# Annual Monitoring Report Final
# Monitoring Year 1 of 5
# Hogan Creek Stream Mitigation Project

DEQ Contract Number: 6496
USACE Action ID: SAW-2011-02268
DWR Project Number: 20120182
SCO# 09-08566-01

Surry County, North Carolina
Data Collected: October 26-December 11, 2015
Data Submitted: January 2016


Submitted to:

NCDEQ - Division of Mitigation Services
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## 1.0 PROJECT SUMMARY

The NCDEQ Division of Mitigation Services (DMS) restored, enhanced, and preserved a total of 9,923 linear feet (LF) of stream channel at the Hogan Creek Stream Mitigation Site (Site) in Surry County, North Carolina generating 5,089 Stream Mitigation Units (SMUs). The restoration project was developed to fulfill stream mitigation requirements accepted by DMS for the Upper Yadkin River Basin Hydrologic Unit Code (HUC) 03040101. This report documents the results of the Monitoring Year 1 monitoring efforts (MY1).

### 1.1 Project Goals

The project goals identified in the Mitigation Plan (Confluence, 2012) include:

- Improve water quality in Hogan Creek and the UTs through reductions in sediment and nutrient inputs from local sources;
- Create conditions for dynamic equilibrium of water and sediment movement between the supply reaches and project reaches;
- Promote floodwater attenuation and secondary functions associated with more frequent and extensive floodwater contact times;
- Improve in-stream habitat by increasing the diversity of bedform features;
- Enhance and protect native riparian vegetation communities; and
- Reduce fecal, nutrient, and sediment loads to project streams by promoting and implementing livestock best management practices.

### 1.2 Project Performance Standards

The performance of the project will be evaluated in accordance with the geomorphic, visual, hydrology, and vegetation components outlined in the Stream Mitigation Guidelines (USACE 2003). The following are specific performance standards.

| **Performance Standards** | |
|---|---|
| **Proposed Ecological Service Enhancements** | **Metrics/Success Criteria** |
| Flood attenuation | a. Evidence of at least two out-of-bank flows (wrack lines, crest gage data) by year 5<br>b. BHR < 1.2 each year |
| Fine sediment storage | a. Evidence of fine sediment on floodplain at least twice by year 5 |
| Maintenance of stable channel bed and banks | a. Annual changes in riffle cross sectional area generally modest (e.g. <20%) and exhibit a stabilizing trend<br>b. Annual width-depth ratio changes generally modest (e.g. <20%) and exhibit a stabilizing trend |

| | |
|---|---|
| Equilibrium sediment transport | a. No trends in widespread development of robust (e.g. comprised of coarse material and/or vegetated actively diverting flow) mid-channel bar features<br>b. Majority of riffle pebble counts indicate maintenance or coarsening of substrate distributions |
| Maintenance of in-stream riffle and pool habitats | a. Overall number and distributions of riffle and pool features are generally maintained<br>b. Pool depths may vary from year to year, but the majority maintain depths sufficient to be observed as distinct features in the profile<br>c. Majority of riffle pebble counts indicate maintenance or coarsening of substrate distributions |
| Filtration of runoff | a. Evidence of floating debris or fine sediment on buffer vegetation at least twice by year 5 |
| Riparian buffer habitat density and diversity | a. Density of 320 live, planted stems/ac at year 3; 260 live, planted stems/acre at year 5<br>b. Four dominant species at year 5 shall be native<br>c. <20% non-native species at year 5, based on measurements of aerial extent |
| Protection of water quality from nutrient and pathogen inputs | a. Observations of intact livestock fencing and absence of evidence of livestock access to streams each year |
| Protection of banks from livestock trampling | a. Observations of intact livestock fencing and absence of evidence of livestock impacts each year |
| Re-vegetation of areas treated for non-native species | a. Bare soil areas shall comprise no more than 10 percent of the total treated area, based on measurements of aerial extent |

Monitoring will consist of collecting morphological, vegetative, and hydrological data to assess the project success based on the restoration goals and objectives on an annual basis for five years or until the success criteria are met. The success of the project will be assessed using measurements of the stream channel's dimension, substrate composition permanent photographs, vegetation, surface water hydrology, and visual assessments. Monitoring requirements include:

| **Monitoring Requirements** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Parameter** | **Monitoring Feature** | **Quantity Length By Reach (ft)** | | | | | |
| | | **Hogan R1** | **Hogan R2** | **UT1** | **UT2** | **UT3** | **Frequency** |
| Dimension | Riffle XS | 2 | 2 | | 2 | | Annual |
| | Pool XS | 1 | 1 | | 1 | | Annual |
| Pattern/Profile | Longitudinal Profile | 1,500 | 1,000 | | 675 | | Annual |
| Substrate | 100 Pebble Count | 2 | 2 | | | | Annual |
| Hydrology | Crest Gauge | | 1 | | 1 | | Semi-Annual |
| Vegetation | Vegetation Plots | 3 | 2 | | 1 | | Annual |
| Visual Assessment | Project Site | Y | Y | Y | Y | Y | Semi-Annual |
| Reference Photos | Permanent Photo Points | 18 | 6 | 3 | 10 | 4 | Annual |

## 1.3 Project Setting and Background

The Site is located in the Piedmont physiographic province (NCGS 2004). The Piedmont is characterized by gently rolling, well rounded hills and long low ridges. Hogan Creek is a main tributary to the Yadkin River in the Upper Yadkin River Basin (HUC 03040101). The site is located approximately 2 miles south of NC 268 on Miller Gap Road, which bisects the project site at the triple box culvert over Hogan Creek. The project site is bordered to the north by Trajan Trail, to the south by Anderson Road, and to the west by Siloam Road. Latitude and longitude for the site are 36.321609 N and 80.602389 W, respectively. A vicinity map is included in Appendix A as Figure 1.

Agriculture is the primary land use in the watershed (41% agriculture land cover). Non-forested buffers and livestock operations were identified as major stressors to water quality within the watershed. The site assessment phase of the project identified other stressors as well, including bank erosion, sediment deposition, disconnection of the streams and floodplains, and exotic plant species. The majority of the project area was utilized as a cattle operation for over fifty years. Cattle accessed Hogan Creek and the downstream reach of UT2 exacerbating bank erosion and allowing direct nutrient and fecal inputs to the streams. Deforested riparian buffers and levee construction along Hogan Creek and unnamed tributaries also contributed to channel degradation.

## 1.4 Project Components and Approach

Stream restoration was accomplished using a natural channel design approach to restore appropriate channel dimension, pattern, and profile (Appendix A Table 1; Appendix B Figure 2). These improved conditions will promote water and sediment transport equilibrium between the stream and its watershed, reconnect the stream to its floodplain and promote healthy in-stream and riparian habitats. The project goals were addressed through the following project objectives:

- Restoration of the dimension, pattern, profile of 761 LF of Hogan Creek Reach 1, 992 LF of Hogan Creek Reach 2, 650 LF of UT2, and 275 LF of UT3.
- Restoration of the dimension and profile (Enhancement I) of 1,200 LF of Hogan Creek Reach 1;
- Limited channel work coupled with livestock exclusion and/or invasive species control (Enhancement II) on 66 LF of UT1 and 280 LF of UT2.
- Livestock exclusion fencing and alternative water source installations;
- Invasive plant species control measures across the entire project wherever necessary; and
- Preservation of approximately 5,699 LF relatively un-impacted forested streams in a permanent conservation easement.

The target stream type for Hogan Creek was a moderately sinuous, moderate width-depth ratio C4, which was appropriate for the relatively flat and wide alluvial valley. Reach 1 was constructed largely within the existing channel with in-stream structures incorporated

to promote sediment transport equilibrium, riffle and pool formation, and enhanced bank stability. Reach 2 of Hogan Creek was constructed mainly off-line in order to position the channel in the low point of the valley and improve floodplain access on both banks.

The target stream type for UT2 and UT3 was a B4, with a moderate width-depth ratio and moderate sinuosity which is suited to the somewhat steeper and more confined tributary valleys. Bankfull benches cut on 10:1 slopes were provided on both banks. The off-line channel segments were designed to promote the formation of riffle and pool sequences while also affording the ability during construction to maintain clean flow separate in the original channel.

The final design was completed in November of 2012. Construction activities and as-built surveys were completed in December of 2014. Planting of the Site took place in March of 2015. The baseline monitoring efforts began in May of 2015 and monitoring year 1 efforts began in October 2015. More detailed information related to the project activity, history, and contacts can be found in Appendix A, Tables 1, 2 and 3.

## 1.5 Project Performance

The region experienced an unusual high amount of precipitation during fall/winter 2015. A nearby gauging station recorded over three inches of rain from October 2-4, 2015, resulting in a bankfull event. This storm event created several areas on Hogan Creek Reach 1 and Reach 2 that required maintenance. The following maintenance activities were completed during December 2015:

- Hogan Reach 1 – Station 18+12. Cross vane was repaired to fix dislodged boulder.
- Hogan Reach 1 – Station 20+12. Left bank was repaired to alleviate scour behind root wad cluster.
- Hogan Reach 2 – Stations 34+00, 36+00, and 38+00. Substrate was added to three constructed riffles in order to address channel incision and repair damaged grade control structures.
- Hogan Reach 2 – Station 36+00. Bank work was required on the left bank to repair 50 linear feet of erosion.

A visual inspection of the entire project was conducted after the repair work to ensure that the project is performing well. Visual assessment tables and photo points are included in Appendix B. With the exception of two areas of aggradation and six areas of toe or lower bank erosion in Reaches 1 and 2 of Hogan Creek, the project as a whole is performing as designed and stream issues were minimal. The six areas, labeled on the current condition plan view (Figure 2 Sheets 1-3) as bank scour/erosion, are scheduled to be live staked during the winter of 2016. Year 2 monitoring efforts will include an evaluation of the need for additional adaptive management.

Vegetation monitoring was conducted October 26, 2015. The MY1 vegetation plot data indicate that the project is on track to meet the interim criterion for survival and growth of 320 stems per acre at the end of the year three monitoring period. Vegetation plot data

and photographs are included in Appendix C. The average stem density for planted stems is 465 stems per acre. The site includes a diverse assemblage of 10 species of native trees and shrubs. Vegetation Plot 3, with a density of 243 stems per acre, was the only plot that did not meet the interim success criteria of 320 stems per acre. Planted and volunteer stem densities were between 243 and 6,232 stems per acre with an average of 2,226 stems per acre for the entire restoration site. Vegetation Plot 1 had a density of 6,232 stems per acre. The high density of volunteers in this plot may have skewed the results for the entire site. Densities are expected to decrease in Vegetation Plot 1 during future monitoring years as herbaceous vegetation becomes more established. Herbicide treatments of exotic invasive plants were conducted during the construction phase and again in July 2015. Observations indicate that the extent of invasive plants has been greatly reduced since the initial treatment; however additional treatments are warranted during 2016, particularly along the upstream reaches of UT2 and the downstream third of Hogan Creek Reach 1. A supplemental planting for the entire site occurred in January 2016.

The geomorphic survey was conducted immediately after the repairs were completed. MY1 data indicate that the streams are generally stable and performing well. Stream survey data and summary tables are included in Appendix D. Cross-section data showed little change between MY0 and MY1, with the exception of areas of minor bed scour in Hogan Creek Reaches 1 and 2. Changes in cross-sectional area and width to depth ratios were generally modest and expected to occur between the baseline and MY1 monitoring years. Longitudinal profile data indicated that the number and distribution of riffle and pool features remained consistent between monitoring years. Pool depths increased in all reaches particularly in Hogan Creek Reach 1 and 2. Riffle lengths and slopes remained consistent with previous monitoring data. Riffle pebble counts indicated a coarsening of bed material overall. The project is meeting the geomorphic performance standards set forth in the mitigation plan.

A bankfull event was documented in October 2015 based on visual observation of wrack lines and sediment deposition throughout the floodplain. Both crest gauges recorded readings indicating a bankfull flow had occurred. A nearby gauging station recorded over three inches of rain from October 2-4, 2015 (NCCRONOS, 2016).

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

## 2.0 METHODOLOGY

The stream monitoring methodologies utilized in 2015 are based on standard guidance and procedures documents (Rosgen 1996 and USACE 2003).

- Stream longitudinal profile and cross-section data were collected throughout three reaches using a total station survey. Approximately 3,175 linear feet of stream

and 9 cross-sections were surveyed. Cross-sections and longitudinal profile start and stop locations were permanently marked with capped rebar and PVC conduit.

- 41 permanent photo points were established throughout the project to visually monitor stream stability and vegetation. Permanent photo points were marked with labeled wooden or PVC stakes.
- Wolman pebble counts were conducted at four representative riffle cross-sections to evaluate particle size distribution over time. A minimum of 100 particles were selected at random and measured (Harrelson 1994).
- Vegetation monitoring included documenting species composition and survival of planted and volunteer species within six randomly located vegetation plots. Each 0.025 acre vegetation plot was permanently marked with rebar and PVC conduit at all four corners.
- Two crest gauges were installed and will be checked during semi-annual visits to determine if a bankfull event has occurred. The crest gauges were installed and surveyed at riffles on Hogan Creek Reach 2 and UT2.
- Visual assessments will be performed on all stream and buffer restoration areas on a semi-annual basis. Problem areas will be noted such as channel instability (lateral and/or vertical instability, structure failure/instability and/or piping, headcuts), vegetation health (low stem density, vegetation mortality, invasive species or encroachment), beaver activity, and livestock access. Areas of concern will be mapped, photographed, and described in future monitoring reports.

## 3.0 REFERENCES


Confluence Engineering, PC. 2012. Hogan Creek Stream Mitigation Plan. NCEEP, Raleigh, NC.

Harrelson, Cheryl, C. Rawlins and J. Potyondy. 1994. Stream Channel Reference Sites: An Illustrated Guide to Field Technique. Gen. Tech. Rep. RM-245. Rocky Mountain Forest and Range Experiment Station. USDA Forest Service. Fort Collins, Colorado.

NCCRONOS (North Carolina Climate Retrieval and Observations Network of the Southeast Database). 2015. State Climate Office of North Carolina. Version 2.7.2. Pilot Mountain 0.7 NW Station ID No. NC-SR-9. Accessed January 2016.

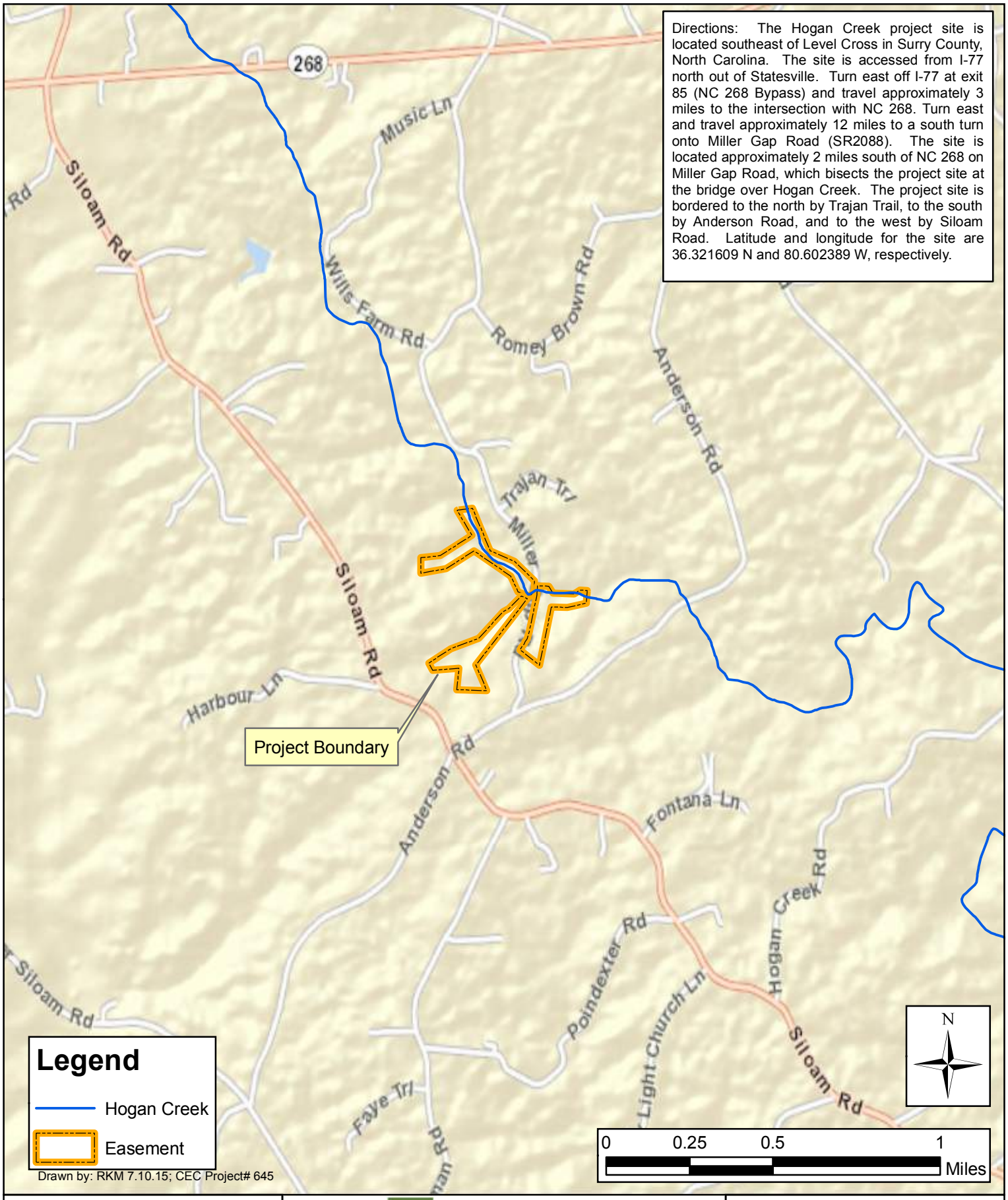
NCGS (North Carolina Geological Survey). 2004. Physiography of North Carolina. Map compiled by the Division of Land Resources. Raleigh.

Rosgen, D. 1996. Applied River Morphology. Wildland Hydrology. Pagosa Springs, Colorado.

USACE (U.S. Army Corps of Engineers). 2003. Stream Mitigation Guidelines. U.S. Army Corps of Engineers – Wilmington District, U.S. Environmental Protection Agency, North Carolina Wildlife Resources Commission, and North Carolina Department of Environment and Natural Resources Division of Water Quality. Wilmington, North Carolina.

# Appendix A
# Figures and Background Tables

# Hogan Creek Stream Mitigation/Project No. 94708

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Vicinity Map

Figure 1

**Table 1. Project Components and Mitigation Credits**
**Hogan Creek Stream Mitigation/ DMS Project No. 94708**

**Mitigation Credit Summaries**

| | Stream | Riparian Wetland | Non-Riparian Wetland | Buffer | Nitrogen Nutrient Offset | | Phosphorous Nutrient Offset |
|---|---|---|---|---|---|---|---|
| Overall Credit | 5,089 | N/A | N/A | N/A | N/A | N/A | N/A |

Project Components

| Project Component or Reach ID | Stationing | Pre-project Footage or Acreage | Restoration Footage or Acreage | Restoration Level | Restoration or Rest Equiv. | Mitigation Ratio | Mitigation Credits | Notes |
|---|---|---|---|---|---|---|---|---|
| Hogan Reach 1 | 10+00 - 22+00 | 1,331 | 1,200 | P2 | EI | 1:1 | 1,200 | - |
| Hogan Reach 1 | 22+00 - 29+61 | 797 | 761 | P2 | R | 1:1 | 743 | Crossing was removed from total |
| Hogan Reach 2 | 30+11 - 40+03 | 876 | 992 | P2 | R | 1:1 | 992 | - |
| UT1,1A, 1B | Upstream of 10+32 | 1,517 | 1,517 | Preservation | P | 5:1 | 303 | - |
| UT1 | 10+32 - 10+98 | 66 | 66 | P3 | EII | 2.5:1 | 26 | - |
| UT2, 2A, 2B,2C | Upstream of 6+50 | 3,230 | 3,230 | Preservation | P | 5:1 | 646 | - |
| UT2 | 6+50 - 9+30 | 280 | 280 | P3 | EII | 2.5:1 | 112 | - |
| UT2 | 9+30 - 15+80 | 633 | 650 | P2 | R | 1:1 | 602 | Crossing was removed from total |
| UT3 | Ustream of 9+30 | 952 | 952 | Preservation | P | 5:1 | 190 | - |
| UT3 | 9+30 - 12+05 | 260 | 275 | P2 | R | 1:1 | 275 | - |

Length and Area Summations

| Restoration Level | Stream (Linear Feet) | Riparian Wetland (acres) | | Non-riparian Wetland (acres) | Buffer (Square feet) | | Upland (acres) | |
|---|---|---|---|---|---|---|---|---|
| | | Riverine | Non-Riverine | | | | | |
| | | - | | | | | | |
| Restoration | 2,678 | - | - | - | - | - | - | - |
| Enhancement | | - | - | - | - | - | - | - |
| Enhancement I | 1,200 | | | | | | | |
| Enhancement II | 346 | | | | | | | |
| Creation | | - | - | - | | | - | - |
| Preservation | 5,699 | - | - | - | | | - | - |
| High Quality Preservation | - | - | - | - | | | - | - |
| | - | - | - | - | | | - | - |

BMP Element

| Element | Location | Purpose/Function | | Notes | | | | |
|---|---|---|---|---|---|---|---|---|
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |

| Table 2. Project Activity and Reporting History<br>Hogan Creek Stream Mitigation/ DMS Project No. 94708 | | |
|---|---|---|
| **Activity or Deliverable** | **Data Collection Complete** | **Completion or Delivery** |
| Mitigation Plan | Oct-11 | Feb-12 |
| Final Design – Construction Plans | Oct-11 | Nov-12 |
| Construction | N/A | Dec-14 |
| Temporary S&E Mix Applied | N/A | Dec-14 |
| Permanent Seed Mix Applied | N/A | Dec-14 |
| Containerized, bare root and B&B plantings for reach/segments | N/A | Mar-15 |
| Baseline Monitoring Document (Year 0 Monitoring - Baseline) | Jun-15 | Aug-15 |
| Stream Repair/Maintenance | N/A | Dec-15 |
| Year 1 Monitoring | Dec-15 | Jan-16 |
| Supplemental Planting | N/A | Jan-16 |
| Year 2 Monitoring | | |
| Year 3 Monitoring | | |
| Year 4 Monitoring | | |
| Year 5 Monitoring | | |

N/A - Not Applicable

| Table 3. Project Contacts Table<br>Hogan Creek Stream Mitigation/ DMS Project No. 94708 | |
|---|---|
| **Designer** | Wildlands Engineering, Inc.<br>167-B Haywood Road<br>Asheville, NC 28806 |
| Primary project design POC | Andrew Bick 828-606-0306 |
| **Construction Contractor** | Carolina Environmental Contracting, Inc.<br>150 Pine Ridge Road<br>Mount Airy, NC 27030 |
| Construction contractor POC | Wayne Taylor 336-341-6489 |
| **Survey Contractor** | Turner Land Surveying, PLLC<br>PO Box 41023<br>Raleigh, NC 27629 |
| Survey Contractor POC | David Turner 919-623-5095 |
| **Planting Contractor** | Keller Environmental, LLC<br>7921 Haymarket Lane<br>Raleigh, NC 27615 |
| Planting Contractor POC | Jay Keller 919-749-8259 |
| **Seeding Contractor** | Carolina Environmental Contracting, Inc.<br>150 Pine Ridge Road<br>Mount Airy, NC 27030 |
| Seeding Contractor POC | Wayne Taylor 336-341-6489 |
| **Seed Mix Sources** | Green Resources 336-855-6363 |
| **Nursery Stock Suppliers** | Foggy Mountain Nursery 336-384-5323 |
| **Monitoring Performers** | Wildlands Engineering, Inc.<br>167-B Haywood Road<br>Asheville, NC 28806<br>ClearWater Environmental Consultants<br>32 Clayton Street<br>Asheville, NC 28801 |
| Stream Monitoring POC | Andrew Bick 828-606-0306 |
| Vegetation Monitoring POC | Andrew Bick 828-606-0306 |

| Table 4. Project Baseline Information and Attributes | |
|---|---|
| Hogan Creek Stream Mitigation/ DMS Project No. 94708 | |
| County | Surry |
| Project Area (acres) | 36 |
| Project Coordinates (latitude and longitude) | 36.321609 N, 80.602389 W |
| **Project Watershed Summary Information** | |
| Physiographic Province | Piedmont |
| River Basin | Yadkin |
| USGS Hydrologic Unit 8-digit | 3040101 |
| USGS Hydrologic Unit 14-digit | 3040101110060 |
| DWR Sub-basin | Pee Dee River Subbasin 03-07-02 |
| Project Drainage Area (acres) | 1,514 ac (2.37 $mi^2$) |
| Project Drainage Area Percentage of Impervious Area | 0.40% |
| CGIA Land Use Classification | Managed Herbaceous Cover, Broadleaf Deciduous Forest Land |

**Reach Summary Information**

| Parameters | Reach 1 Hogan Creek | Reach 2 Hogan Creek | Main Stem UT1 | Main Stem UT2 | UT3 |
|---|---|---|---|---|---|
| Length of Reach Post Construction (LF) | 1,961 | 992 | 1,442 | 2,869 | 1,227 |
| Valley classification (Rosgen) | VIII | VIII | VI | VI | VI |
| Drainage area (acres) | 1,479 | 1,514 | 60 | 81 | 18 |
| NCDWQ stream identification score | 40 | 37 | 31 | 31.5 | 32.5 |
| NCDWQ Water Quality Classification | C | C | C | C | C |
| Morphological Description (Rosgen stream type) | C4 | C4 | E4b | E4b | G4 |
| Evolutionary trend | C-F | C-F | Eb-G | Eb-G | Eb-G |
| Underlying mapped soils | CsA | CsA | CsA, FsE | FsE | FsE |
| Drainage class | well drained | well drained | well drained | well drained | well drained |
| Soil Hydric status | not hydric | not hydric | not hydric | not hydric | not hydric |
| Slope | 0.007 | 0.005 | 0.031 | 0.021 | 0.030 |
| FEMA classification | AE | AE | Not in SFHA | Not in SFHA | Not in SFHA |
| Native vegetation community | Felsic Mesic Forest | Felsic Mesic Forest | Felsic Mesic Forest | Felsic Mesic Forest | Felsic Mesic Forest |
| Percent composition of exotic invasive vegetation | 0 | 0 | 0 | 0 | 0 |

**Wetland Summary Information**

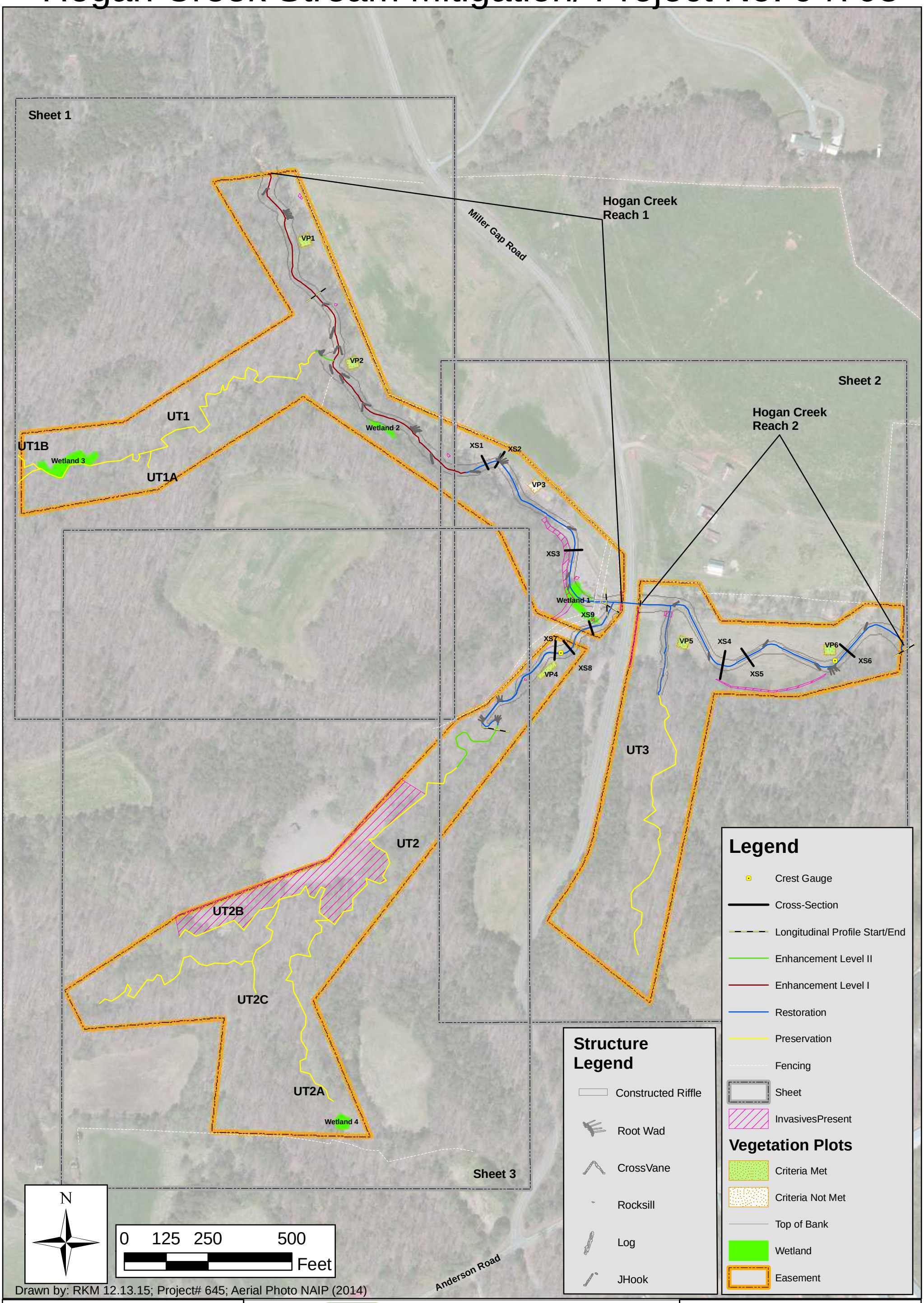
| Parameters | Wetland 1 | Wetland 2 | Wetland 3 | Wetland 4 |
|---|---|---|---|---|
| Size of Wetland (acres) | 0.09 | 0.02 | 0.13 | 0.10 |
| Wetland Type | riparian non-riverine | riparian non-riverine | riparian non-riverine | riparian non-riverine |
| Mapped Soil Series | CsA | CsA and FsE | CsA and FsE | CsA and FsE |
| Drainage class | well drained | well drained | well drained | well drained |
| Soil Hydric Status | not hydric | not hydric | not hydric | not hydric |
| Source of Hydrology | Creek (oxbow) | Toe seep | Toe seep | Impoundment |
| Hydrologic Impairment | none | none | none | none |
| Native vegetation community | Dist. Small Stream/ Narrow FP Forest | Dist. Small Stream/ Narrow FP Forest | Dist. Small Stream/ Narrow FP Forest | Herbaceous |
| Percent composition of exotic invasive vegetation | 0 | 0 | 0 | 0 |

**Regulatory Considerations**

| Regulation | Applicable? | Resolved? | Supporting Documentation |
|---|---|---|---|
| Waters of the United States – Section 404 | Y | Y | 02268 |
| Waters of the United States – Section 401 | Y | Y | NCDWR # 20120182 |
| Endangered Species Act | Y | Y | CE Approved 9/30/11 |
| Historic Preservation Act | N | N/A | - |
| Coastal Zone Management Act (CZMA)/ Coastal Area Management Act (CAMA) | N | N/A | - |
| FEMA Floodplain Compliance | Y | Y | LOMR Submitted 5/2015 |
| Essential Fisheries Habitat | N | N/A | - |

# Appendix B
# Visual Assessment Data

# Hogan Creek Stream Mitigation/ Project No. 94708

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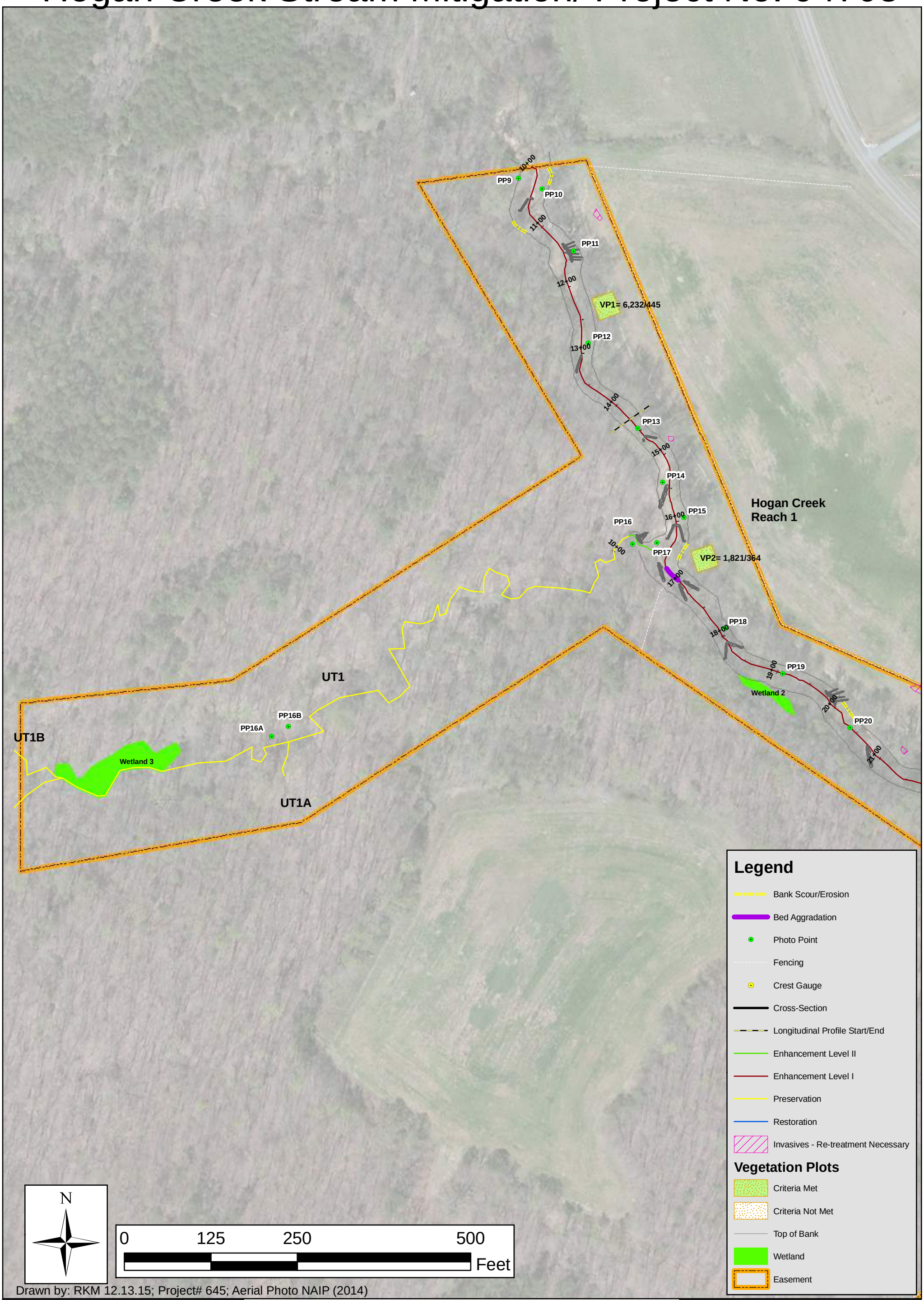
Integrated Current Condition
Plan View
DMS Project # 94708

Figure 2

# Hogan Creek Stream Mitigation/ Project No. 94708

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Integrated Current Condition
Plan View
DMS Project # 94708

Figure 2 Sheet 1

# Hogan Creek Stream Mitigation/ Project No. 94708

XS1
XS2
PP21
23+00
22+00
24+00
VP3= 445/243
PP22
25+00
PP23
26+00
XS3
27+00
PP24
28+00
Wetland 1
PP8
PP25
29+00
30+00
PP26
PP27
31+00
32+00
PP28
PP7
XS9
15+00
PP6
14+00
XS7
13+00
XS8
PP5
12+00
VP4= 3,521/769
PP4
11+00
10+00
PP3
PP2
PP1
11+00
10+00
VP5= 769/486
PP29
33+00
XS4
34+00
PP30
35+00
36+00
XS5
PP31
37+00
VP6= 567/486
PP32
38+00
39+00
40+00
XS6
Hogan Creek
Reach 2
PP28A
UT3
PP28B
PP28C

## Legend

- Bank Scour/Erosion
- Bed Aggradation
- Photo Point
- Fencing
- Crest Gauge
- Cross-Section
- Longitudinal Profile Start/End
- Enhancement Level II
- Enhancement Level I
- Preservation
- Restoration
- Invasives - Re-treatment Necessary

### Vegetation Plots

- Criteria Met
- Criteria Not Met
- Top of Bank
- Wetland
- Easement

N

0 125 250 500 Feet

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Integrated Current Condition
Plan View
DMS Project # 94708

Figure 2 Sheet 2

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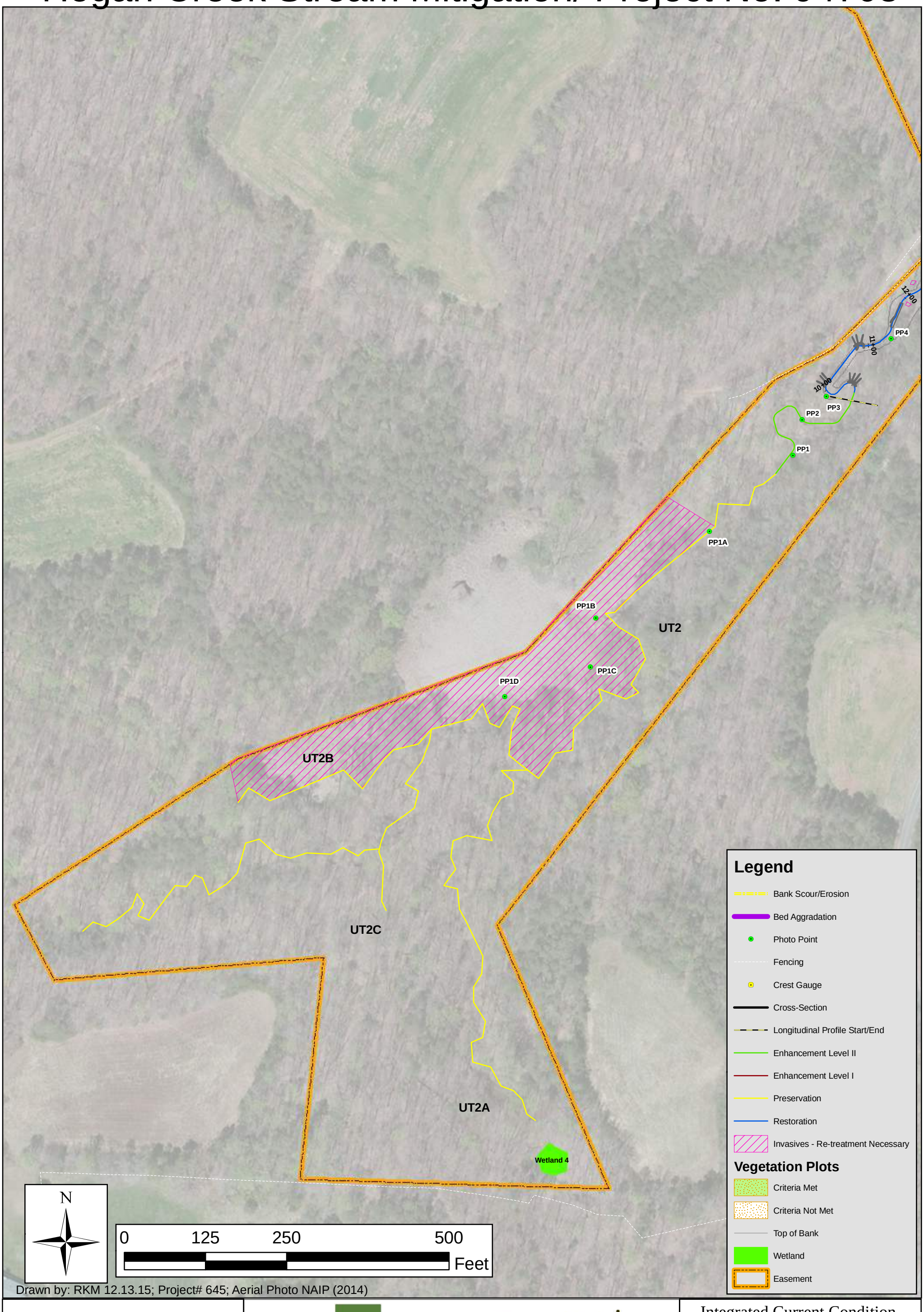


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NCDEQ - Division of Mitigation Services
1652 Mail Service Center
Raleigh, NC 27699-1652

ClearWater
32 Clayton Street
Asheville, North Carolina 28801

Integrated Current Condition
Plan View
DMS Project # 94708

Figure 2 Sheet 3

**Table 5a. Visual Stream Morphology Stability Assessment**
**Hogan Creek Reach 1**
**Assessed Length : 1,961 feet**

| Major Channel Category | Channel Sub-Category | Metric | Number Stable, Performing as Intended | Total Number in As-built | Number of Unstable Segments | Amount of Unstable Footage | % Stable, Performing as Intended | Number with Stabilizing Woody Vegetation | Footage with Stabilizing Woody Vegetation | Adjusted % for Stabilizing Woody Vegetation |
|---|---|---|---|---|---|---|---|---|---|---|
| **1. Bed** | 1. **Vertical Stability** (Riffle and Run units) | 1. Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars) | | | 2 | 52 | 97% | | | |
| | | 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 | | | 5 | 130 | 93% | 0 | 0 | 93% |
| | **2. Undercut** | Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat. | | | 0 | 0 | 100% | 0 | 0 | 100% |
| | **3. Mass Wasting** | Bank slumping, calving, or collapse | | | 0 | 0 | 100% | 0 | 0 | 100% |
| | | | | **Totals** | 5 | 130 | 93% | 0 | 0 | 93% |
| **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. | 5 | 5 | | | 100% | | | |
| | **2a. Piping** | Structures lacking any substantial flow underneath sills or arms. | 12 | 12 | | | 100% | | | |
| | **3. Bank Protection** | Bank erosion within the structures extent of influence does not exceed 15%. (See guidance for this table in EEP monitoring guidance document) | 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**
**Hogan Creek Reach 2**
**Assessed Length : 992 feet**

| Major Channel Category | Channel Sub-Category | Metric | Number Stable, Performing as Intended | Total Number in As-built | Number of Unstable Segments | Amount of Unstable Footage | % Stable, Performing as Intended | Number with Stabilizing Woody Vegetation | Footage with Stabilizing Woody Vegetation | Adjusted % for Stabilizing Woody Vegetation |
|---|---|---|---|---|---|---|---|---|---|---|
| **1. Bed** | 1. **Vertical Stability** (Riffle and Run units) | 1. Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars) | | | 0 | 0 | 100% | | | |
| | | 2. Degradation - Evidence of downcutting | | | 0 | 0 | 100% | | | |
| | **2. Riffle Condition** | 1. Texture/Substrate - Riffle maintains coarser substrate | 6 | 6 | | | 100% | | | |
| | **3. Meander Pool Condition** | 1. Depth Sufficient (Max Pool Depth : Mean Bankfull Depth ≥ 1.6) | 5 | 5 | | | 100% | | | |
| | | 2. Length appropriate (>30% of centerline distance between tail of upstream riffle and head of downstrem riffle) | 5 | 5 | | | 100% | | | |
| | 4.**Thalweg Position** | 1. Thalweg centering at upstream of meander bend (Run) | 5 | 5 | | | 100% | | | |
| | | 2. Thalweg centering at downstream of meander (Glide) | 5 | 5 | | | 100% | | | |
| | | | | | | | | | | |
| **2. Bank** | **1. Scoured/Eroding** | Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion | | | 1 | 15 | 98% | 0 | 0 | 98% |
| | **2. Undercut** | Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat. | | | 0 | 0 | 100% | 0 | 0 | 100% |
| | **3. Mass Wasting** | Bank slumping, calving, or collapse | | | 0 | 0 | 100% | 0 | 0 | 100% |
| | | | | **Totals** | 1 | 15 | 98% | 0 | 0 | 98% |
| **3. Engineered Structures** | **1. Overall Integrity** | Structures physically intact with no dislodged boulders or logs. | 6 | 6 | | | 100% | | | |
| | **2. Grade Control** | Grade control structures exhibiting maintenance of grade across the sill. | 1 | 1 | | | 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) | 6 | 6 | | | 100% | | | |
| | **4. Habitat** | Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth ratio ≥ 1.6 Rootwads/logs providing some cover at base-flow. | 6 | 6 | | | 100% | | | |

**Table 5c. Visual Stream Morphology Stability Assessment**
**UT2**
**Assessed Length : 930 feet**

| Major Channel Category | Channel Sub-Category | Metric | Number Stable, Performing as Intended | Total Number in As-built | Number of Unstable Segments | Amount of Unstable Footage | % Stable, Performing as Intended | Number with Stabilizing Woody Vegetation | Footage with Stabilizing Woody Vegetation | Adjusted % for Stabilizing Woody Vegetation |
|---|---|---|---|---|---|---|---|---|---|---|
| **1. Bed** | 1. **Vertical Stability** (Riffle and Run units) | 1. Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars) | | | 0 | 0 | 100% | | | |
| | | 2. Degradation - Evidence of downcutting | | | 0 | 0 | 100% | | | |
| | **2. Riffle Condition** | 1. Texture/Substrate - Riffle maintains coarser substrate | 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% | 0 | 0 | 100% |
| | **2. Undercut** | Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat. | | | 0 | 0 | 100% | 0 | 0 | 100% |
| | **3. Mass Wasting** | Bank slumping, calving, or collapse | | | 0 | 0 | 100% | 0 | 0 | 100% |
| | | | | **Totals** | 0 | 0 | 100% | 0 | 0 | 100% |
| **3. Engineered Structures** | **1. Overall Integrity** | Structures physically intact with no dislodged boulders or logs. | 6 | 6 | | | 100% | | | |
| | **2. Grade Control** | Grade control structures exhibiting maintenance of grade across the sill. | 2 | 2 | | | 100% | | | |
| | **2a. Piping** | Structures lacking any substantial flow underneath sills or arms. | 4 | 4 | | | 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) | 6 | 6 | | | 100% | | | |
| | **4. Habitat** | Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth ratio ≥ 1.6 Rootwads/logs providing some cover at base-flow. | 6 | 6 | | | 100% | | | |

**Table 5d. Visual Stream Morphology Stability Assessment**
**UT3**
**Assessed Length : 275 feet**

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

| Table 6. Vegetation Condition Assessment<br>Hogan Creek/94708<br>Planted Acreage 6.7 | | | | | | |
|---|---|---|---|---|---|---|
| **Vegetation Category** | **Definitions** | **Mapping Threshold** | **CCPV Depiction** | **Number of Polygons** | **Combined Acreage** | **% of Planted Acreage** |
| **1. Bare Areas** | Very limited cover of both woody and herbaceous material. | 0.1 acres | Pattern and Color | 0 | 0.00 | 0.0% |
| **2. Low Stem Density Areas** | Woody stem densities clearly below target levels based on MY3, 4, or 5 stem count criteria. | 0.1 acres | Pattern and Color | 0 | 0.00 | 0.0% |
| | | | **Total** | 0 | 0.00 | 0.0% |
| **3. Areas of Poor Growth Rates or Vigor** | Areas with woody stems of a size class that are obviously small given the monitoring year. | 0.25 acres | Pattern and Color | 0 | 0.00 | 0.0% |
| | | | **Cumulative Total** | 0 | 0.00 | 0.0% |
| | | | | | | |
| **Easement Acreage** | **36** | | | | | |
| **Vegetation Category** | **Definitions** | **Mapping Threshold** | **CCPV Depiction** | **Number of Polygons** | **Combined Acreage** | **% of Easement Acreage** |
| **4. Invasive Areas of Concern** | Areas or points (if too small to render as polygons at map scale). | 1000 SF | Cross Hatch Pink | 14 | 2.00 | 5.6% |
| | | | | | | |
| **5. Easement Encroachment Areas** | Areas or points (if too small to render as polygons at map scale). | none | Pattern and Color | 0 | 0.00 | 0.0% |


**Photo Point 1 – Downstream**


**Photo Point 1A – Upstream**


**Photo Point 1B – Downstream**


**Photo Point 1C– Upstream**


**Photo Point 1D– Upstream**


**Photo Point 2 - Downstream**

**Photo Point 3 - Upstream**

**Photo Point 4 - Upstream**


**Photo Point 5 – Downstream**


**Photo Point 6 - Downstream**


**Photo Point 7 – Downstream**

**Photo Point 8 – Upstream**


**Photo Point 9 – Downstream**


**Photo Point 10 – Downstream**


**Photo Point 11 – Downstream**


**Photo Point 12 – Downstream**


**Photo Point 13 – Downstream**


**Photo Point 14 – Downstream**


**Photo Point 15 – Downstream**


**Photo Point 16 – Downstream**


**Photo Point 16A – Upstream**


**Photo 16B – Downstream**


**Photo 17 – Downstream**


**Photo Point 18 – Downstream**


**Photo Point 19 – Downstream**


**Photo Point 20 – Downstream**


**Photo Point 21 – Downstream**


**Photo Point 22 – Downstream**


**Photo Point 23 – Downstream**


**Photo Point 24 – Downstream**


**Photo Point 25 – Upstream**


**Photo Point 26 – Downstream**


**Photo Point 27 – Downstream**


**Photo Point 28 – Upstream**


**Photo Point 28A – Upstream**


**Photo Point 28B – Downstream**


**Photo Point 28C – Upstream**


**Photo Point 29 – Downstream**


**Photo Point 30 – Downstream**

**Photo Point 31 – Downstream**


**Photo Point 32 – Downstream**

# Appendix C
# Vegetation Plot Data

| Table 7. Vegetation Plot Results (All Stems) | | | Current Data (MY1 2015) | | | | | | | | | | | | Annual Means | | Annual Means | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Common | | Plot 1 | | Plot 2 | | Plot 3 | | Plot 4 | | Plot 5 | | Plot 6 | | MY0 (2015) | | MY1 (2015) | |
| | Name | Type | P | T | P | T | P | T | P | T | P | T | P | T | P | T | P | T |
| Acer rubrum | Red maple | Tree | 0 | 0 | 0 | 7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 7 |
| Betula nigra | River birch | Tree | 3 | 115 | 0 | 25 | 1 | 3 | 6 | 6 | 0 | 0 | 0 | 0 | 10 | 10 | 10 | 149 |
| Fraxinus pennsylvanica | Green ash | Tree | 4 | 4 | 3 | 3 | 2 | 2 | 4 | 4 | 1 | 1 | 0 | 0 | 17 | 17 | 14 | 14 |
| Juglans nigra | Black walnut | Tree | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| Liriodendron tulipifera | Tulip poplar | Tree | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 68 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 70 |
| Nyssa sylvatica | Black gum | Tree | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 5 | 7 | 7 | 12 | 12 | 12 | 12 |
| Platanus occidentalis | American sycamore | Tree | 2 | 2 | 4 | 5 | 1 | 1 | 7 | 7 | 0 | 1 | 0 | 1 | 13 | 13 | 14 | 17 |
| Prunus serotina | Black cherry | Tree | 0 | 30 | 0 | 2 | 0 | 3 | 0 | 0 | 0 | 6 | 0 | 0 | 0 | 27 | 0 | 41 |
| Quercus alba | White oak | Tree | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| Quercus phellos | Willow oak | Tree | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 3 | 3 | 0 | 0 | 6 | 6 | 4 | 4 |
| Quercus rubra | Northern red oak | Tree | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 |
| Quercus lyrata | Overcup oak | Tree | 2 | 2 | 1 | 1 | 2 | 2 | 2 | 2 | 3 | 3 | 5 | 5 | 13 | 13 | 15 | 15 |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
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| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | Plot area (acres) | | 0.025 | | 0.025 | | 0.025 | | 0.025 | | 0.025 | | 0.025 | | 0.15 | | 0.15 | |
| | Species count | | 4 | 6 | 4 | 8 | 4 | 5 | 4 | 5 | 4 | 6 | 2 | 4 | 6 | 10 | 6 | 10 |
| | Stem Count | | 11 | 154 | 9 | 45 | 6 | 11 | 19 | 87 | 12 | 19 | 12 | 14 | 71 | 102 | 69 | 330 |
| | Stems per Acre | | 445 | 6,232 | 364 | 1,821 | 243 | 445 | 769 | 3,521 | 486 | 769 | 486 | 567 | 479 | 688 | 465 | 2,226 |

**Meets Success Criteria**

**Fails to Meet Interim Success Criteria**

**Type = Tree, Shrub, Livestake**

**P = Planted**

**T = Total**


Vegetation Monitoring Plot 1
Monitoring Year 1 – October 26, 2015


Vegetation Monitoring Plot 2
Monitoring Year 1 – October 26, 2015


Vegetation Monitoring Plot 3
Monitoring Year 1 – October 26, 2015


Vegetation Monitoring Plot 4
Monitoring Year 1 – October 26, 2015

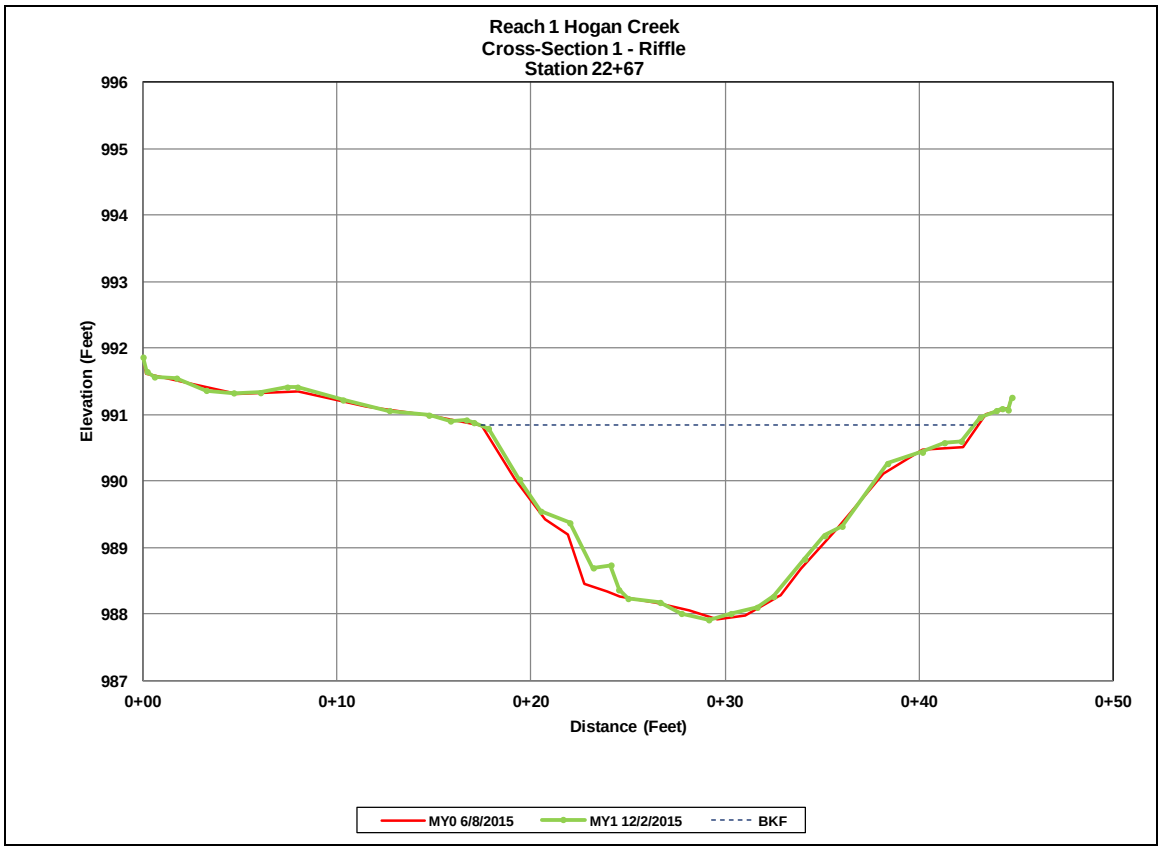

Vegetation Monitoring Plot 5
Monitoring Year 1 – October 26, 2015


Vegetation Monitoring Plot 6
Monitoring Year 1 – October 26, 2015

# Appendix D
# Stream Survey Data

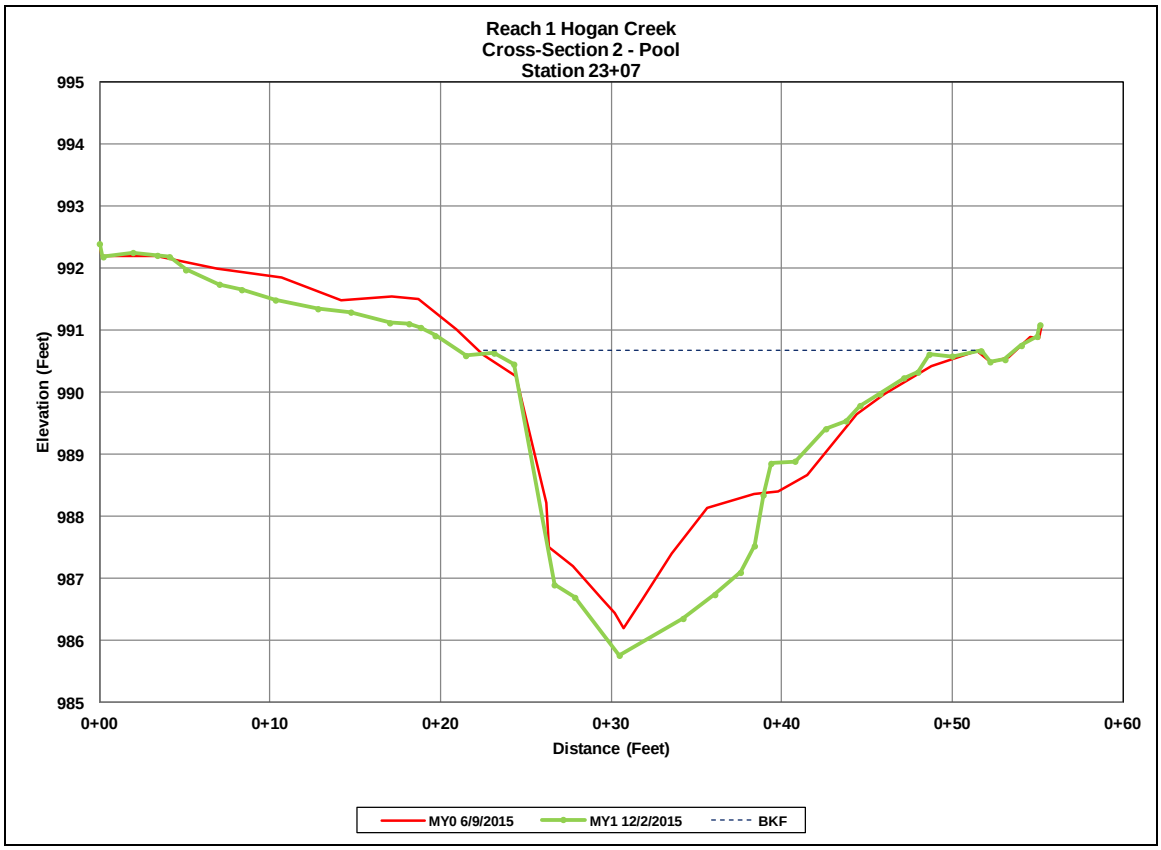
**Cross-Section 1 – Left Top of Bank**

**Cross-Section 1 – Right Top of Bank**



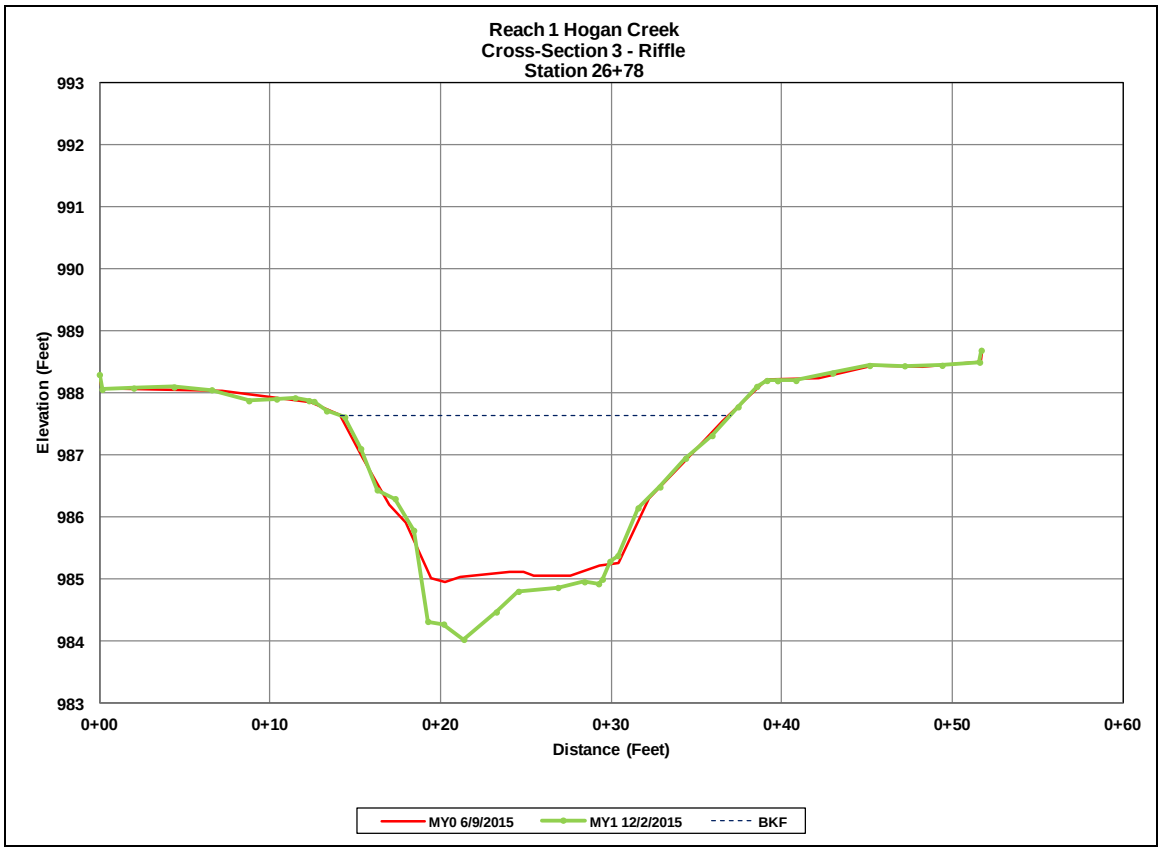

**Cross-Section 2 – Left Top of Bank**


**Cross-Section 2 – Right Top of Bank**



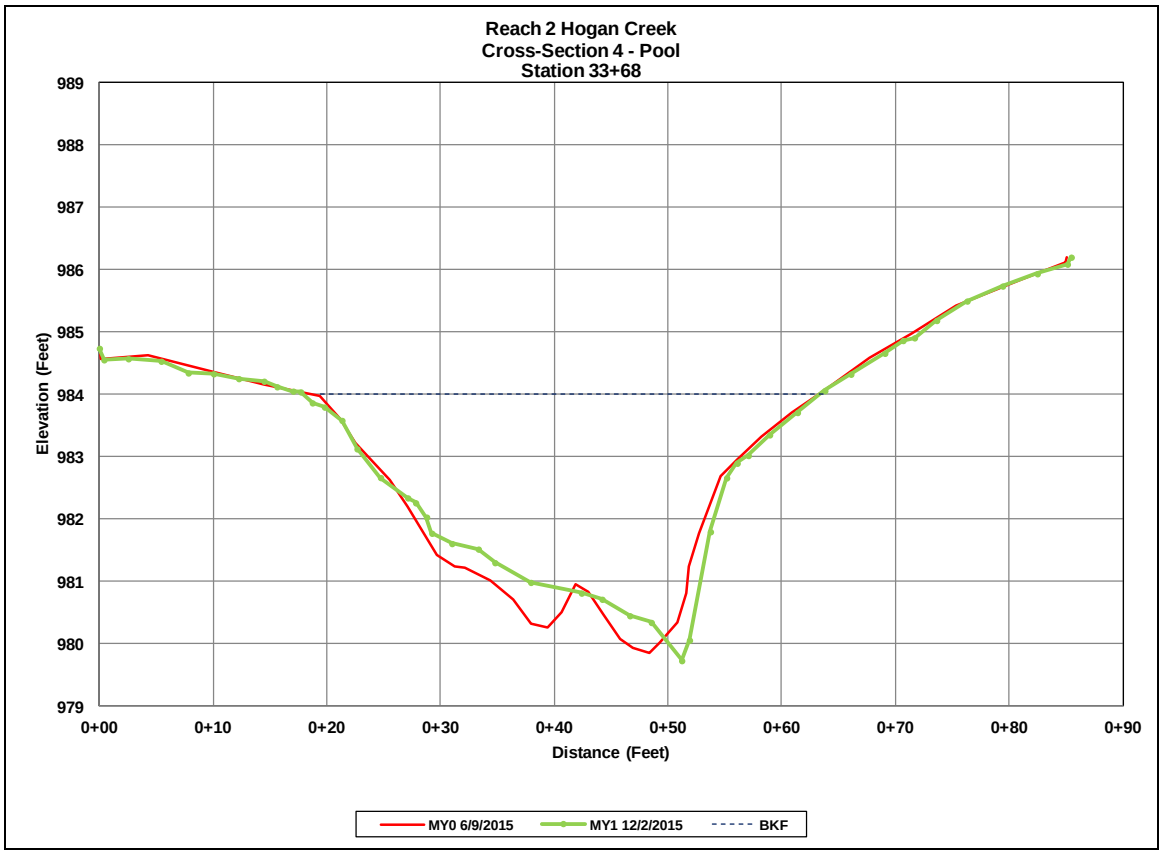

**Cross-Section 3 – Left Top of Bank**


**Cross-Section 3 – Right Top of Bank**



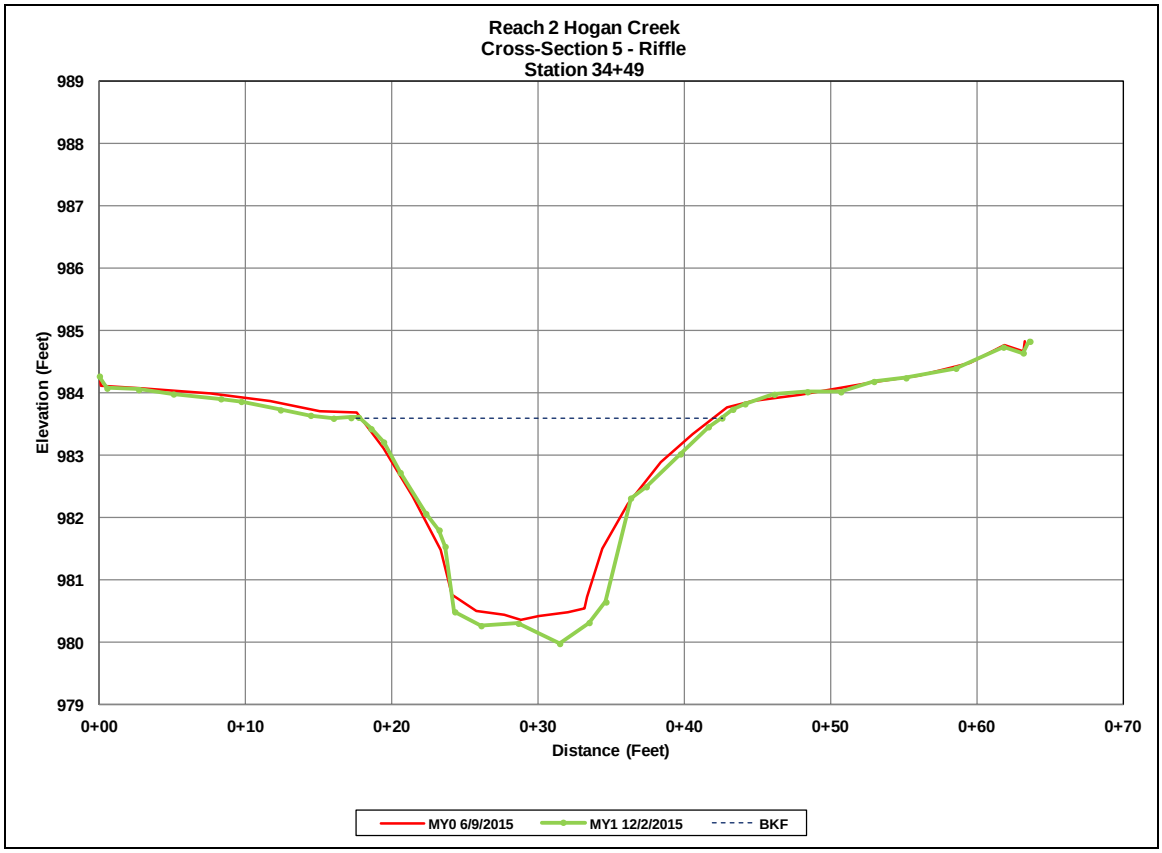
**Cross-Section 4 – Left Top of Bank**


**Cross-Section 4 – Right Top of Bank**



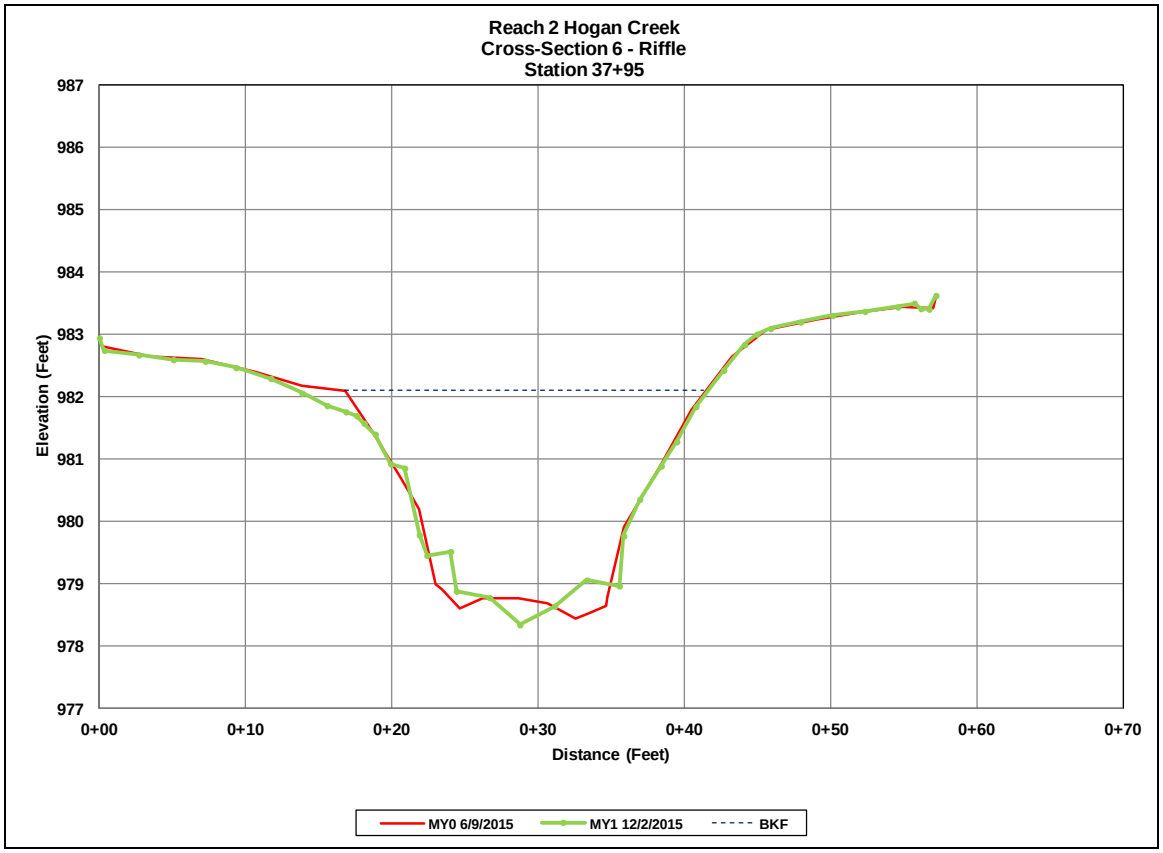
**Cross-Section 5 – Left Top of Bank**

**Cross-Section 5 – Right Top of Bank**



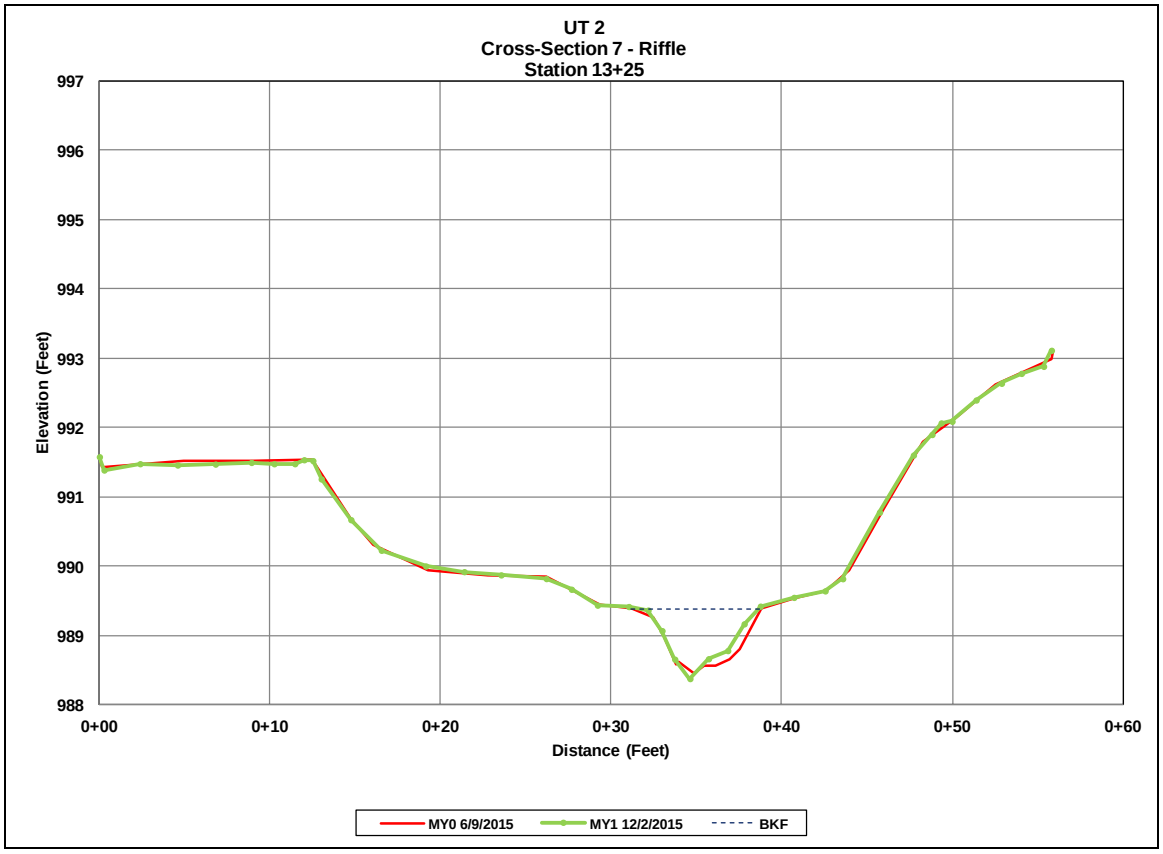
**Cross-Section 6 – Left Top of Bank**

**Cross-Section 6 – Right Top of Bank**



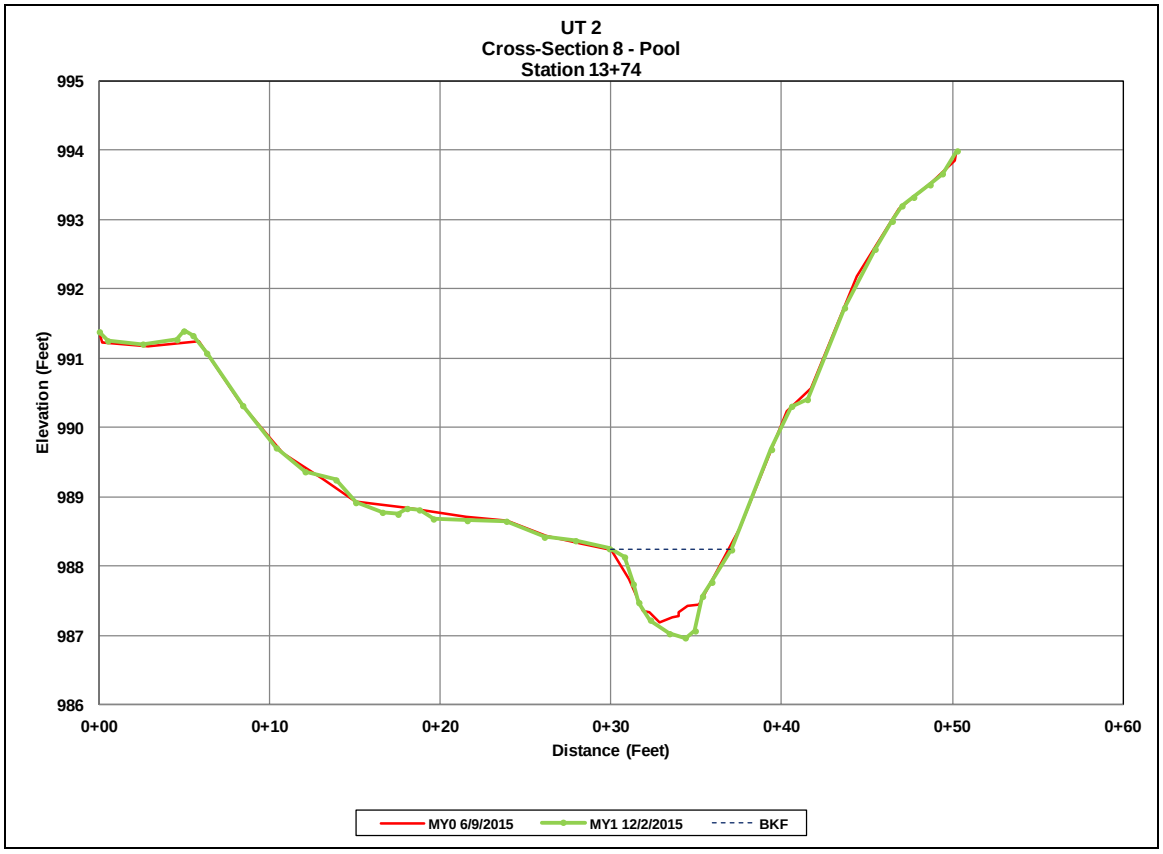

**Cross-Section 7 – Left Top of Bank**


**Cross-Section 7 – Right Top of Bank**



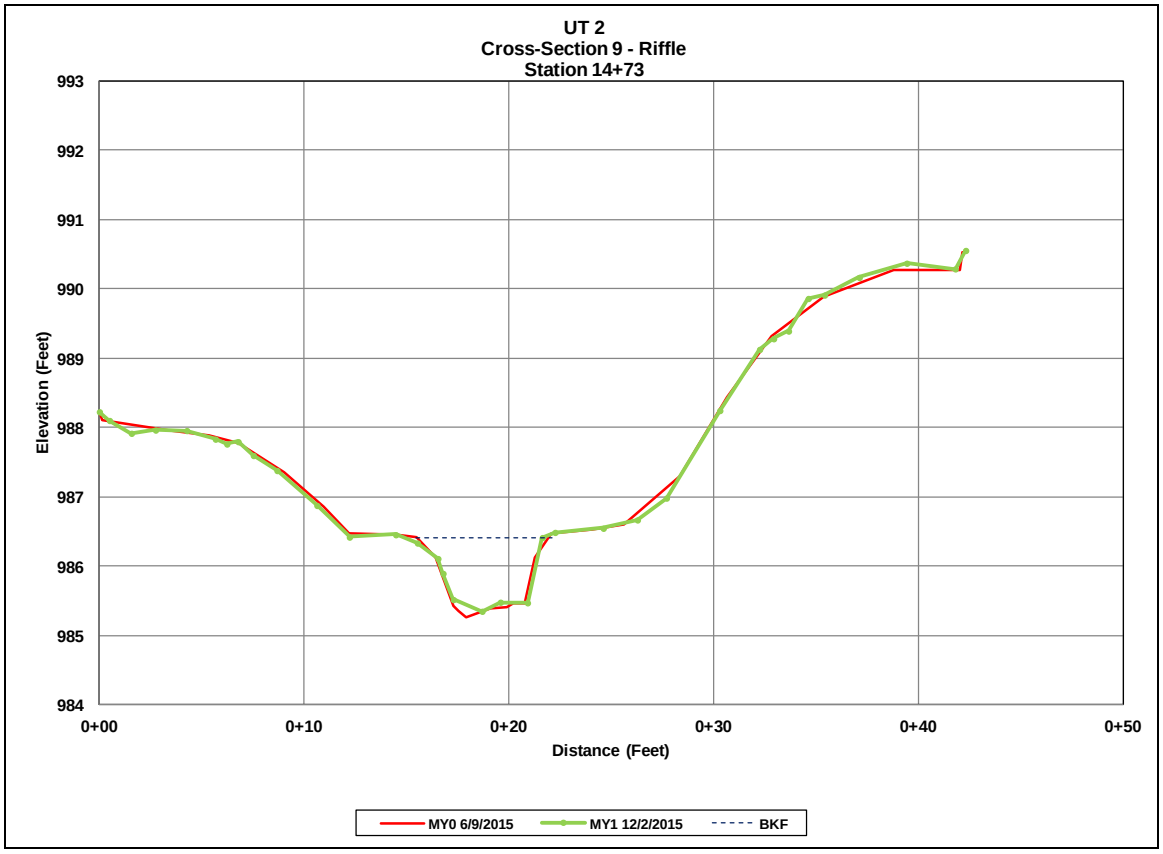

**Cross-Section 8 – Left Top of Bank**


**Cross-Section 8 – Right Top of Bank**




**Cross-Section 9 – Left Top of Bank**

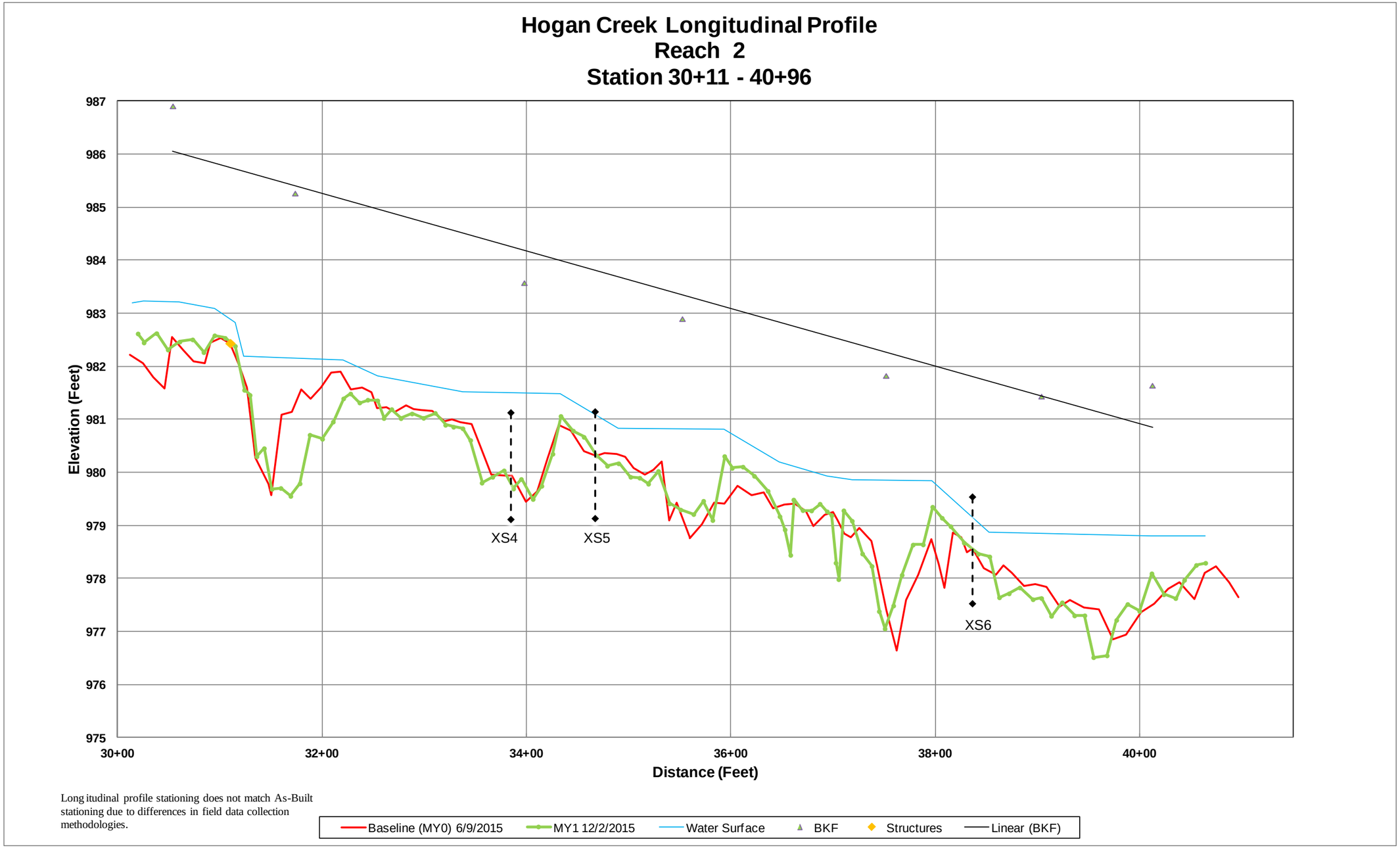

**Cross-Section 9 – Right Top of Bank**



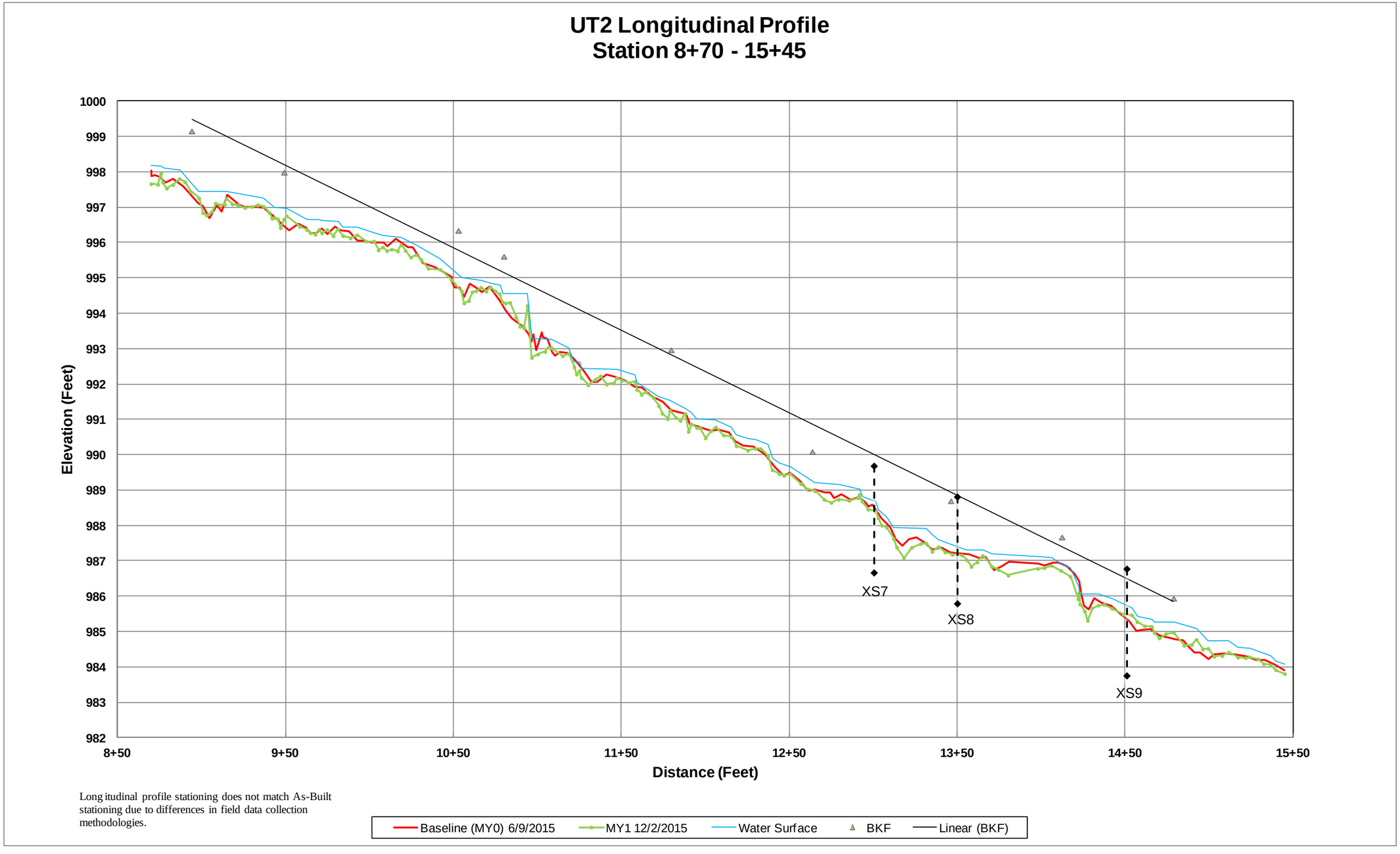
# Hogan Creek Longitudinal Profile
## Reach 1
## Station 14+29 - 29+61


Longitudinal profile stationing does not match As-Built stationing due to differences in field data collection methodologies.

Baseline (MY0) 6/9/2015 | MY1 12/2/2015 | Water Surface | BKF | Structures | Linear (BKF)



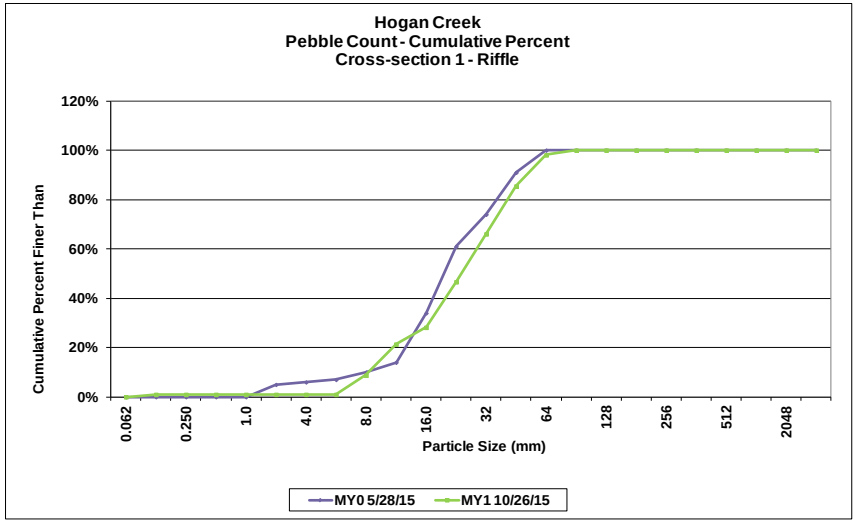

Long itudinal profile stationing does not match As-Built stationing due to differences in field data collection methodologies.

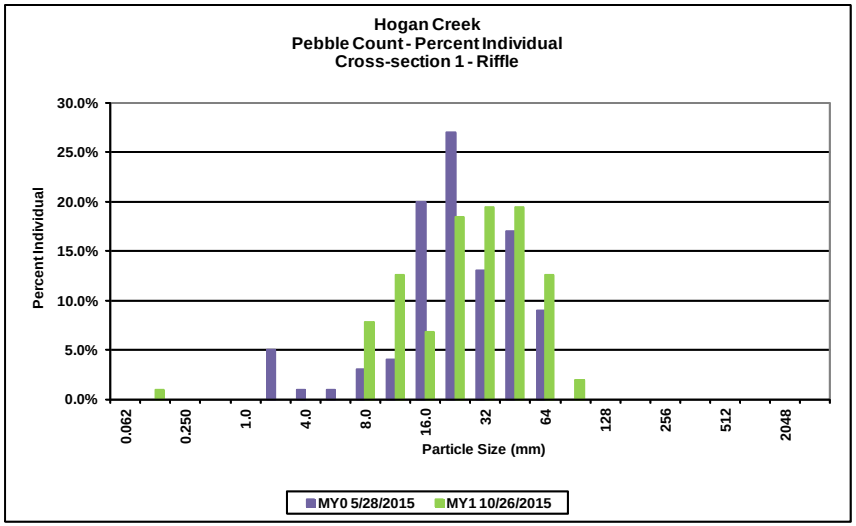



Longitudinal profile stationing does not match As-Built stationing due to differences in field data collection methodologies.

| Hogan Creek Stream Mitigation / 94708<br>Cross Section 1 - Riffle<br>Reach 1 | | | | |
|---|---|---|---|---|
| | | | MY1 | |
| Material | Particle Size Class (mm) | Total | % Individual | % Cumulative |
| silt/clay | 0.062 | | 0.0% | 0% |
| very fine sand | 0.125 | 1 | 1.0% | 1% |
| fine sand | 0.250 | | 0.0% | 1% |
| medium sand | 0.50 | | 0.0% | 1% |
| coarse sand | 1.0 | | 0.0% | 1% |
| very course sand | 2.0 | | 0.0% | 1% |
| very fine gravel | 4.0 | | 0.0% | 1% |
| fine gravel | 5.7 | | 0.0% | 1% |
| fine gravel | 8.0 | 8 | 7.8% | 9% |
| medium gravel | 11.3 | 13 | 12.6% | 21% |
| medium gravel | 16.0 | 7 | 6.8% | 28% |
| course gravel | 22.3 | 19 | 18.4% | 47% |
| course gravel | 32 | 20 | 19.4% | 66% |
| very course gravel | 45 | 20 | 19.4% | 85% |
| very course gravel | 64 | 13 | 12.6% | 98% |
| small cobble | 90 | 2 | 1.9% | 100% |
| medium cobble | 128 | | 0.0% | 100% |
| large cobble | 180 | | 0.0% | 100% |
| very large cobble | 256 | | 0.0% | 100% |
| small boulder | 362 | | 0.0% | 100% |
| small boulder | 512 | | 0.0% | 100% |
| medium boulder | 1024 | | 0.0% | 100% |
| large boulder | 2048 | | 0.0% | 100% |
| bedrock | 4096 | | 0.0% | 100% |
| **Total** | | **103** | **100.0%** | **100%** |

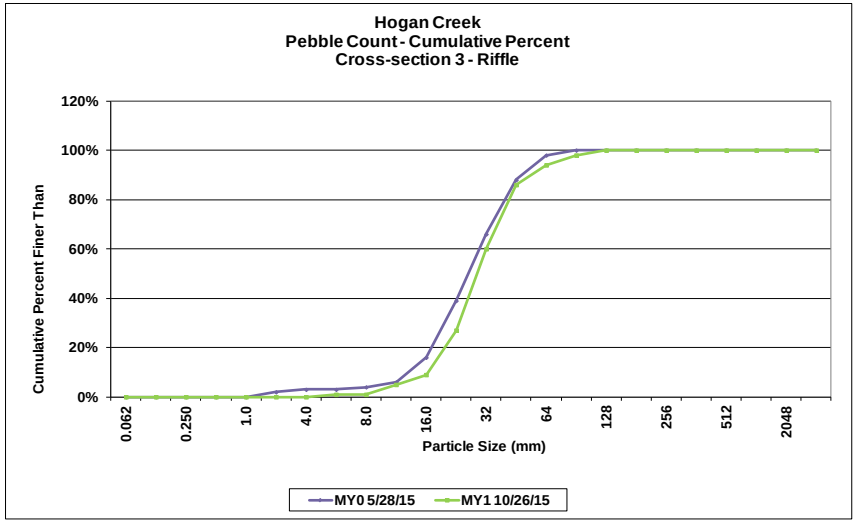
| Summary Data | |
|---|---|
| D50 | **23** |
| D84 | **44** |
| D95 | **59** |

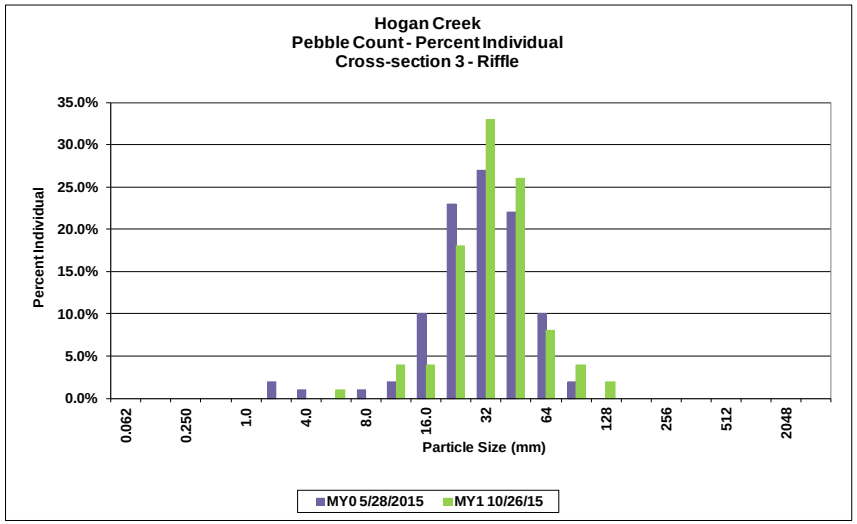


| Hogan Creek Stream Mitigation / 94708<br>Cross Section 3 - Riffle<br>Reach 1 | | | | |
|---|---|---|---|---|
| | | | MY1 | |
| Material | Particle Size Class (mm) | Total | % Individual | % Cumulative |
| silt/clay | 0.062 | | 0.0% | 0% |
| very fine sand | 0.125 | | 0.0% | 0% |
| fine sand | 0.250 | | 0.0% | 0% |
| medium sand | 0.50 | | 0.0% | 0% |
| coarse sand | 1.0 | | 0.0% | 0% |
| very course sand | 2.0 | | 0.0% | 0% |
| very fine gravel | 4.0 | | 0.0% | 0% |
| fine gravel | 5.7 | 1 | 1.0% | 1% |
| fine gravel | 8.0 | | 0.0% | 1% |
| medium gravel | 11.3 | 4 | 4.0% | 5% |
| medium gravel | 16.0 | 4 | 4.0% | 9% |
| course gravel | 22.3 | 18 | 18.0% | 27% |
| course gravel | 32 | 33 | 33.0% | 60% |
| very course gravel | 45 | 26 | 26.0% | 86% |
| very course gravel | 64 | 8 | 8.0% | 94% |
| small cobble | 90 | 4 | 4.0% | 98% |
| medium cobble | 128 | 2 | 2.0% | 100% |
| large cobble | 180 | | 0.0% | 100% |
| very large cobble | 256 | | 0.0% | 100% |
| small boulder | 362 | | 0.0% | 100% |
| small boulder | 512 | | 0.0% | 100% |
| medium boulder | 1024 | | 0.0% | 100% |
| large boulder | 2048 | | 0.0% | 100% |
| bedrock | 4096 | | 0.0% | 100% |
| **Total** | | **100** | **100.0%** | **100%** |

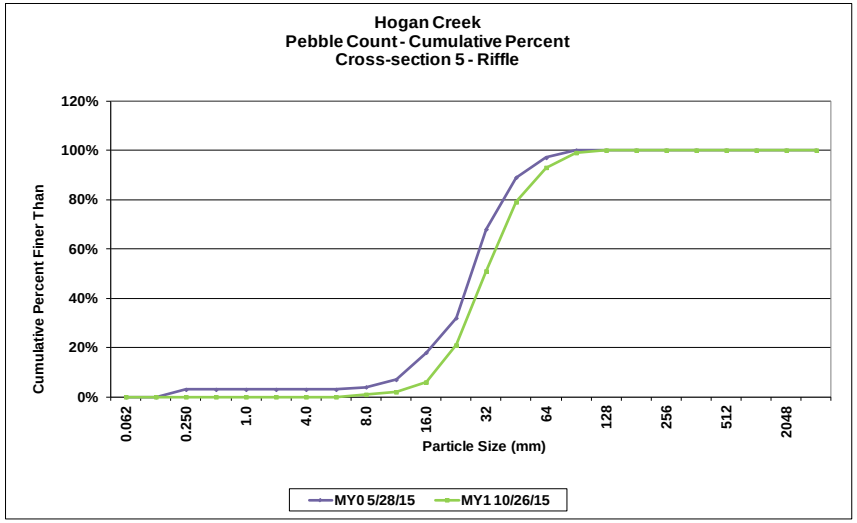
| Summary Data | |
|---|---|
| D50 | **29** |
| D84 | **44** |
| D95 | **70** |

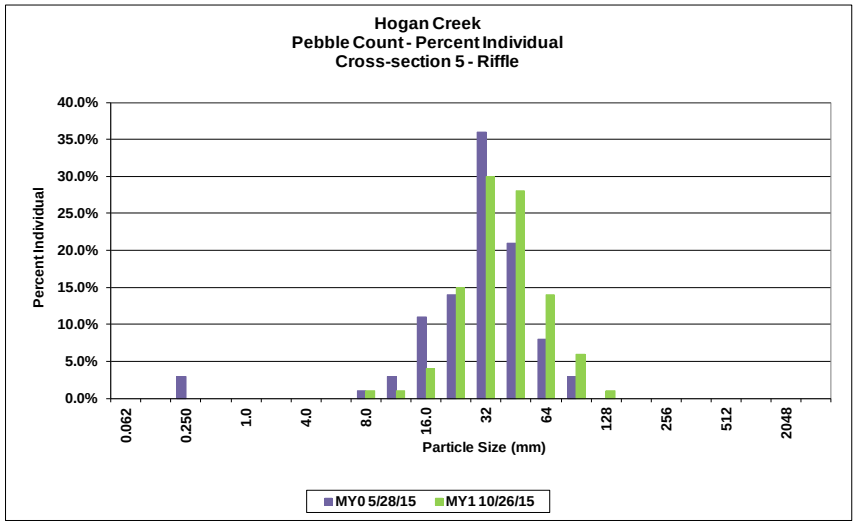


| Hogan Creek Stream Mitigation / 94708<br>Cross Section 5 - Riffle<br>Reach 2 | | | | |
|---|---|---|---|---|
| | | | MY1 | |
| Material | Particle Size Class (mm) | Total | % Individual | % Cumulative |
| silt/clay | 0.062 | | 0.0% | 0% |
| very fine sand | 0.125 | | 0.0% | 0% |
| fine sand | 0.250 | | 0.0% | 0% |
| medium sand | 0.50 | | 0.0% | 0% |
| coarse sand | 1.0 | | 0.0% | 0% |
| very course sand | 2.0 | | 0.0% | 0% |
| very fine gravel | 4.0 | | 0.0% | 0% |
| fine gravel | 5.7 | | 0.0% | 0% |
| fine gravel | 8.0 | 1 | 1.0% | 1% |
| medium gravel | 11.3 | 1 | 1.0% | 2% |
| medium gravel | 16.0 | 4 | 4.0% | 6% |
| course gravel | 22.3 | 15 | 15.0% | 21% |
| course gravel | 32 | 30 | 30.0% | 51% |
| very course gravel | 45 | 28 | 28.0% | 79% |
| very course gravel | 64 | 14 | 14.0% | 93% |
| small cobble | 90 | 6 | 6.0% | 99% |
| medium cobble | 128 | 1 | 1.0% | 100% |
| large cobble | 180 | | 0.0% | 100% |
| very large cobble | 256 | | 0.0% | 100% |
| small boulder | 362 | | 0.0% | 100% |
| small boulder | 512 | | 0.0% | 100% |
| medium boulder | 1024 | | 0.0% | 100% |
| large boulder | 2048 | | 0.0% | 100% |
| bedrock | 4096 | | 0.0% | 100% |
| **Total** | | **100** | **100.0%** | **100%** |

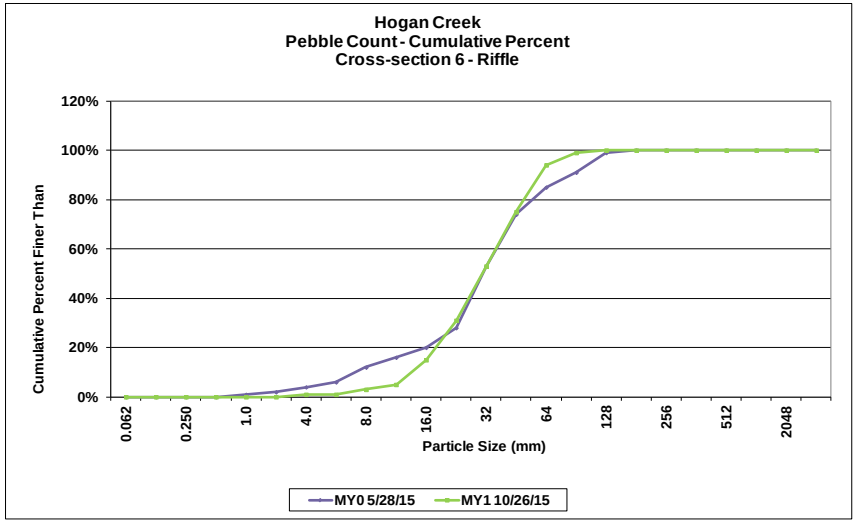
| Summary Data | |
|---|---|
| D50 | **32** |
| D84 | **51** |
| D95 | **72** |



| Hogan Creek Stream Mitigation / 94708<br>Cross Section 6 - Riffle<br>Reach 2 | | | | |
|---|---|---|---|---|
| | | | MY1 | |
| Material | Particle Size Class (mm) | Total | % Individual | % Cumulative |
| silt/clay | 0.062 | | 0.0% | 0% |
| very fine sand | 0.125 | | 0.0% | 0% |
| fine sand | 0.250 | | 0.0% | 0% |
| medium sand | 0.50 | | 0.0% | 0% |
| coarse sand | 1.0 | | 0.0% | 0% |
| very course sand | 2.0 | | 0.0% | 0% |
| very fine gravel | 4.0 | 1 | 1.0% | 1% |
| fine gravel | 5.7 | | 0.0% | 1% |
| fine gravel | 8.0 | 2 | 2.0% | 3% |
| medium gravel | 11.3 | 2 | 2.0% | 5% |
| medium gravel | 16.0 | 10 | 10.0% | 15% |
| course gravel | 22.3 | 16 | 16.0% | 31% |
| course gravel | 32 | 22 | 22.0% | 53% |
| very course gravel | 45 | 22 | 22.0% | 75% |
| very course gravel | 64 | 19 | 19.0% | 94% |
| small cobble | 90 | 5 | 5.0% | 99% |
| medium cobble | 128 | 1 | 1.0% | 100% |
| large cobble | 180 | | 0.0% | 100% |
| very large cobble | 256 | | 0.0% | 100% |
| small boulder | 362 | | 0.0% | 100% |
| small boulder | 512 | | 0.0% | 100% |
| medium boulder | 1024 | | 0.0% | 100% |
| large boulder | 2048 | | 0.0% | 100% |
| bedrock | 4096 | | 0.0% | 100% |
| **Total** | | **100** | **100.0%** | **100%** |

| Summary Data | |
|---|---|
| D50 | **30** |
| D84 | **53** |
| D95 | **69** |



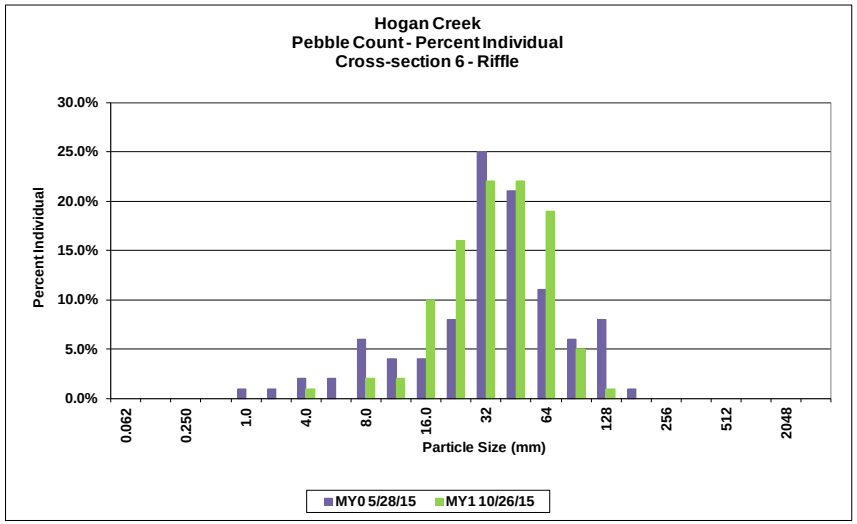



Table 8a. Baseline Stream Data Summary

Hogan Creek/94708 - Reach 1 (1,532 feet)

| Parameter | Gauge | Regional Curve | | | Pre-Existing Condition | | | | | | Reference Reach Data | | | | | | Design | | | Monitoring Baseline | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dimension and Substrate - Riffle Only** | | LL | UL | Eq. | Min | Mean | Med | Max | SD | n | Min | Mean | Med | Max | SD | n | Min | Med | Max | Min | Mean | Med | Max | SD | n |
| Bankfull Width (ft) | - | - | - | - | 21.5 | - | 25.7 | 29.7 | - | - | 27.2 | - | 30.4 | 33.6 | - | - | 22.5 | 23.3 | 24.0 | 22.8 | 24.2 | 24.2 | 25.6 | N/A | 2 |
| Floodprone Width (ft) | | | | | 178.0 | - | 220.0 | 246.0 | - | - | 72.1 | - | 72.3 | 72.5 | - | - | 100.0 | 150.0 | 200.0 | >100 | >100 | >100 | >100 | N/A | 2 |
| Bankfull Mean Depth (ft) | - | - | - | - | 2.0 | - | 1.9 | 2.1 | - | - | 1.9 | - | 2.0 | 2.2 | - | - | 1.8 | 1.9 | 2.2 | 1.7 | 1.8 | 1.8 | 1.8 | N/A | 2 |
| Bankfull Max Depth (ft) | - | | | | 2.5 | - | 2.7 | 3.2 | - | - | 2.4 | - | 2.5 | 2.7 | - | - | 2.5 | 2.6 | 2.8 | 2.7 | 2.8 | 2.8 | 2.9 | N/A | 2 |
| Bankfull Cross Sectional Area ($ft^2$) | - | - | - | - | 45.1 | - | 48.6 | 59.3 | - | - | 50.8 | - | 61.6 | 72.4 | - | - | 40.6 | 44.1 | 47.6 | 41.4 | 42.7 | 42.7 | 43.9 | N/A | 2 |
| Width/Depth Ratio | - | | | | 10.3 | - | 13.6 | 14.9 | - | - | 14.5 | - | 15.0 | 15.6 | - | - | 12.5 | 12.3 | 12.1 | 12.6 | 13.8 | 13.8 | 14.9 | N/A | 2 |
| Entrenchment Ratio | - | | | | 8.3 | - | 8.6 | 8.3 | - | - | 2.7 | - | 2.7 | 2.7 | - | - | 4.4 | 6.5 | 8.3 | >3.9 | >4.2 | >4.2 | >4.4 | N/A | 2 |
| Bank Height Ratio | - | | | | 1.3 | - | 1.3 | 1.4 | - | - | 1.0 | - | 1.0 | 1.1 | - | - | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | N/A | 2 |
| **Profile** | | | | | | | | | | | | | | | | | | | | | | | | | |
| Riffle Length (ft) | | | | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 37.17 | 58.9 | - | 98.4 | - | 8 |
| Riffle Slope (ft/ft) | | | | | 0.010 | - | 0.024 | 0.055 | - | - | 0.019 | - | 0.020 | 0.021 | - | - | 0.007 | 0.010 | 0.013 | 0.002 | 0.010 | - | 0.018 | - | 8 |
| Pool Length (ft) | | | | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 25.0 | 62.6 | - | 88.0 | - | 13 |
| Pool Max depth (ft) | | | | | 4.0 | - | 4.3 | 4.7 | - | - | 3.4 | - | 3.5 | 3.5 | - | - | 4.0 | 4.0 | 4.0 | 2.5 | 3.2 | - | 4.1 | - | 13 |
| Pool Spacing (ft) | | | | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 73.3 | 120.9 | - | 200.1 | - | 12 |
| **Pattern** | | | | | | | | | | | | | | | | | | | | | | | | | |
| Channel Beltwidth (ft) | | | | | 44.0 | - | 65.0 | 117.0 | - | - | 86.0 | - | 86.0 | 86.0 | - | - | 48.0 | 88.0 | 126.0 | 63.0 | 96.5 | 101.0 | 121.0 | 24.9 | 4 |
| Radius of Curvature (ft) | | | | | 20.0 | - | 29.0 | 52.0 | - | - | 19.6 | - | 22.7 | 25.8 | - | - | 67.0 | 73.0 | 101.0 | 70.0 | 76.5 | 75.0 | 86.0 | 6.8 | 4 |
| Rc:Bankfull width (ft/ft) | | | | | 0.9 | - | 1.1 | 1.8 | - | - | 0.7 | - | 0.8 | 0.9 | - | - | 3.0 | 3.1 | 4.2 | 2.9 | 3.2 | 3.1 | 3.6 | N/A | N/A |
| Meander Wavelength (ft) | | | | | 133.0 | - | 297.0 | 479.0 | - | - | 81.0 | - | 81.0 | 81.0 | - | - | 133.0 | 311.0 | 325.0 | 165.0 | 263.7 | 306.0 | 320.0 | 85.7 | 3 |
| Meander Width Ratio | | | | | 2.0 | - | 2.5 | 3.9 | - | - | 3.2 | - | 3.2 | 3.2 | - | - | 2.1 | 3.8 | 5.3 | 2.6 | 4.0 | 4.2 | 5.0 | N/A | N/A |
| | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Substrate, Bed, and Transport parameters** | | | | | | | | | | | | | | | | | | | | | | | | | |
| Ri% / Ru% / P% / G% / S% | | | | | - | | | | | | - | | | | | | - | | | - | | | | | |
| SC% / Sa% / G% / C% / B% / Be% | | | | | - | | | | | | - | | | | | | - | | | 0%,3.5%,96%,0.5%,0%,0% | | | | | |
| d16 / d35 / d50 / d84 / d95 (mm) | | | | | - | | | | | | - | | | | | | - | | | 14, 19, 23, 41, 56 | | | | | |
| Reach Shear Stress (competency) $lb/f^2$ | | | | | - | | | | | | - | | | | | | - | | | - | | | | | |
| Max part size (mm) mobilized at bankfull | | | | | - | | | | | | - | | | | | | - | | | - | | | | | |
| Stream Power (transport capacity) $W/m^2$ | | | | | - | | | | | | - | | | | | | - | | | - | | | | | |
| **Additional Reach Parameters** | | | | | | | | | | | | | | | | | | | | | | | | | |
| Rosgen Classification | - | | | | C4 | | | | | | C4 | | | | | | C4 | | | C4 | | | | | |
| Bankfull Velocity (fps) | - | - | - | - | - | | | | | | | | | | | | - | | | - | | | | | |
| Bankfull Discharge (cfs) | - | - | - | - | - | | | | | | | | | | | | | | | | | | | | |
| Valley length (ft) | | | | | 2,525 | | | | | | 4,730 | | | | | | | | | 1,294 | | | | | |
| Channel Thalweg length (ft) | | | | | 2,762 | | | | | | 327 | | | | | | 2,897 | | | 1,532 | | | | | |
| Sinuosity (ft) | | | | | 1.12 | | | | | | 1.26 | | | | | | 1.15 | | | 1.18 | | | | | |
| Water Surface Slope (Channel) (ft/ft) | - | | | | 0.0064 | | | | | | 0.0127 | | | | | | 0.0071 | | | 0.0063 | | | | | |
| BF slope (ft/ft) | - | | | | 0.0071 | | | | | | 0.0101 | | | | | | 0.0062 | | | 0.0067 | | | | | |
| Bankfull Floodplain Area (acres) | | | | | - | | | | | | - | | | | | | - | | | - | | | | | |
| % of Reach with Eroding Banks | | | | | - | | | | | | - | | | | | | | | | | | | | | |
| Channel Stability or Habitat Metric | | | | | - | | | | | | - | | | | | | | | | | | | | | |
| Biological or Other | | | | | - | | | | | | - | | | | | | | | | | | | | | |

N/A - Not Applicable

- Information Unavailable

Table 8b. Baseline Stream Data Summary

Hogan Creek/94708 - Reach 2 (1,085feet)

| Parameter | Gauge | Regional Curve | | | Pre-Existing Condition | | | | | | Reference Reach Data | | | | | | Design | | | Monitoring Baseline | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dimension and Substrate - Riffle Only** | | LL | UL | Eq. | Min | Mean | Med | Max | SD | n | Min | Mean | Med | Max | SD | n | Min | Med | Max | Min | Mean | Med | Max | SD | n |
| Bankfull Width (ft) | - | - | - | - | 21.5 | - | 25.7 | 29.7 | - | - | 27.2 | - | 30.4 | 33.6 | - | - | 22.5 | 23.3 | 24.0 | 24.2 | 24.5 | 24.5 | 24.7 | N/A | 2 |
| Floodprone Width (ft) | | | | | 178.0 | - | 220.0 | 246.0 | - | - | 72.1 | - | 72.3 | 72.5 | - | - | 100.0 | 150.0 | 200.0 | >100 | >100 | >100 | >100 | N/A | 2 |
| Bankfull Mean Depth (ft) | - | - | - | - | 2.0 | - | 1.9 | 2.1 | - | - | 1.9 | - | 2.0 | 2.2 | - | - | 1.8 | 1.9 | 2.2 | 1.9 | 2.1 | 2.1 | 2.3 | N/A | 2 |
| Bankfull Max Depth (ft) | - | | | | 2.5 | - | 2.7 | 3.2 | - | - | 2.4 | - | 2.5 | 2.7 | - | - | 2.5 | 2.6 | 2.8 | 3.2 | 3.4 | 3.4 | 3.6 | N/A | 2 |
| Bankfull Cross Sectional Area ($ft^2$) | - | - | - | - | 45.1 | - | 48.6 | 59.3 | - | - | 50.8 | - | 61.6 | 72.4 | - | - | 40.6 | 44.1 | 47.6 | 45.2 | 50.9 | 50.9 | 56.6 | N/A | 2 |
| Width/Depth Ratio | - | | | | 10.3 | - | 13.6 | 14.9 | - | - | 14.5 | - | 15.0 | 15.6 | - | - | 12.5 | 12.3 | 12.1 | 10.8 | 11.9 | 11.9 | 13.0 | N/A | 2 |
| Entrenchment Ratio | - | | | | 8.3 | - | 8.6 | 8.3 | - | - | 2.7 | - | 2.7 | 2.7 | - | - | 4.4 | 6.5 | 8.3 | >4.0 | >4.1 | >4.1 | >4.1 | N/A | 2 |
| Bank Height Ratio | - | | | | 1.3 | - | 1.3 | 1.4 | - | - | 1.0 | - | 1.0 | 1.1 | - | - | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | N/A | 2 |
| **Profile** | | | | | | | | | | | | | | | | | | | | | | | | | |
| Riffle Length (ft) | | | | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 95.63 | 111.6 | - | 130.3 | - | 5 |
| Riffle Slope (ft/ft) | | | | | 0.010 | - | 0.024 | 0.055 | - | - | 0.019 | - | 0.020 | 0.021 | - | - | 0.007 | 0.010 | 0.013 | 0.004 | 0.005 | - | 0.007 | - | 5 |
| Pool Length (ft) | | | | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 43.7 | 68.8 | - | 117.1 | - | 5 |
| Pool Max depth (ft) | | | | | 4.0 | - | 4.3 | 4.7 | - | - | 3.4 | - | 3.5 | 3.5 | - | - | 4.0 | 4.0 | 4.0 | 3.80 | 4.73 | - | 5.8 | - | 5 |
| Pool Spacing (ft) | | | | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 164.1 | 208.4 | - | 253.1 | - | 4 |
| **Pattern** | | | | | | | | | | | | | | | | | | | | | | | | | |
| Channel Beltwidth (ft) | | | | | 44.0 | - | 65.0 | 117.0 | - | - | 86.0 | - | 86.0 | 86.0 | - | - | 48.0 | 88.0 | 126.0 | 84.0 | 114.0 | 117.0 | 141.0 | 28.6 | 3 |
| Radius of Curvature (ft) | | | | | 20.0 | - | 29.0 | 52.0 | - | - | 19.6 | - | 22.7 | 25.8 | - | - | 67.0 | 73.0 | 101.0 | 69.0 | 73.3 | 74.0 | 75.0 | 2.8 | 5 |
| Rc:Bankfull width (ft/ft) | | | | | 0.9 | - | 1.1 | 1.8 | - | - | 0.7 | - | 0.8 | 0.9 | - | - | 3.0 | 3.1 | 4.2 | 2.8 | 3.0 | 3.0 | 3.1 | N/A | N/A |
| Meander Wavelength (ft) | | | | | 133.0 | - | 297.0 | 479.0 | - | - | 81.0 | - | 81.0 | 81.0 | - | - | 133.0 | 311.0 | 325.0 | 292.0 | 307.0 | 301.0 | 328.0 | 18.7 | 3 |
| Meander Width Ratio | | | | | 2.0 | - | 2.5 | 3.9 | - | - | 3.2 | - | 3.2 | 3.2 | - | - | 2.1 | 3.8 | 5.3 | 3.4 | 4.7 | 4.8 | 5.8 | N/A | N/A |
| | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Substrate, Bed, and Transport parameters** | | | | | | | | | | | | | | | | | | | | | | | | | |
| Ri% / Ru% / P% / G% / S% | | | | | - | | | | | | | | | | | | - | | | - | | | | | |
| SC% / Sa% / G% / C% / B% / Be% | | | | | - | | | | | | | | | | | | - | | | 0%,3%,9%,89%, 0%, 0% | | | | | |
| d16 / d35 / d50 / d84 / d95 (mm) | | | | | - | | | | | | | | | | | | - | | | 13, 24, 22, 35, 49 | | | | | |
| Reach Shear Stress (competency) $lb/f^2$ | | | | | - | | | | | | | | | | | | - | | | - | | | | | |
| Max part size (mm) mobilized at bankfull | | | | | - | | | | | | | | | | | | - | | | - | | | | | |
| Stream Power (transport capacity) $W/m^2$ | | | | | - | | | | | | | | | | | | - | | | - | | | | | |
| **Additional Reach Parameters** | | | | | | | | | | | | | | | | | | | | | | | | | |
| Rosgen Classification | - | | | | C4 | | | | | | C4 | | | | | | C4 | | | C4 | | | | | |
| Bankfull Velocity (fps) | - | - | - | - | - | | | | | | | | | | | | - | | | - | | | | | |
| Bankfull Discharge (cfs) | - | - | - | - | - | | | | | | | | | | | | | | | | | | | | |
| Valley length (ft) | | | | | 2,525 | | | | | | 4,730 | | | | | | | | | 794 | | | | | |
| Channel Thalweg length (ft) | | | | | 2,762 | | | | | | 327 | | | | | | 2,897 | | | 1,085 | | | | | |
| Sinuosity (ft) | | | | | 1.12 | | | | | | 1.26 | | | | | | 1.15 | | | 1.37 | | | | | |
| Water Surface Slope (Channel) (ft/ft) | - | | | | 0.0064 | | | | | | 0.0127 | | | | | | 0.0071 | | | 0.0050 | | | | | |
| BF slope (ft/ft) | - | | | | 0.0071 | | | | | | 0.0101 | | | | | | 0.0062 | | | 0.0053 | | | | | |
| Bankfull Floodplain Area (acres) | | | | | - | | | | | | - | | | | | | - | | | - | | | | | |
| % of Reach with Eroding Banks | | | | | - | | | | | | - | | | | | | | | | | | | | | |
| Channel Stability or Habitat Metric | | | | | - | | | | | | - | | | | | | | | | | | | | | |
| Biological or Other | | | | | - | | | | | | - | | | | | | | | | | | | | | |

N/A - Not Applicable

- Information Unavailable

Table 8c. Baseline Stream Data Summary

Hogan Creek/94708 - UT2 (675 feet)

| Parameter | Gauge | Regional Curve | | | Pre-Existing Condition | | | | | | Reference Reach Data | | | | | | Design | | | Monitoring Baseline | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dimension and Substrate - Riffle Only** | | LL | UL | Eq. | Min | Mean | Med | Max | SD | n | Min | Mean | Med | Max | SD | n | Min | Med | Max | Min | Mean | Med | Max | SD | n |
| Bankfull Width (ft) | - | - | - | - | - | - | 8.2 | - | - | - | - | - | 7.1 | - | - | - | - | 9.0 | - | 6.5 | 7.1 | 7.1 | 7.6 | N/A | 2 |
| Floodprone Width (ft) | | | | | - | - | 66.0 | - | - | - | - | - | 15.0 | - | - | - | - | 30.0 | - | 21 | 24.9 | 24.9 | 28.8 | N/A | 2 |
| Bankfull Mean Depth (ft) | - | - | - | - | - | - | 1.5 | - | - | - | - | - | 0.9 | - | - | - | - | 0.7 | - | 0.5 | 0.6 | 0.6 | 0.7 | N/A | 2 |
| Bankfull Max Depth (ft) | - | | | | - | - | 2.1 | - | - | - | - | - | 1.2 | - | - | - | - | 1.0 | - | 0.9 | 1.1 | 1.1 | 1.2 | N/A | 2 |
| Bankfull Cross Sectional Area ($ft^2$) | - | - | - | - | - | - | 12.1 | - | - | - | - | - | 6.6 | - | - | - | - | 6.5 | - | 4.0 | 4.4 | 4.4 | 4.7 | N/A | 2 |
| Width/Depth Ratio | - | | | | - | - | 5.6 | - | - | - | - | - | 7.6 | - | - | - | - | 12.5 | - | 8.9 | 11.6 | 11.6 | 14.2 | N/A | 2 |
| Entrenchment Ratio | - | | | | - | - | 8.0 | - | - | - | - | - | 2.1 | - | - | - | - | 3.3 | - | 3.2 | 3.5 | 3.5 | 3.8 | N/A | 2 |
| Bank Height Ratio | - | | | | - | - | 1.6 | - | - | - | - | - | 1.0 | - | - | - | - | 1.0 | - | 1.0 | 1.0 | 1.0 | 1.0 | N/A | 2 |
| **Profile** | | | | | | | | | | | | | | | | | | | | | | | | | |
| Riffle Length (ft) | | | | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 14.3 | 34.4 | - | 67.3 | - | 11 |
| Riffle Slope (ft/ft) | | | | | 0.030 | - | 0.033 | 0.056 | - | - | 0.023 | - | 0.033 | 0.036 | - | - | 0.027 | 0.032 | 0.038 | 0.014 | 0.028 | - | 0.052 | - | 11 |
| Pool Length (ft) | | | | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 4.2 | 11.0 | - | 27.1 | - | 12 |
| Pool Max depth (ft) | | | | | - | - | 2.7 | - | - | - | - | - | 1.5 | - | - | - | - | 1.6 | - | 1.2 | 2.0 | - | 3.2 | - | 12 |
| Pool Spacing (ft) | | | | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 13.1 | 54.8 | - | 151.0 | - | 11 |
| **Pattern** | | | | | | | | | | | | | | | | | | | | | | | | | |
| Channel Beltwidth (ft) | | | | | 28.0 | - | 42.0 | 56.0 | - | - | 62.0 | - | 67.5 | 73.0 | - | - | 17.0 | 26.0 | 49.0 | 26.0 | 38.0 | 39.0 | 54.0 | 2.7 | 5 |
| Radius of Curvature (ft) | | | | | 16.0 | - | 18.5 | 21.0 | - | - | 7.0 | - | 16.0 | 25.0 | - | - | 22.0 | 27.0 | 30.0 | 19.0 | 21.6 | 22.0 | 26.0 | 2.4 | 6 |
| Rc:Bankfull width (ft/ft) | | | | | 2.0 | - | 2.3 | 2.6 | - | - | 1.0 | - | 2.3 | 3.5 | - | - | 2.4 | 3.0 | 3.3 | 2.7 | 3.0 | 3.1 | 3.7 | N/A | N/A |
| Meander Wavelength (ft) | | | | | 128.0 | - | 159.0 | 190.0 | - | - | 53.0 | - | 58.5 | 64.0 | - | - | 73.0 | 103.0 | 130.0 | 101.0 | 112.3 | 109.5 | 132.0 | 2.7 | 6 |
| Meander Width Ratio | | | | | 3.4 | - | 5.1 | 6.8 | - | - | 8.7 | - | 9.5 | 10.3 | - | - | 1.9 | 2.9 | 5.5 | 3.7 | 5.4 | 5.5 | 7.6 | N/A | N/A |
| | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Substrate, Bed, and Transport parameters** | | | | | | | | | | | | | | | | | | | | | | | | | |
| Ri% / Ru% / P% / G% / S% | | | | | - | | | | | | - | | | | | | - | | | - | | | | | |
| SC% / Sa% / G% / C% / B% / Be% | | | | | - | | | | | | | | | | | | - | | | N/A | | | | | |
| d16 / d35 / d50 / d84 / d95 (mm) | | | | | - | | | | | | | | | | | | - | | | N/A | | | | | |
| Reach Shear Stress (competency) $lb/f^2$ | | | | | - | | | | | | - | | | | | | - | | | - | | | | | |
| Max part size (mm) mobilized at bankfull | | | | | - | | | | | | - | | | | | | - | | | - | | | | | |
| Stream Power (transport capacity) $W/m^2$ | | | | | - | | | | | | - | | | | | | - | | | - | | | | | |
| **Additional Reach Parameters** | | | | | | | | | | | | | | | | | | | | | | | | | |
| Rosgen Classification | - | | | | E4b | | | | | | E4b | | | | | | B4 | | | B4 | | | | | |
| Bankfull Velocity (fps) | - | - | - | - | - | | | | | | | | | | | | - | | | - | | | | | |
| Bankfull Discharge (cfs) | - | - | - | - | - | | | | | | | | | | | | | | | | | | | | |
| Valley length (ft) | | | | | 641 | | | | | | 1,350 | | | | | | | | | 544 | | | | | |
| Channel Thalweg length (ft) | | | | | 568 | | | | | | 1,980 | | | | | | 555 | | | 675 | | | | | |
| Sinuosity (ft) | | | | | 1.33 | | | | | | 1.47 | | | | | | 1.4 | | | 1.24 | | | | | |
| Water Surface Slope (Channel) (ft/ft) | - | | | | 0.0235 | | | | | | 0.0263 | | | | | | 0.0223 | | | 0.0218 | | | | | |
| BF slope (ft/ft) | - | | | | 0.0312 | | | | | | 0.0356 | | | | | | 0.0312 | | | 0.0229 | | | | | |
| Bankfull Floodplain Area (acres) | | | | | - | | | | | | - | | | | | | - | | | - | | | | | |
| % of Reach with Eroding Banks | | | | | - | | | | | | - | | | | | | | | | | | | | | |
| Channel Stability or Habitat Metric | | | | | - | | | | | | - | | | | | | | | | | | | | | |
| Biological or Other | | | | | - | | | | | | - | | | | | | | | | | | | | | |

N/A - Not Applicable

- Information Unavailable

| Table 9. Monitoring Data - Dimensional Morphology Summary (Dimensional Parameters – Cross Sections) | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Hogan Creek /94708 Segment/Reach: Hogan Reach 1 (1,532 feet)** | | | | | | | | | | | | | | | | | | |
| | **Cross Section 1 (Riffle)** | | | | | | **Cross Section 2 (Pool)** | | | | | | **Cross Section 3 (Riffle)** | | | | | |
| **Based on fixed baseline bankfull elevation** | Base | MY1 | MY2 | MY3 | MY4 | MY5 | Base | MY1 | MY2 | MY3 | MY4 | MY5 | Base | MY1 | MY2 | MY3 | MY4 | MY5 |
| **Record elevation (datum) used** | 990.8 | 990.8 | | | | | 990.7 | 990.7 | | | | | 987.6 | 987.6 | | | | |
| Bankfull Width (ft) | 25.6 | 25.4 | | | | | 29.1 | 30.6 | | | | | 22.8 | 22.9 | | | | |
| Floodprone Width (ft) | >100 | >100 | | | | | N/A | N/A | | | | | >100 | >100 | | | | |
| Bankfull Mean Depth (ft) | 1.7 | 1.6 | | | | | 2.0 | 2.2 | | | | | 1.8 | 2.0 | | | | |
| Bankfull Max Depth (ft) | 2.9 | 2.9 | | | | | 4.5 | 4.9 | | | | | 2.7 | 3.6 | | | | |
| Bankfull Cross Sectional Area ($ft^2$) | 43.9 | 41.8 | | | | | 57.6 | 66.7 | | | | | 41.4 | 45.9 | | | | |
| Bankfull Width/Depth Ratio | 14.9 | 15.4 | | | | | 14.7 | 14.1 | | | | | 12.6 | 11.4 | | | | |
| Bankfull Entrenchment Ratio | >3.9 | >3.9 | | | | | N/A | N/A | | | | | >4.4 | >4.4 | | | | |
| Bankfull Bank Height Ratio | 1.0 | 1.0 | | | | | 1.0 | 1.0 | | | | | 1.0 | 1.0 | | | | |
| d50 (mm) | 19 | 23 | | | | | N/A | N/A | | | | | 26 | 29 | | | | |
| **Hogan Creek /94708 Segment/Reach: Hogan Reach 2 (1,085 feet)** | | | | | | | | | | | | | | | | | | |
| | **Cross Section 4 (Pool)** | | | | | | **Cross Section 5 (Riffle)** | | | | | | **Cross Section 6 (Riffle)** | | | | | |
| **Based on fixed baseline bankfull elevation** | Base | MY1 | MY2 | MY3 | MY4 | MY5 | Base | MY1 | MY2 | MY3 | MY4 | MY5 | Base | MY1 | MY2 | MY3 | MY4 | MY5 |
| **Record elevation (datum) used** | 984.0 | 984.0 | | | | | 983.6 | 983.6 | | | | | 982.1 | 982.1 | | | | |
| Bankfull Width (ft) | 44.6 | 45.5 | | | | | 24.2 | 24.8 | | | | | 24.7 | 28.1 | | | | |
| Floodprone Width (ft) | N/A | N/A | | | | | >100 | >100 | | | | | >100 | >100 | | | | |
| Bankfull Mean Depth (ft) | 2.2 | 2.1 | | | | | 1.9 | 2.0 | | | | | 2.3 | 2.0 | | | | |
| Bankfull Max Depth (ft) | 4.2 | 4.3 | | | | | 3.2 | 3.6 | | | | | 3.6 | 3.8 | | | | |
| Bankfull Cross Sectional Area ($ft^2$) | 98.9 | 95.4 | | | | | 45.2 | 49.2 | | | | | 56.6 | 56.5 | | | | |
| Bankfull Width/Depth Ratio | 20.1 | 21.7 | | | | | 13.0 | 12.5 | | | | | 10.8 | 14.0 | | | | |
| Bankfull Entrenchment Ratio | N/A | N/A | | | | | >4.1 | >4.0 | | | | | >4.0 | >3.6 | | | | |
| Bankfull Bank Height Ratio | 1.0 | 1.0 | | | | | 1.0 | 1.0 | | | | | 1.0 | 1.0 | | | | |
| d50 (mm) | N/A | N/A | | | | | 27 | 32 | | | | | 31 | 30 | | | | |
| **Hogan Creek /94708 Segment/Reach: UT2 (675 feet)** | | | | | | | | | | | | | | | | | | |
| | **Cross Section 7 (Riffle)** | | | | | | **Cross Section 8 (Pool)** | | | | | | **Cross Section 9 (Riffle)** | | | | | |
| **Based on fixed baseline bankfull elevation** | Base | MY1 | MY2 | MY3 | MY4 | MY5 | Base | MY1 | MY2 | MY3 | MY4 | MY5 | Base | MY1 | MY2 | MY3 | MY4 | MY5 |
| **Record elevation (datum) used** | 989.4 | 989.4 | | | | | 988.2 | 988.2 | | | | | 986.4 | 986.4 | | | | |
| Bankfull Width (ft) | 7.6 | 6.9 | | | | | 6.9 | 7.1 | | | | | 6.5 | 6.8 | | | | |
| Floodprone Width (ft) | 28.8 | 29.0 | | | | | N/A | N/A | | | | | 21.0 | 20.6 | | | | |
| Bankfull Mean Depth (ft) | 0.5 | 0.5 | | | | | 0.6 | 0.7 | | | | | 0.7 | 0.7 | | | | |
| Bankfull Max Depth (ft) | 0.9 | 1.0 | | | | | 1.0 | 1.3 | | | | | 1.2 | 1.1 | | | | |
| Bankfull Cross Sectional Area ($ft^2$) | 4.0 | 3.5 | | | | | 4.4 | 5.1 | | | | | 4.7 | 4.6 | | | | |
| Bankfull Width/Depth Ratio | 14.2 | 13.6 | | | | | 10.7 | 9.8 | | | | | 8.9 | 10.3 | | | | |
| Bankfull Entrenchment Ratio | 3.8 | 4.2 | | | | | N/A | N/A | | | | | 3.2 | 3.0 | | | | |
| Bankfull Bank Height Ratio | 1.0 | 1.0 | | | | | 1.0 | 1.0 | | | | | 1.0 | 1.0 | | | | |
| d50 (mm) | N/A | N/A | | | | | N/A | N/A | | | | | N/A | N/A | | | | |

N/A - Not Applicable

**Table 10a. Monitoring Data - Stream Reach Data Summary**
**Hogan Creek/94708 - Hogan Creek/Reach 1 (1,532 feet)**

| Parameter | Baseline | | | | | | MY-1 | | | | | | MY-2 | | | | | | MY- 3 | | | | | | MY- 4 | | | | | | MY- 5 | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dimension and Substrate - Riffle only** | Min | Mean | Med | Max | SD | n | Min | Mean | Med | Max | SD | 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) | 22.8 | 24.2 | 24.2 | 25.6 | N/A | 2 | 22.9 | 24.2 | 24.2 | 25.4 | N/A | 2 | | | | | | | | | | | | | | | | | | | | | | | | |
| Floodprone Width (ft) | >100 | >100 | >100 | >100 | N/A | 2 | >100 | >100 | >100 | >100 | N/A | 2 | | | | | | | | | | | | | | | | | | | | | | | | |
| Bankfull Mean Depth (ft) | 1.7 | 1.8 | 1.8 | 1.8 | N/A | 2 | 1.6 | 1.8 | 1.8 | 2.0 | N/A | 2 | | | | | | | | | | | | | | | | | | | | | | | | |
| Bankfull Max Depth (ft) | 2.7 | 2.8 | 2.8 | 2.9 | N/A | 2 | 2.9 | 3.3 | 3.3 | 3.6 | N/A | 2 | | | | | | | | | | | | | | | | | | | | | | | | |
| Bankfull Cross Sectional Area ($ft^2$) | 41.4 | 42.7 | 42.7 | 43.9 | N/A | 2 | 41.8 | 43.9 | 43.9 | 45.9 | N/A | 2 | | | | | | | | | | | | | | | | | | | | | | | | |
| Width/Depth Ratio | 12.6 | 13.8 | 13.8 | 14.9 | N/A | 2 | 11.4 | 13.4 | 13.4 | 15.4 | N/A | 2 | | | | | | | | | | | | | | | | | | | | | | | | |
| Entrenchment Ratio | >3.9 | >4.2 | >4.2 | >4.4 | N/A | 2 | >3.9 | >4.2 | >4.2 | >4.4 | N/A | 2 | | | | | | | | | | | | | | | | | | | | | | | | |
| Bank Height Ratio | 1.0 | 1.0 | 1.0 | 1.0 | N/A | 2 | 1.0 | 1.0 | 1.0 | 1.0 | N/A | 2 | | | | | | | | | | | | | | | | | | | | | | | | |
| **Profile** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Riffle Length (ft) | 37.2 | 58.9 | - | 98.4 | - | 8 | 15.0 | 62.1 | 73.5 | 98.0 | - | 8 | | | | | | | | | | | | | | | | | | | | | | | | |
| Riffle Slope (ft/ft) | 0.002 | 0.010 | - | 0.018 | - | 8 | 0.006 | 0.013 | 0.011 | 0.020 | - | 8 | | | | | | | | | | | | | | | | | | | | | | | | |
| Pool Length (ft) | 25.0 | 62.6 | - | 88.0 | - | 13 | 20.0 | 67.1 | 76.0 | 105.0 | - | 13 | | | | | | | | | | | | | | | | | | | | | | | | |
| Pool Max depth (ft) | 2.5 | 3.2 | - | 4.1 | - | 13 | 2.8 | 3.7 | 3.4 | 4.8 | - | 13 | | | | | | | | | | | | | | | | | | | | | | | | |
| Pool Spacing (ft) | 73.3 | 120.9 | - | 200.1 | - | 12 | 52.0 | 112.8 | 111.0 | 148.0 | - | 12 | | | | | | | | | | | | | | | | | | | | | | | | |
| **Pattern** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Channel Beltwidth (ft) | 63.0 | 96.5 | 101.0 | 121.0 | 24.9 | 4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Radius of Curvature (ft) | 70.0 | 76.5 | 75.0 | 86.0 | 6.8 | 4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Rc:Bankfull width (ft/ft) | 2.9 | 3.2 | 3.1 | 3.6 | N/A | N/A | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Meander Wavelength (ft) | 165.0 | 263.7 | 306.0 | 320.0 | 85.7 | 3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Meander Width Ratio | 2.6 | 4.0 | 4.2 | 5.0 | N/A | N/A | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Additional Reach Parameters** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Rosgen Classification | C4 | | | | | | C4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Channel Thalweg length (ft) | 1,532 | | | | | | 1,530 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Sinuosity (ft) | 1.18 | | | | | | 1.18 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Water Surface Slope (Channel) (ft/ft) | 0.0063 | | | | | | 0.0064 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BF slope (ft/ft) | 0.0067 | | | | | | 0.0069 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Ri% / Ru% / P% / G% / S% | - | - | - | - | - | - | - | - | - | - | - | - | | | | | | | | | | | | | | | | | | | | | | | | |
| SC% / Sa% / G% / C% / B% / Be% | 0% | 3.5% | 96% | 0.5% | 0% | 0% | 0% | 0.5% | 98% | 1.5% | 0% | 0% | | | | | | | | | | | | | | | | | | | | | | | | |
| d16 / d35 / d50 / d84 / d95 / | 14 | 19 | 23 | 41 | 56 | | 13 | 21 | 27 | 44 | 62 | | | | | | | | | | | | | | | | | | | | | | | | |
| % of Reach with Eroding Banks | 0% | | | | | | 7% | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Channel Stability or Habitat Metric | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Biological or Other | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

N/A - Not Applicable
- Information Unavailable

**Table 10b. Monitoring Data - Stream Reach Data Summary**
**Hogan Creek/94708 - Hogan Creek/Reach 2 (1,085 feet)**

| Parameter | Baseline | | | | | | MY-1 | | | | | | MY-2 | | | | | | MY- 3 | | | | | | MY- 4 | | | | | | MY- 5 | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dimension and Substrate - Riffle only** | Min | Mean | Med | Max | SD | n | Min | Mean | Med | Max | SD | n | Min | Mean | Med | Max | SD | n | Min | Mean | Med | Max | SD | n | Min | Mean | Med | Max | SD | n | Min | Mean | Med | Max | SD | n |
| Bankfull Width (ft) | 24.2 | 24.5 | 24.5 | 24.7 | N/A | 2 | 24.8 | 26.5 | 26.5 | 28.1 | N/A | 2 | | | | | | | | | | | | | | | | | | | | | | | | |
| Floodprone Width (ft) | >100 | >100 | >100 | >100 | N/A | 2 | >100 | >100 | >100 | >100 | N/A | 2 | | | | | | | | | | | | | | | | | | | | | | | | |
| Bankfull Mean Depth (ft) | 1.9 | 2.1 | 2.1 | 2.3 | N/A | 2 | 2.0 | 2.0 | 2.0 | 2.0 | N/A | 2 | | | | | | | | | | | | | | | | | | | | | | | | |
| Bankfull Max Depth (ft) | 3.2 | 3.4 | 3.4 | 3.6 | N/A | 2 | 3.6 | 3.7 | 3.7 | 3.8 | N/A | 2 | | | | | | | | | | | | | | | | | | | | | | | | |
| Bankfull Cross Sectional Area ($ft^2$) | 45.2 | 50.9 | 50.9 | 56.6 | N/A | 2 | 49.2 | 52.9 | 52.9 | 56.5 | N/A | 2 | | | | | | | | | | | | | | | | | | | | | | | | |
| Width/Depth Ratio | 10.8 | 11.9 | 11.9 | 13.0 | N/A | 2 | 12.5 | 13.3 | 13.3 | 14.0 | N/A | 2 | | | | | | | | | | | | | | | | | | | | | | | | |
| Entrenchment Ratio | >4.0 | >4.1 | >4.1 | >4.1 | N/A | 2 | >3.6 | >3.8 | >3.8 | >4.0 | N/A | 2 | | | | | | | | | | | | | | | | | | | | | | | | |
| Bank Height Ratio | 1.0 | 1.0 | 1.0 | 1.0 | N/A | 2 | 1.0 | 1.0 | 1.0 | 1.0 | N/A | 2 | | | | | | | | | | | | | | | | | | | | | | | | |
| **Profile** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Riffle Length (ft) | 95.6 | 111.6 | - | 130.3 | - | 5 | 56.0 | 91.0 | 101.0 | 125.0 | - | 5 | | | | | | | | | | | | | | | | | | | | | | | | |
| Riffle Slope (ft/ft) | 0.004 | 0.005 | - | 0.007 | - | 5 | 0.004 | 0.009 | 0.007 | 0.018 | - | 5 | | | | | | | | | | | | | | | | | | | | | | | | |
| Pool Length (ft) | 43.7 | 68.8 | - | 117.1 | - | 5 | 60.0 | 87.3 | 64.0 | 135.0 | - | 5 | | | | | | | | | | | | | | | | | | | | | | | | |
| Pool Max depth (ft) | 3.8 | 4.7 | - | 5.8 | - | 5 | 4.0 | 4.8 | 4.6 | 5.7 | - | 5 | | | | | | | | | | | | | | | | | | | | | | | | |
| Pool Spacing (ft) | 164.1 | 208.4 | - | 253.1 | - | 4 | 169.0 | 196.5 | 189.5 | 238.0 | - | 4 | | | | | | | | | | | | | | | | | | | | | | | | |
| **Pattern** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Channel Beltwidth (ft) | 84.0 | 114.0 | 117.0 | 141.0 | 28.6 | 3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Radius of Curvature (ft) | 69.0 | 73.3 | 74.0 | 75.0 | 2.8 | 5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Rc:Bankfull width (ft/ft) | 2.8 | 3.0 | 3.0 | 3.1 | N/A | N/A | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Meander Wavelength (ft) | 292.0 | 307.0 | 301.0 | 328.0 | 18.7 | 3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Meander Width Ratio | 3.4 | 4.7 | 4.8 | 5.8 | N/A | N/A | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Additional Reach Parameters** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Rosgen Classification | C4 | | | | | | C4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Channel Thalweg length (ft) | 1,085 | | | | | | 1,085 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Sinuosity (ft) | 1.37 | | | | | | 1.37 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Water Surface Slope (Channel) (ft/ft) | 0.0050 | | | | | | 0.0045 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BF slope (ft/ft) | 0.0053 | | | | | | 0.0053 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Ri% / Ru% / P% / G% / S% | - | - | - | - | - | - | - | - | - | - | - | - | | | | | | | | | | | | | | | | | | | | | | | | |
| SC% / Sa% / G% / C% / B% / Be% | 0% | 3% | 9% | 89% | 0% | 0% | 0% | 0% | 99% | 1% | 0% | 0% | | | | | | | | | | | | | | | | | | | | | | | | |
| d16 / d35 / d50 / d84 / d95 / | 13 | 24 | 22 | 35 | 49 | | 18 | 25 | 31 | 52 | 70 | | | | | | | | | | | | | | | | | | | | | | | | |
| % of Reach with Eroding Banks | 0% | | | | | | 2% | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Channel Stability or Habitat Metric | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Biological or Other | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

N/A - Not Applicable
- Information Unavailable

**Table 10c. Monitoring Data - Stream Reach Data Summary**
**Hogan Creek/94708 - UT2 (675 feet)**

| Parameter | Baseline | | | | | | MY-1 | | | | | | MY-2 | | | | | | MY- 3 | | | | | | MY- 4 | | | | | | MY- 5 | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dimension and Substrate - Riffle only** | Min | Mean | Med | Max | SD | n | Min | Mean | Med | Max | SD | n | Min | Mean | Med | Max | SD | n | Min | Mean | Med | Max | SD | n | Min | Mean | Med | Max | SD | n | Min | Mean | Med | Max | SD | n |
| Bankfull Width (ft) | 6.5 | 7.1 | 7.1 | 7.6 | N/A | 2 | 6.8 | 6.9 | 6.9 | 6.9 | N/A | 2 | | | | | | | | | | | | | | | | | | | | | | | | |
| Floodprone Width (ft) | 21 | 24.9 | 24.9 | 28.8 | N/A | 2 | 20.6 | 24.8 | 24.8 | 29.0 | N/A | 2 | | | | | | | | | | | | | | | | | | | | | | | | |
| Bankfull Mean Depth (ft) | 0.5 | 0.6 | 0.6 | 0.7 | N/A | 2 | 0.5 | 0.6 | 0.6 | 0.7 | N/A | 2 | | | | | | | | | | | | | | | | | | | | | | | | |
| Bankfull Max Depth (ft) | 0.9 | 1.1 | 1.1 | 1.2 | N/A | 2 | 1.0 | 1.1 | 1.1 | 1.1 | N/A | 2 | | | | | | | | | | | | | | | | | | | | | | | | |
| Bankfull Cross Sectional Area ($ft^2$) | 4.0 | 4.4 | 4.4 | 4.7 | N/A | 2 | 3.5 | 4.1 | 4.1 | 4.6 | N/A | 2 | | | | | | | | | | | | | | | | | | | | | | | | |
| Width/Depth Ratio | 8.9 | 11.6 | 11.6 | 14.2 | N/A | 2 | 10.3 | 12.0 | 12.0 | 13.6 | N/A | 2 | | | | | | | | | | | | | | | | | | | | | | | | |
| Entrenchment Ratio | 3.2 | 3.5 | 3.5 | 3.8 | N/A | 2 | 3.0 | 3.6 | 3.6 | 4.2 | N/A | 2 | | | | | | | | | | | | | | | | | | | | | | | | |
| Bank Height Ratio | 1.0 | 1.0 | 1.0 | 1.0 | N/A | 2 | 1.0 | 1.0 | 1.0 | 1.0 | N/A | 2 | | | | | | | | | | | | | | | | | | | | | | | | |
| **Profile** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Riffle Length (ft) | 14.3 | 34.4 | - | 67.3 | - | 11 | 12.0 | 28.9 | 29.0 | 62.0 | - | 11 | | | | | | | | | | | | | | | | | | | | | | | | |
| Riffle Slope (ft/ft) | 0.014 | 0.028 | - | 0.052 | - | 11 | 0.014 | 0.026 | 0.024 | 0.050 | - | 11 | | | | | | | | | | | | | | | | | | | | | | | | |
| Pool Length (ft) | 4.2 | 11.0 | - | 27.1 | - | 12 | 7.0 | 13.3 | 12.0 | 28.0 | - | 13 | | | | | | | | | | | | | | | | | | | | | | | | |
| Pool Max depth (ft) | 1.2 | 2.0 | - | 3.2 | - | 12 | 1.1 | 1.7 | 1.7 | 2.4 | - | 13 | | | | | | | | | | | | | | | | | | | | | | | | |
| Pool Spacing (ft) | 13.1 | 54.8 | - | 151.0 | - | 11 | 8.0 | 50.4 | 43.5 | 145.0 | - | 12 | | | | | | | | | | | | | | | | | | | | | | | | |
| **Pattern** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Channel Beltwidth (ft) | 26.0 | 38.0 | 39.0 | 54.0 | 2.7 | 5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Radius of Curvature (ft) | 19.0 | 21.6 | 22.0 | 26.0 | 2.4 | 6 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Rc:Bankfull width (ft/ft) | 2.7 | 3.0 | 3.1 | 3.7 | N/A | N/A | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Meander Wavelength (ft) | 101.0 | 112.3 | 109.5 | 132.0 | 2.7 | 6 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Meander Width Ratio | 3.7 | 5.4 | 5.5 | 7.6 | N/A | N/A | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Additional Reach Parameters** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Rosgen Classification | B4 | | | | | | B4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Channel Thalweg length (ft) | 675 | | | | | | 675 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Sinuosity (ft) | 1.24 | | | | | | 1.24 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Water Surface Slope (Channel) (ft/ft) | 0.0218 | | | | | | 0.0208 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BF slope (ft/ft) | 0.0229 | | | | | | 0.0226 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Ri% / Ru% / P% / G% / S% | - | - | - | - | - | - | - | - | - | - | - | - | | | | | | | | | | | | | | | | | | | | | | | | |
| SC% / Sa% / G% / C% / B% / Be% | - | - | - | - | - | - | - | - | - | - | - | - | | | | | | | | | | | | | | | | | | | | | | | | |
| d16 / d35 / d50 / d84 / d95 / | | - | - | - | - | | | - | - | - | - | | | | | | | | | | | | | | | | | | | | | | | | | |
| % of Reach with Eroding Banks | 0% | | | | | | 0% | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Channel Stability or Habitat Metric | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Biological or Other | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

N/A - Not Applicable
- Information Unavailable

# Appendix E

# Hydrologic Data

| Table 11. Verification of Bankfull Events<br>Hogan Creek Stream Mitigation / 94708 | | | | | |
|---|---|---|---|---|---|
| **Reach** | **Date of Data Collection** | **Date of Occurrence** | **Method** | **Measurement (ft)** | **Photo (If Available)** |
| **Hogan Creek Reach 2** | 10/26/2015 | 10/2/2015-10/3/2015 | Crest Gauge | *4.0 | - |
| **UT2** | 10/26/2015 | 10/2/2015-10/3/2015 | Crest Gauge | 0.9 | - |

*Crest Gauge was damaged from bankfull event


Photograph of wrack lines on Hogan Creek Reach 1 Station 26+00


Photograph of wrack lines on Hogan Creek Reach 1 Station 25+00