STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

MICHAEL F. EASLEY
GOVERNOR

LYNDO TIPPETT
SECRETARY

October 20, 2004

Division of Water Quality
1621 Mail Service Center
Raleigh, NC 27699

ATTENTION: Mr. John Hennessy
NCDOT Coordinator

Dear Sir:

SUBJECT: **Buffer Certification Application** for the replacement of Bridge No. 174 over Buffalo Creek on SR 2320 (Riley Hill Road) in Wake County, Division 5, Federal Project No. BRZ-2320 (2), State Project No. 82407701, WBS Element 33138.1.1, T.I.P. No. B-3530.

Please find enclosed a copy of the Categorical Exclusion (CE) Document, PCN, permit drawings, design plan sheets, and mussel survey. The North Carolina Department of Transportation (NCDOT) proposes to replace Bridge No. 174 over Buffalo Creek. The project involves replacing the 40-foot Bridge No. 174 on existing alignment with a new 100-foot bridge. The proposed bridge will consist of two 12-foot travel lanes with 8-foot shoulders, 4 feet of which will be paved. Traffic will be maintained by an off-site detour. The off-site detour will consist of SR 2320, SR 2321, and SR 1003. Buffalo Creek (DWQ Index # 27-57-16-(1)) is a jurisdictional stream under the Neuse Riparian Buffer Rules and is the subject of this application.

NEUSE RIVER BASIN BUFFER RULES

As previously noted, this project is located in the Neuse River Basin (NEU06 sub-basin, HUC 03020201). Therefore, the regulations pertaining to the buffer rules apply. Buffer impacts associated with this project total 1,742 square feet (0.04 acres) for Zone 1 and 871 square feet (0.02 acres) for Zone 2. All practicable measures to minimize impacts within buffer zones were followed. Measures used to minimize impacts to the buffer zone include using the current alignment. According to the buffer rules, bridges are ALLOWABLE. Uses designated as allowable may proceed within the riparian buffer provided that there are no practical alternatives to the requested use pursuant to Item (8) of this Rule. These uses require written authorization from the Division of Water Quality or the delegated local authority.

FEDERALLY-PROTECTED SPECIES

Plants and animals with federal classifications of Endangered (E), Threatened (T), Proposed Endangered (PE), Proposed Threatened (PT), are protected under provisions of Section 7 of the

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

TELEPHONE: 919-715-1500
FAX: 919-715-1501

WEBSITE: WWW.NCDOT.ORG

LOCATION:
2728 CAPITAL BLVD
PLB SUITE 168
RALEIGH NC 27604

Endangered Species Act of 1973, as amended. As of January 29, 2003 the U.S. Fish and Wildlife Service (FWS) lists four federally protected species for Wake County. Table 1 lists these species and their federal status.

Table 1– Federally Protected Species in Wake County, NC

Common Name	Scientific Name	Federal Status*	Biological Conclusion
Bald eagle	*Haliaeetus leucocephalus*	T (proposed for delisting)	No Effect
Red-cockaded woodpecker	*Picoides borealis*	E	No Effect
Dwarf wedge mussel	*Alasmidonta heterodon*	E	No Effect
Michaux's sumac	*Rhus michauxii*	E	No Effect
* E=Endangered and T=Threatened			

A biological conclusion of "No Effect" was given for the dwarf wedge mussel based on two surveys conducted in October 2000 and August 2002 where no dwarf wedge mussels found (see attached letter dated August 02, 2002). Biological conclusions of "No Effect" were given for the remaining three species based on lack of suitable habitat. Additionally a review of the Natural Heritage Program database (last updated on April 7, 2004) revealed no occurrences of federally protected species within 1.0 mile of the project study area.

REGULATORY APPROVAL

NCDOT requests written authorization for a Buffer Certification from the Division of Water Quality. This project has been reviewed for jurisdiction under the Federal Clean Water Act (CWA). There are no impacts to Waters of the US, therefore none of the actions of this project fall under jurisdiction of the CWA. Therefore, no permits pursuant to the CWA are required.

If you have any questions or need additional information, please contact Deanna Riffey at (919) 715-1409.

Sincerely,

Gregory J. Thorpe, Ph.D.
Environmental Management Director, PDEA

Cc:

w/attachment

Mr. Eric Alsmeyer, USACE
Mr. Travis Wilson, NCWRC
Mr. Gary Jordan, USFWS
Mr. Greg Perfetti, P.E., Structure Design
Dr. David Chang, P.E., Hydraulics
Mr. Jon Nance, P.E., Division 5 Engineer
Mr. Chris Murray, Division Environmental Officer
Mr. David Franklin, USACE, Wilmington

w/o attachment

Mr. Jay Bennett, P.E., Roadway Design
Mr. Omar Sultan, Programming and TIP
Mr. Art McMillan, P.E., Highway Design
Ms. Mark Staley, Roadside Environmental
Mr. John Conforti, Project Planning Engineer

Office Use Only: Form Version May 2002

USACE Action ID No. _____ **DWQ No.** _____

(If any particular item is not applicable to this project, please enter "Not Applicable" or "N/A".)

I. Processing

1. Check all of the approval(s) requested for this project:
   - ☐ Section 404 Permit
   - ☐ Section 10 Permit
   - ☐ 401 Water Quality Certification
   - ☒ Riparian or Watershed Buffer Rules
   - ☐ Isolated Wetland Permit from DWQ

2. Nationwide, Regional or General Permit Number(s) Requested: Buffer Certification

3. If this notification is solely a courtesy copy because written approval for the 401 Certification is not required, check here: ☒

4. If payment into the North Carolina Wetlands Restoration Program (NCWRP) is proposed for mitigation of impacts (verify availability with NCWRP prior to submittal of PCN), complete section VIII and check here: ☐

5. If your project is located in any of North Carolina's twenty coastal counties (listed on page 4), and the project is within a North Carolina Division of Coastal Management Area of Environmental Concern (see the top of page 2 for further details), check here: ☐

II. Applicant Information

1. Owner/Applicant Information
   Name: NCDOT
   Mailing Address: Project Development & Environmental Analysis Branch
   1548 Mail Service Center
   Raleigh, NC 27699-1548
   Telephone Number: (919) 733-3141 Fax Number: (919) 733-9794
   E-mail Address: gthorpe@dot.state.nc.us

2. Agent/Consultant Information (A signed and dated copy of the Agent Authorization letter must be attached if the Agent has signatory authority for the owner/applicant.)
   Name: _____
   Company Affiliation: _____
   Mailing Address: _____
   Telephone Number: _____ Fax Number: _____
   E-mail Address: _____

III. Project Information

Attach a **vicinity map** clearly showing the location of the property with respect to local landmarks such as towns, rivers, and roads. Also provide a detailed **site plan** showing property boundaries and development plans in relation to surrounding properties. Both the vicinity map and site plan must include a scale and north arrow. The specific footprints of all buildings, impervious surfaces, or other facilities must be included. If possible, the maps and plans should include the appropriate USGS Topographic Quad Map and NRCS Soil Survey with the property boundaries outlined. Plan drawings, or other maps may be included at the applicant's discretion, so long as the property is clearly defined. For administrative and distribution purposes, the USACE requires information to be submitted on sheets no larger than 11 by 17-inch format; however, DWQ may accept paperwork of any size. DWQ prefers full-size construction drawings rather than a sequential sheet version of the full-size plans. If full-size plans are reduced to a small scale such that the final version is illegible, the applicant will be informed that the project has been placed on hold until decipherable maps are provided.

1. Name of project: Replacement of Bridge No. 174 on SR 2320 (Riley Hill) over Buffalo Creek in Wake County

2. T.I.P. Project Number or State Project Number (NCDOT Only): B-3530

3. Property Identification Number (Tax PIN): _____

4. Location
   County: Wake Nearest Town: Raleigh
   Subdivision name (include phase/lot number): _____
   Directions to site (include road numbers, landmarks, etc.): East of Raleigh on 64, left on Edgemont Road, left on Riley Hill Road (SR 2320), bridge located just past Broughton Road.

5. Site coordinates, if available (UTM or Lat/Long): 35° 51' 40"N, 78° 25' 39"W
   (Note – If project is linear, such as a road or utility line, attach a sheet that separately lists the coordinates for each crossing of a distinct waterbody.)

5. Property size (acres): Approximately 1.9 acres

6. Nearest body of water (stream/river/sound/ocean/lake): Buffalo Creek

7. River Basin: Neuse
   (Note – this must be one of North Carolina's seventeen designated major river basins. The River Basin map is available at http://h2o.enr.state.nc.us/admin/maps/.)

8. Describe the existing conditions on the site and general land use in the vicinity of the project at the time of this application: SR 2320 is a rural minor collector. Land use in the project area is rural consisting of agricultural and light residential development.

9. Describe the overall project in detail, including the type of equipment to be used: (see cover letter)

10. Explain the purpose of the proposed work: Bridge No. 174 is considered to be structurally deficient and functionally obsolete.

IV. Prior Project History

If jurisdictional determinations and/or permits have been requested and/or obtained for this project (including all prior phases of the same subdivision) in the past, please explain. Include the USACE Action ID Number, DWQ Project Number, application date, and date permits and certifications were issued or withdrawn. Provide photocopies of previously issued permits, certifications or other useful information. Describe previously approved wetland, stream and buffer impacts, along with associated mitigation (where applicable). If this is a NCDOT project, list and describe permits issued for prior segments of the same T.I.P. project, along with construction schedules.

N/A

V. Future Project Plans

Are any future permit requests anticipated for this project? If so, describe the anticipated work, and provide justification for the exclusion of this work from the current application.

N/A

VI. Proposed Impacts to Waters of the United States/Waters of the State

It is the applicant's (or agent's) responsibility to determine, delineate and map all impacts to wetlands, open water, and stream channels associated with the project. The applicant must also provide justification for these impacts in Section VII below. All proposed impacts, permanent and temporary, must be listed herein, and must be clearly identifiable on an accompanying site plan. All wetlands and waters, and all streams (intermittent and perennial) must be shown on a

delineation map, whether or not impacts are proposed to these systems. Wetland and stream evaluation and delineation forms should be included as appropriate. Photographs may be included at the applicant's discretion. If this proposed impact is strictly for wetland or stream mitigation, list and describe the impact in Section VIII below. If additional space is needed for listing or description, please attach a separate sheet.

1. Provide a written description of the proposed impacts: There are only buffer impacts due to the bridge replacement. There are no wetland or stream impacts for this project.

2. Individually list wetland impacts below:

Wetland Impact Site Number (indicate on map)	Type of Impact*	Area of Impact (acres)	Located within 100-year Floodplain** (yes/no)	Distance to Nearest Stream (linear feet)	Type of Wetland***
N/A					

* List each impact separately and identify temporary impacts. Impacts include, but are not limited to: mechanized clearing, grading, fill, excavation, flooding, ditching/drainage, etc. For dams, separately list impacts due to both structure and flooding.

** 100-Year floodplains are identified through the Federal Emergency Management Agency's (FEMA) Flood Insurance Rate Maps (FIRM), or FEMA-approved local floodplain maps. Maps are available through the FEMA Map Service Center at 1-800-358-9616, or online at http://www.fema.gov.

*** List a wetland type that best describes wetland to be impacted (e.g., freshwater/saltwater marsh, forested wetland, beaver pond, Carolina Bay, bog, etc.) Indicate if wetland is isolated (determination of isolation to be made by USACE only).

List the total acreage (estimated) of all existing wetlands on the property: N/A

Total area of wetland impact proposed: N/A

3. Individually list all intermittent and perennial stream impacts below:

Stream Impact Site Number (indicate on map)	Type of Impact*	Length of Impact (linear feet)	Stream Name**	Average Width of Stream Before Impact	Perennial or Intermittent? (please specify)
N/A					

* List each impact separately and identify temporary impacts. Impacts include, but are not limited to: culverts and associated riprap, dams (separately list impacts due to both structure and flooding), relocation (include linear feet before and after, and net loss/gain), stabilization activities (cement wall, riprap, crib wall, gabions, etc.), excavation, ditching/straightening, etc. If stream relocation is proposed, plans and profiles showing the linear footprint for both the original and relocated streams must be included.

** Stream names can be found on USGS topographic maps. If a stream has no name, list as UT (unnamed tributary) to the nearest downstream named stream into which it flows. USGS maps are available through the USGS at 1-800-358-9616, or online at www.usgs.gov. Several internet sites also allow direct download and printing of USGS maps (e.g., www.topozone.com, www.mapquest.com, etc.).

Cumulative impacts (linear distance in feet) to all streams on site:_____

4. Individually list all open water impacts (including lakes, ponds, estuaries, sounds, Atlantic Ocean and any other water of the U.S.) below:

Open Water Impact Site Number (indicate on map)	Type of Impact*	Area of Impact (acres)	Name of Waterbody (if applicable)	Type of Waterbody (lake, pond, estuary, sound, bay, ocean, etc.)
N/A				

* List each impact separately and identify temporary impacts. Impacts include, but are not limited to: fill, excavation, dredging, flooding, drainage, bulkheads, etc.

5. Pond Creation

If construction of a pond is proposed, associated wetland and stream impacts should be included above in the wetland and stream impact sections. Also, the proposed pond should be described here and illustrated on any maps included with this application.

Pond to be created in (check all that apply): ☐ uplands ☐ stream ☐ wetlands

Describe the method of construction (e.g., dam/embankment, excavation, installation of draw-down valve or spillway, etc.):_____

_____

Proposed use or purpose of pond (e.g., livestock watering, irrigation, aesthetic, trout pond, local stormwater requirement, etc.):_____

_____

Size of watershed draining to pond:_____ Expected pond surface area:_____

VII. Impact Justification (Avoidance and Minimization)

Specifically describe measures taken to avoid the proposed impacts. It may be useful to provide information related to site constraints such as topography, building ordinances, accessibility, and financial viability of the project. The applicant may attach drawings of alternative, lower-impact site layouts, and explain why these design options were not feasible. Also discuss how impacts were minimized once the desired site plan was developed. If applicable, discuss construction techniques to be followed during construction to reduce impacts.

Impacts are minimized or avoided by replacement of a bridge with another bridge, using the current alignment, and use of an off-site detour.

VIII. Mitigation

DWQ - In accordance with 15A NCAC 2H .0500, mitigation may be required by the NC Division of Water Quality for projects involving greater than or equal to one acre of impacts to freshwater wetlands or greater than or equal to 150 linear feet of total impacts to perennial streams.

USACE – In accordance with the Final Notice of Issuance and Modification of Nationwide Permits, published in the Federal Register on March 9, 2000, mitigation will be required when necessary to ensure that adverse effects to the aquatic environment are minimal. Factors including size and type of proposed impact and function and relative value of the impacted aquatic resource will be considered in determining acceptability of appropriate and practicable mitigation as proposed. Examples of mitigation that may be appropriate and practicable include, but are not limited to: reducing the size of the project; establishing and maintaining wetland and/or upland vegetated buffers to protect open waters such as streams; and replacing losses of

aquatic resource functions and values by creating, restoring, enhancing, or preserving similar functions and values, preferable in the same watershed.

If mitigation is required for this project, a copy of the mitigation plan must be attached in order for USACE or DWQ to consider the application complete for processing. Any application lacking a required mitigation plan or NCWRP concurrence shall be placed on hold as incomplete. An applicant may also choose to review the current guidelines for stream restoration in DWQ's Draft Technical Guide for Stream Work in North Carolina, available at http://h2o.enr.state.nc.us/ncwetlands/strmgide.html.

1. Provide a brief description of the proposed mitigation plan. The description should provide as much information as possible, including, but not limited to: site location (attach directions and/or map, if offsite), affected stream and river basin, type and amount (acreage/linear feet) of mitigation proposed (restoration, enhancement, creation, or preservation), a plan view, preservation mechanism (e.g., deed restrictions, conservation easement, etc.), and a description of the current site conditions and proposed method of construction. Please attach a separate sheet if more space is needed.
   No mitigation required.

2. Mitigation may also be made by payment into the North Carolina Wetlands Restoration Program (NCWRP). Please note it is the applicant's responsibility to contact the NCWRP at (919) 733-5208 to determine availability and to request written approval of mitigation prior to submittal of a PCN. For additional information regarding the application process for the NCWRP, check the NCWRP website at http://h2o.enr.state.nc.us/wrp/index.htm. If use of the NCWRP is proposed, please check the appropriate box on page three and provide the following information:

   Amount of stream mitigation requested (linear feet):_____
   Amount of buffer mitigation requested (square feet):_____
   Amount of Riparian wetland mitigation requested (acres):_____
   Amount of Non-riparian wetland mitigation requested (acres):_____
   Amount of Coastal wetland mitigation requested (acres):_____

IX. Environmental Documentation (required by DWQ)

Does the project involve an expenditure of public (federal/state) funds or the use of public (federal/state) land?

Yes ☒ No ☐

If yes, does the project require preparation of an environmental document pursuant to the requirements of the National or North Carolina Environmental Policy Act (NEPA/SEPA)?

Note: If you are not sure whether a NEPA/SEPA document is required, call the SEPA coordinator at (919) 733-5083 to review current thresholds for environmental documentation.

Yes ☒ No ☐

If yes, has the document review been finalized by the State Clearinghouse? If so, please attach a copy of the NEPA or SEPA final approval letter.

Yes ☒ No ☐

X. Proposed Impacts on Riparian and Watershed Buffers (required by DWQ)

It is the applicant's (or agent's) responsibility to determine, delineate and map all impacts to required state and local buffers associated with the project. The applicant must also provide justification for these impacts in Section VII above. All proposed impacts must be listed herein, and must be clearly identifiable on the accompanying site plan. All buffers must be shown on a map, whether or not impacts are proposed to the buffers. Correspondence from the DWQ Regional Office may be included as appropriate. Photographs may also be included at the applicant's discretion.

Will the project impact protected riparian buffers identified within 15A NCAC 2B .0233 (Neuse), 15A NCAC 2B .0259 (Tar-Pamlico), 15A NCAC 2B .0250 (Randleman Rules and Water Supply Buffer Requirements), or other (please identify_____)?

Yes ☒ No ☐ If you answered "yes", provide the following information:

Identify the square feet and acreage of impact to each zone of the riparian buffers. If buffer mitigation is required calculate the required amount of mitigation by applying the buffer multipliers.

Zone*	Impact (square feet)	Multiplier	Required Mitigation
1	1,742	3	N/A
2	871	1.5	N/A
Total	2,613		

* Zone 1 extends out 30 feet perpendicular from near bank of channel; Zone 2 extends an additional 20 feet from the edge of Zone 1.

If buffer mitigation is required, please discuss what type of mitigation is proposed (i.e., Donation of Property, Conservation Easement, Riparian Buffer Restoration / Enhancement, Preservation or Payment into the Riparian Buffer Restoration Fund). Please attach all appropriate information as identified within 15A NCAC 2B .0242 or .0260.

XI. Stormwater (required by DWQ)

Describe impervious acreage (both existing and proposed) versus total acreage on the site. Discuss stormwater controls proposed in order to protect surface waters and wetlands downstream from the property.

N/A

XII. Sewage Disposal (required by DWQ)

Clearly detail the ultimate treatment methods and disposition (non-discharge or discharge) of wastewater generated from the proposed project, or available capacity of the subject facility.

N/A

XIII. Violations (required by DWQ)

Is this site in violation of DWQ Wetland Rules (15A NCAC 2H .0500) or any Buffer Rules?

Yes ☐ No ☒

Is this an after-the-fact permit application?

Yes ☐ No ☒

XIV. Other Circumstances (Optional):

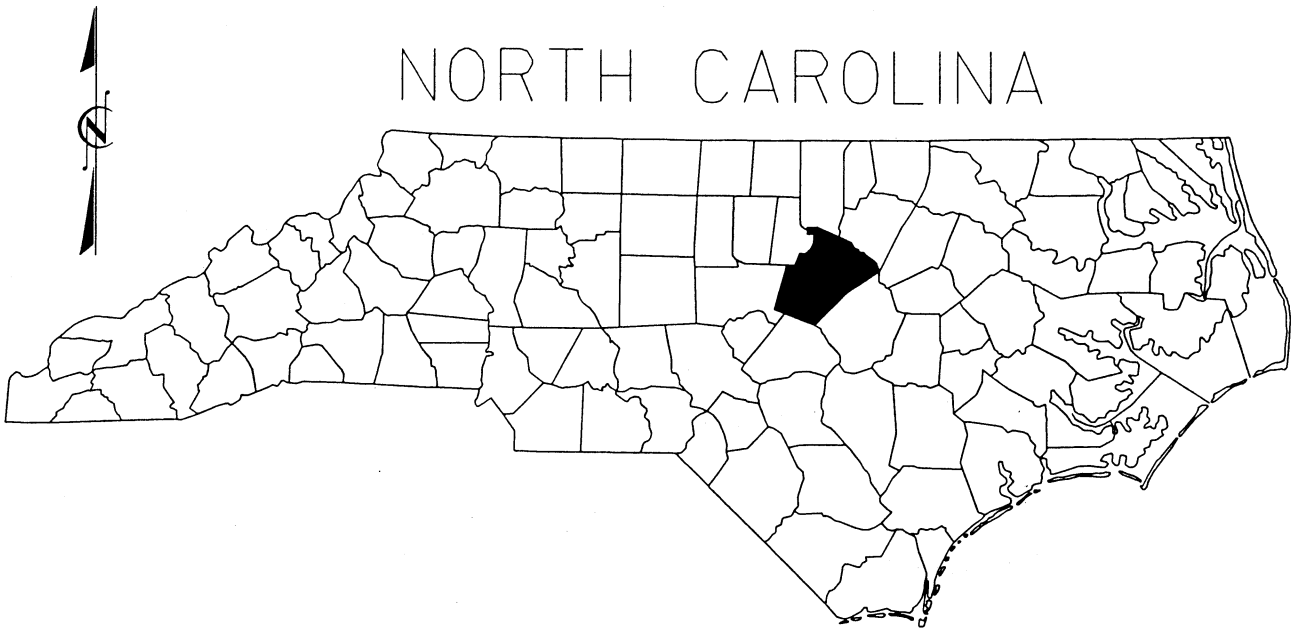
It is the applicant's responsibility to submit the application sufficiently in advance of desired construction dates to allow processing time for these permits. However, an applicant may choose to list constraints associated with construction or sequencing that may impose limits on work schedules (e.g., draw-down schedules for lakes, dates associated with Endangered and Threatened Species, accessibility problems, or other issues outside of the applicant's control).

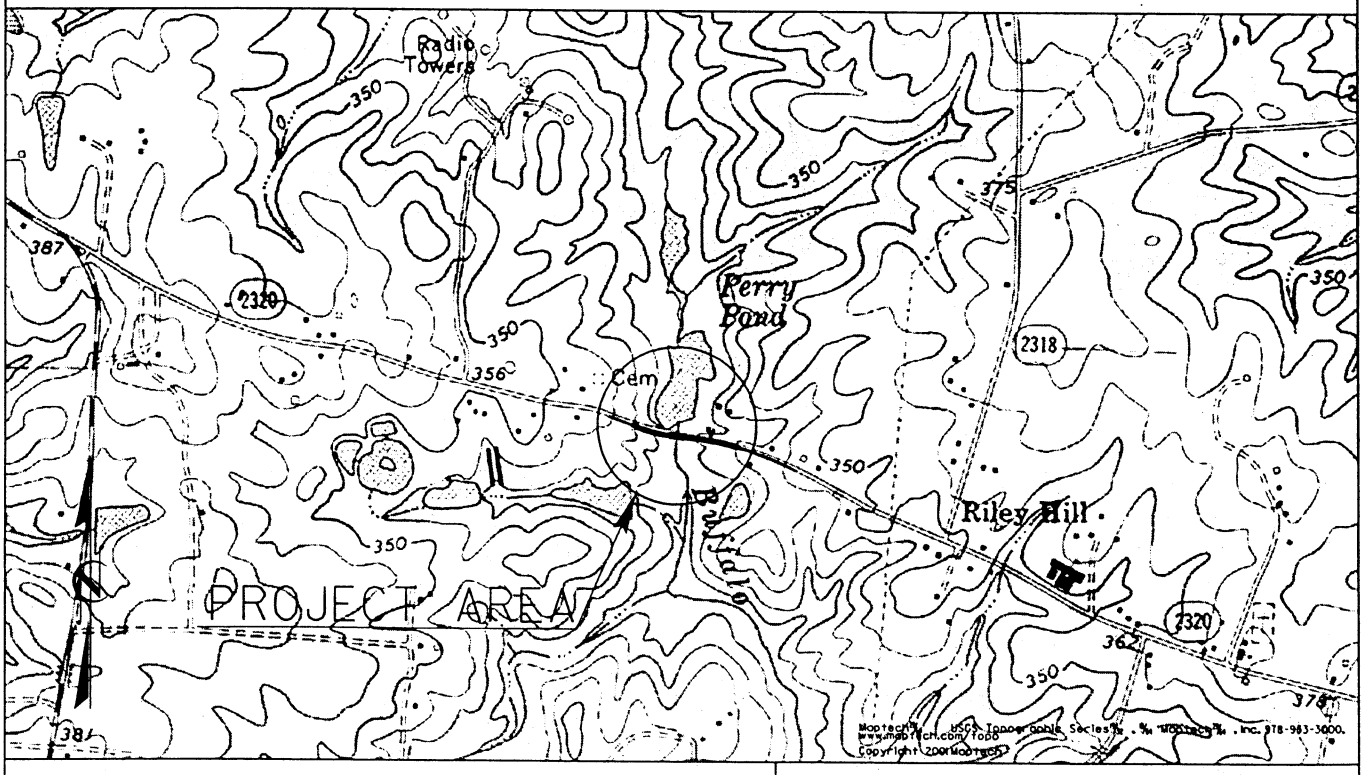
N/A

Applicant/Agent's Signature 10/19/04 **Date**

(Agent's signature is valid only if an authorization letter from the applicant is provided.)

ENGLISH





VICINITY MAP

NCDOT

DIVISION OF HIGHWAYS

WAKE COUNTY

PROJECT: 8.2407701 (B-3530)

BRIDGE #174 ON

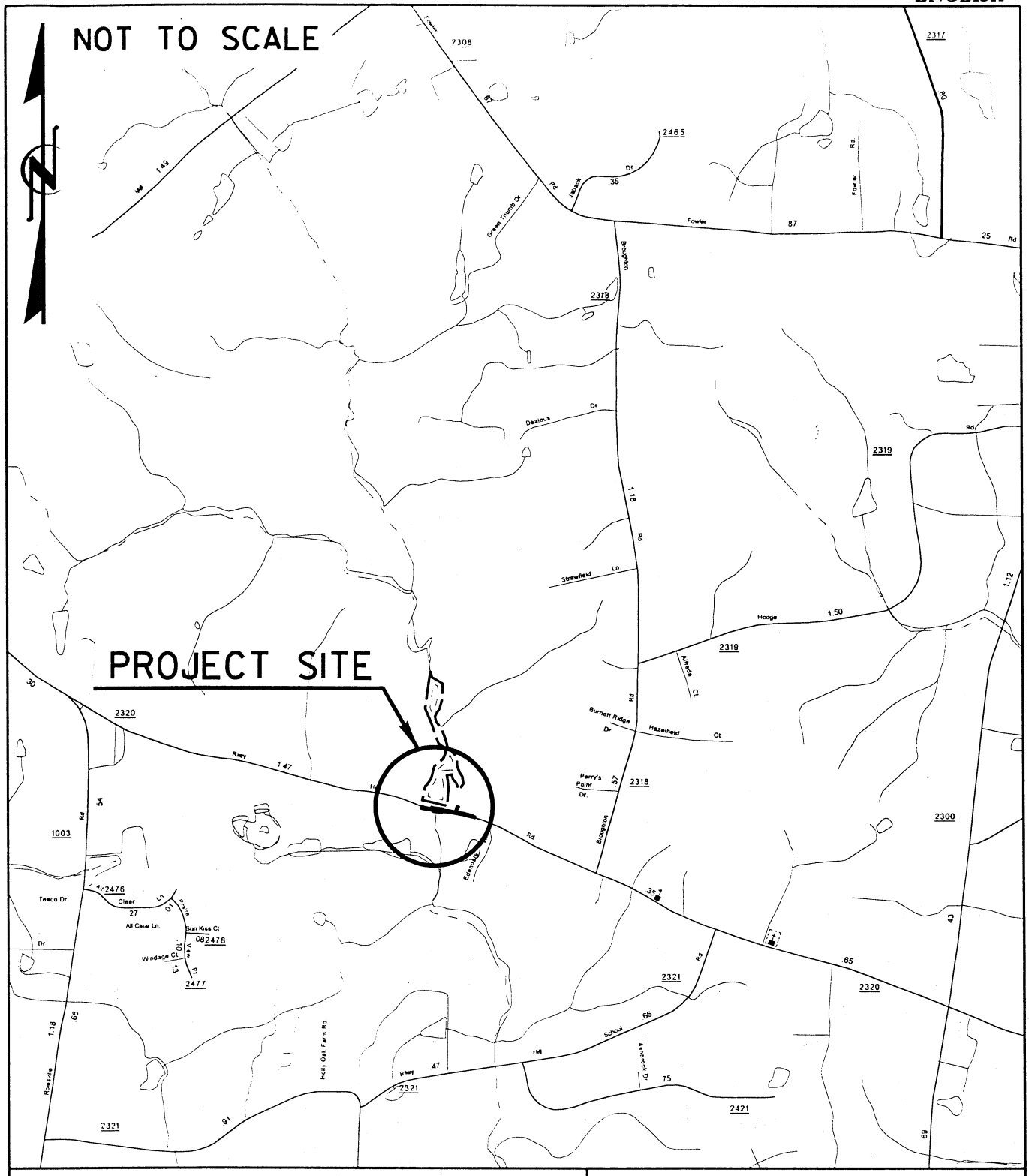
SR 2320 (RILEY HILL ROAD)

OVER BUFFALO CREEK

SHEET 1 OF 7

9/19/03

ENGLISH



NEUSE RIVER BUFFER

LOCATION MAP

NCDOT

DIVISION OF HIGHWAYS

WAKE COUNTY

PROJECT: 8.2407701 (B-3530)

BRIDGE #174 ON

SR 2320 (RILEY HILL ROAD)

OVER BUFFALO CREEK

SHEET 2 OF 7 9/19/03

REVISIONS

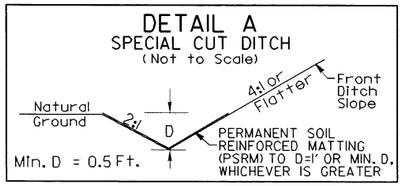
PROJECT REFERENCE NO.	SHEET NO.
B-3530	4
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

Prepared in the Office of:
EARTH TECH
701 Corporate Center Drive, Suite 475
Raleigh, NC 27607
(919) 854-6200 - (919) 854-6259 (FAX)

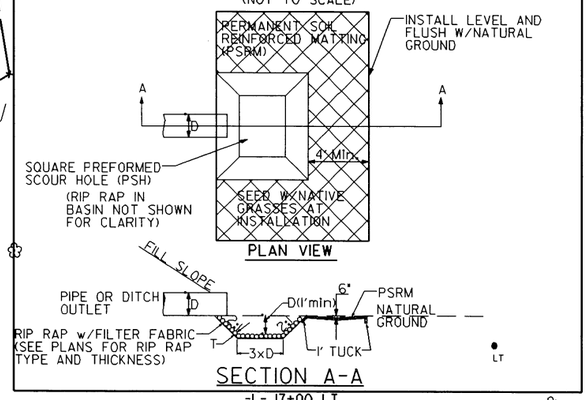
GRAPHIC SCALE
50 25 0 50 100

PLANS

DETAIL A
SPECIAL CUT DITCH
(Not to Scale)

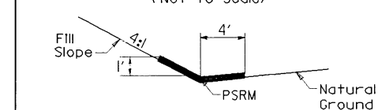


DETAIL B
PREFORMED SCOUR HOLE
(NOT TO SCALE)



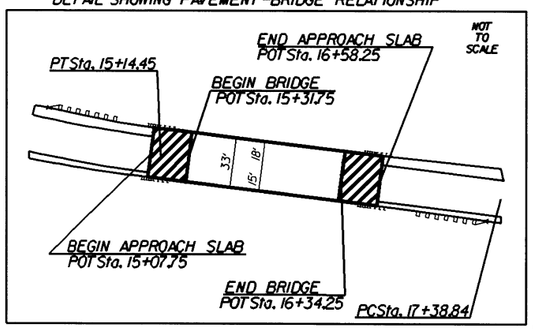
SECTION A-A
-L- 17+00 LT

DETAIL C
TOE PROTECTION
(Not to Scale)



Type of Liner = Permanent Soil Reinforcement Mat
-L- 17+50 - 18+20 LT
-L- 20+50 - 21+10 LT

DETAIL SHOWING PAVEMENT-BRIDGE RELATIONSHIP



DATUM DESCRIPTION

THE LOCALIZED COORDINATE SYSTEM DEVELOPED FOR THIS PROJECT IS BASED ON THE STATE PLANE COORDINATES ESTABLISHED BY FOR MONUMENT "B3530-1"
WITH NAD 83 STATE PLANE GRID COORDINATES OF
NORTHING: 769323.579(ift) EASTING: 2167592.085(ift)
THE AVERAGE COMBINED GRID FACTOR USED ON THIS PROJECT (GROUND TO GRID) IS: 0.99991200
THE N.C. LAMBERT GRID BEARING AND LOCALIZED HORIZONTAL GROUND DISTANCE FROM "B3530-1" TO -L- STATION 10+00.00 IS
S 76° 37' 48.1" E 1,567.12
ALL LINEAR DIMENSIONS ARE LOCALIZED HORIZONTAL DISTANCES
VERTICAL DATUM USED IS NGVD 29

DB. 3830 PG. 68

-L-

PI Sta 13+90.47
Δ = 14° 16' 52.4" (LT)
D = 5° 43' 46.5"
L = 249.25'
T = 125.28'
R = 1,000.00'
Se = 0.06 FT./FT.
R.O. = SEE PLANS

PI Sta 21+32.11
Δ = 19° 24' 23.0" (RT)
D = 2° 29' 28.0"
L = 779.02'
T = 393.28'
R = 2,300.00'
Se = 0.045 FT./FT.
R.O. = SEE PLANS

-DRI-

PI Sta 10+52.88
Δ = 19° 48' 25.2" (LT)
D = 57° 17' 44.8"
L = 34.57'
T = 17.46'
R = 100.00'

IMPACTS ZONE 1
IMPACTS ZONE 2
BZ 1 BUFFER ZONE 1
BZ 2 BUFFER ZONE 2

REVISIONS

PROJECT REFERENCE NO.	SHEET NO.
B-3530	4
R/W SHEET NO.	

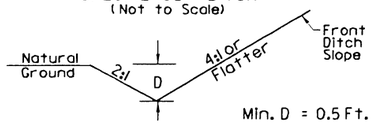
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

Prepared in the Office of:
EARTH TECH
701 Corporate Center Drive, Suite 475
Raleigh, NC 27607
(919) 854-6200 - (919) 854-6259 (FAX)

GRAPHIC SCALE
50 25 0 50 100
PLANS

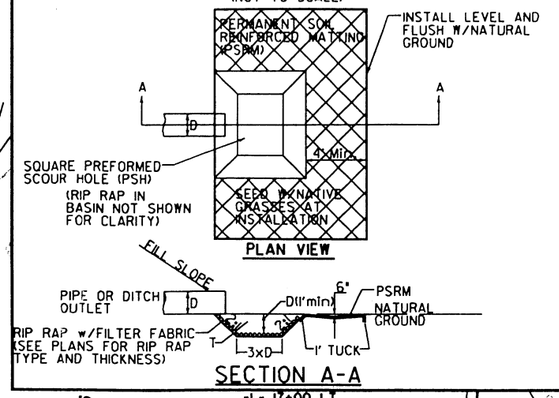
DETAIL
SPECIAL CUT DITCH
(Not to Scale)



Min. D = 0.5 Ft.

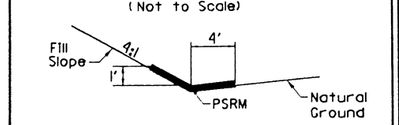
-L- 13+00 - 13+80 RT
-L- 18+50 - 19+50 RT

DETAIL
PREFORMED SCOUR HOLE
(NOT TO SCALE)



SECTION A-A
-L- 17+00 LT

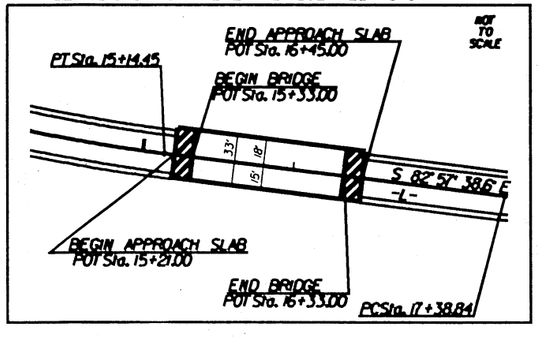
DETAIL
TOE PROTECTION
(Not to Scale)



Type of Liner = Permanent Soil Reinforcement Mat

-L- 17+50 - 18+20 LT
-L- 20+50 - 21+10 LT

DETAIL SHOWING PAVEMENT-BRIDGE RELATIONSHIP



DATUM DESCRIPTION

THE LOCALIZED COORDINATE SYSTEM DEVELOPED FOR THIS PROJECT IS BASED ON THE STATE PLANE COORDINATES ESTABLISHED BY MONUMENT "B3530-1"

WITH NAD 83 / NORTH AMERICAN DATUM OF 1983 (2011) EASTING: 2167592.083071 THE AVERAGE GRID FACTOR USED ON THIS PROJECT IS: 0.99991200

THE GRID BEARING AND LOCAL HORIZONTAL GROUND DISTANCE FROM POT STATION 12+00.00 IS S 56.10° E 1765.42'

ALL LINEAR DISTANCES ARE LOCALIZED HORIZONTAL DISTANCES

THE DATUM USED IS NGVD 29

PI Sta 13+90.47
Δ = 14° 16' 52.4" (LT)
D = 5° 43' 46.5"
L = 249.25'
T = 125.28'
R = 1,000.00'
Se = 0.06 FT./FT.
R.O. = SEE PLANS

PI Sta 21+32.11
Δ = 19° 24' 23.0" (RT)
D = 2° 29' 28.0"
L = 779.02'
T = 393.28'
R = 2,300.00'
Se = 0.045 FT./FT.
R.O. = SEE PLANS

-DR1-
PI Sta 10+52.88
Δ = 19° 48' 25.2" (LT)
D = 57° 17' 44.8"
L = 34.57'
T = 17.46'
R = 100.00'
Se = N.C.

IMPACTS ZONE 1
IMPACTS ZONE 2

NCDOT
DIVISION OF HIGHWAYS
WAKE COUNTY
PROJECT: 8.2407701 (B-3530)
BUFFER IMPACTS
SITE 1
BRIDGE #174 ON
SR 2220 (RILEY HILL ROAD)
OVER BUFFALO CREEK

SHEET OF 9/17/2013

DATE: 9/23/2013
TIME: 11:24:08

PROPERTY OWNERS

NAMES AND ADDRESSES

PARCEL NO.	NAMES	ADDRESSES
4	ROBERT A. PERRY	(Mailing Address) 5404 Riley Hill Road Wendell, NC 27591 (Property Address) 5501 Riley Hill Road Wendell, NC 27591
5	TWIN ACRES COUNTRY CLUB INC.	101 Blalock Court Knightdale, NC 27545
6	BENJAMIN FRANKLIN PERRY JR.	(Mailing Address) 5608 Riley Hill Road Wendell, NC 27591 (Property Address) 5632 Riley Hill Road Wendell, NC 27591

NCDOT

DIVISION OF HIGHWAYS

WAKE COUNTY

PROJECT: 8.2407701 (B-3530)

BRIDGE #174 ON

SR 2320 (RILEY HILL ROAD)

OVER BUFFALO CREEK

9/19/03

WETLAND PERMIT IMPACT SUMMARY

Site No.	Station (From/To)	Structure Size / Type	WETLAND IMPACTS: Fill In Wetlands (ac)	WETLAND IMPACTS: Temp. Fill In Wetlands (ac)	WETLAND IMPACTS: Excavation In Wetlands (ac)	WETLAND IMPACTS: Mechanized Clearing (Method III) (ac)	SURFACE WATER IMPACTS: Fill In SW (Natural) (ac)	SURFACE WATER IMPACTS: Fill In SW (Pond) (ac)	SURFACE WATER IMPACTS: Temp. Fill In SW (ac)	SURFACE WATER IMPACTS: Existing Channel Impacted (ft)	SURFACE WATER IMPACTS: Natural Stream Design (ft)
1	-L- Sta 15+33	100' LONG BRIDGE							0	0	
	TO 16+33	(36' WIDE)									
TOTALS:			0	0	0	0	0	0	0	0	0

NC DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS

WAKE COUNTY
PROJECT 8.2407701 B-3530

SHEET 6 OF 7 9/19/2003

Form Revised 3/22/01

BUFFER IMPACTS SUMMARY

			IMPACT								BUFFER REPLACEMENT	
			TYPE		Hand Clearing			Allowable				
SITE NO.	STRUCTURE SIZE / TYPE	STATION (FROM/TO)	ROAD CROSSING	PARALLEL IMPACT	ZONE 1 (sq ft)	ZONE 2 (sq ft)	TOTAL (sq ft)	ZONE 1 (sq ft)	ZONE 2 (sq ft)	TOTAL (sq ft)	ZONE 1 (sq ft)	ZONE 2 (sq fts)
1	100' Three Span Bridge	-L- Sta 15+33	X					1742	871	2613	0	0
		TO 16+33										
TOTAL:					0	0	0	1742	871	2613	0	0

N.C. DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS

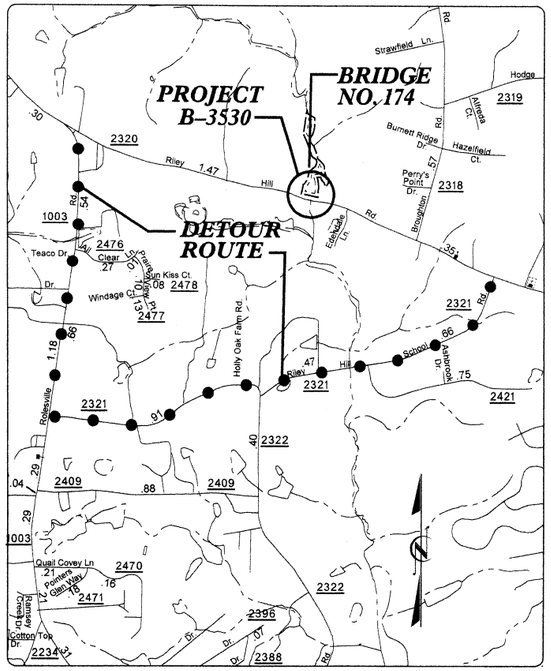
WAKE COUNTY
PROJECT: 8.2407701 (B-3530)

10/1/2003
SHEET 7 OF 7

T.I.P. PROJECT: B-3530

CONTRACT: C200960

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



VICINITY MAP OF B-3530

DETOUR

NCDOT CONTACT : TERESA BRUTON, P.E.,
PROJECT ENGINEER

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

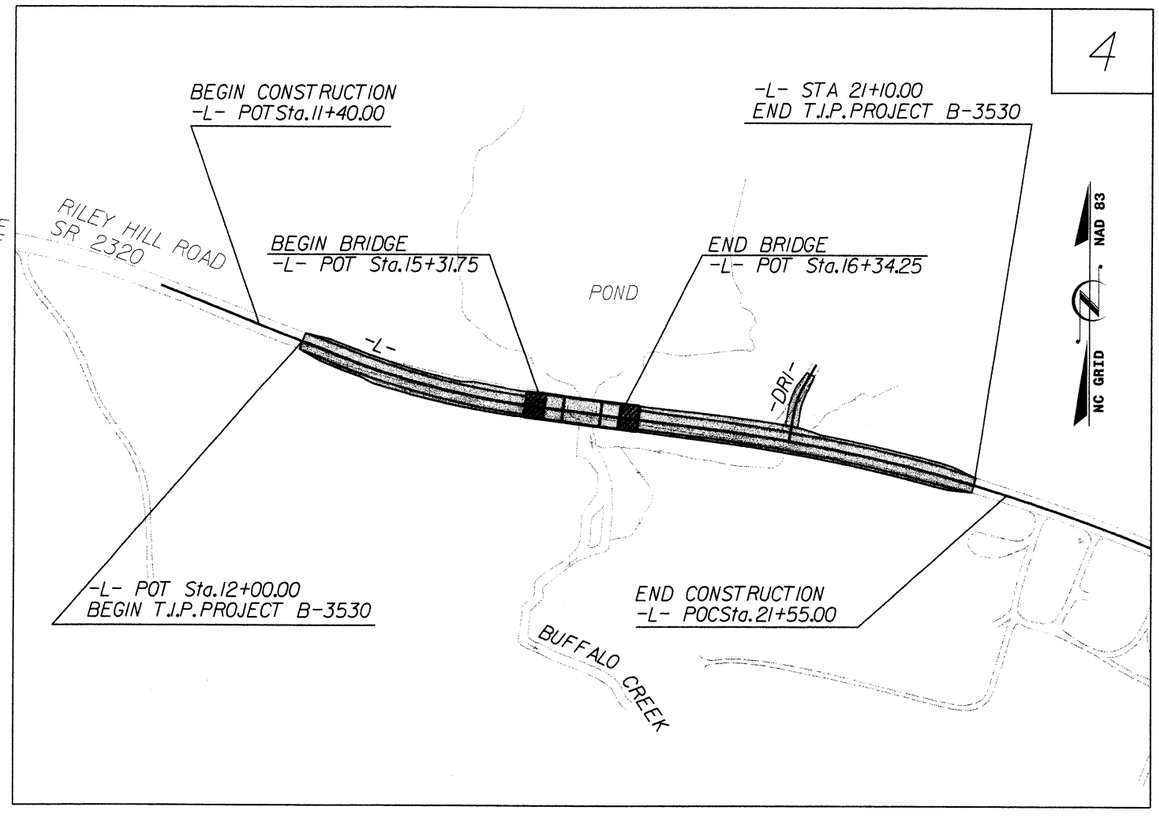
WAKE COUNTY

LOCATION: BRIDGE NO. 174 OVER BUFFALO CREEK ON SR 2320

TYPE OF WORK: GRADING, DRAINAGE, PAVING, AND STRUCTURES

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	B-3530	1	

STATE PROJ. NO.	F. A. PROJ. NO.	DESCRIPTION
33138.1.1	BRZ-2320(2)	PE
33138.2.2	BRZ-2320(2)	R/W, UTIL
33138.3.1	BRZ-2320(4)	CONST.



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 2005 = 7,738

ADT 2025 = 12,200

DHV = 10%

D = 60%

T = 3%

TTST 1% DUAL 2%

V = 50 mph

PROJECT LENGTH

LENGTH ROADWAY T.I.P. PROJECT B-3530 = 0.153 MILES

LENGTH STRUCTURES T.I.P. PROJECT B-3530 = 0.019 MILES

TOTAL LENGTH OF T.I.P. PROJECT B-3530 = 0.172 MILES

2002 STANDARD SPECIFICATIONS

R/W: SEPTEMBER 30, 2003

LETTING DATE: JANUARY 18, 2005

NEIL J. DEAN, P.E.
EARTH TECH PROJECT MANAGER

Prepared In the Office of:

EARTH TECH

A tyco INTERNATIONAL LTD. COMPANY

FOR NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

701 Corporate Center Drive
Suite 475
Raleigh, N.C. 27607
(919)-854-6200
FAX (919)-854-6259

HYDRAULICS ENGINEER

SIGNATURE: JOHN D. R. NICHOLS, P.E.

ROADWAY DESIGN ENGINEER

SIGNATURE: NEIL J. DEAN, P.E.

***DIVISION OF HIGHWAYS
STATE OF NORTH CAROLINA***

P.E.
STATE DESIGN ENGINEER

***DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION***

APPROVED
DIVISION ADMINISTRATOR DATE

5/28/99

PROJECT REFERENCE NO.	SHEET NO.
B-3530	1-A

5/28/99

PROJECT REFERENCE NO.	SHEET NO.
B-3530	1-B

*S.U.E = SUBSURFACE UTILITY ENGINEER

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS
CONVENTIONAL SYMBOLS

ROADS & RELATED ITEMS

Edge of Pavement
Curb
Prop. Slope Stakes Cut — C
Prop. Slope Stakes Fill — F
Prop. Woven Wire Fence
Prop. Chain Link Fence
Prop. Barbed Wire Fence
Prop. Wheelchair Ramp — WCR
Exist. Guardrail
Prop. Guardrail
Equality Symbol
Pavement Removal
Proposed Traffic Signal
Existing Traffic Signal

RIGHT OF WAY

Baseline Control Point
Existing Right of Way Marker
Exist. Right of Way Line w/Marker
Prop. Right of Way Line with Proposed R/W Marker (Iron Pin & Cap)
Prop. Right of Way Line with Proposed (Concrete or Granite) R/W Marker
Exist. Control of Access Line — CA
Prop. Control of Access Line — CA
Exist. Easement Line — E
Prop. Temp. Construction Easement Line — E
Prop. Temp. Drainage Easement Line — TDE
Prop. Perm. Drainage Easement Line — PDE

HYDROLOGY

Stream or Body of Water
Flow Arrow
Disappearing Stream
Spring
Swamp Marsh
Shoreline
Falls, Rapids
Prop Lateral, Tail, Head Ditches — FLOW

STRUCTURES

MAJOR
Bridge, Tunnel, or Box Culvert — CONC
Bridge Wing Wall, Head Wall and End Wall — CONC WW

MINOR
Head & End Wall — CONC HW
Pipe Culvert
Footbridge
Drainage Boxes — CB
Paved Ditch Gutter

UTILITIES

Exist. Pole
Exist. Power Pole
Prop. Power Pole
Exist. Telephone Pole
Prop. Telephone Pole
Exist. Joint Use Pole
Prop. Joint Use Pole
Telephone Pedestal — T
Cable TV Pedestal — C
Hydrant
Satellite Dish
Exist. Water Valve
Sewer Clean Out
Power Manhole — P
Telephone Booth
Water Manhole — W
Light Pole
H-Frame Pole
Power Line Tower
Pole with Base
Gas Valve
Gas Meter
Telephone Manhole — T
Power Transformer
Sanitary Sewer Manhole
Storm Sewer Manhole — S
Tank; Water, Gas, Oil
Water Tank With Legs
Traffic Signal Junction Box — S
Fiber Optic Splice Box — F
Television or Radio Tower
Utility Power Line Connects to Traffic Signal Lines Cut Into the Pavement — TS TS

Recorded Water Line — W W
Designated Water Line (S.U.E.*) — W W
Sanitary Sewer — SS SS
Recorded Sanitary Sewer Force Main — FSS FSS
Designated Sanitary Sewer Force Main(S.U.E.*) — FSS FSS
Recorded Gas Line — G G
Designated Gas Line (S.U.E.*) — G G
Storm Sewer — S S
Recorded Power Line — P P
Designated Power Line (S.U.E.*) — P P
Recorded Telephone Cable — T T
Designated Telephone Cable (S.U.E.*) — T T
Recorded U/G Telephone Conduit — TC TC
Designated U/G Telephone Conduit (S.U.E.*) — TC TC
Unknown Utility (S.U.E.*) — ?UTL ?UTL
Recorded Television Cable — TV TV
Designated Television Cable (S.U.E.*) — TV TV
Recorded Fiber Optics Cable — FO FO
Designated Fiber Optics Cable (S.U.E.*) — FO FO
Exist. Water Meter
U/G Test Hole (S.U.E.*)
Abandoned According to U/G Record — ATTUR
End of Information — E.O.I.

BOUNDARIES & PROPERTIES

State Line
County Line
Township Line
City Line
Reservation Line
Property Line
Property Line Symbol — PL
Exist. Iron Pin — EIP
Property Corner
Property Monument — ECM
Property Number — 123
Parcel Number — 6
Fence Line — WW & ISBW
Existing Wetland Boundaries — WLB
Proposed Wetland Boundaries — WLB
Existing Endangered Animal Boundaries — EAB
Existing Endangered Plant Boundaries — EPB

BUILDINGS & OTHER CULTURE

Buildings
Foundations
Area Outline
Gate
Gas Pump Vent or U/G Tank Cap
Church
School
Park
Cemetery
Dam
Sign — S
Well — W
Small Mine
Swimming Pool

TOPOGRAPHY

Loose Surface
Hard Surface
Change in Road Surface
Curb
Right of Way Symbol — R/W
Guard Post — GP
Paved Walk
Bridge
Box Culvert or Tunnel
Ferry
Culvert
Footbridge
Trail, Footpath
Light House

VEGETATION

Single Tree
Single Shrub
Hedge
Woods Line
Orchard
Vineyard — VINEYARD

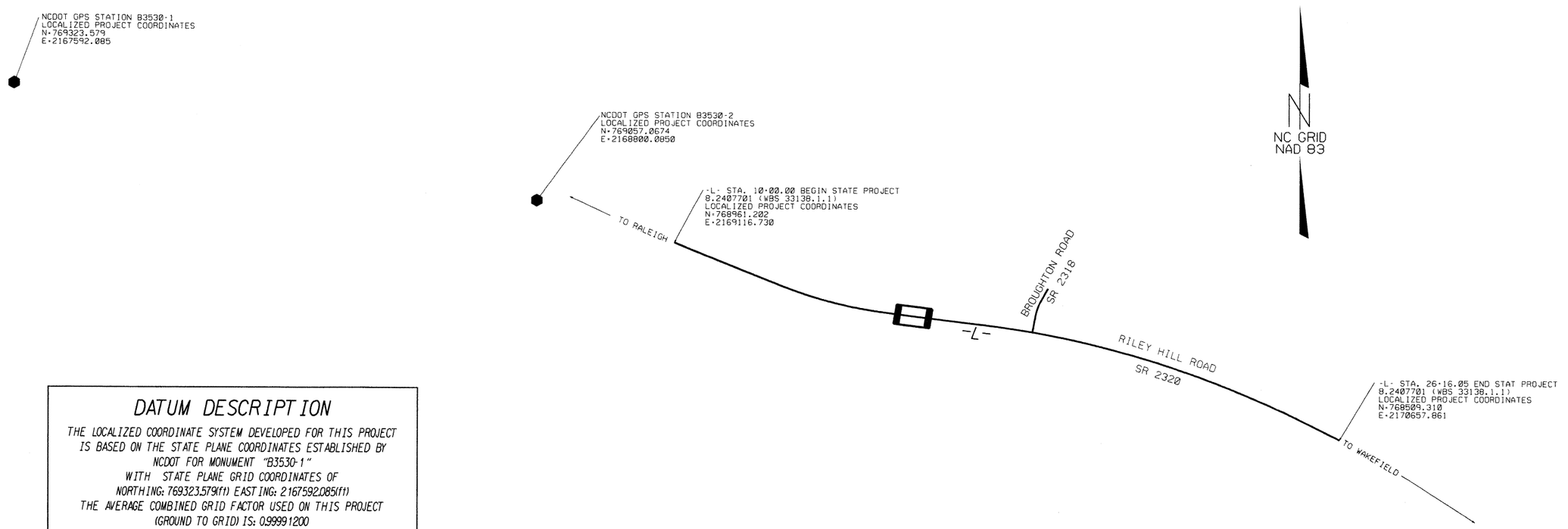
RAILROADS

Standard Gauge — CSX TRANSPORTATION
RR Signal Milepost — MILEPOST 35
Switch — SWITCH

6/2/99

PROJECT REFERENCE NO.	SHEET NO.
B3530	1C
Location and Surveys	

SURVEY CONTROL SHEET 8.2407701
WBS 33138.1.1



DATUM DESCRIPTION

THE LOCALIZED COORDINATE SYSTEM DEVELOPED FOR THIS PROJECT IS BASED ON THE STATE PLANE COORDINATES ESTABLISHED BY NCDOT FOR MONUMENT "B3530-1" WITH STATE PLANE GRID COORDINATES OF NORTHING: 769323.579(ft) EASTING: 2167592.085(ft) THE AVERAGE COMBINED GRID FACTOR USED ON THIS PROJECT (GROUND TO GRID) IS: 0.99991200 THE N.C. LAMBERT GRID BEARING AND LOCALIZED HORIZONTAL GROUND DISTANCE FROM "B3530-1" TO -L- STATION 10+00.00 IS S76° 37' 48.1"E 1567.12 ALL LINEAR DIMENSIONS ARE LOCALIZED HORIZONTAL DISTANCES VERTICAL DATUM USED IS NGVD 29

BL

POINT	DESC.	NORTH	EAST	ELEVATION	L STATION	OFFSET
BL1	BL-1	769091.4000	2168452.6460	351.33	OUTSIDE PROJECT LIMITS	
BL2	BL-2	769032.3220	2168973.0070	349.19	OUTSIDE PROJECT LIMITS	
BL3	BL-3	768861.6300	2169432.2850	323.49	13·31.52	19.82 LT
BL4	BL-4	768813.3930	2169703.8080	318.26	16·11.53	21.57 LT
BL5	BL-5	768733.7850	2170159.2410	322.13	20·71.19	22.59 LT
BL6	BL-6	768610.3310	2170483.7770	333.83	24·15.83	15.20 LT
BL7	BL-7	768445.4340	2170813.3000	341.38	OUTSIDE PROJECT LIMITS	

```
.....................................
100       ELEVATION · 315.52
N 768729      E 2169845
L STATION 17·62 45 RIGHT
NAIL IN 8-INCH GUM TREE
.....................................
.....................................
101       ELEVATION · 318.76
N 768789      E 2169959
L STATION 18·66 32 LEFT
NAIL IN 18-INCH GUM TREE
.....................................
```

NOTES:

THE CONTROL DATA FOR THIS PROJECT CAN BE FOUND ELECTRONICALLY BY SELECTING PROJECT CONTROL DATA AT:
HTTP:\WWW.DOH.DOT.STATE.NC.US/PRECONSTRUCT/HIGHWAY/LOCATION/PROJECT
THE FILES TO BE FOUND ARE AS FOLLOWS
B3530_LS_CONTROL_030716.TXT
SITE CALIBRATION INFORMATION HAS NOT BEEN PROVIDED FOR THIS PROJECT.
IF FURTHER INFORMATION IS NEEDED, PLEASE CONTACT THE LOCATION AND SURVEYS UNIT.

△ *INDICATES GEODETIC CONTROL MONUMENTS USED OR SET FOR HORIZONTAL PROJECT CONTROL BY THE NCDOT LOCATION AND SURVEYS UNIT.*

PROJECT CONTROL ESTABLISHED USING GLOBAL POSITIONING SYSTEM.

NOTE: DRAWING NOT TO SCALE

03:58
\B3530\B-3530\Roadway\Proj\B3530_rdy_tsh.dgn
dgn

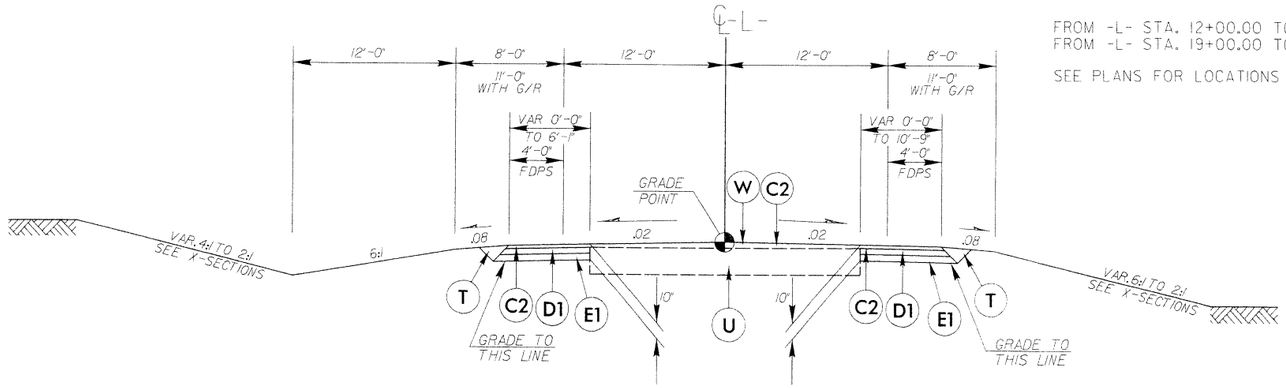
PROJECT REFERENCE NO.	SHEET NO.
B-3530	2
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	PAVEMENT DESIGN ENGINEER

Prepared in the Office of: EARTH TECH
701 Corporate Center Drive, Suite 475
Raleigh, NC 27607
(919) 854-6200 (919) 854-6259 (FAX)

USE TYPICAL SECTION NO. 1:

FROM -L- STA. 12+00.00 TO -L- STA 12+90.00
FROM -L- STA. 19+00.00 TO -L- STA. 21+10.00

SEE PLANS FOR LOCATIONS OF TAPERS

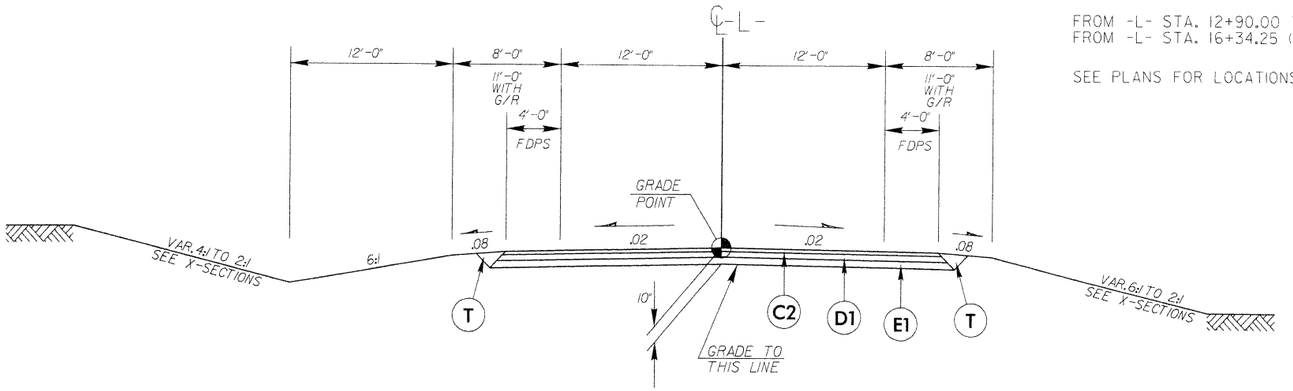


TYPICAL SECTION NO. 1

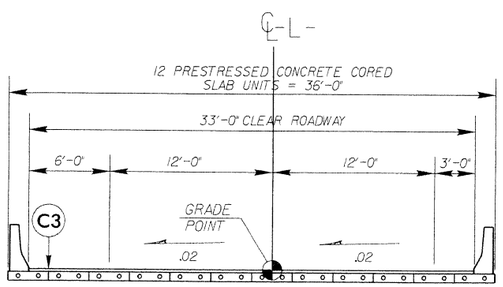
USE TYPICAL SECTION NO. 2:

FROM -L- STA. 12+90.00 TO -L- STA 15+31.75 (BEGIN BRIDGE)
FROM -L- STA. 16+34.25 (END BRIDGE) TO -L- STA. 19+00.00

SEE PLANS FOR LOCATIONS OF TAPERS



TYPICAL SECTION NO. 2



TYPICAL SECTION NO. 3

USE TYPICAL SECTION NO. 3

FROM -L- STA. 15+31.75 TO -L- STA. 16+34.25

PAVEMENT SCHEDULE

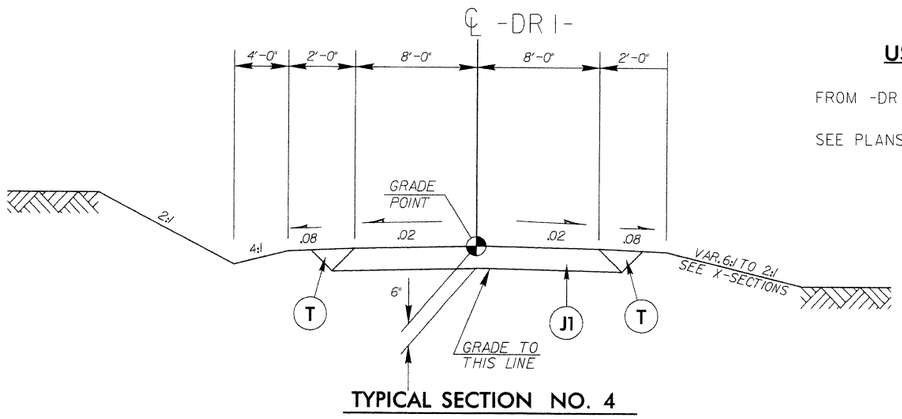
C1	PROP. APPROX. 1½" ASPHALT CONCRETE SURFACE COURSE, TYPE S9.5B, AT AN AVERAGE RATE OF 168 LBS. PER SQ. YD.
C2	PROP. APPROX. 2½" ASPHALT CONCRETE SURFACE COURSE, TYPE S9.5B, AT AN AVERAGE RATE OF 140 LBS. PER SQ. YD. IN EACH OF TWO LAYERS.
C3	PROP. VAR. DEPTH ASPHALT CONCRETE SURFACE COURSE, TYPE S9.5B, AT AN AVERAGE RATE OF 112 LBS. PER SQ. YD. PER 1" DEPTH, TO BE PLACED IN LAYERS NOT TO EXCEED 1½" IN DEPTH.
D1	PROP. APPROX. 3½" ASPHALT CONCRETE INTERMEDIATE COURSE, TYPE I19.0B, AT AN AVERAGE RATE OF 399 LBS. PER SQ. YD.
D2	PROP. VAR. DEPTH ASPHALT CONCRETE INTERMEDIATE COURSE, TYPE I19.0B, AT AN AVERAGE RATE OF 114 LBS. PER SQ. YD. PER 1" DEPTH, TO BE PLACED IN LAYERS NOT LESS THE 2¼" IN DEPTH OR GREATER THAN 4" IN DEPTH
E1	PROP. APPROX. 4" ASPHALT CONCRETE BASE COURSE, TYPE B25.0B, AT AN AVERAGE RATE OF 456 LBS. PER SQ. YD.
E2	PROP. VAR. DEPTH ASPHAL CONCRETE BASE COURSE, TYPE B25.0B, AT AN AVERAGE RATE OF 114 LBS. PER SQ. YD. PER 1" DEPTH, TO BE PLACED IN LAYERS NOT LESS THAN 3" IN DEPTH OR GREATER THAN 5½IN DEPTH.
J1	PROP. 6" AGGREGATE BASE COURSE.
T	EARTH MATERIAL.
U	EXISTING PAVEMENT.
W	VARIABLE DEPTH ASPHALT PAVEMENT (SEE STANDARD WEDGING DETAIL SHEET No. 2A)

NOTE: PAVEMENT EDGE SLOPES ARE 1:1 UNLESS SHOWN OTHERWISE.

DATE: 9/23/2004
TIME: 08:58:40
USER: mfulton
DGN: R:\B3530\B-3530 Roadway\Pro\B3530_rdy_typsec
PRF: CWIANTEWP03350.22pf

PROJECT REFERENCE NO.	SHEET NO.
B-3530	2-A
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	PAVEMENT DESIGN ENGINEER

Prepared in the Office of: EARTH TECH
701 Corporate Center Drive, Suite 475
Raleigh, NC 27607
(919) 854-6200 - (919) 854-6259 (FAX)

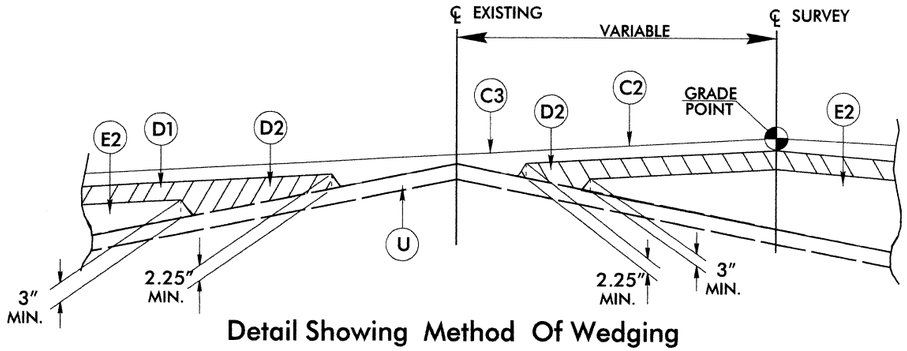


TYPICAL SECTION NO. 4

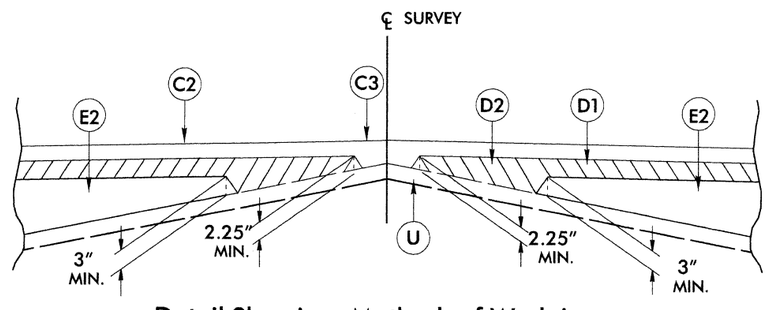
USE TYPICAL SECTION NO. 4

FROM -DR1- STA. 10+15.00 TO -DR1- STA 10+96.50

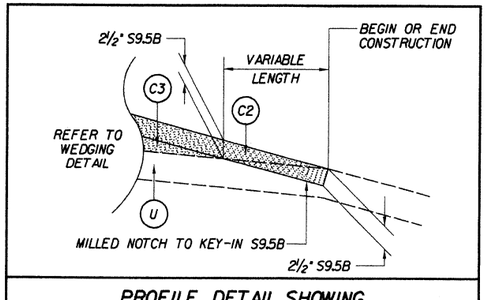
SEE PLANS FOR LOCATIONS OF TAPERS



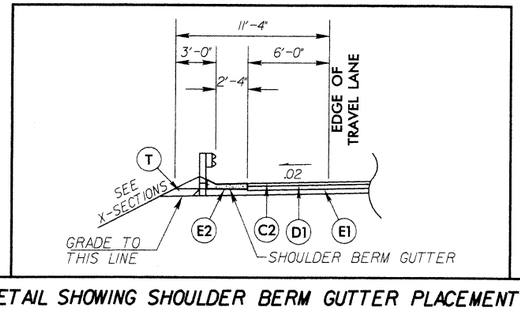
Detail Showing Method Of Wedging



Detail Showing Method of Wedging



PROFILE DETAIL SHOWING TIE-INS AT PROJECT TERMINI



DETAIL SHOWING SHOULDER BERM GUTTER PLACEMENT (SEE PLANS FOR LOCATION)

PAVEMENT SCHEDULE	
C1	1½" S9.5B
C2	2½" S9.5B
C3	VAR. S9.5B
D1	3½" I19.0B
D2	VAR. DEPTH I19.0B
E1	4" B25.0B
E2	VAR. B25.0B
J1	6" ABC
T	EARTH MATERIAL.
U	EXISTING PAVEMENT
W	WEDGING

NOTE 1: PAVEMENT EDGE SLOPES ARE 1:1 UNLESS SHOWN OTHERWISE.

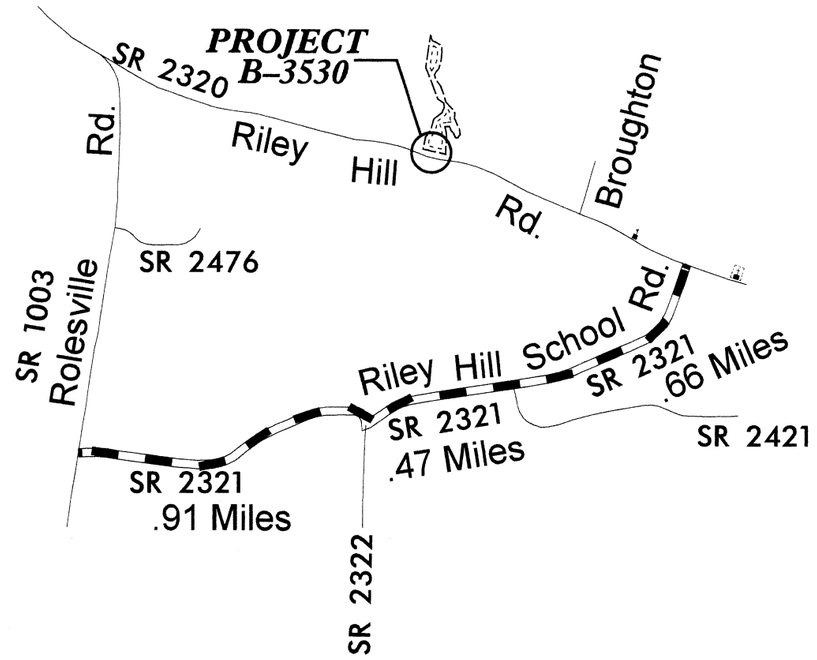
NOTE 2: SEE SHEET 2 FOR DETAILED PAVEMENT SCHEDULE.

DATE: 3/23/2004
TIME: 3:59:28
USER: mdixon
PROJECT: B-3530 Roadway\Proj\B3530_ck_typ.dgn
PRF: CUMMINTEMP\B3530_2A.prf

DETAIL OF OFF-SITE DETOUR RESURFACING

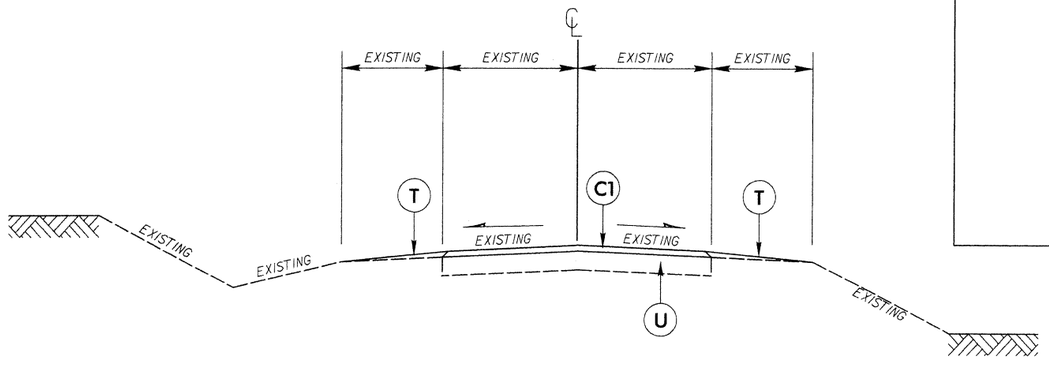
PROJECT REFERENCE NO.	SHEET NO.
B-3530	2-B
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	PAVEMENT DESIGN ENGINEER

Prepared in the Office of: EARTH TECH
701 Corporate Center Drive, Suite 475
Raleigh, NC 27607
(919) 854-6200 - (919) 854-6259(FAX)



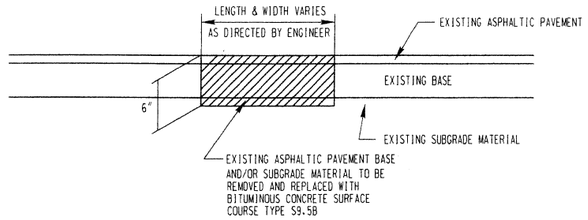
EXISTING ROADS

DETOUR ROUTE ROADS TO BE RESURFACED

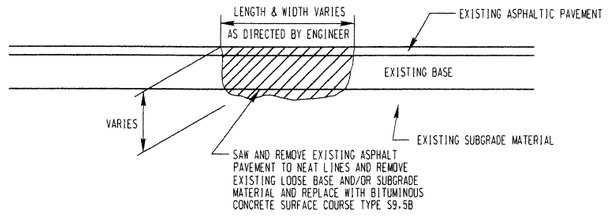


TYPICAL SECTION NO. 5

DETAILS OF REPAIRING EXISTING PAVEMENT PRIOR TO RESURFACING



DETAIL NO. 1



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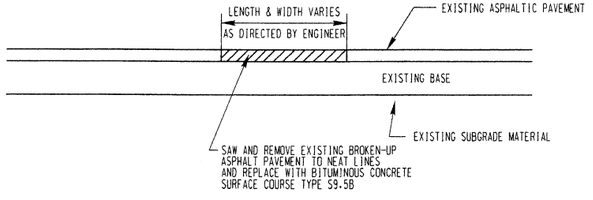


DETAIL NO. 3

USE TYPICAL SECTION NO. 5

ON SR 2321 AS SHOWN ON THE DETAIL OF DETOUR RESURACING

PAVEMENT SCHEDULE	
C1	1½" S9.5B
C2	2½" S9.5B
C3	VAR. S9.5B
D1	3½" I19.0B
D2	VAR. DEPTH I19.0B
E1	4" B25.0B
E2	VAR. B25.0B
J1	6" ABC
T	EARTH MATERIAL.
U	EXISTING PAVEMENT
W	WEDGING

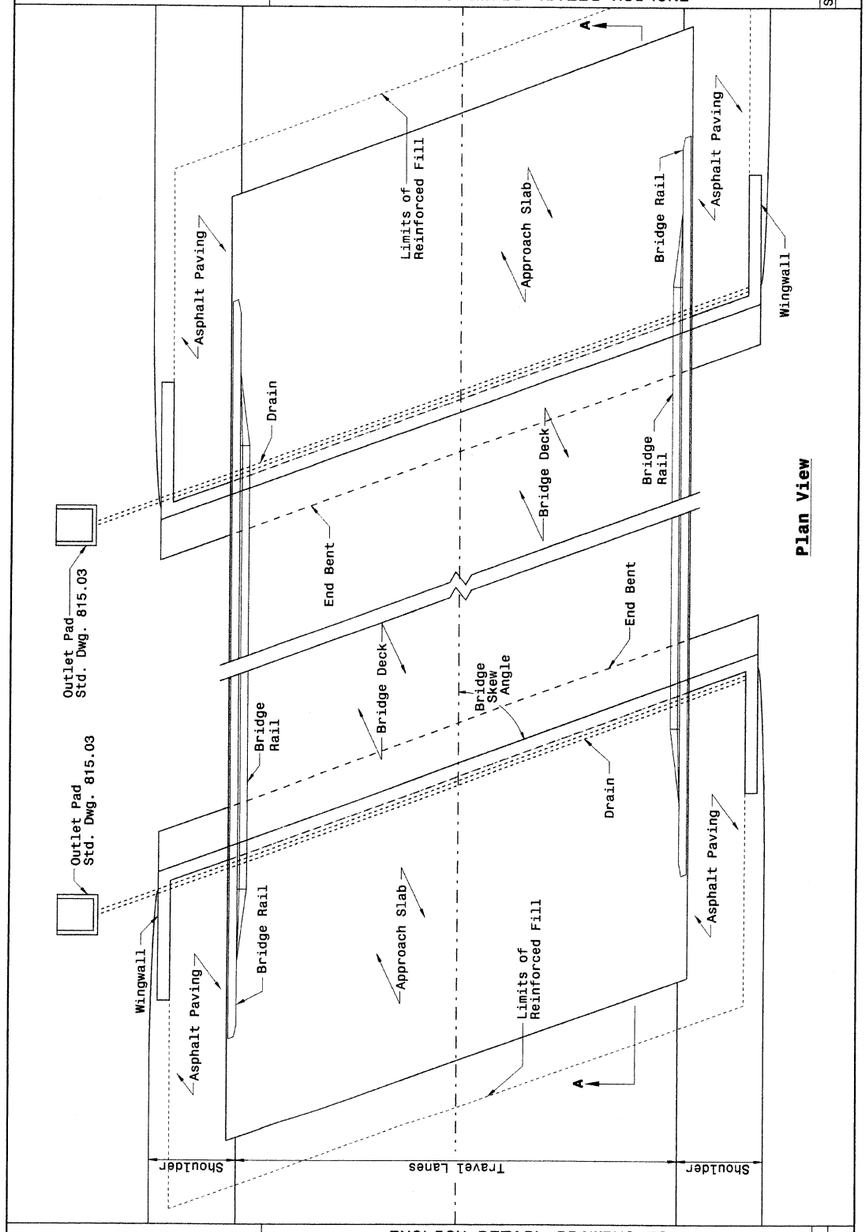
NOTE 1: PAVEMENT EDGE SLOPES ARE 1:1 UNLESS SHOWN OTHERWISE.

NOTE 2: SEE SHEET 2 FOR DETAILED PAVEMENT SCHEDULE.

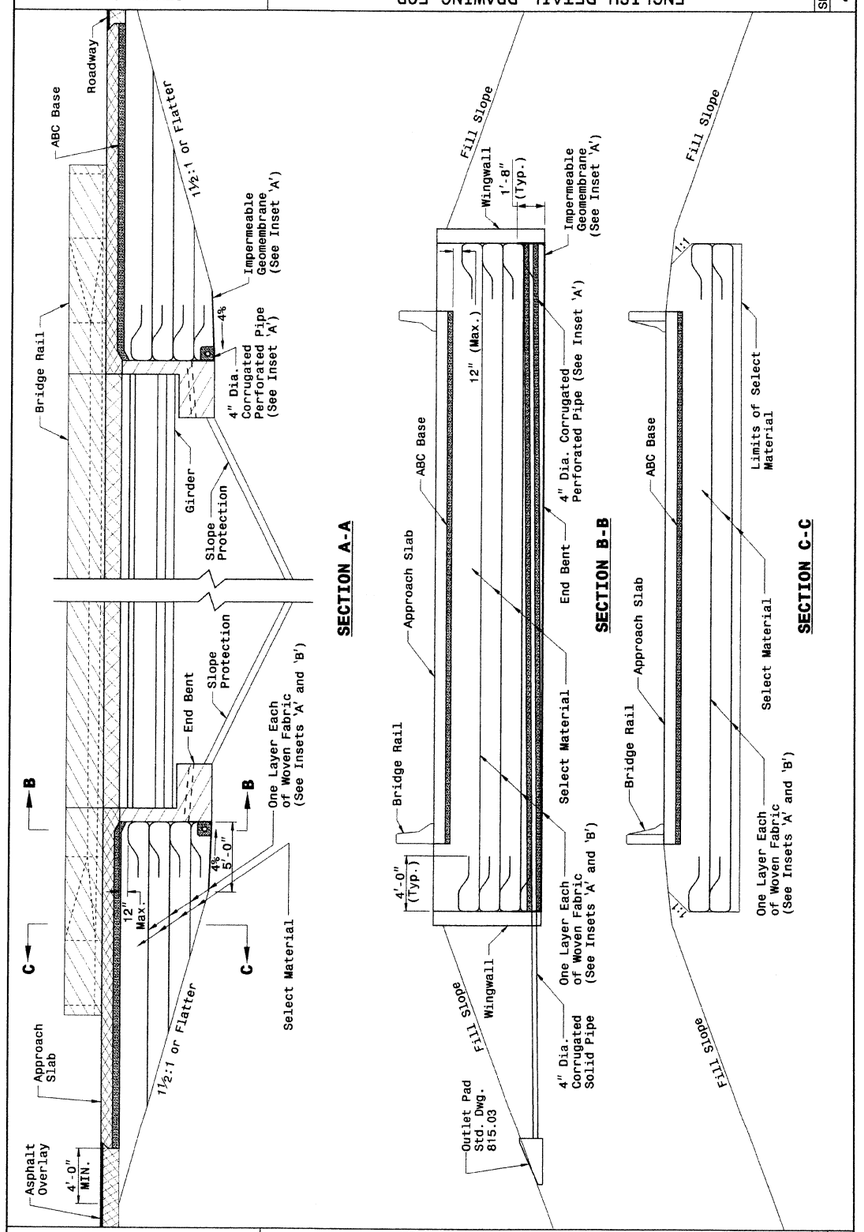
DATE: 9/30/2004
TIME: 08:39

File: n:\proj\b-3530\roadway\rpt\b3530_rdy_typdtp
User: cwinn
Pw: cwinn\Tw\b3530_2b2.prt

PROJECT REFERENCE NO.	SHEET NO.
B-3530	2-C



Plan View



SECTION A-A **SECTION B-B** **SECTION C-C**

STATE OF NORTH CAROLINA DEPT. OF TRANSPORTATION DIVISION OF HIGHWAYS RALEIGH, N.C.	ENGLISH DETAIL DRAWING FOR **REINFORCED BRIDGE APPROACH FILLS**	SHEET 1 OF 4 **422D10**

STATE OF NORTH CAROLINA DEPT. OF TRANSPORTATION DIVISION OF HIGHWAYS RALEIGH, N.C.	ENGLISH DETAIL DRAWING FOR **REINFORCED BRIDGE APPROACH FILLS** PRESTRESSED AND PLATE GIRDER BRIDGES	SHEET 2 OF 4 **422D10**

STATE OF NORTH CAROLINA DEPT. OF TRANSPORTATION DIVISION OF HIGHWAYS RALEIGH, N.C.	ENGLISH DETAIL DRAWING FOR **REINFORCED BRIDGE APPROACH FILLS**	SHEET 1 OF 4 **422D10**

STATE OF NORTH CAROLINA DEPT. OF TRANSPORTATION DIVISION OF HIGHWAYS RALEIGH, N.C.	ENGLISH DETAIL DRAWING FOR **REINFORCED BRIDGE APPROACH FILLS** PRESTRESSED AND PLATE GIRDER BRIDGES	SHEET 2 OF 4 **422D10**

DESIGN SERVICES UNIT
STANDARDS AND SPECIAL DESIGN
Office 919-250-4128 FAX 919-250-4119

SEE PLATE FOR TITLE

ORIGINAL BY: 2002 STANDARDS DATE: 01-15-02
MODIFIED BY: E.E. WARD DATE: 04-02-04
CHECKED BY: DATE:
FILE SPEC.: stds/02stdstodetails/english/422d10.dgn

PROJECT REFERENCE NO.	SHEET NO.
B-3530	Z-D

STATE OF
NORTH CAROLINA
DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
RALEIGH, N.C.

ENGLISH DETAIL DRAWING FOR
REINFORCED BRIDGE APPROACH FILLS
CORED SLAB BRIDGES

SHEET 3 OF 4
422D10

SECTION A-A

SECTION B-B

SECTION C-C

STATE OF
NORTH CAROLINA
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DIVISION OF HIGHWAYS
RALEIGH, N.C.

ENGLISH DETAIL DRAWING FOR
REINFORCED BRIDGE APPROACH FILLS
INSETS AND CHARTS

SHEET 4 OF 4
422D10

Typical Fabric Lift and Wrap
Showing Second and Above Lifts

Inset 'B'

Height of Backwall	Number of Fabric Layers
4'-6" - 5'-9"	3
5'-10" - 7'-2"	4
7'-3" - 8'-8"	5
8'-9" - 10'-1"	6
10'-2" - 11'-8"	7

Note: Cored Slab Structures Require 2 Fabric Layers.

Cored Slab Bridge
Showing First Lift and Drains

Girder Bridge
Showing First Lift and Drains

Inset 'A'

Length of Bridge End Bent Inside Wingwalls
If Bridge Skew is Less Than or Equal to 90°: $\frac{\text{(Roadway Width + 7'-0")}}{\text{Sin (Bridge Skew Angle)}}$ = Dis. Between Wingwalls
If Bridge Skew is Greater Than 90°: $\frac{\text{(Roadway Width + 7'-0")}}{\text{Cos (Bridge Skew Angle - 90°)}}$ = Dis. Between Wingwalls

STATE OF
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RALEIGH, N.C.

ENGLISH DETAIL DRAWING FOR
REINFORCED BRIDGE APPROACH FILLS
CORED SLAB BRIDGES

SHEET 3 OF 4
422D10

DESIGN SERVICES UNIT
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ORIGINAL BY: 2002 STANDARDS DATE: 01-15-02
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STATE OF
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RALEIGH, N.C.

ENGLISH DETAIL DRAWING FOR
REINFORCED BRIDGE APPROACH FILLS
INSETS AND CHARTS

SHEET 4 OF 4
422D10

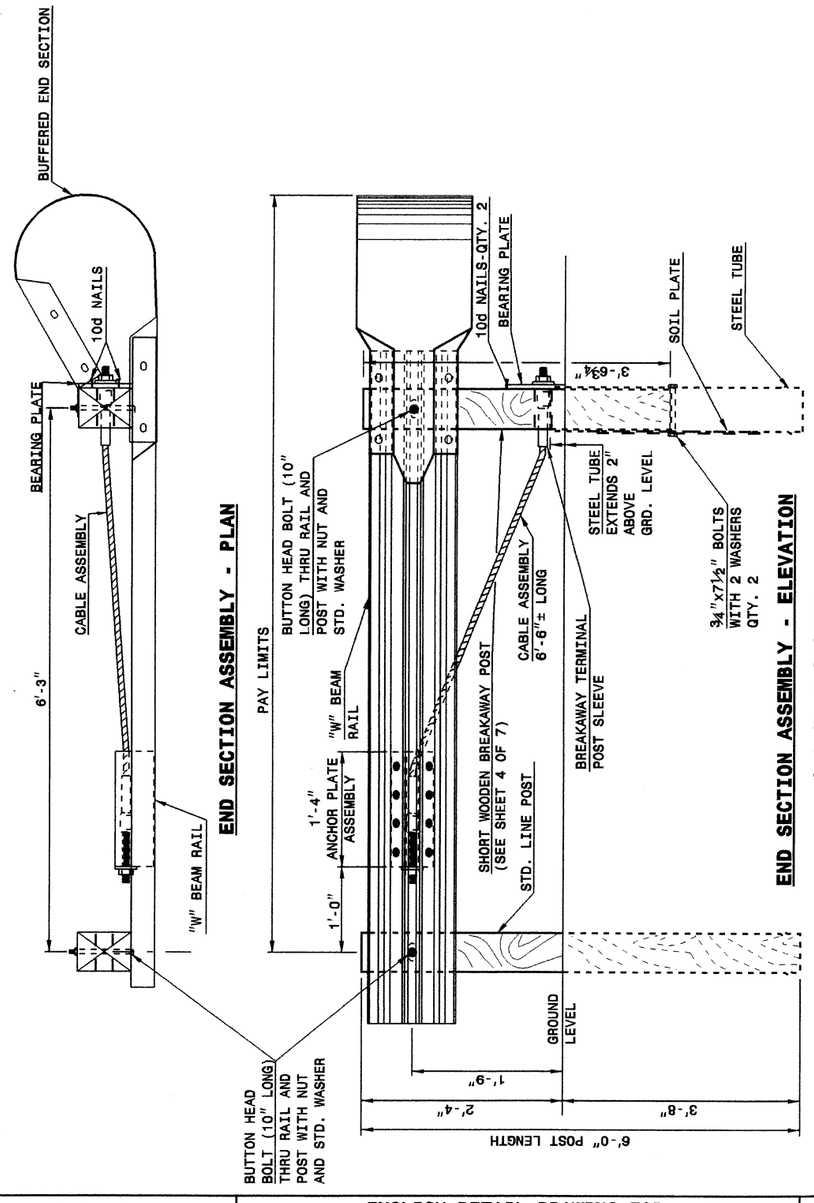
5/14/99

PROJECT REFERENCE NO.	SHEET NO.
B-3530	2-E

STATE OF
NORTH CAROLINA
DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
RALEIGH, N.C.

ENGLISH DETAIL DRAWING FOR
GUARDRAIL INSTALLATION

SHEET 1 OF 7
862D02



STATE OF
NORTH CAROLINA
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RALEIGH, N.C.

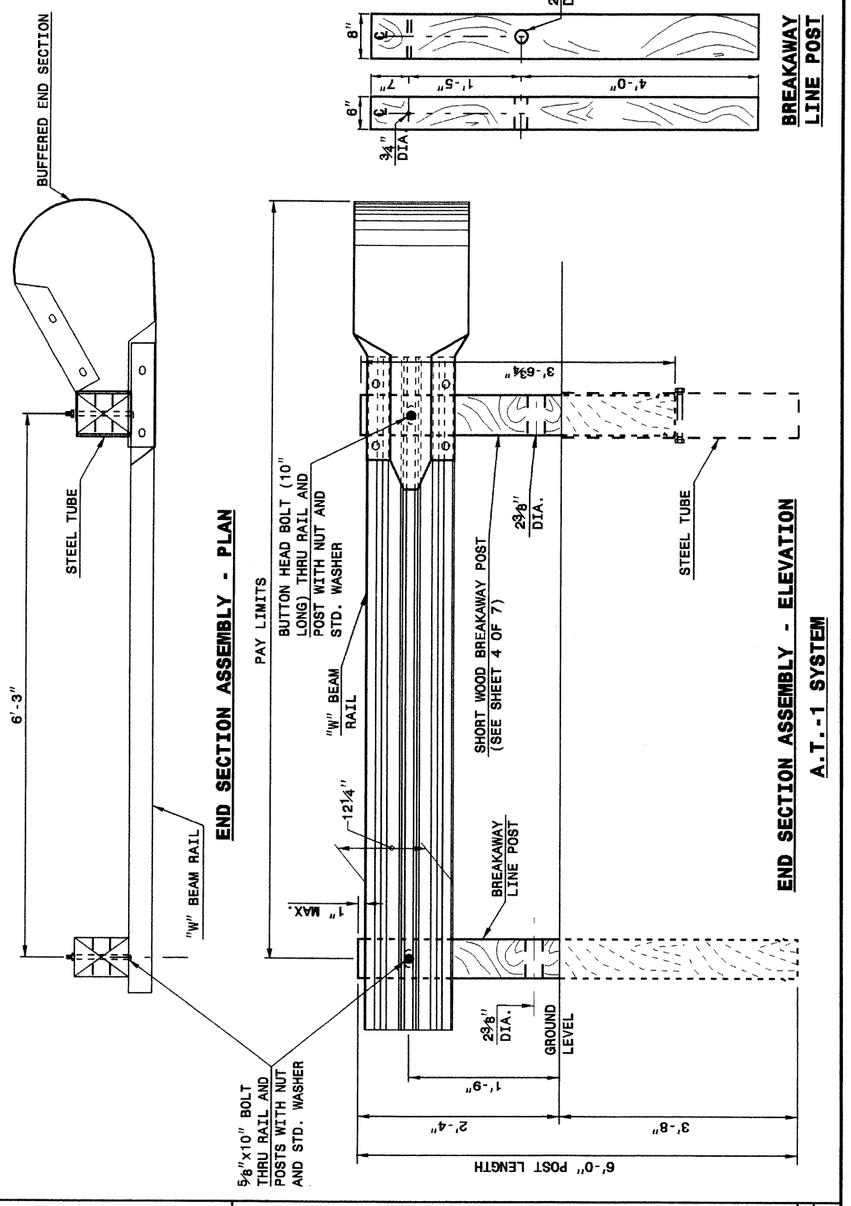
ENGLISH DETAIL DRAWING FOR
GUARDRAIL INSTALLATION

SHEET 1 OF 7
862D02

STATE OF
NORTH CAROLINA
DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
RALEIGH, N.C.

ENGLISH DETAIL DRAWING FOR
GUARDRAIL INSTALLATION

SHEET 2 OF 7
862D02



STATE OF
NORTH CAROLINA
DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
RALEIGH, N.C.

ENGLISH DETAIL DRAWING FOR
GUARDRAIL INSTALLATION

SHEET 2 OF 7
862D02

DESIGN SERVICES UNIT
STANDARDS AND SPECIAL DESIGN
Office 919-250-4128 FAX 919-250-4119

SEE PLATE FOR TITLE

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MODIFIED BY: E.E. WARD DATE: 02-09-03
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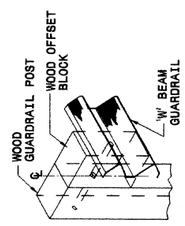
5/14/99

PROJECT REFERENCE NO.	SHEET NO.
B-3530	2-F

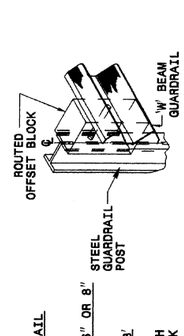
STATE OF NORTH CAROLINA
DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
RALEIGH, N.C.

ENGLISH DETAIL DRAWING FOR
GUARDRAIL INSTALLATION

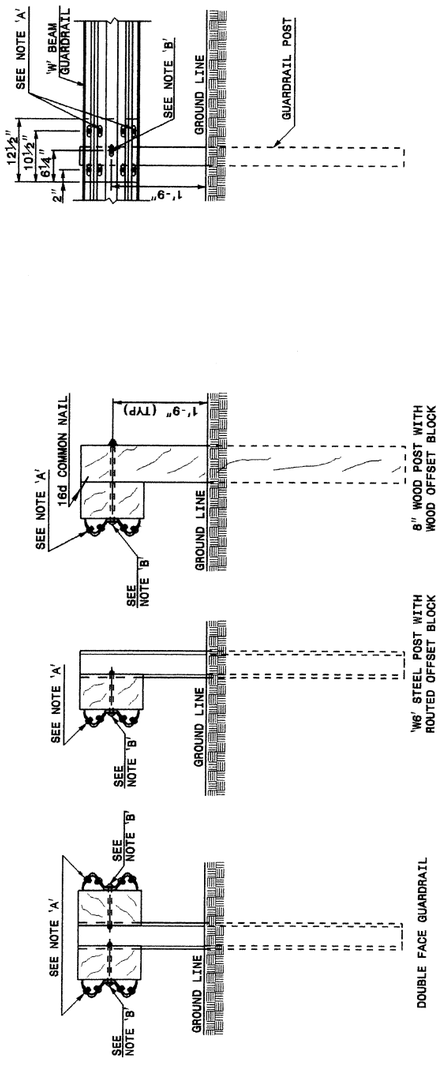
SHEET 3 OF 7
862D02



ISOMETRIC VIEWS



PLAN



SIDE

FRONT

TYPICAL GUARDRAIL AND GUARDRAIL POST ALTERNATIVES

NOTES:
A - 5/8" DIA. BUTTON HEAD SPLICE BOLT 1¼" LONG WITH STD. WASHER UNDER NUT (8 REQ. PER SPLICE JOINT).
B - 5/8" DIA. BUTTON HEAD BOLT 7½"/8" LONG WITH NUT FOR BOLTING 8"/8" ROUTED OFFSET BLOCK TO STEEL POSTS OR 6"/8" ROUTED OFFSET BLOCK TO WOOD POSTS (1 REQ. PER LOCATION)
5/8" DIA. BUTTON HEAD BOLT 18" LONG WITH STD. WASHER UNDER NUT FOR BOLTING TO WOOD POSTS (1 REQ. PER LOCATION)
C - FIELD PUNCHING OF HOLES INTO GUARDRAIL SHALL BE AS DIRECTED BY THE ENGINEER.

STATE OF
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RALEIGH, N.C.

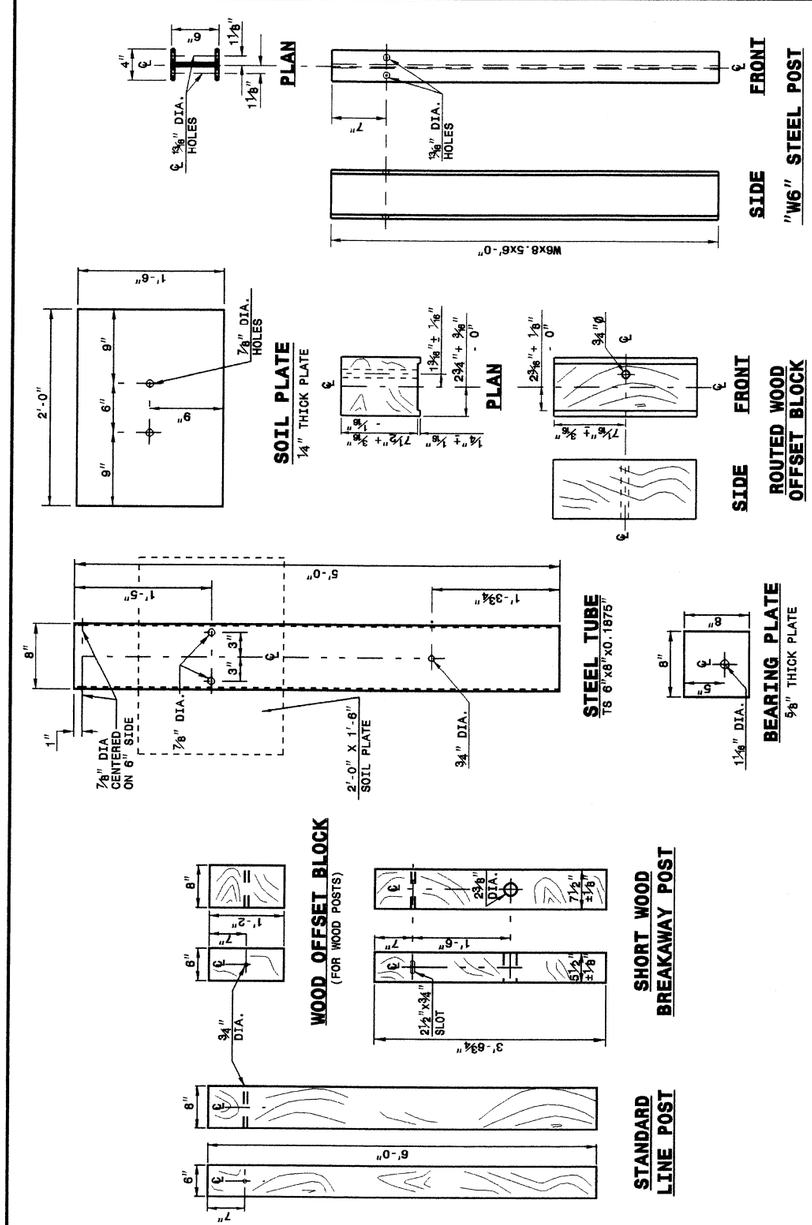
ENGLISH DETAIL DRAWING FOR
GUARDRAIL INSTALLATION

SHEET 3 OF 7
862D02

STATE OF
NORTH CAROLINA
DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
RALEIGH, N.C.

ENGLISH DETAIL DRAWING FOR
GUARDRAIL INSTALLATION

SHEET 4 OF 7
862D02



SYSTEM PARTS

STATE OF
NORTH CAROLINA
DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
RALEIGH, N.C.

ENGLISH DETAIL DRAWING FOR
GUARDRAIL INSTALLATION

SHEET 4 OF 7
862D02

DESIGN SERVICES UNIT
STANDARDS AND SPECIAL DESIGN
Office 919-250-4128 FAX 919-250-4119

SEE PLATE FOR TITLE

ORIGINAL BY: 2002 STD.862.02 DATE:
MODIFIED BY: E.E. WARD DATE: 02-09-03
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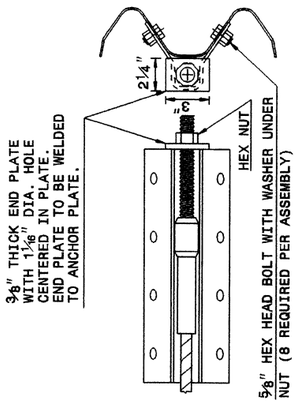
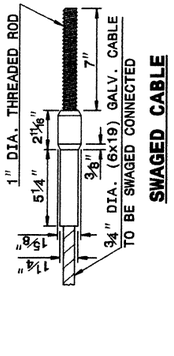
5/14/99

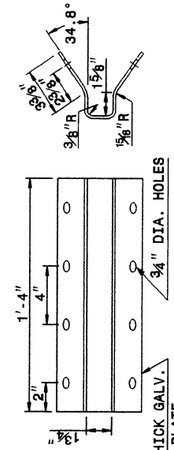
PROJECT REFERENCE NO.	SHEET NO.
B-3530	2-G



ANCHOR PLATE ASSEMBLY



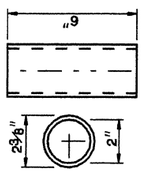
SWAGED CABLE



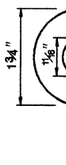
ANCHOR PLATE

CABLE ASSEMBLY

SYSTEM PARTS

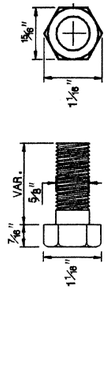


BREAKAWAY TERMINAL POST SLEEVE

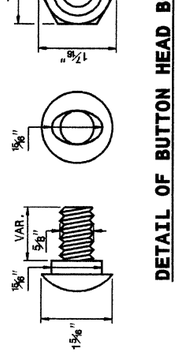


DETAIL OF STANDARD WASHER

STANDARD WASHER: TYPICAL USE UNDER NUT WITH WOOD POST

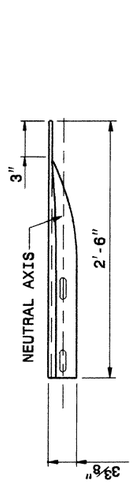


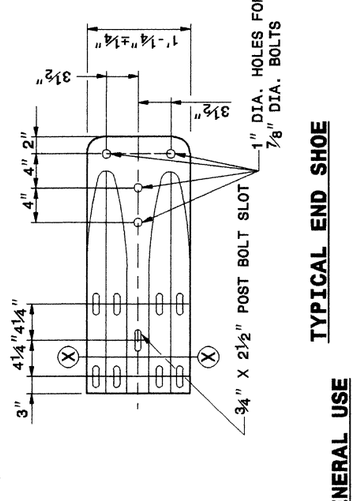
DETAIL OF STANDARD HEX BOLT AND NUT



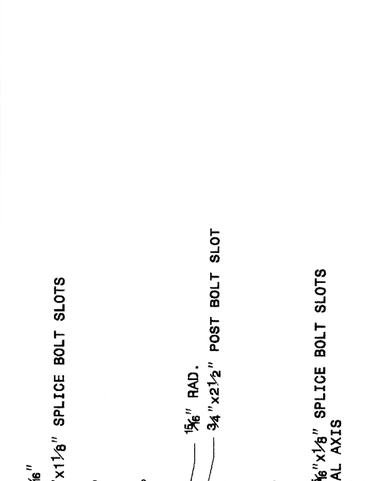
DETAIL OF BUTTON HEAD BOLT AND NUT

SYSTEM PARTS

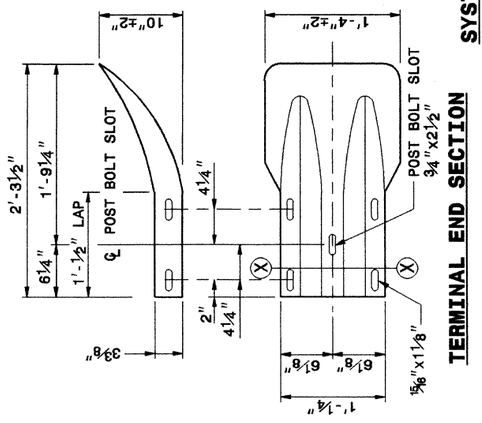




TYPICAL END SHOE



SECTION X-X



TERMINAL END SECTION

SYSTEM PARTS - GENERAL USE

DESIGN SERVICES UNIT
STANDARDS AND SPECIAL DESIGN
Office 919-250-4128 FAX 919-250-4119

SEE PLATE FOR TITLE

ORIGINAL BY: 2002 STD. 862.02 DATE:
MODIFIED BY: E.E. WARD DATE: 02-09-03
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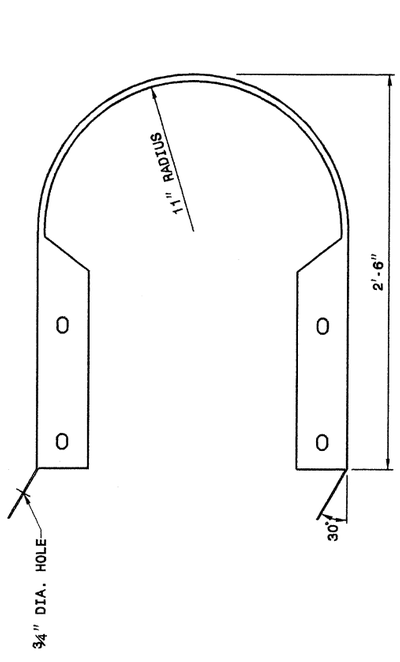
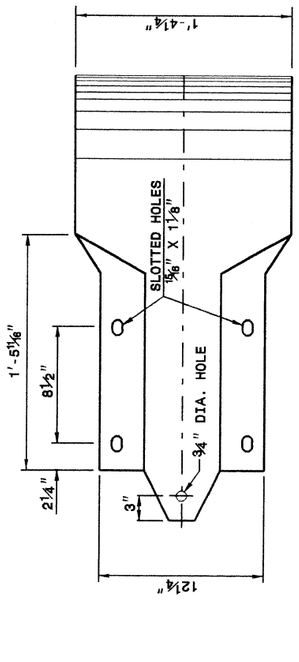
PROJECT REFERENCE NO.	SHEET NO.
B-3530	2-H

STATE OF NORTH CAROLINA DEPT. OF TRANSPORTATION DIVISION OF HIGHWAYS RALEIGH, N.C.	ENGLISH DETAIL DRAWING FOR **GUARDRAIL INSTALLATION**	SHEET 7 OF 7 **862D02**



PLAN



ELEVATION

BUFFERED END SECTION

STATE OF NORTH CAROLINA DEPT. OF TRANSPORTATION DIVISION OF HIGHWAYS RALEIGH, N.C.	ENGLISH DETAIL DRAWING FOR **GUARDRAIL INSTALLATION**	SHEET 7 OF 7 **862D02**

DESIGN SERVICES UNIT
STANDARDS AND SPECIAL DESIGN
Office 919-250-4128 FAX 919-250-4119

SEE PLATE FOR TITLE

ORIGINAL BY: 2002 STD. 862.02 DATE:
MODIFIED BY: E.E. WARD DATE: 02-09-03
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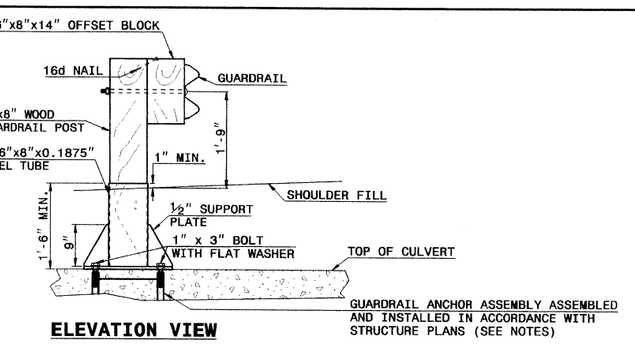
AT DS188660

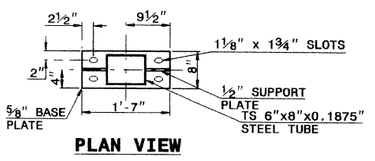
STATE OF NORTH CAROLINA
DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
RALEIGH, N.C.

ENGLISH DETAIL DRAWING FOR
STRUCTURE ANCHOR UNITS
ANCHORAGE FOR GUARDRAIL POST ON BOX CULVERT

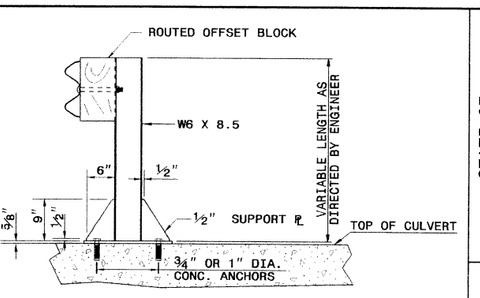
SHEET 1 OF 4
862D03



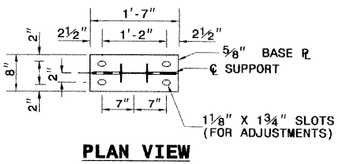
ELEVATION VIEW



PLAN VIEW



ELEVATION VIEW



PLAN VIEW

NOTES FOR:
GUARDRAIL POST ANCHORED TO STRUCTURE:
-USE FULL LENGTH ¼" BUTT WELDS AT ALL LOCATIONS OF CONTACT BETWEEN THE BASE PLATE, SUPPORT PLATES AND STEEL POST OR STEEL TUBE.
-USE POST AND POST BASE PLATES CONFORMING TO THE REQUIREMENTS OF A.S.T.M. A-36 AND GALVANIZED AFTER FABRICATION TO CONFORM TO A.S.T.M. A-123.
-USE WOOD POSTS WHICH FIT SNUGLY IN THE STEEL TUBE WITH A MAXIMUM OF ⅛" CLEARANCE BETWEEN TUBE WALL AND POST.

NEW STRUCTURES:
-ATTACH POST TO INSERT ASSEMBLY UNITS (USING ANCHOR BOLTS SUPPLIED WITH INSERTS) WHICH HAVE BEEN CAST INTO THE STRUCTURE DURING CONSTRUCTION.

EXISTING STRUCTURES:
-USE CONCRETE ANCHORS CONSISTING OF A STUD BOLT WITH NUT AND WASHER. USE STUDS THREADED ON ONE END AND HAVING AN EXPANDED WEDGE ASSEMBLY POSITIONED AROUND A TAPERED AREA AT THE OTHER END. USE ANCHORS WHICH PROVIDE A MINIMUM SAFE HOLDING POWER OF 2875 LBS. FOR A ¾" OR 1" DIAMETER BOLT. CALCULATE HOLDING POWER BASED ON ¼ THE ACTUAL HOLDING POWER OF THE ANCHOR IN 3500 PSI CONCRETE AS DETERMINED BY AN APPROVED COMMERCIAL TESTING LABORATORY.

-USE ANCHORS GALVANIZED IN ACCORDANCE WITH A.S.T.M. A-153. SIZE HOLES FOR THE CONCRETE ANCHORS IN ACCORDANCE WITH THE ANCHOR MANUFACTURER'S RECOMMENDATIONS. DRILL HOLES WITH A CARBIDE OR DIAMOND TIPPED MASONRY BIT POWERED BY A ROTARY OR ROTARY IMPACT DRILL. NO OTHER IMPACT TOOLS WILL BE PERMITTED. DRILL HOLES VERTICALLY. FURNISH DOCUMENTATION OF HOLE SIZE RECOMMENDED FOR THE SPECIFIED ANCHOR TO THE ENGINEER BEFORE DRILLING HOLES. THOROUGHLY CLEAN HOLES FOR ANCHORS OF ALL CONCRETE CHIPS, DUST, GREASE, OIL, ETC. BEFORE ANCHORS ARE INSTALLED. REPAIR ALL DAMAGE CAUSED BY THIS WORK TO THE SATISFACTION OF THE ENGINEER.

ANCHORAGE FOR GUARDRAIL POST ON BOX CULVERT

STATE OF NORTH CAROLINA
DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
RALEIGH, N.C.

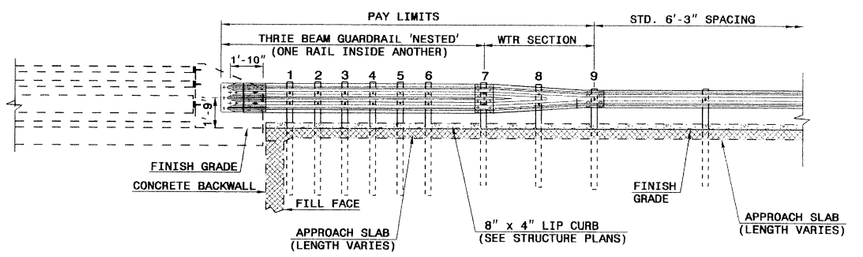
ENGLISH DETAIL DRAWING FOR
STRUCTURE ANCHOR UNITS
ANCHORAGE FOR GUARDRAIL POST ON BOX CULVERT

SHEET 1 OF 4
862D03

STATE OF NORTH CAROLINA
DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
RALEIGH, N.C.

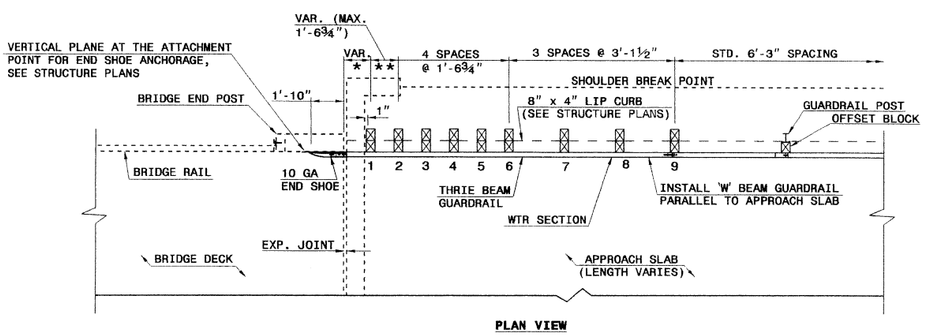
ENGLISH DETAIL DRAWING FOR
STRUCTURE ANCHOR UNITS
GUARDRAIL ANCHOR UNIT, TYPE III
FOR ATTACHMENT TO RAIL ON BRIDGE

SHEET 2 OF 4
862D03



ELEVATION

NOTE:
**POST NOT REQUIRED FOR SKEW ANGLES GREATER THAN 150° OR LESS THAN 30° UNLESS OTHERWISE DIRECTED BY THE ENGINEER.
*THE DISTANCE FROM END OF BRIDGE RAIL TO CENTER LINE OF THE FIRST POST SHOULD BE 11½" IF CONCRETE BACKWALL IS NOT PRESENT.
-SHOULDER BERM GUTTER MUST BE INSTALLED WITHIN THE PAY LIMITS IF THE ANCHOR UNIT IS NOT ADJACENT TO AN APPROACH SLAB.
-MEASURE GUARDRAIL HEIGHT FROM THE TOP OF ADJACENT SURFACE (SHOULDER, BERM, OR GUTTER).
-USE NO STEEL POSTS WITHIN THE GUARDRAIL ANCHOR UNIT LIMITS.
-LAP JOINTS IN THE DIRECTION OF TRAFFIC FLOW.
-SEE SHEET 4 FOR POST SECTIONS 1 THRU 9.



PLAN VIEW

GUARDRAIL ANCHOR UNIT, TYPE III FOR ATTACHMENT TO RAIL ON BRIDGE

DESIGN SERVICES UNIT
STANDARDS AND SPECIAL DESIGN
Office 919-250-4128 FAX 919-250-4119

SEE PLATE FOR TITLE

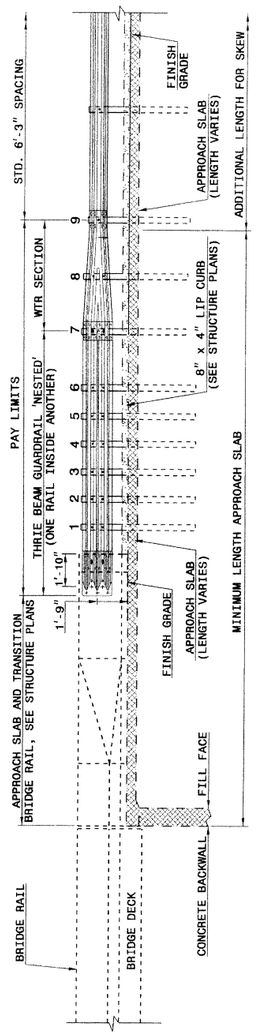
ORIGINAL BY: 2002 STANDARDS DATE: 01-15-02
MODIFIED BY: E.E. WARD DATE: 04-07-04
CHECKED BY: DATE:

PROJECT REFERENCE NO. B-3535
SHEET NO. 2-I

PROJECT REFERENCE NO.	SHEET NO.
B-3530	2-J

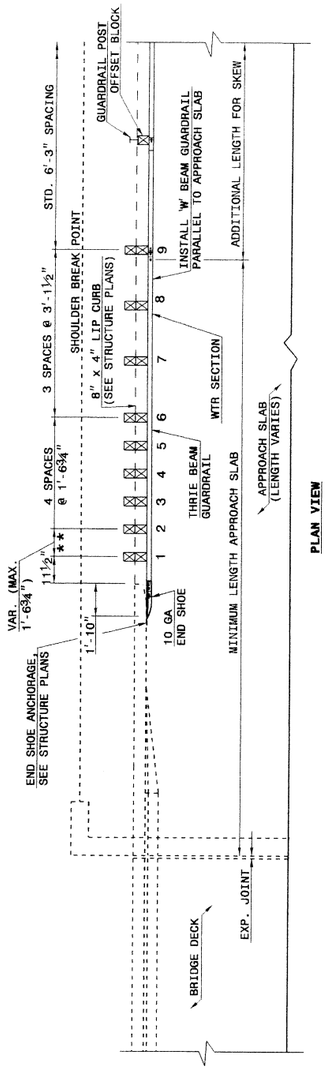
ENGLISH DETAIL DRAWING FOR
STRUCTURE ANCHOR UNITS
GUARDRAIL ANCHOR UNIT, TYPE III
FOR ATTACHMENT TO RAIL ON APPROACH SLAB

STATE OF
NORTH CAROLINA
DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
RALEIGH, N.C.



ELEVATION

NOTE:
**POST NOT REQUIRED FOR SKEW ANGLES GREATER THAN 150° OR LESS THAN 30° UNLESS OTHERWISE DIRECTED BY THE ENGINEER.
-MEASURE GUARDRAIL HEIGHT FROM THE TOP OF ADJACENT SURFACE (SHOULDER, BERM, OR GUTTER).
-USE NO STEEL POSTS WITHIN THE GUARDRAIL ANCHOR UNIT LIMITS.
-LAP JOINTS IN THE DIRECTION OF TRAFFIC FLOW.
-SEE SHEET 4 FOR POST SECTIONS 1 THRU 9.

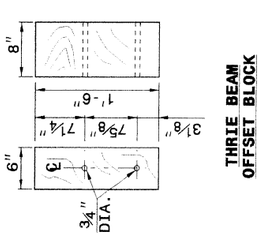


PLAN VIEW

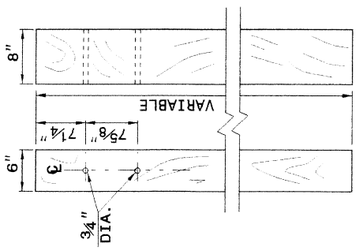
GUARDRAIL ANCHOR UNIT, TYPE III
FOR ATTACHMENT TO RAIL ON APPROACH SLAB

ENGLISH DETAIL DRAWING FOR
STRUCTURE ANCHOR UNITS
GUARDRAIL ANCHOR UNIT, TYPE III

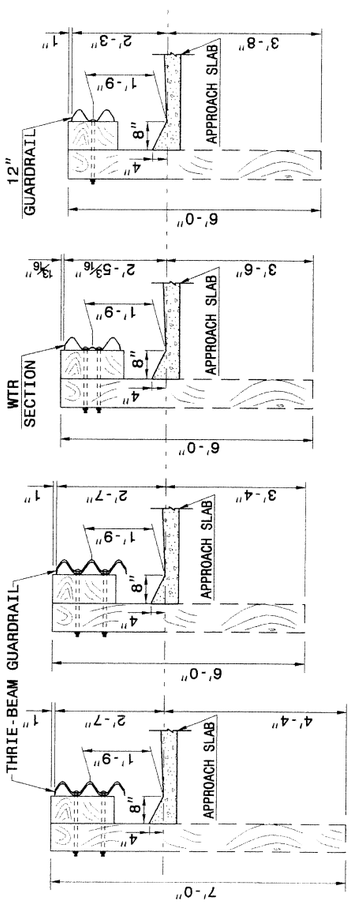
STATE OF
NORTH CAROLINA
DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
RALEIGH, N.C.



THRIE BEAM OFFSET BLOCK

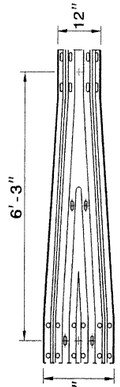


THRIE BEAM LINE POST

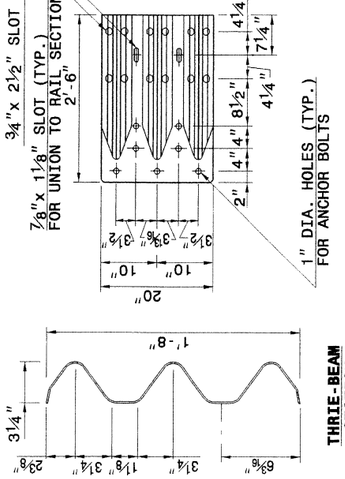


SECTION OF 'W' BEAM POST 9
SECTION OF WTR BEAM POST 8
SECTION OF THRIE BEAM POST 7
SECTION OF THRIE BEAM POSTS 1 THRU 6

NOTE: THE MID POST AND OFFSET BLOCK OF THE WTR SECTION WILL REQUIRE SPECIAL BOLT HOLE DRILLING IN THE THRIE BEAM OFFSET BLOCK AND LINE POST.



WTR SECTION
ELEVATION VIEW



END SHOE

THRIE-BEAM SECTION

DESIGN SERVICES UNIT
STANDARDS AND SPECIAL DESIGN
Office 919-250-4128 FAX 919-250-4119

SEE PLATE FOR TITLE

ORIGINAL BY:	2002 STANDARDS	DATE:	01-15-02
MODIFIED BY:	E.E. WARD	DATE:	04-07-04
CHECKED BY:		DATE:	
FILE SPEC:	c:\stds02\stdstodate\si\english\862d03.dgn		

PROJECT REFERENCE NO.	SHEET NO.
B-3530	3
R/W SHEET NO.	

Prepared in the Office of:
EARTH TECH
701 Corporate Center Drive, Suite 475
Raleigh, NC 27607
(919) 854-6200 - (919) 854-6259(FAX)

COMPUTED BY: DEL DATE: 8/20/2004

CHECKED BY: NJD DATE: 8/21/2004

PROJECT NO.	SHEET NO.
B-3530	3-A

C00026267

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

LIST OF PIPES, ENDWALLS, ETC. (FOR PIPES 48" & UNDER)

STATION	LOCATION (LT, RT, OR CL)	STRUCTURE NO. FROM	STRUCTURE NO. TO	TOP ELEVATION	INVERT ELEVATION	INVERT ELEVATION	SLOPE CRITICAL	CLASS III R.C. PIPE (UNLESS NOTED OTHERWISE) 12"	15"	18"	24"	30"	36"	42"	48"	BITUMINOUS COATED C.S. PIPE TYPE B (UNLESS NOTED OTHERWISE) .064 12"	.064 15"	.064 18"	.064 24"	.079 30"	.079 36"	.109 42"	.109 48"	15" SIDE DRAIN PIPE	18" SIDE DRAIN PIPE	24" SIDE DRAIN PIPE	ENDWALLS STD. 838.01 OR STD. 838.11 (UNLESS NOTED OTHERWISE) CU. YARDS R.C.P.	ENDWALLS STD. 838.01 OR STD. 838.11 (UNLESS NOTED OTHERWISE) CU. YARDS C.S.P.	QUANTITIES FOR DRAINAGE STRUCTURES "TOTAL L.F. FOR PAY QUANTITY SHALL BE COL. 24 + (1.3 X COL. B) PER EACH (0' THRU 5.0')	LIN. FT. A 5.0' THRU 10.0'	LIN. FT. B 10.0' AND ABOVE	C.B. STD. 840.01 OR STD. 840.02	FRAME, GRATES, AND HOOD STANDARD 840.03 TYPE OF GRATE E	F	G	D.I. STD. 840.14 OR STD. 840.15	D.I. FRAME AND GRATE STD. 840.16	M.D.I. TYPE "A" STD. 840.17 OR 840.26	M.D.I. TYPE "B" STD. 840.18 OR 840.27	M.D.I. TYPE "D" STD. 840.19 OR 840.28	M.D.I. FRAME WITH GRATE STD. 840.20	M.D.I. FRAME WITH TWO GRATES STD. 840.22	M.D.I. (N.S.) FRAME WITH GRATE STD. 840.24	M.D.I. (N.S.) FRAME WITH TWO GRATES STD. 840.24	J.B. STD. 840.31 OR 840.32	MANHOLE STD. 840.51	M.H. STD. 840.51 OR 840.53	M.H. FRAME AND COVER STD. 840.54	T.B.D.I. STD. 840.35	FRAMES AND NARROW SLOT FLAT GRATES STD. 840.29	CORR. STEEL ELBOWS NO. & SIZE	CONC. COLLARS CL. "B" C.Y. STD. 840.72	CONC. & BRICK PIPE PLUG, C.Y. STD. 840.71	PIPE REMOVAL LIN. FT.	REMARKS
-L- 16+66	LT	1		319.7						32																	1																			1	1				
	LT	1	2		317.45	315.80																																													
-L- 17+00	LT	2		319.60																							1																			1	1				
-L- 17+00	LT	2	3		315.60	315.00				12																																									
-L- 18+70	CL	4	4		314.60	313.20									200												4																								DOUBLE PIPE W / ENDWALL
SHEET TOTALS										44					200												4			2															2	2				

ABBREVIATIONS	
C.B.	CATCH BASIN
N.D.I.	NARROW DROP INLET
D.I.	DROP INLET
M.D.I.	MEDIAN DROP INLET
M.D.I.(N.S.)	MEDIAN DROP INLET (NARROW SLOT)
J.B.	JUNCTION BOX
M.H.	MANHOLE
T.B.D.I.	TRAFFIC BEARING DROP INLET
T.B.J.B.	TRAFFIC BEARING JUNCTION BOX

COMPUTED BY: DEL DATE: 8/14/04
CHECKED BY: NJD DATE: 8/14/24

PROJECT NO.	SHEET NO.
B-3530	3-B

C00026267

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

SUMMARY OF EARTHWORK

IN CUBIC YARDS

Station	Station	Uncl. Excav.	Embank. +%	Borrow	Waste
-L- 12+00	-L- 15+33	306	809	503	
-L- 16+33	-L- 21+55	635	709	74	
-DR1- 10+15	-DR1- 10+96	1	2	1	
SUBTOTAL		636	711	75	
PROJECT TOTAL		942	1520	578	
EST. 5% TO REPLACE TOPSOIL					
ON 'BORROW PIT				29	
GRAND TOTALS		942		607	
	SAY	1000		650	

-L- PAVEMENT STRUCTURE VOLUME = 130 CY
ESTIMATED UNDERCUT = 200 CY

APPROXIMATE QUANTITIES ONLY. UNCLASSIFIED EXCAVATION, BORROW EXCAVATION, SHOULDER BORROW, FINE GRADING, CLEARING AND GRUBBING, BREAKING OF EXISTING PAVEMENT, AND REMOVAL OF EXISTING PAVEMENT WILL BE PAID FOR AT THE CONTRACT LUMP SUM PRICE FOR "GRADING."

SUMMARY OF EXISTING ASPHALT PAVEMENT REMOVAL

LINE	Station	Station	LOC LT/RT/CL	YD^2
-L-	12+90	15+62.83	CL	659
-L-	16+02.66	19+00	CL	648
			SUBTOTAL	1307
			SAY	1400

"N" = DISTANCE FROM EDGE OF LANE TO FACE OF GUARDRAIL
TOTAL SHOULDER WIDTH = DISTANCE FROM EDGE OF TRAVEL LANE TO SHOULDER BREAK POINT.
FLARE LENGTH = DISTANCE FROM LAST SECTION OF PARALLEL GUARDRAIL TO END OF GUARDRAIL.
W = TOTAL WIDTH OF FLARE FROM BEGINNING OF TAPER TO END OF GUARDRAIL.
G = GATING IMPACT ATTENUATOR TYPE 350
NG = NON-GATING IMPACT ATTENUATOR TYPE 350

GUARDRAIL SUMMARY

LINE	BEG. STA.	END STA.	LOC.	LENGTH STRAIGHT	LENGTH SHOP CURVED	LENGTH DOUBLE FACED	WARRANT POINT APPR. END	WARRANT POINT TRAIL. END	"N" DIST FROM E.O.L.	TOTAL SHLDR WIDTH	FLAIR LENGTH APPR. END	FLAIR LENGTH TRAIL. END	W APPR. END	W TRAIL. END	ANCHORS XI MOD	ANCHORS III	ANCHORS GRAU 350	ANCHORS AT-1	ANCHORS TES	ANCHORS CAT-1	ANCHORS VI MOD	IMP. ATTEN. TYPE 350 EA	IMP. ATTEN. TYPE 350 G	IMP. ATTEN. TYPE 350 NG	REMOVE EXISTING GRDRAIL		REMARKS
-L-	14+32.25	15+19.75	LT	87.50				15+19.75	6.00	9.00		18.75		0.375		1	1										ROADWAY STANDARD 862.01 SH 3 OF 11
-L-	13+07.25	15+19.75	RT.	212.50			15+19.75		3.00	6.00	143.75		2.875			1	1										ROADWAY STANDARD 862.01 SH 3 OF 11
-L-	16+46.25	18+47	LT	187.50	37.5		16+46.25		6.00	9.00	162.49		2.00			1		1									SHOP CURVE GUARDRAIL RADIUS = 20 FT.
-L-	16+46.25	17+33.75	RT.	87.50				16+46.25	3.00	6.00		18.75		0.375		1	1										ROADWAY STANDARD 862.01 SH 3 OF 11
SUBTOTALS			SUBTOTALS	575.00	37.5											4	3	1									
		LESS ANCHOR DEDUCTIONS																									
		TYPE III	4 @ 18.75'	-75.00																							
		GRAU-350	3 @ 50'	-150.00																							
		AT-1	1 @ 6.25'	-6.25																							
			TOTALS	343.75	37.5											4	3	1									
			SAY	350.00	37.5											4	3	1									
			(5 ADDITIONAL POSTS)																								

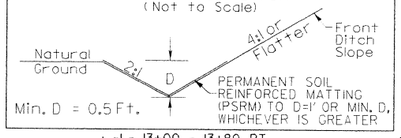
REVISIONS

PROJECT REFERENCE NO.	SHEET NO.
B-3530	4
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

Prepared in the Office of: EARTH TECH
701 Corporate Center Drive, Suite 475 Raleigh, NC 27607
(919) 854-6200 - (919) 854-6259 (FAX)

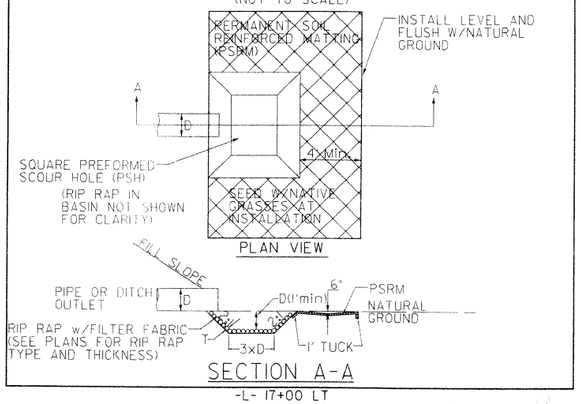
GRAPHIC SCALE
50 25 0 50 100
PLANS

DETAIL A
SPECIAL CUT DITCH
(Not to Scale)



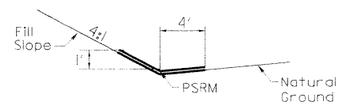
-L- 13+00 - 13+80 RT
-L- 18+50 - 19+50 RT

DETAIL B
PREFORMED SCOUR HOLE
(NOT TO SCALE)



-L- 17+00 LT

DETAIL C
TOE PROTECTION
(Not to Scale)



Type of Liner = Permanent Soil Reinforcement Mat

-L- 17+50 - 18+20 LT
-L- 20+50 - 21+10 LT

DETAIL SHOWING PAVEMENT-BRIDGE RELATIONSHIP

DATUM DESCRIPTION

THE LOCALIZED COORDINATE SYSTEM DEVELOPED FOR THIS PROJECT IS BASED ON THE STATE PLANE COORDINATES ESTABLISHED BY FOR MONUMENT "B3530-1" WITH NAD 83 STATE PLANE GRID COORDINATES OF NORTHING: 769323.579(ft) EASTING: 2167592.085(ft) THE AVERAGE COMBINED GRID FACTOR USED ON THIS PROJECT (GROUND TO GRID) IS: 0.99991200 THE N.C. LAMBERT GRID BEARING AND LOCALIZED HORIZONTAL GROUND DISTANCE FROM "B3530-1" TO -L- STATION 10+00.00 IS S 76° 37' 48.1" E 1,567.12 ALL LINEAR DIMENSIONS ARE LOCALIZED HORIZONTAL DISTANCES VERTICAL DATUM USED IS NGVD 29

-L-

PI Sta 13+90.47	PI Sta 21+32.11
Δ = 14° 16' 52.4" (LT)	Δ = 19° 24' 23.0" (RT)
D = 5° 43' 46.5"	D = 2° 29' 28.0"
L = 249.25'	L = 779.02'
T = 125.28'	T = 393.28'
R = 1,000.00'	R = 2,300.00'
Se = 0.06 FT./FT.	Se = 0.045 FT./FT.
R.O. = SEE PLANS	R.O. = SEE PLANS

-DRI-

PI Sta 10+52.88
Δ = 19° 48' 25.2" (LT)
D = 57° 17' 44.8"
L = 34.57'
T = 17.46'
R = 100.00'
Se = N.C.

/ FOR -L- PROFILE SEE SHEET 5
FOR -DRI- PROFILE SEE SHEET 5

DATE: 9/20/2004
TIME: 09:58:55

USER: wilson
DGN: C:\GEOPAK\B-3530\design\Plts\B3530_roy_x04.dgn
DRV: CURRENT (Cell=ROADWAY_PLAN_SHEET)

PROJECT REFERENCE NO.	SHEET NO.
B-3530	5
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

Prepared in the Office of: EARTH TECH
701 Corporate Center Drive, Suite 475
Raleigh, NC 27607
(919) 854-6200 - (919) 854-6259 (FAX)

-L-

BENCH MARK TBM-100
-L- STA 17+61.45
OFFSET 44.89' RT
EL= 315.52'
NAIL IN 8" GUM TREE

BENCH MARK TBM-101
-L- STA 18+66.08
OFFSET 32.21' LT
EL= 318.76'
NAIL IN 18" GUM TREE

BEGIN GRADE -L- STA.12+00.00
ELEV. 330.09

PI = 13+70.00
EL = 321.81'
K = 79
VC = 340'

BEGIN BRIDGE
-L- STA.15+31.75

END BRIDGE
-L- STA.16+34.25

END GRADE -L- STA.21+10.00
ELEV. 325.23

PI = 19+00.00
EL = 318.74'
K = 114
VC = 420'

(-)4.8702%
(-)3.5420%
(-)0.5800%
(-)0.5800%
(+)3.0921%
(+)4.1600%

BEGIN SPECIAL CUT DITCH
13+00 RT EL.324.2

END SPECIAL CUT DITCH
13+80 RT EL.320.5

DITCH RT.

-L- STA 18+58.94
-DRI- STA 11+08.49
EL=320.22

EX.24"

PROPOSED 2-42"

BEGIN SPECIAL CUT DITCH
18+50 RT EL.314.2

END SPECIAL CUT DITCH
19+50 RT EL.318.4

BRIDGE HYDRAULIC DATA

DESIGN DISCHARGE	=	1510 CFS
DESIGN FREQUENCY	=	25 YRS
DESIGN HW ELEVATION	=	316.1 FT
BASE DISCHARGE	=	2020 CFS
BASE FREQUENCY	=	100 YRS
BASE HW ELEVATION	=	316.8 FT
OVERTOPPING DISCHARGE	=	3890 CFS
OVERTOPPING FREQUENCY	=	500+ YRS
OVERTOPPING ELEVATION	=	320.0 FT
DATE OF SURVEY	=	4/28/2003
W.S. ELEVATION AT DATE OF SURVEY	=	311.5 FT

PIPE HYDRAULIC DATA
DRAINAGE STRUCTURE NO.3

DRAINAGE AREA	=	48.4 AC
DESIGN FREQUENCY	=	25 YRS
DESIGN DISCHARGE	=	63 CFS
DESIGN HW ELEVATION	=	317.3 FT
100 YEAR DISCHARGE	=	101 CFS
100 YEAR HW ELEVATION	=	318.3 FT
OVERTOPPING FREQUENCY	=	200 YRS
OVERTOPPING DISCHARGE	=	136 CFS
OVERTOPPING ELEVATION	=	319.5 FT

FOR -L- PLANVIEW SEE SHEET 4

-DRI-

PI = 10+96.50
EL = 320.76'

BEGIN GRADE
-DRI- STA.10+15.00
ELEV. = 319.75

END GRADE
-DRI- STA.10+88.50
ELEV. = 320.61

-L- STA 18+58.94
-DRI-STA 11+08.49
EL=320.22

(+)0.9383%
(+)3.2833%
(-)2.7500%
(+)1.5000%
(FLOPS)
(-)4.5000%

FOR -DRI- PLANVIEW SEE SHEET 4

PROJ. REFERENCE NO.	SHEET NO.
B-3530	X-1

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

CROSS-SECTION SUMMARY

NOTE: EMBANKMENT COLUMN INCLUDES BACKFILL FOR UNDERCUT

Station L	Uncl. Exc. (cu. yd.)	Embt (cu. yd.)
12+00.0000	0	0
12+50.0000	17	46
13+00.0000	32	54
13+50.0000	65	77
14+00.0000	52	113
14+50.0000	23	123
15+00.0000	8	132

Station L	Uncl. Exc. (cu. yd.)	Embt (cu. yd.)
16+50.0000	0	0
17+00.0000	0	116
17+50.0000	0	101
18+00.0000	4	73
18+50.0000	13	67
19+00.0000	47	65
19+50.0000	64	45
20+00.0000	58	40
20+50.0000	73	35
21+00.0000	101	28

Station Dr1	Uncl. Exc. (cu. yd.)	Embt (cu. yd.)
10+50.0000	1	3
TOTAL	558	1118

Approximate quantities only. Unclassified excavation, borrow excavation, shoulder borrow, fine grading, clearing and grubbing, breaking of existing pavement and removal of existing pavement will be paid for at the lump sum price for "Grading".

PROJ. REFERENCE NO.	SHEET NO.
B-3530	X-2
-L- RILEY HILL RD.	

0 10

14+00.0000

322.38 0.0600 0.0600 322.26 6:1 2:1

13+50.0000

324.20 0.0600 0.0600 323.67 6:1 2:1 324.97

13+00.0000

325.85 0.0600 0.0539 325.39 6:1 6:1 3:1 324.15

12+50.0000

327.81 VAR. 0.0600 0.0339 327.58 6:1 4:1 325.820

12+00.0000

330.09 EXISTING EXISTING 330.09 6:1 6:1 4:1 327.935

11+50.0000

332.95

330 320 340

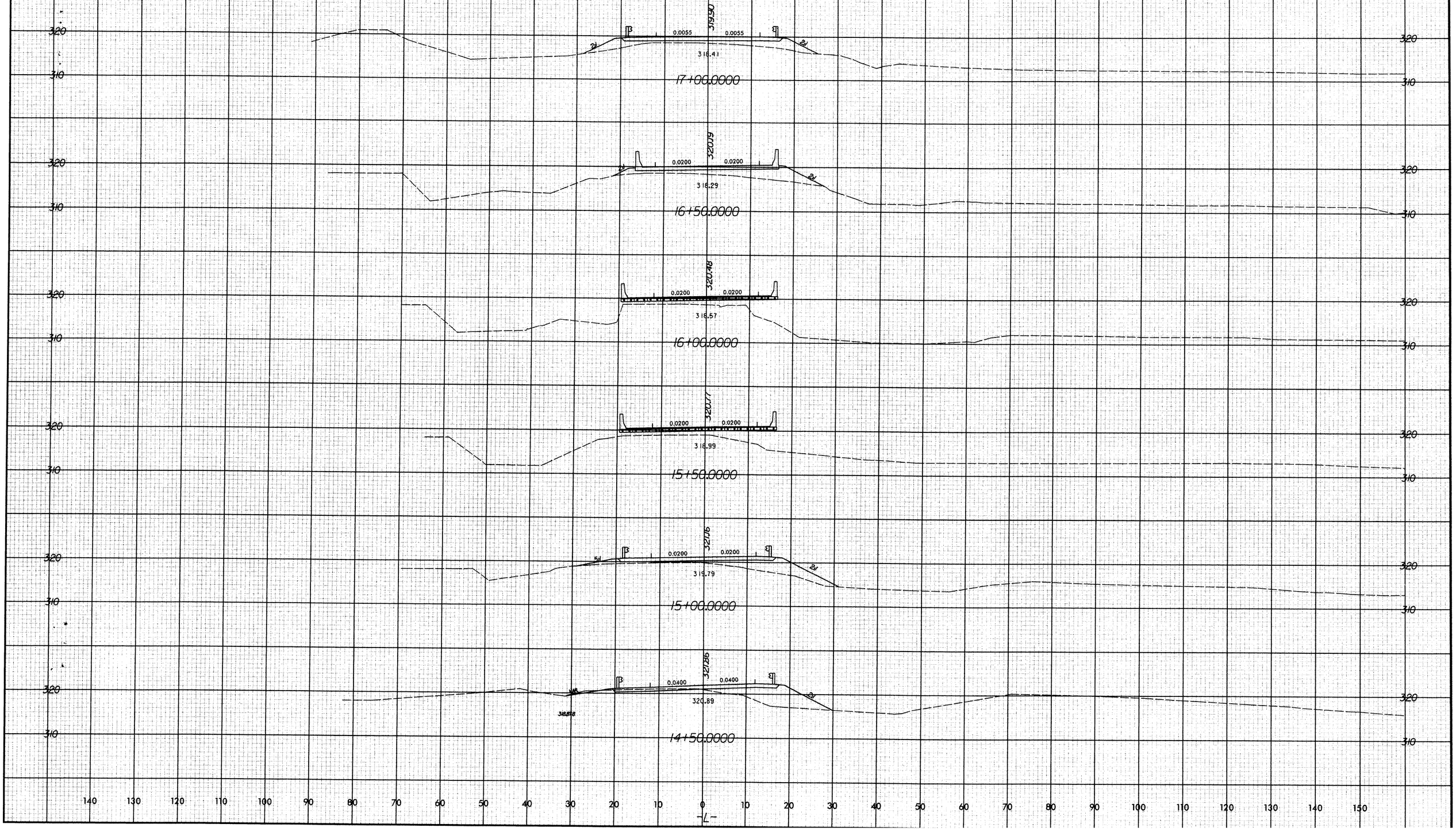
APPROXIMATE QUANTITIES ONLY. UNCLASSIFIED EXCAVATION, BORROW EXCAVATION, SHOULDER BORROW, FINE GRADING, CLEARING AND GRUBBING, BREAKING OF EXISTING PAVEMENT, AND REMOVAL OF EXISTING PAVEMENT WILL BE PAID FOR AT THE CONTRACT LUMP SUM PRICE FOR "GRADING."

140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

-L-

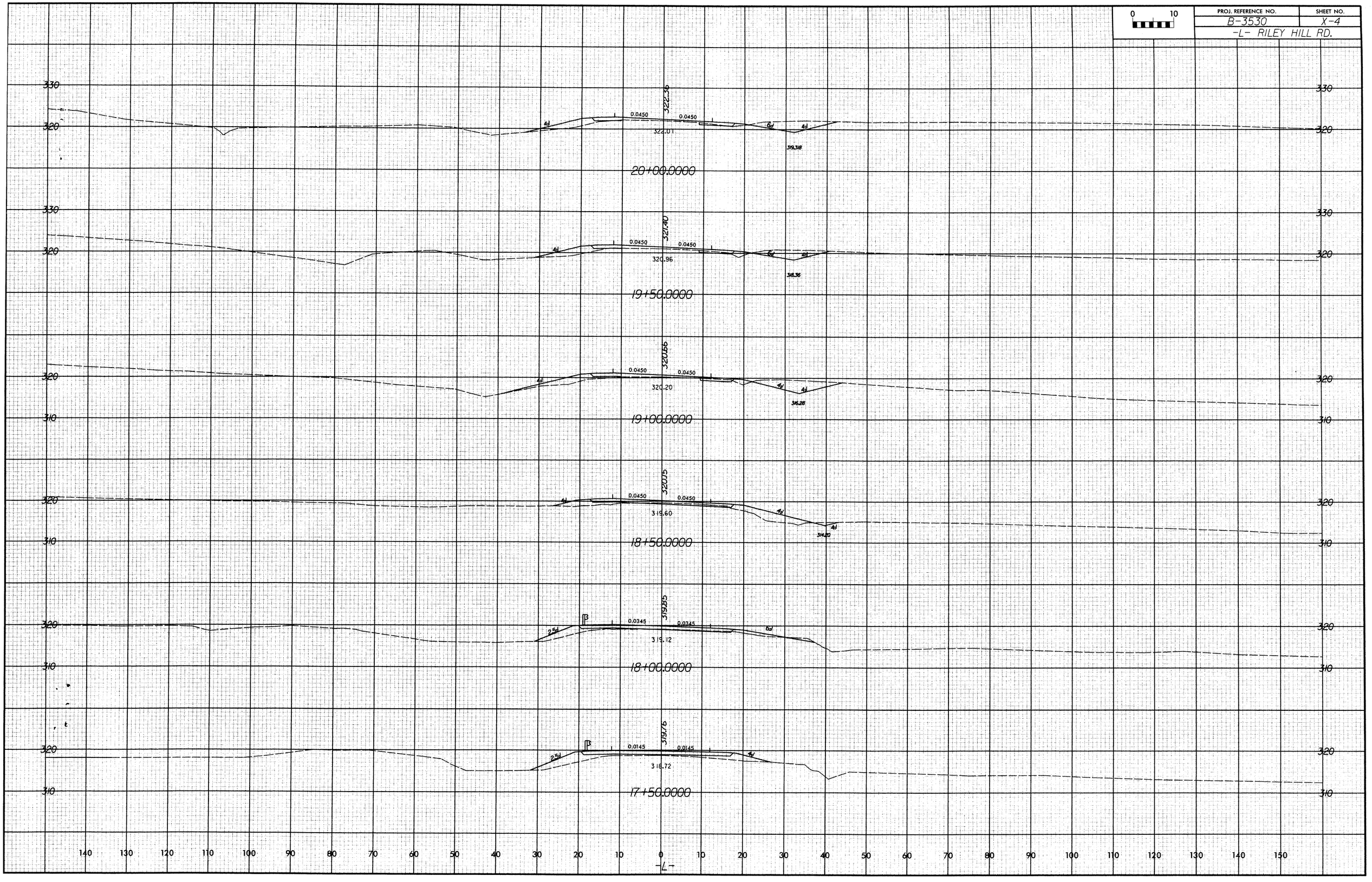
PROJ. REFERENCE NO.	SHEET NO.
B-3530	X-3
-L- RILEY HILL RD.	

0 10



PROJ. REFERENCE NO.	SHEET NO.
B-3530	X-4
-L- RILEY HILL RD.	

0 10



PROJ. REFERENCE NO.	SHEET NO.
B-3530	X-5
-L- RILEY HILL RD.	

0 10

326.49

21+50.0000

EXISTING EXISTING

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B-3530	X-6

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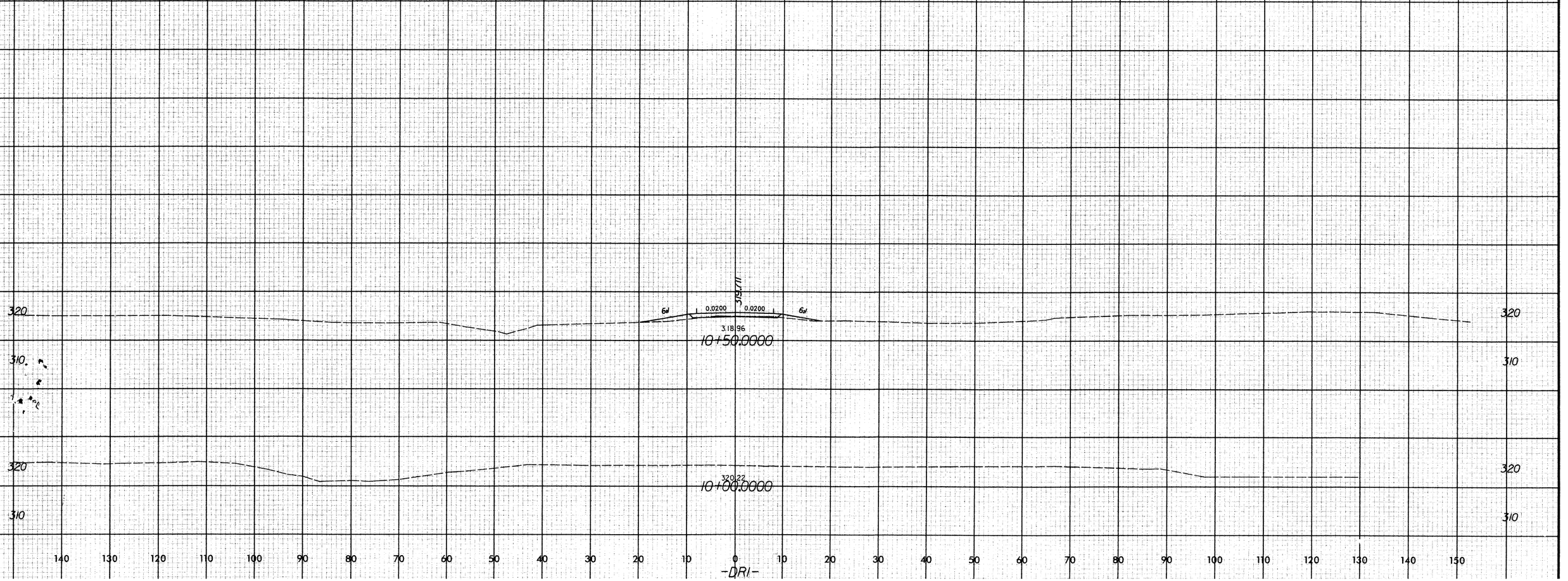

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

MICHAEL F. EASLEY
GOVERNOR

LYNDO TIPPETT
SECRETARY

August 02, 2002

Memorandum To: John Conforti, R.E.M., Project Manager
Consultant Engineering Unit

Attention: Lynn Smith, Permit Specialist

From: Tim Savidge, Section 7 Team

Subject: Freshwater mussel survey report for proposed Replacement of Bridge # 174 on SR 2320 over Buffalo Creek, Wake County TIP Project # B-3530.

The proposed project involves replacing Bridge # 174 over Buffalo Creek in Wake County. The federally Endangered dwarf-wedge mussel (*Alasmidonta heterodon*) is listed by the US Fish and Wildlife Service as occurring in Wake County. The dwarf-wedge mussel has been recorded in Buffalo Creek approximately 24 miles downstream in Johnston County. Bridge # 174 occurs just below the dam for Perry Pond. Below the bridge, Buffalo Creek is a braided channel running through a swamp, which is not typical habitat for the dwarf-wedge mussel. NCDOT Environmental Specialists Logan Williams and Sue Brady visited the project site on October 20, 2000. Surveys were conducted by wading using a batiscope from approximately (@) 300 feet downstream to the bridge. Two eastern elliptio mussels (*Elliptio complanata*) and 1 relict shell of the paper pondshell (*Utterbackia imbecillis*) were found in 1 man-hours of survey time. NCDOT Environmental Specialists Tim Savidge and Sharon Snider revisited the project site on August 01, 2002. Surveys were conducted from a point approximately 1000 feet downstream up to the bridge. Water depth was shallow < 2feet, and the water was turbid. Tactile methodology was used due to the poor visibility. Mussels were fairly uncommon (patchy distribution), but easily found. A total of 18 eastern elliptio mussels, 7 paper pondshell, 3 green lance (*Elliptio viridula*) and 1 Carolina slabshell (*Elliptio congaraea*) were found in 1.5 man-hours of survey time. The introduced Asian clam (*Corbicula fluminea*) was present, but rare (2 individuals). The aquatic snail the pointed campeloma (*Campeloma deceisum*) was abundant in the creek. The dwarf-wedge mussel was not found during the surveys.

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LOCATION:
TRANSPORTATION BUILDING
1 SOUTH WILMINGTON STREET
RALEIGH NC

Biological Conclusion: **No Effect**

Based on the survey results, it is apparent that the dwarf-wedge mussel does not occur in this reach of Buffalo Creek. Although this species has been recorded in Buffalo Creek at least 24 miles downstream of the project crossing, two impoundment's, Robertsons Pond and Wendell Lake occur between the subject crossing and the portion of Buffalo Creek that is occupied by the dwarf-wedge mussel. Because of the distance and the presence of two lakes between the subject project and occupied habitat, impacts to the population downstream are not anticipated. It can be concluded that project construction will not impact this species.

cc: V[redacted], Ph.D., Assistant Branch Manager
Brian Yamamoto, Unit Head

Wake County

SR 2320

Bridge No. 174 Over Buffalo Creek

Federal Aid Project No. BRZ-2320(2)

State Project 8.2407701

TIP Project No. B-3530

CATEGORICAL EXCLUSION

US DEPARTMENT OF TRANSPORTATION

FEDERAL HIGHWAY ADMINISTRATION

AND

NC DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

APPROVED:

8/5/02
DATE

for L. Gail Grimes, P.E., Assistant Manager
Project Development and Environmental Analysis Branch
NCDOT

8/6/02
DATE

Nicholas L. Graf, P.E.
for Division Administrator, FHWA

Wake County

SR 2320

Bridge No. 174 Over Buffalo Creek

Federal Aid Project No. BRZ-2320(2)

State Project 8.2407701

TIP Project No. B-3530

CATEGORICAL EXCLUSION

August 2002

Document Prepared by

EARTH TECH

A tyco INTERNATIONAL LTD. COMPANY

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REGISTERED ENVIRONMENTAL MANAGER JOHN G. CONFORTI REM 9766 NREP

SPECIAL PROJECT COMMITMENTS

Wake County
SR 2320
Bridge No. 174 Over Buffalo Creek
Federal Aid Project No. BRZ- 2320(2)
State Project 8. 2407701
TIP Project No. B-3530

In addition to the standard Nationwide Permit No. 23 Conditions, the General Nationwide Permit Conditions, Section 404 Only Conditions, Regional Conditions, State Consistency Conditions, NCDOT's Guidelines for Best Management Practices for Bridge Demolition and Removal, NCDOT's Guidelines for Best Management Practices for the Protection of Surface Waters, General Certification Conditions, and Section 401 Conditions of Certification, the following special commitments have been agreed to by NCDOT:

Project Development and Environmental Analysis Branch:

The stream impacts associated with the project will likely be lower than the 150 linear-foot (45.7 m) threshold. If it becomes apparent during final design that more than 150 linear feet (45.7 m) of stream will be impacted, mitigation measures will be considered.

Wake County
SR 2320
Bridge No. 174 Over Buffalo Creek
Federal Aid Project No. BRZ- 2320(2)
State Project 8. 2407701
TIP Project No. B-3530

INTRODUCTION: Bridge No. 174 is included in the 2002–2008 North Carolina Department of Transportation (NCDOT) Transportation Improvement Program (TIP) and in the Federal Aid Bridge Replacement Program. The location is shown in **Figure 1**. No substantial environmental impacts are anticipated. The project is classified as a Federal "Categorical Exclusion".

I. PURPOSE AND NEED

NCDOT Bridge Maintenance Unit records indicate the bridge has a sufficiency rating of 39 out of a possible of 100 for a new structure. The bridge is considered structurally deficient and functionally obsolete. The replacement of this inadequate structure will result in safer and more efficient traffic operations.

II. EXISTING CONDITIONS

SR 2320 (Riley Hill Road) in Wake County is classified as "Rural Minor Collector" in the Statewide Functional Classification System.

Through the project area, SR 2320 has 18-foot (5.5-meter [m]) wide pavement with 5-foot (1.5 m) unstabilized shoulders. The right-of-way is 60 feet (18.3 m) wide. SR 2320 has good vertical and horizontal alignment at the immediate bridge location. The posted speed limit on SR 2320 is 45 miles per hour (72 kilometers per hour) near the bridge.

The existing bridge was constructed in 1960. The superstructure consists of a timber floor on a steel girder floor beam system. The substructure consists of timber caps on timber piles encased in concrete. The abutments are vertical. The existing bridge consists of one 40.5-foot (12.3 m) span and the clear roadway width is 24.4 feet (7.4 m). The crown of the roadway is situated approximately 8 feet (2.4 m) over the bed of Buffalo Creek. Presently, the posted weight limit is 17 tons for single vehicles and 21 tons for trucks with trailers. The bridge is located in a tangent section of SR 2320 and crosses Swift Creek at approximately 90 degrees. Photographs of the approaches to the existing bridge are shown in **Figure 4**.

The average daily traffic volume on SR 2320 at Bridge No. 174 is approximately 7,400 vehicles per day in 2002. By the design year 2025, the average daily traffic volume is expected to increase to 12,200 vehicles per day. The projected traffic volume includes two percent dual-tired vehicles and one percent truck-tractor semi-trailers. Four school buses each cross the bridge two times daily. SR 2320 is not a designated bicycle route.

Four crashes were reported within 1000 feet (305 m) of Bridge No. 174 in the period between January 1, 1998 and December 31, 2000.

1. Pedestrian collision approximately 370 feet (113 m) from the bridge.

2. Animal collision approximately 210 feet (64 m) from the bridge.

3. Single vehicle ran off the road to the right at one of the bridge approaches. The vehicle's estimated travel speed was 60 mph (posted speed limit is 45 mph).

An underground telephone line is located along the south side of SR 2320. A dam is located just north of the existing bridge.

III. ALTERNATIVES

A. Project Description

The project replaces the existing bridge over Buffalo Creek with a bridge at approximately the same location. The bridge will have two 12-foot (3.6 m) lanes with 8-foot (2.4 m) shoulders. The approaches will have two 12-foot (3.6 m) lanes with 8-foot (2.4 m) shoulders, 4 feet (1.2 m) of the shoulders being paved. **Figure 3** shows the typical cross-sections of the roadway approaches and bridge. The proposed design speed is 50 mph.

B. Detailed Study Alternatives

Three alternatives were carried forward for detailed study in this Categorical Exclusion. **Figure 2** shows sketches of all the alternatives listed below.

Alternative 1 replaces the bridge on the existing alignment with a bridge, while using an off-site detour to maintain traffic during construction. The off-site detour consists of SR 2320, SR 2321 (Riley Hill Secondary Road), and SR 1003. The total off-site detour length is approximately 5 miles (8 km). The off-site detour would require motorist to travel an additional 0.7-mile. **Figure 1** shows the proposed detour.

Alternative 2 replaces the bridge on the existing alignment with a bridge, while using three temporary 72-inch (1.8 m) diameter pipes that are each 64 feet (19.5 m) long to facilitate an on-site detour south of the existing bridge to maintain traffic during construction.

Alternative 3 replaces the bridge to the south (downstream) of the existing location with a bridge and will re-align the roadway. Traffic will be maintained during construction on the existing bridge.

C. Alternatives Eliminated from Further Study

No Action. This alternative consists of short-term minor reconstruction and maintenance activities that are part of an ongoing plan for continuing operation of the existing bridge and roadway system in the project area. Many of the structural elements are decaying or corroding. Decay and corrosion has already reduced the bridge's safe load-bearing capacity. Although further maintenance activities will slow the decay, closing the bridge will eventually be necessary.

The replacement of the existing bridge with a culvert was considered but eliminated from consideration due to the presence of a Natural Heritage Program-designated Coastal Plain Small Stream Swamp and the Neuse River Buffer Rules. A bridge will serve to minimize impacts to buffer and natural area.

D. Preferred Alternative

Alternative 1, replacing the existing bridge on the existing alignment while using an off-site detour to maintain traffic during construction, is the preferred alternative. **Alternative 1** was selected because it has the least right-of-way impacts and relocation impacts (**Alternative 3** has 2 relocations), the least terrestrial and riparian buffer impacts, and the lowest right-of-way and construction costs of all the alternatives.

IV. ESTIMATED COSTS

Construction and right-of-way cost estimates for the alternatives studied are presented below in **Table 1**.

Table 1: Estimated Costs

	Preferred Alternative 1	Alternative 2	Alternative 3
Structure Removal	$8,272	$8,272	$8,272
Structure	$146,020	$146,020	$121,940
Roadway Approaches	$151,490	$151,490	$700,800
Detour Structure & Approaches	NA	$325,775	NA
Miscellaneous and Mobilization	$137,218	$283,443	$373,988
Engineering and Contingencies	$82,000	$160,000	$195,000
Right-of-way/Utilities/Relocations	$37,000	$91,850	$160,100
Total Cost of Alternative	**$562,000**	**$1,166,850**	**$1,560,100**

The estimated cost of the project, as shown in the 2002-2008 Transportation Improvement Program, is $483,000, including $33,000 for right-of-way and $390,000 for construction. Right-of-way acquisition is scheduled for Federal Fiscal Year 2002, with construction to follow in Federal Fiscal Year 2003.

V. NATURAL RESOURCES

An evaluation of natural resources in the immediate area of potential project impact was performed. The evaluation included: 1) an assessment of biological features in the vicinity of the existing roadway including descriptions of vegetation, wildlife, protected species, wetlands, and water quality issues; 2) an evaluation of probable impacts resulting from construction; and 3) a preliminary determination of permit needs and conceptual mitigation options. The information included in this report was taken from the Natural Resources Technical Report, which is on file in the Project Development and Environmental Analysis Branch.

A. Methodology

Published information and resources were collected prior to the field investigation. Information sources used to prepare this report include the following:

- United States Geological Survey (USGS) quadrangle map (Knightdale, 1981)
- United States Fish and Wildlife Service (USFWS) National Wetlands Inventory (NWI) Map (Knightdale, 1987)
- NCDOT aerial photograph of project area (1:1200)
- Soil Survey of Wake County Area (Natural Resources Conservation Service [NRCS] 1970)
- North Carolina Department of Environment and Natural Resources (NCDENR) basin-wide assessment information (NCDENR, 1996)
- USFWS list of protected and candidate species

- North Carolina Natural Heritage Program (NHP) files of rare species and unique habitats

Water resource information was obtained from publications posted on the World Wide Web by NCDENR Division of Water Quality (DWQ). Information concerning the occurrence of federally protected species in the study area was obtained from the USFWS list of protected and candidate species (March 2002), posted on the World Wide Web by the Ecological Services branch of the USFWS office in North Carolina. Information concerning species under state protection was obtained from the NHP database of rare species and unique habitats. NHP files were reviewed for documented sightings of species on state or federal lists and locations of significant natural areas.

A general field survey was conducted along the proposed project route by Earth Tech biologists on August 22, 2000. Water resources were identified and their physical characteristics were recorded. For the purposes of this study, a brief habitat assessment was performed within the project area of Buffalo Creek. Plant communities and their associated wildlife were identified using a variety of observation techniques, including active searching, visual observations, and identifying characteristic signs of wildlife (sounds, tracks, scats, and burrows). Terrestrial community classifications generally follow Schafale and Weakley (1990) where appropriate and plant taxonomy follows Radford et al. (1968). Vertebrate taxonomy follows Potter et al. (1980), Martof et al. (1980), and Webster et al. (1985). Vegetative communities were mapped using aerial photography of the project site. Predictions regarding wildlife community composition involved a general qualitative habitat assessment based on existing vegetative communities.

Jurisdictional wetlands, if present, were delineated and evaluated based on criteria established in the U.S. Army Corps of Engineers Wetlands Delineation Manual (USACE, 1987). Wetlands were classified based on Cowardin et al. (1979).

B. Physiography and Soils

The project area lies in the east-central portion of North Carolina within the Piedmont physiographic province. Elevations in the project area are approximately 315 feet (96.0 m) above mean sea level (National Geodetic Vertical Datum, 1929). The topography of the project vicinity is gently rolling with moderate slopes rising from both riverbanks.

The proposed project is in a rural area in Wake County approximately 4.8 miles (7.7 km) south of Rolesville, NC. Wake County's major economic resource is light industry. The population of Wake County in 1990 was 592,218 (North Carolina Office of State Budget, Planning and Management 1999).

Information about soils in the project area was taken from the Soil Survey of Wake County, North Carolina (USDA, 1970). The map units in the project area are Appling sandy loam, Durham loamy sand, and Wehadkee soils.

- Appling sandy loam is mapped on both sides of Buffalo Creek within the project area. These soils are sloping to strongly sloping and well drained. Although strongly acid, with fertilization many crops can be grown in Appling soils. Appling soils do not commonly have hydric inclusions. The depth to the seasonally high water table is greater than 10 feet (3.0 m).

- Durham loamy sand is mapped on the north side of Riley Hill Road immediately east of the pond within the project area. Durham soils are well drained and are found on rounded low elevation divides. These soils are suitable for many types of farming and much of the acreage is in cultivation. Durham soils do not commonly have hydric inclusions. The depth to the seasonally high water table is greater than 10 feet (3.0 m).

- Wehadkee soils are mapped in the Buffalo Creek bed and floodplain within the project area. This soil is commonly flooded for long periods of time. Wehadkee soil is nearly level and drains slowly. The seasonal high water table is at the surface. Most areas of Wehadkee are forested. Wehadkee is classified as a hydric soil and may also have some hydric inclusions of Bibb and Roanoke soils.

Site index is a measure of soil quality and productivity. The index is the average height, in feet, that dominant and co-dominant trees of a given species attain in a specified number of years (typically 50). The site index applies to fully-stocked, even-aged, unmanaged stands. The soils in the project area have the following site indices:

- The Appling and Durham soils have a site index of 75 to 85 for loblolly pine (Pinus taeda) and yellow poplar (Liriodendron tulipifera).

- The Wehadkee soils have a site index of 85 to 95 for loblolly pine (Pinus taeda) and 85 to 100 for yellow poplar (Liriodendron tulipifera).

C. Water Resources

This section contains information concerning water resources likely to be impacted by the proposed project. Water resources assessments include the physical characteristics likely to be impacted by the proposed project (determined by field survey), best usage classifications, and water quality aspects of the water resources. Probable impacts to surface waters are also discussed, as well as means to minimize impacts.

1. Waters Impacted

The project is located in the Neuse River basin (NEU06 sub-basin, Hydrologic Unit Code 03020201). Buffalo Creek originates about 3.3 miles (5.2 km) north of the project area. Immediately upstream of the current bridge location, Buffalo Creek is dammed to form Perry Pond (1.8 acres). From the project area, the creek meanders in a southerly direction about 23 miles (37.0 km) to its confluence with the Little River.

2. Water Resource Characteristics

Buffalo Creek is approximately 15 feet (4.6 m) wide in the study area and flows south in the project area, forming small riffle-pool sequences. The substrate of Buffalo Creek at this point consists of about 80 percent coarse sand and gravel and about 20 percent medium sized cobbles. Cypress knees protrude along the banks and in the creek bed. The water was brown and semi-opaque the day of the site visit. The depth ranged from about one foot (30 cm) in pools to less than 6 inches (15 cm) in the riffles.

Both banks are about 18 inches (46 cm) high and are indistinct in places. Natural levees are not present. The floodplain is low and flat with a few shallow depressions and sloughs. The creek is about 50 percent shaded by scattered trees growing on and behind the bank tops. Cypress knees, trees, and herbaceous vegetation grow along the creek bank.

A small non-jurisdictional drain enters the project area from the northeast and crosses under the road in a culvert about 260 feet (79.2 m) east of bridge No. 174. The drain then continues parallel to the road and empties into Buffalo Creek 20 feet (6.1 m) downstream of the bridge. In addition, a non-jurisdictional swale forms a loop on the east side of Buffalo Creek. No water was observed in the swale at the time of the site visit.

Surface waters in North Carolina are assigned a classification by the DWQ that is designed to maintain, protect, and enhance water quality within the state. Buffalo Creek [Index # 27-57-16-(1)] is classified as a *C NSW* water body (NCDENR, 1999). The Class C designation refers to waters protected for secondary recreation and aquatic life propagation and survival. Secondary recreation includes wading, boating, and other uses involving human body contact with water where such activities take place in an infrequent, unorganized, or incidental manner. There are no restrictions on watershed development activities.

"NSW" refers to nutrient sensitive waters. These waters require additional nutrient management to control excessive vegetative and algal growth. In general, pollution controls require no increase in nutrients above background levels.

No waters classified as High Quality Water (HQW), Water Supply I or II, or Outstanding Resource Waters (ORW) occur within 1.0 mile (1.6 km) of the project study area.

3. Anticipated Impacts to Water Resources

Any action that affects water quality can adversely affect aquatic organisms. Temporary impacts during the construction phases may result in long-term impacts to the aquatic community. In general, replacing an existing structure in the same location with an off-site detour is the preferred environmental approach. Bridge replacement at a new location results in more severe impacts, and physical impacts are incurred at the point of bridge replacement.

Project construction may result in the following impacts to surface water resources:

- Increased sediment loading and siltation as a consequence of watershed vegetation removal, erosion, and/or construction.
- Decreased light penetration/water clarity from increased sedimentation.
- Changes in water temperature with vegetation removal.
- Changes in the amount of available organic matter with vegetation removal.
- Increased concentration of toxic compounds from highway runoff, construction activities and construction equipment, and spills from construction equipment.
- Alteration of water levels and flows as a result of interruptions and/or additions to surface and groundwater flow from construction.

Construction impacts may not be restricted to the communities in which the construction activity occurs, but may also affect downstream communities. Efforts will be made to ensure that no sediment leaves the construction site. NCDOT's Best Management Practices for the Protection of Surface Waters will be implemented, as applicable, during the construction phase of the project to ensure that no sediment leaves the construction site.

4. Impacts Related to Bridge Demolition and Removal

Demolition and removal of a highway bridge over Waters of the United States requires a permit from the U.S. Army Corps of Engineers. Effective 9/20/99, this permit is included with the permit for bridge reconstruction. The permit application henceforth will require disclosure of demolition methods and potential impacts to the body of water in the planning document for the bridge reconstruction.

Section 402-2 "Removal of Existing Structures" of NCDOT's Standard Specifications for Roads and Structures stipulates that "excavated materials shall not be deposited...in rivers, streams, or impoundments", and "the dropping of parts or components of structures into any body of water will not be permitted unless there is no other practical method of removal. The removal from the water of any part or component of a structure shall be done so as to keep any resulting siltation to a minimum." To meet these specifications, NCDOT shall adhere to Best Management Practices for the Protection of Surface Waters, as supplemented with Best Management Practices for Bridge Demolition and Removal.

In addition, all in-stream work shall be classified into one of three categories as follows:

Case 1) In-water work is limited to an absolute minimum, due to the presence of Outstanding Resource Waters or threatened and/or endangered species, except for the removal of the portion of the sub-structure below the water. The work is carefully coordinated with the responsible agency to protect the Outstanding Resource Water or T&E species.

Case 2) No work at all in the water during moratorium periods associated with fish migration, spawning, and larval recruitment into nursery areas.

Case 3) No special restrictions other than those outlined in Best Management Practices for Protection of Surface Waters and supplements added by the Bridge Demolition and Removal document, dated 9/20/99.

Buffalo Creek in the vicinity of the proposed project is a Class C water, and is awarded no special protection. Therefore, Case 3 applies to the proposed replacement of Bridge No. 174 over Buffalo Creek.

The superstructure consists of a timber deck on top of a timber floor / steel girder floor beam system. The substructure consists of end bents and internal bents constructed from timber piles encased in concrete. The maximum potential fill is 4.74 cubic yards (3.62 m^3).

D. Biotic Resources

Terrestrial and aquatic communities are included in the description of biotic resources. Living systems described in the following sections include communities of associated plants and animals. These descriptions refer to the dominant flora and fauna in each community and the relationships of these biotic components. Descriptions of the terrestrial systems are presented in the context of plant community classifications. Representative animal species that are likely to occur in these habitats (based on published range distributions) are also cited. Scientific nomenclature and common names (when applicable) are used for the

plant and animal species described. Subsequent references to the same species are by the common name only.

1. Plant Communities

Three plant (terrestrial) communities were identified within the project area: a disturbed roadside community, a floodplain forest, and a maintained landscape. Dominant faunal components associated with these terrestrial areas will be discussed in each community description. Many species are adapted to the entire range of habitats found along the project alignment, but may not be mentioned separately in each community description.

a. Disturbed Roadside Community

This community covers the area adjacent to the road shoulders in the project area. Woody vegetation is cut back on a periodic basis to keep the roadway clear. Species include red maple (*Acer rubrum*), sweetgum (*Liquidambar styraciflua*), American elm (*Ulmus americana*), poison ivy (*Toxicodendron radicans*), trumpet creeper (*Campsis radicans*), Japanese honeysuckle (*Lonicera japonica*), and a goldenrod (*Solidago* sp.).

The animal species present in these disturbed habitats are opportunistic and capable of surviving on a variety of resources, ranging from vegetation to both living and dead faunal components. Northern mockingbird (*Mimus polyglottos*), starling (*Sturnus vulgaris*), and American robin (*Turdus migratorius*) are common birds that use these habitats. The area may also be used by the Virginia opossum (*Didelphis virginiana*), various species of mice (*Peromyscus* sp.), Eastern garter snake (*Thamnophis sirtalis*), and American toad (*Bufo americanus*).

b. Floodplain Forest Community

This community occurs along the banks of Buffalo Creek. Canopy species include bald cypress (*Taxodium distichum*), red maple, loblolly pine (*Pinus taeda*), American elm, and sweetgum. The understory includes American holly (*Ilex opaca*), musclewood (*Carpinus caroliniana*), sweetbay (*Magnolia virginiana*), and dogwood (*Cornus* amomum*)*. Herbaceous species present include false nettle (*Boehmeria cylindrica*), cardinal flower (*Lobelia cardinalis*), spotted jewelweed (*Impatiens capensis*), lizard's tail (*Saururus cernuus*), and netted chain-fern (*Woodwardia areolata*). This community probably represents a marginal example of a Coastal Plain Small Stream Swamp (Brownwater Subtype) as described by Schafale and Weakley (1990). The TNC classification is most likely I.C.3.N.b.060 *Pinus taeda – Quercus (pagoda, michauxii, shumardii)* Temporarily Flooded Forest Alliance. This community has also been identified by the Natural Heritage Program as an important Coastal Plain Small Stream Swamp.

Small isolated pockets of hydric soil occur within the floodplain forest community. The individual pockets of hydric soil are generally 50 square feet (230 m^2) in size. These areas occupy less than one-tenth of an acre of the project area.

Raccoon (*Procyon lotor*) and beaver (*Castor canadensis*) may be expected here, along with belted kingfisher (*Megaceryle alcyon*), Carolina wren (*Thryothorus ludovicianus*), and eastern box turtle (*Terrapene carolina*).

c. Maintained Landscape

This community occurs outside of the Buffalo Creek floodplain throughout the project area. It consists of residential lawns, agricultural fields, and pasture. Residential lawns are found on both sides of Riley Hill Rd. east of Buffalo Creek. Scattered trees and ornamental shrubs are located in the lawns. The agricultural field on the south side of Riley Hill Rd. near the eastern extent of the project area was planted in soybeans. The pasture located in the southwestern portion of the project area contains scattered open grown hardwoods.

Bird species likely to inhabit this community include tufted titmouse (*Parus bicolor*), and Carolina chickadee (*Parus carolinensis*). Other inhabitants may include eastern chipmunk (*Tamias striatus*), gray squirrel (*Sciurus carolinensis*), and black rat snake (*Elaphe obsoleta*).

2. Aquatic Communities

Within the project area, Buffalo Creek is a mid-gradient, second-order stream. The bed material consists of coarse sand and gravel, and cobbles, with a small percentage of silt. On the day of the site visit, the water was coffee colored with suspended sediment. The riparian community is mostly deciduous trees. No aquatic vegetation was seen rooted in the creek bed.

3. Anticipated Impacts to Biotic Communities

Project construction will have various impacts to the previously described terrestrial and aquatic communities. Any construction activities in or near these resources have the potential to impact biological functions. This section quantifies and qualifies potential impacts to the natural communities within the project area in terms of the area impacted and the plants and animals affected. Temporary and permanent impacts are considered here along with recommendations to minimize or eliminate impacts.

a. Terrestrial Communities

Terrestrial communities in the project area will be impacted permanently by project construction from clearing and paving. Estimated impacts are based on

the length of the alternate and the entire study corridor width. Alternative 1 is 100 feet (30.5 m) wide and 2,088 feet (636.4 m) long. Alternative 2 is 100 feet (30.5 m) wide, 2,088 feet (636.4 m) long for the replacement, and 1,147 feet (349.6 m) long for the detour. Alternative 3 is 100 feet (30.5 m) wide and 2,106 feet (641.9 m) long. **Table 2** describes the potential impacts to terrestrial communities by habitat type. Because impacts are based on the entire study corridor width, the actual loss of habitat will likely be less than the estimate.

Table 2: Estimated Area of Impact to Terretrial Communities

	Area of Impact in Acres (Hectares)					
	Alternative 1		Alternative 2		Alternative 3	
Community	Temp.	Perm.	Temp.	Perm.	Temp.	Perm.
Maintained Roadside	0.0 (0.0)	0.3 (0.1)	0.3 (0.1)	0.3 (0.1)	0.0 (0.0)	0.4 (0.2)
Floodplain Forest	0.0 (0.0)	0.4 (0.1)	1.0 (0.4)	0.4 (0.1)	0.0 (0.0)	1.2 (0.5)
Maintained Landscape	0.0 (0.0)	0.0 (0.0)	0.7 (0.3)	0.0 (0.0)	0.0 (0.0)	2.5 (1.0)
Total Impact	**0.0** (0.0)	**0.7 (0.2)**	**2.0 (0.8)**	**0.7 (0.2)**	**0.0** (0.0)	**4.1 (1.7)**

Destruction of natural communities along the project alignment will result in the loss of foraging and breeding habitats for the various animal species that utilize the area. Animal species will be displaced into surrounding communities. Adult birds, mammals, and some reptiles are mobile enough to avoid mortality during construction. Young animals and less mobile species, such as many amphibians, may suffer direct loss during construction. The plants and animals that are found in the upland communities are generally common throughout the piedmont of North Carolina.

Impacts to terrestrial communities, particularly in locations having steep to moderate slopes, can result in the aquatic community receiving heavy sediment loads as a consequence of erosion. Construction impacts may not be restricted to the communities in which the construction activity occurs, but may also affect downstream communities. Efforts should be made to ensure that no sediment leaves the construction site.

b. Wetland Communities

The Knightdale, NC NWI map shows a palustrine forested seasonally flooded wetland occupying the floodplain of Buffalo Creek in the proposed project area. However, no jurisdictional wetlands were observed the day of the site visit. Buffalo Creek meets the definition of surface waters, and is therefore classified as Waters of the United States. The channel is 15 feet (4.6 m) wide within the project area.

c. Aquatic Communities

Impacts to aquatic communities include fluctuations in water temperatures as a result of the loss of riparian vegetation. Shelter and food resources, both in the

aquatic and terrestrial portions of these organisms' life cycles, will be affected by losses in the terrestrial communities. The loss of aquatic plants and animals will affect terrestrial fauna, which rely on them as a food source.

Temporary and permanent impacts to aquatic organisms may result from increased sedimentation. Aquatic invertebrates may drift downstream during construction and recolonize the disturbed area once it has been stabilized. Sediments have the potential to affect fish and other aquatic life in several ways, including the clogging and abrading of gills and other respiratory surfaces, affecting the habitat by scouring and filling of pools and riffles, altering water chemistry, and smothering different life stages. Increased sedimentation may cause decreased light penetration through an increase in turbidity.

Wet concrete should not come into contact with surface water during bridge construction. Potential adverse effects can be minimized through the implementation of NCDOT *Best Management Practices for Protection of Surface Waters*. Erosion control methods will be implemented as included in *NCDOT's Best Management Practices for Protection of Surface Waters* and *Erosion and Sediment Control Guidelines*.

E. Special Topics

1. "Waters of the United States": Jurisdictional Issues

Wetlands and surface waters fall under the broad category of "Waters of the United States" as defined in 33 CFR § 328.3 and in accordance with provisions of Section 404 of the Clean Water Act (33 U.S.C. 1344). The U.S. Army Corps of Engineers (USACE) regulates these waters. Any action that proposes to dredge or place fill material into surface waters or wetlands falls under these provisions.

No wetlands will be impacted by the project.

Project construction cannot be accomplished without infringing on the surface waters. Anticipated surface water impacts fall under the jurisdiction of the USACE and the DWQ. Within the project area, Buffalo Creek is 15 feet (4.6 m) wide. Assuming a study corridor of 100 feet (30.5 m) for each alternative, the construction of the new bridge will impact 100 linear feet (30.5 m) of stream, and a total area of 1500 square feet (139.4 sq m) of surface waters.

2. Permits

Impacts to jurisdictional surface waters are anticipated from the proposed project. Permits and certifications from various state and federal agencies may be required prior to construction activities.

Construction is likely to be authorized by Nationwide Permit (NWP) No. 23, as promulgated under 61 FR 2020, 2082; January 15, 2002. This permit authorizes activities undertaken, assisted, authorized, regulated, funded, or financed in whole or in part, by another Federal agency or department where that agency or department has determined that, pursuant to the Council on Environmental Quality Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act:

- the activity, work, or discharge is categorically excluded from environmental documentation because it is included within a category of actions which neither individually nor cumulatively have a significant effect on the human environment; and
- the Office of the Chief Engineer has been furnished notice of the agency's or department's application for the categorical exclusion and concurs with that determination.

This project will also require a 401 Water Quality Certification or waiver thereof, from the Department of Environment and Natural Resources (DENR) prior to issuance of the NWP 23. Section 401 of the Clean Water Act requires that the state issue or deny water certification for any federally permitted or licensed activity that results in a discharge into Waters of the U.S. Final permit decision rests with the USACE.

Because this project will likely be authorized under a Nationwide Permit, mitigation for impacts to surface waters may or may not be required by the USACE. In accordance with the Division of Water Quality Wetland Rules [15A NCAC 211 .0506 (h)] "Fill or alteration of more than one acre of wetlands will require compensatory mitigation; and fill or alteration of more than 150 linear feet of streams may require compensatory mitigation." Because wetland impacts will be less than an acre, wetland mitigation likely will not be required. A total of 100 linear feet (30.5 m) of Buffalo Creek is located in the study area. If the final length of stream impact is greater than 150 linear feet (45.6 m), compensatory mitigation may be required.

3. Buffer Rules

Pursuant to 15 NCAC 2B .0233, Riparian Area Rules for Nutrient Sensitive Waters in the Neuse River Basin apply to this project. The rules state that roads, bridges, stormwater management facilities, ponds, and utilities may be allowed within the 50-foot riparian buffer area of subject streams where no practical alternative exists. They also state that these structures shall be located, designed, constructed, and maintained to have minimal disturbance, to provide maximum erosion protection, to have the least adverse effects on aquatic life and habitat, and to protect water quality to the maximum extent practical through the use of best management practices. Every reasonable effort will be made to avoid and minimize stream impacts.

Estimated impacts to the riparian buffers are quantified in **Table 3** below. Impacts to Zone 1 are based on a buffer width of 30 feet (9.1 m) measured landward from the top of bank or rooted vegetation. Impacts to Zone 2 are based on a buffer width of 20 feet measured from the outer edge of Zone 1. Both Buffalo Creek and the small tributary from the west appear on the Wake County Soil Survey maps and are therefore subject to the rules. An on-site determination by NC DWQ personnel may exempt the tributary from the rules. If this occurs the impacts in **Table 3** will be significantly lowered. The Neuse Buffer Certification would be obtained from NC DWQ in conjunction with a 401 Water Quality Permit.

Table 3: Estimated Impacts to Riparian Buffers

	Neuse Buffer Impact in Acres (Hectares)					
	Alternative 1		Alternative 2		Alternative 3	
	Temp.	Perm.	Temp.	Perm.	Temp.	Perm.
Zone 1	0.0 (0.0)	0.24 (0.10)	0.16 (0.06)	0.24 (0.10)	0.0 (0.0)	0.41 (0.17)
Zone 2	0.0 (0.0)	0.23 (0.09)	0.14 (0.06)	0.23 (0.09)	0.0 (0.0)	0.25 (0.10)
Total Impact	**0.0** (0.0)	**0.47 (0.19)**	**0.30 (0.12)**	**0.47 (0.19)**	**0.0** (0.0)	**0.66 (0.27)**

F. Rare and Protected Species

Some populations of plants and animals are declining either as a result of natural forces or their difficulty competing with humans for resources. Rare and protected species listed for Wake County, and any likely impacts to these species as a result of the proposed project construction, are discussed in the following sections.

1. Federally Protected Species

Plants and animals with a federal classification of Endangered (E), Threatened (T), Proposed Endangered (PE), and Proposed Threatened (PT) are protected under provisions of Section 7 and Section 9 of the Endangered Species Act of 1973, as amended.

The USFWS lists four species under federal protection in Wake County as of March 2002. These species are listed in **Table 4.**

Table 4: Species Under Federal Protection in Wake County

Common Name	Scientific Name	Federal Status
Vertebrates		
Bald eagle	*Haliaeetus leucocephalus*	Threatened (proposed to be delisted)
Red-cockaded woodpecker	*Picoides borealis*	Endangered
Invertebrates		
Dwarf wedge mussel	*Alasmidonta heterodon*	Endangered
Vascular Plants		
Michaux's sumac	*Rhus michauxii*	Endangered

Notes: Endangered-A species that is threatened with extinction throughout all or a significant portion of its range.
Threatened-A species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

A brief description of the characteristics and habitat requirements of each species follows, along with a conclusion regarding potential project impact.

***Haliaeetus leucocephalus* (bald eagle) Threatened (proposed to be delisted)**

Family: Accipitridae
Federally Listed: 1967

A large raptor, the bald eagle has a wingspread of about 7 feet (2.1 m). Its plumage is mainly dark brown, and adults have a pure white head and tail. First year juveniles are often chocolate brown to blackish, sometimes with white mottling on the tail, belly, and underwings. The head and tail become increasingly white with age until full adult plumage is reached in the fifth or sixth year. An opportunistic predator, the bald eagle feeds primarily on fish but also takes a variety of birds, mammals, and turtles (both live and as carrion) when fish are not readily available.

The bald eagle is primarily riparian, associated with coasts, rivers, and lakes, usually nesting near bodies of water where it feeds. Selection of nesting sites varies tremendously depending on the species of trees growing in a particular area. In the Southeast, nests are constructed in dominant or codominant pines or cypress. Nests are usually constructed in living trees, but bald eagles will occasionally use dead ones.

Biological Conclusion: **No Effect**

While suitable nesting sites exist in pine and cypress trees, Buffalo Creek and Perry Pond are not large enough to provide an adequate food source for bald eagles. A review of the NHP files did not reveal any records of bald eagles in the project vicinity. It can be concluded that the project will not impact this threatened species.

***Picoides borealis* (red-cockaded woodpecker)** **Endangered**

Family: Picidae
Federally Listed: 1970

The red-cockaded woodpecker is 7 to 8 inches (18 to 20 cm) long with a wingspan of 14 to 15 inches (35 to 38 cm). There are black and white horizontal stripes on its back, and its cheeks and underparts are white. Its flanks are black streaked. The cap and stripe on the side of the neck and the throat are black. The male has a small red spot on each side of the black cap. After the first post-fledgling molt, fledgling males have a red crown patch. This woodpecker's diet is composed mainly of insects, which include ants, beetles, wood-boring insects, caterpillars, and corn ear worms if available. About 16 to 18 percent of their diet includes seasonal wild fruit.

Open stands of pines with a minimum age of 80 to 120 years, depending on the site, provide suitable nesting habitat. Longleaf pines (*Pinus palustris*) are most commonly used, but other species of southern pine are also acceptable. Dense stands (stands that are primarily hardwood or that have a dense hardwood understory) are avoided. Foraging habitat is provided in pine and pine hardwood stands 30 years old or older with foraging preference for pine trees 10 inches (25 cm) or larger in diameter. In good, well stocked pine habitats, sufficient foraging substrate can be provided on 80 to 125 acres (32 to 50 ha).

Biological Conclusion: **No Effect**

Within the project area, no suitable red-cockaded woodpecker habitat exists. These birds are not associated with cypress-hardwood riparian areas or maintained habitats. A search of the NHP files did not reveal any records of red-cockaded woodpeckers in the project vicinity. It can be concluded that the project will not threaten this endangered species.

***Alasmidonta heterodon* (dwarf wedge mussel)** **Endangered**
Family: Unionidae
Federally Listed: 1990

The dwarf wedge mussel's shell rarely exceeds 1.5 inches (3.8 cm) in length. It's also the only North American freshwater mussel that has two lateral teeth on the right valve, but only one on the left (Fuller, 1977). The female's shell is inflated in the back where the marsupial gills are located. Little is known about the species' life history and reproductive cycle. Gravid females have been observed from late August until June (Clarke, 1981). Like other freshwater mussels, this species' eggs are fertilized in the female as sperm passes through its gills; the resulting larvae than attaches to a fish host. Although this host is still unknown, strong evidence suggests that it is an anadromous fish, which migrates from the ocean into freshwater to spawn.

The dwarf wedge mussel inhabits creek and river areas with a slow to moderate current and a sand, gravel, or muddy bottom. These areas must be nearly silt free. In North Carolina the dwarf wedge mussel exists in the Neuse and Tar River basins.

Biological Conclusion: **No Effect**

Based on the survey results, it is apparent that the dwarf-wedge mussel does not occur in this reach of Buffalo Creek. Although this species has been recorded in Buffalo Creek at least 24 miles downstream of the project crossing, two impoundment's, Robertsons Pond and Wendell Lake occur between the subject crossing and the portion of Buffalo Creek that is occupied by the dwarf-wedge mussel. Because of the distance and the presence of two lakes between the subject project and occupied habitat, impacts to the population downstream are not anticipated. It can be concluded that project construction will not impact this species.

Rhus michauxii (Michaux's sumac) **Endangered**

Family: Anacardiaceae
Federally Listed: 1989

Michaux's sumac or false poison sumac is a densely hairy shrub with erect stems, which are 12 to 36 inches (30 to 90 cm) in height. The shrub's compound leaves are narrowly winged at their base, dull on their tops, and veiny and slightly hairy on their bottoms. Each leaf is finely toothed on its edges. Flowers are greenish-yellow to white and 4-5 parted. Each plant is unisexual. With a male plant the flowers and fruits are solitary, with a female plant all flowers are grouped in 3 to 5 stalked clusters. The plant flowers from April to June; its fruit, a dull red drupe, is produced in October and November.

Michaux's sumac grows in sandy or rocky open woods in association with basic soils. Apparently, this plant survives best in areas where some form of disturbance has provided an open area. Eleven of the plant's 16 remaining populations are on highway rights-of way, roadsides, or on the edges of artificially maintained clearings. Two other populations are in areas with periodic fires, and two more populations exist on sites undergoing natural succession. One population is situated in a natural opening on the rim of a Carolina bay. Currently, the plant is known to survive in the following North Carolina Counties: Richmond (6 populations), Hoke (3 populations), Scotland (2 populations), Franklin (1 population), Davie (1 population), Robeson (1 population), and Wake (1 population).

Biological Conclusion: **No Effect**

No habitat exists in the project area for Michaux's sumac. The soils in the project area are all acidic. A search of the NHP database found no occurrences of

Michaux's sumac in the project vicinity. In addition, Earth Tech biologists conducted a field survey for Michaux's sumac and found no occurrences in the project area. It can be concluded that the project will not impact this endangered species.

2. Federal Species of Concern

Federal Species of Concern (FSC) are not legally protected under the Endangered Species Act and are not subject to any of its provisions, including Section 7, until they are formally proposed or listed as Threatened or Endangered. **Table 5** includes FSC species listed for Wake County and their state classifications. Organisms which are listed as Endangered (E), Threatened (T), or Special Concern (SC) on the North Carolina Natural Heritage Program list of Rare Plant and Animal Species are afforded state protection under the State Endangered Species Act and the North Carolina Plant Protection and Conservation Act of 1979. However, the level of protection given to state-listed species does not apply to NCDOT activities.

Table 5: Federal Species of Concern in Wake County

Common Name	Scientific Name	State Status	Habitat present
Vertebrates			
Bachman's sparrow	*Aimophila aestivalis*	SC	No
Southeastern myotis	*Myotis austroriparius*	SC	Yes
Pinewoods shiner	*Lythrurus matutinus*	SR	No
Carolina Darter	*Etheostoma collis lepidinion*	none	No
Southern hognose snake	*Heterodon simus*	SR	No
Invertebrates			
Diana fritillary butterfly	*Speyeria diana*	SR	No
Atlantic pigtoe	*Fusconaia masoni*	T	No
Green floater	*Lasmigona subviridus*	E	No
Yellow lance	*Elliptio lanceolata*	T	No
Vascular Plants			
Carolina least trillium	*Trillium pusillum* var. *pusillum*	E	No
Sweet pinesap	*Monotropsis odorata*	C	No
Key: T = Threatened, E = Endangered, SC = Special Concern, C = Candidate, SR = Significantly Rare			

Bog spicebush does not appear on the March 2002 USFWS list of protected species for Wake County, however this species is listed by the NC NHP on their website (last updated July 2001) as a Federal Species of Concern. John Finnegan, Data Systems Manager of the NC NHP, stated on August 21, 2001

that the NC NHP has one record of bog spicebush from northern Wake County in 1997.

No FSC species were observed during the site visit, and none are recorded at NHP as occurring within 2.0 miles (3.2 km) of the project area.

3. Summary of Anticipated Impacts

The proposed project is not anticipated to impact any threatened or endangered species.

VI. CULTURAL RESOURCES

A. Compliance Guidelines

This project is subject to compliance with Section 106 of the National Historic Preservation Act of 1966, as amended, implemented by the Advisory Council on Historic Preservation's Regulations for Compliance with Section 106, codified as 36 CFR Part 800. Section 106 requires that Federal agencies to take into account the effect of their undertakings (federally-funded, licensed, or permitted) on properties included in or eligible for inclusion in the National Register of Historic Places and afford the Advisory Council a reasonable opportunity to comment on such undertakings.

B. Historic Architectural Resources

All structures within the Area of Potential Effect (APE) were photographed, and later reviewed by the State Historic Preservation Office (SHPO). None of the properties were considered eligible, and in a concurrence form dated June 1, 2000 the SHPO concurred that there are no historic architectural resources either listed in or eligible for listing in the National Register of Historic Places within the APE. A copy of the concurrence form is included in the Appendix.

C. Archaeological Resources

An archaeological survey was done in the project's APE. During the course of the survey, no prehistoric or historic archaeological sites were located within the area. Due to absence of cultural material, the investigator recommended that no further archaeological investigation be conducted in connection with this project. The SHPO, in a memorandum dated April 5, 2002 concurred with this recommendation since the project will not involve significant archaeological resources.

VII. ENVIRONMENTAL EFFECTS

Anticipated impacts to the resources in the project area are described in this section. The project is considered to be a Federal "Categorical Exclusion" because of its limited scope and insignificant environmental consequences. The project is expected to have an overall positive impact. Replacement of the inadequate bridge will result in safer traffic operations.

The project is not in conflict with any plan, existing land use, or zoning regulation. No significant change in land use is expected to result from construction of the project.

No adverse effect on public facilities or services is anticipated. The project is not expected to adversely affect social, economic, or religious opportunities in the area.

No adverse effect on families or communities is anticipated. Right-of-way acquisition will be limited. No residences or businesses will be relocated.

There are no publicly owned parks, recreational facilities, or wildlife and waterfowl refuges of national, state, or local significance in the vicinity of the project.

The Farmland Protection Policy Act requires all federal agencies or their representatives to consider the potential impacts to prime and important farmland soils by all land acquisition and construction projects. Prime and important farmland soils are defined by the U.S. Natural Resources Conservation Service. No prime or important farmlands will be impacted by the proposed project. In addition, the proposed project is anticipated to be limited to the existing right of way, and the land use adjacent to the project is residential.

This project is an air quality "neutral" project, so it is not required to be included in the regional emission analysis (if applicable) and a project level CO analysis is not required. This project is not anticipated to create any adverse effects on the air quality of this attainment area.

Traffic volumes will not increase or decrease because of this project. There are no receptors located in the immediate project area. The project's impact on noise and air quality will not be significant.

Noise levels could increase during construction but will be temporary. If vegetation is disposed of by burning, all burning shall be done in accordance with applicable local laws and regulations of the North Carolina SIP for air quality in compliance with 15 NAACO 2D.0520. This evaluation completes the assessment requirements for highway traffic noise (23 CFR Part 772) and for air quality (1990 CAAA and NEPA), and no additional reports are required.

An examination of records at the North Carolina Department of Environment and Natural Resources, Division of Water Quality, Groundwater Section and the Division of Waste Management revealed neither underground storage tanks, hazardous waste sites, regulated or unregulated landfills, nor dump sites in the project area.

Wake County is a participant in the National Flood Insurance Program (NFIP). Flood Insurance Study maps for Wake County show that Bridge No. 174 is located in a FEMA 100-year floodplain. Replacement of this bridge is not expected to affect the 100-year floodplain.

On the basis of the above discussions, it is concluded that no significant adverse environmental effects will result from implementation of this project.

VIII. PUBLIC INVOLVEMENT

A newsletter was circulated in October 2001 to inform residents in the area of the proposed project. No comments have been received as a result of the newsletter.

IX. AREAS OF CONTROVERSY

There are no areas of controversy on this project.

X. AGENCY COMMENTS

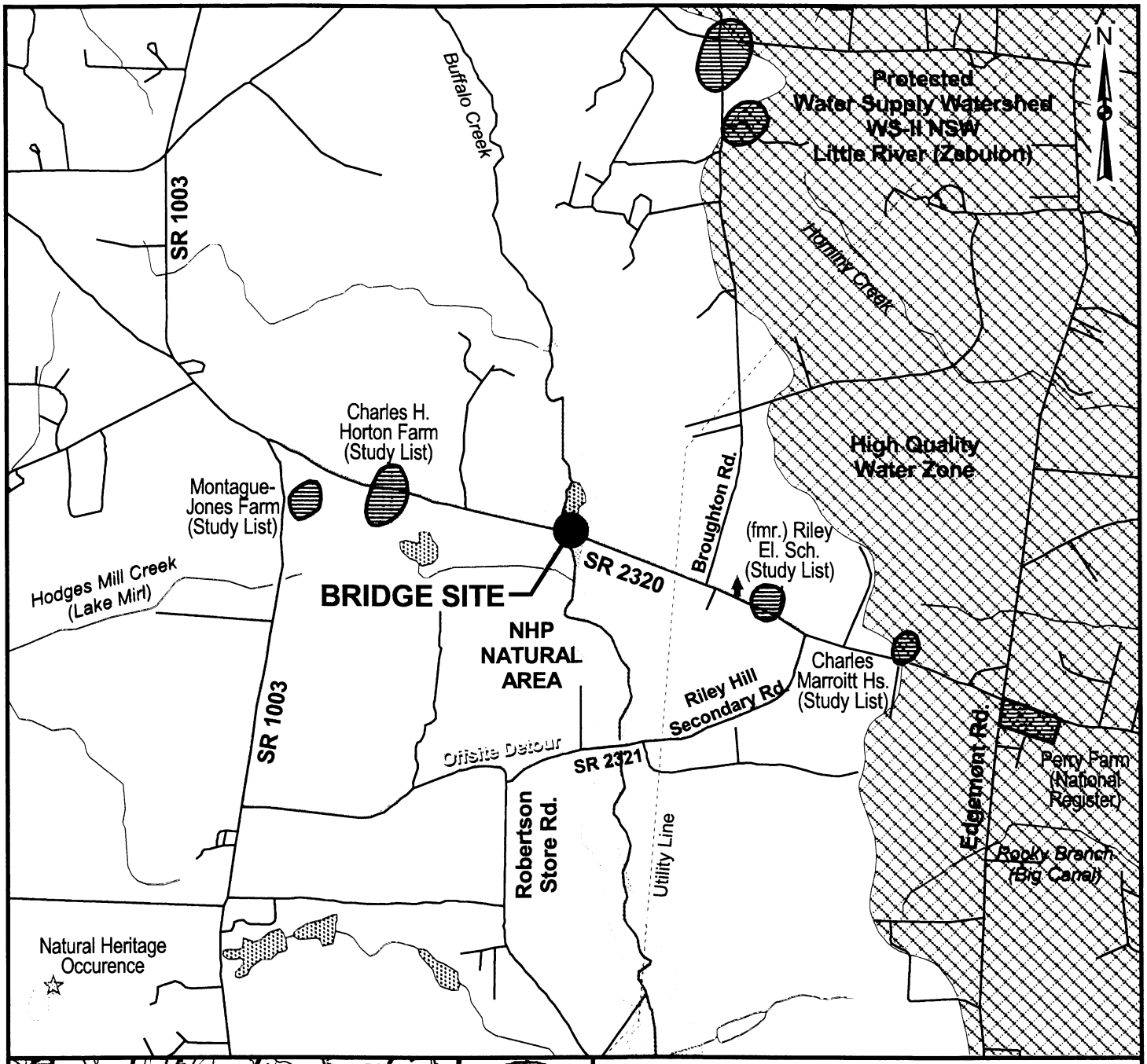
A. Federal

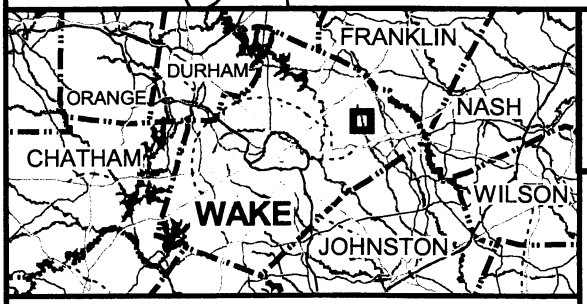
The United States Department of Agriculture's Natural Resource Conservation Service provided a letter stating they had no comments on the project. No other federal agencies provided written comments. Other agencies were contacted and some provided verbal or email input.

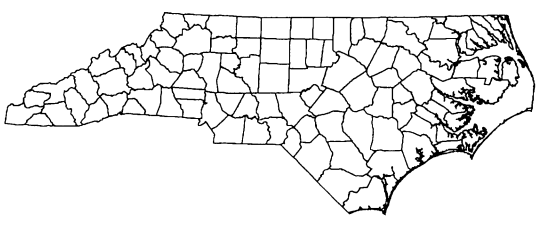
B. State

North Carolina Wildlife Resources Commission, October 8, 2001: Their standard comments apply. They are not aware of any threatened or endangered species in the project vicinity.

FIGURES





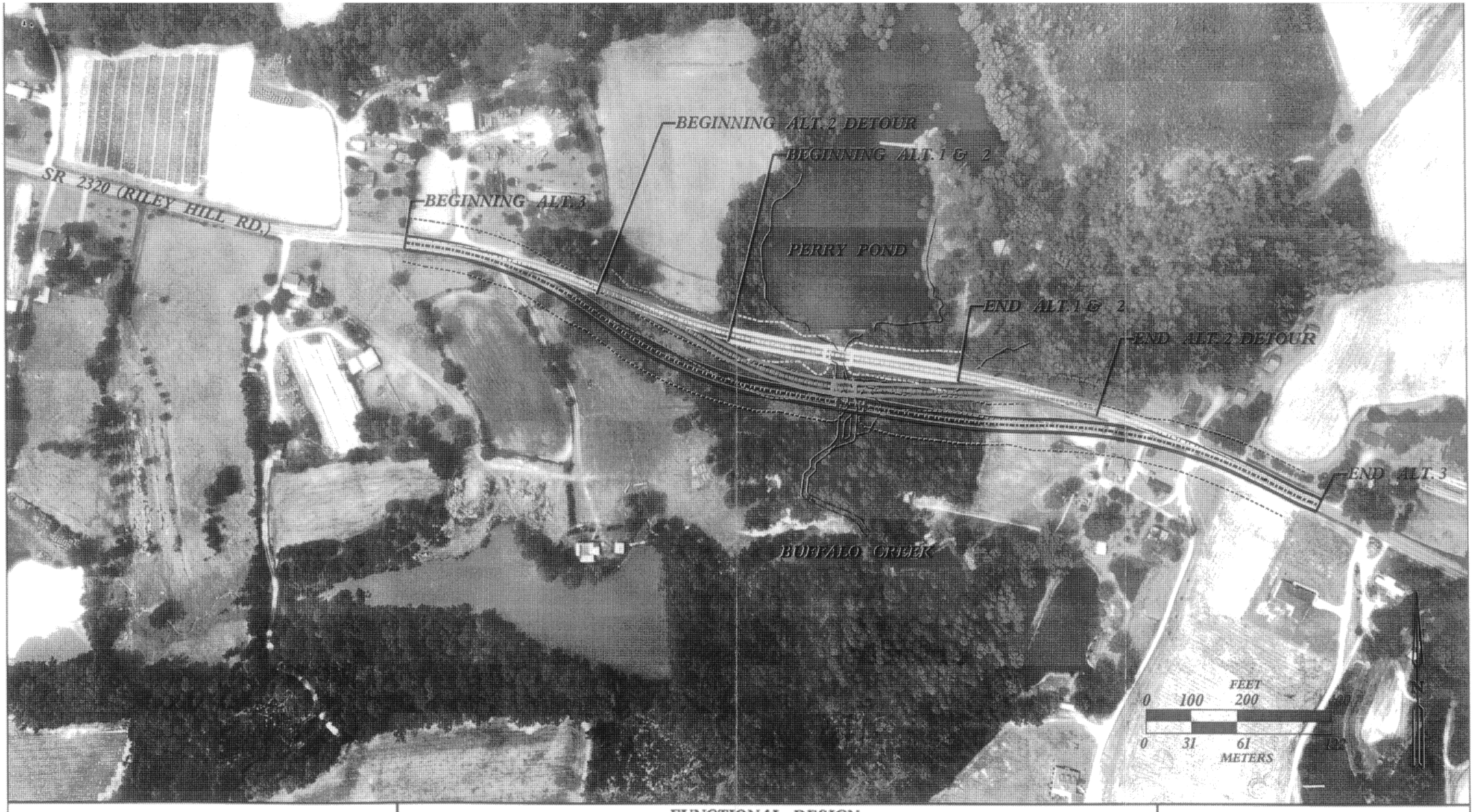


North Carolina - Department of Transportation
Division of Highways
Project Development and Environmental Analysis Branch

FIGURE 1
VICINITY MAP

REPLACEMENT OF BRIDGE NUMBER 174
ON SR 2320 OVER BUFFALO CREEK
WAKE COUNTY
TIP NO. B-3530

0.5 0 0.5 1 Miles

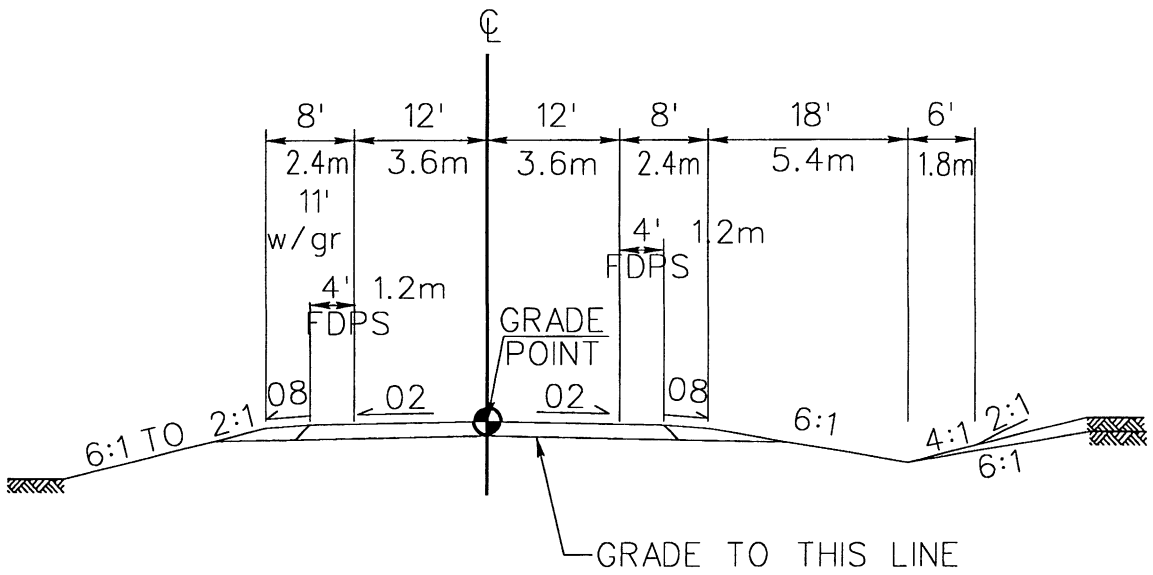


North Carolina Department of Transportation
Division of Highways
Project Development & Environmental Analysis Branch

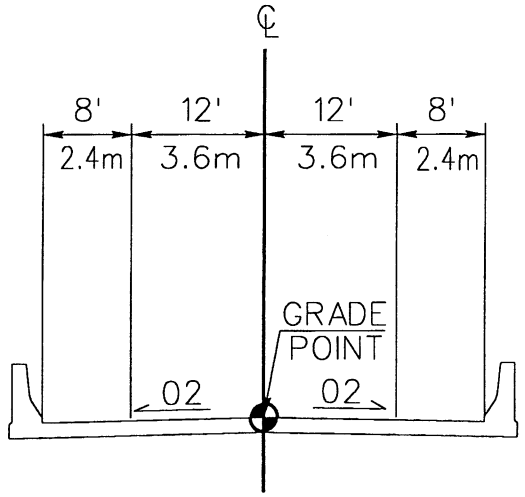
FUNCTIONAL DESIGN LEGEND

- Alt. 1 &2 Centerline
- Alt. 1 &2 Edge of Pavement
- Alt. 1 &2 Construction Limits
- Alt. 3 Centerline
- Alt. 3 Edge of Pavement
- Alt. 3 Construction Limits
- Alt. 2 Det. Centerline
- Alt. 2 Det. Edge of Pavement
- Alt. 2 Det. Construction Limits

FIGURE 2
ALTERNATIVES 1, 2 & 3
REPLACEMENT OF BRIDGE NO. 174
ON SR 2320 OVER
BUFFALO CREEK
WAKE COUNTY
TIP NO. B-3530



TYPICAL ROADWAY APPROACH SECTION



TYPICAL SECTION ON STRUCTURE

TRAFFIC DATA

ADT 2002	7400
ADT 2025	12200
DUAL	2%
TTST	1%

FUNCTIONAL CLASSIFICATION: RURAL COLLECTOR

NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
PROJECT DEVELOPMENT AND
ENVIRONMENTAL ANALYSIS BRANCH

FIGURE 3
TYPICAL SECTION

BRIDGE NO. 174 ON SR 2320
OVER RILEY HILL CREEK
WAKE COUNTY

TIP NO. B-3530

NOT TO SCALE

Looking at the downstream side of the bridge.

Looking downstream from the bridge.

North Carolina – Department of Transportation

Division of Highways

Project Development and
Environmental Analysis Branch

FIGURE 4a
VIEWS OF BRIDGE

REPLACEMENT OF BRIDGE NUMBER 174
ON SR 2320 OVER BUFFALO CREEK
WAKE COUNTY
TIP NO. B-3530

Looking west at bridge.

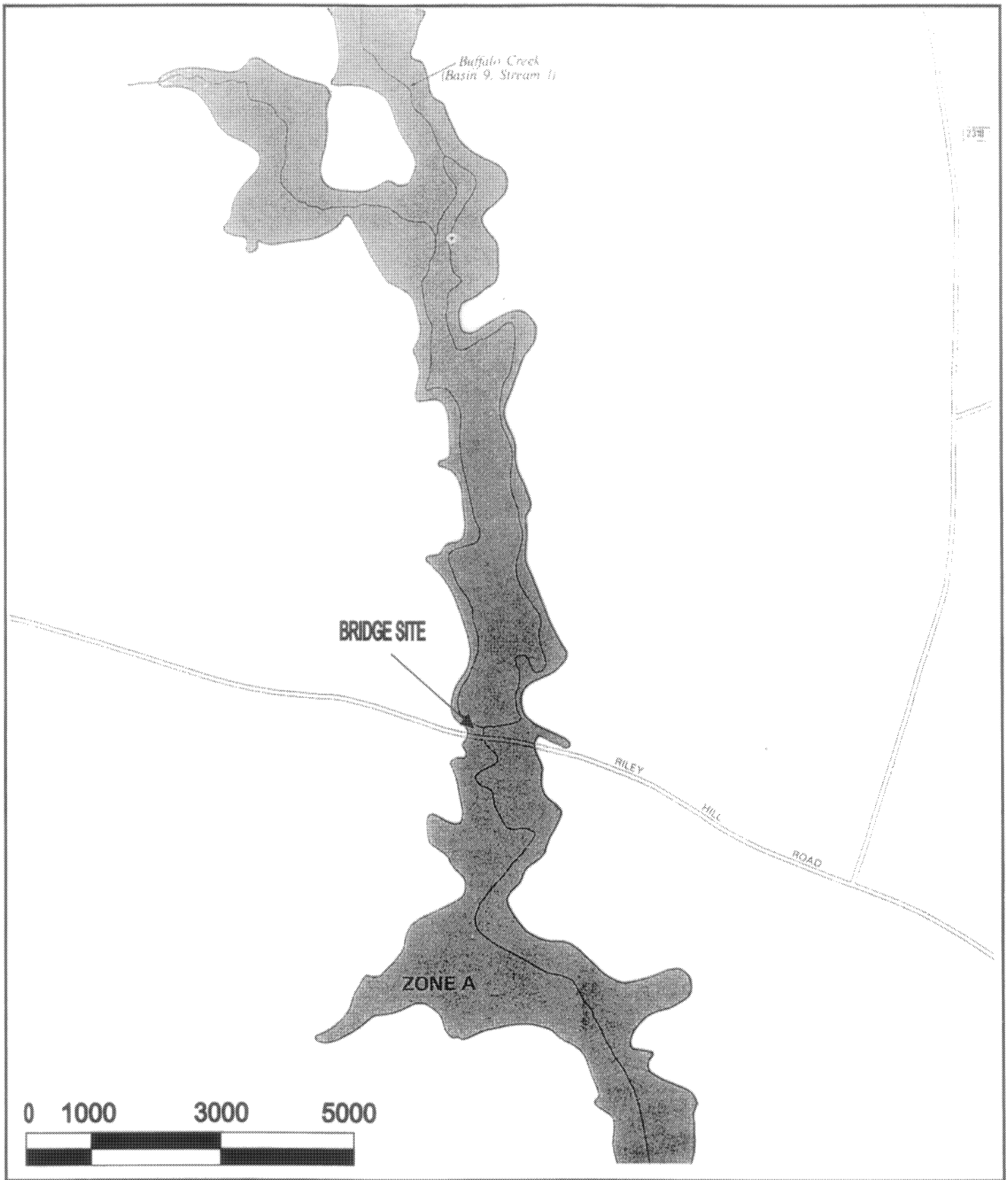
North Carolina – Department of Transportation

Division of Highways

Project Development and
Environmental Analysis Branch

FIGURE 4b
VIEWS OF BRIDGE

REPLACEMENT OF BRIDGE NUMBER 174
ON SR 2320 OVER BUFFALO CREEK
WAKE COUNTY
TIP NO. B-3530



North Carolina – Department of Transportation

Division of Highways

Project Development and Environmental Analysis Branch

FIGURE 5
FEMA 100 – YEAR FLOODPLAIN MAP
REPLACEMENT OF BRIDGE NUMBER 174
ON SR 2320 OVER BUFFALO CREEK
WAKE COUNTY
TIP NO. B-3530

APPENDIX

USDA

ıited States
:partment of
ɣriculture

ıtural
:sources
ɔnservation
:rvice

105 Bland Rd.
Suite 205
aleigh, NC 27609

(919) 873-2134

October 30, 2000

Mr. John Conforti
Project Development & Environmental Analysis Branch
1548 Mail Service Center
Raleigh, NC 27699-1548

Dear Mr. Conforti:

Thank you for the opportunity to provide comments on Bridge Group XXVIII bridge replacement projects listed below:

TIP Project No.	County	Bridge Number	Road Carried	Stream Crossed
B-3643	Granville	72	SR1004 (Providence Rd.)	Hachers Run
B-3644	Granville	226	SR1120 (Veasey Rd.)	Knap of Reeds Creek
B-3645	Granville	201	SR 1435 (Davis Chapel Rd.)	Little Grassy Creek
B-3653	Halifax	162	SR1450 (Branch Rd.)	Chockoyotte Creek
B-3853	Halifax	82	NC561	Marsh Swamp
B-3702	Vance	19	SR 1305 (Barker Rd.)	Flat Creek
B-3915	Vance	21	SR 1303 (Hicksboro Rd.)	Flat Creek
B-3521	Wake	273	SR 1006 (Old Stage Rd.)	Middle Creek
B-3523	Wake	525	SR 1300 (Kildaire Farm Rd.)	Swift Creek
B-3530	Wake	174	SR 2320 (Riley Hill Rd.)	Buffalo Creek
B-3703	Wake	317	SR 1404 (Johnson Pond Rd.)	Middle Creek
B-3704	Wake	108	SR 1834 (Norwood Rd.)	Lower Bartons Creek
B-3705	Wake	125	SR 2045 (Burlington Mills Rd.)	Smiths Creek
B-3917	Wake	311	SR 1379 (Penny Rd.)	Lake Wheeler (Swift Cr.)
B-3918	Wake	127	SR 2044 (Ligon Mill Rd.)	Tom Creek

The Natural Resources Conservation Service does not have any comments at this time.

Sincerely,

Mary K. Combs
State Conservationist

North Carolina Department of Cultural Resources

State Historic Preservation Office

David L. S. Brook, Administrator

James B. Hunt Jr., Governor
Betty Ray McCain, Secretary

Division of Archives and History
Jeffrey J. Crow, Director

November 18, 2000

MEMORANDUM

TO: William D. Gilmore, PE, Manager
Project Development & Environmental Analysis Branch
NC Department of Transportation

FROM: David Brook RBG for David Brook
Deputy State Historic Preservation Officer

RE: Replacement of Bridge No. 174 on SR 2320, B-3530
Bridge Group XXVIII, Wake County, ER 01-7791

Thank you for your memorandum of October 2, 2000, concerning the above project.

Duke Farm (WA 1390), located on State road 1903

We recommend an architectural historian on your staff evaluate the above property to determine its eligibility for listing in the National Register of Historic Places and report the findings to us.

Given the close proximity of Perry Pond, it is likely that a mill or mill site is within the project area. We recommend that an archaeological survey be conducted within the area of potential effect (APE) of the proposed bridge replacement and any discovered archaeological sites be evaluated for their eligibility for inclusion in the National Register of Historic Places.

The above comments are made pursuant to Section 106 of the National Historic Preservation Act and the Advisory Council on Historic Preservation's Regulations for Compliance with Section 106 codified at 36 CFR Part 800.

Thank you for your cooperation and consideration. If you have questions concerning the above comment, please contact Renee Gledhill-Earley, environmental review coordinator, at 919/733-4763.

cc: Tom Padgett, NCDOT

3530

	Location	Mailing Address	Telephone/Fax
ADMINISTRATION	507 N. Blount St., Raleigh NC	4617 Mail Service Center, Raleigh NC 27699-4617	(919) 733-4763 • 733-8653
ARCHAEOLOGY	421 N. Blount St., Raleigh NC	4619 Mail Service Center, Raleigh NC 27699-4619	(919) 733-7342 • 715-2671
RESTORATION	515 N. Blount St., Raleigh NC	4613 Mail Service Center, Raleigh NC 27699-4613	(919) 733-6547 • 715-4801
SURVEY & PLANNING	515 N. Blount St., Raleigh NC	4618 Mail Service Center, Raleigh NC 27699-4618	(919) 733-6545 • 715-4801

Conforti

North Carolina Department of Cultural Resources
State Historic Preservation Office
David L. S. Brook, Administrator

Michael F. Easley, Governor
Lisbeth C. Evans, Secretary
Jeffrey J. Crow, Deputy Secretary
Office of Archives and History

Division of Historical Resources
David J. Olson, Director

April 5, 2002

MEMORANDUM

TO: William D. Gilmore, Manager
Project Development and Environmental Analysis Branch
Division of Highways
Department of Transportation

FROM: David Brook for DBrook

SUBJECT: Archaeological Survey Report, Bridge No. 179 on SR 2320 over Buffalo Creek, 8.2407701, Federal Project No. BRZ-2320(2), B-3530, Wake County, ER 01-7791 and ER 02-9329

We have received the archaeological survey report by Nick Bon-Harper for the above project from Matt Wilkerson of your staff.

During the course of the survey, no prehistoric or historic archaeological sites were located within the area. Due to the absence of cultural material, Mr. Bon-Harper has recommended that no further archaeological investigation be conducted in connection with this project. We concur with this recommendation since the project will not involve significant archaeological resources.

The report meets our office's guidelines and those of the Secretary of the Interior. Specific concerns and/or corrections which need to be addressed in the preparation of a final report are attached for the author's use.

The above comments are made pursuant to Section 106 of the National Historic Preservation Act and the Advisory Council on Historic Preservation's Regulations for Compliance with Section 106 codified at 36 CFR Part 800.

Thank you for your cooperation and consideration. If you have questions concerning the above comment, please contact Renee Gledhill-Earley, environmental review coordinator, at 919/733-4763. In all future communication concerning this project, please cite the above-referenced tracking number.

Enclosure

cc: FHWA
Matt Wilkerson, NCDOT
Deborah Joy, Legacy Research Associates, Inc.

Specific Comments, Archaeological Survey Report
Replacement of Bridge No. 179 on SR 2320 over Buffalo Creek
Wake County, TIP No. B-3530, ER 02-7791 & ER 02-9329

1. The report needs to include the amount of acreage surveyed for this project
2. Page 5, last paragraph: The survey of Raleigh-Durham Airport covered 7200 acres, not 72,000 acres.
3. Page 7, paragraph 4: Most of the reports cited as research non-compliance investigations were conducted in compliance with Section 106 or Section 110 of the National Historic Preservation Act. These include Cantley 1992; Claggett & Cable 1982; Cultural Resource Group 1990; Eastman and Lautzenheiser 1992; Gossett & Gossett 1975; McCormick 1970; Gunn et al. 1997a-b and Little-Stokes 1979.
4. The excavations conducted by Claggett and Cable 1982 and the survey by McCormick 1970 took place in Chatham County, not Wake County.

Federal Aid =BRZ-2320(2) *TIP* =B-3530 *County*

CONCURRENCE FORM FOR PROPERTIES NOT ELIGIBLE FOR THE NATIONAL REGISTER OF HISTORIC PLACES

Project Description: Replace Bridge No. 174 on SR 2320 over Buffalo Creek

On June 1, 2000, representatives of the

- [x] North Carolina Department of Transportation (NCDOT)
- [x] Federal Highway Administration (FHWA)
- [x] North Carolina State Historic Preservation Office (SHPO)

Reviewed the subject project at

- [ ] a scoping meeting
- [x] photograph review session/consultation
- [ ] other

All parties present agreed

- [ ] there are no properties over fifty years old within the project's area of potential effect.
- [x] there are no properties less than fifty years old which are considered to meet Criterion Consideration G within the project's area of potential effect.
- [x] there are properties over fifty years old (list attached) within the project's area of potential effect, but based on the historical information available and the photographs of each property, properties identified as Prop. #1 (Twin Acres Co. Club) are considered not eligible for the National Register and no further evaluation of them is necessary.
- [x] there are no National Register-listed properties located within the project's area of potential effect.

Signed:

Mary Pope Furr — 6·1·2000
Representative, NCDOT — Date

Richard C. Hancock — 6/1/00
FHWA, for the Division Administrator, or other Federal Agency — Date

Representative, SHPO — 6/1/00
Date

David Brook Supinger — 6/19/00
State Historic Preservation Officer — Date

If a survey report is prepared, a final copy of this form and the attached list will be included.

B-3530

North Carolina Wildlife Resources Commission

Charles R. Fullwood, Executive Director

TO: Yvonne G. G. Howell, PE
Earth Tech

FROM: David Cox, Highway Project Coordinator
Habitat Conservation Program

DATE: October 8, 2001

SUBJECT: NCDOT Bridge Replacements in Granville, Halifax, Vance, and Wake counties of North Carolina. TIP Nos. B-3643, B-3644, B-3645, B-3653, B-3853, B-3702, B-3915, B-3521, B-3523, B-3530, B-3703, B-3704, B-3705, B-3917, and B-3918.

Biologists with the N. C. Wildlife Resources Commission (NCWRC) have reviewed the information provided and have the following preliminary comments on the subject project. Our comments are provided in accordance with provisions of the National Environmental Policy Act (42 U.S.C. 4332(2)(c)) and the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661-667d).

On bridge replacement projects of this scope our standard recommendations are as follows:

1. We generally prefer spanning structures. Spanning structures usually do not require work within the stream and do not require stream channel realignment. The horizontal and vertical clearances provided by bridges allows for human and wildlife passage beneath the structure, does not block fish passage, and does not block navigation by canoeists and boaters.

2. Bridge deck drains should not discharge directly into the stream.

3. Live concrete should not be allowed to contact the water in or entering into the stream.

4. If possible, bridge supports (bents) should not be placed in the stream.

5. If temporary access roads or detours are constructed, they should be removed back to original ground elevations immediately upon the completion of the project. Disturbed areas should be seeded or mulched to stabilize the soil and native tree species should be planted with a spacing of not more than 10'x10'. If possible, when using temporary structures the area should be cleared but not grubbed. Clearing the area with chain

Mailing Address: Division of Inland Fisheries • 1721 Mail Service Center • Raleigh, NC 27699-1721
Telephone: (919) 733-3633 ext. 281 • Fax: (919) 715-7643

saws, mowers, bush-hogs, or other mechanized equipment and leaving the stumps and root mat intact, allows the area to revegetate naturally and minimizes disturbed soil.

6. A clear bank (riprap free) area of at least 10 feet should remain on each side of the steam underneath the bridge.

7. In trout waters, the N.C. Wildlife Resources Commission reviews all U.S. Army Corps of Engineers nationwide and general '404' permits. We have the option of requesting additional measures to protect trout and trout habitat and we can recommend that the project require an individual '404' permit.

8. In streams that contain threatened or endangered species, NCDOT biologist Mr. Tim Savidge should be notified. Special measures to protect these sensitive species may be required. NCDOT should also contact the U.S. Fish and Wildlife Service for information on requirements of the Endangered Species Act as it relates to the project.

9. In streams that are used by anadromous fish, the NCDOT official policy entitled "Stream Crossing Guidelines for Anadromous Fish Passage (May 12, 1997)" should be followed.

10. In areas with significant fisheries for sunfish, seasonal exclusions may also be recommended.

11. Sedimentation and erosion control measures sufficient to protect aquatic resources must be implemented prior to any ground disturbing activities. Structures should be maintained regularly, especially following rainfall events.

12. Temporary or permanent herbaceous vegetation should be planted on all bare soil within 15 days of ground disturbing activities to provide long-term erosion control.

13. All work in or adjacent to stream waters should be conducted in a dry work area. Sandbags, rock berms, cofferdams, or other diversion structures should be used where possible to prevent excavation in flowing water.

14. Heavy equipment should be operated from the bank rather than in stream channels in order to minimize sedimentation and reduce the likelihood of introducing other pollutants into streams.

15. Only clean, sediment-free rock should be used as temporary fill (causeways), and should be removed without excessive disturbance of the natural stream bottom when construction is completed.

16. During subsurface investigations, equipment should be inspected daily and maintained to prevent contamination of surface waters from leaking fuels, lubricants, hydraulic fluids, or other toxic materials.

If corrugated metal pipe arches, reinforced concrete pipes, or concrete box culverts are used:

1. The culvert must be designed to allow for fish passage. Generally, this means that the culvert or pipe invert is buried at least 1 foot below the natural stream bed. If multiple cells are required the second and/or third cells should be placed so that their bottoms are at stream bankful stage (similar to Lyonsfield design). This could be

accomplished by constructing a low sill on the upstream end of the other cells that will divert low flows to another cell. This will allow sufficient water depth in the culvert or pipe during normal flows to accommodate fish movements. If culverts are long, notched baffles should be placed in reinforced concrete box culverts at 15 foot intervals to allow for the collection of sediments in the culvert, to reduce flow velocities, and to provide resting places for fish and other aquatic organisms moving through the structure.

2. If multiple pipes or cells are used, at least one pipe or box should be designed to remain dry during normal flows to allow for wildlife passage.

3. Culverts or pipes should be situated so that no channel realignment or widening is required. Widening of the stream channel at the inlet or outlet of structures usually causes a decrease in water velocity causing sediment deposition that will require future maintenance.

4. Riprap should not be placed on the stream bed.

In most cases, we prefer the replacement of the existing structure at the same location with road closure. If road closure is not feasible, a temporary detour should be designed and located to avoid wetland impacts, minimize the need for clearing and to avoid destabilizing stream banks. If the structure will be on a new alignment, the old structure should be removed and the approach fills removed from the 100-year floodplain. Approach fills should be removed down to the natural ground elevation. The area should be stabilized with grass and planted with native tree species. If the area that is reclaimed was previously wetlands, NCDOT should restore the area to wetlands. If successful, the site may be used as wetland mitigation for the subject project or other projects in the watershed.

Project specific comments:

1. B-3643 – Granville County – Bridge No. 72 over Hatchers Run. Standard comments apply. We are not aware of any threatened of endangered species in the project vicinity.

2. B-3644 - Granville County – Bridge No. 226 over Knap of Reeds Creek. NCDOT should be aware that NCWRC has designated NCWRC gamelands in the vicinity of this bridge. Impacts to gameland properties should be avoided. There are also records of state listed mussels upstream of the project. Therefore, due to the potential for impacts to listed species we request that NCDOT perform a mussel survey prior to the construction of this bridge.

3. B-3645 – Granville County – Bridge No. 201 over Little Grassy Creek. Standard comments apply. We are not aware of any threatened of endangered species in the project vicinity.

4. B-3653 – Halifax County – Bridge No. 162 over Chockoyotte Creek. Due to the potential for anadromous fish at this location, NCDOT should closely follow the "Stream Crossing Guidelines for Anadromous Fish Passage". This includes an in-water work moratorium from February 15 to June 15. We are not aware of any threatened of endangered species in the project vicinity. Standard comments apply.

5. B-3853 – Halifax County – Bridge No. 82 over Marsh Swamp. Standard comments apply. We are not aware of any threatened of endangered species in the project vicinity.

6. B-3702 – Vance County – Bridge No. 19 over Flat Creek. Standard comments apply. We are not aware of any threatened of endangered species in the project vicinity.

7. B-3915 - Vance County – Bridge No. 21 over Flat Creek. Standard comments apply. We are not aware of any threatened of endangered species in the project vicinity.

8. B-3521– Wake County – Bridge No 273 over Middle Creek. Due to the potential for anadromous fish at this location, NCDOT should closely follow the "Stream Crossing Guidelines for Anadromous Fish Passage". This includes an in-water work moratorium from February 15 to June 15. There are also records of state listed mussels upstream of the project. Therefore, due to the potential for impacts to listed species we request that NCDOT perform a mussel survey prior to the construction of this bridge. Standard comments apply.

9. B-3523 – Wake County – Bridge No. 525 over Swift Creek. Standard comments apply. We are not aware of any threatened of endangered species in the project vicinity.

10. B-3530 - Wake County – Bridge No. 174 over Buffalo Creek. Standard comments apply. We are not aware of any threatened of endangered species in the project vicinity.

11. B-3703 – Wake County – Bridge No. 317 over Middle Creek. There are records of state listed mussels upstream of the project. Therefore, due to the potential for impacts to listed species we request that NCDOT perform a mussel survey prior to the construction of this bridge. Standard comments apply.

12. B-3704 – Wake County -- Bridge No. 108 over Lower Bartons Creek. Standard comments apply. We are not aware of any threatened of endangered species in the project vicinity.

13. B-3705 – Wake County – Bridge No. 125 over Smiths Creek. Standard comments apply. We are not aware of any threatened of endangered species in the project vicinity.

14. B-3917 Wake County – Bridge No. 311 over Lake Wheeler (Swift Creek). Standard comments apply. We are not aware of any threatened of endangered species in the project vicinity.

15. B-3918 – Wake County – Bridge No. 127 over Tom Creek. Standard comments apply. We are not aware of any threatened of endangered species in the project vicinity.

We request that NCDOT routinely minimize adverse impacts to fish and wildlife resources in the vicinity of bridge replacements. The NCDOT should install and maintain sedimentation control measures throughout the life of the project and prevent wet concrete from contacting water in or entering into these streams. Replacement of bridges with spanning structures of some type, as opposed to pipe or box culverts, is recommended in most cases. Spanning structures allow wildlife passage along streambanks, reducing habitat fragmentation and vehicle related mortality at highway crossings.

If you need further assistance or information on NCWRC concerns regarding bridge replacements, please contact me at (919) 528-9886. Thank you for the opportunity to review and comment on these projects.