STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

MICHAEL F. EASLEY
GOVERNOR

LYNDO TIPPETT
SECRETARY

October 8, 2007

U.S. Army Corps of Engineers
Regulatory Field Office
151 Patten Avenue, Room 208
Asheville, NC 28801-5006

ATTN: Mr. Steve Lund
NCDOT Coordinator

Subject: **Application for Individual Section 404 and 401 permits for R-2320G** for the proposed extension of US 52 from the existing intersection of NC 24-27-73, NC 138, and US 52 to the existing intersection of SR 1785 (Johns Road) and US 52 in Albemarle, Stanly County; NCDOT Division 10. Federal Project No. NHF-52(10), State Project No. 8.1680401; TIP No. R-2320G. Debit $570.00 from WBS Element No. 34422.1.1

Dear Sir:

The North Carolina Department of Transportation (NCDOT) proposes to extend US 52. The project begins along US 52 approximately 0.5 mile north of SR 1785 (Johns Road) (southern terminus) and extends northward on new location and along existing NC 138 to the intersection of NC 24-27-73, NC 138, and US 52 (northern terminus). Two typical sections are identified for the proposed extension of US 52. At the northern project terminus, a five-lane curb and gutter typical section is used along NC 138 south of the intersection of NC 24-27-73 and existing US 52. A four-lane divided typical section is used along the new location portion of the project and along existing US 52 at the southern terminus. The length of the proposed US 52 Extension project is approximately 3.5 miles. A right-of-way minimum width of 100 feet is needed for the five-lane typical section, and a minimum width of 200 feet is needed for the four-lane typical section.

This application package consists of the cover letter, ENG Form 4345, North Carolina Department of Environment and Natural Resources, Ecosystem Enhancement Program (EEP) mitigation acceptance letter, US Fish & Wildlife Service (USFWS) Concurrence letter, permit drawings, and roadway plan sheets.

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

TELEPHONE: 919-715-1334 or
919-715-1335

FAX: 919-715-5501

WEBSITE: WWW.NCDOT.ORG

LOCATION:
PARKER LINCOLN BUILDING
2728 CAPITAL BLVD. SUITE 240
RALEIGH NC 27604

Project Schedule: The Review Date and the Let Date for the project are April 1, 2008 and May 20, 2008, respectively.

Purpose and Need: As identified in the EA, the purpose of the project is to connect two sections of US 52 that are separated by approximately 0.25 mile of NC 24-27-73. The proposed improvements eliminate turning movements between US 52 and NC 24-27-73 (an "offset intersection") that are required by the current separation. Other factors contributing to the need of the project are increases in the capacity of the highway and safety improvements for roadway users.

Summary of Permanent Impacts: Permanent impacts to jurisdictional areas of the proposed project consist of a total of 948 linear feet of stream impacts and 0.19 acre of surface water (pond) impact.

Summary of Temporary Impacts: Temporary impacts to jurisdictional areas of the proposed project consist of a total of 0.03 acre of stream impacts.

Utility Impacts: There will be no jurisdictional resources impacted from utilities.

Summary of Mitigation: The project has been designed to avoid and minimize impacts to jurisdictional areas throughout the NEPA and design processes. Compensatory mitigation for the 948 linear feet of permanent impact to jurisdictional streams will be provided by EEP.

NEPA DOCUMENT STATUS

An Environmental Assessment (EA) was submitted by NCDOT on November 27, 2000 for R-2320G in compliance with the National Environmental Policy Act. The document addressed the extension of US 52 from the existing intersection of NC 24-27-73, NC 138, and US 52 to the existing intersection of SR 1785 (Johns Road) and US 52. The EA explains the purpose and need for the project; provides a description of the alternatives considered; and characterizes the social, economic, and environmental effects. After the EA was approved it was circulated to federal, state, and local agencies. On March 12, 2003 a FONSI was approved for R-2320G. Copies of the EA and FONSI have been provided to regulatory review agencies involved in the approval process. Additional copies will be provided upon request.

INDEPENDENT UTILITY

The subject project is in compliance with 23 CFR Part 771.111(f) which lists the Federal Highway Administration (FHWA) characteristics of independent utility of a project:

(1) The project connects logical termini and is of sufficient length to address environmental matters on a broad scope,

(2) The project is usable and a reasonable expenditure, even if no additional transportation improvements are made in the area;
(3) The project does not restrict consideration of alternatives for other reasonably foreseeable transportation improvements.

RESOURCE STATUS

All project waters are located within the Yadkin-Pee Dee River Basin and within USGS Hydrologic Unit 03040105.

Jurisdictional Status

Three (3) jurisdictional streams and one (1) surface water (pond) are located on the project. Rock Creek (Stream Index No. 13-17-31-1-3-1) and the two unnamed tributaries to Rock Creek are classified as C waters. Rock Creek is not included on the 2006 303(d) list of impacted streams. Jurisdictional impacts are reported in Table 1.

Potential wetland communities were investigated pursuant to the 1987 Corps of Engineers Wetland Delineation Manual. Jurisdictional determinations for wetlands and streams were verified by Steve Lund of the U.S. Army Corps of Engineers on October 31, 2001. Pete Colwell of the N.C. Division of Water Quality (DWQ) and Mary Ellen Haggard of the N.C. Wildlife Resources Commission (WRC) also attended the field review. There are no jurisdictional wetlands located on the project.

Table 1. Jurisdictional Impacts for TIP Project R-2320G, Stanly County.

Site	Station No. (from/to)	Structure Size/ Type	Stream Impacted	Pond Impacts (acres)	Permanent Stream Impacts (lf)	Temporary Stream Impacts (ac)
1	-L- 94+00 to 95+25	Roadway fill	pond	0.19	-	-
2	-L- 118+00 to 120+50	3 @ 8′x 8′ RCBC	Rock Creek	-	469	0.02
3	-L- 137+95	60″ RCP	UT to Rock Creek	-	414	< 0.01
4	-Y4- 9+10	10′x 9′ RCBC	UT to Rock Creek	-	65	0.01
Total				0.19	948	0.03

Impacts to Waters of the United States

Site 1 (Permit Drawing Sheet 7 of 18) -L- 94+00 to 95+25:
To accommodate the new road and drainage features, the pond will be filled.
Permanent Impacts: 0.19 acre of surface water impact
Temporary Impacts: 0 acre

Site 2 (Permit Drawing Sheet 9 of 18) -L- 118+00 to 120+50:
An approximately 224-foot long, triple barrel 8′ x 8′ Reinforced Concrete Box Culvert (RCBC) will be installed for the Rock Creek crossing. The orientation of the RCBC,

along with the inlet and outlet channels, was selected to allow for future extension of the culvert in a straight line for unobstructed flow. The permanent impacts are due to the filling of a portion of the existing stream channel, with the stream flow directed through the RCBC and the adjacent 40-foot long inlet channel and 205-foot long outlet channel. The temporary impacts are to the existing stream from tying in the inlet and outlet channels.

Permanent Impacts: 469 linear feet of stream impact
Temporary Impacts: 0.02 acre of temporary stream impact

Site 3 (Permit Drawing Sheet 11 of 18) -L- 137+95:
An approximately 320-foot long, 60″ Reinforced Concrete Pipe (RCP) will be installed for the crossing of an unnamed tributary to Rock Creek by both the new road and Service Road 3. The RCP will convey water from the south side of the new road to the north side of Service Road 3 as a single conveyance structure. The permanent impacts are from the installation of the 60″ RCP. The temporary impacts are to the existing stream during RCP installation.

Permanent Impact: 414 linear feet of stream impact
Temporary Impact: <0.01 acre of temporary stream impact

Site 4 (Permit Drawing Sheet 13 of 18) -Y4- 9+10:
In order to connect Southside Road (SR 1906) to the project, an existing 60″ Corrugated Metal Pipe (CMP) located in an unnamed tributary to Rock Creek will be replaced with a 10′ X 9′ Reinforced Concrete Box Culvert (RCBC). The permanent impacts are due to the filling of a portion of the existing stream channel and the installation of the RCBC. The temporary impacts are to the existing stream during RCBC installation.

Permanent Impacts: 65 linear feet of stream impact
Temporary Impacts: 0.01 acre of temporary stream impact

FEDERALLY PROTECTED SPECIES

Plants and animals with Federal classifications of Endangered (E), Threatened (T), Proposed Endangered (PE) and Proposed Threatened (PT) are protected under provisions of Sections 7 and 9 of the Endangered Species Act (ESA) of 1973, as amended. The current USFWS listing of federally protected species for Stanly County, dated May 5, 2007, is shown in Table 2.

Table 2. Federally Protected Species for Stanly County

Common Name	Scientific Name	Status	Biological Conclusion
Bald eagle	*Haliaeetus leucocephalus*	Delisted*	Not Applicable
Schweinitz's sunflower	*Helianthus schweinitzii*	Endangered	May Effect, Not Likely to Adversely Affect

* The bald eagle was delisted on August 8, 2007. Note that the current USFWS listing (dated May 5, 2007) still lists the bald eagle as Threatened.

The bald eagle has been delisted as of August 8, 2007 from the Endangered Species Act. The bald eagle will still be protected under the Bald and Golden Eagle Protection Act. Within the project area, there is no suitable nesting habitat in the form of large trees with a clear flight path to water. In addition, there are no water resources of sufficient size to provide foraging habitat for the bald eagle within the project vicinity. Therefore, this project will have No Effect on the bald eagle.

During the September 1999 surveys of suitable habitat for the Schweinitz's sunflower within the proposed alignments, no specimens of the federally endangered plants were identified; therefore a No Effect biological conclusion was included in the EA. However, during subsequent field surveys in November 2003, Schweinitz's sunflower was identified within the proposed construction limits of the preferred alternative. In March 2004, a field review of the alternative and the Schweinitz's sunflower population was conducted with NCDOT biologist Karen Lynch, USFWS representative Marella Buncick, and NCDOT Division 10 Environmental Officer Larry Thompson. As a result of the meeting, the alternative was redesigned and shifted to avoid impact to the Schweinitz's sunflower. The Schweinitz's sunflower population was incorporated into the project right-of-way (see Plan Sheet 6). NCDOT attempted, but was unable to acquire an additional 50-foot radius around the Schweinitz's sunflower population due to the landowner's denial. Because a small population of Schweinitz's sunflower was found within the proposed right-of-way, the biological conclusion in the Environmental Assessment was changed from "No Effect" to "May Affect, Not Likely to Adversely Affect".

On August 28, 2007, NCDOT biologists conducted a survey of all areas of suitable habitat along the project corridor. No populations of Schweinitz's sunflower were observed, including the populations previously identified that were incorporated within the project's right-of-way. A concurrence request letter, dated September 11, 2007, was submitted to the USFWS. In a letter dated September 25, 2007, the USFWS concurred with the "May Affect, Not Likely to Adversely Affect" biological conclusion for Schweinitz's sunflower (letter attached).

INDIRECT AND CUMULATIVE IMPACT ANALYSIS

Existing rules for the 401 Water Quality Certification Program [15A NCAC 2H.0506(b)(4)] require that the DWQ determine that a project "does not result in cumulative impacts, based on past or reasonably anticipated future impacts, that cause or will cause a violation of downstream water quality standards."

The Qualitative Indirect and Cumulative Effects (ICE) Assessment, dated March 22, 2005, is summarized below.

Consideration of Indirect Effects: This project will primarily assist local traffic movements and not provide a high speed commuting corridor with new access to undeveloped lands. Population growth and market demand for developable land in this area is low. These conditions, as well as the lack of public utilities throughout the

majority of the GISA (Growth Impact Study Area), should limit the potential for land use change as a result of TIP R-2320G. Most growth in Stanly County is still expected to occur in the western portion of the county closer to Charlotte and I-485. Because TIP R-2320G is only 3.0 miles in length and the speed limit is not proposed to substantially change, travel times savings related to improved accessibility and mobility will be relatively minor. Additionally, the project is not intended to serve any explicit economic development purpose or a specific development.

Study Area Trends and information: Lake Tillery Water Supply Watershed-IV protected area covers the southeast portion of the growth impact study area. Within the WS-IV protected area, development is limited to two dwelling units per acre or 24% built-upon area. The Watershed Protection Ordinance of Stanly County requires a 35-foot vegetative buffer along all perennial waters. There are no High Quality Waters, Outstanding Resource Waters, or 303(d) impaired water bodies within the GISA.

Consideration of Cumulative Effects: When combined with TIP R-2320A-F, the widening of US 52 from US 74 to the southern terminus of TIP R-2320G, the two projects may improve regional mobility and accessibility from Wadesboro to Albemarle. Growth influence would mainly come in the form of commercial and industrial uses with improved access to one of the major north-south routes (I-85) and east-west routes (US 74, soon to be I-74) in North Carolina. Cumulative effects could also result from TIP R-2320G when it considered with TIP R-967, the widening of NC 24/27/73 to four lanes from the western city limits of Locust to the western city limits of Albemarle. These two projects combined may create development opportunities south of NC 24/27/73 for commuters from the Albemarle area to I-485 and Charlotte. As the market for development is slow, there are few other non-transportation projects (major developments, planned public facilities/utilities, etc.) under construction or planned within the GISA that could contribute to a higher level of potential cumulative effects associated with TIP R-2320G.

Based on the findings and conclusions of this report as they relate to the low potential for land use change and existing environmental conditions/regulations, any indirect and cumulative effects resulting from TIP R-2320G have a low potential of impacting water quality throughout the GISA.

The full report on the Indirect & Cumulative effects of R-2320-G is available at NCDOT's Community Studies Unit.

CULTURAL RESOURCES

Archaeology & Historical Structures: On April 22, 1998, the SHPO indicated that there are no known archaeological sites within the proposed project area. Based on the SHPO's knowledge of the project area, it was determined that it was unlikely that any archaeological resources which may be eligible for inclusion in the National Register of Historic Places would be affected by the project construction. Archaeological resource survey work was conducted to determine if significant archaeological resources might be disturbed. Therefore, the SHPO recommended that no archaeological investigation be

conducted in connection with this project. The SHPO concurrence letter is found in Appendix 4 in the EA.

An historic architectural survey for structures listed in or eligible for listing in the National Register of Historic Places was conducted in the project area. No properties in the project area are listed in the National Register; however, two properties were determined to be eligible: Rock Creek Park and Hatley Farm. On June 15, 2000, representatives of the FHWA, SHPO, and NCDOT reviewed the impacts proposed to Rock Creek Park and Hatley Farm and concurred that the Alternative 5 (the preferred and designated alternative) had no effect on these properties. The concurrence form for the assessment of effects is located in Appendix 4 in the EA. The shift in Alignment 5 to avoid impacts to the Schweinitz's sunflower population did not alter the no effect determination for these properties.

FEMA COMPLIANCE

Stanly County is currently a participant in the National Flood Insurance Regulatory Program. The proposed stream crossings are not located in any detailed flood study or flood hazard areas. The floodplain areas at the major stream crossings are wooded and rural.

MITIGATION OPTIONS

The Army Corps of Engineers has adopted, through the Council on Environmental Quality (CEQ), a wetland mitigation policy that embraces the concept of "no net loss of wetlands" and sequencing. The purpose of this policy is to restore and maintain the chemical, biological, and physical integrity of the waters of the United States. Mitigation of wetland and surface water impacts has been defined by the CEQ to include: avoiding impacts, minimizing impacts, rectifying impacts, reducing impacts over time and compensating for impacts (40 CFR 1508.20). Executive Order 11990 (Protection of Wetlands) and Department of Transportation Order 5660.1A (Preservation of the Nations Wetlands), emphasize protection of the functions and values provided by wetlands. These directives require that new construction in wetlands be avoided as much as possible and that all practicable measures are taken to minimize or mitigate impacts to wetlands.

Avoidance & Minimization: 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, and minimization measures were incorporated as part of the project design.

The following site-specific measures were employed by NCDOT during design of this project to avoid/minimize impacts to waters of the U.S.:

- Of the five alternatives presented in the EA, the alternative selected had the least impact upon jurisdictional waters of the U.S. The preferred alternative avoided impacts to wetlands and had the least extent of stream impact.

- In areas where stream crossings were unavoidable, the crossings were kept as close to perpendicular as practicable with fill slopes of 2:1.
- The shoulder section design provides grassy swale treatment of the roadway runoff throughout most of the project in order to provide treatment of runoff before its discharge into receiving streams.
- Curb and gutter was utilized only where the project ties to existing NC 138 (Aquadale Road), where curb and gutter was previously utilized.
- The Reinforced Concrete Box Culvert at Site 2 will be buried one foot below the streambed to allow for natural aquatic passage. Sills will be placed in the barrels to create a low flow channel and control the width of the channel at the inlet and outlet.
- The Reinforced Concrete Pipe at Site 3 will be buried one foot below the streambed to allow for natural aquatic passage. Class 1 riprap will be placed along both banks of the stream, extending 20 feet from the outlet to minimize bank erosion. No riprap will be placed in the bottom of the channel.
- The proposed stream crossing at Site 4 occurs at an existing crossing. The existing 60″ CMP will be replaced with a 9′ X 10′ RCBC to allow better hydraulic connection. In addition, the current design speed has been maintained, rather than increased, which allows for a shorter structure with reduced fill. Therefore, the potential impacts to the stream have been minimized.
- The proposed alignment has been redesigned and shifted to avoid impacts to a Schweinitz's sunflower population that was identified within the original alignment.
- Additionally, the Schweinitz's sunflower population was incorporated into the project right-of-way.
- There is controlled-access on the majority of the new location portion of this project, which will limit development.
- Impacts to a Significant Natural Heritage Area, the Union Chapel Enon Knolls, have been avoided.

The NCDOT's guidelines for Best Management Practices for the Protection of Surface Waters will be enforced throughout the duration of the project construction to minimize impacts to waters of the U.S.

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. Compensatory actions often include restoration, creation, and enhancement of waters of the United States.

The necessary compensatory mitigation to offset unavoidable impacts to waters that are jurisdictional under the federal Clean Water Act will be provided by EEP within the same 8-digit cataloguing unit. Pursuant to the letter dated August 21, 2007, compensatory stream mitigation will be provided by EEP in accordance with Section X of the Amendment No. 2 to the Memorandum of Agreement between the N.C. Department of Environment and Natural Resources, NCDOT, and the USACE, fully executed on March 8, 2007 (Tri-Party MOA) (letter attached). EEP will provide mitigation for 948 linear

feet of impacts to warm water streams. The EEP has also sent an Acceptance Letter (dated August 21, 2007) to the USACE on which the DWQ was copied.

REGULATORY APPROVALS

Application is hereby made to the Department of the Army for a Section 404 Individual Permit and to the DWQ for an Individual Section 401 Water Quality Certification for the above-described activities. In compliance with Section 143-215.3D(e) of the NCAC, we will provide $570.00 to act as payment for processing the Section 401 permit application previously noted in this application (see Subject line). We are providing five copies of this application to the North Carolina Department of Environment and Natural Resources, Division of Water Quality. **The NCDOT requests a permit expiration date of ten (10) years from date of issue to allow for completion of project construction.**

A copy of this application will be posted on the NCDOT website at http://www.ncdot.org/doh/preconstruct/pe/neu/permit.html.

Thank you for your assistance with this project. If you have any questions or need additional information, please contact Bill Barrett at wabarrett@dot.state.nc.us or (919) 715-1624.

Sincerely,

E. L. Lusk

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

w/attachments
Mr. John Hennessy, NCDWQ (5 Copies)
Ms. Marella Buncick, USFWS
Ms. Marla Chambers, NCWRC
Ms. Kathy Matthews, USEPA
Mr. Ronald Mikulak, USEPA, Atlanta, GA
Mr. Clarence W. Coleman, P.E., FHWA
Dr. David Chang, P.E., Hydraulics
Mr. Greg Perfetti, P.E., Structure Design
Mr. Victor Barbour, Project Services Unit
Mr. Mark Staley, Roadside Environmental
Mr. Barry Moose, PE, Division Engineer
Mr. Larry Thompson, DEO

w/o attachments
Mr. Jay Bennett, P.E., Roadway Design
Mr. Majed Alghandour, P. E.,
Programming and TIP
Mr. Art McMillan, P.E., Highway Design
Mr. Scott McLendon, USACE, Wilmington
Ms. Beth Harmon, EEP
Mr. Todd Jones, NCDOT External Audit Branch
Mr. Carl Goode, PE, Human Environment Unit Head
Mr. Steven Brown, P.E., Project Planning Engineer

APPLICATION FOR DEPARTMENT OF THE ARMY PERMIT
(33 CFR 325)

OMB APPROVAL NO. 0710-003
Expires December 31, 2004

Public reporting burden for this collection of information is estimated to average 10 hours per response, although the majority of applications should require 5 hours or less. This includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Department of Defense, Washington Headquarters Service Directorate of Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302; and to the Office of Management and Budget, Paperwork Reduction Project (0710-0003), Washington, DC 20503. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to any penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number. Please DO NOT RETURN your form to either of those addresses. Completed applications must be submitted to the District Engineer having jurisdiction over the location of the proposed activity.

PRIVACY ACT STATEMENT

Authority: Rivers and Harbors Act, Section 10, 33 USC 403: Clean Water Act, Section 404, 33 USC 1344; Marine Protection, Research and Sanctuaries Act, 33 USC 1413, Section 103. Principal Purpose: Information provided on this form will be used in evaluating the application for a permit. Routine Uses: This information may be shared with the Department of Justice and other federal, state, and local government agencies. Submission of requested information is voluntary, however, if information is not provided the permit application cannot be evaluated nor can a permit be issued.

One set of original drawings or good reproducible copies which show the location and character of the proposed activity must be attached to this application (see sample drawings and instructions) and be submitted to the District Engineer having jurisdiction over the location of the proposed activity. An application that is not completed in full will be returned.

(ITEMS 1 THRU 4 TO BE FILLED BY THE CORPS)

1. APPLICATION NO.	2. FIELD OFFICE CODE	3. DATE RECEIVED	4. DATE APPLICATION COMPLETED

(ITEMS BELOW TO BE FILLED BY APPLICANT)

5. APPLICANT'S NAME	8. AUTHORIZED AGENT'S NAME AND TITLE (an agent is not required)
North Carolina Department of Transportation, Project Development & Environmental Analysis	
6. APPLICANT'S ADDRESS 1598 Mail Service Center Raleigh, NC 27699-1598	9. AGENT'S ADDRESS
7. APPLICANT'S PHONE NOs. W/AREA CODE a. Residence b. Business 919-733-3141	10. AGENT'S PHONE NOs. W/AREA CODE a. Residence b. Business

11. STATEMENT OF AUTHORIZATION

I hereby authorize, _____ to act in my behalf as my agent in the processing of this application and to furnish, upon request, supplemental information in support of this permit application.

APPLICANT'S SIGNATURE _____ DATE _____

NAME, LOCATION, AND DESCRIPTION OR PROJECT OR ACTIVITY

12. PROJECT NAME OR TITLE (see instructions)

R-2320 G, The extension of US 52 from the existing intersection of NC 24-27-73, NC 138, and US 52 to the existing intersection of SR 1785 (Johns Road).

13. NAME OF WATERBODY, IF KNOWN (if applicable)

Rock Creek and two UTs of Rock Creek

14. PROJECT STREET ADDRESS (if applicable)

The project begins along US 52 in Albemarle approximately 0.5 miles north of SR 1785

15. LOCATION OF PROJECT

Stanly (COUNTY) NC (STATE)

16. OTHER LOCATION DESCRIPTIONS, IF KNOWN (see instructions) **Section, Township, Range, Lat/Lon, and/or Accessors's Parcel Number, for example.**

17. DIRECTIONS TO THE SITE

Please see attached permit drawings.

18. Nature of Activity (Description of project, include all features)

Road extension, approximately 3.5 miles, on new location.

19. Project Purpose (Describe the reason or purpose of the project, see instructions)

Public transportation; connect two sections of US 52 that are separated by approximately 0.25 mile of NC 24-27-73; eliminate turning movements between US 52 and NC 24-27-73; improve traffic flow and increase safety.

USE BLOCKS 20-22 IF DREDGED AND/OR FILL MATERIAL IS TO BE DISCHARGED

20. Reason(s) for Discharge

R-2320 G, The extension of US 52 from the existing intersection of NC 24-27-73, NC 138, and US 52 to the existing intersection of SR 1785 (Johns Road).

21. Type(s) of Material Being Discharged and the Amount of Each Type in Cubic Yards

Earthen fill material, box culverts

22. Surface Area in Acres of Wetlands or Other Waters Filled (see instructions)

Rock Creek = 469 linear feet perennial stream
UTs of Rock Creek = 479 linear feet of perennial stream
Isolated, non-jurisdictional surface water (pond) = 0.19 acre
Wetlands = no wetland impacts

23. Is Any Portion of the Work Already Complete? Yes ___ No _X_ IF YES, DESCRIBE THE COMPLETED WORK

24. Addresses of Adjoining Property Owners, Lessees, Etc., Whose Property Adjoins the Waterbody (If more than can be entered here, please attach a supplemental list).

Please see the attached Sheet 3 of 18 in the permit drawing package.

25. List of Other Certifications or Approvals/Denials Received from other Federal, State, or Local Agencies for Work Described in This Application.

-None-

* Would include but is not restricted to zoning, building, and flood plain permits

26. Application is hereby made for a permit or permits to authorize the work described in this application. I certify that the information in this application is complete and accurate. I further certify that I possess the authority to undertake the work described herein or am acting as the duly authorized agent of the applicant.

E. P. Fuel — 10-12-07

SIGNATURE OF APPLICANT | DATE | SIGNATURE OF AGENT | DATE

The application must be signed by the person who desires to undertake the proposed activity (applicant) or it may be signed by a duly authorized agent if the statement in block 11 has been filled out and signed.

18 U.S.C. Section 1001 provides that: Whoever, in any manner within the jurisdiction of any department or agency of the United States knowingly and willfully falsifies, conceals, or covers up any trick, scheme, or disguises a material fact or makes any false, fictitious or fraudulent statements or representations or makes or uses any false writing or document knowing same to contain any false, fictitious or fraudulent statements or entry, shall be fined not more than $10,000 or imprisoned not more than five years or both.

Ecosystem Enhancement
PROGRAM

August 21, 2007

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, North Carolina 27699-1548

Dear Dr. Thorpe:

Subject: EEP Mitigation Acceptance Letter:

R-2320G, Albemarle – US 52 Extension from the Intersection of US 52/ NC73/NC 24/27 and NC 138 to the Intersection of US 52 and SR 1785 (Johns Road), Stanly County

The purpose of this letter is to notify you that the Ecosystem Enhancement Program (EEP) will provide the compensatory stream mitigation for the subject project. Based on the information supplied by you on August 7, 2007, the impacts are located in CU 03040105 of the Yadkin River Basin in the Southern Piedmont (SP) Eco-Region, and are as follows:

Warm Stream: 948 feet

EEP commits to implementing sufficient compensatory stream mitigation to offset the impacts associated with this project by the end of the MOA Year in which this project is permitted, in accordance with Section X of the Amendment No. 2 to the Memorandum of Agreement between the North Carolina Department of Environment and Natural Resources, the North Carolina Department of Transportation, and the U. S. Army Corps of Engineers, fully executed on March 8, 2007. If the above referenced impact amounts are revised, then this mitigation acceptance letter will no longer be valid and a new mitigation acceptance letter will be required from EEP.

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

Sincerely,

James B. Stanfill for

William D. Gilmore, P.E.
EEP Director

cc: Mr. Steve Lund, USACE – Asheville
Mr. John Hennessy, Division of Water Quality, Wetlands/401 Unit
File: R-2320G

CR 9.28.07
ACC: L. Williams

Barrett

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Asheville Field Office
160 Zillicoa Street
Asheville, North Carolina 28801

September 25, 2007

Mr. Phil S. Harris, III, PE
Manager, Natural Environment Unit
North Carolina Department of Transportation
1598 Mail Service Center
Raleigh, North Carolina 27699-1598

Dear Mr. Harris:

Subject: Endangered Species Concurrence for the Proposed Extension of US 52 from the Existing Intersection of NC 24-27-73, NC 138, and US 52 to the Existing Intersection of SR 1785 (Johns Road) and US 52 in Albemarle, Stanly County, North Carolina, TIP No. R-2320G, Federal Aid Project No. NHF-52(10), WBS Element No. 344221.1

As requested by the North Carolina Department of Transportation (NCDOT), we have reviewed the natural resources information and the biological conclusion for federally protected species for the subject project. We provide the following comments in accordance with the provisions of section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531-1543) (Act).

The NCDOT proposes to extend US 52 for approximately 3.5 miles from the existing intersection of NC 24-27-73, NC 138, and US 52, just south of Albemarle, to the existing intersection of SR 1785 (Johns Road) and US 52. The northern section will follow existing NC 138, and the southern portion will be on new location.

In several successive surveys conducted since 1999, federally endangered Schweinitz's sunflower (*Helianthus schweinitzii*) plants were located within the right-of-way of the preferred alternative--Alternative 5. Through discussions with Roadway Design and with some design revisions, it was determined that the plants could be avoided during project implementation. In a final survey conducted on August 22, 2007, no plants were located in the areas where they occurred previously. Their absence could be attributed to the current drought, but the specific cause wasn't obvious. Although the plants were not located in the latest survey, the area of suitable habitat will be fenced to protect the site during construction and will be maintained in the NCDOT right-of-way after construction is completed. If the plants reappear in the future, the NCDOT has committed to manage this area as a roadside rare plant population, including the installation of "No Mowing" signs where appropriate.

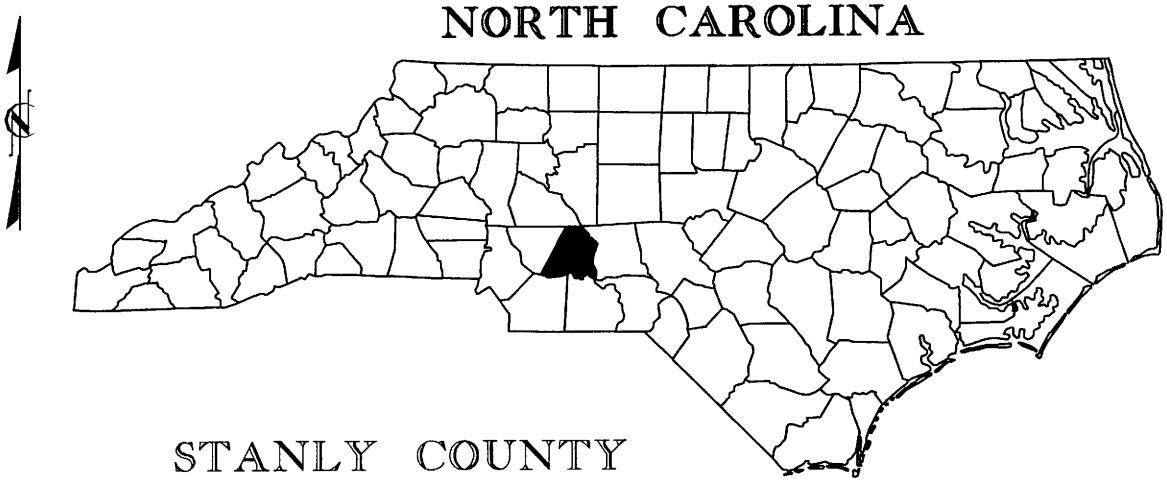
Given the avoidance of the previous plant locations and current suitable habitat and future protection for the site, we can concur with your conclusion that this project is "not likely to adversely affect" Schweinitz's sunflower. We believe the requirements under section 7(c) of the Act are fulfilled for this species. However, obligations under section 7 of the Act 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, (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 is determined that may be affected by the identified action.

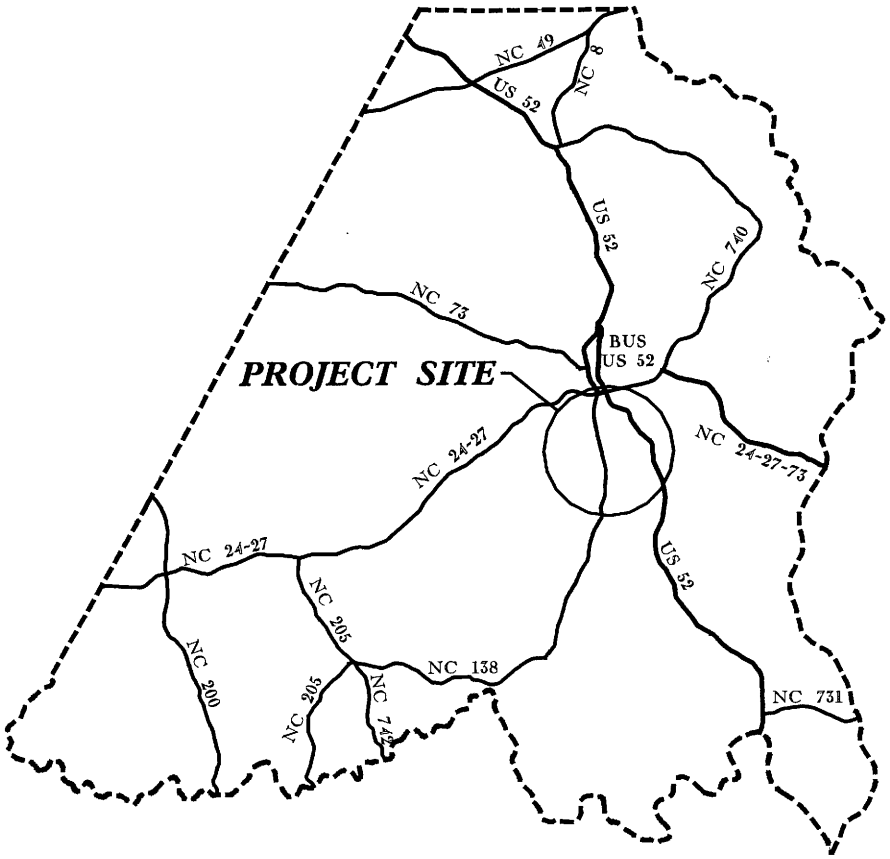
If you have questions about these comments please contact Ms. Marella Buncick of our staff at 828/258-3939, Ext. 237. In any future correspondence concerning this project, please reference our Log Number 4-2-98-099.

Sincerely,

Brian P. Cole
Field Supervisor

cc:
Ms. Marla J. Chambers, Western NCDOT Permit Coordinator, North Carolina Wildlife Resources Commission, 12275 Swift Road, Oakboro, NC 28129
Mr. Steve Lund, Asheville Regulatory Field Office, U.S. Army Corps of Engineers, 151 Patton Avenue, Room 208, Asheville, NC 28801-5006
Ms. Polly Lespinasse, Mooresville Regional Office, North Carolina Division of Water Quality, 610 East Center Avenue, Suite 301, Mooresville, NC 28115





WETLAND
&
SURFACE WATERS

VICINITY MAP

NCDOT

DIVISION OF HIGHWAYS
STANLY COUNTY
PROJECT: 34422.1.1 (R-2320G)
US 52 EXT. - ALBEMARLE
FROM US 52, NC 73, NC 24-27 & NC 138
TO SR 1785

Permit Drawing
Sheet 1 of 18

SHEET 1 OF 14

7 // 27 // 07

7/30/2007
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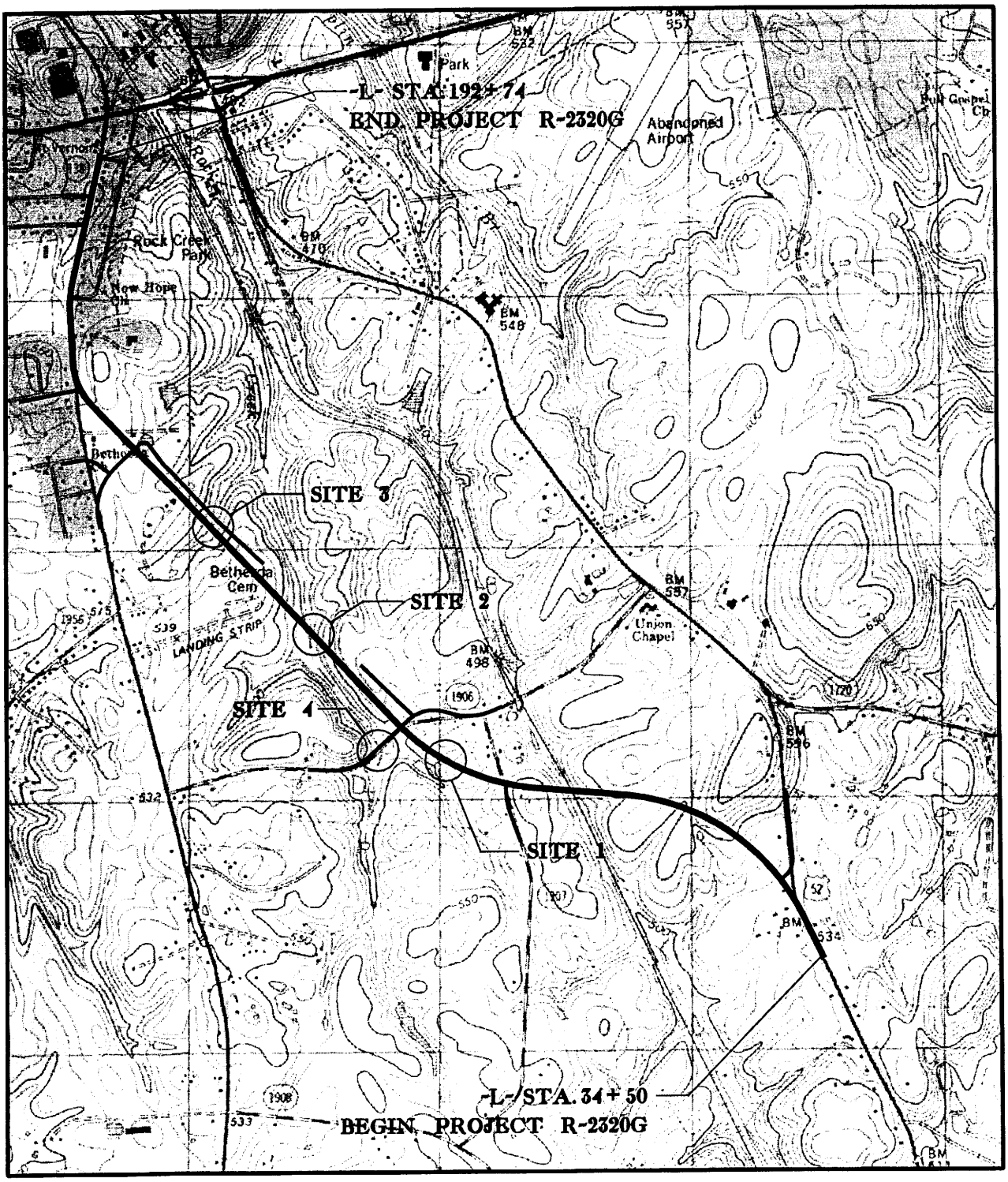
Ko & Associates, P.C.



SITE MAP

NCDOT

DIVISION OF HIGHWAYS

STANLY COUNTY

PROJECT: 34422.1.1 (R-2320G)

US 52 EXT. - ALBEMARLE

FROM US 52, NC 73, NC 24-27 & NC 138

TO SR 1785

Permit Drawing Sheet 2 of 18

~~SHEET 1 OF 11~~

7 / 27 / 07

7/30/2007
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KS & Associates, P.C.

WETLAND LEGEND

WLB WETLAND BOUNDARY

WETLAND

DENOTES FILL IN WETLAND

DENOTES PERMANENT SURFACE WATER IMPACT

DENOTES PERMANENT SURFACE WATER IMPACT (POND)

DENOTES TEMPORARY FILL IN WETLAND

DENOTES EXCAVATION IN WETLAND

DENOTES TEMPORARY SURFACE WATER IMPACT

DENOTES MECHANIZED CLEARING

FLOW DIRECTION

TB TOP OF BANK

WE EDGE OF WATER

C PROP. LIMIT OF CUT

F PROP. LIMIT OF FILL

PROP. RIGHT OF WAY

NG NATURAL GROUND

PL PROPERTY LINE

TDE TEMP. DRAINAGE EASEMENT

PDE PERMANENT DRAINAGE EASEMENT

EAB EXIST. ENDANGERED ANIMAL BOUNDARY

EPB EXIST. ENDANGERED PLANT BOUNDARY

WATER SURFACE

LIVE STAKES

BOULDER

COIR FIBER ROLLS

PROPOSED BRIDGE

PROPOSED BOX CULVERT

PROPOSED PIPE CULVERT
12"-48" PIPES
54" PIPES & ABOVE

(DASHED LINES DENOTE EXISTNG STRUCTURES)

SINGLE TREE

WOODS LINE

DRAINAGE INLET

ROOTWAD

RIP RAP

5 ADJACENT PROPERTY OWNER OR PARCEL NUMBER IF AVAILABLE

PREFORMED SCOUR HOLE

LEVEL SPREADER (LS)

DITCH / GRASS SWALE

NCDOT

DIVISION OF HIGHWAYS

STANLY COUNTY

PROJECT: 34422.1.1 (R-2320G)

US 52 EXT. - ALBEMARLE

FROM US 52, NC 73, NC 24-27 & NC 138

TO SR 1785

Permit Drawing Sheet 3 of 18

SHEET 6 OF 14

7 / 27 / 07

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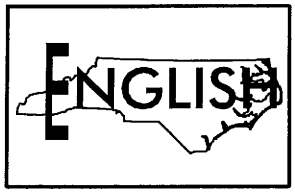
SUMMARY OF AFFECTED PROPERTY OWNERS

TRACT NO.	PROPERTY OWNER	ADDRESS	SITE NO.
12	JAMES CONRAD TRULL, ET AL	37156 SOUTHSIDE ROAD ALBEMARLE, NC 28001	1
14	LORENA H. LOWDER	3 RUTHERGLEN LANE GREENSBORO, NC 27455	3
14A	JIMMY DRAKE	37004 SOUTHSIDE ROAD ALBEMARLE, NC 28001	3
16	JOHN FRANK RUMMAGE & WIFE GLADYS V. RUMMAGE	24156 NC-138 HIGHWAY ALBERMARLE, NC 28001	2
19	LILES McSWAIN	24296 NC-138 HIGHWAY ALBERMARLE, NC 28001	4



NCDOT

DIVISION OF HIGHWAYS

STANLY COUNTY

PROJECT: 34422.1.1 (R-2320G)

US 52 EXT. - ALBEMARLE

FROM US 52, NC 73, NC 24-27 & NC 138

TO SR 1785

SHEET ~~5 OF 14~~ 7 / 27 / 07

Permit Drawing
Sheet 4 of 15

7/30/2007
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WETLAND PERMIT IMPACT SUMMARY

Site No.	Rdwy Sht No.	Station (From/To)	Structure Size / Type	WETLAND IMPACTS: Permanent Fill In Wetlands (ac)	WETLAND IMPACTS: Temp. Fill In Wetlands (ac)	WETLAND IMPACTS: Excavation in Wetlands (ac)	WETLAND IMPACTS: Mechanized Clearing in Wetlands (ac)	WETLAND IMPACTS: Hand Clearing in Wetlands (ac)	SURFACE WATER IMPACTS: Permanent SW impacts (ac)	SURFACE WATER IMPACTS: Temp. SW impacts (ac)	SURFACE WATER IMPACTS: Existing Channel Impacts Permanent (ft)	SURFACE WATER IMPACTS: Existing Channel Impacts Temp. (ft)	SURFACE WATER IMPACTS: Natural Stream Design (ft)
1	9	-L- 94+00 - 95+25	ROADWAY FILL	---	---	---	---	---	0.19	---	---	---	---
2	11	-L- 118+00 - 120+50	3@ 8'x8' RCBC	---	---	---	---	---	0.08	0.02	469	117	---
3	12	-L- 137+95	60" RCP	---	---	---	---	---	0.03	< 0.01	414	72	---
4	19	-Y4- 9+10	10'x9' RCBC	---	---	---	---	---	0.01	0.01	65	72	---
TOTALS:				0.00	0.00	0.00	0.00	0.00	0.31	0.03	948	261	0

SHEET 4 OF 14

ATN Revised 3/31/05

Permit Drawing
Sheet 5 of 18

NC DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS

STANLY COUNTY
PROJECT: 34422.1.1 (R-2320G)

~~SHEET 4 OF 14~~ 7/27/2007

PROJECT:34422.1.1 TIP PROJECT: R-2320G

09/08/99

7/30/2007
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Ko & Associates, P.C.

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

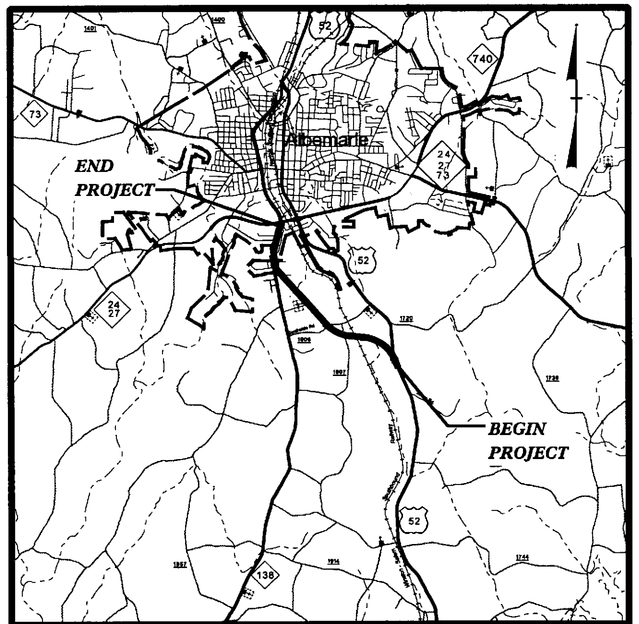
STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

STANLY COUNTY

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	R-2320G	1	
STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION	
34422.1.1	NHF-52(10)	P.E.	

NCDOT
DIVISION OF HIGHWAYS
STANLY COUNTY
PROJECT: 34422.1.1 (R-2320G)
US 52 EXT.- ALBEMARLE
FROM US 52, NC 73, NC 24-27 & NC 138
TO SR 1785
~~SHEET 6 OF 14~~ 7/27/07

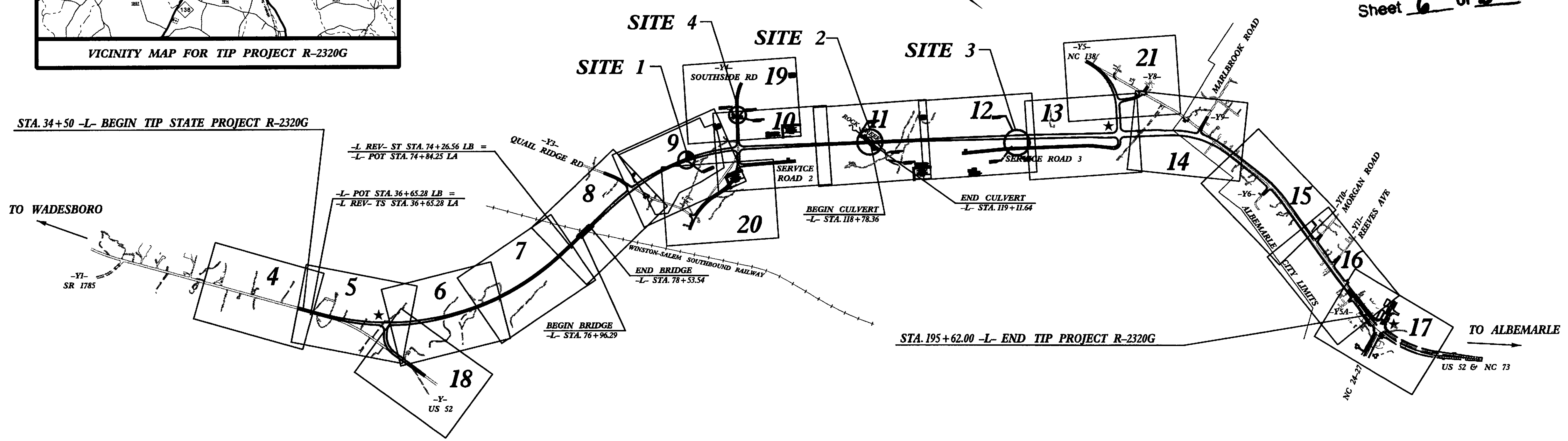
Permit Drawing
Sheet 6 of 18



VICINITY MAP FOR TIP PROJECT R-2320G

LOCATION: *Albemarle - US 52 Extension from the Intersection of US 52, NC 73, NC 24-27 & NC 138 to Intersection of US 52 and SR 1785 (Johns Road)*

TYPE OF WORK: *Grading, Drainage, Paving, Curb & Gutter Structures, Signing and Signals*



A PORTION (0.6 MILES) OF THIS PROJECT IS WITHIN THE MUNICIPAL BOUNDARIES OF ALBEMARLE.

THIS IS A PARTIAL CONTROLLED-ACCESS PROJECT WTIH ACCESS BEING LIMITED TO POINTS AS SHOWN ON THE PLANS.

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

NCDOT CONTACT: CATHY S. HOUSER, P.E., ROADWAY DESIGN - ENGINEERING COORDINATION

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

GRAPHIC SCALES

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

DESIGN DATA

ADT 2005 = 8,400/16,100
ADT 2025 = 11,300/21,500
DHV = 10 %
D = 60 %
T = 9 % *
V = 60/50 MPH
* TTST 5% DUAL 4%

PROJECT LENGTH

LENGTH OF ROADWAY TIP PROJECT R-2320G	=	3.005 mi.
LENGTH OF STRUCTURE TIP PROJECT R-2320G	=	0.036 mi
TOTAL LENGTH OF TIP PROJECT R-2320G	=	3.041 mi.

Prepared In the Office of:
KO & ASSOCIATES, P.C.
1011 Schaub Dr. Suite 202, Raleigh, NC 27606 919-851-6066
for
North Carolina Department of Transportation

2006 STANDARD SPECIFICATIONS

RIGHT OF WAY DATE:

LETTING DATE:
January 20, 2009

Brian A. Wiles, P.E.
PROJECT ENGINEER

HYDRAULICS ENGINEER

SIGNATURE: P.E.

ROADWAY DESIGN ENGINEER

SIGNATURE: P.E.

DIVISION OF HIGHWAYS
STATE OF NORTH CAROLINA

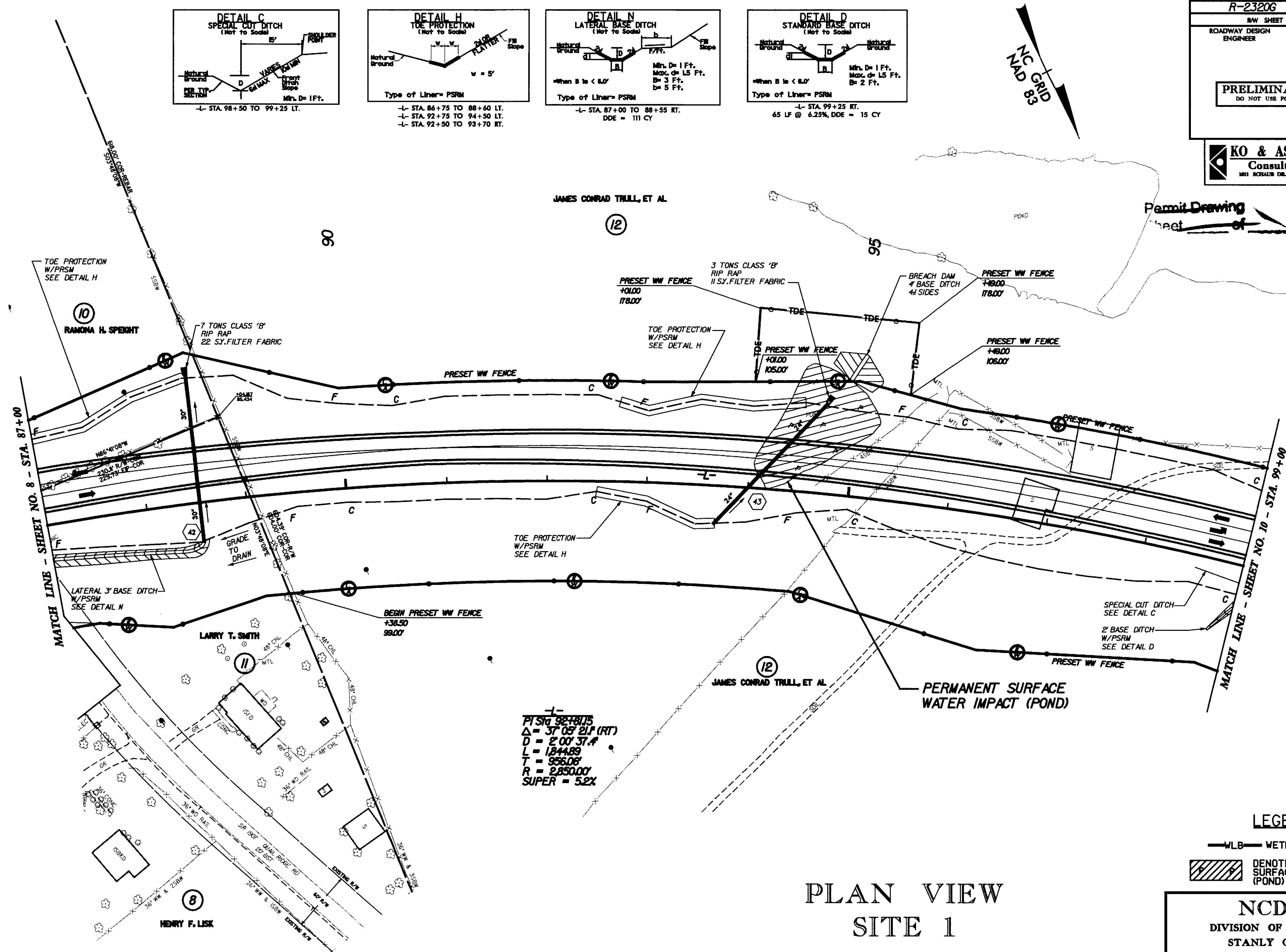
STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

P.E.
STATE HIGHWAY DESIGN ENGINEER

PROJECT REFERENCE NO.	SHEET NO.
R-2320G	9
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

KO & ASSOCIATES, P.C.
Consulting Engineers
1011 SCHAUB DR., SUITE *202 RALEIGH, N.C. 27606
(919) 851-6066



DETAIL C
SPECIAL CUT DITCH
(Not to Scale)
-L- STA. 98+50 TO 99+25 LT.
DETAIL H
TOE PROTECTION
(Not to Scale)
Type of Liner= PSRM
-L- STA. 86+75 TO 88+60 LT.
-L- STA. 92+75 TO 94+50 LT.
-L- STA. 92+50 TO 93+70 RT.
DETAIL N
LATERAL BASE DITCH
(Not to Scale)
Min. D= 1 Ft.
Max. d= 1.5 Ft.
B= 3 Ft.
b= 5 Ft.
Type of Liner= PSRM
-L- STA. 87+00 TO 88+55 RT.
DDE = 111 CY
DETAIL D
STANDARD BASE DITCH
(Not to Scale)
Min. D= 1 Ft.
Max. d= 1.5 Ft.
B= 2 Ft.
Type of Liner= PSRM
-L- STA. 99+25 RT.
65 LF @ 6.25%, DDE = 15 CY
NC GRID NAD 83
JAMES CONRAD TRULL, ET AL
RAMONA H. SPEIGHT
LARRY T. SMITH
HENRY F. LISK
TOE PROTECTION W/PRSM SEE DETAIL H
7 TONS CLASS 'B' RIP RAP 22 SY.FILTER FABRIC
3 TONS CLASS 'B' RIP RAP 11 SY.FILTER FABRIC
BREACH DAM 4' BASE DITCH 4:1 SIDES
PRESET WW FENCE
BEGIN PRESET WW FENCE
LATERAL 3' BASE DITCH W/PSRM SEE DETAIL N
SPECIAL CUT DITCH SEE DETAIL C
2' BASE DITCH W/PSRM SEE DETAIL D
MATCH LINE - SHEET NO. 8 - STA. 87+00
MATCH LINE - SHEET NO. 10 - STA. 99+00
PERMANENT SURFACE WATER IMPACT (POND)
GRADE TO DRAIN
-L-
PI Sta 92+81.15
Δ = 37° 05' 21.1" (RT)
D = 2° 00' 37.4"
L = 1,844.89
T = 956.06'
R = 2,850.00'
SUPER = 5.2%
POND

LEGEND

—WLB— WETLAND

DENOTES IMPACTS IN SURFACE WATER (POND)

PLAN VIEW
SITE 1

SCALE: 1"= 100' HORIZ.

SEE SHEET NO. 27 FOR -L- PROFILE

Permit Drawing
Sheet 7 of 18

NCDOT
DIVISION OF HIGHWAYS
STANLY COUNTY
PROJECT: 34422.1.1 (R-2320G)
US 52 EXT.- ALBEMARLE
FROM US 52, NC 73, NC 24-27 & NC 138
TO SR 1785

SHEET 7 OF 11

7/27/07

PROJECT REFERENCE NO.	SHEET NO.
R-2320G	9
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

Permit Drawing Sheet ___ of ___

KO & ASSOCIATES, P.C.
Consulting Engineers
1611 SCHAUB DR., SUITE 202 RALEIGH, N.C. 27606
(919) 851-6066

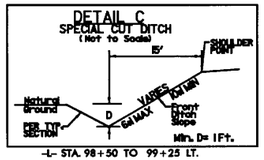
ENGLISH

NC GRID NAD 83

REVISIONS

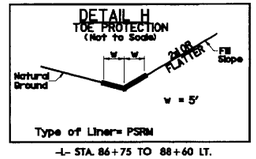
8/17/99

DETAIL C
SPECIAL CUT DITCH
(Not to Scale)



-L- STA. 98+50 TO 99+25 LT.

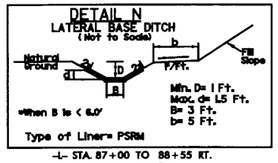
DETAIL H
TOE PROTECTION
(Not to Scale)



Type of Liner= PSRM

-L- STA. 86+75 TO 88+60 LT.
-L- STA. 92+75 TO 94+50 LT.
-L- STA. 92+50 TO 93+70 RT.

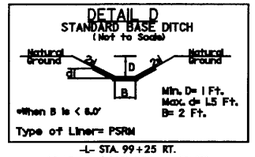
DETAIL N
LATERAL BASE DITCH
(Not to Scale)



Type of Liner= PSRM

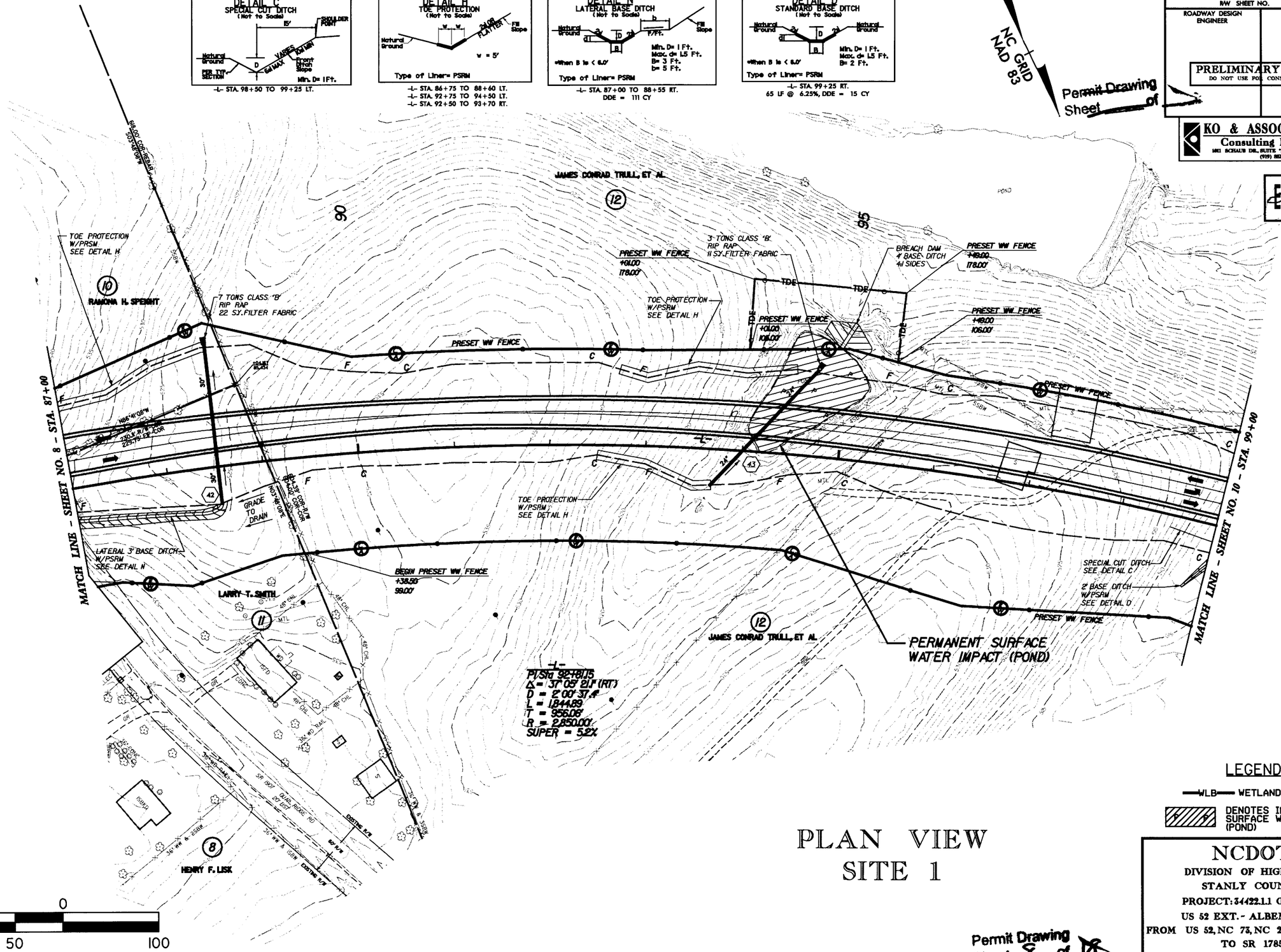
-L- STA. 87+00 TO 88+55 RT.
DDE = 111 CY

DETAIL D
STANDARD BASE DITCH
(Not to Scale)



Type of Liner= PSRM

-L- STA. 99+25 RT.
65 LF @ 6.25%, DDE = 15 CY



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

SEE SHEET NO. 27 FOR -L- PROFILE

PLAN VIEW
SITE 1

LEGEND

—WLB— WETLAND

DENOTES IMPACTS IN SURFACE WATER (POND)

Permit Drawing Sheet 8 of 18

NCDOT
DIVISION OF HIGHWAYS
STANLY COUNTY
PROJECT: 34422.1.1 (R-2320G)
US 52 EXT.- ALBEMARLE
FROM US 52, NC 73, NC 24-27 & NC 138
TO SR 1785

~~SHEET 7 OF 14~~ 7/27/07

7/30/2007
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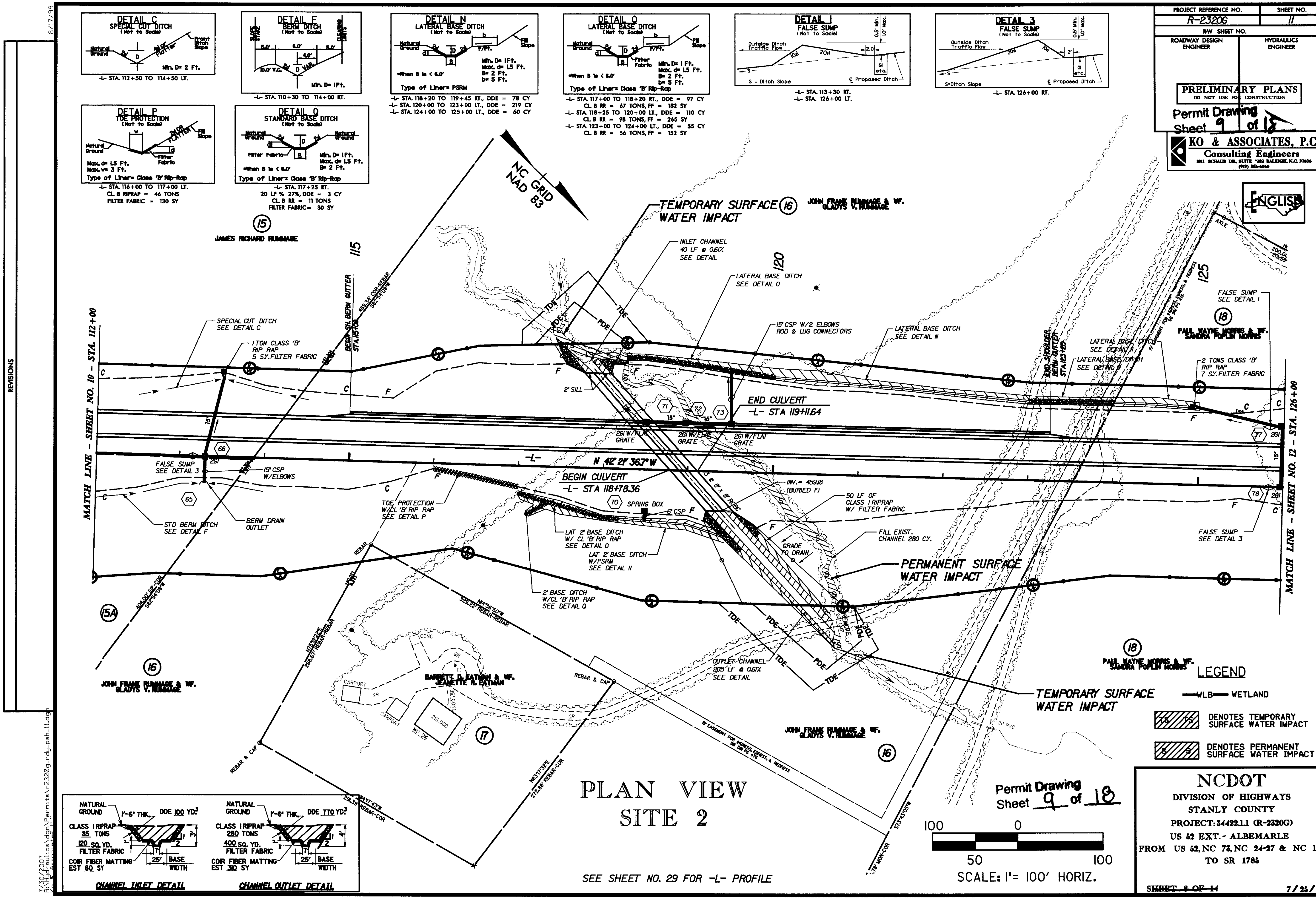
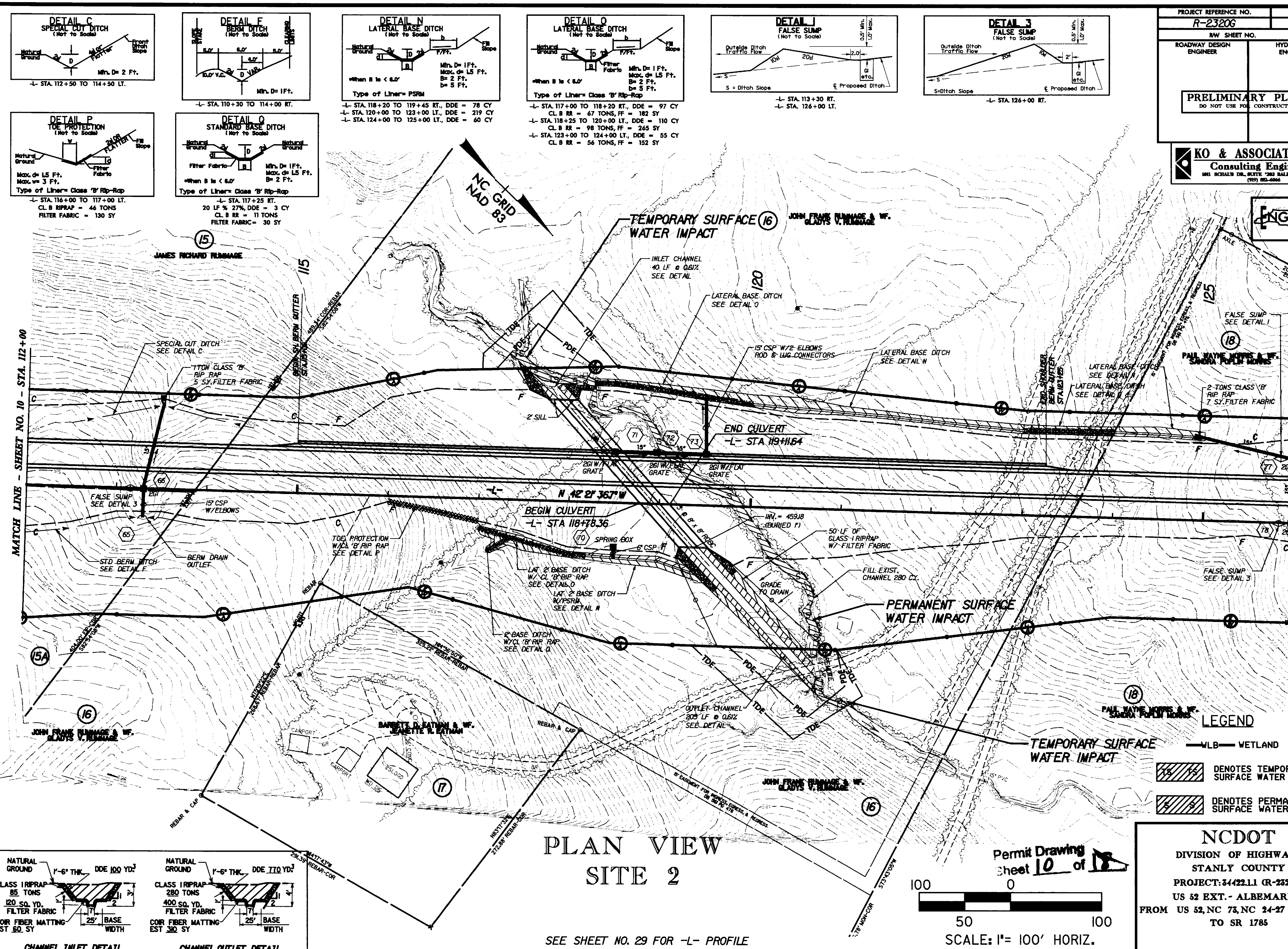


PROJECT REFERENCE NO. R-2320G
SHEET NO. 11
RW SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION
Permit Drawing Sheet 9 of 18
KO & ASSOCIATES, P.C.
Consulting Engineers
ENGLISH
DETAIL C
SPECIAL CUT DITCH
(Not to Scale)
Natural Ground
Front Ditch Slope
Min. D= 2 Ft.
-L- STA. 112+50 TO 114+50 LT.
DETAIL F
BERM DITCH
(Not to Scale)
Min. D= 1Ft.
-L- STA. 110+30 TO 114+00 RT.
DETAIL N
LATERAL BASE DITCH
(Not to Scale)
Natural Ground
Fill Slope
Min. D= 1Ft.
Max. d= 1.5 Ft.
B= 2 Ft.
b= 5 Ft.
*When B is < 6.0'
Type of Liner= PSRM
-L- STA. 118+20 TO 119+45 RT., DDE = 78 CY
-L- STA. 120+00 TO 123+00 LT., DDE = 219 CY
-L- STA. 124+00 TO 125+00 LT., DDE = 60 CY
DETAIL O
LATERAL BASE DITCH
(Not to Scale)
Natural Ground
Filter Fabric
Fill Slope
Min. D= 1 Ft.
Max. d= 1.5 Ft.
B= 2 Ft.
b= 5 Ft.
*When B is < 6.0'
Type of Liner= Class 'B' Rip-Rap
-L- STA. 117+00 TO 118+20 RT., DDE = 97 CY
CL. B RR = 67 TONS, FF = 182 SY
-L- STA. 118+25 TO 120+00 LT., DDE = 110 CY
CL. B RR = 98 TONS, FF = 265 SY
-L- STA. 123+00 TO 124+00 LT., DDE = 55 CY
CL. B RR = 56 TONS, FF = 152 SY
DETAIL 1
FALSE SUMP
(Not to Scale)
Outside Ditch Traffic Flow
S = Ditch Slope
Proposed Ditch
-L- STA. 113+30 RT.
-L- STA. 126+00 LT.
DETAIL 3
FALSE SUMP
(Not to Scale)
Outside Ditch Traffic Flow
S=Ditch Slope
Proposed Ditch
-L- STA. 126+00 RT.
DETAIL P
TOE PROTECTION
(Not to Scale)
Natural Ground
Filter Fabric
Fill Slope
Max. d= 1.5 Ft.
Max. w= 3 Ft.
Type of Liner= Class 'B' Rip-Rap
-L- STA. 116+00 TO 117+00 LT.
CL. B RIPRAP = 46 TONS
FILTER FABRIC = 130 SY
DETAIL Q
STANDARD BASE DITCH
(Not to Scale)
Natural Ground
Filter Fabric
Min. D= 1Ft.
Max. d= 1.5 Ft.
B= 2 Ft.
*When B is < 6.0'
Type of Liner= Class 'B' Rip-Rap
-L- STA. 117+25 RT.
20 LF % 27%, DDE = 3 CY
CL. B RR = 11 TONS
FILTER FABRIC = 30 SY
NC GRID NAD 83
15 JAMES RICHARD RUMMAGE
TEMPORARY SURFACE WATER IMPACT
16 JOHN FRANK RUMMAGE & WF. GLADYS V. RUMMAGE
INLET CHANNEL 40 LF @ 0.61% SEE DETAIL
LATERAL BASE DITCH SEE DETAIL O
15" CSP W/2 ELBOWS ROD & LUG CONNECTORS
LATERAL BASE DITCH SEE DETAIL N
FALSE SUMP SEE DETAIL 1
18 PAUL WAYNE MORRIS & WF. SANDRA POPLIN MORRIS
SPECIAL CUT DITCH SEE DETAIL C
1 TON CLASS 'B' RIP RAP 5 SY. FILTER FABRIC
2 TONS CLASS 'B' RIP RAP 7 SY. FILTER FABRIC
MATCH LINE - SHEET NO. 10 - STA. 112+00
MATCH LINE - SHEET NO. 12 - STA. 126+00
2' SILL
END CULVERT -L- STA 119+11.64
BEGIN CULVERT -L- STA 118+78.36
N 42°21'36.7" W
FALSE SUMP SEE DETAIL 3
15" CSP W/ELBOWS
STD BERM DITCH SEE DETAIL F
BERM DRAIN OUTLET
TOE PROTECTION W/CL 'B' RIP RAP SEE DETAIL P
SPRING BOX
LAT 2' BASE DITCH W/ CL 'B' RIP RAP SEE DETAIL O
LAT 2' BASE DITCH W/PSRM SEE DETAIL N
2' BASE DITCH W/CL 'B' RIP RAP SEE DETAIL Q
INV.= 459.18 (BURIED 1')
50 LF OF CLASS I RIPRAP W/ FILTER FABRIC
FILL EXIST. CHANNEL 280 CY.
GRADE TO DRAIN
PERMANENT SURFACE WATER IMPACT
OUTLET CHANNEL 205 LF @ 0.61% SEE DETAIL
TEMPORARY SURFACE WATER IMPACT
15A
16 JOHN FRANK RUMMAGE & WF. GLADYS V. RUMMAGE
BARRETT D. EATMAN & WF. JEANETTE N. EATMAN
17
18 PAUL WAYNE MORRIS & WF. SANDRA POPLIN MORRIS
16 JOHN FRANK RUMMAGE & WF. GLADYS V. RUMMAGE
LEGEND
WLB WETLAND
DENOTES TEMPORARY SURFACE WATER IMPACT
DENOTES PERMANENT SURFACE WATER IMPACT
PLAN VIEW
SITE 2
Permit Drawing Sheet 9 of 18
SCALE: 1"= 100' HORIZ.
SEE SHEET NO. 29 FOR -L- PROFILE
CHANNEL INLET DETAIL
NATURAL GROUND
CLASS I RIPRAP 85 TONS
120 SQ. YD. FILTER FABRIC
COIR FIBER MATTING EST 60 SY
DDE 100 YD.³
CHANNEL OUTLET DETAIL
NATURAL GROUND
CLASS I RIPRAP 280 TONS
400 SQ. YD. FILTER FABRIC
COIR FIBER MATTING EST 310 SY
DDE 770 YD.³
NCDOT
DIVISION OF HIGHWAYS
STANLY COUNTY
PROJECT: 34422.1.1 (R-2320G)
US 52 EXT.- ALBEMARLE
FROM US 52, NC 73, NC 24-27 & NC 138 TO SR 1785
SHEET 8 OF 14
7/25/07
REVISIONS
8/17/99

PROJECT REFERENCE NO.	SHEET NO.
R-2320G	11
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

KO & ASSOCIATES, P.C.
Consulting Engineers


DETAIL C
SPECIAL CUT DITCH
(Not to Scale)
-L- STA. 112+50 TO 114+50 LT.
DETAIL F
BERM DITCH
(Not to Scale)
-L- STA. 110+30 TO 114+00 RT.
DETAIL N
LATERAL BASE DITCH
(Not to Scale)
Type of Liner= PSRM
-L- STA. 118+20 TO 119+45 RT., DDE = 78 CY
-L- STA. 120+00 TO 123+00 LT., DDE = 219 CY
-L- STA. 124+00 TO 125+00 LT., DDE = 60 CY
DETAIL O
LATERAL BASE DITCH
(Not to Scale)
Type of Liner= Class 'B' Rip-Rap
DETAIL 1
FALSE SUMP
(Not to Scale)
-L- STA. 113+30 RT.
-L- STA. 126+00 LT.
DETAIL 3
FALSE SUMP
(Not to Scale)
-L- STA. 126+00 RT.
DETAIL P
TOE PROTECTION
(Not to Scale)
Type of Liner= Class 'B' Rip-Rap
-L- STA. 116+00 TO 117+00 LT.
CL. B RIPRAP = 46 TONS
FILTER FABRIC = 130 SY
DETAIL Q
STANDARD BASE DITCH
(Not to Scale)
Type of Liner= Class 'B' Rip-Rap
-L- STA. 117+25 RT.
NC GRID NAD 83
TEMPORARY SURFACE WATER IMPACT
PERMANENT SURFACE WATER IMPACT
JAMES RICHARD RUMMAGE
JOHN FRANK RUMMAGE & WF. GLADYS V. RUMMAGE
PAUL WAYNE MORRIS & WF. SANDRA POPLIN MORRIS
BARRETT D. EATMAN & WF. JEANETTE R. EATMAN
INLET CHANNEL 40 LF @ 0.61% SEE DETAIL
OUTLET CHANNEL 205 LF @ 0.61% SEE DETAIL
END CULVERT -L- STA 119+11.64
BEGIN CULVERT -L- STA 118+78.36
N 42°21'36.7" W
MATCH LINE - SHEET NO. 10 - STA. 112+00
MATCH LINE - SHEET NO. 12 - STA. 126+00
LEGEND
WLB — WETLAND
DENOTES TEMPORARY SURFACE WATER IMPACT
DENOTES PERMANENT SURFACE WATER IMPACT
CHANNEL INLET DETAIL
CHANNEL OUTLET DETAIL
SCALE: 1"= 100' HORIZ.

PLAN VIEW
SITE 2

SEE SHEET NO. 29 FOR -L- PROFILE

Permit Drawing Sheet 10 of 18

NCDOT
DIVISION OF HIGHWAYS
STANLY COUNTY
PROJECT: 34422.1.1 (R-2320G)
US 52 EXT. - ALBEMARLE
FROM US 52, NC 73, NC 24-27 & NC 138
TO SR 1785

7/25/07

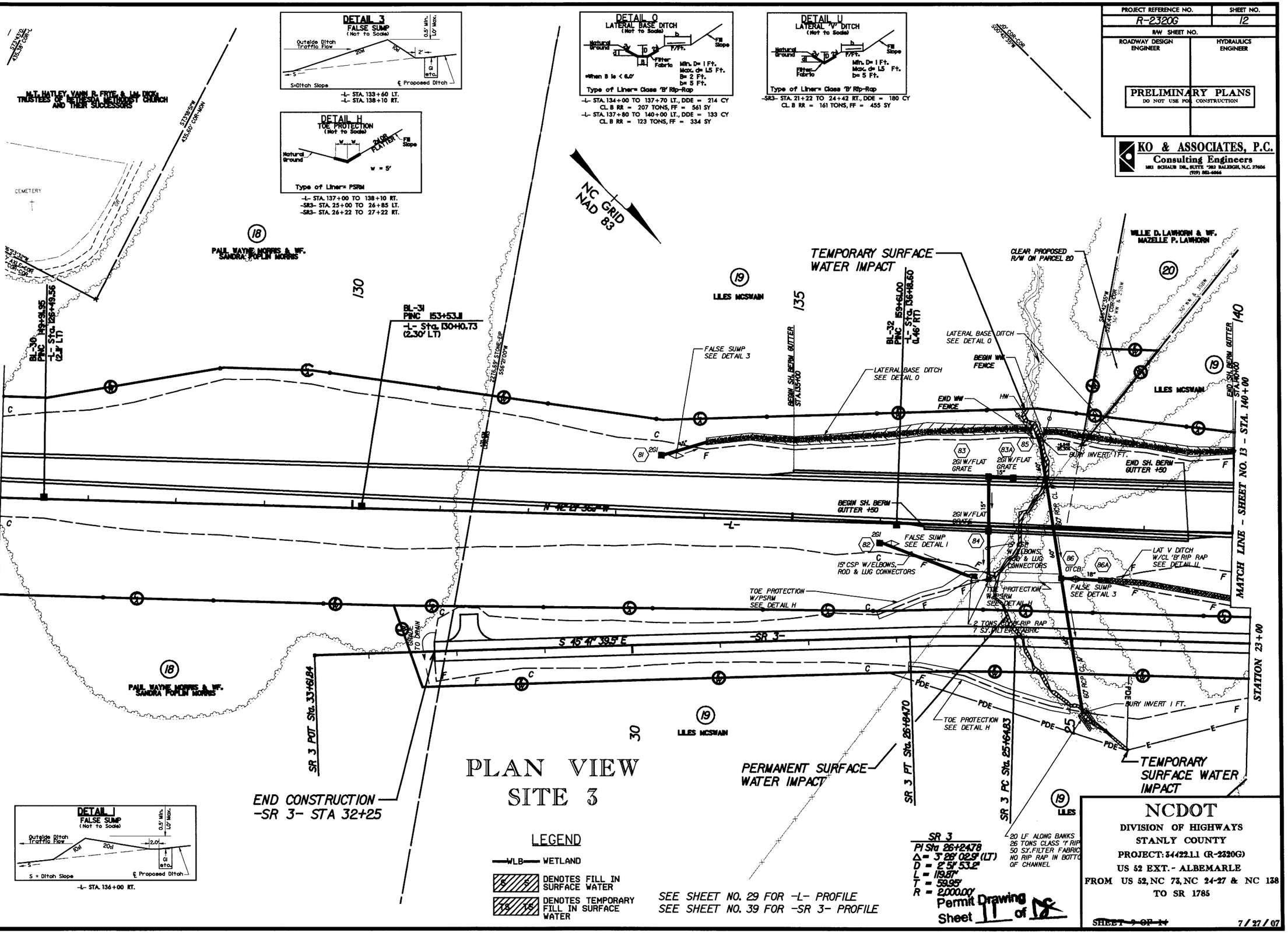
PROJECT REFERENCE NO.	SHEET NO.
R-2320G	12
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

KO & ASSOCIATES, P.C.
Consulting Engineers
1801 SCHAUB DR., SUITE 202 RALEIGH, N.C. 27606
(919) 851-6066

REVISIONS

8/17/99



NCDOT
DIVISION OF HIGHWAYS
STANLY COUNTY
PROJECT: 54422.1.1 (R-2320G)
US 52 EXT. - ALBEMARLE
FROM US 52, NC 73, NC 24-27 & NC 138
TO SR 1785

~~SHEET 9 OF 14~~ 7/27/07

7/30/2007
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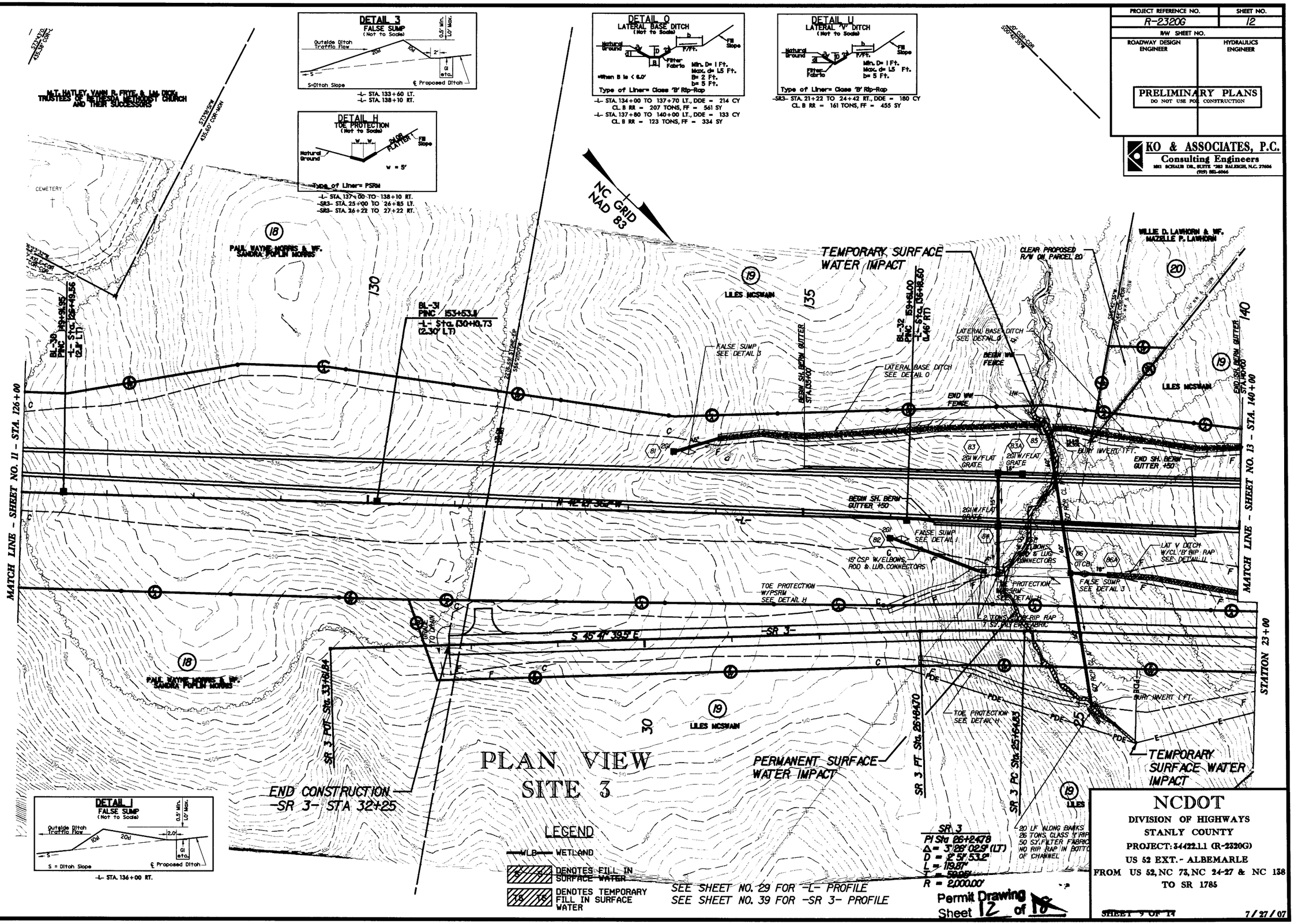
ko & associates, p.a.

PROJECT REFERENCE NO.	SHEET NO.
R-2320G	12
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

KO & ASSOCIATES, P.C.
Consulting Engineers
8601 SCHALIS DR., SUITE 720 RALEIGH, N.C. 27606
(919) 851-6046

REVISIONS 8/17/99



NCDOT
DIVISION OF HIGHWAYS
STANLY COUNTY
PROJECT: 34422.1.1 (R-2320G)
US 52 EXT.- ALBEMARLE
FROM US 52, NC 73, NC 24-27 & NC 138
TO SR 1785

SHEET 9 OF 14 7/27/07

Permit Drawing Sheet 12 of 18

7/30/2007
R:\Hydraulics\dgn\Permits\r2320g_rdy_psh_12.dgn
K & Associates, P.A.

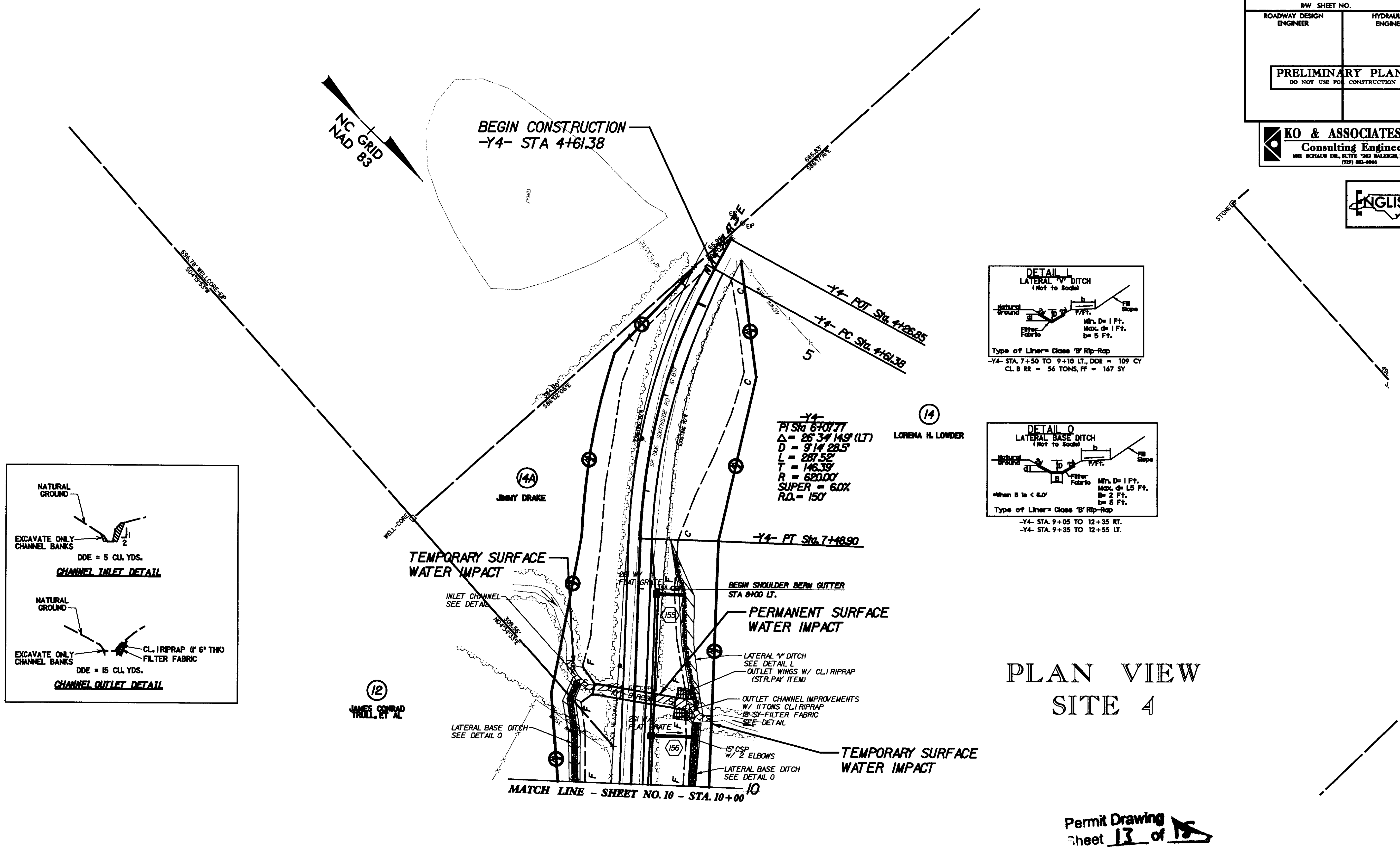
PROJECT REFERENCE NO.	SHEET NO.
R-2320G	19

R/W SHEET NO.

ROADWAY DESIGN ENGINEER | HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

KO & ASSOCIATES, P.C.
Consulting Engineers



NC GRID NAD 83
BEGIN CONSTRUCTION -Y4- STA 4+61.38
-Y4- POT Sta. 4+26.85
-Y4- PC Sta. 4+61.38
-Y4-
PI Sta 6+07.77
Δ = 26° 34' 14.9" (LT)
D = 9° 14' 28.5"
L = 287.52'
T = 146.39'
R = 620.00'
SUPER = 6.0%
R.D. = 150'
-Y4- PT Sta. 7+48.90
14 LORENA H. LOWDER
14A JIMMY DRAKE
12 JAMES CONRAD TRULL, ET AL
TEMPORARY SURFACE WATER IMPACT
PERMANENT SURFACE WATER IMPACT
BEGIN SHOULDER BERM GUTTER STA 8+00 LT.
INLET CHANNEL SEE DETAIL
LATERAL 'V' DITCH SEE DETAIL L
OUTLET WINGS W/ CL.I RIPRAP (STR.PAY ITEM)
OUTLET CHANNEL IMPROVEMENTS W/ 11 TONS CL.I RIPRAP
18 SY FILTER FABRIC
SEE DETAIL
15" CSP W/ 2 ELBOWS
LATERAL BASE DITCH SEE DETAIL O
MATCH LINE - SHEET NO. 10 - STA. 10+00
DETAIL L
LATERAL 'V' DITCH
(Not to Scale)
Natural Ground
Filter Fabric
Fill Slope
Min. D= 1 Ft.
Max. d= 1 Ft.
b= 5 Ft.
Type of Liner= Class 'B' Rip-Rap
-Y4- STA. 7+50 TO 9+10 LT., DDE = 109 CY
CL. B RR = 56 TONS, FF = 167 SY
DETAIL O
LATERAL BASE DITCH
(Not to Scale)
Min. D= 1 Ft.
Max. d= 1.5 Ft.
B= 2 Ft.
b= 5 Ft.
Type of Liner= Class 'B' Rip-Rap
-Y4- STA. 9+05 TO 12+35 RT.
-Y4- STA. 9+35 TO 12+55 LT.
NATURAL GROUND
EXCAVATE ONLY CHANNEL BANKS
DDE = 5 CU. YDS.
CHANNEL INLET DETAIL
CL. I RIPRAP (1' 6" THK)
FILTER FABRIC
DDE = 15 CU. YDS.
CHANNEL OUTLET DETAIL

PLAN VIEW
SITE 4

Permit Drawing Sheet 13 of 15

SCALE: 1"= 100' HORIZ.

SEE SHEET NO. 35 FOR -Y4- PROFILE

LEGEND

WLB — WETLAND

DENOTES TEMPORARY SURFACE WATER IMPACT

DENOTES PERMANENT SURFACE WATER IMPACT

NCDOT
DIVISION OF HIGHWAYS
STANLY COUNTY
PROJECT: 34422.1.1 (R-2320G)
US 52 EXT.- ALBEMARLE
FROM US 52, NC 73, NC 24-27 & NC 138
TO SR 1785

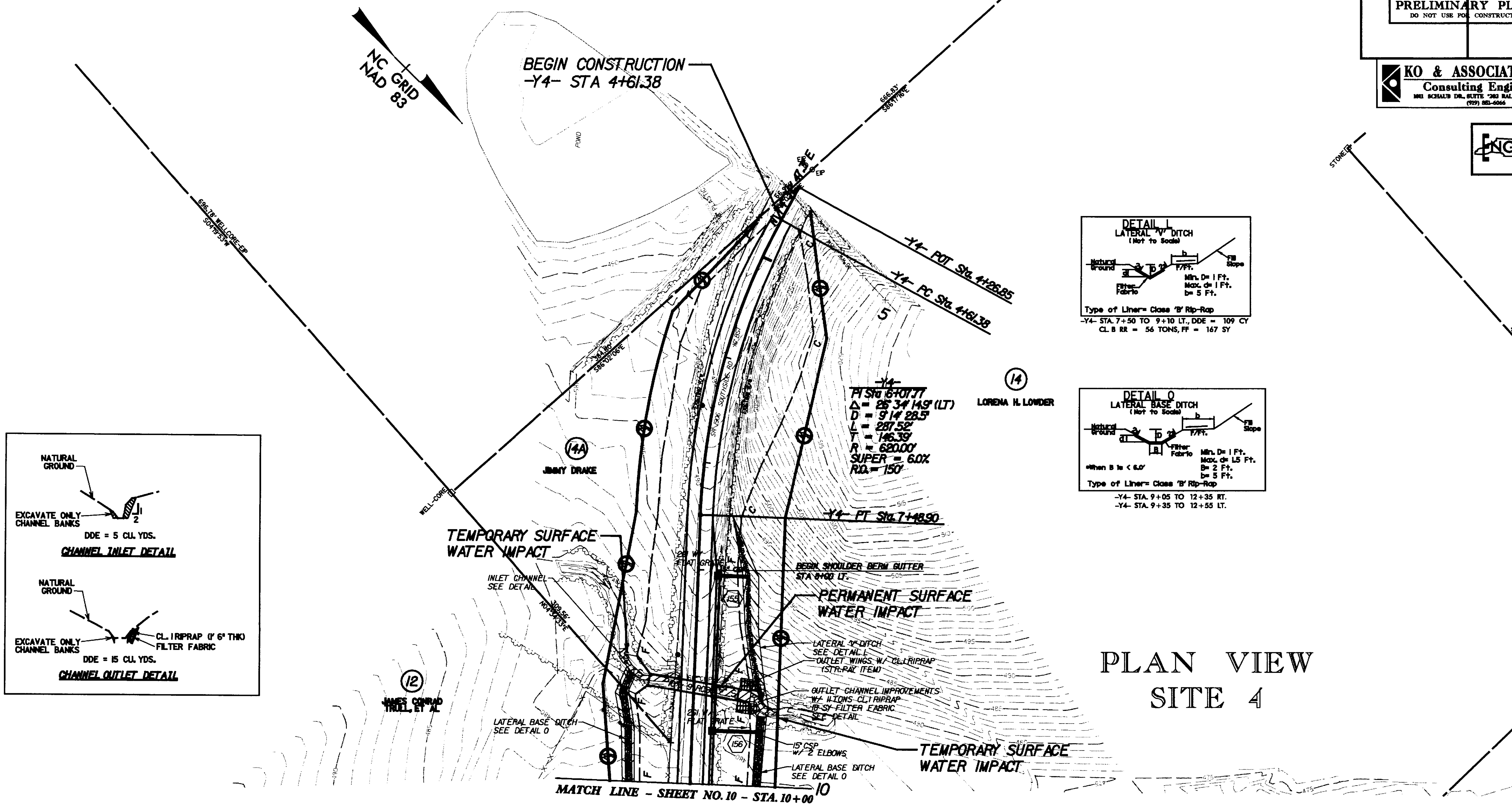
~~SHEET 10 OF 14~~ 7/27/07

REVISIONS
5/10/05 R/W Revision Added Parcel 14A with Owner

PROJECT REFERENCE NO.	SHEET NO.
R-2320G	19
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

KO & ASSOCIATES, P.C.
Consulting Engineers



NC GRID NAD 83
BEGIN CONSTRUCTION -Y4- STA 4+61.38
-Y4- POT Sta. 4+26.85
-Y4- PC Sta. 4+61.38
-Y4- PI Sta 6+07.77
Δ = 26° 34' 14.9" (LT)
D = 9° 14' 28.5"
L = 287.52'
T = 146.39'
R = 620.00'
SUPER = 6.0%
R.O. = 150'
-Y4- PT Sta. 7+48.90
14 LORENA H. LOWDER
14A JIMMY DRAKE
12 JAMES CONRAD TRULL, ET AL
TEMPORARY SURFACE WATER IMPACT
INLET CHANNEL SEE DETAIL
PERMANENT SURFACE WATER IMPACT
BEGIN SHOULDER BERM GUTTER STA 8+00 LT.
LATERAL "V" DITCH SEE DETAIL L
OUTLET WINGS W/ CL. I RIPRAP (STR. PAY ITEM)
OUTLET CHANNEL IMPROVEMENTS W/ 11 TONS CL. I RIPRAP 18 SY FILTER FABRIC SEE DETAIL
15" CSP W/ 2 ELBOWS
LATERAL BASE DITCH SEE DETAIL O
TEMPORARY SURFACE WATER IMPACT
MATCH LINE - SHEET NO. 10 - STA. 10+00
DETAIL L LATERAL "V" DITCH (Not to Scale)
Type of Liner= Class 'B' Rip-Rap
-Y4- STA. 7+50 TO 9+10 LT., DDE = 109 CY CL. B RR = 56 TONS, FF = 167 SY
DETAIL O LATERAL BASE DITCH (Not to Scale)
Type of Liner= Class 'B' Rip-Rap
-Y4- STA. 9+05 TO 12+35 RT.
-Y4- STA. 9+35 TO 12+55 LT.
NATURAL GROUND
EXCAVATE ONLY CHANNEL BANKS
DDE = 5 CU. YDS.
CHANNEL INLET DETAIL
CL. I RIPRAP (1' 6" THK)
FILTER FABRIC
DDE = 15 CU. YDS.
CHANNEL OUTLET DETAIL

PLAN VIEW SITE 4

Permit Drawing Sheet 14 of 18

REVISIONS: 5/10/05 R/W Revision Added Parcel 14A with Owner

LEGEND

—WLB— WETLAND

DENOTES TEMPORARY SURFACE WATER IMPACT

DENOTES PERMANENT SURFACE WATER IMPACT

SCALE: 1"= 100' HORIZ. (100 0 50 100)

SEE SHEET NO. 35 FOR -Y4- PROFILE

NCDOT
DIVISION OF HIGHWAYS
STANLY COUNTY
PROJECT: 34422.1.1 (R-2320G)
US 52 EXT.- ALBEMARLE
FROM US 52, NC 73, NC 24-27 & NC 138 TO SR 1785

7/27/07

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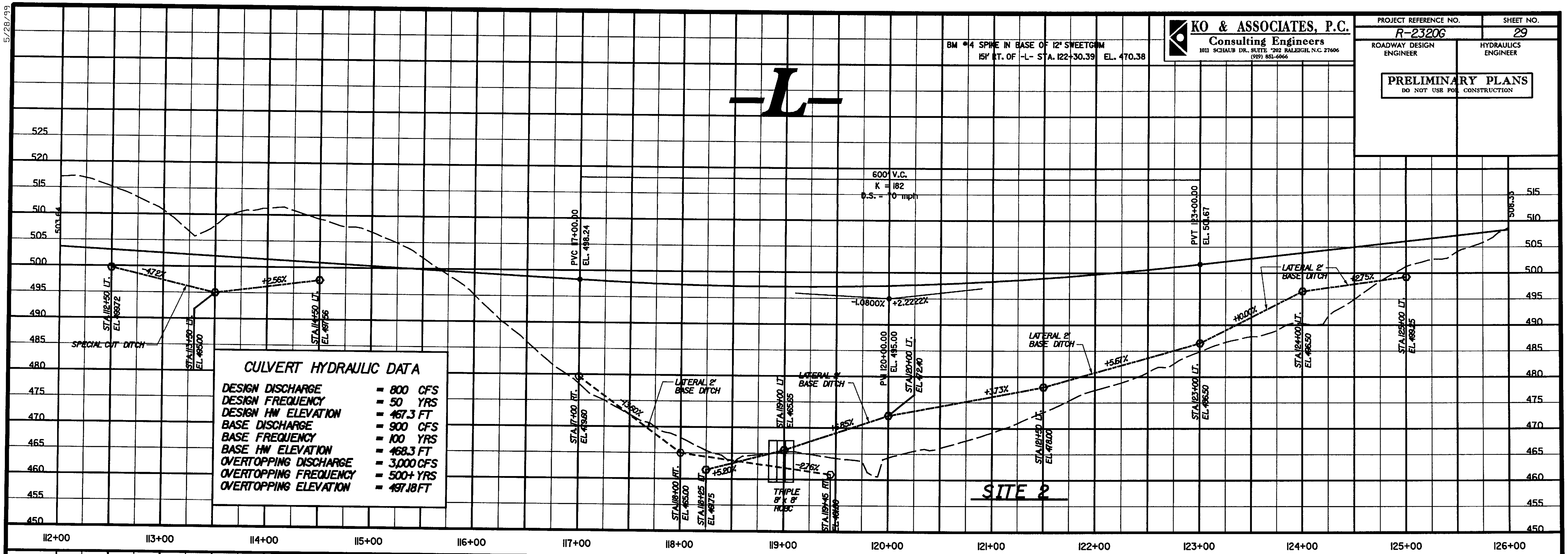
5/28/99

KO & ASSOCIATES, P.C.
Consulting Engineers
1011 SCHAUB DR. SUITE 202 RALEIGH, N.C. 27606
(919) 851-6066

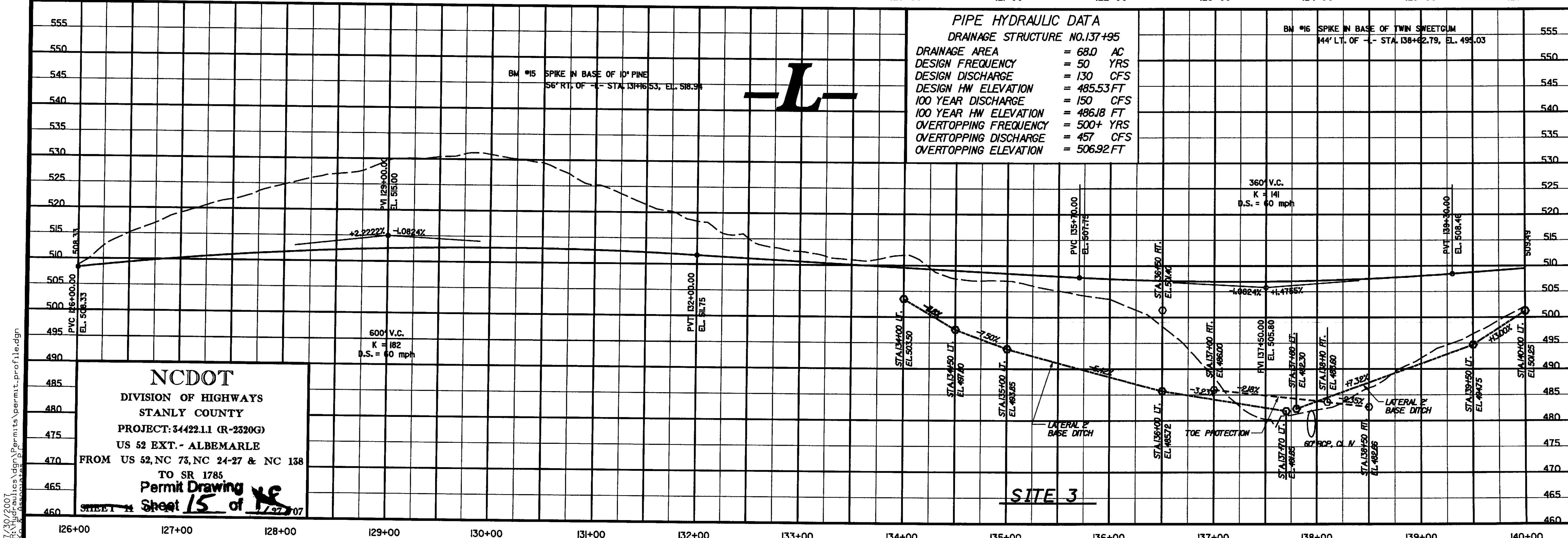
PROJECT REFERENCE NO.	SHEET NO.
R-2320G	29
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION



CULVERT HYDRAULIC DATA

DESIGN DISCHARGE	= 800 CFS
DESIGN FREQUENCY	= 50 YRS
DESIGN HW ELEVATION	= 467.3 FT
BASE DISCHARGE	= 900 CFS
BASE FREQUENCY	= 100 YRS
BASE HW ELEVATION	= 468.3 FT
OVERTOPPING DISCHARGE	= 3,000 CFS
OVERTOPPING FREQUENCY	= 500+ YRS
OVERTOPPING ELEVATION	= 497.18 FT



PIPE HYDRAULIC DATA
DRAINAGE STRUCTURE NO.137+95

DRAINAGE AREA	= 68.0 AC
DESIGN FREQUENCY	= 50 YRS
DESIGN DISCHARGE	= 130 CFS
DESIGN HW ELEVATION	= 485.53 FT
100 YEAR DISCHARGE	= 150 CFS
100 YEAR HW ELEVATION	= 486.18 FT
OVERTOPPING FREQUENCY	= 500+ YRS
OVERTOPPING DISCHARGE	= 457 CFS
OVERTOPPING ELEVATION	= 506.92 FT

NCDOT
DIVISION OF HIGHWAYS
STANLY COUNTY
PROJECT: 34422.1.1 (R-2320G)
US 52 EXT. - ALBEMARLE
FROM US 52, NC 73, NC 24-27 & NC 138
TO SR 1785
Permit Drawing
Sheet 15 of 16
~~SHEET 11~~

7/30/2007
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Ko & Associates P.C.

5/28/99

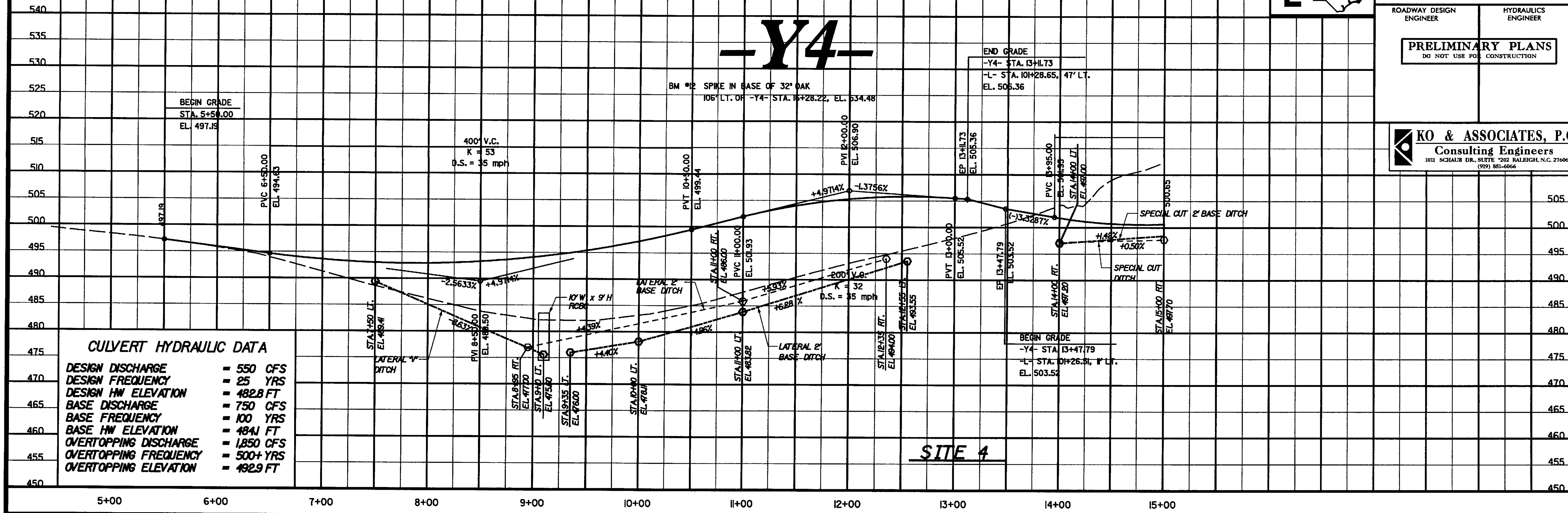
ENGLISH

PROJECT REFERENCE NO.	SHEET NO.
R-2320G	35
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

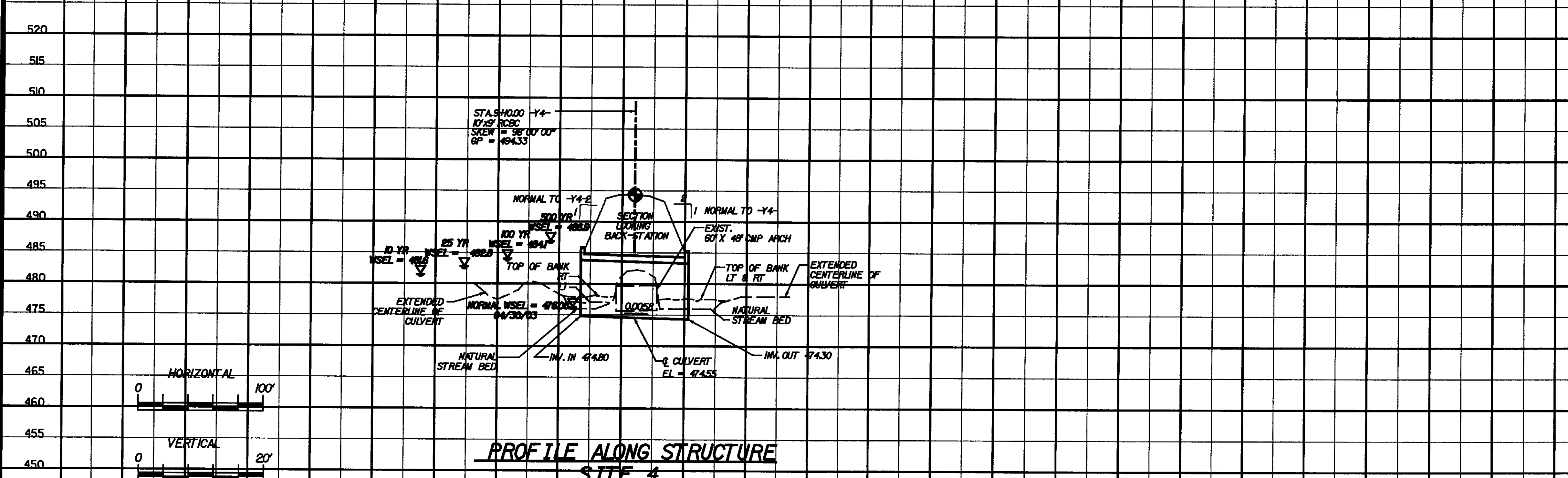
KO & ASSOCIATES, P.C.
Consulting Engineers
1011 SCHAUB DR., SUITE 202 RALEIGH, N.C. 27606
(919) 851-6066

-Y4-



CULVERT HYDRAULIC DATA

DESIGN DISCHARGE	=	550 CFS
DESIGN FREQUENCY	=	25 YRS
DESIGN HW ELEVATION	=	482.8 FT
BASE DISCHARGE	=	750 CFS
BASE FREQUENCY	=	100 YRS
BASE HW ELEVATION	=	484.1 FT
OVERTOPPING DISCHARGE	=	1,850 CFS
OVERTOPPING FREQUENCY	=	500+ YRS
OVERTOPPING ELEVATION	=	492.9 FT



PROFILE ALONG STRUCTURE
SITE 4

NCDOT
DIVISION OF HIGHWAYS
STANLY COUNTY
PROJECT: 34422.1.1 (R-2320G)
US 52 EXT. - ALBEMARLE
FROM US 52, NC 73, NC 24-27 & NC 138
Permit Drawing
Sheet 16 of 17
SHEET 12 OF 14 7/27/07

7/30/2007
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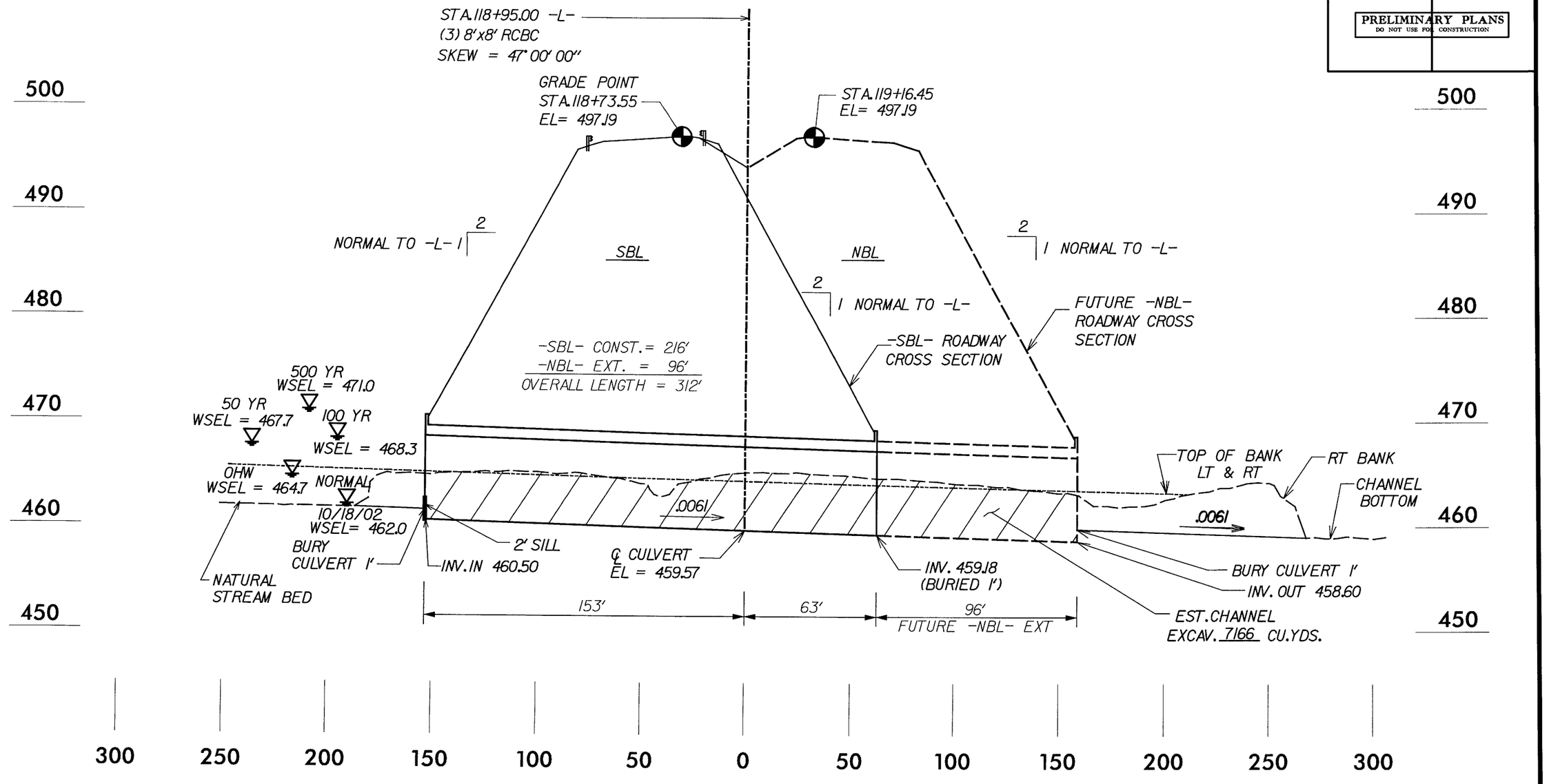
8/17/99

KO & ASSOCIATES, P.C. Consulting Engineers 1011 SCHAUB DR., SUITE 202 RALEIGH, N.C. 27606 (919) 851-6066	PROJECT REFERENCE NO. R-2320G	SHEET NO.
	R/W SHEET NO.	
	ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION



PROFILE ALONG STRUCTURE
SITE 2

SCALE:
1"= 50' HORIZONTAL
1"= 10' VERTICAL

ENGLISH

NCDOT
DIVISION OF HIGHWAYS
STANLY COUNTY
PROJECT: 34422.1.1 (R-2320G)
US 52 EXT.- ALBEMARLE
FROM US 52, NC 73, NC 24-27 & NC 138
TO SR 1785

Permit Drawing Sheet 17 of 17

~~SHEET 17 OF 14~~ 7/27/07

7/30/2007
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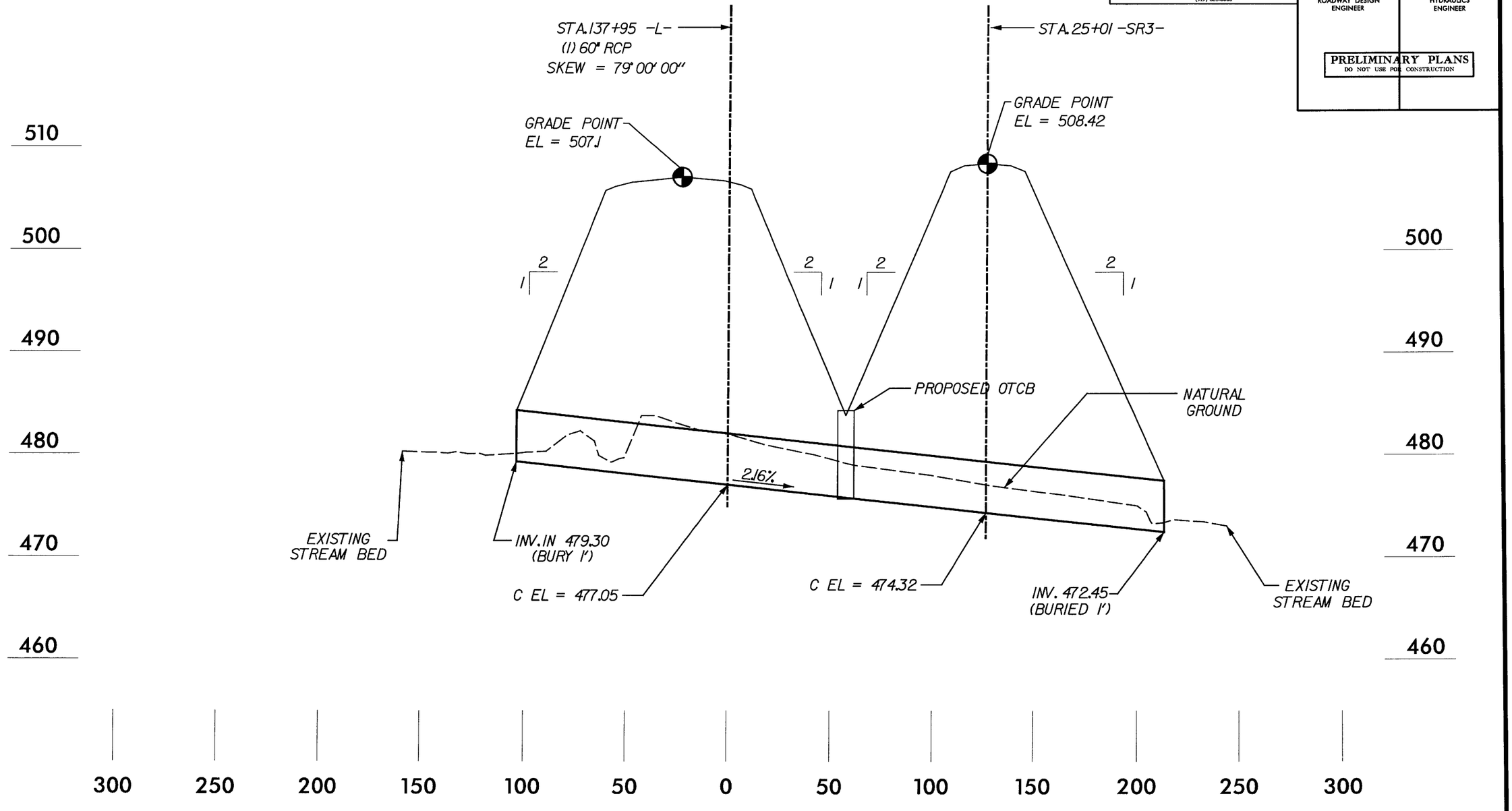
KO & Associates, P.A.

8/17/99

KO & ASSOCIATES, P.C.
Consulting Engineers
1011 SCHAUB DR., SUITE 202 RALEIGH, N.C. 27606
(919) 851-6066

PROJECT REFERENCE NO.	SHEET NO.
R-2320G	
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION



PROFILE ALONG STRUCTURE
SITE 3

SCALE:
1"= 50' HORIZONTAL
1"= 10' VERTICAL

Permit Drawing Sheet 18 of 18

NCDOT
DIVISION OF HIGHWAYS
STANLY COUNTY
PROJECT: 34422.1.1 (R-2320G)
US 52 EXT.- ALBEMARLE
FROM US 52, NC 73, NC 24-27 & NC 138
TO SR 1785

SHEET 14 OF 14 — 7/27/07

7/30/2007
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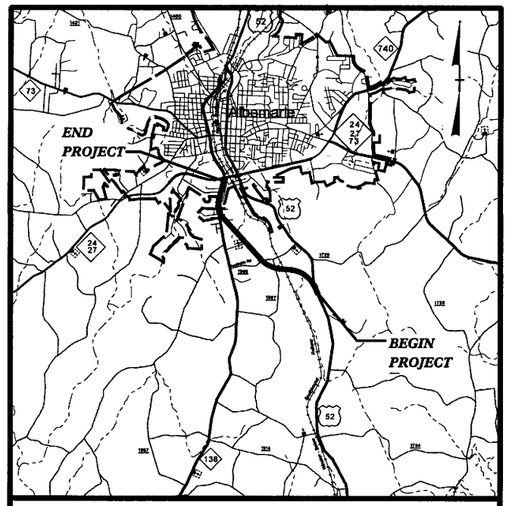
KO & Associates, P.

09/08/99

TIP PROJECT: R-2320G

PROJECT:34422.1.1 TIP

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



VICINITY MAP FOR TIP PROJECT R-2320G

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

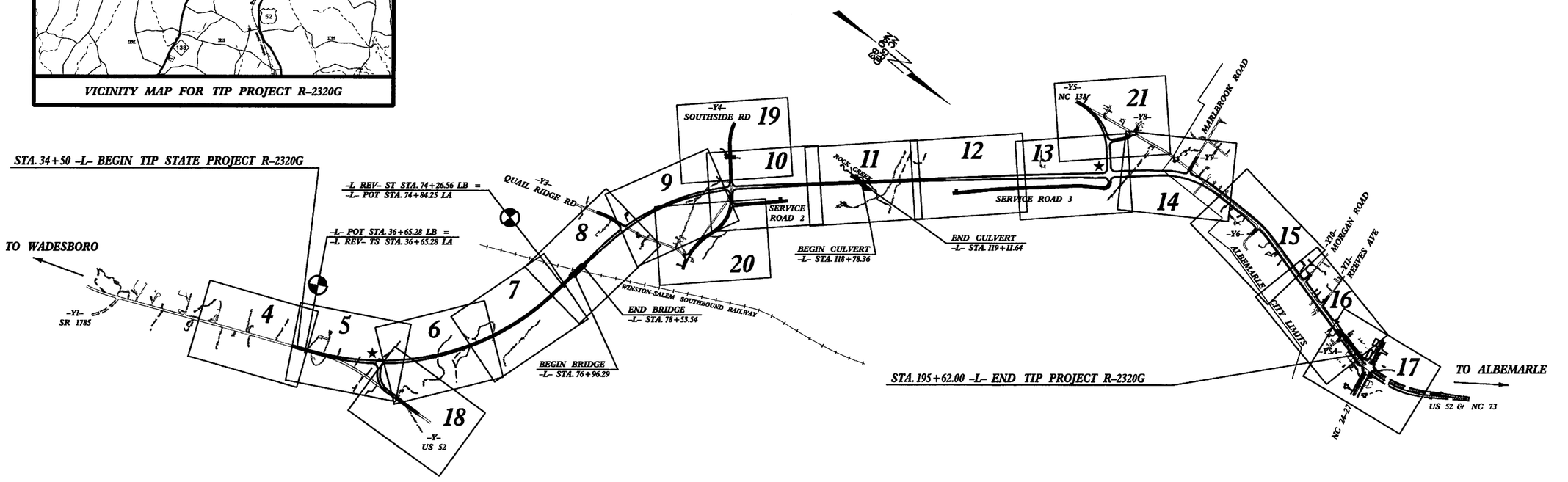
STANLY COUNTY

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	R-2320G	1	
STATE PROJ. NO.	F. A. PROJ. NO.	DESCRIPTION	
34422.1.1	NHF-52(10)	P.E.	

90% REVIEW PLANS 11/22/2005

LOCATION: *Albemarle – US 52 Extension from the Intersection of US 52, NC 73, NC 24–27 & NC 138 to Intersection of US 52 and SR 1785 (Johns Road)*

TYPE OF WORK: *Grading, Drainage, Paving, Curb & Gutter Structures, Signing and Signals*



A PORTION (0.6 MILES) OF THIS PROJECT IS WITHIN THE MUNICIPAL BOUNDARIES OF ALBEMARLE.

NCDOT CONTACT: CATHY S. HOUSER, P.E., ROADWAY DESIGN – ENGINEERING COORDINATION

THIS IS A PARTIAL CONTROLLED–ACCESS PROJECT WTIH ACCESS BEING LIMITED TO POINTS AS SHOWN ON THE PLANS.

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

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

GRAPHIC SCALES

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

DESIGN DATA

ADT 2005 = 8,400/16,100
ADT 2025 = 11,300/21,500
DHV = 10 %
D = 60 %
T = 9 % *
V = 60/50 MPH

* TTST 5% DUAL 4%

PROJECT LENGTH

LENGTH OF ROADWAY TIP PROJECT R-2320G	=	*3.005 mi.*
LENGTH OF STRUCTURE TIP PROJECT R-2320G	=	*0.036 mi*
TOTAL LENGTH OF TIP PROJECT R-2320G	=	*3.041 mi.*

Prepared In the Office of:
KO & ASSOCIATES, P.C.
1011 Schaub Dr. Suite 202 , Raleigh, NC 27606 919-851-6066
for
North Carolina Department of Transportation

2002 STANDARD SPECIFICATIONS

RIGHT OF WAY DATE:

LETTING DATE: January 20, 2009

Brian A. Wiles, P.E.
PROJECT ENGINEER

HYDRAULICS ENGINEER

SIGNATURE: P.E.

ROADWAY DESIGN ENGINEER

SIGNATURE: P.E.

DIVISION OF HIGHWAYS STATE OF NORTH CAROLINA

P.E.
STATE HIGHWAY DESIGN ENGINEER

1/11/2006
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KO & Associates, P.C.

5/28/99

PROJECT REFERENCE NO.	SHEET NO.
R-2320G	1-B

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

CONVENTIONAL SYMBOLS

*S.U.E = SUBSURFACE UTILITY ENGINEER

ROADS & RELATED ITEMS

- Edge of Pavement
- Curb
- Prop. Slope Stakes Cut — C
- Prop. Slope Stakes Fill — F
- Prop. Woven Wire Fence
- Prop. Chain Link Fence
- Prop. Barbed Wire Fence
- Prop. Wheelchair Ramp — WCR
- Curb Cut for Future Wheelchair Ramp — CCFR
- Exist. Guardrail
- Prop. Guardrail
- Equality Symbol
- Pavement Removal

RIGHT OF WAY

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

HYDROLOGY

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

STRUCTURES

MAJOR

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

MINOR

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

UTILITIES

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

- Recorded Water Line — W W
- Designated Water Line (S.U.E.*) — W W
- Sanitary Sewer — SS SS
- Recorded Sanitary Sewer Force Main — FSS FSS
- Designated Sanitary Sewer Force Main(S.U.E.*) — FSS FSS
- Recorded Gas Line — G G
- Designated Gas Line (S.U.E.*) — G G
- Storm Sewer — S S
- Recorded Power Line — P P
- Designated Power Line (S.U.E.*) — P P
- Recorded Telephone Cable — T T
- Designated Telephone Cable (S.U.E.*) — T T
- Recorded U/G Telephone Conduit — TC TC
- Designated U/G Telephone Conduit (S.U.E.*) — TC TC
- Unknown Utility (S.U.E.*) — ?UTL ?UTL
- Recorded Television Cable — TV TV
- Designated Television Cable (S.U.E.*) — TV TV
- Recorded Fiber Optics Cable — FO FO
- Designated Fiber Optics Cable (S.U.E.*) — FO FO
- Exist. Water Meter — 0
- U/G Test Hole (S.U.E.*) — ATTUR
- Abandoned According to U/G Record — E.O.I.
- End of Information

BOUNDARIES & PROPERTIES

- State Line
- County Line
- Township Line
- City Line
- Reservation Line
- Property Line
- Property Line Symbol — PL
- Exist. Iron Pin — EIP
- Property Corner
- Property Monument — EXM
- Property Number — 123
- Parcel Number — 6
- Fence Line — WW & ISBW
- Existing Wetland Boundaries — WLB
- High Quality Wetland Boundary — HQ WLB
- Medium Quality Wetland Boundaries — MQ WLB
- Low Quality Wetland Boundaries — LQ WLB
- Proposed Wetland Boundaries — WLB
- Existing Endangered Animal Boundaries — EAB
- Existing Endangered Plant Boundaries — EPB

BUILDINGS & OTHER CULTURE

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

TOPOGRAPHY

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

VEGETATION

- Single Tree
- Single Shrub
- Hedge
- Woods Line
- Orchard
- Vineyard — VINEYARD

RAILROADS

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

revised 02/02/00

6/2/99

PROJECT REFERENCE NO.	SHEET NO.
R-2320G	2
ROADWAY DESIGN ENGINEER	PAVEMENT DESIGN ENGINEER

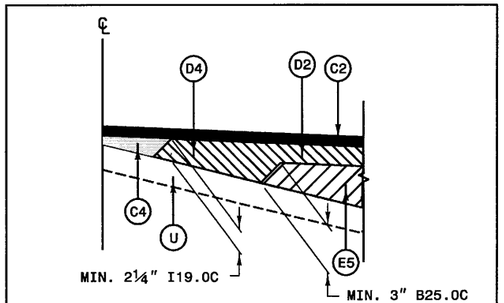
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

KO & ASSOCIATES, P.C.
Consulting Engineers
1011 SCHAUB DR., SUITE 202 RALEIGH, N.C. 27606
(919) 851-6066

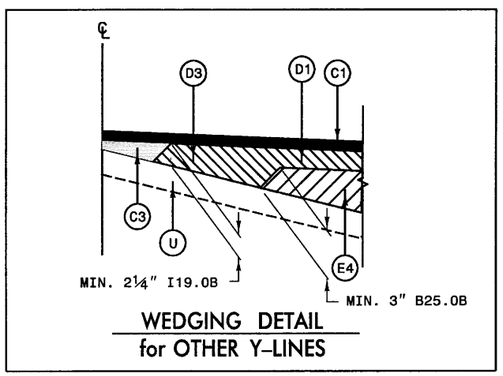
PAVEMENT SCHEDULE

CODE	DESCRIPTION
C1	PROP. APPROX. 3" ASPHALT CONCRETE SURFACE COURSE, TYPE S9.5B, AT AN AVERAGE RATE OF 168 LBS. PER SQ. YD. IN EACH OF TWO LAYERS
C2	PROP. APPROX. 3" ASPHALT CONCRETE SURFACE COURSE, TYPE S9.5C, AT AN AVERAGE RATE OF 168 LBS. PER SQ. YD. IN EACH OF TWO LAYERS
C3	PROP.VAR. DEPTH ASPHALT CONCRETE SURFACE COURSE, TYPE S9.5B, AT AN AVERAGE RATE OF 112 LBS. PER SQ. YD. PER 1" DEPTH TO BE PLACED IN LAYERS NOT TO EXCEED 1½" IN DEPTH.
C4	PROP.VAR. DEPTH ASPHALT CONCRETE SURFACE COURSE, TYPE S9.5C, AT AN AVERAGE RATE OF 112 LBS. PER SQ. YD. PER 1" DEPTH TO BE PLACED IN LAYERS NOT TO EXCEED 1½" IN DEPTH.
D1	PROP. APPROX. 3" ASPHALT CONCRETE INTERMEDIATE COURSE, TYPE I19.0B, AT AN AVERAGE RATE OF 342 LBS. PER SQ. YD.
D2	PROP. APPROX. 4" ASPHALT CONCRETE INTERMEDIATE COURSE, TYPE I19.0C, AT AN AVERAGE RATE OF 456 LBS. PER SQ. YD.
D3	PROP. VAR. DEPTH ASPHALT CONCRETE INTERMEDIATE COURSE, TYPE I19.0B, AT AN AVE. RATE OF 114 LBS. PER SQ. YD. PER 1" DEPTH TO BE PLACED IN LAYERS NOT LESS THAN 2¼" IN DEPTH OR GREATER THAN 4" IN DEPTH.
D4	PROP. VAR. DEPTH ASPHALT CONCRETE INTERMEDIATE COURSE, TYPE I19.0C, AT AN AVE. RATE OF 114 LBS. PER SQ. YD. PER 1" DEPTH TO BE PLACED IN LAYERS NOT LESS THAN 2¼" IN DEPTH OR GREATER THAN 4" IN DEPTH.
E1	PROP. APPROX. 4" ASPHALT CONCRETE BASE COURSE, TYPE B25.0B, AT AN AVERAGE RATE OF 456 LBS. PER SQ. YD.
E2	PROP. APPROX. 4½" ASPHALT CONCRETE BASE COURSE, TYPE B25.0B, AT AN AVERAGE RATE OF 513 LBS. PER SQ. YD.
E3	PROP. APPROX. 7" ASPHALT CONCRETE BASE COURSE, TYPE B25.0C, AT AN AVERAGE RATE OF 399 LBS. PER SQ. YD. IN EACH OF TWO LAYERS
E4	PROP. VAR. DEPTH ASPHALT CONCRETE BASE COURSE, TYPE B25.0B, AT AN AVE. RATE OF 114 LBS. PER SQ. YD. PER 1" DEPTH TO BE PLACED IN LAYERS NOT LESS THAN 3" IN DEPTH OR GREATER THAN 5½" IN DEPTH.
E5	PROP. VAR. DEPTH ASPHALT CONCRETE BASE COURSE, TYPE B25.0C, AT AN AVE. RATE OF 114 LBS. PER SQ. YD. PER 1" DEPTH TO BE PLACED IN LAYERS NOT LESS THAN 3" IN DEPTH OR GREATER THAN 5½" IN DEPTH.
J1	PROP. APPROX. 6" AGGREGATE BASE COURSE
J2	PROP. APPROX. 8" AGGREGATE BASE COURSE
J3	PROP. APPROX. 10" AGGREGATE BASE COURSE
K	BASE TO BE TREATED WITH LIME TO A DEPTH OF 8" AT A RATE OF 20 lbs/sy AS DIRECTED BY THE ENGINEER OR BASE TO BE TREATED WITH CEMENT TO A DEPTH OF 7" AT A RATE OF 55 lbs/sy AS DIRECTED BY THE ENGINEER OR BASE TO BE TREATED WITH AGGREGATE AT A RATE OF 250 lbs/sy AND CEMENT AT A RATE OF 55 lbs/sy TO A DEPTH OF 7" AS DIRECTED BY THE ENGINEER (SEE PROJECT SPECIAL PROVISIONS)
P	PRIME COAT AT THE RATE OF 0.35 GAL PER SQ. YD.
R1	PROPOSED 2'-6" CURB & GUTTER
T	EARTH MATERIAL
U	EXISTING ASPHALT PAVEMENT
W	VARIABLE DEPTH ASPHALT PAVEMENT (SEE WEDGING DETAIL)

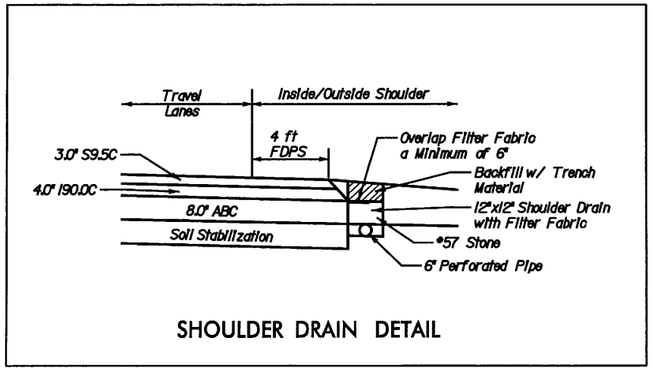
NOTE: ALL PAVEMENT EDGE SLOPES ARE 1:1 UNLESS NOTED OTHERWISE.



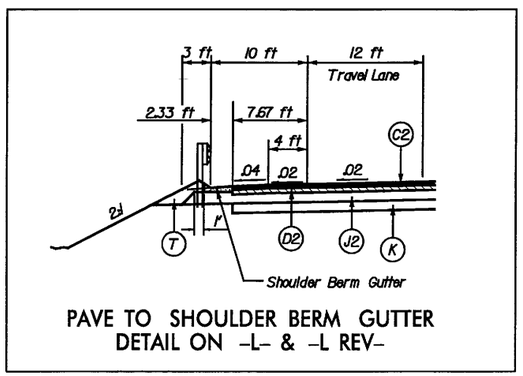
WEDGING DETAIL
for -L-, -Y6-, -Y10- & -Y11-



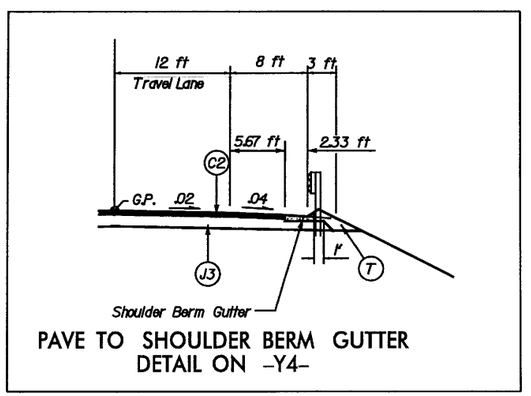
WEDGING DETAIL
for OTHER Y-LINES



SHOULDER DRAIN DETAIL



PAVE TO SHOULDER BERM GUTTER
DETAIL ON -L- & -L REV-

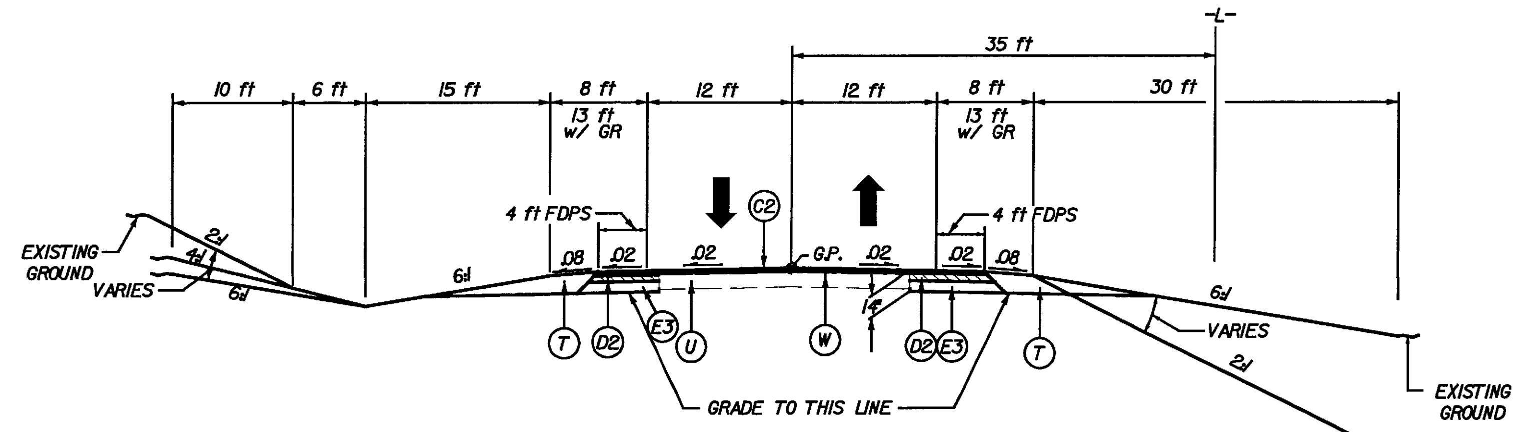


PAVE TO SHOULDER BERM GUTTER
DETAIL ON -Y4-

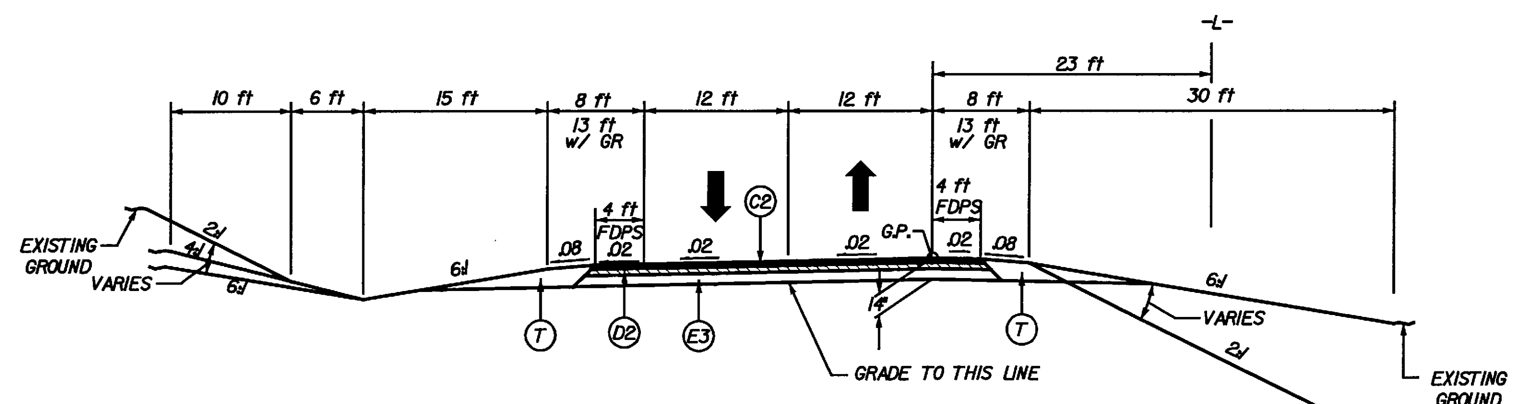
PROJECT REFERENCE NO.	SHEET NO.
R-2320G	2-A
ROADWAY DESIGN ENGINEER	PAVEMENT DESIGN ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

KO & ASSOCIATES, P.C.
Consulting Engineers
1011 SCHAUB DR., SUITE *202 RALEIGH, N.C. 27606
(919) 851-6066



TYPICAL SECTION NO. 1
-L- STA 35+00 TO -L- STA 36+65.28 LB
-L REV- STA 36+65.28 LA TO -L REV- STA 38+90.28

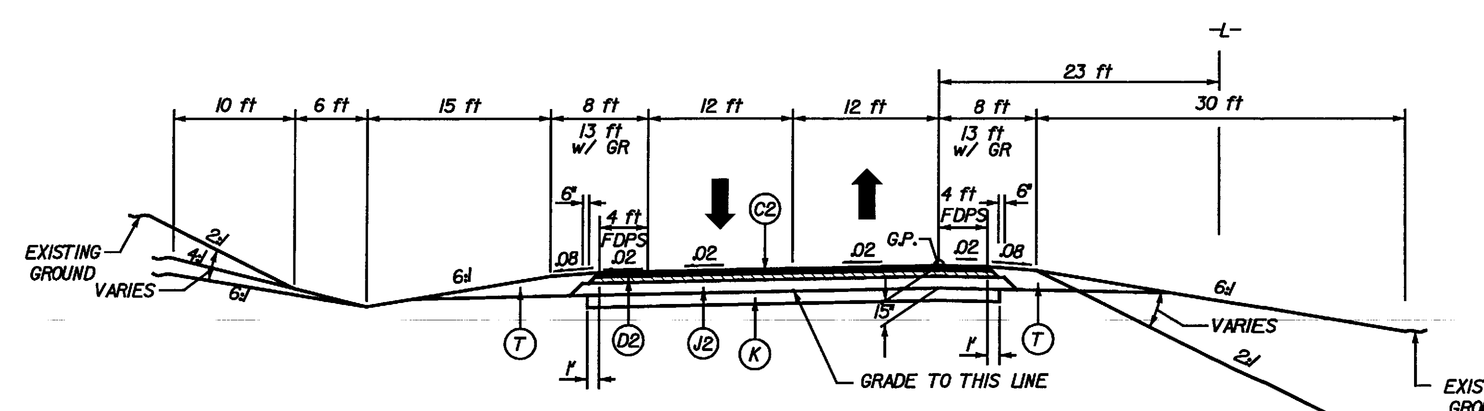


TYPICAL SECTION NO. 2
-L REV- STA 38+90.28 TO -L REV- STA 42+00.00

PAVEMENT SCHEDULE

CODE	DESCRIPTION	CODE	DESCRIPTION
C1	PROP. APPROX. 3" ASPH. CONC. SURFACE COURSE, TYPE S9.5B	E3	PROP. APPROX. 7" ASPH. CONC. BASE COURSE, TYPE B25.0C
C2	PROP. APPROX. 3" ASPH. CONC. SURFACE COURSE, TYPE S9.5C	E4	PROP. VAR. DEPTH ASPH. CONC. BASE COURSE, TYPE B25.0B
C3	PROP.VAR. DEPTH ASPH. CONC. SURFACE COURSE, TYPE S9.5B	E5	PROP. VAR. DEPTH ASPH. CONC. BASE COURSE, TYPE B25.0C
C4	PROP.VAR. DEPTH ASPH. CONC. SURFACE COURSE, TYPE S9.5C	J1	PROP. APPROX. 6" AGGREGATE BASE COURSE
D1	PROP. APPROX. 3" ASPH. CONC. INTERMEDIATE COURSE, TYPE I19.0B	J2	PROP. APPROX. 8" AGGREGATE BASE COURSE
		J3	PROP. APPROX. 10" AGGREGATE BASE COURSE
D2	PROP. APPROX. 4" ASPH. CONC. INTERMEDIATE COURSE, TYPE I19.0C	K	SUBGRADE STABILIZATION
		P	PRIME COAT
D3	PROP. VAR. DEPTH ASPH. CONC. INTERMEDIATE COURSE, TYPE I19.0B	R1	PROP. 2'-6" CURB & GUTTER
		T	EARTH MATERIAL
D4	PROP. VAR. DEPTH ASPH. CONC. INTERMEDIATE COURSE, TYPE I19.0C	U	EXISTING ASPH. PAVEMENT
E1	PROP. APPROX. 4" ASPH. CONC. BASE COURSE, TYPE B25.0B	W	VARIABLE DEPTH ASPH. PAVEMENT (SEE WEDGING DETAILS, SEE SHEET NO. 2)
E2	PROP. APPROX. 4½" ASPH. CONC. BASE COURSE, TYPE B25.0B		

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



TYPICAL SECTION NO. 3
-L REV- STA 42+00.00 TO -L REV- STA 46+75.00

6/2/99

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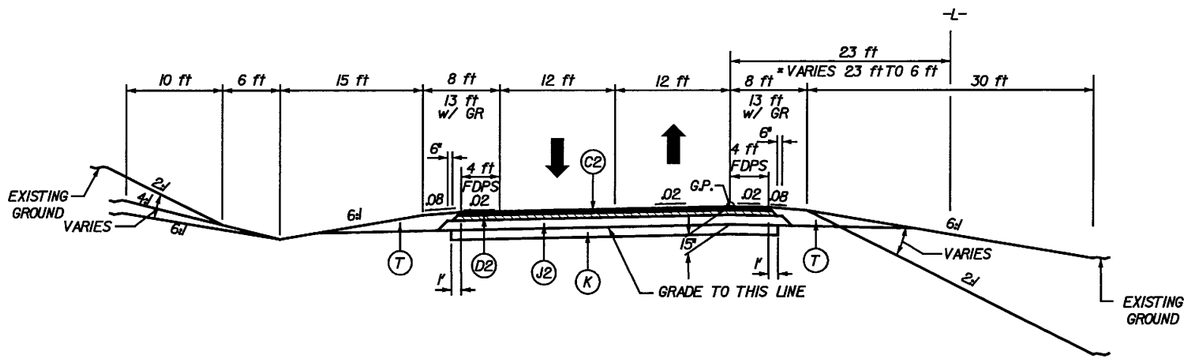
r:\roadway\proj\r2320g_rdy_typ.dgn

PROJECT REFERENCE NO.	SHEET NO.
R-2320G	2-B
ROADWAY DESIGN ENGINEER	PAVEMENT DESIGN ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

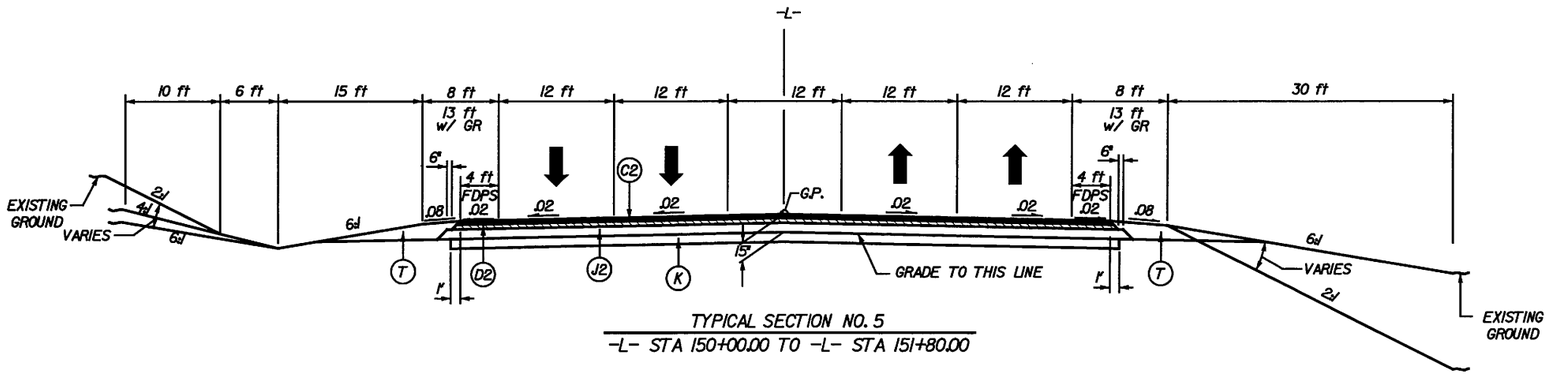
KO & ASSOCIATES, P.C.
Consulting Engineers
1011 SCHAUB DR., SUITE 200 RALEIGH, N.C. 27606
(919) 851-6066



TYPICAL SECTION NO. 4

-L REV- STA 46+75.00 TO -L REV- STA 74+26.56 LB
-L- 74+84.25 LA TO -L- STA 76+96.29
-L- 78+53.54 TO -L- STA 150+00.00

* GRADE POINT LOCATION VARIES:
23' AT -L- STA 140+00 TO 6' AT -L- STA 150+00



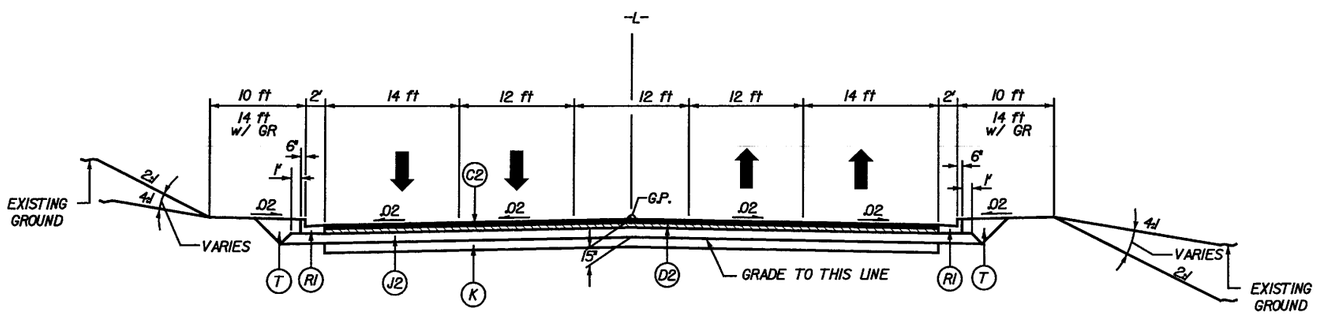
TYPICAL SECTION NO. 5

-L- STA 150+00.00 TO -L- STA 151+80.00

PAVEMENT SCHEDULE

CODE	DESCRIPTION
C1	PROP. APPROX. 3" ASPH. CONC. SURFACE COURSE, TYPE S9.5B
C2	PROP. APPROX. 3" ASPH. CONC. SURFACE COURSE, TYPE S9.5C
C3	PROP.VAR. DEPTH ASPH. CONC. SURFACE COURSE, TYPE S9.5B
C4	PROP.VAR. DEPTH ASPH. CONC. SURFACE COURSE, TYPE S9.5C
D1	PROP. APPROX. 3" ASPH. CONC. INTERMEDIATE COURSE, TYPE I19.0B
D2	PROP. APPROX. 4" ASPH. CONC. INTERMEDIATE COURSE, TYPE I19.0C
D3	PROP. VAR. DEPTH ASPH. CONC. INTERMEDIATE COURSE, TYPE I19.0B
D4	PROP. VAR. DEPTH ASPH. CONC. INTERMEDIATE COURSE, TYPE I19.0C
E1	PROP. APPROX. 4" ASPH. CONC. BASE COURSE, TYPE B25.0B
E2	PROP. APPROX. 4½" ASPH. CONC. BASE COURSE, TYPE B25.0B
E3	PROP. APPROX. 7" ASPH. CONC. BASE COURSE, TYPE B25.0C
E4	PROP. VAR. DEPTH ASPH. CONC. BASE COURSE, TYPE B25.0B
E5	PROP. VAR. DEPTH ASPH. CONC. BASE COURSE, TYPE B25.0C
J1	PROP. APPROX. 6" AGGREGATE BASE COURSE
J2	PROP. APPROX. 8" AGGREGATE BASE COURSE
J3	PROP. APPROX. 10" AGGREGATE BASE COURSE
K	SUBGRADE STABILIZATION
P	PRIME COAT
R1	PROP. 2'-6" CURB & GUTTER
T	EARTH MATERIAL
U	EXISTING ASPH. PAVEMENT
W	VARIABLE DEPTH ASPH. PAVEMENT (SEE WEDGING DETAILS, SEE SHEET NO. 2)

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



TYPICAL SECTION NO. 6

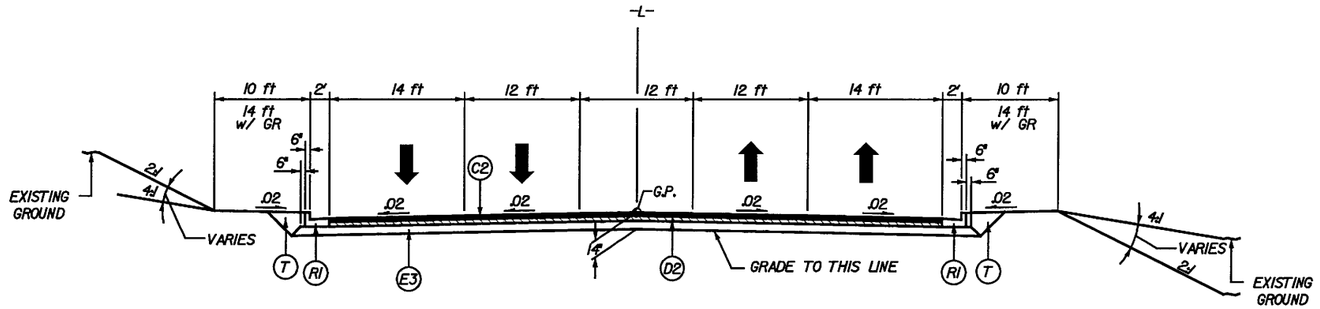
-L- STA 151+80.00 TO -L- STA 165+00.00

6/2/99

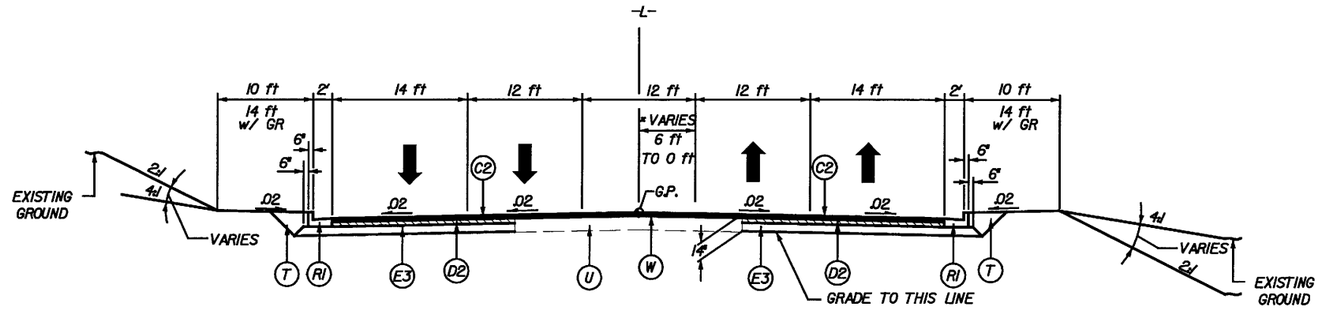
PROJECT REFERENCE NO.	SHEET NO.
R-2320G	2-C
ROADWAY DESIGN ENGINEER	PAVEMENT DESIGN ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

KO & ASSOCIATES, P.C.
Consulting Engineers
1011 SCHAUB DR., SUITE 202 RALEIGH, N.C. 27606
(919) 851-6066



TYPICAL SECTION NO. 7
-L- STA 177+50.00 TO -L- STA 186+50.00



TYPICAL SECTION NO. 8
-L- STA 165+00.00 TO -L- STA 177+50
-L- STA 186+50.00 TO -L- STA 192+71.47
-L- STA 192+71.47 TO -L- STA 195+62.00
MILL AND RESURFACE AS DIRECTED BY ENGINEER

* WIDTH VARIES FROM 6' AT -L- STA 189+35 TO 0' AT -L- STA 192+98

PAVEMENT SCHEDULE

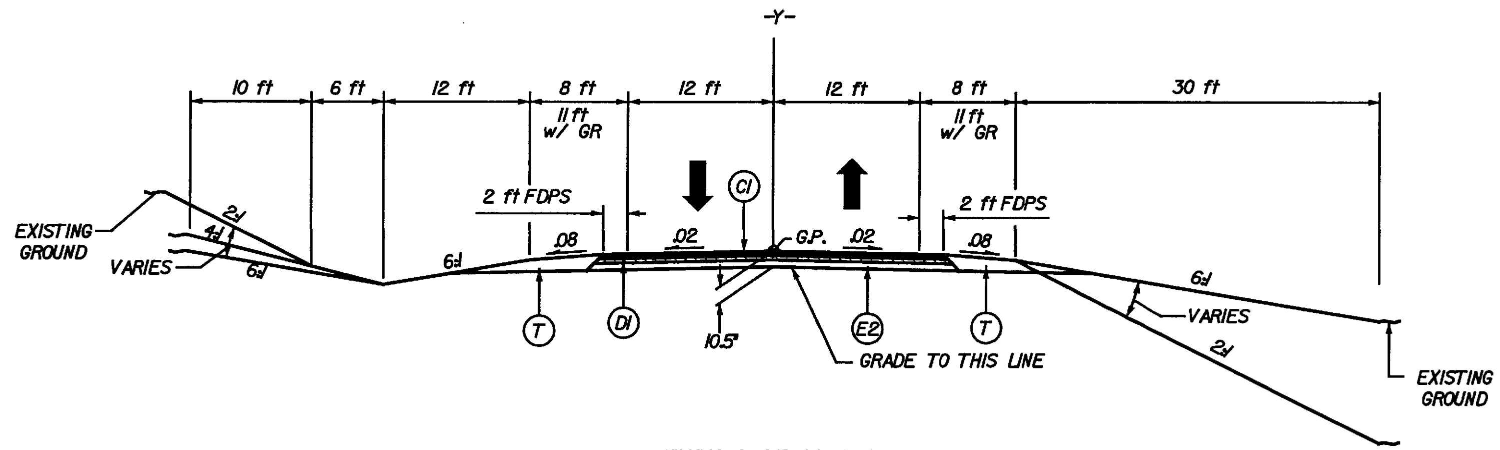
CODE	DESCRIPTION
C1	PROP. APPROX. 3" ASPH. CONC. SURFACE COURSE, TYPE S9.5B
C2	PROP. APPROX. 3" ASPH. CONC. SURFACE COURSE, TYPE S9.5C
C3	PROP.VAR. DEPTH ASPH. CONC. SURFACE COURSE, TYPE S9.5B
C4	PROP.VAR. DEPTH ASPH. CONC. SURFACE COURSE, TYPE S9.5C
D1	PROP. APPROX. 3" ASPH. CONC. INTERMEDIATE COURSE, TYPE I19.0B
D2	PROP. APPROX. 4" ASPH. CONC. INTERMEDIATE COURSE, TYPE I19.0C
D3	PROP. VAR. DEPTH ASPH. CONC. INTERMEDIATE COURSE, TYPE I19.0B
D4	PROP. VAR. DEPTH ASPH. CONC. INTERMEDIATE COURSE, TYPE I19.0C
E1	PROP. APPROX. 4" ASPH. CONC. BASE COURSE, TYPE B25.0B
E2	PROP. APPROX. 4½" ASPH. CONC. BASE COURSE, TYPE B25.0B
E3	PROP. APPROX. 7" ASPH. CONC. BASE COURSE, TYPE B25.0C
E4	PROP. VAR. DEPTH ASPH. CONC. BASE COURSE, TYPE B25.0B
E5	PROP. VAR. DEPTH ASPH. CONC. BASE COURSE, TYPE B25.0C
J1	PROP. APPROX. 6" AGGREGATE BASE COURSE
J2	PROP. APPROX. 8" AGGREGATE BASE COURSE
J3	PROP. APPROX. 10" AGGREGATE BASE COURSE
K	SUBGRADE STABILIZATION
P	PRIME COAT
R1	PROP. 2'-6" CURB & GUTTER
T	EARTH MATERIAL
U	EXISTING ASPH. PAVEMENT
W	VARIABLE DEPTH ASPH. PAVEMENT (SEE WEDGING DETAILS, SEE SHEET NO. 2)

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

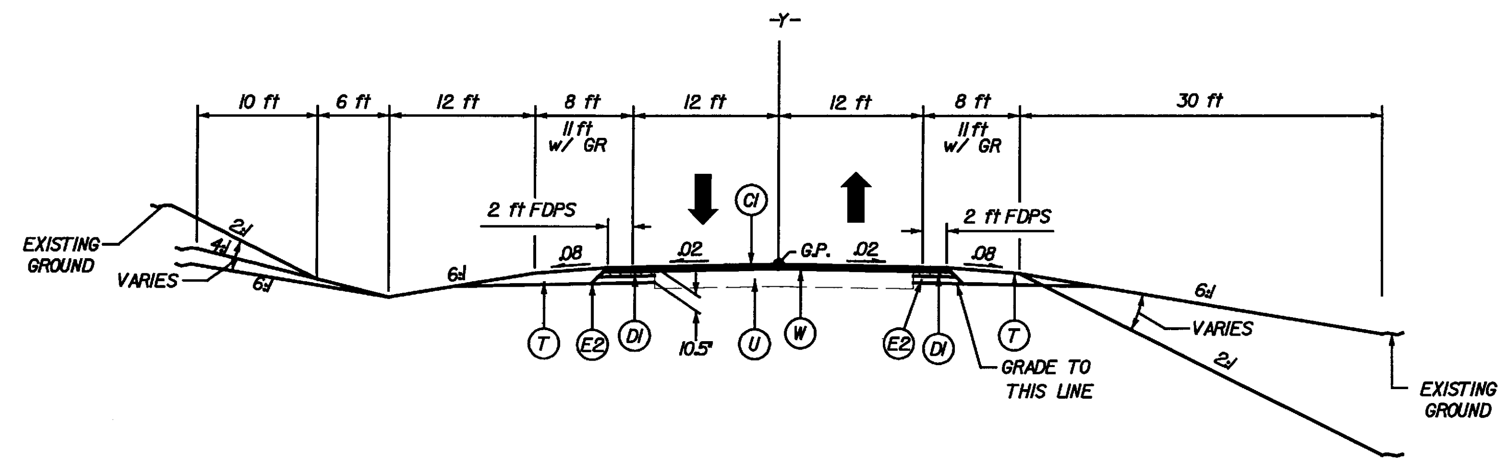
PROJECT REFERENCE NO.	SHEET NO.
R-2320G	2-D
ROADWAY DESIGN ENGINEER	PAVEMENT DESIGN ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

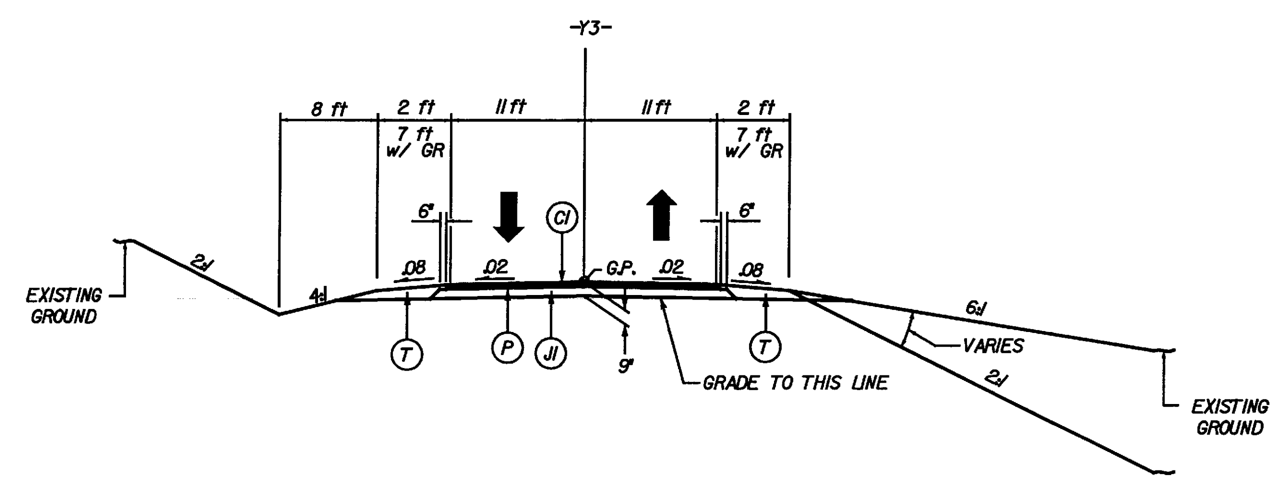
KO & ASSOCIATES, P.C.
Consulting Engineers
1011 SCHAUB DR., SUITE *202 RALEIGH, N.C. 27606
(919) 851-6066



TYPICAL SECTION NO. 9
-Y- STA 9+88.76 TO -Y- STA 13+00



TYPICAL SECTION NO. 10
-Y- STA 13+00 TO -Y- STA 18+50



TYPICAL SECTION NO. 11
-Y3- STA 13+00.00 TO -Y3- STA 17+11.63

PAVEMENT SCHEDULE

CODE	DESCRIPTION
C1	PROP. APPROX. 3" ASPH. CONC. SURFACE COURSE, TYPE S9.5B
C2	PROP. APPROX. 3" ASPH. CONC. SURFACE COURSE, TYPE S9.5C
C3	PROP.VAR. DEPTH ASPH. CONC. SURFACE COURSE, TYPE S9.5B
C4	PROP.VAR. DEPTH ASPH. CONC. SURFACE COURSE, TYPE S9.5C
D1	PROP. APPROX. 3" ASPH. CONC. INTERMEDIATE COURSE, TYPE I19.0B
D2	PROP. APPROX. 4" ASPH. CONC. INTERMEDIATE COURSE, TYPE I19.0C
D3	PROP. VAR. DEPTH ASPH. CONC. INTERMEDIATE COURSE, TYPE I19.0B
D4	PROP. VAR. DEPTH ASPH. CONC. INTERMEDIATE COURSE, TYPE I19.0C
E1	PROP. APPROX. 4" ASPH. CONC. BASE COURSE, TYPE B25.0B
E2	PROP. APPROX. 4½" ASPH. CONC. BASE COURSE, TYPE B25.0B

CODE	DESCRIPTION
E3	PROP. APPROX. 7" ASPH. CONC. BASE COURSE, TYPE B25.0C
E4	PROP. VAR. DEPTH ASPH. CONC. BASE COURSE, TYPE B25.0B
E5	PROP. VAR. DEPTH ASPH. CONC. BASE COURSE, TYPE B25.0C
J1	PROP. APPROX. 6" AGGREGATE BASE COURSE
J2	PROP. APPROX. 8" AGGREGATE BASE COURSE
J3	PROP. APPROX. 10" AGGREGATE BASE COURSE
K	SUBGRADE STABILIZATION
P	PRIME COAT
R1	PROP. 2'-6" CURB & GUTTER
T	EARTH MATERIAL
U	EXISTING ASPH. PAVEMENT
W	VARIABLE DEPTH ASPH. PAVEMENT (SEE WEDGING DETAILS, SEE SHEET NO. 2)

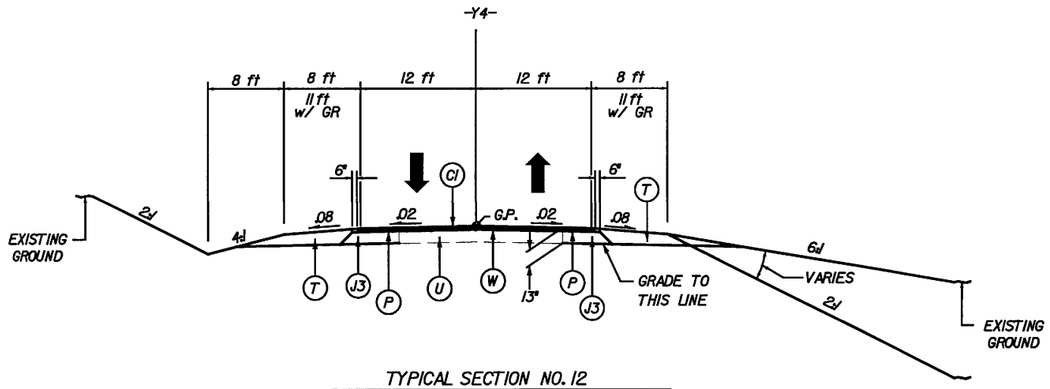
NOTE: ALL PAVEMENT EDGE SLOPES ARE 1:1 UNLESS NOTED OTHERWISE.

6/2/99

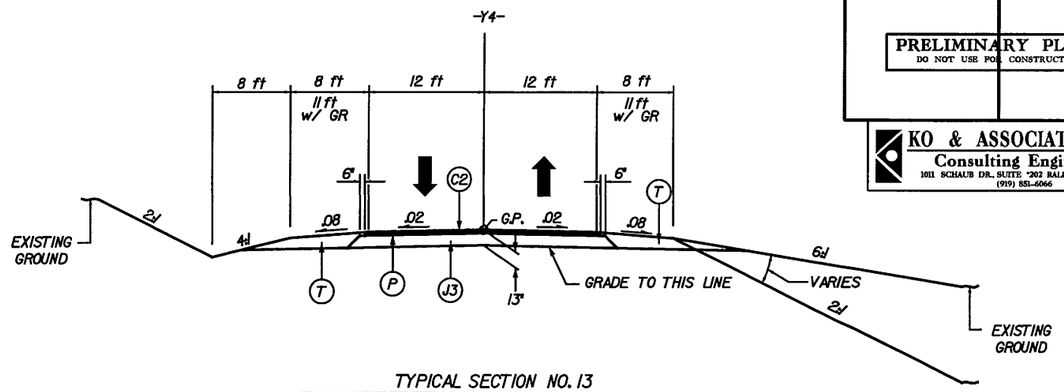
PROJECT REFERENCE NO.	SHEET NO.
R-2320G	2-E
ROADWAY DESIGN ENGINEER	PAVEMENT DESIGN ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

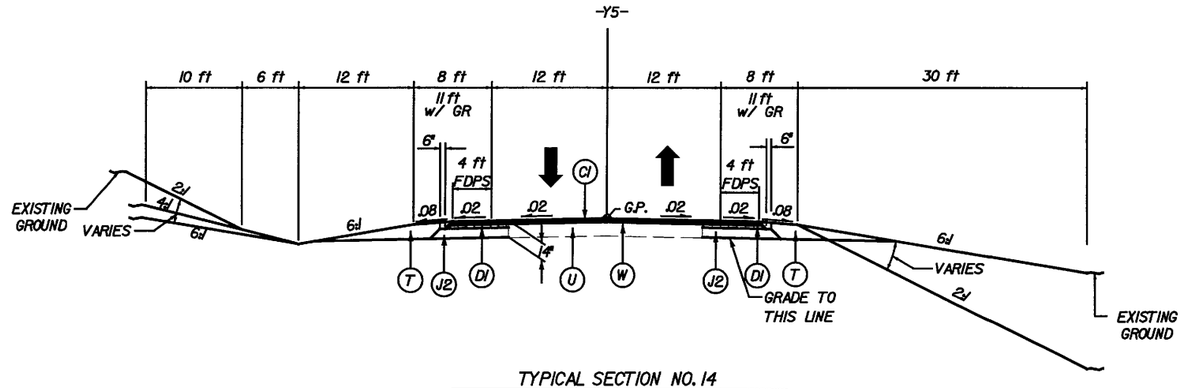
KO & ASSOCIATES, P.C.
Consulting Engineers
1011 SCHAUB DR., SUITE 202 RALEIGH, N.C. 27606
(919) 851-6066



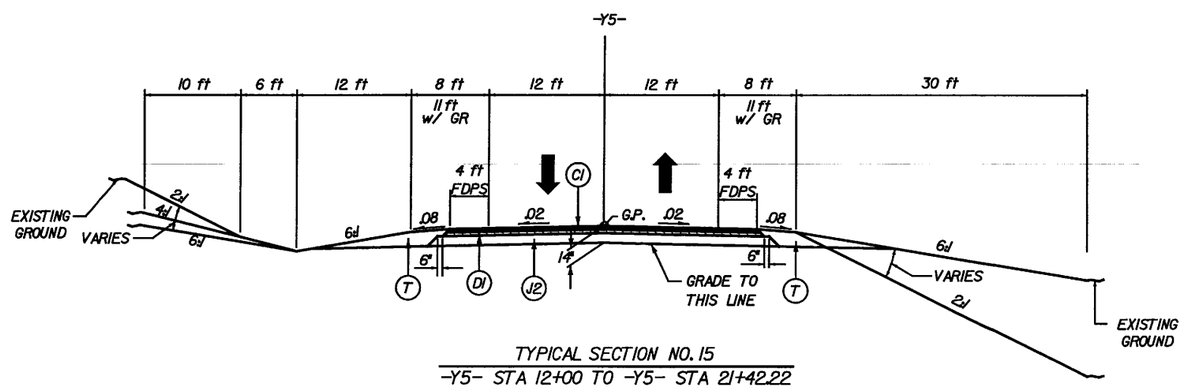
TYPICAL SECTION NO. 12
-Y4- STA 5+50.00 TO -Y4- STA 6+25.00
-Y4- STA 25+00.00 TO -Y4- STA 26+50.00



TYPICAL SECTION NO. 13
-Y4- STA 6+25.00 TO -Y4- STA 13+11.73
-Y4- STA 13+47.79 TO -Y4- STA 25+00.00



TYPICAL SECTION NO. 14
-Y5- STA 10+35 TO -Y5- STA 12+00



TYPICAL SECTION NO. 15
-Y5- STA 12+00 TO -Y5- STA 21+42.22

PAVEMENT SCHEDULE

CODE	DESCRIPTION
C1	PROP. APPROX. 3" ASPH. CONC. SURFACE COURSE, TYPE S9.5B
C2	PROP. APPROX. 3" ASPH. CONC. SURFACE COURSE, TYPE S9.5C
C3	PROP.VAR. DEPTH ASPH. CONC. SURFACE COURSE, TYPE S9.5B
C4	PROP.VAR. DEPTH ASPH. CONC. SURFACE COURSE, TYPE S9.5C
D1	PROP. APPROX. 3" ASPH. CONC. INTERMEDIATE COURSE, TYPE I19.0B
D2	PROP. APPROX. 4" ASPH. CONC. INTERMEDIATE COURSE, TYPE I19.0C
D3	PROP. VAR. DEPTH ASPH. CONC. INTERMEDIATE COURSE, TYPE I19.0B
D4	PROP. VAR. DEPTH ASPH. CONC. INTERMEDIATE COURSE, TYPE I19.0C
E1	PROP. APPROX. 4" ASPH. CONC. BASE COURSE, TYPE B25.0B
E2	PROP. APPROX. 4½" ASPH. CONC. BASE COURSE, TYPE B25.0B
E3	PROP. APPROX. 7" ASPH. CONC. BASE COURSE, TYPE B25.0C
E4	PROP. VAR. DEPTH ASPH. CONC. BASE COURSE, TYPE B25.0B
E5	PROP. VAR. DEPTH ASPH. CONC. BASE COURSE, TYPE B25.0C
J1	PROP. APPROX. 6" AGGREGATE BASE COURSE
J2	PROP. APPROX. 8" AGGREGATE BASE COURSE
J3	PROP. APPROX. 10" AGGREGATE BASE COURSE
K	SUBGRADE STABILIZATION
P	PRIME COAT
R1	PROP. 2'-6" CURB & GUTTER
T	EARTH MATERIAL
U	EXISTING ASPH. PAVEMENT
W	VARIABLE DEPTH ASPH. PAVEMENT (SEE WEDGING DETAILS, SEE SHEET NO. 2)

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

1/11/2006
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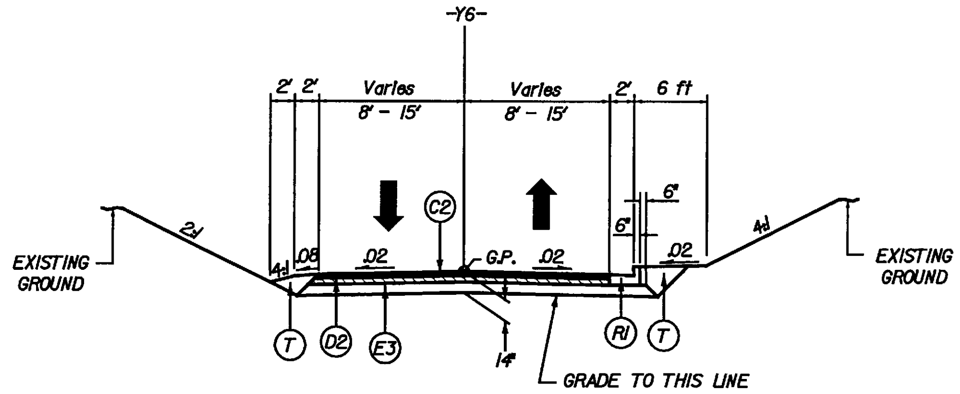
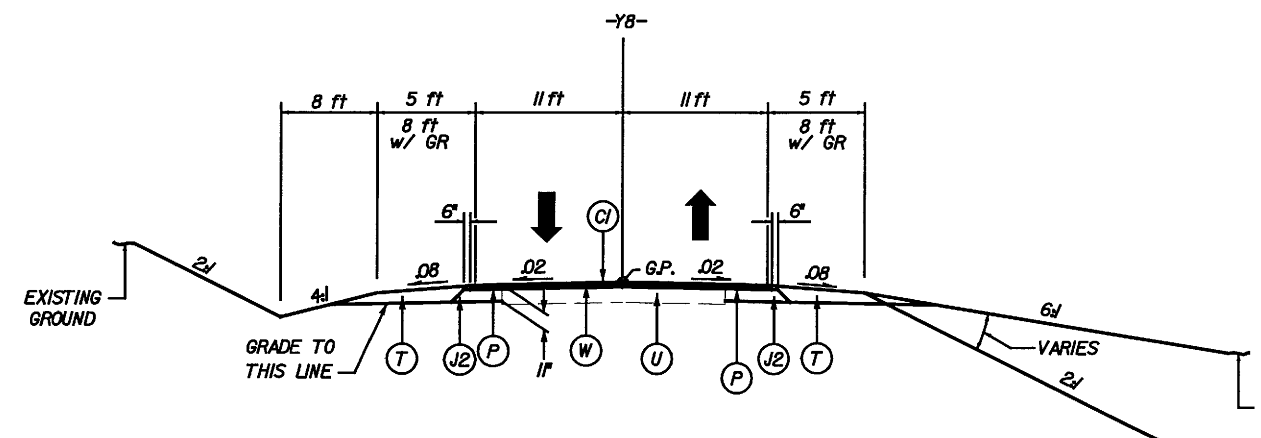
PROJECT REFERENCE NO.	SHEET NO.
R-2320G	2-F
ROADWAY DESIGN ENGINEER	PAVEMENT DESIGN ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

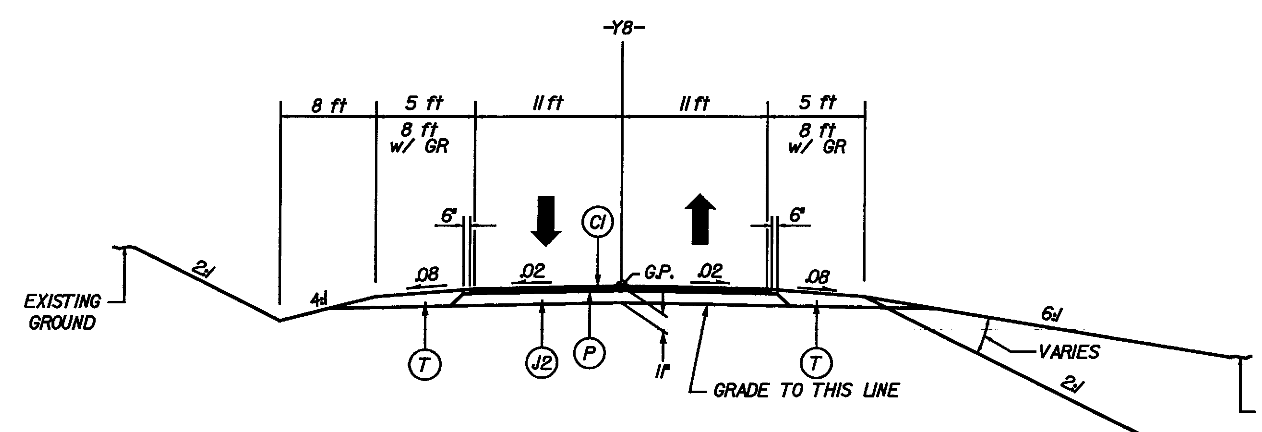
KO & ASSOCIATES, P.C.
Consulting Engineers
1011 SCHAUB DR., SUITE 202 RALEIGH, N.C. 27606
(919) 851-6066



TYPICAL SECTION NO. 16
-Y6- STA 10+32.00 TO -Y6- STA 11+50.00



TYPICAL SECTION NO. 17
-Y8- STA 12+15.00 TO -Y8- STA 13+10.00



TYPICAL SECTION NO. 18
-Y8- STA 13+10.00 TO -Y8- STA 16+48.83

PAVEMENT SCHEDULE

CODE	DESCRIPTION	CODE	DESCRIPTION
C1	PROP. APPROX. 3" ASPH. CONC. SURFACE COURSE, TYPE S9.5B	E3	PROP. APPROX. 7" ASPH. CONC. BASE COURSE, TYPE B25.0C
C2	PROP. APPROX. 3" ASPH. CONC. SURFACE COURSE, TYPE S9.5C	E4	PROP. VAR. DEPTH ASPH. CONC. BASE COURSE, TYPE B25.0B
C3	PROP.VAR. DEPTH ASPH. CONC. SURFACE COURSE, TYPE S9.5B	E5	PROP. VAR. DEPTH ASPH. CONC. BASE COURSE, TYPE B25.0C
C4	PROP.VAR. DEPTH ASPH. CONC. SURFACE COURSE, TYPE S9.5C	J1	PROP. APPROX. 6" AGGREGATE BASE COURSE
		J2	PROP. APPROX. 8" AGGREGATE BASE COURSE
D1	PROP. APPROX. 3" ASPH. CONC. INTERMEDIATE COURSE, TYPE I19.0B	J3	PROP. APPROX. 10" AGGREGATE BASE COURSE
		K	SUBGRADE STABILIZATION
D2	PROP. APPROX. 4" ASPH. CONC. INTERMEDIATE COURSE, TYPE I19.0C	P	PRIME COAT
		R1	PROP. 2'-6" CURB & GUTTER
D3	PROP. VAR. DEPTH ASPH. CONC. INTERMEDIATE COURSE, TYPE I19.0B	T	EARTH MATERIAL
		U	EXISTING ASPH. PAVEMENT
D4	PROP. VAR. DEPTH ASPH. CONC. INTERMEDIATE COURSE, TYPE I19.0C	W	VARIABLE DEPTH ASPH. PAVEMENT (SEE WEDGING DETAILS, SEE SHEET NO. 2)
E1	PROP. APPROX. 4" ASPH. CONC. BASE COURSE, TYPE B25.0B		
E2	PROP. APPROX. 4½" ASPH. CONC. BASE COURSE, TYPE B25.0B		

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

6/2/99
1/11/2006
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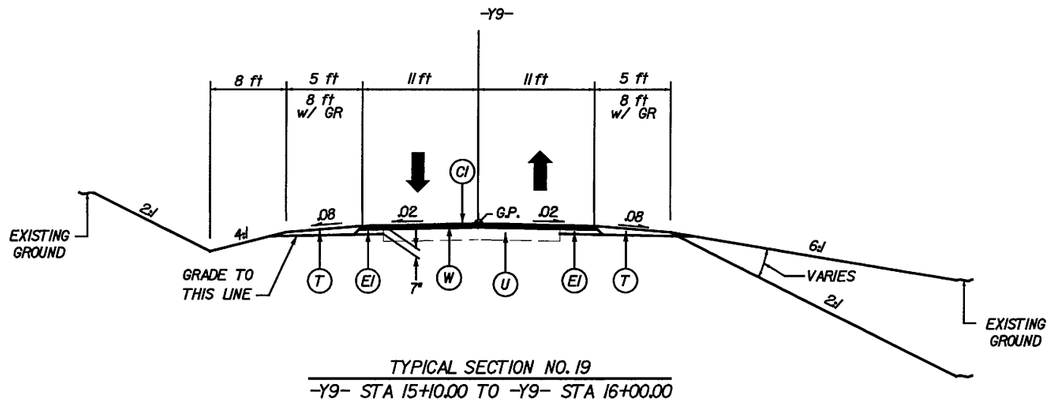
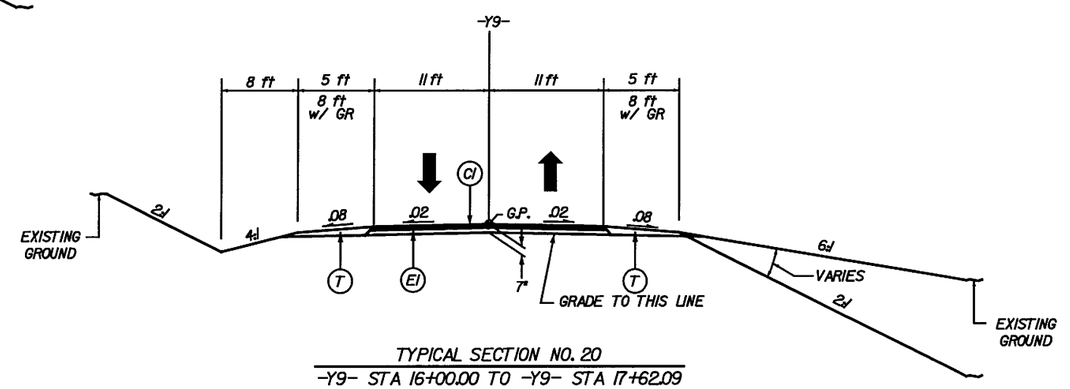
PROJECT REFERENCE NO.	SHEET NO.
R-2320G	2-G
ROADWAY DESIGN ENGINEER	PAVEMENT DESIGN ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

KO & ASSOCIATES, P.C.
Consulting Engineers
1011 SCHAUB DR., SUITE 202 RALEIGH, N.C. 27606
(919) 851-6066



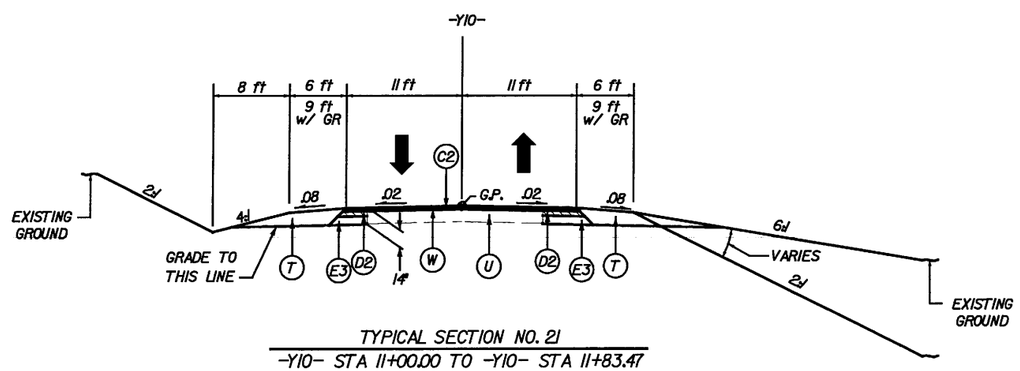
TYPICAL SECTION NO. 19
-Y9- STA 15+10.00 TO -Y9- STA 16+00.00



TYPICAL SECTION NO. 20
-Y9- STA 16+00.00 TO -Y9- STA 17+62.09

PAVEMENT SCHEDULE			
CODE	DESCRIPTION	CODE	DESCRIPTION
C1	PROP. APPROX. 3" ASPH. CONC. SURFACE COURSE, TYPE S9.5B	E3	PROP. APPROX. 7" ASPH. CONC. BASE COURSE, TYPE B25.0C
C2	PROP. APPROX. 3" ASPH. CONC. SURFACE COURSE, TYPE S9.5C	E4	PROP. VAR. DEPTH ASPH. CONC. BASE COURSE, TYPE B25.0B
C3	PROP.VAR. DEPTH ASPH. CONC. SURFACE COURSE, TYPE S9.5B	E5	PROP. VAR. DEPTH ASPH. CONC. BASE COURSE, TYPE B25.0C
C4	PROP.VAR. DEPTH ASPH. CONC. SURFACE COURSE, TYPE S9.5C	J1	PROP. APPROX. 6" AGGREGATE BASE COURSE
D1	PROP. APPROX. 3" ASPH. CONC. INTERMEDIATE COURSE, TYPE I19.0B	J2	PROP. APPROX. 8" AGGREGATE BASE COURSE
D2	PROP. APPROX. 4" ASPH. CONC. INTERMEDIATE COURSE, TYPE I19.0C	J3	PROP. APPROX. 10" AGGREGATE BASE COURSE
D3	PROP. VAR. DEPTH ASPH. CONC. INTERMEDIATE COURSE, TYPE I19.0B	K	SUBGRADE STABILIZATION
D4	PROP. VAR. DEPTH ASPH. CONC. INTERMEDIATE COURSE, TYPE I19.0C	P	PRIME COAT
E1	PROP. APPROX. 4" ASPH. CONC. BASE COURSE, TYPE B25.0B	R1	PROP. 2'-6" CURB & GUTTER
E2	PROP. APPROX. 4½" ASPH. CONC. BASE COURSE, TYPE B25.0B	T	EARTH MATERIAL
		U	EXISTING ASPH. PAVEMENT
		W	VARIABLE DEPTH ASPH. PAVEMENT (SEE WEDGING DETAILS, SEE SHEET NO. 2)

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



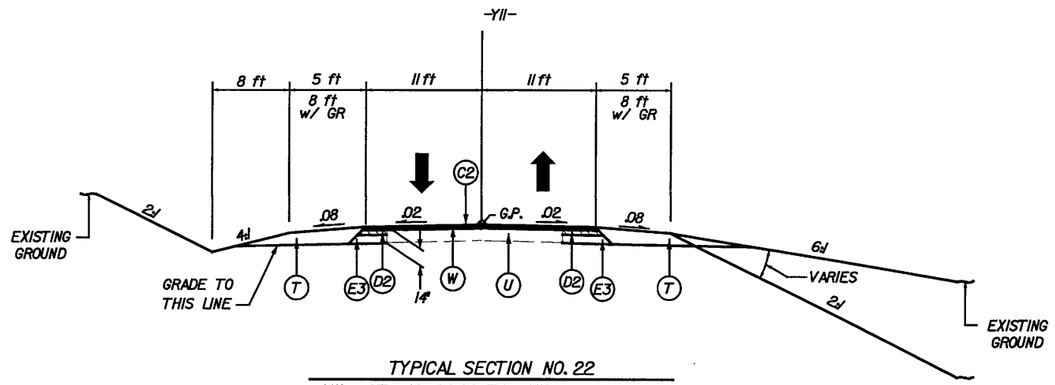
TYPICAL SECTION NO. 21
-Y10- STA 11+00.00 TO -Y10- STA 11+83.47

6/2/99

PROJECT REFERENCE NO.	SHEET NO.
R-2320G	2-H
ROADWAY DESIGN ENGINEER	PAVEMENT DESIGN ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

KO & ASSOCIATES, P.C.
Consulting Engineers
1011 SCHAUB DR., SUITE 202 RALEIGH, N.C. 27606
(919) 851-6066

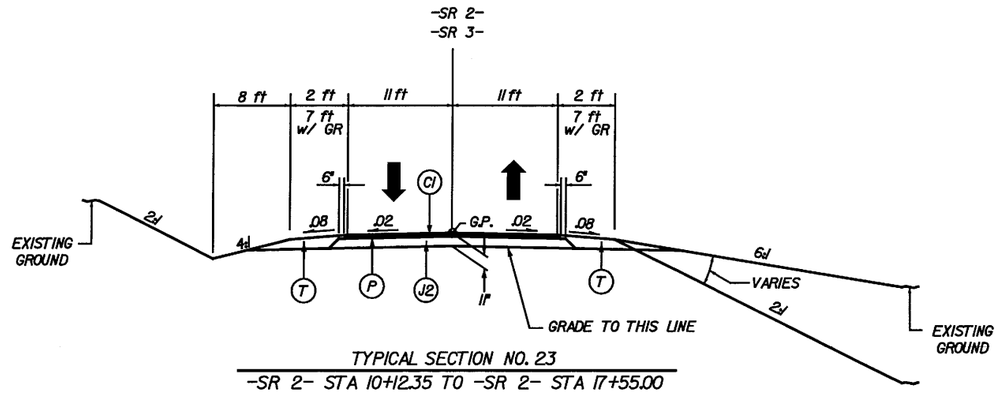


TYPICAL SECTION NO. 22
-Y11- STA 10+50.00 TO -Y11- STA 11+86.31

PAVEMENT SCHEDULE

CODE	DESCRIPTION
C1	PROP. APPROX. 3" ASPH. CONC. SURFACE COURSE, TYPE S9.5B
C2	PROP. APPROX. 3" ASPH. CONC. SURFACE COURSE, TYPE S9.5C
C3	PROP.VAR. DEPTH ASPH. CONC. SURFACE COURSE, TYPE S9.5B
C4	PROP.VAR. DEPTH ASPH. CONC. SURFACE COURSE, TYPE S9.5C
D1	PROP. APPROX. 3" ASPH. CONC. INTERMEDIATE COURSE, TYPE I19.0B
D2	PROP. APPROX. 4" ASPH. CONC. INTERMEDIATE COURSE, TYPE I19.0C
D3	PROP. VAR. DEPTH ASPH. CONC. INTERMEDIATE COURSE, TYPE I19.0B
D4	PROP. VAR. DEPTH ASPH. CONC. INTERMEDIATE COURSE, TYPE I19.0C
E1	PROP. APPROX. 4" ASPH. CONC. BASE COURSE, TYPE B25.0B
E2	PROP. APPROX. 4½" ASPH. CONC. BASE COURSE, TYPE B25.0B
E3	PROP. APPROX. 7" ASPH. CONC. BASE COURSE, TYPE B25.0C
E4	PROP. VAR. DEPTH ASPH. CONC. BASE COURSE, TYPE B25.0B
E5	PROP. VAR. DEPTH ASPH. CONC. BASE COURSE, TYPE B25.0C
J1	PROP. APPROX. 6" AGGREGATE BASE COURSE
J2	PROP. APPROX. 8" AGGREGATE BASE COURSE
J3	PROP. APPROX. 10" AGGREGATE BASE COURSE
K	SUBGRADE STABILIZATION
P	PRIME COAT
R1	PROP. 2'-6" CURB & GUTTER
T	EARTH MATERIAL
U	EXISTING ASPH. PAVEMENT
W	VARIABLE DEPTH ASPH. PAVEMENT (SEE WEDGING DETAILS, SEE SHEET NO. 2)

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



TYPICAL SECTION NO. 23
-SR 2- STA 10+12.35 TO -SR 2- STA 17+55.00
-SR 3- STA 10+32.00 TO -SR 3- STA 32+25.00

1/11/2006
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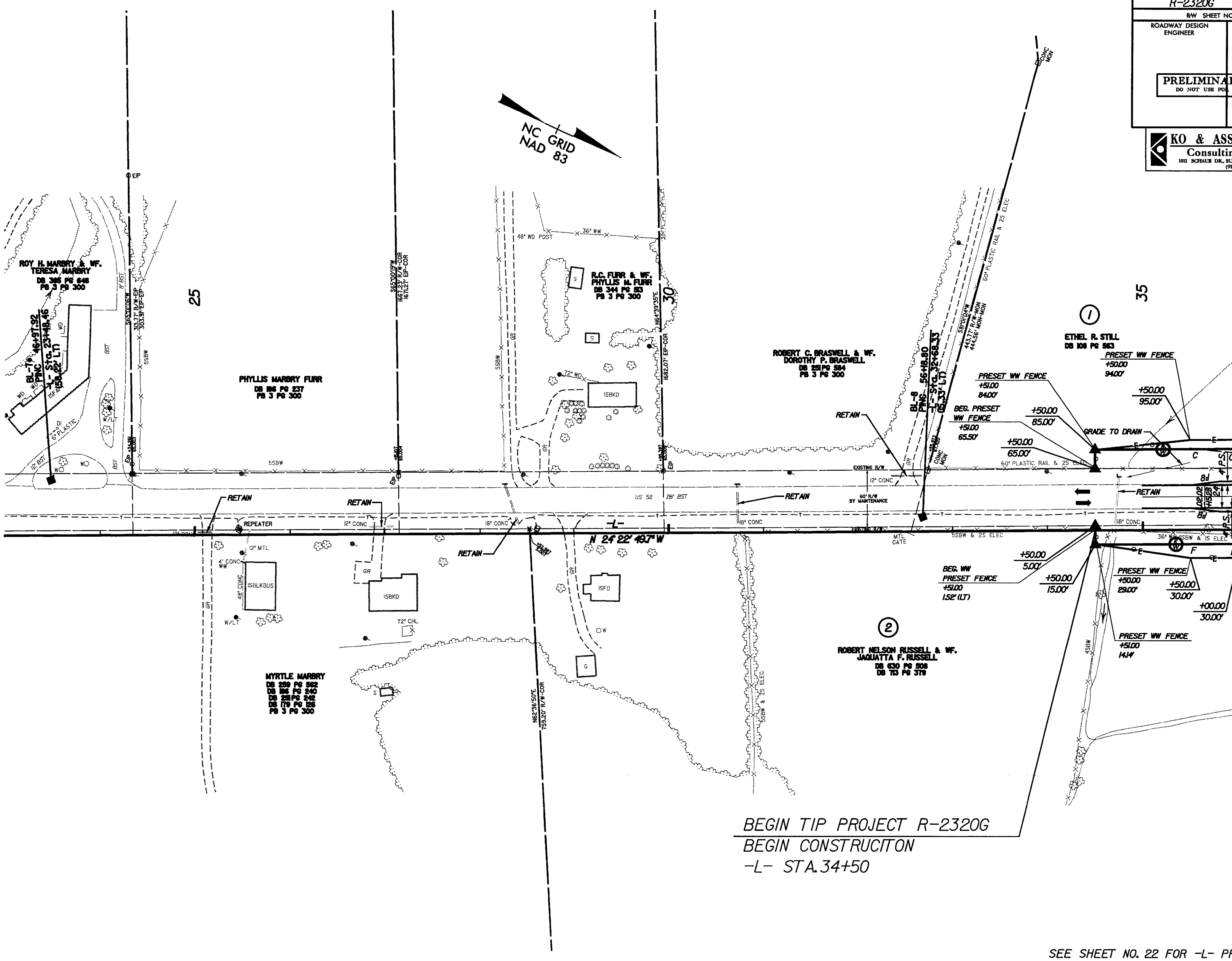
ko & associates, p.a.

PROJECT REFERENCE NO.	SHEET NO.
R-2320G	4
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

KO & ASSOCIATES, P.C.
Consulting Engineers
1011 SCHAUB DR., SUITE *202 RALEIGH, N.C. 27606
(919) 851-6066



NC GRID
NAD 83
ROY H. MARBRY & WF.
TERESA MARBRY
DB 365 PG 648
PB 3 PG 300
PHYLLIS MARBRY FURR
DB 186 PG 237
PB 3 PG 300
R.C. FURR & WF.
PHYLLIS M. FURR
DB 344 PG 53
PB 3 PG 300
ROBERT C. BRASWELL & WF.
DOROTHY P. BRASWELL
DB 251 PG 584
PB 3 PG 300
ETHEL R. STILL
DB 108 PG 563
ROBERT NELSON RUSSELL & WF.
JAQUATTA F. RUSSELL
DB 630 PG 508
DB 713 PG 379
MYRTLE MARBRY
DB 259 PG 562
DB 186 PG 240
DB 251 PG 242
DB 179 PG 126
PB 3 PG 300
25
30
35
RETAIN
REPEATER
US 52
-L-
N 24° 22' 49.7" W
PRESET WW FENCE
BEG. PRESET WW FENCE
GRADE TO DRAIN
BEG. WW PRESET FENCE
MATCH LINE - SHEET NO. 5 - STA. 36+00
BEGIN TIP PROJECT R-2320G
BEGIN CONSTRUCITON
-L- STA.34+50

SEE SHEET NO. 22 FOR -L- PROFILE

REVISIONS

8/17/99

1/11/2006
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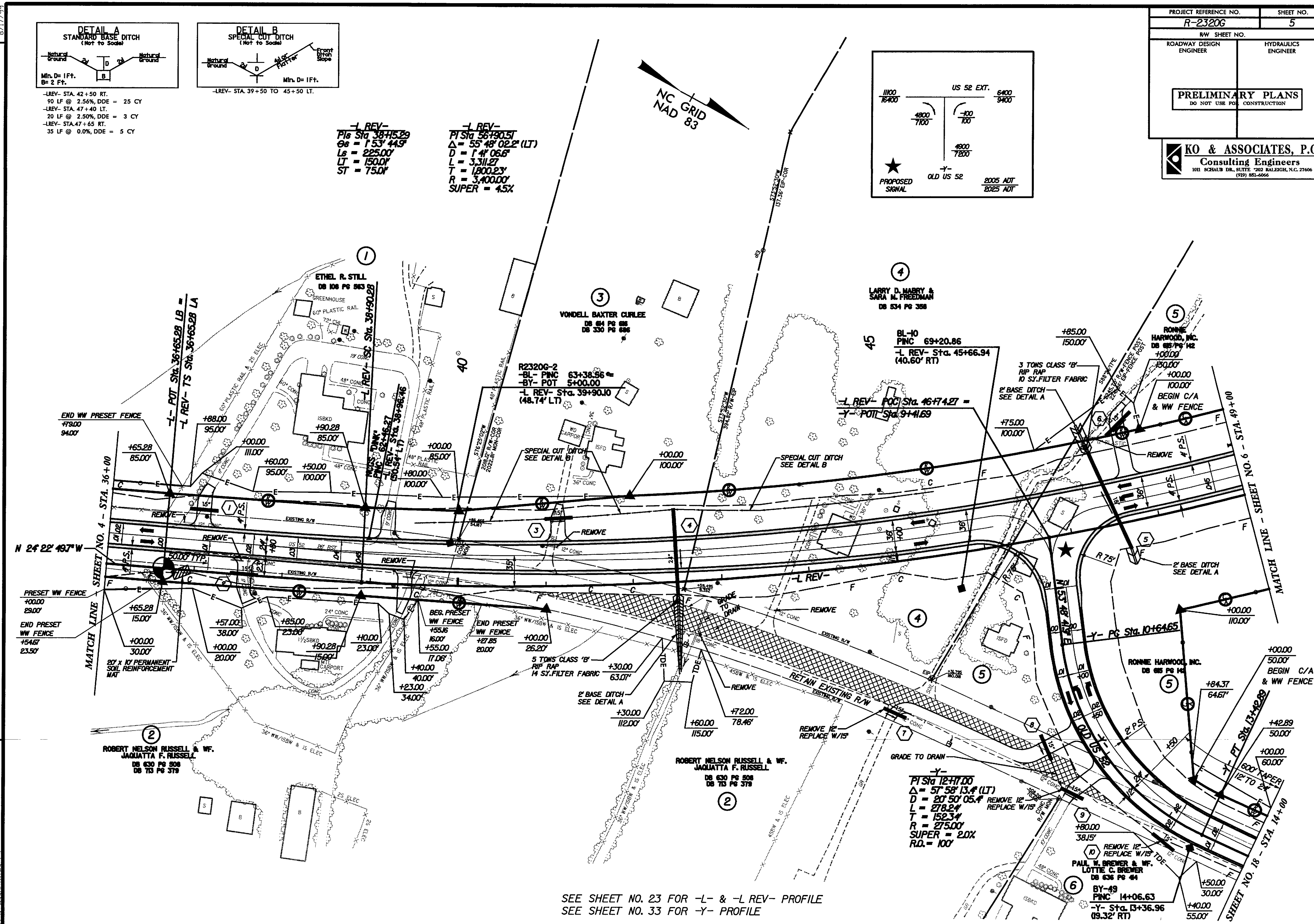
PROJECT REFERENCE NO.	SHEET NO.
R-2320G	5
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

KO & ASSOCIATES, P.C.
Consulting Engineers
1011 SCHAUB DR., SUITE 202 RALEIGH, N.C. 27606
(919) 851-6066

8/17/99

REVISIONS
11/04/04 R/W Revision Alignment Revision from Sta 36+65.28 -LREV- to Sta 74+26.65 -LREV-
5/10/05 R/W Revision Parcel 5 Owner Name Change



DETAIL A
STANDARD BASE DITCH
(Not to Scale)
Natural Ground
Min. D= 1 Ft.
B= 2 Ft.
-LREV- STA. 42+50 RT.
90 LF @ 2.56%, DDE = 25 CY
-LREV- STA. 47+40 LT.
20 LF @ 2.50%, DDE = 3 CY
-LREV- STA.47+65 RT.
35 LF @ 0.0%, DDE = 5 CY
DETAIL B
SPECIAL CUT DITCH
(Not to Scale)
Natural Ground
4:1 or Flatter
Front Ditch Slope
Min. D= 1 Ft.
-LREV- STA. 39+50 TO 45+50 LT.
-L REV-
PIs Sta 38+15.29
Θs = 1° 53' 44.9"
Ls = 225.00'
LT = 150.01'
ST = 75.01'
-L REV-
PI Sta 56+90.51
Δ = 55° 48' 02.2" (LT)
D = 1° 41' 06.6"
L = 3,311.27
T = 1,800.23'
R = 3,400.00'
SUPER = 4.5%
NC GRID NAD 83
US 52 EXT.
11100 / 16400
6400 / 9400
4800 / 7100
-100 / 100
4900 / 7200
-Y- OLD US 52
PROPOSED SIGNAL
2005 ADT / 2025 ADT
ETHEL R. STILL
DB 108 PG 563
VONDELL BAXTER CURLEE
DB 614 PG 616
DB 330 PG 686
LARRY D. MABRY & SARA M. FREEDMAN
DB 534 PG 358
RONNIE HARWOOD, INC.
DB 615 PG 142
ROBERT NELSON RUSSELL & WF. JAQUATTA F. RUSSELL
DB 630 PG 508
DB 713 PG 379
PAUL W. BREWER & WF. LOTTIE C. BREWER
DB 636 PG 414
R2320G-2
-BL- PINC 63+38.56
-BY- POT 5+00.00
-L REV- Sta. 39+90.10 (48.74' LT)
BL-10
PINC 69+20.86
-L REV- Sta. 45+66.94 (40.60' RT)
-L REV- POC Sta. 46+74.27 =
-Y- POT Sta. 9+41.69
-L- POT Sta. 36+65.28 LB =
-L REV- TS Sta. 36+65.28 LA
-L REV- SC Sta. 38+90.28
-L REV- Sta. 38+96.46
-Y- PC Sta. 10+64.65
-Y- PT Sta. 13+42.89
N 24° 22' 49.7" W
MATCH LINE SHEET NO. 4 - STA. 36+00
MATCH LINE - SHEET NO. 6 - STA. 49+00
SHEET NO. 18 - STA. 14+00
-Y-
PI Sta 12+17.00
Δ = 51° 58' 13.4" (LT)
D = 20° 50' 05.4"
L = 278.24'
T = 152.34'
R = 275.00'
SUPER = 2.0%
R.O. = 100'
BY-49
PINC 14+06.63
-Y- Sta. 13+36.96 (19.32' RT)
END WW PRESET FENCE
PRESET WW FENCE
BEG. PRESET WW FENCE
END PRESET WW FENCE
BEGIN C/A & WW FENCE
SPECIAL CUT DITCH SEE DETAIL B
2' BASE DITCH SEE DETAIL A
3 TONS CLASS 'B' RIP RAP 10 SY.FILTER FABRIC
5 TONS CLASS 'B' RIP RAP 14 SY.FILTER FABRIC
20' x 10' PERMANENT SOIL REINFORCEMENT MAT
RETAIN EXISTING R/W
REMOVE 12" REPLACE W/15"
GRADE TO DRAIN
600' TAPER 12' TO 24'
OLD US 52
REMOVE

SEE SHEET NO. 23 FOR -L- & -L REV- PROFILE
SEE SHEET NO. 33 FOR -Y- PROFILE

1/11/2006
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PROJECT REFERENCE NO.	SHEET NO.
R-2320G	6
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

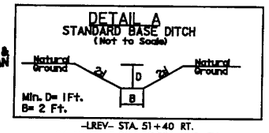
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

KO & ASSOCIATES, P.C.
Consulting Engineers
1011 SCHAUB DR., SUITE 202 RALEIGH, N.C. 27606
(919) 851-6066

8/17/99

REVISIONS
11/04/04 R/W Revision Alignment Revision from Sta 36+65.28 -LREV- to Sta 74+26.65 -LREV-
5/10/05 R/W Revision Parcel 5 Owner Name Change

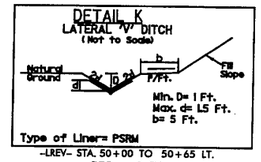
DETAIL A
STANDARD BASE DITCH
(Not to Scale)



-LREV- STA. 51+40 RT.
36 LF @ 2.00%, DDE = 3 CY

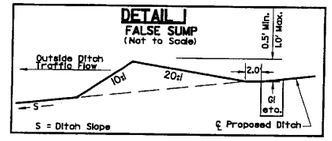
LARRY D. MABRY &
SARA M. FREEDMAN
DB 534 PG 358

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



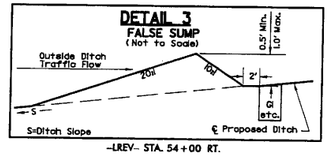
Type of Liner= PSRM
-LREV- STA. 50+00 TO 50+65 LT.
DDE = 9 CY

DETAIL J
FALSE SUMP
(Not to Scale)



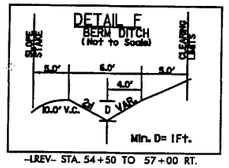
-LREV- STA. 54+00 LT.

DETAIL 3
FALSE SUMP
(Not to Scale)



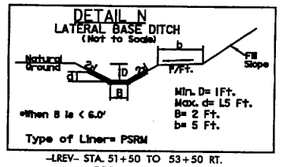
-LREV- STA. 54+00 RT.

DETAIL F
BERM DITCH
(Not to Scale)



-LREV- STA. 54+50 TO 57+00 RT.

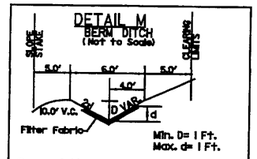
DETAIL N
LATERAL BASE DITCH
(Not to Scale)



Type of Liner= PSRM
-LREV- STA. 51+50 TO 53+50 RT.
DDE = 135 CY

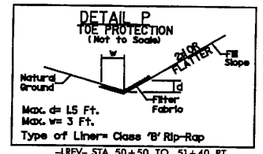
NC GRID
NAD 83

DETAIL M
BERM DITCH
(Not to Scale)



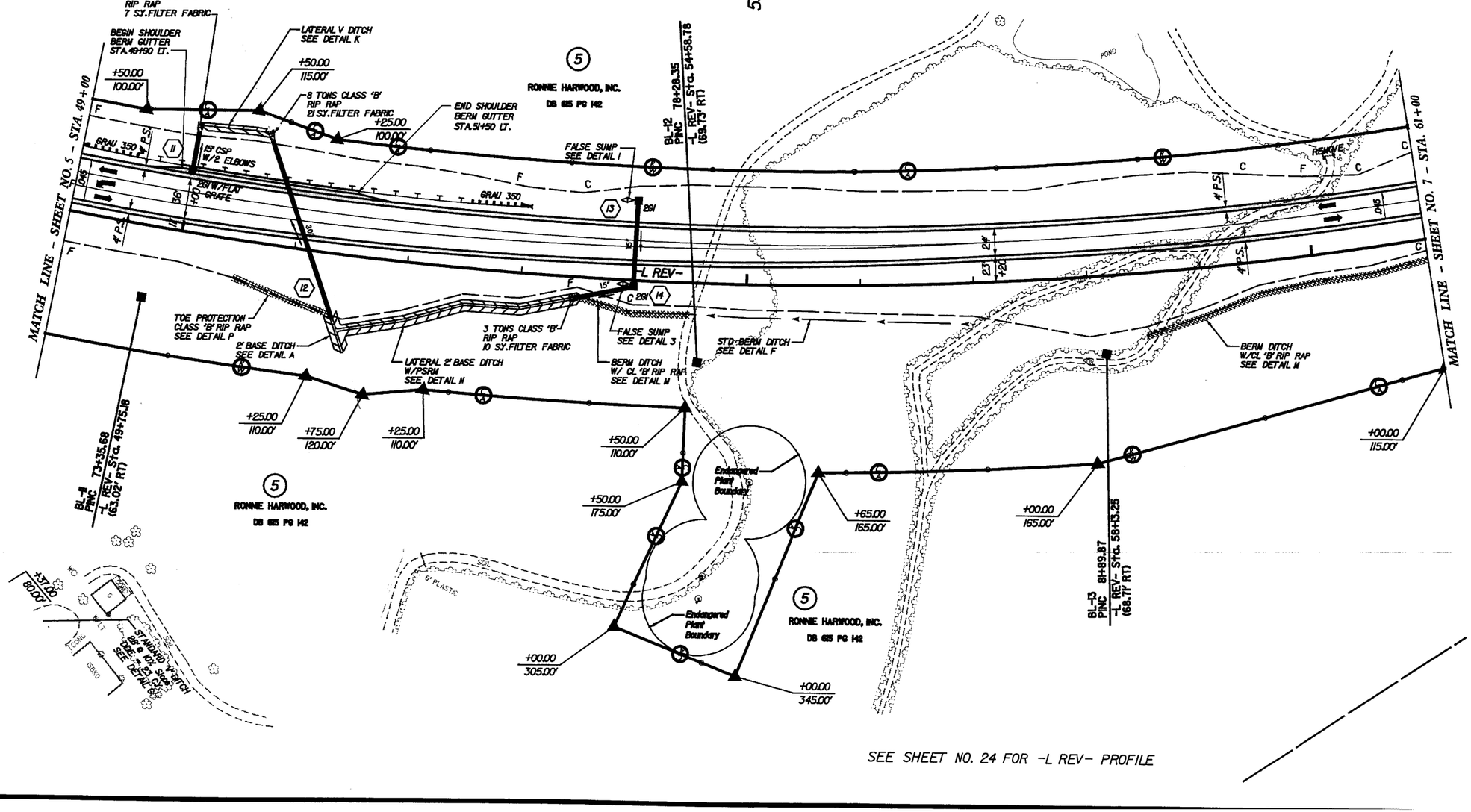
Type of Liner= CLASS 'B' RIP RAP
-LREV- STA. 53+50 TO 54+50 RT.
CL. B RIPRAP = 35 TONS
FILTER FABRIC = 105 SY.
-LREV- STA. 58+50 TO 61+50 RT.
CL. B RIPRAP = 105 TONS
FILTER FABRIC = 314 SY

DETAIL P
TOE PROTECTION
(Not to Scale)



Type of Liner= Class 'B' Rip-Rap
-LREV- STA. 50+50 TO 51+40 RT.
CL. B RIPRAP = 41 TONS
FILTER FABRIC = 117 SY

-L REV-
PI Sta 56+90.51
Δ= 55° 48' 02.2" (LT)
D = 1° 41' 06.6"
L = 3,311.27'
T = 1,800.23'
R = 3,400.00'
SUPER = 4.5%



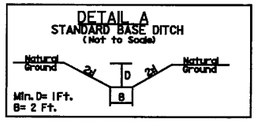
SEE SHEET NO. 24 FOR -L REV- PROFILE

PROJECT REFERENCE NO.	SHEET NO.
R-2320G	7
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

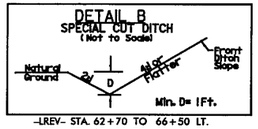
KO & ASSOCIATES, P.C.
Consulting Engineers
1011 SCHAUB DR., SUITE 202 RALEIGH, N.C. 27606
(919) 851-6066

DETAIL A
STANDARD BASE DITCH
(Not to Scale)



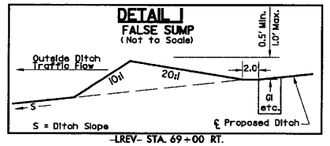
-LREV- STA. 61+95 RT.
30 LF @ 3.0%, DDE = 3 CY
-LREV- STA. 68+15 RT.
75 LF @ 3.7%, DDE = 10 CY
-LREV- STA. 69+00 LT.
160 LF @ 0.2%, DDE = 25 CY.
-LREV- STA. 72+40 TO 72+75 LT.
35 LF @ 0.25%, DDE = 15 CY

DETAIL B
SPECIAL CUT DITCH
(Not to Scale)



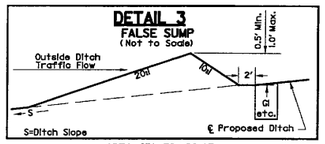
-LREV- STA. 62+70 TO 66+50 LT.
-LREV- STA. 67+00 TO 68+00 RT.

DETAIL J
FALSE SUMP
(Not to Scale)



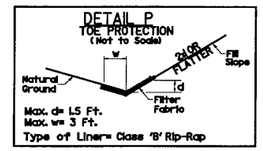
-LREV- STA. 69+00 RT.
-LREV- STA. 69+50 LT.

DETAIL 3
FALSE SUMP
(Not to Scale)



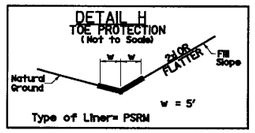
-LREV- STA. 72+20 LT.

DETAIL P
TOE PROTECTION
(Not to Scale)



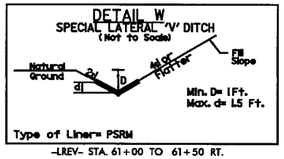
-LREV- STA. 73+50 TO 76+00 RT.
CL. B RIPRAP = 115 TONS
FILTER FABRIC = 325 SY
Type of Liner= Class 'B' Rip-Rap

DETAIL H
TOE PROTECTION
(Not to Scale)



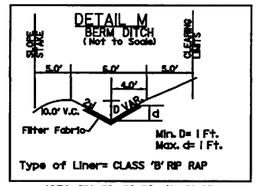
Type of Liner= PSRM
-LREV- STA. 61+35 TO 62+35 LT.

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



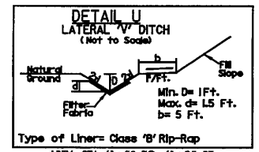
Type of Liner= PSRM
-LREV- STA. 61+00 TO 61+50 RT.

DETAIL M
BERM DITCH
(Not to Scale)



Type of Liner= CLASS 'B' RIP RAP
-LREV- STA. 58+50 TO 61+50 RT.

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

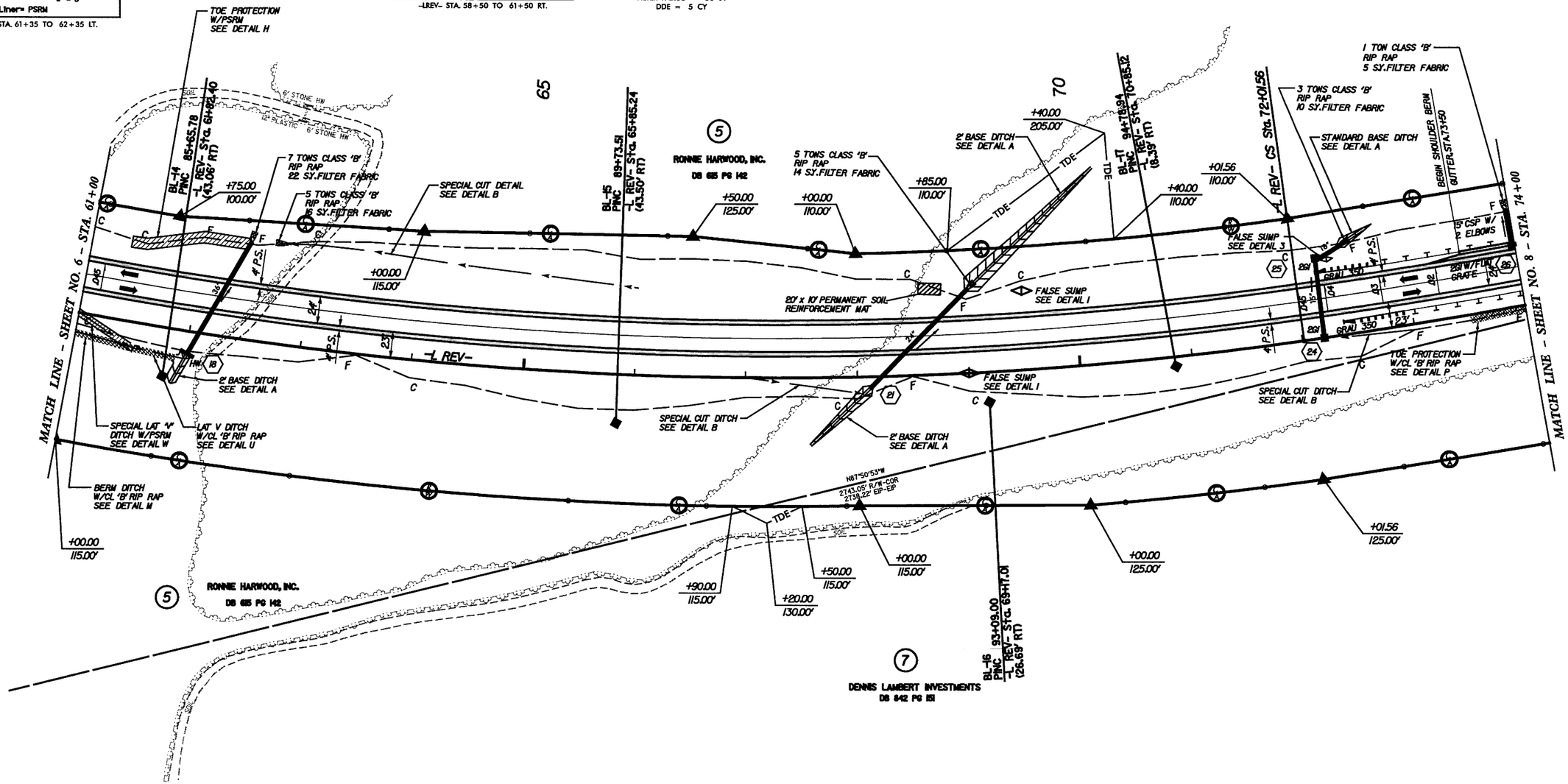


Type of Liner= Class 'B' Rip-Rap
-LREV- STA. 61+50 TO 61+95 RT.
CL. B RIPRAP = 21 TONS
FILTER FABRIC = 58 SY
DDE = 5 CY

NC GRID NAD 83

-L REV-
PI Sta 56+90.51
Δ = 55° 48' 02.2" (LT)
D = 1° 41' 06.6"
L = 3,311.27'
T = 1,800.23'
R = 3,400.00'
SUPER = 4.5%

-L REV-
PIs Sta 72+76.56
Θs = 1° 53' 44.9"
Ls = 225.00'
LT = 150.01'
ST = 75.01'



DATE		
11/04/04	R/W Revision	Alignment Revision from Sta 36+65.28 -LREV- to Sta 74+26.65 -LREV-
5/10/05	R/W Revision	Parcels 5 & 7 Owner Name Change

REVISIONS

8/17/99

1/11/2006
F:\roadway\pro\r-2320g_r-dy_psh_07.dgn
KO & Associates, P.C.

PROJECT REFERENCE NO.	SHEET NO.
R-2320G	8

RW SHEET NO.

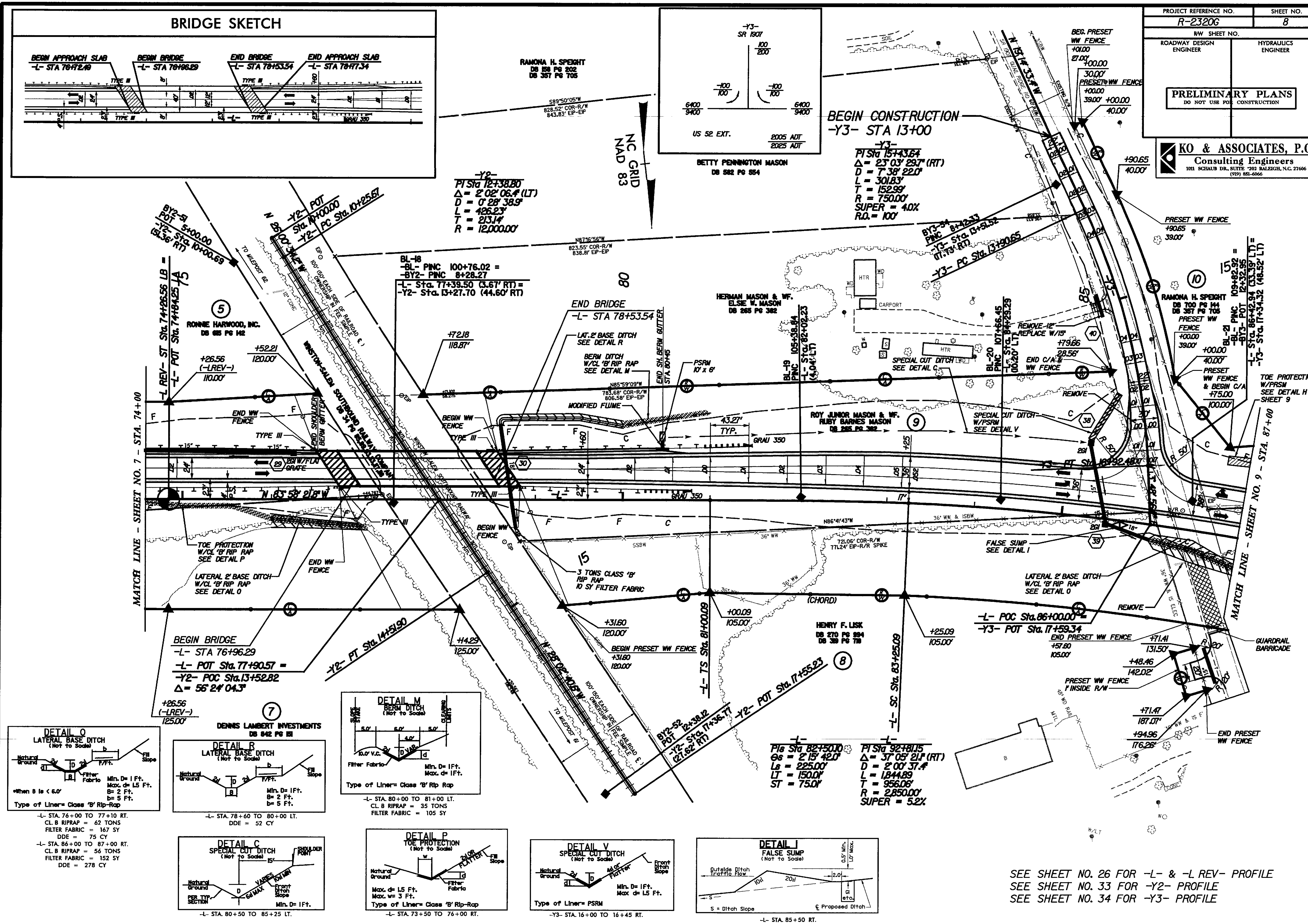
ROADWAY DESIGN ENGINEER | HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

KO & ASSOCIATES, P.C.
Consulting Engineers
1011 SCHAUB DR., SUITE 202 RALEIGH, N.C. 27606
(919) 851-6066

REVISIONS

11/04/04 R/W Revision Alignment Revision from Sta 36+65.28 -LREV- to Sta 74+26.65 -LREV-
5/10/05 R/W Revision Parcels 5 & 7 Owner Name Change
11/17/05 R/W Revision Parcel 9 Proposed R/W Line moved to Property Line



SEE SHEET NO. 26 FOR -L- & -L REV- PROFILE
SEE SHEET NO. 33 FOR -Y2- PROFILE
SEE SHEET NO. 34 FOR -Y3- PROFILE

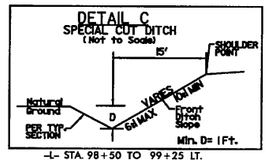
PROJECT REFERENCE NO.	SHEET NO.
R-2320G	9
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

KO & ASSOCIATES, P.C.
Consulting Engineers
1011 SCHAUB DR., SUITE 202 RALEIGH, N.C. 27606
(919) 851-6066

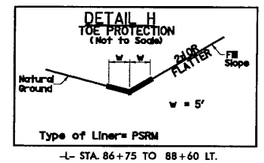
REVISIONS 8/17/99

DETAIL C
SPECIAL CUT DITCH
(Not to Scale)



-L- STA. 98+50 TO 99+25 LT.

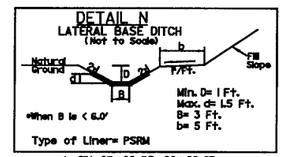
DETAIL H
TOE PROTECTION
(Not to Scale)



Type of Liner= PSRM

-L- STA. 86+75 TO 88+60 LT.
-L- STA. 92+75 TO 94+50 LT.
-L- STA. 92+50 TO 93+70 RT.

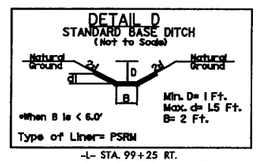
DETAIL N
LATERAL BASE DITCH
(Not to Scale)



Type of Liner= PSRM

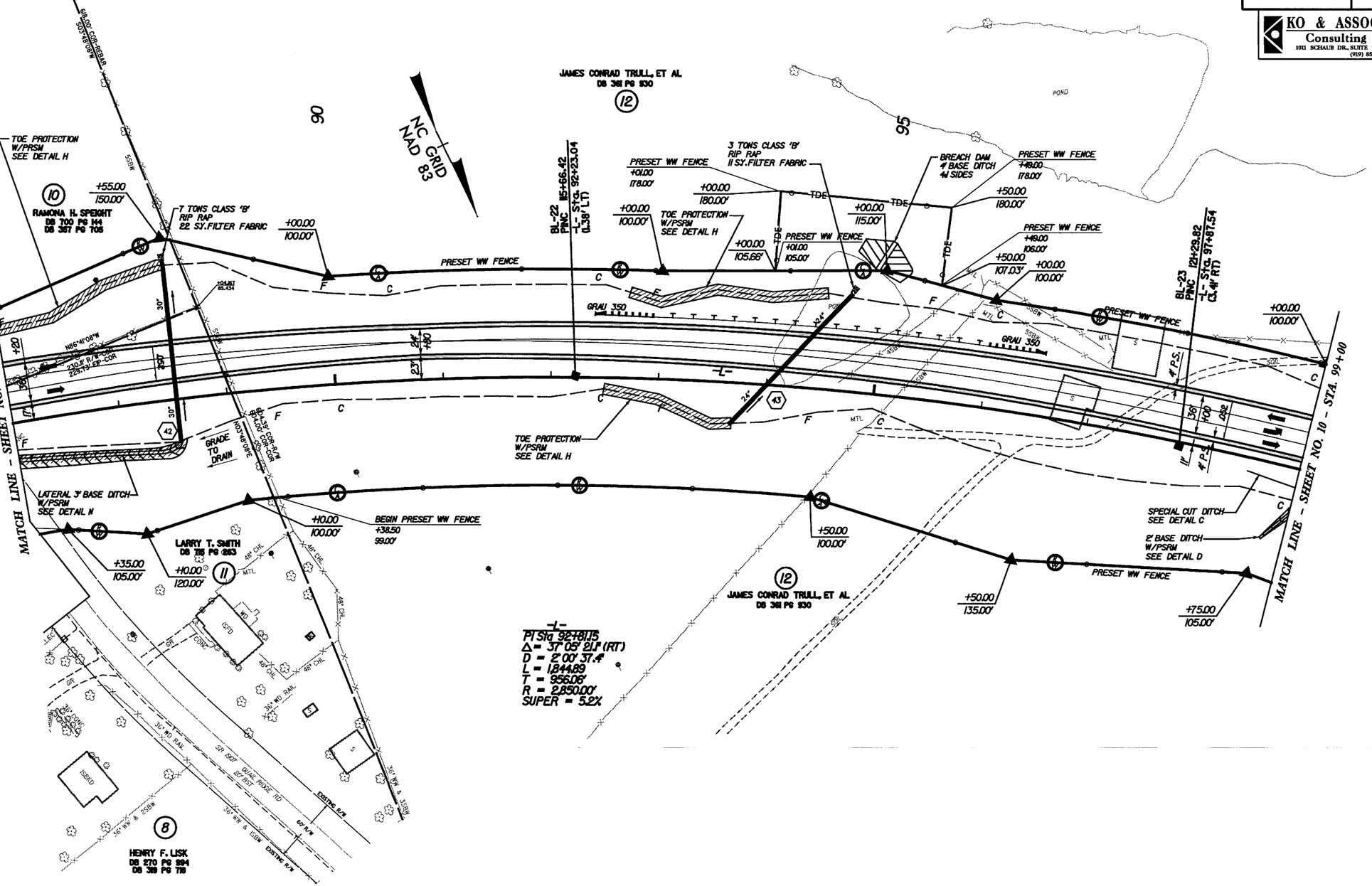
-L- STA. 87+00 TO 88+55 RT.
DDE = 111 CY

DETAIL D
STANDARD BASE DITCH
(Not to Scale)



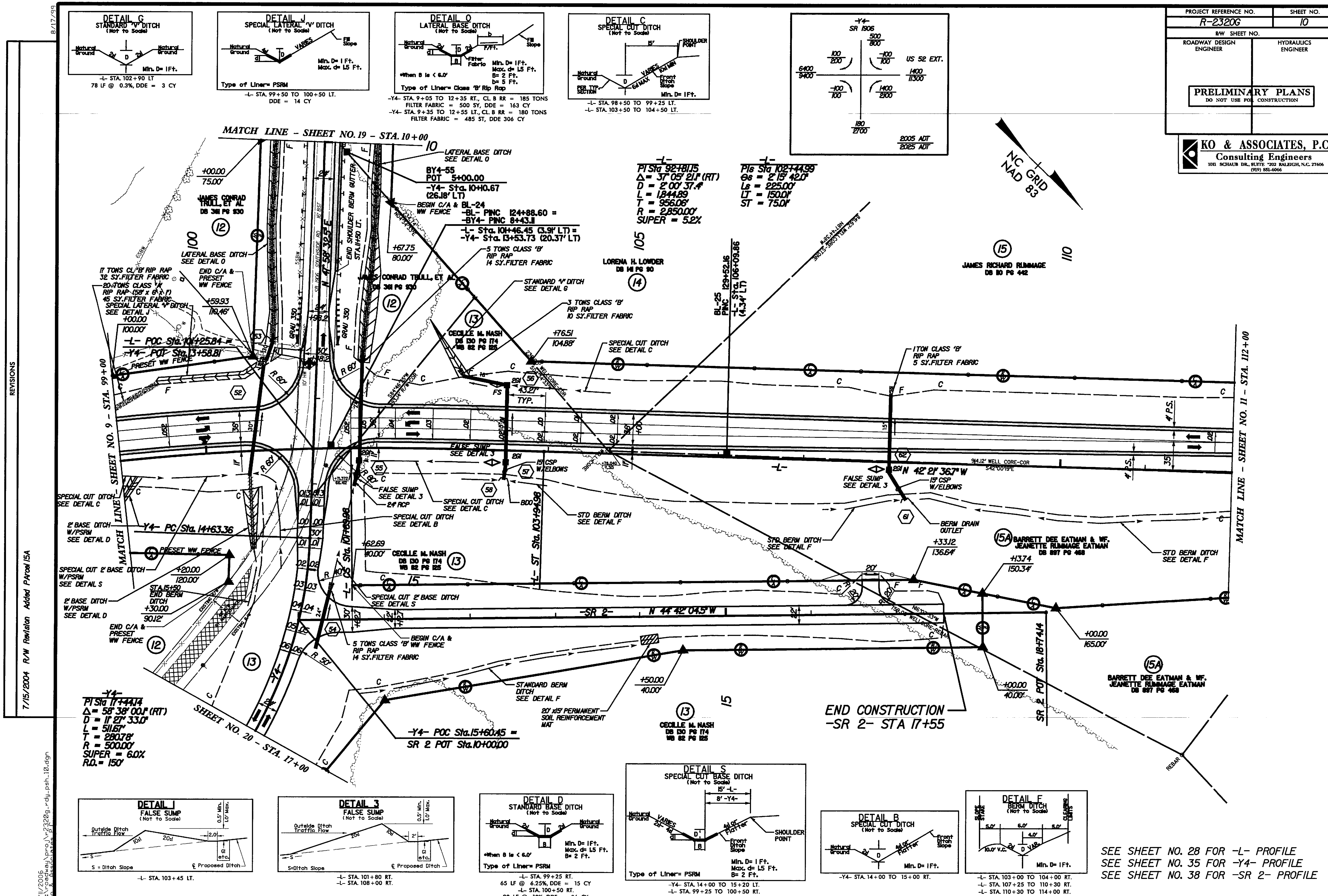
Type of Liner= PSRM

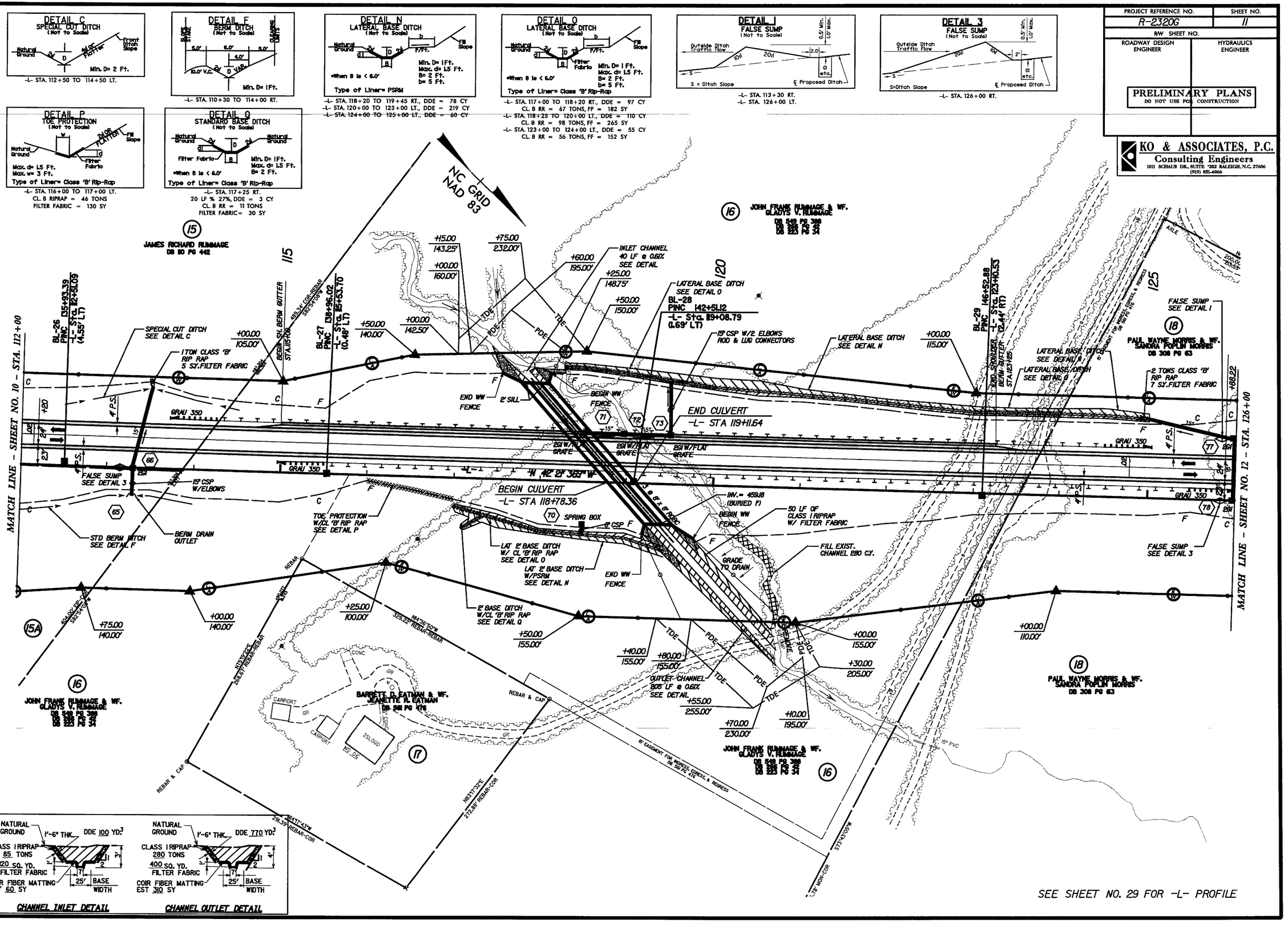
-L- STA. 99+25 RT.
65 LF @ 6.25%, DDE = 15 CY



SEE SHEET NO. 27 FOR -L- PROFILE

1/11/2006
R:\roadway\proj\r-2320g-rdy_psh_09.dgn
KO & Associates, P.C.


PROJECT REFERENCE NO. R-2320G
SHEET NO. 10
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION
KO & ASSOCIATES, P.C.
Consulting Engineers
1011 SCHAUB DR., SUITE 202 RALEIGH, N.C. 27606
(919) 851-6066
NC GRID NAD 83
REVISIONS
7/15/2004 R/W Revision Added Parcel 15A
DETAIL G
STANDARD "V" DITCH
(Not to Scale)
-L- STA. 102+90 LT
78 LF @ 0.3%, DDE = 3 CY
DETAIL J
SPECIAL LATERAL "V" DITCH
(Not to Scale)
Type of Liner= PSRM
-L- STA. 99+50 TO 100+50 LT.
DDE = 14 CY
DETAIL O
LATERAL BASE DITCH
(Not to Scale)
Type of Liner= Class 'B' Rip Rap
-Y4- STA. 9+05 TO 12+35 RT., CL B RR = 185 TONS
FILTER FABRIC = 500 SY, DDE = 163 CY
-Y4- STA. 9+35 TO 12+55 LT., CL B RR = 180 TONS
FILTER FABRIC = 485 SY, DDE 306 CY
DETAIL C
SPECIAL CUT DITCH
(Not to Scale)
-L- STA. 98+50 TO 99+25 LT.
-L- STA. 103+50 TO 104+50 LT.
-Y4- SR 1906
US 52 EXT.
2005 ADT
2025 ADT
MATCH LINE - SHEET NO. 19 - STA. 10+00
MATCH LINE - SHEET NO. 9 - STA. 99+00
MATCH LINE - SHEET NO. 11 - STA. 112+00
SHEET NO. 20 - STA. 17+00
JAMES CONRAD TRULL, ET AL
DB 361 PG 930
LORENA H. LOWDER
DB 141 PG 90
JAMES RICHARD RUMMAGE
DB 110 PG 442
CECILLE M. NASH
DB 130 PG 174
WB 82 PG 125
BARRETT DEE EATMAN & WF. JEANETTE RUMMAGE EATMAN
DB 897 PG 468
-L-
PI Sta 92+81.15
Δ = 37° 05' 21.1" (RT)
D = 2° 00' 37.4"
L = 1,844.89
T = 956.06'
R = 2,850.00'
SUPER = 5.2%
-L-
PIs Sta 102+44.99
θs = 2° 15' 42.0"
Ls = 225.00'
LT = 150.01'
ST = 75.01'
-Y4-
PI Sta 17+44.14
Δ = 58° 38' 00.1" (RT)
D = 11° 27' 33.0"
L = 511.67'
T = 280.78'
R = 500.00'
SUPER = 6.0%
R.O. = 150'
BY4-55
POT 5+00.00
-Y4- Sta. 10+10.67
(26.18' LT)
-BL- PINC 124+88.60 =
-BY4- PINC 8+43.11
-L- Sta. 101+46.45 (3.91' LT) =
-Y4- Sta. 13+53.73 (20.37' LT)
-L- POC Sta. 101+25.84 =
-Y4- POT Sta. 13+58.81
-Y4- PC Sta. 14+63.36
-Y4- POC Sta. 15+60.45 =
SR 2 POT Sta. 10+00.00
N 42° 21' 36.7" W
N 44° 42' 04.5" W
END CONSTRUCTION
-SR 2- STA 17+55
DETAIL I
FALSE SUMP
(Not to Scale)
-L- STA. 103+45 LT.
DETAIL 3
FALSE SUMP
(Not to Scale)
-L- STA. 101+80 RT.
-L- STA. 108+00 RT.
DETAIL D
STANDARD BASE DITCH
(Not to Scale)
Type of Liner= PSRM
-L- STA. 99+25 RT.
65 LF @ 6.25%, DDE = 15 CY
-L- STA. 100+50 RT.
90 LF @ 10%, DDE = 36 CY
DETAIL S
SPECIAL CUT BASE DITCH
(Not to Scale)
Type of Liner= PSRM
-Y4- STA. 14+00 TO 15+20 LT.
-L- STA. 99+25 TO 100+50 RT.
DETAIL B
SPECIAL CUT DITCH
(Not to Scale)
-Y4- STA. 14+00 TO 15+00 RT.
DETAIL F
BERM DITCH
(Not to Scale)
-L- STA. 103+00 TO 104+00 RT.
-L- STA. 107+25 TO 110+30 RT.
-L- STA. 110+30 TO 114+00 RT.
SEE SHEET NO. 28 FOR -L- PROFILE
SEE SHEET NO. 35 FOR -Y4- PROFILE
SEE SHEET NO. 38 FOR -SR 2- PROFILE
8/17/99
1/11/2006


DETAIL C
SPECIAL CUT DITCH
(Not to Scale)
Natural Ground
Slope Flatter
Front Ditch Slope
Min. D= 2 Ft.
-L- STA. 112+50 TO 114+50 LT.
DETAIL F
BERM DITCH
(Not to Scale)
SLOPE STAKE
CLEARING LIMITS
5.0'
6.0'
4.0'
10.0' V.C.
Min. D= 1Ft.
-L- STA. 110+30 TO 114+00 RT.
DETAIL N
LATERAL BASE DITCH
(Not to Scale)
Fill Slope
F/Ft.
Min. D= 1Ft.
Max. d= 1.5 Ft.
B= 2 Ft.
b= 5 Ft.
*When B is < 6.0'
Type of Liner= PSRM
-L- STA. 118+20 TO 119+45 RT., DDE = 78 CY
-L- STA. 120+00 TO 123+00 LT., DDE = 219 CY
-L- STA. 124+00 TO 125+00 LT., DDE = 60 CY
DETAIL O
LATERAL BASE DITCH
(Not to Scale)
Filter Fabric
Min. D= 1 Ft.
Max. d= 1.5 Ft.
B= 2 Ft.
b= 5 Ft.
*When B is < 6.0'
Type of Liner= Class 'B' Rip-Rap
-L- STA. 117+00 TO 118+20 RT., DDE = 97 CY
CL. B RR = 67 TONS, FF = 182 SY
-L- STA. 118+25 TO 120+00 LT., DDE = 110 CY
CL. B RR = 98 TONS, FF = 265 SY
-L- STA. 123+00 TO 124+00 LT., DDE = 55 CY
CL. B RR = 56 TONS, FF = 152 SY
DETAIL I
FALSE SUMP
(Not to Scale)
Outside Ditch Traffic Flow
10d
20d
0.5' Min.
1.0' Max.
2.0'
d
etc.
S = Ditch Slope
℄ Proposed Ditch
-L- STA. 113+30 RT.
-L- STA. 126+00 LT.
DETAIL 3
FALSE SUMP
(Not to Scale)
Outside Ditch Traffic Flow
20d
10d
2'
0.5' Min.
1.0' Max.
d
etc.
S=Ditch Slope
℄ Proposed Ditch
-L- STA. 126+00 RT.
DETAIL P
TOE PROTECTION
(Not to Scale)
W
2d
2d
FALSE FLATTER
Fill Slope
Natural Ground
d
Filter Fabric
Max. d= 1.5 Ft.
Max. w= 3 Ft.
Type of Liner= Class 'B' Rip-Rap
-L- STA. 116+00 TO 117+00 LT.
CL. B RIPRAP = 46 TONS
FILTER FABRIC = 130 SY
DETAIL Q
STANDARD BASE DITCH
(Not to Scale)
Natural Ground
2d
D
d
2d
Natural Ground
Filter Fabric
B
Min. D= 1Ft.
Max. d= 1.5 Ft.
B= 2 Ft.
*When B is < 6.0'
Type of Liner= Class 'B' Rip-Rap
-L- STA. 117+25 RT.
20 LF % 27%, DDE = 3 CY
CL. B RR = 11 TONS
FILTER FABRIC= 30 SY
PROJECT REFERENCE NO.
R-2320G
SHEET NO.
11
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION
KO & ASSOCIATES, P.C.
Consulting Engineers
1011 SCHAUB DR., SUITE 202 RALEIGH, N.C. 27606
(919) 851-6066
REVISIONS
8/17/99
7/15/2004 R/W Revision Added Parcel 15A
MATCH LINE - SHEET NO. 10 - STA. 112+00
MATCH LINE - SHEET NO. 12 - STA. 126+00
N.C. GRID NAD 83
(15) JAMES RICHARD RUMMAGE DB 110 PG 442
(16) JOHN FRANK RUMMAGE & WF. GLADYS V. RUMMAGE DB 548 PG 388 DB 555 PG 32 DB 223 PG 34
(17) BARRETT D. EATMAN & WF. JEANETTE R. EATMAN DB 561 PG 476
(18) PAUL WAYNE MORRIS & WF. SANDRA POPLIN MORRIS DB 308 PG 63
BL-26 PINC 135+93.39 -L- Sta. 112+50.09 (4.55' LT)
BL-27 PINC 138+96.02 -L- Sta. 115+53.70 (0.48' LT)
BL-28 PINC 142+51.12 -L- Sta. 119+08.79 (1.69' LT)
BL-29 PINC 146+52.88 -L- Sta. 123+90.53 (12.44' RT)
BEGIN SH. BERM GUTTER STA.115+70.00
END SHOULDER BERM GUTTER STA.123+90.25
SPECIAL CUT DITCH SEE DETAIL C
1 TON CLASS 'B' RIP RAP 5 SY. FILTER FABRIC
INLET CHANNEL 40 LF @ 0.61% SEE DETAIL
LATERAL BASE DITCH SEE DETAIL N
LATERAL BASE DITCH SEE DETAIL O
15' CSP W/2 ELBOWS ROD & LUG CONNECTORS
FALSE SUMP SEE DETAIL I
2 TONS CLASS 'B' RIP RAP 7 SY. FILTER FABRIC
END WW FENCE
2' SILL
BEGIN WW FENCE
END CULVERT -L- STA 119+11.64
BEGIN CULVERT -L- STA 118+78.36
FALSE SUMP SEE DETAIL 3
STD BERM DITCH SEE DETAIL F
BERM DRAIN OUTLET
TOE PROTECTION W/CL 'B' RIP RAP SEE DETAIL P
SPRING BOX
8" CSP
INV.= 459.18 (BURIED 1')
50 LF OF CLASS I RIPRAP W/ FILTER FABRIC
FILL EXIST. CHANNEL 280 CY.
GRADE TO DRAIN
LAT. 2' BASE DITCH W/ CL 'B' RIP RAP SEE DETAIL O
LAT. 2' BASE DITCH W/PSRM SEE DETAIL N
2' BASE DITCH W/CL 'B' RIP RAP SEE DETAIL Q
OUTLET CHANNEL 205 LF @ 0.61% SEE DETAIL
CARPORT
CONC
WOOD
25'LOGD
MD DIA
REBAR & CAP
REBAR
CMP
15" PVC
15' EASEMENT FOR INGRESS, EGRESS & REGRESS DB 561 PG 476
N 42° 21' 36.2" W
N 36°50'W 323.22' REBAR-REBAR
N 17°19'E 268.67' REBAR-REBAR
N 83°17'E 272.88' REBAR-COR
S 44°17'43"W 291.39' REBAR-COR
S 73°43'05"W
.78' MON-COR
SEE SHEET NO. 29 FOR -L- PROFILE
NATURAL GROUND
1'-6" THK.
DDE 100 YD.³
CLASS I RIPRAP 85 TONS
120 SQ. YD. FILTER FABRIC
COIR FIBER MATTING EST 60 SY
25' BASE WIDTH
CHANNEL INLET DETAIL
DDE 770 YD.³
CLASS I RIPRAP 280 TONS
400 SQ. YD. FILTER FABRIC
COIR FIBER MATTING EST 310 SY
CHANNEL OUTLET DETAIL
1/11/2006
c:\roadway\proj\r2320g_rdy_psh_11.dgn
kevin.bass

PROJECT REFERENCE NO.	SHEET NO.
R-2320G	12
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

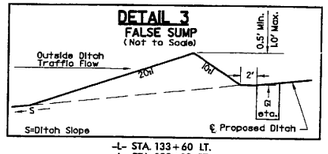
KO & ASSOCIATES, P.C.
Consulting Engineers
1011 SCHAUB DR., SUITE 202 RALEIGH, N.C. 27606
(919) 851-6066

REVISIONS

7/15/2004 R/W Revision Parcel 20 Added Monuments 205' offset

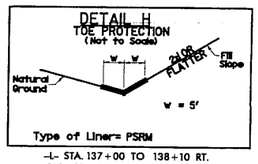
8/17/99

DETAIL 3
FALSE SUMP
(Not to Scale)



-L- STA. 133+60 LT.
-L- STA. 138+10 RT.

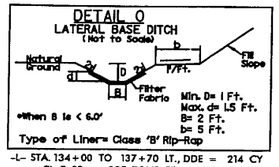
DETAIL H
TOE PROTECTION
(Not to Scale)



Type of Liner= PSRM

-L- STA. 137+00 TO 138+10 RT.
-SR3- STA. 25+00 TO 26+85 LT.
-SR3- STA. 26+22 TO 27+22 RT.

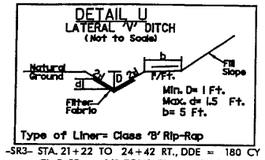
DETAIL O
LATERAL BASE DITCH
(Not to Scale)



Type of Liner= Class 'B' Rip-Rap

-L- STA. 134+00 TO 137+70 LT., DDE = 214 CY
CL B RR = 207 TONS, FF = 561 SY
-L- STA. 137+80 TO 140+00 LT., DDE = 133 CY
CL B RR = 123 TONS, FF = 334 SY

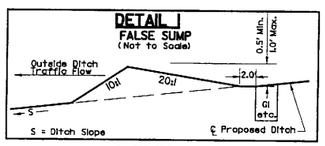
DETAIL U
LATERAL 'V' DITCH
(Not to Scale)



Type of Liner= Class 'B' Rip-Rap

-SR3- STA. 21+22 TO 24+42 RT., DDE = 180 CY
CL. B RR = 161 TONS, FF = 455 SY

DETAIL I
FALSE SUMP
(Not to Scale)



-L- STA. 136+00 RT.

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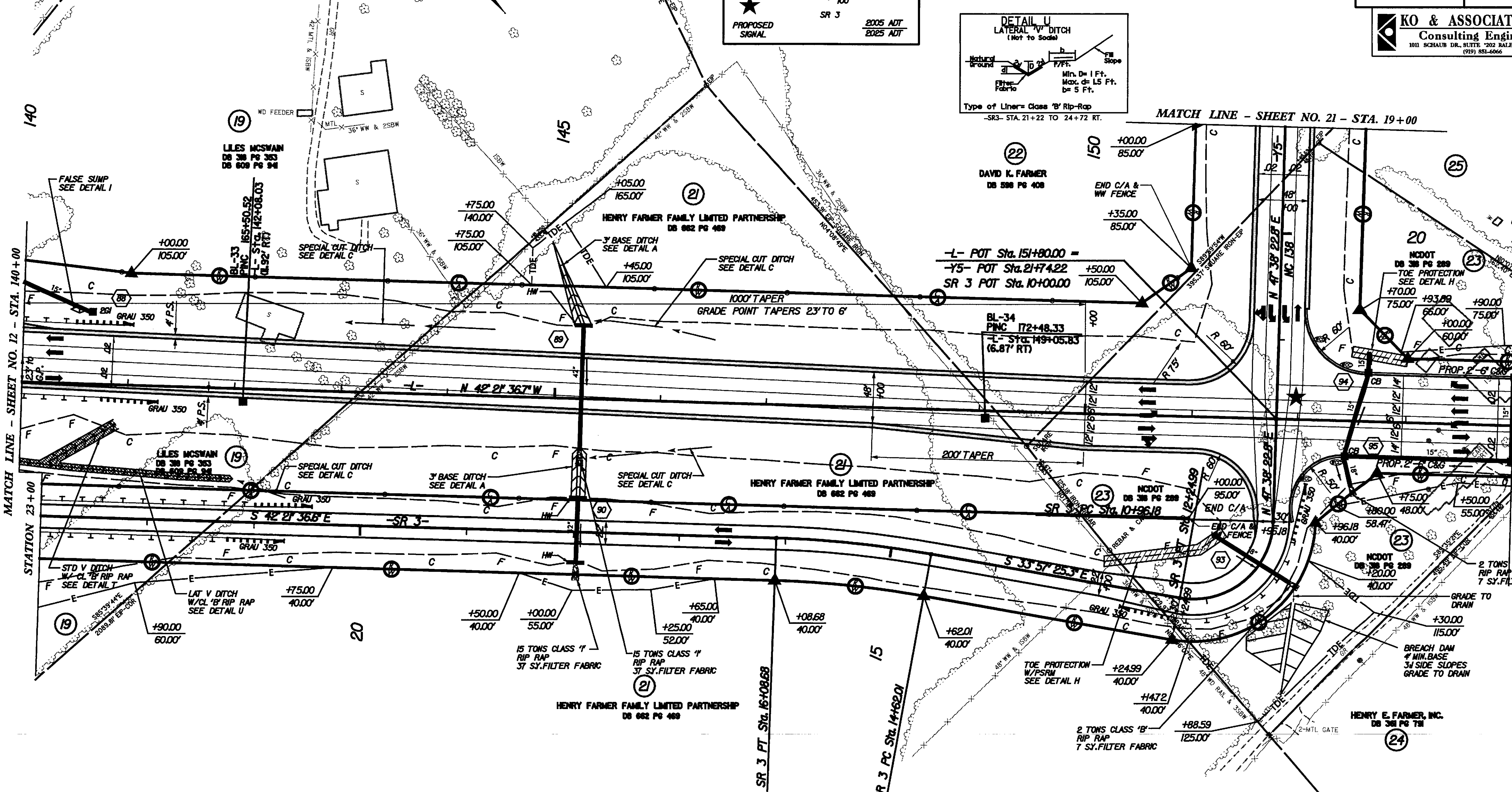
KO & Associates, P.A.

PROJECT REFERENCE NO.	SHEET NO.
R-2320G	13
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

KO & ASSOCIATES, P.C.
Consulting Engineers
1011 SCHAUB DR., SUITE 202 RALEIGH, N.C. 27606
(919) 851-6066



DETAIL A
STANDARD BASE DITCH
(Not to Scale)
Min. D= 1 Ft.
B= 3 Ft.
-L- STA. 145+25 LT.
80 LF @ 6.88%, DDE = 12 CY
-L- STA. 145+25 RT.
45 LF @ 0.7%, DDE = 10 CY

-Y5- NC 138
US 52 EXT.
PROPOSED SIGNAL
SR 3
2005 ADT
2025 ADT

DETAIL T
STANDARD 'V' DITCH
(Not to Scale)
Min. D= 1 Ft.
Max. d= 1.5 Ft.
Type of Liner= Class 'B' Rip-Rap
-SR3- STA. 22+25 TO 23+00 RT.
70 LF @ 10.27%, DDE = 5 CY
CL. B RR = 32 TONS, FF = 91 SY

DETAIL H
TOE PROTECTION
(Not to Scale)
w = 5'
Type of Liner= PSRM
-L- STA. 152+50 TO 153+00 LT.
-SR3- STA. 11+00 TO 13+00 RT.

DETAIL U
LATERAL 'V' DITCH
(Not to Scale)
Min. D= 1 Ft.
Max. d= 1.5 Ft.
b= 5 Ft.
Type of Liner= Class 'B' Rip-Rap
-SR3- STA. 21+22 TO 24+72 RT.

DETAIL I
FALSE SUMP
(Not to Scale)
-L- STA. 140+70 LT.

DETAIL C
SPECIAL CUT DITCH
(Not to Scale)
Min. D= 1 Ft.
-L- STA. 143+00 TO 144+50 LT.
-L- STA. 145+25 TO 146+50 RT.
-L- STA. 145+25 TO 146+50 RT.

SR 3
PI Sta 15+35.48
Δ = 8° 24' 11.3" (LT)
D = 5° 43' 46.5"
L = 146.66'
T = 73.46'
R = 1,000.00'
SUPER = NC

SR 3
PI Sta 11+83.07
Δ = 98° 24' 11.9" (RT)
D = 76° 23' 39.7"
L = 128.81'
T = 86.89'
R = 75.00'
SUPER = NC

SEE SHEET NO. 30 FOR -L- PROFILE
SEE SHEET NO. 36 FOR -Y5- PROFILE
SEE SHEET NO. 39 FOR -SR 3- PROFILE

REVISIONS
11/17/2005 Change Owner Name on Parcel 23

8/17/99
1/11/2006
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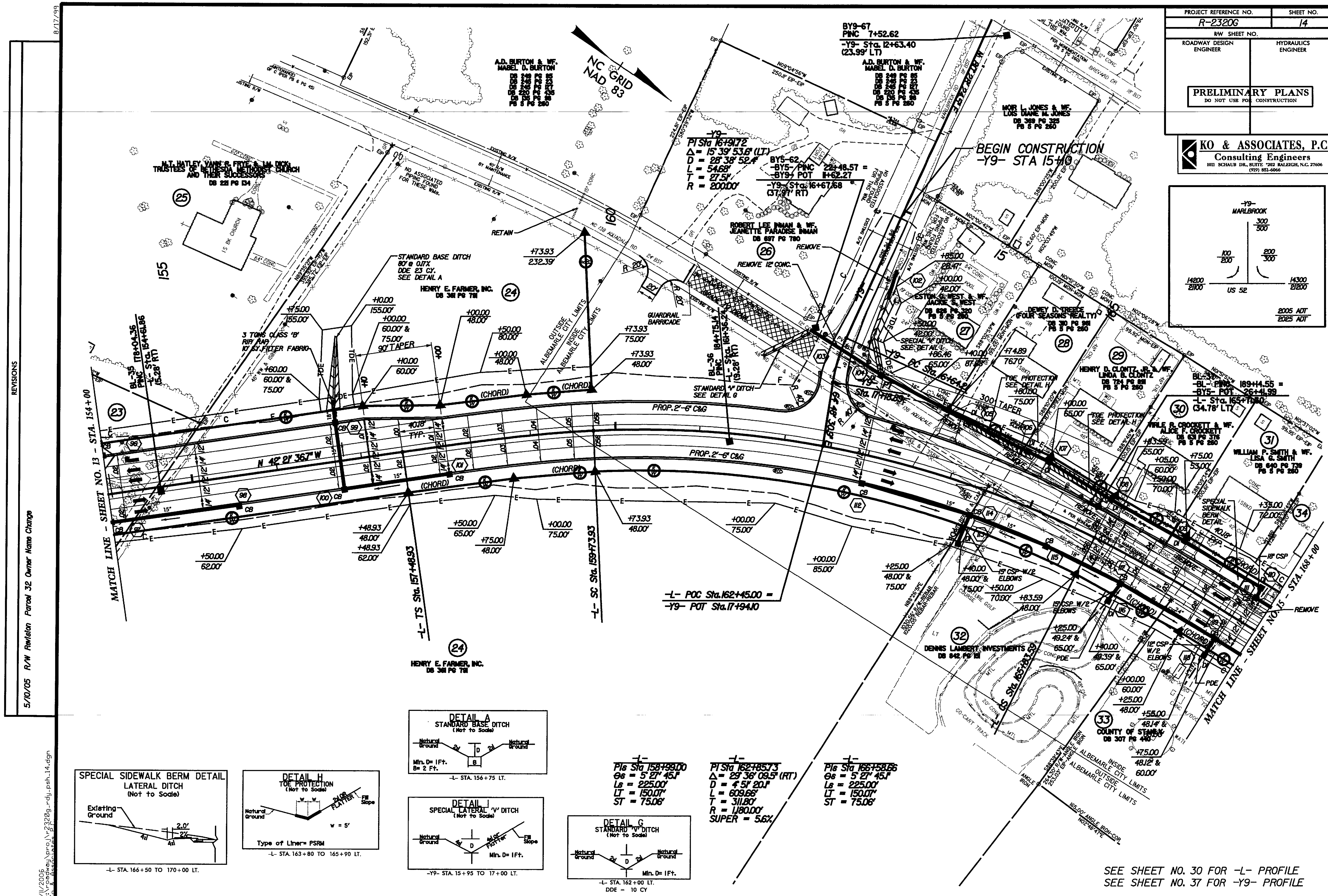
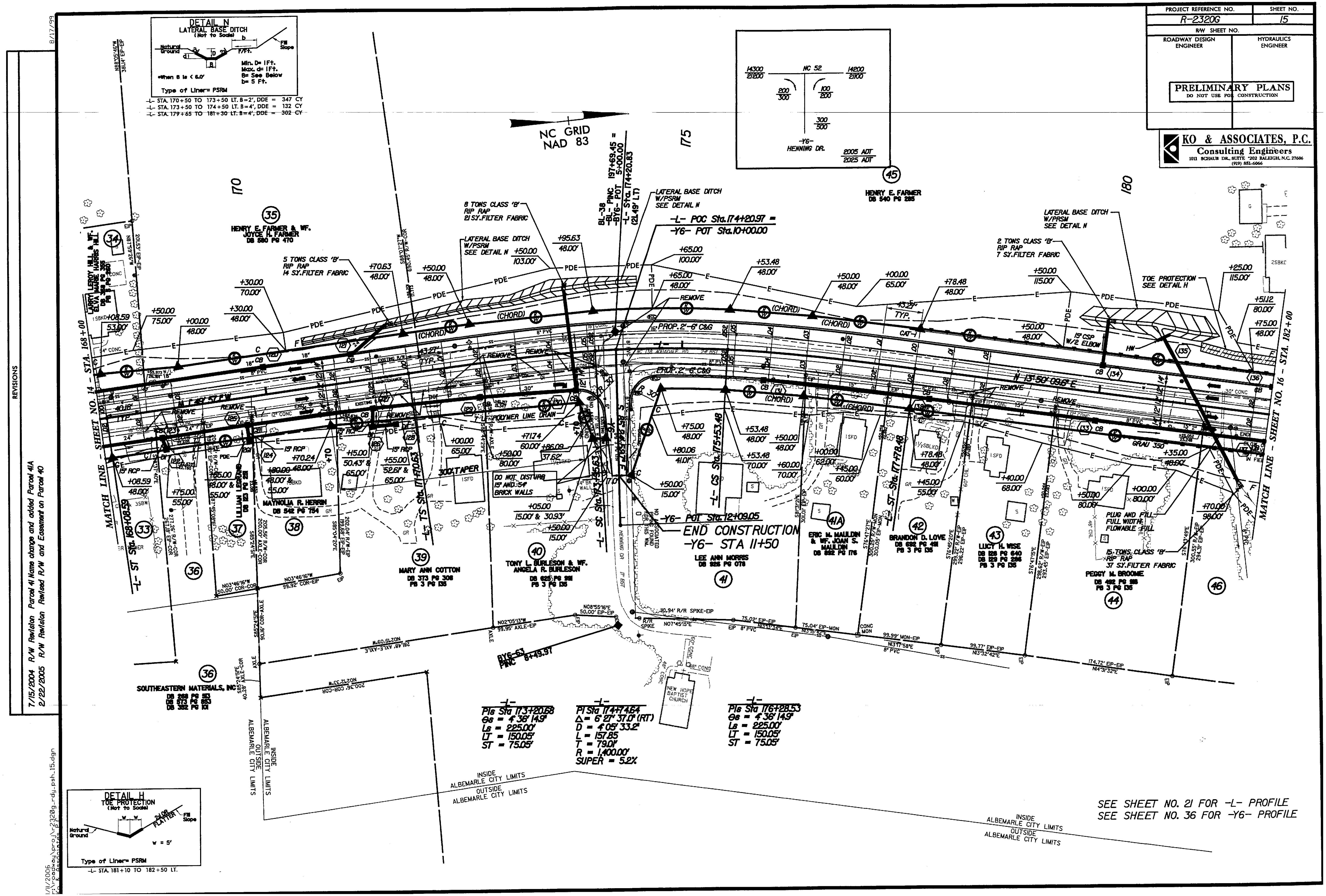

PROJECT REFERENCE NO.
SHEET NO.
R-2320G
14
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION
KO & ASSOCIATES, P.C.
Consulting Engineers
REVISIONS
5/10/05 R/W Revision Parcel 32 Owner Name Change
8/17/99
NC GRID NAD 83
BEGIN CONSTRUCTION -Y9- STA 15+10
-Y9- MARLBROOK
US 52
2005 ADT
2025 ADT
A.D. BURTON & WF. MABEL D. BURTON
N.T. HATLEY, VANN R. FRYE, & J.W. DICK, TRUSTEES OF BETHESDA METHODIST CHURCH AND THEIR SUCCESSORS
HENRY E. FARMER, INC.
ROBERT LEE INMAN & WF. JEANETTE PARADISE INMAN
MOIR L. JONES & WF. LOIS DIANE M. JONES
ESTON G. WEST & WF. JACKIE S. WEST
DEWEY D. TREECE (FOUR SEASONS REALTY)
HENRY D. CLONTZ, JR. & WF. LINDA B. CLONTZ
MERLE R. CROCKETT & WF. ALICE F. CROCKETT
WILLIAM P. SMITH & WF. LISA G. SMITH
DENNIS LAMBERT INVESTMENTS
COUNTY OF STANLY
MATCH LINE - SHEET NO. 13 - STA. 154+00
MATCH LINE - SHEET NO. 15 - STA. 168+00
N 42° 21' 36.7" W
-L- TS Sta. 157+48.93
-L- SC Sta. 159+73.93
-L- POC Sta.162+45.00 = -Y9- POT Sta.17+94.10
OUTSIDE ALBEMARLE CITY LIMITS
INSIDE ALBEMARLE CITY LIMITS
STANDARD BASE DITCH
3 TONS CLASS 'B' RIP RAP
-L- PIs Sta 158+99.00 Θs = 5° 27' 45.1" Ls = 225.00' LT = 150.07' ST = 75.06'
-L- PI Sta 162+85.73 Δ = 29° 36' 09.5" (RT) D = 4° 51' 20.1" L = 609.66' T = 311.80' R = 1,180.00' SUPER = 5.6%
-L- PIs Sta 166+58.66 Θs = 5° 27' 45.1" Ls = 225.00' LT = 150.07' ST = 75.06'
-Y9- PI Sta 16+91.72 Δ = 15° 39' 53.6" (LT) D = 28° 38' 52.4" L = 54.68' T = 27.51' R = 200.00'
SPECIAL SIDEWALK BERM DETAIL
LATERAL DITCH
(Not to Scale)
-L- STA. 166+50 TO 170+00 LT.
DETAIL H
TOE PROTECTION
(Not to Scale)
Type of Liner= PSRM
-L- STA. 163+80 TO 165+90 LT.
DETAIL A
STANDARD BASE DITCH
(Not to Scale)
Min. D= 1Ft.
B= 2 Ft.
-L- STA. 156+75 LT.
DETAIL I
SPECIAL LATERAL 'V' DITCH
(Not to Scale)
-Y9- STA. 15+95 TO 17+00 LT.
DETAIL G
STANDARD 'V' DITCH
(Not to Scale)
-L- STA. 162+00 LT.
DDE = 10 CY
SEE SHEET NO. 30 FOR -L- PROFILE
SEE SHEET NO. 37 FOR -Y9- PROFILE
1/11/2006


PROJECT REFERENCE NO.
R-2320G
SHEET NO.
15
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION
KO & ASSOCIATES, P.C.
Consulting Engineers
1011 SCHAUB DR., SUITE 202 RALEIGH, N.C. 27606
(919) 851-6066
DETAIL N
LATERAL BASE DITCH
(Not to Scale)
Type of Liner= PSRM
-L- STA. 170+50 TO 173+50 LT. B=2', DDE = 347 CY
-L- STA. 173+50 TO 174+50 LT. B=4', DDE = 132 CY
-L- STA. 179+65 TO 181+30 LT. B=4', DDE = 302 CY
NC GRID
NAD 83
NC 52
-Y6-
HENNING DR.
2005 ADT
2025 ADT
-L- POC Sta.174+20.97 =
-Y6- POT Sta.10+00.00
HENRY E. FARMER & WF. JOYCE H. FARMER
HENRY E. FARMER
MARY ANN COTTON
TONY L. BURLESON & WF. ANGELA R. BURLESON
LEE ANN MORRIS
ERIC M. MAULDIN & WF. JOAN S. MAULDIN
BRANDON D. LOVE
LUCY H. WISE
PEGGY M. BROOME
MAYNOLIA R. HERRIN
SOUTHEASTERN MATERIALS, INC
END CONSTRUCTION
-Y6- STA 11+50
MATCH LINE - SHEET NO. 14 - STA. 168+00
MATCH LINE - SHEET NO. 16 - STA. 182+00
NEW HOPE BAPTIST CHURCH
INSIDE ALBEMARLE CITY LIMITS
OUTSIDE ALBEMARLE CITY LIMITS
PIs Sta 173+20.68
Θs = 4°36'14.9"
Ls = 225.00'
LT = 150.05'
ST = 75.05'
PI Sta 174+74.64
Δ= 6°27'37.0" (RT)
D = 4°05'33.2"
L = 157.85
T = 79.01'
R = 1,400.00'
SUPER = 5.2%
PIs Sta 176+28.53
Θs = 4°36'14.9"
Ls = 225.00'
LT = 150.05'
ST = 75.05'
SEE SHEET NO. 21 FOR -L- PROFILE
SEE SHEET NO. 36 FOR -Y6- PROFILE
DETAIL H
TOE PROTECTION
(Not to Scale)
Type of Liner= PSRM
-L- STA. 181+10 TO 182+50 LT.
REVISIONS
7/15/2004 R/W Revision Parcel 41 Name change and added Parcel 41A
2/22/2005 R/W Revision Revised R/W and Easement on Parcel 40

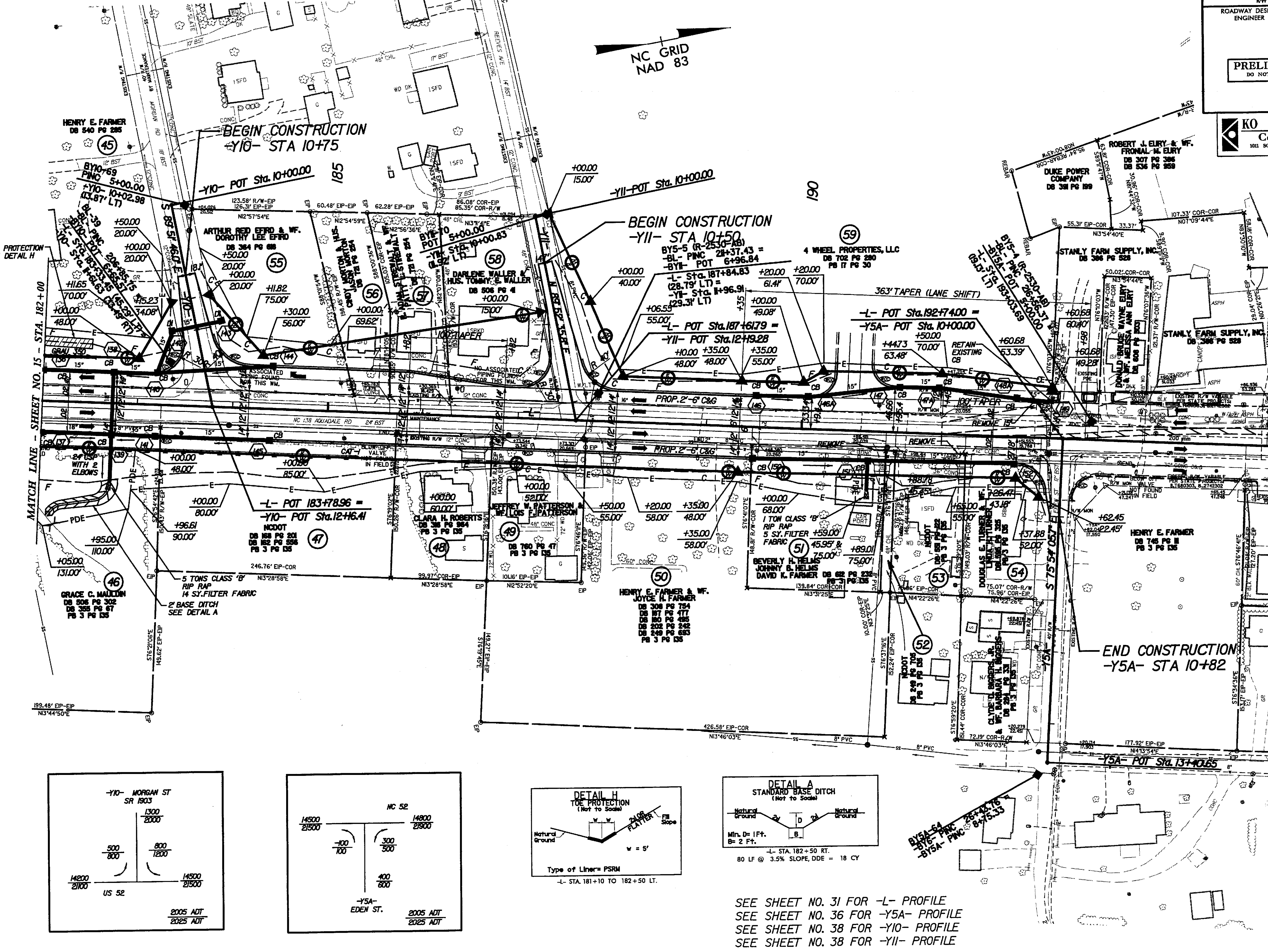
PROJECT REFERENCE NO.	SHEET NO.
R-2320G	16

R/W SHEET NO.

ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

KO & ASSOCIATES, P.C.
Consulting Engineers
1011 SCHAUB DR., SUITE 202 RALEIGH, N.C. 27606
(919) 851-6066



SEE SHEET NO. 31 FOR -L- PROFILE
SEE SHEET NO. 36 FOR -Y5A- PROFILE
SEE SHEET NO. 38 FOR -Y10- PROFILE
SEE SHEET NO. 38 FOR -Y11- PROFILE

REVISIONS

12/14/04	Revised Sta/Off at 184+00 RT to +00.00/80.00'
2/22/2005	Added Drive Sta.190+50 Left and Revised R/W and Easement 190+00 LT to 190+60 LT
11/17/2005	Changed Owner Names on Parcels 47, 52 and 53.

8/17/99

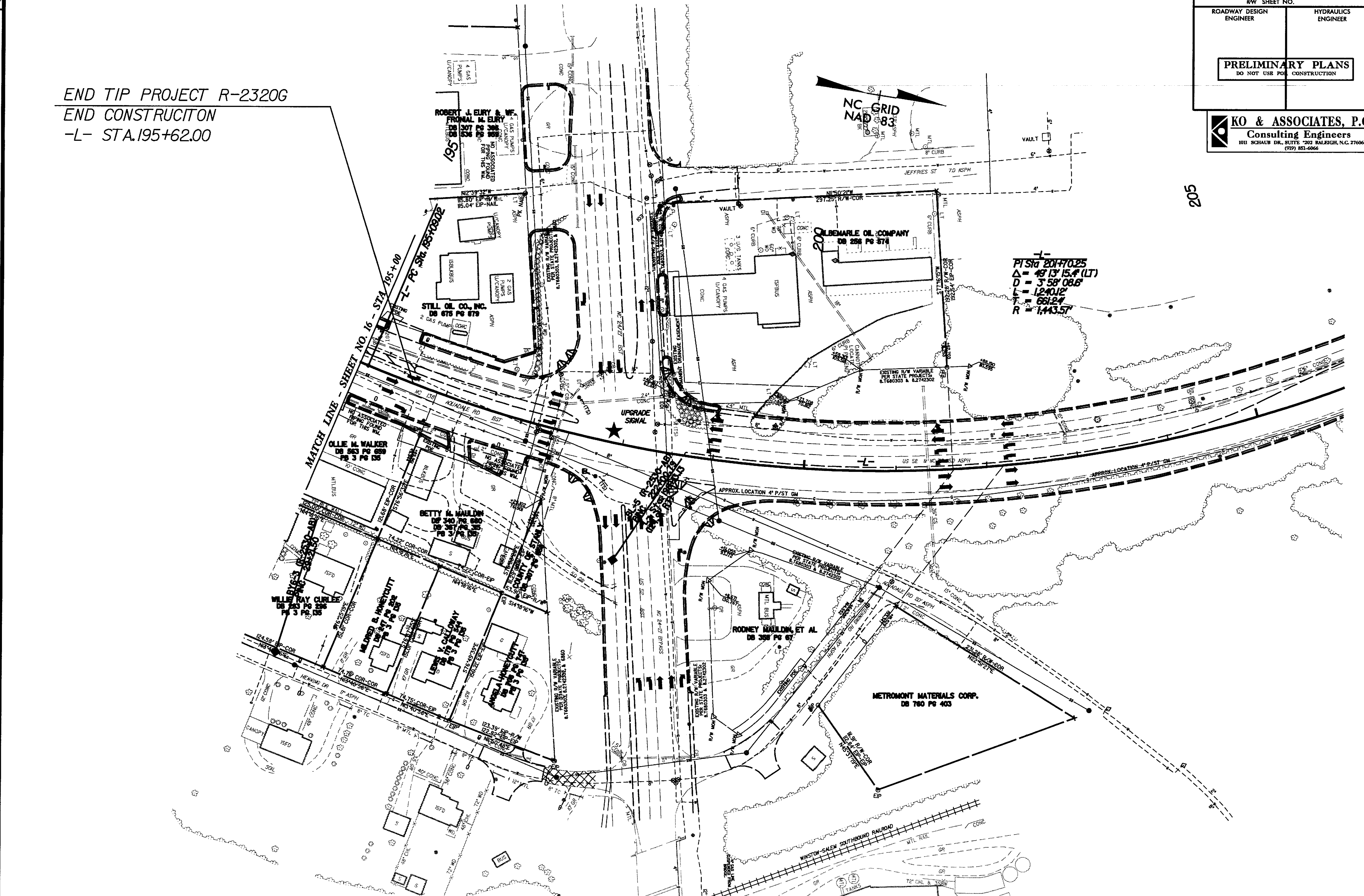
PROJECT REFERENCE NO.	SHEET NO.
R-2320G	17
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

KO & ASSOCIATES, P.C.
Consulting Engineers
1011 SCHAUB DR., SUITE 202 RALEIGH, N.C. 27606
(919) 851-6066

REVISIONS

2/22/2005 R/W Revision Added Approximate location of 4" Gas Main Right of Station 198+50± to Station 206+00±.



END TIP PROJECT R-2320G
END CONSTRUCITON
-L- STA.195+62.00
NC GRID NAD 83
MATCH LINE - SHEET NO. 16 - STA 195+00
-L- PC Sta. 195+09.02
UPGRADE SIGNAL
ROBERT J. EURY & WF. FRONIAL M. EURY
STILL OIL CO., INC. DB 675 PG 879
ALBEMARLE OIL COMPANY
OLLIE M. WALKER
BETTY M. MAULDIN
WILLIE RAY CURLEE DB 283 PG 296 PB 3 PG 135
RODNEY MAULDIN, ET AL
METROMONT MATERIALS CORP. DB 760 PG 403
JEFFRIES ST
AQUADALE RD
WINSTON-SALEM SOUTHBOUND RAILROAD
APPROX. LOCATION 4" P/ST GM
PI Sta 201+70.25
Δ = 49° 13' 15.4" (LT)
D = 3° 58' 08.6"
L = 1,240.12'
T = 661.24'
R = 1,443.57'
205
200
195

SEE SHEET NO. 32 FOR -L- PROFILE

8/17/99

1/11/2006
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PROJECT REFERENCE NO.	SHEET NO.
R-2320G	18
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

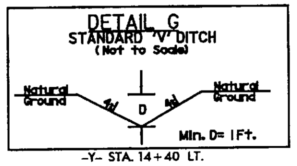
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

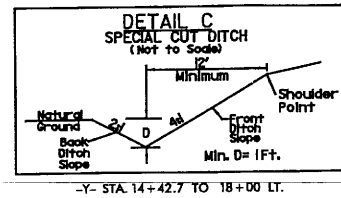
KO & ASSOCIATES, P.C.
Consulting Engineers
1011 SCHAUB DR., SUITE 202 RALEIGH, N.C. 27606
(919) 851-6066

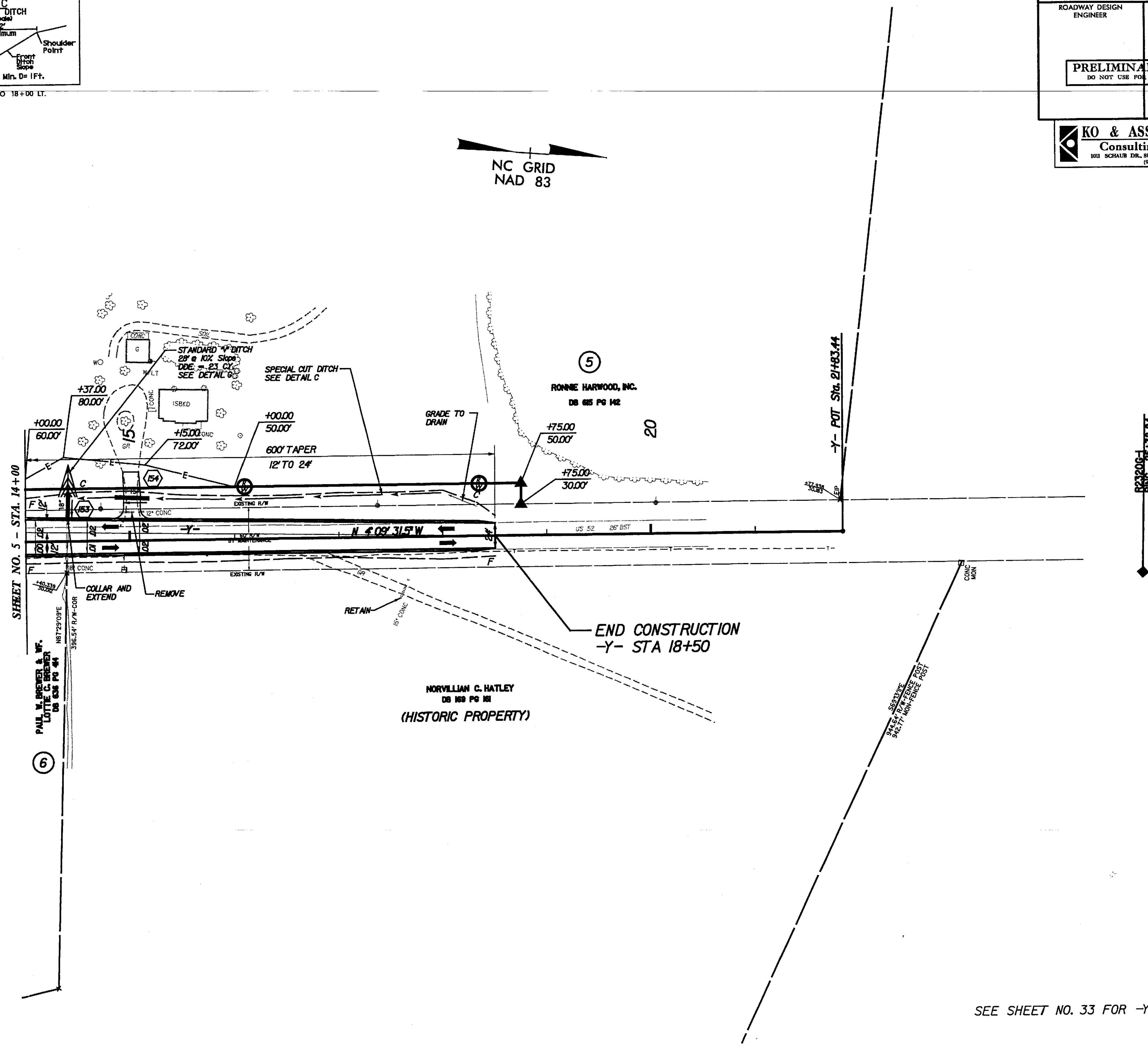
8/17/99

REVISIONS

5/10/05 R/W Revision Parcel 5 Owner Name Change







NC GRID
NAD 83
STANDARD "V" DITCH
28' @ 10% Slope
DDE. = 23 CY
SEE DETAIL G
SPECIAL CUT DITCH
SEE DETAIL C
GRADE TO DRAIN
+37.00
80.00'
+00.00
60.00'
+15.00
72.00'
+00.00
50.00'
600' TAPER
12' TO 24'
+75.00
50.00'
+75.00
30.00'
5
RONNIE HARWOOD, INC.
DB 615 PG 142
20
-Y- POT Sta. 21+83.44
R2320G-1
PINC 25+38.84
SHEET NO. 5 - STA. 14+00
N 4°09' 31.5" W
US 52
COLLAR AND EXTEND
REMOVE
RETAIN
END CONSTRUCTION
-Y- STA 18+50
NORVILLIAN C. HATLEY
DB 169 PG 181
(HISTORIC PROPERTY)
PAUL W. BREWER & WF.
LOTTIE C. BREWER
DB 636 PG 464
6
CONC MON

SEE SHEET NO. 33 FOR -Y- PROFILE

PROJECT REFERENCE NO.	SHEET NO.
R-2320G	19
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

KO & ASSOCIATES, P.C.
Consulting Engineers
1011 SCHAUB DR., SUITE 202 RALEIGH, N.C. 27606
(919) 851-6066

8/17/99

REVISIONS

5/10/05 R/W Revision Added Parcel 14A with Owner

NC GRID NAD 83

BEGIN CONSTRUCTION
-Y4- STA 4+61.38

+75.00
19.25'

+41.48
20.00'

+75.00
60.00'

+50.00
85.00'

-Y4- PCT Sta. 4+26.85

-Y4- PC Sta. 4+61.38

-Y4-
PI Sta 6+07.77
Δ = 26° 34' 14.9" (LT)
D = 9° 14' 28.5"
L = 287.52'
T = 146.39'
R = 620.00'
SUPER = 6.0%
R.O. = 150'

-Y4- PT Sta. 7+48.90

+48.90
80.00'

+48.90
60.00'

+10.00
85.00'

+00.00
75.00'

(14A) JIMMY DRAKE
DB 809 PG 548

(14) LORENA H. LOWDER
DB 141 PG 90

(12) JAMES CONRAD TRULL, ET AL
DB 361 PG 930

BEGIN SHOULDER BERM GUTTER
STA 8+00 LT.

INLET CHANNEL SEE DETAIL

LATERAL "V" DITCH
SEE DETAIL L

OUTLET WINGS W/ CL.I RIPRAP
(STR.PAV ITEM)

OUTLET CHANNEL IMPROVEMENTS
W/ 11 TONS CL.I RIPRAP
18-SY FILTER FABRIC
SEE DETAIL

15" CSP
W/ 2 ELBOWS

LATERAL BASE DITCH
SEE DETAIL O

LATERAL BASE DITCH
SEE DETAIL O

MATCH LINE - SHEET NO. 10 - STA. 10+00

DETAIL L
LATERAL "V" DITCH
(Not to Scale)

Type of Liner= Class 'B' Rip-Rap
-Y4- STA. 7+50 TO 9+10 LT., DDE = 109 CY
CL. B RR = 56 TONS, FF = 167 SY

DETAIL O
LATERAL BASE DITCH
(Not to Scale)

*When B is < 6.0'
Type of Liner= Class 'B' Rip-Rap
-Y4- STA. 9+05 TO 12+35 RT.
-Y4- STA. 9+35 TO 12+55 LT.

NATURAL GROUND
EXCAVATE ONLY CHANNEL BANKS
DDE = 5 CU. YDS.
CHANNEL INLET DETAIL

NATURAL GROUND
EXCAVATE ONLY CHANNEL BANKS
CL. I RIPRAP (1' 6" THK)
FILTER FABRIC
DDE = 15 CU. YDS.
CHANNEL OUTLET DETAIL

SEE SHEET NO. 35 FOR -Y4- PROFILE

1/11/2006
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KO & Associates, P.C.

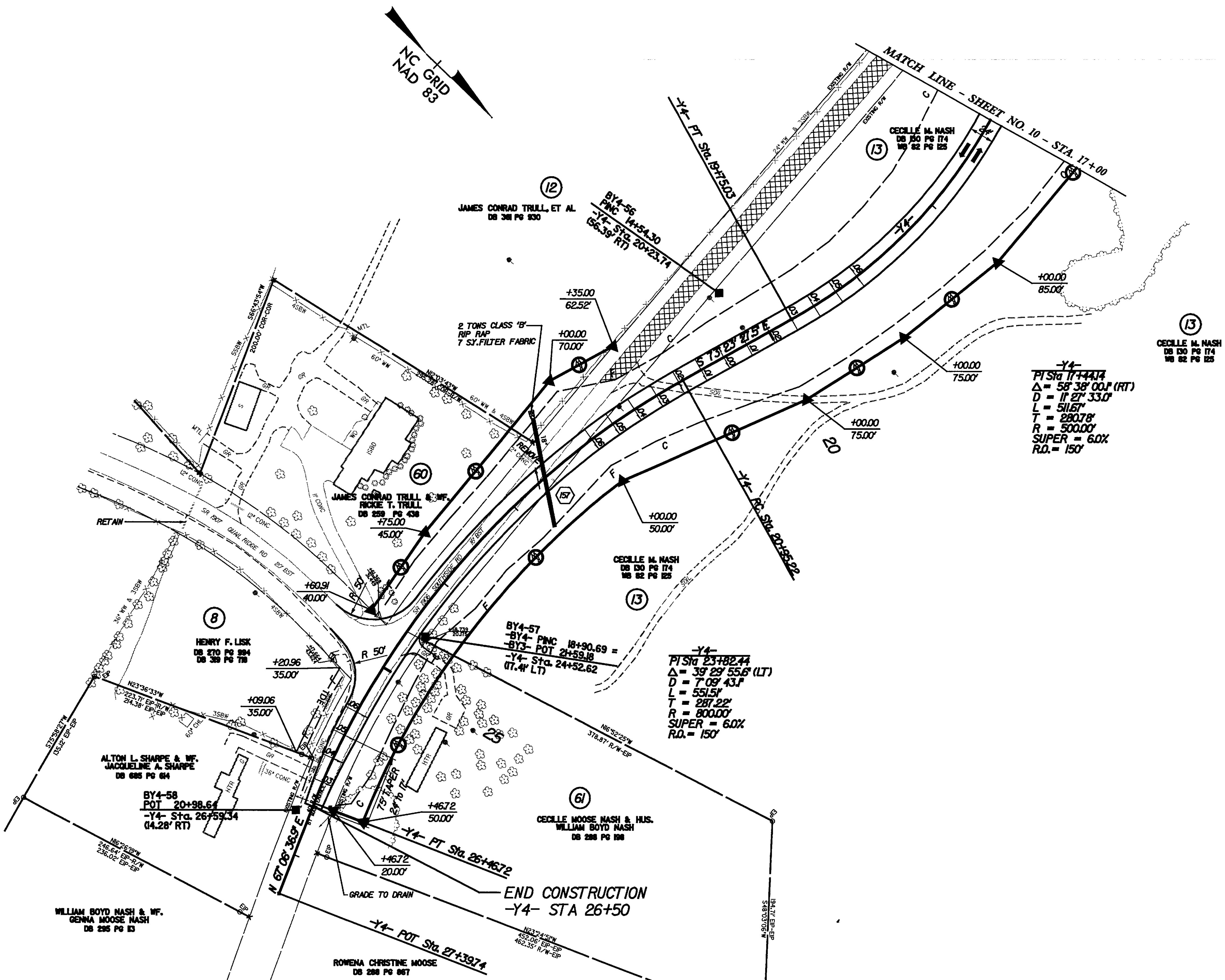
PROJECT REFERENCE NO.	SHEET NO.
R-2320G	20
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

KO & ASSOCIATES, P.C.
Consulting Engineers
1011 SCHAUB DR., SUITE *202 RALEIGH, N.C. 27606
(919) 851-6066

REVISIONS

8/17/99



NC GRID
NAD 83
MATCH LINE - SHEET NO. 10 - STA. 17+00
-Y4- PT Sta. 19+75.03
JAMES CONRAD TRULL, ET AL
DB 381 PG 930
CECILLE M. NASH
DB 130 PG 174
WB 82 PG 125
BY4-56
PINC 14+54.30
-Y4- Sta. 20+23.74
(56.39' RT)
2 TONS CLASS 'B' RIP RAP
7 SY. FILTER FABRIC
+35.00
62.52'
+00.00
70.00'
+00.00
85.00'
+00.00
75.00'
-Y4-
PI Sta 17+44.14
Δ = 58° 38' 00.1" (RT)
D = 11° 27' 33.0"
L = 511.67'
T = 280.78'
R = 500.00'
SUPER = 6.0%
R.O. = 150'
JAMES CONRAD TRULL & WF.
RICKIE T. TRULL
DB 259 PG 436
+75.00
45.00'
RETAIN
SR 1367 QUAIL RIDGE RD
-Y4- PC Sta. 20+95.22
+00.00
50.00'
+60.91
40.00'
HENRY F. LISK
DB 270 PG 994
DB 319 PG 718
BY4-57
-BY4- PINC 18+90.69 =
-BY3- POT 21+59.18
-Y4- Sta. 24+52.62
(17.4' LT)
-Y4-
PI Sta 23+82.44
Δ = 39° 29' 55.6" (LT)
D = 7° 09' 43.1"
L = 551.51'
T = 287.22'
R = 800.00'
SUPER = 6.0%
R.O. = 150'
R 50'
+20.96
35.00'
+09.06
35.00'
N23°36'33"W
ALTON L. SHARPE & WF.
JACQUELINE A. SHARPE
DB 685 PG 614
BY4-58
POT 20+98.64
-Y4- Sta. 26+59.34
(14.28' RT)
75' TAPER
+46.72
50.00'
-Y4- PT Sta. 26+46.72
+46.72
20.00'
GRADE TO DRAIN
END CONSTRUCTION
-Y4- STA 26+50
CECILLE MOOSE NASH & HUS.
WILLIAM BOYD NASH
DB 288 PG 198
N16°52'25"W
378.87' R/W-EIP
WILLIAM BOYD NASH & WF.
GENNA MOOSE NASH
DB 295 PG 83
ROWENA CHRISTINE MOOSE
DB 288 PG 867
-Y4- POT Sta. 27+39.74
N 67° 06' 36.9" E
S 73° 27' 27.5" E

SEE SHEET NO. 35 FOR -Y4- PROFILE

1/11/2006
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PROJECT REFERENCE NO.	SHEET NO.
R-2320G	21
R/W SHEET NO.	

ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

KO & ASSOCIATES, P.C.
Consulting Engineers
1011 SCHAUB DR., SUITE *202 RALEIGH, N.C. 27606
(919) 851-6066

8/17/99

REVISIONS

SEE SHEET NO. 36 FOR -Y5- PROFILE
SEE SHEET NO. 37 FOR -Y8- PROFILE

1/11/2006
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5/28/99

PROJECT REFERENCE NO.	SHEET NO.
R-2320G	22

ROADWAY DESIGN ENGINEER

HYDRAULICS ENGINEER

PRELIMINARY PLANS
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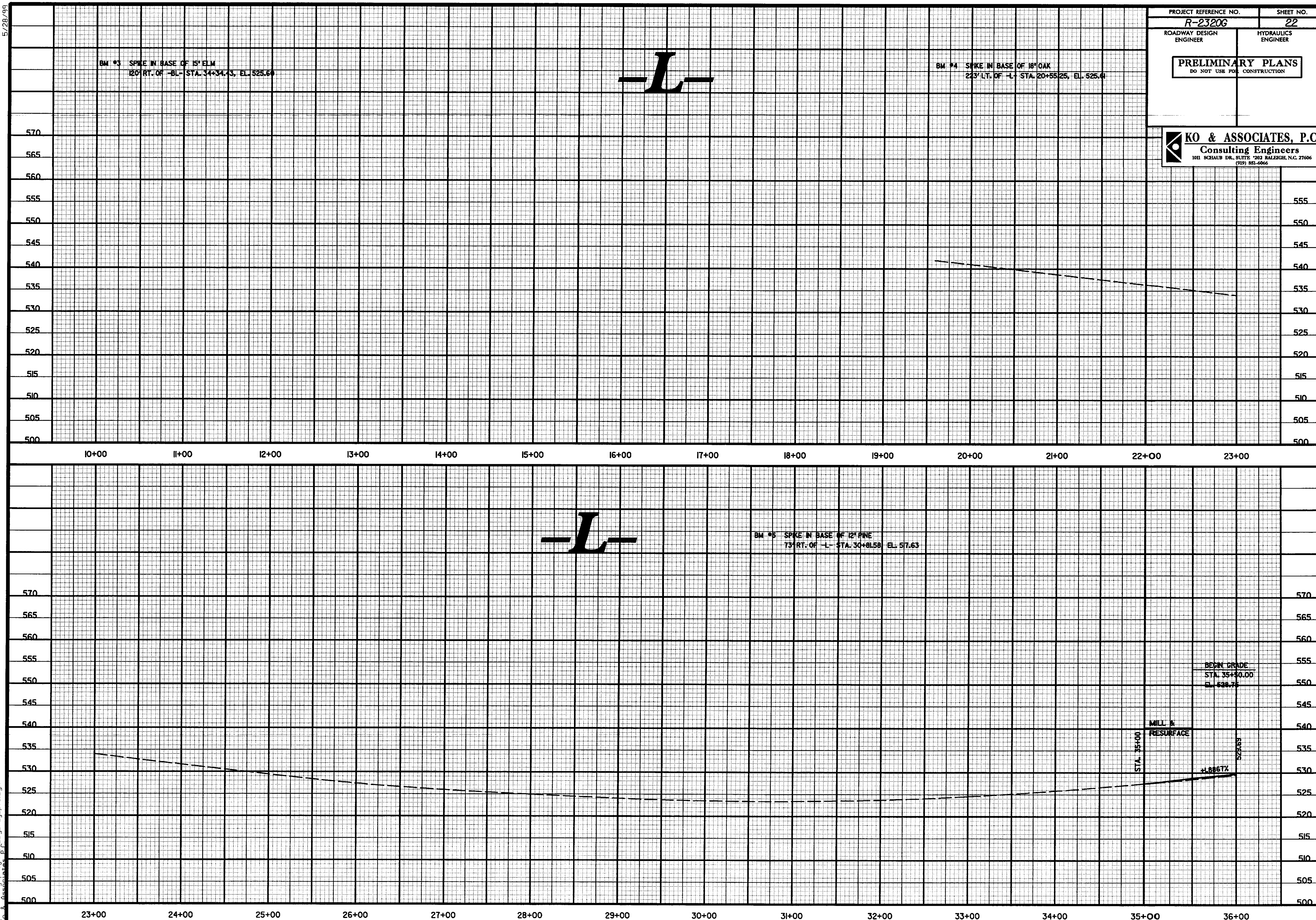

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PROJECT REFERENCE NO. R-2320G | SHEET NO. 23
ROADWAY DESIGN ENGINEER | HYDRAULICS ENGINEER

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-L REV-

PIPE HYDRAULIC DATA

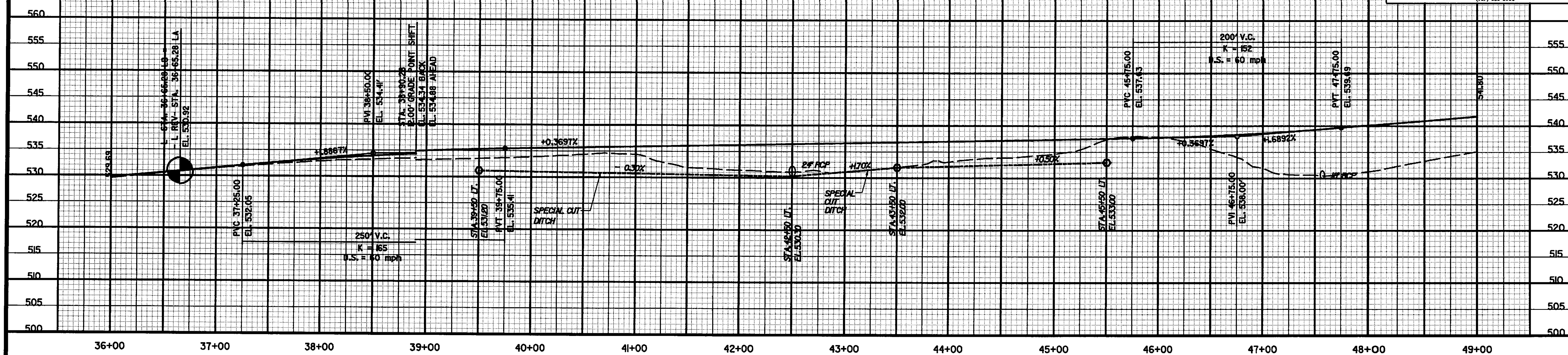
DRAINAGE STRUCTURE NO. 42+50

DRAINAGE AREA	=	4.4	AC
DESIGN FREQUENCY	=	50	YRS
DESIGN DISCHARGE	=	10	CFS
DESIGN HW ELEVATION	=	531.95	FT
100 YEAR DISCHARGE	=	12	CFS
100 YEAR HW ELEVATION	=	532.17	FT
OVERTOPPING FREQUENCY	=	500+	YRS
OVERTOPPING DISCHARGE	=	22	CFS
OVERTOPPING ELEVATION	=	533.50	FT

PIPE HYDRAULIC DATA

DRAINAGE STRUCTURE NO. 47+57

DRAINAGE AREA	=	1.0	AC
DESIGN FREQUENCY	=	50	YRS
DESIGN DISCHARGE	=	27	CFS
DESIGN HW ELEVATION	=	531.20	FT
100 YEAR DISCHARGE	=	31	CFS
100 YEAR HW ELEVATION	=	531.34	FT
OVERTOPPING FREQUENCY	=	500+	YRS
OVERTOPPING DISCHARGE	=	12	CFS
OVERTOPPING ELEVATION	=	532.75	FT



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PROJECT REFERENCE NO.	SHEET NO.
R-2320G	24

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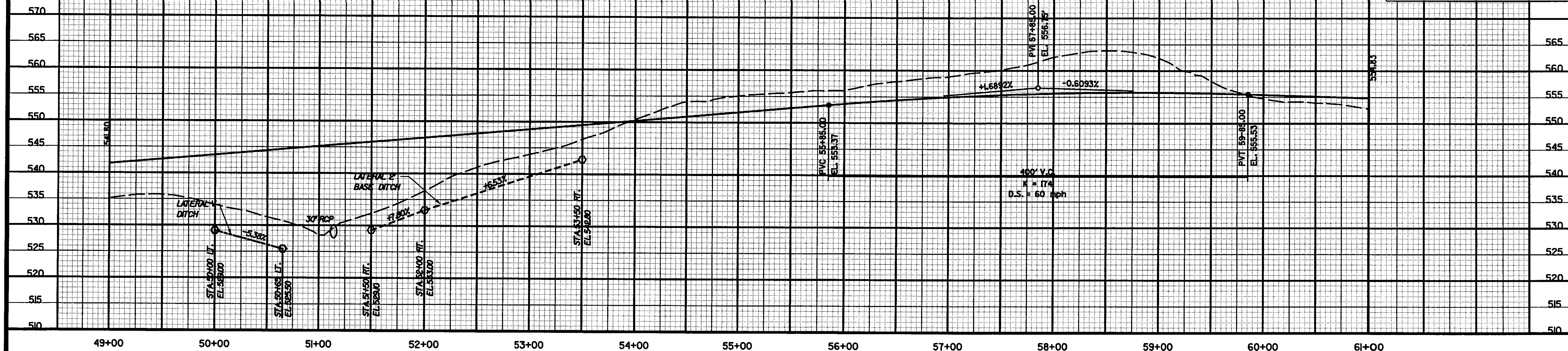
-L REV-

BM *7 SPIKE IN BASE OF TWIN OAKS
29' RT. OF -L REV- STA. 54+26.96, EL. 550.71



PIPE HYDRAULIC DATA

DRAINAGE STRUCTURE NO. 51+14

DRAINAGE AREA	=	12.7	AC
DESIGN FREQUENCY	=	50	YRS
DESIGN DISCHARGE	=	20	CFS
DESIGN HW ELEVATION	=	531.15	FT
100 YEAR DISCHARGE	=	24	CFS
100 YEAR HW ELEVATION	=	531.48	FT
OVERTOPPING FREQUENCY	=	500+	YRS
OVERTOPPING DISCHARGE	=	80	CFS
OVERTOPPING ELEVATION	=	539.00	FT

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PIPE HYDRAULIC DATA

DRAINAGE STRUCTURE NO.62+08

DRAINAGE AREA	=	23.9	AC
DESIGN FREQUENCY	=	50	YRS
DESIGN DISCHARGE	=	35	CFS
DESIGN HW ELEVATION	=	548.05	FT
100 YEAR DISCHARGE	=	42	CFS
100 YEAR HW ELEVATION	=	548.37	FT
OVERTOPPING FREQUENCY	=	200+/-	YRS
OVERTOPPING DISCHARGE	=	56	CFS
OVERTOPPING ELEVATION	=	550.60	FT

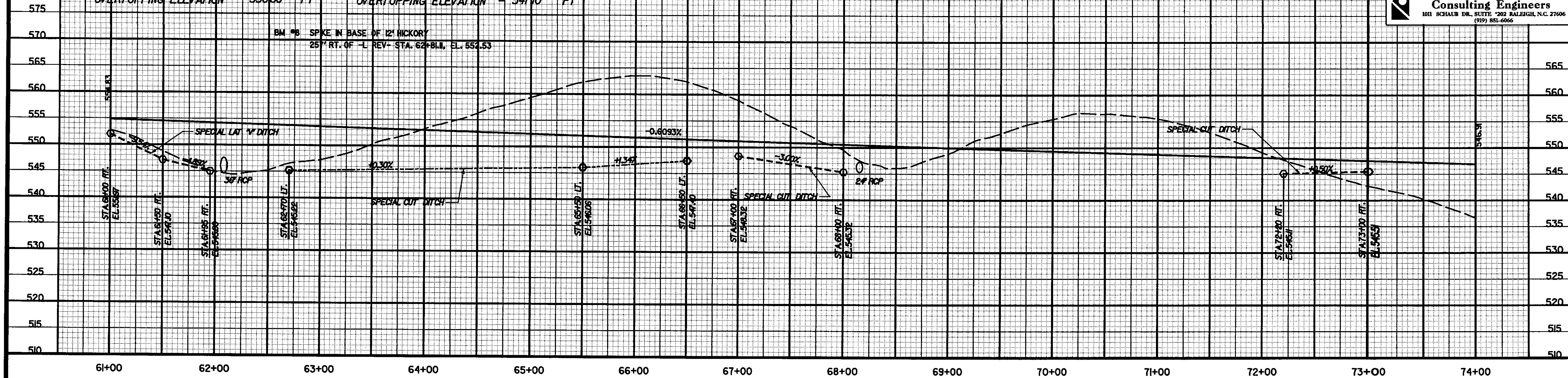
PIPE HYDRAULIC DATA

DRAINAGE STRUCTURE NO.68+15

DRAINAGE AREA	=	3.9	AC
DESIGN FREQUENCY	=	50	YRS
DESIGN DISCHARGE	=	9	CFS
DESIGN HW ELEVATION	=	546.79	FT
100 YEAR DISCHARGE	=	11	CFS
100 YEAR HW ELEVATION	=	547.02	FT
OVERTOPPING FREQUENCY	=	500	YRS
OVERTOPPING DISCHARGE	=	17	CFS
OVERTOPPING ELEVATION	=	547.10	FT

BM #8 SPIKE IN BASE OF 12" HICKORY
257' RT. OF -L REV- STA. 62+81.11, EL. 552.53

BM #9 SPIKE IN BASE OF 12" HICKORY
123' LT. OF -L REV- STA. 70+21.11, EL. 548.66



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PROJECT REFERENCE NO.	SHEET NO.
R-2320G	26

ROADWAY DESIGN ENGINEER

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-L-

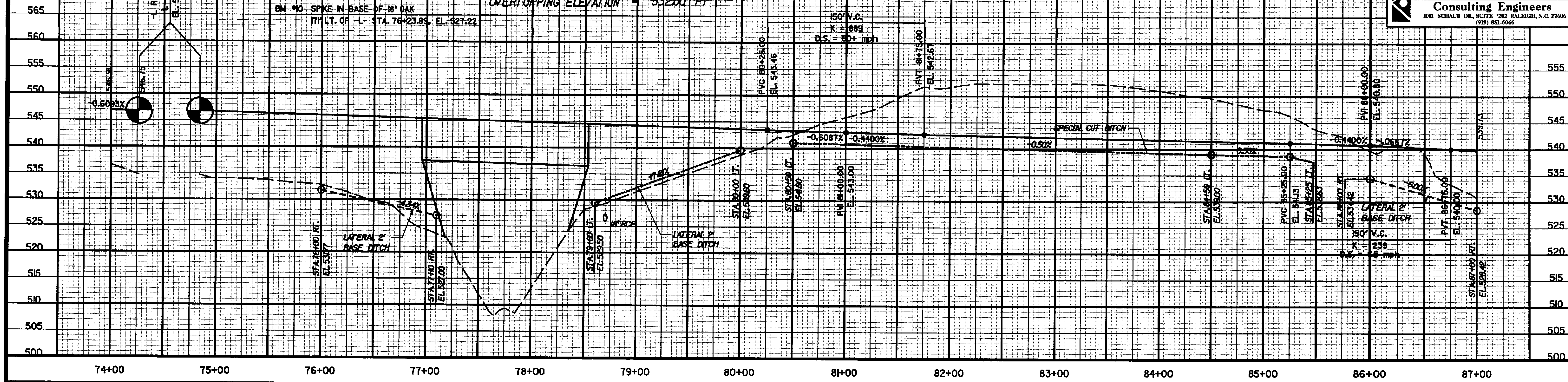
PIPE HYDRAULIC DATA

DRAINAGE STRUCTURE NO.78+70

DRAINAGE AREA	=	1.6	AC
DESIGN FREQUENCY	=	50	YRS
DESIGN DISCHARGE	=	5	CFS
DESIGN HW ELEVATION	=	530.74	FT
100 YEAR DISCHAPGE	=	6	CFS
100 YEAR HW ELEVATION	=	530.91	FT
OVERTOPPING FREQUENCY	=	500+	YRS
OVERTOPPING DISCHARGE	=	12	CFS
OVERTOPPING ELEVATION	=	532.00	FT

BM #10 SPIKE IN BASE OF 18' OAK
171' LT. OF -L- STA. 76+23.89, EL. 527.22

BM #11 SPIKE IN BASE OF POWER POLE
262' RT. OF -L- STA. 86+23.29, EL. 543.77


-L- REV. STA. 74+26.56 LE =
-L- STA. 74+84.25 LA
EL. 546.75
-0.6093%
LATERAL 2' BASE DITCH
STA. 76+00 RT. EL. 531.77
STA. 77+10 RT. EL. 527.00
18" RCP
STA. 78+60 LT. EL. 529.50
150' V.C.
K = 889
D.S. = 80+ mph
PVC 80+25.00 EL. 543.46
PVT 81+75.00 EL. 542.67
PVI 81+00.00 EL. 543.00
STA. 80+00 LT. EL. 539.60
STA. 80+50 LT. EL. 541.00
-0.5087%
-0.4400%
SPECIAL CUT DITCH
0.50%
STA. 84+50 LT. EL. 539.00
PVC 85+25.00 EL. 541.13
STA. 85+25 LT.
STA. 86+00 RT. EL. 534.42
PVI 86+00.00 EL. 540.80
-0.4400%
-1.0667%
150' V.C.
K = 239
D.S. = 56 mph
PVT 86+75.00 EL. 540.00
STA. 87+00 RT. EL. 528.42
539.73
74+00
75+00
76+00
77+00
78+00
79+00
80+00
81+00
82+00
83+00
84+00
85+00
86+00
87+00

PROJECT REFERENCE NO.	SHEET NO.
R-2320G	27

ROADWAY DESIGN ENGINEER

HYDRAULICS ENGINEER

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-L-

PIPE HYDRAULIC DATA

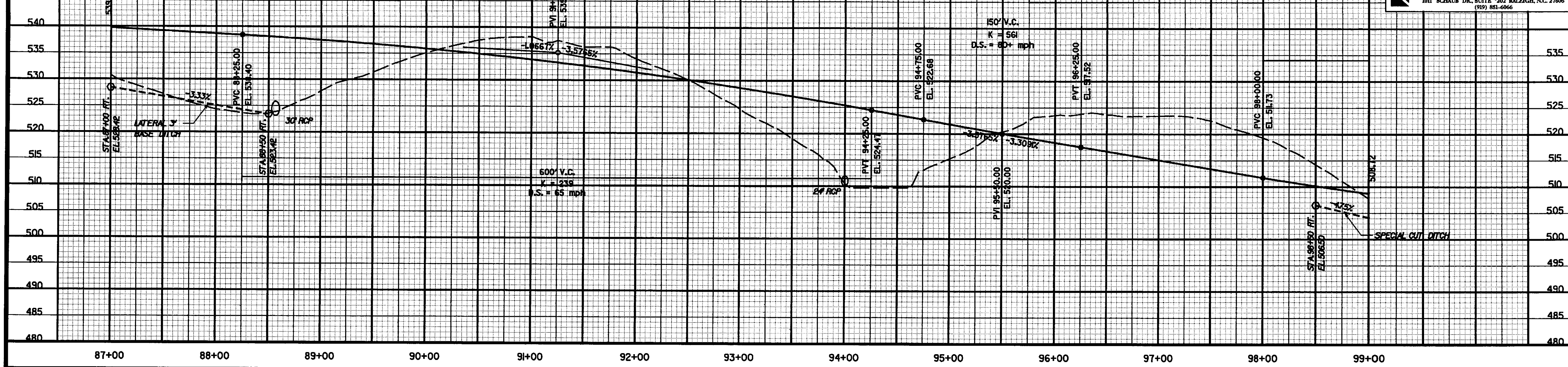
DRAINAGE STRUCTURE NO. 88+55

DRAINAGE AREA	= 7.9	AC
DESIGN FREQUENCY	= 50	YRS
DESIGN DISCHARGE	= 27	CFS
DESIGN HW ELEVATION	= 526.18	FT
100 YEAR DISCHARGE	= 31	CFS
100 YEAR HW ELEVATION	= 526.40	FT
OVERTOPPING FREQUENCY	= 500+	YRS
OVERTOPPING DISCHARGE	= 64	CFS
OVERTOPPING ELEVATION	= 531.43	FT

PIPE HYDRAULIC DATA

DRAINAGE STRUCTURE NO. 94+00

DRAINAGE AREA	= 5.2	AC
DESIGN FREQUENCY	= 50	YRS
DESIGN DISCHARGE	= 12	CFS
DESIGN HW ELEVATION	= 516.33	FT
100 YEAR DISCHARGE	= 14	CFS
100 YEAR HW ELEVATION	= 516.55	FT
OVERTOPPING FREQUENCY	= 500+	YRS
OVERTOPPING DISCHARGE	= 37	CFS
OVERTOPPING ELEVATION	= 519.19	FT



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PROJECT REFERENCE NO.	SHEET NO.
R-2320G	28

ROADWAY DESIGN ENGINEER | HYDRAULICS ENGINEER

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-L-

PIPE HYDRAULIC DATA

DRAINAGE STRUCTURE NO.100+55

DRAINAGE AREA	= 8.5	AC
DESIGN FREQUENCY	= 50	YRS
DESIGN DISCHARGE	= 29	CFS
DESIGN HW ELEVATION	= 499.81	FT
100 YEAR DISCHARGE	= 33	CFS
100 YEAR HW ELEVATION	= 500.14	FT
OVERTOPPING FREQUENCY	= 100+	YRS
OVERTOPPING DISCHARGE	= 38	CFS
OVERTOPPING ELEVATION	= 500.60	FT

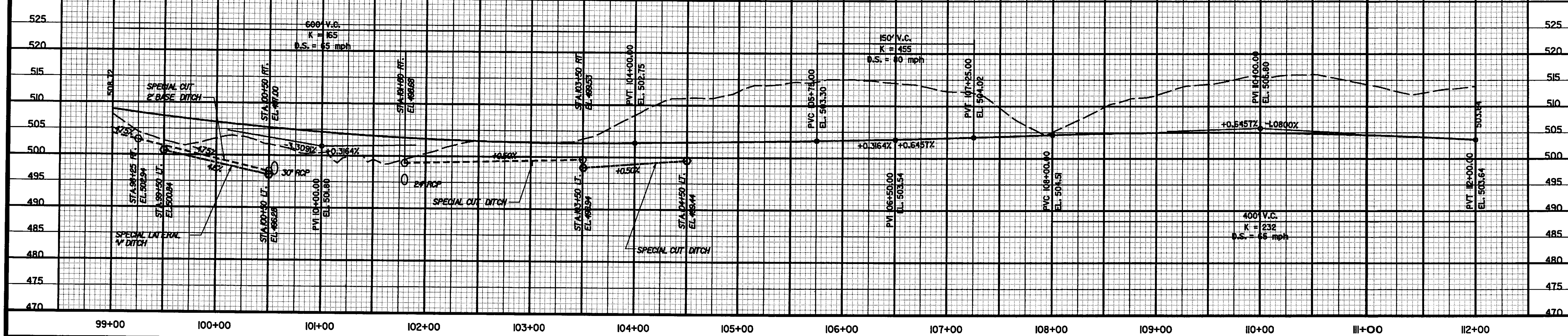
PIPE HYDRAULIC DATA

DRAINAGE STRUCTURE NO.101+80

DRAINAGE AREA	= 5.7	AC
DESIGN FREQUENCY	= 50	YRS
DESIGN DISCHARGE	= 18	CFS
DESIGN HW ELEVATION	= 499.54	FT
100 YEAR DISCHARGE	= 20	CFS
100 YEAR HW ELEVATION	= 499.58	FT
OVERTOPPING FREQUENCY	= 500+	YRS
OVERTOPPING DISCHARGE	= 38	CFS
OVERTOPPING ELEVATION	= 500.60	FT

BM #12 SPIKE IN BASE OF 32" OAK
304' RT. OF -L- STA. 101+87.24, EL. 534.48

BM #13 SPIKE IN BASE OF 18" PINE
157' RT. OF -L- STA. 111+08.75, EL. 541.76



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PROJECT REFERENCE NO.	SHEET NO.
R-2320G	29
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

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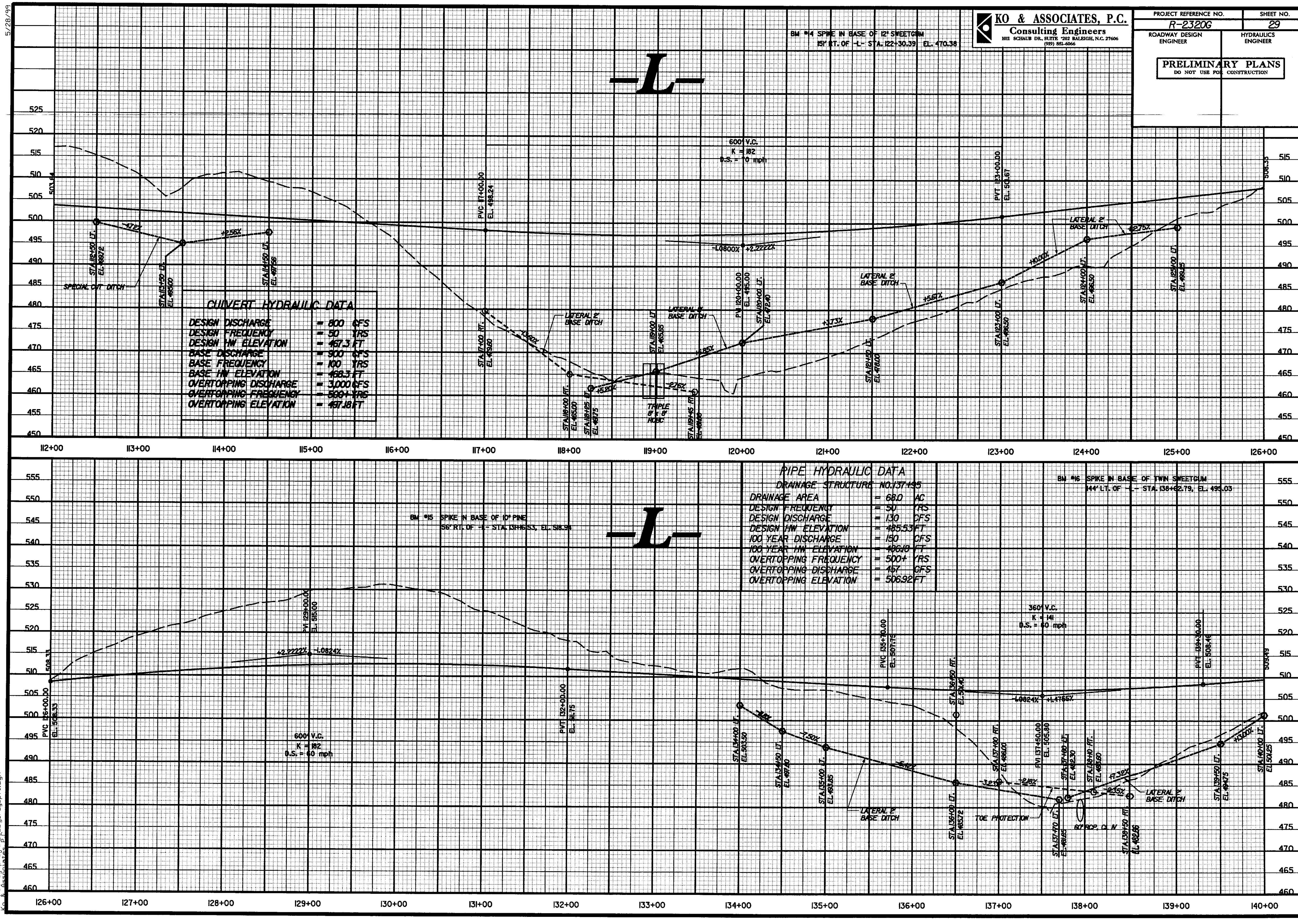

CULVERT HYDRAULIC DATA

DESIGN DISCHARGE	= 800 CFS
DESIGN FREQUENCY	= 50 YRS
DESIGN HW ELEVATION	= 467.3 FT
BASE DISCHARGE	= 900 CFS
BASE FREQUENCY	= 100 YRS
BASE HW ELEVATION	= 468.3 FT
OVERTOPPING DISCHARGE	= 3,000 CFS
OVERTOPPING FREQUENCY	= 500+ YRS
OVERTOPPING ELEVATION	= 497.18 FT

PIPE HYDRAULIC DATA

DRAINAGE STRUCTURE NO. 137+95

DRAINAGE AREA	= 68.0 AC
DESIGN FREQUENCY	= 50 YRS
DESIGN DISCHARGE	= 130 CFS
DESIGN HW ELEVATION	= 485.53 FT
100 YEAR DISCHARGE	= 150 CFS
100 YEAR HW ELEVATION	= 486.18 FT
OVERTOPPING FREQUENCY	= 500+ YRS
OVERTOPPING DISCHARGE	= 457 CFS
OVERTOPPING ELEVATION	= 506.92 FT

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PROJECT REFERENCE NO.	SHEET NO.
R-2320G	30
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PIPE HYDRAULIC DATA

DRAINAGE STRUCTURE NO. 145+25

DRAINAGE AREA	= 35.0	AC
DESIGN FREQUENCY	= 50	YRS
DESIGN DISCHARGE	= 60	CFS
DESIGN HW ELEVATION	= 513.52	FT
100 YEAR DISCHARGE	= 70	CFS
100 YEAR HW ELEVATION	= 513.62	FT
OVERTOPPING FREQUENCY	= 100+	YRS
OVERTOPPING DISCHARGE	= 71	CFS
OVERTOPPING ELEVATION	= 513.74	FT

-L-

BM #1 SPIKE IN BASE OF 18" OAK
204' LT. OF -L- STA. 146+81.92, EL. 522.22

509.49

+2.00%

STA. 143+00 LT.
EL. 510.08

SPECIAL CUT DITCH

STA. 144+90 LT.
EL. 513.74

42" RCP

STA. 144+65 LT.
EL. 510.00

STA. 145+65 RT.
EL. 510.00

+3.55%

+5.37%

SPECIAL CUT DITCH

STA. 146+50 LT.
EL. 514.69

STA. 146+50 RT.
EL. 514.71

SPECIAL CUT DITCH

+1.47551%

STA. 150+00.00
CONSTRUCTION POINT SHIFT
EL. 524.24 BACK
EL. 524.36 AHEAD

+1.47551%

530.27

140+00 141+00 142+00 143+00 144+00 145+00 146+00 147+00 148+00 149+00 150+00 151+00 152+00 153+00 154+00

585 580 575 570 565 560 555 550 545 540 535 530 525 520 515 510 505 500 495 490 485 480

-L-

530.27

+1.47551%

PVC 157+25.00
EL. 535.06

PVI 159+75.00
EL. 538.15

-1.46102%

500' V.C.
K = 170
D.S. = 60 mph

PVT 162+25.00
EL. 535.08

PVC 167+65.00
EL. 526.87

526.84

154+00 155+00 156+00 157+00 158+00 159+00 160+00 161+00 162+00 163+00 164+00 165+00 166+00 167+00 168+00

585 580 575 570 565 560 555 550 545 540 535 530 525 520 515 510 505 500 495 490

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PROJECT REFERENCE NO.	SHEET NO.
R-2320G	31

ROADWAY DESIGN ENGINEER

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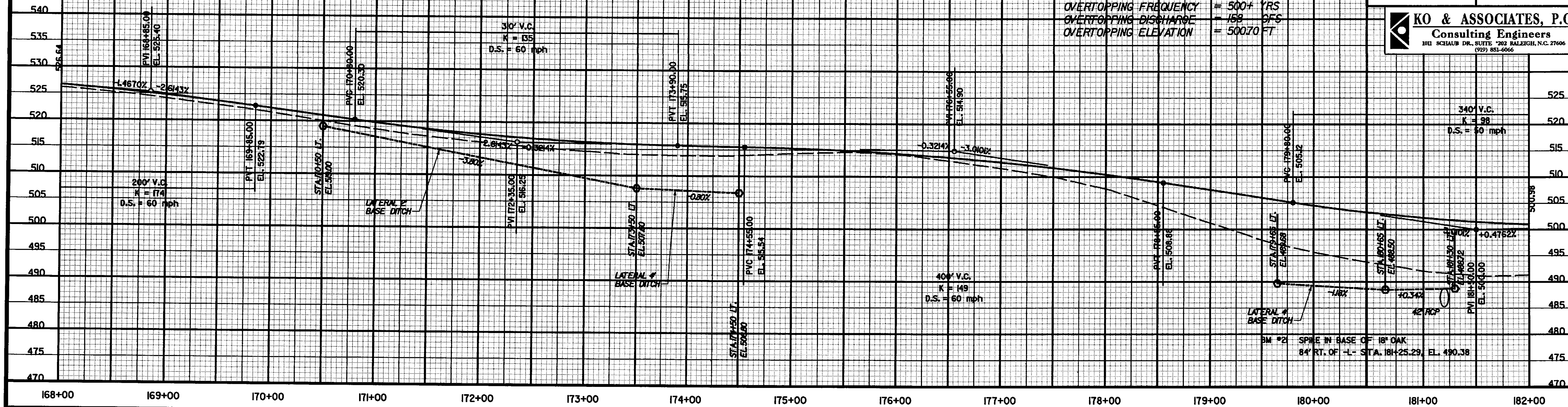
-L-

BM #20 SPIKE IN BASE OF 18" OAK
93' RT. OF -L- STA. 169+18.36, EL. 528.73

PIPE HYDRAULIC DATA

DRAINAGE STRUCTURE NO. 181+20

DRAINAGE AREA	= 28.0	AC
DESIGN FREQUENCY	= 50	YRS
DESIGN DISCHARGE	= 75	CFS
DESIGN HW ELEVATION	= 494.75	FT
100 YEAR DISCHARGE	= 85	CFS
100 YEAR HW ELEVATION	= 495.30	FT
OVERTOPPING FREQUENCY	= 500+	YRS
OVERTOPPING DISCHARGE	= 158	CFS
OVERTOPPING ELEVATION	= 500.70	FT



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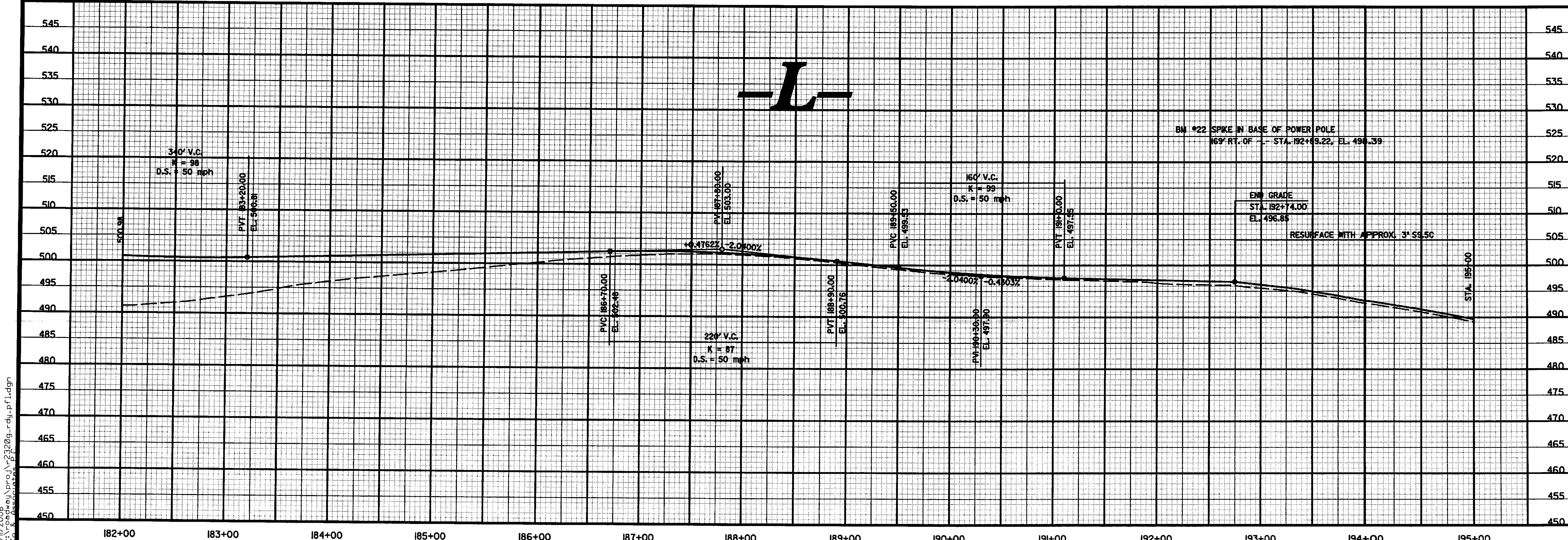

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PROJECT REFERENCE NO.	SHEET NO.
R-2320G	32

ROADWAY DESIGN ENGINEER

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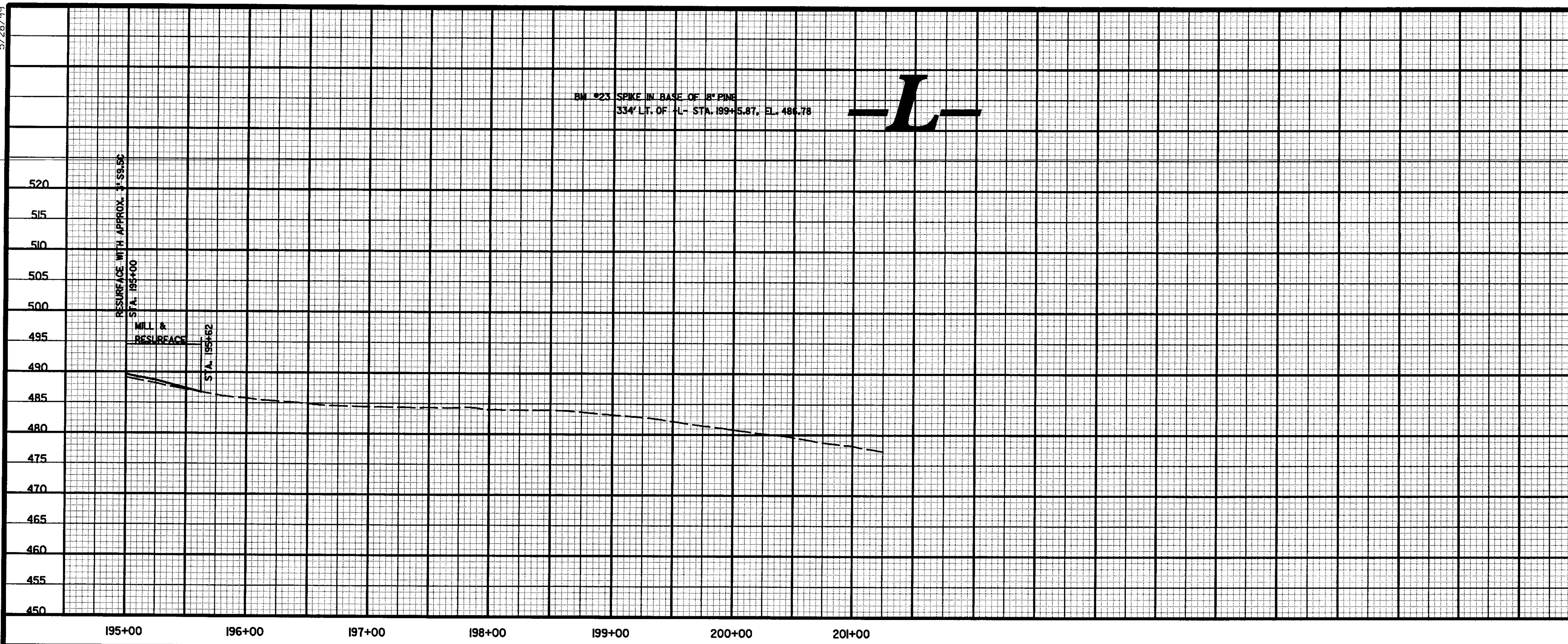

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PIPE HYDRAULIC DATA

DRAINAGE STRUCTURE NO.14+40

DRAINAGE AREA	= 4.20	AC
DESIGN FREQUENCY	= 25	YRS
DESIGN DISCHARGE	= 10	CFS
DESIGN HW ELEVATION	= 533.22	FT
100 YEAR DISCHARGE	= 13	CFS
100 YEAR HW ELEVATION	= 533.92	FT
OVERTOPPING FREQUENCY	= 100+	YRS
OVERTOPPING DISCHARGE	= 18	CFS
OVERTOPPING ELEVATION	= 535.24	FT

BM #6 SPIKE IN BASE OF POWER POLE
3' LT. OF -Y- STA. 14+72.43, EL. 533.39

-Y-

END GRADE
STA. 15+00.00
EL. 536.36

MINIMUM 2.5" OVERLAY

BEGIN GRADE
-Y- STA. 9+30.67
-L- STA. 46+74.91, 19 LT.
EL. 538.87

300' V.C.
K = 85
D.S. = 35 mph

BP 9+30.67 EL. 538.87
PVI 10+75.00 EL. 541.40
PVC 11+56.00 EL. 539.27
PVT 14+50.00 EL. 536.01
STA. 18+00.00 END 2.5" OVERLAY
STA. 18+50.00 END CONSTRUCTION
(+)1.7536%
(-)2.8442%
(-)2.8444%
(+)0.6750%
+1.46%
+2.33%
AVC 10+00.00 EL. 540.08
150' V.C. K = 33 D.S. = 35 mph
PVT 11+50.00 EL. 539.27
PVI 13+00.00 EL. 535.00
18" RCP
STA. 14+50 LT. EL. 531.80
SPECIAL CUT DITCH
STA. 17+00 LT. EL. 534.86
STA. 18+00 LT. EL. 537.45

10+00 11+00 12+00 13+00 14+00 15+00 16+00 17+00 18+00 19+00 20+00 21+00

565 560 555 550 545 540 535 530 525 520 515 510 505 500

-Y2-

515 510 505 500 495 490 485 480 475 470

10+00 11+00 12+00 13+00 14+00 15+00 16+00 17+00

515 510 505 500 495 490 485 480 475 470

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R-2320G	33
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R-2320G	34
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-Y3-

BEGIN GRADE
STA. 13+00.00
EL. 548.87

PVC 13+15.00
EL. 549.16

PVI 14+90.00
EL. 552.60

+1.9645%

-1.7873%

SPECIAL CUT DITCH

350' V.C.
K = 56
D.S. = 40 mph

STA 16+00 RT.
EL. 544.54

STA. 16+60 RT.
EL. 544.63

PVT 16+55.00
EL. 544.22

-4.7873%

EP 17+11.63
EL. 541.99

END GRADE
-Y3- STA. 17+11.63
-L- STA. 85+91.65, 47' LT.
EL. 541.99

555 550 545 540 535 530 525 520 515 510 505 500

10+00 11+00 12+00 13+00 14+00 15+00 16+00 17+00

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PROJECT REFERENCE NO.	SHEET NO.
R-2320G	35
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

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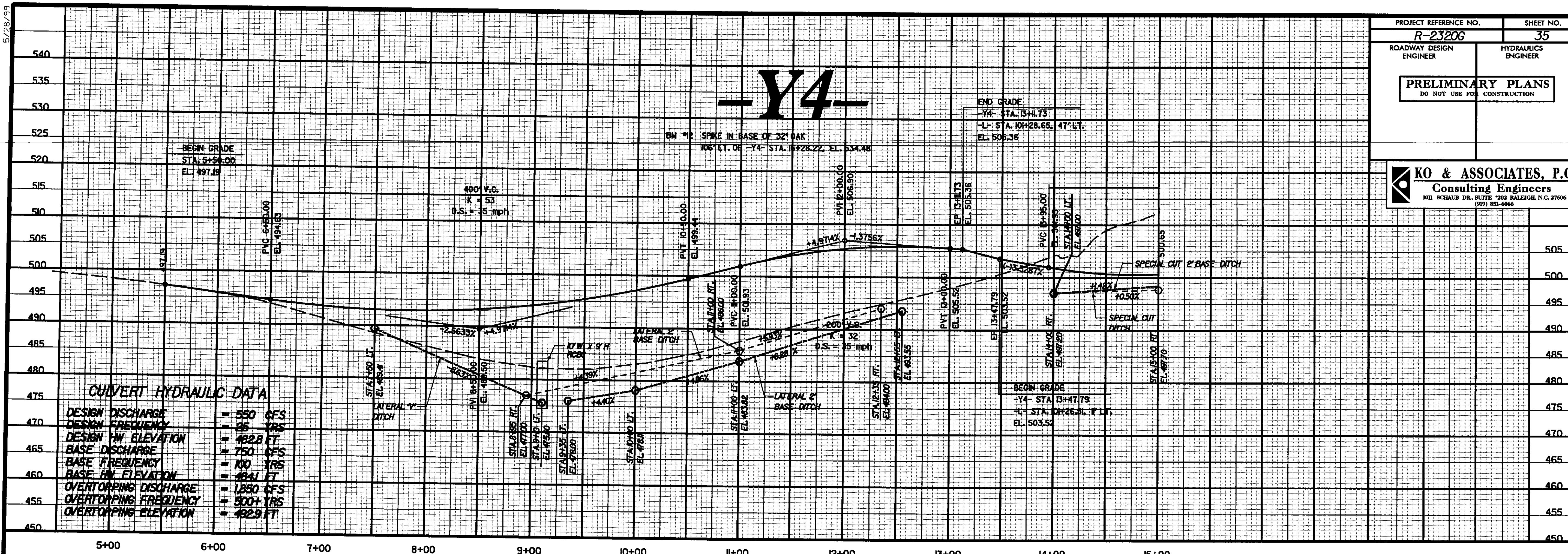
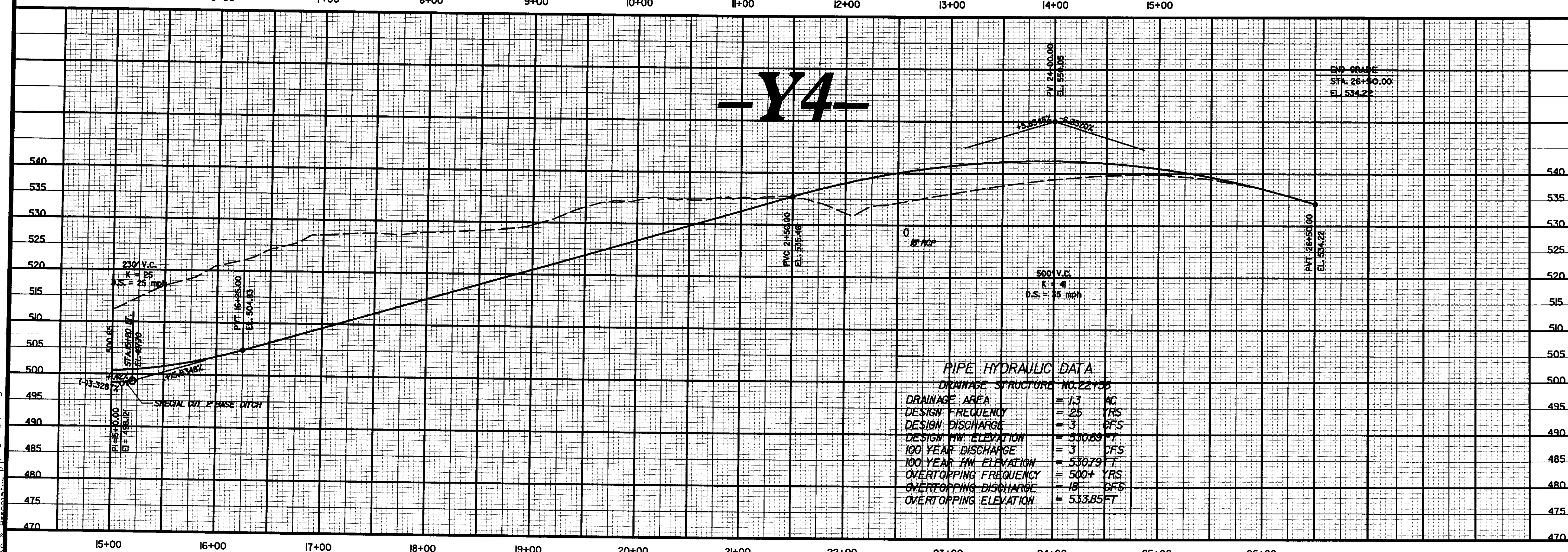
-Y4-



CULVERT HYDRAULIC DATA

DESIGN DISCHARGE	= 550 CFS
DESIGN FREQUENCY	= 25 YRS
DESIGN HW ELEVATION	= 482.8 FT
BASE DISCHARGE	= 750 CFS
BASE FREQUENCY	= 100 YRS
BASE HW ELEVATION	= 484.1 FT
OVERTOPPING DISCHARGE	= 1,850 CFS
OVERTOPPING FREQUENCY	= 500+ YRS
OVERTOPPING ELEVATION	= 492.9 FT

-Y4-



PIPE HYDRAULIC DATA

DRAINAGE STRUCTURE NO.22+58

DRAINAGE AREA	= 1.3 AC
DESIGN FREQUENCY	= 25 YRS
DESIGN DISCHARGE	= 3 CFS
DESIGN HW ELEVATION	= 530.89 FT
100 YEAR DISCHARGE	= 3 CFS
100 YEAR HW ELEVATION	= 530.79 FT
OVERTOPPING FREQUENCY	= 500+ YRS
OVERTOPPING DISCHARGE	= 18 CFS
OVERTOPPING ELEVATION	= 533.85 FT

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ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
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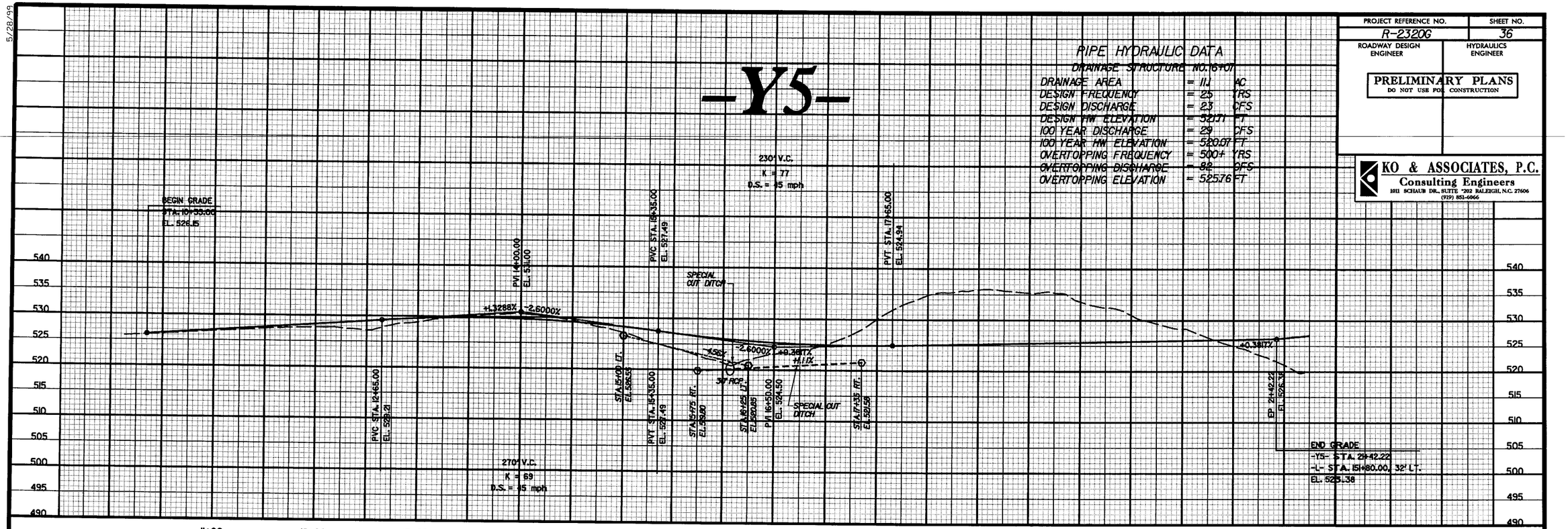
KO & ASSOCIATES, P.C.
Consulting Engineers
1011 SCHAUB DR., SUITE 202 RALEIGH, N.C. 27606
(919) 851-6066

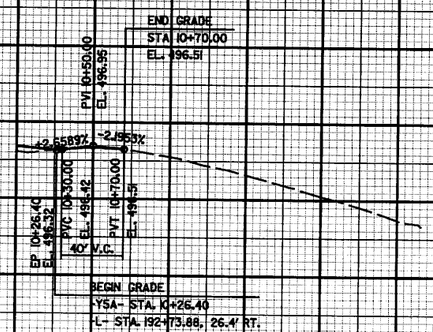
-Y5-

PIPE HYDRAULIC DATA
DRAINAGE STRUCTURE NO. 16+01

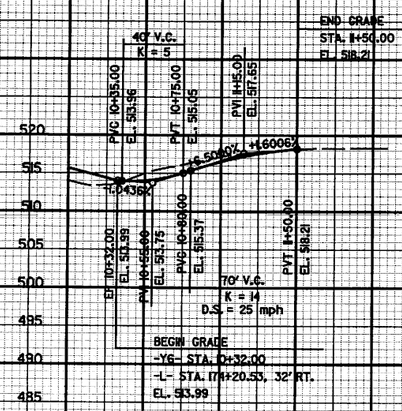
DRAINAGE AREA	= 11.4	AC
DESIGN FREQUENCY	= 25	YRS
DESIGN DISCHARGE	= 23	CFS
DESIGN HW ELEVATION	= 521.71	FT
100 YEAR DISCHARGE	= 29	CFS
100 YEAR HW ELEVATION	= 520.07	FT
OVERTOPPING FREQUENCY	= 500+	YRS
OVERTOPPING DISCHARGE	= 82	CFS
OVERTOPPING ELEVATION	= 525.76	FT



-Y5A-



-Y6-



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KO & Associates, P.A.

PROJECT REFERENCE NO.	SHEET NO.
R-2320G	37

ROADWAY DESIGN ENGINEER

HYDRAULICS ENGINEER

PRELIMINARY PLANS
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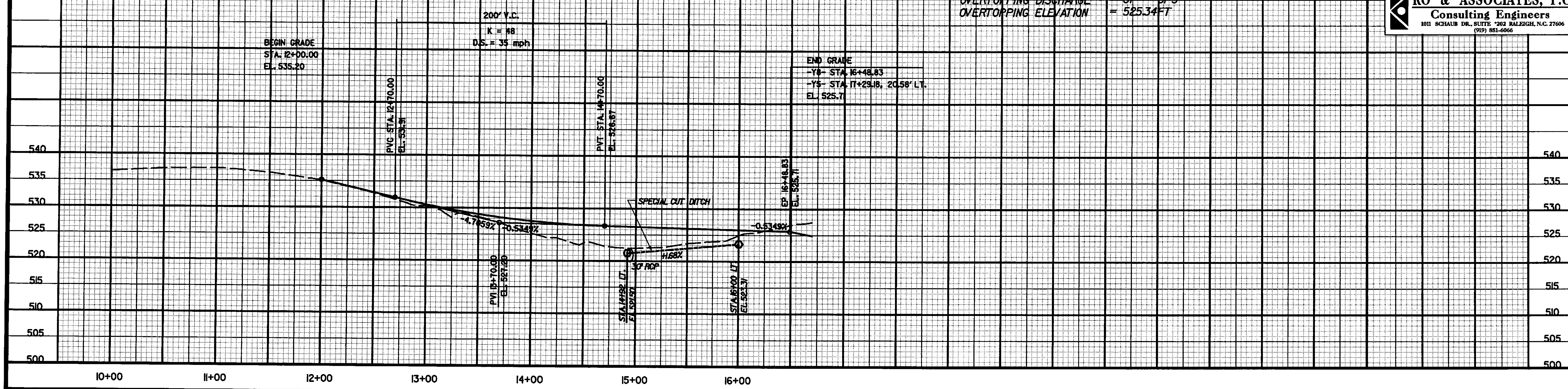
-Y8-

BM *18 SPIKE IN BASE OF 18" SWEETGUM
48' RT. OF -Y8- STA. 13+44.85, EL. 525.64

PIPE HYDRAULIC DATA

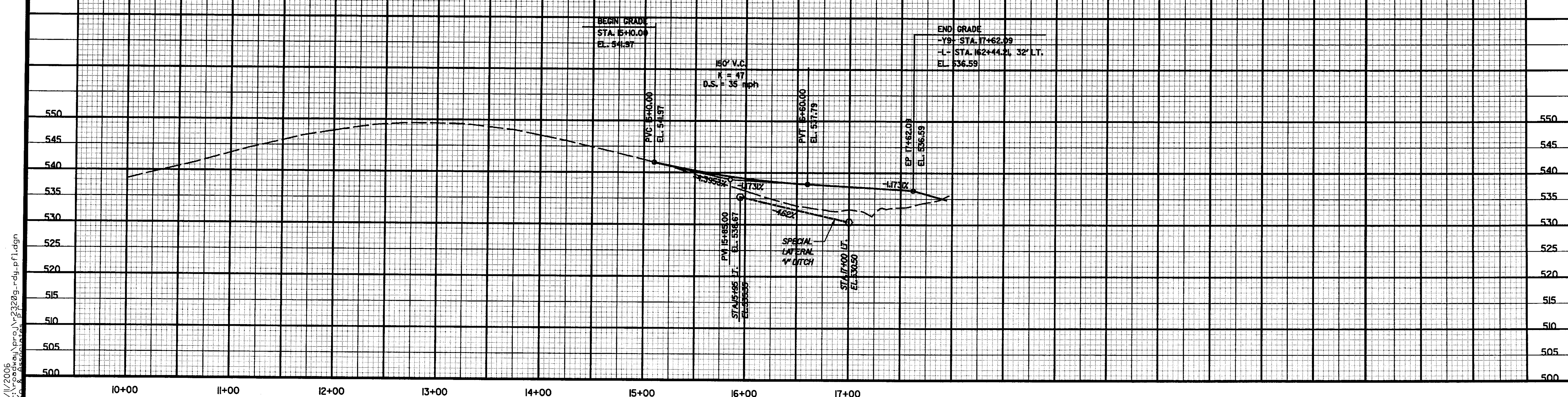
DRAINAGE STRUCTURE NO.14+945

DRAINAGE AREA	= 7.66	AC
DESIGN FREQUENCY	= 25	YRS
DESIGN DISCHARGE	= 16	CFS
DESIGN HW ELEVATION	= 524.52	FT
100 YEAR DISCHARGE	= 21	CFS
100 YEAR HW ELEVATION	= 524.83	FT
OVERTOPPING FREQUENCY	= 200+	YRS
OVERTOPPING DISCHARGE	= 31	CFS
OVERTOPPING ELEVATION	= 525.34	FT



-Y9-

BM *19 SPIKE IN BASE OF POWER POLE
28' LT. OF -Y9- STA. 14+68.15, EL. 546.72



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5/28/99

PROJECT REFERENCE NO.	SHEET NO.
R-2320G	38
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
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-Y10-

BEGIN GRADE
STA. 11+60.00
EL. 503.62

-6.0330%

250' V.C.
K = 5
D.S. = >5 mph

PVC 11+40.00
EL. 504.12

PVT 11+90.00
EL. 501.35

+1.7600%

PVI 11+40.00
EL. 500.00

EP 11+83.47
EL. 500.41

END GRADE
-Y10- STA. 11+83.47
-L- STA. 103+71.16, 32' LT.
EL. 500.41

10+00 11+00 12+00

-Y11-

BEGIN GRADE
STA. 11+70.00
EL. 501.79

+0.3512%

EP 11+86.31
EL. 501.83

END GRADE
-Y11- STA. 11+86.31
-L- STA. 103+63.84, 32' LT.
EL. 501.83

10+00 11+00 12+00

PIPE HYDRAULIC DATA
DRAINAGE STRUCTURE NO. 10+40

DRAINAGE AREA	= 5.0	AC
DESIGN FREQUENCY	= 25	YRS
DESIGN DISCHARGE	= 12	CFS
DESIGN HW ELEVATION	= 501.66	FT
100 YEAR DISCHARGE	= 15	CFS
100 YEAR HW ELEVATION	= 501.93	FT
OVERTOPPING FREQUENCY	= 500+	YRS
OVERTOPPING DISCHARGE	= 26	CFS
OVERTOPPING ELEVATION	= 503.11	FT

-SR 2-

BEGIN GRADE
-SR 2- STA. 10+12.35
-Y1- STA. 15+57.14, 12 LT.
EL. 502.33

EP 10+12.35
EL. 502.33

+2.4649%

250' V.C.
K = 60
D.S. = 40 mph

PVC 13+00.00
EL. 509.42

PVI 14+25.00
EL. 502.50

+2.4649%

+6.6000%

PVT 15+50.00
EL. 520.75

END GRADE
STA. 17+55.00
EL. 534.28

10+00 11+00 12+00 13+00 14+00 15+00 16+00 17+00 18+00

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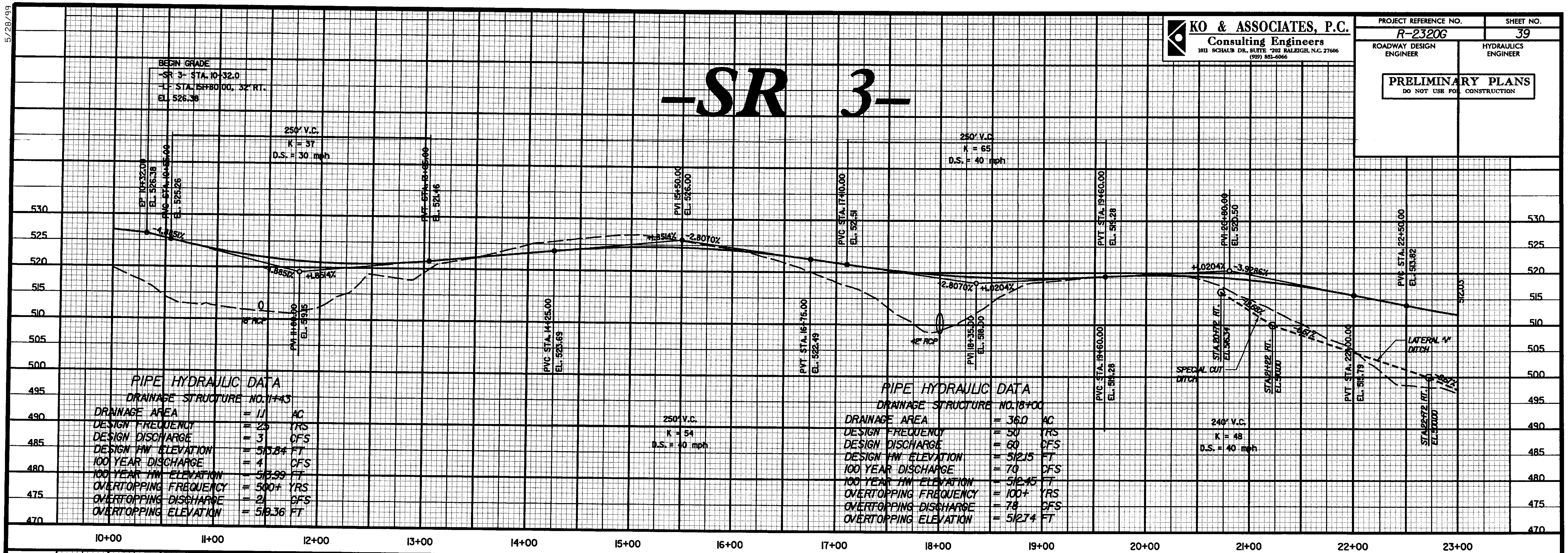
PROJECT REFERENCE NO.	SHEET NO.
R-2320G	39
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

-SR 3-



PIPE HYDRAULIC DATA

DRAINAGE STRUCTURE NO. 11+43

DRAINAGE AREA	= 1.1	AC
DESIGN FREQUENCY	= 25	YRS
DESIGN DISCHARGE	= 3	CFS
DESIGN HW ELEVATION	= 513.84	FT
100 YEAR DISCHARGE	= 4	CFS
100 YEAR HW ELEVATION	= 513.99	FT
OVERTOPPING FREQUENCY	= 500+	YRS
OVERTOPPING DISCHARGE	= 21	CFS
OVERTOPPING ELEVATION	= 519.36	FT

PIPE HYDRAULIC DATA

DRAINAGE STRUCTURE NO. 18+00

DRAINAGE AREA	= 36.0	AC
DESIGN FREQUENCY	= 50	YRS
DESIGN DISCHARGE	= 60	CFS
DESIGN HW ELEVATION	= 512.15	FT
100 YEAR DISCHARGE	= 70	CFS
100 YEAR HW ELEVATION	= 512.45	FT
OVERTOPPING FREQUENCY	= 100+	YRS
OVERTOPPING DISCHARGE	= 78	CFS
OVERTOPPING ELEVATION	= 512.74	FT

-SR 3-