STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

BEVERLY PERDUE
GOVERNOR

EUGENE CONTI
SECRETARY

February 8, 2010

MEMORANDUM TO: Mr. J. B. Setzer, P.E.
Division Fourteen Engineer

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

SUBJECT: Macon County, Widening of NC 28 (Bryson City Road) from near intersection of NC 28 (Bryson City Road) and SR 1323 (Riverview Street) to SR 1378 (Bennett Road); T.I.P. Number R-2408B; Federal Aid Project No. STP-28(1); State Project 8.1970801

Attached is the U.S. Army Corps of Engineers Section 404 Individual Permit and N.C. Division of Water Quality Section 401 Individual 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:
http://www.ncdot.gov/doh/preconstruct/pe/neu/permit.html

PSH/gyb

Attachment

Cc: W/attachment
Mr. Randy Garris, P.E. State Contract Officer
Mr. Mark Davis, Division Environmental Officer
Dr. Charles Nicholson, TVA

Cc: W/o attachment (see website for attachments)
Mr. Majed Alghandour, P. E., Programming and TIP
Mr. Jay Bennett, P.E., Roadway Design
Dr. David Chang, P.E., Hydraulics
Mr. Art McMillan, P.E., Highway Design
Mr. Tom Koch, P.E., Structure Design
Mr. Mark Staley, Roadside Environmental
Mr. John F. Sullivan, FHWA
Mr. Ron Hancock, P.E., State Roadway Construction Engineer
Mr. Mike Robinson, P.E., State Bridge Construction Engineer
Ms. Beth Harmon, EEP
Ms. Teresa Hart, P.E., PDEA Western Region Unit Head

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

TELEPHONE: 919-733-3141
FAX: 919-715-1501
WEBSITE: WWW.DOH.DOT.STATE.NC.US

LOCATION:
TRANSPORTATION BUILDING
1 SOUTH WILMINGTON STREET
RALEIGH NC

PROJECT COMMITMENTS

Macon County
Widening of NC 28 (Bryson City Road) from near
intersection of NC 28 (Bryson City Road) and
SR 1323 (Riverview Street) to SR 1378 (Bennett Road)
Federal Aid Project No. STP - 28(1)
WBS No. 34427.1.1
State Project No. 8.1970801
T.I.P. Project No. R-2408B

Commitments Developed During Project Development

Roadway Design Unit and Division 14

- The proposed action includes 4-foot paved shoulders. The paved shoulder will provide bicycle accommodations throughout the length of the project.
- Consider reducing cut slope impacts (with shoulder berm gutter, expressway gutter, or steeper slopes) to minimize relocation impacts.
- Three to four locations on the project will utilize expressway gutter to minimize relocation impacts.

- Evaluate shifting the alignment westward just south of the SR 1323 and NC 28 intersection to minimize residential impacts. This alignment shift will be executed within the project limits of R-2408A.

Project Development and Environmental Analysis Branch, Roadway Design Unit and Division 14

- The proposed fill on the east side of NC 28 between Stations 117+00 and 119+00 will be placed without removing the existing topsoil. This section of the project has been identified as an environmentally sensitive area.

The fill in this environmentally sensitive area will be placed on existing section without removal of the native topsoil. Additionally, berm ditches within the environmentally sensitive area will be located within the proposed Right of Way.

Hydraulics Unit and Structures

- A TVA Section 26a permit is required for all proposed obstructions involving streams or floodplains in the Tennessee River drainage basin. The TVA is a cooperating agency for this project.

A TVA Section 26a permit will be prepared for the project. TVA is a cooperating agency and has participated in Hydraulic Design Review Meetings on the project.

- Coordinate with the Federal Emergency Management Agency and local authorities in the final design stage to ensure compliance with applicable floodplain ordinances.

No floodplain issues have been identified on this project. If floodplain compliance issues are identified, coordination with FEMA and local authorities will be required.

- Investigate the feasibility of constructing a bottomless culvert over Rocky Branch. If a bottomless culvert is not feasible, the traditional culvert will be appropriately sized and placed.

A bottomless culvert design is feasible and will be constructed over Rocky Branch.

Roadway Design Unit, Hydraulics Unit, and Roadside Environmental Unit

- The proposed project is located within a critical habitat area for the federally protected Appalachian elktoe mussel, littlewing pearlymussel, spotfin chub, and the Virginia spirea. Therefore, NCDOT will implement erosion and sedimentation control measures, as specified by NCDOT's "Design Standards in Sensitive Watersheds" (15A NCAC 04B.0124). Detailed plans for the placement of appropriate hydraulic drainage structures will be determined during the final design of the project.

Roadway Design Unit, Roadside Environmental Unit, and Division 14

- To avoid or reduce impacts to the federally protected Indiana Bat, NCDOT will:
  1. Leave damaged and dead trees as long as they do not create a safety hazard.
  2. Avoid, to the extent practicable, stream degradation by channelization, siltation, or other pollution to protect macroinvertebrate food sources for bats.

Commitment number one has been changed to read "A moratorium for tree cutting on the project will occur between April 15 through October 15 to avoid interactions with potential nesting habitat for Indiana bats."

Division 14

- To minimize impacts to the spotfin chub and other listed species, in-stream work and land disturbance in riparian areas will be conducted, to the extent practicable, between the months of May through October.

Commitments Developed During Project Permitting

Project Development and Environmental Analysis Branch (NEU), Roadside Environmental Unit, and Division 14

401 Condition #2: Compensatory mitigation for impacts to 613 linear feet of streams at a replacement ratio of 1:1 is required. Compensatory mitigation for impacts to jurisdictional streams shall be provided by onsite stream relocations of 393 linear feet of Rocky Branch and 190 linear feet of a UT to Little Tennessee River (*A Section*). The onsite stream relocations shall be constructed in accordance with the design submitted in your application received April 22, 2009. 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 Quality 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 583 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 NCDWQ 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 30-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.

The permittee shall visually monitor the vegetative plantings to assess and ensure complete stabilization of the mitigation stream segments. The monitoring shall be conducted annually for a minimum of 3 years after final planting. Photo documentation shall be utilized to document the success of the riparian vegetation and submitted to NCDWQ in a final report within sixty (60) days after completing monitoring. After 3 years the NCDOT shall contact the NCDWQ to schedule a site visit to "close out" the mitigation site.

401 Condtion #6: All channel relocations will be constructed in a dry work area and stabilized before stream flows are diverted. Channel relocations will be completed and stabilized, and must be approved on site by DWQ staff, prior to diverting water into the new channel. Whenever possible, channel relocations shall be allowed to stabilize for an entire growing season. Vegetation used for bank stabilization shall be limited to native woody species, and should include establishment of a 30 foot wide wooded and an adjacent 20 foot wide vegetated buffer on both sides of the relocated channel to the maximum extent practical. A transitional phase incorporating coir fiber and seedling establishment is allowable. 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.

Roadside Environmental Unit and Division 14

401 Condtion #26: Native riparian vegetation (ex. river birch, shagbark hickory, green ash, black gum, sycamore, black willow, tag alder, red chokeberry, ironwood, silky dogwood, spicebush, swamp milkwood, hop sedge, lurid sedge, bottlebrush grass, joe-pye-weed, bonseset) must be reestablished within the construction limits of the project by the end of the growing season following completion of construction.

Project Development and Environmental Analysis Branch (NEU)

404 Condtion #15: Compensatory mitigation for unavoidable impacts to 663 linear feet of cool-water stream channel (HUC 06010202) and 0.09 acre of jurisdictional wetlands associated with the proposed project shall be provided by a combination of on-site stream restoration and debiting from the Tulula Bog Mitigation Site. The Tulula Bog Mitigation Site shall be debited at a 1:1 ratio for impacts to 0.09 acre of jurisdictional wetlands and 80 linear feet of stream channel. The on-site mitigation sites, which are detailed on the permit plan sheet numbers 2F, 2G, and 2H, shall be preserved by expansion of right-of-way at the Rocky Branch site and purchasing (fee simple) the UT to the Little Tennessee River in the A Section.

DEPARTMENT OF THE ARMY
WILMINGTON DISTRICT, CORPS OF ENGINEERS
69 DARLINGTON AVENUE
WILMINGTON, NORTH CAROLINA 28403-1343

REPLY TO
ATTENTION OF:

January 29, 2010

Regulatory Division

Action ID: SAW-2009-00860; NCDOT TIP No. R-2408B

Dr. Gregory J. Thorpe, PhD, Manager
Project Development and Environmental Analysis Branch
N.C. Department of Transportation
Division of Highways
1598 Mail Service Center
Raleigh, North Carolina 27699-1598

Dear Dr. Thorpe:

Enclosed is a Department of the Army permit to discharge fill material into 663 linear feet of stream channel in Rocky Branch and unnamed tributaries and 0.09 acre of adjacent wetland, within the Little Tennessee River drainage, associated with the widening of NC Highway 28 in Franklin, Macon County, North Carolina. (TIP No. R-2408B).

Any deviation in the authorized work will likely require modification of this permit. If a change in the authorized work is necessary, you should promptly submit revised plans to the Corps showing the proposed changes. You may not undertake the proposed changes until the Corps notifies you that your permit has been modified.

Carefully read your permit. The general and special conditions are important. Your failure to comply with these conditions could result in a violation of Federal law. Certain significant conditions require that:

a. You must complete construction before December 31, 2015.

b. You must allow representatives from this office to make periodic visits to your worksite as deemed necessary to assure compliance with permit plans and conditions.

You must notify this office in advance as to when you intend to commence and complete work.

You should address all questions regarding this authorization to Mr. David Baker, Regulatory Division, Asheville Regulatory Field Office, telephone (828) 271-7980, extension 225.

Sincerely,

for Jefferson M. Ryscavage
Colonel, U.S. Army
District Commander

Enclosures

Copy furnished (with enclosures):

Chief, Source Data Unit
NOAA/National Ocean Service
ATTN: Sharon Tear N/CS261
1315 East-West Hwy., Rm 7316
Silver Spring, Maryland 20910-3282

Copies furnished (with special conditions and plans):

Mr. Ronald J. Mikulak, Chief
Wetlands Regulatory Section
61 Forsyth Street
Atlanta, Georgia 30303

Mr. Pete Benjamin
U.S. Fish and Wildlife Service
Fish and Wildlife Enhancement
Post Office Box 33726
Raleigh, North Carolina 27636-3726

Mr. Ron Sechler
National Marine Fisheries Service
Pivers Island
Beaufort, North Carolina 28516

Mr. Doug Huggett
Division of Coastal Management
N.C. Department of Environment
and Natural Resources
400 Commerce Avenue
Morehead City, North Carolina 28557

Mr. David Rackley
National Marine Fisheries Service
219 Fort Johnson Road
Charleston, South Carolina 29412-9110

DEPARTMENT OF THE ARMY PERMIT

Permittee **Dr. Gregory J. Thorpe, Director, Project Development and Environmental Analysis Branch, North Carolina Department of Transportation**

Permit No. **SAW-2009-0860**

Issuing Office **CESAW-RG-A**

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 that office acting under the authority of the commanding officer.

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

Project Description: **to discharge fill material into 0.09 acres of wetland, and 663 linear feet of stream channel in Rocky Branch and unnamed tributaries to the Little Tennessee River in conjunction with the widening of NC Highway 28. (TIP No. R-2408B).**

Project Location: **in Franklin, Macon County, North Carolina**

Permit Conditions:

General Conditions:

1. The time limit for completing the work authorized ends on **December 31, 2015** 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 Condition 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 is 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 made 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 33 CFR 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 measures 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.

E. L. Lusk for Gregory J. Thorpe, PhD — Jan 22, 2010

(PERMITTEE) **NORTH CAROLINA DEPARTMENT OF TRANSPORTATION** *(DATE)*

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

Henry Wicker — Jan 29, 2010

(DISTRICT COMMANDER) **JEFFERSON M. RYSCAVAGE** *(DATE)*
for **COLONEL**

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

NCDENR
North Carolina Department of Environment and Natural Resources
Division of Water Quality
Coleen H. Sullins
Director

Beverly Eaves Perdue
Governor

Dee Freeman
Secretary

July 21, 2009

Dr. Greg Thorpe, PhD., Manager
Project Development and Environmental Analysis
North Carolina Department of Transportation
1548 Mail Service Center
Raleigh, North Carolina, 27699-1548

JUL 27 2009

Subject: 401 Water Quality Certification Pursuant to Section 401 of the Federal Clean Water Act with ADDITIONAL CONDITIONS for Proposed widening of NC 28 from north of SR 1323 (Riverview Street) to south of SR 1378 (Bennett Road) in Macon County, TIP R-2408B, Division 14, Federal Aid Project No. STP-28(1), DWQ Project No. 20090451. Individual Certification No. WQC0003806

Dear Dr. Thorpe:

Attached hereto is a copy of Certification No. 3806 issued to The North Carolina Department of Transportation dated July 21, 2009.

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

Sincerely,

for Coleen H. Sullins
Director

Attachments

cc: David Baker, US Army Corps of Engineers, Asheville Field Office
Mark Davis, Division 14 Environmental Officer
Kathy Matthews, Environmental Protection Agency
Marla Chambers, NC Wildlife Resources Commission
Mike Parker, DWQ Asheville Regional Office
File Copy

Transportation Permitting Unit
1650 Mail Service Center, Raleigh, North Carolina 27699-1650
Location: 2321 Crabtree Blvd., Raleigh, North Carolina 27604
Phone: 919-733-1786 \ FAX: 919-733-6893
Internet: http://h2o.enr.state.nc.us/ncwetlands/

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 (DWQ) Regulations in 15 NCAC 2H .0500 . This certification authorizes the NCDOT to impact 0.09 acres of jurisdictional wetlands and 879 linear feet of jurisdictional streams in Macon County. The project shall be constructed pursuant to the application dated received April 22, 2009. The authorized impacts are as described below:

R-2408B Stream Impacts in the Little Tennessee River Basin

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)
1A	0	0	9	31	40	0
1	0	0	41	4	45	0
2	0	0	65	46	111	65
3	0	0	442	60	502	442
4	0	0	106	75	181	106
Total	**0**	**0**	**663**	**216**	**879**	**613**

Total Stream Impact for Project: 879 linear feet

R-2408B Wetland Impacts in the Little Tennessee River Basin

Site	Fill (ac)	Fill (temporary) (ac)	Excavation (ac)	Mechanized Clearing (ac)	Hand Clearing (ac)	Total Wetland Impact (ac)
3	0.05	0	0	0	0	0.05
5	0.04	0	0	0	0	0.04
Total	**0.09**	**0**	**0**	**0**	**0**	**0.09**

Total Wetland Impact for Project: 0.09 acres.

The application provides adequate assurance that the discharge of fill material into the waters of the Little Tennessee 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 April 22, 2009. Should your project change, you are required to notify the DWQ 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. The permittee shall use *Design Standards in Sensitive Watersheds*[15A NCAC 4B.0124(a)-(e)] for the entire project corridor. However, due to the size of the project, NC DOT shall not be required to meet 15A NCAC 4B .0124(a) regarding the maximum amount of uncovered acres. Temporary cover (wheat, millet, or similar annual grain) or permanent herbaceous cover shall be planted on all bare soil within 15 business days of ground disturbing activities to provide erosion control. Coir fiber matting shall be used in conjunction with appropriate seeding on disturbed soils involving steep slopes in riparian areas, and should be secured in place with staples and wherever possible include installation of live stakes of native trees.

   Straw mulch and tall fescue shall not be used in the establishment of temporary or permanent groundcover within riparian zones. Coir fiber matting shall be used in conjunction with appropriate seeding for the establishment of permanent herbaceous cover on disturbed soils within the riparian area. Hydro seeding along with wood or cellulose based hydro mulch applied from a fertilizer and limestone free tank is allowable at the appropriate rate for the establishment of temporary groundcover within riparian zones. Discharging hydroseed mixtures and wood or cellulose mulch into surface waters is prohibited. Riparian areas are defined as a distance 25 feet landward from top of stream bank.

2. Compensatory mitigation for impacts to 613 linear feet of streams at a replacement ratio of 1:1 is required. Compensatory mitigation for impacts to jurisdictional streams shall be provided by onsite stream relocations of 393 linear feet of Rocky Branch and 190 linear feet of a UT to the Little Tennessee River. The onsite stream relocations shall be constructed in accordance with the design submitted in your application received April 22, 2009. 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 Quality 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 583 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 NCDWQ 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 30-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.

   The permittee shall visually monitor the vegetative plantings to assess and ensure complete stabilization of the mitigation stream segments. The monitoring shall be conducted annually for a minimum of 3 years after final planting. Photo documentation shall be utilized to document the success of the riparian vegetation and submitted to NCDWQ in a final report within sixty (60) days after completing monitoring. After 3 years the NCDOT shall contact the NCDWQ to schedule a site visit to "close out" the mitigation site.

3. Compensatory mitigation for the remaining 30 linear feet of impact shall be debited from the Tulula Bog Mitigation Site. These credits shall be accounted for on the ledger for the Tulula Bog Mitigation Site.

4. Due to severe slope conditions, the outlet of the pipe to the stream restoration on the UT to Little Tennessee River at 28+00R on the R-2408A section shall not be buried.

5. Two copies of the final construction drawings shall be furnished to NCDWQ Central Office prior to the pre-construction meeting. The permittee shall provide written verification that the final construction drawings comply with the permit drawings contained in the application dated received April 22, 2009. Any deviations from the approved drawings are not authorized unless approved by the NC Division of Water Quality.

6. All channel relocations will be constructed in a dry work area and stabilized before stream flows are diverted. Channel relocations will be completed and stabilized, and must be approved on site by DWQ staff, prior to diverting water into the new channel. Whenever possible, channel relocations shall be allowed to stabilize for an entire growing season. Vegetation used for bank stabilization shall be limited to native woody species, and should include establishment of a 30 foot wide wooded and an adjacent 20 foot wide vegetated buffer on both sides of the relocated channel to the maximum extent practical. A transitional phase incorporating coir fiber and seedling establishment is allowable. 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.

7. Bridge deck drains should 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.*

8. Unless otherwise approved in this certification, placement of culverts and other structures in waters, streams, and wetlands 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 DWQ. If this condition is unable to be met due to bedrock or other limiting features encountered during construction, please contact the NC DWQ for guidance on how to proceed and to determine whether or not a permit modification will be required.

9. 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.

10. 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.

11. 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.

12. 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.

13. The Permittee shall ensure that the final design drawings adhere to the permit and to the permit drawings submitted for approval.

14. 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.

15. 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.

16. 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.

17. No rock, sand or other materials shall be dredged from the stream channel except where authorized by this certification.

18. Discharging hydroseed mixtures and washing out hydroseeders and other equipment in or adjacent to surface waters is prohibited.

19. 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 DWQ 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, DWQ may reevaluate and modify this certification.

20. All fill slopes located in jurisdictional wetlands shall be placed at slopes no flatter than 3:1, unless otherwise authorized by this certification.

21. A copy of this Water Quality Certification shall be maintained on site at 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.

22. 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.

23. 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.

24. The Permittee shall report any violations of this certification to the Division of Water Quality within 24 hours of discovery.

25. Upon completion of the project (including any impacts at associated borrow or waste site), the NCDOT Division Engineer shall complete and return the enclosed "Certification of Completion Form" to notify DWQ when all work included in the 401 Certification has been completed.

26. Native riparian vegetation (ex. river birch, shagbark hickory, green ash, black gum, sycamore, black willow, tag alder, red chokeberry, ironwood, silky dogwood, spicebush, swamp milkwood, hop sedge, lurid sedge, bottlebrush grass, joe-pye-weed, boneset) must be

reestablished within the construction limits of the project by the end of the growing season following completion of construction.

27. 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.

28. 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.

29. Sediment and erosion control measures shall not be placed in wetlands or waters unless otherwise approved by this Certification.

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 this Certification is unacceptable to you have the right to an adjudicatory hearing upon written request within sixty (60) days following receipt of this Certification. This request must be in the form of a written petition conforming to Chapter 150B of the North Carolina General Statutes and filed with the Office of Administrative Hearings, 6714 Mail Service Center, Raleigh, N.C. 27699-6714. If modifications are made to an original Certification, you have the right to an adjudicatory hearing on the modifications upon written request within sixty (60) days following receipt of the Certification. Unless such demands are made, this Certification shall be final and binding.

This the 21st day of July 2009

DIVISION OF WATER QUALITY

for Coleen H. Sullins
Director

WQC No. 3806

ACTION ID: SAW-2009-00860; TIP NO., R-2408B SPECIAL CONDITIONS

1. All work must be performed in strict compliance with the attached plans, which are a part of this permit. Any modifications to the permit plans must be approved by the Corps of Engineers prior to implementation.

2. Failure to institute and carry out the details of the following special conditions will result in a directive to cease all ongoing and permitted work within waters and/or wetlands associated with the permitted project or such other remedies and/or fines as the District Engineer or his authorized representatives may seek.

3. The permittee will ensure that the construction design plans for this project do not deviate from the permit plans attached to this authorization. Written verification shall be provided that the final construction drawings comply with the attached permit drawings prior to any active construction in waters of the United States, including wetlands. Any deviation in the construction design plans will be brought to the attention of the Corps of Engineers, Asheville Regulatory Field Office prior to any active construction in waters and wetlands.

4. The permittee shall schedule a pre-construction meeting between their representatives, the contractor and the Corps of Engineers, Asheville Regulatory Field Office, NCDOT Regulatory Project Manager prior to any work in jurisdictional waters and wetlands to ensure that there is a mutual understanding of all terms and conditions contained in this DA permit. The permittee shall provide the NCDOT Regulatory Project Manager with a copy of the final plans at least two weeks prior to the pre-construction 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 pre-construction meeting for a time when the Corps of Engineers and North Carolina Division of Water Quality (NCDWQ) Project Managers can attend. The permittee shall notify the Corps of Engineers and NCDWQ Project Managers a minimum of thirty (30) days in advance of the meeting.

5. 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, and any authorized modifications. A copy of this permit and any authorized modifications, including all conditions, shall be available at the project site during construction and maintenance of this project.

6. Except as authorized by this permit or any Corps of Engineers 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 nor shall any activities take place that cause the degradation of waters or wetlands. 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 and wetlands or to reduce the reach of waters and wetlands.

7. To ensure that all borrow and waste activities occur on uplands and do not result in the degradation of adjacent waters and wetlands, 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 Corps of Engineers with appropriate maps indicating the locations of proposed borrow or waste sites as soon as such information is available. The permittee will coordinate with the Corps of Engineers before approving any borrow or waste sites that are within 400 feet of any stream or wetland. 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 preceding condition 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 the preceding condition. 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.

8. 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.

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

10. The permittee shall take measures to prevent live or fresh concrete from coming into contact with any surface waters until the concrete has hardened and cured.

11. 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 nonerodable materials. Grubbing of riparian vegetation will not occur until immediately before construction begins on a given segment of stream channel.

12. All authorized culverts will be installed to allow the passage of low stream flows and the continued movement of fish and other aquatic life as well as to prevent head-cutting of the streambed. For all box culverts and for pipes greater than 48 inches in diameter, the bottom of the culvert will be buried one foot below the bed of the stream unless such burial would be impractical and the Corps of Engineers has waived this requirement. For culverts 48 inches in diameter or smaller, the bottom of the pipe will be buried below the bed of the stream to a depth equal to or greater than 20 percent of the diameter of the culvert. Design and placement of culverts and other structures including temporary erosion control measures shall not be conducted in a manner that may result in the disequilibrium of wetlands, streambeds or stream banks adjacent to, upstream of or downstream of the structures. In order to allow for the continued movement of bed load and aquatic organisms, existing channel widths and depths will be maintained at the inlet and outlet ends of culverts. Riprap armoring of streams at culvert inlets and outlets shall be minimized above ordinary high water elevation in favor of bioengineering techniques such as bank sloping, erosion control matting and revegetation with deep-rooted native woody plants.

13. Unless 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.

14. All mechanized equipment operating near surface waters shall be regularly inspected to prevent contamination of streams from leakage of fuels, lubricants, hydraulic fluids or other toxic materials. No equipment staging or storage of construction material will occur in wetlands. Hydro-seeding equipment will not be discharged or washed out into any surface waters or wetlands. In the event of a spill of petroleum products or any other hazardous waste, the permittee shall immediately report it to the NC Division of Water Quality at (919) 733-5083 or (800) 662-7956 and provisions of the North Carolina Oil Pollution and Hazardous Substances Control Act will be followed.

15. Compensatory mitigation for unavoidable impacts to 663 linear feet of cool-water stream channel (HUC 06010202) and 0.09 acre of jurisdictional wetlands associated with the proposed project shall be provided by a combination of on-site stream restoration and debiting from the Tulula Bog Mitigation Site. The Tulula Bog Mitigation Site shall be debited at a 1:1 ratio for impacts to 0.09 acre of jurisdictional wetlands and 80 linear feet of stream channel. The on-site mitigation sites, which are detailed on the permit plan sheet numbers 2F, 2G, and 2H, shall be preserved by

expansion of right-of-way at the Rocky Branch site and purchasing (fee simple) the UT to the Little Tennessee River in the A Section.

16. The permittee will report any violation of the above conditions and any violations of Section 404 of the Clean Water Act from unauthorized work in writing to the Wilmington District, US Army Corps of Engineers within 24 hours of the permittee's discovery of the violation.

17. All conditions of the North Carolina Division of Water Quality's Section 401 Water Quality Certification No. 3806, original dated July 21, 2009 are hereby incorporated as special conditions of this permit

Adjacent Property Owners

Owner/ Business	Address	Site	Parcel
Robert Paul Revis	980 Windy Gap Rd, Franklin, NC 28734	1	53
Mark Robert Nowicki	Franklin, NC 28734	1A	
Gary Wayne Crisp	19 Lee Talent Rd, Franklin, NC 28734	2	56
Carole Ann Simmons	2600-1 Peachtree Rd NW, Atlanta, GA 30305	3	60
Nanthala Power & Light Co (former = Crescent Resources Inc.)	Main St, Franklin, NC 28734	4 & 5	62
Larry Dale Fouts	85 Aylen Village Ln, Franklin, NC 28734	4	64

Permit Drawing
Sheet 1 of 19

NC DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS

Macon County
PROJ - 34427.1.1 (R-2408B)

SHEET 08/25/2008

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)
1A	SR 1468 Huges Lane	54" RCP & JB						0.00	0.00	9	31	
1	-Y5- 12+00 RT	36" RCP						0.01	0.01	24	4	
1	-Y5- 12+00 RT	BANK STAB.								17		
2	-Y6- 12+07 LT	72" RCP & JB						0.01	0.01	43	46	
2	-Y6- 12+07 LT	BANK STAB.								22		
3	-L- 99+42/104+68 LT	strm relocation/fill	0.05					0.04	0.01	442	60	393
4	-L- 108+22/109+85	16'x7' Bottomless Culv.						0.02	0.03	84	75	
4	-L- 108+22/109+85	BANK STAB.								22		
5	-L- 109+03/109+60 LT	Rdy fill	0.04									
TOTALS:			0.09					0.09	0.06	663	216	393

Permit Drawing
Sheet 2 of 19

NC DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS

MACON COUNTY
WBS - 34427.1.1 (R-2408B)

SHEET 2/25/2009

ATN Revised 3/31/05

TIP PROJECT: R-2408B

CONTRACT:

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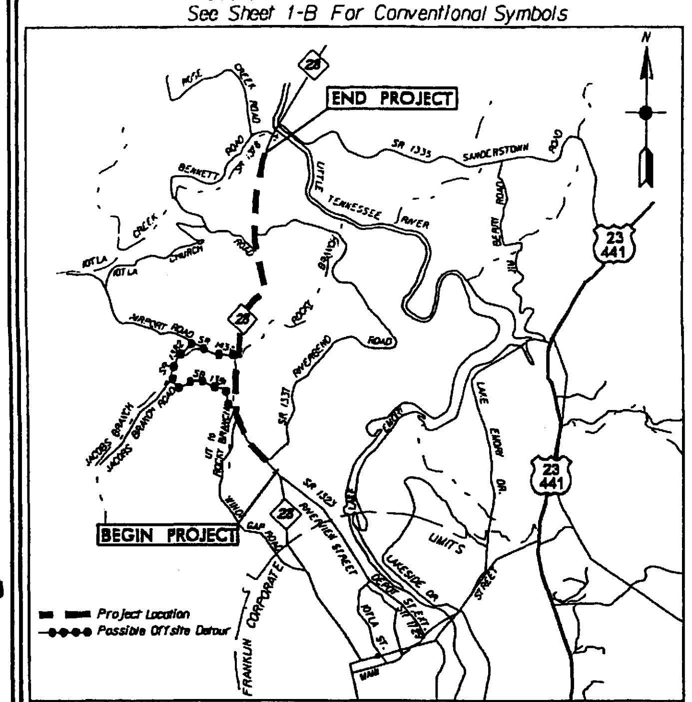
See Sheet 1-A For Index of Sheets
See Sheet 1-B For Conventional Symbols



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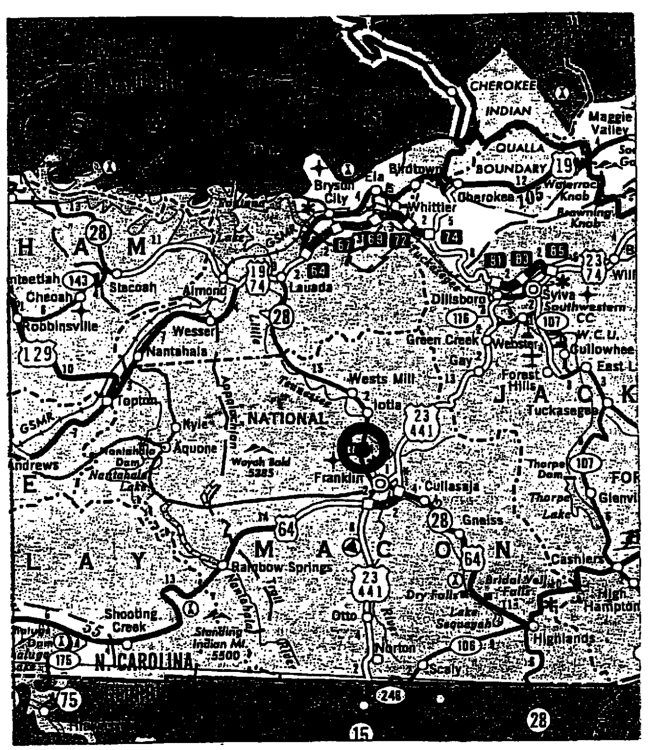


PROJECT

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

MACON COUNTY

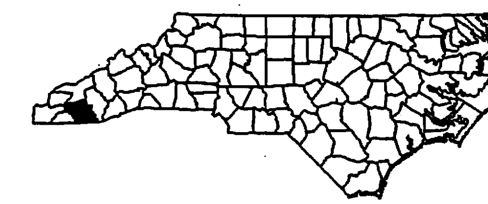
LOCATION: NC 28 FROM NORTH OF SR 1323 (RIVERVIEW ST.)
TO SOUTH OF SR 1378 (BENNETT RD.)

TYPE OF WORK: GRADING, DRAINAGE, CULVERT, WIDENING, AND PAVING

PERMIT DRAWINGS

Permit Drawing
Sheet 3 of 19

STATE	STATE PROJECT REFERENCE NO.		SHEET NO.	TOTAL SHEETS
N.C.	R-2408B		1	
STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION		
34427.1.1	STP-28 (1)	P.E.		
34427.2.3	STP-0028 (4)	R/W, UTIL		
		CONST.		



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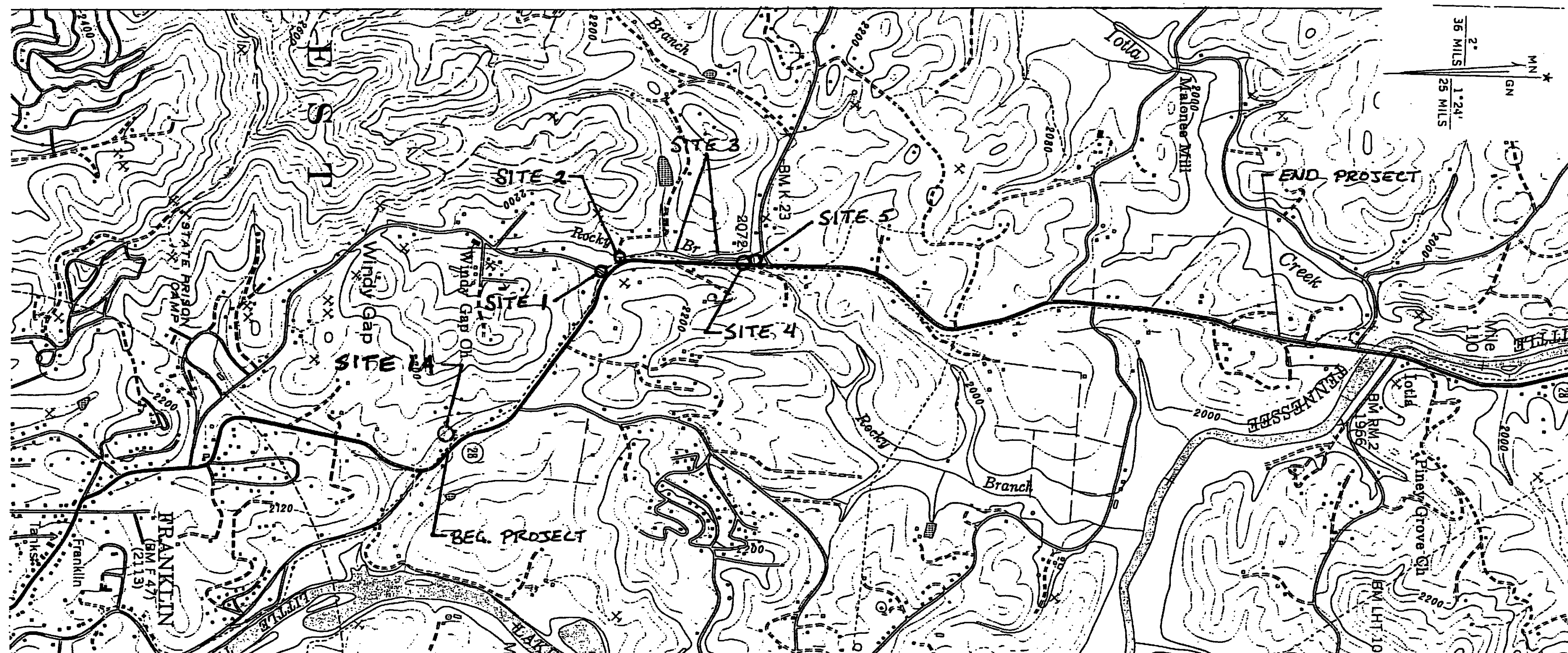
DECLINATION AT CENTER OF SHEET



SCALE 1:24 000

1 ½ 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 .5 0 1 KILOMETER

FRANKLIN QUADRANGLE
NORTH CAROLINA-MACON CO
7.5 MINUTE SERIES (TOPOGRAPHIC) 167-NW

CONTOUR INTERVAL 40 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

THIS PROJECT DOES NOT FALL WITHIN THE MUNICIPAL BOUNDARIES OF THE CITY OF FRANKLIN.

CLEARING ON THIS PROJECT SHALL BE PERFORMED TO THE LIMITS ESTABLISHED BY METHOD II

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 2007 = 10,400
ADT 2030 = 15,300
DHV = 9%
D = 60%
T = 7% *
V_D = 50 TO 60 MPH

* TTST 2% DUAL 5%

PROJECT LENGTH

LENGTH ROADWAY TIP PROJECT R-2408B = 2.500 MI
LENGTH STRUCTURE TIP PROJECT R-2408B = 0.000 MI
TOTAL LENGTH TIP PROJECT R-2408B = 2.500 MI

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

2006 STANDARD SPECIFICATIONS

RIGHT OF WAY DATE:
NOVEMBER 28, 2007

LETTING DATE:
NOVEMBER 17, 2009

JASON MOORE, PE
PROJECT ENGINEER

JEANIE TYSON
PROJECT DESIGN ENGINEER

HYDRAULICS ENGINEER

SIGNATURE: P.E.

ROADWAY 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

09/08

TIP PROJECT: R-2408B

CONTRACT:

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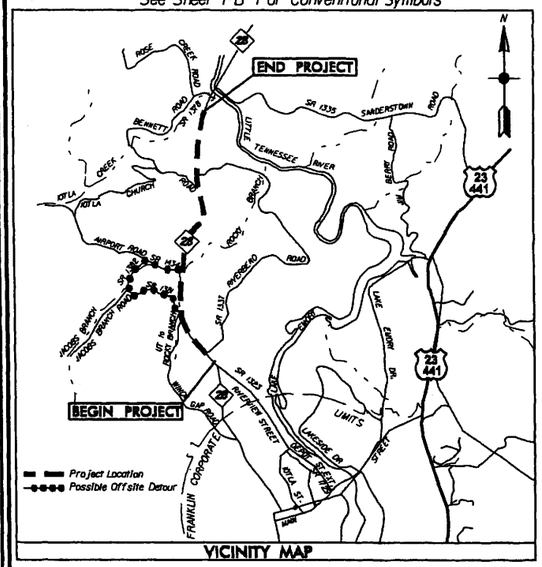
See Sheet 1-A For Index of Sheets
See Sheet 1-B For Conventional Symbols



STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

MACON COUNTY

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	R-2408B	1	

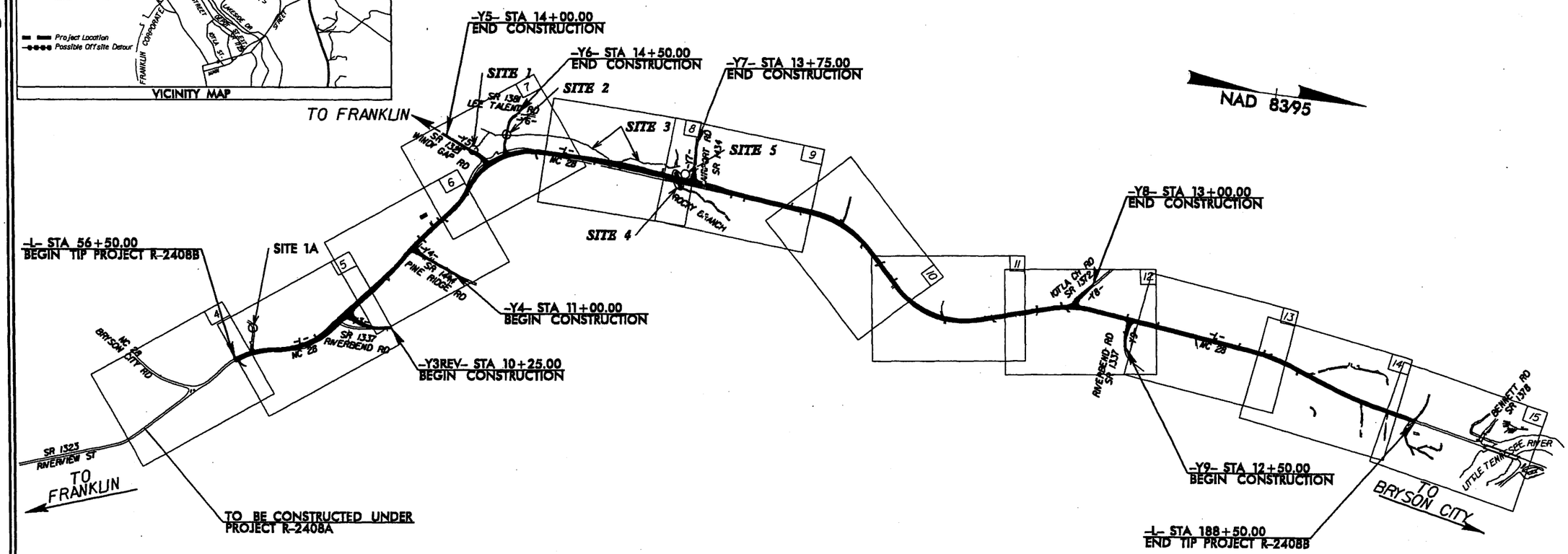
STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION
34427.1.1	STP-28 (1)	P.E.
34427.2.3	STP-0028 (4)	R/W, UTIL
		CONST.

Permit Drawing Sheet 4 of 19

LOCATION: NC 28 FROM NORTH OF SR 1323 (RIVERVIEW ST.) TO SOUTH OF SR 1378 (BENNETT RD.)

TYPE OF WORK: GRADING, DRAINAGE, CULVERT, WIDENING, AND PAVING

PERMIT DRAWINGS



** DESIGN EXCEPTION NEEDED FOR

THIS PROJECT DOES NOT FALL WITHIN THE MUNICIPAL BOUNDARIES OF THE CITY OF FRANKLIN.

CLEARING ON THIS PROJECT SHALL BE PERFORMED TO THE LIMITS ESTABLISHED BY METHOD II

SEE SHEETS 16 - 23 FOR DETOURS

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 2007 = 10,400
ADT 2030 = 15,300
DHV = 9%
D = 60%
T = 7% *
V_D = 50 TO 60 MPH

* TTST 2% DUAL 5%

PROJECT LENGTH

LENGTH ROADWAY TIP PROJECT R-2408B = 2.500 MI
LENGTH STRUCTURE TIP PROJECT R-2408B = 0.000 MI
TOTAL LENGTH TIP PROJECT R-2408B = 2.500 MI

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

2006 STANDARD SPECIFICATIONS

RIGHT OF WAY DATE: NOVEMBER 28, 2007

LETTING DATE: NOVEMBER 17, 2009

JASON MOORE, PE
PROJECT ENGINEER

JEANIE TYSON
PROJECT DESIGN ENGINEER

HYDRAULICS ENGINEER

SIGNATURE: P.E.

ROADWAY DESIGN ENGINEER

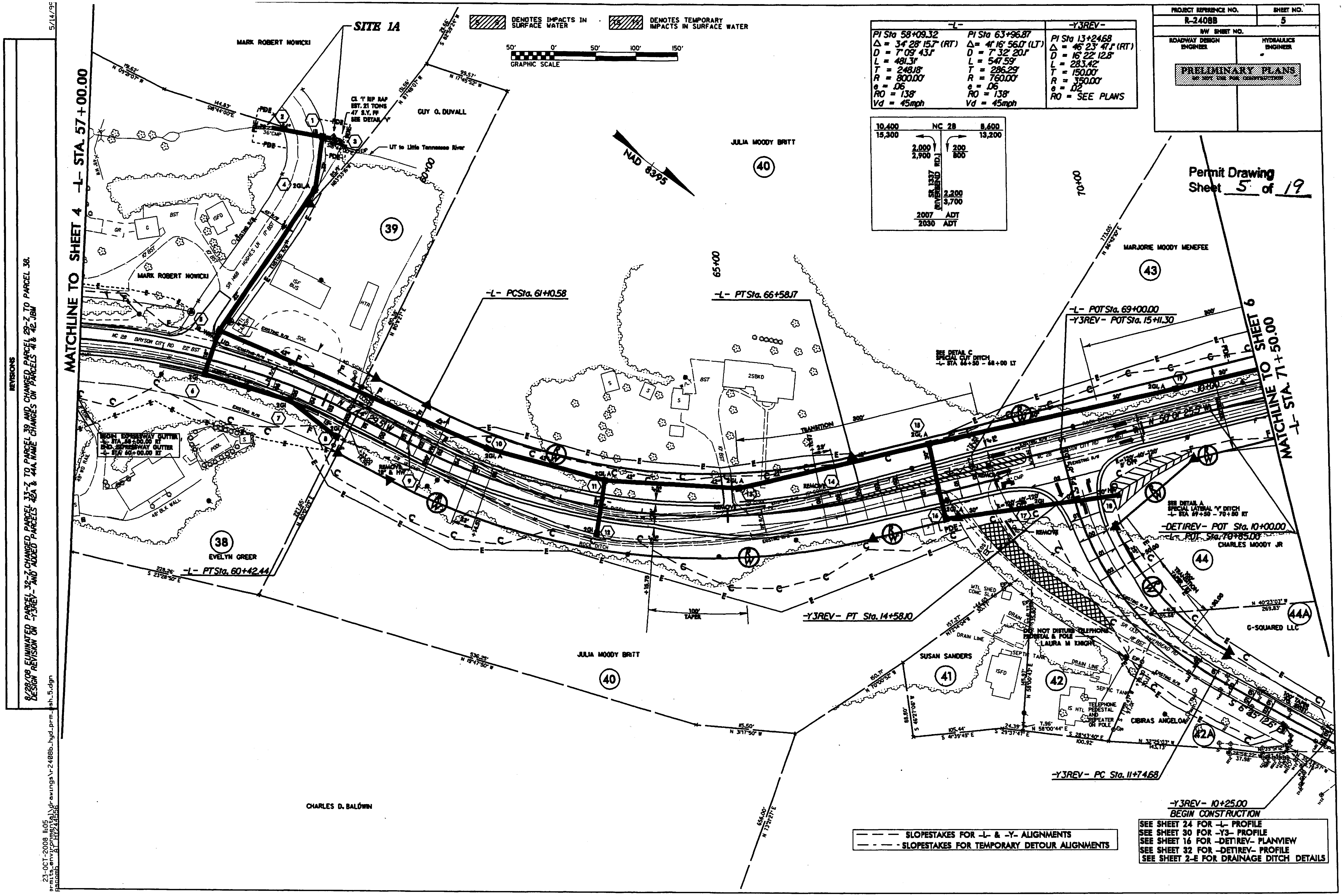
SIGNATURE: P.E.

DIVISION OF HIGHWAYS STATE OF NORTH CAROLINA

STATE DESIGN ENGINEER P.E.

DEPARTMENT OF TRANSPORTATION FEDERAL HIGHWAY ADMINISTRATION

APPROVED
DIVISION ADMINISTRATOR DATE


PROJECT REFERENCE NO. R-2408B
SHEET NO. 5
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION
Permit Drawing Sheet 5 of 19
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
GRAPHIC SCALE 50' 0' 50' 100' 150'
SITE 1A
-L-
PI Sta 58+09.32
Δ = 34° 28' 15.7" (RT)
D = 7° 09' 43.1"
L = 481.31'
T = 248.18'
R = 800.00'
e = .06
RO = 138'
Vd = 45mph
PI Sta 63+96.87
Δ = 41° 16' 56.0" (LT)
D = 7° 32' 20.1"
L = 547.59'
T = 286.29'
R = 760.00'
e = .06
RO = 138'
Vd = 45mph
-Y3REV-
PI Sta 13+24.68
Δ = 46° 23' 47.1" (RT)
D = 16° 22' 12.8"
L = 283.42'
T = 150.00'
R = 350.00'
e = .02
RO = SEE PLANS
NC 28
10,400
15,300
8,600
13,200
2,000
2,900
200
800
SR 1337 (RIVERBEND RD.)
2,200
3,700
2007 ADT
2030 ADT
NAD 83/95
MATCHLINE TO SHEET 4 -L- STA. 57+00.00
MATCHLINE TO SHEET 6 -L- STA. 71+50.00
MARK ROBERT NOWICKI
GUY O. DUVALL
JULIA MOODY BRITT
MARJORIE MOODY MENEFEE
CHARLES MOODY JR
G-SQUARED LLC
EVELYN GREER
SUSAN SANDERS
LAURA M KNIGHT
CIBIRAS ANGELO
CHARLES D. BALDWIN
UT to Little Tennessee River
CL 'I' RIP RAP EST. 21 TONS 47 S.Y. FF SEE DETAIL 'F'
-L- PCSta. 61+10.58
-L- PTSta. 66+58.17
-L- PTSta. 60+42.44
-L- POTSta. 69+00.00
-Y3REV- POTSta. 15+11.30
-Y3REV- PT Sta. 14+58.10
-Y3REV- PC Sta. 11+74.68
-Y3REV- 10+25.00 BEGIN CONSTRUCTION
-DETIREV- POT Sta. 10+00.00
-L- POT Sta. 70+85.00
SEE DETAIL C SPECIAL CUT DITCH -L- STA 66+50 - 68+00 LT
SEE DETAIL A SPECIAL LATERAL 'V' DITCH -L- STA 69+50 - 70+50 RT
BEGIN EXPRESSWAY GUTTER -L- STA 59+00.00 RT
END EXPRESSWAY GUTTER -L- STA 60+00.00 RT
DO NOT DISTURB TELEPHONE PEDESTAL & POLE
SLOPESTAKES FOR -L- & -Y- ALIGNMENTS
SLOPESTAKES FOR TEMPORARY DETOUR ALIGNMENTS
SEE SHEET 24 FOR -L- PROFILE
SEE SHEET 30 FOR -Y3- PROFILE
SEE SHEET 16 FOR -DETIREV- PLANVIEW
SEE SHEET 32 FOR -DETIREV- PROFILE
SEE SHEET 2-E FOR DRAINAGE DITCH DETAILS
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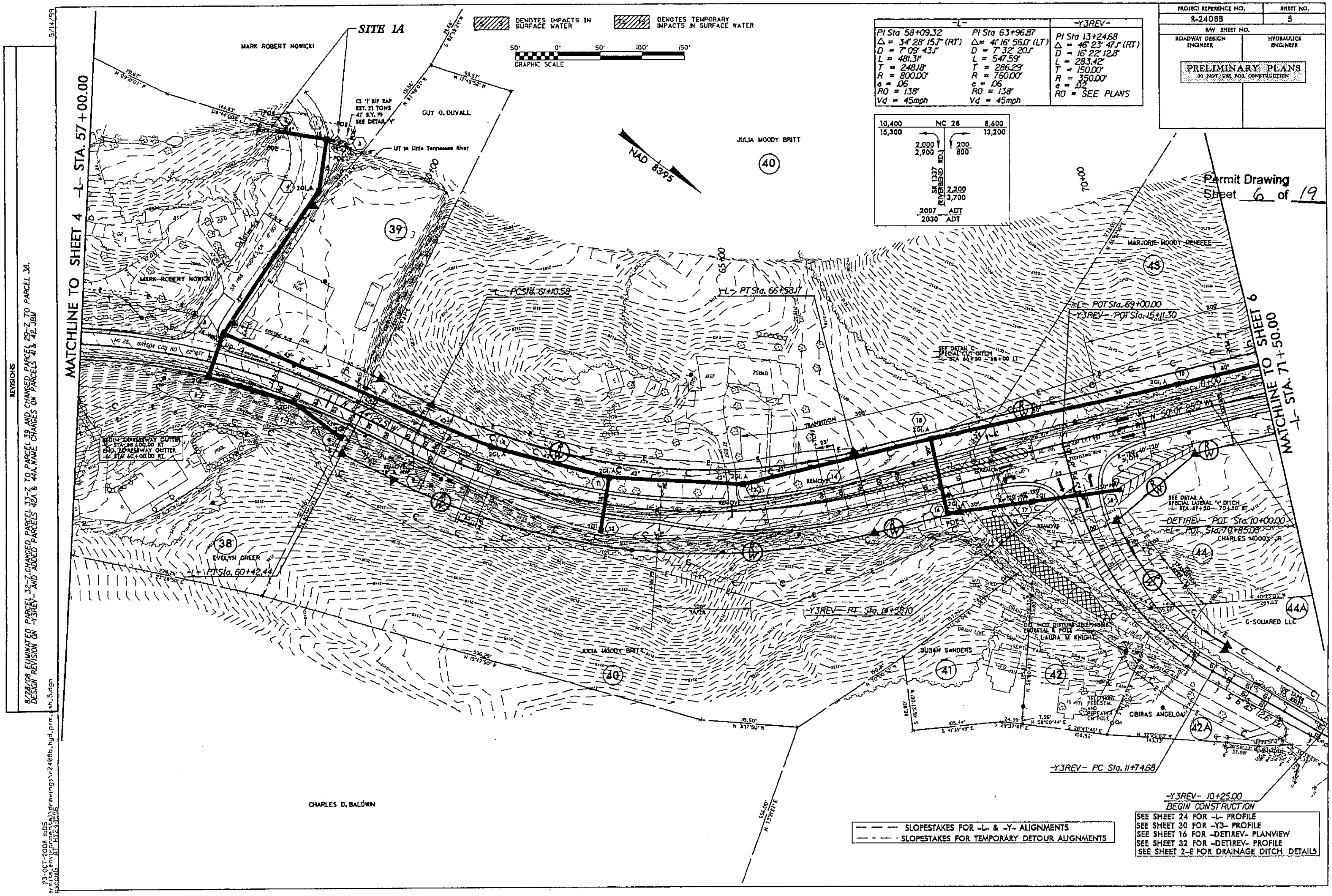
PROJECT REFERENCE NO. R-2408B
SHEET NO. 5
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION
Permit Drawing Sheet 6 of 19
-L-
PI Sta 58+09.32
Δ = 34°28'15.7" (RT)
D = 7°09'43.1"
L = 481.31'
T = 248.18'
R = 800.00'
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RO = 138'
Vd = 45mph
-Y3REV-
PI Sta 13+24.68
Δ = 46°23'47.5" (RT)
D = 16°22'12.8"
L = 283.42'
T = 150.00'
R = 350.00'
e = .02
RO = SEE PLANS
10,400
15,300
NC 28
8,600
13,200
2,000
2,900
200
800
SR 1337 (RIVERBEND RD.)
2,200
3,700
2007 ADT
2030 ADT
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
50' 0' 50' 100' 150'
GRAPHIC SCALE
NAD 83/95
SITE 1A
MARK ROBERT NOWICKI
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G-SQUARED LLC
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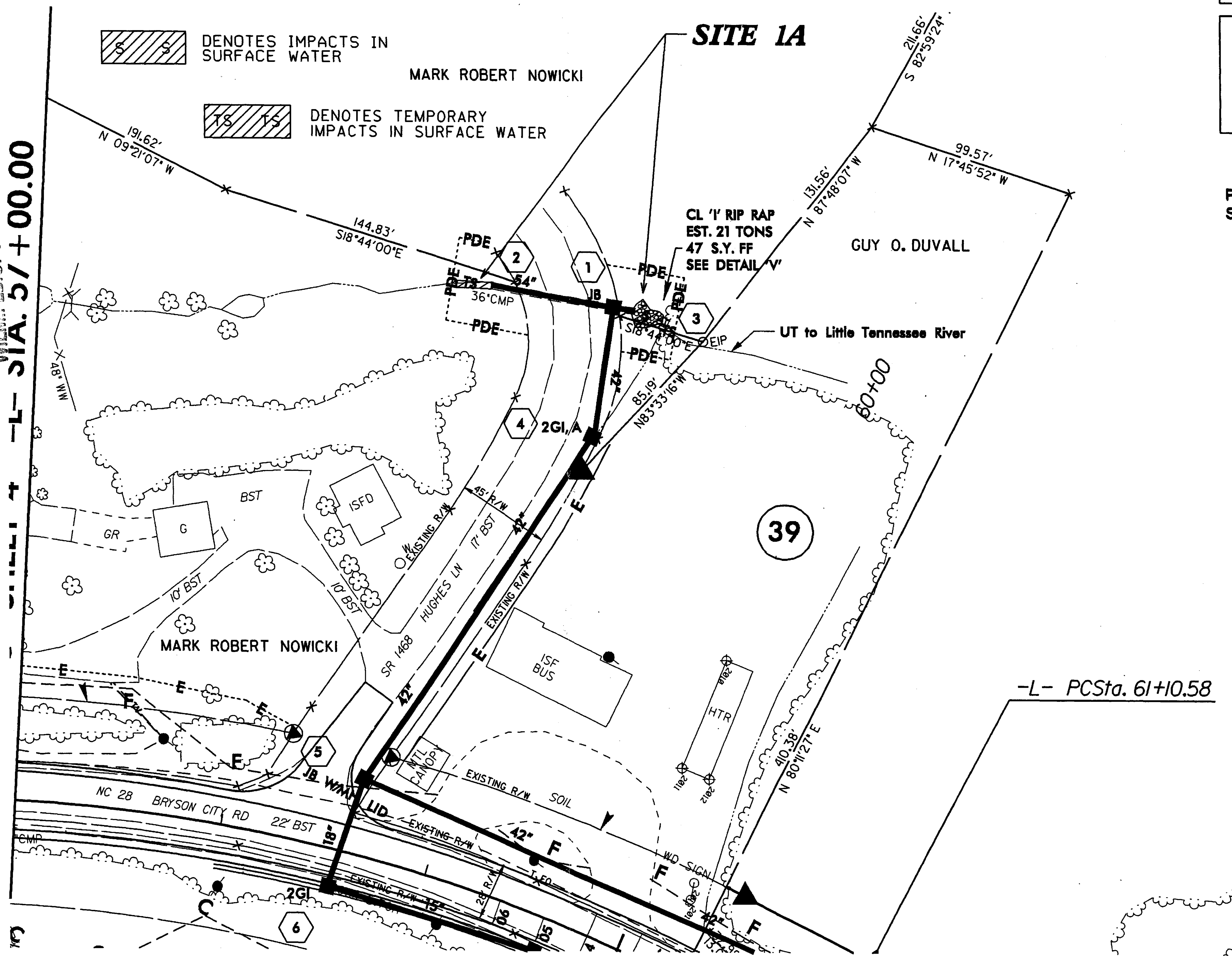
CL 'I' RIP RAP
EST. 21 TONS
47 S.Y. FF
SEE DETAIL 'Y'
UT to Little Tennessee River
-L- PC Sta. 61+10.58
-L- PT Sta. 66+53.17
-L- PT Sta. 60+42.44
-L- POT Sta. 69+00.00
-Y3REV- POT Sta. 15+11.30
-Y3REV- PT Sta. 14+58.10
-Y3REV- PC Sta. 11+74.68
-DETIREV- POT Sta. 10+00.00
-L- POT Sta. 70+85.00
SEE DETAIL C
SPECIAL CUT DITCH
SEE DETAIL A
SPECIAL LATERAL 'V' DITCH
BEGIN EXPRESSWAY GUTTER
END EXPRESSWAY GUTTER
DO NOT DISTURB TELEPHONE PEDESTAL & POLE
TRANSITION
100' TAPER
MATCHLINE TO SHEET 4 -L- STA. 57+00.00
MATCHLINE TO SHEET 6 -L- STA. 71+50.00
-Y3REV- 10+25.00
BEGIN CONSTRUCTION
SEE SHEET 24 FOR -L- PROFILE
SEE SHEET 30 FOR -Y3- PROFILE
SEE SHEET 16 FOR -DETIREV- PLANVIEW
SEE SHEET 32 FOR -DETIREV- PROFILE
SEE SHEET 2-E FOR DRAINAGE DITCH DETAILS
SLOPESTAKES FOR -L- & -Y- ALIGNMENTS
SLOPESTAKES FOR TEMPORARY DETOUR ALIGNMENTS
REVISIONS
8/28/08 ELIMINATED PARCEL 32-Z CHANGED PARCEL 33-Z TO PARCEL 39 AND CHANGED PARCEL 29-Z TO PARCEL 38.
DESIGN REVISION ON -Y3REV- AND ADDED PARCELS 42A & 44A MADE CHANGES ON PARCELS 41 & 42.JBM
5/14/99
23-OCT-2008 8:05

PROJECT REFERENCE NO.	SHEET NO.
R-2408B	5
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

Permit Drawing
Sheet 7 of 19



SITE 1A ENLARGEMENT

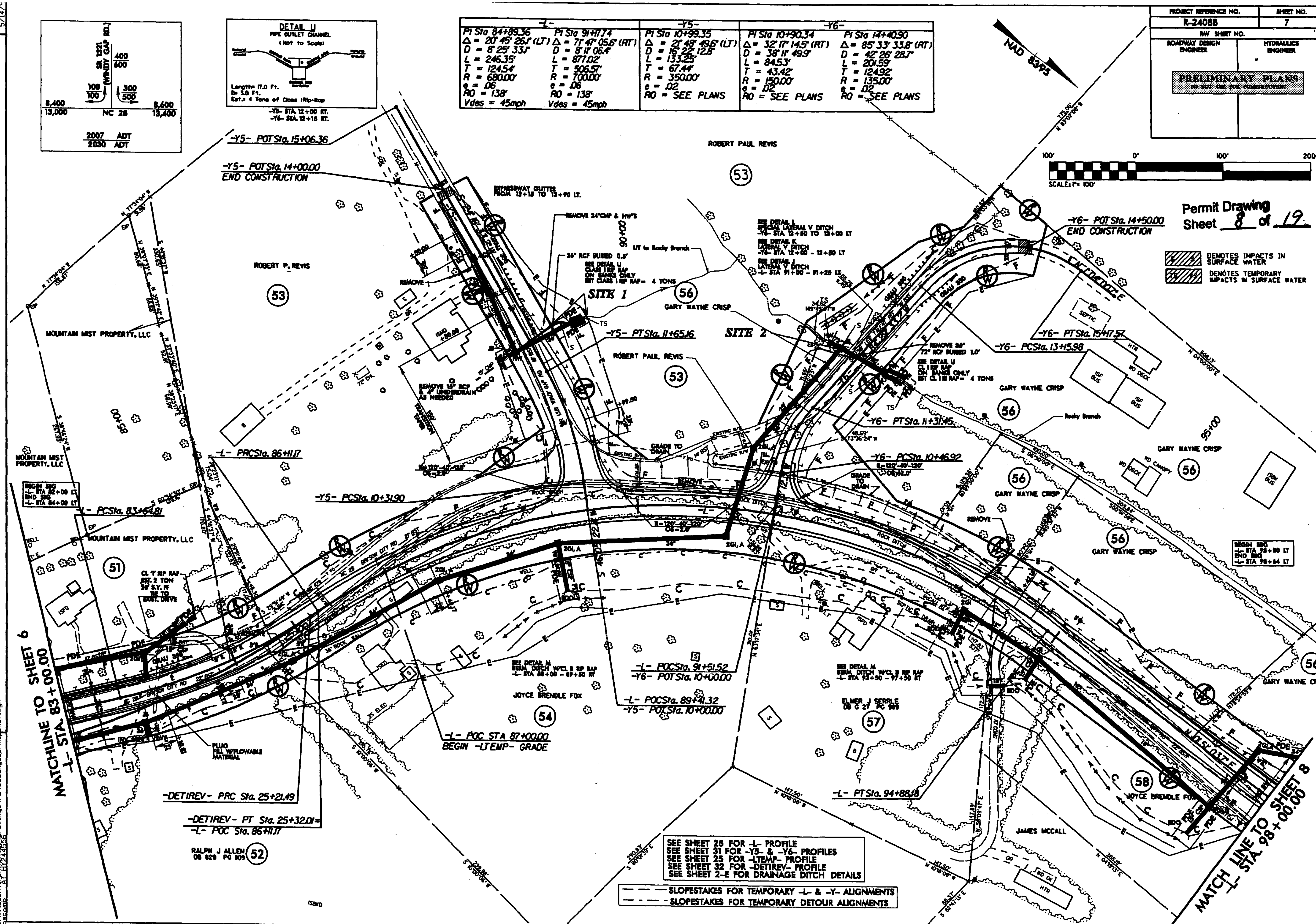
50' 0' 50' 100' 150'
GRAPHIC SCALE

RECEIVED
JAN 26 2010
REGULATORY WILM.FD.OFC.

REVISIONS
8/28/08 ELIMINATED PARCEL 33-Z TO PARCEL 39 AND CHANGED PARCEL 29-Z TO PARCEL 38.
DESIGN REVISION ON -Y3REV- AND ADDED PARCELS 42A & 44A. NAME CHANGES ON PARCELS 41 & 42. IBM

5/14/99

23-OCT-2008 11:21
HY244556



PROJECT REFERENCE NO. R-2408B
SHEET NO. 7
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION
NAD 83/95
Permit Drawing Sheet 8 of 19
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
SCALE: 1" = 100'
DETAIL U
PIPE OUTLET CHANNEL
(Not to Scale)
Length= 17.0 Ft.
D= 3.0 Ft.
Est.= 4 Tons of Class I Rip-Rap
-Y5- STA. 12+00 RT.
-Y6- STA. 12+18 RT.
SR 1321 (WINDY GAP RD.)
NC 28
2007 ADT
2030 ADT
-Y5- POT Sta. 15+06.36
-Y5- POT Sta. 14+00.00
END CONSTRUCTION
ROBERT PAUL REVIS
ROBERT P. REVIS
MOUNTAIN MIST PROPERTY, LLC
SITE 1
SITE 2
GARY WAYNE CRISP
-Y6- POT Sta. 14+50.00
END CONSTRUCTION
-Y6- PT Sta. 15+17.57
-Y6- PC Sta. 13+15.98
-Y5- PT Sta. 11+65.16
-Y6- PT Sta. 11+31.45
-Y6- PC Sta. 10+46.92
-L- PRC Sta. 86+11.17
-Y5- PC Sta. 10+31.90
-L- PC Sta. 83+64.81
-L- POC Sta. 91+51.52
-Y6- POT Sta. 10+00.00
-L- POC Sta. 89+41.32
-Y5- POT Sta. 10+00.00
-L- POC STA 87+00.00
BEGIN -LTEMP- GRADE
-DETIREV- PRC Sta. 25+21.49
-DETIREV- PT Sta. 25+32.01=
-L- POC Sta. 86+11.17
-L- PT Sta. 94+88.18
JOYCE BRENDLE FOX
ELMER J SERRLE
JAMES MCCALL
RALPH J ALLEN
MATCHLINE TO SHEET 6 -L- STA. 83+00.00
MATCH LINE TO SHEET 8 -L- STA. 98+00.00
SEE SHEET 25 FOR -L- PROFILE
SEE SHEET 31 FOR -Y5- & -Y6- PROFILES
SEE SHEET 25 FOR -LTEMP- PROFILE
SEE SHEET 32 FOR -DETIREV- PROFILE
SEE SHEET 2-E FOR DRAINAGE DITCH DETAILS
SLOPESTAKES FOR TEMPORARY -L- & -Y- ALIGNMENTS
SLOPESTAKES FOR TEMPORARY DETOUR ALIGNMENTS
REVISIONS
CHANGED ROW PARCEL NUMBERS ON ROBERT PAUL REVIS PARCELS TO NO. 53 12/11/07
14-NOV-2008 13:19

-L-		-Y5-	-Y6-	
PI Sta 84+89.36	PI Sta 91+17.74	PI Sta 10+99.35	PI Sta 10+90.34	PI Sta 14+40.90
Δ = 20° 45' 26.1" (LT)	Δ = 71° 47' 05.6" (RT)	Δ = 21° 48' 49.6" (LT)	Δ = 32° 17' 14.5" (RT)	Δ = 85° 33' 33.8" (RT)
D = 8° 25' 33.1"	D = 8° 11' 06.4"	D = 16° 22' 12.8"	D = 38° 11' 49.9"	D = 42° 26' 28.7"
L = 246.35'	L = 877.02'	L = 133.25'	L = 84.53'	L = 201.59'
T = 124.54'	T = 506.57'	T = 67.44'	T = 43.42'	T = 124.92'
R = 680.00'	R = 700.00'	R = 350.00'	R = 150.00'	R = 135.00'
e = .06	e = .06	e = .02	e = .02	e = .02
RO = 138'	RO = 138'	RO = SEE PLANS	RO = SEE PLANS	RO = SEE PLANS
Vdes = 45mph	Vdes = 45mph			

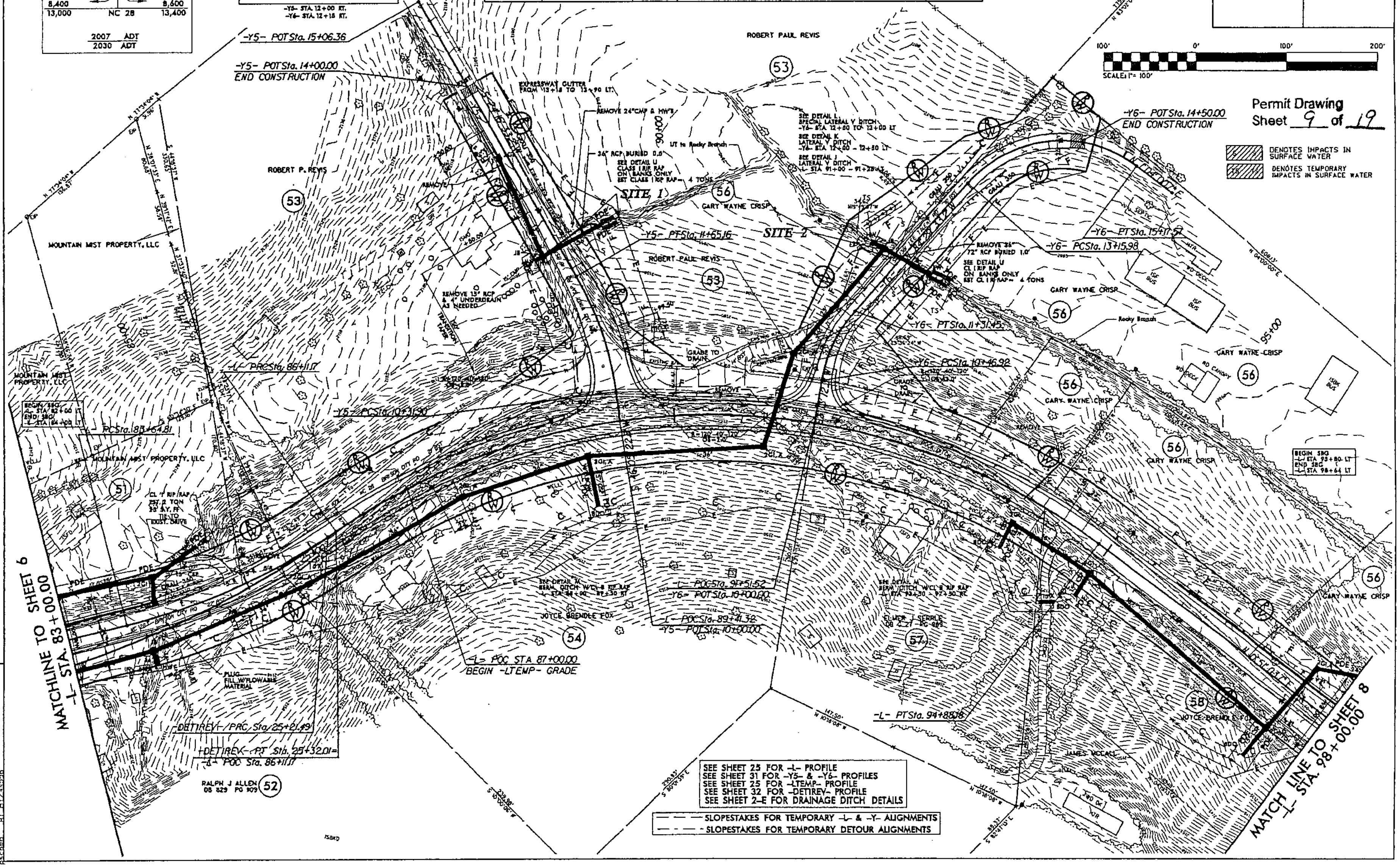
PROJECT REFERENCE NO.	SHEET NO.
R-2408B	7
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

Permit Drawing
Sheet 9 of 19

DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER

-L-		-Y5-	-Y6-	
PI Sta 84+89.36	PI Sta 91+17.74	PI Sta 10+99.35	PI Sta 10+90.34	PI Sta 14+40.90
Δ = 20° 45' 26.1" (LT)	Δ = 71° 47' 05.6" (RT)	Δ = 21° 48' 49.6" (LT)	Δ = 32° 17' 14.5" (RT)	Δ = 85° 33' 33.8" (RT)
D = 8° 25' 33.1"	D = 8° 11' 06.4"	D = 16° 22' 12.8"	D = 38° 11' 49.9"	D = 42° 26' 28.7"
L = 246.35'	L = 877.02'	L = 133.25'	L = 84.53'	L = 201.59'
T = 124.54'	T = 506.57'	T = 67.44'	T = 43.42'	T = 124.92'
R = 680.00'	R = 700.00'	R = 350.00'	R = 150.00'	R = 135.00'
e = .06	e = .06	e = .02	e = .02	e = .02
RO = 138'	RO = 138'	RO = SEE PLANS	RO = SEE PLANS	RO = SEE PLANS
Vdes = 45mph	Vdes = 45mph			



SR 1321 (WINDY GAP RD.)
NC 28
2007 ADT
2030 ADT
DETAIL U
PIPE OUTLET CHANNEL
(Not to Scale)
NAD 83/95
SCALE: 1" = 100'
-Y5- POT Sta. 15+06.36
-Y5- POT Sta. 14+00.00
END CONSTRUCTION
-Y6- POT Sta. 14+50.00
END CONSTRUCTION
ROBERT PAUL REVIS
ROBERT P. REVIS
MOUNTAIN MIST PROPERTY, LLC
GARY WAYNE CRISP
SITE 1
SITE 2
JOYCE BRENDLE FOX
ELMER SERPLE
RALPH J ALLEN
JAMES MCCALL
-L- PRC Sta. 86+11.17
-Y5- PC Sta. 10+31.90
-Y5- PT Sta. 11+65.16
-Y6- PT Sta. 15+11.57
-Y6- PC Sta. 13+15.98
-Y6- PT Sta. 11+31.45
-Y6- PC Sta. 10+46.92
-L- POC Sta. 91+51.52
-Y6- POT Sta. 10+00.00
-L- POC Sta. 89+41.32
-Y5- POT Sta. 10+00.00
-L- POC STA 87+00.00
BEGIN -LTEMP- GRADE
-L- PT Sta. 94+88.08
-DETIREV- /PRC Sta. 25+21.49
-DETIREV- PT Sta. 25+32.01
-L- POC Sta. 86+11.17
MATCHLINE TO SHEET 6
-L- STA. 83+00.00
MATCH LINE TO SHEET 8
-L- STA. 98+00.00
SEE SHEET 25 FOR -L- PROFILE
SEE SHEET 31 FOR -Y5- & -Y6- PROFILES
SEE SHEET 25 FOR -LTEMP- PROFILE
SEE SHEET 32 FOR -DETIREV- PROFILE
SEE SHEET 2-E FOR DRAINAGE DITCH DETAILS
SLOPESTAKES FOR TEMPORARY -L- & -Y- ALIGNMENTS
SLOPESTAKES FOR TEMPORARY DETOUR ALIGNMENTS

REVISIONS

CHANGED ROW PARCEL NUMBERS ON ROBERT PAUL REVIS PARCELS TO NO. 53 12/11/07

5/14/99

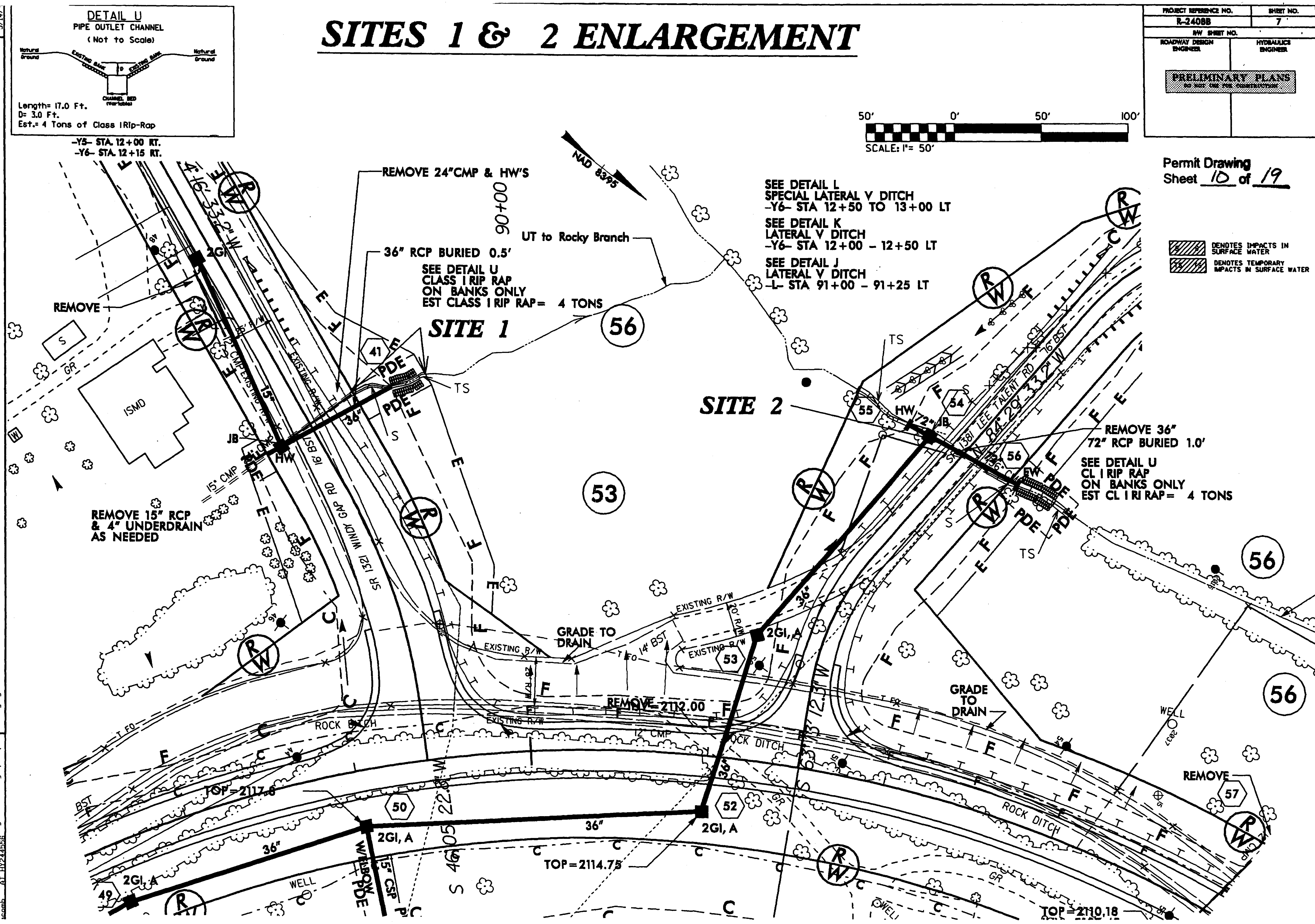
14-NOV-2008 13:20
r:\rmists\environmental\drawings\r2408b_hyd_prm_psh_7.dgn

SITES 1 & 2 ENLARGEMENT

PROJECT REFERENCE NO.	SHEET NO.
R-2408B	7
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

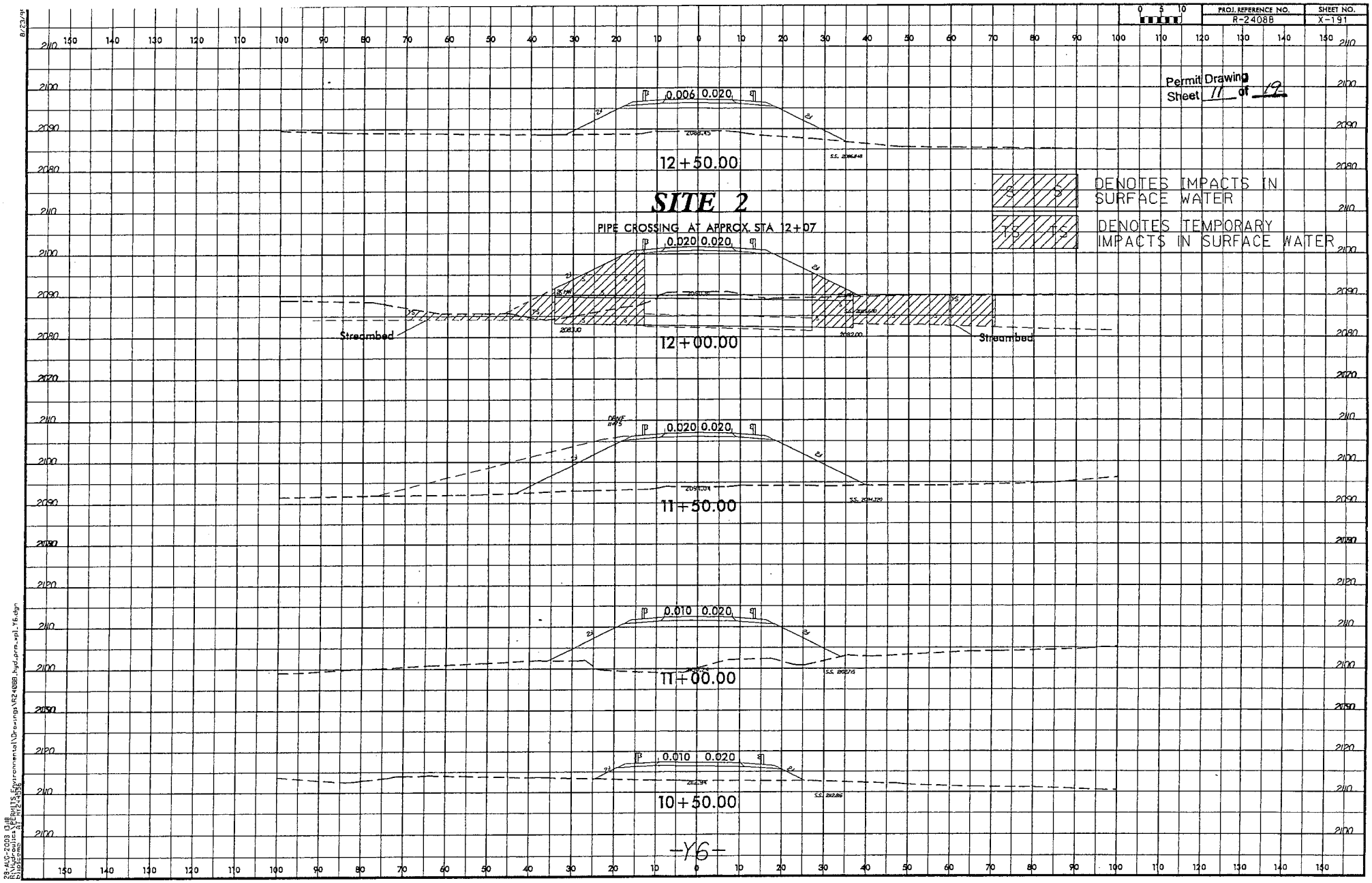
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

Permit Drawing
Sheet 10 of 19



CHANGED ROW PARCEL NUMBERS ON ROBERT PAUL REVIS PARCELS TO NO. 53 12/11/07

REVISIONS


PROJ. REFERENCE NO.
R-24088
SHEET NO.
X-191
Permit Drawing
Sheet 11 of 19
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
SITE 2
PIPE CROSSING AT APPROX. STA 12+07
0.006 0.020
12+50.00
0.020 0.020
Streambed
12+00.00
Streambed
0.020 0.020
11+50.00
0.010 0.020
11+00.00
0.010 0.020
10+50.00
-Y6-

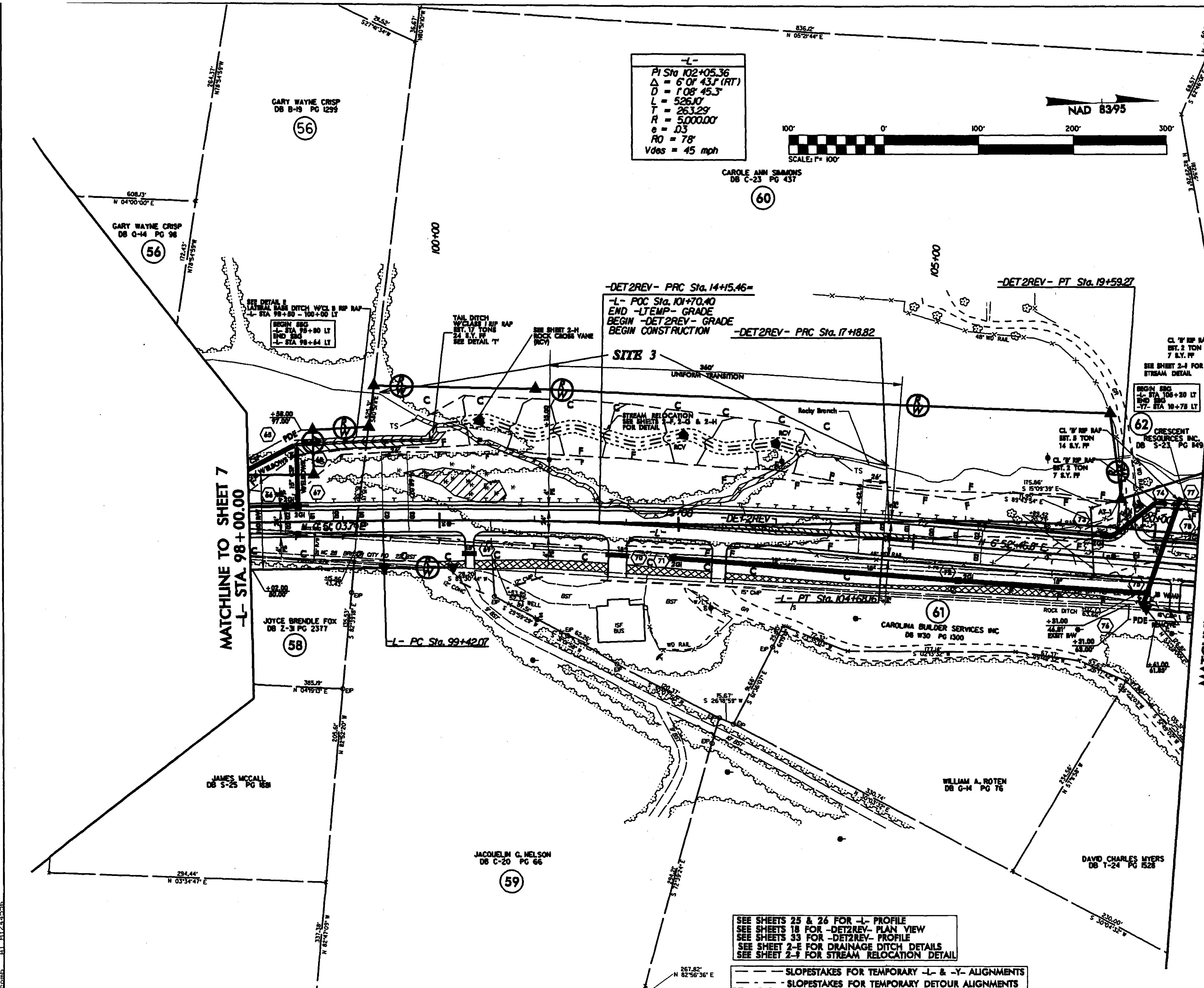
PROJECT REFERENCE NO.	SHEET NO.
R-2408B	8

R/W SHEET NO.

ROADWAY DESIGN ENGINEER — HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

Permit Drawing
Sheet 12 of 19



-L-
PI Sta 102+05.36
Δ = 6°01' 43.1" (RT)
D = 1°08' 45.3"
L = 526.10'
T = 263.29'
R = 5,000.00'
e = .03
RO = 78'
Vdes = 45 mph
NAD 83/95
SCALE: 1" = 100'
GARY WAYNE CRISP DB B-19 PG 1299
CAROLE ANN SIMMONS DB C-23 PG 437
GARY WAYNE CRISP DB G-14 PG 98
-DET2REV- PRC Sta. 14+15.46=
-L- POC Sta. 101+70.40
END -LTEMP- GRADE
BEGIN -DET2REV- GRADE
BEGIN CONSTRUCTION
-DET2REV- PRC Sta. 17+18.82
-DET2REV- PT Sta. 19+59.27
SITE 3
360' UNIFORM TRANSITION
STREAM RELOCATION
Rocky Branch
CRESCENT RESOURCES INC. DB S-23 PG 849
MATCHLINE TO SHEET 7 -L- STA. 98+00.00
MATCHLINE TO SHEET 9 -L- STA. 108+00.00
-L- PC Sta. 99+42.07
-L- PT Sta. 104+68.06
JOYCE BRENDLE FOX DB Z-31 PG 2377
CAROLINA BUILDER SERVICES INC DB W30 PG 1300
JAMES MCCALL DB S-25 PG 1681
WILLIAM A. ROTEN DB G-14 PG 76
JACQUELIN G. NELSON DB C-20 PG 66
DAVID CHARLES MYERS DB T-24 PG 1528

DENOTES FILL IN WETLAND
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER

SEE SHEETS 25 & 26 FOR -L- PROFILE
SEE SHEETS 18 FOR -DET2REV- PLAN VIEW
SEE SHEETS 33 FOR -DET2REV- PROFILE
SEE SHEET 2-E FOR DRAINAGE DITCH DETAILS
SEE SHEET 2-F FOR STREAM RELOCATION DETAIL

— — — SLOPESTAKES FOR TEMPORARY -L- & -Y- ALIGNMENTS
— · — SLOPESTAKES FOR TEMPORARY DETOUR ALIGNMENTS

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5/14/99

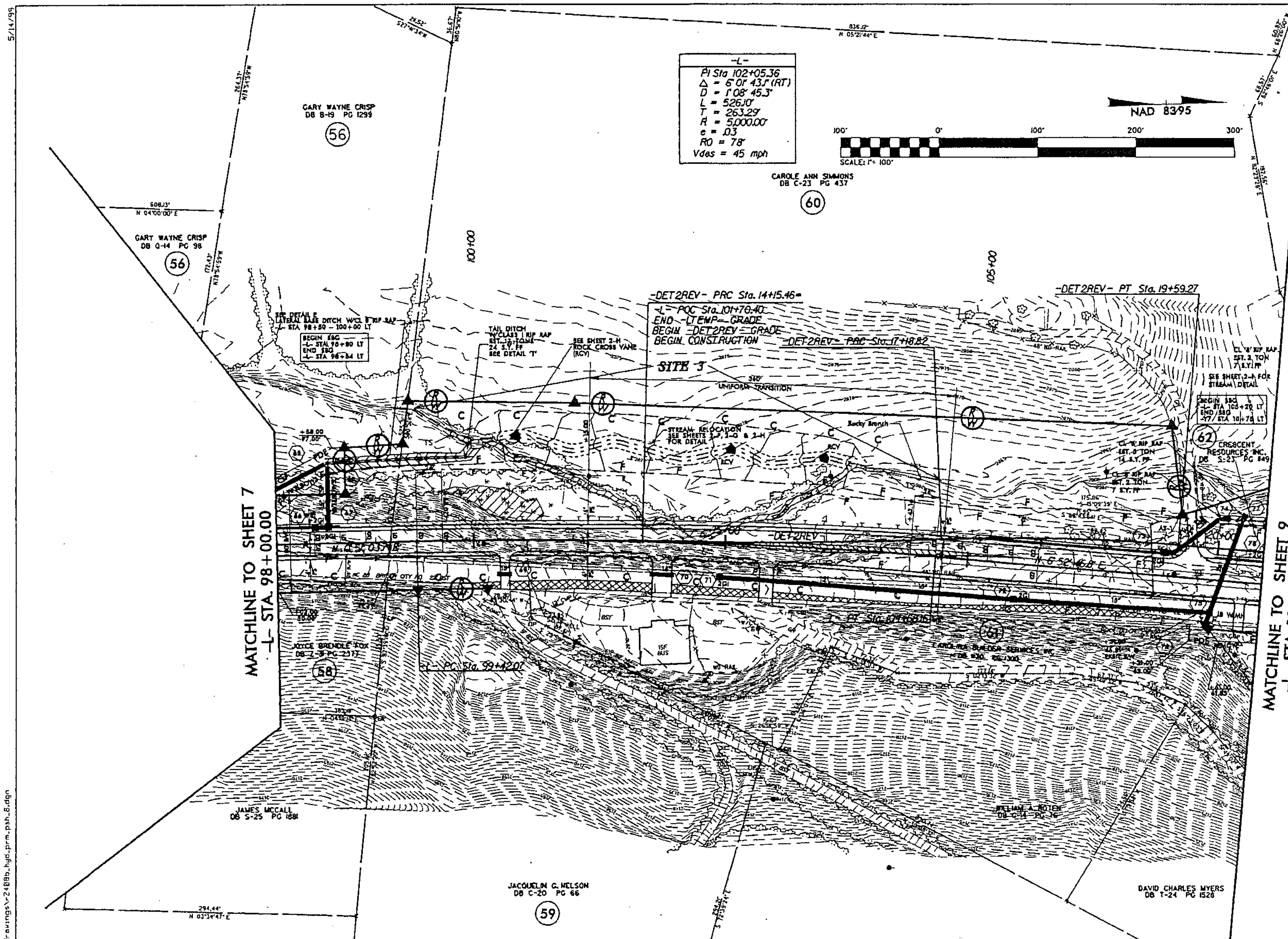
23-OCT-2008 12:19

PROJECT REFERENCE NO.	SHEET NO.
R-2408B	8
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

Permit Drawing
Sheet 13 of 19

DENOTES FILL IN WETLAND
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER



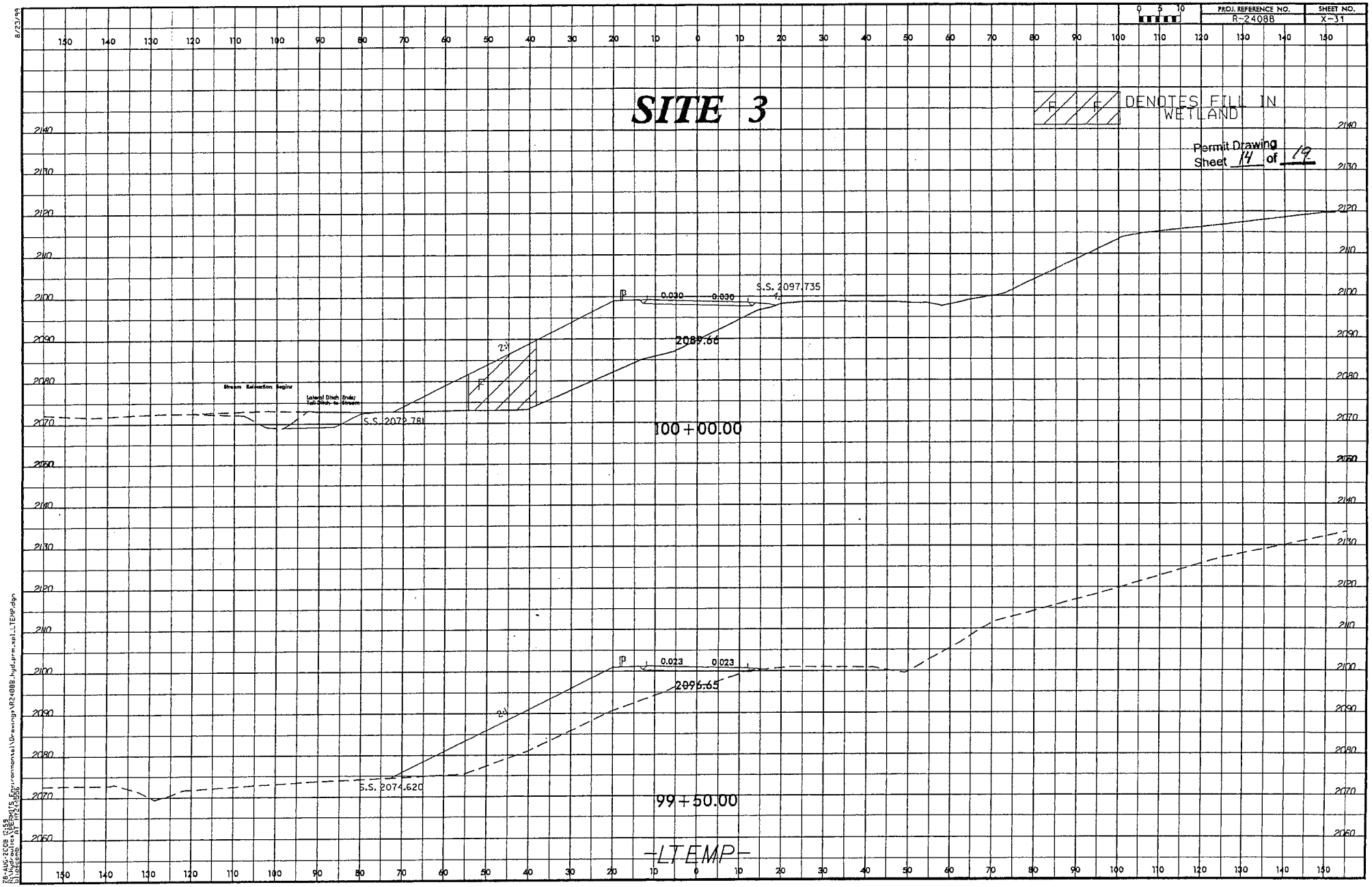
-L-
PI Sta 102+05.36
Δ = 6° 01' 43.5" (RT)
D = 1° 08' 45.3"
L = 526.10'
T = 263.29'
R = 5,000.00'
e = .03
RO = 78'
Vdes = 45 mph
NAD 83/95
SCALE: 1" = 100'
GARY WAYNE CRISP
DB B-19 PG 1299
56
GARY WAYNE CRISP
DB Q-14 PG 98
CAROLE ANN SIMMONS
DB C-23 PG 437
60
JACQUELIN G. NELSON
DB C-20 PG 66
59
JAMES MCCALL
DB S-25 PG 1681
DAVID CHARLES MYERS
DB T-24 PG 1526
CRESCENT RESOURCES INC.
DB S-23 PG 849
62
58
-DET2REV- PRC Sta. 14+15.46
-L- POC Sta. 101+70.40
END -LTEMP- GRADE
BEGIN -DET2REV- GRADE
BEGIN CONSTRUCTION
-DET2REV- PRC Sta. 17+18.82
-DET2REV- PT Sta. 19+59.27
SITE 3
UNIFORM TRANSITION
Rocky Branch
STREAM RELOCATION SEE SHEETS 2-F, 2-G & 2-H FOR DETAIL
SEE SHEET 2-H ROCK CROSS VANE (RCV)
TAIL DITCH W/CLASS I RIP RAP EST. 12 TONS 24 S.Y. FF SEE DETAIL 'T'
-L- PC Sta. 99+42.07
100+00
105+00
MATCHLINE TO SHEET 7 -L- STA. 98+00.00
MATCHLINE TO SHEET 9 -L- STA. 108+00.00

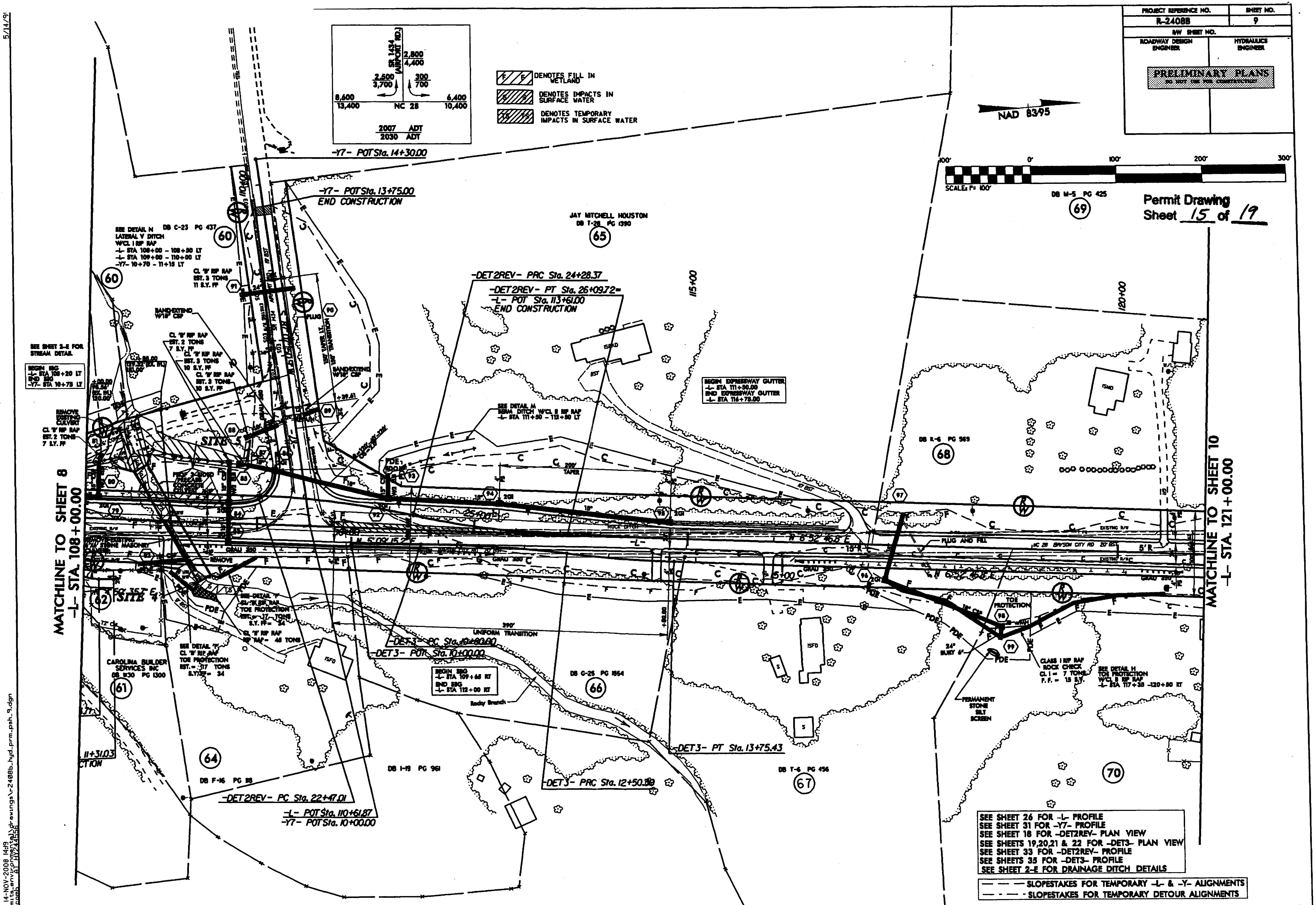
SEE SHEETS 25 & 26 FOR -L- PROFILE
SEE SHEETS 18 FOR -DET2REV- PLAN VIEW
SEE SHEETS 33 FOR -DET2REV- PROFILE
SEE SHEET 2-E FOR DRAINAGE DITCH DETAILS
SEE SHEET 2-F FOR STREAM RELOCATION DETAIL

SLOPESTAKES FOR TEMPORARY -L- & -Y- ALIGNMENTS
SLOPESTAKES FOR TEMPORARY DETOUR ALIGNMENTS

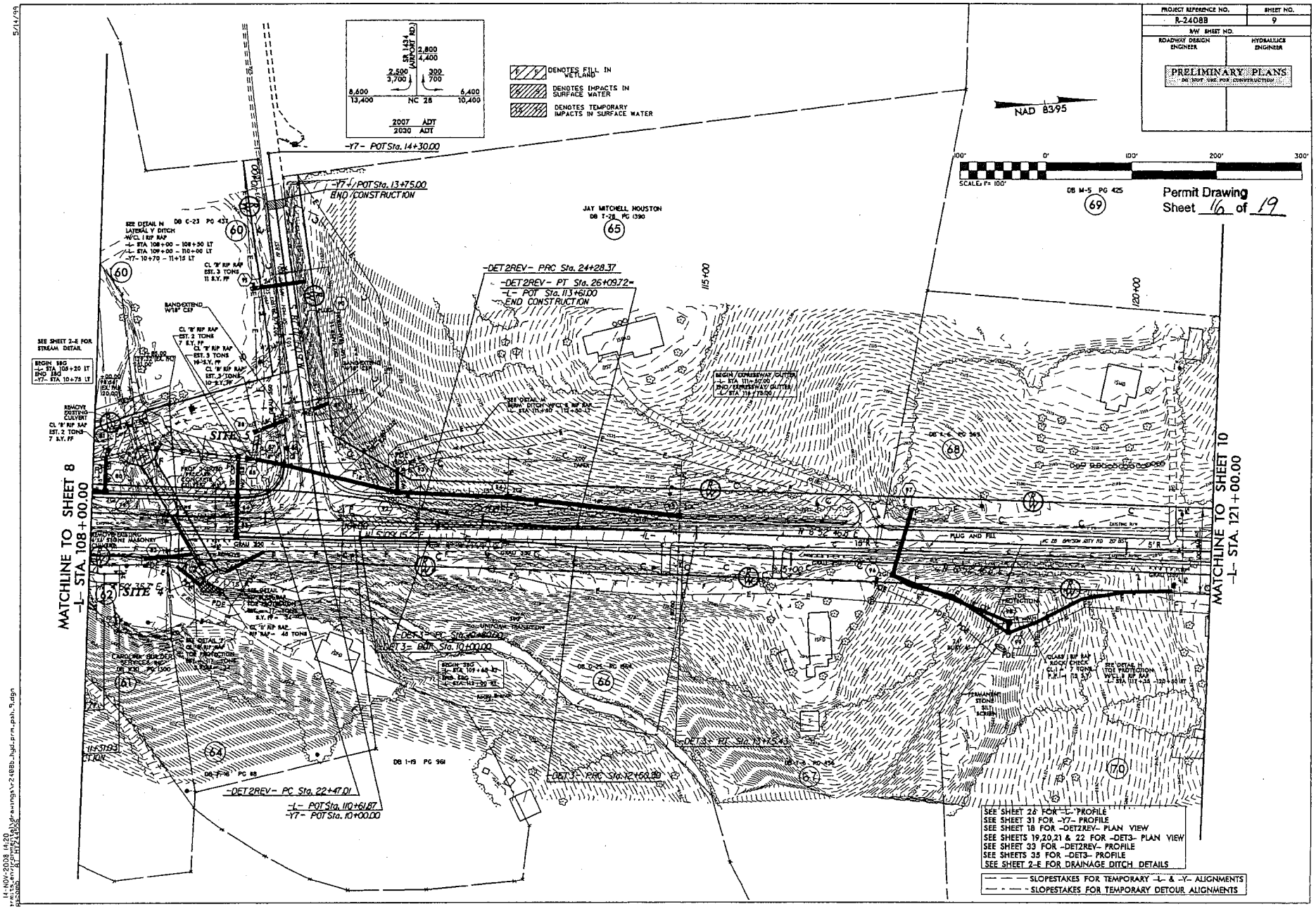
5/14/99

23-OCT-2008 12:20


SITE 3
F F DENOTES FILL IN WETLAND
Permit Drawing Sheet 14 of 14
PROJ. REFERENCE NO. R-2408B
SHEET NO. X-31
0 5 10
Stream Relocation Begins
Lateral Ditch Ends Tail Ditch to Stream
S.S. 2072.781
100+00.00
0.030
0.030
S.S. 2097.735
2089.66
2%
S.S. 2074.620
99+50.00
0.023
0.023
2096.65
2%
-LTEMP-



PROJECT REFERENCE NO. R-2408B
SHEET NO. 9
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
PRELIMINARY PLANS
NAD 83/95
SCALE: 1" = 100'
100' 0' 100' 200' 300'
Permit Drawing
Sheet 15 of 19
SR 1434 (AIRPORT RD.)
2,800
4,400
2,500
3,700
300
700
8,600
13,400
NC 28
6,400
10,400
2007 ADT
2030 ADT
DENOTES FILL IN WETLAND
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
-Y7- POT Sta. 14+30.00
-Y7- POT Sta. 13+75.00
END CONSTRUCTION
JAY MITCHELL HOUSTON
DB T-28 PG 1390
DB C-23 PG 437
DB M-5 PG 425
-DET2REV- PRC Sta. 24+28.37
-DET2REV- PT Sta. 26+09.72=
-L- POT Sta. 113+61.00
END CONSTRUCTION
115+00
120+00
BEGIN EXPRESSWAY GUTTER
-L- STA 111+50.00
END EXPRESSWAY GUTTER
-L- STA 116+78.00
SEE SHEET 2-E FOR STREAM DETAIL
SEE DETAIL M
BERM DITCH W/CL B RIP RAP
-L- STA 111+50 - 112+50 LT
DB K-6 PG 563
SITE 5
SITE 4
MATCHLINE TO SHEET 8
-L- STA. 108+00.00
MATCHLINE TO SHEET 10
-L- STA. 121+00.00
PLUG AND FILL
NC 28 BRYSON CITY RD
UNIFORM TRANSITION
-DET3- PC Sta. 10+80.00
-DET3- POT Sta. 10+00.00
BEGIN SBG
-L- STA 109+65 RT
END SBG
-L- STA 112+00 RT
Rocky Branch
CAROLINA BUILDER SERVICES INC
DB 830 PG 1300
DB C-25 PG 1554
DB I-19 PG 961
DB F-16 PG 88
DB T-6 PG 456
-DET3- PT Sta. 13+75.43
-DET3- PRC Sta. 12+50.30
-DET2REV- PC Sta. 22+47.01
-L- POT Sta. 110+61.87
-Y7- POT Sta. 10+00.00
TOE PROTECTION
PERMANENT STONE SILT SCREEN
CLASS I RIP RAP ROCK CHECK
SEE DETAIL H
TOE PROTECTION
SEE SHEET 26 FOR -L- PROFILE
SEE SHEET 31 FOR -Y7- PROFILE
SEE SHEET 18 FOR -DET2REV- PLAN VIEW
SEE SHEETS 19,20,21 & 22 FOR -DET3- PLAN VIEW
SEE SHEET 33 FOR -DET2REV- PROFILE
SEE SHEETS 35 FOR -DET3- PROFILE
SEE SHEET 2-E FOR DRAINAGE DITCH DETAILS
SLOPESTAKES FOR TEMPORARY -L- & -Y- ALIGNMENTS
SLOPESTAKES FOR TEMPORARY DETOUR ALIGNMENTS


PROJECT REFERENCE NO. R-2408B
SHEET NO. 9
RW SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
PRELIMINARY PLANS
NOT FOR CONSTRUCTION
NAD 83/95
SCALE: 1" = 100'
Permit Drawing Sheet 16 of 19
SR 1434 (AIRPORT RD)
2,800 4,400
2,500 3,700
300 700
8,600 13,400
NC 28
6,400 10,400
2007 ADT
2030 ADT
DENOTES FILL IN WETLAND
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
-Y7- POT Sta. 14+30.00
-Y7- POT Sta. 13+75.00
END CONSTRUCTION
JAY MITCHELL HOUSTON
DB T-28 PG 1390
DB M-5 PG 425
-DET2REV- PRC Sta. 24+28.37
-DET2REV- PT Sta. 26+09.72
-L- POT Sta. 113+61.00
END CONSTRUCTION
115+00
120+00
SEE SHEET 2-E FOR STREAM DETAIL
SITE 5
SITE 4
MATCHLINE TO SHEET 8 -L- STA. 108+00.00
MATCHLINE TO SHEET 10 -L- STA. 121+00.00
-DET2REV- PC Sta. 22+47.01
-L- POT Sta. 110+61.87
-Y7- POT Sta. 10+00.00
-DET3- PC Sta. 10+80.00
-DET3- POT Sta. 10+00.00
-DET3- PRC Sta. 12+60.00
-DET3- PT Sta. 13+15.43
SEE SHEET 26 FOR -L- PROFILE
SEE SHEET 31 FOR -Y7- PROFILE
SEE SHEET 18 FOR -DET2REV- PLAN VIEW
SEE SHEETS 19,20,21 & 22 FOR -DET3- PLAN VIEW
SEE SHEET 33 FOR -DET2REV- PROFILE
SEE SHEETS 35 FOR -DET3- PROFILE
SEE SHEET 2-E FOR DRAINAGE DITCH DETAILS
SLOPESTAKES FOR TEMPORARY -L- & -Y- ALIGNMENTS
SLOPESTAKES FOR TEMPORARY DETOUR ALIGNMENTS

SITES 4 & 5 ENLARGEMENT

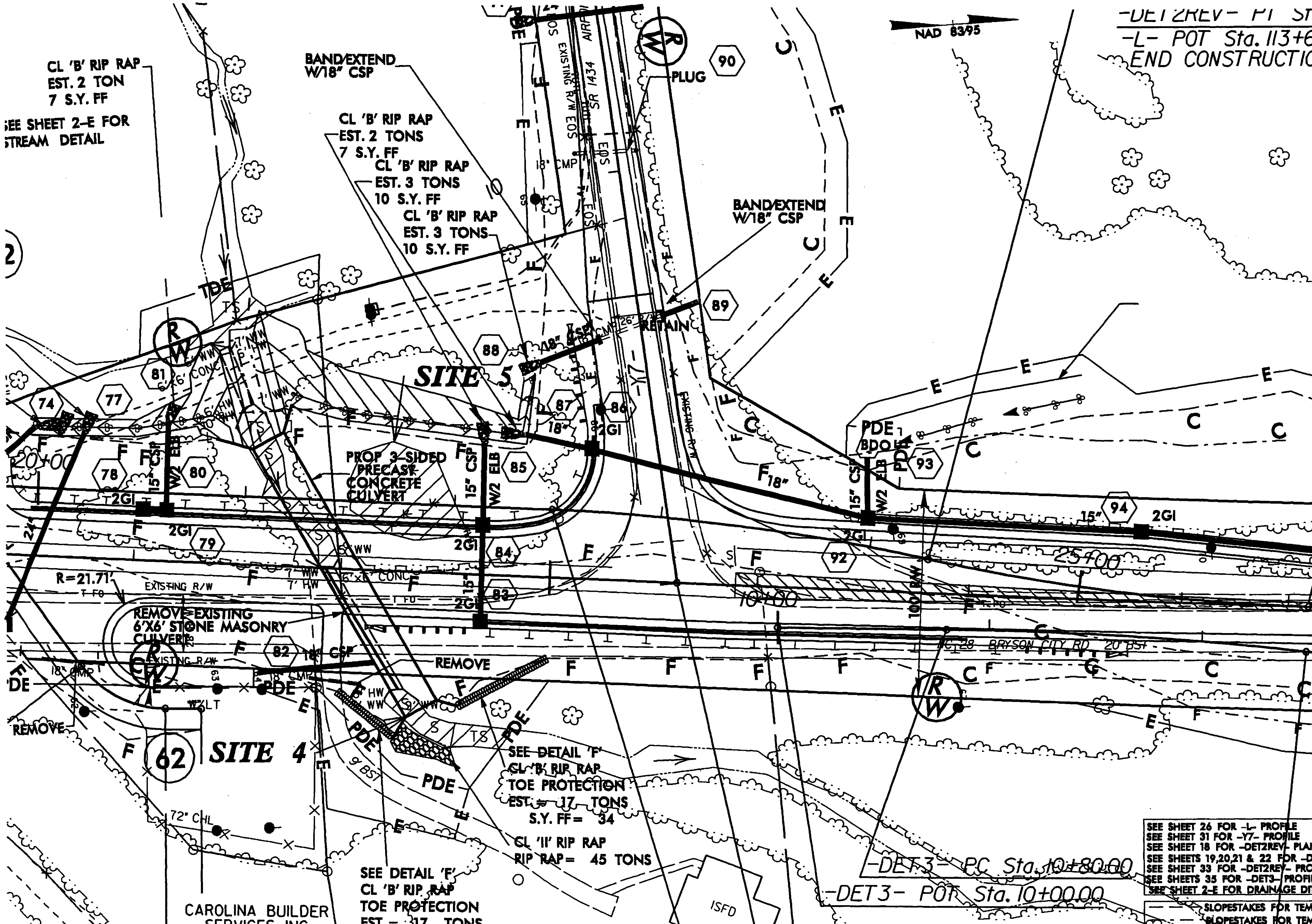
PROJECT REFERENCE NO.	SHEET NO.
R-2408B	9
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

50' 0' 50' 100'
SCALE: 1" = 50'

Permit Drawing
Sheet 17 of 19

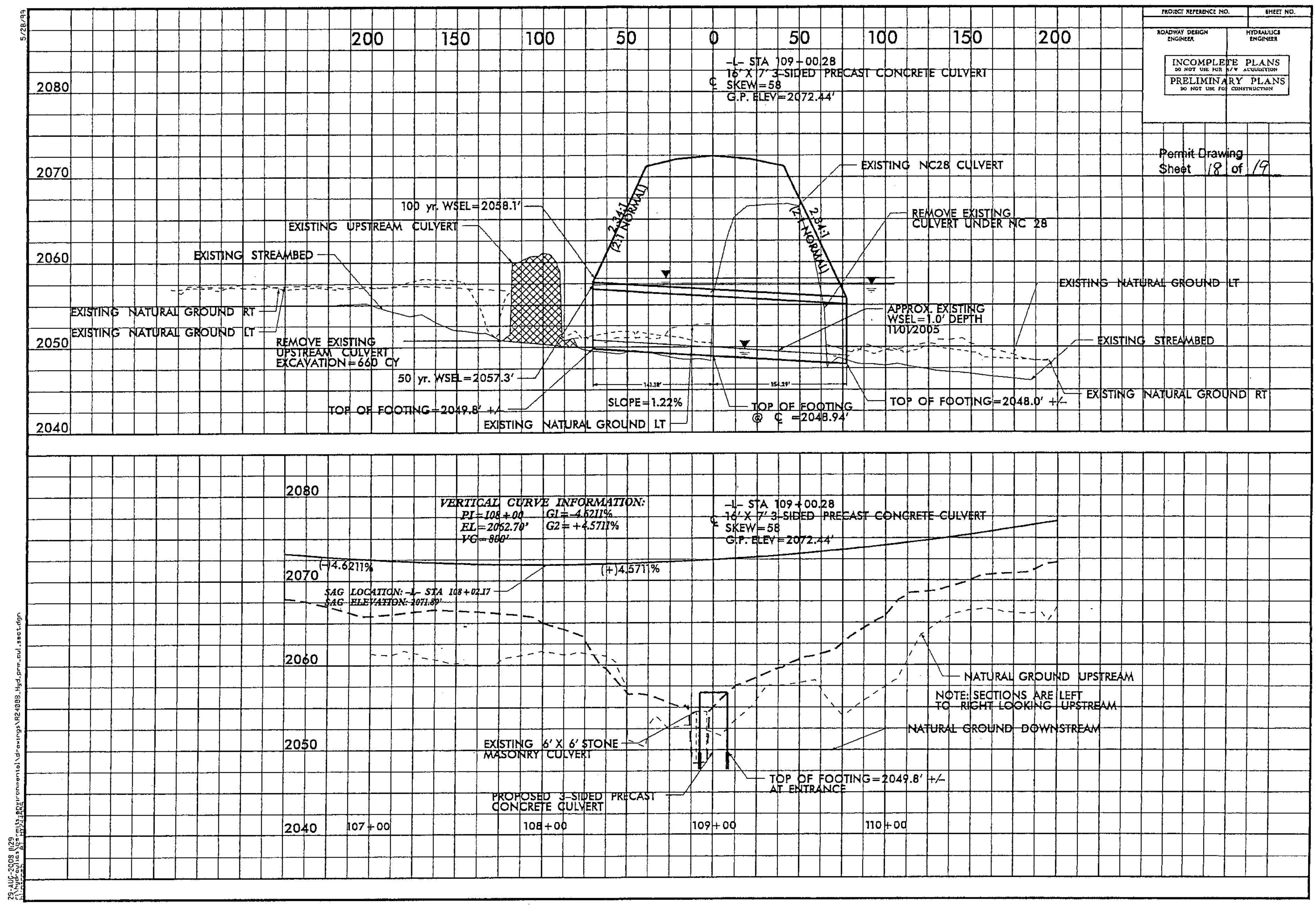
DENOTES FILL IN WETLAND
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER



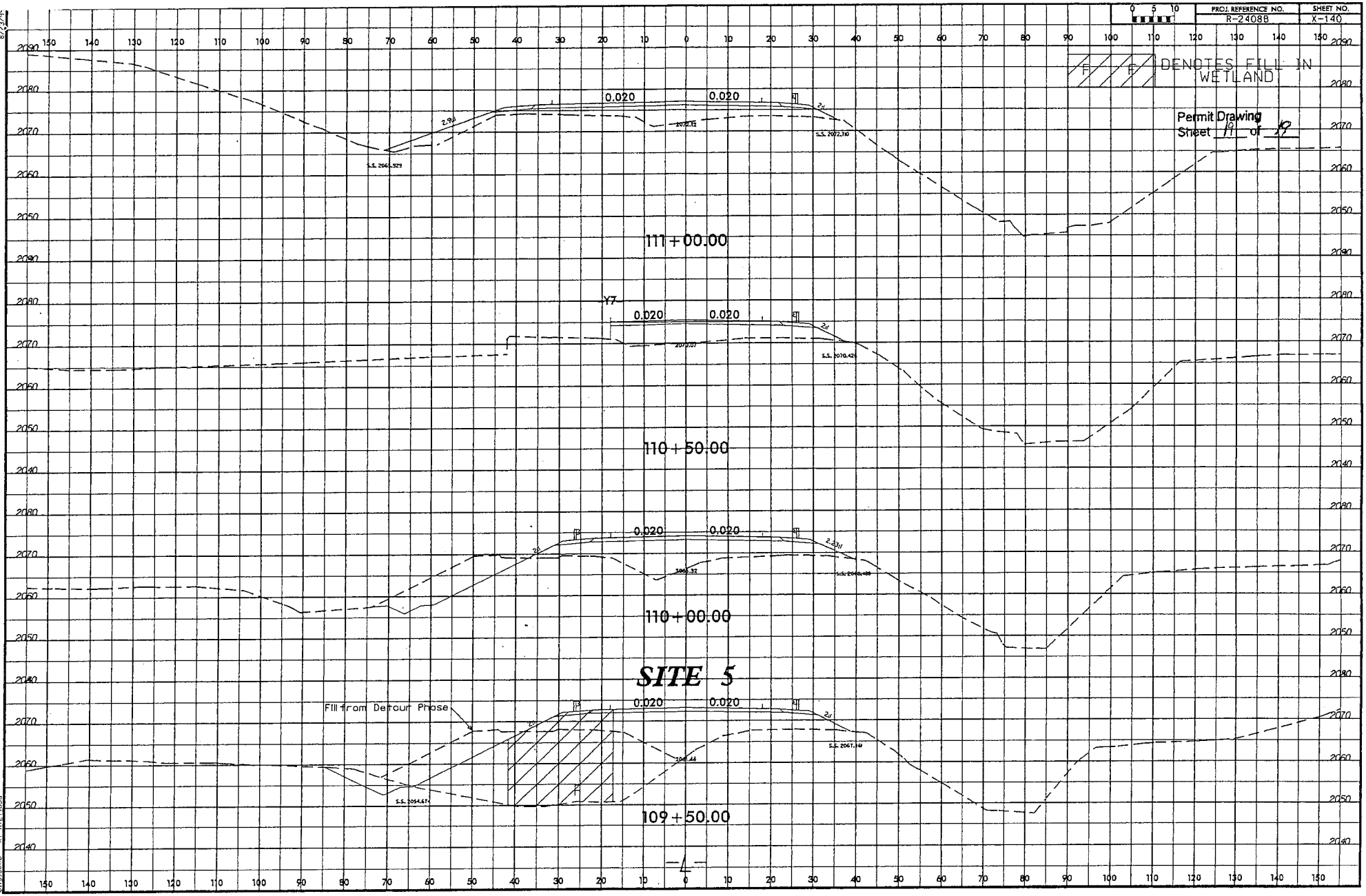
SEE SHEET 26 FOR -L- PROFILE
SEE SHEET 31 FOR -Y7- PROFILE
SEE SHEET 18 FOR -DET2REV- PLAN VIEW
SEE SHEETS 19,20,21 & 22 FOR -DET3- PLAN VIEW
SEE SHEET 33 FOR -DET2REV- PROFILE
SEE SHEETS 35 FOR -DET3- PROFILE
SEE SHEET 2-E FOR DRAINAGE DITCH DETAILS

SLOPESTAKES FOR TEMPORARY -L- & -Y- ALIGNMENTS
SLOPESTAKES FOR TEMPORARY DETOUR ALIGNMENTS

RECEIVED
JAN 2 2009



PROJECT REFERENCE NO.
SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION
Permit Drawing
Sheet 18 of 19
200 150 100 50 0 50 100 150 200
2080
2070
2060
2050
2040
-L- STA 109+00.28
16' X 7' 3-SIDED PRECAST CONCRETE CULVERT
℄ SKEW=58
G.P. ELEV=2072.44'
EXISTING NC28 CULVERT
2.34:1 (2:1 NORMAL)
REMOVE EXISTING CULVERT UNDER NC 28
100 yr. WSEL=2058.1'
EXISTING UPSTREAM CULVERT
EXISTING STREAMBED
EXISTING NATURAL GROUND RT
EXISTING NATURAL GROUND LT
REMOVE EXISTING UPSTREAM CULVERT EXCAVATION=660 CY
APPROX. EXISTING WSEL=1.0' DEPTH 11/01/2005
50 yr. WSEL=2057.3'
SLOPE=1.22%
TOP OF FOOTING=2049.8' +/-
TOP OF FOOTING @ ℄ =2048.94'
TOP OF FOOTING=2048.0' +/-
VERTICAL CURVE INFORMATION:
PI=108+00 G1=-4.6211%
EL=2062.70' G2=+4.5711%
VC=800'
(-)4.6211%
(+)4.5711%
SAG LOCATION: -L- STA 108+02.17
SAG ELEVATION: 2071.89'
NATURAL GROUND UPSTREAM
NOTE: SECTIONS ARE LEFT TO RIGHT LOOKING UPSTREAM
NATURAL GROUND DOWNSTREAM
EXISTING 6' X 6' STONE MASONRY CULVERT
TOP OF FOOTING=2049.8' +/- AT ENTRANCE
PROPOSED 3-SIDED PRECAST CONCRETE CULVERT
107+00
108+00
109+00
110+00
5/28/99
29-AUG-2008 11:29

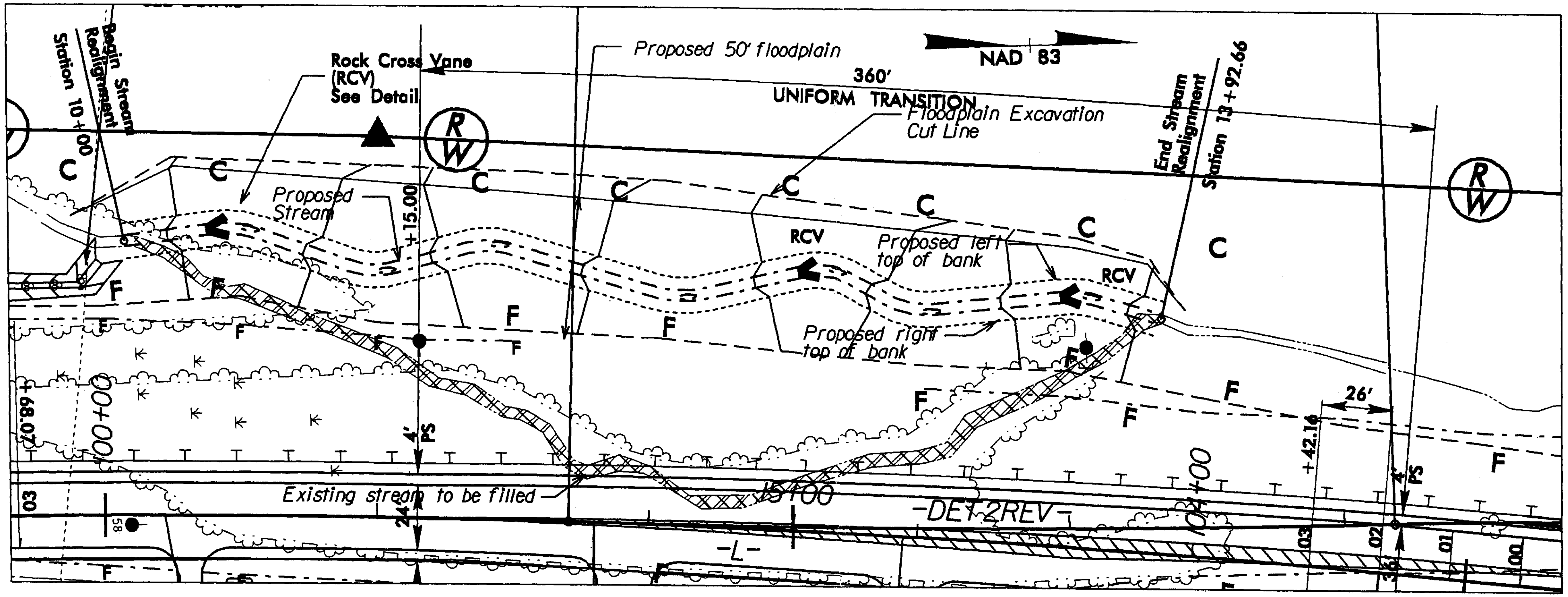

PROJ. REFERENCE NO.
R-24088
SHEET NO.
X-140
DENOTES FILL IN WETLAND
Permit Drawing
Sheet 11 of 12
111+00.00
110+50.00
110+00.00
SITE 5
109+50.00
Fill from Detour Phase
0.020
0.020
S.S. 2061.529
S.S. 2072.310
S.S. 2070.424
S.S. 2066.488
S.S. 2054.674
S.S. 2067.161

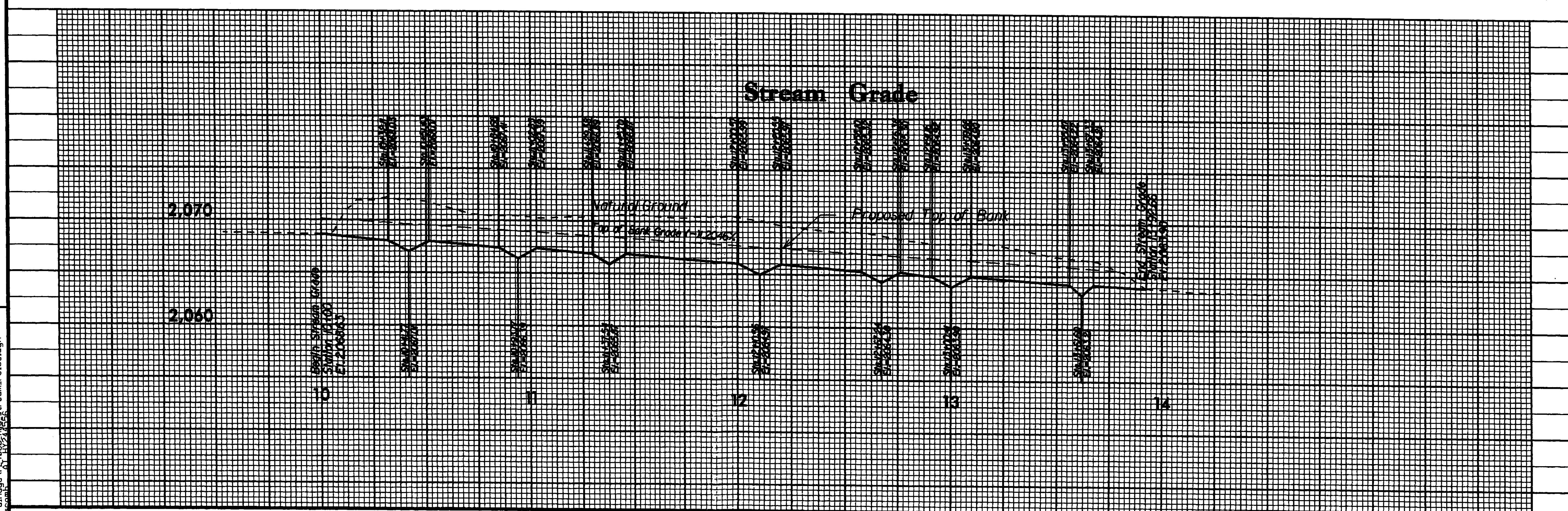
Stream Relocation -L- 100+00 to 104+00 Left

PROJECT REFERENCE NO.	SHEET NO.
R-2408B	2-F
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





REVISIONS

8/17/99

Stream Relocation Site 3

Summary

An unnamed tributary to Rocky Branch will be impacted by proposed roadway fill near stations 100 to 104 on the left side of the alignment. The stream is perennial and has a drainage area of 360 acres. The existing stream varies in classification from a G5 to a C5 using the Rosgen classification system. The sinuosity is very slight. Where sufficient vegetation is present, the stream is stable. The floodplain is generally available for flooding relief, except in thoses sections that are entrenched. The streambed is predominately sand.

The proposed stream will be classified as a Rosgen C5 stream. Rock cross-vanes will be used to establish grade control at both ends of the proposed realignment. Referencing a stable portion of the stream just below the reach, a similar dimension, patter, and profile will be established.

The stream will be relocated and restored using a priority-2 stream restoration approach. To the extent practicable, a constructed floodplain will be created along the stream relocation to provide bankfull flood stage relief. This will decrease shear stresses along the stream. Additionally, rock cross-vanes will establish grade control and prevent head-cutting. Pools will be constructed in the stream relocation and should continue to provide aquatic habitat. To ensure long-term stability of the stream, the riparian buffer will be held in Right of Way to allow for vegetation establishment and buffer protection.

Sediment Transport Analysis

Shear stress, $\tau = \gamma R s$

γ = density of water (62.4 lb/ft^2)
R = hydraulic radius = Area/Wetted Perimeter
s = slope

Stream power computation

$P = v\tau$

v = channel velocity (ft/s)
τ = shear stress (lb/ft^2)

Sediment transport analysis, continued

Existing Stream

$R = 10.0ft^2/9.5ft = 1.05ft$
$s = 0.011ft/ft$
$\tau = (62.4\ lb/ft^3)(1.05ft)(0.011ft/ft) = 0.72lb/ft^2$

$P = (5.5\ ft/s)(0.72lb/ft^2) = 3.96\ ft.lbs/s.ft^2$

Reference Stream

$R = 12.3ft^2/13.7ft = 0.90ft$
$s = 0.012ft/ft$
$\tau = (62.4\ lb/ft^3)(0.90ft)(0.012ft/ft) = 0.67lb/ft^2$

$P = (4.8\ ft/s)(0.67lb/ft^2) = 3.22\ ft.lbs/s.ft^2$

Proposed Stream

$R = 12.8ft^2/13.5ft = 0.95ft$
$s = 0.012ft/ft$
$\tau = (62.4\ lb/ft^3)(0.95ft)(0.012ft/ft) = 0.71lb/ft^2$

$P = (4.6\ ft/s)(0.71lb/ft^2) = 3.26\ ft.lbs/s.ft^2$

Variables	*Existing Channel*	*Proposed Reach*	*Reference Reach*	*Reference Reach*
			Lost Cove Cr.	Downstream
1. Stream type	G5/C5	C5	C3	C5
2. Drainage area (D.A.) ac.	360 ac.	360 ac.	24.8 sq. mi.	360 ac.
3. Bankfull width (Wbkf) ft.	11.0	13.0	62.3	13.3
4. Bankfull mean depth (dbkf) ft.	0.91	0.98	3.36	0.92
5. Width/depth ratio (Wbkf/dbkf)	12.1	13.2	18.5	14.5
6. Bankfull cross-sectional area (Abkf) $ft.^2$	10.0	12.8	208.0	12.2
7. Bankfull mean velocity (Vbkf) ft/sec	5.5	4.6		4.8
8. Bankfull discharge (Qbkf) $ft.^3$/sec	55	59		59
9. Bankfull max depth (dmbkf) ft.	2.0	1.5	5.4	1.8
10. Width of floodprone area (Wfpa) ft.	17 to 70	50	>200	71
11. Entrenchment ratio (Wfpa/Wbkf)	2.0 to 6.4	3.8	>3	5.3
12. Meander length (Lm) ft.	30 to 80	90 to 124	540	38 to 51
13. Ratio of meander length to bankfull width (Lm/Wbkf)	2.7 to 7.3	6.9 to 9.5	8.7	2.9 to 3.8
14. Radius of curvature (Rc) ft.	12 to 25	25 to 40	62.5	20 to 30
15. Ratio of radius of curvature to bankfull width (Rc/Wbkf)	1.1 to 2.3	1.9 to 3.1	1	1.5 to 2.3
16. Belt width (Wblt) ft.	20	25	500	18
17. Meander width ratio (Wblt/Wbkf)	1.80	1.90	8	1.40
18. Sinuosity (stream length/valley length) (K)	1.05	1.03	1.2	1.09
19. Valley Slope (VS)	1.05%	1.30%	0.0088	1.27%
20. Average slope (CS)	1.10%	1.20%	0.0084	1.39%
21. Pool slope	0.001	0.001		0.001
22. Ratio of pool slope to average slope	0.091	0.083		0.072
23. Maximum pool depth (dpmax) ft.	1.9	2.5	7.7	1.8
24. Ratio of pool depth to average bankfull depth (dp/dbkf)	2.09	2.54	2.3	1.96
25. Pool width (Wp) ft.	16.0	15.0	59.5	14.0
26. Ratio of pool width to bankfull width	1.45	1.15	0.96	1.05
27. Pool to pool spacing ft.	30 to 80	35 to 70	190	30 to 80
28. Ratio of pool to pool spacing to bankfull width	1.9 to 5.2	2.7 to 5.4	3.05	2.3 to 6.0
29. Ratio of lowest bank height to bankfull height (or max bankfull depth) (BHlow/dmbkf)	0.7	1.0	1.0	0.6

NATURAL CHANNEL DESIGN DATA

MORPHOLOGICAL MEASUREMENT TABLE

SITE 3 Station 99+42 to 104+68

N.C. DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
Macon County
PROJECT: 34427.1.1 (R-2408B)

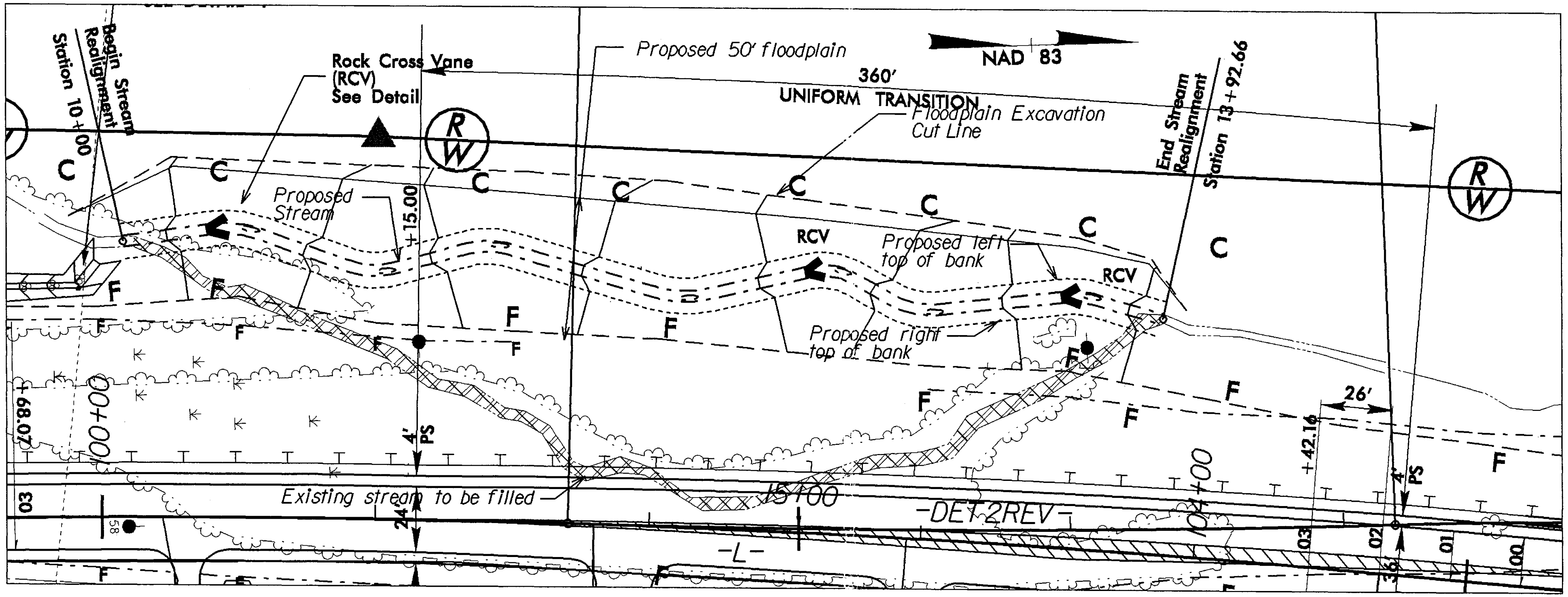
SHEET __ OF __ 10/24/2008

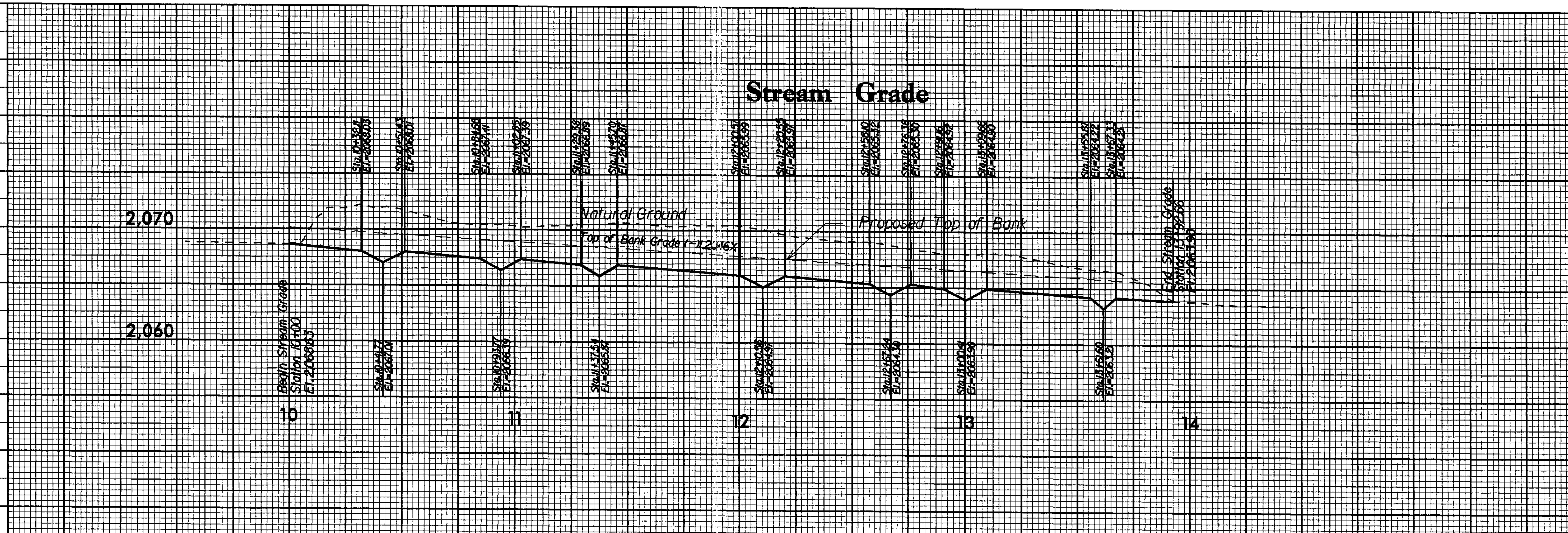
Stream Relocation –L– 100+00 to 104+00 Left

PROJECT REFERENCE NO.	SHEET NO.
R-2408B	2-F
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





REVISIONS

8/17/99

22-OCT-2008 15:43

PROJECT REFERENCE NO.	SHEET NO.
R-2408B	2-G
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

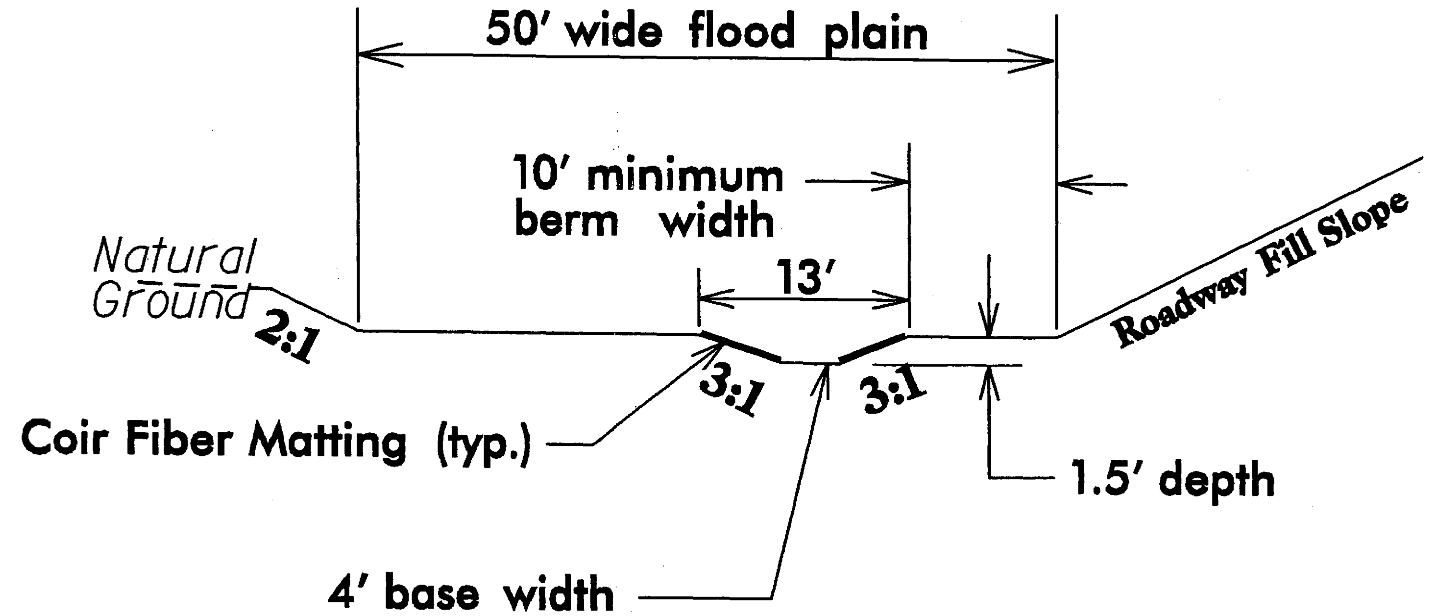
INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

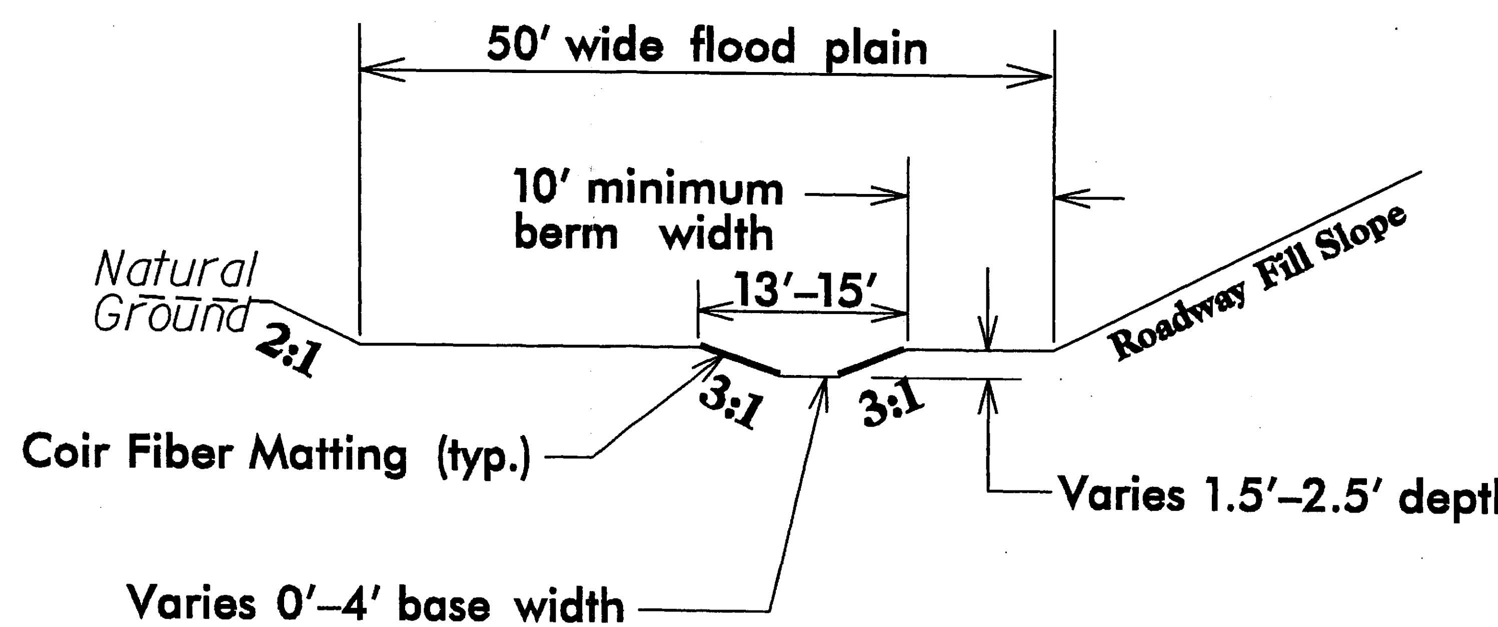
Stream Details

NOT TO SCALE

Typical Stream Dimensions



Typical Stream Section with Pool



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JAN 26 2010

5/14/99

22-OCT-2008 15:57
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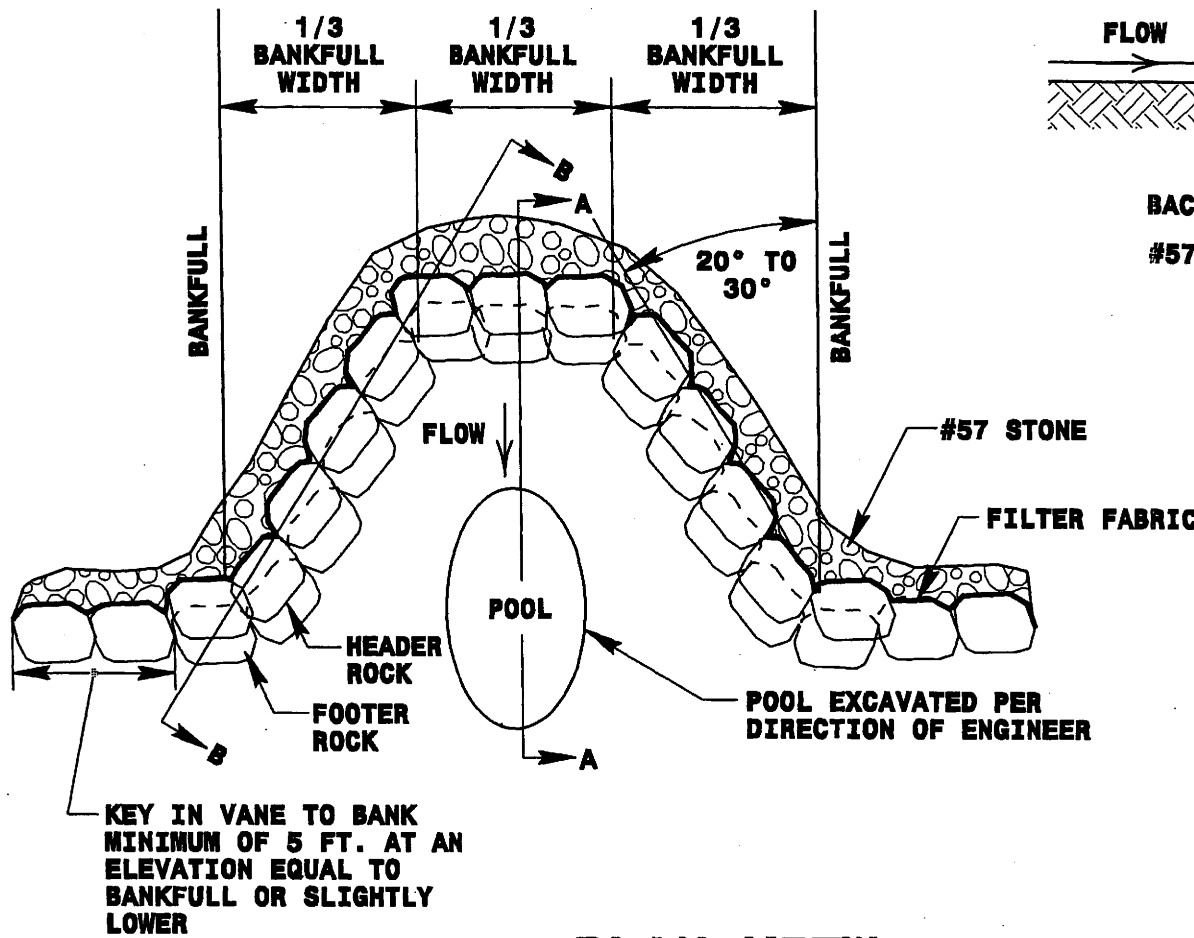
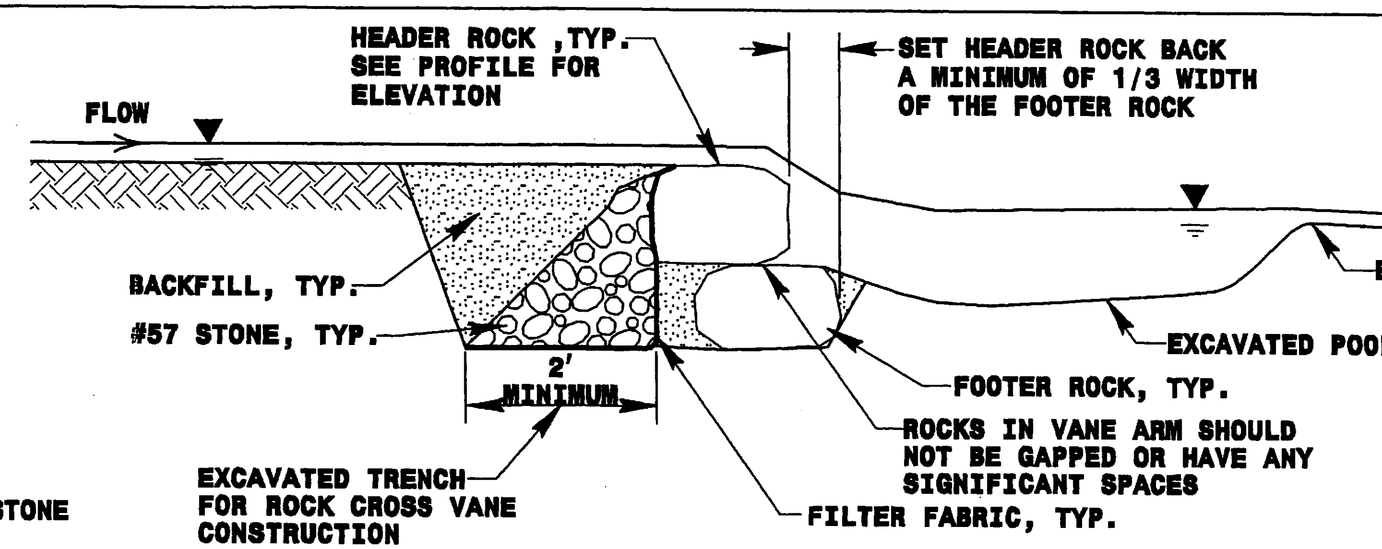
PROJECT REFERENCE NO.	SHEET NO.
R-2408B	2-H
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

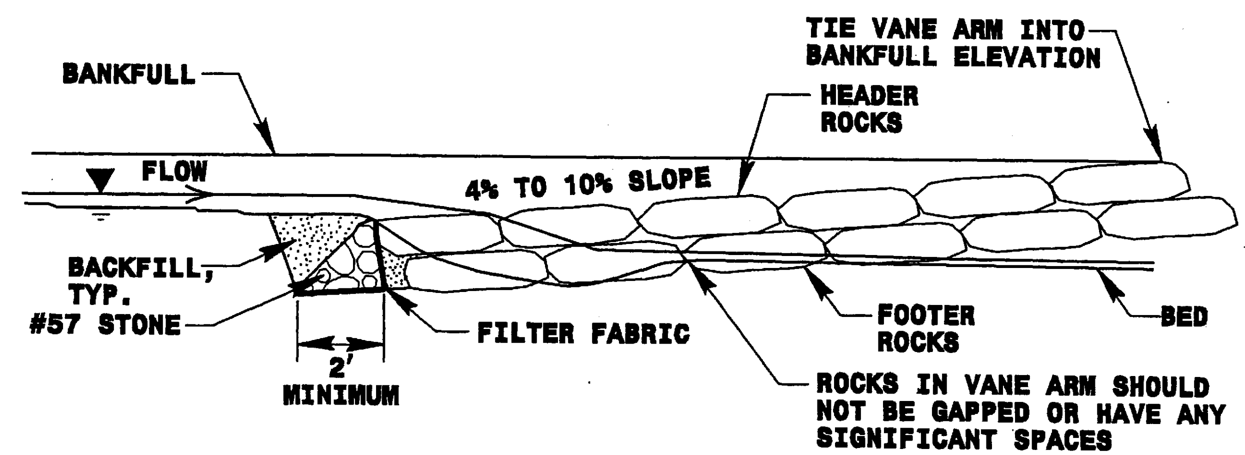
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION



PLAN VIEW



SECTION A-A



SECTION B-B

	BOULDER DIMENSIONS (FT)		
STATION	HEIGHT	LENGTH	WIDTH
-L-100+40	1	4	2
-L-102+55	1	4	2
-L-103+48	1	4	2

ROCK CROSS VANE DETAIL

NOT TO SCALE

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.

5/14/99

22-OCT-2008 15:57
r2408b_hyd_stream_reloc.dgn

UT to LittleTennessee
Stream Mitigation Plan
TIP R-2408
WBS No. 34427.1.1
January 2009

The North Carolina Department of Transportation will perform on-site mitigation for stream impacts associated with TIP R-2408. The mitigation site contains approximately 190 linear feet of stream restoration and occurs within the right of way located adjacent to NC 28 near station 28+00R.

NCDOT proposes to restore 190 linear feet of stream by removing an existing 18" reinforced concrete pipe (RCP), establishing a stable stream channel, and replanting a buffer along the unamed tributary that leads to Little Tennessee River. This site is proposed to offset 190 feet of stream impacts associated with the road project.

Existing Conditions

This project is located in the central region of Macon County on NC 28 about two miles north of Franklin NC. NCDOT plans to widen NC 28, making it a four lane road. The existing unnamed tributary runs East Northeast to West Southwest through an 18 inch (RCP) pipe perpendicular to NC 28. Steep upstream topography varies greatly from the topography downstream of the culvert. The riparian area adjacent to the stream is currently grass with a very sparse riparian buffer. The stream flows from pipe to wetland therefore no existing dimensions are shown in the geomorphic Table.

Proposed Conditions

The proposed stream channel design involves removing approximately 190 linear feet of existing 18" RCP and restoring the appropriate dimension, pattern and profile to the stream. The design proposes an A t ype channel with a 13% slope transitioning into a B type channel with a 6.5 % slope.The cross-sectional area for this stream is 2.5 square feet. This information is shown in detail on the morphological table included in Appendix A. The proposed design includes reshaping the stream channel, applying the appropriate cross sectional areas and installing grade control structures. The design parameters were verified using the NC Regional Curves found in Appendix A. A minimum 50' buffer along each side of the channel will be planted at a a density rate of 680 trees per acre on 8 foot centers with the following species: silky willow, (salix sericea) elderberry,(*sambucus canadensis*) for Type I. Northern red oak, (*quercus rubra*), american sycamore (*platanus occidentalis*), white oak (*quercus alba*), yellow poplar (*liriodendron tulipifera*) for Type II. The mitigation site was purchased fee simple and will be held in perpetuity by NCDOT.

Monitoring

NCDOT proposes to monitor the restoration site by visual observation for channel and bank stability and by, photo documentation for the survival and the density of the vegetation. NCDOT will monitor the site for a minimum of three years or until the site is a success. The USACE stream quality assessment forms used to evaluate success criteria are shown in Appendix A.

Appendix A:

MORPHOLOGICAL MEASUREMENTS TABLE

STREAM NAME AND LOCATION

-REACH NAME- Sta. 1n + nn.nn to Sta. nn + nn.nn

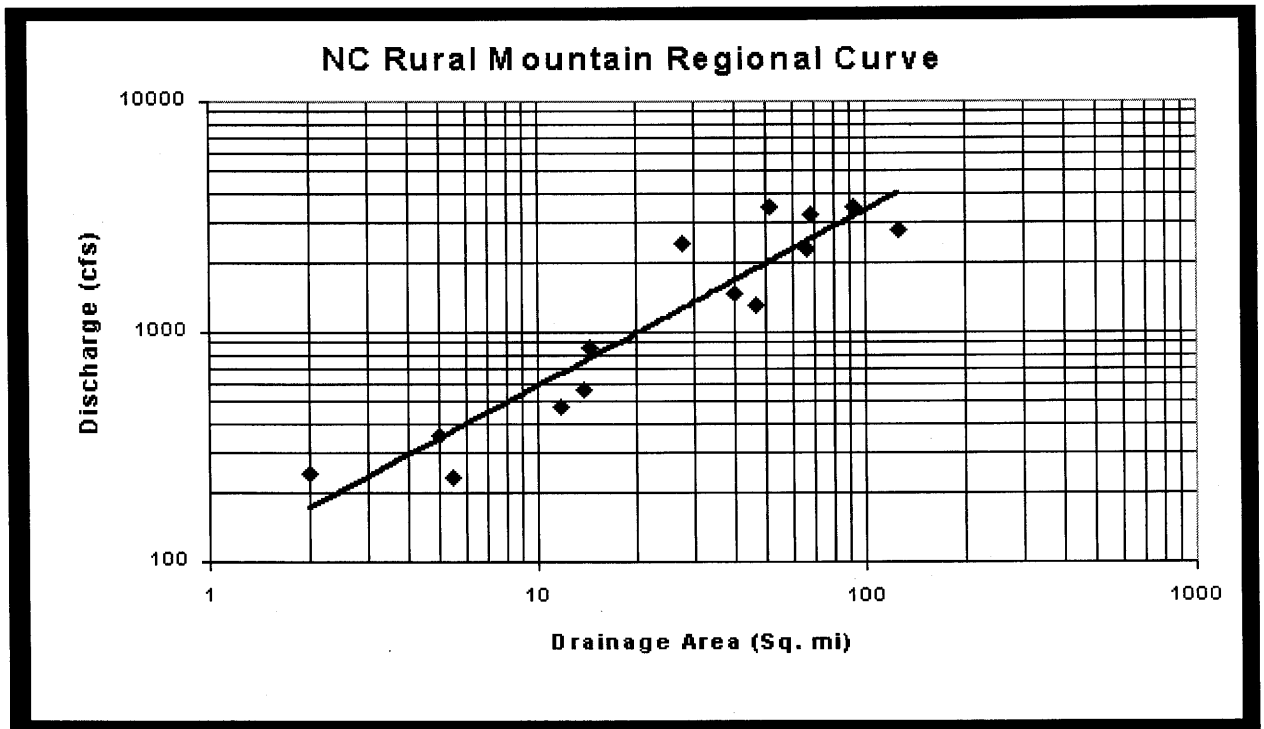
Variables	Existing Channel	Proposed Reach	USGS Station	Reference Reach
1. Stream type	--	A	--	A
2. Drainage area	-----	0.5	-----	7.42
3. Bankfull width	Mean: ----- Range:	Mean: 5 Range:		Mean: 9.7 Range:
4. Bankfull mean depth	Mean: ----- Range:	Mean: 1 Range:		Mean: 1.65 Range:
5. Width/depth ratio	Mean: ----- Range:	Mean: 5 Range:		Mean: 7.23 Range:
6. Bankfull cross-sectional area	Mean: ----- Range:	Mean: 2.5 Range:		Mean: ----- Range:
7. Bankfull mean velocity	Mean: ----- Range:	Mean: ----- Range:		Mean: ----- Range:
8. Bankfull discharge. cfs	Mean: ----- Range:	Mean: ----- Range:		Mean: ----- Range:
9. Bankfull max depth	Mean: ----- Range:	Mean: 1 Range:		Mean: 1.37 Range:
10. Width of floodprone area	Mean: ----- Range:	Mean: 50 Range:		Mean: 13.93 Range:
11. Entrenchment ratio	Mean: ----- Range:	Mean: 10 Range:		Mean: 89.04 Range:
12. Meander length	Mean: ----- Range:	Mean: 20 Range:		Mean: ----- Range:
13. Ratio of meander length to bankfull width	Mean: ----- Range:	Mean: ----- Range:		Mean: ----- Range:
14. Radius of curvature	Mean: ----- Range:	Mean: ----- Range:		Mean: ----- Range:
15. Ratio of radius of curvature to bankfull width	Mean: ----- Range:	Mean: ----- Range:		Mean: ----- Range:
16. Belt width	Mean: ----- Range:	Mean: 7.00 Range:		Mean: ----- Range:
17. Meander width ratio	Mean: ----- Range:	Mean: 1.4 Range:		Mean: ----- Range:
18. Sinuosity (stream length/valley length)	Mean: ----- Range:	Mean: 1.0 Range:		Mean: 1.05 Range:
19. Valley slope	Mean: ----- Range:	Mean: 15% Range:		Mean: 7.9 Range:
20. Average slope	Mean: ----- Range:	Mean: 15% Range:		Mean: 6.41% Range: 2.5 - 9.8
21. Pool slope	Mean: ----- Range:	Mean: ----- Range:		Mean: ----- Range:
22. Ratio of pool slope to average slope	Mean: Range:	Mean: ----- Range:		Mean: ----- Range:
23. Maximum pool depth	Mean: ----- Range:	Mean: ----- Range:		Mean: ----- Range:
24. Ratio of pool depth to average bankfull depth	Mean: ----- Range:	Mean: 5 Range:		Mean: 8 Range:
25. Pool width	Mean: ----- Range:	Mean: ----- Range:		Mean: ----- Range:
26. Ratio of pool width to bankfull width	Mean: ----- Range:	Mean: 10 Range:		Mean: 2.4 Range:
27. Pool to pool spacing	Mean: ----- Range:	Mean: ----- Range:		Mean: ----- Range:
28. Ratio of pool to pool spacing to bankfull width	Mean: ----- Range:	Mean: ----- Range:		Mean: ----- Range:
29. Ratio of lowest bank height to bankfull height (or max bankfull depth)	Mean: ----- Range:	Mean: ----- Range:		Mean: ----- Range:

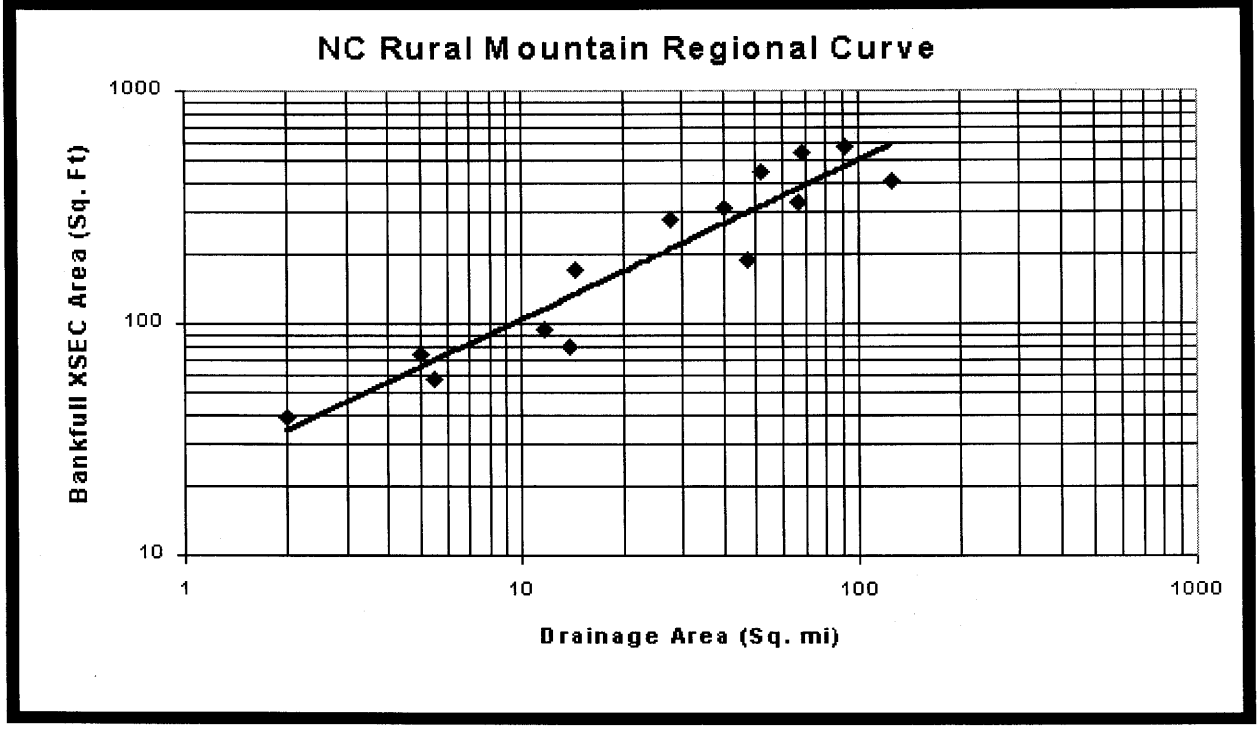
MORPHOLOGICAL MEASUREMENTS TABLE

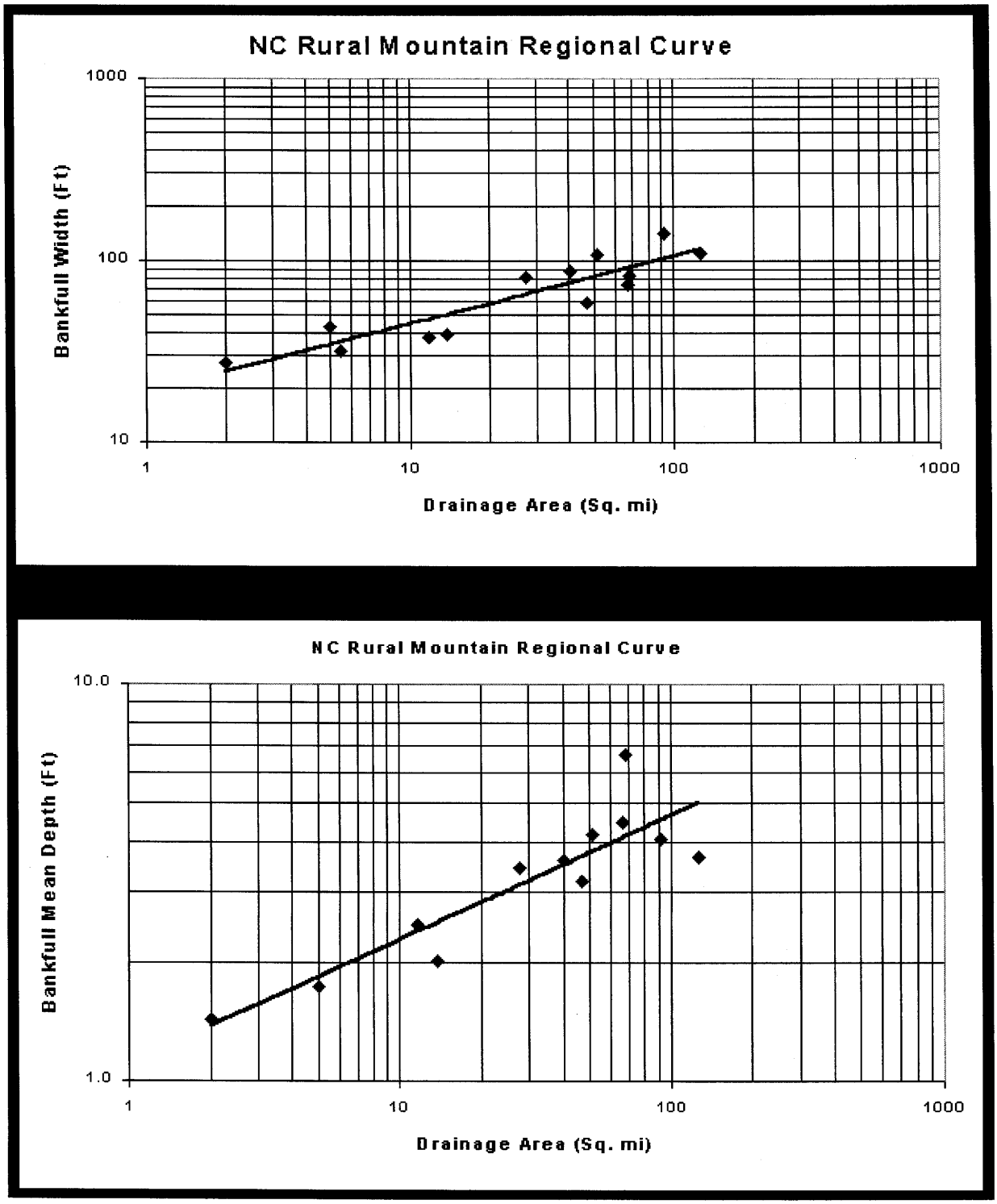
STREAM NAME AND LOCATION

-REACH NAME- Sta. 1n+nn.nn to Sta. nn+nn.nn

Variables	Existing Channel	Proposed Reach	USGS Station	Reference Reach
1. Stream type	--	B	--	A
2. Drainage area	-----	0.5	-----	7.42
3. Bankfull width	Mean: ----- Range:	Mean: 5 Range:	-----	Mean: .97 Range:
4. Bankfull mean depth	Mean: ----- Range:	Mean: 1 Range:	-----	Mean: 7.65 Range:
5. Width/depth ratio	Mean: ----- Range:	Mean: 5 Range:	-----	Mean: 7.23 Range:
6. Bankfull cross-sectional area	Mean: ----- Range:	Mean: 2.5 Range:	-----	Mean: ----- Range:
7. Bankfull mean velocity	Mean: ----- Range:	Mean: ----- Range:	-----	Mean: ----- Range:
8. Bankfull discharge, cfs	Mean: ----- Range:	Mean: ----- Range:	-----	Mean: ----- Range:
9. Bankfull max depth	Mean: ----- Range:	Mean: 1 Range:	-----	Mean: 1.37 Range:
10. Width of floodprone area	Mean: ----- Range:	Mean: 50 Range:	-----	Mean: 13.93 Range:
11. Entrenchment ratio	Mean: ----- Range:	Mean: 10 Range:	-----	Mean: 89.04 Range:
12. Meander length	Mean: ----- Range:	Mean: 35 Range:	-----	Mean: ----- Range:
13. Ratio of meander length to bankfull width	Mean: ----- Range:	Mean: ----- Range:	-----	Mean: ----- Range:
14. Radius of curvature	Mean: ----- Range:	Mean: ----- Range:	-----	Mean: ----- Range:
15. Ratio of radius of curvature to bankfull width	Mean: ----- Range:	Mean: ----- Range:	-----	Mean: ----- Range:
16. Belt width	Mean: ----- Range:	Mean: 7.00 Range:	-----	Mean: ----- Range:
17. Meander width ratio	Mean: ----- Range:	Mean: 1.4 Range:	-----	Mean: ----- Range:
18. Sinuosity (stream length/valley length)	Mean: ----- Range:	Mean: 1.0 Range:	-----	Mean: 1.05 Range:
19. Valley slope	Mean: ----- Range:	Mean: 5.45% Range:	-----	Mean: 7.9 Range:
20. Average slope	Mean: ----- Range:	Mean: 6.5% Range:	-----	Mean: 6.41% Range: 2.5 - 9.8
21. Pool slope	Mean: ----- Range:	Mean: ----- Range:	-----	Mean: ----- Range:
22. Ratio of pool slope to average slope	Mean: Range:	Mean: ----- Range:	-----	Mean: ----- Range:
23. Maximum pool depth	Mean: ----- Range:	Mean: ----- Range:	-----	Mean: ----- Range:
24. Ratio of pool depth to average bankfull depth	Mean: ----- Range:	Mean: 5 Range:	-----	Mean: 8 Range:
25. Pool width	Mean: ----- Range:	Mean: ----- Range:	-----	Mean: ----- Range:
26. Ratio of pool width to bankfull width	Mean: ----- Range:	Mean: 2.1 Range:	-----	Mean: 2.4 Range:
27. Pool to pool spacing	Mean: ----- Range:	Mean: ----- Range:	-----	Mean: ----- Range:
28. Ratio of pool to pool spacing to bankfull width	Mean: ----- Range:	Mean: ----- Range:	-----	Mean: ----- Range:
29. Ratio of lowest bank height to bankfull height (or max bankfull depth)	Mean: ----- Range:	Mean: ----- Range:	-----	Mean: ----- Range:


NC Rural Mountain Regional Curve
10000
1000
100
Discharge (cfs)
1
10
100
1000
Drainage Area (Sq. mi)


NC Rural Mountain Regional Curve
1000
100
10
Bankfull XSEC Area (Sq. Ft)
1
10
100
1000
Drainage Area (Sq. mi)


NC Rural Mountain Regional Curve
Bankfull Width (Ft)
1000
100
10
1
10
100
1000
Drainage Area (Sq. mi)
NC Rural Mountain Regional Curve
Bankfull Mean Depth (Ft)
10.0
1.0
1
10
100
1000
Drainage Area (Sq. mi)

Channel Mitigation Monitoring Sheets I, II, III, AND IV

Monitoring Data Record

Project Title: _____ COE Action ID: _____
Stream Name: _____ DWQ Number: _____
City, County and other Location Information: _____
Date Construction Completed:_____ Monitoring Year: ( ) of 5
Ecoregion:_____ 8 digit HUC unit_____
USGS Quad Name and Coordinates: _____
Rosgen Classification: _____
Length of Project: _____ Urban or Rural: _____ Watershed Size: _____
Monitoring DATA collected by: _____ Date: _____
Applicant Information:
Name: _____
Address: _____
Telephone Number: _____ Email address:_____
Consultant Information:
Name: _____
Address: _____
Telephone Number: _____ Email address:_____
Project Status: _____
_____

Monitoring Level required by COE and DWQ (404 permit/ 401 Cert.): Level **1** ~~2~~ ~~3~~
Monitoring Level 1 requires completion of *Section 1, Section 2 and Section 3*

Section 1. PHOTO REFERENCE SITES
(Monitoring at all levels must complete this section)

Total number of reference photo locations at this site: _____
Dates reference photos have been taken at this site: _____
_____
Individual from whom additional photos can be obtained (name, address, phone):_____
_____
Other Information relative to site photo reference: _____
_____

If required to complete Level 3 monitoring only stop here; otherwise, complete section 2.

Section 2. PLANT SURVIVAL
Attach plan sheet indicating reference photos.

Identify specific problem areas (missing, stressed, damaged or dead plantings):

Estimated causes, and proposed/required remedial action:

ADDITIONAL COMMENTS:

If required to complete Level 1 and Level 2 monitoring only stop here; otherwise, complete section 3.

Section 3. CHANNEL STABILITY

Visual Inspection: The entire stream project as well as each in-stream structure and bank stabilization/revetment structure must be evaluated and problems addressed.

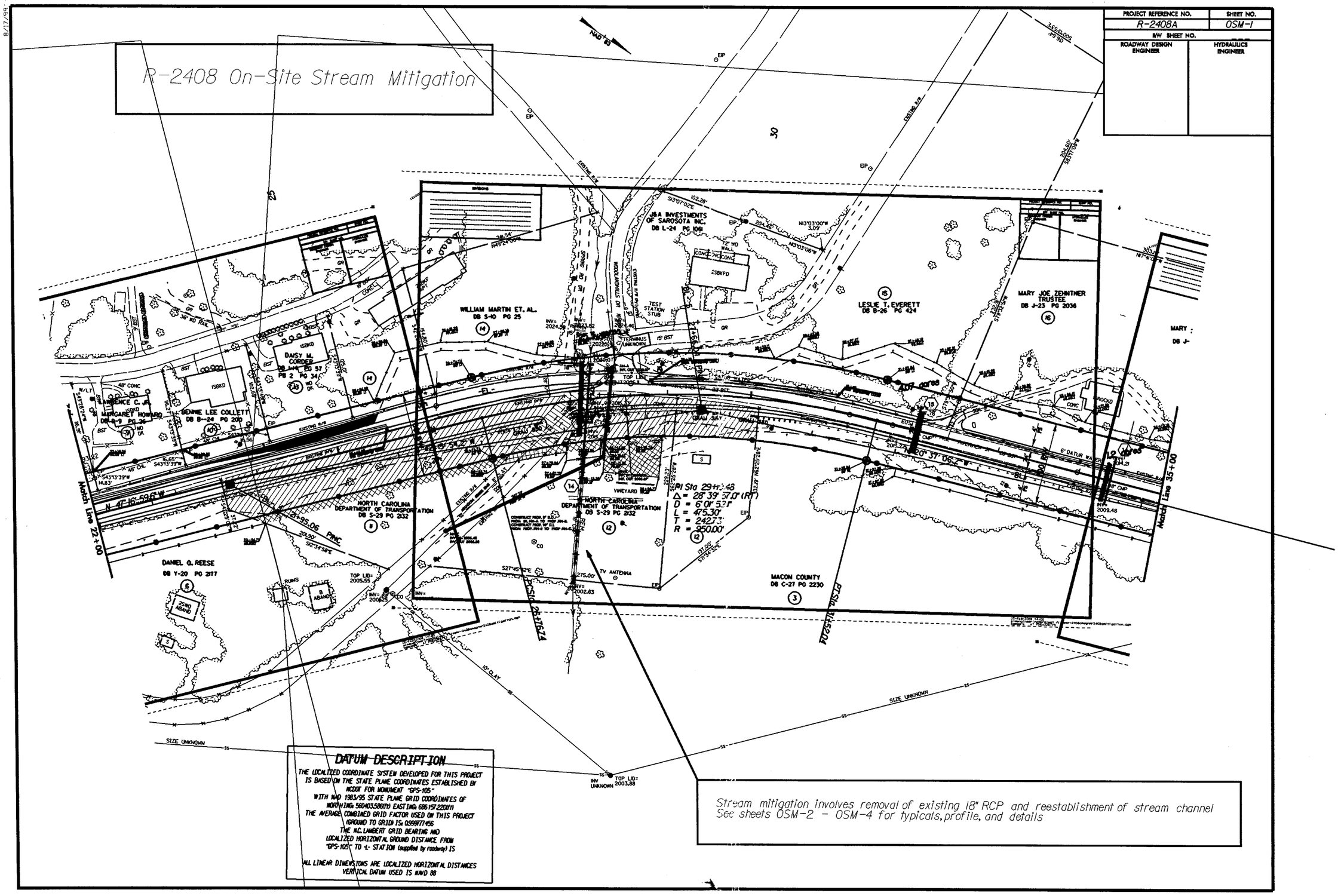
Report on the visual inspection of channel stability. Physical measurements of channel stability/morphology will not be required. Include a discussion of any deviations from as-built and an evaluation of the significance of these deviations and whether they are indicative of a stabilizing or destabilizing situation.

Date Inspected	Station Number	Station Number	Station Number	Station Number	Station Number
Structure Type					
Is water piping through or around structure?					
Head cut or down cut present?					
Bank or scour erosion present?					
Other problems noted?					

8/17/99

R-2408 On-Site Stream Mitigation

PROJECT REFERENCE NO.	SHEET NO.
R-2408A	OSM-1
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER



DATUM DESCRIPTION

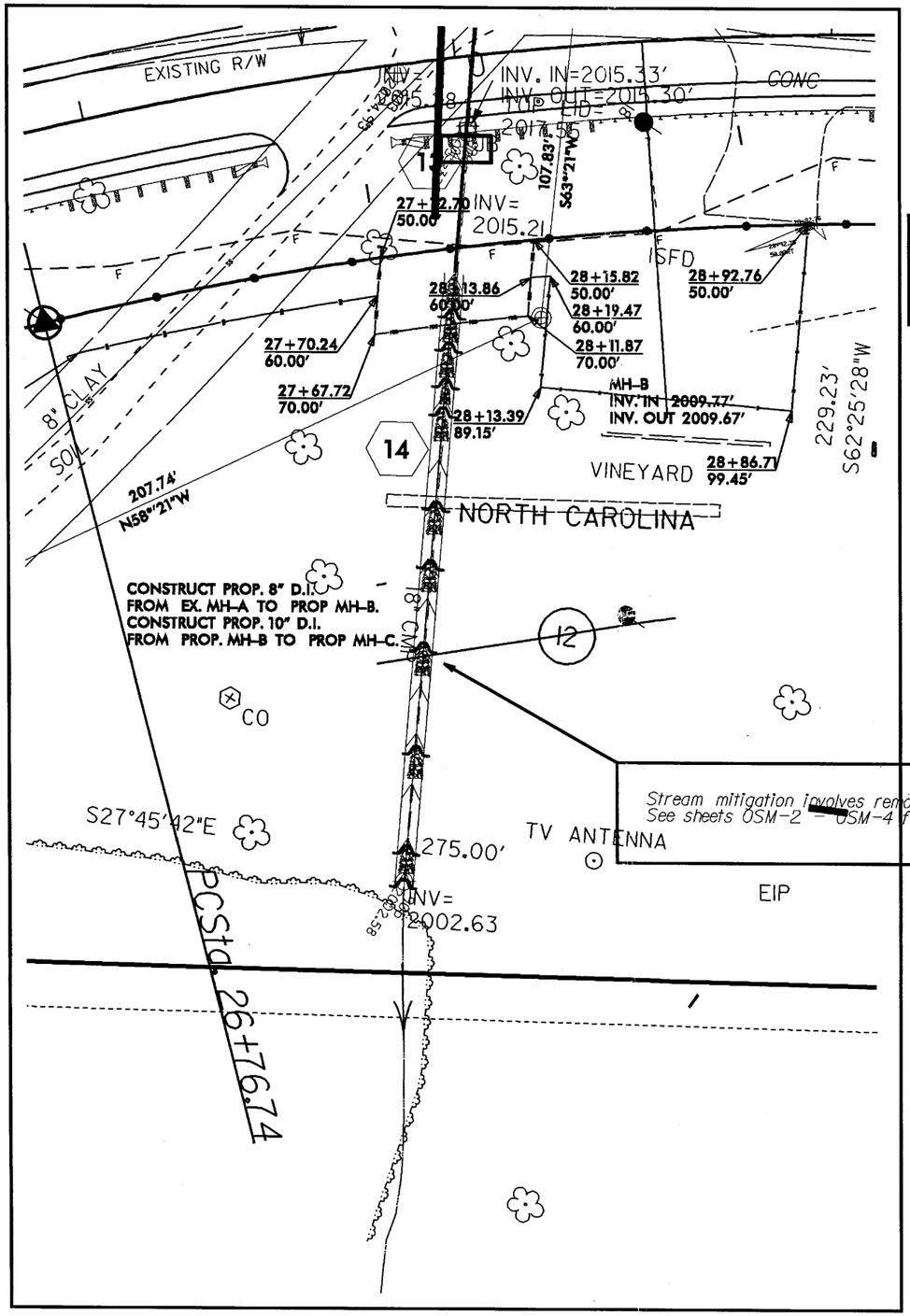
THE LOCALIZED COORDINATE SYSTEM DEVELOPED FOR THIS PROJECT IS BASED ON THE STATE PLANE COORDINATES ESTABLISHED BY NCDOT FOR MONUMENT "GPS-105"
WITH NAD 1983/95 STATE PLANE GRID COORDINATES OF
NORTHING: 560403.586m(ft) EASTING: 686157.220m(ft)
THE AVERAGE COMBINED GRID FACTOR USED ON THIS PROJECT (GROUND TO GRID) IS: 0.999977455
THE N.C. LAMBERT GRID BEARING AND LOCALIZED HORIZONTAL GROUND DISTANCE FROM "GPS-105" TO -L- STATION (supplied by roadway) IS

ALL LINEAR DIMENSIONS ARE LOCALIZED HORIZONTAL DISTANCES
VERTICAL DATUM USED IS NAVD 88

Stream mitigation involves removal of existing 18" RCP and reestablishment of stream channel
See sheets OSM-2 - OSM-4 for typicals, profile, and details

8/17/99

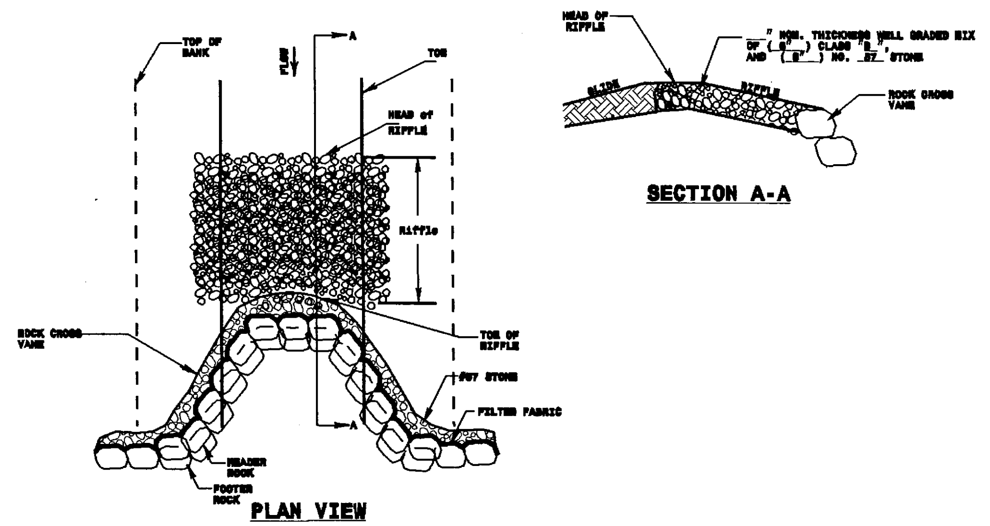
PROJECT REFERENCE NO.	SHEET NO.
R-2408A	OSM-2
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER



R-2408 On-Site Stream Mitigation

Stream mitigation involves removal of existing 18" RCP and reestablishment of stream channel
See sheets OSM-2 - OSM-4 for typicals, profile, and details

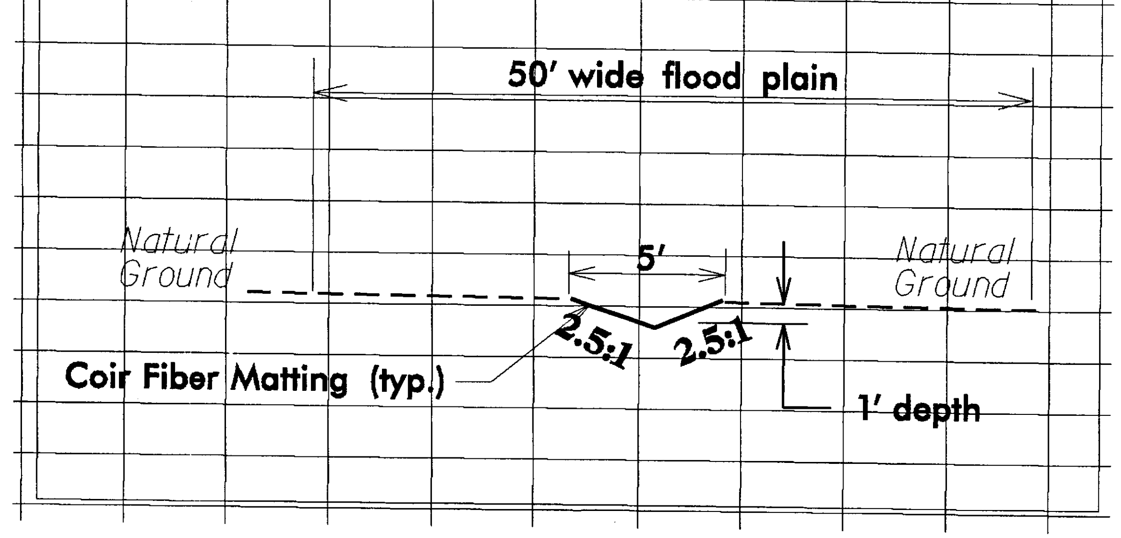
PROJECT REFERENCE NO.	SHEET NO.
R-2408A	OSM-3
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

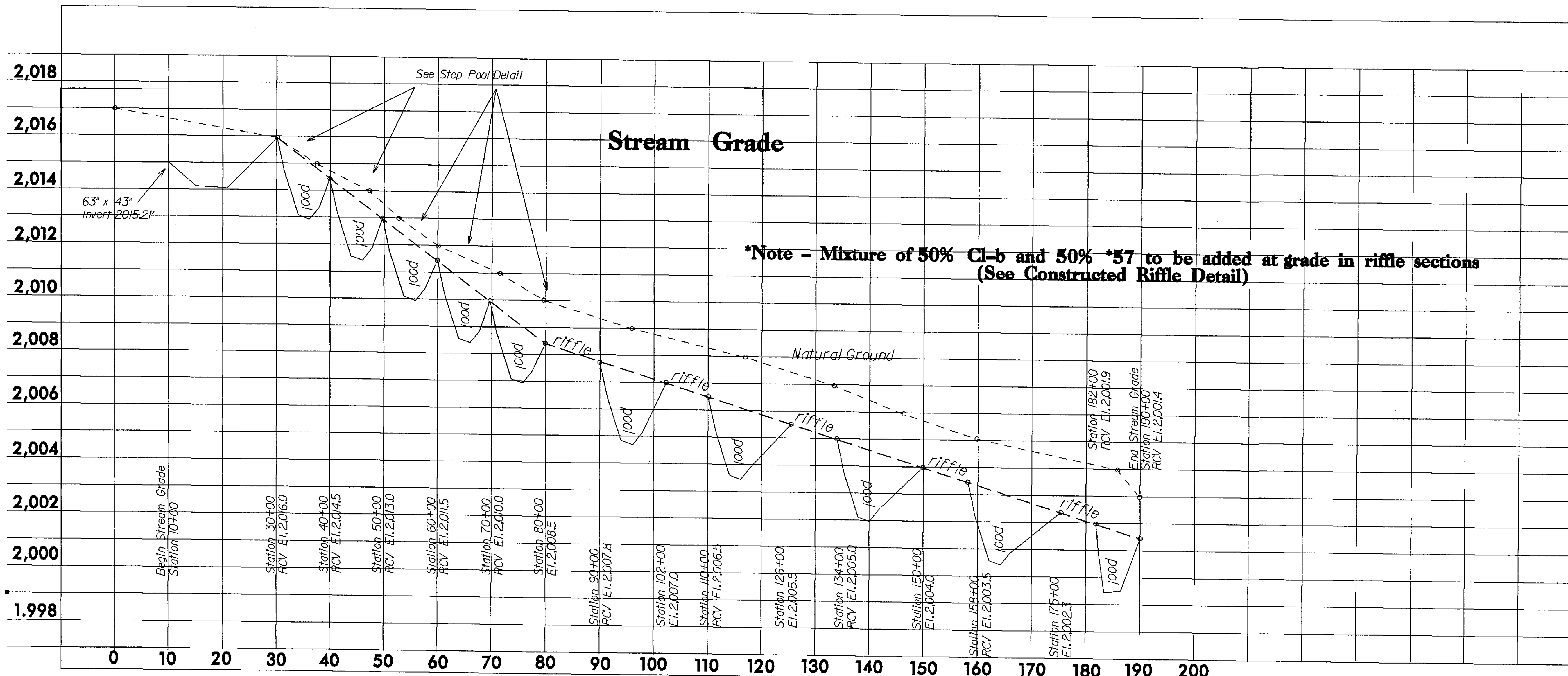


CONSTRUCTED RIFFLE DETAIL

NOT TO SCALE

Typical Stream Dimensions

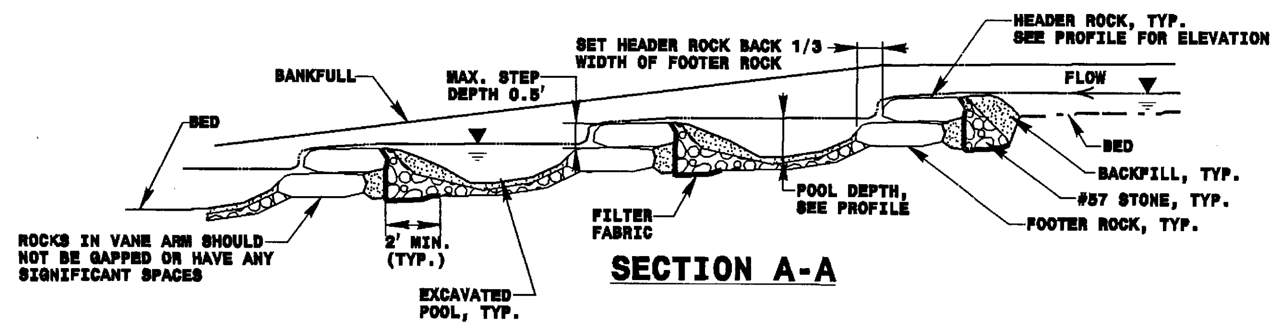




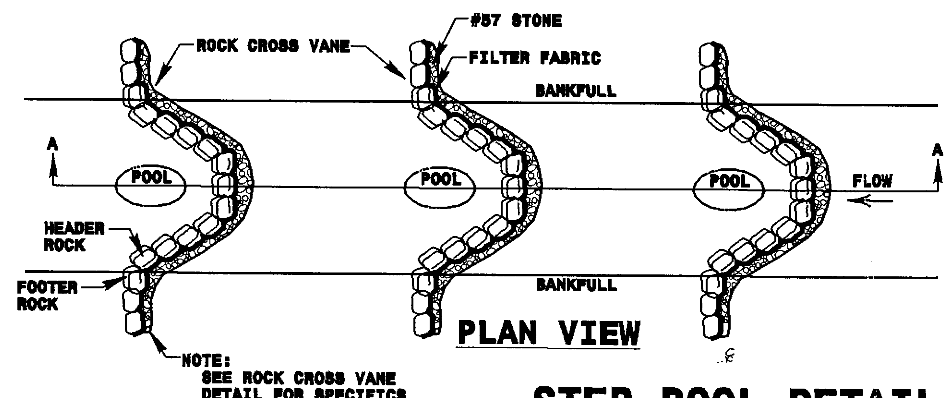
*Note – Mixture of 50% Cl-b and 50% *57 to be added at grade in riffle sections (See Constructed Riffle Detail)

5/14/99

05-FEB-2009 14:00 engineering\project files\r-2408a\dgn\r-2408amitigation.dgn



SECTION A-A

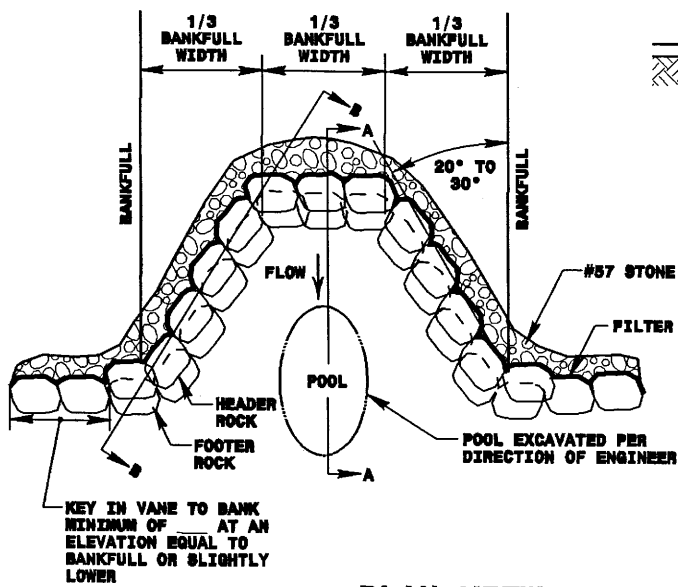


PLAN VIEW

NOTES:
1. STEPS TO BE SHORT, FREQUENT, AND CLOSELY SPACED.
2. POOL SPACING SHALL BE INVERSELY PROPORTIONAL TO STREAM SLOPE, AND DIRECTLY PROPORTIONAL TO BANKFULL WIDTH.
3. POOL DEPTHS AT BANKFULL ELEVATION SHALL BE TYPICALLY 2 TO 3 TIMES DEEPER THAN STEP DEPTHS AT BANKFULL ELEVATION.
4. ADEQUATE NUMBER OF FOOTER BOULDERS TO BE USED IN ORDER TO HOLD UP THE BOULDERS AT HEAD OF STEPS DURING HIGH ENERGY/HIGH FLOW EVENTS.
5. STEP POOL DEPTH SHOULD BE 2 TO 3 TIMES BANKFULL DEPTH.

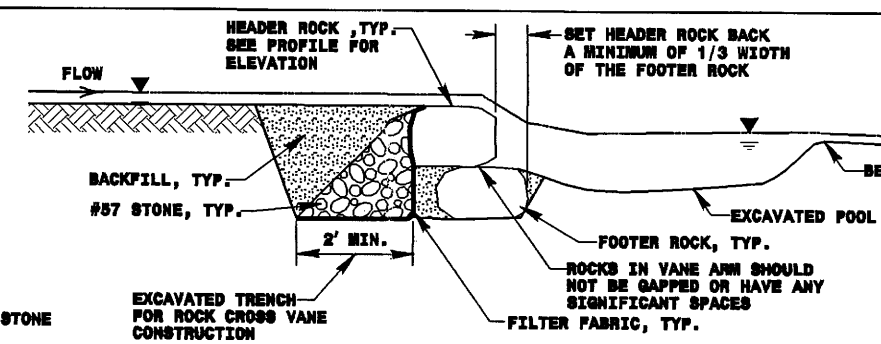
STEP POOL DETAIL

NOT TO SCALE

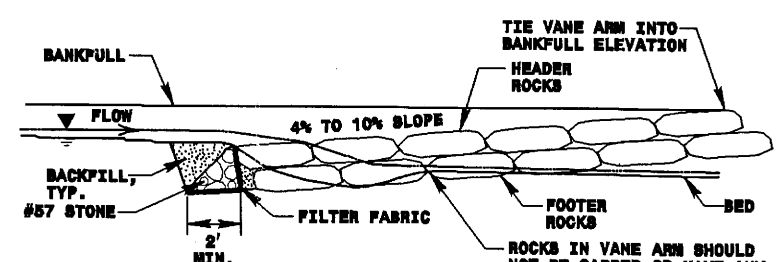


PLAN VIEW

STATION	BOULDER DIMENSIONS (FT) HEIGHT	LENGTH	WIDTH
___	1	2	2
___	1	2	2
___	___	___	___
___	___	___	___
___	___	___	___
___	___	___	___



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.

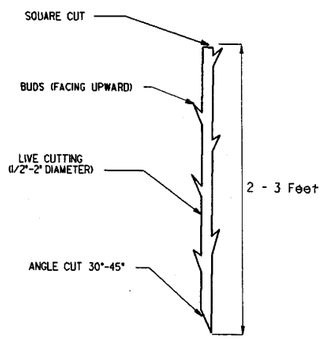
ROCK CROSS VANE DETAIL FOR STEP POOLS

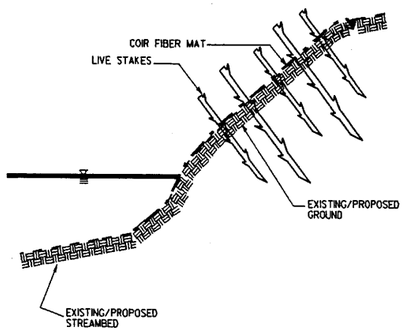
NOT TO SCALE

PLANTING DETAILS

LIVE STAKES PLANTING DETAIL

LIVE STAKE

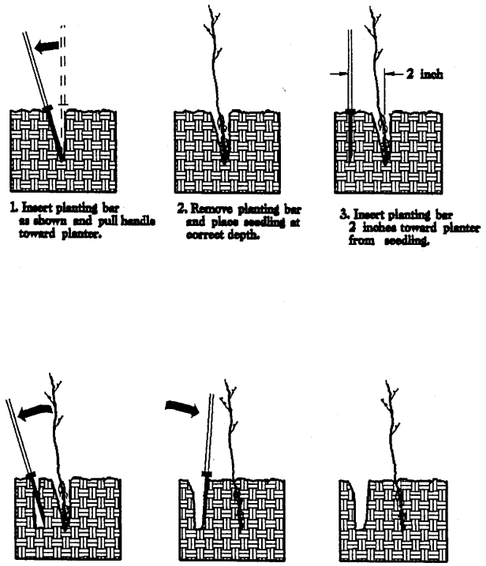




BANK STABILIZATION WITH LIVE STAKES

NOTE:
LIVE STAKES SHALL BE SPACED APPROXIMATELY 4 FEET ON CENTER
LIVE STAKES SHALL BE DRIVEN UNTIL APPROXIMATELY ¾ OF LIVE STAKE IS WITHIN GROUND

BAREROOT PLANTING DETAIL DIBBLE PLANTING METHOD USING THE KBC PLANTING BAR



1. Insert planting bar as shown and pull handle toward planter.
2. Remove planting bar and place seedling at correct depth.
3. Insert planting bar 2 inches toward planter from seedling.
4. Pull handle of bar toward planter, firming soil at bottom.
5. Push handle forward firming soil at top.
6. Leave compaction hole open. Water thoroughly.

PLANTING NOTES:

PLANTING BAG
During planting, seedlings shall be kept in a moist canvas bag or similar container to prevent the root systems from drying.

KBC PLANTING BAR
Planting bar shall have a blade with a triangular cross section, and shall be 12 inches long, 4 inches wide and 1 inch thick at center.

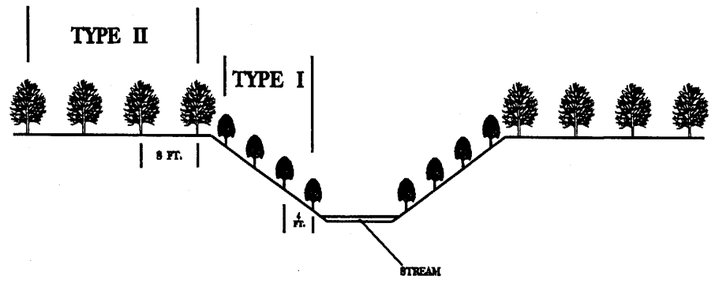
ROOT PRUNING
All seedlings shall be root pruned, if necessary, so that no roots extend more than 10 inches below the root collar.

☐ TYPE 1 STREAMBANK REFORESTATION SHALL BE PLANTED 3 FT. TO 5 FT. ON CENTER, RANDOM SPACING, AVERAGING 4 FT. ON CENTER, APPROXIMATELY 2724 PLANTS PER ACRE.

☐ TYPE 2 STREAMBANK REFORESTATION SHALL BE PLANTED 6 FT. TO 10 FT. ON CENTER, RANDOM SPACING, AVERAGING 8 FT. ON CENTER, APPROXIMATELY 680 PLANTS PER ACRE.

☐ NOTE: TYPE 1 AND TYPE 2 STREAMBANK REFORESTATION SHALL BE PAID FOR AS "STREAMBANK REFORESTATION"

STREAMBANK REFORESTATION TYPICAL



STREAMBANK REFORESTATION

MIXTURE, TYPE, SIZE, AND FURNISH SHALL CONFORM TO THE FOLLOWING:

TYPE 1		
50% SALIX NIGRA	BLACK WILLOW	2 ft – 3 ft LIVE STAKES
50% CORNUS AMOMUM	SILKY DOGWOOD	2 ft – 3 ft LIVE STAKES
TYPE 2		
25% LIRIODENDRON TULIPIFERA	TULIP POPLAR	12 in – 18 in BR
25% PLATANUS OCCIDENTALIS	SYCAMORE	12 in – 18 in BR
25% PRUNUS SEROTINA	BLACK CHERRY	12 in – 18 in BR
25% BETULA NIGRA	RIVER BIRCH	12 in – 18 in BR

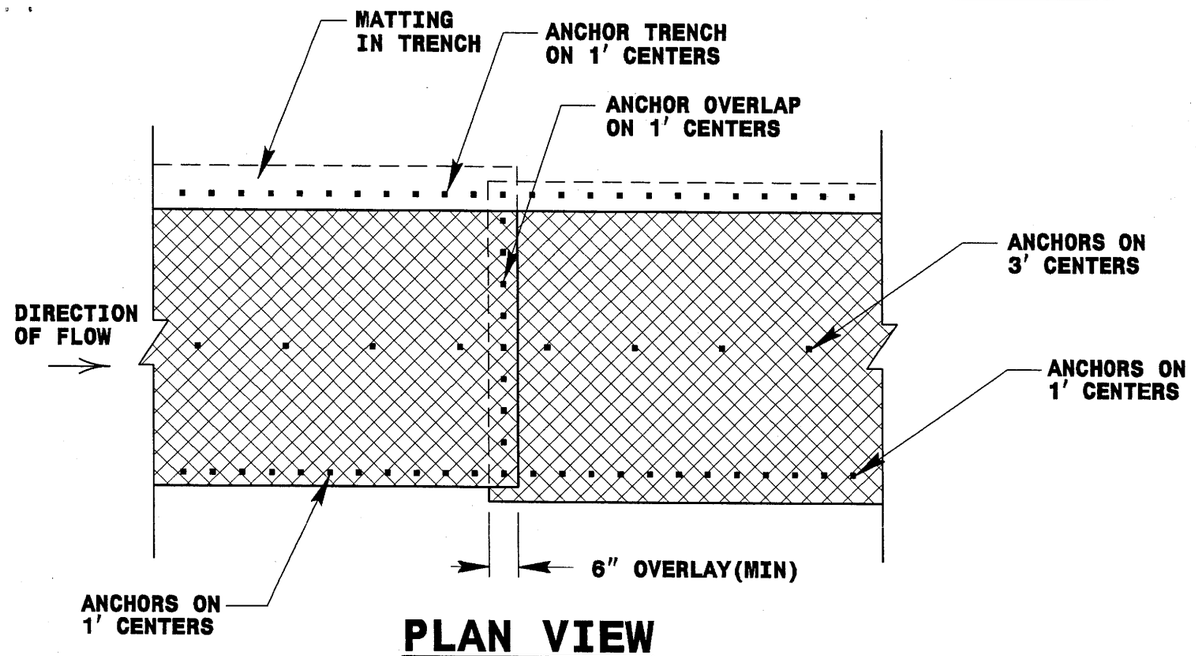
☐ SEE PLAN SHEETS FOR AREAS TO BE PLANTED

PROJECT REFERENCE NO.	SHEET NO.
R-2408B	RF-2
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

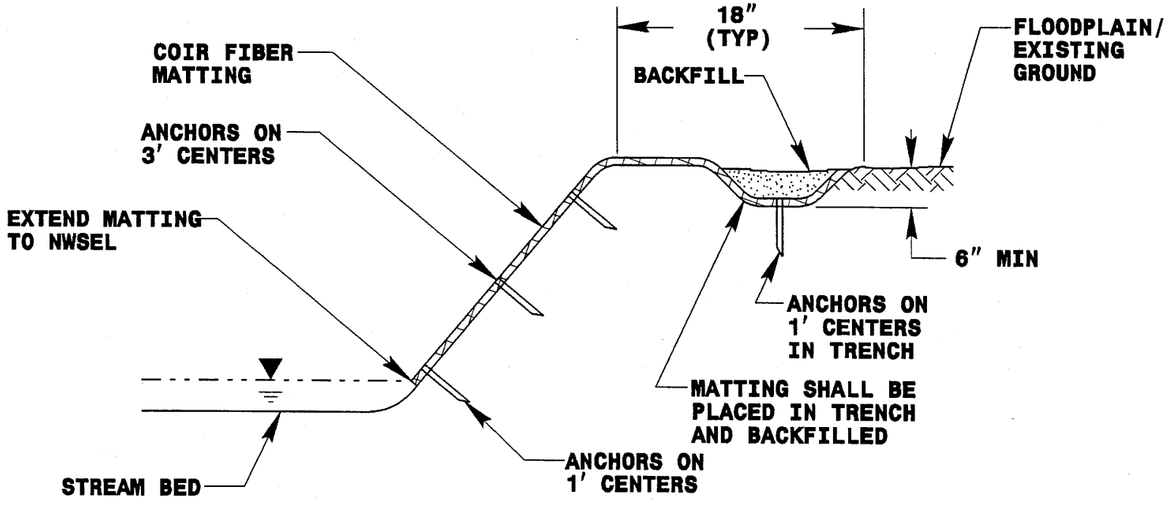
STREAMBANK REFORESTATION DETAIL SHEET 1 OF 2

N.C.D.O.T. - ROADSIDE ENVIRONMENTAL UNIT

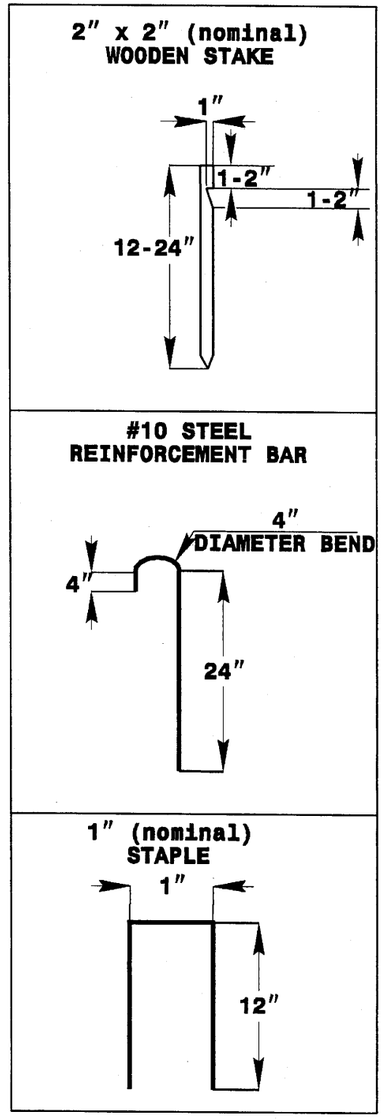
PROJECT REFERENCE NO.	SHEET NO.
R-2408B	RF-3
NW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER



PLAN VIEW



TYPICAL CROSS SECTION



ANCHOR OPTIONS

COIR FIBER MATTING DETAIL

NOT TO SCALE

STREAMBANK REFORESTATION

DETAIL SHEET 2 OF 2

N.C.D.O.T. - ROADSIDE ENVIRONMENTAL UNIT