MITIGATION PLAN
FINAL

Mill Dam Creek Restoration Site
Yadkin County, North Carolina
DMS Project Number 97136
DEQ Contract 6898
SAW-2016-01335

FULL-DELIVERY PROJECT

Yadkin River Basin
Cataloging Unit 03040101

Prepared for:

NC Department of Environmental Quality
Division of Mitigation Services
1652 Mail Service Center
Raleigh, NC 27699-1652
December 7, 2018

Prepared by:

KCI Associates of North Carolina, PC
4505 Falls of Neuse Rd, Suite 400
Raleigh, NC 27609
(919) 783-9214

KCI Project Staff: Tim Morris, Alex French, Adam Spiller, Joe Sullivan, and Kristin Knight-Meng

This mitigation plan has been written in conformance with the requirements of the following:

- *Federal rule for compensatory mitigation project sites as described in the Federal Register Title 33 Navigation and Navigable Waters Volume 3 Chapter 2 Section § 332.8 paragraphs (c)(2) through (c)(14).*
- *NCDEQ Division of Mitigation Services In-Lieu Fee Instrument signed and dated July 28, 2010*

These documents govern NCDMS operations and procedures for the delivery of compensatory mitigation.

KCI ASSOCIATES OF NC

ISO 9001:2015 CERTIFIED

ENGINEERS • PLANNERS • SCIENTISTS • CONSTRUCTION MANAGERS

4505 Falls of Neuse Rd., Suite 400 • Raleigh, NC 27609 • Phone 919-783-9214 • Fax 919-783-9266

Date: December 7, 2018

To: Kim Browning, USACE

From: Tim Morris, Project Manager
KCI Associates of North Carolina, P.A.

Subject: Mill Dam Creek Restoration Site
Mitigation Plan Review – Response to IRT Comments
Yadkin River Basin - 03040101
Yadkin County, North Carolina
DEQ Contract No. #6898
DMS Project #97136
USACE AID #: SAW-2016-01335

Below are our responses to comments received on the mitigation plan for the Mill Creek Dam Restoration Site. All of the following changes have been completed in the revised mitigation plan. Please contact me if you have any questions or would like clarification concerning these responses.

Mac Haupt, NCDWR:

1. Section 3.1.1 - Landscape Characteristics - states in second paragraph that Fairview soils are "hydric interfluvial soils". The Fairview series is a non-hydric soil (Typic Kanhapludult).

- ***We have removed the hydric reference.***

2. DWR believes Section 4.0 - Functional Uplift Potential should have mentioned more about the existing wetlands on site and their potential to be enhanced. For example, it is possible some of the existing wetlands may be enhanced while other portions of filled relic stream channel may develop into wetlands, this will be important to show a net positive functional gain to the wetlands on site for permit purposes.

- ***We have updated the text in the second paragraph of Section 4.0 to read:***
  "….. The site will also provide the ancillary benefit of protecting and enhancing 0.43 acre of existing wetlands (shown in the jurisdictional wetlands in Section 12.8 and Figure 7). These riparian wetlands will be improved by increased overbank flooding and elevated groundwater levels in proximity to the restored stream profiles. Additional riparian wetlands may form alongside the restored channels as well. In particular, the former pond bed along T6 has the potential to develop new wetlands."

3. Section 6.4 for Tributary 3 does mention that "the stream restoration will serve to improve wetland hydrology". DWR would prefer that that a gauge be installed to document this statement.

- ***We will install two groundwater gauges within existing wetlands WA (along T7) and WH (along T8) to characterize benefits from restored streams to wetland hydroperiods.***

4. One negative aspect about this project is the number of crossings (10). In the future, DWR requests that the number of crossings be minimized.

- ***We realize the number of crossings is not ideal, but unfortunately they were necessary to accommodate the number of landowners (8) involved in this project. We typically try to minimize the number of crossings as much as we can.***

5. There are several tables that note project reaches with very small drainage areas:
    a. Trib T3 - 7 acres
    b. Trib T4 - 3 acres
    c. Trib T6A-2 - 9 acres
    d. Trib 8A – 7 acres

    Please be aware that the IRT will be paying close attention to the reaches to ensure that the tributaries maintain an appropriate flow regime. DWR noted that a couple of submitted (DWR) Stream Forms showed two reaches with low intermittent scores, Tribs 5A and the top of 8A. KCI may want to consider installing stream gauges in these features.

- ***We have added stream gauge and/or camera monitoring to T5A and T8A in both the mitigation plan text and on Figure 10.***

6. Section 7.0 Performance Standards- states that "project streams must also show a minimum of 30 days of continuous flow…" Please realize this standard was developed initially for coastal headwater systems. The standard is currently being applied to intermittent streams statewide. While the IRT is currently reviewing this standard for intermittent streams outside the coastal plain, the 30-day flow metric does not apply to perennial streams.

- ***Noted. We will monitor these streams throughout the year to determine the duration of continuous flow. We anticipate that the streams classified as perennial on-site will have a greater period than the 30-day standard.***

7. The design sheets need to show the location of the jurisdictional wetlands. This will be a requirement for PCN review. Tributaries with wetlands adjacent are T7, T8, the top of T3 and UTHC2. In addition, DWR prefers that the stream plan view and profile view appear on the same page.

- ***We have added the jurisdictional wetlands to the plans. We have made that note about plan and profile for future plansets.***

8. DWR likes that fact that KCI intends to install a stream gauge on Tributary 1A, DWR suggests the installation occur at Sta 154+25.

- ***We have moved the stream gauge to this location. As a result, we have also changed the monitoring cross-section to this location in order to keep monitored dimensional data with the gauge results.***

9. DWR likes the fact that this is a large, mostly contiguous (a lot of crossings) project. Moreover, DWR likes the proposed Regenerative Stormwater Conveyances that are planned to be installed.

Kim Browning, USACE:

1. Section 4.0: I agree with DWR's comment #2, and would add that while I agree that the wetlands on-site will likely see a functional uplift, and even though there are no wetland credits being sought, it is recommended that wetland gauges be installed and monitored in order to demonstrate no functional loss and/or acreage loss of wetlands with this project, especially for the wetlands along T7. We cannot authorize impacts, even for restoration, if we are not able to demonstrate that projects won't impact/degrade existing wetlands (or other aquatic resources) without at least ensuring that those wetlands will be replaced elsewhere. And the best way to do this is through groundwater gauges.

- ***We will install two groundwater gauges within existing wetlands WA (along T7) and WH (along T8) to characterize benefits from restored streams to wetland hydroperiods.***

    a. It might also be beneficial to include the data collection sheets associated with documenting existing conditions. NC WAM/SAM forms would be beneficial to document existing conditions, and to compare to in the event that there's a perceived functional loss associated with the restoration project.

    - ***We will complete NC WAM forms for the wetlands near T3, T7, and T8 prior to construction and then again at project close-out.***

2. USACE agrees that 10 culverts and two utility crossings seems excessive for this project, especially the culvert on reach T8 where such a small sections of stream is planned for restoration before the easement ends.

- ***We realize the number of crossings is not ideal, but unfortunately they were necessary to accommodate the number of landowners(8) involved in this project. We typically try to minimize the number of crossings as much as we can.***

3. Section 7.0: Table 4 indicates that both C and B channels are proposed for this project. If that's the case, please update the Stream Geomorphology Performance standard to include "The Entrenchment Ratio (ER) shall be no less than 1.4 for all measured riffle cross-sections on a given reach (for B channels)."

- ***This has been added to Section 7.0.***

4. Please include the location of existing wetlands on the Plan Sheets.

- ***We have added the jurisdictional wetlands to the plans.***

5. Section 6.7: Please include a description of the planned pond dam removal, as well as the proposed pond bed sediment removal.

- **We have added further description of the removal in Section 6.7 – please see the revised mitigation plan.**

6. Section 8.0: Vegetation Monitoring—Veg plots should be added to the areas with existing wetlands, particularly along T7 and in the area where the pond bed currently is.

- ***We have converted three of the planned randomly placed plots to permanent plots within former pond along T6, Wetland WA along T7, and Wetland WH along T8. See revised Figure 10. Proposed Monitoring Map.***

Sincerely,

Tim Morris
Project Manager

TABLE OF CONTENTS

FIGURES

TABLES

1.0 PROJECT INTRODUCTION

The Mill Dam Creek Restoration Site (MDCRS) is a full-delivery stream mitigation project being developed for the North Carolina Division of Mitigation Services (DMS) in the Yadkin River Basin (03040101 8-digit cataloging unit) in Yadkin County, North Carolina. The site's natural hydrologic regime has been substantially modified through the relocation and straightening of the existing stream channels, livestock impacts, and clearing of riparian buffer. This site offers the chance to restore streams impacted by pasture and agriculture to a stable headwater ecosystem with a functional riparian buffer and floodplain access.

The project site is located approximately 0.5 mile north of East Bend, NC in Yadkin County. The existing primary stream, an unnamed tributary to Hall Creek (UTHC), and its fourteen tributaries are comprised of 13,506 proposed linear feet (lf). MDCRS is 0.2 mile north on Shady Grove Church Road (SR-1538) from the intersection with Shoals Road (SR-1546). The center of the site is at approximately 36.2390°N and 80.5201°W in the East Bend USGS Quadrangle.

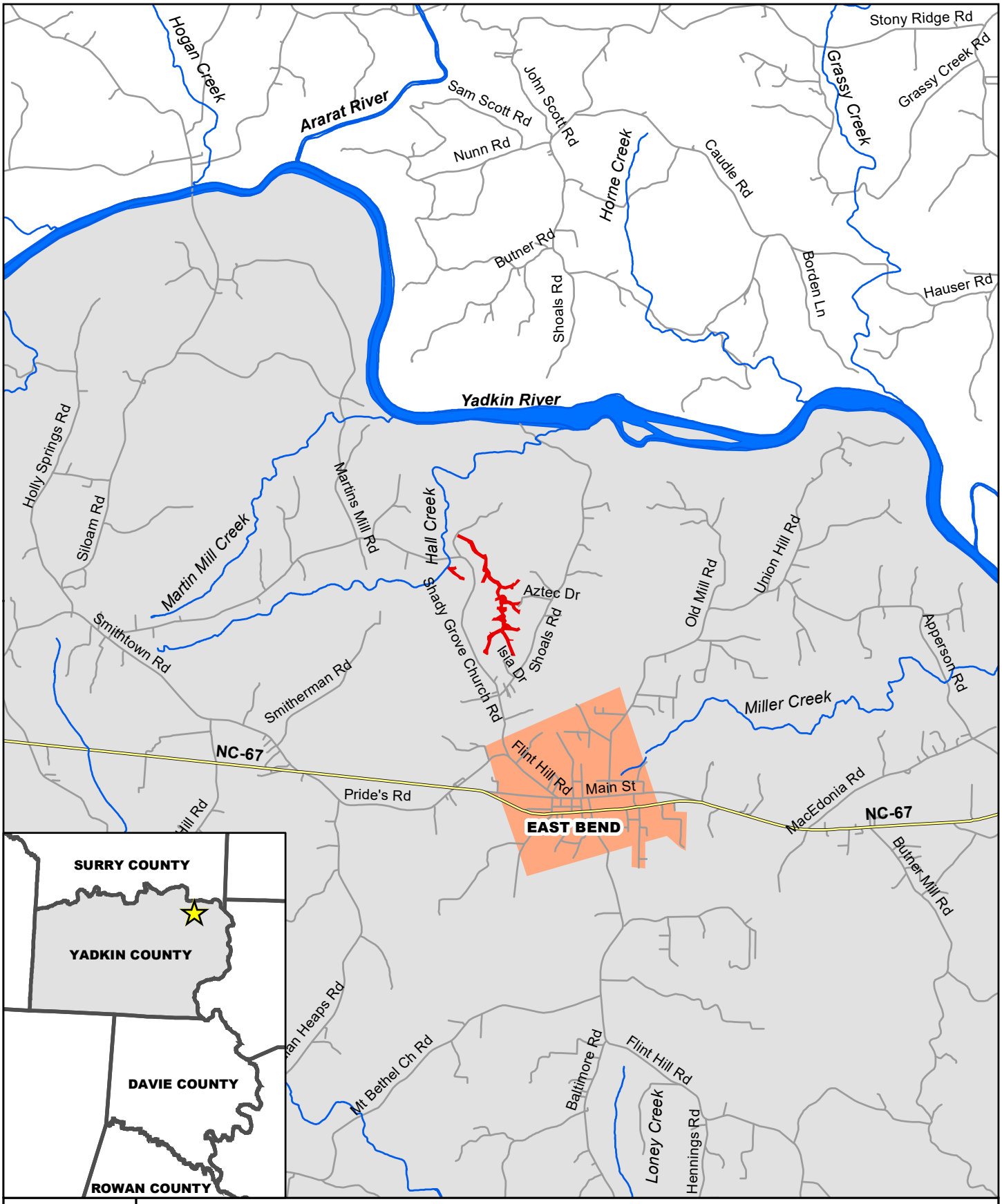
The MDCRS will restore a stable stream ecosystem with a combination of Restoration, Enhancement I, and Enhancement II techniques. The majority of the project streams (78%) will use a Priority 1 Approach aside from those areas that require a Priority 2 transition out of steep or incised areas. In addition to the traditional stream restoration actions, three regenerative stormwater conveyances will be used in combination with seep stabilization and long-term easement protection to treat and protect an additional 1,852 linear feet of incoming drainage routes in the project watershed. Approximately 0.43 acre of existing jurisdictional wetlands are also being protected in the conservation easement. Altogether, the project will restore and protect a vital headwater watershed in the Yadkin Basin.

Once site grading is complete, the unforested portions of the stream buffer will be planted with riparian species. The site will be monitored for a minimum of seven years or until the success criteria are met. The table below summarizes the credits that will be produced from this project.

Table 1. Credit Summary

Mill Dam Creek Restoration Site, Yadkin County DMS Contract 6898; DMS Project Number 97136									
Mitigation Credits									
	Stream		Riparian Wetland		Non-riparian Wetland		Buffer	Nitrogen Nutrient Offset	Phosphorous Nutrient Offset
Type	R	RE	R	RE	R	RE			
Linear Feet/Acres	7,165	6,340							
Credits	7,165	3,125							
TOTAL CREDITS	10,290								

R=Restoration RE=Restoration Equivalent



KCI

Figure 1. Vicinity Map, Mill Dam Creek, Yadkin County, NC

Project Easement
Cities and Towns
Streams
Major Rivers
Roads
State Highway

N

0 0.5 1 Miles

2.0 WATERSHED APPROACH AND SITE SELECTION

The site's watershed, Hydrologic Unit Code (HU) 03040101110070, Grassy Creek and Horne Creek, was identified in the 2009 Upper Yadkin Pee-Dee River Basin RBRP as a Targeted Local Watershed (TLW) (NCEEP 2009). The watershed is largely rural in nature (31% agriculture and 61% forest with four documented animal operations). At the time of the River Basin Restoration Priorities (RBRP) plan, there were 11.4% of the HU's land in conservation (primarily Pilot Mountain State Park), and the Wildlife Resources Commission (WRC) marked the HU as a priority area. The RBRP listed impacts from agriculture use, including stream bank erosion, excessive sedimentation, livestock access to streams, and stormwater pollution (fecal coliform), as the major stressors within this TLW. The goals and priorities for the MDCRS are based on the information presented in the Upper Yadkin River Basin Restoration Priorities: maintaining and enhancing water quality, restoring hydrology, and improving fish and wildlife habitat (NCEEP, 2009). The project will support the following basin priorities:

- Managing stormwater runoff
- Reducing fecal coliform inputs
- Improving/restoring riparian buffers
- Reducing sediment loading
- Improving stream stability
- Reducing nutrient loading
- Excluding livestock and implementing other agricultural BMP's
- Protection of high-resource value waters, including water supply watershed designated waters.

The project is also located in the Ararat River Local Watershed Plan (LWP) study area. The Ararat River was designated a LWP Study Area due to poor water quality and aquatic habitat degradation issues, as well as the presence of good candidate sites for stream restoration in rural catchments (NCEEP 2009). The stressors within the Ararat River LWP are erosion and sedimentation, missing or degraded riparian buffers, stormwater runoff, and nutrient and fecal coliform "hot spots" (NCEEP 2013).

There are no conservation or protected areas located adjacent to the project site. While most of the project land is in agriculture or pasture, the upstream headwaters have forested riparian buffers. With the protection of this stream, there will be continuous buffers along the majority of streams within the project watershed.

The nearest named downstream water body is Hall Creek, which is about 500 feet downstream of UTHC at the lower end of the project. The confluence of Tributary 8 with Hall Creek is also within the project. The section of Hall Creek downstream of the site is identified as 12-74, and is classified for surface water as Class WS-IV. This reach of Hall Creek was not listed as impaired on the 2016 303(d) list.

The project watershed is shown in Figure 2, and another map illustrating the project location in relation to the LWP is shown in Figure 3.

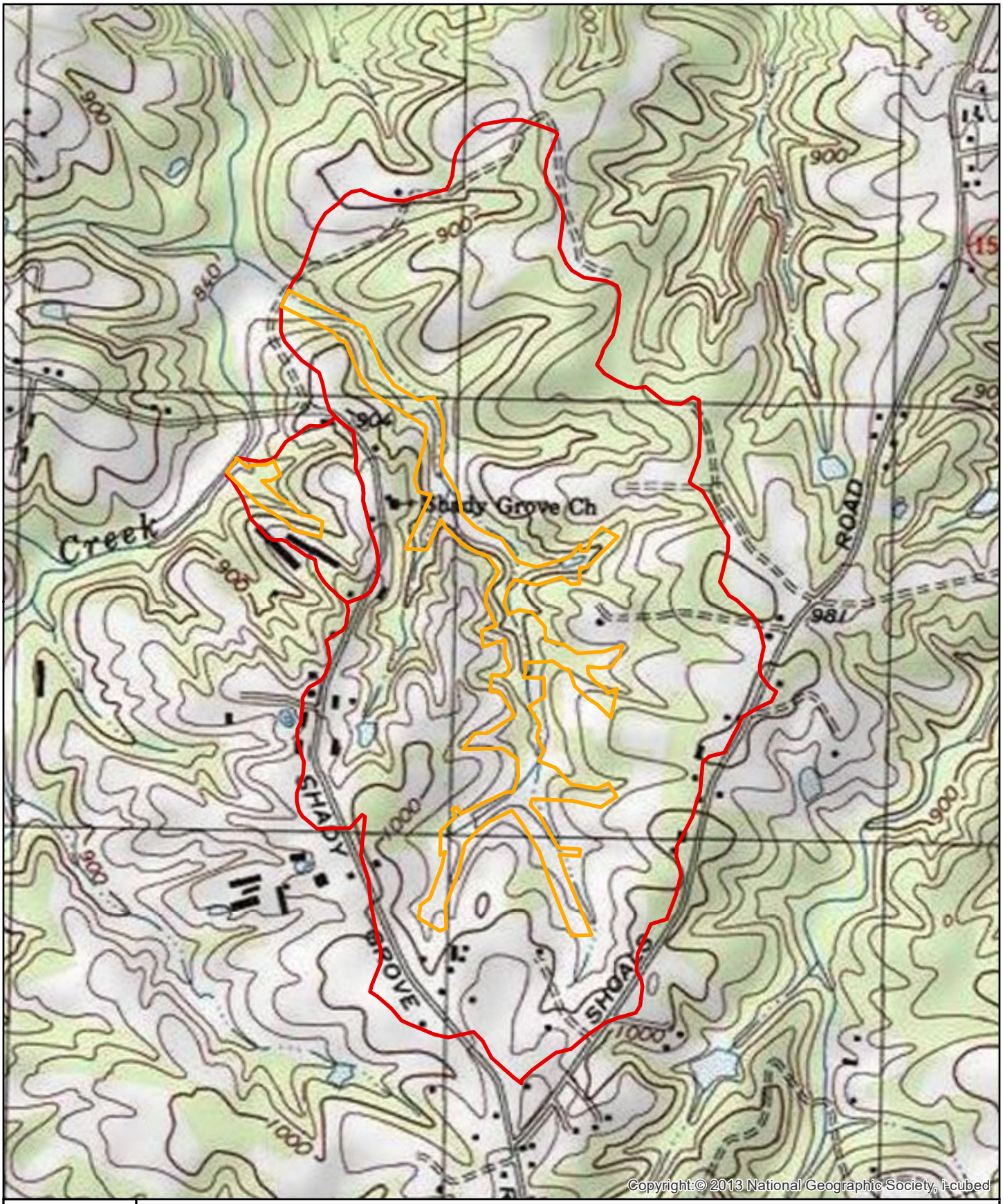


Figure 2. Project Site Watershed Map, Mill Dam Creek, Yadkin County, NC

Project Easement

Project Watershed (400 ac)

N

0 500 1,000 Feet

Image Source: USGS DRG, East Bend Quad.

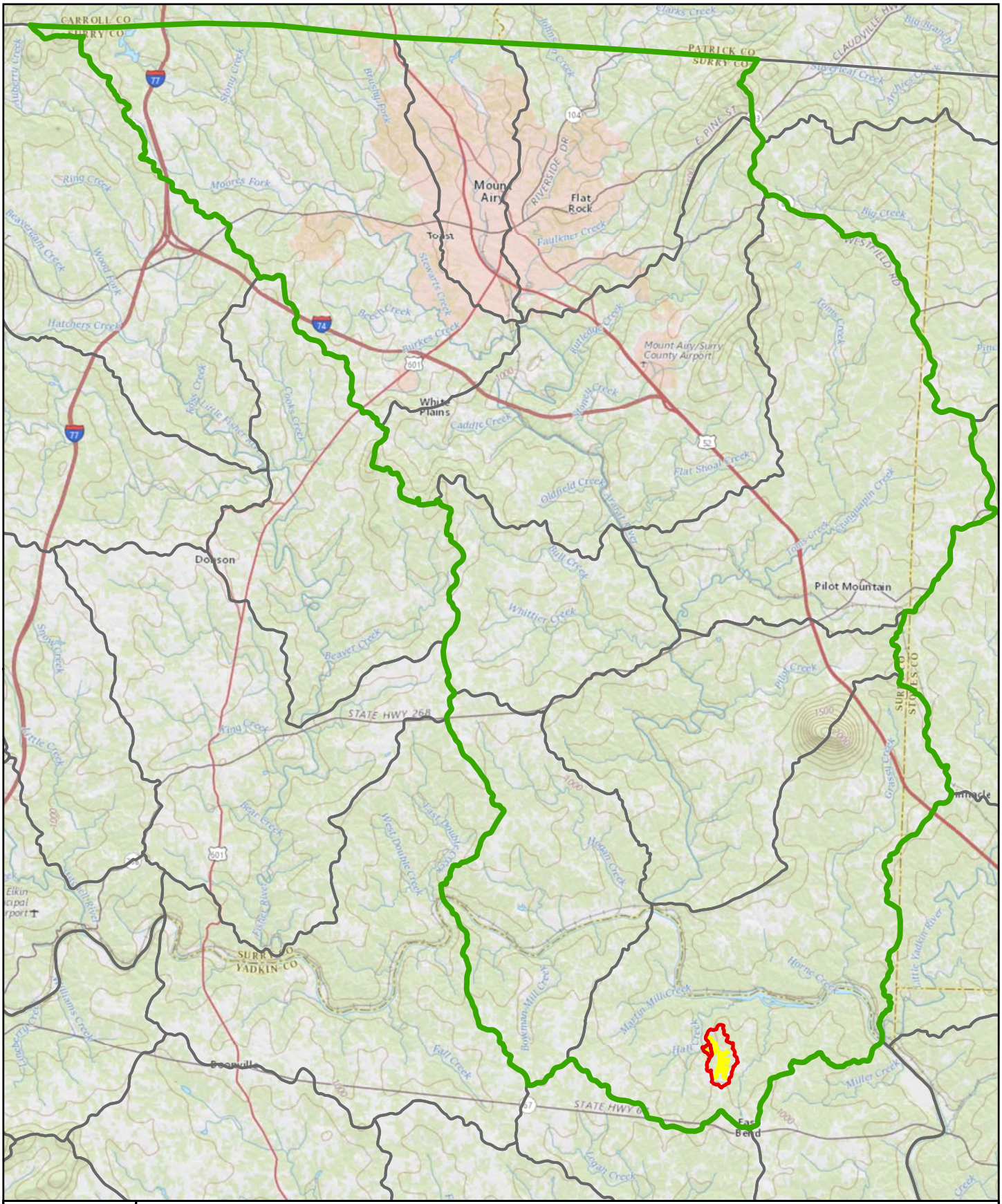


Figure 3. Project Site / LWP Watershed Map, Mill Dam Creek, Yadkin County, NC

Ararat River & Upper Yadkin LWP

14-digit Hydrologic Units

Project Watershed

Project Easement

N

0 1.5 3 Miles

Image Source: See map

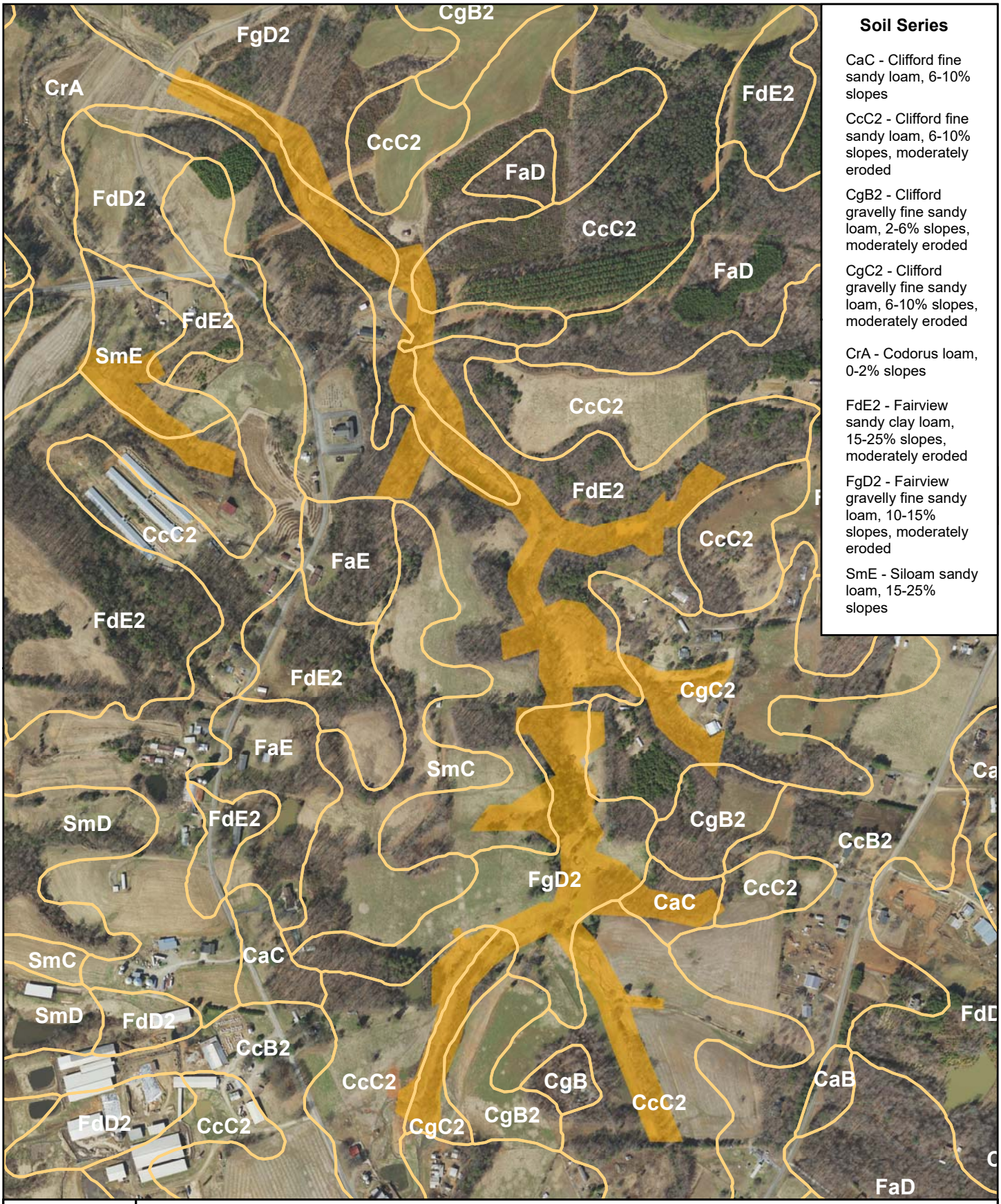
3.0 BASELINE AND EXISTING CONDITIONS

3.1 Watershed Processes and Resource Conditions

3.1.1 Landscape Characteristics

The site lies within the Northern Inner Piedmont (Level IV 45e) ecoregion of the Piedmont. The Northern Inner Piedmont has higher elevations and more rugged topography than other areas of the Piedmont and mostly consists of a mosaic of cropland, pasture, and forest. The natural vegetation contains Virginia pine, chestnut oak, and many mountain disjunct plant species. This area is typified by rolling to hilly well-dissected upland that contains mostly gneiss and schist bedrock covered with clayey and micaceous saprolite (Griffith et al. 2002). The MDCRS is within the Sauratown Mountains Anticlinorium and the geologic formation mapped at the project is Metagraywacke and Muscovite-Biotite Schist (CZmg), which consists of metamorphosed basaltic to andesitic tuffs and flows, grayish green to black and locally includes hypabyssal intrusives and minor felsic metavolcanic rock (USGS 2018). The project watershed consists of steeper, confined first-order stream valleys converging onto the floodplain of UTHC. The valley along UTHC varies from semi-confined to open, and boulders and bedrock are interspersed in the reaches.

According to the Soil Survey of Yadkin County, the majority of the proposed project consists of Fairview soils (FdE2 and FgD2), which are interfluvial soils that transition into floodplain soils consisting of Cordus loam (CrA) and Siloam sandy loam (SmE) along the lower portions of UTHC and Tributary 8, the two streams that near the confluence with Hall Creek. The results of the soil survey are presented in the following map (Figure 4). These soil types do not present any major limitations for typical construction activities associated with stream restoration.



KCI

Figure 4. NRCS Soil Survey, Mill Dam Creek, Yadkin County, NC

NRCS Soil Survey (Yadkin County)

Proposed Easement (40.2 ac)

N

0 300 600 Feet

Image Source: See map

3.1.2 Land Use/Land Cover and Chronology of Impacts

The project watershed for the MDCRS is comprised of 0.63 square miles (400 acres). Current land use within the project watershed consists of forest (45%), pasture/farmland (39%), low-density residential development (15%), and roads (1%); the estimated percent impervious is 3%. The project site is located in a rural area in northeastern Yadkin County. The development pressure within the project watershed is low. Current land use is shown in Figure 5.

The MDCRS has undergone modifications that have altered the site hydrology and vegetation. Historic aerials were examined for any information about how the site has changed over recent history (Figures 6a and 6b). Historic aerials were obtained from the NRCS, USGS EarthExplorer, and Google Earth for 1950, 1963, 1966, 1976, 1993, 2002, 2010, and 2014.

The site has been systematically impacted over the past 65 years. The primary impacts to the system are associated with channelization and clearing throughout the site to utilize the resources in support of agricultural production. In the earliest aerial photo from 1950, most of the upstream portions of the project have already been cleared and there is widespread agriculture occurring along all of the tributaries. T1 and T1A are forested in the 1950 photo, but were cleared by 1963. A portion of UTHC, upstream of the confluence with T9, was impacted by silvicultural practices. The field west of the stream has been cleared by 1963 and was expanded by 1976. The 1976 photo illustrates that the site has been impacted by several alterations, including the construction of the first chicken house south of T8. Shady Grove Church Road was also altered and moved away from T8A. Between 1976 and 1993, the area has had more clearing and low-density development. This includes more residences along Shady Grove Church Road and Shoals Road, and trees have been cleared along T5, T5A and T5B. These photos also show that by 2002, the pond at the confluence of T6 and T6a has been built and that the original chicken house adjacent to T8 was removed, and two additional chicken houses were constructed. Prior to 2010, the eastern bank of Hall Creek, downstream of the project, was reforested. During this time, UTHC and T9 were impacted by silvicultural practices, including areas of clear cutting. By 2014, a crossing was added across UTHC in order to access the fields north of T9 and the area around T9 was planted with pine trees.

Over the 65 years of available record, both physical and functional impacts to the project streams on the site have been documented. These impacts included: channel modification, ditching, impacts from adjacent row cropping and timber harvesting, and general vegetation removal.

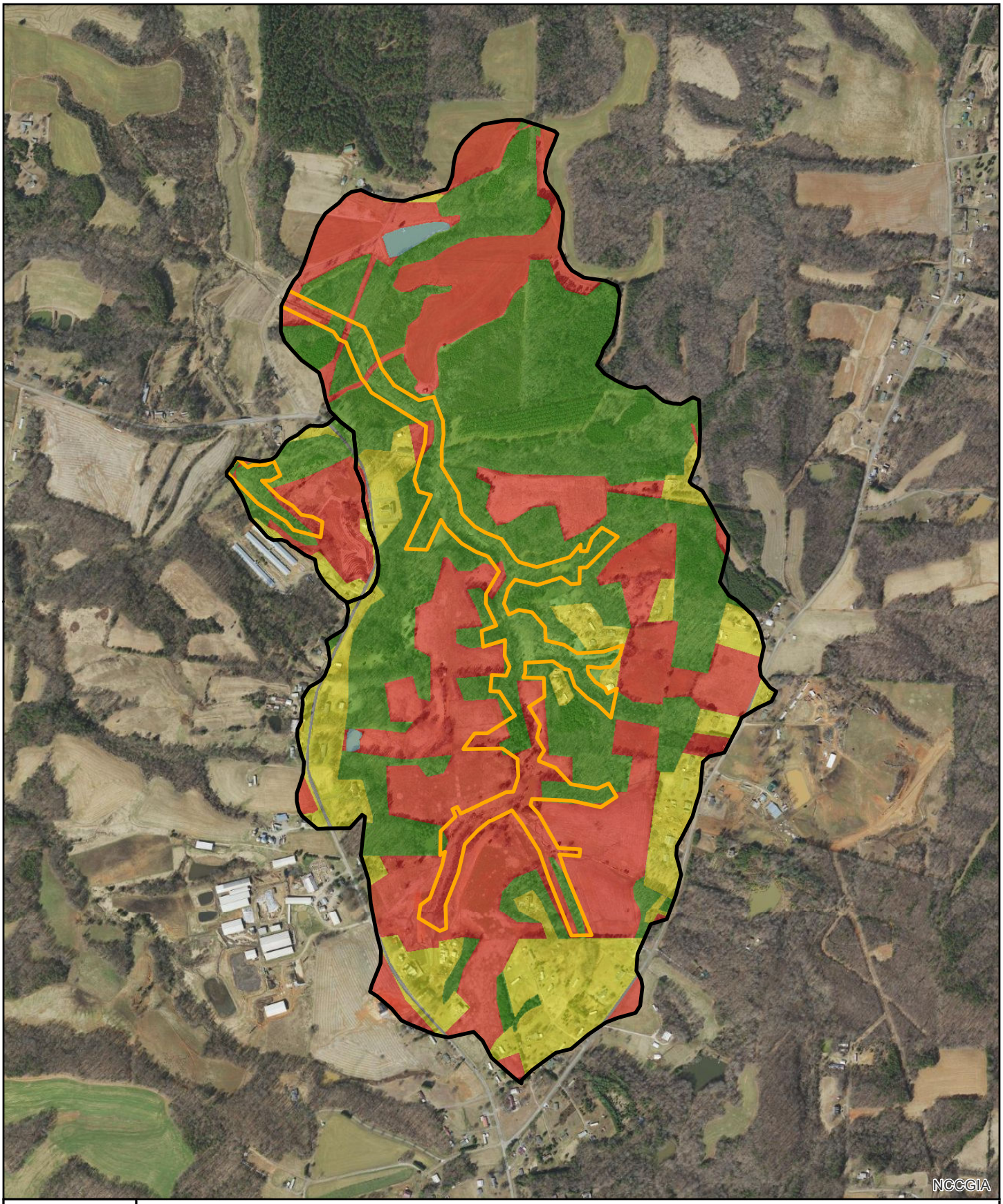


Figure 5. Project Landuse, Mill Dam Creek, Yadkin County, NC

Land Use

- Water
- Forest (45%)
- Pasture/Farmland (39%)
- Low-Density Development (15%)
- Roads (1%)
- Project Watershed (400 ac)
- Proposed Easement

N

0 500 1,000 Feet

Image Source: NC One Map Orthoimagery, 2014.

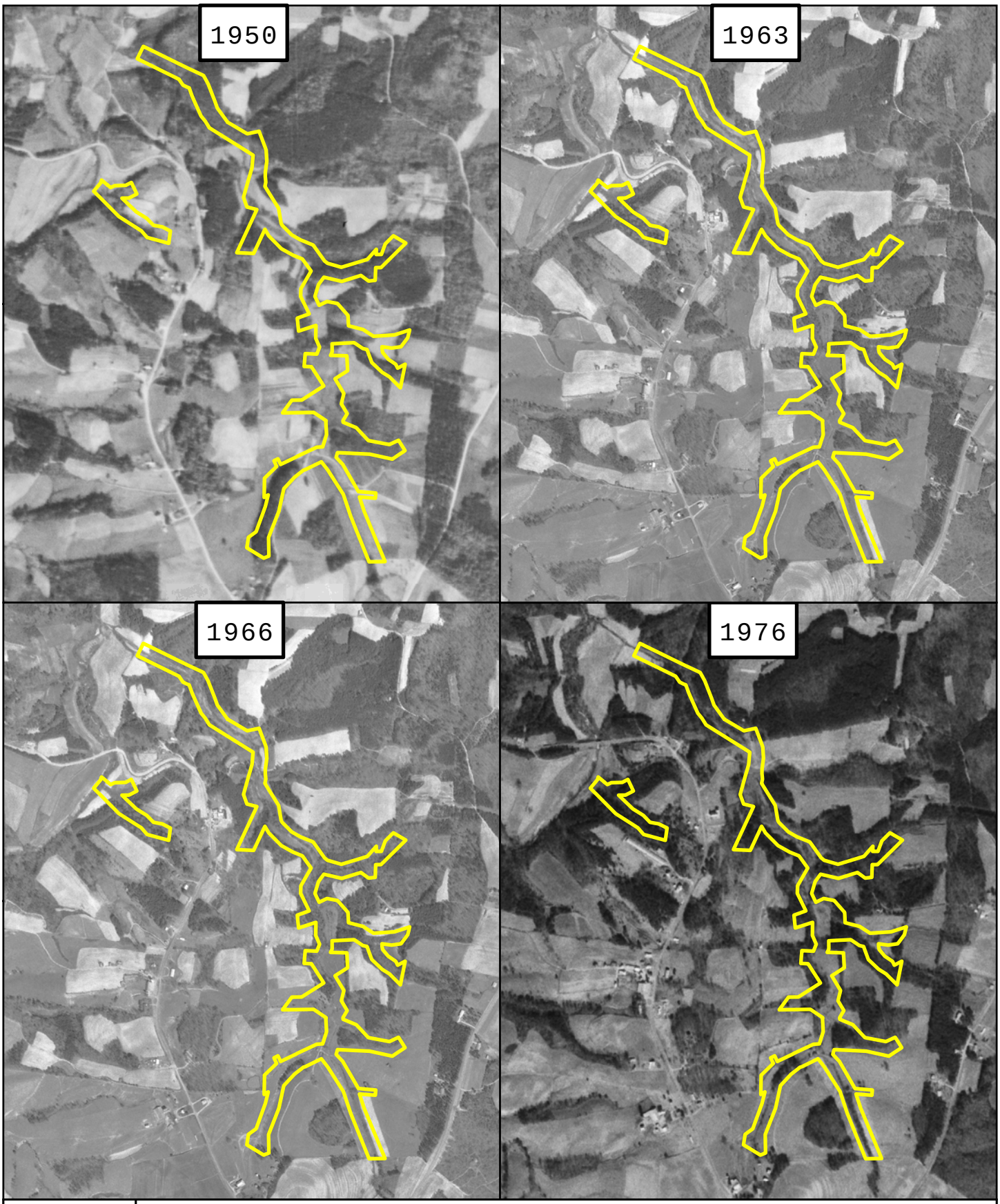


Figure 6A. Historic Aerial Photographs, Mill Dam Creek, Yadkin County, NC

Project Easement

N

0 1,250 2,500 Feet

Image Sources: USGS Earth Explorer.

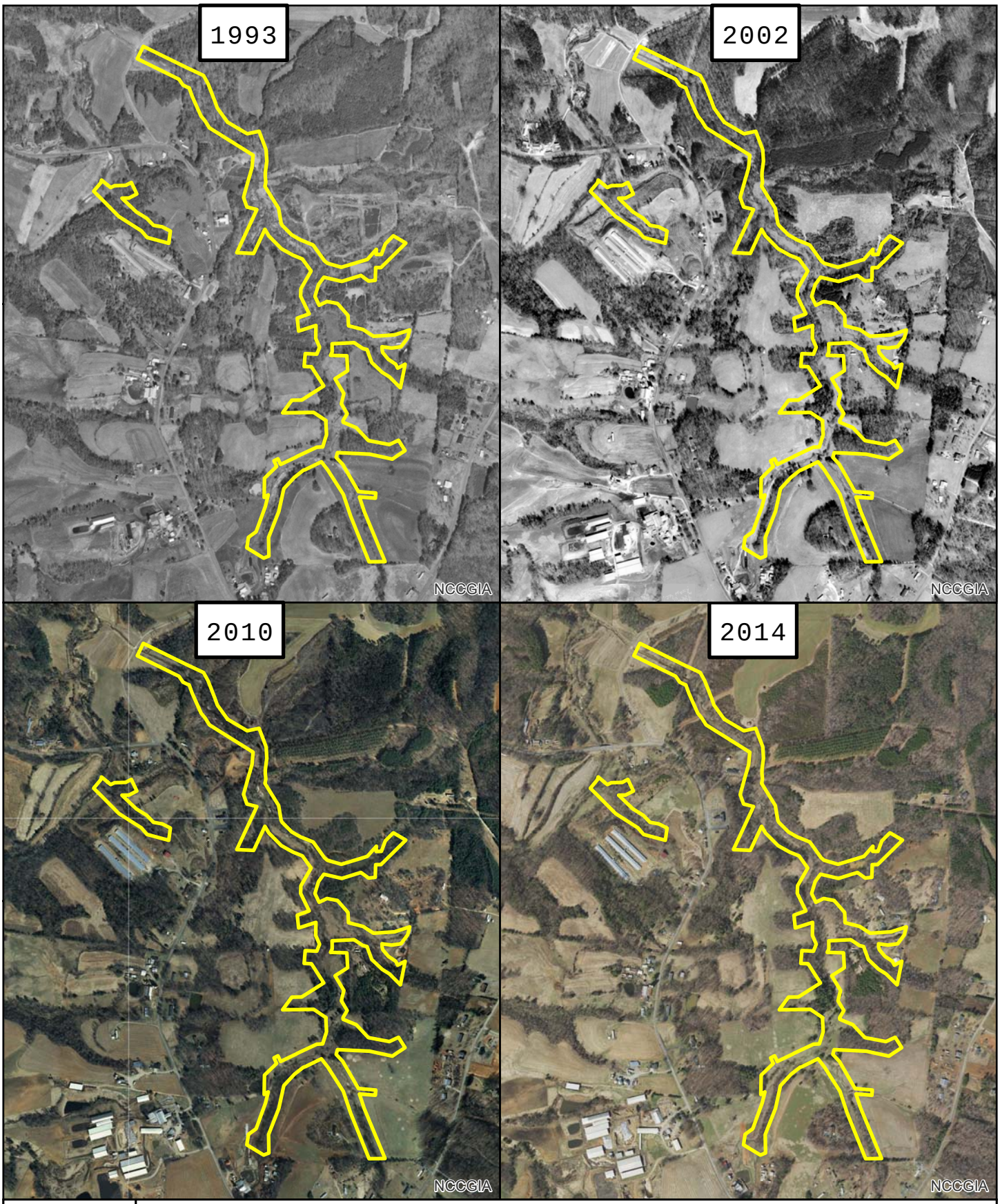


Figure 6B. Historic Aerial Photographs, Mill Dam Creek, Yadkin County, NC

Project Easement

N

0 1,250 2,500 Feet

Image Sources: USGS Earth Explorer.

3.1.3. Watershed Disturbance and Response

The project site and its 15 streams have experienced landscape and vegetative modifications to allow for agriculture and grazing. The existing site conditions are shown in Figure 7 and seen in site photographs.

A project-wide assessment of stream stability and causes of impairment was performed at the project. There are four main sections of the primary channel, which is an unnamed tributary to Hall Creek (UTHC), and 14 additional streams (tributaries 1, 1A, 2, 3, 4, 5, 5A, 5B, 6, 6A, 7, 8, 8A, and 9). The project streams are generally in Stage III (Degradation) in the channel evolutionary process (Simon and Rinaldi 2006). The primary disturbance to the system has been the relocation and straightening of the project streams, which has disconnected flow from a frequently accessible floodplain or floodprone area. There have been disturbances to the sediment regime of the site, but they are localized on-site from upslope erosion induced by cattle and direct impacts on stream banks made by cattle hooves. Former or existing dams have interrupted natural sediment processes on UTHC, T6 and T8. Of the project streams, approximately 29% are experiencing low levels of erosion, 60% moderate levels, and 11% high levels of erosion. The majority of the project streams have bank height ratios greater than 1.5, as seen in the table below, which indicates the degree of incision that has occurred across the project channels.

Table 2. Existing Stream Bank Height and Entrenchment Ratios

Stream	Existing Bank Height Ratios	Existing Entrenchment Ratios
UTHC1	1.0 - 10.4	1.2 - 2.6
UTHC3	2.7-3.2	1.2
T1	1.0 - 4.5	1.5 - 4.4
T1A	19.6	1.1
T2	3.3	1.3
T3	5.5	1.2
T4	6.9	1.9
T6	4.4	1.2
T6A	ponded	ponded
T7	1.7	1.4
T8	2.5	1.1
T8A	2.7	1.1
T9	1.7	1.9

The primary hydrologic feature at the site is UTHC, which runs for 6,619 existing lf through the project. UTHC has been divided into four sections: UTHC1 (1,874 lf), UTHC2 (1,494 lf), UTHC3 (1,411 lf), and UTHC4 (1,840 lf). UTHC1 enters the project from a driveway culvert at the southern limit of the project. The upper 700 lf are channelized and have been straightened. This section is incised with vertical banks and no floodplain access; vegetation is limited to a small number of early successional and invasive species along the banks. From this point forward, the valley topography changes and the bank height ratio decreases. At this transition, a highly eroded ephemeral drain joins the stream from the west. This drain receives direct runoff from the adjacent row crop agriculture and contributes sediment and nutrient-rich waters to UTHC1. After this drain confluence, UTHC1 meanders through alluvial deposits and repeatedly runs into the adjacent terrace, creating bank erosion just upstream of the confluence with T1. Downstream from this confluence, UTHC1 flows north to confluences with Tributaries 2 and 3. This section of UTHC1 has been impacted by livestock and is characterized by eroding banks, no riparian buffer, poorly defined bed features, and variable bank height ratios. After the T2 confluence, there are numerous bedrock outcrops.

After the confluence with T3, UTHC2 starts as the stream becomes bedrock dominated, which provides vertical stability along UTHC until the confluence with Tributary 6. The banks are vertical, eroding, and undercut. There is a vegetated buffer along the western side of the channel, but the width of vegetation on the eastern side is limited and full of invasive species. Livestock also access this section, with their impacts spread throughout the stream.

UTHC3 begins approximately 70 feet upstream of the confluence with Tributary 6, and the stream continues to flow north-northwest. Approximately 33% of this section is experiencing severe bank erosion and the bed lacks well-developed riffle and pool morphology. The vegetation along UTHC3 is limited to a narrow vegetated buffer with early successional species. Based on the three surveyed cross-sections, the assessed channel dimensions are oversized compared to the expected bankfull channel for a stream of this drainage size. There are spoil piles from channelization along the right bank (mapped on Figure 7). There is a relic floodplain in this part of the valley, and the LIDAR data show that the open area to the left of the channel is lowest part of the valley, which indicates that the channel may have been moved to its current location. Approximately 700 lf after the confluence with Tributary 6, the UTHC stream valley narrows and the stream flows through an old breached earthen dam. After this dam, UTHC3 continues in a similar condition, but with evidence of potential legacy sediments from a history of agricultural erosion within the valley.

UTHC4 starts approximately 500 lf after the confluence with Tributary 7 at an existing crossing on UTHC. After the crossing, the channel has widened and bank erosion is predominant. There are still mature trees along UTHC4 in this area, but many are undercut, and not contributing to bank protection. Access roads have been constructed through the riparian buffer. After flowing under another utility easement, the slope of the valley begins to decrease and the channel has been straightened and ditched to allow for row crop cultivation. The bottom 500 lf of this section are straight and incised with minimal bed heterogeneity and a narrow band of riparian vegetation growing on the banks, ending at an existing crossing over the channel.

Tributary 1 (T1) begins at a small pond just outside of the project easement and flows toward the southeast. This channel has been severely degraded by livestock impacts, has sparse riparian vegetation, and widespread eroding banks. The project easement extends to the northwest here to capture a spring/seep that flows over bedrock and then to T1. Approximately 300 lf downstream of the beginning of T1 is the confluence with Tributary 1A (T1A), which is a highly incised channel that receives large amounts of sediment from eroding gullies at its upstream limits. Where T1A begins, the gullies have cut the stream deep into the landscape, with the majority of its length having bank heights of 12 to 15 feet. Areas of dumped agricultural and residential trash are also scattered along this reach. After the confluence of the two reaches, T1 has no buffer and continues to flow northeast to its confluence with UTHC.

Tributary 2 (T2) forms where multiple ephemeral drainages converge. Some of these drains are forested, while others flow from the adjacent row crops to the east and south. This area is approximately 50-feet long and has multiple headcuts contributing to sediment loading to downstream reaches. After this point, the stream flows west through a valley with a wide hardwood buffer on the right bank and a variable width buffer on the left. Where T2 emerges from the forest into a pasture, the channel begins to incise with signs of active erosion and livestock impacts.

Approximately 300 lf downstream of the T2 confluence, Tributary 3 (T3) flows into UTHC. T3 is 378 lf long and begins at a seepage-driven wetland. Where the flow becomes concentrated, a deep headcut begins and the channel becomes incised flowing east. The remainder of this channel has steep eroding banks, high bank height ratios, livestock impacts, and poorly developed bed features.

Tributary 4 (T4) is 151 existing lf, with the hydrology source being a combination of ground and surface water. Flow begins at a severe headcut, and after this point the stream flows east and is defined by short, steep, and erosive bed features and bank erosion along vertical banks.

Tributary 5 (T5) joins UTHC from the east. The 1,205-lf stream generally flows to the northwest and the lower two-thirds of the channel are characterized by a partially confined valley that has a mix of early successional vegetation throughout the riparian buffer and stream banks. There are several small headcuts through this portion of the channel, but the channel erosion is moderate. The upper portion of T5 is split into three small streams at a failing crossing: T5, T5A, and T5B. All three of these streams are close to houses and have some level of buffer clearing and accumulated residential and agricultural trash from sporadic dumping. T5 is the southernmost and has low bank heights, but the right bank of this portion of T5 is completely cleared of vegetation. T5A is the next small stream (65 lf) to the north; the vegetation along both banks have been cleared and there is trash in the channel. This stream is fed by a spring at the top of the reach. The next stream to the north is T5B, which begins at a culvert under a driveway. This stream is approximately 438 lf with channel incision, but a thin line of alders (*Alnus serrulata*) on the banks offers some bank protection. After these alders, the riparian vegetation has either been cleared or is a thicket of invasive species.

The next downstream stream is Tributary 6, part of which is ponded. T6 flows from the east to its confluence with UTHC. Starting at the top of this drainage, two small tributaries flow into the pond. The upper portion of T6 (325 lf) flows in from the northeast and T6A (157 lf) flows in from the southeast. Both of these are cattle-impacted and embedded with fine sediment where they flow into the pond and their upstream portions are generally steep boulder and bedrock-controlled channels with isolated areas of moderate bank erosion. Just of upstream of where T6 joins the pond, there is an eroded access road and culverted crossing. Sediment is washing off of the road in this location and into T6 and the pond. The lower portion of T6, approximately 350 lf through the pond and then 271 lf starting at a piped dam outlet, is devoid of bank vegetation and has extensive cattle impacts. The dam is earthen, approximately 15-feet tall and 100-feet wide, and impounds an approximately 0.4-acre pond. There is an overflow spillway on the north end of the dam. The outlet to this spillway is highly eroded and large amounts of sediment have been washed downstream.

Tributary 7 (T7) flows into UTHC approximately 150 lf downstream of the breached dam on UTHC noted above. The upstream reach of T7 (165 lf) is in a more confined valley with an intact riparian buffer and a bed controlled by boulder and bedrock outcrops. The lower portion (335 lf) is incised, with eroding banks, headcuts, and minimal vegetation along the banks. There is one wetland area (0.1 acre) along the left bank midway upstream of T7.

Tributary 9 (T9) is 133 lf and is similar to the lower reach of T7. There is an unstable portion of channel along the downstream segment where T9 ties into UTHC.

The remaining two tributaries, Tributaries 8 and 8A (T8 and T8A), are located on the opposite side of Shady Grove Church Road from the rest of the site. Both small channels on this side of the road have been altered by past agricultural practices and have impacts caused by present day livestock access. Tributary 8 (T8) flows directly to Hall Creek and T8A joins T8 approximately 150 lf upstream of this confluence. The upstream part of T8 begins at a headcut where livestock impacts have destroyed the banks and any bed form that used to be present. From this headcut, the stream form and banks are more intact as it flows down the confined and relatively steep valley with bedrock and boulder grade control. The riparian buffer in this area has scattered medium-sized trees, but minimal understory vegetation other than invasive vegetation. When the stream comes out of the confined valley, the channel flows into a wetland area where an old farm pond has filled with sediment and the stream has breached the southwestern side of the earthen dam. This breach is now an active headcut. From the breach, the stream flows northwest, through a bedrock ford crossing, and then after several headcuts meets Hall Creek. T8A flows into T8 just upstream of the bedrock ford. This stream flows in from the east. The stream begins at a large headcut, about 220 lf upstream of the confluence with T8. This portion of channel is damaged by livestock, and has active headcuts. Overland and seepage flow from the southeastern side of the valley is intercepted by a toe of slope drain that prevents this hydrologic source from contributing flow to T8A.

A jurisdictional determination was submitted to the US Army Corps of Engineers on November 14, 2016 and was approved on January 5, 2017. The approved jurisdictional determination is included in Section 12.8. In addition to the project streams, there are nine jurisdictional wetlands at the site (see Table 3 below). Following the completion of the mitigation plan, a pre-construction notification (PCN) will be completed to apply for a Nationwide 27 Permit (NWP) to comply with Sections 401 and 404 of the Clean Water Act with the Wilmington District of the US Army Corps of Engineers and the NCDEQ Division of Water Resources.

Table 3. Existing Wetlands

Wetland ID	NCWAM	Hydrologic Class	Cowardin Class	Size (Acres)	Location
WA	Headwater Forest	Riparian	PFO	0.11	Left bank along lower end of T7
WB	Bottomland Hardwood Forest	Riparian	PFO	0.03	Left bank of UTHC2 upstream of T6
WC	Headwater Forest	Riparian	PEM	0.10	Upstream of T3
WE	Headwater Forest	Riparian	PFO	0.07	Upstream of existing pond on T6
WG	Headwater Forest	Riparian	PSS	0.01	Upper portion of T8
WH	Headwater Forest	Riparian	PFO	0.06	Right bank along lower section of T8
WI	Headwater Forest	Riparian	PFO	0.02	Right bank along lower section of T8
WJ	Headwater Forest	Riparian	PFO	0.02	Right bank along lower section of T8
WK	Headwater Forest	Riparian	PSS	0.01	Upstream of T8A

The project attribute table below summarizes current conditions at the site and Figure 7 displays the current conditions at the site.

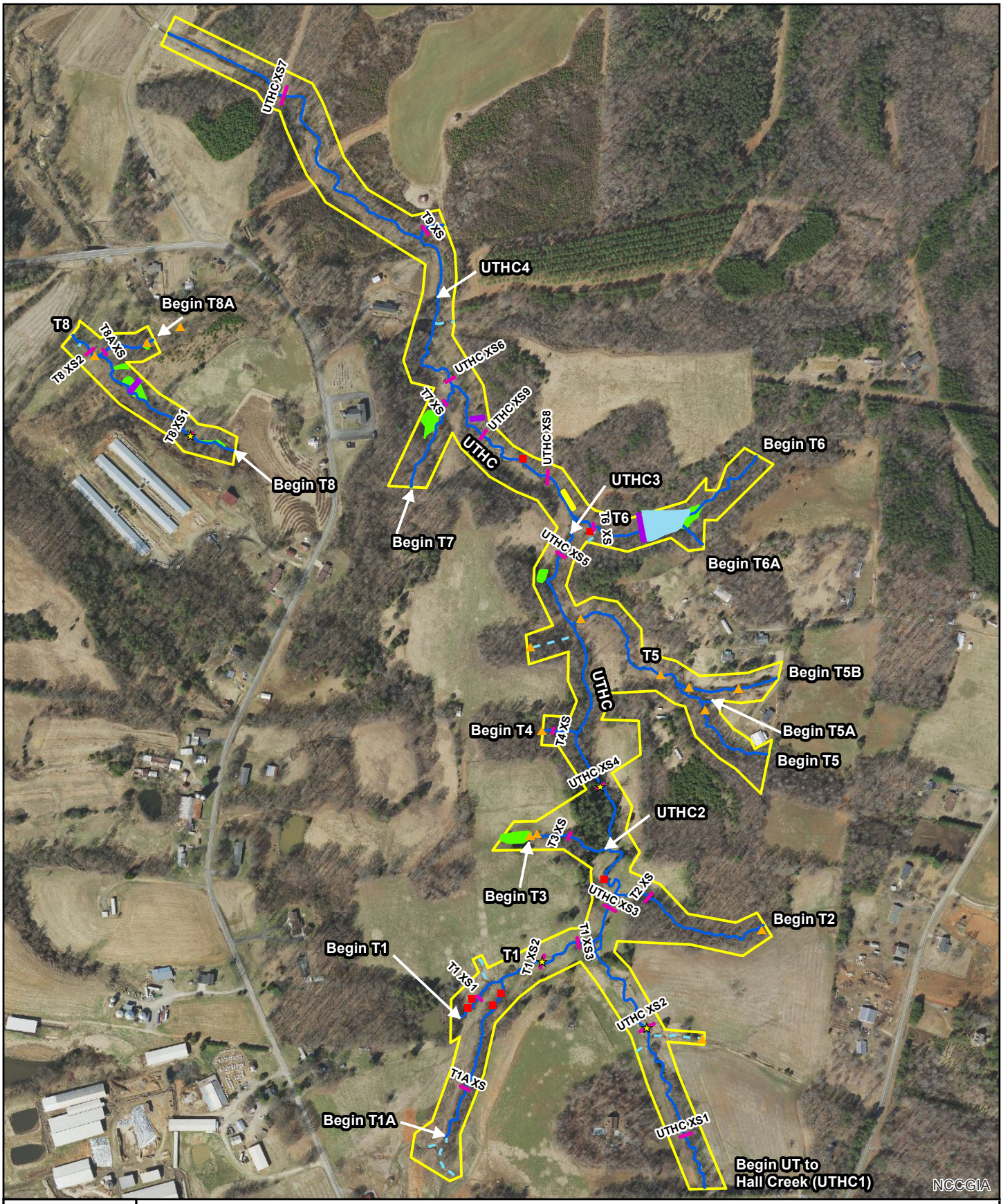
Table 4. Project Attribute Table

Project Information			
Project Name	Mill Dam Creek Restoration Site		
County	Yadkin County		
Project Area (acres)	40.2 acres		
Project Coordinates (lat. and long.)	36.2390°N, 80.5201°W		
Planted Acreage (Acres of Woody Stems Planted)	29.2 acres		
Project Watershed Summary Information			
Physiographic Province	Piedmont		
River Basin	Yadkin		
USGS Hydrologic Unit 8-digit	03040101	**USGS Hydrologic Unit 14-digit**	03040101110070
DWQ Sub-basin	03-07-02		
Project Drainage Area (acres)	400 acres		
Project Drainage Area Percentage of Impervious Area	3%		
CGIA Land Use Classification	Forest (45%), Pasture/Farmland (39%), Low-density Residential Development (15%), and Roads (1%).		
Existing Reach Summary Information			
Parameters	**All Reaches Combined**		
Length of reach (linear feet)	14,024		
Valley Confinement	Partially confined to confined		
Drainage area (acres)	400 acres		
Perennial, Intermittent, Ephemeral	Intermittent - Perennial		
NCDWQ Water Quality Classification	C (Aquatic Life, Secondary Recreation)		
Rosgen Stream Classification (Existing/Proposed)	F4/G4/C4/B4		
Evolutionary trend (Simon)	Stage III		
FEMA classification	Zone AE at confluence of T8 and Hall Creek, otherwise none		
Existing Wetland Summary Information			
Parameters	**WA,WB, WE, WG, WK**	**WC**	**WH, WI, WJ**
Size of Wetland (acres)	0.23	0.10	0.10
Wetland Type	Riparian Non-Riverine	Riparian Non-Riverine	Riparian Non-Riverine
Mapped Soil Series	Fairview	Fairview	Siloam
Drainage class	Well drained	Well drained	Well drained
Soil Hydric Status	Non-Hydric	Non-Hydric	Non-Hydric
Source of Hydrology	Groundwater	Groundwater	Groundwater
Restoration or Enhancement Method	N/A (Preservation)	Areas of erosion to stabilize	N/A (Preservation)
Regulatory Considerations			
Regulation	**Applicable?**	**Resolved?**	**Supporting Documentation**
Waters of the United States – Section 404	Yes	Applying for NWP 27	Preliminary JD approved
Waters of the United States – Section 401	Yes	Applying for NWP 27	Preliminary JD approved
Endangered Species Act**	Yes	Yes	USFWS
Historic Preservation Act**	No	Yes	NCSHPO
Coastal Zone Management Act ** (CZMA)/ Coastal Area Management Act (CAMA)	No	N/A	N/A
FEMA Floodplain Compliance	No	Yes	N/A
Essential Fisheries Habitat**	No	N/A	N/A

**Items addressed in the Categorical Exclusion in Appendix.

Table 4 continued

Stream Parameters	**UTHC**	**T1, T1A**	**T2**	**T3**	**T4**	**T5, T5B**
Length of reach (linear feet)	6,619	1,510	731	378	151	1,643
Drainage area (acres)	389 acres	43 acres	16 acres	7 acres	3 acres	39 acres
NCDWR Classification	WS-IV	WS-IV	WS-IV	WS-IV	WS-IV	WS-IV
Rosgen Classification	F4, C4, B4	B4, C4, F4, G4	G4	G4	B4	B4,C4
Evolutionary trend	Stage III	Stage III	Stage III	Stage III	Stage III	Stage III
Mapped Soil Series	Clifford/ Fairview,Cordus	Clifford	Clifford	Fairview	Fairview	Clifford, Fairview
Drainage class	Well drained, Somewhat Poorly Drained	Well drained	Well drained	Well drained	Well drained	Well drained
Soil Hydric status	Non-Hydric, Hydric	Non-Hydric	Non-Hydric	Non-Hydric	Non-Hydric	Non-Hydric
Slope	1.4-2.1%	2.2-2.6%	3.8%	5.9%	8.9%	2.7%
FEMA classification	Zone X	Zone X	Zone X	Zone X	Zone X	Zone X
Existing vegetation community	Pasture, Forest	Pasture	Forest	Pasture, Forest	Forest	Pasture, Forest
Thermal regime	Warm	Warm	Warm	Warm	Warm	Warm
Stream Parameters	**T5A**	**T6, T6A**	**T7**	**T8, T8A**	**T9**	
Length of reach (linear feet)	65	1,103	500	1,189	133	
Drainage area (acres)	0.5 acre	29 acres	41 acres	21 acres	29 acres	
NCDWR Classification	WS-IV	WS-IV	WS-IV	WS-IV	WS-IV	
Rosgen Classification	B4, F4	G4	G4	G4	B4	
Evolutionary trend	Stage III	Stage III	Stage III	Stage III	Stage III	
Mapped Soil Series	Clifford	Fairview	Fairview, Cordus	Siloam	Fairview	
Drainage class	Well drained	Well drained	Well drained	Well drained	Well drained	
Soil Hydric status	Non-Hydric	Non-Hydric	Non-Hydric	Non-Hydric	Non-Hydric	
Slope	N/A	4.1%	3.3%	4.4-5.2%	3.9%	
FEMA classification	Zone X	Zone X	Zone X	Zone X, Zone AE at confl w/Hall Creek	Zone X	
Existing vegetation community	Pasture, Forest	Forest	Forest	Pasture, Forest	Forest	
Thermal regime	Warm	Warm	Warm	Warm	Warm	



KCI

Figure 7. Existing Conditions, Mill Dam Creek, Yadkin County, NC

Proposed Easement (40.2 ac)
Existing Streams
Ephemeral or Other Drainage Features
Existing Ponds
Existing Wetlands (0.43 ac)
Cross-Sections
Reference Cross-Sections
Cattle Wallows
Headcuts
Spoil Piles
Berms

N

0 250 500 Feet

Image Source: NC OneMap Orthoimagery, 2014.

3.1.4 Site Photographs

Photo 1: View of livestock impact to UTHC-1

Photo 2: Beginning of T1 at culvert from pond

Photo 3: Active erosion on UTHC-1 just upstream of confluence with T1

Photo 4: Headcut at beginning of T2

Photo 5: Cattle-impacted wetland at beginning of T3

Photo 6: Two headcuts from wetland seep area to beginning of T3

Photo 7: Typical view of bedrock in UTHC-2

Photo 8. Representative photo of ephemeral drain that will be included in restoration project.

Photo 9: Outlet of T5A from a seep.

Photo 10: Typical section of T5A.

Photo 11: Pond at confluence of T6 and T6a

Photo 12: Pond outlet to T6

Photo 13: View cattle impact to T6 below pond

Photo 14: Active erosion and deposition on UTHC-3 downstream of confluence with T6

Photo 15: Eroding outer bank on UTHC3

Photo 16: Overwidened section and right bank erosion on UTHC3.

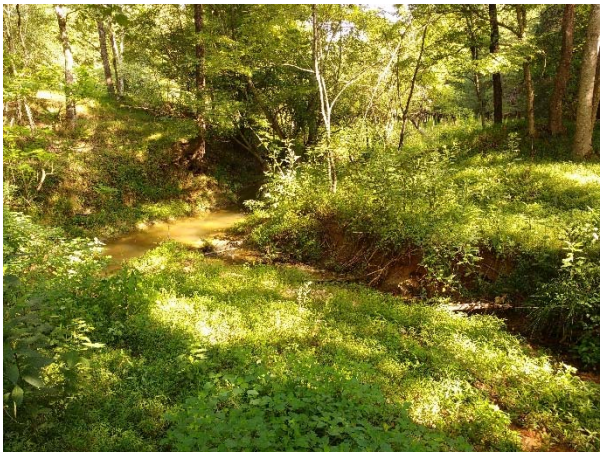


Photo 17: Eroding bank along UTHC3

Photo 18: Undercut outer bank on UTHC3

Photo 19: Active erosion on UTHC-3 just upstream of confluence with T7

Photo 20: Active erosion on UTHC-3

Photo 21: Entrenched portion of T7

Photo 22: Active erosion on UTHC-4

Photo 23: Active erosion on UTHC-4

Photo 24: View of UTHC-4.

Photo 25: Straightened section of UTHC-4

Photo 26. Downstream end of project on UTHC-4

Photo 27: Cattle impact at beginning of T8

Photo 28: View of T8 further downstream

Photo 29: Confluence of T8 and T8A

Photo 30: Looking downstream on T9

4.0 FUNCTIONAL UPLIFT POTENTIAL

Cattle impacts, vegetation removal, and channelization are among the causes that have reduced the functionality of the project streams and riparian buffers. The proposed project captures a large proportion of the project watershed's drainage routing and offers the opportunity to produce functional uplift at the site that would not otherwise occur within the near future.

The uplift for MDCRS will be achieved at the hydraulic, geomorphological, and physicochemical functional levels. Hydraulic improvements will come either from relocating projects streams to a location with a historic floodplain or establishing an accessible floodprone area. Reestablishing this type of connectivity will return a hydraulic routing system through this stream corridor that will distribute flood flows through a broader area with reduced in-channel stress rather than within a confined channel. Geomorphological functional uplift will be achieved through channels sized to the bankfull flow, a planform and profile design emphasizing bedform variation with woody debris for bank protection and habitat, and the reestablishment of a forested riparian corridor. As a result, bank migration and lateral stability will be restored to a sustainable level and the banks and bed will accommodate design flows. Sediment inputs will decrease due to reduced bank erosion and sediment transport can return to an equilibrium level that will accommodate watershed inputs. Riparian plantings will further support geomorphological functionality by increasing bank stability. Physicochemical functions will improve with the reductions in bacterial and nutrient inputs to the project streams from converted land use (pasture to forested buffer) and filtering capabilities of the riparian buffer. These nutrient and bacterial parameters will not be monitored directly, but rather have been estimated as a reduced contribution to project streams of 2.56 $x10^{14}$ fecal coliform colonies, 727 pounds of total nitrogen, and 59 pounds of total phosphorus per year (based on NCDMS 2016 guidance; see Section 12.2).

Consideration of future impacts to the area that could limit functional uplift opportunities is important when assessing project potential. As mentioned above, the project will permanently protect the majority of the streams and drainages in the project watershed. Approximately 89% of the jurisdictional streams within the project watershed are protected in the permanent conservation easement, and an additional 1,850 lf of other drainage conveyances will be included as well. We are improving three of the ephemeral channels with regenerative stormwater conveyances (RSCs) and stabilizing other non-jurisdictional features from further erosion. The site will also provide the ancillary benefit of protecting and enhancing 0.43 acre of existing wetlands (shown in the jurisdictional wetlands in Section 12.8 and Figure 7). These riparian wetlands will be improved by increased overbank flooding and elevated groundwater levels in proximity to the restored stream channels. Additional riparian wetlands may form alongside the restored channels as well. In particular, the former pond bed along T6 has the potential to develop new wetlands. These non-credit generating improvements to the project will help protect the longevity of the restored streams and the headwater ecosystem as a whole. The table below summarizes the project goals and objectives that will lead to functional improvements and the monitoring tools that will be used to track these changes to the site.

5.0 MITIGATION PROJECT GOALS AND OBJECTIVES

Table 5. Project Goals, Objectives, and Functional Outcomes

Goals	Objective	Functional Level	Function-Based Parameter Effects	Monitoring Measurement
Restore channelized and livestock-impacted streams to stable C and B-type channels	Relocate or stabilize channelized and/or incised streams to connect to a floodplain or floodprone area	Hydraulics	Floodplain Connectivity	Flood Frequency
				Bank Height Ratio and Entrenchment Ratio
	Install a cross-section sized to the bankfull discharge	Geomorphology	Bank Migration/Lateral Stability	Cross-Sectional Survey
				Visual Inspection of Bank Stability
	Create bedform diversity with pools, riffles, and habitat structures	Geomorphology	Bed Form Diversity	Percent Riffle and Pool, Facet Slopes, Visual Inspection
				Visual Inspection of Feature Maintenance
Restore a forested riparian buffer to provide bank stability, filtration, and shading	Fence out livestock to reduce nutrient, bacterial, and sediment impacts from adjacent grazing and farming practices to the project tributaries.	Geomorphology	Bed Material Characterization	Pebble Count
		Physicochemical	Nutrient and Bacteria Reductions	Estimated Reductions based on Converted Land Use
	Plant the site with native trees and shrubs and an herbaceous seed mix.	Geomorphology/ Species Composition	Vegetation	Density
				Species Composition/Diversity

Table adapted from Harman et al 2012

6.0 DESIGN APPROACH AND MITIGATION WORK PLAN

Mitigation at the MDCRS will includes: the realignment of the project streams to their relic floodplains or development of floodprone benches, exclusion of cattle, installation of three RSCs at point sources of concentrated flow coming from outside the easement, long-term protection of existing wetlands, and the establishment of a native riparian buffer.

The project will restore and enhance a total of 13,506 lf, which will generate 10,290 lf of stream credit within the conservation easement. An overview map of the proposed mitigation is shown in Figure 8 and the project plan sheets are included in Section 12.1. Based on the deficiencies described above, a mitigation work plan has been developed to restore the project streams and achieve functional improvements. Mitigation will occur along UTHC and multiple reaches along fourteen tributaries.

The project streams were designed using a modified reference reach approach using four stable on-site cross-sections (see Section 12.2 for data) for dimensional data in combination with pattern data taken from the UT Fisher River reference and supplemental morphological criteria information from Harmon et al. 2012. The on-site cross-sections represented areas with evident bankfull indicators (see Figure 7 for

locations). The UT Fisher River site is located in Surry County, and is approximately 20 miles to the northwest of MDCRS. The reference site has a drainage area of approximately 0.38 square mile and sediment size comparable to the range at MDCRS, ranging from fine to coarse gravel for the D50-D84 values. The common reference values from Harmon et al. 2012 were also used to adjust the design criteria as necessary to fit the existing site conditions. The range of slopes at the MDCRS (from 1.5% along UTHC to 11% on T4) required adjustments for each reach.

6.1 UT Hall Creek (UTHC)

UTHC is the primary stream channel at the site and involves 2,927 lf of Restoration, 2,208 lf of Enhancement I, and 1,018 lf of Enhancement II over four sections that have been divided into eight reaches. The first section, UTHC1, will involve the restoration of 1,874 lf. It begins at the culvert under the driveway at the southern end of the site. Since the elevation of this reach is controlled by this culvert, the beginning will start as a Priority 2 approach and then transition to a Priority 1 approach for the majority of the reach. As this reach transitions to a Priority 1 approach, the stream will be realigned through the valley bottom with variable bedform and wood habitat features added to the channel. After the confluence with T2, the restoration design will begin to transition to match the channel form of the next reach, UTHC2; as a result, two separate cross-section designs (UTHC1 Top for the reach above T2 and UTHC1 Bottom for the reach below T2 – see plans in Section 12.1) will be used. The end of UTHC1 will resemble the Priority 2 transition at the top of the reach as the stream gains more bedrock near UTHC2. The design incorporates these rock features for natural grade control.

UTHC2 begins at the confluence with T3 and is a reach that will provide 1,494 lf of Enhancement I. Given the predominance of bedrock in the profile, there are minimal proposed bed changes, but there will be modifications made to the channel cross-section. The profile will be enhanced where feasible, focusing on the addition of deep water pools where possible. The UTHC2 work will focus on grading back and repairing banks, adding wood to the channel, and extending the floodprone area by benching the channel where possible. The RSC to be installed along “Ditch 2” (see Figure 8 and construction plans as well as the RSC section below) will provide additional water quality uplift to this reach. This, in combination with the stabilization work done on “Ditch 1” along UTHC1, will be considered ancillary project benefits to help justify the Enhancement I approach for UTHC2.

After the confluence with Tributary 6, UTHC3 starts, which is a restoration reach of 1,411 lf. There will be a transition design to a Priority 1 approach that will follow a similar method used for the transitional portions of UTHC1, going from a Priority 2 to 1 approach, and then back again to a Priority 2 approach at the end of the reach. The design transitions UTHC3 back to its historic floodplain, where a new pattern with riffles, pools, and woody debris in the channel will be constructed. At the end of UTHC3, the stream will transition back to UTHC4, an enhancement reach.

UTHC4 begins at an existing road crossing approximately 500 lf downstream of T7. Mitigation along UTHC4 will be a mixture of Enhancement I and II approaches with four separate reaches: UTHC4-1 with 297 lf Enhancement I, UTHC4-2 with 521 lf of Enhancement II, UTHC4-3 with 419 lf of Enhancement I, and UTHC4-4 with 497 lf of Enhancement I. This targeted design approach for UTHC4 focuses on stabilizing banks, working around existing mature trees, creating benches along the existing stream, planting open areas of the riparian buffer, and reducing exotic invasive species in a way that maintains the existing intact features and vegetation while improving the degraded portions of stream.

6.2 Tributaries 1 and 1A

T1 will be restored using a Priority 1 approach for approximately 734 lf. The design will raise the bed of the channel so that there is an active floodplain along its length. The easement will also incorporate an active ephemeral seep coming in from the north before the T1A confluence that will be stabilized and revegetated. While not a creditable asset, protecting this source of hydrology is a benefit to the project streams. T1A will be restored for 795 lf. A RSC (see below) will be installed upstream of the start of T1A (STA 148+78-150+00) to reduce sediment and nutrient inputs from the surrounding livestock pasture runoff. The bed elevation for T1A will be raised as much as possible given the constraints of how deeply the stream is incised. The wide bench/floodplain meets the DMS design guidelines for Priority 2 restoration. Towards the bottom of the reach where the valley widens to join T1, the design will more closely align with a Priority 1 approach.

6.3 Tributary 2

For T2, there are two reaches: the upstream Enhancement II reach (T2-1) and the downstream Restoration reach (T2-2). The upper reach will be enhanced using an Enhancement II methodology for approximately 498 lf (STA 200+00-204+98). Channel work at the top of T2-1 will arrest the active headcuts and grade the banks to a stable angle and form. The rest of T2-1 will receive intermittent bank grading and the areas of cleared easement outside of the wooded corridor will be planted with native vegetation. Invasive plants will be treated throughout the easement. T2-2, the lower reach from STA 204+98-207+63, will be restored using a Priority 1 approach for approximately 265 lf. Restoration will begin where the stream leaves the existing wooded corridor. The design will raise the bed of the channel so that there is an active floodplain along its length.

6.4 Tributary 3

T3 will be restored using a Priority 1 approach for 369 lf. An existing wetland area has been incorporated into the conservation easement at the head of this tributary. Stream restoration will begin downstream of this wetland and will raise the bed elevation at the very beginning of the reach where there is an existing headcut that is partially draining the wetland. The stream restoration will serve to improve wetland hydrology. The design will raise the bed of the channel so that there is an active floodplain along its length.

6.5 Tributary 4

T4 will be restored using a Priority I approach for approximately 151 lf. Restoration efforts will begin at the upstream end of this reach where there is currently a large headcut. The stabilized grade transition from the upper part of the channel will allow the stream to match the existing channel elevation downstream. Further downstream on T4, grade control structures will be installed to stabilize the steep, degraded stream bed until the confluence with UTHC.

6.6 Tributaries 5, 5A, and 5B

These three tributaries will be enhanced using an Enhancement II methodology for approximately 1,685 lf. The work along T5 will concentrate on stabilizing local areas of instability, such as near the confluence with UTHC where there is a failing culverted crossing, intermittent bank grading, livestock exclusion, invasive vegetation control, removing trash and dumped debris from the channel, and replanting the cleared parts of the easement. A similar design approach will be used for T5A and T5B.

6.7 Tributaries 6 and 6A

T6 and T6A will each be divided into upper and lower reaches. The upper reaches, T6-1 (259 lf) and T6A-1 (60 lf), will both be Enhancement II, and the lower reaches, T6-2 (658 lf) and T6A-2 (101 lf), will be Restoration. The Enhancement II reaches for both streams have boulder and bedrock grade control. As a result, enhancement will be take the form of ancillary work, such as stabilization of the access road adjacent to T6, which has undergone heavy erosion, removal of the entire pond dam and the pond itself, and the stabilization of the pond overflow area, which is also actively eroding and contributing sediment to the system.

The restoration reaches, T6-2 and T6A-2, will include the removal of the existing dam. The dam removal process will require the pond to be dewatered early in the construction sequence to allow adequate time for both the pond and pond sediments to dewater prior to mass excavation. Based on a bathymetric survey conducted during the assessment phase of the project, there are accumulated soft sediments that have embedded the lower half of the existing pond riser structure. The pond will be dewatered initially using a combination of pumps and siphons that will convey clear water around the pond dam to the lower portion of T6. Another clear water diversion will be in place to move baseflow from the upper portions of T6 and T6A (above the pond) to the lower portion of T6, thus minimizing inputs to the pond during the dewatering period. Once the clear water has been decanted from the pond, a sump will be established using a perforated 55 gallon drum encased in 57 stone to continue to draw water from the pond sediments. This water will be pumped through a sediment bag and discharged below the dam. Once the sediment is adequately dewatered, the fill around the riser structure will be removed to expose the bottom of the vertical riser pipe. The pipe will be cut off at an elbow to allow clear water to continue to drain from the pond bottom. It is likely that a diversion channel will need to be temporarily excavated through the pond bottom to allow sediments and baseflow to bypass the pond through the cut riser pipe. The temporary channel will be stabilized with coir fiber matting and will be seeded and stabilized. The pond will then be allowed to naturally dewater for as long as it takes to be able to adequately work the pond sediment. At that point, the pond dam will be removed as per the project plans. When the dam is removed down to the riser outlet elevation, the riser structure will be removed and abandoned, and the stream and floodplain will be graded to match the planform and profile shown in the plans. If workable, the existing pond sediments will be reused to build the floodplain along with the sediments excavated from the pond dam. Furnished or salvaged topsoil will be used to surface treat all planting areas within the floodplain extents shown on the plans. Adequate lime and fertilizer will be used to ensure adequate vegetative stabilization of the former pond area. The lower reaches will be restored as they transition into the former pond area. Restoration will then continue with a Priority 1 approach to the confluence with UTHC3. The design will raise the bed of the channel so that there is an active floodplain/bench along its length.

6.8 Tributary 7

Similar to other project streams, T7's mitigation has been divided into an upper Enhancement II reach (T7-1 with 165 lf) and a downstream Restoration reach (T7-2 with 348 lf). The work along T7-1 will consist of livestock exclusion, riparian planting, intermittent bank grading, invasive vegetation treatment, and installation of grade control structures. Restoration will begin where T7-2 begins to lose bed and bank stability. The design will raise the bed of the channel so that there is an active floodplain along its length and construct a variable bed morphology that the stream currently does not have.

6.9 Tributaries 8 and 8A

T8 has two reaches: T8-1 with 445 lf of Enhancement II at the top and T8-2 with 426 lf of Restoration at the bottom of the stream. T8A consists of a single Restoration reach of 263 lf. T8-1 begins at a severe headcut that has been further degraded by livestock, so much so that there are no clearly defined banks along the stream. A new channel form will be reshaped to connect the stream up and downstream of this problem area. Downstream of the headcut on T8-1, the remainder of enhancement will consist of livestock exclusion, invasive species control, and riparian buffer planting. At the transition to restoration at T8-2, the design will preserve the wetland that has developed in the old pond footprint and create a transition of the channel through the breached pond dam to begin a Priority 1 restoration continuing until the confluence with Hall Creek. T8A also begins at a headcut, which will be stabilized, and from that point the stream will be brought up as a Priority 1 restoration until the confluence with T8.

6.10 Tributary 9

T9 will consist of the restoration of 129 lf. Due to the short length of the stream within the project, a Priority 2 approach is necessary. The design focuses on creating a transition from a new upstream crossing, which will replace a currently deteriorating crossing, to the confluence with UTHC.

6.11 Regenerative Stormwater Conveyances

As part of the restoration of the whole project watershed, we are installing three RSCs. They will be installed in key locations where severe erosion is occurring and where storm flows are expected to need continued treatment from land uses outside of the easement boundaries. The RSCs will also provide grade control in these steep areas. Each of the RSCs will contain biofiltration components that will enhance nutrient cycling and serve as a sink for detrimental pollutants before they reach project streams. These structures will consist of a sand/mulch mixture overlaid with riffle stone (see Section 12.1 for RSC structural details).

The RSCs are designed to be self-sustaining. Throughout the life of these structures, they will go through an evolution, which starts as a cascade/pool system that stores and filters stormwater in the underlying media and then evolves to a cascade/wetland system that treats the water in pocket wetland pools as the pore space in the underlying media fills. This evolution will occur over different timescales depending on the conditions at each RSC. This evolution of function and self-sustaining quality makes these structures ideal for this project.

6.12 Crossings

Ten culverted crossings and one bridge crossing will be installed as part of the project, four on UTHC and the remainder on T1, T5, T6, T6A (upstream of easement), T7 (bridge upstream of easement), T8, and T9 (upstream of easement). The crossings will be fenced as necessary to exclude livestock. The culverts have been designed to be embedded 1’ below the proposed streambed elevation to allow aquatic organism passage and will have floodplain drain pipes to connect flows on either side of the crossing during large events. These crossing locations are included on Figure 8.

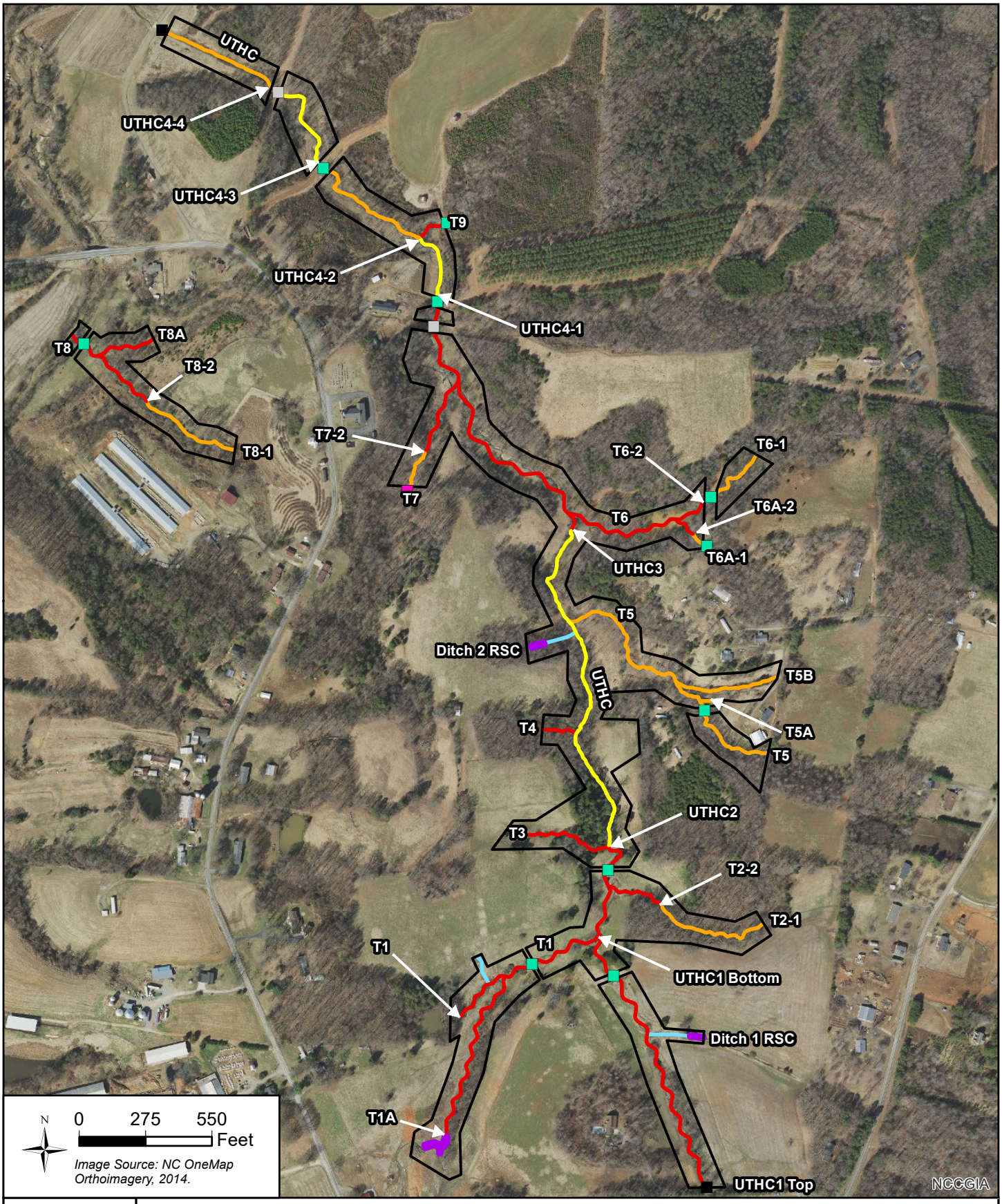


Figure 8. Project Asset Map, Mill Dam Creek, Yadkin County, NC

Proposed Easement (40.2 ac)

Stream Mitigation

Restoration (7,165 lf / 7,165 SMCs)

Enhancement I (2,209 lf / 1,472 SMCs)

Enhancement II (1,018 lf / 407 SMCs)

Ephemeral Drainages or Other Ditches

Exceptions

Regenerative Stormwater Conveyances (3)

Existing Culvert

Proposed Bridge

Proposed Culverts

Utility Exceptions

6.13 Design Determination

KCI conducted bankfull verification by locating four reference cross-sections on-site that had stable bankfull indicators (see Figure 7 for locations). Using these on-site field measurements, we developed our own local curve relating drainage area and cross-sectional area (cross-sectional area had a higher R value than discharge for this site). This curve was compared to the rural Piedmont regional curve estimates for cross-sectional area (Harman et al., 1999). A summary of the bankfull verification is provided in the table below. Based on the results, we used our local curve rather than the North Carolina rural Piedmont curve for our design values.

Table 6. Local Curve Bankfull Determination

Cross-Section Location	Acres	Drainage Area (Sq. Miles)	Field XS Area (sf)	XS Area Estimate (sf) from Local Regional Curve	Q (cfs)
T8 XS1	13.1	0.020	2.5	2.4	13.8
T1 XS2	42.9	0.067	3.8	4.0	13.6
UTHC XS2	52.6	0.082	4.0	4.4	15.6
UTHC XS4	127.8	0.200	7.3	6.6	37.4

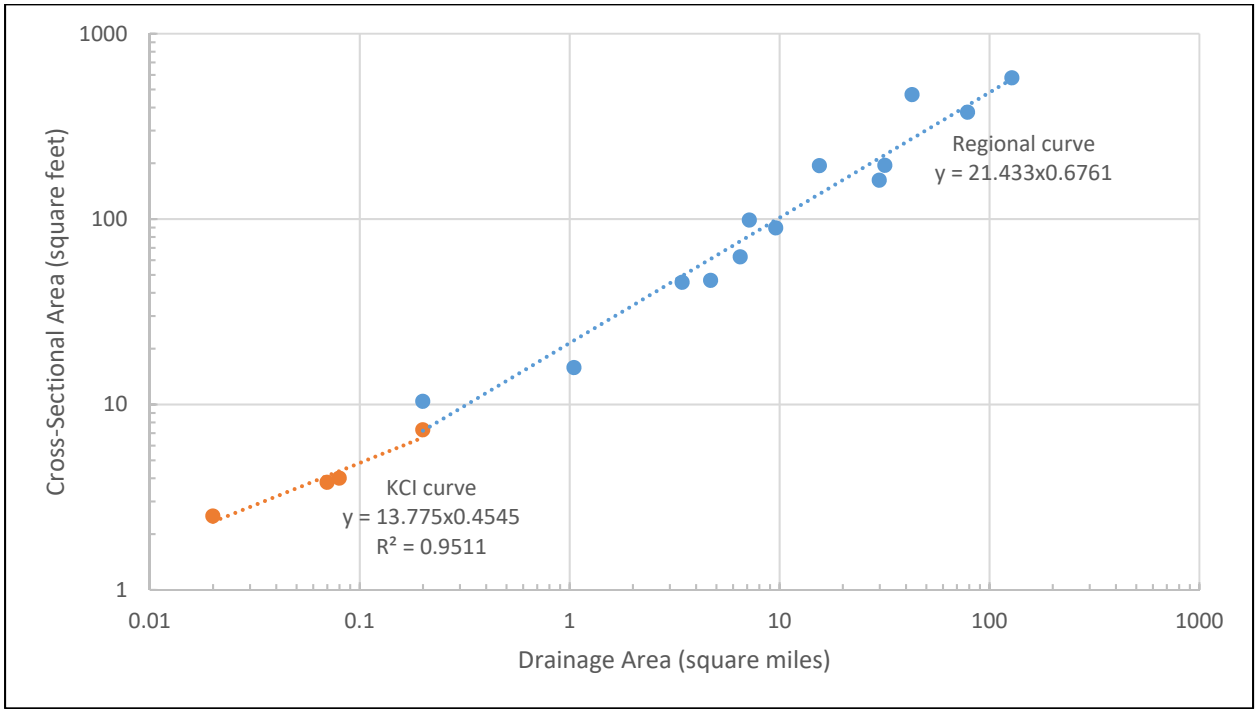


Figure 9. Local Curve for Bankfull Area Determination

6.14 Sediment

In order to analyze the existing sediment conditions within the project stream, 18 pebble counts were completed across the site and 2 bulk samples were done on UTHC for trend analysis. These data are provided in Section 12.2 and summarized in Table 7 below. The sediment sampling shows that the predominant sizes in the gravel range through the project streams. Bedrock exists along UTHC2 and UTHC4, and is scattered throughout the tributaries. Based on the sampling and site observations, we determined that UTHC has an active bed system with a moderate supply of incoming gravel. The remainder of the project streams all have small watershed areas that drain to them and are supply limited. Currently, active slope or bank erosion is contributing finer gravels and sands to the project streams, and these sources will be stabilized during the project restoration. The easement encompasses the majority of the headwaters for this system and will reduce or eliminate channel erosion. As a result, the project's headwater tributaries will function as threshold channels, which is defined as a stream where the bed material inflow is negligible and the channel boundary is immobile even at high flows (Shields et al. 2003). As opposed to an active bed system, a threshold channel never achieves full sediment transport; the system only achieves partial sediment transport.

Based on the collected sediment and cross-section data, average shear stress and critical shear stress values were calculated to compare the existing conditions to the proposed riffle cross-section designs. The shear stress values for the designed reaches were calculated and related to the movement of a particular grain size using Shield's threshold of motion curve (Shields *et al.* 1936). For the existing cross-sections, the calculations showed that for UTHC, the average shear stress and critical shear stress based on existing bed material are similar. We will harvest and retain as much of the natural gravel along UTHC as we can to seed the new riffles. The smaller headwater streams, particularly those with smaller existing bed material, such as T1A, T4, T6, T8A, and T9, may experience larger average shear stresses than the critical shear stress based on the smaller types of sediment in these headwater areas. The restoration of these areas will reduce the upstream sediment supply from slope and bank erosion through the installation of the RSCs at the top of T1A and T4 as well as the stabilization at the heads of the other tributaries. In addition, we will install bed and bank protection in these upper reaches to protect the channels from erosion and excessive scour. Table 7 presents the results from sediment sampling at the site and the calculated shear stresses across the project streams. The project design aimed to reduce average shear stress across all of the channels. However, higher slopes in the upper reaches create average shear stresses greater than the critical shear stress of the existing bed material; as a result, we have included grade control structures, constructed riffles, and bank protection, among other features, to prevent excessive mobilization of smaller material.

Table 7. Sediment Results and Shear Stress Comparison.

Reach	Type	Cross-Section ID	Avg Shear Stress (lb/sf)	Predicted Grain Diam. (mm)	Measured D50 (mm)	Measured D84 (mm)	Modif. Critical Shear Stress (lb/sf)
UTHC1 (Top)	Existing	UTHC XS2	0.47	36	37	97	0.832
UTHC1 (Bottom)	Existing	UTHC XS3	0.89	69	12	92	0.327
UTHC2	Existing	UTHC XS4	1.03	80	5.2	55	0.149
UTHC2	Existing	UTHC XS5	0.82	63	16	65	0.385
UTHC3	Existing	UTHC XS6	0.82	63	26	67	0.546
UTHC3	Existing	UTHC XS6	0.82	63	13.6	30.1	0.256
UTHC4	Existing	UTHC XS7	0.71	54	21	86	0.507
UTHC4	Existing	UTHC XS7	0.71	54	20.4	44.4	0.408
T1A	Existing	T1A	0.51	38	0.13	2.9	0.004
T1	Existing	T1 XS1	0.93	72	2.8	38	0.080
T1	Existing	T1 XS3	0.87	67	0.062	25	N/A
T2	Existing	T2	0.98	77	21	58	0.451
T3	Existing	T3	1.03	80	25	130	0.649
T4	Existing	T4	1.34	106	0.21	4.3	0.007
T6	Existing	T6	1.31	104	4.1	13	0.082
T7	Existing	T7	1.20	94	22	66	0.484
T8A	Existing	T8A	0.91	71	0.062	0.062	0.001
T8	Existing	T8 XS1	1.11	87	8.5	81	0.248
T8	Existing	T8 XS2	1.40	111	1.4	30	0.046
T9	Existing	T9	1.28	101	0.15	0.23	0.002
UTHC1	Proposed	UTHC1 (Top)	0.79	61	37	97	0.832
UTHC1	Proposed	UTHC1 (Bottom)	0.85	66	12	92	0.327
UTHC3	Proposed	UTHC3	0.74	57	26	67	0.546
T1	Proposed	T1	0.82	63	2.8	38	0.080
T1A	Proposed	T1A	0.81	63	0.13	2.9	0.004
T2	Proposed	T2	0.96	75	21	58	0.451
T3	Proposed	T3	1.34	106	25	130	0.649
T4	Proposed	T4	0.79	61	0.21	4.3	0.007
T5	Proposed	T5	0.79	61	N/A	N/A	N/A
T6	Proposed	T6	0.92	72	4.1	13	0.082
T6A	Proposed	T6A	2.09	168	N/A	N/A	N/A
T7	Proposed	T7	0.75	58	22	66	0.484
T8A	Proposed	T8A	0.96	75	0.062	0.062	0.001
T8	Proposed	T8	1.27	100	8.5	81	0.248
T9	Proposed	T9	1.13	88	0.15	0.23	0.002

6.15 Morphological Essential Parameters Tables

Table 8. Morphological Essential Parameters for UTHC-1 (Top)

Parameter	Existing Condition	Reference Condition	Proposed
Valley Width (ft)	15-50	N/A	28-60
Contributing Drainage Area (acres)	53	Variable	53
Channel/Reach Classification	F4	B4c	C4
Design Discharge Width (ft)	5.8-10.6	9.0-10.0	6.5
Design Discharge Depth (ft)	0.4-0.8	1.1-1.2	0.5
Design Discharge Area (ft^2)	2.8-4.5	10.4-10.7	3.4
Design Discharge Velocity (ft/s)	3.8-5.1	4.1-4.5	4.3
Design Discharge (cfs)	11-16	42-46	15
Water Surface Slope	0.021	0.013	0.025
Sinuosity	1.2	1.2	1.2
Width/Depth Ratio	7.6-28.2	8-10	12.4
Bank Height Ratio	1-10.4	1.0	1.0
Entrenchment Ratio	1.2-2.6	1.3-2.3	7.7
d16 / d35 / d50 / d84 / d95 / dip / disp (mm)	1.3/18/37/97/130/-0.38/15.5	Gravel	Gravel

Table 9. Morphological Essential Parameters for UTHC-1 (Bottom)

Parameter	Existing Condition	Reference Condition	Proposed
Valley Width (ft)	15-50	N/A	28-60
Contributing Drainage Area (acres)	114	Variable	114
Channel/Reach Classification	F4	B4c	C4
Design Discharge Width (ft)	5.8-10.6	9.0-10.0	9.0
Design Discharge Depth (ft)	0.4-0.8	1.1-1.2	0.7
Design Discharge Area (ft^2)	2.8-4.5	10.4-10.7	6.1
Design Discharge Velocity (ft/s)	3.8-5.1	4.1-4.5	4.6
Design Discharge (cfs)	11-16	42-46	28
Water Surface Slope	0.021	0.013	0.021
Sinuosity	1.2	1.2	1.2
Width/Depth Ratio	7.6-28.2	8-10	13.4
Bank Height Ratio	1-10.4	1.0	1.0
Entrenchment Ratio	1.2-2.6	1.3-2.3	5.6
d16 / d35 / d50 / d84 / d95 / dip / disp (mm)	1.3/18/37/97/130/-0.38/15.5	Gravel	Gravel

Table 10. Morphological Essential Parameters for UTHC3

Parameter	Existing Condition	Reference Condition	Proposed
Valley Width (ft)	16-55	N/A	40-80
Contributing Drainage Area (acres)	297	Variable	297
Channel/Reach Classification	F4	B4c	C4
Design Discharge Width (ft)	14.1	9.0-10.0	12.0
Design Discharge Depth (ft)	0.8	1.1-1.2	0.9
Design Discharge Area (ft^2)	11.7	10.4-10.7	11.4
Design Discharge Velocity (ft/s)	4.4	4.1-4.5	4.6
Design Discharge (cfs)	51	42-46	52
Water Surface Slope	0.014	0.013	0.015
Sinuosity	1.2	1.2	1.2
Width/Depth Ratio	17	8-10	12.7
Bank Height Ratio	3.2	1.0	1.0
Entrenchment Ratio	1.2	1.3-2.3	5.7
d16 / d35 / d50 / d84 / d95 / dip / disp (mm)	2.7/15/26/40/92/-0.24/6.1	Gravel	Gravel

Table 11. Morphological Essential Parameters for T1

Parameter	Existing Condition	Reference Condition	Proposed
Valley Width (ft)	15-35	N/A	30-40
Contributing Drainage Area (acres)	43	Variable	43
Channel/Reach Classification	B4, C4, G4	B4c	C4b
Design Discharge Width (ft)	4.1-7.5	N/A	6.5
Design Discharge Depth (ft)	0.5-0.7	N/A	0.5
Design Discharge Area (ft^2)	2.7-3.8	N/A	3.4
Design Discharge Velocity (ft/s)	3.6-4.9	N/A	4.3
Design Discharge (cfs)	13-14	N/A	15
Water Surface Slope	0.026	N/A	0.026
Sinuosity	1.1	1.1-1.3	1.1
Width/Depth Ratio	6.2-14.9	12-18	12.4
Bank Height Ratio	1-4.5	1.0-1.1	1.0
Entrenchment Ratio	1.5-4.4	2.2+	5.4
d16 / d35 / d50 / d84 / d95 / dip / disp (mm)	0.13/0.37/3/38/66/-0.06/17.6	Gravel	Gravel

Table 12. Morphological Essential Parameters for T1A

Parameter	Existing Condition	Reference Condition	Proposed
Valley Width (ft)	7-20	N/A	25-35
Contributing Drainage Area (acres)	29	Variable	29
Channel/Reach Classification	F4	B4c	C4b
Design Discharge Width (ft)	7.1	N/A	5.5
Design Discharge Depth (ft)	0.4	N/A	0.5
Design Discharge Area (ft^2)	2.8	N/A	2.5
Design Discharge Velocity (ft/s)	3.4	N/A	4.2
Design Discharge (cfs)	10	N/A	11
Water Surface Slope	0.022	N/A	0.030
Sinuosity	1.1	1.1-1.3	1.1
Width/Depth Ratio	18.2	12-18	12.1
Bank Height Ratio	19.6	1.0-1.1	1.0
Entrenchment Ratio	1.1	2.2+	6.4
d16 / d35 / d50 / d84 / d95 / dip / disp (mm)	0.062/0.072/0.13/2.9/71/0.4/12.2	Gravel	Gravel

Table 13. Morphological Essential Parameters for T2-2

Parameter	Existing Condition	Reference Condition	Proposed
Valley Width (ft)	10-20	N/A	20-30
Contributing Drainage Area (acres)	16	Variable	16
Channel/Reach Classification	G4	B4c	C4b
Design Discharge Width (ft)	3.1	N/A	4.5
Design Discharge Depth (ft)	0.5	N/A	0.4
Design Discharge Area (ft^2)	1.5	N/A	1.7
Design Discharge Velocity (ft/s)	4.7	N/A	4.5
Design Discharge (cfs)	6	N/A	8
Water Surface Slope	0.038	N/A	0.042
Sinuosity	1.1	1.1-1.3	1.1
Width/Depth Ratio	6.3	12-18	12.0
Bank Height Ratio	3.3	1.0-1.1	1.0
Entrenchment Ratio	1.3	2.2+	4.9
d16 / d35 / d50 / d84 / d95 / dip / disp (mm)	0.26/13/21/58/84/-0.48/41.8	Gravel	Gravel

Table 14. Morphological Essential Parameters for T3

Parameter	Existing Condition	Reference Condition	Proposed
Valley Width (ft)	6-20	N/A	15-25
Contributing Drainage Area (acres)	7	Variable	7
Channel/Reach Classification	G4	B4c	C4b
Design Discharge Width (ft)	3.5	N/A	4.5
Design Discharge Depth (ft)	0.3	N/A	0.4
Design Discharge Area (ft^2)	1.1	N/A	1.7
Design Discharge Velocity (ft/s)	4.4	N/A	5.3
Design Discharge (cfs)	5	N/A	9
Water Surface Slope	0.059	N/A	0.059
Sinuosity	1.1	1.1-1.3	1.1
Width/Depth Ratio	11.3	12-18	12.0
Bank Height Ratio	3.3	1.0-1.1	1.0
Entrenchment Ratio	1.2	2.2+	4
d16 / d35 / d50 / d84 / d95 / dip / disp (mm)	0.062/3.1/25/130/240/-0.52/204.2	Gravel	Gravel

Table 15. Morphological Essential Parameters for T4

Parameter	Existing Condition	Reference Condition	Proposed
Valley Width (ft)	6-13	N/A	10-19
Contributing Drainage Area (acres)	3	Variable	3
Channel/Reach Classification	B4	B4c	C4b
Design Discharge Width (ft)	2.5	N/A	4.5
Design Discharge Depth (ft)	0.3	N/A	0.4
Design Discharge Area (ft^2)	0.7	N/A	1.7
Design Discharge Velocity (ft/s)	5.2	N/A	5.3
Design Discharge (cfs)	3	N/A	9
Water Surface Slope	0.089	N/A	0.113
Sinuosity	1.0	1.1-1.3	1.0
Width/Depth Ratio	9.4	12-18	12.0
Bank Height Ratio	6.9	1.0-1.1	1.0
Entrenchment Ratio	1.9	2.2+	3.6
d16 / d35 / d50 / d84 / d95 / dip / disp (mm)	0.11/0.16/0.21/4.3/120/0.41/11.2	Gravel	Gravel

Table 16. Morphological Essential Parameters for T6-2

Parameter	Existing Condition	Reference Condition	Proposed
Valley Width (ft)	10-30	N/A	27-35
Contributing Drainage Area (acres)	29	Variable	29
Channel/Reach Classification	G4	B4c	C4b
Design Discharge Width (ft)	4.4	N/A	5.5
Design Discharge Depth (ft)	0.6	N/A	0.5
Design Discharge Area (ft^2)	2.6	N/A	2.5
Design Discharge Velocity (ft/s)	3.9	N/A	4.5
Design Discharge (cfs)	10	N/A	11
Water Surface Slope	0.041	N/A	0.034
Sinuosity	1.0	1.1-1.3	1.1
Width/Depth Ratio	7.5	12-18	12.1
Bank Height Ratio	4.4	1.0-1.1	1.0
Entrenchment Ratio	1.1	2.2+	4.4
d16 / d35 / d50 / d84 / d95 / dip / disp (mm)	0.19/1.6/4.1/13/27/-0.31/12.4	Gravel	Gravel

Table 17. Morphological Essential Parameters for T6A-2

Parameter	Existing Condition	Reference Condition	Proposed
Valley Width (ft)	20-30	N/A	22-30
Contributing Drainage Area (acres)	9	Variable	9
Channel/Reach Classification	N/A	B4c	C4b
Design Discharge Width (ft)	*	N/A	4.5
Design Discharge Depth (ft)	*	N/A	0.4
Design Discharge Area (ft^2)	*	N/A	1.7
Design Discharge Velocity (ft/s)	*	N/A	6.6
Design Discharge (cfs)	*	N/A	11
Water Surface Slope	*	N/A	0.091
Sinuosity	*	1.1-1.3	1.1
Width/Depth Ratio	*	12-18	12.0
Bank Height Ratio	*	1.0-1.1	1.0
Entrenchment Ratio	*	2.2+	5.3
d16 / d35 / d50 / d84 / d95 / dip / disp (mm)	*	Gravel	Gravel

* Existing conditions are ponded.

Table 18. Morphological Essential Parameters for T7-2

Parameter	Existing Condition	Reference Condition	Proposed
Valley Width (ft)	16-26	N/A	17-32
Contributing Drainage Area (acres)	41	Variable	41
Channel/Reach Classification	G4	B4c	C4b
Design Discharge Width (ft)	3.2	N/A	6.5
Design Discharge Depth (ft)	0.8	N/A	0.5
Design Discharge Area (ft^2)	2.4	N/A	3.4
Design Discharge Velocity (ft/s)	5.3	N/A	4.2
Design Discharge (cfs)	13	N/A	14
Water Surface Slope	0.033	N/A	0.024
Sinuosity	1.1	1.1-1.3	1.1
Width/Depth Ratio	4.1	12-18	12.4
Bank Height Ratio	1.7	1.0-1.1	1.0
Entrenchment Ratio	1.4	2.2+	4.3
d16 / d35 / d50 / d84 / d95 / dip / disp (mm)	1.2/7.9/22/66/89/-0.30/10.7	Gravel	Gravel

Table 19. Morphological Essential Parameters for T8-2

Parameter	Existing Condition	Reference Condition	Proposed
Valley Width (ft)	10-20	N/A	17-37
Contributing Drainage Area (acres)	21	Variable	21
Channel/Reach Classification	G4	B4c	C4b
Design Discharge Width (ft)	3.6	N/A	5.5
Design Discharge Depth (ft)	0.7	N/A	0.5
Design Discharge Area (ft^2)	2.4	N/A	2.5
Design Discharge Velocity (ft/s)	5.5	N/A	5.2
Design Discharge (cfs)	13	N/A	13
Water Surface Slope	0.044	N/A	0.045
Sinuosity	1.1	1.1-1.3	1.1
Width/Depth Ratio	5.5	12-18	12.1
Bank Height Ratio	2.5	1.0-1.1	1.0
Entrenchment Ratio	1.1	2.2+	4.4
d16 / d35 / d50 / d84 / d95 / dip / disp (mm)	0.13/2.2/8.5/81/140/-0.25/37.5	Gravel	Gravel

Table 20. Morphological Essential Parameters for T8A

Parameter	Existing Condition	Reference Condition	Proposed
Valley Width (ft)	10-23	N/A	14-28
Contributing Drainage Area (acres)	7	Variable	7
Channel/Reach Classification	G4	B4c	C4b
Design Discharge Width (ft)	3.1	N/A	4.5
Design Discharge Depth (ft)	0.3	N/A	0.4
Design Discharge Area (ft^2)	1.0	N/A	1.7
Design Discharge Velocity (ft/s)	3.8	N/A	4.6
Design Discharge (cfs)	4	N/A	8
Water Surface Slope	0.052	N/A	0.044
Sinuosity	1.1	1.1-1.3	1.1
Width/Depth Ratio	5.5	12-18	12.0
Bank Height Ratio	2.7	1.0-1.1	1.0
Entrenchment Ratio	1.1	2.2+	4.4
d16 / d35 / d50 / d84 / d95 / dip / disp (mm)	N/A	Gravel	Gravel

Table 21. Morphological Essential Parameters for T9

Parameter	Existing Condition	Reference Condition	Proposed
Valley Width (ft)	10-22	N/A	16-32
Contributing Drainage Area (acres)	29	Variable	29
Channel/Reach Classification	B4	B4c	C4b
Design Discharge Width (ft)	2.9	N/A	5.5
Design Discharge Depth (ft)	0.7	N/A	0.5
Design Discharge Area (ft^2)	2.0	N/A	2.5
Design Discharge Velocity (ft/s)	4.9	N/A	5.0
Design Discharge (cfs)	10	N/A	12
Water Surface Slope	0.039	N/A	0.042
Sinuosity	1.0	1.1-1.3	1.1
Width/Depth Ratio	4.3	12-18	12.1
Bank Height Ratio	1.7	1.0-1.1	1.0
Entrenchment Ratio	1.9	2.2+	4.0
d16 / d35 / d50 / d84 / d95 / dip / disp (mm)	0.062/0.13/0.15/0.23/3.7/-0.13/2.0	Gravel	Gravel

6.16 Planting

All unforested portions of the project easement will be planted to establish a forested riparian buffer. The planting plan is shown in the attached project plan sheets (Section 12.1). Trees and shrubs will be planted at a density of 968 stems per acre (9 feet x 5 feet spacing) in an area of approximately 19.6 acres to achieve a mature survivability of 210 stems per acre after seven years. Woody vegetation planting will be conducted during dormancy. Species to be planted may consist of the following shown in two separate zones.

Zone 1

Common Name	Scientific Name	Wetland Status (Eastern Mts & Piedmont)
River Birch	*Betula nigra*	FACW
Green Ash	*Fraxinus pennsylvanica*	FACW
Tulip Poplar	*Liriodendron tulipifera*	FACU
American Sycamore	*Platanus occidentalis*	FACW
Swamp Chestnut Oak	*Quercus michauxii*	FACW
Willow Oak	*Quercus phellos*	FAC

Zone 2

Common Name	Scientific Name	Wetland Status (Eastern Mts & Piedmont)
American Persimmon	*Diospyros virginiana*	FAC
Tulip Poplar	*Liriodendron tulipifera*	FACU
White Oak	*Quercus alba*	FACU
Southern Red Oak	*Quercus falcata*	FACU
Pin Oak	*Quercus palustris*	FACW
Willow Oak	*Quercus phellos*	FAC

On the restored stream banks, live stakes will be used to provide natural stabilization. Species identified for live staking include:

Common Name	Scientific Name
Silky Dogwood	*Cornus amomum*
Black Willow	*Salix nigra*
Silky Willow	*Salix sericea*
Common Elderberry	*Sambucus canadensis*

A custom herbaceous seed mix composed of native species will also be developed and used to further stabilize and restore the site.

6.17 Project Assets

The tables below outline the anticipated project assets that will be produced from the MDCRS project and are shown in Figure 8.

Table 22. Project Asset Table

Project Component -or- Reach ID	Existing Footage/ Acreage	Stationing	Restoration Footage or Acreage	Creditable Footage or Acreage	Restoration Level	Approach Priority Level	Mitigation Ratio (X:1)	Mitigation Credits	Notes/Comments
UTHC1 Top	1,333	10+00-22+81	1,281	1,249	R	P2 10+00-11+50, then P1	1	1,249	Crossing Exception STA 20+51 - 20+83
UTHC1 Bottom	541	22+81-27+39	457	438	R	P1, then P2 24+50-27+39	1	438	Crossing Exception STA 25+72 - 25+91
UTHC2	1,494	27+39-42+32	1,493	1,493	EI	N/A	1.5	995	
UTHC3	1,411	42+32-55+57	1,325	1,240	R	P1 except P2 42+32-44+00 and 53+50-55+57	1	1,240	Utility Exception STA 54+07 - 54+49; Crossing Exception STA 55+14 - 55+57
UTHC4-1	1,840	55+57-58+53	297	297	EI	N/A	1.5	198	
UTHC4-2		58+53-63+75	521	521	EII	N/A	2.5	208	
UTHC4-3		63+75-68+55	481	419	EI	N/A	1.5	279	Crossing Exception STA 63+75 - 64+37
UTHC4-4		68+55-73+97	542	497	EII	N/A	2.5	199	Utility Exception STA 68+55 - 69+00
T1	764	100+00-107+51	751	734	R	P2 100+00-101+80, then P1	1	734	Crossing Exception STA 104+00 - 104+16
T1A	746	150+00-157+95	795	795	R	P2	1	795	
T2-1	499	200+00-204+98	498	498	EII	N/A	2.5	199	
T2-2	232	204+98-207+63	265	265	R	P2	1	265	
T3	378	300+00-303+69	369	369	R	P1/P2	1	369	
T4	151	400+00-401+51	151	151	R	P1	1	151	
T5	1,205	1000+00-1012+13	1,213	1,182	EII	N/A	2.5	473	Crossing Exception STA 1003+59 - 1003+90

Table 22. Project Asset Table, continued

Project Component -or- Reach ID	Existing Footage/ Acreage	Stationing	Restoration Footage or Acreage	Creditable Footage or Acreage	Restoration Level	Approach Priority Level	Mitigation Ratio (X:1)	Mitigation Credits	Notes/Comments
T5A	65	1200+00-1200+65	65	65	EII	N/A	2.5	26	
T5B	438	1300+00-1304+38	438	438	EII	N/A	2.5	175	
T6-1	325	600+00-603+22	322	259	EII	N/A	2.5	103	Crossing Exception STA 602+59 - 603+22
T6-2	621	603+22-609+80	658	658	R	P1	1	658	
T6A-1	60	650+00-650+60	60	61	EII	N/A	2.5	24	
T6A-2	97	650+60-651+61	101	101	R	P1	1	101	
T7-2	165	700+00-701+65	165	165	EII	N/A	2.5	66	
T7-2	335	701+65-705+13	348	348	R	P1	1	348	
T8-1	445	800+00-804+45	445	445	EII	N/A	2.5	178	
T8-2	486	804+45-808+94	448	426	R	P1	1	426	Crossing Exception STA 808+20 - 808+42
T8A	258	850+00-852+63	263	263	R	P1	1	263	
T9	133	900+00-901+29	129	129	R	P1, then P2 900+71-901+29	1	129	
TOTAL	**14,024**		**13,882**	**13,506**				**10,290**	

Table 23. Length and Summations by Mitigation Category

Restoration Level	Stream (linear feet)	Riparian Wetland (acres)		Non-riparian Wetland (acres)	Buffer (square feet)
		Riverine	Non-Riverine		
Restoration	7,165				
Enhancement					
Enhancement I	2,208				
Enhancement II	4,132				
Creation					
Preservation					
High Quality Preservation					

Table 24. Overall Assets Summary

Mill Dam Creek Restoration Site (Project ID - 97136)	
Overall Assets Summary	
Asset Category	**Overall Credits**
Stream	10,290
RP Wetland	
NR Wetland	
Buffer	

7.0 PERFORMANCE STANDARDS

Monitoring of the MDCRS shall occur for a minimum of seven years following construction. The following performance standards for stream mitigation are based on the *Wilmington District Stream and Wetland Compensatory Mitigation Update* (NCIRT 2016) and will be used to judge site success.

Vegetation Performance

The site must achieve a woody stem density of 260 stems/acre after five years and 210 stems/acre after seven years to be considered successful. Trees in each plot must average 7 feet in height at Year 5 and 10 feet at Year 7. A single species may not account for more than 50% of the required number of stems within any plot. Volunteers must be present for a minimum of two growing seasons before being included performance standards in Year 5 and Year 7. For any volunteer tree stem to count toward vegetative success, it must be a species from the approved planting list included in Section 6.16. If monitoring indicates that any of these standards are not being met, corrective actions will take place.

Stream Hydrologic Performance

During the monitoring period, a minimum of four bankfull events must be recorded within the seven-year monitoring period for the project streams. These bankfull events must occur in separate monitoring years. Bankfull events will be verified using automatic stream monitoring gauges on UTHC1 and UTHC3 to record daily stream depth readings. The project streams must also show a minimum of 30 continuous flow days within a calendar year (assuming normal precipitation). A "normal" year will be based on NRCS climatological data for Yadkin County with the 30th to 70th percentile thresholds as the range of normal, as documented in the USACE Technical Report "Accessing and Using Meteorological Data to Evaluate Wetland Hydrology, April 2000."

Stream Geomorphology Performance

The site's geomorphology for all reaches will be monitored per the NCIRT 2016 monitoring guidelines. The bank height ratio (BHR) should not exceed 1.2. The entrenchment ratio (ER) must not fall below 2.2 for C and E channels or below 1.4 for B channels. BHR and ER at any measured riffle cross-section should not change by more than 10% from the baseline condition during any given monitoring interval (e.g., no more than 10% between years 1 and 2, 2 and 3, 3 and 5, or 5 and 7). There will be an overall assessment for each reach to distinguish localized versus systemic concerns for that stream. Adjustment and lateral movement following construction and as the channel settles over the monitoring period are to be expected. Geomorphological measurements of cross-sections will be used to determine if any adjustments that occur are out of the range typically expected for this type of stream.

8.0 MONITORING PLAN

Monitoring of the MDCRS shall consist of the collection and analysis of stream hydrology, stability, and vegetation survivability data to support the evaluation of the project in meeting established performance standards described above. The Proposed Monitoring Plan in Figure 10 shows the proposed locations of monitoring features described below.

Vegetation Monitoring

Vegetation monitoring will take place between July 1st and leaf drop. The success of the riparian buffer plantings will be evaluated using thirty 0.02-acre square or rectangular plots within the planted stream buffer. Eighteen plots will be permanently installed, while the remainder will be randomly placed at the

time of each monitoring visit. Vegetation must be planted and plots established at least 180 days prior to the start of the first year of monitoring.

In the permanent plots, the plant's height, species, location, and origin (planted versus volunteer) will be noted. In the random plots, species and height will be recorded. In all plots, invasive stems will also be recorded to determine the percentage of invasive stems present. Additionally, a photograph will be taken of each plot. Beginning at the end of the first growing season, the site's vegetation will be monitored in years 1, 2, 3, 5, and 7.

Hydrologic Monitoring

Bankfull events on-site will be verified using two automatic stream monitoring gauges on UTHC1 and UTHC 3. Additional gauges and/or recording devices such as cameras (set to record a photo or video a minimum of once per day) will be installed on T1A, T5A, T8A, and other locations as needed to document the presence of flow. In addition, two gauges will be installed to monitor groundwater levels within existing wetlands: one gauge within wetland WA along T7 and another gauge within wetland WH along T8.

Stream Geomorphology Monitoring

For stream monitoring, the purpose of monitoring is to evaluate the stability of the restored stream. Following the procedures established in the USDA Forest Service Manual, Stream Channel Reference Sites (Harrelson et al. 1994) and the methodologies utilized in the Rosgen stream assessment and classification system (1994 and 1996), data collected will consist of detailed dimension measurements, longitudinal profiles, and bed materials sampling.

Dimension

Thirty-two permanent cross-sections (24 riffles and 8 pools) will be established throughout the site to capture each reach that is being either restored or completed with Enhancement I. More riffle cross-sections will be used given the amount of Enhancement I reaches on the project. The distribution of the cross-sections is as follows and as shown on Figure 10: UTHC1 Top (2 riffles and 1 pool), UTHC1 Bottom (1 riffle and 1 pool), UTHC2 (2 riffles), UTHC3 (2 riffles and 1 pool), UTHC4-1 (1 riffle), UTHC4-3 (2 riffles), T1 (1 riffle and 1 pool), T1A (2 riffles), T2-2 (1 riffle and 1 pool), T3 (1 riffle and 1 pool), T4 (1 riffle), T6-2 (1 riffle and 1 pool), T6A-2 (1 riffle), T7-2 (1 riffle and 1 pool), T8-2 (2 riffles), T8A (2 riffles), and T9 (1 riffle). The extents of each cross-section will be recorded by either conventional survey or GPS. The cross-sectional surveys shall provide a detailed measurement of the stream and banks and will include points on the adjacent floodplain or valley, at the top of bank, bankfull, at all breaks in slope, the edge of water, and thalweg. Width/depth, bank height and entrenchment ratios, as well as bankfull cross-sectional area, width, max depth and mean depth will be calculated for each riffle cross-section based on the survey data. The BHR will be measured by using a constant bankfull area over the monitoring period and adjusting the bankfull elevation each monitoring event based on how this area fits in the cross-sectional data. The revised bankfull elevation will then be used to calculate BHR along with the current low bank height. Width/depth ratios, bankfull cross-sectional area, width, max depth and mean depth will be calculated for each pool cross-section. Cross-section measurements will take place in Years 1, 2, 3, 5, and 7.

Profile

Detailed longitudinal profile will be conducted along the lengths of all restoration reaches during the as-built survey. Measurements will include slopes (average, pool, and riffle) as well as calculations of pool-

to-pool spacing. No additional profile measurements will be taken during the monitoring period unless deemed necessary due to concerns about bed elevation adjustments.

Visual Assessment

An annual site walk will be conducted at the end of each monitoring period to document any problem areas. Specific problem areas that could arise include excessive bank erosion, bed deposition or aggradation, problems with the installed structures, or sparse vegetative cover. The findings of the visual assessment as well as any recommended corrective actions for problem areas will be summarized in the monitoring reports by way of a Current Conditions Plan View (CCPV) figure.

Photograph reference points (PRPs) will be established to assist in characterizing the site and to allow qualitative evaluation of the site conditions. The location of each photo point will be marked in the monitoring plan and the bearing/orientation of the photograph will be documented to allow for repeated use.

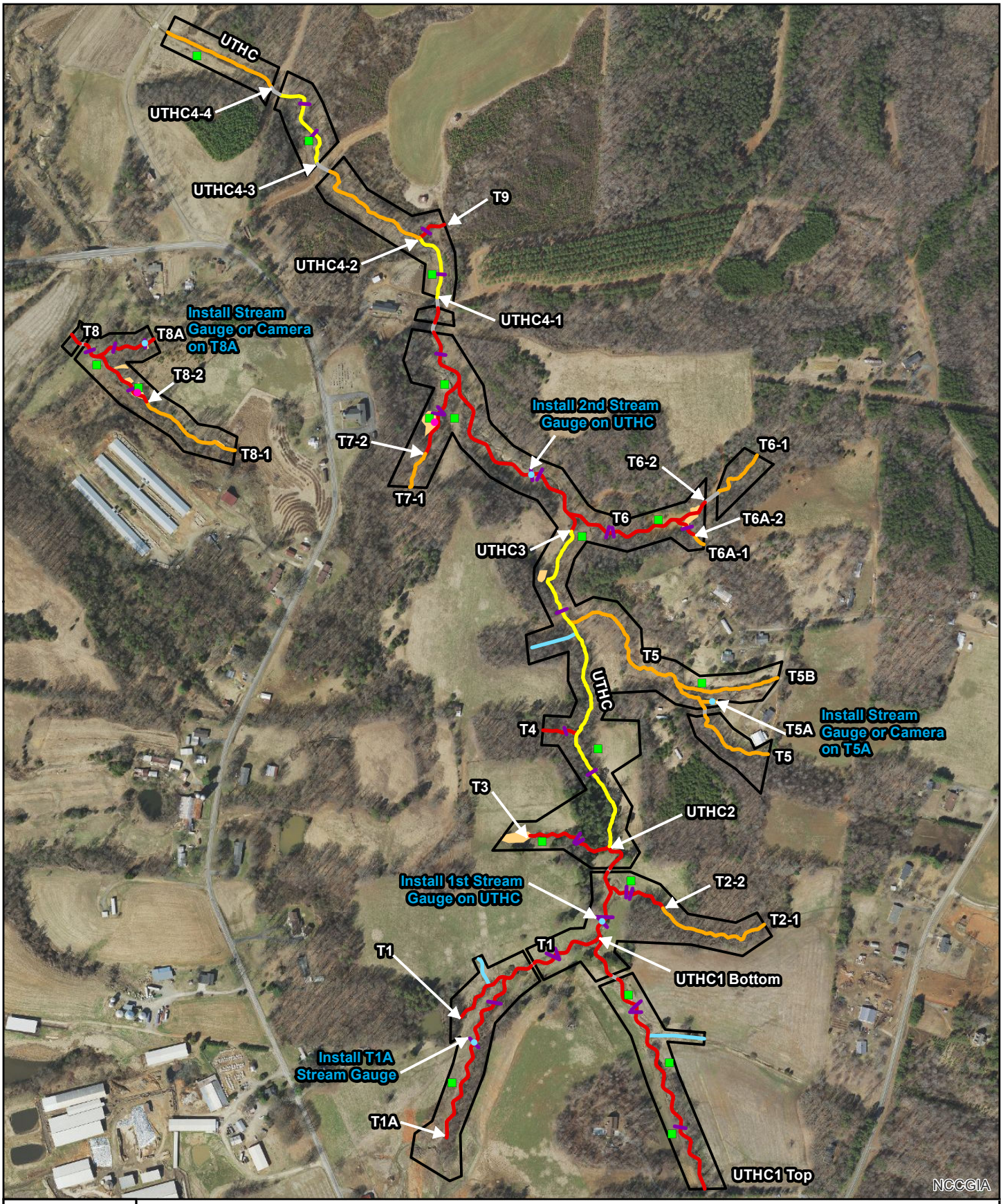
Reporting

Annual monitoring data will be reported using the most current DMS monitoring template from June 2017. The monitoring report shall provide a project data chronology that will facilitate an understanding of project status and trends, population of DMS databases for analysis, research purposes, and assist in decision making regarding project close-out. The report will document the monitored components and include all collected data, analyses, and photographs. The first scheduled monitoring will be conducted during the first full growing season following project completion. The site will be monitored for performance standards for seven years after completion of construction. Full monitoring reports will be completed in Years 1, 2, 3, 5, and 7. Limited monitoring reports (CCPV, photos, stream gauge data, and site narrative) will be submitted in Years 4 and 6.

Table 25. Monitoring Requirements

Mill Dam Creek Restoration Site				
Required	**Parameter**	**Quantity**	**Frequency**	**Notes**
Yes	Pattern and Profile	7,165 lf (all restoration reaches)	Once, during as-built survey	Additional measurements in later years may be taken as necessary
Yes	Stream Dimension	32 cross-sections (24 riffles, 8 pools)	Monitoring Years 1, 2, 3, 5, and 7	
Yes	Stream Hydrology	2 pressure transducer gauges; 3 other gauges or cameras on T1A, T5A, and T8A	Annual – throughout year	1 on UTHC1, 1 on UTHC3, 1 on T1A, 1 on T5A, and 1 on T8A
Yes	Wetland Hydrology	2 pressure transducer gauges	Annual – throughout growing season	1 within Wetland WH along T7 and 1 within Wetland WA along T8
Yes	Vegetation	30 vegetation monitoring plots	Monitoring Years 1, 2, 3, 5, and 7	18 permanently fixed, 12 randomly located each monitoring visit
Yes	Exotic and nuisance vegetation		Annual	Locations of invasive vegetation will be mapped*
Yes	Project boundary		Semi-annual	Locations of vegetation damage, boundary encroachments, etc. will be mapped

* See Section 12.10 for proposed invasive species management.



KCI

Figure 10. Proposed Monitoring, Mill Dam Creek, Yadkin County, NC

- Proposed Easement (40.2 ac)
- Proposed Monitoring XS (32)
- Proposed Veg Plots (18 permanent)
- Proposed Stream Gauge
- Proposed Wetland Gauge
- Existing Wetlands
- Restoration
- Enhancement I
- Enhancement II
- Ephemeral or Other Ditches
- Exceptions

N

0 275 550 Feet

Image Source: NC OneMap Orthoimagery, 2014.

9.0 ADAPTIVE MANAGEMENT PLAN

In the event the mitigation site or a specific component of the mitigation site fails to achieve the necessary performance standards as specified in the mitigation plan, KCI shall notify the members of the IRT and work with the IRT to develop contingency plans and remedial actions.

10.0 LONG-TERM MANAGEMENT PLAN

The site will be transferred to the NCDEQ Stewardship Program. This party shall serve as conservation easement holder and long-term steward for the property and will conduct periodic inspection of the site to ensure that restrictions required in the conservation easement are upheld. Funding will be supplied by the responsible party on a yearly basis until such time an endowment is established. The NCDEQ Stewardship Program is developing an endowment system within the non-reverting, interest-bearing Conservation Lands Conservation Fund Account. The use of funds from the Endowment Account will be governed by North Carolina General Statue GS 113A-232(d)(3). Interest gained by the endowment fund may be used for the purpose of stewardship, monitoring, stewardship administration, and land transaction costs, if applicable. The Stewardship Program will periodically install signage as needed to identify boundary markings as needed. Any fencing or permanent crossings will be the responsibility the owner of the underlying fee to maintain.

11.0 REFERENCES CITED

Griffith, G., J. Omernik, and J. Comstock. 2002. Ecoregions of North Carolina, Regional Descriptions. US E.P.A. Last accessed at: https://archive.epa.gov/wed/ecoregions/web/html/ncsc_eco.html

Harman, W.A., G.D. Jennings, J.M. Patterson, D.R. Clinton, L.O. Slate, A.G. Jessup, J. R. Everhart, and R.E. Smith. 1999. Bankfull Hydraulic Geometry Relationships for North Carolina Streams. Wildland Hydrology. AWRA Symposium Proceedings. Edited by D.S. Olsen and J.P. Potyondy. American Water Resources Association. June 30 – July 2, 1999. Bozeman, MT.

Harman, W. and R. Starr. 2011. Natural Channel Design Review Checklist. US Fish and Wildlife Service, Chesapeake Bay Field Office, Annapolis, MD and US Environmental Protection Agency, Office of Wetlands, Oceans, and Watersheds, Wetlands Division. Washington, D.C. EPA 843-B-12-005

Harman, W., R. Starr, M. Carter, K. Tweedy, M. Clemmons, K. Suggs, C. Miller. 2012. A Function-Based Framework for Stream Assessment and Restoration Projects. US Environmental Protection Agency, Office of Wetlands, Oceans, and Watersheds, Washington, DC EPA 843-K-12-006.

Harrelson, C.C., C.L. Rawlins, and J.P. Potyondy. 1994. Stream Channel Reference Sites: an Illustrated Guide to Field Technique. Gen. Tech. Rep. RM-245. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station.

NCDENR, Ecosystem Enhancement Program. 2005a. Local Watershed Plan for the Yadkin River Basin: Upper Uwharrie River Watershed. Raleigh, NC. Last accessed at: http://portal.ncdenr.org/c/document_library/get_file?uuid=915e0164-8786-4a36-91b9-8305515def02&groupId=60329

NCDENR, Ecosystem Enhancement Program. 2005b. Upper Uwharrie Local Watershed Plan: Fact Sheet. Raleigh, NC. Last accessed at: http://portal.ncdenr.org/c/document_library/get_file?uuid=80ebfb8a-3478-4ecf-bac1-e888d8ddb563&groupId=60329

NCDEQ, Division of Mitigation Services. 2016. Quantifying Benefits to Water Quality from Livestock Exclusion and Riparian Buffer Establishment for Stream Restoration. Last accessed at: http://deq.nc.gov/about/divisions/mitigation-services/dms-vendors/rfp-forms-templates

NCDEQ, Division of Mitigation Services. 2017. Annual Monitoring Report Format, Data Requirements, and Content Guidance. Last accessed at: https://ncdenr.s3.amazonaws.com/s3fs-public/Mitigation%20Services/Document%20Management%20Library/Guidance%20and%20Template%20Documents/13_DMS_Mon_Rep_Templ_June_2017.pdf

NCDEQ, Division of Water Resources. 2016 Draft 303(d) list. Raleigh, NC. Last accessed at: https://deq.nc.gov/about/divisions/water-resources/planning/classification-standards/303d/303d-files

NCDEQ, Division of Water Resources. 2018. Surface Water Classification. Last accessed at: http://deq.nc.gov/about/divisions/water-resources/planning/classification-standards/classifications

North Carolina Interagency Review Team. 2016. Wilmington District Stream and Wetland Compensatory Mitigation Update. Last accessed at: http://saw-reg.usace.army.mil/PN/2016/Wilmington-District-Mitigation-Update.pdf

Rosgen, D.L. 1994. A Classification of Natural Rivers. Catena 22: 169-199.

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

Shields, FD Jr, RR Copeland, PC Klingeman, MW Doyle, and A Simon. 2003. Design for Stream Restoration. Journal of Hydraulic Engineering 129 (8), 575-584.

Shields, Ing. A., W. P. Ott, and J. C. Van Uchelen. 1936. Application of Similarity Principles and Turbulence Research to Bed-load Movement. Pasadena, CA: Soil Conservation Service, California Institute of Technology.

Simon, Andrew and Massimo Rinaldi. 2006. Disturbance, stream incision, and channel evolution: The roles of excess transport capacity and boundary materials in controlling channel response. Geomorphology, Volume 79, Issue 3-4, p. 361-383.

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

USGS. 2018. Metagraywacke and Muscovite-Biotite Schist. https://mrdata.usgs.gov/geology/state/sgmc-unit.php?unit=NCCAZmg;5

12.0 APPENDICES

12.1 Plan Sheets

KCI JOB# : 161601703

CONTRACT #: 6898

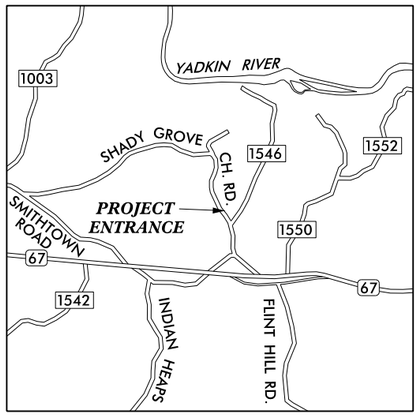
NCDEQ DIVISION OF MITIGATION SERVICES

STATE	DMS PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
N.C.	97136	1	24

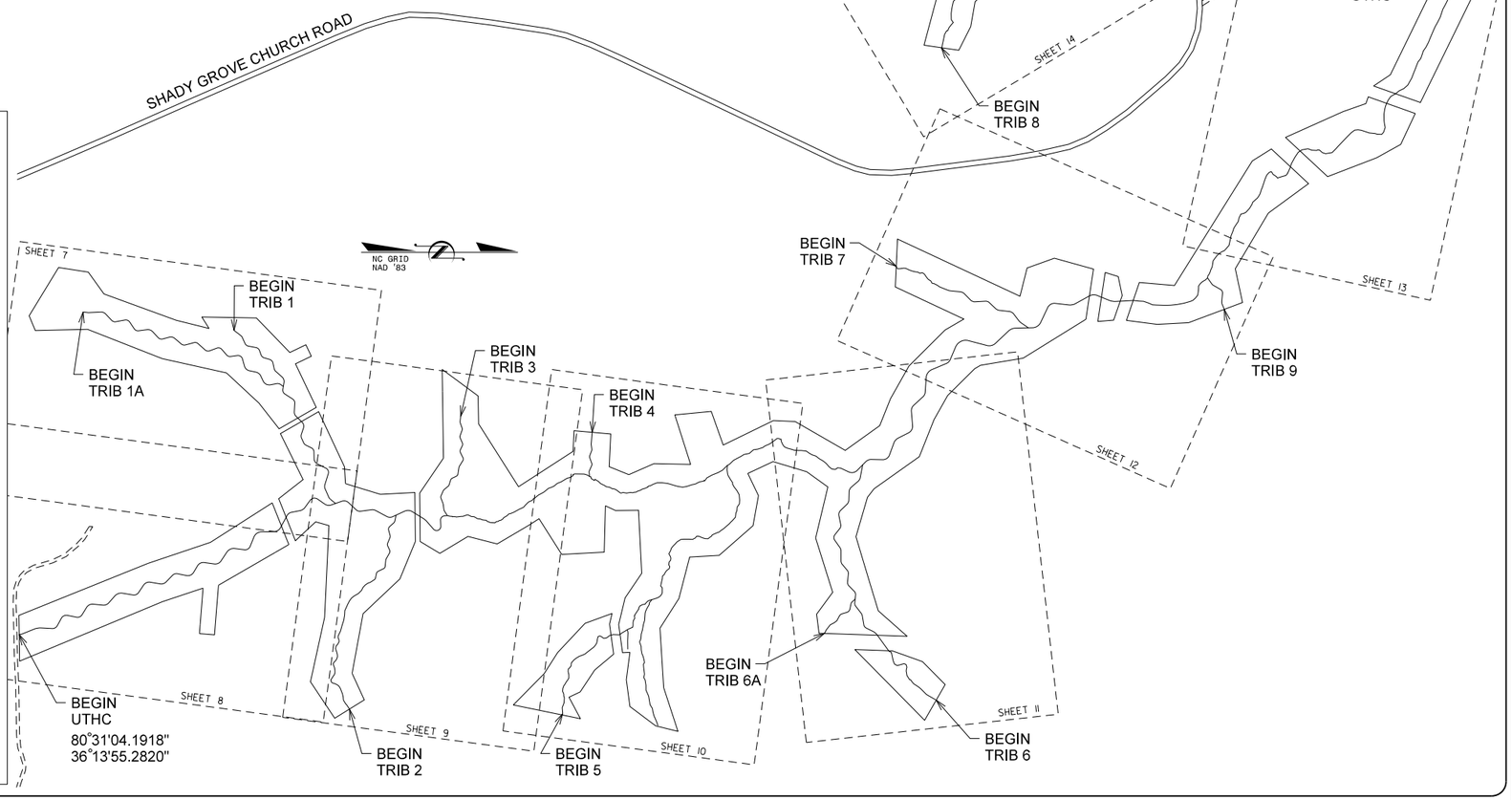
REVISIONS		

MILL DAM CREEK STREAM RESTORATION SITE

YADKIN COUNTY, NORTH CAROLINA



VICINITY MAP
NOT TO SCALE



PROJECT COMPONENTS – TOTAL CREDITS 10,290						
Reach ID	Proposed Stationing	Existing Footage	Approach	Mitigation Ratio	R Footage	R -or- R Equivalent
T1*	100+00 to 107+51	748	R	1:1	734	734
T1A	150+00 to 157+95	739	R	1:1	795	795
T2-1	200+00 to 204+98	498	EII	2.5:1	498	199
T2-2	204+98 to 207+63	265	R	1:1	265	265
T3	300+00 to 303+69	378	R	1:1	369	369
T4	400+00 to 401+51	151	R	1:1	151	151
T5*	1000+00 to 1012+13	1,174	EII	2.5:1	1,182	473
T5A	1200+00 to 1200+65	65	EII	2.5:1	65	26
T5B	1300+00 to 1304+38	438	EII	2.5:1	438	175
T6-1*	600+00 to 602+59	259	EII	2.5:1	259	104
T6-2	602+59 to 609+80	621	R	1:1	658	658
T6A-1	650+00 to 650+60	60	EII	2.5:1	60	24
T6A-2	650+60 to 651+61	97	R	1:1	101	101
T7-1	700+00 to 701+65	165	EII	2.5:1	165	66
T7-2	701+65 to 705+13	335	R	1:1	348	348
T8-1*	800+00 to 804+45	445	EII	2.5:1	445	178
T8-2	804+45 to 808+94	464	R	1:1	426	426
T8A	850+00 to 852+63	258	R	1:1	263	263
T9	900+00 to 901+29	133	R	1:1	129	129
UTHC1 Top*	10+00-22+81	1,333	R	1:1	1,249	1,249
UTHC1 Bottom*	22+81-27+39	541	R	1:1	438	438
UTHC2	27+39-42+32	1,494	EI	1.5:1	1,493	995
UTHC3*	42+32-55+57	1,411	R	1:1	1,240	1,240
UTHC4-1	55+57-58+53	1,840	EI	1.5:1	297	198
UTHC4-2	58+53-63+75		EII	2.5:1	521	208
UTHC4-3*	63+75-68+55		EI	1.5:1	419	279
UTHC4-4*	68+55-73+97		EII	2.5:1	497	199

* Crossings have been removed from creditable linear footage for all project streams.

DIRECTIONS TO SITE

From Raleigh, follow I–40 West towards Winston–Salem. Take exit 188 to follow US–421 North. Take exit 244 off of US–421 onto Williams Road. At the traffic circle take the third exit onto Shallowford Rd. Turn right onto Conrad Rd. Turn left onto Old US421. Turn right onto Flint Hill Rd. Turn left onto Main St. Slight right onto Fairground Rd. Turn right onto Shady Grove Rd. Follow for about a mile; the site entrance will be at 4413 Shady Grove Church Rd.

INDEX OF SHEETS

Prepared in the Office of:

KCI ASSOCIATES OF NC
ENGINEERS•PLANNERS•ECOLOGISTS
4505 FALLS OF NEUSE ROAD
SUITE 400
RALEIGH, NC 27609

Prepared for:

MATTHEW REID
DMS PROJECT MANAGER

LIN XU
DMS REVIEW COORDINATOR

Prepared by:

GARY M. MRYNCZA, PE
PROJECT ENGINEER

ALEX FRENCH
PROJECT DESIGNER

PROJECT ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 32733 ENGINEER GARY MICHAEL MRYNCZA

SIGNATURE: P.E.

GENERAL NOTES:

BEARINGS AND DISTANCES:
- ALL BEARINGS ARE NAD 1983 GRID BEARINGS.
- ALL DISTANCES AND COORDINATES SHOWN ARE HORIZONTAL (GROUND) VALUES.

UTILITY/SUBSURFACE PLANS:
- NO SUBSURFACE PLANS ARE AVAILABLE ON THIS PROJECT.
- EXISTING UNDERGROUND UTILITIES HAVE NOT BEEN VERIFIED.
- THE CONTRACTOR IS RESPONSIBLE FOR CONTACTING A UTILITY LOCATOR AND ESTABLISHING THE EXACT LOCATION OF ANY AND ALL EXISTING UTILITIES IN THE PROJECT REACH.

CONTROL POINTS

DESCRIPTION	NORTHING	EASTING	ELEV	POINT
MILL DAM 1	906433.72	1552754.88	1007.74	1
MILL DAM 2	906784.49	1550793.65	999.31	2
MILL DAM 3	908920.82	1550521.12	968.14	3
MILL DAM 4	910728.58	1548637.89	931.06	4
MILL DAM 5	911824.03	1550305.86	861.62	5
MILL DAM 6	910632.90	1554600.60	963.71	6
MILL DAM 7	909965.25	1552331.55	947.62	7
RV6	926085.40	1539064.52	805.05	9
AUTUMN	915514.39	1574618.78	802.30	10
EAST BEND	901350.85	1553874.99	1068.88	11
KCI	906899.28	1552214.96	956.99	12
KCI	907390.22	1552074.10	939.31	13
KCI#14	906839.03	1551169.59	979.01	14
KCI#15	907378.47	1551306.72	952.23	15
KCI#16	908093.58	1552046.36	924.83	16
KCI#17	908557.45	1551959.23	924.62	17
KCI#18	907613.45	1551482.76	937.21	18
KCI	907521.34	1551394.95	944.63	19
KCI	907211.62	1551314.00	955.42	20
KCI	907089.19	1551294.01	959.66	21
KCI	906963.06	1551259.62	958.01	22
KCI	909054.89	1551675.91	904.30	400

* CONTACT DESIGN REPRESENTATIVE FOR FULL LIST OF CONTROL POINTS

PROJECT LEGEND:

Proposed Thalweg w/Approximate Bankfull Limits ..... 

Proposed Step Pool ..... 

Proposed Riffle Enhancement ..... 

Proposed Riffle Grade Control ..... 

Proposed Riffle Cascade ..... 

Proposed Live Lift ..... 

Existing Channel to be Filled ..... 

Proposed Channel Block ..... 

Existing Tree Line ..... 

Minor Contour Line .....

Major Contour Line .....

NORTH CAROLINA PROFESSIONAL SEAL 32733 ENGINEER GARY MICHAEL MRYNCZA

NO.	DESCRIPTION	DATE
	REVISIONS	

NCDEQ - DIVISION OF MITIGATION SERVICES

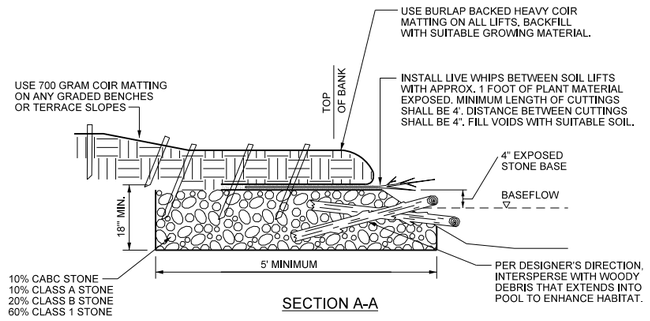
KCI ASSOCIATES OF NC
ENGINEERS • PLANNERS • SCIENTISTS
4505 FALLS OF NEUSE ROAD, SUITE 400
RALEIGH, NORTH CAROLINA 27609

MILL DAM CREEK
STREAM RESTORATION SITE
YADKIN COUNTY, NORTH CAROLINA

DATE: AUGUST 2018
SCALE: N.T.S.

GENERAL NOTES & PROJECT LEGEND

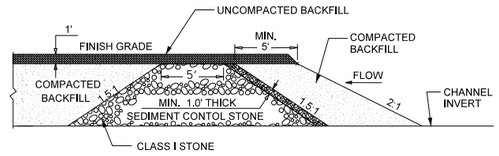
SHEET 2 OF 24



SECTION A-A

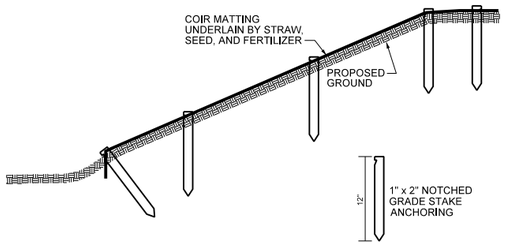
NOTE:
USE 1.5'x1"x2" WOODEN STAKES ON 1' CENTERS. STAKES SHALL HAVE A 'ROOFING' NAIL AT TOP TO KEEP FABRIC FROM SLIPPING OFF.

LIVE LIFT
SCALE: NTS

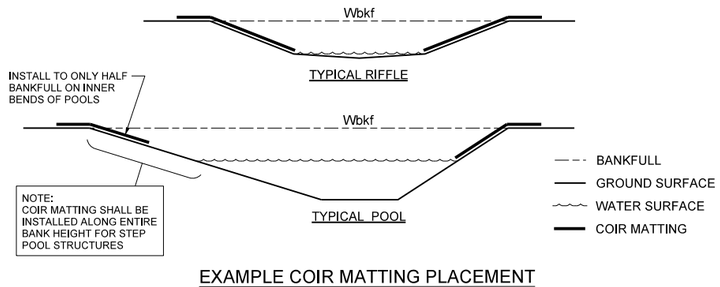


CHANNEL BLOCK
SCALE: NTS

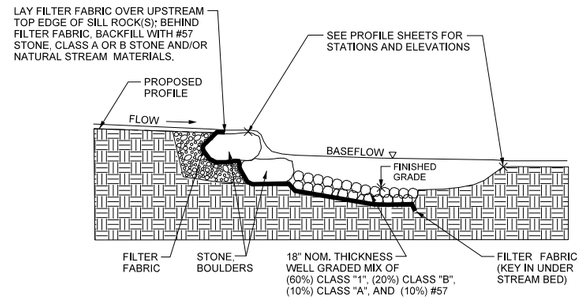
NOTES:
-MATTING SHALL BE INSTALLED PRIOR TO THE INTRODUCTION OF WATER TO A STREAM SECTION.
-ALL DISTURBED AREAS INSIDE FLOOD-PLAIN EXTENTS SHALL BE SEEDED DAILY.
-GROUND SHALL BE PREPARED AND SEED & FERTILIZER APPLIED ACCORDING TO PROJECT SPECIAL PROVISIONS.
-MATTING SHALL BE INSTALLED ALONG BOTH SIDES OF NEW STREAM LENGTH.
-MATTING SHALL EXTEND FROM TOE OF SLOPE TO THE TOP OF BANK.
-MATTING SHALL BE APPLIED AND STAKED IN ACCORDANCE WITH PROJECT SPECIAL PROVISIONS.



COIR MATTING
SCALE: NTS



EXAMPLE COIR MATTING PLACEMENT
SCALE: NTS



PROFILE VIEW

NOTES:

FOR DOUBLE STEP POOLS, CONTINUE ROCK MIXTURE FROM FIRST SILL ALL THE WAY TO THE SECOND SILL. DO NOT STOP AT THE 6FT MINIMUM AS SHOWN IN THE SINGLE STEP POOL PLAN VIEW.

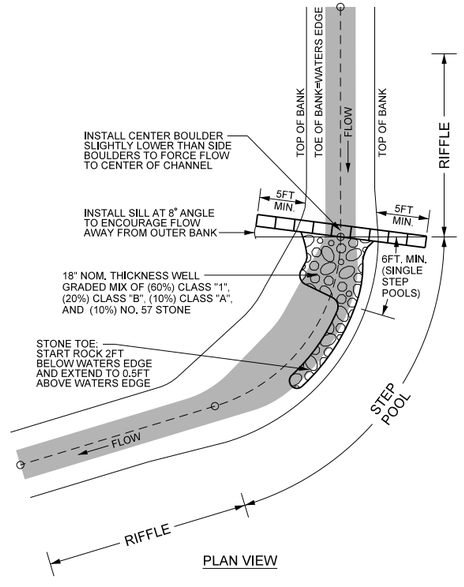
BOULDERS SHOULD BE NATIVE STONES OR SHOT ROCK, ANGULAR AND OBLONG, WITH AN AXIS APPROXIMATELY 3' L x 2' W x 1.5' D.

BOULDER SILLS TO EXTEND 5' MINIMUM INTO STREAM BANKS FOR STEP POOL STRUCTURES.

STONE INSTALLATION: START BY INSTALLING STONE MIXTURE, THEN ADD SURGE STONE TO FILL IN VOIDS. FINISH BY WASHING IN NATURAL STREAM MATERIAL TO OBTAIN FINAL GRADE.

IF APPROVED BY DESIGNER, BOULDER SILLS CAN BE REPLACED WITH LIVE HARDWOOD LOGS FOUND ON SITE. LOGS MUST BE A MINIMUM OF 10" DIAMETER AND STACKED IN A TRIANGLE FORMATION. NAIL (WITH PLASTIC WASHER) FILTER FABRIC TO THE TOP LOG AND CONTINUE DOWN AND UNDER STRUCTURE AS SHOWN ON STEP POOL DETAIL.

LOG SILL



PLAN VIEW

STEP POOL
SCALE: NTS

NORTH CAROLINA PROFESSIONAL SEAL 32733 ENGINEER GARY MICHAEL MRYNCZA

REVISIONS

DESCRIPTION	DATE
SYM.	

NCDEQ - DIVISION OF MITIGATION SERVICES

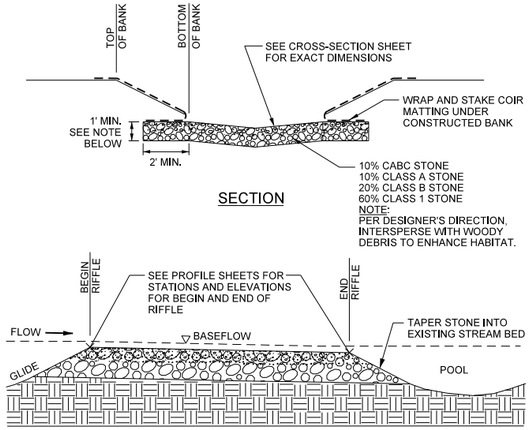
KCI ASSOCIATES OF NC
ENGINEERS • PLANNERS • SCIENTISTS
4505 FALLS OF NEUSE ROAD, SUITE 400
RALEIGH, NORTH CAROLINA 27609

MILL DAM CREEK
STREAM RESTORATION SITE

YADKIN COUNTY, NORTH CAROLINA

DATE: AUGUST 2018
SCALE: N.T.S.

DETAILS



SECTION

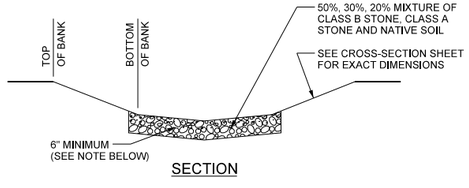
PROFILE

NOTE:

STONE INSTALLATION: START BY INSTALLING STONE MIXTURE. THEN ADD SURGE STONE TO FILL IN VOIDS. FINISH BY WASHING IN NATURAL STREAM MATERIAL TO OBTAIN FINAL GRADE.

RIFFLE GRADE CONTROL

SCALE: NTS



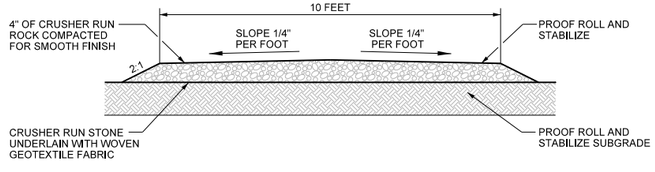
SECTION

NOTE:

START BY INSTALLING CLASS B STONE AND CLASS A STONE MIXTURE, FINISH BY WASHING IN NATURAL STREAM MATERIAL TO OBTAIN FINAL GRADE.

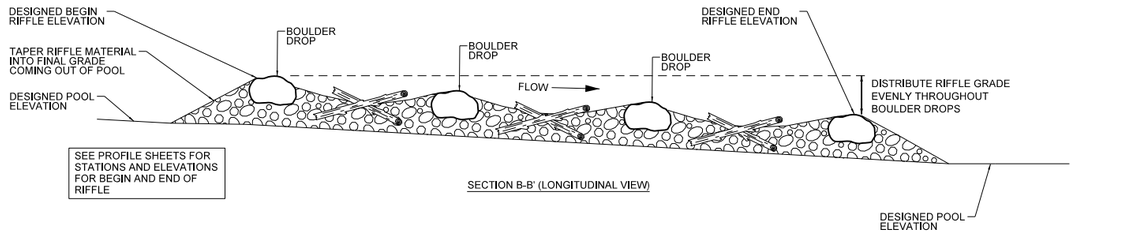
RIFFLE ENHANCEMENT

SCALE: NTS

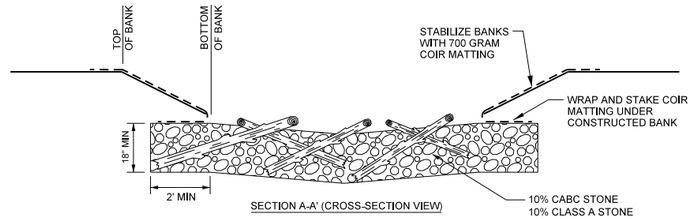


STABILIZED ACCESS DRIVE

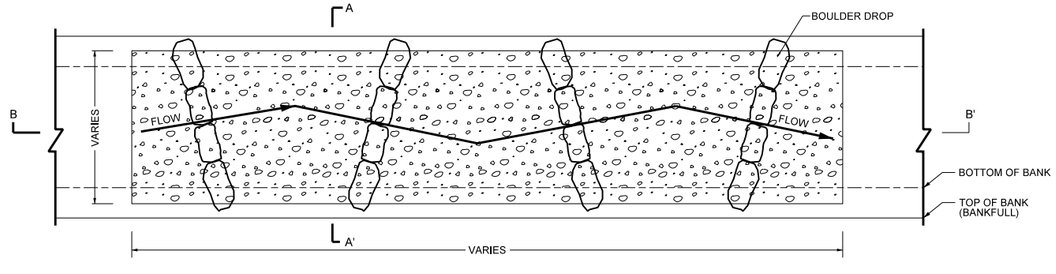
SCALE: NTS



SECTION B-B' (LONGITUDINAL VIEW)



SECTION A-A' (CROSS-SECTION VIEW)



PLAN VIEW

CASCADING RIFFLE

SCALE: NTS

NOTES:

WRAP AND STAKE COIR MATTING UNDER CONSTRUCTED BANK THROUGHOUT ENTIRE LENGTH OFF RIFFLE SECTIONS.

SEE CROSS-SECTION SHEET FOR EXACT DIMENSIONS.

NORTH CAROLINA PROFESSIONAL SEAL 32733 ENGINEER GARY MICHAEL MRYNCZA

REVISIONS

SYM.	DESCRIPTION	DATE

NCDEQ - DIVISION OF MITIGATION SERVICES

KCI ASSOCIATES OF NC
ENGINEERS • PLANNERS • SCIENTISTS
4505 FALLS OF NEUSE ROAD, SUITE 400
RALEIGH, NORTH CAROLINA 27609

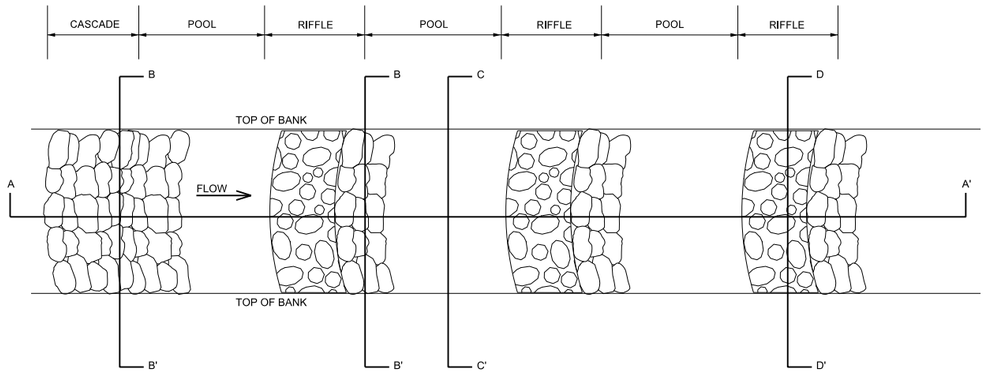
MILL DAM CREEK
STREAM RESTORATION SITE

YADKIN COUNTY, NORTH CAROLINA

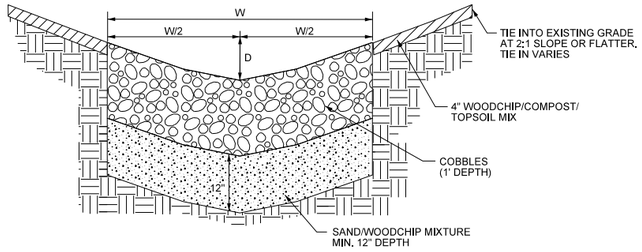
DATE: AUGUST 2018
SCALE: N.T.S.

DETAILS

SHEET 4 OF 24

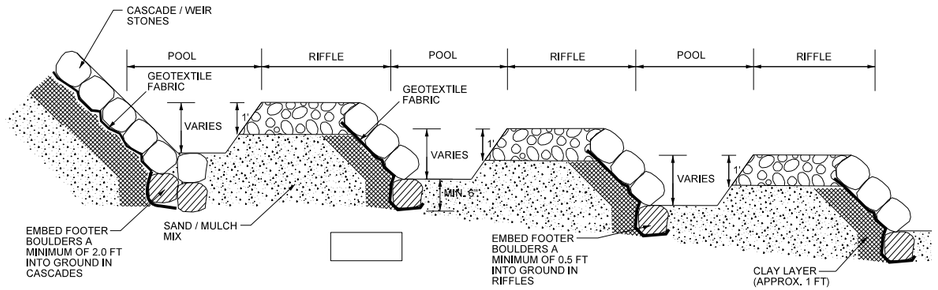


REGENERATIVE STORMWATER CONVEYANCE DETAIL - PLAN VIEW
SCALE: NTS



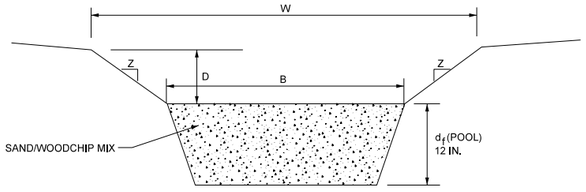
SECTION D-D' - RIFFLE CROSS-SECTION
SCALE: NTS

NOTES: - SEE STRUCTURE TABLE FOR WIDTH AND DEPTH DIMENSIONS
- FOR TRIBUTARY 4, DRAINAGE DITCH 1, AND DRAINAGE DITCH 2 THE RIFFLE DEPTH SHALL BE 2' AND THE SAND/MULCH MIX WILL NOT BE INSTALLED.

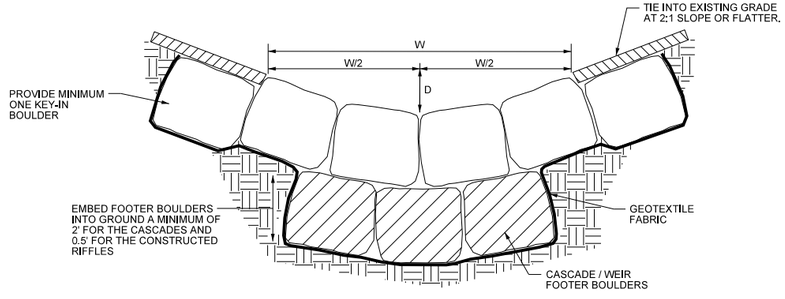


SECTION A - A' - TYPICAL PROFILE VIEW
SCALE: NTS

NOTES:
- FOR TRIBUTARY T1A, GEOTEXTILE FABRIC BELOW RIFFLE STONE SHALL BE BACKED BY 1 FOOT OF CLAY MATERIAL.
- FOR DRAINAGE DITCH 1 & DRAINAGE DITCH 2, THE RIFFLE STONE DEPTH SHALL BE 2' AND THE SAND/MULCH MIX WILL ONLY BE INSTALLED UNDER THE POOLS.

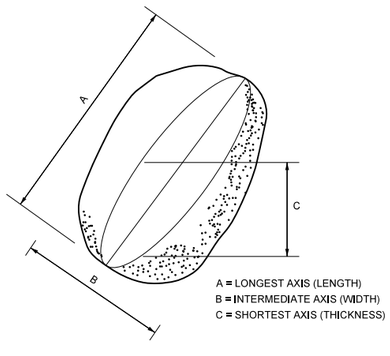


SECTION C - C' - POOL CROSS SECTION
SCALE: NTS

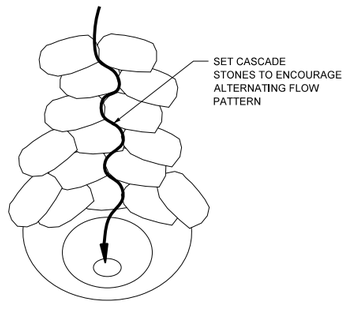


SECTION B-B' - CASCADE AND RIFFLE BOULDER WEIR CROSS-SECTION
SCALE: NTS

NOTES: SEE STRUCTURE TABLE FOR WIDTH AND DEPTH DIMENSIONS



ROCK AXIS DEFINITION (RSC)
SCALE: NTS



CASCADE PLAN DETAIL (RSC)
SCALE: NTS

RSC STRUCTURE TABLE				
FROM STA.	TO STA.	WIDTH (W) (FT)	DEPTH (D) (FT)	DESCRIPTION
TRIBUTARY 1A				
148+94	149+02	14	1.4	RSC RIFFLE
149+18	149+28	14	1.1	RSC CASCADE
149+44	149+52	14	1.4	RSC RIFFLE
149+68	149+76	14	1.4	RSC RIFFLE
149+92	150+00	14	1.4	RSC RIFFLE
DRAINAGE DITCH 1				
1400+00	1400+10	7	1.5	RSC ENHANCED RIFFLE
1400+21.5	1400+31.5	7	1.5	RSC ENHANCED RIFFLE
1400+43	1400+57	7	1.5	RSC ENHANCED RIFFLE
DRAINAGE DITCH 2				
1450+00	1450+13	10	0.7	RSC ENHANCED RIFFLE
1450+23..5	1450+35.5	10	0.7	RSC ENHANCED RIFFLE
1450+47	1450+54.5	10	0.7	RSC ENHANCED RIFFLE

RSC POOL DIMENSIONS				
REACH	WIDTH (W) (FT)	DEPTH (D) (FT)	BOTTOM WIDTH (B) (FT)	SIDE SLOPE (Z) (FT/FT)
TRIBUTARY 1A	14	2.4	4.4	2
DRAINAGE DITCH 1	7	2.5	1.0	1.2
DRAINAGE DITCH 2	10	1.7	3.2	2

STONE SIZES FOR RSC STRUCTURE TYPES			
AXIS	A (LONGEST)	B (INTERMEDIATE)	C (SHORTEST)
STRUCTURE TYPE	MAX.	RANGE	MIN.
RIFFLES*	CLASS I (5")	CLASS I (10")	CLASS I (17")
ENHANCED RIFFLE*	CLASS II (9")	CLASS II (14")	CLASS II (23")
CASCADE / WEIR	2.0'	2.0'- 3.0'	2.0'

* STRUCTURE SHALL INCLUDE A MIX OF 10% 57 STONE, 10% CLASS A, 10% CLASS B IN ADDITION TO THE SPECIFIED STONE

WOODCHIP/COMPOST/TOPSOIL MIXTURE	
60%	TOPSOIL
20%	COMPOST
20%	WOODCHIPS

SAND/WOODCHIP MIXTURE	
80%	SAND (0.02" TO 0.04")
20%	WOODCHIPS

ONSITE SAND MAY BE USED WITH THE APPROVAL OF THE ENGINEER.

NORTH CAROLINA PROFESSIONAL SEAL 32733 ENGINEER GARY MICHAEL MRYNCZA

REVISIONS

SYM.	DESCRIPTION	DATE

NCDEQ - DIVISION OF MITIGATION SERVICES

KCI ASSOCIATES OF NC
ENGINEERS • PLANNERS • SCIENTISTS
4505 FALLS OF NEUSE ROAD, SUITE 400
RALEIGH, NORTH CAROLINA 27609

MILL DAM CREEK
STREAM RESTORATION SITE
YADKIN COUNTY, NORTH CAROLINA

DATE: AUGUST 2018
SCALE: N.T.S.

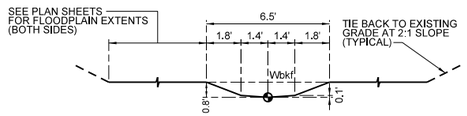
RSC DETAILS

SHEET 5 OF 24

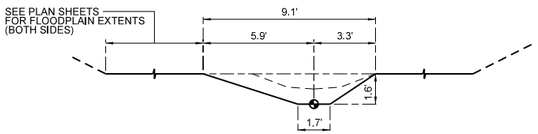
REACHES:

UTHC1 (TOP): STATION 10+00 TO 22+81
TRIBUTARY 1: STATION 100+00 TO 107+51
TRIBUTARY 5: STATION 1011+35 TO 1012+13
TRIBUTARY 7: STATION 701+65 TO 705+13

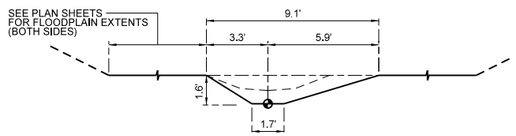
"C4" STREAM TYPE



TYPICAL RIFFLE
= THALWEG LOCATION



TYPICAL POOL - RIGHT MEANDER

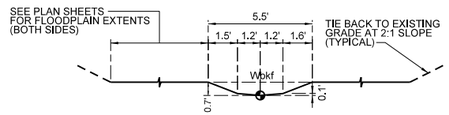


TYPICAL POOL - LEFT MEANDER

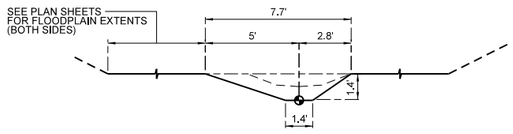
REACHES:

TRIBUTARY 1A: STATION 150+00 TO 157+95
TRIBUTARY 6: STATION 602+59 TO 609+80
TRIBUTARY 8: STATION 800+75 TO 801+07
STATION 804+45 TO 808+94
TRIBUTARY 9: STATION 900+00 TO 901+29

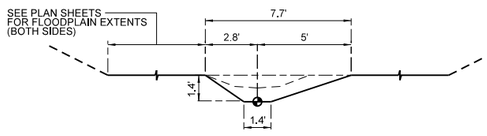
"C4b" STREAM TYPE



TYPICAL RIFFLE
= THALWEG LOCATION



TYPICAL POOL - RIGHT MEANDER

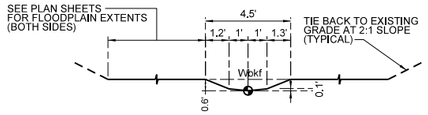


TYPICAL POOL - LEFT MEANDER

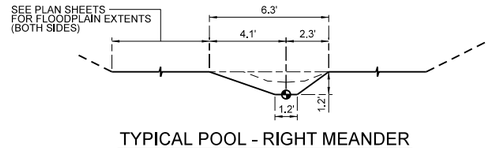
REACHES:

TRIBUTARY 2: STATION 200+00 TO 200+68
STATION 204+99 TO 207+63
TRIBUTARY 3: STATION 300+00 TO 303+69
TRIBUTARY 4: STATION 400+00 TO 401+51
TRIBUTARY 5: STATION 1003+45 TO 1003+97
STATION 1004+69 TO 1005+86
TRIBUTARY 5B: STATION 1304+05 TO 1304+38
TRIBUTARY 6A: STATION 650+60 TO 651+61
TRIBUTARY 8A: STATION 850+00 TO 852+63

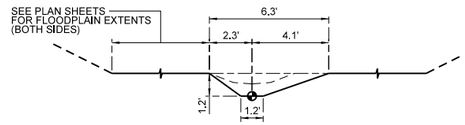
"C4b" STREAM TYPE



TYPICAL RIFFLE
= THALWEG LOCATION

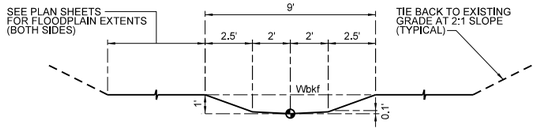


TYPICAL POOL - RIGHT MEANDER

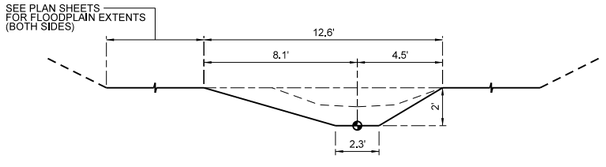


TYPICAL POOL - LEFT MEANDER

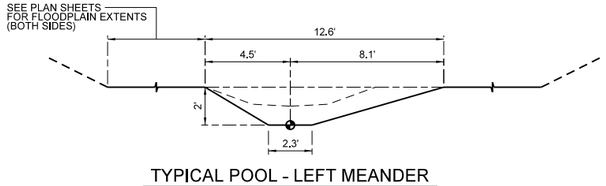
REACH : UTHC1 (BOTTOM)
STATION 22+81 TO 27+39
"C4" STREAM TYPE



TYPICAL RIFFLE
= THALWEG LOCATION

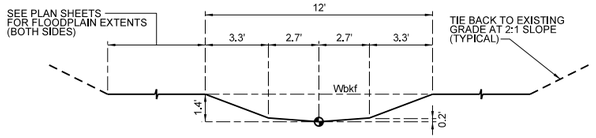


TYPICAL POOL - RIGHT MEANDER

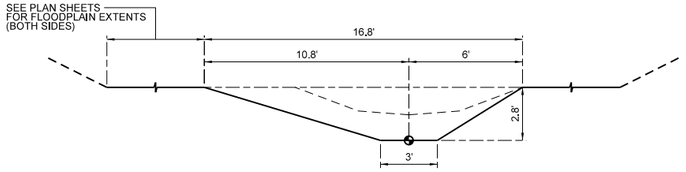


TYPICAL POOL - LEFT MEANDER

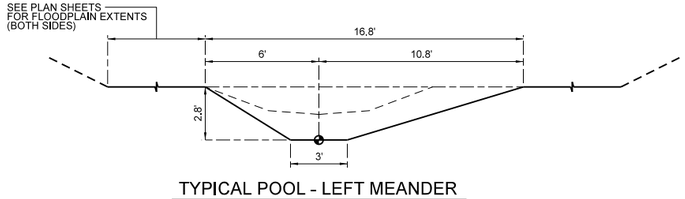
REACH : UTHC3
STATION 42+32 TO 55+57
"C4" STREAM TYPE



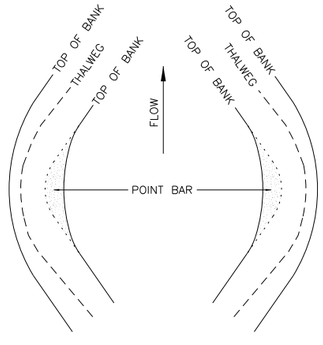
TYPICAL RIFFLE
= THALWEG LOCATION



TYPICAL POOL - RIGHT MEANDER



TYPICAL POOL - LEFT MEANDER



LEFT MEANDER RIGHT MEANDER

NORTH CAROLINA PROFESSIONAL SEAL 32733 ENGINEER GARY MICHAEL MRYNCZA

–4′ –2′ 0′ 4′ 8′
GRAPHIC SCALE

NO.	DESCRIPTION	DATE
	REVISIONS	

NCDEQ - DIVISION OF MITIGATION SERVICES

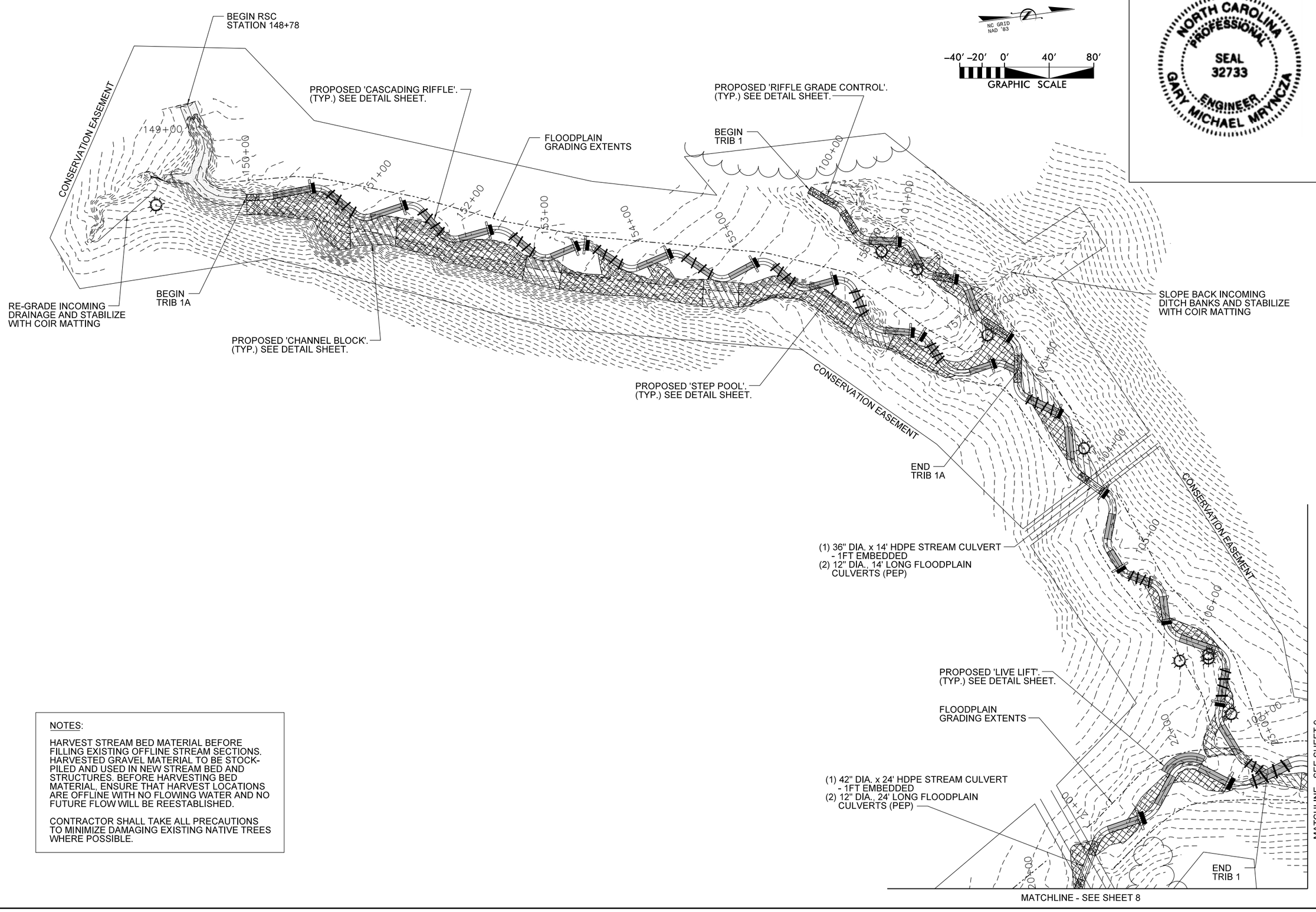
KCI ASSOCIATES OF NC
ENGINEERS • PLANNERS • SCIENTISTS
4505 FALLS OF NEUSE ROAD, SUITE 400
RALEIGH, NORTH CAROLINA 27609

MILL DAM CREEK
STREAM RESTORATION SITE
YADKIN COUNTY, NORTH CAROLINA

DATE: AUGUST 2018
SCALE: SEE SHEET

TYPICAL CROSS SECTIONS

SHEET 6 OF 24



NOTES:

HARVEST STREAM BED MATERIAL BEFORE FILLING EXISTING OFFLINE STREAM SECTIONS. HARVESTED GRAVEL MATERIAL TO BE STOCK-PILED AND USED IN NEW STREAM BED AND STRUCTURES. BEFORE HARVESTING BED MATERIAL, ENSURE THAT HARVEST LOCATIONS ARE OFFLINE WITH NO FLOWING WATER AND NO FUTURE FLOW WILL BE REESTABLISHED.

CONTRACTOR SHALL TAKE ALL PRECAUTIONS TO MINIMIZE DAMAGING EXISTING NATIVE TREES WHERE POSSIBLE.

NORTH CAROLINA PROFESSIONAL SEAL 32733 ENGINEER GARY MICHAEL MRYNCZA

SYM.	DESCRIPTION	DATE
	REVISIONS	

NCDEQ - DIVISION OF MITIGATION SERVICES

KCI ASSOCIATES OF NC
ENGINEERS • PLANNERS • SCIENTISTS
4505 FALLS OF NEUSE ROAD, SUITE 400
RALEIGH, NORTH CAROLINA 27609

MILL DAM CREEK STREAM RESTORATION SITE

YADKIN COUNTY, NORTH CAROLINA

DATE: AUGUST 2018
SCALE: GRAPHIC

SITE PLAN

REACH:
T1 & T1A

NORTH CAROLINA PROFESSIONAL SEAL 32733 ENGINEER GARY MICHAEL MRYNCZA

NC GRID NAD '83

–40′ –20′ 0′ 40′ 80′

GRAPHIC SCALE

MATCHLINE - SEE SHEET 7

MATCHLINE - SEE SHEET 9

PROPOSED 'LIVE LIFT'. (TYP.) SEE DETAIL SHEET.

(1) 42" DIA. x 24' HDPE STREAM CULVERT - 1FT EMBEDDED
(2) 12" DIA., 24' LONG FLOODPLAIN CULVERTS (PEP)

PROPOSED 'RIFFLE GRADE CONTROL'. (TYP.) SEE DETAIL SHEET.

FLOODPLAIN GRADING EXTENTS

END TRIB 1 / START UTHC1 BOTTOM

SLOPE BACK INCOMING DITCH BANKS AND STABILIZE WITH COIR MATTING

CONSERVATION EASEMENT

PROPOSED 'CASCADING RIFFLE'. (TYP.) SEE DETAIL SHEET.

PROPOSED 'RIFFLE ENHANCEMENT'. (TYP.) SEE DETAIL SHEET.

PROPOSED 'STEP POOL'. (TYP.) SEE DETAIL SHEET.

SLOPE BACK INCOMING DITCH BANKS AND STABILIZE WITH COIR MATTING

FLOODPLAIN GRADING EXTENTS

BEGIN 'DITCH 1' RSC STATION 1400+00

CONSERVATION EASEMENT

PROPOSED 'CHANNEL BLOCK'. (TYP.) SEE DETAIL SHEET.

BEGIN UTHC 1 TOP

STABILIZE INCOMING DRAINAGE WITH COIR MATTING AND GRADE TO DRAIN INTO UTHC

NOTES:

HARVEST STREAM BED MATERIAL BEFORE FILLING EXISTING OFFLINE STREAM SECTIONS. HARVESTED GRAVEL MATERIAL TO BE STOCK-PILED AND USED IN NEW STREAM BED AND STRUCTURES. BEFORE HARVESTING BED MATERIAL, ENSURE THAT HARVEST LOCATIONS ARE OFFLINE WITH NO FLOWING WATER AND NO FUTURE FLOW WILL BE REESTABLISHED.

CONTRACTOR SHALL TAKE ALL PRECAUTIONS TO MINIMIZE DAMAGING EXISTING NATIVE TREES WHERE POSSIBLE.

SYM.	DESCRIPTION	DATE
	REVISIONS	

NCDEQ - DIVISION OF MITIGATION SERVICES

KCI ASSOCIATES OF NC
ENGINEERS • PLANNERS • SCIENTISTS
4505 FALLS OF NEUSE ROAD, SUITE 400
RALEIGH, NORTH CAROLINA 27609

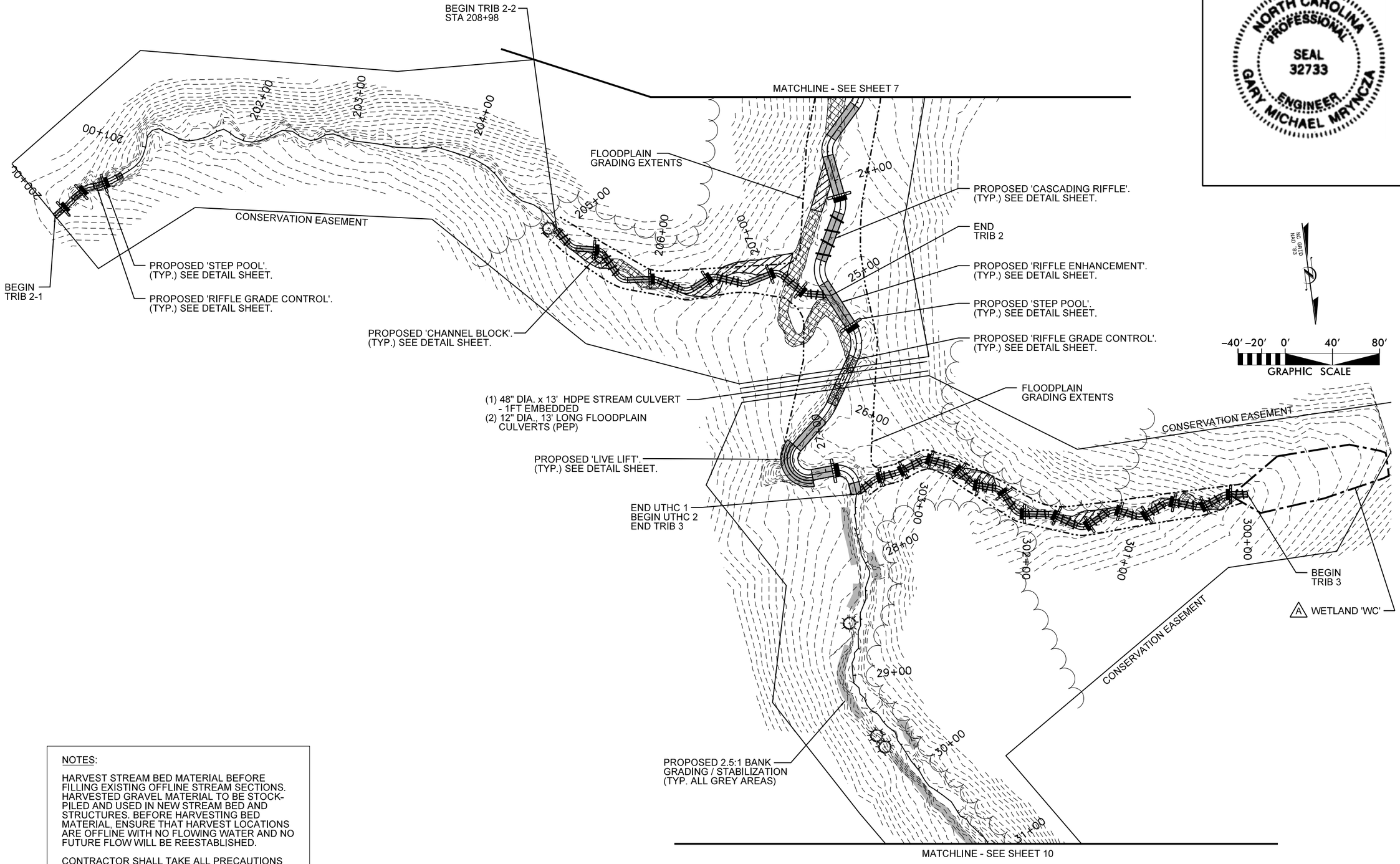
MILL DAM CREEK
STREAM RESTORATION SITE

YADKIN COUNTY, NORTH CAROLINA

DATE: AUGUST 2018
SCALE: GRAPHIC

SITE PLAN

REACH: UTHC



NOTES:

HARVEST STREAM BED MATERIAL BEFORE FILLING EXISTING OFFLINE STREAM SECTIONS. HARVESTED GRAVEL MATERIAL TO BE STOCK-PILED AND USED IN NEW STREAM BED AND STRUCTURES. BEFORE HARVESTING BED MATERIAL, ENSURE THAT HARVEST LOCATIONS ARE OFFLINE WITH NO FLOWING WATER AND NO FUTURE FLOW WILL BE REESTABLISHED.

CONTRACTOR SHALL TAKE ALL PRECAUTIONS TO MINIMIZE DAMAGING EXISTING NATIVE TREES WHERE POSSIBLE.

NORTH CAROLINA PROFESSIONAL SEAL 32733 ENGINEER GARY MICHAEL MRYNCZA

	DATE	DESCRIPTION	SYM.
REVISIONS			
REVISIONS PER IRT COMMENTS	DEC 2018		

NCDEQ – DIVISION OF MITIGATION SERVICES

KCI ASSOCIATES OF NC
ENGINEERS • PLANNERS • SCIENTISTS
4505 FALLS OF NEUSE ROAD, SUITE 400
RALEIGH, NORTH CAROLINA 27609

MILL DAM CREEK
STREAM RESTORATION SITE

YADKIN COUNTY, NORTH CAROLINA

DATE: AUGUST 2018
SCALE: GRAPHIC

SITE PLAN

REACH:
T2, T3, & UTHC

SHEET 9 OF 24

MATCHLINE - SEE SHEET 9

CONSERVATION EASEMENT

BEGIN TRIB 5

1000+00

1001+00

1002+00

1003+00

ALL EXISTING DEBRIS AND WOODEN POSTS INSIDE EASEMENT TO BE REMOVED

BEGIN TRIB 5A

1200+00

1004+00

1005+00

(1) 30" DIA. x 24' HDPE STREAM CULVERT - 1FT EMBEDDED
(2) 12" DIA., 24' LONG FLOODPLAIN CULVERTS (PEP)

EXISTING CULVERT TO BE REMOVED

1006+00

1007+00

1008+00

1303+00

1304+00

1302+00

1301+00

1300+00

END TRIB 5B

BEGIN TRIB 5B

PROPOSED 'RIFFLE ENHANCEMENT'. (TYP.) SEE DETAIL SHEET. (TIE INTO UPSTREAM HEADCUT AND DOWNSTREAM BED ELEVATIONS)

PROPOSED 2.5:1 BANK GRADING / STABILIZATION (TYP. ALL GREY AREAS)

EXISTING OVERHEAD UTILITIES TO BE RELOCATED OUTSIDE OF EASEMENT

CONSERVATION EASEMENT

1009+00

1010+00

1011+00

1012+00

PROPOSED 'CHANNEL BLOCK'. (TYP.) SEE DETAIL SHEET.

PROPOSED 'STEP POOL'. (TYP.) SEE DETAIL SHEET.

PROPOSED 'CASCADING RIFFLE'. (TYP.) SEE DETAIL SHEET.

CONSERVATION EASEMENT

BEGIN TRIB 4

32+00

33+00

34+00

35+00

36+00

37+00

38+00

39+00

PROPOSED 'RIFFLE GRADE CONTROL'. (TYP.) SEE DETAIL SHEET.

FLOODPLAIN GRADING EXTENTS

END TRIB 5

BEGIN 'DITCH 2' RSC STATION 1450+00

CONSERVATION EASEMENT

SLOPE BACK INCOMING DITCH BANKS AND STABILIZE WITH COIR MATTING

PROPOSED 'LIVE LIFT'. SEE DETAIL SHEET. (TYP.)

WETLAND 'WB' A

MATCHLINE - SEE SHEET 11

NC GRID NAD 83

–40′ –20′ 0′ 40′ 80′

GRAPHIC SCALE

NOTES:

HARVEST STREAM BED MATERIAL BEFORE FILLING EXISTING OFFLINE STREAM SECTIONS. HARVESTED GRAVEL MATERIAL TO BE STOCK-PILED AND USED IN NEW STREAM BED AND STRUCTURES. BEFORE HARVESTING BED MATERIAL, ENSURE THAT HARVEST LOCATIONS ARE OFFLINE WITH NO FLOWING WATER AND NO FUTURE FLOW WILL BE REESTABLISHED.

CONTRACTOR SHALL TAKE ALL PRECAUTIONS TO MINIMIZE DAMAGING EXISTING NATIVE TREES WHERE POSSIBLE.

NORTH CAROLINA PROFESSIONAL SEAL 32733 ENGINEER GARY MICHAEL MRYNCZA

REVISIONS

			DESCRIPTION	DATE
1			REVISIONS PER IRT COMMENTS	DEC 2018

NCDEQ – DIVISION OF MITIGATION SERVICES

KCI ASSOCIATES OF NC
ENGINEERS • PLANNERS • SCIENTISTS
4505 FALLS OF NEUSE ROAD, SUITE 400
RALEIGH, NORTH CAROLINA 27609

MILL DAM CREEK
STREAM RESTORATION SITE

YADKIN COUNTY, NORTH CAROLINA

DATE: AUGUST 2018
SCALE: GRAPHIC

SITE PLAN

REACH:
T4, T5, T5A, T5B & UTHC

NORTH CAROLINA PROFESSIONAL SEAL 32733 ENGINEER GARY MICHAEL MRYNCZA

EXISTING DRIVE

BEGIN TRIB 6A-1

BEGIN TRIB 6A-2 STA 650+60

NEW PATH OF EXISTING GRAVEL DRIVE TO BE RE-ROUTED OUTSIDE OF CONSERVATION EASEMENT. INSTALL 10' WIDE GRAVEL DRIVE WITH STABILIZED SIDE V-DITCH.

BEGIN TRIB 6-2 STA 603+22

CONSERVATION EASEMENT

BEGIN TRIB 6-1

WETLAND 'WE' A

END TRIB 6A

PROPOSED 'RIFFLE GRADE CONTROL'. (TYP.) SEE DETAIL SHEET.

PROPOSED 'STEP POOL'. (TYP.) SEE DETAIL SHEET.

PROPOSED 'CASCADING RIFFLE'. (TYP.) SEE DETAIL SHEET.

STABILIZED EROSION AREA LONG WOODLINE BY GRADING NEW SLOPE AND TOPPING WITH SUITABLE TOPSOIL. SEED AND MULCH.

(1) 30" DIA. x 24' HDPE STREAM CULVERT - 1FT EMBEDDED
(2) 12" DIA., 24' LONG FLOODPLAIN CULVERTS (PEP)

INSTALL 10' WIDE GRAVEL DRIVE WITH STABILIZED SIDE V-DITCH

STABILIZED EROSION AREA CAUSED BY BREACHED LEVEE WITH SEED AND MULCH

EXISTING POND LEVEE TO BE REMOVED AND RE-GRADED TO MATCH NEW STREAM FLOODPLAIN

CONSERVATION EASEMENT

MATCHLINE - SEE SHEET 10

PROPOSED 2.5:1 BANK GRADING / STABILIZATION (TYP. ALL GREY AREAS)

PROPOSED 'LIVE LIFT'. (TYP.) SEE DETAIL SHEET.

WETLAND 'WB' A

CONSERVATION EASEMENT

END UTHC 2
BEGIN UTHC 3

END TRIB 6A

FLOODPLAIN GRADING EXTENTS

PROPOSED 'CHANNEL BLOCK'. (TYP.) SEE DETAIL SHEET.

FLOODPLAIN GRADING EXTENTS

PROPOSED OXBOW (FILL IF NEEDED FOR GRADING BALANCE)

MATCHLINE - SEE SHEET 12

NOTES:

HARVEST STREAM BED MATERIAL BEFORE FILLING EXISTING OFFLINE STREAM SECTIONS. HARVESTED GRAVEL MATERIAL TO BE STOCK-PILED AND USED IN NEW STREAM BED AND STRUCTURES. BEFORE HARVESTING BED MATERIAL, ENSURE THAT HARVEST LOCATIONS ARE OFFLINE WITH NO FLOWING WATER AND NO FUTURE FLOW WILL BE REESTABLISHED.

CONTRACTOR SHALL TAKE ALL PRECAUTIONS TO MINIMIZE DAMAGING EXISTING NATIVE TREES WHERE POSSIBLE.

NC GRID NAD 83

–40′ –20′ 0′ 40′ 80′
GRAPHIC SCALE

REVISIONS			
SYM.	DESCRIPTION	DATE	
1	REVISIONS PER IRT COMMENTS	DEC 2018	

NCDEQ – DIVISION OF MITIGATION SERVICES

KCI ASSOCIATES OF NC
ENGINEERS • PLANNERS • SCIENTISTS
4505 FALLS OF NEUSE ROAD, SUITE 400
RALEIGH, NORTH CAROLINA 27609

MILL DAM CREEK STREAM RESTORATION SITE

YADKIN COUNTY, NORTH CAROLINA

DATE: AUGUST 2018
SCALE: GRAPHIC

SITE PLAN

REACH: T6, T6A & UTHC

NORTH CAROLINA PROFESSIONAL SEAL 32733 ENGINEER GARY MICHAEL MRYNCZA

NC GRID NAD '83

–40′ –20′ 0′ 40′ 80′

GRAPHIC SCALE

MATCHLINE - SEE SHEET 13

CONSERVATION EASEMENT

PROPOSED 'RIFFLE GRADE CONTROL'. SEE DETAIL SHEET. (TYP.)

END TRIB 9 / BEGIN UTHC4-2

PROPOSED 2.5:1 BANK GRADING / STABILIZATION (TYP. ALL GREY AREA)

EXCAVATE APPROX. 1FT FROM POOL TO ENHANCE EXISTING PROFILE

PROPOSED 'LIVE LIFT'. (TYP.) SEE DETAIL SHEET.

PROPOSED 'CHANNEL BLOCK'. (TYP.) SEE DETAIL SHEET.

BEGIN TRIB 9

PROPOSED OXBOW (FILL IF NEEDED FOR GRADING BALANCE)

ENHANCE EXISTING RIFFLE WITH GRAVEL MATERIAL HARVESTED UPSTREAM

END UTHC 3 BEGIN UTHC 4-1

WETLAND 'WA'

FLOODPLAIN GRADING EXTENTS

PROPOSED 'CASCADING RIFFLE'. (TYP.) SEE DETAIL SHEET.

CONSERVATION EASEMENT

BEGIN TRIB 7-2 STA 701+65

NEW PATH OF EXISTING GRAVEL DRIVE TO BE RE-ROUTED OUTSIDE OF CONSERVATION EASEMENT

(1) 4.0' H X 9.0' W X 24' LONG STREAM CULVERT (CONCRETE BOX) -1FT EMBEDDED
(2) 12" DIA., 24' LONG FLOODPLAIN CULVERTS (PEP)

(1) 36" DIA. x 24' HDPE STREAM CULVERT - 1FT EMBEDDED
(2) 12" DIA., 24' LONG FLOODPLAIN CULVERTS (PEP)

BEGIN TRIB 7-1

FLOODPLAIN GRADING EXTENTS

END TRIB 7

PROPOSED 16-FT WIDE / 27-FT LONG BRIDGE CROSSING

PROPOSED 'STEP POOL'. (TYP.) SEE DETAIL SHEET.

PROPOSED 'RIFFLE ENHANCEMENT'. (TYP.) SEE DETAIL SHEET.

CONSERVATION EASEMENT

REMNANTS OF ABANDONED MILL DAM TO BE REMOVED AND GRADED TO MATCH NEW STREAM FLOODPLAIN

MATCHLINE - SEE SHEET 11

NOTES:

HARVEST STREAM BED MATERIAL BEFORE FILLING EXISTING OFFLINE STREAM SECTIONS. HARVESTED GRAVEL MATERIAL TO BE STOCK-PILED AND USED IN NEW STREAM BED AND STRUCTURES. BEFORE HARVESTING BED MATERIAL, ENSURE THAT HARVEST LOCATIONS ARE OFFLINE WITH NO FLOWING WATER AND NO FUTURE FLOW WILL BE REESTABLISHED.

CONTRACTOR SHALL TAKE ALL PRECAUTIONS TO MINIMIZE DAMAGING EXISTING NATIVE TREES WHERE POSSIBLE.

REVISIONS			
SYM.	DESCRIPTION	DATE	
	REVISIONS PER IRT COMMENTS	DEC 2018	

NCDEQ – DIVISION OF MITIGATION SERVICES

KCI ASSOCIATES OF NC
ENGINEERS • PLANNERS • SCIENTISTS
4505 FALLS OF NEUSE ROAD, SUITE 400
RALEIGH, NORTH CAROLINA 27609

MILL DAM CREEK
STREAM RESTORATION SITE

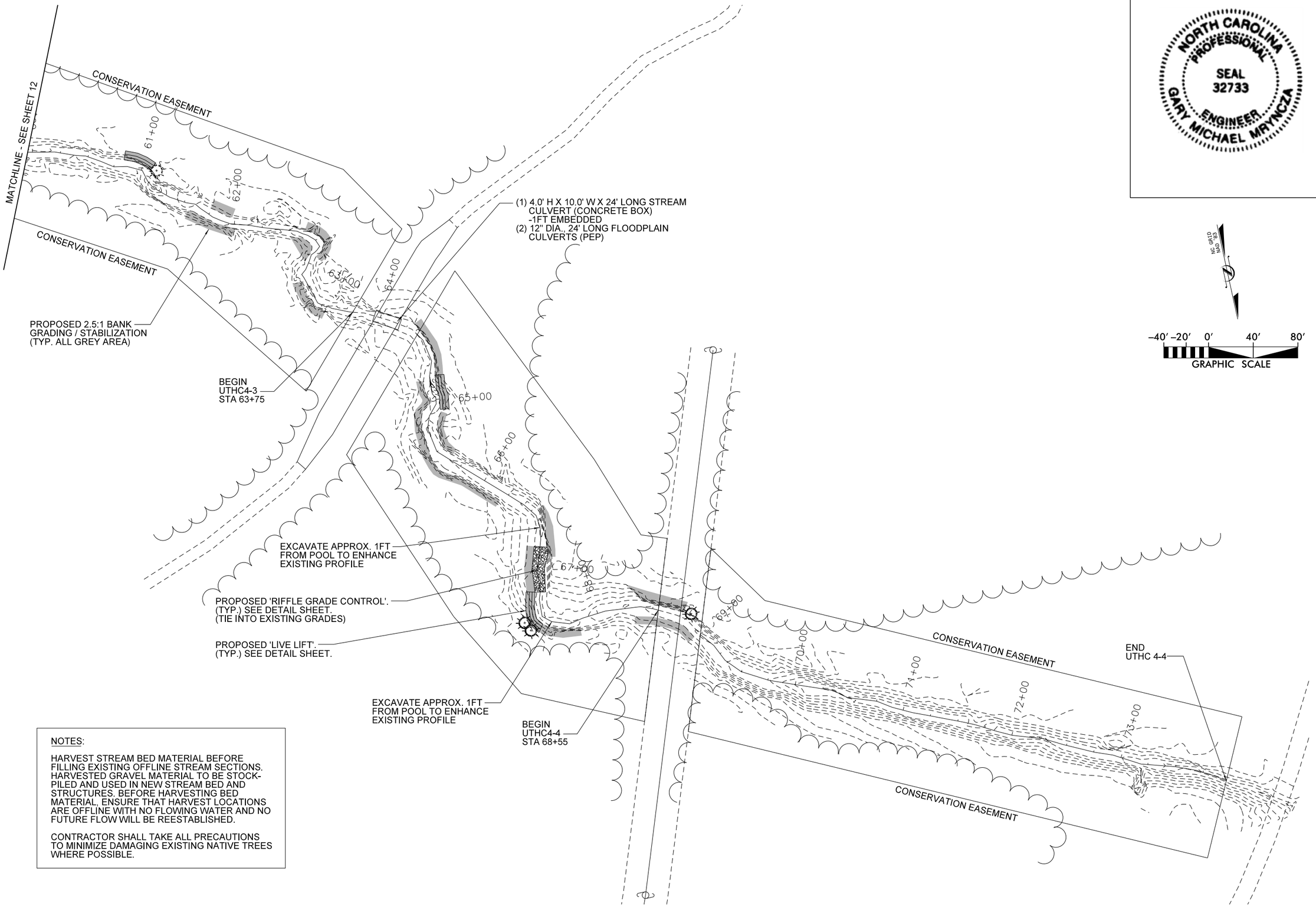
YADKIN COUNTY, NORTH CAROLINA

DATE: AUGUST 2018
SCALE: GRAPHIC

SITE PLAN

REACH:
T7, T9
& UTHC

SHEET 12 OF 24



NOTES:

HARVEST STREAM BED MATERIAL BEFORE FILLING EXISTING OFFLINE STREAM SECTIONS. HARVESTED GRAVEL MATERIAL TO BE STOCK-PILED AND USED IN NEW STREAM BED AND STRUCTURES. BEFORE HARVESTING BED MATERIAL, ENSURE THAT HARVEST LOCATIONS ARE OFFLINE WITH NO FLOWING WATER AND NO FUTURE FLOW WILL BE REESTABLISHED.

CONTRACTOR SHALL TAKE ALL PRECAUTIONS TO MINIMIZE DAMAGING EXISTING NATIVE TREES WHERE POSSIBLE.

NORTH CAROLINA PROFESSIONAL SEAL 32733 ENGINEER GARY MICHAEL MRYNCZA

NC GRID NORTH

–40′ –20′ 0′ 40′ 80′

GRAPHIC SCALE

NO.	DESCRIPTION	DATE
	REVISIONS	

NC NCDEQ - DIVISION OF MITIGATION SERVICES

KCI ASSOCIATES OF NC
ENGINEERS • PLANNERS • SCIENTISTS
4505 FALLS OF NEUSE ROAD, SUITE 400
RALEIGH, NORTH CAROLINA 27609

MILL DAM CREEK
STREAM RESTORATION SITE

YADKIN COUNTY, NORTH CAROLINA

DATE: AUGUST 2018
SCALE: GRAPHIC

SITE PLAN

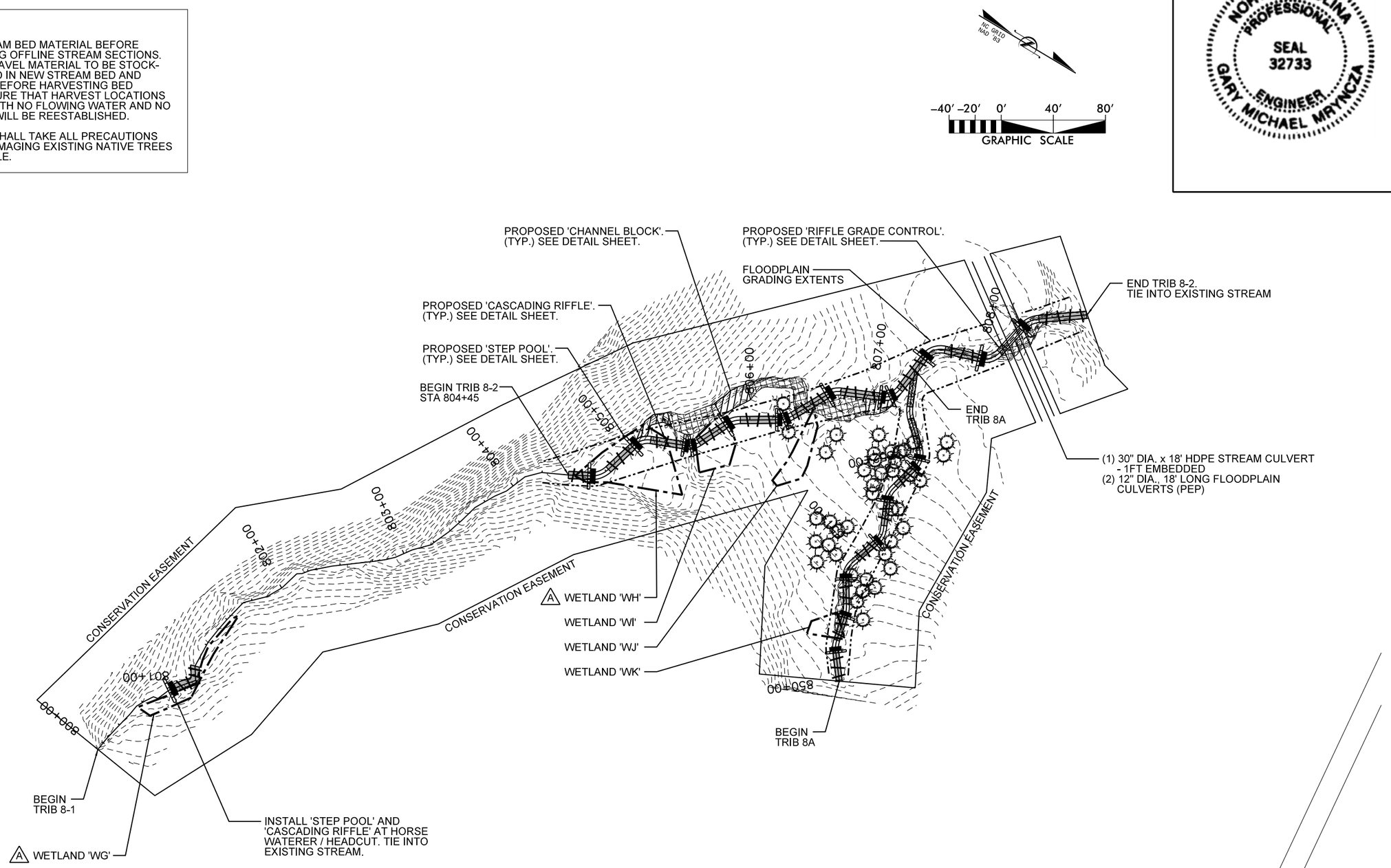
REACH: UTHC

SHEET 13 OF 24

NOTES:

HARVEST STREAM BED MATERIAL BEFORE FILLING EXISTING OFFLINE STREAM SECTIONS. HARVESTED GRAVEL MATERIAL TO BE STOCK-PILED AND USED IN NEW STREAM BED AND STRUCTURES. BEFORE HARVESTING BED MATERIAL, ENSURE THAT HARVEST LOCATIONS ARE OFFLINE WITH NO FLOWING WATER AND NO FUTURE FLOW WILL BE REESTABLISHED.

CONTRACTOR SHALL TAKE ALL PRECAUTIONS TO MINIMIZE DAMAGING EXISTING NATIVE TREES WHERE POSSIBLE.



NORTH CAROLINA PROFESSIONAL SEAL 32733 ENGINEER GARY MICHAEL MRYNCZA

REVISIONS	DESCRIPTION	DATE
1	REVISIONS PER IRT COMMENTS	DEC 2018

NCDEQ – DIVISION OF MITIGATION SERVICES

KCI
ENGINEERS • PLANNERS • SCIENTISTS
ASSOCIATES OF NC
4505 FALLS OF NEUSE ROAD, SUITE 400
RALEIGH, NORTH CAROLINA 27609

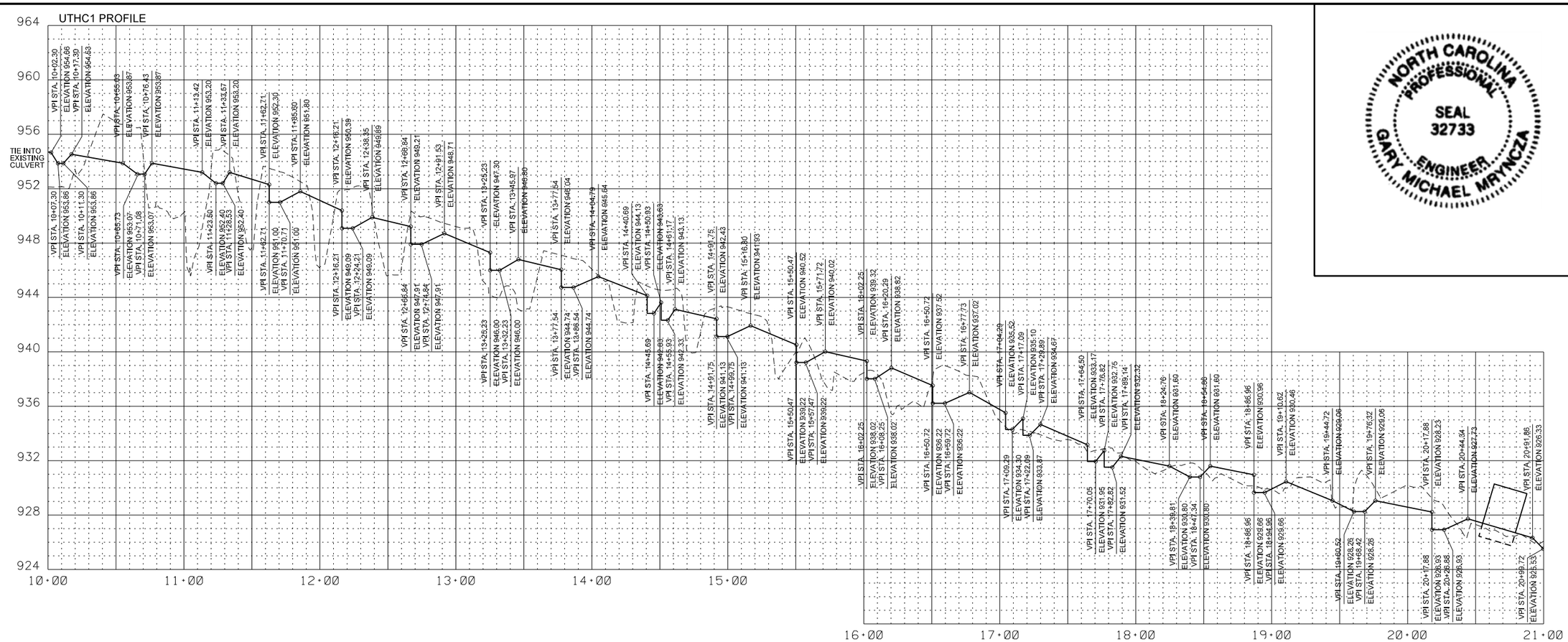
MILL DAM CREEK
STREAM RESTORATION SITE

YADKIN COUNTY, NORTH CAROLINA

DATE: AUGUST 2018
SCALE: GRAPHIC

SITE PLAN

REACH:
T8 & T8A



NORTH CAROLINA PROFESSIONAL SEAL 32733 ENGINEER GARY MICHAEL MRYNCZA

NO.	DESCRIPTION	DATE
	REVISIONS	

NCDEQ - DIVISION OF MITIGATION SERVICES

KCI ENGINEERS • PLANNERS • SCIENTISTS
ASSOCIATES OF NC
4505 FALLS OF NEUSE ROAD, SUITE 400
RALEIGH, NORTH CAROLINA 27609

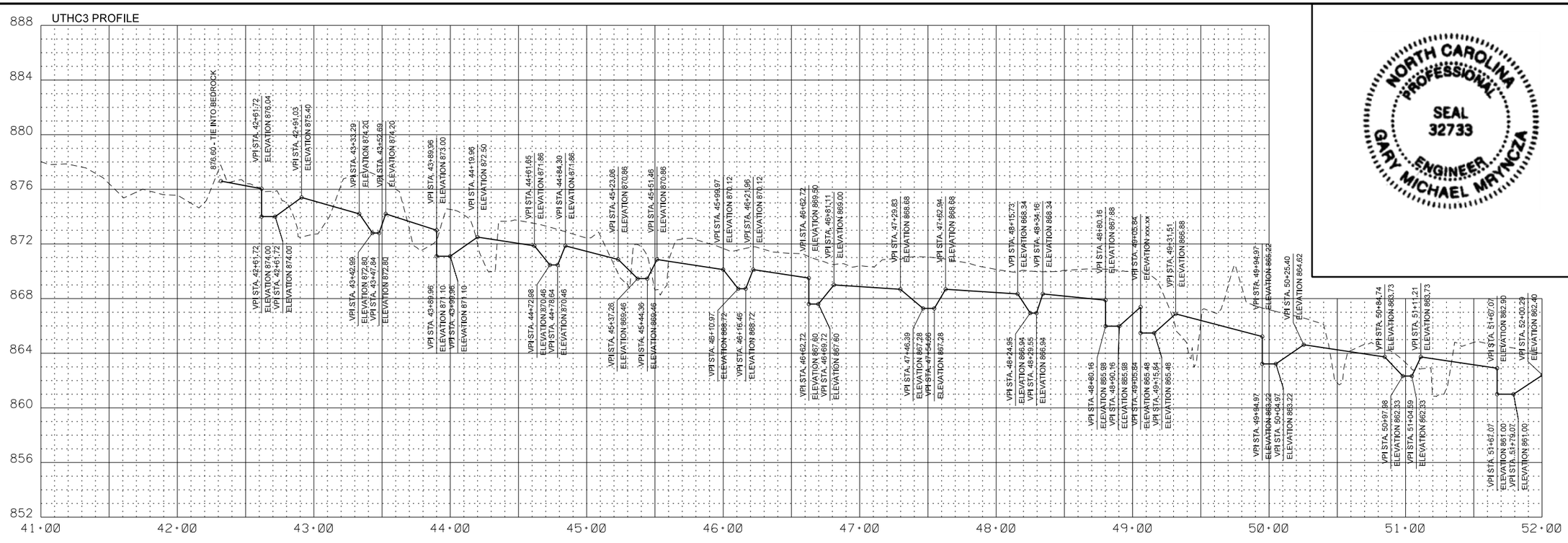
MILL DAM CREEK
STREAM RESTORATION SITE

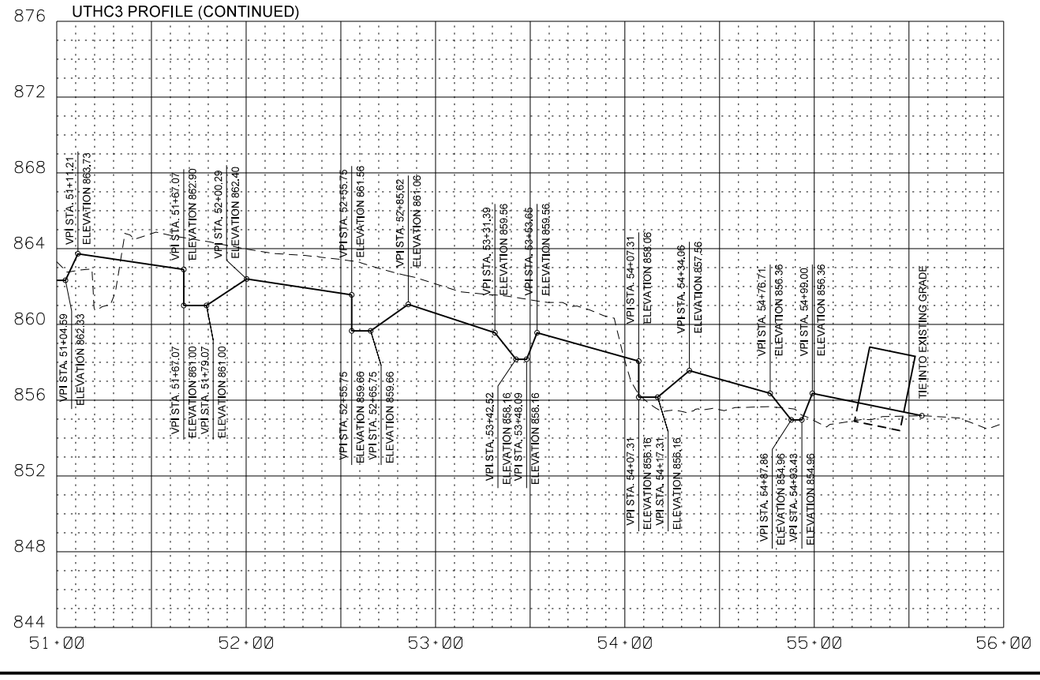
YADKIN COUNTY, NORTH CAROLINA

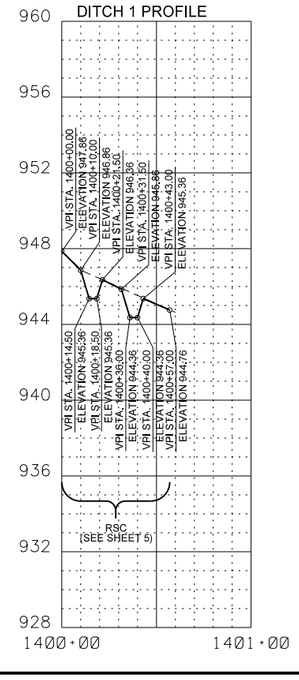
DATE: AUGUST 2018
SCALE: 1"=40'

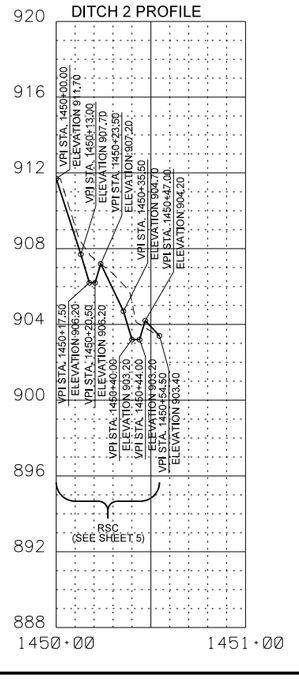
PROFILE
UTHC1

SHEET 15 OF 24









NORTH CAROLINA PROFESSIONAL SEAL 32733 ENGINEER GARY MICHAEL MRYNCZA

NO.	DESCRIPTION	DATE
	REVISIONS	

NCDEQ - DIVISION OF MITIGATION SERVICES

KCI ASSOCIATES OF NC
ENGINEERS • PLANNERS • SCIENTISTS
4505 FALLS OF NEUSE ROAD, SUITE 400
RALEIGH, NORTH CAROLINA 27609

MILL DAM CREEK
STREAM RESTORATION SITE

YADKIN COUNTY, NORTH CAROLINA

DATE: AUGUST 2018
SCALE: 1"=40'

PROFILE
UTHC3

SHEET 16 OF 24

SYM.	DESCRIPTION	DATE
	REVISIONS	

NCDEQ - DIVISION OF MITIGATION SERVICES

KCI ASSOCIATES OF NC
ENGINEERS • PLANNERS • SCIENTISTS
4505 FALLS OF NEUSE ROAD, SUITE 400
RALEIGH, NORTH CAROLINA 27609

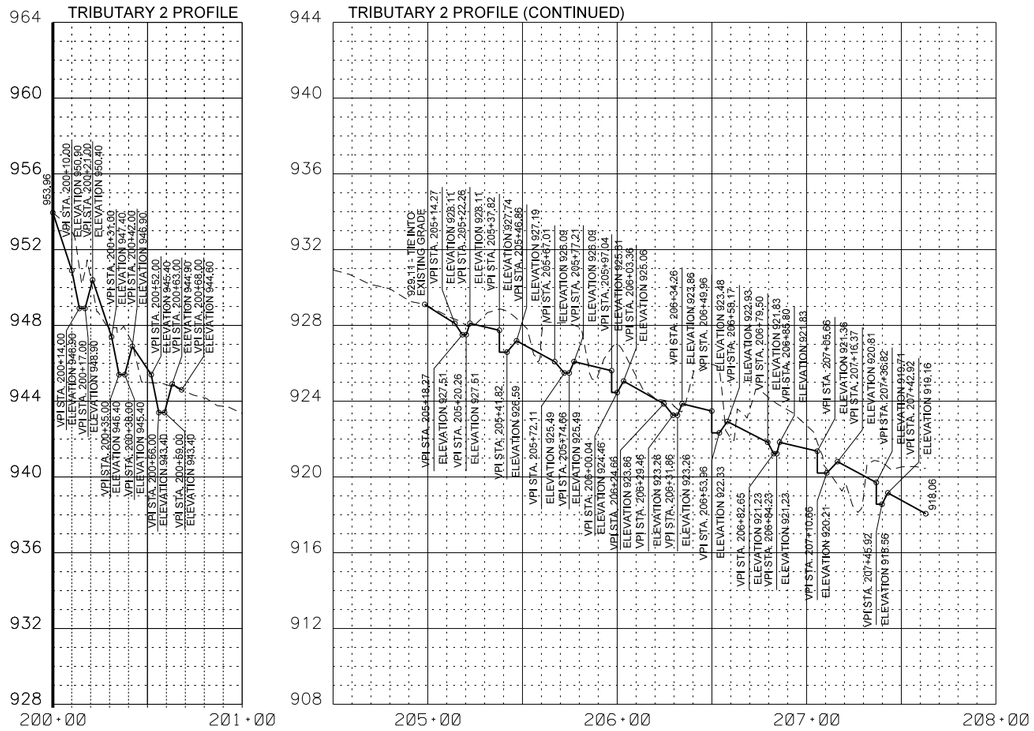
MILL DAM CREEK
STREAM RESTORATION SITE

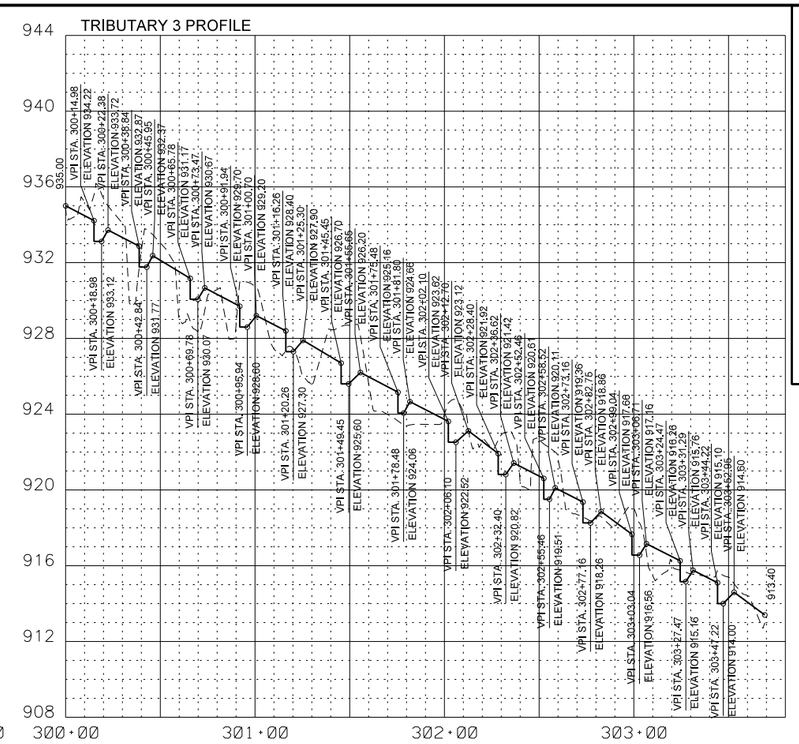
YADKIN COUNTY, NORTH CAROLINA

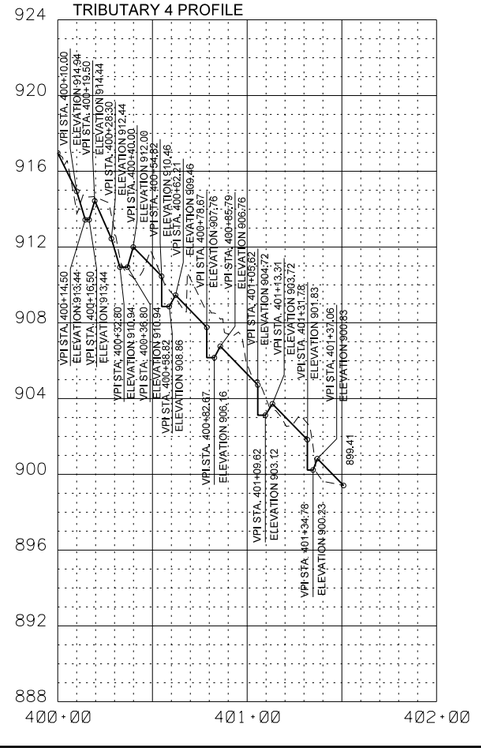
DATE: AUGUST 2018
SCALE: 1"=40'

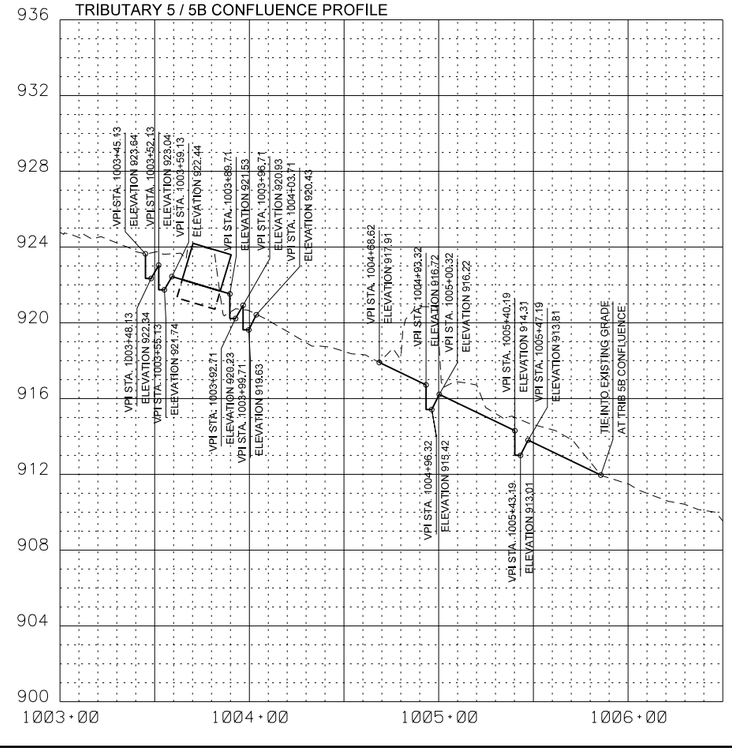
PROFILES
T1, T1A

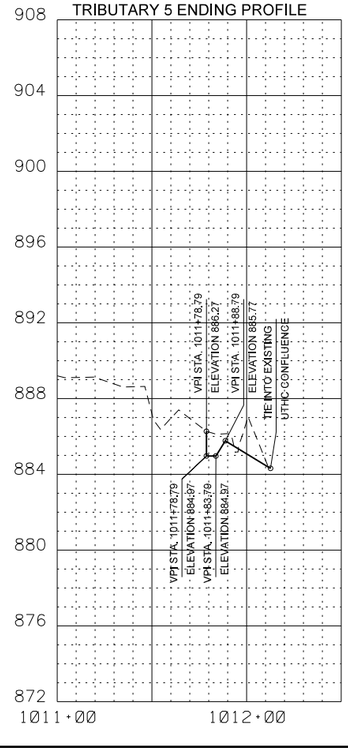
SHEET 17 OF 24

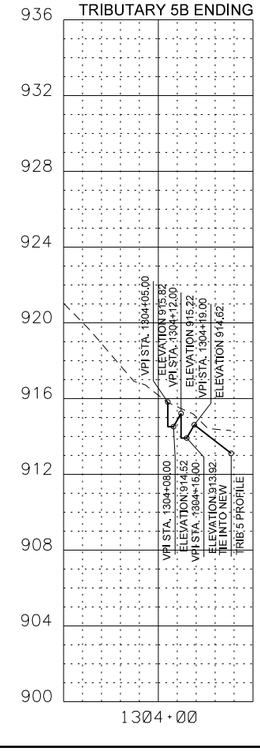












NORTH CAROLINA PROFESSIONAL SEAL 32733 ENGINEER GARY MICHAEL MRYNCZA

NCDEQ - DIVISION OF MITIGATION SERVICES

KCI ASSOCIATES OF NC
ENGINEERS • PLANNERS • SCIENTISTS
4505 FALLS OF NEUSE ROAD, SUITE 400
RALEIGH, NORTH CAROLINA 27609

SYM.	DESCRIPTION	DATE
	REVISIONS	

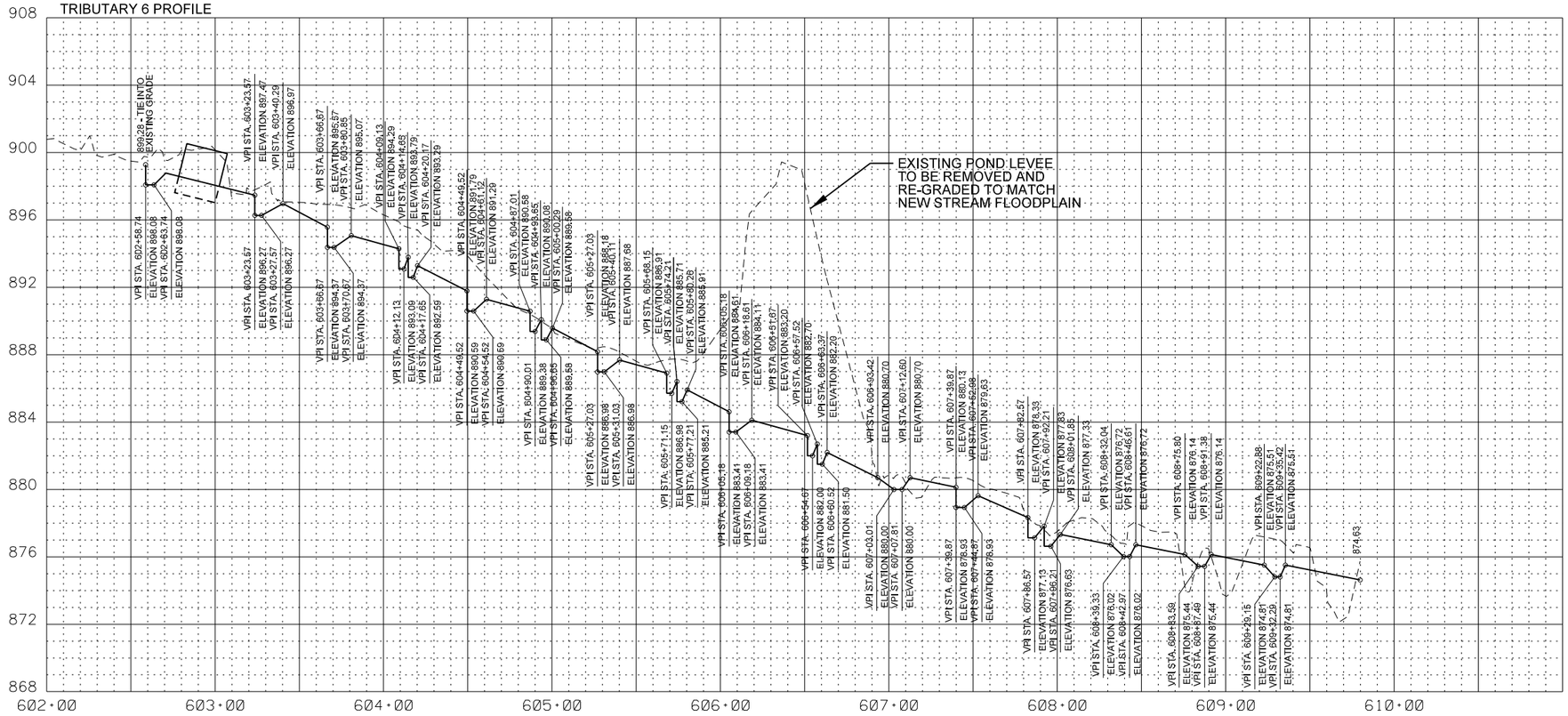
MILL DAM CREEK
STREAM RESTORATION SITE

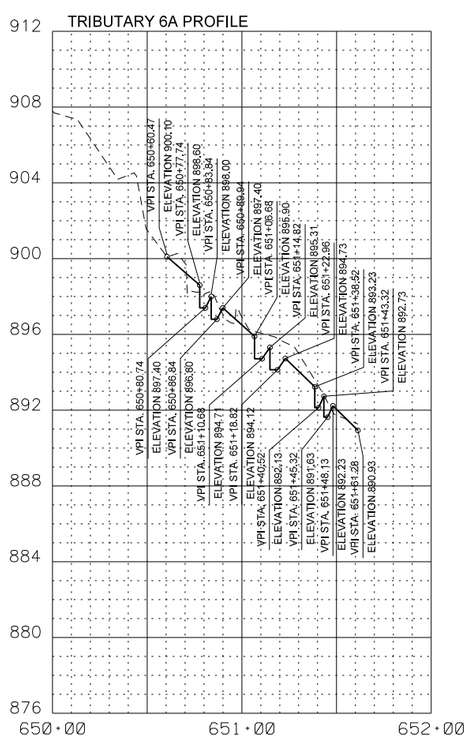
YADKIN COUNTY, NORTH CAROLINA

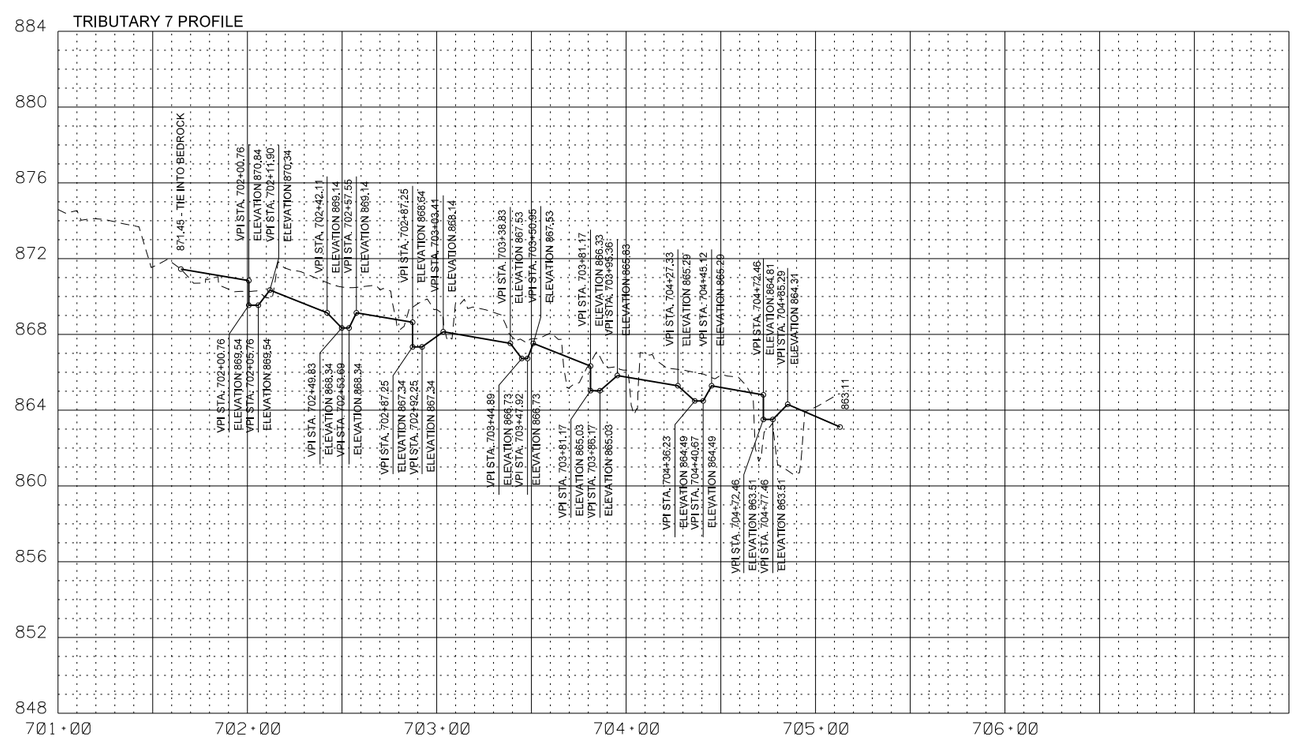
DATE: AUGUST 2018
SCALE: 1"=40'

PROFILES
T2, T3, T4, T5

SHEET 18 OF 24







NORTH CAROLINA PROFESSIONAL SEAL 32733 ENGINEER GARY MICHAEL MRYNCZA

NO.	DESCRIPTION	DATE
SYM.	REVISIONS	

NCDEQ - DIVISION OF MITIGATION SERVICES

KCI ENGINEERS • PLANNERS • SCIENTISTS
ASSOCIATES OF NC
4505 FALLS OF NEUSE ROAD, SUITE 400
RALEIGH, NORTH CAROLINA 27609

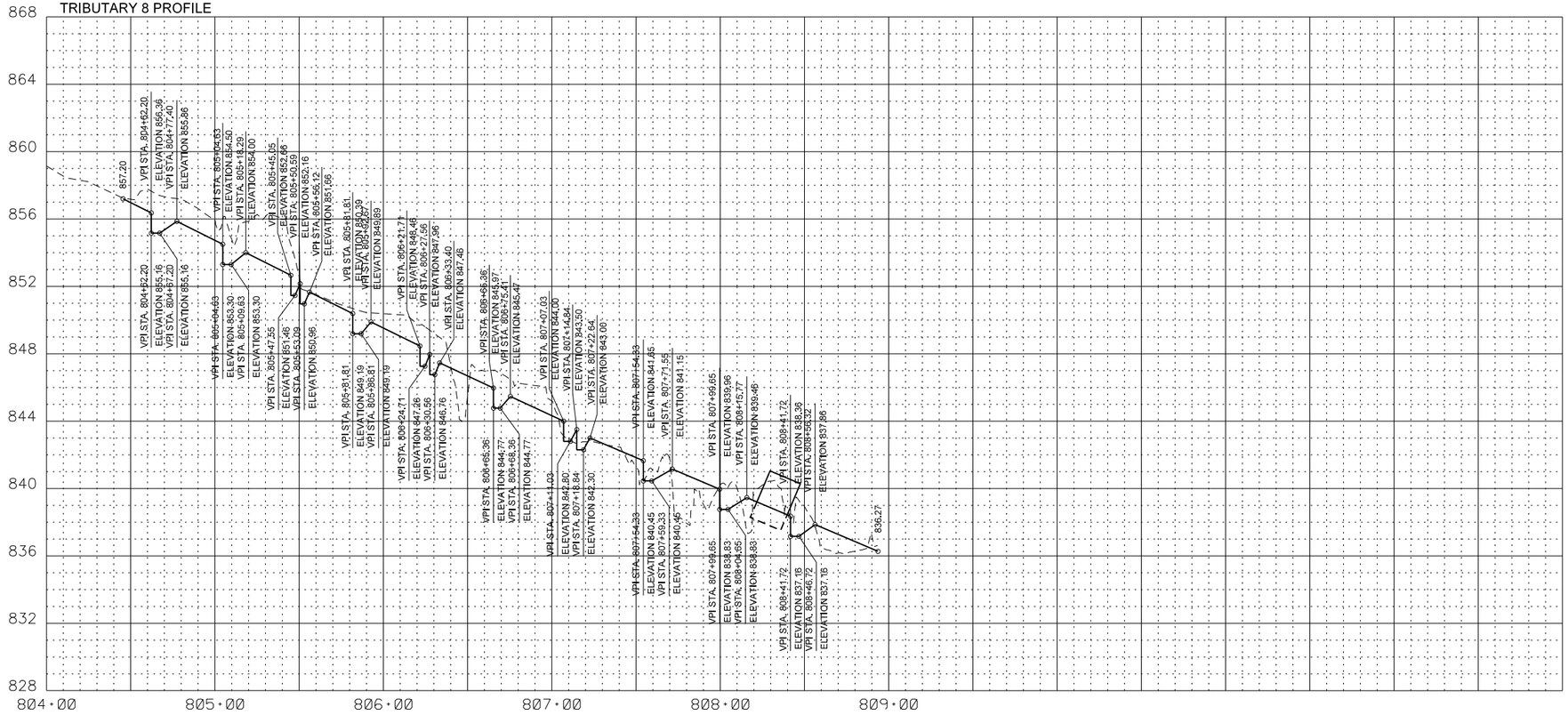
MILL DAM CREEK STREAM RESTORATION SITE

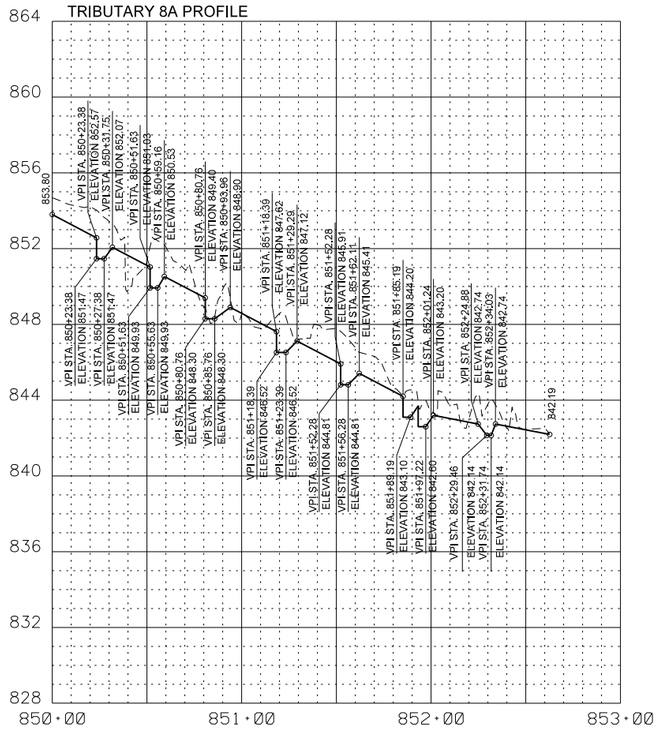
YADKIN COUNTY, NORTH CAROLINA

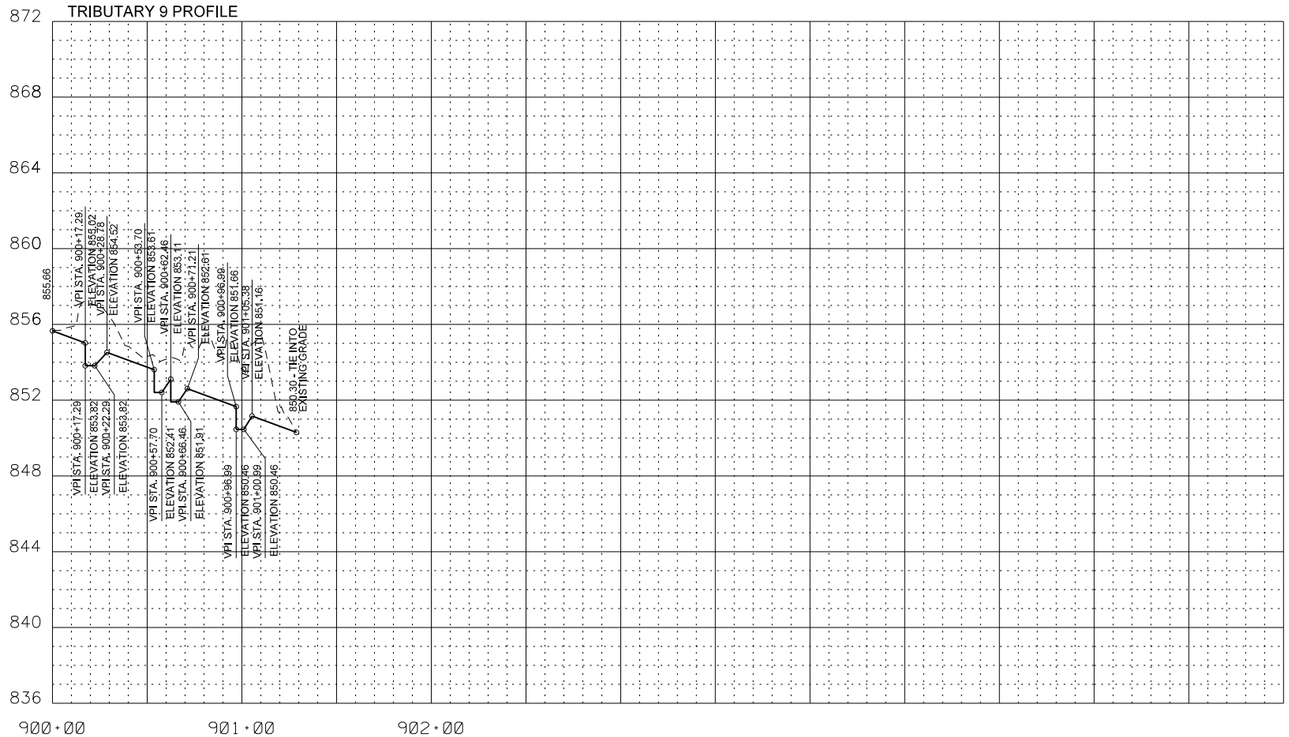
DATE: AUGUST 2018
SCALE: 1"=40'

PROFILES T6, T6A, T7

SHEET 19 OF 24







NORTH CAROLINA PROFESSIONAL SEAL 32733 ENGINEER GARY MICHAEL MRYNCZA

NO.	DESCRIPTION	DATE
SYM.	REVISIONS	

NCDEQ - DIVISION OF MITIGATION SERVICES

KCI ASSOCIATES OF NC
ENGINEERS • PLANNERS • SCIENTISTS
4505 FALLS OF NEUSE ROAD, SUITE 400
RALEIGH, NORTH CAROLINA 27609

MILL DAM CREEK STREAM RESTORATION SITE

YADKIN COUNTY, NORTH CAROLINA

DATE: AUGUST 2018
SCALE: 1"=40'

PROFILES T8, T8A, T9

STREAM ZONE :

STREAM ZONE
LIVE STAKES: 1.5' TO 2' LENGTHS, 1/2' TO 2" DIAMETER,
PLANT AT 3' SPACING, RANDOM SPECIES PLACEMENT.

COMMON NAME	SCIENTIFIC NAME
BLACK WILLOW	
SILKY WILLOW	
SILKY DOGWOOD	
COMMON ELDERBERRY	

NOTE: NO SINGLE LIVE STAKING SPECIES SHALL COMPOSE MORE THAN 40% OF THE TOTAL NUMBER OF LIVE STAKES TO BE INSTALLED.

RIPARIAN FOREST PLANTING:

PLANTING ZONE 1 = 25.7 ACRES

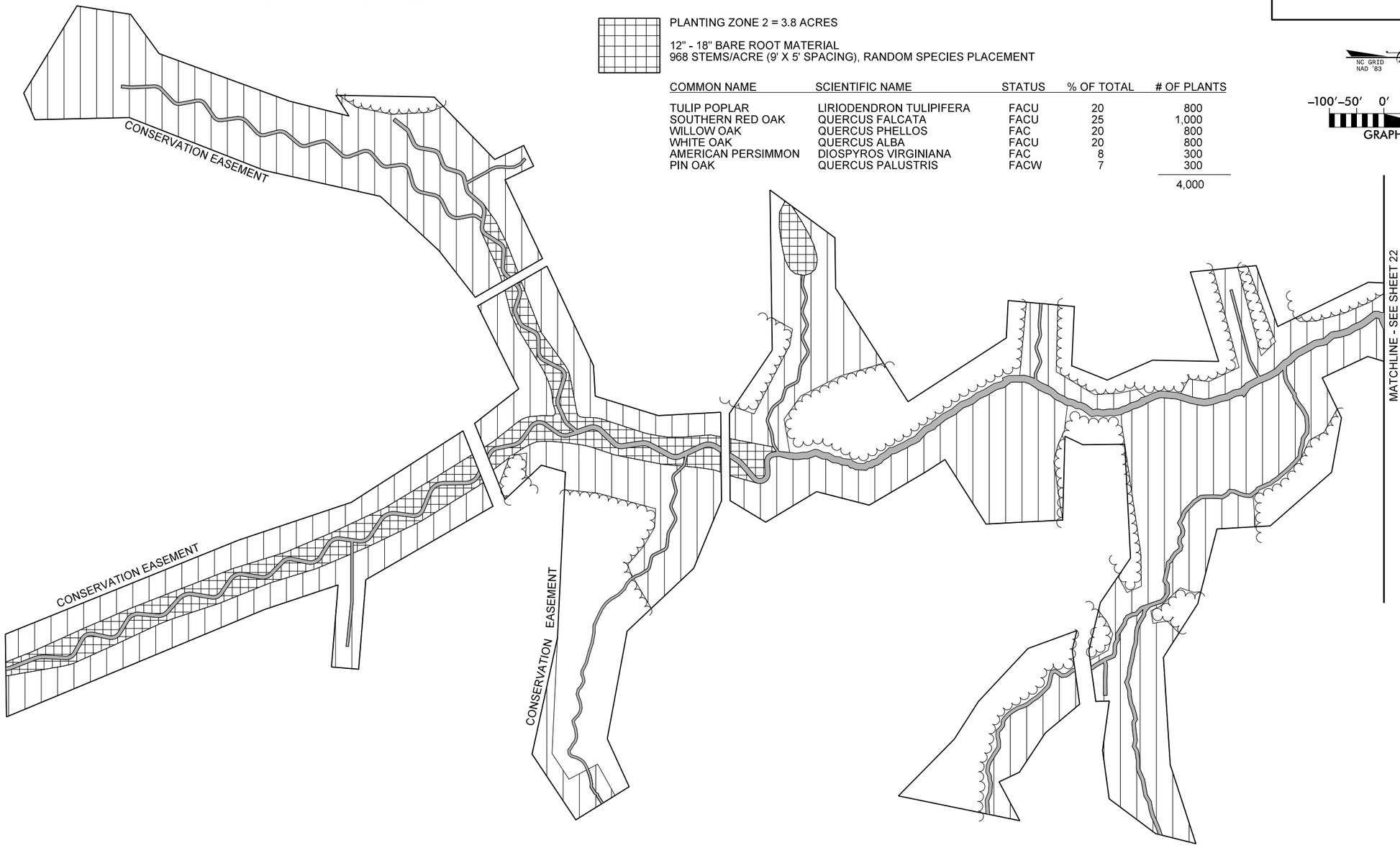
12" - 18" BARE ROOT MATERIAL
968 STEMS/ACRE (9' X 5' SPACING), RANDOM SPECIES PLACEMENT

COMMON NAME	SCIENTIFIC NAME	STATUS	% OF TOTAL	# OF PLANTS
RIVER BIRCH	BETULA NIGRA	FACW	20	5,000
GREEN ASH	FRAXINUS PENNSYLVANICA	FACW	20	5,000
SWAMP CHESTNUT OAK	QUERCUS MICHAUXII	FACW	20	5,000
WILLOW OAK	QUERCUS PHELLOS	FAC	10	2,500
AMERICAN SYCAMORE	PLATANUS OCCIDENTALIS	FACW	20	5,000
TULIP POPLAR	LIRIODENDRON TULIPIFERA	FACU	10	2,500
				25,000

PLANTING ZONE 2 = 3.8 ACRES

12" - 18" BARE ROOT MATERIAL
968 STEMS/ACRE (9' X 5' SPACING), RANDOM SPECIES PLACEMENT

COMMON NAME	SCIENTIFIC NAME	STATUS	% OF TOTAL	# OF PLANTS
TULIP POPLAR	LIRIODENDRON TULIPIFERA	FACU	20	800
SOUTHERN RED OAK	QUERCUS FALCATA	FACU	25	1,000
WILLOW OAK	QUERCUS PHELLOS	FAC	20	800
WHITE OAK	QUERCUS ALBA	FACU	20	800
AMERICAN PERSIMMON	DIOSPYROS VIRGINIANA	FAC	8	300
PIN OAK	QUERCUS PALUSTRIS	FACW	7	300
				4,000



NC GRID
NAD '83

-100' -50' 0' 100' 200'
GRAPHIC SCALE

NORTH CAROLINA PROFESSIONAL SEAL 32733 ENGINEER GARY MICHAEL MRYNCZA

REVISIONS

SYM.	DESCRIPTION	DATE

NCDEQ - DIVISION OF MITIGATION SERVICES

KCI ASSOCIATES OF NC
ENGINEERS • PLANNERS • SCIENTISTS
4505 FALLS OF NEUSE ROAD, SUITE 400
RALEIGH, NORTH CAROLINA 27609

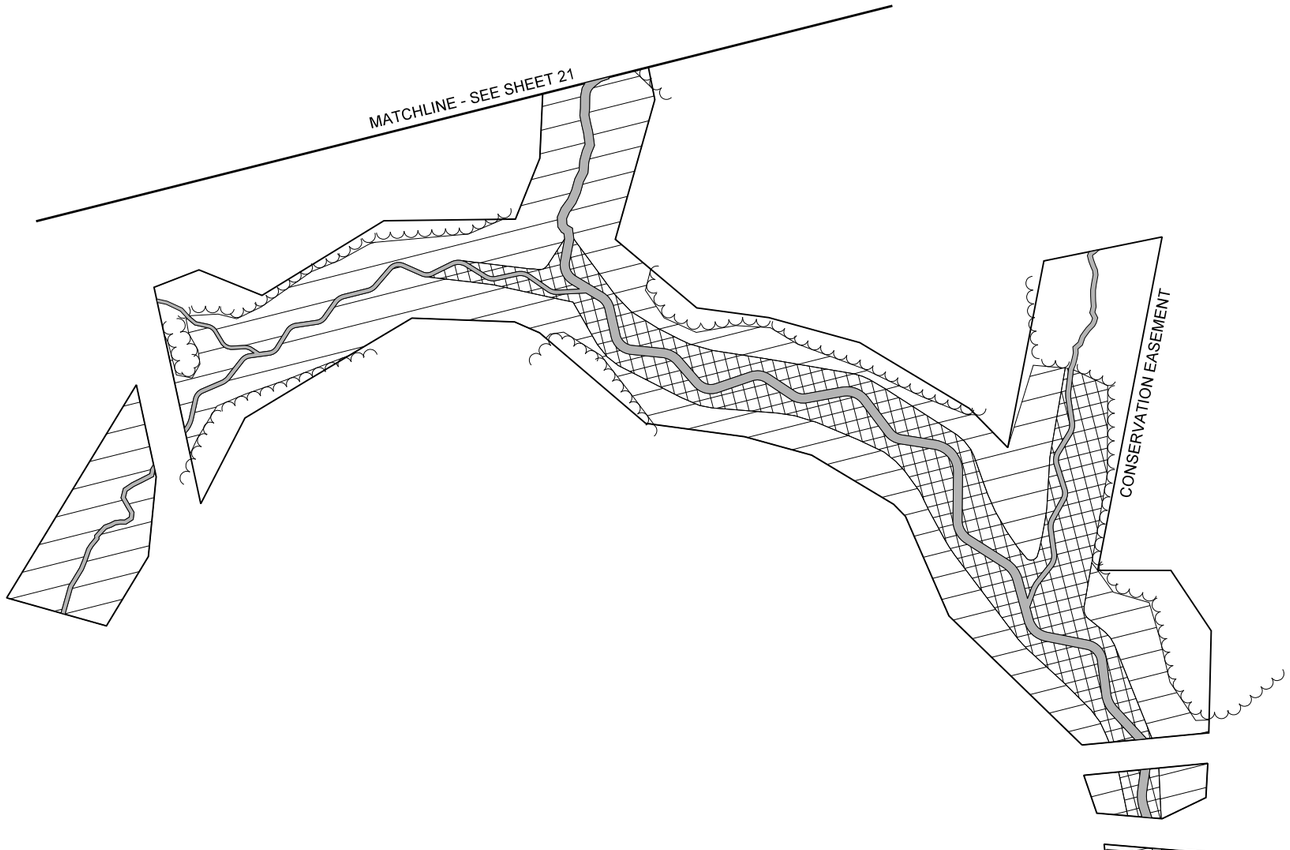
MILL DAM CREEK
STREAM RESTORATION SITE

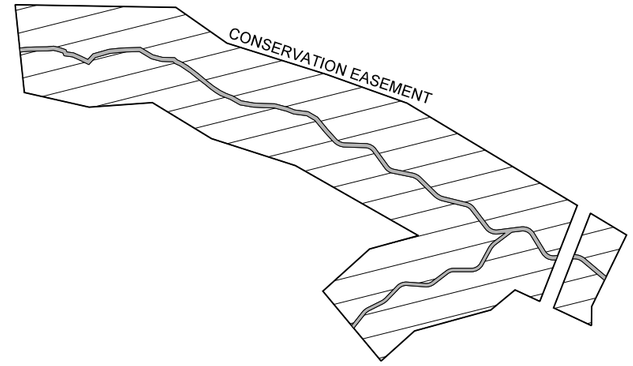
YADKIN COUNTY, NORTH CAROLINA

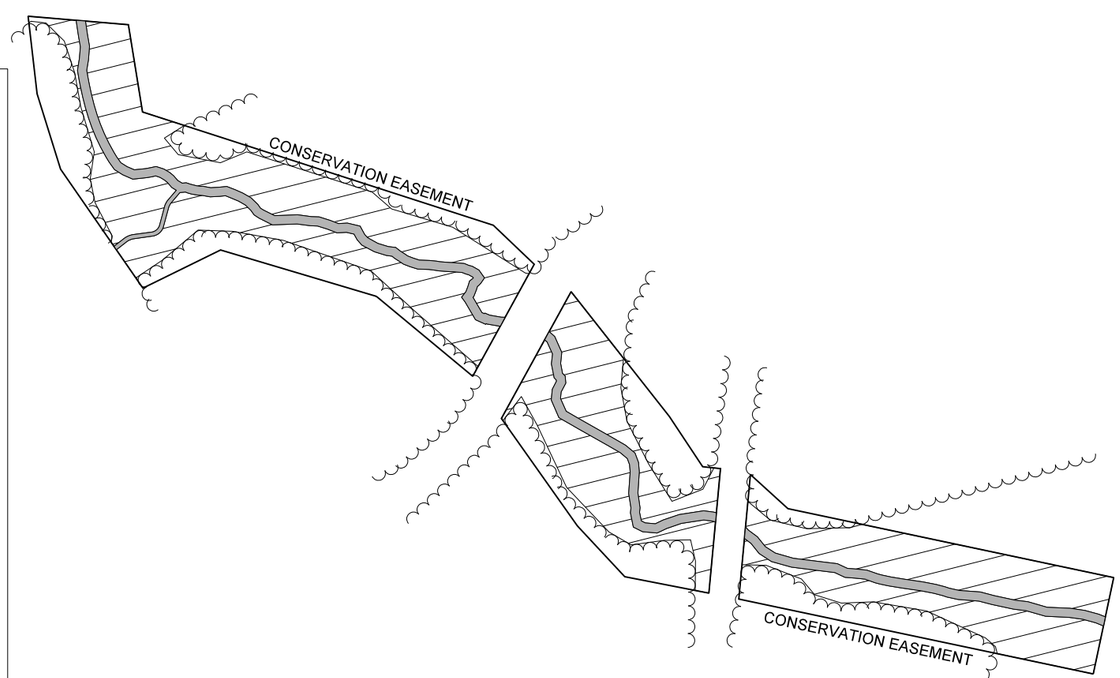
DATE: AUGUST 2018
SCALE: GRAPHIC

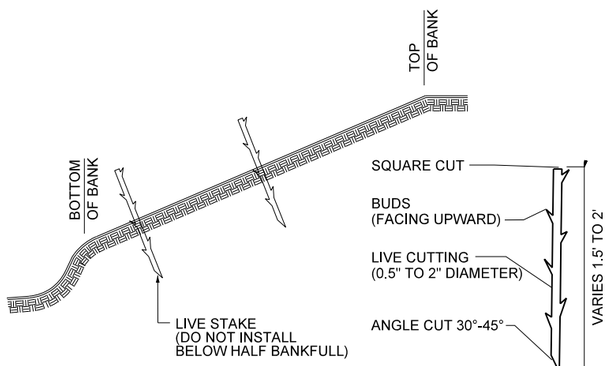
PLANTING PLAN

SHEET 21 OF 24









PLANTING NOTES:

UTHC:
RIFFLES - 2 ROWS OF LIVE STAKES ON BOTH SIDES OF CHANNEL.
POOLS - NO LIVE STAKES ON INNER BENDS, 2 ROWS ON OUTER BENDS.

ALL OTHER TRIBUTARIES:
RIFFLES - 1 ROW OF LIVE STAKES ON BOTH SIDES OF CHANNEL.
POOLS - NO LIVE STAKES ON INNER BENDS, 1 ROWS ON OUTER BENDS.

INSTALL STAKES AT 3' SPACING.

LIVE STAKES

SCALE: NTS

NORTH CAROLINA PROFESSIONAL SEAL 32733 ENGINEER GARY MICHAEL MRYNCZA

REVISIONS

SYM.	DESCRIPTION	DATE

NCDEQ - DIVISION OF MITIGATION SERVICES

KCI ASSOCIATES OF NC
ENGINEERS • PLANNERS • SCIENTISTS
4505 FALLS OF NEUSE ROAD, SUITE 400
RALEIGH, NORTH CAROLINA 27609

MILL DAM CREEK
STREAM RESTORATION SITE

YADKIN COUNTY, NORTH CAROLINA

DATE: AUGUST 2018
SCALE: GRAPHIC

PLANTING PLAN

SHEET 22 OF 24

EASEMENT BOUNDARY MARKING

THE EASEMENT BOUNDARY WILL BE MARKED WITH METAL POSTS AND CONSERVATION EASEMENT SIGNS AT THE CORNERS AND AT A MINIMUM OF 100' INTERVALS ALONG THE BOUNDARY.

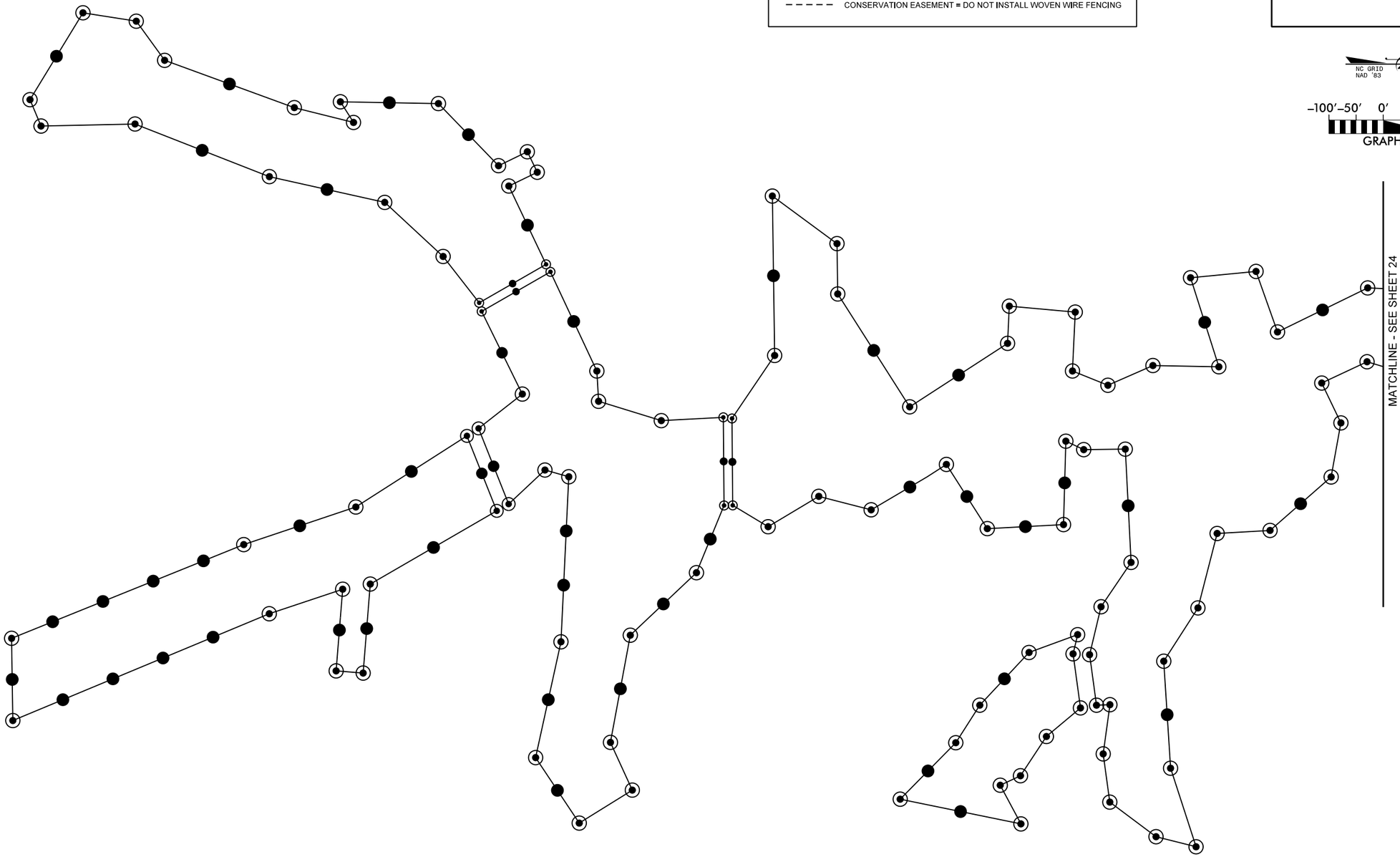
- 6-FOOT TALL DURABLE WITNESS POSTS AND 5/8" REBAR 30" IN LENGTH WITH 3-1/4" ALUMINUM CAPS ON ALL EASEMENT CORNERS. CAPS SHALL MEET DMS SPECIFICATIONS (BERNSTEN RBD5325 IMPRINTED WITH NC STATE LOGO #B9087 OR EQUIVALENT). AFTER INSTALLATION, CAPS SHALL BE STAMPED WITH THE CORRESPONDING NUMBER.
- 6-FOOT TALL DURABLE WITNESS POST ALONG BOUNDARY OF CONSERVATION EASEMENT. POSTS SHALL BE MADE OF MATERIAL THAT WILL LAST A MINIMUM OF 20 YEARS. THE PROVIDER SHALL ATTACH A CONSERVATION EASEMENT SIGN TO EACH WITNESS POST AND PLACE ADDITIONAL SIGNS AT NO MORE THAN 100-FOOT INTERVALS ON BOUNDARY LINES.
- CONSERVATION EASEMENT = INSTALL WOVEN WIRE FENCING
- CONSERVATION EASEMENT = DO NOT INSTALL WOVEN WIRE FENCING

NORTH CAROLINA PROFESSIONAL SEAL 32733 ENGINEER GARY MICHAEL MRYNCZA

NC GRID NAD '83

–100' –50' 0' 100' 200'

GRAPHIC SCALE



REVISIONS

SYM.	DESCRIPTION	DATE

NCDEQ - DIVISION OF MITIGATION SERVICES

KCI ASSOCIATES OF NC
ENGINEERS • PLANNERS • SCIENTISTS
4505 FALLS OF NEUSE ROAD, SUITE 400
RALEIGH, NORTH CAROLINA 27609

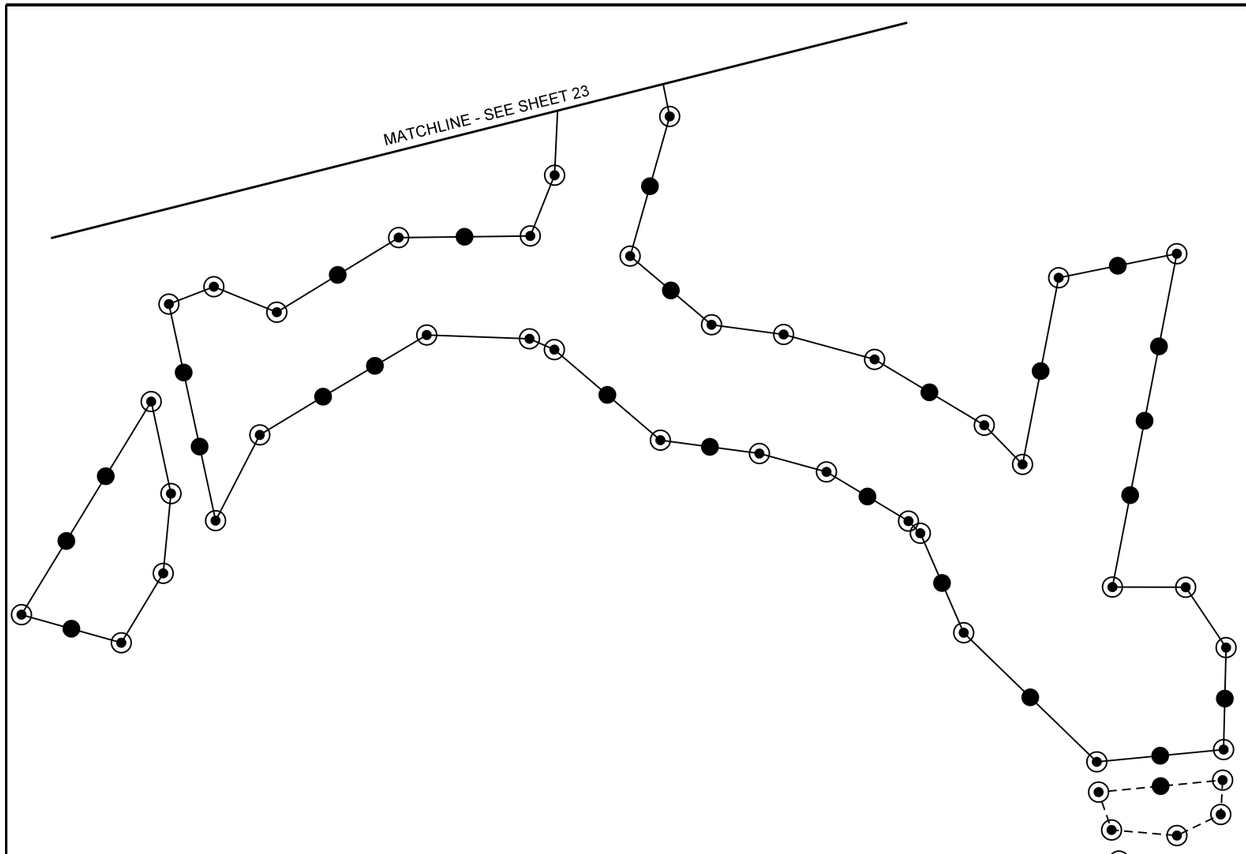
MILL DAM CREEK
STREAM RESTORATION SITE

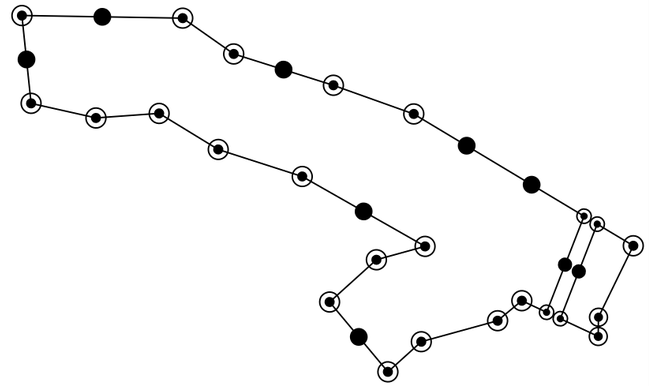
YADKIN COUNTY, NORTH CAROLINA

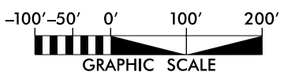
DATE: AUGUST 2018
SCALE: GRAPHIC

BOUNDARY MARKING PLAN

SHEET 23 OF 24







EASEMENT BOUNDARY MARKING

THE EASEMENT BOUNDARY WILL BE MARKED WITH METAL POSTS AND CONSERVATION EASEMENT SIGNS AT THE CORNERS AND AT A MINIMUM OF 100' INTERVALS ALONG THE BOUNDARY.

- 6-FOOT TALL DURABLE WITNESS POSTS AND 5/8" REBAR 30" IN LENGTH WITH 3-1/4" ALUMINUM CAPS ON ALL EASEMENT CORNERS. CAPS SHALL MEET DMS SPECIFICATIONS (BERNSTEN RBD5325 IMPRINTED WITH NC STATE LOGO #B9087 OR EQUIVALENT). AFTER INSTALLATION, CAPS SHALL BE STAMPED WITH THE CORRESPONDING NUMBER.
- 6-FOOT TALL DURABLE WITNESS POST ALONG BOUNDARY OF CONSERVATION EASEMENT. POSTS SHALL BE MADE OF MATERIAL THAT WILL LAST A MINIMUM OF 20 YEARS. THE PROVIDER SHALL ATTACH A CONSERVATION EASEMENT SIGN TO EACH WITNESS POST AND PLACE ADDITIONAL SIGNS AT NO MORE THAN 100-FOOT INTERVALS ON BOUNDARY LINES.
- CONSERVATION EASEMENT = INSTALL WOVEN WIRE FENCING
- CONSERVATION EASEMENT = DO NOT INSTALL WOVEN WIRE FENCING

NORTH CAROLINA PROFESSIONAL SEAL 32733 ENGINEER GARY MICHAEL MRYNCZA

SYM.	DESCRIPTION	DATE
	REVISIONS	

NCDEQ - DIVISION OF MITIGATION SERVICES

KCI ASSOCIATES OF NC
ENGINEERS • PLANNERS • SCIENTISTS
4505 FALLS OF NEUSE ROAD, SUITE 400
RALEIGH, NORTH CAROLINA 27609

MILL DAM CREEK
STREAM RESTORATION SITE

YADKIN COUNTY, NORTH CAROLINA

DATE: AUGUST 2018
SCALE: GRAPHIC

BOUNDARY MARKING PLAN

SHEET 24 OF 24

12.2 Data Analysis/Supplemental Information and Maps

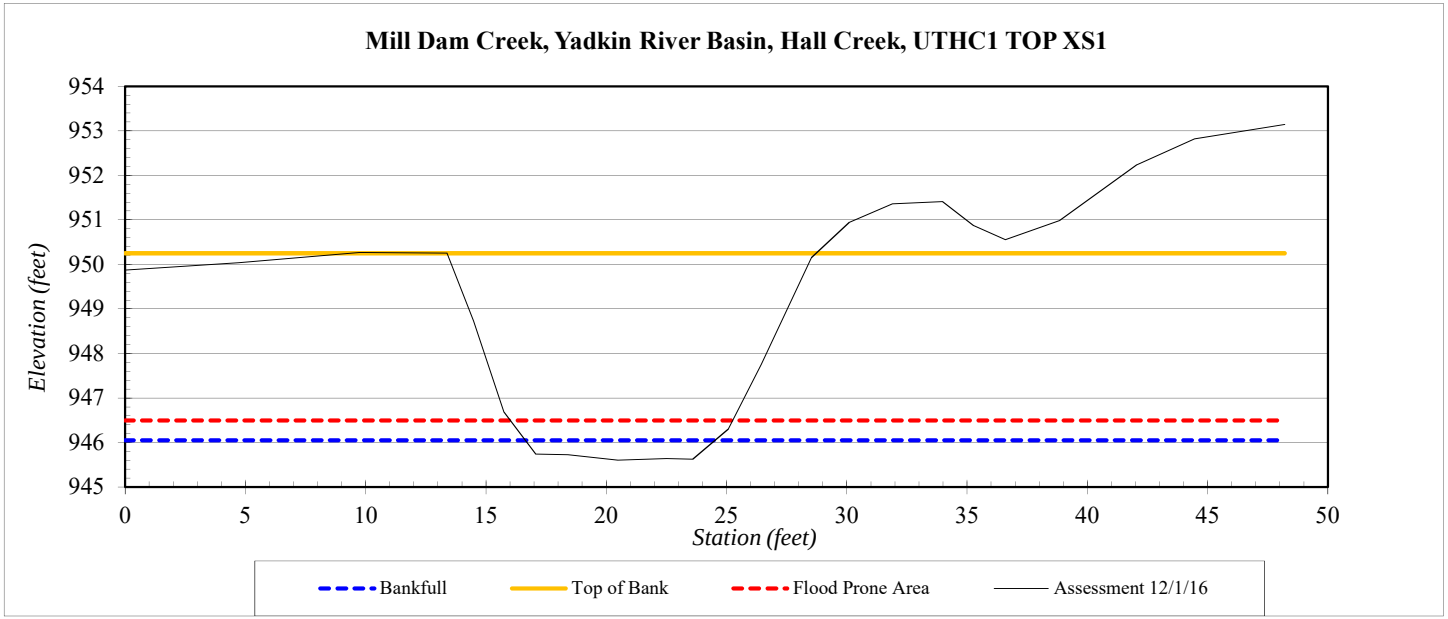
Existing Conditions Cross-Sections
Pebble Counts and Bulk Sampling
Stream Morphological Tables
Reference Reach Data (UT Fisher River)
Estimated Nutrient and Bacterial Reductions

Cross-Section Plots

River Basin:	Yadkin
Watershed:	Hall Creek
XS ID	UTHC1 TOP XS1
Drainage Area (sq mi):	30 acres
Date:	12/1/2016
Field Crew:	A. French, T. Seelinger

Station	Elevation
0.0	949.87
4.7	950.04
9.7	950.27
13.4	950.25
14.5	948.73
15.8	946.68
17.1	945.74
18.4	945.73
20.5	945.61
22.5	945.64
23.6	945.63
25.1	946.30
26.4	947.75
28.5	950.15
30.1	950.94
31.9	951.36
34.0	951.41
35.3	950.88
36.6	950.55
38.9	950.98
42.1	952.24
44.5	952.82
48.2	953.14

SUMMARY DATA	
Bankfull Elevation:	946.05
Top of Bank Elevation:	950.25
Bankfull Cross-Sectional Area:	2.8
Bankfull Width:	7.9
Flood Prone Area Elevation:	946.49
Flood Prone Width:	9.2
Max Depth at Bankfull:	0.4
Mean Depth at Bankfull:	0.4
W / D Ratio:	22.2
Entrenchment Ratio:	1.2
Bank Height Ratio:	10.4

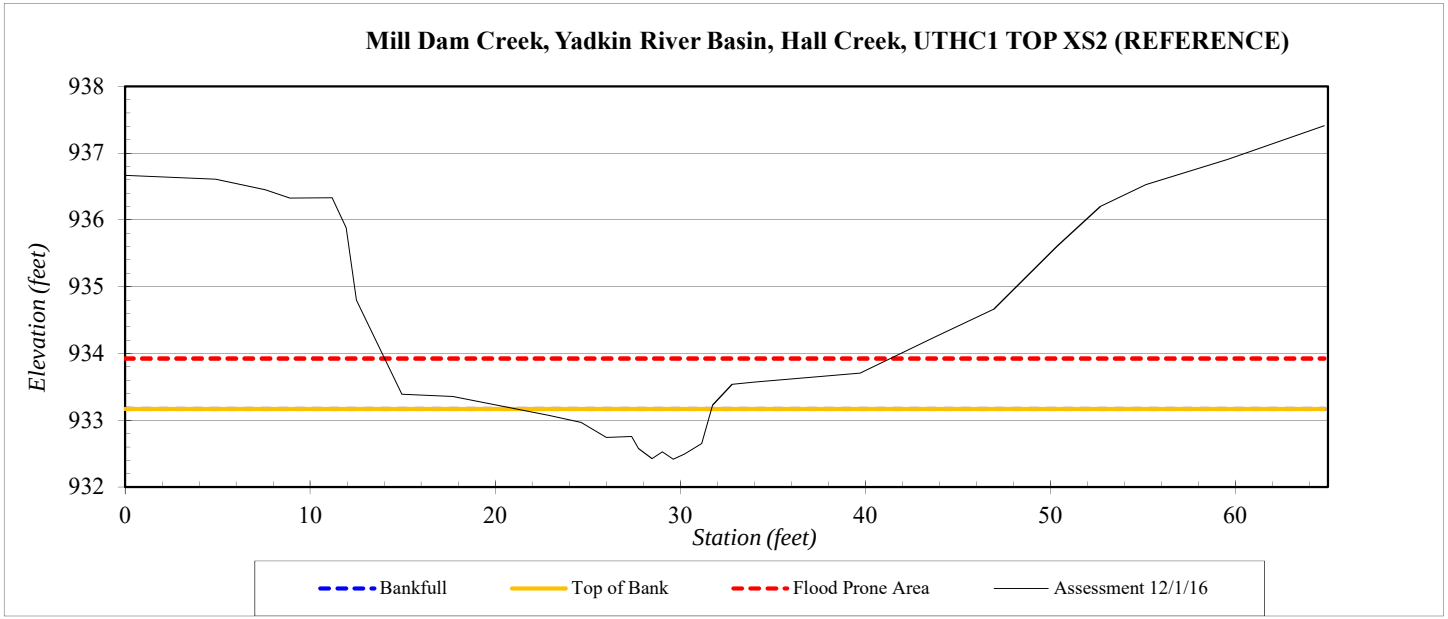


Cross-Section Plots

River Basin:	Yadkin
Watershed:	Hall Creek
XS ID	UTHC1 TOP XS2 (REFERENCE)
Drainage Area (sq mi):	53 acres
Date:	12/1/2016
Field Crew:	A. French, T. Seelinger

Station	Elevation
0.0	936.67
4.9	936.61
7.6	936.45
8.9	936.33
11.2	936.33
12.0	935.88
12.5	934.80
15.0	933.39
17.7	933.36
22.9	933.07
24.6	932.97
26.0	932.74
27.4	932.76
27.7	932.58
28.5	932.43
29.0	932.53
29.6	932.42
30.2	932.50
31.2	932.65
31.8	933.22
32.8	933.54
34.0	933.57
39.7	933.70
43.8	934.25
46.9	934.66
50.4	935.61
52.7	936.20
55.2	936.53
59.6	936.91
64.8	937.41

SUMMARY DATA	
Bankfull Elevation:	933.17
Top of Bank Elevation:	933.17
Bankfull Cross-Sectional Area:	4.0
Bankfull Width:	10.6
Flood Prone Area Elevation:	933.92
Flood Prone Width:	27.3
Max Depth at Bankfull:	0.8
Mean Depth at Bankfull:	0.4
W / D Ratio:	28.2
Entrenchment Ratio:	2.6
Bank Height Ratio:	1.0

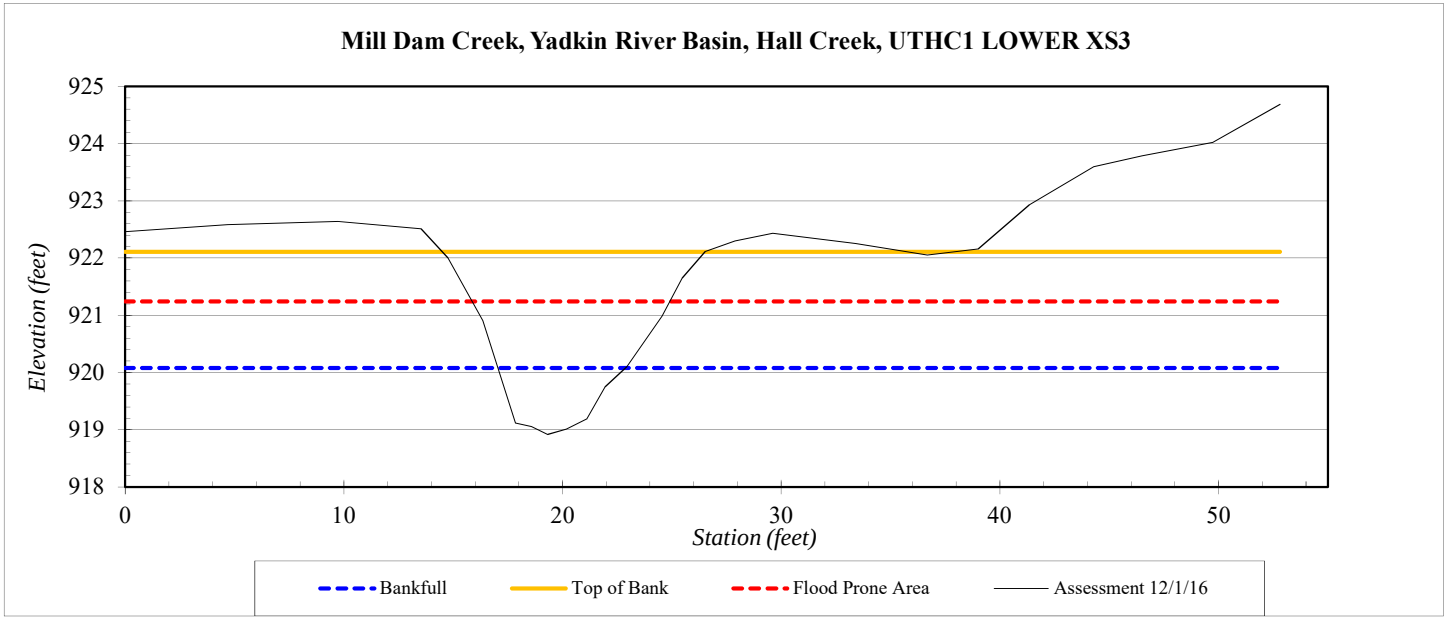


Cross-Section Plots

River Basin:	Yadkin
Watershed:	Hall Creek
XS ID	UTHC1 LOWER XS3
Drainage Area (sq mi):	84 acres
Date:	12/1/2016
Field Crew:	A. French, T. Seelinger

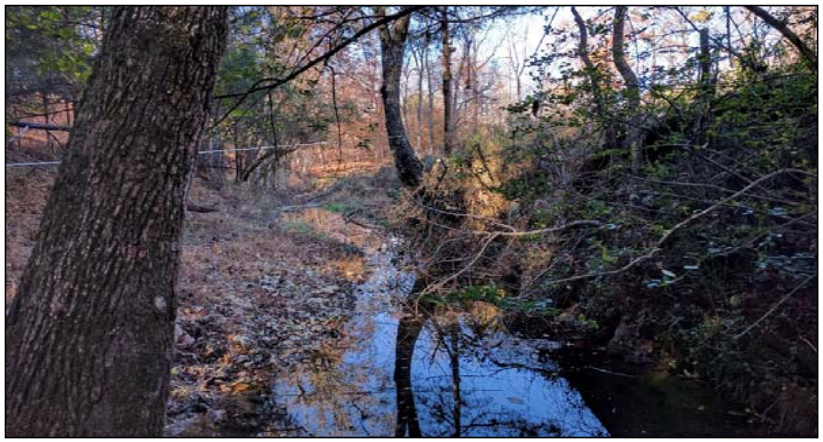
Station	Elevation
0.0	922.46
4.7	922.58
9.7	922.64
13.5	922.51
14.8	922.00
16.4	920.91
17.8	919.12
18.6	919.06
19.3	918.92
20.2	919.01
21.1	919.19
21.9	919.75
22.9	920.10
24.5	920.98
25.5	921.65
26.5	922.12
27.9	922.30
29.6	922.43
33.4	922.25
36.7	922.05
39.0	922.16
41.3	922.93
44.3	923.60
46.5	923.78
49.7	924.02
52.8	924.68

SUMMARY DATA	
Bankfull Elevation:	920.08
Top of Bank Elevation:	922.11
Bankfull Cross-Sectional Area:	4.5
Bankfull Width:	5.8
Flood Prone Area Elevation:	921.24
Flood Prone Width:	9.0
Max Depth at Bankfull:	1.2
Mean Depth at Bankfull:	0.8
W / D Ratio:	7.6
Entrenchment Ratio:	1.5
Bank Height Ratio:	2.7



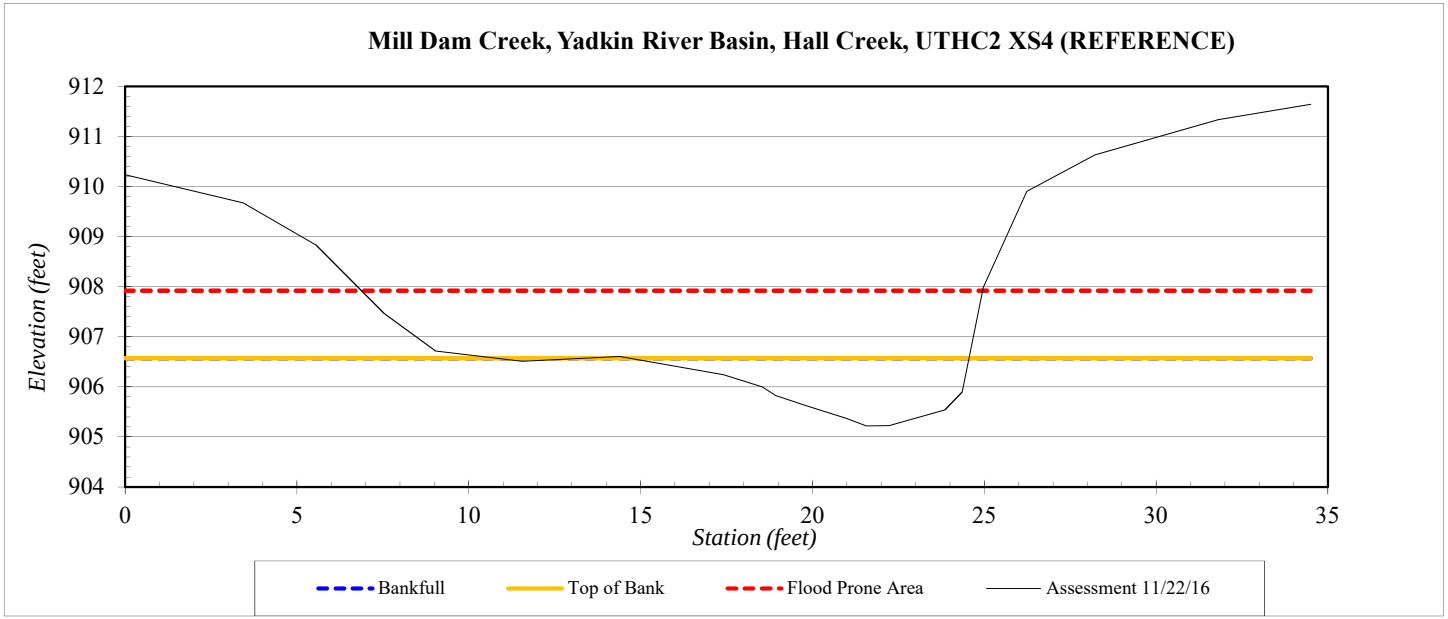
Cross-Section Plots

River Basin:	Yadkin
Watershed:	Hall Creek
XS ID	UTHC2 XS4 (REFERENCE)
Drainage Area (sq mi):	120 acres
Date:	11/22/2016
Field Crew:	A. French, T. Seelinger



Station	Elevation
0.0	910.24
3.4	909.67
5.6	908.83
7.5	907.48
9.0	906.72
11.6	906.51
14.4	906.61
17.4	906.25
18.5	906.00
18.9	905.83
19.9	905.62
21.0	905.36
21.6	905.22
22.2	905.22
23.9	905.54
24.4	905.90
25.0	907.98
26.2	909.90
28.2	910.63
31.8	911.33
34.5	911.64

SUMMARY DATA	
Bankfull Elevation:	906.57
Top of Bank Elevation:	906.57
Bankfull Cross-Sectional Area:	7.3
Bankfull Width:	9.9
Flood Prone Area Elevation:	907.92
Flood Prone Width:	18.1
Max Depth at Bankfull:	1.3
Mean Depth at Bankfull:	0.7
W / D Ratio:	13.3
Entrenchment Ratio:	1.8
Bank Height Ratio:	1.0

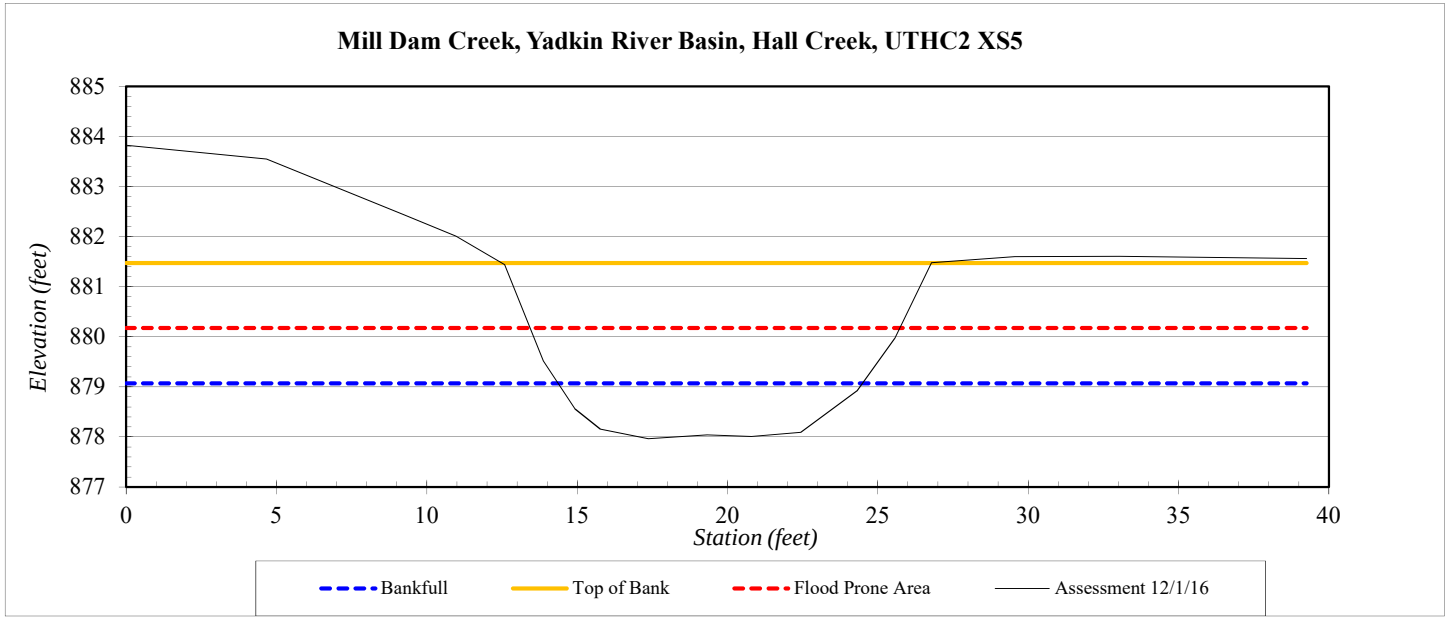


Cross-Section Plots

River Basin:	Yadkin
Watershed:	Hall Creek
XS ID	UTHC2 XS5
Drainage Area (sq mi):	170 acres
Date:	12/1/2016
Field Crew:	A. French, T. Seelinger

Station	Elevation
0.0	883.82
4.7	883.55
9.2	882.44
11.0	882.01
12.6	881.44
13.9	879.52
14.9	878.56
15.8	878.15
17.4	877.96
19.3	878.04
20.8	878.01
22.4	878.09
24.3	878.93
25.6	879.96
26.8	881.48
29.6	881.60
33.0	881.61
39.3	881.56

SUMMARY DATA	
Bankfull Elevation:	879.07
Top of Bank Elevation:	881.47
Bankfull Cross-Sectional Area:	8.7
Bankfull Width:	10.1
Flood Prone Area Elevation:	880.18
Flood Prone Width:	12.3
Max Depth at Bankfull:	1.1
Mean Depth at Bankfull:	0.9
W / D Ratio:	11.7
Entrenchment Ratio:	1.2
Bank Height Ratio:	3.2

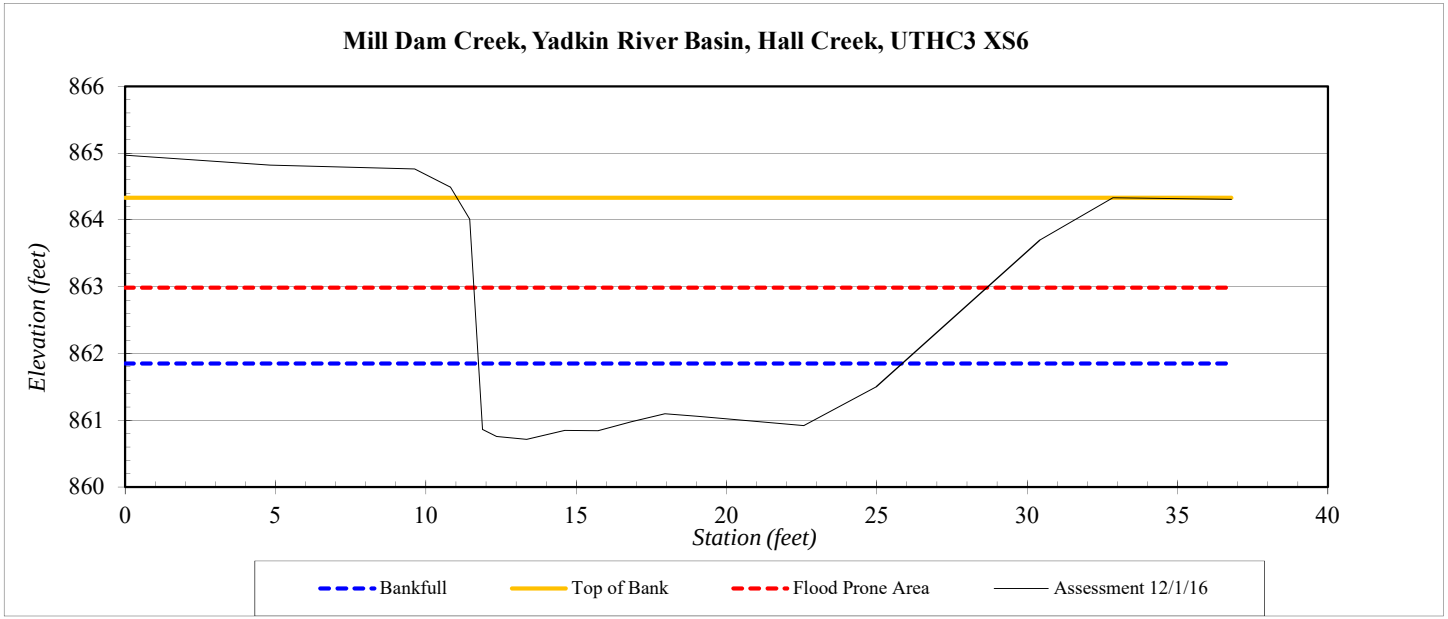


Cross-Section Plots

River Basin:	Yadkin
Watershed:	Hall Creek
XS ID	UTHC3 XS6
Drainage Area (sq mi):	280 acres
Date:	12/1/2016
Field Crew:	A. French, T. Seelinger

Station	Elevation
0.0	864.97
4.8	864.82
9.6	864.76
10.8	864.49
11.5	864.01
11.9	860.86
12.4	860.76
13.4	860.71
14.6	860.85
15.7	860.84
16.8	860.98
18.0	861.10
19.0	861.06
22.6	860.92
25.0	861.50
30.4	863.70
32.9	864.33
36.8	864.31

SUMMARY DATA	
Bankfull Elevation:	861.85
Top of Bank Elevation:	864.33
Bankfull Cross-Sectional Area:	11.7
Bankfull Width:	14.1
Flood Prone Area Elevation:	862.99
Flood Prone Width:	17.1
Max Depth at Bankfull:	1.1
Mean Depth at Bankfull:	0.8
W / D Ratio:	17.0
Entrenchment Ratio:	1.2
Bank Height Ratio:	3.2

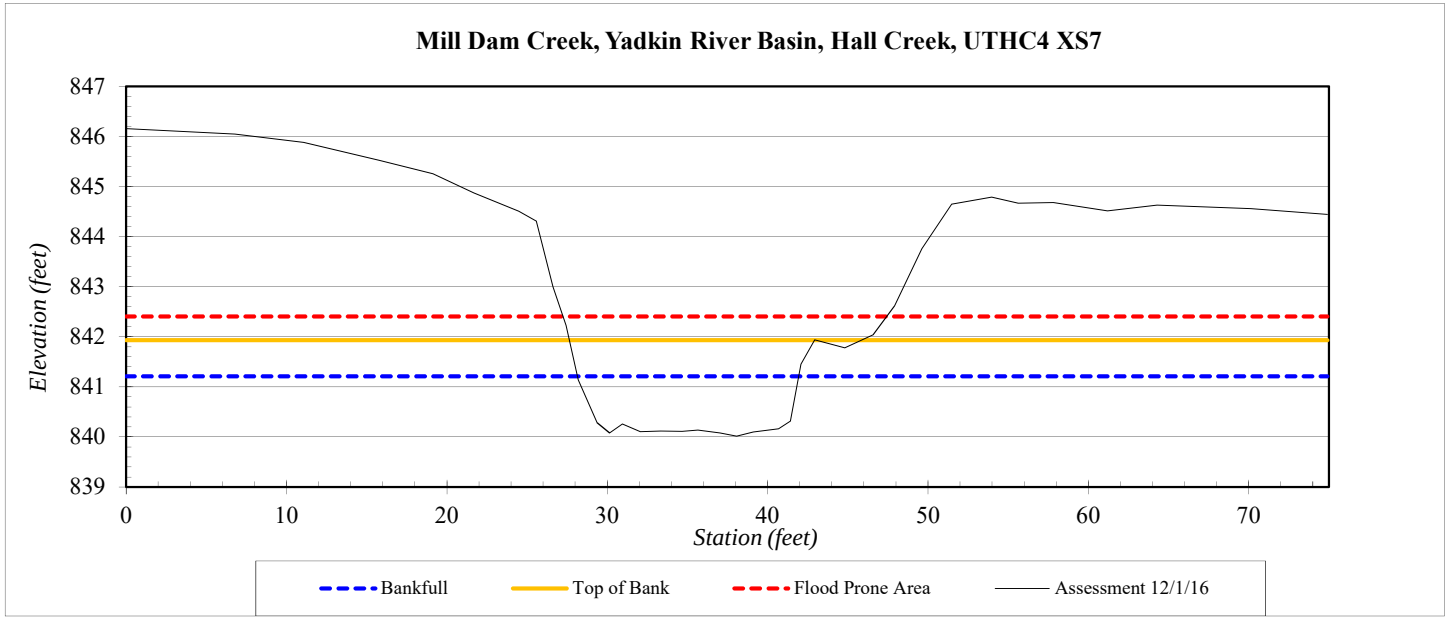


Cross-Section Plots

River Basin:	Yadkin
Watershed:	Hall Creek
XS ID	UTHC4 XS7
Drainage Area (sq mi):	365 acres
Date:	12/1/2016
Field Crew:	A. French, T. Seelinger

Station	Elevation
0.0	846.15
6.8	846.05
11.1	845.88
15.8	845.52
19.1	845.25
21.7	844.87
24.5	844.51
25.6	844.31
26.6	843.00
27.4	842.22
28.2	841.14
29.4	840.28
30.1	840.08
31.0	840.26
32.1	840.10
33.3	840.12
34.7	840.11
35.7	840.14
37.0	840.08
38.1	840.02
39.1	840.10
40.7	840.16
41.4	840.32
42.1	841.45
42.9	841.94
44.8	841.78
46.6	842.04
47.9	842.61
49.6	843.76
51.5	844.65
54.0	844.79
55.6	844.67
57.8	844.68
61.2	844.51
64.3	844.63
70.1	844.56
74.9	844.44

SUMMARY DATA	
Bankfull Elevation:	841.21
Top of Bank Elevation:	841.93
Bankfull Cross-Sectional Area:	13.9
Bankfull Width:	13.8
Flood Prone Area Elevation:	842.40
Flood Prone Width:	20.2
Max Depth at Bankfull:	1.2
Mean Depth at Bankfull:	1.0
W / D Ratio:	13.7
Entrenchment Ratio:	1.5
Bank Height Ratio:	1.6

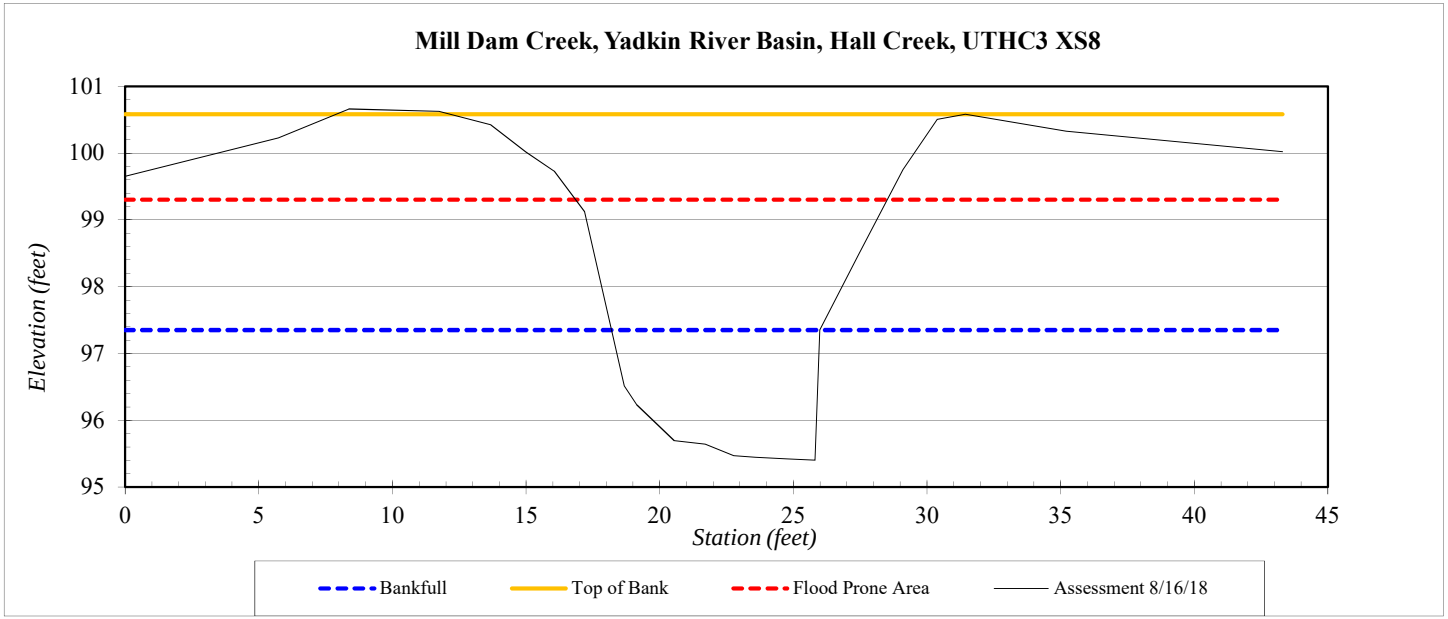


Cross-Section Plots

River Basin:	Yadkin
Watershed:	Hall Creek
XS ID	UTHC3 XS8
Drainage Area (sq mi):	280 acres
Date:	8/16/2018
Field Crew:	J. Sullivan, T. Seelinger

Station	Elevation
0.0	99.65
5.7	100.23
8.4	100.66
11.7	100.62
13.7	100.42
15.0	100.02
16.1	99.73
17.2	99.12
18.7	96.52
19.1	96.23
20.5	95.69
21.7	95.64
22.8	95.47
23.6	95.45
24.8	95.42
25.8	95.40
26.0	97.35
27.5	98.49
29.1	99.75
30.4	100.51
31.4	100.58
35.2	100.33
43.3	100.02

SUMMARY DATA	
Bankfull Elevation:	97.35
Top of Bank Elevation:	100.58
Bankfull Cross-Sectional Area:	12.5
Bankfull Width:	7.8
Flood Prone Area Elevation:	99.30
Flood Prone Width:	9.2
Max Depth at Bankfull:	2.0
Mean Depth at Bankfull:	1.6
W / D Ratio:	4.9
Entrenchment Ratio:	1.2
Bank Height Ratio:	2.7

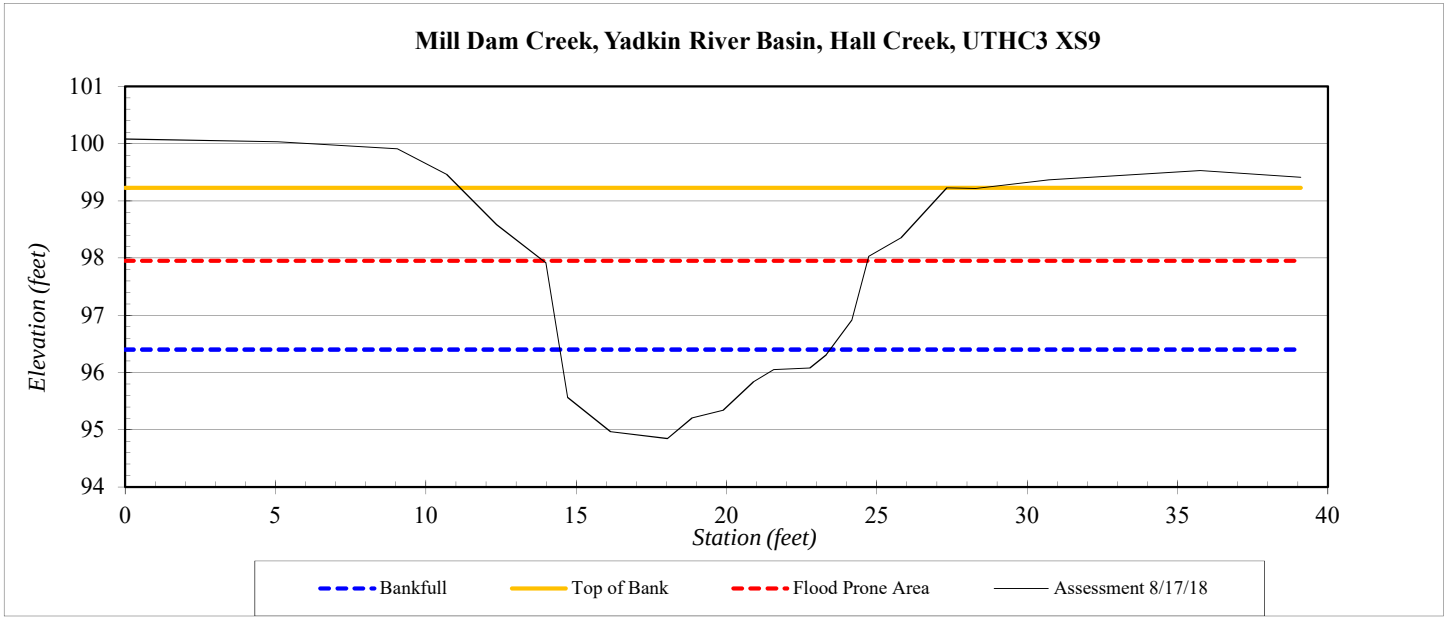


Cross-Section Plots

River Basin:	Yadkin
Watershed:	Hall Creek
XS ID	UTHC3 XS9
Drainage Area (sq mi):	280 acres
Date:	8/16/2018
Field Crew:	J. Sullivan, T. Seelinger

Station	Elevation
0.0	100.08
5.1	100.03
9.1	99.91
10.7	99.46
12.4	98.59
14.0	97.92
14.7	95.57
16.1	94.97
18.0	94.85
18.9	95.21
19.9	95.34
20.9	95.84
21.6	96.05
22.8	96.08
23.3	96.31
24.2	96.91
24.7	98.03
25.8	98.36
27.3	99.23
28.3	99.22
30.7	99.36
35.8	99.53
39.1	99.41

SUMMARY DATA	
Bankfull Elevation:	96.40
Top of Bank Elevation:	99.23
Bankfull Cross-Sectional Area:	8.5
Bankfull Width:	9.0
Flood Prone Area Elevation:	97.95
Flood Prone Width:	10.8
Max Depth at Bankfull:	1.6
Mean Depth at Bankfull:	0.9
W / D Ratio:	8.4
Entrenchment Ratio:	1.4
Bank Height Ratio:	2.8

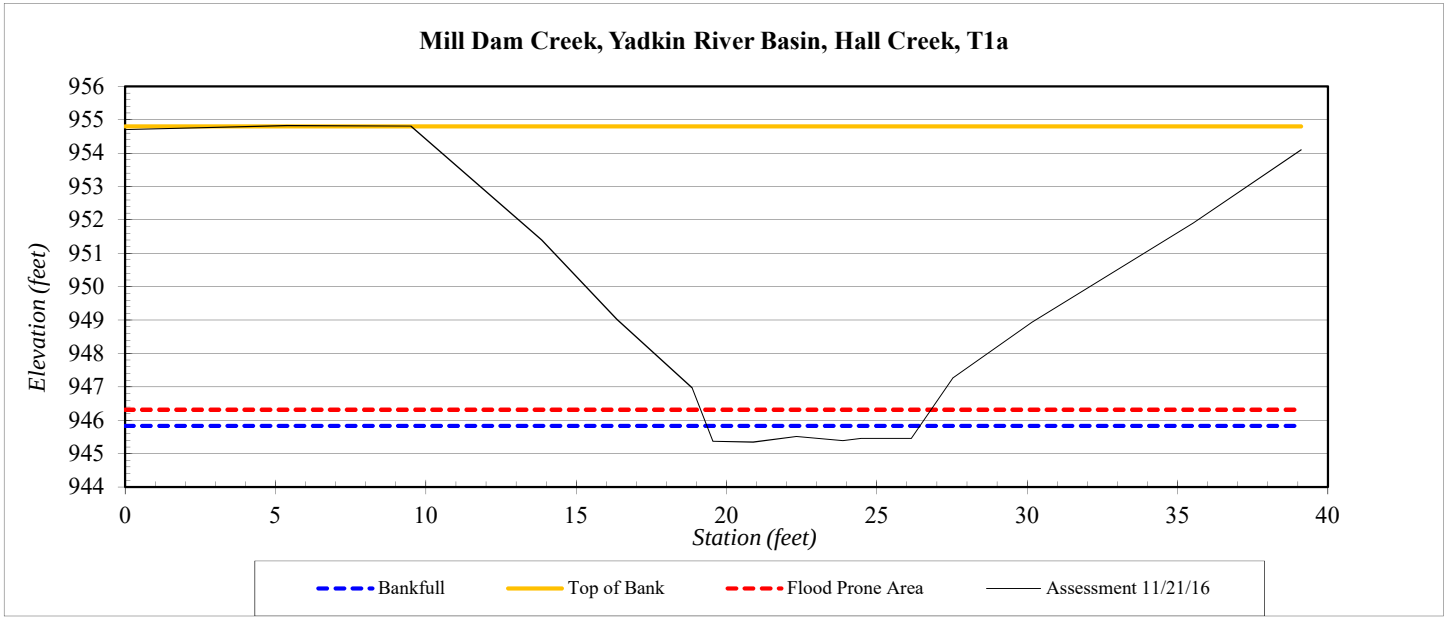


Cross-Section Plots

River Basin:	Yadkin
Watershed:	Hall Creek
XS ID	T1a
Drainage Area (sq mi):	29 acres
Date:	11/21/2016
Field Crew:	A. French, T. Seelinger

Station	Elevation
0.0	954.71
5.4	954.83
9.5	954.81
13.9	951.40
16.4	949.02
18.9	946.97
19.5	945.37
20.9	945.35
22.3	945.52
23.9	945.39
24.5	945.45
26.1	945.45
27.5	947.26
30.2	948.94
35.5	951.91
39.1	954.10

SUMMARY DATA	
Bankfull Elevation:	945.83
Top of Bank Elevation:	954.80
Bankfull Cross-Sectional Area:	2.8
Bankfull Width:	7.1
Flood Prone Area Elevation:	946.31
Flood Prone Width:	7.7
Max Depth at Bankfull:	0.5
Mean Depth at Bankfull:	0.4
W / D Ratio:	18.2
Entrenchment Ratio:	1.1
Bank Height Ratio:	19.6

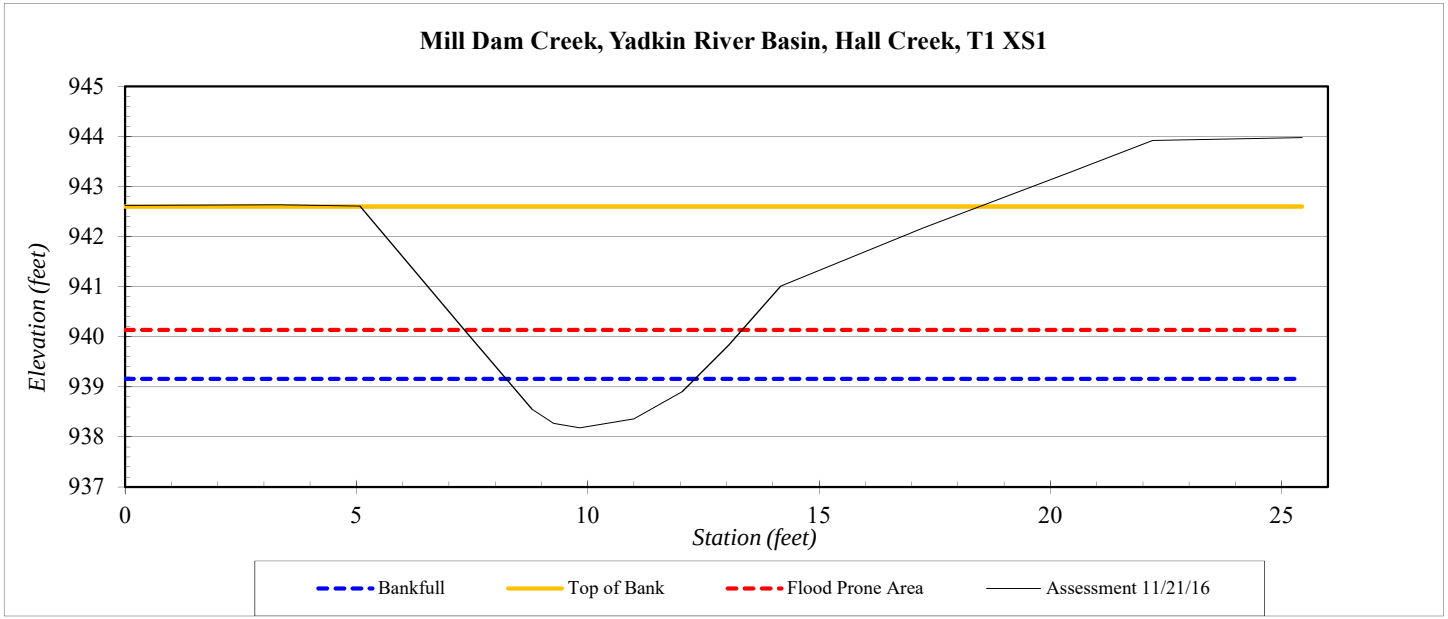


Cross-Section Plots

River Basin:	Yadkin
Watershed:	Hall Creek
XS ID	T1 XS1
Drainage Area (sq mi):	30 acres
Date:	11/21/2016
Field Crew:	A. French, T. Seelinger

Station	Elevation
0.0	942.62
3.3	942.63
5.1	942.61
7.3	940.12
8.8	938.55
9.3	938.27
9.8	938.18
11.0	938.36
12.0	938.90
13.0	939.83
14.2	941.01
17.3	942.17
20.4	943.29
22.2	943.92
25.4	943.98

SUMMARY DATA	
Bankfull Elevation:	939.16
Top of Bank Elevation:	942.60
Bankfull Cross-Sectional Area:	2.7
Bankfull Width:	4.1
Flood Prone Area Elevation:	940.14
Flood Prone Width:	6.0
Max Depth at Bankfull:	1.0
Mean Depth at Bankfull:	0.7
W / D Ratio:	6.2
Entrenchment Ratio:	1.5
Bank Height Ratio:	4.5

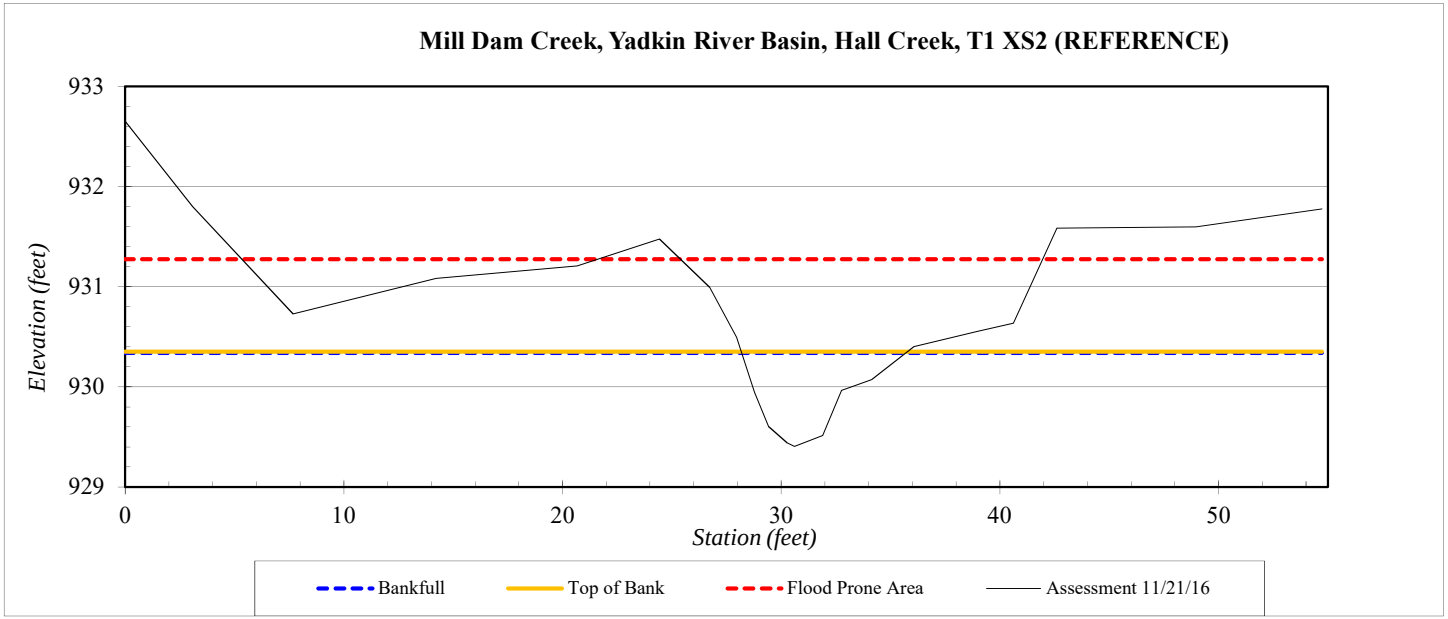


Cross-Section Plots

River Basin:	Yadkin
Watershed:	Hall Creek
XS ID	T1 XS2 (REFERENCE)
Drainage Area (sq mi):	43 acres
Date:	11/21/2016
Field Crew:	A. French, T. Seelinger

Station	Elevation
0.0	932.65
3.1	931.80
7.7	930.73
14.2	931.08
20.7	931.21
24.4	931.47
26.7	930.99
28.0	930.49
28.8	929.95
29.4	929.60
30.3	929.44
30.6	929.41
31.9	929.51
32.8	929.97
34.2	930.07
36.1	930.40
39.0	930.56
40.6	930.63
42.6	931.58
49.0	931.60
54.7	931.78

SUMMARY DATA	
Bankfull Elevation:	930.34
Top of Bank Elevation:	930.35
Bankfull Cross-Sectional Area:	3.8
Bankfull Width:	7.5
Flood Prone Area Elevation:	931.27
Flood Prone Width:	16.6
Max Depth at Bankfull:	0.9
Mean Depth at Bankfull:	0.5
W / D Ratio:	14.9
Entrenchment Ratio:	2.2
Bank Height Ratio:	1.0

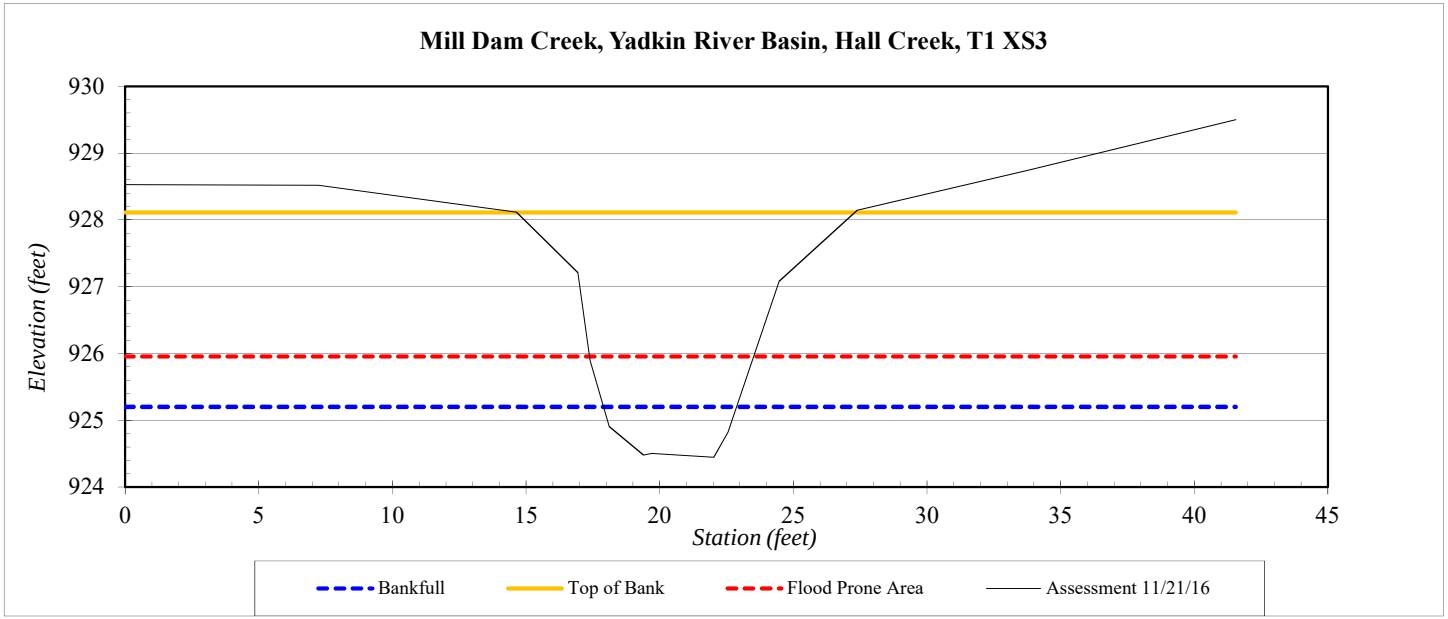


Cross-Section Plots

River Basin:	Yadkin
Watershed:	Hall Creek
XS ID	T1 XS3
Drainage Area (sq mi):	40 acres
Date:	11/21/2016
Field Crew:	A. French, T. Seelinger

Station	Elevation
0.0	928.53
7.2	928.52
14.6	928.12
16.9	927.21
17.4	925.90
18.1	924.91
19.4	924.48
19.7	924.50
22.0	924.45
22.6	924.82
24.5	927.08
27.4	928.15
33.7	928.74
41.6	929.50

SUMMARY DATA	
Bankfull Elevation:	925.20
Top of Bank Elevation:	928.11
Bankfull Cross-Sectional Area:	3.0
Bankfull Width:	5.0
Flood Prone Area Elevation:	925.95
Flood Prone Width:	6.1
Max Depth at Bankfull:	0.8
Mean Depth at Bankfull:	0.6
W / D Ratio:	8.4
Entrenchment Ratio:	1.2
Bank Height Ratio:	4.9

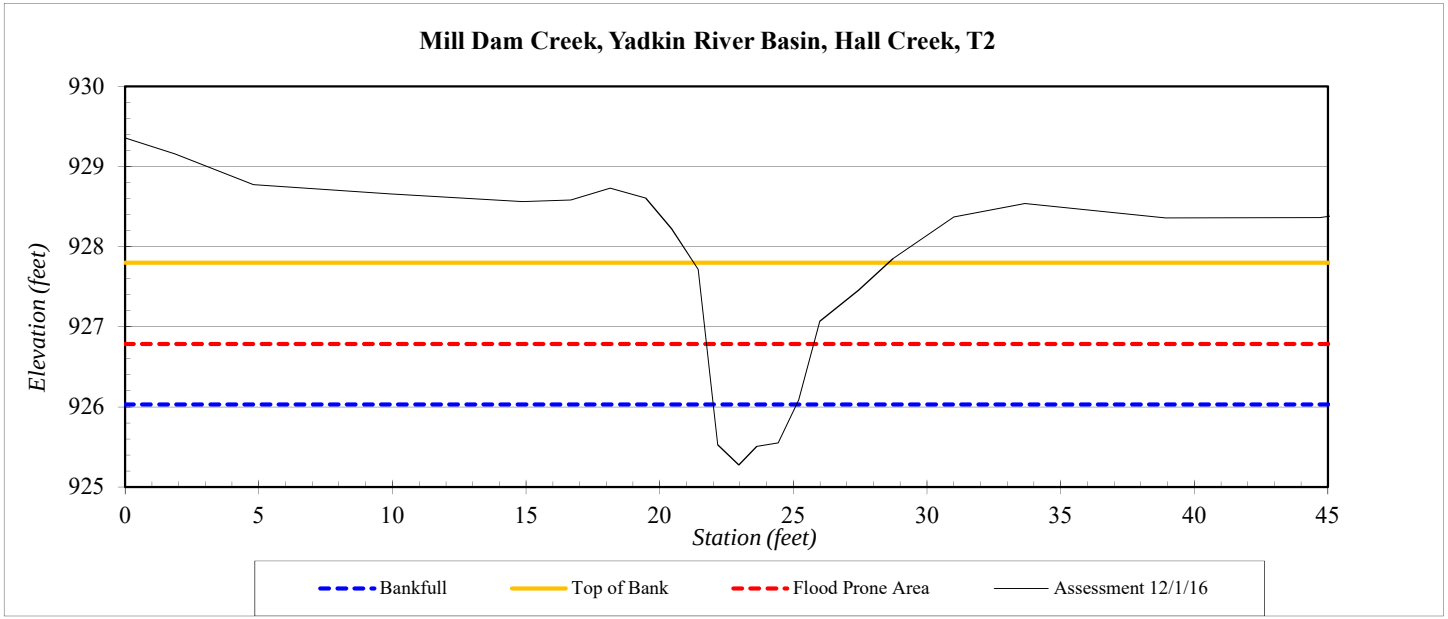


Cross-Section Plots

River Basin:	Yadkin
Watershed:	Hall Creek
XS ID	T2
Drainage Area (sq mi):	16 acres
Date:	12/1/2016
Field Crew:	A. French, T. Seelinger

Station	Elevation
0.0	929.36
1.9	929.15
4.8	928.77
9.9	928.66
14.9	928.56
16.7	928.58
18.2	928.73
19.5	928.60
20.4	928.22
21.4	927.71
22.2	925.53
23.0	925.27
23.6	925.51
24.4	925.55
25.2	926.08
26.0	927.07
27.4	927.45
28.7	927.85
31.0	928.37
33.7	928.54
38.9	928.36
44.7	928.36
51.3	928.68
54.8	928.92

SUMMARY DATA	
Bankfull Elevation:	926.03
Top of Bank Elevation:	927.80
Bankfull Cross-Sectional Area:	1.5
Bankfull Width:	3.1
Flood Prone Area Elevation:	926.79
Flood Prone Width:	4.0
Max Depth at Bankfull:	0.8
Mean Depth at Bankfull:	0.5
W / D Ratio:	6.3
Entrenchment Ratio:	1.3
Bank Height Ratio:	3.3

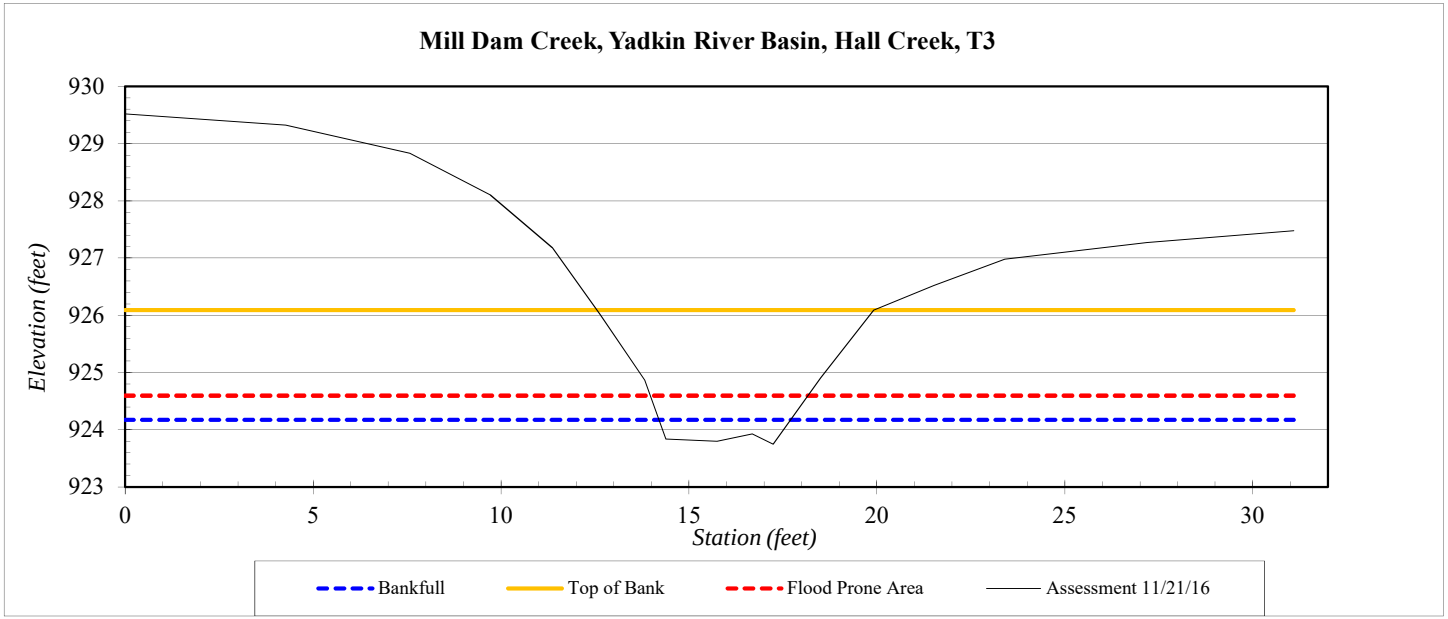


Cross-Section Plots

River Basin:	Yadkin
Watershed:	Hall Creek
XS ID	T3
Drainage Area (sq mi):	7 acres
Date:	11/21/2016
Field Crew:	A. French, T. Seelinger

Station	Elevation
0.0	929.52
4.3	929.32
7.6	928.83
9.7	928.10
11.4	927.18
12.6	926.00
13.8	924.87
14.4	923.84
15.7	923.80
16.7	923.92
17.2	923.75
18.5	924.91
19.9	926.09
21.5	926.52
23.4	926.98
27.2	927.27
31.1	927.48

SUMMARY DATA	
Bankfull Elevation:	924.17
Top of Bank Elevation:	926.09
Bankfull Cross-Sectional Area:	1.1
Bankfull Width:	3.5
Flood Prone Area Elevation:	924.60
Flood Prone Width:	4.2
Max Depth at Bankfull:	0.4
Mean Depth at Bankfull:	0.3
W / D Ratio:	11.3
Entrenchment Ratio:	1.2
Bank Height Ratio:	5.5

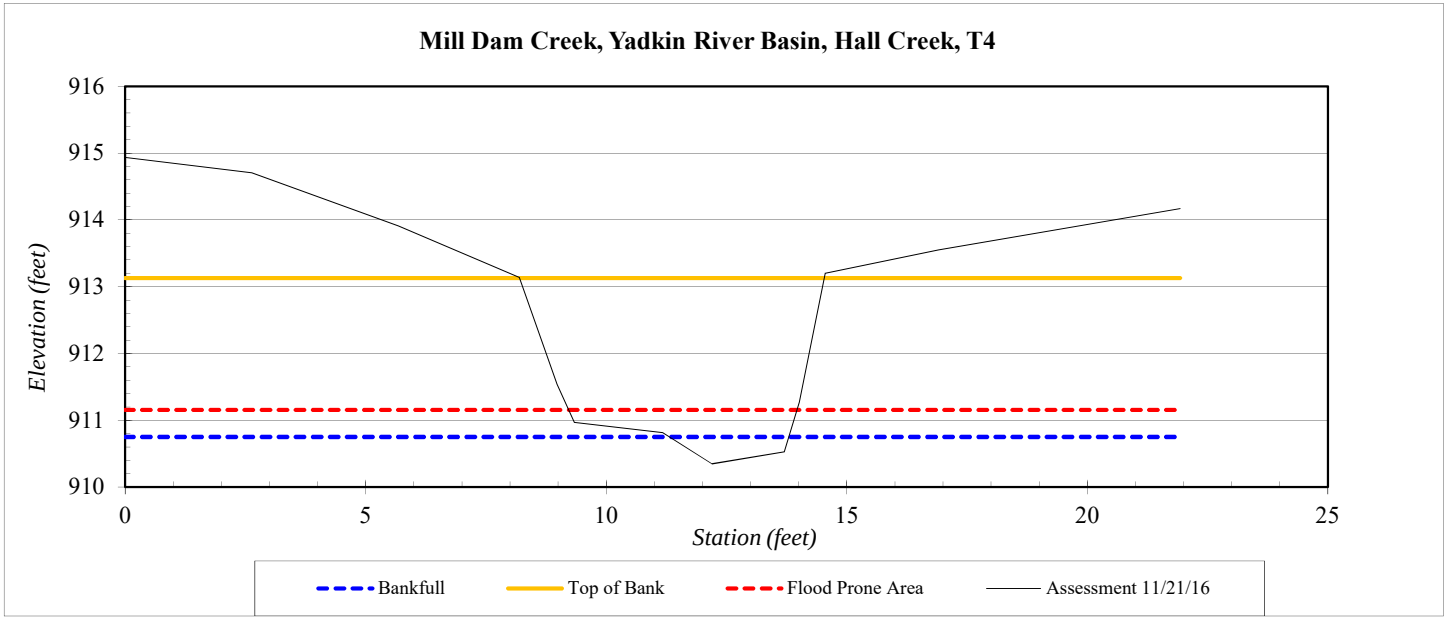


Cross-Section Plots

River Basin:	Yadkin
Watershed:	Hall Creek
XS ID	T4
Drainage Area (sq mi):	4 acres
Date:	11/21/2016
Field Crew:	A. French, T. Seelinger

Station	Elevation
0.0	914.94
2.6	914.71
5.7	913.91
8.2	913.14
9.0	911.54
9.3	910.97
11.2	910.82
12.2	910.35
13.7	910.53
14.0	911.27
14.5	913.20
16.9	913.55
21.9	914.17

SUMMARY DATA	
Bankfull Elevation:	910.75
Top of Bank Elevation:	913.13
Bankfull Cross-Sectional Area:	0.7
Bankfull Width:	2.5
Flood Prone Area Elevation:	911.15
Flood Prone Width:	4.7
Max Depth at Bankfull:	0.4
Mean Depth at Bankfull:	0.3
W / D Ratio:	9.4
Entrenchment Ratio:	1.9
Bank Height Ratio:	6.9

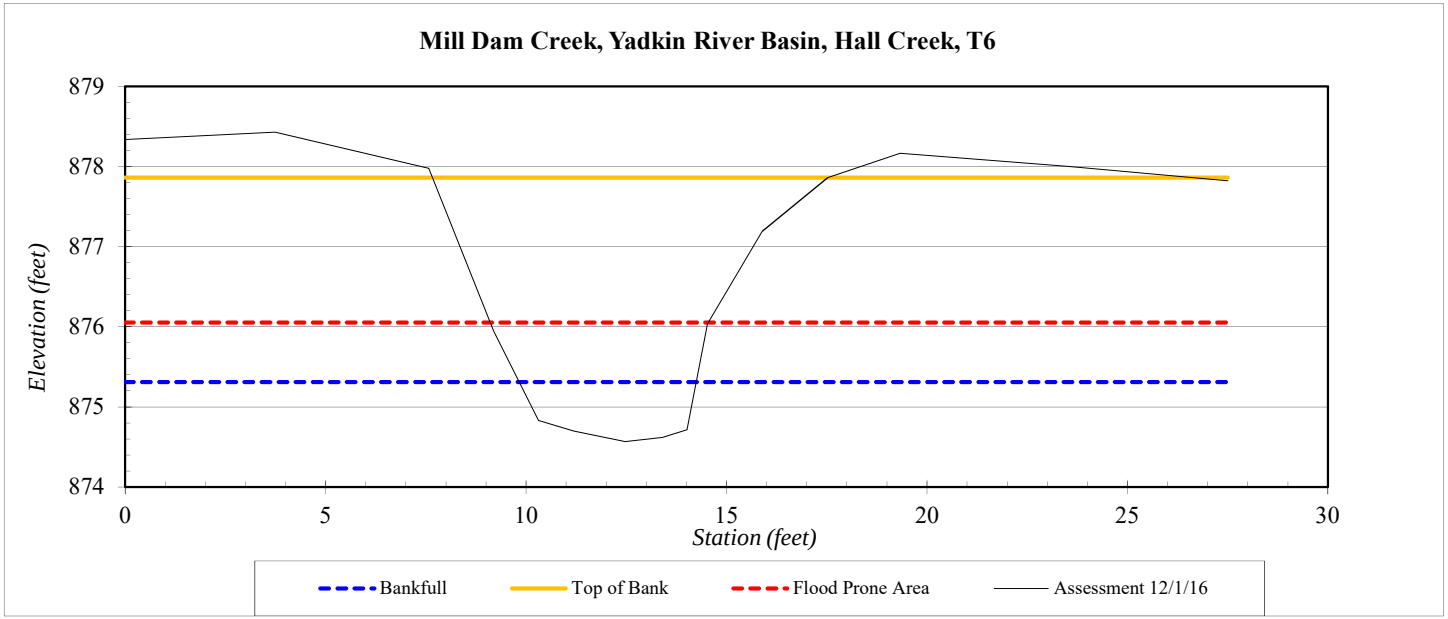


Cross-Section Plots

River Basin:	Yadkin
Watershed:	Hall Creek
XS ID	T6
Drainage Area (sq mi):	29 acres
Date:	12/1/2016
Field Crew:	A. French, T. Seelinger

Station	Elevation
0.0	878.34
3.7	878.43
7.6	877.98
9.2	875.95
10.3	874.83
11.2	874.70
12.5	874.57
13.4	874.62
14.0	874.71
14.5	876.04
15.9	877.19
17.5	877.86
19.3	878.16
23.5	878.00
27.5	877.82

SUMMARY DATA	
Bankfull Elevation:	875.31
Top of Bank Elevation:	877.86
Bankfull Cross-Sectional Area:	2.6
Bankfull Width:	4.4
Flood Prone Area Elevation:	876.05
Flood Prone Width:	5.4
Max Depth at Bankfull:	0.7
Mean Depth at Bankfull:	0.6
W / D Ratio:	7.5
Entrenchment Ratio:	1.2
Bank Height Ratio:	4.4

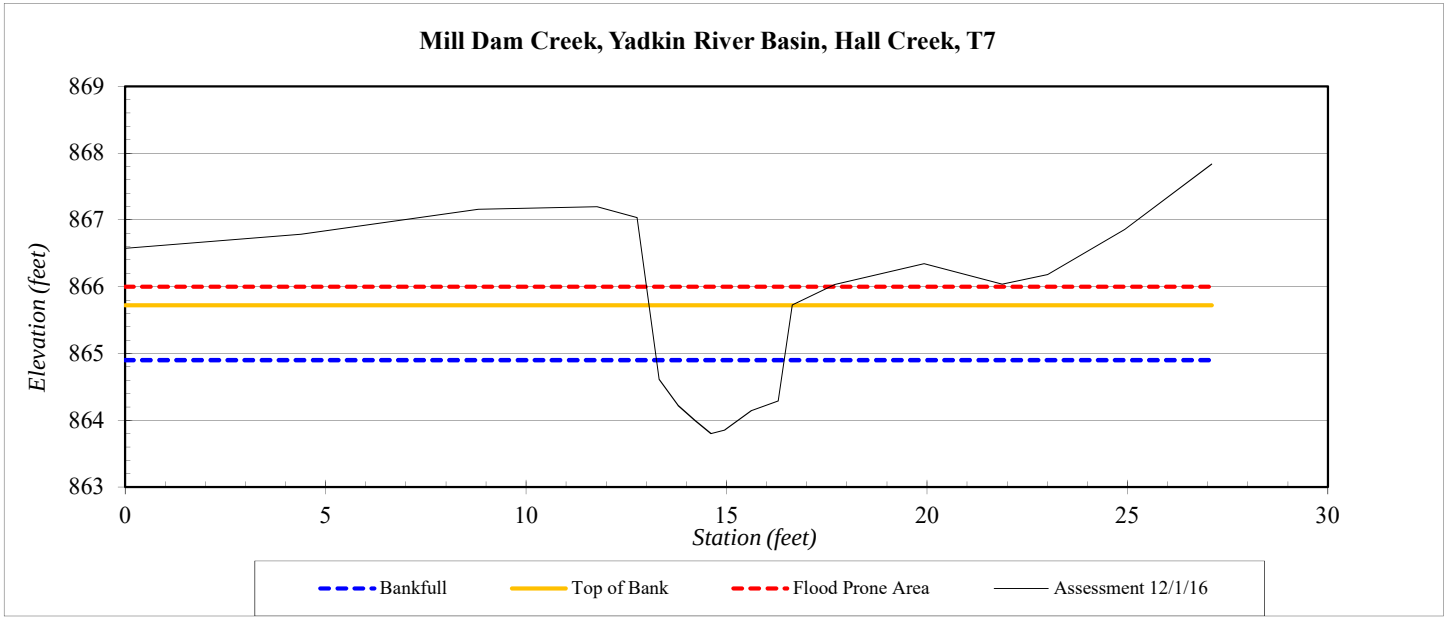


Cross-Section Plots

River Basin:	Yadkin
Watershed:	Hall Creek
XS ID	T7
Drainage Area (sq mi):	40 acres
Date:	12/1/2016
Field Crew:	A. French, T. Seelinger

Station	Elevation
0.0	866.58
4.4	866.78
8.8	867.16
11.8	867.20
12.8	867.03
13.3	864.61
13.8	864.22
14.2	864.00
14.6	863.80
15.0	863.85
15.6	864.15
16.3	864.29
16.6	865.73
17.7	866.03
19.9	866.35
21.9	866.04
23.0	866.18
24.9	866.86
27.1	867.84

SUMMARY DATA	
Bankfull Elevation:	864.90
Top of Bank Elevation:	865.72
Bankfull Cross-Sectional Area:	2.4
Bankfull Width:	3.2
Flood Prone Area Elevation:	866.00
Flood Prone Width:	4.6
Max Depth at Bankfull:	1.1
Mean Depth at Bankfull:	0.8
W / D Ratio:	4.1
Entrenchment Ratio:	1.4
Bank Height Ratio:	1.7

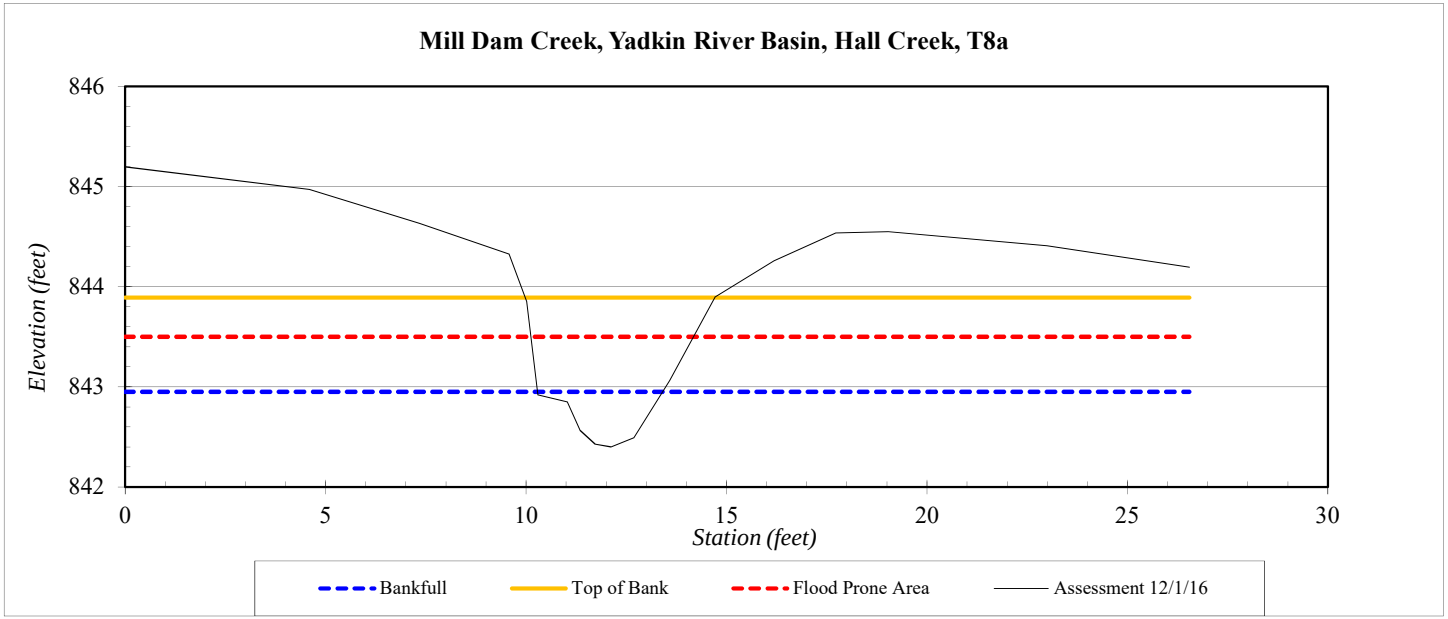


Cross-Section Plots

River Basin:	Yadkin
Watershed:	Hall Creek
XS ID	T8a
Drainage Area (sq mi):	7 acres
Date:	12/1/2016
Field Crew:	A. French, T. Seelinger

Station	Elevation
0.0	845.20
4.6	844.97
7.3	844.63
9.6	844.33
10.0	843.85
10.3	842.92
11.0	842.85
11.4	842.56
11.7	842.43
12.1	842.40
12.7	842.49
13.6	843.06
14.7	843.90
16.2	844.26
17.7	844.54
19.0	844.55
23.0	844.41
26.5	844.19

SUMMARY DATA	
Bankfull Elevation:	842.95
Top of Bank Elevation:	843.89
Bankfull Cross-Sectional Area:	1.0
Bankfull Width:	3.1
Flood Prone Area Elevation:	843.50
Flood Prone Width:	4.1
Max Depth at Bankfull:	0.5
Mean Depth at Bankfull:	0.3
W / D Ratio:	10.2
Entrenchment Ratio:	1.3
Bank Height Ratio:	2.7

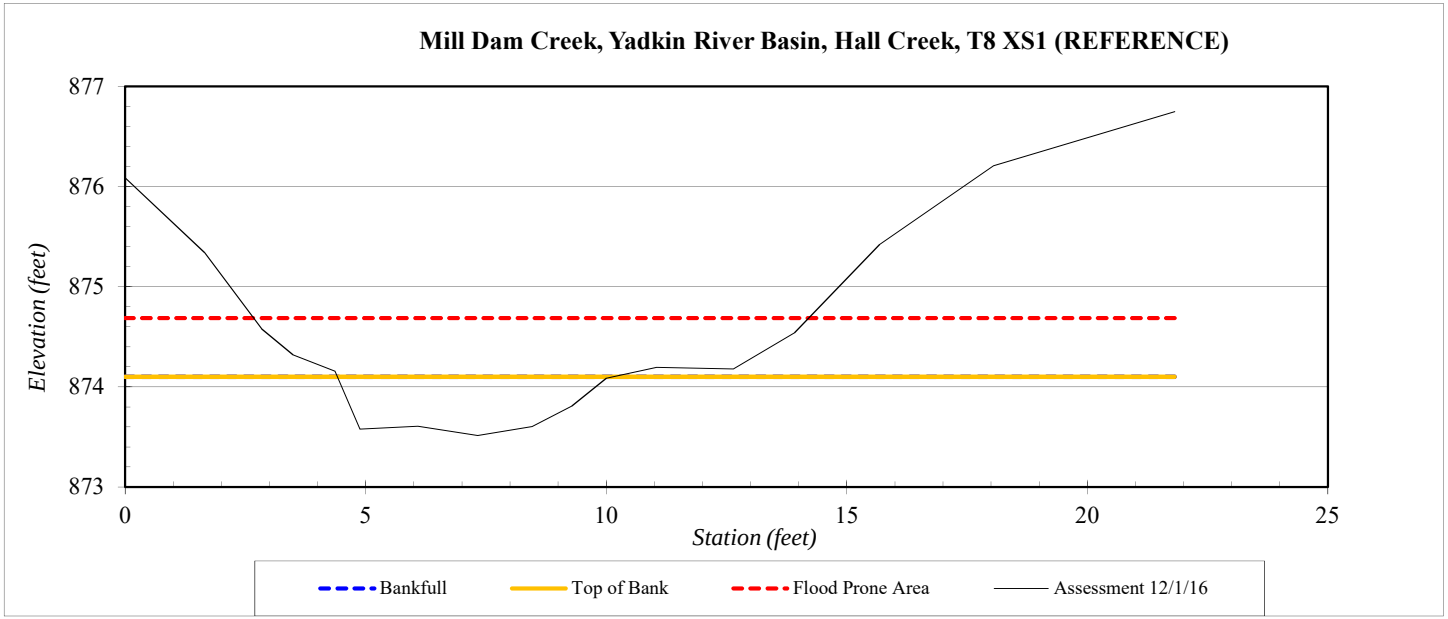


Cross-Section Plots

River Basin:	Yadkin
Watershed:	Hall Creek
XS ID	T8 XS1 (REFERENCE)
Drainage Area (sq mi):	15 acres
Date:	12/1/2016
Field Crew:	A. French, T. Seelinger

Station	Elevation
0.0	876.09
1.7	875.34
2.8	874.58
3.5	874.32
4.4	874.16
4.9	873.58
6.1	873.61
7.3	873.51
8.5	873.60
9.3	873.81
10.0	874.09
11.0	874.19
12.6	874.18
13.9	874.54
15.7	875.42
18.1	876.21
21.8	876.75

SUMMARY DATA	
Bankfull Elevation:	874.10
Top of Bank Elevation:	874.10
Bankfull Cross-Sectional Area:	2.5
Bankfull Width:	5.7
Flood Prone Area Elevation:	874.69
Flood Prone Width:	11.5
Max Depth at Bankfull:	0.6
Mean Depth at Bankfull:	0.4
W / D Ratio:	13.4
Entrenchment Ratio:	2.0
Bank Height Ratio:	1.0

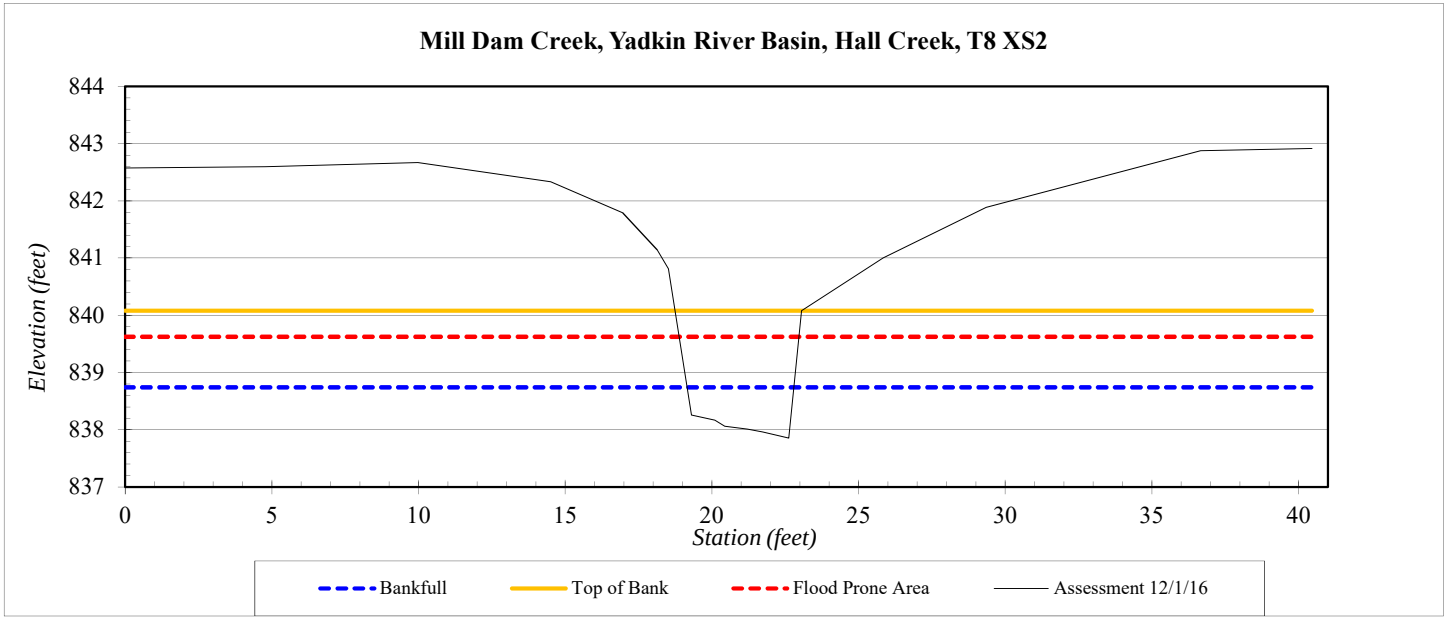


Cross-Section Plots

River Basin:	Yadkin
Watershed:	Hall Creek
XS ID	T8 XS2
Drainage Area (sq mi):	21 acres
Date:	12/1/2016
Field Crew:	A. French, T. Seelinger

Station	Elevation
0.0	842.58
4.8	842.60
10.0	842.67
14.5	842.34
17.0	841.79
18.1	841.14
18.5	840.81
19.3	838.26
20.1	838.17
20.4	838.06
21.2	838.01
21.7	837.96
22.6	837.86
23.1	840.08
25.8	841.00
29.4	841.88
36.7	842.87
40.5	842.91

SUMMARY DATA	
Bankfull Elevation:	838.74
Top of Bank Elevation:	840.08
Bankfull Cross-Sectional Area:	2.4
Bankfull Width:	3.6
Flood Prone Area Elevation:	839.62
Flood Prone Width:	4.1
Max Depth at Bankfull:	0.9
Mean Depth at Bankfull:	0.7
W / D Ratio:	5.5
Entrenchment Ratio:	1.1
Bank Height Ratio:	2.5

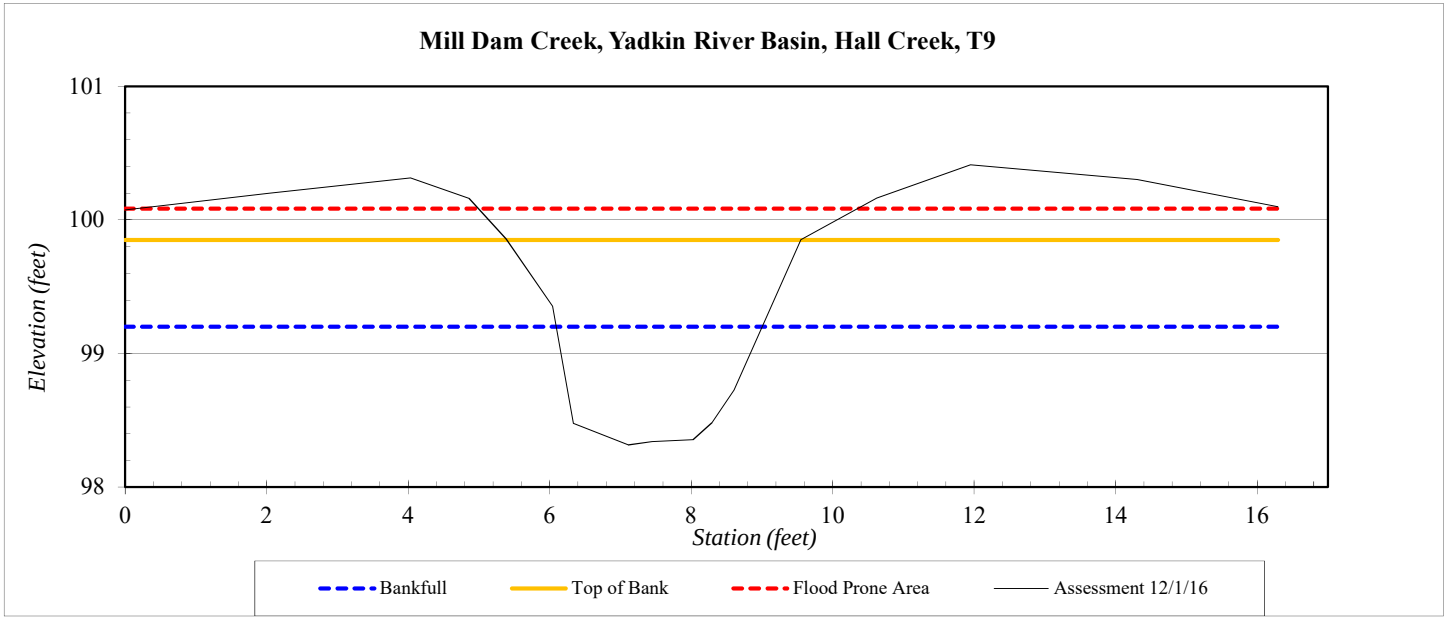


Cross-Section Plots

River Basin:	Yadkin
Watershed:	Hall Creek
XS ID	T9
Drainage Area (sq mi):	29 acres
Date:	12/1/2016
Field Crew:	A. French, T. Seelinger

Station	Elevation*
0.0	100.07
2.0	100.20
4.0	100.31
4.9	100.16
5.4	99.86
6.0	99.35
6.3	98.48
7.1	98.31
7.4	98.34
8.0	98.35
8.3	98.48
8.6	98.73
9.6	99.85
10.6	100.16
12.0	100.41
14.3	100.30
16.3	100.10

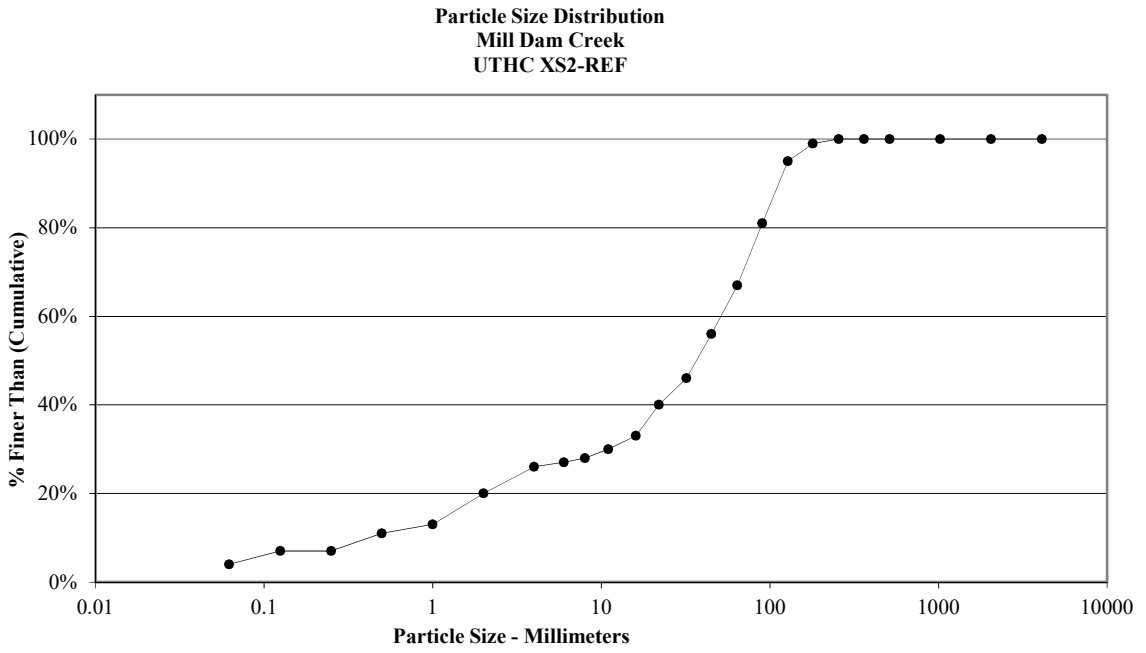
SUMMARY DATA	
Bankfull Elevation:	99.20
Top of Bank Elevation:	99.85
Bankfull Cross-Sectional Area:	2.0
Bankfull Width:	2.9
Flood Prone Area Elevation:	100.09
Flood Prone Width:	5.5
Max Depth at Bankfull:	0.9
Mean Depth at Bankfull:	0.7
W / D Ratio:	4.3
Entrenchment Ratio:	1.9
Bank Height Ratio:	1.7



*assumed elevation

UTHC XS2-REF			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	4
Very Fine	.062 - .125	S	3
Fine	.125 - .25	A	
Medium	.25 - .50	N	4
Coarse	.50 - 1	D	2
Very Coarse	1 - 2	S	7
Very Fine	2 - 4		6
Fine	4 - 5.7	G	1
Fine	5.7 - 8	R	1
Medium	8 - 11.3	A	2
Medium	11.3 - 16	V	3
Coarse	16 - 22.6	E	7
Coarse	22.6 - 32	L	6
Very Coarse	32 - 45	S	10
Very Coarse	45 - 64		11
Small	64 - 90	C	14
Small	90 - 128	O	14
Large	128 - 180	B	4
Large	180 - 256	L	1
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		Total	100

Note:



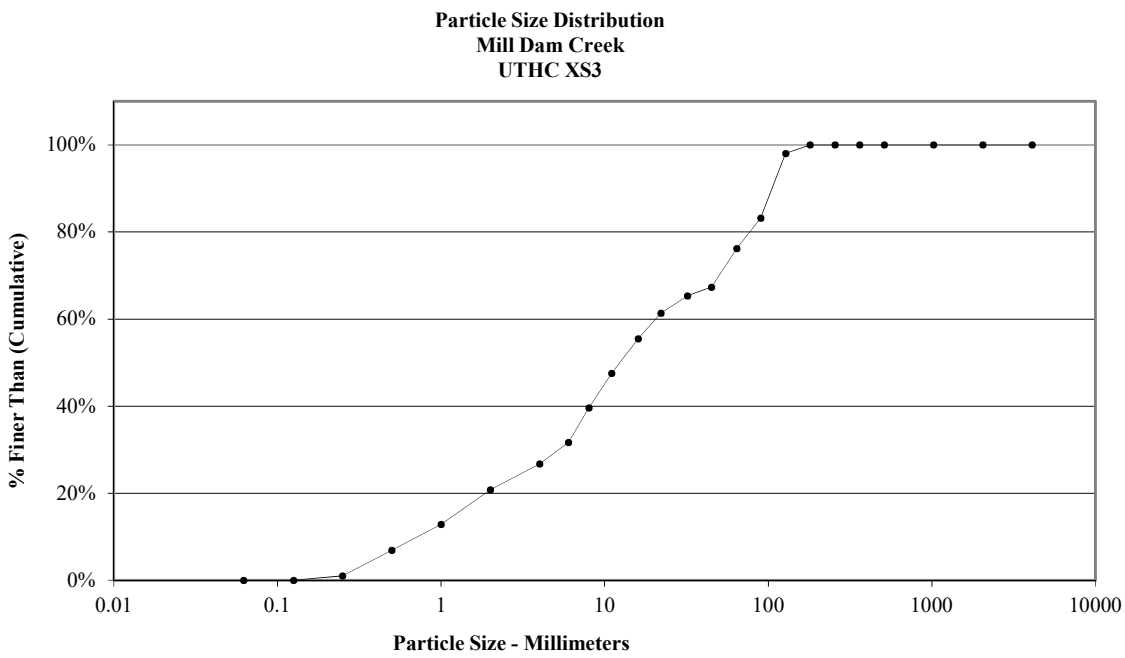
Size (mm)	
D16	1.3
D35	18
D50	37
D65	60
D84	97
D95	130

Size Distribution	
mean	11.2
dispersion	15.5
skewness	-0.38

Type	
silt/clay	4%
sand	16%
gravel	47%
cobble	33%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

UTHC XS3			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	
Very Fine	.062 - .125	S	
Fine	.125 - .25	A	1
Medium	.25 - .50	N	6
Coarse	.50 - 1	D	6
Very Coarse	1 - 2	S	8
Very Fine	2 - 4		6
Fine	4 - 5.7	G	5
Fine	5.7 - 8	R	8
Medium	8 - 11.3	A	8
Medium	11.3 - 16	V	8
Coarse	16 - 22.6	E	6
Coarse	22.6 - 32	L	4
Very Coarse	32 - 45	S	2
Very Coarse	45 - 64		9
Small	64 - 90	C	7
Small	90 - 128	O	15
Large	128 - 180	B	2
Large	180 - 256	L	
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		Total	101

Note:



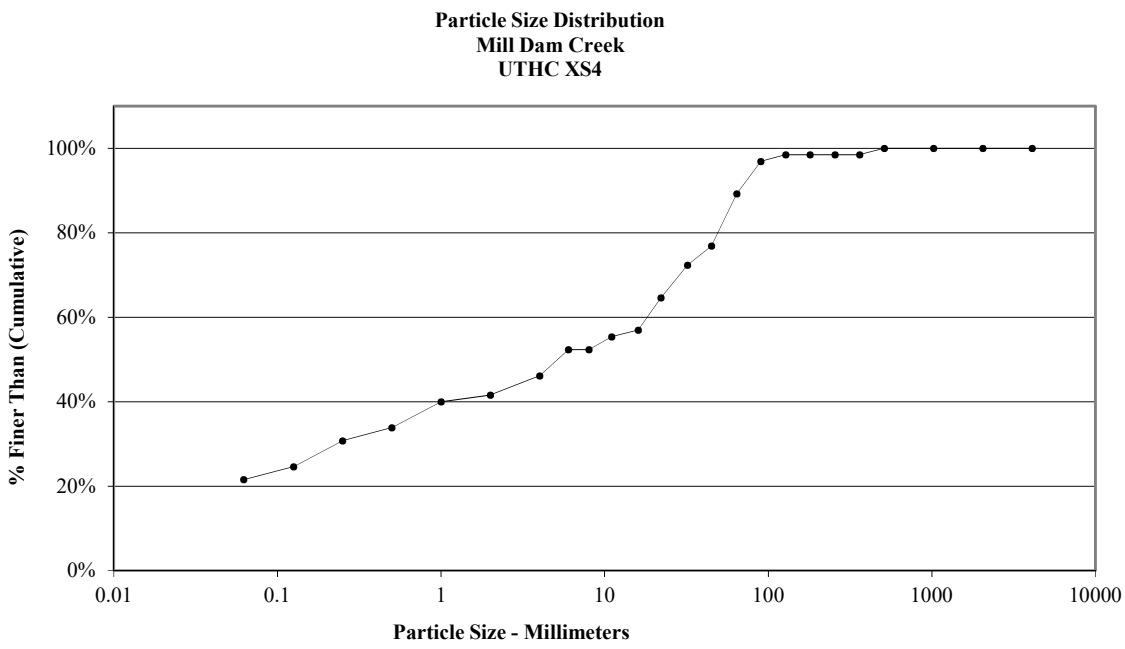
Size (mm)	
D16	1.3
D35	6.8
D50	12
D65	31
D84	92
D95	120

Size Distribution	
mean	10.9
dispersion	8.4
skewness	-0.03

Type	
silt/clay	0%
sand	21%
gravel	55%
cobble	24%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

UTHC XS4			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	14
Very Fine	.062 - .125	S	2
Fine	.125 - .25	A	4
Medium	.25 - .50	N	2
Coarse	.50 - 1	D	4
Very Coarse	1 - 2	S	1
Very Fine	2 - 4		3
Fine	4 - 5.7	G	4
Fine	5.7 - 8	R	
Medium	8 - 11.3	A	2
Medium	11.3 - 16	V	1
Coarse	16 - 22.6	E	5
Coarse	22.6 - 32	L	5
Very Coarse	32 - 45	S	3
Very Coarse	45 - 64		8
Small	64 - 90	C	5
Small	90 - 128	O	1
Large	128 - 180	B	
Large	180 - 256	L	
Small	256 - 362	B	
Small	362 - 512	L	1
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	34
		Total	99

Note:



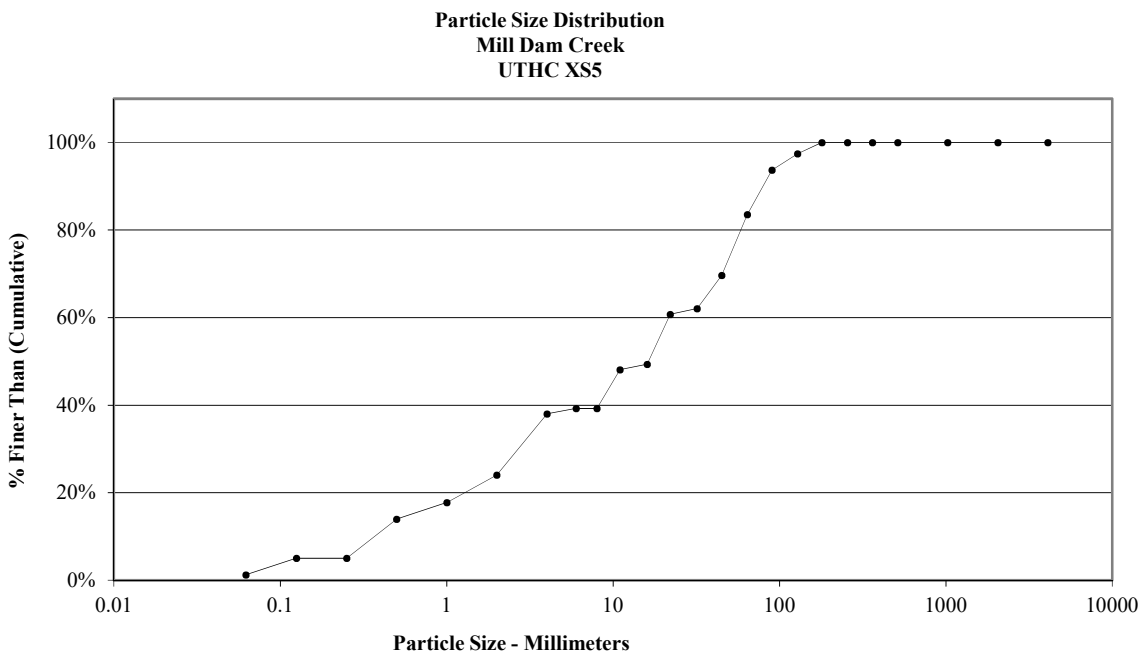
Size (mm)	
D16	0.062
D35	0.57
D50	5.2
D65	22
D84	55
D95	83

Size Distribution	
mean	0.1
dispersion	2.2
skewness	0.18

Type	
silt/clay	14%
sand	13%
gravel	31%
cobble	6%
boulder	1%
bedrock	34%
hardpan	0%
wood/det	0%
artificial	0%

UTHC XS5			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	1
Very Fine	.062 - .125	S	3
Fine	.125 - .25	A	
Medium	.25 - .50	N	7
Coarse	.50 - 1	D	3
Very Coarse	1 - 2	S	5
Very Fine	2 - 4		11
Fine	4 - 5.7	G	1
Fine	5.7 - 8	R	
Medium	8 - 11.3	A	7
Medium	11.3 - 16	V	1
Coarse	16 - 22.6	E	9
Coarse	22.6 - 32	L	1
Very Coarse	32 - 45	S	6
Very Coarse	45 - 64		11
Small	64 - 90	C	8
Small	90 - 128	O	3
Large	128 - 180	B	2
Large	180 - 256	L	
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	26
		Total	105

Note:



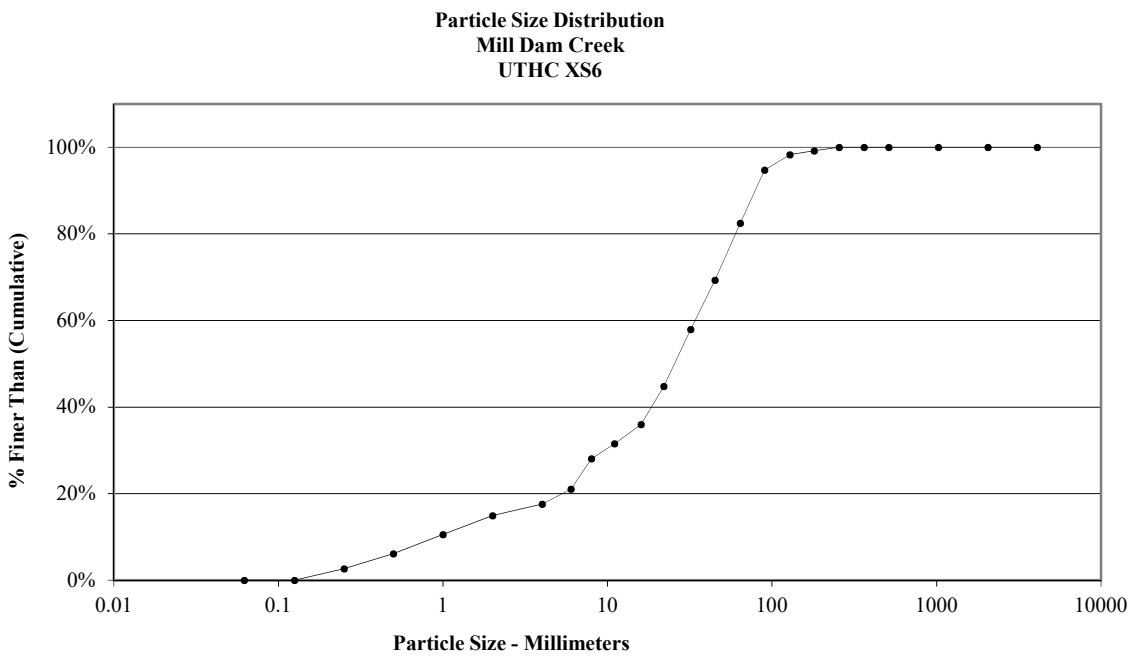
Size (mm)	
D16	0.73
D35	3.4
D50	16
D65	37
D84	65
D95	100

Size Distribution	
mean	6.9
dispersion	13.0
skewness	-0.26

Type	
silt/clay	1%
sand	17%
gravel	45%
cobble	12%
boulder	0%
bedrock	25%
hardpan	0%
wood/det	0%
artificial	0%

UTHC XS6			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	
Very Fine	.062 - .125	S	
Fine	.125 - .25	A	3
Medium	.25 - .50	N	4
Coarse	.50 - 1	D	5
Very Coarse	1 - 2	S	5
Very Fine	2 - 4		3
Fine	4 - 5.7	G	4
Fine	5.7 - 8	R	8
Medium	8 - 11.3	A	4
Medium	11.3 - 16	V	5
Coarse	16 - 22.6	E	10
Coarse	22.6 - 32	L	15
Very Coarse	32 - 45	S	13
Very Coarse	45 - 64		15
Small	64 - 90	C	14
Small	90 - 128	O	4
Large	128 - 180	B	1
Large	180 - 256	L	1
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		Total	114

Note:



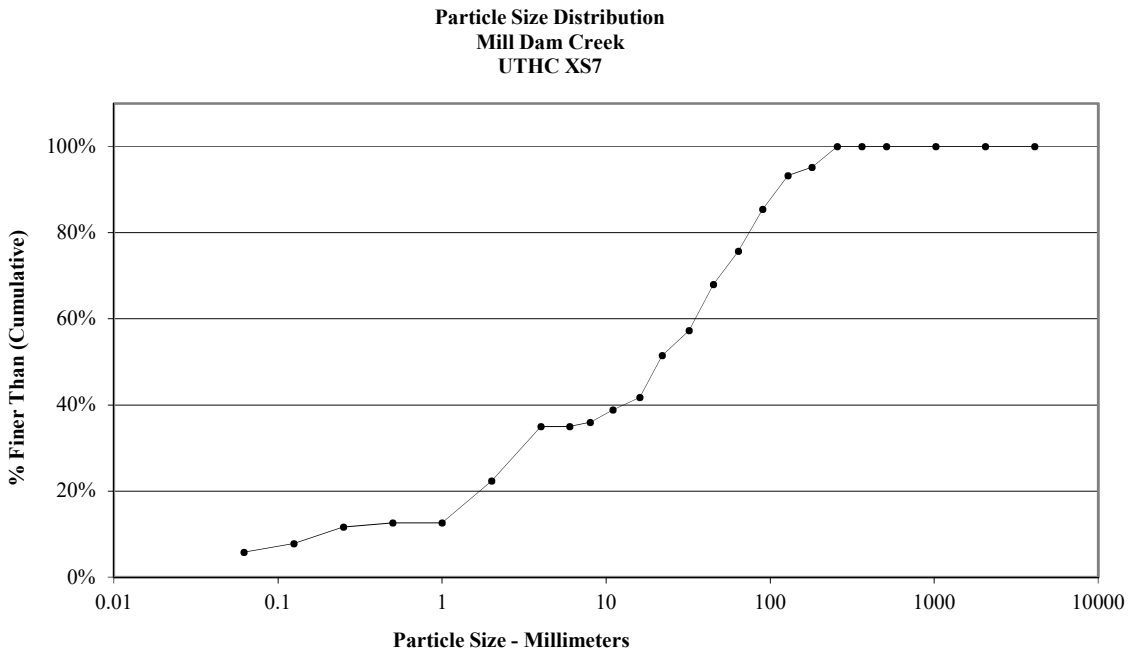
Size (mm)	
D16	2.7
D35	15
D50	26
D65	40
D84	67
D95	92

Size Distribution	
mean	13.4
dispersion	6.1
skewness	-0.24

Type	
silt/clay	0%
sand	15%
gravel	68%
cobble	18%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

UTHC XS7			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	6
Very Fine	.062 - .125	S	2
Fine	.125 - .25	A	4
Medium	.25 - .50	N	1
Coarse	.50 - 1	D	
Very Coarse	1 - 2	S	10
Very Fine	2 - 4		13
Fine	4 - 5.7	G	
Fine	5.7 - 8	R	1
Medium	8 - 11.3	A	3
Medium	11.3 - 16	V	3
Coarse	16 - 22.6	E	10
Coarse	22.6 - 32	L	6
Very Coarse	32 - 45	S	11
Very Coarse	45 - 64		8
Small	64 - 90	C	10
Small	90 - 128	O	8
Large	128 - 180	B	2
Large	180 - 256	L	5
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	14
		Total	117

Note:



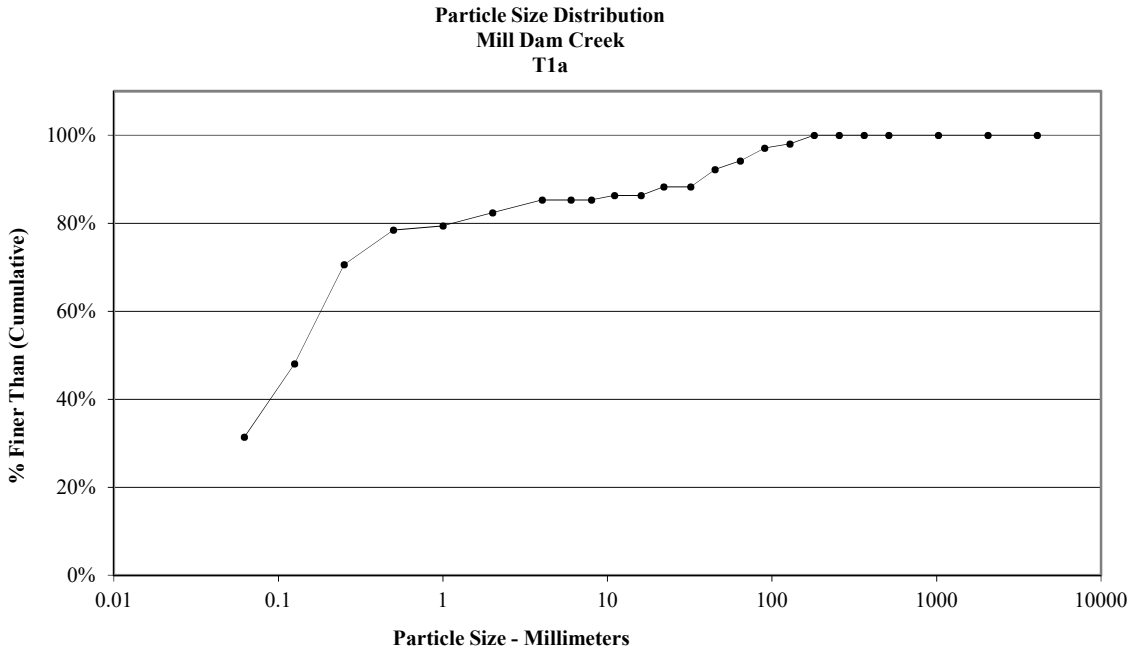
Size (mm)	
D16	1.3
D35	6.1
D50	21
D65	41
D84	86
D95	180

Size Distribution	
mean	10.6
dispersion	10.1
skewness	-0.22

Type	
silt/clay	5%
sand	15%
gravel	47%
cobble	21%
boulder	0%
bedrock	12%
hardpan	0%
wood/det	0%
artificial	0%

T1a			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	32
Very Fine	.062 - .125	S	17
Fine	.125 - .25	A	23
Medium	.25 - .50	N	8
Coarse	.50 - 1	D	1
Very Coarse	1 - 2	S	3
Very Fine	2 - 4		3
Fine	4 - 5.7	G	
Fine	5.7 - 8	R	
Medium	8 - 11.3	A	1
Medium	11.3 - 16	V	
Coarse	16 - 22.6	E	2
Coarse	22.6 - 32	L	
Very Coarse	32 - 45	S	4
Very Coarse	45 - 64		2
Small	64 - 90	C	3
Small	90 - 128	O	1
Large	128 - 180	B	2
Large	180 - 256	L	
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		Total	102

Note:



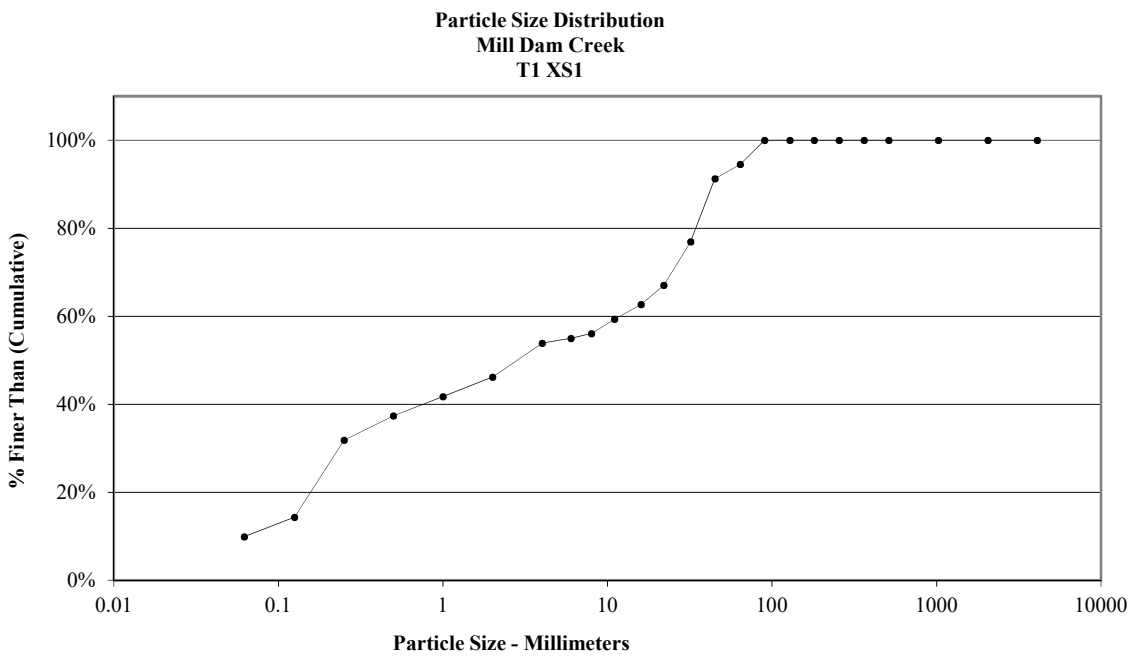
Size (mm)	
D16	0.062
D35	0.072
D50	0
D65	0.21
D84	2.9
D95	71

Size Distribution	
mean	0.4
dispersion	12.2
skewness	0.40

Type	
silt/clay	31%
sand	51%
gravel	12%
cobble	6%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

T1 XS1			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	9
Very Fine	.062 - .125	S	4
Fine	.125 - .25	A	16
Medium	.25 - .50	N	5
Coarse	.50 - 1	D	4
Very Coarse	1 - 2	S	4
Very Fine	2 - 4		7
Fine	4 - 5.7	G	1
Fine	5.7 - 8	R	1
Medium	8 - 11.3	A	3
Medium	11.3 - 16	V	3
Coarse	16 - 22.6	E	4
Coarse	22.6 - 32	L	9
Very Coarse	32 - 45	S	13
Very Coarse	45 - 64		3
Small	64 - 90	C	5
Small	90 - 128	O	
Large	128 - 180	B	
Large	180 - 256	L	
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		Total	91

Note:



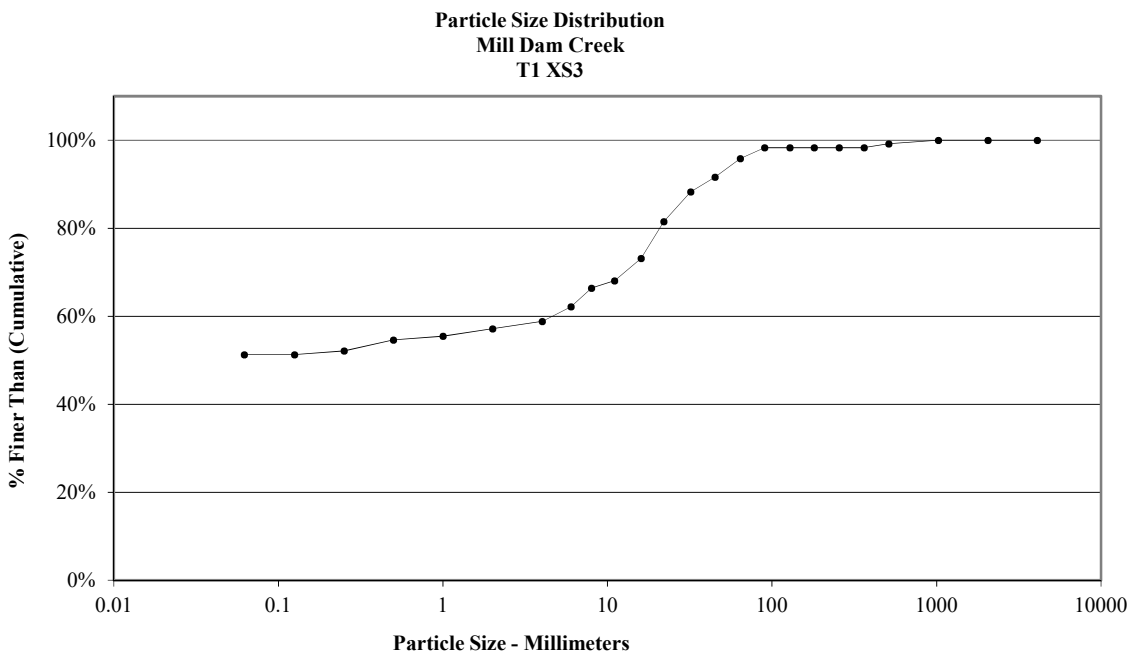
Size (mm)	
D16	0.13
D35	0.37
D50	3
D65	19
D84	38
D95	66

Size Distribution	
mean	2.2
dispersion	17.6
skewness	-0.06

Type	
silt/clay	10%
sand	36%
gravel	48%
cobble	5%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

T1 XS3			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	61
Very Fine	.062 - .125	S	
Fine	.125 - .25	A	1
Medium	.25 - .50	N	3
Coarse	.50 - 1	D	1
Very Coarse	1 - 2	S	2
Very Fine	2 - 4		2
Fine	4 - 5.7	G	4
Fine	5.7 - 8	R	5
Medium	8 - 11.3	A	2
Medium	11.3 - 16	V	6
Coarse	16 - 22.6	E	10
Coarse	22.6 - 32	L	8
Very Coarse	32 - 45	S	4
Very Coarse	45 - 64		5
Small	64 - 90	C	3
Small	90 - 128	O	
Large	128 - 180	B	
Large	180 - 256	L	
Small	256 - 362	B	
Small	362 - 512	L	1
Medium	512 - 1024	D	1
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		Total	119

Note:



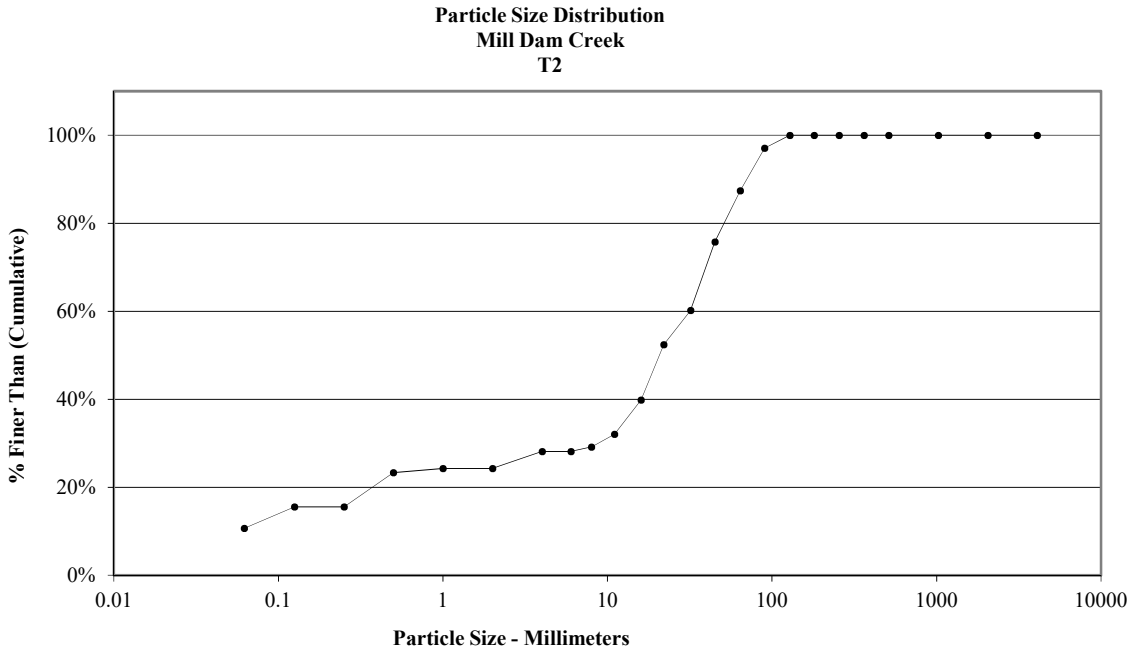
Size (mm)	
D16	0.062
D35	0.062
D50	0
D65	7.3
D84	25
D95	60

Size Distribution	
mean	1.2
dispersion	202.1
skewness	0.81

Type	
silt/clay	51%
sand	6%
gravel	39%
cobble	3%
boulder	2%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

T2			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	11
Very Fine	.062 - .125	S	5
Fine	.125 - .25	A	
Medium	.25 - .50	N	8
Coarse	.50 - 1	D	1
Very Coarse	1 - 2	S	
Very Fine	2 - 4		4
Fine	4 - 5.7	G	
Fine	5.7 - 8	R	1
Medium	8 - 11.3	A	3
Medium	11.3 - 16	V	8
Coarse	16 - 22.6	E	13
Coarse	22.6 - 32	L	8
Very Coarse	32 - 45	S	16
Very Coarse	45 - 64		12
Small	64 - 90	C	10
Small	90 - 128	O	3
Large	128 - 180	B	
Large	180 - 256	L	
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		Total	103

Note:



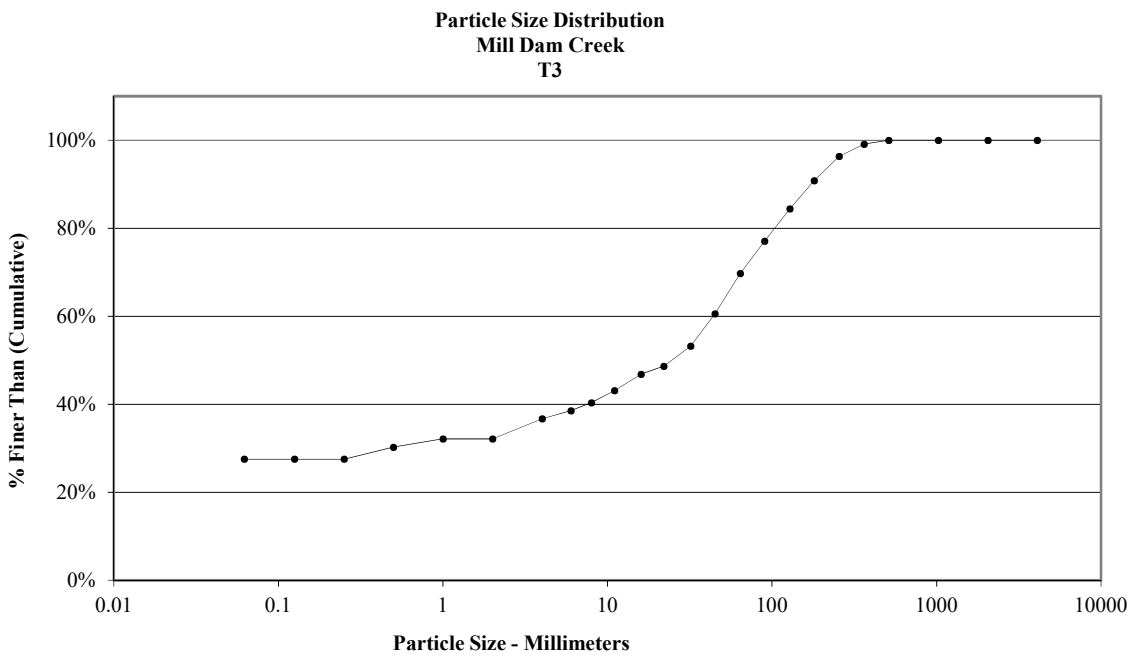
Size (mm)	
D16	0.26
D35	13
D50	21
D65	36
D84	58
D95	84

Size Distribution	
mean	3.9
dispersion	41.8
skewness	-0.48

Type	
silt/clay	11%
sand	14%
gravel	63%
cobble	13%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

T3			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	30
Very Fine	.062 - .125	S	
Fine	.125 - .25	A	
Medium	.25 - .50	N	3
Coarse	.50 - 1	D	2
Very Coarse	1 - 2	S	
Very Fine	2 - 4		5
Fine	4 - 5.7	G	2
Fine	5.7 - 8	R	2
Medium	8 - 11.3	A	3
Medium	11.3 - 16	V	4
Coarse	16 - 22.6	E	2
Coarse	22.6 - 32	L	5
Very Coarse	32 - 45	S	8
Very Coarse	45 - 64		10
Small	64 - 90	C	8
Small	90 - 128	O	8
Large	128 - 180	B	7
Large	180 - 256	L	6
Small	256 - 362	B	3
Small	362 - 512	L	1
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		Total	109

Note:



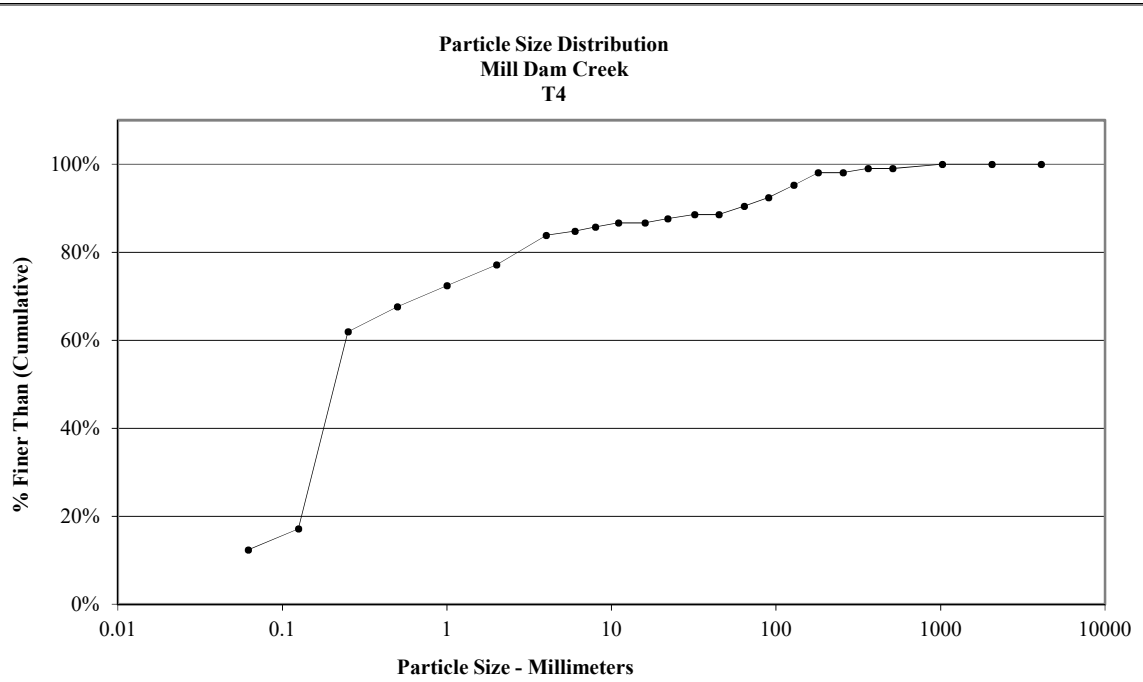
Size (mm)	
D16	0.062
D35	3.1
D50	25
D65	53
D84	130
D95	240

Size Distribution	
mean	2.8
dispersion	204.2
skewness	-0.52

Type	
silt/clay	28%
sand	5%
gravel	38%
cobble	27%
boulder	4%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

T4			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	13
Very Fine	.062 - .125	S	5
Fine	.125 - .25	A	47
Medium	.25 - .50	N	6
Coarse	.50 - 1	D	5
Very Coarse	1 - 2	S	5
Very Fine	2 - 4		7
Fine	4 - 5.7	G	1
Fine	5.7 - 8	R	1
Medium	8 - 11.3	A	1
Medium	11.3 - 16	V	
Coarse	16 - 22.6	E	1
Coarse	22.6 - 32	L	1
Very Coarse	32 - 45	S	
Very Coarse	45 - 64		2
Small	64 - 90	C	2
Small	90 - 128	O	3
Large	128 - 180	B	3
Large	180 - 256	L	
Small	256 - 362	B	1
Small	362 - 512	L	
Medium	512 - 1024	D	1
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		Total	105

Note:



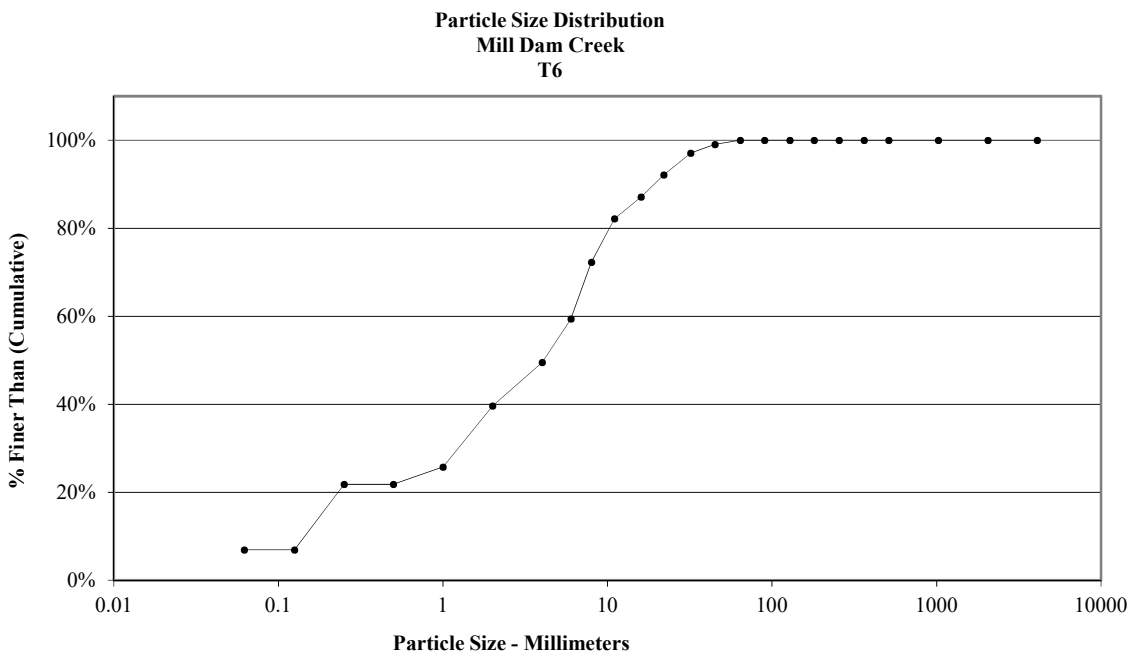
Size (mm)	
D16	0.11
D35	0.16
D50	0
D65	0.36
D84	4.3
D95	120

Size Distribution	
mean	0.7
dispersion	11.2
skewness	0.41

Type	
silt/clay	12%
sand	65%
gravel	13%
cobble	8%
boulder	2%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

T6			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	7
Very Fine	.062 - .125	S	
Fine	.125 - .25	A	15
Medium	.25 - .50	N	
Coarse	.50 - 1	D	4
Very Coarse	1 - 2	S	14
Very Fine	2 - 4		10
Fine	4 - 5.7	G	10
Fine	5.7 - 8	R	13
Medium	8 - 11.3	A	10
Medium	11.3 - 16	V	5
Coarse	16 - 22.6	E	5
Coarse	22.6 - 32	L	5
Very Coarse	32 - 45	S	2
Very Coarse	45 - 64		1
Small	64 - 90	C	
Small	90 - 128	O	
Large	128 - 180	B	
Large	180 - 256	L	
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		Total	101

Note:



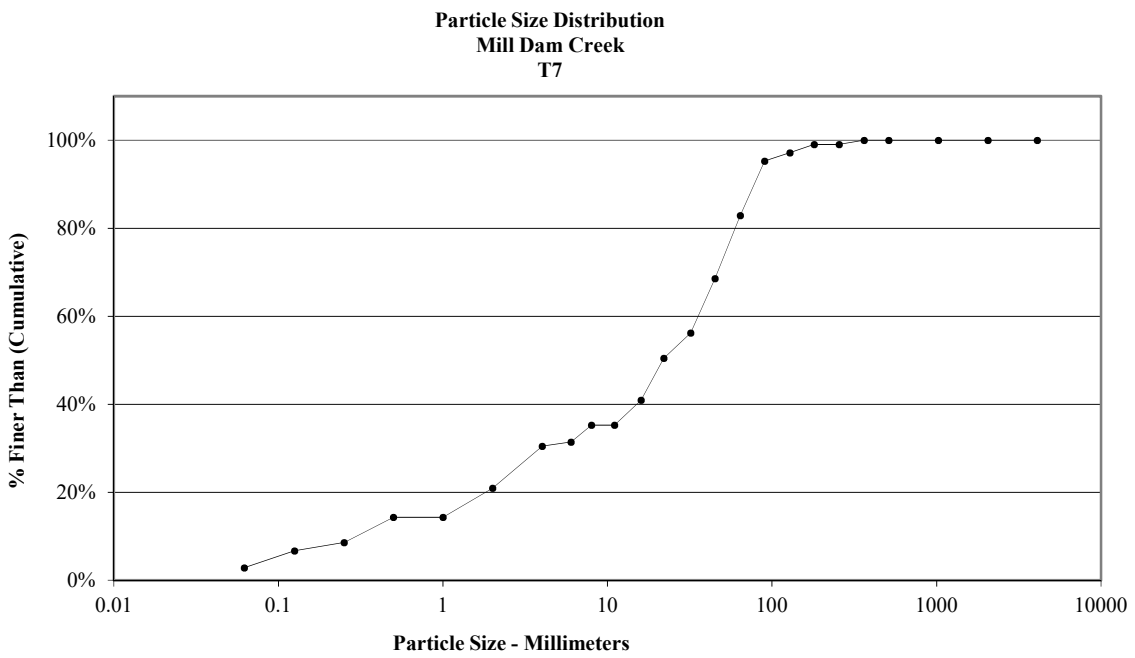
Size (mm)	
D16	0.19
D35	1.6
D50	4
D65	6.8
D84	13
D95	27

Size Distribution	
mean	1.6
dispersion	12.4
skewness	-0.31

Type	
silt/clay	7%
sand	33%
gravel	60%
cobble	0%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

T7			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	3
Very Fine	.062 - .125	S	4
Fine	.125 - .25	A	2
Medium	.25 - .50	N	6
Coarse	.50 - 1	D	
Very Coarse	1 - 2	S	7
Very Fine	2 - 4		10
Fine	4 - 5.7	G	1
Fine	5.7 - 8	R	4
Medium	8 - 11.3	A	
Medium	11.3 - 16	V	6
Coarse	16 - 22.6	E	10
Coarse	22.6 - 32	L	6
Very Coarse	32 - 45	S	13
Very Coarse	45 - 64		15
Small	64 - 90	C	13
Small	90 - 128	O	2
Large	128 - 180	B	2
Large	180 - 256	L	
Small	256 - 362	B	1
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		Total	105

Note:



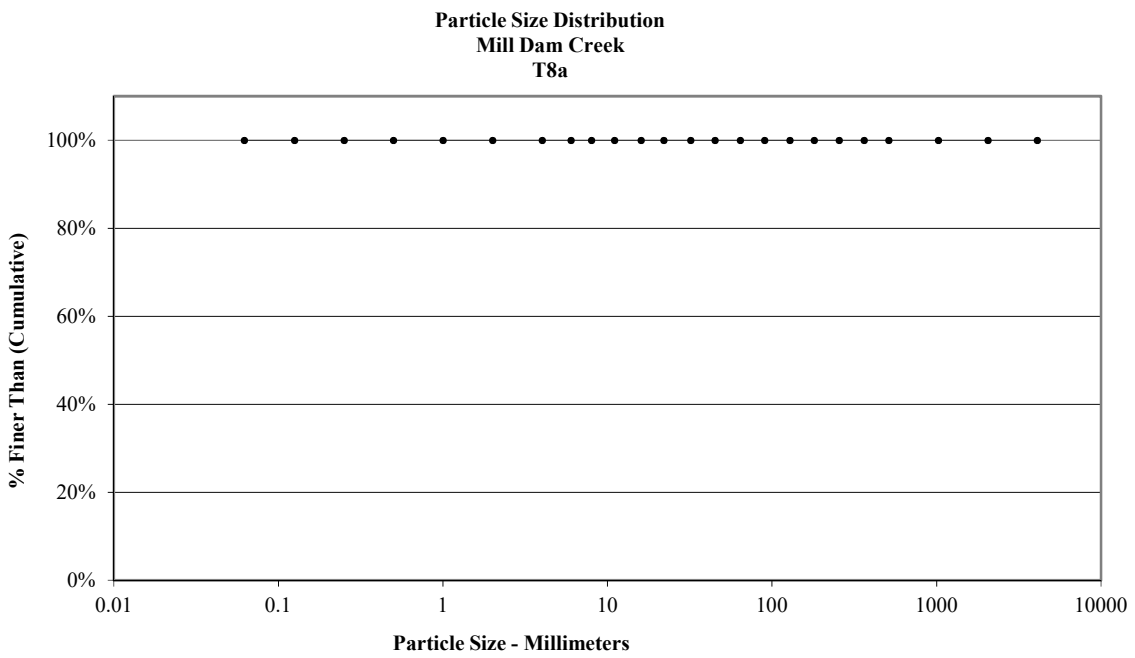
Size (mm)	
D16	1.2
D35	7.9
D50	22
D65	41
D84	66
D95	89

Size Distribution	
mean	8.9
dispersion	10.7
skewness	-0.30

Type	
silt/clay	3%
sand	18%
gravel	62%
cobble	16%
boulder	1%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

T8a			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	100
Very Fine	.062 - .125	S	
Fine	.125 - .25	A	
Medium	.25 - .50	N	
Coarse	.50 - 1	D	
Very Coarse	1 - 2	S	
Very Fine	2 - 4		
Fine	4 - 5.7	G	
Fine	5.7 - 8	R	
Medium	8 - 11.3	A	
Medium	11.3 - 16	V	
Coarse	16 - 22.6	E	
Coarse	22.6 - 32	L	
Very Coarse	32 - 45	S	
Very Coarse	45 - 64		
Small	64 - 90	C	
Small	90 - 128	O	
Large	128 - 180	B	
Large	180 - 256	L	
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		Total	100

Note:



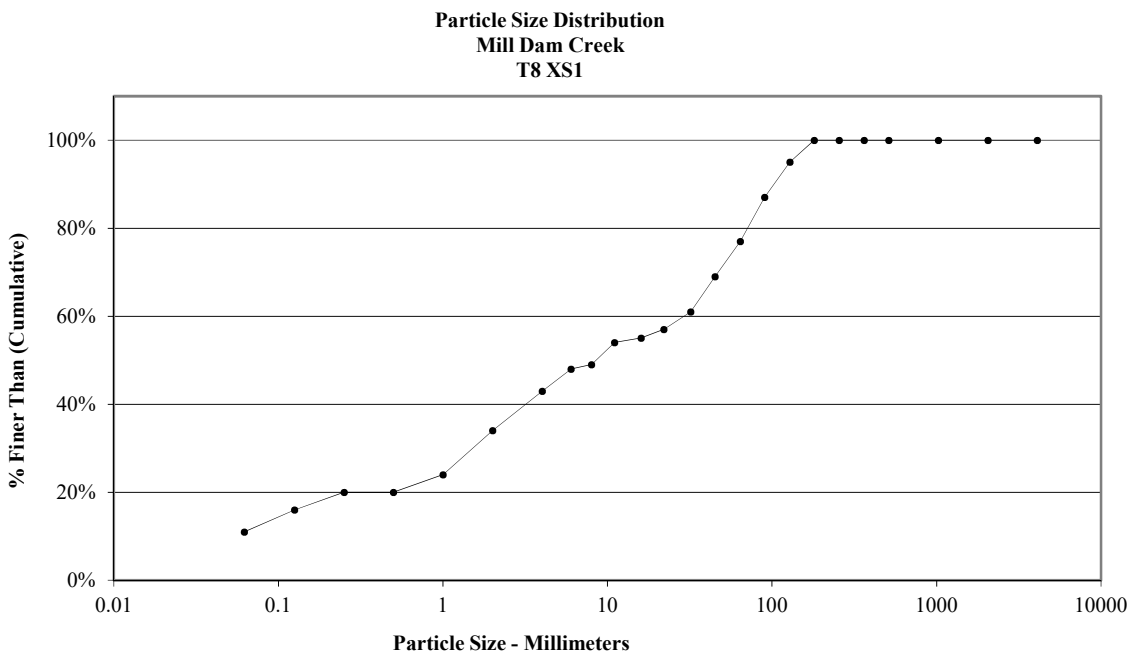
Size (mm)	
D16	0.062
D35	0.062
D50	0.062
D65	0.062
D84	0.062
D95	0.062

Size Distribution	
mean	0.1
dispersion	1.0
skewness	---

Type	
silt/clay	100%
sand	0%
gravel	0%
cobble	0%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

T8 XS1			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	11
Very Fine	.062 - .125	S	5
Fine	.125 - .25	A	4
Medium	.25 - .50	N	
Coarse	.50 - 1	D	4
Very Coarse	1 - 2	S	10
Very Fine	2 - 4		9
Fine	4 - 5.7	G	5
Fine	5.7 - 8	R	1
Medium	8 - 11.3	A	5
Medium	11.3 - 16	V	1
Coarse	16 - 22.6	E	2
Coarse	22.6 - 32	L	4
Very Coarse	32 - 45	S	8
Very Coarse	45 - 64		8
Small	64 - 90	C	10
Small	90 - 128	O	8
Large	128 - 180	B	5
Large	180 - 256	L	
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		Total	100

Note:



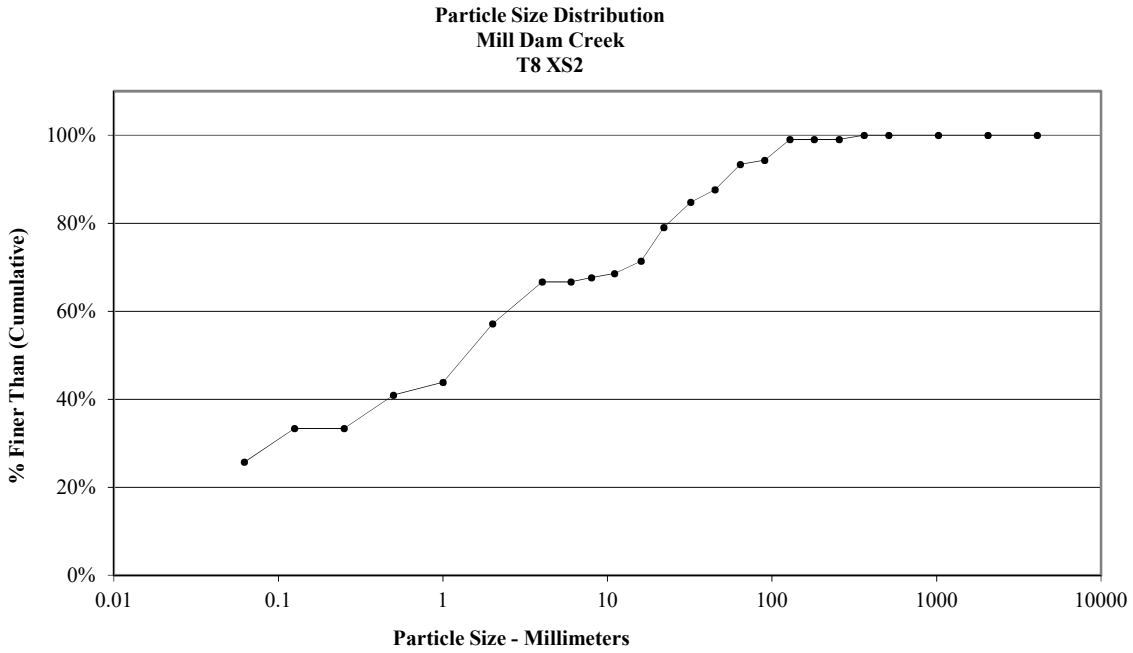
Size (mm)	
D16	0.13
D35	2.2
D50	9
D65	38
D84	81
D95	140

Size Distribution	
mean	3.2
dispersion	37.5
skewness	-0.25

Type	
silt/clay	11%
sand	23%
gravel	43%
cobble	23%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

T8 XS2			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	27
Very Fine	.062 - .125	S	8
Fine	.125 - .25	A	
Medium	.25 - .50	N	8
Coarse	.50 - 1	D	3
Very Coarse	1 - 2	S	14
Very Fine	2 - 4		10
Fine	4 - 5.7	G	
Fine	5.7 - 8	R	1
Medium	8 - 11.3	A	1
Medium	11.3 - 16	V	3
Coarse	16 - 22.6	E	8
Coarse	22.6 - 32	L	6
Very Coarse	32 - 45	S	3
Very Coarse	45 - 64		6
Small	64 - 90	C	1
Small	90 - 128	O	5
Large	128 - 180	B	
Large	180 - 256	L	
Small	256 - 362	B	1
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		Total	105

Note:



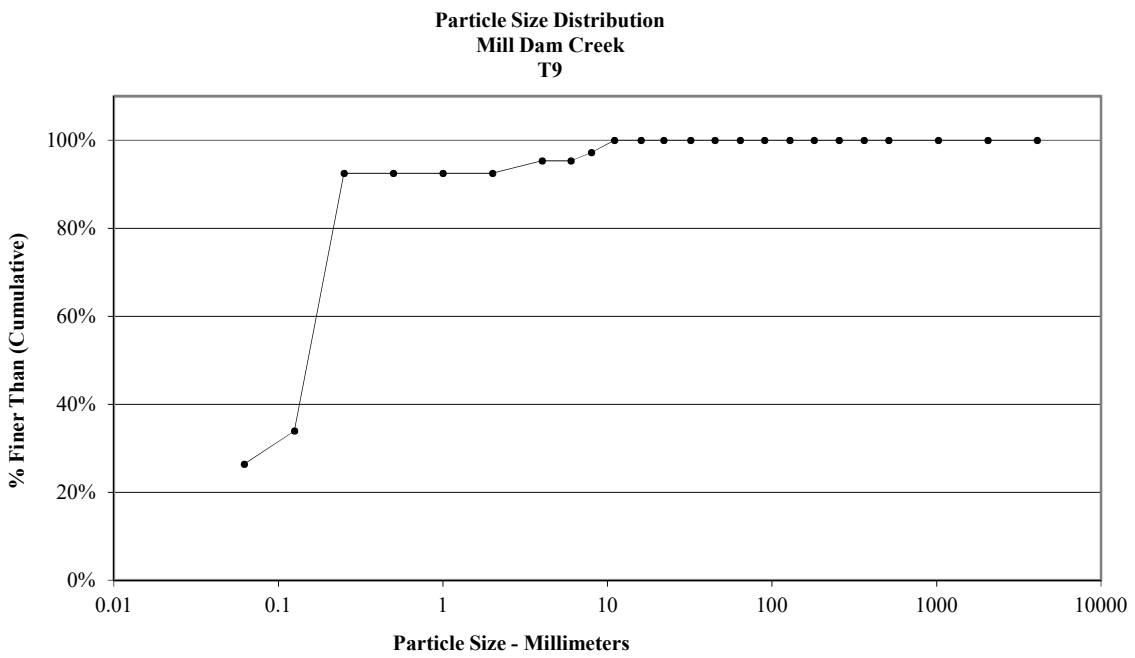
Size (mm)	
D16	0.062
D35	0.29
D50	1
D65	3.5
D84	30
D95	95

Size Distribution	
mean	1.4
dispersion	22.0
skewness	-0.01

Type	
silt/clay	26%
sand	31%
gravel	36%
cobble	6%
boulder	1%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

T9			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	28
Very Fine	.062 - .125	S	8
Fine	.125 - .25	A	62
Medium	.25 - .50	N	
Coarse	.50 - 1	D	
Very Coarse	1 - 2	S	
Very Fine	2 - 4		3
Fine	4 - 5.7	G	
Fine	5.7 - 8	R	2
Medium	8 - 11.3	A	3
Medium	11.3 - 16	V	
Coarse	16 - 22.6	E	
Coarse	22.6 - 32	L	
Very Coarse	32 - 45	S	
Very Coarse	45 - 64		
Small	64 - 90	C	
Small	90 - 128	O	
Large	128 - 180	B	
Large	180 - 256	L	
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		Total	106

Note:



Size (mm)	
D16	0.062
D35	0.13
D50	0
D65	0.18
D84	0.23
D95	3.7

Size Distribution	
mean	0.1
dispersion	2.0
skewness	-0.13

Type	
silt/clay	26%
sand	66%
gravel	8%
cobble	0%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Point / Side BAR-BULK MATERIALS SAMPLE DATA: Size Distribution Analysis

Party: A. French, T. Seelinger, R. Jones

Location: Mill Dam Creek

Date: Dec-2016

Notes: Located at UTHC-XS6

SUB SAMPLES

	Sieve Size (mm)		Sieve Size (mm)		Sieve Size (mm)		Sieve Size (mm)		Sieve Size (mm)		Sieve Size (mm)		Sieve Size (mm)		Sieve Size (mm)		Sieve Size (mm)		Sieve Size (mm)	
	< 1.0		1.0		2.0		4.0		8.0		16.0		31.5		63.0					
	Tare Weight (kg)		Tare Weight (kg)		Tare Weight (kg)		Tare Weight (kg)		Tare Weight (kg)		Tare Weight (kg)		Tare Weight (kg)		Tare Weight (kg)		Tare Weight (kg)		Tare Weight (kg)	
	0.91		0.91		1.25		1.30		1.79		1.36		1.36		1.30					
	Sample Weights		Sample Weights		Sample Weights		Sample Weights		Sample Weights		Sample Weights		Sample Weights		Sample Weights		Sample Weights		Sample Weights	
	Total	Net	Total	Net	Total	Net	Total	Net	Total	Net	Total	Net	Total	Net	Total	Net	Total	Net	Total	Net
1	2.2	1.3	1.5	0.6	1.9	0.6	2.2	0.9	2.7	0.9	3.4	2.1	5.1	3.7	2.9	1.6				
2																				
3																				
4																				
5																				
6																				
7																				
8																				
9																				
10																				
11																				
12																				
13																				
14																				
15																				
Net Wt. Total	1.3			0.6		0.6		0.9		0.9		2.1		3.7		1.6		0.0		0.0
% Grand Tot.	11.4%			4.9%		5.4%		7.3%		7.5%		17.8%		31.9%		13.9%		0.0%		0.0%
Accum. % =<	11.4%		→	16.3%	→	21.7%	→	29.0%	→	36.5%	→	54.3%	→	86.1%	→	100.0%	→	100.0%	→	100.0%

11.6

GRAND TOTAL SAMPLE WEIGHT

SURFACE MATERIALS DATA
(Two Largest Particles)

No.	Dia.	WT.
1	22mm	0.028 kg
2	28mm	0.028 kg

Bucket + Materials Weight_____

Bucket Tare Weight_____

Materials Weight_____
(Materials less than: _____mm.)

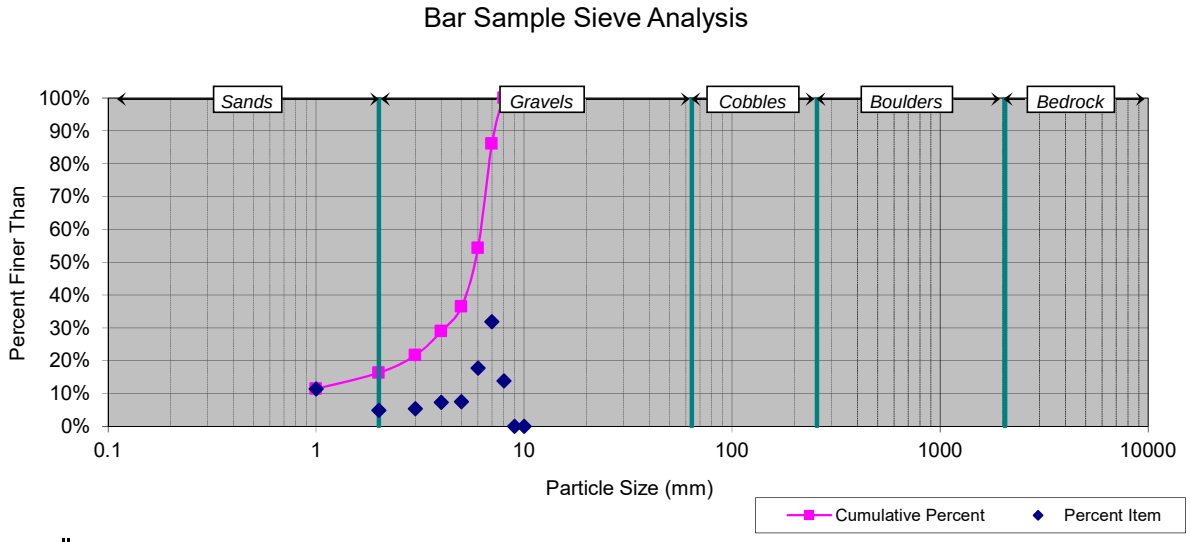
Be Sure to Add Separate Material Weights to Grand Total

NOTES

Bar Sample Sieve Analysis

Smallest Sieve Passed (mm)	Weight (oz)	% Item	Percent Finer Than
<1	1.3322	11.4%	11.4%
1.0	0.6	4.9%	16.3%
2.0	0.6	5.4%	21.7%
4.0	0.9	7.3%	29.0%
8.0	0.9	7.5%	36.5%
16.0	2.1	17.8%	54.3%
31.5	3.7	31.9%	86.1%
63.0	1.6	13.9%	100.0%
0.0	0.0	0.0%	100.0%
0.0	0.0	0.0%	100.0%
Total:	11.6	100%	

Stream:	Mill Dam Creek
Watershed:	
Location:	UTHC-XS6
Note:	Pavement Sample # 2 (0-6 inches)



Size percent less than (mm)					Percent by substrate type					
D16	D35	D50	D84	D95	silt/clay	sand	gravel	cobble	boulder	bedrock
7.0	7.0	13.6	30.1	49.1	0%	22%	78%	0%	---	---

Point / Side BAR-BULK MATERIALS SAMPLE DATA: Size Distribution Analysis

Party: A. French, T. Seelinger, R. Jones

Location: Mill Dam Creek | Date: Dec-2016 | Notes: Located at UTHC-XS7

SUB SAMPLES

	Sieve Size (mm)		Sieve Size (mm)		Sieve Size (mm)		Sieve Size (mm)		Sieve Size (mm)		Sieve Size (mm)		Sieve Size (mm)		Sieve Size (mm)		Sieve Size (mm)		Sieve Size (mm)	
	< 1.0		1.0		2.0		4.0		8.0		16.0		31.5		63.0					
	Tare Weight (kg)		Tare Weight (kg)		Tare Weight (kg)		Tare Weight (kg)		Tare Weight (kg)		Tare Weight (kg)		Tare Weight (kg)		Tare Weight (kg)		Tare Weight (kg)		Tare Weight (kg)	
	1.08		0.91		1.25		1.30		1.79		1.36		1.36		1.30					
	Sample Weights		Sample Weights		Sample Weights		Sample Weights		Sample Weights		Sample Weights		Sample Weights		Sample Weights		Sample Weights		Sample Weights	
	Total	Net	Total	Net	Total	Net	Total	Net	Total	Net	Total	Net	Total	Net	Total	Net	Total	Net	Total	Net
1	1.6	0.5	1.3	0.4	1.7	0.4	2.4	1.1	2.6	0.8	3.1	1.8	5.0	3.6	5.3	4.0				
2																				
3																				
4																				
5																				
6																				
7																				
8																				
9																				
10																				
11																				
12																				
13																				
14																				
15																				
Net Wt. Total	0.5			0.4		0.4		1.1		0.8		1.8		3.6		4.0		0.0		0.0
% Grand Tot.	3.8%			3.4%		3.4%		8.8%		6.3%		14.0%		28.6%		31.8%		0.0%		0.0%
Accum. % =<	3.8%	→		7.2%	→	10.6%	→	19.4%	→	25.7%	→	39.6%	→	68.2%	→	100.0%	→	100.0%	→	100.0%

12.6

GRAND TOTAL SAMPLE WEIGHT

SURFACE MATERIALS DATA
(Two Largest Particles)

No.	Dia.	WT.
1	22mm	0.028 kg
2	28mm	0.028 kg

Bucket + Materials Weight_____

Bucket Tare Weight_____

Materials Weight_____
(Materials less than: _____mm.)

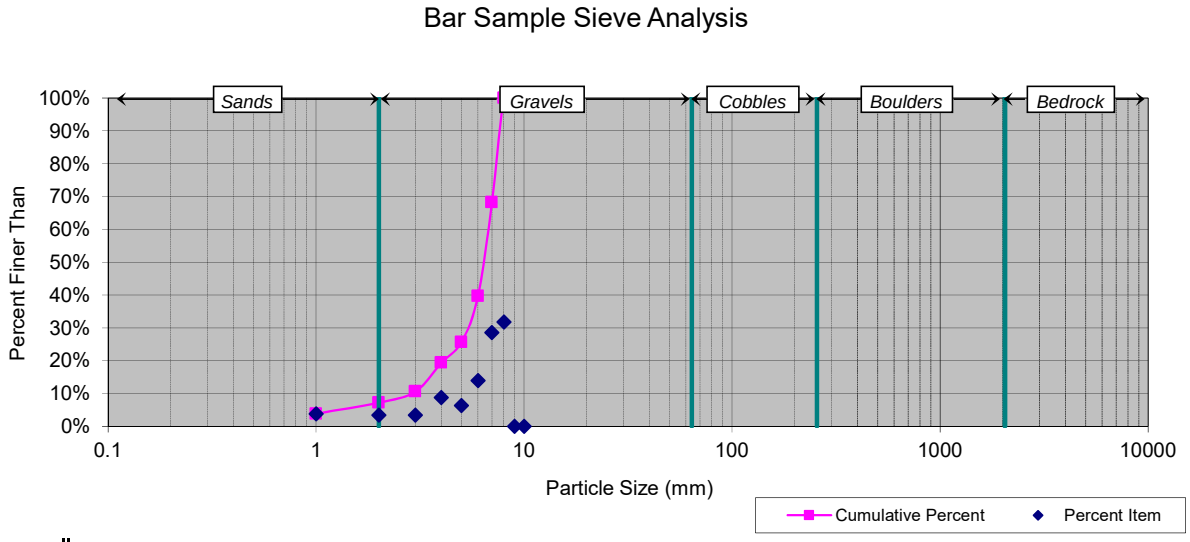
Be Sure to Add Separate Material Weights to Grand Total

NOTES

Bar Sample Sieve Analysis

Smallest Sieve Passed (mm)	Weight (oz)	% Item	Percent Finer Than
<1	0.4819	3.8%	3.8%
1.0	0.4	3.4%	7.2%
2.0	0.4	3.4%	10.6%
4.0	1.1	8.8%	19.4%
8.0	0.8	6.3%	25.7%
16.0	1.8	14.0%	39.6%
31.5	3.6	28.6%	68.2%
63.0	4.0	31.8%	100.0%
0.0	0.0	0.0%	100.0%
0.0	0.0	0.0%	100.0%
Total:	12.6	100%	

Stream:	Mill Dam Creek
Watershed:	
Location:	UTHC-XS7
Note:	Pavement Sample # 3 (0-6 inches)



Size percent less than (mm)					Percent by substrate type					
D16	D35	D50	D84	D95	silt/clay	sand	gravel	cobble	boulder	bedrock
3.1	12.7	20.4	44.4	56.5	0%	11%	89%	0%	---	---

Morphological Criteria

Variables		Existing Channel													Reference for UTHC	Stable Design Ratios 'C' stream	Stable Design Ratios 'Bc'stream	Restored Reach												
		UTHC1	UTHC3	T1	T1A	T2	T3	T4	T6	T6A	T7	T8	T8A	T9	UTFR			UTHC1 (top)	UTHC1 (bottom)	UTHC3	T1	T1A	T2	T3	T4	T6	T6A	T7	T8	T8A	T9
Stream Type (Rosgen)		F4, C4, B4	F4	B4, C4, G4	F4	G4	G4	B4	G4	**	G4	G4	G4	B4	B4c	C4	B4c	C4	C4	C4	C4b	C4b	C4b	C4b	C4b	C4b	C4b	C4b	C4b	C4b	C4b
Drainage Area (mi^2)		0.18	0.46	0.07	0.04	0.02	0.01	0.01	0.03	0.01	0.06	0.03	0.01	0.04	0.38	~	~	0.08	0.18	0.46	0.07	0.04	0.02	0.01	0.01	0.03	0.01	0.06	0.03	0.01	0.04
Bankfull Width (W_{bkf}) (ft)		5.8 - 10.6	8.5-14.1	4.1 - 7.5	7.1	3.1	3.5	2.5	4.4	**	3.2	3.6	3.1	2.9	9.0 -- 10.0	~	~	6.5	9	12	6.5	5.5	4.5	4.5	4.5	5.5	4.5	6.5	5.5	4.5	5.5
Bankfull Mean Depth (D_{bkf}) (ft)		0.4 - 0.8	0.8-1.6	0.5 - 0.7	0.4	0.5	0.3	0.3	0.6	**	0.8	0.7	0.3	0.7	1.1 -- 1.2	~	~	0.5	0.7	0.9	0.5	0.5	0.4	0.4	0.4	0.5	0.4	0.5	0.5	0.4	0.5
Bankfull Cross-Sectional Area (A_{bkf}) (ft^2)		2.8 - 4.5	8.5-12.5	2.7 - 3.8	2.8	1.5	1.1	0.7	2.6	**	2.4	2.4	1	2	10.4 -- 10.7	~	~	3.4	6.1	11.4	3.4	2.5	1.7	1.7	1.7	2.5	1.7	3.4	2.5	1.7	2.5
Width / Depth Ratio (W_{bkf}/ D_{bkf})		7.6 - 28.2	5-17	6.2 - 14.9	18.2	6.3	11.3	9.4	7.5	**	4.1	5.5	5.5	4.3	8.0 -- 10.0	10 -- 15	12 -- 18	12.4	13.4	12.7	12.4	12.1	12	12	12	12.1	12	12.4	12.1	12	12.1
Maximum Depth (d_{mbkf}) (ft)		0.4 - 1.2	1.1-2.0	0.8 - 1.0	0.5	0.8	0.4	0.4	0.7	**	1.1	0.9	0.9	0.9	1.3 -- 1.5	~	~	0.8	1	1.5	0.8	0.7	0.6	0.6	0.6	0.7	0.6	0.8	0.7	0.6	0.7
Width of Flood Prone Area (W_{fpa}) (ft)		9.0 - 27.3	17.1	6.0 - 32.8	7.7	4	4.2	4.7	5.4	**	4.6	4.1	4.1	5.5	13 -- 21	~	~	50	50	68	35	35	22	18	16	24	24	28	25	20	22
Entrenchment Ratio (ER)		1.2 - 2.6	1.2	1.5 - 4.4	1.1	1.3	1.2	1.9	1.2	**	1.4	1.1	1.1	1.9	1.3 -- 2.3	>2.5	>2.2	7.7	5.6	5.7	5.4	6.4	4.9	4	3.6	4.4	5.3	4.3	4.5	4.4	4
Sinuosity (stream length/valley length) (K)		1.2	1.2	1.1	1.1	1.1	1.1	1.0	1.0	**	1.1	1.1	1.1		1.2	1.2 -- 1.4	1.1 -- 1.3	1.2		1.2	1.1	1.1	1.1	1.1	1.0	1.1	1.1	1.1	1.1	1.1	1.1
Dimension	Pool Mean Depth (ft)	*	*	*	*	*	*	*	*	**	*	*	*	*	1.2 -- 1.4	~	~	0.9	1.2	1.6	0.9	0.8	0.7	0.7	0.7	0.8	0.7	0.9	0.8	0.7	0.8
	Riffle Mean Depth (ft) (Dbkf)	0.4 - 0.8	0.8-1.6	0.5 - 0.7	0.4	0.5	0.3	0.3	0.6	**	0.8	0.7	0.3	0.7	1.1 -- 1.2	~	~	0.5	0.7	0.9	0.5	0.5	0.4	0.4	0.4	0.5	0.4	0.5	0.5	0.4	0.5
	Pool Width (ft)	*	*	*	*	*	*	*	*	**	*	*	*	*	8.4 -- 11.6	~	~	9.1	12.6	16.8	9.1	7.7	6.3	6.3	6.3	7.7	6.3	9.1	7.7	6.3	7.7
	Riffle Width (ft)	5.8 - 10.6	8.5-14.1	4.1 - 7.5	7.1	3.1	3.5	2.5	4.4	**	3.2	3.6	3.1	2.9	90. -- 9.9	~	~	6.5	9	12	6.5	5.5	4.5	4.5	4.5	5.5	4.5	6.5	5.5	4.5	5.5
	Pool XS Area (sf)	*	*	*	*	*	*	*	*	**	*	*	*	*	11.6 -- 13.4	~	~	8.6	14.9	27.7	8.6	6.4	4.5	4.5	4.5	6.4	4.5	8.6	6.4	4.5	6.4
	Riffle XS Area (sf)	2.8 - 4.5	8.5-12.5	2.7 - 3.8	2.8	1.5	1.1	0.7	2.6	**	2.4	2.4	1	2	10.4 -- 10.7	~	~	3.4	6.1	11.4	3.4	2.5	1.7	1.7	1.7	2.5	1.7	3.4	2.5	1.7	2.5
	Pool Width / Riffle Width	*	*	*	*	*	*	*	*	**	*	*	*	*	0.8 -- 1.3	1.2 -- 1.7	1.1 -- 1.5	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
	Pool Max Depth / D_{bkf}	*	*	*	*	*	*	*	*	**	*	*	*	*	2.1 -- 2.4	1.5 -- 3.5	2.0 -- 3.5	3.2	2.9	3.1	3.2	2.8	3	3	3	2.8	3	3.2	2.8	3	2.8
	Bank Height Ratio	1.0 - 10.4	2.7-3.2	1.0 - 4.5	19.6	3.3	5.5	6.9	4.4	**	1.7	2.5	2.7	1.7	1.0	1.0 -- 1.1	1.0 -- 1.1	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
	Mean Bankfull Velocity (V) (fps)	3.8 - 5.1	3.7-5.1	3.6 - 4.9	3.4	4.7	4.4	5.2	3.9	**	5.3	5.5	3.8	4.9	4.1 -- 4.5	3.5 -- 5.0	4.0 -- 6.0	4.3	4.6	4.6	4.4	4.2	4.5	5.3	7.3	4.5	6.6	4.2	5.2	4.6	5
	Bankfull Discharge (Q) (cfs)	11 -- 16	51	13 -- 14	9.5	6.3	4.8	3.4	10	**	13	13.4	3.7	9.7	42 -- 46	~	~	14.6	28	51.9	14.8	10.5	7.7	9.1 ***	, ga	11.2	11.4	14.3	12.9****	7.9***	12.4**
Pattern	Radius of Curvature (Rc) (ft)	*	*	*	*	*	*	*	*	**	*	*	*	*	13 -- 42	~	~	18 - 27	18 - 27	24 - 36	15 - 22	15 - 22	Na	Na	Na	Na	Na	15 - 22	Na	Na	Na
	Belt Width (Wblt) (ft)	*	*	*	*	*	*	*	*	**	*	*	*	*	45	~	~	26 - 49	36 - 61	39 - 57	23 - 41	20 - 28	Na	Na	Na	Na	Na	Na	20 - 24	Na	Na	24
	Meander Length (Lm) (ft)	*	*	*	*	*	*	*	*	**	*	*	*	*	93 -- 136	~	~	84 - 125	54 - 118	111 - 173	60 - 83	72 - 84	Na	Na	Na	Na	Na	85 - 88	Na	Na	Na
	Radius of Curvature / Bankfull Width	*	*	*	*	*	*	*	*	**	*	*	*	*	1.3 -- 4.4	2 -- 3	Na	2.8 - 4.1	2.0 - 3.0	2.0 - 3.0	2.3 - 3.4	2.3 - 3.4	Na	Na	Na	Na	Na	2.3 - 3.4	Na	Na	Na
	Meander Width Ratio (Wblt / Wbkf)	*	*	*	*	*	*	*	*	**	*	*	*	*	4.5 -- 5.0	3.5 -- 8	Na	4.0 - 7.5	4.0 - 6.8	3.3 - 4.8	3.5 - 6.3	3.6 - 5.1	Na	Na	Na	Na	Na	3.1 - 3.7	Na	Na	Na
	Meander Length / Bankfull Width	*	*	*	*	*	*	*	*	**	*	*	*	*	9.0 -- 15.0	7 -- 14	Na	12.9 - 19.2	6.0 - 13.1	9.3 - 14.4	8.2 - 11.4	11.1 - 12.9	Na	Na	Na	Na	Na	13.1 - 13.5	Na	Na	Na
Profile	Valley slope	0.028	0.017	0.028	0.039	0.049	0.06	0.12	0.042	**	0.03	0.045	0.051	0.013	0.016	0.005 - 0.015	0.005 - 0.015	0.028	0.025	0.017	0.029	0.032	0.046	0.065	0.118	0.038	0.098	0.026	0.05	0.047	0.045
	Average water surface slope	0.021	0.014	0.026	0.022	0.038	0.059	0.089	0.041	**	0.033	0.044	0.052	0.039	0.013	~	~	0.025	0.021	0.015	0.026	0.03	0.042	0.059	0.113	0.034	0.091	0.024	0.045	0.044	0.042
	Riffle slope	0.024 - 0.033	0.015	0.019 - 0.028	0.025	0.04	0.058	0.1	0.02	**	0.032	0.041	0.044	0.031	0.013 - 0.028	~	~	0.018 - 0.046	0.022 - 0.038	0.007 - 0.032	0.015 - 0.060	0.020 - 0.062	0.024 - 0.063	0.051 - 0.074	0.102 - 0.103	0.020 - 0.053	0.087 - 0.099	0.017 - 0.043	0.043 - 0.050	0.019 - 0.052	0.037
	Pool slope	*	*	*	*	*	*	*	*	**	*	*	*	*	0 -- 0.001	~	~	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Pool to pool spacing	*	*	*	*	*	*	*	*	**	*	*	*	*	30 -- 59	~	~	48 - 70	51 - 66	52 - 101	25 - 63	32 - 58	21 - 34	20 - 30	24 - 27	32 - 47	22 - 23	36 - 57	32 - 45	28 -- 38	34 - 36
	Arc length	*	*	*	*	*	*	*	*	**	*	*	*	*	3 -- 25	~	~	16 - 32	14 - 35	19 - 51	10-21	12-29	Na	Na	Na	Na	Na	11-18	Na	Na	Na
	Riffle Slope / Avg. Water Surface Slope	1.1 - 1.6	1.1	0.7 - 1.1	1.1	1.1	1.0	1.1	0.5	**	1.0	0.9	0.8	0.8	1.0 -- 2.2	1.2 -- 1.5	1.1 -- 1.8	0.7 - 1.8	1.0 - 1.7	0.5 - 2.1	0.6 - 2.3	0.7 - 2.1	0.6 - 1.5	0.9 - 1.3	0.90	0.6 - 1.6	1.0 - 1.1	0.7 - 1.8	1.0 - 1.1	0.4 - 1.2	0.90
	Pool Slope / Avg. Water Surface Slope	*	*	*	*	*	*	*	*	**	*	*	*	*	0	0 -- 0.2	0 -- 0.4	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Pool to Pool Spacing / Bankfull Width	*	*	*	*	*	*	*	*	**	*	*	*	*	3.3 -- 6.0	3.5 -- 7.0	1.5 -- 6.0	7.4 - 10.8	5.6 - 7.3	4.3 - 8.4	3.9 - 9.7	5.8 - 10.5	4.7 - 7.6	4.4 - 6.7	5.3 - 6.0	5.8 - 8.5	4.9 - 5.1	5.5 - 10.4	5.8 - 8.2	6.2 - 8.4	6.2 - 6.5

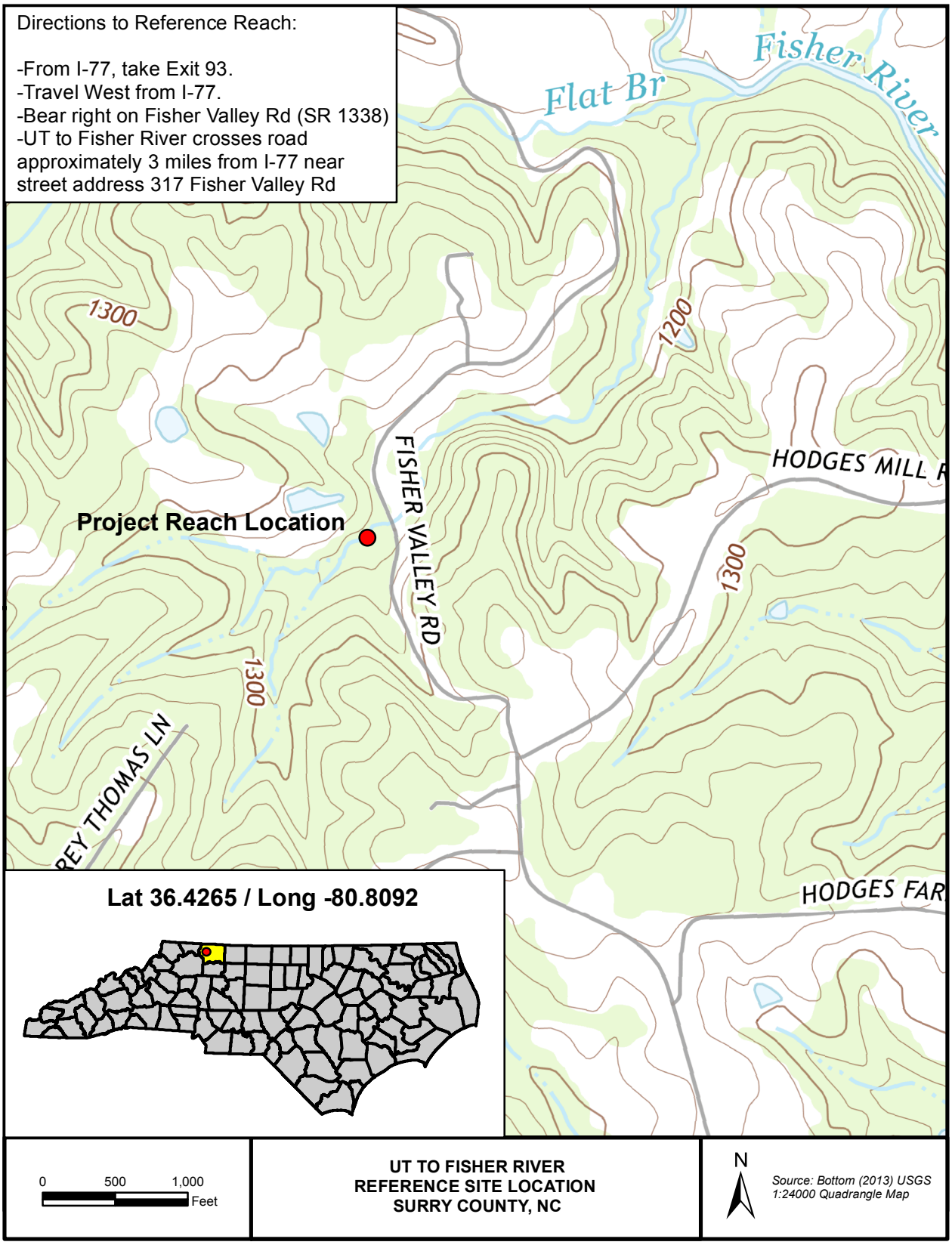
* : no data shown for pools in existing stream do to channelization / lack of bed diversity

** : no cross-section data collected (ponded area)

***: cross-section sized larger for constructability

****: cross-section sized larger than regional curve to match discharge on stable upstream cross-section

Na : not applicable for steeper step pool stream types

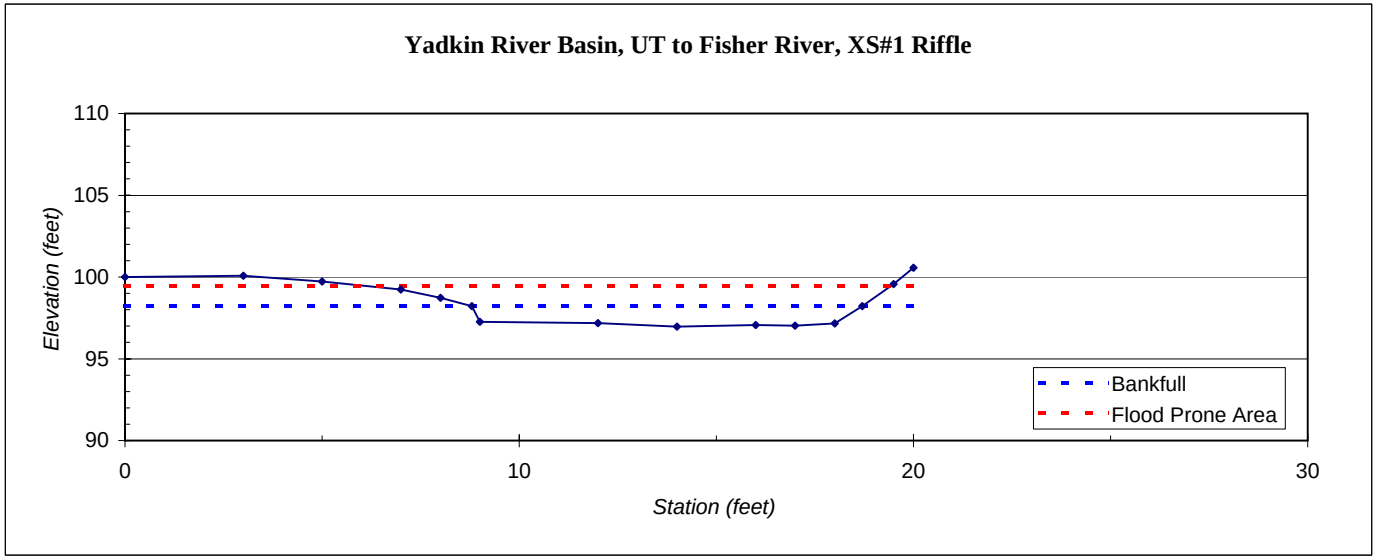

Directions to Reference Reach:
-From I-77, take Exit 93.
-Travel West from I-77.
-Bear right on Fisher Valley Rd (SR 1338)
-UT to Fisher River crosses road approximately 3 miles from I-77 near street address 317 Fisher Valley Rd
Flat Br
Fisher River
1300
1200
1300
1300
FISHER VALLEY RD
HODGES MILL R
Project Reach Location
REY THOMAS LN
HODGES FAR
Lat 36.4265 / Long -80.8092
0
500
1,000
Feet
UT TO FISHER RIVER
REFERENCE SITE LOCATION
SURRY COUNTY, NC
N
Source: Bottom (2013) USGS
1:24000 Quadrangle Map

River Basin:	Yadkin
Watershed:	UT to Fisher River
XS ID	XS#1 Riffle
Drainage Area (sq mi):	0.38
Date:	6/9/2005
Field Crew:	G. Mryncza, A. Spiller

Station	Rod Ht.	Elevation
0.0	2.22	100.00
3.0	2.15	100.07
5.0	2.50	99.72
7.0	2.98	99.24
8.0	3.49	98.73
8.8	4.00	98.22
9.0	4.96	97.26
12.0	5.03	97.19
14.0	5.25	96.97
16.0	5.16	97.06
17.0	5.20	97.02
18.0	5.06	97.16
18.7	4.00	98.22
19.5	2.65	99.57
20.0	1.66	100.56

SUMMARY DATA	
Bankfull Elevation:	98.22
Bankfull Cross-Sectional Area:	10.40
Bankfull Width:	10.00
Flood Prone Area Elevation:	99.47
Flood Prone Width:	13.10
Max Depth at Bankfull:	1.25
Mean Depth at Bankfull:	1.04
W / D Ratio:	9.6
Entrenchment Ratio:	1.30
Bank Height Ratio:	2.08
Slope (ft/ft):	0.013
Discharge (cfs)	42

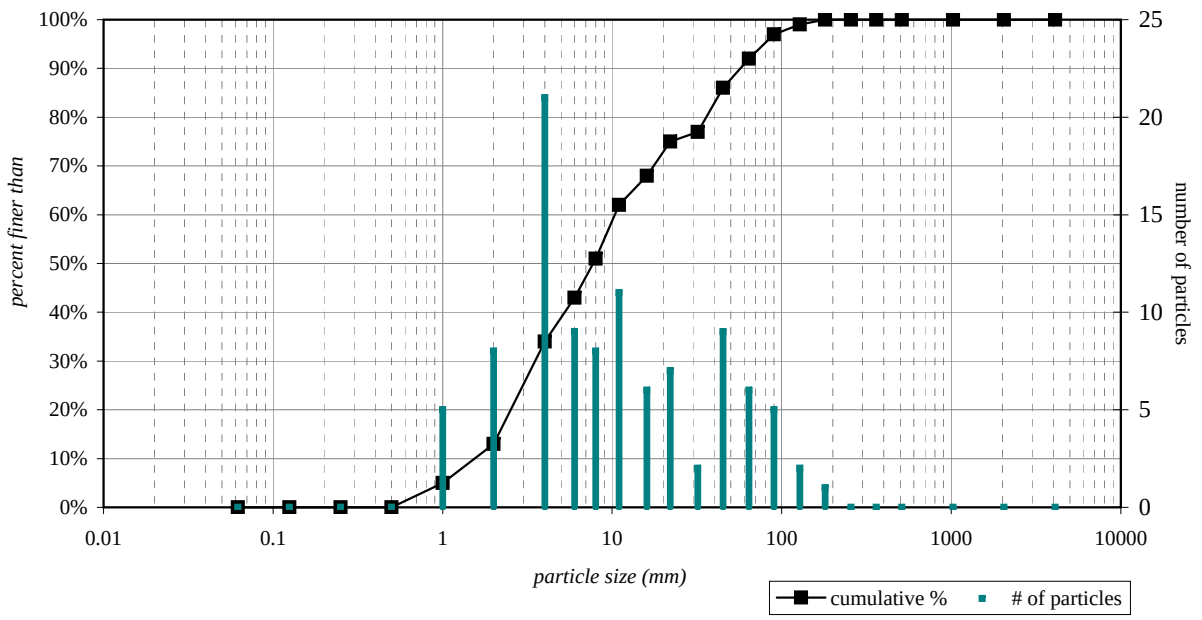
Stream Type:	B4c



Pebble Count

Material	Size Range (mm)		Count
silt/clay	0	0.062	**0**
very fine sand	0.062	0.13	**0**
fine sand	0.13	0.25	**0**
medium sand	0.25	0.5	**0**
coarse sand	0.5	1	**5**
very coarse sand	1	2	**8**
very fine gravel	2	4	**21**
fine gravel	4	6	**9**
fine gravel	6	8	**8**
medium gravel	8	11	**11**
medium gravel	11	16	**6**
coarse gravel	16	22	**7**
coarse gravel	22	32	**2**
very coarse gravel	32	45	**9**
very coarse gravel	45	64	**6**
small cobble	64	90	**5**
medium cobble	90	128	**2**
large cobble	128	180	**1**
very large cobble	180	256	**0**
small boulder	256	362	**0**
small boulder	362	512	**0**
medium boulder	512	1024	**0**
large boulder	1024	2048	**0**
very large boulder	2048	4096	**0**
		total particle count:	100

UT to Fsher River
Surry County, NC
Riffle #1 (Sta. 01+00)
Note:



bedrock		
clay hardpan		
detritus/wood		
artificial		
total count:	100	

based on sediment particles only	size percent less than (mm) D16	D35	D50	D65	D84	D95	particle size distribution gradation	geo mean	std dev
	2.208	4.18	7.7	13	42	79	4.5	9.6	4.3

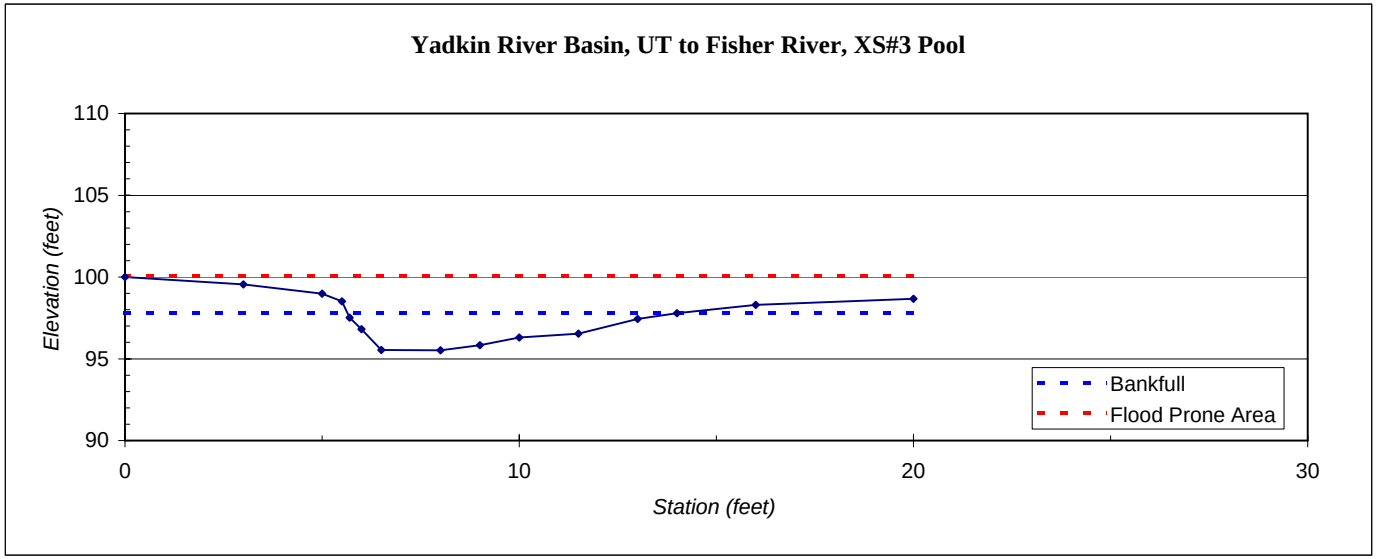
based on total count	percent by substrate type silt/clay	sand	gravel	cobble	boulder	bedrock	hardpan	wood/det	artificial
	0%	13%	79%	8%	0%	0%	0%	0%	0%

River Basin:	Yadkin
Watershed:	UT to Fisher River
XS ID	XS#3 Pool
Drainage Area (sq mi):	0.38
Date:	6/9/2005
Field Crew:	G. Mryncza, A. Spiller

Station	Rod Ht.	Elevation
0.0	1.33	100.00
3.0	1.78	99.55
5.0	2.35	98.98
5.5	2.82	98.51
5.7	3.81	97.52
6.0	4.52	96.81
6.5	5.79	95.54
8.0	5.82	95.51
9.0	5.50	95.83
10.0	5.02	96.31
11.5	4.80	96.53
13.0	3.90	97.43
14.0	3.55	97.78
16.0	3.03	98.30
20.0	2.66	98.67

SUMMARY DATA	
Bankfull Elevation:	97.78
Bankfull Cross-Sectional Area:	11.60
Bankfull Width:	8.35
Flood Prone Area Elevation:	100.05
Flood Prone Width:	
Max Depth at Bankfull:	2.27
Mean Depth at Bankfull:	1.39
W / D Ratio:	6.0
Entrenchment Ratio:	
Bank Height Ratio:	0.85
Slope (ft/ft):	0.001
Discharge (cfs)	52

Stream Type:	B4c

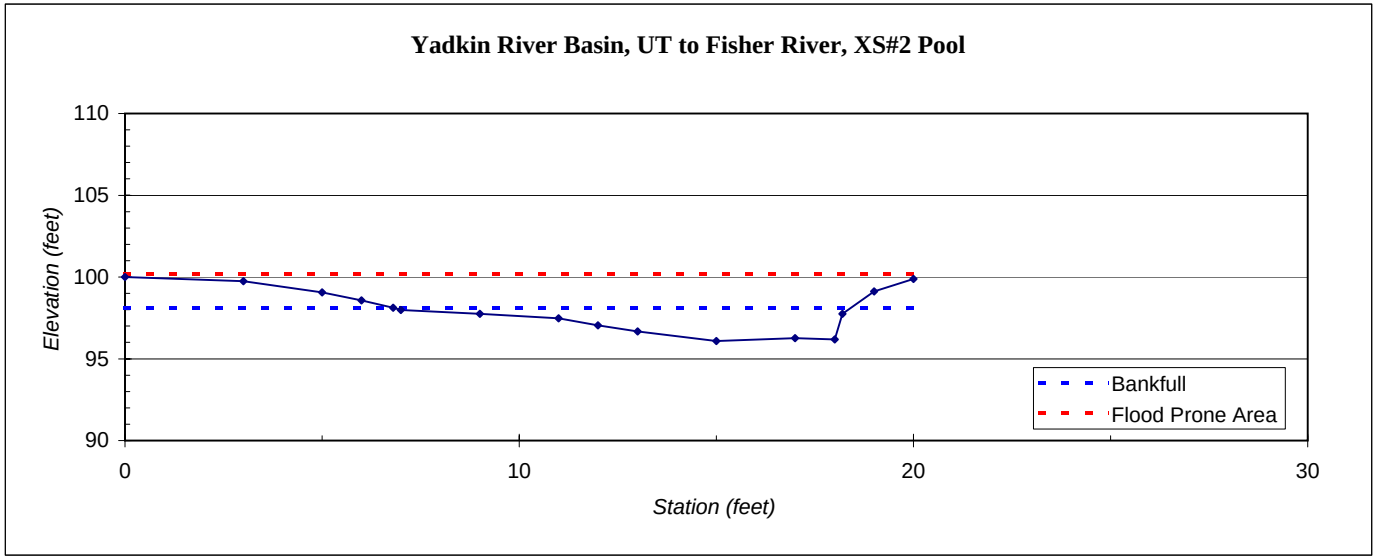


River Basin:	Yadkin
Watershed:	UT to Fisher River
XS ID	XS#2 Pool
Drainage Area (sq mi):	0.38
Date:	6/9/2005
Field Crew:	G. Mryncza, A. Spiller

Station	Rod Ht.	Elevation
0.0	2.68	100.00
3.0	2.94	99.74
5.0	3.61	99.07
6.0	4.10	98.58
6.8	4.56	98.12
7.0	4.70	97.98
9.0	4.94	97.74
11.0	5.21	97.47
12.0	5.64	97.04
13.0	6.00	96.68
15.0	6.59	96.09
17.0	6.42	96.26
18.0	6.50	96.18
18.2	4.93	97.75
19.0	3.56	99.12
20.0	2.80	99.88

SUMMARY DATA	
Bankfull Elevation:	98.12
Bankfull Cross-Sectional Area:	13.40
Bankfull Width:	11.62
Flood Prone Area Elevation:	100.15
Flood Prone Width:	
Max Depth at Bankfull:	2.03
Mean Depth at Bankfull:	1.15
W / D Ratio:	10.1
Entrenchment Ratio:	
Bank Height Ratio:	0.81
Slope (ft/ft):	0.001
Discharge (cfs)	56

Stream Type:	B4c

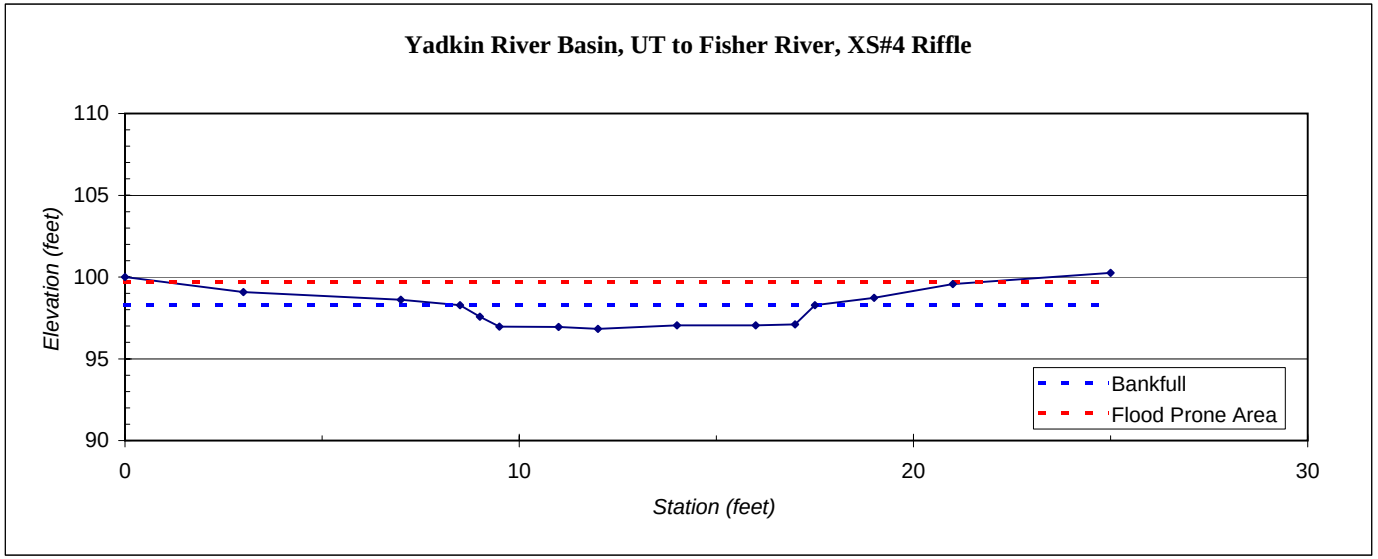


River Basin:	Yadkin
Watershed:	UT to Fisher River
XS ID	XS#4 Riffle
Drainage Area (sq mi):	0.38
Date:	6/9/2005
Field Crew:	G. Mryncza, A. Spiller

Station	Rod Ht.	Elevation
0.0	4.62	100.00
3.0	5.54	99.08
7.0	6.01	98.61
8.5	6.34	98.28
9.0	7.04	97.58
9.5	7.66	96.96
11.0	7.67	96.95
12.0	7.79	96.83
14.0	7.58	97.04
16.0	7.57	97.05
17.0	7.51	97.11
17.5	6.34	98.28
19.0	5.90	98.72
21.0	5.06	99.56
25.0	4.37	100.25

SUMMARY DATA	
Bankfull Elevation:	98.28
Bankfull Cross-Sectional Area:	10.70
Bankfull Width:	9.00
Flood Prone Area Elevation:	99.73
Flood Prone Width:	20.50
Max Depth at Bankfull:	1.45
Mean Depth at Bankfull:	1.19
W / D Ratio:	7.6
Entrenchment Ratio:	2.30
Bank Height Ratio:	1.00
Slope (ft/ft):	0.013
Discharge (cfs)	46

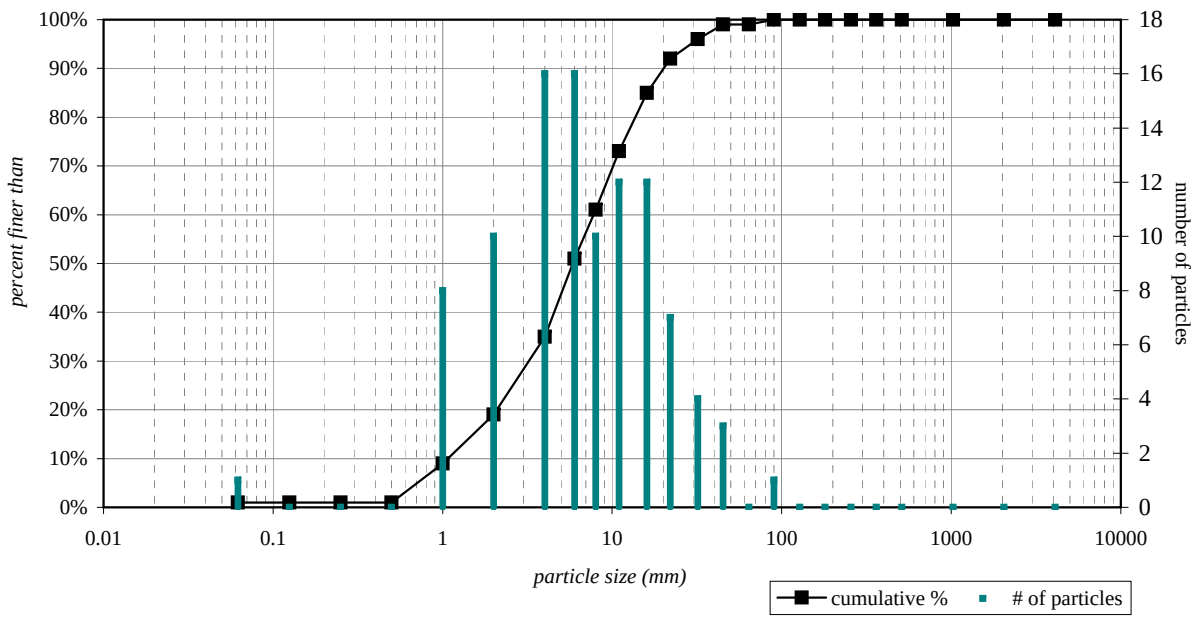
Stream Type:	B4c



Pebble Count

Material	Size Range (mm)		Count
silt/clay	0	0.062	**1**
very fine sand	0.062	0.13	**0**
fine sand	0.13	0.25	**0**
medium sand	0.25	0.5	**0**
coarse sand	0.5	1	**8**
very coarse sand	1	2	**10**
very fine gravel	2	4	**16**
fine gravel	4	6	**16**
fine gravel	6	8	**10**
medium gravel	8	11	**12**
medium gravel	11	16	**12**
coarse gravel	16	22	**7**
coarse gravel	22	32	**4**
very coarse gravel	32	45	**3**
very coarse gravel	45	64	**0**
small cobble	64	90	**1**
medium cobble	90	128	**0**
large cobble	128	180	**0**
very large cobble	180	256	**0**
small boulder	256	362	**0**
small boulder	362	512	**0**
medium boulder	512	1024	**0**
large boulder	1024	2048	**0**
very large boulder	2048	4096	**0**
	total particle count:		100

UT to Fsher River
Surry County, NC
Riffle #2 (Sta. 02+55)
Note:



bedrock		
clay hardpan		
detritus/wood		
artificial		
total count:	100	

based on sediment particles only	size percent less than (mm) D16	D35	D50	D65	D84	D95	particle size distribution gradation	geo mean	std dev
	1.625	4.00	5.8	9	16	29	3.1	5.0	3.1

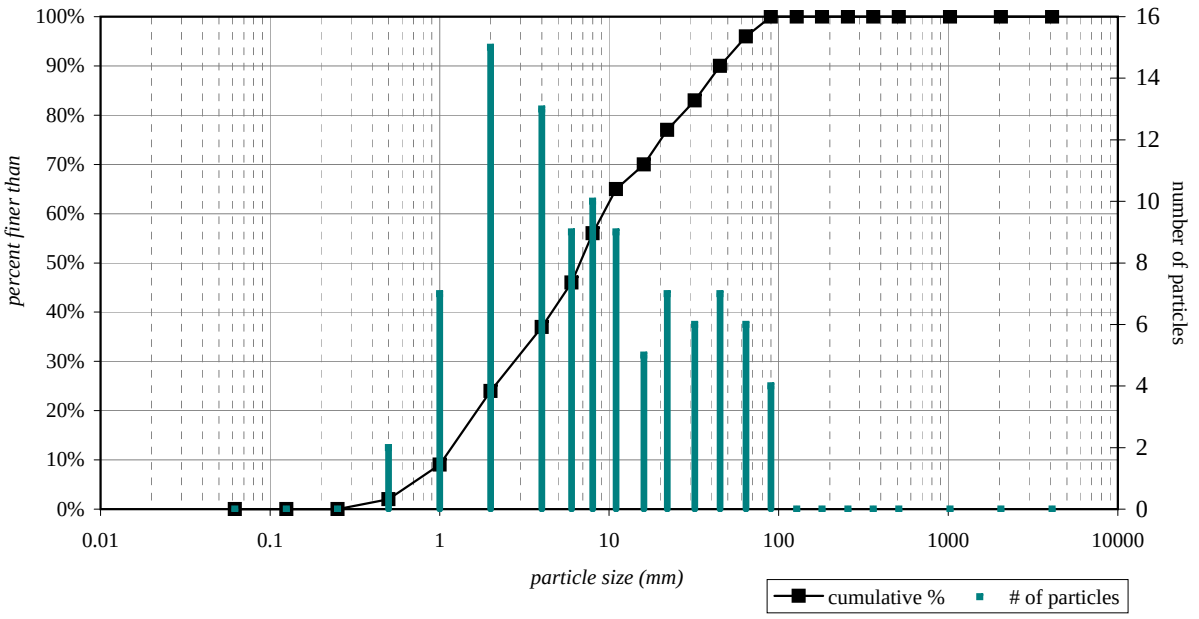
based on total count	percent by substrate type silt/clay	sand	gravel	cobble	boulder	bedrock	hardpan	wood/det	artificial
	1%	18%	80%	1%	0%	0%	0%	0%	0%

Pebble Count

Material	Size Range (mm)		Count
silt/clay	0	0.062	**0**
very fine sand	0.062	0.13	**0**
fine sand	0.13	0.25	**0**
medium sand	0.25	0.5	**2**
coarse sand	0.5	1	**7**
very coarse sand	1	2	**15**
very fine gravel	2	4	**13**
fine gravel	4	6	**9**
fine gravel	6	8	**10**
medium gravel	8	11	**9**
medium gravel	11	16	**5**
coarse gravel	16	22	**7**
coarse gravel	22	32	**6**
very coarse gravel	32	45	**7**
very coarse gravel	45	64	**6**
small cobble	64	90	**4**
medium cobble	90	128	**0**
large cobble	128	180	**0**
very large cobble	180	256	**0**
small boulder	256	362	**0**
small boulder	362	512	**0**
medium boulder	512	1024	**0**
large boulder	1024	2048	**0**
very large boulder	2048	4096	**0**
		total particle count:	100

UT to Fsher River
Surry County, NC

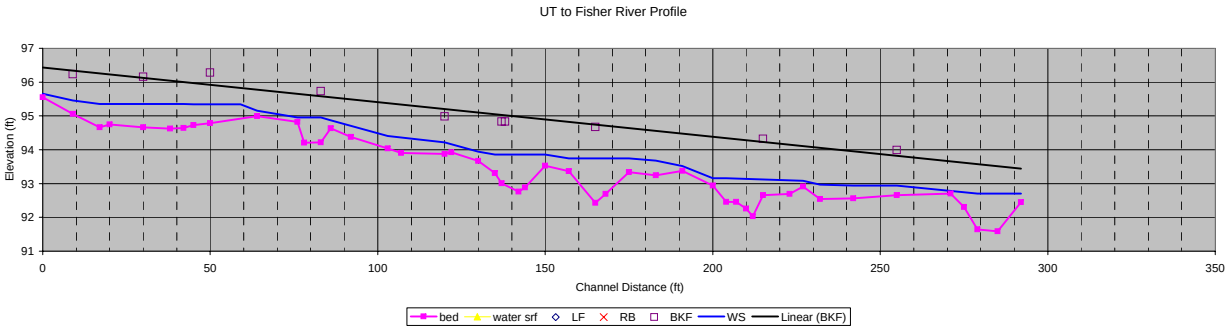
Note: **Reach Pebble Count**



bedrock		
clay hardpan		
detritus/wood		
artificial		
	total count:	100

based on sediment particles only	size percent less than (mm)						particle size distribution		
	D16	D35	D50	D65	D84	D95	gradation	geo mean	std dev
	1.382	3.60	6.7	11	34	60	4.9	6.8	4.9

based on total count	percent by substrate type								
	silt/clay	sand	gravel	cobble	boulder	bedrock	hardpan	wood/det	artificial
	0%	24%	72%	4%	0%	0%	0%	0%	0%



Elevation BM: 100

notes	inc distance	station	BS	HI	FS TP	FS bed	depth water	FS LB	FS RB	FS BKF	FS WS	AZ azimuth	ELEV bed	ELEV water srf	ELEV LF	ELEV RB	ELEV BKF	ELEV WS
		5		100		4.45					4.34		95.55					95.66
	9	14		100		4.94				3.77	4.54		95.06				96.23	95.46
	8	22		100		5.34					4.65		94.66					95.35
	3	25		100		5.25							94.75					
	10	35		100		5.34				3.84	4.65		94.66				96.16	95.35
	8	43		100		5.38							94.62					
	4	47		100		5.36					4.65		94.64					95.35
	3	50		100		5.27					4.66		94.73					95.34
	5	55		100		5.21				3.72			94.79				96.28	
	9	64		100							4.66							95.34
	5	69	-0.53	99.47		4.48					4.32		94.99					95.15
	12	81		99.47		4.65					4.51		94.82					94.96
	2	83		99.47		5.26							94.21					
	5	88		99.47		5.25				3.74	4.51		94.22				95.73	94.96
	3	91		99.47		4.84					4.6		94.63					94.87
	6	97		99.47		5.09							94.38					
	11	108		99.47		5.43					5.06		94.04					94.41
	4	112		99.47		5.56							93.91					
	13	125		99.47		5.59				4.49	5.25		93.88				94.98	94.22
	18	143		99.47						4.64							94.83	
	-16	127		99.47		5.55							93.92					
	8	135		99.47		5.8					5.53		93.67					93.94
	5	140		99.47		6.16					5.61		93.31					93.86
	2	142		99.47		6.46				4.64			93.01				94.83	
	5	147		99.47		6.71							92.76					
	2	149		99.47		6.59					5.61		92.88					93.86
	6	155		99.47		5.94					5.61		93.53					93.86
	7	162		99.47		6.1					5.73		93.37					93.74
	8	170		99.47		7.04				4.8	5.73		92.43				94.67	93.74
	3	173		99.47		6.78							92.69					
	7	180		99.47		6.13					5.73		93.34					93.74
	8	188	-1.56	97.91		4.67					4.23		93.24					93.68
	8	196		97.91		4.53					4.39		93.38					93.52
	9	205		97.91		4.97					4.75		92.94					93.16
	4	209		97.91		5.45					4.75		92.46					93.16
	3	212		97.91		5.45							92.46					
	3	215		97.91		5.65							92.26					
	2	217		97.91		5.88							92.03					
	3	220		97.91		5.25				3.59			92.66				94.32	
	8	228		97.91		5.22							92.69					
	4	232		97.91		5					4.83		92.91					93.08
	5	237		97.91		5.37					4.94		92.54					92.97
	10	247		97.91		5.35					4.97		92.56					92.94
	13	260	2.46	100.37		7.71				6.38	7.43		92.66				93.99	92.94
	16	276		100.37		7.67							92.7					
	4	280		100.37		8.06							92.31					
	4	284		100.37		8.73					7.67		91.64					92.7
	6	290		100.37		8.78					7.67		91.59					92.7
	7	297		100.37		7.92					7.67		92.45					92.7

Estimated Reduction in Total Nitrogen and Total Phosphorus for Mill Dam Creek Restoration Project

Cattle Exclusion (Grazing Pasture)

TN reduction (lbs/yr) = 51.04 (lbs/ac/yr) x Area (ac)
TP reduction (lbs/yr) = 4.23 (lbs/ac/yr) x Area (ac)

	Reduction (lbs/ac/year)	Acres	Total Reduction (lbs/year)
TN	51.04	12.8	653.3
TP	4.23	12.8	54.1

Nutrient Reduction from Buffer Adjacent to Agricultural Fields

TN reduction (lbs/yr) = 75.77 (lbs/ac/yr) x Area (ac)
TP reduction (lbs/yr) = 4.88 (lbs/ac/yr) x Area (ac)

	Reduction (lbs/ac/year)	Acres	Total Reduction (lbs/year)
TN	75.8	1.0	73.5
TP	4.9	1.0	4.7

Total Estimated Nitrogen and Phosphorus Reduction from Exclusion and Buffer

	Cattle Exclusion	Buffer	Total Reduction (lbs/year)
TN	653.3	73.5	**727**
TP	54.1	4.7	**59**

Estimate of the Amount of Fecal Coliform Prevented from Entering Stream due to Livestock Exclusion at the Mill Dam Creek Restoration Project

1. Fecal from direct input

	# cows	Average Weight	Total Weight	AU=total/1000
An animal unit (AU) is one thousand pounds of livestock. Assume avg cow weighs 1500 lb.	50	1,500	75,000	75

Fecal Coliform Reduction from Direct Input (col) = 2.2×10^{11}(col/AU/day) x AU x 0.085

Fecal (col/AU/day)	AU	Percent	Total (col/day)	Total(col/year)	Total (half-year grazing)
2.200E+11	75	0.085	1.403E+12	5.119E+14	2.560E+14

2. Fecal from buffer filtering

Weighted Curve Number

Land Use / Hydrologic Soil Group	CN	Acres	Weighted CN
Pasture (Fair) / A	49	0.1	70.5
Pasture (Fair) / B	69	10.7	
Pasture (Fair) / C	79	1.7	
Pasture (Fair) / D	84	0.3	

Runoff - Q (inches)

P (annual rainfall in inches)	Weighted CN	S (inches)	Ia (inches)	Q (inches)
46.64	70.5	4.18	0.84	42.0

Fecal Coliform Reduction from Buffer Filtration (col) = Runoff's fecal coliform concentration (col/gal) x Runoff volume (Gal) x 0.85

Common Fecal Coliform	Fecal conc (col/gal)	Q (in)	Total acres	Volume (in-ac)	Vol (gal)	Fecal reduction (col/year)
Pastures under Continually Grazing Year-round	1,894,000					
Pastures Grazed for Half of Year	329,500	42.0	12.8	536.0	14,554,285	4.076E+11
Pastures Grazed for Two Months of Year	340,900					

Total Coliform Reducation

Direct Input Reduction	2.560E+14
Buffer Filtration	4.076E+11
Total (col/year)	**2.564E+14**

12.3 Site Protection Instrument

12-210

EASEMENT LINE TABLE

LINE	LENGTH	BEARING
E1	116.53	S08°09'40"W
E2	212.26	N74°57'05"W
E3	82.25	N40°49'17"W
E4	250.53	N57°27'13"W
E5	262.22	N44°53'53"W
E6	136.11	N35°26'22"E
E7	36.05	S50°48'35"E
E8	41.51	N64°33'02"E
E9	104.45	N88°44'41"E
E10	59.37	N62°03'25"E
E11	120.09	S25°44'39"E
E12	83.23	S62°03'25"W
E13	66.63	S88°44'41"W
E14	186.56	S46°14'24"E
E15	116.47	S58°02'49"E
E16	91.38	S44°30'13"E
E17	83.63	S79°59'25"E
E18	87.77	S63°11'13"E
E19	55.51	N44°53'53"W
E20	104.90	N40°05'04"E
E21	25.38	N14°50'26"E
E22	55.28	S50°48'35"E
E23	134.02	S35°26'22"W
E24	85.79	N24°05'55"W
E25	79.55	N19°25'57"W
E26	23.71	N70°02'35"W
E27	165.12	N19°26'54"E
E28	113.13	S64°50'27"E
E29	44.51	S28°55'19"E
E30	248.95	S22°27'49"W
E31	66.95	N33°39'28"W
E32	439.53	N63°56'37"W
E33	130.10	N26°03'23"E
E34	478.36	S63°56'37"E
E35	164.95	S19°26'54"W
E36	248.95	N22°27'49"E
E37	47.18	S28°55'19"E
E38	173.71	S21°07'15"E
E39	190.88	S42°54'08"W
E40	123.90	N24°05'55"W
E41	165.22	S36°12'46"E
E42	214.65	S59°19'11"E
E43	114.22	N77°57'22"E
E44	170.74	S20°33'48"E
E45	177.53	S80°39'07"W
E46	417.04	N58°00'05"W
E47	74.72	N32°09'30"W
E48	168.52	N42°54'08"E
E49	177.53	N80°39'07"E
E50	20.23	S20°33'48"E

EASEMENT LINE TABLE

LINE	LENGTH	BEARING
E51	104.18	S03°09'01"E
E52	103.09	S07°30'51"W
E53	132.73	N71°00'45"W
E54	116.71	N04°54'35"E
E55	69.57	N58°00'05"W
E56	27.79	S04°45'31"E
E57	69.21	S78°00'53"W
E58	93.89	N81°23'51"W
E59	45.36	N17°14'29"E
E60	64.21	N78°25'44"E
E61	86.60	S71°00'45"E
E62	83.90	S81°23'51"E
E63	75.67	S25°24'54"W
E64	76.58	S82°05'29"W
E65	94.89	N15°30'38"E
E66	NOT	USED
E67	NOT	USED
E68	NOT	USED
E69	NOT	USED
E70	159.23	N87°26'33"W
E71	448.33	N25°03'29"E
E72	96.70	N75°44'21"W
E73	95.83	N19°41'11"W
E74	39.80	N15°29'04"E
E75	76.58	N82°05'29"E
E76	60.40	S03°39'59"W
E77	104.64	S67°02'48"E
E78	55.31	S27°51'57"E
E79	84.02	S43°56'33"E
E80	109.00	S01°56'07"E
E81	65.30	S55°00'13"E
E82	52.40	N77°31'33"E
E83	163.40	S45°08'02"E
E84	136.95	S57°19'12"E
E85	188.11	S31°23'05"E
E86	28.69	S22°52'18"E
E87	115.52	S24°01'53"W
E88	74.74	S25°26'18"W
E89	78.31	S16°34'25"W
E90	114.93	S25°27'14"E
E91	25.09	S14°39'42"E
E92	24.07	S58°06'14"E
E93	308.59	S16°23'40"E
E94	24.68	S12°45'53"W
E95	106.74	S12°45'53"W
E96	229.86	S88°25'08"E
E97	140.79	S03°01'42"W
E98	140.37	S57°28'38"W
E99	125.91	S57°28'38"W
E100	215.12	N32°57'05"W

EASEMENT LINE TABLE

LINE	LENGTH	BEARING
E101	68.73	N87°18'49"W
E102	122.11	N05°09'26"E
E103	108.70	S87°18'49"E
E104	70.41	N21°57'39"E
E105	90.65	N23°39'51"W
E106	121.62	N01°06'01"E
E107	172.32	S72°22'00"W
E108	121.36	N05°30'08"W
E109	118.45	N70°27'14"E
E110	185.06	N26°02'19"W
E111	72.33	N02°41'30"E
E112	191.60	N29°56'28"E
E113	140.58	N35°43'49"W
E114	96.00	N68°12'33"W
E115	124.51	N60°33'28"W
E116	168.85	N44°54'43"W
E117	72.34	N30°12'58"W
E118	250.95	S25°04'51"W
E119	147.12	N64°56'31"W
E120	135.17	N36°20'17"E
E121	92.79	N89°10'07"E
E122	205.02	S57°28'38"W
E123	76.10	S60°10'52"E
E124	329.32	S45°26'37"W
E125	124.20	N01°57'39"E
E126	105.80	N19°41'14"E
E127	107.05	N45°14'59"E
E128	60.76	S60°10'52"E
E129	63.62	S82°59'06"W
E130	89.63	N53°48'35"W
E131	188.67	S72°38'41"W
E132	173.77	N76°35'59"W
E133	86.31	S35°56'19"W
E134	116.54	S16°42'42"W
E135	92.31	S25°08'09"E
E136	81.58	N64°18'28"E
E137	101.30	S79°44'30"E
E138	149.70	S41°10'42"E
E139	36.14	S03°16'56"E
E140	312.68	N74°04'41"W
E141	24.07	N58°06'14"W
E142	25.09	N14°39'42"W
E143	114.93	N25°27'14"W
E144	78.31	N16°34'25"E
E145	74.74	N25°26'18"E
E146	115.52	N24°01'53"E
E147	28.69	N22°52'18"W
E148	188.11	N31°23'05"W
E149	136.95	N57°19'12"W
E150	163.40	N45°08'02"W

EASEMENT LINE TABLE

LINE	LENGTH	BEARING
E151	52.40	S77°31'33"W
E152	65.30	N55°00'13"W
E153	109.00	N01°56'07"W
E154	84.02	N43°56'33"W
E155	55.31	N27°51'57"W
E156	104.64	N67°02'48"W
E157	60.40	N03°39'59"E
E158	75.67	N25°24'54"E
E159	84.24	S81°23'51"E
E160	244.78	S31°45'30"E
E161	143.27	S09°26'20"E
E162	22.37	S30°12'58"E
E163	126.23	S44°54'43"E
E164	91.83	S60°33'28"E
E165	131.91	S68°12'33"E
E166	184.06	S35°21'50"E
E167	35.85	S52°27'06"E
E168	135.69	S73°46'00"E
E169	159.22	N73°21'45"E
E170	97.58	N73°00'10"E
E171	127.36	N41°24'39"E
E172	292.40	S01°57'39"W
E173	25.01	S04°45'31"E
E174	70.57	N81°23'51"W
E175	69.21	N78°00'53"E
E176	766.92	S87°04'34"W
E177	24.68	N12°45'53"E
E178	308.59	N16°23'40"W
E179	312.68	S74°04'41"E
E180	61.58	S03°16'56"E
E181	141.75	S75°32'30"E
E182	116.74	S57°18'12"E
E183	197.68	N86°21'51"E
E184	152.28	N72°01'15"E
E185	76.10	S14°06'22"W
E186	26.25	S36°48'43"W
E187	80.22	S36°48'43"W
E188	89.75	S82°10'57"W
E189	91.52	N82°13'02"W
E190	24.73	S02°06'56"E
E191	65.84	S82°10'57"W
E192	87.16	N21°20'25"W
E193	324.12	N87°04'34"E
E194	227.27	S11°33'30"W
E195	353.69	N45°26'57"W
E196	41.14	N56°13'48"E
E197	29.96	N00°34'08"W
E198	25.16	N21°20'25"W
E199	59.59	N82°10'57"E
E200	81.99	S39°56'52"E

EASEMENT LINE TABLE

LINE	LENGTH	BEARING
E201	86.74	S56°33'10"E
E202	41.19	S25°09'45"E
E203	80.81	N61°51'55"E
E204	76.00	N88°25'08"W
E205	106.74	N12°45'53"E
E206	67.17	N87°04'34"E
E207	76.65	S00°40'45"E
E208	36.49	S25°18'52"W
E209	82.23	N57°24'07"W
E210	132.98	N46°54'57"W
E211	95.49	N20°07'44"W
E212	36.41	S76°32'33"E
E213	41.03	N82°10'57"E
E214	25.16	S21°20'25"E
E215	29.96	S00°34'08"E
E216	41.14	S56°13'48"W
E217	207.60	S45°26'57"E
E218	98.74	N55°52'56"W
E219	166.51	N87°04'34"E
E220	87.16	S21°20'25"E
E221	28.18	S82°10'57"W
E222	90.84	N76°32'33"W
E223	202.58	N87°18'02"W
E224	91.25	N64°54'27"E
E225	55.88	N86°47'31"E
E226	121.06	N17°08'26"E
E227	114.60	N03°02'46"W
E228	162.49	N89°31'12"E
E229	134.03	S67°39'39"E
E230	167.85	S43°22'09"E
E231	200.94	S79°30'22"E
E232	96.78	N65°23'11"E
E233	115.25	S31°51'33"E
E234	83.42	S56°20'17"W
E235	569.73	N87°17'16"W
E236	140.24	N55°53'51"W
E237	293.97	S89°10'07"W
E238	12.92	N36°20'17"E
E239	577.77	N57°28'38"E
E240	162.08	S31°05'58"E
E241	99.75	S14°25'43"W
E242	108.86	S30°55'27"E
E243	76.23	S31°04'54"W
E244	160.21	S89°31'12"W
E245	75.32	S87°17'16"E
E246	45.68	S15°47'30"W
E247	91.78	S43°07'57"E
E248	150.10	S68°18'32"W
E249	59.20	N38°05'02"W
E250	133.29	N22°13'58"E

EASEMENT LINE TABLE

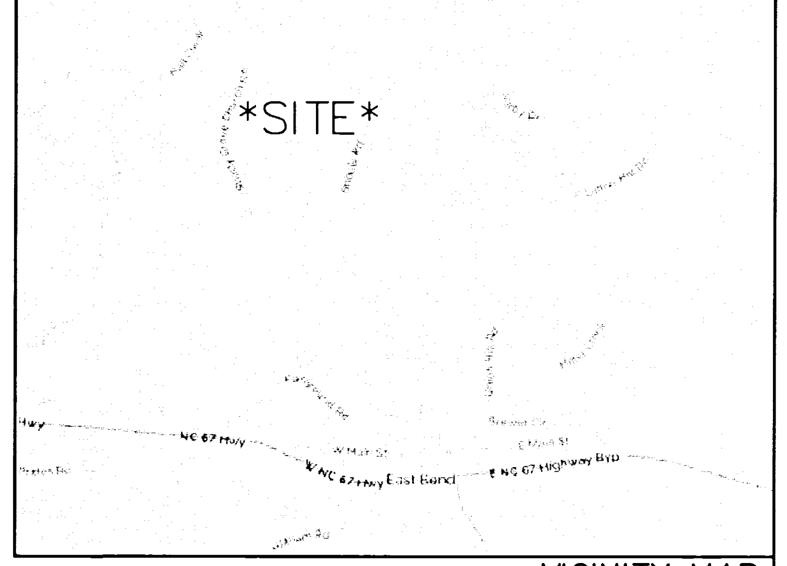
LINE	LENGTH	BEARING
E251	269.49	S30°03'29"E
E252	164.58	S85°24'39"E
E253	50.00	S04°35'21"W
E254	151.08	N85°24'39"W
E255	142.77	S18°28'27"E
E256	512.31	S22°36'16"E
E257	151.65	S89°08'30"W
E258	461.70	N21°58'39"W
E259	218.01	N18°32'00"W
E260	243.32	N32°36'36"W
E261	148.78	N68°18'32"E
E262	265.12	S87°17'16"E
E263	61.69	S56°20'17"W
E264	218.53	N77°38'59"W
E265	133.29	S22°13'58"W
E266	43.40	N38°05'02"W
E267	169.93	S63°47'30"W
E268	146.34	N29°53'20"W
E269	110.67	N64°54'27"E
E270	202.58	S87°18'02"E
E271	108.25	S52°06'42"W
E272	146.80	S42°47'28"W
E273	217.98	S12°34'25"W
E274	266.07	S21°23'21"W
E275	173.43	S01°14'26"E
E276	52.74	S67°16'48"W
E277	187.57	N58°36'57"W
E278	99.54	N08°56'07"E
E279	89.12	N54°03'25"E
E280	254.64	N20°02'14"E
E281	112.54	N14°02'16"E
E282	45.10	S57°35'15"W
E283	180.78	N01°02'10"E
E284	159.41	N45°56'35"E
E285	59.05	N25°50'48"W
E286	42.00	N64°09'12"E
E287	58.30	S25°50'48"E
E288	159.89	N64°33'32"E
E289	142.29	S29°53'20"E

LINE TABLE

LINE	LENGTH	BEARING
L1	154.98	S72°59'46"W
L2	223.18	S53°44'52"W
L3	20.29	N44°53'53"W
L4	261.57	S14°50'26"W
L5	500.16	N22°27'49"E
L6	40.23	N64°27'26"W
L7	67.35	S20°04'39"E
L8	128.50	N62°30'42"E
L9	296.82	N03°30'42"E
L10	242.99	N79°40'50"E
L11	624.58	S80°39'07"W
L12	42.12	S00°43'32"W
L13	40.33	S15°56'24"W
L14	233.51	N87°26'33"W
L15	20.00	N02°33'27"E
L16	922.76	S08°16'49"W
L17	24.56	S88°25'50"E
L18	249.86	S00°22'23"W
L19	187.68	S00°24'19"W
L20	25.00	S00°24'19"W
L21	104.18	S39°15'29"W
L22	164.84	S46°57'12"W
L23	185.23	N88°19'23"E
L24	191.24	N57°28'38"E
L25	434.12	S03°02'42"E
L26	130.78	S24°26'16"W
L27	42.77	N29°20'36"E
L28	577.72	S87°51'57"W
L29	128.89	N02°14'24"E
L30	253.64	S89°18'50"W
L31	183.09	N65°56'25"W
L32	247.13	S78°00'53"W
L33	39.21	S87°04'34"W
L33A	234.90	S11°30'40"W
L34	146.09	N45°26'57"W
L35	67.14	N50°00'01"W
L36	153.86	N88°25'08"W
L37	16.15	N07°23'16"E
L38	25.25	S29°46'21"E
L39	16.47	S73°51'03"W

NOTES:

1. THIS PLAT DOES NOT REPRESENT A BOUNDARY SURVEY OF THE PARENT TRACTS. THE PARENT TRACT BOUNDARIES ADJACENT TO THIS EASEMENT ARE NOT CHANGED BY THIS PLAT. BOUNDARY INFORMATION SHOWN HEREON WAS DERIVED FROM DEEDS AND MAPS OF RECORD IN ROWAN COUNTY AND MONUMENTATION FOUND IN THE FIELD.
2. DISTANCES SHOWN ARE HORIZONTAL GROUND DISTANCES IN U.S. SURVEY FEET UNLESS OTHERWISE NOTED.
3. AREA COMPUTED BY COORDINATE METHOD.
4. THE BASIS OF THE MERIDIANS AND COORDINATES FOR THIS PLAT IS THE NORTH CAROLINA STATE PLANE COORDINATE SYSTEM, NORTH AMERICAN DATUM 1983 (NAD 83), BASED ON DIFFERENTIAL GPS OBSERVATIONS PERFORMED IN NOVEMBER 2016. ALL DISTANCES ARE GROUND UNLESS OTHERWISE NOTED.
5. DEED REFERENCES: AS SHOWN HEREON.
6. SUBJECT PROPERTIES KNOWN AS TAX NUMBER: AS SHOWN HEREON.
7. SUBJECT PROPERTIES PARTIALLY LIE WITHIN THE AREA DESIGNATED AS ZONE "X", BASED ON FEDERAL FLOOD INSURANCE RATE MAP 3710585000J EFFECTIVE MAY 18, 2009.
8. NO UNDERGROUND UTILITY LOCATING PERFORMED DURING THE COURSE OF THIS SURVEY.



VICINITY MAP
(NOT TO SCALE)

1	909901.10	1550398.57
2	909785.76	1550382.03
3	909840.87	1550177.05
4	909903.11	1550123.28
5	910037.89	1549912.10
6	910223.64	1549727.01
7	910334.53	1549805.93
8	910311.76	1549833.87
9	910329.59	1549871.35
10	910331.88	1549975.78
11	910359.70	1550028.23
12	910251.53	1550080.39
13	910212.53	1550006.87
14	910211.08	1549940.26
15	910082.04	1550075.00
16	910020.40	1550173.82
17	909955.23	1550237.87
18	909940.70	1550320.24
19	910238.01	1549712.69
20	910277.34	1549673.50
21	910357.60	1549741.05
22	910382.13	1549747.55
23	910347.20	1549790.40
24	911097.21	1550637.08
25	911175.53	1550602.05
26	911250.54	1550575.59
27	911258.64	1550553.30
28	911414.33	1550608.28
29	911366.23	1550710.68
30	911327.28	1550732.20
31	911275.98	1550517.00
32	911331.71	1550479.90
33	911524.77	1550085.04
34	911641.65	1550142.19
35	911431.52	1550571.93
36	911285.98	1550755.02
37	911123.94	1550817.61
38	910984.11	1550687.67
39	911060.68	1550840.73
40	910927.38	1550938.35
41	910817.85	1551122.95
42	910841.69	1551234.66
43	910681.83	1551294.63
44	910652.99	1551119.46
45	910873.98	1550765.78
46	910937.24	1550726.01
47	910662.89	1551301.73
48	910558.87	1551307.46
49	910456.66	1551293.98
50	910499.84	1551168.47

51	910616.12	1551178.46
52	910414.54	1551293.44
53	910386.85	1551295.75
54	910372.47	1551228.05
55	910386.52	1551135.21
56	910429.84	1551148.65
57	910442.72	1551211.56
58	910347.74	1551124.13
59	910335.19	1551207.09
60	910266.84	1551174.61
61	910256.31	1551098.76
62		
63		
64		
65		
66	909690.66	1551183.32
67	909697.77	1551024.25
68	910103.90	1551214.13
69	910127.72	1551120.41
70	910217.95	1551088.13
71	910206.57	1551170.75
72	910165.76	1551267.11
73	910116.86	1551292.96
74	910056.37	1551351.26
75	909947.43	1551354.94
76	909909.98	1551408.44
77	909921.29	1551459.60
78	909806.02	1551575.41
79	909732.08	1551690.68
80	909571.49	1551788.64
81	909545.06	1551799.80
82	909439.55	1551752.75
83	909372.06	1551720.65
84	909297.00	1551698.31
85	909193.22	1551747.71
86	909168.95	1551754.06
87	909156.23	1551774.49
88	908860.19	1551861.59
89	908836.12	1551856.14
90	908732.02	1551832.55
91	908729.92	1551908.53
92	908585.08	1552069.76
93	908509.61	1551951.41
94	908441.92	1551845.24
95	908622.43	1551728.23
96	908625.65	1551659.58
97	908747.27	1551670.55
98	908742.18	1551779.14
99	908807.48	1551805.47
100	908890.51	1551769.08

101	909012.11	1551771.42
102	908959.91	1551607.20
103	909080.71	1551595.56
104	909120.34	1551707.19
105	909286.62	1551625.95
106	909358.87	1551629.35
107	909524.90	1551724.98
108	909639.02	1551642.88
109	909674.66	1551553.74
110	909735.86	1551445.31
111	909855.44	1551326.10
112	909917.95	1551289.69
113	909715.98	1551195.17
114	909825.77	1552553.64
115	909787.93	1552619.66
116	909556.88	1552385.00
117	909681.00	1552389.25
118	909780.62	1552424.89
119	909855.98	1552500.92
120	909437.81	1552330.89
121	909430.04	1552267.75
122	909482.96	1552195.42
123	909426.68	1552015.34
124	909466.95	1551846.30
125	909397.07	1551795.64
126	909285.46	1551762.13
127	909201.89	1551801.35
128	909237.26	1551874.86
129	909219.22	1551974.54
130	909106.54	1552073.10
131	909070.46	1552075.17
132	910322.59	1551290.38
133	910114.46	1551419.22
134	909973.12	1551442.72
135	909953.79	1551453.98
136	909864.39	1551543.10
137	909819.26	1551623.07
138	909770.29	1551745.55
139	909620.19	1551852.08
140	909598.34	1551880.50
141	909560.40	1552010.78
142	909605.99	1552163.34
143	909634.52	1552256.66
144	909730.03	1552340.90
145	910361.92	1551297.82
146	908875.24	1552622.06
147	909008.98	1552078.70
148	908973.58	1552215.96
149	908910.52	1552314.20
150	908923.06	1552511.49

151	908970.06	1552656.33
152	908896.26	1552637.79
153	908811.02	1552573.99
154	908798.81	1552485.07
155	908811.20	1552394.39
156	908786.48	1552395.30
157	908777.53	1552330.08
158	908858.71	1552298.36
159	908647.06	1552614.14
160	908424.40	1552568.61
161	908672.52	1552316.56
162	908695.39	1552350.76
163	908725.35	1552350.46
164	908748.79	1552341.30
165	908756.89	1552400.34
166	908694.04	1552452.99
167	908646.23	1552525.37
168	908608.95	1552542.88
169	908839.55	1551923.22
170	908762.91	1551924.13
171	908526.88	1552464.50
172	908571.18	1552395.23
173	908662.02	1552298.10
174	908751.68	1552265.24
175	908743.21	1552300.65
176	908794.84	1552213.81
177	908850.22	1552132.07
178	908773.70	1552302.16
179	907816.71	1551898.93
180	907826.25	1551696.57
181	907864.95	1551779.20
182	907868.08	1551834.99
183	907983.76	1551870.67
184	908098.20	1551864.58
185	908099.56	1552027.06
186	908048.62	1552151.03
187	907926.60	1552266.28
188	907890.01	1552463.87
189	907930.31	1552551.85
190	907832.43	1552612.68
191	907786.19	1552543.26
192	908114.22	1551866.66
193	908192.85	1551750.53
194	908188.58	1551456.59
195	908370.83	1552035.12
196	908274.23	1552010.27
197	908180.84	1552066.21
198	908115.56	1552026.86
199	907813.15	1551974.16
200	907769.19	1551961.73

201	907702.21	1552024.48
202	907646.73	1551885.01
203	907693.33	1551848.49
204	907680.29	1552037.02
205	907447.05	1552172.00
206	907433.88	1552336.05
207	907384.04	1552332.05
208	907396.13	1552181.46
209	907260.71	1552226.70
210	906787.76	1552423.62
211	906785.49	1552271.99
212	907213.64	1552099.20
213	907420.34	1552029.90
214	907625.31	1551898.77
215	907798.73	1552278.43
216	907751.99	1552491.91
217	907727.49	1551821.72
218	907652.44	1551669.26
219	907779.32	1551596.34
220	907647.86	1551653.44
221	907581.38	1551568.01
222	907473.65	1551468.28
223	907260.90	1551420.83
224	907013.16	1551323.79
225	906839.76	1551327.55
226	906819.39	1551278.90
227	906917.08	1551118.77
228	907015.41	1551134.23
229	907067.72	1551206.38
230	907306.95	1551293.63
231	907416.13	1551320.93
232	907391.95	1551282.85
233	907572.70	1551286.12
234	907683.55	1551400.68
235	907736.70	1551374.93
236	907755.01	1551412.73
237	907702.54	1551438.15
238	907771.23	1551582.53

I, JAMES M. GELLENTHIN, HEREBY DECLARE THAT THIS MAP WAS DRAWN UNDER MY SUPERVISION FROM A SURVEY MADE UNDER MY SUPERVISION, THAT THE BOUNDARIES NOT SURVEYED ARE CLEARLY INDICATED, AS DRAWN FROM INFORMATION AS SHOWN HEREON; THAT THE RATIO OF PRECISION AS CALCULATED IS GREATER THAN 1:10,000; THAT THIS MAP DOES REPRESENT AN OFFICIAL BOUNDARY SURVEY AND HAS BEEN PREPARED IN ACCORDANCE WITH G.S. 47-30 AS AMENDED. WITNESS MY ORIGINAL SIGNATURE, REGISTRATION NUMBER AND SEAL THIS 30TH DAY OF MAY, 2017

NORTH CAROLINA REGISTRATION NUMBER L-3860
JAMES M. GELLENTHIN

I, JAMES M. GELLENTHIN, PROFESSIONAL LAND SURVEYOR, NO. L-3860, CERTIFY TO THE FOLLOWING AS REQUIRED IN G.S. 47-30(f)(11):

THAT THE SURVEY IS OF ANOTHER CATEGORY, SUCH AS THE RECOMBINATION OF EXISTING PARCELS, A COURT ORDERED SURVEY, OR OTHER EXCEPTION TO THE DEFINITION OF SUBDIVISION.

NORTH CAROLINA REGISTRATION NUMBER L-3860
JAMES M. GELLENTHIN

STATE OF NORTH CAROLINA
YADKIN COUNTY

PRESENTED FOR REGISTRATION AND RECORDED IN THIS OFFICE IN BOOK OF MAPS ____________, PAGE ____________ THIS THE ____________ DAY OF ____________, 2017.

REGISTER OF DEEDS

STATE OF NORTH CAROLINA
YADKIN COUNTY
Dean Vallier REVIEW OFFICER OF YADKIN COUNTY, CERTIFY THAT THE MAP OR PLAT WHICH THIS CERTIFICATION IS AFFIXED MEETS ALL STATUTORY REQUIREMENTS FOR RECORDING.

Dean Vallier 6/8/2017
REVIEW OFFICER DATE

FILED Jun 08, 2017 08:06:22 am
BOOK 00012
PAGE 0210
INSTRUMENT # 02111
FILED FOR RECORD - YADKIN COUNTY NC
ARIC WILHELM, REGISTER OF DEEDS

OWNER CERTIFICATION (CE #1) SPO FILE NO. 99-O

I HEREBY CERTIFY THAT I AM THE OWNER OF THE PROPERTY SHOWN AND DESCRIBED HEREON, WHICH IS LOCATED IN THE SUBDIVISION JURISDICTION OF THE COUNTY OF YADKIN AND THAT I HEREBY ADOPT THIS PLAN OF SUBDIVISION WITH MY FREE CONSENT AND ESTABLISH MINIMUM SETBACK LINES AS NOTED.

6-5-17
SARA C WOOD DATE

OWNER CERTIFICATION (CE #2 & 3) SPO FILE NO. 99-N

I HEREBY CERTIFY THAT I AM THE OWNER OF THE PROPERTY SHOWN AND DESCRIBED HEREON, WHICH IS LOCATED IN THE SUBDIVISION JURISDICTION OF THE COUNTY OF YADKIN AND THAT I HEREBY ADOPT THIS PLAN OF SUBDIVISION WITH MY FREE CONSENT AND ESTABLISH MINIMUM SETBACK LINES AS NOTED.

6-5-2017
JOEL DINKINS DATE

6-5-2017
CANDICE DINKINS DATE

OWNER CERTIFICATION (CE #4) SPO FILE NO. 99-P

I HEREBY CERTIFY THAT I AM THE OWNER OF THE PROPERTY SHOWN AND DESCRIBED HEREON, WHICH IS LOCATED IN THE SUBDIVISION JURISDICTION OF THE COUNTY OF YADKIN AND THAT I HEREBY ADOPT THIS PLAN OF SUBDIVISION WITH MY FREE CONSENT AND ESTABLISH MINIMUM SETBACK LINES AS NOTED.

6-5-17
DONALD GRAY MATHIS DATE

OWNER CERTIFICATION (CE #5) SPO FILE NO. 99-T

I HEREBY CERTIFY THAT I AM THE OWNER OF THE PROPERTY SHOWN AND DESCRIBED HEREON, WHICH IS LOCATED IN THE SUBDIVISION JURISDICTION OF THE COUNTY OF YADKIN AND THAT I HEREBY ADOPT THIS PLAN OF SUBDIVISION WITH MY FREE CONSENT AND ESTABLISH MINIMUM SETBACK LINES AS NOTED.

6-7-17
BRYCE B SMITHERMAN JR DATE

6-7-17
DEANNA SMITHERMAN DATE

OWNER CERTIFICATION (CE #6 & 8) SPO FILE NO. 99-Q

I HEREBY CERTIFY THAT I AM THE OWNER OF THE PROPERTY SHOWN AND DESCRIBED HEREON, WHICH IS LOCATED IN THE SUBDIVISION JURISDICTION OF THE COUNTY OF YADKIN AND THAT I HEREBY ADOPT THIS PLAN OF SUBDIVISION WITH MY FREE CONSENT AND ESTABLISH MINIMUM SETBACK LINES AS NOTED.

6.5.17
JOSE SAMUEL POZO DATE

OWNER CERTIFICATION (CE #7) SPO FILE NO. 99-R

I HEREBY CERTIFY THAT I AM THE OWNER OF THE PROPERTY SHOWN AND DESCRIBED HEREON, WHICH IS LOCATED IN THE SUBDIVISION JURISDICTION OF THE COUNTY OF YADKIN AND THAT I HEREBY ADOPT THIS PLAN OF SUBDIVISION WITH MY FREE CONSENT AND ESTABLISH MINIMUM SETBACK LINES AS NOTED.

6-5-17
SANTOS POZO DATE

OWNER CERTIFICATION (CE #9) SPO FILE NO. 99-S

I HEREBY CERTIFY THAT I AM THE OWNER OF THE PROPERTY SHOWN AND DESCRIBED HEREON, WHICH IS LOCATED IN THE SUBDIVISION JURISDICTION OF THE COUNTY OF YADKIN AND THAT I HEREBY ADOPT THIS PLAN OF SUBDIVISION WITH MY FREE CONSENT AND ESTABLISH MINIMUM SETBACK LINES AS NOTED.

6-5-17
ROY D RUSSELL DATE

OWNER CERTIFICATION (CE #10) SPO FILE NO. 99-U

I HEREBY CERTIFY THAT I AM THE OWNER OF THE PROPERTY SHOWN AND DESCRIBED HEREON, WHICH IS LOCATED IN THE SUBDIVISION JURISDICTION OF THE COUNTY OF YADKIN AND THAT I HEREBY ADOPT THIS PLAN OF SUBDIVISION WITH MY FREE CONSENT AND ESTABLISH MINIMUM SETBACK LINES AS NOTED.

6-5-17
STEPHEN BAITY DATE

6-5-17
JANICE SMITHERMAN BAITY DATE

OWNER CERTIFICATION (CE #11) SPO FILE NO. 99-W

I HEREBY CERTIFY THAT I AM THE OWNER OF THE PROPERTY SHOWN AND DESCRIBED HEREON, WHICH IS LOCATED IN THE SUBDIVISION JURISDICTION OF THE COUNTY OF YADKIN AND THAT I HEREBY ADOPT THIS PLAN OF SUBDIVISION WITH MY FREE CONSENT AND ESTABLISH MINIMUM SETBACK LINES AS NOTED.

6-5-17
JAMES A SMITHERMAN DATE

6-5-17
KAREN R SMITHERMAN DATE

OWNER CERTIFICATION (CE #12) SPO FILE NO. 99-V

I HEREBY CERTIFY THAT I AM THE OWNER OF THE PROPERTY SHOWN AND DESCRIBED HEREON, WHICH IS LOCATED IN THE SUBDIVISION JURISDICTION OF THE COUNTY OF YADKIN AND THAT I HEREBY ADOPT THIS PLAN OF SUBDIVISION WITH MY FREE CONSENT AND ESTABLISH MINIMUM SETBACK LINES AS NOTED.

6-5-17
CHARLES LEE SMITHERMAN DATE

6-5-17
DENISE P SMITHERMAN DATE

FINAL PLAT
CONSERVATION EASEMENT
FOR
STATE OF NORTH CAROLINA
DEPARTMENT OF ENVIRONMENTAL QUALITY
DIVISION OF MITIGATION SERVICES
PROJECT NAME: MILL DAM CREEK RESTORATION PROJECT
DMS PROJECT #: 97136
SPO FILE NOS. 99-N THRU 99-W
EAST BEND TOWNSHIP, YADKIN COUNTY
NORTH CAROLINA

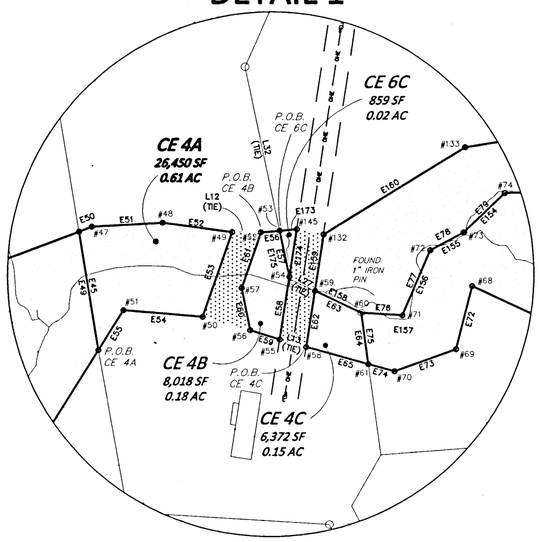
DATE:	SCALE:	SHEET:
JANUARY 11, 2017	1" = 300'	1 OF 2

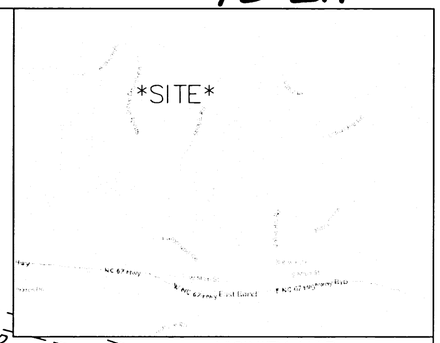
KCI ASSOCIATES OF N.C.
ENGINEERS, SURVEYORS AND PLANNERS
KCI ASSOCIATES OF NORTH CAROLINA C-0764
4505 FALLS OF NEUSE ROAD, FLOOR 4
RALEIGH, NC 27607
PHONE (919) 783-9214 * FAX (919) 783-9266

12-211

FILED Jun 08, 2017 08:07:01 am
BOOK **00012**
PAGE **0211**
INSTRUMENT # **02112**
FILED FOR RECORD - YADKIN COUNTY NC
ARIC WILHELM, REGISTER OF DEEDS

DETAIL 1





VICINITY MAP
(NOT TO SCALE)

NC GRID NORTH (NAD 83)

SHOALS ROAD

ACCESS EASEMENT
DB 0121(PG0) 84

SEE DETAIL 2

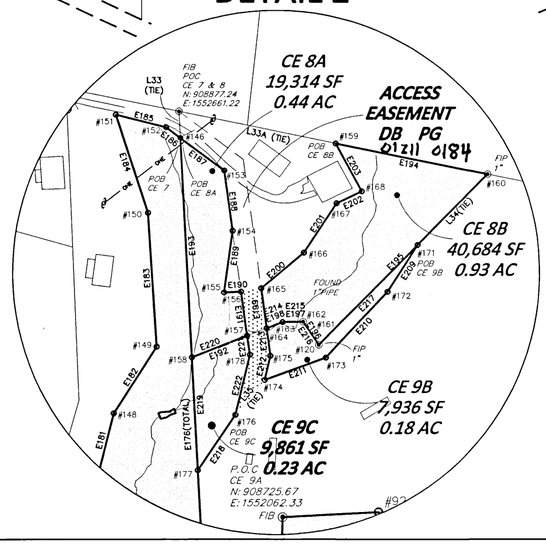
SEE DETAIL 1

CE 6A 30,705 SF 0.70 AC
CE 7 115,202 SF 2.64 AC
CE 9A 8,244 SF 0.19 AC
CE 6B 201,512 SF 4.63 AC
CE 5A 305,749 SF 7.01 AC
CE 5B 4,997 SF 0.11 AC
CE 10A 144,782 SF 3.32 AC
CE 11C 4,850 SF 0.11 AC
CE 11A 17,182 SF 0.39 AC
CE 10B 117,526 SF 2.70 AC
CE 12A 32,203 SF 0.74 AC
CE 11B 139,747 SF 3.21 AC
CE 12B 165,254 SF 3.79 AC
CE 3B 83,143 SF 2.02 AC
CE 3A 30,937 SF 0.71 AC
CE 2A 29,630 SF 0.68 AC
CE 2B 64,122 SF 1.47 AC
CE 1A 123,836 SF 2.84 AC
CE 1B 6,637 SF 0.15 AC

N/F SAMUEL GOMEZ PIN: 595100207109 SHOALS ROAD DB: 469 PG: 191
N/F JULIA POZO PIN: 5950295192 3050 AZTEC DR DB:1020 PG: 494
N/F SANTOS POZO PIN: 595000281838 3054 AZTEC DR DB: 284 PG: 177
N/F JOSE SAMUEL POZO PIN: 595000282701 3064 AZTEC DR DB: 992 PG: 092
N/F ROY D RUSSELL PIN: 595000282332 SHOALS RD DB: 0487 PG: 0338
N/F JAMES A SMITHERMAN KAREN R SMITHERMAN PIN: 595027478 3633 SHOALS RD DB: 1179 PG: 144
N/F JAMES A SMITHERMAN & KAREN R SMITHERMAN PIN: 595000168998 3633 SHOALS RD DB: 288 PG: 198
N/F JOSE SAMUEL POZO PIN: 5950291625 3046 AZTEC DR DB: 332 PG: 802
N/F DONALD GRAY MATHIS PIN: 595100109505 4147 SHADY GROVE CHURCH ROAD DB: 899 PG: 230
N/F JOEL & CANDICE DINKINS PIN: 595100112104 4209 SHADY GROVE CHURCH ROAD DB: 984 PG: 513
N/F BRYCE B SMITHERMAN JR & DEANNA SMITHERMAN PIN: 595019501S SHADY GROVE CH RD DB: 1179 PG: 137
N/F CHARLES LEE SMITHERMAN DENISE P SMITHERMAN PIN: 595017354 4508 SHADY GROVE CHURCH RD DB: 1179 PG: 130
N/F TRACY ANN AND EDWARD SMITHERMAN PIN: 594000998002 4248 SHADY GROVE CHURCH RD DB: 11E PG: 69
N/F DAVID L SMITHERMAN PIN: 595000989139 4325 SHADY GROVE CH RD DB: 302 PG: 507
N/F JANICE SMITHERMAN BAITY ET VIR STEPHEN BAITY PIN: 595018812 2 4341 SHADY GROVE RD DB:1179 PG: 151
N/F GUY V SMITHERMAN JR & CAROLYN SMITHERMAN PIN: 595000989522 4305 SHADY GROVE CH RD DB: 301 PG: 440
N/F SHADY GROVE METHODIST CHURCH PIN: 595000998976 DB: 240 PG: 694
N/F JOY D LINEBERRY PIN: 595100006367 4217 SHADY GROVE RD DB: 1031 PG: 004
N/F MICHAEL C & DENISE P WOOD PIN: 595000097299 4325 SHADY GROVE CH RD DB: 476 PG: 294
N/F BENNY & SADIE WOOD PIN: 595000095873 DB: 270 PG: 863
N/F SARA C WOOD PIN: 595000091858 4236 SHADY GROVE CHURCH RD DB: 13E PG: 186
N/F SARA C WOOD PIN: 595000094255 DB: 13E PG: 186
N/F JOEL & CANDICE DINKINS PIN: 595100015820 DB: 326 PG: 790
N/F JOEL DINKINS PIN: 595100015820 SHADY GROVE CHURCH ROAD DB: 326 PG: 790
N/F JOHN R BEANE PIN: 595100001581 DB: 213 PG: 895
N/F CHRISTINA HUTCHENS PIN: 595100909479 DB: 1157 PG: 349
N/F CLIFFORD POWELL PIN: 594100917201 DB: 326 PG: 59
N/F EDWARD & TRACY ANN SMITHERMAN PIN: 594000998002 4248 SHADY GROVE CHURCH RD DB: 11E PG: 69
N/F NOEL J WOOD JR ESTATE PIN: 594100807114 DB: 13E PG: 186

EXISTING 40' POWERLINE EASEMENT
SANDY GROVE CHURCH RD (80' PUBLIC R/W)
PECAN RIDGE DRIVE (PRIVATE DRIVE)
ACCESS LOCATION
NCGS MON EAST BEND (FZ1787) N:901550.80 E:1553874.93 CSF: 0.99996962
N25°23'40"W 6053.50'(GRID)

DETAIL 2



LEGEND

- EXISTING PK NAIL
- EXISTING IRON
- 5/8"*30" REBAR SET W/3.25" ALUMINUM CAP WITH STATE SEAL
- CALCULATED POINT
- EXISTING MONUMENT
- NEW CONSERVATION EASEMENT FOR "DIVISION OF MITIGATION SERVICES"
- TEMPORARY CONSTRUCTION EASEMENT AT CROSSING LOCATION
- P.O.B. POINT OF BEGINNING
- P.O.C. POINT OF COMMENCEMENT

GRAPHIC SCALE
300 0 150 300 600
1 INCH = 300 FEET

FINAL PLAT
CONSERVATION EASEMENT
FOR
STATE OF NORTH CAROLINA
DEPARTMENT OF ENVIRONMENTAL QUALITY
DIVISION OF MITIGATION SERVICES
PROJECT NAME: MILL DAM CREEK RESTORATION PROJECT
DMS PROJECT #: 97136
SPO FILE NO. 99-N THRU 99-W
EAST BEND TOWNSHIP, YADKIN COUNTY
NORTH CAROLINA

DATE:	SCALE:	SHEET:
JANUARY 11, 2017	1" = 300'	2 OF 2

KCI ASSOCIATES OF NORTH CAROLINA C-0764

KCI ASSOCIATES OF N.C.
ENGINEERS, SURVEYORS AND PLANNERS

4505 FALLS OF NEUSE ROAD, FLOOR 4
RALEIGH, NC 27607
PHONE (919) 783-9214 • FAX (919) 783-9266

12.4 Credit Release Schedule

All credit releases will be based on the total credit generated as reported in the final design plans unless otherwise documented and provided to the Interagency Review Team following construction. Under no circumstances shall any mitigation project be debited until the necessary DA authorization has been received for its construction or the District Engineer (DE) has otherwise provided written approval for the project in the case where no DA authorization is required for construction of the mitigation project. The DE, in consultation with the Interagency Review Team (IRT), will determine if performance standards have been satisfied sufficiently to meet the requirements of the release schedules below. In cases where some performance standards have not been met, credits may still be released depending on the specifics of the case. Monitoring may be required to restart or be extended, depending on the extent to which the site fails to meet the specified performance standard. The release of project credits will be subject to the criteria described as follows:

Stream Credit Release Schedule – 7 year Timeframe			
Monitoring Year	**Credit Release Activity**	**Interim Release**	**Total Released**
0	Initial Allocation – see requirements below	30%	30%
1	First year monitoring report demonstrates performance standards are being met	10%	40%
2	Second year monitoring report demonstrates performance standards are being met	10%	50%
3	Third year monitoring report demonstrates performance standards are being met	10%	60%
4	Fourth year monitoring report demonstrates performance standards are being met	5%	65% (75%*)
5	Fifth year monitoring report demonstrates performance standards are being met	10%	75% (85%*)
6	Sixth year monitoring report demonstrates performance standards are being met	5%	80% (90%*)
7	Seventh year monitoring report demonstrates performance standards are being met, and project has received close-out approval from IRT	10%	90% (100%*)

**See Subsequent Credit Releases description below*

Initial Allocation of Released Credits

The initial allocation of released credits, as specified in the mitigation plan can be released by the NCDMS without prior written approval of the DE upon satisfactory completion of the following activities:

a. Approval of the final Mitigation Plan
b. Recordation of the preservation mechanism, as well as a title opinion acceptable to the USACE covering the property
c. Completion of project construction (the initial physical and biological improvements to the mitigation site) pursuant to the mitigation plan; Per the NCDMS Instrument, construction means that a mitigation site has been constructed in its entirety, to include planting, and an as-built report has been produced. As-built reports must be sealed by an engineer prior to project closeout, if appropriate but not prior to the initial allocation of released credits.
d. Receipt of necessary DA permit authorization or written DA approval for projects where DA permit issuance is not required

Subsequent Credit Releases

All subsequent credit releases must be approved by the DE, in consultation with the IRT, based on a determination that required performance standards have been achieved. For stream project with a 7-year monitoring period, a reserve of 10% of a site's total stream credits shall be released after four bankfull events have occurred, in separate years, provided the channel is stable and all other performance standards are met. In the event that less than four bankfull events occur during the monitoring period, release of these reserve credits shall be at the discretion of the IRT. As projects approach milestones associated with credit release, the NCDMS will submit a request for credit release to the DE along with documentation substantiating achievement of criteria required for release to occur. This documentation will be included with the annual monitoring report.

12.5 Financial Assurance

Pursuant to Section IV H and Appendix III of the Division of Mitigation Service's In-Lieu Fee Instrument dated July 28, 2010, the North Carolina Department of Environmental Quality (formerly NCDENR) has provided the U.S. Army Corps of Engineers Wilmington District with a formal commitment to fund projects to satisfy mitigation requirements assumed by DMS. This commitment provides financial assurance for all mitigation projects implemented by the program.

12.6 Maintenance Plan

The site will be monitored on a regular basis, with a physical inspection of the site conducted a minimum of once per year throughout the post-construction monitoring period until performance standards are met. These site inspections may identify site components and features that require routine maintenance. Routine maintenance should be expected most often in the first two years following site construction and may include the following. Maintenance needs or actions will be recorded in the annual monitoring reports. See the Section 12.9 for more information on invasive species.

Planned Maintenance

Component/Feature	Maintenance Through Project Close-Out
Stream	Routine channel maintenance and repair activities may include securing of loose coir matting and supplemental installations of live stakes and other target vegetation along the channel. Areas where stormwater and floodplain flows intercept the channel (such as the proposed water quality treatment areas) may also require maintenance to prevent bank failures, knick points, and erosion.
Vegetation	Vegetation shall be maintained to ensure the health and vigor of the targeted plant community. Any vegetation control requiring herbicide application will be performed in accordance with NC Department of Agriculture (NCDA) rules and regulations.
Site Boundary	Site boundaries shall be identified in the field to ensure clear distinction between the mitigation site and adjacent properties. Boundaries may be identified by fence, marker, bollard, post, tree-blazing, or other means as allowed by site conditions and/or conservation easement. Boundary markers disturbed, damaged, or destroyed will be repaired and/or replaced on an as needed basis up until the project is closed out.
Beaver Control	The site will be monitored for the presence of beaver. Adaptive management approaches will be used to evaluate whether or not beaver or their structures should be controlled at the site.

12.7 Stream and Wetland Delineation (Incl. Stream Identification Forms)

KCI
ASSOCIATES OF NC

ISO 9001:2008 CERTIFIED
ENGINEERS • PLANNERS • SCIENTISTS • CONSTRUCTION MANAGERS
4505 Falls of Neuse Rd., Suite 400 • Raleigh, NC 27609 • Phone 919-783-9214 • Fax 919-783-9266

November 14, 2016

Mr. William Elliott
Asheville Regulatory Field Office
US Army Corps of Engineers
151 Patton Avenue, Room 208
Asheville, North Carolina 28801-5006

Subject: Request for Preliminary Jurisdictional Determination
Mill Dam Creek Restoration Site
Yadkin County, North Carolina

Dear Mr. Elliott;

KCI has completed a delineation of streams and wetlands for the above referenced project. The attached information, including required forms, tables, and figures, is submitted for your review and determination of jurisdiction under the Clean Water Act (CWA).

Project Description & Methodology

As shown in Figure 1, the Mill Dam Creek Restoration Site is located in Yadkin County, NC within the Yadkin River Basin (USGS HUC 03040101). This restoration will be done for the North Carolina Division of Mitigation Services (DMS) In-Lieu Fee Program. This delineation was performed in compliance with methodology set forth in the U.S. Army Corps of Engineers (USACE) Wetland Delineation Manual (USACE 1987) and subsequent guidance including the Eastern Mountains and Piedmont Regional Supplement. Streams were assessed for jurisdiction under the CWA using field indications of ordinary high water mark and the North Carolina Division of Water Quality (NCDWQ) Stream Identification Form, Version 4.11.

Wetlands were delineated using survey flagging at regular locations along the wetland-upland boundary. All boundaries either form complete polygons, tie to surface water features such as streams or ponds, or tie to the edge of the study area. Streams points were collected using sub-meter GPS technology at representative points to depict center lines. Wetland Determination Forms were completed for each type of wetland community encountered.

Delineation Results

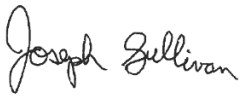
Figure 2 is presented using the East Bend US Geological Survey 1:24,000 Quadrangle Map. Figure 3 presents the results of the delineation, including streams and wetlands overlaid on 2014 Statewide Aerial Photographs.

Table 1 presents detailed information on the jurisdictional stream within the study area, including status (intermittent or perennial), length, width, NCDWQ Score, and latitude/longitude. Based on field data, approximately 12,921 linear feet of stream are present within the study area. Table 2 presents detailed information on each wetland feature including NC Wetland Assessment Method type, Hydrologic Class, Cowardin Class, size, representative wetland delineation form identification, and latitude/longitude. Based on field data, there are approximately 0.43 acres of wetlands and 0.44 acres of pond present within the study area.

We respectfully request your review of this information, so that a preliminary jurisdictional determination under the CWA may be obtained. If you have any questions, need additional information, or would like to schedule a site visit, please contact me at your earliest convenience at (919) 278-2533 or Joe.Sullivan@kci.com.

Sincerely,

KCI Associates of North Carolina



Joseph Sullivan
Environmental Scientist

Attachments:

- Jurisdictional Determination (JD) Request Form
- Preliminary Jurisdictional Determination Form
- Table 1: Stream Summary Table
- Table 2: Wetland Summary Table
- Table 3: Surface Water Summary Table
- Figure 1: Vicinity Map
- Figure 2: USGS Map
- Figure 3: Jurisdictional Features Map
- Stream and Wetland Data Forms
- Offers to Purchase Easement Restrictions

Jurisdictional Determination Request

A. PARCEL INFORMATION

Street Address: East of Shady Grove Church Road and West of Shoals Road
City, State: East Bend, NC
County: Yadkin
Directions: From Raleigh, take I-40 west towards Greensboro. Take exit 188 to US-421 north. Take exit 244. Take Conrad Rd, Old U.S. 421 and Flint Hill Rd to Shady Grove Church Rd.

Parcel Index Number(s) (PIN): 595100015820, 595100112104, 595100109505, 595000282701, 5950291625, 595000281888, 595000282332, 5950273465, 595000194361, 595000091858

B. REQUESTOR INFORMATION

Name: Joe Sullivan, KCI Technologies Inc.
Mailing Address: 4505 Falls of Neuse Rd. Suite 400, Raleigh, NC 27609
Telephone Number: (919) 278-2533
Electronic Mail Address[1]: Joe.Sullivan@kci.com

Select one:

- ☐ I am the current property owner.
- ☑ I am an Authorized Agent or Environmental Consultant[2]
- ☐ Interested Buyer or Under Contract to Purchase
- ☐ Other, please explain.

C. PROPERTY OWNER INFORMATION

Name: Multiple - See Attached Offers to Purchase Easement Restrictions
Mailing Address:

Telephone Number:
Electronic Mail Address[3]:

☐ Proof of Ownership Attached (e.g. a copy of Deed, County GIS/Parcel/Tax Record data)

[1] If available
[2] Must attach completed Agent Authorization Form
[3] If available

D. PROPERTY OWNER CERTIFICATION[4]

I, the undersigned, a duly authorized owner of record of the property/properties identified herein, do authorize representatives of the Wilmington District, U.S. Army Corps of Engineers (Corps) to enter upon the property herein described for the purpose of conducting on-site investigations and issuing a determination associated with Waters of the U.S. subject to Federal jurisdiction under Section 404 of the Clean Water Act and/or Section 10 of the Rivers and Harbors Act of 1899.

See Offers to Purchase Easement Restrictions

Property Owner (please print) Date

Property Owner Signature

E. JURISDICTIONAL DETERMINATION TYPE

Select One:

☑ I am requesting that the Corps provide a preliminary JD for the property identified herein. This request does include a delineation.

☐ I am requesting that the Corps provide a preliminary JD for the property identified herein. This request does NOT include a delineation.

☐ I am requesting that the Corps investigate the property/project area for the presence or absence of WoUS[5] and provide an approved JD for the property identified herein. This request does NOT include a request for a verified delineation.

☐ I am requesting that the Corps delineate the boundaries of all WoUS on a property/project area and provide an approved JD (this may or may not include a survey plat).

☐ I am requesting that the Corps evaluate and approve a delineation of WoUS (conducted by others) on a property/project area and provide an approved JD (may or may not include a survey plat).

[4] For NCDOT requests following the current NCDOT/USACE protocols, skip to Part E.
[5] Waters of the United States

F. ALL REQUESTS

☑ Map of Property or Project Area (attached). This Map must clearly depict the boundaries of the area of evaluation.

☑ Size of Property or Project Area 36.92 acres

☑ I verify that the property (or project) boundaries have recently been surveyed and marked by a licensed land surveyor OR are otherwise clearly marked or distinguishable.

G. JD REQUESTS FROM CONSULTANTS OR AGENCIES

(1) Preliminary JD Requests:

☑ Completed and signed Preliminary Jurisdictional Determination Form[6].

☑ Project Coordinates: 36.2393 Latitude -80.5199 Longitude

Maps (no larger than 11x17) with Project Boundary Overlay:

☑ Large and small scale maps that depict, at minimum: streets, intersections, towns

☑ Aerial Photography of the project area

☑ USGS Topographic Map

☐ Soil Survey Map

☐ Other Maps, as appropriate (e.g. National Wetland Inventory Map, Proposed Site Plan, previous delineation maps, LIDAR maps, FEMA floodplain maps)

[6] See Appendix A of this Form. From Regulatory Guidance Letter No. 08-02, dated June 26, 2008

Delineation Information (when applicable)[7]:

Wetlands:

- [x] Wetland Data Sheets[8]
- [x] Upland Data Sheets
- [ ] Landscape Photos, if taken

Tributaries:

- [ ] USACE Assessment Forms
- [x] Other Assessment Forms (when appropriate)

- [ ] Field Sketch overlain on legible Map that includes:
  - All aquatic resources (for sites with multiple resources, label and identify)
  - Locations of wetland data points and/or tributary assessment reaches
  - Locations of photo stations
  - Approximate acreage/linear footage of aquatic resources

(2) Approved JDs including Verification of a Delineation:

- [ ] Project Coordinates: _____ Latitude _____ Longitude

Maps (no larger than 11x17) with Project Boundary Overlay:

- [ ] Large and small scale maps that depict, at minimum: streets, intersections, towns
- [ ] Aerial Photography of the project area
- [ ] USGS Topographic Map
- [ ] Soil Survey Map
- [ ] Other Maps, as appropriate (e.g. National Wetland Inventory Map, Proposed Site Plan, previous delineation maps)

[7] 1987 Manual Regional Supplements and Data forms can be found at:
http://www.usace.army.mil/Missions/CivilWorks/RegulatoryProgramandPermits/reg_supp.aspx
Wetland and Stream Assessment Methodologies can be found at:
http://portal.ncdenr.org/c/document_library/get_file?uuid=76f3c58b-dab8-4960-ba43-45b7faf06f4c&groupId=38364 and,
http://www.saw.usace.army.mil/Portals/59/docs/regulatory/publicnotices/2013/NCSAM_Draft_User_Manual_130318.pdf

[8] Delineation information must include, at minimum, one wetland data sheet for each wetland/community type.

Delineation Information (when applicable):

Wetlands:

☐ Wetland Data Sheets[9]

☐ Upland Data Sheets

Tributaries:

☐ USACE Assessment Forms

☐ Other Assessment Forms (when appropriate)

☐ Landscape Photos, if taken

☐ Field Sketch overlain on legible Map that includes:

- All aquatic resources (for sites with multiple resources, label and identify)
- Locations of wetland data points and/or tributary assessment reaches
- Locations of photo stations
- Approximate acreage/linear footage of aquatic resources

Supporting Jurisdictional Information (for Approved JDs only)

☐ Approved Jurisdictional Determination Form(s) (also known as "Rapanos Form(s)")

☐ Map(s) depicting the potential (or lack of potential) hydrologic connection(s), adjacency, etc. to navigable waters.

[9] Delineation information must include, at minimum, one wetland data sheet for each wetland/community type.

I. REQUESTS FOR CORPS APPROVAL OF SURVEY PLAT

Prior to final production of a Plat, the Wilmington District recommends that the Land Surveyor electronically submit a draft of a Survey Plat to the Corps project manager for review.

Due to storage limitations of our administrative records, the Corps requires that all hard-copy submittals include at least one original Plat (to scale) that is no larger than 11"x17" (the use of match lines for larger tracts acceptable). Additional copies of a plat, including those larger than 11"x17", may also be submitted for Corps signature as needed. The Corps also accepts electronic submittals of plats, such as those transmitted as a Portable Document Format (PDF) file. Upon verification, the Corps can electronically sign these plats and return them via e-mail to the requestor.

(1) PLATS SUBMITTED FOR APPROVAL

☐ Must be sealed and signed by a licensed professional land surveyor

☐ Must be to scale (all maps must include both a graphic scale and a verbal scale)

☐ Must be legible

☐ Must include a North Arrow, Scale(s), Title, Property Information

☐ Must include a legible WoUS Delineation Table of distances and bearings/metes and bounds/GPS coordinates of all surveyed delineation points

☐ Must clearly depict surveyed property or project boundaries

☐ Must clearly identify the known surveyed point(s) used as reference (e.g. property corner, USGS monument)

☐ When wetlands are depicted:

- Must include acreage (or square footage) of wetland polygons
- Must identify each wetland polygon using an alphanumeric system

☐ When tributaries are depicted:

- Must include either a surveyed, approximate centerline of tributary with approximate width of tributary OR surveyed Ordinary High Water Marks (OHWM) of tributary
- Must identify each tributary using an alphanumeric system
- Must include linear footage of tributaries and calculated area (using approximate widths or surveyed OHWM)
- Must include name of tributary (based on the most recent USGS topographic map) or, when no USGS name exists, identify as "unnamed tributary"

☐ all depicted WoUS (wetland polygons and tributary lines) must intersect or tie-to surveyed project/property boundaries

☐ Must include the location of wetland data points and/or tributary assessment reaches

☐ Must include, label accordingly, and depict acreage of all waters not currently subject to the requirements of the CWA (e.g. "isolated wetlands", "non-jurisdictional waters"). NOTE: An approved JD must be conducted in order to make an official Corps determination that a particular waterbody or wetland is <u>not</u> jurisdictional.

☐ Must include and survey all existing conveyances (pipes, culverts, etc.) that transport WoUS

(2) CERTIFICATION LANGUAGE

☐ When the entire actual Jurisdictional Boundary is depicted:

include the following Corps Certification language:

"This certifies that this copy of this plat accurately depicts the boundary of the jurisdiction of Section 404 of the Clean Water Act as determined by the undersigned on this date. Unless there is a change in the law or our published regulations, the determination of Section 404 jurisdiction may be relied upon for a period not to exceed five (5) years from this date. The undersigned completed this determination utilizing the appropriate Regional Supplement to the 1987 U.S. Army Corps of Engineers Wetlands Delineation Manual."

Regulatory Official: _____

Title: _____

Date: _____

USACE Action ID No.: _____

☐ When uplands may be present within a depicted Jurisdictional Boundary:

include the following Corps Certification language:

"This certifies that this copy of this plat identifies all areas of waters of the United States regulated pursuant to Section 404 of the Clean Water Act as determined by the undersigned on this date. Unless there is change in the law or our published regulations, this determination of Section 404 jurisdiction may be relied upon for a period not to exceed five years from this date. The undersigned completed this determination utilizing the appropriate Regional Supplement to the 1987 U.S. Army Corps of Engineers Wetlands Delineation Manual."

Regulatory Official: _____

Title: _____

Date: _____

USACE Action ID No.: _____

(3) GPS SURVEYS

For Surveys prepared using a Global Positioning System (GPS), the Survey must include all of the above, as well as:

☐ be at sub-meter accuracy at each survey point.

☐ include an accuracy verification:
One or more known points (property corner, monument) shall be located with the GPS and cross-referenced with the existing traditional property survey (metes and bounds).

☐ include a brief description of the GPS equipment utilized.

ATTACHMENT A

PRELIMINARY JURISDICTIONAL DETERMINATION FORM

BACKGROUND INFORMATION

A. REPORT COMPLETION DATE FOR PRELIMINARY JURISDICTIONAL DETERMINATION (JD): _____

B. NAME AND ADDRESS OF PERSON REQUESTING PRELIMINARY JD:

Joe Sullivan, KCI Technologies Inc.

4505 Falls of Neuse Rd. Suite 400, Raleigh, NC 27609

C. DISTRICT OFFICE, FILE NAME, AND NUMBER:

_____

D. PROJECT LOCATION(S) AND BACKGROUND INFORMATION:

East of Shady Grove Church Road and West of Shoals Road, East Bend NC

(USE THE ATTACHED TABLE TO DOCUMENT MULTIPLE WATERBODIES AT DIFFERENT SITES)

State: NC County/parish/borough: Yadkin City: East Bend

Center coordinates of site (lat/long in degree decimal format):
Lat. 36.2393 °N; Long. -80.5199 °W.

Universal Transverse Mercator: _____

Name of nearest waterbody: Hall Creek

Identify (estimate) amount of waters in the review area:

Non-wetland waters:

12,921 linear feet: 6 width (ft) and/or 1.78 acres.

Cowardin Class: Riverine

Stream Flow: Intermittent / Perennial

Wetlands: 0.43 acres.

Cowardin Class: Forested

Name of any water bodies on the site that have been identified as Section 10 waters:

Tidal: _____

Non-Tidal: _____

E. REVIEW PERFORMED FOR SITE EVALUATION (CHECK ALL THAT APPLY):

☐ Office (Desk) Determination. Date: _____

☐ Field Determination. Date(s): _____

SUPPORTING DATA. Data reviewed for preliminary JD (check all that apply - checked items should be included in case file and, where checked and requested, appropriately reference sources below):

☑ Maps, plans, plots or plat submitted by or on behalf of the applicant/consultant: Vicinity Map

☑ Data sheets prepared/submitted by or on behalf of the applicant/consultant.

☐ Office concurs with data sheets/delineation report.

☐ Office does not concur with data sheets/delineation report.

☐ Data sheets prepared by the Corps: _____

☐ Corps navigable waters' study: _____

☐ U.S. Geological Survey Hydrologic Atlas: _____

☐ USGS NHD data

☐ USGS 8 and 12 digit HUC maps

☑ U.S. Geological Survey map(s). Cite scale & quad name: 1:24K East Bend

☐ USDA Natural Resources Conservation Service Soil Survey. Citation: _____

☐ National wetlands inventory map(s). Cite name: _____

☐ State/Local wetland inventory map(s): _____

☐ FEMA/FIRM maps: _____

☐ 100-year Floodplain Elevation is: _____ (National Geodectic Vertical Datum of 1929)

☑ Photographs: ☑ Aerial (Name & Date): 2014 NC Statewide Aerial Photographs or ☐ Other (Name & Date): _____

☐ Previous determination(s). File no. and date of response letter: _____

☐ Other information (please specify): _____

1. The Corps of Engineers believes that there may be jurisdictional waters of the United States on the subject site, and the permit applicant or other affected party who requested this preliminary JD is hereby advised of his or her option to request and obtain an approved jurisdictional determination (JD) for that site. Nevertheless, the permit applicant or other person who requested this preliminary JD has declined to exercise the option to obtain an approved JD in this instance and at this time.

2. In any circumstance where a permit applicant obtains an individual permit, or a Nationwide General Permit (NWP) or other general permit verification requiring "pre-construction notification" (PCN), or requests verification for a non-reporting NWP or other general permit, and the permit applicant has not requested an approved JD for the activity, the permit applicant is hereby made aware of the following: (1) the permit applicant has elected to seek a permit authorization based on a preliminary JD, which does not make an official determination of jurisdictional waters; (2) that the applicant has the option to request an approved JD before accepting the terms and conditions of the permit authorization, and that basing a permit authorization on an approved JD could possibly result in less compensatory mitigation being required or different special conditions; (3) that the applicant has the right to request an individual permit rather than accepting the terms and conditions of the NWP or other general permit authorization; (4) that the applicant can accept a permit authorization and thereby agree to comply with all the terms and conditions of that permit, including whatever mitigation requirements the Corps has determined to be necessary; (5) that undertaking any activity in reliance upon the subject permit authorization without requesting an approved JD constitutes the applicant's acceptance of the use of the preliminary JD, but that either form of JD will be processed as soon as is practicable; (6) accepting a permit authorization (e.g., signing a proffered individual permit) or undertaking any activity in reliance on any form of Corps permit authorization based on a preliminary JD constitutes agreement that all wetlands and other water bodies on the site affected in any way by that activity are jurisdictional waters of the United States, and precludes any challenge to such jurisdiction in any administrative or judicial compliance or enforcement action, or in any administrative appeal or in any Federal court; and (7) whether the applicant elects to use either an approved JD or a preliminary JD, that JD will be processed as soon as is practicable. Further, an approved JD, a proffered individual permit (and all terms and conditions contained therein), or individual permit denial can be administratively appealed pursuant to 33 C.F.R. Part 331, and that in any administrative appeal, jurisdictional issues can be raised (see 33 C.F.R. 331.5(a)(2)). If, during that administrative appeal, it becomes necessary to make an official determination whether CWA jurisdiction exists over a site, or to provide an official delineation of jurisdictional waters on the site, the Corps will provide an approved JD to accomplish that result, as soon as is practicable.

This preliminary JD finds that there *"may be"* waters of the United States on the subject project site, and identifies all aquatic features on the site that could be affected by the proposed activity, based on the following information:

IMPORTANT NOTE: The information recorded on this form has not necessarily been verified by the Corps and should not be relied upon for later jurisdictional determinations.

Signature and date of
Regulatory Project Manager
(REQUIRED)

Joseph Sullivan 11/14/16

Signature and date of
person requesting preliminary JD
(REQUIRED, unless obtaining
the signature is impracticable)

Table 1.

Stream Name	Stream Status	Length (Feet)	Width (Feet)	NCDWQ Score	Latitude	Longitude
UT to Hall Creek (UTHC)	Perennial	6,130	7	-	36.2415	-80.5219
T1	Perennial	757	5	41	36.2347	-80.5200
T1A	Perennial	744	5	-	36.2337	-80.5210
T2	Perennial	616	5	32	36.2351	-80.5183
T3	Perennial	346	4	35	36.2360	-80.5198
T4	Intermittent	171	4	26	36.2372	-80.5200
T5	Perennial	1,174	5	37.5	36.2378	-80.5183
T5B	Perennial	321	4	32	36.2377	-80.5175
T6	Perennial	638	6	32 / 33.5	36.2395	-80.5190
T6A	Perennial	123	4	-	36.2395	-80.5182
T7	Perennial	468	6	40.5	36.2409	-80.5217
T8	Perennial	888	5	36.5	36.2408	-80.5258
T8A	Perennial	222	5	-	36.2415	-80.5261
T9	Perennial	124	5	39.5	36.2431	-80.5215
Drain 2	Intermittent	199	5	20	36.2422	-80.5217

Table 2.

Wetland ID	NCWAM	Hydrologic Class	Cowardin Class	Size (Acres)	USACE Forms		Latitude	Longitude
					WET	UP		
WA	Headwater Forest	Riparian	PFO	0.11	X	X	36.2408	-80.5218
WB	Bottomland Hardwood Forest	Riparian	PFO	0.03	WA	WA	36.2390	-80.5202
WC	Headwater Forest	Riparian	PEM	0.10	WA	WA	36.2360	-80.5205
WE	Headwater Forest	Riparian	PFO	0.07	N/A	WA	36.2397	-80.5181
WG	Headwater Forest	Riparian	PSS	0.01	X	X	36.2404	-80.5248
WH	Headwater Forest	Riparian	PFO	0.06	WG	WG	36.2410	-80.5260
WI	Headwater Forest	Riparian	PFO	0.02	WG	WG	36.2411	-80.5261
WJ	Headwater Forest	Riparian	PFO	0.02	WG	WG	36.2413	-80.5262
WK	Headwater Forest	Riparian	PSS	0.01	WG	WG	36.2416	-80.5256

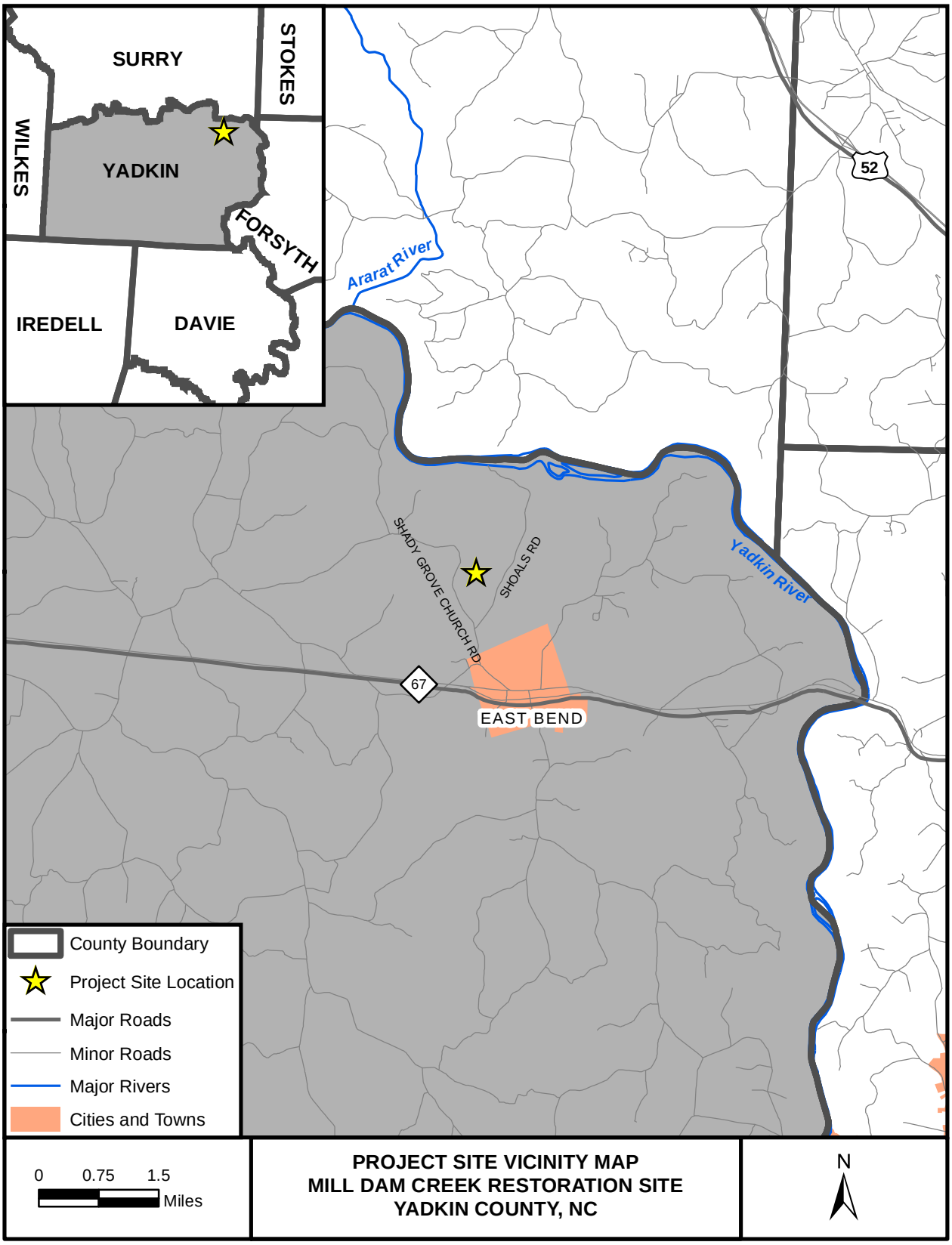
Table 2.

Pond ID	Isolated (Y/N)	Size (Acres)	Latitude	Longitude
PA	No	0.44	36.2396	-80.5185

X = Data Forms Completed

N/A = Wetland Forms not completed due to animal interference.

PFO = Palustrine Forested; PSS = Palustrine Scrub-Shrub; PEM = Palustrine Emergent


SURRY
STOKES
WILKES
YADKIN
FORSYTH
IREDELL
DAVIE
Ararat River
52
SHADY GROVE CHURCH RD
SHOALS RD
Yadkin River
67
EAST BEND
County Boundary
Project Site Location
Major Roads
Minor Roads
Major Rivers
Cities and Towns
0 0.75 1.5
Miles
PROJECT SITE VICINITY MAP
MILL DAM CREEK RESTORATION SITE
YADKIN COUNTY, NC
N

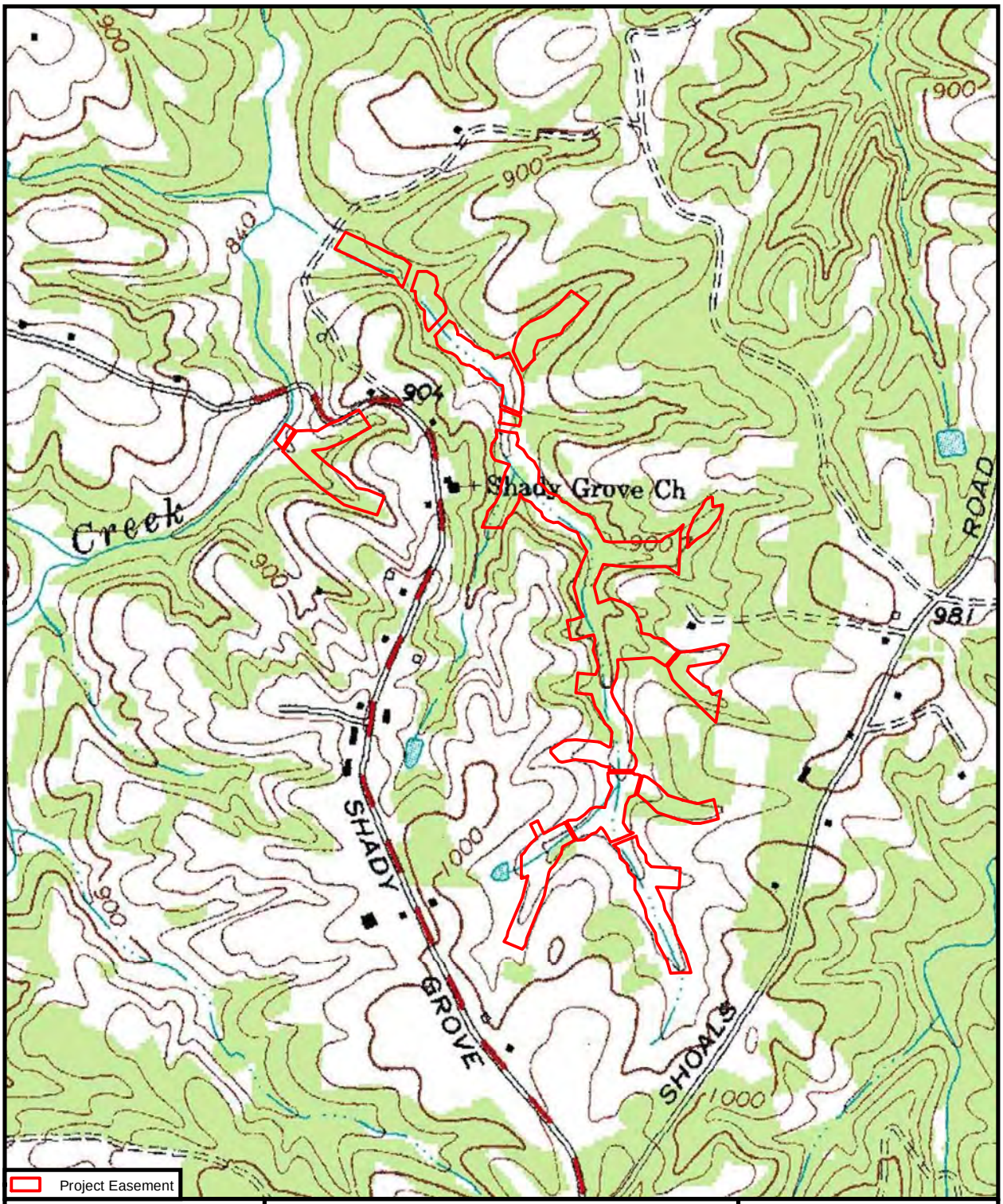
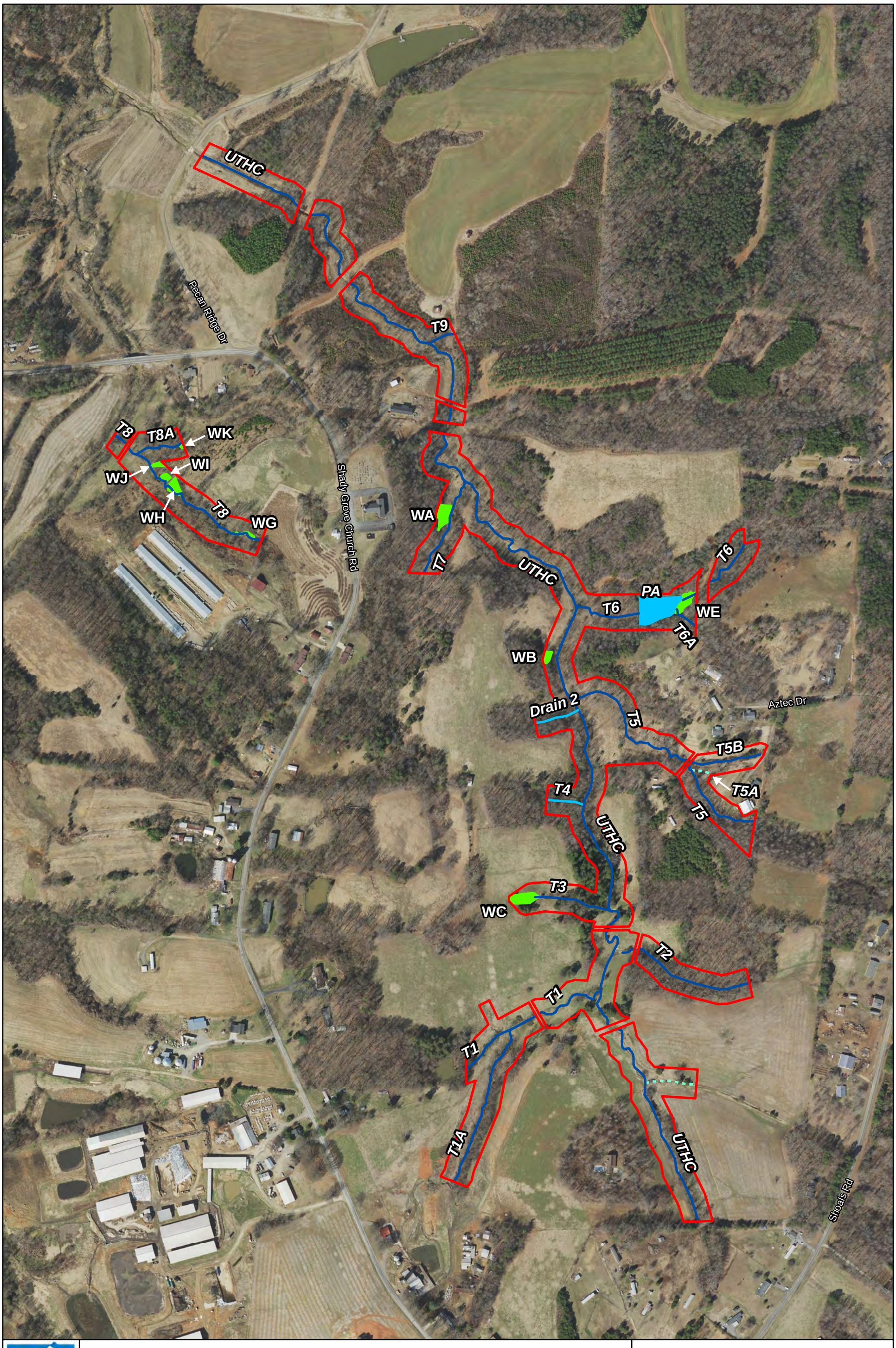


FIGURE 2. USGS TOPOGRAPHIC MAP
MILL DAM CREEK RESTORATION SITE
YADKIN COUNTY, NC

Source: USGS DRG, East Bend Quad.



Project Easement
Ephemeral Channels
Intermittent Streams
Perennial Streams
Wetlands
Pond

400 200 0 400
Feet

Image Source: NC OneMap
2014 Aerial Imagery

N
W E
S

KCI ASSOCIATES OF NC

Figure 3: Jurisdictional Features Map
Mill Dam Creek Restoration Site
Yadkin County, NC

November 2016

NC DWQ Stream Identification Form Version 4.11

Date: 1/12/16	**Project/Site:** HWI site/T1	**Latitude:**
Evaluator: AF, TS	**County:** Yadkin	**Longitude:**
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 41	**Stream Determination (circle one)** Ephemeral Intermittent (Perennial)	**Other** *e.g. Quad Name:*

A. Geomorphology (Subtotal = 23)	Absent	Weak	Moderate	Strong
1[a]. Continuity of channel bed and bank	0	1	2	(3)
2. Sinuosity of channel along thalweg	0	(1)	2	3
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence	0	1	2	(3)
4. Particle size of stream substrate	0	1	2	(3)
5. Active/relict floodplain	0	1	(2)	3
6. Depositional bars or benches	0	1	2	(3)
7. Recent alluvial deposits	0	1	2	(3)
8. Headcuts	0	1	2	(3)
9. Grade control	0	(0.5)	1	1.5
10. Natural valley	0	0.5	1	(1.5)
11. Second or greater order channel	(No = 0)		Yes = 3	

[a] artificial ditches are not rated; see discussions in manual

B. Hydrology (Subtotal = 12)				
12. Presence of Baseflow	0	1	2	(3)
13. Iron oxidizing bacteria	0	1	2	(3)
14. Leaf litter	1.5	(1)	0.5	0
15. Sediment on plants or debris	0	(0.5)	1	1.5
16. Organic debris lines or piles	0	0.5	1	(1.5)
17. Soil-based evidence of high water table?	No = 0		(Yes = 3)	

C. Biology (Subtotal = 6)				
18. Fibrous roots in streambed	(3)	2	1	0
19. Rooted upland plants in streambed	(3)	2	1	0
20. Macrobenthos (note diversity and abundance)	(0)	1	2	3
21. Aquatic Mollusks	(0)	1	2	3
22. Fish	(0)	0.5	1	1.5
23. Crayfish	(0)	0.5	1	1.5
24. Amphibians	(0)	0.5	1	1.5
25. Algae	(0)	0.5	1	1.5
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5 (Other = 0)			

*perennial streams may also be identified using other methods. See p. 35 of manual.

Notes:

Sketch:

NC DWQ Stream Identification Form Version 4.11

Date: 1/13/16	**Project/Site:** Hall Site / T2	**Latitude:**
Evaluator: AF, JS	**County:** Yadkin	**Longitude:**
Total Points: 32 *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30**	**Stream Determination (circle one)** Ephemeral Intermittent (Perennial)	**Other** *e.g. Quad Name:*

A. Geomorphology (Subtotal = 17)	Absent	Weak	Moderate	Strong
1[a]. Continuity of channel bed and bank	0	1	(2)	3
2. Sinuosity of channel along thalweg	0	(1)	2	3
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence	0	1	(2)	3
4. Particle size of stream substrate	0	1	(2)	3
5. Active/relict floodplain	0	1	(2)	3
6. Depositional bars or benches	0	1	2	(3)
7. Recent alluvial deposits	0	(1)	2	3
8. Headcuts	0	1	(2)	3
9. Grade control	0	0.5	(1)	1.5
10. Natural valley	0	0.5	(1)	1.5
11. Second or greater order channel	(No = 0)		Yes = 3	

[a] artificial ditches are not rated; see discussions in manual

B. Hydrology (Subtotal = 10)				
12. Presence of Baseflow	0	1	2	(3)
13. Iron oxidizing bacteria	(0)	1	2	3
14. Leaf litter	1.5	1	(0.5)	0
15. Sediment on plants or debris	0	(0.5)	1	1.5
16. Organic debris lines or piles	0	0.5	(1)	1.5
17. Soil-based evidence of high water table?	No = 0		(Yes = 3)	

C. Biology (Subtotal = 7)				
18. Fibrous roots in streambed	(3)	2	1	0
19. Rooted upland plants in streambed	(3)	2	1	0
20. Macrobenthos (note diversity and abundance)	0	(1)	2	3
21. Aquatic Mollusks	(0)	1	2	3
22. Fish	(0)	0.5	1	1.5
23. Crayfish	(0)	0.5	1	1.5
24. Amphibians	(0)	0.5	1	1.5
25. Algae	(0)	0.5	1	1.5
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5 Other = 0			

*perennial streams may also be identified using other methods. See p. 35 of manual.

Notes: 4 caddisflies

Sketch:

NC DWQ Stream Identification Form Version 4.11

Date: 1/13/16	**Project/Site:** Hall site / T3	**Latitude:**
Evaluator: AF, TS	**County:** Yadkin	**Longitude:**
Total Points: 35 *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30**	**Stream Determination (circle one)** Ephemeral Intermittent (Perennial)	**Other** *e.g. Quad Name:*

A. Geomorphology (Subtotal = 20)	Absent	Weak	Moderate	Strong
1[a]. Continuity of channel bed and bank	0	1	2	(3)
2. Sinuosity of channel along thalweg	0	1	(2)	3
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence	0	1	(2)	3
4. Particle size of stream substrate	0	1	2	(3)
5. Active/relict floodplain	0	(1)	2	3
6. Depositional bars or benches	0	1	2	(3)
7. Recent alluvial deposits	0	(1)	2	3
8. Headcuts	0	1	2	(3)
9. Grade control	0	(0.5)	1	1.5
10. Natural valley	0	0.5	1	(1.5)
11. Second or greater order channel	(No = 0)		Yes = 3	

[a] artificial ditches are not rated; see discussions in manual

B. Hydrology (Subtotal = 9)				
12. Presence of Baseflow	0	1	2	(3)
13. Iron oxidizing bacteria	0	(1)	2	3
14. Leaf litter	1.5	1	(0.5)	0
15. Sediment on plants or debris	0	0.5	(1)	1.5
16. Organic debris lines or piles	0	(0.5)	1	1.5
17. Soil-based evidence of high water table?	No = 0		(Yes = 3)	

C. Biology (Subtotal = 6)				
18. Fibrous roots in streambed	(3)	2	1	0
19. Rooted upland plants in streambed	(3)	2	1	0
20. Macrobenthos (note diversity and abundance)	(0)	1	2	3
21. Aquatic Mollusks	(0)	1	2	3
22. Fish	(0)	0.5	1	1.5
23. Crayfish	(0)	0.5	1	1.5
24. Amphibians	(0)	0.5	1	1.5
25. Algae	(0)	0.5	1	1.5
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5 (Other = 0)			

*perennial streams may also be identified using other methods. See p. 35 of manual.

Notes:

Sketch:

NC DWQ Stream Identification Form Version 4.11

Date: 1/13/16	**Project/Site:** Hall Site / Dam 2	**Latitude:**
Evaluator: AF, TS	**County:** Yadkin	**Longitude:**
Total Points: 80 *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30**	**Stream Determination (circle one)** Ephemeral (Intermittent) Perennial	**Other** *e.g. Quad Name:*

A. Geomorphology (Subtotal = 10.5)	Absent	Weak	Moderate	Strong
1[a]. Continuity of channel bed and bank	0	1	(2)	3
2. Sinuosity of channel along thalweg	0	(1)	2	3
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence	0	(1)	2	3
4. Particle size of stream substrate	0	(1)	2	3
5. Active/relict floodplain	0	(1)	2	3
6. Depositional bars or benches	(0)	1	2	3
7. Recent alluvial deposits	0	(1)	2	3
8. Headcuts	0	1	(2)	3
9. Grade control	0	(0.5)	1	1.5
10. Natural valley	0	0.5	(1)	1.5
11. Second or greater order channel	No = 0		Yes = 3	

[a] artificial ditches are not rated; see discussions in manual

B. Hydrology (Subtotal = 4.5)				
12. Presence of Baseflow	0	1	(2)	3
13. Iron oxidizing bacteria	0	(1)	2	3
14. Leaf litter	1.5	1	(0.5)	0
15. Sediment on plants or debris	(0)	0.5	1	1.5
16. Organic debris lines or piles	0	0.5	(1)	1.5
17. Soil-based evidence of high water table?	No = 0		Yes = 3	

C. Biology (Subtotal = 5)				
18. Fibrous roots in streambed	3	(2)	1	0
19. Rooted upland plants in streambed	(3)	2	1	0
20. Macrobenthos (note diversity and abundance)	(0)	1	2	3
21. Aquatic Mollusks	(0)	1	2	3
22. Fish	(0)	0.5	1	1.5
23. Crayfish	(0)	0.5	1	1.5
24. Amphibians	(0)	0.5	1	1.5
25. Algae	(0)	0.5	1	1.5
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5 (Other = 0)			

*perennial streams may also be identified using other methods. See p. 35 of manual.

Notes:

Sketch:

NC DWQ Stream Identification Form Version 4.11

Date: 1/13/16	**Project/Site:** Hall Site /T4	**Latitude:**
Evaluator: AF, TS	**County:** Yadkin	**Longitude:**
Total Points: 26 *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30**	**Stream Determination (circle one)** Ephemeral Intermittent Perennial	**Other** *e.g. Quad Name:*

A. Geomorphology (Subtotal = 12)	Absent	Weak	Moderate	Strong
1[a]. Continuity of channel bed and bank	0	1	(2)	3
2. Sinuosity of channel along thalweg	0	(1)	2	3
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence	0	(1)	2	3
4. Particle size of stream substrate	0	(1)	2	3
5. Active/relict floodplain	(0)	1	2	3
6. Depositional bars or benches	0	1	(2)	3
7. Recent alluvial deposits	0	(1)	2	3
8. Headcuts	0	1	(2)	3
9. Grade control	0	0.5	(1)	1.5
10. Natural valley	0	0.5	(1)	1.5
11. Second or greater order channel	No = 0		Yes = 3	

[a] artificial ditches are not rated; see discussions in manual

B. Hydrology (Subtotal = 8)				
12. Presence of Baseflow	0	1	(2)	3
13. Iron oxidizing bacteria	0	(1)	2	3
14. Leaf litter	1.5	(1)	0.5	0
15. Sediment on plants or debris	0	(0.5)	1	1.5
16. Organic debris lines or piles	0	(0.5)	1	1.5
17. Soil-based evidence of high water table?	No = 0		(Yes = 3)	

C. Biology (Subtotal = 6)				
18. Fibrous roots in streambed	(3)	2	1	0
19. Rooted upland plants in streambed	(3)	2	1	0
20. Macrobenthos (note diversity and abundance)	(0)	1	2	3
21. Aquatic Mollusks	(0)	1	2	3
22. Fish	(0)	0.5	1	1.5
23. Crayfish	(0)	0.5	1	1.5
24. Amphibians	(0)	0.5	1	1.5
25. Algae	(0)	0.5	1	1.5
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5 (Other = 0)			

*perennial streams may also be identified using other methods. See p. 35 of manual.

Notes:

Sketch:

NC DWQ Stream Identification Form Version 4.11

Date: 1/13/16	**Project/Site:** Hall site/TS	**Latitude:**
Evaluator: AF, TS	**County:** Yadkin	**Longitude:**
Total Points: 37.5 *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30**	**Stream Determination (circle one)** Ephemeral Intermittent (Perennial)	**Other** *e.g. Quad Name:*

A. Geomorphology (Subtotal = 19.5)	Absent	Weak	Moderate	Strong
1[a]. Continuity of channel bed and bank	0	1	2	(3)
2. Sinuosity of channel along thalweg	0	(1)	2	3
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence	0	1	2	(3)
4. Particle size of stream substrate	0	1	2	(3)
5. Active/relict floodplain	0	1	2	(3)
6. Depositional bars or benches	(0)	1	2	3
7. Recent alluvial deposits	0	(1)	2	3
8. Headcuts	0	1	2	(3)
9. Grade control	0	0.5	(1)	1.5
10. Natural valley	0	0.5	1	(1.5)
11. Second or greater order channel	(No = 0)		Yes = 3	

[a] artificial ditches are not rated; see discussions in manual

B. Hydrology (Subtotal = 11)				
12. Presence of Baseflow	0	1	2	(3)
13. Iron oxidizing bacteria	0	1	2	(3)
14. Leaf litter	1.5	(1)	0.5	0
15. Sediment on plants or debris	0	(0.5)	1	1.5
16. Organic debris lines or piles	0	(0.5)	1	1.5
17. Soil-based evidence of high water table?	No = 0		(Yes = 3)	

C. Biology (Subtotal = 6)				
18. Fibrous roots in streambed	(3)	2	1	0
19. Rooted upland plants in streambed	(3)	2	1	0
20. Macrobenthos (note diversity and abundance)	(0)	1	2	3
21. Aquatic Mollusks	(0)	1	2	3
22. Fish	(0)	0.5	1	1.5
23. Crayfish	(0)	0.5	1	1.5
24. Amphibians	(0)	0.5	1	1.5
25. Algae	(0)	0.5	1	1.5
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5 (Other = 0)			

*perennial streams may also be identified using other methods. See p. 35 of manual.

Notes:

Sketch:

NC DWQ Stream Identification Form Version 4.11

Date: 1/13/16	**Project/Site:** Hall site/TSA	**Latitude:**
Evaluator: AF, TS	**County:** Yadkin	**Longitude:**
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 13.75	**Stream Determination (circle one)** (Ephemeral) Intermittent Perennial	**Other** *e.g. Quad Name:*

A. Geomorphology (Subtotal = 6)	Absent	Weak	Moderate	Strong
1[a]. Continuity of channel bed and bank	0	(1)	2	3
2. Sinuosity of channel along thalweg	0	(1)	2	3
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence	(0)	1	2	3
4. Particle size of stream substrate	0	(1)	2	3
5. Active/relict floodplain	0	1	(2)	3
6. Depositional bars or benches	(0)	1	2	3
7. Recent alluvial deposits	(0)	1	2	3
8. Headcuts	(0)	1	2	3
9. Grade control	(0)	0.5	1	1.5
10. Natural valley	0	0.5	(1)	1.5
11. Second or greater order channel	(No = 0)		Yes = 3	

[a] artificial ditches are not rated; see discussions in manual

B. Hydrology (Subtotal = 3.5)				
12. Presence of Baseflow	0	1	2	(3)
13. Iron oxidizing bacteria	(0)	1	2	3
14. Leaf litter	1.5	1	0.5	(0)
15. Sediment on plants or debris	(0)	0.5	1	1.5
16. Organic debris lines or piles	0	(0.5)	1	1.5
17. Soil-based evidence of high water table?	No = 0		Yes = 3	

C. Biology (Subtotal = 4.25)				
18. Fibrous roots in streambed	3	2	(1)	0
19. Rooted upland plants in streambed	3	(2)	1	0
20. Macrobenthos (note diversity and abundance)	(0)	1	2	3
21. Aquatic Mollusks	(0)	1	2	3
22. Fish	(0)	0.5	1	1.5
23. Crayfish	(0)	0.5	1	1.5
24. Amphibians	(0)	0.5	1	1.5
25. Algae	0	(0.5)	1	1.5
26. Wetland plants in streambed	(FACW = 0.75) OBL = 1.5 Other = 0			

*perennial streams may also be identified using other methods. See p. 35 of manual.

Notes:

Sketch:

T5A

Not submitted with JD - completed later

NC DWQ Stream Identification Form Version 4.11

Date: 8/16/19	**Project/Site:** Mill Dam Creek	**Latitude:**
Evaluator: J. Sullivan	**County:** Yadkin	**Longitude:**
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 19.25	**Stream Determination (circle one)** Ephemeral Intermittent Perennial	**Other** *e.g. Quad Name:*

A. Geomorphology (Subtotal = 6)

	Absent	Weak	Moderate	Strong
1[a]. Continuity of channel bed and bank	0	(1)	2	3
2. Sinuosity of channel along thalweg	0	(1)	2	3
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence	(0)	1	2	3
4. Particle size of stream substrate	0	(1)	2	3
5. Active/relict floodplain	0	1	(2)	3
6. Depositional bars or benches	(0)	1	2	3
7. Recent alluvial deposits	(0)	1	2	3
8. Headcuts	(0)	1	2	3
9. Grade control	0	(0.5)	1	1.5
10. Natural valley	0	(0.5)	1	1.5
11. Second or greater order channel	No = 0		Yes = 3	

[a] artificial ditches are not rated; see discussions in manual

B. Hydrology (Subtotal = 8)

12. Presence of Baseflow	0	1	(2)	3
13. Iron oxidizing bacteria	0	(1)	2	3
14. Leaf litter	1.5	(1)	0.5	0
15. Sediment on plants or debris	0	(0.5)	1	1.5
16. Organic debris lines or piles	0	(0.5)	1	1.5
17. Soil-based evidence of high water table?	No = 0		(Yes = 3)	

C. Biology (Subtotal = 5.25)

18. Fibrous roots in streambed	3	2	(1)	0
19. Rooted upland plants in streambed	(3)	2	1	0
20. Macrobenthos (note diversity and abundance)	(0)	1	2	3
21. Aquatic Mollusks	(0)	1	2	3
22. Fish	(0)	0.5	1	1.5
23. Crayfish	(0)	0.5	1	1.5
24. Amphibians	(0)	0.5	1	1.5
25. Algae	0	(0.5)	1	1.5
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5 Other = 0			

*perennial streams may also be identified using other methods. See p. 35 of manual.

Notes: Mole nettle & juncus in stream. Channel flows from spring.

Sketch:

NC DWQ Stream Identification Form Version 4.11

Date: 1/13/16	**Project/Site:** Hall Site / TS B	**Latitude:**
Evaluator: AF, TS	**County:** Yadkin	**Longitude:**
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 32	**Stream Determination (circle one)** Ephemeral Intermittent (Perennial)	**Other** *e.g. Quad Name:*

A. Geomorphology (Subtotal = 18)	Absent	Weak	Moderate	Strong
1[a]. Continuity of channel bed and bank	0	1	2	(3)
2. Sinuosity of channel along thalweg	0	(1)	2	3
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence	0	1	2	(3)
4. Particle size of stream substrate	0	1	2	(3)
5. Active/relict floodplain	0	1	(2)	3
6. Depositional bars or benches	0	(1)	2	3
7. Recent alluvial deposits	(0)	1	2	3
8. Headcuts	0	1	2	(3)
9. Grade control	0	(0.5)	1	1.5
10. Natural valley	0	0.5	1	(1.5)
11. Second or greater order channel	(No = 0)		Yes = 3	

[a] artificial ditches are not rated; see discussions in manual

B. Hydrology (Subtotal = 8)				
12. Presence of Baseflow	0	1	2	(3)
13. Iron oxidizing bacteria	(0)	1	2	3
14. Leaf litter	1.5	(1)	0.5	0
15. Sediment on plants or debris	0	(0.5)	1	1.5
16. Organic debris lines or piles	0	(0.5)	1	1.5
17. Soil-based evidence of high water table?	No = 0		(Yes = 3)	

C. Biology (Subtotal = 6)				
18. Fibrous roots in streambed	(3)	2	1	0
19. Rooted upland plants in streambed	(3)	2	1	0
20. Macrobenthos (note diversity and abundance)	(0)	1	2	3
21. Aquatic Mollusks	(0)	1	2	3
22. Fish	(0)	0.5	1	1.5
23. Crayfish	(0)	0.5	1	1.5
24. Amphibians	(0)	0.5	1	1.5
25. Algae	(0)	0.5	1	1.5
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5 (Other = 0)			

*perennial streams may also be identified using other methods. See p. 35 of manual.

Notes:

Sketch:

NC DWQ Stream Identification Form Version 4.11

Date: 1/13/16	**Project/Site:** Hall site/T6-top	**Latitude:**
Evaluator: AF, JS	**County:** Yadkin	**Longitude:**
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 32	**Stream Determination (circle one)** Ephemeral Intermittent (Perennial)	**Other** *e.g. Quad Name:*

A. Geomorphology (Subtotal = 15)	Absent	Weak	Moderate	Strong
1[a]. Continuity of channel bed and bank	0	1	2	(3)
2. Sinuosity of channel along thalweg	0	(1)	2	3
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence	0	(1)	2	3
4. Particle size of stream substrate	0	1	(2)	3
5. Active/relict floodplain	0	1	(2)	3
6. Depositional bars or benches	(0)	1	2	3
7. Recent alluvial deposits	(0)	1	2	3
8. Headcuts	0	1	2	(3)
9. Grade control	0	0.5	1	(1.5)
10. Natural valley	0	0.5	1	(1.5)
11. Second or greater order channel	(No = 0)		Yes = 3	

[a] artificial ditches are not rated; see discussions in manual

B. Hydrology (Subtotal = 9.5)				
12. Presence of Baseflow	0	1	2	(3)
13. Iron oxidizing bacteria	0	(1)	2	3
14. Leaf litter	1.5	(1)	0.5	0
15. Sediment on plants or debris	(0)	0.5	1	1.5
16. Organic debris lines or piles	0	0.5	1	(1.5)
17. Soil-based evidence of high water table?	No = 0		(Yes = 3)	

C. Biology (Subtotal = 7.5)				
18. Fibrous roots in streambed	(3)	2	1	0
19. Rooted upland plants in streambed	(3)	2	1	0
20. Macrobenthos (note diversity and abundance)	(0)	1	2	3
21. Aquatic Mollusks	(0)	1	2	3
22. Fish	(0)	0.5	1	1.5
23. Crayfish	(0)	0.5	1	1.5
24. Amphibians	(0)	0.5	1	1.5
25. Algae	0	0.5	1	(1.5)
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5 (Other = 0)			

*perennial streams may also be identified using other methods. See p. 35 of manual.

Notes:

Sketch:

NC DWQ Stream Identification Form Version 4.11

Date: 1/13/16	**Project/Site:** Hall Site/ TB	**Latitude:**
Evaluator: AF, TS	**County:** Yadkin	**Longitude:**
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 33.5	**Stream Determination (circle one)** Ephemeral Intermittent (Perennial)	**Other** *e.g. Quad Name:*

A. Geomorphology (Subtotal = 18.5)	Absent	Weak	Moderate	Strong
1[a]. Continuity of channel bed and bank	0	1	2	(3)
2. Sinuosity of channel along thalweg	0	(1)	2	3
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence	0	(1)	2	3
4. Particle size of stream substrate	0	1	2	(3)
5. Active/relict floodplain	0	1	2	(3)
6. Depositional bars or benches	0	1	(2)	3
7. Recent alluvial deposits	0	(1)	2	3
8. Headcuts	(0)	1	2	3
9. Grade control	(0)	0.5	1	1.5
10. Natural valley	0	0.5	1	(1.5)
11. Second or greater order channel	No = 0		(Yes = 3)	

[a] artificial ditches are not rated; see discussions in manual

B. Hydrology (Subtotal = 9)				
12. Presence of Baseflow	0	1	2	(3)
13. Iron oxidizing bacteria	0	(1)	2	3
14. Leaf litter	1.5	(1)	0.5	0
15. Sediment on plants or debris	(0)	0.5	1	1.5
16. Organic debris lines or piles	0	0.5	(1)	1.5
17. Soil-based evidence of high water table?	No = 0		(Yes = 3)	

C. Biology (Subtotal = 6)				
18. Fibrous roots in streambed	(3)	2	1	0
19. Rooted upland plants in streambed	(3)	2	1	0
20. Macrobenthos (note diversity and abundance)	(0)	1	2	3
21. Aquatic Mollusks	(0)	1	2	3
22. Fish	(0)	0.5	1	1.5
23. Crayfish	(0)	0.5	1	1.5
24. Amphibians	(0)	0.5	1	1.5
25. Algae	(0)	0.5	1	1.5
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5 (Other = 0)			

*perennial streams may also be identified using other methods. See p. 35 of manual.

Notes:

Sketch:

NC DWQ Stream Identification Form Version 4.11

Date: 1/13/16	**Project/Site:** Hall Site/T7	**Latitude:**
Evaluator: AF, TS	**County:** Yadkin	**Longitude:**
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 40.5	**Stream Determination (circle one)** Ephemeral Intermittent (Perennial)	**Other** *e.g. Quad Name:*

A. Geomorphology (Subtotal = 25)

	Absent	Weak	Moderate	Strong
1[a]. Continuity of channel bed and bank	0	1	2	(3)
2. Sinuosity of channel along thalweg	0	(1)	2	3
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence	0	1	2	(3)
4. Particle size of stream substrate	0	1	2	(3)
5. Active/relict floodplain	0	1	2	(3)
6. Depositional bars or benches	0	1	2	(3)
7. Recent alluvial deposits	0	1	2	(3)
8. Headcuts	(0)	1	2	3
9. Grade control	0	0.5	1	(1.5)
10. Natural valley	0	0.5	1	(1.5)
11. Second or greater order channel	No = 0		(Yes = 3)	

[a] artificial ditches are not rated; see discussions in manual

B. Hydrology (Subtotal = 8.5)

12. Presence of Baseflow	0	1	2	(3)
13. Iron oxidizing bacteria	(0)	1	2	3
14. Leaf litter	1.5	1	(0.5)	0
15. Sediment on plants or debris	0	(0.5)	1	1.5
16. Organic debris lines or piles	0	0.5	1	(1.5)
17. Soil-based evidence of high water table?	No = 0		(Yes = 3)	

C. Biology (Subtotal = 7)

18. Fibrous roots in streambed	(3)	2	1	0
19. Rooted upland plants in streambed	(3)	2	1	0
20. Macrobenthos (note diversity and abundance)	(0)	1	2	3
21. Aquatic Mollusks	(0)	1	2	3
22. Fish	(0)	0.5	1	1.5
23. Crayfish	(0)	0.5	1	1.5
24. Amphibians	(0)	0.5	1	1.5
25. Algae	0	0.5	(1)	1.5
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5 (Other = 0)			

*perennial streams may also be identified using other methods. See p. 35 of manual.

Notes:

Sketch:

NC DWQ Stream Identification Form Version 4.11

Date: 1/13/16	**Project/Site:** Hall site/T8	**Latitude:**
Evaluator: AF, TS	**County:** Yadkin	**Longitude:**
Total Points: 36.5 *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30**	**Stream Determination (circle one)** Ephemeral Intermittent (Perennial)	**Other** *e.g. Quad Name:*

A. Geomorphology (Subtotal = 20)

	Absent	Weak	Moderate	Strong
1[a]. Continuity of channel bed and bank	0	1	2	(3)
2. Sinuosity of channel along thalweg	0	(1)	2	3
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence	0	1	(2)	3
4. Particle size of stream substrate	0	1	2	(3)
5. Active/relict floodplain	0	1	(2)	3
6. Depositional bars or benches	0	(1)	2	3
7. Recent alluvial deposits	0	1	(2)	3
8. Headcuts	0	1	2	(3)
9. Grade control	0	0.5	1	(1.5)
10. Natural valley	0	0.5	1	(1.5)
11. Second or greater order channel	(No = 0)		Yes = 3	

[a] artificial ditches are not rated; see discussions in manual

B. Hydrology (Subtotal = 10.5)

12. Presence of Baseflow	0	1	2	(3)
13. Iron oxidizing bacteria	0	(1)	2	3
14. Leaf litter	1.5	(1)	0.5	0
15. Sediment on plants or debris	(0)	0.5	1	1.5
16. Organic debris lines or piles	0	0.5	1	(1.5)
17. Soil-based evidence of high water table?	No = 0		(Yes = 3)	

C. Biology (Subtotal = 6)

18. Fibrous roots in streambed	(3)	2	1	0
19. Rooted upland plants in streambed	(3)	2	1	0
20. Macrobenthos (note diversity and abundance)	(0)	1	2	3
21. Aquatic Mollusks	(0)	1	2	3
22. Fish	(0)	0.5	1	1.5
23. Crayfish	(0)	0.5	1	1.5
24. Amphibians	(0)	0.5	1	1.5
25. Algae	0	0.5	(1)	1.5
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5 (Other = 0)			

*perennial streams may also be identified using other methods. See p. 35 of manual.

Notes:

Sketch:

NC DWQ Stream Identification Form Version 4.11

Date: 1/13/16	**Project/Site:** HWI site / T8A-top	**Latitude:**
Evaluator: AF, TS	**County:** Yadkin	**Longitude:**
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 19.5	**Stream Determination (circle one)** Ephemeral (Intermittent) Perennial	**Other** *e.g. Quad Name:*

A. Geomorphology (Subtotal = 6.5)	Absent	Weak	Moderate	Strong
1[a]. Continuity of channel bed and bank	0	(1)	2	3
2. Sinuosity of channel along thalweg	(0)	1	2	3
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence	(0)	1	2	3
4. Particle size of stream substrate	(0)	1	2	3
5. Active/relict floodplain	0	(1)	2	3
6. Depositional bars or benches	(0)	1	2	3
7. Recent alluvial deposits	(0)	1	2	3
8. Headcuts	0	1	2	(3)
9. Grade control	(0)	0.5	1	1.5
10. Natural valley	0	0.5	1	(1.5)
11. Second or greater order channel	(No = 0)		Yes = 3	

[a] artificial ditches are not rated; see discussions in manual

B. Hydrology (Subtotal = 8)				
12. Presence of Baseflow	0	1	2	(3)
13. Iron oxidizing bacteria	(0)	1	2	3
14. Leaf litter	1.5	(1)	0.5	0
15. Sediment on plants or debris	(0)	0.5	1	1.5
16. Organic debris lines or piles	0	0.5	(1)	1.5
17. Soil-based evidence of high water table?	No = 0		(Yes = 3)	

C. Biology (Subtotal = 5)				
18. Fibrous roots in streambed	3	(2)	1	0
19. Rooted upland plants in streambed	(3)	2	1	0
20. Macrobenthos (note diversity and abundance)	(0)	1	2	3
21. Aquatic Mollusks	(0)	1	2	3
22. Fish	(0)	0.5	1	1.5
23. Crayfish	(0)	0.5	1	1.5
24. Amphibians	(0)	0.5	1	1.5
25. Algae	(0)	0.5	1	1.5
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5 (Other = 0)			

*perennial streams may also be identified using other methods. See p. 35 of manual.

Notes:

Sketch:

NC DWQ Stream Identification Form Version 4.11

Date: 1/13/16	**Project/Site:** Hall site / T9	**Latitude:**
Evaluator: AF, TS	**County:** Yadkin	**Longitude:**
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 39.5	**Stream Determination (circle one)** Ephemeral Intermittent (Perennial)	**Other** *e.g. Quad Name:*

A. Geomorphology (Subtotal = 25)	Absent	Weak	Moderate	Strong
1[a]. Continuity of channel bed and bank	0	1	2	(3)
2. Sinuosity of channel along thalweg	0	1	2	(3)
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence	0	1	2	(3)
4. Particle size of stream substrate	0	1	2	(3)
5. Active/relict floodplain	0	1	2	(3)
6. Depositional bars or benches	0	1	2	(3)
7. Recent alluvial deposits	0	1	2	(3)
8. Headcuts	0	(1)	2	3
9. Grade control	0	0.5	1	(1.5)
10. Natural valley	0	0.5	1	(1.5)
11. Second or greater order channel	(No = 0)		Yes = 3	

[a] artificial ditches are not rated; see discussions in manual

B. Hydrology (Subtotal = 8.5)				
12. Presence of Baseflow	0	1	2	(3)
13. Iron oxidizing bacteria	0	1	2	(3)
14. Leaf litter	1.5	(1)	0.5	0
15. Sediment on plants or debris	(0)	0.5	1	1.5
16. Organic debris lines or piles	0	0.5	1	(1.5)
17. Soil-based evidence of high water table?	No = 0		Yes = 3	

C. Biology (Subtotal = 6)				
18. Fibrous roots in streambed	(3)	2	1	0
19. Rooted upland plants in streambed	(3)	2	1	0
20. Macrobenthos (note diversity and abundance)	(0)	1	2	3
21. Aquatic Mollusks	(0)	1	2	3
22. Fish	(0)	0.5	1	1.5
23. Crayfish	(0)	0.5	1	1.5
24. Amphibians	(0)	0.5	1	1.5
25. Algae	(0)	0.5	1	1.5
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5 Other = 0			

*perennial streams may also be identified using other methods. See p. 35 of manual.

Notes:

Sketch:

WA wet

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont Region

Project/Site: Mill Dam Creek City/County: Yadkin Sampling Date: 6/21/16

Applicant/Owner: KCT State: NC Sampling Point: WA-wet

Investigator(s): J. Sullivan & T. Seelinger Section, Township, Range:

Landform (hillslope, terrace, etc.): Floodplain Local relief (concave, convex, none): Slope (%): ~

Subregion (LRR or MLRA): P-136 Lat: 36.2408 Long: -80.5218 Datum: NAD 83

Soil Map Unit Name: Fairview Sandy Clay Loam NWI classification: PFO

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? No Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? No (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ____	**Is the Sampled Area within a Wetland?** Yes X No ____
Hydric Soil Present?	Yes X No ____	
Wetland Hydrology Present?	Yes X No ____	

Remarks:
Wetland has been impacted by livestock

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- X Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- X Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- X Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- X Stunted or Stressed Plants (D1)
- X Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes X No ____ Depth (inches): 1

Water Table Present? Yes X No ____ Depth (inches): 0

Saturation Present? (includes capillary fringe) Yes X No ____ Depth (inches): 0

Wetland Hydrology Present? Yes X No ____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants. Sampling Point: WA-Wet

Tree Stratum (Plot size: 30 ft.)	Absolute % Cover	Dominant Species?	Indicator Status
1. Alnus serrulata	20	X	OBL
2. Salix nigra	20	X	OBL
3.			
4.			
5.			
6.			
7.			
	40 = Total Cover		
50% of total cover: 20	20% of total cover: 8		
Sapling/Shrub Stratum (Plot size: 30 ft)			
1. Alnus serrulata	20	X	OBL
2. Ligustrum sinensis	10	X	FACU
3.			
4.			
5.			
6.			
7.			
8.			
9.			
	30 = Total Cover		
50% of total cover: 15	20% of total cover: 6		
Herb Stratum (Plot size: 5ft)			
1. Microstegium vimineum	40	X	FAC
2. Trifolium sp.	5		NI
3. Amphicarpaea bracteata	15		FAC
4. Bahemia cylindrica	5		FACW
5. Veronia noveboracensis	20	X	FACW
6. Toxicodendron capensis	5		FACW
7. Cicuta maculata	5		OBL
8. Rubus argutus	5		FACU
9.			
10.			
11.			
	100 = Total Cover		
50% of total cover: 50	20% of total cover: 20		
Woody Vine Stratum (Plot size: 30ft)			
1. Lonicera japonica	10	X	FAC
2.			
3.			
4.			
5.			
	16 = Total Cover		
50% of total cover: 5	20% of total cover: 2		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 6 (A)

Total Number of Dominant Species Across All Strata: 7 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 86% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:	
OBL species	x 1 =	
FACW species	x 2 =	
FAC species	x 3 =	
FACU species	x 4 =	
UPL species	x 5 =	
Column Totals: (A)		(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- X 2 - Dominance Test is >50%
- ___ 3 - Prevalence Index is ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes X No ___

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: WA-WET

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-3	10YR 4/1	90	7.5YR 4/6	10	C	PL	SL	
3-6	10YR 4/1	80	10YR 5/6	20	C	PL	SL	
6-12	10YR 4/1	100					SL	
12-18	10YR 4/1	60	10YR 5/6	40			SL	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10) **(LRR N)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- ___ Thin Dark Surface (S9) **(MLRA 147, 148)**
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- ___ Umbric Surface (F13) **(MLRA 136, 122)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 148)**
- ___ Red Parent Material (F21) **(MLRA 127, 147)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(MLRA 147)**
- ___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes X No ____

Remarks:

WA up

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont Region

Project/Site: Mill Dam creek City/County: Yadkin Sampling Date: 6/21/16

Applicant/Owner: KCI State: NC Sampling Point: WA - up

Investigator(s): J. Sullivan & T. Seelinger Section, Township, Range:

Landform (hillslope, terrace, etc.): Local relief (concave, convex, none): Slope (%):

Subregion (LRR or MLRA): P-136 Lat: 36.2410 Long: -80.5218 Datum: NAD83

Soil Map Unit Name: Fairview Sandy clay loam NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes _____ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes _____ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes _____	No X	**Is the Sampled Area within a Wetland?** Yes _____ No X
Hydric Soil Present?	Yes _____	No X	
Wetland Hydrology Present?	Yes _____	No X	

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes _____	No X	Depth (inches): _____
Water Table Present?	Yes _____	No X	Depth (inches): _____
Saturation Present? (includes capillary fringe)	Yes _____	No X	Depth (inches): _____

Wetland Hydrology Present? Yes _____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants. Sampling Point: WA-UP

Tree Stratum (Plot size: 30 ft.)	Absolute % Cover	Dominant Species?	Indicator Status
1. Liquidambar styraciflua	20	Y	FACW
2. Carya glabra	10	Y	FACU
3.			
4.			
5.			
6.			
7.			
	30 = Total Cover		
50% of total cover: 15	20% of total cover: 6		

Sapling/Shrub Stratum (Plot size: 30 ft.)			
1. Liquidambar styraciflua	10	X	FACW
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
	10 = Total Cover		
50% of total cover: 5	20% of total cover: 2		

Herb Stratum (Plot size: 5ft)			
1. Solanum carolinense	10		FACU
2. Scheda roneus grandiflorus	30	X	FACU
3. Daucus carota	10		UPL
4. Plantago lanceolata	20	X	UPL
5. Rubus argutus	20	X	FACU
6. Smilax bona-nox	10		FACU
7.			
8.			
9.			
10.			
11.			
	100 = Total Cover		
50% of total cover: 50	20% of total cover: 20		

Woody Vine Stratum (Plot size: 30 ft.)			
1. None			
2.			
3.			
4.			
5.			
	= Total Cover		
50% of total cover:	20% of total cover:		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 6 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species	x 1 =
FACW species	x 2 =
FAC species	x 3 =
FACU species	x 4 =
UPL species	x 5 =
Column Totals: (A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes ___ No X

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: WA-UP1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-6	7.5YR 3/3	100					C	
6-12	7.5YR 3/3	100					C	gravel

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10) **(LRR N)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- ___ Thin Dark Surface (S9) **(MLRA 147, 148)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- ___ Umbric Surface (F13) **(MLRA 136, 122)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 148)**
- ___ Red Parent Material (F21) **(MLRA 127, 147)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(MLRA 147)**
- ___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** _____ **No** X

Remarks:

WF wet

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont Region

Project/Site: Mill Dam Creek City/County: Yadkin Sampling Date: 6/21/16

Applicant/Owner: KCI State: NC Sampling Point: WF-wet

Investigator(s): J. Sullivan & T. Seelinger Section, Township, Range:

Landform (hillslope, terrace, etc.): Floodplain Local relief (concave, convex, none): Slope (%): —

Subregion (LRR or MLRA): P-136 Lat: 36.2437 Long: -80.5208 Datum: NAD83

Soil Map Unit Name: Fairview gravelly fine sandy loam NWI classification: PFO

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? No Are "Normal Circumstances" present? Yes X No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? No (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No _____	**Is the Sampled Area within a Wetland?** Yes X No _____
Hydric Soil Present?	Yes X No _____	
Wetland Hydrology Present?	Yes X No _____	

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- X Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- X Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- X Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes X No _____ Depth (inches): 1

Water Table Present? Yes X No _____ Depth (inches): 0

Saturation Present? (includes capillary fringe) Yes X No _____ Depth (inches): 0

Wetland Hydrology Present? Yes X No _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants. Sampling Point: WF-WT

Tree Stratum (Plot size: 30ft)	Absolute % Cover	Dominant Species?	Indicator Status
1. Carpinus caroliniana	10	Y	FAC
2. Quercus nigra	10	Y	FAC
3.			
4.			
5.			
6.			
7.			
	20 = Total Cover		
50% of total cover: 10	20% of total cover: 4		
Sapling/Shrub Stratum (Plot size: 30ft)			
1. Lindera benzoin	10	Y	FAC
2. Quercus alba	5	Y	FACU
3. Liriodendron tulipifera	5	Y	FACU
4. Pinus virginiana	5	Y	NI
5.			
6.			
7.			
8.			
9.			
	25 = Total Cover		
50% of total cover: 12.5	20% of total cover: 5		
Herb Stratum (Plot size: 5ft)			
1. Carex sp.	50	Y	FACW
2. Lindera benzoin	10		FAC
3. Boehmeria cylindrica	20	X	FACW
4. Osmunda regalis	10		OBL
5. Toxicodendron radicans	10		FAC
6.			
7.			
8.			
9.			
10.			
11.			
	100 = Total Cover		
50% of total cover: 50	20% of total cover: 20		
Woody Vine Stratum (Plot size: 30ft)			
1. none			
2.			
3.			
4.			
5.			
	= Total Cover		
50% of total cover:	20% of total cover:		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 5 (A)

Total Number of Dominant Species Across All Strata: 8 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 63% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:	
OBL species	x 1 =	
FACW species	x 2 =	
FAC species	x 3 =	
FACU species	x 4 =	
UPL species	x 5 =	
Column Totals:	(A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- X 2 - Dominance Test is >50%
- ___ 3 - Prevalence Index is ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes X No ___

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: WF-VC

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-3	10YR 3/2	100					L	
3-8	10YR 4/2	100					SL	
8-18	10YR 4/2	95	2.5YR 4/6	5	C	PL	SL	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10) **(LRR N)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- ___ Thin Dark Surface (S9) **(MLRA 147, 148)**
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- ___ Umbric Surface (F13) **(MLRA 136, 122)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 148)**
- ___ Red Parent Material (F21) **(MLRA 127, 147)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(MLRA 147)**
- ___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** X **No** _____

Remarks:

WFup

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont Region

Project/Site: Mill Dam Creek City/County: Yadkin Sampling Date: 6/21/16

Applicant/Owner: KCI State: NC Sampling Point: WF-up

Investigator(s): J. Sullivan + T. Seelinger Section, Township, Range:

Landform (hillslope, terrace, etc.): Local relief (concave, convex, none): Slope (%): 5%

Subregion (LRR or MLRA): P-136 Lat: 36.2436 Long: -80.5207 Datum: NAD83

Soil Map Unit Name: Fairview gravelly fine sandy loam NWI classification: —

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? No Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? No (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ____	**Is the Sampled Area within a Wetland?** Yes ____ No X
Hydric Soil Present?	Yes ____ No X	
Wetland Hydrology Present?	Yes ____ No X	

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ____	No X	Depth (inches): —
Water Table Present?	Yes ____	No X	Depth (inches): —
Saturation Present? (includes capillary fringe)	Yes ____	No X	Depth (inches): —

Wetland Hydrology Present? Yes ____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants. Sampling Point: WF up

Tree Stratum (Plot size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1. Prunus serotina	20	X	FACU
2. Cornus florida	20	X	FACU
3.			
4.			
5.			
6.			
7.			
	40 = Total Cover		
50% of total cover: 20	20% of total cover: 8		

Sapling/Shrub Stratum (Plot size: 30 ft)			
1. Cornus florida	30	X	FACU
2. Liriodendron tulipifera	30	X	FAC
3. Carpinus caroliniana	10		FAC
4. Liriodendron tulipifera	10		FACU
5. Ilex opaca	10		FACU
6. Quercus alba	10		FACU
7.			
8.			
9.			
	100 = Total Cover		
50% of total cover: 50	20% of total cover: 20		

Herb Stratum (Plot size: 1 m)			
1. Quercus alba	20	X	FAC
2. Fraxinus pennsylvanica	5		FACW
3. Lindera benzoin	20	X	FAC
4. Boehmeria cylindrica	5		FACW
5. Parthenocissus quinquefolia	10		FAC
6. Lonicera japonica	10		FAC
7. Ilex rotundifolia	10		FAC
8.			
9.			
10.			
11.			
	80 = Total Cover		
50% of total cover: 40	20% of total cover: 16		

Woody Vine Stratum (Plot size: 30 ft.)			
1. Lonicera japonica	10	X	FAC
2.			
3.			
4.			
5.			
	10 = Total Cover		
50% of total cover: 5	20% of total cover: 2		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 4 (A)

Total Number of Dominant Species Across All Strata: 7 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 57% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:	
OBL species	x 1 =	
FACW species	x 2 =	
FAC species	x 3 =	
FACU species	x 4 =	
UPL species	x 5 =	
Column Totals: (A)		(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- X 2 - Dominance Test is >50%
- ___ 3 - Prevalence Index is ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes X No ___

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL Sampling Point: WF up

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-12	7.5YR 5/6	100					CL	
12-16	10YR 6/3	80	7.5YR 4/6	20	C	PL	SCL	
16-18+	10YR 5/2	80	7.5YR 4/6	20			SCL	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10) **(LRR N)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- ___ Thin Dark Surface (S9) **(MLRA 147, 148)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- ___ Umbric Surface (F13) **(MLRA 136, 122)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 148)**
- ___ Red Parent Material (F21) **(MLRA 127, 147)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(MLRA 147)**
- ___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** _____ **No** X

Remarks:

WG wet

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont Region

Project/Site: Mill Dam Creek City/County: Yadkin Sampling Date: 6/21/16

Applicant/Owner: KCI State: NC Sampling Point: WG-wet

Investigator(s): J. Sullivan & T. Seelinger Section, Township, Range:

Landform (hillslope, terrace, etc.): ~~Flood~~ plain Local relief (concave, convex, none): Slope (%):

Subregion (LRR or MLRA): P-136 Lat: 36.2404 Long: -80.5248 Datum: NAD83

Soil Map Unit Name: Fairview gravelly fine sandy loam NWI classification: PFO

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No (If no, explain in Remarks.)

Are Vegetation , Soil , or Hydrology significantly disturbed? No Are "Normal Circumstances" present? Yes Y No

Are Vegetation , Soil , or Hydrology naturally problematic? No (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No	**Is the Sampled Area within a Wetland?** Yes X No
Hydric Soil Present?	Yes X No	
Wetland Hydrology Present?	Yes X No	

Remarks: Wetland has been impacted by livestock

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- X Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- X Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes	No X	Depth (inches): —
Water Table Present?	Yes X	No	Depth (inches): 6
Saturation Present? (includes capillary fringe)	Yes X	No	Depth (inches): 6

Wetland Hydrology Present? Yes X No

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants. Sampling Point: W6-wet

Tree Stratum (Plot size: 30ft.)	Absolute % Cover	Dominant Species?	Indicator Status
1. none			
2.			
3.			
4.			
5.			
6.			
7.			
	= Total Cover		
50% of total cover: ____	20% of total cover: ____		
Sapling/Shrub Stratum (Plot size: 30ft.)			
1. none			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
	= Total Cover		
50% of total cover: ____	20% of total cover: ____		
Herb Stratum (Plot size: 1m)			
1. Polygonum sp.	40	X	FACW
2. Schedonorus arundinaceus	5		FACU
3. Juncus effusus	10		FACW
4. Solidago sp	10		NI
5. Daucus carota	5		UPL
6. Trifolium sp.	5		NI
7. Eupatorium capillifolium	5		FACU
8. Polygonum sagittatum	10		OBL
9. Cicuta maculata	10		OBL
10.			
11.			
	100 = Total Cover		
50% of total cover: 50	20% of total cover: 20		
Woody Vine Stratum (Plot size: 30ft)			
1. none			
2.			
3.			
4.			
5.			
	= Total Cover		
50% of total cover: ____	20% of total cover: ____		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 % (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:	
OBL species ____	x 1 =	____
FACW species ____	x 2 =	____
FAC species ____	x 3 =	____
FACU species ____	x 4 =	____
UPL species ____	x 5 =	____
Column Totals: ____ (A)		____ (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- X 2 - Dominance Test is >50%
- ___ 3 - Prevalence Index is ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes X No ____

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL Sampling Point: WG-WC+

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-2	10YR 4/3	100					SL	
2-12	10YR 4/1	80	10YR 4/6	20	C	M PL	SL	
12-19	10YR 5/1	100					SCL	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10) **(LRR N)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- ___ Thin Dark Surface (S9) **(MLRA 147, 148)**
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- ___ Umbric Surface (F13) **(MLRA 136, 122)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 148)**
- ___ Red Parent Material (F21) **(MLRA 127, 147)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(MLRA 147)**
- ___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** X **No** _____

Remarks:

WG up

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont Region

Project/Site: Mill Dam Creek City/County: Yadkin Sampling Date: 6/21/16

Applicant/Owner: KCI State: NC Sampling Point: WG up

Investigator(s): J. Sullivan & T. Seelinger Section, Township, Range:

Landform (hillslope, terrace, etc.): Local relief (concave, convex, none): Slope (%): 15%

Subregion (LRR or MLRA): P-136 Lat: 36.2463 Long: -80.5247 Datum: NAD83

Soil Map Unit Name: Fairview gravelly fine sandy loam NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? No Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? No (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____ No X	**Is the Sampled Area within a Wetland?** Yes ____ No X
Hydric Soil Present?	Yes ____ No X	
Wetland Hydrology Present?	Yes ____ No X	

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ____	No X	Depth (inches): —
Water Table Present?	Yes ____	No X	Depth (inches): —
Saturation Present? (includes capillary fringe)	Yes ____	No X	Depth (inches): —

Wetland Hydrology Present? Yes ____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants. Sampling Point: W6 up

Tree Stratum (Plot size: 30ft)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	= Total Cover		
50% of total cover:	20% of total cover:		
Sapling/Shrub Stratum (Plot size: 15ft)			
1. Ligustrum sinense	30	X	FACU
2. Rubus argutus	50	X	FACU
3. Quercus alba	10		FACU
4. Solidago sp.	10		
5.			
6.			
7.			
8.			
9.			
	100 = Total Cover		
50% of total cover: 50	20% of total cover: 20		
Herb Stratum (Plot size: 5ft)			
1. Schedonorus arundinaceus	60	X	FACU
2. Rubus argutus	20	X	FACU
3. Lonicera japonica	10		FAC
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	90 = Total Cover		
50% of total cover: 45	20% of total cover: 18		
Woody Vine Stratum (Plot size: 30ft)			
1. Vitis rotundifolia	5	X	FAC
2. Lonicera japonica	5	X	FAC
3.			
4.			
5.			
	10 = Total Cover		
50% of total cover: 5	20% of total cover: 2		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 6 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 33% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species	x 1 =
FACW species	x 2 =
FAC species	x 3 =
FACU species	x 4 =
UPL species	x 5 =
Column Totals: (A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes ___ No X

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: WG UP

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-11	7.5YR5/6	100					SL	
11-18	10YR5/3	100					SCL	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10) **(LRR N)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- ___ Thin Dark Surface (S9) **(MLRA 147, 148)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- ___ Umbric Surface (F13) **(MLRA 136, 122)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 148)**
- ___ Red Parent Material (F21) **(MLRA 127, 147)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(MLRA 147)**
- ___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** _____ **No** X

Remarks:

12.8 Approved Jurisdictional Determination

U.S. ARMY CORPS OF ENGINEERS
WILMINGTON DISTRICT

Action I.D.: SAW-2016-01335 County: Yadkin, U.S.G.S. Quad: NC-EAST BEND

NOTIFICATION OF JURISDICTIONAL DETERMINATION

Property Owner/Agent: **KCI Environmental Technologies and Construction, INC., Landmark Center II**
Address: **4601 Six Forks Road, Suite 220 Raleigh, North Carolina 27609**
Telephone No.:

Property description:
Size (acres): 36.92
Nearest Waterway: Hall Creek
Coordinates: 36.2393, -80.5199

Nearest Town: East Bend
River Basin: Pee Dee
Hydrologic Unit Code: 03040101

Location Description: The site is located east of Shady Grove Road and West of Shoals Road near East Bend in Yadkin County, NC at Coordinates: 36.2393, -80.5199

Indicate Which of the Following Apply:

A. Preliminary Determination

X Based on preliminary information, there may be waters and wetlands on the above described property. We strongly suggest you have this property inspected to determine the extent of Department of the Army (DA) jurisdiction. To be considered final, a jurisdictional determination must be verified by the Corps. This preliminary determination is not an appealable action under the Regulatory Program Administrative Appeal Process (Reference 33 CFR Part 331).). If you wish, you may request an approved JD (which may be appealed), by contacting the Corps district for further instruction. Also, you may provide new information for further consideration by the Corps to reevaluate the JD.

B. Approved Determination

_ There are Navigable Waters of the United States within the above described property subject to the permit requirements of Section 10 of the Rivers and Harbors Act and Section 404 of the Clean Water Act. Unless there is a change in the law or our published regulations, this determination may be relied upon for a period not to exceed five years from the date of this notification.

_ There are waters and wetlands on the above described property subject to the permit requirements of Section 404 of the Clean Water Act (CWA)(33 USC § 1344). Unless there is a change in the law or our published regulations, this determination may be relied upon for a period not to exceed five years from the date of this notification.

_ We strongly suggest you have the waters and wetlands on your property delineated. Due to the size of your property and/or our present workload, the Corps may not be able to accomplish this wetland delineation in a timely manner. For a more timely delineation, you may wish to obtain a consultant. To be considered final, any delineation must be verified by the Corps.

_ The waters and wetlands on your property have been delineated and the delineation has been verified by the Corps. We strongly suggest you have this delineation surveyed. Upon completion, this survey should be reviewed and verified by the Corps. Once verified, this survey will provide an accurate depiction of all areas subject to CWA jurisdiction on your property which, provided there is no change in the law or our published regulations, may be relied upon for a period not to exceed five years.

_ The waters and wetlands have been delineated and surveyed and are accurately depicted on the plat signed by the Corps Regulatory Official identified below on _____. Unless there is a change in the law or our published regulations, this determination may be relied upon for a period not to exceed five years from the date of this notification.

_ There are no waters of the U.S., to include wetlands, present on the above described property which are subject to the permit requirements of Section 404 of the Clean Water Act (33 USC 1344). Unless there is a change in the law or our published regulations, this determination may be relied upon for a period not to exceed five years from the date of this notification.

CF: Joe Sullivan, KCI Terchnologies, Inc., 4505 Falls of Neuse Rd. Suite 400, Raleigh, NC 27609

Janice and Steven Baity, 4341 Shady Grove Church Road, East Bend, NC 27018

James and Karen Smitherman, 3633 Shoals Road, East Bend NC 27018

Bryce and Deanna Smitherman, PO Box 167 Sea Level, NC 28577

Charles and Denise Smitherman, 4508 Shady Grove Church Road, East Bend, NC 27018

Roy Russell Jr, 1670 Jordan Drive, Winston Salem, NC 27105

Santos Pozo, 3046 Shoals Road East Bend, NC 27018

Jose Samuel Pozo, 2064 Aztec Drive, East Bend, NC 27018

Donald Gray Mathis, PO Box 671, East Bend, 27018

Clifford J. Powell, 2920 Davis Road, East Bend, NC 27018

E: PRELIMINARY JURISDICTIONAL DETERMINATION: You do not need to respond to the Corps regarding the preliminary JD. The Preliminary JD is not appealable. If you wish, you may request an approved JD (which may be appealed), by contacting the Corps district for further instruction. Also you may provide new information for further consideration by the Corps to reevaluate the JD.

SECTION II - REQUEST FOR APPEAL or OBJECTIONS TO AN INITIAL PROFFERED PERMIT

REASONS FOR APPEAL OR OBJECTIONS: (Describe your reasons for appealing the decision or your objections to an initial proffered permit in clear concise statements. You may attach additional information to this form to clarify where your reasons or objections are addressed in the administrative record

ADDITIONAL INFORMATION: The appeal is limited to a review of the administrative record, the Corps memorandum for the record of the appeal conference or meeting, and any supplemental information that the review officer has determined is needed to clarify the administrative record. Neither the appellant nor the Corps may add new information or analyses to the record. However, you may provide additional information to clarify the location of information that is already in the administrative record.

POINT OF CONTACT FOR QUESTIONS OR INFORMATION:

If you have questions regarding this decision and/or the appeal process you may contact:	If you only have questions regarding the appeal process you may also contact:
William Elliott, Project Manager USACE, Asheville Regulatory Field Office 151 Patton Ave RM 208 Asheville, NC 28801 828-271-7980	Mr. Jason Steele, Administrative Appeal Review Officer CESAD-PDO U.S. Army Corps of Engineers, South Atlantic Division 60 Forsyth Street, Room 10M15 Atlanta, Georgia 30303-8801 Phone: (404) 562-5137

RIGHT OF ENTRY: Your signature below grants the right of entry to Corps of Engineers personnel, and any government consultants, to conduct investigations of the project site during the course of the appeal process. You will be provided a 15 day notice of any site investigation, and will have the opportunity to participate in all site investigations.

	Date:	Telephone number:
_____ Signature of appellant or agent.		

For appeals on Initial Proffered Permits send this form to:

District Engineer, Wilmington Regulatory Division, Attn: William Elliott, 69 Darlington Avenue, Wilmington, North Carolina 28403

For Permit denials, Proffered Permits and approved Jurisdictional Determinations send this form to:

Division Engineer, Commander, U.S. Army Engineer Division, South Atlantic, Attn: Mr. Jason Steele, Administrative Appeal Officer, CESAD-PDO, 60 Forsyth Street, Room 10M15, Atlanta, Georgia 30303-8801 Phone: (404) 562-5137

ATTACHMENT A
PRELIMINARY JURISDICTIONAL DETERMINATION FORM

BACKGROUND INFORMATION

A. **REPORT COMPLETION DATE FOR PRELIMINARY JURISDICTIONAL DETERMINATION (JD):** JANUARY 5, 2017

B. **NAME AND ADDRESS OF PERSON REQUESTING PRELIMINARY JD:**
Joe Sullivan, KCI Technologies Inc.
4505 Falls of Neuse Rd. Suite 400, Raleigh, NC 27609

C. **DISTRICT OFFICE, FILE NAME, AND NUMBER:** SAW-2016-01335
CESAW-RG-A-KCI ENVIRONMENTAL TECH

D. **PROJECT LOCATION(S) AND BACKGROUND INFORMATION:**
East of Shady Grove Church Road and West of Shoals Road, East Bend NC

(USE THE ATTACHED TABLE TO DOCUMENT MULTIPLE WATERBODIES AT DIFFERENT SITES)

State: NC County/parish/borough: Yadkin City: East Bend

Center coordinates of site (lat/long in degree decimal format):
Lat. 36.2393 °N; Long. -80.5199 °W.

Universal Transverse Mercator:

Name of nearest waterbody: Hall Creek

Identify (estimate) amount of waters in the review area:
Non-wetland waters:
12,921 linear feet: 6 width (ft) and/or 1.78 acres.

Cowardin Class: Riverine

Stream Flow: Intermittent / Perennial

Wetlands: 0.43 acres.

Cowardin Class: Forested

Name of any water bodies on the site that have been identified as Section 10 waters:
Tidal:
Non-Tidal:

E. REVIEW PERFORMED FOR SITE EVALUATION (CHECK ALL THAT APPLY):

☐ Office (Desk) Determination. Date: _____

☐ Field Determination. Date(s): _____

SUPPORTING DATA. Data reviewed for preliminary JD (check all that apply - checked items should be included in case file and, where checked and requested, appropriately reference sources below):

☑ Maps, plans, plots or plat submitted by or on behalf of the applicant/consultant: Vicinity Map

☑ Data sheets prepared/submitted by or on behalf of the applicant/consultant.

- ☐ Office concurs with data sheets/delineation report.
- ☐ Office does not concur with data sheets/delineation report.

☐ Data sheets prepared by the Corps: _____

☐ Corps navigable waters' study: _____

☐ U.S. Geological Survey Hydrologic Atlas: _____

☐ USGS NHD data

☐ USGS 8 and 12 digit HUC maps

☑ U.S. Geological Survey map(s). Cite scale & quad name: 1:24K East Bend

☐ USDA Natural Resources Conservation Service Soil Survey.
Citation: _____

☐ National wetlands inventory map(s). Cite name: _____

☐ State/Local wetland inventory map(s): _____

☐ FEMA/FIRM maps: _____

☐ 100-year Floodplain Elevation is: _____
(National Geodectic Vertical Datum of 1929)

☑ Photographs: ☑ Aerial (Name & Date): 2014 NC Statewide Aerial Photographs or
☐ Other (Name & Date): _____

☐ Previous determination(s). File no. and date of response letter: _____

☐ Other information (please specify): _____

This preliminary JD finds that there *"may be"* waters of the United States on the subject project site, and identifies all aquatic features on the site that could be affected by the proposed activity, based on the following information:

IMPORTANT NOTE: The information recorded on this form has not necessarily been verified by the Corps and should not be relied upon for later jurisdictional determinations.

Signature and date of
Regulatory Project Manager
(REQUIRED)

JAN 5, 2017

Signature and date of
person requesting preliminary JD
(REQUIRED, unless obtaining
the signature is impracticable)

11/14/16

Table 2.

Wetland ID	NCWAM	Hydrologic Class	Cowardin Class	Size (Acres)	USACE Forms		Latitude	Longitude
					WET	UP		
WA	Headwater Forest	Riparian	PFO	0.11	X	X	36.2408	-80.5218
WB	Bottomland Hardwood Forest	Riparian	PFO	0.03	WA	WA	36.2390	-80.5202
WC	Headwater Forest	Riparian	PEM	0.10	WA	WA	36.2360	-80.5205
WE	Headwater Forest	Riparian	PFO	0.07	N/A	WA	36.2397	-80.5181
WG	Headwater Forest	Riparian	PSS	0.01	X	X	36.2404	-80.5248
WH	Headwater Forest	Riparian	PFO	0.06	WG	WG	36.2410	-80.5260
WI	Headwater Forest	Riparian	PFO	0.02	WG	WG	36.2411	-80.5261
WJ	Headwater Forest	Riparian	PFO	0.02	WG	WG	36.2413	-80.5262
WK	Headwater Forest	Riparian	PSS	0.01	WG	WG	36.2416	-80.5256

Table 2.

Pond ID	Isolated (Y/N)	Size (Acres)	Latitude	Longitude
PA	No	0.44	36.2396	-80.5185

X = Data Forms Completed

N/A = Wetland Forms not completed due to animal interference.

PFO = Palustrine Forested; PSS = Palustrine Scrub-Shrub; PEM = Palustrine Emergent

12.9 Invasive Species

The site will be monitored for the presence of invasive species during both the visual assessments and vegetation plot monitoring events and will follow the guidance in the *Wilmington District Stream and Wetland Compensatory Mitigation Update* (NCIRT 2016) regarding invasive species. A list of non-native invasive species for North Carolina is found in the NC SAM User Manual Appendix I.

Per the NCIRT 2016 guidance, invasive species management should occur when the functional integrity of the vegetative community is impacted. One or more invasive species may present a threat to the site, but the desirable species may have the ability to survive or outcompete despite the competition. Once an invasive species is identified as impairing the site, physical and/or chemical removal and treatment should occur. Any control measures will be noted in the annual monitoring reports.

North Carolina Interagency Review Team. 2016. Wilmington District Stream and Wetland Compensatory Mitigation Update. Last accessed at: http://saw-reg.usace.army.mil/PN/2016/Wilmington-District-Mitigation-Update.pdf

N.C. Stream Functional Assessment Team. 2016. N.C. Stream Assessment Method (NC SAM) User Manual. (https://ribits.usace.army.mil/ribits_apex/f?p=107:150:16800695257725::NO::P150_DOCUMENT_ID:36298)

12.10 Approved FHWA Categorical Exclusion

Categorical Exclusion Form for Division of Mitigation Services Projects
Version 1.4

Note: Only Appendix A should to be submitted (along with any supporting documentation) as the environmental document.

Part 1: General Project Information	
Project Name:	Mill Dam Creek Restoration Site
County Name:	Yadkin County, NC
DMS Number:	97136
Project Sponsor:	KCI Technologies, Inc.
Project Contact Name:	Tim Morris
Project Contact Address:	4601 Six Forks Rd, Suite 220, Raleigh, NC 27609
Project Contact E-mail:	tim.morris@kci.com
EEP Project Manager:	Matthew Reid

Project Description

For Official Use Only

Reviewed By:

10/12/2016
Date

DMS Project Manager

Conditional Approved By:

Date

For Division Administrator
FHWA

☐ **Check this box if there are outstanding issues**

Final Approval By:

10-12-16
Date

For Division Administrator
FHWA

Part 2: All Projects Regulation/Question	Response
Coastal Zone Management Act (CZMA)	
1. Is the project located in a CAMA county?	☐ Yes ☒ No
2. Does the project involve ground-disturbing activities within a CAMA Area of Environmental Concern (AEC)?	☐ Yes ☐ No ☒ N/A
3. Has a CAMA permit been secured?	☐ Yes ☐ No ☒ N/A
4. Has NCDCM agreed that the project is consistent with the NC Coastal Management Program?	☐ Yes ☐ No ☒ N/A
Comprehensive Environmental Response, Compensation and Liability Act (CERCLA)	
1. Is this a "full-delivery" project?	☒ Yes ☐ No
2. Has the zoning/land use of the subject property and adjacent properties ever been designated as commercial or industrial?	☐ Yes ☒ No ☐ N/A
3. As a result of a limited Phase I Site Assessment, are there known or potential hazardous waste sites within or adjacent to the project area?	☐ Yes ☒ No ☐ N/A
4. As a result of a Phase I Site Assessment, are there known or potential hazardous waste sites within or adjacent to the project area?	☐ Yes ☐ No ☒ N/A
5. As a result of a Phase II Site Assessment, are there known or potential hazardous waste sites within the project area?	☐ Yes ☐ No ☒ N/A
6. Is there an approved hazardous mitigation plan?	☐ Yes ☐ No ☒ N/A
National Historic Preservation Act (Section 106)	
1. Are there properties listed on, or eligible for listing on, the National Register of Historic Places in the project area?	☐ Yes ☒ No
2. Does the project affect such properties and does the SHPO/THPO concur?	☐ Yes ☐ No ☒ N/A
3. If the effects are adverse, have they been resolved?	☐ Yes ☐ No ☒ N/A
Uniform Relocation Assistance and Real Property Acquisition Policies Act (Uniform Act)	
1. Is this a "full-delivery" project?	☒ Yes ☐ No
2. Does the project require the acquisition of real estate?	☒ Yes ☐ No ☐ N/A
3. Was the property acquisition completed prior to the intent to use federal funds?	☐ Yes ☒ No ☐ N/A
4. Has the owner of the property been informed: * prior to making an offer that the agency does not have condemnation authority; and * what the fair market value is believed to be?	☒ Yes ☐ No ☐ N/A

Part 3: Ground-Disturbing Activities Regulation/Question	Response
American Indian Religious Freedom Act (AIRFA)	
1. Is the project located in a county claimed as "territory" by the Eastern Band of Cherokee Indians?	☐ Yes ☒ No
2. Is the site of religious importance to American Indians?	☐ Yes ☐ No ☒ N/A
3. Is the project listed on, or eligible for listing on, the National Register of Historic Places?	☐ Yes ☐ No ☒ N/A
4. Have the effects of the project on this site been considered?	☐ Yes ☐ No ☒ N/A
Antiquities Act (AA)	
1. Is the project located on Federal lands?	☐ Yes ☒ No
2. Will there be loss or destruction of historic or prehistoric ruins, monuments or objects of antiquity?	☐ Yes ☐ No ☒ N/A
3. Will a permit from the appropriate Federal agency be required?	☐ Yes ☐ No ☒ N/A
4. Has a permit been obtained?	☐ Yes ☐ No ☒ N/A
Archaeological Resources Protection Act (ARPA)	
1. Is the project located on federal or Indian lands (reservation)?	☐ Yes ☒ No
2. Will there be a loss or destruction of archaeological resources?	☐ Yes ☐ No ☒ N/A
3. Will a permit from the appropriate Federal agency be required?	☐ Yes ☐ No ☒ N/A
4. Has a permit been obtained?	☐ Yes ☐ No ☒ N/A
Endangered Species Act (ESA)	
1. Are federal Threatened and Endangered species and/or Designated Critical Habitat listed for the county?	☒ Yes ☐ No
2. Is Designated Critical Habitat or suitable habitat present for listed species?	☐ Yes ☒ No ☐ N/A
3. Are T&E species present or is the project being conducted in Designated Critical Habitat?	☐ Yes ☐ No ☒ N/A
4. Is the project "likely to adversely affect" the specie and/or "likely to adversely modify" Designated Critical Habitat?	☐ Yes ☐ No ☒ N/A
5. Does the USFWS/NOAA-Fisheries concur in the effects determination? (By virtue of no-response)	☐ Yes ☐ No ☒ N/A
6. Has the USFWS/NOAA-Fisheries rendered a "jeopardy" determination?	☐ Yes ☐ No ☒ N/A

Executive Order 13007 (Indian Sacred Sites)	
1. Is the project located on Federal lands that are within a county claimed as "territory" by the EBCI?	☐ Yes ☒ No
2. Has the EBCI indicated that Indian sacred sites may be impacted by the proposed project?	☐ Yes ☐ No ☒ N/A
3. Have accommodations been made for access to and ceremonial use of Indian sacred sites?	☐ Yes ☐ No ☒ N/A
Farmland Protection Policy Act (FPPA)	
1. Will real estate be acquired?	☒ Yes ☐ No
2. Has NRCS determined that the project contains prime, unique, statewide or local important farmland?	☒ Yes ☐ No ☐ N/A
3. Has the completed Form AD-1006 been submitted to NRCS?	☒ Yes ☐ No ☐ N/A
Fish and Wildlife Coordination Act (FWCA)	
1. Will the project impound, divert, channel deepen, or otherwise control/modify any water body?	☒ Yes ☐ No
2. Have the USFWS and the NCWRC been consulted?	☒ Yes ☐ No ☐ N/A
Land and Water Conservation Fund Act (Section 6(f))	
1. Will the project require the conversion of such property to a use other than public, outdoor recreation?	☐ Yes ☒ No
2. Has the NPS approved of the conversion?	☐ Yes ☐ No ☒ N/A
Magnuson-Stevens Fishery Conservation and Management Act (Essential Fish Habitat)	
1. Is the project located in an estuarine system?	☐ Yes ☒ No
2. Is suitable habitat present for EFH-protected species?	☐ Yes ☐ No ☒ N/A
3. Is sufficient design information available to make a determination of the effect of the project on EFH?	☐ Yes ☐ No ☒ N/A
4. Will the project adversely affect EFH?	☐ Yes ☐ No ☒ N/A
5. Has consultation with NOAA-Fisheries occurred?	☐ Yes ☐ No ☒ N/A
Migratory Bird Treaty Act (MBTA)	
1. Does the USFWS have any recommendations with the project relative to the MBTA?	☐ Yes ☒ No
2. Have the USFWS recommendations been incorporated?	☐ Yes ☐ No ☒ N/A
Wilderness Act	
1. Is the project in a Wilderness area?	☐ Yes ☒ No
2. Has a special use permit and/or easement been obtained from the maintaining federal agency?	☐ Yes ☐ No ☒ N/A

12.11 Agency Correspondence

Memoranda

ENGINEERS ♦ SURVEYORS ♦ SCIENTISTS ♦ CONSTRUCTION MANAGERS

LANDMARK CENTER II, SUITE 220 ♦ 4601 SIX FORKS ROAD ♦ RALEIGH, NC 27609 ♦ 919-783-9214 ♦ (FAX) 919-783-9266

TO:	Matthew Reid, DMS PM Todd Tugwell, ACOE
FROM:	Tim Morris, KCI
DATE:	July 25, 2016
SUBJECT:	Mill Dam Creek Stream Restoration Project IRT Site Review Meeting KCI Project Number: 201601703

Attendees:

Sue Homewood, NC DWR
Todd Tugwell, ACOE
Paul Weisner, DMS
Matthew Reid, DMS
Tim Morris, KCI
Steve Stokes, KCI
Adam Spiller, KCI

An IRT field review was conducted for the above referenced project on July 19, 2016 starting at 9:00 am. Weather was partly sunny. According to Weather Underground approximately 1.16" of rainfall had fallen in West Bend in the previous 14 days and 2.50" had fallen since the beginning of July. All project streams (UTHC and Tributaries 1 -9) were reviewed. Tributary 1 and the upper portion of Tributary 6 were dry. All other streams exhibited flow at the time of the site visit. Tim Morris and Adam Spiller from KCI presented the project to the attendees. The following issues and concerns were documented at the meeting and will be addressed in the future development of the site.

T1A – IRT generally OK with approach. Consider adding easement to cover eroding ephemeral drains and for BMP development. Must monitor channel carefully to ensure there is no stream loss associated with bringing the stream bed up. IRT suggested a stream gauge to monitor flow during monitoring period.

T1- Dry at the time of site visit. Corps indicated that they probably would not require mitigation if they were permitting an impact to this stream. Seemed OK with it in the context of the entire

project since this was the only restoration reaches on an intermittent (dry) stream. Suggested a stream gauge here to monitor flow during monitoring period.

T2 – IRT was OK with R (lower) and E2 (upper) approach. IRT discussed possibly doing more R in the upper section in the woods but ultimately backed off that thought. KCI would consider doing more R in the woods if the IRT would grant R credit. The spacing of the trees would allow KCI to do construction with minimal damage to the existing canopy. Additional feedback on T2 approach is appreciated.

T3 – IRT was OK with approach, including doing wetland rehabilitation within the emergent seep at the head of the stream. KCI would need to provide a pre-con well if trying to claim wetland credit via rehabilitation. KCI won't likely have all of this data for inclusion in the Mitigation Plan (MP) plan, but the IRT said it's fine to keep recording until construction is started as long as in the MP we explain how it will be used once it's collected (compare to post construction monitoring). DMS does not know at this point if wetland credits will be needed/contracted.

T4 – IRT suggested Restoration instead of E2 on this reach (approximately 200'). KCI will modify approach to R.

T5 – IRT generally agreed with our approach. Similar to any other "light touch"/E2 reaches, we need to make sure that we quantify the amount of work that's being done on the stream to illustrate that we're doing enough work for it to be called E2. For T5A, need to clarify that this isn't just from a leaky well, but is from an actual spring/seep.

T6 – IRT agreed to approach but expressed reservation about E2 on T6 (because it was dry) and questioned the feasibility of removing the dam. KCI to provide detailed justification of E2 on upper portion of T6. KCI intends to remove the dam in its entirety, not just notch the dam.

T7 – IRT generally agreed to the R/E2 approach here. The wetland in this area was largely functional and the IRT indicated that it would not be a candidate for rehabilitation.

T8 – IRT asked KCI to remove E2 from the beginning of T8A. Because of the presence of the toe-drain, KCI will consider wetland rehab here if DMS is contracting credits. IRT generally OK with the approach for the rest of T8 and T8A.

T9 – IRT recommended a 5:1 ratio for the E2 section. Restoration section was OK. KCI will eliminate E2 section as it does not make sense financially (credits do not justify cost).

UTHC – IRT generally OK with all calls until Mathis property although the IRT expressed

concern about the approach from T6 to the Mathis Property. *Mathis property is the second crossing downstream of T6/UTHC confluence*. Strong justification for R approach will need to be provided in the MP. IRT requested changing R to E1 on the Mathis Property, then E2 from bottom of Mathis Property to the next crossing, then E1 from that crossing to the powerline crossing, then E2 to the bottom of the project. (see attached mitigation type and extent map) for final changes.

Assuming agency concurrence with this memo, this approach will result in the deduction of approximately 675 credits from the initially proposed 11,000 credits.

Meeting adjourned @ approximately 1pm.

Key:

R – Restoration
E1 – Enhancement 1
E2 – Enhancement 2
UTHC – Unnamed Tributary to Hall Creek

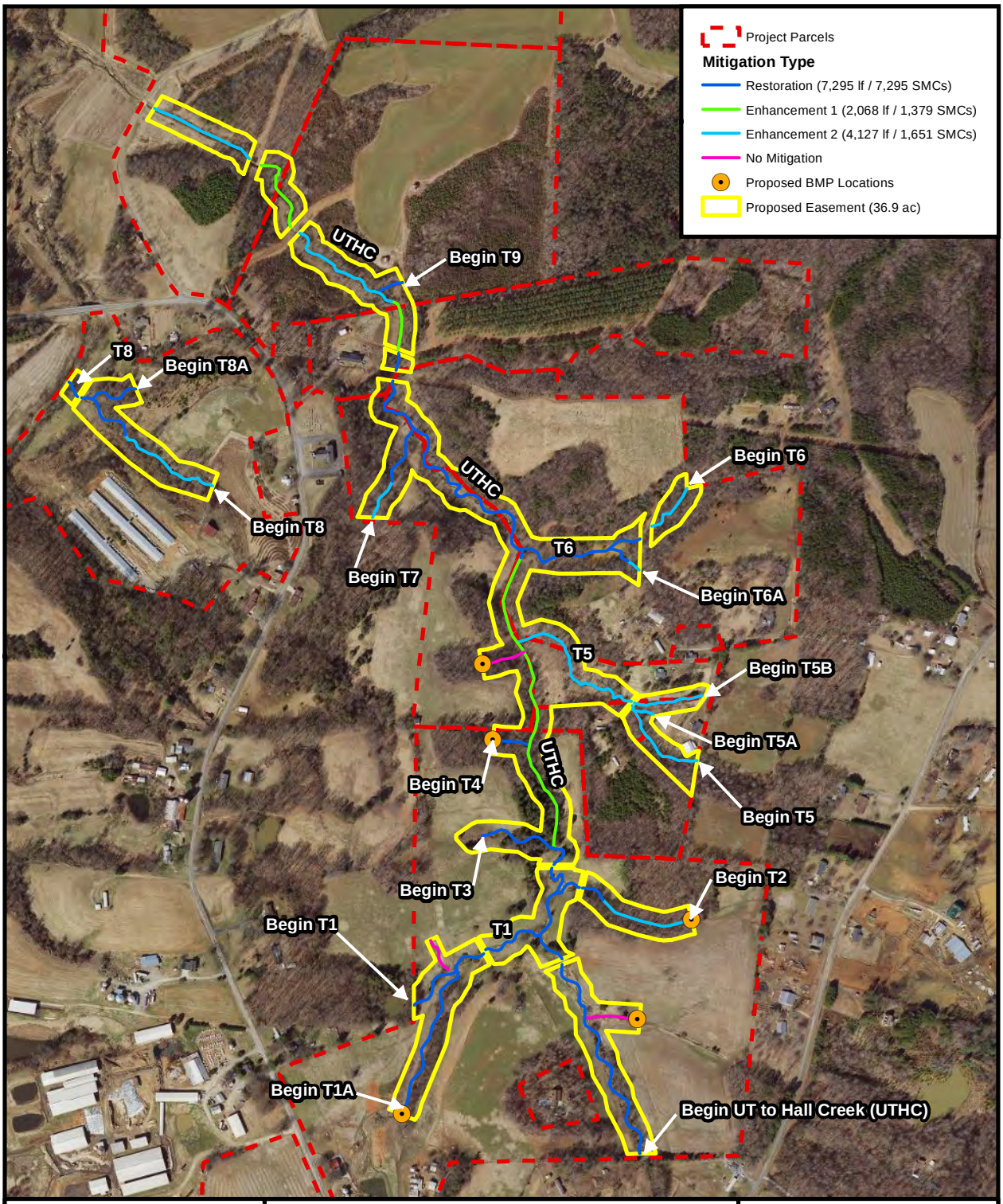


FIGURE 11. PROPOSED MITIGATION TYPE AND EXTENT
MILL DAM CREEK RESTORATION SITE
YADKIN COUNTY, NC