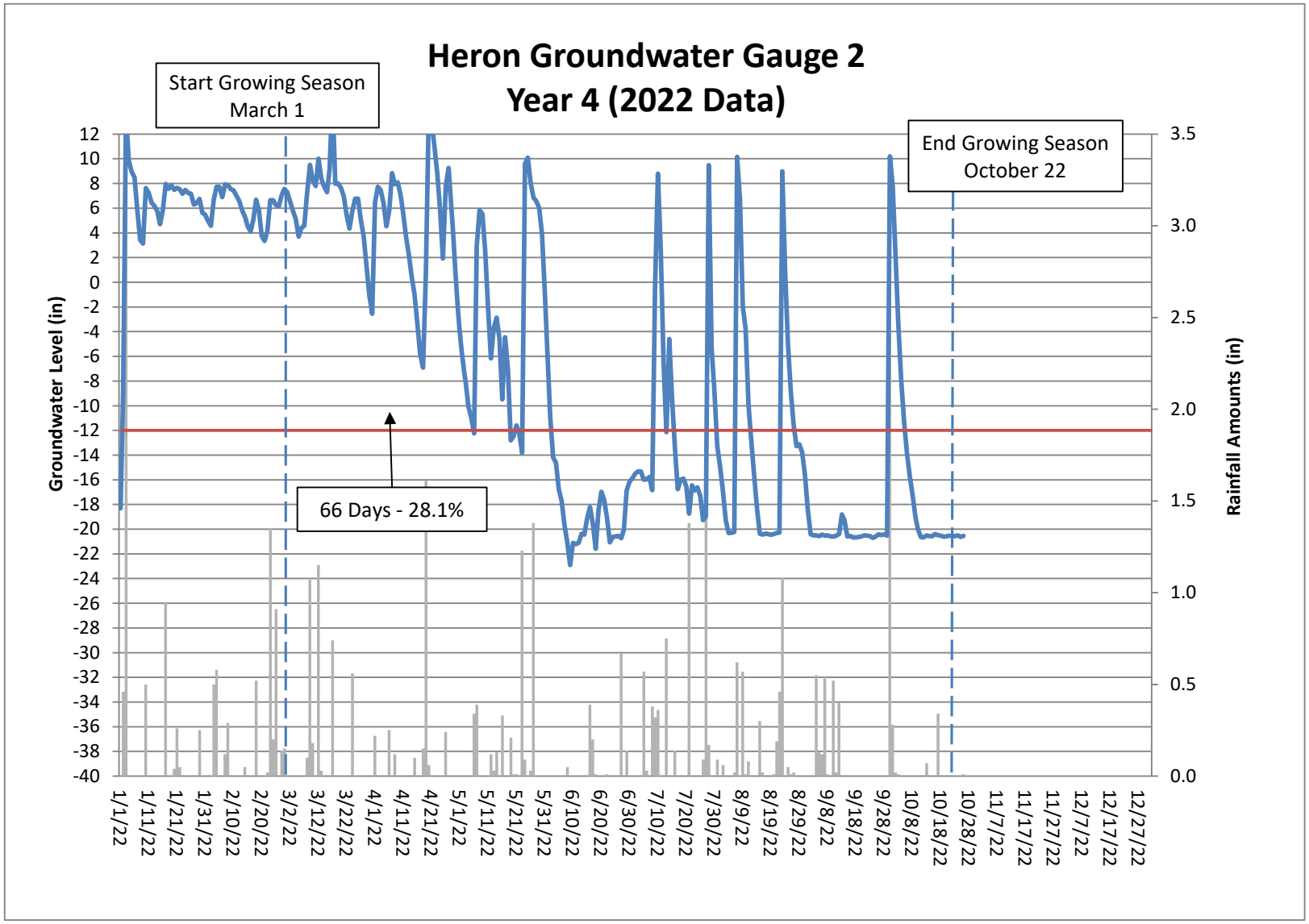
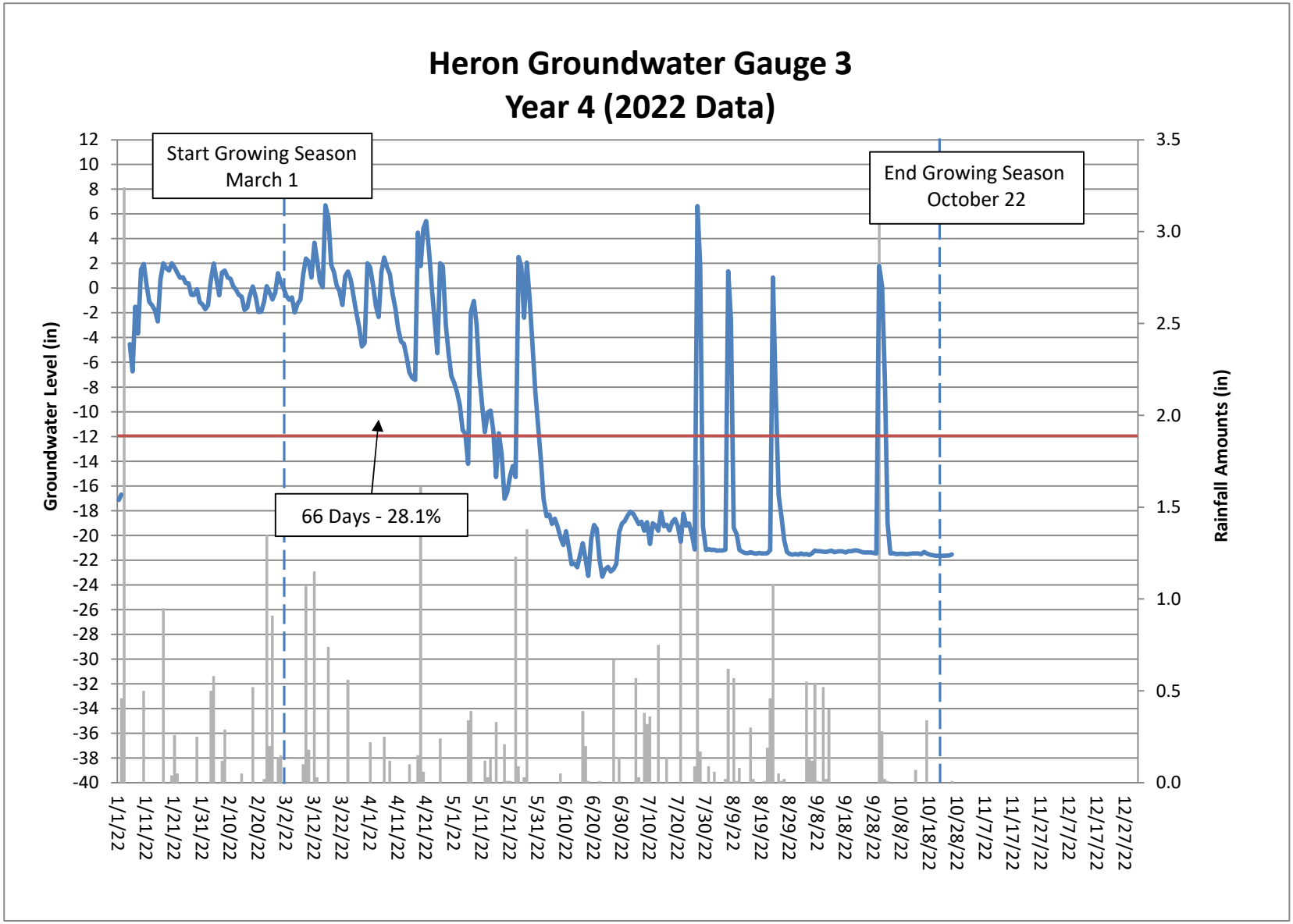
11/27/22
12/7/22
12/17/22
12/27/22


Heron Groundwater Gauge 2
Year 4 (2022 Data)
Start Growing Season
March 1
End Growing Season
October 22
66 Days - 28.1%
Groundwater Level (in)
Rainfall Amounts (in)
12
10
8
6
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
-24
-26
-28
-30
-32
-34
-36
-38
-40
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
1/1/22
1/11/22
1/21/22
1/31/22
2/10/22
2/20/22
3/2/22
3/12/22
3/22/22
4/1/22
4/11/22
4/21/22
5/1/22
5/11/22
5/21/22
5/31/22
6/10/22
6/20/22
6/30/22
7/10/22
7/20/22
7/30/22
8/9/22
8/19/22
8/29/22
9/8/22
9/18/22
9/28/22
10/8/22
10/18/22
10/28/22
11/7/22
11/17/22
11/27/22
12/7/22
12/17/22
12/27/22


Heron Groundwater Gauge 3
Year 4 (2022 Data)
Start Growing Season
March 1
End Growing Season
October 22
66 Days - 28.1%
Groundwater Level (in)
Rainfall Amounts (in)
12
10
8
6
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
-24
-26
-28
-30
-32
-34
-36
-38
-40
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
1/1/22
1/11/22
1/21/22
1/31/22
2/10/22
2/20/22
3/2/22
3/12/22
3/22/22
4/1/22
4/11/22
4/21/22
5/1/22
5/11/22
5/21/22
5/31/22
6/10/22
6/20/22
6/30/22
7/10/22
7/20/22
7/30/22
8/9/22
8/19/22
8/29/22
9/8/22
9/18/22
9/28/22
10/8/22
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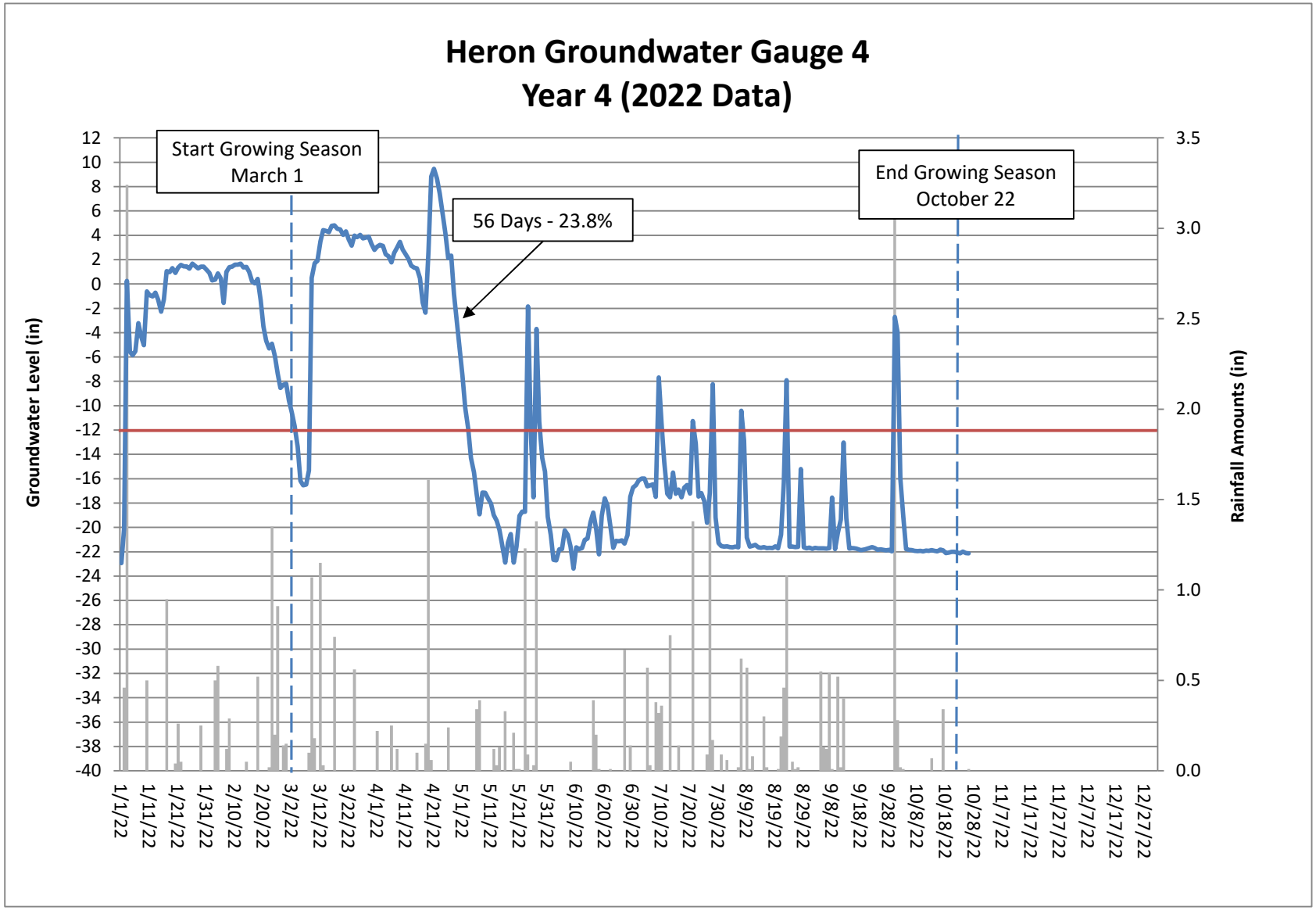
11/27/22
12/7/22
12/17/22
12/27/22


Heron Groundwater Gauge 4
Year 4 (2022 Data)
Start Growing Season
March 1
End Growing Season
October 22
56 Days - 23.8%
Groundwater Level (in)
Rainfall Amounts (in)
12
10
8
6
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
-24
-26
-28
-30
-32
-34
-36
-38
-40
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
1/1/22
1/11/22
1/21/22
1/31/22
2/10/22
2/20/22
3/2/22
3/12/22
3/22/22
4/1/22
4/11/22
4/21/22
5/1/22
5/11/22
5/21/22
5/31/22
6/10/22
6/20/22
6/30/22
7/10/22
7/20/22
7/30/22
8/9/22
8/19/22
8/29/22
9/8/22
9/18/22
9/28/22
10/8/22
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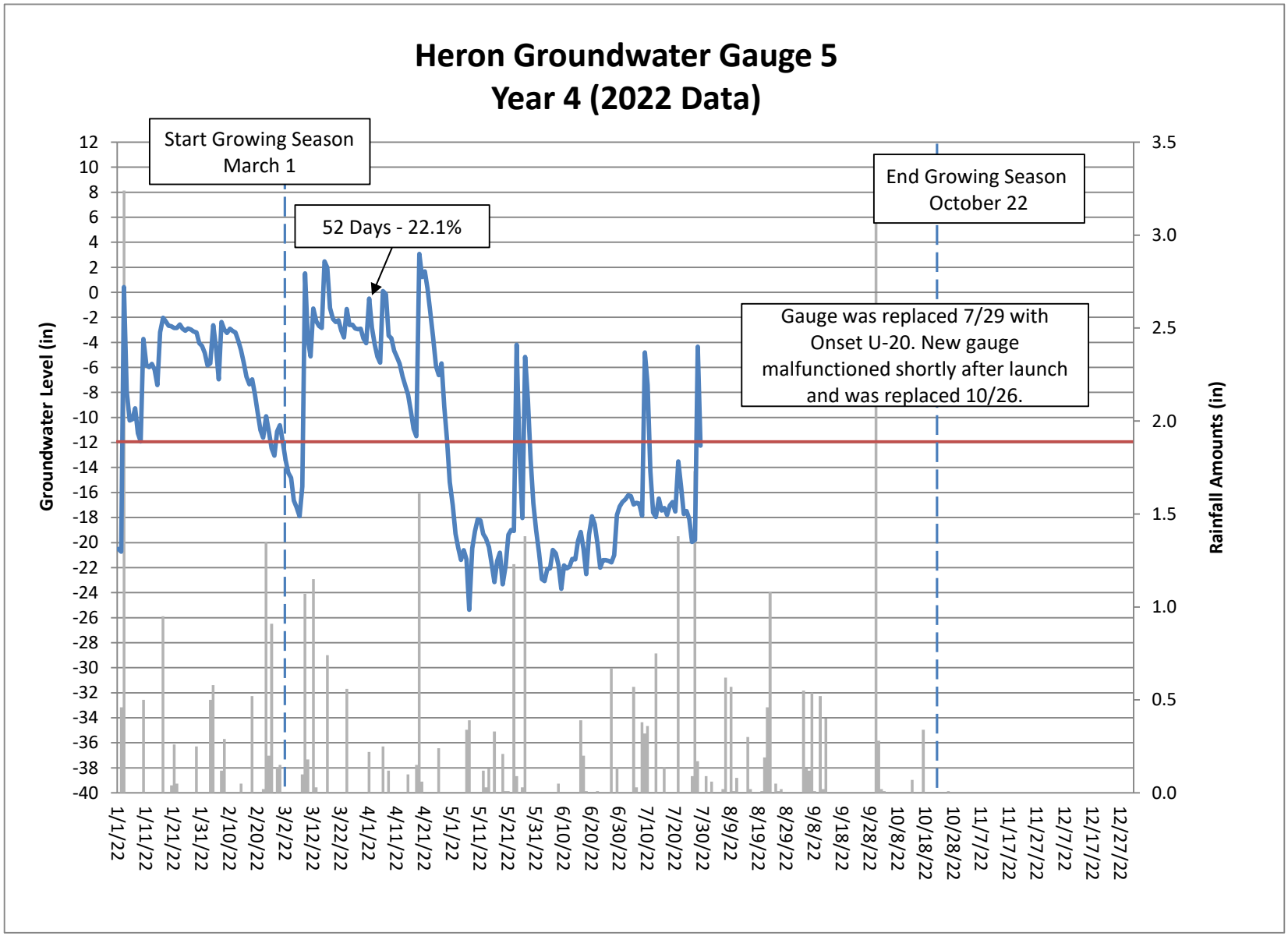
11/7/22
11/17/22
11/27/22
12/7/22
12/17/22
12/27/22


Heron Groundwater Gauge 5
Year 4 (2022 Data)
Start Growing Season
March 1
52 Days - 22.1%
End Growing Season
October 22
Gauge was replaced 7/29 with
Onset U-20. New gauge
malfunctioned shortly after launch
and was replaced 10/26.
Groundwater Level (in)
Rainfall Amounts (in)
12
10
8
6
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
-24
-26
-28
-30
-32
-34
-36
-38
-40
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
1/1/22
1/11/22
1/21/22
1/31/22
2/10/22
2/20/22
3/2/22
3/12/22
3/22/22
4/1/22
4/11/22
4/21/22
5/1/22
5/11/22
5/21/22
5/31/22
6/10/22
6/20/22
6/30/22
7/10/22
7/20/22
7/30/22
8/9/22
8/19/22
8/29/22
9/8/22
9/18/22
9/28/22
10/8/22
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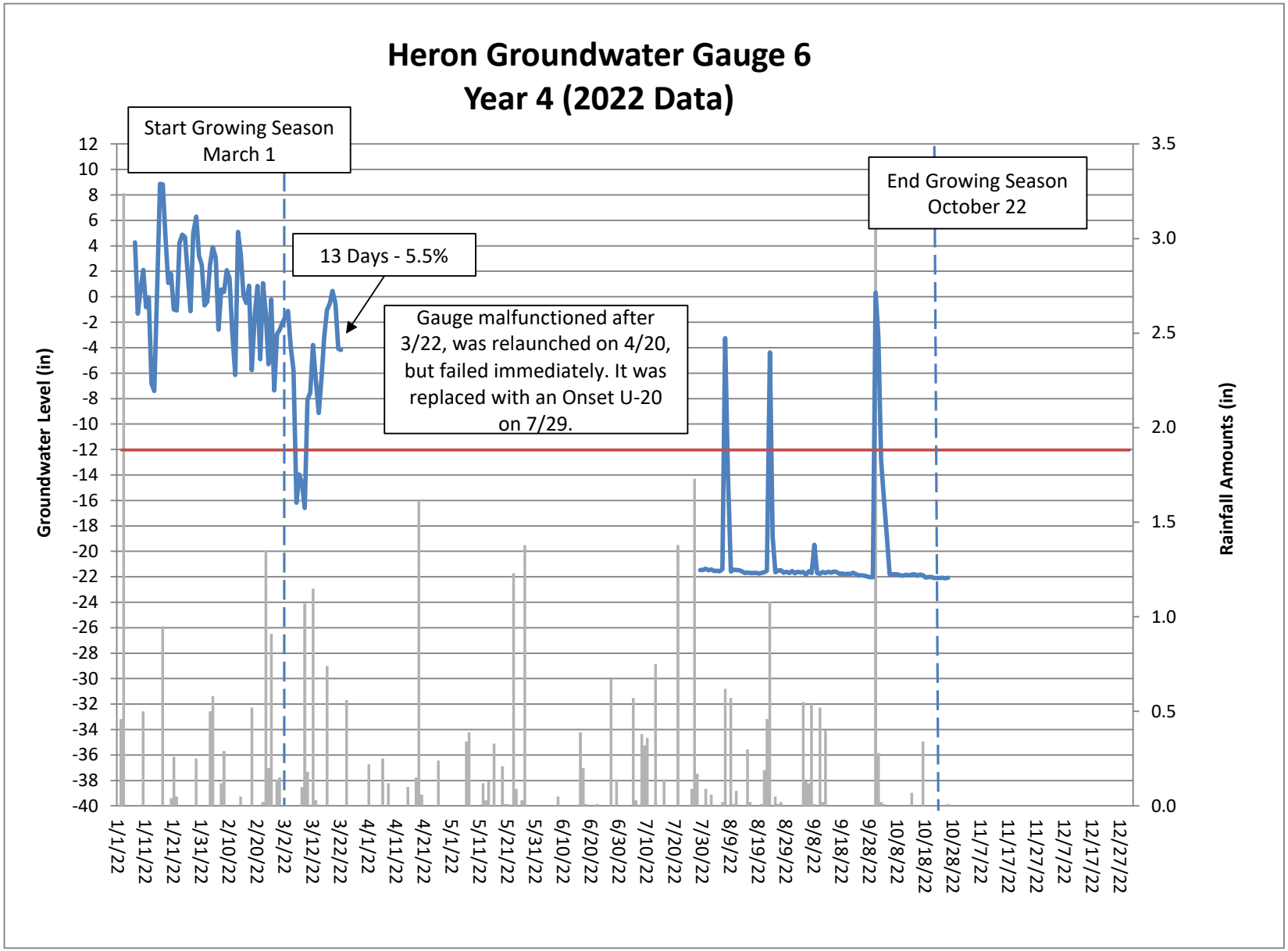
11/27/22
12/7/22
12/17/22
12/27/22


Heron Groundwater Gauge 6
Year 4 (2022 Data)
Start Growing Season
March 1
End Growing Season
October 22
13 Days - 5.5%
Gauge malfunctioned after 3/22, was relaunched on 4/20, but failed immediately. It was replaced with an Onset U-20 on 7/29.
Groundwater Level (in)
Rainfall Amounts (in)
12
10
8
6
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
-24
-26
-28
-30
-32
-34
-36
-38
-40
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
1/1/22
1/11/22
1/21/22
1/31/22
2/10/22
2/20/22
3/2/22
3/12/22
3/22/22
4/1/22
4/11/22
4/21/22
5/1/22
5/11/22
5/21/22
5/31/22
6/10/22
6/20/22
6/30/22
7/10/22
7/20/22
7/30/22
8/9/22
8/19/22
8/29/22
9/8/22
9/18/22
9/28/22
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11/27/22
12/7/22
12/17/22
12/27/22

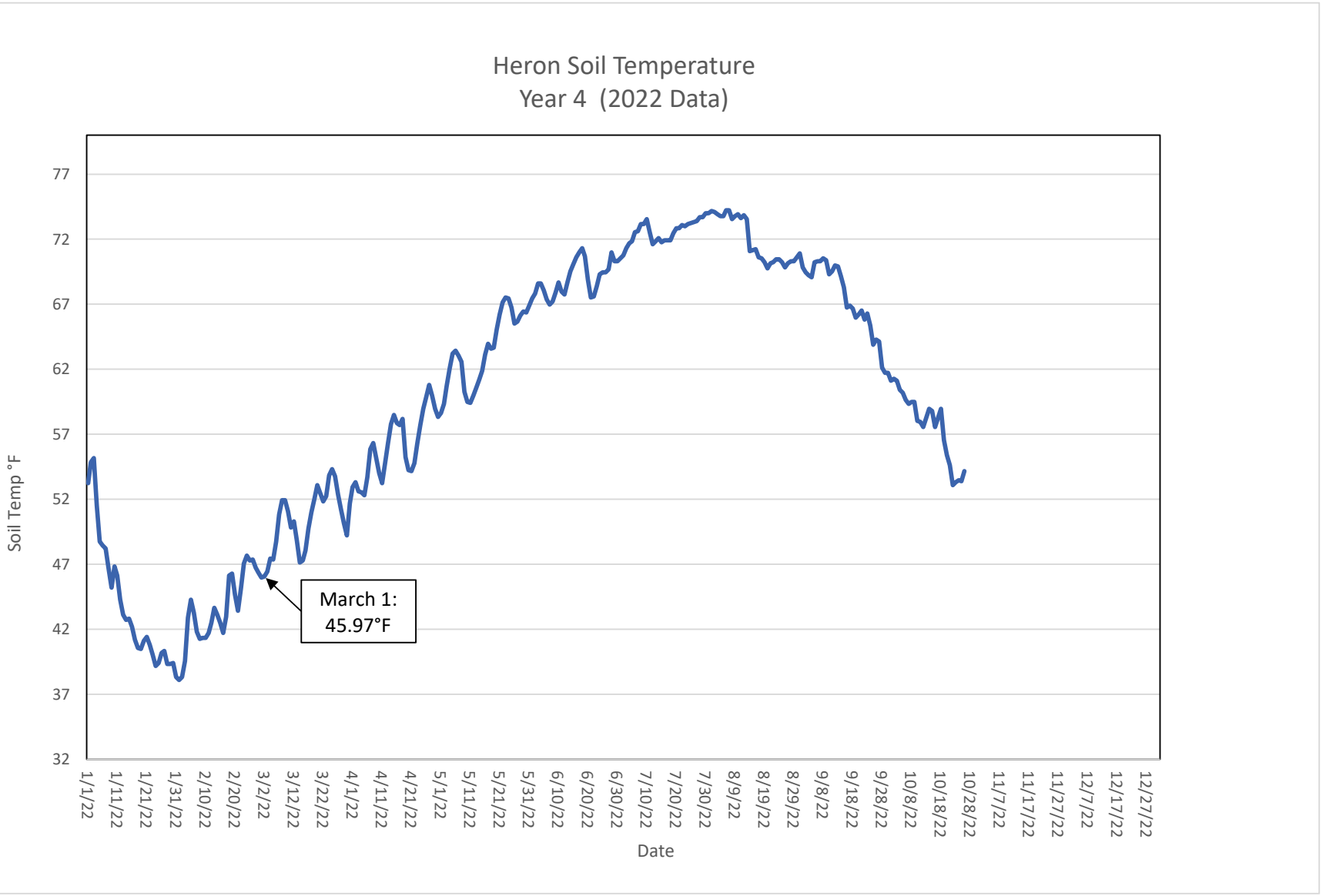
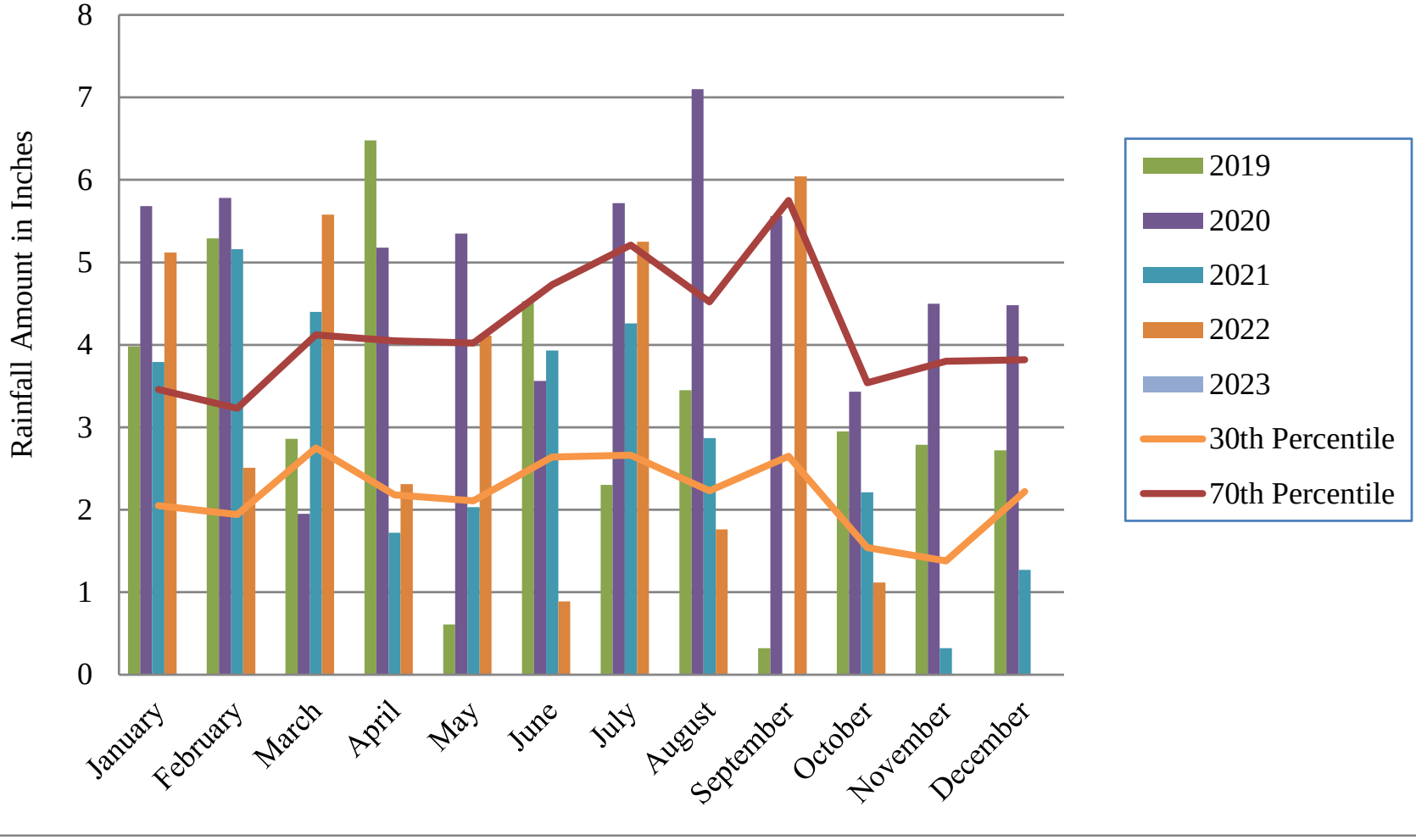

Heron Soil Temperature
Year 4 (2022 Data)
Soil Temp °F
77
72
67
62
57
52
47
42
37
32
March 1:
45.97°F
1/1/22
1/11/22
1/21/22
1/31/22
2/10/22
2/20/22
3/2/22
3/12/22
3/22/22
4/1/22
4/11/22
4/21/22
5/1/22
5/11/22
5/21/22
5/31/22
6/10/22
6/20/22
6/30/22
7/10/22
7/20/22
7/30/22
8/9/22
8/19/22
8/29/22
9/8/22
9/18/22
9/28/22
10/8/22
10/18/22
10/28/22
11/7/22
11/17/22
11/27/22
12/7/22
12/17/22
12/27/22
Date

Figure E1: Heron
30-70 Percentile Graph for Rainfall
Current year data from on-site rain gauge
30-70th percentile data from WETS Station: Burlington Alamance Regional Airport, NC

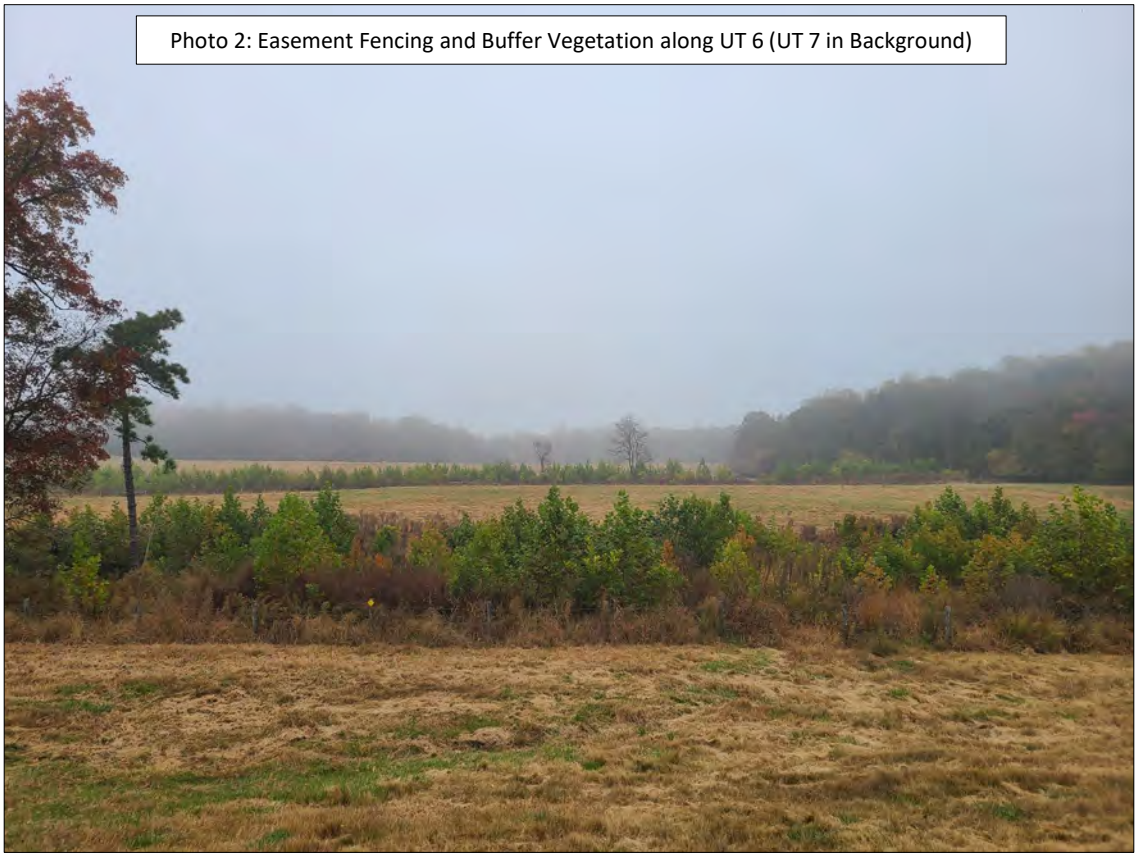


Appendix F.
Site Photo Log

Heron
MY-04 (2022) Photo Log

Photo 1: Easement Fencing and Buffer Vegetation along UT 4

Photo 2: Easement Fencing and Buffer Vegetation along UT 6 (UT 7 in Background)



Heron
MY-04 (2022) Photo Log

Photo 3: Buffer Vegetation along UT 5

Photo 4: Easement Fencing and Buffer Vegetation along UT 7

Heron
MY-04 (2022) Photo Log

Photo 5: UT 1B Piped Crossing – Upstream End

Photo 6: UT 1B Piped Crossing – Downstream End

Heron
MY-04 (2022) Photo Log

Photo 7: UT 4 Piped Crossing – Upstream End

Photo 8: UT 4 Piped Crossing – Downstream End

Heron
MY-04 (2022) Photo Log

Photo 9: UT 5A Piped Crossing – Upstream End

Photo 10: UT 5A Piped Crossing – Downstream End

Heron
MY-04 (2022) Photo Log

Photo 11: UT 7A Piped Crossing – Upstream End

Photo 12: UT 7A Piped Crossing – Downstream End

Heron
MY-04 (2022) Photo Log

Photo 13: UT 7B Easement Break – Facing north
(Note: No photo taken at upstream end due to hornet nest)

Photo 14: UT 7B Easement Break – Downstream End

Heron
MY-04 (2022) Photo Log

Photo 15: Bud Burst of Ulmus americana
Photo Taken 2/28/22

Photo 16: Bud Burst of Nyssa sylvatica
Photo Taken 2/28/22

Heron
MY-04 (2022) Photo Log

Photo 17: UT1 Flow 1/20/22

Photo 18: UT1 Flow 3/14/22

Heron
MY-04 (2022) Photo Log

Photo 19: UT5 Flow 1/24/22

Photo 20: UT5 Flow 4/3/22

Heron
MY-04 (2022) Photo Log

Photo 21: UT6 Flow 1/10/22

Photo 22: UT6 Flow 2/5/22

Heron
MY-04 (2022) Photo Log

Photo 23: UT7 Flow 1/15/22

Photo 24: UT7 Flow 3/29/22

Heron
MY-04 (2022) Photo Log

Photo 25: UT8 Flow 4/20/22

Photo 26: Herons along UT8