BASELINE MONITORING DOCUMENT & AS-BUILT BASELINE REPORT

ADKIN BRANCH STREAM RESTORATION PROJECT
PHASE 1 – WASHINGTON AVE. TO LINCOLN ST.

Lenoir County, North Carolina
Project ID No. 050656101

Prepared for:

NCDENR-Ecosystem Enhancement Program
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Data Collected: February - March, 2011
Submitted: September 9, 2011

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I HEREBY CERTIFY THAT THE DOCUMENTS CONTAINED HEREIN, ADKIN BRANCH BASELINE MONITORING DOCUMENT & AS-BUILT BASELINE REPORT, WERE PREPARED BY ME OR UNDER MY DIRECT SUPERVISION.

SIGNED SEALED, AND DATED THIS 7TH DAY OF JULY 2011.

Chris L. Smith, PE

NORTH CAROLINA PROFESSIONAL SEAL 035636 ENGINEER CHRISTOPHER L. SMITH

EXECUTIVE SUMMARY

The North Carolina Ecosystem Enhancement Program (NCEEP) has completed Phase I of the Adkin Branch Stream Restoration Project (hereafter referred to as the "Project") in Kinston, Lenoir County, North Carolina to assist in fulfilling stream mitigation needs in the Project area.

The primary goals of the Project focused on restoring a stable dimension, pattern, and profile to Adkin Branch and UT to Adkin Branch, improving water quality, decreasing floodwater levels, restoring aquatic and riparian habitat, and implementing best management practices (BMPs) for stormwater quality and retention. These goals were accomplished by:

1. Reducing sediment input to Adkin Branch by restoring 7,579 linear feet of stream to a stable dimension, pattern, and profile, and establishing a vegetated stream bank, floodplain, and terrace forest. Forest vegetation species were selected by studying a Reference Forest Ecosystem located directly upstream of the Project and reviewing species listed in *Classification of the Natural Communities of North Carolina: Third Approximation* (Schafale and Weakley 1990) for a Coastal Plain Levee Forest. A total of 32.44 acres of the conservation easement were reforested.
2. Promoting floodwater attenuation and decreasing floodwater levels by excavating a gently sloping floodplain that begins at the bankfull discharge elevation and slopes up to the terrace elevation, in addition to increasing roughness in the floodplain by establishing a vegetated riparian buffer.
3. Improving aquatic habitat by enhancing stream bed variability (ripple-pool sequence), and introducing woody debris in the form of rootwads, log vanes, and log sills. A ripple-pool sequence and woody debris structures will provide places for forage, cover, and reproduction for fauna and flora.
4. Improving terrestrial habitat by restoring a forested riparian corridor through a highly urbanized environment, which has historically experienced vegetation maintenance and forest segmentation. This corridor will provide a diversity of habitats such as mature forest, early successional forest, riparian wetlands and uplands.
5. Reducing nonpoint source pollution associated with urban land uses (i.e. maintained ball fields, roadways, residential communities, etc.) by providing a vegetated riparian buffer adjacent to streams to treat surface runoff. Reforestation of the Project resulted in a total of 1,171,272 sq. ft. (26.89 acres) of Neuse River Riparian Buffers (area within 200' of top of bank of channel that is at least 50' wide).
6. Improving water quality by creating 0.69 acres of riparian stormwater wetland adjacent to the UT to Adkin Branch, implementing six (6) sand filter device BMPs along Adkin Branch for stormwater runoff to retain sediments and nutrients prior to entering Adkin Branch, and removing creosote timber retaining walls throughout the project.

Prior to construction, the Project contained a degraded stream channel with a disturbed riparian buffer. The Project watershed is characterized primarily by urban development associated with the City of Kinston, agriculture, disturbed forest, former neighborhoods, a former landfill, and a

former wastewater treatment plant. The removal of riparian vegetation, impervious surfaces, and straightening and rerouting of stream channels, had resulted in degraded water quality and unstable channel characteristics (stream entrenchment, erosion, and bank collapse). Many of the former neighborhoods, landfill, and wastewater treatment plant were purchased by the City of Kinston with Federal Emergency Management Agency (FEMA) funds following flooding from Hurricanes Fran and Floyd.

Project construction was completed between March 9, 2009 and April 1, 2011. The project restored 7,579 linear feet of stream using Priority II restoration by constructing a new meandering channel within the Adkin Branch and UT's floodplains, incorporating in-stream structures, installing grade control structures, and planting native vegetative species. The Project will be protected by a permanent conservation easement held by the State of North Carolina.

Project activities provide 7,787* Stream Mitigation Units and 3,990 lbs of Neuse River Nutrient Offset Pound Reduction Credits. Riparian Buffer areas may be used for stream & wetland mitigation, stream & riparian buffer mitigation, or nutrient offset buffer restoration credit (Estimating/Calculating Riparian Buffer Credits, EEP PPPM Section 8.3.1.2). Credit options for Riparian Buffer restoration areas are summarized below:

Credit Options for Riparian Buffer Restoration Areas					
Neuse Riparian Buffer Restoration Credits			Nutrient Offset Buffer Restoration Credits		
50' Area (sf)	50' - 200' Adjusted Area (sf)*	Credit Yield**	<= 50' Nitrogen Removal (lbs)***	50' - 200' Nitrogen Removal (lbs)***	Credit Yield***
562,799	696,704	1,259,503	0	31,751	31,751
* - Credits adjusted based on proposed DWQ guidelines (DRAFT Regulatory Guidance for the Calculation of Stream and Buffer Mitigation Credit for Buffer Widths Different from Standard Minimum Widths, Version 4.5, July 20, 2010)					
** - Riparian Buffer Restoration Credit Yield is the sum of 50' area and 50' - 200' adjusted area					
*** - Nitrogen Credits were calculated based on a rate of 2,273 lbs per acre over 30 years per DWQ policy (Estimating/Calculating Riparian Buffer Credits, EEP PPPM Section 8.3.1.2)					

It is to be noted that the Adkin Branch Stream Restoration project was instituted before October 11, 2007, and is grandfathered to allow mitigation credit for buffer restoration out to 200 feet as measured horizontally out from the water surface. Allowing this project to be grandfathered is in accordance with an email from Tom Reeder (DWQ) dated October 10, 2007 which states: "This decision was made so as to not penalize those projects that may have been completed in good faith under any misunderstanding caused by the distribution of the internal DWQ memo dated Oct 23, 2002".

The first year monitoring report will be submitted at the end of December. Monitoring will continue for five years or until agreed upon success criteria are achieved, with a report submitted by the end of December for each monitoring year. Monitoring will include a survey of representative stream profiles and cross-sections, representative surveys of vegetation, and an annual monitoring report verifying that the Site has remained relatively unchanged.

At this time, no issues or mitigating factors have arisen in the period immediately following the completion of grading and planting.

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1.0 PROJECT GOALS, BACKGROUND AND ATTRIBUTES

1.1 Location and Setting

The Project is located on the southeast side of the City of Kinston, in Lenoir County, North Carolina and includes Adkin Branch and an unnamed tributary (UT) to Adkin Branch (Figure 1, Appendix A). Phase I of the Project begins at Washington Ave. and ends at Lincoln Street. The surrounding watershed is highly urbanized. The Project is located in United States Geological Survey (USGS) Hydrologic Unit (HU) and Targeted Local Watershed 03020202060030 (North Carolina Division of Water Quality [NCDWQ] Subbasin 03-04-05) of the Neuse River Basin and will service USGS 8-digit Cataloging Unit (CU) 03020202. The Project site is located in the Coastal Plain physiographic province of North Carolina.

1.2 Project Goals and Objectives

The primary goals of this stream restoration project focused on:

1. Restoring a stable dimension, pattern, and profile to Adkin Branch and UT to Adkin Branch,
2. Improving water quality,
3. Decreasing floodwater levels,
4. Restoring aquatic and riparian habitat, and
5. Implementing best management practices (BMPs) for stormwater quality and retention.

These goals were accomplished by:

1. Reducing sediment input to Adkin Branch by restoring 7,579 linear feet of stream to a stable dimension, pattern, and profile, and establishing a vegetated stream bank, floodplain, and terrace forest. Forest vegetation species were selected by studying a Reference Forest Ecosystem located directly upstream of the Project and reviewing species listed in *Classification of the Natural Communities of North Carolina: Third Approximation* (Schafale and Weakley 1990) for a Coastal Plain Levee Forest. A total of 32.44 acres of the conservation easement were reforested.
2. Promoting floodwater attenuation and decreasing floodwater levels by excavating a gently sloping floodplain that begins at the bankfull discharge elevation and slopes up to the terrace elevation, in addition to increasing roughness in the floodplain by establishing a vegetated riparian buffer.
3. Improving aquatic habitat by enhancing stream bed variability (ripple-pool sequence), and introducing woody debris in the form of rootwads, log vanes, and log sills. A ripple-pool sequence and woody debris structures will provide places for forage, cover, and reproduction for fauna and flora.
4. Improving terrestrial habitat by restoring a forested riparian corridor through a highly urbanized environment, which has historically experienced vegetation maintenance and forest segmentation. This corridor will provide a diversity of habitats such as mature forest, early successional forest, riparian wetlands and uplands.

7. Reducing nonpoint source pollution associated with urban land uses (i.e. maintained ball fields, roadways, residential communities) by providing a vegetated riparian buffer adjacent to streams to treat surface runoff. Reforestation of the Project resulted in a total of 1,171,272 sq. ft. (26.89 acres) of Neuse River Riparian Buffers (area within 200' of top of bank of channel that is at least 50' wide).
5. Improving water quality by creating 0.69 acres of riparian stormwater wetland adjacent to the UT to Adkin Branch, implementing six (6) sand filter device BMPs along Adkin Branch for stormwater runoff to retain sediments and nutrients prior to entering Adkin Branch, and removing creosote timber retaining walls throughout the project.

1.3 Project Structure, Restoration Type and Approach

1.3.1 Project Structure

Phase I of the Project restored 7,579 linear feet of Adkin Branch and a UT between Washington Ave. and Lincoln St. in the City of Kinston, NC. Accounting for varying Riparian Buffer widths, utility easements, and stormwater conveyances throughout the site, Project activities provide 7,787* Stream Mitigation Units and 3,990 lbs of Neuse River Nutrient Offset Pound Reduction Credits. Riparian Buffer areas may be used for stream & wetland mitigation, stream & riparian buffer mitigation, or nutrient offset buffer restoration credit (Estimating/Calculating Riparian Buffer Credits, EEP PPPM Section 8.3.1.2). Credit options for Riparian Buffer restoration areas are summarized below:

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** - Riparian Buffer Restoration Credit Yield is the sum of 50' area and 50' - 200' adjusted area					
*** - Nitrogen Credits were calculated based on a rate of 2,273 lbs per acre over 30 years per DWQ policy (Estimating/Calculating Riparian Buffer Credits, EEP PPPM Section 8.3.1.2)					

The structure and components of the Project are summarized in Figure 1 and Table 1, Appendix A. Additional credit calculation figures and documentation are attached in Appendix D.

The original project scope, Restoration Plan, and Construction Plans included an additional reach upstream of Phase I, from NC 11/55 to Washington Ave. Due to a delay in easement acquisition, this portion of the project will be constructed separately as Phase II.

1.3.2 Restoration Type and Approach

Prior to construction, the Project contained a degraded stream channel with a disturbed riparian buffer. The removal of riparian vegetation, impervious surfaces, and straightening and rerouting of stream channels, had resulted in degraded water quality and unstable channel characteristics (stream entrenchment, erosion, and bank collapse).

Adkin Branch and the UT were designed and constructed using Priority II restoration techniques. In-stream structures were installed to control grade, protect banks, and to increase bed form diversity for aquatic habitat. Other construction activities included excavating a floodplain bench, installing sod matting, backfilling of the abandoned channel, installing channel plugs, removing timber and concrete bag walls, removing three pedestrian bridges, constructing two new pedestrian bridges, installing a stormwater wetland and six BMP sand filter devices, and planting with native vegetative species. Planting occurred within 32.44 acres of the 35.97 acre conservation easement, including stream banks, floodplain, and stormwater BMPs. Target natural communities consist of Coastal Plain Levee Forest (Brownwater subtype), stream-side assemblage, and stormwater BMP wetland assemblage (Schafale and Weakley 1990).

1.4 Project History, Contacts and Attribute Data

The Project watershed is characterized primarily by urban development associated with the City of Kinston. Other land uses in the watershed include agriculture, disturbed forest, former neighborhoods, a former landfill, and a former wastewater treatment plant. Many of the former neighborhoods, the landfill, and the wastewater treatment plant were purchased by the City of Kinston with Federal Emergency Management Agency (FEMA) funds following flooding from Hurricanes Fran and Floyd. The City of Kinston donated permanent conservation easements on these properties and other City owned properties (parks, public housing) for areas associated with this Project. Easements on the privately owned properties were obtained in a joint effort between the City of Kinston and the EEP.

Florence and Hutcheson (F&H) provided engineering, design, and construction oversight services to the EEP for the Project. Construction began in March 2009, however Article 29 was declared on the Original Contractor in January 2010. The contractor's surety hired a new contractor (Surety Contractor) to complete the Original Contractor's work. Repairs to damages resulting from Tropical Storm Ida in November 2009 were completed under an Informal Contract by a third contractor (Repair Contractor). The Informal Contract also covered planting of bare root trees throughout the site and ball-and-burlap trees along the conservation easement line at Holloway Park. The repair work included the installation of in-stream structures, reshaping of the channel banks, regrading overbank scour areas, and installation of soil lifts in areas damaged by Tropical Storm Ida. All grading and planting was completed by April 1, 2011.

Completed project activities, reporting history, completion dates, project contacts, and background information are summarized in Tables 2-4 (Appendix A).

2.0 SUCCESS CRITERIA

In general, the restoration success criteria, and required remediation actions, are based on Appendix II of the *Stream Mitigation Guidelines* (USACE et al. 2003).

2.1 Morphologic Parameters and Channel Stability

Success criteria for stream restoration will include 1) successful classification of the reach as a functioning stream system (Rosgen 1996) and 2) channel variables indicative of a stable stream system.

The channel configuration will be measured on an annual basis in order to track changes in channel geometry and profile. These data will be utilized to determine the success in restoring stream channel stability. Specifically, the width-to-depth ratio should characterize a B-type channel for Adkin Branch and an E-type or borderline E-/C-type channel for the UT to Adkin Branch, bank-height ratios indicative of a stable or moderately unstable channel, and minimal changes in cross-sectional area, channel width, and/or bank erosion along the monitoring reach. The field indicator of bankfull will be described in each monitoring year and indicated on a representative channel cross-section figure. If the stream channel is down-cutting or the channel width is enlarging due to bank erosion, additional bank or slope stabilization methods will be employed.

2.1.1 Dimension

General maintenance of a stable cross-section and hydrologic access to the floodplain features over the course of the monitoring period will generally represent success in dimensional stability. Some changes in dimension (such as lowering of bankfull width) should be expected. Key parameters such as cross-sectional area and the channel's width to depth ratio should demonstrate modest overall change. Riffle sections should generally maintain a Bank Height ratio of 1.0 to 1.5, with some variation in this ratio naturally occurring. Pool sections naturally adjust based on recent flows and time between flows, therefore more variation on pool section geometry is expected.

2.1.2 Pattern and Profile

The profile should not demonstrate significant trends towards degradation or aggradation over a significant portion of a reach. Additionally, bed form variables should remain noticeably intact and consistent with original design parameters that were based off of reference conditions. Pattern features should show little adjustment over the standard 5 year monitoring period. In addition, channel abandonment and/or shoot cutoffs must not occur and sinuosity values must remain at approximately 1.03 – 1.04 (thalweg distance/straight-line distance) for Adkin Branch and approximately 1.3 for the UT to Adkin Branch.

2.1.3 Substrate

The stream substrate is predominately sand, and is not expected to coarsen over time; therefore, pebble counts are not proposed as part of the stream success criteria.

2.2 Vegetation

Success criteria have been established to verify that the vegetation component supports community elements necessary for forest development. Success criteria are dependent upon the density and growth of characteristic forest species. Additional success criteria are dependent upon density and growth of "Character Tree Species." Character Tree Species include planted species along with species identified through visual inventory of an approved reference (relatively undisturbed) forest community used to orient the project design. All canopy tree species planted and identified in the reference forest will be utilized to define "Character Tree Species" as termed in the success criteria. This project seeks both stream and riparian buffer credit which have differing success criteria as described below.

Stream

Vegetation monitoring will be considered successful for stream mitigation credit if at least 260 stems/acre (trees and shrubs), both, volunteer and planted, are surviving at the end of five years. The interim measure of vegetative success for the site will be the survival of at least 320 3-year old stems per acre at the end of year three of the monitoring period and 280 4-year old stems per acre at the end of year four of the monitoring period.

Buffer

Vegetation monitoring will be considered successful for riparian buffer mitigation credit if at least 320 native planted hardwood stems/acre (trees only) are surviving at the end of year five. Planted vegetation must include a minimum of at least two planted native hardwood tree species. There is no interim measure of vegetative success for riparian buffers.

2.3 Hydrology

Success criteria include documentation of two bankfull channel events during the monitoring period. In the event that less than two bankfull events occur during the first five years, monitoring will continue until the second event is documented. In addition, bankfull events must occur during separate monitoring years.

3.0 MONITORING PLAN GUIDELINES

Monitoring of Project restoration efforts will be performed until success criteria are fulfilled. Monitoring is proposed for the stream channel, stormwater management devices, and vegetation. The establishment, collection, and summarization of monitoring data shall be conducted in accordance with the most current version of the EEP document entitled *Procedural Guidance and Content Requirements for EEP Monitoring Reports (version 1.3)*.

3.1 Stream Hydrology

Verification of bankfull events and changes in stream hydrology will be recorded by crest gauges installed in the stream as well as visual evidence of above bankfull flows. Two crest gages were installed along Adkin Branch and two were installed along the UT (Figures 2-13, Appendix A). Evidence of above bankfull flows may include trash/debris lines in or above the floodplain, vegetation pushed over towards the downstream direction in the floodplain, terrace slope scour, and staining of vegetation. Early monitoring of crest gauges will allow for additional verification of bankfull design targets.

All visits to the site for purposes of data collection will be documented by the monitoring performer and will describe in detail: weather conditions; physical appearance of the site; highest stage for that monitoring interval as recorded on the crest gauge; a reset of the crest gauge; photo documentation. Data collected for the purposes of bankfull verification will be compiled and summarized in each annual version of the monitoring report.

3.2 Stream Channel Stability and Geomorphology

Three reaches (Washington Ave. to Gordon St., Gordon St. to Lincoln St., and the UT) were established for monitoring stream dimension, pattern, and longitudinal profile (Figures 2-13, Appendix A). The Restoration Plan for the Project indicated two reaches between Gordon St. and Lincoln St., separated at Caswell St. Due to the similarity of the design parameters for the two reaches, they were combined into a single reach for monitoring. Annual monitoring surveys will include assessment of channel cross-sections on riffles and pools and a water surface profile of the channel. The stream will be classified according to stream geometry and substrate (Rosgen 1996). Significant changes in channel morphology will be tracked and reported by comparing data in each successive monitoring year. In addition, visual assessments of the stream will be conducted by walking the length of stream.

3.2.1 Dimension

Seventeen permanent cross-sections were established and will be used to evaluate stream dimension. Cross-sections are permanently monumented with 2-foot rebar posts at each end point. Cross-sections will be measured to provide a detailed evaluation of the stream and banks including points on the adjacent floodplain, top of bank, bankfull, breaks in slope, edge of water, and thalweg. Data will be used to calculate bankfull dimensions, width-depth ratios, entrenchment ratios, and bank height ratios for each cross-section. In addition, photographs will be taken at each permanent cross-section location annually.

3.2.2 Profile

The three reaches established for monitoring will be surveyed annually using a Total Station to collect data on channel thalweg, bankfull, and water surface elevations. The profile data will be used to calculate water surface slopes, riffle/pool lengths and depths, and pool-to-pool spacing.

3.2.3 Pattern

Stream parameters such as channel belt width, radius of curvature, and meander wavelength will be collected in monitoring year five if profile and dimensional data indicate that significant geo-morphological adjustments have occurred.

3.2.4 Visual Assessments

Visual stream morphology stability assessments will be completed annually in each of the three monitoring reaches in accordance with the most current version of the EEP document entitled *Procedural Guidance and Content Requirements for EEP Monitoring Reports (version 1.3)*. The visual assessment data will be used to assess the channel bed, banks, and in-stream structures.

3.2.5 Bank Stability Assessments

Bank stability will be assessed as part of the annual visual assessment and will consist of cataloging the amount of bank footage demonstrating some level of instability. Near Bank Stress (NBS) and Bank Erosion Hazard Index (BEHI) assessments were not part of the pre-construction existing conditions surveys, therefore they will not be included in the monitoring phase.

3.3 Vegetation

Twenty-two sample vegetation plots (10-meter by 10-meter) were installed within the Site as per guidelines established in CVS-EEP Protocol for Recording Vegetation, Version 4.0 (Lee et al. 2006). Vegetation plots are permanently monumented with 4-foot metal garden posts at each corner. In each sample plot, vegetation parameters to be monitored will conform to Level 2 Standards and include species composition and species density. Visual observations of the percent cover of shrub and herbaceous species will also be documented by photograph.

3.4 Stormwater Wetland

Plant coverage within the stormwater wetland should be assessed and documented each growing season. If a minimum of 70 percent coverage is not achieved after the second growing season, supplemental planting should be completed. Plant coverage of 90 to 95 percent is desirable. Vegetation monitoring will be considered successful for riparian buffer mitigation credit if at least 320 native planted hardwood stems/acre (trees only), are surviving at the end of year five.

3.5 Watershed

Any changes to the project watershed will be monitored and recorded. In the event that a change to the watershed might introduce new sediment or changes in water flow to the site, such as a new development upstream, it will be closely monitored and analyzed. Any significant effects to site streams will be documented so that action can be taken, if necessary. Additionally, rare or

significant hydrologic and weather events will be recorded in detail so that changes to site streams can be accounted for.

4.0 MAINTENANCE AND CONTINGENCY PLANS

In the event that success criteria are not fulfilled, a mechanism for contingency will be implemented.

4.1 Stream

In the event that stream success criteria are not fulfilled, a mechanism for contingency will be implemented. Stream contingency may include, but may not be limited to 1) structure repair and/or installation; 2) repair of dimension, pattern, and/or profile variables; and 3) bank stabilization. The method of contingency is expected to be dependent upon stream variables that are not in compliance with success criteria. Primary concerns, which may jeopardize stream success, include 1) structure failure, 2) headcut migration through the Site, and/or 3) bank erosion.

4.1.1 Structure Failure

In the event that structures are compromised, the affected structure will be repaired, maintained, or replaced. Once the structure is repaired or replaced, it must function to stabilize adjacent stream banks and/or maintain grade control within the channel. Structures which remain intact, but exhibit flow around, beneath, or through the header/footer pilings will be repaired by excavating a trench on the upstream side of the structure and reinstalling filter fabric in front of the pilings. Structures which have been compromised, resulting in shifting or collapse of header/footer pilings, will be removed and replaced with a structure suitable for Project flows.

4.1.2 Headcut Migration through the Site

In the event that a headcut occurs within the Project (identified visually or through measurements [i.e. bank-height ratios exceeding 1.4]), provisions for impeding headcut migration and repairing damage caused by the headcut will be implemented. Headcut migration may be impeded through the installation of in-stream grade control structures (log sill and/or log cross-vane) and/or restoring stream geometry variables until channel stability is achieved. Channel repairs to stream geometry may include channel backfill with coarse material and stabilizing the material with erosion control matting, vegetative transplants, and/or willow stakes.

4.1.3 Bank Erosion

In the event that severe bank erosion occurs at the Project resulting in elevated width-to-depth ratios, contingency measures to reduce bank erosion and width-to-depth ratio will be implemented. Bank erosion contingency measures may include the installation of soil lifts and/or other bank stabilization measures. If the resultant bank erosion induces shoot cutoffs or channel abandonment, a channel may be excavated which will reduce shear stress to stable values.

4.2 Vegetation

If vegetation success criteria are not achieved based on average density calculations from combined plots over the entire restoration area, supplemental planting may be performed with

tree species approved by regulatory agencies. Supplemental planting will be performed as needed until achievement of vegetation success criteria.

4.3 Stormwater Management Devices

Stormwater BMP devices will be monitored and maintained periodically, as necessary, to ensure the life of the devices. The City of Kinston has agreed to provide maintenance for the sand filter BMP devices and the stormwater wetland for the life of the BMPs (30 years) per Attachment C of the Conservation Easement. A maintenance guideline manual will be provided to the City of Kinston by EEP.

4.3.1 Sand Filter Devices

The maintenance guidelines are summarized as follows (NCDWQ 2005):

- The sediment chamber outlet devices should be cleaned or repaired when drawdown times exceed 24 hours. In addition, trash and debris should be removed as necessary and sediment should be cleaned out when it accumulates to 6 inches or more.
- When the infiltration capacity of the filter diminishes or water ponds on the filter bed surface for greater than 24 hours, the topsoil and underlying 3 inches of filter material should be removed and replaced. The removed sediments should be tested and disposed of appropriately. Sediment/silt should be removed from the filter bed when accumulation exceeds 1 inch.
- Vegetation within the sediment chamber should be mowed to limit the height to 12 inches.
- Direct maintenance access should be provided to the pretreatment area and the filter bed.

5.0 AS-BUILT STATE

This section documents the as-built/baseline condition. Appendices B & C include Tables 5, 6 & 7 which detail specific geomorphic and vegetative data in relation to the as-built conditions.

5.1 As-built/Record Drawings

The As-built/Record Drawings are attached in Appendix E.

5.2 Morphologic State of the Channel

Upon completion of grading and structure installation, a baseline survey was performed for the three monitoring reaches and 17 cross-sections. Baseline morphologic data is summarized in Tables 5a-c and Table 6 in Appendix B. Plots of the profiles are shown in Figures 14-16 in Appendix B. Cross-section plots and photos can also be found in Appendix B. Cross-section photos were taken facing in the downstream direction.

5.3 Sediment Transport in the As-built State

As-built capacity (unit stream power) values are depicted in Table 5 and can be compared with design and existing values for each reach. For sand based systems such as Adkin Branch and the UT to Adkin Branch, capacity is the primary tool for assessing the channel's ability to transport sediment through the system.

5.4 Verification of Plantings

After planting was completed, an initial evaluation was performed per guidelines established in CVS-EEP Protocol for Recording Vegetation, Version 4.0 (Lee et al. 2006) to verify planting methods were successful and to determine initial species composition and density. Baseline vegetation plot data can be found in Table 7 in Appendix C. Plot photos are also located in Appendix C. Initial stem count measurements indicate an average of 881 planted stems per acre (excluding live stakes) across the Site. In addition, each individual plot met success criteria based on planted stems alone. Final planting tables (8a-b) can be found in Appendix C.

6.0 REFERENCES

Lee, M.T., R.K. Peet, S.D. Roberts, and T.R. Wentworth. 2006. CVS-EEP Protocol for Recording Vegetation. Version 4.0. North Carolina Department of Environment and Natural Resources, Ecosystem Enhancement Program. Raleigh, North Carolina.

North Carolina Division of Water Quality (NCDWQ). 2005. Updated Draft Manual of Stormwater Best Management Practices. North Carolina Department of Environment and Natural Resources, Raleigh, North Carolina.

Rosgen, D.L. 1996. Applied River Morphology. Wildland Hydrology Books, Pagosa Springs, CO.

Schafale, M.P. and A.S. Weakley. 1990. Classification of the Natural Communities of North Carolina: Third Approximation. North Carolina Natural Heritage Program, Division of Parks and Recreation, North Carolina Department of Environment, Health, and Natural Resources. Raleigh, North Carolina.

United States Army Corps of Engineers, United States Environmental Protection Agency, North Carolina Wildlife Resources Commission, North Carolina Division of Water Quality (USACE et al.). 2003. Stream Mitigation Guidelines.

United States Geological Survey (USGS). 1974. Hydrologic Unit Map - 1974. State of North Carolina.

Estimating/Calculating Riparian Buffer Credits, EEP PPPM Section 8.3.1.2.

DRAFT Regulatory Guidance for the Calculation of Stream and Buffer Mitigation Credit for Buffer Widths Different from Standard Minimum Widths, NC Interagency Review Team (IRT), Version 4.5, July 20, 2010.

DWQ Memo #2008-019, dated August 19, 2008.

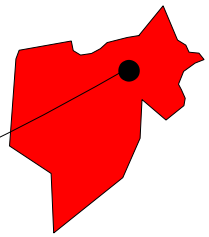
DWQ Memo #2009-006, dated November 17, 2009.

7.0 APPENDICES

Appendix A: General Tables & Figures

Lenoir County
North Carolina

PROJECT AREA



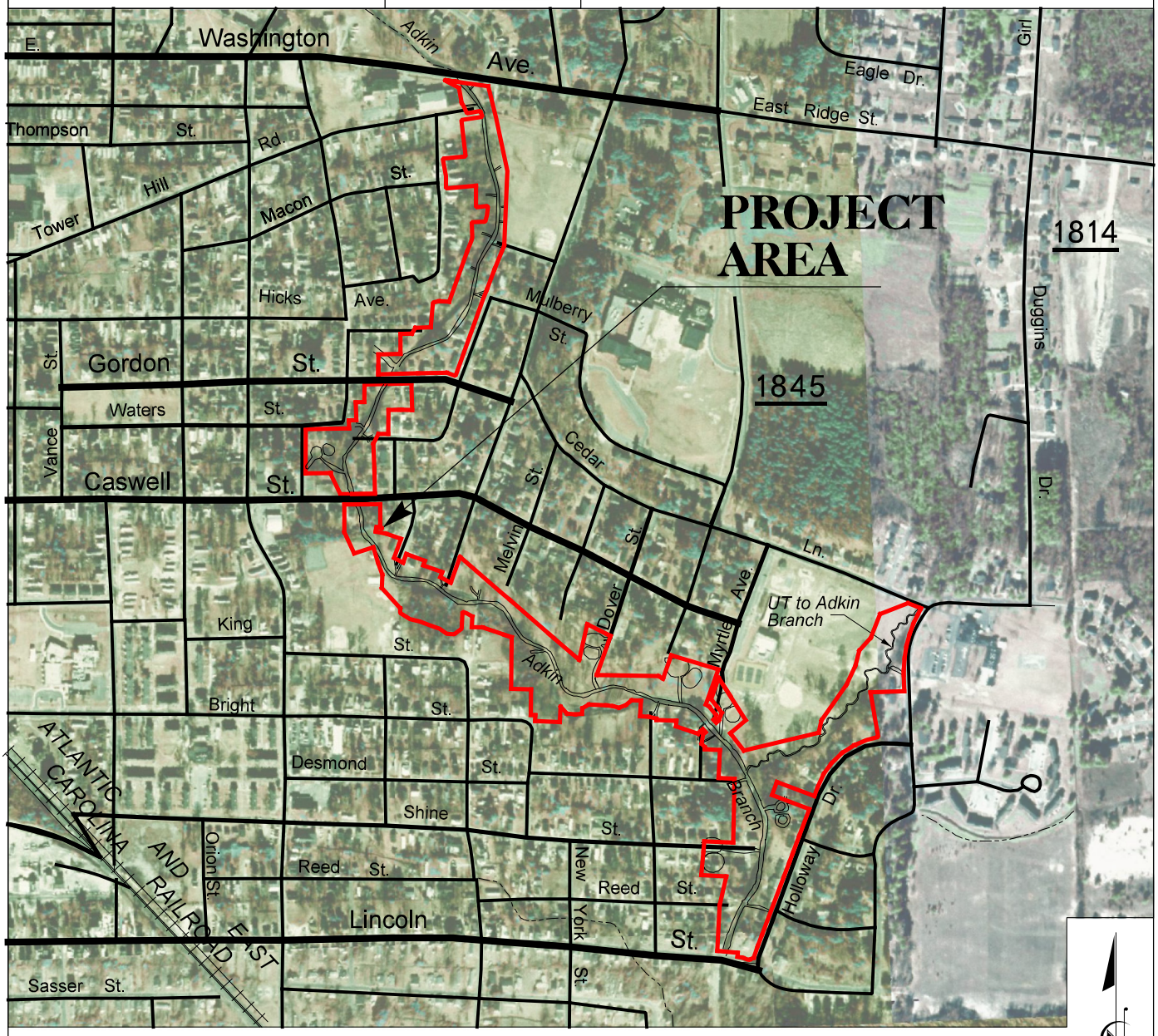
Date: 06/15/11	Figure: 1

Vicinity/Asset Map

Adkin Branch Phase I
PROJECT NO. 050656101
Lenoir County, North Carolina

Florence & Hutcheson
CONSULTING ENGINEERS
5121 KINGDOM WAY, SUITE 100
RALEIGH, N.C. 27607
(919) 851-6066
License No: F-0258

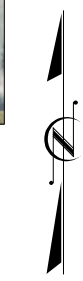
Ecosystem Enhancement PROGRAM



FROM RALEIGH:

- Take I-40 East for approximately 6.5 miles to US 70 East
- Take US Hwy 70 East for approximately 68.5 miles to NC 11/55
- Turn left and travel Northeast on NC 11/55 thru Kinston for 1.7 miles
- Turn left onto Martin Luther King Jr Blvd. and travel for 0.5 miles
- Turn right onto the East Washington Ave. and travel 0.4 miles to the intersection with Adkin Branch Project. Site is Southeast of Washington Ave.

"The subject project site is an environmental restoration site of the NCDENR Ecosystem Enhancement Program (EEP) and is encompassed by a recorded conservation easement, but is bordered by land under private ownership. Accessing the site may require traversing areas near or along the easement boundary and therefore access by the general public is not permitted. Access by authorized personnel of state and federal agencies or their designees/ contractors involved in the development, oversight and stewardship of the restoration site is permitted within the terms and timeframes of their defined roles. Any intended site visitation or activity by any person outside of these previously sanctioned roles and activities requires prior coordination with EEP."



0 500 1000

FEET

Table 1. Project Components and Mitigation Credits

Mitigation Credits										
	Stream	Riparian Wetland		Non-riparian Wetland		Riparian Buffer **		Nitrogen Nutrient Offset		
								Pound Reduction	Buffer Restoration **	
Type	R	R	RE	R	RE	50'	50' - 200'		<= 50'	50' - 200'
Totals	7,787 *	N/A	N/A	N/A	N/A	562,799	696,704 *	3,990	0	31,751

Project Components						
Project Component -or- Reach ID	Stationing/Location	Existing Footage/ Acreage	Approach (PI, PII etc.)	Restoration -or- Restoration Equivalent	Restoration Footage or Acreage	Mitigation Ratio
Reach 1	Washington Ave. to Gordon St.	1,680	PII	R	1,727	Varies*
Reach 2	Gordon St. to Lincoln St.	4,224	PII	R	4,270	Varies*
Reach 3	UT to Adkin Branch.	1,200	PII	R	1,582	Varies*
Riparian Buffers	50'	7.58	-	R	12.92	1 to 1
	50' - 200'			R	13.97	Varies*

Component Summation						
Restoration Level	Stream (linear feet)	Riparian Wetland (acres)		Non-riparian Wetland (acres)	Buffer (square ft.)	Upland (acres)
		Riverine	Non-Riverine			
Restoration	7,579	N/A	N/A	N/A	1,171,272	N/A
Enhancement		N/A	N/A	N/A	N/A	N/A
Enhancement II	N/A					
Enhancement II	N/A					
Creation		N/A	N/A	N/A		
Preservation	N/A	N/A	N/A	N/A		N/A
High Quality Preservation	N/A	N/A	N/A	N/A		N/A

BMP Elements				
Element	Location	Purpose/Function	30 yr. Total Nitrogen Reduction (lbs)	Notes
Stormwater Wetland	UT Adkin	Water Quality / Nutrient Uptake	N/A	-
BMP #4 - Sand Filter	Miller St.	Water Quality / Infiltration	300	-
BMP #5 - Sand Filter	Dover St.	Water Quality / Infiltration	750	-
BMP #6 - Sand Filter	Seacrest St.	Water Quality / Infiltration	1,170	-
BMP #7 - Sand Filter	Myrtle Ave.	Water Quality / Infiltration	600	-
BMP #8 - Sand Filter	Holloway Dr.	Water Quality / Infiltration	180	-
BMP #9 - Sand Filter	Shine St.	Water Quality / Infiltration	990	-

* - Stream & Riparian Buffer Mitigation Credit numbers were adjusted based on proposed DWQ guidelines (DRAFT Regulatory Guidance for the Calculation of Stream and Buffer Mitigation Credit for Buffer Widths Different from Standard Minimum Widths, Version 4.5, July 20, 2010). See Appendix D for further explanation.

** - Riparian Buffer areas may be used for stream & wetland mitigation, stream & riparian buffer mitigation, or nutrient offset credit (*Estimating/Calculating Riparian Buffer Credits, EEP PPPM Section 8.3.1.2)* .

Table 2. Project Activity and Reporting History

Activity or Report	Data Collection Complete	Completion or Delivery
Restoration Plan		March 2007
Final Design – Construction Plans		May 2007
Bid Opening		October 2008
Begin Construction		March 2009
Tropical Storm Ida	*November 2009*	
Article 29 declared on original contractor		January 2010
Surety Contractor Begin Construction		June 2010
Tropical Storm Repairs Bid Opening		September 2010
Begin Tropical Storm Repairs Construction		December 2010
Construction Complete		April 2011
Baseline Monitoring Document	March 2011	July 2011
Year 1 Monitoring		
Year 2 Monitoring		
Year 3 Monitoring		
Year 4 Monitoring		
Year 5 Monitoring		

Table 3. Project Contact Table

Designer	Florence & Hutcheson, Inc. 5121 Kingdom Way, Suite 100 Raleigh, North Carolina 27607 Kevin Williams (919) 851-6066
Original Contractor	Appalachian Environmental Services 1165 W. Main St. Sylva, NC 28779 Mickey B. Henson
Surety Contractor	Environmental Quality Resources, LLC 1405 Benson Court, Suite C Baltimore, MD 21227 John Talley (443) 304-3310
Repair Contractor	Fluvial Solutions P.O. Box 28749 Raleigh, NC 27611 Peter Jelenevsky (919) 821-4300
Planting Contractor	Bruton Natural Systems (Fluvial Solutions Sub-contractor) PO Box 1197 Fremont, NC 27830 Charlie Bruton (919) 242-6555
Seeding Contractor	See Original Contractor, Surety Contractor, & Repair Contractor above.
Nursery Stock Suppliers	1) ArborGen - South Carolina SuperTree Nursery 2) Evergreen Partners of Raleigh 3) NC Division of Forest Resources
Monitoring Performers	
Stream Monitoring	Florence & Hutcheson, Inc. 5121 Kingdom Way, Suite 100 Raleigh, North Carolina 27607 Ryan Smith (919) 851-6066
Vegetation Monitoring	Axiom Environmental, Inc. 218 Snow Avenue Raleigh, North Carolina 27603 Corri Faquin (919) 414-2471

Table 4. Project Baseline Information and Attributes

Project Information				
Project Name		Adkin Branch Stream Restoration Project – Phase I		
County		Lenoir		
Project Area (acres)		36		
Project Coordinates		035º 15' 13" N, 77º 33' 36'' W (@ Lincoln St.)		
Project Watershed Summary Information				
Physiographic Province		Coastal Plain		
River Basin		Neuse		
USGS 8-digit HUC	3020202		USGS 14-digit HUC	3020202060030
NCDWQ Subbasin		03-04-05		
Project Drainage Area		5.46 sq. mi (at Lincoln St.)		
Watershed Land Use	Urban Land	76%	Agricultural Land	13%
	Mixed Forest / Disturbed Forest	7%	Evergreen Forest	4%

Reach Summary Information			
Parameters	**Adkin Branch**		**UT to Adkin**
	Washington Ave. to Gordon St.	**Gordon St. to Lincoln St.**	
Length of reach (linear ft)	1727	4270	1582
Valley Classification	VIII		VIII
Drainage Area (acres)	3220	3495	78
NCDWQ stream ID score	39.5		27
NCDWQ Classification	C		C
Pre-Existing Stream Type	G5	B5c	E5
As-built Stream Type	B5c	B5c	C/E5
Underlying mapped soils	Bibb		Kenansville
Drainage Class	Poorly Drained		Well-drained
Soil Hydric Status	Hydric		Non-Hydric
Slope	0.0016	0.0014	0.0022
FEMA Classification	AE		
Native Vegetation Community	Coastal Plain Levee Forest / Streamside Assemblage		
Percent compostion of exotic invasive vegetation	5%	10%	5%

Wetland Summary Information
N/A

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

MONITORING PLANS

PROJECT REFERENCE NO.	FIGURE NO.
ADKIN BRANCH	2

Florence & Hutcheson
CONSULTING ENGINEERS
5121 Kingdom Way, Suite 100 Raleigh, NC 27607
NC License No: P-0238

25 0 50
SCALE

WASHINGTON AVENUE
GRAVEL WALK
PEDESTRIAN BRIDGE
ADKIN BRANCH
XS-1
XS-2
VEG PLOT 1
VEG PLOT 2
BEGIN REACH 1 PROFILE
36+00
37+00
38+00
39+00
40+00
41+00
-MATCHLINE- SEE FIGURE NO. 3
9'CONC
48"CHL
20'CONC
72"CHL
10'CONC
ISBKD
POOL
CONC
24" CONC
GUARDRAIL
36" CONC
MTL
HWL
HEADWALL
24" RCP
15" CONC
CHARLES B. STEWART ALUMNI CENTER
26' BST
16' BST
SS
E

LEGEND

- CONSERVATION EASEMENT LINE
- LOG CROSS VANE
- LOG VANE
- LOG SILL
- XS- MONITORING CROSS SECTION (XS-)
- VEGETATION PLOT
- CREST GAUGE

MONITORING PLANS ADKIN BRANCH		
SCO#: 050656101	COUNTY: LENOIR	
DESIGNED BY: RVS		
CHECKED BY: RKW	DATE: 5/11	

6/30/2011
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Florence & Hutcheson, Inc.

MONITORING PLANS

PROJECT REFERENCE NO.	FIGURE NO.
ADKIN BRANCH	3

Florence & Hutcheson
CONSULTING ENGINEERS
5121 Kingdom Way, Suite 100 Raleigh, NC 27607
NC License No: P-0238

25 0 50
SCALE

N

ELM STREET

MULBERRY STREET

SYCAMORE STREET

ADKIN BRANCH

PINE STREET

HICKS AVENUE

42+00
43+00
44+00
45+00
46+00
47+00
48+00

15" RCP
18" RCP
15" CONC
W/LT
SS
LT
E

XS-3
XS-4

VEG PLOT 3

SEWER PLUG

EXISTING 15" RCP

EXISTING YARD INLET

STORAGE BUILDINGS

SOIL

BST

W/LT

-MATCHLINE- SEE FIGURE NO. 2

-MATCHLINE- SEE FIGURE NO. 4

LEGEND

- E — CONSERVATION EASEMENT LINE
- ROOTWAD
- LOG VANE
- LOG SILL
- XS– MONITORING CROSS SECTION (XS–)
- VEGETATION PLOT
- CREST GAUGE

MONITORING PLANS ADKIN BRANCH			
SCO#:	050656101	COUNTY:	LENOIR
DESIGNED BY:	RVS		
CHECKED BY:	RKW	DATE:	5/11

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Florence & Hutcheson, PA

MONITORING PLANS

PROJECT REFERENCE NO.	FIGURE NO.
ADKIN BRANCH	4

Florence & Hutcheson
CONSULTING ENGINEERS
5121 Kingdom Way, Suite 100 Raleigh, NC 27607
NC License No: P-0238

25 0 50
SCALE

SYCAMORE ROAD
SYCAMORE RD 30'BST
ISBKD
CONC
8'CONC
FX'CONC
VEG PLOT 5
VEG PLOT 4
49+00
50+00
51+00
52+00
53+00
55+00
ADKIN BRANCH
SEWER PLUG
XS-5
EAST GORDON STREET
HTR
ISFD
12'CONC
48"CHL
15" CONC DI
15" RCP
GUARDRAIL
END REACH 1 PROFILE
CREST GAUGE 1
CULVERT 1 3-9X10 BARRELS
15" PIPE
18" RCP
15" RCP
MATCHLINE– SEE FIGURE NO. 3
MATCHLINE– SEE FIGURE NO. 5
CHESTNUT ST
CHESTNUT STREET
OHE
ISFD

LEGEND

- CONSERVATION EASEMENT LINE
- LOG CROSS VANE
- LOG VANE
- LOG SILL
- XS– MONITORING CROSS SECTION (XS–)
- VEGETATION PLOT
- CREST GAUGE

MONITORING PLANS ADKIN BRANCH			
SCO#:	050656101	COUNTY:	LENOIR
DESIGNED BY:	RVS		
CHECKED BY:	RKW	DATE:	5/11

6/30/2011
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Florence & Hutcheson, Inc.

MONITORING PLANS

PROJECT REFERENCE NO.	FIGURE NO.
ADKIN BRANCH	5

Florence & Hutcheson
CONSULTING ENGINEERS
5121 Kingdom Way, Suite 100 Raleigh, NC 27607
NC License No: P-0238

25 0 50
SCALE

N

-MATCHLINE- SEE FIGURE NO. 4

-MATCHLINE- SEE FIGURE NO. 6

SYCAMORE ROAD

NORTH CYPRESS STREET

CANOPY

11'CONC

ISBKD

10'CONC

48"CONC

27" CONC

18" RCP

20" CONC

8" CONC

56+00

57+00

58+00

59+00

60+00

30"BLK WALL

BEGIN REACH 2 PROFILE

CULVERT 2 3-9X10 BARRELS

VEG PLOT 7

10' OF RIP RAP BURIED

END EXISTING 15" RCP

ADKIN BRANCH

CLAY STREET

VEG PLOT 6

WATERS STREET

2-4" PVC

T-IRON

C-WEIR

BMP #4

ISFD

ISBK

48"CHL

CANOPY

EAST CASWELL STREET

24" CONC

12'CONC

SOIL

LT

BST

END/EXISTING 15" RCP

W/LT

LEGEND

- E — CONSERVATION EASEMENT LINE
- LOG CROSS VANE
- LOG VANE
- LOG SILL
- XS– MONITORING CROSS SECTION (XS–)
- VEGETATION PLOT
- CREST GAUGE

MONITORING PLANS ADKIN BRANCH			
SCO #:	050656101	COUNTY:	LENOIR
DESIGNED BY:	RVS		
CHECKED BY:	RKW	DATE:	5/11

6/30/2011
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Florence & Hutcheson, PC

MONITORING PLANS

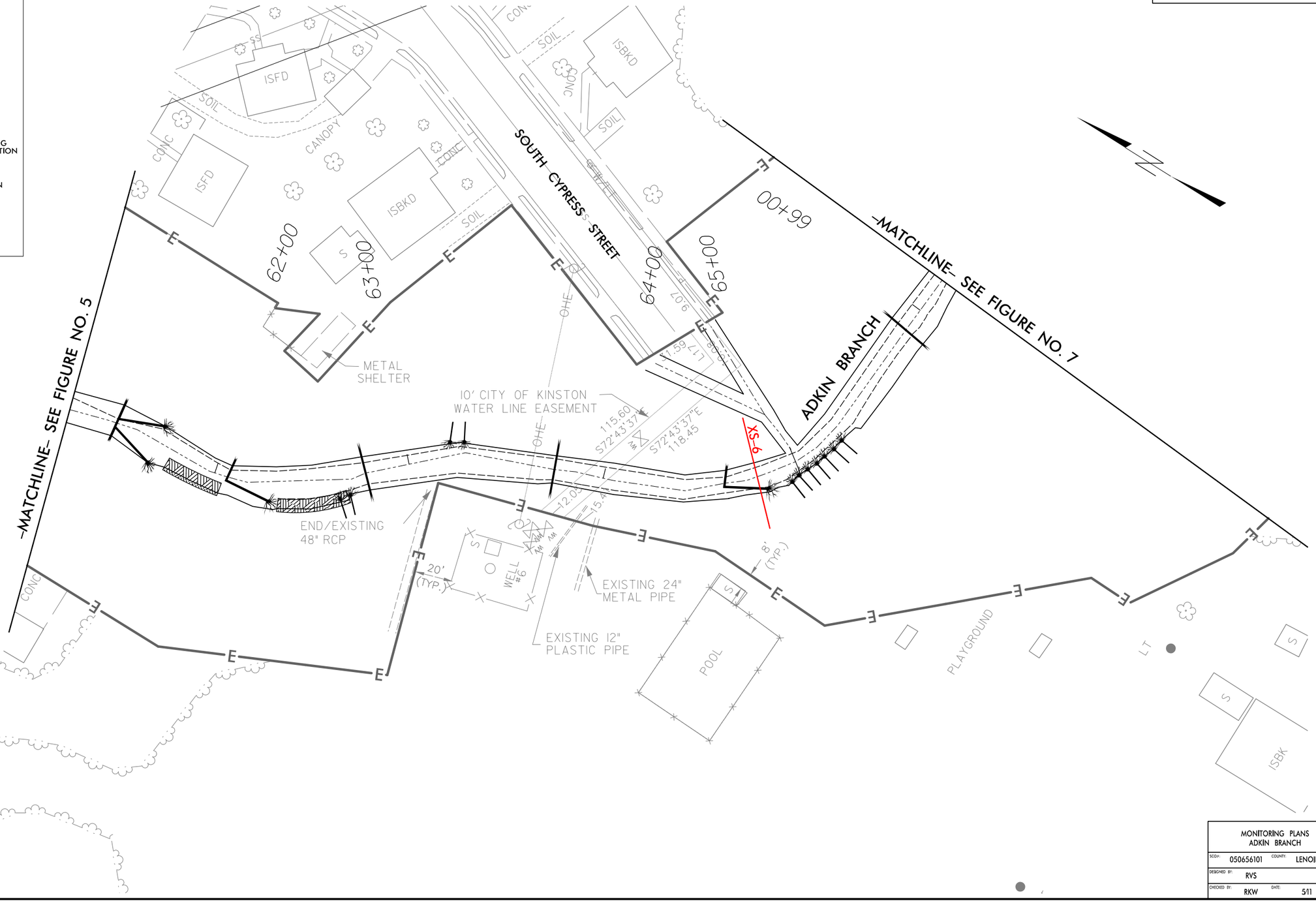
PROJECT REFERENCE NO.	FIGURE NO.
ADKIN BRANCH	6

Florence & Hutcheson
CONSULTING ENGINEERS
5121 Kingdom Way, Suite 100 Raleigh, NC 27607
NC License No: P-0238

25 0 50
SCALE

LEGEND

- CONSERVATION EASEMENT LINE (E)
- ROOTWAD
- LOG CROSS VANE
- LOG VANE
- LOG SILL
- SOIL LIFT
- MONITORING CROSS SECTION (XS–)
- VEGETATION PLOT
- CREST GAUGE



MONITORING PLANS ADKIN BRANCH		
SCO#: 050656101	COUNTY: LENOIR	
DESIGNED BY: RVS		
CHECKED BY: RKW	DATE: 5/11	

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Florence & Hutcheson, PA

MONITORING PLANS

PROJECT REFERENCE NO.	FIGURE NO.
ADKIN BRANCH	7

Florence & Hutcheson
CONSULTING ENGINEERS
5121 Kingdom Way, Suite 100 Raleigh, NC 27607
NC License No: P-0238

25 0 50
SCALE

SOUTH ROCHELLE BLVD.
SOUTH MELVIN STREET
ADKIN BRANCH
67+00
68+00
69+00
70+00
71+00
72+00
72"CHL
48"CONC
CONC
ISBKD
ISFD
SHED
HTR
EXISTING PAVEMENT
EXISTING FENCE
VEG PLOT 8
VEG PLOT 9
VEG PLOT 10
XS-7
-MATCHLINE- SEE FIGURE NO. 6
-MATCHLINE- SEE FIGURE NO. 8

LEGEND

- CONSERVATION EASEMENT LINE
- ROOTWAD
- LOG VANE
- LOG SILL
- SOIL LIFT
- XS-- MONITORING CROSS SECTION (XS--)
- VEGETATION PLOT
- CREST GAUGE

MONITORING PLANS ADKIN BRANCH			
SCO #:	050656101	COUNTY:	LENOIR
DESIGNED BY:	RVS		
CHECKED BY:	RKW	DATE:	5/11

6/30/2011
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Florence & Hutcheson, Inc.

MONITORING PLANS

PROJECT REFERENCE NO.	FIGURE NO.
ADKIN BRANCH	8

Florence & Hutcheson
CONSULTING ENGINEERS
5121 Kingdom Way, Suite 100 Raleigh, NC 27607
NC License No: P-0238

25 0 50
SCALE

LEGEND

- E — CONSERVATION EASEMENT LINE
- ROOTWAD
- LOG VANE
- LOG SILL
- SOIL LIFT
- XS– MONITORING CROSS SECTION (XS–)
- VEGETATION PLOT
- CREST GUAGE

N

–MATCHLINE– SEE FIGURE NO. 7

73+00
74+00
75+00
76+00
77+00
78+00
79+00

XS-8
XS-9

VEG PLOT 11
VEG PLOT 12
VEG PLOT 13

CREST GAUGE 2

BMP #5
C-WEIR
END/EXISTING 24" RCP
24" PVC

DOVER STREET
DOVER STREET

ADKIN BRANCH

EXISTING FENCE
X OHE X
15" CONC
MH
36" GUM
30" OAK
48" OAK
36" PIN
72" OAK
40" GUM
ISFD
ISBK APT
ISBK APT
ISBK APT
SOIL
SOIL
SOIL
CONC
R
R

–MATCHLINE– SEE FIGURE NO. 9

MONITORING PLANS ADKIN BRANCH		
SCO#: 050656101	COUNTY: LENOIR	
DESIGNED BY: RVS		
CHECKED BY: RKW	DATE: 5/11	

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MONITORING PLANS

PROJECT REFERENCE NO.	FIGURE NO.
ADKIN BRANCH	9

Florence & Hutcheson
CONSULTING ENGINEERS
5121 Kingdom Way, Suite 100 Raleigh, NC 27607
NC License No: P-0238

25 0 50
SCALE

SOUTH SEACREST STREET

SOUTH MYRTLE AVENUE

ASPHALT HUMP

ASPHALT HUMP

END/EXISTING 24" RCP

BMP #6

18" RCP

T-IRON

C-WEIR

BMP #7

18" RCP

C-WEIR

T-IRON

JB

TENNIS COURTS

EXISTING FENCE

OHE

ISBLKD

ISBKD

2SBKD

CONC

8'CONC

10'CONC

18"BK WALL

30"C&G

48"CONC

18"CONC

8"BST

18"CHL

SOIL

80+00

81+00

82+00

82+28

83+00

84+00

85+00

XS-10

XS-11

ADKIN BRANCH

VEG PLOT 14

2-4" PVC

BRIDGE

48"WW

ASPHALT HUMP

FORREST STREET

36"CHL

72" CHL

SOUTH MYRTLE AVENUE

-MATCHLINE- SEE FIGURE NO. 8

-MATCHLINE- SEE FIGURE NO. 10

LEGEND

- E — CONSERVATION EASEMENT LINE
- ROOTWAD
- LOG CROSS VANE
- LOG SILL
- SOIL LIFT
- XS- — MONITORING CROSS SECTION (XS-)
- VEGETATION PLOT
- CREST GAUGE

MONITORING PLANS ADKIN BRANCH			
SCO#: 050656101	COUNTY: LENOIR		
DESIGNED BY: RVS			
CHECKED BY: RKW	DATE: 5/11		

6/30/2011
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MONITORING PLANS

PROJECT REFERENCE NO.	FIGURE NO.
ADKIN BRANCH	10

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5121 Kingdom Way, Suite 100 Raleigh, NC 27607
NC License No: P-0238

25 0 50
SCALE

-MATCHLINE- SEE FIGURE NO. 12

-MATCHLINE- SEE FIGURE NO. 9

-MATCHLINE- SEE FIGURE NO. 11

HOLLOWAY DRIVE

DESMOND STREET

ADKIN BRANCH

UT ADKIN BRANCH

SCORE BOARD

CONC

24+00

25+00

87+00

88+00

89+00

90+00

END REACH 3 PROFILE

XS-12

BMP #8

C-WEIR

T-IRON

2-4" PVC

VEG PLOT 15

VEG PLOT 16

VEG PLOT 17

LEGEND

- CONSERVATION EASEMENT LINE
- ROOTWAD
- LOG CROSS VANE
- LOG VANE
- LOG SILL
- SOIL LIFT
- FLOODPLAIN INTERCEPTOR (FPI)
- XS- MONITORING CROSS SECTION (XS-)
- VEGETATION PLOT
- CREST GAUGE

MONITORING PLANS ADKIN BRANCH			
SCO#: 050656101	COUNTY: LENOIR		
DESIGNED BY: RVS			
CHECKED BY: RKW	DATE: 5/11		

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MONITORING PLANS

PROJECT REFERENCE NO.	FIGURE NO.
ADKIN BRANCH	11

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CONSULTING ENGINEERS
5121 Kingdom Way, Suite 100 Raleigh, NC 27607
NC License No: P-0238

25 0 50
SCALE

LEGEND

- CONSERVATION EASEMENT LINE
- LOG CROSS VANE
- DOUBLE STEP LOG CROSS VANE
- DOUBLE STEP LOG VANE
- LOG SILL
- SOIL LIFT
- MONITORING CROSS SECTION (XS–)
- VEGETATION PLOT
- CREST GAUGE

–MATCHLINE– SEE FIGURE NO. 10

91+00
92+00
93+00
94+00
95+00
96+00

END REACH 2 PROFILE

VEG PLOT 19

VEG PLOT 18

HOLLOWAY DRIVE

REED STREET

ADKIN BRANCH

ISBKD ABAND

ISBKD ABAND

42"CONC

10' CONC

CONC

2-4" PVC

C-WEIR

BMP #9

IRONS

18" RCP

EAST SHINE STREET

ASPHALT HUMP

42"CONC

36"CHL

36"CHL

REED STREET

LINCOLN STREET

SOIL

SOIL

SOIL

15" CONC

15" CONC

8'BST

MONITORING PLANS
ADKIN BRANCH

SCO#: 050656101 COUNTY: LENOIR
DESIGNED BY: RVS
CHECKED BY: RKW DATE: 5/11

6/30/2011
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Florence & Hutcheson, inc.

MONITORING PLANS

PROJECT REFERENCE NO.	FIGURE NO.
ADKIN BRANCH	12

Florence & Hutcheson
CONSULTING ENGINEERS
5121 Kingdom Way, Suite 100 Raleigh, NC 27607
NC License No: P-0238

25 0 50
SCALE

BASEBALL FIELD

LT

LIGHT POLE (FIELD)

LIGHT POLE (FIELD)

60" OAK

23+00 22+00 21+00 20+00 19+00 18+00 17+00

E

–MATCHLINE– SEE FIGURE NO. 10

–MATCHLINE– SEE FIGURE NO. 13

XS–17

XS–16

XS–15

UT ADKIN BRANCH

CREST GAUGE 3

CREST GAUGE 4

VEG PLOT 22

VEG PLOT 21

HOLLOWAY DRIVE

10"CONC

42"CONC

LEGEND

- E — CONSERVATION EASEMENT LINE
- LOG SILL
- XS– — MONITORING CROSS SECTION (XS–)
- VEGETATION PLOT
- CREST GAUGE

MONITORING PLANS ADKIN BRANCH		
SCO.: 050656101	COUNTY:	LENOIR
DESIGNED BY: RVS		
CHECKED BY: RKW	DATE:	5/11

6/30/2011
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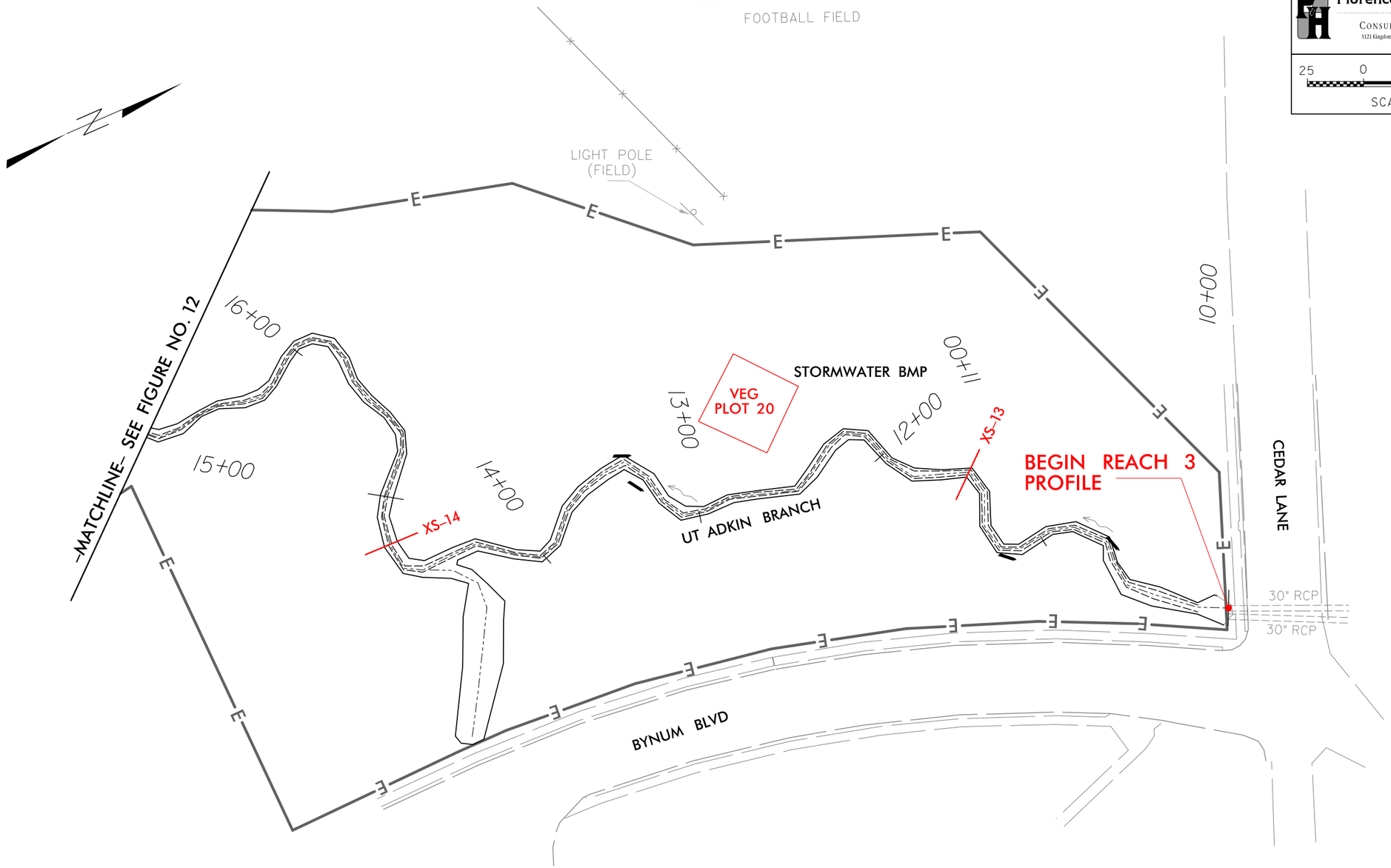
Florence & Hutcheson, Inc.

MONITORING PLANS

PROJECT REFERENCE NO.	FIGURE NO.
ADKIN BRANCH	13

Florence & Hutcheson
CONSULTING ENGINEERS
5121 Kingdom Way, Suite 100 Raleigh, NC 27607
NC License No: P-0238

25 0 50
SCALE



LEGEND

- CONSERVATION EASEMENT LINE
- LOG SILL
- XS- MONITORING CROSS SECTION (XS-)
- VEGETATION PLOT
- CREST GAUGE

MONITORING PLANS
ADKIN BRANCH

SCO#:	050656101	COUNTY:	LENOIR
DESIGNED BY:	RVS		
CHECKED BY:	RKW	DATE:	5/11

6/30/2011
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Florence & Hutcheson, PC

Appendix B: Morphological Summary Data, Plots, & Photos

Table 5a. Baseline Stream Data Summary – Reach 1

Parameter	Existing Condition (Wash Ave. to Gordon)	Refernce Reach (Johnson Mill)	Proposed (Wash Ave. to Gordon)	Reach 1 Baseline (Washington Ave. to Gordon St.)					
Dimension and Substrate - Riffle	Mean	Mean	Mean	Min	Mean	Med	Max	SD	n
Bankfull Width (ft)	20.90	21.20	22.00	14.84	15.95	14.99	18.03	1.80	3
Floodprone Width (ft)	29.40	34.90	40.00	28.45	42.14	41.72	56.25	13.90	3
Bankfull Mean Depth (ft)	1.95	2.25	1.38	0.92	1.35	1.42	1.70	0.40	3
Bankfull Max Depth (ft)	2.26	2.42	1.65	1.50	2.11	2.07	2.77	0.64	3
Bankfull Cross Sectional Area (ft^2)	40.90	47.60	30.30	13.78	21.57	25.23	25.69	6.75	3
Width/Depth Ratio	10.70	9.40	16.00	8.73	12.57	12.70	16.29	3.78	3
Entrenchment Ratio	1.40	1.60	1.80	1.90	2.67	2.31	3.79	0.99	3
Bank Height Ratio	-	-	-	1.00	1.00	1.00	1.00	0.00	3
d50 (mm)	-	-							
Profile									
Riffle Length (ft)	-	-	-	13.69	88.32	82.84	173.90	51.83	14
Riffle Slope (ft/ft)	0.0012	0.00001	0.0026	0.0002	0.0016	0.0013	0.0062	0.0016	14
Pool Length (ft)	-	-	-	11.36	24.52	24.15	46.88	8.60	19
Pool Max depth (ft)	3.18	3.56	3.44	2.11	2.99	2.86	4.33	0.72	19
Pool Spacing (ft)	183 - 231	91.1 - 130.0	88 - 132	22.73	95.81	94.46	180.40	41.64	18
Pool Cross Sectional Area (ft^2)	35.50	47.97	39.33	25.48	36.62	36.62	47.75	15.75	2
Pattern									
Channel Beltwidth (ft)	30 - 50	50 - 1500	44 - 176						
Radius of Curvature (ft)	150 - 320	43 - 235	66 - 110						
Rc: Bankfull Width (ft/ft)	7.2 - 15.3	2.0 - 11.1	3.0 - 5.0						
Meander Wavelength (ft)	175 - 400	250 - 400	264 - 418						
Meander Width Ratio	1.43 - 2.39	2.4 - 70.9	2.0 - 8.0						
Substrate, bed and transport parameters									
Ri% / P%	-	-	-	73% / 27%					
SC% / Sa% / G% / C% / B% / Be%	-	-	-						
d16 / d35 / d50 / d84 / d95/ di^{p} / di^{sp} (mm)	-	-	-						
Reach Shear Stress (competency) lb/ft^2	N/A		N/A	N/A					
Max part size (mm) mobilized at bankfull	-		-	-					
Unit Stream Power (transport capacity) lbs/ft.s	0.075	0.197	0.220	0.325					
Additional Reach Parameters									
Drainage Area (SM)	4.60	13.50	5.03						
Impervious cover estimate (%)	-	-	-						
Rosgen Classification	G5	B5c	B5c	B5c					
Bankfull Velocity (fps)	1.20	1.70	1.70	1.95					
Bankfull Discharge (cfs)	50.00	80.90	50.00						
Valley length (ft)	-	-	1685	1685					
Channel Thalweg length (ft)	-	-	1750	1727					
Sinuosity (ft)	1.04	1.10	1.04	1.03					
Water Surface Slope (Channel) (ft/ft)	0.0005	0.0010	0.0016	0.00166					
BF slope (ft/ft)	-	-	-	0.00240					
Bankfull Floodplain Area (acres)	-	-	-						
Proportion over wide (%)	-	-							
Entrenchment Class (ER Range)	-	-							
Incision Class (BHR Range)	-	-							
BEHI VL% / L% / M% / H% / VH% / E%	-	-							
Channel Stability or Habitat Metric	-	-							
Biological or Other	-	-							

It should be noted that As-built conditions were completed at the end of construction. Many storm events had occurred between beginning of construction and end of construction that naturally modified constructed parameters.

Table 5b. Baseline Stream Data Summary – Reach 2

Parameter	Existing Condition (Gordon to Lincoln))	Refernce Reach (Johnson Mill)	Proposed (Gordon to Lincoln)	Reach 2 Baseline (Gordon St. to Lincoln St.)					
Dimension and Substrate - Riffle	Mean	Mean	Mean	Min	Mean	Med	Max	SD	n
Bankfull Width (ft)	23.60	21.20	22.00	16.23	16.98	16.81	17.91	0.85	3
Floodprone Width (ft)	45.00	34.90	40.00	48.33	52.40	51.29	57.58	4.72	3
Bankfull Mean Depth (ft)	1.83	2.25	1.47	1.46	1.66	1.64	1.88	0.21	3
Bankfull Max Depth (ft)	2.98	2.42	1.76	2.21	2.38	2.26	2.68	0.26	3
Bankfull Cross Sectional Area (ft^2)	43.30	47.60	32.30	23.68	28.32	27.58	33.70	5.05	3
Width/Depth Ratio	12.90	9.40	15.00	9.53	10.30	10.25	11.12	0.80	3
Entrenchment Ratio	1.90	1.60	1.80	2.99	3.09	3.05	3.22	0.12	3
Bank Height Ratio	-	-	-	1.00	1.00	1.00	1.00	0.00	3
d50 (mm)	-	-							
Profile									
Riffle Length (ft)	-	-	-	27.43	62.71	62.38	93.27	19.56	10
Riffle Slope (ft/ft)	0.0024	0.00001	0.0031	0.0002	0.0013	0.0010	0.0039	0.0013	10
Pool Length (ft)	-	-	-	14.20	56.38	56.82	113.64	27.38	39
Pool Max depth (ft)	4.14	3.56	3.67	2.74	4.23	4.22	6.48	0.76	39
Pool Spacing (ft)	59.62 - 117.86	91.1 - 130.0	88.0 - 132.0	17.05	73.45	69.60	164.78	32.96	38
Pool Cross Sectional Area (ft^2)	58.41	47.97	45.17	31.92	48.19	48.21	64.42	13.63	4
Pattern									
Channel Beltwidth (ft)	75 -120	50 - 1500	44.0 - 176.0						
Radius of Curvature (ft)	40 - 146	43 - 235	66.0 - 110.0						
Rc: Bankfull Width (ft/ft)	1.7 - 6.2	2.0 - 11.1	3.0 - 5.0						
Meander Wavelength (ft)	224 - 260	250 - 400	264.0 - 418.0						
Meander Width Ratio	3.18 - 5.08	2.4 - 70.9	2.0 - 8.0						
Substrate, bed and transport parameters									
Ri% / P%	-	-	-	29% / 71% *					
SC% / Sa% / G% / C% / B% / Be%	-	-	-						
d16 / d35 / d50 / d84 / d95/ di^p / di^{sp} (mm)	-	-	-						
Reach Shear Stress (competency) lb/ft^2	N/A		N/A	N/A					
Max part size (mm) mobilized at bankfull	-		-	-					
Unit Stream Power (transport capacity) lbs/ft.s	0.106	0.197	0.230	0.321					
Additional Reach Parameters									
Drainage Area (SM)	5.30	13.50	5.50						
Impervious cover estimate (%)	-	-	-						
Rosgen Classification	B5	B5c	B5c	B5c					
Bankfull Velocity (fps)	1.30	1.70	1.80	1.99					
Bankfull Discharge (cfs)	55.00	80.90	55.00						
Valley length (ft)	-	-	4106	4106					
Channel Thalweg length (ft)	-	-	4246	4270					
Sinuosity (ft)	1.12	1.10	1.03	1.04					
Water Surface Slope (Channel) (ft/ft)	0.0007	0.0010	0.0014	0.0016					
BF slope (ft/ft)	-	-	-	0.0018					
Bankfull Floodplain Area (acres)	-	-	-						
Proportion over wide (%)	-	-							
Entrenchment Class (ER Range)	-	-							
Incision Class (BHR Range)	-	-							
BEHI VL% / L% / M% / H% / VH% / E%	-	-							
Channel Stability or Habitat Metric	-	-							
Biological or Other	-	-							

It should be noted that As-built conditions were completed at the end of construction. Many storm events had occurred between beginning of construction and end of construction that naturally modified constructed parameters.

* Reach 2 is a predominately pool system due to need to drop grade at the lower end of the project.

Table 5c. Baseline Stream Data Summary – Reach 3

Parameter	Existing Condition (UT to Adkin Branch)	Refernce Reach (UT to Wildcat Branch)	Proposed (UT to Adkin Branch)	Reach 3 Baseline (UT to Adkin Branch)					
Dimension and Substrate - Riffle	Mean	Mean	Mean	Min	Mean	Med	Max	SD	n
Bankfull Width (ft)	3.60	7.70	6.00	6.06	7.27	7.69	8.06	1.06	3
Floodprone Width (ft)	8.30	130.00	15.00	23.07	27.62	25.11	34.69	6.20	3
Bankfull Mean Depth (ft)	0.47	1.03	0.55	0.35	0.42	0.40	0.50	0.08	3
Bankfull Max Depth (ft)	3.40	1.56	0.85	0.72	0.81	0.82	0.90	0.09	3
Bankfull Cross Sectional Area (ft^2)	1.70	7.90	3.30	2.43	3.04	2.68	4.00	0.84	3
Width/Depth Ratio	7.60	7.50	11.00	15.15	17.75	16.12	21.97	3.69	3
Entrenchment Ratio	2.30	16.90	2.50	2.86	3.95	3.26	5.72	1.55	3
Bank Height Ratio	-	-	-	1.00	1.00	1.00	1.00	0.00	3
d50 (mm)	-	-							
Profile									
Riffle Length (ft)	-	-	-	9.59	34.33	26.34	165.84	30.38	28
Riffle Slope (ft/ft)	0.0002	0.0021	0.0032	0.0012	0.0051	0.0044	0.0121	0.0031	28
Pool Length (ft)	-	-	-	4.26	21.38	23.26	52.81	12.04	32
Pool Max depth (ft)	1.45	1.90	1.36	0.64	1.59	1.32	2.95	0.70	32
Pool Spacing (ft)	21.63	14.0 - 16.6	12.0 - 36.0	13.49	42.26	37.22	93.07	20.82	30
Pool Cross Sectional Area (ft^2)	4.40	10.80	4.91	1.81	3.58	3.58	5.34	2.50	2
Pattern									
Channel Beltwidth (ft)	50.00	13.8 - 19.4	12.0 - 36.0						
Radius of Curvature (ft)	93 - 105	10.9 - 15.3	12.0 - 18.0						
Rc: Bankfull Width (ft/ft)	26.0 - 29.3	1.4 - 2.0	2.0 - 3.0						
Meander Wavelength (ft)	212 -517	22.5 - 29.0	18.0 - 48.0						
Meander Width Ratio	13.97	1.8 - 2.5	2.0 - 6.0						
Substrate, bed and transport parameters									
Ri% / P%	-	-	-	58% / 42%					
SC% / Sa% / G% / C% / B% / Be%	-	-	-						
d16 / d35 / d50 / d84 / d95/ di^p / di^{sp} (mm)	-	-	-						
Reach Shear Stress (competency) lb/ft^2	N/A		N/A	N/A					
Max part size (mm) mobilized at bankfull	-		-	-					
Unit Stream Power (transport capacity) lbs/ft.s	0.007	0.140	0.080	0.083					
Additional Reach Parameters									
Drainage Area (SM)	0.12	0.44	0.12						
Impervious cover estimate (%)	-	-	-						
Rosgen Classification	E5	E5	E5	E5					
Bankfull Velocity (fps)	2.10	1.20	1.10	1.44					
Bankfull Discharge (cfs)	3.50	9.20	3.50						
Valley length (ft)	1200	-	1200	1200					
Channel Thalweg length (ft)	1200	-	1615	1582					
Sinuosity (ft)	1.00	1.15	1.35	1.32					
Water Surface Slope (Channel) (ft/ft)	0.0001	0.0024	0.0022	0.0028					
BF slope (ft/ft)	-	-	-	0.0030					
Bankfull Floodplain Area (acres)	-	-	-						
Proportion over wide (%)	-	-							
Entrenchment Class (ER Range)	-	-							
Incision Class (BHR Range)	-	-							
BEHI VL% / L% / M% / H% / VH% / E%	-	-							
Channel Stability or Habitat Metric	-	-							
Biological or Other	-	-							

It should be noted that As-built conditions were completed at the end of construction. Many storm events had occurred between beginning of construction and end of construction that naturally modified constructed parameters.

Table 6. Morphology and Hydraulic Monitoring Summary (Dimensional Parameters – Cross Section)

	Cross Section 1 (Riffle)							Cross Section 2 (Pool)							Cross Section 3 (Riffle)							Cross Section 4 (Pool)							Cross Section 5 (Riffle)						
Dimension and substrate[1]	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Bankfull Width (ft)	14.84							24.28							18.03							17.42							14.99						
Floodprone Width (ft)	56.25							72.2							41.72							39.81							28.45						
Bankfull Mean Depth (ft)	1.7							1.97							1.42							1.46							0.92						
Bankfull Max Depth (ft)	2.77							3.33							2.07							2.05							1.5						
Bankfull Cross Sectional Area (ft^2)	25.23							47.75							25.69							25.48							13.78						
Bankfull Width/Depth Ratio	8.73							12.32							12.7							11.93							16.29						
Bankfull Entrenchment Ratio	3.79							2.97							2.31							2.29							1.9						
Bankfull Bank Height Ratio	1							1							1							1							1						

	Cross Section 6 (Pool)							Cross Section 7 (Riffle)							Cross Section 8 (Pool)							Cross Section 9 (Riffle)							Cross Section 10 (Riffle)						
Dimension and substrate[1]	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Bankfull Width (ft)	15.1							17.91							16.57							16.81							16.23						
Floodprone Width (ft)	57.39							57.58							50.57							51.29							48.33						
Bankfull Mean Depth (ft)	2.94							1.88							1.93							1.64							1.46						
Bankfull Max Depth (ft)	4.39							2.68							3.51							2.21							2.26						
Bankfull Cross Sectional Area (ft^2)	44.41							33.7							31.92							27.58							23.68						
Bankfull Width/Depth Ratio	5.14							9.53							8.59							10.25							11.12						
Bankfull Entrenchment Ratio	3.8							3.22							3.05							3.05							2.99						
Bankfull Bank Height Ratio	1							1							1							1							1						

	Cross Section 11 (Pool)							Cross Section 12 (Pool)							Cross Section 13 (Pool)							Cross Section 14 (Riffle)							Cross Section 15 (Riffle)						
Dimension and substrate[1]	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Bankfull Width (ft)	16.31							23.66							5.89							7.69							6.06						
Floodprone Width (ft)	72.56							82.52							24.44							25.11							34.69						
Bankfull Mean Depth (ft)	3.19							2.72							0.31							0.35							0.4						
Bankfull Max Depth (ft)	4.71							4.68							0.71							0.72							0.9						
Bankfull Cross Sectional Area (ft^2)	52.00							64.42							1.81							2.68							2.43						
Bankfull Width/Depth Ratio	5.11							8.7							19							21.97							15.15						
Bankfull Entrenchment Ratio	4.45							3.49							4.15							3.26							5.72						
Bankfull Bank Height Ratio	1							1							1							1							1						

	Cross Section 16 (Pool)							Cross Section 17 (Riffle)						
Dimension and substrate[1]	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Bankfull Width (ft)	11.59							8.06						
Floodprone Width (ft)	30.42							23.07						
Bankfull Mean Depth (ft)	0.46							0.5						
Bankfull Max Depth (ft)	1.11							0.82						
Bankfull Cross Sectional Area (ft^2)	5.34							4						
Bankfull Width/Depth Ratio	25.2							16.12						
Bankfull Entrenchment Ratio	2.62							2.86						
Bankfull Bank Height Ratio	1							1						

NOTE:
Reach 1 - Washington Ave. to Gordon St. - Cross-Sections 1 through 5
Reach 2 - Gordon St. to Lincoln St. - Cross-Sections 6 - 12
Reach 3 - UT to Adkin Branch - Cross-Sections 13-17

1 = Based on fixed baseline bankfull elevation. Widths and depths for each resurvey will be based on the baseline bankfull datum regardless of dimensional/depositional development.

Figure 14. Reach 1 (Washington Ave. to Gordon St.) - Longitudinal Profile

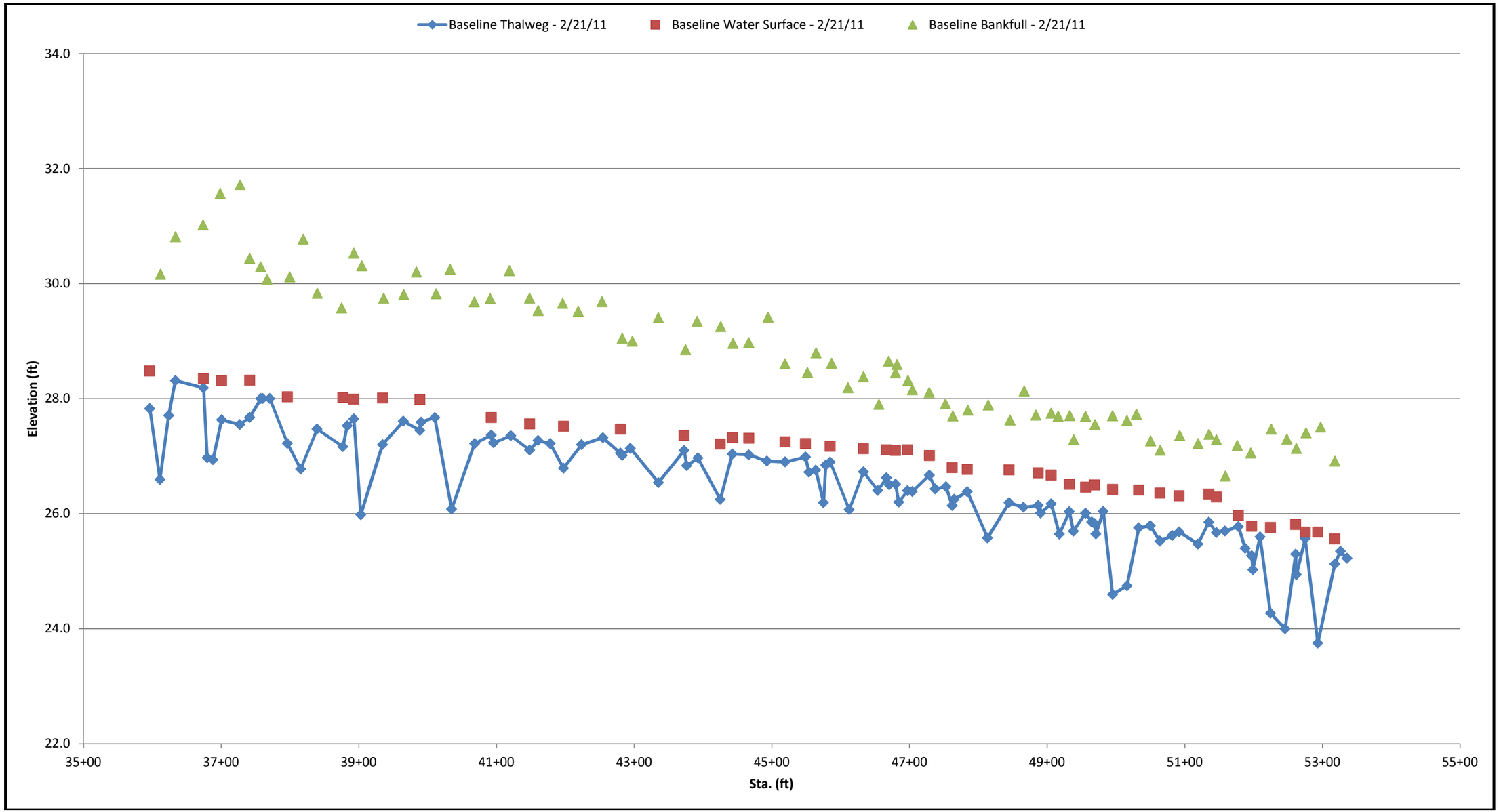


Figure 15. Reach 2 (Gordon St. to Lincoln St.) - Longitudinal Profile

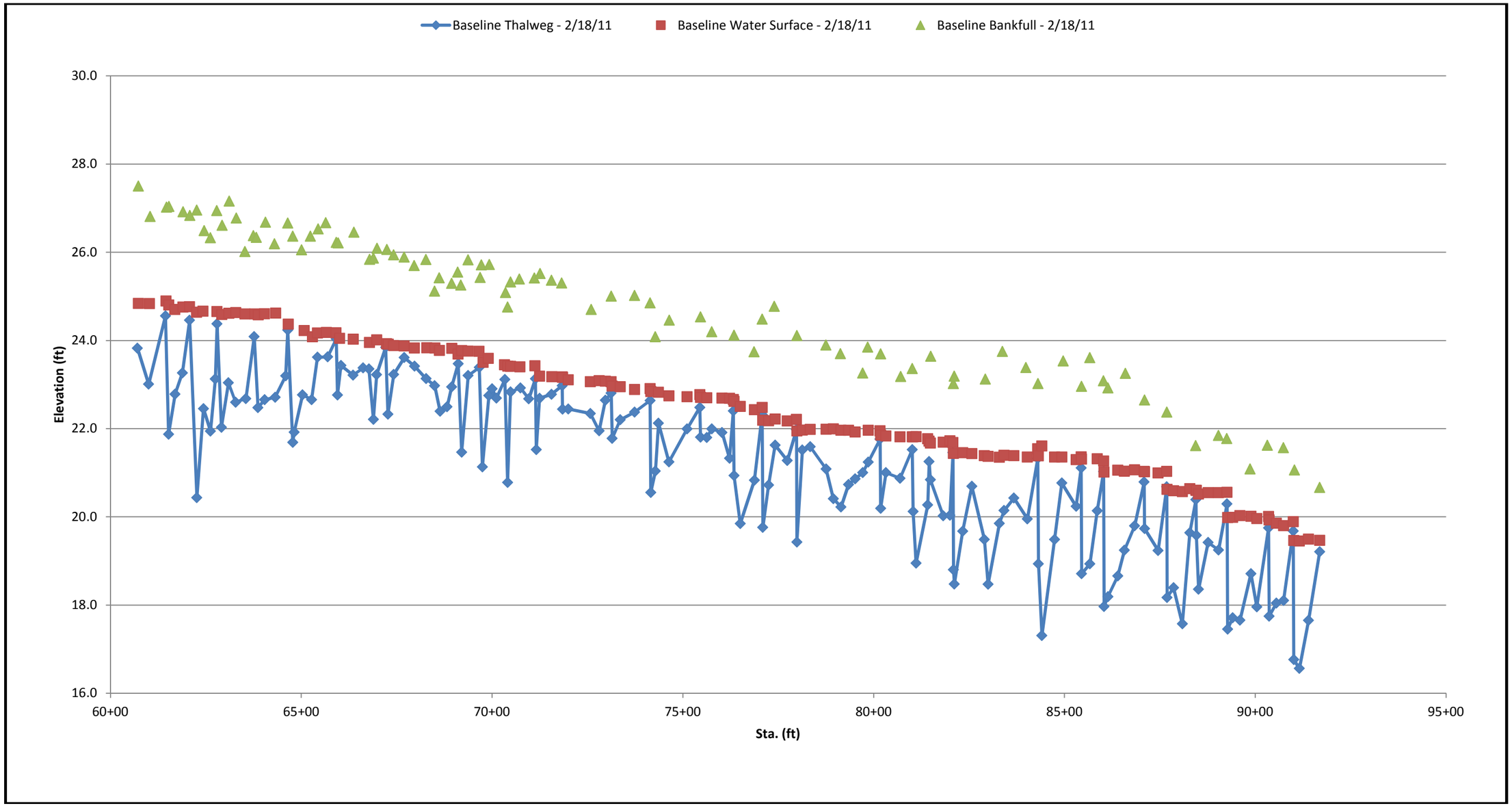
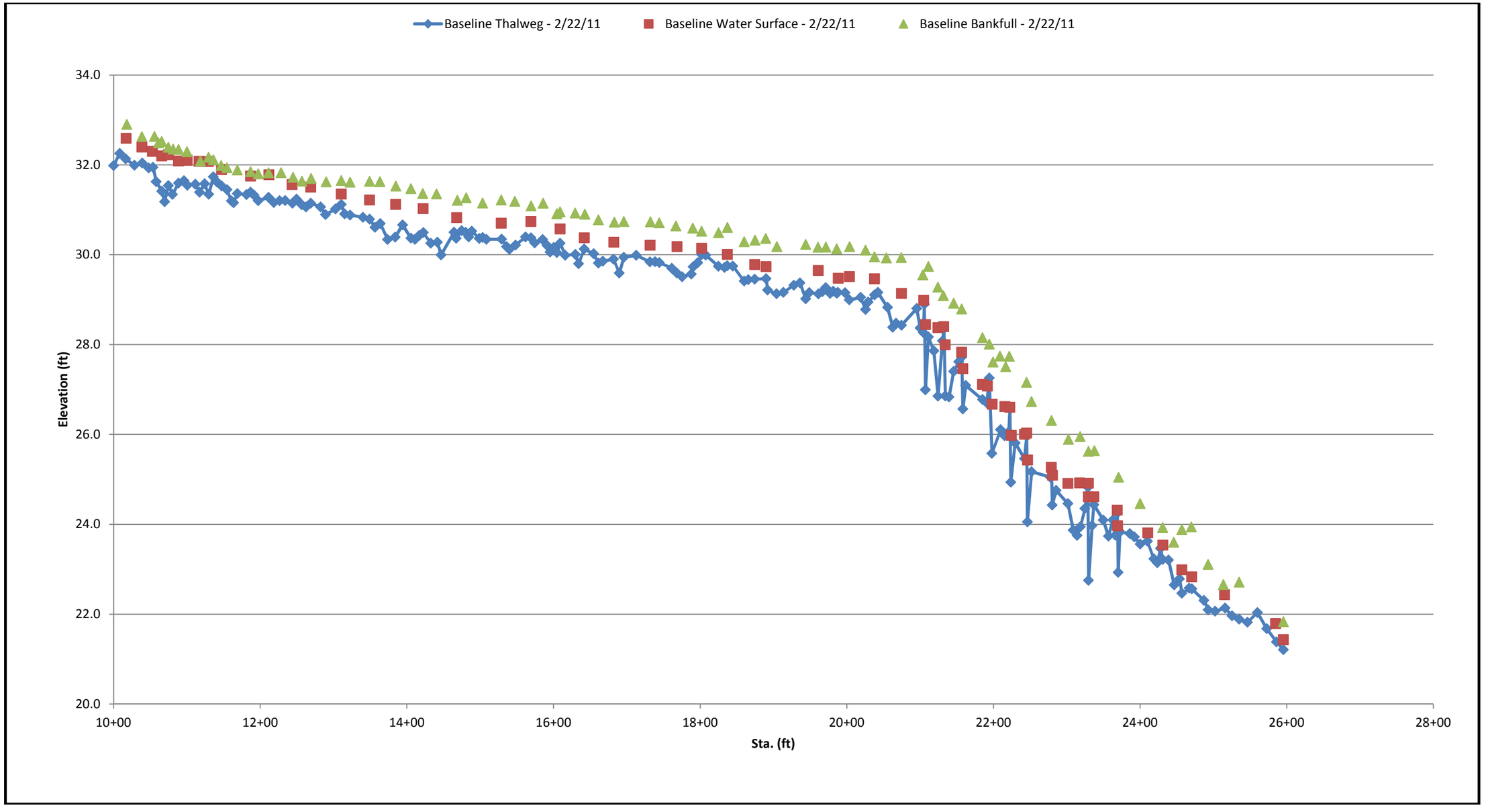
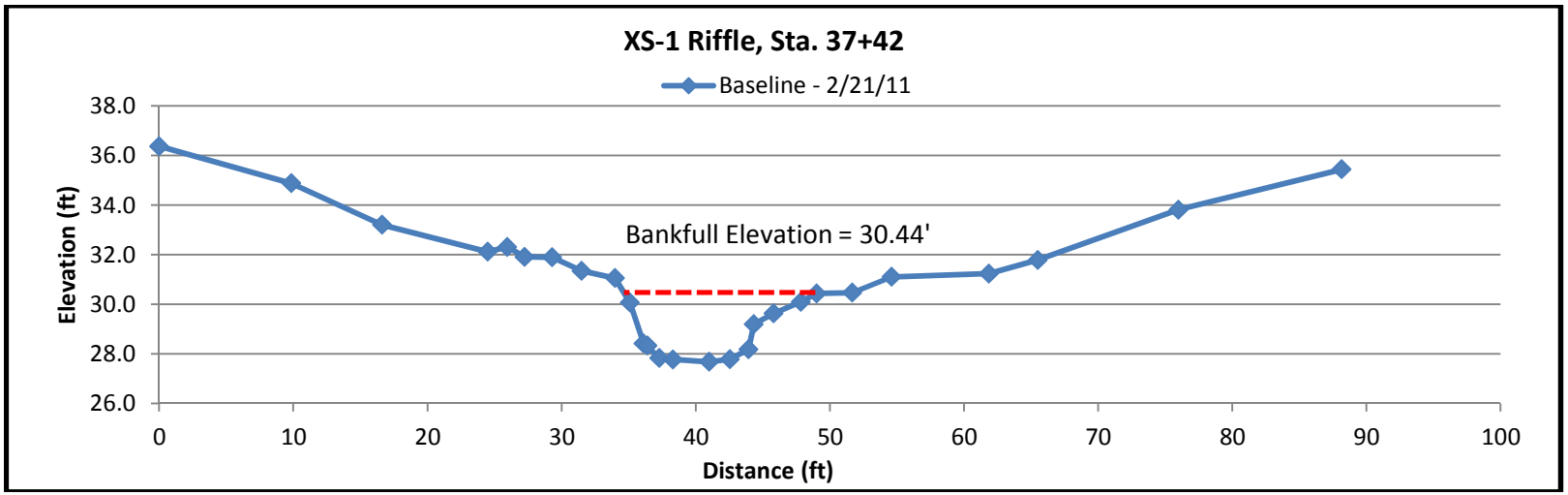


Figure 16. Reach 3 (UT to Adkin Branch) - Longitudinal Profile

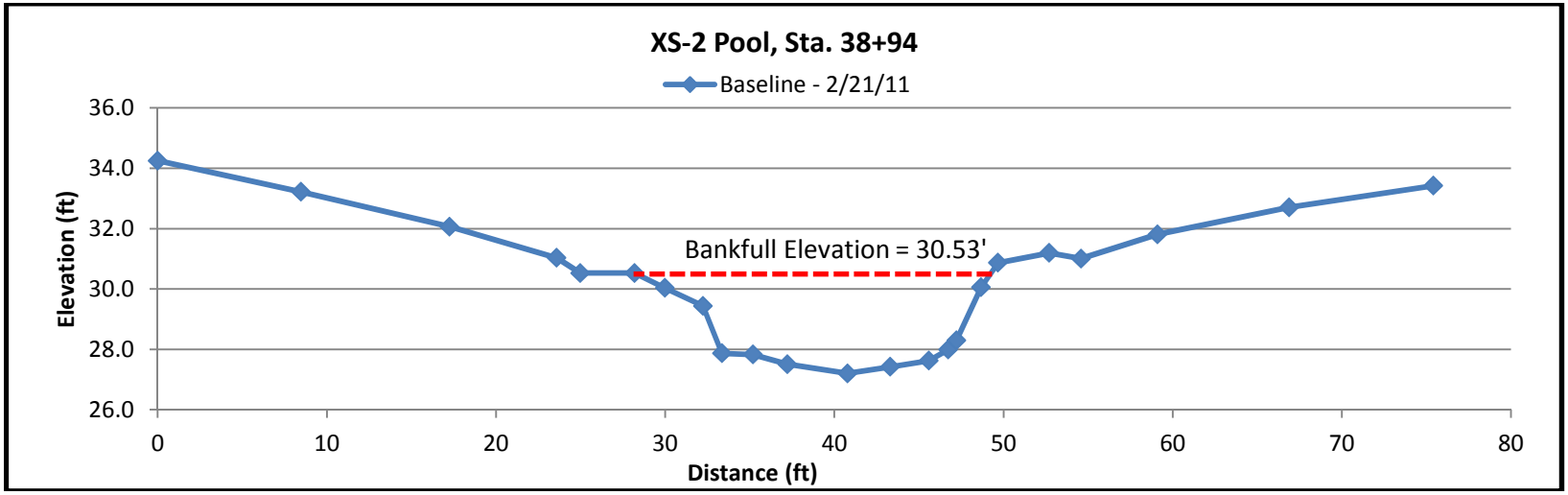


Cross Section Plots & Photos

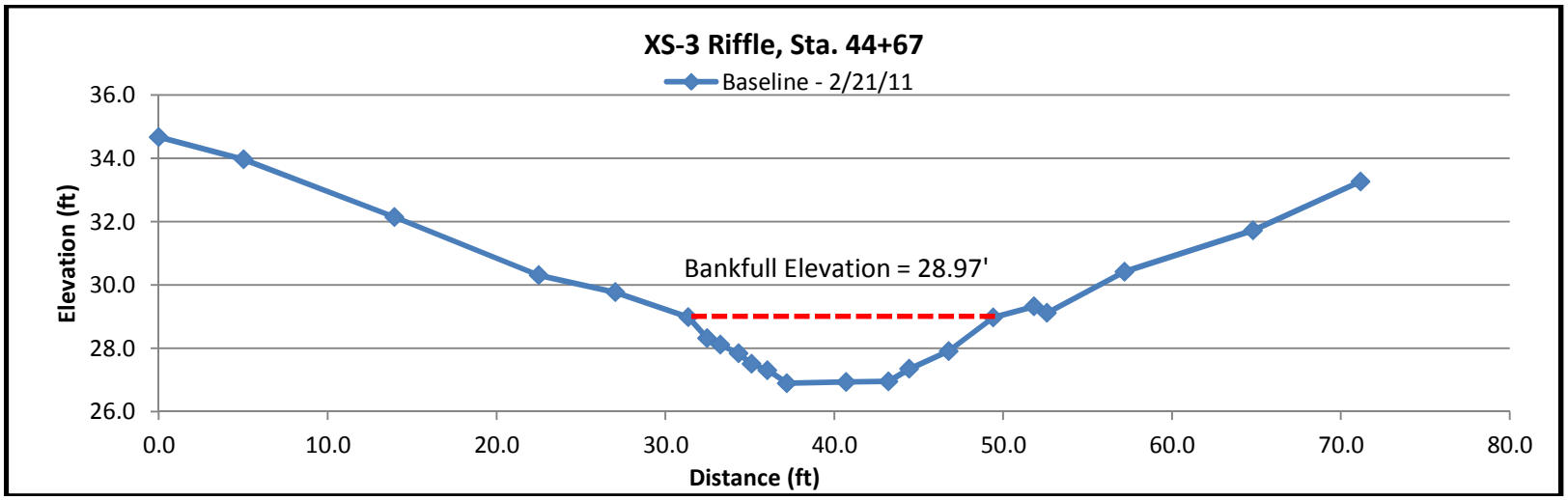
Reach 1 Cross Sections – Washington Ave. to Gordon St.



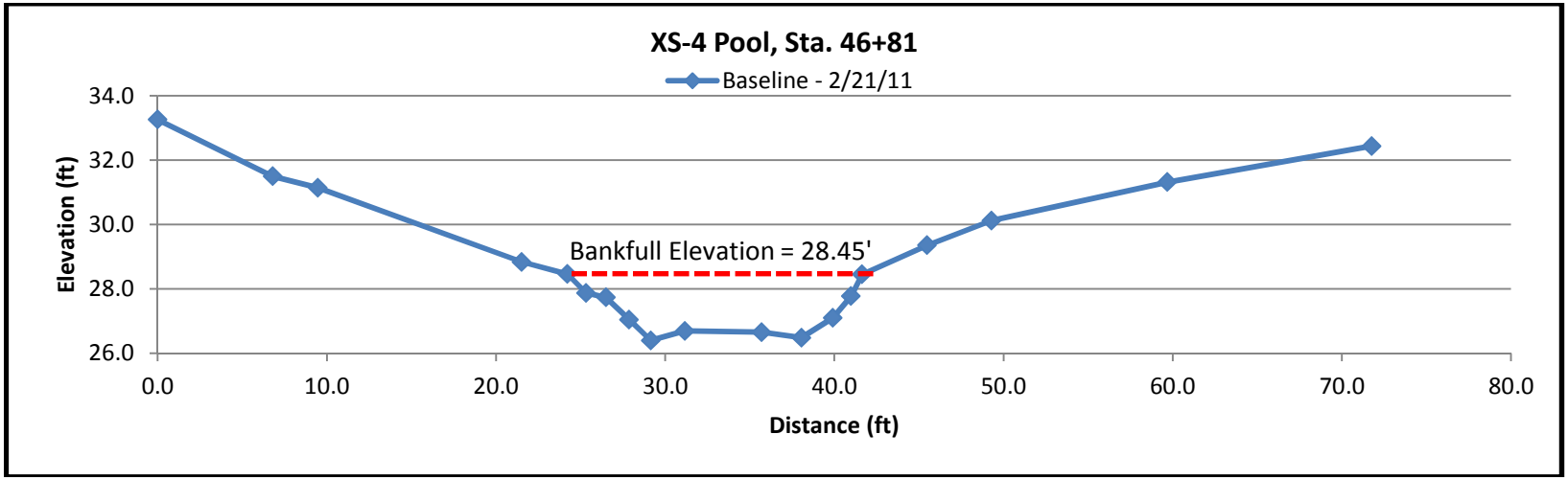
Bankfull Width (ft)	14.84
Floodprone Width (ft)	56.25
Bankfull Mean Depth (ft)	1.7
Bankfull Max Depth (ft)	2.77
Bankfull Cross Sectional Area (ft^2)	25.23
Bankfull Width/Depth Ratio	8.73
Bankfull Entrenchment Ratio	3.79
Bankfull Bank Height Ratio	1



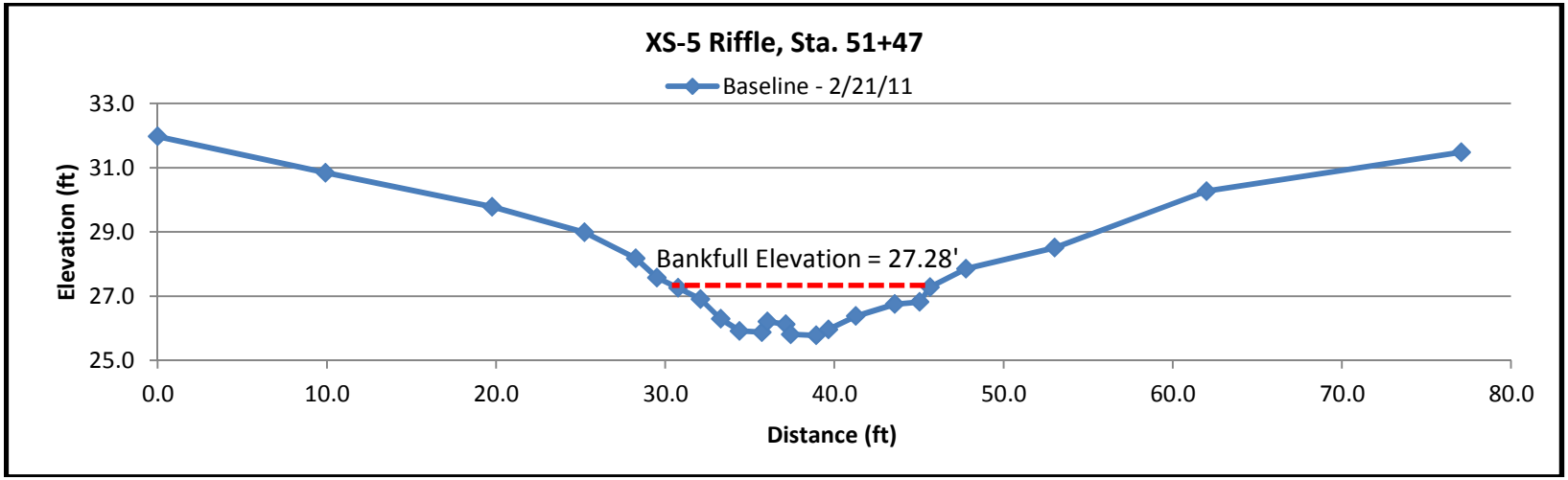
Bankfull Width (ft)	24.28
Floodprone Width (ft)	72.2
Bankfull Mean Depth (ft)	1.97
Bankfull Max Depth (ft)	3.33
Bankfull Cross Sectional Area (ft^2)	47.75
Bankfull Width/Depth Ratio	12.32
Bankfull Entrenchment Ratio	2.97
Bankfull Bank Height Ratio	1



Bankfull Width (ft)	18.03
Floodprone Width (ft)	41.72
Bankfull Mean Depth (ft)	1.42
Bankfull Max Depth (ft)	2.07
Bankfull Cross Sectional Area (ft^2)	25.69
Bankfull Width/Depth Ratio	12.7
Bankfull Entrenchment Ratio	2.31
Bankfull Bank Height Ratio	1

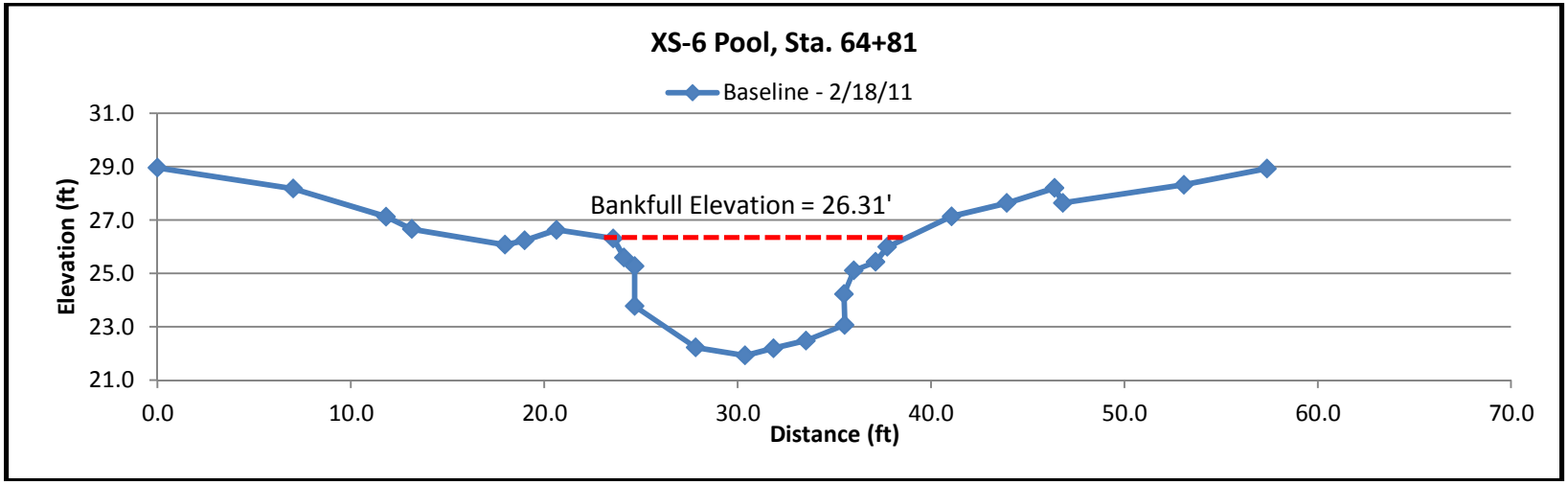


Bankfull Width (ft)	17.42
Floodprone Width (ft)	39.81
Bankfull Mean Depth (ft)	1.46
Bankfull Max Depth (ft)	2.05
Bankfull Cross Sectional Area (ft^2)	25.48
Bankfull Width/Depth Ratio	11.93
Bankfull Entrenchment Ratio	2.29
Bankfull Bank Height Ratio	1

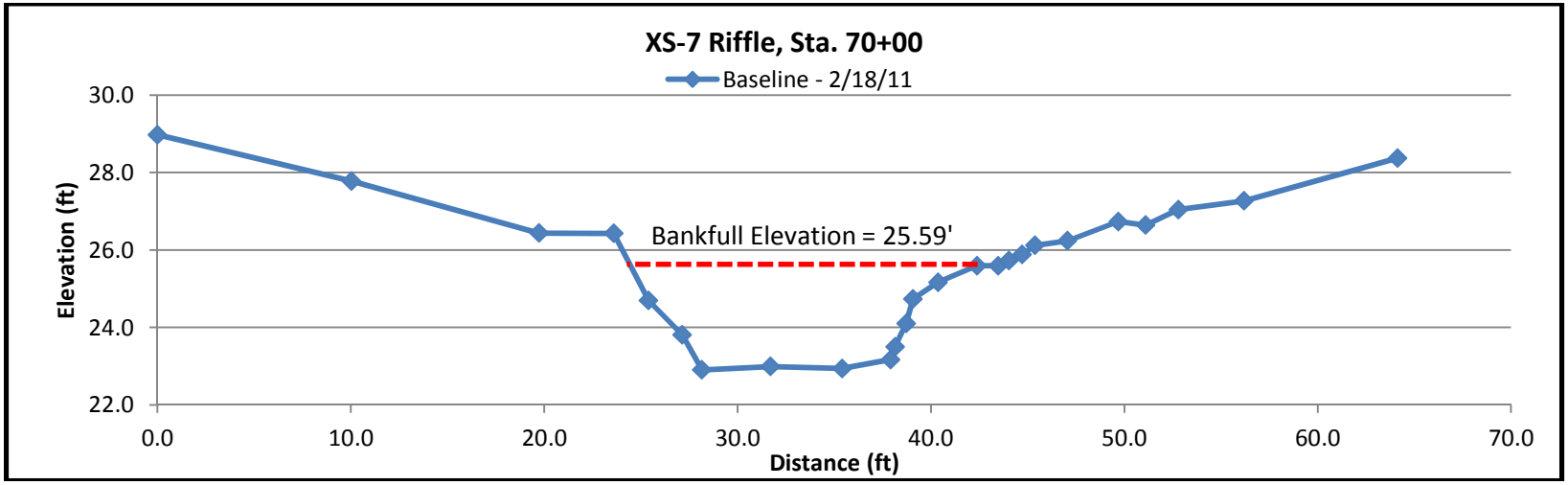


Bankfull Width (ft)	14.99
Floodprone Width (ft)	28.45
Bankfull Mean Depth (ft)	0.92
Bankfull Max Depth (ft)	1.5
Bankfull Cross Sectional Area (ft^2)	13.78
Bankfull Width/Depth Ratio	16.29
Bankfull Entrenchment Ratio	1.9
Bankfull Bank Height Ratio	1

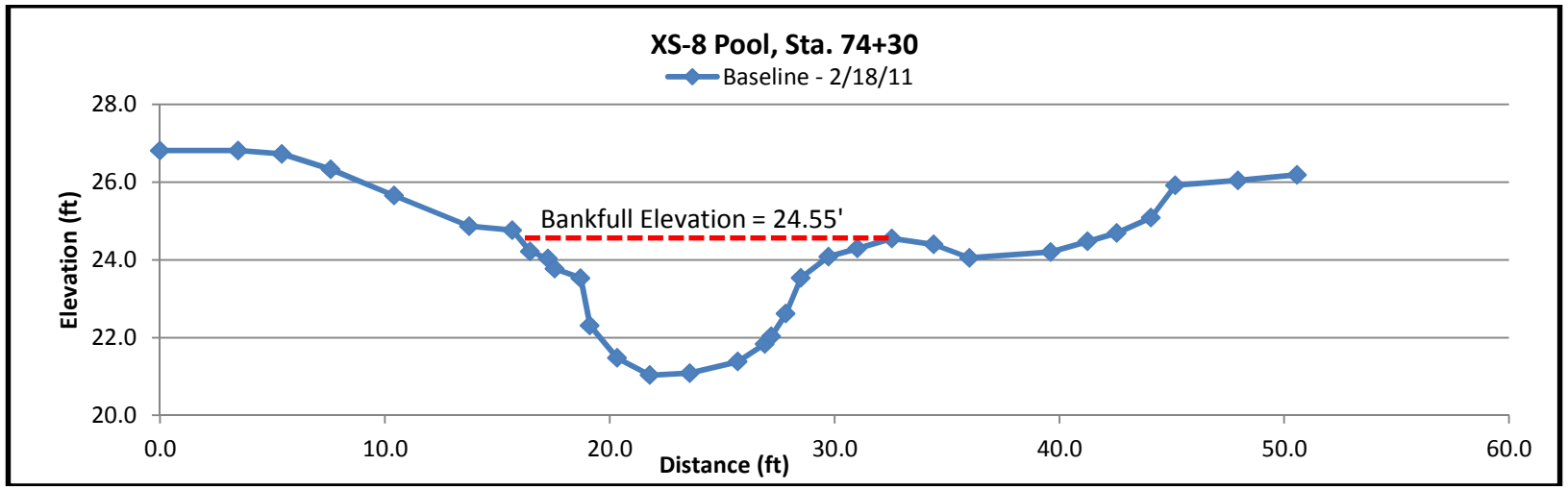
Reach 2 Cross Sections – Caswell St. to Lincoln St.



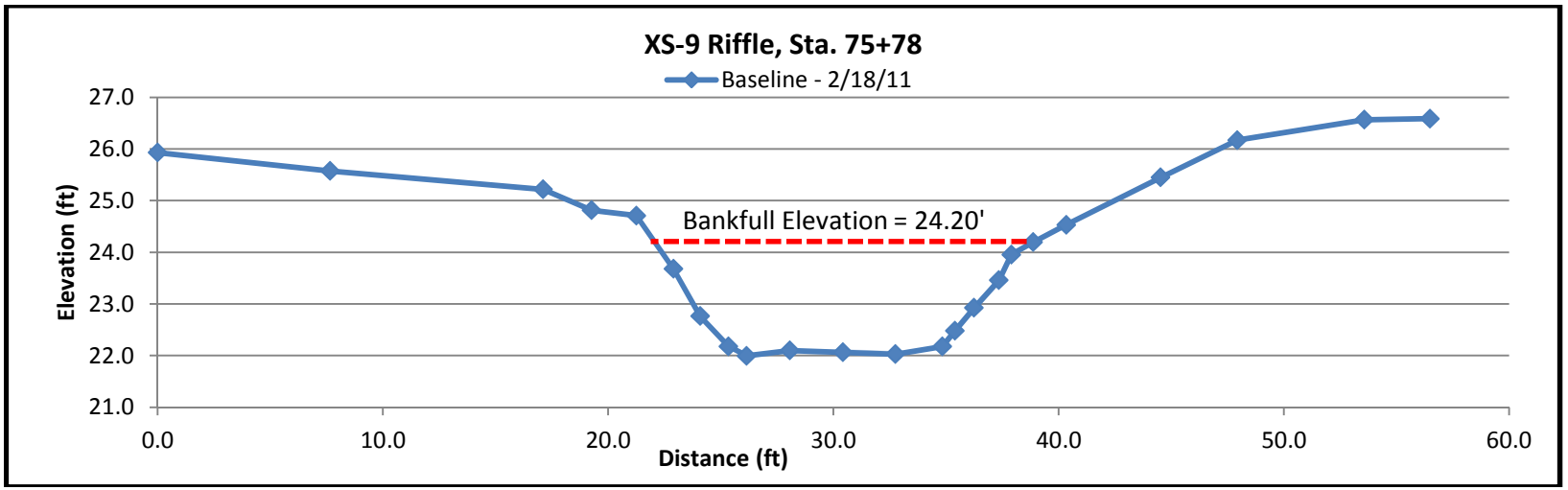
Bankfull Width (ft)	15.1
Floodprone Width (ft)	57.39
Bankfull Mean Depth (ft)	2.94
Bankfull Max Depth (ft)	4.39
Bankfull Cross Sectional Area (ft^2)	44.41
Bankfull Width/Depth Ratio	5.14
Bankfull Entrenchment Ratio	3.8
Bankfull Bank Height Ratio	1



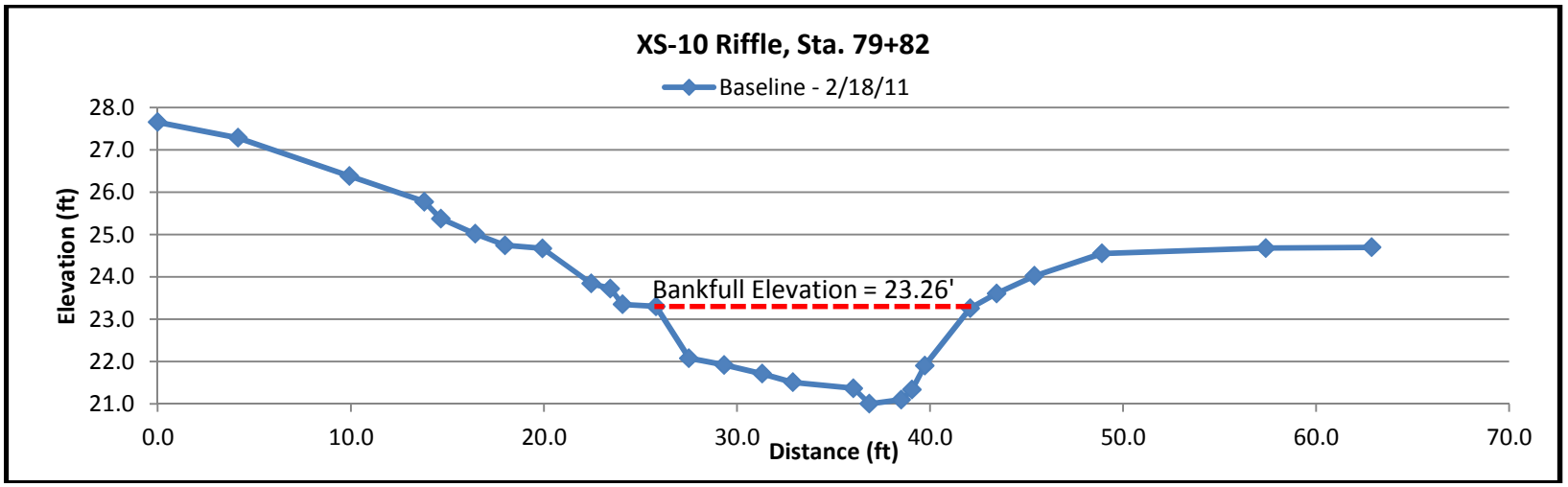
Bankfull Width (ft)	17.91
Floodprone Width (ft)	57.58
Bankfull Mean Depth (ft)	1.88
Bankfull Max Depth (ft)	2.68
Bankfull Cross Sectional Area (ft^2)	33.7
Bankfull Width/Depth Ratio	9.53
Bankfull Entrenchment Ratio	3.22
Bankfull Bank Height Ratio	1



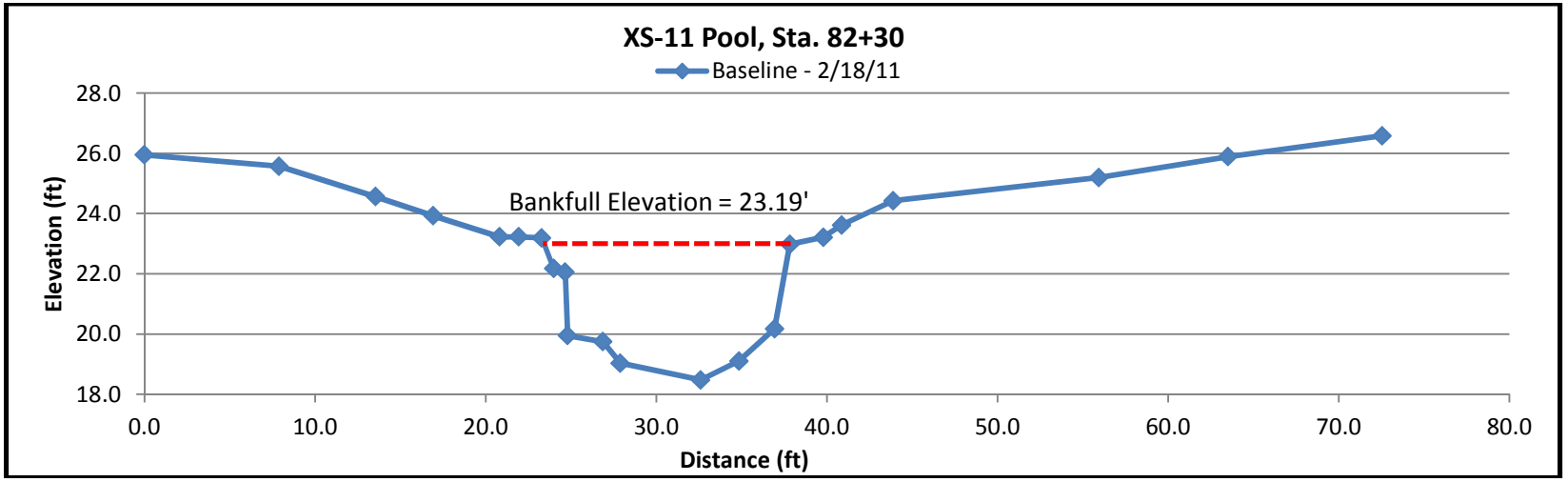
Bankfull Width (ft)	16.57
Floodprone Width (ft)	50.57
Bankfull Mean Depth (ft)	1.93
Bankfull Max Depth (ft)	3.51
Bankfull Cross Sectional Area (ft^2)	31.92
Bankfull Width/Depth Ratio	8.59
Bankfull Entrenchment Ratio	3.05
Bankfull Bank Height Ratio	1



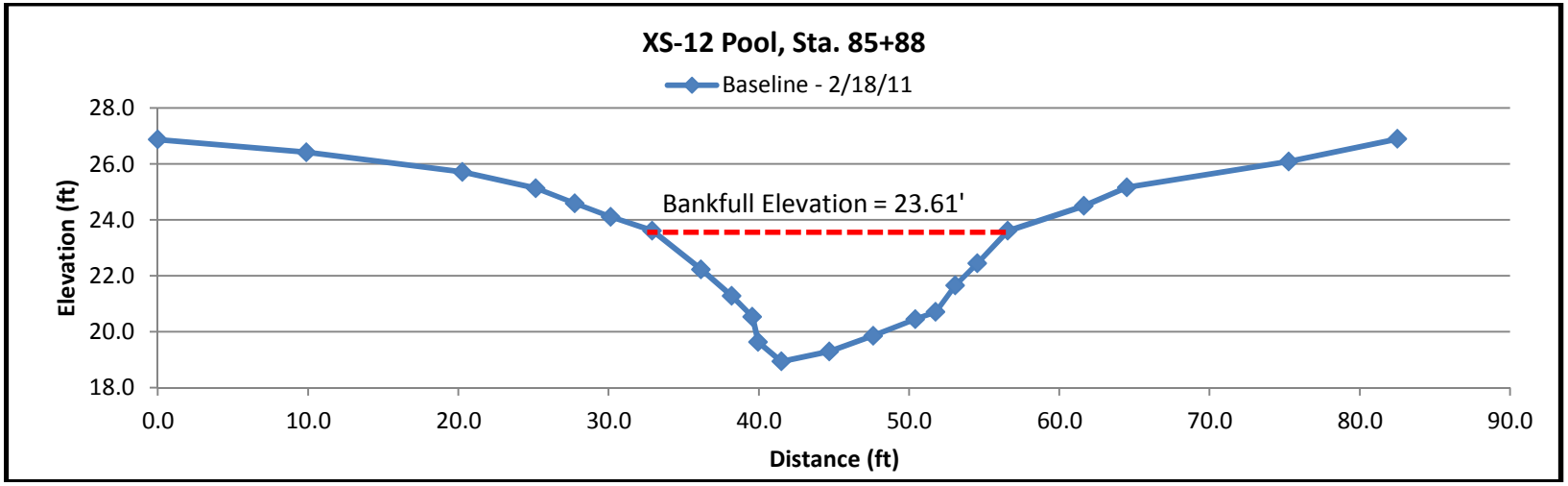
Bankfull Width (ft)	16.81
Floodprone Width (ft)	51.29
Bankfull Mean Depth (ft)	1.64
Bankfull Max Depth (ft)	2.21
Bankfull Cross Sectional Area (ft^2)	27.58
Bankfull Width/Depth Ratio	10.25
Bankfull Entrenchment Ratio	3.05
Bankfull Bank Height Ratio	1



Bankfull Width (ft)	16.23
Floodprone Width (ft)	48.33
Bankfull Mean Depth (ft)	1.46
Bankfull Max Depth (ft)	2.26
Bankfull Cross Sectional Area (ft^2)	23.68
Bankfull Width/Depth Ratio	11.12
Bankfull Entrenchment Ratio	2.99
Bankfull Bank Height Ratio	1

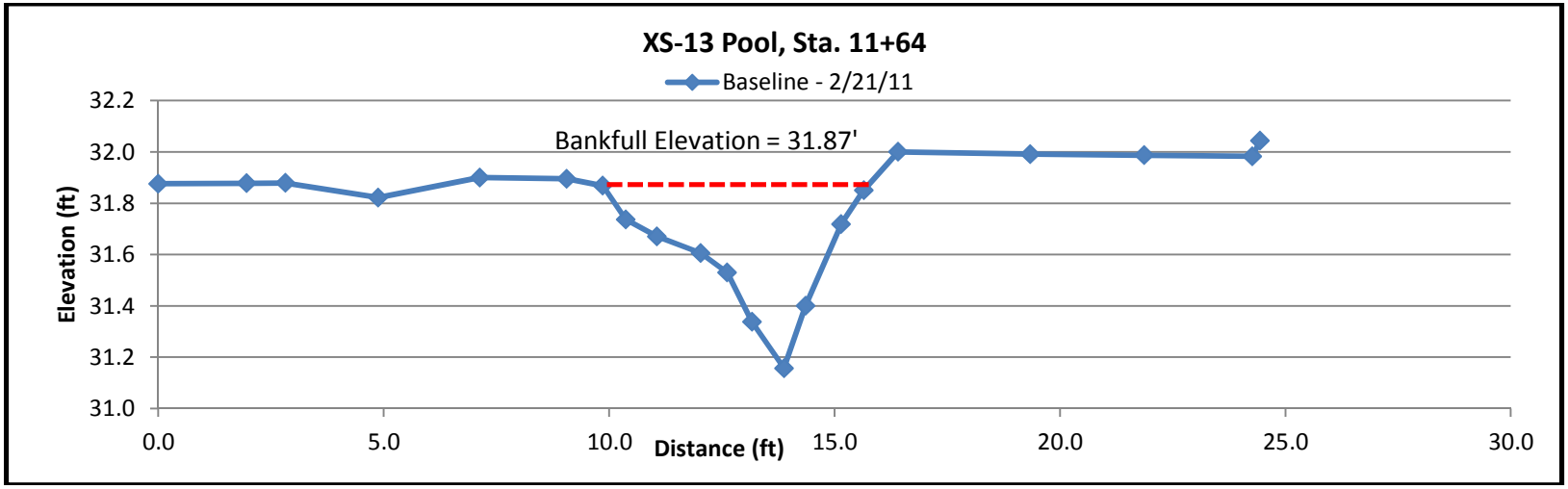


Bankfull Width (ft)	16.31
Floodprone Width (ft)	72.56
Bankfull Mean Depth (ft)	3.19
Bankfull Max Depth (ft)	4.71
Bankfull Cross Sectional Area (ft^2)	52.00
Bankfull Width/Depth Ratio	5.11
Bankfull Entrenchment Ratio	4.45
Bankfull Bank Height Ratio	1

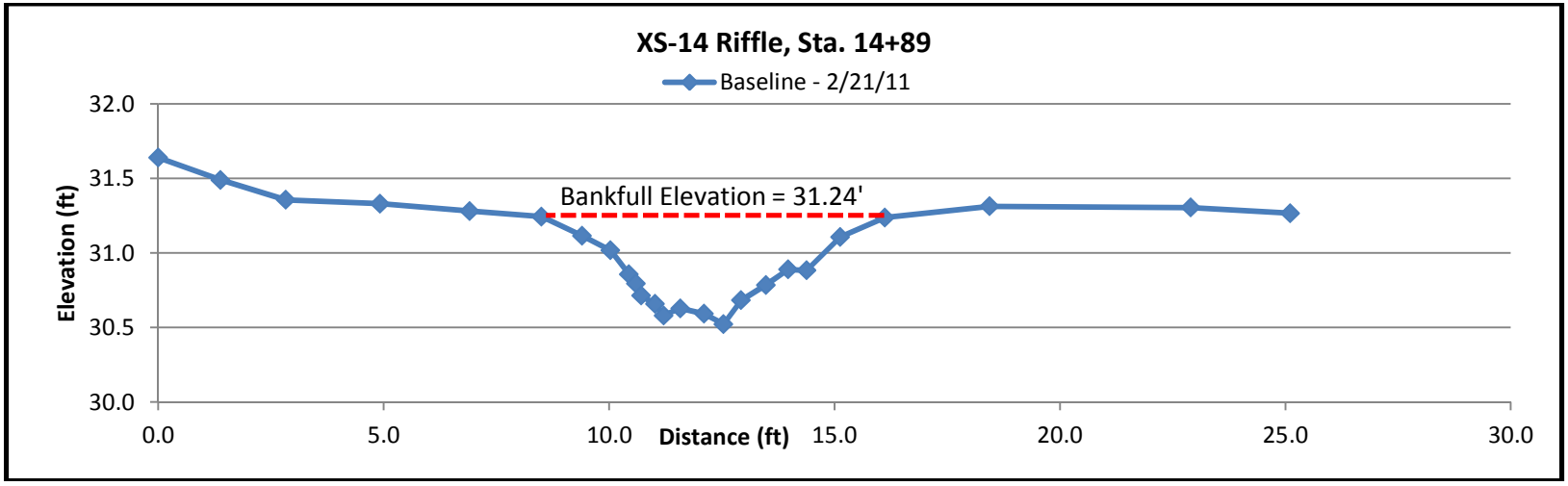


Bankfull Width (ft)	23.66
Floodprone Width (ft)	82.52
Bankfull Mean Depth (ft)	2.72
Bankfull Max Depth (ft)	4.68
Bankfull Cross Sectional Area (ft^2)	64.42
Bankfull Width/Depth Ratio	8.7
Bankfull Entrenchment Ratio	3.49
Bankfull Bank Height Ratio	1

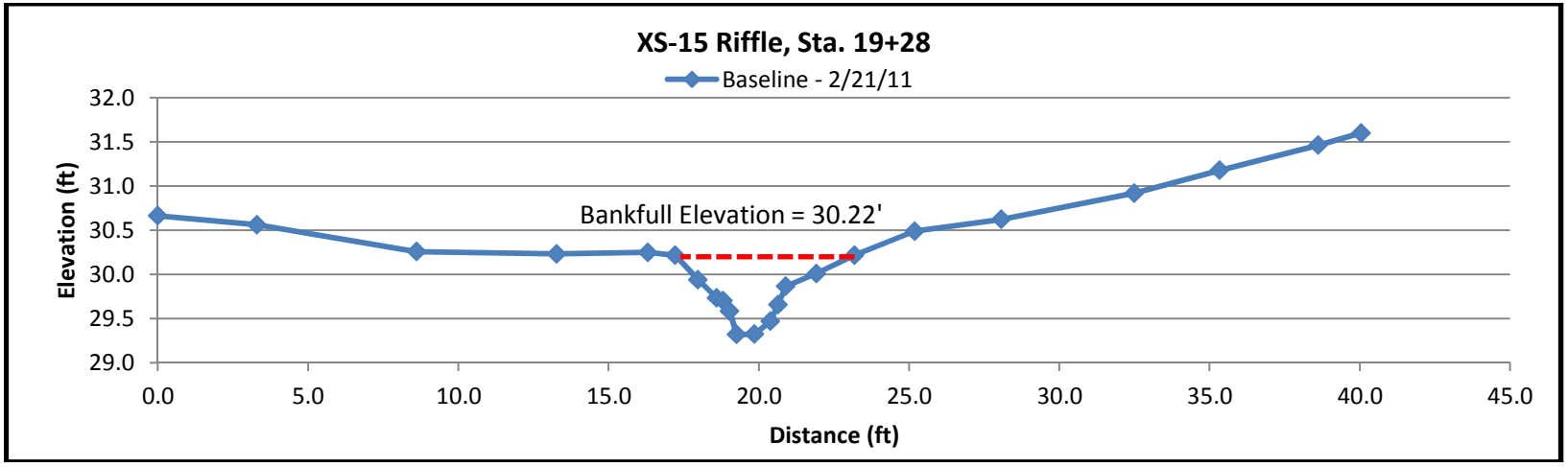
Reach 3 Cross Sections – UT to Adkin Branch



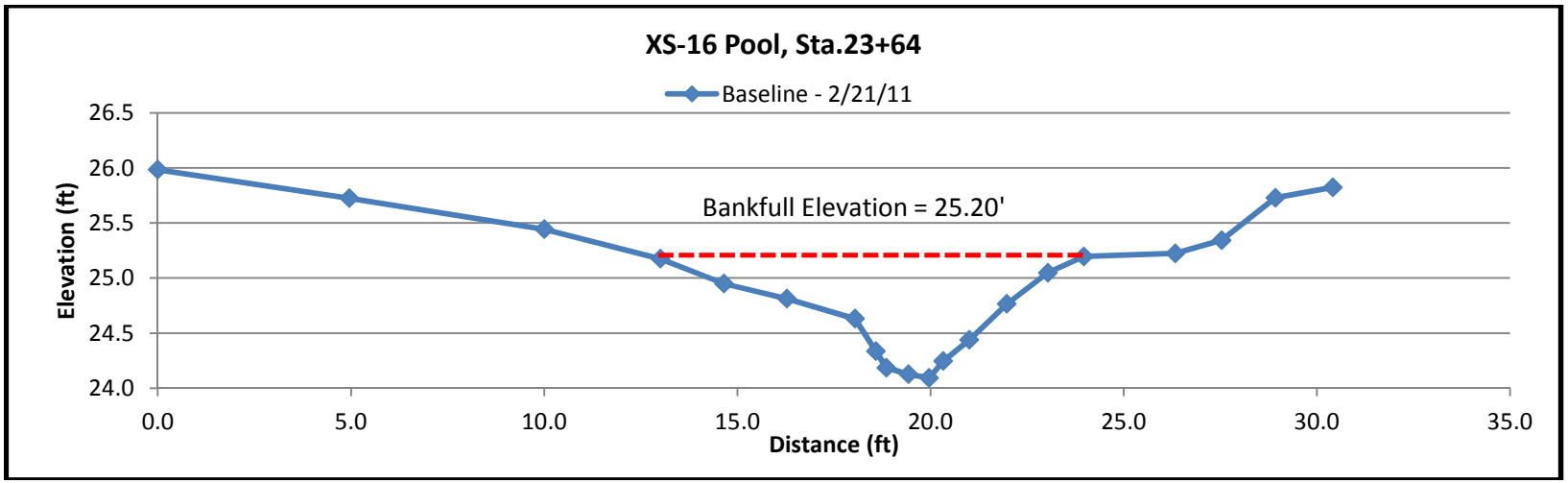
Bankfull Width (ft)	5.89
Floodprone Width (ft)	24.44
Bankfull Mean Depth (ft)	0.31
Bankfull Max Depth (ft)	0.71
Bankfull Cross Sectional Area (ft^2)	1.81
Bankfull Width/Depth Ratio	19
Bankfull Entrenchment Ratio	4.15
Bankfull Bank Height Ratio	1



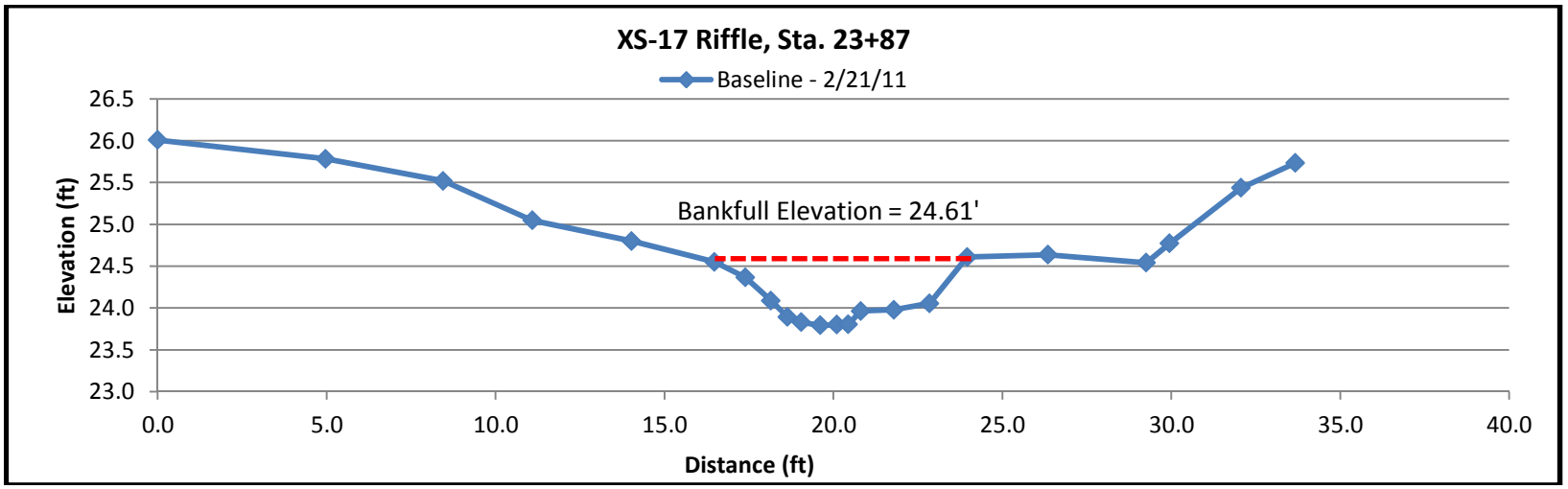
Bankfull Width (ft)	7.69
Floodprone Width (ft)	25.11
Bankfull Mean Depth (ft)	0.35
Bankfull Max Depth (ft)	0.72
Bankfull Cross Sectional Area (ft^2)	2.68
Bankfull Width/Depth Ratio	21.97
Bankfull Entrenchment Ratio	3.26
Bankfull Bank Height Ratio	1



Bankfull Width (ft)	6.06
Floodprone Width (ft)	34.69
Bankfull Mean Depth (ft)	0.4
Bankfull Max Depth (ft)	0.9
Bankfull Cross Sectional Area (ft^2)	2.43
Bankfull Width/Depth Ratio	15.15
Bankfull Entrenchment Ratio	5.72
Bankfull Bank Height Ratio	1



Bankfull Width (ft)	11.59
Floodprone Width (ft)	30.42
Bankfull Mean Depth (ft)	0.46
Bankfull Max Depth (ft)	1.11
Bankfull Cross Sectional Area (ft^2)	5.34
Bankfull Width/Depth Ratio	25.2
Bankfull Entrenchment Ratio	2.62
Bankfull Bank Height Ratio	1



Bankfull Width (ft)	8.06
Floodprone Width (ft)	23.07
Bankfull Mean Depth (ft)	0.5
Bankfull Max Depth (ft)	0.82
Bankfull Cross Sectional Area (ft^2)	4
Bankfull Width/Depth Ratio	16.12
Bankfull Entrenchment Ratio	2.86
Bankfull Bank Height Ratio	1

Appendix C: Vegetation Data & Photos

Table 7. Planted and Total Stem Counts (Species by Plot with Annual Means)

			Current Plot Data (MY0 2011)																																	
			007-AXE-0001			007-AXE-0002			007-AXE-0003			007-AXE-0004			007-AXE-0005			007-AXE-0006			007-AXE-0007			007-AXE-0008			007-AXE-0009			007-AXE-0010			007-AXE-0011			007-AXE-0012			007-AXE-0013		
Scientific Name	Common Name	Species Type	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T
Alnus serrulata	hazel alder	Shrub Tree																																						
Betula nigra	river birch	Tree	22	22	22	9	9	9	1	1	1	6	6	6	4	4	4				2	2	2	1	1	1	4	4	4	1	1	1	1	1	1	6	6	6	4	4	4
Carpinus caroliniana	American hornbeam	Shrub Tree							3	3	3				9	9	9				3	3	3				4	4	4	2	2	2	1	1	1				1	1	1
Carya	hickory	Tree	1	1	1	3	3	3	2	2	2	2	2	2																						2	2	2	2	2	2
Cephalanthus occidentalis	common buttonbush	Shrub Tree	41	41	41																																				
Cornus amomum	silky dogwood	Shrub	60	60	60																																				
Crataegus	hawthorn	Shrub Tree																																	1						
Liquidambar styraciflua	sweetgum	Tree						15			8																					7			37						
Pinus taeda	loblolly pine	Tree																					1																		
Platanus occidentalis	American sycamore	Tree																																	6						
Prunus serotina	black cherry	Shrub Tree				2	2	2				2	2	2																								4	4	4
Quercus	oak	Shrub Tree							4	4	4	3	3	3	8	8	8	3	3	3	3	3	3	4	4	4	2	2	2				2	2	2	1	1	1			
Quercus falcata	southern red oak	Tree				4	4	4	6	6	6	4	4	4	7	7	7	14	14	14	3	3	3	8	8	8	7	7	7	7	7	7	9	9	9	5	5	5	9	9	9
Quercus nigra	water oak	Tree							2	2	2																														
Robinia pseudoacacia	black locust	Tree																														4									
Salix nigra	black willow	Tree	1	22	22																																				
Ulmus alata	winged elm	Tree																																							
Unknown		unknown	1	1	1						9	2	2	2													1	1	1												
	Stem count		126	147	147	18	18	33	18	18	35	19	19	19	28	28	28	17	17	17	11	11	12	13	13	13	18	18	18	10	10	21	13	13	57	14	14	14	20	20	20
	size (ares)		1			1			1			1			1			1			1			1			1			1			1			1			1		
	size (ACRES)		0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02		
	Species count		6	6	6	4	4	5	6	6	8	6	6	6	4	4	4	2	2	2	4	4	5	3	3	3	5	5	5	3	3	5	4	4	7	4	4	4	5	5	5
	Stems per ACRE		5099	5949	5949	728	728	1335	728	728	1416	769	769	769	1133	1133	1133	688	688	688	445	445	486	526	526	526	728	728	728	405	405	850	526	526	2307	567	567	567	809	809	809

			Current Plot Data (MY0 2011)																										Annual Means									
			007-AXE-0014			007-AXE-0015			007-AXE-0016			007-AXE-0017			007-AXE-0018			007-AXE-0019			007-AXE-0020			007-AXE-0021			007-AXE-0022			MY0 (2011)			MY1 (2012)			MY2 (2013)			MY3 (2014)		
Scientific Name	Common Name	Species Type	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T									
Alnus serrulata	hazel alder	Shrub Tree				1	1	1																					1	1	1									
Betula nigra	river birch	Tree				5	5	5							6	6	6	2	2	2	7	7	7	1	1	1				82	82	82									
Carpinus caroliniana	American hornbeam	Shrub Tree	5	5	5	1	1	1				7	7	7	1	1	1	5	5	5	2	2	2	1	1	1	3	3	3	48	48	48									
Carya	hickory	Tree	2	2	2	9	9	9				3	3	3							4	4	4							30	30	30									
Cephalanthus occidentalis	common buttonbush	Shrub Tree				3	3	3																						44	44	44									
Cornus amomum	silky dogwood	Shrub	1	1	1	5	5	5							1	1	1	2	2	2				1	1	1				70	70	70									
Crataegus	hawthorn	Shrub Tree																														1									
Liquidambar styraciflua	sweetgum	Tree			1												1												1			70									
Pinus taeda	loblolly pine	Tree																														1									
Platanus occidentalis	American sycamore	Tree															1															7									
Prunus serotina	black cherry	Shrub Tree																												8	8	8									
Quercus	oak	Shrub Tree				3	3	3	3	3	3	3	3	3	1	1	1	5	5	5	1	1	1	2	2	2				48	48	48									
Quercus falcata	southern red oak	Tree	6	6	6	9	9	9	8	8	8	2	2	2	5	5	5	3	3	3	2	2	2	7	7	7	10	10	10	135	135	135									
Quercus nigra	water oak	Tree				1	1	1										1	1	1				3	3	3				7	7	7									
Robinia pseudoacacia	black locust	Tree																														4									
Salix nigra	black willow	Tree																												1	22	22									
Ulmus alata	winged elm	Tree							1	1	1																			1	1	1									
Unknown		unknown																												4	4	13									
	Stem count		14	14	15	37	37	37	12	12	12	15	15	15	14	14	16	18	18	18	16	16	16	15	15	15	13	13	14	479	500	592									
	size (ares)		1			1			1			1			1			1			1			1			1			22											
	size (ACRES)		0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.54											
	Species count		4	4	5	9	9	9	3	3	3	4	4	4	5	5	7	6	6	6	5	5	5	6	6	6	2	2	3	13	13	18									
	Stems per ACRE		567	567	607	1497	1497	1497	486	486	486	607	607	607	567	567	647	728	728	728	647	647	647	607	607	607	526	526	567	881	920	1089									

Volunteer
Exceeds requirements by 10%
Exceeds requirements, but by less than 10%
Fails to meet requirements, by less than 10%
Fails to meet requirements by more than 10%

PnoLS = planted, not a Live Stake
P-all = all planted
T = Total

Table 8a. Final Planting Plan

Vegetation Association	Requested Coastal Plain Levee Forest	Revised Coastal Plain Levee Forest	Stream-side Assemblage - Adkin Branch	Stream-side Assemblage - UT to Adkin Branch	Stormwater BMP Wetland Assemblage	TOTAL
Area (acres)	**30.65 Acres**	**30.65 Acres**	**1.40 Acres**	**0.19 Acres**	**0.69 Acres**	**63.58 Acres**
Species	**Number Planted 680/AC (% of total)**	**Number Planted 680/AC (% of total)**	**Number Planted 12812/AC (% of total)**	**Number Planted 4271/AC (% of total)**	**Number Planted 680/AC (% of total)**	**Number planted**
River birch (*Betula nigra*)*	3,127 (15)	4,169 (20)				3,127
Slippery elm (*Ulmus rubra*)*	2,085 (10)	0 (0)				2,085
Winged elm (*Ulmus alata*)*	2,085 (10)	0 (0)				2,085
Pignut hickory (*Carya glabra*)*	2,085 (10)	0 (0)				2,085
Black walnut (Juglans nigra)*	0 (0)	1,043 (5)				0
Mockernut hickory (*Carya tomentosa*)*	3,127 (15)	4,169 (20)				3,127
Southern red oak (*Quercus falcata* var. *falcata*)*	2,085 (10)	3,127 (15)				2,085
Water oak (*Quercus nigra*)*	2,085 (10)	3,127 (15)				2,085
Ironwood (*Carpinus caroliniana*)*	2,085 (10)	0 (0)				2,085
Redbud (Cercis canadensis)*	0 (0)	3,127 (15)				0
Sassafras (*Sassafras albidum*)*	1,043 (5)	1,043 (5)				1,043
Black cherry (*Prunus serotina*)*	1,043 (5)	0 (0)				1,043
Persimmon (Diospyros virginiana)*	0 (0)	1,043 (5)				0
Black willow (*Salix nigra*)**			3,585 (20)	162 (20)	71 (15)	3,818
Silky dogwood (*Cornus amomum*)**			3,585 (20)	162 (20)	71 (15)	3,818
Buttonbush (*Cephalanthus occidentalis*)**			2,689 (15)	122 (15)	71 (15)	2,882
Elderberry (*Sambucus canadensis*)**			2,689 (15)	122 (15)		2,811
Tag alder (*Alnus serrulata*)**			2,689 (15)	122 (15)	71 (15)	2,882
Bald cypress (*Taxodium distichum*)**					71 (15)	71
Water tupelo (*Nyssa aquatica*)**					71 (15)	71
Arrow arum (*Peltandra virginica*)**					47 (10)	47
Common rush (Juncus effusus)**			2,689 (15)	122 (15)		2,811
TOTAL	**20,850 (100)**	**20,848 (100)**	**17,926 (100)**	**812 (100)**	**473 (100)**	**40,061**

* Planted at a density of 680 stems/acre (~ 8-foot spacing).

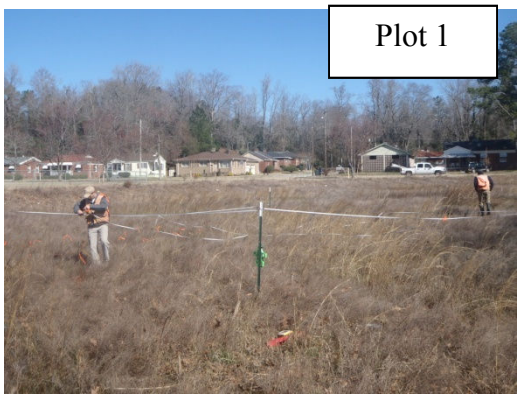
** Planted at ~ 2-foot spacing along three rows on Adkin Branch and ~4-foot spacing along one row on UT to Adkin Branch if in Stream-side Assemblage or 680 stems/acre at 2' spacing if planted in Stormwater BMP.
*** Emergent herbaceous seed mix spread at a rate of 50 pounds per acre.

Table 8b. Holloway Park Ball & Burlap

Table 8b. Holloway Park Ball & Burlap Planting		
Vegetation Association	*Holloway Park Ball & Burlap Requested 12/9/10*	**Holloway Park Ball & Burlap Revised 1/3/11**
Species	*86 Total Plants (% of total)*	**86 Total Plants (% of total)**
River birch (*Betula nigra*)*	*17 (20)*	20 (23.0)
Pignut hickory (*Carya glabra*)*	*13 (15)*	15 (17.5)
Mockernut hickory (*Carya tomentosa*)*	*13 (15)*	
Southern red oak (*Quercus falcata* var. *falcata*)*	*17 (20)*	21 (24.5)
Water oak (*Quercus nigra*)*	*13 (15)*	15 (17.5)
Black cherry (*Prunus serotina*)*	*13 (15)*	15 (17.5)
TOTAL	*86 (100)*	**86 (100)**

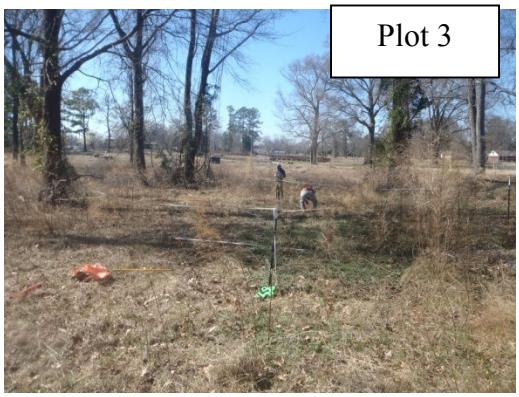
Vegetation Baseline Monitoring Photographs (taken March 2011)

Plot 1



Plot 2

Plot 3



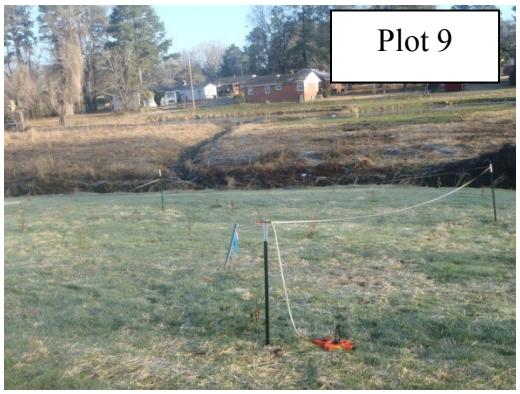
Plot 4

Plot 5

Plot 6

Plot 7

Plot 8


Plot 9


Plot 10


Plot 11


Plot 12


Plot 13


Plot 14


Plot 15


Plot 16

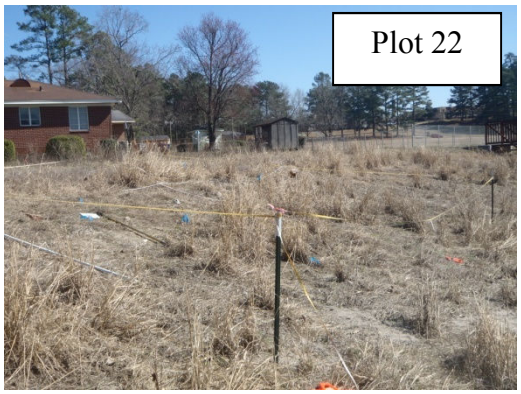

Plot 17


Plot 18


Plot 19


Plot 20


Plot 21


Plot 22

Appendix D: Credit Calculation Documentation and Figures

The following tables and figures were prepared to document the methods used in determining stream restoration (SR), riparian buffer restoration (RBR), nutrient offset pound reduction (NO lb.), and nutrient offset buffer restoration (NOBR) credits for the Project. It is to be noted that the Adkin Branch Stream Restoration project was instituted before October 11, 2007, and is grandfathered to allow mitigation credit for buffer restoration out to 200 feet as measured horizontally out from the water surface. Allowing this project to be grandfathered is in accordance with an email from Tom Reeder (DWQ) dated October 10, 2007 which states: "This decision was made so as to not penalize those projects that may have been completed in good faith under any misunderstanding caused by the distribution of the internal DWQ memo dated Oct 23, 2002".

Riparian buffer areas were measured for three different categories: areas with less than 50' buffer, areas with a 50' buffer, and areas with a buffer greater than 50' and up to 200'. Stream and Riparian Buffer restoration credits were calculated based on Tables 1 and 3 in the *DRAFT Regulatory Guidance for the Calculation of Stream and Buffer Mitigation Credit for Buffer Widths Different from Standard Minimum Widths, Version 4.5, July 20, 2010*. Riparian Buffer restoration areas may be used for stream & wetland mitigation, stream & riparian buffer mitigation, or nutrient offset buffer restoration credit (Estimating/Calculating Riparian Buffer Credits, EEP PPPM Section 8.3.1.2).

Stream lengths and buffer areas were outlined and measured in MicroStation. For each buffered ditch entering the project area, 0.10 acres was deducted from the corresponding buffer area (DWQ Memo #2008-019, dated August 19, 2008). For areas with buffer widths between 50' to 200', the buffers were divided into areas with similar widths and assigned an average width to determine the appropriate buffer correction factor. A similar approach was used for SR credits. Each reach was divided into segments with similar buffer widths to determine the percent increase or decrease in stream restoration credit. Left and right banks were calculated separately and then averaged to determine total credits.

Sewer easement and stormwater BMP footprints within the conservation easement were not included in riparian buffer acreage calculations. In areas where the sewer easement lies within Zone 2 (30'-50'), buffer credit was allowed for the area between the easement and the stream top of bank at the full 1:1 ratio (DWQ Memo #2009-006, dated November 17, 2009). Segments of the stream in these areas were also calculated at a 1:1 ratio. No stream credit was given for segments of channel at perpendicular sewer easement crossings or at pedestrian bridge crossings.

Stream Restoration Credits (SR)

Stream Restoration Credit Summary				
	Gross LF	**Left Bank Adjusted LF***	**Right Bank Adjusted LF***	**Credit Yield****
Washington to Gordon	1,727	1,778	1,740	1,759
Gordon to Caswell	620	671	650	661
Caswell to Lincoln	3,650	3,815	3,725	3,770
Adkin Branch Subtotal	**5,997**	**6,264**	**6,115**	**6,189**
UT Adkin	1,582	1,631	1,565	1,598
TOTAL LF	**7,579**	**7,894**	**7,681**	**7,787**
* - LF (Linear Feet) adjusted based on proposed DWQ guidelines (DRAFT Regulatory Guidance for the Calculation of Stream and Buffer Mitigation Credit for Buffer Widths Different from Standard Minimum Widths, Version 4.5, July 20, 2010)				
** - Credit Yield is the average of left and right bank adjusted LF				

Neuse Riparian Buffer Restoration Credits (RBR)

Riparian Buffer Restoration Credit Summary				
	50' Area (sf)	50' - 200' Gross Area (sf)	50' - 200' Adjusted Area (sf)*	Credit Yield**
Washington to Gordon	110,986	113,251	125,269	236,255
Gordon to Caswell	50,195	68,346	77,405	127,600
Caswell to Lincoln	286,008	329,882	381,370	667,378
UT Adkin	115,610	96,994	112,661	228,271
TOTAL (sf)	**562,799**	**608,473**	**696,704**	**1,259,503**
TOTAL (ac)	**12.92**	**13.97**	**15.99**	**28.91**

* - Areas adjusted based on proposed values in Table 1 of the "Draft Regulatory Guidance for the Calculation of Stream and Buffer Mitigation Credit for Buffer Widths Different From Standard Minimum Widths NC IRT Version 4.5 July 20, 2010".

** - Credit Yield is the sum of 50' area and 50' - 200' adjusted area

Neuse Nutrient Offset Pound Reduction Credits (NO lb.)

Nutrient Offset Pound Reduction Credit Summary				
BMP	Pre-Existing Annual Total Nitrogen Load (lbs/yr)	Annual Total Nitrogen Load w/ BMP (lbs/yr)	Annual Total Nitrogen Load Reduction (lbs/yr)	30 yr. Total Nitrogen Reduction (lbs)
BMP 4	29	19	10	300
BMP 5	72	47	25	750
BMP 6	111	72	39	1,170
BMP 7	56	36	20	600
BMP 8	18	12	6	180
BMP 9	94	61	33	990
			Total	**3,990**

Neuse Nutrient Offset Buffer Restoration Credits (NOBR)

Nutrient Offset Buffer Restoration Credit Summary						
	<= 50'		50' - 200'		Total	
	Area (ac)	Nitrogen Credits*	Area (sf)	Nitrogen Credits**	Area (ac)	Nitrogen Credits**
Washington to Gordon	2.65	0	2.60	5,910	5.25	5,910
Gordon to Caswell	1.18	0	1.57	3,566	2.75	3,566
Caswell to Lincoln	6.88	0	7.57	17,214	14.45	17,214
UT Adkin	2.88	0	2.23	5,061	5.11	5,061
TOTAL	**13.60**	**0**	**13.97**	**31,751**	**27.57**	**31,751**

* - In accordance with EEP PPPM Section 8.3.1.2, *Estimating/Calculating Riparian Buffer Credits*, no Nitrogen Credits were calculated for 0-50' buffer area.

** - Nitrogen Credits were calculated based on a rate of 2,273 lbs per acre over 30 years per DWQ policy (*Estimating/Calculating Riparian Buffer Credits, EEP PPPM Section 8.3.1.2*)

Adkin Branch - Stream Restoration Credit Calculations												
	Left Bank						Right Bank					
	Beg Sta.	End Sta.	LF*	Buffer Width (ft)	% increase or decrease in stream credit**	Net LF***	Beg Sta.	End Sta.	LF*	Buffer Width (ft)	% increase or decrease in stream credit**	Net LF***
Washington to Gordon	35+99	36+56	56.9	30	62.5%	35.6	35+99	36+61	61.8	30	62.5%	38.6
	36+56	37+83	127.2	65	103.5%	131.6	36+61	37+68	107.3	60	103.5%	111.0
	37+83	37+88	5.1	50	100.0%	5.1	37+68	38+01	33.1	0	0.0%	0.0
	37+88	37+95	7.0	0	0.0%	0.0	38+01	39+90	188.4	100	106.0%	199.7
	37+95	41+39	344.2	60	103.5%	356.3	39+90	41+23	133.7	200	113.0%	151.0
	41+39	44+23	284.0	50	100.0%	284.0	41+23	42+58	134.9	100	106.0%	143.0
	44+23	47+63	339.9	65	103.5%	351.8	42+58	43+13	54.8	45	94.0%	51.6
	47+63	48+26	62.5	50	100.0%	62.5	43+13	44+71	158.1	90	106.0%	167.6
	48+26	53+26	500.6	115	110.0%	550.6	44+71	48+31	359.6	75	103.5%	372.1
							48+31	50+45	214.0	90	106.0%	226.8
							50+45	52+11	166.3	80	106.0%	176.3
							52+11	52+47	36.5	27	62.5%	22.8
							52+47	53+26	79.0	50	100.0%	79.0
Sub-total			**1,727**			**1,778**			**1,727**			**1,740**
Gordon to Caswell	54+07	55+25	117.8	115	110%	129.6	54+07	57+02	294.6	65	103.5%	304.9
	55+25	56+44	118.9	75	104%	123.0	57+02	58+06	104.9	130	110.0%	115.4
	56+44	56+90	46.4	65	104%	48.1	58+06	58+31	24.3	200	113.0%	27.4
	56+90	60+27	336.4	110	110%	370.1	58+31	58+90	59.0	130	110.0%	64.9
							58+90	59+87	97.5	60	103.5%	100.9
							59+87	60+27	39.2	45	94.0%	36.8
Sub-total			**620**			**671**			**620**			**650**
	60+78	62+63	184.6	80	106%	195.6	60+78	63+16	237.5	75	103.5%	245.8
	62+63	62+84	21.7	45	94%	20.4	63+16	64+88	172.1	20	50.0%	86.0
	62+84	64+18	133.8	85	106%	141.9	64+88	68+89	401.3	150	110.0%	441.5
	64+18	65+51	132.5	65	104%	137.1	68+89	69+15	26.5	45	94.0%	24.9
	65+51	66+48	97.1	100	106%	102.9	69+15	72+18	303.0	105	110.0%	333.3
	66+48	67+23	75.6	65	104%	78.3	72+18	72+65	46.7	40	87.5%	40.9
	67+23	67+81	57.8	45	94%	54.3	72+65	76+50	384.5	160	113.0%	434.5
	67+81	70+61	279.8	120	110%	307.8	76+50	77+20	70.8	90	106.0%	75.0
	70+61	71+08	46.8	50	100%	46.8	77+20	77+72	51.1	45	94.0%	48.1
	71+08	75+17	409.3	80	106%	433.8	77+72	80+01	229.0	75	103.5%	237.0
	75+17	78+21	304.2	125	110%	334.7	80+01	80+50	49.6	30	62.5%	31.0
	78+21	78+87	66.0	60	104%	68.3	80+50	84+16	365.5	80	106.0%	387.4
	78+87	78+95	7.7	50	100%	7.7	84+16	84+22	6.5	23	50.0%	3.3
	78+95	82+46	350.9	70	104%	363.1	84+22	84+29	7.0	0	0.0%	0.0

Caswell to Lincoln	82+46	82+63	17.3	60	104%	17.9	84+29	84+36	6.8	23	50.0%	3.4
	82+63	82+93	30.4	50	100%	30.4	84+36	85+26	90.4	70	103.5%	93.6
	82+93	83+38	44.4	170	113%	50.1	85+26	85+72	45.6	45	94.0%	42.9
	83+38	84+16	78.3	50	100%	78.3	85+72	86+59	87.0	95	106.0%	92.2
	84+16	84+23	6.5	25	50%	3.3	86+59	86+89	30.3	0	0.0%	0.0
	84+23	84+30	7.0	0	0%	0.0	86+89	87+24	34.3	50	100.0%	34.3
	84+30	84+36	6.1	23	50%	3.1	87+24	91+33	408.9	115	110.0%	449.8
	84+36	85+07	70.8	50	100%	70.8	91+33	91+53	20.1	0	0.0%	0.0
	85+07	85+28	21.7	120	110%	23.8	91+53	96+04	451.2	115	110.0%	496.3
	85+28	86+59	130.5	50	100%	130.5	96+04	97+28	124.2	50	100.0%	124.2
	86+59	86+89	30.3	0	0%	0.0						
	86+89	87+73	83.5	50	100%	83.5						
	87+73	88+37	64.7	115	110%	71.2						
	88+37	88+89	52.0	90	106%	55.1						
	88+89	89+32	42.9	80	106%	45.5						
	89+32	91+32	200.1	175	113%	226.1						
	91+32	91+52	20.1	0	0%							
	91+52	97+28	575.3	140	110%	632.9						
Sub-total			**3,650**			**3,815**			**3,650**			**3,725**
UT Adkin	10+00	11+20	119.5	30	63%	74.7	10+00	10+22	21.5	50	100.0%	21.5
	11+20	16+76	556.3	75	104%	575.7	10+22	19+49	927.8	80	106.0%	983.5
	16+76	16+84	8.4	35	81%	6.8	19+49	20+91	141.6	20	50.0%	70.8
	16+84	24+39	754.6	150	110%	830.0	20+91	21+92	101.0	50	100.0%	101.0
	24+39	25+82	143.4	50	100%	143.4	21+92	22+06	13.9	48	94.0%	13.1
							22+06	23+40	134.5	60	103.5%	139.2
							23+40	24+05	64.6	40	87.5%	56.5
							24+05	24+75	69.7	65	103.5%	72.2
							24+75	25+82	107.5	50	100.0%	107.5
Sub-total			**1,582**			**1,631**			**1,582**			**1,565**
TOTAL LF*			**7,579**			**7,894**			**7,579**			**7,681**

* - LF = Linear Feet

** - As shown in Table 3 of the *"Draft Regulatory Guidance for the Calculation of Stream and Buffer Mitigation Credit for Buffer Widths Different From Standard Minimum Widths NC IRT Version 4.5 July 20, 2010"*.

*** - Net LF is equal to LF times the percent increase or decrease in stream credit.

Adkin Branch - Riparian Buffer Restoration Area Calculations

	Left Bank																													
	< 50'						50'						50' - 200'						< 50'						50'				50' - 200'					
	Beg Sta.	End Sta.	Area (sf)	# Ditches	Deduct (sf)*	Net Area (sf)	Beg Sta.	End Sta.	Area (sf)	# Ditches	Deduct (sf)*	Net Area (sf)	Beg Sta.	End Sta.	Area (sf)	Width (ft)	BCF**	Net Area (sf)	Beg Sta.	End Sta.	Area (sf)	# Ditches	Deduct (sf)*	Net Area (sf)	Beg Sta.	End Sta.	Area (sf)	# Ditches	Deduct (sf)*	Net Area (sf)	Beg Sta.	End Sta.	Area (sf)	Width (ft)	BCF**	Net Area (sf)
Washington to Gordon	36+00	36+56	1306	1	4350	0	36+56	37+87	7408	0	0	7408	36+56	37+82	2046	65	1.04	2137	36+00	36+61	3095	0	0	3095	36+61	37+67	4568	1	4350	218	36+61	37+67	747	60	1.03	770
							37+94	53+26	71722	5	21750	49972	37+94	41+38	4349	60	1.03	4482	42+57	43+11	2535	0	0	2535	38+00	42+57	22597	1	4350	18247	38+00	39+88	9729	100	1.12	10906
													44+22	47+63	4688	65	1.04	4896	52+10	52+46	1422	0	0	1422	43+11	52+10	43080	2	8700	34380	39+88	41+21	22792	200	1.26	28632
													48+25	53+26	27450	115	1.15	31485							52+46	53+26	5111	1	4350	761	41+21	42+57	5700	100	1.12	6389
																															43+11	44+70	4830	90	1.10	5321
																															44+70	48+30	9980	75	1.07	10670
																															48+30	50+43	11795	90	1.10	12994
																															50+43	52+10	6095	80	1.08	6586
																															52+46	53+26	3050	0	0.00	0
Sub-total						**0**						**57,380**			**38,533**			**42,999**						**7,052**						**53,606**			**74,718**			**82,269**
Gordon to Caswell							54+07	60+21	30987	1	4350	26637	54+07	55+24	13009	115	1.15	14921	59+88	60+21	1401	0	0	1401	54+07	58+96	23679	1	4350	19329	54+07	55+24	1457	65	1.04	1522
													55+24	56+44	4158	75	1.07	4446							59+23	59+88	4229	0	0	4229	55+24	56+44	2061	65	1.04	2152
													56+44	56+90	893	65	1.04	933													56+44	57+02	995	0	0.00	0
													56+90	60+21	17381	110	1.14	19791													57+02	58+07	8168	130	1.17	9559
																															58+07	58+31	6345	200	1.26	7971
																															58+31	58+91	12931	130	1.17	15134
																															58+91	59+88	948	60	1.03	977
Sub-total						**0**						**26,637**			**35,441**			**40,090**						**1,401**						**23,558**			**32,905**			**37,315**
Caswell to Lincoln	62+56	62+77	832	0	0	832	60+78	62+56	7586	0	0	7586	60+78	62+56	4515	80	1.08	4879	63+09	64+81	3172	0	0	3172	60+78	63+09	12484	0	0	12484	60+78	63+09	6819	75	1.07	7291
	67+17	67+74	2682	2	8712	0	62+77	67+17	21487	1	4350	17137	62+77	64+11	5584	85	1.09	6094	68+83	69+10	1240	0	0	1240	64+81	68+83	21554	0	0	21554	64+81	68+83	44946	150	1.20	53854
	84+16	84+23	171	0	0	171	67+74	78+02	49472	1	4350	45122	64+11	65+44	1018	0	0.00	0	72+14	72+62	1947	0	0	1947	69+10	72+14	13634	0	0	13634	69+10	72+14	10396	105	1.13	11747
	84+30	84+36	151	0	0	151	78+20	82+38	21520	0	0	21520	65+44	66+41	5369	100	1.12	6018	77+23	77+74	2376	0	0	2376	72+62	77+23	24881	1	4350	20531	72+62	76+48	51320	160	1.21	62148
							82+46	84+16	9219	0	0	9219	66+41	67+17	1415	65	1.04	1478	80+02	80+52	1676	0	0	1676	77+74	80+02	10347	0	0	10347	76+48	77+23	4077	90	1.10	4492
							84+36	84+88	1288	0	0	1288	67+74	70+57	20482	120	1.16	23658	84+16	84+23	152	0	0	152	80+52	84+16	17388	2	8700	8688	77+74	80+02	4767	75	1.07	5097
							85+03	86+60	6797	0	0	6797	71+04	75+15	11506	80	1.08	12433	84+30	843+36	150	0	0	150	84+36	85+27	4607	1	4350	257	80+52	84+16	6486	80	1.08	7009
							86+91	87+11	1124	0	0	1124	75+15	78+02	10263	125	1.16	11934	85+27	85+73	1879	0	0	1879	85+73	86+60	4206	0	0	4206	84+36	85+27	0	70	1.06	0
							87+36	89+14	10534	0	0	10534	78+20	78+90	794	60	1.03	818							86+91	91+35	20407	1	4350	16057	85+73	86+60	4072	95	1.11	4526
							89+24	91+35	9486	0	0	9486	78+97	82+38	9977	70	1.06	10547							91+54	96+86	25766	0	0	25766	86+91	91+35	22538	115	1.15	25851
							91+54	96+86	27021	1	4350	22671	82+46	82+64	263	60	1.03	271													91+54	96+86	25099	115	1.15	28788
													82+95	83+39	8883	170	1.22	10865																		
													85+08	85+29	1671	120	1.16	1930																		
													87+72	88+34	4036	115	1.15	4629																		
													88+34	88+83	1794	90	1.10	1976																		
													88+83	89+14	1596	80	1.08	1725																		
													89+14	91+35	24701	140	1.18	29263																		
													91+54	96+86	35495	140	1.18	42051																		
Sub-total						**1,154**						**152,484**			**149,362**			**170,568**						**12,592**						**133,524**			**180,520**			**210,802**
UT Adkin	10+00	11+24	277	0	0	277	11+24	16+94	24263	1	4350	19913	11+24	16+94	6963	75	1.07	7445	19+73	21+21	3426	0	0	3426	10+00	19+73	43452	0	0	43452	10+00	19+73	20556	80	1.08	22212
	16+94	17+04	791	0	0	791	17+04	25+55	39909	0	0	39909	17+04	24+73	67973	150	1.20	81445	22+22	22+36	1629	0	0	1629	21+21	22+22	3044	0	0	3044	22+36	23+72	704	60	1.03	726
																			23+72	24+38	3770	0	0	3770	22+36	23+72	5212	0	0	5212	24+38	25+10	798	65	1.04	833
																									24+38	25+55	4080	0	0	4080						
Sub-total						**1,068**						**59,822**			**74,936**			**88,890**						**8,825**						**55,788**			**22,058**			**23,771**
Total						**2,222**						**296,323**			**298,272**			**342,548**						**29,870**						**266,476**			**310,201**			**354,156**

* - For each buffered ditch entering the project area, 0.10 acres was deducted from the corresponding buffer area per Scenario 1 in the *DWQ Memo #2008-019, dated August 19, 2008.*

** - BCF = Buffer Effectiveness Correction Factor. BCF was determined using the Table 1 and the corresponding formula found in section 3a of the DRAFT Regulatory Guidance for the Calculation of Stream and Buffer Mitigation Credit for Buffer Widths Different from Standard Minimum Widths, Version 4.5, July 20, 2010.

LEGEND

- EASEMENT BOUNDARY
- AS–BUILT TOP OF BANK
- < 50′ BUFFER (0 RIPARIAN BUFFER OR NUTRIENT OFFSET BUFFER CREDIT)
- 50′ BUFFER
- 50′ – 200′ BUFFER
- SEWER EASEMENT
- DITCH BUFFER CREDIT DEDUCTION

Florence & Hutcheson
CONSULTING ENGINEERS
5121 Kingdom Way, Suite 100 Raleigh, NC 27607
NC License No: F-0258

ADKIN BRANCH

EAST GORDON ST

WASHINGTON AVE

40+00

45+00

50+00

35+00

50 0 100

SCALE

ADKIN BRANCH CREDIT CALCULATION FIGURES	
SCO#: 050656101	COUNTY: LENOIR
FIGURE D.1	
	DATE: 07/07/11

LEGEND

- EASEMENT BOUNDARY
- AS–BUILT TOP OF BANK
- < 50′ BUFFER (0 RIPARIAN BUFFER OR NUTRIENT OFFSET BUFFER CREDIT)
- 50′ BUFFER
- 50′ – 200′ BUFFER
- SEWER EASEMENT
- DITCH BUFFER CREDIT DEDUCTION

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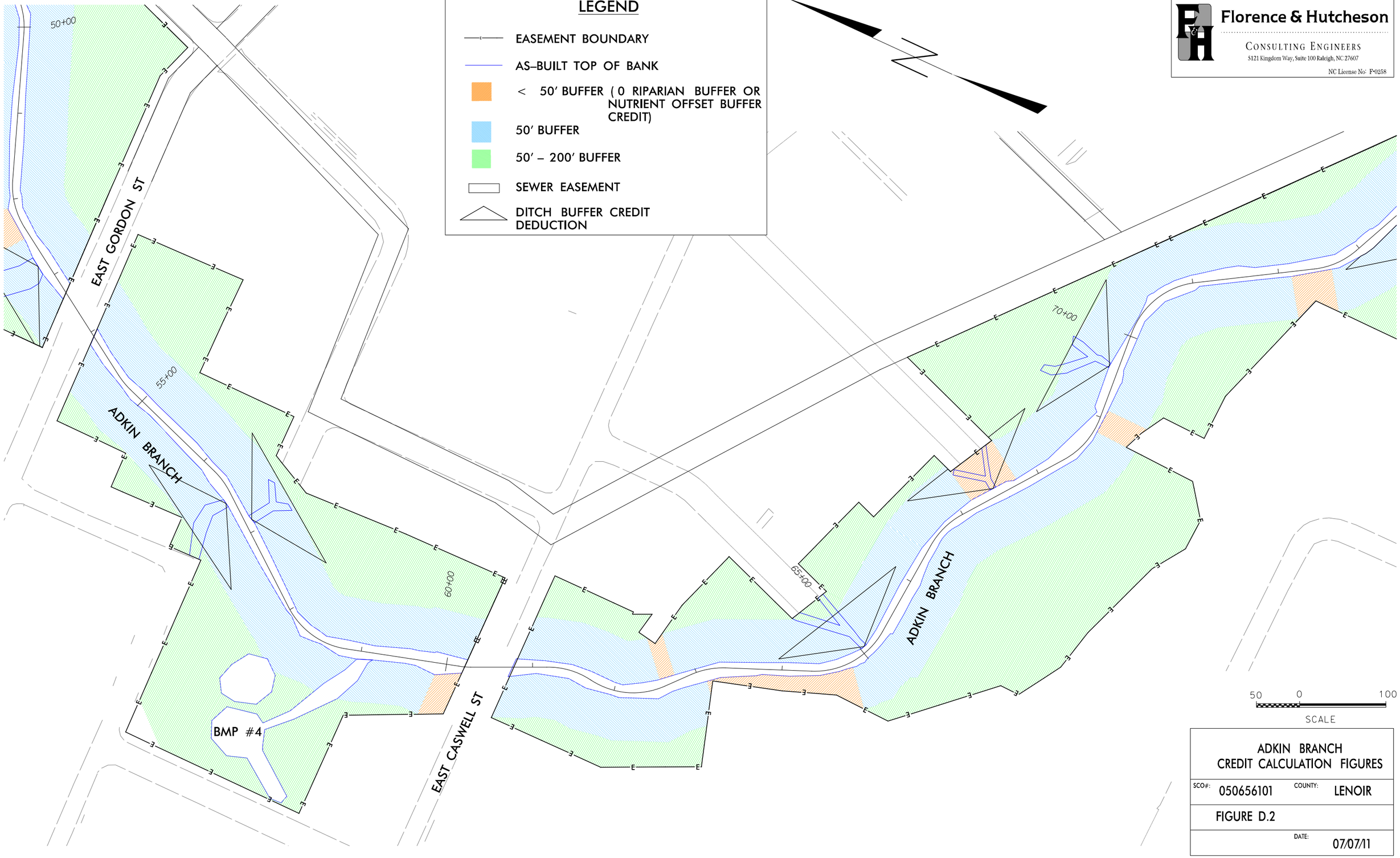

50 0 100
SCALE

ADKIN BRANCH
CREDIT CALCULATION FIGURES

SCO#: 050656101 COUNTY: LENOIR

FIGURE D.2

DATE: 07/07/11

LEGEND

- EASEMENT BOUNDARY
- AS–BUILT TOP OF BANK
- < 50′ BUFFER (0 RIPARIAN BUFFER OR NUTRIENT OFFSET BUFFER CREDIT)
- 50′ BUFFER
- 50′ – 200′ BUFFER
- SEWER EASEMENT
- DITCH BUFFER CREDIT DEDUCTION

Florence & Hutcheson

CONSULTING ENGINEERS

5121 Kingdom Way, Suite 100 Raleigh, NC 27607

NC License No: F-0258

BMP #5

BMP #6

BMP #7

BMP #8

ADKIN BRANCH

UT TO ADKIN BRANCH

75+00

80+00

85+00

25+00

90+00

50 0 100

SCALE

ADKIN BRANCH CREDIT CALCULATION FIGURES

SCO#: 050656101 COUNTY: LENOIR

FIGURE D.3

DATE: 07/07/11

Florence & Hutcheson
CONSULTING ENGINEERS
5121 Kingdom Way, Suite 100 Raleigh, NC 27607
NC License No: F-0258

LEGEND

- EASEMENT BOUNDARY
- AS–BUILT TOP OF BANK
- < 50′ BUFFER (0 RIPARIAN BUFFER OR NUTRIENT OFFSET BUFFER CREDIT)
- 50′ BUFFER
- 50′ – 200′ BUFFER
- SEWER EASEMENT
- DITCH BUFFER CREDIT DEDUCTION

UT TO ADKIN BRANCH
ADKIN BRANCH
HOLLOWAY DR
LINCOLN ST
15+00
20+00
25+00
85+00
90+00
95+00
BMP #7
BMP #8
BMP #9

50 0 100
SCALE

ADKIN BRANCH CREDIT CALCULATION FIGURES

SCO#: 050656101 COUNTY: LENOIR

FIGURE D.4

DATE: 07/07/11

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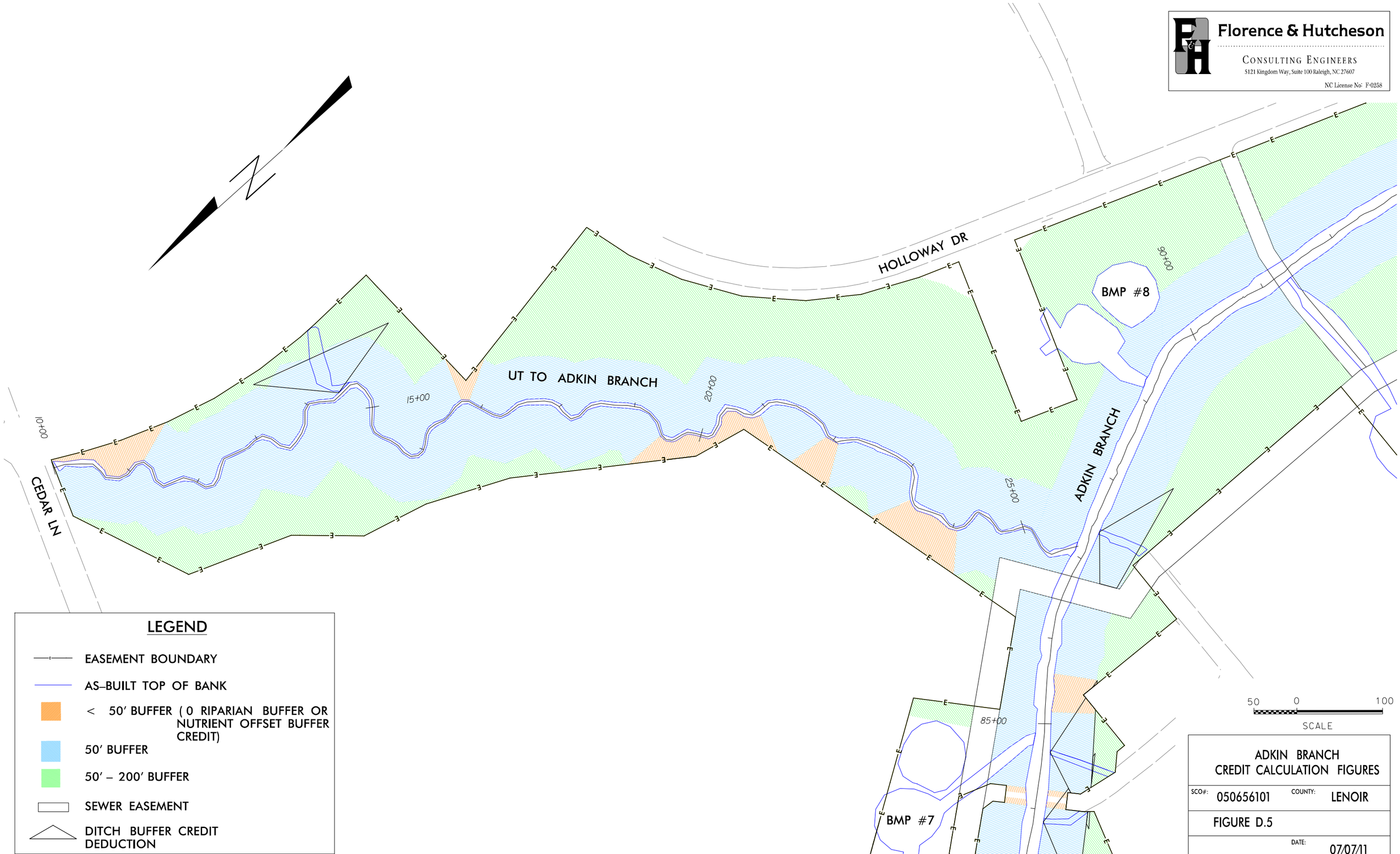


LEGEND

- EASEMENT BOUNDARY
- AS–BUILT TOP OF BANK
- < 50′ BUFFER (0 RIPARIAN BUFFER OR NUTRIENT OFFSET BUFFER CREDIT)
- 50′ BUFFER
- 50′ – 200′ BUFFER
- SEWER EASEMENT
- DITCH BUFFER CREDIT DEDUCTION

50 0 100
SCALE

ADKIN BRANCH CREDIT CALCULATION FIGURES

SCO#: 050656101 COUNTY: LENOIR

FIGURE D.5

DATE: 07/07/11

Appendix E: As-Built/Record Drawing Plan Sheets
(Attached)

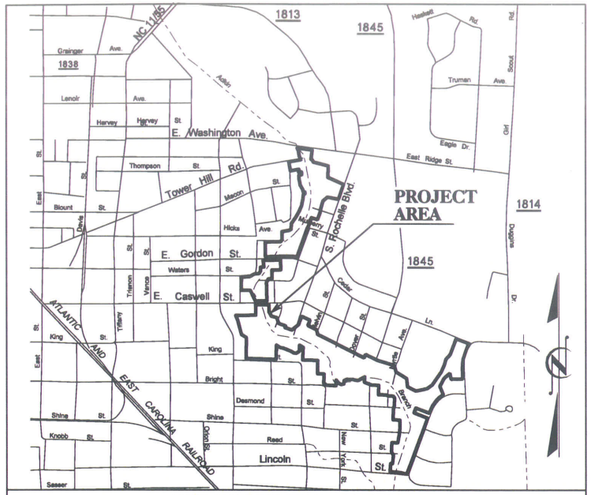
STATE		SHEET NO.	TOTAL SHEETS
N.C.	ADKIN BRANCH	1	13

ADKIN BRANCH
RECORD DRAWINGS
STREAM RESTORATION

LOCATION: KINSTON (LENOIR COUNTY), NORTH CAROLINA
LAT: 35°15'42.5" N LONG: 77°33'55.6" W

RECORD DRAWINGS

This record drawing has been prepared in part, based upon information furnished by others. While this information is believed to be reliable, the Engineer cannot assure its accuracy, and thus is not responsible for the accuracy of this record drawing or for any errors or omissions which may have been incorporated into it as a result. Those relying on this record document are advised to obtain independent verification of its accuracy before applying for any purpose.



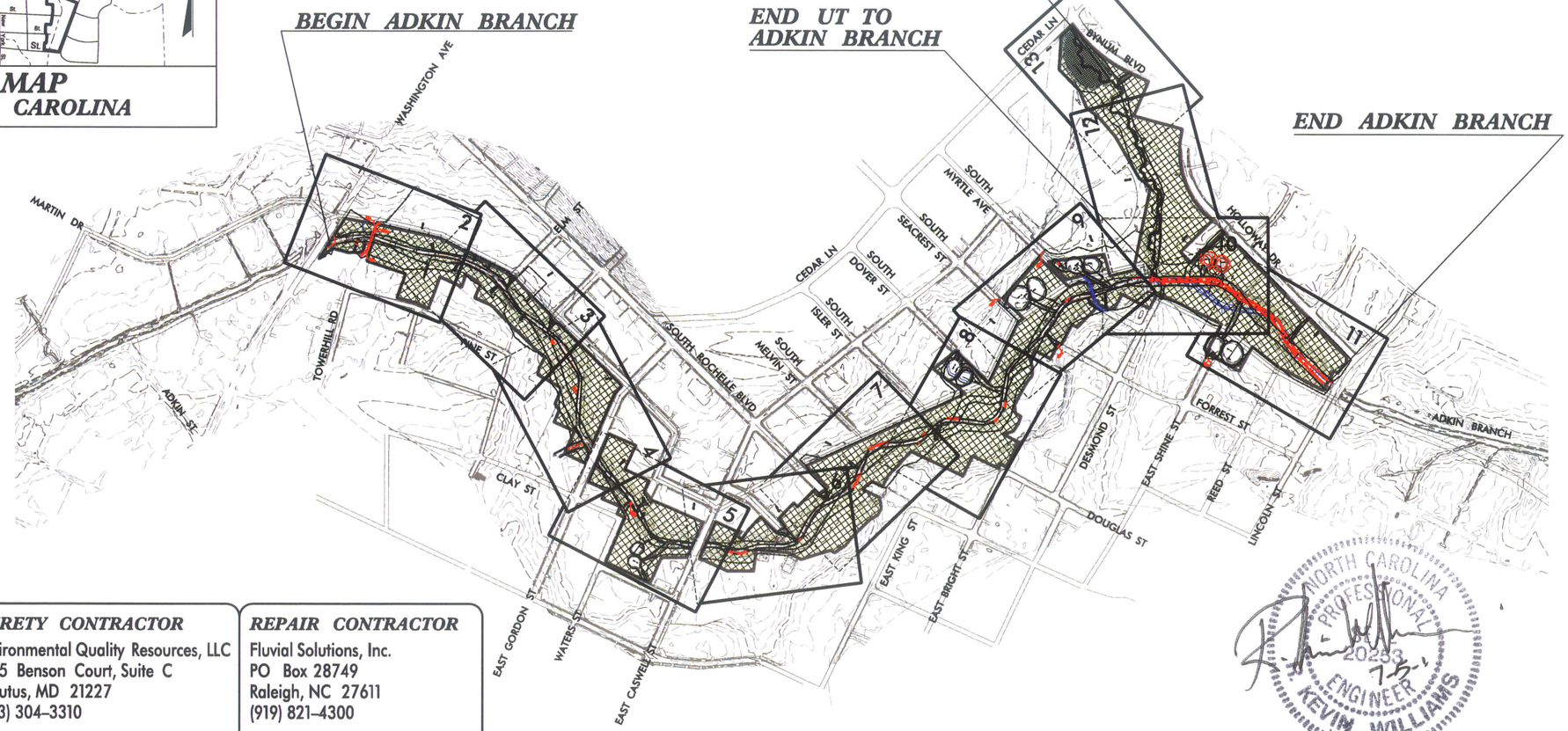
VICINITY MAP
KINSTON, NORTH CAROLINA

BEGIN ADKIN BRANCH

BEGIN UT TO ADKIN BRANCH

END UT TO ADKIN BRANCH

END ADKIN BRANCH



ORIGINAL CONTRACTOR
Appalachian Environmental Services
1165 W. Main Street
Slyva, NC 28779

SURETY CONTRACTOR
Environmental Quality Resources, LLC
1405 Benson Court, Suite C
Arbutus, MD 21227
(443) 304–3310

REPAIR CONTRACTOR
Fluvial Solutions, Inc.
PO Box 28749
Raleigh, NC 27611
(919) 821–4300

GRAPHIC SCALES

25 0 25 50
PLANS

INDEX OF SHEETS

DISTURBED AREA = 49.86 Ac.

PROJECT LENGTH

	ADKIN BRANCH	UT TO ADKIN BRANCH
EXISTING STREAM LENGTH =	8,392 FT	1,200 FT
CONSTRUCTED STREAM LENGTH =	5,922 FT	1,582 FT

Ecosystem Enhancement PROGRAM

OWNER CONTACT:

KRISTIE CORSON
EEP PROJECT MANAGER

LIN XU
REVIEW COORDINATOR

Prepared In the Office of:

Florence & Hutcheson
CONSULTING ENGINEERS
5121 KINGDOM WAY, SUITE 100
RALEIGH, N.C. 27607
(919) 851-6066
License No: P-0258

R. KEVIN WILLIAMS
PROJECT ENGINEER

RYAN V. SMITH
PROJECT DESIGNER

NORTH CAROLINA PROFESSIONAL 2033 ENGINEER KEVIN WILLIAMS

CONTRACT: ADKIN BRANCH

SCO: 050656101

6/16/2011
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ADKIN BRANCH RECORD DRAWINGS

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CONSULTING ENGINEERS
5121 Kingdom Way, Suite 100 Raleigh, NC 27607
NC License No: P-0256

PROJECT REFERENCE NO.	SHEET NO.
ADKIN BRANCH	2
PROJECT ENGINEER	

RECORD DRAWINGS

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25 0 50
SCALE

NORTH CAROLINA PROFESSIONAL 20253 ENGINEER KEVIN WILLIAMS

LEGEND

- LIMITS OF DISTURBANCE
- CONSERVATION EASEMENT LINE
- THALWEG
- BANKFULL
- TOE OF SLOPE
- FENCE LINE
- LOG CROSS VANE
- LOG VANE
- LOG SILL
- CONSTRUCTION REVISIONS
- ORIGINAL CONSTRUCTION PLANS
- IMPERVIOUS CHANNEL PLUG
- STREAMSIDE ASSEMBLAGE PLANTING ZONE
- COASTAL PLAIN LEVEE FOREST PLANTING ZONE

WASHINGTON AVENUE

BEGIN ADKIN BRANCH

40+00

GRAVEL WALK

PEDESTRIAN BRIDGE

GRASS SWALE

24" RCP

GUARDRAIL

HEADWALL

CHARLES B. STEWART ALUMNI CENTER

-MATCHLINE- SEE SHEET NO. 3

RECORD DRAWINGS ADKIN BRANCH		
SCO#: 050656101	COUNTY: LENOIR	
DESIGNED BY: RVS		
CHECKED BY: RKW	DATE: 6/10/11	

6/16/2011
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ADKIN BRANCH RECORD DRAWINGS

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NC License No: P-0258

PROJECT REFERENCE NO.	SHEET NO.
ADKIN BRANCH	3
PROJECT ENGINEER	

RECORD DRAWINGS

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NORTH CAROLINA PROFESSIONAL SEAL 20253 ENGINEER R. KEVIN WILLIAMS

25 0 50
SCALE

NOTE:
PIPE INSTALLED BY THE CITY OF KINSTON WITHIN EASEMENT TO BE REMOVED BY THE CITY.

BALL FIELD

ELM STREET

MULBERRY STREET

SYCAMORE STREET

PINE STREET

HICKS AVENUE

45+00

72"CHL

72"CONC

48"CHL

ISBKAPT

ISFD

ISBLKD

GRASS SWALE

RIP-RAP SWALE

18"RCP

SEWER PLUG

EXISTING 15" RCP

EXISTING YARD INLET

STORAGE BUILDINGS

SOIL

-MATCHLINE- SEE SHEET NO. 2

-MATCHLINE- SEE SHEET NO. 4

LEGEND

- LIMITS OF DISTURBANCE
- CONSERVATION EASEMENT LINE
- THALWEG
- BANKFULL
- TOE OF SLOPE
- FENCE LINE
- ROOTWAD
- LOG VANE
- LOG SILL
- CONSTRUCTION REVISIONS
- ORIGINAL CONSTRUCTION PLANS
- IMPERVIOUS CHANNEL PLUG
- STREAMSIDE ASSEMBLAGE PLANTING ZONE
- COASTAL PLAIN LEVEE FOREST PLANTING ZONE

RECORD DRAWINGS ADKIN BRANCH		
SCO #: 050656101	COUNTY:	LENOIR
DESIGNED BY:	RVS	
CHECKED BY:	RKW	DATE: 6/10/11

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ADKIN BRANCH RECORD DRAWINGS

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PROJECT REFERENCE NO.	SHEET NO.
ADKIN BRANCH	4
PROJECT ENGINEER	

RECORD DRAWINGS

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NORTH CAROLINA PROFESSIONAL SEAL 025375 ENGINEER KEVIN WILLIAMS

25 0 50
SCALE

SYCAMORE ROAD
EAST GORDON STREET
CHESTNUT STREET
50+00
55+00
-MATCHLINE- SEE SHEET NO. 3
-MATCHLINE- SEE SHEET NO. 5
SEWER PLUG
CULVERT 3-9X10 BARRELS
GRASS SWALE
GUARDRAIL
15" RCP
18" RCP
15" PIPE
15" DI CONC
ISBD
CONC
HTR
ISFD
OHE
48"CHL

LEGEND

- LIMITS OF DISTURBANCE
- CONSERVATION EASEMENT LINE
- THALWEG
- BANKFULL
- TOE OF SLOPE
- LOG CROSS VANE
- LOG VANE
- LOG SILL
- CONSTRUCTION REVISIONS
- ORIGINAL CONSTRUCTION PLANS
- IMPERVIOUS CHANNEL PLUG
- STREAMSIDE ASSEMBLAGE PLANTING ZONE
- COASTAL PLAIN LEVEE FOREST PLANTING ZONE

RECORD DRAWINGS ADKIN BRANCH		
SCO#: 050656101	COUNTY: LENOIR	
DESIGNED BY: RVS		
CHECKED BY: RKW	DATE: 6/10/11	

6/16/2011
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ADKIN BRANCH RECORD DRAWINGS

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NC License No: P-0268

PROJECT REFERENCE NO.	SHEET NO.
ADKIN BRANCH	5
PROJECT ENGINEER	

RECORD DRAWINGS

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25 0 50
SCALE

NORTH CAROLINA PROFESSIONAL SEAL 20293 ENGINEER KEVIN WILLIAMS

LEGEND

- LIMITS OF DISTURBANCE
- CONSERVATION EASEMENT LINE
- THALWEG
- BANKFULL
- TOE OF SLOPE
- LOG CROSS VANE
- LOG VANE
- LOG SILL
- CONSTRUCTION REVISIONS
- ORIGINAL CONSTRUCTION PLANS
- IMPERVIOUS CHANNEL PLUG
- STREAMSIDE ASSEMBLAGE PLANTING ZONE
- COASTAL PLAIN LEVEE FOREST PLANTING ZONE

-MATCHLINE- SEE SHEET NO. 4

-MATCHLINE- SEE SHEET NO. 6

SYCAMORE ROAD

NORTH CYPRESS STREET

CLAY STREET

WATERS STREET

EAST CASWELL STREET

GRASS SWALE

RIP RAP SWALE

10' OF RIP RAP BURIED

END EXISTING 15" RCP

2-41 PVC

T-IRON

C-WEIR

BMP #4

CULVERT 2 3-9'X10' BARRELS

60+00

CANOPY

ISBKD

ISFD

ISBK

SOIL

RST

END/EXISTING 15" RCP

30"BLK STL

48"CONC

27" CONC

18" CONC

24" CONC

12" CONC

10' CONC

20" CONC

48"CMP

48"CHL

RECORD DRAWINGS
ADKIN BRANCH

BCO#:	050656101	COUNTY:	LENOIR
DESIGNED BY:	RVS		
CHECKED BY:	RKW	DATE:	6/10/11

6/16/2011
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ADKIN BRANCH RECORD DRAWINGS

LEGEND

- LIMITS OF DISTURBANCE
- CONSERVATION EASEMENT LINE
- THALWEG
- BANKFULL
- TOE OF SLOPE
- ROOTWAD
- LOG CROSS VANE
- LOG VANE
- LOG SILL
- SOIL LIFT
- CONSTRUCTION REVISIONS
- ORIGINAL CONSTRUCTION PLANS
- IMPERVIOUS CHANNEL PLUG
- STREAMSIDE ASSEMBLAGE PLANTING ZONE
- COASTAL PLAIN LEVEE FOREST PLANTING ZONE

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PROJECT REFERENCE NO.	SHEET NO.
ADKIN BRANCH	6
PROJECT ENGINEER	

RECORD DRAWINGS

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NORTH CAROLINA PROFESSIONAL SEAL 202537 ENGINEER R. KEVIN WILLIAMS

25 0 50
SCALE

RECORD DRAWINGS ADKIN BRANCH		
SCO#: 050656101	COUNTY: LENOIR	
DESIGNED BY: RVS		
CHECKED BY: RKW	DATE: 6/10/11	

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ADKIN BRANCH RECORD DRAWINGS

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25 0 50
SCALE

PROJECT REFERENCE NO.	SHEET NO.
ADKIN BRANCH	7
PROJECT ENGINEER	

RECORD DRAWINGS

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SOUTH ROCHELLE BLVD.

SOUTH MELVIN STREET

10+00

RIPRAP SWALE

RIP RAP SWALE

EXISTING PAVEMENT

EXISTING FENCE

ISBKD

ISFD

SHED

HTR

72"CHL

36"CHL

48"CONC

CONC

-MATCHLINE- SEE SHEET NO. 6

-MATCHLINE- SEE SHEET NO. 8

NORTH CAROLINA PROFESSIONAL SEAL 20253 ENGINEER R. KEVIN WILLIAMS 7-5-11

LEGEND

- LIMITS OF DISTURBANCE
- CONSERVATION EASEMENT LINE
- THALWEG
- BANKFULL
- TOE OF SLOPE
- ROOTWAD
- LOG VANE
- LOG SILL
- SOIL LIFT
- CONSTRUCTION REVISIONS
- ORIGINAL CONSTRUCTION PLANS
- IMPERVIOUS CHANNEL PLUG
- STREAMSIDE ASSEMBLAGE PLANTING ZONE
- COASTAL PLAIN LEVEE FOREST PLANTING ZONE

RECORD DRAWINGS ADKIN BRANCH		
SCO#: 050656101	COUNTY: LENOIR	
DESIGNED BY: RVS		
CHECKED BY: RKW	DATE: 6/10/11	

6/6/2011
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ADKIN BRANCH RECORD DRAWINGS

LEGEND

- LIMITS OF DISTURBANCE
- CONSERVATION EASEMENT LINE
- THALWEG
- BANKFULL
- TOE OF SLOPE
- ROOTWAD
- LOG VANE
- LOG SILL
- SOIL LIFT
- CONSTRUCTION REVISIONS
- ORIGINAL CONSTRUCTION PLANS
- IMPERVIOUS CHANNEL PLUG
- STREAMSIDE ASSEMBLAGE PLANTING ZONE
- COASTAL PLAIN LEVEE FOREST PLANTING ZONE

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PROJECT REFERENCE NO.	SHEET NO.
ADKIN BRANCH	8
PROJECT ENGINEER	

RECORD DRAWINGS

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25 0 50
SCALE

NORTH CAROLINA PROFESSIONAL SEAL 20253 ENGINEER R. KEVIN WILLIAMS

-MATCHLINE- SEE SHEET NO. 7

-MATCHLINE- SEE SHEET NO. 9

BMP #5
C-WEIR
GRASS SWALE
DOVER STREET
75+00
END/EXISTING 24" RCP
2-4" PVC
15" CONC
MH
36" GUM
30" OAK
48" OAK
72" OAK
40" GUM
ISFD
ISBK APT
ISBK APT
ISBK APT
SOIL
SOIL
SOIL
CONC

RECORD DRAWINGS ADKIN BRANCH	
SCO#: 050656101	COUNTY: LENOIR
DESIGNED BY: RVS	
CHECKED BY: RKW	DATE: 6/10/11

6/16/2011
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ADKIN BRANCH RECORD DRAWINGS

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PROJECT REFERENCE NO.	SHEET NO.
ADKIN BRANCH	9
PROJECT ENGINEER	

RECORD DRAWINGS

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25 0 50
SCALE

NORTH CAROLINA PROFESSIONAL SEAL 20253 ENGINEER R. KEVIN WILLIAMS

LEGEND

- LIMITS OF DISTURBANCE
- CONSERVATION EASEMENT LINE
- THALWEG
- BANKFULL
- TOE OF SLOPE
- ROOTWAD
- LOG CROSS VANE
- LOG SILL
- SOIL LIFT
- CONSTRUCTION REVISIONS
- ORIGINAL CONSTRUCTION PLANS
- IMPERVIOUS CHANNEL PLUG
- STREAMSIDE ASSEMBLAGE PLANTING ZONE
- COASTAL PLAIN LEVEE FOREST PLANTING ZONE

SOUTH SEACREST STREET
SOUTH MYRTLE AVENUE
FORREST STREET
ASPHALT HUMP
ASPHALT HUMP
ASPHALT HUMP
END/EXISTING 24" RCP
80+00
BMP #6
18" RCP
T-IRON
C-WEIR
2-4" PVC
BMP #7
18" RCP
C-WEIR
T-IRON
2-4" PVC
18" RCP
JB
8" PVC
GRAVEL WALK
GRAVEL WALK
PEDESTRIAN WALKWAY
BRIDGE
RIP RAP SWALE
GRASS & RIP RAP SWALE
TENNIS COURTS
EXISTING FENCE
ISBKD
2SBKD
18"BK WALL
8'CONC
10'CONC
48"CONC
30"C&G
8"BST
OHE
-MATCHLINE- SEE SHEET NO. 8
-MATCHLINE- SEE SHEET NO. 10

RECORD DRAWINGS ADKIN BRANCH	
SCO#: 050656101	COUNTY: LENOIR
DESIGNED BY: RVS	
CHECKED BY: RKW	DATE: 6/10/11

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PROJECT REFERENCE NO.	SHEET NO.
ADKIN BRANCH	10
PROJECT ENGINEER	

RECORD DRAWINGS

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25 0 50
SCALE

-MATCHLINE- SEE SHEET NO. 12

-MATCHLINE- SEE SHEET NO. 9

-MATCHLINE- SEE SHEET NO. 11

HOLLOWAY DRIVE

DESMOND STREET

SCORE BOARD

BMP #8

C-WEIR

T-IRON

2-4" PVC

25+00

30

90+00

NORTH CAROLINA PROFESSIONAL SEAL 20253 ENGINEER KEVIN WILLIAMS

LEGEND

- LIMITS OF DISTURBANCE
- CONSERVATION EASEMENT LINE
- THALWEG
- BANKFULL
- TOE OF SLOPE
- ROOTWAD
- LOG CROSS VANE
- LOG VANE
- LOG SILL
- SOIL LIFT
- FLOODPLAIN INTERCEPTOR (FPI)
- CONSTRUCTION REVISIONS
- ORIGINAL CONSTRUCTION PLANS
- IMPERVIOUS CHANNEL PLUG
- STREAMSIDE ASSEMBLAGE PLANTING ZONE
- COASTAL PLAIN LEVEE FOREST PLANTING ZONE

RECORD DRAWINGS
ADKIN BRANCH

SCO#: 050656101 COUNTY: LENOIR
DESIGNED BY: RVS
CHECKED BY: RKW DATE: 6/10/11

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ADKIN BRANCH RECORD DRAWINGS

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PROJECT REFERENCE NO.	SHEET NO.
ADKIN BRANCH	11

PROJECT ENGINEER

RECORD DRAWINGS

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NORTH CAROLINA PROFESSIONAL SEAL 20353 ENGINEER KEVIN WILLIAMS

25 0 50
SCALE

LEGEND

- LIMITS OF DISTURBANCE
- CONSERVATION EASEMENT LINE
- THALWEG
- BANKFULL
- TOE OF SLOPE
- LOG CROSS VANE
- DOUBLE STEP LOG CROSS VANE
- DOUBLE STEP LOG VANE
- LOG SILL
- SOIL LIFT
- CONSTRUCTION REVISIONS
- ORIGINAL CONSTRUCTION PLANS
- IMPERVIOUS CHANNEL PLUG
- STREAMSIDE ASSEMBLAGE PLANTING ZONE
- COASTAL PLAIN LEVEE FOREST PLANTING ZONE

HOLLOWAY DRIVE
REED STREET
GRASS SWALE
95+00
END ADKIN BRANCH
-MATCHLINE- SEE SHEET NO. 10
2-4" PVC
C-WEIR
BMP #9
IRONS
18" RCP
EAST SHINE STREET
ASPHALT HUMP
REED STREET
LINCOLN STREET
42"CONC
36"CHL
18"CONC
15"CONC
ISBKD ABAND
SOIL

RECORD DRAWINGS ADKIN BRANCH		
SCO#: 050656101	COUNTY: LENOIR	
DESIGNED BY: RVS		
CHECKED BY: RKW	DATE: 6/10/11	

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ADKIN BRANCH RECORD DRAWINGS

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PROJECT REFERENCE NO.	SHEET NO.
ADKIN BRANCH	12
PROJECT ENGINEER	

RECORD DRAWINGS

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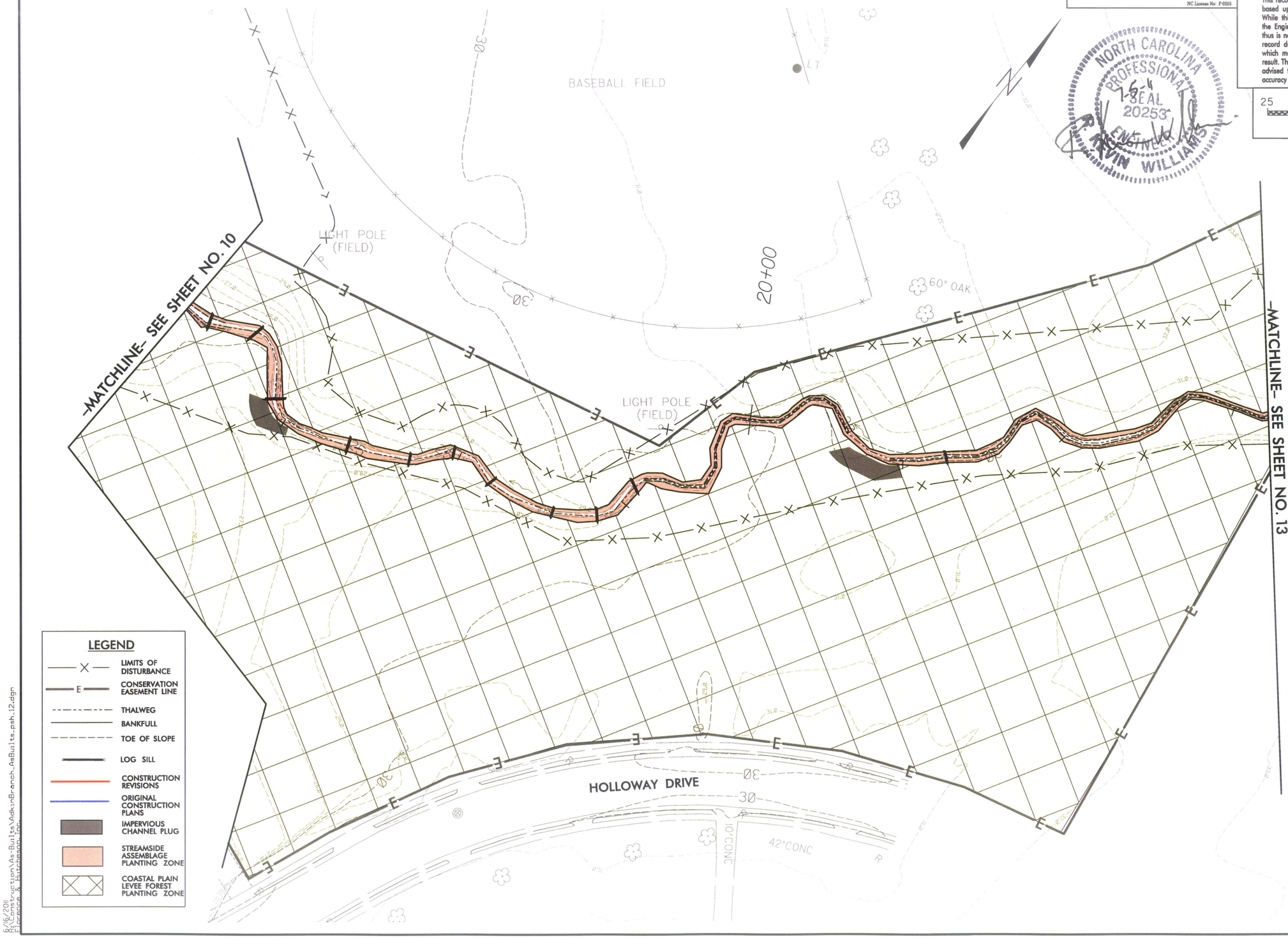
NORTH CAROLINA PROFESSIONAL SEAL 20253 ENGINEER R. KEVIN WILLIAMS

25 0 50
SCALE



RECORD DRAWINGS ADKIN BRANCH	
SCO#: 050656101	COUNTY: LENOIR
DESIGNED BY: RVS	
CHECKED BY: RKW	DATE: 6/10/11

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ADKIN BRANCH RECORD DRAWINGS

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PROJECT REFERENCE NO.	SHEET NO.
ADKIN BRANCH	13
PROJECT ENGINEER	

RECORD DRAWINGS

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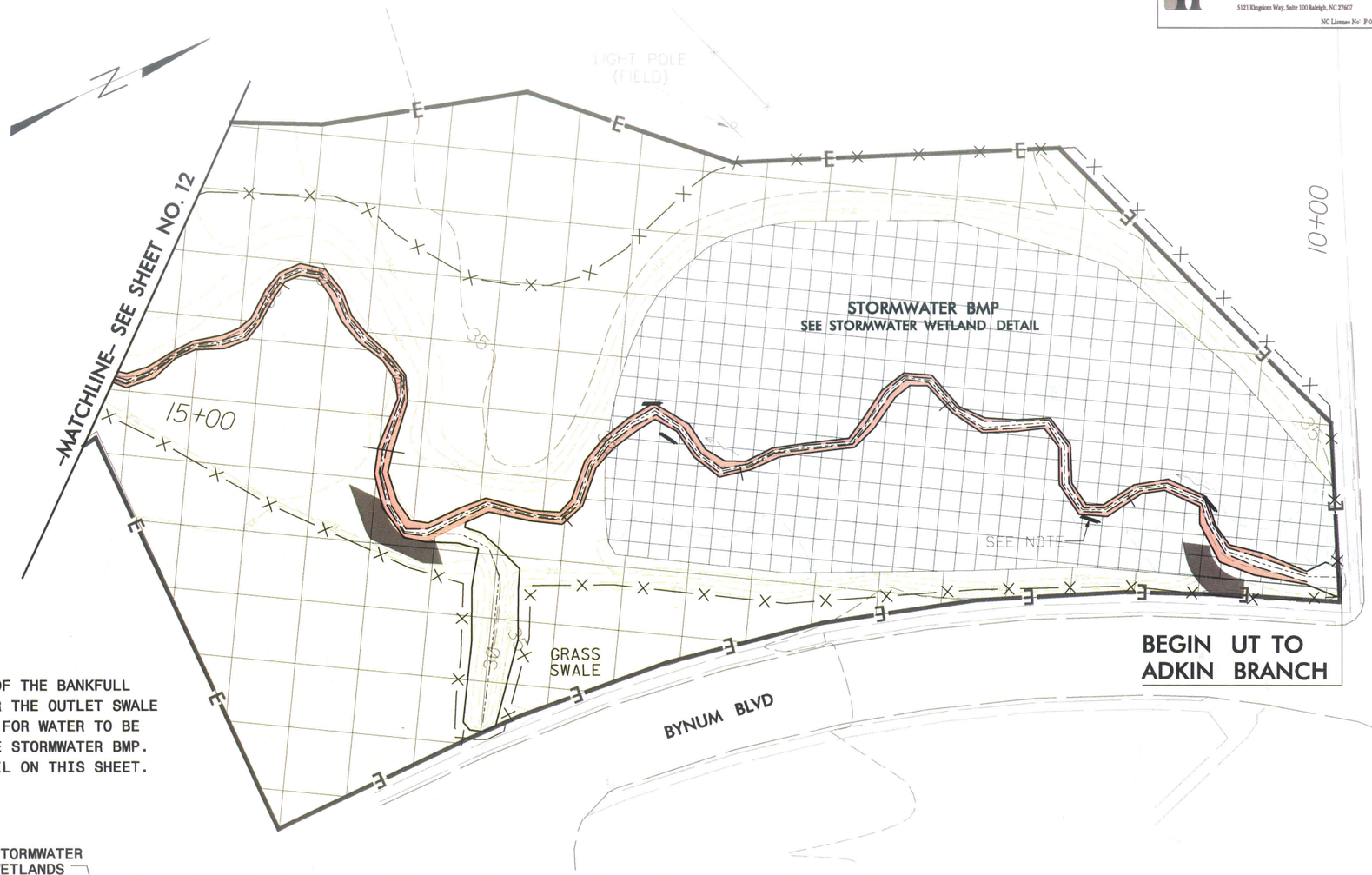
25 0 50
SCALE

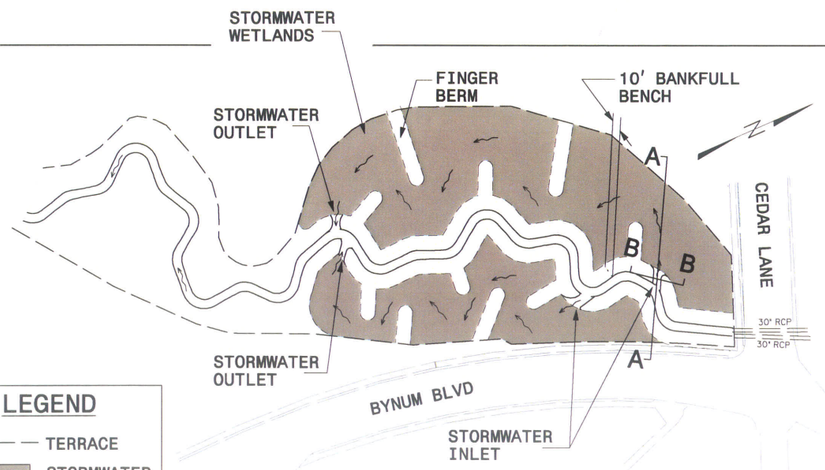
NORTH CAROLINA PROFESSIONAL SEAL 20253 ENGINEER R. KEVIN WILLIAMS

LEGEND

- LIMITS OF DISTURBANCE
- CONSERVATION EASEMENT LINE
- THALWEG
- BANKFULL
- TOE OF SLOPE
- LOG SILL
- CONSTRUCTION REVISIONS
- ORIGINAL CONSTRUCTION PLANS
- IMPERVIOUS CHANNEL PLUG
- STREAMSIDE ASSEMBLAGE PLANTING ZONE
- COASTAL PLAIN LEVEE FOREST PLANTING ZONE
- COASTAL PLAIN LEVEE FOREST PLANTING ZONE



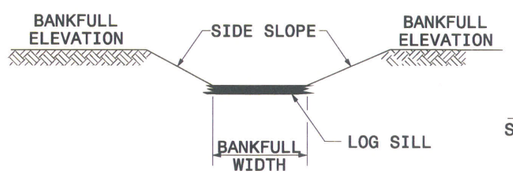
NOTE:
LOG SILLS PLACED OUTSIDE OF THE BANKFULL CHANNEL MAINTIAN GRADE FOR THE OUTLET SWALE AT HALF BANKFULL TO ALLOW FOR WATER TO BE DISTRIBUTED THROUGHOUT THE STORMWATER BMP. SEE THE CONSTRUCTION DETAIL ON THIS SHEET.



LEGEND

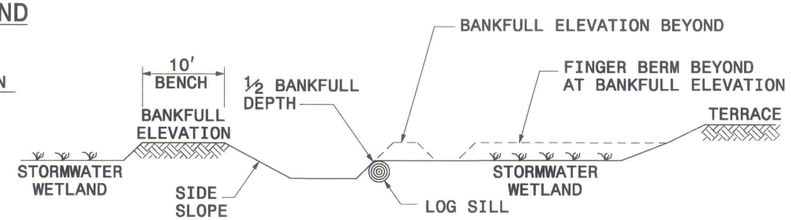
- TERRACE
- STORMWATER WETLAND

STORMWATER WETLAND



STORMWATER INLET/OUTLET
CROSS-SECTION
SECTION B-B

NOTES:
1. INVERT SET AT ½ BANKFULL DEPTH.
2. LOG SILL SET AT INVERT TO PROTECT FROM SCOUR.
3. BASE WIDTH SHALL BE ½ BANKFULL CHANNEL BASE WIDTH. SIDE SLOPES SHALL BE BUILT AT A 3:1 SLOPE.



STORMWATER INLET/OUTLET
PROFILE
SECTION A-A

NOTES:
1. STORMWATER WETLAND'S ELEVATION SHALL BE SET AT ½ THE BANKFULL DEPTH UP FROM CHANNEL INVERT.

RECORD DRAWINGS ADKIN BRANCH			
SCO#: 050656101	COUNTY: LENOIR		
DESIGNED BY: RVS			
CHECKED BY: RKW	DATE: 6/10/11		

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