STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

PAT L. MCCRORY
GOVERNOR

ANTHONY J. TATA
SECRETARY

February 4, 2014

MEMORANDUM TO: Mr. Mike Mills, P.E.
Division 7 Engineer

FROM: Philip S. Harris, III, P.E., Section Head
Natural Environment Section
Project Development and Environmental Analysis Unit

SUBJECT: New location facility from SR 2011 to the Haw River at US 220, Greensboro, Guilford County. WBS No. 34429.1.1
TIP R-2413A&B

Please find attached the USACE Section 404 Individual Permit and NCDWQ Section 401 Water Quality Certification for the above-referenced project. All environmental permits have been received for the construction of this project.

A copy of this permit package will be posted on the NCDOT website at:
https://connect.ncdot.gov/resources/Environmental/Pages/default.aspx

Cc:
Mr. Randy Garris, P.E., State Contract Officer
Mr. Jerry Parker, Division Environmental Officer
Mr. Majed Alghandour, P.E., Programming and TIP
Mr. Jay Bennett, P.E., Roadway Design
Mr. Art McMillian, P.E., Hydraulics
Mr. Tom Koch, P.E., Structure Design
Mr. Mark Stalely, Roadside Environmental
Mr. Ron Hancock, P.E., State Roadway Construction Engineer
Mr. Eric Midkiff, P.E., PDEA Central Unit
Mr. Clarence Coleman, FHWA
Mr. Chris Militscher, EPA
Mr. Beth Harmon, EEP
Mr. Phillip Ayscue, Office of Inspector General
Ms. Leilani Paugh, Natural Environment Section
Mr. Randy Griffin, Natural Environment Section
Mr. Lonnie Brooks, Transportation Program Management

MAILING ADDRESS:
NC DEPARTMENT OF TRANSPORTATION
PROJECT DEVELOPMENT & ENVIRONMENTAL ANALYSIS UNIT
1598 MAIL SERVICE CENTER
RALEIGH NC 27699-1548

TELEPHONE: 919-707-6000
FAX: 919-212-5785
WEBSITE:NCDOT.GOV

LOCATION:
CENTURY CENTER, BUILDING B
1020 BIRCH RIDGE DRIVE
RALEIGH NC 27610

PROJECT COMMITMENTS

NC 68- US 220 Connector
From NC 68 at SR 2133 to existing intersection of NC 68 and US 220
Guilford and Rockingham Counties
WBS Element 34429.1.1
TIP Project R-2413

COMMITMENTS FROM PROJECT DEVELOPMENT AND DESIGN

Current status, changes, or additions to the project commitments as shown in the environmental document for the project are printed in italics. All commitments, which are not pertinent to R-2413-A & B have been grayed out.

Hydraulics Unit/ Roadside Environmental Unit:

- Best Management Practices will be employed.
  Action: Standard Commitment.

Roadway Design Unit/ PDEA Unit/ Division 7:

- NCDOT will coordinate with resource agencies (USCOE, USFWS, NCWRC and DEM) during the permitting phase of the project to develop a mutually agreeable mitigation plan.

  Mitigation opportunities will be explored that will provide for wetland restoration, enhancement, and/or creation within the same drainage as the wetland loss.

  Action: There is ongoing coordination with the resource agencies. Mitigation plans to be included with the permit application.

  The use of previously converted farmland will be explored for wetland restoration sites.

  Action: No suitable sites found.

  The donation of orphaned plots (uneconomic remnants) of farmland and forest to the county greenway and/or parks and recreation programs will be considered

  Action: This will be addressed after project construction by Division 7.

Roadway Design/Hydraulics/ Structures/ PDEA/ Roadside Environmental:

- There will be continuing efforts for cooperation between NCDOT and the resource agencies with respect to the crossings of Reedy Fork Creek and the Haw River.

  NCDOT will construct a hazardous spill catch basin (HSCB) at the Reedy Fork Creek Crossing, which lies within the Greensboro watershed. Additional HSCBs will be considered for other locations within the Greensboro Watershed during the development of preliminary and final design plans.

  NCDOT will provide a self-contained bridge drainage system for the crossing of Reedy Fork Creek. The bridge drainage will be tied in with the hazardous spill catch basin.

  Action: This commitment will not be implemented. NCDOT policy does not require the construction of HSCB basin at this site. A Basin is not required if it is over 1/2 mile from the critical area of a stream classified WS-III (Reedy Fork). This project is at 1.9 miles from the critical area. BMP's on the design plans are avoiding direct discharge into the surface water and discharging as far away from the surface water as practicable. Also grassed swales and preformed scour holes are being used where practicable. No hazardous catch basin is being constructed.

  NCDOT will provide bridged crossings of Reedy Fork Creek and the Haw River that allow wildlife, pedestrian, and equestrian access along both sides of the waterway. The Reedy Fork Creek crossing will provide 10 feet of natural surface on one bank, and 10 feet of natural surface as well as 10 feet of stabilized trail on the other bank for passage beneath the bridge. *The Haw River crossing will provide 10 feet of natural surface on each side of the channel for passage beneath the bridge.*

  Action: The bridge length will accommodate wildlife, pedestrian and equestrian access per the commitment. The trail will be stabilized with vegetation.

PDEA Unit:

- NCDOT will coordinate with the USCOE and the NC Department of Cultural Resources (NCDCR) regarding the possible need for archaeological survey in the vicinity of 404 permit areas to assess the nature, extent, condition and significance of archaeological resources that might be damaged or destroyed by the proposed action.

Action: Coordination between USACE and NCDCR was completed in 2007; Concurrence in November 2007 from SHPO concluded no property is eligible for the National Register.

Contract and Proposal Unit/ Division 7:

- NCDOT will attempt to salvage merchantable timber during the clearing of right-of-way for the project. NCDOT's general contract for right-of-way c1earing provides opportunity for contractors to market saleable trees.

  Action: This commitment is standard and general in NCDOT contracts.

Roadway Design Unit/ Hydraulics Unit/ Structures Unit:

- The project will include pedestrian culverts at Brookbank Road and at the abandoned railroad. At Deboe Road, a 7.5-foot offset will be included on one side of the bridge for the accommodation of future sidewalks.

  Action: (14'X10') pedestrian culverts are included at the Brookbank Road and the abandoned railroad. Also, a 7.5 foot off-set is included for future sidewalks at Deboe Road, Alcorn Road and Bunch Road.

- NCDOT committed to altering their design plans for the southbound off-ramp at NC 150 to avoid direct impacts to the private recreation center for the Henson Forest subdivision.

  Action: The current design avoids any impacts to the recreation center.

- NCDOT agreed to include equalizer pipes in the design for water flow between the wetland areas, and include sills in the culverts to prevent head cuts at a crossing of an unnamed tributary to Reedy Fork Creek.

  Action: The current design includes 10'X10' equalizer culvert, sills are included in pipes where required and necessary.

- NCDOT will construct a single 7-foot by 8-foot culvert at a crossing of unnamed tributary to Haw River.

  Action: The current design includes 10'X8' culvert with sills.

PDEA Unit:

- *Based on preliminary noise studies, NCDOT will evaluate noise abatement measures at the following locations during final design:*

  -Golden Acres Subdivision south of Alcorn Road
  -Trailer court at US 220 and NC 65
  -Trailer court across US 220 from Spotswood Road
  -Homes west of US 220 at Ogborn Mill Road (SR 1100)
  -Homes east of US 220 at Ogborn Mill Road (SR 1100)

NOTE: Noise Barriers: For the updated traffic noise analysis prepared in April 2009, only one barrier was found to be reasonable and feasible. This barrier is located along Section C near Spotswood Road, north of the Connector/US 220 interchange from Station 34+80 to Station 39+60. This barrier is 19 feet high and 1,576 feet long and is located on the west side of US 220.

COMMITMENTS DEVELOPED FROM PERMITTING

Natural Environment Engineering Group and Onsite Mitigation Group:

404 condition 20
Mitigation:

A. In Lieu Fee: In order to compensate for impacts associated with this permit, mitigation shall be provided in accordance with the provisions outlined on the most recent version of the attached Compensatory Mitigation Responsibility Transfer Form. The requirements of this form, including any special conditions listed on this form, are hereby incorporated as special conditions of this permit authorization.

B. Permittee Responsible Mitigation:
1. The Permittee shall fully implement the compensatory mitigation plan, entitled, R-2413 A & B, Plan for Onsite Mitigation, dated (revised) July 1, 2013 for the unavoidable impacts to 3,155 linear feet of streams. Activities prescribed by this plan shall be initiated prior to, or concurrently with, commencement of any construction activities within jurisdictional areas authorized by this permit. The permittee shall (re-establish, rehabilitate, enhance, establish) 3,155 linear feet of streams in accordance with the plan with the following conditions:

a) The permittee, NCDOT, is the party responsible for the implementation, performance and long term management of the compensatory mitigation project.

b) Any changes or modifications to your mitigation plan shall be approved by the Corps.

c) The permittee shall maintain the entire mitigation site in its natural condition, as altered by the work in the mitigation plan, in perpetuity. Prohibited activities within the mitigation site specifically include, but are not limited to: filling; grading; excavating; earth movement of any kind; construction of roads, walkways, buildings, signs, or any other structure; any activity that may alter the drainage patterns on the property; the destruction, cutting, removal, mowing, or other alteration of vegetation on the property; disposal or storage of any garbage, trash, debris or other waste material; graze or water animals, or use for any agricultural or horticultural purpose; or any other activity which would result in the property being adversely impacted or destroyed, except as specifically authorized by this permit.

d) All mitigation areas shall be monitored for a minimum of 5 years or until deemed successful by the Corps in accordance with the monitoring requirements included in the mitigation plan.

2. Remedial Mitigation Plan: If the compensatory mitigation fails to meet the performance standards 5 years after completion of the compensatory mitigation objectives, the compensatory mitigation will be deemed unsuccessful. Within 60 days of notification by the Corps that the compensatory mitigation is unsuccessful, the Permittee shall submit to the Corps an alternate compensatory mitigation proposal to fully offset the functional loss that occurred as a result of the project. The alternate compensatory mitigation proposal may be required to include additional mitigation to compensate for the temporal loss of wetland function associated with the unsuccessful compensatory mitigation activities. The Corps reserves the right to fully evaluate, amend, and approve or reject the alternate compensatory mitigation proposal. Within 120 days of Corps approval, the Permittee will complete the alternate compensatory mitigation proposal.

3. Mitigation Release: The Permittee's responsibility to complete the required compensatory mitigation, as set forth in the Compensatory Mitigation Special Condition of this permit will not be considered fulfilled until mitigation success has been demonstrated and written verification has been provided by the Corps. A mitigation area which has been released will no longer require monitoring or reporting by the Permittee; however the Permittee, Successors and subsequent Transferees remain perpetually responsible to ensure that the mitigation area(s) remain in a condition appropriate to offset the authorized impacts in accordance with the approved mitigation and monitoring plan and the general and special conditions of this permit.

<u>401 condition 4</u>
Compensatory mitigation for impacts to 8,171 linear feet of streams for the R-2413A project and 3,594 for the R-2413B project at a replacement ration of 1:1 is required. Compensatory mitigation for impacts to jurisdictional streams shall be provided by onsite stream relocations of 2,180 linear feet of stream for the R-2413A project and 765 linear feet for the R-2413B project. The onsite stream relocation shall be constructed in accordance with the design submitted in your application dated received July 19, 2013 and August 23, 2013. All onsite mitigation sites shall be protected in perpetuity by a conservation easement or through NCDOT fee simple acquisition and recorded in the NCDOT Natural Environment Section mitigation geodatabase. Please be reminded that as-builts for the completed streams shall be submitted to the North Carolina Division of Water Resources 401 Wetland Unit with the as-builts for the rest of the project. If the parameters of this condition are not met, then the permittee shall supply additional stream mitigation for the 2,180 linear feet of impacts. All channel relocations will be constructed in a dry work area, will be completed and stabilized, and must be approved on site by NCDWR staff, prior to diverting water into the new channel. Whenever possible, channel relocations shall be allowed to stabilize for an entire growing season. All stream relocations shall have a 50-foot wide native wooded buffer planted on both sides of the stream unless otherwise authorized by this Certification. A transitional phase

incorporating rolled erosion control product (RECP) and appropriate temporary ground cover is allowable.

401 condition 5
The stream mitigation site shall be monitored annually for five years or until success criteria are satisfied. Monitoring protocols shall follow the Monitoring Level I outlined in the Stream Mitigation Guidelines, April 2003.

Division 7/ Roadside Environmental Unit:

401 condition 16
For the 1,149 linear feet of streams being impacted due to site dewatering activities, the site shall be graded to its preconstruction contours and revegetated with appropriated native species.

DEPARTMENT OF THE ARMY PERMIT

Permittee: NORTH CAROLINA DEPARTMENT OF TRANSPORTATION - ATTN: MR. RICHARD HANCOCK

Permit No: SAW-2013-00557

Issuing Office: USAED, WILMINGTON

NOTE: The term "you" and its derivatives, as used in this permit, means the permittee or any future transferee. The term "this office" refers to the appropriate district or division office of the Corps of Engineers having jurisdiction over the permitted activity or the appropriate official of the office acting under the authority of the commanding officer.

You are authorized to perform work in the accordance with the terms and conditions specified below.

Project Description: The project, identified as R-2413A&B, consists of the construction of a 7.8 mile, four-lane divided facility on new location. R-2413A&B begins at SR 2011 (Edgefield Road) and extends to the Haw River at US 220 in Summerfield, Guilford County, North Carolina. Total permanent impacts for the construction of this project are 12,912 linear feet of jurisdictional stream channel, 5.47 acres of adjacent wetlands and 0.6 acre of jurisdictional open waters. Total temporary impacts for the construction of this project are 1,151 linear feet of jurisdictional stream channel and 0.18 acre of adjacent wetlands. All impacts are within the Cape Fear River basin (Hydrologic Categorical Unit 03030002).

In order to compensate for impacts associated with this permit, mitigation shall be provided through on-site mitigation as described in the July 18, 2013 mitigation plan, including the revisions provided on January 15, 2014 and in accordance with the provisions outlined on the most recent version of the attached Compensatory Mitigation Responsibility Transfer Form. The requirements of this form, including any special conditions listed on this form, are hereby incorporated as special conditions of this permit authorization.

Project Location: The project, identified as R-2413A&B begins at SR 2011 (Edgefield Road) and extends to the Haw River at US 220 in Summerfield, Guilford County, North Carolina. Segment A starts at SR 2011 (Edgefield Road) and extends to SR 2127 (Brookbank Road) and Segment B starts at SR 2127 and extends to the Haw River at US 220. Coordinates (in decimal degrees) for the site are 36.1775° N, -79.9350° W (NAD83/WGS84). The site contains a portion Reedy Fork, four (4) unnamed tributaries to Brush Creek, thirty-one (31) unnamed tributaries to Reedy Fork and seven (7) unnamed tributaries to the Haw River and fourteen (14) adjacent wetland areas in the Cape Fear River Basin (8-Digit Cataloging Unit 03030002).

Permit Conditions:

General Conditions:

1. The time Limit for completing the work authorized ends on December 31, 2019. **If you find that you need more time to complete the authorized activity, submit your request for a time extension to this office for consideration at least one month before the above date is reached.**

2. You must maintain the activity authorized by this permit in good condition and in conformance with the terms and conditions of this permit. You are not relieved of this requirement if you abandon the permitted activity, although you may make a good faith transfer to a third party in compliance with General Conditions 4 below. Should you wish to cease to maintain the authorized activity or should you desire to abandon it without a good faith transfer, you must obtain a modification of this permit from this office, which may require restoration of the area.

3. If you discover any previously unknown historic or archeological remains while accomplishing the activity authorized by this permit, you must immediately notify this office of what you have found. We will initiate the Federal and state coordination required to determine if the remains warrant a recovery effort or if the site eligible for listing in the National Register of Historic Places.

4. If you sell the property associated with this permit, you must obtain the signature of the new owner in the space provided and forward a copy of the permit to this office to validate the transfer of this authorization.

5. If a conditioned water quality certification has been issued for your project, you must comply with the conditions specified in the certification as special conditions to this permit. For your convenience, a copy of the certification is attached if it contains such conditions.

6. You must allow representatives from this office to inspect the authorized activity at any time deemed necessary to ensure that it is being or has been accomplished in accordance with the terms and conditions of your permit.

Special Conditions:

*SEE ATTACHED SPECIAL CONDITIONS

Further Information:

1. Congressional Authorities: You have been authorized to undertake the activity described above pursuant to:

( ) Section 10 of the Rivers and Harbors Act of 1899 (33 U.S. C. 403).

(X) Section 404 of the clean Water Act (33 U.S.C. 1344)

( ) Section 103 of the Marine Protection, Research and Sanctuaries Act of 1972 (33 U.S.C. 1413).

2. Limits of this authorization.

a. This permit does not obviate the need to obtain other Federal, state, or local authorizations required by law.

b. This permit does not grant any property rights or exclusive privileges.

c. This permit does not authorize any injury to the property or rights of others.

d. This permit does not authorize interference with any existing or proposed Federal project.

3. Limits of Federal Liability. In issuing this permit, the Federal Government does not assume any liability for the following:

a. Damages to the permitted project or uses thereof as a result of other permitted or unpermitted activities or from natural causes.

b. Damages to the permitted project or uses thereof as a result of current or future activities undertaken by or on behalf of the United states in the public interest.

c. Damages to persons, property, or to other permitted or unpermitted activities or structures caused by the activity authorized by this permit.

d. Design or construction deficiencies associated with the permitted work.

e. Damage claims associated with any future modification, suspension, or revocation of this permit.

4. Reliance on Applicant's Data: The determination of this office that issuance of this permit is not contrary to the public interest was mad in reliance on the information you provided.

5. Reevaluation of Permit Decision. This office may reevaluate its decision on this permit at any time the circumstances warrant. Circumstances that could require a reevaluation include, but are not limited to, the following:

a. You fail to comply with the terms and conditions of this permit.

b. The information provided by you in support of your permit application proves to have been false, incomplete, or inaccurate (see 4 above).

c. Significant new information surfaces which this office did not consider in reaching the original public interest decision.

Such a reevaluation may result in a determination that it is appropriate to use the suspension, modification, and revocation procedures contained in 33 CFR 325.7 or enforcement procedures such as those contained in 33CFR 326.4 and 326.5. The referenced enforcement procedures provide for the issuance of an administrative order requiring you to comply with the terms and conditions of your permit and for the initiation of legal action where appropriate. You will be required to pay for any corrective measures ordered by this office, and if you fail to comply with such directive, this office may in certain situations (such as those specified in 33 CFR 209.170) accomplish the corrective measure by contract or otherwise and bill you for the cost.

6. Extensions. General condition 1 establishes a time limit for the completion of the activity authorized by this permit. Unless there are circumstances requiring either a prompt completion of the authorized activity or a reevaluation of the public interest decision, the Corps will normally give favorable consideration to a request for an extension of this time limit.

Your signature below, as permittee, indicates that you accept and agree to comply with the terms and conditions of this permit.

Ralph Sloan III — 01/27/2014

(PERMITTEE) NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
ATTN: MR. RICHARD HANCOCK

(DATE)

This permit becomes effective when the Federal official, designated to act for the Secretary of the Army, has signed below.

for Jean B. Gibbs — 28 Jan 2014

(DISTRICT Commander) STEVEN A. BAKER, COLONEL

(DATE)

When the structures or work authorized by this permit are still in existence at the time the property is transferred, the terms and conditions of this permit will continue to be binding on the new owner(s) of the property. To validate the transfer of this permit and the associated liabilities associated with compliance with its terms and conditions, have the transferee sign and date below.

(Transferee) _____ **(Date)** _____

*U.S. GOVERNMENT PRINTING OFFICE: 1986 – 717-425

SPECIAL CONDITIONS
ACTION ID. SAW-2013-00557
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION R-2413A&B

WORK LIMITS

1. CONSTRUCTION PLANS: All work authorized by this permit must be performed in strict compliance with the attached plans for R-2413A&B dated May 16, 2013 (for R-2413A, sheets 44-46, 53-55, 66A-66C and 80 were revised on July 1, 2013, sheet 81 was revised on July 16, 2013 and for R-2413B sheets 13-16 and sheet 31 were revised July 1, 2013), which are a part of this permit. Any modification to these plans must be approved by the US Army Corps of Engineers (USACE) prior to implementation.

2.UNAUTHORIZED DREDGE OR FILL: Except as authorized by this permit or any USACE approved modification to this permit, no excavation, fill or mechanized land-clearing activities shall take place at any time in the construction or maintenance of this project, within waters or wetlands. This permit does not authorize temporary placement or double handling of excavated or fill material within waters or wetlands outside the permitted area. This prohibition applies to all borrow and fill activities connected with this project.

3. MAINTAIN CIRCULATION AND FLOW OF WATERS: Except as specified in the plans attached to this permit, no excavation, fill or mechanized land-clearing activities shall take place at any time in the construction or maintenance of this project, in such a manner as to impair normal flows and circulation patterns within waters or wetlands or to reduce the reach of waters or wetlands.

4. DEVIATION FROM PERMITTED PLANS: Except as authorized by this permit or any USACE approved modification to this permit, no excavation, fill, or mechanized land-clearing activities shall take place at any time in the construction or maintenance of this project, within waters or wetlands, or shall any activities take place that cause the degradation of waters or wetlands. There shall be no excavation from, waste disposal into, or degradation of, jurisdictional wetlands or waters associated with this permit without appropriate modification of this permit, including appropriate compensatory mitigation. This prohibition applies to all borrow and fill activities connected with this project. In addition, except as specified in the plans attached to this permit, no excavation, fill or mechanized land-clearing activities shall take place at any time in the construction or maintenance of this project, in such a manner as to impair normal flows and circulation patterns within, into, or out of waters or wetlands or to reduce the reach of waters or wetlands.

5. PRECONSTRUCTION MEETING: The permittee shall schedule and attend a preconstruction meeting between its representatives, the contractors representatives, and the Corps of Engineers, Raleigh Field Office, NCDOT Regulatory Project Manager, prior

to any work within jurisdictional waters and wetlands to ensure that there is a mutual understanding of all the terms and conditions contained with this Department of Army Permit. The permittee shall provide the USACE, Raleigh Field Office, NCDOT Project Manager, with a copy of the final permit plans at least two weeks prior to the preconstruction meeting along with a description of any changes that have been made to the project's design, construction methodology or construction timeframe. The permittee shall schedule the preconstruction meeting for a time frame when the USACE, NCDCM, and NCDWQ Project Managers can attend. The permittee shall invite the Corps, NCDCM, and NCDWQ Project Managers a minimum of thirty (30) days in advance of the scheduled meeting in order to provide those individuals with ample opportunity to schedules and participate in the required meeting.

RELATED LAWS

6. WATER CONTAMINATION: All mechanized equipment will be regularly inspected and maintained to prevent contamination of waters and wetlands from fuels, lubricants, hydraulic fluids, or other toxic materials. In the event of a spill of petroleum products or any other hazardous waste, the permittee shall immediately report it to the N.C. Division of Water Quality at (919) 733-3300 or (800) 858-0368 and provisions of the North Carolina Oil Pollution and Hazardous Substances Control Act will be followed.

PROJECT MAINTENANCE

7. NOTIFICATION OF CONSTRUCTION COMMENCEMENT AND COMPLETION: The permittee shall advise the Corps in writing prior to beginning the work authorized by this permit and again upon completion of the work authorized by this permit.

8. CLEAN FILL: Unless otherwise authorized by this permit, all fill material placed in waters or wetlands shall be generated from an upland source and will be clean and free of any pollutants except in trace quantities. Metal products, organic materials (including debris from land clearing activities), or unsightly debris will not be used. Soils used for fill shall not be contaminated with any toxic substance in concentrations governed by Section 307 of the Clean Water Act.

9. PERMIT DISTRIBUTION: The permittee shall require its contractors and/or agents to comply with the terms and conditions of this permit in the construction and maintenance of this project, and shall provide each of its contractors and/or agents associated with the

construction or maintenance of this project with a copy of this permit. A copy of this permit, including all conditions, shall be available at the project site during construction and maintenance of this project.

10. SILT-FENCING: The permittee shall employ all sedimentation and erosion control measures necessary to prevent an increase in sedimentation or turbidity within waters and wetlands outside the permit area. This shall include, but is not limited to, the immediate installation of silt fencing or similar appropriate devices around all areas subject to soil disturbance or the movement of earthen fill, and the immediate stabilization of all disturbed areas. Additionally, the project must remain in full compliance with all aspects of the Sedimentation Pollution Control Act of 1973 (North Carolina General Statutes Chapter 113A Article 4).

11. PERMIT REVOCATION: The permittee, upon receipt of a notice of revocation of this permit or upon its expiration before completion of the work will, without expense to the United States and in such time and manner as the Secretary of the Army or his authorized representative may direct, restore the water or wetland to its pre-project condition.

12. EROSION CONTROL MEASURES IN WETLANDS: The permittee shall remove all sediment and erosion control measures placed in wetlands or waters, and shall restore natural grades in those areas, prior to project completion.

ENFORCEMENT

13. REPORTING ADDRESS: All reports, documentation and correspondence required by the conditions of this permit shall be submitted to the following address: U.S. Army Corps of Engineers, Regulatory Division, Raleigh Regulatory Field Office, Attn: Mr. Andrew Williams, 3331 Heritage Trade Drive, Wake Forest, NC 27587, and by telephone at: 919-554-4884 extension 26. The Permittee shall reference the following permit number, SAW-2001-21125, on all submittals.

14. REPORTING VIOLATIONS OF THE CLEAN WATER ACT AND RIVERS AND HARBORS ACT: Violation of these conditions or violation of Section 404 of the Clean Water Act of Section 10 of the Rivers and Harbors Act must be reported in writing to the Wilmington District U.S. Army Corps of Engineers within 24 hours of the permitee's discovery of the violation.

SPECIAL CONDITIONS
ACTION ID. SAW-2013-00557
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION R-2413A&B

15. COMPLIANCE INSPECTION: A representative of the Corps of Engineers will periodically and randomly inspect the work for compliance with these conditions. Deviations from these procedures may result in an administrative financial penalty and/or directive to cease work until the problem is resolved to the satisfaction of the Corps.

16. CULVERTS:

A. Unless otherwise requested in the applicant's application and depicted on the approved work plans, culverts greater than 48 inches in diameter will be buried at least one foot below the bed of the stream. Culverts 48 inches in diameter and less shall be buried or placed on the stream bed as practicable and appropriate to maintain aquatic passage, and every effort shall be made to maintain existing channel slope. The bottom of the culvert must be placed at a depth below the natural stream bottom to provide for passage during drought or low flow conditions. Destabilizing the channel and head cutting upstream should be considered in the placement of the culvert.

B. Measures will be included in the construction/installation that will promote the safe passage of fish and other aquatic organisms. The dimension, pattern, and profile of the stream above and below a pipe or culvert should not be modified by widening the stream channel or by reducing the depth of the stream in connection with the construction activity. The width, height, and gradient of a proposed opening should be such as to pass the average historical low flow and spring flow without adversely altering flow velocity. Spring flow should be determined from gauge data, if available. In the absence of such data, bankfull flow can be used as a comparable level.

17. SEDIMENT EROSION CONTROL:

A. During the clearing phase of the project, heavy equipment must not be operated in surface waters or stream channels. Temporary stream crossings will be used to access the opposite sides of stream channels. All temporary diversion channels and stream crossings will be constructed of non-erodible materials. Grubbing of riparian vegetation will not occur until immediately before construction begins on a given segment of stream channel.

B. No fill or excavation impacts for the purposes of sedimentation and erosion control shall occur within jurisdictional waters, including wetlands, unless the impacts are included on the plan drawings and specifically authorized by this permit.

C. The permittee shall remove all sediment and erosion control measures placed in wetlands or waters, and shall restore natural grades on those areas, prior to project completion.

D. The permittee shall use appropriate sediment and erosion control practices which equal or exceed those outlined in the most recent version of the "North Carolina Sediment and Erosion Control Planning and Design Manual" to assure compliance with the appropriate turbidity water quality standard. Erosion and sediment control practices must be in full compliance with all specifications governing the proper design, installation and operation and maintenance of such Best Management Practices in order to assure compliance with the appropriate turbidity water quality standards. This shall include, but is not limited to, the immediate installation of silt fencing or similar appropriate devices around all areas subject to soil disturbance or the movement of earthen fill, and the immediate stabilization of all disturbed areas. Additionally, the project must remain in full compliance with all aspects of the Sedimentation Pollution Control Act of 1973 (North Carolina General Statutes Chapter 113A Article 4). Adequate sedimentation and erosion control measures must be implemented prior to any ground disturbing activities to minimize impacts to downstream aquatic resources. These measures must be inspected and maintained regularly, especially following rainfall events. All fill material must be adequately stabilized at the earliest practicable date to prevent sediment from entering into adjacent waters or wetlands.

18. TEMPORARY FILLS: Temporary fills must be removed in their entirety and the affected areas returned to pre-construction elevations. The affected areas must be revegetated, as appropriate.

19. BORROW AND WASTE:

A. To ensure that all borrow and waste activities occur on high ground and do not result in the degradation of adjacent wetlands and streams, except as authorized by this permit, the permittee shall require its contractors and/or agents to identify all areas to be used to borrow material, or to dispose of dredged, fill, or waste material. The permittee shall provide the USACE with appropriate maps indicating the locations of proposed borrow or waste sites as soon as the permittee has that information. The permittee will coordinate with the USACE before approving any borrow or waste sites that are within 400 feet of any streams or wetlands.

B. All jurisdictional wetland delineations on borrow and waste areas shall be verified by the Corps of Engineers and shown on the approved reclamation plans. The permittee shall ensure that all such areas comply with the Special Condition 4 of this permit and shall require and maintain documentation of the location and characteristics of all borrow and disposal sites associated with this project. This documentation will include data regarding soils, vegetation and hydrology sufficient to clearly demonstrate compliance with Special Condition 4. All information will be available to the Corps of Engineers upon request. The permittee shall require its contractors to complete and execute reclamation plans for each waste and borrow site and provide written documentation that the reclamation plans have been implemented and all work is completed. This documentation will be provided to the Corps of Engineers within 30 days of the completion of the reclamation work.

20. MITIGATION: In order to compensate for impacts associated with this permit, mitigation shall be provided in accordance with the provisions outlined on the most recent version of the attached Compensatory Mitigation Responsibility Transfer Form. The requirements of this form, including any special conditions listed on this form, are hereby incorporated as special conditions of this permit authorization.

A. In Lieu Fee: In order to compensate for impacts associated with this permit, mitigation shall be provided in accordance with the provisions outlined on the most recent version of the attached Compensatory Mitigation Responsibility Transfer Form. The requirements of this form, including any special conditions listed on this form, are hereby incorporated as special conditions of this permit authorization.

B. Permittee Responsible Mitigation:

1. The Permittee shall fully implement the compensatory mitigation plan, entitled, R-2413A&B, Plan for On-Site Mitigation, dated (revised) July 1, 2013 for the unavoidable impacts to 3,080 linear feet of streams. Activities prescribed by this plan shall be initiated prior to, or concurrently with, commencement of any construction activities within jurisdictional areas authorized by this permit. The permittee shall (re-establish, rehabilitate, enhance, establish) 2,945 linear feet of streams in accordance with the plan with the following conditions:

   a) The permittee, NCDOT, is the party responsible for the implementation, performance and long term management of the compensatory mitigation project.

   b) Any changes or modifications to your mitigation plan shall be approved by the Corps.

c) The permittee shall maintain the entire mitigation site in its natural condition, as altered by the work in the mitigation plan, in perpetuity. Prohibited activities within the mitigation site specifically include, but are not limited to: Filling; grading; excavating; earth movement of any kind; construction of roads, walkways, buildings, signs, or any other structure; any activity that may alter the drainage patterns on the property; the destruction, cutting, removal, mowing, or other alteration of vegetation on the property; disposal or storage of any garbage, trash, debris or other waste material; graze or water animals, or use for any agricultural or horticultural purpose; or any other activity which would result in the property being adversely impacted or destroyed, except as specifically authorized by this permit.

d) All mitigation areas shall be monitored for a minimum of 5 years or until deemed successful by the Corps in accordance with the monitoring requirements included in the mitigation plan.

2. Remedial Mitigation Plan: If the compensatory mitigation fails to meet the performance standards 5 years after completion of the compensatory mitigation objectives, the compensatory mitigation will be deemed unsuccessful. Within 60 days of notification by the Corps that the compensatory mitigation is unsuccessful, the Permittee shall submit to the Corps an alternate compensatory mitigation proposal to fully offset the functional loss that occurred as a result of the project. The alternate compensatory mitigation proposal may be required to include additional mitigation to compensate for the temporal loss of wetland function associated with the unsuccessful compensatory mitigation activities. The Corps reserves the right to fully evaluate, amend, and approve or reject the alternate compensatory mitigation proposal. Within 120 days of Corps approval, the Permittee will complete the alternate compensatory mitigation proposal.

3. Mitigation Release: The Permittee's responsibility to complete the required compensatory mitigation, as set forth in the Compensatory Mitigation Special Condition of this permit will not be considered fulfilled until mitigation success has been demonstrated and written verification has been provided by the Corps. A mitigation area which has been released will no longer require monitoring or reporting by the Permittee; however the Permittee, Successors and subsequent Transferees remain perpetually responsible to ensure that the mitigation area(s) remain in a condition appropriate to offset the authorized impacts in accordance with the approved mitigation and monitoring plan and the general and special conditions of this permit.

U.S. ARMY CORPS OF ENGINEERS
Wilmington District
Compensatory Mitigation Responsibility Transfer Form

Permittee: North Carolina Department of Transportation **Action ID:** SAW-2013-00557
Project Name: NCDOT/R-2413A&B/Division 7 **County:** Guilford

Instructions to Permittee: The Permittee must provide a copy of this form to the Mitigation Sponsor, either an approved Mitigation Bank or the North Carolina Ecosystem Enhancement Program (NCEEP), who will then sign the form to verify the transfer of the mitigation responsibility. Once the Sponsor has signed this form, it is the Permittee's responsibility to ensure that to the U.S. Army Corps of Engineers (USACE) Project Manager identified on page two is in receipt of a signed copy of this form before conducting authorized impacts, unless otherwise specified below. If more than one mitigation Sponsor will be used to provide the mitigation associated with the permit, or if the impacts and/or the mitigation will occur in more than one 8-digit Hydrologic Unit Code (HUC), multiple forms will be attached to the permit, and the separate forms for each Sponsor and/or HUC must be provided to the appropriate mitigation Sponsors.

Instructions to Sponsor: The Sponsor must verify that the mitigation requirements (credits) shown below are available at the identified site. By signing below, the Sponsor is accepting full responsibility for the identified mitigation, regardless of whether or not they have received payment from the Permittee. Once the form is signed, the Sponsor must update the bank ledger and provide a copy of the signed form and the updated bank ledger to the Permittee, the USACE Project Manager, and the Wilmington District Mitigation Office (see contact information on page 2). The Sponsor must also comply with all reporting requirements established in their authorizing instrument.

Permitted Impacts and Compensatory Mitigation Requirements:

Permitted Impacts Requiring Mitigation* **8-digit HUC and Basin:** 03030002, Cape Fear River Basin

Stream Impacts (linear feet)			Wetland Impacts (acres)			
Warm	Cool	Cold	Riparian Riverine	Riparian Non-Riverine	Non-Riparian	Coastal
9,594				5.47		

*If more than one mitigation sponsor will be used for the permit, only include impacts to be mitigated by this sponsor.

Compensatory Mitigation Requirements: **8-digit HUC and Basin:** 03030002, Cape Fear River Basin

Stream Mitigation (credits)			Wetland Mitigation (credits)			
Warm	Cool	Cold	Riparian Riverine	Riparian Non-Riverine	Non-Riparian	Coastal
18,340				10.94		

Mitigation Site Debited: NCEEP
(List the name of the bank to be debited. For umbrella banks, also list the specific site. For NCEEP, list NCEEP. If the NCEEP acceptance letter identifies a specific site, also list the specific site to be debited).

Section to be completed by the Mitigation Sponsor

Statement of Mitigation Liability Acceptance: I, the undersigned, verify that I am authorized to approve mitigation transactions for the Mitigation Sponsor shown below, and I certify that the Sponsor agrees to accept full responsibility for providing the mitigation identified in this document (see the table above), associated with the USACE Permittee and Action ID number shown. I also verify that released credits (and/or advance credits for NCEEP), as approved by the USACE, are currently available at the mitigation site identified above. Further, I understand that if the Sponsor fails to provide the required compensatory mitigation, the USACE Wilmington District Engineer may pursue measures against the Sponsor to ensure compliance associated with the mitigation requirements.

Mitigation Sponsor Name: _____

Name of Sponsor's Authorized Representative: _____

_____ _____
Signature of Sponsor's Authorized Representative **Date of Signature**

USACE Wilmington District
Compensatory Mitigation Responsibility Transfer Form, Page 2

Conditions for Transfer of Compensatory Mitigation Credit:

- Once this document has been signed by the Mitigation Sponsor and the USACE is in receipt of the signed form, the Permittee is no longer responsible for providing the mitigation identified in this form, though the Permittee remains responsible for any other mitigation requirements stated in the permit conditions.
- Construction within jurisdictional areas authorized by the permit identified on page one of this form can begin only after the USACE is in receipt of a copy of this document signed by the Sponsor, confirming that the Sponsor has accepted responsibility for providing the mitigation requirements listed herein. For authorized impacts conducted by the North Carolina Department of Transportation (NCDOT), construction within jurisdictional areas may proceed upon permit issuance; however, a copy of this form signed by the Sponsor must be provided to the USACE within 30 days of permit issuance. NCDOT remains fully responsible for the mitigation until the USACE has received this form, confirming that the Sponsor has accepted responsibility for providing the mitigation requirements listed herein.
- Signed copies of this document must be retained by the Permittee, Mitigation Sponsor, and in the USACE administrative records for both the permit and the Bank/ILF Instrument. It is the Permittee's responsibility to ensure that the USACE Project Manager (address below) is provided with a signed copy of this form.
- If changes are proposed to the type, amount, or location of mitigation after this form has been signed and returned to the USACE, the Sponsor must obtain case-by-case approval from the USACE Project Manager and/or North Carolina Interagency Review Team (NCIRT). If approved, higher mitigation ratios may be applied, as per current District guidance and a new version of this form must be completed and included in the USACE administrative records for both the permit and the Bank/ILF Instrument.

Comments/Additional Conditions: Additional on site mitigation is also required. See permit conditions.

This form is not valid unless signed below by the USACE Project Manager and by the Mitigation Sponsor on Page 1. ***Once signed, the Sponsor should provide copies of this form along with an updated bank ledger to: 1) the Permittee, 2) the USACE Project Manager at the address below, and 3) the Wilmington District Mitigation Office, Attn: Todd Tugwell, 11405 Falls of Neuse Road, Wake Forest, NC 27587 (email: todd.tugwell@usace.army.mil).*** Questions regarding this form or any of the permit conditions may be directed to the USACE Project Manager below.

USACE Project Manager: Andy Williams
USACE Field Office: Raleigh Regulatory Field Office
US Army Corps of Engineers
3331 Heritage Trade Drive, Suite 105
Wake Forest, North Carolina 27587
Email: Andrew.e.williams2@usace.army.mil

Andrew Williams
USACE Project Manager Signature

January 23, 2014
Date of Signature

Current Wilmington District mitigation guidance, including information on mitigation ratios, functional assessments, and mitigation bank location and availability, and credit classifications (including stream temperature and wetland groupings) is available at http://ribits.usace.army.mil.

The Wilmington District is committed to providing the highest level of support to the public. To help us ensure we continue to do so, please complete the Customer Satisfaction Survey located at our website at http://regulatory.usacesurvey.com/ to complete the survey online.

North Carolina Department of Environment and Natural Resources
Division of Water Resources
Water Quality Programs
Thomas A. Reeder
Director

Pat McCrory
Governor

John E. Skvarla, III
Secretary

February 3, 2014

Mr. Richard W. Hancock, P.E., Manager
Project Development and Environmental Analysis
North Carolina Department of Transportation
1598 Mail Service Center
Raleigh, North Carolina, 27699-1598

Subject: 401 Water Quality Certification Pursuant to Section 401 of the Federal Clean Water Act with ADDITIONAL CONDITIONS for Proposed new location facility from SR 2011 (Edgefield Road) to the Haw River at US 220 in Guilford County, WBS Element No. 34429.1.1. TIP No. R-2413AB. NCDWR Project No. 20130517 v.2- Modification

Dear Mr. Hancock:

Attached hereto is a copy of Certification No. 3971issued to The North Carolina Department of Transportation (NCDOT) dated February 3, 2014. This certification replaces the one issued October 28, 2013.

If we can be of further assistance, do not hesitate to contact us.

Sincerely,

Thomas A. Reeder

Attachments

cc: Andy Williams, US Army Corps of Engineers, Raleigh Field Office (electronic copy only)
Jerry Parker, PE, Division 7 Engineer (electronic copy only)
Chris Militscher, Environmental Protection Agency (electronic copy only)
Travis Wilson, NC Wildlife Resources Commission (electronic copy only)
Jason Elliott, NCDOT, Roadside Environmental Unit (electronic copy only)
Beth Harmon, Ecosystem Enhancement Program (electronic copy only)
Amy Euliss, DWR Winston Salem Regional Office (electronic copy only)
File Copy

Transportation and Permitting Unit
1650 Mail Service Center, Raleigh, North Carolina 27699-1650
Location: 512 N. Salisbury St. Raleigh, North Carolina 27604
Phone: 919-807-6300 \ FAX: 919-807-6488
Internet: www.ncwaterquality.org

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401 Water Quality Certification Pursuant to Section 401 of the Federal Clean Water Act with ADDITIONAL CONDITIONS

THIS CERTIFICATION is issued in conformity with the requirements of Section 401 Public Laws 92-500 and 95-217 of the United States and subject to the North Carolina Division of Water Quality (NCDWQ) Regulations in 15 NCAC 2H .0500. This certification authorizes the NCDOT to impact 3.33 acres of jurisdictional wetlands for the R-2413A project and 2.15 acres of jurisdictional wetlands for the R-2413B project in Guilford County. There will also be impacts to 10045 linear feet of jurisdictional streams for the R-2413A project and 4016 linear feet of jurisdictional streams for the R-2413B project in Guilford County. The project shall be constructed pursuant to the application dated received May 17, 2013 with additional information dated received July 19, 2013, and August 23, 2013. The authorized impacts are as described below:

Stream Impacts in the Cape Fear River Basin for R-2413A

4 (S63)	553	42	595	553
5 (S56)	428	33	461	428
6 (S53)	432	21	453	432
7A (S51)	424	21	445	424
7B (S50)	26	10	36	0
7C (S49)	31	0	31	31
8A (S46)	675	50	725	675
8B (S47)	50	0	50	0
8C (S45)	34	0	34	0
10A (S40)	446	41	487	446
10B (S42)	49	0	49	0
10C (S41)	116	0	116	0
11 (S39A)	47	17	64	0
12A (S37A)	299	0	299	299
12B (S37C)	131	0	131	0
13A (S35)	525	10	535	525
13B (S36)	106	0	106	0
14A (S31)	576	20	596	576
14B (S32)	258	10	268	258
15A (S29A)	533	41	574	533
15B (S30)	46	0	46	0
16A (S27)	362	29	391	362
16B (S28)	33	0	33	33
18 (S25)	0	172	172	0
19 S23B)	507	34	541	507
20 (S34)	240	0	240	240
21A (S22A/B/S22B)	288	262	550	288
21B (S22.5)	149	0	149	0
22 (S62)	276	22	298	276
23 (S23A)	0	12	12	0
TOTAL	**9093**	**952**	**10045**	**8171**

Total Stream Impact for R-2413A Project: 10045 linear feet

Stream Impacts in the Cape Fear River Basin for R-2413B

Site	Permanent Fill in Intermittent Stream (linear ft)	Temporary Fill in Intermittent Stream (linear ft)	Permanent Fill in Perennial Stream (linear ft)	Temporary Fill in Perennial Stream (linear ft)	Total Stream Impact (linear ft)	Stream Impacts Requiring Mitigation (linear ft)
1 (S22)			284	45	329	284
2 (S17)			246	15	261	246
3 (S13)			726	30	756	726
4 (S12)	50	15			65	0
5 (S10)			565	24	589	565
5A (S11)			146	17	163	0
6 (S9B)			0	21	21	0
7 (S6A)			411	30	441	411
8 (S3A)			645	0	645	645
8d (S3A)			464	0	464	464
8e (S5)			29	0	29	0
8g (S3a)			253	0	253	253
TOTAL	**50**	**15**	**3769**	**182**	**4016**	**3594**

Total Stream Impact for R-2413B Project: 4016 linear feet

Wetland Impacts in the Cape Fear River Basin for R-2413A

Site (wetland no.)	Fill (ac)	Fill (temporary) (ac)	Excavation (ac)	Mechanized Clearing (ac)	Hand Clearing (ac)	Total Wetland Impact (ac)	Impacts Requiring Mitigation (ac)
1 (W40)	0.01					0.01	0.01
4 (W35)	0.24			0.02		0.26	0.26
6 (W34)	0.01					0.01	0.01
10A (W28)	0.01		0.01			0.02	0.02
10C (W27)	0.01			0.01		0.02	0.02
11 (W25)	0.12					0.12	0.12
15A (W19)	0.01					0.01	0.01
16A (W18)	0.15					0.15	0.15
17 (W17)	0.35			0.03		0.38	0.38
20 (W22)	0.11					0.11	0.11
21A (W14A)	2.11			0.13		2.24	2.24
Total	**3.13**	**0.00**	**0.01**	**0.19**	**0.00**	**3.33**	**3.33**

Total Wetland Impact for R-2413A Project: 3.33 acres.

Wetland Impacts in the Cape Fear River Basin for R-2413B

Site	Fill (ac)	Fill (temporary) (ac)	Excavation (ac)	Mechanized Clearing (ac)	Hand Clearing (ac)	Total Wetland Impact (ac)	Impacts Requiring Mitigation (ac)
1 (W14)	1.87			0.23		2.10	2.10
8A (W7)	0.02					0.02	0.02
8B (W6)	0.03					0.03	0.03
Total	**1.92**	**0.00**	**0.00**	**0.23**	**0.00**	**2.15**	**2.15**

Total Wetland Impact for R-2413B Project: 2.15 acres.

The application provides adequate assurance that the discharge of fill material into the waters of the Cape Fear River Basin in conjunction with the proposed development will not result in a violation of applicable Water Quality Standards and discharge guidelines. Therefore, the State of North Carolina certifies that this activity will not violate the applicable portions of Sections 301, 302, 303, 306, 307 of PL 92-500 and PL 95-217 if conducted in accordance with the application and conditions hereinafter set forth.

This approval is only valid for the purpose and design that you submitted in your application dated received May 17, 2013 with additional information dated received July 19, 2013, and August 23, 2013. Should your project change, you are required to notify the NCDWR and submit a new application. If the property is sold, the new owner must be

given a copy of this Certification and approval letter, and is thereby responsible for complying with all the conditions. If any additional wetland impacts, or stream impacts, for this project (now or in the future) exceed one acre or 150 linear feet, respectively, additional compensatory mitigation may be required as described in 15A NCAC 2H .0506 (h) (6) and (7). For this approval to remain valid, you are required to comply with all the conditions listed below. In addition, you should obtain all other federal, state or local permits before proceeding with your project including (but not limited to) Sediment and Erosion control, Coastal Stormwater, Non-discharge and Water Supply watershed regulations. This Certification shall expire on the same day as the expiration date of the corresponding Corps of Engineers Permit.

Condition(s) of Certification:

1. Any modifications to this 401 Water Quality Certification that propose additional stream impacts or increased impervious surface requiring additional stormwater management may be subject the Jordan Water Supply Nutrient Strategy (15A NCAC02B .0267). The NCDOT shall coordinate with the NCDWR prior to submitting a modification request to determine the applicability of the Jordan Water Supply Nutrient Strategy. This condition does not apply to major modifications for additional sections of the project that were covered under the Finding of No Significant Impact or approved in the Avoidance and Minimization stage of the project.
2. The NCDOT Division Environmental Officer or Environmental Assistant will conduct a pre-construction meeting with all appropriate staff to ensure that the project supervisor and essential staff understand the potential issues with stream and pipe alignment at the permitted site. NCDWR staff shall be invited to the pre-construction meeting.
3. Channel relocations shall be completed and stabilized, and approved on site by NCDWR staff, prior to diverting water into the new channel. Stream banks shall be matted with coir-fiber matting. Vegetation used for bank stabilization shall be limited to native riparian vegetation, and should include establishment of a vegetated buffer on both sides of the relocated channel to the maximum extent practical. Also, rip-rap may be allowed if it is necessary to maintain the physical integrity of the stream, but the applicant must provide written justification and any calculations used to determine the extent of rip-rap coverage requested. Once the stream has been turned into the new channel, it may be necessary to relocate stranded fish to the new channel to prevent fish kills.
4. Compensatory mitigation for impacts to 8171 linear feet of streams for the R-2413A project and 3594 for the R-2413B project at a replacement ratio of 1:1 is required. Compensatory mitigation for impacts to jurisdictional streams shall be provided by onsite stream relocations of 2,180 linear feet of stream for the R-2413A project and 765 linear feet of stream for the R-2413B project. The onsite stream relocation shall be constructed in accordance with the design submitted in your application dated received July 19, 2013, August 23, 2013. All on-site mitigation sites shall be protected in perpetuity by a conservation easement or through NCDOT fee simple acquisition and recorded in the NCDOT Natural Environment Unit mitigation geodatabase. Please be reminded that as-builts for the completed streams shall be submitted to the North Carolina Division of Water Resources 401 Wetlands Unit with the as-builts for the rest of the project. If the parameters of this condition are not met, then the permittee shall supply additional stream mitigation for the 2,180 linear feet of impacts. All channel relocations will be constructed in a dry work area, will be completed and stabilized, and must be approved on site by NCDWR staff, prior to diverting water into the new channel. Whenever possible, channel relocations shall be allowed to stabilize for an entire growing season. All stream relocations shall have a 50-foot wide native wooded buffer planted on both sides of the stream unless otherwise authorized by this Certification. A transitional phase incorporating rolled erosion control product (RECP) and appropriate temporary ground cover is allowable.
5. The stream mitigation site shall be monitored annually for five years or until success criteria are satisfied. Monitoring protocols shall follow the Monitoring Level I outlined in the Stream Mitigation Guidelines, April 2003.
6. Compensatory mitigation for 8171 linear feet of impact to streams for the R-2413A project and 3594 linear feet of impact to streams for the R-2413B project is required. We understand that you have chosen to perform compensatory mitigation for impacts to 5,991 linear feet of streams for the R-2413A project and 2829 linear feet of streams for the R-2413B project through the North Carolina Ecosystem Enhancement Program (EEP), and that the EEP has agreed to implement the mitigation for the project. EEP has indicated in a letter dated September 24, 2013 that they will assume responsibility for satisfying the federal Clean Water Act compensatory mitigation requirements for the above-referenced project, in accordance with the EEP Mitigation Banking Instrument signed July 28, 2010.
7. Compensatory mitigation for impacts to 3.33 acres for the R-2413A project and 2.15 acres for the R-2413B project (riparian) wetlands is required. We understand that you have chosen to perform compensatory mitigation for impacts to wetlands through the North Carolina Ecosystem Enhancement Program (EEP), and that the EEP has agreed to implement the mitigation for the project. EEP has indicated in a letter dated

September 24, 2013 that they will assume responsibility for satisfying the federal Clean Water Act compensatory mitigation requirements for the above-referenced project, in accordance with EEP's Mitigation Banking Instrument signed July 28, 2010.

8. At locations where ponds will be drained, proper measures will be taken to drain the pond with limited impact to upstream and downstream channel stability as well as to native aquatic species. Proper measures will be taken to avoid sediment release and/or sediment accumulation downstream as a result of pond draining. If typical pond draining techniques will create significant disturbance to native aquatic species, additional measures such as collection and relocation may be necessary to prevent a significant fish kill. NCDOT shall consult with NC Wildlife Resources staff to determine if there are any sensitive species, and the most appropriate measures to limit impacts to these species. The permittee shall observe any natural channel re-establishment, or utilize natural channel construction techniques, to ensure that the jurisdictional stream channel above and below the drained pond remain stable, and that no additional impacts occur within the natural stream channel as a result of draining the pond.
9. The post-construction removal of any temporary bridge structures must return the project site to its preconstruction contours and elevations. The impacted areas shall be revegetated with appropriate native species.
10. Bridge deck drains shall not discharge directly into the stream. Stormwater shall be directed across the bridge and pre-treated through site-appropriate means (grassed swales, pre-formed scour holes, vegetated buffers, etc.) before entering the stream. Please refer to the most current version of *Stormwater Best Management Practices.*
11. Bridge piles and bents shall be constructed using driven piles (hammer or vibratory) or drilled shaft construction methods. More specifically, jetting or other methods of pile driving are prohibited without prior written approval from the NCDWR first.
12. No drill slurry or water that has been in contact with uncured concrete shall be allowed to enter surface waters. This water shall be captured, treated, and disposed of properly.
13. All bridge construction shall be performed from the existing bridge, temporary work bridges, temporary causeways, or floating or sunken barges. If work conditions require barges, they shall be floated into position and then sunk. The barges shall not be sunk and then dragged into position. Under no circumstances should barges be dragged along the bottom of the surface water.
14. If multiple pipes or barrels are required, they shall be designed to mimic natural stream cross section as closely as possible including pipes or barrels at flood plain elevation and/or sills where appropriate. Widening the stream channel should be avoided. Stream channel widening at the inlet or outlet end of structures typically decreases water velocity causing sediment deposition that requires increased maintenance and disrupts aquatic life passage.
15. Riprap shall not be placed in the active thalweg channel or placed in the streambed in a manner that precludes aquatic life passage. Bioengineering boulders or structures should be properly designed, sized and installed.
16. For the 1,149 linear feet of streams being impacted due to site dewatering activities, the site shall be graded to its preconstruction contours and revegetated with appropriate native species.
17. The stream channel shall be excavated no deeper than the natural bed material of the stream, to the maximum extent practicable. Efforts must be made to minimize impacts to the stream banks, as well as to vegetation responsible for maintaining the stream bank stability. Any applicable riparian buffer impact for access to stream channel shall be temporary and be revegetated with native riparian species.
18. Pipes and culverts used exclusively to maintain equilibrium in wetlands, where aquatic life passage is not a concern, shall not be buried. These pipes shall be installed at natural ground elevation.
19. All portions of the proposed project draining to 303(d) listed watersheds that are impaired due to biological criteria exceedances shall not discharge stormwater directly to surface waters. Stormwater shall be treated using appropriate best management practices (e.g., vegetated conveyances, constructed wetlands, detention ponds, etc.) prior to discharging to surface waters.
20. Unless otherwise approved in this certification, placement of culverts and other structures in open waters and streams shall be placed below the elevation of the streambed by one foot for all culverts with a diameter greater than 48 inches, and 20 percent of the culvert diameter for culverts having a diameter less than 48 inches, to allow low flow passage of water and aquatic life. Design and placement of culverts and other structures including temporary erosion control measures shall not be conducted in a manner that may result in dis-equilibrium of wetlands or streambeds or banks, adjacent to or upstream and down stream of the above structures. The applicant is required to provide evidence that the equilibrium is being maintained if requested in writing by NCDWR. If this condition is unable to be met due to bedrock or other limiting features encountered during construction, please contact NCDWR for guidance on how to proceed and to determine whether or not a permit modification will be required.

21. If concrete is used during construction, a dry work area shall be maintained to prevent direct contact between curing concrete and stream water. Water that inadvertently contacts uncured concrete shall not be discharged to surface waters due to the potential for elevated pH and possible aquatic life and fish kills.
22. During the construction of the project, no staging of equipment of any kind is permitted in waters of the U.S., or protected riparian buffers.
23. The dimension, pattern and profile of the stream above and below the crossing shall not be modified. Disturbed floodplains and streams shall be restored to natural geomorphic conditions.
24. The use of rip-rap above the Normal High Water Mark shall be minimized. Any rip-rap placed for stream stabilization shall be placed in stream channels in such a manner that it does not impede aquatic life passage.
25. The Permittee shall ensure that the final design drawings adhere to the permit and to the permit drawings submitted for approval.
26. Prior to commencing ground disturbing activities, an acceptable monitoring and mitigation plan for the presence of sulfide-bearing rock must be approved by the NCDWR.
27. All work in or adjacent to stream waters shall be conducted in a dry work area. Approved BMP measures from the most current version of NCDOT Construction and Maintenance Activities manual such as sandbags, rock berms, cofferdams and other diversion structures shall be used to prevent excavation in flowing water.
28. Heavy equipment shall be operated from the banks rather than in the stream channel in order to minimize sedimentation and reduce the introduction of other pollutants into the stream.
29. All mechanized equipment operated near surface waters must be regularly inspected and maintained to prevent contamination of stream waters from fuels, lubricants, hydraulic fluids, or other toxic materials.
30. No rock, sand or other materials shall be dredged from the stream channel except where authorized by this certification.
31. Discharging hydroseed mixtures and washing out hydroseeders and other equipment in or adjacent to surface waters is prohibited.
32. The permittee and its authorized agents shall conduct its activities in a manner consistent with State water quality standards (including any requirements resulting from compliance with §303(d) of the Clean Water Act) and any other appropriate requirements of State and Federal law. If the NCDWR determines that such standards or laws are not being met (including the failure to sustain a designated or achieved use) or that State or federal law is being violated, or that further conditions are necessary to assure compliance, the NCDWR may reevaluate and modify this certification.
33. All fill slopes located in jurisdictional wetlands shall be placed at slopes no flatter than 3:1, unless otherwise authorized by this certification..
34. A copy of this Water Quality Certification shall be maintained on the construction site at all times. In addition, the Water Quality Certification and all subsequent modifications, if any, shall be maintained with the Division Engineer and the on-site project manager.
35. The outside buffer, wetland or water boundary located within the construction corridor approved by this authorization shall be clearly marked by highly visible fencing prior to any land disturbing activities. Impacts to areas within the fencing are prohibited unless otherwise authorized by this certification.
36. The issuance of this certification does not exempt the Permittee from complying with any and all statutes, rules, regulations, or ordinances that may be imposed by other government agencies (i.e. local, state, and federal) having jurisdiction, including but not limited to applicable buffer rules, stormwater management rules, soil erosion and sedimentation control requirements, etc.
37. The Permittee shall report any violations of this certification to the Division of Water Resources within 24 hours of discovery.
38. Upon completion of the project (including any impacts at associated borrow or waste sites), the NCDOT Division Engineer shall complete and return the enclosed "Certification of Completion Form" to notify NCDWR when all work included in the 401 Certification has been completed.
39. Native riparian vegetation must be reestablished in the riparian areas within the construction limits of the project by the end of the growing season following completion of construction.
40. There shall be no excavation from, or waste disposal into, jurisdictional wetlands or waters associated with this permit without appropriate modification. Should waste or borrow sites, or access roads to waste or borrow sites, be located in wetlands or streams, compensatory mitigation will be required since that is a direct impact from road construction activities.
41. Sediment and erosion control measures shall not be placed in wetlands or waters unless otherwise approved by this Certification.
42. Erosion and sediment control practices must be in full compliance with all specifications governing the proper design, installation and operation and maintenance of such Best Management Practices in order to protect surface waters standards:

a. The erosion and sediment control measures for the project must be designed, installed, operated, and maintained in accordance with the most recent version of the *North Carolina Sediment and Erosion Control Planning and Design Manual.*
b. The design, installation, operation, and maintenance of the sediment and erosion control measures must be such that they equal, or exceed, the requirements specified in the most recent version of the *North Carolina Sediment and Erosion Control Manual.* The devices shall be maintained on all construction sites, borrow sites, and waste pile (spoil) projects, including contractor-owned or leased borrow pits associated with the project.
c. For borrow pit sites, the erosion and sediment control measures must be designed, installed, operated, and maintained in accordance with the most recent version of the *North Carolina Surface Mining Manual.*
d. The reclamation measures and implementation must comply with the reclamation in accordance with the requirements of the Sedimentation Pollution Control Act

Violations of any condition herein set forth may result in revocation of this Certification and may result in criminal and/or civil penalties. This Certification shall become null and void unless the above conditions are made conditions of the Federal 404 and/or Coastal Area Management Act Permit. This Certification shall expire upon the expiration of the 404 or CAMA permit.

If you wish to contest any statement in the attached Certification you must file a petition for an administrative hearing. You may obtain the petition form from the office of Administrative hearings. You must file the petition with the office of Administrative Hearings within sixty (60) days of receipt of this notice. A petition is considered filed when it is received in the office of Administrative Hearings during normal office hours. The Office of Administrative Hearings accepts filings Monday through Friday between the hours of 8:00am and 5:00pm, except for official state holidays. The original and one (1) copy of the petition must be filed with the Office of Administrative Hearings.

The petition may be faxed-provided the original and one copy of the document is received by the Office of Administrative Hearings within five (5) business days following the faxed transmission.
The mailing address for the Office of Administrative Hearings is:

Office of Administrative Hearings
6714 Mail Service Center
Raleigh, NC 27699-6714
Telephone: (919)-431-3000, Facsimile: (919)-431-3100

A copy of the petition must also be served on DENR as follows:

Mr. Lacy Presnell, General Counsel
Department of Environment and Natural Resources
1601 Mail Service Center

This the 3th day of February 2014

DIVISION OF WATER RESOURCES



Thomas A. Reeder

WQC No. 3971

North Carolina Department of Environment and Natural Resources
Division of Water Resources
Water Quality Programs

Pat McCrory
Governor

Thomas A. Reeder
Director

John E. Skvarla, III
Secretary

NCDWR Project No.: _____ **County:** _____

Applicant: _____

Project Name: _____

Date of Issuance of 401 Water Quality Certification: _____

Certificate of Completion
Upon completion of all work approved within the 401 Water Quality Certification or applicable Buffer Rules, and any subsequent modifications, the applicant is required to return this certificate to the 401 Transportation Permitting Unit, North Carolina Division of Water Resources, 1650 Mail Service Center, Raleigh, NC, 27699-1650. This form may be returned to NCDWR by the applicant, the applicant's authorized agent, **or** the project engineer. It is not necessary to send certificates from all of these.

Applicant's Certification

I, _____, hereby state that, to the best of my abilities, due care and diligence was used in the observation of the construction such that the construction was observed to be built within substantial compliance and intent of the 401 Water Quality Certification and Buffer Rules, the approved plans and specifications, and other supporting materials.

Signature: _____ Date: _____

Agent's Certification

I, _____, hereby state that, to the best of my abilities, due care and diligence was used in the observation of the construction such that the construction was observed to be built within substantial compliance and intent of the 401 Water Quality Certification and Buffer Rules, the approved plans and specifications, and other supporting materials.

Signature: _____ Date:_____

Engineer's Certification

_____ Partial _____ Final

I, _____, as a duly registered Professional Engineer in the State of North Carolina, having been authorized to observe (periodically, weekly, full time) the construction of the project,for the Permittee hereby state that, to the best of my abilities, due care and diligence was used in the observation of the construction such that the construction was observed to be built within substantial compliance and intent of the 401 Water Quality Certification and Buffer Rules, the approved plans and specifications, and other supporting materials.

Signature _____ Registration No. _____

Date _____

Transportation and Permitting Unit
1650 Mail Service Center, Raleigh, North Carolina 27699-1650
Location: 512 N. Salisbury St. Raleigh, North Carolina 27604
Phone: 919-807-6300 \ FAX: 919-807-6488
Internet: www.ncwaterquality.org

An Equal Opportunity \ Affirmative Action Employer

One NorthCarolina Naturally

FILE COPY

See Sheet 1-A For Index of Sheets

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

Permit Drawing Sheet 1 of 81

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	R-2413A	1	

STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION
34429.1.1		PE
34429.2.2		RW, UTIL

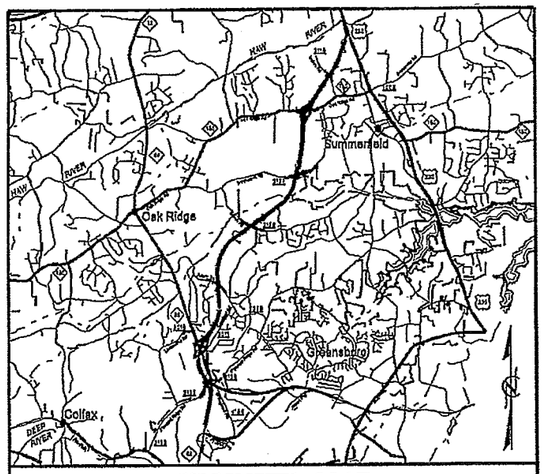
2013-00557

NAD 83/ NSRS 2007

GUILFORD COUNTY

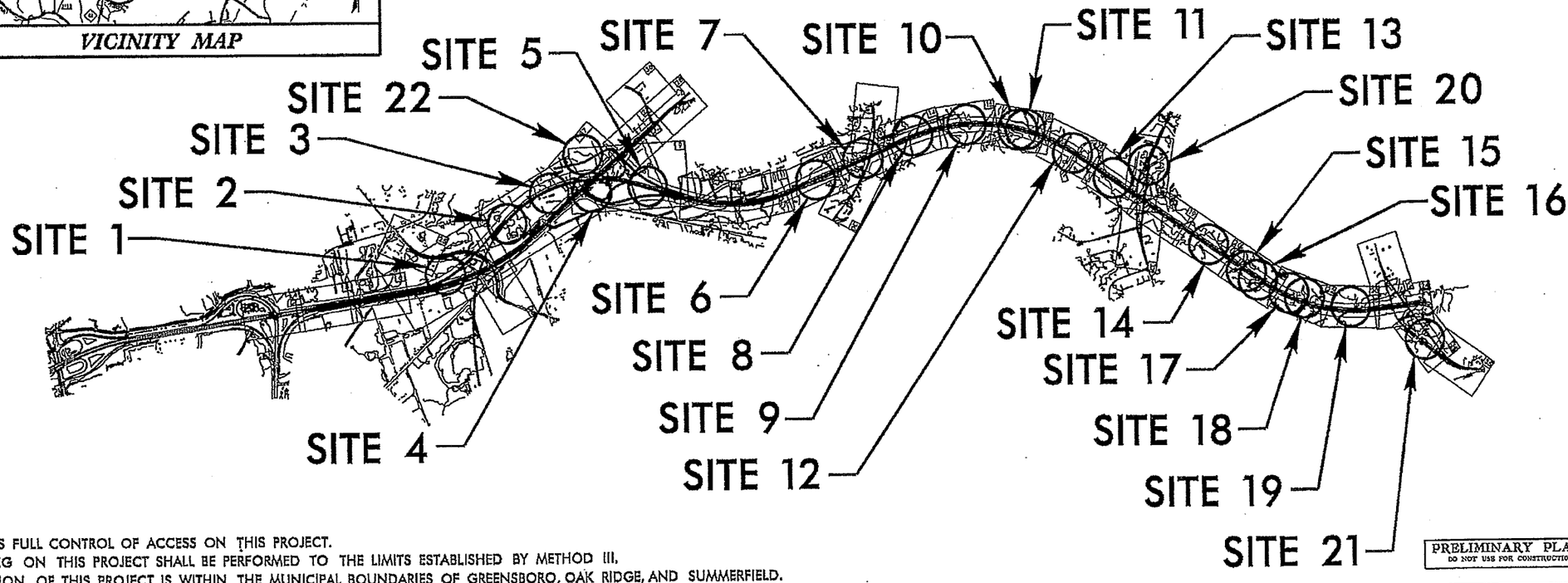
LOCATION: NC 68 CONNECTOR – FROM FOUR LANES AT SR 2011 (EDGEFIELD ROAD) TO SR 2127 (BROOKBANK ROAD)

TYPE OF WORK: GRADING, PAVING, WIDENING, RESURFACING, DRAINAGE, STRUCTURES, SIGNING, SIGNALS, AND ITS



VICINITY MAP

WETLAND & STREAM IMPACTS



THERE IS FULL CONTROL OF ACCESS ON THIS PROJECT.
CLEARING ON THIS PROJECT SHALL BE PERFORMED TO THE LIMITS ESTABLISHED BY METHOD III.
A PORTION OF THIS PROJECT IS WITHIN THE MUNICIPAL BOUNDARIES OF GREENSBORO, OAK RIDGE, AND SUMMERFIELD.

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

GRAPHIC SCALES

50 25 0 50 100
PLANS

50 25 0 50 100
PROFILE (HORIZONTAL)

10 5 0 10 20
PROFILE (VERTICAL)

DESIGN DATA

ADT 2012 = 23,000
ADT 2035 = 40,800
DHV = 11 %
D = 70 %
T = 15 % *
V = 70 MPH
* TTST 10% DUAL 5%
FUNC CLASS – INTERSTATE

PROJECT LENGTH

LENGTH ROADWAY TIP PROJECT R-2413A = 4.803 MILES

LENGTH STRUCTURE TIP PROJECT R-2413A = 0.150 MILES

TOTAL LENGTH TIP PROJECT R-2413A = 4.953 MILES

Prepared in the Office of:
DIVISION OF HIGHWAYS
1000 Birch Ridge Dr., Raleigh NC, 27610

2006 STANDARD SPECIFICATIONS

RIGHT OF WAY DATE: NOVEMBER 18, 2011

LETTING DATE: APRIL 15, 2014

TONY HOUSER, PE
PROJECT ENGINEER

VACANT
PROJECT DESIGN ENGINEER

HYDRAULICS ENGINEER

SIGNATURE:

ROADWAY DESIGN ENGINEER

SIGNATURE:

DIVISION OF HIGHWAYS STATE OF NORTH CAROLINA

STATE HIGHWAY DESIGN ENGINEER

TIP PROJECT: R-2413A

CONTRACT:

$$$$$$SYSTIME$$$$$$
$$$$$$USERNAME$$$$$$

REVISIONS
R/W REVISION: PROPERTY OWNER NAME AND DEED BOOK INFORMATION HAVE BEEN CORRECTED ON PARCELS 5 AND 6. TBR 5-31-12
R/W REVISION: PROPERTY OWNER NAME AND DEED BOOK INFORMATION HAS BEEN CHANGED ON PARCEL 1. CEH 2/27/13.

PROJECT REFERENCE NO.	SHEET NO.
R-2413A	7
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

Permit Drawing
Sheet 2 of 81

NAD 83/NSRS 2007

SITE 1

GRAPHIC SCALE
100 50 0 100 200
PLANS

-Y2- PRC Sta. 22+21.79

-Y2- POC Sta. 28+43.03 =
-RPIB- POT Sta. 21+58.76

-Y2- POC Sta. 28+75.00 =
-DR2- POT Sta. 10+00.00

-DR2- PC Sta. 10+81.48

-DR2- POT Sta. 12+93.34

END CONSTRUCTION
-DR2- Sta. 12+65.62
-DR2- PT Sta. 12+75.22

-Y1- POT Sta. 38+32.98 =
-RPIB- ST Sta. 40+79.93 (47.00' LT)

-RPIB- CS Sta. 38+79.93

-RPIB- TS Sta. 23+11.72

-RPIB- SC Sta. 25+11.72

-L- POC Sta. 103+85.70
-Y2- POC Sta. 31+03.85

-L- POC Sta. 100+23.52

-Y1- POC Sta. 56+34.84

-Y1- POC Sta. 59+87.47 =
-Y2- POC Sta. 33+79.20

-Y1- POC Sta. 40+00.00

FUTURE STRUCTURES
(BUILD UNDER I-5110)
-L- POC Sta. 97+50.00

MATCH TO SHEET 6

MATCH TO SHEET 25

MATCH TO SHEET 8

MATCH TO SHEET 26

-Y2- STA. 36+00

-Y1- STA. 63+50

DENOTES IMPACTS IN SURFACE WATER

DENOTES TEMPORARY IMPACTS IN SURFACE WATER

DENOTES FILL IN WETLAND

DETAIL
PIPE OUTLET CHANNEL
(Not to Scale)

Est.= 24 Tons of Class 'I' Rip-Rap
32 Square Yards Filter Fabric

REVISIONS
R/W REVISION: PROPERTY OWNER NAME AND DEED BOOK INFORMATION HAVE BEEN CORRECTED ON PARCELS 5 AND 6. TBR 5-31-12 R/W REVISION: PROPERTY OWNER NAME AND DEED BOOK INFORMATION HAS BEEN CHANGED ON PARCEL 1. CEH 2/27/13.

Permit Drawing
Sheet 3 of 81

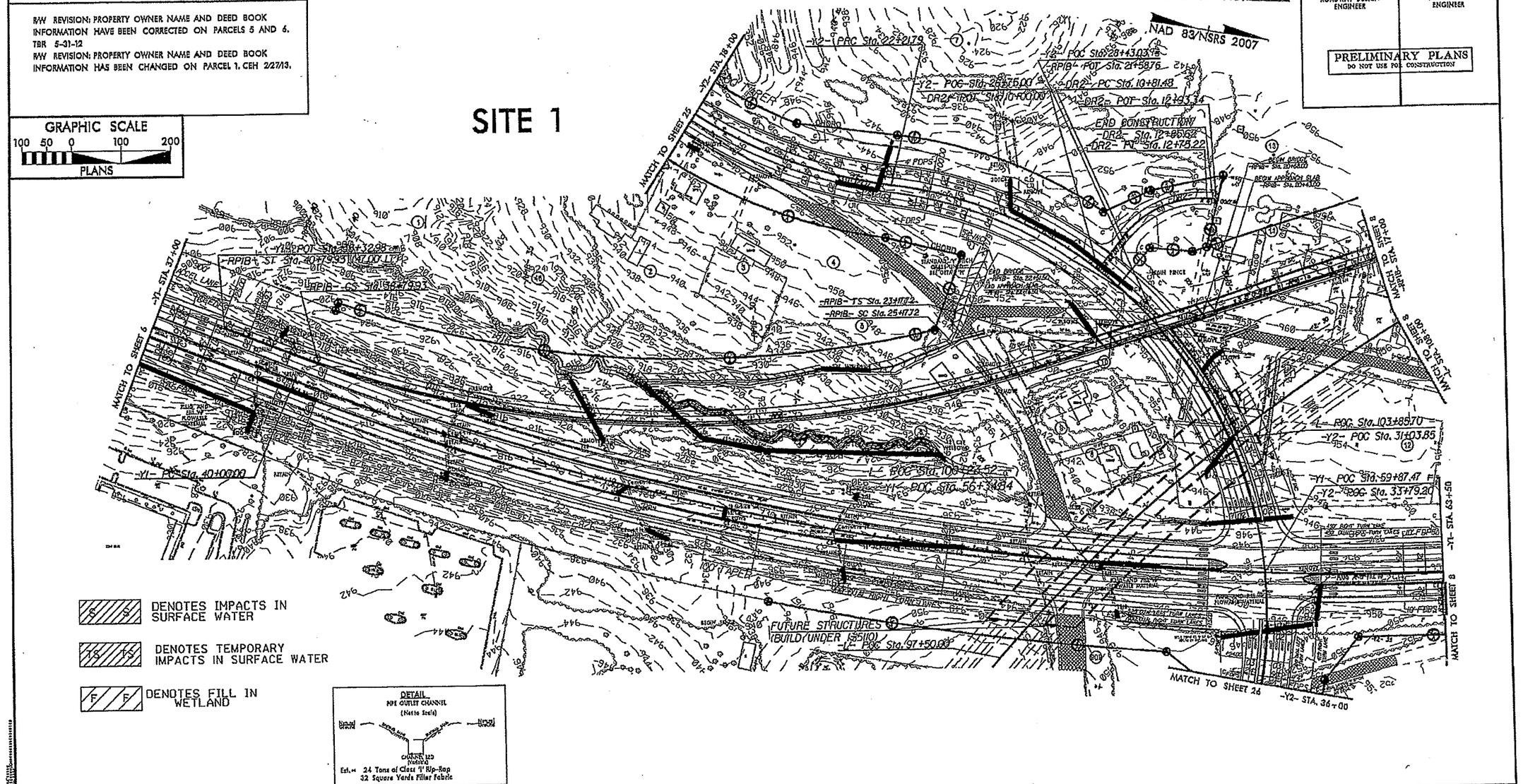
PROJECT REFERENCE NO.	SHEET NO.
R-2413A	7
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

SITE 1

GRAPHIC SCALE
100 50 0 100 200
PLANS

NAD 83/NSRS 2007



S/S DENOTES IMPACTS IN SURFACE WATER

TS/TS DENOTES TEMPORARY IMPACTS IN SURFACE WATER

F/F DENOTES FILL IN WETLAND

DETAIL
RIP OUTLET CHANNEL
(Not to Scale)

Est.+- 24 Tons of Class 'I' Rip-Rap
32 Square Yards Filter Fabric

PROJECT REFERENCE NO.	SHEET NO.
R-2413A	7
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

Permit Drawing
Sheet 4 of 81

NAD 83/NSRS 2007

8/17/99

REVISIONS

100' 0' 100'

SCALE: 1"= 100'

SITE 1

S S DENOTES IMPACTS IN SURFACE WATER

TS TS DENOTES TEMPORARY IMPACTS IN SURFACE WATER

F F DENOTES FILL IN WETLAND

-RPIB- 30

5

SANDRA K. SMITH

RW

C A

24" W/ELBOWS

JS

F

EXISTING R/W

42" RCP-IV

-RPIB-

50

MH

42" RCP-III

MH

15"

42" RCP-III

JB w/MH

HW

6

60" CONC

RETAIN

C

Convert to JB

15" RCP-IV

48" CONC

18" RCP

RETAIN

NC 68 LYNWOOD SMITH EXPWY SBL 30' BST

+49.91
167.44'

FS

2GI

15" RCP

64" CONC

COLLAR

CB

JB w/Slab Lid

15" CSP

ELBOWS

RETAIN

RETAIN

PROJ. REFERENCE NO.	SHEET NO.
R-2413A	X-304

Permit Drawing 01
Sheet 5 of 11

8/23/99

FILL IN WETLAND
PERMANENT SURFACE WATER IMPACTS
S.S. 929.79
924.09
29+00.00
0.040 1.060
4:1
S.S. 928.08
928.08

PERMANENT SURFACE WATER IMPACTS
FILL IN WETLAND
S.S. 928.01
926.82
28+50.00
0.040 1.060
4:1
S.S. 930.04
928.04

S.S. 929.08
921.83
28+00.00
0.040 1.060
4:1
S.S. 934.10

S.S. 929.42
927.42
27+50.00
0.040 1.060
4:1
S.S. 940.25
938.90

—DEVID—

$$$$$SYSTIME$$$$$
$$$$$USERNAME$$$$$

Permit Drawing Sheet 6 of 81

PROJECT REFERENCE NO.	SHEET NO.
R-2413A	8
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

GRAPHIC SCALE
100 50 0 100 200
PLANS

DETAIL
PIPE OUTLET CHANNEL
(Not to Scale)

Est.= 32 Tons of Class 'I' Rip-Rap
40 Square Yards Filter Fabric

DETAIL
PIPE OUTLET CHANNEL
(Not to Scale)

Est.= 18 Tons of Class 'I' Rip-Rap
25 Square Yards Filter Fabric

SITE 2

SITE 3

(CONTINUED ON SHEET 37)

NAD 83/NSRS 2007

-L- POC Sta. 115+00.00 =
-RPIB- POT Sta. 10+00.00 (59.00' LT)

-Y1- PRC Sta. 77+43.73

-Y1- POC Sta. 77+75.00 =
-Y1A- POT Sta. 10+00.00

-Y1- PT Sta. 86+33.85

-Y1A- PC Sta. 10+66.37

-L- STA. 135+00

MATCH TO SHEET 7
-L- STA. 108+00

MATCH TO SHEET 7
-Y1- STA. 63+50

MATCH TO SHEET 9
-Y1- STA. 84+50

2A
2B
2C

JAMES R & DELORES P HIGGINS
PEARRIDGE, INC.
PUMP PIPE SALES & SERVICE, INC.
REGIONAL AIRLINE SERVICES INC.
JAMES WILLIAM SUPER
COLLEEN STAFFORD MCCLUSTON
RONALD GRAHAM HALL
FAMILY TRUST OF JOHNNY ODELL PITTS et al
GENEVA H. TUCKER, TRUSTEE
JOHNNY ODELL PITTS
WALTER T & BETTY P PARRISH
SAKAAN 68 LLC
BLAIR & MARY ANN EVERETT
SACK FAMILY PROPERTIES LLC

DENOTES IMPACTS IN SURFACE WATER

DENOTES TEMPORARY IMPACTS IN SURFACE WATER

Permit Drawing
Sheet 7 of 81

PROJECT REFERENCE NO.	SHEET NO.
R-2413A	8
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

GRAPHIC SCALE
100 50 0 100 200
PLANS

DETAIL
PIPE OUTLET CHANNEL
(Not to Scale)
Est.= 32 Tons of Class 'I' Rip-Rap
40 Square Yards Filter Fabric

DETAIL
PIPE OUTLET CHANNEL
(Not to Scale)
Est.= 16 Tons of Class 'I' Rip-Rap
25 Square Yards Filter Fabric

SITE 2

SITE 3

(CONTINUED ON SHEET 37)

NAD 83/NSRS 2007

-L- POC Sta.115+00.00 =
-RPIB- POT Sta.10+00.00 (69.00' LT)

2A
2B
2C

-Y1- POC Sta.77+75.00 =
-Y1A- POT Sta.10+00.00

-Y1- PRC Sta.77+43.73

-Y1- PT Sta.86+23.85

-Y1- STA. 63+50

-L- STA. 135+00

MATCH TO SHEET 7 STA. 104+00

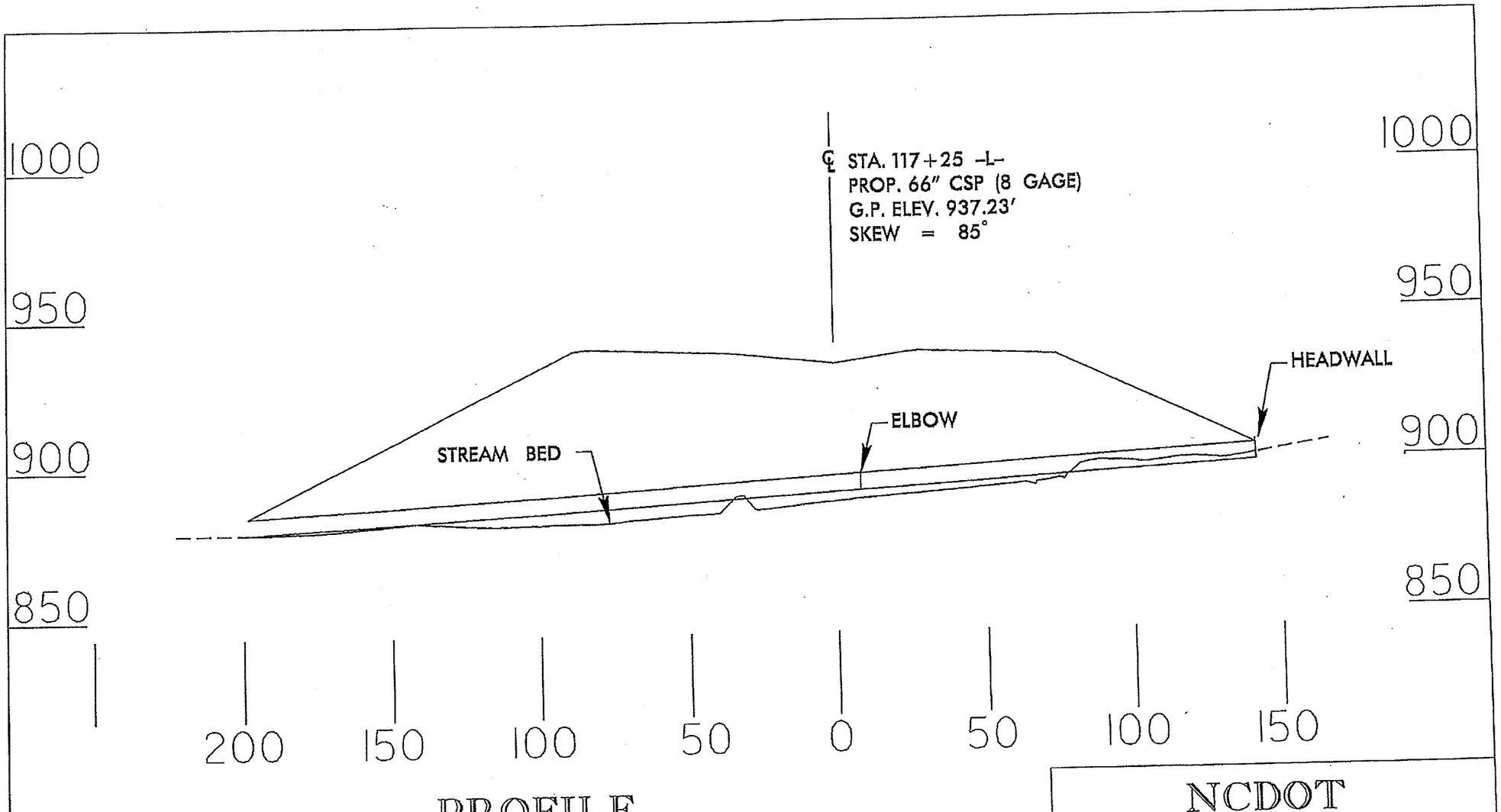
MATCH TO SHEET 7 STA. 104+00

MATCH TO SHEET 9 STA. 88+47

DENOTES IMPACTS IN SURFACE WATER

DENOTES TEMPORARY IMPACTS IN SURFACE WATER

Permit Drawing
Sheet 8 of 81



PROFILE

NCDOT
DIVISION OF HIGHWAYS
GUILFORD COUNTY
PROJECT: 34429.1.1 (R-2413A)
NC 68 CONNECTOR
FROM FOUR LANES AT
SR 2011 TO SR 2127

SHEET OF 2/13/13

Permit Drawing Sheet 9 of 81

NAD 83/NSRS 2007

PROJECT REFERENCE NO.	SHEET NO.
R-2413A	8
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

SITE 2

DENOTES IMPACTS IN SURFACE WATER

DENOTES TEMPORARY IMPACTS IN SURFACE WATER

2A

2B

2C

66" CSP
2 2/3" x 1/2"
CORRUGATIONS
.8 GAGE

2GI

ELBOW

75" CSP

ELBOWS

PSH
SEE DETAIL SHEET

HW

BENT

BENT

HTR

HTR

HTR

TB

SF

JS

RW

F

C

±14.80
101.30

100' 0' 100'

SCALE: 1"= 100'

8/17/18

Permit Drawing
Sheet 10 of 81

NAD 83/NSRS 2007

PROJECT REFERENCE NO.	SHEET NO.
R-2413A	8 & 37
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

8/17/99

REVISIONS

SITE 3
(IMPACTS FROM SHEET 8 AND SHEET 37)

DENOTES IMPACTS IN SURFACE WATER

DENOTES TEMPORARY IMPACTS IN SURFACE WATER

FAMILY TRUST OF
HNNY ODELL PITTS et al

FAMILY TRUST OF
JOHNNY ODELL PITTS et al

GENEVA M. TUCKER,
TRUSTEE

937

22

EST. 2 TONS CL 'B' RIP RAP
EST. 7 SY FF

GRAU 350

GRAU 350

GRAU 350

GRAU 350

2GI

2GI

15" RCP-III

24" RCP-IV
BUR. 20%

-Y/C-
N 9°00'00.0" E

36" CSP W/ELBOWS
3" x 1" CORRUGATIONS
8 GAGE

100' 0' 100'

SCALE: 1"= 100'

Permit Drawing
Sheet 11 of 81

PROJECT REFERENCE NO.	SHEET NO.
R-2413A	9
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

F/F DENOTES FILL IN WETLAND

S/S DENOTES IMPACTS IN SURFACE WATER

TS/TS DENOTES TEMPORARY IMPACTS IN SURFACE WATER

NAD 83/NSRS 2007

DETAIL
PIPE OUTLET CHANNEL
(Not to Scale)

Est.= 18 Tons of Class 'I' Rip-Rap
24 Square Yards Filter Fabric

SITE 4

(CONTINUED ON SHEET 37)

DETAIL
PIPE OUTLET CHANNEL
(Not to Scale)

Est.= 32 Tons of Class 'I' Rip-Rap
40 Square Yards Filter Fabric

SITE 5

GRAPHIC SCALE
100 50 0 100 200
PLANS

Permit Drawing
Sheet 12 of 81

PROJECT REFERENCE NO.	SHEET NO.
R-2413A	9
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

F/F DENOTES FILL IN WETLAND

S/S DENOTES IMPACTS IN SURFACE WATER

TS/TS DENOTES TEMPORARY IMPACTS IN SURFACE WATER

SITE 4

(CONTINUED ON SHEET 37)

DETAIL
RIP OUTLET CHANNEL
(Not to Scale)

Est.= 18 Tons of Class 'I' Rip-Rap
24 Square Yards Filter Fabric

NAD 83/NSRS 2007

MATCH TO SHEET 37
-Y1- STA. 104+50

MATCH TO SHEET 8
-Y1- STA. 135+00

MATCH TO SHEET 8
-Y1- STA. 85+50

MATCH TO SHEET 10
-Y1- STA. 164+00

GRAPHIC SCALE
100 50 0 100 200
PLANS

DETAIL
RIP OUTLET CHANNEL
(Not to Scale)

Est.= 32 Tons of Class 'I' Rip-Rap
40 Square Yards Filter Fabric

SITE 5

SITE 4

(CONTINUED ONTO SHEET 37)

Permit Drawing Sheet 13 of 81

NAD 83/NSRS 2007

PROJECT REFERENCE NO.	SHEET NO.
R-2413A	9
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

18 TONS CLASS 'I' RIP RAP
24 SY FILTER FABRIC

INV
BURIED 20%

36" CSP (8Ga)
3"x1" Corr.

RPDE

RW

CA

F

C

B

GRADING LIMITS

REMOVE 12" RCP

REMOVE 12" RCP

133

B

EXISTING R/W

914

N.C.D.O.T.

REMOVE

TYPE M350
+85.84
136.11'

MTL

TB.

10' GR

131

CB

86.88
22.5
EIP

15"

TOE PROTECTION

PLUG
FILL W/
FLOWABLE
MATERIAL

LOCATION APPROXIMATELY AS SHOWN

EXISTING R/W

ATTENUATOR

913

N.C.D.O.T.

24

2GI-A

TRENCHLESS 15" WELD

DENOTES IMPACTS IN SURFACE WATER

DENOTES TEMPORARY IMPACTS IN SURFACE WATER

DENOTES FILL IN WETLAND

100' 0' 100'

SCALE: 1"= 100'

REVISIONS

8/17/99

PROJ. REFERENCE NO. R-2413A

SHEET NO. X-21

Permit Drawing No. 7
Sheet 7A of 24

PERMANENT IMPACT IN SURFACE WATERS

FILL IN WETLANDS

FILL IN WETLANDS

138+00.00

137+50.00

S.S. 907.82

S.S. 907.66

Permit Drawing Sheet 15 of 81

PROJECT REFERENCE NO.	SHEET NO.
R-2413A	9
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

NAD 83/NSRS 2007

SITE 5

MARY P. POTTS BROWN

28

32 TONS CLASS 'I' RIP RAP 40 SY FF

TAPER

C F

CAT-1

S 39°00'00.0"W

EST. 5 TON CL 'B' RIP RAP EST. 14 SY FILT. FAB.

24" W/ELBOWS

66" SPSP (10GA) ALUMINIZED 6"x2" CORR.

2GI

LATERAL 'V' DITCH PSRM LINED SEE DETAIL 'AE' 215 SY PSRM 111 CY DDE

LATERAL 'V' DITCH PSRM LINED SEE DETAIL 'AE' 215 SY PRSM 111 CY DDE

SPECIAL LATERAL 'V' DITCH PSRM LINED SEE DETAIL 'X' 100 SY PSRM

GRAU 350

24" RCP-III

18"

2GI

TBJB

-RPIA-

66" SPSP (10GA.) ALUMINIZED 6"x2" CORR. TBJB W/ELBOWS

66" RCP-III

-RPID-

TBJB

2GI

15"

66" RCP-III

HW

SPECIAL CUT DITCH PSRM LINED SEE DETAIL 'X' 100 SY PSRM

EST. 1 TON CL 'B' RIP RAP EST. 5 SY FF

SPECIAL LATERAL 'V' DITCH GRASS LINED SEE DETAIL 'G'

50' INC

+50.00

MEDIAN

16:1 TAPER

24"

1' FBPS

200' PAVED

S S DENOTES IMPACTS IN SURFACE WATER

TS TS DENOTES TEMPORARY IMPACTS IN SURFACE WATER

F F DENOTES FILL IN WETLAND

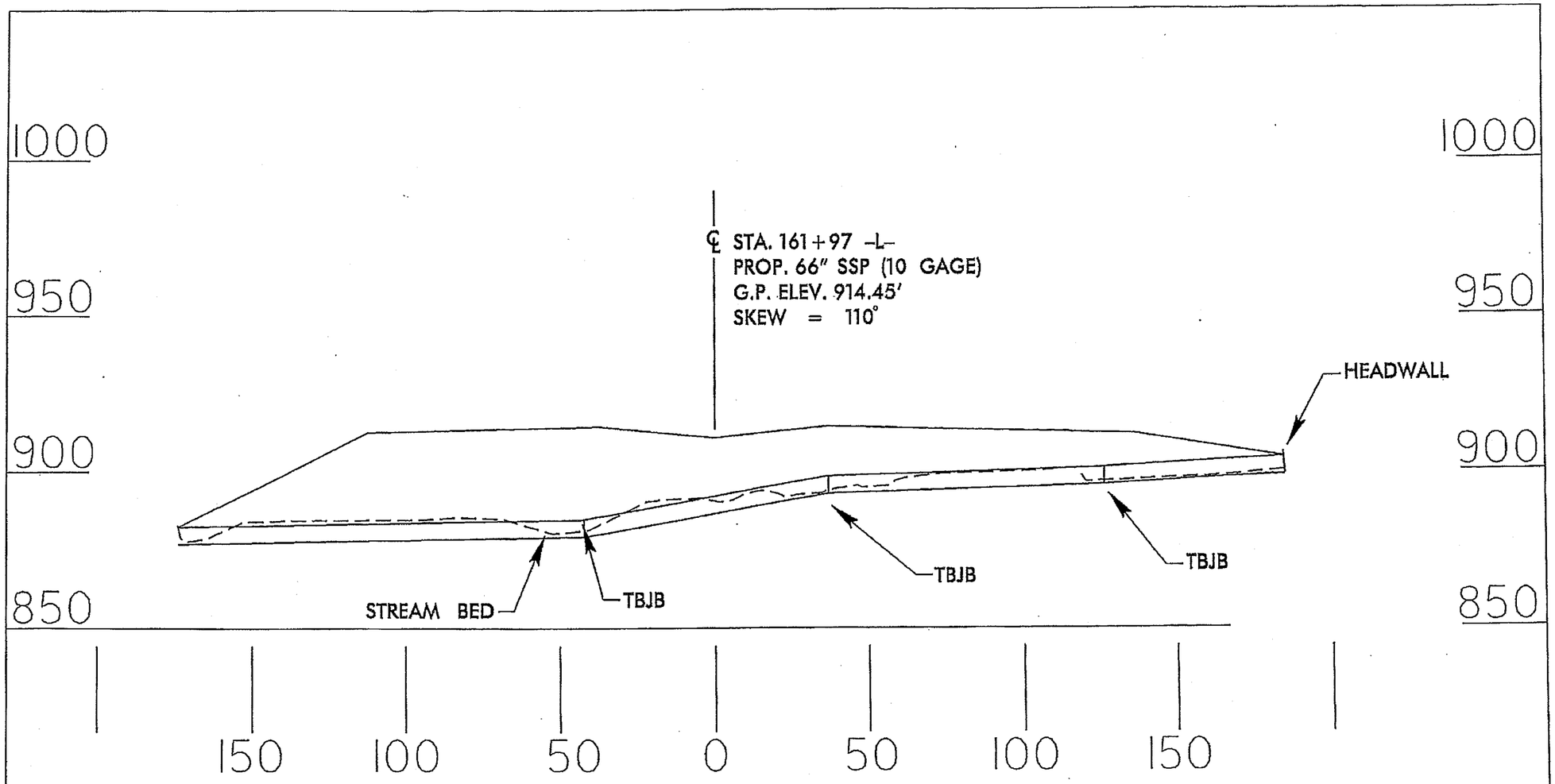
165

100' 0' 100'

SCALE: 1"= 100'

8/17/99

REVISIONS



PROFILE

NCDOT

DIVISION OF HIGHWAYS

GUILFORD COUNTY

PROJECT: 34429.1.1 (R-2413A)

NC 68 CONNECTOR

FROM FOUR LANES AT

SR 2011 TO SR 2127

SHEET 16 OF 81

2/13/13

GRAPHIC SCALE
100 50 0 100 200
PLANS

Permit Drawing Sheet 17 of 81
NAD 83/NSRS 2007

PROJECT REFERENCE NO.	SHEET NO.
R-2413A	12
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

SITE 6

REVISIONS
8/17/99 R/W REVISION: PARCEL NUMBER 80 HAS BEEN DELETED, NO CLAIM ON BRANCH WATER FARMS, INC. CEH 2/27/13.

BRANCH WATER FARMS INC.
BRANCH WATER FARMS INC.
195
200
205
4' LATERAL BASE DITCH SEE DETAIL 'A' 460 TONS CLASS 'I' RIP RAP 724 SY FF 4021 CY DDE
24 TONS CLASS 'I' RIP RAP 32 SY FILETEX FABRIC
3' CLASS 'B' ROCK CHECK DAMS 2' TOP WIDTH; 2:1 SIDE SLOPES RIP RAP SIDES 1.0' ABOVE DAM 12 TONS CLASS 'B' RIP RAP
4' LATERAL BASE DITCH GRASS LINED SEE DETAIL 'AG' 3363 CY DDE
EST. 2 TONS CL 'B' RIP RAP EST. 7 SY FILT. FAB.
NCDOT (FORMERLY JAMES A. WESTBROOK)
926
SPRING BOX
60" RCP-IV
JB w/SIDE Ltd
54" CSP (.109 Ga.) ALUMINIZED
16:1 TAPER
GRAU 350
2GI 15°
2GI
FS
CAT-1
ELBOWS
MATCH LINE SHEET 11 -L- STA. 191+00
-L- STA. 205+00 MATCH TO SHEET 13
NCDOT (FORMERLY JAMES A. WESTBROOK)
925
TOE PROTECTION 158 TONS CLASS 'I' RIP RAP LINED SEE DETAIL 'E' -L- STA. 199+88 TO -L- STA. 199+88
EXISTING R/W
2' LATERAL BASE DITCH GRASS LINED SEE DETAIL 'I' 2330 CY DDE
HW
EST. 2 TONS CL 'B' RIP RAP EST. 7 SY FILT. FAB.
2' SPECIAL CUT BASE DITCH GRASS LINED SEE DETAIL 'G'
BERM DITCH SEE STD. 240.01 -L- STA. 199+00 to 201+25
2' LATERAL BASE DITCH SEE DETAIL 'C' 112 TONS CLASS 'B' RIP RAP 325 SY FF 990 CY DDE
PEGGY PEGRAM TWIDDY
32
RANDALL TODD WILSON
33
W/LT 204
HTR
MTL CANOPY
ISFD
CONC
GR
12' CLR
S S DENOTES IMPACTS IN SURFACE WATER
TS TS DENOTES TEMPORARY IMPACTS IN SURFACE WATER
F F DENOTES FILL IN WETLAND

DETAIL
RIP RAP OUTLET CHANNEL
(Not to Scale)
CHANNEL BED (Varies)
Est.= 24 Tons of Class 'I' Rip-Rap
32 Square Yards Filter Fabric

GRAPHIC SCALE
100 50 0 100 200
PLANS

Permit Drawing Sheet 18 of 84

NAD 83/NSRS 2007

PROJECT REFERENCE NO.	SHEET NO.
R-2413A	12
NW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

SITE 6

MATCH LINE SHEET 11 -L- STA. 191+00

-L- STA. 205+00 MATCH TO SHEET 13

BRANCH WATER FARMS INC.

FORMERLY JAMES A. WESTBROOK

RANDALL TODD WILSON

PEGGY PEGRAM TWIDDY

4' LATERAL BASE DITCH SEE DETAIL 'A' 160 TONS CLASS 'B' RIP RAP 744 SY FP 4021 CY DDE

24 TONS CLASS 'I' RIP RAP 32 SY FILTER FABRIC

3' CLASS 'B' ROCK CHECK DAMS 2' TOP WIDTH 2:1 SIDE SLOPES RIP RAP SIDES 6" ABOVE DAM 12 TONS CLASS 'B' RIP-RAP

4' LATERAL BASE DITCH GRASS LINED SEE DETAIL 'AG' 3363 CY DDE

EST. 2 TONS CL 'B' RIP RAP EST. 7 SY FILT. FAB.

16:1 TAPER

54" CMP 110 AUGMENTED

TOE PROTECTION 156 TONS CLASS 'B' RIP RAP LINED SEE DETAIL 'C' -L- STA. 191+37 TO -L- STA. 193+36

EXISTING R/W

2' LATERAL BASE DITCH GRASS LINED SEE DETAILS 3360 CY DDE

2' LATERAL BASE DITCH SEE DETAIL 'C' 112 TONS CLASS 'B' RIP RAP 525 SY FP 1980 CY DDE

EST. 2 TONS CL 'B' RIP RAP EST. 7 SY FILT. FAB.

2' SPECIAL CUT BASS DITCH GRASS LINED SEE DETAIL 'CL'

BERM DITCH SEE STD. 240.01 -L- STA. 199+20 to 201+25

W/LT 204

HTR

SPD

DENOTES IMPACTS IN SURFACE WATER

DENOTES TEMPORARY IMPACTS IN SURFACE WATER

DENOTES FILL IN WETLAND

DETAIL
PIPE OUTLET CHANNEL
(Not to Scale)

CHANNEL 110 (Variable)

Est. w 24 Tons of Class 'I' Rip-Rap
32 Square Yards Filter Fabric

REVISIONS

R/W REVISION: PARCEL NUMBER 80 HAS BEEN DELETED. NO CLAIM ON BRANCH WATER FARMS, INC. CEH 2/27/15.

8/17/99

$$$$USER$$$$ $$$$TIME$$$$ $$$$DATE$$$$ $$$$CONFIGNAME$$$$

8/17/99

REVISIONS

SITE 6

S S DENOTES IMPACTS IN SURFACE WATER

TS TS DENOTES TEMPORARY IMPACTS IN SURFACE WATER

F F DENOTES FILL IN WETLAND

Permit Drawing Sheet 19 of 81

NAD 83/NSRS 2007

PROJECT REFERENCE NO.	SHEET NO.
R-2413A	12
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

4' LATERAL BASE DITCH
SEE DETAIL 'A'
460 TONS CLASS 'I' RIP RAP
744 SY FF
4021 CY DDE

24 TONS CLASS 'I' RIP RAP
32 SY FILETER FABRIC

EIP

HW

F

45" HW ALUMINIZED CSP

JB w/Slab Lid

60" RCP-IV

SPRING BOX

42" CSP (14 Ga.)

TB

54" CSP (10 Ga.) ALUMINIZED

16:1 TAPER

2GI

15" RCP-IV

FS

CAT-1

ELBOWS

×26.8'
4.5%

2' LATERAL BASE DITCH
GRASS LINED
SEE DETAIL 'B'
2530 CY DDE

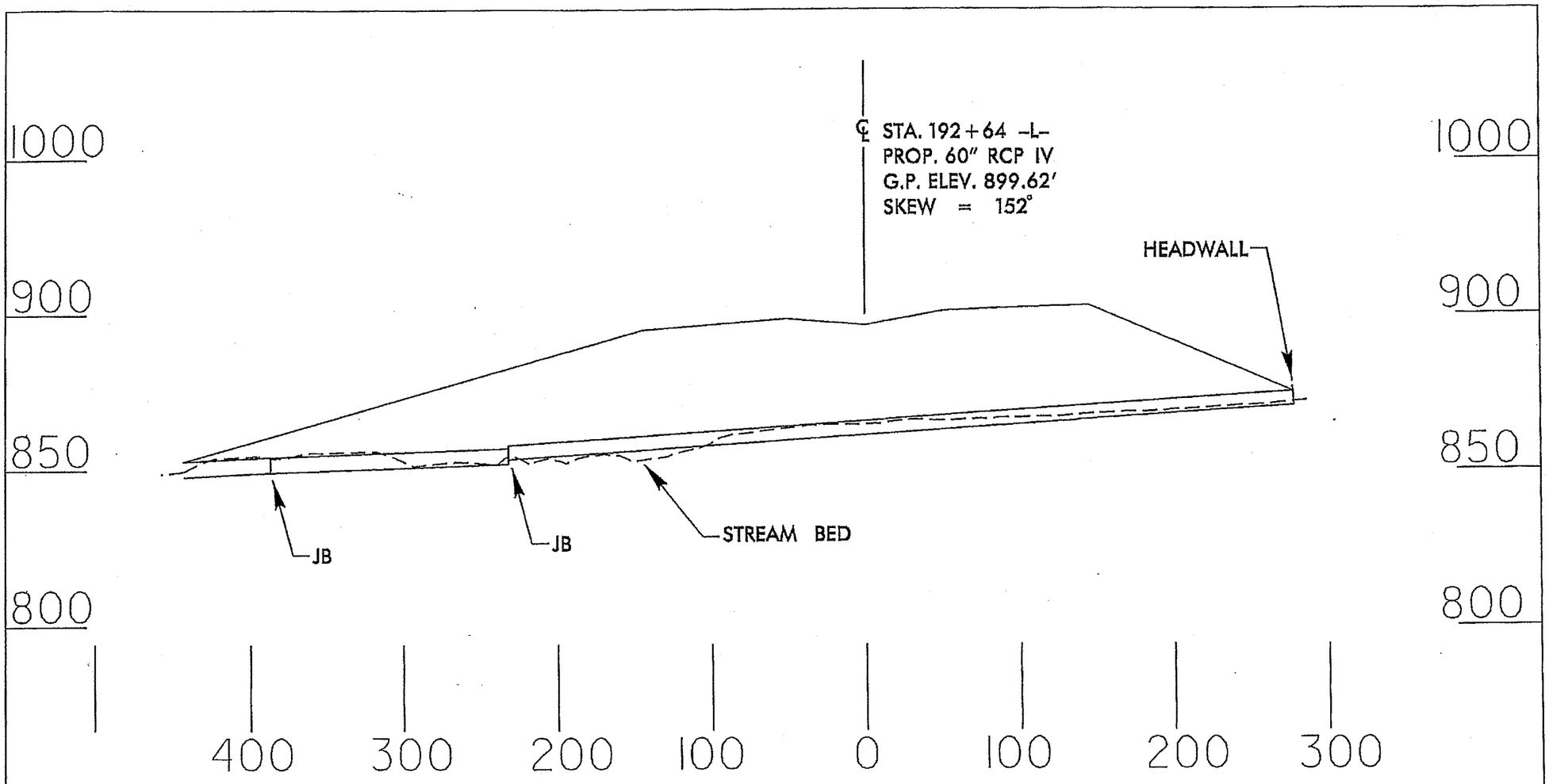
EST. 2 TONS CL 'B' RIP RAP
EST. 7 SY FILT. FAB.

2' SPECIAL CUT BASE DITCH
GRASS LINED
SEE DETAIL 'O'

100' 0' 100'

SCALE: 1"= 100'

$$$$$$SYSTEM$$$$$$
$$$$$$



PROFILE

NCDOT

DIVISION OF HIGHWAYS
GUILFORD COUNTY
PROJECT: 34429.1.1 (R-2413A)
NC 68 CONNECTOR
FROM FOUR LANES AT
SR 2011 TO SR 2127

SHEET 20 OF 81 2/13/13

Permit Drawi
Sheet 21 of 81

NAD 83/NSRS 2007

PROJECT REFERENCE NO.	SHEET NO.
R-2413A	13
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

REVISIONS

8/17/99

R/W REVISION: A PROPERTY LINE HAS BEEN ADDED TO PARCEL 35 WHICH RESULTED IN A NEW PARCEL DESIGNATED AS PARCEL 36A. PARCEL 36A IS OWNED BY THOMAS AND CATHY MORRISON. CEH 1/23/2013

R/W REVISION: PARCEL NUMBER 80 HAS BEEN DELETED. NO CLAIM ON BRANCH WATER FARMS, INC. CEH 2/27/13

DETAIL
APE OUTLET CHANNEL
(Not to Scale)

Est.= 24 Tons of Class 'I' Rip-Rap
32 Square Yards Filter Fabric

MATCH TO SHEET 29 -Y3- STA. 18+50

DORTHY H. CONRAD, TRUSTEE U/W ELWOOD MACK CONRAD

EST. 1 TON CL 'B' RIP RAP
EST. 5 SY FILT. FAB.

DORTHY H. CONRAD, TRUSTEE U/W ELWOOD MACK CONRAD

DORTHY H. CONRAD, TRUSTEE U/W ELWOOD MACK CONRAD

BRANCH WATER FARMS INC.

910 NCDOT (FORMERLY CORA T. PEGRAM)

4' STANDARD BASE DITCH
SEE DETAIL 'AO'
1700 CY DDE
80 TONS CLASS 'I'
113 SY FF

912 NCDOT (FORMERLY BILL STORK)

925 NCDOT (FORMERLY JAMES A. WESTBROOK)

24 TONS CLASS 'I' RIP RAP
33 SY FILTER FABRIC

7A

7B

7C

35

SCRUB

36A THOMAS & CATHY MORRISON

SPECIAL CUT DITCH
GRASS LINED
SEE DETAIL 'O'

REMOVE 2' RIP

EST. 3 TONS CL 'B' RIP RAP
EST. 7 SY FILT. FAB.

ATTENUATOR

ATTENUATOR

MATCH TO SHEET 12 -L- STA. 205+00

MATCH TO SHEET 14 -L- STA. 219+00

-Y3- 20

-Y3- 25

-Y3- STA. 27+50

MATCH TO SHEET 30

NCDOT 2GI-A (FORMERLY CORA PEGRAM) 910

TOE PROTECTION
25 TONS CLASS 'B'
82 SY FILT. FABRIC
SEE DETAIL 'E'

2' STANDARD BASE DITCH
FSRM LINED
SEE DETAIL 'S'
150 CY DDE
45 SY FSRM

EARTH BERM W/4' TOP WIDTH
3:1H SIDE SLOPES
350 CY FILL
TOP ELEV. 872.0'

33 RANDALL TODD WILSON

34 MARSHALL R. TWIDDY AND PEGGY P. TWIDDY

2' LATERAL BASE DITCH
GRASS LINED
SEE DETAIL 'K'
437 CY DDE

37 VANCE DALE PEGRAM

LOLA M. PEGRAM 36

BERM DITCH
SEE STD. 240.01
-L- STA. 218+00 to 219+00

SITE 7

DENOTES IMPACTS IN SURFACE WATER

DENOTES TEMPORARY IMPACTS IN SURFACE WATER

GRAPHIC SCALE
100 50 0 100 200
PLANS

Permit Drawing Sheet 28 of 81

NAD 83/NSRS 2007

PROJECT REFERENCE NO.	SHEET NO.
R-2413A	13
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

REVISIONS

8/17/99

R/W REVISION, A PROPERTY LINE HAS BEEN ADDED TO PARCEL 36 WHICH RESULTED IN A NEW PARCEL DESIGNATED AS PARCEL 36A. PARCEL 36A IS OWNED BY THOMAS AND CATHY MORRISON. CEH 1/23/2013

R/W REVISION, PARCEL NUMBER 80 HAS BEEN DELETED. NO CLAIM ON BRANCH WATER FARMS, INC. CEH 2/27/13

DETAIL
FOR OUTLET CHANNEL
(Not to Scale)

Est.= 24 Tons of Class 'I' Rip-Rap
32 Square Yards Filter Fabric

-L- STA. 205+00

MATCH TO SHEET 12

-L- STA. 219+00

MATCH TO SHEET 14

MATCH TO SHEET 29 -Y3- STA. 18+50

MATCH TO SHEET 30 -Y3- STA. 27+50

7A

7B

7C

BRANCH WATER FARMS INC.

DORTHY H. CONRAD, TRUSTEE U/W ELWOOD MACK CONRAD

NCDOT (FORMERLY JAMES A. WESTBROOK)

NCDOT (FORMERLY CORA T. PEGRAM)

NCDOT (FORMERLY BILL STORK)

RANDALL TODD WILSON

MARSHALL R. TWIDDY AND PEGGY P. TWIDDY

THOMAS & CATHY MORRISON

VANCE DALE PEGRAM

LOLA M. PEGRAM

ATTENUATOR

SITE 7

DENOTES IMPACTS IN SURFACE WATER

DENOTES TEMPORARY IMPACTS IN SURFACE WATER

GRAPHIC SCALE
100 50 0 100 200
PLANS

8/17/99

REVISIONS

100' 0' 100'

SCALE: 1"= 100'

SITE 7

S S DENOTES IMPACTS IN SURFACE WATER

TS TS DENOTES TEMPORARY IMPACTS IN SURFACE WATER

Permit Drawing
Sheet 23 of 81

NAD 83/NSRS 2007

PROJECT REFERENCE NO.	SHEET NO.
R-2413A	13
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

BRANCH WATER FARMS INC.

NCDOT
(FORMERLY JAMES A. WESTBROOK)

925

7B 7C 7A

24 TONS CLASS 'I' RIP RAP
32 SY FILTER FABRIC

CLASS I RIP RAP
33 TONS CLASS I

54" CSP (10GA) ALUMINIZED W/ELBOWS

60" CSP (10GA) ALUMINIZED

54" CSP (10GA) ALUMINIZED

2GI-A

2GI

CAT-1

TBJB
wSlab Lid

24" RCP III

18" RCP-III

15" RCP-III

54" RCP-IV

15" W/ELBOW

ELBOWS

+92.20
15.45'

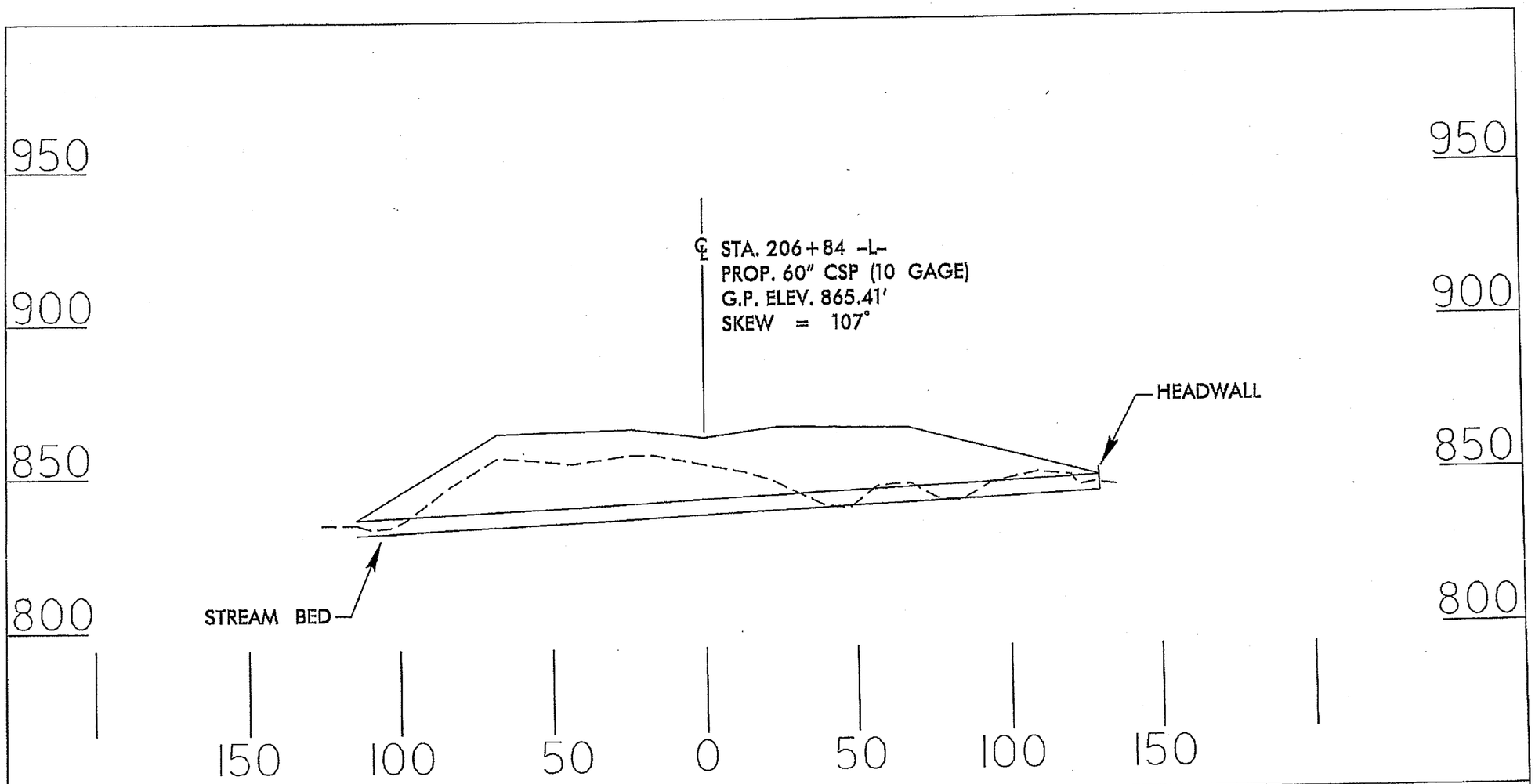
TOE PROTECTION
25 TONS CLASS 'B'
RIP RAP LINED
SEE DETAIL 'E'

EARTH BERM W/5' TOP WIDTH
2:1 SIDE SLOPES
350 CY FILL
TOP ELEV. 872.0'

33 RANDALL TODD WILSON

34 MARSHALL R. TWIDDY AND PEGGY P. TWIDDY

EIP TB HW FS RW CA



PROFILE

NCDOT
DIVISION OF HIGHWAYS
GUILFORD COUNTY
PROJECT: 34429.1.1 (R-2413A)
NC 68 CONNECTOR
FROM FOUR LANES AT
SR 2011 TO SR 2127

SHEET 24 OF 81 2/13/13

PROJECT REFERENCE NO.	SHEET NO.
R-2413A	14
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

Permit Drawing
Sheet 25 of 81

NAD 83/NSRS 2007

GRAPHIC SCALE
100 50 0 100 200
PLANS

REVISIONS

R/W REVISION: PARCEL 36 HAS BEEN SPLIT INTO THREE SEPARATE PARCELS. THE PROP. R/W LINE LOCATED RIGHT OF -L- BETWEEN STA.232+65.68 AND STA.235+30.83 HAS BEEN CHANGED TO AN EXIST. R/W LINE. CEH 11/21/2012

R/W REVISION: A PROPERTY LINE HAS BEEN ADDED TO PARCEL 36 WHICH RESULTED IN NEW PARCEL DESIGNATED AS PARCEL 36A. PARCEL 36A IS OWNED BY THOMAS AND CATHY MORRISON. CEH 1/23/2013

8/17/99

SITE 8

SITE 9

8A

8B

-L- STA. 219+00

-L- STA. 233+00

MATCH TO SHEET 13

MATCH TO SHEET 15

VANCE DALE PEGRAM

SHUGART MANAGEMENT, INC.

NCDOT (FORMERLY BRAME CORPORATION)

DONEYAN SOUTH

RIP RAP ENERGY DISSIPATOR BASIN
100 TONS CLASS I RIP RAP
110 SY FILTER FABRIC
100 CY EXCAVATION
SEE DETAIL 'AA'

SPECIAL LATERAL 'V' DITCH
FSRM LINED
SEE DETAIL 'A'
120 SY FSRM

SPECIAL CUT DITCH
GRASS LINED
SEE DETAIL 'D'

16:1 TAPER

EARTH BERM WITH
8' TOP WIDTH
2:1 SIDE SLOPES
TOP ELEV.=478.0'
40 CY FILL

BERM DITCH
SEE STD. 240.01
-L- STA. 221+00 TO 223+00

STANDARD 'V' DITCH
GRASS LINED
SEE DETAIL 'H'
60 CY EXCAVATION

4' LATERAL BASE DITCH
SEE DETAIL 'A'
368 TONS CLASS 'I' RIP RAP
393 SY FB
533 CY DDE

TOE PROTECTION
327 TONS CLASS 'B' RIP RAP LINED
SEE DETAIL 'E'
-L- STA. 228+40 TO -L- STA. 234+95

EST. 1 TON CL 'B' RIP RAP
EST. SY FILT. FAB.

EXISTING 66' DUKE POWER R/W DB 2743 PG 972

CRYSTAL COAST POWER R/W DB 2243 PG 972

S/S DENOTES IMPACTS IN SURFACE WATER

TS/TS DENOTES TEMPORARY IMPACTS IN SURFACE WATER

P/P DENOTES IMPACTS IN SURFACE WATER (POND)

$$$$$SYSTIME$$$$$
$$$$$SYSDATE$$$$$
$$$$$USERNAME$$$$$

GRAPHIC SCALE
100 50 0 100 200
PLANS

Permit Drawing Sheet 26 of 81
NAD 83/NSRS 2007

PROJECT REFERENCE NO.	SHEET NO.
R-2413A	14
MW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

REVISIONS
8/17/99
R/W REVISION: PARCEL 36 HAS BEEN SPLIT INTO THREE SEPARATE PARCELS, THE PROP. R/W LINE LOCATED RIGHT OF -L- BETWEEN STA.232+65.68 AND STA.235+30.85 HAS BEEN CHANGED TO AN EXIST. R/W LINE. CEH 11/21/2012
R/W REVISION: A PROPERTY LINE HAS BEEN ADDED TO PARCEL 36 WHICH RESULTED IN NEW PARCEL DESIGNATED AS PARCEL 36A. PARCEL 36A IS OWNED BY THOMAS AND CATHY MORRISON. CEH 1/25/2013

SITE 8

SITE 9

8A

8B

MATCH TO SHEET 13 -L- STA. 219+00

MATCH TO SHEET 15 -L- STA. 233+00

VANCE DALE PEGRAM

SHUGART MANAGEMENT, INC.

NCDOT (FORMERLY BRAME CORPORATION)

SPECIAL LATERAL 'V' DITCH PSRIP LINED SEE DETAIL 'X' 120 SY PSRM

SPECIAL CUT DITCH GRASS LINED SEE DETAIL 'D'

RIP RAP ENERGY DISSIPATOR BASIN 100 TONS CLASS I RIP RAP 510 SY RIPRAP/FABRIC 100 CY EXCAVATION SEE DETAIL 'AA'

EARTH BERM WITH 6' TOP WIDTH 2:1 SIDE SLOPES TOP ELEV.=878.0 40 CY FILL

BERM DITCH SEE STD. 240.01 -L- STA. 221+00 TO 223+00

STANDARD V-DITCH GRASS LINED SEE DETAIL 'H' 60 CY EXCAVATION

LATERAL BASE DITCH SEE DETAIL 'AA' 568 TONS CLASS I RIP RAP 515 SY FILT 553 SY DD3

TOE PROTECTION 337 TONS CLASS 'B' RIP RAP LINED SEE DETAIL 'P' -L- STA. 228+40 TO -L- STA. 234+90

EST. 1 TON CL 'B' RIP RAP 557 SY FILT. FAB.

EXISTING R/W

EXISTING DUKE POWER R/W DB 2143 PG 372

DENOTES IMPACTS IN SURFACE WATER

DENOTES TEMPORARY IMPACTS IN SURFACE WATER

DENOTES IMPACTS IN SURFACE WATER (POND)

Permit Drawing
Sheet 27 of 81

NAD 83/NSRS 2007

PROJECT REFERENCE NO.	SHEET NO.
R-2413A	14
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

8/17/99

REVISIONS

SITE 8

SITE 9

916
NCDOT
(FORMERLY BRAME CORPORATION)

EXISTING R/W

F

TB

66" CSP (8 GA) ALUMINIZED

CAT-1

JB w/Slab Lid

8A

TBJB w/Slab Lid

15"

2GI

FS

15" RCP-IV

8B

ELBOWS

15"

HWS

TB

TS

TB

+39.56
176.07

SHUGART MANAGEMENT, INC.

TOE PROTECTION
327 TONS CLASS 'B' RIP RAP LINED
SEE DETAIL 'E'
-L- STA. 228+40 TO -L- STA. 234+95

'L 'B' RIP RAP
T. FAB.

EIP

38

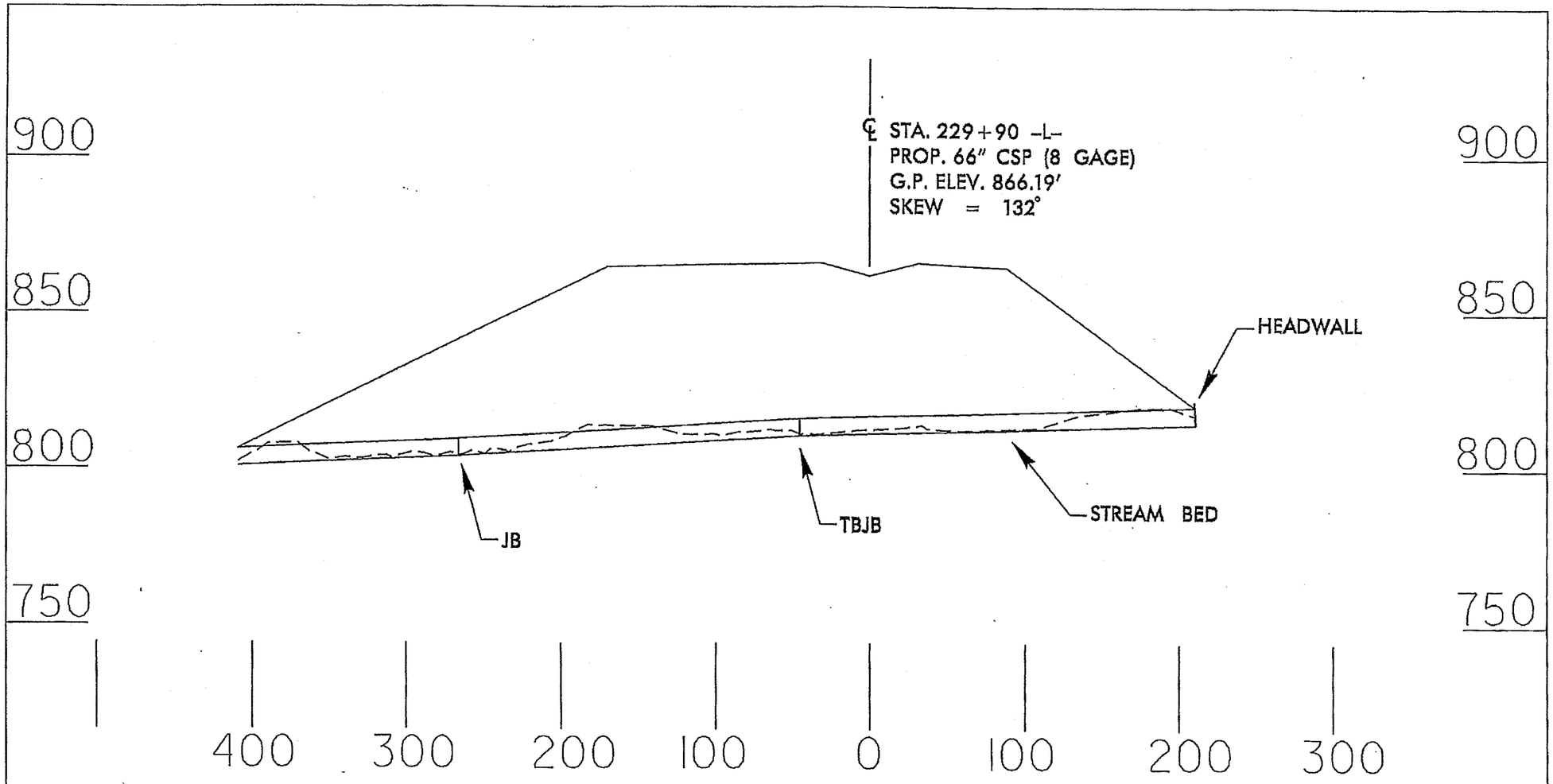
100' 0' 100'

SCALE: 1"= 100'

DENOTES IMPACTS IN SURFACE WATER

DENOTES TEMPORARY IMPACTS IN SURFACE WATER

DENOTES IMPACTS IN SURFACE WATER (POND)



PROFILE

NCDOT

DIVISION OF HIGHWAYS

GUILFORD COUNTY

PROJECT: 34429.1.1 (R-2413A)

NC 68 CONNECTOR

FROM FOUR LANES AT

SR 2011 TO SR 2127

SHEET 28 OF 81 2/13/13

Permit Drawing
Sheet 29 of 81

NAD 83/NSRS 2007

PROJECT REFERENCE NO.	SHEET NO.
R-2413A	15
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

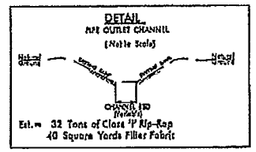
8/17/99

REVISIONS

R/W REVISION, PARCEL 38 HAS BEEN SPLIT INTO THREE SEPARATE PARCELS, THE PROP. R/W LINE LOCATED RIGHT OF -L- BETWEEN STA.232+65.68 AND STA.235+30.83 HAS BEEN CHANGED TO AN EXIST. R/W LINE. CEH 11/21/2012

SITE 8

DETAIL
RIP OUTLET CHANNEL
(Not to Scale)



S S DENOTES IMPACTS IN SURFACE WATER

P P DENOTES IMPACTS IN SURFACE WATER (POND)

TS TS DENOTES TEMPORARY IMPACTS IN SURFACE WATER

8A

8C

4' LATERAL BASE DITCH
SEE DETAIL 'A'
368 TONS CLASS 'I' RIP RAP
595 SY FF

EXISTING 66' DUKE POWER R/W DB 2743 PG 172

SCRUB

EP 6.05' OFF LINE

NCDOT (FORMERLY BRAME CORPORATION) 916

32 TONS CLASS 'I' RIP RAP
40 SY FILTER FABRIC

SPECIAL CUT DITCH GRASS LINED SEE DETAIL 'D'

2' STANDARD BASE DITCH GRASS LINED SEE DETAIL 'H'
250 CY EXCAVATION

NCDOT (FORMERLY BOBBY E. AND SHIRLEY SMITH) 917

EST. 1 TON CL 'B' RIP RAP
EST. 3 SY FILT. FAB.

EST. 5 TONS CL 'B' RIP RAP
EST. 14 SY FILT. FAB.

SPECIAL CUT DITCH GRASS LINED SEE DETAIL 'D'

TOE PROTECTION
88 TONS CLASS 'B' RIP RAP LINED
SEE DETAIL 'E'
-L- STA. 246+50 to 247+50

-L- STA. 233+00

-L- STA. 247+00

MATCH TO SHEET 14

MATCH TO SHEET 16

SHUGART MANAGEMENT, INC. 38

EST. 2 TON CL 'B' RIP RAP
EST. 7 SY FILT. FAB.

TOE PROTECTION
345 TONS CLASS 'B' RIP RAP LINED
SEE DETAIL 'E'
-L- STA. 228+40 TO -L- STA. 235+30

DONEVAN SOUTH

TAIWO A. ANDE

DAVID A. CRANMER AND LINDA A. CRANMER

SEPTIC EASEMENT FOR 60 POOS

SHUGART MANAGEMENT, INC.

PSH
SEE DETAIL 'AP'

4' LATERAL BASE DITCH
SEE DETAIL 'AA'
58 TONS CLASS 'B' RIP RAP
165 SY FF
140 CY DDE

DONALD LINEBERRY 39

SITE 9

SITE 10

10A

10B

FOR -L- PROFILE, SEE SHEET NO. 41

FOR DITCH DETAILS, SEE SHEET NOS. 2-W & 2-X

Permit Drawing Sheet 30 of 81

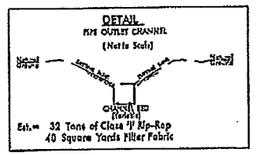
NAD 83/NSRS 2007

PROJECT REFERENCE NO.	SHEET NO.
R-2413A	15
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

SITE 8

DETAIL
RIP OUTLET CHANNEL
(Not to Scale)



Est.= 32 Tons of Class 'I' Rip-Rap
40 Square Yards Filter Fabric

DENOTES IMPACTS IN SURFACE WATER

DENOTES IMPACTS IN SURFACE WATER (POND)

DENOTES TEMPORARY IMPACTS IN SURFACE WATER

8A

8C

MATCH TO SHEET 14

-L- STA. 233+00

-L- STA. 247+00

MATCH TO SHEET 16

10A

10B

SITE 9

SITE 10

FOR -L- PROFILE, SEE SHEET NO. 41

FOR DITCH DETAILS, SEE SHEET NOS. 2-W & 2-X

REVISIONS

R/W REVISION: PARCEL 38 HAS BEEN SPLIT INTO THREE SEPARATE PARCELS. THE PROP. R/W LINE LOCATED RIGHT OF -L- BETWEEN STA.232+65.68 AND STA.235+30.83 HAS BEEN CHANGED TO AN EXIST. R/W LINE. CEH 11/21/2012

8/17/99

Permit Drawing Sheet 31 of 81

PROJECT REFERENCE NO.	SHEET NO.
R-2413A	15
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

NAD 83/NSRS 2007

SITE 8

SITE 9

S S DENOTES IMPACTS IN SURFACE WATER

P P DENOTES IMPACTS IN SURFACE WATER (POND)

TS TS DENOTES TEMPORARY IMPACTS IN SURFACE WATER

100' 0' 100'

SCALE: 1"= 100'

8A

8C

TB TB PDE PDE

32 TONS CLASS 'A' RIP RAP
40 SY FILTER FABRIC

SCRUB

HW HW

F

66" CSP (8 GA) ALUMINIZED

42" CSP (10 GA) ALUMINIZED W/ELBOWS

6' STEEL

REMOVE

NCDOT (FORMERLY BRAME CORPORATION)

916

EST. 1 TON CL 'B' RIP RAP
EST. 5 SY FILT. FAB.

15" GRAU 350

2GI 2GI

2GI FS

15" RCP-IV

2GI 15" 2GI-A CAT-1

18" ELBOWS

WE 823.5'

N 39°16'02" E 301.16'

EST. 2 TON CL 'B' RIP RAP
EST. 7 SY FILT. FAB.

SHUGART MANAGEMENT, INC.

38

EXISITNG R/W

TOE PROTECTION
345 TONS CLASS 'B' RIP RAP LINED
SEE DETAIL 'E'
-L- STA. 228+40 TO -L- STA. 235+30

DONEVAN SOUTH

REVISIONS 8/17/99

PROJECT REFERENCE NO.	SHEET NO.
R-2413A	16
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

Permit Drawing
Sheet 32 of 81

NAD 83/NSRS 2007

8/17/99

REVISIONS

SITE 10

10A

10C

SITE 11

MATCH TO SHEET 15 -L- STA. 247+00

MATCH TO SHEET 17 -L- STA. 261+00

SCRUB

DONALD LINEBERRY (39)

NCDOT (FORMERLY ALLEN AND RACHEL STANLEY ESTATE) (920)

OLENE S. SHOTWELL, ET AL (81)

TOE PROTECTION 6 TONS CLASS 'A' RIP RAP LINED SEE DETAIL 'E' -L- STA. 247+50 to 247+50

4' LATERAL BASE DITCH SEE DETAIL 'AS' 97 TONS CLASS 'B' RIP RAP 294 SY FP 414 CY DDE

18 TONS CLASS 'I' RIP RAP 25 SY FILTER FABRIC

TOE PROTECTION 106 TONS CLASS 'B' RIP RAP SEE DETAIL 'E'

GRADE TO DRAIN

SPECIAL CUT DITCH GRASS LINED SEE DETAIL 'D'

TOE PROTECTION 178 TONS CLASS 'B' RIP RAP LINED SEE DETAIL 'E'

EST. 1 TONS CL 'B' RIP RAP EST. 5 SY CLT. FAB.

FSH SEE DETAIL 'AQ'

DETAIL
PIPE OUTLET CHANNEL
(Not to Scale)

CHANNEL 110 (Typical)

Est.= 32 Tons of Class 'I' Rip-Rap
40 Square Yards Filter Fabric

F/F DENOTES FILL IN WETLAND

E/E DENOTES EXCAVATION IN WETLAND

S/S DENOTES IMPACTS IN SURFACE WATER

TS/TS DENOTES TEMPORARY IMPACTS IN SURFACE WATER

DENOTES MECHANIZED CLEARING

GRAPHIC SCALE
100 50 0 100 200
PLANS

Permit Drawing
Sheet 33 of 81

NAD 83/NSRS 2007

PROJECT REFERENCE NO.	SHEET NO.
R-2413A	16
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

8/17/99

REVISIONS

SITE 10

10A

10C

SITE 11

MATCH TO SHEET 15

MATCH TO SHEET 17

-L- STA. 247+00

-L- STA. 261+00

DONALD LINEBERRY

NCDOT (FORMERLY ALLEN AND RACHEL STANLEY ESTATE)

OLENE SHOTWELL, ETUX

DETAIL
PIPE OUTLET CHANNEL
(Not to Scale)

Est.= 32 Tons of Class 'I' Rip-Rap
40 Square Yards Filter Fabric

DENOTES FILL IN WETLAND

DENOTES EXCAVATION IN WETLAND

DENOTES IMPACTS IN SURFACE WATER

DENOTES TEMPORARY IMPACTS IN SURFACE WATER

DENOTES MECHANIZED CLEARING

GRAPHIC SCALE
100 50 0 100 200
PLANS

PROJECT REFERENCE NO.	SHEET NO.
R-2413A	16
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

Permit Drawing Sheet 64 of 81

NAD 83/NSRS 2007

8/17/99

REVISIONS

SITE 10

SITE 11

39 DONALD LINEBERRY

TOE PROTECTION
58 TONS CLASS 'B' RIP RAP LINED
SEE DETAIL 'E'
-L- STA. 246+50 to 247+50

4' LATERAL BASE DITCH
SEE DETAIL 'AS'
97 TONS CLASS 'B' RIP RAP
294 SY FF
414 CY DDE

18 TONS CLASS 'I' RIP RAP
25 SY FILTER FABRIC

TOE PROTECTION
106 TONS CLASS 'B' RIP RAP
SEE DETAIL 'E'

72" CSP (8 GA) ALUMINIZED

48" CSP (10 GA) ALUMINIZED

TBJB
w/Slab Lid
SEE SPECIAL DETAIL

2GI

15"

ELBOWS

10C

10A

10B

SCRUB

4' LATERAL BASE DITCH
SEE DETAIL 'AS'
58 TONS CLASS 'B' RIP RAP
155 SY FF

TOE PROTECTION
78 TONS CLASS 'B' RIP RAP LINED
SEE DETAIL 'E'
EST. 1 TON CL 'B' RIP R
EST. 5 SY FILT. FAB.

DONALD LINEBERRY

39

F F DENOTES FILL IN WETLAND

E E DENOTES EXCAVATION IN WETLAND

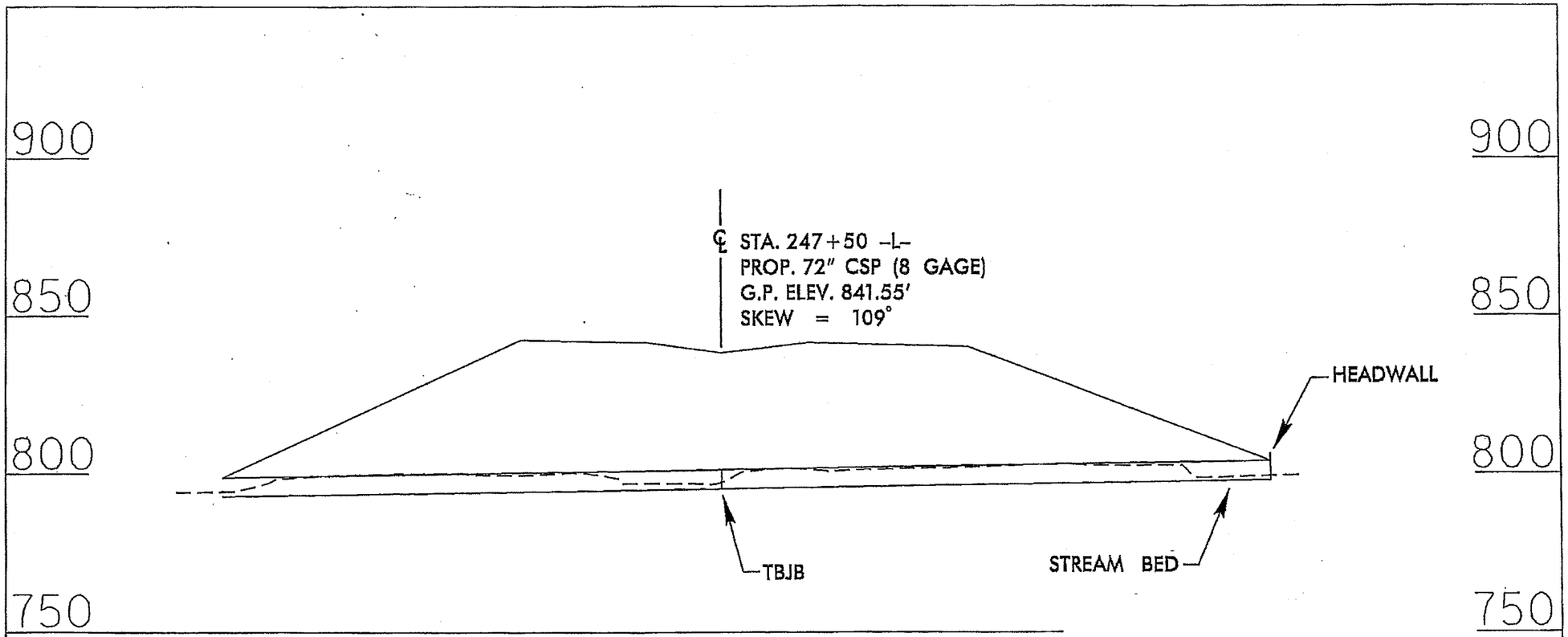
S S DENOTES IMPACTS IN SURFACE WATER

TS TS DENOTES TEMPORARY IMPACTS IN SURFACE WATER

DENOTES MECHANIZED CLEARING

100' 0' 100'

SCALE: 1"= 100'



PROFILE

NCDOT

DIVISION OF HIGHWAYS

GUILFORD COUNTY

PROJECT: 34429.1.1 (R-2413A)

NC 68 CONNECTOR

FROM FOUR LANES AT

SR 2011 TO SR 2127

SHEET 35 OF 81 2/13/13

Permit Drawing
Sheet 22 of 91

8/23/99

FILL IN WETLANDS

250+50.00

250+00.00

249+50.00

249+00.00

SYSTUSERNAME$$$

Permit Drawing Sheet 32 of 81

PROJECT REFERENCE NO.	SHEET NO.
R-2413A	17
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

NAD 83/NSRS 2007

DENOTES IMPACTS IN SURFACE WATER

DENOTES TEMPORARY IMPACTS IN SURFACE WATER

SITE 12

MATCH TO INSET A-A

MATCH TO INSET B-B

MATCH TO INSET B-B

-L- +40.00 575.00' RT

-L- +75.00 615.00' RT

-L- +54.00 672.00' RT

-L- +66.00 770.00'RT

81 OLENE S. SHOTWELL, ET AL DB 6284 PG 2277 DB 1734 PG 0648

920 NCDOT (FORMERLY ALLEN AND RACHEL STANLEY ESTATE)

82 JOHN W. RUMLEY AND CAROLYN T. RUMLEY

12B

12A

MATCH TO SHEET 16 -L- STA. 261+00

MATCH TO SHEET 18 -L- STA. 275+00

2' STANDARD BASE DITCH GRASS LINED SEE DETAIL 'A' 70 CY EXCAVATION

LATERAL 'V' DITCH GRASS LINED SEE DETAIL 'I' 204 CY DDE

EST. 11 TONS CL I RIP RAP EST. 22 SY FILT. FAB.

GRADE TO DRAIN

SPECIAL CUT DITCH GRASS LINED SEE DETAIL 'D'

2' STANDARD BASE DITCH PSRM LINED SEE DETAIL 'B' 60 CY EXCAVATION 40 SY PSRM

SPECIAL CUT DITCH GRASS LINED SEE DETAIL 'D'

SEE MITIGATION SITE 1 SHEET DSM-3

SEE MITIGATION SITE 1 SHEET DSM-3

4' LATERAL BASE DITCH SEE DETAIL 'A' 152 TONS CLASS 'I' RIP RAP 365 SY FF 462 CY DDE

EST. 1 TON CL 'B' RIP RAP EST. 5 SY FILT. FAB.

SPECIAL CUT DITCH GRASS LINED SEE DETAIL 'D'

SCRUB

GRAU 350

EXISTING R/W

(EXIST C/A)

OLENE S. SHOTWELL, ET AL

GRAPHIC SCALE

100 50 0 100 200

PLANS

REVISIONS

8/17/99

PROJECT REFERENCE NO.	SHEET NO.
R-2413A	11
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

Permit Drawing Sheet 38 of 81

NAD 83/NSRS 2007

8/17/98

REVISIONS

DENOTES IMPACTS IN SURFACE WATER

DENOTES TEMPORARY IMPACTS IN SURFACE WATER

SITE 12

MATCH TO INSET A-A

MATCH TO INSET B-B

MATCH TO INSET B-B

MATCH TO INSET A-A

MATCH TO SHEET 16 -L- STA. 261+00

MATCH TO SHEET 18 -L- STA. 275+00

12A

12B

NCDOT (FORMERLY ALLEN AND RACHEL STANLEY ESTATE)

OLENE S. SHOTWELL, ET AL

JOHN W. RUMLEY AND CAROL TH. L. RUMLEY

2' STANDARD BASE DITCH GRASS LINED SEE DETAIL 'M' 70 CY EXCAVATION

LATERAL 'A' DITCH GRASS LINED SEE DETAIL 'I' 204 CY DIG

EST. 11 TONS CL I RIP RAP EST. 22 SY FILTER FAB

GRADE TO DRAIN

SPECIAL CUT DITCH GRASS LINED SEE DETAIL 'G'

2' STANDARD BASE DITCH GRASS LINED SEE DETAIL 'K' 40 CY EXCAVATION 40 SY FAB

SPECIAL CUT DITCH GRASS LINED SEE DETAIL 'O'

SEE MITIGATION SITE SHEET OM-3

EST. 4 TONS CL I RIP RAP

SPECIAL CUT DITCH GRASS LINED SEE DETAIL 'O'

CONTRAS BASE DITCH SEE DETAIL 'J'

519 TONS CLASS B RIP RAP

519 SY FB

519 CY GEO

GRAU 350

SCRUB

EXIST CMP

EXISTING R/W

GRAPHIC SCALE

100 50 0 100 200

PLANS

Permit Drawing Sheet 39 of 81

PROJECT REFERENCE NO.	SHEET NO.
R-2413A	17
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

NAD 83/NSRS 2007

8/17/99

REVISIONS

SITE 12

DENOTES IMPACTS IN SURFACE WATER

DENOTES TEMPORARY IMPACTS IN SURFACE WATER

SEE MITIGATION SITE 1 SHEET OSM-5

12B

12A

SCRUB

EST. 1 TON CL 'B' RIP RAP
EST. 5 SY FILT. FAB.

SPECIAL CUT DITCH
GRASS LINED
SEE DETAIL 'D'

72" CSP (8 GA.) ALUMINIZED

15" RCP-IV

2GI

ELBOWS

GRAU 350

16:1 TAPER

CAT-1

HW

TB

F

C

4' LATERAL BASE DITCH
SEE DETAIL 'L'
152 TONS CLASS 'B' RIP RAP
383 SY FF
662 CY DDE

EXISTING R/W

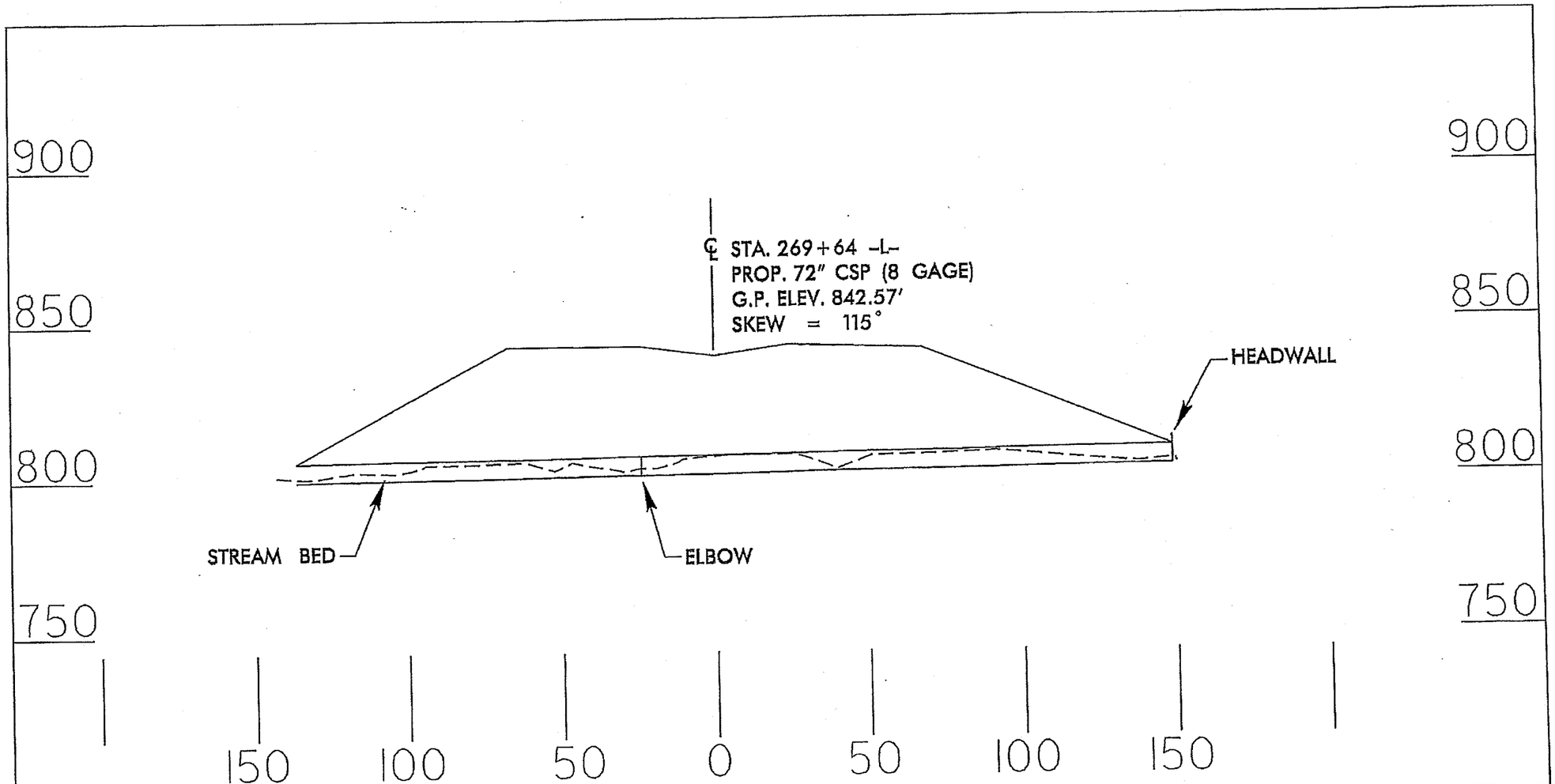
-L- +65.00

(EXIST C/A)

SEE MITIGATION SITE 1 SHEET OSM-4

100' 0' 100'

SCALE: 1"= 100'



PROFILE

NCDOT

DIVISION OF HIGHWAYS

GUILFORD COUNTY

PROJECT: 34429.1.1 (R-2413A)

NC 68 CONNECTOR

FROM FOUR LANES AT

SR 2011 TO SR 2127

SHEET 40 OF 81 2/13/13

Permit Drawing Sheet 41 of 81

NAD 83/NSRS 2007

PROJECT REFERENCE NO.	SHEET NO.
R-2413A	18
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

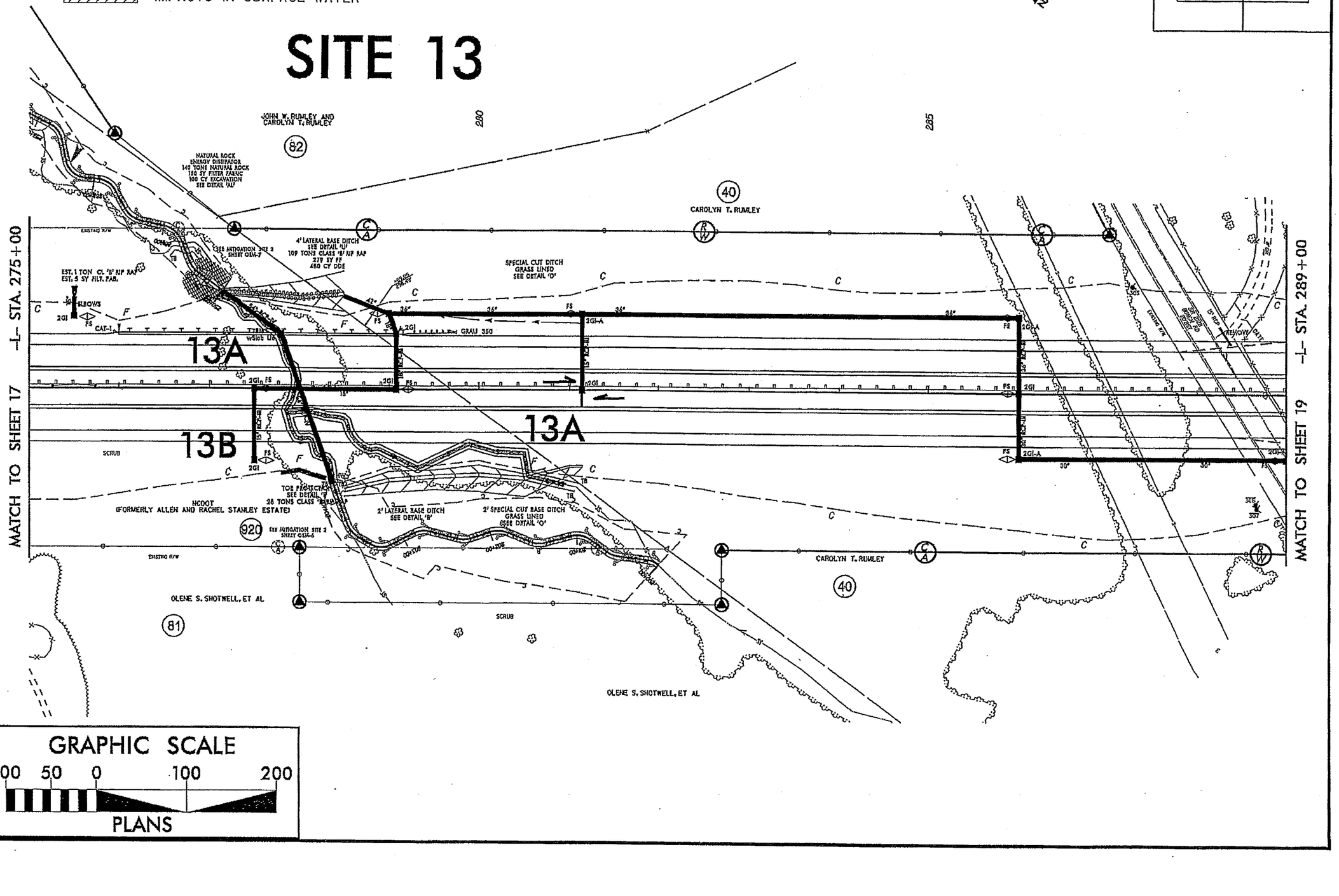
8/17/99

REVISIONS

DENOTES IMPACTS IN SURFACE WATER

DENOTES TEMPORARY IMPACTS IN SURFACE WATER

SITE 13



GRAPHIC SCALE

100 50 0 100 200

PLANS

PROJECT REFERENCE NO.	SHEET NO.
R-2413A	18
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

Permit Drawing
Sheet 42 of 81

NAD 83/NSRS 2007

DENOTES IMPACTS IN SURFACE WATER

DENOTES TEMPORARY IMPACTS IN SURFACE WATER

SITE 13

13A

13B

13A

-L- STA. 275+00

MATCH TO SHEET 17

-L- STA. 289+00

MATCH TO SHEET 19

JOHN W. RUMLEY AND CAROLYN T. RUMLEY

CAROLYN T. RUMLEY

NCDOT (FORMERLY ALLEN AND RACHEL STANLEY ESTATE)

OLENE S. SHOTWELL, ET AL

NATURAL ROCK ENERGY DISSIPATOR 140 TONS NATURAL ROCK 250 SY FILTER FABRIC 100 CY EXCAVATION SEE DETAIL 'A'

1' LATERAL BASE DITCH SEE DETAIL 'J' 109 TONS CLASS 'B' RIP RAP 279 SY FF 180 CY EXC

SPECIAL CUT DITCH GRASS LINED SEE DETAIL 'D'

1' LATERAL BASE DITCH SEE DETAIL 'B'

2' SPECIAL CUT BASE DITCH GRASS LINED SEE DETAIL 'G'

SEE MITIGATION SITE 2 SHEET G3A-2

SEE MITIGATION SITE 2 SHEET G3A-1

SCRUB

EXISTING R/W

GRAPHIC SCALE

100 50 0 100 200

PLANS

REVISIONS

8/17/99

$SYSTIME$$$

R-2413A	18
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION	

Permit Drawing Sheet 43 of 81

NAD 83/NSRS 2007

SITE 13

DENOTES IMPACTS IN SURFACE WATER

DENOTES TEMPORARY IMPACTS IN SURFACE WATER

EXISTING R/W

SEE MITIGATION SITE 2 SHEET OSM-7

4' LATERAL BASE DITCH
SEE DETAIL 'U'
109 TONS CLASS 'B' RIP RAP
279 SY FF
460 CY DDE

SPECIAL CUT DITCH
GRASS LINED
SEE DETAIL 'D'

EST. 1 TON CL 'B' RIP RAP
EST. 5 SY FILT. FAB.

15" ELBOWS

2GI

FS

CAT-1

54" RCP-IV

TBJB w/Slab Lid

+69.05
298.49'

42"

36"

36"

FS

36"

2GI-A

2GI

GRAU 350

18" RCP-III

15" RCP-III

13A

2GI FS

2GI FS

15"

54" RCP-IV

15" RCP-III

13A

SCRUB

FS 13B

2GI

HW

TB

TOE PROTECTION
SEE DETAIL 'E'
28 TONS CLASS 'B' RIP RAP

NCDOT
(FORMERLY ALLEN AND RACHEL STANLEY ESTATE)

2' LATERAL BASE DITCH
SEE DETAIL 'B'

2' SPECIAL CUT BASE DITCH
GRASS LINED
SEE DETAIL 'O'

203+00

202+00

201+00

920

SEE MITIGATION SITE 2 SHEET OSM-6

100' 0' 100'

SCALE: 1"= 100'

REVISIONS 8/17/99

PROJECT REFERENCE NO.	SHEET NO.
R-2413A	20
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

Permit Drawing
Sheet 44 of 81
Revised 7/1/13

8/17/99

REVISIONS

DENOTES IMPACTS IN SURFACE WATER

DENOTES TEMPORARY IMPACTS IN SURFACE WATER

SITE 14

NAD 83/NSRS 2007

MATCH TO SHEET 19

-L- STA. 303+00

-L- STA. 317+00

MATCH TO SHEET 21

14A

14B

945Z
BANDERA FARMS, INC.

945
NCDOT
(FORMERLY BANDERA FARMS, INC.)

EXISTING R/W

TOE PROTECTION
SEE DETAIL 'E'
81 TONS RIP RAP

36 TONS CLASS 'I' RIP RAP

EST. 1 TON CL 'B' RIP RAP
EST. 5 SY FILT. FAB.

15" WELBOWS CAT-1

2GI

SPECIAL LATERAL 'V' DITCH
GRASS LINED
SEE DETAIL 'G'

EST. 1 TONS CL 'B' RIP RAP
EST. 5 SY FILT. FAB.

GRAU 350

SPECIAL CUT DITCH
GRASS LINED
SEE DETAIL 'D'

2' STANDARD BASE DITCH
GRASS LINED
SEE DETAIL 'A'
50CY EXCAVATION

SPECIAL CUT DITCH
GRASS LINED
SEE DETAIL 'D'

EST. 3 TONS CL 'B' RIP RAP
EST. 11 SY FILT. FAB.

24" RCP III

FS

EST. 2 TONS CLASS 'B' RIP RAP
EST. 7 SY FILT. FAB.

SPECIAL CUT DITCH
GRASS LINED
SEE DETAIL 'D'

4' STANDARD BASE DITCH
SEE DETAIL 'A'
260CY EXCAVATION
33 TONS CLASS I
77 SY FF

4' STANDARD BASE DITCH
GRASS LINED
SEE DETAIL 'A'
200CY EXCAVATION

TOE PROTECTION
SEE DETAIL 'E'
284 TONS RIP RAP

TOE PROTECTION
SEE DETAIL 'E'
285 TONS RIP RAP

BDO

SEE STD. 240.01
-L- STA. 315+50 to 317+00

GRAPHIC SCALE
100 50 0 100 200
PLANS

PROJECT REFERENCE NO.	SHEET NO.
R-2413A	20
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

Permit Drawing
Sheet 45 of 81
Revised 7/11/16

8/17/99

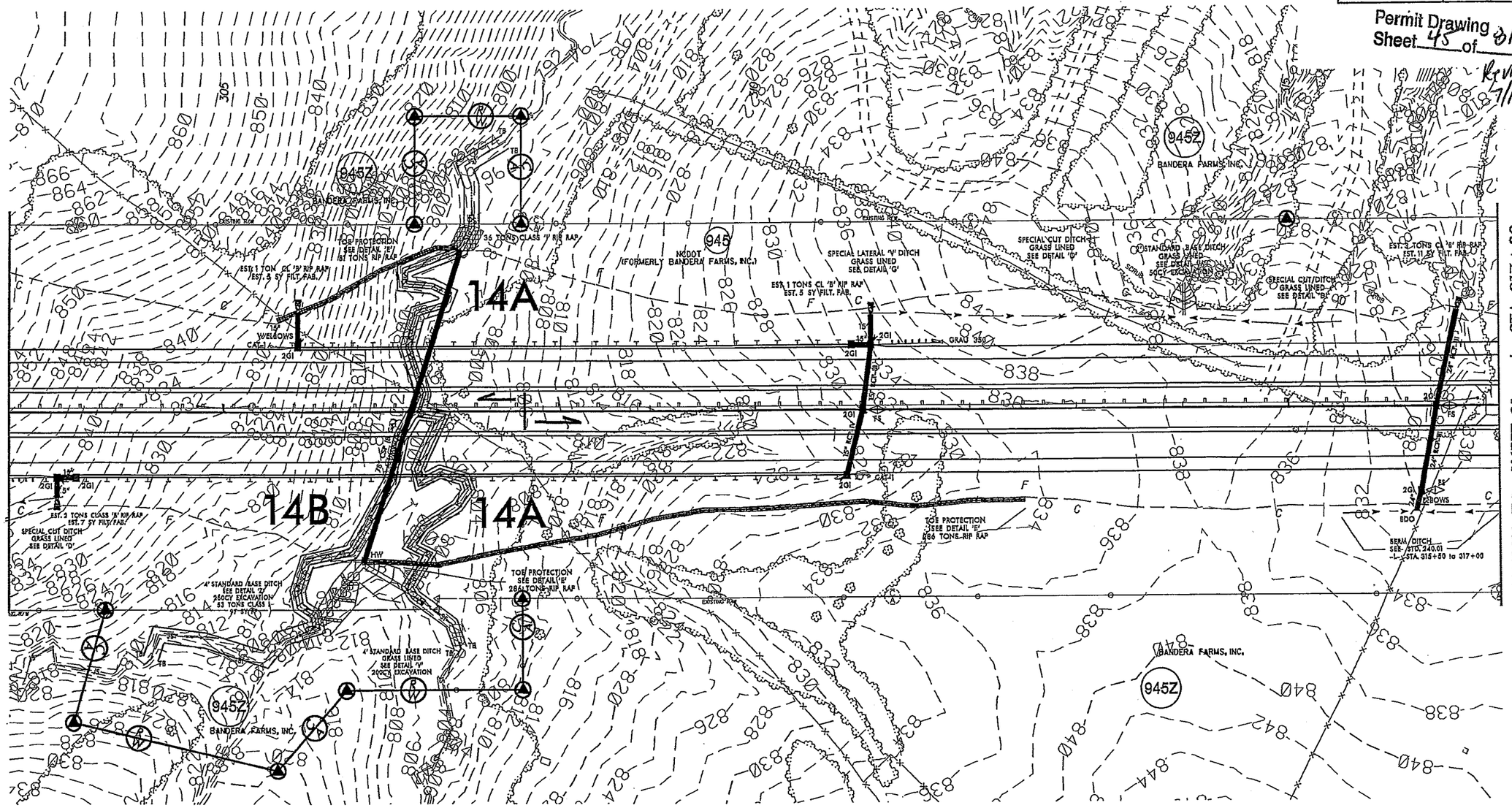
REVISIONS

DENOTES IMPACTS IN SURFACE WATER

DENOTES TEMPORARY IMPACTS IN SURFACE WATER

SITE 14

NAD 83/NSRS 2007



GRAPHIC SCALE

100 50 0 100 200

PLANS

DGN: SYSTIME: INTERNAME:

NAD 83/NSRS 2007

R/W SHEET NO.

ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

Permit Drawing
Sheet 46 of 81
Revised 7/1/13

945Z
BANDERA FARMS, INC.

EXISTING R/W

TOE PROTECTION
SEE DETAIL 'E'
81 TONS RIP RAP

EST. 1 TON CL 'B' RIP RAP
EST. 5 SY FILT. FAB.

36 TONS CLASS 'I' RIP RAP

945
NCDOT
(FORMERLY BANDERA FARMS, INC.)

14A

15"
W/ELBOWS
CAT-1
2GI

78" CSP (8 GA.)
ALUMINIZED

14B

14A

4' STANDARD BASE DITCH
SEE DETAIL 'Z'
260CY EXCAVATION
53 TONS CLASS I
97 SY FF

HW

TOE PROTECTION
SEE DETAIL 'E'
286 TONS RIP RAP

4' STANDARD BASE DITCH
GRASS LINED
SEE DETAIL 'V'

SITE 14

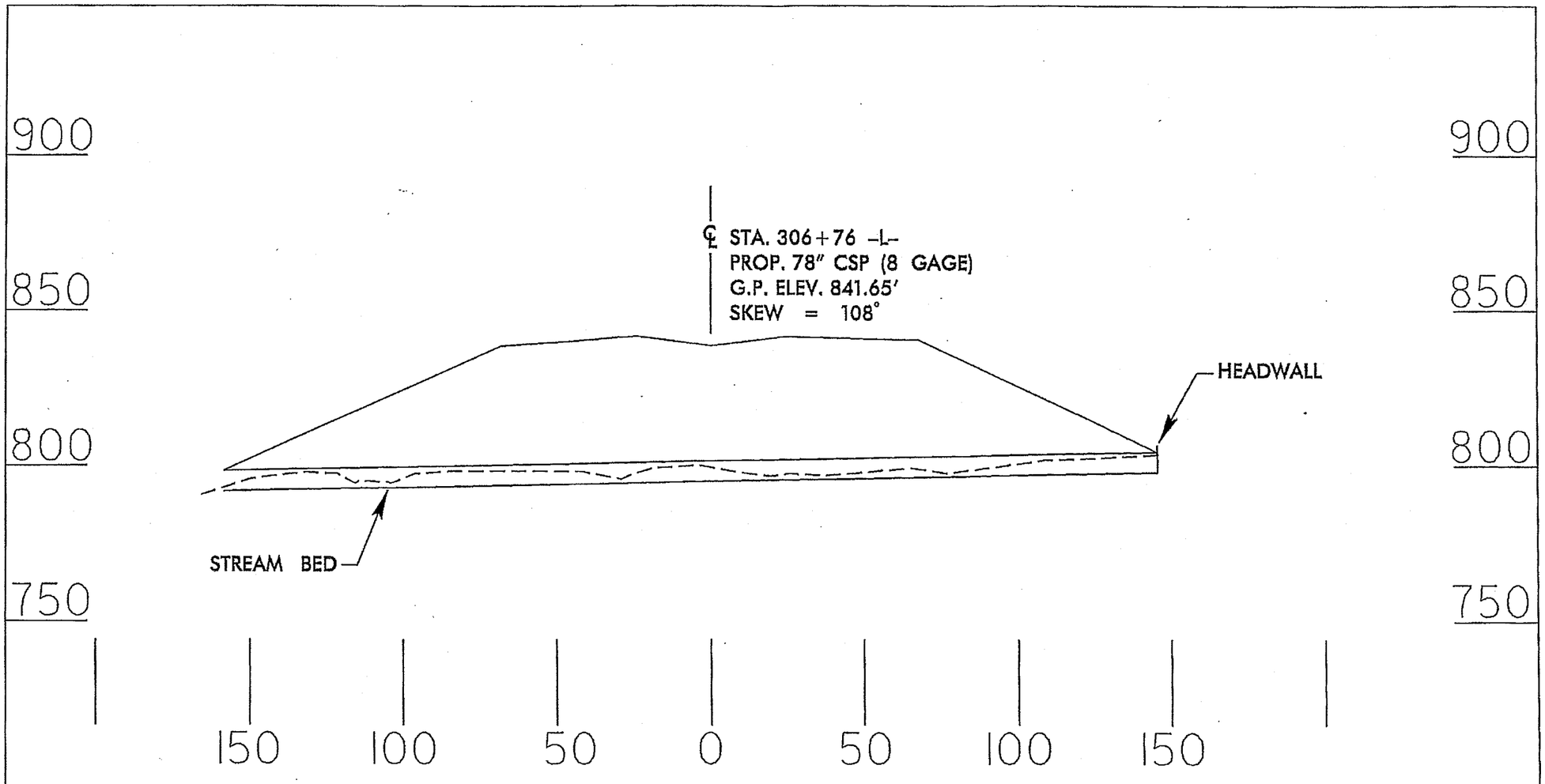
TS TS DENOTES TEMPORARY IMPACTS IN SURFACE WATER

S S DENOTES IMPACTS IN SURFACE WATER

100' 0' 100'
SCALE: 1"= 100'

REVISIONS

8/17/



PROFILE

NCDOT
DIVISION OF HIGHWAYS
GUILFORD COUNTY
PROJECT: 34429.1.1 (R-2413A)
NC 68 CONNECTOR
FROM FOUR LANES AT
SR 2011 TO SR 2127

SHEET 47 OF 81 2/13/13

PROJECT REFERENCE NO.	SHEET NO.
R-2413A	21
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

Permit Drawing Sheet 48 of 81

NAD 83/NSRS 2007

SITE 15

SITE 16

CITY OF GREENSBORO

REVISIONS 8/17/99

MATCH TO SHEET 20

MATCH TO SHEET 22

-L- STA. 317+00

-L- STA. 331+00

945Z
BANDERA FARMS, INC.

915A
NCDOT
(FORMERLY SESSOMS DEVELOPMENT, LLC)

915
NCDOT
(FORMERLY SESSOMS DEVELOPMENT, LLC)

44
ARTHUR M. BIRIG AND ANN S. BIRIG

DAVID L. BULLINS AND JEANNA L. BULLINS

RICHARD J. DISPENSA AND SUSAN DISPENSA

EDWARD B. WAYNICK AND DANA J. WAYNICK

DETAIL
PIPE OUTLET CHANNEL
(Not to Scale)

Est.= 24 Tons of Class 'I' Rip-Rap
32 Square Yards Filter Fabric

DETAIL
PIPE OUTLET CHANNEL
(Not to Scale)

Est.= 32 Tons of Class 'I' Rip-Rap
40 Square Yards Filter Fabric

24 TONS CLASS 'I' RIP RAP
32 SY FILTER FABRIC

32 TONS CLASS 'I' RIP RAP
40 SY FILTER FABRIC

SPECIAL CUT DITCH GRASS LINED SEE DETAIL 'D'

SPECIAL CUT DITCH GRASS LINED SEE DETAIL 'D'

SEE DETAIL 'AQ'

SEE DETAIL 'AP'

SEE SPECIAL DETAIL

2' LATERAL BASE DITCH FERN LINED SEE DETAIL 'AN' 260 SY JEAN 715 CY DOE

2' LATERAL BASE DITCH GRASS LINED SEE DETAIL 'N' 1612 CY DOE

15A

15B

16A

16B

S S DENOTES IMPACTS IN SURFACE WATER

TS TS DENOTES TEMPORARY IMPACTS IN SURFACE WATER

F F DENOTES FILL IN WETLAND

GRAPHIC SCALE
100 50 0 100 200
PLANS

PROJECT REFERENCE NO.	SHEET NO.
R-2413A	21
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

Permit Drawing Sheet 49 of 81

NAD 83/NSRS 2007

SITE 15

SITE 16

8/17/99

REVISIONS

-L- STA. 317+00

-L- STA. 331+00

MATCH TO SHEET 20

MATCH TO SHEET 22

CITY OF GREENSBORO

BANDERA FARMS, INC.

NCDOT (FORMERLY SESSOMS DEVELOPMENT, LLC)

RICHARD J. DISPENSA AND SUSAN DISPENSA

EDWARD B. WAYNICK AND DANA J. WAYNICK

DAVID L. BULLINS AND JEANNA L. BULLINS

ARTHUR M. BROOKS AND ANN S. BROOKS

15A

15B

16A

16B

DETAIL
RIP OUTLET CHANNEL
(Not to Scale)

Est.= 44 Tons of Class "I" Rip-Rap
32 Square Yards Filter Fabric

DETAIL
RIP OUTLET CHANNEL
(Not to Scale)

Est.= 32 Tons of Class "I" Rip-Rap
40 Square Yards Filter Fabric

32 TONS CLASS "I" RIP RAP
32 SY FILTER FABRIC

32 TONS CLASS "I" RIP RAP
40 SY FILTER FABRIC

SPECIAL CUT DITCH GRASS LINED SEE DETAIL 'D'

SPECIAL CUT DITCH GRASS LINED SEE DETAIL 'B'

72" CSP (16 GA) ALUMINIZED

54" CSP (16 GA) ALUMINIZED

TRIB w/Slab Lid SEE SPECIAL DETAIL

DENOTES IMPACTS IN SURFACE WATER

DENOTES TEMPORARY IMPACTS IN SURFACE WATER

DENOTES FILL IN WETLAND

GRAPHIC SCALE
100 50 0 100 200
PLANS

Permit Drawing Sheet 50 of 81

NAD 83/NSRS 2007

PROJECT REFERENCE NO.	SHEET NO.
R-2413A	21
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

8/17/99

REVISIONS

SITE 15

SITE 16

DENOTES IMPACTS IN SURFACE WATER

DENOTES TEMPORARY IMPACTS IN SURFACE WATER

DENOTES FILL IN WETLAND

100' 0' 100'

SCALE: 1"= 100'

24 TONS CLASS 'I' RIP RAP
32 SY FILTER FABRIC

SEE DETAIL 'AQ'

32 TONS CLASS 'I' RIP RAP
40 SY FILTER FABRIC

+87.80
185.25'

54" CSP (10 GA.) ALUMINIZED

24" ELBOWS

72" CSP (8 GA.) ALUMINIZED

CAT-1

2GI

24" RCP-III

TBJB w/Slab Lid

TBJB w/Slab Lid
SEE SPECIAL DETAIL

15B

16B

16A

15A

SPRING BOX

SPRING

2SBKD

CONC

16:1 TAPER

15" RCP-IV

15" CONC

REMOVE 15" RCP

2' LATERAL BASE DITCH
PSRM LINED
SEE DETAIL 'AI'
260 SY PSRM
713 CY DDE

2' LATERAL BASE DITCH
GRASS LINED
SEE DETAIL 'K'
1092 CY DDE

NCDOT
(FORMERLY SESSOMS DEVELOPMENT, LLC)

NCDOT
(FORMERLY SESSOMS DEVELOPMENT, LLC)

HW

EIP

TES

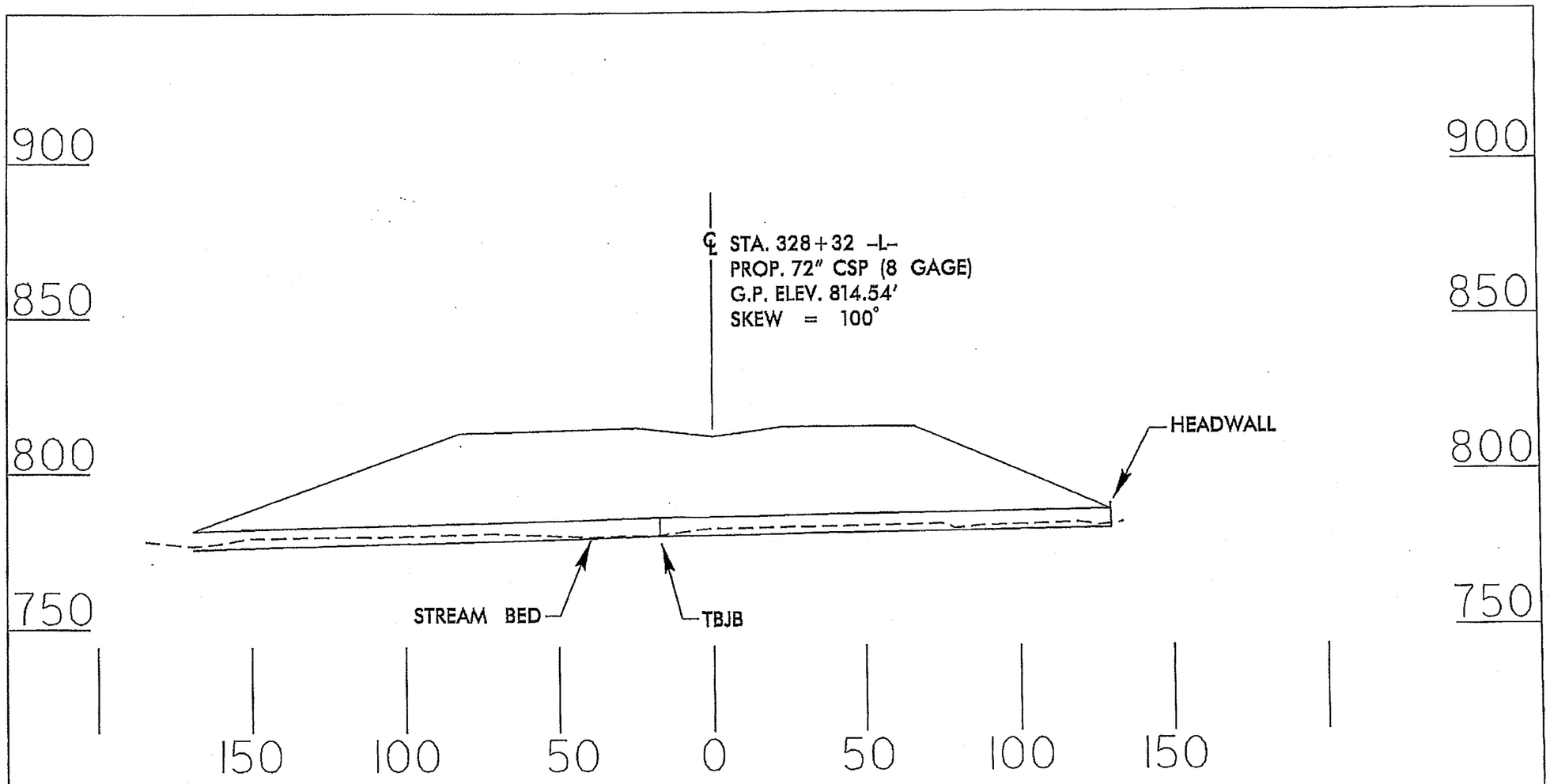
TB

FS

RW

C/A

WLB



PROFILE

NCDOT

DIVISION OF HIGHWAYS

GUILFORD COUNTY

PROJECT: 34429.1.1 (R-2413A)

NC 68 CONNECTOR

FROM FOUR LANES AT

SR 2011 TO SR 2127

SHEET 51 OF 81 2/13/13

8/23/99

PROJ. REFERENCE NO. R-2413A | SHEET NO. X-267

0 5 10

Permit Drawing
Sheet 52 of 104

328+50.00

328+00.00

327+50.00

327+00.00

PERMANENT IMPACTS IN SURFACE WATER

FILL IN WETLAND

FILL IN WETLAND

FILL IN WETLAND

MECHANIZED CLEARING

SS 785.75

SS 782.45

SS 783.09

SS 787.84

D.F. 812.703

D.F. 813.135

D.F. 813.447

D.F. 813.457

$$$$$$SYSTIME$$$$$$
$$$$$$DGN$$$$$$

PROJECT REFERENCE NO.	SHEET NO.
R-2413A	22
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

Permit Drawing
Sheet 53 of 81

Revised
7/16/13

8/17/99

REVISIONS

R/W REVISION. PARCEL NUMBER 45 HAS BEEN CHANGED TO PARCEL NUMBER 47. CEH 2/27/13.

GRAPHIC SCALE
100 50 0 100 200
PLANS

NAD 83/NSRS 2007

SITE 17

CITY OF GREENSBORO

ROY LEE HEDRICK AND BARBARA HEDRICK

OLLIE T. HARRELL AND RHUMELL M. HARRELL

HARRELL, OLLIE T AND RHUMELL M

ARTHUR M. IHRIG AND ANN S. IHRIG

PAUL R. MOUNCE

-L- STA. 331+00

-L- STA. 344+00

MATCH TO SHEET 21

MATCH TO SHEET 23

PSH SEE DETAIL 'AP'

ELBOWS

ATTENUATOR

CLASS II RIP RAP (STRUCTURE PAY ITEM)

5' STANDARD BASE DITCH SEE DETAIL 'A' 46 TONS CLASS 'B' RIP RAP 123 SY FF 40 CY DDE

5' LATERAL BASE DITCH SEE DETAIL 'AA' 92 TONS CLASS 'B' RIP RAP 245 SY FF

HC HC DENOTES HAND CLEARING

F F DENOTES FILL IN WETLAND

DENOTES MECHANIZED CLEARING

TS TS DENOTES TEMPORARY IMPACTS IN SURFACE WATER

T T DENOTES TEMPORARY FILL IN WETLAND

SITE 18

R/W REVISION. PARCEL NUMBER 45 HAS BEEN CHANGED TO PARCEL NUMBER 47. CEH 2/27/13.

$$$$SYSTIME$$$$
$$$$USERNAME$$$$
$$$$DGN$$$$
$$$$RFNAME$$$$

PROJECT REFERENCE NO.	SHEET NO.
R-2413A	22
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

GRAPHIC SCALE
100 50 0 100 200
PLANS

NAD 83/NSRS 2007

Permit Drawing
Sheet 54 of 81
Revised
7/16/13

REVISIONS
8/17/99
R/W REVISION: PARCEL NUMBER 45 HAS BEEN CHANGED TO PARCEL NUMBER 47. CEH 2/27/13.

SITE 17

CITY OF GREENSBORO
ROY LEE HEDRICK AND BARBARA HEDRICK
OLLIE T. HARRELL AND RHUMELL M. HARRELL
HARRELL, OLLIE T AND RHUMELL M
ARTHUR M. IHRIG AND ANN S. IHRIG
PAUL R. MOUNCE
PSH SEE DETAIL 'AP'
ELBOWS
ATTENUATOR
SHOULDER DRAIN
3' STANDARD BASE DITCH SEE DETAIL 'V' 46 TONS CLASS 'B' RIP RAP 123 SY FF 40 CY/DDE
3' LATERAL BASE DITCH SEE DETAIL 'AP' 28 TONS CLASS 'B' RIP RAP 249 SY FF
CLASS II RIP RAP (STRUCTURE PAY ITEM)
HARRELL, OLLIE T AND RHUMELL M (STRUCTURE PAY ITEM)
MATCH TO SHEET 21 -L- STA. 331+00
MATCH TO SHEET 23 -L- STA. 344+00

DENOTES HAND CLEARING
DENOTES FILL IN WETLAND
DENOTES MECHANIZED CLEARING
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
DENOTES TEMPORARY FILL IN WETLAND

SITE 18

PROJECT REFERENCE NO.	SHEET NO.
R-2413A	22
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

NAD 83/NSRS 2007

Permit Drawing Sheet 55 of 81

Revised 7/16/13

8/17/99

REVISIONS

SITE 17

SITE 18

44 ARTHUR M. IHRIG AND ANN S. IHRIG

HC HC DENOTES HAND CLEARING

F F DENOTES FILL IN WETLAND

DENOTES MECHANIZED CLEARING

TS +46.30 / 38.88 TS DENOTES TEMPORARY IMPACTS IN SURFACE WATER

T T DENOTES TEMPORARY FILL IN WETLAND

PSH SEE DETAIL 'AP'

HW

EIP

ELBOWS

36" CSP (10 GA) ALUMINIZED

15"

15" RCP-IV

2GI

FS

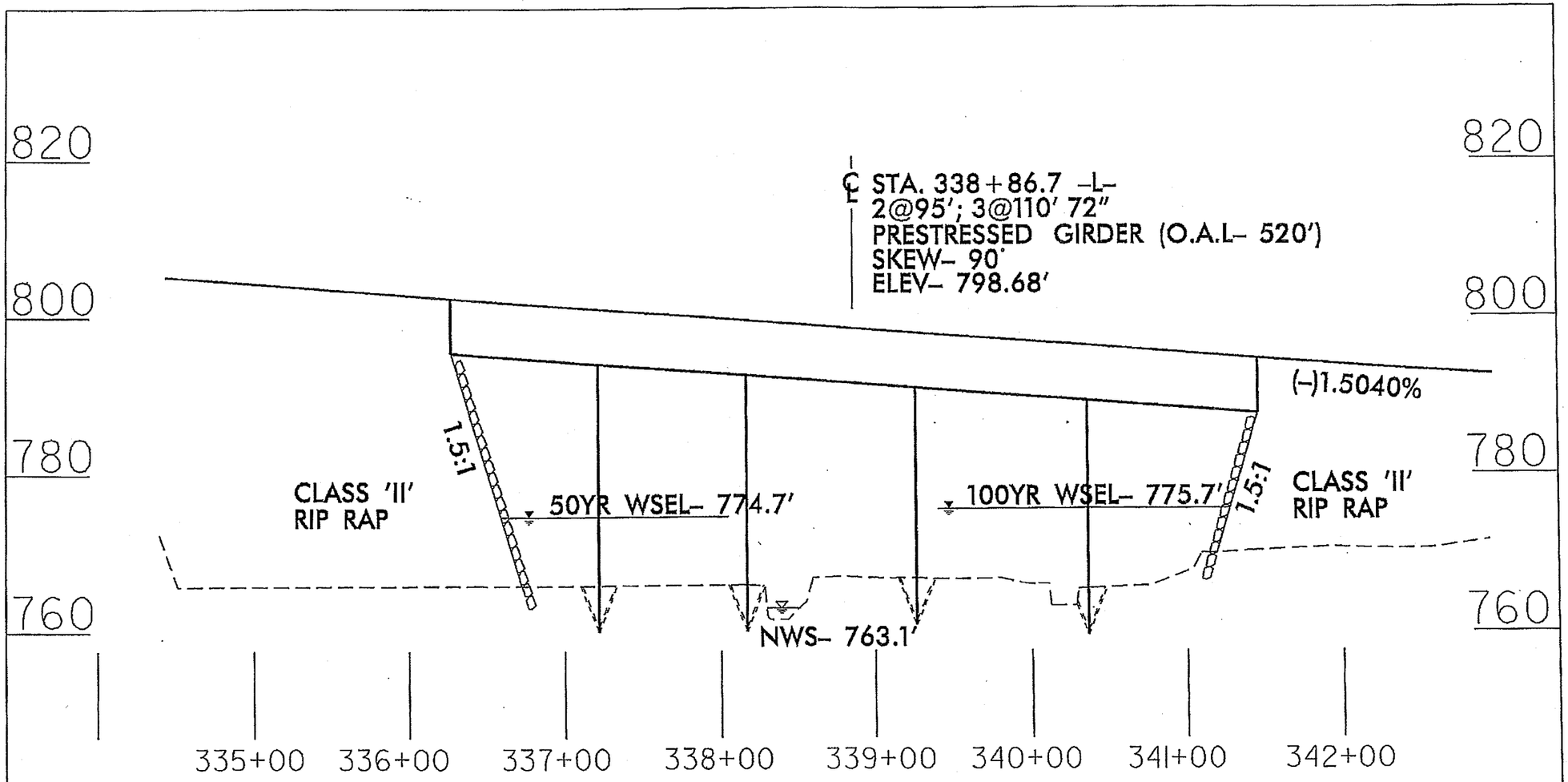
ATTENUATOR

CLASS II RIP RAP (STRUCTURE PAY ITEM)

HARRELL, OLLIE T (STRUCTURE AND RHUMELL M

47

SCALE: 1"= 100'



PROFILE

NCDOT

DIVISION OF HIGHWAYS
GUILFORD COUNTY
PROJECT: 34429.1.1 (R-2413A)
NC 68 CONNECTOR
FROM FOUR LANES AT
SR 2011 TO SR 2127

SHEET 56 OF 81 2/13/13

8/23/99

0 5 10

PROJ. REFERENCE NO.	SHEET NO.
R-2413A	X-270

Permit Drawing
Sheet 52 of 67

FILL IN WETLANDS

MECHANIZED CLEARING

FILL IN WETLANDS

334+50.00

334+00.00

333+50.00

$$$$$$SYSTIME$$$$$$
$$$$$$USERNAME$$$$$$

8/23/99

0 5 10

PROJ. REFERENCE NO. R-2413A

SHEET NO. X-274

Permit Drawing
Sheet 52 of 271

EMPORARY FILL IN WETLANDS

340+50.00 (-L-)

340+00.00 (-L-)

339+50.00 (-L-)

$$$$$$$SYSTIME$$$$$

$$$$$$$DGN$$$$$$$

PROJECT REFERENCE NO.	SHEET NO.
R-2413A	23
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

Permit Drawing
Sheet 59 of 81

NAD 83/NSRS 2007

8/17/99

REVISIONS

SITE 19

HARRELL, OLLIE T AND RHUBELL M (47)

TONY P. JOHNSON AND RHONDA R. JOHNSON

PAUL R. MOUNCE (48)

WILLIAM K. TEAGUE AND MARTHA R. TEAGUE (49)

MATCH TO SHEET 22

MATCH TO SHEET 24

-L- STA. 344+00

-L- STA. 357+50

3' LATERAL BASE DITCH
SEE DETAIL 'AA'
92 TONS CLASS 'A' RIP RAP
245 SY FF
231 CY DDE

EST. 2 TONS CLASS 'B' RIP RAP
EST. 7 SY FILT. FAB.

LATERAL 'V' DITCH
GRASS LINED
SEE DETAIL 'I'
36 CY DDE

SPECIAL LATERAL 'C' DITCH
GRASS LINED
SEE DETAIL 'G'

EARTH BERM
5' TOP WIDTH
2:1 SIDE SLOPES
TOP ELEV.= 796.0'
@25 CY FILL

2' SPECIAL LATERAL BASE DITCH
GRASS LINED
SEE DETAIL 'F'

EST. 1 TON CL 'B' RIP RAP
EST. 3 SY FILT. FAB.

GRAU 330

24" RCP-IV

24" TAPER

2GI

2GI-A

15" WIDENING

24" WIDENING

EST. 1 TON CL 'B' RIP RAP
EST. 5 SY FILT. FAB.

4' LATERAL CHANNEL CHANGE
GRASS LINED
SEE DETAIL 'ZZ'
1339 CY DDE

24 TONS CLASS 'I' RIP RAP
32 SY FILTER FABRIC

EST. 5 TONS CL 'B' RIP RAP
EST. 14 SY FILT. FAB.

SPECIAL LATERAL 'V' DITCH
GRASS LINED
SEE DETAIL 'G'

SPECIAL CUT DITCH
GRASS LINED
SEE DETAIL 'D'

DENOTES IMPACTS IN SURFACE WATER

DENOTES TEMPORARY IMPACTS IN SURFACE WATER

DETAIL 'ZZ'
LATERAL CHANNEL CHANGE
(Not to Scale)

Min. D= 2 Ft.
B= 4 Ft.
b= 3 Ft.

FROM STA. 348+50 TO STA. 351+50 RT.

DETAIL
RIP OUTLET CHANNEL
(Not to Scale)

CHANNEL STA (Varies)

Est.= 24 Tons of Class 'I' Rip-Rap
32 Square Yards Filter Fabric

GRAPHIC SCALE
100 50 0 100 200
PLANS

$$$$$$SYSTIMES$$$$$$
$$$$$$DATE$$$$$$
$$$$$$USERNAME$$$$$$

Permit Drawing Sheet 60 of 81

NAD 83/NSRS 2007

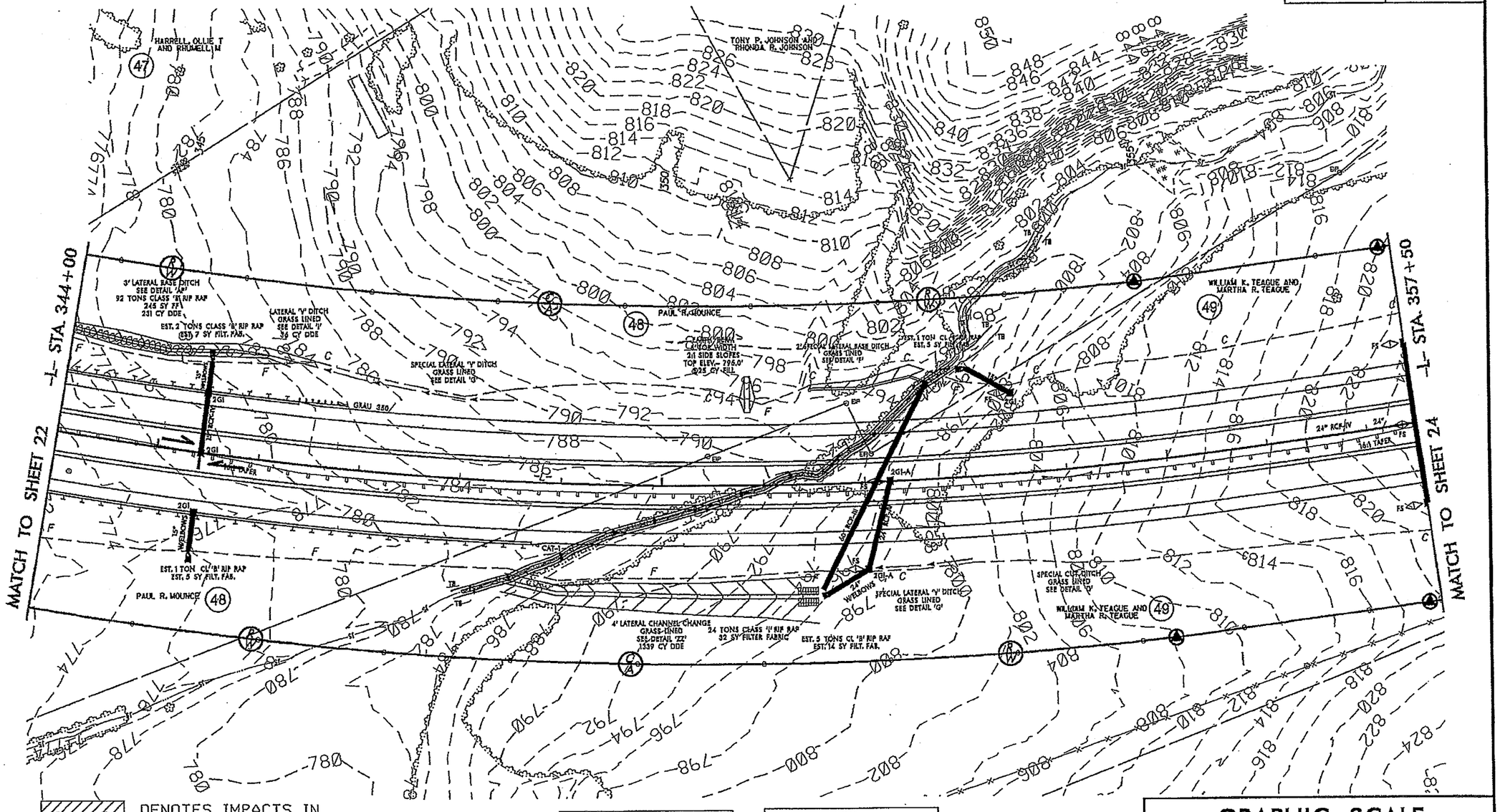
PROJECT REFERENCE NO.	SHEET NO.
R-2413A	23
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

SITE 19

REVISIONS

8/17/99



Permit Drawing Sheet 61 of 81

NAD 83/NSRS 2007

PROJECT REFERENCE NO.	SHEET NO.
R-2413A	23
MW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

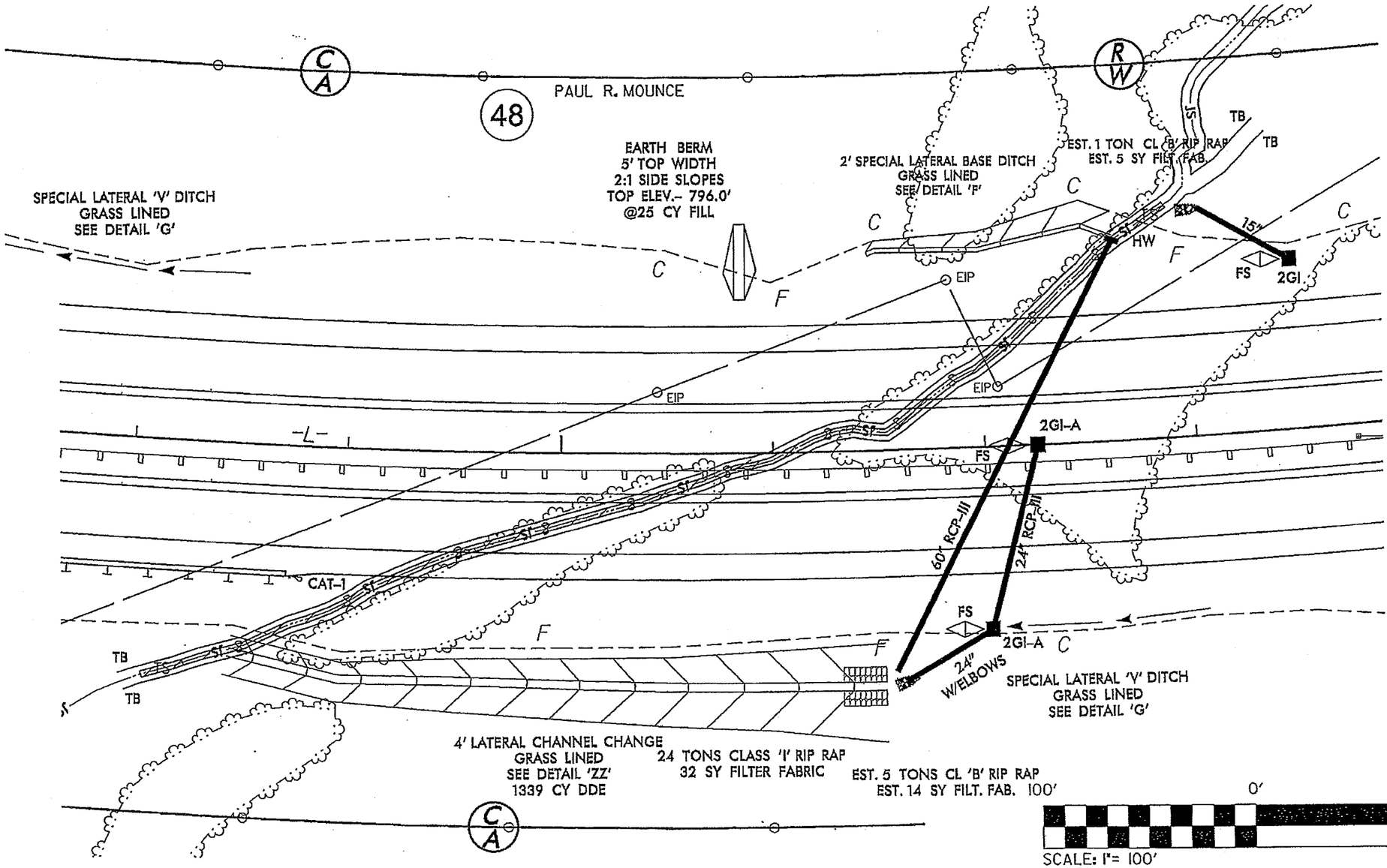
8/17/99

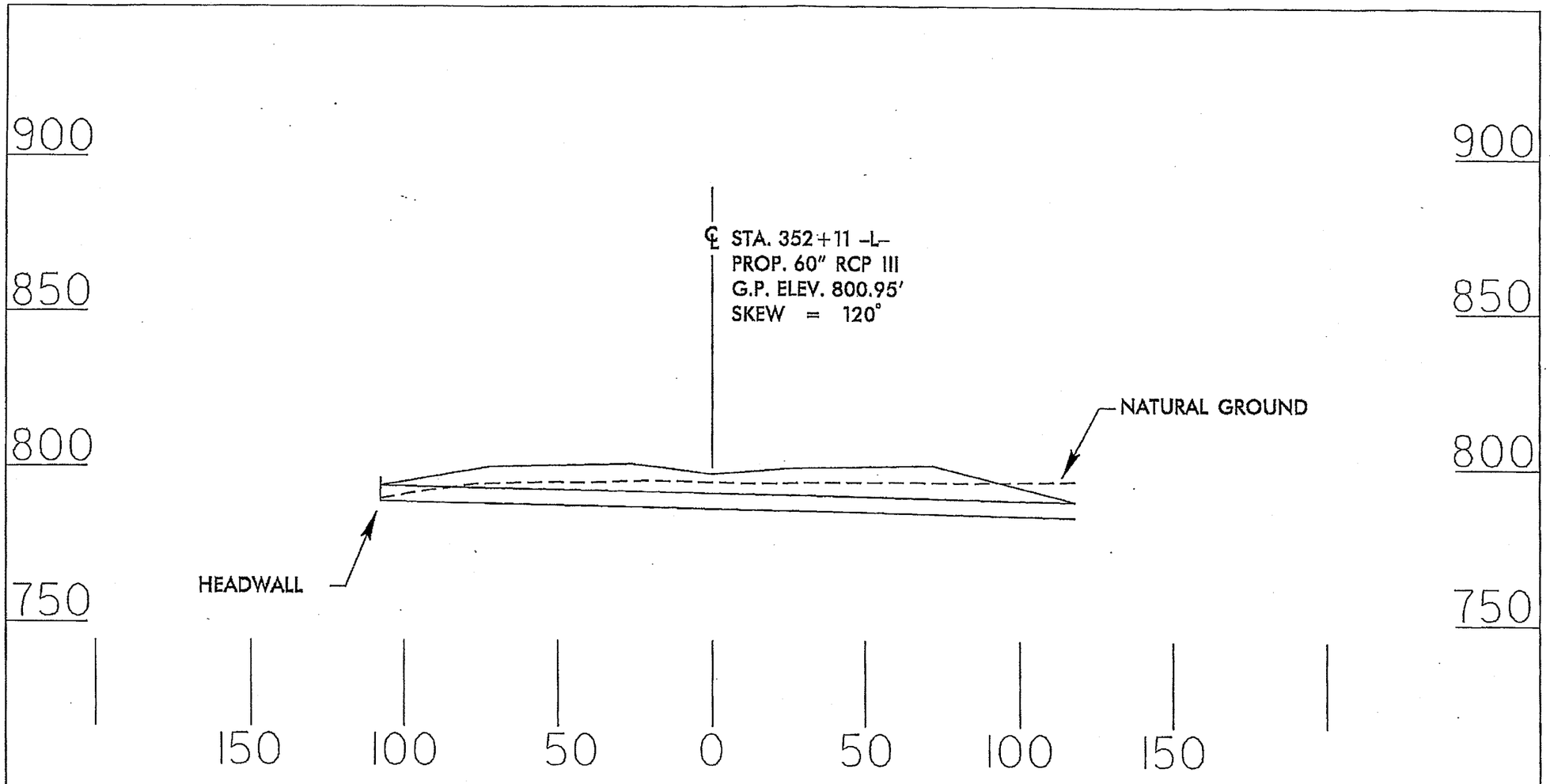
REVISIONS

SITE 19

DENOTES IMPACTS IN SURFACE WATER

DENOTES TEMPORARY IMPACTS IN SURFACE WATER





PROFILE

NCDOT
DIVISION OF HIGHWAYS
GUILFORD COUNTY
PROJECT: 34429.1.1 (R-2413A)
NC 68 CONNECTOR
FROM FOUR LANES AT
SR 2011 TO SR 2127

SHEET 42 OF 81 2/13/13

Permit Drawing Sheet 63 of 81

NAD 83/NSRS 2007

R-2413A	31
RAW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

8/17/99

REVISIONS

SITE 20

DENOTES IMPACTS IN SURFACE WATER

DENOTES FILL IN WETLAND

-Y4- 10

-Y4- 15

-Y4- 20

-Y4- STA. 20+50

MATCH TO SHEET 19

BANDERA FARMS, INC.

945Z

BANDERA FARMS, INC.

945Z

2' STANDARD BASE DITCH GRASS LINED SEE DETAIL '2A' 10CY EXCAVATION

ENERGY DISSIPATOR SEE DETAIL

EST. 1 TON CL 'B' RIP RAP EST. 5 SY FILT. FAB.

BEGIN FENCE

TOE PROTECTION SEE DETAIL 'E' 46 TONS CLASS 'B' RIP RAP

36" CSP (10 GA) ALUMINIZED

ELBOWS

GRAU 350 34 RCP IV

GRAU 350 34 RCP IV

SR 2128 DUNCH RD 27FT

24" RCP

4.0% EP TO R/W

S 00°53'53" W 360.31'

JOHN W. RUMLEY AND CAROLYN T. RUMLEY

82

ARTHUR FRANK LONG

ISFD

60

MAIL

S 85°10'00" E 327.43'

REMOVE

EXISTING R/W

LOD EP TO R/W

DITCH R/W

HW

303

302

S 58%

LATERAL 'V' DITCH GRASS LINED SEE DETAIL 'I' 573 CY-DDE

92

HCDOT (FORMERLY RICHARD ROSS)

TOE PROTECTION SEE DETAIL 'E' 92 TONS CLASS 'B' RIP RAP

4' RIP-RAP SELEC

RETAIN

12" RCP

0.93% EP TO R/W EP

304

JOHN W. RUMLEY AND CAROLYN T. RUMLEY

40

CAROLYN T. RUMLEY

S 28°20'00" W 155.52'

GRAPHIC SCALE

100 50 0 100 200

PLANS

Permit Drawing
Sheet 64 of 81

NAD 83/NSRS 2007

R-2413A	31
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

S S DENOTES IMPACTS IN SURFACE WATER

F F DENOTES FILL IN WETLAND

SITE 20

-Y4- STA. 20+50

MATCH TO SHEET 19

GRAPHIC SCALE
100 50 0 100 200
PLANS

REVISIONS

8/17/98

R-2413A | 31
NW SHEET NO.
ROADWAY DESIGN ENGINEER | HYDRAULICS ENGINEER
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

Permit Drawing Sheet 65 of 81

NAD 83/NSRS 2007

8/17/98

REVISIONS

2' STANDARD BASE DITCH
GRASS LINED
SEE DETAIL 'M'
10CY EXCAVATION

ENERGY DISSIPATOR
SEE DETAIL

EST. 1 TON CL 'B' RIP RAP
EST. 5 SY FILTER FAB.

945Z
BANDERA FARMS, INC.

-Y4- 20

BEGIN FENCE

TOE PROTECTION
SEE DETAIL 'E'
46 TONS CLASS 'B' RIP RAP

36" CSP (10 GA.) ALUMINIZED

ELBOWS

15"

TB

N 85°18'48" W 768.00'

2GI

GRADE 350

15" RCP-IV

+48.37
194.40'

5' EIP TO R/W

EIP

EXISTING R/W

HW

303

24" RCP

5 SBW

LATERAL 'V' DITCH
GRASS LINED
SEE DETAIL 'I'
573 CY DDE

921
NCDOT
(FORMERLY
RICHARD ROSS)

TOE PROTECTION
SEE DETAIL 'E'
92 TONS CLASS 'B' RIP RAP

4' WWF W/SELEC

EXISTING R/W

304

RETAIN

12" RCP
0.92' EIP TO R/W

EIP

SITE 20

DENOTES IMPACTS IN SURFACE WATER

DENOTES FILL IN WETLAND

100' 0' 100'

SCALE: 1"= 100'

8/23/99

PROJ. REFERENCE NO. R-2413A

SHEET NO. X-391

Permit Drawing Sheet 7 of 9

19+50.00

19+00.00

18+50.00

18+00.00

PERMANENT IMPACTS IN SURFACE WATER

FILL IN WETLANDS

FILL IN WETLANDS

PERMANENT IMPACTS IN SURFACE WATER

FILL IN WETLANDS

FILL IN WETLANDS

$$$$$$SYSTIME$$$$$$

$$$$$$DIVISION$$$$$$

$$$$$$USERNAME$$$$$$

SITE 23

NAD 83/NSRS 2007

R-2413A	33
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

Permit Drawing
Sheet 16 of 91

Revised 7/1/13

DENOTES TEMPORARY IMPACTS IN SURFACE WATER

MATCH TO SHEET 2A

-Y5- STA. 18+00

BEGIN CONSTRUCTION
-Y5- PC Sta. 10+00.00

-Y5- PT Sta. 17+46.56

MARY SUE M. ATKINS

CHARLES RANDALL ATKINS (64)

CHARLES H. ATKINS AND MARY M. ATKINS (63)

WILLIAM K. TEAGUE AND MARTHA R. TEAGUE (54)

RHONDA M. JOHNSON (86)

CRISS T. HARRELL AND ANNA L. HARRELL

OLLIE T. HARRELL AND RHUWELL M. HARRELL (47)

PAUL R. MOUNCE (48)

TEAGUE, WILLIAM K. (50)

SR 1127 BROOKBANK RD 22' BST

EXISTING R/W

EXISTING R/W PB 146 PG 33

20' UTILITY EASEMENT PBBS PG72

30' UTILITY EASEMENT PBBS PG72

30' NATURAL GAS EASEMENT PBBS PG72

SPECIAL CUT DITCH GRASS LINED SEE DETAIL 'D'

SPECIAL LATERAL 'V' DITCH FORM LINED SEE DETAIL 'V' 103 SY FORM

SPECIAL CUT DITCH GRASS LINED SEE DETAIL 'D'

SPECIAL LATERAL 'V' DITCH GRASS LINED SEE DETAIL 'D'

3' STANDARD BASE DITCH CLASS 'B' RIP RAP SEE DETAIL 'AR' @ 1500cy EXC

EST 2 TONS CL 'B' RIP RAP 55.7 SY FF

EST 2 TONS CL 'B' RIP RAP 55.4 SY FF

TRANSITION TO PIPE

ELBOWS

REMOVE 15" RCP

REMOVE 18" RCP

15" RCP

18" RCP

22" RCP

-Y5- +00.00 30.65'RT EXIST R/W

-Y5- +00.00 29.21'RT EXIST R/W

-Y5- +60.00 60.00'RT

-Y5A +90.00 51.98'RT EXIST R/W

-Y5- +60.00 114.20'RT EXIST R/W

-Y5- +00.00 185.00'RT

-Y5- +70.00 195.00'RT

-Y5- +10.00 135.00'LT

-Y5- +60.84 135.42'LT

-Y5- +90.00 50.00'LT 65.00'LT

-Y5- +55.00 75.00'LT

-Y5- +05.00 59.00'LT 24.48'SLT

PAVEMENT REMOVAL

FOR -Y5- PROFILE, SEE SHEET NO. 61

DRIVEWAY RADII ARE 15', UNLESS NOTED

FOR DITCH DETAILS, SEE SHEET NO. 2-W & 2-X

REVISIONS

DESIGN REVISION: THE VERTICAL ALIGNMENT FOR -Y5- HAS BEEN REVISED. JLT 1/28/2013

R/W REVISION: PARCEL NUMBER 87 HAS BEEN CHANGED TO PARCEL 86. CEH 2/27/13.

8/17/99

\\\\\\\SYSTIME\$\$\$

PROJECT REFERENCE NO.	SHEET NO.
R-2413A	33
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

Permit Drawing
Sheet 66B of 91

Revised
7/1/13

8/17/99

REVISIONS

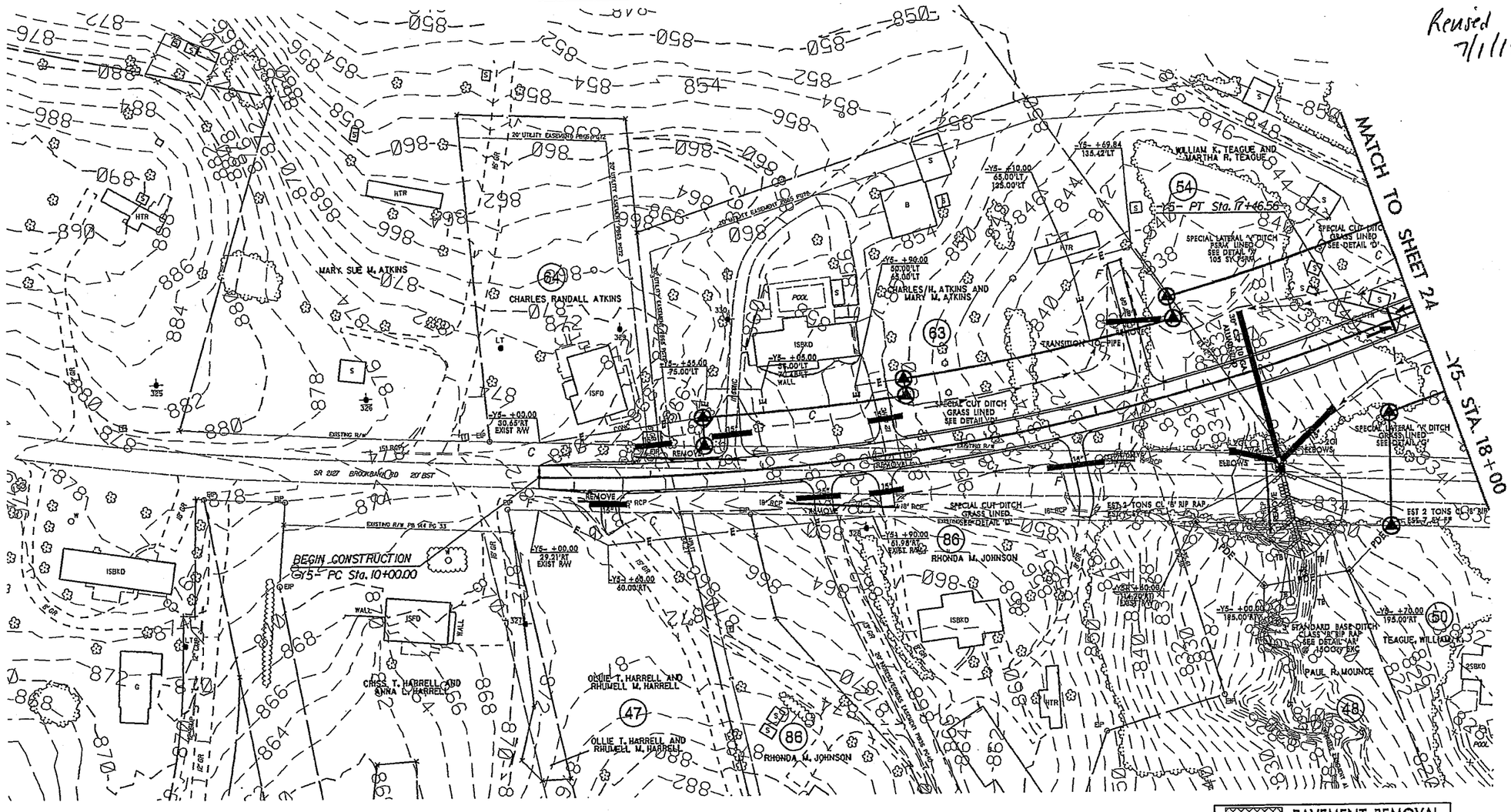
DESIGN REVISION: THE VERTICAL AUGINMENT FOR -Y5- HAS BEEN REVISED. JLT 1/28/2013

R/W REVISION: PARCEL NUMBER 87 HAS BEEN CHANGED TO PARCEL 86. PARCEL 86 HAS BEEN COMBINED WITH PARCEL 86. CEH 2/27/13.

SITE 23

NAD 83/NSRS 2007

TS TS DENOTES TEMPORARY IMPACTS IN SURFACE WATER



PAVEMENT REMOVAL

FOR -Y5- PROFILE, SEE SHEET NO. 61

DRIVEWAY RADII ARE 15', UNLESS NOTED

FOR DITCH DETAILS, SEE SHEET NO. 2-W & 2-X

PROJECT REFERENCE NO.	SHEET NO.
R-2413A	33
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

Permit Drawing
Sheet 106C of 81

Revised
7/1/13

8/17/99

REVISIONS

100' 0' 100'

SCALE: 1"= 100'

NAD 83/NSRS 2007

SPECIAL LATERAL 'V' DITCH
PSRM LINED
SEE DETAIL 'X'
105 SY PSRM

SPECIAL CUT DITCH
GRASS LINED
SEE DETAIL 'D'

INS AND
KINS

HTR

18" RCP

12" RCP
REMOVE

TRANSITION TO PIPE

+23+34
85.42'

30" CSP (10 GA.)
ALUMINIZED

GRAU 350

EASEMENT NO RECORD FOUND

15"

AL CUT DITCH
ASS LINED
DETAIL 'D'

EXISTING R/W

2GI
ELBOWS

15" RCP
REMOVE

SPECIAL LATERAL 'V' DITCH
GRASS LINED
SEE DETAIL 'G'

-Y5- +55.00
75.00'RT

RETAIN

12" RCP

ECIAL CUT DITCH
GRASS LINED
SEE DETAIL 'D'

EST 2 TONS CL 'B' RIP RAP
EST 7 SY FF

24" RCP
REMOVE

+52.02
1.00'RT

WALL

A M. JOHNSON

+35.61
106.30'

PDE

TB

-Y5- +60.00
114.20'RT
EXIST R/W

-Y5- +00.00
185.00'RT

-Y5- +70.00
195.00'RT

50

TEAGUE, WILLIAM K.

3' STANDARD BASE DITCH
CLASS 'B' RIP RAP
SEE DETAIL 'AR'
@ 1500cy EXC

PAUL R. MOUNCE

48

HTR

EIP

SITE 23

TS TS DENOTES TEMPORARY IMPACTS IN SURFACE WATER

8/17/99

REVISIONS

R/W REVISION: PARCEL NUMBER 53 HAS BEEN CHANGED TO PARCEL NUMBER 54. CEH 1/23/2013

DESIGN REVISION: THE VERTICAL ALIGNMENT FOR -Y5- HAS BEEN REVISED. JLT 1/28/2013

GRAPHIC SCALE

100 50 0 100 200

PLANS

Permit Drawing Sheet 67 of 81

NAD 83/NSRS 2007

PROJECT REFERENCE NO.	SHEET NO.
R-2413A	34
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

MATCH TO SHEET 24 -Y5- STA. 27+50

MATCH TO SHEET 35 -Y5- STA. 37+00

21A

21B

WILLIAM K. TEAGUE AND MARTHA R. TEAGUE

TOWN OF SUMMERFIELD

SCRUB

EDNA R. MCCURSTON

TEAGUE, WILLIAM K. AND MARTHA R.

SR 2127 BROOKDALE RD

SPRING BOX

ELBOWS

TOE PROTECTION

EST. 2 TONS CL 'B' RIP RAP
EST. 7 SY FILT. FAB.

SITE 21

F/F DENOTES FILL IN WETLAND

DENOTES MECHANIZED CLEARING

TS/TS DENOTES TEMPORARY IMPACTS IN SURFACE WATER

S/S DENOTES IMPACTS IN SURFACE WATER

PROJECT REFERENCE NO.	SHEET NO.
R-2413A	34
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

Permit Drawing
Sheet 68 of 81

NAD 83/NSRS 2007

GRAPHIC SCALE
100 50 0 100 200
PLANS

REVISIONS
8/17/98
R/W REVISION: PARCEL NUMBER 53 HAS BEEN CHANGED TO PARCEL NUMBER 54. CEH 1/23/2013
DESIGN REVISION: THE VERTICAL ALIGNMENT FOR -Y5- HAS BEEN REVISED. JLT 1/28/2013

21A

21B

MATCH TO SHEET 24 -Y5- STA. 27+50

MATCH TO SHEET 35 -Y5- STA. 37+00

WILLIAM K. TEAGUE AND MARTHA R. TEAGUE

TOWN OF SUMMERFIELD

SCRUB

SR 2127 BROOKBANK RD

EDNA R. MCCUISTON

SITE 21

DENOTES FILL IN WETLAND

DENOTES MECHANIZED CLEARING

DENOTES TEMPORARY IMPACTS IN SURFACE WATER

DENOTES IMPACTS IN SURFACE WATER

Permit Drawing
Sheet 69 of 81

NAD 83/NSRS 2007

PROJECT REFERENCE NO.	SHEET NO.
R-2413A	34
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

8/17/99

REVISIONS

100' 0' 100'

SCALE: 1"= 100'

SPRING BOX

72" CSP (14 Ga)

4' LATERAL BASE DITCH
SEE DETAIL 'L'
89 TONS CLASS 'B' RIP RAP
432 SY FF
793 CY DDE

20 TONS CLASS I RIP RAP

20 TONS CLASS I RIP RAP

TOE PROTECTION
PSRM LINED
SEE DETAIL 'W'
436 SY FF

SCRUB

SR 2127 BROOKBANK RD 20' BST

SEE MITIGATION SITE 4
SHEET OSM-9

54

WILLIAM K.
TEAGUE AND
MARTHA R. TEAGUE

REMOVE 6'WIDE X 16.8' HIGH

TES

TB

3SBW

TOWN OF SUMMERFIELD

72

SCRUB

SITE 21

54

IE, WILLIAM K. AND MARTHA R.

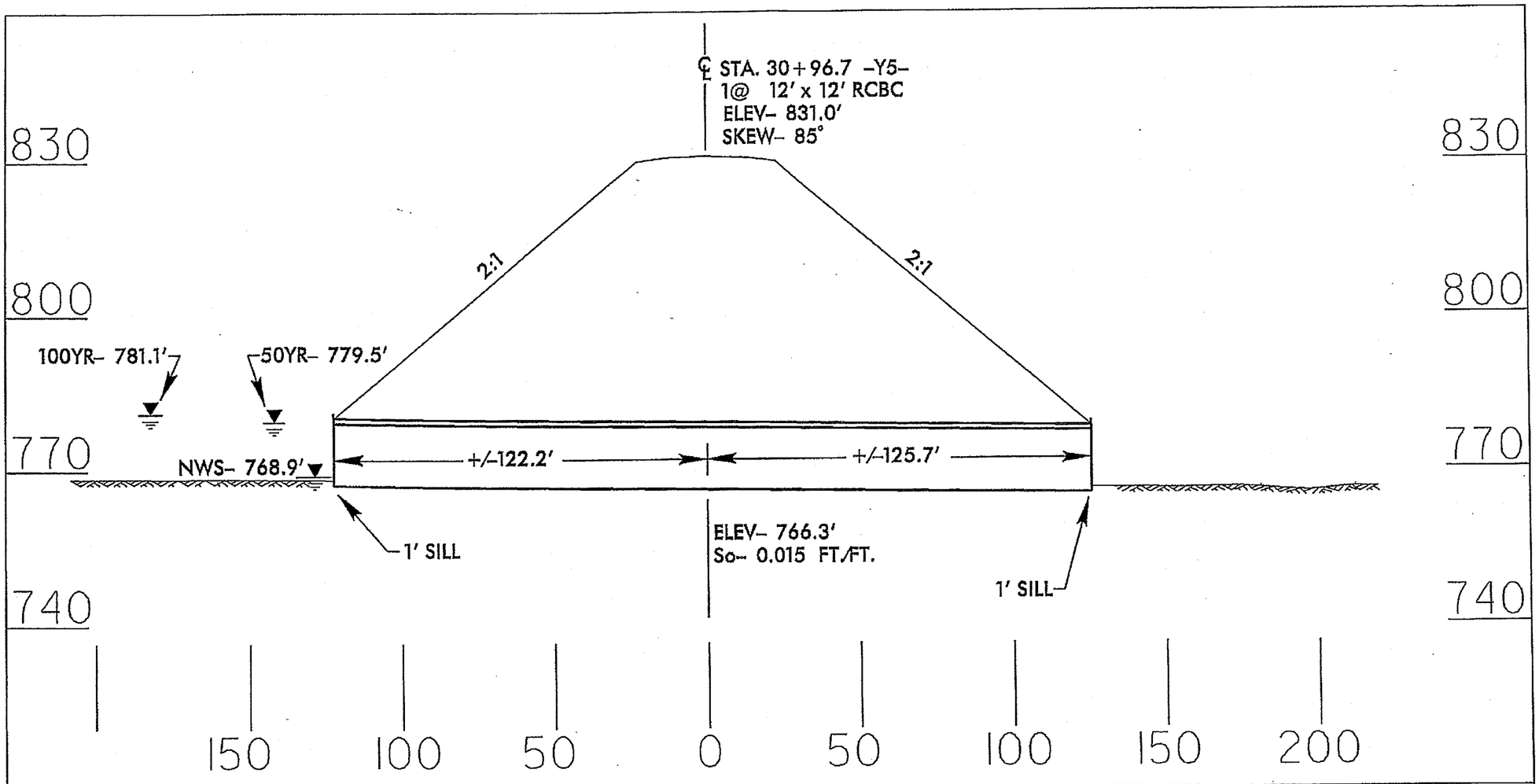
21A

F F DENOTES FILL IN WETLAND

DENOTES MECHANIZED CLEARING

TS TS DENOTES TEMPORARY IMPACTS IN SURFACE WATER

S S DENOTES IMPACTS IN SURFACE WATER



PROFILE

NCDOT
DIVISION OF HIGHWAYS
GUILFORD COUNTY
PROJECT: 34429.1.1 (R-2413A)
NC 68 CONNECTOR
FROM FOUR LANES AT
SR 2011 TO SR 2127

SHEET 70 OF 81 2/13/13

Permit Drawing
Sheet 41 of 61

8/23/99

MECHANIZED CLEARING

FILL IN WETLANDS

0.020

0.020

-L-

32+00.00

31+50.00

-Y5-

$$$$USERNAME$$$$

$$$$SYSTIME$$$$

Permit Drawing Sheet 72 of 81

NAD 83/NSRS 2007

PROJECT REFERENCE NO.	SHEET NO.
R-2413A	37
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

DENOTES IMPACTS IN SURFACE WATER

DENOTES TEMPORARY IMPACTS IN SURFACE WATER

DENOTES FILL IN WETLAND

DENOTES MECHANIZED CLEARING

REVISIONS

8/17/99

DESIGN REVISION: THE HORIZONTAL DESIGN FOR -Y1C- HAS BEEN REVISED. THE LEFT TURN LANE ON -Y1C- HAS BEEN REMOVED AND THE CONCRETE ISLAND HAS BEEN
REVISED TO RESTRICT LEFT TURNS OUT OF -Y1C-. JLT 1/28/2013
R/W REVISION: THE RIGHT OF WAY LABELS ON -Y1C- LOCATED ON PARCEL 26 HAVE BEEN REVISED BUT THE RIGHT OF WAY AREA HAS NOT CHANGED. CEH 2/1/13
R/W REVISION: PROPERTY OWNER NAME AND DEED BOOK INFORMATION HAS BEEN CHANGED ON PARCELS 25 AND 26. CEH 2/27/13.

SITE 3

SITE 4

SITE 22

FAMILY TRUST OF JOHNNIE ODELL PITTS et al

GENEVA M. TUCKER, TRUSTEE

SHEILA D. HAUGER

WALLACE A KENNEDY JR. & HARRIET H KENNEDY, CO-TRUSTEES OF W.A. KENNEDY, JR. REVOCABLE TRUST

DETAIL
PIPE OUTLET CHANNEL
(Not to Scale)
Est.= 18 Tons of Class 'I' Rip-Rap
25 Square Yards Filter Fabric

DETAIL
PIPE OUTLET CHANNEL
(Not to Scale)
Est.= 24 Tons of Class 'I' Rip-Rap
32 Square Yards Filter Fabric

LATERAL 'V' DITCH LINED W/FERM SEE DETAIL 'AE' 45 SY FERM 81 CY DDB

EST. 2 TONS CL 'B' RIP RAP EST. 7 SY FF

16 TONS CLASS 'I' RIP RAP 25 SY FF

TOE PROTECTION 69 TONS CLASS 'B' RIP RAP LINED SEE DETAIL 'E'

SPECIAL CUT DITCH GRASS LINED SEE DETAIL 'D'

SPECIAL LATERAL 'V' DITCH GRASS LINED SEE DETAIL 'G'

24 TONS CLASS 'I' RIP RAP 32 SY FF

TOE PROTECTION 76 TONS CLASS 'B' RIP RAP LINED SEE DETAIL 'E'

BEGIN FENCE

FENCE

5' LATERAL BASE DITCH LINED W/FERM SEE DETAIL 'AF' 423 SY FERM 3258 CY DDB

GRAU 350

GRAU 350 TX-3

MATCH TO SHEET 9 -Y1C- STA. 26+00

GRAPHIC SCALE
100 50 0 100 200
PLANS

Permit Drawing Sheet 73 of 81

NAD 83/NSRS 2007

PROJECT REFERENCE NO.	SHEET NO.
R-2413A	37
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

S S DENOTES IMPACTS IN SURFACE WATER

TS TS DENOTES TEMPORARY IMPACTS IN SURFACE WATER

F F DENOTES FILL IN WETLAND

DENOTES MECHANIZED CLEARING

8/17/98

REVISIONS

DESIGN REVISION: THE HORIZONTAL DESIGN FOR -Y1C- HAS BEEN REVISED. THE LEFT TURN LANE ON -Y1C- HAS BEEN REMOVED AND THE CONCRETE ISLAND HAS BEEN
REVISED TO RESTRICT LEFT TURNS OUT OF -Y1C-. JLT 1/28/2013
R/W REVISION: THE RIGHT OF WAY LABELS ON -Y1C- LOCATED ON PARCEL 26 HAVE BEEN REVISED BUT THE RIGHT OF WAY AREA HAS NOT CHANGED. CEH 2/1/13
R/W REVISION: PROPERTY OWNER NAME AND DEED BOOK INFORMATION HAS BEEN CHANGED ON PARCELS 25 AND 26. CEH 2/27/13.

DETAIL
PIPE OUTLET CHANNEL
(Not to Scale)
CHANNEL END (VARIES)
Est.= 18 Tons of Class 'I' Rip-Rap
25 Square Yards Filter Fabric

DETAIL
PIPE OUTLET CHANNEL
(Not to Scale)
CHANNEL END (VARIES)
Est.= 18 Tons of Class 'I' Rip-Rap
25 Square Yards Filter Fabric

DETAIL
PIPE OUTLET CHANNEL
(Not to Scale)
CHANNEL END (VARIES)
Est.= 24 Tons of Class 'I' Rip-Rap
32 Square Yards Filter Fabric

SITE 3

SITE 4

SITE 22

FAIRY TRUSTY OF JOHNNY ODELL PITTS ET AL

LATERAL 'V' DITCH LINED W/SMA SEE DETAIL 'AB' 31 SY PERM 31 CY DDE

EST. 2 TONS CL. 'A' RIP-RAP 2 SY FF

GENEVA M. TUCKER, TRUSTEE

18 TONS CLASS 'I' RIP RAP 25 SY FF

TOE PROTECTION 49 TONS CLASS 'I' RIP RAP LINED SEE DETAIL 'E'

SHEILA D. HAUGER

SPECIAL CUT DITCH GRASS LINED SEE DETAIL 'D'

SPECIAL LATERAL 'V' DITCH GRASS LINED SEE DETAIL 'G'

24 TONS CLASS 'I' RIP RAP 32 SY FF

BEGIN FENCE

TOE PROTECTION 49 TONS CLASS 'I' RIP RAP LINED SEE DETAIL 'E'

WALLACE A KENNEDY JR. & HARRIET H KENNEDY, CO-TRUSTEES OF W.A. KENNEDY, JR. REVOCABLE TRUST

FENCE

MATCH TO SHEET 9 -Y1C- STA. 26+00

GRAPHIC SCALE
100 50 0 100 200
PLANS

PROJECT REFERENCE NO.	SHEET NO.
R-2413A	37
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

Permit Drawing
Sheet 74 of 81

NAD 83/NSRS 2007

SITE 3

SITE 4

S S DENOTES IMPACTS IN SURFACE WATER

TS TS DENOTES TEMPORARY IMPACTS IN SURFACE WATER

F F DENOTES FILL IN WETLAND

DENOTES MECHANIZED CLEARING

N 86°23'53" E 213.66'

937

LATERAL 'V' DITCH LINED W/PSRM SEE DETAIL 'AE' 45 SY PSRM 81 CY DDE

EST. 2 TONS CL. 'B' RIP RAP
EST. 7 SY FF

18 TONS CLASS 'I' RIP RAP 25 SY FF

18 TONS CLASS 'I' RIP RAP 25 SY FF

3703 3702 3705 3704 3701 3706 3707

15" RCP 2GI

36" RCP-IV BUR. 20%

GRAU 350

TOE PROTECTION CLASS 'B' RIP RAP LINED SEE DETAIL 'E' 69 TONS

22

GENEVA M. TUCKER, TRUSTEE

RW

TB JS TW

135

100' 0' 100'

SCALE: 1"= 100'

8/17/99

REVISIONS

8/23/99

R-2413A | X-433

Sheet 4

Permit Drawing
Sheet 75 of 87

18+00.00

17+50.00

17+00.00

16+50.00

0.020 | 0.020

S.S. 895.08

S.S. 895.28

S.S. 897.83

S.S. 898.20

S.S. 878.08

S.S. 878.61

S.S. 880.42

PERMANENT SURFACE WATER IMPACTS

TEMPORARY SURFACE WATER IMPACTS

MECHANIZED CLEARING

FILL IN WETLANDS

FILL IN WETLANDS

PERMANENT SURFACE WATER IMPACTS

FILL IN WETLANDS

YIC

Permit Drawing Sheet 76 of 81

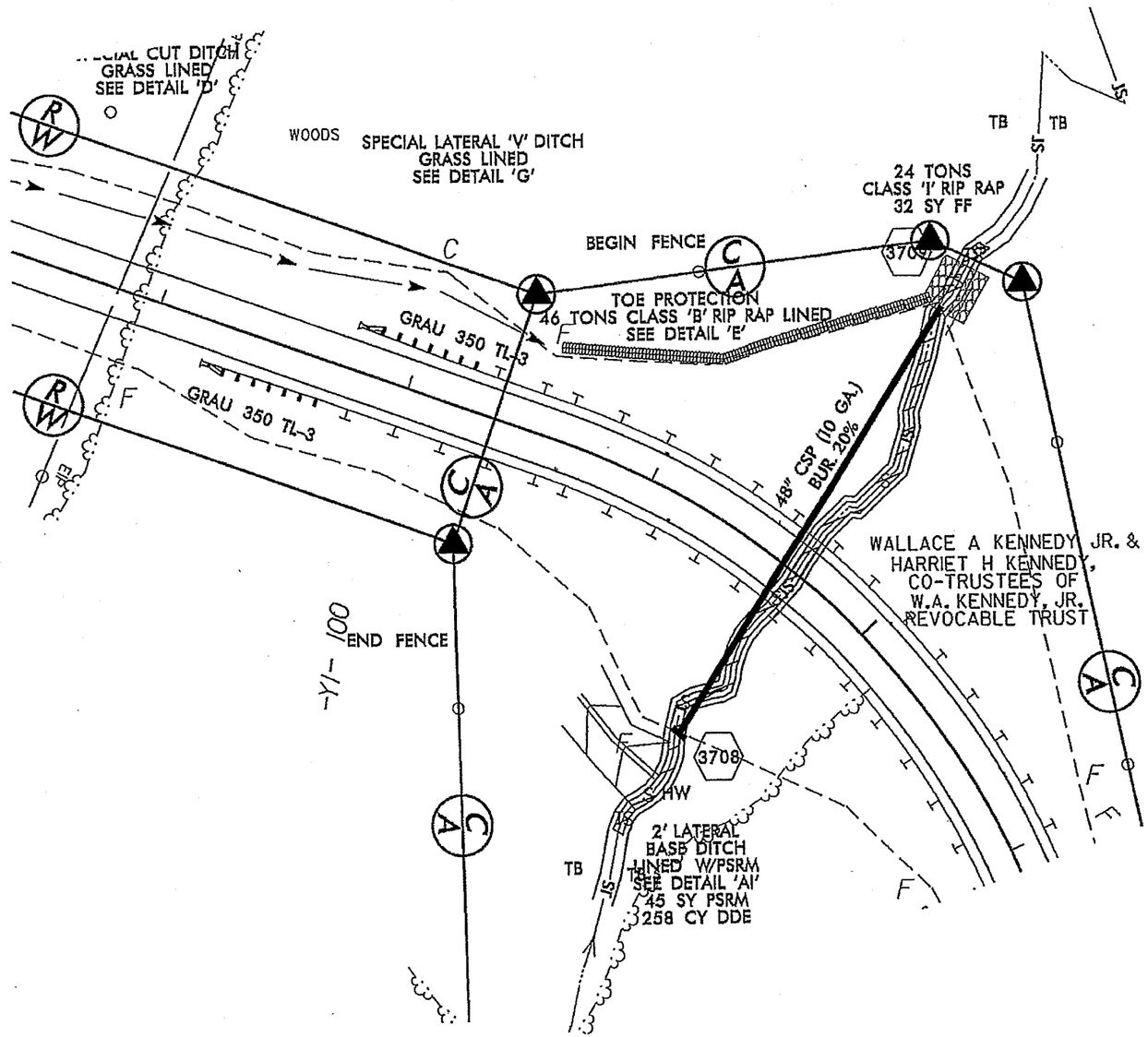
NAD 83/NSRS 2007

R-2413A	37
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

8/17/94

REVISIONS



SITE 22

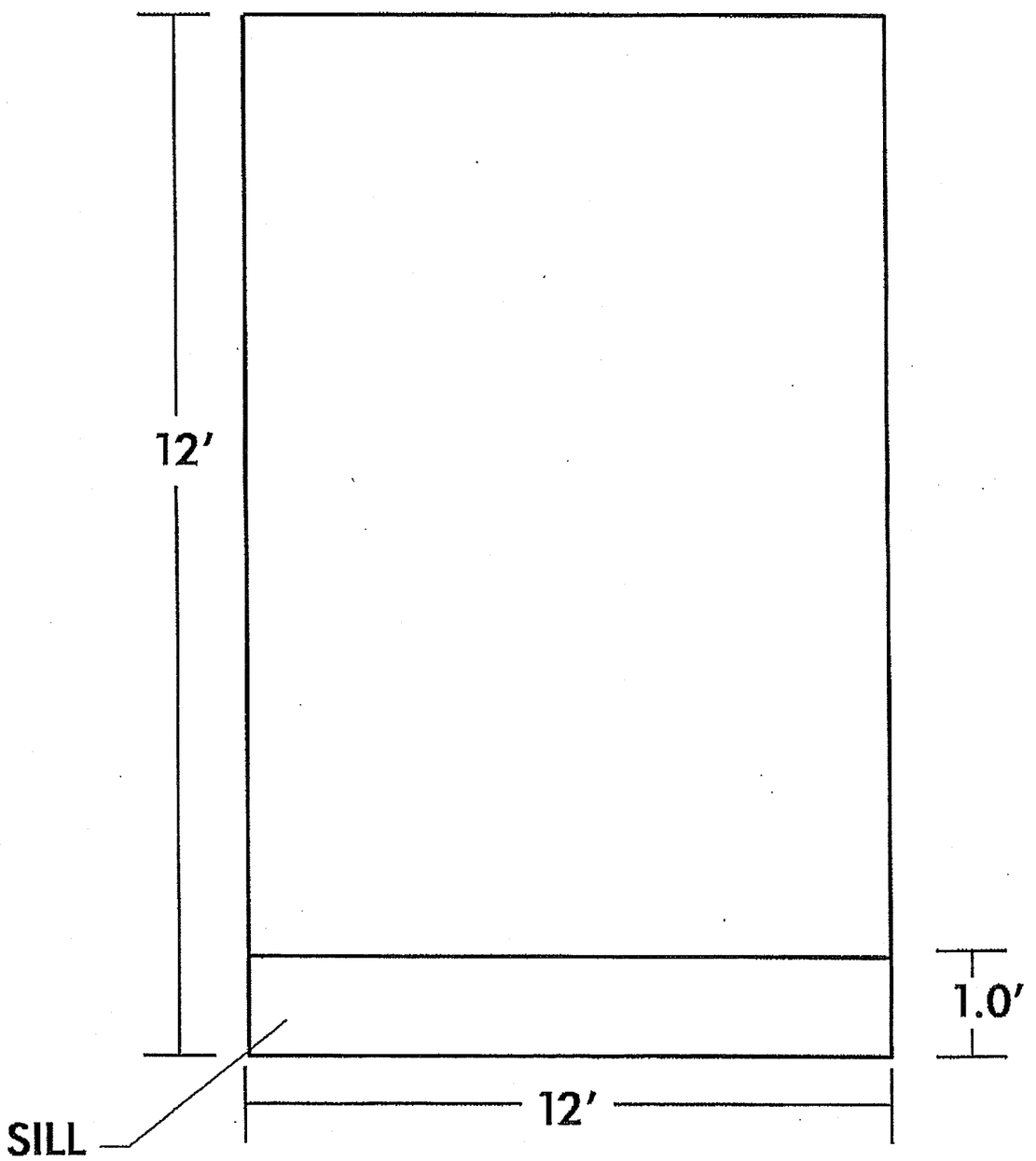
DENOTES IMPACTS IN SURFACE WATER

DENOTES TEMPORARY IMPACTS IN SURFACE WATER

100' 0' 100'

SCALE: 1"= 100'

SILL DETAIL



(PLACE SILL AT INLET AND OUTLET)

Permit Drawing
Sheet 71 of 81

WETLAND PERMIT IMPACT SUMMARY

			WETLAND IMPACTS					SURFACE WATER IMPACTS				
Site No.	Station (From/To)	Structure Size / Type	Permanent Fill In Wetlands (ac)	Temp. Fill In Wetlands (ac)	Excavation in Wetlands (ac)	Mechanized Clearing in Wetlands (ac)	Hand Clearing in Wetlands (ac)	Permanent SW impacts (ac)	Temp. SW impacts (ac)	Existing Channel Impacts Permanent (ft)	Existing Channel Impacts Temp. (ft)	Natural Stream Design (ft)
1	26+50 to 32+50 -RP1B-	42" RCP	0.01					0.13	<0.01	699	22	
		Bank Stabilization								20		
2	117+00 -L-	66" CSP										
2a.								<0.01	<0.01	60	18	
2b.		Road Fill						<0.01	<0.01	44	7	
2c.		Road Fill						0.05	<0.01	366	22	
		Bank Stabilization								20		
3	133+50 -L- &	36" CSP & 42" RCP						0.02	<0.01	212	36	
	12+00 -Y1C-	Bank Stabilization								32		
4	138+00 -L- &	2 @ 36" CSP	0.24			0.02		0.02	<0.01	523	42	
	16+00 to 17+00 -Y1C-	Bank Stabilization								30		
5	161+00 to 162+00 -L-	66" SPSP						0.03	<0.01	408	33	
		Bank Stabilization								20		
6	193+50 to 197+00 -L-	60" RCP & 54" CSP	<0.01					0.04	<0.01	409	21	
		Bank Stabilization								23		
SUBTOTALS:			0.26			0.02		0.29	0.08	2,866	201	

NC DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GUILFORD
COUNTY
WBS - 34429.1.1 (R-2413A)

ATN Revised 3/31/05

WETLAND PERMIT IMPACT SUMMARY

Site No.	Station (From/To)	Structure Size / Type	WETLAND IMPACTS: Permanent Fill In Wetlands (ac)	WETLAND IMPACTS: Temp. Fill In Wetlands (ac)	WETLAND IMPACTS: Excavation in Wetlands (ac)	WETLAND IMPACTS: Mechanized Clearing in Wetlands (ac)	WETLAND IMPACTS: Hand Clearing in Wetlands (ac)	SURFACE WATER IMPACTS: Permanent SW impacts (ac)	SURFACE WATER IMPACTS: Temp. SW impacts (ac)	SURFACE WATER IMPACTS: Existing Channel Impacts Permanent (ft)	SURFACE WATER IMPACTS: Existing Channel Impacts Temp. (ft)	SURFACE WATER IMPACTS: Natural Stream Design (ft)
7	206+50 to 208+50 -L-	60" CSP & 54" CSP										
7a.								0.03	<0.01	379	21	
		Bank Stabilization								45		
7b.								<0.01	<0.01	26	10	
7c.								<0.01		31		
8	228+00 to 233+50 -L-	66" CSP										
8a.								0.06	<0.01	654	50	
		Bank Stabilization								21		
8b.								<0.01		50		
8c.								<0.01		34		
9	232+50 to 235+50 -L-	42" CSP						0.60 (pond)				
10	247+50 -L-	72" CSP										
10a.			0.01		<0.01			0.05	<0.01	426	41	
		Bank Stabilization								20		
10b.								<0.01		49		
10c.			<0.01			0.01		0.01		116		
11	249+50 to 251+50 -L-	48" CSP	0.12					<0.01	<0.01	47	17	
SUBTOTALS:			0.14		<0.01	0.01		0.81	0.05	1,898	139	

ATN Revised 3/31/05

NC DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GUILFORD
COUNTY
WBS - 34429.1.1 (R-2413A)

WETLAND PERMIT IMPACT SUMMARY

			WETLAND IMPACTS					SURFACE WATER IMPACTS				
Site No.	Station (From/To)	Structure Size / Type	Permanent Fill In Wetlands (ac)	Temp. Fill In Wetlands (ac)	Excavation in Wetlands (ac)	Mechanized Clearing in Wetlands (ac)	Hand Clearing in Wetlands (ac)	Permanent SW impacts (ac)	Temp. SW impacts (ac)	Existing Channel Impacts Permanent (ft)	Existing Channel Impacts Temp. (ft)	Natural Stream Design (ft)
12	269+50 -L-	72" CSP										
12a.								0.03		299		1163*
12b.								0.01		131		
13	277+00 to 281+00 -L-	54" RCP										
13a.								0.04	<0.01	525	10	977*
13b.								0.01		106		
14	307+00 -L-	78" CSP										
14a.								0.07		551	20	
14b.								0.02		258	10	
		Bank Stabilization								25		
15	322+50 to 326+00 -L-	54" CSP										
15a.			0.01					0.04	<0.01	513	41	
		Bank Stabilization								20		
15b.								<0.01		46		
16	327+50 to 329+50 -L-	72" CSP										
16a.			0.15					0.02	<0.01	342	29	
		Bank Stabilization								20		
16b.								<0.01		33		
SUBTOTALS:			0.16					0.21	0.03	2,869	110	2,140

* See Plan for On-Site Mitigation

NC DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GUILFORD
COUNTY
WBS - 34429.1.1 (R-2413A)

SHEET 80 O 81 7/1/2013

ATN Revised 3/31/05

WETLAND PERMIT IMPACT SUMMARY

Site No.	Station (From/To)	Structure Size / Type	WETLAND IMPACTS: Permanent Fill In Wetlands (ac)	Temp. Fill In Wetlands (ac)	Excavation in Wetlands (ac)	Mechanized Clearing in Wetlands (ac)	Hand Clearing in Wetlands (ac)	SURFACE WATER IMPACTS: Permanent SW impacts (ac)	Temp. SW impacts (ac)	Existing Channel Impacts Permanent (ft)	Existing Channel Impacts Temp. (ft)	Natural Stream Design (ft)
17	334+00 to 336+50 -L-	36" CSP	0.35			0.03						
18	338+00 to 340+50 -L-	Bridge		0.04			0.13		0.03		172	
19	348+00 to 353+00 -L-	60" RCP						0.03	<.01	507	34	
20	17+50 to 19+00 -Y4-	36" CSP	0.11					0.02		240		
21	29+00 to 36+00 -Y5-	1 @ 12' X 12' RCBC										
21a.			2.11			0.13		0.06	0.09	288	262	250*
21b.		Road Fill						0.01		149		
22	24+50 -Y1C-	48" CSP						0.02	<.01	256	22	
		Bank Stabilization								20		
23	16+50-Y1C-	30" CSP/PDE							<.01		12	
SUBTOTALS:			2.57	0.04	<0.01	0.13	0.13	0.14	0.15	1,460	502	250
TOTALS:			3.13	0.04	<0.01	0.19	0.13	1.45	0.31	9,093	922	2,390

* See Plan for On-Site Mitigation

ATN Revised 3/31/05

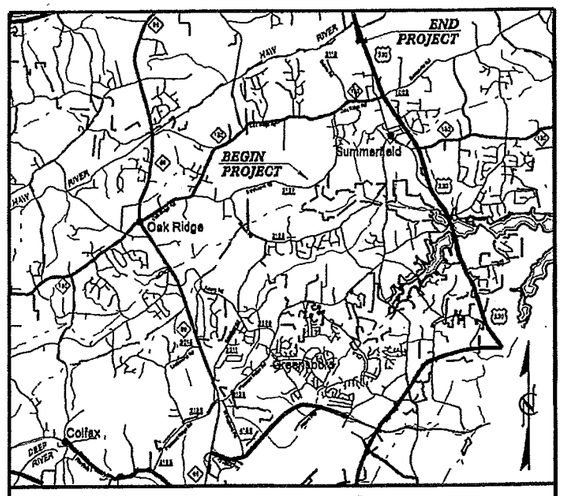
NC DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GUILFORD
COUNTY
WBS - 34429.1.1 (R-2413A)

SHEET 81 OF 81 7/16/2013

TIP PROJECT: R-2413B

CONTRACT:

~~See Sheet 1-A For Index of Sheets~~
See Sheet 1-B For Conventional Symbols
See Sheet 1-C thru 1-E For Survey Control Sheets



VICINITY MAP

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

GUILFORD COUNTY

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	R-2413B	1	
STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION	
34429.1.1		PE	
34429.2.3		R/W,UTL	

RECEIVED
MAY 16 2013
RALEIGH REGULATORY
FIELD OFFICE

Permit Drawing
Sheet 1 of 31

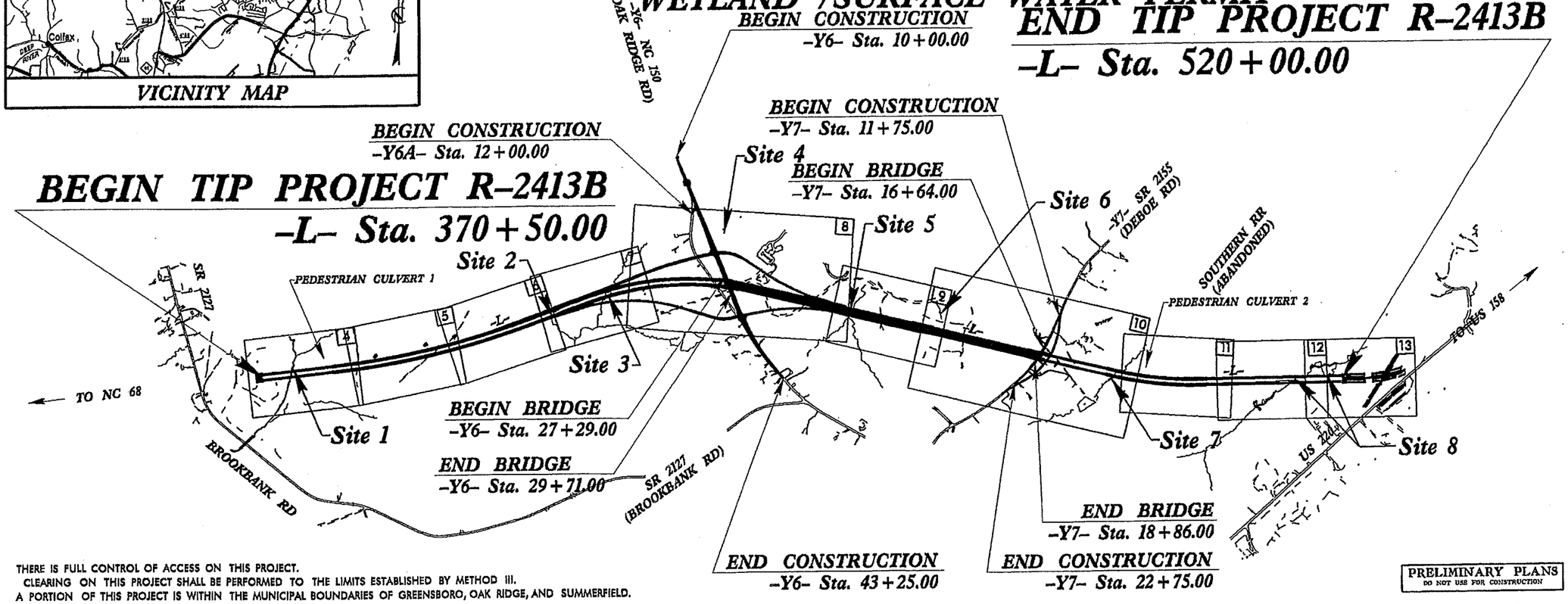
2013-00557

LOCATION: NC 68 CONNECTOR – FROM SR 2127 (BROOKBANK ROAD) TO HAW RIVER

TYPE OF WORK: GRADING, PAVING, WIDENING, RESURFACING, DRAINAGE, STRUCTURES, SIGNING, GUARDRAIL, SIGNALS, AND ITS.

NAD 83/ NSRS 2007

WETLAND /SURFACE WATER PERMIT



THERE IS FULL CONTROL OF ACCESS ON THIS PROJECT.
CLEARING ON THIS PROJECT SHALL BE PERFORMED TO THE LIMITS ESTABLISHED BY METHOD III.
A PORTION OF THIS PROJECT IS WITHIN THE MUNICIPAL BOUNDARIES OF GREENSBORO, OAK RIDGE, AND SUMMERFIELD.

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

GRAPHIC SCALES

PLANS: 50 25 0 50 100
PROFILE (HORIZONTAL): 50 25 0 50 100
PROFILE (VERTICAL): 10 5 0 10 20

DESIGN DATA

ADT 2012 = 23,000
ADT 2035 = 40,800
DHV = 11 %
D = 65 %
T = 15 % *
V = 70 MPH
* TTST 10% DUAL 5%
FUNC CLASS – INTERSTATE

PROJECT LENGTH

LENGTH ROADWAY TIP PROJECT R-2413B = 2.831 MILES

TOTAL LENGTH TIP PROJECT R-2413B = 2.831 MILES

Prepared in the Office of:
DIVISION OF HIGHWAYS
1000 Birch Ridge Dr., Raleigh NC, 27610

2012 STANDARD SPECIFICATIONS

RIGHT OF WAY DATE: JANUARY 26, 2012

LETTING DATE: APRIL 15, 2014

TONY HOUSER, PE
PROJECT ENGINEER

JEFFREY TEAGUE, PE
PROJECT DESIGN ENGINEER

HYDRAULICS ENGINEER

SIGNATURE:

ROADWAY DESIGN ENGINEER

SIGNATURE:

DIVISION OF HIGHWAYS
STATE OF NORTH CAROLINA

STATE HIGHWAY DESIGN ENGINEER

$$$$$$SYSTIME$$$$$$
$$$$$$$$$$$$$$$$$$DGN$$$$$$$$$$$$$$$$$$
$$$$USERNAME$$$$

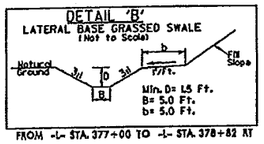
6/2/99

PROJECT REFERENCE NO.	SHEET NO.
R-2413B	2-1
ROADWAY DESIGN ENGINEER	PAVEMENT DESIGN ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

Permit Drawing
Sheet 2 of 31

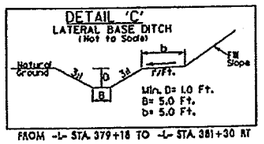
DETAIL 'B'
LATERAL BASE GRASSED SWALE
(Not to Scale)



Min. D= 1.5 Ft.
B= 5.0 Ft.
b= 5.0 Ft.

FROM -L- STA. 377+00 TO -L- STA. 378+82 RT

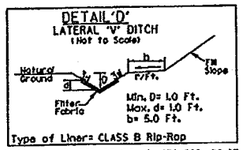
DETAIL 'C'
LATERAL BASE DITCH
(Not to Scale)



Min. D= 1.0 Ft.
B= 5.0 Ft.
b= 5.0 Ft.

FROM -L- STA. 379+18 TO -L- STA. 381+30 RT

DETAIL 'D'
LATERAL 'V' DITCH
(Not to Scale)

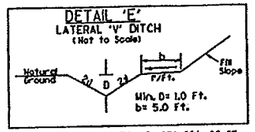


Min. D= 1.0 Ft.
Max. d= 1.0 Ft.
B= 5.0 Ft.
b= 5.0 Ft.

Type of Liner= CLASS B Rip-Rap

FROM -L- STA. 381+30 TO -L- STA. 382+00 RT

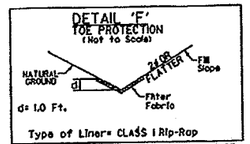
DETAIL 'E'
LATERAL 'V' DITCH
(Not to Scale)



Min. D= 1.0 Ft.
b= 5.0 Ft.

FROM -L- STA. 382+00 TO -L- STA. 386+00 RT

DETAIL 'F'
TOE PROTECTION
(Not to Scale)



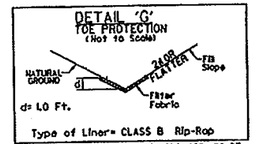
d= 1.0 Ft.

Type of Liner= CLASS I Rip-Rap

FROM -L- STA. 371+50 TO -L- STA. 372+70 RT
FROM -L- STA. 449+80 TO -L- STA. 451+50 RT
FROM -L- STA. 457+60 TO -L- STA. 457+00 RT
FROM -L- STA. 371+00 TO -L- STA. 373+90 LT
FROM -L- STA. 449+30 TO -L- STA. 453+10 LT

FROM -Y6- STA. 19+00 TO -Y6- STA. 21+50 LT

DETAIL 'G'
TOE PROTECTION
(Not to Scale)



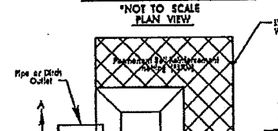
d= 1.0 Ft.

Type of Liner= CLASS B Rip-Rap

FROM -L- STA. 464+00 TO -L- STA. 468+50 RT
FROM -L- STA. 488+50 TO -L- STA. 491+50 RT
FROM -L- STA. 491+77 TO -L- STA. 494+00 RT
FROM -L- STA. 503+50 TO -L- STA. 507+70 RT
FROM -L- STA. 373+90 TO -L- STA. 374+65 LT
FROM -L- STA. 465+00 TO -L- STA. 467+00 LT
FROM -L- STA. 519+00 TO -L- STA. 520+00 LT

FROM -Y6- STA. 33+30 TO -Y6- STA. 33+80 RT
FROM -RP6C- STA. 32+30 TO -RP6C- STA. 34+00 RT

DETAIL 'I'
LATERAL BASE DITCH
(Not to Scale)

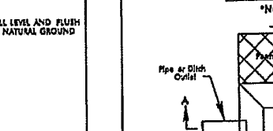


Min. D= 1.0 Ft.
Max. d= 1.0 Ft.
B= 2.0 Ft.
b= 3.0 Ft.

Type of Liner= CLASS B Rip-Rap

FROM -L- STA. 410+50 TO -L- STA. 413+20 LT

DETAIL 'J'
LATERAL BASE DITCH
(Not to Scale)

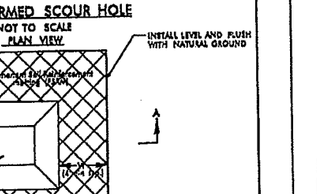


Min. D= 1.0 Ft.
Max. d= 1.0 Ft.
B= 2.0 Ft.
b= 5.0 Ft.

Type of Liner= CLASS B Rip-Rap

FROM -L- STA. 458+05 TO -L- STA. 460+00 LT
FROM -Y6- STA. 19+50 TO -Y6- STA. 22+65 RT

DETAIL 'L'
PIPE OUTLET CHANNEL
(Not to Scale)



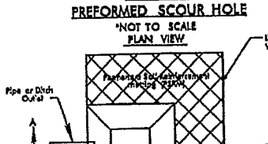
Min. D= 4.0 Ft.
Max. d= 3.5 Ft.
B= 4.0 Ft.

Type of Liners CLASS I Rip-Rap

-L- STA. 410+78 RT
-L- STA. 453+14 LT

-Y6- STA. 21+68 LT

DETAIL 'N'
LATERAL 'V' DITCH
(Not to Scale)

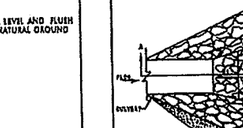


Min. D= 1.0 Ft.
Max. d= 1.0 Ft.
b= 5.0 Ft.

Type of Liner= CLASS B Rip-Rap

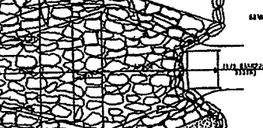
FROM -L- STA. 417+50 TO -L- STA. 420+50 LT

DETAIL 'O'
DRY DETENTION BASIN
END VIEW
(Not to Scale)



FROM -L- STA. 422+00 TO -L- STA. 425+00 RT

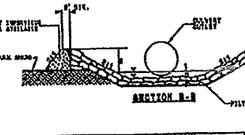
DETAIL 'P'
BERM BASE DITCH
(Not to Scale)



Min. D= 1.0 Ft.
B= 2.0 Ft.
b= 5.0 Ft.

FROM -L- STA. 428+00 TO -L- STA. 429+00 RT
FROM -RP6D- STA. 16+70 TO -RP6D- STA. 19+50 LT

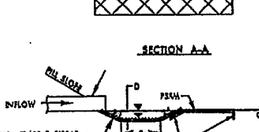
DETAIL 'Q'
BERM 'V' DITCH
(Not to Scale)



Min. D= 1.0 Ft.
b= 5.0 Ft.

FROM -L- STA. 427+00 TO -L- STA. 428+00 RT
FROM -L- STA. 427+00 TO -L- STA. 430+00 LT
FROM -L- STA. 435+40 TO -L- STA. 437+50 LT

DETAIL 'R'
SPECIAL LATERAL 'V' DITCH
(Not to Scale)

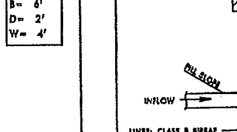


Min. D= 1.0 Ft.

FROM -L- STA. 506+30 TO -L- STA. 507+50 LT

FROM -RP6C- STA. 31+50 TO -RP6C- STA. 33+50 LT
FROM -DR7B- STA. 10+50 TO -DR7B- STA. 11+50 LT

DETAIL 'S'
STANDARD 'V' DITCH
(Not to Scale)

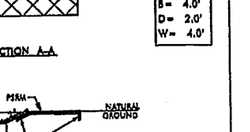


Min. D= 1.0 Ft.

-L- STA. 508+40 RT

-RP6B- STA. 29+00 RT
-RP6B- STA. 27+50 LT

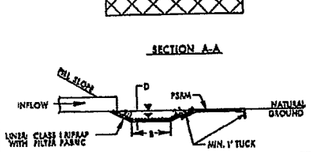
DETAIL 'T'
LATERAL 'V' DITCH
(Not to Scale)



Min. D= 1.0 Ft.
b= 5.0 Ft.

FROM -Y6- STA. 25+00 TO -Y6- STA. 26+00 RT
FROM -Y7- STA. 15+50 TO -Y7- STA. 16+50 RT

DETAIL 'U'
SPECIAL LATERAL 'V' DITCH
(Not to Scale)



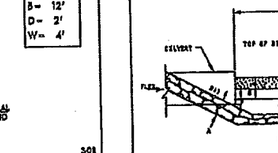
Min. LO D= Ft.
Max. 1.0 d= Ft.

Type of Liner= CLASS B Rip-Rap

FROM -L- STA. 475+85 TO -L- STA. 476+50 RT
FROM -L- STA. 517+00 TO -L- STA. 518+50 RT

FROM -Y6- STA. 25+15 TO -Y6- STA. 27+35 LT

DETAIL 'V'
BERM BASE DITCH
(Not to Scale)

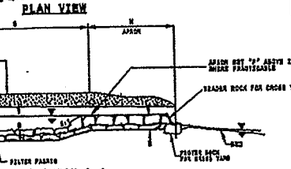


Min. D= LO Ft.
Max. d= 1.0 Ft.
B= 2.0 Ft.
b= 5.0 Ft.

Type of Liner= CLASS B Rip-Rap

FROM -RP6D- STA. 19+80 TO -RP6D- STA. 20+50 LT

DETAIL 'X'
LATERAL BASE DITCH
(Not to Scale)

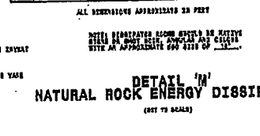


Min. D= 3.0 Ft.
Max. d= 3.0 Ft.
B= 3.0 Ft.
b= 5.0 Ft.

Type of Liner= CLASS I Rip-Rap ON BANKS

FROM STA. 452+00 TO STA. 453+00 -L- RT

DETAIL 'Z'
STANDARD 'V' DITCH
(Not to Scale)



Min. D= 1.0 Ft.
Max. d= 1.0 Ft.

Type of Liner= CLASS I Rip-Rap

-L- STA. 456+45 LT

DETAIL 'AA'
STANDARD 'V' DITCH
(Not to Scale)

Min. D= 1.0 Ft.
Max. d= 1.0 Ft.

Type of Liner= CLASS B Rip-Rap

-L- STA. 462+50 LT

DETAIL 'AB'
STANDARD BASE DITCH
(Not to Scale)

Min. D= 2.0 Ft.
Max. d= 2.0 Ft.
B= 3.0 Ft.

Type of Liner= CLASS I Rip-Rap

-L- STA. 464+88 LT

DETAIL 'AC'
LATERAL BASE DITCH
(Not to Scale)

Min. D= 1.0 Ft.
Max. d= 1.0 Ft.
B= 3.0 Ft.
b= 5.0 Ft.

Type of Liner= CLASS I Rip-Rap

FROM -L- STA. 453+00 TO -L- STA. 454+50 RT
FROM -L- STA. 475+00 TO -L- STA. 475+50 LT
FROM -L- STA. 488+00 TO -L- STA. 490+30 LT

DETAIL 'AD'
STANDARD BASE DITCH
(Not to Scale)

Min. D= 3.0 Ft.
Max. d= 2.0 Ft.
B= 3.0 Ft.

Type of Liner= CLASS I Rip-Rap

-L- STA. 475+89 RT

DETAIL 'AE'
BERM 'V' DITCH
(Not to Scale)

Min. D= LO Ft.
Max. d= LO Ft.
b= 5.0 Ft.

Type of Liner= CLASS B RIP RAP

FROM -L- STA. 476+50 TO -L- STA. 477+50 RT

DETAIL 'AF'
SPECIAL LATERAL 'V' DITCH
(Not to Scale)

Min. D= LO Ft.

FROM -Y7- STA. 19+23 TO -Y7- STA. 20+50 RT

DETAIL 'AG'
STANDARD BASE DITCH
(Not to Scale)

Min. D= 3.0 Ft.
Max. d= 3.0 Ft.
B= 6.0 Ft.

Type of Liner= CLASS I Rip-Rap

-L- STA. 490+35 LT

DETAIL 'AH'
SPECIAL LATERAL BASE DITCH
(Not to Scale)

Min. D= LO Ft.
Max. d= LO Ft.
B= 2.0 Ft.

Type of Liner= CLASS B Rip-Rap

FROM -L- STA. 505+00 TO -L- STA. 506+30 LT

DETAIL 'AI'
STANDARD BASE DITCH
(Not to Scale)

Min. D= 2.0 Ft.
Max. d= 1.5 Ft.
B= 5.0 Ft.

Type of Liner= CLASS I Rip-Rap

-L- STA. 508+20 RT
-L- STA. 475+55 LT

DETAIL 'AJ'
LATERAL BASE DITCH
(Not to Scale)

Min. D= LO Ft.
Max. d= 1.0 Ft.
B= 5.0 Ft.
b= 5.0 Ft.

Type of Liner= CLASS B Rip-Rap

FROM -L- STA. 511+00 TO -L- STA. 515+90 LT

DETAIL 'AK'
STANDARD BASE DITCH
(Not to Scale)

Min. D= 3.0 Ft.
Max. d= 3.0 Ft.
B= 3.0 Ft.

Type of Liner= CLASS I Rip-Rap ON BANKS

FROM STA. 451+85 TO STA. 452+00 -L- RT
FROM STA. 453+00 TO STA. 453+32 -L- RT

DETAIL 'AL'
LATERAL BASE DITCH
(Not to Scale)

Min. D= 1.5 Ft.
Max. d= 1.5 Ft.
B= 3.0 Ft.
b= 5.0 Ft.

Type of Liner= CLASS B Rip-Rap

FROM -L- STA. 510+76 TO -L- STA. 517+00 RT

DETAIL 'AM'
BANK STABILIZATION
(Not to Scale)

Min. D= 4.0 Ft.
Max. d= 3.0 Ft.
B= 3.0 Ft.

Type of Liner= CLASS I Rip-Rap

-Y6- STA. 22+00 LT
-L- STA. 411+00 RT
-L- STA. 463+00 LT

DETAIL 'AN'
LATERAL BASE DITCH
(Not to Scale)

Min. D= 2.0 Ft.
Max. d= 2.0 Ft.
B= 5.0 Ft.
b= 5.0 Ft.

Type of Liner= CLASS I Rip-Rap

FROM -L- STA. 417+57 TO -L- STA. 418+00 RT

DETAIL 'A'
PREFORMED SCOUR HOLE
*NOT TO SCALE

-L- STA. 463+78 LT

DETAIL 'W'
PREFORMED SCOUR HOLE
*NOT TO SCALE

-L- STA. 373+25 RT
-L- STA. 413+80 RT
-L- STA. 481+65 RT

DETAIL 'W'
PREFORMED SCOUR HOLE
*NOT TO SCALE

-RP6A- STA. 16+00 RT

-L- STA. 417+40 RT

6/2/99 SYSTIME
SCHEMELEDMONDSON

PROJECT REFERENCE NO.	SHEET NO.
R-2413B	4
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

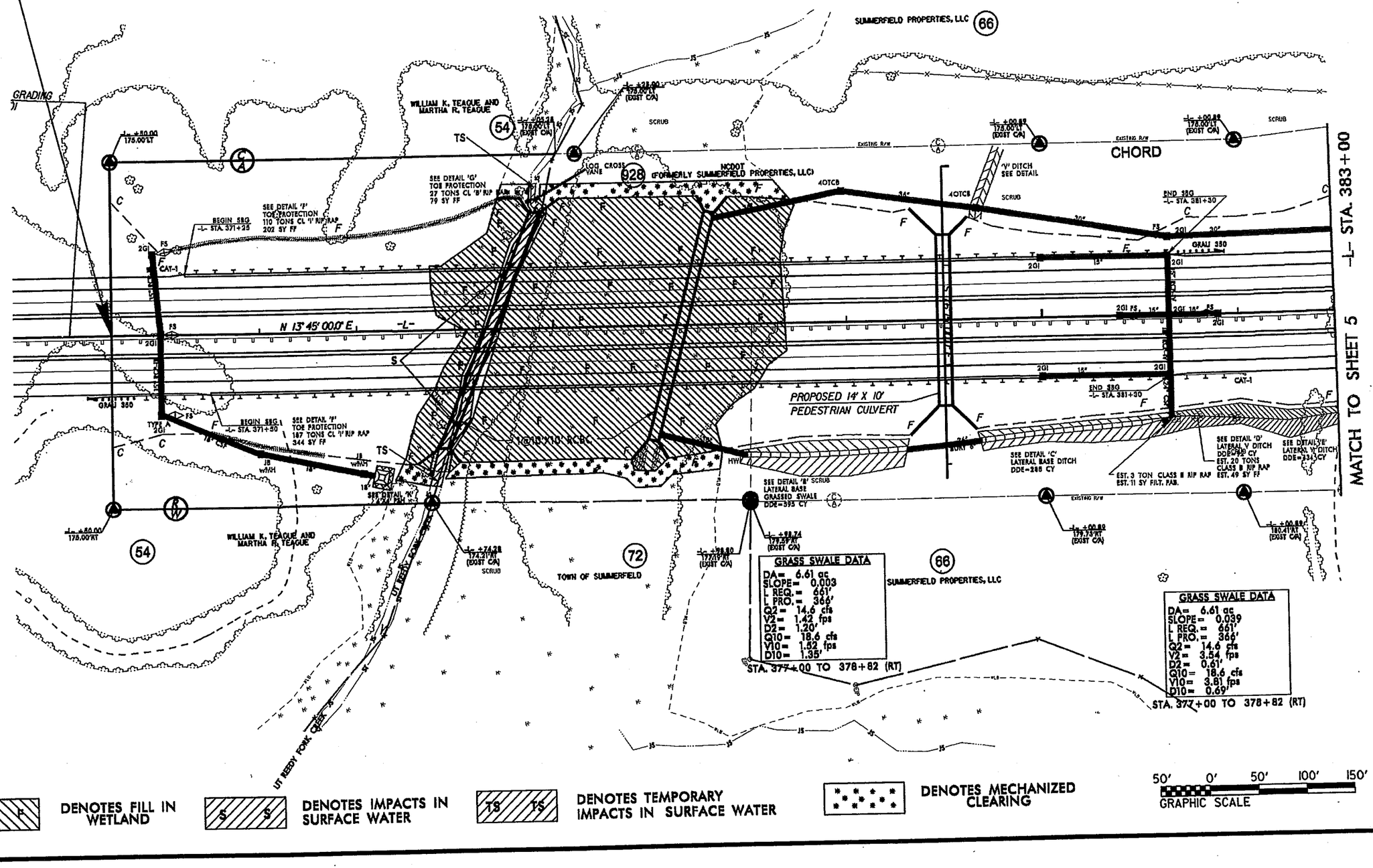
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

Permit Drawing
Sheet 3 of 31

NAD 83/NSRS 2007

BEGIN TIP PROJECT R-2413B -L- Sta. 370+50.00
END TIP PROJECT R-2413A -L- Sta. 370+50.00
TIE GUARDRAIL & MEDIAN GUIDERAIL TO TIP PROJECT R-2413A

SITE 1



REVISIONS 8/17/99

SYSTIMES DON HUSSEY HOUSE

PROJECT REFERENCE NO.	SHEET NO.
R-2413B	4
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

Permit Drawing
Sheet 4 of 21

NAD 83/NSRS 2007

BEGIN TIP PROJECT R-2413B -L- Sta. 370+50.00
END TIP PROJECT R-2413A -L- Sta. 370+50.00
TIE GUARDRAIL & MEDIAN GUIDERAIL TO TIP PROJECT R-2413A

SITE 1

REVISIONS 8/17/99

SUMMERFIELD PROPERTIES, LLC (66)
WILLIAM K. TEAGUE AND MARTHA R/TEAGUE (54)
MCDOT (FORMERLY SUMMERFIELD PROPERTIES, LLC) (928)
TOWN OF SUMMERFIELD (72)
WILLIAM K. TEAGUE AND MARTHA R. TEAGUE (54)
SUMMERFIELD PROPERTIES, LLC (66)
LT REEDY FORK CREEK
GRADING
CHORD
N 13°45'00.0" E -L-
PROPOSED 14' X 10' PEDESTRIAN CULVERT
1@10'X10' RCBC
BEGIN SBG -L- STA. 371+25
END SBG -L- STA. 381+30
BEGIN SBG -L- STA. 371+60
SEE DETAIL 'F' TOE PROTECTION 110 TONS CL 'I' RIP RAP 202 SY FF
SEE DETAIL 'F' TOE PROTECTION 27 TONS CL 'B' RIP RAP 79 SY FF
SEE DETAIL 'F' TOE PROTECTION 167 TONS CL 'I' RIP RAP 344 SY FF
SEE DETAIL 'B' SCRUB LATERAL BASE GRASSED SWALE DDE=393 CY
SEE DETAIL 'C' LATERAL BASE DITCH DDE=288 CY
SEE DETAIL 'D' LATERAL V DITCH DDE=92 CY EST. 20 TONS CLASS B RIP RAP EST. 49 SY FF
SEE DETAIL 'E' LATERAL V DITCH DDE=334 CY
EST. 3 TON CLASS B RIP RAP EST. 11 SY FILT. FAB.
'V' DITCH SEE DETAIL
LOG CROSS VANE
SCRUB
EXISTING R/W
40OTCB
GRAU 350
TYPE A 2GI
2GI
CAT-1
HWL
EOP
TS
WWH

GRASS SWALE DATA
DA = 6.61 ac
SLOPE = 0.003
L REQ. = 661'
L PRO. = 366'
Q2 = 14.6 cfs
V2 = 1.42 fps
D2 = 1.20'
Q10 = 18.6 cfs
V10 = 1.52 fps
D10 = 1.35'
STA. 377+00 TO 378+82 (RT)

GRASS SWALE DATA
DA = 6.61 ac
SLOPE = 0.039
L REQ. = 661'
L PRO. = 366'
Q2 = 14.6 cfs
V2 = 3.54 fps
D2 = 0.61'
Q10 = 18.6 cfs
V10 = 3.81 fps
D10 = 0.69'
STA. 377+00 TO 378+82 (RT)

-L- STA. 383+00
MATCH TO SHEET 5

F F DENOTES FILL IN WETLAND
S S DENOTES IMPACTS IN SURFACE WATER
TS TS DENOTES TEMPORARY IMPACTS IN SURFACE WATER
DENOTES MECHANIZED CLEARING

50' 0' 50' 100' 150'
GRAPHIC SCALE

$$$$$$SYSTIME$$$$$$
$$$$$$USERNAME$$$$$$

PROJECT REFERENCE NO.	SHEET NO.
R-2413B	7
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

Permit Drawing
Sheet 5 of 31

NAD 83/NSRS 2007

8/17/99

REVISIONS

SITE 2

SITE 3

NORMAN R. JOHNSON

-L- ST Sta. 410+65.27

-L- STA. 410+00

MATCH TO SHEET 6

SEE DETAIL 'I'
LATERAL BASE DITCH
122 TONS CL 'B' RIP RAP
346 SY FF
DDE=1,008 CY

-L- TS Sta. 414+18.82 =
-RP6B- POT Sta. 10+00.00 (47.00' LT)

-L- SC Sta. 416+68.82

EST. 2 TONS CL. B RIP RAP
EST. 7 SY FILT. FAB.

927
NCDOT
(FORMERLY NORMAN R. JOHNSON

SEE DETAIL 'N'
LATERAL V DITCH
105 TONS CL 'B' RIP RAP
314 SY FF
DDE=524 CY

-RP6B- TS Sta. 19+07.44

CHORDCHORD

MATCH TO SHEET 8
-RP6B- STA. 19+50

MATCH TO SHEET 8
-L- STA. 423+50

-RP6B-

N 0° 35' 00.0" W

N 3° 25' 00.0" E

-L- N 0° 35' 00.0" W

16:1 TAPER

BEGIN JS

BEGIN SBG
-L- STA. 410+00

JB w/MH

BANK STABILIZATION

TS

BANK STABILIZATION
SEE DETAIL 'AM'
EST. 16 TONS CL I RIP RAP
EST. 12 S.Y. FF
EST. 16 C.Y. DDE

-RP6C- TS Sta. 11+50.00

-RP6C- SC Sta. 11+50.00

SEE DETAIL 'K'
4'X4' PSH

927
NCDOT
(FORMERLY NORMAN R. JOHNSON

-L- POT Sta. 412+00.00 =
-RP6C- POT Sta. 10+00.00 (47.00' RT)
SKEW ANGLE FROM -L- = 4° 00' 00.0"

SEE DETAIL 'M'
ENERGY DISSIPATOR
BASIN

NON JS

-RP6C-

END SBG
-RP6C- STA. 11+78.82

SEE DETAIL 'O'
DRY DETENTION BASIN
DDE=861 CY

DRY DETENTION BASIN
WATER QUALITY
VOL. REQ'D=806 CY
VOL. PROVIDED=920 CY

SEE DETAIL 'AN'
LATERAL BASE DITCH
60 TONS CL 'I' RIP RAP
97 SY FF
DDE=137 CY

903
NCDOT
(FORMERLY DELBERT R. FENTRESS)

CHORD

SCRUB

66
SUMMERFIELD PROPERTIES, LLC

S S DENOTES IMPACTS IN SURFACE WATER

TS TS DENOTES TEMPORARY IMPACTS IN SURFACE WATER

50' 0' 50' 100' 150'
GRAPHIC SCALE

$$$$$$$SYSTIME$$$$$$$
$$$$$$$LOGIN$$$$$$$

PROJECT REFERENCE NO.	SHEET NO.
R-2413B	7
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

Permit Drawing
Sheet 9 of 31

NAD 83/NSRS 2007

8/17/99

REVISIONS

SITE 2

SITE 3

-L- ST Sta. 410+65.27

-L- STA. 410+00

-L- TS Sta. 414+18.82 =
-RP6B- POT Sta. 10+00.00 (47.00' LT)

-L- SC Sta. 416+68.82

-RP6B-

N 0° 35' 00.0" W

N 3° 25' 00.0" E

-RP6C- TS Sta. 11+50.00

-RP6C- SC Sta. 11+50.00

-L- POT Sta. 412+00.00 =
-RP6C- POT Sta. 10+00.00 (47.00' RT)
SKEW ANGLE FROM -L- = 4° 00' 00.0"

-RP6B- TS Sta. 19+07.44

CHORD

MATCH TO SHEET 6

MATCH TO SHEET 8
-L- STA. 423+50

MATCH TO SHEET 8
-RP6B- STA. 19+50

MATCH TO SHEET 8
-RP6C- STA. 21+25

NORMAN R. JOHNSON

NCDOT (FORMERLY NORMAN R. JOHNSON) 927

NCDOT (FORMERLY DELBERT R. FENTRESS) 903

SUMMERFIELD PROPERTIES, LLC 66

SEE DETAIL 'H'
LATERAL BASE DITCH
123 TONS CL 'B' RIP RAP
346 SY FF
DDE=1,008 CY

SEE DETAIL 'N'
LATERAL V DITCH
105 TONS CL 'B' RIP RAP
314 SY FF
DDE=814 CY

SEE DETAIL 'AA'
BANK STABILIZATION
EST. 16 TONS CL 'B' RIP RAP
EST. 72 S.Y. FF
EST. 19 C.Y. DDE

SEE DETAIL 'JJ'
ENERGY DISSIPATOR
BASIN

SEE DETAIL 'AN'
LATERAL BASE DITCH
68 TONS CL 'I' RIP RAP
92 SY FF
DDE=137 CY

SEE DETAIL 'O'
DRY DETENTION BASIN
DDE=869 CY

DRY DETENTION BASIN
WATER QUALITY
VOL. REQ'D=806 CY
VOL. PROVIDED=900 CY

EST. 2 TONS CL. B RIP RAP
EST. 7 SY FILTER FAB.

END SBG -RP6C- STA. 11+78.82

BEGIN SBG -L- STA. 410+00

BANK STABILIZATION

NON JS

SCRUB

S S DENOTES IMPACTS IN SURFACE WATER

TS TS DENOTES TEMPORARY IMPACTS IN SURFACE WATER

50' 0' 50' 100' 150'
GRAPHIC SCALE

$$$$$$$SYSTIME$$$$$$$
$$$$$$$USERNAME$$$$$$$DGN$$$$$$$

PROJECT REFERENCE NO.	SHEET NO.
R-2413B	8
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

DENOTES IMPACTS IN SURFACE WATER

DENOTES TEMPORARY IMPACTS IN SURFACE WATER

50' 0' 50' 100' 150'
GRAPHIC SCALE

Permit Drawing
Sheet 7 of 31

NAD 83/NSRS 2007

SITE 4

MATCH TO SHEET 14 -Y6A- STA. 11+00

MATCH TO SHEET 14 -Y6- STA. 19+00

MATCH TO SHEET 7 -RP6B- STA. 19+50

MATCH TO SHEET 7 -L- STA. 423+50

MATCH TO SHEET 7 -RP6C- STA. 21+25

MATCH TO SHEET 15 -Y6- STA. 35+00

MATCH TO SHEET 9 -L- STA. 451+00

SOULE, KENNETH W. AND ROSE M.

DAVID M. RAMONA AND JUDEY RAMONA

MCDOT (FORMERLY JOHN T. SPRUILL)

MCDOT (FORMERLY IZULA T. FEATHERS)

MCDOT (FORMERLY DELBERT R. FEATHERS)

MCDOT (FORMERLY CREGORY L. DOBBINS)

MCDOT (FORMERLY DONALD L. HENSON)

RICHARD LEON BESSON AND JOAN Y. BESSON

HENSON FOREST HOA, INC.

HENSON FOREST HOMEOWNERS ASSOCIATION, INC.

RICHARD CALASS AND BARBARA CALASS

HENSON VILLAGE, LLC

DRY DETENTION BASIN
WATER QUALITY
VOL. REQ'D =
VOL. PROVIDED =

Dry Detention Basin With Draw Down Skimmer

Earth Berm/ Fence

BANK STABILIZATION

CHORD

BEGIN SBG -RP6D- STA. 13+25

PROJECT REFERENCE NO.	SHEET NO.
R-2413B	8
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

DENOTES IMPACTS IN SURFACE WATER

DENOTES TEMPORARY IMPACTS IN SURFACE WATER

50' 0' 50' 100' 150'
GRAPHIC SCALE

Permit Drawing
Sheet 8 of 31

NAD 83/NSRS 2007

SITE 4

MATCH TO SHEET 14 -Y6A- STA. 11+00

MATCH TO SHEET 14 -Y6- STA. 19+00

MATCH TO SHEET 7 -RP6B- STA. 19+50

MATCH TO SHEET 7 -L- STA. 23+50

MATCH TO SHEET 7 -RP6C- STA. 21+25

MATCH TO SHEET 15 -Y6- STA. 35+00

MATCH TO SHEET 9 -L- STA. 451+00

DRY DETENTION BASIN
WATER QUALITY
VOL. REQ'D=
VOL. PROVIDED=

Dry Detention Basin
With Draw Down Structure

Earth Berm

SODLE, KENNETH W. AND ROSE M.

NCDOT (FORMERLY NORMAN R. JOHNSON)

NCDOT (FORMERLY DELBERT R. VENTRESS)

NCDOT (FORMERLY JOHN T. STREET)

NCDOT (FORMERLY IZULA T. VENTRESS)

NCDOT (FORMERLY GREGORY LS DUNLAP)

NCDOT (FORMERLY DONALD L. HENSON)

DAVID M. & LORRIE L. RAMOS AND JUDEY RAMOS

RICHARD LEON BEECH AND JOHN T. BEECH

HENSON FOREST HOA, INC.

HENSON FOREST HOMEOWNERS ASSOCIATION, INC.

RICHARD G. CALASS AND BARBARA CALASS

HENSON VILLAGE, LLC

N 39°40'00" E

S 37°24'00" W

PROJECT REFERENCE NO.	SHEET NO.
R-2413B	9
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

Permit Drawing Sheet 9 of 31

NAD 83/NSRS 2007

8/17/99

REVISIONS

SITE 5

HENSON FOREST HOMEOWNERS ASSOCIATION, INC. (26)

HENSON FOREST HOA, INC. (26)

HENSON FOREST HOA, INC. (26)

NCDOT (FORMERLY DONALD L. HENSON) (904)

NCDOT (FORMERLY DONALD L. HENSON) (904)

HENSON VILLAGE, LLC (30)

HENSON VILLAGE, LLC (30)

PAUL G. MILAM AND VIRGINIA MILAM

BANK STABILIZATION
SEE DETAIL 'AM'
EST. 15 TONS CLASS I RIP RAP
EST. 12 S.Y. F.P.
EST. 18 C.Y. DDE

BANK STABILIZATION
DETAIL 'AM'

SEE DETAIL 'F'
TOE PROTECTION
232 TONS CL 'I' RIP RAP
427 SY FF

SEE DETAIL 'F'
TOE PROTECTION
128 TONS CL 'I' RIP RAP
237 SY FF

SEE DETAIL 'F'
TOE PROTECTION
97 TONS CL 'I' RIP RAP
178 SY FF

SEE DETAIL 'F'
STANDARD 'I' DITCH
17 TONS CL I RIP RAP
30 SY FF
DDE=30 CY

SEE DETAIL 'AC'
LATERAL BASE DITCH
92 TONS CL I RIP RAP
178 SY FF

SEE DETAIL 'AC'
LATERAL BASE DITCH
46 TONS CL B R/P RAP
248 SY FF
DDE=447 CY

SEE DETAIL 'AA'
STANDARD 'V' DITCH
49 TONS CL B RIP RAP
147 SY FF
DDE=150 CY

SEE DETAIL 'AK'
STAND. BASE DITCH
30 TONS CL I R/P RAP ON BANKS
4 SY FF
EST.DDE=40 CY

SEE DETAIL 'AK'
STANDARD BASE DITCH
65 TONS CL I R/P RAP ON BANKS
11 SY FF
EST. DDE=20 CY

SEE DETAIL 'AC'
LATERAL BASE DITCH
199 TONS CL I R/P RAP ON BANKS
490 SY FF

SEE DETAIL 'A'
6'X6' PSH

-L- STA. 451+00

-L- STA. 464+00

MATCH TO SHEET 8

MATCH TO SHEET 10

N 33° 40' 00.0" E -L-

N 33° 40' 00.0" E

-L- POT Sta. 451+9279 =
-RP6D- ST Sta. 10+80.00 (47.00' RT)

END SB0
-L- STA. 455+18

SITE 5A

S S DENOTES IMPACTS IN SURFACE WATER

TS TS DENOTES TEMPORARY IMPACTS IN SURFACE WATER

50' 0' 50' 100' 150'
GRAPHIC SCALE

SYSTIMESTAMP
USERNAME

PROJECT REFERENCE NO.	SHEET NO.
R-2413B	9
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

Permit Drawing
Sheet 10 of 31

NAD 83/NSRS 2007

REVISIONS

8/17/99

SITE 5

HENSON FOREST HOMEOWNERS ASSOCIATION, INC.

HENSON FOREST HOA, INC.

HENSON FOREST HOA, INC.

NCDOT (FORMERLY DONALD L. HENSON)

NCDOT (FORMERLY DONALD L. HENSON)

PAUL G. MILAM AND VIRGINIA MILAM

HENSON VILLAGE, LLC

HENSON VILLAGE, LLC

-L- STA. 451+00

MATCH TO SHEET 8

-L- STA. 464+00

MATCH TO SHEET 10

-L= POT Sta. 451+9279 =
-RP6D- ST Sta. 10+80.00 (47.00' RT)

BANK STABILIZATION DETAIL 'AM'

SEE DETAIL 'F' TOE PROTECTION 272 TONS CL II RIP RAP 457 SY FF

SEE DETAIL 'F' TOE PROTECTION 128 TONS CL II RIP RAP 257 SY FF

SEE DETAIL 'F' TOE PROTECTION 97 TONS CL II RIP RAP 178 SY FF

SEE DETAIL 'AA' STANDARD V DITCH 49 TONS CL B RIP RAP 147 SY FF DDE=150 CY

SEE DETAIL 'AC' LATERAL BASE DITCH 97 TONS CL I RIP RAP 178 SY FF

SEE DETAIL 'AK' STANDARD BASE DITCH 49 TONS CL I RIP RAP ON BANKS 31.89 FF VFT. DDE=20 CY

SEE DETAIL 'AK' STAND. BASE DITCH 30 TONS CL I RIP RAP ON BANKS 6 SY FF EST. DDE=40 CY

SEE DETAIL 'AC' LATERAL BASE DITCH 88 TONS CL B RIP RAP 248 SY FF DDE=147 CY

SEE DETAIL 'AC' LATERAL BASE DITCH 193 TONS CL I RIP RAP ON BANKS 430 SY FF

SEE DETAIL 'A' STD. PIER

SITE 5A

S S DENOTES IMPACTS IN SURFACE WATER

TS TS DENOTES TEMPORARY IMPACTS IN SURFACE WATER

50' 0' 50' 100' 150'
GRAPHIC SCALE

PROJECT REFERENCE NO.	SHEET NO.
R-2413B	10
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

Permit Drawing
Sheet 11 of 31

NAD 83/NSRS 2007

SITE 6

SITE 7

MATCH TO SHEET 9 — STA. 464+00

MATCH TO SHEET 11 — STA. 491+00

HENSON FOREST HOMEOWNERS ASSOCIATION, INC.

KEVIN J. MILLS

ROBERT E. ATKINSON AND MARIAN E. ATKINSON

J. VAN FRIDDLE AND SARAH D. FRIDDLE

HENSON VILLAGE, LLC

PAUL G. MILAM AND VIRGINIA MILAM

MOODY GWENDOLYN DONALD L. HENSON

STELLA COOK SMITH

MARY F. PARRISH

JAMES LEO FORREST AND SHIRLEY S. FORREST

JAMES LEO PARRISH AND SHIRLEY S. PARRISH

FRANCES B. ANGEL

FRANCES B. AMOEL

JEFFREY W. REEH

SEE DETAIL 'AB' STAND. BASE DITCH EST. 93 TONS CL 'I' RIP RAP

SEE DETAIL 'AC' STANDARD BASE DITCH EST. 61 TONS CL 'I' RIP RAP

SEE DETAIL 'AC' LATERAL BASE DITCH 45 TONS CL 1 RIP RAP 74 SY FF DOE=14 CY

SEE DETAIL 'T' LATERAL V DITCH DOE=47 CY

SEE DETAIL 'AA' STAND. BASE DITCH

SEE DETAIL 'AC' SPECIAL LATERAL DITCH

SEE DETAIL 'AC' SPECIAL V DITCH

SEE DETAIL 'G' TOE PROTECTION 59 TONS CL 'B' RIP RAP 87 SY FF

SEE DETAIL 'O' TOE PROTECTION 70 TONS CL 'B' RIP RAP 210 SY FF

SEE DETAIL 'AG' STAND. BASE DITCH 41 TONS CLASS I RIP RAP ON GEOTEX DOE=40 CY

SEE DETAIL 'AG' LAT. BASE DITCH 103 TONS CLASS I RIP RAP 268 SY FF DOE=250 CY

SEE DETAIL 'O' TOE PROTECTION 109 TONS CL 'B' RIP RAP 79 SY FF

EST. 2 TONS CL B RIP RAP EST. 7 SY FILT. FAB

EST. 6 TONS CLASS I RIP RAP EST. 14 SY FILT. FAB

DENOTES IMPACTS IN SURFACE WATER

DENOTES TEMPORARY IMPACTS IN SURFACE WATER

50' 0' 50' 100' 150'
GRAPHIC SCALE

PROJECT REFERENCE NO.	SHEET NO.
R-2413B	10
NW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

Permit Drawing
Sheet 12 of 31

NAD 83/NSRS 2007

SITE 6

SITE 7

MATCH TO SHEET 9 -L- STA. 464+00

MATCH TO SHEET 11 -L- STA. 491+00

HENSON FOREST HOMEOWNERS ASSOCIATION, INC.

HENSON VILLAGE, LLC

MOOT (FORMERLY DONALD L. HENSON)

ROBERT E. ATKINSON AND LAURA C. ATKINSON

A. VAN FROELE AND SARAH D. FROELE

STEELA COOK SMITH

LARRY F. PARRISH

JAMES LEO FORREST AND SHIRLEY S. FORREST

JAMES LEO BARRIER AND SHIRLEY S. PARRISH

FRANCES B. ANGEL

JEFFREY W. REDD

PAUL G. MILAM AND VIRGINIA MILAM

DENOTES IMPACTS IN SURFACE WATER

DENOTES TEMPORARY IMPACTS IN SURFACE WATER

50' 0' 50' 100' 150'
GRAPHIC SCALE

RECEIVED
JUL 25 2013
RALEIGH REGULATORY
FIELD OFFICE

RECEIVED
JUL 25 2013
RALEIGH REGULATORY
FIELD OFFICE

2013-00557
Permit Drawing
Sheet 13 of 31
Revised 7/1/13

NAD 83/NSRS 2007

PROJECT REFERENCE NO.	SHEET NO.
R-2413B	12
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

REVISIONS
8/17/99

SITE 8

STREAM RELOCATION
SEE MITIGATION PLAN
SHEET OSM 11

SITE 8g

SITE 8a

505 510

MAX D. BALLINGER, TRUSTEE (11Z)

SMAAN 220, LLC (15)

-L- +84.11 178.67'LT (EXIST C/A)

-L- +76.80 178.68'LT (EXIST C/A)

-L- +80.00 270.00'LT

-L- +80.00 178.68'LT (EXIST C/A)

SCRUB

SEE DETAIL 'AI'
LAT. BASE DITCH
280 TONS CL. B RIP RAP
750 SY FF
DDE=1739 CY

SEE DETAIL 'AH'
SPECIAL BASE DITCH
59 TONS CLASS B RIP RAP
165 SY FF

SEE DETAIL 'R'
SPECIAL V DITCH

CL B RIP RAP

BEGIN SBG
-L- STA. 510+75

CAT-1

MATCH TO SHEET 11 -L- STA. 504+00

MATCH TO SHEET 13 -L- STA. 517+00

END SBG
-L- STA. 516+50

GRAU 350 2GI

BEGIN SBG
-L- STA. 505+25

SEE DETAIL 'G'
TOE PROTECTION
77 TONS CL 'B' RIP RAP
231 SY FF

-L- +30 175.00'RT

4OTCB W/MAN HOLE

PROPOSED 1@10'X8' RCBC W/ALTERNATE LOW FLOW SILLS

NCDOT
(FORMERLY MAX D. BALLINGER, TRUSTEE
PURCHASED AS PARCEL 11 UNDER R-2413C)

MAX D. BALLINGER, TRUSTEE (11Z)

SEE DETAIL 'AI'
STANDARD BASE DITCH

STREAM RESTORATION
SEE MITIGATION PLAN

SEE DETAIL 'AL'
LAT. BASE DITCH
380 TONS CL B RIP RAP
1013 SY FF
DDE=889 CY

-L- +25.00 175.00'RT

-L- +00.00 195.00'RT

BATTIN ENTERPRISES LLC, (18)

BATTIN REAL ESTATE LLC, (19)

-L- +93.28 175.40'RT (EXIST R/W)

UTILITY EASEMENT PETS FROM

BATTIN, ROBERT D AND JOAN M (17)

UT TO HAW RIVER

FLOODPLAIN GRADING
SEE MITIGATION PLAN

TEMPORARY WETLAND EXCAVATION

REMOVE

SITE 8c

SITE 8f

STREAM RESTORATION
SEE MITIGATION PLAN
SHEET OSM 10

SITE 8b

TE TE DENOTES TEMPORARY EXCAVATION IN WETLAND

S S DENOTES IMPACTS IN SURFACE WATER

50' 0' 50' 100' 150'
GRAPHIC SCALE

$$$$$$$$SYSTIME$$$$$$
$$$$$$$$LOGIN$$$$$$$$

PROJECT REFERENCE NO.	SHEET NO.
R-2413B	12
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

Permit Drawing
Sheet 14 of 31
Revised 7/1/13

NAD 83/NSRS 2007

8/17/99

REVISIONS

SITE 8

SITE 8a

SITE 8g

STREAM RELOCATION
SEE MITIGATION PLAN
SHEET OSM 11

-L- STA. 504+00

-L- STA. 517+00

MATCH TO SHEET 11

MATCH TO SHEET 13

SIMAAN 220, LLC

MAX D. BALLINGER, TRUSTEE

NCDOT
(FORMERLY MAX D. BALLINGER, TRUSTEE
PURCHASED AS PARCEL II UNDER R-2413C)

BATTIN REAL ESTATE LLC.

BATTIN ENTERPRISES LLC.

BATTIN, ROBERT D AND JOAN M

SEE DETAIL 'AH'
SPECIAL BASE DITCH
59 TONS CLASS B RIP RAP
165 SY FF

SEE DETAIL 'R'
SPECIAL V DITCH

SEE DETAIL 'AJ'
LAT. BASE DITCH
260 TONS CL. B RIP RAP
730 SY FF
DDE=1739 CY

SEE DETAIL 'G'
TOE PROTECTION
77 TONS CL 'B' RIP RAP
231 SY FF

SEE DETAIL 'AI'
STANDARD BASE DITCH

SEE DETAIL 'AL'
LAT. BASE DITCH
380 TONS CL B RIP RAP
1013 SY FF
DDE=889 CY

CL B RIP RAP

BEGIN SBG
-L- STA. 505+25

BEGIN SBG
-L- STA. 510+75

END SBG
-L- STA. 516+50

PROPOSED 10@10'X8' RCBC
W/ALTERNATE LOW FLOW SILLS

4OTCB
WYMAN HOLE

FLOODPLAIN GRADING
SEE MITIGATION PLAN

TEMPORARY
WETLAND
EXCAVATION

REMOVE

STREAM RESTORATION
SEE MITIGATION PLAN

UT TO HAW RIVER

SITE 8c

SITE 8f
STREAM RESTORATION
SEE MITIGATION PLAN
SHEET OSM 10

SITE 8b

TE TE DENOTES TEMPORARY EXCAVATION IN WETLAND

S S DENOTES IMPACTS IN SURFACE WATER

50' 0' 50' 100' 150'
GRAPHIC SCALE

8/17/99

PROJECT REFERENCE NO.	SHEET NO.
R-2413B	13
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

Permit Drawing
Sheet 15 of 31
Revised
7/11/13

NAD 83/NSRS 2007

STREAM RELOCATION
SEE MITIGATION PLAN
SHEET OSM 11

NOTE: STREAM MITIGATION
SEE OSM SHEET 11

SEE DETAIL 'AM'
CHANNEL RELOCATION

SITE 8e

SITE 8d

SEE DETAIL 'G'
TOE PROTECTION
35 TONS CL B RIP RAP
105 SY FF

END SBG
-L- STA. 520+00

GRAU 350

-L-

520

-L- +00.00
270.00 LT

-L- +00.00
175.64' LT
(EXIST C/A)

TIE FENCE TO R-2413C

EXISTING R/W

-L- +22.80
175.64' LT
(EXIST C/A)

-L- POT Sta. 521+22.80
END CONSTRUCTION

(12)
MAX D. BALLINGER, TRUSTEE
DB 3561 PG 1460

END TIP PROJECT R-2413B -L- Sta. 520+00.81

BEGIN TIP PROJECT R-2413C -L REV- Sta. 18+30.000
TIE MEDIAN GUIDERAIL TO TIP PROJECT R-2413C

(11)
NCDOT
(FORMERLY MAX D. BALLINGER, TRUSTEE
PURCHASED AS PARCEL 11 UNDER R-2413C)

-L- +47.35
175.41' RT
(EXIST C/A)

(11Z)
BALLINGER TRUSTEE, MAX D.
DB 3561 PG 1460

CONC

50' 0' 50' 100' 150'
GRAPHIC SCALE

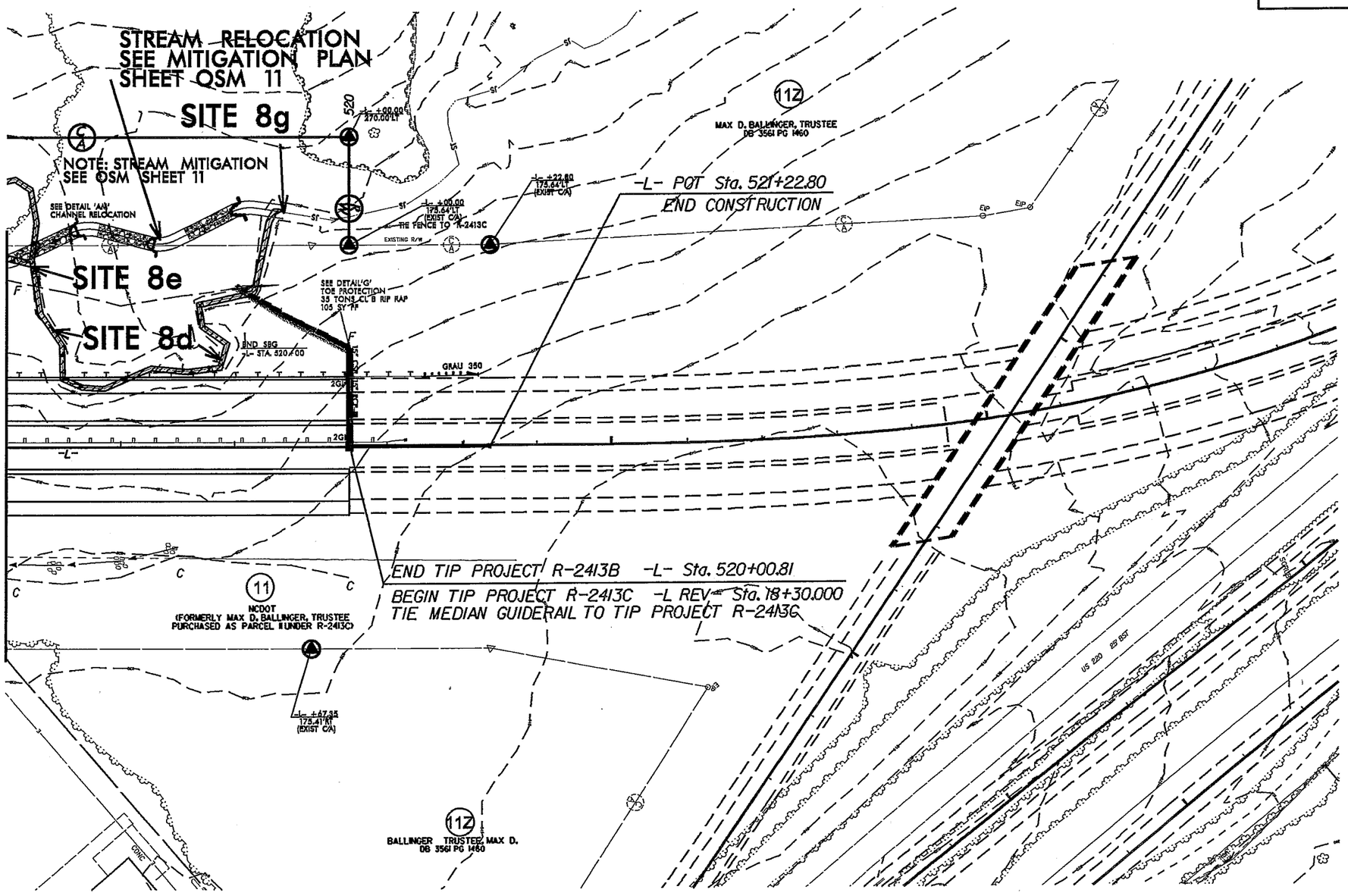
$$$$SYSTIME$$$$

8/17/99

Permit Drawing
Sheet 16 of 31
Revised 7/11/13
NAD 83/NSRS 2007

PROJECT REFERENCE NO.	SHEET NO.
R-2413B	13
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

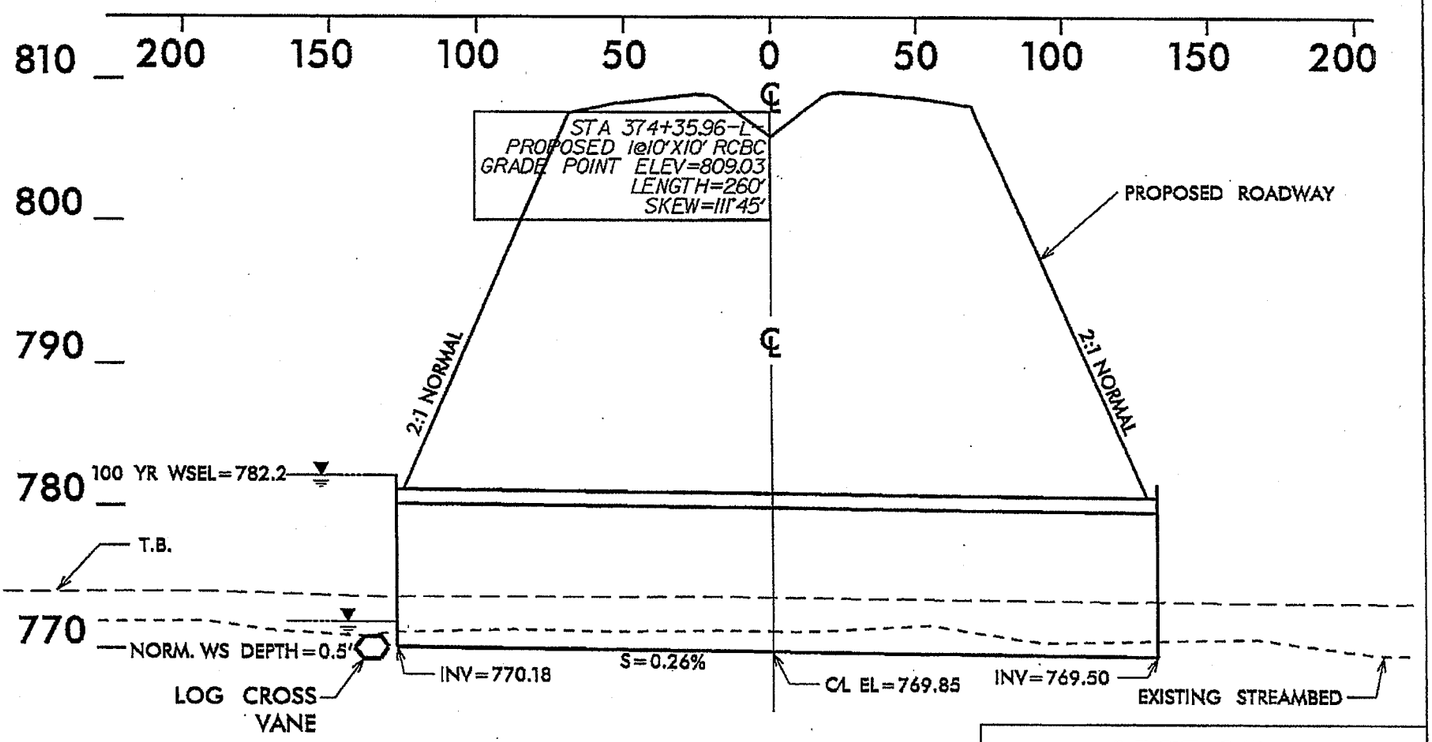
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION



S S DENOTES IMPACTS IN SURFACE WATER

50' 0' 50' 100' 150'
GRAPHIC SCALE

$$$$$$$$SYSTIME$$$$$$
$$$$$$$$



PROFILE

SITE 1

(MAIN CHANNEL)

SCALE

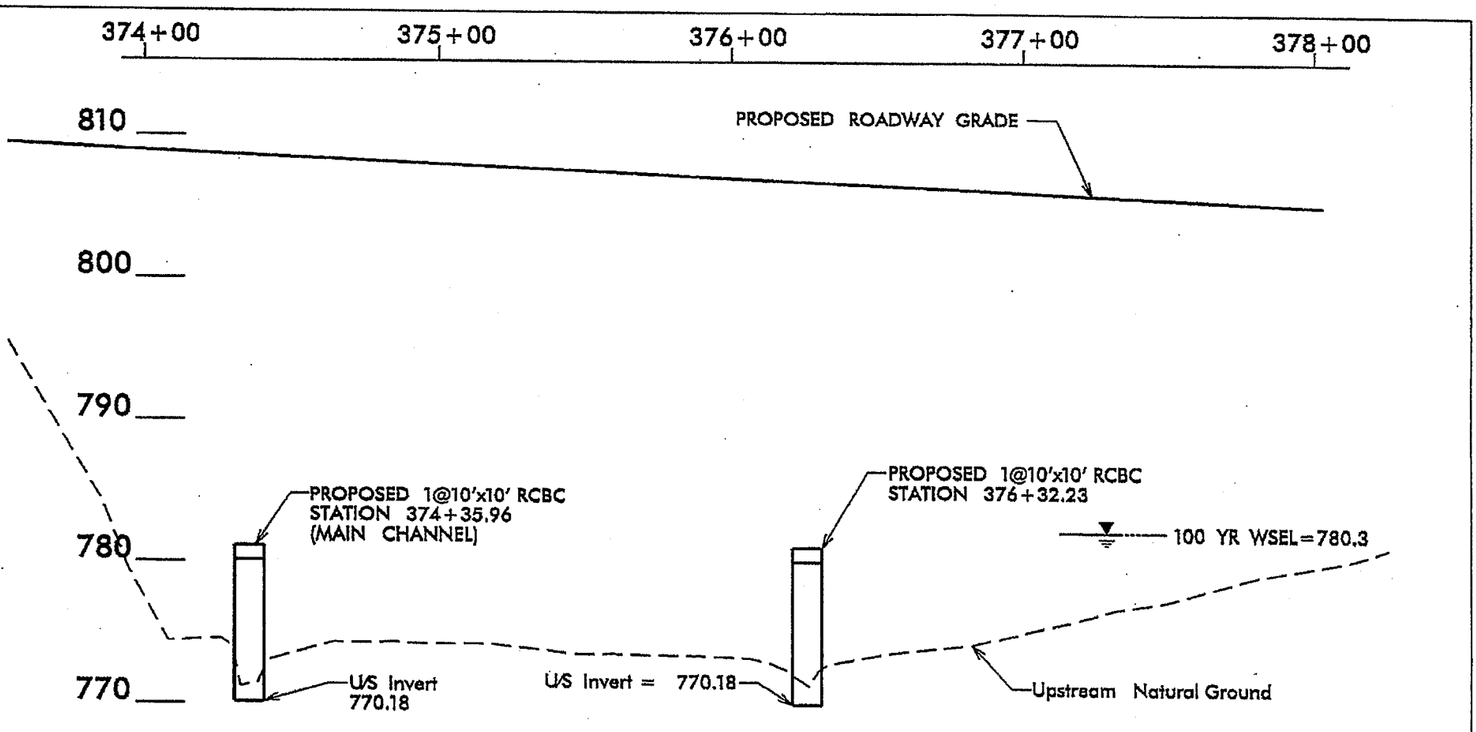
1:50' HORIZONTAL

1:10' VERTICAL

RECEIVED
MAY 16 2013
RALEIGH REGULATORY
FIELD OFFICE

NCDOT
DIVISION OF HIGHWAYS
GUILFORD COUNTY
PROJECT: 34429.1.1 (R2413B)
NC 68 BETWEEN
SR 2127 (BROOKBANK ROAD)
AND NC 150

SHEET 17 OF 31 04/01/13



SECTION

SITE 1

SCALE

1:50' HORIZONTAL

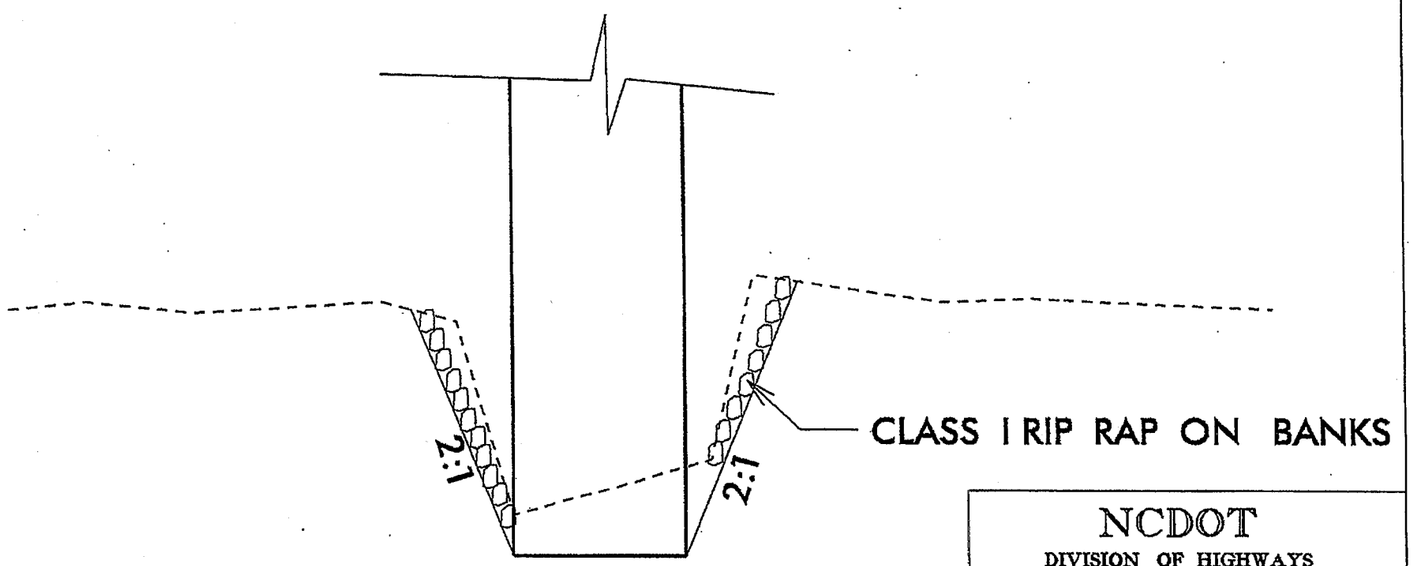
1:10' VERTICAL

NCDOT
DIVISION OF HIGHWAYS
GUILFORD COUNTY
PROJECT: 34429.1.1 (R2413B)
NC 68 BETWEEN
SR 2127 (BROOKBANK ROAD)
AND NC 150

SHEET 18 OF 31 04/01/13

DETAIL OF RIP RAP ON BANKS AT D/S FACE OF 1@10'X10' RCBC

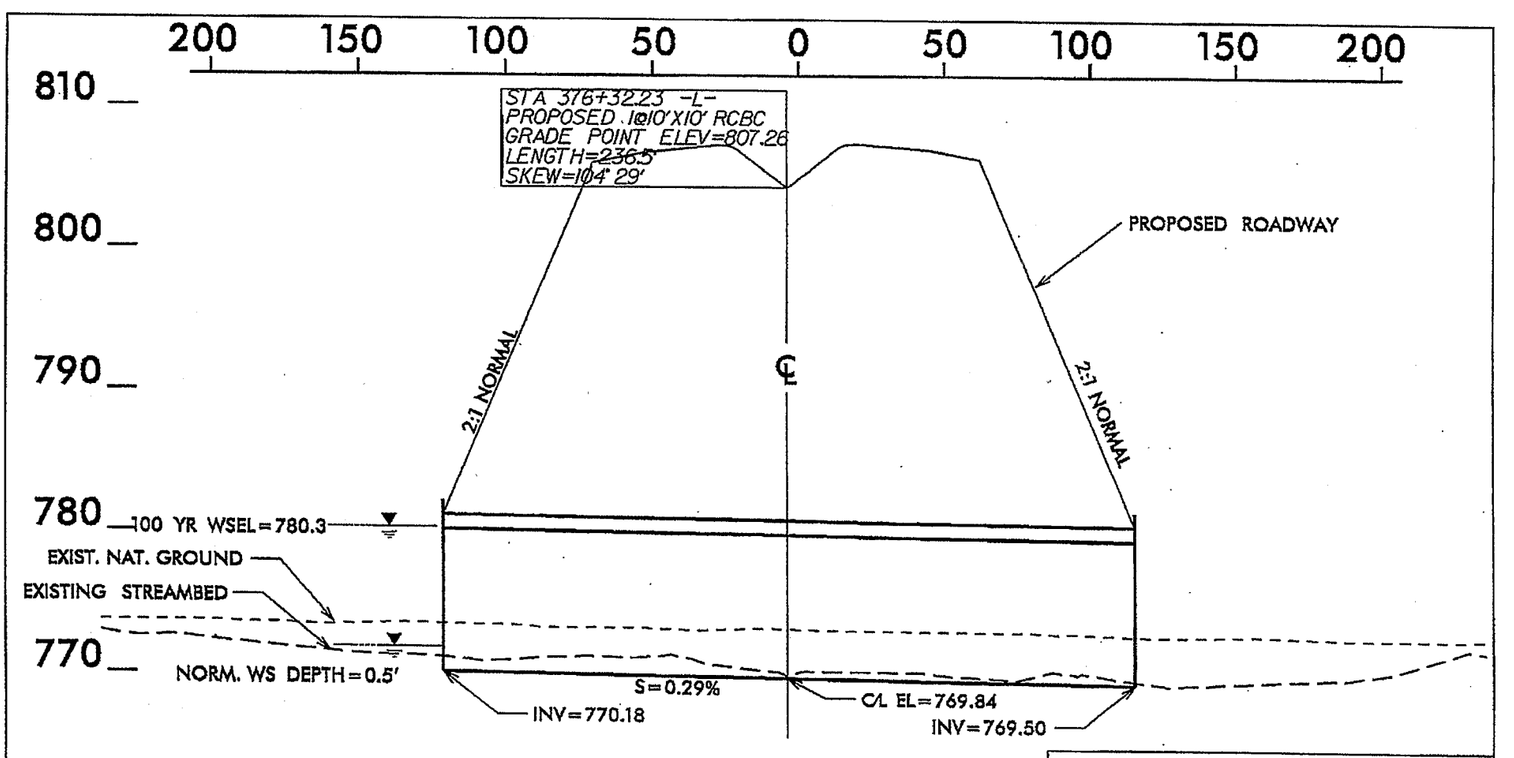
(N.T.S.)



SITE 1

NCDOT
DIVISION OF HIGHWAYS
GUILFORD COUNTY
PROJECT: 34429.1.1 (R2413B)
NC 68 BETWEEN
SR 2127 (BROOKBANK ROAD)
AND NC 150

SHEET 19 OF 31 04/01/13



PROFILE
SITE 1

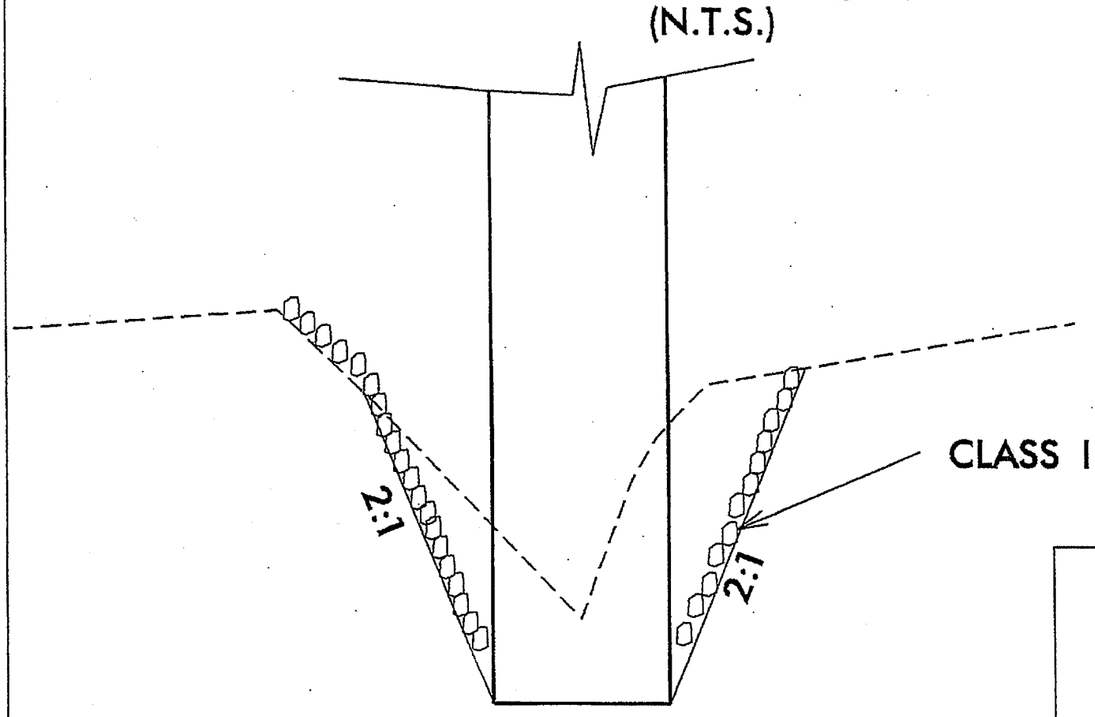
SCALE
1:50' HORIZONTAL
1:10' VERTICAL

NCDOT
DIVISION OF HIGHWAYS
GUILFORD COUNTY
PROJECT: 34429.1.1 (R2413B)
NC 68 BETWEEN
SR 2127 (BROOKBANK ROAD)
AND NC 150

SHEET 20 OF 31 04/01/13

DETAIL OF RIP RAP ON BANKS AT D/S FACE OF 1@10'X10' RCBC

(N.T.S.)



SITE 1

NCDOT
DIVISION OF HIGHWAYS
GUILFORD COUNTY
PROJECT: 34429.1.1 (R2413B)
NC 68 BETWEEN
SR 2127 (BROOKBANK ROAD)
AND NC 150

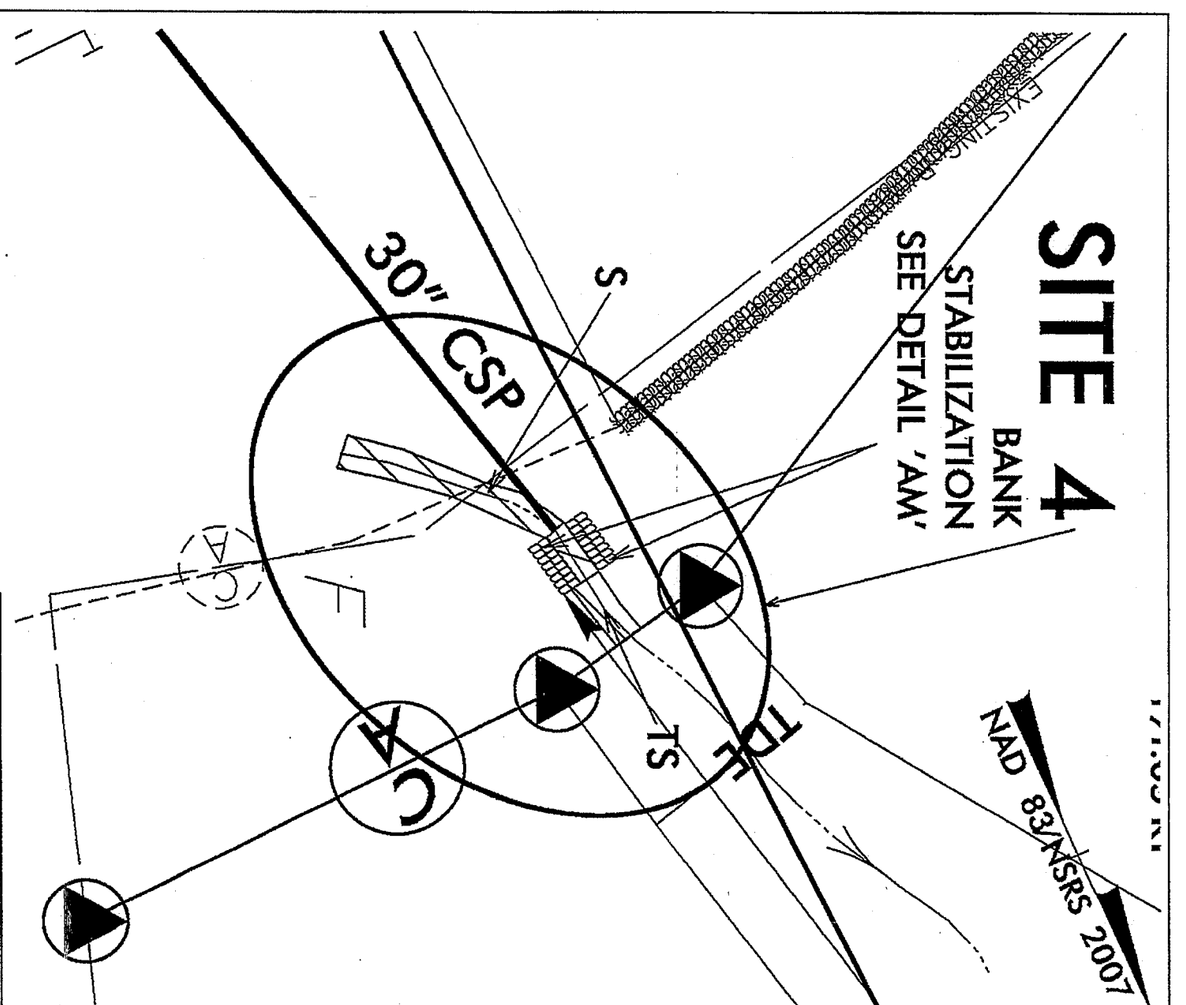
SHEET 21 OF 31 04/01/13

IMPACT ENLARGEMENT

S/S DENOTES IMPACTS IN SURFACE WATER

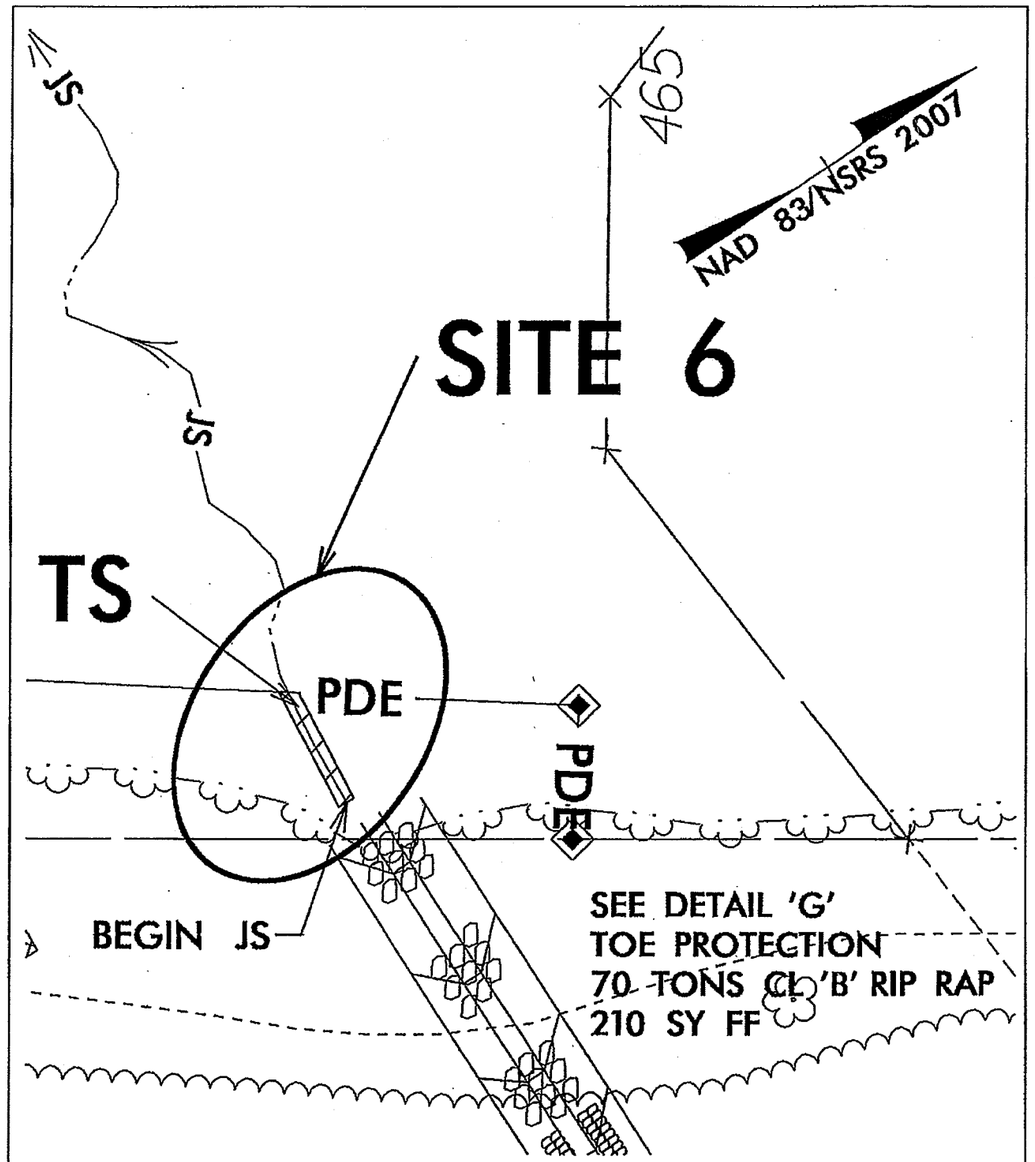
TS DENOTES TEMPORARY IMPACTS IN SURFACE WATER

25' 0' 25'
GRAPHIC SCALE



NCDOT
DIVISION OF HIGHWAYS
GUILFORD COUNTRY
PROJECT: 34429.1.1 (R-2413B)
NC 68 BETWEEN
SR 2127 (BROOKBANK ROAD)
AND NC 150

SHEET 22 OF 31 04/01/13



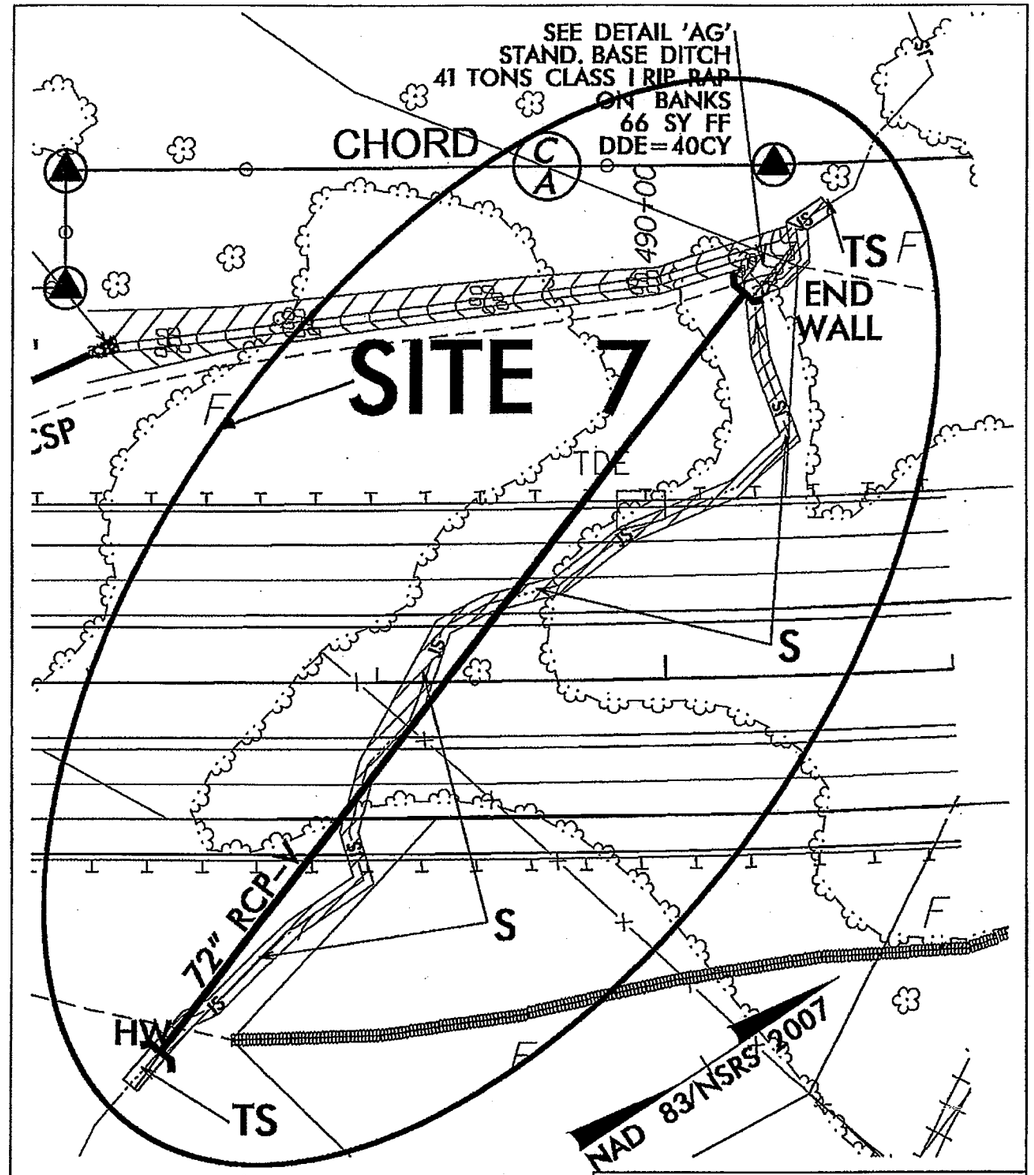
IMPACT ENLARGEMENT

TS DENOTES TEMPORARY IMPACTS IN SURFACE WATER

25' 0' 25'
GRAPHIC SCALE

NCDOT
DIVISION OF HIGHWAYS
GUILFORD COUNTRY
PROJECT: 34429.1.1 (R-2413B)
NC 68 BETWEEN
SR 2127 (BROOKBANK ROAD)
AND NC 150

SHEET 23 OF 31 04/01/13



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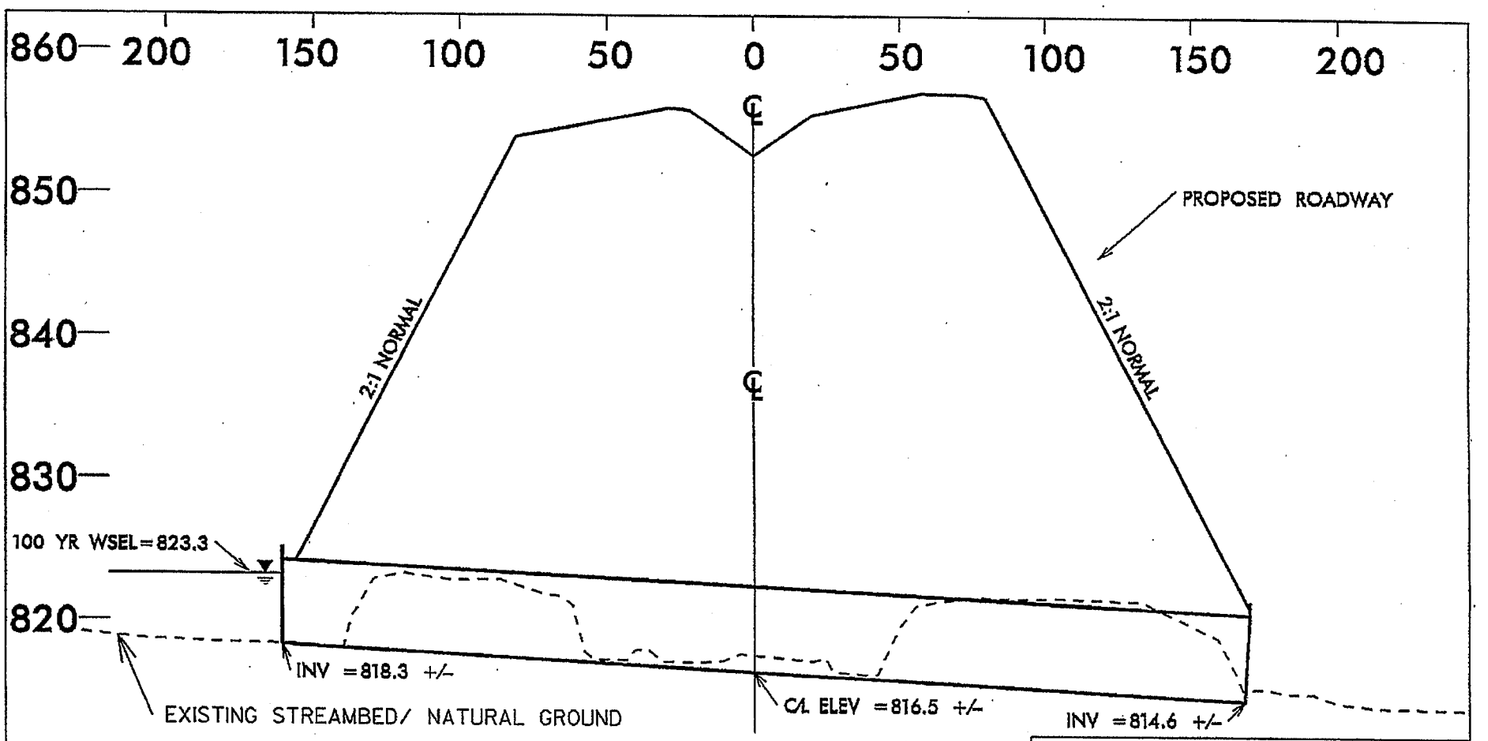
S/S DENOTES IMPACTS IN SURFACE WATER

TS DENOTES TEMPORARY IMPACTS IN SURFACE WATER

50' 0' 50'
GRAPHIC SCALE

NCDOT
DIVISION OF HIGHWAYS
GUILFORD COUNTRY
PROJECT: 34429.1.1 (R-2413B)
NC 68 BETWEEN
SR 2127 (BROOKBANK ROAD)
AND NC 150

SHEET 24 OF 31 04/01/13



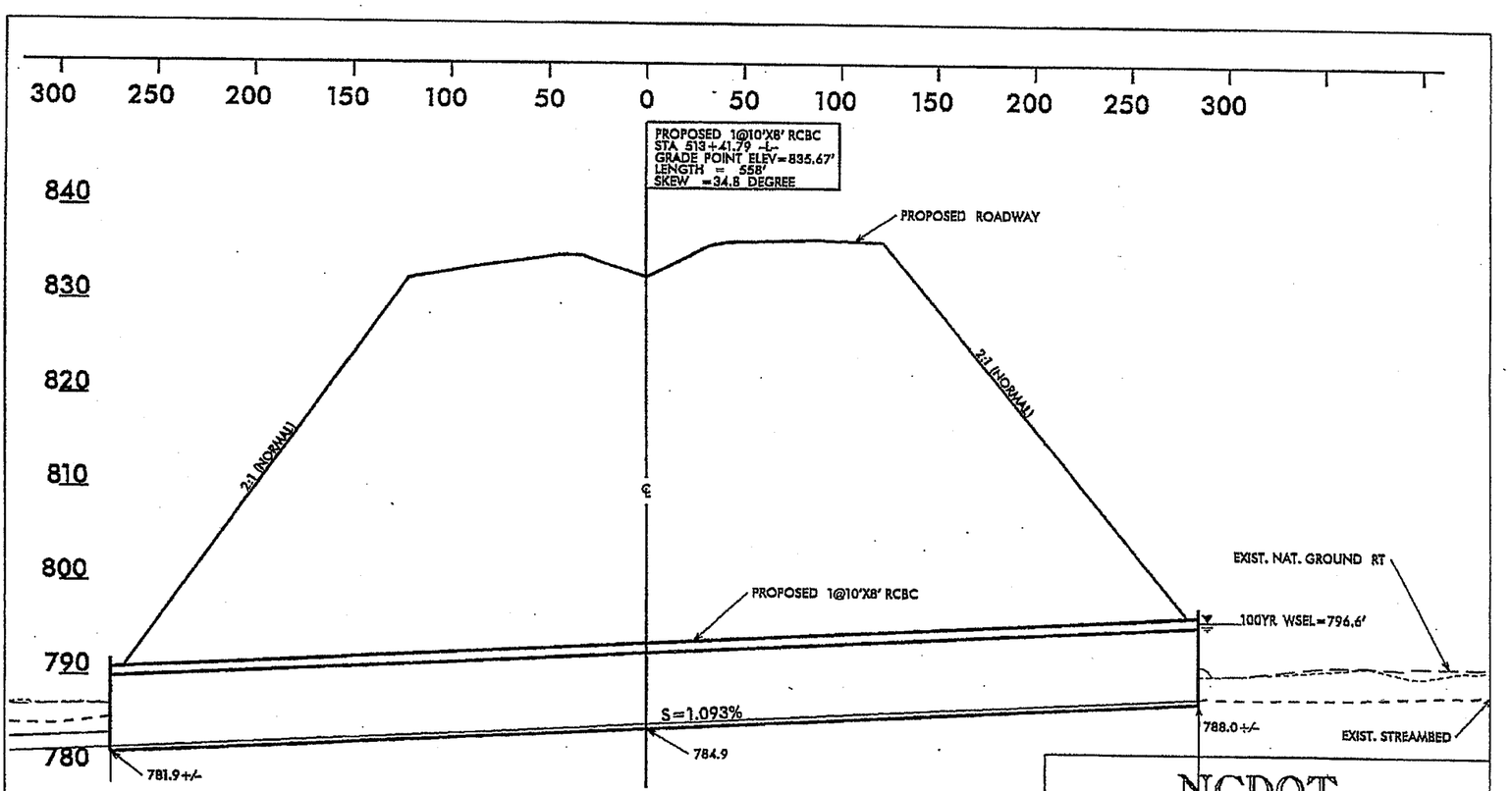
PROFILE

SITE 7

SCALE
1:50' HORIZONTAL
1:10' VERTICAL

NCDOT
DIVISION OF HIGHWAYS
CABARRUS COUNTY
PROJECT: 34429.1.1 (R-2413B)
NC 68 BETWEEN
SR 2127 (BROOKBANK ROAD)
AND NC 150

SHEET 25 OF 31 04/01/13



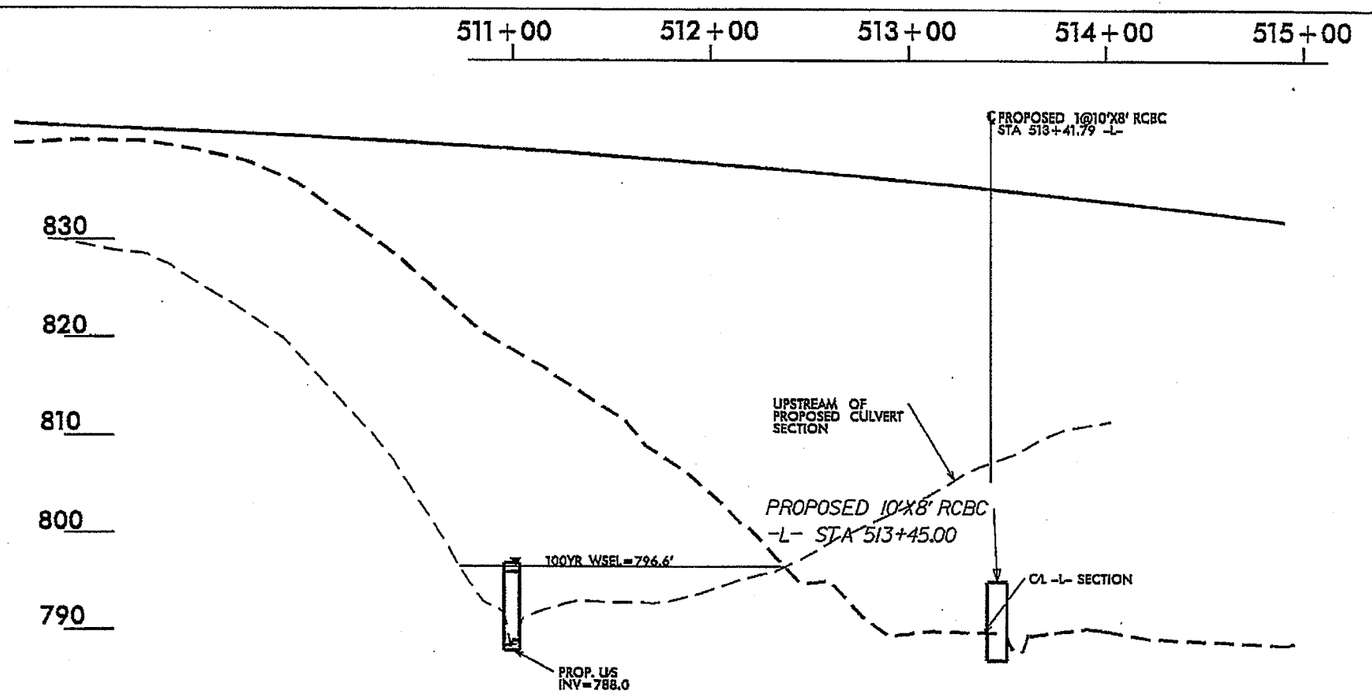
PROFILE

(N.T.S.)

SITE 8

NCDOT
DIVISION OF HIGHWAYS
GUILFORD COUNTY
PROJECT: 34429.1.1 (R2413B)
NC 68 BETWEEN
SR 2127 (BROOKBANK ROAD)
AND NC 150

SHEET 26 OF 31 04/01/13

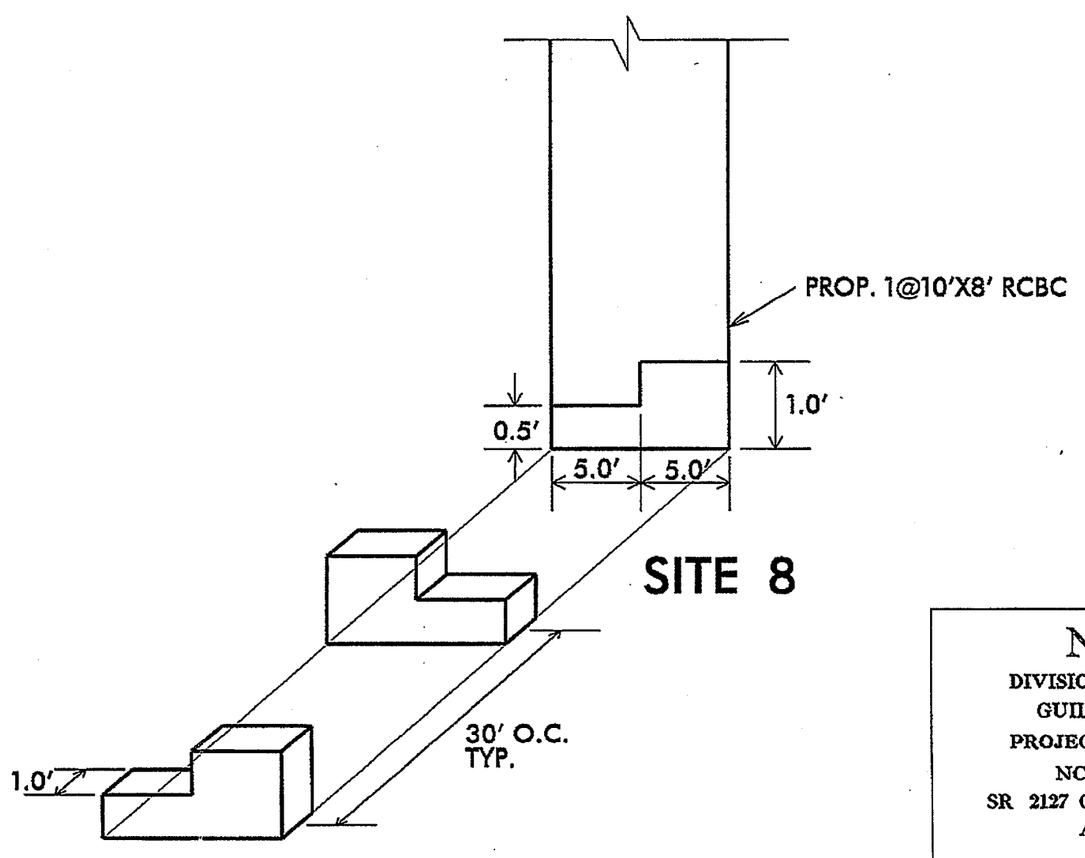


SECTION
(N.T.S)
SITE 8

NCDOT
DIVISION OF HIGHWAYS
GUILFORD COUNTY
PROJECT: 34429.1.1 (R2413B)
NC 68 BETWEEN
SR 2127 (BROOKBANK ROAD)
AND NC 150

SHEET 27 OF 31 04/01/13

DETAIL OF ALTERNATING SILLS
(N.T.S.)

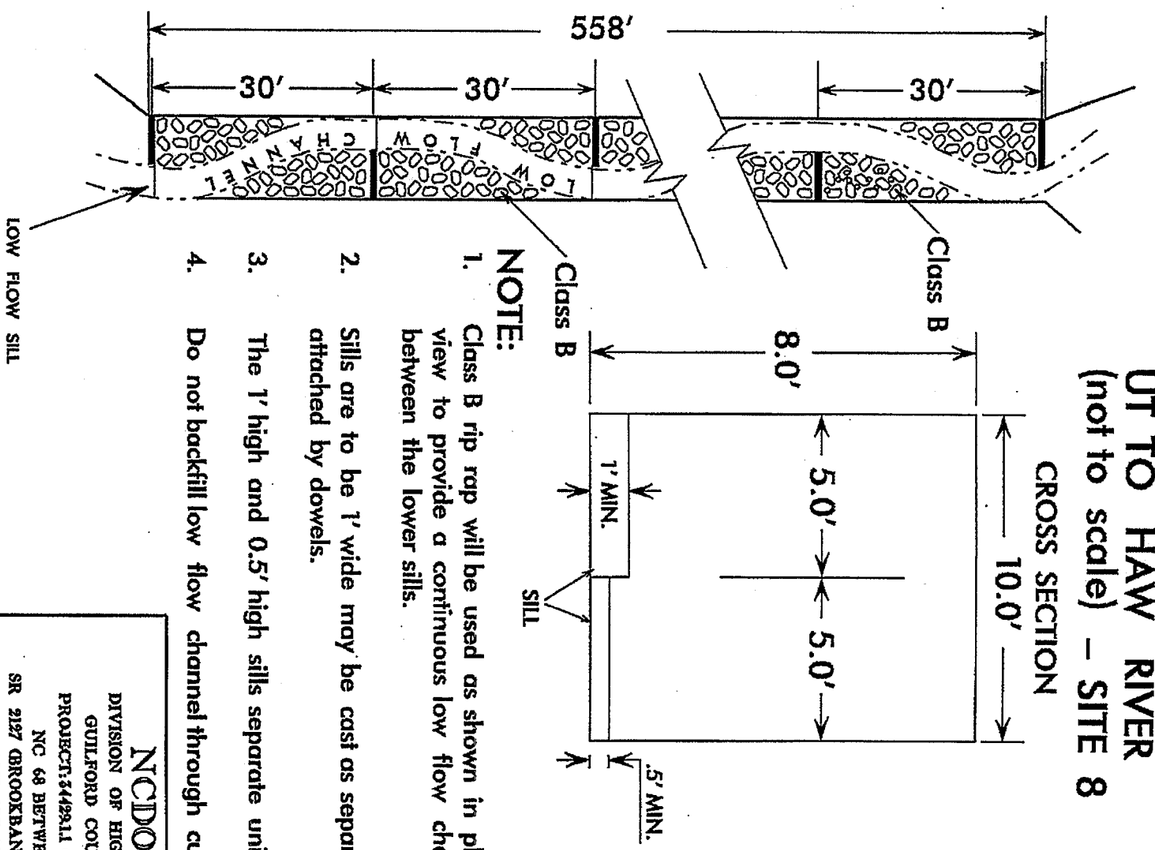


SITE 8

NCDOT
DIVISION OF HIGHWAYS
GUILFORD COUNTY
PROJECT: 34429.1.1 (R2413B)
NC 68 BETWEEN
SR 2127 (BROOKBANK ROAD)
AND NC 150

SHEET 28 OF 31 04/01/13

DETAIL OF LOW FLOW CHANNEL AND SILLS
-L- STA 513+41.79
PROPOSED 1 @ 10'X8' RCBC
UT TO HAW RIVER
(not to scale) – SITE 8



CROSS SECTION

NOTE:

1. Class B rip rap will be used as shown in plan view to provide a continuous low flow channel between the lower sills.
2. Sills are to be 1' wide may be cast as separately and attached by dowels.
3. The 1' high and 0.5' high sills separate units.
4. Do not backfill low flow channel through culvert.

NCDOT
DIVISION OF HIGHWAYS
GUILFORD COUNTY
PROJECT: 34429.1.1 (R2413B)
NC 68 BETWEEN
SR 2157 (BROOKBANK ROAD)
AND NC 150

SHEET 29 OF 31 04/01/13

WETLAND PERMIT IMPACT SUMMARY

			WETLAND IMPACTS					SURFACE WATER IMPACTS				
Site No.	Station (From/To)	Structure Size / Type	Permanent Fill In Wetlands (ac)	Temp. Fill In Wetlands (ac)	Temp. Excavation in Wetlands (ac)	Mechanized Clearing in Wetlands (ac)	Hand Clearing in Wetlands (ac)	Permanent SW impacts (ac)	Temp. SW impacts (ac)	Existing Channel Impacts Permanent (ft)	Existing Channel Impacts Temp. (ft)	Natural Stream Design (ft)
1	374+00 -L-	10' x10' RCBC						0.07	0.01	260	45	
	374+00 -L- Rt.	Bank Stabilization								24		
	376+00 -L-	10' x10' RCBC/ Roadway Fill	1.87			0.23						
2	410+50 -L-	42" RCP						0.02	<0.01	235	15	
		Bank Stabilization								11		
3	419+00 -L-	54" RCP						0.10	<0.01	726	30	
4	22+70 -Y6-	30" CSP						0.01	<0.01	39	15	
		Bank Stabilization								11		
5	452+50 -L-	60" RCP Roadway Fill						0.10	<0.01	554	24	
		Bank Stabilization								11		
5A		Roadway Fill						0.02	<0.01	146	17	
6	464+40 -L-	36" RCP							<0.01		21	
7	489+15 -L-	72" RCP						0.06	<0.01	411	30	
SUBTOTALS:			1.87			0.23		0.38	0.03	2428	197	

NOTES: Site 7 includes 30' of stream relocation.

NC DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS

GUILFORD COUNTY
WBS - 34429.1.1 (R-2413B)

SHEET 30 OF 31 5/2/2013

WETLAND PERMIT IMPACT SUMMARY

Site No.	Station (From/To)	Structure Size / Type	WETLAND IMPACTS: Permanent Fill In Wetlands (ac)	Temp. Fill In Wetlands (ac)	Temp. Excavation in Wetlands (ac)	Mechanized Clearing in Wetlands (ac)	Hand Clearing in Wetlands (ac)	SURFACE WATER IMPACTS: Permanent SW impacts (ac)	Temp. SW impacts (ac)	Existing Channel Impacts Permanent (ft)	Existing Channel Impacts Temp. (ft)	Natural Stream Design (ft)
8	513+00 -L-	10' X 8' RCBC						0.06		645		
8a		Roadway Fill	0.02									
8b		Roadway Fill	0.03									
8c		Flood Plain Exc.			0.01							
8f	508+20 to 511+00 -L- Rt.	Stream Restoration										373
8d	517+25 to 519+11 -L- Lt.	Roadway Fill						0.03		464		
8g	515+75 to 519+43 -L- Lt.	Stream Relocation								253		392
8e	516+94 to 517+23 -L- Rt.	Roadway Fill						<0.01		29		
SUBTOTALS:			0.05		0.01			0.09		1391		765
TOTALS:			1.92		0.01	0.23		0.47	0.03	3819	197	765

NOTES:

NC DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS

GUILFORD COUNTY
WBS - 34429.1.1 (R-2413B)

7/1/2013

Revised 7/1/13

On-Site Stream Mitigation Plan

R-2413 A&B NC 68 Connector from SR 2011 to the Haw River

Guilford County, North Carolina

T.I.P. Number R-2413 A&B

WBS No's: 34429.1.1, 34429.2.2, 34429.2.3

JUNE 25, 2013

The North Carolina Department of Transportation (NCDOT) plans to use on-site stream mitigation to offset unavoidable impacts to existing streams from the construction of the proposed NC 68 Connector corridor (R-2413A&B) in Guilford County. Five potential stream mitigation sites associated with the R-2413 A&B project were assessed in December 2010. This mitigation project will provide approximately 2,945 linear feet of stream mitigation credits in the Cape Fear River Basin. The sites are located along the proposed R-2413 A corridor in Guilford County between SR 2011 (Edgefield Road) and SR 2127(Brookbank Road) and along the proposed R-2413 B corridor in Guilford County between SR 2127 (Brookbank Road) and the Haw River.

Field reviews confirmed that all five stream reaches are perennial. The combined existing length of the stream reaches is approximately 3,080 linear feet. The combined proposed length of the stream reaches is approximately 3,155 linear feet. A summary of the stream locations, mitigation approaches, and lengths are provided in Table 1. More detailed descriptions of the existing and proposed conditions of each site are presented in the following sections.

TABLE 1. STREAM INFORMATION

Mitigation Site	JD Stream No.	Roadway Plan Sheet	Roadway Station	Existing Length (ft.)	Mitigation Type	Proposed Length (ft.)
Site 1	S37a/ 38	17 (R-2413A)	269+00 to 271+50	1,300	Enhancement	350
					Restoration	813
Site 2	S35/ 36	18 (R-2413A)	274+50 to 282+50	1,000	Relocation/ Restoration	906
					Enhancement	71
Site 3	Mitigation Site 3 has been removed.					
Site 4	S22a/ 22b	34 (R-2413A)	-Y5-Sta. 30+50 to -Y5 Sta. 32+10	170	Restoration	250
Site 5	S3a	12 (R-2413B)	508+30 to 511+20	610	Restoration/ Relocation	765
		13 (R-2413B)	517+10 to 519+30			

1.0 BASELINE

The R-2413 A&B mitigation sites are located in Guilford County between State Route 2011 (Edgefield Road) and State Route 2127 (Brookbank Road) and between State Route 2127 (Brookbank Road) and the Haw River. See Figures 1 and 2A – 2D at the end of this report. The eight digit USGS Hydrologic Unit Code (HUC) for all five sites is 03030002 (Cape Fear Basin). Sites 1 through 4 lie within the 11 digit USGS HUC 03030002010, and the North Carolina Division of Water Quality (NCDWQ) sub-basin number for these four sites is 03-06-02. Site 5 lies within the 11 digit USGS HUC 03030002020 and the NCDWQ sub-basin number is 03-06-01. All sites are designated by the North Carolina Division of Water Quality (NCDWQ) as Nutrient Sensitive Waters. All stream Sites, 1 through 5, were classified as perennial in NCDOT's 2009 State EA/FONSI Reevaluation. Table 2 provides NCDWQ Stream Classifications of the proposed mitigation reaches.

TABLE 2. SITE LOCATION INFORMATION

Mitigation Site	Roadway Station	Stream Name	Stream Classification	Stream Index Number
Site 1 WM 041-034	269+00 to 271+50	UT to Reedy Creek	WS-III; NSW	16-11-(1)
Site 2 WM 041-035	274+50 to 282+50	UT to Reedy Creek	WS-III; NSW	16-11-(1)
Site 3 WM 041-036	Mitigation Site 3 has been removed.			
Site 4 WM 041-037	-Y5-Sta. 30+50 to -Y5 Sta. 32+10	UT to Reedy Creek	WS-III; NSW	16-11-(1)
Site 5 WM 041-038	508+30 to 511+20			
	517+10 to 519+30	UT to Haw River	WS-V; NSW	16-(1)

WS-III = Water Supply III - Moderately Developed; WS-V = Water Supply V - Upstream; NSW Nutrient Sensitive Waters

2.0 SITE SELECTION

A discussion of the watershed information and existing conditions for each project stream site is provided in the sections that follow. Existing condition geomorphology parameters and measurements are provided in Appendix B.

GENERAL WATERSHED INFORMATION

The watersheds for the project reaches are primarily rural, ranging from low density residential to agricultural land uses. The watersheds are estimated to range from 5 to 50 percent low density residential and commercial development with the remainder agriculture and forest. Future zoning for most of the watersheds is primarily low to moderate density residential so changes in land use are expected over the next 10 years. Watershed drainage areas are summarized in Table 3 for the project sites.

TABLE 3. DRAINAGE AREAS FOR PROJECT REACHES

Mitigation Site	Stream Name	Drainage Area (square miles)
Site 1	UT to Reedy Creek	0.13
Site 2	UT to Reedy Creek	0.09
Site 4	UT to Reedy Creek	3.04
Site 5	UT to Haw River	0.41

SITE 1 (WM 041-034)

An unnamed tributary (UT) to Reedy Fork flows approximately 2,700 feet from its headwaters to its confluence with Reedy Creek (Figure 2A). The stream is shown on the USGS topographic quadrangle as an intermittent stream. Observations during field investigations indicate that the upper portion of the stream is likely intermittent and the lower portion appears to be perennial. The UT flows through two distinct valley sections. The upper valley section has a relatively steep down valley slope with a tighter cross valley slope. The lower valley becomes less steep down valley and the cross valley slope becomes broader as the stream approaches its confluence with Reedy Creek. Much of the stream within the upper valley is entrenched and the stream within the lower valley is deeply incised. Both portions of the stream show signs of instability. A riparian buffer surrounds the stream with early successional woody vegetation adjacent to the stream banks. Based on a review of available aerial photography, the riparian areas appear to have been logged between 1999 and 2002. The channel materials are primarily sands with intermixed gravel-sized material. The upper and lower portions of the existing stream channel are classified as Rosgen G5 stream types. The watershed for this UT to Reedy Creek is approximately 0.13 square miles at its confluence with the larger stream at the downstream end of the site. The watershed is approximately 70% wooded and 30% agricultural or light residential. According to Guilford County Geographic Information System (GIS) data, future land use of the watershed is low residential (1 to 2 dwelling units/acre).

SITE 2 (WM 041-035)

This UT to Reedy Creek flows within Site 2 from its headwaters approximately 2,500 feet toward a confluence with the Site 1 UT to Reedy Creek (Figure 2B). This upper portion of the UT is not shown on the USGS topographic quadrangle as a blue line stream. Similar to Site 1, observations during field investigations indicate that the upper portion of the stream is likely intermittent and the lower portion appears to be perennial. The Site 2 UT to Reedy Creek has a relatively steep down valley slope within the upper reach with a tight cross valley slope. The lower reach valley becomes less steep and the cross valley slope becomes broader as the stream approaches its confluence with the Site 1 UT to Reedy Creek. The upper reach of this existing channel near the proposed area of impact is relatively stable and classifies as a Rosgen E5 channel. The lower portion of Site 2 varies from an E5 to G5 channel and has a severe headcut that is gradually moving up through the system. The UT is moderately sinuous. Sand materials with inclusions of gravel material dominate the upper channel and gravel materials dominate the lower channel. A riparian buffer surrounds the stream with early successional woody vegetation adjacent to the stream banks. As with Site 1, based on a review of available aerial photography, the riparian areas appear to have been logged between 1999 and 2002. Kudzu has invaded an adjacent hill side in the upper portion of the reach. The watershed for this UT to Reedy Creek is 0.09 square miles at the downstream end of the site. The watershed is approximately 70% forested and 30% agricultural or light residential. According to Guilford County GIS data, future land use of the watershed is low residential (1 to 2 dwelling units/acre).

SITE 3 (WM 041-036)

Mitigation Site 3 has been removed.

SITE 4 (WM 041-037)

A UT to Reedy Creek flows through Site 4 within a broad and gently sloping valley (Figure 2D). The UT is depicted as perennial on the USGS topographic quadrangle and observations during the field investigations confirmed that the reach is perennial. The channel within Site 4 appears to have frequent access to its floodplain and has an entrenchment ratio of 5.4. The UT has a low sinuosity within the project reach and classifies as a Rosgen E5 stream type. The channel flows through an existing culvert under Brookbank Road. The riparian area upstream of Brookbank Road consists of mature woody vegetation and the riparian area downstream of Brookbank Road appeared to be impacted by Kudzu during the site visit. The watershed is approximately 3.04 square miles at the downstream end of the site. The watershed is 40% forested and the remainder is residential or agricultural.

SITE 5 (WM 041-038)

Site 5 consists of a UT to Haw River (Figure 2E). The stream valley is relatively broad with a flat down valley slope. The lower portion of the UT is depicted as perennial on the USGS topographic quadrangle. An instream pond is depicted on the USGS topographic quadrangle between the lower and upper portions. Site investigations revealed that the pond is no longer

present because the stream has routed around the East side of the old dam resulting in significant bank erosion. The lower cross valley slope becomes broader as the stream approaches its confluence with Haw River. The riparian buffer consists of mature woody vegetation. The channel is incised and straightened and shows signs of instability. Within the upper reach the stream classifies as an E5 channel but is slightly entrenched and is trying to re-establish pattern by eroding the existing banks. The watershed is 0.41 square miles at the downstream end of the site. The watershed is 60% forested and 40% residential or agricultural.

3.0 SITE PROTECTION INSTRUMENT

The mitigation areas are presently located within or will be located within the NCDOT Right-of-Way for the project. The sites are designated on the plan sheets as a mitigation area and will placed on the Natural Environment Section's Mitigation GeoDatabase. This database is provided to all NCDOT personnel as a record of mitigation sites and their attributes, including prohibited activities. NCDOT is held by virtue of the permit associated with this mitigation site and the associated roadway impacts to protect the site in perpetuity.

4.0 OBJECTIVES

The goals for these projects are to restore/relocate 2,734 linear feet of stream and enhance 421 linear feet of stream. This will be achieved by: improving floodplain function by matching floodplain elevation with bankfull stage; establishing native stream bank and floodplain vegetation; improving water quality in the Cape Fear River watershed by reducing sediment and nutrient inputs; and improving aquatic and riparian habitat by creating deeper pools and areas of re-aeration, planting a riparian buffer, and reducing bank erosion.

5.0 MITIGATION WORK PLAN

The stream mitigation plan for each of the four project sites is described in the sections that follow. Detailed plan sheets have been provided to NCDOT with the submittal of this mitigation plan narrative.

SITE 1 (WM 041-034)

A combination of Priority II and Priority I restoration is proposed for the upper reach of the Site 1 stream channel. A portion of the upper reach of Site 1 will only require enhancement measures with occasional log vanes, some boulder toe protection, and minor bank grading (see OSM-4, -12 and XS-01, -02). The channel is currently an incised G5 Rosgen stream type channel that will be restored to a stable C5 channel by establishing a lower valley at the bankfull elevation for the upstream portion then gradually elevating the stream channel to allow bankfull and higher flows access to the existing floodplain prior to flowing into the proposed 72" culvert under the new roadway alignment. Priority I restoration is proposed for the lower reach of Site 1. The existing channel classifies as an incised G5 Rosgen stream type that will also be restored to a stable C5 channel. As channel flow exits the 72" culvert under the proposed roadway it will flow into a

stream channel that will be elevated to allow proper floodplain access at the bankfull elevation on new location. The stream channel will be relocated back to the center of the existing valley.

Proper sinuosity and radius of curvature will be restored to both the upper and lower stream reaches to provide stability. Proper riffle-pool sequencing will also be returned to the channels along with in-stream rock and log structures to provide immediate grade control of the newly excavated channels. The installation of these structures will increase stability of the profile and banks while allowing time for vegetation to establish and natural bed materials to be transported throughout the system.

Special attention must also be given to the possible change in flow regime in this system as it may be influenced by storm water runoff from the proposed roadway. The proposed stream channel design anticipates the increased impervious area and increased flashy flows from contributing adjacent roadway stormwater runoff. This is achieved by maximizing radii of curvature to ensure that bends in the stream channel are gradual enough to accommodate flashy flows. Similarly, the belt width of the proposed stream channel is narrowed, slightly straightening the flood plain to convey flood flows without excessively increasing shear stress along the edges of the newly constructed floodplain.

All floodplains and floodplain slopes will be over-excavated 6 inches starting 3 feet from top of stream bank and backfilled with topsoil to final grade (see detail on OSM-2 in design plan sheets). Additionally, per NCDOT's Native Seeding and Mulching Provision, 4000 lbs/acre of lime will be applied and 500 lbs/acre of 10-20-20 fertilizer will be applied.

The proposed riparian buffer for Site 1 upper extends a minimum of 50 feet from the top of bank from both sides of the stream channel and totals approximately 1.97 acres. The required buffer will be included within proposed right-of-way. The proposed riparian buffer for Site 1 lower will extend a minimum of 50 feet from the top of bank on both sides and would require a minimum of 1.27 acres. Due to the fact that Site 1 lower and Site 2 lower are located adjacent to each other on the north side of the proposed roadway, the proposed right-of-way will include Site 1 lower, Site 2 lower, their respective riparian buffers and the forested drainage area between the two. Design parameters for the proposed stream can be found in the morphological table in Appendix B.

SITE 2 (WM 041-035)

The upper reach of the existing stream channel on Site 2 will be relocated away from the toe of fill material using a Priority I restoration approach. The existing channel in this location is fairly stable but will be directly impacted by the fill slope as shown in the on-site mitigation construction drawings. The existing upper reach channel transitions from a B5 at the upper extent of the project to an E5 where the channel will be impacted by the future roadway work. The relocated channel will be designed as a C5 channel with gradual 3:1 side slopes that will be

planted and will eventually transition to an E5 channel over time as the channel narrows. The lower reach of Site 2 Classifies as an E5 channel that transitions to a G5 channel downstream of a large 4.0 foot head cut that is moving up through the system. This lower reach begins at the outlet of the proposed 54 inch culvert and it is anticipated that the roadway drainage would expedite the upstream progression of the existing head cut. The proposed restored lower reach channel will also be designed as a C5 channel with gradual 3:1 side slopes that will be planted and eventually transition to an E5 channel as the channel narrows over time.

Appropriate sinuosity and radius of curvature will be restored to both the upstream and downstream reach channels to provide stability. The channels will be elevated to their historic floodplain in some locations where possible, improving their cross sectional dimension and allowing bankfull and higher flows to access the floodplain. Proper riffle-pool sequencing will also be returned to the channels with corrected pattern and the installation of rock and log structures. The installation of these in-stream structures will increase stability of the profile and banks while allowing time for vegetation to establish and natural bed materials to be transported throughout the system.

Special attention must also be given to the possible change in flow regime in this system as it may be influenced by storm water runoff from the proposed roadway. The proposed stream channel design anticipates the increased impervious area and increased flashy flows from contributing adjacent roadway stormwater runoff. This is achieved by maximizing radii of curvature to ensure that bends in the stream channel are gradual enough to accommodate flashy flows. Similarly, the belt width of the proposed stream channel is narrowed, slightly straightening the flood plain to convey flood flows without excessively increasing shear stress along the edges of the newly constructed floodplain.

All floodplains and floodplain slopes will be over-excavated 6 inches starting 3 feet from top of stream bank and backfilled with topsoil to final grade (see detail on OSM-2 in design plan sheets). Additionally, per NCDOT's Native Seeding and Mulching Provision, 4000 lbs/acre of lime will be applied and 500 lbs/acre of 10-20-20 fertilizer will be applied.

The proposed riparian buffer for Site 2 upper extends a minimum of 50 feet from the top of bank from both sides and would require approximately 1.33 acres. The required buffer will be included within proposed right-of-way. The proposed riparian buffer for Site 2 lower will extend a minimum of 50 feet from the top of bank on both sides and would require a minimum of 1.48 acres. Due to the fact that Site 1 lower and Site 2 lower are located adjacent to each other on the north side of the proposed roadway, the proposed right-of-way will include Site 1 lower, Site 2 lower, their respective riparian buffers and the forested drainage area between the two. Design parameters for the proposed stream can be found in the morphological table in Appendix B.

Some Kudzu is present adjacent to the very upper reaches of Site 2. NCDOT proposes to minimize the potential spread of this species from construction-related activities. NCDOT will also attempt to suppress the Kudzu within the ROW of the mitigation sites by herbicide applications prior to reforestation and during the required post construction monitoring period.

SITE 3 (WM 041-036)
Mitigation Site 3 has been removed.

SITE 4 (WM 041-037)
A Priority II restoration approach is proposed for the stream reach at Site 4. The current channel classifies as a Rosgen E5 stream channel and flows through an existing culvert under Brookbank Road. The proposed restoration of this reach will consist of excavating a new stream channel and floodplain through the existing Brookbank Road fill material. This road will be abandoned with the proposed improvements associated with R-2413A&B and presents an opportunity to re-connect the upstream floodplain with the floodplain downstream of the existing roadway fill. The proposed channel through this reach will be a C5 channel. Banks and floodplain will be planted with native species and the channel is expected to narrow over time to an E5 channel. The proposed reach is not long enough to establish pattern within the restored reach, but in-stream log cross vanes will be installed to provide profile stabilization and in-stream habitat. Preliminary design parameters for the proposed stream can be found in the morphological table in Appendix B.

Presently, Kudzu grows in areas adjacent to this site. NCDOT proposes to minimize the potential spread of this species from construction-related activities. NCDOT will also attempt to suppress the Kudzu within the ROW of the mitigation sites by herbicide applications prior to reforestation and during the required post construction monitoring period. The proposed riparian buffer for this channel would extend 50 feet from the top of bank from both sides and would total approximately 1.01 acres. The revised right-of-way encompasses the required easement area.

SITE 5 (WM 041-038)
The upper reach of Site 5 will be restored using Priority I restoration. At the upstream end of the proposed restoration a pipe and causeway will be removed and floodplain connectivity restored to both the right and left floodplains. Causeway removal and grading will result in 0.01 acres of temporary wetland impacts. Downstream, the existing channel will be relocated to the center of the existing floodplain and elevated so that bankfull and higher flows can access the existing floodplain. The lower reach of Site 5 will be relocated by re-establishing a natural stream channel and proper floodplain through the existing dam. The existing stream channel breached the dam along the east side of the floodplain and is therefore currently eroding the toe of the existing floodplain and the fill material of the old dam. The channel will be relocated back to the center of the existing floodplain and a significant portion of the dam will be removed to ensure

the upstream floodplain is hydraulically connected to the lower floodplain. The existing channels at Site 5 classify as incised E5 channels that are actively eroding in an effort to re-establish appropriate pattern and dimension. The appropriate dimension, pattern, and profile will be restored to the relocated channels in both the upper and lower reaches.

Special attention will be given to the change in flow regime that could occur from the storm water runoff of the proposed roadway. The proposed stream channel design anticipates the increased impervious area and increased flashy flows from contributing adjacent roadway stormwater runoff. This is achieved by maximizing radii of curvature to ensure that bends in the stream channel are gradual enough to accommodate flashy flows. Similarly, the belt width of the proposed stream channel is narrowed, slightly straightening the flood plain to convey flood flows without excessively increasing shear stress along the edges of the newly constructed floodplain.

All floodplains and floodplain slopes will be over-excavated 6 inches starting 3 feet from top of stream bank and backfilled with topsoil to final grade (see detail on OSM-2 in design plan sheets). Additionally, per NCDOT's Native Seeding and Mulching Provision, 4000 lbs/acre of lime will be applied and 500 lbs/acre of 10-20-20 fertilizer will be applied.

A Rosgen type C5 channel is proposed for both the upstream and downstream reaches. Rock and log in-stream structures will be installed along the restored reaches to ensure that the newly constructed stream channels remain stable until mature vegetation is established on the banks and native bed material is transported into the relocated channels. Preliminary design parameters for the proposed stream can be found in the morphological table in Appendix B. The proposed riparian buffer for this channel would extend 50 feet from the top of bank from both sides and would total approximately 2.18 acres. The required buffer will be included within proposed right-of-way in order to provide easements along proposed cut lines associated with the proposed stream restoration and to ensure a 50 foot minimum riparian buffer is provided on all stream reaches.

6.0 PERFORMANCE STANDARDS

Success for vegetation monitoring within the riparian buffer and wetland areas is based on the survival of at least 320 stems at year three and 260 stems of five year old trees at year five. Assessment of channel stability will be based on the survival of riparian vegetation and lack of significant bank erosion, channel widening or down-cutting.

7.0 MONITORING REQUIREMENTS

An As-built will be submitted within 60 days of completion of the project. The As-built will document changes in the dimension, pattern, profile, vegetation plantings, and structures of the constructed channels.

The following components of Level 1 monitoring will be performed each year of the 5-year monitoring period: Reference photos, plant survival (i.e., identify specific problem areas (missing, stressed, damaged or dead plantings), estimated causes and proposed/required remedial action); visual inspection of channel stability. Physical measurements of channel stability/morphology will not be performed. A monitoring report will be submitted within 60 days after completing the monitoring.

8.0 OTHER INFORMATION

STREAM REFERENCE RESTORATION STUDIES

A reference reach is a stream segment that represents a stable channel within particular valley morphology. A stable stream is defined as a stream, which over time and in the present climate transports the flows and sediment produced by its watershed in such a manner that the dimension, pattern, and profile are maintained without either aggrading or degrading (Rosgen, 1996, 1998).

The methodology used for the reference reach analysis consisted of the following tasks: (1) identify reference quality sections of the project reaches that could be used for dimension and/or pattern analysis, (2) identify nearby reference reaches that have been previously located and surveyed and can be used to provide pattern data, (3) survey and classify the stream morphology for the on-site reference reaches, and (4) develop dimensionless ratios based on reference reach data and past project data under similar morphological conditions.

Reference data collected during field investigations for on-site mitigation work for U-2525B were utilized as regional reference reaches. U-2525B is the Greensboro Eastern Loop project located in Guilford County between US Highway 70 and US Highway 29. These stable reference sections were identified within the project reaches where stable bankfull features had developed and provided information regarding bankfull dimension. These locations were identified by the presence of a consistent bankfull indicator, typically a well formed bankfull bench, and stable, vegetated stream banks. Cross-section surveys were conducted in these locations to evaluate stream dimension. The bankfull cross-section areas were then plotted versus drainage area and compared to published Rural Piedmont regional curve data, provided by the North Carolina Stream Restoration Institute (SRI) (See Figure on next page).

As illustrated in Figure labeled "Regional Curve Information Used for Design" on the following page, the cross sectional areas surveyed at stable reference reach locations correlates with the Rural Piedmont Regional Curve Data. Also, three of the four off-site reference reach locations agree with the Rural Piedmont Regional Curve Data. The stream designs were based on the collected data since this data was verified by the Rural Piedmont Regional Curve Data.

The majority of the work proposed for this project will consist of restoration or relocation approaches, with the exception of approximately 350 linear feet of Site 1 and 71 linear feet of Site 2 which will be enhancement. All of the sites will be designed as type "C" channels to provide for stable banks during construction and floodplain connectivity. With time the "C" channel will adjust to a stable "E" channel as vegetation establishes on the banks and width/depth ratios decrease. The enhancement work will consist of installing in-stream structures, along with limited channel grading, and planting the banks and riparian buffer. The in-stream structures will stabilize channel banks and halt progression of head cuts, and provide increased habitat.

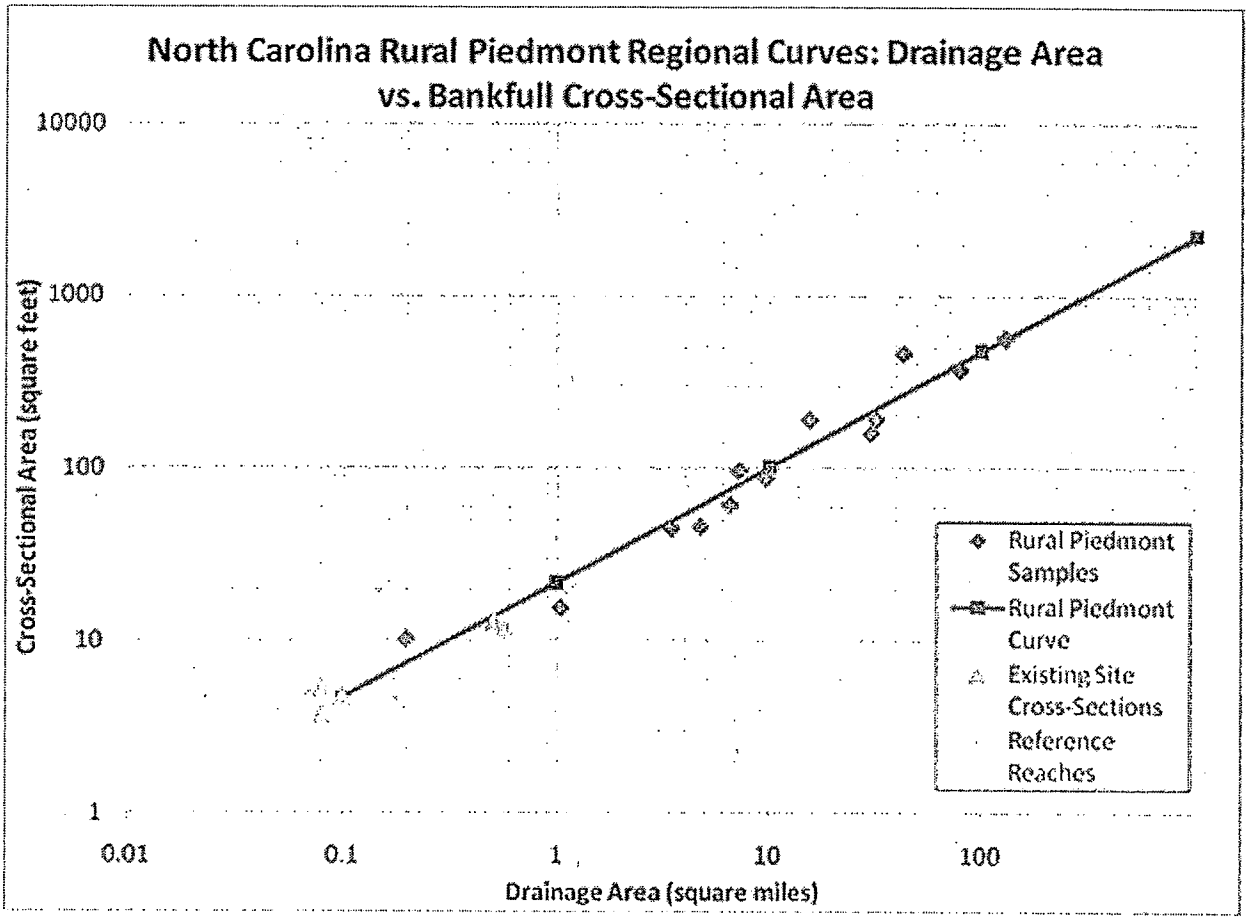


FIGURE: REGIONAL CURVE INFORMATION USED FOR DESIGN

Shear stress calculations were completed for all reaches and are included in Appendix C. The data show that the shear stresses for the proposed designs will generally be kept approximately the same or slightly increased with a few exceptions. Site 1 Lower shear stress will be increased to ensure proper sediment transport. Site 2 shear stress will be greatly increased from the existing conditions. This is because a significant 4.0 foot headcut exists in the current channel

resulting in abnormally flat reaches upstream and downstream of the headcut. The proposed conditions for Site 2 will distribute this drop over several grade control structures. Shear stress for Site 4 is increased to an appropriate level for sediment transport as compared to the very low existing conditions shear stress which currently does not provide proper sediment transport. Although most reaches do not have significant increases in shear stress, incorporation of in-stream structures for grade control is implemented on all reaches. This is especially important since all restoration/relocation sites will be excavated on new location and will not immediately have the properly sorted materials transported in from upstream. Constructed riffles and harvesting of existing bed material will be used to the extent feasible to provide this immediate supply of properly sorted bed material.

9.0 DETERMINATION OF CREDITS

NCDOT has made an effort to restore/relocate and enhance approximately 3,155 feet of streams adjacent to the R-2413A&B project to meet mitigation requirements. The streams are being purchased as right-of-way for the roadway project. These sites will have controlled access to ensure they are protected from local landowner encroachment. Also, placing these streams and riparian buffers into right-of-way guarantees that no future impacts will occur directly to these channels due to commercial or residential development along the corridor.

Sites 1 and 2 are both first order streams that drain directly into Reedy Creek, an NCDWQ classified NSW, and WS-III, that flows into Lake Brandt, part of Greensboro's water supply. USACE stream quality assessments scored 47 and 43 for Sites 1 and 2 respectively. By performing the restoration and enhancement measures outlined in this mitigation plan, NCDOT is providing quality in-kind stream mitigation immediately upstream and downstream of the proposed impact site.

Site 4 is a third order stream also draining into Reedy Creek. This UT scored 60 on the USACE stream quality assessments. The existing culvert and roadway embankment of Brookbank Road significantly constrict the floodplain of this stream. The removal of the existing culvert and roadway embankment daylights 70+ feet stream and restores floodplain connectivity and capacity, immediately downstream of the proposed impact.

The UT to the Haw River to be restored/relocated at Site 5 scored 63 on the USACE stream quality assessment. However, this evaluation was completed on a section of the stream downstream of the proposed mitigation work. The proposed mitigation work will take place on a section of stream that has been altered by the construction of an earth dam. The breaching/failure of this dam caused a huge slope failure at the lower end of Site 5, and in turn is resulting in significant channel incision and head cutting at the upstream end of Site 5. UT's within the proposed mitigation work area (JD streams S4 and S5) scored only 40 points on the

USACE stream quality assessment. Further, significant timber logging has taken place at the upstream end of Site 5 since the assessments were performed. NCDOT's proposed mitigation will restore this stream and its buffer to function at its "pre-dam" level. This in-kind mitigation is located immediately upstream and downstream of the proposed impact and will ultimately help improve water quality flowing into the Haw River, NCDWQ classification WS-V; NSW.

NCDOT proposes to restore/relocate and enhance approximately 2,945 feet of streams and associated buffer adjacent to the R-2413A&B project, in partial fulfillment of mitigation requirements. The planned stream mitigation will restore significant lengths of degraded headwater streams that drain directly into water supply and nutrient sensitive streams. The proposed stream designs also take into account potential future watershed conditions. By placing the mitigation projects within right-of-way NCDOT has protected these sites for the future. NCDOT has considerable experience and a history of success with the design and construction of on-site stream mitigation projects. There are presently no known in lieu fee or mitigation bank sites within the 14-digit HUC of the proposed mitigation sites. Existing in lieu fee and mitigation bank sites within the same 8-digit HUC are all located downstream of Greensboro's water supply reservoirs.

Based on the factors outlined above, NCDOT proposes the credit ratios shown below in Table 4. All remaining unavoidable stream impacts will be offset by compensatory mitigation provided by the Ecosystem Enhancement Program (EEP).

MITIGATION SUMMARY

TABLE 4. MITIGATION IMPACT SUMMARY AND PROPOSED CREDITS*

Mitigation Site No.	Mitigation Description	Existing Channel Impacts Permanent (ft)	Existing Channel Impacts Temp. (ft)	Natural Stream Design (ft)	Credit Ratio	Proposed Credit (ft)
1 Upper	Enhancement		350	350	2:1	175
	Restoration	368		304	1:1	304
1 Lower	Restoration	505	53	509	1:1	509
2 Upper	Relocation	308		424	1:1	424
2 Lower	Restoration	513		482	1:1	482
	Enhancement		87	71	2:1	36
4	Restoration		**	250	1:1	250
5 Upper***	Restoration	403	20	373	1:1	373
5 Lower	Restoration/ Relocation	746		392	1:1	392
TOTALS		2843	510	3155		2945

Table 4. notes:

* Impacts associated roadway fill slopes, culverts, and pipes are listed on the Wetland Impact Summary Sheet for Sites 12, 13, 14, and 21 on R-2413A and Site 8 for R-2413B.

** Impacts for Mitigation Site 4 are included in the impact summary sheet for R-2413A, Site 21

*** Temporary wetland impacts associated with Mitigation Site 5 Upper are included in the Wetland Impact Summary Sheet for R-2413B, Site 8c.

9.1 CREDIT RELEASE SCHEDULE

NCDOT proposes immediate, full release of the proposed stream mitigation as outlined above as on-site mitigation for unavoidable stream impacts associated with R-2413 A&B.

10.0 GEOGRAPHIC SERVICE AREA

The proposed Geographic Service Area (GSA) for the mitigation sites is composed of the 8-digit Hydrologic Cataloging Unit (HUC) 03030002.

11.0 MAINTENANCE PLAN

The mitigation site will be held by NCDOT and placed on the NES mitigation geodatabase. Once monitoring is completed and the site is closed out, it will be placed in the NCDOT Stewardship Program for long term maintenance and protection.

If an appropriate third party recipient is identified in the future, then the transfer of the property will include a conservation easement or other measure to protect the natural features and mitigation value of the site in perpetuity.

12.0 LONG TERM ADAPTIVE MANAGEMENT PLAN

The sites will be managed by the NCDOT according to the mitigation plan. Beaver management will be instituted during the monitoring period. Encroachments into the area will be investigated and appropriate measures taken to minimize any negative effects. In the event that unforeseen issues arise that affect the management of the site, any remediation will be addressed by NCDOT in coordination with the Interagency Review Team.

13.0 FINANCIAL ASSURANCES

NCDOT is held by permit conditions associated with R-2413 A&B to preserve the stream restoration and enhancement areas. NCDOT has established funds for each project and within each Division to monitor the mitigation site and to protect it in perpetuity.

MITIGATION IMPACT SUMMARY

			WETLAND IMPACTS					SURFACE WATER IMPACTS				
Mitigation Site No.	Mitigation Station Station (From/To)	Mitigation Description	Permanent Fill In Wetlands (ac)	Temp. Fill In Wetlands (ac)	Excavation in Wetlands (ac)	Mechanized Clearing in Wetlands (ac)	Hand Clearing in Wetlands (ac)	Permanent SW impacts (ac)	Temp. SW impacts (ac)	Existing Channel Impacts Permanent (ft)	Existing Channel Impacts Temp. (ft)	Natural Stream Design (ft)
1 Upper	100+00 to 103+50	Enhancement									350	350
	103+50 to 106+55	Restoration								368		304
1 Lower	150+00 to 155+09	Restoration								505	53	509
2 Upper	200+00 to 204+24	Relocation								225	83	424
2 Lower	250+00 to 255+54	Restoration								513		482
		Enhancement									87	71
4	400+00 to 402+50	Restoration									*	250
5 Upper	500+00 to 503+73	Restoration								403	20	373
5 Lower	550+00 to 553+92	Restoration/ Relocation								**		392
TOTALS:										2014	593	3155

* - Impacts for Site 4 are included in the impact summary table for R-2413A Site 21

** - Impacts for Site 5 Lower are included in the impact summary table for R-2413B Site 8

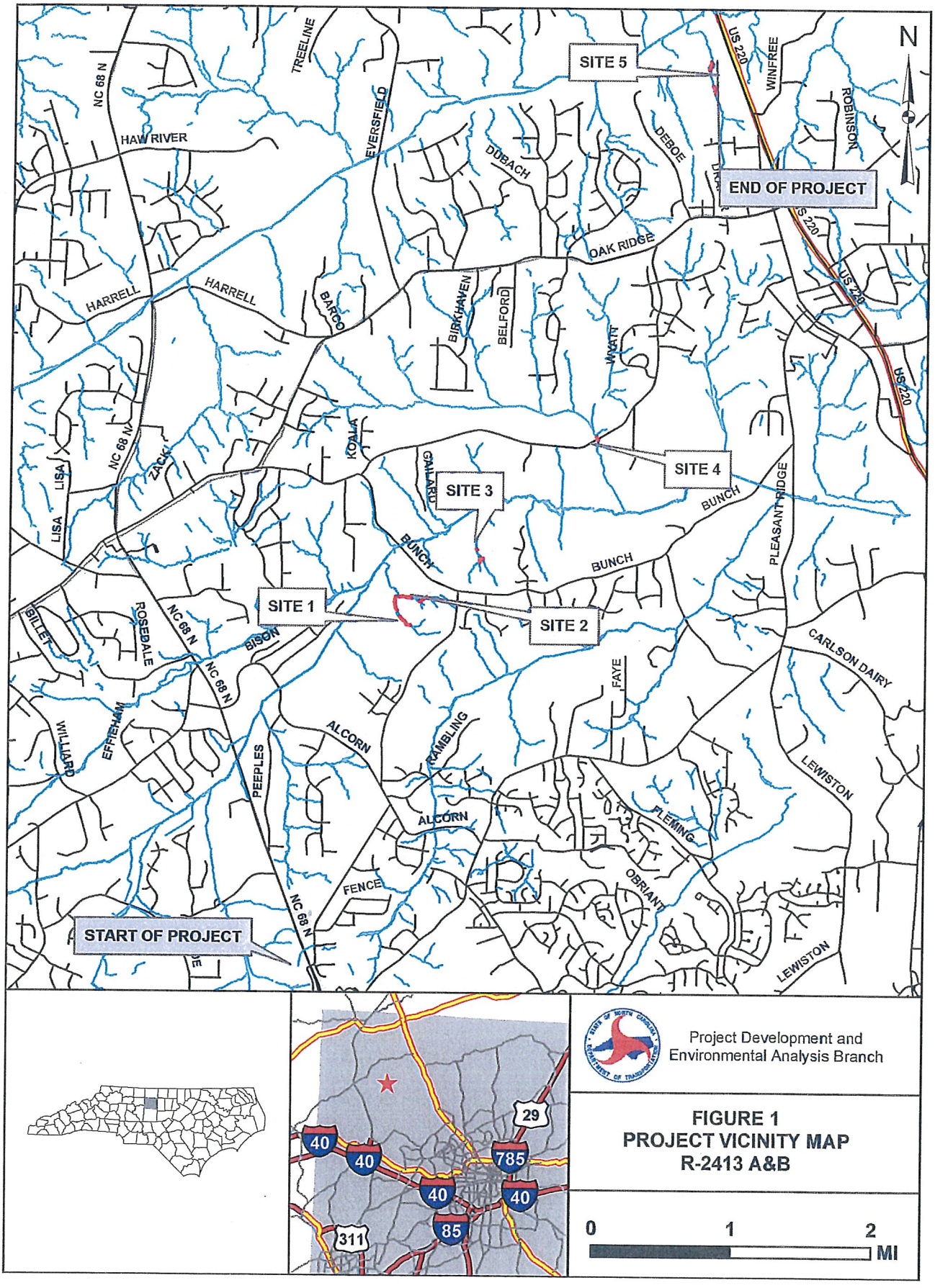
For impacts associated with the roadway fill slopes, culverts and pipes please see Wetland Impact Summary Sheet for Site 12, Site 13 and Site 21 on R-2413A and Site 8 for R-2413B

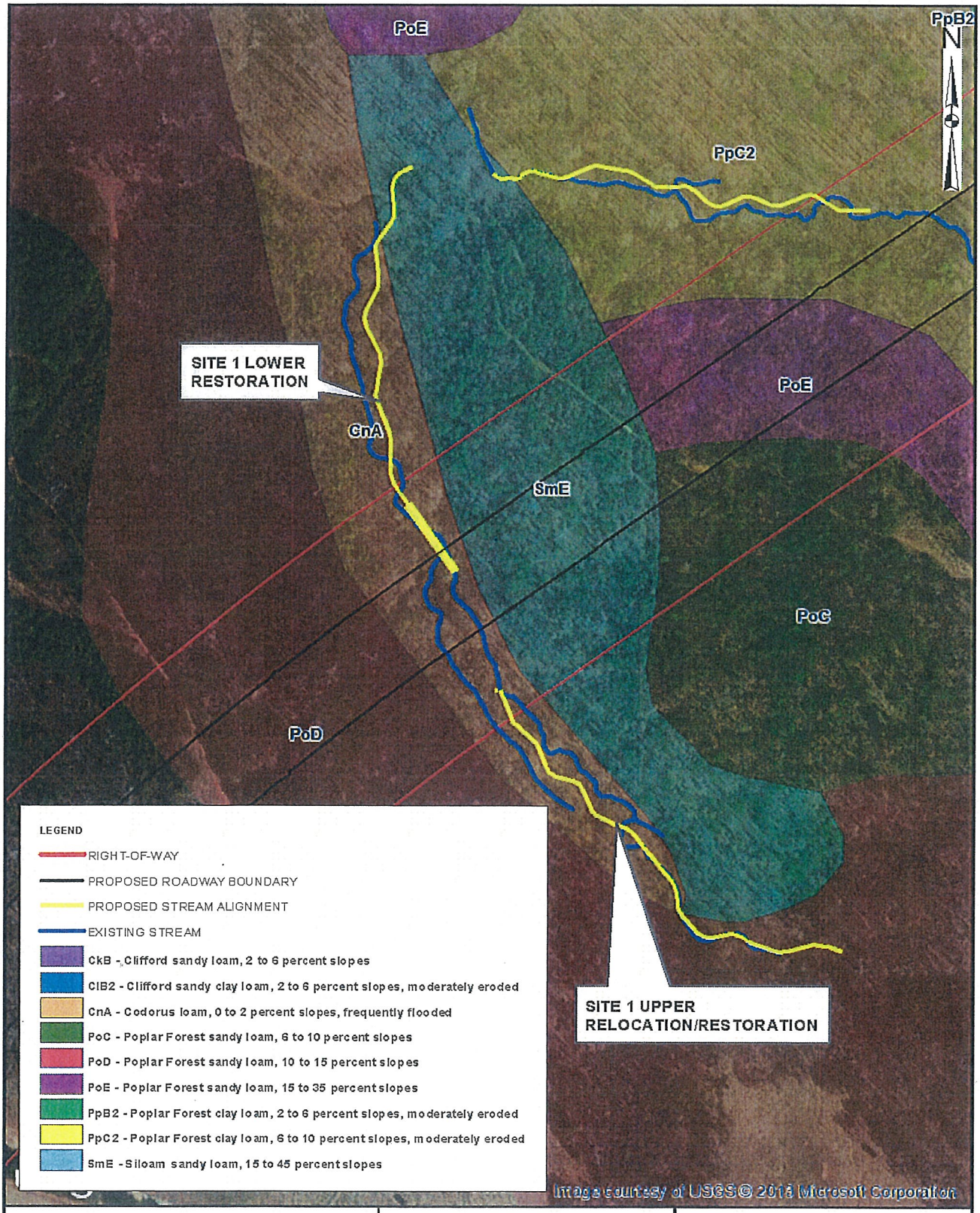
Temporary Wetland Impacts associated with Site 5 Upper are shown in the Wetland Impact Summary Sheet for R-2413B Site 8

ATN Revised 3/31/05

NC DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GUILFORD
COUNTY
WBS - 34429.1.1 (R-2413A & B)

SHEET 1 OF 1 6/25/2013

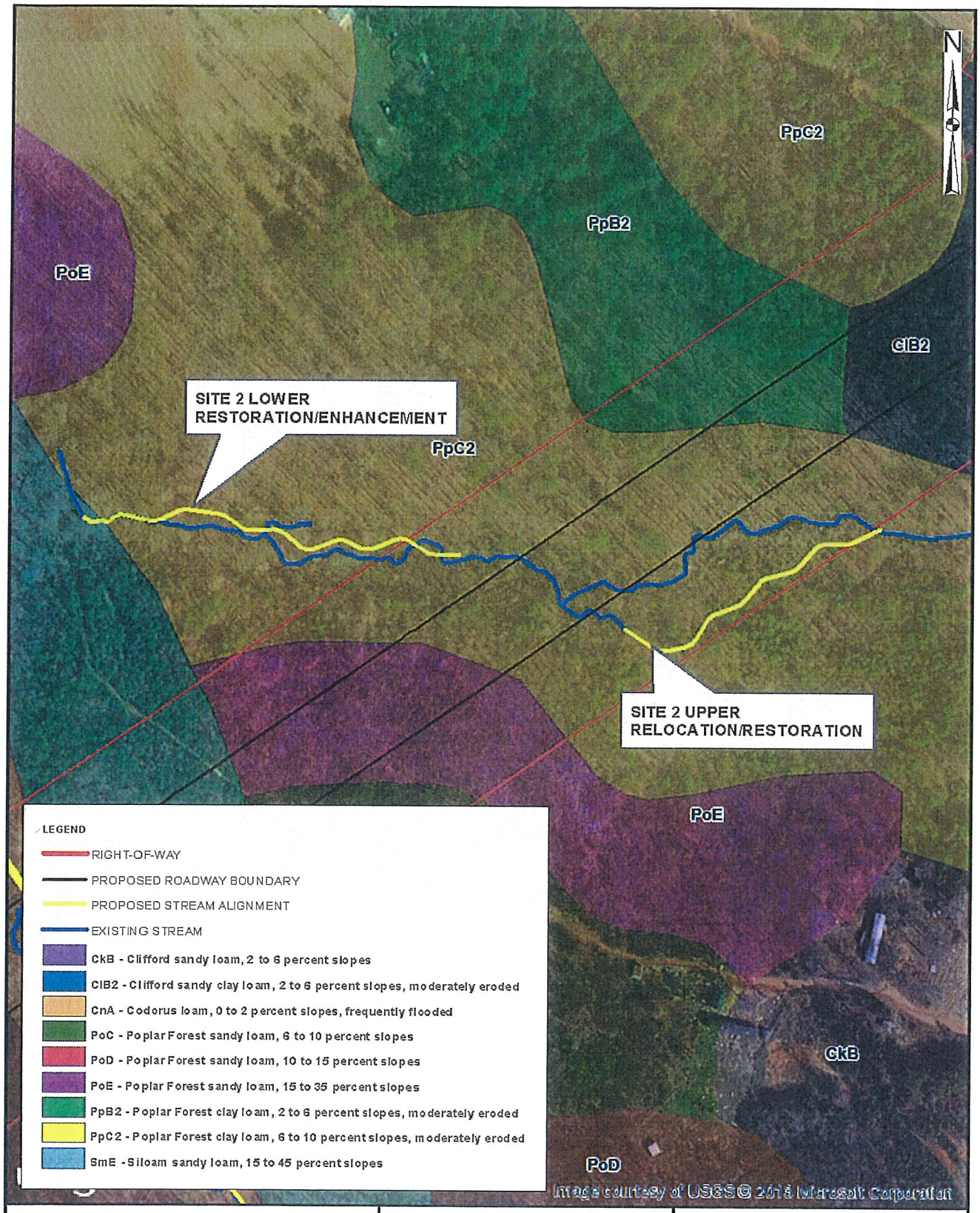

N
SITE 5
END OF PROJECT
SITE 4
SITE 3
SITE 1
SITE 2
START OF PROJECT
HAW RIVER
HARRELL
TREELINE
EVERSFIELD
DUBACH
DEBOE
OAK RIDGE
BARCO
BIRKHAVEN
BELFORD
IVYATT
KOALA
GAILARD
BUNCH
PLEASANT RIDGE
CARLSON DAIRY
LEWISTON
FAYE
ALCORN
RAMBLING
PEEPLES
FLEMING
OBRIANT
FENCE
BISON
ROSEDALE
BILLET
WILLIARD
EFFIRHAM
ZACK
LISA
NC 68 N
US 220
WINFREE
ROBINSON
29
40
785
85
311
Project Development and Environmental Analysis Branch
FIGURE 1
PROJECT VICINITY MAP
R-2413 A&B
0
1
2
MI



Project Development and Environmental Analysis Branch

0 100 200 Feet

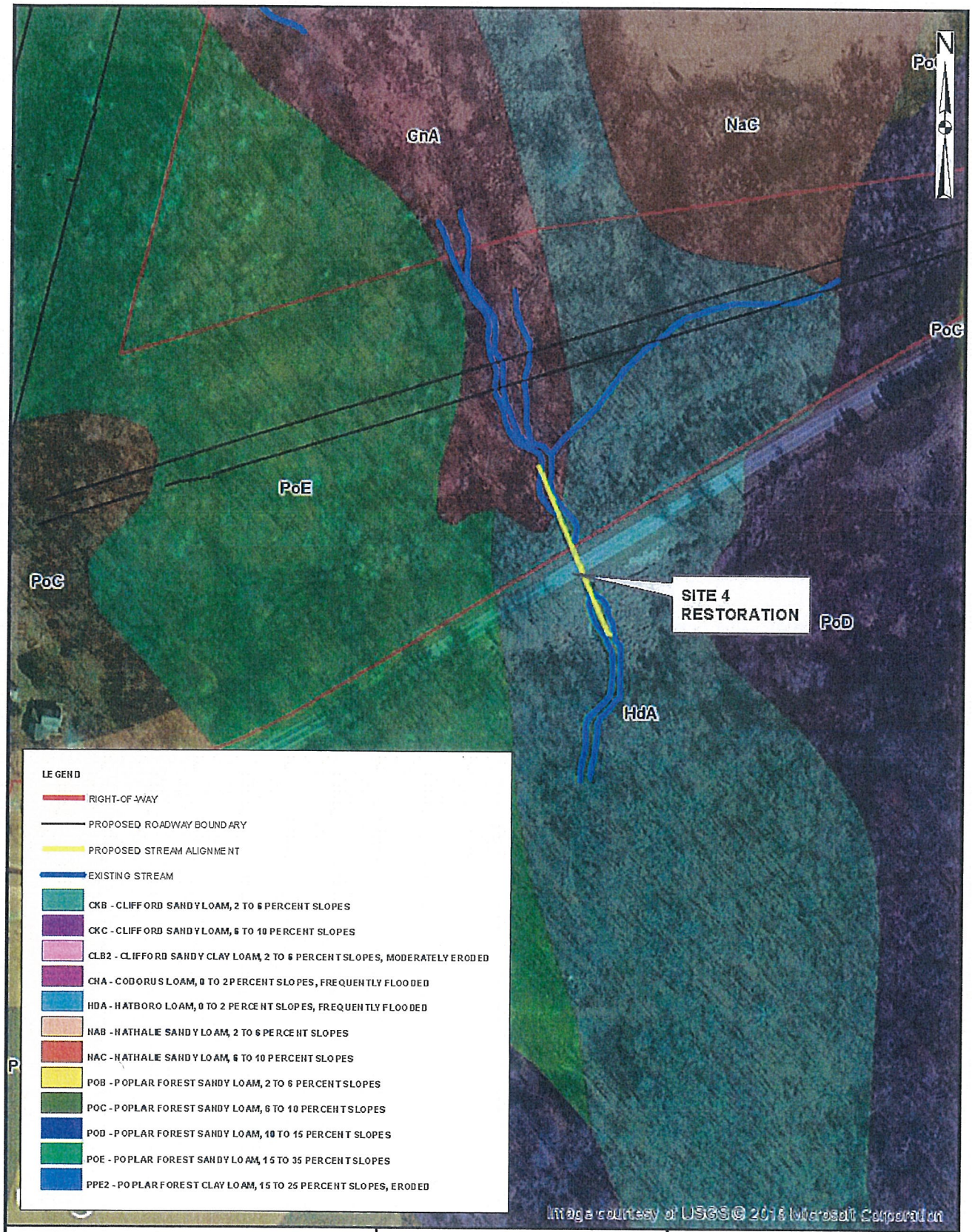
FIGURE 2A
SOILS MAP
R-2413 A&B, SITE 1



Project Development and Environmental Analysis Branch

0 100 200 Feet

FIGURE 2B
SOILS MAP
R-2413 A&B, SITE 2



Project Development and Environmental Analysis Branch

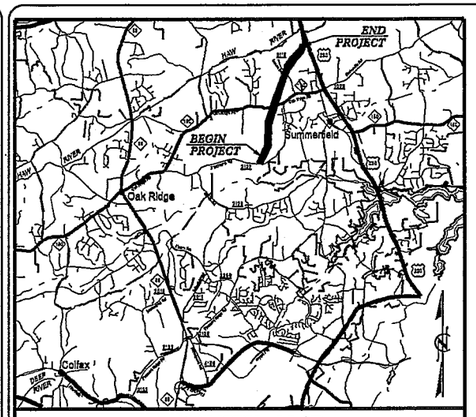
0 137.5 275 Feet

FIGURE 2C
SOILS MAP
R-2413 A&B, SITE 4

09/26/11

TIP PROJECT: R-2413 A&B

CONTRACT:



VICINITY MAP

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	R-2413A&B	OSM-1	52

STATE PROJ. NO.	F. A. PROJ. NO.	DESCRIPTION
		PE
		ROW

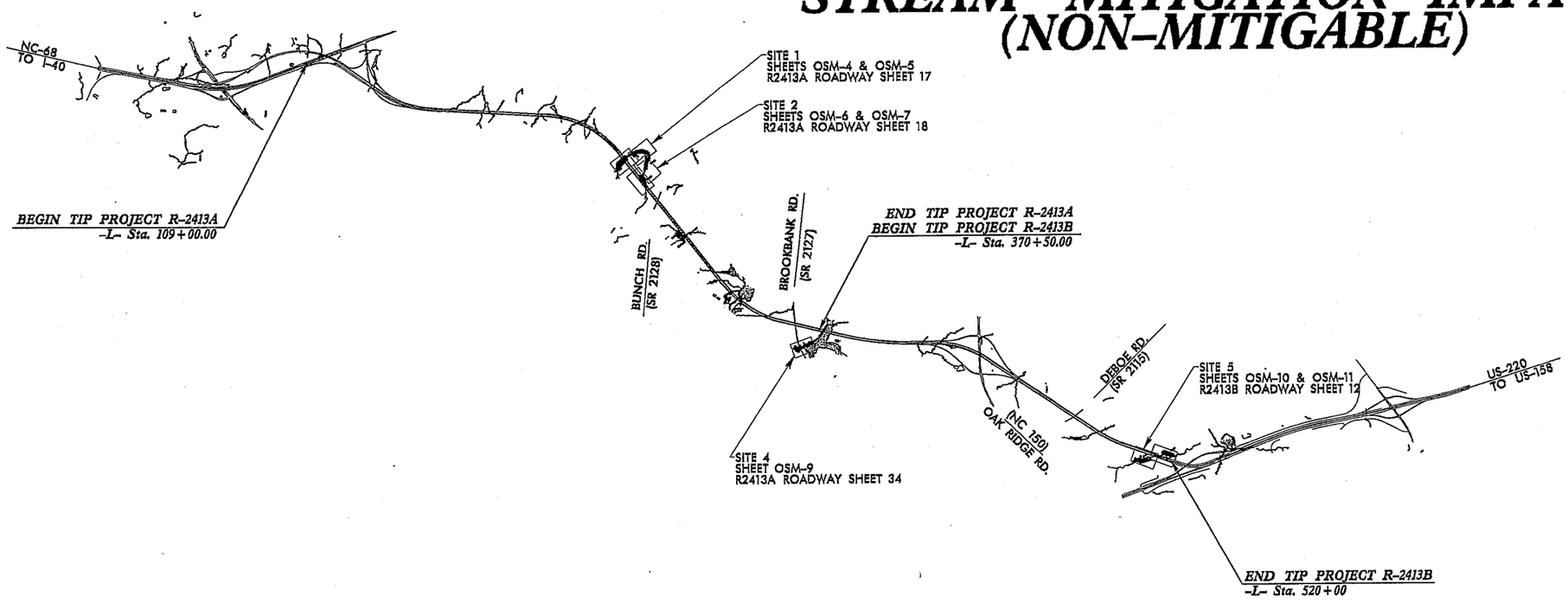
PLAN FOR ON-SITE MITIGATION GUILFORD COUNTY

NAD 83

LOCATION: NC 68 CONNECTOR – FROM SR 2011 (EDGEFIELD ROAD) TO HAW RIVER

TYPE OF WORK: STREAM RELOCATION, STREAM RESTORATION, STREAM ENHANCEMENT

STREAM MITIGATION IMPACTS (NON-MITIGABLE)



REV. 07/02/2013

NC DOT CONTACT: PETE ALLEN

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

GRAPHIC SCALES

30 15 0 30 60
PLANS

30 15 0 30 60
PROFILE (HORIZONTAL)

6 3 0 6 12
PROFILE (VERTICAL)

DESIGN DATA

PROJECT LENGTH

MITIGATION SITE	MITIGATION TYPE	LENGTH
SITE 1	RESTORATION/ENHANCEMENT	870LF
SITE 2	RELOCATION/RESTORATION/ENHANCEMENT	900LF
SITE 4	RESTORATION	250LF
SITE 5	RESTORATION/RELOCATION	760LF

2012 STANDARD SPECIFICATIONS

DESIGN ENGINEER

P.E.
SIGNATURE:

DIVISION OF HIGHWAYS
STATE OF NORTH CAROLINA

P.E.
STATE DESIGN ENGINEER

DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

APPROVED
DIVISION ADMINISTRATOR DATE

Impacts Associated with Mitigation (Non-mitigable)

S S — DENOTES IMPACTS IN SURFACE WATER

TS TS — DENOTES TEMPORARY IMPACTS IN SURFACE WATER

Rev. 07/01/2013

R-2413A&B	OSM-4

PROJECT ENGINEER

APPROVED BY:

DATE:

SITE 1-UPPER PLAN

30 15 0 30 60

NAD 83

SITE 1-UPPER

SITE 1-UPPER ENHANCEMENT

BOULDER TOE PROTECTION

END ENHANCEMENT BEGIN RESTORATION STA. 103+30

ENHANCEMENT LAY BACK LEFT BANK AT A 3:1 SLOPE

ENHANCEMENT LAY BACK RIGHT BANK AT A 3:1 SLOPE, SEE CROSS SECTION AT STATION 103+00

ENHANCEMENT LAY BACK RIGHT BANK AT A 3:1 SLOPE, SEE CROSS SECTION AT STATION 102+00

ENHANCEMENT LAY BACK RIGHT BANK AT A 3:1 SLOPE

BOULDER TOE PROTECTION

BEGIN ENHANCEMENT STA.100+00

PROPOSED WOVEN WIRE FENCE

GRADE EXISTING SWALE TO DRAIN TO PROPOSED CHANNEL

TIE PROPOSED WOVEN WIRE FENCE TO RIGHT-OF-WAY FENCING

END RESTORATION STA. 106+54.69, TIE TO 72" CSP

72" CSP (8 GA.) ALUMINIZED

TIE PROPOSED WOVEN WIRE FENCE TO RIGHT-OF-WAY FENCING

GRADE EXISTING SWALE TO DRAIN TO PROPOSED CHANNEL

EXISTING R/W

SCRUB

SCRUB

100+00 101+00 102+00 103+00 104+00 105+00 106+00

1703 1705 1706 1708 1709-I

2GI 15" 15" RCP-IV ELBOWS

TB WLB WLF WLB FP C MH

81 CA RW RM

09/26/13
22-APR-2013 10:12
R-2413A\Design\Permit Drawings\R2413_NEU_OSM-04_PSH_impacts.dgn
jester

Impacts Associated with Mitigation (Non-mitigable)

Rev. 07/01/2013

SITE 1 - LOWER PLAN

R-2413A&B	OSM-5
PROJECT ENGINEER	
APPROVED BY:	
DATE:	

30 15 0 30 60

NAD 83

DENOTES IMPACTS IN SURFACE WATER

DENOTES TEMPORARY IMPACTS IN SURFACE WATER

CHORD

±20 174.59' LT (EXIST C/A)

TIE PROPOSED WOVEN WIRE FENCE TO RIGHT-OF-WAY FENCING

BEGIN RESTORATION STA.150+00. TIE TO PROPOSED 72" CSP

72" CSP (8 GA.) ALUMINIZED

PROPOSED 72" CSP

ELBOW

MATCHLINE SEE SHEET OSM-4

16:1 TAPER

RCP-IV

2GI

CLASS 'B' RIP RAP

15"

SPECIAL CUT DITCH GRASS LINED SEE DETAIL 'D'

SITE 1 LOWER

SCRUB

270

±30.00 440.00' RT

±35.00 600.00' LT

END RESTORATION STA.154+09. TIE TO EXISTING CHANNEL

MATCHLINE SEE SHEET OSM-7

09/25/11
22-APR-2013 10:15
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$$USER: ALEX.BRENDLE

09/26/11

Impacts Associated with Mitigation (Non-mitigable)

PROJECT REFERENCE NO.	SHEET NO.
R-2413A&B	OSM-6

PROJECT ENGINEER

APPROVED BY:

DATE:

Rev. 07/01/2013

SITE 2-UPPER PLAN

DENOTES IMPACTS IN SURFACE WATER

DENOTES TEMPORARY IMPACTS IN SURFACE WATER

NAD 83

30 15 0 30 60

SCALE

SITE 2-UPPER

PROPOSED WOVEN WIRE FENCE

TIE IN EXISTING CHANNEL TO PROPOSED CHANNEL ACROSS THE CROSS-VANE ARM AT THE DIRECTION OF THE ENGINEER.

TIE PROPOSED WOVEN WIRE FENCE TO RIGHT-OF-WAY FENCING

TIE PROPOSED WOVEN WIRE FENCE TO RIGHT-OF-WAY FENCING

BEGIN RELOCATION STA. 200+00

END RELOCATION STA. 204+25.21E TO 54" RCP.

201+00

202+00

203+00

SCRUB

GRAU 350

TBJB w/Slab Lid

-L-

N 54° 40' 00.0" E

2GI

2GI-A

FS

15" RCP-III

18" RCP-III

54" RCP-III

36"

1813

1807

1808

1818

1805

1806

40

81

920

SF

TB

JS

C

F

23-JUN-2013 15:08
R-2413A NPDES Permit Drawings\R2413_NEU_OSM-06_PSH_Impacts.dgn

Rev. 07/01/2013

PROJECT REFERENCE NO.	SHEET NO.
R-2413A&B	OSM-7

PROJECT ENGINEER

APPROVED BY:

DATE:

SITE 2-LOWER PLAN

30 15 0 30 60

NAD 83

MATCHLINE SEE SHEET OSM-6

MATCHLINE SEE SHEET OSM-5

SITE 2-LOWER

Impacts Associated with Mitigation
(Non-mitigable)

BEGIN RESTORATION STA. 250+06. TIE TO 54" RCP.

CLASS 'I' RIP RAP SEE DETAIL 'AJ'

CLASS 'B' RIP RAP

ELBOWS

2GI

CAT-1

w/Slab Lid

TIE PROPOSED WOVEN WIRE FENCE TO RIGHT-OF-WAY FENCING

-L- +27.44
175.27'LT
(EXIST CA)

PROPOSED WOVEN WIRE FENCE

-L- +00.00
2.88'LT

GRADE TO DRAIN INTO PROPOSED CHANNEL NEAR STATION 253+00

250+00

254+00

255+00

END RESTORATION
BEGIN ENHANCEMENT
STA. 254+82.4. TIE
TO EXISTING CHANNEL

END ENHANCEMENT
STA. 255+53.89

-L- +25.00
530.00' RT

DENOTES IMPACTS IN SURFACE WATER

DENOTES TEMPORARY IMPACTS IN SURFACE WATER

22-APR-2013 10:15
R-2413A\Mitigation Permit Drawings\R2413_NEU_OSM-07_PSH_impacts.dgn

Impacts Associated with Mitigation (Non-mitigable)

PROJECT REFERENCE NO.	SHEET NO.
R-2413A&B	OSM-08

PROJECT ENGINEER

APPROVED BY:

DATE:

Rev. 07/01/2013

SITE 4 PLAN

30 15 0 30 60

S S DENOTES IMPACTS IN SURFACE WATER

TS TS DENOTES TEMPORARY IMPACTS IN SURFACE WATER

SITE 4

SCRUB

SR 2127 BROOKBANK RD

N 73° 00' 00.0" E

-Y5-

WLB

F

TB

TES

REMOVE

9.7' HIGH X 16.8' WIDE CMP

1@ 12'x12' RCBC

END RESTORATION STA. 400+00

END RESTORATION STA. 402+50

400+00

401+00

402+00

2' FDPS

2GI

RCP-IV

15"

ELBOWS

CLASS 'B' RIP RAP

4' LATERAL BASE DITCH CLASS 'B' RIP RAP LINED SEE DETAIL 'L'

54

72

3340

NAD 83

25-JUN-2013 06:57
R-2413A\Mitigation Permit Drawings\R2413_NEU_OSM-09_PSH_impacts.dgn
User: BHESKETH

Impacts Associated with Mitigation (Non-mitigable)

Rev. 07/01/2013

R-2413A&B	OSM-9
PROJECT ENGINEER	
APPROVED BY:	
DATE:	

SITE 5-UPPER PLAN

30 15 0 30 60

MATCHLINE SEE SHEET OSM-11

SITE 5-UPPER

30" CSP

42" CSP

1217

1207

PROPOSED 1@10'X8' RCBC W/ALTERNATE LOW FLOW SILLS (BY OTHERS)

END RESTORATION STA. 503+72.77 TIE TO PROPOSED 10'x8' RCBC

503+00

502+00

501+00

500+00

HATCHED AREA TO BE GRADED DOWN TO APPROXIMATELEY 6 INCHES ABOVE THE ADJACENT VALLEY IN AN EFFORT TO PROVIDE FLOODPLAIN CONNECTIVITY, WHILE MAINTAINING WETLAND HYDROLOGY. TARGET ELEVATION IS 795.7

TEMPORARY WETLAND EXCAVATION

TEMPORARY STREAM IMPACTS

BEGIN RESTORATION STA. 500+00

WLB

S S DENOTES IMPACTS IN SURFACE WATER

TS TS DENOTES TEMPORARY IMPACTS IN SURFACE WATER

25-JUN-2013 07:40
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User: PSHEARIN

PROJECT REFERENCE NO.	SHEET NO.
R-2413A&B	OSM-10

PROJECT ENGINEER

APPROVED BY:

DATE:

Rev. 07/01/2013

SITE 5-LOWER PLAN

30 15 0 30 60

NAD 83

09/2

5/5

520

SEE DETAIL 'AJ'
LAT. BASE DITCH
280 TONS CL. B RIP RAP
750 SY FF
DDE=1739 CY

SITE 5-LOWER

SEE DETAIL 'AM'
CHANNEL RELOCATION
FF
DDE=5000 CY

551+00

553+00

EXISTING R/W

END RESTORATION
STA. 553+91.59

SEE DETAIL'G'
TOE PROTECTION
35 TONS CL B RIP RAP
105 SY FF

BEGIN RESTORATION
STA. 550+88
TIE TO PROPOSED
10'x7' RCBC

1212 2GI

15" RCP-III

2GI

1213 FS

15" RCP-III

2GI

15" 2GI 1215

1214 SP

2GI 1303

15" CSP

2GI 1301

15" RCP-III

2GI 1302

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R2413A_Plans_Sheet_Permit Drawings\R2413_NEU_OSM-11_PSH_impacts.dgn

MITIGATION IMPACT SUMMARY

Mitigation Site No.	Mitigation Station Station (From/To)	Mitigation Description	WETLAND IMPACTS					SURFACE WATER IMPACTS				
			Permanent Fill In Wetlands (ac)	Temp. Fill In Wetlands (ac)	Excavation in Wetlands (ac)	Mechanized Clearing in Wetlands (ac)	Hand Clearing in Wetlands (ac)	Permanent SW impacts (ac)	Temp. SW impacts (ac)	Existing Channel Impacts Permanent (ft)	Existing Channel Impacts Temp. (ft)	Natural Stream Design (ft)
1 Upper	100+00 to 103+50	Enhancement									350	350
	103+50 to 106+55	Restoration								368		304
1 Lower	150+00 to 155+09	Restoration								505	53	509
2 Upper	200+00 to 204+24	Relocation								225	83	424
2 Lower	250+00 to 255+54	Restoration								513		482
		Enhancement									87	71
4	400+00 to 402+50	Restoration									*	250
5 Upper	500+00 to 503+73	Restoration								403	20	373
5 Lower	550+00 to 553+92	Restoration/ Relocation								**		392
TOTALS:										2014	593	3155

* - Impacts for Site 4 are included in the impact summary table for R-2413A Site 21

** - Impacts for Site 5 Lower are included in the impact summary table for R-2413B Site 8

For impacts associated with the roadway fill slopes, culverts and pipes please see Wetland Impact Summary Sheet for Site 12, Site 13 and Site 21 on R-2413A and Site 8 for R-2413B

Temporary Wetland Impacts associated with Site 5 Upper are shown in the Wetland Impact Summary Sheet for R-2413B Site 8

NC DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GUILFORD
COUNTY
WBS - 34429.1.1 (R-2413A & B)

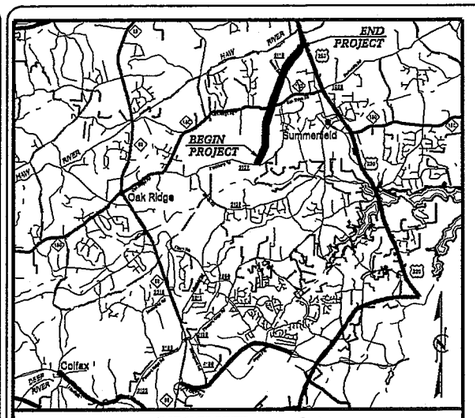
SHEET 1 OF 1 6/25/2013

ATN Revised 3/31/05

09/26/11

TIP PROJECT: R-2413 A&B

CONTRACT:



VICINITY MAP

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

PLAN FOR ON-SITE MITIGATION GUILFORD COUNTY

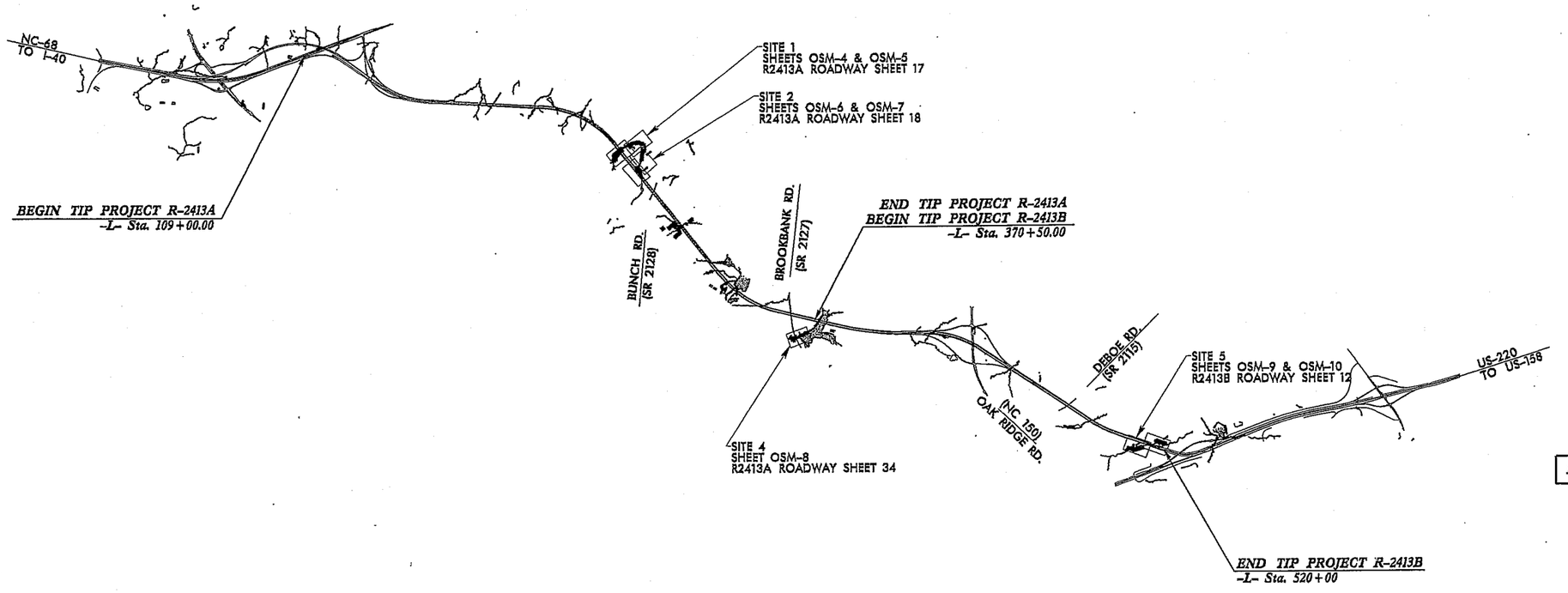
STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	R-2413A&B	OSM-1	53

STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION
		PE
		ROW

NAD 83

LOCATION: *NC 68 CONNECTOR – FROM SR 2011 (EDGEFIELD ROAD) TO HAW RIVER*

TYPE OF WORK: *STREAM RELOCATION, STREAM RESTORATION, STREAM ENHANCEMENT*



REV. 07/01/2013

NC DOT CONTACT: PETE ALLEN

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

GRAPHIC SCALES

30 15 0 30 60
PLANS

30 15 0 30 60
PROFILE (HORIZONTAL)

6 3 0 6 12
PROFILE (VERTICAL)

DESIGN DATA

PROJECT LENGTH

MITIGATION SITE	MITIGATION TYPE	LENGTH
SITE 1	RESTORATION/ENHANCEMENT	870LF
SITE 2	RELOCATION/RESTORATION/ENHANCEMENT	900LF
SITE 4	RESTORATION	250LF
SITE 5	RESTORATION/RELOCATION	760LF

PREPARED IN THE OFFICE OF:
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NC License F-0102

2012 STANDARD SPECIFICATIONS

DESIGN ENGINEER

SIGNATURE: *P.E.*

DIVISION OF HIGHWAYS
STATE OF NORTH CAROLINA

STATE DESIGN ENGINEER *P.E.*

DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

APPROVED
DIVISION ADMINISTRATOR *DATE*

Rev. 07-01-2013

09/26/11

GENERAL NOTES

ALL WORK SHALL BE PERFORMED IN ACCORDANCE WITH THE FOLLOWING STANDARDS:

A) NORTH CAROLINA DEPARTMENT OF TRANSPORTATION "STANDARD SPECIFICATIONS FOR ROADS AND STRUCTURES, DATED JANUARY 2012, AND ANY SUPPLEMENTS THERETO ISSUED PRIOR TO THE DATE OF RECEIPT OF BIDS.

B) NORTH CAROLINA DEPARTMENT OF TRANSPORTATION "ROADWAY STANDARD DRAWINGS, ENGLISH" DATED JANUARY 2012, AND ANY SUPPLEMENTS ISSUED THERETO PRIOR TO THE DATE OF RECEIPT OF BIDS.

ALL RIGHT OF WAY CORNER MARKERS OR FENCING SHALL BE PLACED BY OTHERS AS NECESSARY.

THE CONTRACTOR IS RESPONSIBLE FOR AVOIDING ANY DISTURBANCE OR DAMAGE TO EXISTING UTILITIES AND SHALL BE RESPONSIBLE FOR IMMEDIATELY REPAIRING ANY DAMAGES AT A COST INCIDENTAL TO THIS CONTRACT.

ABANDONED SECTIONS OF THE EXISTING CHANNEL SHALL BE FILLED TO THE MAXIMUM EXTENT FEASIBLE WITH MATERIAL EXCAVATED ON-SITE. THIS EXCAVATED MATERIAL SHALL BE STOCKPILED ADJACENT TO THE REACHES OF CHANNEL OR DITCHES TO BE BACKFILLED.

THE CONTRACTOR MAY UTILIZE THE DESIGNATED STAGING AREA AND THE AREA INSIDE THE PROPOSED RIGHT OF WAY FOR STAGING AND STOCKPILING EQUIPMENT AND MATERIALS.

THE STREAM SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE TYPICAL SECTIONS.

SUBSURFACE PLANS: NO SUBSURFACE PLANS ARE AVAILABLE ON THE PROJECT. THE CONTRACTOR SHOULD MAKE HIS OWN INVESTIGATION AS TO THE SUBSURFACE CONDITIONS.

ROADWAY STANDARD DRAWINGS

(REV. JANUARY 2012)

THE FOLLOWING ROADWAY STANDARDS AS APPEAR IN "ROADWAY STANDARD DRAWINGS" - ROADWAY DESIGN UNIT - N.C. DEPARTMENT OF TRANSPORTATION - RALEIGH, N.C., DATED JANUARY 2012 AND THE LATEST REVISION THERETO ARE APPLICABLE TO THIS PROJECT AND BY REFERENCE HEREBY ARE CONSIDERED A PART OF THESE PLANS.

CONSTRUCTION SEQUENCING

THIS STREAM MITIGATION PROJECT CONSISTS OF FIVE SITES. ONCE WORK BEGINS ON A STREAM SITE, THE CONTRACTOR MUST COMPLETE THAT SITE BEFORE MOVING WORK CREWS AND EQUIPMENT TO A DIFFERENT SITE, UNLESS APPROVED TO DO SO BY THE ENGINEER.

LAYOUT LOCATION OF THE NEW STREAM CHANNEL, CONSTRUCTION EASEMENT LIMITS, AND GRADE STAKES. THE ENGINEER MUST INSPECT AND APPROVE ALL LAYOUT WORK BEFORE CONSTRUCTION MAY BEGIN.

MOBILIZE EQUIPMENT AND MATERIALS TO THE SITE.

INSTALL CONSTRUCTION ENTRANCE PER EROSION CONTROL PLAN.

ESTABLISH STAGING AREAS AND MARK CONSTRUCTION EQUIPMENT ACCESS LOCATIONS WITH VISIBLE MARKERS. CONSTRUCTION EQUIPMENT SHALL BE CONTAINED WITHIN THE LIMITS OF CONSTRUCTION AS DEPICTED IN THE PLANS OR SPECIFIED BY THE ENGINEER.

INSTALL TEMPORARY EROSION CONTROL MEASURES.

BEGIN FLOODPLAIN GRADING, INCLUDING EXCAVATION OF BANKFULL BENCHES AT LOCATIONS DEPICTED IN THE PLANS AND AS DIRECTED BY THE ENGINEER. STOCKPILE MATERIALS IN AREAS DESIGNATED ON THE PLANS. KEEP TOPSOIL SEPARATE FROM OTHER STOCKPILE MATERIAL. TOPSOIL MATERIAL WILL BE USED LATER ON IN THE FLOODPLAIN.

TOPSOIL SHALL BE EXCAVATED AND STOCKPILED SEPARATELY FROM THE WASTE MATERIAL SO THAT IT CAN BE PLACED BACK ON THE FLOODPLAIN ONCE GRADING IS COMPLETE. NO DIRECT PAYMENT WILL BE MADE FOR THIS EXCAVATION.OVER-EXCAVATE FLOODPLAIN AND FLOODPLAIN SLOPES TO A DEPTH OF 6" BELOW FINAL GRADE AND PLACE 6" OF TOPSOIL TO FILL TO FINAL GRADE. OVER-EXCAVATION SHOULD BEGIN 3' FROM TOP OF BANK AND EXTEND TO EXCAVATION LIMITS. SEE TYPICAL SECTIONS FOR DETAIL.
INSTALL IMPERVIOUS DIKES AND PUMP AROUND SYSTEM TO PUMP STREAM DISCHARGE AROUND THE IMMEDIATE WORK AREA AS NECESSARY.

CONSTRUCTION SHALL PROCEED IN SUCCESSIVE REACHES WITH THE UPSTREAM REACH BEING COMPLETED PRIOR TO INITIATING CONSTRUCTION OF THE ADJACENT DOWNSTREAM REACH. EACH REACH SHALL BE LIMITED IN LENGTH TO WORK THAT CAN BE COMPLETED BEFORE ALLOWING WATER TO FLOW THROUGH THAT REACH. COMPLETION OF A REACH SHALL CONSIST OF CHANNEL CONSTRUCTION, FLOODPLAIN GRADING, IN-STREAM STRUCTURE INSTALLATION, BED MATERIAL INSTALLATION, AND EROSION CONTROL MEASURES. CONSTRUCTION SHALL BE DONE IN THE DRY, WITH THE CHANNEL FLOW PUMPED AROUND THE REACH UNDER CONSTRUCTION AS NECESSARY.

AT THE END OF EACH DAYS CONSTRUCTION WORK, THE CONTRACTOR SHALL SEED ALL DISTURBED AREAS AND COVER THE STREAM BANKS AND BANKFULL BENCHES WITH COIR FIBER MATTING. IN ADDITION, THE CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTAINING ALL TEMPORARY EROSION CONTROL MEASURES ON A DAILY BASIS THROUGHOUT THE CONSTRUCTION PROCESS.

ONCE NEW CHANNEL CONSTRUCTION IS COMPLETE, THE CONTRACTOR SHALL INSTALL STREAM PLUGS TO DIRECT STREAM FLOW INTO THE NEW CHANNEL. THE CONTRACTOR SHALL THEN FILL IN THE ABANDONED SECTIONS OF THE EXISTING CHANNEL TO THE EXTENT FEASIBLE AND AS DIRECTED BY THE ENGINEER. CONTRACTOR WILL ENSURE THAT VEGETATION HAS BEEN ESTABLISHED ALONG THE BANKS OF THE NEW STREAM CHANNEL BEFORE DIRECTING FLOW INTO THE NEW STREAM CHANNEL. FOR NEW STREAM CHANNEL REACHES WHERE THIS IS NOT POSSIBLE, THE CONTRACTOR SHOULD GET APPROVAL FROM THE ENGINEER BEFORE DIRECTING FLOW INTO THE NEW STREAM CHANNEL.

AFTER ALL IN-STREAM WORK IS COMPLETED, THE CONTRACTOR SHALL REMOVE TEMPORARY EROSION CONTROL MEASURES AND TEMPORARY STREAM ACCESS AND SCARIFY ANY COMPACTED AREAS AS DIRECTED BY THE ENGINEER. ALL PORTIONS OF THE SITE SHALL BE STABILIZED WITH TEMPORARY EROSION CONTROL MEASURES.

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NC LICENSE F-0102

PROJECT REFERENCE NO.	SHEET NO.
R-2413A&B	OSM-1A

PROJECT ENGINEER

APPROVED BY:

DATE:

INDEX OF SHEETS, CONSTRUCTION SEQUENCING, AND GENERAL NOTES

INDEX OF SHEETS

OSM-1	TITLE SHEET
OSM-1A	INDEX OF SHEETS, CONSTRUCTION SEQUENCING, GENERAL NOTES
OSM-1B	CONVENTIONAL PLAN SHEET SYMBOLS
OSM-2	TYPICAL SECTIONS
OSM-2A	DETAILS -COIR FIBER MATTING -ROCK CROSS VANE -LOG CROSS VANE -NATURAL ROCK ENERGY DISSIPATOR
OSM-2B	-CONSTRUCTED RIFFLE -ROOT WAD -ROCK A VANE -BOULDER TOE PROTECTION
OSM-2C	-ROCK VANE -LOG VANE -STREAM PLUG
OSM-2D	-EXAMPLE OF PUMP AROUND OPERATION -LOG SILL
OSM-2E-OSM-2G	-MORPHOLOGICAL TABLES
OSM-3	SUMMARY OF QUANTITIES EARTHWORK SUMMARY
OSM-4-10	PLAN SHEETS
OSM-11-17	PROFILE SHEETS
XS-01-XS-19	CROSS SECTIONS

REFORESTATION NOTES, DETAILS, AND PLANS WILL BE INCLUDED IN REU PLANS

STREAM SYMBOLS

PLAN VIEW SYMBOLS

ROCK VANE

LOG VANE

LOG CROSS VANE

LOG SILL

STORMWATER OUTLET STEP POOL

BB——BB BACK OF FLOODPLAIN BENCH

BOULDER TOE PROTECTION

ROCK A-VANE

ROCK CROSS VANE

CONSTRUCTED RIFFLE

STREAM PLUG

BACKFILL EXISTING CHANNEL

PROFILE SYMBOLS

EXISTING GROUND ELEVATION

PROPOSED GROUND ELEVATION

PROPOSED BANKFULL

PROPOSED LOG SILL

PROPOSED LOG CROSS VANE

CONSTRUCTED RIFFLE

PROPOSED ROCK CROSS VANE

PROPOSED ROCK A-VANE

PROPOSED STEP POOL STRUCTURE

$$$$$$$$SYSTIME$$$$$$$$
$$$$$$$$USERNAME$$$$$$$$

Rev-07-01-2013

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PROJECT REFERENCE NO.	SHEET NO.
R-2413A&B	OSM-1B

Note: Not to Scale

****S.U.E. = Subsurface Utility Engineering***

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

CONVENTIONAL PLAN SHEET SYMBOLS

BOUNDARIES AND PROPERTY:

- State Line
- County Line
- Township Line
- City Line
- Reservation Line
- Property Line
- Existing Iron Pin — EIP
- Property Corner
- Property Monument — ECM
- Parcel/Sequence Number — 123
- Existing Fence Line
- Proposed Woven Wire Fence
- Proposed Chain Link Fence
- Proposed Barbed Wire Fence
- Existing Wetland Boundary — WLB
- Proposed Wetland Boundary — WLB
- Existing Endangered Animal Boundary — EAB
- Existing Endangered Plant Boundary — EPB

BUILDINGS AND OTHER CULTURE:

- Gas Pump Vent or U/G Tank Cap
- Sign — S
- Well — W
- Small Mine
- Foundation
- Area Outline
- Cemetery
- Building
- School
- Church
- Dam

HYDROLOGY:

- Stream or Body of Water
- Hydro, Pool or Reservoir
- Jurisdictional Stream — JS
- Buffer Zone 1 — BZ 1
- Buffer Zone 2 — BZ 2
- Flow Arrow
- Disappearing Stream
- Spring
- Wetland
- Proposed Lateral, Tail, Head Ditch — FLOW
- False Sump

RAILROADS:

- Standard Gauge — CSX TRANSPORTATION
- RR Signal Milepost — MILEPOST 35
- Switch — SWITCH
- RR Abandoned
- RR Dismantled

RIGHT OF WAY:

- Baseline Control Point
- Existing Right of Way Marker
- Existing Right of Way Line
- Proposed Right of Way Line — RW
- Proposed Right of Way Line with Iron Pin and Cap Marker — RW
- Proposed Right of Way Line with Concrete or Granite Marker — RW
- Existing Control of Access — CA
- Proposed Control of Access — CA
- Existing Easement Line — E
- Proposed Temporary Construction Easement — E
- Proposed Temporary Drainage Easement — TDE
- Proposed Permanent Drainage Easement — PDE
- Proposed Permanent Drainage / Utility Easement — DUE
- Proposed Permanent Utility Easement — PUE
- Proposed Temporary Utility Easement — TUE
- Proposed Permanent Easement with Iron Pin and Cap Marker

ROADS AND RELATED FEATURES:

- Existing Edge of Pavement
- Existing Curb
- Proposed Slope Stakes Cut — C
- Proposed Slope Stakes Fill — F
- Proposed Wheel Chair Ramp — WCR
- Existing Metal Guardrail
- Proposed Guardrail
- Existing Cable Guiderail
- Proposed Cable Guiderail
- Equality Symbol
- Pavement Removal

VEGETATION:

- Single Tree
- Single Shrub
- Hedge
- Woods Line
- Orchard
- Vineyard

EXISTING STRUCTURES:

MAJOR:

- Bridge, Tunnel or Box Culvert — CONC
- Bridge Wing Wall, Head Wall and End Wall — CONC WW

MINOR:

- Head and End Wall — CONC HW
- Pipe Culvert
- Footbridge
- Drainage Box: Catch Basin, DI or JB — CB
- Paved Ditch Gutter
- Storm Sewer Manhole — S
- Storm Sewer — S

UTILITIES:

POWER:

- Existing Power Pole
- Proposed Power Pole
- Existing Joint Use Pole
- Proposed Joint Use Pole
- Power Manhole — P
- Power Line Tower
- Power Transformer
- U/G Power Cable Hand Hole — HH
- H-Frame Pole
- Recorded U/G Power Line — P
- Designated U/G Power Line (S.U.E.*) — P

TELEPHONE:

- Existing Telephone Pole
- Proposed Telephone Pole
- Telephone Manhole — T
- Telephone Booth
- Telephone Pedestal — T
- Telephone Cell Tower
- U/G Telephone Cable Hand Hole — HH
- Recorded U/G Telephone Cable — T
- Designated U/G Telephone Cable (S.U.E.*) — T
- Recorded U/G Telephone Conduit — TC
- Designated U/G Telephone Conduit (S.U.E.*) — TC
- Recorded U/G Fiber Optics Cable — T FO
- Designated U/G Fiber Optics Cable (S.U.E.*) — T FO

WATER:

- Water Manhole — W
- Water Meter
- Water Valve
- Water Hydrant
- Recorded U/G Water Line — W
- Designated U/G Water Line (S.U.E.*) — W
- Above Ground Water Line — A/G Water

TV:

- TV Satellite Dish
- TV Pedestal — TV
- TV Tower
- U/G TV Cable Hand Hole — HH
- Recorded U/G TV Cable — TV
- Designated U/G TV Cable (S.U.E.*) — TV
- Recorded U/G Fiber Optic Cable — TV FO
- Designated U/G Fiber Optic Cable (S.U.E.*) — TV FO

GAS:

- Gas Valve
- Gas Meter
- Recorded U/G Gas Line — G
- Designated U/G Gas Line (S.U.E.*) — G
- Above Ground Gas Line — A/G Gas

SANITARY SEWER:

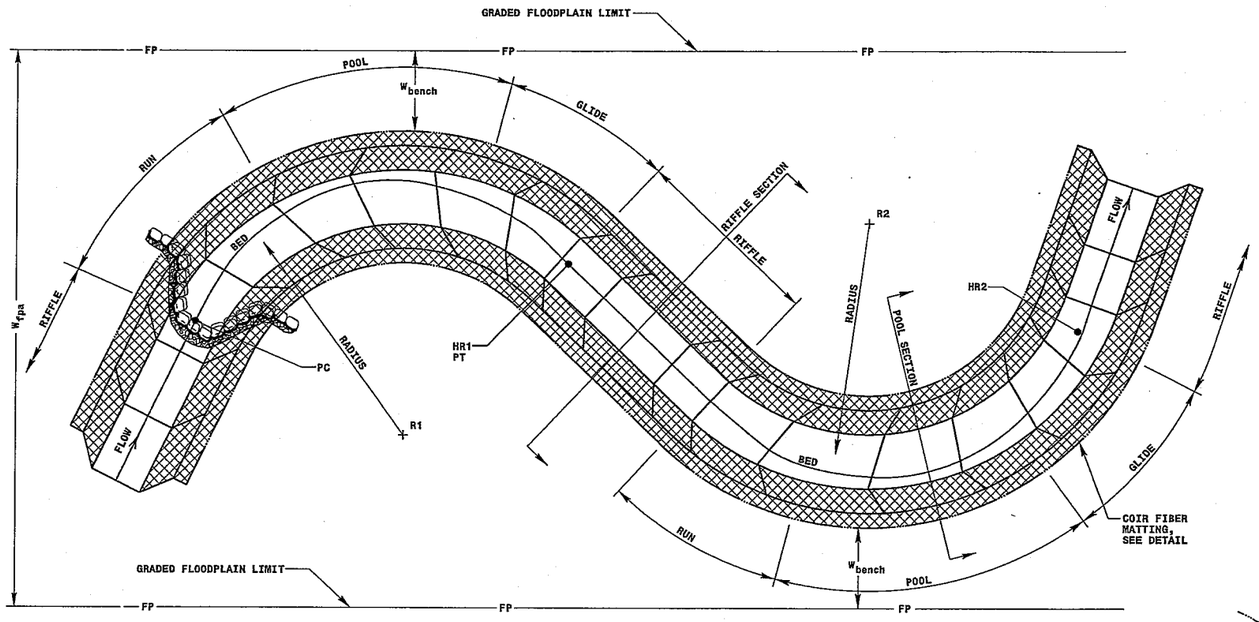
- Sanitary Sewer Manhole
- Sanitary Sewer Cleanout
- U/G Sanitary Sewer Line — SS
- Above Ground Sanitary Sewer — A/G Sanitary Sewer
- Recorded SS Forced Main Line — FSS
- Designated SS Forced Main Line (S.U.E.*) — FSS

MISCELLANEOUS:

- Utility Pole
- Utility Pole with Base
- Utility Located Object
- Utility Traffic Signal Box — S
- Utility Unknown U/G Line — ?U/L
- U/G Tank; Water, Gas, Oil
- A/G Tank; Water, Gas, Oil
- U/G Test Hole (S.U.E.*)
- Abandoned According to Utility Records — AATUR
- End of Information — E.O.I.

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05/26/11



TYPICAL PLAN

PREPARED IN THE OFFICE OF:

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NC LICENSE F-0102

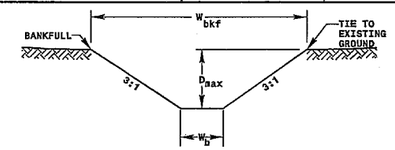
PROJECT REFERENCE NO.	SHEET NO.
R-2413A&B	OSM-2

PROJECT ENGINEER

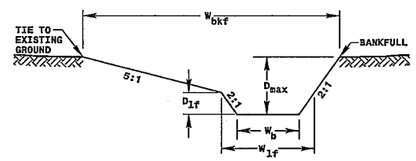
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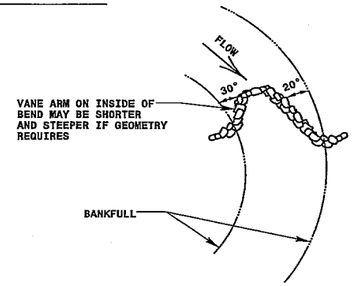
TYPICAL SECTIONS



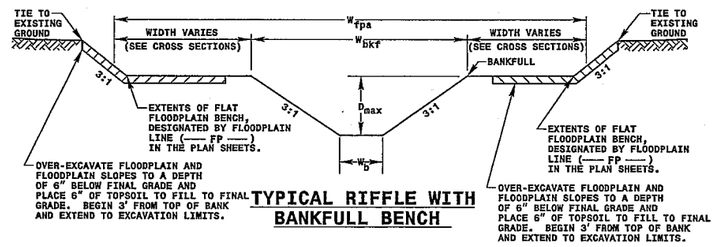
TYPICAL RIFFLE



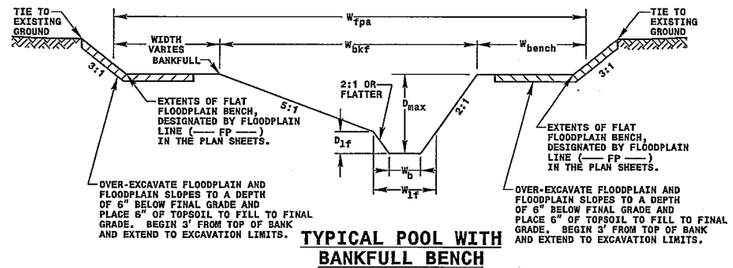
TYPICAL POOL



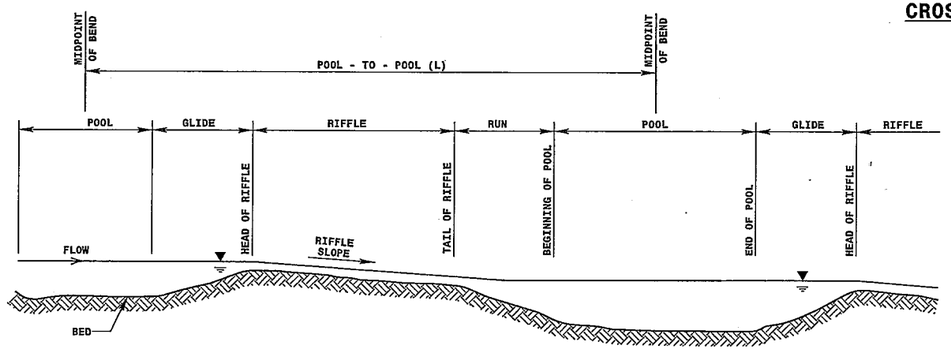
CROSS VANE CONSTRUCTION IN MEANDER-BEND PLAN VIEW



TYPICAL RIFFLE WITH BANKFULL BENCH



TYPICAL POOL WITH BANKFULL BENCH



TYPICAL PROFILE

NOTES:
1. THE COORDINATES FOR EACH CENTER OF RADIUS (EX. "R1","R2") AND EACH HEAD OF RIFFLE (EX. "HR1", "HR2") ARE INDICATED ON THE PLAN SHEETS.

W_{bkf} = BANKFULL WIDTH
D_{max} = MAXIMUM DEPTH
W_b = BOTTOM WIDTH
W_{fpa} = FLOOD PRONE AREA WIDTH
W_{lf} = LOW FLOW WIDTH
D_{lf} = LOW FLOW DEPTH

CHANNEL TYPICAL DETAIL

NOT TO SCALE

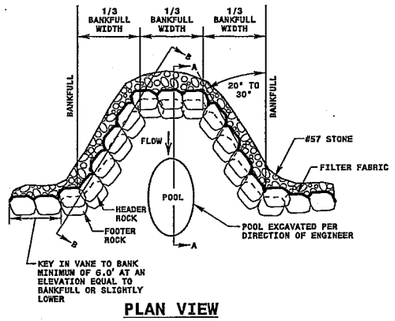
CROSS-SECTION DIMENSIONS (IN FEET)

		RIFFLE				POOL							
SITE	REACH	W_{bkf}	D_{max}	W_b	W_{fpa}	W_{bkf}	W_{lf}	D_{lf}	D_{max}	W_b	W_{fpa}	W_{bench}	Width/Depth Ratio
SITE 1-UPPER	SEE PLAN SHEETS FOR DRAFT STATIONS	7.6	0.8	2.8	SEE CROSS SECTIONS	9.4	3.8	0.7	1.5	1.0	SEE CROSS SECTIONS	3.8 MIN.	13.9
SITE 1-LOWER	SEE PLAN SHEETS FOR DRAFT STATIONS	8.4	0.9	3.0	SEE CROSS SECTIONS	10.6	4.3	0.7	1.6	1.5	SEE CROSS SECTIONS	4.2 MIN.	13.8
SITE 2	SEE PLAN SHEETS FOR DRAFT STATIONS	7.6	0.8	2.8	SEE CROSS SECTIONS	9.4	3.8	0.7	1.5	1.0	SEE CROSS SECTIONS	3.8 MIN.	13.9
SITE 3	SEE PLAN SHEETS FOR DRAFT STATIONS	7.3	0.8	2.5	SEE CROSS SECTIONS	9.4	3.8	0.7	1.5	1.0	SEE CROSS SECTIONS	3.7 MIN.	13.6
SITE 4	SEE PLAN SHEETS FOR DRAFT STATIONS	25.0	2.5	10.0	SEE CROSS SECTIONS	30.5	13.0	2.0	4.5	5.0	SEE CROSS SECTIONS	12.5 MIN.	14.3
SITE 5	SEE PLAN SHEETS FOR DRAFT STATIONS	11.7	1.2	4.5	SEE CROSS SECTIONS	14.4	6.0	1.0	2.2	2.0	SEE CROSS SECTIONS	5.9 MIN.	14.1

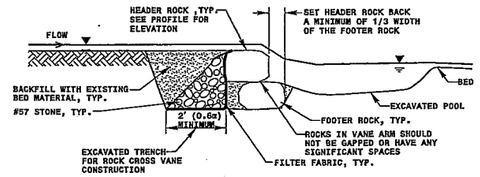
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$$$$ENGINEER$$$$
$$$$DRAWN$$$$
$$$$CHECKED$$$$

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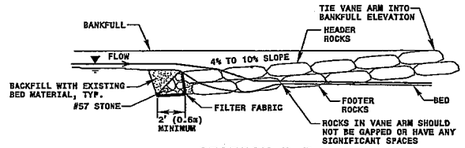
09/25/11



PLAN VIEW



SECTION A-A



SECTION B-B

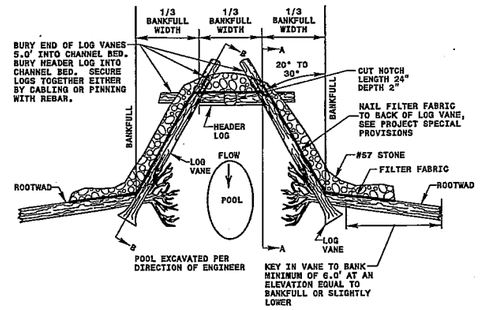
BOULDER SIZE DATA CHART			
REACH	BOULDER DIMENSIONS HEIGHT	WIDTH	LENGTH
SITE 1	2'	3'	4'
SITE 2	2'	3'	4'
SITE 3	2'	3'	4'
SITE 4	2'	3'	4'
SITE 5	2'	3'	4'

NOTE: THESE DIMENSIONS SPECIFY THE MINIMUM BOULDER SIZE

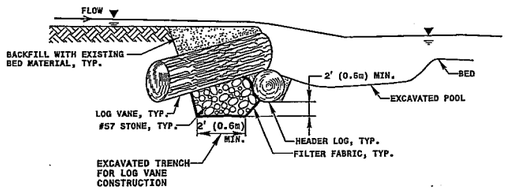
NOTES:
1. DEEPEST PART OF POOL TO BE IN LINE WITH WHERE VANE ARM TIES INTO BANKFULL.
2. DO NOT EXCAVATE POOL TOO CLOSE TO FOOTER BOULDERS.
3. CLASS "A" STONE CAN BE USED TO REDUCE VOIDS BETWEEN HEADERS AND FOOTERS.
4. COMPACT BACKFILL TO EXTENT POSSIBLE OR AT THE DIRECTION OF THE ENGINEER.
5. POOL DEPTH SHOULD BE 2 TO 3 TIMES BANKFULL DEPTH.

ROCK CROSS VANE DETAIL

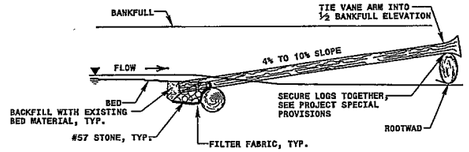
NOT TO SCALE



PLAN VIEW



SECTION A-A



SECTION B-B

NOTES:
1. DEEPEST PART OF POOL TO BE IN LINE WITH WHERE VANE ARM TIES INTO BANKFULL.
2. DO NOT EXCAVATE POOL TOO CLOSE TO FOOTER BOULDERS.
3. CLASS "A" STONE CAN BE USED TO REDUCE VOIDS BETWEEN HEADERS AND FOOTERS.
4. COMPACT BACKFILL TO EXTENT POSSIBLE OR AT THE DIRECTION OF THE ENGINEER.
5. POOL DEPTH SHOULD BE 2 TO 3 TIMES BANKFULL DEPTH.

LOG CROSS VANE DETAIL

NOT TO SCALE

PREPARED IN THE OFFICE OF:
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NC LICENSE F-0102

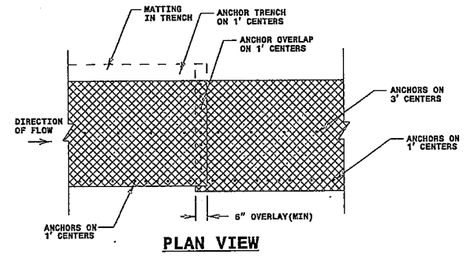
PROJECT REFERENCE NO.	SHEET NO.
R-2413A&B	OSM-2A

PROJECT ENGINEER

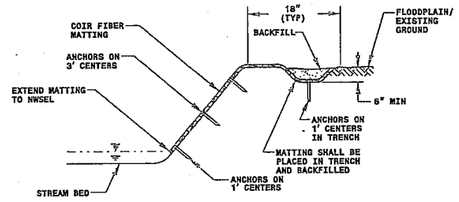
APPROVED BY:

DATE:

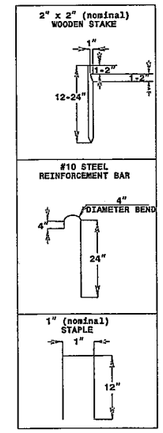
DETAILS 1 OF 4



PLAN VIEW



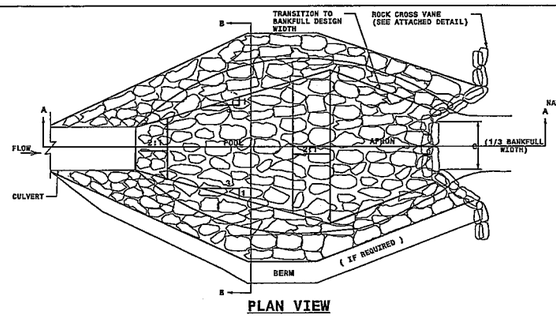
TYPICAL CROSS SECTION



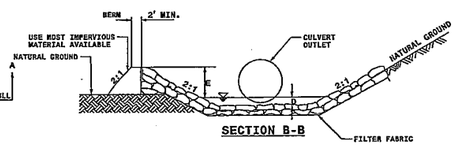
ANCHOR OPTIONS

COIR FIBER MATTING DETAIL

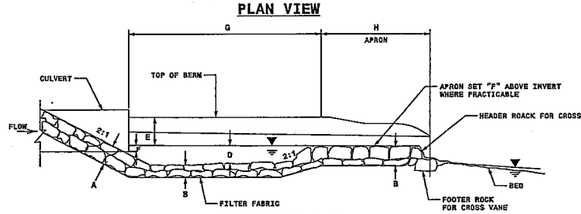
NOT TO SCALE



PLAN VIEW



SECTION B-B



SECTION A-A

SITE NUMBER	STREAM STATION	CULVERT SIZE	RIP RAP BASIN A	B	C	D	E	F	G	H
2	350+02	54" RCP	2.5	2.0	4.0	2.0	3.0	0.3	20	10

ALL DIMENSIONS APPROXIMATE IN FEET

NOTE: DISSIPATOR ROCKS SHOULD BE NATIVE STONE OR SHOT ROCK, ANGULAR AND OBLONG WITH AN APPROXIMATE d50 SIZE OF CLASS I.

NATURAL ROCK ENERGY DISSIPATOR DETAIL

NOT TO SCALE

SYSTIME=09/25/2011 09:25:11

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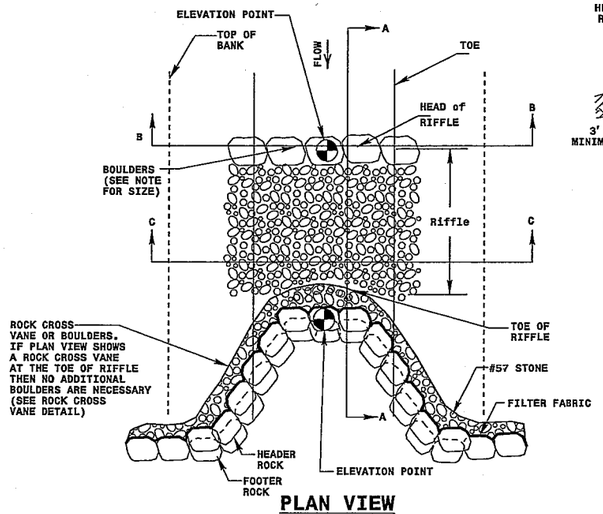
PROJECT REFERENCE NO.	SHEET NO.
R-2413A&B	OSM-2B

PROJECT ENGINEER

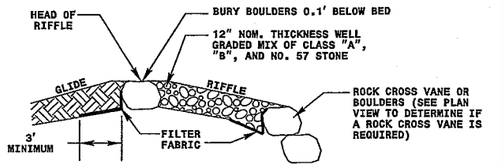
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DATE:

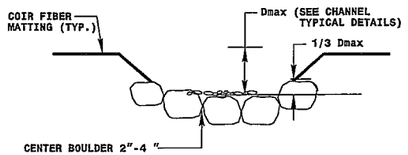
DETAILS 2 OF 4



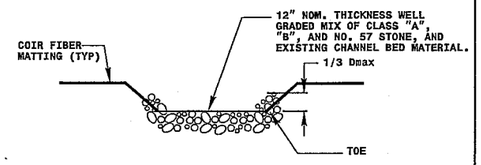
PLAN VIEW



SECTION A-A



SECTION B-B

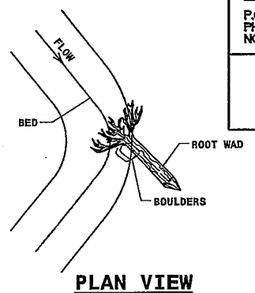


SECTION C-C

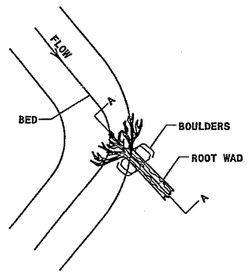
NOTE:
1. BOULDERS SHOULD BE NATIVE STONES OR SHOT ROCK, ANGULAR AND OBLONG, WITH AN AXIS APPROXIMATELY 4'Lx3'Wx2'D
2. NOT ALL CONSTRUCTED RIFFLES REQUIRE A ROCK CROSS VANE ON THE TOE OF RIFFLE.
3. IF NO ROCK CROSS VANE IS PROPOSED AT THE TOE OF RIFFLE, INSTALL BOULDERS AT THE TOE OF RIFFLE TO SECURE CONSTRUCTED RIFFLE MATERIAL.

CONSTRUCTED RIFFLE DETAIL

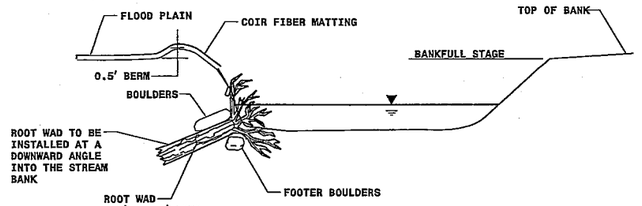
NOT TO SCALE



PLAN VIEW
DRIVE POINT METHOD



PLAN VIEW
TRENCHING METHOD



SECTION A-A

NOTES:

ORIENT ROOT WADS SO THAT THE STREAM FLOW MEETS THE ROOT WAD STRAIGHT ON, DEFLECTING THE WATER AWAY FROM THE BANK.

METHODS OF INSTALLATION:

DRIVE POINT METHOD:

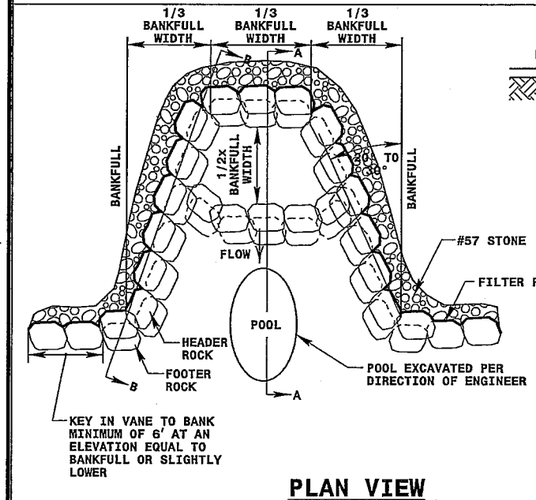
SHARPEN THE END OF THE LOG BEFORE "DRIVING" AT A DOWNWARD ANGLE INTO THE BANK. BOULDER SHOULD BE PLACED ON EACH SIDE OF THE ROOT WAD TO PIN IT IN PLACE. THE BOULDERS SHALL BE APPROXIMATELY 2' X 3' X 4'. ONE-THIRD OF THE ROOT WAD SHOULD REMAIN BELOW NORMAL BASE FLOW CONDITIONS.

TRENCHING METHOD:

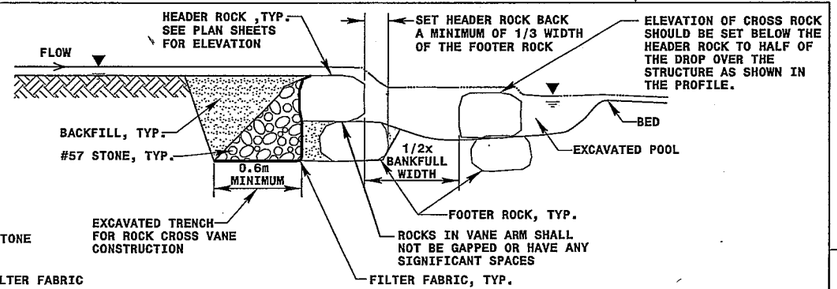
IF THE ROOT WAD CANNOT BE DRIVEN INTO THE BANK OR THE BANK NEEDS TO BE RECONSTRUCTED, THE TRENCHING METHOD SHOULD BE USED. THIS METHOD REQUIRES THAT A TRENCH BE EXCAVATED FOR THE LOG PORTION OF THE ROOT WAD. IN THIS CASE, FOOTER BOUDERS SHOULD BE INSTALLED UNDERNEATH THE ROOT WAD IN A TRENCH EXCAVATED PARALLEL TO THE BANK AND WELL BELOW THE STREAM BED. BOULDERS SHOULD BE PLACED ON EACH SIDE OF THE ROOTWAD TO PIN IT IN PLACE. THE BOULDERS SHOULD BE APPROXIMATELY 2' X 3' X 4'. ONE-THIRD OF THE ROOT WAD SHOULD REMAIN BELOW NORMAL BASE FLOW CONDITIONS.

ROOT WAD DETAIL

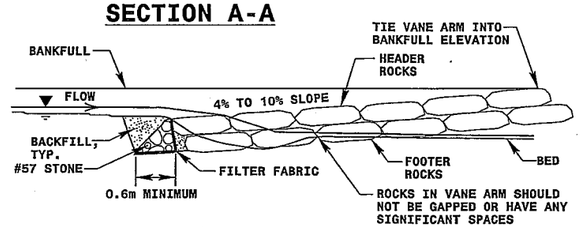
NOT TO SCALE



PLAN VIEW



SECTION A-A



SECTION B-B

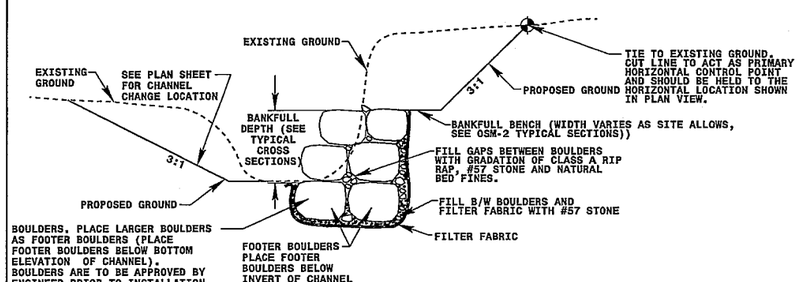
BOULDER SIZE DATA CHART			
	BOULDER DIMENSIONS		
REACH	HEIGHT	WIDTH	LENGTH
SITE 1	2'	3'	4'
SITE 2	2'	3'	4'
SITE 3	2'	3'	4'
SITE 4	2'	3'	4'
SITE 5	2'	3'	4'

NOTE: THESE DIMENSIONS SPECIFY THE MINIMUM BOULDER SIZE

NOTES:
1. DEEPEST PART OF POOL TO BE IN LINE WITH WHERE VANE ARM TIES INTO BANKFULL.
2. DO NOT EXCAVATE POOL TOO CLOSE TO FOOTER BOULDERS.
3. CLASS "A" STONE CAN BE USED TO REDUCE VOIDS BETWEEN HEADERS AND FOOTERS.
4. COMPACT BANKFULL TO EXTENT POSSIBLE OR AT THE DIRECTION OF THE ENGINEER.
5. POOL DEPTH SHOULD BE 2 TO 3 TIMES BANKFULL DEPTH.

ROCK A VANE DETAIL

NOT TO SCALE

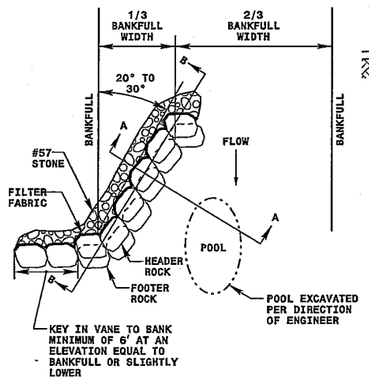


BOULDER TOE PROTECTION

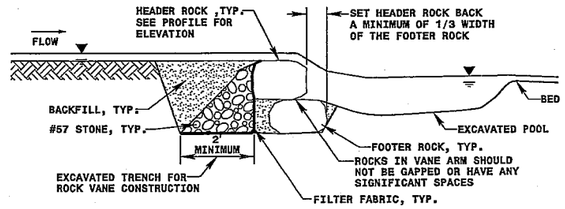
NOT TO SCALE

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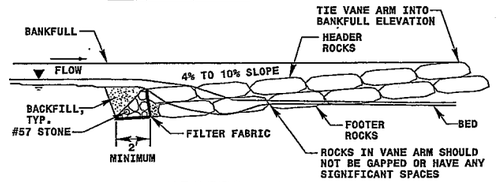
09/26/11



PLAN VIEW



SECTION A-A



SECTION B-B

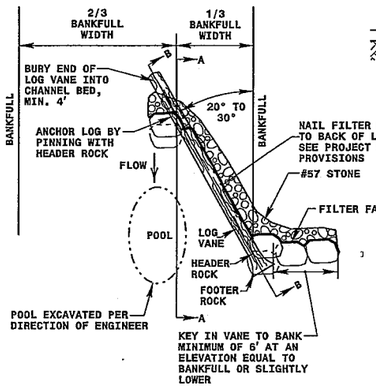
BOULDER SIZE DATA CHART			
REACH	BOULDER DIMENSIONS HEIGHT	WIDTH	LENGTH
SITE 1	2'	3'	4'
SITE 2	2'	3'	4'
SITE 3	2'	3'	4'
SITE 4	2'	3'	4'
SITE 5	2'	3'	4'

NOTE: THESE DIMENSIONS SPECIFY THE MINIMUM BOULDER SIZE

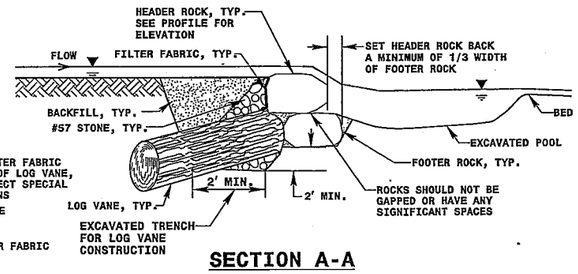
NOTES:
1. DEEPEST PART OF POOL TO BE IN LINE WITH WHERE VANE ARM TIES INTO BANKFULL.
2. DO NOT EXCAVATE POOL TOO CLOSE TO FOOTER BOULDERS.
3. CLASS "A" STONE CAN BE USED TO REDUCE VOIDS BETWEEN HEADERS AND FOOTERS.
4. COMPACT BACKFILL TO EXTENT POSSIBLE OR AT THE DIRECTION OF THE ENGINEER.
5. POOL DEPTH SHOULD BE 2 TO 3 TIMES BANKFULL DEPTH.

ROCK VANE DETAIL

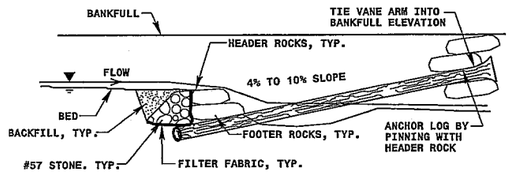
NOT TO SCALE



PLAN VIEW



SECTION A-A



SECTION B-B

BOULDER SIZE DATA CHART			
REACH	BOULDER DIMENSIONS HEIGHT	WIDTH	LENGTH
SITE 1	2'	3'	4'
SITE 2	2'	3'	4'
SITE 3	2'	3'	4'
SITE 4	2'	3'	4'
SITE 5	2'	3'	4'

NOTE: THESE DIMENSIONS SPECIFY THE MINIMUM BOULDER SIZE

NOTES:
1. DEEPEST PART OF POOL TO BE IN LINE WITH WHERE VANE ARM TIES INTO BANKFULL.
2. DO NOT EXCAVATE POOL TOO CLOSE TO FOOTER BOULDERS.
3. CLASS "A" STONE CAN BE USED TO REDUCE VOIDS BETWEEN HEADERS AND FOOTERS.
4. COMPACT BACKFILL TO EXTENT POSSIBLE OR AT THE DIRECTION OF THE ENGINEER.
5. POOL DEPTH SHOULD BE 2 TO 3 TIMES BANKFULL DEPTH.

LOG VANE DETAIL

NOT TO SCALE

$$$$SYSTIME$$$$
$$$$USERNAME$$$$
$$$$DGN$$$$

PREPARED IN THE OFFICE OF:
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PROJECT REFERENCE NO.	SHEET NO.
R-2413A&B	OSM-2C

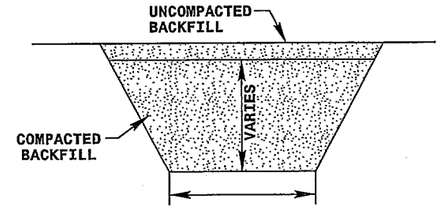
PROJECT ENGINEER

APPROVED BY:

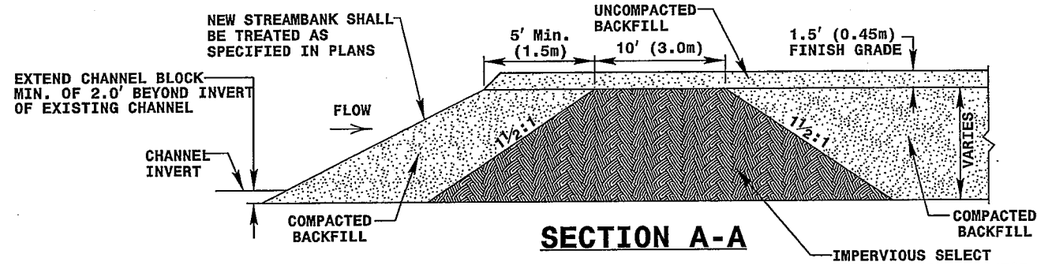
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DETAILS 3 OF 4

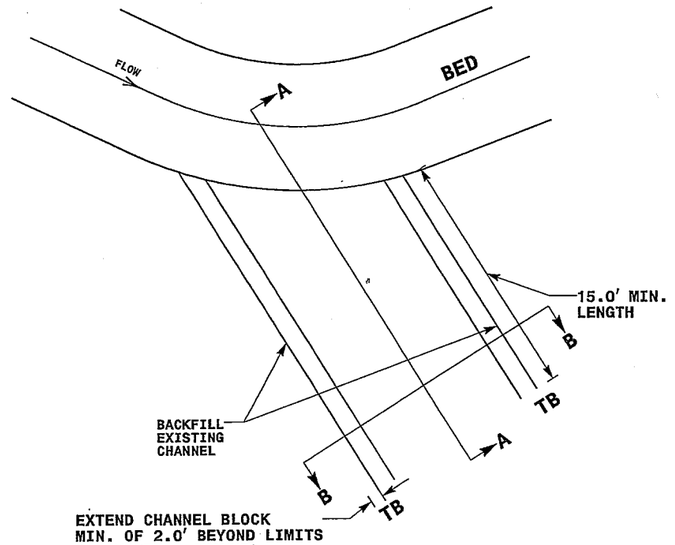
NOTES:
1) CHANNEL BLOCK SHALL BE INSTALLED IN ACCORDANCE WITH THE PROJECT SPECIFICATIONS.
2) BLOCK SHOULD BE INSTALLED AT THE INTERFACE BETWEEN EXISTING CHANNEL AND PROPOSED CHANNEL.
3) BOTTOM OF BLOCK SHOULD BE A MINIMUM OF 2.0' BELOW THE INVERT OF THE EXISTING CHANNEL.
4) BLOCK SHOULD EXTEND A MINIMUM OF 2.0' BEYOND THE LIMITS OF THE EXISTING STREAM CHANNEL.
5) INSTALL EROSION CONTROL MATTING AND SEED IN ACCORDANCE WITH THE PROJECT SPECIFICATIONS IMMEDIATELY AFTER GRADING.
6) COMPACT BACKFILL TO EXTENT POSSIBLE OR AT THE DIRECTION OF THE ENGINEER.



SECTION B-B



SECTION A-A



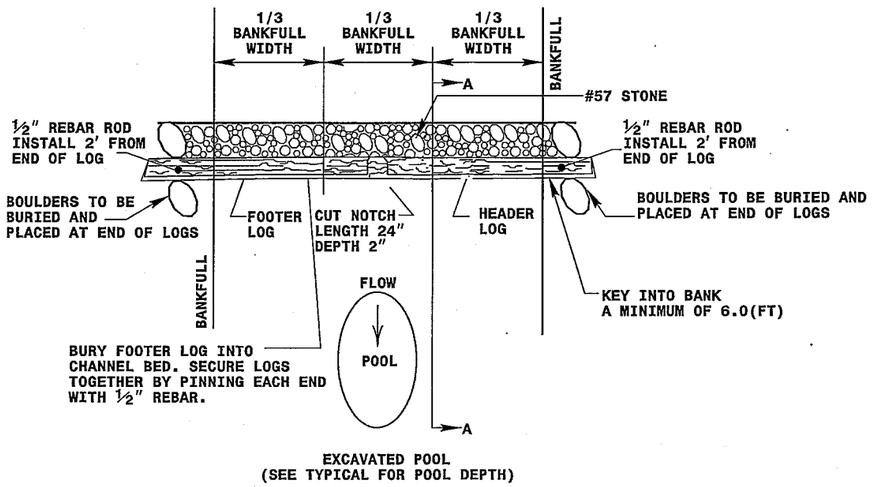
PLAN VIEW

STREAM PLUG

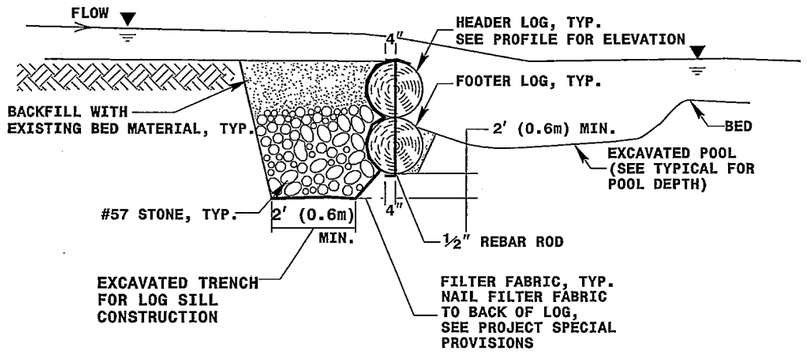
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09/26/11



PLAN VIEW



SECTION A-A

NOTES:

1. DO NOT EXCAVATE POOL CLOSE TO FOOTER LOG.
2. CLASS "A" STONE CAN BE USED TO REDUCE VOIDS BETWEEN HEADERS AND FOOTERS.
3. COMPACT BACKFILL TO EXTENT POSSIBLE OR AT THE DIRECTION OF THE ENGINEER.
4. POOL DEPTH SHOULD BE 2 TO 3 TIMES BANKFULL DEPTH.
5. BOULDERS TO BE 2'x3'x4' MIN.

LOG SILL DETAIL

NOT TO SCALE

$$$$USERNAME$$$$
$$$$SYSTIME$$$$
$$$$DGN$$$$

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Kimley-Horn and Associates, Inc.
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PROJECT REFERENCE NO.	SHEET NO.
R-2413A&B	OSM-2D

PROJECT ENGINEER

APPROVED BY:

DATE:

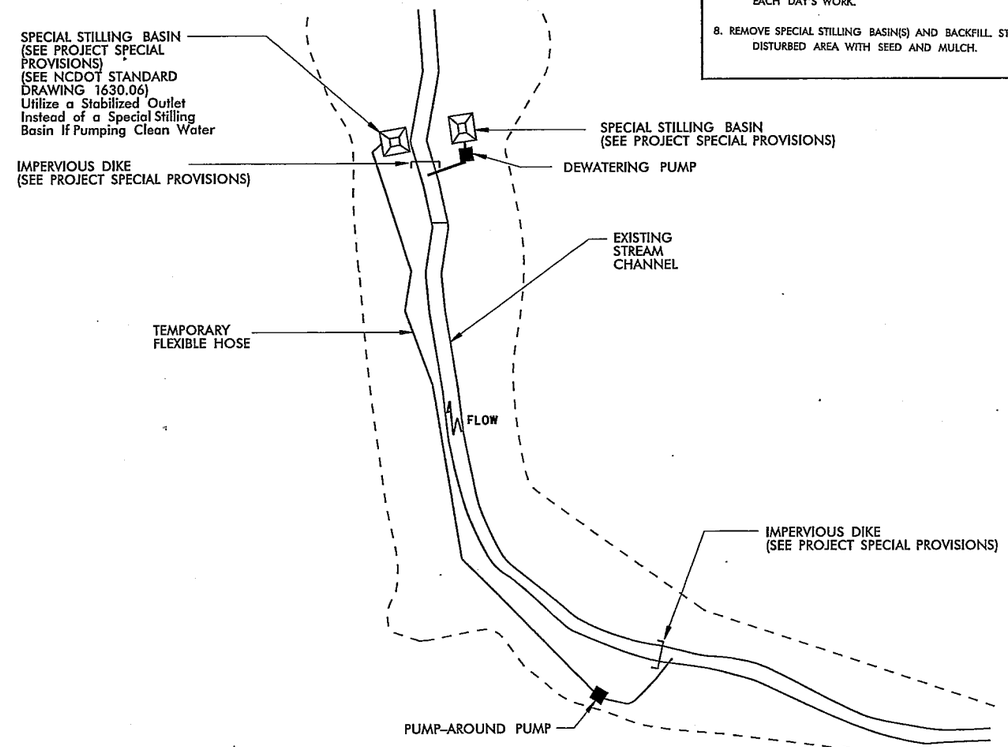
DETAILS 4 OF 4

NOTES:

1) All excavation shall be performed in only dry or isolated sections of channel.
2) Impervious dikes are to be used to isolate work from stream flow when necessary.
3) All graded areas shall be stabilized within 24 hours.
4) Maintenance of stream flow operations shall be incidental to the work. This includes polyethylene sheeting, diversion pipes, pumps and hoses.
5) Pumps and hoses shall be of sufficicient size to dewater the work area.

SEQUENCE OF CONSTRUCTION FOR PUMP AROUND OPERATION

1. INSTALL SPECIAL STILLING BASIN(S).
2. INSTALL UPSTREAM PUMP AND TEMPORARY FLEXIBLE HOSE.
3. PLACE UPSTREAM IMPERVIOUS DIKE AND BEGIN PUMPING OPERATIONS FOR STREAM DIVERSION.
4. PLACE DOWNSTREAM IMPERVIOUS DIKE AND PUMPING APPARATUS. DEWATER ENTRAPPED AREA. AREA TO BE DEWATERED SHALL BE EQUAL TO ONE DAY'S WORK.
5. PERFORM STREAM RESTORATION WORK IN ACCORDANCE WITH THE PLANS.
6. EXCAVATE ANY ACCUMULATED SILT AND DEWATER BEFORE REMOVAL OF IMPERVIOUS DIKES. REMOVE IMPERVIOUS DIKES, PUMPS, AND TEMPORARY FLEXIBLE HOSE. (DOWNSTREAM IMPERVIOUS DIKES FIRST).
7. ALL GRADING AND STABILIZATION MUST BE COMPLETED IN ONE DAY WITHIN THE PUMP AROUND AREAS BETWEEN THE IMPERVIOUS DIKES. THE IMPERVIOUS DIKE LOCATIONS AS SHOWN ON THIS SHEET ONLY SHOW THE UPPER AND LOWER EXTENT OF WORK FOR EACH STREAM SEGMENT. THE CONTRACTOR IS RESPONSIBLE FOR DETERMINING THE LOCATION OF THE IMPERVIOUS DIKE(S) FOR EACH DAY'S WORK.
8. REMOVE SPECIAL STILLING BASIN(S) AND BACKFILL. STABILIZE DISTURBED AREA WITH SEED AND MULCH.



EXAMPLE OF PUMP-AROUND OPERATION

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PREPARED IN THE OFFICE OF:
Kimley-Horn and Associates, Inc.
P.O. BOX 33068 - RALEIGH, NORTH CAROLINA 27636-3068
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NC LICENSE F-0102

PROJECT REFERENCE NO.	SHEET NO.
R-2413A&B	OSM-2E

PROJECT ENGINEER

APPROVED BY:

DATE:

MORPHOLOGICAL TABLE

VARIABLES	Reference Reach Tributary to Riddicks Creek (KHA)	Reference Reach Riddicks Creek (KHA)	Reference Reach Tributary to Lake Jeanette (NCDOT)	Reference Reach Tributary to Rich Fork (KHA)	SITE 1 UPPER EXISTING	Regional Curves Peidmont Rural/Rosgen Reference Values	SITE 1 UPPER DESIGN	SITE 1 LOWER EXISTING	Regional Curves Peidmont Rural/Rosgen Reference Values	SITE 1 LOWER DESIGN
STATION	--	--	--	--	--	--	--	--	--	--
1. Stream Type (Rosgen)	C5	E5	E5	B4	G5	C/E	C5	G5	C/E	C5
2. Drainage Area (sq. mile)	0.18	0.07	0.15	1.12	0.13	0.13	0.13	0.13	0.13	0.13
3. Bankfull Width	Mean: 7.9	Mean: 6.6	Mean: 12.0	Mean: 15.2	Mean: 5.9	Mean: 5.0	Mean: 7.6	Mean: 8.8	Mean: 5.0	Mean: 8.4
(W_{bkf})	Range: -- --	Range: 5.7 7.5	Range: 12.0 13.5	Range: -- --	Range: -- --	Range: -- --	Range: -- --	Range: -- --	Range: -- --	Range: -- --
4. Bankfull Mean	Mean: 0.6	Mean: 0.8	Mean: 1.6	Mean: 1.2	Mean: 1.18	Mean: 0.8	Mean: 0.5	Mean: 1.78	Mean: 0.8	Mean: 0.6
depth (d_{bkf})	Range: -- --	Range: 0.7 0.8	Range: 1.4 1.7	Range: -- --	Range: -- --	Range: -- --	Range: -- --	Range: -- --	Range: -- --	Range: -- --
5. Width/Depth Ratio	Mean: 13.5	Mean: 8.7	Mean: 8.4	Mean: 12.7	Mean: 5.0	Mean: 6.3	Mean: 13.9	Mean: 3.8	Mean: 6.3	Mean: 13.8
(W_{bkf}/d_{bkf})	Range: -- --	Range: 8.2 9.2	Range: 7.1 9.6	Range: -- --	Range: -- --	Range: -- --	Range: -- --	Range: -- --	Range: -- --	Range: -- --
6. Bankfull cross-sectional	Mean: 4.6	Mean: 5.1	Mean: 19.4	Mean: 19.0	Mean: 4.0	Mean: 5.4	Mean: 4.2	Mean: 12.0	Mean: 5.4	Mean: 5.1
Area (Abkf)	Range: -- --	Range: 4.0 6.1	Range: 18.8 20.0	Range: -- --	Range: -- --	Range: -- --	Range: -- --	Range: -- --	Range: -- --	Range: -- --
7. Bankfull Mean Velocity	Mean: Not Reported	Mean: Not Reported	Mean: 5.6	Mean: 5.1	Mean: 4.3	Mean: 3.8	Mean: 4.2	Mean: 2.5	Mean: 3.8	Mean: 5.9
(V_{bkf})	Range: -- --	Range: -- --	Range: 5.2 6.2	Range: -- --	Range: 4.0 4.7	Range: -- --	Range: 3.9 4.6	Range: 2.4 2.8	Range: -- --	Range: 5.5 6.5
8. Bankfull Discharge, cfs	Mean: Not Reported	Mean: Not Reported	Mean: 109.3	Mean: 96.9	Mean: 17.4	Mean: 20.8	Mean: 17.4	Mean: 30.2	Mean: 20.8	Mean: 30.2
(Q_{bkf})	Range: -- --	Range: -- --	Range: 100.7 119.6	Range: -- --	Range: 16.2 19.0	Range: -- --	Range: 16.2 19.0	Range: 28.2 33.4	Range: -- --	Range: 28.2 33.4
9. Bankfull Maximum Depth	Mean: 1.0	Mean: 1.5	Mean: 2.9	Mean: 1.9	Mean: 1.4	Mean: --	Mean: 0.8	Mean: 1.8	Mean: --	Mean: 0.9
(d_{max})	Range: -- --	Range: 1.3 1.6	Range: -- --	Range: -- --	Range: -- --	Range: -- --	Range: -- --	Range: -- --	Range: -- --	Range: -- --
10. Max d_{max}/d_{bkf}	Mean: 1.7	Mean: 2.0	Mean: 2.4	Mean: 1.6	Mean: 1.2	Mean: 1.4	Mean: 1.5	Mean: 1.0	Mean: 1.4	Mean: 1.5
ratio	Range: -- --	Range: 1.9 2.0	Range: -- --	Range: -- --	Range: -- --	Range: 1.2 1.5	Range: -- --	Range: -- --	Range: 1.2 1.5	Range: -- --
11. Low Bank Height to max	Mean: 1.0	Mean: 1.3	Mean: Not Reported	Mean: 1.1	Mean: 3.5	Mean: --	Mean: 1.0	Mean: 2.1	Mean: --	Mean: 1.0
d_{bkf} ratio	Range: -- --	Range: 1.20 2.50	Range: -- --	Range: -- --	Range: -- --	Range: -- --	Range: -- --	Range: -- --	Range: -- --	Range: -- --
12. Width of Flood Prone	Mean: 36.0	Mean: 27.4	Mean: 49.0	Mean: 23.3	Mean: 8.0	Mean: --	Mean: 80.0	Mean: 9.0	Mean: --	Mean: 84.0
Area (W_{fpa})	Range: -- --	Range: 20.0 34.0	Range: -- --	Range: -- --	Range: -- --	Range: -- --	Range:	Range: -- --	Range: -- --	Range: -- --
13. Entrenchment Ratio	Mean: 4.6	Mean: 4.2	Mean: 4.4	Mean: 1.5	Mean: 1.4	Mean: --	Mean: 10.5	Mean: 1.3	Mean: --	Mean: 10.0
(W_{fpa}/W_{bkf})	Range: -- --	Range: 3.5 4.6	Range: 4.1 4.7	Range: -- --	Range: -- --	Range: -- --	Range: -- --	Range: -- --	Range: -- --	Range: -- --
14. Meander Length	Mean: 80.5	Mean: 32.0	Mean: 22.0	Mean: --	Mean: 73.5	Mean: --	Mean: 85.0	Mean: 79.5	Mean: --	Mean: 103.0
(L_m)	Range: 64.0 97.0	Range: 25.0 45.0	Range: 22.0 69.0	Range: -- --	Range: 43.0 104.0	Range: -- --	Range: 68.4 106.4	Range: 75.0 84.0	Range: -- --	Range: 89.0 117.0
15. Ratio of Meander Length to	Mean: 10.2	Mean: 4.8	Mean: 1.8	Mean: --	Mean: 12.5	Mean: 11.5	Mean: 11.2	Mean: 11.6	Mean: 11.5	Mean: 12.3
Bankfull Width (L_m/W_{bkf})	Range: 8.1 12.3	Range: 3.8 6.8	Range: 1.8 5.8	Range: -- --	Range: 7.3 17.7	Range: 9.0 14.0	Range: 9.0 14.0	Range: 11.0 12.3	Range: 9.0 14.0	Range: 9.0 14.0
16. Radius of Curvature	Mean: 13.4	Mean: 11.3	Mean: 7.3	Mean: --	Mean: 29.0	Mean: --	Mean: 22.8	Mean: 31.0	Mean: --	Mean: 25.2
(R_c)	Range: 8.5 22.0	Range: 5.7 18.8	Range: 7.3 17.3	Range: -- --	Range: 18.0 40.0	Range: -- --	Range: 19.0 26.6	Range: 20.0 42.0	Range: -- --	Range: 21.0 29.4
17. Ratio of Radius of Curvature	Mean: 1.7	Mean: 1.7	Mean: 0.6	Mean: --	Mean: 4.9	Mean: 2.8	Mean: 3.0	Mean: 4.5	Mean: 2.8	Mean: 3.0
to Bankfull Width (R_c/W_{bkf})	Range: 1.1 2.8	Range: 0.9 2.8	Range: 0.6 1.4	Range: -- --	Range: 3.1 6.8	Range: 2.5 3.0	Range: 2.5 3.5	Range: 2.9 6.1	Range: 2.5 3.0	Range: 2.5 3.5
18. Belt Width	Mean: 34.0	Mean: 15.8	Mean: 45.0	Mean: --	Mean: 20.6	Mean: --	Mean: 24.4	Mean: 30.5	Mean: --	Mean: 23.1
(W_{blt})	Range: -- --	Range: 10.5 22.0	Range: -- --	Range: -- --	Range: 13.1 28.1	Range: -- --	Range: 19.0 25.1	Range: 25.0 36.0	Range: -- --	Range: 21.0 25.2
19. Meander Width Ratio	Mean: 4.3	Mean: 2.4	Mean: 3.8	Mean: --	Mean: 3.5	Mean: 4.0	Mean: 3.2	Mean: 4.5	Mean: 4.0	Mean: 2.8
(W_{blt}/W_{bkf})	Range: -- --	Range: 1.6 3.3	Range: -- --	Range: -- --	Range: 2.2 4.8	Range: 3.0 5.0	Range: 2.5 3.3	Range: 3.7 5.3	Range: 3.0 5.0	Range: 2.5 3.0
20. Sinuosity (k)	Mean: 1.30	Mean: 1.40	Mean: Not Reported	Mean: 1.07	Mean: 1.15	Mean: --	Mean: 1.11	Mean: 1.24	Mean: --	Mean: 1.14
(Stream Length / Valley Length)	Range: -- --	Range: -- --	Range: -- --	Range: -- --	Range:	Range: -- --	Range: -- --	Range:	Range: -- --	Range:
21. Valley Slope (S_{valley})	Mean: 0.0022	Mean: 0.0130	Mean: Not Reported	Mean: 0.0166	Mean: 0.0175	Mean: --	Mean: 0.0175	Mean: 0.0205	Mean: --	Mean: 0.0205
(ft/ft)	Range: -- --	Range: -- --	Range: -- --	Range: -- --	Range:	Range: -- --	Range:	Range:	Range: -- --	Range:
22. Average Stream Slope	Mean: 0.0017	Mean: 0.0093	Mean: 0.0033	Mean: 0.0157	Mean: 0.0152	Mean: --	Mean: 0.0150	Mean: 0.0053	Mean: --	Mean: 0.0185
(S_{avg}) = (S_{valley}/k)	Range: -- --	Range: -- --	Range: -- --	Range: -- --	Range: -- --	Range: -- --	Range: -- --	Range: -- --	Range: -- --	Range: -- --
23. Riffle Slope	Mean: 0.0049	Mean: 0.0540	Mean: Not Reported	Mean: 0.0522	Mean: 0.0154	Mean: --	Mean: 0.0162	Mean: 0.0200	Mean: --	Mean: 0.0193
(S_{rff})	Range: 0.0000 0.0257	Range: 0.0100 0.0800	Range: -- --	Range: 0.0077 0.0961	Range: 0.0138 0.0170	Range: -- --	Range: 0.0101 0.0224	Range: 0.0125 0.0275	Range: -- --	Range: 0.0102 0.0284
24. Ratio of Riffle Slope to Avg.	Mean: 2.9	Mean: 5.8	Mean: --	Mean: 3.3	Mean: 1.0	Mean: 1.8	Mean: 1.1	Mean: 3.8	Mean: 1.8	Mean: 1.0
Slope (S_{riffle}/S_{avg})	Range: 0.0 15.3	Range: 0.6 4.5	Range: -- --	Range: -- --	Range: 0.9 1.1	Range: 1.5 2.0	Range: 0.7 1.5	Range: 2.4 5.2	Range: 1.5 2.0	Range: 0.6 1.5
25. Pool Slope	Mean: 0.0002	Mean: 0.0024	Mean: Not Reported	Mean: 0.0032	Mean: 0.0054	Mean: --	Mean: 0.0001	Mean: 0.0001	Mean: --	Mean: 0.0001
(S_{pool})	Range: 0.0000 0.0007	Range: 0.0000 0.0100	Range: -- --	Range: 0.0009 0.0065	Range: 0.0043 0.0060	Range: -- --	Range: 0.0001 0.0015	Range: 0.0001 0.0010	Range: -- --	Range: 0.0001 0.0015
26. Ratio of Pool Slope to Avg.	Mean: 0.1	Mean: 0.3	Mean: --	Mean: 0.2	Mean: 0.4	Mean: 0.0	Mean: 0.0	Mean: 0.0	Mean: 0.0	Mean: 0.0
Slope (S_{pool}/S_{avg})	Range: 0.0 0.4	Range: 0.0 0.6	Range: -- --	Range: 0.1 0.4	Range: 0.3 0.4	Range: 0.0 0.1	Range: 0.0 0.1	Range: 0.0 0.2	Range: 0.0 0.1	Range: 0.0 0.1
27. Maximum Pool	Mean: 2.0	Mean: 2.0	Mean: 3.1	Mean: 3.0	Mean: 1.5	Mean: --	Mean: 1.5	Mean: 1.3	Mean: --	Mean: 1.6
Depth (d_{pool})	Range: -- --	Range: -- --	Range: -- --	Range: 2.3 3.9	Range: -- --	Range: -- --	Range: -- --	Range: -- --	Range: -- --	Range: -- --
28. Ratio of Pool Depth to Avg.	Mean: 3.4	Mean: 2.3	Mean: 2.0	Mean: 2.5	Mean: 1.3	Mean: 3.0	Mean: 2.7	Mean: 0.7	Mean: 3.0	Mean: 2.6
Depth (d_{pool}/d_{bkf})	Range: -- --	Range: -- --	Range: -- --	Range: 1.9167 3.2833	Range: -- --	Range: 2.5 3.5	Range: -- --	Range: -- --	Range: 2.5 3.5	Range: -- --
29. Pool Width	Mean: 11.5	Mean: 8.1	Mean: 19.6	Mean: 16.3	Mean: 6.3	Mean: --	Mean: 9.4	Mean: 7.9	Mean: --	Mean: 10.6
(W_{pool})	Range: -- --	Range: -- --	Range: -- --	Range: -- --	Range: -- --	Range: -- --	Range: -- --	Range: -- --	Range: -- --	Range: -- --
30. Ratio of Pool Width to	Mean: 1.5	Mean: 1.2	Mean: 1.6	Mean: 1.1	Mean: 1.1	Mean: 1.5	Mean: 1.2	Mean: 1.2	Mean: 1.5	Mean: 1.3
Bankfull Width (W_{pool}/W_{bkf})	Range: -- --	Range: -- --	Range: -- --	Range: -- --	Range: -- --	Range: 1.3 1.7	Range: -- --	Range: -- --	Range: 1.3 1.7	Range: -- --
31. Pool Area	Mean: Not Reported	Mean: Not Reported	Mean: 27.0	Mean: 22.7	Mean: 7.6	Mean: --	Mean: 7.0	Mean: 8.0	Mean: --	Mean: 8.8
(A_{pool})	Range: -- --	Range: -- --	Range: -- --	Range: -- --	Range: -- --	Range: -- --	Range: -- --	Range: -- --	Range: -- --	Range: -- --
32. Ratio of Pool Area to	Mean: --	Mean: --	Mean: 1.4	Mean: 1.2	Mean: 1.9	Mean: --	Mean: 1.7	Mean: 0.7	Mean: --	Mean: 1.7
Bankfull Area (A_{pool}/A_{bkf})	Range: -- --	Range: -- --	Range: -- --	Range: -- --	Range: -- --	Range: -- --	Range: -- --	Range: -- --	Range: -- --	Range: -- --
33. Pool to Pool Spacing	Mean: 38.3	Mean: 22.9	Mean: Not Reported	Mean: 33.1	Mean: 38.0	Mean: --	Mean: 46.0	Mean: 32.7	Mean: --	Mean: 52.5
(p - p)	Range: 18 78	Range: 8 48	Range: -- --	Range: 20 52	Range: 32.0 56.0	Range: -- --	Range: 38.0 53.2	Range: 25.0 37.0	Range: -- --	Range: 44.0 61.0
34. Ratio of Pool to Pool Spacing	Mean: 4.8	Mean: 3.5	Mean: --	Mean: 2.2	Mean: 6.5	Mean: 6.0	Mean: 6.1	Mean: 4.8	Mean: 6.0	Mean: 6.3
to Bankfull Width (p-p/Wbkf)	Range: 2.3 9.9	Range: 1.1 7.3	Range: -- --	Range: 1.3 3.4	Range: 5.4 9.5	Range: 5.0 7.0	Range: 5.0 7.0	Range: 3.7 5.4	Range: 5.0 7.0	Range: 5.0 7.0

1. Geomorphic feature was not visibly present due to channelization and/or urban impacts to stream channel.
2. Feature was not measured as part of the project field effort

$$$$USERNAME$$$$ $$$$SYSTIME$$$$ $$$$DGN$$$$

Rev. 07-01-13

09/26/11

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R-2413A&B	OSM-2F

PROJECT ENGINEER

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DATE:

MORPHOLOGICAL TABLE

VARIABLES		SITE 2 EXISTING		Regional Curves Peidmont Rural/Rosgen Reference Values		SITE 2 DESIGN	
STATION		--		--		--	
1.	Stream Type	E5		C/E		C5	
	(Rosgen)						
2.	Drainage Area	0.09		0.09		0.09	
	(sq. mile)						
3.	Bankfull Width	Mean: 6.2		Mean: 4.3		Mean: 7.6	
	(W_{bkf})	Range: --	--	Range: --	--	Range: --	--
4.	Bankfull Mean	Mean: 0.62		Mean: 0.7		Mean: 0.5	
	depth (d_{bkf})	Range: --	--	Range: --	--	Range: --	--
5.	Width/Depth Ratio	Mean: 10.0		Mean: 6.1		Mean: 13.9	
	(W_{bkf}/d_{bkf})	Range: --	--	Range: --	--	Range: --	--
6.	Bankfull cross-sectional	Mean: 3.9		Mean: 4.3		Mean: 4.2	
	Area (Abkf)	Range: --	--	Range: --	--	Range: --	--
7.	Bankfull Mean Velocity	Mean: 4.4		Mean: 3.8		Mean: 4.0	
	(V_{bkf})	Range: 4.1	4.8	Range: --	--	Range: 3.8	4.5
8.	Bankfull Discharge, cfs	Mean: 16.8		Mean: 16.3		Mean: 16.8	
	(Q_{bkf})	Range: 15.7	18.6	Range: --	--	Range: 15.7	18.6
9.	Bankfull Maximum Depth	Mean: 1.1		Mean: --		Mean: 0.8	
	(d_{max})	Range: --	--	Range: --	--	Range: --	--
10.	Max d_{max}/d_{bkf}	Mean: 1.8		Mean: 1.4		Mean: 1.5	
	ratio	Range: --	--	Range: 1.2	1.5	Range: --	--
11.	Low Bank Height to max	Mean: 1.0		Mean: --		Mean: 1.0	
	d_{bkf} ratio	Range: --	--	Range: --	--	Range: --	--
12.	Width of Flood Prone	Mean: 15.9		Mean: --		Mean: 34.0	
	Area (W_{fpa})	Range: --	--	Range: --	--	Range: 25.0	38
13.	Entrenchment Ratio	Mean: 2.6		Mean: --		Mean: 4.5	
	(W_{fpa}/W_{bkf})	Range: --	--	Range: --	--	Range: 3.3	5.0
14.	Meander Length	Mean: 77.5		Mean: --		Mean: 89.0	
	(L_m)	Range: 75.0	80.0	Range: --	--	Range: 72.0	100.0
15.	Ratio of Meander Length to	Mean: 12.4		Mean: 11.5		Mean: 11.7	
	Bankfull Width (L_m/W_{bkf})	Range: 12.0	12.8	Range: 9.0	14.0	Range: 9.0	14.0
16.	Radius of Curvature	Mean: 28.0		Mean: --		Mean: 22.8	
	(R_c)	Range: 18.0	38.0	Range: --	--	Range: 19.0	26.6
17.	Ratio of Radius of Curvature	Mean: 4.5		Mean: 3.0		Mean: 3.0	
	to Bankfull Width (R_c/W_{bkf})	Range: 2.9	6.1	Range: 2.5	3.5	Range: 2.5	3.5
18.	Belt Width	Mean: 21.8		Mean: --		Mean: 23.4	
	(W_{bk})	Range: 6.5	37.0	Range: --	--	Range: 19.0	25.1
19.	Meander Width Ratio	Mean: 3.5		Mean: 4.0		Mean: 3.1	
	(W_{bk}/W_{bkf})	Range: 1.0	5.9	Range: 3.0	5.0	Range: 2.5	3.3
20.	Sinuosity (k)	Mean: 1.16		Mean: --		Mean: 1.18	
	(Stream Length / Valley Length)	Range:		Range: --	--	Range:	
21.	Valley Slope (Sv_{alley})	Mean: 0.0506		Mean: --		Mean: 0.0506	
	(ft/ft)	Range:		Range: --	--	Range:	
22.	Average Stream Slope	Mean: 0.0158		Mean: --		Mean: 0.0257	
	(S_{avg}) = (S_{valley}/k)	Range: 0.0054	0.0158	Range: --	--	Range: --	--
23.	Riffle Slope	Mean: 0.0295		Mean: --		Mean: 0.0288	
	(S_{rff})	Range: 0.0090	0.0500	Range: --	--	Range: 0.0106	0.0469
24.	Ratio of Riffle Slope to Avg.	Mean: 1.9		Mean: 1.8		Mean: 1.1	
	Slope (S_{rffle}/S_{avg})	Range: 0.6	3.2	Range: 1.5	2.0	Range: 0.4	1.8
25.	Pool Slope	Mean: 0.0001		Mean: --		Mean: 0.0001	
	(S_{pool})	Range: 0.0001	0.0010	Range: --	--	Range: 0.0001	0.0015
26.	Ratio of Pool Slope to Avg.	Mean: 0.0		Mean: 0.0		Mean: 0.0	
	Slope (S_{pool}/S_{avg})	Range: 0.0	0.1	Range: 0.0	0.1	Range: 0.0	0.1
27.	Maximum Pool	Mean: 1.5		Mean: --		Mean: 1.5	
	Depth (d_{pool})	Range: --	--	Range: --	--	Range: --	--
28.	Ratio of Pool Depth to Avg.	Mean: 2.4		Mean: 3.0		Mean: 2.7	
	Depth (d_{pool}/d_{bkf})	Range: --	--	Range: 2.5	3.5	Range: --	--
29.	Pool Width	Mean: 5.9		Mean: --		Mean: 9.4	
	(W_{pool})	Range: --	--	Range: --	--	Range: --	--
30.	Ratio of Pool Width to	Mean: 0.9		Mean: 1.5		Mean: 1.2	
	Bankfull Width (W_{pool}/W_{bkf})	Range: --	--	Range: 1.3	1.7	Range: --	--
31.	Pool Area	Mean: 5.0		Mean: --		Mean: 7.0	
	(A_{pool})	Range: --	--	Range: --	--	Range: --	--
32.	Ratio of Pool Area to	Mean: 1.3		Mean: --		Mean: 1.7	
	Bankfull Area (A_{pool}/A_{bkf})	Range: --	--	Range: --	--	Range: --	--
33.	Pool to Pool Spacing	Mean: 23.5		Mean: --		Mean: 46.5	
	(p - p)	Range: 18.0	29.0	Range: --	--	Range: 39.0	54.0
34.	Ratio of Pool to Pool Spacing	Mean: 3.8		Mean: 6.0		Mean: 6.1	
	to Bankfull Width (p-p/Wbkf)	Range: 2.9	4.7	Range: 5.0	7.0	Range: 5.0	7.0

1. Geomorphic feature was not visibly present due to channelization and/or urban impacts to stream channel.
2. Feature was not measured as part of the project field effort

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09/26/11

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MORPHOLOGICAL TABLE

VARIABLES	SITE 4 EXISTING	Regional Curves Peidmont Rural/Rosgen Reference Values	SITE 4 DESIGN	SITE 5 EXISTING	Regional Curves Peidmont Rural/Rosgen Reference Values	SITE 5 DESIGN
STATION	–	–	–	–	–	–
1. Stream Type (Rosgen)	E5	C/E	C5	E5 --> F5	C/E	C5
2. Drainage Area (sq. mile)	3.04	3.04	3.04	0.41	0.41	0.41
3. Bankfull Width (W_{bkf})	Mean: 15.7	Mean: 19.2	Mean: 25.0	Mean: 6.6	Mean: 8.1	Mean: 11.7
	Range: – –	Range: – –	Range: – –	Range: – –	Range: – –	Range: – –
4. Bankfull Mean depth (d_{bkf})	Mean: 2.06	Mean: 2.1	Mean: 1.8	Mean: 0.98	Mean: 1.1	Mean: 0.8
	Range: – –	Range: – –	Range: – –	Range: – –	Range: – –	Range: – –
5. Width/Depth Ratio (W_{bkf}/d_{bkf})	Mean: 7.6	Mean: 9.0	Mean: 14.3	Mean: 6.8	Mean: 7.2	Mean: 14.1
	Range: – –	Range: – –	Range: – –	Range: – –	Range: – –	Range: – –
6. Bankfull cross-sectional Area (Abkf)	Mean: 32.4	Mean: 45.6	Mean: 43.8	Mean: 6.6	Mean: 11.7	Mean: 9.7
	Range: – –	Range: – –	Range: – –	Range: – –	Range: – –	Range: – –
7. Bankfull Mean Velocity (V_{bkf})	Mean: 1.5	Mean: 4.3	Mean: 1.1	Mean: 3.4	Mean: 4.0	Mean: 2.3
	Range: 1.4 1.7	Range: – –	Range: 1.0 1.2	Range: 3.2 3.8	Range: – –	Range: 2.2 2.6
8. Bankfull Discharge, cfs (Q_{bkf})	Mean: 49.0	Mean: 198.3	Mean: 49.0	Mean: 22.6	Mean: 46.9	Mean: 22.6
	Range: 45.7 54.1	Range: – –	Range: 45.7 54.1	Range: 21.1 25.0	Range: – –	Range: 21.1 25.0
9. Bankfull Maximum Depth (d_{max})	Mean: 2.85	Mean: –	Mean: 2.5	Mean: 1.4	Mean: –	Mean: 1.2
	Range: – –	Range: – –	Range: – –	Range: – –	Range: – –	Range: – –
10. Max d_{max}/d_{bkf} ratio	Mean: 1.4	Mean: 1.4	Mean: 1.4	Mean: 1.4	Mean: 1.4	Mean: 1.4
	Range: – –	Range: 1.2 1.5	Range: – –	Range: – –	Range: 1.2 1.5	Range: – –
11. Low Bank Height to max d_{bkf} ratio	Mean: 1.1	Mean: –	Mean: 1.0	Mean: 2.0	Mean: –	Mean: 1.0
	Range: – –	Range: – –	Range: – –	Range: – –	Range: – –	Range: – –
12. Width of Flood Prone Area (W_{fpa})	Mean: 85.0	Mean: –	Mean: 85.0	Mean: 14.5	Mean: –	Mean: 80.0
	Range: – –	Range: – –	Range:	Range: – –	Range: – –	Range:
13. Entrenchment Ratio (W_{fpa}/W_{bkf})	Mean: 5.4	Mean: –	Mean: 3.4	Mean: 2.2	Mean: –	Mean: 6.8
	Range: – –	Range: – –	Range: – –	Range: – –	Range: – –	Range: – –
14. Meander Length (L_m)	Mean: 101.0	Mean: –	Mean: 180.0	Mean: 70.0	Mean: –	Mean: 140.5
	Range: 94.0 108.0	Range: – –	Range: – –	Range: 37.5 115.0	Range: – –	Range: 112.0 169.0
15. Ratio of Meander Length to Bankfull Width (L_m/W_{bkf})	Mean: 6.4	Mean: 11.5	Mean: 7.2	Mean: 10.6	Mean: 11.5	Mean: 12.0
	Range: 6.0 6.9	Range: 9.0 14.0	Range: – –	Range: 5.7 17.3	Range: 9.0 14.0	Range: 9.0 14.0
16. Radius of Curvature (R_c)	Mean: 78.0	Mean: –	Mean: 75.0	Mean: 35.0	Mean: –	Mean: 35.1
	Range: 56.0 100.0	Range: – –	Range: 62.5 87.5	Range: 18.0 52.0	Range: – –	Range: 29.3 41.0
17. Ratio of Radius of Curvature to Bankfull Width (R_c/W_{bkf})	Mean: 5.0	Mean: 2.8	Mean: 3.0	Mean: 5.3	Mean: 2.8	Mean: 3.0
	Range: 3.6 6.4	Range: 2.5 3.0	Range: 2.5 3.5	Range: 2.7 7.8	Range: 2.5 3.0	Range: 2.5 3.5
18. Belt Width (W_{blt})	Mean: 39.8	Mean: –	Mean: 28.0	Mean: 26.0	Mean: –	Mean: 32.0
	Range: 37.5 42.0	Range: – –	Range: 25.0 75.0	Range: 17.0 35.0	Range: – –	Range: 29.0 35.0
19. Meander Width Ratio (W_{blt}/W_{bkf})	Mean: 2.5	Mean: 4.0	Mean: 1.1	Mean: 3.9	Mean: 4.0	Mean: 2.7
	Range: 2.4 2.7	Range: 3.0 5.0	Range: 1.0 3.0	Range: 2.6 5.3	Range: 3.0 5.0	Range: 2.5 3.0
20. Sinuosity (k) (Stream Length / Valley Length)	Mean: 1.02	Mean: –	Mean: 1.00	Mean: 1.14	Mean: –	Mean: 1.15
	Range:	Range: – –	Range:	Range: – –	Range: – –	Range:
21. Valley Slope (Sv_{alley}) (ft/ft)	Mean: 0.0200	Mean: –	Mean: 0.0200	Mean: 0.0155	Mean: –	Mean: 0.0155
	Range:	Range: – –	Range:	Range: – –	Range: – –	Range:
22. Average Stream Slope (S_{avg}) = (S_{valley}/k)	Mean: 0.0019	Mean: –	Mean: 0.0020	Mean: 0.0097	Mean: –	Mean: 0.0138
	Range: – –	Range: – –	Range: – –	Range: – –	Range: – –	Range: – –
23. Riffle Slope (S_{rff})	Mean: 0.0012	Mean: –	Mean: 0.0027	Mean: 0.0103	Mean: –	Mean: 0.0158
	Range: 0.0005 0.0019	Range: – –	Range: 0.0021 0.0033	Range: – –	Range: – –	Range: 0.0126 0.0189
24. Ratio of Riffle Slope to Avg.$_n$ Slope (S_{rffl}/S_{avg})	Mean: 0.6	Mean: 1.8	Mean: 1.4	Mean: 1.1	Mean: 1.8	Mean: 1.2
	Range: 0.3 1.0	Range: 1.5 2.0	Range: 1.1 1.7	Range: – –	Range: 1.5 2.0	Range: 0.91 1.4
25. Pool Slope (S_{pool})	Mean: 0.0001	Mean: –	Mean: 0.0001	Mean: 0.00010	Mean: –	Mean: 0.0001
	Range: 0.0001 0.0010	Range: – –	Range: 0.0001 0.0015	Range: 0.0001 0.0010	Range: – –	Range: 0.0001 0.0015
26. Ratio of Pool Slope to Avg. Slope (S_{pool}/S_{avg})	Mean: 0.1	Mean: 0.0	Mean: 0.1	Mean: 0.0	Mean: 0.0	Mean: 0.0
	Range: 0.1 0.5	Range: 0.0 0.1	Range: 0.0 0.1	Range: 0.0 0.1	Range: 0.0 0.1	Range: 0.0 0.1
27. Maximum Pool Depth (d_{pool})	Mean: 2.4	Mean: –	Mean: 4.5	Mean: 1.6	Mean: –	Mean: 2.2
	Range: – –	Range: – –	Range: – –	Range: – –	Range: – –	Range: – –
28. Ratio of Pool Depth to Avg. Depth (d_{pool}/d_{bkf})	Mean: 1.1	Mean: 3.0	Mean: 2.6	Mean: 1.6	Mean: 3.0	Mean: 2.6
	Range: – –	Range: 2.5 3.5	Range: – –	Range: – –	Range: 2.5 3.5	Range: – –
29. Pool Width (W_{pool})	Mean: 16.2	Mean: –	Mean: 30.5	Mean: 8.7	Mean: –	Mean: 14.4
	Range: – –	Range: – –	Range: – –	Range: – –	Range: – –	Range: – –
30. Ratio of Pool Width to Bankfull Width (W_{pool}/W_{bkf})	Mean: 1.0	Mean: 1.5	Mean: 1.2	Mean: 1.3	Mean: 1.5	Mean: 1.2
	Range: – –	Range: 1.3 1.7	Range: – –	Range: – –	Range: 1.3 1.7	Range: – –
31. Pool Area (A_{pool})	Mean: 36.8	Mean: –	Mean: 72.4	Mean: 8.8	Mean: –	Mean: 16.2
	Range: – –	Range: – –	Range: – –	Range: – –	Range: – –	Range: – –
32. Ratio of Pool Area to Bankfull Area (A_{pool}/A_{bkf})	Mean: 1.1	Mean: –	Mean: 1.7	Mean: 1.3	Mean: –	Mean: 1.7
	Range: – –	Range: – –	Range: – –	Range: – –	Range: – –	Range: – –
33. Pool to Pool Spacing (p - p)	Mean: 76.5	Mean: –	Mean: 97.0	Mean: 43.0	Mean: –	Mean: 78.0
	Range: 50.0 107.0	Range: – –	Range: 58.0 136.0	Range: 26.0 60.0	Range: – –	Range: 60.0 90.0
34. Ratio of Pool to Pool Spacing to Bankfull Width (p-p/Wbkf)	Mean: 5.0	Mean: 6.0	Mean: 3.9	Mean: 6.5	Mean: 6.0	Mean: 6.7
	Range: 3.2 6.8	Range: 5.0 7.0	Range: 2.3 5.5	Range: 3.9 9.0	Range: 5.0 7.0	Range: 5.0 7.0

1. Geomorphic feature was not visibly present due to channelization and/or urban impacts to stream channel.
2. Feature was not measured as part of the project field effort

SYSTEM\$\$\$

Rev. 07-01-13

09/26/11

PREPARED IN THE OFFICE OF:
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NC LICENSE F-0102

PROJECT REFERENCE NO.	SHEET NO.
R-2413A&B	OSM-3

PROJECT ENGINEER

APPROVED BY:

DATE:

SUMMARY OF QUANTITIES,
SUMMARY OF EARTHWORK
FOR MITIGATION

SUMMARY OF QUANTITIES

DESCRIPTION	SECTION	QUANTITIY	UNIT	ITEM DESCRIPTION
0000400000–N	SP	1	LS	CONSTRUCTION SURVEYING FOR MITIGATION
0043000000–N	SP	1	LS	GRADING FOR MITIGATION
1077000000–M	1610	670	TON	#57 STONE
3656000000–M	1042	2,100	SY	FILTER FABRIC FOR DRAINAGE
3651000000–M	SP	2,800	TON	BOULDER
3642000000–M	SP	270	TON	PLAIN RIP RAP, CLASS A
3649000000–M	SP	250	TON	PLAIN RIP RAP, CLASS B
3628000000–M	SP	170	TON	PLAIN RIP RAP, CLASS I
6133000000–N	SP	1	LS	DIVERSION PUMPING FOR MITIGATION
6133000000–N	SP	8	EA	LOGS
6133000000–N	SP	2	EA	ROOTWADS

SUMMARY OF EARTHWORK FOR MITIGATION

LOCATION	MITIGATION UNCLASSIFIED EXCAV. (CU.YD.)	MITIGATION EMBANKMENT	MITIGATION BORROW (CU.YD.)	MITIGATION WASTE (CU.YD.)
SITE 1	1,359	1,083	0	276
SITE 2	8,056	692	0	7,364
SITE 4	5,038	196	0	4,842
SITE 5	3,413	1,279	0	2,134
SUBTOTAL	17,866	3,250	0	14,616

APPROXIMATE QUANTITIES ONLY, MITIGATION UNCLASSIFIED EXCAVATION, MITIGATION BORROW EXCAVATION, MITIGATION FINE GRADING AND MITIGATION CLEARING AND GRUBBING WILL BE PAID FOR AT THE CONTRACT LUMP SUM PRICE FOR "GRADING FOR MITIGATION".

$$$$SYSTIME$$$$
$$$$FILENAME$$$$

Rev. 07-01-13

09/26/11

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PROJECT REFERENCE NO.	SHEET NO.
R-2413A&B	OSM-4

PROJECT ENGINEER

APPROVED BY:

DATE:

SITE 1-UPPER PLAN

30 15 0 30 60

NAD 83

SITE 1-UPPER

SITE 1-UPPER ENHANCEMENT

ROCK CROSS VANE (RCV1)

LOG VANE (LV1)

ROCK A-VANE (RAV1)

ROCK CROSS VANE (RCV3)

ROCK A-VANE (RAV4)

ROCK CROSS VANE (RCV5)

ROCK A-VANE (RAV2)

ROCK CROSS VANE (RCV2)

ROCK CROSS VANE (RCV4)

CENTER OF RADIUS (R1)

CENTER OF RADIUS (R2)

CENTER OF RADIUS (R3)

CENTER OF RADIUS (R4)

CENTER OF RADIUS (R5)

CENTER OF RADIUS (R6)

CENTER OF RADIUS (R7)

CENTER OF RADIUS (R8)

CENTER OF RADIUS (R9)

CENTER OF RADIUS (R10)

CENTER OF RADIUS (R11)

CENTER OF RADIUS (R12)

LOG STILL (LS1)

PROPOSED WOVEN WIRE FENCE

BOULDER TOE PROTECTION

END ENHANCEMENT BEGIN RESTORATION STA. 103+50

ENHANCEMENT LAY BACK LEFT BANK AT A 3:1 SLOPE

ENHANCEMENT LAY BACK RIGHT BANK AT 3:1 SLOPE SEE CROSS SECTION AT STATION 103+00

ENHANCEMENT LAY BACK RIGHT BANK AT A 3:1 SLOPE

ENHANCEMENT LAY BACK RIGHT BANK AT A 3:1 SLOPE SEE CROSS SECTION AT STATION 103+00

BEGIN ENHANCEMENT STA. 100+00

GRADE EXISTING SWALE TO DRAIN TO PROPOSED CHANNEL

GRADE EXISTING SWALE TO DRAIN TO PROPOSED CHANNEL

TIE PROPOSED WOVEN WIRE FENCE TO RIGHT-OF-WAY FENCING

END RESTORATION STA. 106+54.69. TIE TO 72" CSP

TIE PROPOSED WOVEN WIRE FENCE TO RIGHT-OF-WAY FENCING

EXISTING RIGHT OF WAY

100+00 101+00 102+00 103+00 104+00 105+00 106+00

WLB WLE

$$$$USER$$$$ $$$$TIME$$$$ $$$$DGN$$$$

Rev. 07-01-13

09/26/11

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PROJECT REFERENCE NO.	SHEET NO.
R-2413A&B	OSM-5

PROJECT ENGINEER

APPROVED BY:

DATE:

SITE 1- LOWER PLAN

30 15 0 30 60

NAD 83

EXISTING CONTROLLED ACCESS LINE

BEGIN RESTORATION STA 150+00. ENSURE INVERT OF ROCK CROSS VANE (RCV1) IS PLACED 10' HIGHER THAN OUTLET INVERT OF PROPOSED 72" CSP

TIE PROPOSED WOVEN WIRE FENCE TO RIGHT-OF-WAY FENCING

PROPOSED 72" CSP

ROCK CROSS VANE (RCV1)

ROCK CROSS VANE (RCV2)

ROCK CROSS VANE (RCV3)

ROCK CROSS VANE (RCV4)

ROCK CROSS VANE (RCV5)

ROCK CROSS VANE (RCV6)

ROCK CROSS VANE (RCV7)

ROCK CROSS VANE (RCV8)

ROCK CROSS VANE (RCV9)

ROCK A-VANE (RAV1)

CENTER OF RADIUS (R1)

CENTER OF RADIUS (R2)

CENTER OF RADIUS (R3)

CENTER OF RADIUS (R4)

CENTER OF RADIUS (R5)

CENTER OF RADIUS (R6)

CENTER OF RADIUS (R7)

CENTER OF RADIUS (R8)

CENTER OF RADIUS (R9)

PROPOSED WOVEN WIRE FENCE

SITE 1-LOWER

150+00

151+00

152+00

153+00

154+00

155+00

END RESTORATION STA 155+09. TIE TO EXISTING CHANNEL

FP

C

RW

MATCHLINE SEE SHEET OSM-4

MATCHLINE SEE SHEET OSM-7

$$$$SYSTIME$$$$
$$$$SYSTIMAGE$$$$

Rev-07-01-13

09/26/11

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NC LICENSE: F-0102

PROJECT REFERENCE NO.	SHEET NO.
R-2413A&B	OSM-6

PROJECT ENGINEER

APPROVED BY:

DATE:

SITE 2-UPPER PLAN

30 15 0 30 60

NAD 83

SITE 2-UPPER

ROCK CROSS VANE (RCV1)
ROCK CROSS VANE (RCV2)
ROCK CROSS VANE (RCV3)
ROCK CROSS VANE (RCV4)
ROCK CROSS VANE (RCV5)
ROCK CROSS VANE (RCV6)
ROCK CROSS VANE (RCV7)
ROCK CROSS VANE (RCV8)
ROCK CROSS VANE (RCV9)
ROCK A-VANE (RAV1)

CENTER OF RADIUS (R1)
CENTER OF RADIUS (R2)
CENTER OF RADIUS (R3)
CENTER OF RADIUS (R4)
CENTER OF RADIUS (R5)
CENTER OF RADIUS (R6)
CENTER OF RADIUS (R7)
CENTER OF RADIUS (R8)
CENTER OF RADIUS (R9)

TIE PROPOSED WOVEN WIRE FENCE TO RIGHT-OF-WAY FENCING

BEGIN RELOCATION STA. 200+00

PROPOSED WOVEN WIRE FENCE

TIE PROPOSED WOVEN WIRE FENCE TO RIGHT-OF-WAY FENCING

END RELOCATION STA. 204+23.77. TIE TO SR RGP.

200+00 201+00 202+00 203+00 204+00

FP

C/A

RW

SYSTEM\$\$\$

Rev-07-01-13

09/26/11

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PROJECT REFERENCE NO.	SHEET NO.
R-2413A&B	OSM-7

PROJECT ENGINEER

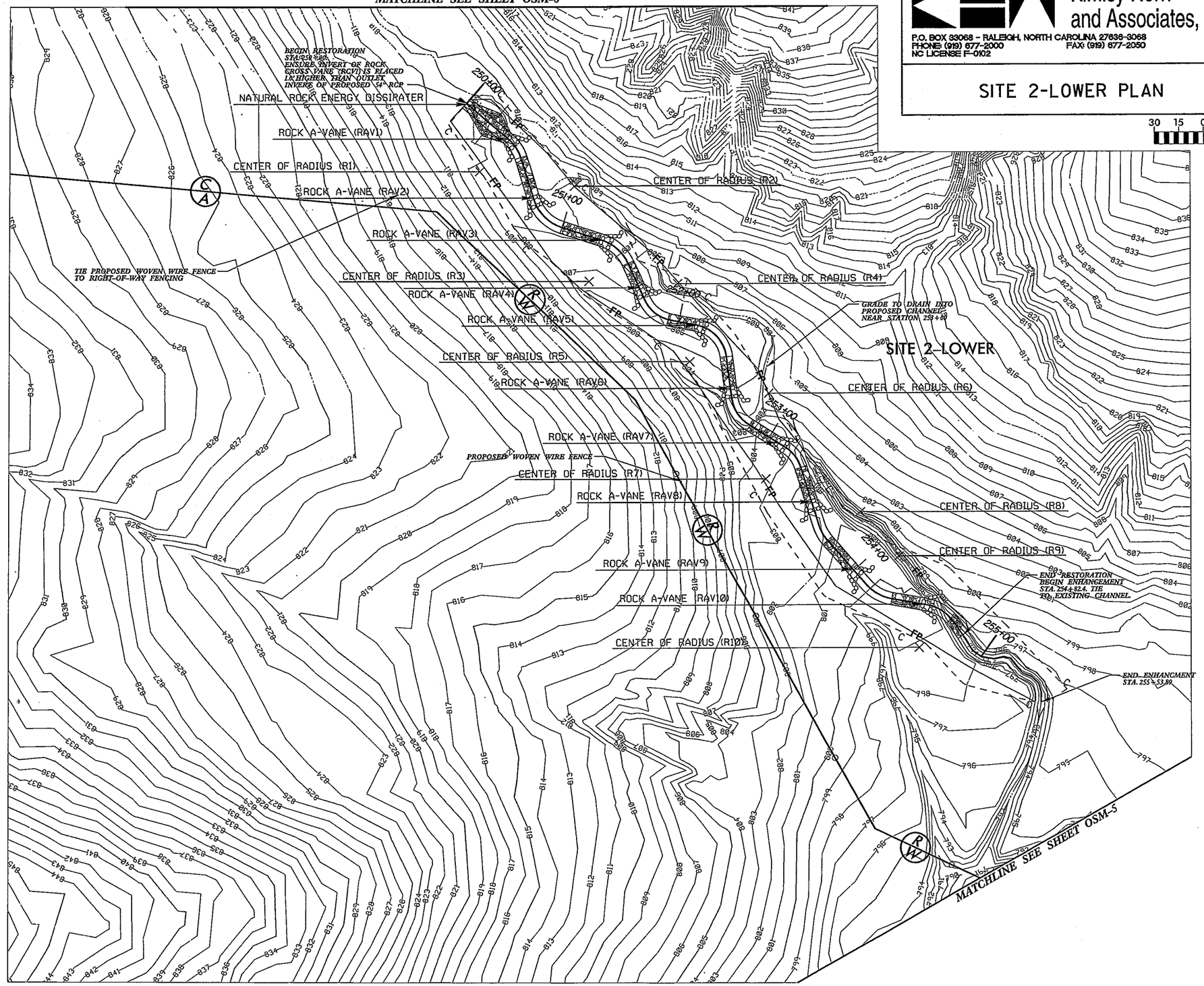
APPROVED BY:

DATE:

SITE 2-LOWER PLAN

30 15 0 30 60

NAD 83



@@@@@@@SYSTIME@@@@@
@@@@@@@USERNAME@@@@@@@DGN@@@@@@@

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09/26/11

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PROJECT REFERENCE NO.	SHEET NO.
R-2413A&B	OSM-08

PROJECT ENGINEER

APPROVED BY:

DATE:

SITE 4 PLAN

30 15 0 30 60

NAD 83

EXISTING RIGHT OF WAY

PROPOSED WOVEN WIRE FENCE

BEGIN RESTORATION STA. 400+00

END RESTORATION STA. 402+50

SITE 4

ROCK CROSS VANE (RCV1)

LOG CROSS VANE (LCV1)

400+00

401+00

402+00

EXISTING RIGHT OF WAY

$USERNAME$
$DATE$
$TIME$
$PLOTSTYLETABLE$
$LAYOUT$
$XREFS$

Rev. 07-01-13

05/26/11

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PROJECT REFERENCE NO.	SHEET NO.
R-2413A&B	OSM-9

PROJECT ENGINEER

APPROVED BY:

DATE:

SITE 5-UPPER PLAN

30 15 0 30 60

MATCHLINE SEE SHEET OSM-11

TIE PROPOSED DRAINAGE DITCH TO LEFT ARM OF PROPOSED ROCK VANE (RCV2). FINAL GRADE OF DITCH SHOULD BE APPROVED BY THE DESIGN ENGINEER PRIOR TO COMPLETION OF GRADING.

TIE PROPOSED WOVEN WIRE FENCE TO RIGHT-OF-WAY FENCING

HATCHED AREA TO BE GRADED DOWN TO APPROXIMATELEY 6 INCHES ABOVE THE ADJACENT VALLEY IN AN EFFORT TO PROVIDE FLOODPLAIN CONNECTIVITY WHILE MAINTAINING WETLAND HYDROLOGY. TARGET ELEVATION IS 795.1

BEGIN RESTORATION STA. 500+00

PROPOSED WOVEN WIRE FENCE

END RESTORATION STA. 503+72.79 TIE TO PROPOSED 10'x8' RCBC

TIE PROPOSED WOVEN WIRE FENCE TO RIGHT-OF-WAY FENCING

TIE PROPOSED DRAINAGE DITCH TO PROPOSED STREAM CHANNEL ALONG CONSTRUCTED RIFFLE. FINAL GRADE SHOULD BE APPROVED BY THE DESIGN ENGINEER PRIOR TO COMPLETION OF GRADING.

PROPOSED (@10%) RCBC W/ALTERNATE LOW FLOW SILLS (BY OTHERS)

NAD 83

ROCK CROSS VANE (RCV1)

ROCK CROSS VANE (RCV2)

ROCK A-VANE (RAV1)

ROCK CROSS VANE (RCV3)

LOG SILL (LS1)

CENTER OF RADIUS (R1)

CENTER OF RADIUS (R2)

CENTER OF RADIUS (R3)

CENTER OF RADIUS (R4)

CENTER OF RADIUS (R5)

SITE 5-UPPER

500+00

502+00

504+00

FP

C

$SYSTIME$
DGN
$USERNAME$

Rev. 07-01-13

09/26/11

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PROJECT REFERENCE NO.	SHEET NO.
R-2413A&B	OSM-10

PROJECT ENGINEER

APPROVED BY:

DATE:

SITE 5-LOWER PLAN

30 15 0 30 60

NAD 83

SITE 5-LOWER

TIE PROPOSED DRAINAGE DITCH TO LEFT ARM OF PROPOSED ROCK CROSS VANE (RCV1). FINAL GRADE SHOULD BE APPROVED BY THE DESIGN ENGINEER PRIOR TO COMPLETION OF GRADING.

TIE PROPOSED WOVEN WIRE FENCE TO RIGHT-OF-WAY FENCING

BEGIN RESTORATION STA. 550+00

TIE TO PROPOSED 10'x8' RCBC-789

ENSURE INVERT OF ROCK CROSS VANE (RCV1) IS PLACED 1.0' HIGHER THAN THE OUTLET INVERT OF THE PROPOSED 10'x8' RCBC

PROPOSED WOVEN WIRE FENCE

TIE PROPOSED WOVEN WIRE FENCE TO RIGHT-OF-WAY FENCING

END RESTORATION STA. 553+00

EXISTING RIGHT OF WAY

ROCK CROSS VANE (RCV1)

ROCK CROSS VANE (RCV2)

ROCK 4-VANE (R4V1)

ROCK 4-VANE (R4V2)

ROCK CROSS VANE (RCV3)

CENTER OF RADIUS (R1)

CENTER OF RADIUS (R2)

CENTER OF RADIUS (R3)

CENTER OF RADIUS (R4)

550+00

551+00

552+00

553+00

FP

C

RW

Rev. 07-01-13

09/26/11

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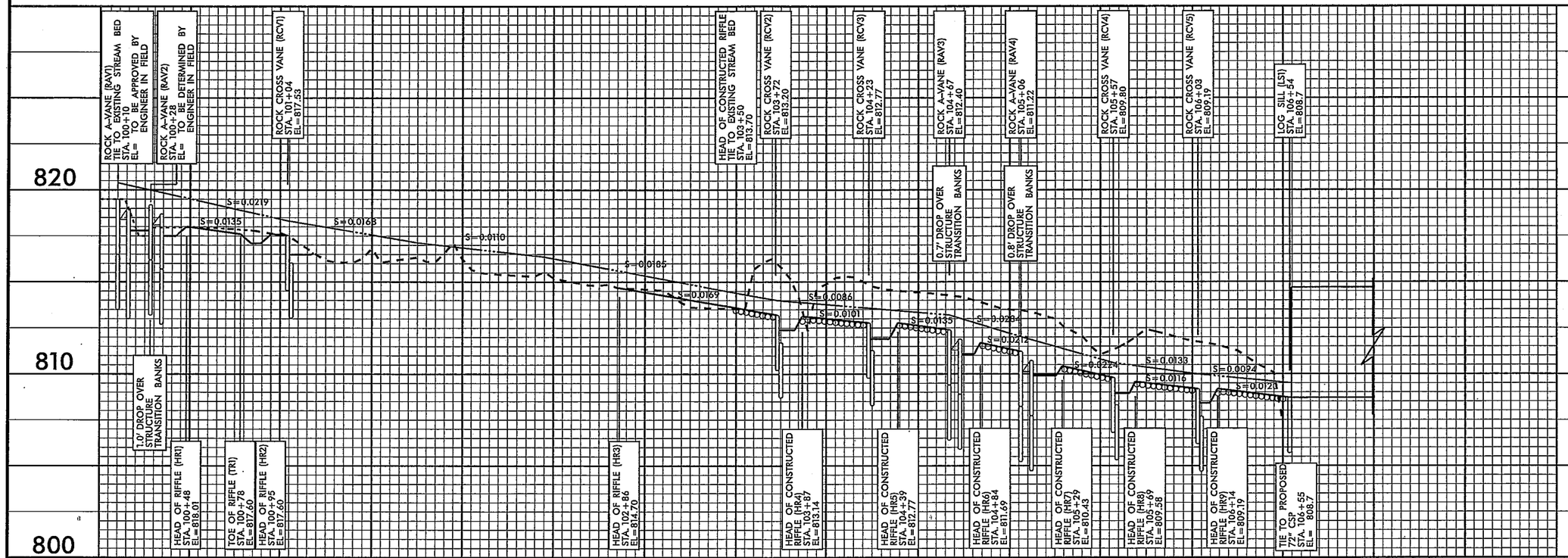
PROJECT REFERENCE NO.	SHEET NO.
R-2413A&B	OSM-11

PROJECT ENGINEER

APPROVED BY:

DATE:

SITE 1 UPPER PROFILE



LEGEND

- EXISTING GROUND ELEVATION
- PROPOSED GROUND ELEVATION
- ESTIMATED EXISTING GROUND ELEVATION (STA.100+00 TO 100+85)
- PROPOSED BANKFULL
- PROPOSED LOG SILL
- PROPOSED LOG CROSS VANE
- CONSTRUCTED RIFFLE
- PROPOSED ROCK CROSS VANE
- PROPOSED ROCK A-VANE

HORIZONTAL	VERTICAL
15 0 30	1.5 0 3

Rev. 07-01-13

09/26/11

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PROJECT REFERENCE NO.	SHEET NO.
R-2413A&B	OSM-12

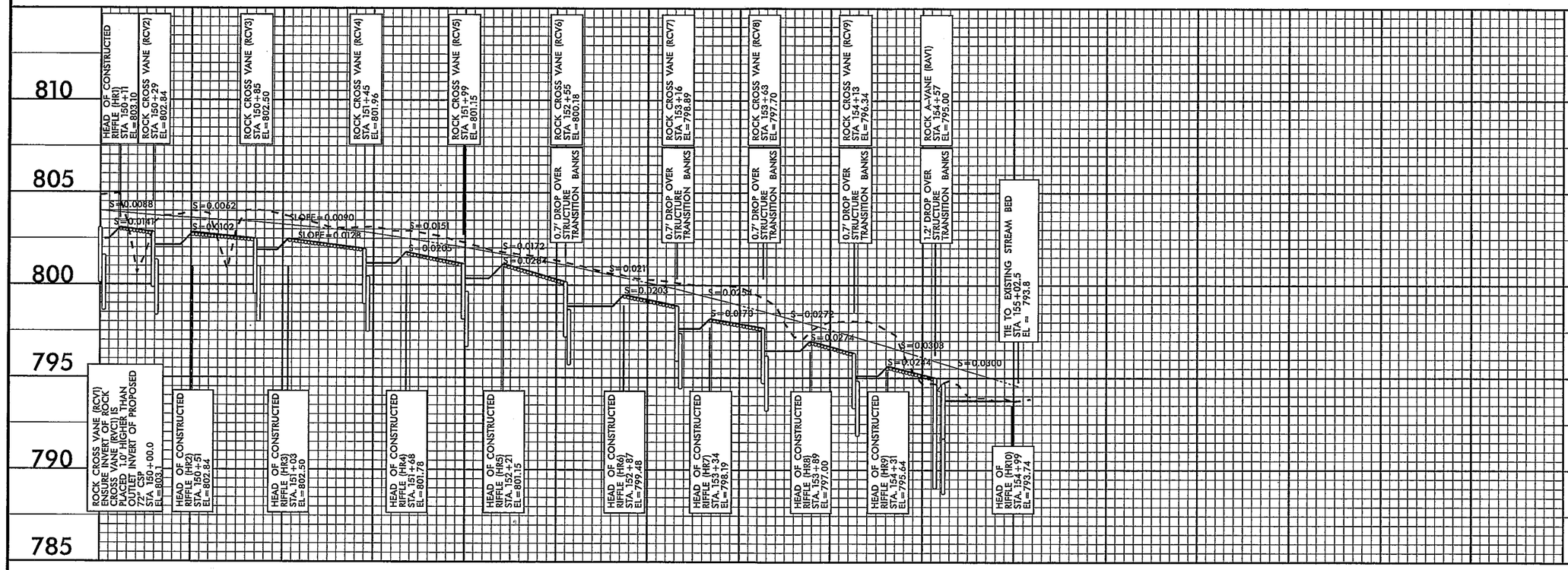
PROJECT ENGINEER

APPROVED BY:

DATE:

SITE 1 LOWER PROFILE

SITE 1 LOWER



LEGEND

- EXISTING GROUND ELEVATION
- PROPOSED GROUND ELEVATION
- PROPOSED BANKFULL
- PROPOSED LOG SILL
- PROPOSED LOG CROSS VANE
- CONSTRUCTED RIFFLE
- PROPOSED ROCK CROSS VANE
- PROPOSED ROCK A-VANE

HORIZONTAL 15 0 30

VERTICAL 1.5 0 3

Rev- 07-01-13

09/26/11

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PROJECT REFERENCE NO.	SHEET NO.
R-2413A&B	OSM-13

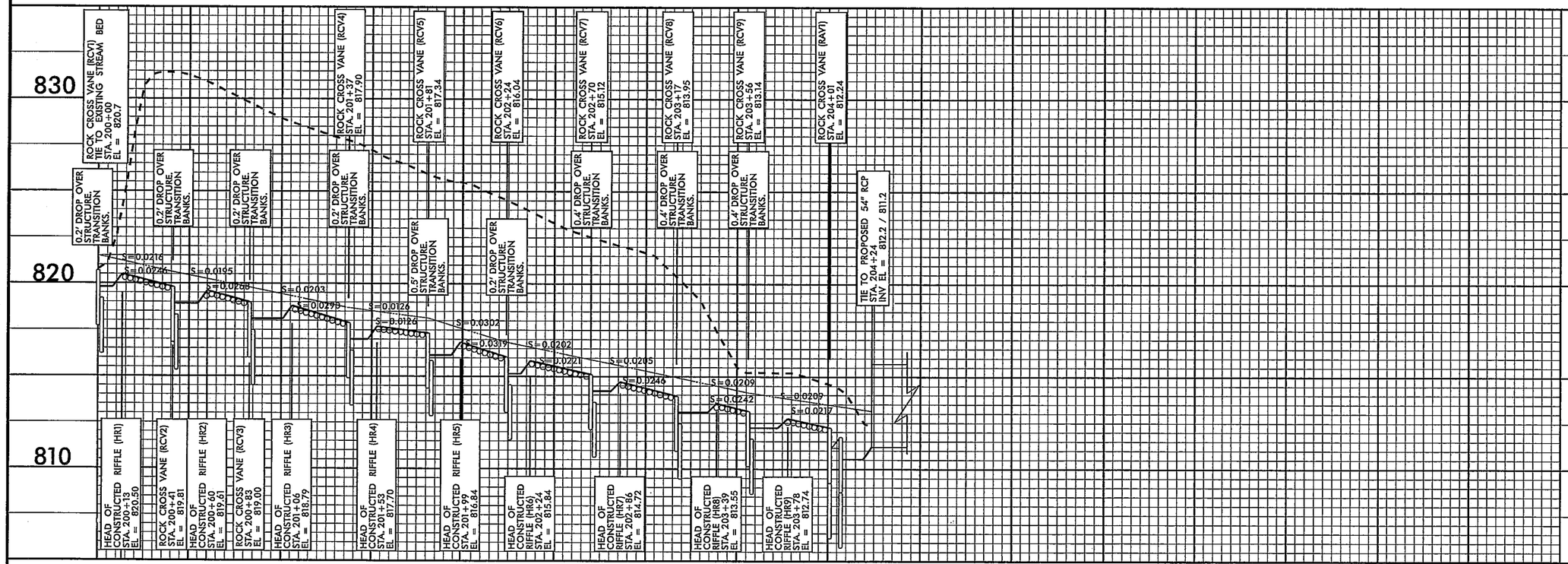
PROJECT ENGINEER

APPROVED BY:

DATE:

SITE 2 UPPER PROFILE

SITE 2 UPPER



LEGEND

- EXISTING GROUND ELEVATION
- PROPOSED GROUND ELEVATION
- PROPOSED BANKFULL
- PROPOSED LOG SILL
- PROPOSED LOG CROSS VANE
- CONSTRUCTED RIFFLE
- PROPOSED ROCK CROSS VANE
- PROPOSED ROCK A-VANE

15 0 30 HORIZONTAL

1.5 0 3 VERTICAL

Rev. 07-01-13

09/26/11

PREPARED IN THE OFFICE OF:
Kimley-Horn and Associates, Inc.
P.O. BOX 33068 - RALEIGH, NORTH CAROLINA 27636-3068
PHONE: (919) 677-2000 FAX: (919) 677-2050
NC LICENSE F-0102

PROJECT REFERENCE NO.	SHEET NO.
R-2413A&B	OSM-14

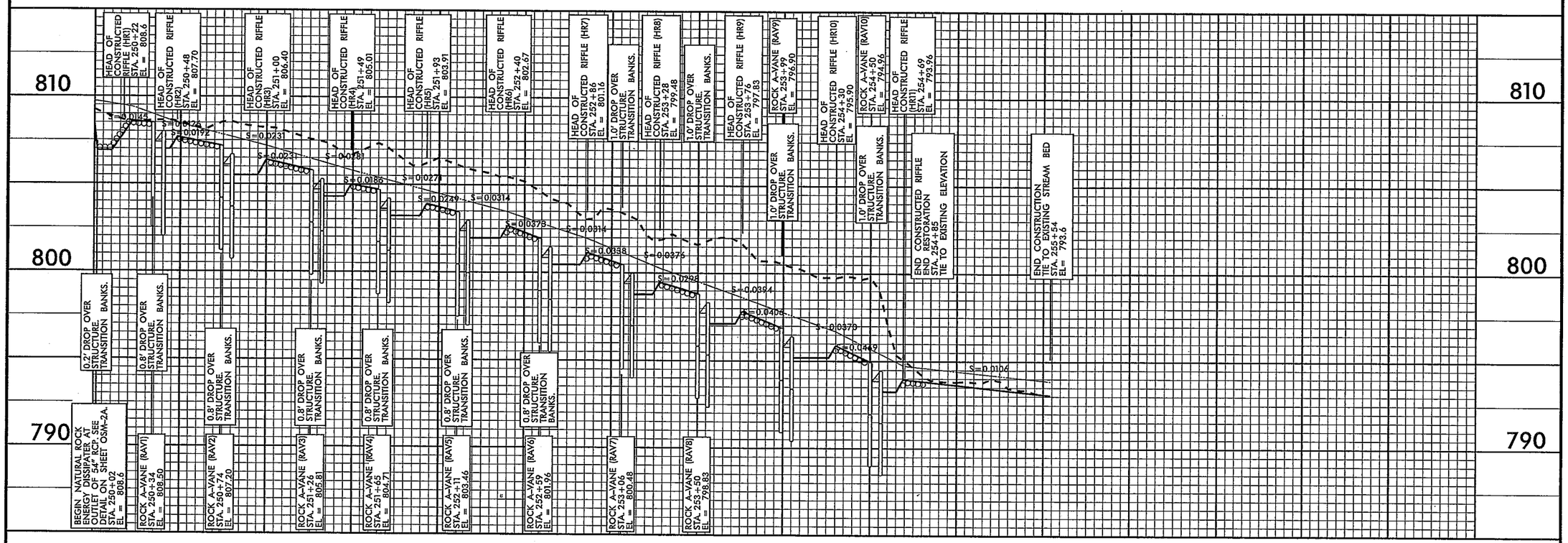
PROJECT ENGINEER

APPROVED BY:

DATE:

SITE 2 LOWER PROFILE

SITE 2 LOWER



LEGEND

EXISTING GROUND ELEVATION

PROPOSED GROUND ELEVATION

PROPOSED BANKFULL

PROPOSED LOG SILL

PROPOSED LOG CROSS VANE

CONSTRUCTED RIFFLE

PROPOSED ROCK CROSS VANE

PROPOSED ROCK A-VANE

HORIZONTAL 15 0 30

VERTICAL 1.5 0 3

Rev. 07-01-13

05/26/11

PREPARED IN THE OFFICE OF:

Kimley-Horn and Associates, Inc.

P.O. BOX 33068 - RALEIGH, NORTH CAROLINA 27636-3068
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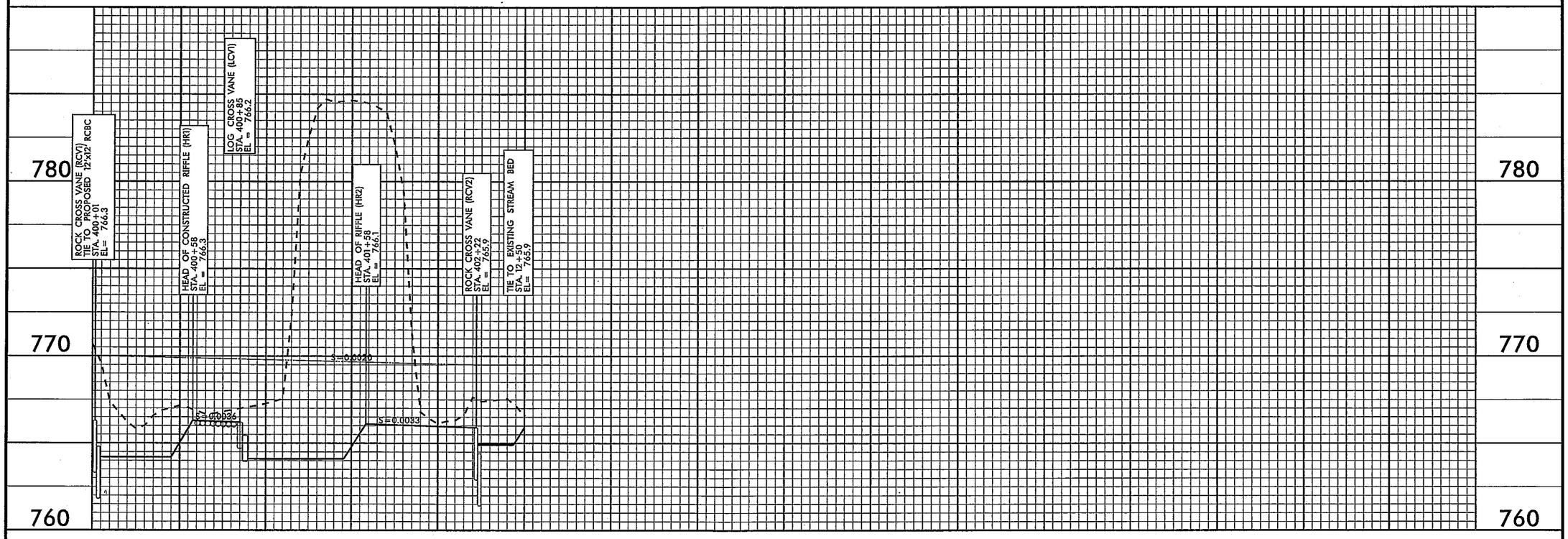
PROJECT REFERENCE NO.	SHEET NO.
R-2413A&B	OSM-15

PROJECT ENGINEER

APPROVED BY:

DATE:

SITE 4 PROFILE



LEGEND

EXISTING GROUND ELEVATION

PROPOSED GROUND ELEVATION

PROPOSED BANKFULL

PROPOSED LOG SILL

PROPOSED LOG CROSS VANE

CONSTRUCTED RIFFLE

PROPOSED ROCK CROSS VANE

PROPOSED ROCK A-VANE

15 0 30 HORIZONTAL

1.5 0 3 VERTICAL

Rev. 07-01-13

09/26/11

PREPARED IN THE OFFICE OF:

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NC LICENSE F-0102

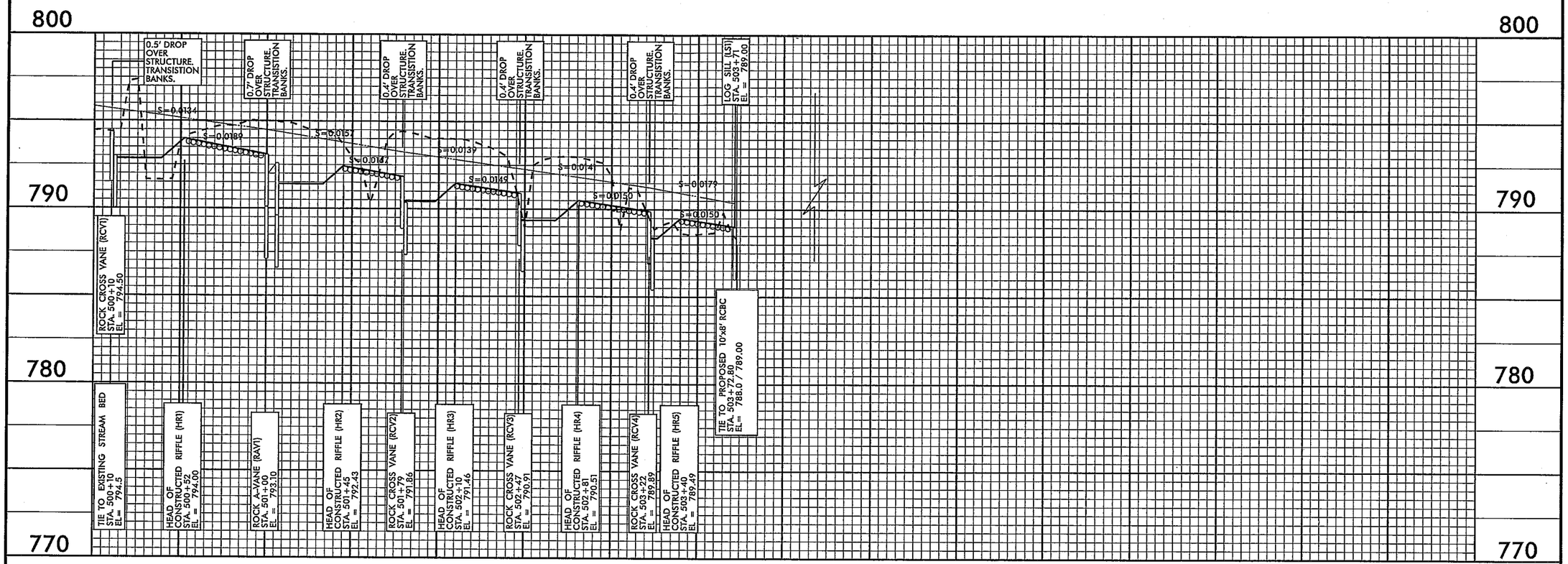
PROJECT REFERENCE NO.	SHEET NO.
R-2413A&B	OSM-16

PROJECT ENGINEER

APPROVED BY:

DATE:

SITE 5 UPPER PROFILE



LEGEND

EXISTING GROUND ELEVATION

PROPOSED GROUND ELEVATION

PROPOSED BANKFULL

PROPOSED LOG SILL

PROPOSED LOG CROSS VANE

CONSTRUCTED RIFFLE

PROPOSED ROCK CROSS VANE

PROPOSED ROCK A-VANE

HORIZONTAL	VERTICAL
15 0 30	1.5 0 3

09/26/11

Rev. 07-01-13

PREPARED IN THE OFFICE OF:
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P.O. BOX 33068 - RALEIGH, NORTH CAROLINA 27636-3068
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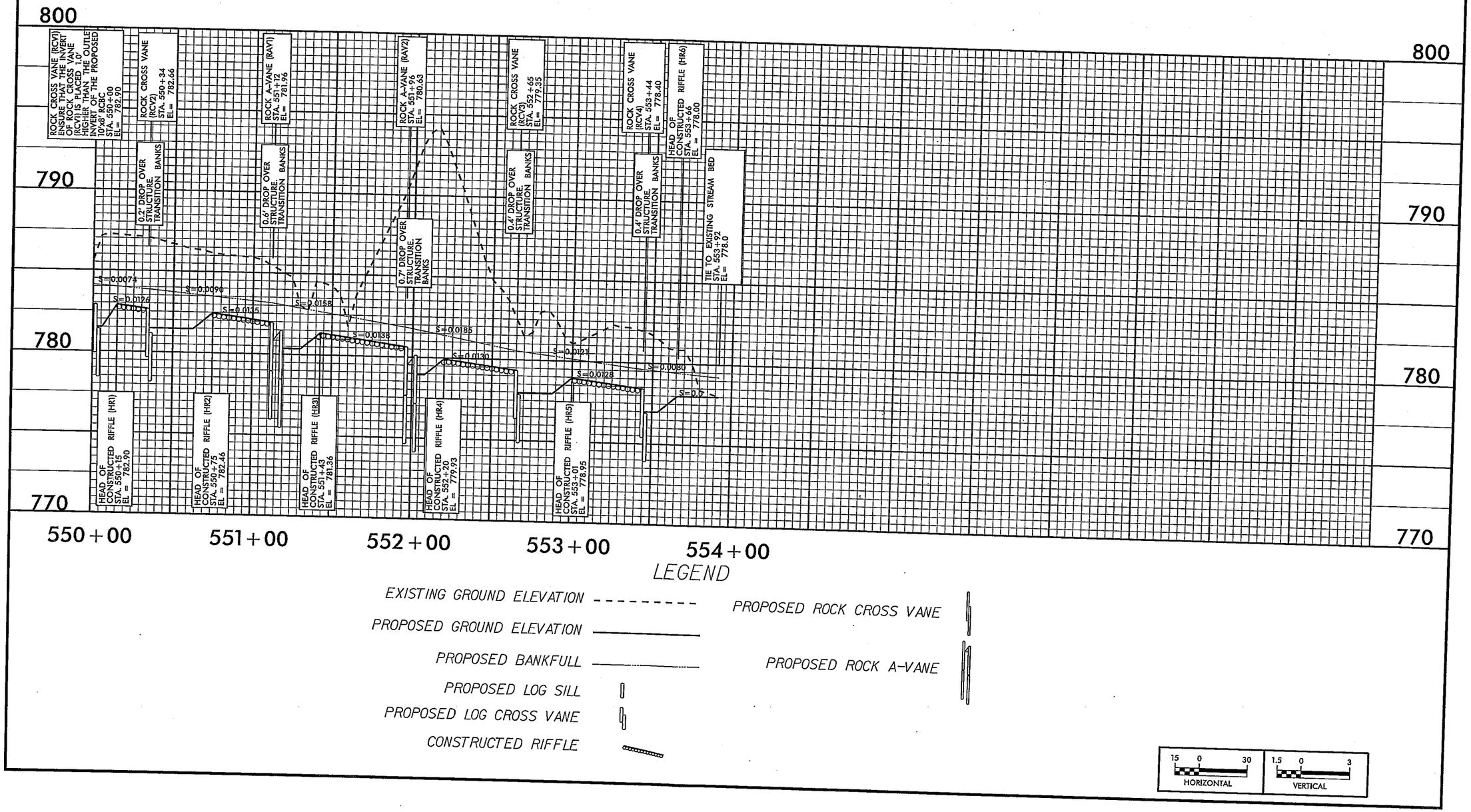
PROJECT REFERENCE NO.	SHEET NO.
R-2413A&B	OSM-17

PROJECT ENGINEER

APPROVED BY:

DATE:

SITE 5 LOWER PROFILE



LEGEND

EXISTING GROUND ELEVATION

PROPOSED GROUND ELEVATION

PROPOSED BANKFULL

PROPOSED LOG SILL

PROPOSED LOG CROSS VANE

CONSTRUCTED RIFFLE

PROPOSED ROCK CROSS VANE

PROPOSED ROCK A-VANE

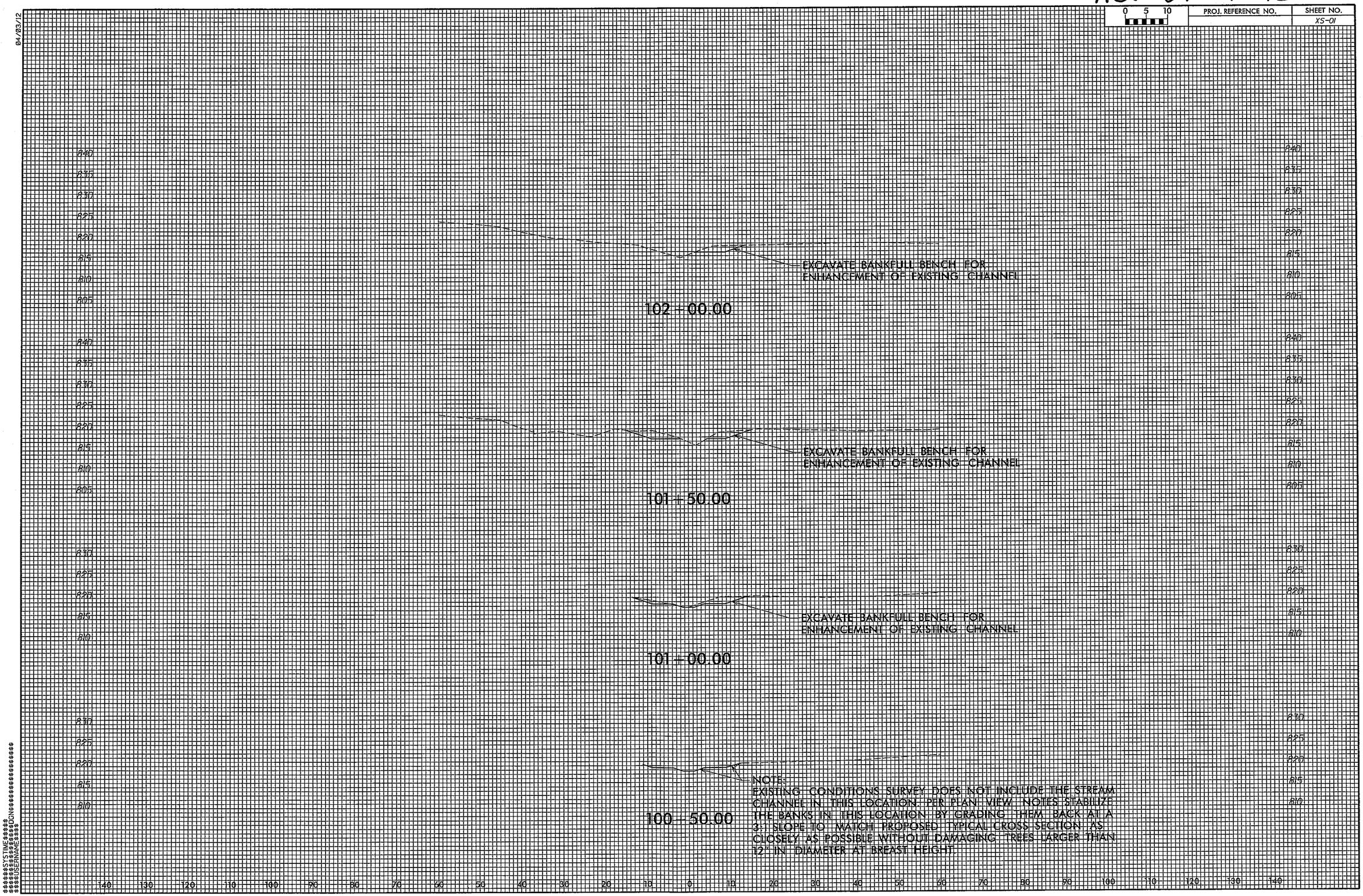
15 0 30 HORIZONTAL

1.5 0 3 VERTICAL

Rev. 07-01-13

04/03/12

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Rev. 07-01-13

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		XS-02

04/03/12

104+00.00

635 630 625 620 615 610 605 600

103+50.00

635 630 625 620 615 610 605

103+00.00

635 630 625 620 615 610 605

EXCAVATE BANKFULL BENCH FOR ENHANCEMENT OF EXISTING CHANNEL

102+50.00

635 630 625 620 615 610 605

EXCAVATE BANKFULL BENCH FOR ENHANCEMENT OF EXISTING CHANNEL

140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140

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Rev. 07-01-13

04/03/12

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106+00.00

105+50.00

105+00.00

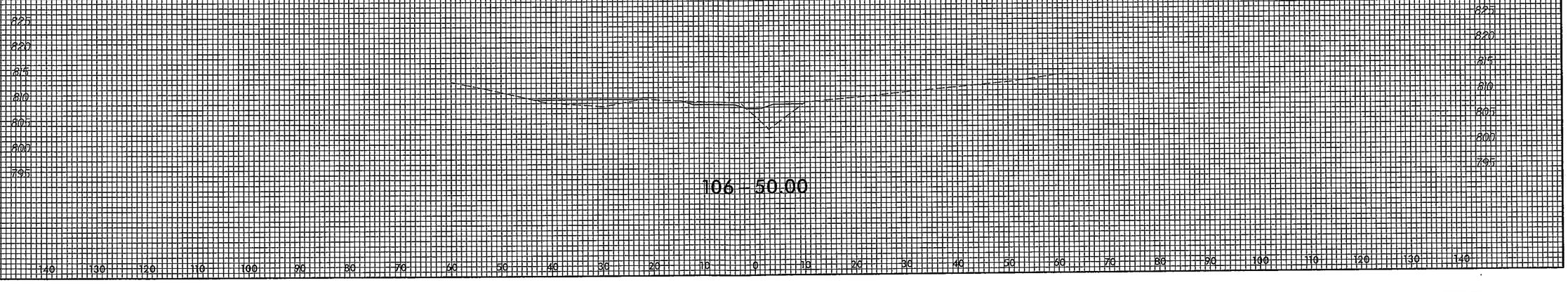
104+50.00

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Rev. 07-01-13

04/03/12

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		XS-04



$$$$$$$$SYSTIME$$$$$
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Rev. 07-01-13.

04/03/12

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151+50.00

151+00.00

150+50.00

150+00.00

$$$$$$$SYSTIME$$$$$$
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Rev. 07-01-13

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		XS-06

04/03/12

153+50.00

153+00.00

152+50.00

152+00.00

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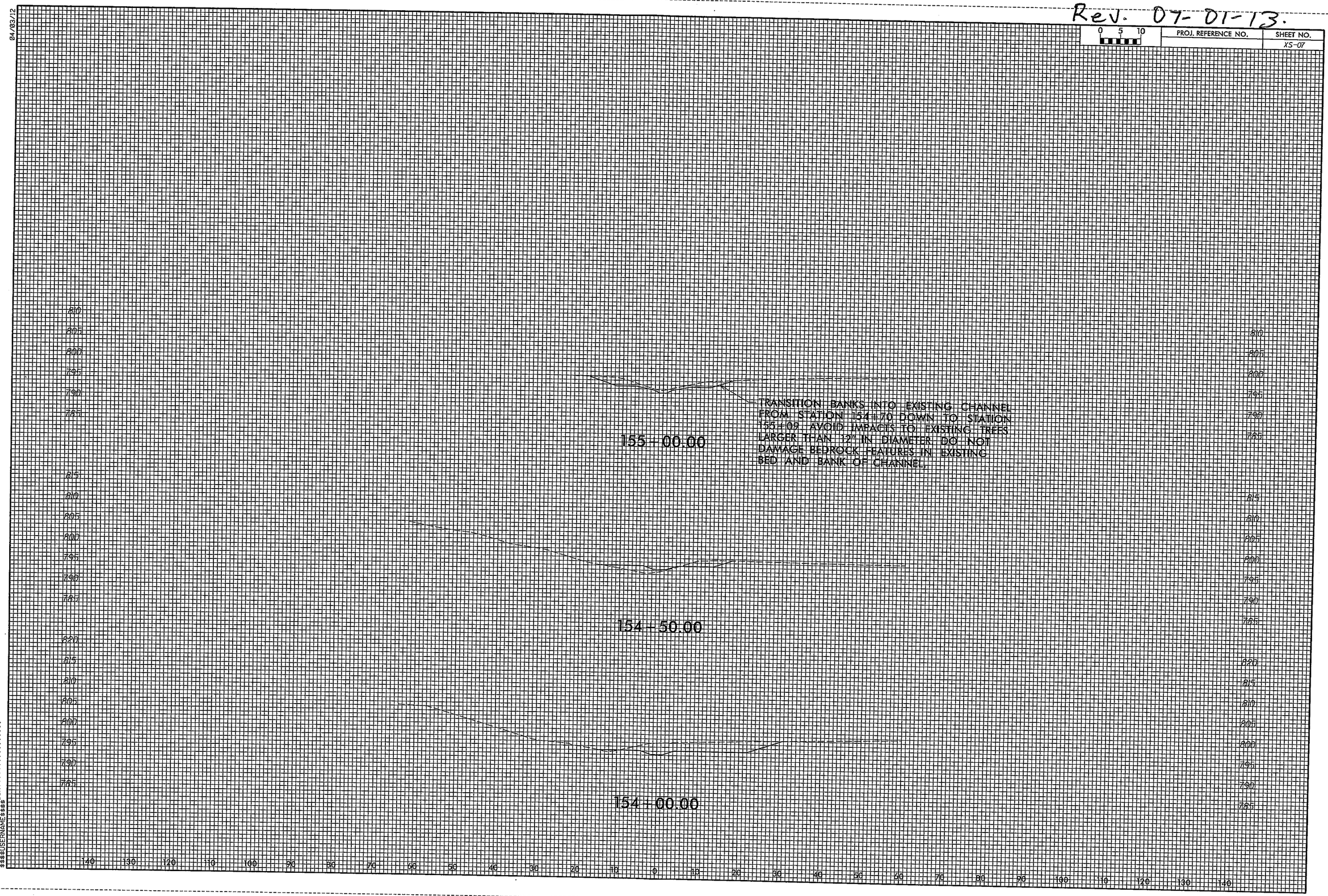
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Rev. 07-01-13.

04/03/12

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PROJ. REFERENCE NO.	SHEET NO.
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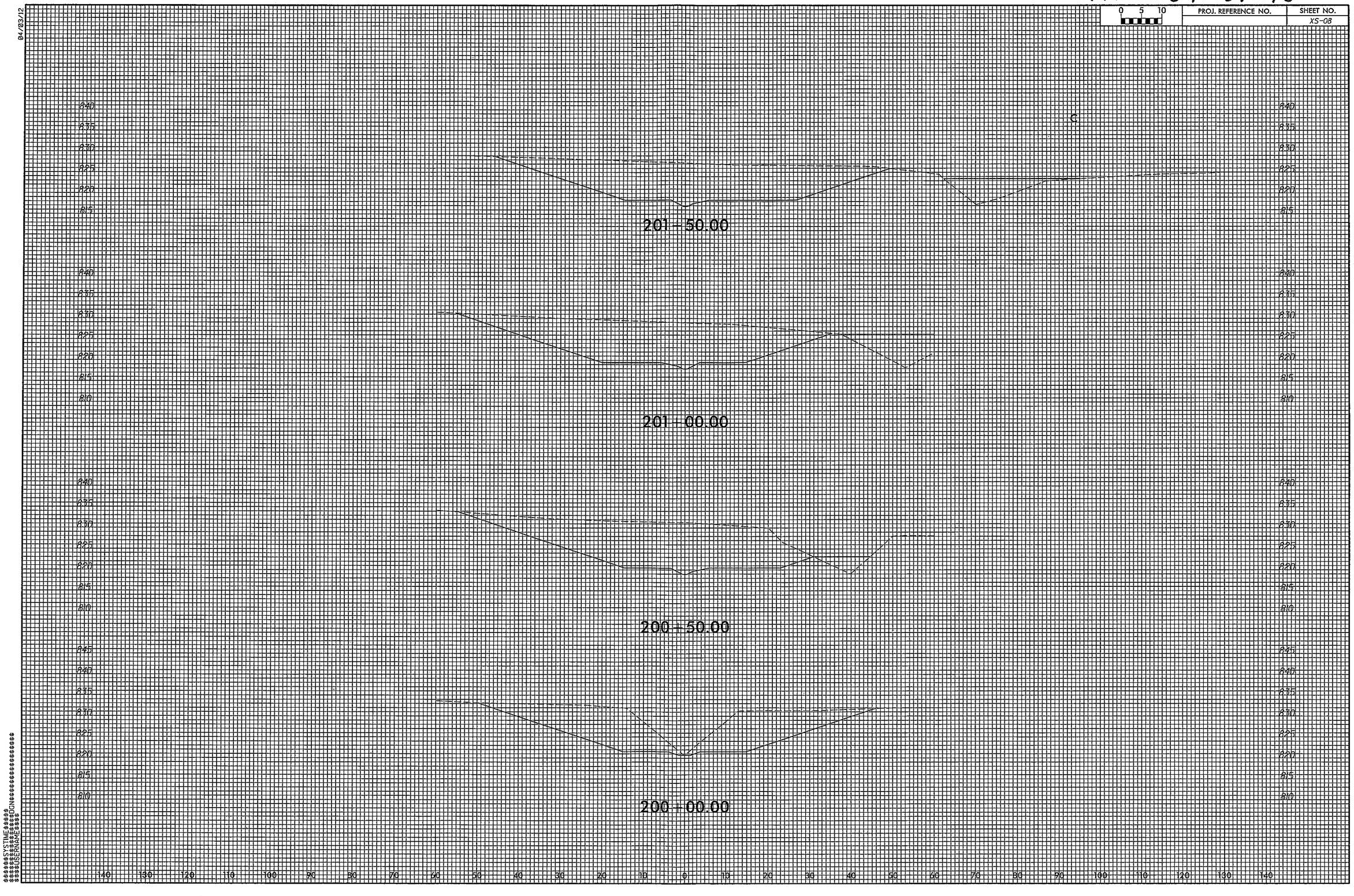


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Rev. 07-01-13

04/03/12

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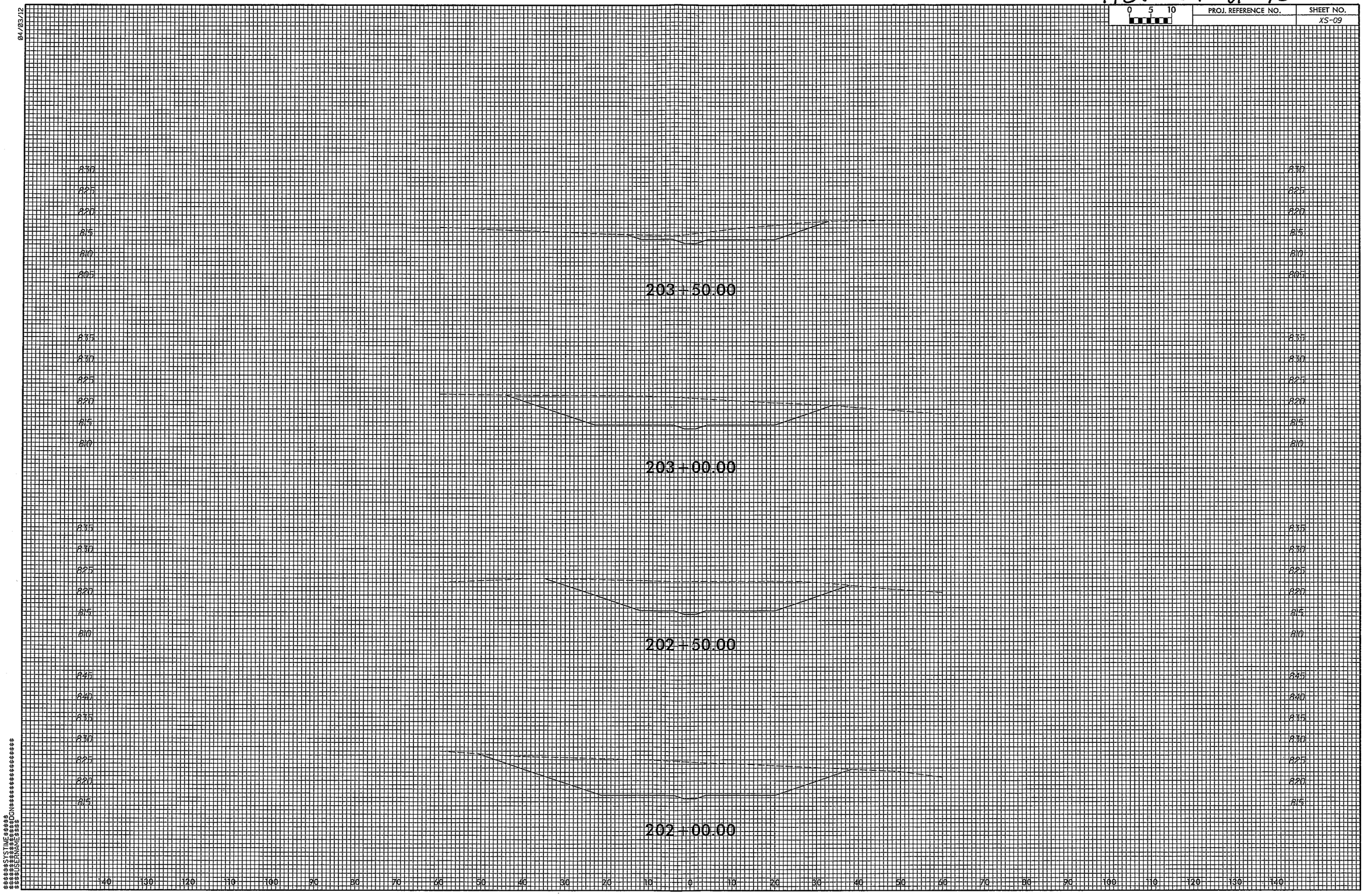


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Rev. 07-01-13

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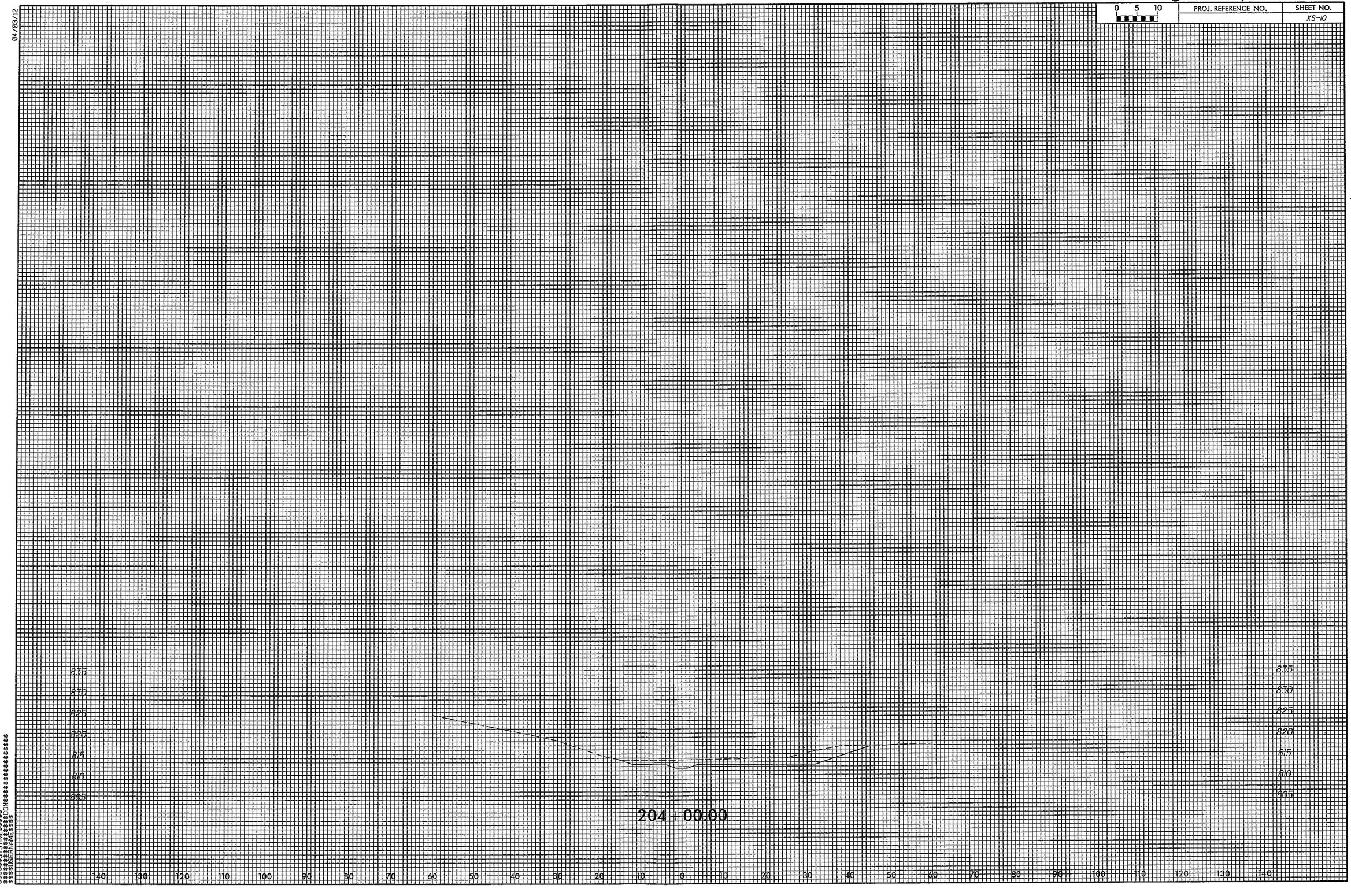


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Rev. 07-01-13

04/03/12

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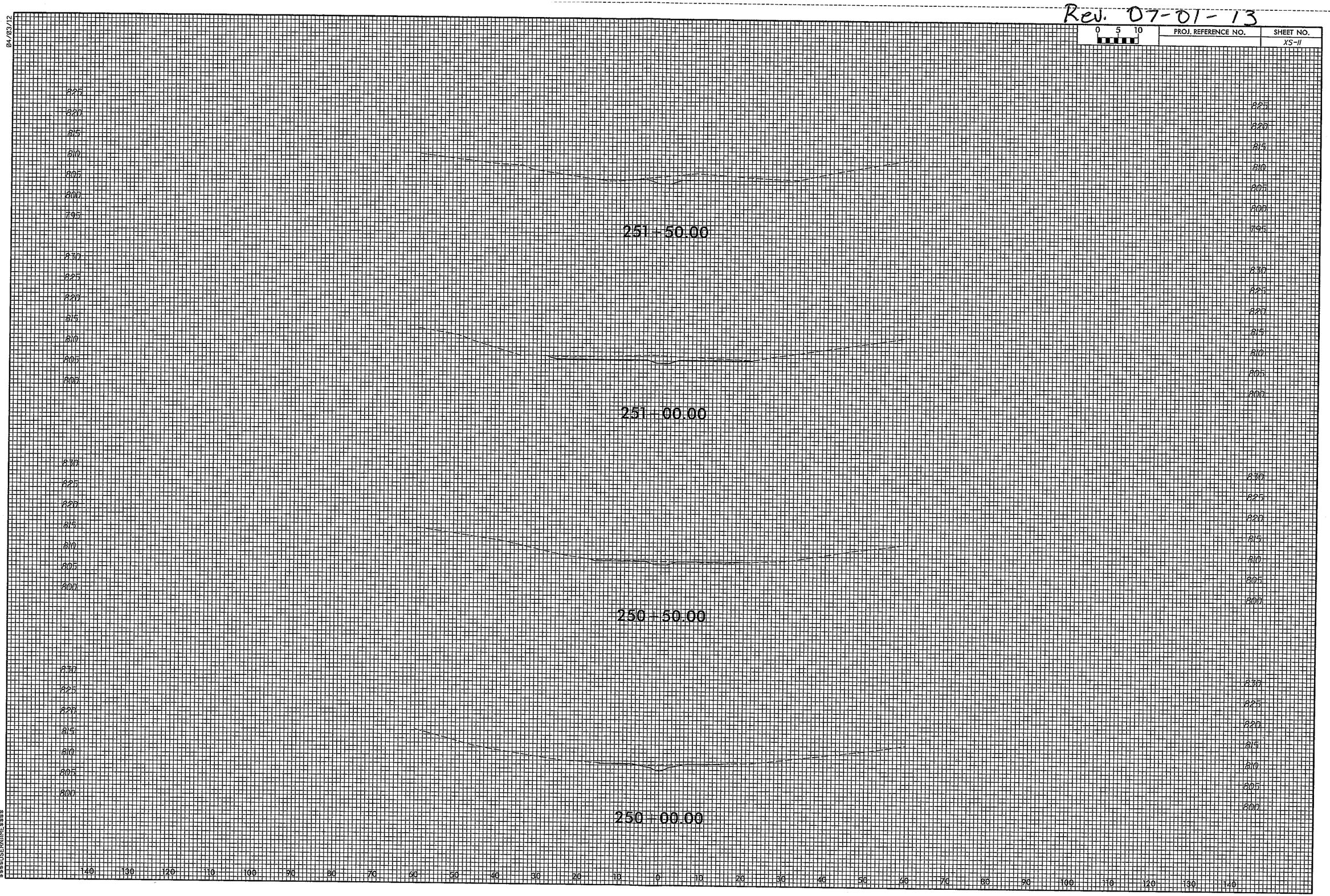


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Rev. 07-01-13

04/03/12

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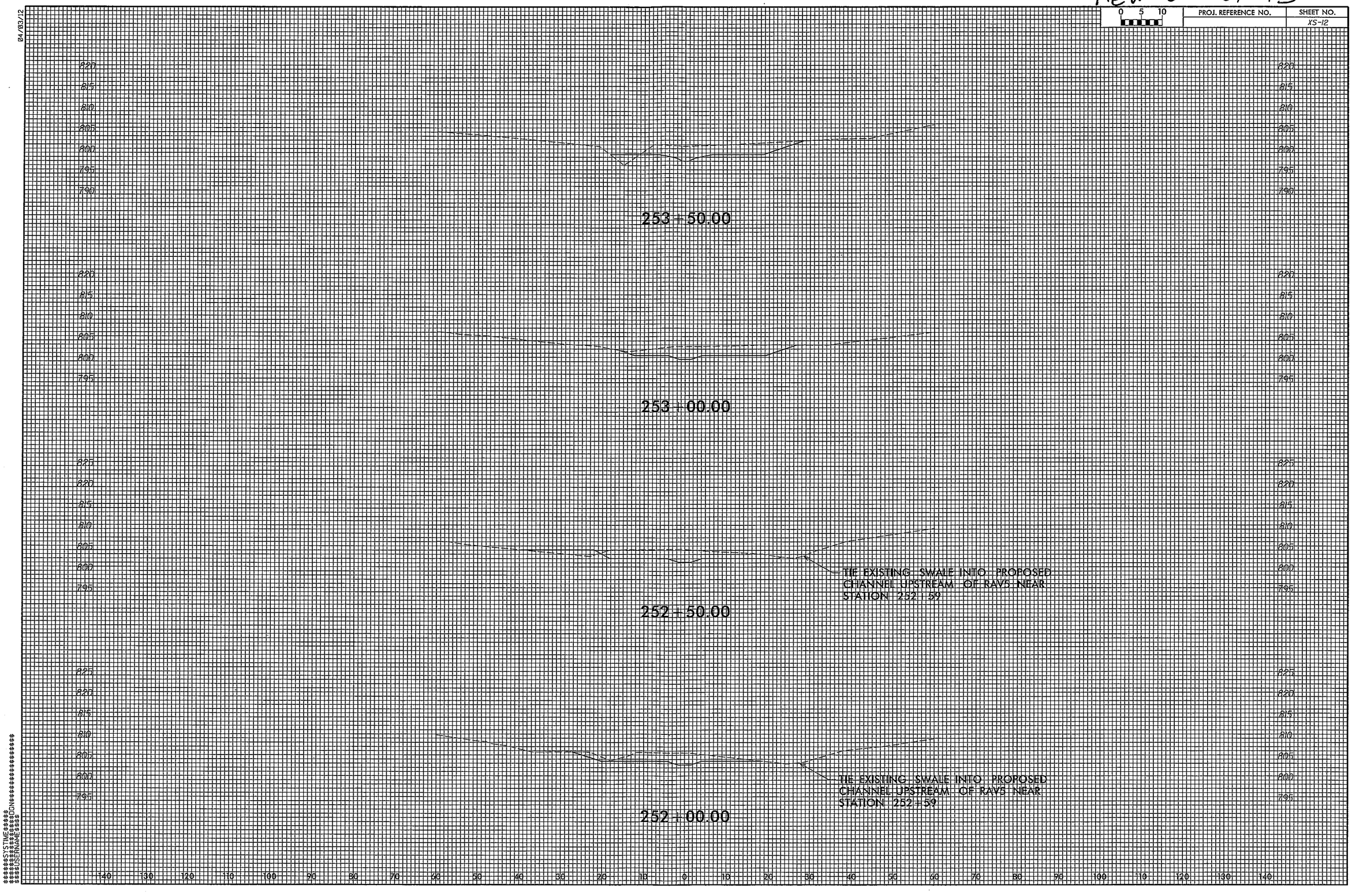
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Rev. 07-01-13

04/03/12

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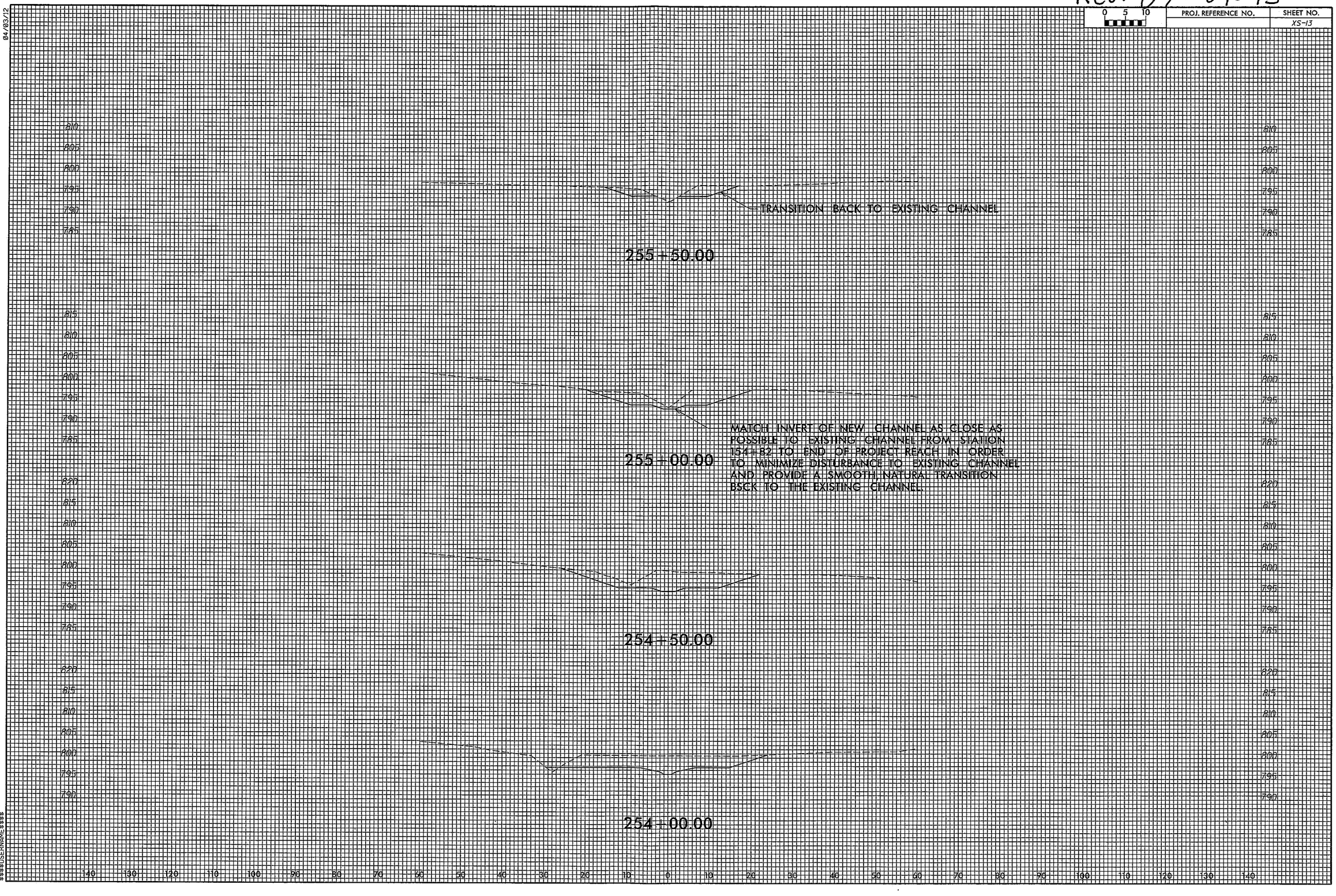


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Rev. 07-01-13

04/03/12

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		XS-13



$$$$$$$$SYSTIME$$$$$$
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Rev. 07-01-13

04/03/12

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PROJ. REFERENCE NO.	SHEET NO.
	XS-14

401+50.00

401+00.00

400+50.00

400+00.00

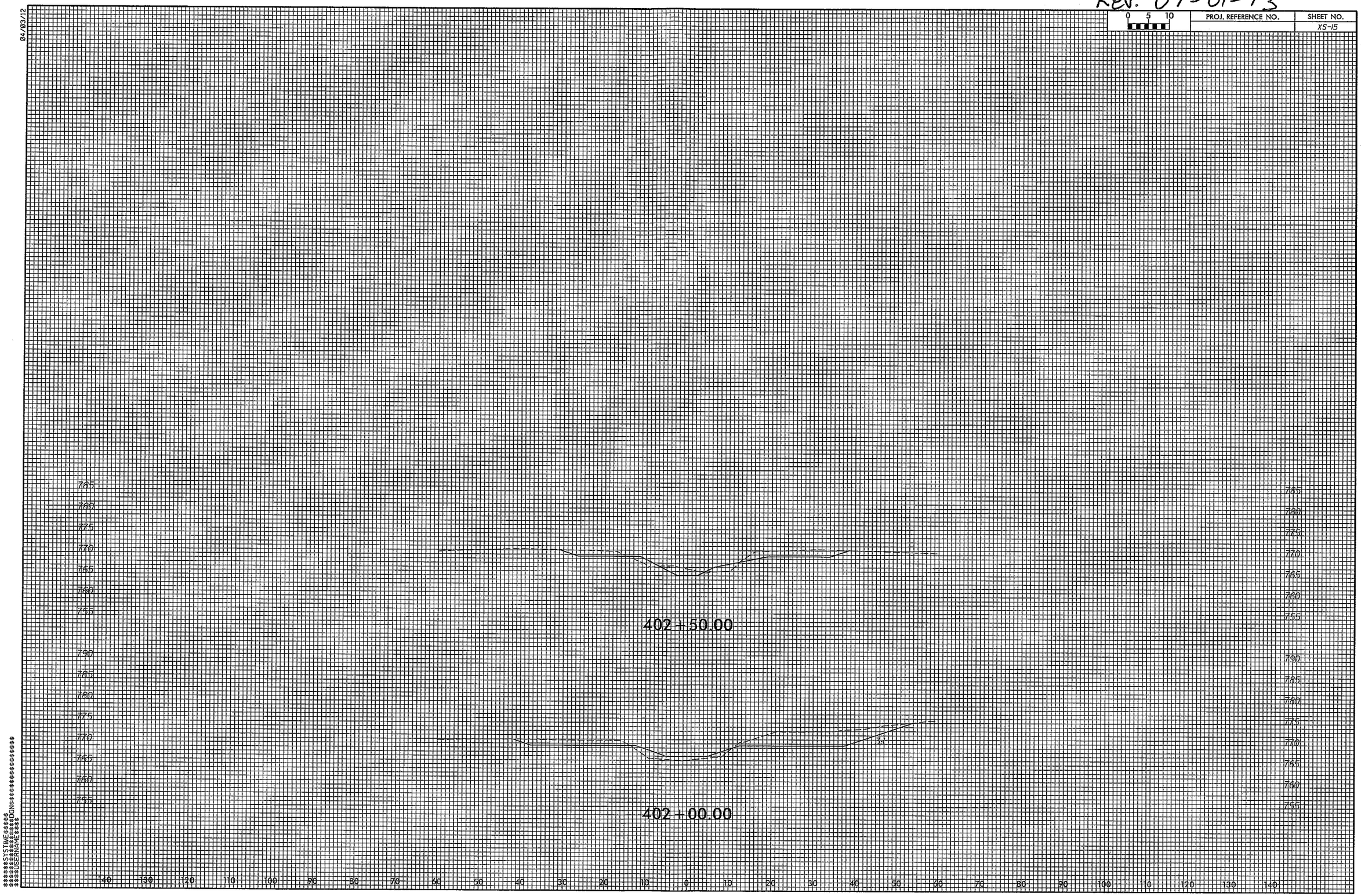
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Rev. 07-01-13

04/03/12

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PROJ. REFERENCE NO.	SHEET NO.
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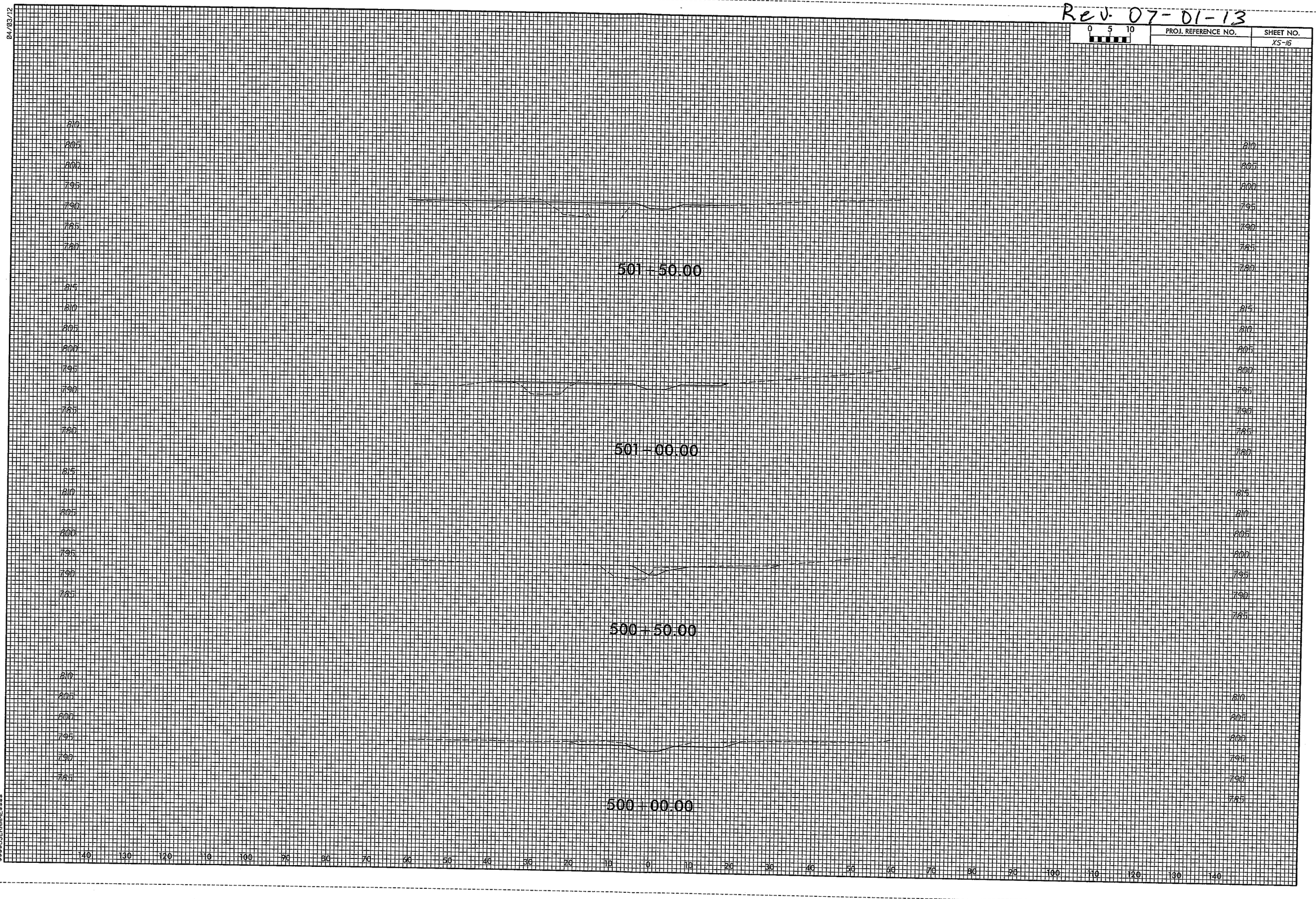
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Rev. 07-01-13

04/03/12

0 5 10

PROJ. REFERENCE NO.	SHEET NO.
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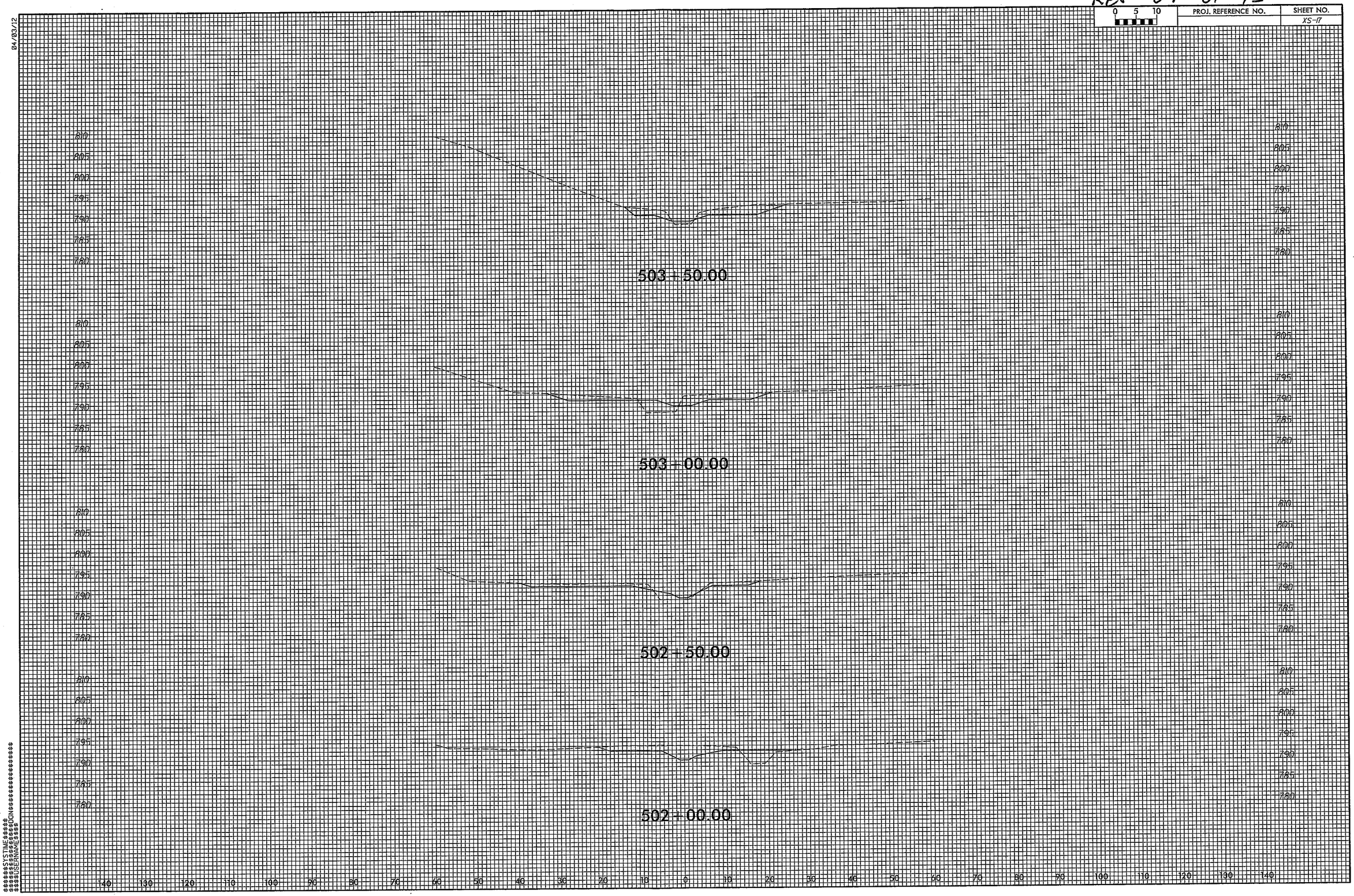


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Rev. 07-01-13

04/03/12

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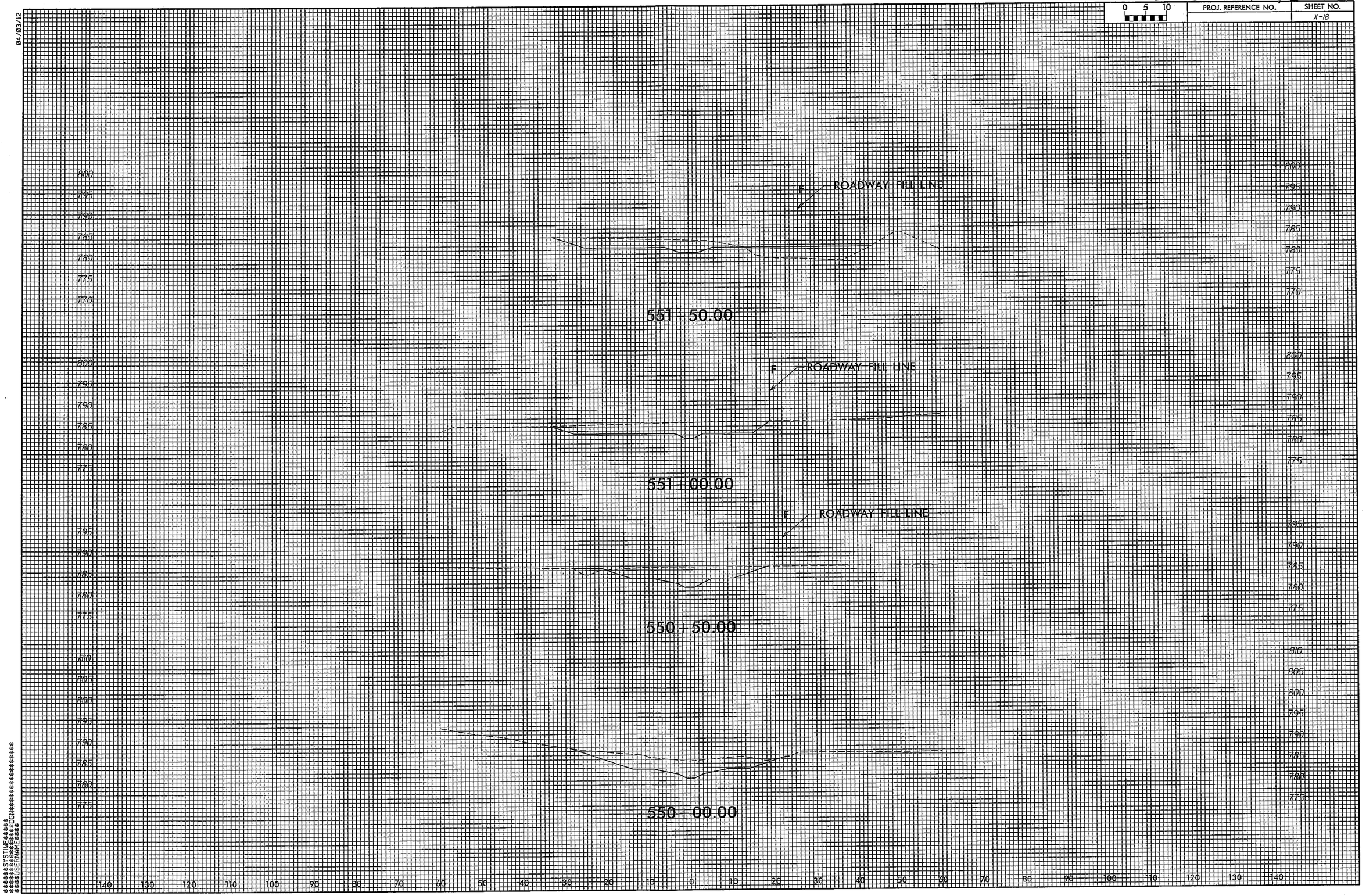
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Rev. 07-01-13

04/03/12

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PROJ. REFERENCE NO.	SHEET NO.
	X-18



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Rev. 07-01-13

04/03/12

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