STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

MICHAEL F. EASLEY
GOVERNOR

LYNDO TIPPETT
SECRETARY

November 24, 2004

U.S. Army Corps of Engineers
Raleigh Field Office
6508 Falls of the Neuse Road/Suite 120
Raleigh, NC 27615

ATTENTION: Mr. Eric Alsmeyer,
NCDOT Coordinator

Dear Sir:

SUBJECT: **Nationwide 23 Permit Application** for the replacement of Bridge Nos. 301 and 471 on SR 1375 (Lake Wheeler Road) over Swift Creek and the Lake Wheeler Spillway in Wake County. NCDOT Division 5, Federal Project No. BRSTP-1375 (2), State Project No. 82406201, WBS Element No. 33023.1.1, T.I.P. No. B-3375.

Please find enclosed three copies of the Categorical Exclusion (CE) Document, permit drawings, and design plan sheets. The project involves replacing Bridge No. 301, a three span 92- foot structure, with an 11-foot by 9-foot reinforced concrete box culvert and Bridge No. 471, a four span 162-foot structure, with a 172-foot bridge. The culvert for Bridge No. 301 will be an in place replacement and the new bridge for No. 471 will be on new alignment east of the existing structure. The proposed bridge for Bridge No. 471 will consist of three 12-foot travel lanes with 8-foot shoulders. Traffic will be maintained on existing roadway and structures during first stage of construction and will be detoured onto the partially constructed roadway and structures during the second stage of construction.

IMPACTS TO WATERS OF THE UNITED STATES

The project is located within the Neuse River Basin (03-04-02 sub-basin). The bridges targeted for replacement span the relict channel of Swift Creek and the Lake Wheeler Spillway with no direct involvement of additional streams or tributaries. The proposed project will not affect the open water of Lake Wheeler.

Swift Creek is a well-defined Piedmont stream, which has been impounded to form two reservoirs in the vicinity of the project: Lake Wheeler upstream of the project and Lake Benson downstream of the project. Swift Creek is typically characterized by moderate flow and riffle-pool morphology; however, within the project area, stream flow has been redirected by the construction of the Lake Wheeler dam and Swift Creek now takes two forms: a relict channel and a concrete spillway. The North Carolina Division of Water Quality has assigned this section of Swift Creek DWQ Index No. 27-43-(1) and a best usage classification of WS III and Nutrient Sensitive Waters (NSW). A jurisdictional determination on December 27, 2003 concurred that the relict channel under Bridge No. 301 is a shrub-scrub wetland.

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

TELEPHONE: 919-733-3141
FAX: 919-733-9794
WEBSITE: www.NCDOT.ORG

LOCATION:
TRANSPORTATION BUILDING
1 SOUTH WILMINGTON STREET
RALEIGH NC 27699

Permanent Impacts
The new structure for Bridge No. 471 will span the concrete spillway. There will be no bents in the water and no stream impacts. Bridge No. 301 will be replaced with a culvert and will result in permanent wetland impacts of 0.134 acres for installation of the culvert. There will be 0.13 acres of fill in the wetlands and 0.004 acres of mechanized clearing. The wetland will be a total take due to the hydraulic source being conveyed in the culvert. As proposed in the project commitments High Quality Water erosion and sedimentation control measures will be utilized.

Buffer Impacts
Although the project lies within the Neuse Buffer Basin, no buffer impacts are expected for this project. A meeting in October 2004 was held with Nicole Thomson and John Hennessy of NCDWQ and NCDOT to discuss the vicinity of buffers to the project. The project does not cross any buffers.

Utility Impacts
No impacts from utility relocations are anticipated as a result of this project.

Bridge Demolition
Bridge No. 471 was built in 1956. It is a four-span structure that is 162 feet long and 24 feet wide. The superstructure consists of a reinforced concrete floor on steel I-beams. The end bents are reinforced concrete abutments and the interior bents are reinforced concrete solid piers.

Bridge No. 301 was constructed in 1952. It is a three-span structure that is 92 feet long and 24 feet wide. The superstructure consists of a reinforced concrete floor on steel I-beams. The substructure is composed of reinforced concrete caps on timber piles.

There is a small potential for components of Bridges No. 301 and 471 to be dropped into Waters of the United States during bridge removal. Therefore, Best Management Practices for Bridge Demolition and Removal will be implemented during the demolition and construction of both bridges.

Restoration Plan
Removal and Disposal Plan: The contractor will be required to submit a reclamation plan for the removal of and disposal of all material off-site at an upland location. The contractor will use excavation equipment for removal of any earthen material. Heavy–duty trucks, dozers, cranes and various other pieces of mechanical equipment necessary for construction of roadways and bridges will be used on site. All material placed in the stream will be removed from the stream at that time. The contractor will have the option of reusing any of the materials that the engineer deems suitable in the construction of project. After the erosion control devices are no longer needed, all temporary materials will become the property of the contractor.

Following construction of the bridge, all material used in the construction of the structure will be removed. The existing approach fill will be removed to natural grade and the area will be re-vegetated according to NCDOT guidelines. Class I riprap and filter fabric will be used for bank stabilization. Pre-project elevations will be restored.

Schedule: The project calls for a letting of February 15, 2005 with a date of availability of March 29, 2005. It is expected that the contractor will choose to start construction in March.

MITIGATION OPTIONS

Despite the minimization strategies employed for the proposed project, the resulting permanent wetland impacts will be 0.134 acres. Consequently, the project will require compensatory mitigation.

***Avoidance, Minimization, and Mitigation*:** The NCDOT is committed to incorporating all reasonable and practicable design features to avoid and minimize jurisdictional impacts, and to provide full compensatory mitigation of all remaining, unavoidable jurisdictional impacts. Avoidance measures were taken during

the planning and NEPA compliance stages; minimization measures were incorporated as part of the project design.

According to the Clean Water Act (CWA) §404(b)(1) guidelines, NCDOT must avoid, minimize, and mitigate, in sequential order, impacts to waters of the US. The following is a list of the project's jurisdictional stream avoidance/minimization activities proposed or completed by NCDOT:

Avoidance/Minimization:

- The new bridge will not have bents located in the water.
- The new bridge will be 10 feet longer than the existing bridge.
- Limited instream activity
- An onsite detour using the existing bridges and then the partially constructed new bridge will be used.
- High Quality Water Erosion and sedimentation control measures.
- Avoided buffer zone impacts.
- Usage of preformed scour holes.

Based on the above considerations, it is determined that there is no practicable alternative to the proposed construction in jurisdictional Waters of the U.S. and that the proposed action includes all practicable methods to avoid and/or minimize jurisdictional wetland impacts that may result from such use.

COMPENSATION: The primary emphasis of the compensatory mitigation is to reestablish a condition that would have existed if the project were not built. As previously stated, mitigation is limited to reasonable expenditures and practicable considerations related to highway operation. Mitigation is generally accomplished through a combination of methods designed to replace stream loss as a result of construction of the project.

Based upon the agreements stipulated in the "Memorandum of Agreement Among the North Carolina Department of Environment and Natural Resources, the North Carolina Department of Transportation, and the U.S. Army Corps of Engineers, Wilmington District" (MOA), it is understood that the North Carolina Department of Environment and Natural Resources Ecosystem Enhancement Program (EEP), will assume responsibility for satisfying the federal Clean Water Act compensatory mitigation requirements for NCDOT projects that are listed in Exhibit 1 of the subject MOA during the EEP transition period which ends on June 30, 2005.

Since the subject project is listed in Exhibit 1, the remaining necessary compensatory mitigation to offset unavoidable impacts to waters that are jurisdictional under the federal Clean Water Act will be provided by the EEP. An acceptance letter dated November 17, 2004 from EEP is attached. The offsetting mitigation will derive from an inventory of assets already in existence within the same 8-digit cataloguing unit. The Department has avoided and minimized impacts to jurisdictional resources to the greatest extent possible as described above. The unavoidable permanent impacts to 0.134 acres of a jurisdictional wetland will be offset by compensatory mitigation provided by the EEP program.

FEDERALLY PROTECTED SPECIES

Plants and animals with federal classification of Endangered (E), Threatened (T), Proposed Endangered (PE), and Proposed Threatened (PT) are protected under the provisions of Section 7 and Section 9 of the Endangered Species Act of 1973, as amended. As of January 29, 2003 the United States Fish and Wildlife Service (USFWS) 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 wedgemussel	*Alasmidonta heterodon*	E	May Affect Not Like To Adversely Affect
Michaux's sumac	*Rhus michauxii*	E	No Effect
* E=Endangered and T=Threatened			

A biological conclusion of "No Effect" was given for the Bald eagle and Red-cockaded woodpecker due to lack of suitable habitat. Two surveys were conducted in August 2000 and in October 2004 for Michaux's sumac based on potential habitat. No species of Michaux's sumac were found during either survey. A biological conclusion of "No Effect" was given for Michaux's sumac.

Two dwarf wedgemussel surveys were conducted on May 28, 2003 and June 25, 2003. The surveys extended from the road crossing at each bridge to a point approximately 500 meters downstream of the confluence of Swift Creek and the old channel of Swift Creek. No specimens of dwarf wedgemussel were found. However, due to the fact that the dwarf wedgemussel has been found several miles downstream below Lake Benson and that the project site has potential habitat, a biological conclusion of "May Affect, Not Likely to Adversely Affect" was given to the dwarf wedgemussel. Concurrence has been received from the USFWS (see attached letter dated September 8, 2003).

Additionally a review of the Natural Heritage Program database (last updated on April 7, 2004) revealed no occurrences of these federally protected species within 1.0 mile of the project study area.

REGULATORY APPROVALS

Section 404 Permit: This project is being processed by the Federal Highway Administration as a "Categorical Exclusion" in accordance with 23 CFR 771.115(b). The NCDOT requests that these activities be authorized by a Nationwide Permit 23 (67 FR 2020; January 15, 2002).

Section 401 Permit: We anticipate 401 General Water Quality Certification (WQC) 3403 will apply to this project. The NCDOT will adhere to all general conditions of the WQC. Therefore, written concurrence from the NCDWQ is not required. In accordance with 15A NCAC 2H 0.0501(a) and 15A NCAC 2B 0.200 we are providing two copies of this application to the North Carolina Department of Environment and Natural Resources, Division of Water Quality, as notification.

A copy of this permit application will be posted on the NCDOT website at: http://www.ncdot.org/planning/pe/naturalunit/Permit.html. If you have any questions or need additional information please call Ms. Deanna Riffey at (919) 715-1409.

Sincerely,

Gregory J. Thorpe, Ph.D., Environmental Management Director,
Project Development Environmental Analysis Branch

Cc:

W/attachment

Mr. John Hennessy, Division of Water Quality (2 copies)
Mr. Travis Wilson, NCWRC

Mr. Gary Jordan, USFWS
Dr. David Chang, P.E., Hydraulics
Mr. Greg Perfetti, P.E., Structure Design
Mr. Jon Nance, P.E., Division Engineer
Mr. Chris Murray , DEO

W/o attachment

Mr. Jay Bennett, P.E., Roadway Design
Mr. Omar Sultan, Program Management
Mr. Art McMillan, P.E., Highway Design
Mr. Mark Staley, Roadside Environmental
Mr. David Franklin, USACE, Wilmington
Ms. Theresa Ellerby, P.E., PDEA
Ms. Beth Harmon, EEP
Ms. Laurie P. Smith, CPA, NCDOT, Program Management

Ecosystem Enhancement PROGRAM

November 17, 2004

Mr. Gregory J. Thorpe, Ph.D.
Environmental Management Director
Project Development and Environmental Analysis Branch
North Carolina Department of Transportation
1548 Mail Service Center
Raleigh, NC 27699-1548

Dear Dr. Thorpe:

Subject: EEP Mitigation Acceptance Letter:

B-3375, Bridges 301 and 471 over Swift Creek and the Lake Wheeler Spillway, Wake County

The purpose of this letter is to notify you that the Ecosystem Enhancement Program (EEP) will provide wetland mitigation for the subject project. Based on the information supplied by you in a letter dated November 5, 2004, the impacts are located in CU 03020201 of the Neuse River Basin in the Northern Inner Coastal Plain Eco-Region, and are as follows:

Riverine Wetland: 0.134 acre

As stated in your letter, the subject project is listed in Exhibit 2 of the Memorandum of Agreement among the North Carolina Department of Environment and Natural Resources, the North Carolina Department of Transportation, and the U. S. Army Corps of Engineers, Wilmington District dated July 22, 2003. The wetland mitigation for the subject project will be provided in accordance with this agreement.

If you have any questions or need additional information, please contact Ms. Beth Harmon at 919-715-1929.

Sincerely,

William D. Gilmore

William D. Gilmore, P.E.
Transition Manager

cc: Eric Alsmeyer, USACE-Raleigh
John Hennessy, Division of Water Quality, Wetlands/401 Unit
File: B-3375

Ecosystem Enhancement PROGRAM

November 17, 2004

Mr. Eric Alsmeyer
US Army Corps of Engineers
Raleigh Regulatory Field Office
6508 Falls of the Neuse Road, Suite 120
Raleigh, North Carolina 27615

Dear Mr. Alsmeyer:

Subject: EEP Mitigation Acceptance Letter:

B-3375, Bridges 301 and 471 over Swift Creek and Lake Wheeler Spillway on SR 1375, Wake County; Neuse River Basin (Cataloging Unit 03200201); Central Piedmont Eco-Region

The purpose of this letter is to notify you that the Ecosystem Enhancement Program (EEP) will provide mitigation for the 0.134 acres of unavoidable riverine wetlands impacts associated with the above referenced project.

The subject project is listed in Exhibit 2 of the Memorandum of Agreement among the North Carolina Department of Environment and Natural Resources, the North Carolina Department of Transportation, and the U. S. Army Corps of Engineers, Wilmington District dated July 22, 2003; however, EEP intends to provide riverine wetland compensatory mitigation at a ratio up to 2:1 in Cataloging Unit 03020201 of the Neuse River Basin

If you have any questions or need additional information, please contact Ms. Beth Harmon at (919) 715-1929.

Sincerely,

William D. Gilmore, P.E.
Transition Manager

cc: Phil Harris, Office of Natural Environment, NCDOT
John Hennessy, Division of Water Quality, Wetlands/401 Unit
File: B-3375

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Raleigh Field Office
Post Office Box 33726
Raleigh, North Carolina 27636-3726

September 8, 2003

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

Dear Dr. Thorpe:

This letter is in response to your letter of August 18, 2003 which provided the U.S. Fish and Wildlife Service (Service) with the biological conclusion of the North Carolina Department of Transportation (NCDOT) that the replacement of Bridge No. 301 over Swift Creek on SR 1375 and Bridge No. 471 over Lake Wheeler Spillway on SR 1375 in Wake County, North Carolina (TIP No. B-3375) may affect, but is not likely to adversely affect the federally-endangered dwarf wedgemussel (*Alasmidonta heterodon*). These comments are provided in accordance with section 7 of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531-1543).

According to the information you submitted, mussel surveys were conducted at the project site on May 28, 2003 and June 25, 2003. The survey extended from the road crossings at each bridge to a point approximately 500 meters downstream of the confluence of Swift Creek and the old channel of Swift Creek. The impounded area upstream of the road crossing is not considered suitable habitat for the species. No specimens of dwarf wedgemussel were found. However, as the survey report noted, the dwarf wedgemussel has been found several miles downstream below Lake Benson.

Although no specimens of dwarf wedgemussel were found in the surveyed reach of Swift Creek, the possibility of the species' presence in Swift Creek between Lake Wheeler and Lake Benson cannot be discounted. For this reason, and because the creeper (*Strophitus undulatus*), a Federal Species of Concern, was found in the surveyed area, the Service recommends stringent use of appropriate erosion control practices.

Based on the mussel survey results, the Service concurs with your conclusion that the proposed bridge replacements may affect, but are not likely to adversely affect the dwarf wedgemussel. We believe that the requirements of section 7 (a)(2) of the ESA have been satisfied. We remind you that obligations under section 7 consultation must be reconsidered if: (1) new information reveals impacts of this identified action that may affect listed species or critical habitat in a manner not previously considered in this review; (2) this action is subsequently modified in a

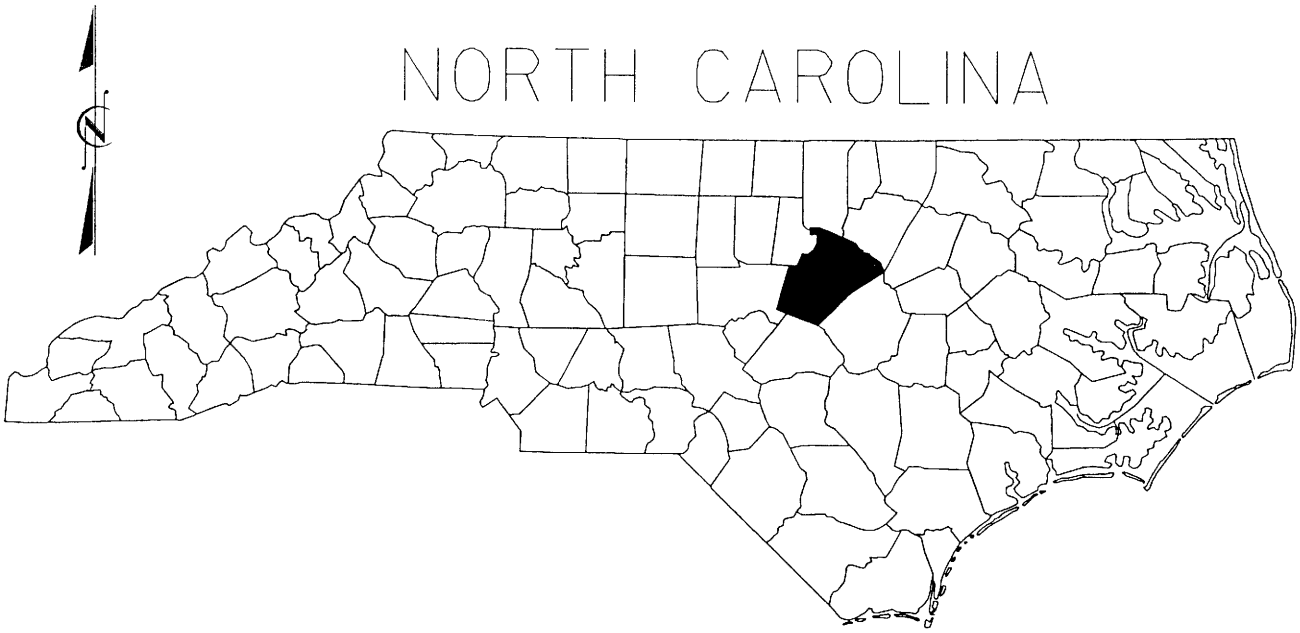
manner that was not considered in this review; or (3) a new species is listed or critical habitat determined that may be affected by this identified action.

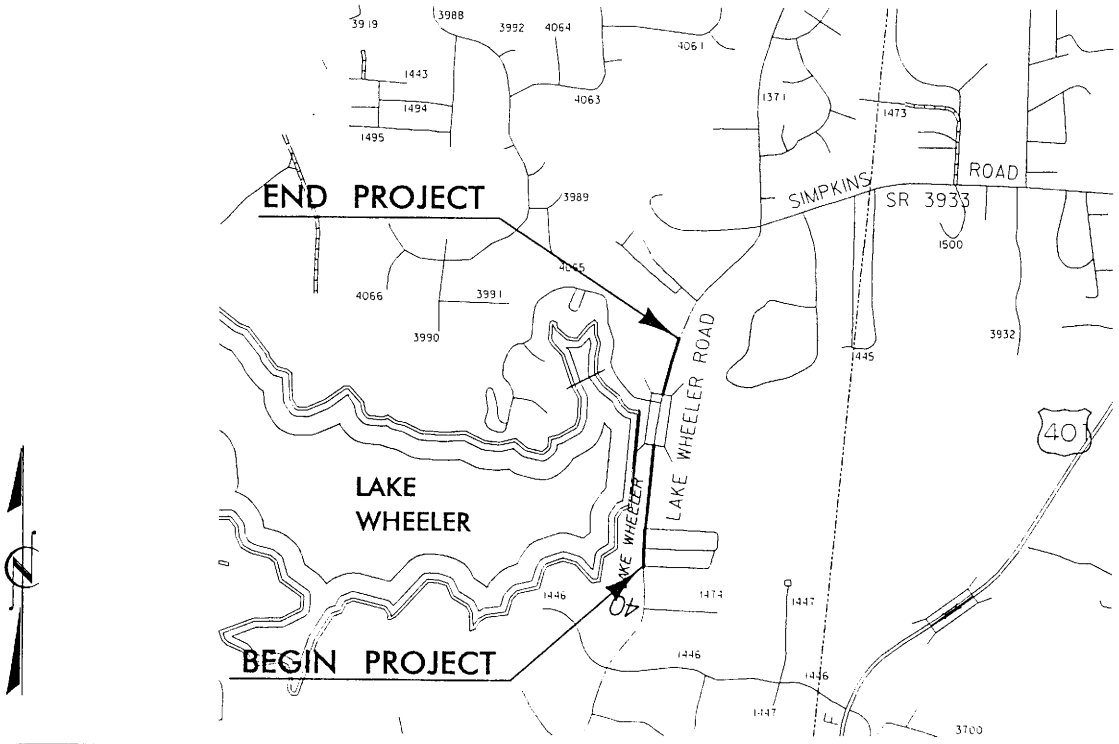
The Service appreciates the opportunity to review this project. If you have any questions regarding our response, please contact Mr. Gary Jordan at (919) 856-4520 (Ext. 32).

Sincerely,

for Garland B. Pardue, Ph.D.
Ecological Services Supervisor

cc: Eric Alsmeyer, USACE, Raleigh, NC
David Franklin, USACE, Wilmington, NC
John Hennessy, NCDWQ, Raleigh, NC
Travis Wilson, NCWRC, Creedmore, NC
Chris Militscher, USEPA, Raleigh, NC



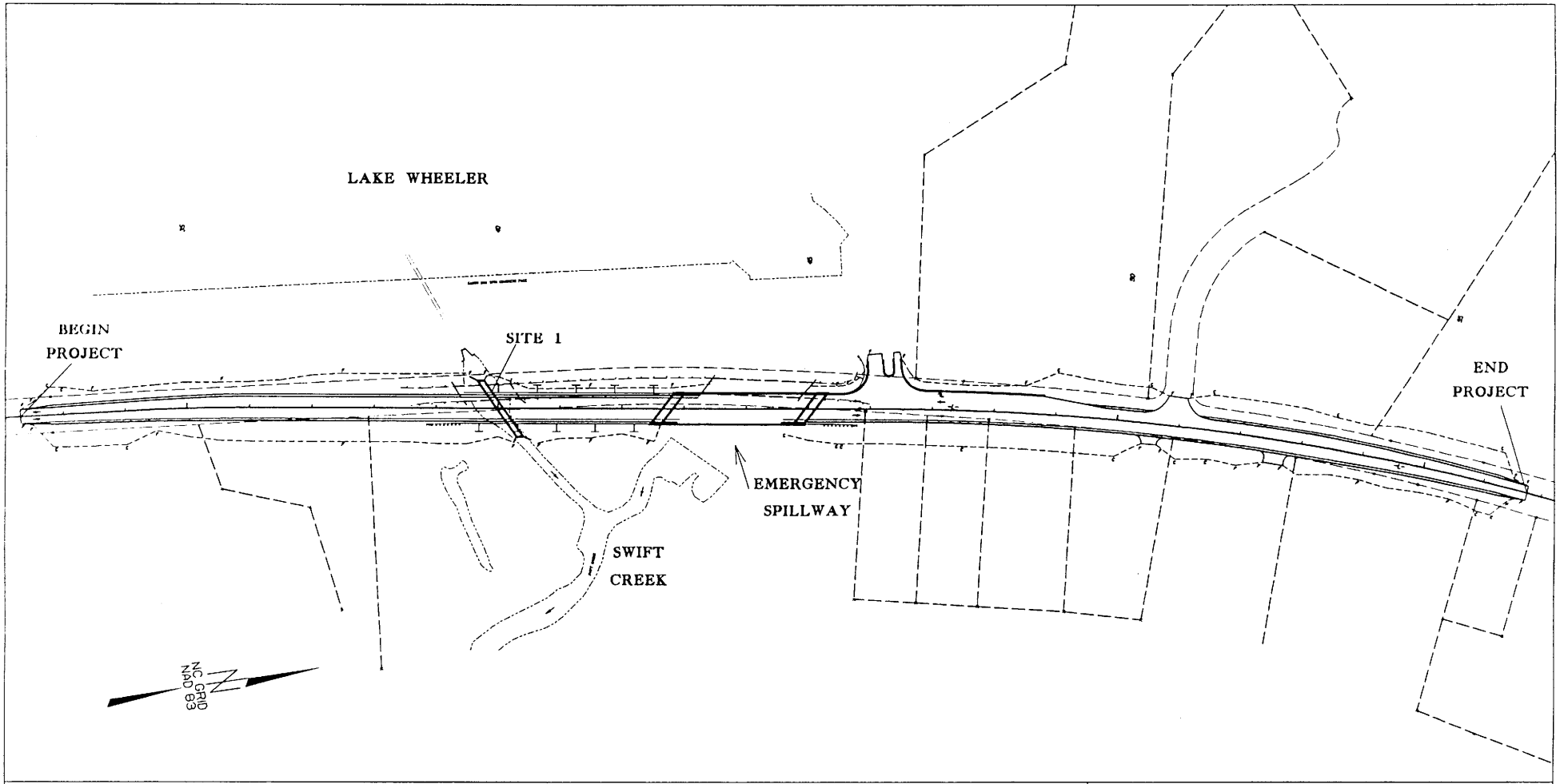


VICINITY MAPS

NCDOT

DIVISION OF HIGHWAYS
WAKE COUNTY
PROJECT: 8.2406201 (B-3375)
SR 1375 (LAKE WHEELER RD.)
BETWEEN CITY OF RALEIGH &
SR 1010

SHEET 1 OF 6 3/10/03



SITE MAP

(NOT TO SCALE)

NCDOT

DIVISION OF HIGHWAYS

WAKE COUNTY

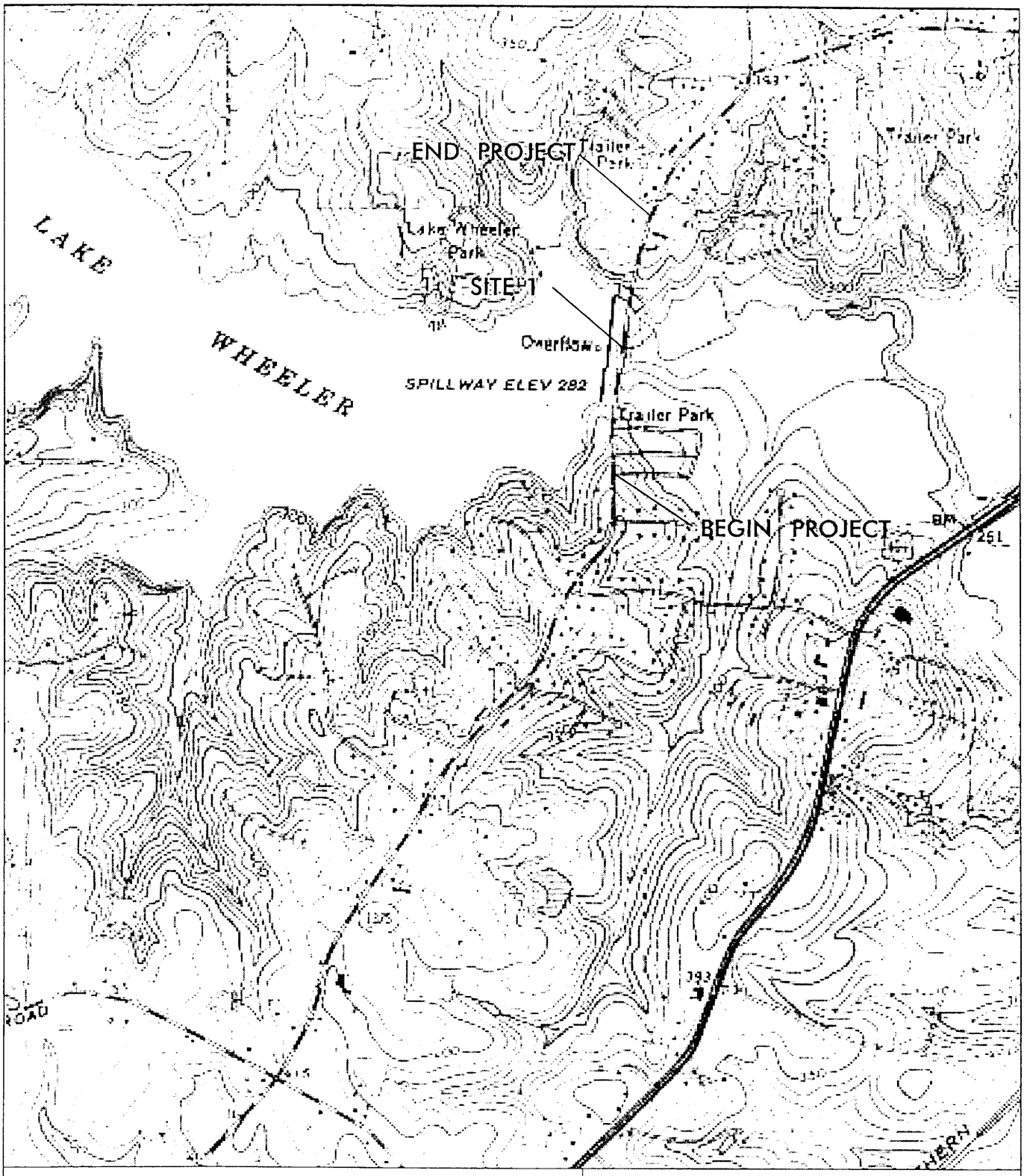
PROJECT: 8.2406201 (B-3375)

SR 1375 (LAKE WHEELER RD.)

BETWEEN CITY OF RALEIGH &

SR 1010

SHEET 2 OF 6 3/10/03



TOPO MAP

SCALE 1" = 2000'

NCDOT

DIVISION OF HIGHWAYS

WAKE COUNTY

PROJECT: 8.2406201 (B-3375)

SR 1375 (LAKE WHEELER RD.)

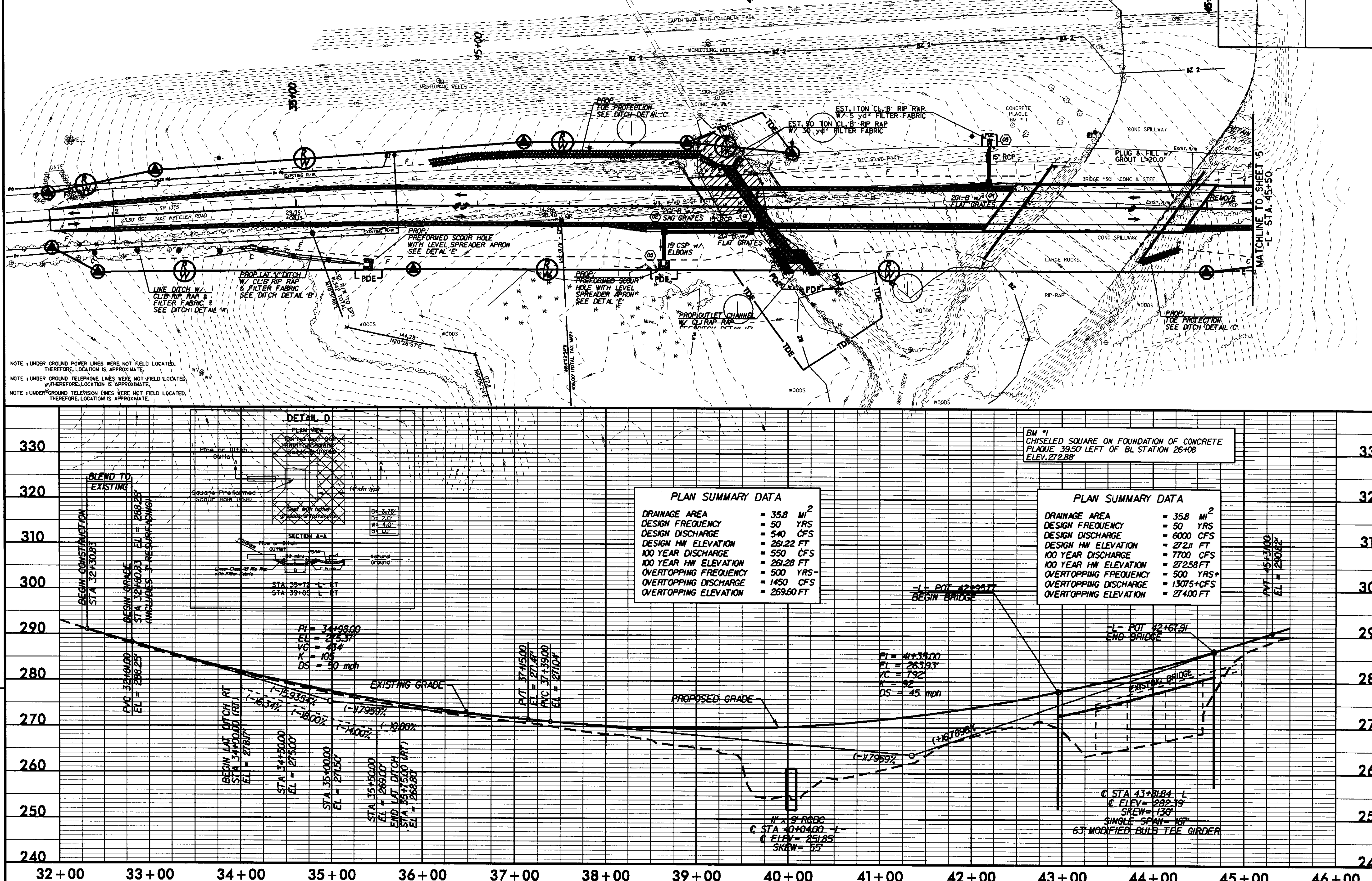
BETWEEN CITY OF RALEIGH &

SR 1010

SHEET 3 OF 6

3/10/03

WETLANDS IMPACTS



NAD 83
NC GRID
SPILLWAY VALVES
LAKE WHEELER
EARTH DAM WITH CONCRETE FACE
MONITORING WELLS
35+00
40+00
45+00
PROP. TOE PROTECTION SEE DITCH DETAIL 'C'
EST. 1 TON CL.'B' RIP RAP W/ 5 yd² FILTER FABRIC
EST. 50 TON CL.'B' RIP RAP W/ 30 yd² FILTER FABRIC
CONC SPILLWAY
PLUG & FILL w/ GROUT L=20.0'
BRIDGE #301 CONC & STEEL
SR 1375 LAKE WHEELER ROAD
2GI-B w/ SAG GRATES 15" RCP
2GI-B w/ FLAT GRATES
15" CSP w/ ELBOWS
PROP./ PREFORMED SCOUR HOLE WITH LEVEL SPREADER APRON SEE DETAIL 'E'
PROP. PREFORMED SCOUR HOLE WITH LEVEL SPREADER APRON SEE DETAIL 'E'
LINE DITCH W/ CL.'B' RIP RAP & FILTER FABRIC SEE DITCH DETAIL 'A'
PROP. LAT 'V' DITCH W/ CL.'B' RIP RAP & FILTER FABRIC SEE DITCH DETAIL 'B'
PROP OUTLET CHANNEL W/ CL.I RAP RAP
PROP. TOE PROTECTION SEE DITCH DETAIL 'C'
MATCHLINE TO SHEET 5 -L- STA. 45+50
SWIFT CREEK
WOODS
LARGE ROCKS
RIP-RAP
NOTE : UNDER GROUND POWER LINES WERE NOT FIELD LOCATED, THEREFORE, LOCATION IS APPROXIMATE.
NOTE : UNDER GROUND TELEPHONE LINES WERE NOT FIELD LOCATED, THEREFORE, LOCATION IS APPROXIMATE.
NOTE : UNDER GROUND TELEVISION LINES WERE NOT FIELD LOCATED, THEREFORE, LOCATION IS APPROXIMATE.
DETAIL D
BM #1
CHISELED SQUARE ON FOUNDATION OF CONCRETE PLAQUE 39.50' LEFT OF BL STATION 26+08
ELEV. 272.88'
BLEND TO EXISTING
BEGIN CONSTRUCTION STA 32+30.83
BEGIN GRADE STA 32+60.83 EL = 288.25' (INCLUDES 3' RESURFACING)
PVC 33+81.00 EL = 286.25'
PI = 34+98.00
EL = 275.37'
VC = 434'
K = 105
DS = 50 mph
EXISTING GRADE
PROPOSED GRADE
PVT 37+15.00 EL = 271.47'
PVC 37+39.00 EL = 271.04'
PI = 41+35.00
EL = 263.93'
VC = 792'
K = 92
DS = 45 mph
-L- POT 42+95.77 BEGIN BRIDGE
-L- POT 42+67.91 END BRIDGE
EXISTING BRIDGE
PVT 45+37.00 EL = 290.82'
11' x 9' RCBC
℄ STA 40+04.00 -L-
℄ ELEV = 251.85'
SKEW = 55°
℄ STA 43+81.84 -L-
℄ ELEV = 282.39'
SKEW = 130°
SINGLE SPAN = 167'
63" MODIFIED BULB TEE GIRDER
(-1.5935%)
(-1.634%)
(-1.600%)
(-1.7959%)
(-1.400%)
(-1.000%)
(-1.7959%)
(+1.6789%)
330
320
310
300
290
280
270
260
250
240
32+00
33+00
34+00
35+00
36+00
37+00
38+00
39+00
40+00
41+00
42+00
43+00
44+00
45+00
46+00

PLAN SUMMARY DATA

DRAINAGE AREA	= 35.8 MI^2
DESIGN FREQUENCY	= 50 YRS
DESIGN DISCHARGE	= 540 CFS
DESIGN HW ELEVATION	= 261.22 FT
100 YEAR DISCHARGE	= 550 CFS
100 YEAR HW ELEVATION	= 261.28 FT
OVERTOPPING FREQUENCY	= 500 YRS-
OVERTOPPING DISCHARGE	= 1450 CFS
OVERTOPPING ELEVATION	= 269.60 FT

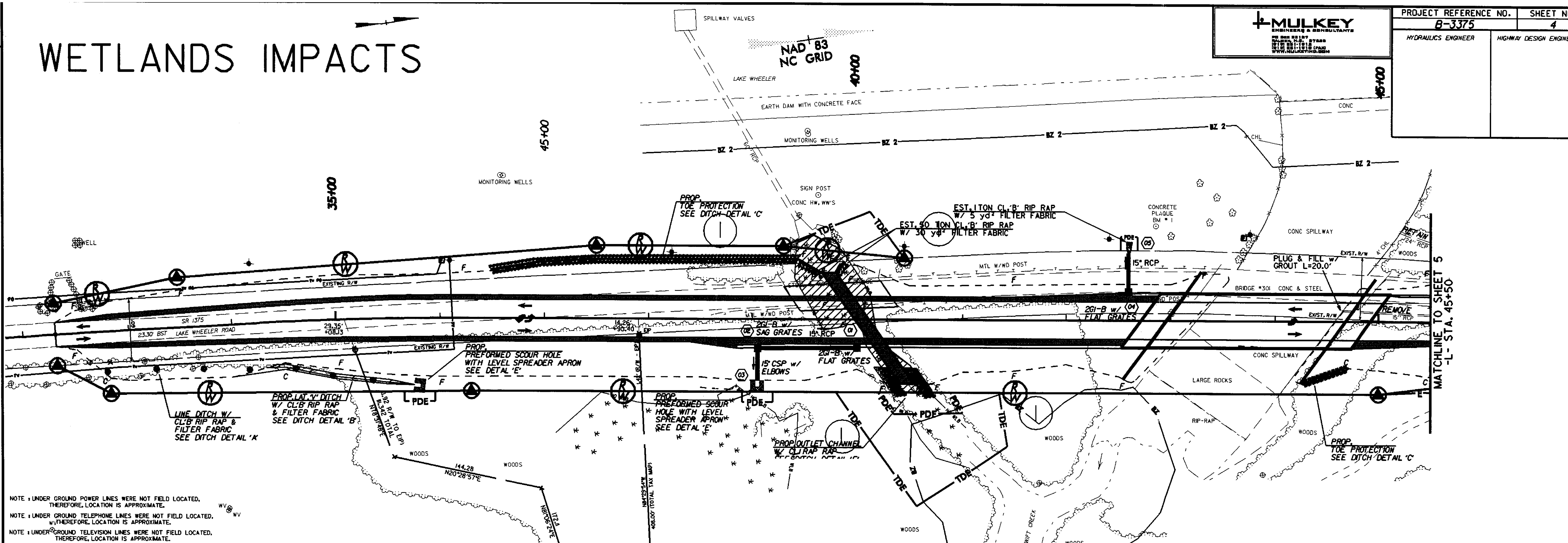
PLAN SUMMARY DATA

DRAINAGE AREA	= 35.8 MI^2
DESIGN FREQUENCY	= 50 YRS
DESIGN DISCHARGE	= 6000 CFS
DESIGN HW ELEVATION	= 272.11 FT
100 YEAR DISCHARGE	= 7700 CFS
100 YEAR HW ELEVATION	= 272.58 FT
OVERTOPPING FREQUENCY	= 500 YRS+
OVERTOPPING DISCHARGE	= 13075+CFS
OVERTOPPING ELEVATION	= 274.00 FT

REVISIONS

WETLANDS IMPACTS

PROJECT REFERENCE NO.	SHEET NO.
B-3375	4
HYDRAULICS ENGINEER	HIGHWAY DESIGN ENGINEER



NAD 83
NC GRID
LAKE WHEELER
EARTH DAM WITH CONCRETE FACE
MONITORING WELLS
SPILLWAY VALVES
SR 1375
LAKE WHEELER ROAD
CONC SPILLWAY
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MATCHLINE TO SHEET 5 -L- STA. 45+50
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LARGE ROCKS
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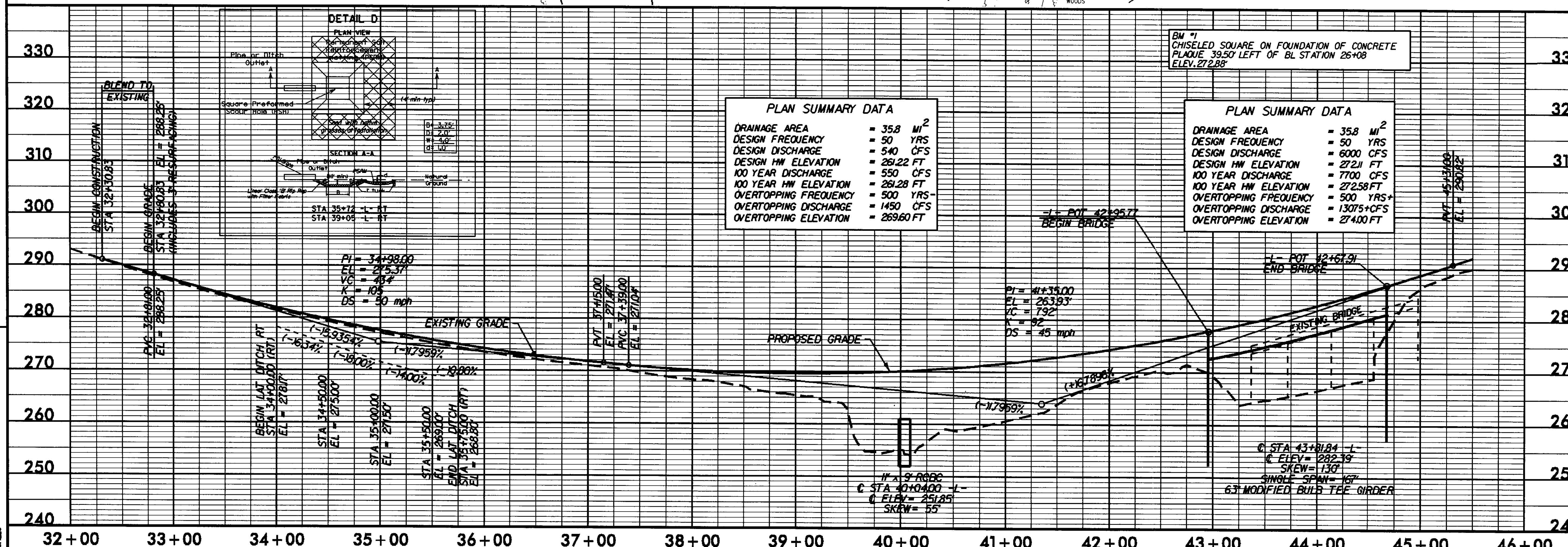

DETAIL D
BEGIN CONSTRUCTION STA 32+30.83
PI = 34+98.00 EL = 275.37' VC = 434' K = 105 DS = 50 mph
PI = 41+35.00 EL = 263.93' VC = 792' K = 92 DS = 45 mph
EXISTING GRADE
PROPOSED GRADE
EXISTING BRIDGE
-L- POT 42+95.77 BEGIN BRIDGE
-L- POT 42+67.91 END BRIDGE
11' x 9' RCBC ℄ STA 40+04.00 -L- ℄ ELEV= 251.85' SKEW= 55°
℄ STA 43+81.84 -L- ℄ ELEV= 282.39' SKEW= 130° SINGLE SPAN= 167' 63" MODIFIED BULB TEE GIRDER
32+00 33+00 34+00 35+00 36+00 37+00 38+00 39+00 40+00 41+00 42+00 43+00 44+00 45+00 46+00

BM #1
CHISELED SQUARE ON FOUNDATION OF CONCRETE PLAQUE 39.50' LEFT OF BL STATION 26+08
ELEV. 272.88'

PLAN SUMMARY DATA

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100 YEAR DISCHARGE	= 550 CFS
100 YEAR HW ELEVATION	= 261.28 FT
OVERTOPPING FREQUENCY	= 500 YRS-
OVERTOPPING DISCHARGE	= 1450 CFS
OVERTOPPING ELEVATION	= 269.60 FT

PLAN SUMMARY DATA

DRAINAGE AREA	= 35.8 MI^2
DESIGN FREQUENCY	= 50 YRS
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100 YEAR DISCHARGE	= 7700 CFS
100 YEAR HW ELEVATION	= 272.58 FT
OVERTOPPING FREQUENCY	= 500 YRS+
OVERTOPPING DISCHARGE	= 13075+CFS
OVERTOPPING ELEVATION	= 274.00 FT

REVISIONS

PROPERTY OWNERS

NAMES AND ADDRESSES

PARCEL NO.	NAMES	ADDRESSES
1	CITY OF RALEIGH	222 W. HARGETT ST. RALEIGH, NC 27602

NCDOT

DIVISION OF HIGHWAYS

WAKE COUNTY

PROJECT: 8.2406201 (B-3375)

SR 1375 (LAKE WHEELER RD.)

BETWEEN CITY OF RALEIGH &

SR 1010

3/10/03

WETLANDS IMPACT PERMIT SUMMARY

Site No.	Station (From/To)	Structure Size / Type	Fill In Wetlands (ac)	Temp. Fill In Wetlands (ac)	Excavation In Wetlands (ac)	Mechanized Clearing (Method III) (ac)	Fill In SW (Natural) (ac)	Fill In SW (Pond) (ac)	Temp. Fill In SW (ac)	Existing Channel Impacted (ft)	Natural Stream Design (ft)
1	-L- 40+08	Culvert	0.13			0.004					
TOTALS:			0.13	0	0	<0.01	0	0	0	0	0

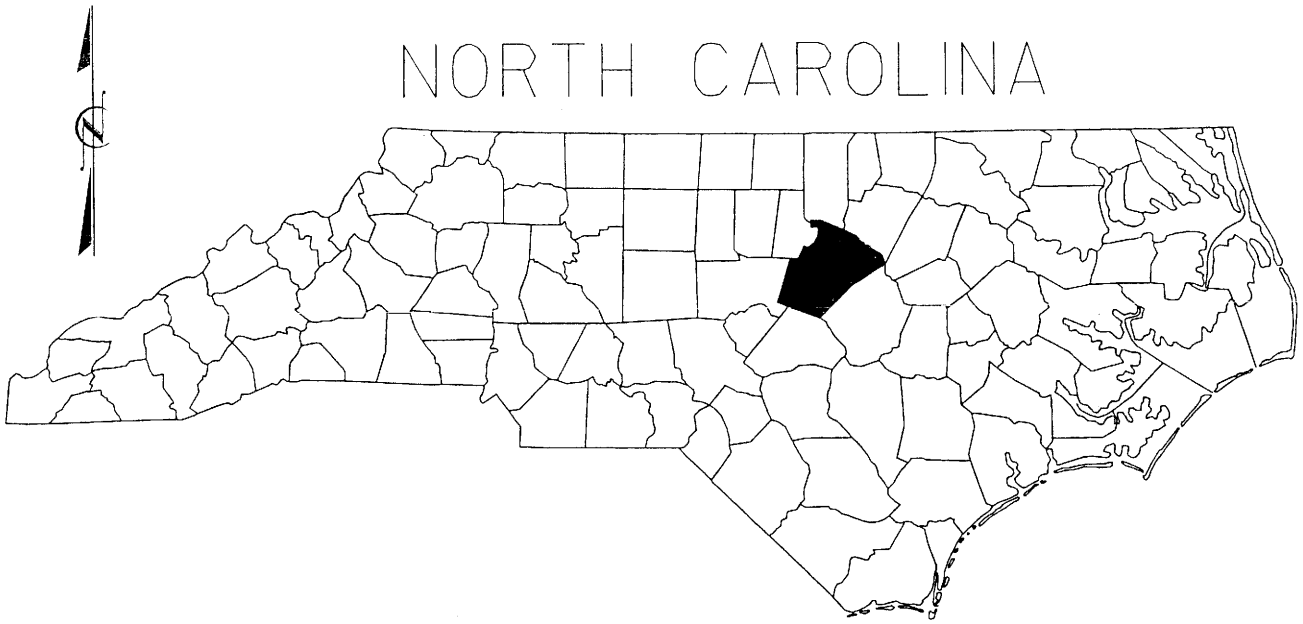
Form Revised 3/22/01

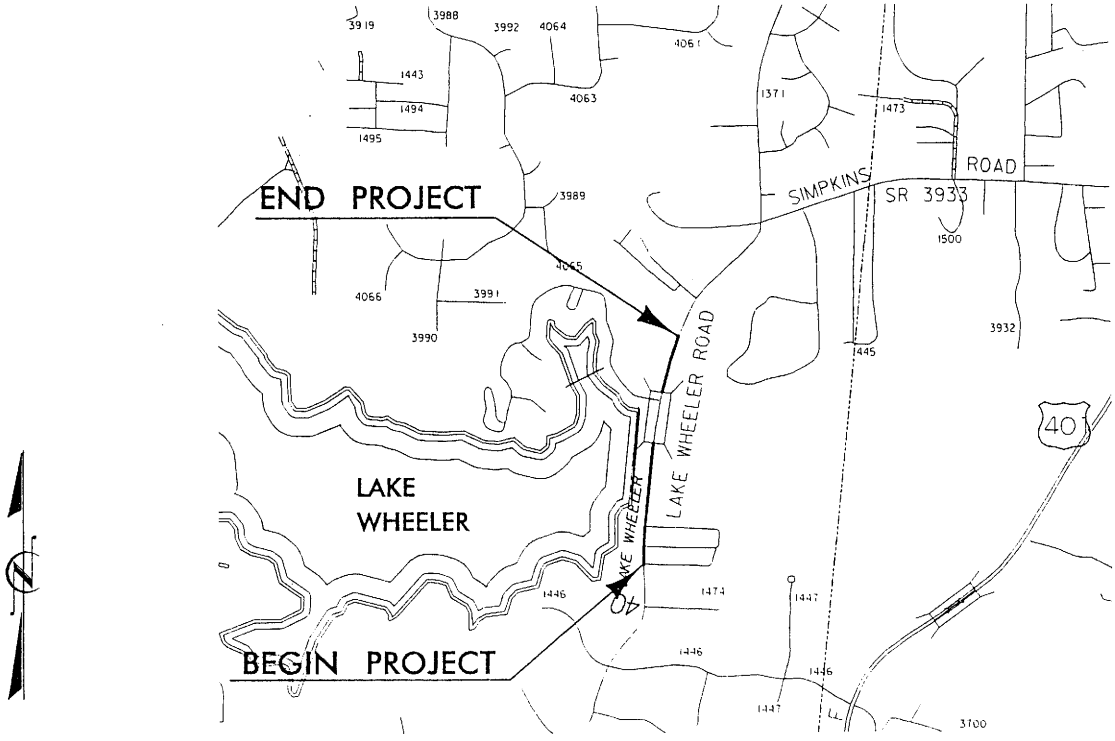
NCDOT

DIVISION OF HIGHWAYS
WAKE COUNTY
PROJECT 8.2406201 (B-3375)
BRIDGE 301 OVER SWIFT CREEK
AND BRIDGE 471 OVER LAKE
WHEELER SPILLWAY ON SR 1375

SHEET 6 OF 6

Rev 10/25/04
3/10/03





BUFFER VICINITY MAPS

NCDOT

DIVISION OF HIGHWAYS

WAKE COUNTY

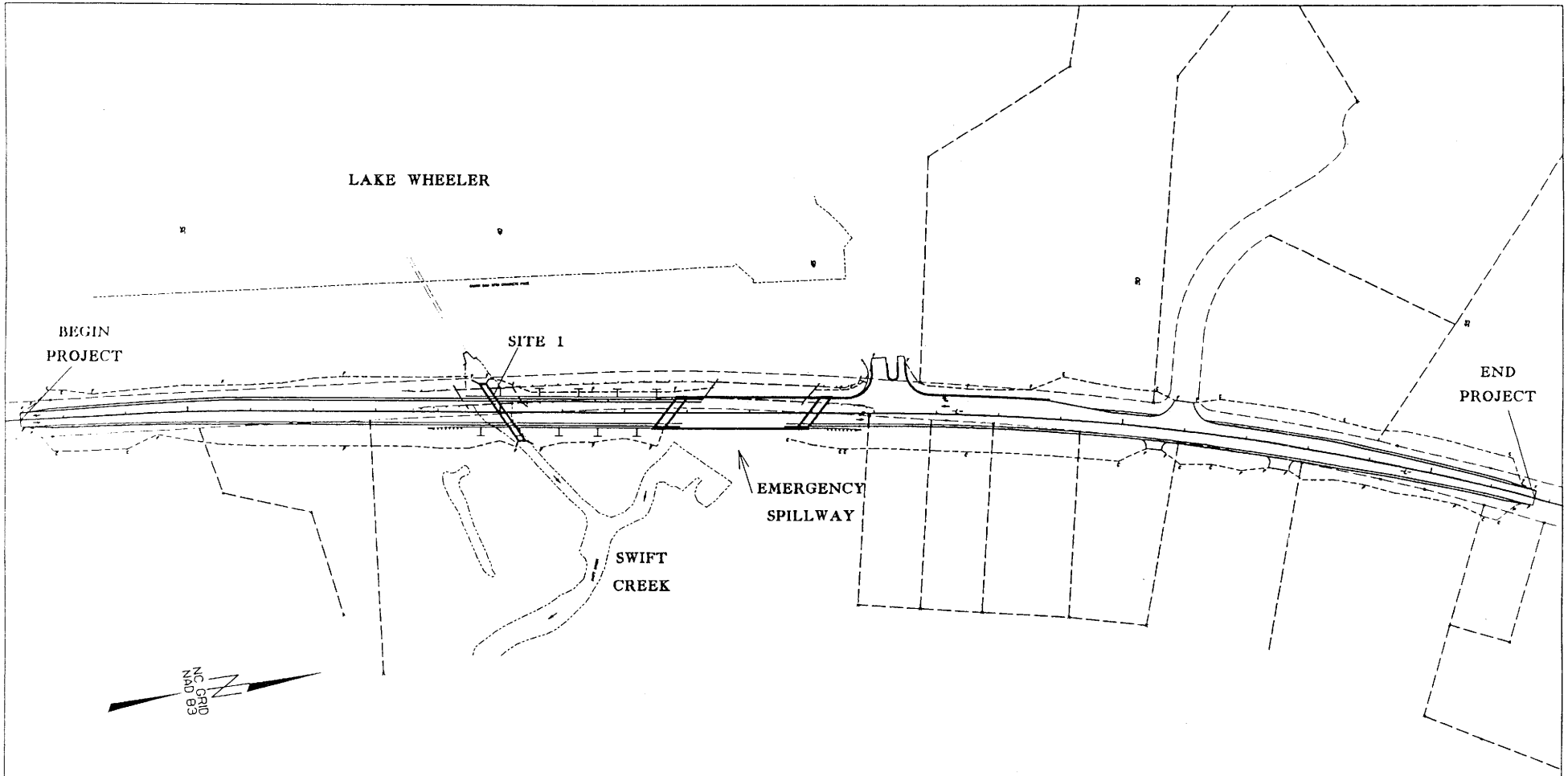
PROJECT: 8.2406201 (B-3375)

SR 1375 (LAKE WHEELER RD.)

BETWEEN CITY OF RALEIGH &

SR 1010

SHEET 1 OF 6 3/10/03



SITE MAP

(NOT TO SCALE)

NCDOT

DIVISION OF HIGHWAYS

WAKE COUNTY

PROJECT: 8.2406201 (B-3375)

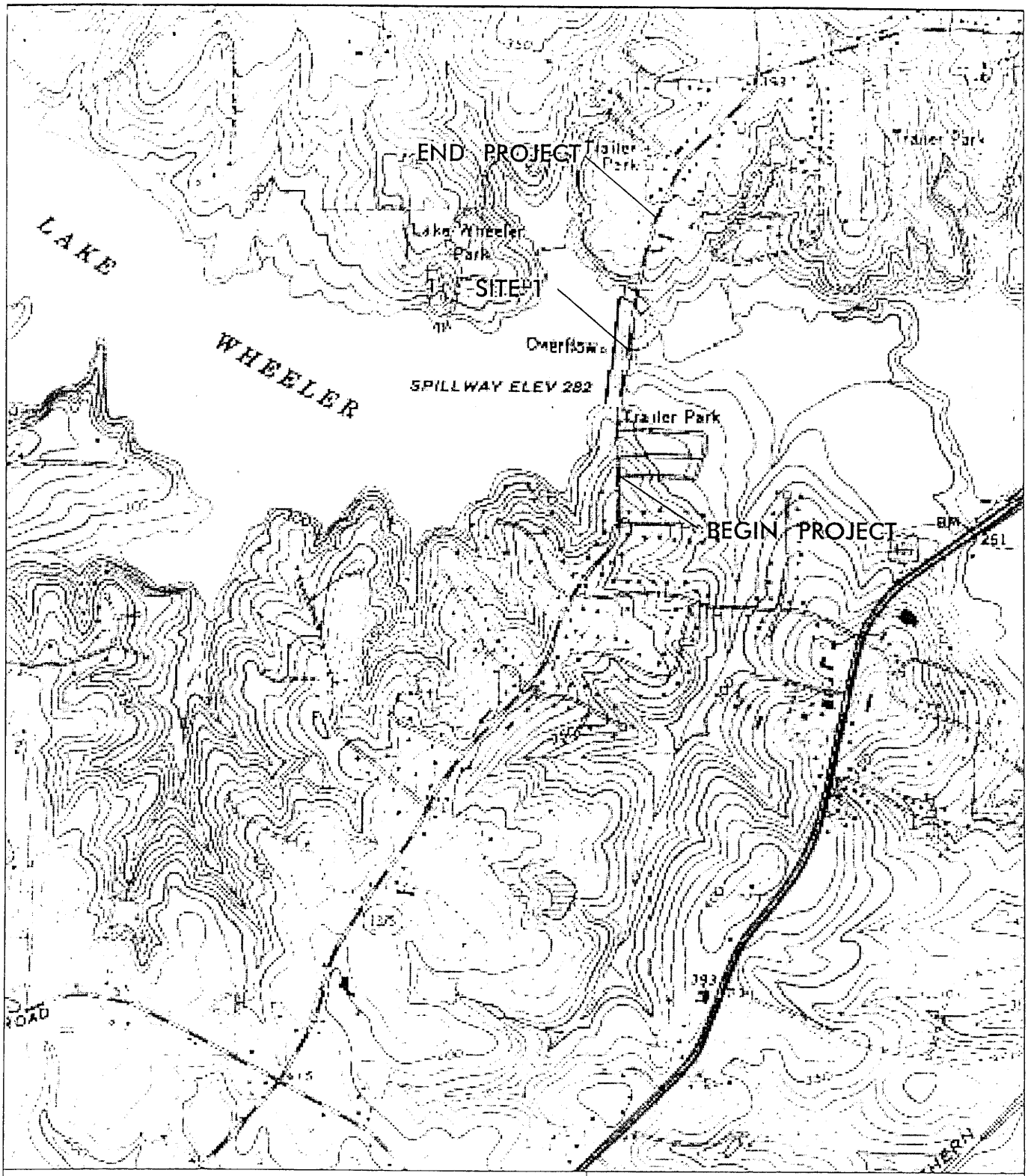
SR 1375 (LAKE WHEELER RD.)

BETWEEN CITY OF RALEIGH &

SR 1010

SHEET 2 OF 6

3/10/03



TOPO MAP

SCALE 1" = 2000'

NCDOT

DIVISION OF HIGHWAYS

WAKE COUNTY

PROJECT: 8.2406201 (B-3375)

SR 1375 (LAKE WHEELER RD.)

BETWEEN CITY OF RALEIGH &

SR 1010

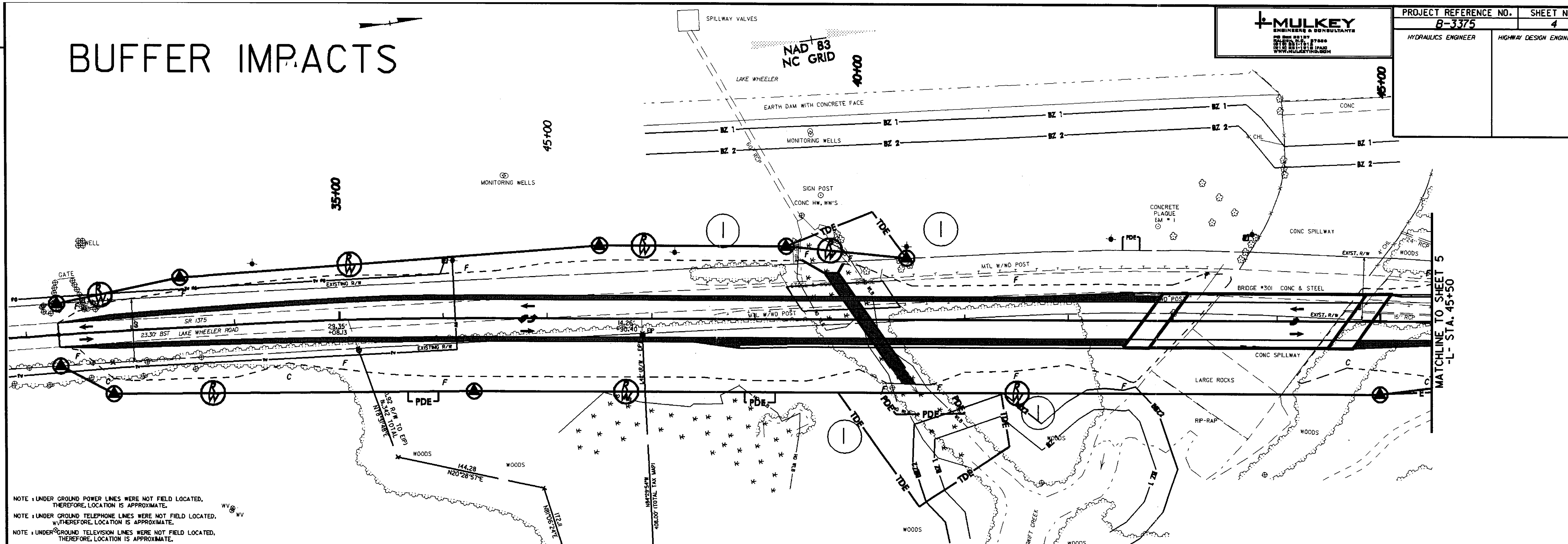
SHEET 3 OF 6

3/10/05

PROJECT REFERENCE NO.	SHEET NO.
B-3375	4
HYDRAULICS ENGINEER	HIGHWAY DESIGN ENGINEER

MULKEY ENGINEERS & CONSULTANTS

BUFFER IMPACTS

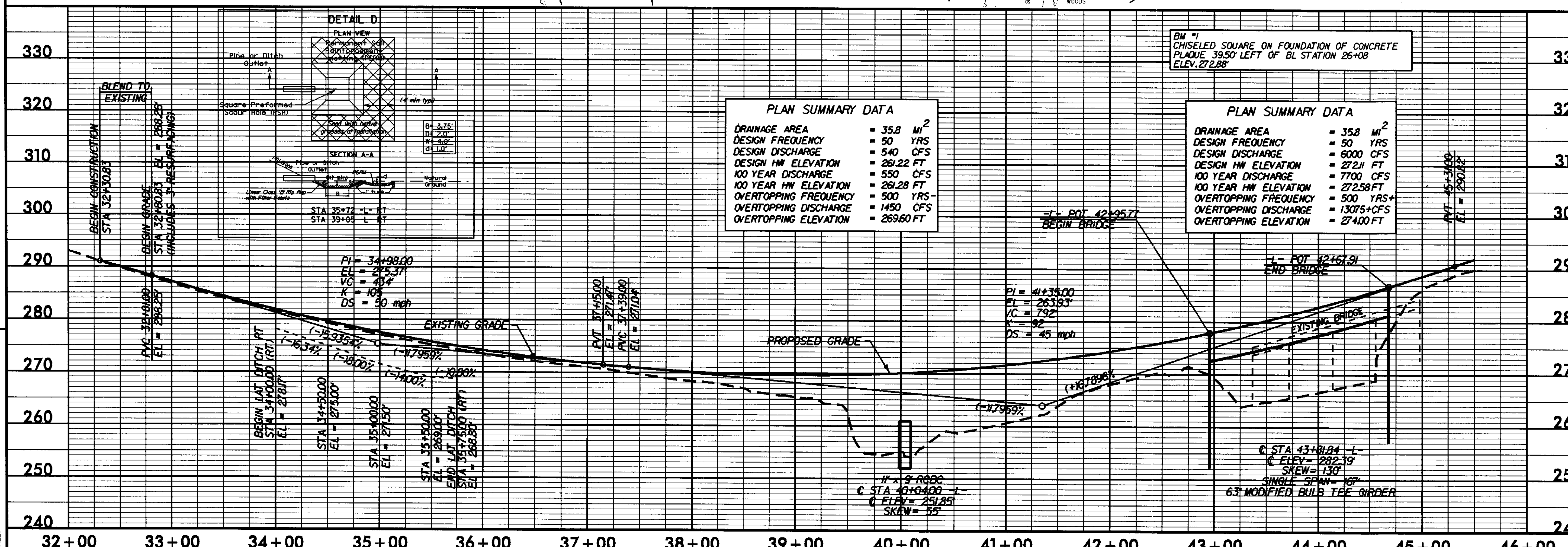


NOTE : UNDER GROUND POWER LINES WERE NOT FIELD LOCATED, THEREFORE, LOCATION IS APPROXIMATE.

NOTE : UNDER GROUND TELEPHONE LINES WERE NOT FIELD LOCATED, THEREFORE, LOCATION IS APPROXIMATE.

NOTE : UNDER GROUND TELEVISION LINES WERE NOT FIELD LOCATED, THEREFORE, LOCATION IS APPROXIMATE.

REVISIONS



BM #1
CHISELED SQUARE ON FOUNDATION OF CONCRETE PLAQUE 39.50' LEFT OF BL STATION 26+08
ELEV. 272.88'

PLAN SUMMARY DATA

DRAINAGE AREA	= 35.8 MI^2
DESIGN FREQUENCY	= 50 YRS
DESIGN DISCHARGE	= 540 CFS
DESIGN HW ELEVATION	= 261.22 FT
100 YEAR DISCHARGE	= 550 CFS
100 YEAR HW ELEVATION	= 261.28 FT
OVERTOPPING FREQUENCY	= 500 YRS-
OVERTOPPING DISCHARGE	= 1450 CFS
OVERTOPPING ELEVATION	= 269.60 FT

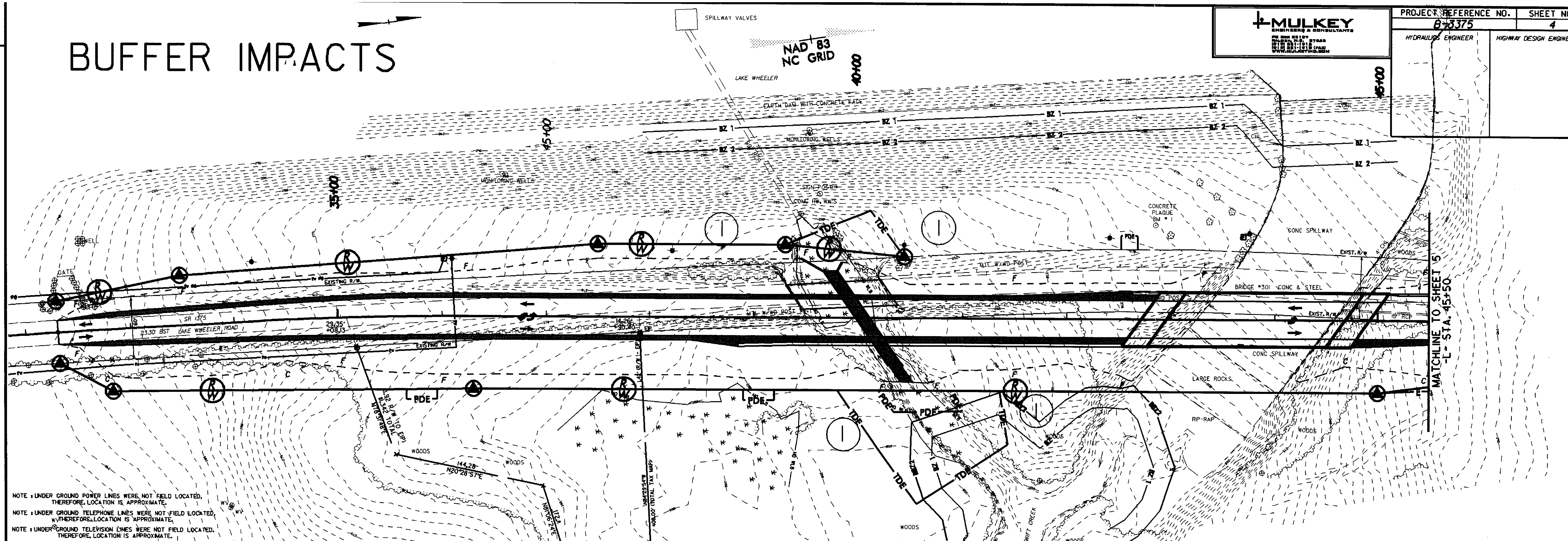
PLAN SUMMARY DATA

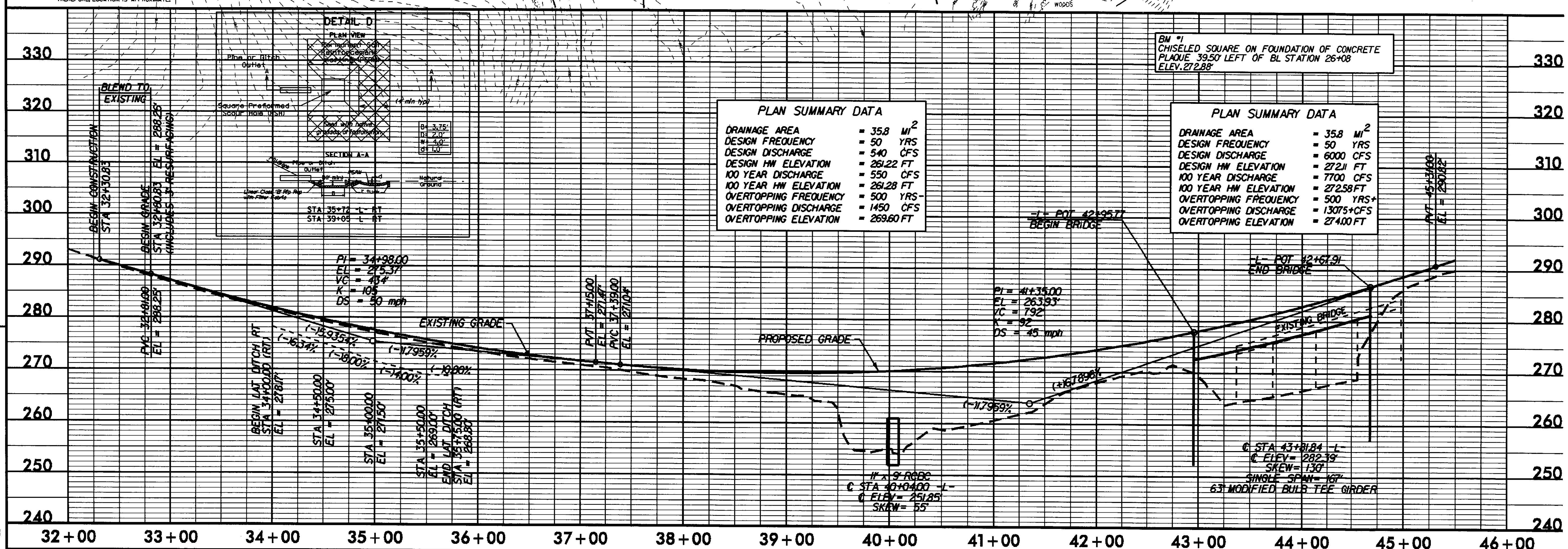
DRAINAGE AREA	= 35.8 MI^2
DESIGN FREQUENCY	= 50 YRS
DESIGN DISCHARGE	= 6000 CFS
DESIGN HW ELEVATION	= 272.11 FT
100 YEAR DISCHARGE	= 7700 CFS
100 YEAR HW ELEVATION	= 272.58 FT
OVERTOPPING FREQUENCY	= 500 YRS+
OVERTOPPING DISCHARGE	= 13075+CFS
OVERTOPPING ELEVATION	= 274.00 FT

BUFFER IMPACTS

PROJECT REFERENCE NO.	SHEET NO.
B-3375	4
HYDRAULICS ENGINEER	HIGHWAY DESIGN ENGINEER

MULKEY ENGINEERS & CONSULTANTS





BM #1
CHISELED SQUARE ON FOUNDATION OF CONCRETE PLAQUE 39.50' LEFT OF BL STATION 26+08
ELEV. 272.88'

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OVERTOPPING DISCHARGE	= 13075+ CFS
OVERTOPPING ELEVATION	= 274.00 FT

PROPERTY OWNERS

NAMES AND ADDRESSES

PARCEL NO.	NAMES	ADDRESSES
1	CITY OF RALEIGH	222 W. HARGETT ST. RALEIGH, NC 27602

NCDOT

DIVISION OF HIGHWAYS

WAKE COUNTY

PROJECT: 8.2406201 (B-3375)

SR 1375 (LAKE WHEELER RD.)

BETWEEN CITY OF RALEIGH &

SR 1010

3/10/03

BUFFER IMPACTS SUMMARY

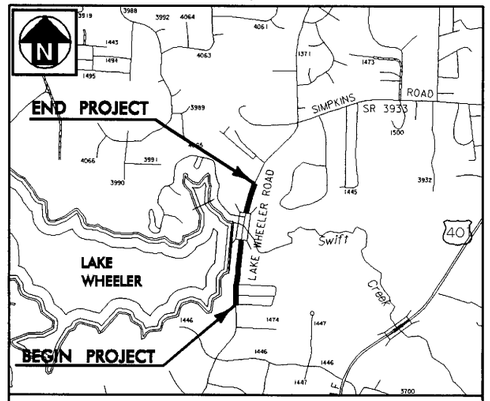
			IMPACT								BUFFER REPLACEMENT	
			TYPE		ALLOWABLE			MITIGABLE				
SITE NO.	STRUCTURE SIZE / TYPE	STATION (FROM/TO)	ROAD CROSSING	PARALLEL IMPACT	ZONE 1 (ft^2)	ZONE 2 (ft^2)	TOTAL (ft^2)	ZONE 1 (ft^2)	ZONE 2 (ft^2)	TOTAL (ft^2)	ZONE 1 (ft^2)	ZONE 2 (ft^2)
TOTAL:					0.0	0.0	0.0	0.0	0.0	0.0		

N.C. DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
WAKE COUNTY
PROJECT: 8.2406201 (B-3375)
BRIDGE 301 OVER SWIFT CREEK
AND BRIDGE 471 OVER LAKE
WHEELER SPILLWAY ON SR 1375

TIP: B-3375

CONTRACT: C201165

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



VICINITY MAP
(NOT TO SCALE)

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

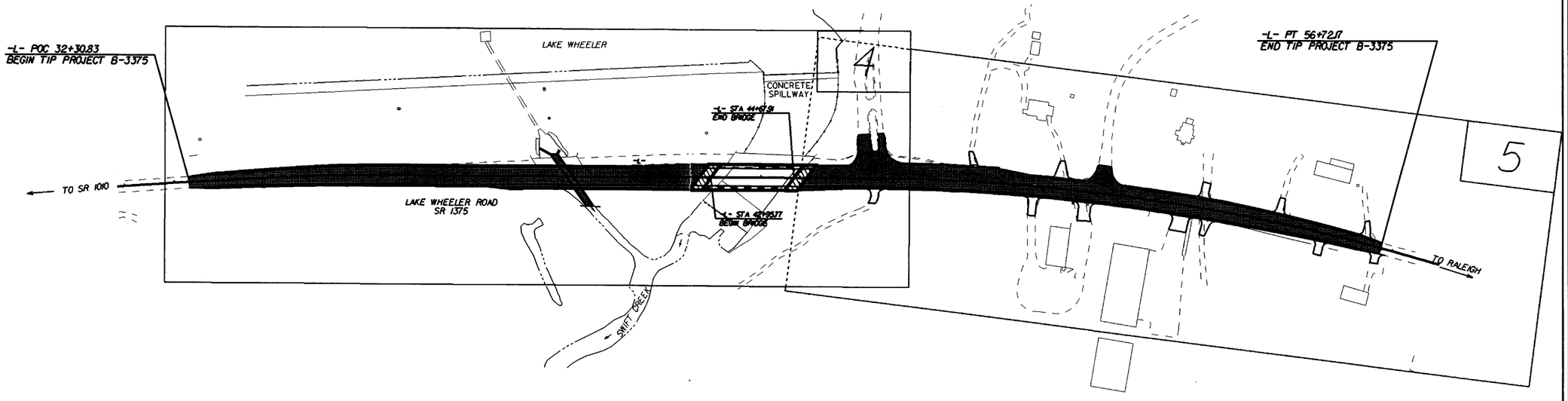
WAKE COUNTY

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	B-3375	1	

W.B.S. NO.	F.A. PROJ. NO.	DESCRIPTION
33023.1.1	BRSTP-1375(2)	P.E.
33023.2.2	BRSTP-1375(2)	R/W / UTIL.
33023.3.1	BRSTP-1375(4)	CONST.

LOCATION: BRIDGE 301 OVER SWIFT CREEK ON SR 1375 AND BRIDGE 471 OVER LAKE WHEELER SPILLWAY ON SR 1375 (LAKE WHEELER ROAD)

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



MULKEY
ENGINEERS & CONSULTANTS
PO BOX 98127
RALEIGH, N.C. 27624
(919) 851-1818
(919) 851-1818 (FAX)
WWW.MULKEYENG.COM

GRAPHIC SCALE

25' 0 50'
PLANS
25' 0 50'
PROFILE (HORIZONTAL)
5' 0 10'
PROFILE (VERTICAL)

PROJECT LENGTH

LENGTH ROADWAY TIP PROJECT B-3375	=	0.429	MILES
LENGTH STRUCTURES TIP PROJECT B-3375	=	0.033	MILES
TOTAL LENGTH TIP PROJECT B-3375	=	0.462	MILES

DESIGN DATA

	ADT (2005)	ADT (2025)	DHV	D	T	V
-L-	13,361	22,100	10%	60%	7% (2% TTST + 5% DUALS)	40 MPH

Prepared in the Office of:
Mulkey Engineers & Consultants
FOR THE N. C. DEPT. OF TRANSPORTATION

2002 STANDARD SPECIFICATIONS

RIGHT OF WAY DATE: JANUARY 16, 2004

LETTING DATE: FEBRUARY 15, 2005

JOHNNY BANKS
MULKEY E & C
PROJECT MANAGER

TIM S. HAYES, PE
MULKEY E & C
PROJECT DESIGN ENGINEER

NCDOT CONTACT: CATHY S. HOUSER, P.E.
ROADWAY DESIGN - PROJECT ENGINEER

HYDRAULICS ENGINEER

SIGNATURE: P.E.

ROADWAY DESIGN

SIGNATURE: P.E.

DIVISION OF HIGHWAYS
STATE OF NORTH CAROLINA

P.E.
STATE HIGHWAY ENGINEER - DESIGN

DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

APPROVED FOR
DIVISION ADMINISTRATOR DATE

DATE: TIME: FILE:

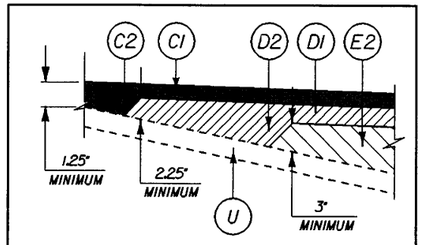
MULKEY
ENGINEERS & CONSULTANTS

PROJECT REFERENCE NO.	SHEET NO.
B-3375	2
PAVEMENT DESIGN ENGINEER	HIGHWAY DESIGN ENGINEER

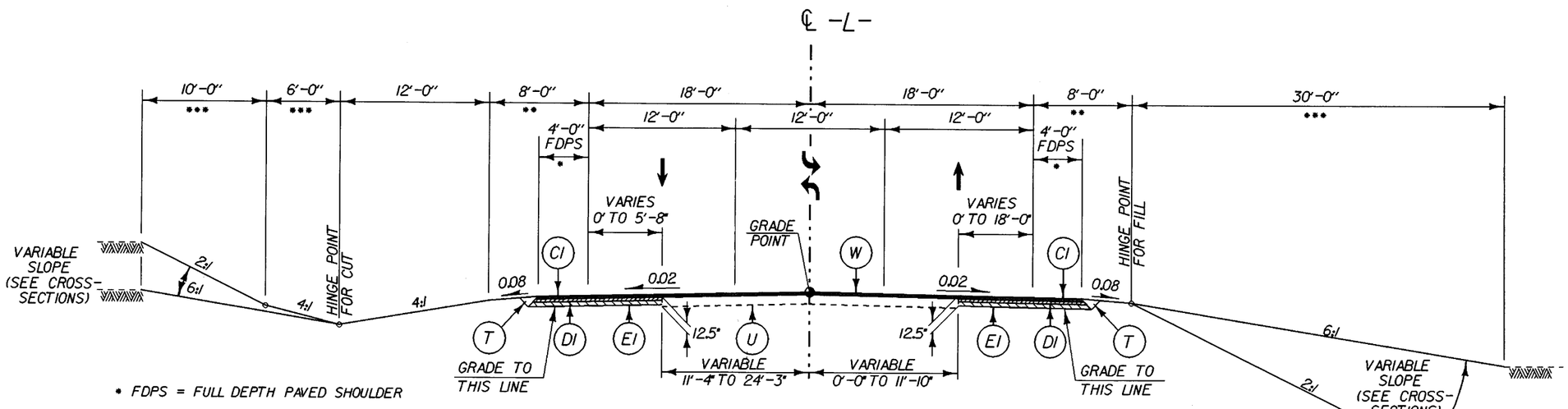
PAVEMENT SCHEDULE

C1	PROPOSED APPROXIMATELY 3" ASPHALT CONCRETE SURFACE COURSE, TYPE S9.5B, AT AN AVERAGE RATE OF 168 LBS. PER SQUARE YARD IN EACH OF 2 LAYERS
C2	PROPOSED VARIABLE DEPTH ASPHALT CONCRETE SURFACE COURSE, TYPE S9.5B, AT AN AVERAGE RATE OF 112 LBS. PER SQUARE YARD PER 1" DEPTH. TO BE PLACED IN LAYERS NOT LESS THAN 1.25" NOR GREATER THAN 1.5" IN DEPTH
D1	PROPOSED APPROXIMATELY 4" ASPHALT CONCRETE INTERMEDIATE COURSE, TYPE 119.0B, AT AN AVERAGE RATE OF 456 LBS. PER SQUARE YARD
D2	PROPOSED VARIABLE DEPTH ASPHALT CONCRETE INTERMEDIATE COURSE, TYPE 119.0B, AT AN AVERAGE RATE OF 114 LBS. PER SQUARE YARD PER 1" DEPTH. TO BE PLACED IN LAYERS NOT LESS THAN 2.25" NOR GREATER THAN 4" IN DEPTH.
E1	PROPOSED APPROXIMATELY 5 1/2" ASPHALT CONCRETE BASE COURSE, TYPE B25.0B, AT AN AVERAGE RATE OF 627 LBS. PER SQUARE YARD
E2	PROPOSED VARIABLE DEPTH ASPHALT CONCRETE BASE COURSE, TYPE B25.0B, AT AN AVERAGE RATE OF 114 LBS. PER SQUARE YARD PER 1" DEPTH. TO BE PLACED IN LAYERS NOT LESS THAN 3" NOR GREATER THAN 5.5" IN DEPTH.
R1	EXISTING 30" CONCRETE CURB
R2	2'-6" CONCRETE CURB AND GUTTER
T	EARTH MATERIAL
U	EXISTING PAVEMENT
W	WEDGING (SEE WEDGING DETAIL THIS SHEET)

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



WEDGING DETAIL (W)



* FDPS = FULL DEPTH PAVED SHOULDER

** 11'-0" W/ GUARDRAIL

*** WHEN THESE DISTANCES INDICATE SLOPES OUTSIDE THE LIMITS OF 6:1 TO 2:1 THE DISTANCE BECOMES VARIABLE AND THE MAXIMUM OR MINIMUM SLOPE MAINTAINED.

TYPICAL SECTION NO. 1

USE TYPICAL SECTION NO. 1 AS FOLLOWS:
TRANSITION FROM EXISTING TO T.S. NO. 1 FROM -L- STA. 32+30.83 TO -L- STA 32+80.83
FROM 32+80.83 TO -L- STA 39+40
FROM -L- STA. 48+80.00 TO -L- STA. 56+22.17
TRANSITION FROM T.S. NO. 1 TO EXISTING FROM -L- STA. 56+22.17 TO -L- STA. 56+72.17

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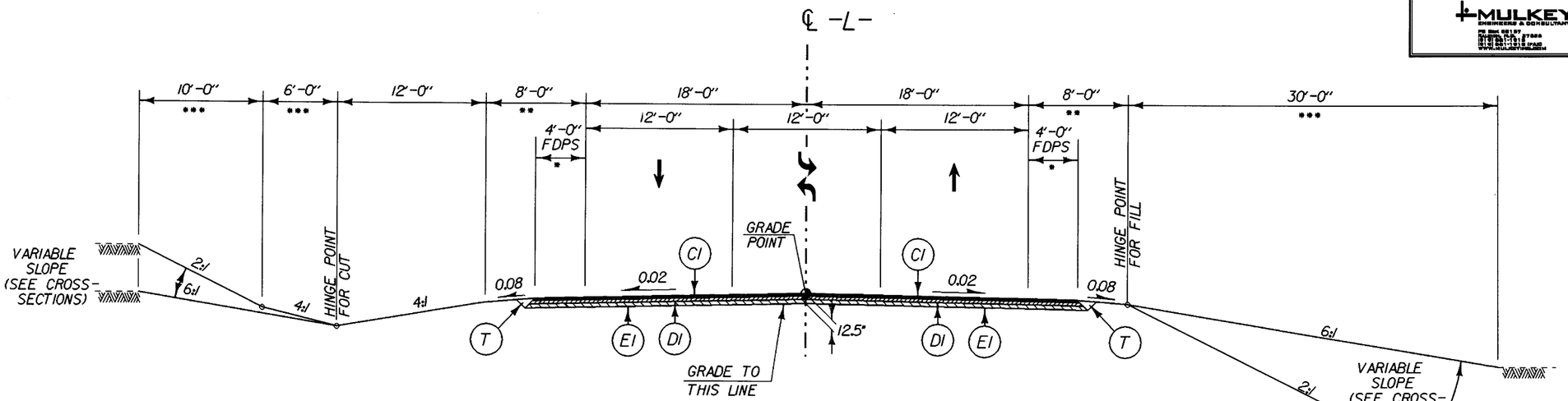
PROJECT REFERENCE NO.	SHEET NO.
B-3375	2-A
PAVEMENT DESIGN ENGINEER	HIGHWAY DESIGN ENGINEER



TYPICAL SECTION NO. 2

USE TYPICAL SECTION NO. 2 AS FOLLOWS:

-L- STA. 39+40 TO STA. 42+95.77 (BEGIN BRIDGE)

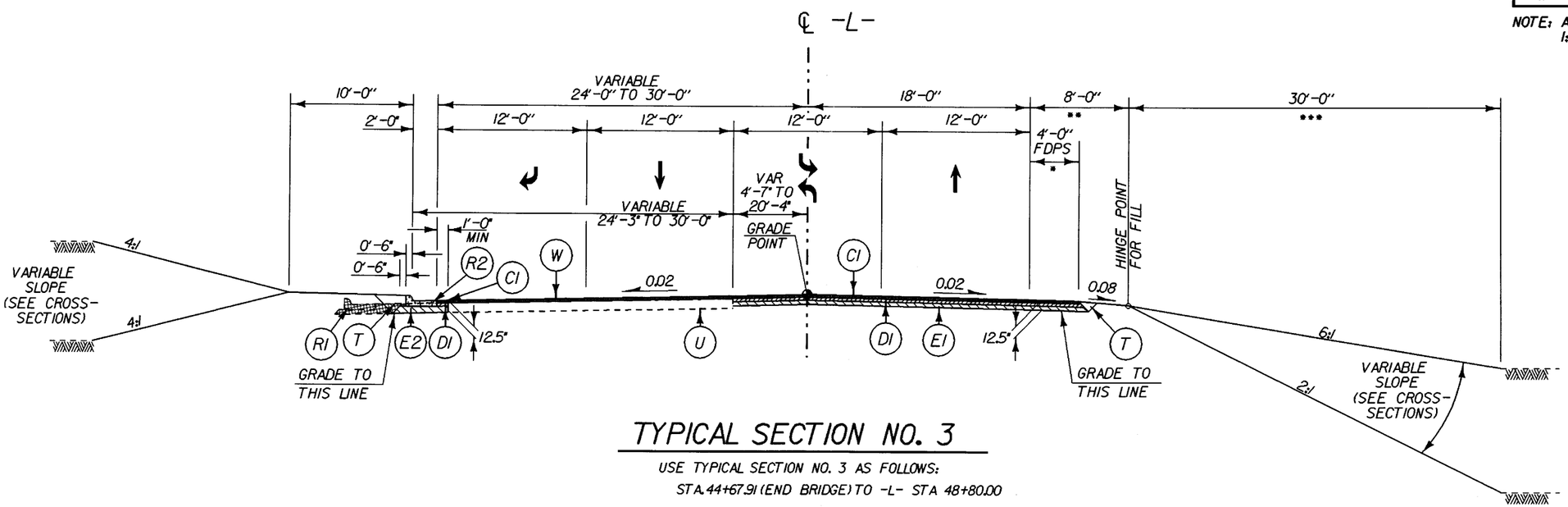
* FDPS = FULL DEPTH PAVED SHOULDER

** 11'-0" W/ GUARDRAIL

*** WHEN THESE DISTANCES INDICATE SLOPES OUTSIDE THE LIMITS OF 6:1 TO 2:1 THE DISTANCE BECOMES VARIABLE AND THE MAXIMUM OR MINIMUM SLOPE MAINTAINED.

CI	3" S9.5B
DI	4" I19.0B
EI	5 ½" B25.0B
E2	VAR. DEPTH B25.0B
RI	EXISTING 30" CONCRETE CURB
R2	2'-6" CONCRETE CURB AND GUTTER
T	EARTH MATERIAL
U	EXISTING PAVEMENT
W	WEDGING

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



TYPICAL SECTION NO. 3

USE TYPICAL SECTION NO. 3 AS FOLLOWS:

STA. 44+67.91 (END BRIDGE) TO -L- STA 48+80.00

PROJECT REFERENCE NO.	SHEET NO.
B-3375	4
HYDRAULICS ENGINEER	HIGHWAY DESIGN ENGINEER

MULKEY
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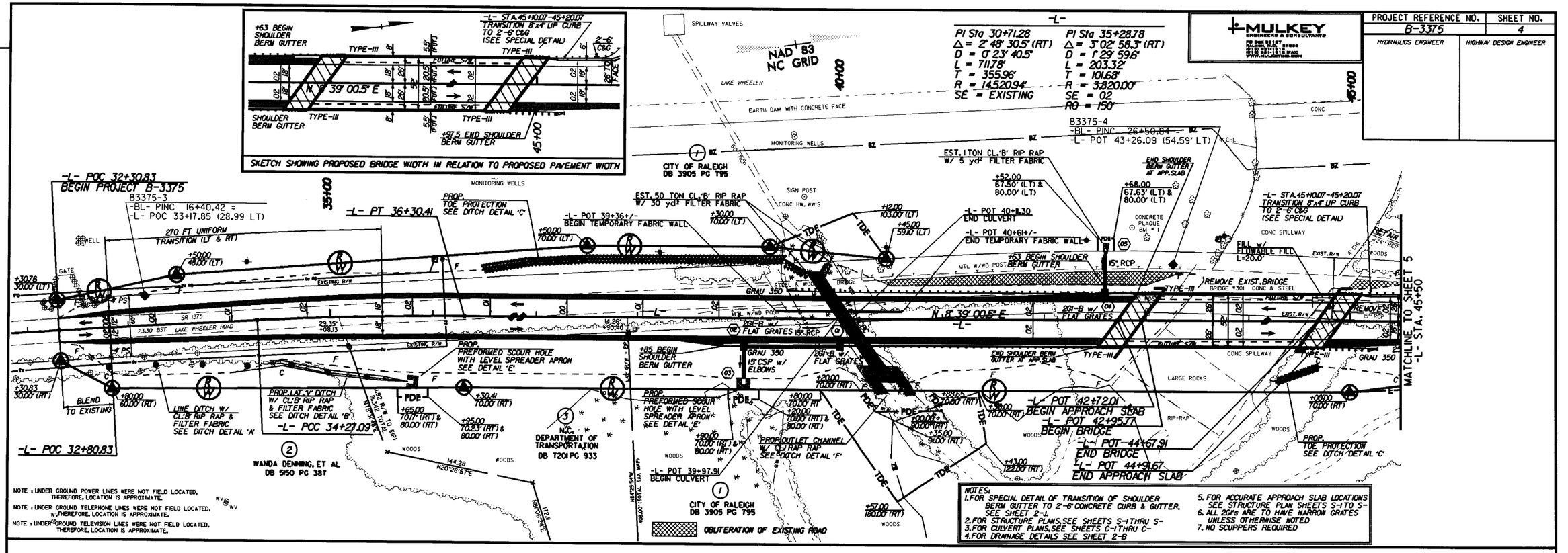
PO BOX 98187
RALEIGH, N.C. 27624
(919) 851-1818 FAX
WWW.MULKEYINC.COM

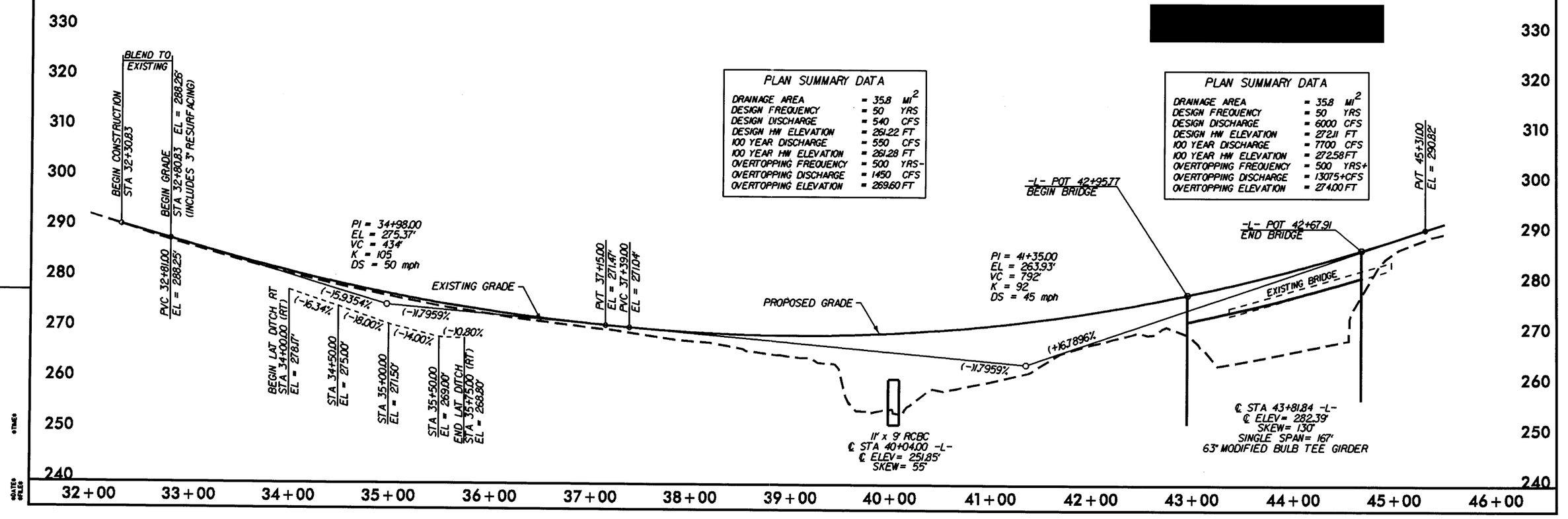
REVISIONS



PI Sta 30+71.28
Δ = 2° 48' 30.5" (RT)
D = 0° 23' 40.5"
L = 711.78'
T = 355.96'
R = 14,520.94'
SE = EXISTING

PI Sta 35+28.78
Δ = 3° 02' 58.3" (RT)
D = 1° 29' 59.6"
L = 203.32'
T = 101.68'
R = 3,820.00'
SE = 02
RO = 150'

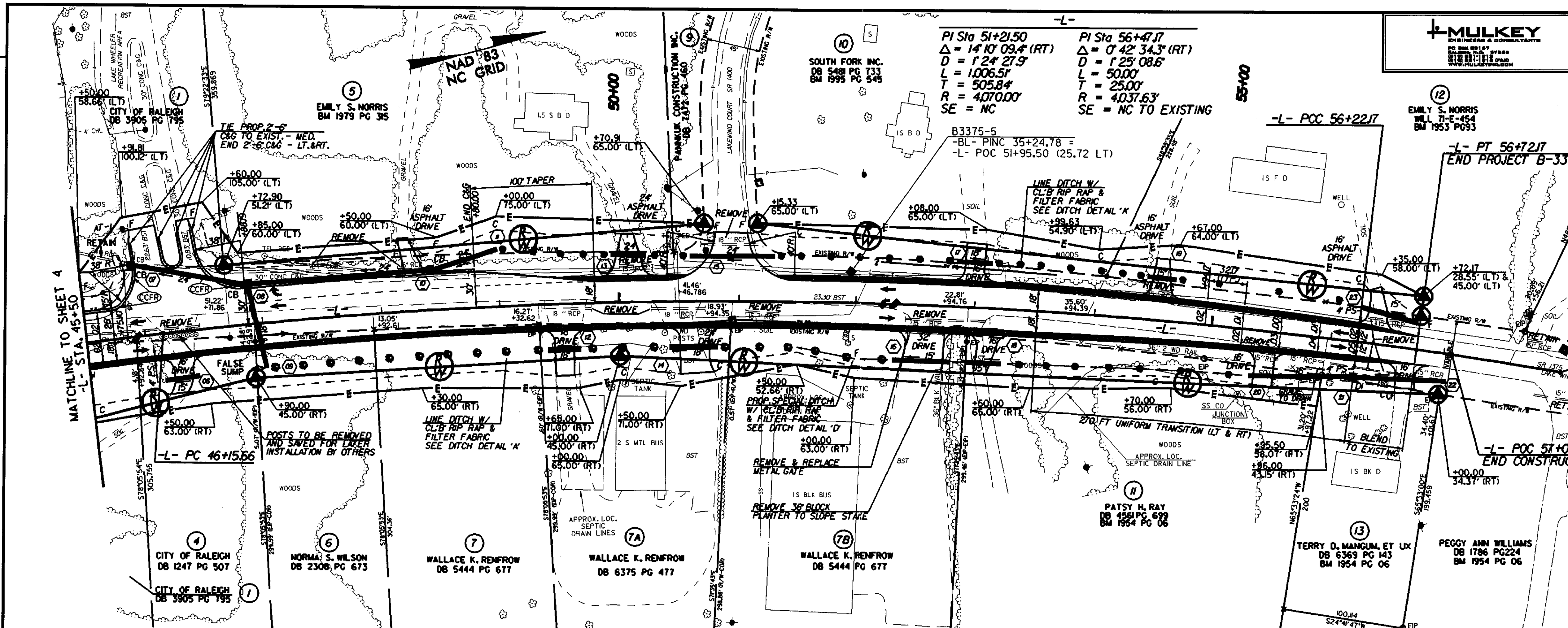
NOTES:
1. FOR SPECIAL DETAIL OF TRANSITION OF SHOULDER BERM GUTTER TO 2'-6" CONCRETE CURB & GUTTER, SEE SHEET 2-J.
2. FOR STRUCTURE PLANS, SEE SHEETS S-1 THRU S-
3. FOR CULVERT PLANS, SEE SHEETS C-1 THRU C-
4. FOR DRAINAGE DETAILS SEE SHEET 2-B
5. FOR ACCURATE APPROACH SLAB LOCATIONS SEE STRUCTURE PLAN SHEETS S-1 TO S-
6. ALL 2GI's ARE TO HAVE NARROW GRATES UNLESS OTHERWISE NOTED
7. NO SCUPPERS REQUIRED



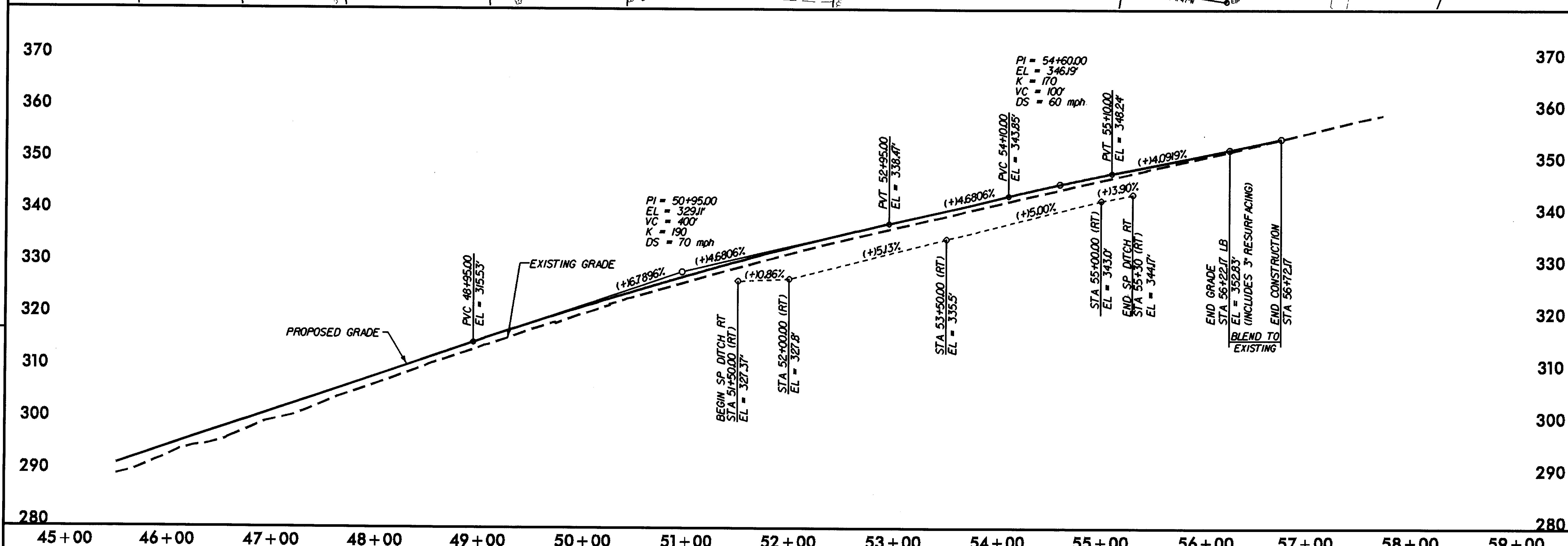
PROJECT REFERENCE NO.	SHEET NO.
B-3375	5
HYDRAULICS ENGINEER	HIGHWAY DESIGN ENGINEER

MULKEY ENGINEERS & CONSULTANTS

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION



-L-
PI Sta 51+21.50
Δ = 14° 10' 09.4" (RT)
D = 1° 24' 27.9"
L = 1,006.51'
T = 505.84'
R = 4,070.00'
SE = NC
PI Sta 56+47.17
Δ = 0° 42' 34.3" (RT)
D = 1° 25' 08.6"
L = 50.00'
T = 25.00'
R = 4,037.63'
SE = NC TO EXISTING
NAD 83 NC GRID
MATCHLINE TO SHEET 4 -L- STA. 45+5.0
-L- PC 46+15.66
-L- PCC 56+22.17
-L- PT 56+72.17
END PROJECT B-3375
-L- POC 57+07
END CONSTRUCTION
-L- POC 58+00
B3375-5
-BL- PINC 35+24.78 =
-L- POC 51+95.50 (25.72 LT)
CITY OF RALEIGH DB 3905 PG 795
EMILY S. NORRIS BM 1979 PG 315
SOUTH FORK INC. DB 5481 PG 733 BM 1995 PG 545
EMILY S. NORRIS WILL 71-E-454 BM 1953 PG93
SUSAN A. PERRY DB 5582 PG 209 BM 1993 PG 193
CITY OF RALEIGH DB 1247 PG 507
NORMA S. WILSON DB 2306 PG 673
WALLACE K. RENFROW DB 5444 PG 677
WALLACE K. RENFROW DB 6375 PG 477
WALLACE K. RENFROW DB 5444 PG 677
PATSY H. RAY DB 4561 PG 699 BM 1954 PG 06
TERRY D. MANGUM, ET UX DB 6369 PG 143 BM 1954 PG 06
PEGGY ANN WILLIAMS DB 1786 PG224 BM 1954 PG 06
POSTS TO BE REMOVED AND SAVED FOR LATER INSTALLATION BY OTHERS
LINE DITCH W/ CL'B' RIP RAP & FILTER FABRIC SEE DITCH DETAIL 'K'
PROP. SPECIAL DITCH W/ CL'B' RIP RAP & FILTER FABRIC SEE DITCH DETAIL 'D'
REMOVE & REPLACE METAL GATE
REMOVE 38' BLOCK PLANTER TO SLOPE STAKE
270 FT UNIFORM TRANSITION (LT & RT)
BLEND TO EXISTING
100' TAPER
REMOVE



PI = 50+95.00
EL = 329.11'
VC = 400'
K = 190
DS = 70 mph
PI = 54+60.00
EL = 346.19'
K = 170
VC = 100'
DS = 60 mph
PVC 48+95.00 EL = 315.53'
PVT 52+95.00 EL = 338.41'
PVC 54+10.00 EL = 343.85'
PVT 55+10.00 EL = 348.24'
(+)6.7896%
(+)4.6806%
(+)4.0919%
(+)0.86%
(+)5.13%
(+)5.00%
(+)3.90%
EXISTING GRADE
PROPOSED GRADE
BEGIN SP DITCH RT STA 51+50.00 (RT) EL = 327.37'
STA 52+00.00 (RT) EL = 327.8'
STA 53+50.00 (RT) EL = 335.5'
STA 55+00.00 (RT) EL = 343.0'
END SP DITCH RT STA 55+30 (RT) EL = 344.17'
END GRADE STA 56+22.17 LB EL = 352.83' (INCLUDES 3" RESURFACING)
BLEND TO EXISTING
END CONSTRUCTION STA 56+72.17
370
360
350
340
330
320
310
300
290
280
45+00
46+00
47+00
48+00
49+00
50+00
51+00
52+00
53+00
54+00
55+00
56+00
57+00
58+00
59+00

REVISIONS

Wake County
SR 1375 (Lake Wheeler Road)
Bridge No. 301 Over Swift Creek
And
Bridge No. 471 Over Lake Wheeler Spillway
Federal Aid Project BRSTP-1375(2)
State Project 8.2406201
T.I.P. B-3375

CATEGORICAL EXCLUSION

AND

PROGRAMMATIC SECTION 4(F) EVALUATION AND APPROVAL

UNITED STATES DEPARTMENT OF TRANSPORTATION

FEDERAL HIGHWAY ADMINISTRATION

AND

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

APPROVED:

11·26·03
DATE

for Gregory J. Thorpe, Ph.D.
Environmental Management Director
Project Development and Environmental Analysis Branch, NCDOT

11/26/03
DATE

for John F. Sullivan, III
Division Administrator
Federal Highway Administration

Wake County
SR 1375 (Lake Wheeler Road)
Bridge No. 301 Over Swift Creek
And
Bridge No. 471 Over Lake Wheeler Spillway
Federal Aid Project BRSTP-1375(2)
State Project 8.2406201
T.I.P. B-3375

CATEGORICAL EXCLUSION

AND

PROGRAMMATIC SECTION 4(F) EVALUATION AND APPROVAL

November 2003

Documentation Prepared by:
Mulkey Engineers & Consultants
Cary, North Carolina

11/19/03
Date

J. A. Bissett, Jr., PE
Branch Manager

11/19/03
Date

Pamela R. Williams
Project Manager

For the North Carolina Department of Transportation

11/26/03
Date

Theresa Ellerby
Project Manager
Consultant Engineering Unit

PROJECT COMMITMENTS

Wake County
SR 1375 (Lake Wheeler Road)
Bridge No. 301 Over Swift Creek
And
Bridge No. 471 Over Lake Wheeler Spillway
Federal Aid Project BRSTP-1375(2)
State Project 8.2406201
T.I.P. B-3375

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 Best Management Practices for the Protection of Surface Waters (BMPs), NCDOT's Guidelines for Best Management Practices for Bridge Demolition and Removal, 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, Hydraulics Unit, and Division Engineer

NCDENR Riparian Buffer Rules for the Neuse River (15A NCAC 2B .0233) will be implemented as applicable.

High Quality Water (HQW) erosion and sedimentation control measures will be utilized on this project.

Roadway Design Unit/Hydraulics Unit/Division

An "Approval to Modify" permit will be required in accordance with the North Carolina Dam Safety Law of 1967 (General Statute 143-215-23. et seq.) and the regulation promulgated there under codified at North Carolina Administrative Code, title 15A, Subchapter 2K (15A NCAC 2K).

Prior to the initiation of any construction activity, two sets of plans, specifications and engineering design data for the work will be submitted to the office of NCDENR, Division of Land Resources, for review and approval 120-days prior to commencement of any construction activities.

Roadway Design/Structures

The bridge and roadway will be designed to accommodate for future widening for bicycle and pedestrian traffic.

The design will provide accommodations for a future signalized at-grade crossing near the driveway entrance to the Lake Wheeler Park.

Wake County
SR 1375 (Lake Wheeler Road)
Bridge No. 301 Over Swift Creek
And
Bridge No. 471 Over Lake Wheeler Spillway
Federal Aid Project BRSTP-1375(2)
State Project 8.2406201
T.I.P. B-3375

INTRODUCTION: The replacement of Bridge No. 301 and Bridge No. 471 are included in the 2004-2010 North Carolina Department of Transportation (NCDOT) Transportation Improvement Program (T.I.P.) and in the Federal-Aid Bridge Replacement Program. Bridge locations are shown in Figure 1. No substantial environmental impacts are anticipated. The project is classified as a Federal "Categorical Exclusion".

I. PURPOSE AND NEED

The NCDOT Bridge Maintenance Unit records indicate that Bridge No. 301 has a sufficiency rating of 34.7 out of a possible 100 for a new structure. Bridge No. 471 has a sufficiency rating of 56.8. The bridges are considered functionally obsolete and structurally deficient. The replacement of these inadequate structures will result in safer and more efficient traffic operations.

II. EXISTING CONDITIONS

Bridge No. 301 is located on SR 1375 (Lake Wheeler Road) in Wake County, approximately 0.5 miles (0.8 kilometers) south of the intersection with SR 1371. Bridge No. 471 is located on SR 1375 approximately 300 feet (91 meters) north of Bridge No. 301. SR 1375 is classified as an urban collector in the statewide functional classification system. Additionally, SR 1375 is classified as a major thoroughfare in the Capital Area MPO Thoroughfare Plan and in the Raleigh Comprehensive Plan. Land use in the project area is non-urban with moderately dense residential development and low-density commercial development. SR 1375 is a two-lane facility that currently serves commuting and local traffic. SR 1375 runs parallel to and is at the base of the Lake Wheeler Dam. This is an earth dam with a concrete spillway, which is crossed by Bridge No. 471. The entrance to Lake Wheeler and Lake Wheeler Park is located in the northwest quadrant of the project.

Lake Wheeler was constructed in 1956 by the Army Corps of Engineers as Raleigh's secondary auxiliary water supply. Lake Wheeler and Lake Wheeler Park form an 800-acre (323.7-hectare) facility with 650 acres (263 hectares) of lake and 150 acres (60.7 hectares) of park. Numerous services are provided including fishing, bass tournaments, boat shows, the annual Tarheel Regatta, picnic shelters, lakeside conference room facilities, and private boat launching. Lake Wheeler is managed by the Raleigh Parks and Recreation Department.

Bridge No. 301 was constructed in 1952. It is a three-span structure with an overall length of 92 feet (28 meters) and a clear roadway width of 24 feet (7.2 meters). The superstructure consists of a reinforced concrete floor on steel I-beams. The substructure consists of reinforced concrete caps on timber piles.

The bridge has a posted weight limit of 18 tons (18.28 metric tons) for single vehicle (SV) and 23 tons (23.37 metric tons) for truck-tractor semi trailer (TTST).

Bridge No. 471 was constructed in 1956. It is a four-span structure with an overall length of 162 feet (49.4 meters) and a clear roadway width of 24 feet (7.2 meters). The superstructure consists of a reinforced concrete floor on steel I-beams. The end bents are reinforced concrete abutments and the interior bents are reinforced concrete solid piers. The bridge has a posted weight limit of 28 tons (28.44 metric tons) for single vehicle (SV) and 33 tons (33.53 metric tons) for truck-tractor semi trailer (TTST).

SR 1375 has two travel lanes with a clear roadway width of 20 feet (6.0 meters) with 8-foot (2.4-meter) grass shoulders. The posted speed limit is 35 miles per hour (mph) in the vicinity of the bridges.

An overhead utility line extends parallel to the west side of the bridges and there are several monitoring wells bored into the dam. There are no utilities attached to the bridges. It is anticipated that the utility impacts will be low.

No accidents were reported near Bridge No. 301 during the period from December 1, 1999 to November 30, 2002.

One accident was reported near Bridge No. 471 during the period from December 1, 1999 to November 30, 2002. No fatalities were associated with the accident.

This section of SR 1375 in Wake County is in an urban area boundary but is not part of a designated bicycle route nor is it listed in the TIP as needing incidental bicycle accommodations. Bridges within an urban area boundary with shoulder approaches should allow sufficient offsets between travel lanes and outside railing to permit the future placement of sidewalks.

The 2003 estimated average daily traffic (ADT) volume for Bridge No. 301 and Bridge No. 471 is 12,500 vehicles per day (vpd). The projected ADT is 25,300 vpd by the design year 2030.

Seven school buses cross the bridges twice per day, for fourteen trips per day.

III. ALTERNATIVES

A. Project Description

Based on a preliminary hydraulics analysis the proposed replacement structure for Bridge No. 301 will be a reinforced concrete box culvert. The proposed replacement structure for Bridge No. 471 will be a bridge. The length and opening size of the proposed structures may increase or decrease as necessary to accommodate peak flows, as determined by a more detailed hydraulic analysis to be performed during the final design phase of the project.

The proposed grade will be raised approximately six feet (1.8 meters) to accommodate the increase in structure depth. This project will have a 40 mph (70 kmh) design speed.

The bridge and roadway will be designed to accommodate for future widening and 8-foot (2.4-meter) shoulders will be provided on the new structure to provide for bicycle and pedestrian traffic. The design will provide accommodations for a future signalized at-grade crossing near the driveway entrance to the Lake Wheeler Park. The installation of the signal at this location will not be part of this project.

B. Build Alternatives

The four (4) build alternatives that were studied for replacing the existing bridges are described below.

Alternative A replaces Bridge No. 301 and Bridge No. 471 on the existing alignment (Figure 2). Traffic will be detoured off-site during construction (Figure 1). The proposed detour route is approximately 4.5 miles (7.24 kilometers) in length along the following routes: SR 1146, US 401, and SR 1375. The off-site detour has a road user cost of approximately $6,600,000 per year.

Bridge No. 301 will be replaced with a 11-foot (3.3-meter) by 9-foot (2.7-meter) reinforced concrete box culvert. The proposed replacement structure for Bridge No. 471 is a bridge approximately 195 feet (59 meters) in length. The proposed bridge will provide two 12-foot (3.6-meter) travel lanes with 8-foot (2.4-meter) shoulders.

SR 1375 will consist of two 12-foot (3.6-meter) travel lanes and 8-foot (2.4-meter) shoulders, including 4-foot (1.2-meter) paved shoulders across the proposed culvert and approaches to Bridge No. 471. The approach work will extend approximately 600 feet (182 meters) to the south of Bridge No. 471 and approximately 500 feet (152 meters) north of Bridge No. 471.

Alternative A was not selected as the preferred alternative due to the following reasons:

- Replacing the bridges on the existing alignment does not allow for future symmetrical widening of SR 1375 due to impact to the earth dam.
- The high traffic volume and road user cost makes the off-site detour undesirable.
- Alternative A does not provide a center turning lane that Alternative E provides

Alternative B replaces Bridge No. 301 and Bridge No. 471 on the existing alignment (Figure 2A). During construction traffic will be maintained by an on-site detour located downstream (east) of the existing structures.

Bridge No. 301 will be replaced with a 11-foot (3.3-meter) by 9-foot (2.7-meter) reinforced concrete box culvert. The proposed replacement structure for Bridge No. 471 is a bridge approximately 195 feet (59 meters) in length. The proposed bridge will provide two 12-foot (3.6-meter) travel lanes with 8-foot (2.4-meter) shoulders.

SR 1375 will consist of two 12-foot (3.6-meter) travel lanes and 8-foot (2.4-meter) shoulders, including 4-foot (1.2-meter) paved shoulders across the proposed culvert and approaches to Bridge No. 471. The approach work will extend approximately 1000 feet (305 meters) to the south of Bridge No. 471 and approximately 800 feet (244 meters) north of Bridge No. 471.

Alternative B was not selected as the preferred alternative because of the following reasons:

- In order to provide appropriate clearance to construct the culvert and new bridge, the temporary detour will be located further downstream which will result in greater impacts to the stream than Alternative E.
- Replacing the bridges on the existing alignment does not allow for future symmetrical widening of SR 1375 due to impact to the earth dam.
- Alternative B does not provide a center turning lane that Alternative E provides

Alternative D replaces Bridge No. 301 and Bridge No. 471 on new alignment downstream (east) of the existing bridge (Figure 2B).

Bridge No. 301 will be replaced with a 11-foot (3.3-meter) by 9-foot (2.7-meter) reinforced concrete box culvert. The proposed replacement structure for Bridge No. 471 is a bridge approximately 198 feet (60 meters) in length. The proposed bridge will provide two 12-foot (3.6-meter) travel lanes with 8-foot (2.4-meter) shoulders.

SR 1375 will consist of two 12-foot (3.6-meter) travel lanes and 8-foot (2.4-meter) shoulders, including 4-foot (1.2-meter) paved shoulders across the proposed culvert and approaches to Bridge No. 471. The approach work will extend approximately 1200 feet (365 meters) to the south of Bridge No. 471 and approximately 1000 feet (305 meters) north of Bridge No. 471. Traffic will be maintained on the existing roadway and structures during construction.

Alternative D was not selected as the preferred alternative because Alternative D does not provide a center turning lane that Alternative E provides. A center turning lane will improve safety and reduce traffic congestion as well as enhance the entrance to Lake Wheeler Park.

Alternative E (Preferred) replaces Bridge No. 301 and Bridge No. 471 on new alignment downstream (east) of the existing structure (Figure 2C). Staged construction will be utilized to replace Bridge No. 301 and Bridge No. 471. Traffic will be maintained on the existing roadway and structures during the first stage of construction. During stage 2, the traffic will be routed onto the partially constructed roadway and structures. Then the existing structure will be demolished in order to construct the remaining roadway.

Bridge No. 301 will be replaced with an 11-foot (3.3-meter) by 9-foot (2.7-meter) reinforced concrete box culvert. The proposed bridge replacement for Bridge No. 471 is a bridge approximately 172 feet (52 meters) in length. The proposed bridge will provide three 12-foot (3.6-meter) travel lanes with 8-foot (2.4-meter) shoulders.

The proposed approach roadway will consist of three 12-foot (3.6-meter) travel lanes and 8-foot (2.4-meter) shoulders, including 4-foot (1.2-meter) paved shoulders across the proposed culvert and approaches to Bridge No. 471 (Figure 4). The approach work will extend approximately 1100 feet (335 meters) to the south of Bridge No. 471 and approximately 1200 feet (365 meters) north of Bridge No. 471.

C. Alternatives Eliminated from Further Study

Alternatives eliminated from further consideration and specific reasons for elimination are discussed below.

Alternative C replaces Bridge No. 301 and Bridge No. 471 on the new alignment upstream (west) of the existing bridge.

Bridge No. 301 will be replaced with a 9-foot (2.7-meter) by 8-foot (2.4-meter) reinforced concrete box culvert. The proposed replacement structure for Bridge No. 471 is a bridge approximately 195 feet (59 meters) in length. The proposed bridge will provide two 12-foot (3.6-meter) travel lanes with 8-foot (2.4-meter) shoulders.

The proposed approach roadway will consist of two 12-foot (3.6-meter) travel lanes and 8-foot (2.4-meter) shoulders, including 4-foot (1.2-meter) paved shoulders. Traffic will be maintained on the existing roadway and structures during construction.

Alternative C was eliminated from further consideration to avoid impacts to the Lake Wheeler Dam.

The "do-nothing' alternative was not considered reasonable and feasible because it will eventually necessitate the closure of the existing bridge and traffic service provided by SR 1375.

Investigation of the existing structure by the NCDOT Bridge Maintenance Unit indicates that the bridge cannot be rehabilitated due to the deteriorated condition.

D. Preferred Alternative

Alternative E was selected as the preferred alternative for the following reasons:

- Maintains the existing traffic pattern during construction.
- Stage construction of the bridge over the spillway will minimize potential impacts to Swift Creek by keeping the proposed bridge as close to the existing structure as possible.
- Provides a center turning lane, which will improve traffic congestion associated with the Lake Wheeler Park.
- Enhances the entrance of Lake Wheeler Park.
- Allows for future widening of SR 1375.
- Minimize impacts to the earth dam and park entrance.

The Division Engineer concurs with Alternative E as the preferred alternative. The City of Raleigh, Department of Parks and Recreation and Public Utilities agrees with the preferred Alternative E.

IV. ESTIMATED COST

The estimated costs of the alternatives, based on current dollars are as follows:

	ALTERNATIVES			
	A	B	D	E (Preferred)
Bridge No. 301(RCBC)	$ 43,600	$ 48,000	$ 60,300	**$ 132,500**
Bridge No. 471	405,600	405,600	405,600	**781,600**
Roadway Approaches	312,850	394,100	636,800	**679,500**
Detour Structure and Approaches	0	310,400	0	**0**
Remove Existing Structures	48,800	48,800	48,800	**52,500**
Misc. & Mob.	365,150	543,100	518,500	**268,900**
Eng. & Contingencies	224,000	350,000	330,000	**285,000**
Right-of-way Costs	85,000	94,000	204,000	**218,000**
Total Project Cost	$1,485,000	$2,194,000	$2,204,000	**$2,418,000**

The estimated cost of the project as shown in the 2004-2010 Transportation Improvement Program is $2,360,000, including $360,000 for prior years and $2,000,000 for construction.

V. NATURAL RESOURCES

A. Methodology

Materials and research data in support of this investigation have been derived from a number of sources including applicable U.S. Geological Survey (USGS) topographic mapping (Lake Wheeler, NC 7.5 minute quadrangle), U.S. Fish and Wildlife Service (FWS) National Wetlands Inventory (NWI) mapping (Lake Wheeler, NC 7.5 minute quadrangle), Natural Resources Conservation Service (formerly, Soil Conservation Service) county soils mapping (SCS 1970), and recent aerial photography.

Bridges No. 301 and No. 471 were visited on August 31, 2000. The study corridor was walked and visually surveyed for noteworthy features. For purposes of field surveys, the study corridor was assumed to be approximately 2300 feet (701.0 meters) in length and 300 feet (91.4 meters) in width to ensure all proposed alternatives received proper coverage. Impact calculations are based on estimated right-of-way width, which is 60 feet (18.3 meters). Actual impacts will be limited to construction limits and are expected to be less than those shown for right-of-way. Special concerns evaluated in the field include:

1) Potential habitat for protected species.
2) Wetlands and water quality protection in Swift Creek.

Plant community descriptions are based on a classification system utilized by the North Carolina Natural Heritage Program (NHP) (Schafale and Weakley 1990). When appropriate, community classifications were modified to better reflect field observations. Vascular plant names follow nomenclature found in Radford *et al.* (1968). Jurisdictional areas were evaluated using the three-parameter approach following

U.S. Army Corps of Engineers (COE) delineation guidelines (DOA 1987). Jurisdictional areas were characterized according to a classification scheme established by Cowardin *et al.* (1979). Aquatic and terrestrial wildlife habitat requirements and distributions were determined by supportive literature (Martof *et al.* 1980; Webster *et al.* 1985; Menhinick 1991; Potter *et al.* 1980, Hamel 1992; Palmer and Braswell 1995; Rohde *et al.* 1994). Water quality information for area streams and tributaries was derived from available sources (DWQ 1997, 1998). Quantitative sampling was not undertaken to support existing data.

The February 25, 2003 FWS listing of federal-protected species with ranges which extend into Wake County was utilized for this report. In addition, NHP records documenting presence of federal- or state-listed species were consulted before commencing the field investigation and an updated records search was performed on August 8, 2003.

B. Physiography and Soils

The study corridor is underlain by the Raleigh Belt geologic formation within the Piedmont physiographic province of North Carolina. Topography of the area is characterized as rolling with steeper areas along the outer floodplain limits of major streams. The study corridor is located in, and adjacent to, the floodplain of Swift Creek. Elevations in the study corridor range from a high of approximately 340 feet (103.6 meters) National Geodetic Vertical Datum (NGVD) to a low of approximately 250 feet (76.2 meters) NGVD in Swift Creek (USGS Lake Wheeler, NC quadrangle).

Soil mapping units within the study corridor include Wehadkee (*Fluvaquentic Dystrocrepts*), Congaree (*Typic Udifluents*), and Augusta (*Aeric Ochraquults*) within the Swift Creek floodplain. Soil types found at higher elevations include Made Land on the dam and spillway, Appling (*Typic Hapludults*) on uplands north of the floodplain, and Cecil (*Typic Hapludults*) on uplands south of the floodplain (SCS 1970).

Wehadkee silt loam consists of nearly level, poorly drained soils with moderate to moderately-rapid permeability. These soils occur throughout the county on floodplains and streams. Wehadkee soils are considered hydric within Wake County (NRCS 1997). Congaree fine sandy loam consists of nearly-level, well-drained soils with moderate to moderately-rapid permeability. These soils occur in association with floodplains and streams throughout the county. Congaree soils are considered non-hydric with hydric inclusions within Wake County (NRCS 1997). Augusta fine sandy loam consists of nearly-level to gently-sloping, poorly-drained soils with moderately slow permeability. These soils occur on terraces along large streams in the county. Augusta soils are considered non-hydric with hydric inclusions within Wake County (NRCS 1997). Made Land is a designation for recently deposited fill material. Appling gravelly sandy loam and sandy loam consists of gently to strongly sloping, well-drained soils with moderate permeability. These soils typically occur on side slopes and rounded divides. Cecil sandy loam consists of gently to steeply sloping, well-drained soils with moderate permeability. These soils occur on side slopes and rounded divides. Both Appling and Cecil soils are considered non-hydric in Wake County.

C. Water Resources

1. Waters Impacted

The study corridor is located within sub-basin 03-04-02 of the Neuse River Basin (DWQ 1998). This area is part of USGS Hydrologic Unit 03020201 of the South Atlantic-Gulf Region. The bridges targeted for replacement span the relict channel of Swift Creek and the Lake Wheeler spillway with no direct involvement of additional streams or tributaries. The area of the drainage basin for Swift Creek at the subject location is 35.2 square miles (91.2 square kilometers). The N.C. Division of Water Quality (DWQ 1997) has assigned Stream Index Number 27-43-(1) to this section of Swift Creek. The proposed project will not affect the open waters of Lake Wheeler.

2. Stream Characteristics

Swift Creek is a well-defined Piedmont stream which has been impounded to form two reservoirs in the vicinity of the project: Lake Wheeler immediately upstream of the project and Lake Benson approximately three miles (4.8 kilometers) downstream of the project. Swift Creek is typically characterized by moderate flow and riffle-pool morphology; however, within the study corridor, stream flow has been redirected by the construction of the Lake Wheeler dam in 1957 and Swift Creek now takes two forms: an original, relict channel and a concrete spillway.

The original, relict channel of Swift Creek is currently spanned by Bridge No. 301, which is situated approximately mid-way along the Lake Wheeler dam. This channel appears to transport flowing water on an infrequent basis. The upper end of the channel ends at the base of the Lake Wheeler earth dam, and is fed by a concrete pipe connecting to spillway valves situated approximately 75 feet (22.9 meters) upstream of the dam within the reservoir. The relict channel appears to have been partially filled with sands and clays. Slumped soils in the channel adjacent to the banks and mid-channel islands currently support hydrophytic vegetation. The channel displays little evidence of flowing water. The relict channel extends as described from Bridge No. 301 crossing downstream approximately 250 feet (76.2 meters) to the current Swift Creek channel, which is being fed by the dam spillway. Banks of the relict channel are approximately 4 to 8 feet (1.2 to 2.4 meters) high and support forest vegetation

The Lake Wheeler spillway is currently spanned by Bridge No. 471, which is situated at the north end of the Lake Wheeler dam. This channel consists of a sloped, concrete spillway, approximately 110 feet (33.5 meters) wide, that extends from a point approximately 175 feet (53.3 meters) upstream of the bridge to a point approximately 100 feet (30 meters) below the bridge. The lower end of the spillway is extended downstream by approximately 60 feet (18.3 meters) of large rocks and an additional 30 feet (9.1 meters) of rip-rap. Below the rip-rap, and well outside of the study corridor, a stream channel forms with a width of approximate 30 feet (9.1 meters) and a gravel and cobble substrate. During the recent site investigation, water clarity was good and water depth ranged from one to six inches (2.5 to 15.2 centimeters) across the spillway. Land adjacent to the spillway is separated by a concrete wall approximately two to 4 feet (0.6 to 1.2 meters) high. These areas support forest vegetation.

The Swift Creek floodplain extends across the majority of the eastern side of the study corridor. The floodplain supports mature, forest vegetation which is characterized by both wetland and non-wetland areas.

3. Best Usage Classifications and Water Quality

Classifications are assigned to waters of the State of North Carolina based on the existing or contemplated best usage of various streams or segments of streams in the basin. A best usage classification of **WS-III** and Nutrient Sensitive Waters (**NSW**) has been assigned to this portion of Swift Creek (DWQ 1998). The designation **WS-III** denotes surface water used as a source of water supply for drinking, culinary, or food processing purposes. **WS III** waters are generally in low to moderately developed watersheds. The classification and its rules are designed to control existing and future sources of water pollution that could threaten the quality of the water supply. The supplemental classification **NSW** refers to waters needing additional nutrient management because they are subject to excessive growth of microscopic and macroscopic vegetation (DWQ 1998). No designated High Quality Waters (**HQW**), Outstanding Resource Waters (**ORW**), Water Supply I (**WS-I**), or Water Supply II (**WS-II**) waters occur within 1.0 mile (1.6 kilometers) of the study corridor.

The Division of Water Quality (DWQ) has initiated a whole-basin approach to water quality management for the 17 river basins within the state. Water quality for the proposed study corridor is summarized in the Neuse River basin wide water quality plan (DWQ 1998). Swift Creek has a biological rating of **Fair.** The biological rating is based on macro-invertebrate sampling in Swift Creek at the Holly Springs Road crossing, approximately 1.5 miles (2.4 kilometers) above Lake Wheeler and 4 miles (6.4 kilometers) above the study corridor. The nearest sample station downstream is more than 8 miles (12.9 kilometers) away in Johnston County. Swift Creek is rated as **Partially Supporting** designated uses because of sediment and nutrient loading from point and non-point sources. This Neuse River sub-basin supports six major point-source dischargers and 58 minor dischargers. Total permitted flow for the six major dischargers is 74.70 million gallons per day (MGD) (282.8 million liters per day [MLD]) while total permitted flow for the minor dischargers is 3.95 MGD (15.0 MLD) (DWQ 1998). None of the dischargers in this sub-basin discharge into Swift Creek upstream of the study corridor.

4. Anticipated Impacts to Water Resources

a. General Impacts

Proposed project alternatives include replacement of an existing bridge over the relict channel of Swift Creek with a box culvert and complete bridging of the Lake Wheeler spillway. Neither of these actions is expected to adversely affect the current water quality and flow regime. Aquatic habitat will be lost with the replacement of Bridge No. 301 with a culvert; however, a culvert will be installed at an elevation that allows for continuation of pre-project flows and continued sediment transport. Temporary construction impacts due to erosion and sedimentation will be minimized through implementation of a stringent erosion control schedule and the use of best management practices. The contractor will follow contract specifications pertaining to erosion control measures as outlined in 23 CFR 650 Subpart B and Article 107-13 entitled "Control of Erosion, Siltation, and Pollution" (NCDOT, Specifications for Roads and Structures). These measures include: the use of dikes, berms, silt basins, and other containment measures to control runoff; elimination of construction staging areas in floodplains and adjacent to waterways; re-seeding of herbaceous cover on disturbed sites; management of chemicals (herbicides, pesticides, de-icing compounds) with potential negative impacts on water quality; and avoidance of direct discharges into steams by catch basins and roadside vegetation.

The proposed bridge replacement over Swift Creek will allow for a continuation of pre-project stream flows in Swift Creek, thereby protecting the integrity of this waterway. Long-term impacts to adjacent reaches resulting from construction are expected to be negligible. In order to minimize impacts to water resources, NCDOT Best Management Practices (BMPs) for the Protection of Surface Waters will be strictly enforced during the entire life of the project.

b. Impacts related to Bridge Demolition and Removal

In order to protect the water quality and aquatic life in the area affected by this project, the NCDOT and all contractors will follow appropriate guidelines for bridge demolition and removal. These guidelines are presented in the three NCDOT documents "Pre-Construction Guidelines for Bridge Demolition and Removal," "Policy: Bridge Demolition and Removal in Water of the United States", and "Best Management Practices for Bridge Demolition and Removal (BMP-BDR)."

There is potential for components of Bridge No. 301 to be dropped into Waters of the United States during construction. The resulting temporary fill associated with the bridge removal is approximately 32.6 cubic yards (24.9 cubic meters). There are no Waters of the United States under Bridge No. 471; therefore, there is no potential for components of this bridge to be dropped into waters of the United States during construction. However, there is potential for debris to be washed downstream into Waters of the United States if it is dropped into the spillway. For this reason, BMP-BDR will be used for Bridge No. 471 as well.

D. BIOTIC RESOURCES

1. Plant Communities

Three distinct plant communities were identified within the study corridor: Mesic Mixed Hardwood Forest, pine forest, and disturbed/maintained land. These plant communities are described below.

Mesic Mixed Hardwood Forest - This community approximates that described by Schafale and Weakley (1990) as Mesic Mixed Hardwood Forest (Piedmont Subtype), therefore capitalization is utilized in references to this community name. Mesic Mixed Hardwood Forest occurs throughout the Swift Creek floodplain adjacent to the east side of the existing roadway and along the outer slope of the south side of the floodplain. This forest is mature, highly complex structurally, and includes a variety of hydrologic regimes ranging from rare to temporary to seasonal flooding. Drier areas occur along the floodplain and roadside slopes. These areas support canopy species such as American beech (*Fagus grandifolia*), tulip poplar (*Liriodendron tulipifera*), black gum (*Nyssa sylvatica*), sweetgum (*Liquidambar styraciflua*), shagbark hickory (*Carya ovata*), and loblolly pine (*Pinus taeda*). Subcanopy species include flowering dogwood (*Cornus florida*), ironwood (*Carpinus caroliniana*), and eastern hop-hornbeam (*Ostrya virginiana*). Chinese privet (*Ligustrum sinense*), and arrow-wood (*Viburnum dentatum*); seedlings of canopy and sub-canopy species comprise the shrub layer. Common vines are poison ivy (*Toxicodendron radicans*), Virginia creeper (*Parthenocissus quinquefolia*), and muscadine (*Vitis rotundifolia*). A sparse herb assemblage includes partridgeberry (*Mitchella repens*), rattlesnake fern (*Botrychium virginianum*), Nepal microstegium (*Microstegium vimineum*), southern lady fern (*Athyrium asplenioides*), and Christmas fern (*Polystichum acrostichoides*).

Wetter areas of this hardwood forest occur along the toe of the outer floodplain slope and in depressional areas within the floodplain. These areas support canopy species such as cherrybark oak (*Quercus pagoda*), swamp chestnut oak (*Q. michauxii*), tulip poplar, red maple (*Acer rubrum*), green ash (*Fraxinus pennsylvanica*), and river birch (*Betula nigra*). Subcanopy species include ironwood green ash, red maple, and southern sugar maple (*Acer barbatum*). American holly (*Ilex opaca*), elderberry (*Sambucus canadensis*), giant cane (*Arundinaria gigantea*), and saplings of canopy and sub-canopy species comprise the shrub layer. Green-brier (*Smilax rotundifolia*) and climbing hempweed (*Mikania scandens*) are common vines. The sometimes dense herb assemblage includes cardinal flower (*Lobelia cardinalis*), false nettle (*Boehmeria cylindrica*), lizard's tail (*Saururus cernuus*), and netted chain-fern (*Woodwardia areolata*).

Pine Forest - Pine forest occurs on uplands on both sides of the existing roadway north of the Lake Wheeler dam. This community is characterized as a mature forest dominated by a canopy of greater than 70 percent pine. The canopy primarily includes loblolly pine, and scattered hardwoods. Sweetgum, river birch, black cherry (*Prunus serotina*), and northern red oak (*Quercus rubra*) extend into the canopy. Understory and shrub species include mimosa (*Albizia julibrissin*), water oak (*Quercus nigra*), flowering dogwood, and wax myrtle (*Myrica cerifera*). A locally-dense herb and vine assemblage include poison ivy, trumpet creeper (*Campsis radicans*), Nepal microstegium, sericea (*Lespedeza* sp.), cat-brier (*Smilax glauca*), muscadine, and yellow jessamine (*Gelsemium sempervirens*).

Disturbed/Maintained Land - Regularly-maintained areas associated with roadside shoulders and the Lake Wheeler dam comprise this community designation. This community is dominated by herbs and grasses, but also includes scattered shrubs and some trees. Characteristic species include grass (*Festuca* sp.), vasey grass (*Paspalum urvillei*), Nepal microstegium, goatsbeard (*Aruncus dioicus*), dog fennel (*Eupatorium capillifolium*), English plantain (*Plantago lanceolata*), broomsedge (*Andropogon virginicus*), sericea (*Lespedeza* sp.), panic grass (*Panicum* sp.), broom panic grass (*Dichanthelium scoparium*), foxtail grass (*Setaria* sp.), ragweed (*Ambrosia* sp.), poison ivy, poke weed (*Phytolacca americana*), poison ivy, trumpet creeper, and horse nettle (*Solanum carolinense*). The vicinity of the upper end of the relict Swift Creek channel support more hydrophytic species such as river birch, tag alder (*Alnus serrulata*), red maple, black willow (*Salix nigra*), elderberry, wool-grass (*Scirpus cyperinus*), sedges (*Carex* spp.), smartweeds (*Polygonum* spp.), soft rush (*Juncus effusus*), and sensitive fern (*Onochlea sensibilis*).

2. Plant Communities within the Study Corridor

Plant community impact areas (for Alternates A though D) are estimated based on the amount of each plant community present within the projected 60-foot (18.3 meter) right-of-way for each alternative (actual impacts within construction limits will be less). Impacts for Alternate E are based on cut-and-fill limits.

Table 1: Potential Impacts
Plant community areas, in acres (hectares) for replacement of Bridge No. 301 and Bridge No. 471.

Community	Areas within Alternatives			
	Alt. A	Alt. B	Alt. D	**Alt. E (preferred)**
Mesic Mixed Hardwood Forest	0.13 (0.05)	0.51 (0.21)	0.63 (0.25)	**0.62 (0.25)**
Pine Forest	0.05 (0.02)	0.13 (0.05)	0.21 (0.08)	**0.34 (0.14)**
Disturbed/Maintained Land	0.57 (0.23)	0.50 (0.20)	0.99 (0.40)	**2.11 (0.85)**
Total	0.75 (0.30)	1.14 (0.46)	1.83 (0.74)	**3.07 (1.24)**

Permanent impacts to plant communities resulting from bridge replacements are generally restricted to narrow strips adjacent to the existing bridges and roadway approach segments. Within the study corridor, Mesic Mixed Hardwood Forest is considered to be of substantially higher environmental quality than the remainder of the communities.

Alternate A, replacement in place, includes a small amount of natural community and the smallest total area of the alternatives. Alternatives B and D include an intermediate amount of area; however, both include a large percentage of natural community. Alternate E includes the greatest area of potential impact and a large percentage of natural community.

From an ecological perspective, impacts of upgrading existing road facilities are minimal. No new fragmentation of plant communities will be created, as the project will result only in alteration of community boundaries. Roadside-forest edges typically serve as vectors for invasive species encroachment into adjacent natural communities. An example of an undesirable invasive species utilizing roadsides is kudzu *(Pueraria lobata)*. The establishment of a hardy groundcover on road shoulders as soon as practicable will limit the availability of construction areas to invasive and undesirable plants.

Implementation of Alternates D, and E, resulting in a new alignment, will allow for removal of fill and bridge structures associated with the existing facility. These areas will be restored through planting with native vegetation.

3. Wildlife

a. Terrestrial

Signs of two mammals, racoon (*Procyon lotor*) and beaver (*Castor canadensis*), were observed within the study corridor. Other mammal species expected to occur within the study corridor are white-tailed deer *(Odocoileus virginianus)*, Virginia opossum (*Didelphis virginiana*), muskrat (*Ondatra zibethicus*), meadow vole (*Microtus pennsylvanicus*), white-footed mouse (*Peromyscus leucopus*), short-tailed shrew (*Blarina brevicauda*), and little brown bat (*Myotis lucifugus*).

Birds observed within or adjacent to the corridor were great blue heron (*Ardea herodias*), great egret (*A. alba*), mourning dove (*Zenaida macroura*), red-shouldered hawk (*Buteo lineatus*), red-tailed hawk (*Buteo jamaicensis*), American crow (*Corvus brachyrhynchos*), American robin (*Turdus migratorius*), northern cardinal (*Cardinalis cardinalis*), Carolina wren (*Thryothorus ludovicianus*), Carolina chickadee (*Poecile carolinensis*), and bluejay (*Cyanocitta cristata*). Additional avian species expected to occur within roadside/disturbed habitat of the study corridor are eastern meadowlark (*Sturnella magna*), eastern bluebird (*Sialia sialis*), brown-headed cowbird (*Molothrus ater*), and indigo bunting (*Passerina cyanea*). Avian species expected to occur within bottomland forest habitat of the study corridor are red-eyed vireo (*Vireo olivaceus*), yellow warbler (*Dendroica petechia*), northern parula (*Parula americana*), Baltimore oriole (*Icterus galbula*), downy woodpecker (*Picoides pubescens*), and barred owl (*Strix varia*).

One terrestrial reptile was observed, Carolina anole (*Anolis carolinensis*) and no terrestrial amphibians were observed. Other herptile species expected to occur in terrestrial areas of the study corridor are eastern box turtle (*Terrapene carolina*), eastern fence lizard (*Sceloporus undulatus*), five-lined skink (*Eumeces fasciatus*), black racer (*Coluber constrictor*), worm snake (*Carphophis amoenus*), rat snake (*Elaphe obsoleta*), brown snake (*Storeria dekayi*), eastern garter snake (*Thamnophis sirtalis*), copperhead (*Agkistrodon contortrix*), and American toad (*Bufo americanus*).

b. Aquatic

Limited surveys resulted in documentation of one amphibian species: the southern leopard frog (*Rana utricularia*). No aquatic reptile species were observed within the study corridor. The vicinity of the study corridor does provide suitable habitat for snapping turtle (*Chelydra serpentina*), northern water snake (*Nerodia sipedon*), queen snake (*Regina septemvittata*), eastern newt (*Notophthalmus viridescens*), northern dusky salamander (*Desmognathus fuscus*), two-lined salamander (*Eurycea cirrigera*), green frog (*Rana clamitans*), gray treefrog (*Hyla versicolor*), and pickerel frog (*Rana palustris*).

No sampling was undertaken in Swift Creek channels to determine fishery potential. Visual surveys of Swift Creek revealed presence of fish below the dam spillway, but none in the relict channel. Fish species which may be present in Swift Creek are highfin shiner (*Notropis altipinnis*), rosyside dace (*Clinostomus funduloides*), bluehead chub (*Nocomis leptocephalus*), Johnny darter (*Etheostoma nigrum*), northern hog sucker (*Hypentelium nigricans*), margined madtom (*Noturus insignis*), redbreast sunfish (*Lepomis auritus*), and bluegill (*L. macrochirus*).

c. Anticipated Impacts to Wildlife

Due to the limited extent of infringement on natural communities, the proposed bridge replacements will not result in substantial loss or displacement of known terrestrial or aquatic animal populations. No substantial habitat fragmentation is expected since most improvements will be restricted to existing roadside margins. Construction noise and associated disturbances will have short-term impacts on avifauna and migratory wildlife movement patterns, although long-term impacts are expected to be negligible. Short-term impacts associated with turbidity and suspended sediments will affect benthic populations. Temporary impacts to downstream habitat from increased sediment during construction will be minimized by the implementation of stringent erosion control measures.

E. SPECIAL TOPICS

1. Waters of the United States

Surface waters within the embankments of the relict Swift Creek channel and vegetated wetlands within the Swift Creek floodplain are subject to jurisdictional consideration under Section 404 of the Clean Water Act as "waters of the United States" (33 CFR section 328.3). NWI mapping indicates that areas upstream of the study corridor (Lake Wheeler) exhibit characteristics of a lacustrine, limnetic, unconsolidated bottom, permanently flooded, impounded (L1UBHh) system and areas downstream of the study corridor exhibit characteristics of a palustrine, broad-leaved, deciduous forest system that is seasonally flooded (PFO1C) (Cowardin *et al.* 1979). Field investigations confirmed this assessment, and found that the relict channel of Swift Creek is a riverine, lower perennial, unconsolidated bottom, mud substrate system (R2UB5). Immediately east of the study corridor, Swift Creek is a riverine, upper perennial, unconsolidated bottom, cobble-gravel system (R3UB1) (Cowardin *et al.* 1979). There is no jurisdictional stream associated with the Swift Creek spillway. Construction of the Lake Wheeler reservoir resulted in re-direction of flow across a spillway consisting of a concrete bed and sidewalls within study corridor limits.

Vegetated wetlands associated with depressional areas within the Swift Creek floodplain are subject to jurisdictional consideration under Section 404 of the Clean Water Act as "Waters of the United States" (33 CFR section 328.3). These areas are defined by the presence of three primary criteria: hydric soils, hydrophytic vegetation, and evidence of hydrology at or near the surface for a portion (12.5 percent) of the growing season (DOA 1987).

The Neuse River Basin Rule applies to 50-foot (15.2 meter) wide riparian buffers directly adjacent to surface waters in the Neuse River Basin. This rule does not apply to portions of the riparian buffer where a use is existing and ongoing. Any change in land use within the riparian buffer is characterized as an impact. The Nutrient Sensitive Waters Management Strategy for the Protection and Maintenance of Riparian Buffers (15 A NCAC 2B .0233) provides a designation for uses that cause impacts to riparian buffers within the Neuse Basin. Expected activities involved with project development include impacts to riparian buffers adjacent to the relict channel of Swift Creek.

Table 2: Potential Impacts
Area in acres (hectares) and linear distance in feet (meters).

Jurisdictional Area Type	Areas and Linear Distances; acres (hectares) / feet (meters)			
	Alt. A	Alt. B	Alt. D	Alt. E (preferred)
Stream Length at culvert Temporary Impact for detour	80 (24.4)	83 (25.3) 70 (21.3)	88 (26.8)	130 (39.6)
Stream Area for culvert Temporary Impact for detour	0.10 (0.04)	0.10 (0.04) 0.05(0.02)	0.06 (0.024)	0.11 (0.045)
Forested Wetland Area	---	0.005 (0.002)	0.001 (0.0004)	---
Riparian Buffer Area	0.10 (0.04)	0.19 (0.08)	0.20 (0.08)	0.28 (0.11)
Riparian Buffer Length	80 (24.4)	83 (25.3)	88 (26.8)	130 (39.6)

One vegetated wetland occurs within the study corridor within the Mesic Mixed Hardwood Forest. This wetland satisfies the three-parameter approach outlined by the COE (DOA 1987); see attached Routine Wetland Determination data forms). These plants are growing on Wehadkee soils which exhibit values, chromas, and mottles characteristic of hydric soils. Evidence of wetland hydrology includes surface saturation, watermarks, drainage patterns, oxidized root channels, and water-stained leaves. Only the Alternate B and D right-of-ways include wet portions of the Mesic Mixed Hardwood Forest, and these wet areas are extremely small.

There is the potential that components of Bridge No. 301 may be dropped into waters of the United States during construction. This project can be classified as Case 3, where there are no special restrictions other than those outlined in Best Management Practices for Protection of Surface Waters. Debris dropped into the spillway from the demolition of Bridge No. 471 may wash downstream into waters of the United States; Best Management Practices for Protection of Surface Waters will be used for Bridge No. 471.

2. Permits

This project is being processed as a Categorical Exclusion (CE) under Federal Highway Administration (FHWA) guidelines. Nationwide Permit (NWP) No. 23 (61 FR 65874, 65916; December 13, 1996) has been issued by the US Army Corps of Engineers (COE) for CEs due to expected minimal impact. DWQ has issued a General 401 Water Quality Certification for NWP No. 23. However, use of this permit will require written notice to DWQ. In the event that NWP No. 23 will not suffice, minor impacts attributed to bridging and associated approach improvements are expected to qualify under General Bridge Permit 031 issued by the Wilmington COE District. Notification to the Wilmington COE office is required if this general permit is utilized.

Any modifications to Bridge No. 471 and Bridge No. 301's structure will have an impact on the safety of the dam and possibly the spillway capacity of the dam. An "Approval to Modify" permit will be required in accordance with the North Carolina Dam Safety Law of 1967 (General Statute 143-215.23 et

seq.) and the regulations promulgated thereunder codified at North Carolina Administrative Code, title 15A, Subchapter 2K (15A NCAC 2K).

Prior to initiation of any construction activity, two sets of plans, specifications and engineering design data for the work will be submitted to the NCDENR Division of Land Resources for review and approval, 120 days prior to commencement of any construction activities.

3. Riparian Buffer Protection Rules for the Neuse River Basin

Since this project is within the Neuse River Basin, it is subject to NCDENR riparian buffer rules (15A NCAC 02B .0233). These rules were developed to protect and preserve existing riparian buffers and are part of larger nutrient reduction strategies for the basin.

The Neuse River Basin Rule applies to 50-foot (15.2 meter) wide riparian buffers directly adjacent to surface waters in the Neuse River Basin. The buffer rules require that riparian areas be protected and maintained on the banks of waterways in the basin. The rules do not apply to portions of the riparian buffer where a use is existing and ongoing as of August 1, 2000. Existing uses include transportation facilities. The only portion of the buffer that contains the footprint of the existing use is exempt.

Activities in the buffer area beyond the footprint of the existing use are classified as either "exempt", "allowable", "allowable with mitigation", or "prohibited". The following lists of activities that may be subject to buffer rules within the study area are provided along with their classifications. Depending upon project alternatives, not all of the uses listed may apply, and other uses not listed here, such as utility crossings and roadside drainage ditches, among others, may be regulated under the buffer rules. Guidelines will be consulted in entirety to review all project related uses subject to the buffer rules.

Table 3: Buffer rule guidelines:

Use	Exempt	Allowable	Allowable With Mitigation	Prohibited
Bridges		X		
Road crossings that impact less than or equal to 40 linear feet (12 linear meters)	X			
Road crossings that impact greater than 40 linear ft. (12 linear meters) but less than or equal to 150 linear ft. (46 linear meters) or 0.33 acres (0.13 hectares) of riparian area		X		
Road crossings that impact greater than 150 linear ft. (46 linear meters) or greater than 0.33 acres (0.13 hectares) of riparian buffer			X	
Temporary roads used for bridge construction or replacement provided that restoration activities such as soil stabilization and revegetation occur immediately after construction		X		

Activities deemed "exempt" will be designed, constructed, and maintained to minimize soil disturbance and to provide the maximum water quality protection practicable. "Allowable" activities may proceed within the riparian buffer provided that there are no practical alternatives to the requested use. Written authorization from the DWQ or delegated local authority is required. Activities deemed "allowable with mitigation" may proceed within the riparian buffer if there are no practical alternatives to the requested use and an appropriate mitigation strategy has been approved. Written authorization from the DWQ or

delegated local authority is required. "Prohibited" activities, none of which are listed above, may not proceed within the riparian buffer unless a variance is granted from the DWQ or delegated local authority.

4. Mitigation

Compensatory mitigation is not proposed for this project due to the limited nature of project impacts. However, utilization of BMPs will be used in an effort to minimize impacts. Replanting disturbed areas with native wetland species and removing of temporary fill material upon project completion could mitigate temporary impacts to floodplains associated with the construction activities. A final determination regarding mitigation to Waters of the United States rests with the COE.

F. Protected Species

1. Federal Protected Species

Species with the federal classification of Endangered or Threatened are protected under the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531 *et seq.*). The term "Endangered species" is defined as "any species which is in danger of extinction throughout all or a substantial portion of its range", and the term "Threatened species" is defined as "any species which is likely to become an Endangered species within the foreseeable future throughout all or a substantial portion of its range" (16 U.S.C. 1532).

Table 4: Federally protected species that are recorded for Wake County (February 25, 2003 FWS list):

Common Name	Scientific Name	Status
Red-cockaded woodpecker	*Picoides borealis*	Endangered
Bald Eagle	*Haliaeetus leucocephalus*	Threatened
Dwarf wedgemussel	*Alasmidonta heterodon*	Endangered
Michaux's sumac	*Rhus michauxii*	Endangered

Red-cockaded Woodpecker - This small woodpecker (7 to 8.5 inches [17.8 to 21.6 centimeters] long) has a black head, prominent white cheek patch, and black-and-white barred back. Males often have red markings (cockades) behind the eye, but the cockades may be absent or difficult to see (Potter *et al.* 1980). Primary habitat consists of mature to over-mature southern pine forests dominated by loblolly (*Pinus taeda*), long-leaf (*P. palustris*), slash (*P. elliotii*), and pond (*P. serotina*) pines (Thompson and Baker 1971). Nest cavities are constructed in the heartwood of living pines, generally older than 70 years, which have been infected with red-heart disease. Nest cavity trees tend to occur in clusters, which are referred to as colonies (FWS 1985). The woodpecker drills holes into the bark around the cavity entrance, resulting in a shiny, resinous buildup around the entrance that allows for easy detection of active nest trees. Pine flatwoods or pine-dominated savannas, which have been maintained by frequent

natural fires, serve as ideal nesting and foraging sites for this woodpecker. Development of a thick understory may result in abandonment of cavity trees.

Of study corridor plant communities, only pine forest might be considered potential habitat for red-cockaded woodpecker. However, characteristics of the local pine forests are not suitable for this woodpecker. The forest contains a dense, closed canopy of approximately 40- to 50-year old pines with scattered hardwood trees and a dense sub-canopy/shrub assemblage comprised almost exclusively of hardwood species. Suitable nesting habitat does not occur within 1.0 mile (1.6 kilometers) of the study corridor, and NHP records do not document the occurrence of red-cockaded woodpeckers in the vicinity of the study corridor.

> **BIOLOGICAL CONCLUSION:** The project corridor contains poor to unsuitable habitat for red-cockaded woodpecker foraging and no suitable habitat for red-cockaded woodpecker nesting. There is no nesting habitat within 1.0 mile (1.6 kilometers) of the project corridor, and NHP records have no documentation of red-cockaded woodpeckers in the vicinity of the project corridor. No red-cockaded woodpeckers were seen or heard and no cavity holes or cavity starts were observed during the site visit. Based on the record search and field investigations, this project will not affect the red-cockaded woodpecker. Therefore, the project will have **NO EFFECT** on the red-cockaded woodpecker.

Bald Eagle - The bald eagle is a large raptor with a wingspan greater than six feet (1.8 meters). Adult bald eagles are dark brown with a white head and tail. Immature eagles are brown with whitish mottling on the tail, belly, and wing linings. Bald eagles typically feed on fish but may also take birds and small mammals. In the Carolinas, nesting season extends from December through May (Potter *et al.* 1980). Bald eagles typically nest in tall, living trees in a conspicuous location near open water. Eagles forage over large bodies of water and utilize adjacent trees for perching (Hamel 1992). Disturbance activities within a primary zone extending 750 to 1500 feet (228.6 to 457.2 meters) from a nest tree are considered to result in unacceptable conditions for eagles (FWS 1987). The FWS recommends avoiding disturbance activities, including construction and tree-cutting within this primary zone. Within a secondary zone, extending from the primary zone boundary out to a distance of one mile (1.6 kilometers) from a nest tree, construction and land-clearing activities will be restricted to the non-nesting period. The FWS also recommends avoiding alteration of natural shorelines where bald eagles forage, and avoiding substantial land-clearing activities within 1500 feet (457.2 meters) of known roost sites.

Although a large, open water body (Lake Wheeler) occurs immediately adjacent to the study corridor, and some large trees are associated with the hardwood forest associated with the Swift Creek floodplain, eagles are not expected to utilize the site for nesting, foraging, or roosting due to the constant disturbance generated by automobile traffic on the existing road facility. NHP records do not document the occurrence of the bald eagle on Lake Wheeler. However, the eagle has been documented on Yates Millpond approximately 1.5 mile (2.4 kilometers) north of the study corridor as well as other lakes in the region, and it should be expected that eagles will periodically occur in the vicinity of the study corridor.

> **BIOLOGICAL CONCLUSION:** The project corridor contains potential suitable habitat for bald eagle foraging and nesting; however, constant noise and motion associated with the existing road facility through the study corridor decrease the likelihood that eagles will frequent the

vicinity study corridor. NHP records have no documentation of bald eagles on Lake Wheeler, but there is documentation the eagle has been observed approximately 1.5 mile (2.4 kilometers) north of the study corridor on Yates Millpond. A comprehensive nesting survey was not performed, but no bald eagle nests were observed within the site vicinity. Based on field investigations and best professional judgment, this project will not affect bald eagle. Therefore this project will have **NO EFFECT** on the bald eagle.

Dwarf Wedge Mussel - The dwarf wedge mussel is relatively small, averaging 1.0 to 1.5 inches (2.5 to 3.8 centimeters) long. The shells are olive-green to dark brown in color and are sub-rhomboidally shaped. The shells of females are swollen posteriorly, while males are generally flattened (TSCFTM 1990). The preferred habitats are streams with moderate flow velocities and bottoms varying in texture from gravel and coarse sand to mud, especially just downstream of debris and on banks of accreting sediment. This species was previously known only from a few, disjunct populations in the Neuse River basin (Johnston County) and Tar River basin (Granville County). Statewide surveys conducted since 1992 have expanded this species' range in North Carolina. This species is now known from the Neuse Basin in Orange, Wake, Johnston, and Nash Counties, and from Tar River Basin in Granville, Vance, Warren, Franklin, Halifax, and Nash Counties.

Stream habitat within the study corridor is characterized by moderate flow over a sand/gravel/mud substrate. Swift Creek downstream of the subject bridge has well-established riffle-pool structure with occasional sand-mud bars. NHP files have no documentation of this species within 1.0 mile (1.6 kilometers) of the study corridor.

BIOLOGICAL CONCLUSION: NHP files have no documentation of this species within 1.0 mile (1.6 kilometers) of the project corridor. Riparian areas within the project corridor constitute potential habitat for dwarf wedge mussel. Qualified biologists visited the project site on May 28, 2003 and June 25, 2003. Surveys were conducted from a point approximately 1640 feet (500 meters) downstream of the confluence of the old channel and Swift Creek to the base of the road crossing (see Appendix for complete report). Mussel species were located, however no specimens of dwarf-wedge mussel were found. Stringent use of appropriate erosion control practice will be implemented as applicable. Based upon the survey, this project is not likely to adversely affect the dwarf-wedge mussel. The USFWS in a letter dated September 8,. 2003 concurs that the proposed bridge replacement project may affect, but will not likely to adversely affect the dwarf-wedge mussel. **MAY AFFECT – NOT LIKELY TO ADVERSELY AFFECT.**

Michaux's sumac - Michaux's sumac is a densely pubescent, deciduous, rhizomatous shrub, usually less than 2 feet (0.6 meter) high. The alternative, compound leaves consist of 9 to 13 hairy, round-based, toothed leaflets borne on a hairy rachis that may be slightly winged (Radford *et al.* 1968). Small male and female flowers are produced during June on separate plants; female flowers are produced on terminal, erect clusters followed by small, hairy, red fruits (drupes) in August and September. Michaux's sumac tends to grow in disturbed areas where competition is reduced by periodic fire or other disturbances, and may grow along roadside margins or utility right-of-ways. In the Piedmont, Michaux's sumac appears to prefer clay soil derived from mafic rocks or sandy soil derived from granite; in the Sandhills, it prefers loamy swales (Weakley 1993). Michaux's sumac ranges from south Virginia through Georgia in the inner Coastal Plain and lower Piedmont.

The study corridor supports areas of maintained, early successional roadside/disturbed land suitable for Michaux's sumac. Although the site visit was conducted during the fruiting season for Michaux's sumac, a survey for this species within appropriate habitat found no evidence of the presence of this species within the study corridor. All roadsides, meadows, lawns, and woodland edges within the study corridor were surveyed.

BIOLOGICAL CONCLUSION: Portions of this project occur in areas, which contain roadside/disturbed and early-successional vegetation along road shoulders, a maintained lawn on the Lake Wheeler earth dam, and forest edges. However, NHP files have no documentation of this species within 1.0 mile (1.6 kilometers) of the study corridor, and the species was not observed during a survey conducted on August 31, 2000. Therefore this project will have **NO EFFECT** on Michaux's sumac.

Table 5: Federal Species of Concern - The February 25, 2003 FWS list also includes a category of species designated as "Federal species of concern" (FSC) for Wake County:

Common Name	Scientific Name	Potential Habitat	State Status
Southeastern myotis*	*Myotis austroriparius*	Yes	SC
Bachman's sparrow	*Aimophila aestivalis*	No	SC
Southern hognose snake	*Heterodon simus*	No	SC
Carolina darter	*Etheostoma collis lepidinion*	Yes	SC
Pinewoods shiner	*Lythrurus matutinus*	Yes	SR
Diana fritillary butterfly*	*Speyeria diana*	Yes	SR
Atlantic pigtoe	*Fusconaia masoni*	No	E
Green floater	*Lasmigona subviridus*	No	E
Yellow lance	*Elliptio lanceolata*	No	E
Carolina least trillium*	*Trillium pusillum var. pusillum*	No	E
Sweet pinesap	*Monotropsis odorata*	No	SR-T
Bog spicebush	*Lindera subcoriacea*	No	E
Flatrock panic grass	*Panicum lithophilum*	No	NL

*Historic populations
E = Endangered; T = Threatened; SC = Special concern; SR = Significantly rare; C = Candidate; NL = Not Listed.

The FSC designation provides no federal protection under the ESA for the species listed. NHP files have no documentation of FSC species within the study corridor or within 1.0 mile (1.6 kilometers) of the study corridor.

2. State Protected Species

Plant and animal species which are on the North Carolina state list as Endangered (E), Threatened (T), Special Concern (SC), Candidate (C), Significantly Rare (SR), or Proposed (P) (Amoroso 1999, LeGrand and Hall 1999) receive limited protection under the North Carolina Endangered Species Act (G.S. 113-331 *et seq.*) and the North Carolina Plant Protection Act of 1979 (G.S. 106-202 *et seq.*). NHP records indicate that no terrestrial or aquatic State-listed species have been documented within 1.0 mile (1.6 kilometers) of the study corridor. During the survey conducted for the dwarf-wedge mussel, a state protected mussel species was located. One specimen of the creeper (*Strophitus undulatus*) was found. This species is listed as Threatened in North Carolina.

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, and with the Advisory Council on Historic Preservation's Regulations for Compliance Section 106, codified at 36 CFR Part 800. Section 106 requires Federal agencies to take into account the effect of their undertakings (funded, licensed, or permitted) on properties listed on or eligible for inclusion on the National Register of Historic Places, and to afford the Advisory Council on Historic Preservation a reasonable opportunity to comment.

B. Historic Architecture

A field survey of the Area of Potential Effects (APE) was conducted on March 1, 2000. All structures within the APE were photographed, and later reviewed by NCDOT architectural and historians and North Carolina State Historic Preservation Office (HPO). In a concurrence form dated March 27, 2000, the State Historic Preservation Officer (SHPO) concurred that there are no historic architectural resources either listed 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. Archaeology

The State Historic Preservation Officer (SHPO), in a memorandum dated June 29, 2000 stated, "We have conducted a review of the project and are aware of no properties of architectural, historic, or archaeological significance which would be affected by the project. Therefore, we have no comment on the project as currently proposed." A copy of the memorandum is included in the Appendix.

VII. Environmental Effects

The project is expected to have an overall positive impact. Replacement of inadequate bridges will result in safer traffic operations.

The project is a Federal "Categorical Exclusion" due to its limited scope and lack of substantial environmental consequences.

The bridge replacements will not have an adverse effect on the quality of the human or natural environment with the use of current NCDOT standards and specifications.

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

No adverse impact on families or communities is anticipated. Right of way acquisition will be limited. No relocatees are expected with implementation of the proposed alternative.

In compliance with Executive Order 12898 (Federal Actions to Address Environmental Justice in Minority Populations and Low Income Populations) a review was conducted to determine whether minority or low-income populations were receiving disproportionately high and adverse human health or environmental impacts as a result of this project. The investigation determined the project would not disproportionately impact any minority or low-income populations.

Lake Wheeler Park is located in the Northwest Quadrant of the project. The entrance to the park will be improved by adding turning lanes into the park; therefore, 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.

There are no publicly owned 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 Natural Resources Conservation Service (NRCS). Since there are no prime or important farmlands in the immediate vicinity of the proposed bridge the Farmland Protection Policy does not apply.

The project is located in Wake County, which is within the Raleigh-Durham nonattainment area for ozone (O_3) and carbon monoxide (CO) as defined by the EPA. The 1990 Clean Air Act Amendments (CAAA) designated these areas as "moderate" nonattainment area for O_3 and CO. However, due to improved monitoring data, these areas were redesignated as "maintenance" for O_3 on June17, 1994, and "maintenance" for CO on September 18, 1995. Section 176(c) of the intent of the state air quality implementation plan (SIP). The current SIP does not contain any transportation control measures for Wake County. The Capital Area 2025 Long Range Transportation Plan (LRTP) and the 2000-2006 Metropolitan Transportation Improvement Program (MTIP) has been determined to conform to the intent of the SIP. The USDOT air conformity approval of the LRTP was August 20, 1999 and the USDOT air quality conformity approval for the MTIP was October 1, 2001. The current conformity determination is consistent with the final conformity rule found in 40 CFR Parts 51 and 93. There have been no substantial changes in the project's design concept or scope, as used in the conformity analyses.

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 NCAC 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.

The 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.

Based on an examination of records at the North Carolina Department of Environment and Natural Resources, Division of Water Quality, Groundwater Section and the North Carolina Department of Human Resources, Solid Waste Management Section, there should be no environmental liability concerns for this project. However, unregulated USTs and unregulated landfills may be encountered by Right-of-Way during initial contact with impacted properties. NCDOT will be notified of their presence prior to acquisition.

Wake County is a participant in the National Flood Insurance Regular Program. The project site on Swift Creek is included in a detailed F.E.M.A. Study. Attached is a copy of the Flood Insurance Rate Map (Figure 5) on which are shown the approximate limits of the 100-year flood plain in the vicinity of the project.

Based on the above discussion, it is concluded that no significant adverse environmental effects will result from implementation of the project.

VIII. Public Involvement

Efforts were undertaken early in the planning process to contact local officials to involve them in the project development with scoping letters. A newsletter was mailed in June 2001 to local residents explaining the planning process and the Preferred Alternative E.

IX. Agency Comments

The following are comments received during the scooping process:

1. North Carolina Wildlife Resource Commission (NCWRC)

   Comment: *"We request that High Quality Sedimentation and Erosion Control Measures be used due to the stream classification of WS III."*

   Response: NCDOT will follow best management practices for sensitive watersheds (T15A:04B.0024).

2. NCDENR Division of Land Resources

Comment: *"Prior to the initiation of any construction activity, two sets of plans, construction specifications and engineering design data for the work are required to be submitted to this office for review and approval."(See attached letter from NCDENR, dated Feb. 16, 2001)*

Response: NCDOT will submit two sets of plans, construction specifications, and engineering design data to NCDENR, 120 day prior to initiation of any construction activities.

3. NCDENR Division of Parks and Recreation

Comment: *"...the proposed bridge replacement project is outside of the Section 6(f) (3) restrictive boundaries for the Federal Land & Water Conservation Fund Program." (see attached letter dated June 20, 2000")*

Response: No Section 6(f) documentation is needed.

4. City of Raleigh

Comment: *"we request that the bridge be designed to allow for future widening and pedestrian accommodation."*

Response: The bridge and roadway will be designed to accommodate for future widening and 8-foot (2.4-meter) shoulders will be provided on the new structure to accommodate bicycle and pedestrian traffic.

Comment: The City of Raleigh requested that the project be designed to accommodate a future signalized at-grade pedestrian crossing near the existing driveway entrance to Lake Wheeler Park.

Response: The crossing is part of the City's long range Comprehensive Plan. The design will provide accommodations for a future signalized at-grade crossing near the driveway entrance to the Lake Wheeler Park. The installation of the signal at this location will not be part of this project.

X. SECTION 4(F) OF THE DEPARTMENT OF TRANSPORTATION ACT OF 1966

Part 23 CFR 771.135 Section 4(f) (49 U.S.C. 303) states that "The Administrator may not approve the use of land from a significant publicly owned public park, recreation area, or wildlife and waterfowl refuge, or any significant historic site unless a determination is made that: There is no feasible and prudent alternative to the use of land from the property; and the action includes all possible planning to minimize harm to the property resulting from such use."

The proposed replacement of Bridge No. 301 and Bridge No. 471 on SR 1375 (Lake Wheeler Road) will necessitate the taking of land from the Lake Wheeler Park. The entrance to Lake Wheeler Park is

located in the northwest quadrant of the project. Property adjacent to Lake Wheeler Road, to the east and west also belongs to Lake Wheeler Park.

Constructed in 1956 by the Army Corps of Engineers as Raleigh's secondary auxiliary water supply lake, this 800-acre lake park [650 acres of lake; 150 acres of park and land buffer] has rapidly become a favorite capital city getaway. In 1958, Lake Wheeler was approved for controlled fishing and other recreational activities as established by City of Raleigh Ordinance. A Master Plan was developed for Lake Wheeler Park in 1959, noting that this reservoir would provide opportunities for fishing, motor boating, water-skiing, sailing and canoeing.

Numerous services are provided to include: fishing, bass tournaments, in-water new boat shows and demos, evening waterfront concerts, the annual Tarheel Regatta, outdoor equipment expos, water/nature-based educational programming, picnic shelter and lakeside conference room facility rentals, large group & family picnicking opportunities, private boat launchings, and non-motorized boat rentals.

A 100' x 10' state-of-the-art rowing dock was completed during October 2000 for non-motorized activities (sculling, sailing, canoeing, etc.).

During January 2001, the Raleigh City Council adopted an Ordinance banning the launching of personal watercraft on Lake Wheeler. This decision was the result of increasing concerns for safety, noise, shore erosion, and pollution. Personal Watercraft is a designation used to include a variety of "jets-ski" and small "jet-boat" type of craft. All other motorized and non-motorized boats are allowed on Lake Wheeler.

Lake Wheeler Park is managed by the City of Raleigh, Department of Parks and Recreation.

Since this project necessitates the use of a minor amount of land from a publicly owned park and meets the criteria set forth in the Federal Register December 23, 1986, A 'Final Nationwide Section 4(f) Evaluation and Approved for Federally-Aided Highway Projects with Minor Involvement with Public Parks, Recreation Lands, and Wildlife and Waterfowl Refuges' was prepared.

The following alternatives, which avoid use of lands from the public park, have been fully evaluated: (1) do nothing; (2) improve the highway without using the adjacent public park; (3) build an improved facility on new location without using the adjacent public park. These alternatives were not found to be feasible and prudent.

No Build Alternative: The No Build or "Do-Nothing" is not considered feasible and prudent because it will eventually necessitate removal of the bridges. This is not prudent due to the traffic service provided by SR 1375 (Lake Wheeler Road).

Rehabilitation of the Existing Bridge: This alternative is not considered feasible and prudent due to the age and deteriorated condition of the existing bridges.

Replacement of Bridge No. 301 and Bridge No. 471 on New Location: Replacing the bridges on new location without using park property will not provide the same transportation access and service as the current location. Therefore, this alternative is not considered feasible or prudent.

The City of Raleigh Department of Parks and Recreation have concurred with Alternative E as the preferred alternative and all possible planning to minimize impact to the public park were incorporated into this project. The approved Final Nationwide Section 4(f) Evaluation and Approval for Federally-Aided Highway Projects with Minor Involvement with Public Parks, Recreation Lands, and Wildlife and Waterfowl Refuges follows.

Mitigation Measures include the following:

1. A three-lane bridge and roadway section will be provided.
2. The park entrance will be improved.
3. The alignment will be shifted downstream to avoid impacts to the earth dam and park entrance.
4. Turning lanes into the park will be provided.
5. No lowering of lake water level is anticipated.

NORTH CAROLINA DIVISION
FINAL NATIONWIDE SECTION 4(f) EVALUATION AND APPROVAL
FOR FEDERALLY-AIDED HIGHWAY PROJECTS WITH MINOR INVOLVEMENT
WITH PUBLIC PARKS, RECREATION LANDS, AND WILDLIFE AND
WATERFOWL REFUGES

F. A. Project BRSTP-1375(2)

State Project 8.2406201

T. I. P. No. B-3375

Description: Replace Bridge No. 301 over Swift Creek and Bridge No.471 over Lake Wheeler Spillway on SR 1375 (Lake Wheeler Road) in Wake County, North Carolina

		Yes	No
1.	Is the proposed project designed to improve the operational characteristics, safety, and/or physical condition of existing highway facilities on essentially the same location?	X	☐
2.	Is the project on new location?	☐	X
3.	Is the Section 4(f) land a publicly owned public park, recreation land, or wildlife and waterfowl refuge located adjacent to the existing highway?	X	☐
4.	Does the amount and location of the land to be used impair the use of the remaining Section 4(f) land, in whole or in part, for its intended purpose? (See chart below)	☐	X

Total size of section 4(f) site Maximum to be acquired

less than 10 acres	.....	10 percent of site
10 acres-100 acres	.....	1 acre
greater than 100 acres	.....	1 percent of site

		Yes	No
5.	Do the proximity impacts of the project (e.g., noise, air and water pollution, wildlife and habitat effects, aesthetic values) on the remaining Section 4(f) land impair the use of such land for its intended purpose?	☐	X
6.	Do the officials having jurisdiction over the Section 4(f) land agree, in writing, with the assessment of the impacts of the proposed project on, and the proposed mitigation for, the Section 4(f) lands?	X	☐
7.	Does the project use land from a site purchased or improved with funds under the Land and Water Conservation Act (Section 6(f)), the Federal Aid in Fish Restoration Act (Dingell-Johnson Act), the Federal Aid in Wildlife Act (Pittman-Robertson Act), or similar laws, or are the lands otherwise encumbered with a Federal interest (e.g., former Federal surplus property)?	☐	X
8.	If the project involves lands described in Item 7 above, does the appropriate Federal Agency object to the land conversion or transfer?	☐	X
9.	Does the project require preparation of an EIS?	☐	X

ALTERNATIVES CONSIDERED AND FOUND NOT TO BE FEASIBLE AND PRUDENT

	Yes	No
The following alternatives were evaluated and found not to be feasible and prudent:	X	☐

1. Do-nothing.

Does the "do nothing" alternative:

		Yes	No
	(a) correct capacity deficiencies?	☐	X
or	(b) correct existing safety hazards?	☐	X
or	(c) correct deteriorated conditions?	☐	X
and	(d) create costs, unusual problems, or impacts of extraordinary measure?	X	☐

2. Improvement of the highway without using the adjacent public park, recreational land, or wildlife waterfowl refuge. — Yes: X, No: ☐

(a) Have minor alignment shifts, changes in standards, use of retaining walls, etc., or traffic management measures been evaluated? — Yes: X, No: ☐

(b) The items in 2(a) would result in (circle, as appropriate)

(i) substantial adverse community impact

or (ii) substantial increased costs

or (iii) unique engineering, transportation, maintenance, or safety problems

or (iv) substantial social, environmental, or economic impacts

or (v) a project which does not meet the need

and (vi) impacts, costs, or problems which are extraordinary magnitude

	Yes	No
3. Build an improved facility on new location without using the public park, recreational land, or wildlife and waterfowl refuge. (This would be a localized "run around.")	X	☐

(a) An alternate on new location would result in: (circle, as appropriate)

(i) a project which does not solve the existing problems

or (ii) substantial social, environmental, or economic impacts

or (iii) a substantial increase in project cost or engineering difficulties

and (iv) such impacts, costs, or difficulties of truly unusual or unique or extraordinary magnitude

MINIMIZATION OF HARM

	Yes	No
1. The project includes all possible planning to minimize harm.	X	☐

2. Measures to minimize harm include the following:
   (circle those which are appropriate)

   a. Replacement of lands used with lands of reasonably equivalent usefulness and location and of at least comparable value.

   b. Replacement of facilities impacted by the project including sidewalks, paths, benches, lights, trees, and other facilities.

   (c.) Restoration and landscaping of disturbed areas.

   (d.) Incorporation of design features and habitat features, where necessary, to reduce or minimize impacts to the Section 4(f) property.

   (e.) Payment of the fair market value of the land and improvements taken or improvements to the remaining Section 4(f) site equal to the fair market value of the land and improvements taken.

   f. Additional or alternative mitigation measures as determined necessary based on consultation with the officials having jurisdiction over the parkland, recreation area, or wildlife or waterfowl refuge.

3. A discussion of specific mitigation measures is provided as follows:

   1. A three-lane bridge and roadway section will be provided.
   2. The park entrance will be improved and landscaping of disturbed areas will be restored.
   3. The alignment will be shifted downstream to minimize impacts to the earth dam and park entrance.
   4. Turning lanes into the park, which will improve traffic congestion associated with the Lake Wheeler Park.

Note: Any response in a box requires additional information prior to approval. Consult Nationwide 4(f) evaluation.

COORDINATION

The proposed project has been coordinated with the following (attach correspondence):

a. Officials having jurisdiction over the Section 4(f) Land

b. Local/State/Federal Agencies

c. US Coast Guard (for bridges requiring bridge permits)

d. DOI, if Section 6(f) lands are involved

SUMMARY AND APPROVAL

The project meets all criteria included in the programmatic 4(f) evaluation approved on December 23, 1986.

All required alternatives have been evaluated and the findings made are clearly applicable to this project. There are no feasible or prudent alternatives, which avoid use of the Section 4(f) land.

The project includes all possible planning to minimize harm, and there are assurances that the measures to minimize harm will be incorporated in the project.

All appropriate coordination has been successfully completed.

Approved:

11.26.03
DATE

for Gregory J. Thorpe, Ph.D.
Environmental Management Director
Project Development and Environmental Analysis Branch, NCDOT

11/26/03
DATE

for John F. Sullivan, III
Division Administrator
Federal Highway Administration

City Of Raleigh
North Carolina

April 23, 2002

Mr. William D. Gilmore, P.E., Manager
Project Development and Environmental Analysis Branch
North Carolina Department of Transportation
1548 Mail Service Center
Raleigh, North Carolina 27699-1548

Subject: Replace Bridge No. 301 over Swift Creek and Bridge No.471 over Lake Wheeler Spillway on SR 1375 (Lake Wheeler Road) in Wake County, F. A. Project No. BRSTP-1375(2), State Project No. 8.2406201, TIP No. B-3375

Dear Mr. Gilmore:

On January 29, 2002 a small group meeting was held at City of Raleigh's Municipal Building. The purpose of this eeting was to evaluate the impacts to Lake Wheeler Park associated with the above bridge replacement project.

Those in attendance were:

Stacy Harris, PE	NCDOT, PDEA
John Wadsworth, PE	NCDOT, PDEA
David Scheffel, PE	NCDOT, Design Services Unit
John Hoppe	City of Raleigh, Dept. of Parks and Recreation
Eric Lamb	City of Raleigh, Transportation Department
Tommy Register, EI	Barbara H. Mulkey Engineering

Subsequent reviews of the project were conducted with various Parks and Recreation staff and discussions were held with North Carolina State Parks staff to discuss the status of federal funding on a portion of the Raleigh property at Lake Wheeler. It was determined that this project was not on park lands assisted with federal funds.

The proposed replacement of Bridge No. 301 and Bridge No. 471 on SR 1375 (Lake Wheeler Road) will necessitate the taking of land from the Lake Wheeler Park property. The entrance to Lake Wheeler Park is located in the northwest quadrant of the project. Property adjacent to Lake Wheeler Road, to the east and west also belongs to the City of Raleigh.

The approach presented is as follows:

Bridge No. 301 and Bridge No. 471 will be replaced on new alignment downstream (east) of the existing bridge. Bridge No. 301 will be replaced by a nine-foot by eight-foot reinforced concrete box culvert. Bridge No. 471 will be replaced with a three-lane bridge. The proposed bridge will have three 12-foot travel lanes with eight-foot shoulders for a clear roadway width of 52 feet. The proposed approach roadway will consist of three 12-foot travel lanes for a total roadway dth of 36 feet. The shoulders will be eight feet wide including four feet of paved shoulders. The approach work will extend approximately 1200 feet to the south of Bridge No. 471 and approximately 1100 feet north of Bridge No. 471. Traffic will be maintained on the existing roadway during construction. Road closure is not anticipated. This project requires the acquisition of approximately 1.3 acres of park property for right-of-way and 0.42 acre for temporary construction easements.

Generally the proposed impacts to Lake Wheeler Park do not adversely affect the functionality of the Park. The turning lanes will enhance access to the park and improve traffic congestion and overall safety of the vehicular traffic entering and exiting Lake Wheeler Park.

The City of Raleigh, Departments of Parks and Recreation and Public Utilities having jurisdiction over the 4(f) property at the entrance to Lake Wheeler Park have reviewed and agree with the impacts to this portion of the 4(f) property and mitigation measures as proposed. The Raleigh Public Utilities Department has jurisdiction over the area of the dam and spillway.

Wake County and the City of Raleigh are interested in developing the greenway along Swift Creek as noted in the adopted Capital Area Greenway Plan. **The bridge should be designed to allow for construction of a standard ten foot wide paved greenway trail to accommodate future plans for construction of a greenway trail in this location.**

Specific mitigation measures NCDOT will provide are:

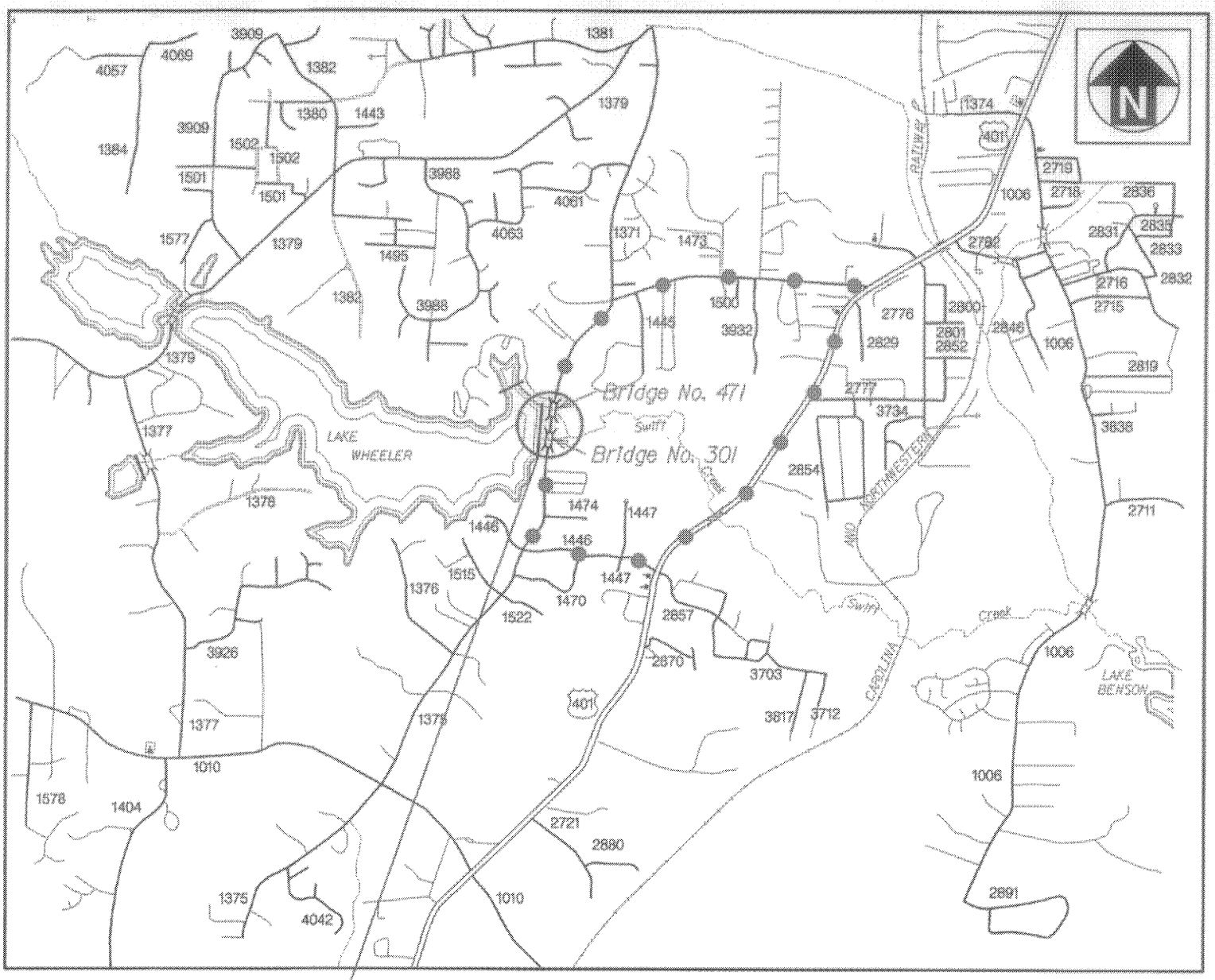
1. A three-lane bridge and roadway section at the Park's entrance.
2. The Park's entrance will be improved by providing adequate turning radius for a motor home pulling a boat trailer and landscaping of disturbed areas will be restored.
3. The alignment will be shifted downstream to minimize impacts to the earth dam and park entrance.
4. Turning lanes into the park, which will improve traffic congestion associated with the Lake Wheeler Park.

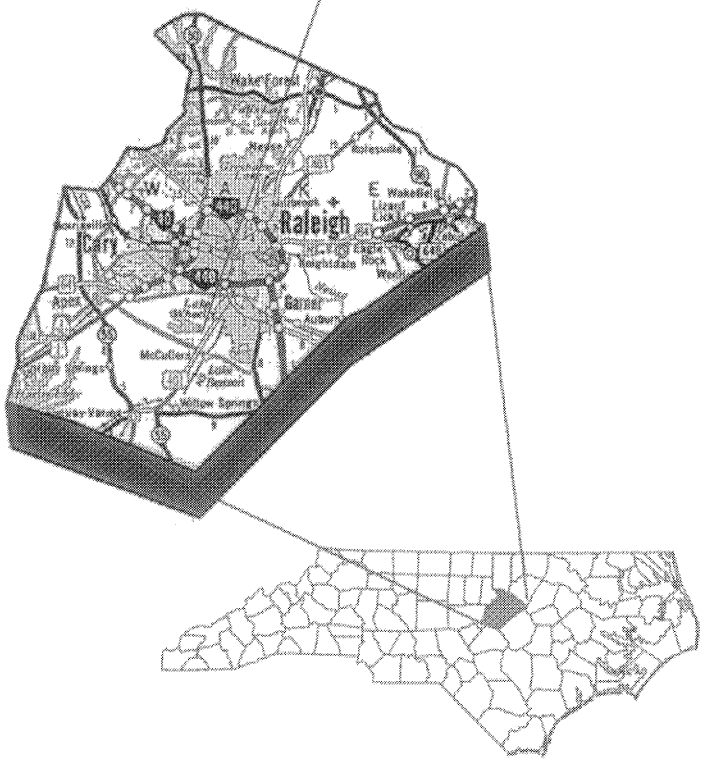
Sincerely,

Richard W. Bailey

Richard W. Bailey,
Design Development Administrator

Copy to:
Dale Crisp, Public Utilities Director
Eric Lamb, Raleigh Transportation
Tommy Register, Barbara H Mulkey Engineering
File





LEGEND

Studied Detour Route

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
PROJECT DEVELOPMENT AND ENVIRONMENTAL ANALYSIS

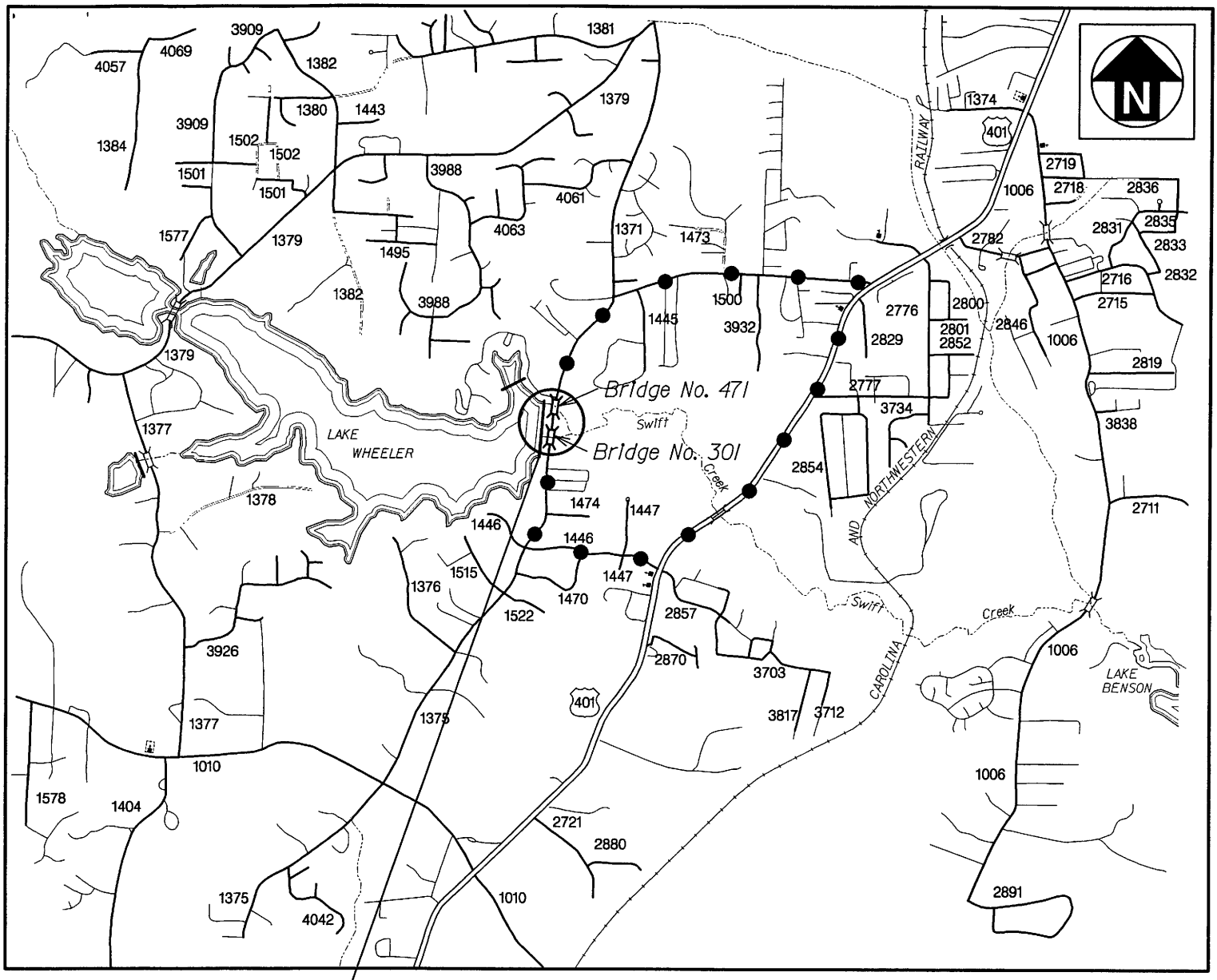
WAKE COUNTY

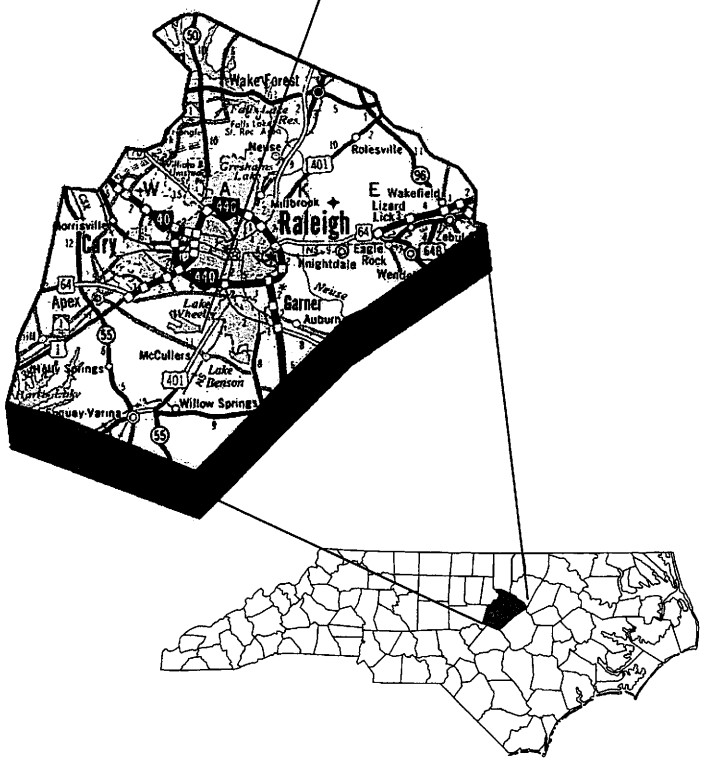
BRIDGE NOS. 471 AND 301 ON SR 1375 OVER LAKE WHEELER SPILLWAY AND SWIFT CREEK

B-3375

0 kilometers 0.8 kilometers 1.6
0 miles 0.5 miles 1.0

FIGURE 1





LEGEND

-●—●—●- Studied Detour Route

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
PROJECT DEVELOPMENT AND ENVIRONMENTAL ANALYSIS

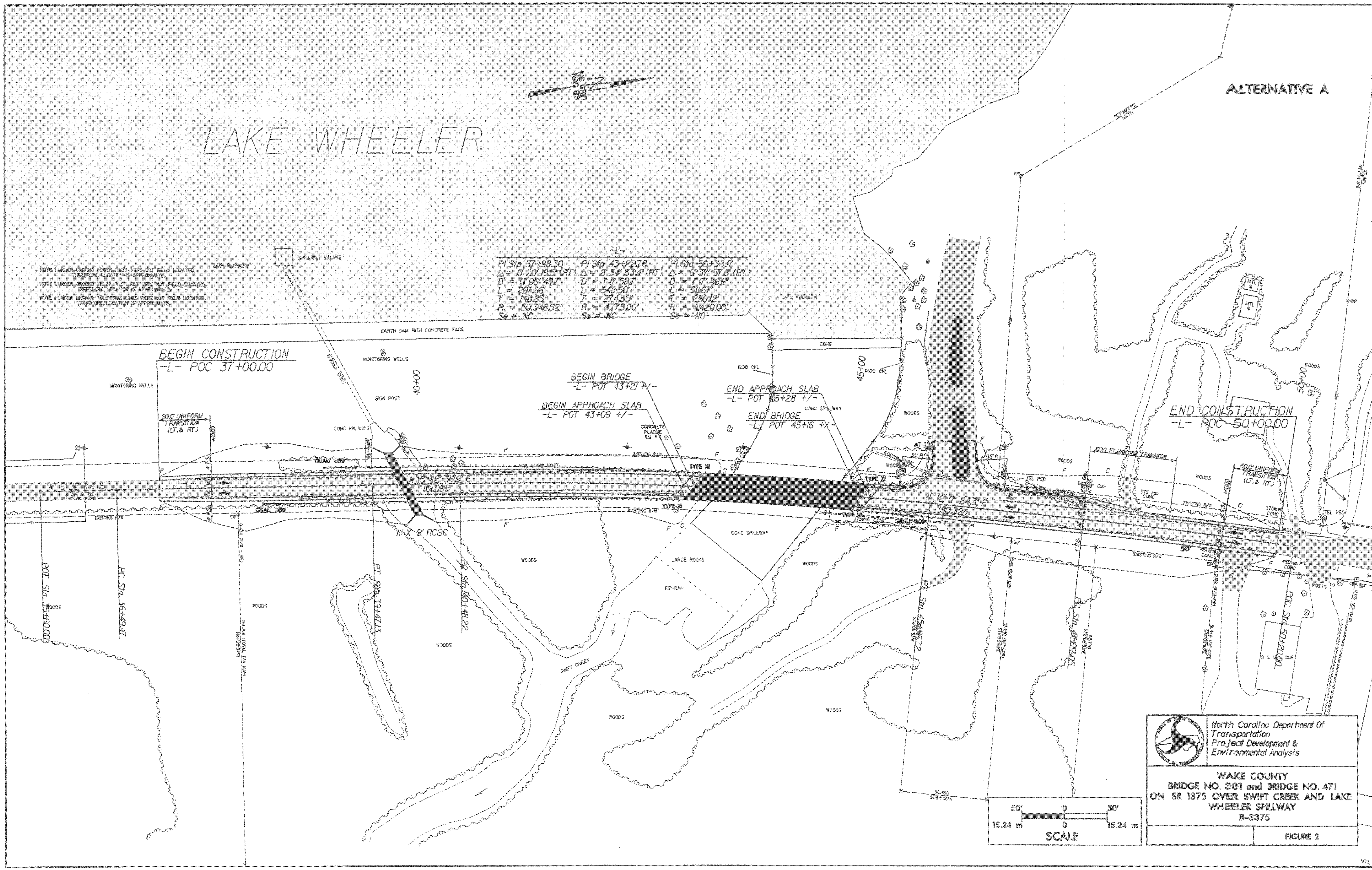
WAKE COUNTY

BRIDGE NOS. 471 AND 301 ON SR 1375 OVER LAKE WHEELER SPILLWAY AND SWIFT CREEK

B-3375

0 kilometers 0.8 kilometers 1.6
0 miles 0.5 miles 1.0

FIGURE 1


ALTERNATIVE A
LAKE WHEELER
NC GRID NAD 83
NOTE : UNDER GROUND POWER LINES WERE NOT FIELD LOCATED, THEREFORE, LOCATION IS APPROXIMATE.
NOTE : UNDER GROUND TELEPHONE LINES WERE NOT FIELD LOCATED, THEREFORE, LOCATION IS APPROXIMATE.
NOTE : UNDER GROUND TELEVISION LINES WERE NOT FIELD LOCATED, THEREFORE, LOCATION IS APPROXIMATE.
SPILLWAY VALVES
-L-
PI Sta 37+98.30 Δ = 0° 20' 19.5" (RT) D = 0° 06' 49.7" L = 297.66' T = 148.83' R = 50,346.52' Se = NC
PI Sta 43+22.78 Δ = 6° 34' 53.4" (RT) D = 1° 11' 59.7" L = 548.50' T = 274.55' R = 4775.00' Se = NC
PI Sta 50+33.17 Δ = 6° 37' 57.6" (RT) D = 1° 17' 46.6" L = 511.67' T = 256.12' R = 4,420.00' Se = NC
EARTH DAM WITH CONCRETE FACE
BEGIN CONSTRUCTION -L- POC 37+00.00
BEGIN BRIDGE -L- POT 43+21 +/-
BEGIN APPROACH SLAB -L- POT 43+09 +/-
END APPROACH SLAB -L- POT 45+28 +/-
END BRIDGE -L- POT 45+16 +/-
END CONSTRUCTION -L- POC 50+00.00
60.0' UNIFORM TRANSITION (LT. & RT.)
100.0 FT UNIFORM TRANSITION
MONITORING WELLS
SIGN POST
CONC SPILLWAY
LARGE ROCKS
RIP-RAP
SWIFT CREEK
WOODS
N 5° 42' 11.4" E 1356.36
N 5° 42' 30.9" E 101.095
N 12° 11' 24.3" E 180.324
11' X 9' RCBC
POT Sta. 35+60.00
PC Sta. 36+49.47
PT Sta. 39+47.13
PC Sta. 40+48.22
PT Sta. 45+96.72
PC Sta. 47+77.05
POC Sta. 50+20.00
North Carolina Department Of Transportation Project Development & Environmental Analysis
WAKE COUNTY
BRIDGE NO. 301 and BRIDGE NO. 471 ON SR 1375 OVER SWIFT CREEK AND LAKE WHEELER SPILLWAY
B-3375
FIGURE 2
50' 0 50'
15.24 m 0 15.24 m
SCALE

ALTERNATIVE B

LAKE WHEELER

PI Sta 33+91.32	PI Sta 37+98.30	PI Sta 43+22.78
Δ = 0°13'54.7" (RT)	Δ = 0°20'19.5" (RT)	Δ = 6°34'53.4" (RT)
D = 0°08'49.7"	D = 0°08'49.7"	D = 1°15'50.7"
L = 233.03'	L = 297.66'	L = 548.50'
T = 116.52'	T = 149.83'	T = 274.55'
R = 50,346.52'	R = 50,346.52'	R = 4,775.00'
Se = NC	Se = NC	Se = NC

BEGIN CONSTRUCTION
-L- POT 32+90.00

50.0' UNIFORM TRANSITION (LT. & RT.)

BEGIN DETOUR
STA. 34+23.24

DETOUR

PI Sta 33+52.04	PI Sta 36+06.68	PI Sta 39+78.76
Δ = 0°09'43.4" (RT)	Δ = 14°35'45.0" (RT)	Δ = 15°09'40.2" (LT)
D = 0°08'49.7"	D = 4°00'00.0"	D = 4°00'00.0"
L = 142.41'	L = 364.90'	L = 379.03'
T = 71.20'	T = 183.44'	T = 190.63'
R = 50,346.52'	R = 1,432.39'	R = 1,432.39'
Se = NC	Se = 0.03	Se = 0.03
	RUNOFF = 100.00'	RUNOFF = 100.00'

BEGIN BRIDGE
-L- POT 43+21 +/-

BEGIN APPROACH SLAB
-L- POT 43+09 +/-

END APPROACH SLAB
-L- POT 45+28 +/-

END BRIDGE
-L- POT 45+16 +/-

BEGIN BRIDGE
STA. 42+52 +/-

END BRIDGE
STA. 44+87 +/-

END CONSTRUCTION
-L- POT 50+00.00

END DETOUR
STA. 50+76.57

EARTH DAM WITH CONCRETE FACE

CONC SPILLWAY

SPILLWAY WALLS

MONITORING WELLS

CITY OF RALEIGH
DB 3905 PG 795

PANNKUK CONSTRUCTION INC.
DB 7472 PG 460

EMILY S. NORRIS
SM 1979 PG 39

WANDA DENNING, ET AL
DB 5150 PG 387

CITY OF RALEIGH
DB 12147 PG 507

NORMA S. WILSON
DB 2308 PG 673

WALLACE F. RENFROW
DB 5444 PG 677

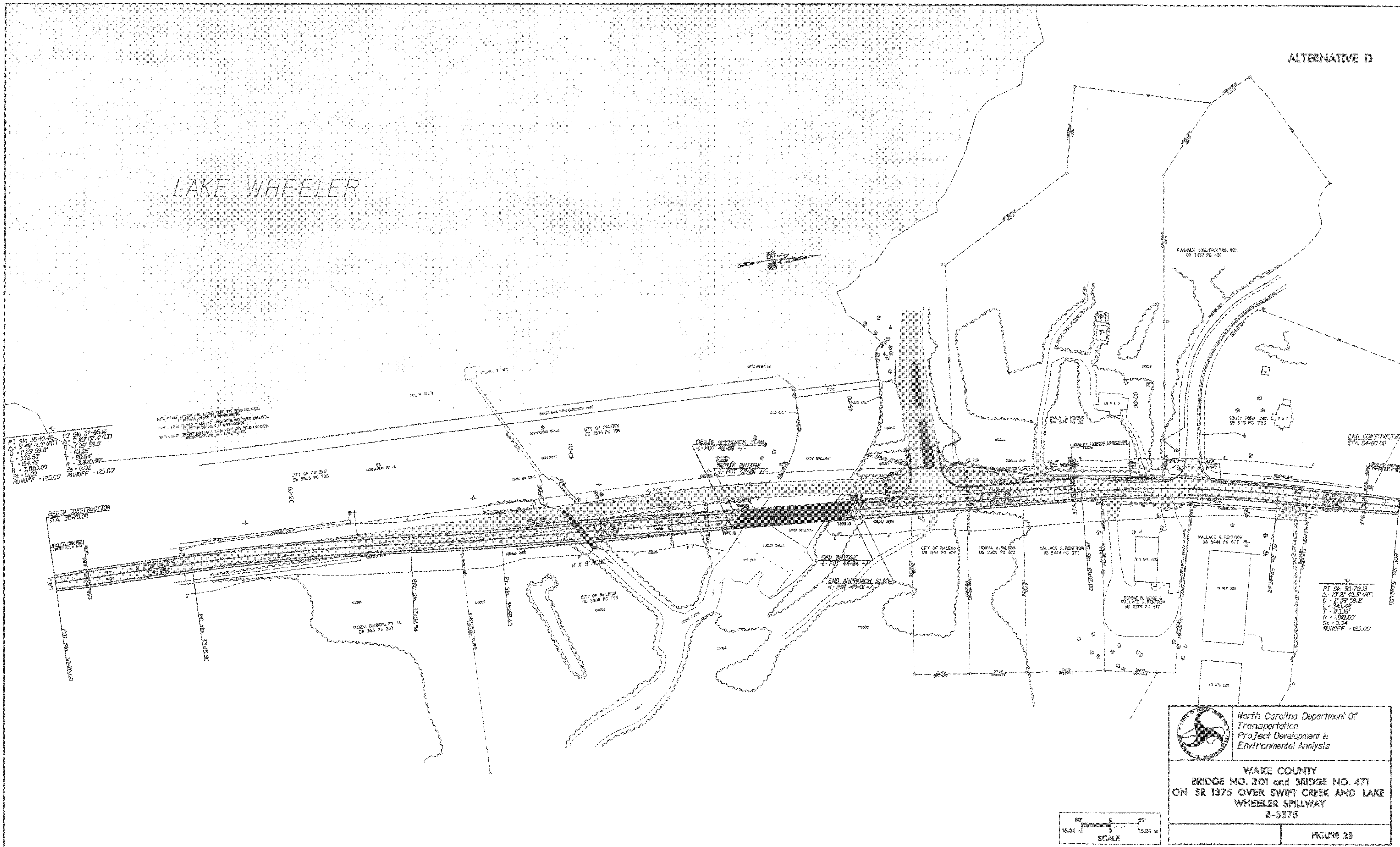
RONNIE D. RICKS &
WALLACE K. RENFROW
DB 6375 PG 477

SCALE: 50' 0 50' / 15.24 m 0 15.24 m

North Carolina Department Of Transportation
Project Development & Environmental Analysis

WAKE COUNTY
BRIDGE NO. 301 and BRIDGE NO. 471
ON SR 1375 OVER SWIFT CREEK AND LAKE WHEELER SPILLWAY
B-3375

FIGURE 2A


ALTERNATIVE D
LAKE WHEELER
BEGIN CONSTRUCTION
STA. 30+70.00
END CONSTRUCTION
STA. 54+60.00
BEGIN APPROACH SLAB
END BRIDGE
END APPROACH SLAB
CITY OF RALEIGH
DB 3905 PG 795
WANDA DENNING, ET AL
EMILY S. MORRIS
PANNELL CONSTRUCTION INC.
SOUTH FORK INC.
NORMA S. WILSON
WALLACE K. RENFROW
DB 5444 PG 677
RONNIE G. RICKS & WALLACE K. RENFROW
PI Sta 50+70.18
Δ = 10° 21' 42.8" (RT)
D = 2° 59' 59.2"
L = 345.42'
T = 173.18'
R = 1,910.00'
Se = 0.04
RUNOFF = 125.00'
PI Sta 35+10.42
PI Sta 37+35.18
North Carolina Department Of Transportation
Project Development & Environmental Analysis
WAKE COUNTY
BRIDGE NO. 301 and BRIDGE NO. 471
ON SR 1375 OVER SWIFT CREEK AND LAKE WHEELER SPILLWAY
B-3375
50' 0 50'
15.24 m 0 15.24 m
SCALE
FIGURE 2B

ALTERNATIVE E
PREFERRED

LAKE WHEELER

LAKE WHEELER

BEGIN CONSTRUCTION
-L- POT 31+30.00

END CONSTRUCTION
-L- POT 56+20.00

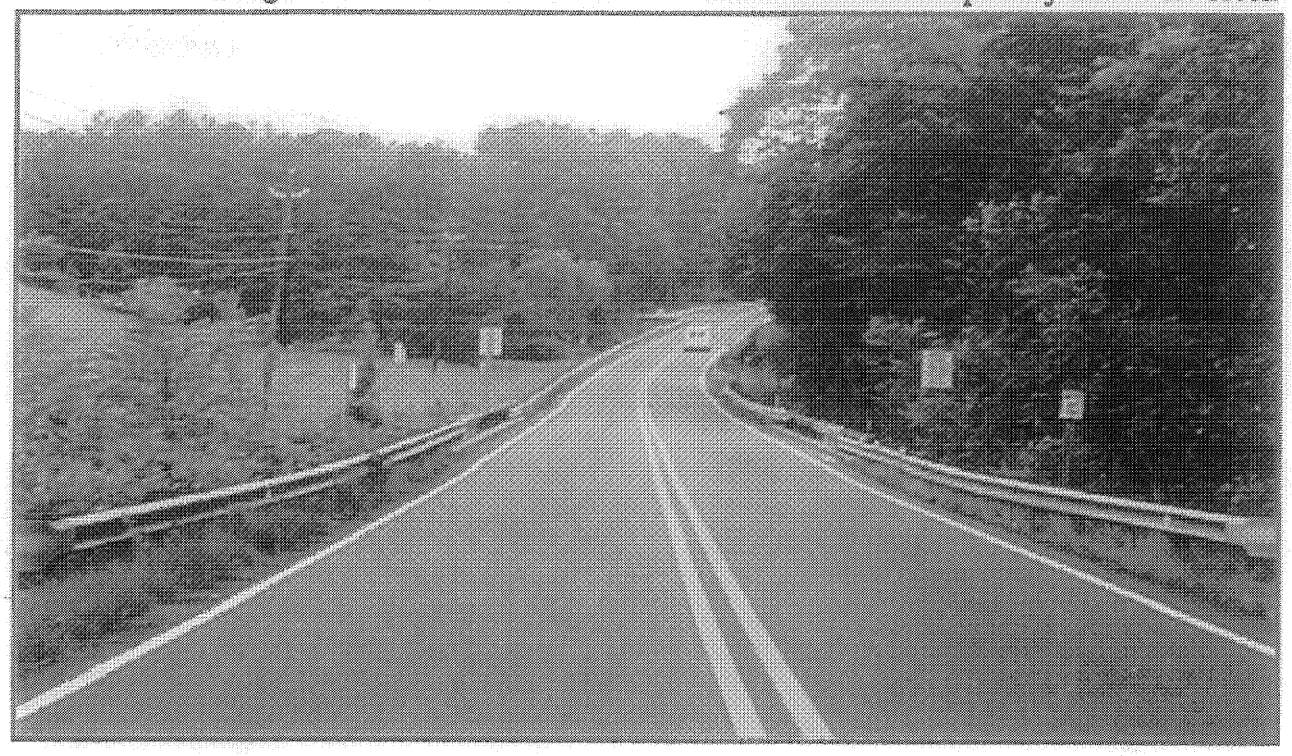
SCALE

North Carolina Department Of Transportation
Project Development & Environmental Analysis

WAKE COUNTY
BRIDGE NO. 301 and BRIDGE NO. 471
ON SR 1375 OVER SWIFT CREEK AND LAKE WHEELER SPILLWAY
B-3375

FIGURE 2C

B-3375
Wake County
Bridge Nos. 471 and 301 on SR 1375 over Lake Wheeler Spillway and Swift Creek

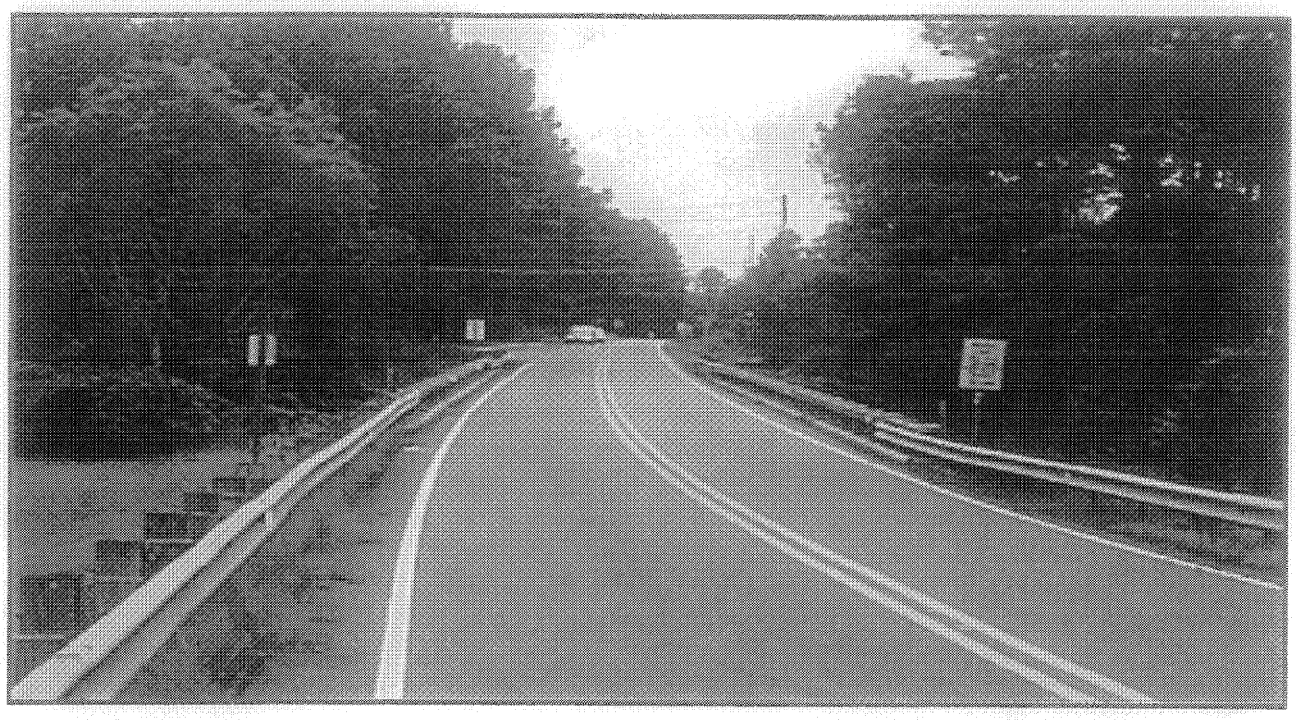


Looking north along SR 1375 across Bridge No. 301.

Looking south along SR 1375 across Bridge No. 301.

Figure 3 A

B-3375
Wake County
Bridge Nos. 471 and 301 on SR 1375 over Lake Wheeler Spillway and Swift Creek



Looking north along SR 1375 across Bridge No. 471.

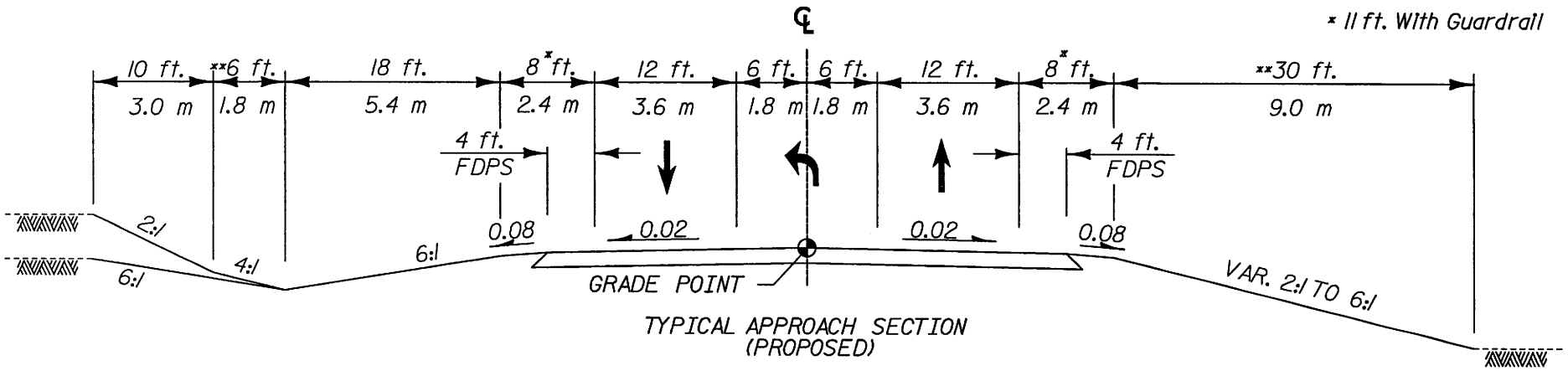
Looking south along SR 1375 across Bridge No. 471. Park entrance to the right.

Figure 3 B

B-3375
Wake County
Bridge Nos. 471 and 301 on SR 1375 over Lake Wheeler Spillway and Swift Creek

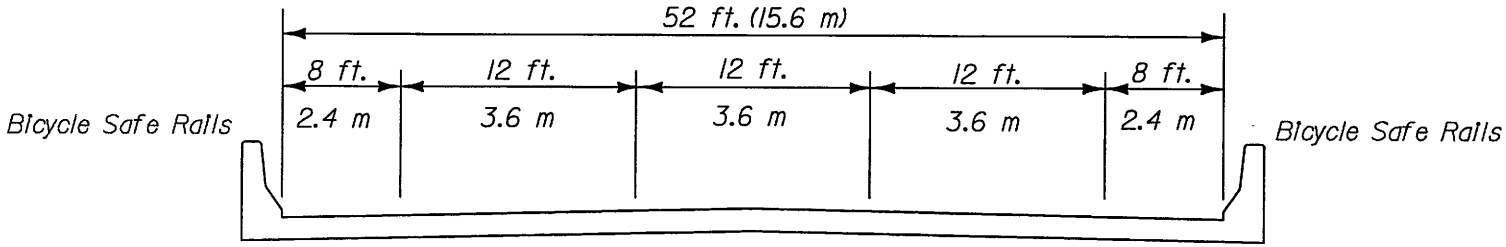
Looking east at Bridge No. 471 from spillway.

Spillway viewed from Bridge No. 471.



TYPICAL APPROACH SECTION
(PROPOSED)

** WHEN THESE DISTANCES INDICATE SLOPES OUTSIDE THE LIMITS 6:1 TO 2:1 THE DISTANCE BECOMES VARIABLE AND THE MAX. OR MIN. SLOPE MAINTAINED



TYPICAL BRIDGE SECTION

DESIGN DATA

(EXISTING) 2003 ADT = 12,500 LOS D
(CONST. YR.) 2005 ADT = 13,400 LOS D
(DESIGN YR.) 2030 ADT = 24,300 LOS E
DUAL 5%
TTST 2%

FUNCTIONAL CLASSIFICATION : URBAN COLLECTOR

North Carolina Department Of Transportation
Project Development & Environmental Analysis

WAKE COUNTY
BRIDGE NOS. 301 & 471 ON SR 1375
LAKE WHEELER ROAD
OVER LAKE WHEELER SPILLWAY
TIP NO: B-3375

FIGURE 4

B-3375
Wake County
Bridge Nos. 471 and 301 on SR 1375 over Lake Wheeler Spillway and Swift Creek

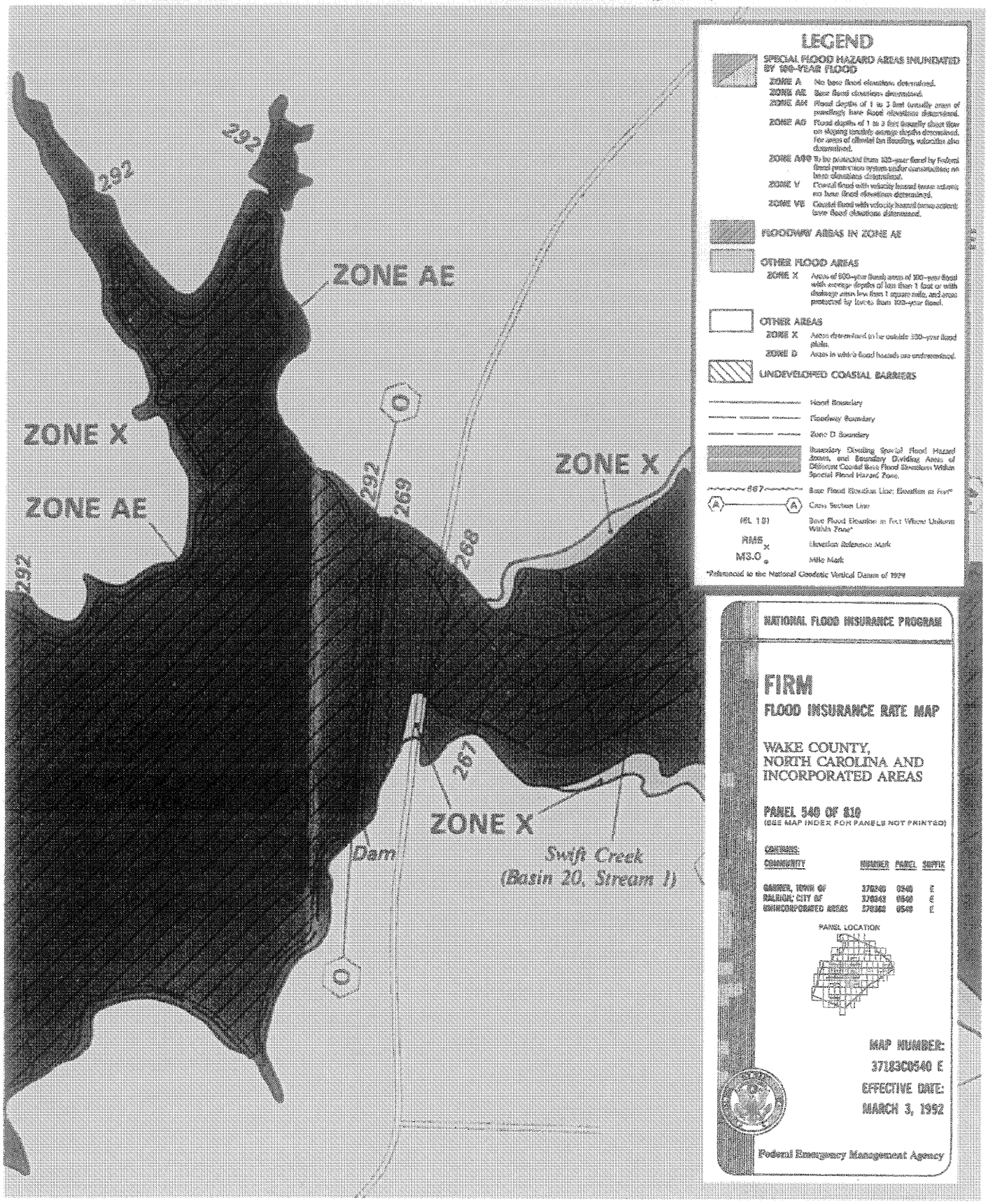


FIGURE 5

FEMA FLOOD MAP

APPENDIX

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Raleigh Field Office
Post Office Box 33726
Raleigh, North Carolina 27636-3726

September 8, 2003

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

Dear Dr. Thorpe:

This letter is in response to your letter of August 18, 2003 which provided the U.S. Fish and Wildlife Service (Service) with the biological conclusion of the North Carolina Department of Transportation (NCDOT) that the replacement of Bridge No. 301 over Swift Creek on SR 1375 and Bridge No. 471 over Lake Wheeler Spillway on SR 1375 in Wake County, North Carolina (TIP No. B-3375) may affect, but is not likely to adversely affect the federally-endangered dwarf wedgemussel (*Alasmidonta heterodon*). These comments are provided in accordance with section 7 of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531-1543).

According to the information you submitted, mussel surveys were conducted at the project site on May 28, 2003 and June 25, 2003. The survey extended from the road crossings at each bridge to a point approximately 500 meters downstream of the confluence of Swift Creek and the old channel of Swift Creek. The impounded area upstream of the road crossing is not considered suitable habitat for the species. No specimens of dwarf wedgemussel were found. However, as the survey report noted, the dwarf wedgemussel has been found several miles downstream below Lake Benson.

Although no specimens of dwarf wedgemussel were found in the surveyed reach of Swift Creek, the possibility of the species' presence in Swift Creek between Lake Wheeler and Lake Benson cannot be discounted. For this reason, and because the creeper (*Strophitus undulatus*), a Federal Species of Concern, was found in the surveyed area, the Service recommends stringent use of appropriate erosion control practices.

Based on the mussel survey results, the Service concurs with your conclusion that the proposed bridge replacements may affect, but are not likely to adversely affect the dwarf wedgemussel. We believe that the requirements of section 7 (a)(2) of the ESA have been satisfied. We remind you that obligations under section 7 consultation must be reconsidered if: (1) new information reveals impacts of this identified action that may affect listed species or critical habitat in a manner not previously considered in this review; (2) this action is subsequently modified in a

manner that was not considered in this review; or (3) a new species is listed or critical habitat determined that may be affected by this identified action.

The Service appreciates the opportunity to review this project. If you have any questions regarding our response, please contact Mr. Gary Jordan at (919) 856-4520 (Ext. 32).

Sincerely,

Tom Augspurger

for Garland B. Pardue, Ph.D.
Ecological Services Supervisor

cc: Eric Alsmeyer, USACE, Raleigh, NC
David Franklin, USACE, Wilmington, NC
John Hennessy, NCDWQ, Raleigh, NC
Travis Wilson, NCWRC, Creedmore, NC
Chris Militscher, USEPA, Raleigh, NC

7/6/00

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Raleigh Field Office
Post Office Box 33726
Raleigh, North Carolina 27636-3726

June 30, 2000

Mr. William D. Gilmore, P.E., Manager
NCDOT
Project Development and Environmental Analysis Branch
1548 Mail Service Center
Raleigh, NC 27699-1548

Dear Mr. Gilmore:

Thank you for your June 2, 2000 request for information from the U.S. Fish and Wildlife Service (Service) on the potential environmental impacts of proposed bridge replacements in Wake and Durham Counties, North Carolina. This report provides scoping information and is provided in accordance with provisions of the Fish and Wildlife Coordination Act (FWCA) (16 U.S.C. 661-667d) and Section 7 of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531-1543). This report also serves as initial scoping comments to federal and state resource agencies for use in their permitting and/or certification processes for this project.

The North Carolina Department of Transportation (NCDOT) proposes to replace the following bridge structures:

1. B-3375 Bridge No. 301 over Swift Creek and Bridge No 471 over Lake Wheeler Spillway on SR 1375 (Lake Wheeler Road), Wake County;

2. B-3450 Bridge No. 217 over New Hope Creek and Bridge No. 122 over Sandy Creek on SR 1116 (Garrett Road), Durham County;

3. B-3451 Bridge No. 119 over Prong of Mud Creek on SR 1306 (Lemur Lane), Durham County;

4. B-3522 Bridge No. 215 over Buffalo Creek on SR 1007 (Poole Road), Wake County; and,

5. B-3528 Bridge No. 429 over Sycamore Creek on SR 1839 (Leesville Road), Wake and Durham Counties.

The following recommendations are provided to assist you in your planning process and to facilitate a thorough and timely review of the project.

Generally, the Service recommends that wetland impacts be avoided and minimized to the maximum extent practical as outlined in Section 404 (b)(1) of the Clean Water Act Amendments of 1977. In regard to avoidance and minimization of impacts, we recommend that proposed highway projects be aligned along or adjacent to existing roadways, utility corridors, or previously developed areas in order to minimize habitat fragmentation and encroachment. Areas exhibiting high biodiversity or ecological value important to the watershed and region should be avoided. Crossings of streams and associated wetland systems should use existing crossings and/or occur on a structure wherever feasible. Where bridging is not feasible, culvert structures that maintain natural water flows and hydraulic regimes without scouring, or impeding fish and wildlife passage, should be employed. Highway shoulder and median widths should be reduced through wetland areas. Roadway embankments and fill areas should be stabilized by using appropriate erosion control devices and techniques. Wherever appropriate, construction in sensitive areas should occur outside fish spawning and migratory bird nesting seasons.

The National Wetlands Inventory (NWI) maps of the Lake Wheeler, Knightdale, Southeast Durham, and Southwest Durham 7.5 Minute Quadrangles show wetland resources in the specific work areas. However, while the NWI maps are useful for providing an overview of a given area, they should not be relied upon in lieu of a detailed wetland delineation by trained personnel using an acceptable wetland classification methodology. Therefore, in addition to the above guidance, we recommend that the environmental documentation for this project include the following in sufficient detail to facilitate a thorough review of the action.

1. The extent and acreage of waters of the U.S., including wetlands, that are to be impacted by filling, dredging, clearing, ditching, or draining. Acres of wetland impact should be differentiated by habitat type based on the wetland classification scheme of the National Wetlands Inventory. Wetland boundaries should be determined by using the 1987 Corps of Engineers Wetlands Delineation Manual and verified by the U.S. Army Corps of Engineers.

2. If unavoidable wetland impacts are proposed, we recommend that every effort be made to identify compensatory mitigation sites in advance. Project planning should include a detailed compensatory mitigation plan for offsetting unavoidable wetland impacts. Opportunities to protect mitigation areas in perpetuity, preferably via conservation easement, should be explored at the outset.

The enclosed lists identify the federally-listed endangered and threatened species, and Federal Species of Concern (FSC) that are known to occur in Durham and Wake Counties. The Service recommends that habitat requirements for the listed species be compared with the available habitats at the respective project sites. If suitable habitat is present within the action area of the project, biological surveys for the listed species should be performed. Environmental documentation that includes survey methodologies, results, and NCDOT's recommendations based on those results, should be provided to this office for review and comment.

FSC's are those plant and animal species for which the Service remains concerned, but further biological research and field study are needed to resolve the conservation status of these taxa. Although FSC's receive no statutory protection under the ESA, we encourage the NCDOT to be

alert to their potential presence, and to make every reasonable effort to conserve them if found. The North Carolina Natural Heritage Program should be contacted for information on species under state protection.

The Service appreciates the opportunity to comment on these projects. Please continue to advise us during the progression of the planning process, including your official determination of the impacts of these projects. If you have any questions regarding these comments, please contact Tom McCartney at 919-856-4520, ext. 32.

Sincerely,

For Tom Augspurger

Dr. Garland B. Pardue
Ecological Services Supervisor

Enclosures

cc:
COE, Raleigh, NC (Eric Alsmeyer)
NCDWQ, Raleigh, NC (John Hennessey)
NCDNR, Northside, NC (David Cox)
FHWA, Raleigh, NC (Nicholas Graf)
EPA, Atlanta, GA (Ted Bisterfield)

FWS/R4:TMcCartney:TM:06/28/00:919/856-4520 extension 32:\bdgswake.dur

B-3375

North Carolina
Department of Environment and Natural Resources

Michael F. Easley, Governor
William G. Ross, Jr., Secretary

Charles H. Gardner, P.G., P.E.,
Director and State Geologist

Division of Land Resources

February 16, 2001

Mr. William D. Gilmore, P. E., Manager
North Carolina Department of Transportation
Project Development and Environmental Analysis Branch
1548 Mail Service Center
Raleigh, North Carolina 27699-1548

RE: Lake Wheeler Dam
Wake County
WAKE-037-H
Neuse River Basin

Bridge Replacement Project B-3375

Dear Mr. Gilmore:

This letter serves to respond to your letter dated June 19, 2000 regarding the referenced bridge replacement project at the subject dam. Please be advised that any modifications to the bridge structure will have an impact on the safety of the dam and possibly on the spillway capacity of the dam. For these reasons, a "Approval to Modify" permit will be required in accordance with the North Carolina Dam Safety Law of 1967 (General Statute 143-215.23 et seq.) and the regulations promulgated thereunder codified at North Carolina Administrative Code, Title 15A, Subchapter 2K (15A NCAC 2K).

Prior to the initiation of any construction activity, two sets of plans, specifications and engineering design data for the work are required to be submitted to this office for review and approval. It is recommended that this information be submitted at least 120 days in advance of the anticipated commencement of construction activities to permit sufficient time for review for this project.

Please contact me at telephone number (919) 733-4574 should you have any questions concerning this matter.

Sincerely,

James K. Leumas, P. E.
State Dam Safety Engineer
Land Quality Section

JKL/
cc: Mr. John L. Holley, Jr., P. E., CPESC

NORTH CAROLINA DEPARTMENT OF
ENVIRONMENT AND NATURAL RESOURCES
DIVISION OF SOIL AND WATER CONSERVATION

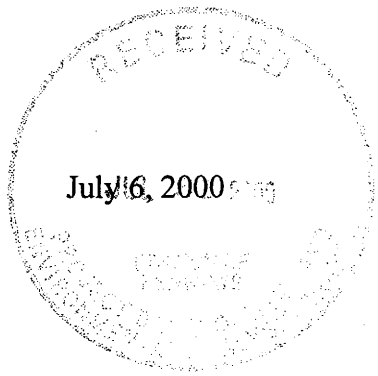
SOIL & WATER CONSERVATION
Yours for Life

NCDENR

JAMES B. HUNT JR.
GOVERNOR

BILL HOLMAN
SECRETARY

DAVID S. VOGEL
DIRECTOR



MEMORANDUM:

July 6, 2000

TO: Melba McGee

FROM: David Harrison

SUBJECT: NCDOT Bridge Replacement Projects B-3375, B-3450, B-3451, B-3522 and B-3528.

The detour routes included in the bridge replacement plans should eliminate any farmland impacts.

If additional land is needed beyond the existing right-of-way the environmental assessment should include information on adverse impacts to Prime or Statewide Important Farmland. The definition of Prime or Statewide Important Farmland is based on the soil series and not on its current land use. Areas that are developed or are within municipal boundaries are exempt from consideration as Prime or Important Farmland.

For additional information, contact the soils specialists with the Natural Resources Conservation Service, USDA, Raleigh, NC at (919) 873-2141.

Cc: Stacy Harris

NC SCHOOLS FIRST IN AMERICA 2010

1614 MAIL SERVICE CENTER, RALEIGH, NORTH CAROLINA 27699-1614
PHONE 919-733-2302 FAX 919-715-3559

North Carolina Wildlife Resources Commission

Charles R. Fullwood, Executive Director

TO: Stacy Harris, PE
Project Engineer, NCDOT

FROM: David Cox, Highway Project Coordinator
Habitat Conservation Program

DATE: January 8, 2001

SUBJECT: NCDOT Bridge Replacements in Wake and Durham counties of North Carolina. TIP Nos. [redacted], B-3450, B-3451, B-3522, and B-3528.

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.

[redacted] – Wake County – Bridge No. 301 over Swift Creek and Bridge No. 471 over Lake Wheeler Spillway. We request that High Quality Sedimentation and Erosion Control Measures be used due to the stream classification of WS-III. We are not aware of any threatened of endangered species in the project vicinity.

2. B-3450 – Durham County – Bridge No. 122 over Sandy Creek and Bridge No. 217 over an unnamed tributary to Sandy Creek. Standard comments apply. We are not aware of any threatened of endangered species in the project vicinity. NCDOT should pay particular attention to wildlife passage issues on these bridges due to the interest in the New Hope Creek Corridor as a greenway and wildlife travel corridor.

3. B-3451 – Durham County – Bridge No. 119 over Mud Creek. Standard comments apply. We are not aware of any threatened of endangered species in the project vicinity.

4. B-3522 – Wake County – Bridge No. 215 over Buffalo Creek. Buffalo Creek has a DWQ classification of B, therefore we request that NCDOT use High Quality Sedimentation and Erosion Control Measures. Standard comments apply. We are not aware of any threatened of endangered species in the project vicinity.

5. B-3528 – Wake/Durham counties – Bridge No. 429 over Sycamore Creek. Sycamore Creek has a DWQ classification of B, therefore we request that NCDOT use High Quality

Sedimentation and Erosion Control Measures. 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.

Federal Aid =BRSTP-1375(2) *TIP* #B-3375 *County*: Wake

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

Project Description: Replace Bridge No. 301 and No. 471 on SR 1375 over Swift Creek and Lake Wheeler Spillway

On March 27, 2000, representatives of the

- [x] North Carolina Department of Transportation (NCDOT)
- [ ] 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

- [x] 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.
- [ ] 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 _____ 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 — 3·27·00
Representative, NCDOT — Date

Michael C. Dawson — 4/13/00
FHWA, for the Division Administrator, or other Federal Agency — Date

Representative, SHPO — 3/27/00
Date

State Historic Preservation Officer — 4/19/00
Date

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

7/6/00

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

June 29, 2000

MEMORANDUM

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

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

SUBJECT: Replacement of Bridge No. 301 over Swift Creek and Bridge No 471 over Lake Wheeler Spillway on SR 1375, TIP B-3375, Wake County, ER 00-10110

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

We have conducted a review of the project and are aware of no properties of architectural, historic, or archaeological significance which would be affected by the project. Therefore, we have no comment on the project as currently proposed.

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.

DB:scb

	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

City Of Raleigh
North Carolina

April 10, 2003

Ms. Cathy S. Houser, P.E.
NC Department of Transportation
Design Services Unit
1591 Mail Service Center
Raleigh, North Carolina 27699-1591

Re: Lake Wheeler Road Bridge Replacement - State Project 8.2406201 (B-3375)/F.A. Project BRSTP-1375(2)

Dear Ms. Houser:

Thank you for the opportunity to comment on the NC Department of Transportation's proposed Lake Wheeler Road Bridge Replacement project. As requested, we are following up on two items discussed in our March 13, 2003 meeting.

The design does not currently accommodate the City of Raleigh's need for a grade-separated greenway access beneath Lake Wheeler Road. It is our understanding that this cannot be added to the plan due to vertical alignment and structural design limitations. As discussed in our meeting, this greenway crossing of Lake Wheeler Road is on the City's Comprehensive Plan and needs to be accommodated in some format with the plans for the current project. With this in mind, we ask that the project be designed to accommodate a future signalized at-grade crossing near the existing driveway entrance to the City of Raleigh's Lake Wheeler Park site. Although it is not anticipated that the signal installation will be needed with the current project, the City would like for the crossing to be made a part of the NC Department of Transportation's plan for this corridor such that future installation of the signal will be anticipated and allowed subject to formal permit approval of the final design. We feel this is a good compromise given the design constraints with the current project presented by a grade-separated crossing.

Discussions regarding the bridge structure design included a question about the need for bicycle accommodations with the design of the bridge typical section. As mentioned in the meeting, the City of Raleigh's current extra-territorial jurisdiction (ETJ) does not currently extend to this project's limits. However, our Comprehensive Plan currently shows Lake Wheeler Road north of the project as a local bicycle corridor. Therefore, we feel that the bridge typical section should be designed to accommodate cyclists.

Thank you again for the chance to have input on the project's design. We feel the opportunity to communicate between our two organizations is critical to the success of projects such as this, and look forward to continued opportunities on future projects. Should you have questions, I can be reached at 890-3030 or by e-mail at dean.fox@ci.raleigh.nc.us.

Sincerely,

J. Dean Fox

J. Dean Fox, P.E.
Senior Project Engineer

Cc: Vic Lebsock, Parks Planner

City Of Raleigh

North Carolina

August 11, 2000

Stacy Harris, PE
NCDOT Project Development &
Environmental Analysis Branch
1548 Mail Service Center
Raleigh, NC 27699-1548

Subject: Request for comments for B-3375 and B-3528

Dear Ms. Harris:

Thank you for the opportunity to provide comments on TIP Bridge Replacement Projects B-3375 and B-3528.

B-3375, which will replace Bridge No. 301 and Bridge No. 471 on Lake Wheeler Road, is outside of the City of Raleigh's current planning jurisdiction. However, these projects are extremely relevant to the City as Lake Wheeler is one of the City's water supply reservoir. These two bridges lie at the base of the Lake Wheeler dam and spillway, and the need to ensure the structural integrity of this dam during the demolition and construction process is paramount. You may wish to refer to the Phase II Evaluation of the Lake Wheeler Dam available from our Public Utilities Department. You may also wish to obtain a copy of the Lake Wheeler Park Master Plan from our Parks and Recreation Department. Additionally, Lake Wheeler Road is classified as a major thoroughfare in the Capital Area MPO Thoroughfare Plan and in the Raleigh Comprehensive Plan. City standards indicate Lake Wheeler Road should provide a 65-foot back-to-back curb and gutter section on 90 feet of right-of-way with 5-foot sidewalks along both sides. While this project may not provide the ultimate future cross-section of Leesville Road, we request that the bridge be designed to allow for future widening and pedestrian accommodation.

B-3528, which will replace Bridge 429 carrying Leesville Road over Sycamore Creek, is in a rapidly growing area of the City. This portion of Leesville Road is classified as a minor thoroughfare in the Capital Area Thoroughfare Plan and in the Raleigh Comprehensive Plan. The City's development standards require Leesville Road to provide a 53-foot back-to-back curb and gutter section on 80 feet of right-of-way with 5-foot sidewalks on both sides. While the immediate bridge replacement may not provide the ultimate future cross-section of Leesville Road, we request that the bridge be designed to allow for future widening and pedestrian accommodation.

Thank you again for the opportunity to provide input on these projects. If we can provide you with any assistance or if you need any additional information, please contact Ed Johnson or Eric Lamb at 890-3430.

Sincerely,

Dempsey E. Benton
City Manager

DEB/ejl

Cc: Jimmie Beckom, PE - Transportation Director
Stewart Sykes, PE - City Engineer
George Chapman, AICP - Planning Director
Dale Crisp, PE - Public Utilities Director

Division of Parks & Recreation

1615 MSC
Raleigh, North Carolina 27699-1615
Telephone: 919/733-4181
Fax: 919/715-3085

FAX TRANSMISSION COVER SHEET

Date: June 20, 2000

To: Tommy Register

Fax: (919) 851-1918

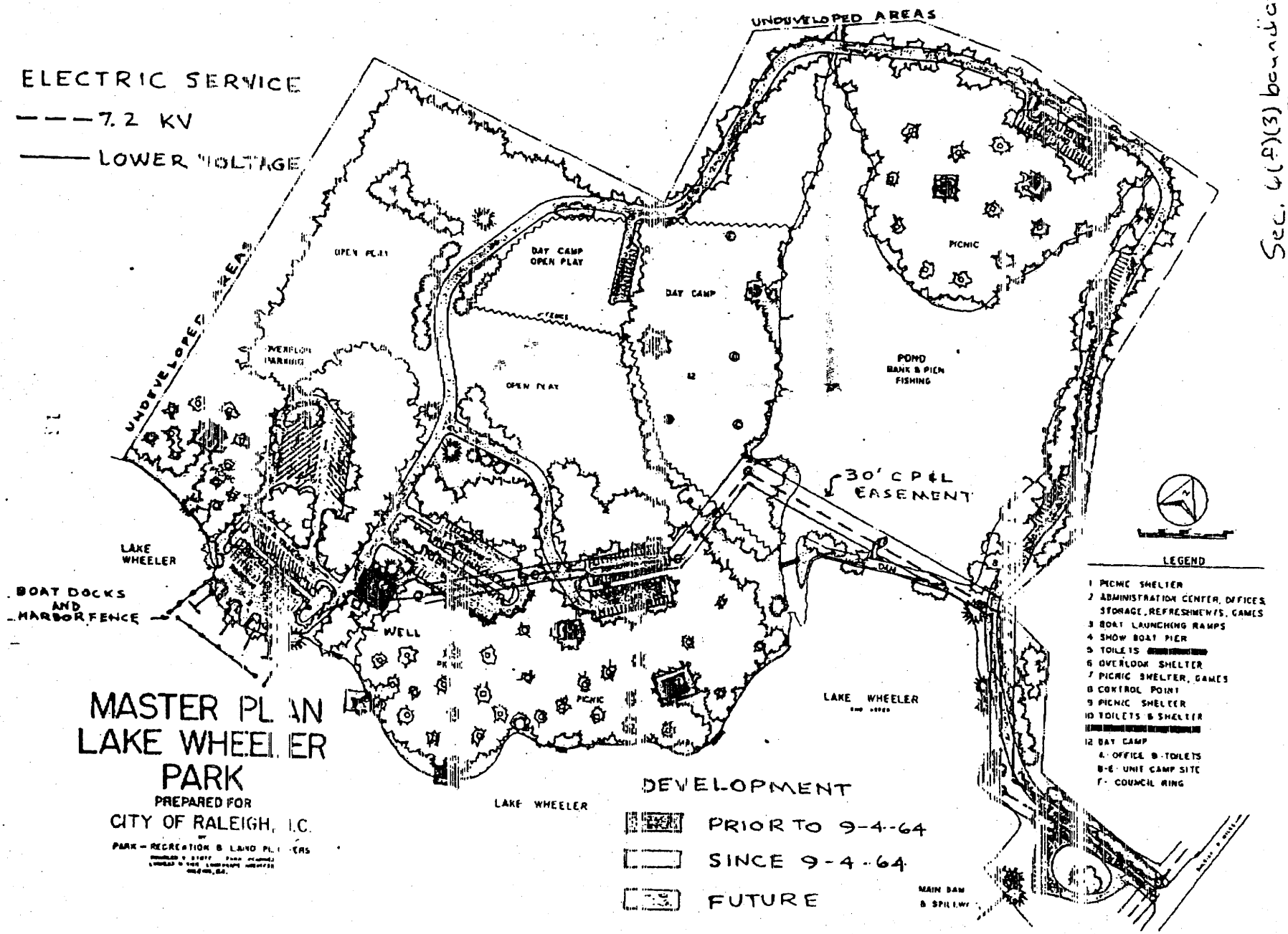
Re: Lake Wheeler Park - Bridge Replacement

Sender: John Poole, Grants Program Manager

You should receive 2 page(s) including this cover sheet.
If you do not receive all the pages, please call John at 919/715-2662.

Comments:

Based on the attached site plan, I'm confident the proposed bridge replacement project is outside the Sec. 6(f)(3) restrictive boundaries for the federal Land & Water Conservation Fund program. The Lake Wheeler project was funded in 1965 and very little documentation was required for projects at that time. You may proceed.



MASTER PLAN LAKE WHEELER PARK

PREPARED FOR

CITY OF RALEIGH, N.C.

BY

PARK – RECREATION & LAND PLANNERS

Sec. 6(A)(3) boundary
Include SU acres

LWCF # 37-00013

ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

upland

Project/Site:	Swift Creek Bridge B-3375	Date:	August 31, 2000
Applicant/Owner:	NCDOT	County:	Wake
Investigator:	ESC Sandy Smith	State:	NC
Do Normal Circumstances Exist on the Site?	(Yes) No	Community ID:	Hardwood Forest
Is the site significantly disturbed (Atypical)?	Yes (No)	Transect ID:	Flag SC-#1
Is the area a potential problem area?	Yes (No)	Plot ID:	upland

VEGETATION

	Dominant Plant Species	Stratum	Indicator		Dominant Plant Species	Stratum	Indicator
1.	Nyssa sylvatica	canopy	FAC	9.	Mitchella repens	herb/vine	FACU+
2.	Betula nigra	1	FACW	10.	Smilax rotundifolia	-	FAC
3.				11.			
4.	Liquidambar	shrub	FAC+	12.			
5.	styraciflua			13.			
6.	Arundinaria		FACW	14.			
7.	gigantea			15.			
8.				16.			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-) 75%

Remarks:

HYDROLOGY

Recorded Data (Describe in Remarks)

- ___ Stream, Lake or Tide Gauge
- ___ Aerial Photographs
- ___ Other
- X No Recorded Data Available

Wetland Hydrology Indicators:

Primary Indicators:

- ___ Inundated
- ___ Saturated in Upper 12 Inches
- ___ Water Marks
- ___ Drift Lines
- ___ Sediment Deposits
- ___ Drainage Patterns in Wetlands

Field Observations:

Depth of Surface Water: 0 (in.)

Depth to Free Water in Pitt: >18 (in.)

Depth to Saturated Soil: >18 (in.)

Secondary Indicators: (2 or more required):

- ___ Oxidized Root Channels in Upper 12 Inches
- ___ Water-Stained Leaves
- ___ Local Soil Survey Data
- ___ FAC-Neutral Test
- ___ Other (Explain in Remarks)

Remarks:

ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Swift Creek Bridge - B-3375	Date: August 31, 2000
Applicant/Owner: NCDOT	County: Wake
Investigator: ESC Sandy Smith	State: NC
Do Normal Circumstances Exist on the Site? (Yes) No	Community ID: Hardwood Forest
Is the site significantly disturbed (Atypical)? Yes (No)	Transect ID: SC-#1
Is the area a potential problem area? Yes (No)	Plot ID: wetland

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. Betula nigra	canopy	FACW	9. Lindinera aggregata	shrub	FACW
2.			10.		
3. Fraxinus	shrub		11. Saururus cernuus	herb	OBL
4. pennsylvanica		FACW	12. Woodwardia areolata		OBL
5. Liquidambar			13. Arisaema triphyllum		FACW-
6. styraciflua		FAC+	14.		
7. Carpinus			15.		
8. caroliniana		FAC	16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-) 75

Remarks:

HYDROLOGY

Recorded Data (Describe in Remarks)

___ Stream, Lake or Tide Gauge

___ Aerial Photographs

___ Other

X No Recorded Data Available

Wetland Hydrology Indicators:

Primary Indicators:

___ Inundated

X Saturated in Upper 12 Inches

X Water Marks

X Drift Lines

___ Sediment Deposits

Drainage Patterns in Wetlands

Field Observations:

Depth of Surface Water: 0 (in.)

Depth to Free Water in Pitt: 18 (in.)

Depth to Saturated Soil: 12 (in.)

Secondary Indicators: (2 or more required):

X Oxidized Root Channels in Upper 12 Inches

___ Water-Stained Leaves

___ Local Soil Survey Data

___ FAC-Neutral Test

Other (Explain in Remarks)

Remarks:

B-3375

Wetland Rating Worksheet

Project name [redacted] Swift Creek Nearest road SR 1375
County Wake Name of Evaluator Sandy Smith Date 9/7/00

Wetland location
- _ on pond or lake
- X on perennial stream
- _ on intermittent stream
- _ within interstream divide
- _ other

Adjacent land use (within 1/2 mile upstream)
- forested/natural vegetation _____ %
- agriculture, urban/suburban _____ %
- impervious surface _____ %
- dam and reservoir

Dominant Vegetation
- (1) Quercus michauxii
- (2) Quercus phellos
- (3) Microstegium nimineum

Soil Series _____
- _ predominantly organic-humus, muck, or peat
- X predominantly mineral- non-sandy
- _ predominantly sandy

Flooding and Wetness
- X semipermanently to permanently flooded or inundated
- _ seasonally flooded or inundated
- _ intermittently flooded or temporary surface water
- _ no evidence of flooding or surface water

Hydraulic Factors
- _ steep topography
- X ditched or channelized
- _ wetland width >/= 50 feet

Wetland Type (select one)
- _ Bottomland hardwood forest
- _ Headwater forest
- X Swamp forest
- _ Wet flat
- _ Pocosin
- _ Pine savanna
- _ Freshwater marsh
- _ Bog/fen
- _ Ephemeral wetland
- _ Other

*The rating system cannot be applied to salt or brackish marshes

Water storage	1	*	4	=	4	
Bank/Shoreline stabilization	4	*	4	=	16	Total score
Pollutant removal	4	*	5	=	20	60
Wildlife habitat	1	*	2	=	2	
Aquatic life value	4	*	4	=	16	
Recreation/Education	2	*	1	=	2	

Add 1 point if in sensitive watershed and >10% nonpoint disturbance within 1/2 mile upstream

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

Michael Easley
GOVERNOR

P.O. BOX 25201, RALEIGH, N.C. 27611-5201

Lyndo Tippett
SECRETARY

August 12, 2003

MEMORANDUM TO: Stacy Harris, P.E., Unit Head
Consultant Engineering Unit

FROM: Jared Gray, Environmental Biologist
Office of the Natural Environment

SUBJECT: Protected species survey report for the Dwarf-wedge mussel (*Alasmidonta heterodon*) for the proposed bridge replacement of Bridge No.301 over Swift Creek and Bridge No. 471 over Lake Wheeler Spillway on SR 1375 (Lake Wheeler Road); Wake County: Federal Aid Project No. BRSTP-1375(2); State Project No. 8.2406201; TIP Project No. B-3375.

ATTENTION: Theresa Ellerby, Project Planning Engineer
Consultant Engineering Unit

Attached, please find a copy of the mussel survey report for your bridge project associated with Swift Creek and the Lake Wheeler Spillway. Tim Savidge of the Catena Group produced this report. Based upon Tim's findings (a significant number of mussels along with a Federal Species of Concern were found), the Biological Conclusion for dwarf-wedge mussel is "May Affect-Not Likely to Adversely Affect" for B-3375. Concurrence with the U.S. Fish and Wildlife Service is required with this determination.

INTRODUCTION

The North Carolina Department of Transportation proposes to replace bridge No. 301 over Swift Creek and Bridge No. 471 over Lake Wheeler Spillway on SR 1375 (Lake Wheeler Road) in Wake County, North Carolina. The federally Endangered dwarf-wedge mussel (*Alasmidonta heterodon*) is listed by the Fish and Wildlife Service (FWS) as occurring in Wake County. Currently, the species is known to occur in Swift Creek in southeast Wake County, below Lake Benson, approximately 11 miles downstream of the project crossing. The species was also reported historically from the Neuse River, at the Poole Bridge, 6 miles east of Raleigh (Johnson 1970). This location is presumably the Poole Road (SR 1007) crossing. The population in the Neuse River is believed to have been extirpated (USFWS 1993).

WATERS IMPACTED

The proposed project will impact Swift Creek and a spillway channel for Lake Wheeler. Swift Creek arises approximately 12 miles northwest of the project crossing in the town of Apex and flows east into the Neuse River approximately 32 miles downstream of the project crossing. The stream within the surveyed reach ranges from 8 meters (26 feet) to 12 meters (39 feet) wide with 2 meter (6 feet) high banks that are fairly stable. The substrate is composed primarily of sand and gravel, with areas of cobble interspersed throughout the surveyed reach. The surrounding landscape is forested, with a wide riparian buffer. The spillway is constructed from concrete, and the channel is lined with rubble (rip rap) for approximately 10 meters (33 feet) below the spillway.

SPECIES DESCRIPTION

Alasmidonta heterodon (dwarf-wedge mussel)
Status: Endangered
Family: Unionidae
Listed: March-14-1990

Characteristics

The dwarf-wedge mussel (*Alasmidonta heterodon*) (DWM) was originally described as *Unio heterodon* (Lea 1829). It was subsequently placed in the genus *Alasmidonta* by Simpson (1914). Ortmann (1914) placed it in a monotypic subgenus *Proalasmidonta*, based on the unique soft-tissue anatomy and conchology. Fuller (1977) believed the characters of *Proalsmidonta* warranted elevation to full generic rank and renamed the species *Proalsmidonta heterodon.* Clarke (1981) retained the genus name Alasmidonta and considered Proalsmidonta to be a subjective synonym of the subgenus Pressodonta Simpson 1900.

The specific epithet *heterodon*, refers to the chief distinguishing characteristic of this species, which is the only North American freshwater mussel that consistently has two lateral teeth on the right valve and only one on the left (Fuller 1977). All other

laterally dentate freshwater mussels in North America normally have two lateral teeth on the left valve and one on the right. The DWM is generally small, with a shell length ranging between 25 mm and 38 mm. The largest specimen ever recorded was 56.5 mm long, taken from the Ashuelot River in New Hampshire (Clarke 1981). The periostracum is generally olive green to dark brown; nacre bluish to silvery white, turning to cream or salmon colored towards the umbonal cavities. Sexual dimorphisim occurs in DWM, with the females having a swollen region on the posterior slope, and the males are generally flattened. A detailed description of the species is provided by Clarke (1981).

Little is known about the reproductive biology of the DWM; however nearly all freshwater mussel species have similar reproductive strategies, which involves a larval stage (glochidium), that becomes a temporary obligatory parasite on a fish. Many mussel species have specific fish hosts which must be present to complete their life cycle. Based upon laboratory infestation experiments, Michaelson (1993) determined that potential fish hosts for the DWM in North Carolina include the tesselated darter (*Etheostoma olmstedi*) and the Johnny darter (*E. nigrum*). Pennak (1989) should be consulted for a general overview of freshwater mussel reproductive biology.

Distribution and Habitat Requirements

The historic range of the DWM was confined to Atlantic slope drainages from the Peticodiac River in New Brunswick, Canada, south to the Neuse River, North Carolina. Occurrence records exist from at least 70 locations, encompassing 15 major drainages, in 11 states and 1 Canadian Province (USFWS 1993b). It is currently believed to have been extirpated from all but 36 localities, 14 of them in North Carolina (USFWS 1997). Strayer et al. (1996) conducted range-wide assessments of remaining DWM populations, and assigned a population status, to each of the populations. The status ratting is based on range size, number of individuals and evidence of reproduction, Seven of the 20 populations assessed are considered "poor", and two others are considered "poor to fair" and "fair to poor" respectively.

The DWM inhabits creeks and rivers of varying sizes (down to approximately 2 meters wide), with slow to moderate flow. A variety of preferred substrates have been described; from coarse sand, firm muddy sand to gravel (USFWS 1993b). In North Carolina they often occur within submerged root mats along stable streambanks (John Alderman, pers. comm.). The wide range of substrate types used by this species suggests that the stability of the substrate is likely as important as the composition.

Threats to Species

The cumulative effects of several factors, including sedimentation, point and non-point discharge, stream modifications (impoundments, channelization etc.) have contributed to the decline of this species throughout its range. With the exception of the Neversink River population in New York, which has an estimated population of over 80,000 mussels, all of the other populations are generally small in numbers and restricted to short reaches of isolated streams. The low numbers of individuals and the restricted

range of most of the surviving populations make them extremely vulnerable to extirpation from a single catastrophic event or activity (Strayer et al. 1996). Catastrophic events may consist of natural events such as flooding, or drought as well as human influenced events such as toxic spills associated with highways or railroads.

Siltation resulting from improper erosion control of various land usage, including agricultural, forestry and development activities has been recognized as a major contributing factor to degradation of mussel populations (USFWS 1996). Siltation has been documented to be extremely detrimental to mussel populations by degrading substrate and water quality, increasing potential exposure to other pollutants and by direct smothering of mussels (Ellis 1936, Marking and Bills 1979). Sediment accumulations of less than 1 inch have been shown to cause high mortality in most mussel species (Ellis 1936). In Massachusetts, a bridge construction project decimated a population of DWM, because of accelerated sedimentation and erosion (Smith 1981). Agriculture and continuing development in the watershed has led to significant sedimentation problems within Swift Creek.

Sewage treatment effluent has been documented to significantly affect the diversity and abundance of mussel fauna (Goudreau et al. 1988). Goudreau et al. (1988) found that recovery of mussel populations may not occur for up to two miles below points of chlorinated sewage effluent.

The impact of impoundments on freshwater mussels has been well-documented (USFWS 1992a, Neves 1993). Construction of dams transforms lotic habitats into lentic habitats, which results in changes with aquatic community composition. These changes associated with inundation adversely affect both adult and juvenile mussels as well as fish community structure, which could eliminate possible fish hosts for glochidia (Fuller 1974). Muscle Shoals on the Tennessee River in northern Alabama, once the richest site for naiads (mussels) in the world, is now at the bottom of Wilson Reservoir and covered with 19 feet of muck (USFWS 1992b). Large portions of all of the river basins within the DWM's range have been impounded and this is believed to be a major factor contributing to the species decline (Master 1986, USFWS 1993b).

The introduction of exotic species such as the Asiatic clam (*Corbicula fluminea*) and zebra mussel (*Dreissena polymorpha*) has also been shown to pose significant threats to native freshwater mussels. The Asiatic clam is now established in most of the major river systems in the United States (Fuller and Powell 1973), including those streams still supporting surviving populations of the DWM. Concern has been raised over competitive interactions for space, food and oxygen with this species and native mussels, possibly at the juvenile stages (Neves and Widlak 1987, Alderman 1995). The zebra mussel, native to the drainage basins of the Black, Caspian and Aral Seas, is an exotic freshwater mussel that was introduced into the Great Lakes in the 1980s and has rapidly expanded its range into the surrounding river basins, including those of the South Atlantic slope (O'Neill and MacNeill 1991). This species competes for food resources and space with native mussels, and is expected to contribute to the extinction of at least 20 freshwater mussel species if it becomes established throughout most of the eastern United

States (USFWS 1992 b). The zebra mussel is not currently known from any river supporting DWM populations (USFWS 1993).

SURVEY EFFORTS

Swift Creek is a perennial streams that could potentially provide habitat for the dwarf-wedge mussel and thus surveys for this and other mussel species were conducted for NCDOT.

Pre Survey Investigation

Prior to conducting in-stream surveys, a review of any survey work that had taken place in the water body was performed. Sources consulted include the North Carolina Natural Heritage Program (NHP) systematic inventory (database) of rare plant and animal species, and the North Carolina Wildlife Resources Commission. The pre-survey searches revealed records of many rare freshwater mussel species, including the dwarf-wedge mussel (*Alasmidonta heterodon*), Atlantic pigtoe (*Fusconaia masoni*), yellow lance (*Elliptio lanceolata*), eastern lampmussel (*Lampsilis radiata*) creeper (*Strophitus undulata*) and notched rainbow (*Villosa constricta*) in Swift Creek below Lake Benson. The Atlantic pigtoe and yellow lance are Federal Species of Concern (FSC) and are considered Endangered in North Carolina. The creeper and eastern lampmussel are considered Threatened and the notched rainbow is considered Special Concern in North Carolina.

Mussel Surveys for this Project

Tim Savidge, and Sarah Luginbuhl of The Catena Group, Inc., and Sharon Snider of NCDOT visited the project crossings on May 28, 2003, and Tim Savidge, Tom Dickinson and Sarah Luginbuhl of The Catena Group, Inc., and Mary Frazer and Karen Lynch of NCDOT visited the project crossings on June 25, 2003. Mussel surveys were conducted from a point approximately 500 meters downstream of the confluence of the old channel and Swift Creek to the base of the road crossing. The Lake habitat upstream of the road crossing is not considered habitat for this species, and was thus not surveyed.

Methodology and Results

Mussel surveys were conducted using visual (mask/snorkel and batiscopes) and tactile methods. Searches were also conducted for relict shells. The presence of a shell was equated with presence of that species, however shells were not factored into the Catch Per Unit Effort (CPUE) for that species. Water level ranged from <6 inches to 3 feet. Timed searches were conducted for 1 hour (3 person/hours) during the May 28 surveys and 30 minutes (2.5 person/hours) during the June 25 survey. Mussels were identified, counted and returned to the substrate. Data points were taken at the 6 locations of the timed searches. A total of 16.5-person hours were spent surveying in Swift Creek. Mussels were generally common, and easily found in the surveyed reach. Three

freshwater mussel species were found during the survey (Table 1.). The dwarf-wedge mussel was not found during the survey.

Table 1. CPUE for Freshwater Mussels in Swift

Scientific Name	Common Name	Number	CPUE #/person hr
Elliptio spp.	Elliptio mussels	1,359	82.36
Utterbackia imbecillis	Paper pondshell	9	0.55
Strophitus undulatus	Creeper	1	0.06

The introduced Asian clam (*Corbicula fluminea*) was observed to be abundant in the surveyed reach. Representative photographs of the three mussel species found in the stream are included in Appendix I.

Discussion

The survey results indicate that viable mussel populations occur in Swift Creek just below the spillway. The creeper, which is protected as Threatened in North Carolina is included in this fauna. Given the survey results it is unlikely that the dwarf-wedge mussel occurs in this reach of Swift creek, however given that the dwarf-wedge mussel does occur in Swift Creek below Lake Benson, its presence between Lake Wheeler and Lake Benson cannot be discounted. Measures should be taken to avoid/minimize impacts to the mussel populations occurring in Swift Creek. Because this species is known to occur downstream of the proposed project, it is recommended that NCDOT consult with the US Fish and Wildlife Service. Consultation procedures are outlined in Section 7 of the Endangered Species Act of 1973 as amended.

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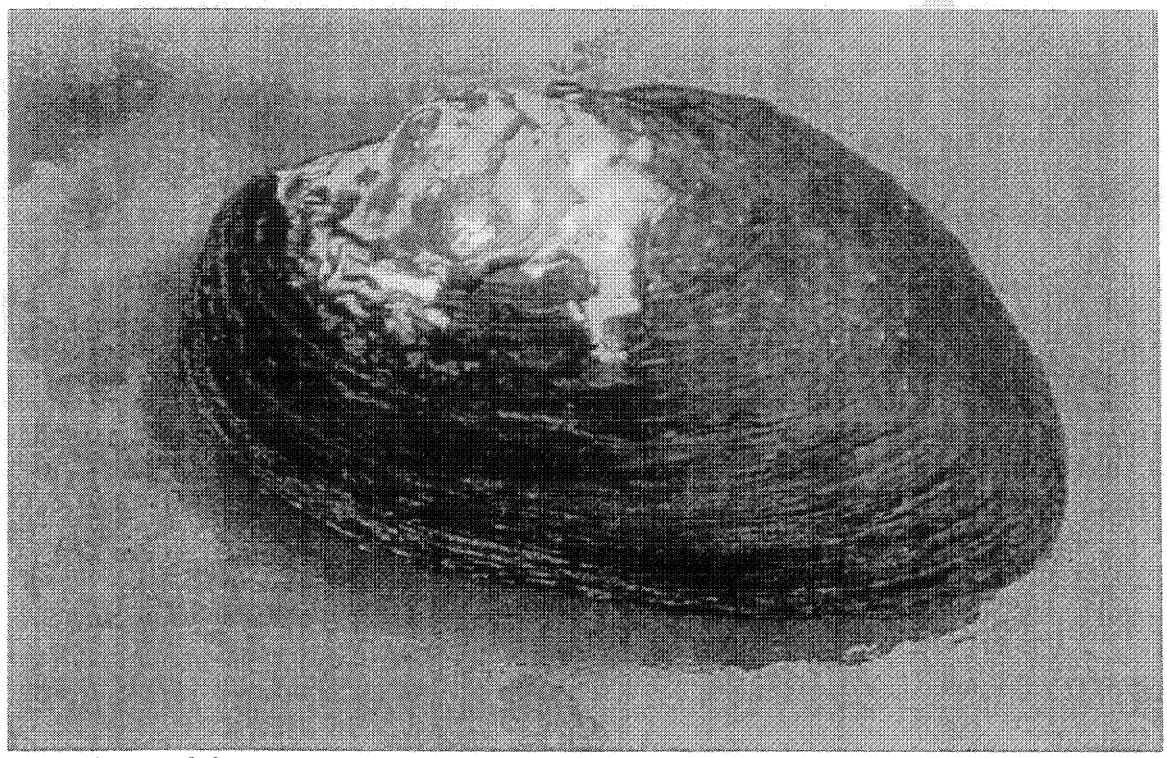
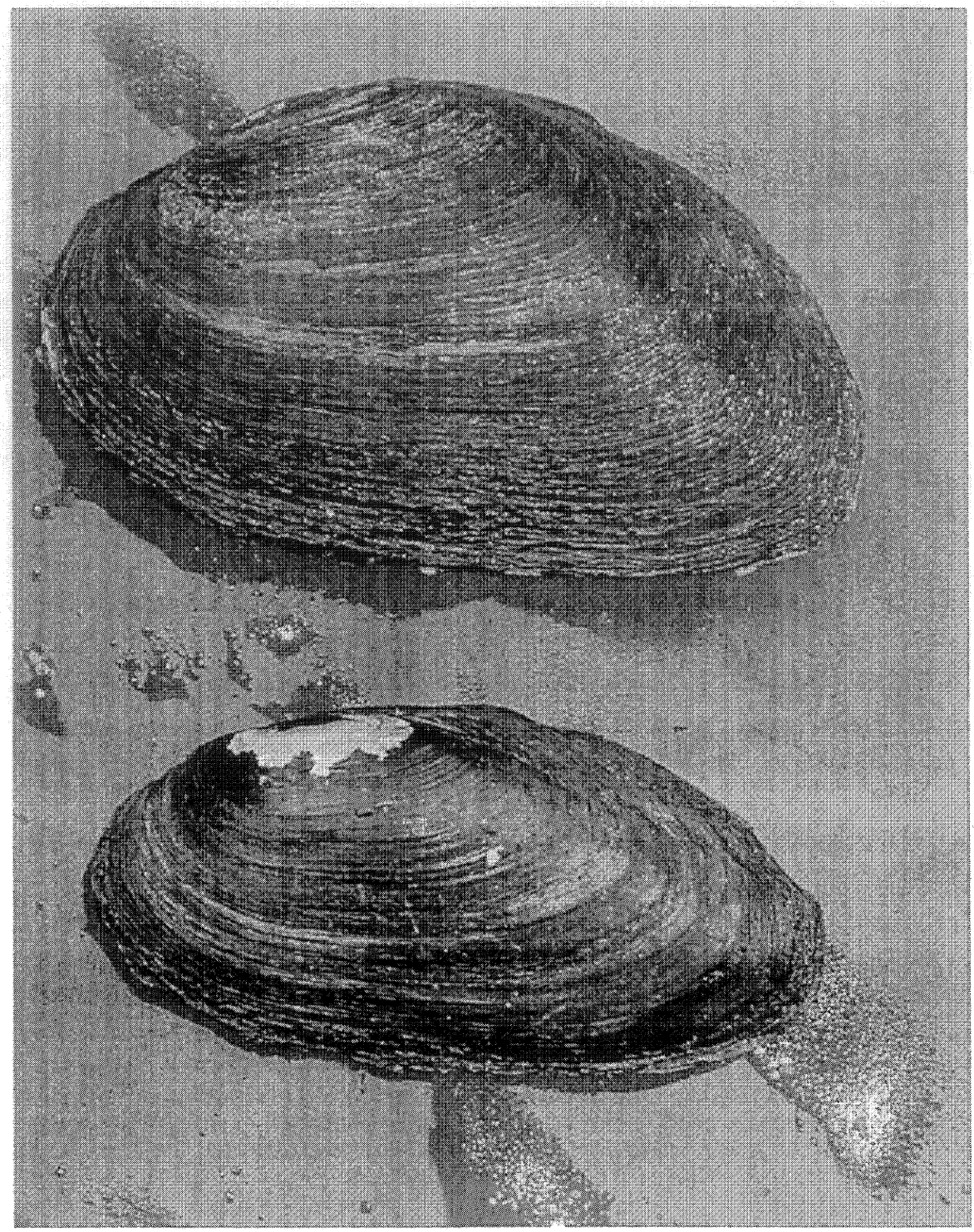
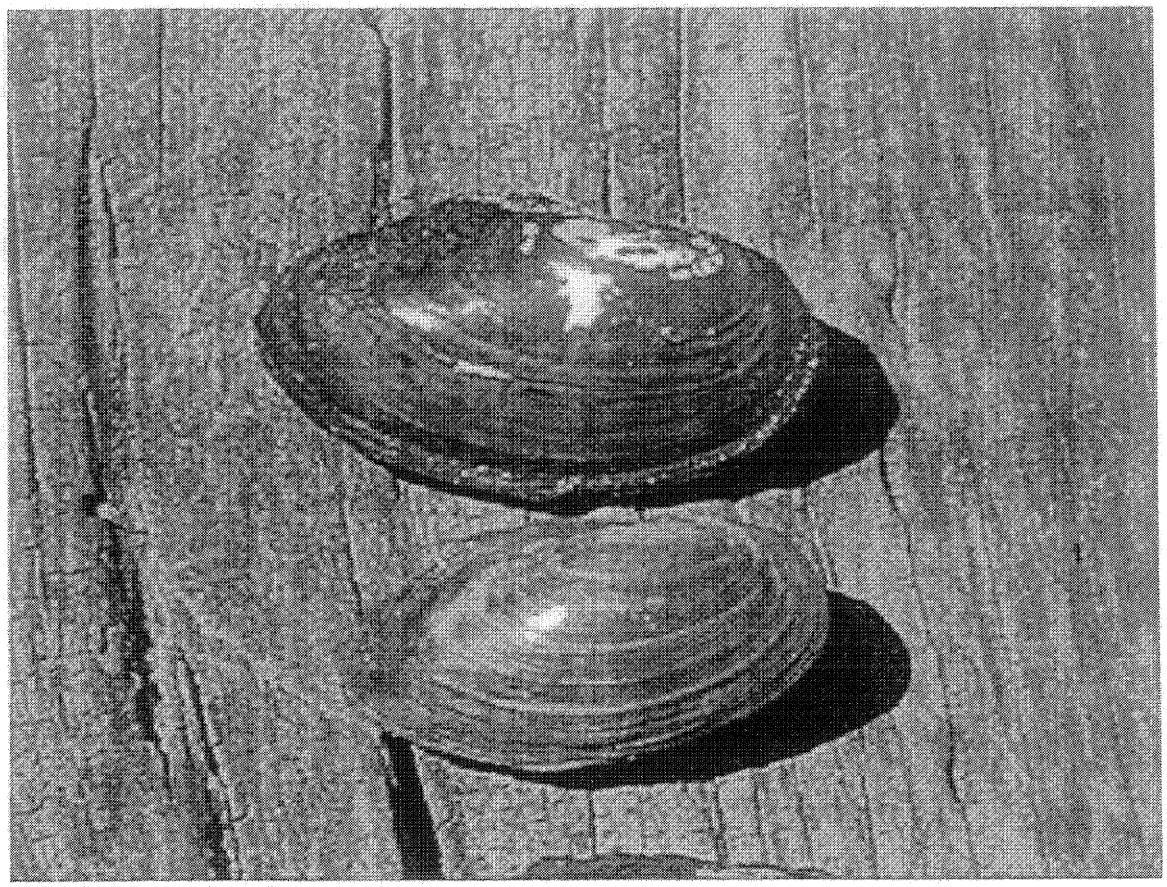
Appendix A. Pictures of mussels found during survey



Strophitus undulates



Elliptio spp.



Utterbackia imbecillis