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STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

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July 21, 2003

U. S. Army Corps of Engineers
Raleigh Regulatory Field Office
6508 Falls of Neuse Road, Suite 120
Raleigh, North Carolina 27615

Attention: Mr. Eric Alsmeyer
NCDOT Coordinator

Subject: **Section 404/401 Individual Permit Application**, Guilford County,
Greensboro Western Urban Loop, from I-85 south of Groometown to
south of I-40 interchange; Federal Aid Project No. STPNHF-NHF-124-
1(1); State Project No. 8.U492101; TIP No. U-2524 AB & AC; USACE
Action Id 199403906; \$475.00 Debit work order 8.U492101, WBS
Element 34820.1.2

Dear Sir:

The North Carolina Department of Transportation (NCDOT) proposes to construct a portion of the Greensboro Western Urban Loop. The project lies in southwestern Guilford County. The proposed project involves construction of a four- to eight-lane freeway on new location. The purpose of this letter is to make application for a Department of the Army permit (Section 404 Individual Permit) from the U.S. Army Corps of Engineers (USACE). Application is also made to the N.C. Division of Water Quality (NCDWQ) for a 401 Individual Water Quality Certification (WQC), Randleman Buffer Certification and Randleman Buffer Variance.

This permit application concentrates upon two sections of TIP No. U-2524; Sections AB and AC. These sections involve 5.23 miles of road construction on new location. These sections are scheduled for letting in November 2003. This application package consists of the cover letter, a concurrence form, ENG Form 4345, 8½" x 11" permit drawings, figures noting the interchange of TIP Nos. I-2402A and U-2524 AB, Randleman Buffer Addendum, Randleman Buffer Variance request, Stormwater Management Plan, and half size plan sheets.

Purpose and Need. Construction of TIP No. U-2524 AB/AC and AB Part I will improve east-west traffic and bypass travel around Greensboro. Construction of TIP No. U-2524

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AB/AC and AB Part I will complete connect with the I-85 Bypass of Greensboro and provide an I-40 Bypass of Greensboro.

Summary of Impacts. Wetland and stream impacts fall under the jurisdiction of two regulations: the federal Clean Water Act (CWA) and the NC Isolated Wetlands Regulations. Impacts to Waters of the United States from construction TIP No. U-2524 AB/AC and AB Part I total 3.87 acres of fill in wetlands, 0.10 acre of excavation in wetlands, 0.17 acre of mechanized clearing in wetlands, 2.05 acres of fill in streams, 3.92 acres of fill ponds, and 11,525 feet of stream impacts. The NCDOT proposes to relocate 4,610 feet of stream on site resulting in an effective loss of 6,919 feet of stream. Construction of the road project will impact 20.46 acres of Zone 1 buffers and 11.79 acres of Zone 2 buffers.

Summary of Compensatory Mitigation. The NCDOT will provide compensatory mitigation for 1.32 acres of wetlands and 7,171 feet of streams. These numbers reflect earlier compensatory mitigation for impacts performed by N.C. Wetland Restoration Program (NCWRP) for most of TIP No. U-2524 AB Part I. Compensatory mitigation for project related impacts to wetlands will be provided at Sandy Creek Wetland Mitigation Site and Blue Tract Mitigation Site in Moore County. Compensatory stream mitigation will be provided at Woodlyn Way, Tick Creek and UT Bear Creek.

The total amount of compensatory buffer mitigation required for the proposed project is 60.26 acres (2624925.6 feet²). The NCDOT proposes to make a payment to NCWRP to compensate for these impacts.

Project Schedule and History

For funding and construction purposes, the project has been divided into seven sections. Table 1 contains information concerning the project section, proposed termini for each section as well as the let date for each section.

Table 1. Information regarding project sections, terminus and let dates.

Section	Section Termini	Let Date
AA	SR 1546 (Guilford College Road), from South of SR 1541 (Wendover Road) to North of SR 1560 (Sapp Road)	September 1998
AB	From North of I-85 near Groometown to North of High Point Road	November 2003
AC	From North of Norfolk Southern RR to south of I-40 Interchange	November 2003
BA	From I-40 Interchange to North of SR 2147 (West Friendly Avenue)	July 2003
BB	From North of SR 2147 (West Friendly Avenue) to North of Bryan Boulevard	July 2003
C	From Bryan Boulevard to SR 2340 (Old Battleground Road)	PY 2008
D	From SR 2340 (Old Battleground Road) to SR 2303 (Lawndale Drive)	PY 2008

TIP No. U-2524 AA

Section AA involved the relocation of a portion of SR 1546 (Guilford College Road) from south of SR 1541 (Wendover Avenue) to north of SR 1560 (Sapp Road) and the construction of a grade separation and interchange at relocated Guilford College Road and Wendover Avenue. This work had logical termini and independent utility from the remaining sections of TIP No. U-2524. This section of TIP No. U-2524 was authorized under a Section 404 Nationwide Permit 14 (USACE Action Id 199820229, NCDWQ # 970498). TIP No. U-2524 AA was completed in January 2001.

TIP No. U-2524 BA/BB

Sections BA and BB were permitted together as these two sections had logical termini and independent utility from the remaining sections of TIP No. U-2524. These two section have been permitted under a Section 404 Individual Permit and 401 Individual WQC (USACE Action Id 200221216, NCDWQ # 01-0318).

TIP No. I-2402 A and U-2524 AB

A portion of the proposed project was previously permitted, but not constructed, and will be referred to as "TIP No. U-2524 AB Part I" in this permit application. This portion of the project is described in the following paragraphs.

A portion of the wetland and stream impacts now found within TIP No. U-2524 AB (Part I) were originally included in the Section 404/401 permit for TIP No. I-2402 A, B and C (USACE Action Id 199502886 and NCDWQ # 98-0349). Figures 1-3 in Attachment A depict the sites impacted under the construction of TIP No. I-2402 A and those permitted, but not impacted, under TIP No. I-2402 A. Figures 4-6 in Attachment A

show the roadway constructed under TIP No. I-2402 A and the road proposed for construction under TIP No. U-2524 AB (Part I).

There were a total of fourteen (14) sites permitted under TIP No. I-2402 A which are proposed for impact under TIP No. U-2524 AB Part I. These sites include Sites 7, 8, 11, 12, 13, 14, 15, 16, 17, 21, 23, 24 and 25 in Section AA and Site 28 from TIP No. I-2402 AB. The permit application for TIP No. I-2402 A included the “ultimate” build for the I-85 Bypass and listed these sites as being impacted in order to connect the I-85 Bypass with TIP No. U-2524 AB. However, the NCDOT only constructed the “interim” design for the I-85 Bypass, thereby not impacting these jurisdictional areas connecting the I-85 Bypass with TIP No. U-2524 AB.

To construct the interim design, the NCDOT impacted portions of Sites 7 and 25. Figures 1-3 note sites impacted under TIP No. I-2402 A and those sites proposed for impact under TIP No. U-2524 AB Part I. These figures provide a lay out of how TIP No. I-2402 A and U-2524 AB connect.

As noted earlier, a description of and mitigation strategy for these fourteen sites from TIP No. I-2402A are included with this permit application for TIP No. U-2524 AB/AC. These sites total 2.82 acres of impact to wetlands, 0.96 acre of surface waters (natural), 0.07 acre of surface water (pond), 4,525 feet of impact. In addition, there will be 1,887 feet of stream relocation using natural channel design. This action will result in an effective channel loss of 2,704 linear feet.

The NCDOT mitigated these impacts by paying into the NCWRP. This portion of the proposed project previously permitted, but not constructed, will be referred to as “TIP No. U-2524 AB Part I” in this permit application.

NEPA Documentation

The Draft Environmental Impact Statement (EIS) for Greensboro Western Urban Loop was approved by the Federal Highway Administration (FHWA) on June 4, 1991. The Final EIS for the subject project was signed by FHWA on February 28, 1995. These documents have been distributed to resource agencies for their review. The Record of Decision (ROD) was approved on August 17, 1995.

Independent Utility and Logical Termini

The projects are 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.

The proposed construction of Greensboro Western Outer Loop, involving Sections AB Part I, AB and AC, has independent utility from the remaining section of the project. These sections can be considered independent of the remaining section because it meets the objectives of "independent utility" as defined by the FHWA:

The NCDOT believes TIP No. U-2524 AB and AC meets the USACE for logical termini as presented above. At a minimization meeting June 15, 2000, the USACE agreed with NCDOT's assessment that it may apply for a Section 404 Individual Permit for the referenced sections (AB and AC) since these sections represented logical termini. Avoidance/ minimization steps were also performed for these two sections in conjunction with Sections BA and BB. Sections BA and BB have been permitted thus this Section 404 permit application only involves Sections AB and AC.

Indirect and Cumulative Impacts Evaluation

The NCDOT has completed an indirect and cumulative effect (ICE) evaluation entitled *Indirect and Cumulative Impact Study*, dated June 2003. Copies of this document were transmitted the the DWQ on July 2, 2003. Additional copies are attached to this application. This report was a qualitative evaluation of the indirect and cumulative effect and will be referred to in this application as an ICE. The ICE evaluation is qualitative because the Randleman Buffer Rules already exist for almost all of the land affected by proposed road project. This was confirmed in a DWQ memorandum from John Dorney to Coleen Sullins dated May 2, 2002. The ICE documented that Hickory Creek (found in Section AB Part I) and unnamed tributaries to South Buffalo Creek (found in Section AB) are 303(d) list streams. A copy of this study is attached to permit application for the USACE and NCDWQ.

The ICI concludes that notable changes in land use patterns are not expected to result from construction of the road project. The City of Greensboro has implemented plans, programs and regulations to protect and improve the city's lakes and streams. The City of High Point has also adopted regulations to protect water quality. With these existing ordinances and regulations, construction of the road project will not result in indirect and cumulative impacts that will adversely affect water quality (ICI, 2003).

Federally Protected Species

There were no federally protected species listed by U. S. Fish and Wildlife Service (USFWS) when the referenced NEPA documents were completed. However, the USFWS now lists the bald eagle (*Haliaeetus leucocephalus*) for Guilford County. The bald eagle is listed as Threatened-Proposed for Delisting.

The NCDOT has concluded that construction of the proposed project will not affect the bald eagle. The basis of this decision lies with the fact that none of the three variables for habitat (close proximity and clear flight path to water, largest living tree and open view of surrounding area) exist within the project right of way.

Cultural Resources

The NCDOT has complied with Section 106 of the National Historic Preservation Act. There are no archaeological sites located in the project impact areas eligible for the National Register of Historic Places. It has also been determined by State Historic Preservation Office that the proposed project will not affect properties found National Register list or eligible for the list.

FEMA

The proposed project does cross floodplains and floodways which are regulated by the Federal Emergency Management Agency (FEMA) therefore no coordination was necessary. The NCDOT committed in the FEIS to designing the project such that floodways can carry the 100-year flood without increasing the flood water elevation more than one foot at any given point.

Wild and Scenic River

There are no waterways in the proposed project impact area having this classification.

Impacts to Waters of the United States

Impacts to waters of the United States cannot be avoided in order to construct the proposed project (TIP No. U-2524 AB/AC and AB Part I). Road construction will result in 3.87 acres of fill in wetlands, 0.10 acres of excavation in wetlands, 0.17 acre of mechanized clearing in wetlands, 2.05 acres of fill in surface waters (natural), 3.92 acres of fill in surface waters (pond) and 11,525 feet of stream impacts. The NCDOT will relocate 4,610 feet of stream, resulting in a stream loss of 6,919 feet.

The proposed project lies in the Cape Fear River Basin. All of TIP No. U-2524 AB Part and AC, as well as most all of TIP No. U-2524 AB, lie in Hydrologic Unit (HU) 03030003. The two exceptions are Sites 1 and 2 of Section AB; these two sites are located in HU 03030002.

The NCDOT has conducted wetland and stream delineations for TIP No. U-2524 AB and AC, as well as TIP No. U-2524 AB Part I. All wetland determinations were performed using criteria outlined in *1987 Corps of Engineers Wetland Delineation Manual*. The wetland delineation for Section AB Part was completed in fall 1996. The delineations for Sections AB and AC were conducted from July 22- September 1, 1998 and from March 22-23, 1999. These delineations have been confirmed by the USACE.

The stream delineation for all these sections was conducted using guidance provided by NCDWQ, "Field location of streams, ditches and ponding: Revision Number Six, Working Draft, dated February 10, 1997." The stream delineation for Section AB Part I was completed in December 1997/January 1998. Stream delineations for Section

AB and AC were conducted during summer 1999. These delineations have been confirmed by the USACE.

Wetland Impacts

Tables 2-4 describes the wetlands impacted by TIP No. U-2524 AB/AC and AB Part I. This table includes information related to wetland impact site number, wetland community, Division of Environmental Management (DEM) rating, and amount/type of wetlands impacted. The DEM rating reflects a wetland evaluation using the Division of Environmental Management (DEM) *Guidance for Rating the Values of Wetlands in North Carolina* (4th Version). Table 5 provides a breakdown of wetland community types impacted and wetland community types for each project section.

Section AB Part I. The total wetland impact for this section of the project is 2.84 acres. The two predominant wetland community types are emergent seeps and headwater forests. There is also a bottomland hardwood wetland community that will be impacted.

A portion of the wetland system at Site 25 was impacted by construction of TIP No. I-2402A. The total wetland impact under TIP No. I-2402A was 1.02 acres, and, of this amount, 0.64 acres will be impacted with TIP No. U-2524 AB Part I.

A comparison of wetland acreages between TIP No. I-2402 A and U-2524 AB Part I revealed a decrease between 0.025-0.07 acre (0.01-0.03 hectare) and an increase of 0.025 acre (0.01 hectare) for several sites. These sites decreasing in the acreage by 0.025 acre include Sites 17 and 21 with Site 14 decreasing by 0.07 acre for Site 14. The increase in acreage (0.025 acre) was for Sites 11 and 13. The net change for these sites between the summary sheets (and for this section) is a decrease of 0.05 acre. The change in these site impacts can be attributed to the use of computer assistance through Microstation now versus the use of a planimeter when the 404/401 permit application was made for TIP No. I-2402A.

Section AB. There are two jurisdictional wetland sites in this section totaling 0.13 acres. Site 1 is located in HU 03030002 and involves impacts to an old pond that has been drained. The vegetation in this wetland is primarily herbaceous including spotted touch me not (*Impatiens capensis*) and false nettle (*Boehmeria cylindrica*) with black willow (*Salix nigra*), elderberry (*Sambucus canadensis*) and silky dogwood (*Cornus amomum*) present along the edge of the old pond. .

- Site 2: This is an alluvial wetland system located downstream of the Hester Park Dam. This small wetland includes vegetation of tag alder (*Alnus serrulata*), spotted touch me not and sweet-gum (*Liquidambar styraciflua*).
- Site 9: This 0.21 acres pond that will be drained by the project. This system is an isolated wetland that has been logged. The site had a DEM rating of 32 and a Cowardin classification of PFO1J (palustrine deciduous forested wetland system that is intermittently flooded). The USACE has determined it does not have jurisdiction over the wetland system at Site 9 and is exempt

from the NC Isolated Wetland Regulations because the 30% Design (hydraulic design) for these two sections of the road project was completed in December 1999, prior to enactment of NCAC 2H.1301.f.5.C. .

Section AC. There are two wetland sites in Section AC, Sites 9 and 1B, and these impacts total 1.19 acres. The wetland community types for these two sites are an old, drained pond and a beaver impoundment.

- Site 9: This is a drained pond located near the existing interchange of Wendover Road/High Point Road. Vegetation is dominated by carex (*Carex* sp.), lobelia (*Lobelia puberla*), beak rush (*Rhychospera* sp.), and rush (*Juncus effusus*).
- Site 1 BA: This is a beaver impoundment and former headwater forest. Vegetation associated with this wetland includes black willow, tag alder, false nettle, and rush. The beaver dam is located downstream from the project area. The NCDOT plans to remove the beaver dam as part of project construction.

Stream Impacts

The proposed project predominantly crosses streams within the Randleman Lake Reservoir although there is one crossing, an unnamed tributary (UT) to South Buffalo Creek, that is not within this watershed. Tables 6-8 describes proposed stream impacts, including site number, stream name, drainage type, surface water impact (natural), surface water impact (pond), existing stream length, relocated stream length, channel loss and amount of compensatory mitigation required. Table 9 summarizes impacts to streams and ponds for each project section.

Section AB Part I. Impacts to streams in this section of the project involve Hickory Creek and its unnamed tributaries, all part of HU 03030003. There are 0.96 acres of stream impacts, 0.07 acres of pond impacts, and 4,590 feet of stream impact. The NCDOT proposes to relocate 1,887 feet of stream; thus the effective stream loss in this section will be 2,704 feet.

The NCDOT has previously mitigated for Site 7 at a ratio of 1:1 because of the poor quality of the stream. It flowed through a cow pasture and was heavily impacted by livestock. The NCDOT mitigated at a ratio of 2:1 for Sites 25 and 28. There are now additional stream impacts at Sites 7 (171 feet) and 17 (676 feet) for which NCDOT needs to account with Section AB Part I. The compensatory mitigation required for AB Part I is 814 feet.

- Site 7: At Site 7, the stream loss at the site has been revised, from 1,123 feet to 952 feet. The stream flows through a livestock pasture and is poor in quality from access to livestock over the years; therefore, a mitigation ratio of 1:1 was used for the 404.401 application for TIP No. I-2402 A. There were two stream impacts through Loop A and between Loop C and IIFly which were

counted toward stream relocation under TIP No. I-2402A. The stream length totaled 171 feet (52 m). Therefore, the correct total of relocation at Site 7 is 952 feet, and the NCDOT needs to mitigate (1:1 ratio as it mitigated previously) for an additional 171 feet of compensatory mitigation at this site.

- Site 17: In the 404/401 permit application for Site 17 for TIP No. I-2402 A, there was not a stream impact. The NCDOT has revised its characterization of the stream and determined the drainage to be a perennial stream. The project will impact 676 feet. A mitigation ratio of 1:1 is proposed for this stream reach because the stream has low quality since it has been degraded by livestock access over the years.
- Site 25: At Site 25, the stream was good in quality and NCDOT mitigated for impacts at a 2:1 ratio for impacts under TIP No. I-2402 A. The channel relocation and most of the culvert construction has been completed under the previous road work. The portion of Site 25 that remains to be constructed is the remaining culvert which will impact 346 feet.
- Site 28: At this site we installed a pipe and approximately 377 feet (115 m) of stream relocation under TIP No. I-2402A. The total amount of stream relocation proposed under TIP No. I-2402A was 1280 feet. Under TIP No. U-2524 AB Part I, the NCDOT proposes to relocate 935 feet. Therefore, the NCDOT will relocate 33 feet more than it had originally planned under the TIP No. I-2402A permit. The increase in footage can be attributed to meanders incorporated into the stream relocation design for this permit application. The NCDOT proposes to apply the “additional” 33 feet toward its compensatory mitigation needs for this section of the project.

Section AB. The predominant stream crossed in this section of the proposed project is Reddick’s Creek. There are also three UT’s to Reddick’s Creek traversed, as well as a UT to South Buffalo Creek and a UT to Bull Run. Impacts to streams total 0.57 acres of stream impacts, 0.48 acres of pond impacts, and 2,877 feet of existing stream impact. The NCDOT will relocate 692 feet of stream, thus there will be an effective 2,186 feet of stream channel loss on Section AB.

- Site 2: This section involves an UT to South Buffalo Creek (intermittent) and lies in HU 03030002. This reach was determined to not have ecological significance, thereby not requiring mitigation. These impacts are 213 feet of stream impact, 0.05 acre surface water impacts (natural) and 0.48 surface water (pond).
- Sites 3,4,6, and 7: The NCDOT will mitigate at a ratio of 2:1 for Sites 3, 4, 6 and for that portion of Site 7 that is perennial. The intermittent portion of Site 7 will be mitigated at a ratio of 1:1. Sites 3, 4, 6 and 7 (perennial) are decent to good quality streams with a riparian buffer. Sites 7 (intermittent) is ecologically significant, although lacks a buffer and has livestock impacts. The total compensatory mitigation needed for Section AB is 2,980 feet.

Section AC. Long Branch and Bull Run are the predominate streams traversed by this section of the proposed road project. There are also five crossings of UTs to Bull Run and two crossing of UT's to Long Branch. There are 0.52 acres of stream impacts, 3.37 acres of pond impacts, and 4,058 linear feet of jurisdictional stream impact. As part of project construction, 2,031 feet of stream relocation will be performed resulting in an effective channel loss of 2,029 feet in Section AC.

The NCDOT proposes to mitigate, at a ratio of 2:1 for Sites 1, 2, 6, 7, 11 and 1 BA, and at a ratio of 1:1 for Site 3. Sites 1, 2, 6, 7, 11 and 1 BA are decent to good quality streams with a riparian buffer. Site 3 is ecologically significant, although the intermittent stream is very entrenched and not connected with its floodplain. The total compensatory stream mitigation needed for Section AC is 3,377 feet.

MITIGATION

The USACE had 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.

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 jurisdictional impacts. Avoidance measures were taken during the planning and NEPA compliance stages; minimization measures were incorporated as part of the project design.

Avoidance and Minimization

An avoidance/minimization meeting was held with USACE, NCDWQ, North Carolina Wildlife Resource (NCWRC) and USFWS. This meeting, held June 15, 2000, involved reviewing wetlands and streams within the corridor for the Greensboro Western Urban Loop (Sections A & B).

Concurrence. The agencies concurred at the end of the meeting that the NCDOT had minimized wetlands and stream impacts to the maximum extent practicable. The NCDOT agreed to use natural stream channel techniques to design stream relocations. Supporting documentation regarding characteristics of relocation channels can be found in the attached permit drawings. Attached to this letter is a copy of the concurrence formed by the project team members (USACE, EPA, USFWS, NCDWQ, and NCWRC) (Attachment B).

Avoidance:

- The NCDOT delineated 13.17 acres of wetlands within the 1000-foot corridor proposed for the road project. The NCDOT was able to avoid 11.85 acres of wetlands by placing the Urban Loop alignment as proposed for construction.
- Wetland W1 near I-40 as described in the EIS will be completely avoided.

Minimization:

- *Long Branch Relocation (Section AC, Site 2BA).* Of particular concern to the agencies was the proposed piping of Long Branch at the proposed Urban Loop/I-40 interchange (Section AC, Site 2BA). This impact and relocation is found on permit drawings for Section AC, Sheets 32-35 of 36, Station 101.80-L- to 12+20-Ramp D-. Due to the substantial amount of channel impacts associated with this stream, the agencies suggested the NCDOT relocate and employ natural stream channel techniques when designing the channel relocation at this site. Natural stream channel techniques has been used in the relocation design. Construction of the relocated channel will be in the dry and was included with the design plans for TIP No. U-2524BA. The decision to include construction of the relocated channel in TIP No. U-2524 BA was made to provide a new, stabilized stream channel capable of receiving water near the time of construction for TIP No. U-2524 AC as Sections BA and AC connect with one another. The NCDOT will be replanting 1.21 acres of Zone 1 (within 30 feet of the stream's top of bank) and 0.74 acres of Zone 2 (within 20 of the stream's top of bank). Vegetation to be planted includes *black willow (Salix nigra)*, *silky dogwood (Cornus amomum)*, *green ashe (Fraxinus pennsylvanica)*, *sycamore (Plantus accidentalis)*, *tulip poplar (Liriodendron tuliperifera)*, and *river birch (Betula nigra)*.
- *UT #3 Reddick's Creek.* The proposed road project has been placed on top of UT #3 Reddick's Creek (Section AB, Site 3) in order to fit between two housing developments. This impact is located on Sheets 9 and 10 of 26, Station No. 34+00 to 37+10 -L-. The NCDOT has minimized impacts to the stream by relocating it south of the proposed roadway. The NCDOT could not place the stream entirely into a relocated channel due to topographic constraints on the site. Relocating the entire stream in a new channel would have led to severe cuts to, and the taking of, highly valued property to accommodate the relocation and associated floodplain. The resource agencies agreed to this minimization technique at this site. The NCDOT will be replanting 0.67 acres of Zone 1 (within 30 feet of the stream's top of bank) and 0.44 acres of Zone 2 (within 20 of the stream's top of bank). Vegetation to be planted includes *black willow (Salix nigra)*, *silky dogwood (Cornus amomum)*, *green ashe (Fraxinus pennsylvanica)*, *sycamore (Plantus accidentalis)*, *tulip poplar (Liriodendron tuliperifera)*, and *river birch (Betula nigra)*.
- All box culvert have been buried one foot. As a result there will be no impacts to aquatic life movements.

- NCDOT commits to planting 50-foot wooded buffers on each side of all stream relocations where allowable considering design constraints and safety.
- The NCDOT met with Ms. Beth Barnes of NCDWQ and you on February 12, 2003. At this meeting, we reviewed the project's plan view, minimization efforts and the connection of TIP No. I-2402 A with U-2524 AB. There were no additional comments from either the DWQ or the USACE about NCDOT's minimization efforts at this meeting.

Compensatory Mitigation

The NCDOT recognizes its need to provide compensation for wetland and stream impacts. The NCDOT proposes the following mitigation strategy to compensate for these impacts. Vicinity maps of these mitigation sites have been attached to this permit application (Appendix C).

Strategy for Wetland Compensatory Mitigation

The NCDOT proposes the following strategy to mitigate for wetland impacts associated with the project. Compensatory mitigation for wetlands will be provided for through payment to NCWRP and at two wetland mitigation sites: Sandy Creek and Blue Tract.

NCWRP. As noted earlier in this permit application, the NCDOT has previously paid the NCWRP to mitigate for wetland impacts in TIP No. U-2524 AB Part I. There has been no increase in the amount of wetland mitigation requirements for TIP No. U-2524 AB Part I. Impacts mitigated by NCWRP for this section of the project total 2.82 acres.

Sandy Creek Mitigation Site. The NCDOT distributed the mitigation planning document for this site to the resource agencies in a letter dated April 7, 1999. This 12 acre site is located in Randolph County (HU 03030003). The site involved restoring 10 acres of bottomland hardwood forest.

The NCDOT constructed and planted the mitigation site during Spring 2001. The groundwater monitoring gauges were installed prior to 2001 growing season. The gauge data gathered to date indicate that all gauges meet groundwater hydrology of greater than 11% for 2001 growing season. The gauge data for this site were included with the Section 404/401 permit application for Sanford Bypass (TIP No. R-2417).

The NCDOT proposes to use 1.32 acres of mitigation from Sandy Creek to satisfy its compensatory wetland mitigation requirements for wetland impacts associated with TIP No. U-2524 AB/AC in HU 03030003. The site has been used twice:

- 2.2 acres for Sanford Bypass project (TIP No. R-2417) (USACE Id 200220899 and NCDWQ 00-1432), and
- 0.79 acres for Greensboro Western Urban Loop (TIP No. U-2524BA/BB) (USACE Action Id 200221216, NCDWQ # 01-0318).

Blue Tract. To satisfy the remaining required compensatory mitigation, the NCDOT proposes to use preservation credits from Blue Tract Mitigation Site. The Blue Tract lies in Moore County (HU 0303004), an adjacent HU. The NCDOT distributed the mitigation plan in June 2001. The NCDOT has discussed the preservation concept and ratios with the agencies. The agencies approved the preservation and mitigation ratios and deleted any mitigation credit for preserving streams on the site. This mitigation site includes 64 acres of cypress-gum swamp preservation and 84.8 acres of bottomland hardwood preservation.

The NCDOT recognizes its proposal to use the Blue Tract lies outside of the impacted basin of HU 03030003. However, the NCDOT believes the quality of these wetland preserved on this tract is very high, much higher than those being impacted by the proposed road project.

Justification for using this mitigation sites lies in the fact that the NCDOT has also worked diligently to identify, purchase and restore wetlands in HU 03030003. However, the NCDOT's efforts to identify, purchase and restore wetlands in this HU have yielded very little available land for wetland mitigation. The NCDOT's efforts to identify wetland mitigation in HU 03030003 were chronicled in the original Section 404/401 permit application for TIP No. U-2524 BA/BB (August 2001).

The NCDOT proposes a higher acreage amount of mitigation at the Blue Tract. The NCDOT and resource agencies agreed to 8:1 ratio for the site when meeting all mitigation needs for a particular project; therefore, the NCDOT suggests using a ratio of 12:1 for the bottomland hardwood community to compensate for wetland impacts for this road project.

The NCDOT proposes to use 7.92 acres of mitigation from the Blue Tract to satisfy its compensatory wetland mitigation requirements for wetland impacts associated with TIP No. U-2524 AB/AC in HU 03030003. The site has been used twice:

- 9.48 acres of bottomland hardwood wetlands for Greensboro Western Urban Loop (TIP No. U-2524 BA/BB) (USACE Action Id 200221216, NCDWQ # 01-0318).
- 11.05 acres of bottomland hardwood for Sanford Bypass (TIP No. R-2417)) (USACE Id 200220899 and NCDWQ 00-1432).

The NCDOT proposes to debit 7.92 acres of the bottomland hardwood preservation component from Blue Tract as compensatory mitigation for impacts from Greensboro Western Urban Loop (TIP No. U-2524 AB/AC).

Strategy for Compensatory Stream Mitigation

The NCDOT proposes the following strategy to mitigate for stream impacts associated with the project. The NCDOT needs to mitigate for 7,171 feet. Compensatory mitigation for streams will be provided for at three mitigation sites: Woodlyn Way, Tick

Creek and UT Bear Creek. Vicinity maps of these mitigation sites have been attached to this permit application. Table 10 summarizes mitigation provided for this road project.

Table 10. Mitigation Sites for Stream Impacts

Site Name	Available Mitigation	Mitigation Used	Mitigation Remaining
Woodlyn Way	1,195	1,195	0
Tick Creek	4,190	4,190	0
UT Bear Creek	3,850	1,786	2,064
Total	9,235	7,171	2,064

Woodlyn Way On-Site Mitigation. This stream mitigation site lies in Guilford County and abuts the proposed project in Section AC. The NCDOT completed a mitigation plan dated January 2002. The mitigation plan was discussed at meeting with the resource agencies on February 7, 2002, and meeting minutes have been provided to the agencies. There were no major changes to the plan except a comment from U.S. Environmental Protection Agency the mitigation credits which are 1150 feet of restoration (1:1 ratio) and 45 feet of enhancement (1:1.5 ratio) with a total mitigation footage of 1180 feet. However, the NCDOT believes full restoration credit is warranted as the mitigation involves a Rosgen Priority I project and a total mitigation footage of 1195 feet.

The NCDOT provided 60% Design Plans of the mitigation site to the resource agencies for their review. The NCDOT summarized comments in a memorandum to the resource agencies dated November 25, 2002.

The NCDOT has completed the design for the project. The NCDOT will construct the site after completion of the roadway project has been completed.

The NCDOT proposes to use the entire mitigation site to provide mitigation for the Greensboro Western Urban Loop.

Tick Creek Mitigation Site. The Tick Creek Mitigation Site lies in Chatham County (HU 03030003). The project involves enhancing/preserving 3,733 feet of Tick Creek, which has several rare mussel species, and conducting a Rosgen Priority I restoration (2,946 feet) for an unnamed tributary of Tick Creek.

The NCDOT described the mitigation project in a mitigation plan developed for the site and dated September 2002. An on-site meeting was held on September 25, 2002 to review the proposed mitigation plan. Comments on the mitigation plan were distributed in a memorandum distributed to meeting participants and dated April 11, 2003. There were no major comments affecting the proposed project. The NCDOT will receive 1,244 feet of credit (3:1 ratio) for enhancing/preserving Tick Creek and 2,946 feet of credit for Priority I restoration of the unnamed tributary of Tick Creek. Total mitigation available at the site is 4,190 feet of stream footage.

The NCDOT provided 60% design plans for agency review and discussed the plans with the resource agencies on April 15, 2003. There were no major changes in the

design from the mitigation plan, and the NCDOT did not receive any comments from the agencies which changed the design.

The NCDOT has finalized the design plans and intends to construct the project late Summer/Fall 2003 and to plant the site after construction of the stream project is completed.

The NCDOT intends to apply all the mitigation available at Tick Creek toward the Greensboro Western Urban Loop (TIP No. U-2524 AB/AC).

UT Bear Creek Mitigation Site. This mitigation site lies in Chatham County (HU 03030003). The project involves restoring a 3,850 feet of stream (2,150 feet UT Bear Creek and 1,700 feet UT1 Bear Creek).

The NCDOT described the mitigation project in a mitigation plan developed for the site and dated June 2003. The NCDOT and the resource agencies reviewed the mitigation plan on June 18, 2003. There were no major changes or concerns about the mitigation plan. There were minor suggestions on the plan regarding the placement of stream crossings for vehicles and livestock.

The NCDOT has begun working to developing design plans for the stream mitigation project. The NCDOT intends to review the design plans with the resource agencies at 60% Design. The construction schedule for the site is Fall 2004 with planting to follow construction of the stream restoration project.

The NCDOT will use 1,786 feet of mitigation from UT Bear Creek. There will be 2,064 feet of mitigation remaining.

Randleman Buffers

The proposed road project impacts an area protected by the Randleman Buffer Rules. The NCDOT has attached to this 404/401 permit application information relevant to impacts to these buffers, entitled "Randleman Buffer Addendum" (Appendix D). Construction of the road project will impact 20.46 acres of Zone 1 buffers and 11.79 acres of Zone 2 buffers.

The NCDOT also requests a variance to the Randleman Buffer Rules. The NCDOT cannot meet the objectives of the Randleman Buffer Rules at two sites, Sites 7 and 28 in TIP No. U-2524 AB Part I. At these two sites, the roadway project lies parallel to the two stream reaches. The variance request is attached to this Section 404/401 permit application (Appendix E).

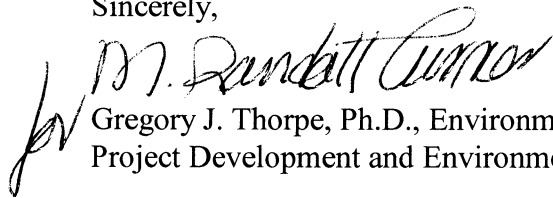
Regulatory Approval

Application is hereby made for a Department of the Army Section 404 Individual Permit for the above-described activities. The proposed action also necessitates Section 401 Individual Water Quality Certification, Randleman Buffer Rule certificate, and a

Randleman Buffer Rule Variance. In compliance with Section 143-215.3D(e) of the North Carolina Administrative Code, the NCDOT asks NCDWQ to debit electronically \$475.00 to act as payment for processing the Section 401 permit application as previously noted in this application (see Subject line). Seven copies of this application are also provided to the NCDWQ for their review.

The NCDOT appreciates the USACE's assistance through the avoidance/minimization process. If you have any questions about this permit application, please contact Mr. Phillip Todd at (919) 715-1467.

Sincerely,

A handwritten signature in black ink, appearing to read "G. J. Thorpe", is written over a printed name and title.

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

cc: Mr. John Dorney, NCDWQ (7 copies)
Mr. Travis Wilson, NCWRC
Ms. Kathy Matthews, USEPA
Mr. Gary Jordan, USFWS
Mr. John F. Sullivan, III, FHWA
Mr. Jay Bennett, P.E., Roadway Design
Mr. Omar Sultan, Programming and TIP
Ms. Debbie Barbour, P.E., Highway Design
Mr. David Chang, P.E., Hydraulics
Mr. Greg Perfetti, P.E., Structure Design
Mr. Mark Staley, Roadside Environmental
Mr. J.M. Mills, P.E., Division Engineer
Mr. Jerry Parker, Division 7 DEO
Mr. David Franklin, USACE, Wilmington (Cover Letter Only)

Table 2. Impacts to Wetlands from TIP No. U-2524 AB Part I

Permit Site	Wetland Community	Cowardin Classification	DEM Rating	Fill (ac)	Excavation (ac)	Mechanized Clearing (ac)	Total Wetland Impact (ac)
8	headwater/emergent seep	PFO1B/PEM2B	28	0.20	n/a	n/a	0.20
11	emergent seep	PEM2B	28	0.07	n/a	n/a	0.07
12	emergent seep	PEM2B	28	0.02	n/a	0.02	0.04
13	emergent seep	PEM2B	33	0.12	n/a	n/a	0.12
14	headwater/emergent seep	PFO1B/PEM2B	33	1.06	n/a	n/a	1.06
15	emergent seep	PEM2B	28	0.05	n/a	n/a	0.05
16	headwater/emergent seep	PFO1B/PEM2B	28	0.20	n/a	n/a	0.20
17	headwater forest	PFO1C	33	0.12	n/a	n/a	0.12
21	headwater forest	PFO1C	46	0.12	n/a	n/a	0.12
23	headwater forest	PFO1C	29	0.17	n/a	n/a	0.17
24	headwater forest	PFO1C	16	0.03	n/a	n/a	0.03
25	bottomland hardwood forest	PFO1C	81	0.59	n/a	0.05	0.64
Totals				2.75	0.00	0.07	2.82

Note: PFO1B denotes palustrine, broad-leaved deciduous forest, that is saturated.

PEM2B denotes palustrine, emergent vegetation that is saturated.

PFO1C denotes palustrine, broad-leaved deciduous forest, that is seasonally saturated.

Table 3. Impacts to Wetlands from TIP No. U-2524 AB

Permit Site	Wetland Community	Cowardin Classification	DEM Rating	Fill (ac)	Excavation (ac)	Mechanized Clearing (ac)	Total Wetland Impact (ac)
1	emergent (old pond)	PEM1B	61	0.10	n/a	n/a	0.10
2	alluvial forest	PFO1C	55	0.03	n/a	n/a	0.03
6	headwater forest	PFO1C	51	n/a	n/a	<0.01	<0.01
Totals				0.03	0.10	0.00	0.13

Note: PEM1B denotes palustrine, persistent emergent wetland system that is saturated.

PFO1C denotes palustrine deciduous forested wetland system that is seasonally flooded.

Table 4. Impacts to Wetlands from TIP No. U-2524 AC

Permit Site	Cowardin Classification	DEM Rating	Fill (ac)	Excavation (ac)	Mechanized Clearing (ac)	Total Wetland Impact (ac)
9	PEM1B	80	0.97	n/a	0.10	1.07
1BA	PFO1Hb	61	0.12	n/a	n/a	0.12
Totals			1.09	0.00	0.10	1.19

Note: PEM1B denotes palustrine, persistent emergent wetland system that is saturated.
PFO1Hb denotes palustrine deciduous forested wetland system that is permanently flooded due to beavers.

Table 5. Wetland Community Type Impacts by Project Section

Wetland Community Type	Section AB (Part I)	Section AB	Section AC	Total Impact per Type (ac)
Emergent	0.28	0.10	1.07	1.45
Emergent/headwater	1.46	n/a	n/a	1.46
Headwater forest	0.44	<0.01	n/a	0.44
Bottomland Hardwood	0.64	n/a	n/a	0.64
Alluvial forest	n/a	0.03	n/a	0.03
Beaver impoundment	n/a	n/a	0.12	0.12
Total Impact per Section	2.82	0.13	1.19	4.13

July 2003

Table 6. Impacts to Streams and Ponds for TIP No. U-2524 AB Part I

Permit Site	Stream Name	Drainage Type	Surface Water Impact (ac)	Surface Water Impact (Pond) (ac)	Existing Length (ft)	Relocated Length (ft)	Channel Loss (ft)	Mitigation Required (ft)
7	UT Hickory Creek	Perennial	0.57	n/a	2402	952	1450*	171
17	UT Hickory Creek	Perennial	0.15	n/a	676	n/a	676	676
25	UT Hickory Creek	Perennial	0.07	n/a	346	n/a	346*	n/a
25b		Pond	n/a	0.07	n/a	n/a	n/a	n/a
28	UT Hickory Creek	Perennial	0.17	n/a	1100	935	165*	(-33)
Totals			0.96	0.07	4525	1887	2704	814

"*" mitigation for channel loss originally provided by NCWRP under TIP No. I-2402 A.

Table 7. Impacts to Streams and Ponds for TIP No. U-2524 AB

Permit Site	Stream Name	Drainage Type	Surface Water Impact (ac)	Surface Water Impact (Pond) (ac)	Existing Length (ft)	Relocated Length (ft)	Channel Loss (ft)	Mitigation Required (ft)
2	UT South Buffalo Creek	Intermittent	0.05	0.48	213	0	213	0
3	UT #3 Reddick's Creek	Perennial	0.26	n/a	958	692	266	532
4	UT Reddick's Creek	Perennial	0.18	n/a	591	n/a	591	1182
6	Reddick's Creek	Perennial	0.03	n/a	233	n/a	233	446
7	UT #1 Reddick's Creek	Perennial	0.01	n/a	318	n/a	318	636
		Intermittent		n/a	184	n/a	184	184
10	UT #10 Bull Run	Intermittent	0.04	n/a	381	n/a	381	n/a
Totals			0.57	0.48	2877	692	2186	2980

July 2003

RANDLEMAN BUFFER ADDENDUM

The purpose of this addendum is to provide the N.C. Division of Water Quality (NCDWQ) with the information needed to evaluate the impacts of the project on the Randleman Basin Riparian Buffer areas. In addition, we are presenting material in this addendum to illustrate that the project has been designed to comply with the Randleman Lake Water Supply Watershed: Protection and Maintenance of Riparian Areas (15A NCAC 02B .0250). Therefore, we request that the NCDWQ issue an Authorization Certificate for the proposed use.

The North Carolina Department of Transportation (NCDOT) proposes to construct a portion of the Greensboro Western Urban Loop. The proposed project involves construction of a four- to eight-lane freeway on new location. The majority of the proposed project lies in Hydrologic Unit 03030003.

Coordination with personnel from NCDWQ and City of Greensboro

The personnel from NCDOT Hydraulics Unit met with representatives from NCDWQ Winston-Salem Regional office on October 18, 2000 to discuss Randleman Buffer Rules. In an attached e-mail from Mr. Larry Coble of NCDWQ, the NCDOT had met the minimum criteria for Randleman Buffer Rules. Mr. Coble stated that the NCDOT needed to receive official approval from local governments regarding compliance with Randlemen Buffer Rules.

The NCDOT contacted the City of Greensboro regarding compliance with Randleman Rules. The City of Greensboro reviewed the drainage plans and “offer(ed) only a few recommendations” to the NCDOT with respect to Randleman Buffer Rules. A copy of this letter from the City of Greensboro, dated June 14, 2001, and a copy of NCDOT’s response to recommendations, have been attached to this permit application.

Since the coordination with NCDWQ field personnel and City of Greensboro staff, the NCDOT has met with NCDWQ central office staff to review the project. Coordination with NCDWQ staff occurred in June 2003. The NCDOT Hydraulics Unit and Project Development and Environmental Development staff reviewed and discussed the design and location of the structures with NCDWQ personnel to accomplish this goal as practicably as possible

Randleman Buffer Rule Impacts

Due to the nature of this project, impacts to the riparian buffer of Reddick’s Creek, Bull Run, Long Branch and their unnamed tributaries, as well as unnamed tributaries of Hickory Creek, are unavoidable.

The NCDOT has minimized impacts to the streams and adjacent buffers by relocating streams in several areas and providing on-site buffer areas for these relocated streams. Vegetation to be planted includes black willow (*Salix nigra*), silky dogwood (*Cornus amomum*), green ashe (*Fraxinus pennsylvanica*), sycamore (*Plantus accidentalis*), tulip poplar (*Liriodendron tuliperifera*), and river birch (*Betula nigra*). Calculations for impacts to the

buffer, available on-site mitigation and compensatory mitigation needs are presented in the attached tables (Tables 1A-6A).

The NCDOT's avoidance and minimization of impacts to streams and wetlands (which are discussed previously in the "Mitigation" section of the Section 404/401 permit application) by default represent avoidance and minimization of impacts to buffers. Drainage flowing in the general direction of the regulated buffers was handled so the 50-foot buffer zone would not be directly impacted. It was the goal of the NCDOT to have the project designed so that the effects of the drainage would not result in water quality impacts to the waters of the Randleman sub basin as required by the Randleman Basin regulations. Total impacts to buffers are 20.46 acres to Zone 1 and 11.79 acres to Zone 2.

The NCDOT will provide on-site buffer at several impact sites, including Site 7 in Section AB Part I, Site 3 in Section AB and Sites 1 and 3 in Section AC), through the stream relocations proposed at these sites. The NCDOT will provide 2.36 acres of Zone 1 on-site buffer mitigation and 1.58 acres of Zone 2 buffer mitigation.

Within the Section 404/401 permit package is a summary of the NCDOT proposal to handle stormwater discharges on TIP No. U-2524 AB Part I and notations for handling stormwater are found on the permit drawings for TIP No. U-2524 AB/AC.

Compensatory Mitigation for Buffer Impacts

The NCDOT has applied the appropriate ratios of 3 and 1.5 to buffer impacts minus the on-site mitigation. The total amount of buffer mitigation required for the proposed project is 60.26 acres (2624925.6 feet²). Based on a cost of 0.97 cents per square foot, the NCDOT will pay \$ 2,546,177.83 to the WRP to provide the necessary buffer mitigation for this project.

Table 1A. Impacts to Randleman Buffer for TIP No. U-2524 ABI

Site No.	Road Crossing	Parallel	Zone 1 (acres)	Zone 2 (acres)	On-Site Mitigation Zone 1 (acres)	On-Site Mitigation Zone 2 (acres)	Total Impact Zone 1 (acres)	Total Impact Zone 2 (acres)
7		x	2.10	1.40	1.30	0.86	0.80	0.54
	x		0.80	0.80			0.80	0.80
	x		0.30	0.20			0.30	0.20
17		x	0.80	0.50			0.80	0.50
25	x		0.40	0.30			0.40	0.30
28		x	1.80	1.30			1.80	1.30
Total			6.20	4.50	1.30	0.86	4.90	3.64

Table 2A. Mitigation Requirements for TIP No. U-2524 ABI

Site No.	Zone 1 (acres)	Zone 2 (acres)	Total Mitigation (acres)
7	5.61	2.81	8.42
17	2.40	0.75	3.15
25	1.20	0.45	1.65
28	5.40	1.95	7.35
Total	14.61	5.96	20.57

Table 3A. Impacts to Randleman Buffer Rules for TIP No. U-2524 AB

Site No.	Road Crossing	Parallel	Zone 1 (acres)	Zone 2 (acres)	On-Site Mitigation Zone 1 (acres)	On-Site Mitigation Zone 2 (acres)	Total Impact Zone 1 (acres)	Total Impact Zone 2 (acres)
3		x	1.35	0.92	0.67	0.44	0.68	0.48
4	x		0.65	0.34			0.65	0.34
6	x		0.42	0.23			0.42	0.23
7	x		0.59	0.04			0.59	0.04
10	x	x	1.03	0.30			1.03	0.30
Total			4.04	1.83	0.67	0.44	3.37	1.39

Table 4A. Mitigation Requirements for TIP No. U-2524 AB

Site No.	Zone 1 (acres)	Zone 2 (acres)	Total Mitigation (acres)
3	2.04	0.72	2.76
4	1.95	0.51	2.46
6	1.26	0.35	1.61
7	1.77	0.06	1.83
10	3.09	0.45	3.54
Total	10.11	2.09	12.2

Table 5A. Impacts to Randleman Buffer Rules for TIP No. U-2524 AC

Site No.	Road Crossing	Parallel	Zone 1 (acres)	Zone 2 (acres)	On-Site Mitigation Zone 1 (acres)	On-Site Mitigation Zone 2 (acres)	Total Impact Zone 1 (acres)	Total Impact Zone 2 (acres)
1	x		0.93	0.61	0.32	0.22	0.61	0.39
2 (p)	x		0.54	0.36			0.54	0.36
2 (i)	x		0.62	0.39			0.62	0.39
3	x		0.50	0.28	0.07	0.05	0.43	0.23
6	x		0.40	0.25			0.40	0.25
7	x		0.52	0.29			0.52	0.29
8			2.74	1.05			2.74	1.05
11	x		0.36	0.24			0.36	0.24
1BA	x		0.49	0.32			0.49	0.32
2BA	x		3.11	1.68	1.21	0.74	3.11	1.68
Total			10.22	5.46	1.61	1.01	9.82	5.20

Note: Site 8 is a temporary impact involving the draining of a pond during construction of the road project.

Table 6A. Mitigation Requirements for TIP No. U-2524 AC

Site No.	Zone 1 (acres)	Zone 2 (acres)	Total Mitigation (acres)
1	1.83	0.59	2.42
2 (p)	1.62	0.54	2.16
2 (l)	1.86	0.59	2.45
3	1.29	0.35	1.64
6	1.20	0.38	1.58
7	1.56	0.44	2.00
11	1.08	0.36	1.44
1BA	1.47	0.48	1.95
2BA	9.33	2.52	11.85
Total	21.24	6.25	27.49

Note: Site 8 is a temporary impact involving the draining of a pond during construction of the road project; the "impact" was not considered for compensatory mitigation purposes.

“General” Major Variance Application for Randleman Buffer Rules

Part 1: General Information

7.

Site No.	Stream Name	Best Usage Classification	Stream Index No.
7	UT Hickory Creek	WS IV *	17-8.5-(1)
28	UT Hickory Creek	WS IV *	17-8.5-(1)

Part 2: Proposed Activity

1. The NCDOT proposes to construct the ultimate roadway design for the I-85 Bypass/ Western Urban Loop. The project for which the variance is requested is TIP No. U-2524 AB/AC, which is a project to construct a freeway on new location from north of existing I-85 to I-40. The western terminus of this project connects to I-40 while the western southern terminus of the project connects with TIP No. I-2402, the southern loop of the I-85 Greensboro Bypass (see attached map, Figures 1-3). TIP No. I-2402 is currently under construction, and its 401 Water Quality Certification (WQC) and Section 404 Permit were issued in December 1998 and May 1999, respectively. Those permits approved both the design of an “interim” portion of I-2402 and the “ultimate” design of the intersection of TIP Nos. U-2524 and I-2402. The “interim” design is incorporated into the “ultimate” design. The “Randleman Rules” (15A N.C.A.C. 2B .0248 - .0251) became effective April 1, 1999, after the 401 WQC was issued.

There are two areas of concern for complying with the Randleman Buffer Rules; Site 7 and Site 28. These areas are noted on the attached plan views and corresponding summary sheet of buffer impacts. Each area is located near the connection TIP Nos. I-2402 and U-2524. The design of the project in those areas was approved in the 401/404 permits for TIP No. I-2402.

Site 7 is a parallel impact with the NCDOT relocating the stream channel along its side fill slopes. There will be a vegetated buffer, and the NCDOT has minimized its impact to the stream and by relocating the stream as much as it can. There are two areas as NCDOT relocates the channel, at its beginning and the end, where the buffer requirement of 50 feet will not be met. Generally speaking, the NCDOT believes it can mitigate on-site for some of the buffer impacts at this site. Impacts to buffers total 2.10 acres for Zone 1 and 1.40 acres for Zone 2.

Site 28 is a parallel impact with the NCDOT relocating the stream channel along its side fill slopes. This site violates the buffer rules because the NCDOT cannot relocate the stream channel to provide the required 50 feet buffer along each side of the stream reach. Impacts to buffers total 1.80 acres for Zone 1 and 1.30 acres for Zone 2.

2. The proposed activity cannot be practically accomplished, reduced or reconfigured to better minimize or eliminate disturbance to the riparian buffers than they already have. There are several reasons. First, Sites 7 and 28 were part of the design for ultimate design for TIP No. I-2402 and construction will be completed for this section in September 2003. Impacts to these sites were approved under the Section 404 and 401 WQC permits issued for this project, prior to the enactment of the Randleman Buffer Rules. However, the sites were not impacted by the on-going construction of the “interim design” for TIP No. I-2402 and have subsequently been included with the proposed construction of TIP No. U-2524AB.

The proposed project has been positioned parallel to the two streams. Sufficient buffer area was not included as part of the roadway design to relocate the streams. The design was completed in the mid 1990s when streams were relocated on-site as a minimization technique for impacts to surface waters. The requirement for 50 foot buffers was not a policy guideline or a rule at this time.

Second, there are topographical constraints affecting the “ultimate” design that preclude full compliance with the Randleman Buffer Rules. To relocate the stream at Site 28 and provide the required buffer, a considerable amount of earth would have to be moved and as reflected on the attached cross sections.

At Site 28, the existing stream channel has a relatively broad, low valley with a low valley slope and a Rosgen stream classification of “E”. Notable characteristics are a relatively high entrenchment ratio (10.3), low average slope (0.012), high belt width (average of 51.3 feet) and high meander width ratio (8.3). Ideally, if the NCDOT was not constrained by the location of the road project and topographic restrictions, the NCDOT would construct a Rosgen stream type which should be present based on the existing conditions, an “E” channel. To comply with the buffer rules (i.e., providing the appropriate buffer and Rosgen “E” stream type), the NCDOT would have to move a considerable amount of earth (10,800 cubic yards and \$ 21,500 to remove the material) and purchase additional right of way (\$91,300). Cost of strict compliance to the buffer rule would total \$ 112,800.

The NCDOT proposes to minimize impacts to the stream reach and buffer by relocating the stream with a narrower valley with a higher valley slope; a Rosgen stream classification of “C”. The notable characteristics of the proposed relocated reach are an low entrenchment ratio (4.85), increased slope (0.0178), lower belt width (average of 21.0 feet) and considerably reduced meander ratio (2.5) when compared to existing conditions (see attached morphological table for Site 28). This relocation does not achieve the 50 foot required buffer along the stream reach.

The NCDOT has attempted to construct stream relocations in similar conditions involving the movement of a considerable amount of earth to relocate the stream channel (examples are TIP No. X-2D and U-2528 AA). The NCDOT has attempted to relocate the 2,100 feet of a stream channel on TIP No. X-2D on three separate occasions, and the relocation is still not stabilized. Three times the NCDOT has taken steps to attempt

stabilization of the relocated stream at a cost of over \$650,000. A fourth time attempt to stabilize the stream is currently underway. It is anticipated that the cost will rise to \$900,000.

Typically, these extensive cuts to re-create the floodplain, flood prone area and thalweg result in placing the stream on unsuitable, unstable material. The soil material may be saprolite or clay. The result is an unstable stream channel having the tendency to downcut thereby increasing the amount of sediment in the stream. The soil material is also sterile, lowering the potential success of establishing vegetation on the site correlating to success of the stream relocation work.

The NCDOT has taken measures to minimize impacts to the stream by proposing to relocate the stream with a Rosgen stream classification of "C" with a series of cross vanes to prevent downcutting and reduce velocities. This stream relocation attempts to minimize impacts to the buffers, minimize the amount of earth moved and to maximize the amount of buffer between the stream and road project as practicable. The NCDOT believes it can relocate this type of stream based on topography and a review of reference reaches.

3. As noted earlier, the NCDOT designed the project in the 1990's, and in some areas, there is not adequate land to treat stormwater discharges to the extent prescribed by the Randleman Buffer Rules. The NCDOT has taken steps to minimize road discharges where practicable by installing pre-formed scour holes to allow for treatment of road discharges. These pre-formed scour holes were not originally part of the design for the roadway project but have been included to comply with Randleman Buffer Rules. A list of treatment areas which meet the Randleman Buffer Rules is attached to this variance request.

However, there are several areas where it is not practicable to adequately treat the stormwater discharges from the road. Treatment cannot occur at other locations because of site conditions or other limiting circumstances. A complete list of areas not complying with the Randleman Buffer Rules attached to this variance request.

4. The NCDOT believes compensatory mitigation will be required for impacts at Site 7 and 28 to the buffer. At Site 7, the NCDOT will impact 3.17 acres (12,840 meters²) of Zone 1 and 2.40 acres (9,691 meters²) of Zone 2.

The NCDOT will restore several acres of buffer by implementing the on-site stream mitigation. At Site 7, the NCDOT will restore 1.30 acres (5,272 meters²) of Zone 1 and 0.86 acres (3,461 meters²) of Zone 2. Therefore, subtracting the on-site mitigation from the impacts, the NCDOT will need to mitigate for 1.87 acres of impacts to Zone 1 buffers and 1.54 acres of Zone 2 buffers. Buffer mitigation, using the appropriate ratios, required at Site 7 is 5.61 acres for Zone 1 buffer impacts and 2.81 acres for Zone 2 buffer impacts for a total mitigation requirement of 8.42 acres (366,755 feet²).

Anticipated impacts to the buffer at Site 28 total 1.80 acres in Zone 1 and 1.30 acres in Zone 2. Mitigation required is 5.40 acres for Zone 1 buffer impacts and 1.95 acres for Zone 2 buffer impacts for a total mitigation requirement of 7.35 acres (320,166 feet²).

The first option in providing mitigation for these buffer impacts is paying into the NC Wetland Restoration Program (NCWRP). Mitigation needs total 15.77 acres (686,921 feet²) for Sites 7 and 28. Based on NCWRP figures for buffer mitigation (0.97 cents per square foot), the NCDOT would pay to the NCWRP \$666,313.37.

A second option is to provide mitigation at the Groometown Road Mitigation Site. This mitigation site will treat stormwater discharge from Groometown Road and provide additional treatment of discharge from the Urban Loop (TIP No. U-2524 AB). A mitigation plan for this site has been attached to this variance request.

5. (1) There are several difficulties and hardships which would result from the strict application of this Rule. These difficulties include (a) the constructed interim designed roadway project, (b) the purchase of additional right of way; and (c) topographic constraints. The “ultimate” design of the interchange connecting TIP Nos. U-2524AB and I-2402 overlaps with the “interim” design of TIP No. I-2402 which is already under construction and will be completed in September 2003. Both the interim and ultimate designs were permitted in 1999 in the Section 404 and 401 WQC permits for TIP No. I-2402. Strict application of this Rule would force NCDOT to abandon project TIP No. U-2524AB in its current form, and necessitate an extensive redesign to avoid buffer impacts which would likely require delaying a needed project and purchasing additional right of way. TIP No. U-2524AB and I-2402 would not be able to intersect with each other as envisioned in the approved permits Section 404 and 401 WQC permits for TIP No. I-2402.

Finally, if a Rosgen “E/C” stream channel is constructed at Site 28 on the described topographical constraints, the result will be large cuts in the earth and the placement of the relocated stream on soils which are unsuitable for construction. The NCDOT has attempted to construct projects in such conditions on other projects. The NCDOT has tried numerous times to stabilize these reaches (three times on TIP No. X-2D upon which a fourth attempt will be made). A considerable amount of money has been spent trying to stabilize these reaches using natural stream channel techniques.

(2) The difficulties and hardships resulting from strict application of the buffer rules are unique to this project. The NCDOT cannot move the alignment of the road project itself to negotiate around these topographical restraints because the construction of the interim design is nearing completion. Both the interim and ultimate designs were specifically sanctioned in the Section 404 and 401 WQC permits for TIP No. I-2402, which were issued prior to enactment of the Randleman Buffer Rules.

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 North Carolina Department of Transportation Project Development & Environmental Analysis	8. AUTHORIZED AGENT'S NAME AND TITLE (an agent is not required)
6. APPLICANT'S ADDRESS 1548 Mail Service Center Raleigh, NC 27699-1548	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) U-2524AB and AC	14. PROJECT STREET ADDRESS (if applicable)
13. NAME OF WATERBODY, IF KNOWN (if applicable) See Tables 6 and 7 of Cover letter for list of Creeks	
15. LOCATION OF PROJECT Guilford NC COUNTY STATE	

16. OTHER LOCATION DESCRIPTIONS, IF KNOWN (see instructions) Section, Township, Range, Lat/Lon, and/or Accessors's Parcel Number, for example.
Guilford County, Greensboro Western Urban Loop, from I-85 south of Groometown to south of I-40 interchange;

17. DIRECTIONS TO THE SITE

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

Construct a four to eight lane freeway on new location

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

Public transportation

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

20. Reason(s) for Discharge

Roadway fill in Wetlands and stream

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

Roadway fill

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

Impacts to Waters of the United States from construction TIP No. U-2524 AB/AC and AB Part I total 3.87 acres of fill in wetlands, 0.10 acre of excavation in wetlands, 0.17 acre of mechanized clearing in wetlands, 2.05 acres of fill in streams, 3.92 acres of fill ponds, and 11,525 feet of stream 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).

See Attached list

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

AGENCY	TYPE APPROVAL	IDENTIFICATION NUMBER	DATE APPLIED	DATE APPROVED	DATE DENIED
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See Attached Cover Letter – Project History Section

* 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.


SIGNATURE OF APPLICANT

7-21-03
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.

SUBJECT: Stormwater Management Plan for U-2524AB Part1, Guilford County.
Greensboro – Western Loop from North of I-85 near Groometown
Road to North of High Point Road

ROADWAY DESCRIPTION:

The U-2524AB1 project goal is to provide a connection between the new Greensboro Bypass and existing I-40. The project is primarily a new interchange at the Greensboro bypass and the I-40 connector. There are three existing box culverts located on the project that are to be retained and extended. All three culverts are on Unnamed Tributaries to Hickory Creek. There are two other jurisdictional streams that are being relocated and several wetland sites that will be impacted.

ENVIRONMENTAL DESCRIPTION:

The Tributaries to Hickory Creek are in the Cape Fear River Basin and are a part of the Randleman Reservoir Watershed. The stream classification for Hickory Creek is WS-IV. The unnamed tributaries to Hickory Creek are not specified on the DENR Stream Classification List. There are four sites that appear on the soils map. There are a total of fifteen permitted sites on the project, with impacts totaling 1399 m (4590 ft.) of stream with 575 m (1887 ft.) of relocated stream utilizing Natural Channel Design, 10.86 ha (26.84 Ac.) of wetlands, and 4.34 ha (10.74 ac.) of Randleman Reservoir Riparian Buffers.

BEST MANAGEMENT PRACTICES AND MAJOR STRUCTURES:

Best Management Practices (BMP's) utilized on this project consist of grassed swales and preformed scour holes.

The following summarizes the locations of each BMP:

Grassed Swales

-I40SBREV-

Station 12+00 to 15+40 Lt.
Station 15+80 to 17+00 Rt.
Station 19+00 to 19+40 Lt.
Station 20+00 to 21+00 Lt.

-I1140NB-

Station 13+40 to 15+90 Lt.
Station 19+00 to 22+00 Lt.
Station 20+60 to 20+90 Rt.

-CSLIP-

Station 17+00 to 18+00 Lt.
Station 17+00 to 18+20 Rt.
Station 18+80 to 19+60 Rt.
Station 18+80 to 19+80 Lt.

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-CSLIP- cont.

Station 20+20 to 22+30 Lt.
Station 21+80 to 24+40 Rt.
Station 24+80 to 26+10 Lt.
Station 26+10 to 27+50 Lt.
Station 28+40 to 29+40 Rt.

-I1SLIP2-

Station 11+20 to 13+00 Lt.
Station 13+00 to 15+00 Lt.

-I1RPB1-

Station 14+60 to 15+60 Lt.
Station 14+60 to 15+70 Rt.

-I1FLY-

Station 12+20 to 13+50 Lt. & Rt.
Station 21+90 to 20+50 Rt.

-LoopC-

Station 12+81 Lt.

Preformed Scour Holes

Station 31+20 -CSLIP- Rt.
Station 31+88 -CSLIP- Rt.
Station 32+20 -CSLIP- Rt.
Station 31+28 -I40SBREV- Rt.
Station 32+08 -I40SBREV- Rt.

Some outlets are not fitted with BMP's due to site conditions or other circumstances. They are summarized below:

-I40SBREV-

- Station 11+60 Rt. – Natural ground falls at 12%; therefore, no preformed scour hole used. There is limited room for any other BMP.
- Station 18+80 Lt. – This system empties into an existing ditch. Other ways of outletting this system were investigated, but elevation constraints would not allow.
- Station 24+20 Lt. – This system ties into the existing system on the new I-85. Rerouting this system was investigated; however, due to elevation constraints we could not provide treatment for this water.
- Station 28+68 Rt. – A Preformed Scour Hole was investigated for this outlet; however, there is not enough room between the fill slope and the stream bank to fit the PSH properly.

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- Station 30+05 Rt. – This system outlet is a 600mm (24”) pipe. Per design guidelines, the maximum pipe diameter for a preformed scour hole is 450mm (18”). Other methods were investigated, but there is limited space.

- I1I40NB- Station 18+60 Lt. – This system outlets into an existing system. Rerouting this water was investigated; however, due to elevation constraints, no other alternative was feasible.
- CSLIP- Station 25+48 and 25+88 Rt. – These pipes empty into an existing roadside ditch on a small service road. There is no room for any other BMP.
- I1FLY- Station 19+00 Lt. – This system empties into an existing ditch with no room for any other BMP.
- I1RPA- Station 11+60 to 14+50 Rt. – These pipes empty into an existing ditch with no room for any other BMP.

Major Structures

Station 31+70 –L- (Tributary to Hickory Creek) Existing 1 @ 2.7m x 1.5m (9 ft. x 5 ft.) reinforced concrete box culvert is to be retained and extended on the outlet end.

Station 11+75 –LoopC- (Tributary to Hickory Creek) Existing 1 @ 2.4m x 1.5m (8 ft. x 5 ft.) reinforced concrete box culvert will be retained and extended on the inlet end.

Station 25+35 –CSLIP- (Tributary to Hickory Creek) Existing 1 @ 2.4m x 1.8m (8 ft. x 6 ft.) reinforced concrete box culvert is to be retained and extended on the outlet end.

Natural Channel Design Summary
Unnamed Tributary to Meadow Creek (Site 7)
TIP No. U-2524AB1
State Project No. 8.U492101
Guilford County, North Carolina

Prepared by Mulkey Engineers and Consultants

May 2003

This natural channel design summary is presented to the North Carolina Department of Transportation (NCDOT) as part of on-site compensatory mitigation for the proposed construction of the Greensboro Western Loop. The proposed roadway extends from north of I-85 near Groometown Road to north of High Point Road on new location. An unnamed tributary (UT) to Hickory Creek, situated immediately east of SR 1497 (Wiley Davis Road) and north of existing I-85, will be relocated westward from its existing location outside of the proposed fill limits. The UT has been identified as a perennial stream and is part of the Cape Fear River Subbasin 03-06-08 (USGS Hydrologic Unit 03030002). A morphological table, complete with existing channel, reference reach, and proposed reach characteristics is attached. In addition, proposed design and detail sheets are also included with this summary. The project is within the Piedmont physiographic province.

The headwaters associated with the UT to Hickory Creek originate at the intersection of SR 1497 (Wiley Davis Road) and McCuiston Road. The UT flows in a southerly direction approximately 1.7 mi (2.7 km) before converging with Hickory Creek, then another 5.0 mi (8.0 km) to the southwest to unite with the Deep River. The drainage area at the project site is approximately 0.08 sq. mi (0.2 sq. km). It is considered urban with primarily residential development. The proposed project will require the stream to be relocated due to existing fill slope design requirements. Overall stream length will be reduced and slope will be increased in order to correctly align the new channel with its modified valley type.

Existing Channel

A 200-foot (61-meter) section of the single thread channel associated with the UT to Hickory Creek was surveyed during March 2003. This section was located near Sta. 10+20 -40SBREV- Right, near the northern terminus of the proposed project area. The surveyed reach exhibited channel characteristics similar to an E4/5b stream type, as noted by the Rosgen Classification of Natural Rivers. The E4/5 stream type exhibits low to moderate sinuosities, gentle to moderately steep channel gradients, and very low channel width/depth ratios. This stream type is generally stable due to the influence of riparian vegetation and planform resistance. Bank erosion and bedload transport rates are typically high and the ratio of bedload to total sediment load often exceeds 50%. These stream types are very sensitive to disturbance and tend to make significant adverse channel adjustments to changes streambank vegetation and in flow regime and sediment supply from the watershed (Rosgen and Silvey, 1998). However, the existing channel at this location classes out as an E type but it is in a state of instability. The channel is incised with a bank height ratio of around 1.3 with headcuts spaced throughout the reach. Only one pool was found in the reach, which was dominated by runs. The UT exhibited a bankfull cross sectional area of 4.0 sq. ft (0.37 sq. m), an average slope of 0.015ft/ft, and a D50 of 2.0 mm. A detailed summary of existing channel conditions is presented in attached morphological table.

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Reference Reach

Due to the existing, unstable condition of the UT, a stable stream (UT Varnals Creek) outside of the project area was selected as the reference reach. This channel was selected based on its watershed components, stream type, and other general characteristics. The reference reach channel is situated in Alamance County and classifies as a B4a. It exhibits a drainage area of 0.24 sq. mi (0.62 sq. km) and a bankfull cross sectional area of 7.9 sq. ft. Based on surveys, the channel is stable and exhibits very low bank height ratios. Its valley characteristics are very comparable with the existing channel. Little to no bank erosion was noted during the survey. A detailed summary of reference conditions are also presented in the attached morphological table.

Proposed Channel

The proposed channel was based on dimensionless ratios derived from the reference reach survey and data interpretation. The bankfull width will be increased from 4.1 ft (1.25 m) to 9.0 ft (2.7 m) and the bankfull mean depth will be reduced from 1.0 ft (0.30 m) to 0.7 ft (0.21 m). As a result, the width/depth ratio will increase to approximately 13 from the existing 4.3 ratio. A decrease in the bankfull mean velocity will occur with the new channel. The design stream will exhibit additional floodprone area; however, minimal pattern will be provided due to site constraints. Slopes will be actually decrease due to a change in the valley; however, an excess energy will be dissipated via step/pool morphology characteristic with the B stream type. Rock cross vanes will be the primary method influencing the step/pool morphology. These cross vanes will be established throughout the channel in riffle sections and used to provide grade control, center the thalweg, and protect the stream banks on both sides of the new channel until vegetation is established. The cross vanes will also decrease shear stresses throughout the reach. The riparian zone adjacent to the channel will be planted with native vegetation conducive to wetter, floodplain areas.

Proposed channel stabilization characteristics are presented on the attached detail sheet. It is anticipated that the riparian zone will be planted with native trees and shrubs above bankfull depth and herbaceous species within the channel.

Sediment Transport

Based on pebble counts and bar samples taken along the existing channel, the D50 averages 2.0 mm and the D84 averages approximately 17.0 mm. The existing channel exhibits a critical shear stress of 0.67 lbs/ft² which may entrain up to a 40 mm particle. Based on the design, the proposed channel will exhibit a critical shear stress of 0.28 lbs/ft² entraining up to a 18 mm particle. This reduction in entrainment will further reduce degradation. In addition, cross vanes will be installed throughout the riffle sections to further reduce the possibility of additional channel degradation.

References

North Carolina Department of Environment and Natural Resources (NCDENR), 1998. Yadkin/Pee Dee Basinwide Water Quality Management Plan.

Rosgen, D. and L. Silvey, 1998. Field Guide for Stream Classification. Wildland Hydrology, Inc.

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Appendix B

Morphological Measurement Table (Site 7)

Variables	Existing Channel	Proposed Reach	USGS Station	Reference Reach
1. Stream type	E4/5b	B4/5c	N/A	B4/1a
2. Drainage area	18.5 Ac.	52 Ac.		154 Ac.
3. Bankfull width	4.1 ft.	9.0 ft.		9.7 ft.
4. Bankfull mean depth	1.0 ft.	0.7 ft.		0.8 ft.
5. Width/depth ratio	4.3	13		12.7
6. Bankfull cross-sectional area	4.0 sq. ft.	6.3 sq. ft.		7.9 sq. ft.
7. Bankfull mean velocity	5.4 ft/s	3.43 ft/s		5.23 ft/s
8. Bankfull discharge, cfs	21.6 cfs	21.6 cfs		41.3 cfs
9. Bankfull max depth	1.4 ft.	1.0 ft.		1.1 ft.
10. Width of floodprone area	35 ft.	13.5ft.		26.2 ft.
11. Entrenchment ratio	8.5	1.5		2.7
12. Meander length	Range: 60-112 ft. Avg: 88 ft.	N/A		59 ft.
13. Ratio of meander length to bankfull width	21.5	N/A		6
14. Radius of curvature	Range: 11.8-36 ft. Avg: 24.6 ft.	N/A		13.4 ft.
15. Ratio of radius of curvature to bankfull width	6	N/A		1.4
16. Belt width	Range: 11.5-27 ft. Avg: 20 ft.	N/A		15 ft.
17. Meander width ratio	4.9	N/A		1.5
18. Sinuosity (stream length/valley length)	1.2	1.0		1.2
19. Valley slope	1.90%	0.74%		4.58%
20. Average slope	1.54%	0.74%		4.05%
21. Pool slope	0.00%	0.07%		0.47%
22. Ratio of pool slope to average slope	0	0.1		0.1
23. Maximum pool depth	1.9 ft.	2.0 ft.		1.6 ft.
24. Ratio of pool depth to average bankfull depth	1.9	3.0		1.9
25. Pool width	5.4 ft.	12.2 ft.		12.0 ft.
26. Ratio of pool width to bankfull width	1.35	1.4		1.2
27. Pool to pool spacing	**	50 ft.		34.5 ft.
28. Ratio of pool to pool spacing to bankfull width	**	5.5		3.5

** Only one pool was found in the existing channel; therefore, we cannot calculate pool to pool spacing

Natural Channel Design Summary
Unnamed Tributary to Meadow Creek (Site 28)
TIP No. U-2524AB1
State Project No. 8.U492101
Guilford County, North Carolina

Prepared by Mulkey Engineers and Consultants

May 2003

This natural channel design summary is presented to the North Carolina Department of Transportation (NCDOT) as part of on-site compensatory mitigation for the proposed construction of the Greensboro Western Loop. The proposed roadway extends from north of I-85 near Groometown Road to north of High Point Road on new location. An unnamed tributary (UT) to Hickory Creek, situated immediately west of SR 1117 (Holden Road) and south of Roberts Court Road, will be relocated southward from its existing location outside of the proposed fill limits. The UT has been identified as a perennial stream and is part of the Cape Fear River Subbasin 03-06-08 (USGS Hydrologic Unit 03030002). A morphological table, complete with existing channel, reference reach, and proposed reach characteristics is attached. In addition, proposed design and detail sheets are also included with this summary. The project is within the Piedmont physiographic province.

The headwaters associated with the UT to Hickory Creek originate at the intersection of SR 1117 (Holden Road) and SR 1392 (Drummond Road). The UT flows in a westerly direction approximately 1.0 mi (1.6 km) before converging with Hickory Creek, then another 5.0 mi (8.0 km) to the southwest to unite with the Deep River. The drainage area at the project site is approximately 0.10 sq. mi (0.26 sq. km). It is considered urban with primarily residential development. The proposed project will require the stream to be relocated due to existing fill slope design requirements. Overall stream length will be reduced and slope will be increased in order to correctly align the new channel with its modified valley type.

Existing Channel

A 1600-foot (488-meter) section of the single thread channel associated with the UT to Hickory Creek was surveyed during March 2003. This section was located near Sta. 29+20 -40SBREV- Right, near the eastern terminus of the proposed project area. The surveyed reach exhibited channel characteristics similar to an E4/1 stream type, as noted by the Rosgen Classification of Natural Rivers. The E4 stream type exhibits low to moderate sinuosities, gentle to moderately steep channel gradients, and very low channel width/depth ratios. This stream type is generally stable due to the influence of riparian vegetation and planform resistance. Bank erosion and bedload transport rates are typically high and the ratio of bedload to total sediment load often exceeds 50%. These stream types are very sensitive to disturbance and tend to make significant adverse channel adjustments to changes streambank vegetation and in flow regime and sediment supply from the watershed (Rosgen and Silvey, 1998). The existing channel at this location classes out as an E type and it is in a state of relative stability. The channel has previously incised but has reestablished a small floodplain at a lower elevation. Due to recent ice storms, there was a large amount of woody debris in the channel creating localized instability. Significant bedrock was noted in several area along the existing channel which is helping prevent further incision. The UT exhibited a bankfull cross sectional area of 5.6 sq. ft (0.52 sq. m), an average slope of 0.012ft/ft, and a D50 of

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2.5mm. A detailed summary of existing channel conditions is presented in attached morphological table.

Reference Reach

Even though the existing channel is relatively stable, a stable stream (UT Lake Jeanette) outside of the project area was selected as the reference reach. This channel was selected based on its watershed components, stream type, and other general characteristics. The reference reach channel is situated in Guilford County and classifies as a C4. It exhibits a drainage area of 0.25 sq. mi (0.65 sq. km) and a bankfull cross sectional area of 7.7 sq. ft. Based on surveys, the channel is stable and exhibits very low bank height ratios. Its valley characteristics are very comparable with the existing channel. Little to no bank erosion was noted during the survey. A detailed summary of reference conditions are also presented in the attached morphological table.

Proposed Channel

The proposed channel was based on dimensionless ratios derived from the reference reach survey, existing channel survey, and data interpretation. The bankfull width will be increased from 6.3 ft (1.92 m) to 8.5 ft (2.6 m) and the bankfull mean depth will be reduced from 0.9 ft (0.27 m) to 0.66 ft (0.20 m). As a result, the width/depth ratio will increase to approximately 13 from the existing 7.0 ratio. A decrease in the bankfull mean velocity will occur with the new channel. The design stream will exhibit additional floodprone area to aid in stress reduction in the channel. Slopes will be increased due to a change in the valley; however, an excess energy will be dissipated via riffle/pool morphology characteristic and planform associated with the C stream type. Rock cross vanes will be the primary method influencing the riffle/pool morphology. These cross vanes will be established throughout the channel in riffle sections and used to provide grade control, center the thalweg, and protect the stream banks on both sides of the new channel until vegetation is established. The cross vanes will also decrease shear stresses throughout the reach. The riparian zone adjacent to the channel will be planted with native vegetation conducive to wetter, floodplain areas.

Proposed channel stabilization characteristics are presented on the attached detail sheet. It is anticipated that the riparian zone will be planted with native trees and shrubs above bankfull depth and herbaceous species within the channel.

Sediment Transport

Based on pebble counts and bar samples taken along the existing channel, the D50 averages 2.5 mm and the D84 averages approximately 30.0 mm. The existing channel exhibits a critical shear stress of 0.54 lbs/ft² which may entrain up to a 35 mm particle. Based on the design, the proposed channel will exhibit a critical shear stress of 0.59 lbs/ft² entraining up to a 38 mm particle. This increase in entrainment will not induce degradation as the active bed sample produced a D84 of 40mm. In addition, cross vanes will be installed throughout the riffle sections to further reduce the possibility of additional channel degradation.

References

North Carolina Department of Environment and Natural Resources (NCDENR), 1998. Yadkin/Pee Dee Basinwide Water Quality Management Plan.

Rosgen, D. and L. Silvey, 1998. Field Guide for Stream Classification. Wildland Hydrology, Inc.

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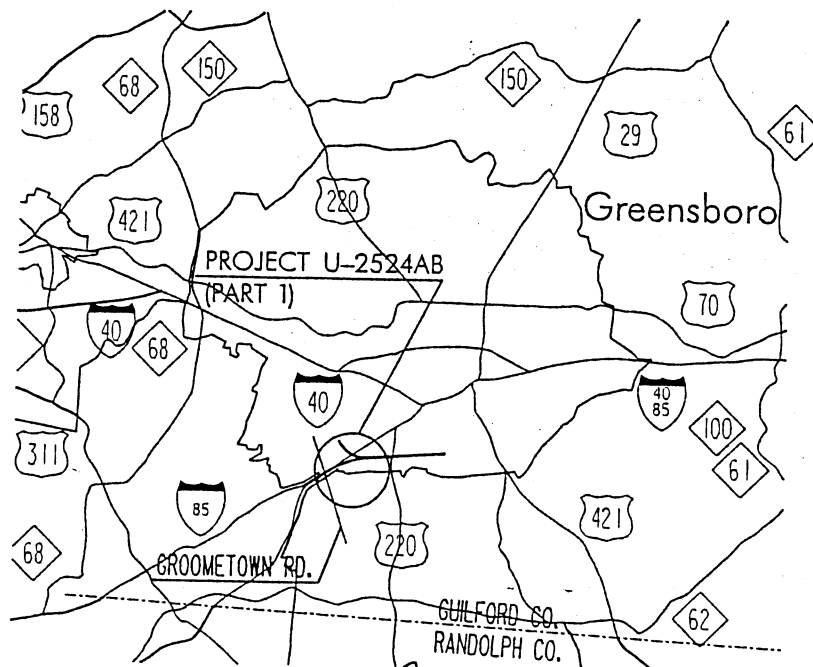
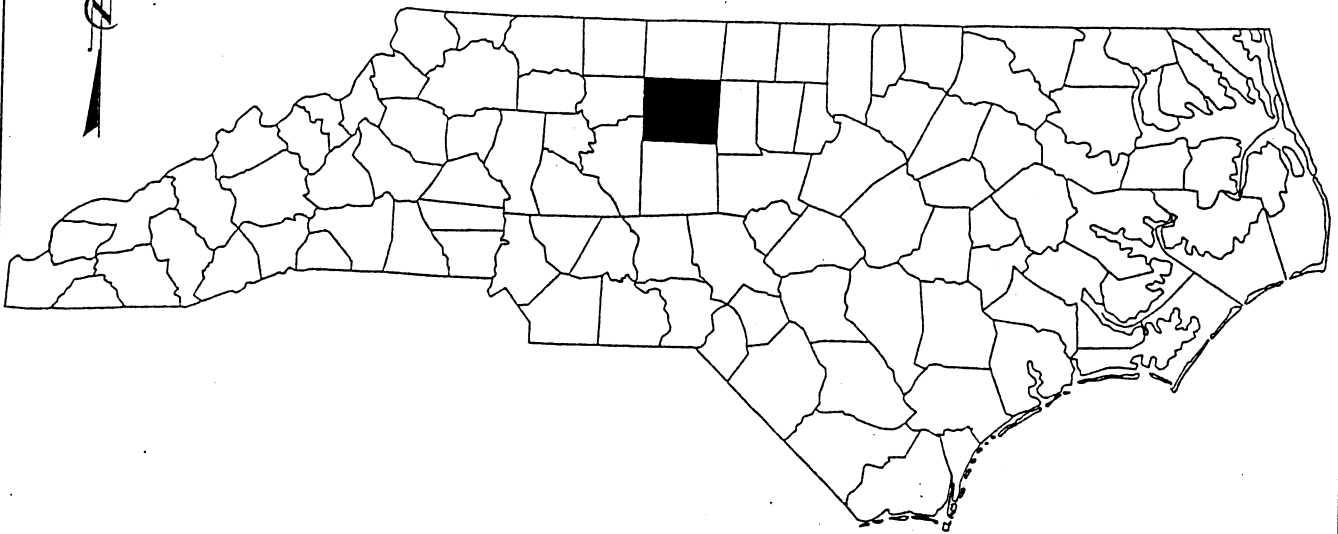
Part 1

Appendix B

Morphological Measurement Table (Site 28) Sheet # 9 of 55

Variables	Existing Channel	Proposed Reach	USGS Station	Reference Reach
1. Stream type	E4	C4	N/A	C4
2. Drainage area	57Ac. - 75Ac.	57Ac. - 75Ac.		160 Ac.
3. Bankfull width	6.3 ft.	8.5 ft.		9.5 ft.
4. Bankfull mean depth	0.9 ft.	0.66 ft.		0.8 ft.
5. Width/depth ratio	7	13		11.7
6. Bankfull cross-sectional area	5.6 sq. ft.	5.6 sq. ft.		7.7 sq. ft.
7. Bankfull mean velocity	4.06 ft/s	3.9 - 4.0 ft/s		4.55 ft/s
8. Bankfull discharge, cfs	22.7 cfs	22.7 cfs		35 cfs
9. Bankfull max depth	1.5 ft.	1.1 ft.		1.3 ft.
10. Width of floodprone area	65 ft.	Range: 32 - 56 ft. Avg: 41.3 ft.		36 ft.
11. Entrenchment ratio	10.3	4.85		3.8
12. Meander length	Range: 85-150 ft. Avg: 120 ft.	Range: 43-114.5 ft. Avg: 73 ft.		Range: 29-69 ft. Avg: 50.2 ft.
13. Ratio of meander length to bankfull width	19	8.6		5.3
14. Radius of curvature	Range: 10.2-36 ft. Avg: 22 ft.	Range: 19-49 ft. Avg: 29.8 ft.		Range: 5.3-22 ft. Avg: 9.7 ft.
15. Ratio of radius of curvature to bankfull width	3.5	3.5		1.02
16. Belt width	Range: 46-63 ft. Avg: 52.5 ft.	Range: 11.8-35 ft. Avg: 21.0 ft.		Range: 26-40 ft. Avg: 33 ft.
17. Meander width ratio	8.3	2.5		3.5
18. Sinuosity (stream length/valley length)	1.35	1.02		1.35
19. Valley slope	1.60%	1.85%		0.76%
20. Average slope	1.20%	U/S: 1.78% D/S: 1.66%		0.57%
21. Pool slope	0.26%	0.35%		Range: 0.012-0.13%. Avg: 0.047%
22. Ratio of pool slope to average slope	0.22	0.2		0.082
23. Maximum pool depth	2.3 ft.	2.0 ft.		2.9 ft.
24. Ratio of pool depth to average bankfull depth	2.56	3.0		3.6
25. Pool width	8.9 ft.	12.2 ft.		10.5
26. Ratio of pool width to bankfull width	1.41	1.4		1.1
27. Pool to pool spacing	58.5 ft.	Range: 24-63 ft. Avg: 39.4 ft.		Range: 20.7-54.8 ft. Avg: 40.2 ft.
28. Ratio of pool to pool spacing to bankfull width	9.3	Range: 2.8-7.4 Avg: 4.5		Range: 2.2-5.8 Avg: 4.23

NORTH CAROLINA



VICINITY MAPS

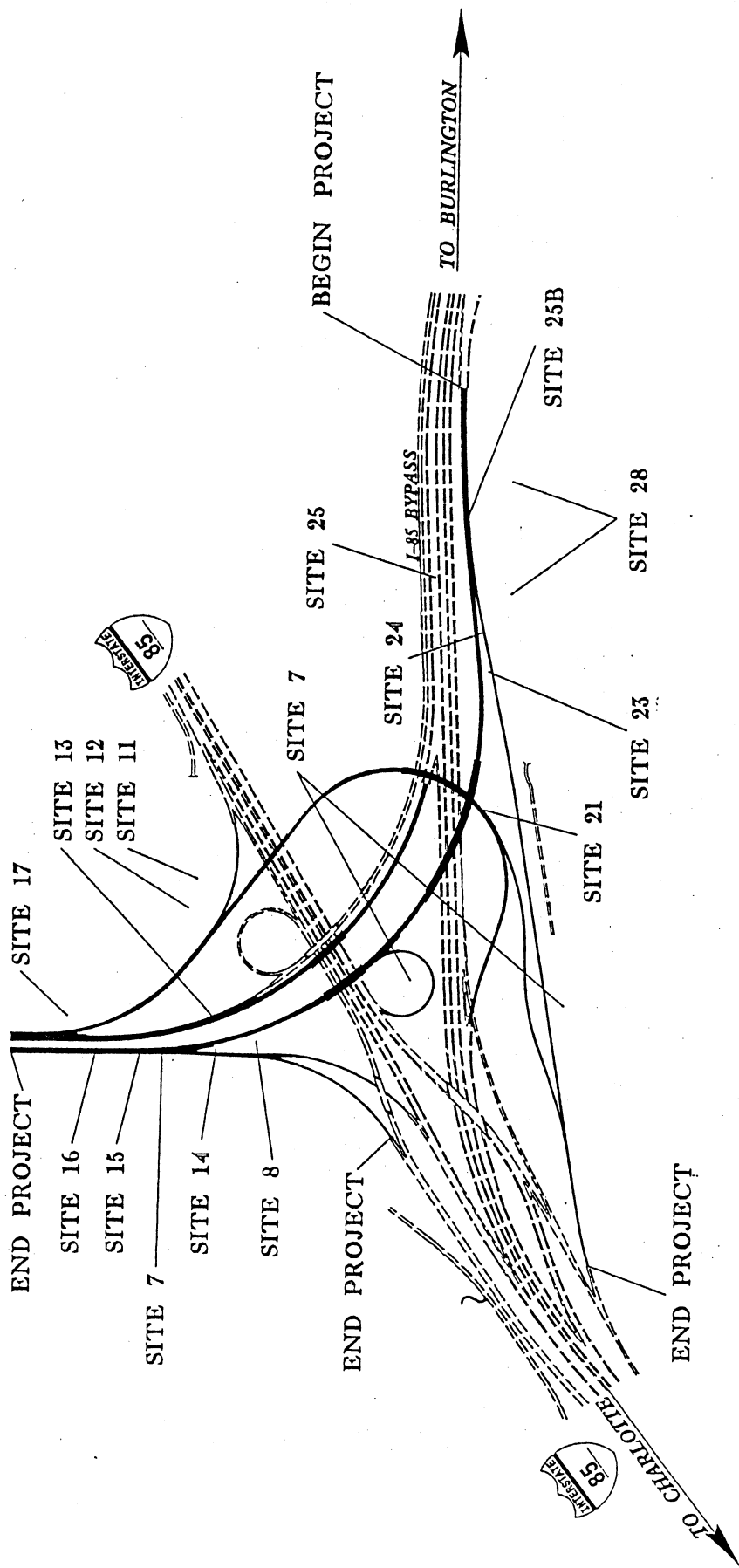
NCDOT

DIVISION OF HIGHWAYS

GUILFORD COUNTY

PROJECT: 8.U492101 (U-2524AB) **Part 1**
GREENSBORO - WESTERN LOOP FROM
NORTH OF I-85 NEAR GROOMETOWN
TO NORTH OF HIGH POINT ROAD
SHEET 10 OF 55

5/15/03



SITE MAP

NCDOT

DIVISION OF HIGHWAYS

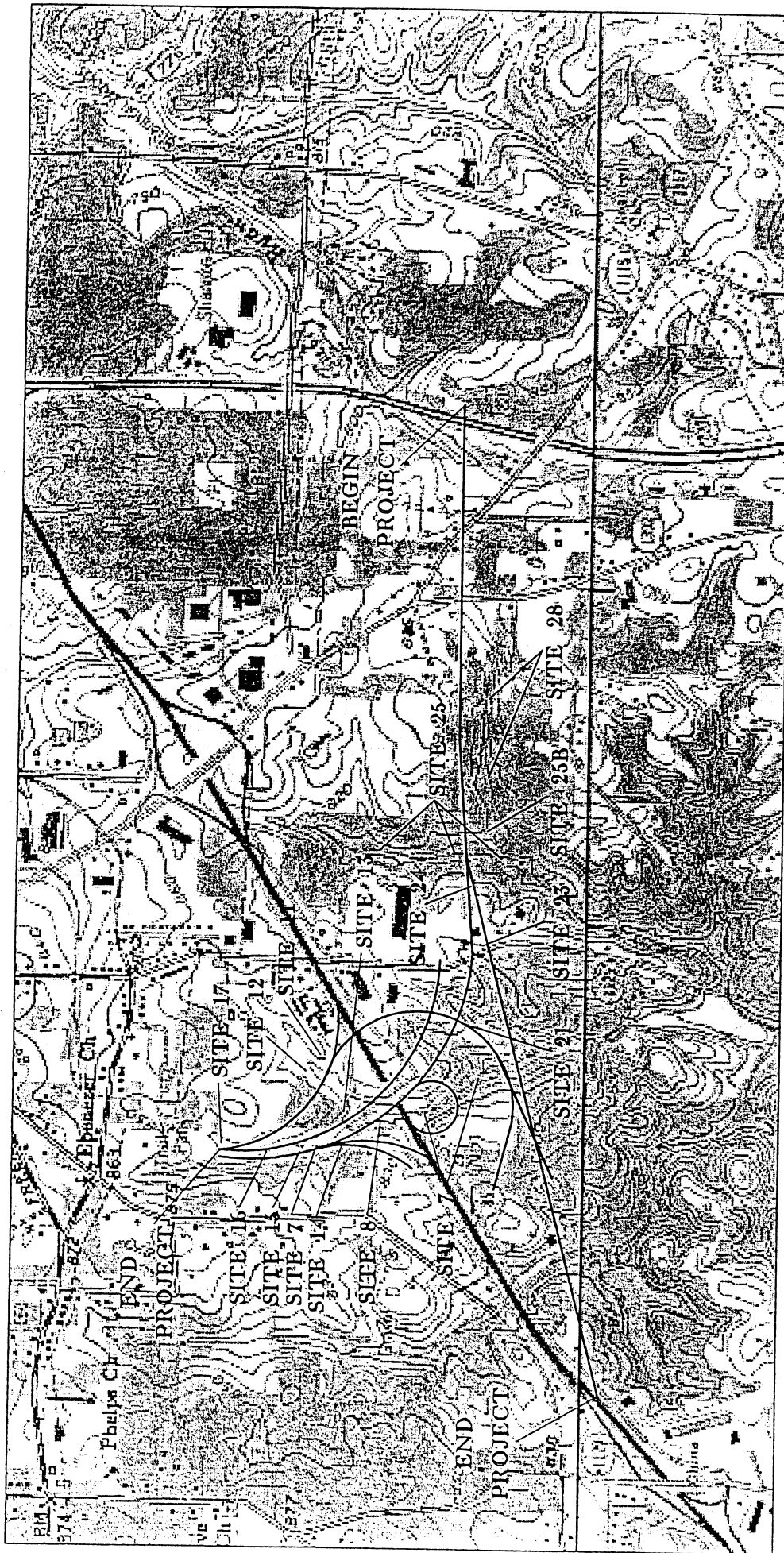
GUILFORD COUNTY

PROJECT: 8.U492101 (U-2524AB)

GREENSBORO - WESTERN LOOP FROM
NORTH OF I-85 NEAR GROOMETOWN
TO NORTH OF HIGH POINT ROAD

SHEET 11 OF 55

5/15/03



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DIVISION OF HIGHWAYS

GUILFORD COUNTY

PROJECT: 8U492101 (U-2524AB)

GREENSBORO - WESTERN LOOP FROM
NORTH OF I-85 NEAR GROOMTOWN
TO NORTH OF HIGH POINT ROAD

SHEET 12 OF 55

5/15/03

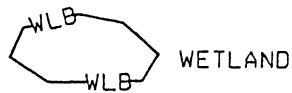
TOPO
MAP

SCALE 1 : 500

BUFFER

LEGEND

—WLB— WETLAND BOUNDARY



WETLAND



ALLOWABLE IMPACTS ZONE 1



ALLOWABLE IMPACTS ZONE 2



MITIGABLE IMPACTS ZONE 1



MITIGABLE IMPACTS ZONE 2

—BZ— RIPARIAN BUFFER ZONE

—BZ1— RIPARIAN BUFFER ZONE 1
30 ft (9.2m)

—BZ2— RIPARIAN BUFFER ZONE 2
20 ft (6.1m)

— 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

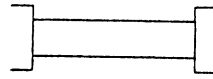
—EPB— EXIST. ENDANGERED
PLANT BOUNDARY

—▽— WATER SURFACE

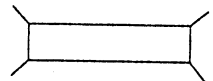
x x x x
x x x x
LIVE STAKES

—○— BOULDER

— — — CORE FIBER ROLLS



PROPOSED BRIDGE



PROPOSED BOX CULVERT



PROPOSED PIPE CULVERT

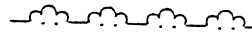
(DASHED LINES DENOTE
EXISTING STRUCTURES)

12"-48"
PIPES

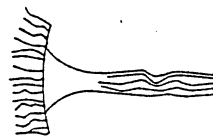
54" PIPES
& ABOVE



SINGLE TREE



WOODS LINE



DRAINAGE INLET



ROOTWAD

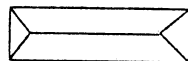
RIP RAP



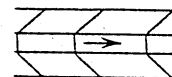
ADJACENT PROPERTY OWNER
OR PARCEL NUMBER
IF AVAILABLE



PREFORMED SCOUR HOLE (PSH)



LEVEL SPREADER (LS)



GRASS SWALE

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DIVISION OF HIGHWAYS

GUILFORD COUNTY


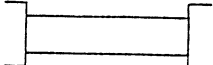

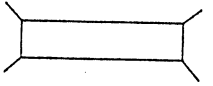
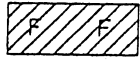
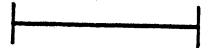
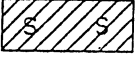
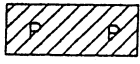
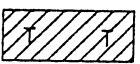

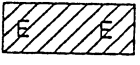
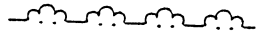
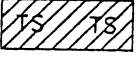
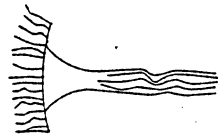
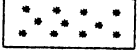
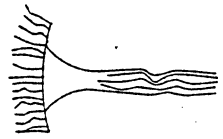
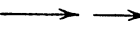

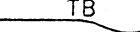

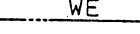

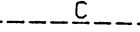
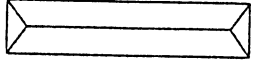
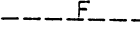
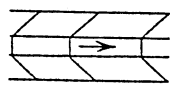

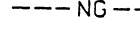
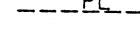
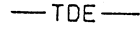
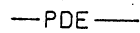

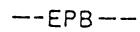

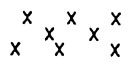

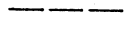
PROJECT: 8.U492101 (U-2524AB)

GREENSBORO - WESTERN LOOP FROM
NORTH OF I-85 NEAR GROOMETOWN
TO NORTH OF HIGH POINT ROAD

SHEET 13 OF 55

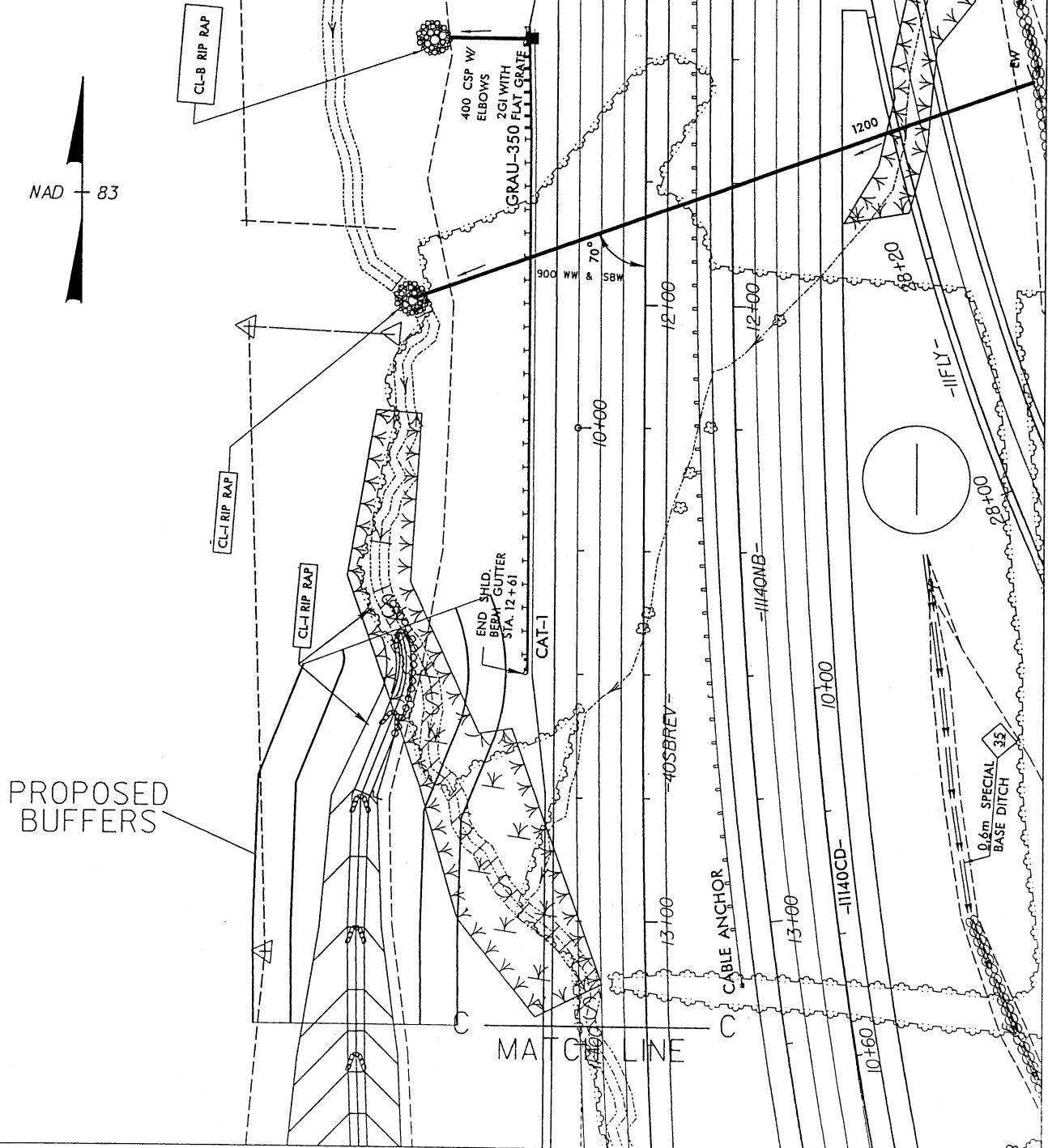
5/15/03

WETLAND LEGEND

	WETLAND BOUNDARY		PROPOSED BRIDGE
	WETLAND		PROPOSED BOX CULVERT
	DENOTES FILL IN WETLAND		PROPOSED PIPE CULVERT
	DENOTES FILL IN SURFACE WATER	(DASHED LINES DENOTE EXISTING STRUCTURES)	12"-48" PIPES
	DENOTES FILL IN SURFACE WATER (POND)		54" PIPES & ABOVE
	DENOTES TEMPORARY FILL IN WETLAND		SINGLE TREE
	DENOTES EXCAVATION IN WETLAND		WOODS LINE
	DENOTES TEMPORARY FILL IN SURFACE WATER		DRAINAGE INLET
	DENOTES MECHANIZED CLEARING		ROOTWAD
	FLOW DIRECTION		RIP RAP
	TOP OF BANK		ADJACENT PROPERTY OWNER OR PARCEL NUMBER IF AVAILABLE
	EDGE OF WATER		PREFORMED SCOUR HOLE
	PROP. LIMIT OF CUT		LEVEL SPREADER (LS)
	PROP. LIMIT OF FILL		DITCH / GRASS SWALE
	PROP. RIGHT OF WAY		
	NATURAL GROUND		
	PROPERTY LINE		
	TEMP. DRAINAGE EASEMENT		
	PERMANENT DRAINAGE EASEMENT		
	EXIST. ENDANGERED ANIMAL BOUNDARY		
	EXIST. ENDANGERED PLANT BOUNDARY		
	WATER SURFACE		
	LIVE STAKES		
	BOULDER		
	CORE FIBER ROLLS		

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DIVISION OF HIGHWAYS
GUILFORD COUNTY
PROJECT: 8.U492101 (U-2524AB)
GREENSBORO - WESTERN LOOP FROM
NORTH OF I-85 NEAR GROOMETOWN
TO NORTH OF HIGH POINT ROAD
SHEET 14 OF 55

5/15/03



PLAN VIEW
STREAM
IMPACTS
SITE 7

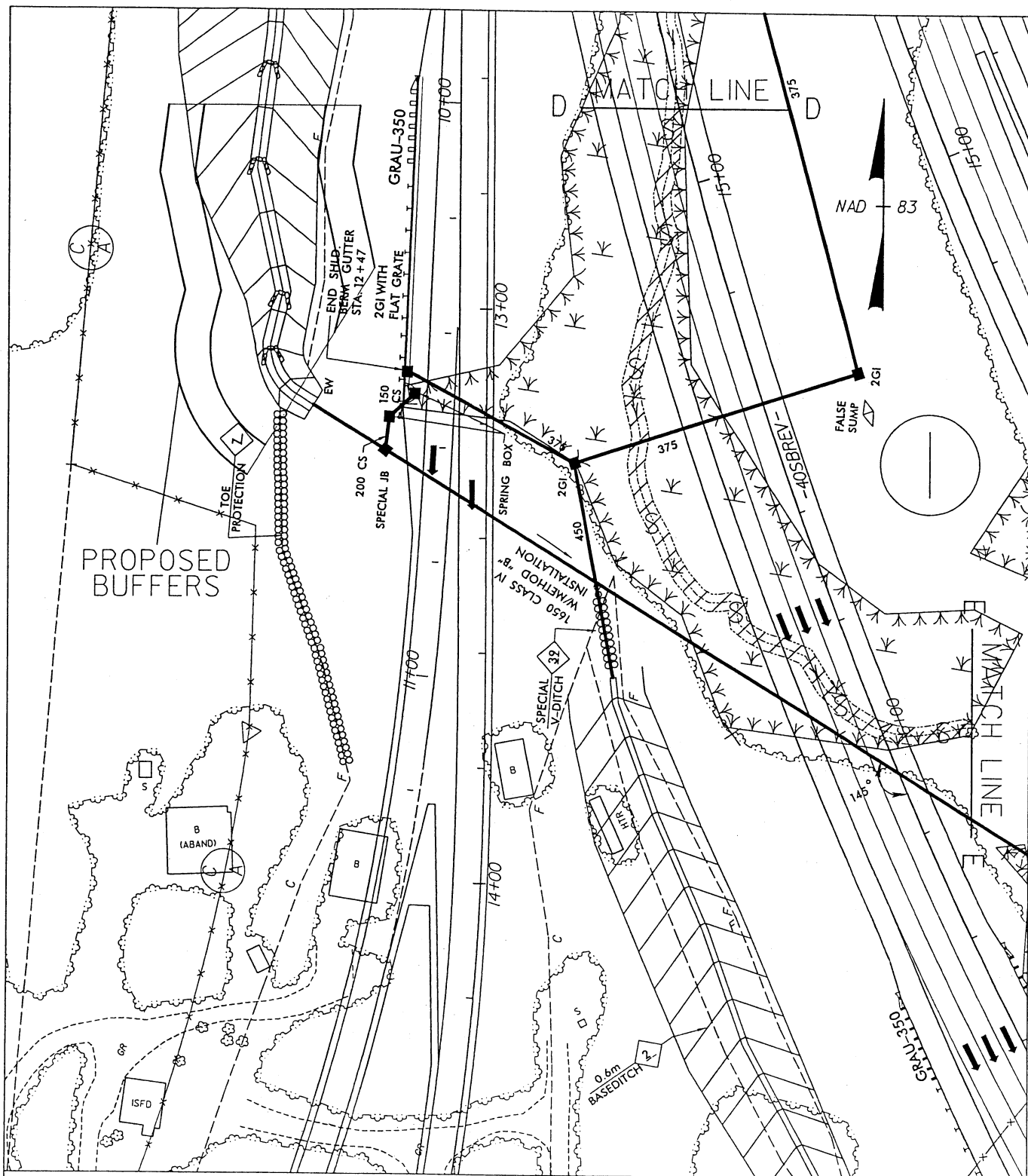
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DIVISION OF HIGHWAYS
GUILFORD COUNTY

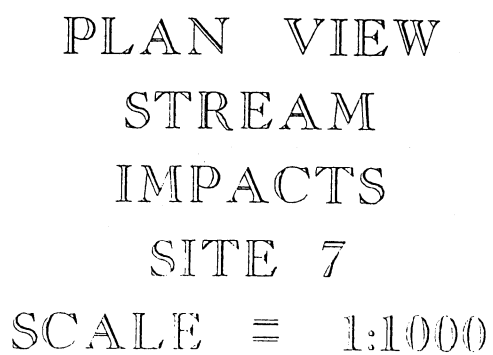
PROJECT: 8.U492101 (U-2524AB)
GREENSBORO - WESTERN LOOP FROM
NORTH OF I-85 NEAR GROOMETOWN
TO NORTH OF HIGH POINT ROAD
SHEET 15 OF 55

5/26/03

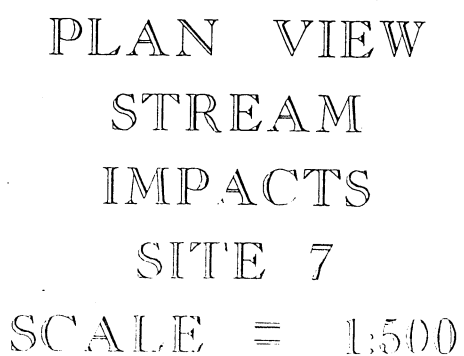


PLAN VIEW
 STREAM
 IMPACTS
 SITE 7
 SCALE = 1:1000

DIVISION OF HIGHWAYS
 GUILFORD COUNTY
 PROJECT: 8.U492101 (U-252-AB)
 GREENSBORO - WESTERN LOOP FROM
 NORTH OF I-85 NEAR GROOMETOWN
 TO NORTH OF HIGH POINT ROAD
 SHEET 17 OF 55
 6/26/03




DIVISION OF HIGHWAYS
GUILFORD COUNTY
PROJECT: 8.U492101 (U-2524AB)
GREENSBORO - WESTERN LOOP FROM
NORTH OF I-85 NEAR GROOMETOWN
TO NORTH OF HIGH POINT ROAD
SHEET 18 OF 55
6/24/03



NCDOT
 DIVISION OF HIGHWAYS
 GUILFORD COUNTY
 PROJECT: 8.U492101 (U-2524AB)
 GREENSBORO - WESTERN LOOP FROM
 NORTH OF I-85 NEAR GROOMETOWN
 TO NORTH OF HIGH POINT ROAD
 SHEET 19 OF 55

July 03
 Tipu-2524AD part 1
 sheet 20 of 55

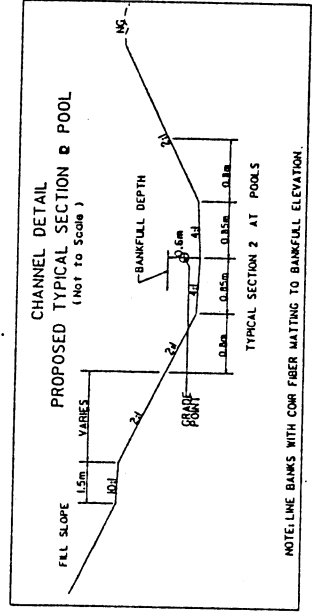
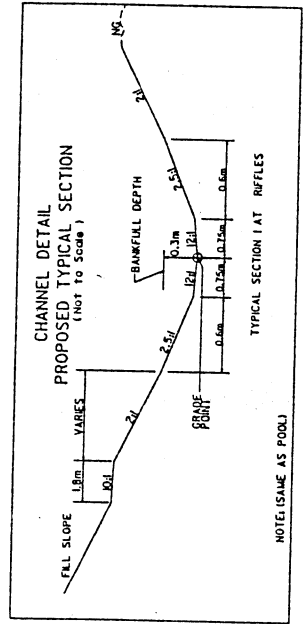
NATURAL CHANNEL DESIGN TYPICALS



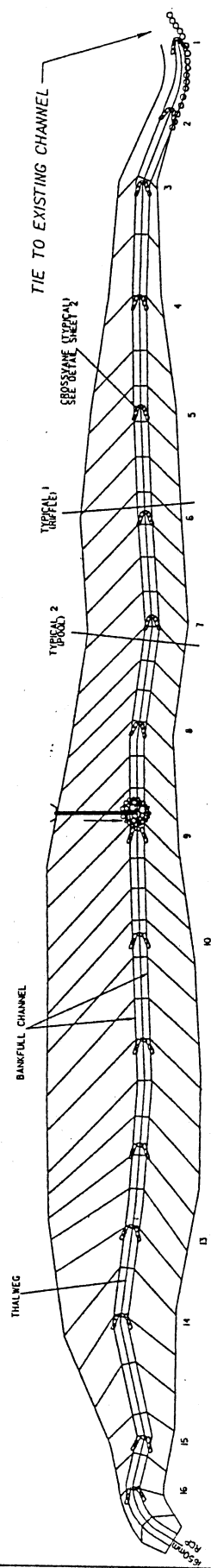
PROJECT REFERENCE NO. U-2524AD1
 SHEET NO. 20 OF 55

PRELIMINARY PLANS
 DO NOT USE FOR CONSTRUCTION

INCOMPLETE PLANS
 DO NOT USE FOR CONSTRUCTION

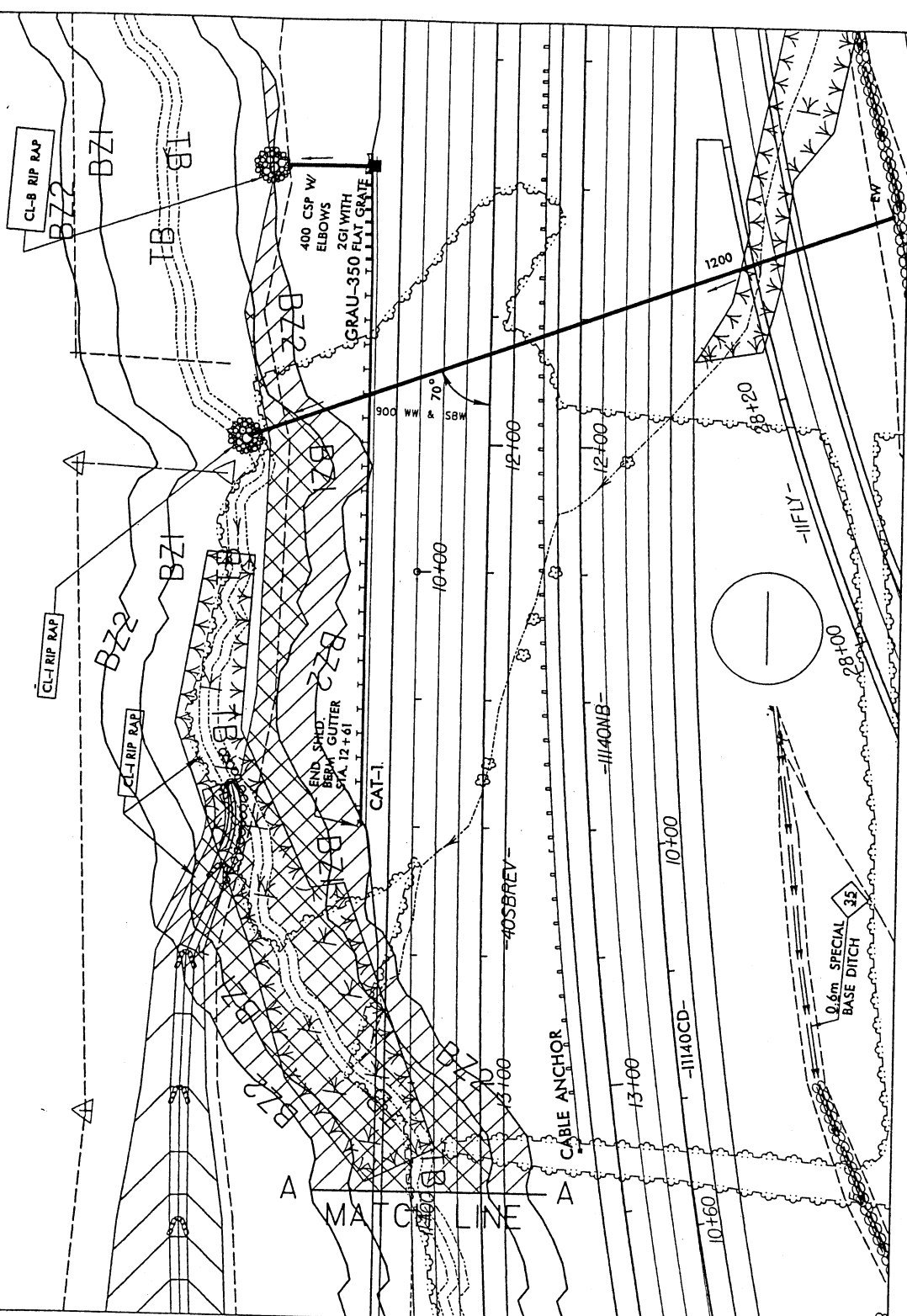
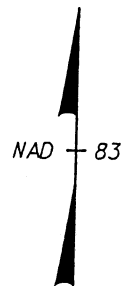


QUANTITIES
 DOE = 1050m²
 BOULDERS = 230 EACH (230 TONS)
 COIR MAT = 1200m²
 GEOTEXTILE FABRIC = 220m²



STRUCTURE #	IMP. ELEV.	BANKFULL ELEV.
1	248.75m	248.00m
2	248.65m	248.90m
3	248.54m	248.84m
4	248.38m	248.68m
5	248.22m	248.33m
6	248.09m	248.39m
7	247.94m	248.24m
8	247.79m	248.09m
9	247.64m	247.94m
10	247.49m	247.79m
11	247.34m	247.64m
12	247.20m	247.50m
13	247.04m	247.34m
14	246.89m	247.19m
15	246.74m	247.04m
16	246.59m	246.89m

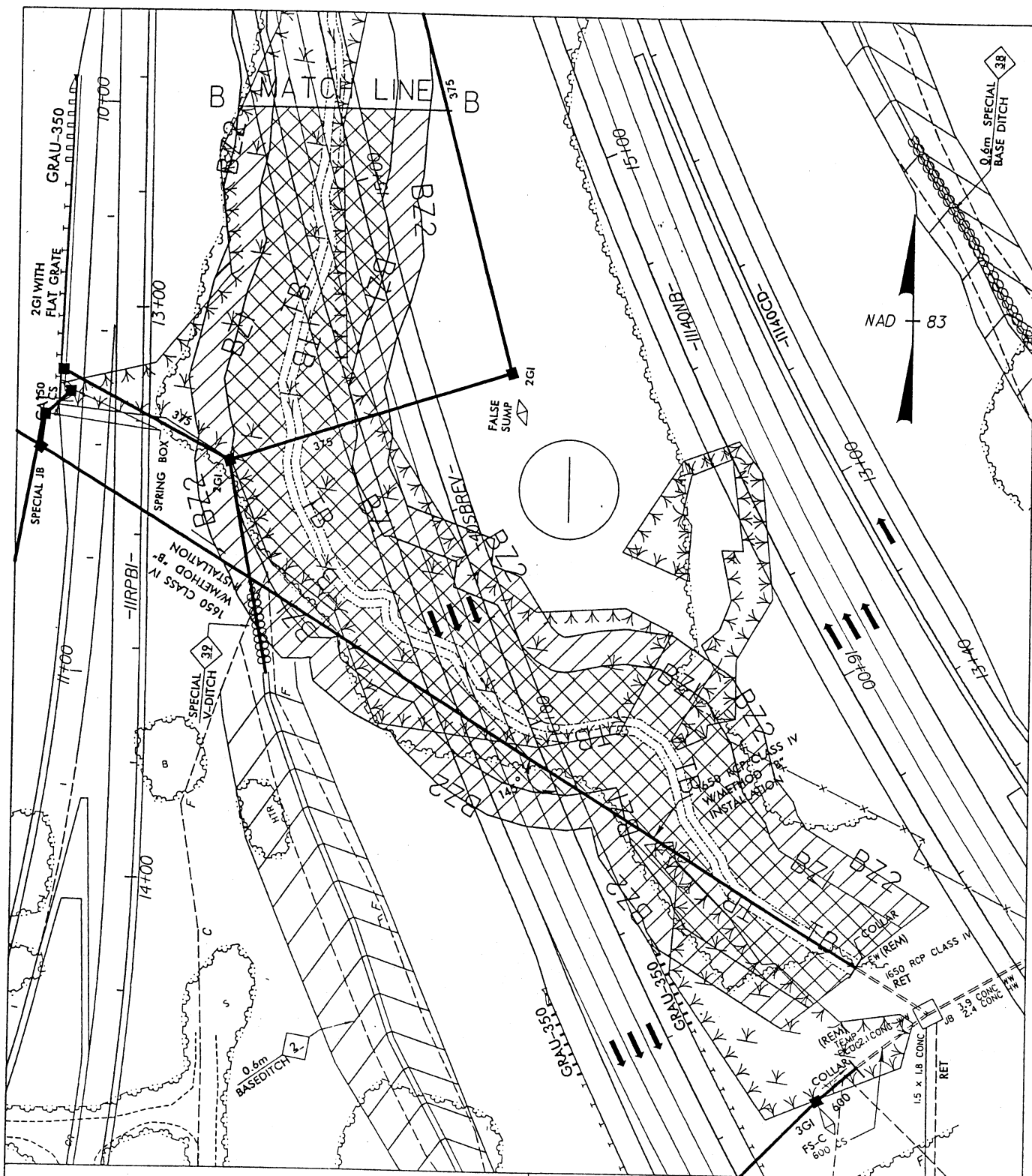
CHANNEL PLAN VIEW SITE # 7



PLAN VIEW
BUFFER
IMPACTS
SITE 7
SCALE = 1:1000

NCDOT
DIVISION OF HIGHWAYS
GUILFORD COUNTY
PROJECT: 8.U492101 (U-2524AB)
GREENSBORO - WESTERN LOOP FROM
NORTH OF I-85 NEAR GROOMETOWN
TO NORTH OF HIGH POINT ROAD
SHEET 24 OF 55
5/15/03

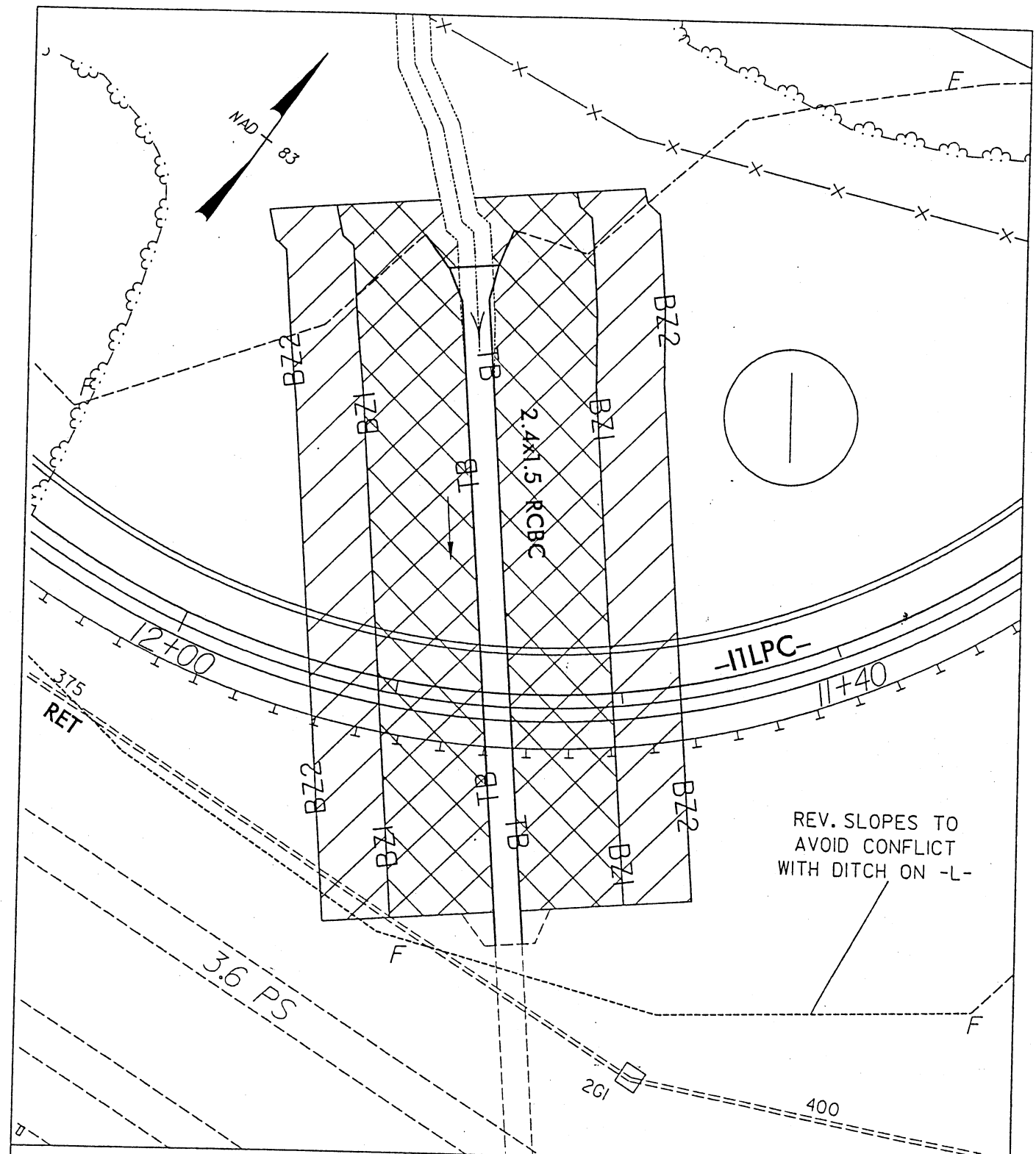
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PLAN VIEW
 BUFFER
 IMPACTS
 SITE 7
 SCALE = 1:1000

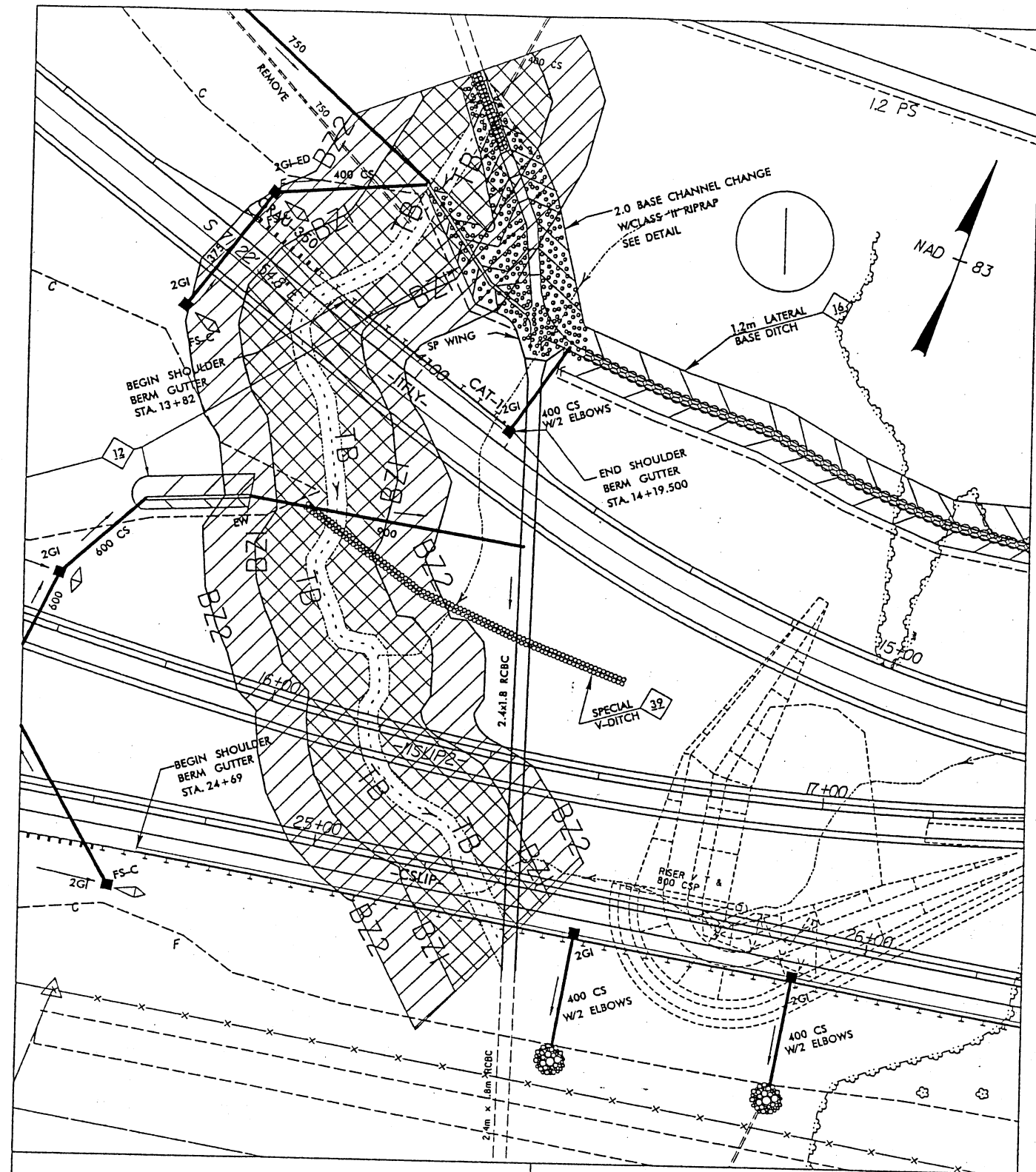
DIVISION OF HIGHWAYS
 GUILFORD COUNTY
 PROJECT: 8.U492101 (U-2524AB)
 GREENSBORO - WESTERN LOOP FROM
 NORTH OF I-85 NEAR GROOMETOWN
 TO NORTH OF HIGH POINT ROAD
 SHEET 22 OF 55

6/24/03



PLAN VIEW
 BUFFER
 IMPACTS
 SITE 7
 SCALE = 1:500

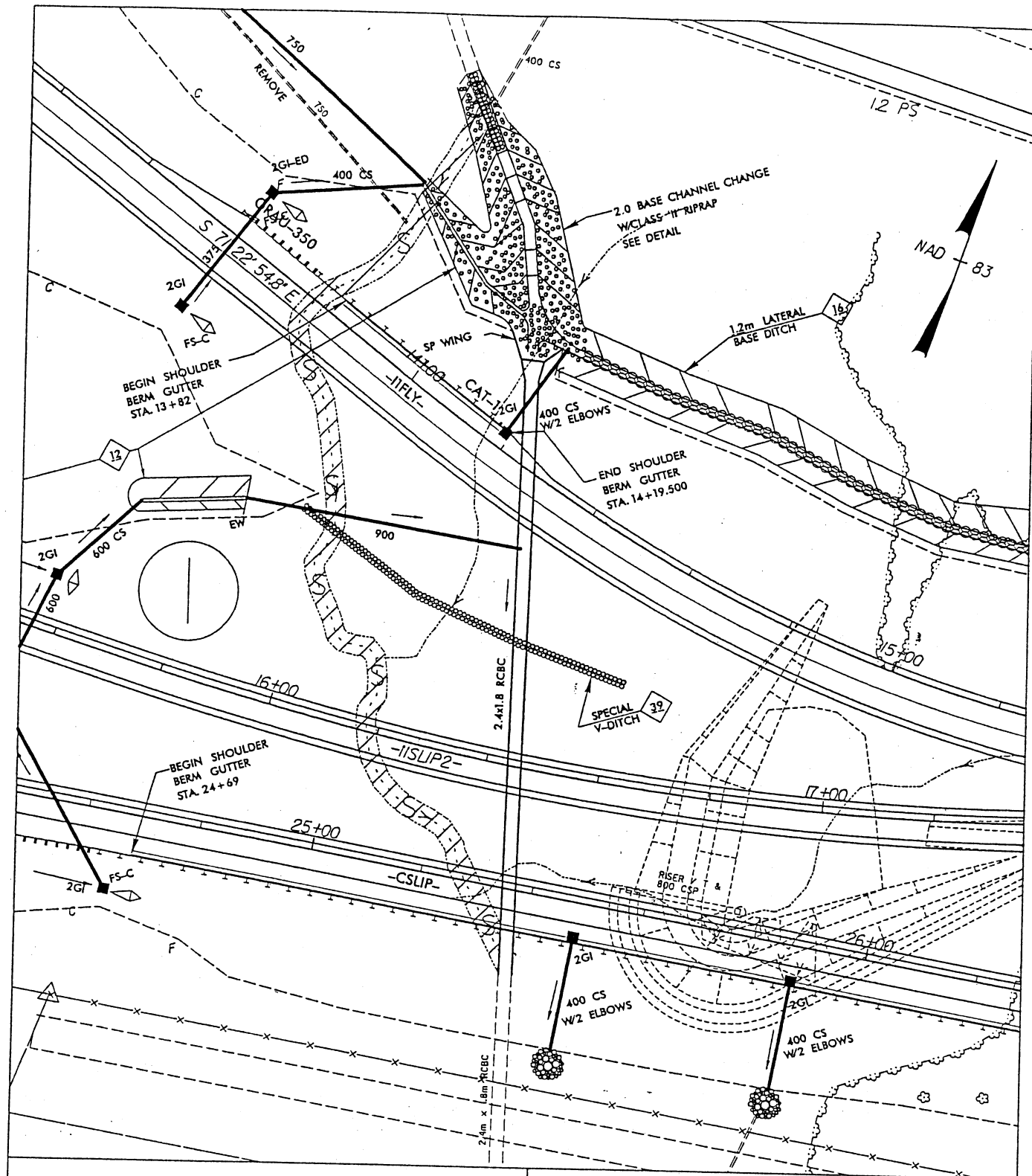
NCDOT
 DIVISION OF HIGHWAYS
 GUILFORD COUNTY
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 GREENSBORO - WESTERN LOOP FROM
 NORTH OF I-85 NEAR GROOMETOWN
 TO NORTH OF HIGH POINT ROAD
 SHEET 24 OF 55
 5/15/03



PLAN VIEW
 BUFFER
 IMPACTS
 SITE 7
 SCALE = 1:1000

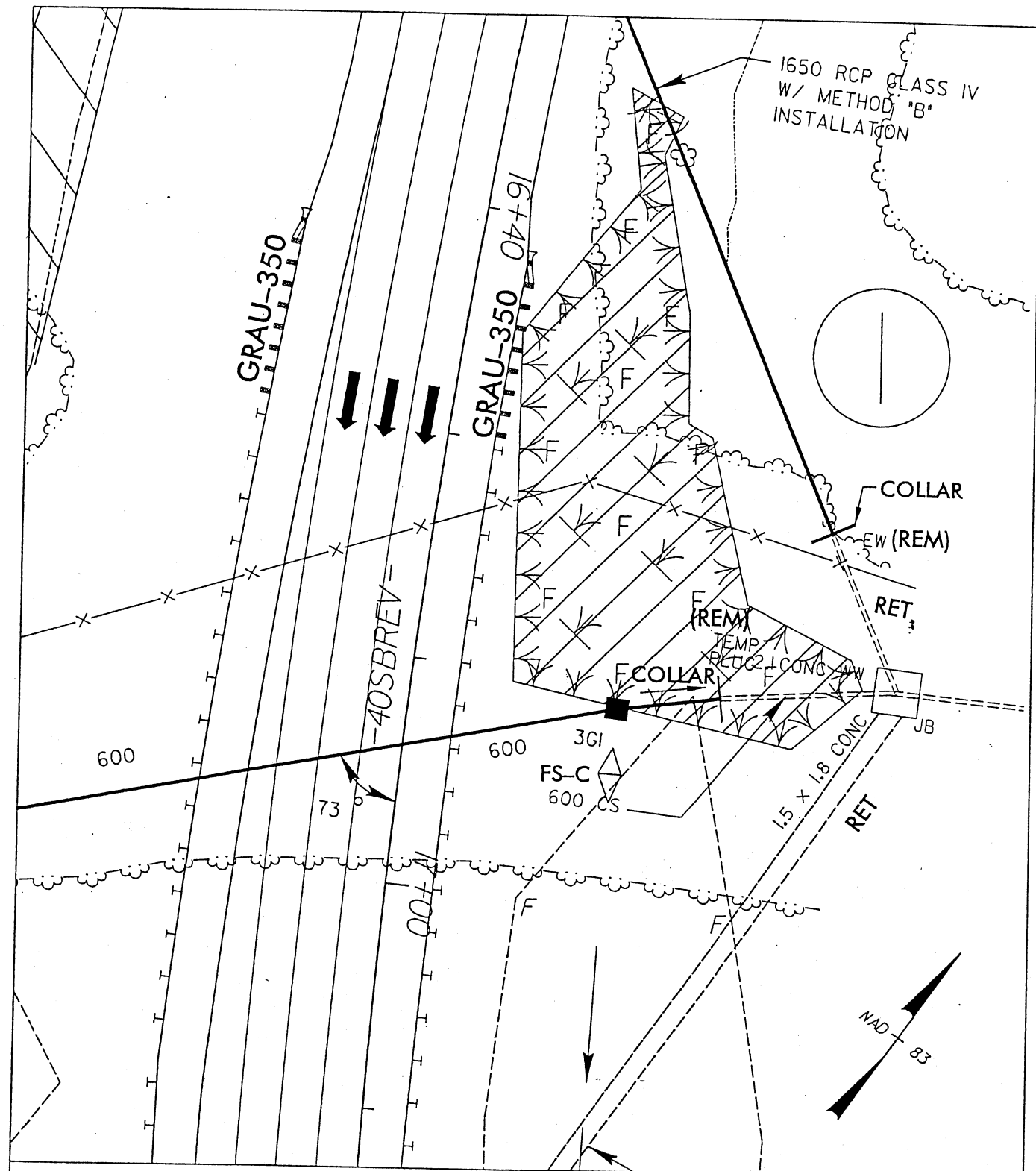
NCDOT
 DIVISION OF HIGHWAYS
 GUILFORD COUNTY
 PROJECT: 8.U492101 (U-2524AB)
 GREENSBORO - WESTERN LOOP FROM
 NORTH OF I-85 NEAR GROOMETOWN
 TO NORTH OF HIGH POINT ROAD
 SHEET 26 OF 55

5/15/03



PLAN VIEW
STREAM
IMPACTS
SITE 7
SCALE = 1:1000

NCDOT
DIVISION OF HIGHWAYS
GUILFORD COUNTY
PROJECT: 8.U492101 (U-2524AB)
GREENSBORO - WESTERN LOOP FROM
NORTH OF I-85 NEAR GROOMETOWN
TO NORTH OF HIGH POINT ROAD
SHEET 27 OF 55
5/15/03



PLAN VIEW
WETLAND
IMPACTS

SITE 8

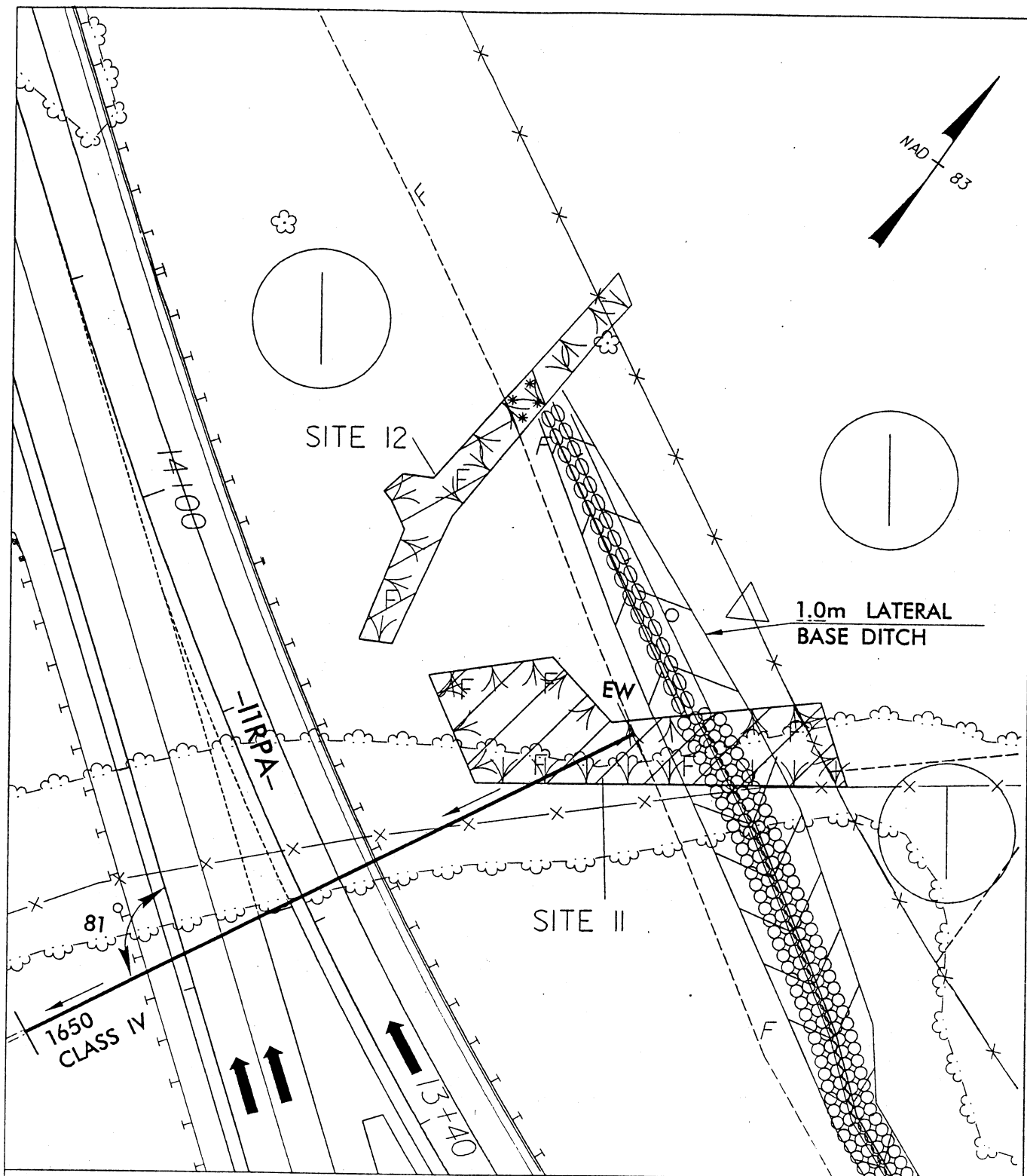
SCALE = 1:500

NCDOT

DIVISION OF HIGHWAYS
GUILFORD COUNTY

PROJECT: 8.U492101 (U-2524AB)
GREENSBORO - WESTERN LOOP FROM
NORTH OF I-85 NEAR GROOMETOWN
TO NORTH OF HIGH POINT ROAD
SHEET 28 OF 55

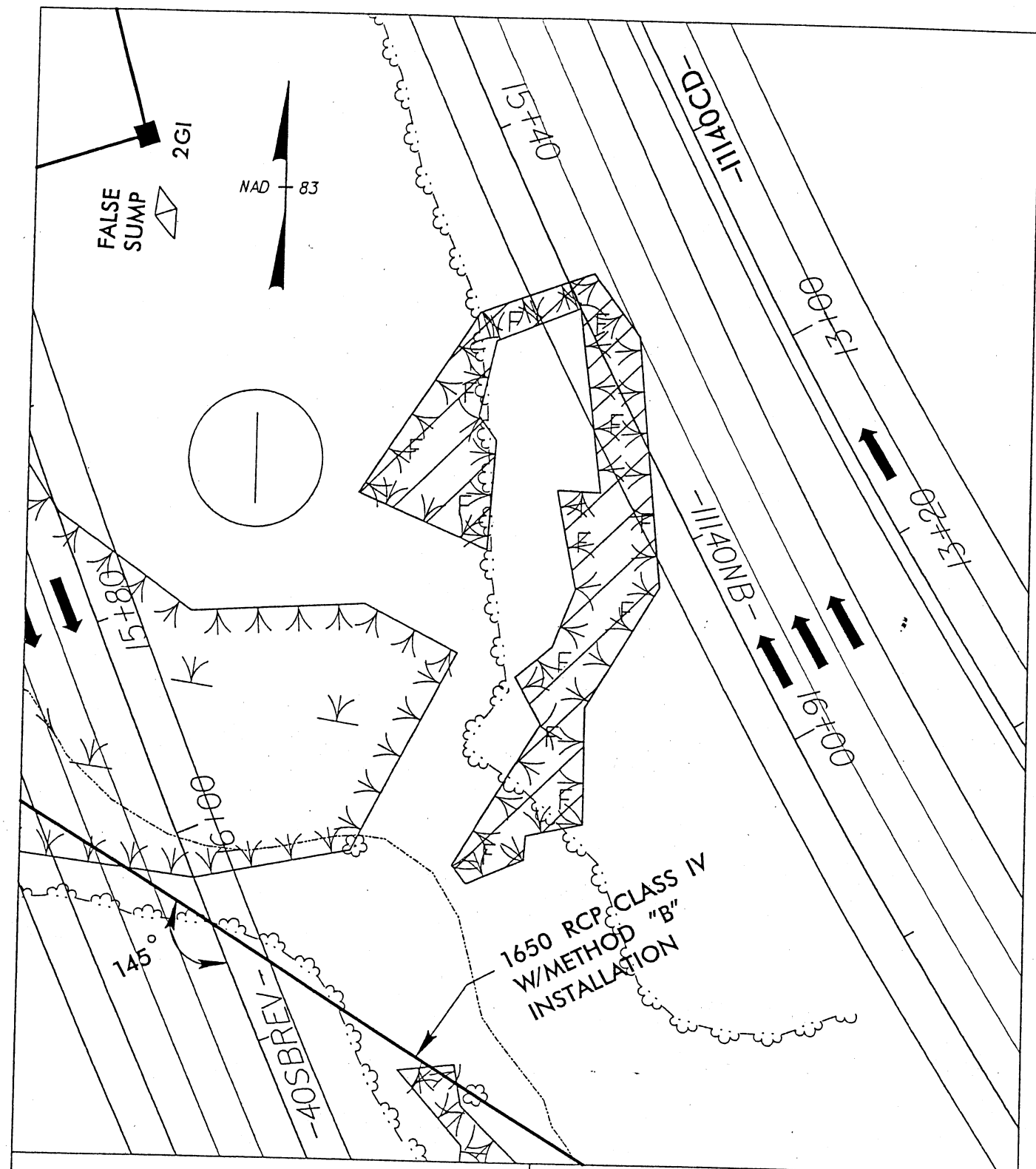
5/15/03



PLAN VIEW
WETLAND
IMPACTS
SITES 11 & 12
SCALE = 1:500

NCDOT
DIVISION OF HIGHWAYS
GUILFORD COUNTY
PROJECT: 8.U492101 (U-2524AB)
GREENSBORO - WESTERN LOOP FROM
NORTH OF I-85 NEAR GROOMETOWN
TO NORTH OF HIGH POINT ROAD
SHEET 29 OF 55

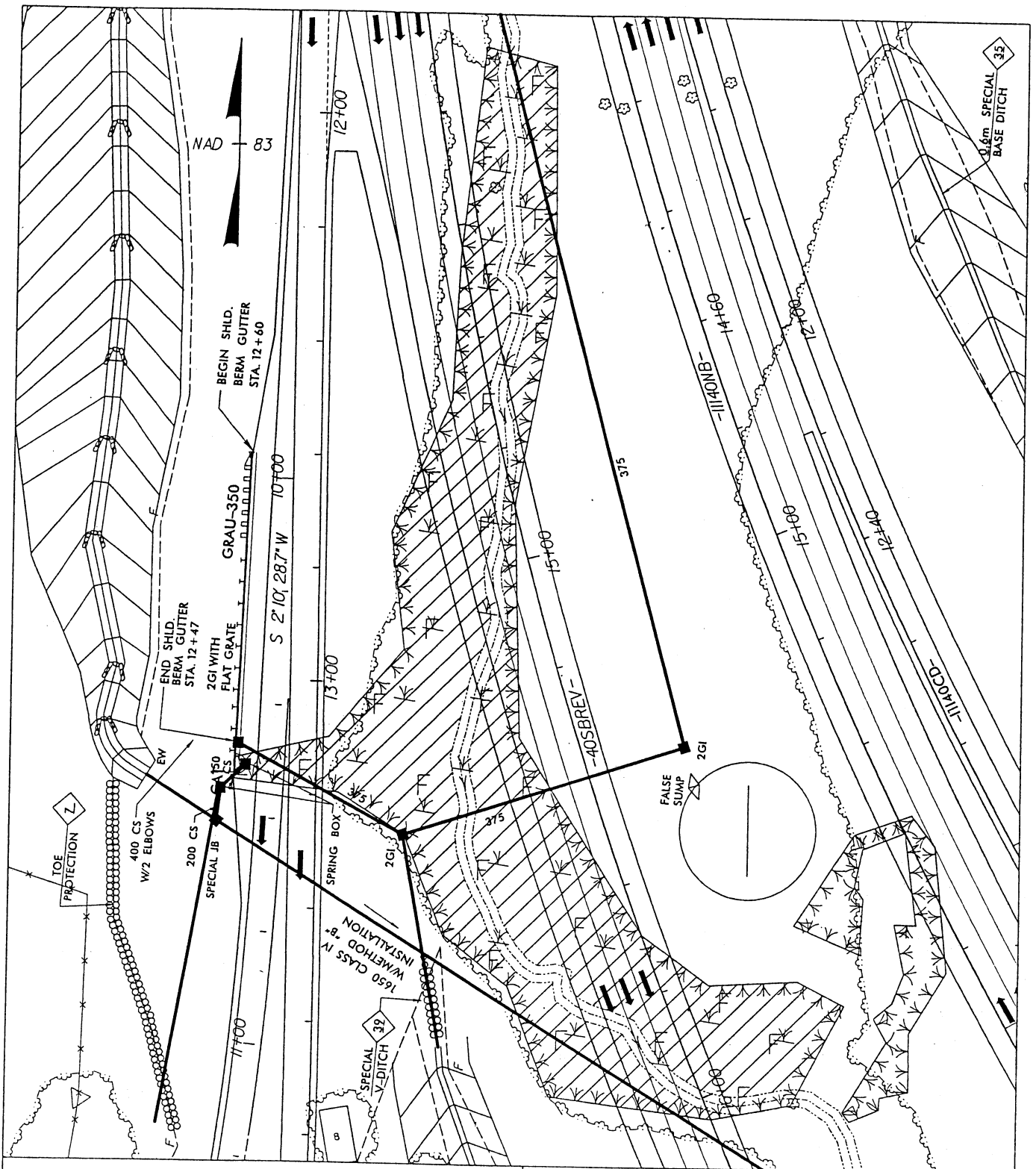
6/30/03



PLAN VIEW
WETLAND
IMPACTS
SITES 13
SCALE = 1:500

NCDOT
DIVISION OF HIGHWAYS
GUILFORD COUNTY
PROJECT: 8.U492101 (U-2524AB)
GREENSBORO - WESTERN LOOP FROM
NORTH OF I-85 NEAR GROOMETOWN
TO NORTH OF HIGH POINT ROAD
SHEET 30 OF 55

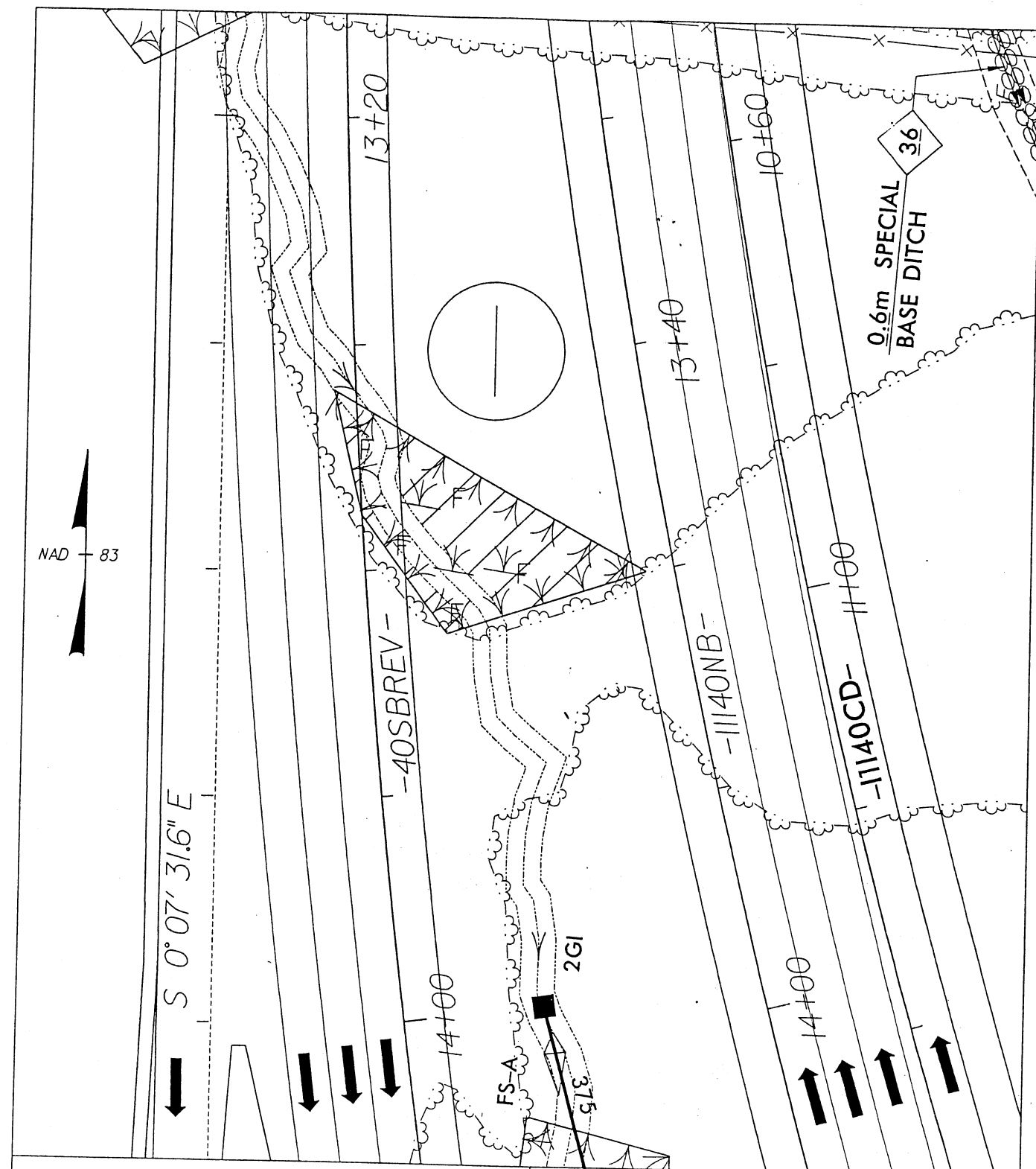
5/15/03



PLAN VIEW
WETLAND
IMPACTS
SITE 14
SCALE = 1:1000

NCDOT
DIVISION OF HIGHWAYS
GUILFORD COUNTY
PROJECT: 8.U492101 (U-2524AB)
GREENSBORO - WESTERN LOOP FROM
NORTH OF I-85 NEAR GROOMETOWN
TO NORTH OF HIGH POINT ROAD
SHEET 31 OF 55

6/24/03



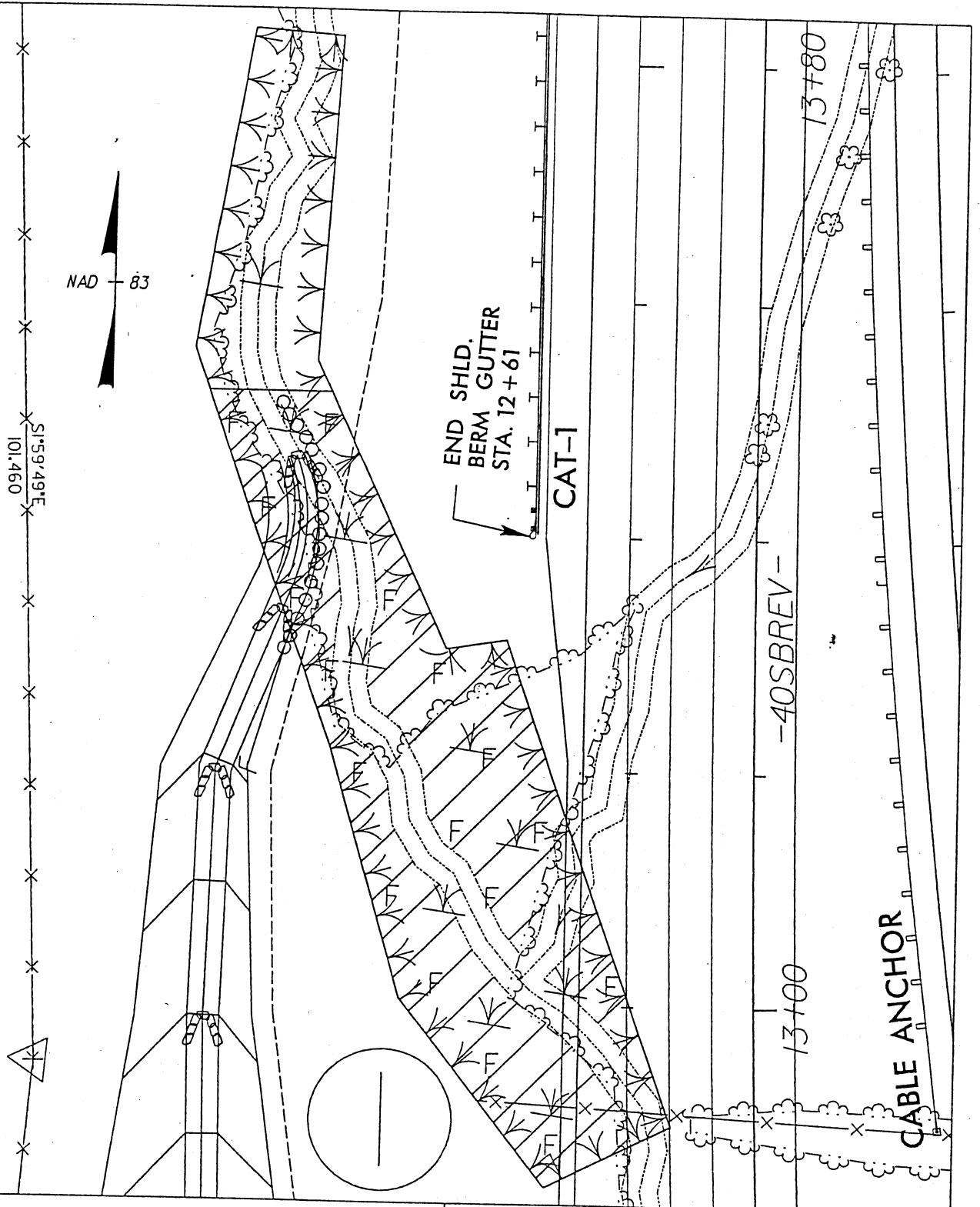
PLAN VIEW
WETLAND
IMPACTS
SITES 15

SCALE = 1:500

NCDOT

DIVISION OF HIGHWAYS
GUILFORD COUNTY
PROJECT: 8.U492101 (U-2524AB)
GREENSBORO - WESTERN LOOP FROM
NORTH OF I-85 NEAR GROOMETOWN
TO NORTH OF HIGH POINT ROAD
SHEET 32 OF 55

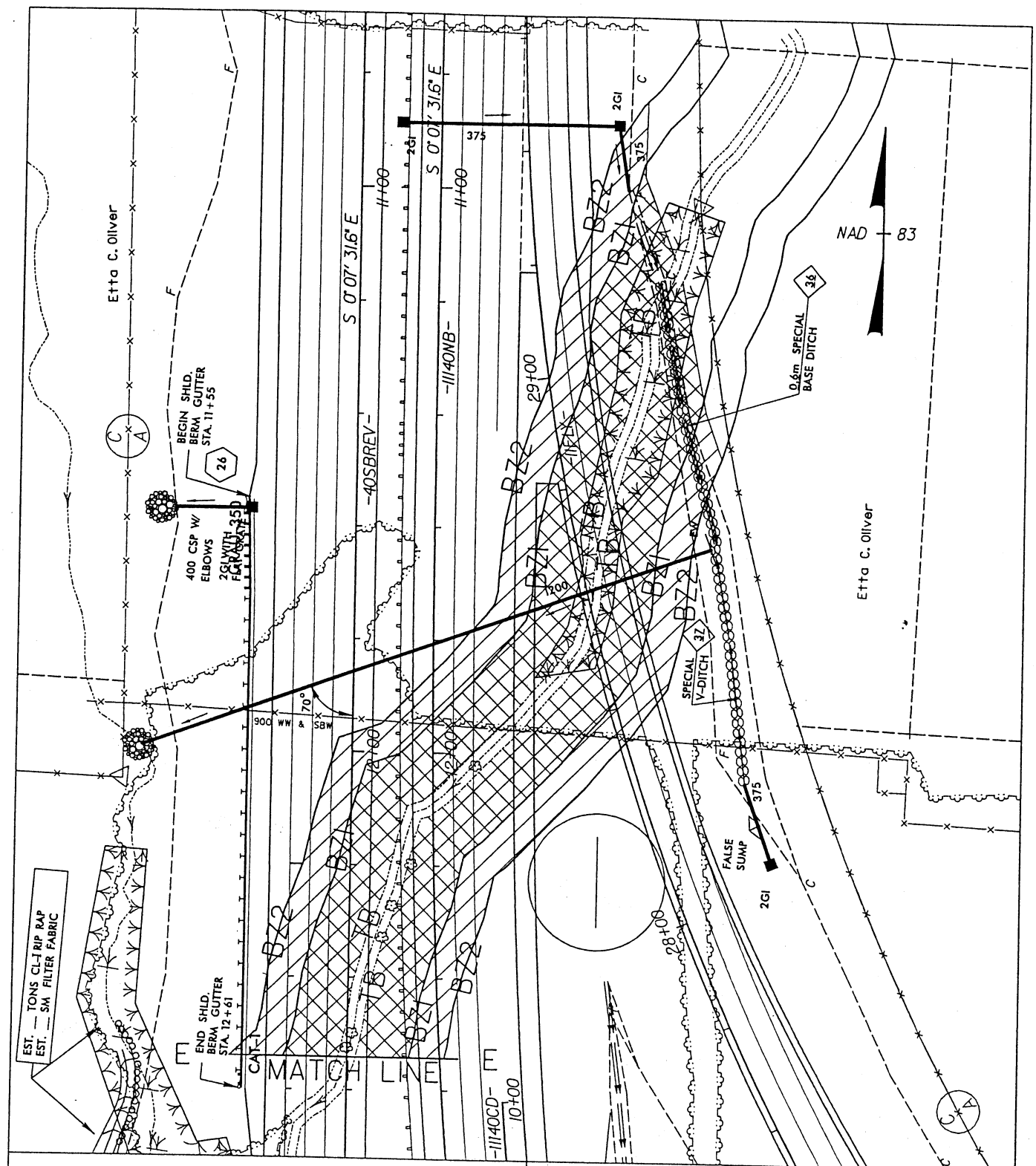
6/24/03

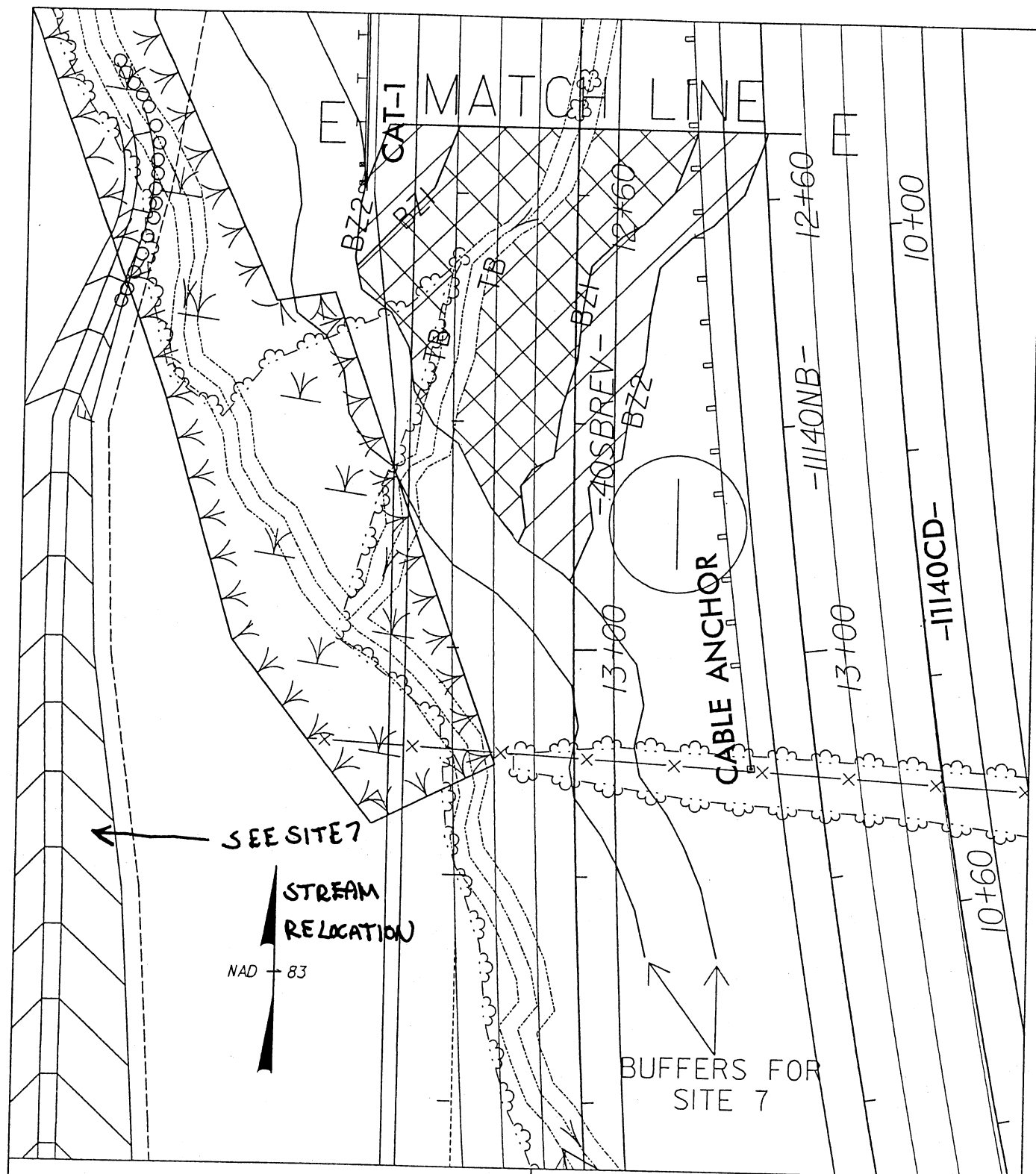


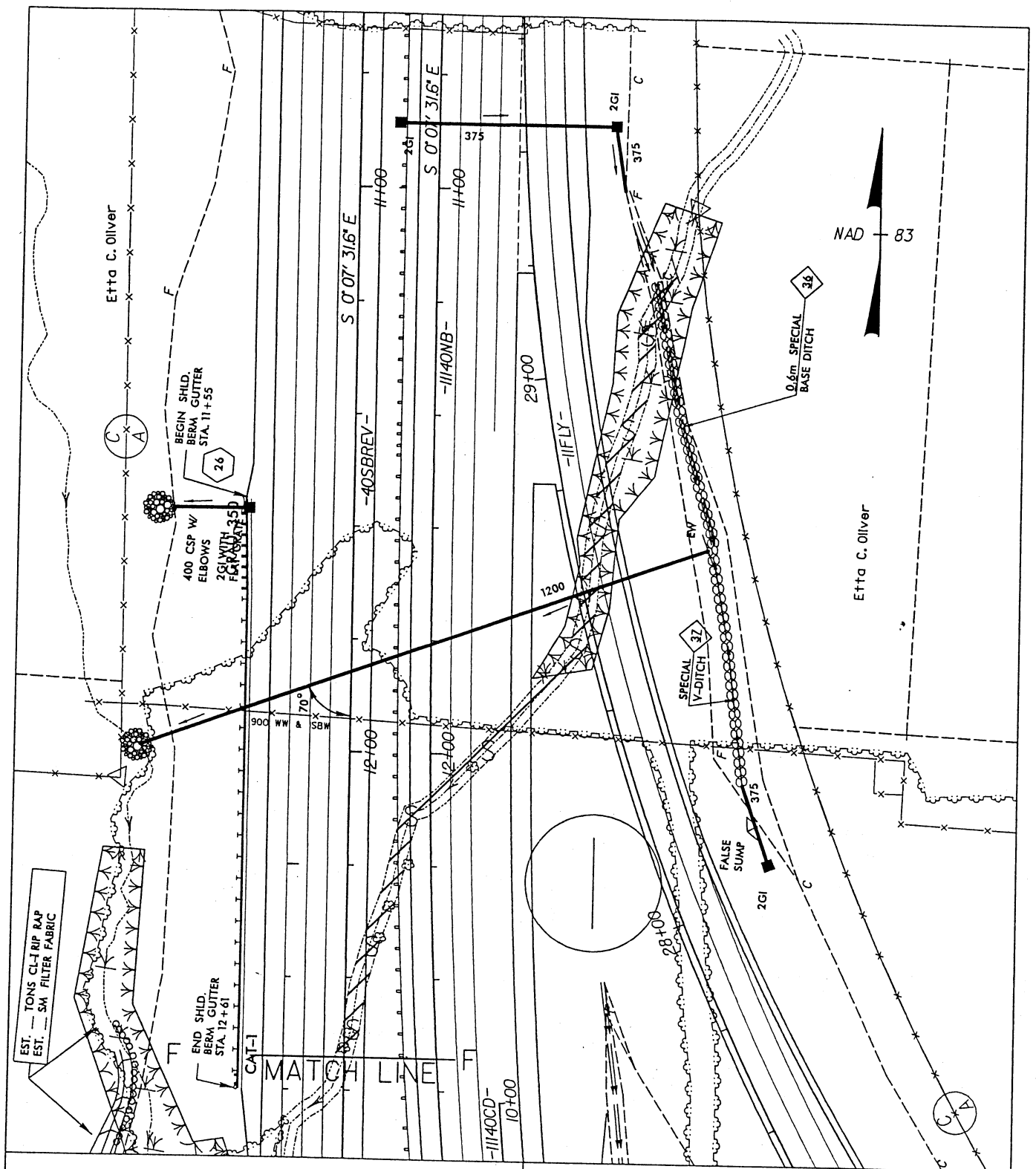
PLAN VIEW
WETLAND
IMPACTS
SITES 16
SCALE = 1:500

NCDOT
DIVISION OF HIGHWAYS
GUILFORD COUNTY
PROJECT: 8.U492101 (U-2524AB)
GREENSBORO - WESTERN LOOP FROM
NORTH OF I-85 NEAR GROOMETOWN
TO NORTH OF HIGH POINT ROAD
SHEET 33 OF 55

5/15/03



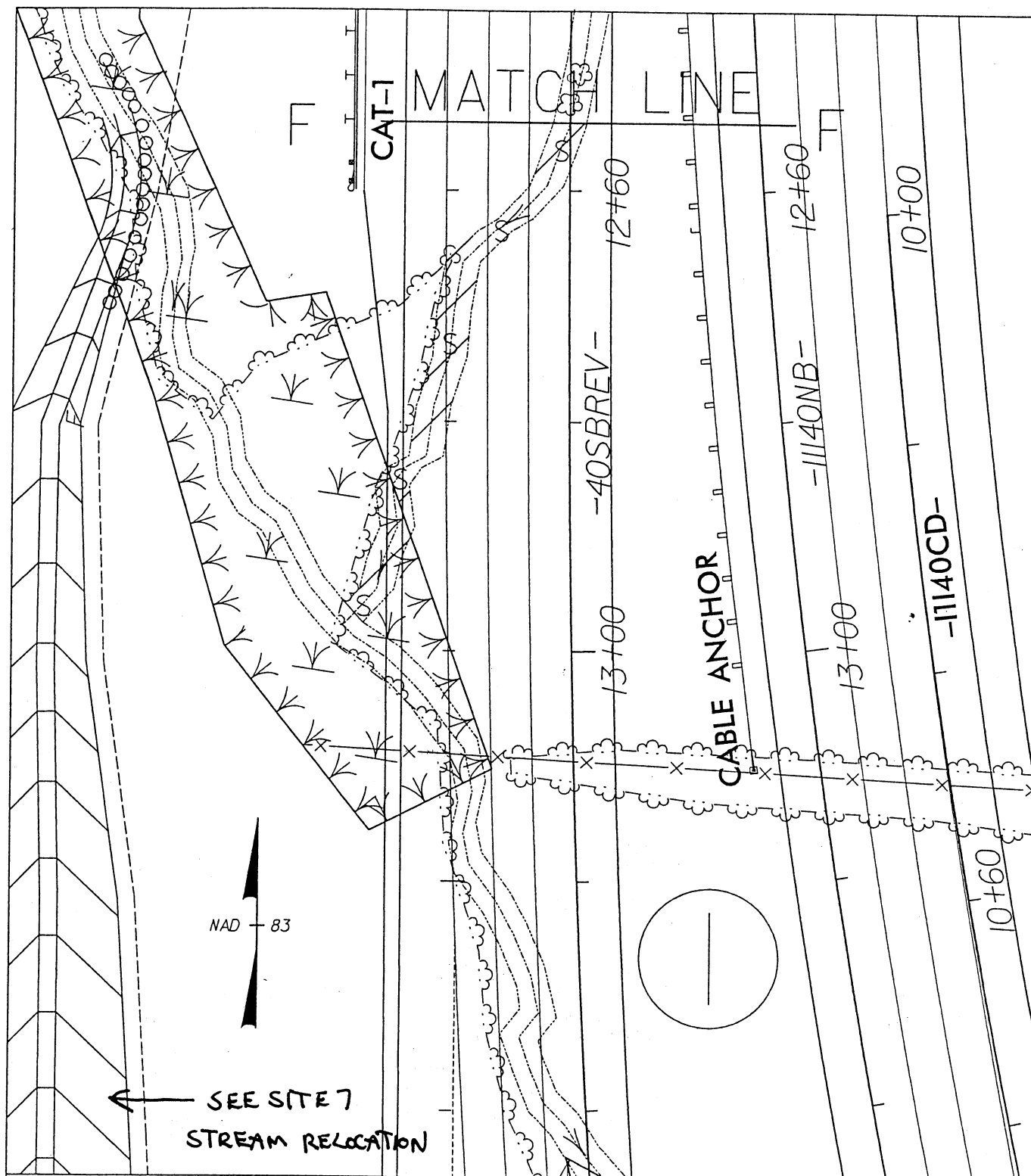




PLAN VIEW
 STREAM
 IMPACTS
 SITE 17
 SCALE = 1:1000

NCDOT
 DIVISION OF HIGHWAYS
 GUILFORD COUNTY
 PROJECT: 8.U492101 (U-2524AB)
 GREENSBORO - WESTERN LOOP FROM
 NORTH OF I-85 NEAR GROOMETOWN
 TO NORTH OF HIGH POINT ROAD
 SHEET 36 OF 55

5/15/03



PLAN VIEW
STREAM
IMPACTS
SITES 17

SCALE = 1:500

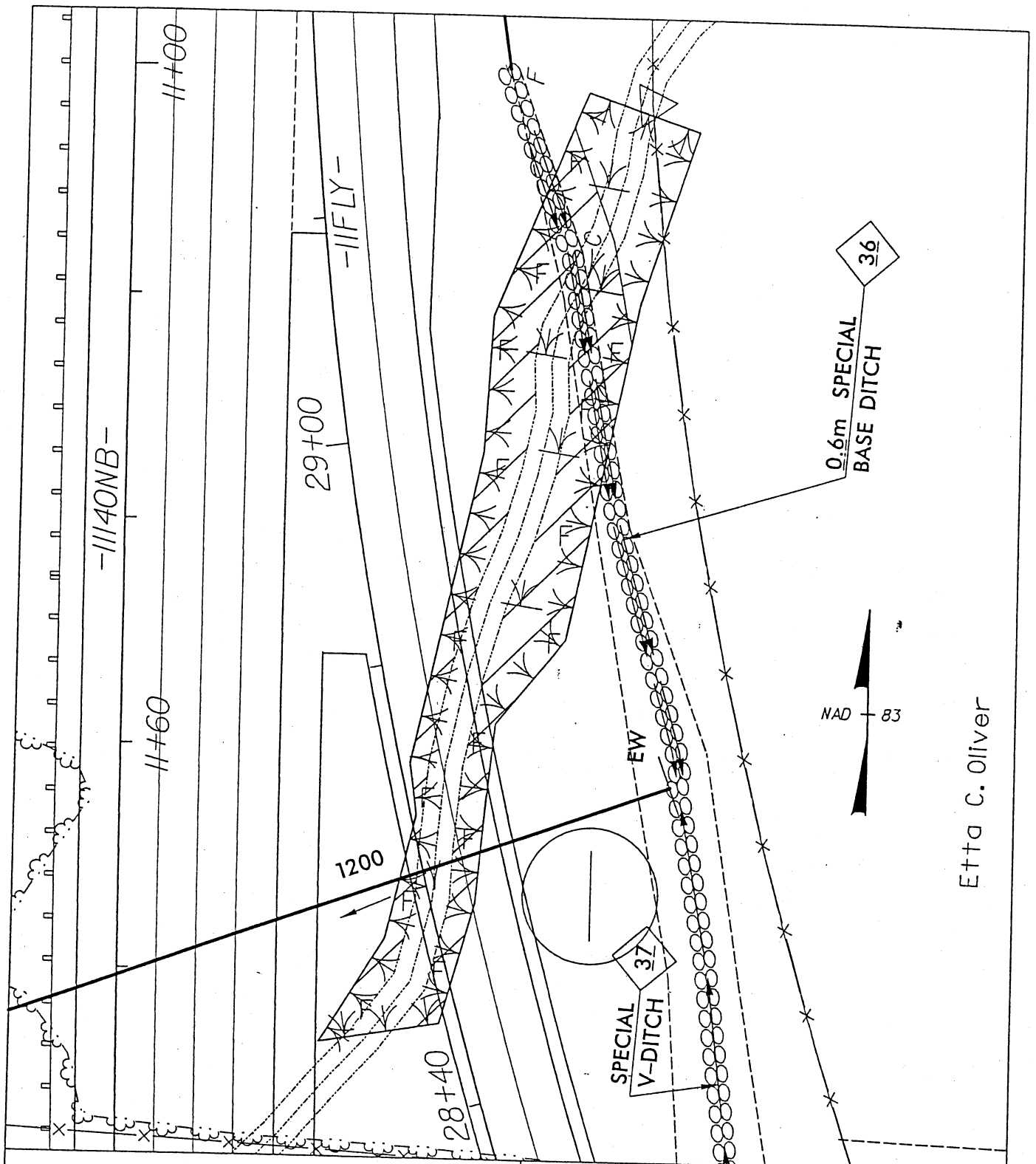
NCDOT

DIVISION OF HIGHWAYS
GUILFORD COUNTY

PROJECT: 8.U492101 (U-2524AB)
GREENSBORO - WESTERN LOOP FROM
NORTH OF I-85 NEAR GROOMETOWN
TO NORTH OF HIGH POINT ROAD

SHEET 37 OF 55

5/15/03



PLAN VIEW
WETLAND
IMPACTS
SITES 17

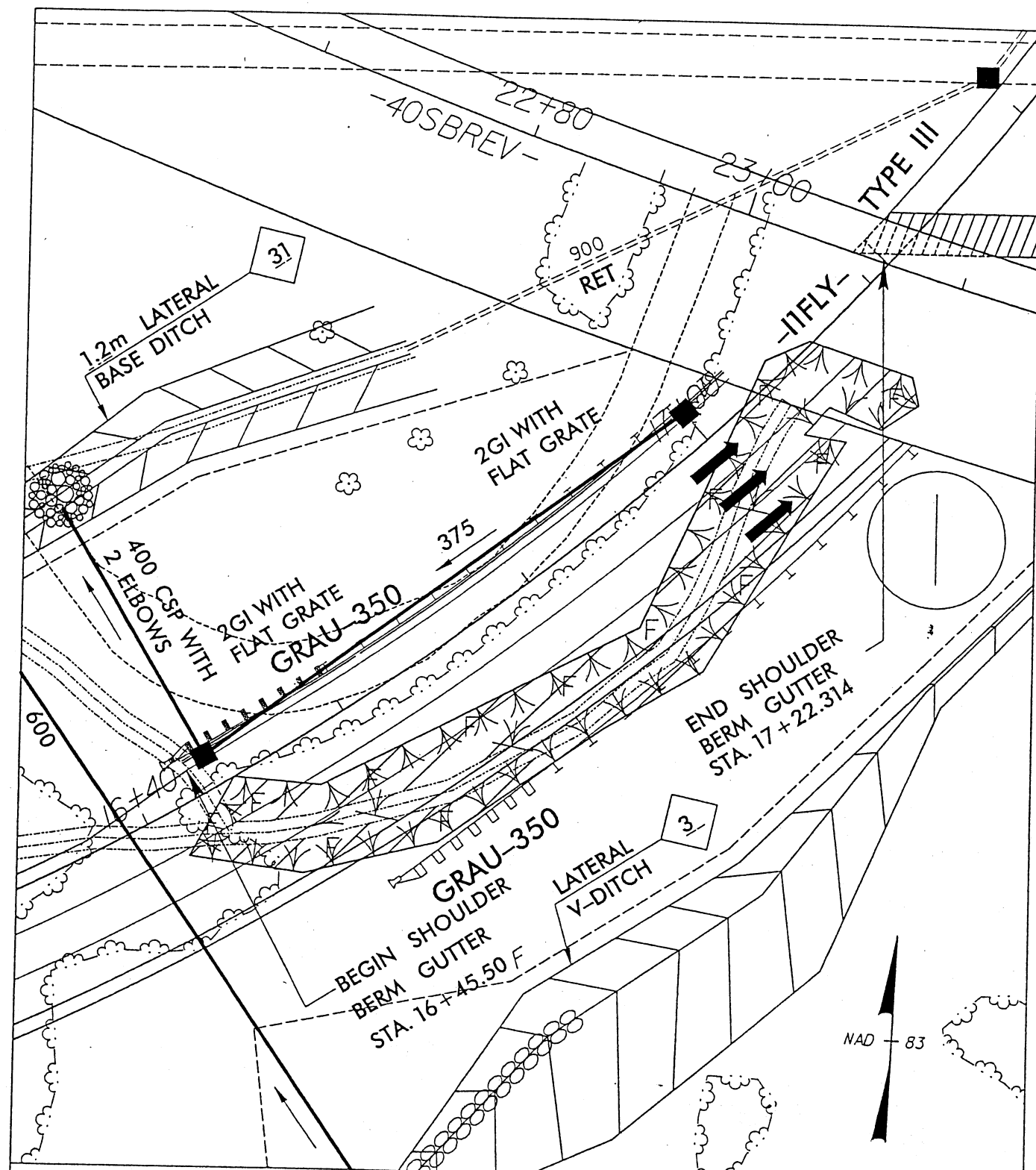
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NCDOT

DIVISION OF HIGHWAYS
GUILFORD COUNTY

PROJECT: 8.U492101 (U-2524AB)
GREENSBORO - WESTERN LOOP FROM
NORTH OF I-85 NEAR GROOMETOWN
TO NORTH OF HIGH POINT ROAD
SHEET 38 OF 55

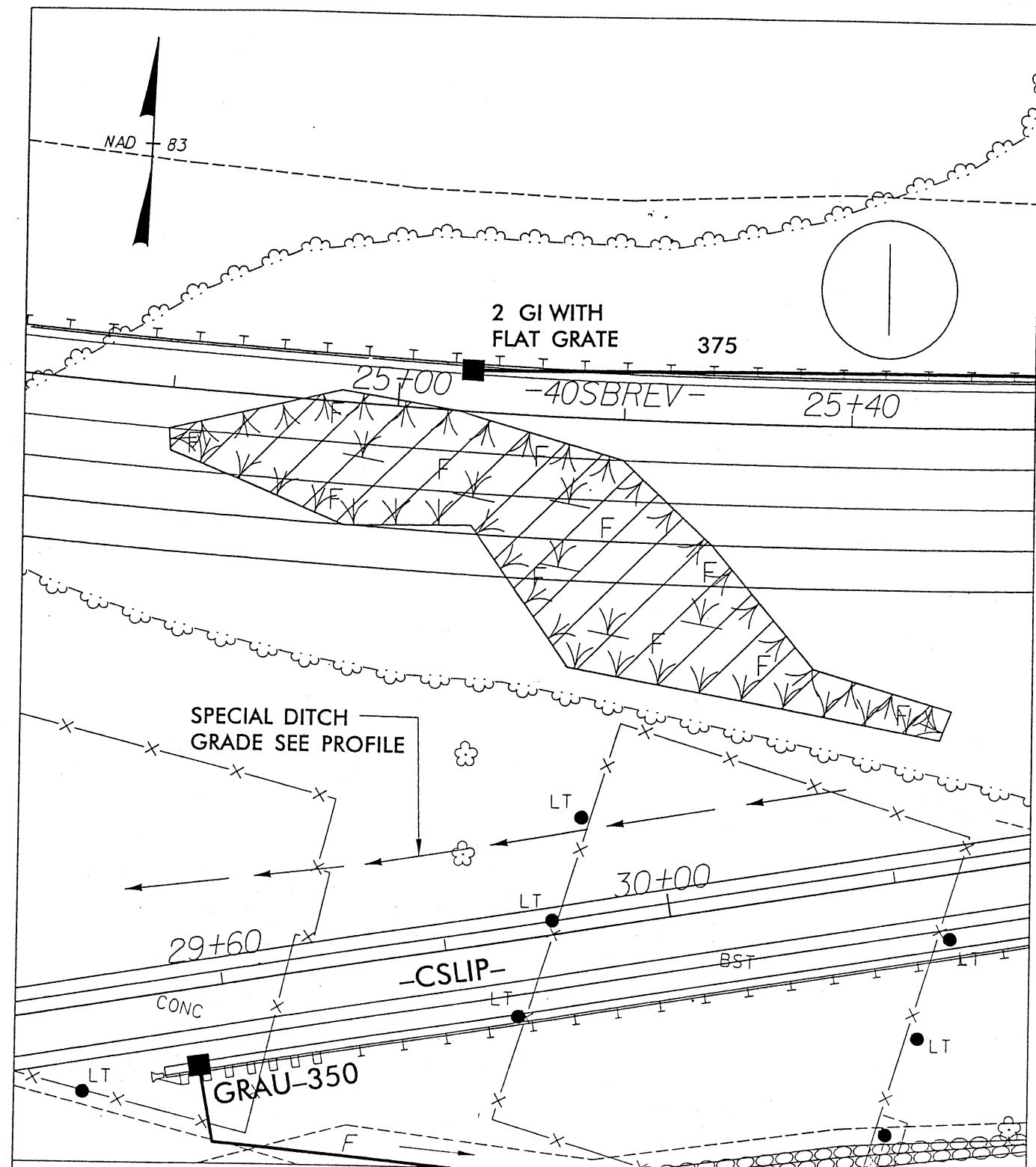
5/15/03



PLAN VIEW
WETLAND
IMPACTS
SITE 21
SCALE = 1:500

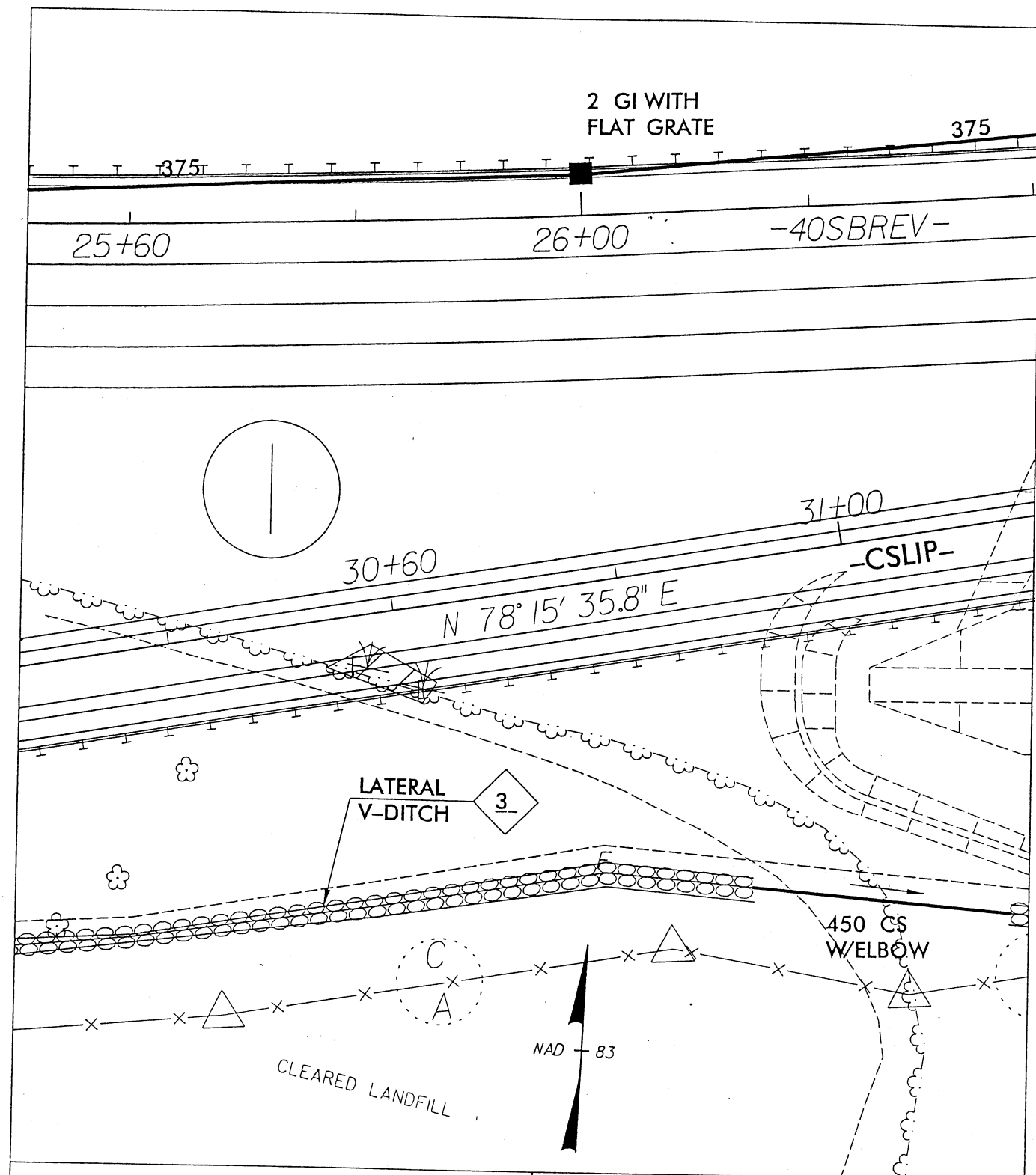
NCDOT
DIVISION OF HIGHWAYS
GUILFORD COUNTY
PROJECT: 8.U492101 (U-2524AB)
GREENSBORO - WESTERN LOOP FROM
NORTH OF I-85 NEAR GROOMETOWN
TO NORTH OF HIGH POINT ROAD
SHEET 39 OF 55

5/15/03



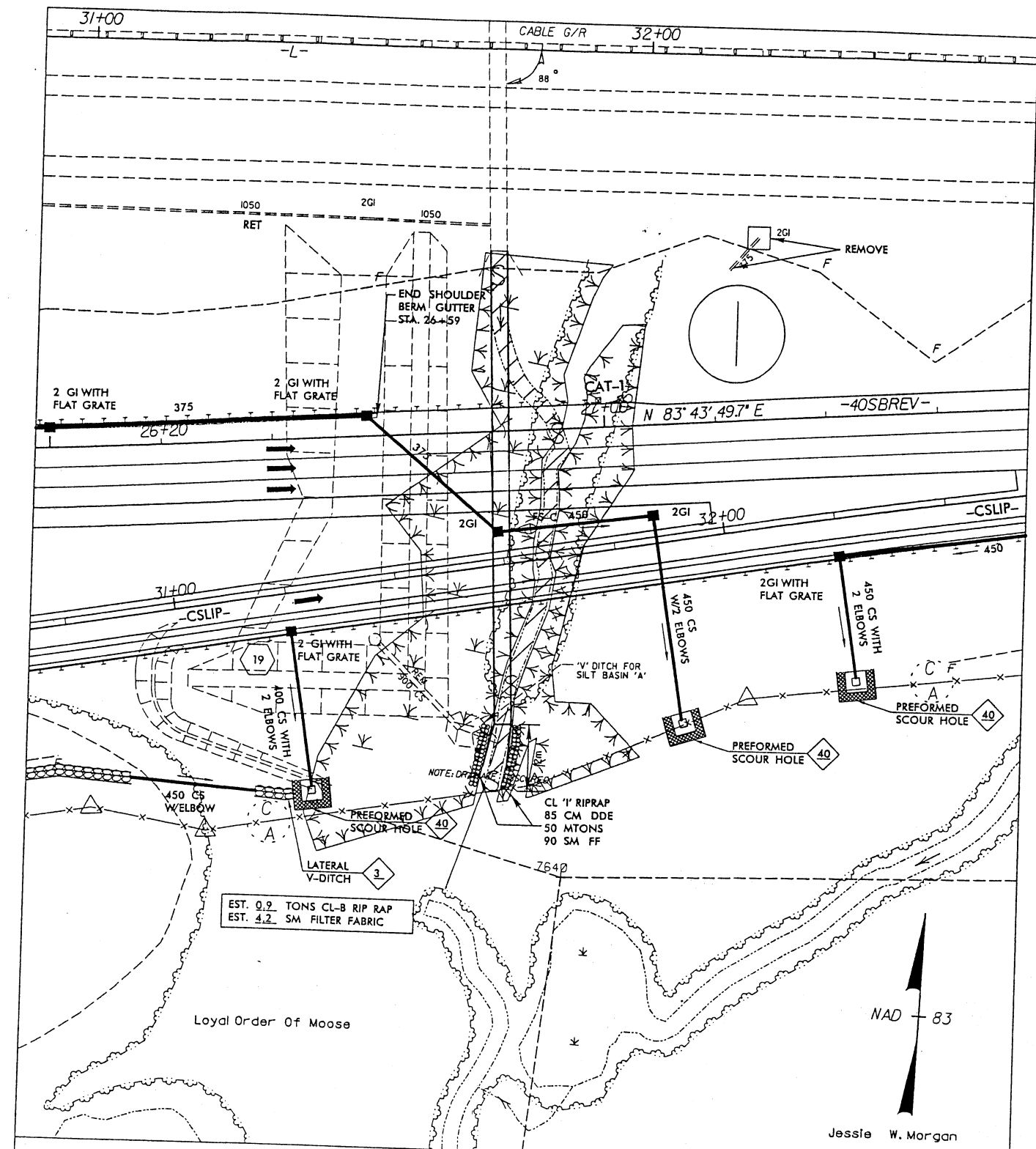
PLAN VIEW
WETLAND
IMPACTS
SITE 23
SCALE = 1:500

NCDOT
DIVISION OF HIGHWAYS
GUILFORD COUNTY
PROJECT: 8.U492101 (U-2524AB)
GREENSBORO - WESTERN LOOP FROM
NORTH OF I-85 NEAR GROOMETOWN
TO NORTH OF HIGH POINT ROAD
SHEET 40 OF 55
6/24/03



PLAN VIEW
WETLAND
IMPACTS
SITE 24
SCALE = 1:500

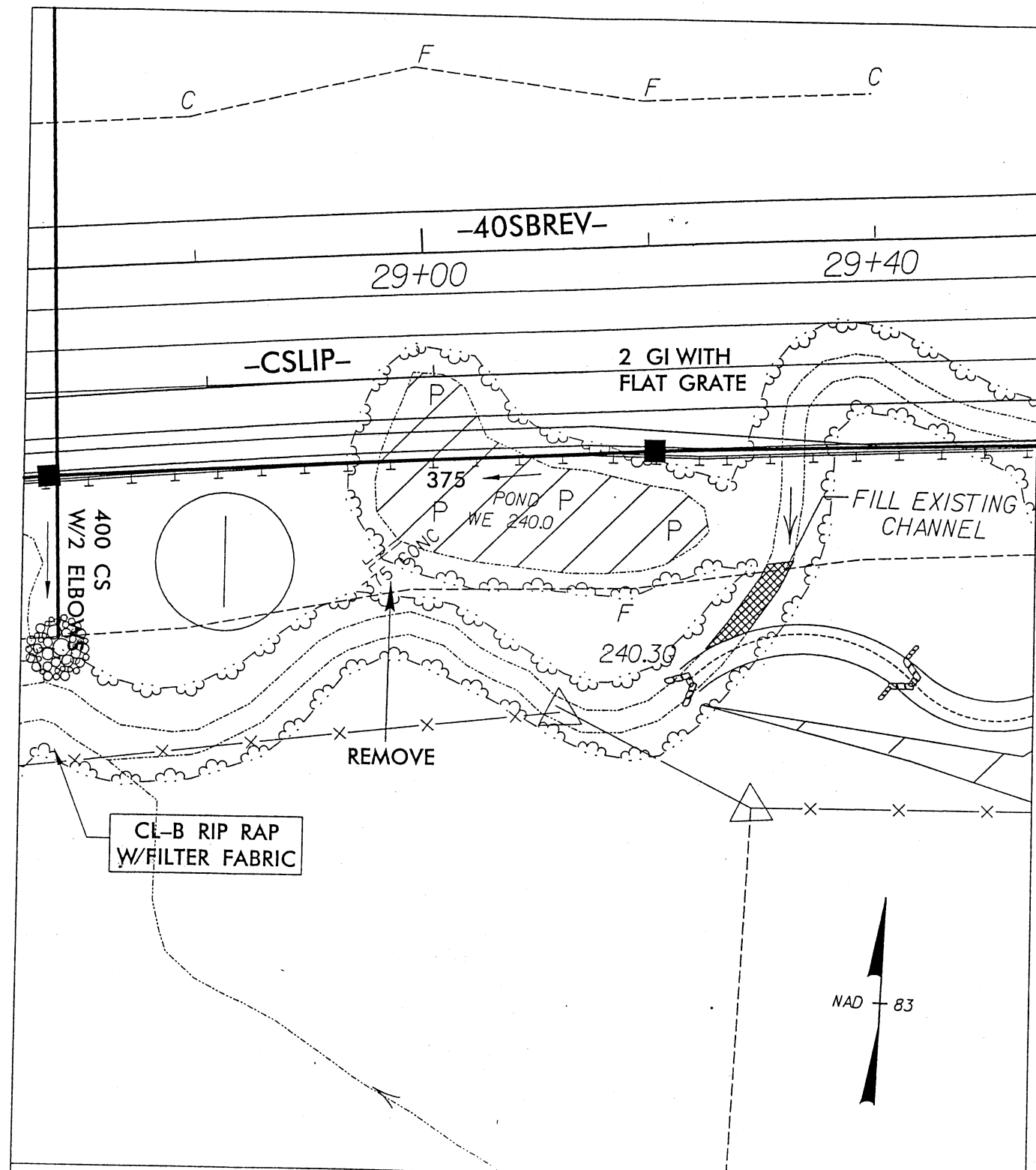
NCDOT
DIVISION OF HIGHWAYS
GUILFORD COUNTY
PROJECT: 8.U492101 (U-2524AB)
GREENSBORO - WESTERN LOOP FROM
NORTH OF I-85 NEAR GROOMETOWN
TO NORTH OF HIGH POINT ROAD
SHEET 41 OF 55
6/24/03



PLAN VIEW
STREAM
IMPACTS
SITE 25
SCALE = 1:1000

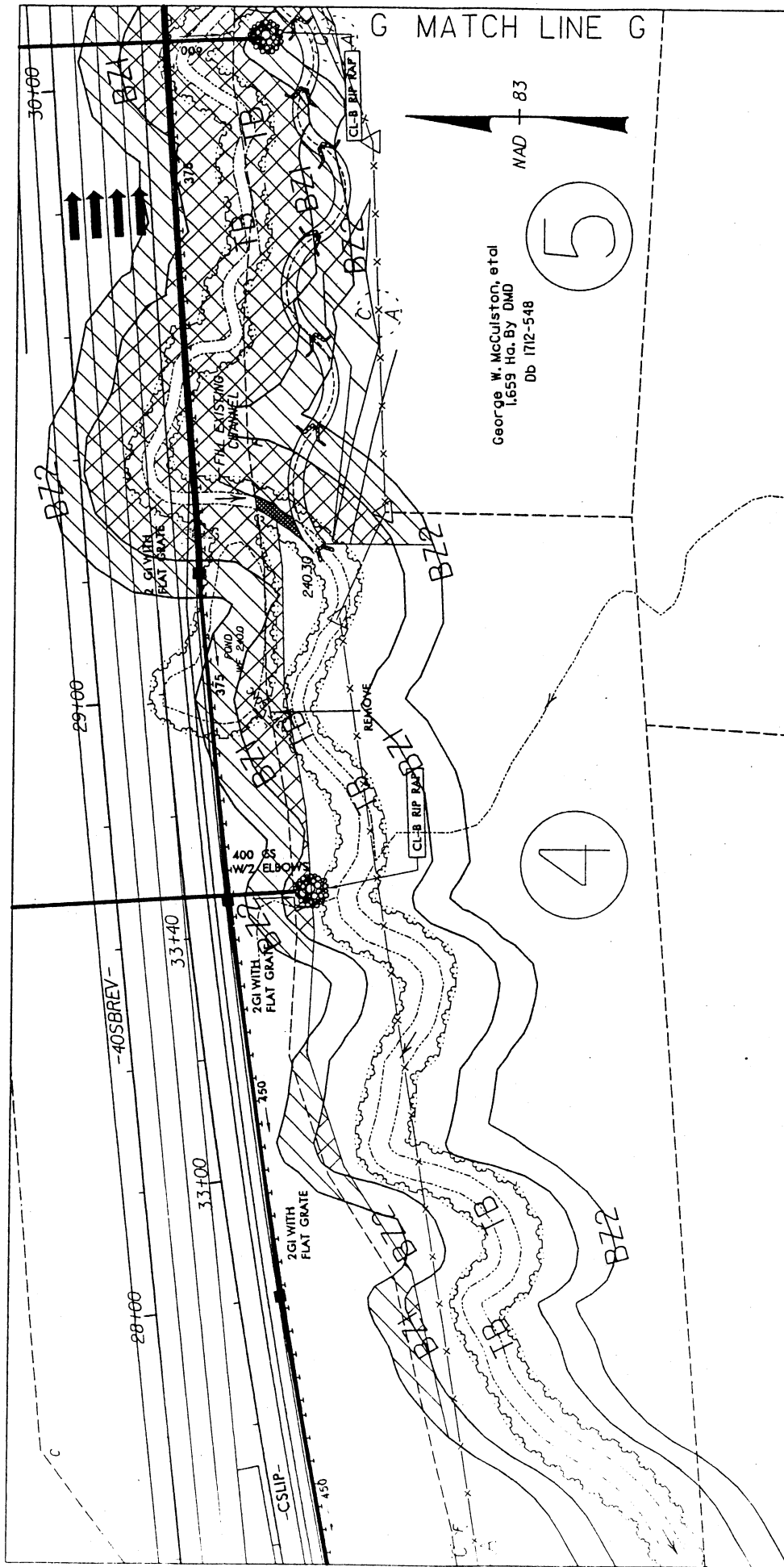
NCDOT
DIVISION OF HIGHWAYS
GUILFORD COUNTY
PROJECT: 8.U492101 (U-2524AB)
GREENSBORO - WESTERN LOOP FROM
NORTH OF I-85 NEAR GROOMETOWN
TO NORTH OF HIGH POINT ROAD
SHEET 43 OF 55

6/24/03



PLAN VIEW
POND
IMPACTS
SITE 25B
SCALE = 1:500

NCDOT
DIVISION OF HIGHWAYS
GUILFORD COUNTY
PROJECT: 8.U492101 (U-2524AB)
GREENSBORO - WESTERN LOOP FROM
NORTH OF I-85 NEAR GROOMETOWN
TO NORTH OF HIGH POINT ROAD
SHEET 45 OF 55
6/24/03



PLAN VIEW

BUFFER

IMPACTS

SITE 28

SCALE = 1:1000

NCDOT

DIVISION OF HIGHWAYS

GUILFORD COUNTY

PROJECT: 8.U492101 (U-2524AB)

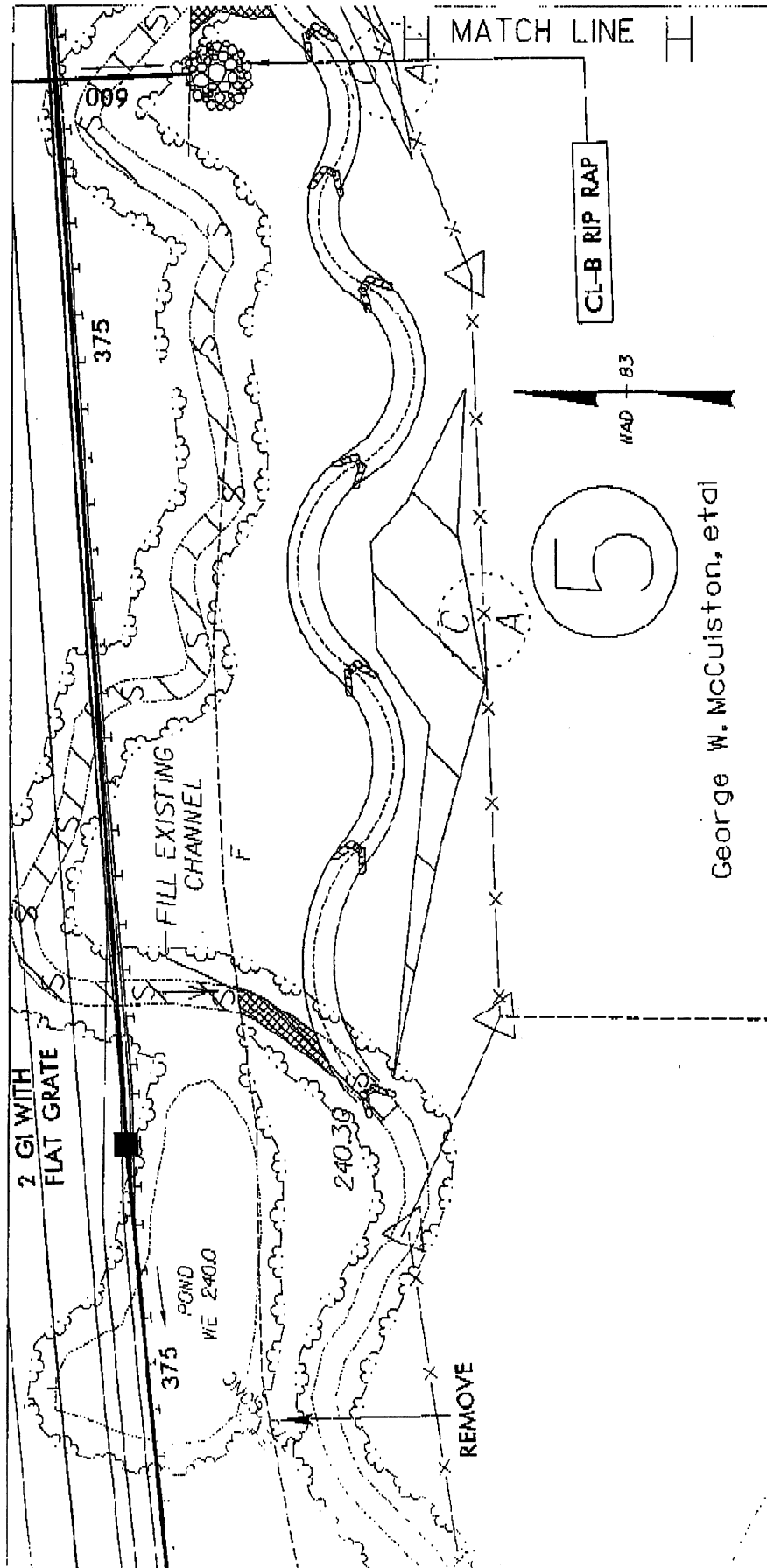
GREENSBORO - WESTERN LOOP FROM

NORTH OF I-85 NEAR GROOMETOWN

TO NORTH OF HIGH POINT ROAD

SHEET 46 OF 55

6/30/03



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DIVISION OF HIGHWAYS

GUILFORD COUNTY

PROJECT: 8.U492101 (U-2324AB)

GREENSBORO - WESTERN LOOP FROM

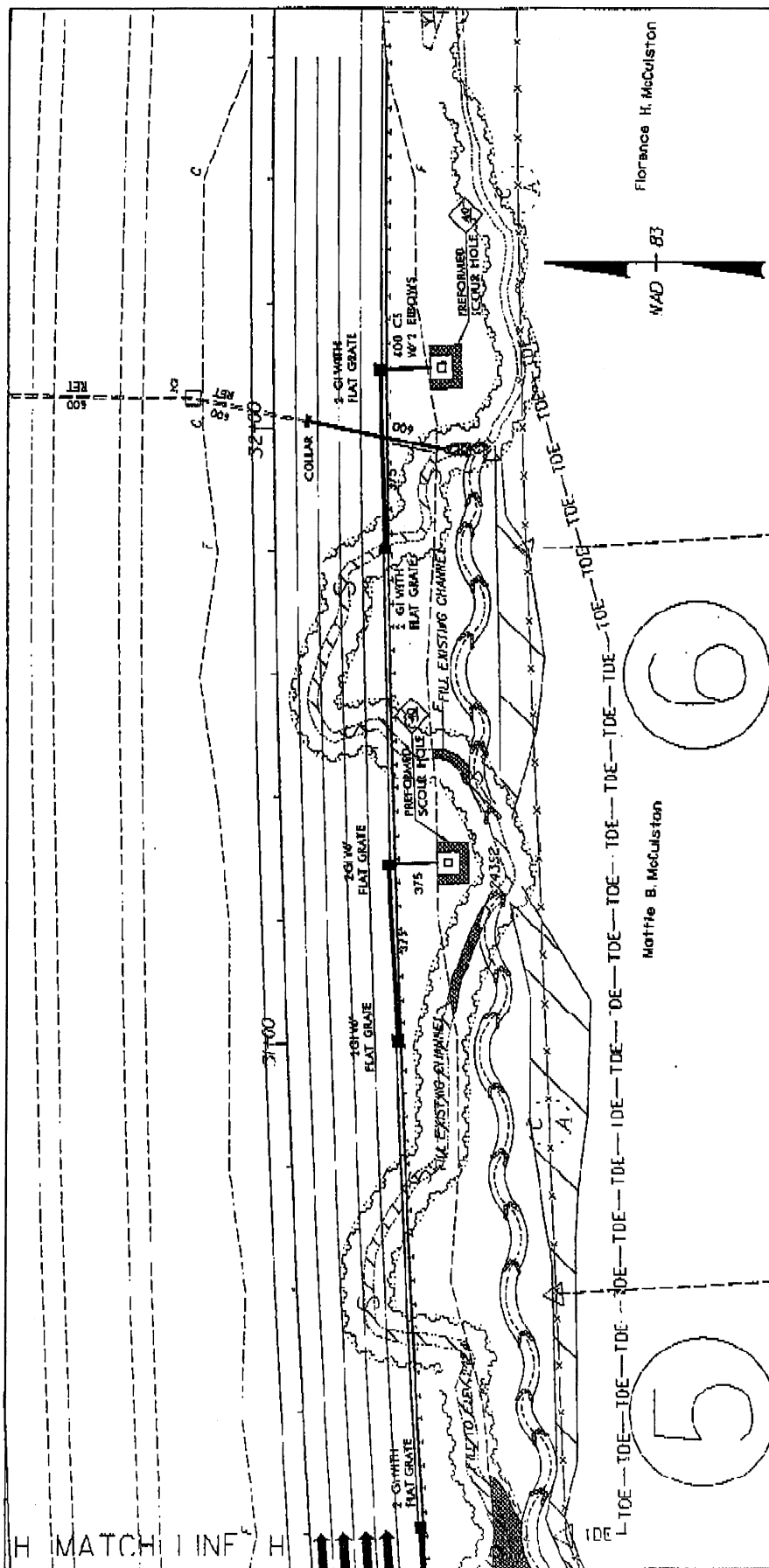
NORTH OF I-85 NEAR GROOMTOWN

TO NORTH OF HIGH POINT ROAD

SHEET 48 OF 55

7/10/03

PLAN VIEW
STREAM
RESTORATION
SITE 28
SCALE = 1:500



NCDOT

DIVISION OF HIGHWAYS

GUILFORD COUNTY

PROJECT: 8.U492101 (U-2524AB)

GREENSBORO - WESTERN LOOP FROM
NORTH OF I-85 NEAR GROOMETOWN
TO NORTH OF HIGH POINT ROAD

SHEET 49 OF 55

7/10/03

PLAN VIEW

STREAM

RESTORATION

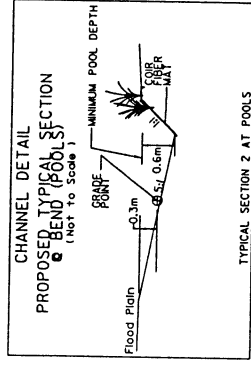
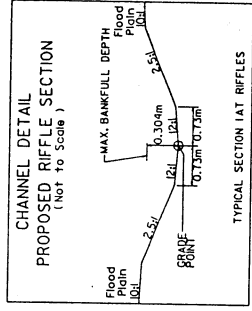
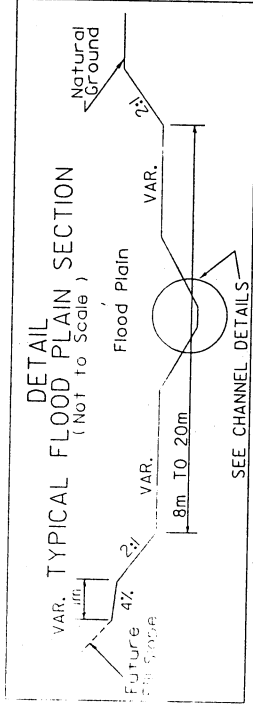
SITE 28

SCALE = 1:1000

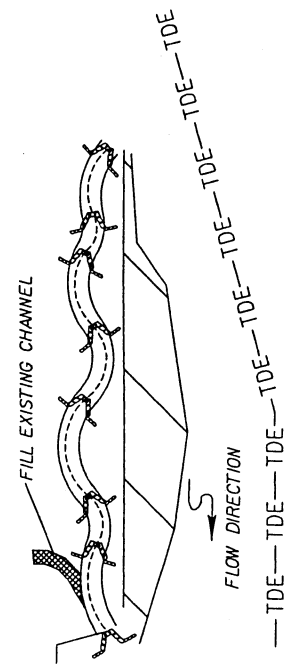
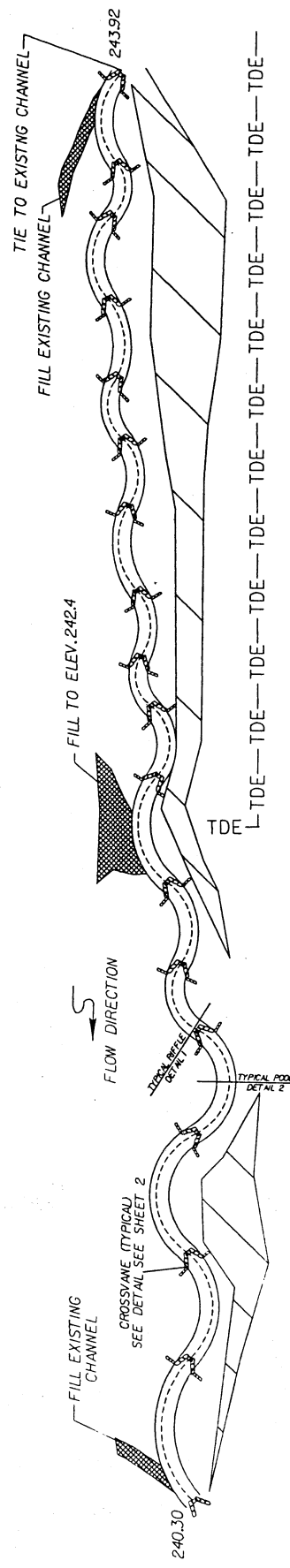
July 03

PROJECT REFERENCE NO.	SHEET NO.
U-2524AB	1
APPROVED ENGINEER	APPROVED OWNER
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION	
INCOMPLETE PLANS DO NOT USE FOR CONSTRUCTION	

NATURAL CHANNEL DESIGN TYPICALS



QUANTITIES
 DDE = 20000m³
 BOULDERS = 400 EACH
 COIR MAT = 260m²
 GEOTEXTILE FABRIC = 350m²




CHANNEL PLAN VIEW

SITE # 28

Tipu-2524AB part 1
 Sheet 50 of 55

July 03



PROJECT REFERENCE NO. U-2524AB1

SHEET NO. 1

PRELIMINARY PLANS
DO NOT USE FOR U/I ACQUISITION

INCOMPLETE PLANS
DO NOT USE FOR CONSTRUCTION

CHANNEL ALIGNMENT DATA & PROFILE INFORMATION

SITE # 28

STA (4058REV)	OFFSET FROM ADSSREV	RADIUS	L _c	INVERT (THAL.WG) (m)	BANKFILL (FLOODPLAIN) (m)
PC/PT29+22.7	38.0m RT.			240.30	240.60
PI 29+32.9	29.9m RT.	15.0m	21.7m		
PC/PT29+42.5	39.1m RT.			240.66	240.96
PI 29+49.8	46.6m RT.	11.0m	16.3m		
PC/PT29+51.4	39.4m RT.			240.93	241.23
PI 29+67.2	29.8m RT.	10.0m	19.2m		
PC/PT29+74.0	41.7m RT.			241.25	241.55
PI 29+80.4	53.6m RT.	8.5m	17.1m		
PC/PT29+88.5	42.7m RT.			241.53	241.83
PI 29+92.3	37.4m RT.	7.0m	10.6m		
PC/PT29+98.0	40.8m RT.			241.71	242.01
PI 30+04.3	44.4m RT.	9.5m	12.3m		
PC/PT30+09.5	39.4m RT.			241.91	242.21
PI 30+16.9	32.5m RT.	11.0m	16.4m		
PC/PT30+24.0	38.3m RT.			242.18	242.48
PI 30+30.0	42.5m RT.	8.0m	10.6m		
PC/PT30+34.5	38.0m RT.			242.36	242.66
PI 30+37.8	35.2m RT.	6.5m	7.5m		
PC/PT30+41.5	37.2m RT.			242.48	242.78
PI 30+46.3	39.3m RT.	9.5m	9.4m		
PC/PT30+50.8	36.7m RT.			242.64	242.94
PI 30+56.7	32.8m RT.	12.0m	12.1m		
PC/PT30+62.9	36.2m RT.			242.85	243.15
PI 30+67.9	38.4m RT.	9.0m	9.7m		
PC/PT30+72.3	35.3m RT.			243.00	243.30

STA (4058REV)	OFFSET FROM ADSSREV	RADIUS	L _c	INVERT (THAL.WG) (m)	BANKFILL (FLOODPLAIN) (m)
PI 30+76.0	32.7m RT.	7.5m	8.2m		
PC/PT30+80.0	34.4m RT.			243.14	243.44
PI 30+86.3	37.5m RT.	12.0m	12.4m		
PC/PT30+92.0	33.6m RT.			243.35	243.65
PI 30+97.9	29.9m RT.	9.0m	11.8m		
PC/PT31+03.5	34.9m RT.			243.54	243.84
PI 31+06.9	38.1m RT.	6.5m	8.8m		
PC/PT31+11.0	35.3m RT.			243.69	243.99
PI 31+17.3	31.6m RT.	10.0m	12.1m		
PC/PT31+22.9	35.9m RT.			243.90	244.20
PI 31+24.4	31.4m RT.	12.0m	11.0m		
PC/PT31+29.0	33.4m RT.			244.50	244.80
PI 31+31.4	34.7m RT.	6.0m	6.5m		
PC/PT31+35.9	32.1m RT.			244.61	244.91
PI 31+40.3	26.9m RT.	9.0m	13.2m		
PC/PT31+45.9	32.2m RT.			244.85	245.15
PI 31+47.0	36.4m RT.	7.0m	9.6m		
PC/PT31+51.0	32.9m RT.			245.02	245.32
PI 31+57.4	29.9m RT.	8.5m	9.4m		
PC/PT31+61.2	32.1m RT.			245.18	245.48
PI 31+66.3	33.7m RT.	6.0m	5.0m		
PC/PT31+68.9	32.9m RT.			245.27	245.57
PI 31+73.5	32.0m RT.	9.0m	8.5m		
PT 31+77.0	35.0m RT.			245.45	245.75

Tip # U-2524AB part 1
sheet 51 of 58

WETLAND PERMIT IMPACT SUMMARY

Site No.	Station (From/To)	Structure Size / Type	WETLAND IMPACTS			SURFACE WATER IMPACTS					
			Fill In wetlands (ha)	Temp. Fill In Wetlands (ha)	Excavation In Wetlands (ha)	Mechanized Clearing (Method III) (ha)	Fill In SW (Natural) (ha)	Fill In SW (Pond) (ha)	Temp. Fill In SW (ha)	Existing Channel Impacted (m)	Natural Stream Design (m)
7	12+00 TO 16+60 -40SBREV.						0.139			488.4	290.1
7	25+35 -CSLIP-	2.4 X 1.8 RCBC					0.37			190.6	
7	11+72 -ILPC-	2.4 X 1.5 RCBC					0.32			65.4	
7	12+00 -40SBREV-						< 0.01			6.4	
7	TOTAL IMPACTS						0.23			731.8	290.1
8	16+60 -40SBREV-		0.08								
11	13+80 RT -L RPA-		0.03								
12	14+00 RT -L RPA-		0.01			< 0.01					
13	15+60 RT -L1140NB-		0.05								
14	15+00 -40SBREV-		0.43								
15	13+60 -40SBREV-		0.02								
16	13+20 LT -40SBREV-		0.08								
17	11+00 TO 13+00 -40SBREV-						0.36			206.0	
17	29+00 -11FLY-		0.05								
21	16+60 -11FLY-		0.05								
23	25+00 -40SBREV-		0.07								
24	30+60 RT -CSLIP-		< 0.01								
25	20+90 -40SBREV-	2.7 X 1.5 RCBC	0.24			0.02					
25	28+90 -40SBREV-	2.7 X 1.5 RCBC					0.03			105.5	
25B	29+00 -40SBREV-							0.03			
28	STREAM RELOCATION						0.07			335.3	285
			1.11	0	0	0.02	0.39	0.03	0	1378.6	575.1
TOTALS											

NCDOT

DIVISION OF HIGHWAYS
 GUILFORD COUNTY
 PROJECT 8U492101 (U-2524AB)
 GREENSBORO - WESTERN LOOP FROM
 NORTH OF I-85 NEAR GROOMTOWN
 TO NORTH OF HIGH POINT ROAD

SHEET 52 OF 55

7/10/2003

See the next sheet

BUFFER IMPACTS SUMMARY

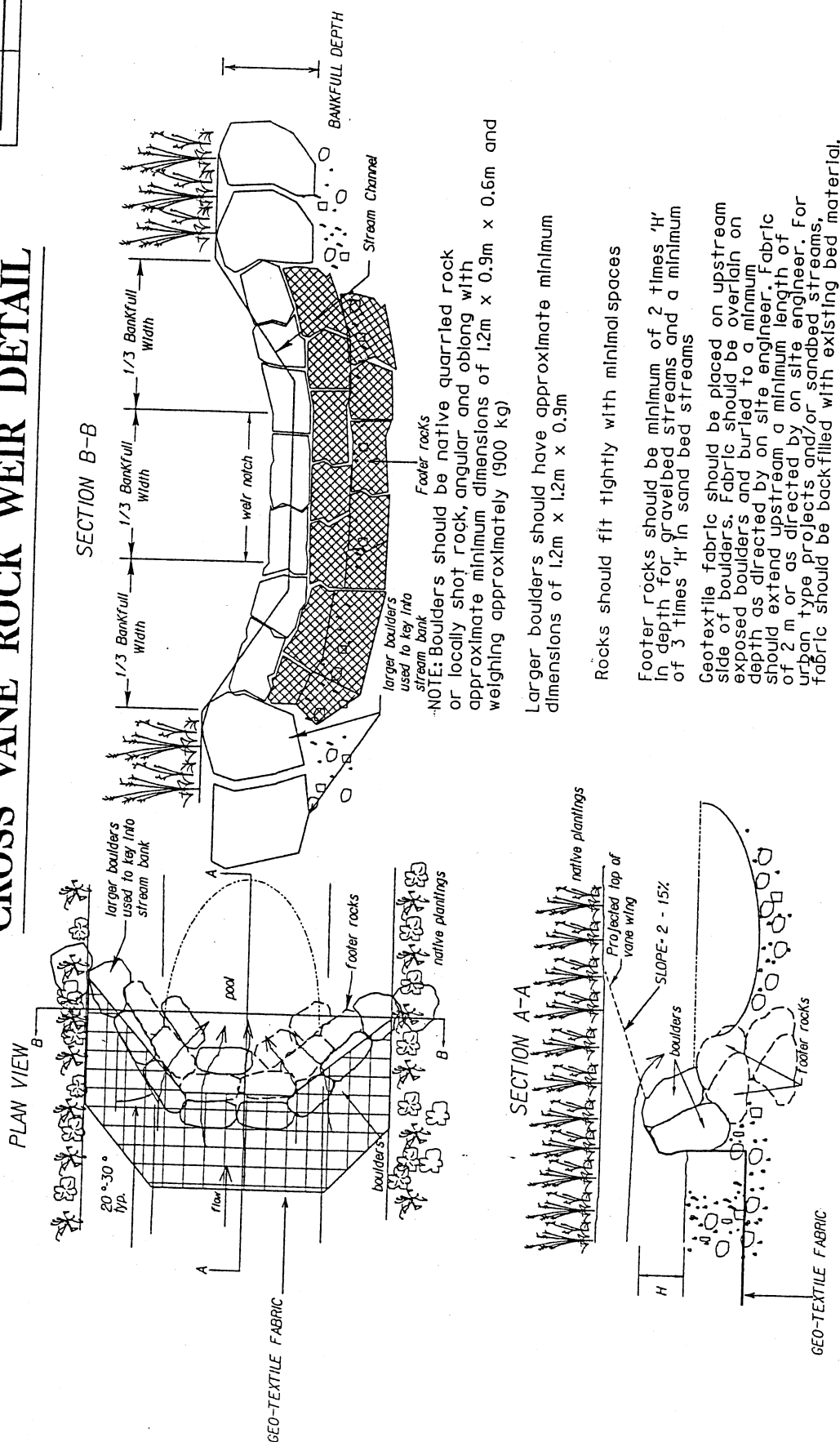
N.C. DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
GUILFORD COUNTY
PROJECT: 8 U492101 (U-2524AB)
GREENSBORO - WESTERN LOOP FROM
NORTH I-85 NEAR GROOMTOWN
TO NORTH OF HIGHTPOINT RD.
6/26/2003
SHEET 53 OF 55

July 03

PROJECT REFERENCE NO. U-2521.01	SHEET NO.
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION INCOMPLETE PLANS DO NOT USE FOR CONSTRUCTION	



CROSS VANE ROCK WEIR DETAIL



H = 0.06m

PROPERTY OWNERS

NAMES AND ADDRESSES

REFERENCE NO.	NAMES	ADDRESSES
1	NORTH CAROLINA DOT	1500 MAIL SERVICE CENTER RALEIGH, NC 27699-1500
4	WET 'N WILD EMERALD POINTE WATER PARK	3910 SOUTH HOLDEN RD. GREENSBORO, NC 27406
5	George W. McCuiston	3100 S. DIXIE HIGHWAY BOCA RATON, FL. 33432
6	Mattie B. McCuiston	3923 S. HOLDEN ROAD GREENSBORO, NC 27406
7	Florence H. McCuiston	3923 S. HOLDEN ROAD GREENSBORO, NC 27406

NCDOT

DIVISION OF HIGHWAYS

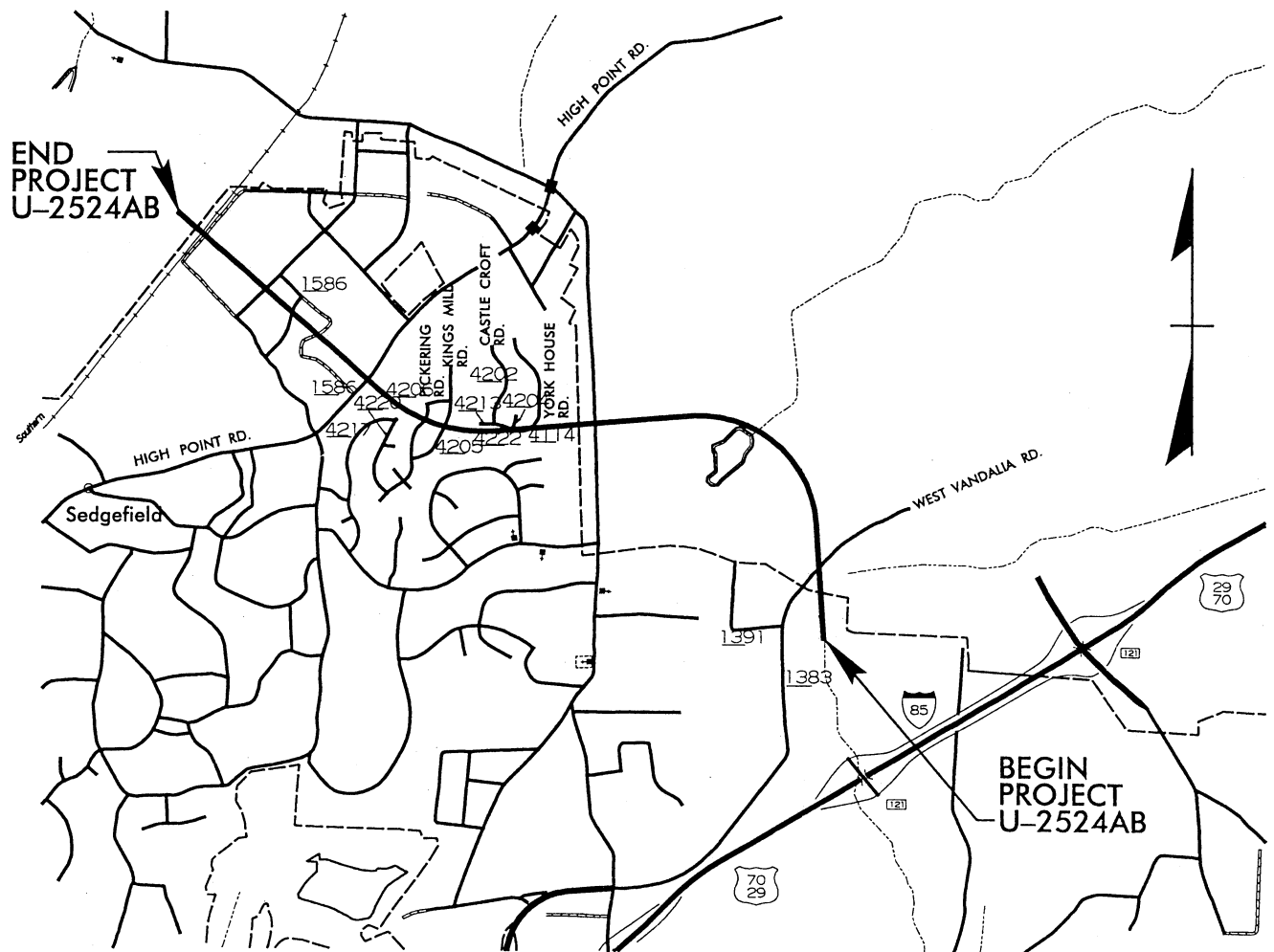
GUILFORD COUNTY

PROJECT: 8.U492101 (U-2524AB)

GREENSBORO - WESTERN LOOP FROM
NORTH OF I-85 NEAR GROOMETOWN
TO NORTH OF HIGH POINT ROAD

SHEET 55 OF 55

6 / 30 / 03



VICINITY MAP OF PROJECT 8J492101

VICINITY MAP



NOT TO SCALE

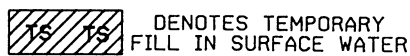
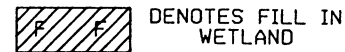
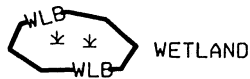
N.C. DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GUILFORD COUNTY

PROJECT 8J492101
U-2524AB

PROPOSED
GREENSBORO OUTER LOOP

LEGEND

WLB WETLAND BOUNDARY



← FLOW DIRECTION

TB TOP OF BANK

WE EDGE OF WATER

---C--- PROP. LIMIT OF CUT

---E--- PROP. LIMIT OF FILL

▲ PROP. RIGHT OF WAY

---NG--- NATURAL GROUND

---PL--- PROPERTY LINE

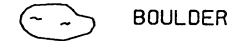
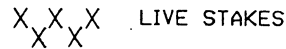
---TDE--- TEMP. DRAINAGE EASEMENT

---PDE--- PERMANENT DRAINAGE EASEMENT

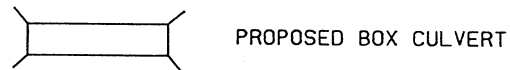
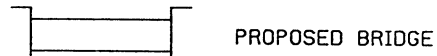
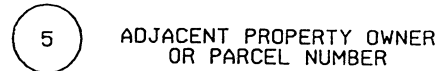
---EAB--- EXIST. ENDANGERED ANIMAL BOUNDARY

---EPB--- EXIST. ENDANGERED PLANT BOUNDARY

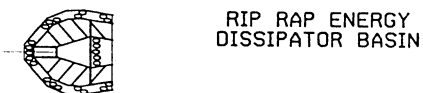
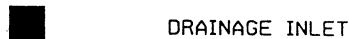
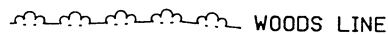
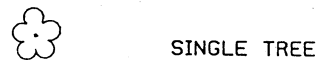
▽ WATER SURFACE



COIR FIBER ROLLS



(DASHED LINES DENOTE EXISTING STRUCTURES)



---BZ 1--- BUFFER ZONE 1

---BZ 2--- BUFFER ZONE 2

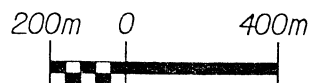
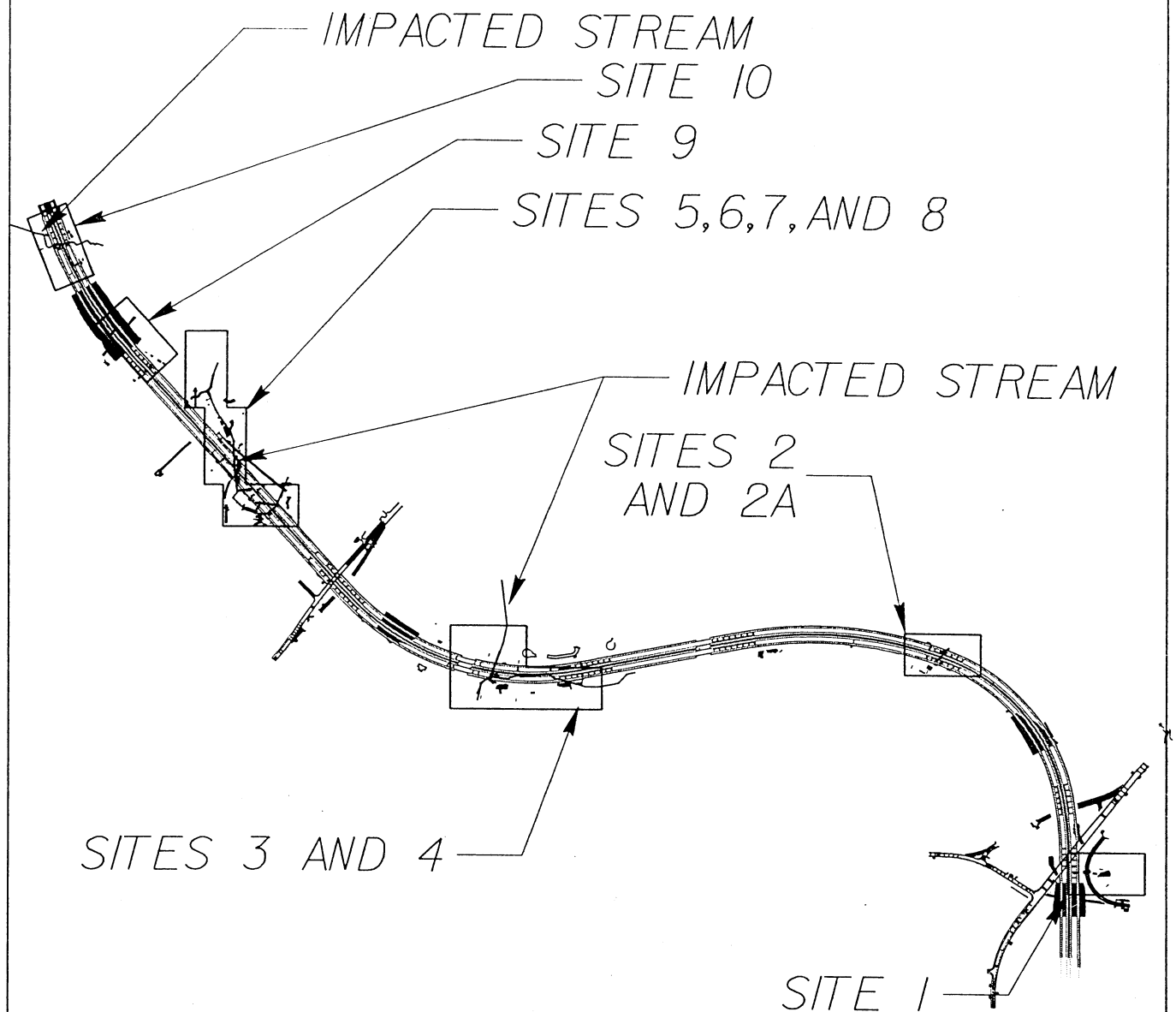
---PROP BZ 2--- PROPOSED BUFFER ZONE 1

---PROP BZ 1--- PROPOSED BUFFER ZONE 2

N.C. DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GUILFORD COUNTY

PROJECT 8J492101
U-2524AB

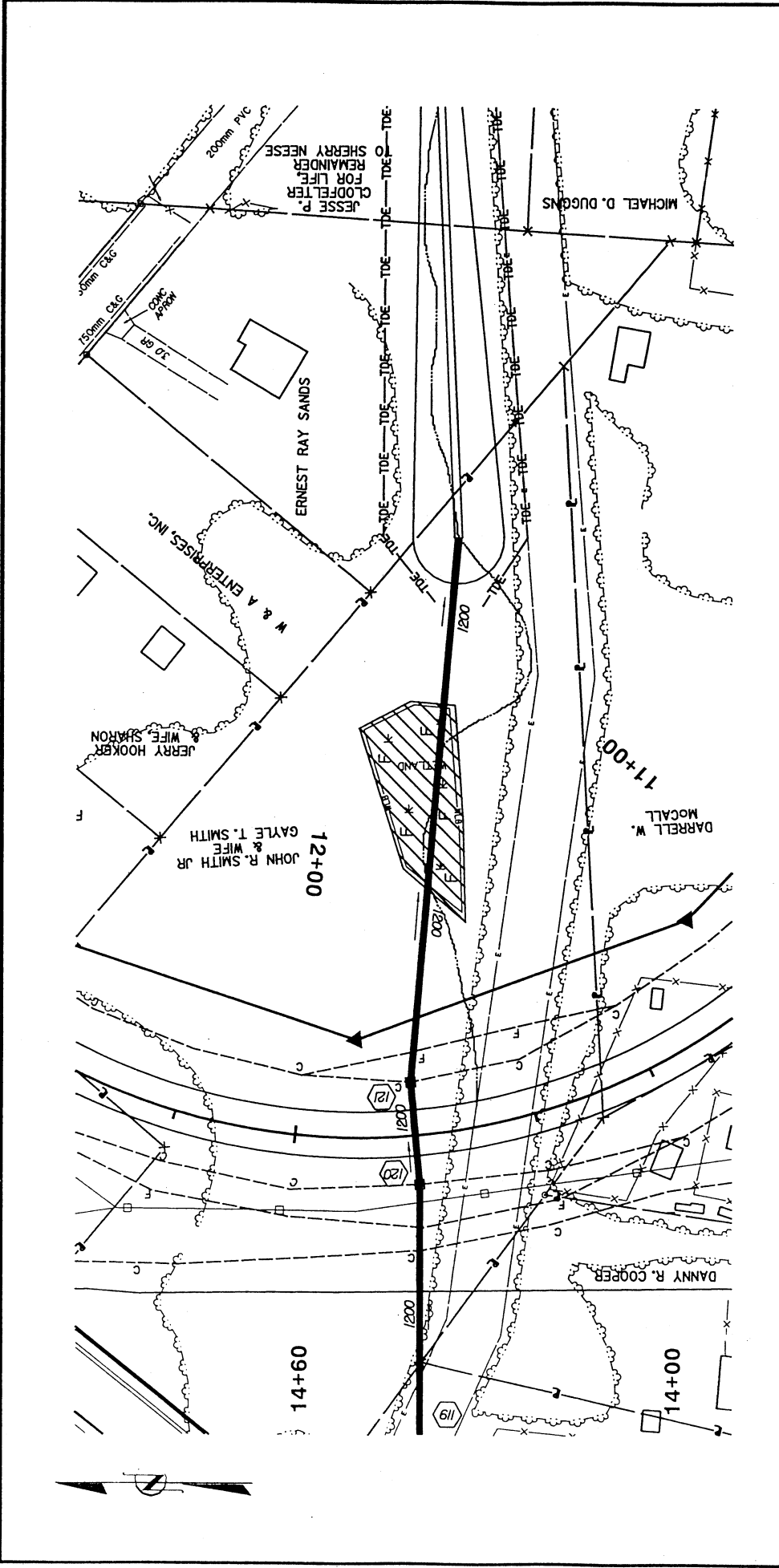
PROPOSED
GREENSBORO OUTER LOOP



N.C. DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GUILFORD COUNTY

PROJECT 8J492101
U-2524AB

PROPOSED
GREENSBORO OUTER LOOP

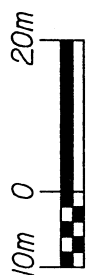


SITE 1

NC. DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GUILFORD COUNTY

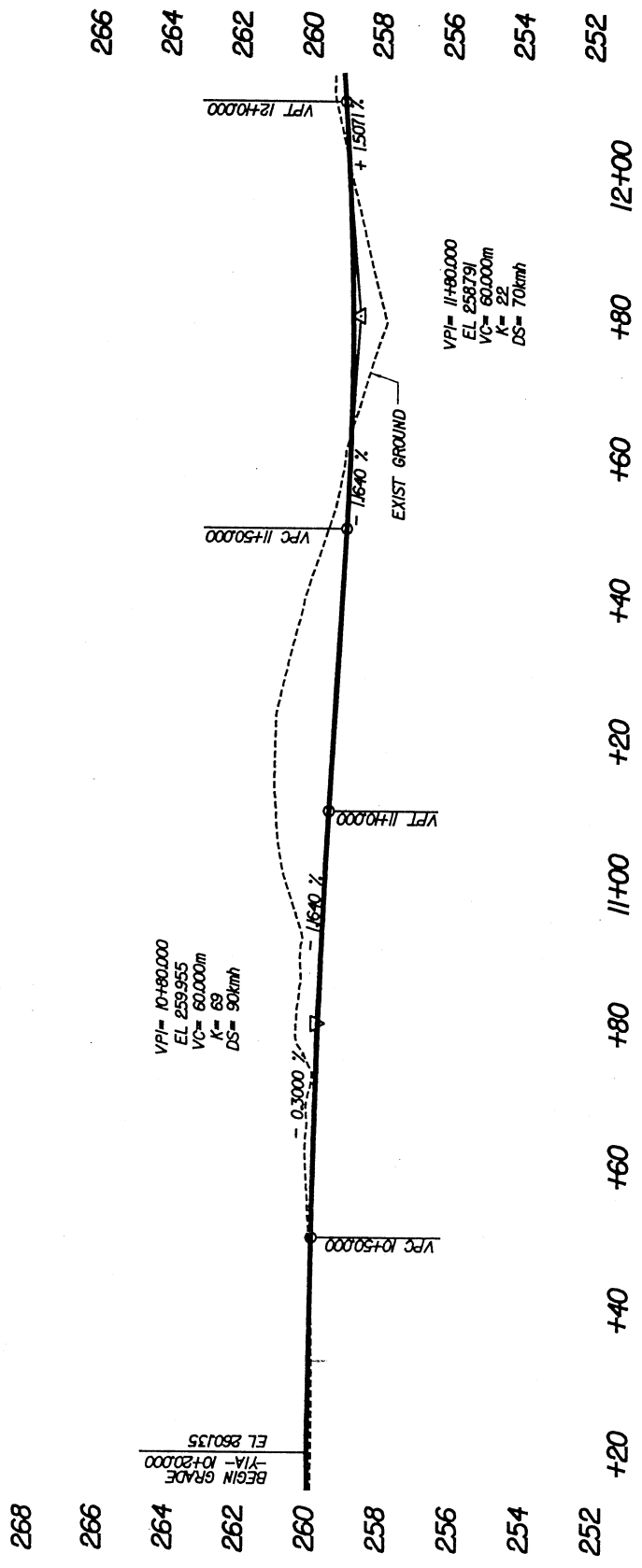
PROJECT 8U492101
U-2524AB

PROPOSED
GREENSBORO OUTER LOOP



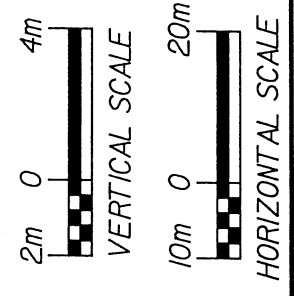
DENOTES FILL
IN WETLAND





PROFILE - SITE 1

YIA



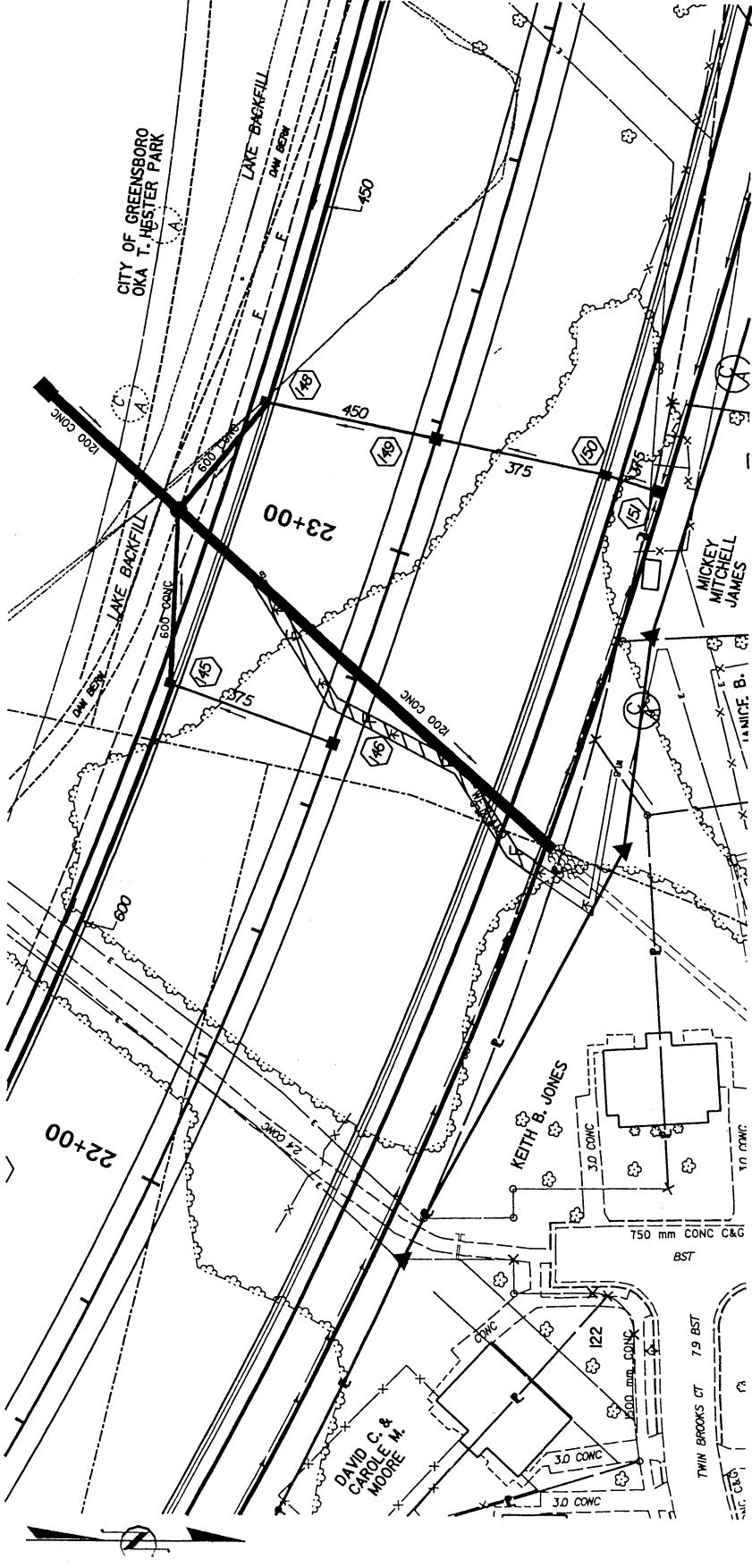
N.C. DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GUILFORD COUNTY

PROJECT 8U492101
U-2524AB

PROPOSED
GREENSBORO OUTER LOOP

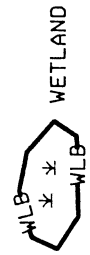
SHEET 5 OF 26

06/03

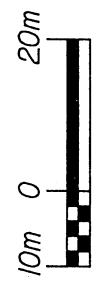


SITE 2

WLB — WETLAND BOUNDARY



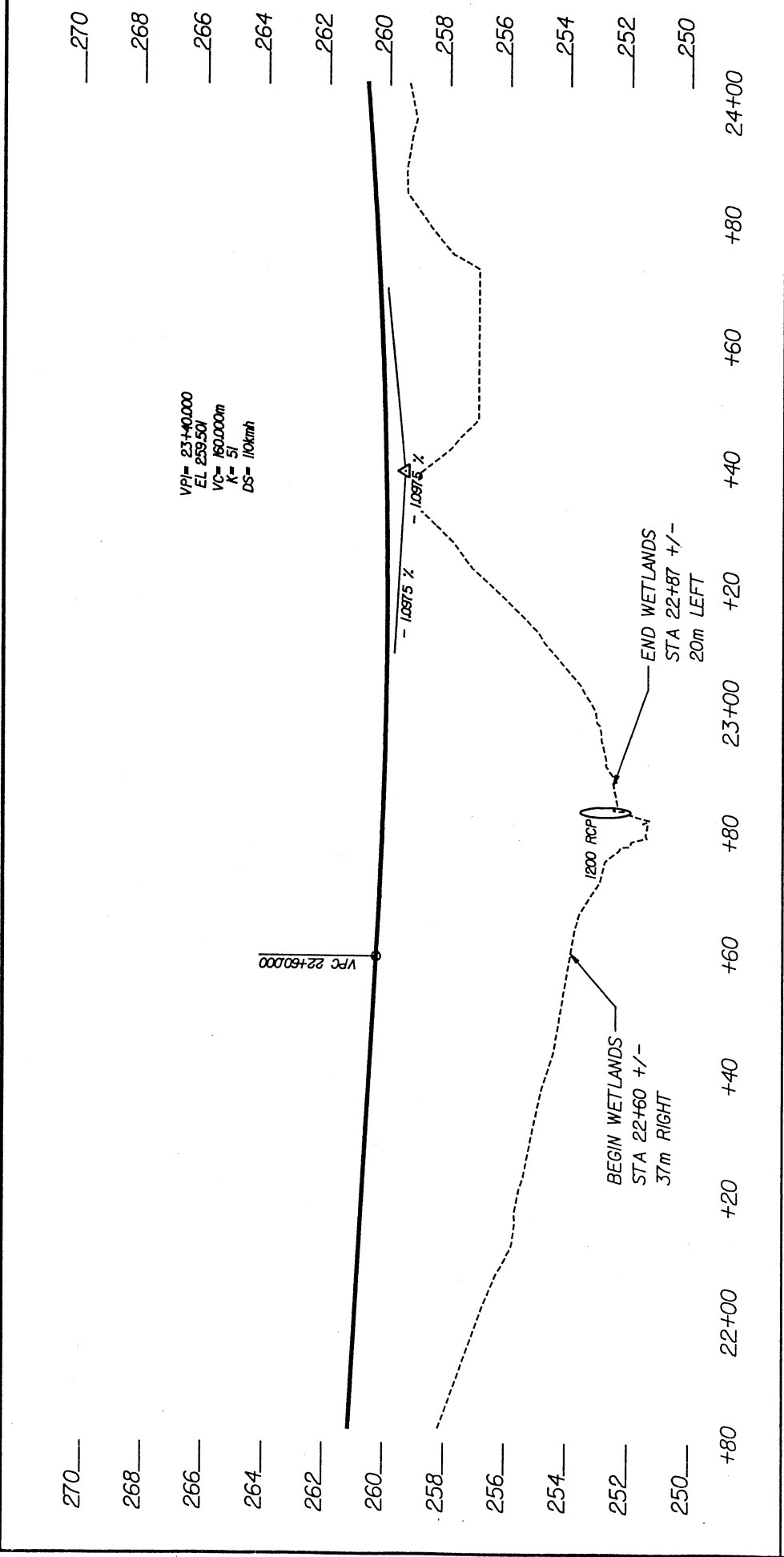
DENOTES FILL IN WETLAND



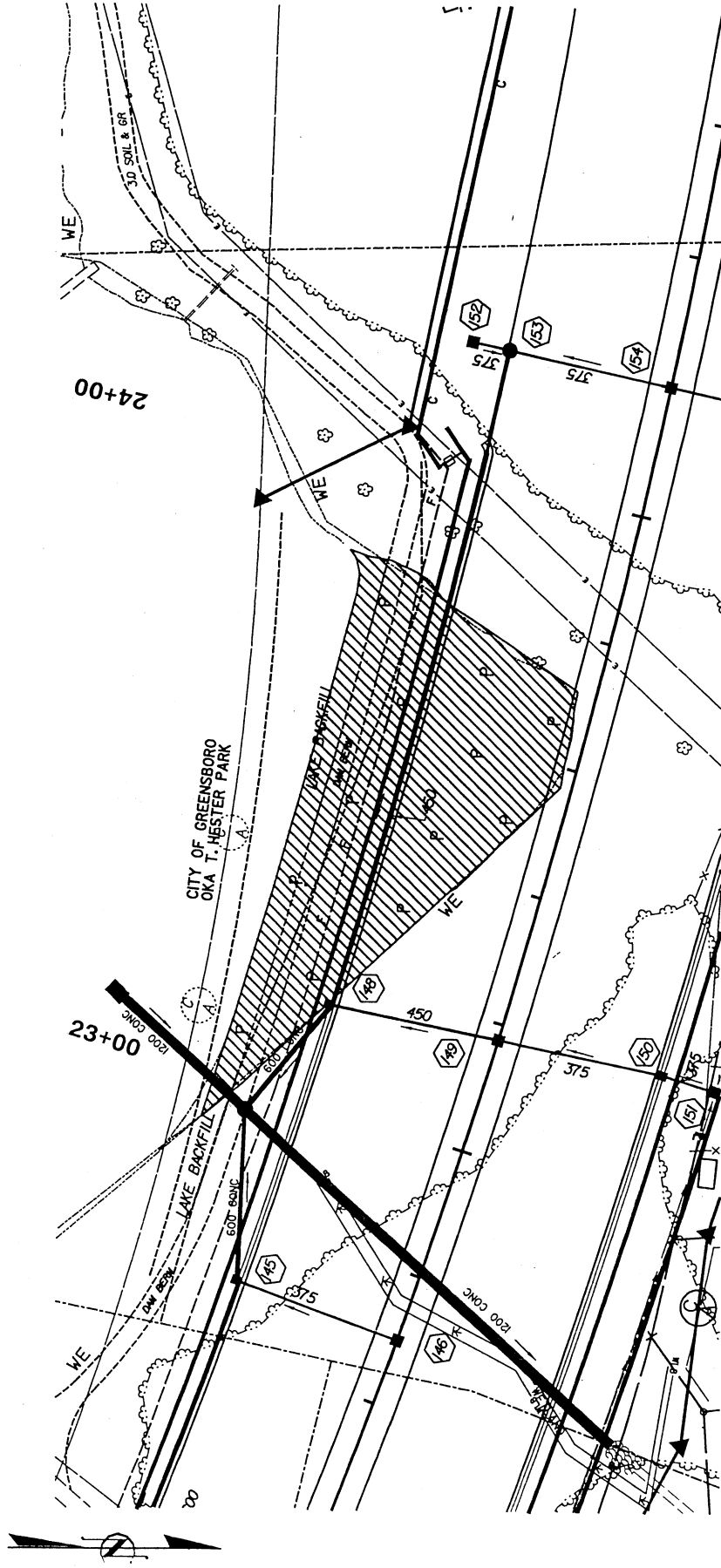
N.C. DEPARTMENT OF TRANSPORTATION
 DIVISION OF HIGHWAYS
 GUILFORD COUNTY

PROJECT 8U492101
 U-2524AB

PROPOSED
 GREENSBORO OUTER LOOP




<p> N.C. DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS GUILFORD COUNTY PROJECT 8J492101 U-2524AB PROPOSED GREENSBORO OUTER LOOP </p>		<p> SHEET 7 OF 26 06/03 </p>
<p> PROFILE - SITE 2 -L- STA 21+80 TO 24+00 LEFT PROFILE </p>		
<div> <div> <p>VERTICAL SCALE</p> </div> <div> <p>HORIZONTAL SCALE</p> </div> </div>		



SITE 2A

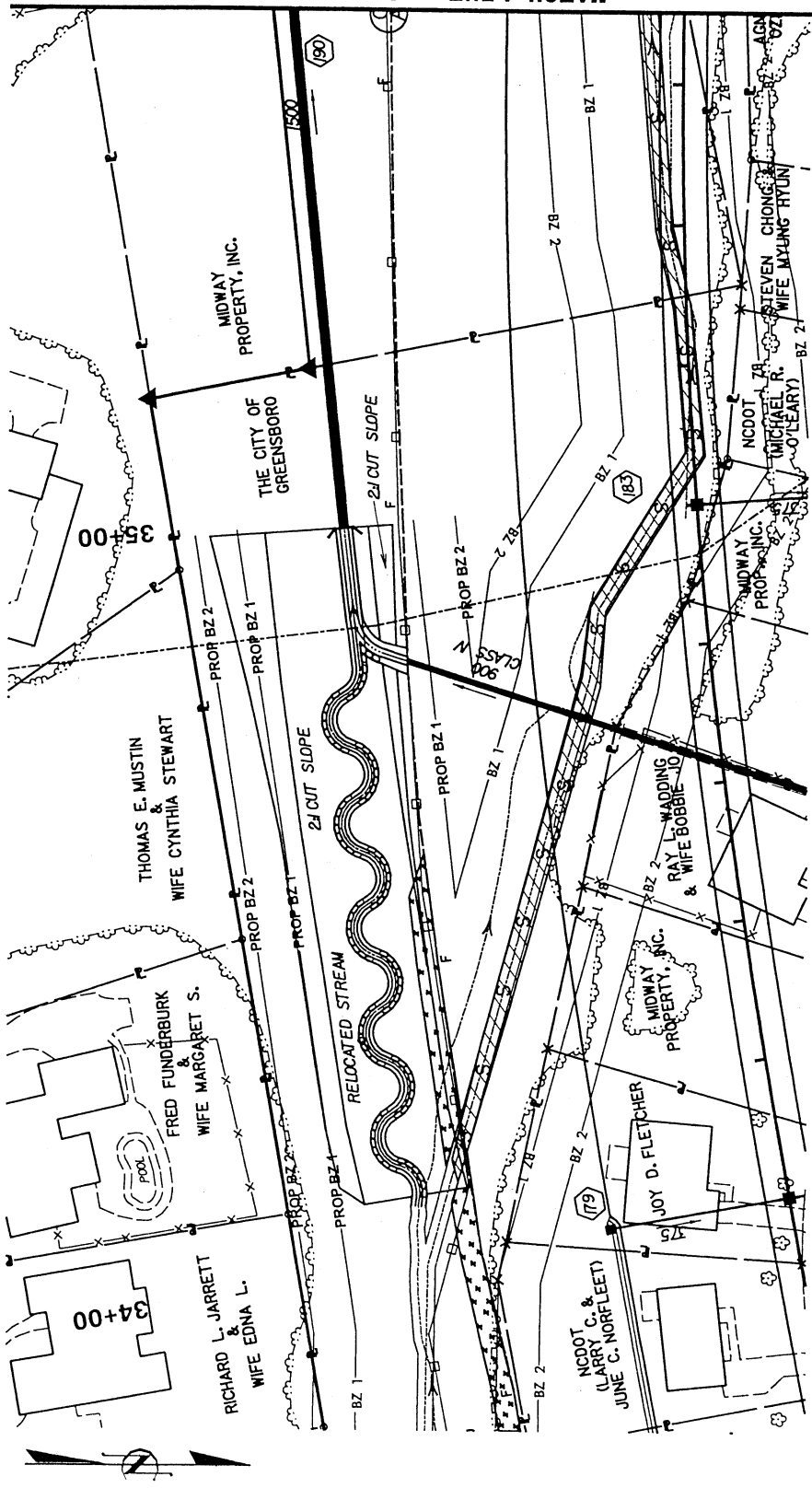
 DENOTES FILL IN
 SURFACE WATER
 (POND)

 WE — EDGE OF WATER



N.C. DEPARTMENT OF TRANSPORTATION
 DIVISION OF HIGHWAYS
 GUILFORD COUNTY
 PROJECT 8J492J01
 U-2524AB

PROPOSED
 GREENSBORO OUTER LOOP



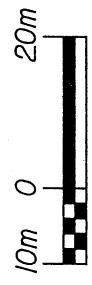
SITE 3

DENOTES FILL IN SURFACE WATER

DENOTES MECHANIZED CLEARING

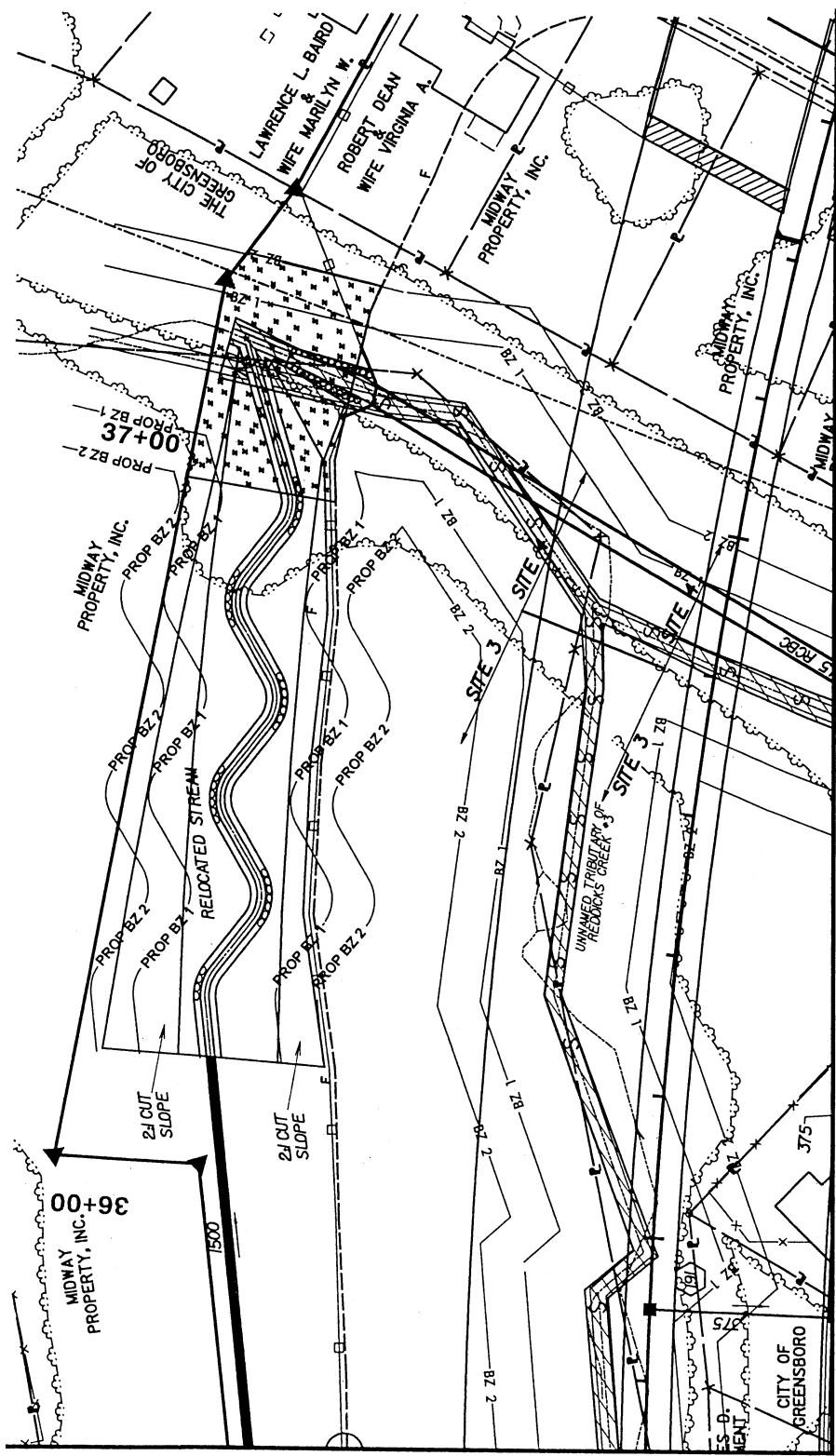
NOTES:

- 1) ALL LONGITUDINAL SLOPES ARE LESS THAN 4%.
- 2) ALL GRASS SWALE SIDE SLOPES ARE NO GREATER THAN 3:1.
- 3) RUNOFF VELOCITIES FOR THE 2 YEAR STORM ARE 2FT/S OR LESS.
- 4) ALL SWALE LENGTHS ARE GREATER THAN 100FT PER ACRE OF DRAINAGE AREA.
- 5) FOR RELOCATED STREAM (-L- 34+09 TO 35+00) SEE DETAIL 20 ON SHEET 12



N.C. DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GUILFORD COUNTY
PROJECT 8J49201
U-2524AB



PROPOSED
GREENSBORO OUTER LOOP



MATCH LINE - SEE SHEET 9

MATCH LINE - SEE SHEET 11

SITES 3 AND 4

-  DENOTES FILL IN SURFACE WATER
-  DENOTES MECHANIZED CLEARING

NOTES:

- 1) ALL LONGITUDINAL SLOPES ARE LESS THAN 4%.
- 2) ALL GRASS SWALE SIDE SLOPES ARE NO GREATER THAN 3:1.
- 3) RUNOFF VELOCITIES FOR THE 2 YEAR STORM ARE 2FT/S OR LESS.
- 4) ALL SWALE LENGTHS ARE GREATER THAN 100FT PER ACRE OF DRAINAGE AREA.
- 5) FOR RELOCATED STREAM (-L- 36+20 TO 37+11) SEE DETAIL 20 ON SHEET 12

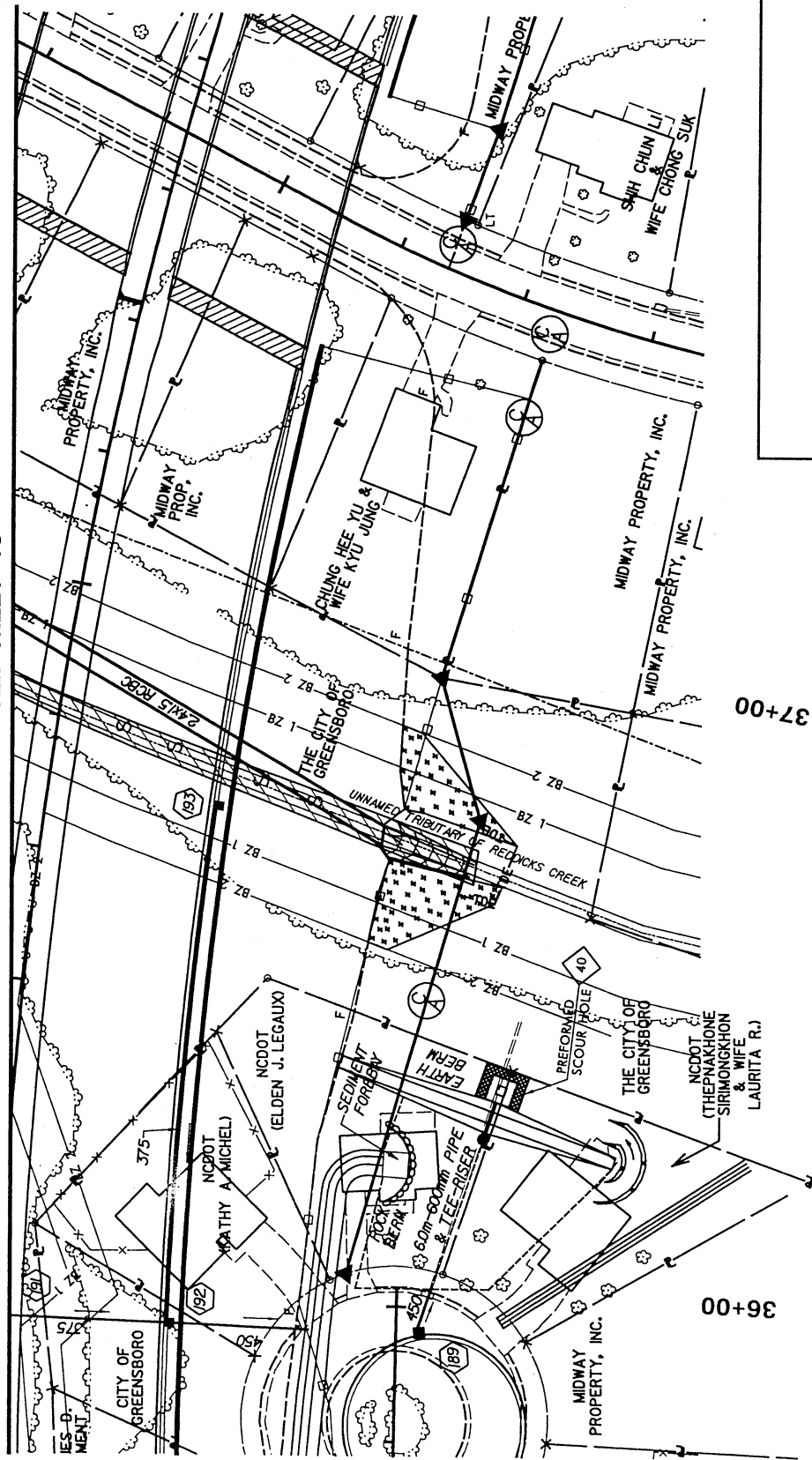


N.C. DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GUILFORD COUNTY

PROJECT 8J492101
U-2524AB

PROPOSED
GREENSBORO OUTER LOOP

MATCH LINE - SEE SHEET 10



NC. DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GUILFORD COUNTY

PROJECT 8U492101
U-2524AB

PROPOSED
GREENSBORO OUTER LOOP

SHEET 11 OF 26

06/03

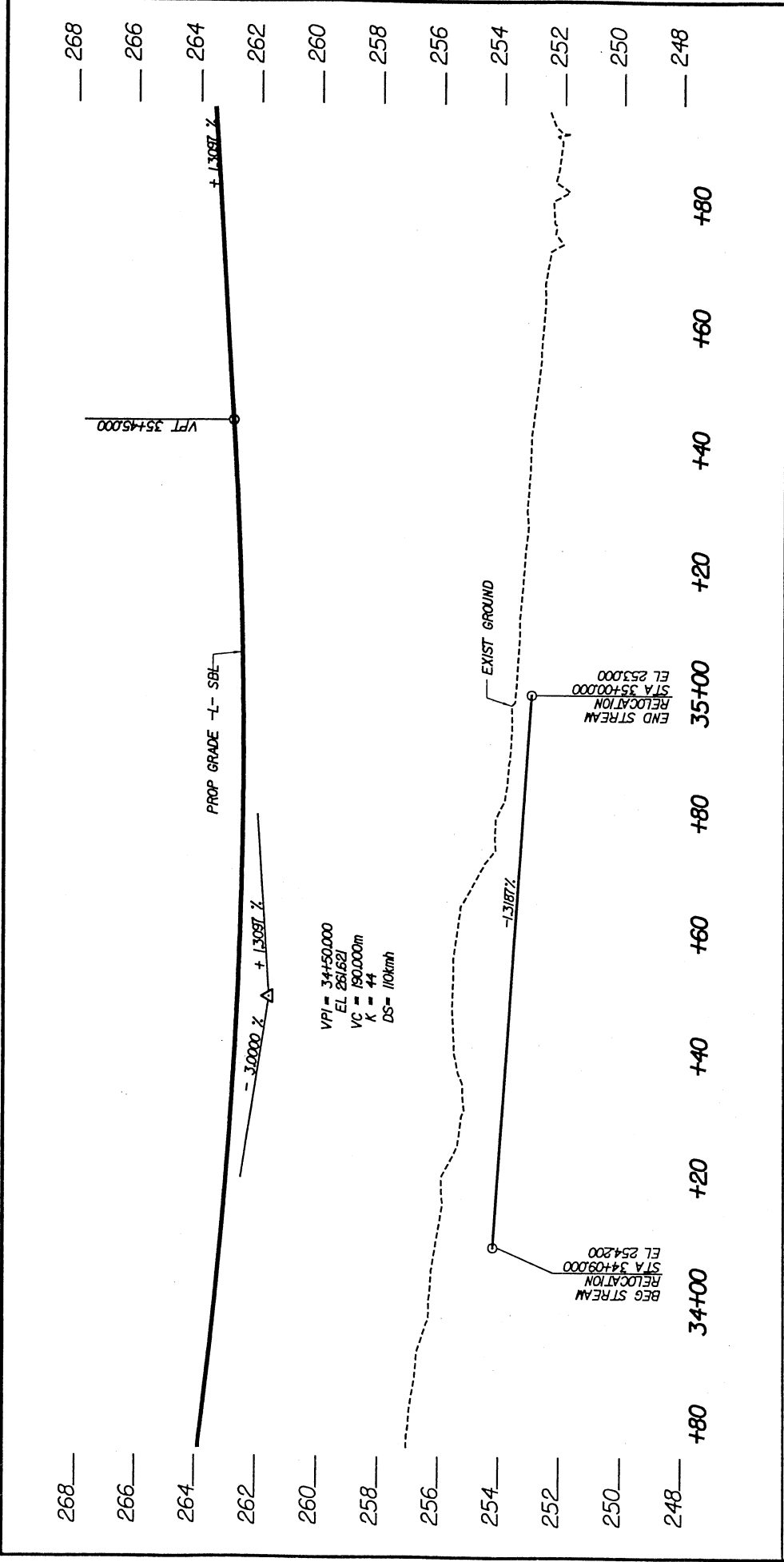
SITE 4

 DENOTES FILL IN SURFACE WATER
 DENOTES MECHANIZED CLEARING

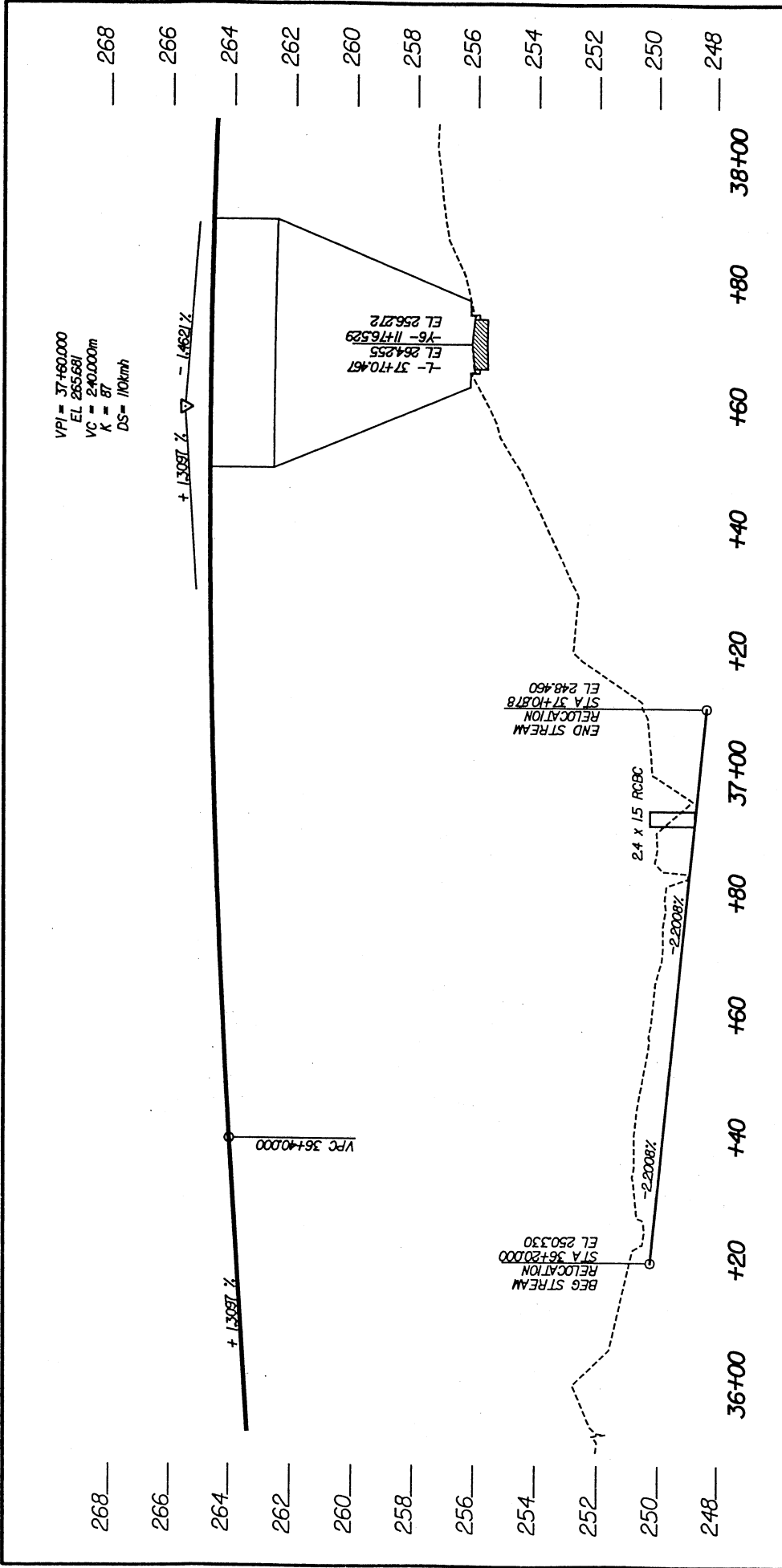


NOTES:

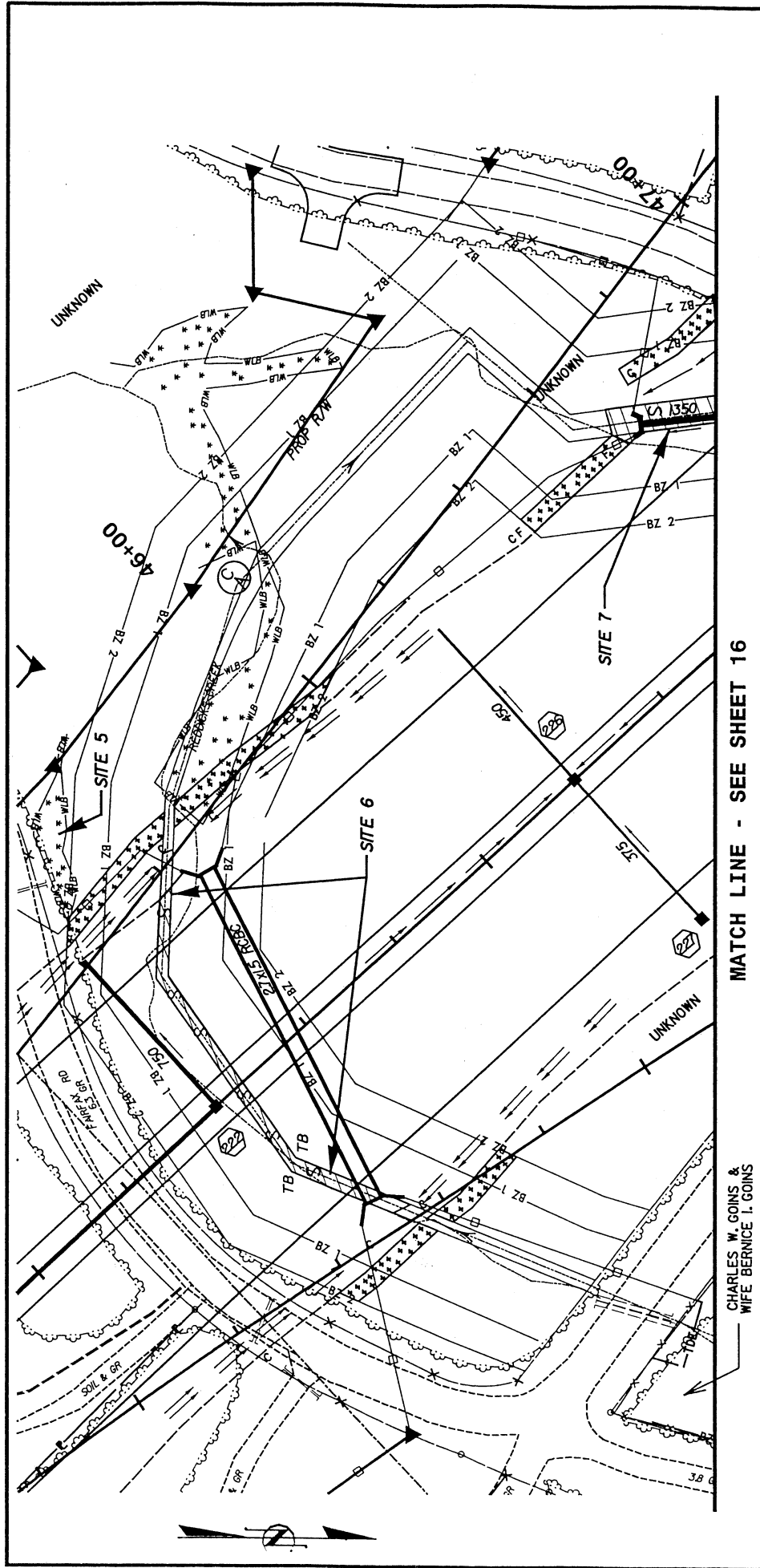
- 1) UPON COMPLETION OF CONSTRUCTION, INSTALL ROCK BERM AT SWALE OUTFALL
- 2) ALL LONGITUDINAL SLOPES ARE LESS THAN 4%.
- 3) ALL GRASS SWALE SIDE SLOPES ARE NO GREATER THAN 3:1.
- 4) RUNOFF VELOCITIES FOR THE 2 YEAR STORM ARE 2FT/S OR LESS.
- 5) ALL SWALE LENGTHS ARE GREATER THAN 100FT PER ACRE OF DRAINAGE AREA.



<p> N.C. DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS GUILFORD COUNTY PROJECT 8J492101 U-2524AB PROPOSED GREENSBORO OUTER LOOP </p>		<p>06/03</p>
<p> STREAM RELOCATION PROFILES -L- STA 34+09 TO 35+00 LEFT PROFILE </p>		
<p> 2m 0 4m VERTICAL SCALE </p> <p> 10m 0 20m HORIZONTAL SCALE </p>		<p>SHEET 13 OF 26</p>



<p> PROFILE SITE 3, 4 AND STREAM RELOCATION -L- STA 36+00 TO 38+00 LEFT PROFILE </p>		<p> N.C. DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS GUILDFORD COUNTY PROJECT 8J1492101 U-2524AB PROPOSED GREENSBORO OUTER LOOP </p>		<p>06/03</p>
<p> 2m 0 4m VERTICAL SCALE </p>		<p> 10m 0 20m HORIZONTAL SCALE </p>		<p> SHEET 14 OF 26 </p>

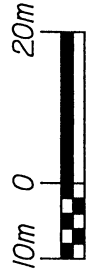


MATCH LINE - SEE SHEET 16

CHARLES W. GOINS &
WIFE BERNICE I. GOINS

SITES 5, 6 AND 7

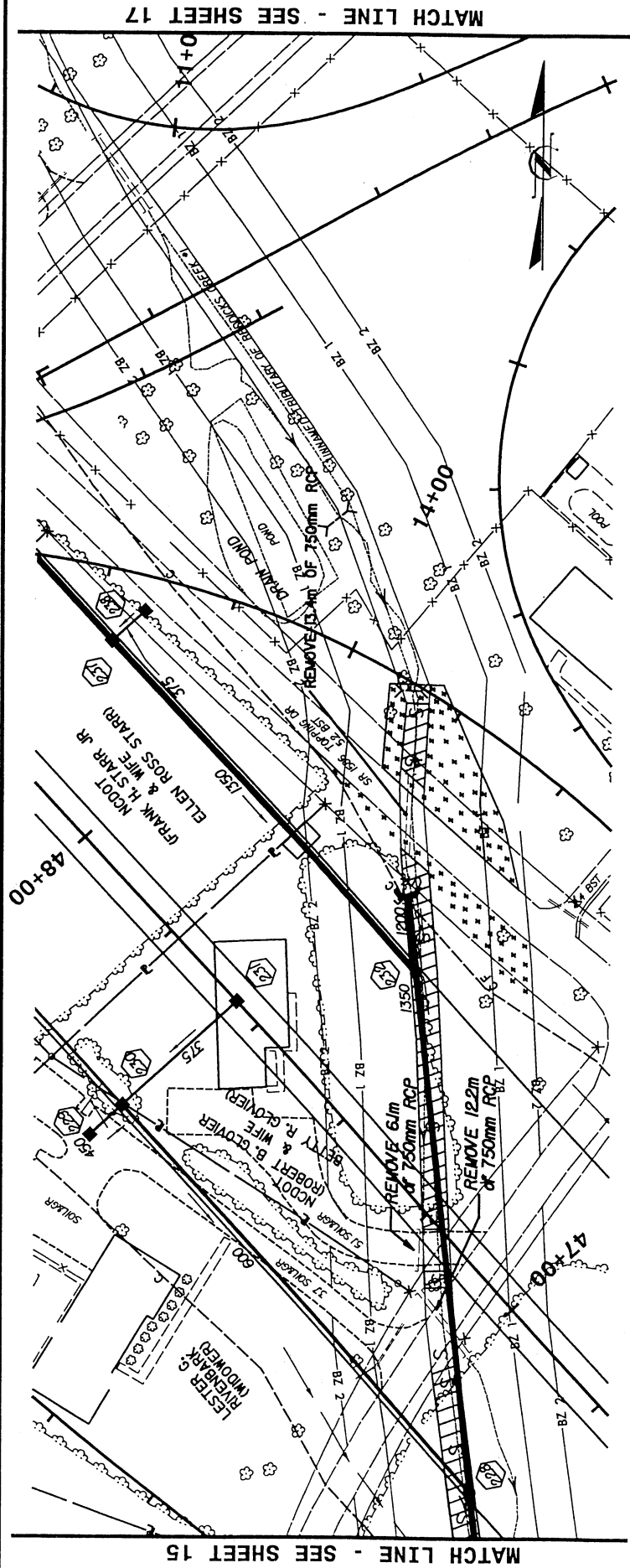
- WLB — WETLAND BOUNDARY
- WLB — DENOTES FILL IN SURFACE WATER
- WLB — DENOTES MECHANIZED CLEARING
- WLB — WETLAND





- NOTES:
- 1) ALL LONGITUDINAL SLOPES ARE LESS THAN 4%.
 - 2) ALL GRASS SWALE SIDE SLOPES ARE NO GREATER THAN 3:1.
 - 3) RUNOFF VELOCITIES FOR THE 2 YEAR STORM ARE 2FT/S OR LESS.
 - 4) ALL SWALE LENGTHS ARE GREATER THAN 100FT PER ACRE OF DRAINAGE AREA.

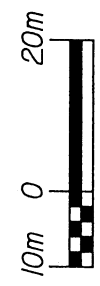
N.C. DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GUILFORD COUNTY
PROJECT 8U492101
U-2524AB

PROPOSED
GREENSBORO OUTER LOOP



SITE 7

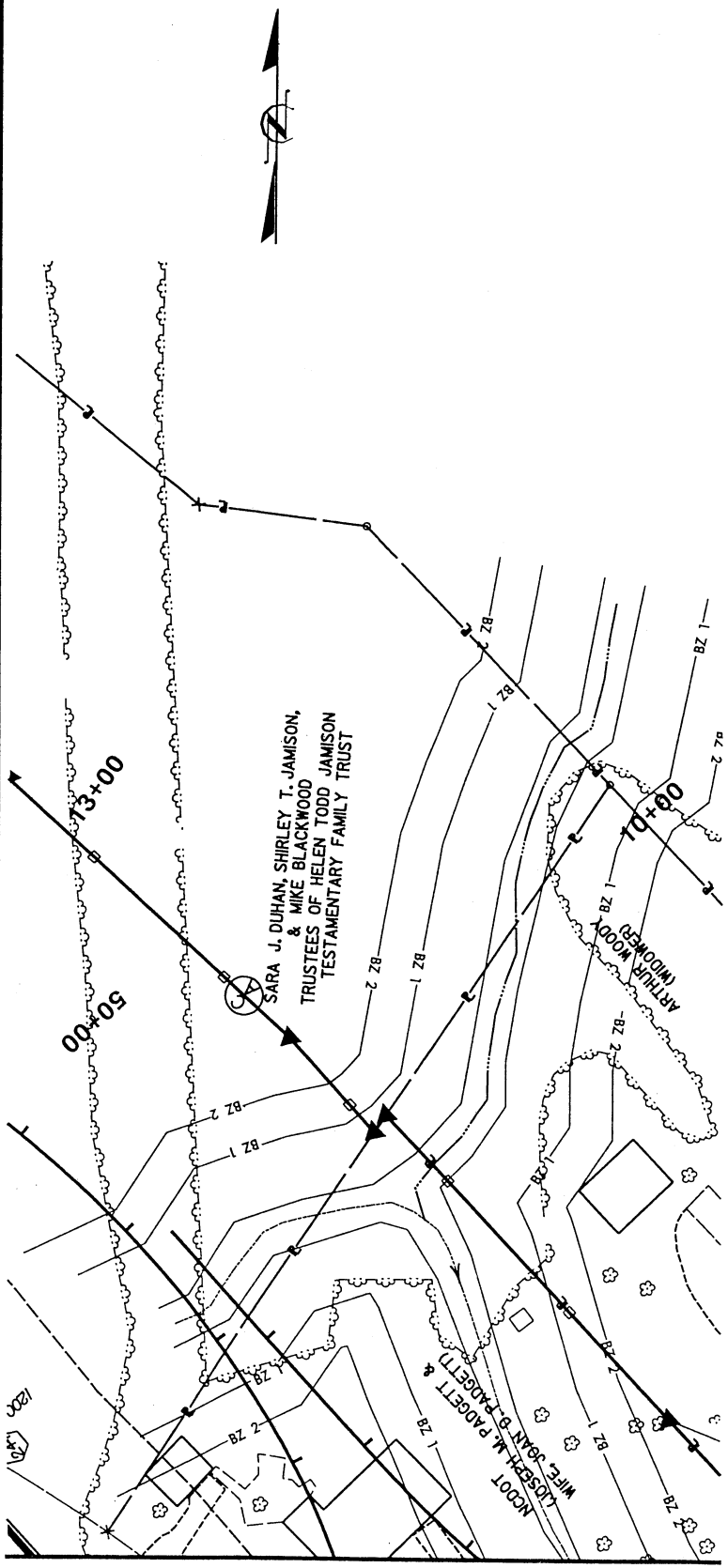
- 
 DENOTES FILL IN SURFACE WATER
- 
 DENOTES MECHANIZED CLEARING



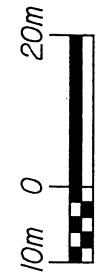
- NOTES:
- 1) ALL LONGITUDINAL SLOPES ARE LESS THAN 4%.
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N.C. DEPARTMENT OF TRANSPORTATION
 DIVISION OF HIGHWAYS
 GUILFORD COUNTY
 PROJECT 8U492101
 U-2524AB

PROPOSED
 GREENSBORO OUTER LOOP



MATCH LINE - SEE SHEET 16

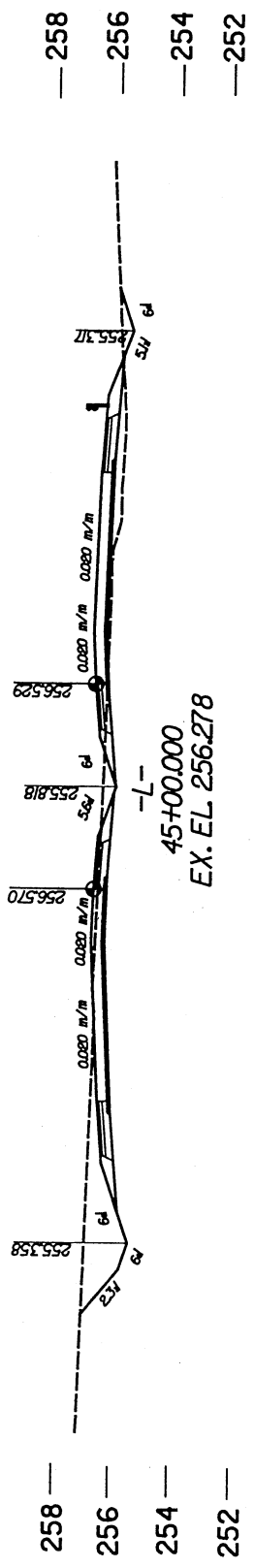


- NOTES:
- 1) ALL LONGITUDINAL SLOPES ARE LESS THAN 4%.
 - 2) ALL GRASS SWALE SIDE SLOPES ARE NO GREATER THAN 3:1.
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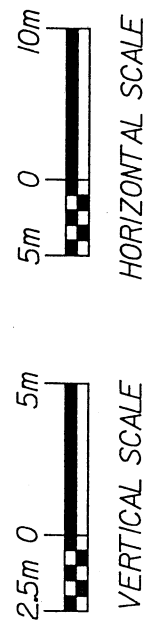
SITE 7

N.C. DEPARTMENT OF TRANSPORTATION
 DIVISION OF HIGHWAYS
 GUILFORD COUNTY
 PROJECT 8J492101
 U-2524AB

PROPOSED
 GREENSBORO OUTER LOOP



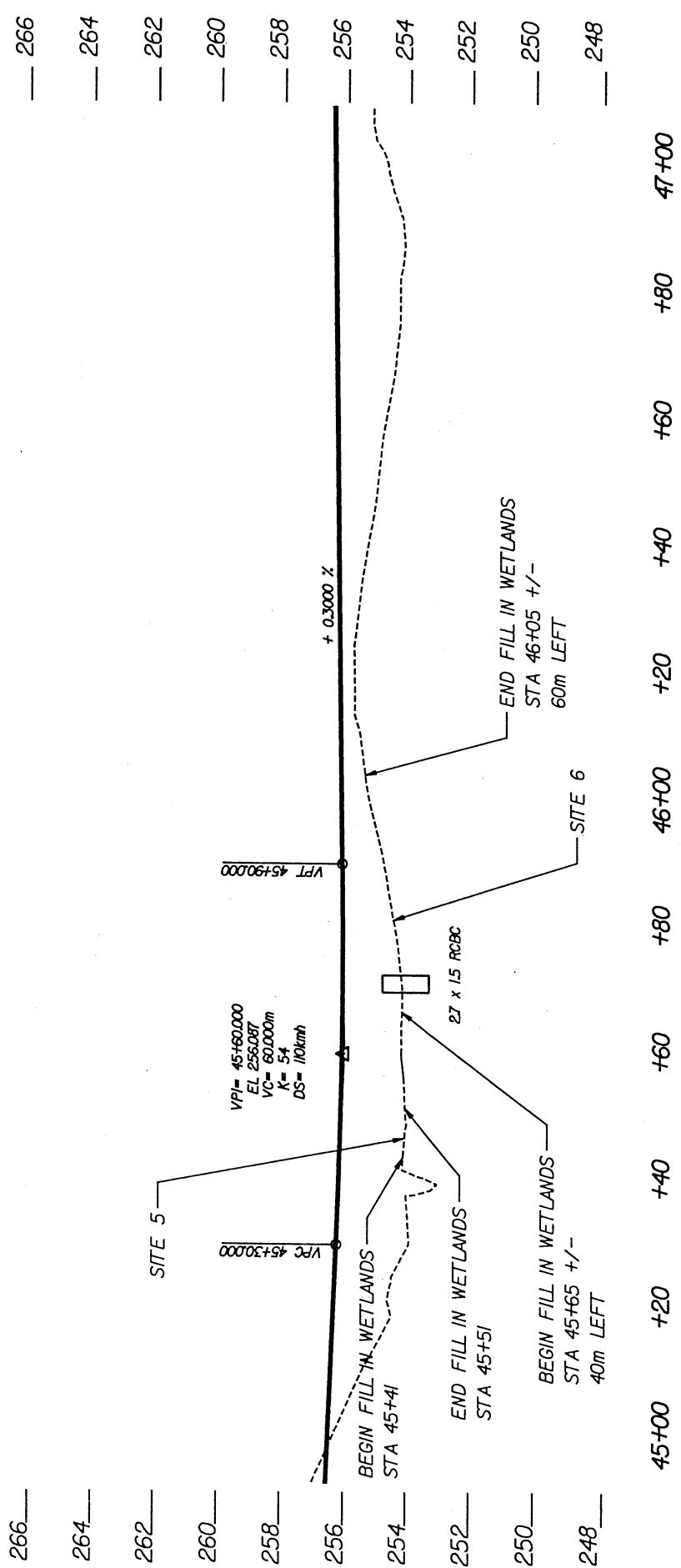
CROSS SECTION - SITE 5,6,& 7



N.C. DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GUILFORD COUNTY

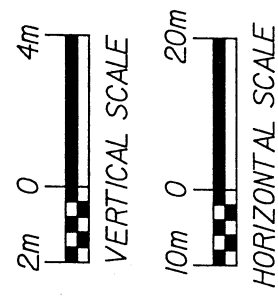
PROJECT 8J49201
U-2524AB

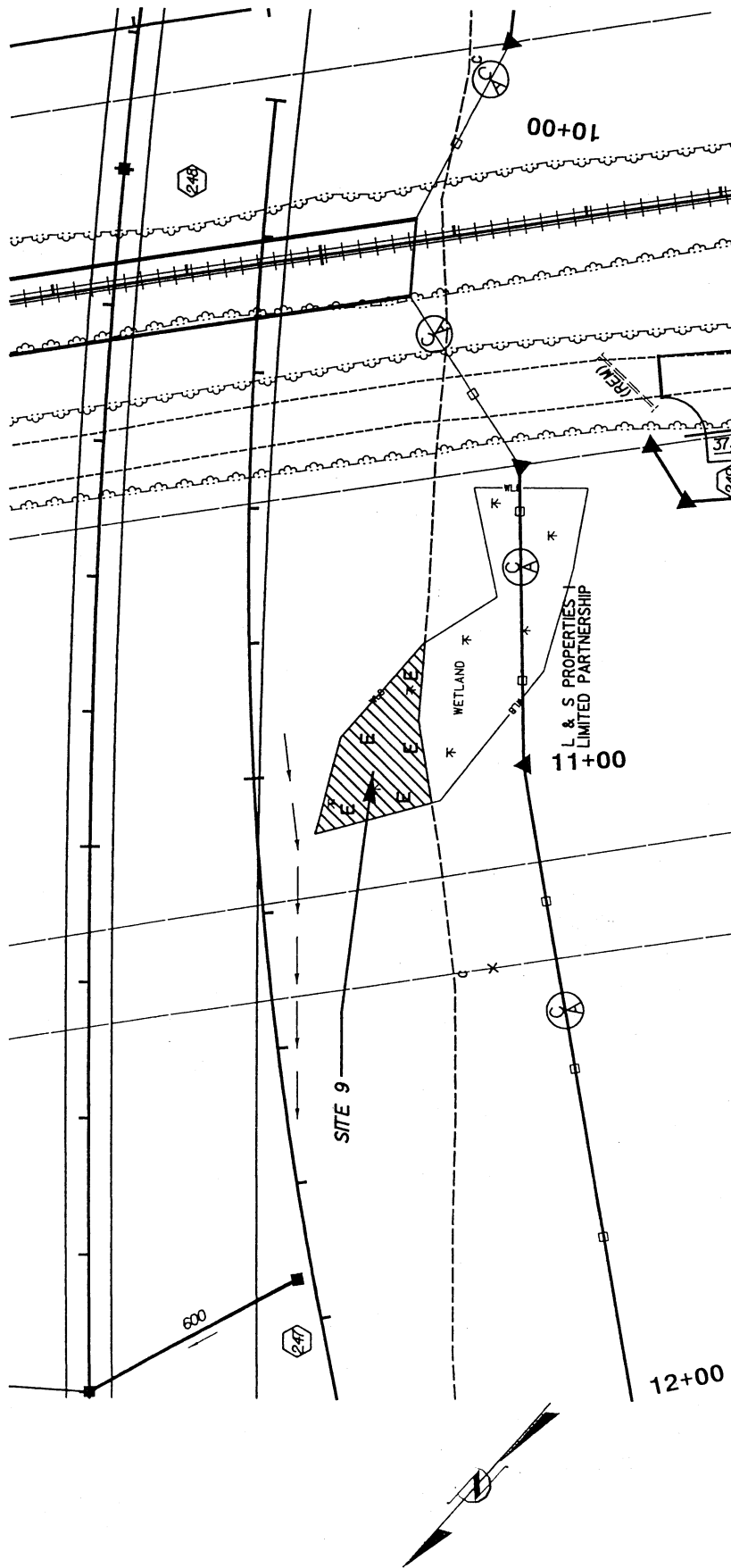
PROPOSED
GREENSBORO OUTER LOOP





PROFILE SITE 5, 6, & 7

-L- STA 45+00 TO 47+00
LEFT PROFILE





SITE 9

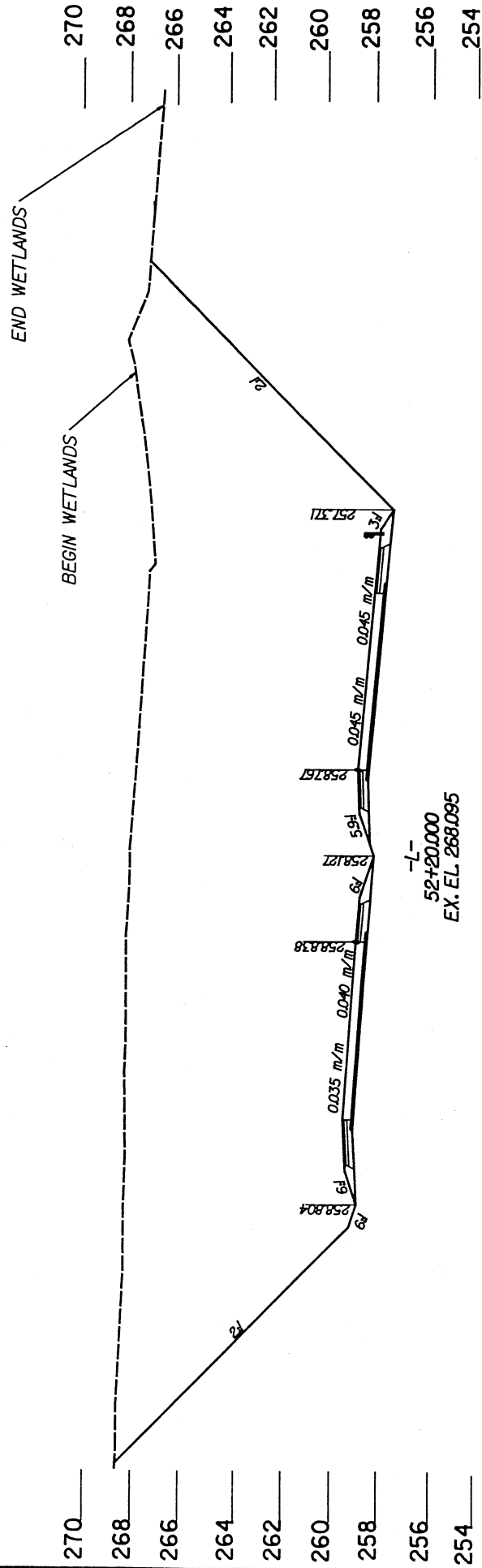
- WLB— WETLAND BOUNDARY
-  WETLAND
-  DENOTES EXCAVATION IN WETLAND



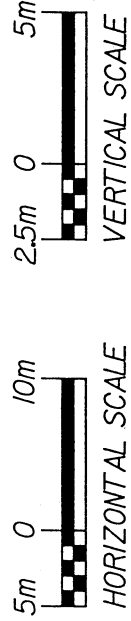
NC. DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GUILFORD COUNTY

PROJECT 8J492101
U-2524AB

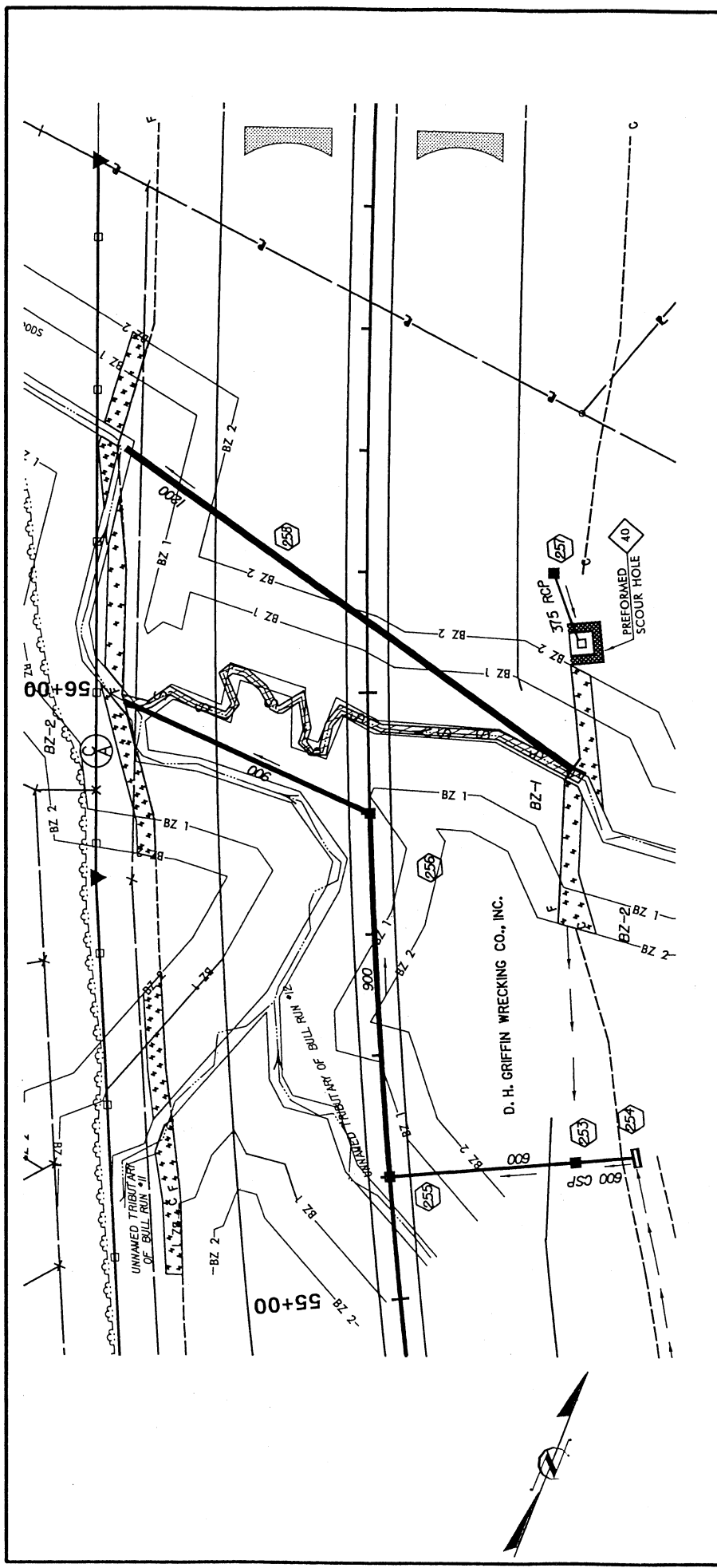
PROPOSED
GREENSBORO OUTER LOOP



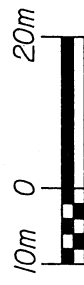
CROSS SECTION - SITE 9



N.C. DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GUILFORD COUNTY
PROJECT 8U492101
U-2524AB
PROPOSED
GREENSBORO OUTER LOOP



SITE 10




 DENOTES FILL IN SURFACE WATER


 DENOTES MECHANIZED CLEARING

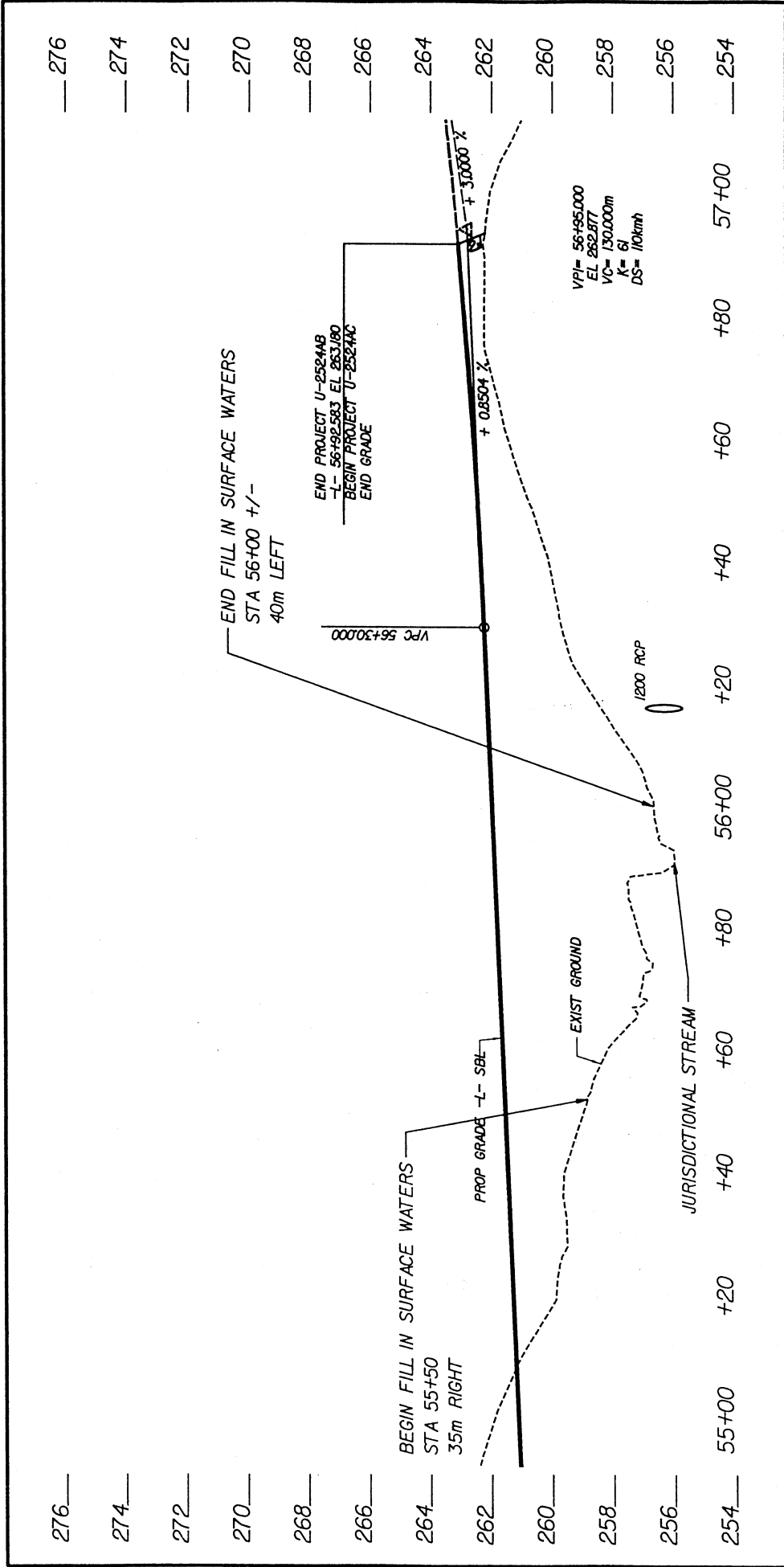
NOTES:

- 1) ALL LONGITUDINAL SLOPES ARE LESS THAN 4%.
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N.C. DEPARTMENT OF TRANSPORTATION
 DIVISION OF HIGHWAYS
 GUILFORD COUNTY

PROJECT 8J492101
 U-25244B

PROPOSED
 GREENSBORO OUTER LOOP



PROFILE - SITE 10

-L- STA 55+00 TO 57+00
LEFT PROFILE

2m 0 4m

10m 0 20m

VERTICAL SCALE

HORIZONTAL SCALE

N.C. DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GUILFORD COUNTY

PROJECT 8U492101
U-2524AB

PROPOSED
GREENSBORO OUTER LOOP

SHEET 23 OF 26

06/03

SITE 1
PARCEL NO.7
JOHN R.SMITH AND WIFE GAYLE T.SMITH
3007 ROBINHOOD DR.
GREENSBORO,NC 27408

SITE 2
CITY OF GREENSBORO
OKA T.HESTER PARK
P.O.BOX 1336
GREENSBORO,NC 27402-3136

SITES 3 AND 4
PARCELS 71 AND 85
CITY OF GREENSBORO
DRAWER W-2
GREENSBORO,NC 27402

PARCEL 75N
MIDWAY PROPERTIES,INC.
PO BOX 14868
GREENSBORO,NC 27415

SITES 5,6, AND 7
PARCEL 115
~~UNKNOWN~~ BROAD ACRES, INC
LARK DRIVE
GREENSBORO, NC 27407

PARCEL 864
NCDOT
PARCEL 116
GOINS/SHINN
2605 TOPPING DRIVE
GREENSBORO,NC 27407

PARCEL 118
LESTER G.RIVENBARK
3002 LARK DRIVE
GREENSBORO,NC 27407

PARCEL 823
NCDOT

PARCEL 121
NCDOT

PARCEL 129
ARTHUR WOODY
2910 CROMWELL ROAD
GREENSBORO,NC 27407

PARCEL 130
TRUSTEES OF HELEN TODD JAMISON TESTAMONY
FAMILY TRUST
503 HOBBS ROAD
GREENSBORO,NC 27403

SITE 9
PARCEL NO.132
L & S PROPERTIES
503 HOBBS ROAD
GREENSBORO,NC 27403

SITE 10
PARCEL NO.131
D.H.GRIFFIN WRECKING CO.,INC.
P.O.BOX 7657
GREENSBORO,NC 27417-7657

AFFECTED PROPERTY OWNERS

N.C. DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GUILFORD COUNTY

PROJECT 8J492101
U-2524AB

PROPOSED
GREENSBORO OUTER LOOP

IMPACT SUMMARY																
Site No.	Station (From/To)	Structure Size	WETLAND IMPACTS				SURFACE WATER IMPACTS					BUFFER IMPACTS		NEW BUFFERS		
			Fill In Wetlands (ha)	Temp. Fill In Wetlands (ha)	Excavation In Wetlands (ha)	Mechanized Clearing (Method III) (ha)	Fill In SW (Natural) (ha)	Fill In SW (Pond) (ha)	Temp. Fill In SW (ha)	Existing Channel Impacted (m)	Relocated Channel (m)	Enclosed Channel (m)	Zone 1 (ha)	Zone 2 (ha)	Zone 1 (ha)	Zone 2 (ha)
1	-Y1A-11+70	1200mm	0.040													
2	L- 22+75	1200mm	0.011													
2A	L- 23+00 TO 23+80								0.196							
3	L-34+00 TO 37+10	1500mm					0.078			292	211	130	0.547	0.365	0.270	0.180
4	L-36+90	2.4m x 1.5m					0.072			180		113	0.264	0.174		
5	L-45+41 TO 45+51															
6	L-45+65 TO 46+05	2.7m x 1.5m				0.003	0.013			71		60	0.168	0.116		
7	L-46+10 TO 49+80	1350mm/1200mm					0.049			153		113	0.239	0.157		
9	L-52+05 TO 52+55				0.085		0.014			116		91	0.416	0.217		
10	L-56+20	1200mm														
TOTALS:			0.051		0.085	0.003	0.225	0.196		812	211	507	1.634	1.029	0.270	0.180

SITE 7 LENGTH OF EXISTING STREAM IMPACTS: INTERMITTENT 56m PERENNIAL 97m

SHEET 25 OF 26

06/03

GRASS SWALE SUMMARY

PERMIT SITE	GRASS SWALE (GS)	LOCATION	SIDE SLOPES	SWALE GRADE (%)	ENGLISH					METRIC				
					SWALE LENGTH (ft)	BASE WIDTH (ft)	Q2 (cfs)	V2 (ft/s)	Q10 (cfs)	V10 (ft/s)	AREA (HA)	SWALE LENGTH (m)	BASE WIDTH (m)	Q2 (cms)
3	GS to 133AH	MED	5:1/6:1	1.03	328		1.8	1.4	2.8	1.6	0.22	100		0.05
3	GS to 133BK	MED	6:1	0.91	328		2.1	1.4	3.2	1.5	0.25	100		0.06
4	GS to 191	MED	6:1	0.92	459		3.5	1.6	5.3	1.8	0.44	140		0.10
4	GS to 1RT	RT	3:1	1.00	197	4	3.9	1.8	6.0	2.0	0.50	60	1.2	0.11
4	GS to 2RT	RT	3:1	0.80	98	4	2.8	1.5	4.6	1.7	0.38	30	1.2	0.08
5,6,&7	GS to 1LT	LT	5:1/6:1	1.16	262		1.8	1.5	2.8	1.7	0.22	80		0.05
5,6,&7	GS to 1RT	RT	6:1	0.83	197		1.4	1.2	2.1	1.3	0.17	60		0.04
5,6,&7	GS to 211	MED	5:1/6:1	1.43	328		2.1	1.7	3.2	1.9	0.25	100		0.06
5,6,&7	GS to 212AH	RT	6:1	0.30	131		3.5	1.0	5.3	1.1	0.42	40		0.10
5,6,&7	GS to 212BK	RT	6:1	1.16	262		2.5	1.6	3.9	1.8	0.32	80		0.07
5,6,&7	GS to 218	MED	6:1	1.10	525		3.5	1.7	5.3	1.9	0.42	160		0.10
5,6,&7	GS to 219	LT	6:1	0.82	394		4.2	1.6	6.4	1.8	0.52	120		0.12
5,6,&7	GS to 220	MED	6:1	1.01	328		1.4	1.3	2.5	1.5	0.20	100		0.04
5,6,&7	GS to 221	RT	6:1	0.81	394		4.6	1.6	7.4	1.8	0.62	120		0.13
5,6,&7	GS to 222	MED	6:1	0.65	394		2.1	1.2	3.2	1.4	0.25	120		0.06
5,6,&7	GS to 226AH	MED	5:1/6:1	0.47	459		2.5	1.1	3.9	1.3	0.32	140		0.07
5,6,&7	GS to 226BK	MED	5:1/6:1	0.30	262		1.4	0.9	2.1	1.0	0.17	80		0.04
5,6,&7	GS to 227	RT	6:1	0.30	328		2.8	1.0	4.6	1.1	0.37	100		0.08
5,6,&7	GS to 229	LT	6:1	0.30	197		1.4	0.8	2.1	0.9	0.17	60		0.04
5,6,&7	GS to 231	MED	6:1	0.30	722		3.5	1.0	5.3	1.1	0.44	220		0.10
5,6,&7	GS to 236	LT	6:1	0.30	591		5.3	1.1	8.1	1.3	0.67	180		0.15
5,6,&7	GS to 238	RT	6:1	0.30	591		4.6	1.1	7.4	1.2	0.62	180		0.13
5,6,&7	GS to 239	LT	6:1	0.48	394		4.6	1.3	7.1	1.5	0.57	120		0.13
5,6,&7	GS to 241	MED	6:1	0.45	459		2.1	1.1	3.5	1.2	0.30	140		0.06
5,6,&7	GS to 243	RT	6:1	0.48	459		4.6	1.3	7.1	1.5	0.59	140		0.13
5,6,&7	GS to 245	LT	6:1	1.23	153		4.6	1.9	7.4	2.1	0.62	60		0.13
5,6,&7	GS to 246	MED	6:1	0.84	116		3.5	1.5	5.7	1.7	0.47	180		0.10
5,6,&7	GS to 247	RT	4:1/5:1	0.70	250		7.8	1.9	12.4	2.1	1.01	80		0.22
5,6,&7	GS to 2LT	LT	3:1	3.75	197	4	1.1	1.8	1.8	2.1	0.15	60	1.2	0.03
5,6,&7	GS to 2RT	RT	3:1	3.00	262	4	1.1	1.7	1.8	2.0	0.15	80	1.2	0.03
5,6,&7	GS to 3LT	LT	3:1	1.17	197	4	1.1	1.2	1.8	1.4	0.15	60	1.2	0.03
5,6,&7	GS to 3RT	RT	3:1	3.00	197	4	1.4	1.8	2.1	2.1	0.17	60	1.2	0.04
5,6,&7	GS to 4LT	LT	6:1	2.04	262		2.1	1.9	3.2	2.1	0.25	80		0.06
5,6,&7	GS to 4RT	RT	6:1	0.30	131		1.1	0.8	1.8	0.9	0.15	40		0.03
10	GS to 248	MED	5:1/6:1	0.85	328		2.1	1.4	3.5	1.6	0.30	100		0.06
10	GS to 250AH	LT	6:1	0.85	0.54		1.8	1.3	2.8	1.5	0.22	100		0.05
10	GS to 250BK	LT	6:1	0.49	0.37		1.1	0.9	1.8	1.0	0.15	40		0.03
10	GS to 251	MED	5:1/6:1	0.85	394		2.8	1.5	4.2	1.6	0.35	120		0.08
10	GS to 252	RT	4:1/6:1	0.61	104		3.5	1.4	5.3	1.6	0.42	120		0.10
10	GS to 253	RT	4:1/5:1	0.30	0.37		1.1	0.8	1.8	1.0	0.15	40		0.03
10	GS to 255	MED	5:1/6:1	0.85	0.42		1.4	1.2	2.1	1.4	0.17	60		0.04
10	GS to 256	MED	5:1/6:1	1.06	0.79		2.5	1.6	3.9	1.8	0.32	120		0.07

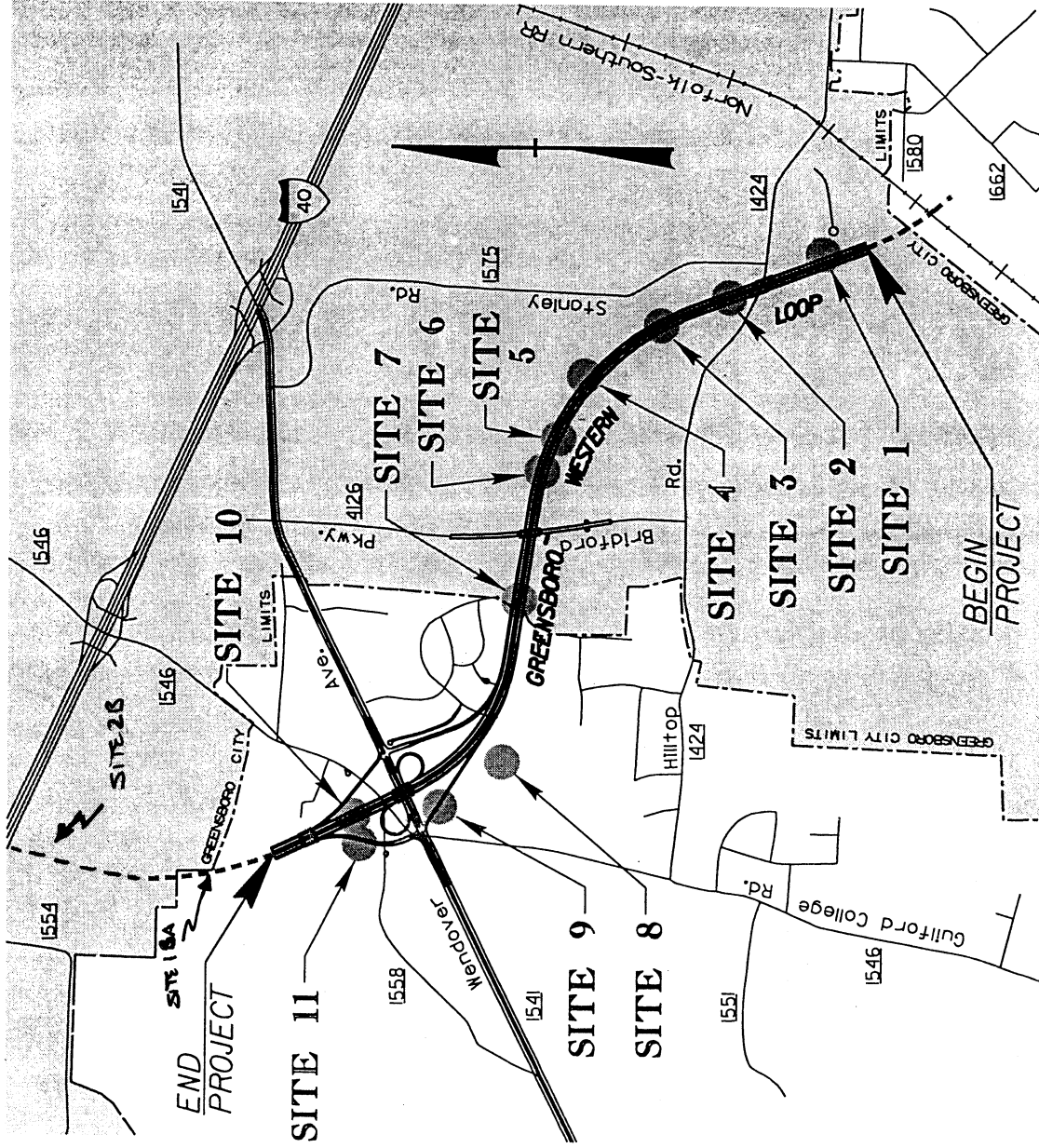
NOTES:

- 1) ALL LONGITUDINAL SLOPES ARE LESS THAN 4%.
- 2) ALL GRASS SWALE SIDE SLOPES ARE NO GREATER THAN 3:1.
- 3) ALL SWALE LENGTHS ARE GREATER THAN 100FT PER ACRE OF DRAINAGE AREA.
- 4) RUNOFF VELOCITIES FOR THE 2 YEAR STORM ARE 2FT/S OR LESS.

N.C. DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS

GUILFORD COUNTY

PROJECT: 8 U492101 U-2524AB
PROPOSED GREENSBORO OUTER LOOP

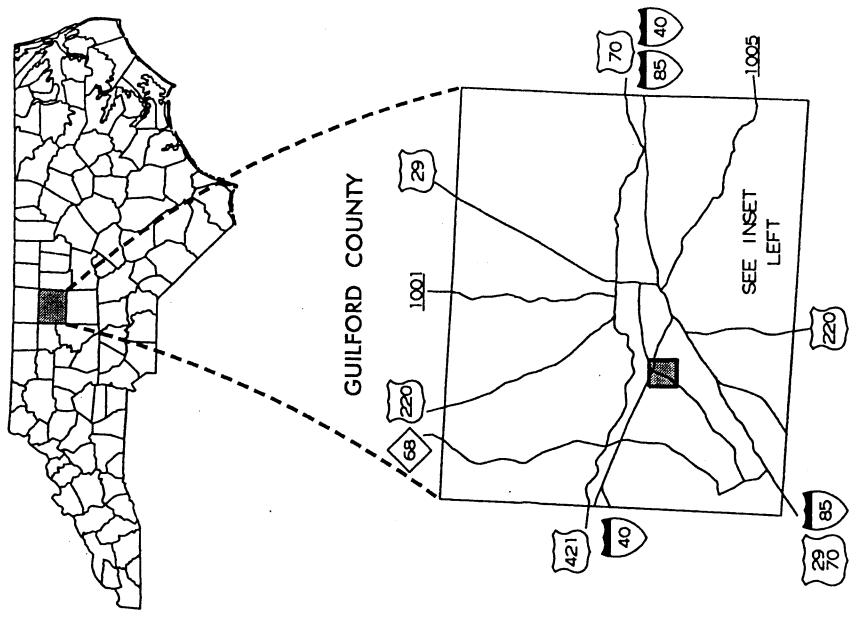


SCALE

.5 0 1 KM



LOCATION MAP



N.C. DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS

GUILFORD COUNTY

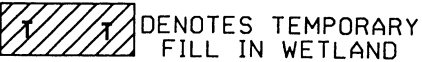
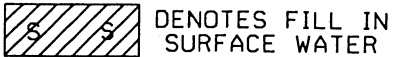
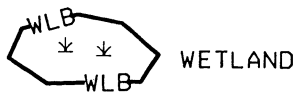
PROJECT: 8U492101 (U-2524AC)
GREENSBORO WESTERN LOOP

SHEET 1 OF 46

6/27/03

LEGEND

—WLB— WETLAND BOUNDARY



←← 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

X X X LIVE STAKES

BOULDER

— — — COIR FIBER ROLLS

ADJACENT PROPERTY OWNER OR PARCEL NUMBER

PROPOSED BRIDGE

PROPOSED BOX CULVERT

PROPOSED PIPE CULVERT

(DASHED LINES DENOTE EXISTING STRUCTURES)

SINGLE TREE

WOODS LINE

DRAINAGE INLET

ROOTWAD

VANE

RIP RAP

RIP RAP ENERGY DISSIPATOR BASIN

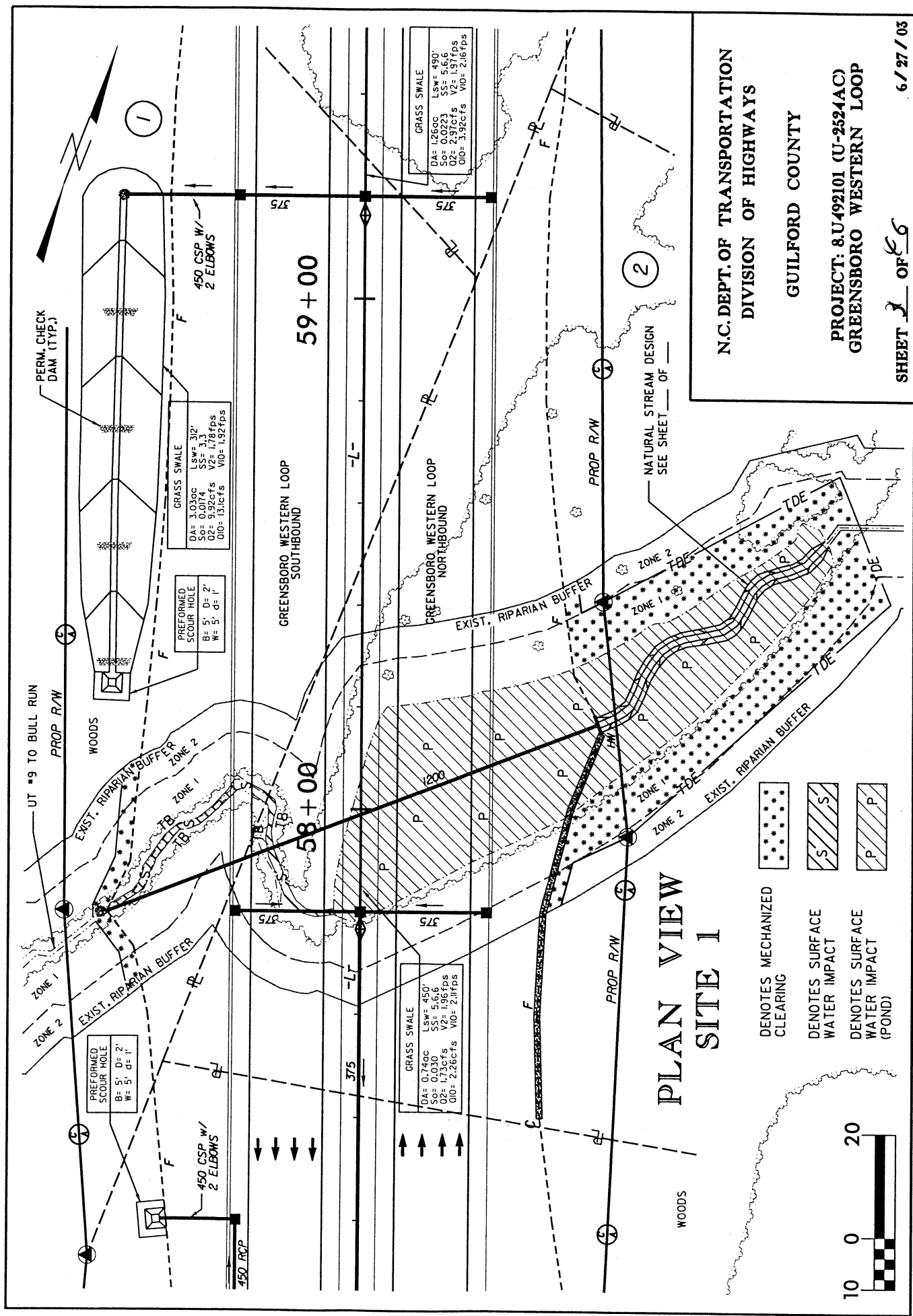
N.C. DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS

GUILFORD COUNTY

PROJECT: 8.U492101 (U-2524AC)
GREENSBORO WESTERN LOOP

SHEET 2 OF 46

6/27/03



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DIVISION OF HIGHWAYS

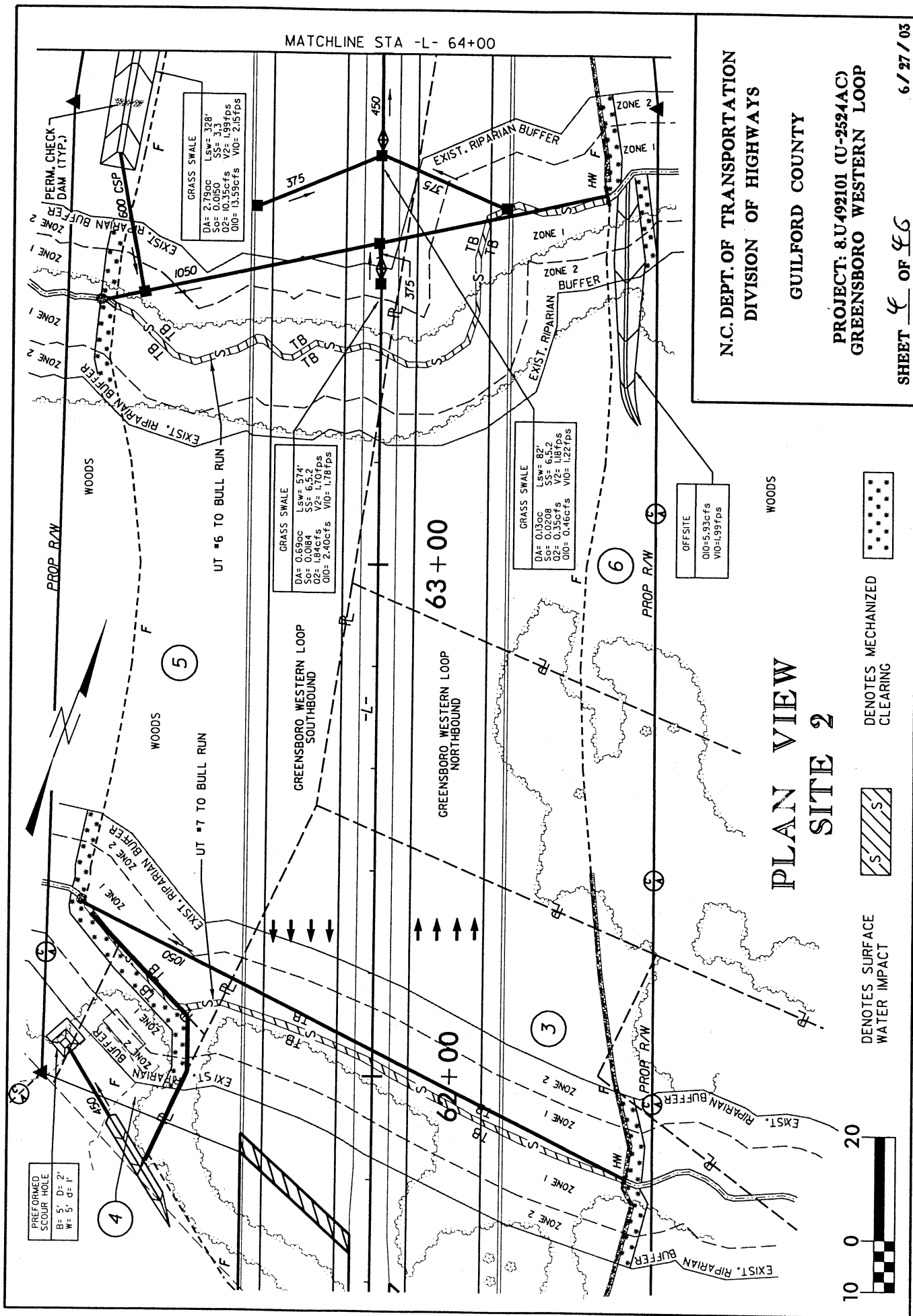
GUILFORD COUNTY

PROJECT: 8.U492101 (U-2524AC)
GREENSBORO WESTERN LOOP

SHEET 3 OF 6

6/27/03

- DENOTES MECHANIZED CLEARING
- DENOTES SURFACE WATER IMPACT
- DENOTES SURFACE WATER IMPACT (POND)



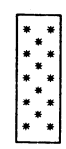
N.C. DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS

GUILFORD COUNTY

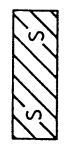
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GREENSBORO WESTERN LOOP

SHEET 4 OF 46

6/27/03

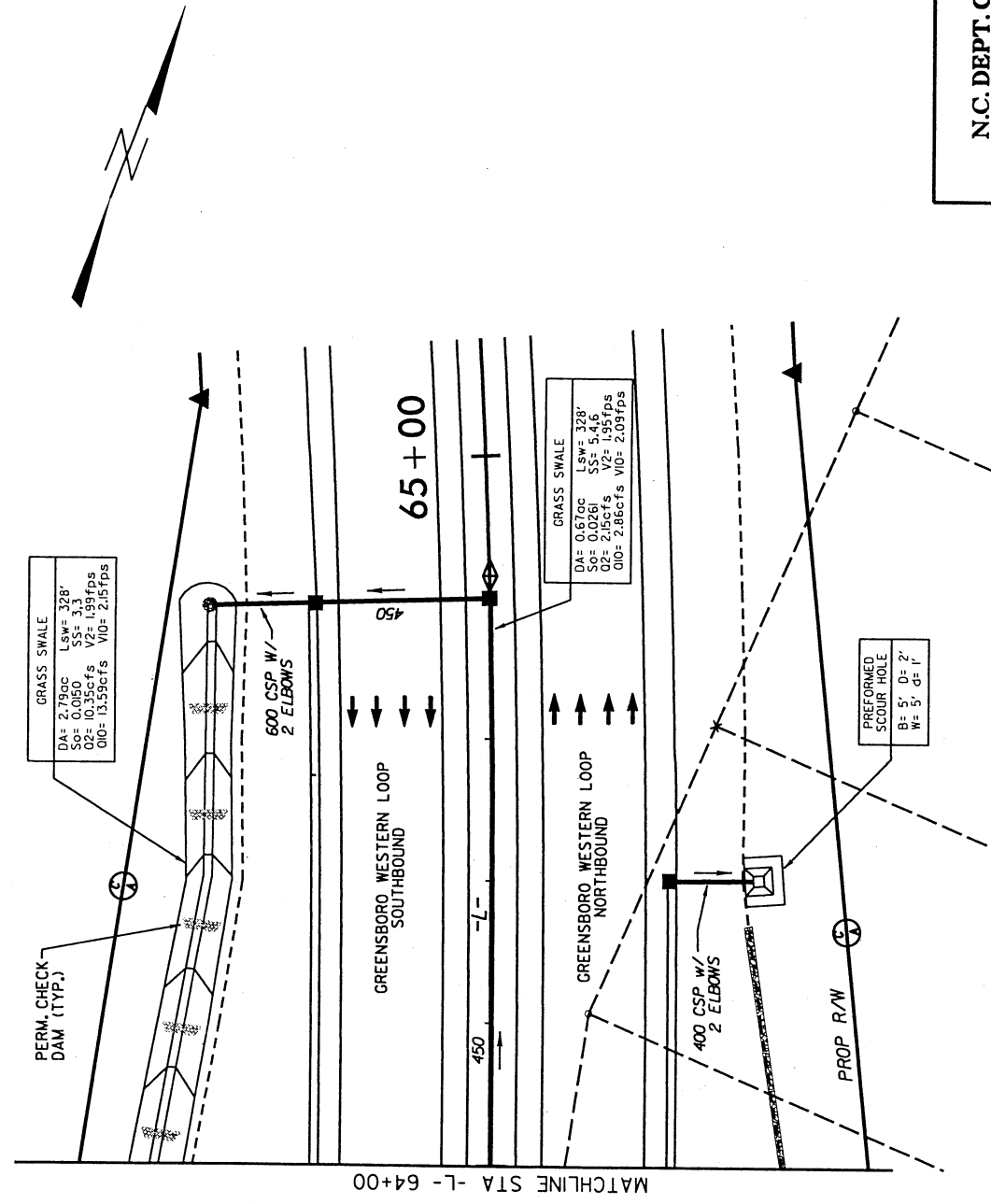


DENOTES MECHANIZED
CLEARING

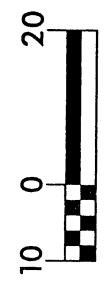


DENOTES SURFACE
WATER IMPACT





PLAN VIEW SITE 2



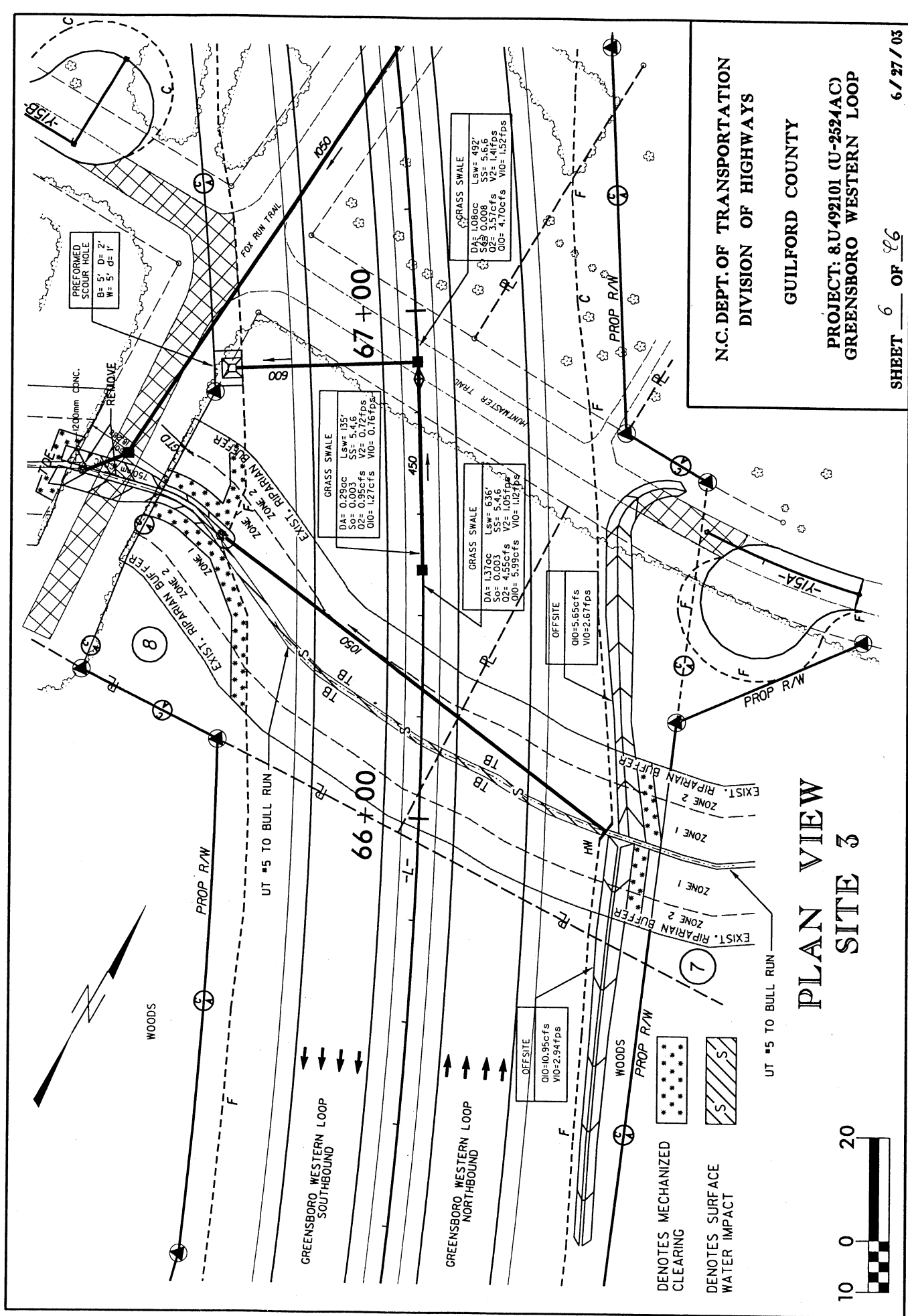
N.C. DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS

GUILFORD COUNTY

PROJECT: 8.U492101 (U-2524AC)
GREENSBORO WESTERN LOOP

SHEET 5 OF 26

6/27/03



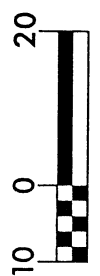
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DIVISION OF HIGHWAYS

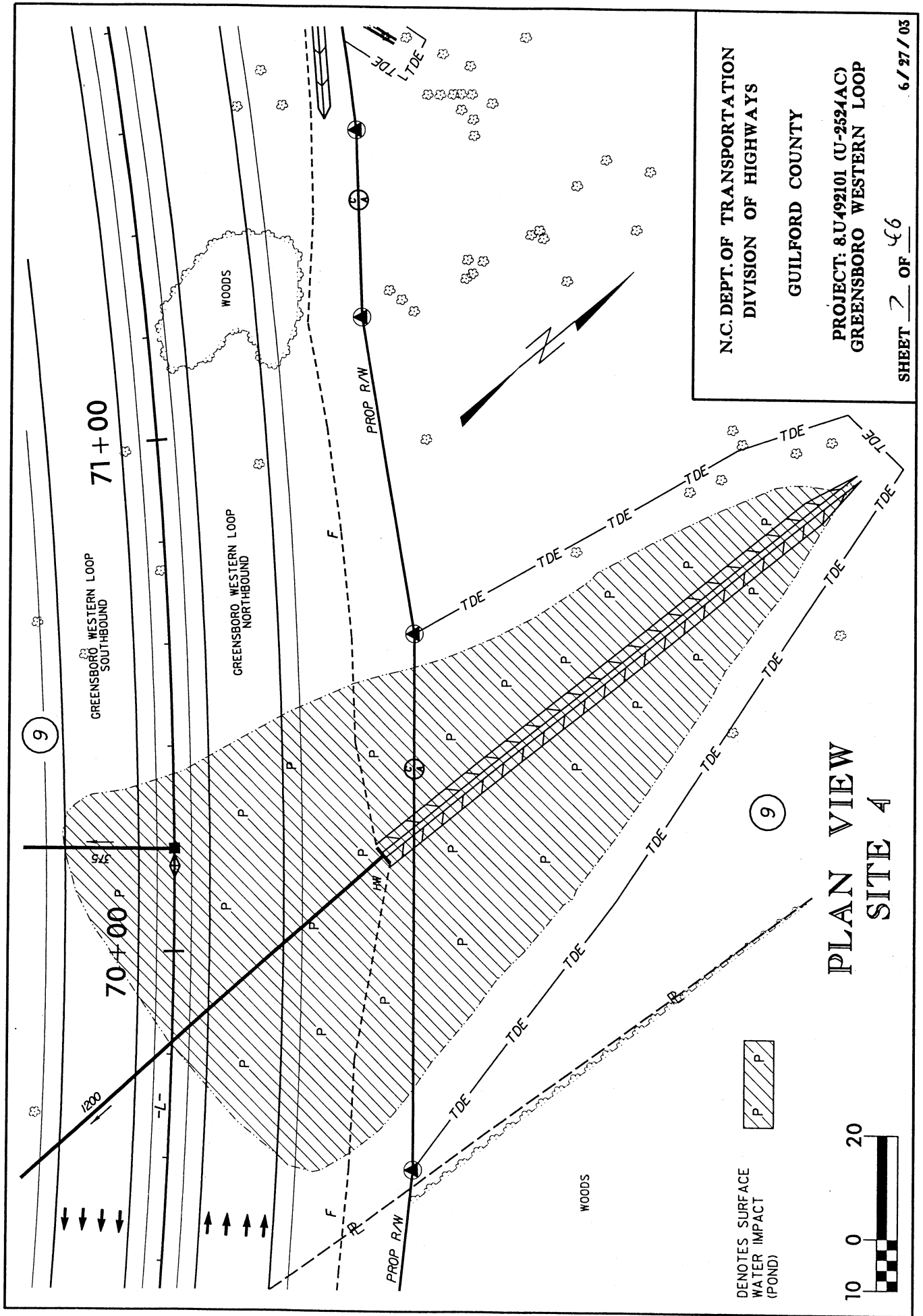
GUILFORD COUNTY

PROJECT: 8.U492101 (U-2524AC)
GREENSBORO WESTERN LOOP

SHEET 6 OF 26

6/27/03





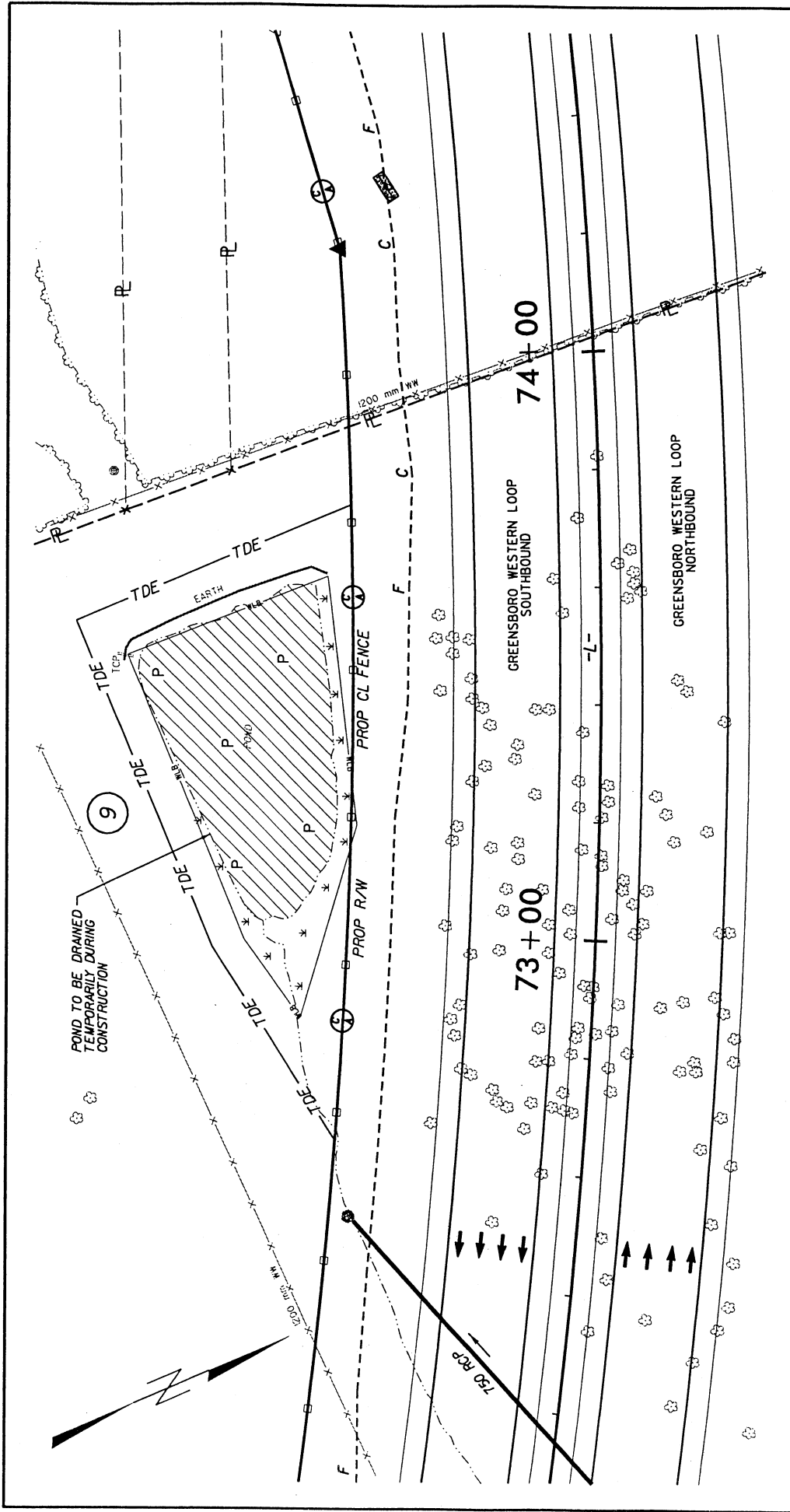
N.C. DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS

GUILFORD COUNTY

PROJECT: 8.U492101 (U-2524/AC)
GREENSBORO WESTERN LOOP

SHEET 2 OF 66

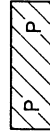
6/27/03



PLAN VIEW SITE 5



DENOTES SURFACE
 WATER IMPACT
 (POND)

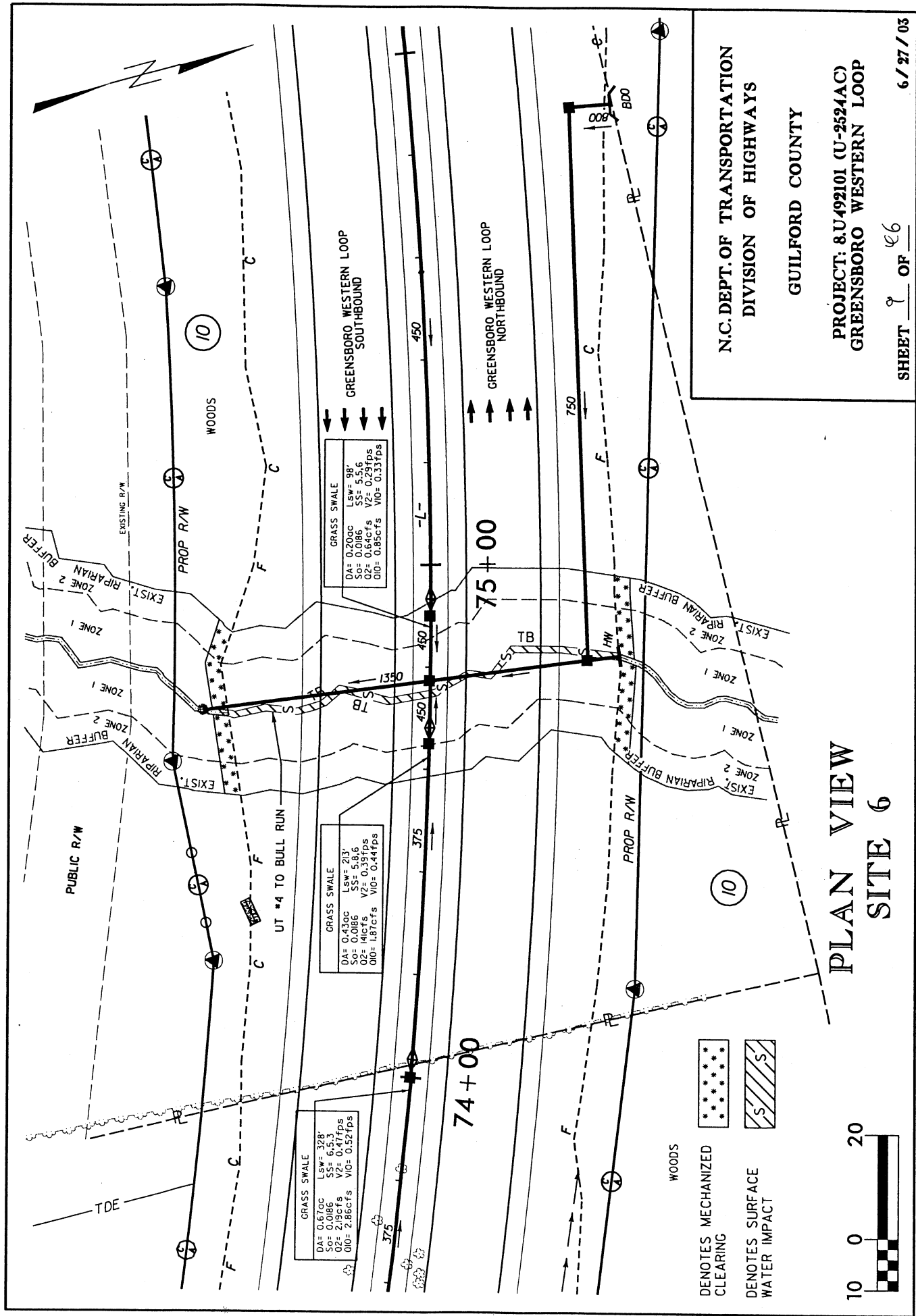


N.C. DEPT. OF TRANSPORTATION
 DIVISION OF HIGHWAYS

GUILFORD COUNTY

PROJECT: 8.U492101 (U-2524AC)
 GREENSBORO WESTERN LOOP

SHEET 8 OF 46 6/27/03



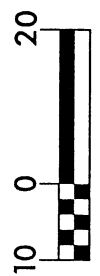
N.C. DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
GUILFORD COUNTY

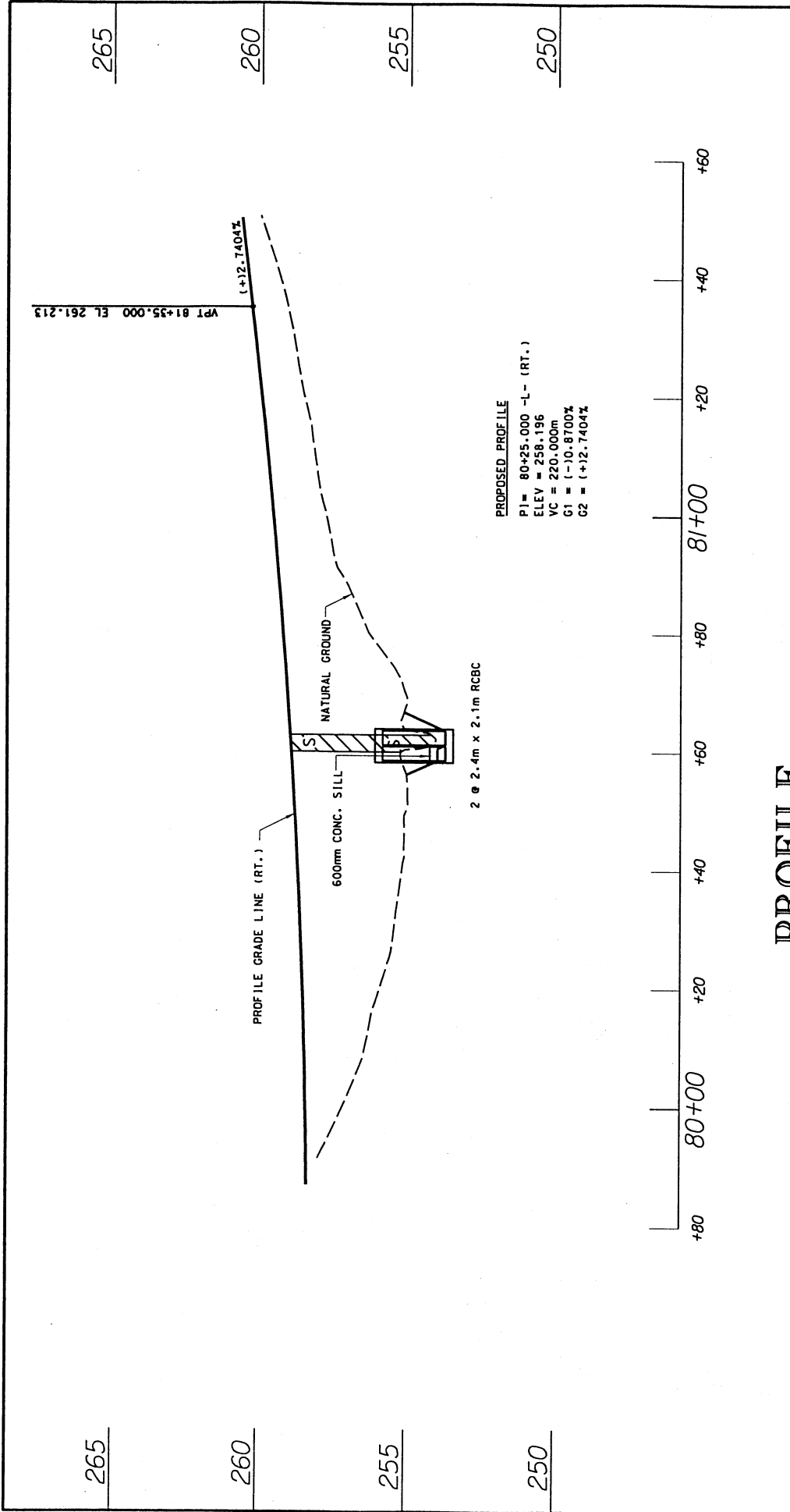
PROJECT: 8U492101 (U-2524AC)
GREENSBORO WESTERN LOOP

SHEET 9 OF 66
6/27/03

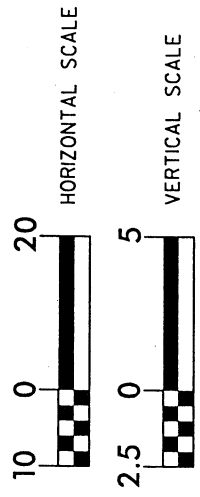
PLAN VIEW
SITE 6

WOODS
DENOTES MECHANIZED
CLEARING
DENOTES SURFACE
WATER IMPACT



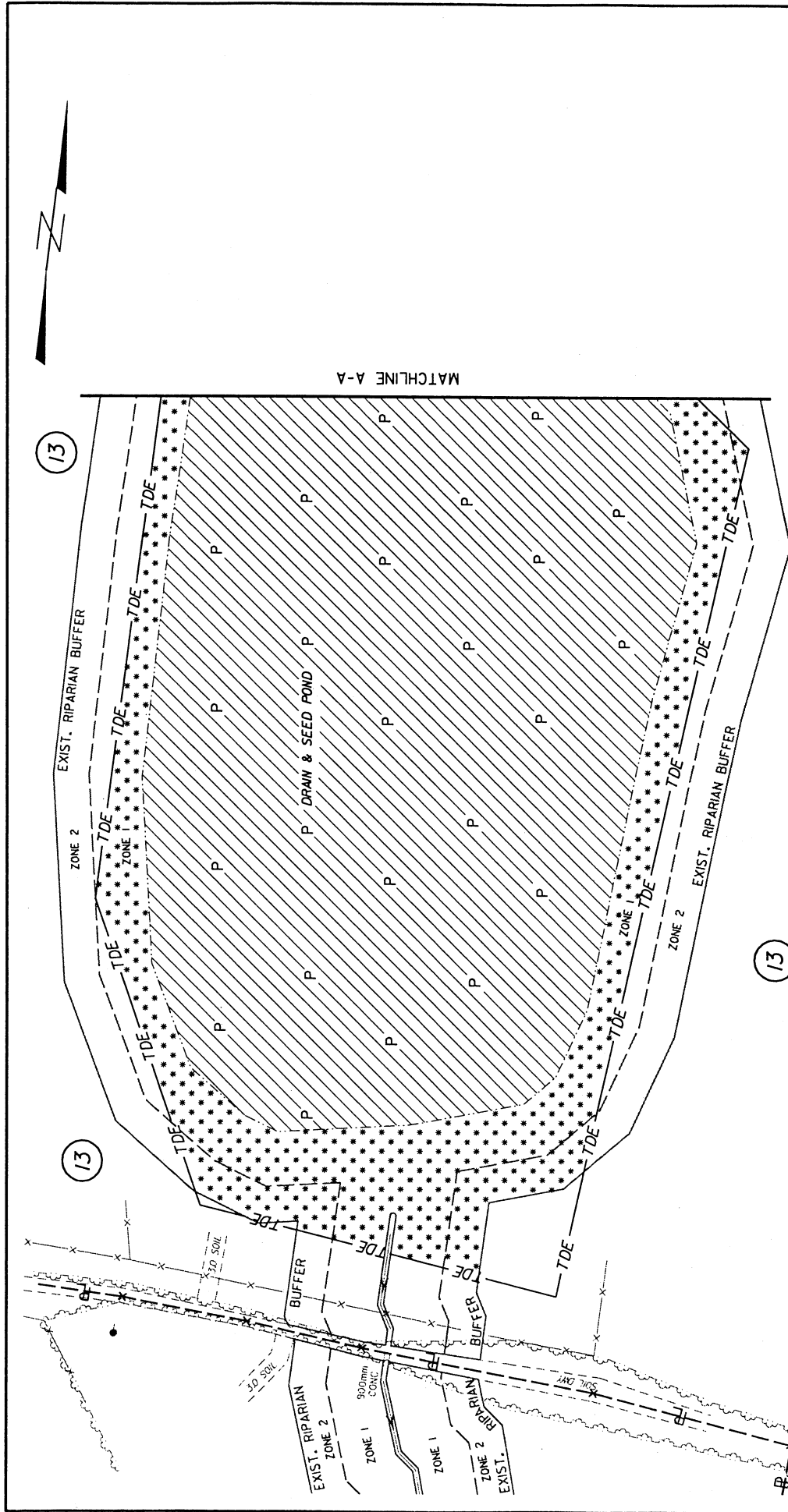


PROFILE SITE 7



N.C. DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
GUILFORD COUNTY

PROJECT: 8.U492101 (U-2524AC)
GREENSBORO WESTERN LOOP



PLAN VIEW SITE 8

- DENOTES MECHANIZED CLEARING
- DENOTES FILL IN SURFACE WATERS (POND)



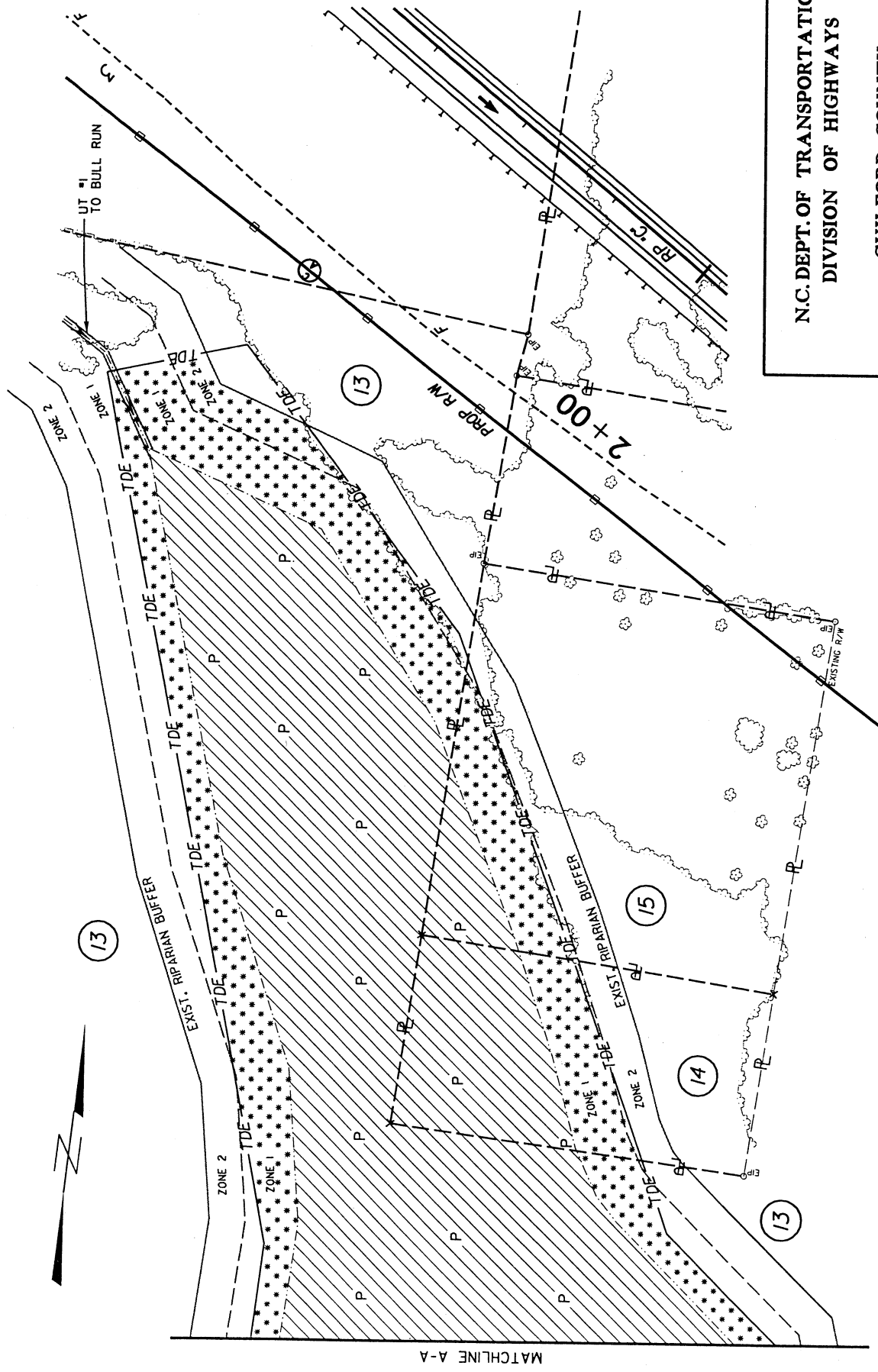
N.C. DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS

GUILFORD COUNTY



PROJECT: 8U492101 (U-2524AC)
GREENSBORO WESTERN LOOP

SHEET 12 OF 46

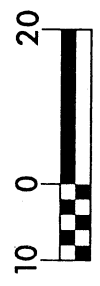
6/27/03



MATCHLINE A-A

- 
 DENOTES MECHANIZED CLEARING
- 
 DENOTES FILL IN SURFACE WATERS (POND)

PLAN VIEW SITE 8



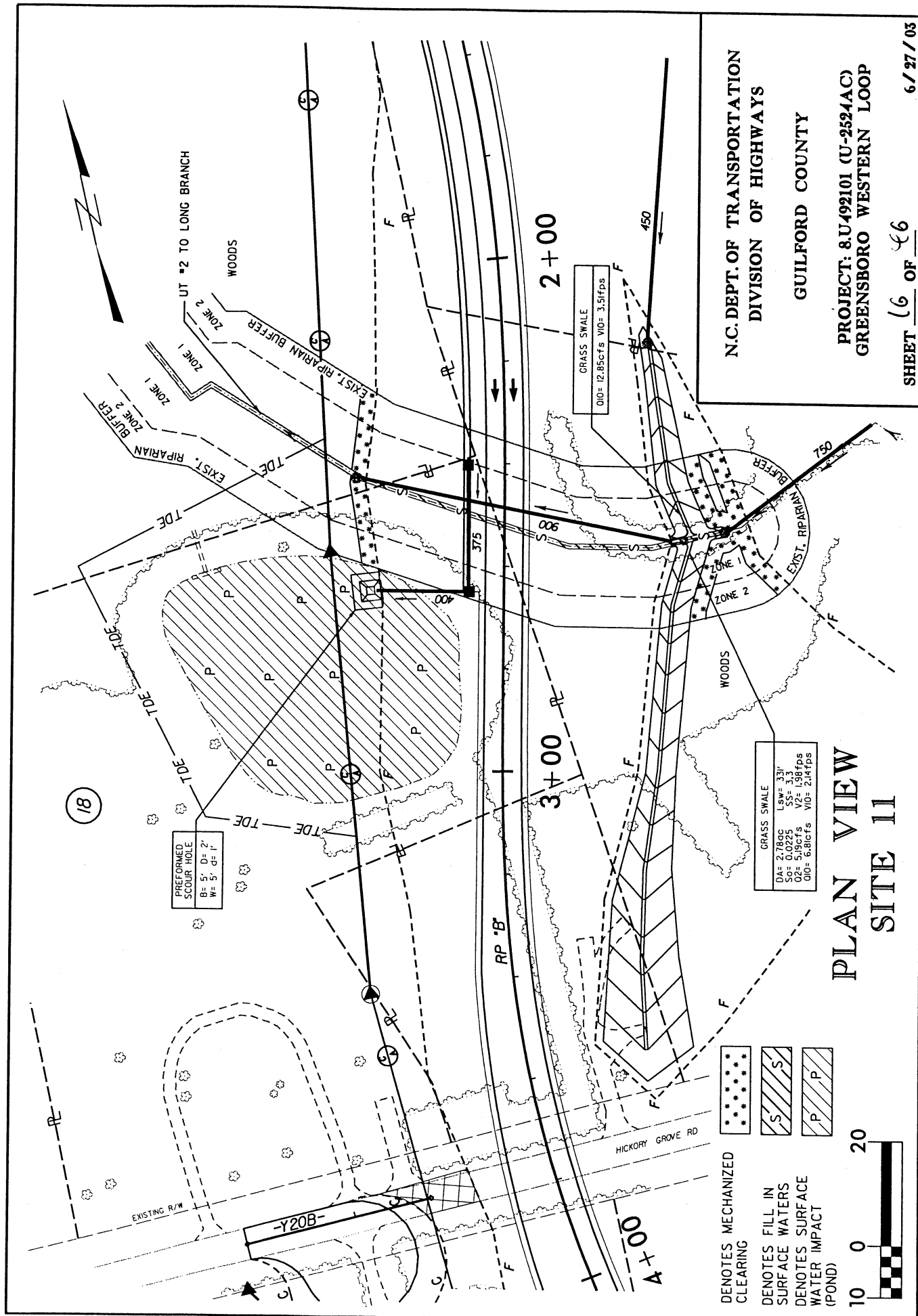
N.C. DEPT. OF TRANSPORTATION
 DIVISION OF HIGHWAYS

GUILFORD COUNTY

PROJECT: 8.U492101 (U-2524AC)
 GREENSBORO WESTERN LOOP

SHEET 13 OF 46

6/27/03



PLAN VIEW SITE 11

N.C. DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
GUILFORD COUNTY

PROJECT: 8.U492101 (U-2524AC)
GREENSBORO WESTERN LOOP

SHEET 66 OF 66 6/27/03

- DENOTES MECHANIZED CLEARING
- DENOTES FILL IN SURFACE WATERS
- DENOTES SURFACE WATER IMPACT (POND)



NCDOT Project No. 8.U492101
T.I.P. No. U-2524AC
Guilford County, NC
Greensboro-Western Loop from North of
Norfolk Southern Railroad to North of SR 1541.

NATURAL STREAM DESIGN
UNNAMED TRIBUTARY NO. 9 TO BULL RUN
Right of -L- Project Station 58+15

Prepared by:
TranSite Consulting Engineers, Inc.
1300 Paddock Dr., Suite G-10
Raleigh, NC 27609

NATURAL STREAM DESIGN
UNNAMED TRIBUTARY NO. 9 TO BULL RUN

Right of -L- Project Station 58+15

The construction of the Greensboro – Western Loop from North of Norfolk Southern Railroad to North of SR 1541 will require that a 0.21 hectare (0.51 acre) pond on Unnamed Tributary No. 9 (UT #9) be drained. Once drained, a 65 meter (213') stream will be constructed in the pond bottom. The stream will begin at the head of the drained pond and continue downstream to the inlet of a 1200mm (48") RCP. The proposed stream relocation is designed according to "natural channel" design principles by Dave Rosgen.

This tributary of Bull Run drains 14.4 hectares (35.6 acres) in Guilford County. Existing land use in the drainage basin is predominantly low density residential and undeveloped. The Guilford County Land Use Plan shows that future land use is low to medium density residential development.

There is no hydraulic gauge data available on this stream. Discharges were estimated using procedures outlined in USGS Water-Resources Report 96-4084, Estimation of Flood-Frequency Characteristics of Small Urban Watersheds in North Carolina.

EXISTING CHANNEL

The existing condition at the proposed stream relocation site is a 0.21 (0.51 acre) hectare pond with an average depth of 2 meters (6.5'). The pond will be drained prior to construction and the proposed stream constructed through the natural bottom.

REFERENCE REACH

Since the proposed relocation site is currently a pond, a "reference reach" was surveyed downstream of the pond outlet. The selected reach is located approximately 25 meters downstream of the pond outlet and is 100 meters in length. This reach was chosen because it represents the current natural stream conditions.

Based on field survey data gathered, this stream reach was classified as an E5 stream. The bed material for this reach was found to be a medium sand with some gravel. The HEC-RAS computer model was used to determine the hydraulic characteristics of the stream such as velocity, shear stress and stream power.

Design and morphological data for the Reference and Proposed streams are shown in the "Morphological Measurement Table".

PROPOSED CHANNEL

The proposed stream is designed to have an E5 classification. The gradient of the proposed stream is controlled by the tie to the head of the pond upstream and the inlet of the 1200mm (48") RCP downstream. The proposed stream is designed to have an average bankfull depth of 0.45 meters (1.5') and an average pool depth of 0.75m (2.5'). The natural banks of the existing pond will serve as the flood prone limits for the proposed stream.

Proposed stream stabilization is shown on the attached detail sheet and will be grass with coir fiber matting along the entire length of both banks. The flood prone limits and other disturbed areas will be stabilized with native woody vegetation. To aid in stability and reduce stream gradient, cross vane rock weirs with 0.3 meter (1.0') channel drops will be placed downstream of all meanders in the "glide section". In addition, rootwads will be

placed along the outside of the stream bends. The stream bottom will match the characteristics of the reference stream.

SEDIMENT TRANSPORT ANALYSIS

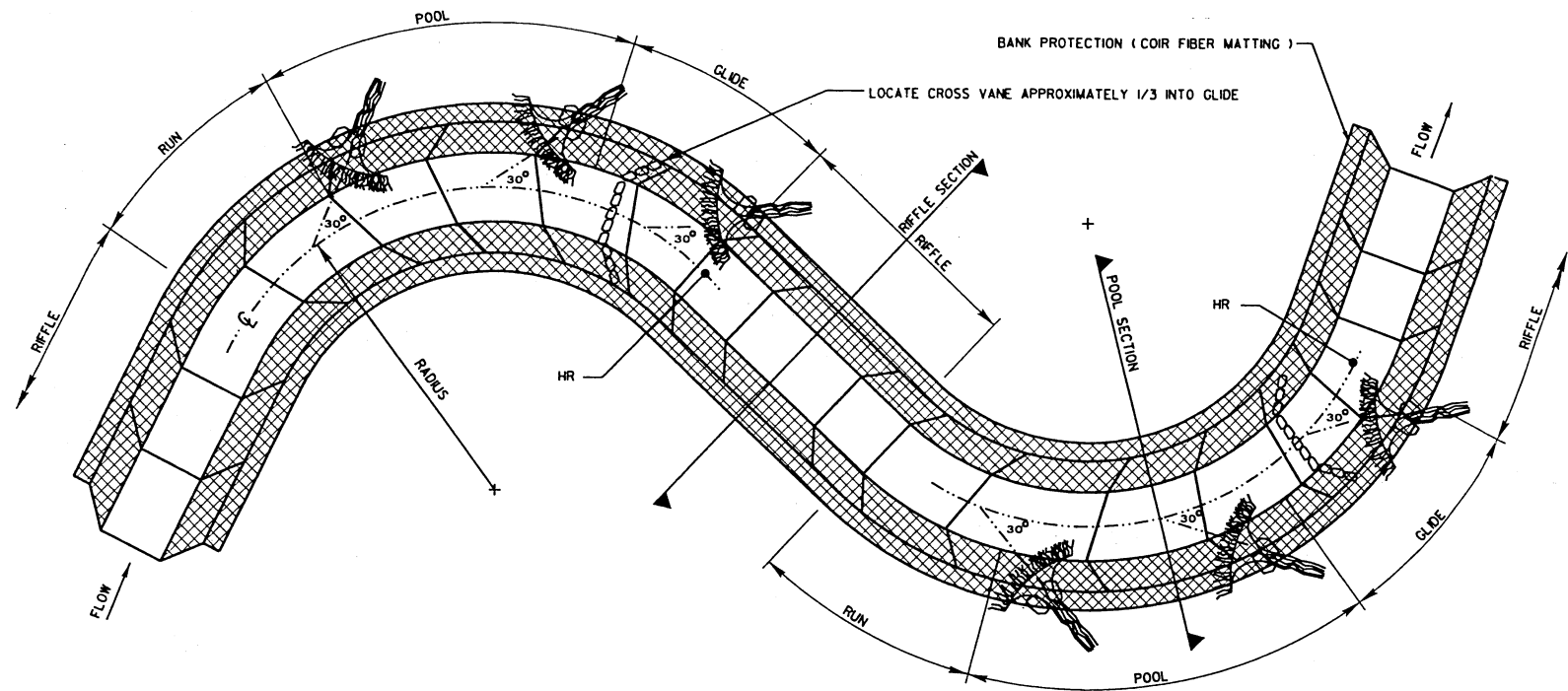
The proposed stream has a bankfull stream power of 3.15 lb/ft-s and a shear stress of 1.01 lb/ft² as compared to 4.74 lb/ft-s and 1.31 lb/ft² for the existing stream. While the proposed values are lower than those of the reference stream, they indicate that the proposed stream will transport the current sediment load without aggrading or degrading the stream bed or banks. Additionally, 2-yr and 10-yr velocities and shear stresses were evaluated and found to be within acceptable limits.

July 03

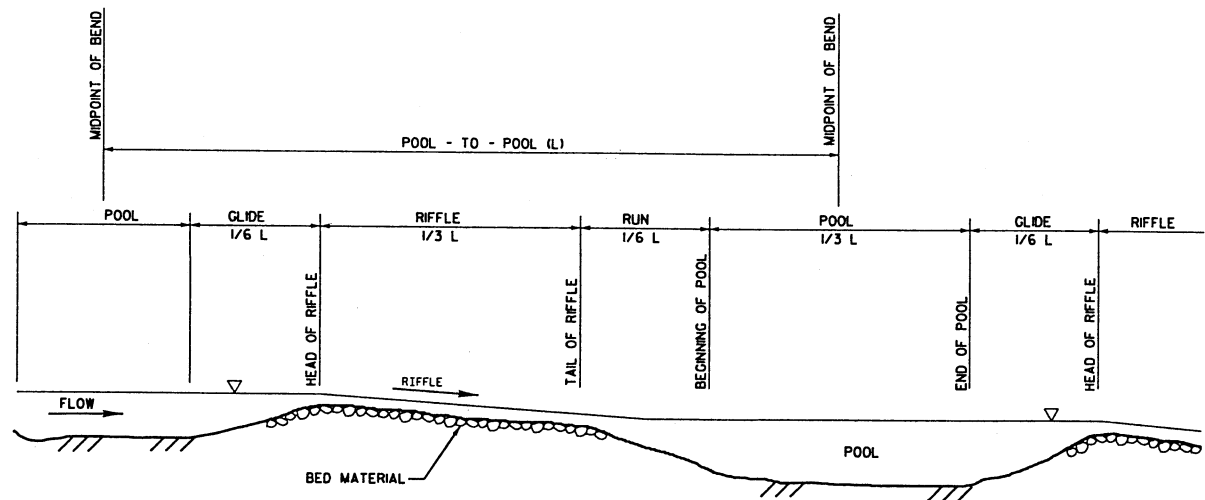
Appendix B

Morphological Measurement Table
U-2524AC, Guilford Co.Tip - Y-2524 AC
sheet 21 of 66

Variables	Existing Channel	Proposed Reach	USGS Station	Reference Reach
1. Stream Type	Pond	E5	-	E5
2. Drainage Area (D.A.)	14.4 ha / 35.6 ac	14.4 ha / 35.6 ac	-	14.4 ha / 35.6 ac
3. Bankfull Width (W_{bkt})	-	3.00 m / 9.84 ft	-	2.10 m / 6.89 ft
4. Bankfull Mean Depth (d_{bkt})	-	0.32 m / 1.03 ft	-	0.37 m / 1.20 ft
5. Width/Depth Ratio (W_{bkt}/d_{bkt})	-	9.55	-	5.74
6. Bankfull Cross-Sectional Area (A_{bkt})	-	0.94 m ² / 10.17 ft ²	-	0.77 m ² / 8.29 ft ²
7. Bankfull Mean Velocity (V_{bkt})	-	0.95 m/s / 3.13 ft/s	-	1.10 m/s / 3.62 ft/s
8. Bankfull Discharge (Q_{bkt})	-	0.90 m ³ /s / 31.8 ft ³ /s	-	0.85 m ³ /s / 30.0 ft ³ /s
9. Bankfull Max Depth (d_{mbkt})	-	0.45 m / 1.48 ft	-	0.60 m / 1.97 ft
10. Width of Floodprone Area (W_{fpa})	-	35.9 m / 117.86 ft	-	10.6 m / 34.9 ft
11. Entrenchment Ratio (W_{fpa}/W_{bkt})	-	11.97	-	5.07
12. Meander Length (L_m)	-	29.0 m / 95.1 ft	-	20.0 m / 65.6 ft
13. Ratio of Meander Length to Bankfull Width (L_m/W_{bkt})	-	9.67	-	9.52
14. Radius of Curvature (R_c)	-	4.10 m / 13.45 ft	-	5.75 m / 18.9 ft
15. Ratio of Radius of Curvature to Bankfull Width (R_c/W_{bkt})	-	1.37	-	2.74
16. Belt Width (W_{blt})	-	9.7 m / 31.8 ft	-	4.5 m / 14.8 ft
17. Meander Width Ratio (W_{blt}/W_{bkt})	-	3.23	-	2.14
18. Sinuosity (K) (stream length/valley length)	-	1.18	-	1.06
19. Valley Slope (VS)	-	2.00%	-	2.12%
20. Average Slope (CS)	-	1.69%	-	2.00%
21. Pool Slope	-	0.00%	-	0.00%
22. Ratio of Pool Slope to Average Slope	-	0.00	-	0.00
23. Maximum Pool Depth (dp_{max})	-	0.75 m / 2.46 ft	-	0.80 m / 2.63 ft
24. Ratio of Pool Depth to Average Bankfull Depth (dp/d_{bkt})	-	2.34	-	2.19
25. Pool Width (W_p)	-	3.9 m / 12.8 ft	-	4.0 m / 13.1 ft
26. Ratio of Pool Width to Bankfull Width (W_p/W_{bkt})	-	1.30	-	1.90
27. Pool to Pool Spacing	-	18.0 m / 59.0 ft	-	13.0 m / 42.7 ft (avg.)
28. Ratio of Pool to Pool Spacing to Bankfull Width	-	6.00	-	6.20
29. Ratio of Lowest Bnk Height to Bankfull Height (or Max Bankfull Depth) (Bh_{low}/d_{mbkt})	-	1.00	-	0.83



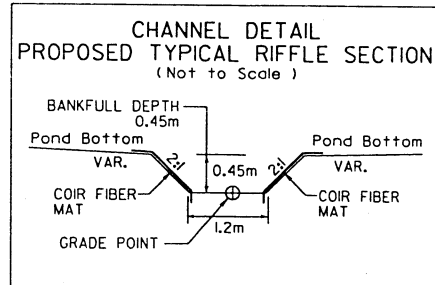
TYPICAL PLAN
NOT TO SCALE



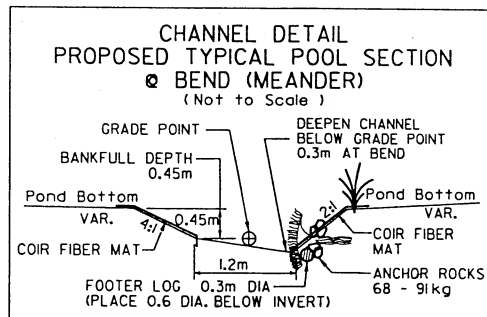
TYPICAL PROFILE
NOT TO SCALE

NOTES:

1. THE POOL TO POOL SPACING (L) SHALL BE MEASURED AS THE DISTANCE FROM THE MIDPOINT OF THE UPSTREAM BEND TO THE MIDPOINT OF THE DOWNSTREAM BEND.
2. REFER TO MORPHOLOGICAL MEASUREMENT TABLE AND PLAN SHEET FOR DIMENSIONS. NOTE THAT POOL TO POOL SPACING VARIES.

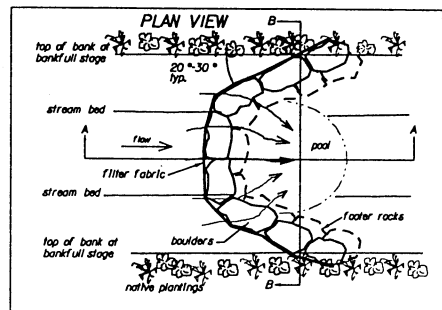
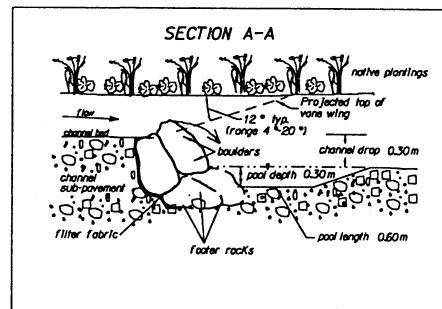
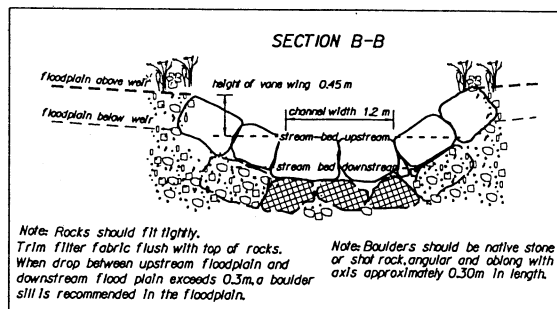


TYPICAL SECTION 1 BETWEEN BENDS



TYPICAL SECTION 2 AT BENDS

NATURAL CHANNEL DESIGN TYPICALS



CROSS VANE ROCK WEIR DETAILS

NOTES:

1. THE CONTRACTOR SHALL LAYOUT THE CHANNEL ALIGNMENT WHICH SHALL CONSIST OF STAKING OUT THE CENTER OF EACH RADIUS, SCRIBING THE CENTER LINE OF THE CHANNEL FOR EACH BEND USING THE INDICATED RADIUS, AND SCRIBING CENTERLINE OF THE TANGENT SECTIONS BY CONNECTING SUCCESSIVE BENDS WITH STRAIGHT LINE. $R_i = \pm 4.10 \text{ m} / 13.45 \text{ ft}$.
2. FIELD ADJUSTMENTS OF THE ALIGNMENT MAY BE REQUIRED TO AVOID CERTAIN OBSTACLES. APPROVAL BY THE ENGINEER OF THE STAKE-OUT ALIGNMENT SHALL BE REQUIRED PRIOR TO INITIATION OF THE CONSTRUCTION OF THE CHANNEL.
3. LOCATE ROCK VANES ACCORDING TO PLAN SHEET.
4. NUMBER OF ROOTWADS INSTALLED TO BE DETERMINED ON SITE.
5. ROOTWADS TO BE SPACED 4x DIAMETER OF ROOT BASE.
6. FOOTER LOG ANCHOR ROCK TO BE PLACED ON THE DOWNSTREAM END OF EACH FOOTER LOG SO THAT IT IS LEANING AGAINST THE LOG ON THE SIDE AWAY FROM THE CHANNEL.
7. WHEN BACKFILLING OVER AND AROUND FOOTER LOGS, ROOTWAD LOGS AND ANCHOR ROCKS FIRMLY SECURE ALL COMPONENTS INCLUDING JOINTS, CONNECTIONS AND GAPS.
8. PLANTINGS SHOULD BE PLACED ABOVE BANKFULL DEPTH.

MORPHOLOGICAL MEASUREMENT TABLE

VARIABLES	EXISTING CHANNEL	PROPOSED REACH	USGS STATION	REFERENCE REACH
1) STREAM TYPE	POND	E5	-	E5
2) DRAINAGE AREA	14.4 ha / 35.6 ac	14.4 ha / 35.6 ac	-	14.4 ha / 35.6 ac
3) BANKFULL WIDTH	-	3.00 m / 9.84 ft	-	2.00 m / 6.59 ft
4) BANKFULL MEAN WIDTH	-	0.32 m / 1.03 ft	-	0.37 m / 1.20 ft
5) WIDTH/DEPTH RATIO	-	9.55	-	5.74
6) BANKFULL CROSS-SECTIONAL AREA	-	0.94 sq m / 10.17 sq ft	-	0.77 sq m / 8.29 sq ft
7) BANKFULL MEAN VELOCITY	-	0.95 m/s / 3.13 fps	-	1.10 m/s / 3.62 fps
8) BANKFULL DISCHARGE	-	0.90 cms / 31.8 cfs	-	0.85 cms / 30.0 cfs
9) BANKFULL MAX DEPTH	-	0.45 m / 1.48 ft	-	0.60 m / 1.97 ft
10) WIDTH OF FLOODPRONE AREA	-	35.9 m / 117.86 ft	-	10.6 m / 34.9 ft
11) ENTRENCHMENT RATIO	-	8.97	-	5.07
12) MEANDER LENGTH	-	29.0 m / 95.1 ft	-	20.0 m / 65.6 ft
13) RATIO OF MEANDER LENGTH TO BANKFULL WIDTH	-	9.67	-	9.52
14) RADIUS OF CURVATURE	-	4.10 m / 13.45 ft	-	5.75 m / 18.9 ft
15) RATIO OF RADIUS OF CURVATURE TO BANKFULL WIDTH	-	1.37	-	2.74
16) BELT WIDTH	-	9.7 m / 31.8 ft	-	4.5 m / 14.8 ft
17) MEANDER WIDTH RATIO	-	3.23	-	2.14
18) SINUOSITY (STREAM LENGTH/VALLEY LENGTH)	-	1.18	-	1.06
19) VALLEY SLOPE	-	2.00%	-	2.12%
20) AVERAGE SLOPE	-	1.69%	-	2.00%
21) POOL SLOPE	-	0.00%	-	0.00%
22) RATIO OF POOL SLOPE TO AVERAGE SLOPE	-	0.00	-	0.00
23) MAXIMUM POOL DEPTH	-	0.75 m / 2.46 ft	-	0.80 m / 2.63 ft
24) RATIO OF POOL DEPTH TO AVERAGE BANKFULL DEPTH	-	2.34	-	2.19
25) POOL WIDTH	-	3.9 m / 12.8 ft	-	4.0 m / 13.1 ft
26) RATIO OF POOL WIDTH TO BANKFULL WIDTH	-	1.30	-	1.90
27) POOL TO POOL SPACING	-	18.0 m / 59.0 ft	-	13.0 m / 42.7 ft (avg)
28) RATIO OF POOL TO POOL SPACING TO BANKFULL WIDTH	-	6.00	-	6.20
29) RATIO OF LOWEST B.L. HEIGHT TO BANKFUL HGT. @ MAX BANKFULL DEPTH	-	1.00	-	0.83

N.C. DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS

GUILFORD COUNTY

PROJECT: 8.U292101 (U-2524AC)
GREENSBORO-WESTERN LOOP

NCDOT Project No. 8.U492101
T.I.P. No. U-2524AC
Guilford County, NC
Greensboro-Western Loop from North of
Norfolk Southern Railroad to North of SR 1541.

**STORMWATER MANAGEMENT
PLAN**

Prepared by:
TranSite Consulting Engineers, Inc.
1300 Paddock Dr., Suite G-10
Raleigh, NC 27609

July 03

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PROJECT INVOLVEMENT

The proposed project is 4.07 kilometers (2.54 miles) in length and will construct a portion of the Greensboro-Western Loop from North of Norfolk Southern Railroad to North of SR 1541 on new location including and interchange at SR-1541 (Wendover Avenue). The project also includes relocating a portion of existing SR-4126 (Bridford Parkway) and widening existing SR-1541 (Wendover Avenue). The Greensboro-Western Loop will be an eight-lane divided facility with grassed medians and predominantly grass swales left and right. In high fill sections, concrete expressway gutter will be utilized.

The proposed project contains one crossing of Bull Run, five crossings of Unnamed Tributaries to Bull Run and one crossing of an Unnamed Tributary to Long Branch. Bull Run and Long Branch are tributaries to Randleman Lake. See Table 1 for a detailed list of the streams and proposed crossings.

Table 1. Stream Crossings

Stream Name	Drainage Area	DEM Classification	Proposed Structure
UT #9 to Bull Run	35.6 acres	WS-I	1 @ 48" RCP
UT #7 to Bull Run	30.6 acres	WS-I	1 @ 42" RCP
UT #6 to Bull Run	24.2 acres	WS-I	1 @ 42" RCP
UT #5 to Bull Run	29.9 acres	WS-I	1 @ 42" RCP
UT #4 to Bull Run	58.9 acres	WS-I	1 @ 54" RCP
Bull Run	0.57 mi ²	WS-I	2 @ 8' x 7' RCBC
UT #2 to Long Branch	20.4 acres	WS-I	1 @ 36" RCP

UT – Unnamed Tributary

In accordance with 15A NCAC 02B .0248, "All waters of the Randleman Lake (Deep River) water supply watershed are classified for water supply uses and designated by the Environmental Management Commission as a Critical Water Supply Watershed pursuant to G.S. 143-214.5(b).

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Tip 4-2524AC
Sheet 24046

Based on the Division of Environmental Management (DEM) Classifications of the impacted streams, all of the sites listed in Table 1 require "Special Consideration".

POTENTIAL IMPACTS

The project is located within the City of Greensboro Corporate Limits and Unincorporated areas of Guilford County. The project is located entirely within the drainage basin of the Randleman Lake and is therefore subject to the requirements of 15A NCAC 2B .0250, Randleman Lake Water Supply Watershed; Protection and Maintenance of Riparian Areas. The purpose of these rules are to protect and preserve the riparian buffers along all streams that drain into the Randleman Lake and maintain their nutrient removal functions.

The Randleman Buffer Rules require that a 50-foot wide riparian buffer directly adjacent to surface waters that drain into the Randleman Reservoir be maintained. The Rule also requires that concentrated runoff from new ditches or manmade conveyances be converted to diffused flow before the runoff enters the riparian buffer.

BEST MANAGEMENT PRACTICES (BMPs)

As noted in Table 1, the proposed project contains seven jurisdictional stream crossings. All seven crossings meet the requirements of 15A NCAC 2B .0251 requiring treatment of stormwater runoff. The following discusses each Site and its proposed BMPs:

Site 1 – UT #9 to Bull Run (-L- Sta. 58+20)

The proposed work at Site 1 involves construction of -L- on new location, a 1 @ 48" RCP and 213 linear feet of natural stream through the drained pond. To facilitate formation of a natural stream bed through the pipe, the upstream and downstream inverts will be buried a minimum of 0.5'. The natural stream is designed in accordance with Rosgen techniques for natural stream design and has an E5 Stream Classification. Based on "Level Spreader" design criteria in Forested Areas, the Northwest, Southwest and Southeast quadrants surrounding the existing and proposed streams have natural ground slopes through the buffer in excess of 6% and therefore are not suitable for installation of level spreaders. In the Northeast quadrant, the natural ground is

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SWMP-2

Tip# U-252 FAC

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grassed but the slope through the buffer exceeds the 8% threshold for level spreaders. Since level spreader design criteria can not be met, grass swales, enhanced grass swales and pre-formed scour holes will be used to provide treatment of stormwater.

Site 2 – UT #7 to Bull Run (-L- Sta. 62+02)

The proposed work at Site 2 involves construction of -L- on new location and a 1 @ 42" RCP. To facilitate formation of a natural stream bed through the pipe, the upstream and downstream inverts will be buried a minimum of 0.5'. No runoff from the proposed roadway is discharged into this stream.

Site 2 – UT #6 to Bull Run (-L- Sta. 63+42)

The proposed work at Site 2 involves construction of -L- on new location and a 1 @ 42" RCP. To facilitate formation of a natural stream bed through the pipe, the upstream and downstream inverts will be buried a minimum of 0.5'. Based on "Level Spreader" design criteria in Forested Areas, the Northeast, Northwest, Southwest and Southeast quadrants surrounding the stream have natural ground slopes through the buffer in excess of 6% and therefore are not suitable for installation of level spreaders. Additionally, in the Southeast quadrant an offsite drainage feature has been relocated to the toe of fill. Since level spreader design criteria can not be met, grass swales, enhanced grass swales and a pre-formed scour hole will be used to provide treatment of stormwater.

Site 3 – UT #5 to Bull Run (-L- Sta. 66+15)

The proposed work at Site 2 involves construction of -L- on new location and a 1 @ 42" RCP. To facilitate formation of a natural stream bed through the pipe, the upstream and downstream inverts will be buried a minimum of 0.5'. In the Northeast and Southeast quadrants, offsite drainage features preclude the use of level spreaders. In the Northwest and Southwest quadrants, irregular natural topography is not suitable for level spreaders. Since level spreader design criteria can not be met, grass swales and a preformed scour hole will be used to provide treatment of stormwater.

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Site 4 – UT #5 to Bull Run (-L- Sta. 74+74)

The proposed work at this location involves the construction of -L- on new location and a 1 @ 54" RCP. To facilitate formation of a natural stream bed through the pipe, the upstream and downstream inverts will be buried a minimum of 0.5'. In the Northwest and Southwest quadrants, the presence of existing right of way for the extension of Ruffin Road precludes the use of level spreaders. In the Northeast and Southeast quadrants, irregular natural topography is not suitable for level spreaders. Since level spreader design criteria can not be met, grass swales will be used to provide treatment of stormwater.

Site 7 – Bull Run (-L- Sta. 80+61)

The proposed work at this location involves the construction of -L- on new location and a 2 @ 8' x 7' RCBC. The RCBC inverts will be buried a minimum of 1.0' upstream and downstream to facilitate formation of a natural stream bed through the RCBC length. Additionally, a 2.0' concrete sill in the left RCBC barrel restricts daily and low flows to the right barrel. In the Northwest and Southwest quadrants, irregular natural topography and the presence of Ruffin Road preclude the use of level spreaders. In the Northeast and Southeast quadrants, irregular natural topography also precludes the use of level spreaders. Since level spreader design criteria can not be met, grass swales and preformed scour holes will be used to provide treatment of stormwater.

Site 11 – UT #2 to Long Branch (-RPB- Sta. 2+52)

The proposed work at this location involves the construction of Ramp B on new location and a 1 @ 36" RCP. To facilitate formation of a natural stream bed through the pipe, the upstream and downstream inverts will be buried a minimum of 0.5'. The Northeast and Southeast quadrants are located within the proposed interchange and are not suitable for installation of level spreaders. In the Southwest quadrant, the slope of natural ground through the buffer is in excess of 6% and therefore are not suitable for installation of level spreaders. Since level spreader design criteria can not be met, grass swales and a preformed scour hole will be used to provide treatment of stormwater.

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See Table 2 for a detailed list of the BMP locations.

DESIGN DETAILS

Design details for the enhanced grass swales, variable width base ditches and preformed scour holes are shown on the Roadway Design plans.

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SWMP-5

Tip # U-2524AC

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Table 2. BMP Locations

BMP	Location	Plan Sheet
Enhanced Grass Swale	-L- 58+25 to 59+20 (Lt)	4, 5
	-L- 63+80 to 64+80 (Lt)	6
Grass Swale	-L- 57+00 to 57+80 (M)	4
	-L- 57+80 to 59+20 (M)	4, 5
	-L- 59+20 to 60+80 (M)	5
	-L- 61+70 to 63+55 (M)	5, 6
	-L- 63+55 to 63+80 (M)	6
	-L- 63+80 to 64+80 (M)	6
	-L- 64+80 to 66+49 (M)	6, 7
	-L- 66+49 to 66+90 (M)	7
	-L- 66+90 to 68+40 (M)	7
	-L- 68+40 to 70+20 (M)	7, 8
	-L- 71+58 to 73+00 (M)	8, 9
	-L- 73+00 to 74+00 (M)	9
	-L- 74+00 to 74+65 (M)	9
	-L- 74+65 to 74+90 (M)	9
	-L- 74+90 to 76+25 (M)	9, 10
	-L- 75+10 to 76+25 (Lt)	9, 10
	-L- 75+30 to 76+25 (Rt)	9, 10
	-L- 76+25 to 77+21 (Lt)	10
	-L- 76+25 to 77+29 (M)	10
	-L- 76+25 to 77+36 (Rt)	10
	-L- 77+60 to 79+68 (Lt)	10, 11
	-L- 77+65 to 79+68 (M)	10, 11
	-L- 77+70 to 79+68 (Rt)	10, 11
	-L- 79+68 to 80+10 (Lt)	11
	-L- 79+68 to 81+30 (M)	11
	-L- 79+68 to 79+90 (R)	11
	-L- 81+30 to 81+80 (M)	11
	-L- 81+80 to 83+28 (M)	11, 12
	-L- 91+70 to 94+70 (M)	14
	-L- 92+40 to 93+66 (Rt)	14
	-L- 94+70 to 95+50 (M)	14
	-L- 95+50 to 95+65 (M)	14
	-RPA- 1+02 to 2+48 (Lt)	14
	-RPB- 2+55 to 3+56 (Lt)	14

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SWMP-6

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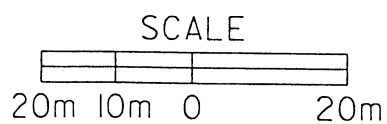
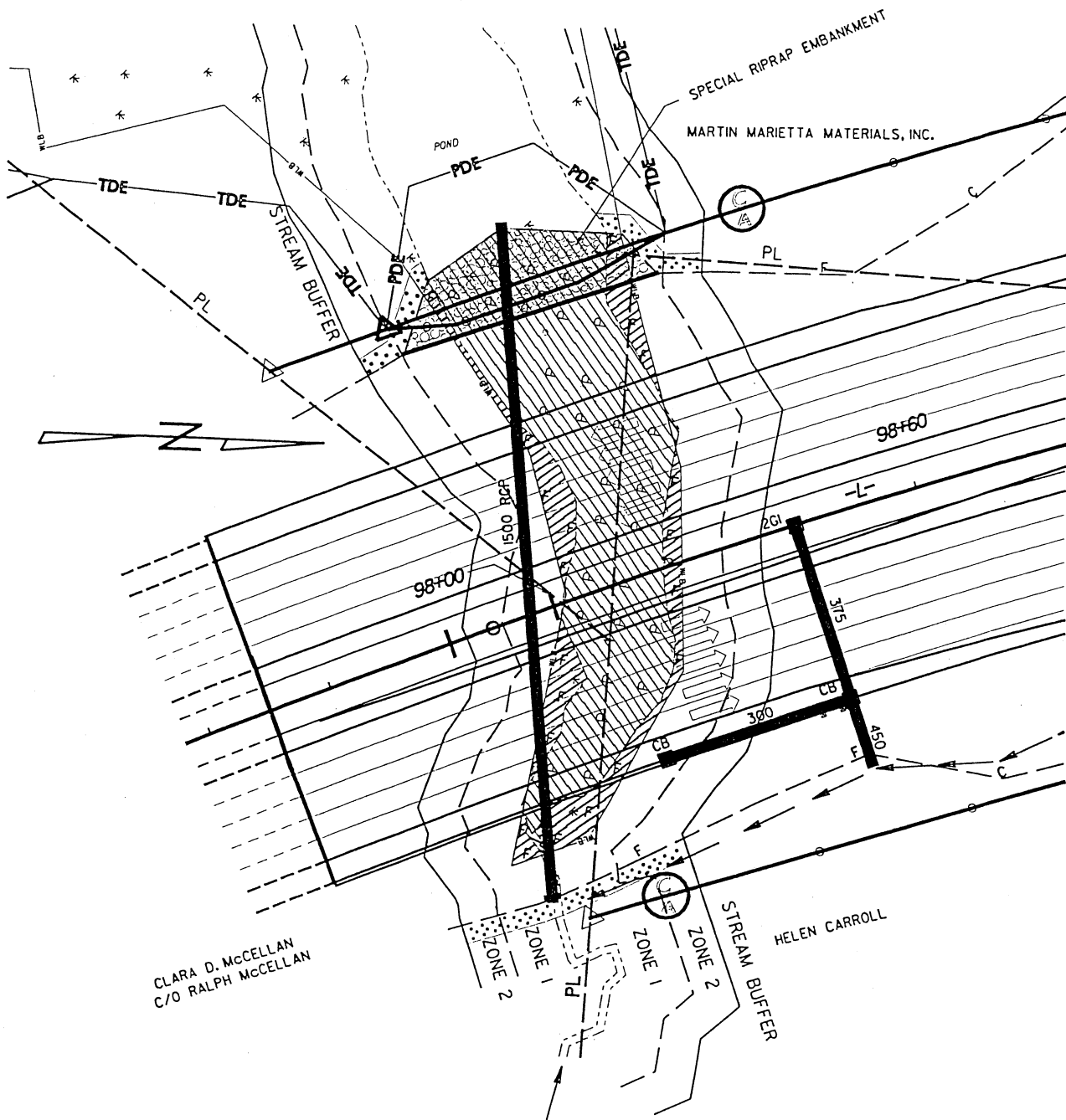
Table 2. BMP Locations (Cont.)

Pre-formed Scour Holes	-L- 57+20 (Lt)	4
	-L- 64+40 (Rt)	6
	-L- 80+35 (Rt)	11
	-L- 87+37 (Lt)	11
	-RPB- 2+65 (Rt)	14
Natural Stream Design	-L- 10+46 to 11+23 (Lt)	4

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SWMP-7

Tip# A-2524AC
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- DENOTES FILL IN WETLAND
- DENOTES FILL IN SURFACE WATER
- DENOTES FILL IN SURFACE WATER (POND)
- DENOTES MECHANIZED CLEARING

SITE #1 BA

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GUILFORD COUNTY

8.U492 101

U-2524 AC

SCALE AS SHOWN

SHEET 31 OF 46

JULY 2003

MATCHLINE

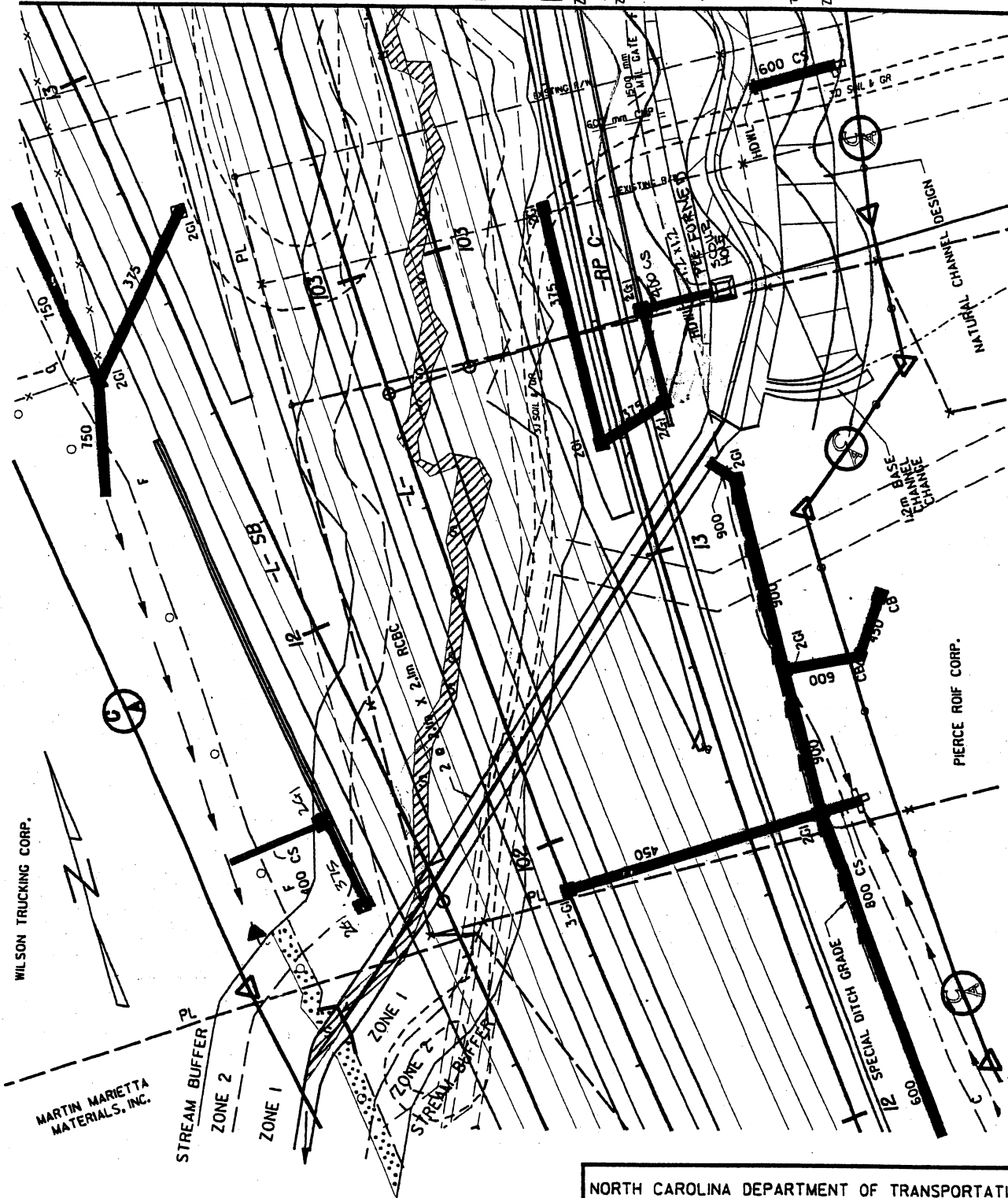
ZONE 2

ZONE 1

FUTURE
BUFFER

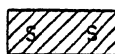
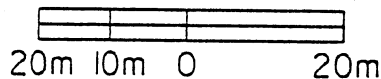
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ZONE 2

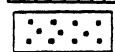


SITE 2 BA

SCALE



DENOTES FILL IN
SURFACE WATER



DENOTES MECHANIZED
CLEARING

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS

GUILFORD COUNTY

8.U492 101

U-2524AC

GREENSBORO WESTERN URBAN LOOP

SCALE AS SHOWN

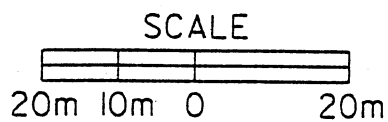
SHEET 32 OF 46

REVISED

6/30/03

[illegible]

SITE 2BA



 DENOTES FILL IN SURFACE WATER

SHEET 33 OF 46

REVISED
6/30/03

MATCHLINE 3

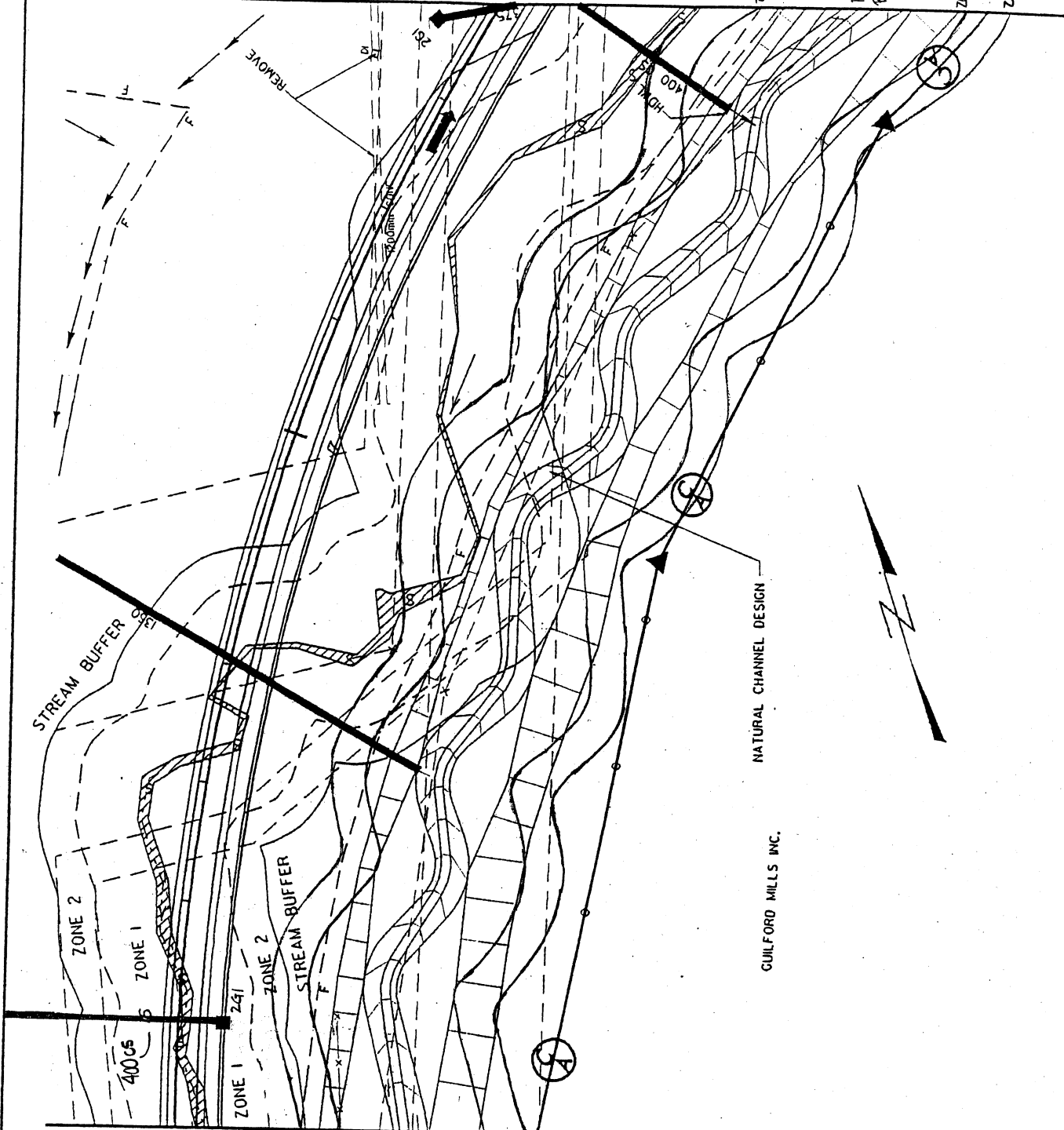
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ZONE 1

FUTURE
BUFFER

ZONE 1

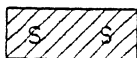
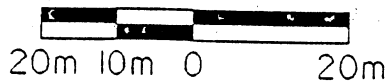
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MATCHLINE 2

SITE 2 BA

SCALE



DENOTES FILL IN
SURFACE WATER

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS

GUILFORD COUNTY

8.U492101

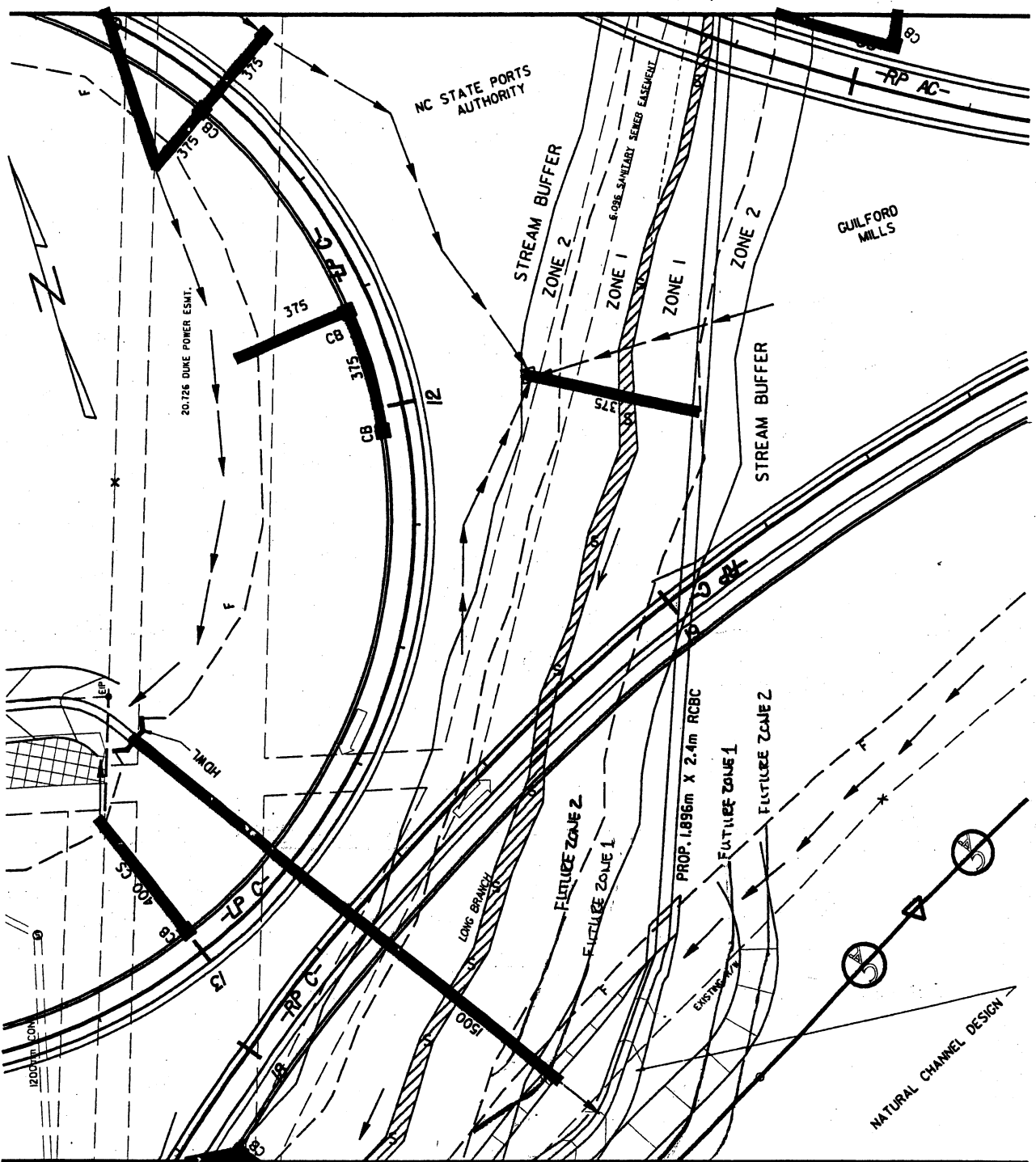
U-2524^{AC}

GREENSBORO WESTERN URBAN LOOP

SCALE AS SHOWN

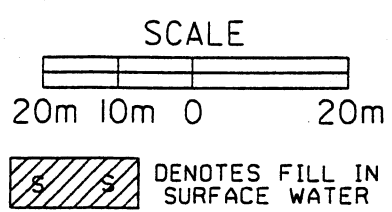
SHEET 34 OF 46

REVISED
6/30/03



MATCHLINE 3

SITE 2 BA



NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GUILFORD COUNTY
8.U492 101
GREENSBORO WESTERN URBAN LOOP
U-2524 AC
SCALE AS SHOWN
SHEET 35 OF 46
REVISED
6/30/03

ITEM	EXISTING STREAM	REFERENCE STREAM	PROPOSED RELOCATION
STREAM NAME	LONG BRANCH	N/A	LONG BRANCH
DRAINAGE AREA (DA)	166 ha.		166 ha.
CHANNEL SLOPE (S)	.0065		.0068
BANKFUL WIDTH (W_{bkr})	2.76M		4.40M
MEAN DEPTH (d_{bkr})	0.66M		0.44M
BANKFUL X-SECTION AREA (A_{bkr})	1.81M ²		1.92M ²
WIDTH/DEPTH RATIO (W_{bkr}/d_{bkr})	4.18		10.0
Maximum DEPTH (d_{mbkr})	0.76M		0.60M
WIDTH Flood-Prone Area (W_{fpa})	40.7M		17.4M
ENTRENCHMENT RATIO (ER)	14.75		3.95
CHANNEL MATERIALS: D50	3mm		3mm
SINUOSITY (K)	1.15		1.05
MEANDERS:			
AVG. LENGTH	12.5M		40.0M
AVG. AMPLITUDE	3.87M		8.0M
AVG. RADIUS	10.0M		10.0M
DISCHARGES:			
Q BANKFULL	2.70cms		2.65cms
Q2	3.73cms		8.94cms
Q10	9.25cms		17.85cms
VELOCITY:			
V BANKFULL	0.43M/S		0.58M/S
V2	0.44M/S		0.91M/S
V10	0.57M/S		1.08M/S
CLASSIFICATION	E3		E3

STREAM DESCRIPTION AND CLASSIFICATION DATA

SITE #2 **BA**

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS

GUILFORD COUNTY

8.U492101

U-2524 **AC**

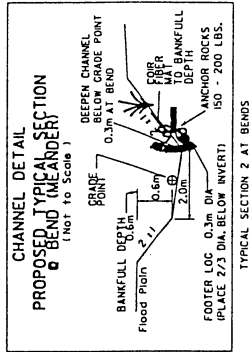
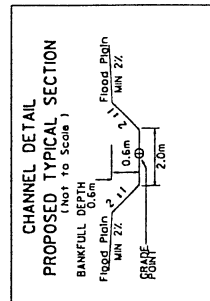
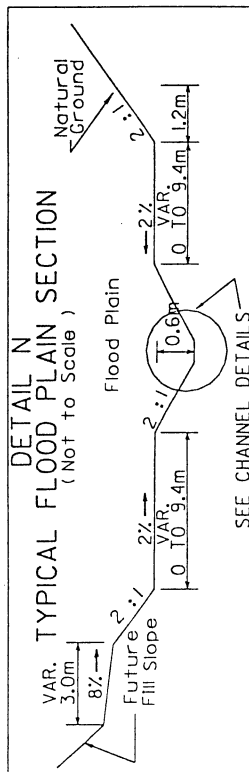
GREENSBORO WESTERN URBAN LOOP

SCALE AS SHOWN

SHEET **36** OF **46**

JULY 2003

NATURAL CHANNEL DESIGN TYPICALS



TYPICAL SECTION 1 BETWEEN BENDS

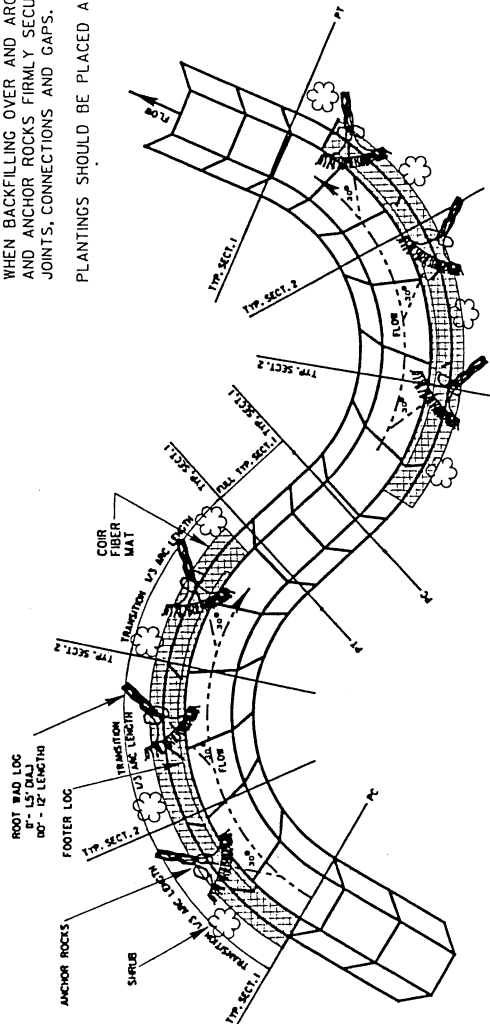
TYPICAL SECTION 2 AT BENDS

NOTES:

- NUMBER OF ROOTWADS INSTALLED TO BE DETERMINED ON SITE
- ROOTWADS TO BE SPACED 4x DIAMETER OF ROOT BASE
- FOOTER LOG ANCHOR ROCK TO BE PLACED ON THE DOWNSTREAM END OF EACH FOOTER LOG SO THAT IT IS LEANING AGAINST THE LOG ON THE SIDE AWAY FROM THE CHANNEL.

WHEN BACKFILLING OVER AND AROUND FOOTER LOGS, ROOTWAD LOGS AND ANCHOR ROCKS FIRMLY SECURE ALL COMPONENTS INCLUDING JOINTS, CONNECTIONS AND GAPS.

PLANTINGS SHOULD BE PLACED ABOVE BANKFULL DEPTH



CHANNEL PLAN VIEW LONG BRANCH SITE 23A

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS

GUILFORD COUNTY

8.U492101

U-2524

GREENSBORO WESTERN URBAN LOOP

SCALE AS SHOWN

SHEET 37 OF 46

July 2003

U-2524 AC (SITE 1 BA + 2 BA)
Revisions for Randleman Buffer (STORMWATER)
June 10, 2003

Site 1BA

- 1) Special ditch grade right of -L- from station 98+40 to 99+20 was eliminated.
- 2) Run off collected at structure #3 meets grass swale criteria. See attached chart.
- 3) Outlet ditch for structure #2 has been widened and flattened with 3:1 side slopes to meet grass swale criteria. In doing so, this eliminates the need for rip rap. See attached chart. Due to the steep terrain at the site, a pre-formed scour hole was not practical. However, the ditch is designed to stop short of the buffers where the water will head up and sheet flow out of the ditch.

Site 2BA

- 1) Ditch left of 12+00 -LSB-...all runoff (structures #19-24) is treated prior to entering ditch except structure #15. See attached chart. A box was added at station ~~11+70 -LSB-~~ to tie to Structure #15 and discharge outside of the buffer. Due to the size of the drainage area and slope, the rip rap could not be eliminated from this ditch.
- 2) -RPC- 13+20 right... Topography would not allow for this system to discharge to the left into the gore area. Therefore, a box was added to allow for discharge to be directed into a pre-formed scour hole at the pipe outlet in the floodplain of the stream.
- 3) -RPC- 14+20 right... Topography would not allow for this system to discharge to the left into the gore area. Therefore, a pre-formed scour hole was placed at the pipe outlet in the floodplain of the stream.
- 4) Structure #27 (-RPC- 16+00)...outlet pipe was revised to cross under -RPC- into the gore area where grass swale criteria is met. See attached chart.
- 5) Per Jenny Fleming, gore area between -RPC- and -LNB- was tightened up previously, under Abdul Rahmani's direction, to fit stream between -RPC- and hill. This eliminated 3000' of culvert at this site.

U-2524 AC (SITES 1BA & 2BA)
(metric)

Permit Site #	Str. #	DA (ha)	required treatment length (m)	actual treatment length (m)	M 1	M 2	Base (m)	Slope	Q2 (cms)	V2 (m/s)	Q10 (cms)	Stable?
1BA	3	0.51	38.4	40+	6	6	0.0	0.02474	0.080	0.34	0.100	Y
	2 outlet	0.34	25.4	30.0	3	3	2.4	0.03	0.230	0.44	0.300	Y
2BA	15**	0.09	7.1	12.0**	2**	2**	1.0	0.016667	0.028	0.63**	0.036	Y
	19	0.15	11.3	85.0	3	3	0.0	0.0133	0.040	0.24	0.047	Y
	20	0.14	10.5	60.0	6	10	0.0	0.0142	0.030	0.13	0.044	Y
	21	0.10	7.5	22.0	4	10	0.0	0.006	0.030	0.09	0.040	Y
	22	0.69	52.0	144.0	3	3	0.0	0.0121	0.150	0.46	0.190	Y
	23	0.44	33.1	140.0	6	6	0.0	0.01	0.100	0.25	0.130	Y
	24	0.38	28.6	220.0	6	6	0.0	0.025778	0.090	0.39	0.110	Y
	27	0.20	15.1	75.0	3	3	0.0	0.007467	0.060	0.23	0.080	Y

* Pre-formed scour holes were placed at the outlet of structure # 16A and 26 in the floodplain of stream.
Topographical constraints will not allow the systems to be discharged to the left into the gore area.

** Structure #15 outlet ditch has 2:1 side slopes and is lined with rip rap.

Project No. 8.U492101 (U-2524AC)
Property Owner List
For
Each Wetland Site

Site NO.	Station	No.	Name	Address
1	-L- 57+80 Lt to -L- 58+06 Lt	(1)	Franklin M. Campbell	2513 E. Woodlan Way Greensboro, NC 27407-5003
	-L- 57+78 Lt to -L- 58+57 Rt.	(2)	Peggy W. Smith Partnership	6605 Arcadiz Rd. Columbia, SC 29206
2	-L- 61+80 Rt. to -L- 62+15 Lt.	(3)	NCDOT	P.O. Box 20521 Raleigh, NC 27611
	-L- 62+12 Lt. to -L- 62+32 Lt.	(4)	Southern Bell	Britt Properties Attn: Meldona Britt Hwy. 200 South Stanfield, NC 28163
	-L- 63+38 Lt. to -L- 63+50 Lt.	(5)	Robert P. Schultheis & Merlyn O. Schultheis	5010 Hilltop Rd. Greensboro, NC 27407
	-L- 63+38 Rt. to -L- 63+72 Rt.	(6)	Stanley Road Baptist Church, Inc.	2500 Stanley Rd. Greensboro, NC 27407
3	-L- 65+58 Rt. to -L- 66+14 Rt.	(7)	Wiley A. Sykes	820 Larkwood Dr. Greensboro, NC 27415
	-L- 66+12 Rt. to -L- 66+55 Lt.	(8)	Ms. Harry L. Hennis, Widow	5955 Church Wood Dr. Greensboro, NC 27407
4	-L- 69+78 Rt. to -L- 70+84 Rt.	(9)	Fred E. Hodgkin & Ruth A. Hodgkin	2225 Mowbray Tr. Greensboro, NC 27407
5	-L- 68+92 Lt. to -L- 74+25 Rt.	(9)	Fred E. Hodgkin & Ruth A. Hodgkin	2225 Mowbray Tr. Greensboro, NC 27407
6	-L- 74+69 Lt. to -L- 74+84 Rt.	(10)	NCDOT	P.O. Box 20521 Raleigh, NC 27611

(continued)

N.C. DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS

GUILFORD COUNTY

PROJECT: 8.U492101 (U-2524AC)
GREENSBORO WESTERN LOOP

SHEET 40 OF 46

6 / 27 / 03

Project No. 8.U492101 (U-2524AC)
Property Owner List
For
Each Wetland Site

Site NO.	Station	No.	Name	Address
7	-L- 80+58 Lt. to -L- 80+66 Lt.	(11)	Wendover South Associates, LP	1900 Interstate Tower Greensboro, NC 28202
	-L- 80+54 Lt. to -L- 80+66 Lt.	(12)	Susan C. Foster, Trustee of James A. Coomes & Frederica Brown Coomes Inter Vivos Trust	5535 Wayne Rd. Greensboro, NC 27407-7316
8	-RPC- 0+15 Lt. to -RPC- 2+53 Lt.	(13)	Ms. Lucille Brown, Widow	5740 Ruffin Rd. Jamestown NC 27282
		(14)	Ms. Patricia M. Brown, Widow	5740 Ruffin Rd. Jamestown NC 27282
		(15)	NCDOT	P.O. Box 20521 Raleigh, NC 27611
9	-RPC- 3+69 Lt. to -RPC- 5+12 Lt.	(16)	NCDOT	P.O. Box 20521 Raleigh, NC 27611
10	-L- 93+55 Rt. to -L- 93+78 Lt.	(17)	Ralph Edward McClellan	P.O. Box 7 Wanchese, NC 27981
11	-RPB- 2+59 Rt. to -RPB- 3+06 Rt.	(18)	Eunice J. Pitts	5912 Hickory Grove Rd. Greensboro, NC 27409

N.C. DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS

GUILFORD COUNTY

PROJECT: 8.U492101 (U-2524AC)
GREENSBORO WESTERN LOOP

SHEET 41 OF 46

6 / 27 / 03

**PROPERTY OWNERS
NAME AND ADDRESS**

OWNER'S NAME

ADDRESS

Helen Carrol
Edwin B. Carroll
4818 West Wendover Avenue
Greensboro, N.C. 27409

Martin Marietta Materials, Inc.
Post Office Box 30013
Raleigh, N.C. 27622-0013

Clara D. McCellan
c/o Ralph McCellan
* owned by NCDOT *

Wilson Trucking Corp.
Attn: David S. Gouldin, II
Wilson Trucking Corporation
P.O. Box 200 Wilson Lane, Fickerville, Va. 22939-0200

Pierce Roof Corp.
Charlottesville Square Condominium Association
P.O. Box 9336
Greensboro, N.C. 27429

Duke Power Co.
* owned by NCDOT *

Guilford Mills, Inc.
c/o Robert Embken, Atty @ Law or Johnny Forbes
6100 West Market Street
Greensboro, N.C. 27407

N C State Ports Authority
* owned by NCDOT *

Ciba Geigy Corp.
Syngenta c/o Mike Clayton
P.O. Box 18300
Greensboro, N.C. 27419

N C Dept. of Transportation
6812 Friendly Road
Greensboro, NC 27410

Coca Cola Company
* owned by NCDOT *

Williams Energy Ventures, Inc.
William Terminals Holdings, L.P.
P.O. Box 21628
Julsa, Ok. 74121-1628

Guilford County Board of Education
712 N. Eugene St.
Greensboro, NC 27401-1654

Amp Inc.
P.O. Box 3608
Harrisburg, PA 17105-3608

PROPERTY OWNER INFORMATION

SITE # 2BA

1BA

N.C. DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
GUILFORD COUNTY
PROJECT No. 8.U492101 U-2524 AC
GREENSBORO WESTERN URBAN LOOP FROM

SHEET 42 OF 46

JULY 2003

PROPERTY OWNERS

NAME AND ADDRESS

OWNER'S NAME

ADDRESS

Mid-America Apartments, L.P.

6584 Polar Ave., Ste.340
Memphis, TN 38138-0612

Alfred K. Sampson, and Wife,
Voultine P. Sampson

* Owned by NCDOT *

Kilpatrick Associates

Greensboro Equipment Care Center, LLC
Mr. Ron Dana
P.O. Box 962

Mast Enterprises

Woodbridge, N.J. 07095-6962

PROPERTY OWNER INFORMATION

SITE # 2BA

N.C. DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
GUILFORD COUNTY

PROJECT No. 8.U492101 U-2524 AC
GREENSBORO WESTERN URBAN LOOP FROM

SHEET 43 OF 46

JULY 2003

IMPACT SUMMARY

Site No.	Station (From/To)	Structure Size	WETLAND IMPACTS				SURFACE WATER IMPACTS						BUFFER IMPACTS	
			Fill In Wetlands (ha)	Temp. Fill In Wetlands (ha)	Excavation In Wetlands (ha)	Mechanized Clearing (Method III) (ha)	Fill In SW (Natural) (ha)	Fill In SW (Pond) (ha)	Temp. Fill In SW (ha)	Existing Channel Impacted (m)	Relocated Channel (m)	Enclosed Channel (m)	Zone 1 (ha)	Zone 2 (ha)
1	-L- 57+80 Lt to 58+57 Rt	1200					0.010	0.251		72.8	60.5	102.7	0.378	0.242
2	-L- 61+80 Rt to 62+33 Lt	1050					0.014			121.2		118.4	0.217	0.137
	-L- 63+38 Rt to 63+74 Rt	1050					0.014			129.2		99.9	0.251	0.163
3	-L- 65+97 Rt to 66+54 Lt	1050					0.013			78.2		94.3	0.204	0.122
4	-L- 69+58 Rt to 70+85 Rt	-						0.848						
5	-L- 73+02 Lt to 73+61 Lt	-						0.128						
6	-L- 74+69 Lt to 74+85 Rt	1350					0.011			85.6		80.5	0.160	0.106
SHEET TOTAL			0.000	0.000	0.000	0.000	0.062	1.227	0.000	487.0	60.5	495.8	1.210	0.770

- ☐ DENOTES DRAINING OF POND IMPACT. POND AT SITE 5 IS A TEMPORARY IMPACT.
☒ THIS QUANTITY REFLECTS AN 18.3m DEDUCTION FOR PIPE BEING REMOVED AND REPLACED WITH OPEN DITCH.

N.C. DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS

GUILFORD COUNTY

PROJECT: 8.U492101
NCDOT T.I.P. No: U-2524AC

SHEET 44 OF 46

6/27/03

IMPACT SUMMARY

Site No.	Station (From/To)	Structure Size	WETLAND IMPACTS				SURFACE WATER IMPACTS						BUFFER IMPACTS			
			Fill In Wetlands (ha)	Temp. Fill In Wetlands (ha)	Excavation In Wetlands (ha)	Mechanized Clearing (Method III) (ha)	Fill In SW (Natural) (ha)	Fill In SW (Pond) (ha)	Temp. Fill In SW (ha)	Existing Channel Impacted (m)	Relocated Channel (m)	Enclosed Channel (m)	Zone 1 (ha)	Zone 2 (ha)		
7	-L- 80+58 Rt to 58+57 Rt	2 @ 2.4 x 2.1 RCBC					0.021				104.4			75.0	0.212	0.116
8	-RPC- 0+15 Lt to 2+53 Lt	-								1.634					1.108	0.488
9	-L- 3+68 Lt to 5+12 Lt	-	0.392			0.041										
10	-L- 93+55 Rt to 93+78 Lt	-								0.015						
11	-RPB- 2+94 Lt to 3+42 Lt	900					0.007	0.217			74.1			61.2	0.147	0.107

□ DENOTES DRAINING OF POND IMPACT. POND AT SITE 8 IS A TEMPORARY IMPACT.

N.C. DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS

GUILFORD COUNTY

PROJECT: 8.U492101
NCDOT T.I.P. No: U-2524AC

SHEET 45 OF 46

6/27/03

IMPACT SUMMARY

			WETLAND IMPACTS				SURFACE WATER IMPACTS				BUFFER IMPACTS			
Site No.	Station (From/To)	Structure Size	Fill In Wetlands (ha)	Temp. Fill In Wetlands (ha)	Excavation In Wetlands (ha)	Mechanized Clearing (Method III) (ha)	Fill In SW (Natural) (ha)	Fill In SW (Pond) (ha)	Temp. Fill In SW (ha)	Existing Channel Impacted (m)	Relocated Channel (m)	Zone 1 (ha)	Zone 2 (ha)	
1BA*	98+00 -L-	1500 RCP	0.05	0.00	0.00	<0.01	<0.01	0.17		13	0	0.20	0.13	
2BA	101+80 -L- /	2@2.1 x 2.1 RCBC	0.00	0.00	0.00	0.00	0.11	0.00		925	540	1.67	1.12	
	12+20 -RP D-													
										</				

* SITE 1 - BEAVER IMPOUNDMENT AREA. A TEMPORARY IMPACT WILL OCCUR IN ADDITION TO ABOVE LISTED QUANTITIES DUE TO TEMPORARY LOWERING OF WATER LEVEL.

METHOD III CLEARING IN WETLANDS (3.0M BEYOND CONSTRUCTION LIMITS)

Buffer restoration at Site 2BA is 0.49 ha for Zone 1 and 0.30 ha for Zone 2

**N.C. DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
GUILFORD COUNTY**

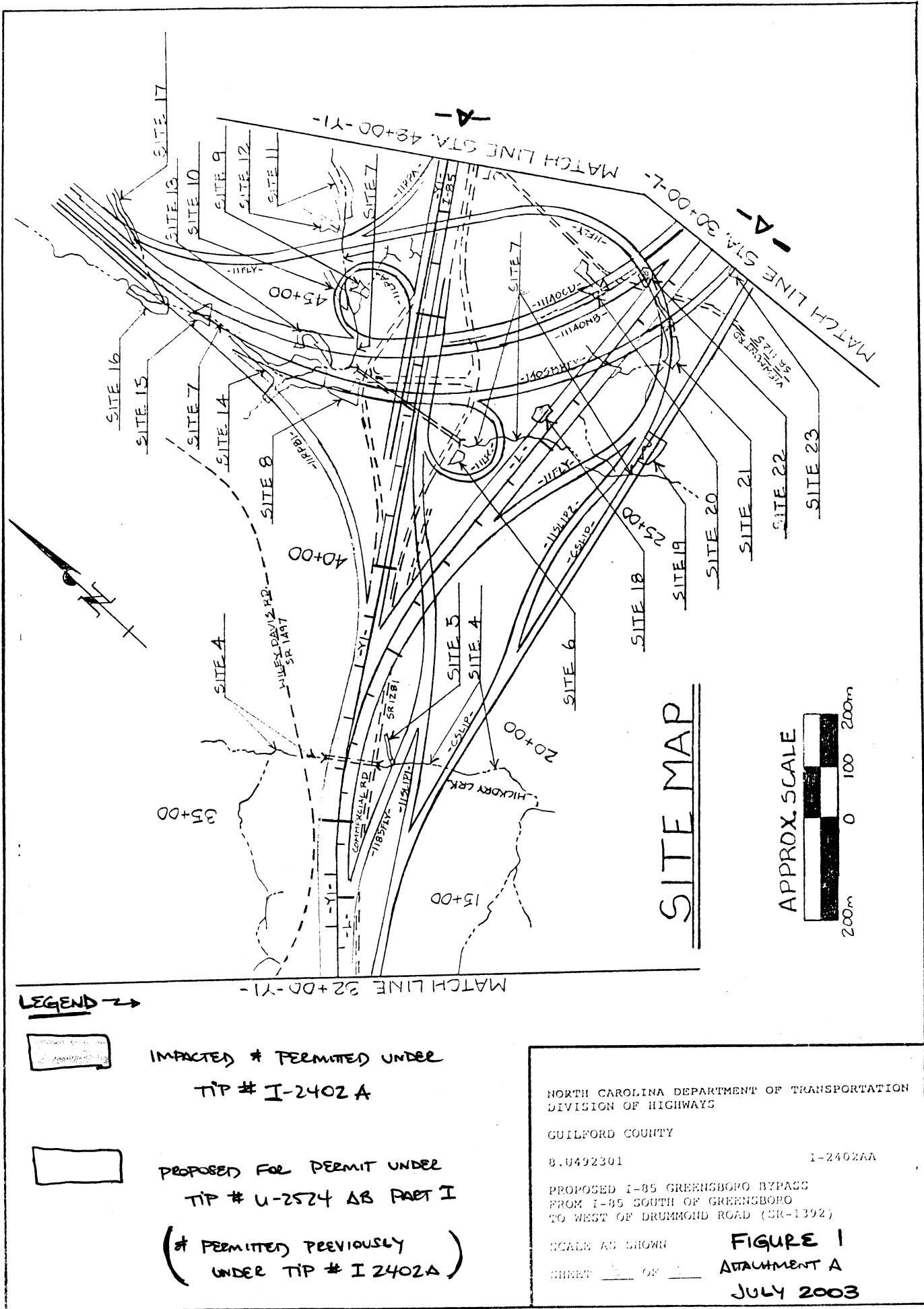
PROJECT: 8.U492101

U-2524AC

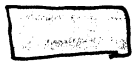
SHEET 46 OF 46

July 2003

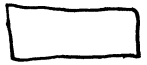
Attachment A



LEGEND →



IMPACTED * PERMITTED UNDER
TIP # I-2402 A



PROPOSED FOR PERMIT UNDER
TIP # U-2524 AB PART I

(* PERMITTED PREVIOUSLY
UNDER TIP # I 2402A)

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS

GUILFORD COUNTY

8.0492301

I-2402AA

PROPOSED I-85 GREENSBORO BYPASS
FROM I-85 SOUTH OF GREENSBORO
TO WEST OF DRUMMOND ROAD (SR-1392)

SCALE AS SHOWN

SHEET 2 OF 2

FIGURE 1
ATTACHMENT A
JULY 2003

SITE MAP

IMPACTED * PERMITTED UNDER

TIP # I 2402A

PROPOSED FOR PERMIT UNDER TIP # U-2824AS

(* PERMITTED PREVIOUSLY)
UNDER TIP # I 2402A

8-
MATCH LINE STA. 35+75.695-L-
END I-2402AA BEGIN I-2402AB

SITE 28

SR 1124
ROBERTS COURT RD.

SITE 29

SITE 30

SR 1392
DRUMMOND RD.

SITE 33

SITE 34

SR 1221
NORTH ANTER RD.

SITE 35

SITE 36

SITE 37

SITE 38

SITE 39

SITE 40

SITE 41

SITE 42

SITE 43

SITE 44

SITE 45

SITE 46

SITE 47

SITE 48

SITE 49

SITE 50

SITE 51

SITE 52

SITE 53

SITE 54

SITE 55

SITE 56

SITE 57

SITE 58

SITE 59

SITE 60

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS

GUILFORD COUNTY

8.U492301

I-2402AB

PROPOSED I-85 GREENSBORO BYPASS
FROM SOUTH OF US-220
TO WEST OF ELM-EUGENE ST. (SR-3300)

SCALE AS SHOWN

SHEET 11 OF 12

FIGURE 2

ATTACHMENT A

JULY 2003

APPROX. SCALE



30+00

25+00

20+00

15+00

10+00

40+00

STA. 40+05.223-L-P.O.T.
STA. 23+17.601-Y5-P.O.T.
STA. 45+42.218-L-P.O.T.
STA. 19+61.066-Y2-P.O.T.

GLENDAL AVE.

US 220

SR 1124

SR 1392

SR 1221

SR 1124

SR 1392

SR 1221

SR 1124

SR 1392

SR 1221

SR 1124

SR 1392

SR 1221

SR 1124

LEGEND



IMPROVED & PERMITTED

UNDER TIP # I-2402A

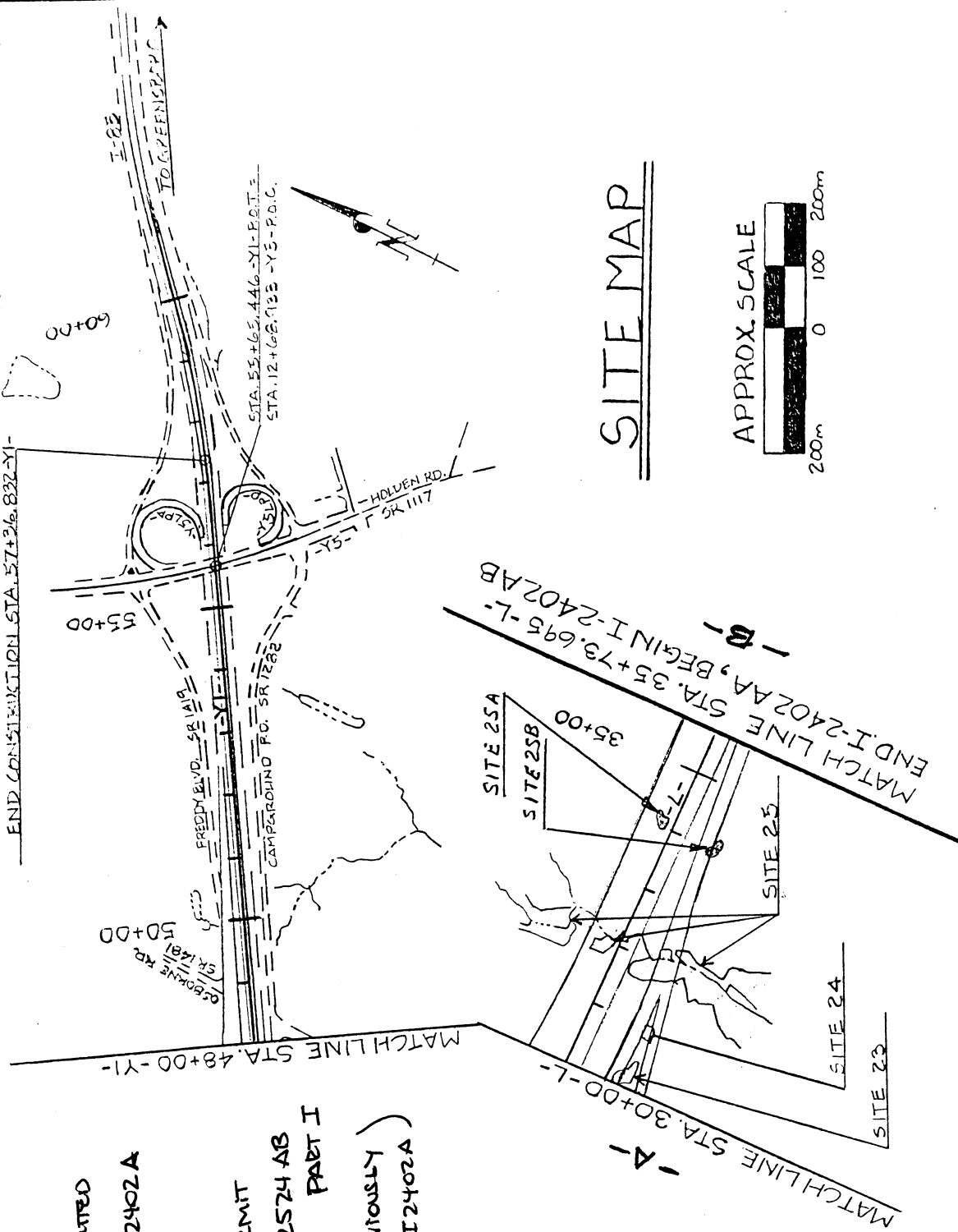
PROPOSED FOR PERMIT



UNDER TIP # U-2524 AB

PART I

(* PERMITTED PREVIOUSLY)
UNDER TIP # I2402A



NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS

GUILFORD COUNTY

8.0492301

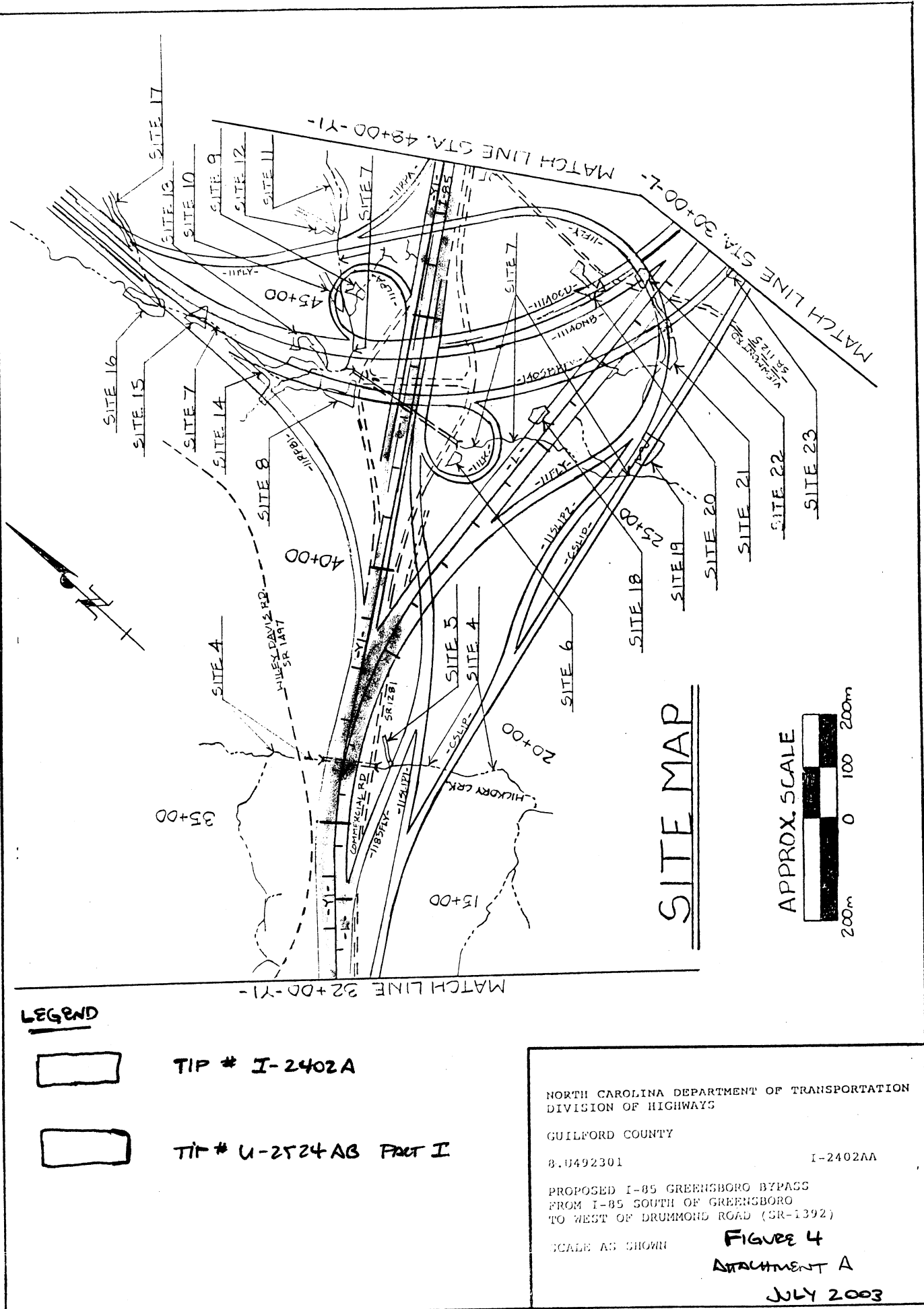
I-2402AA

PROPOSED I-85 GREENSBORO BYPASS
FROM I-85 SOUTH OF GREENSBORO
TO WEST OF DRUMMOND ROAD (SR-1392)

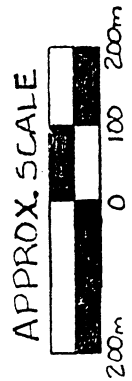
SCALE AS SHOWN

SHEET 2 OF 2

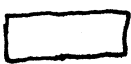
FIGURE 3
ATTACHMENT A
JULY 2003



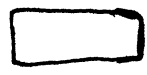
SITE MAP



LEGEND



TIP # I-2402A



TIP # U-2524 AB Part I

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
 DIVISION OF HIGHWAYS

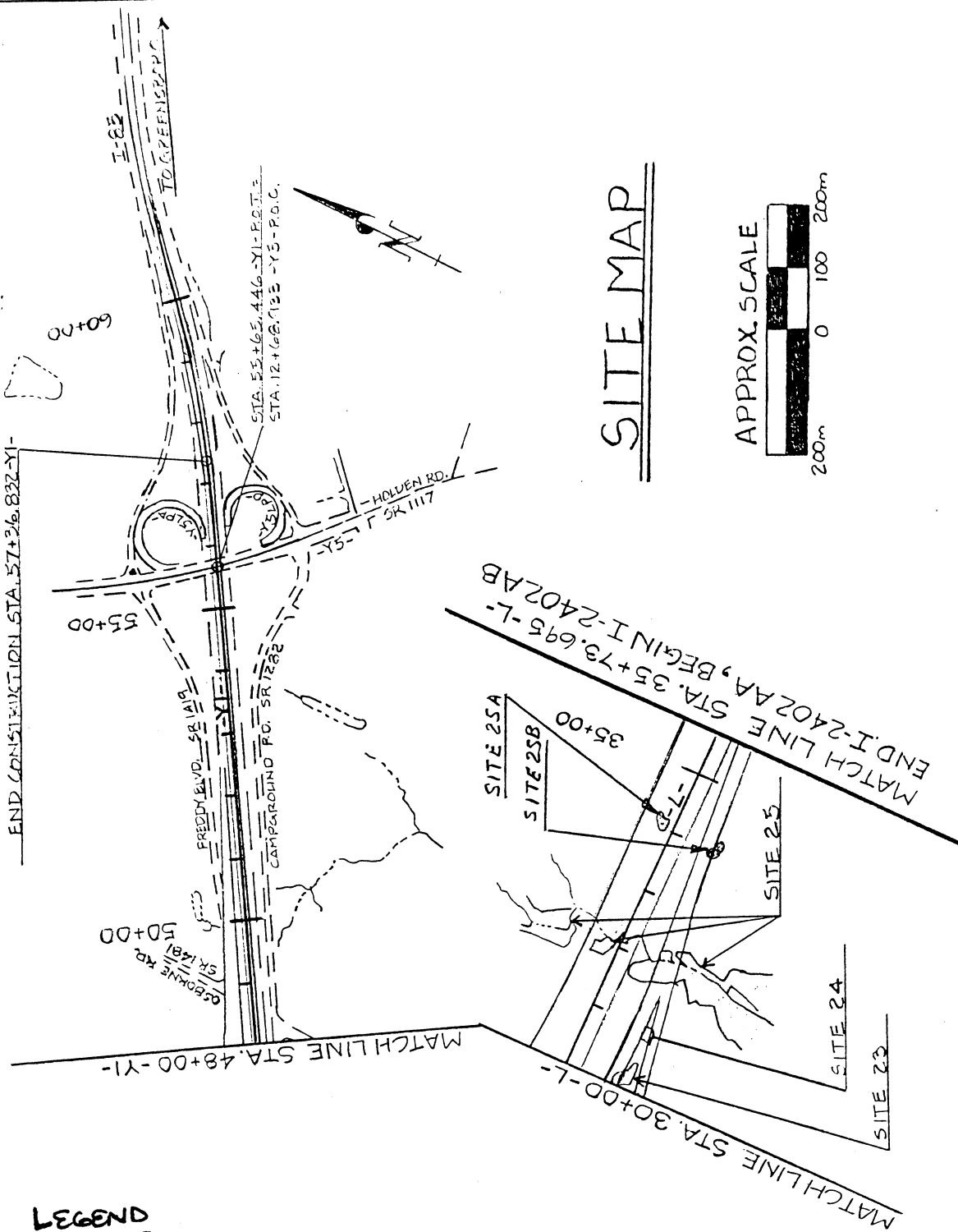
GUILFORD COUNTY

8.0492301 I-2402AA

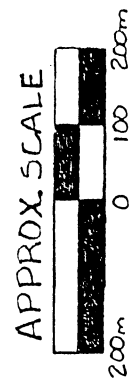
PROPOSED I-85 GREENSBORO BYPASS
 FROM I-85 SOUTH OF GREENSBORO
 TO WEST OF DRUMMOND ROAD (SR-1392)

SCALE AS SHOWN

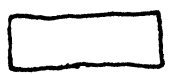
FIGURE 4
ATTACHMENT A
JULY 2003



SITE MAP



LEGEND



TIP # I 2402 A



TIP # U-2524 AB
PART I

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS

GUILFORD COUNTY

8.U492301

I-2402AA

PROPOSED I-85 GREENSBORO BYPASS
FROM I-85 SOUTH OF GREENSBORO
TO WEST OF DRUMMOND ROAD (SR-1392)

FIGURE 5

SCALE AS SHOWN

SHEET ____ OF ____

ATTACHMENT A

JULY 2003

SITE MAP

TIP # I-2402A

TIP # U-2574AB PART I

END I-2402AA BEGIN I-2402AB
STA. 35+75.695 - L -

SITE 28

SR 1124
ROBERTS COURT RD.

SITE 29

SITE 30

SR 1392
DRUMMOND RD.

SITE 33

SITE 34

SR 1221
NORTON PARK RD.

STA. 40+05.223 - L - P.O.T.
STA. 23+17.601 - Y5 - P.O.T.

SITE 31

STA. 45+42.218 - L - P.O.T.
STA. 19+81.056 - Y2 - P.O.T.

SITE 32

25+00

SITE 35

20+00

GLENDAL AVE.

45+00

US 220

12RPA -

12LPA -

12RPA -

12LPA -

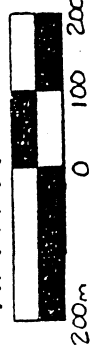
15+00

SITE 36

MATCH LINE STA. 30+00 - L -

10+00

APPROX. SCALE



NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS

GUILFORD COUNTY

8.U492301

I-2402AB

PROPOSED I-85 GREENSBORO BYPASS
FROM SOUTH OF US-220
TO WEST OF ELM-EUGENE ST. (SR-3300)

SCALE AS SHOWN

FIGURE 6

SHEET ____ OF ____

ATTACHMENT A

JULY 2003

Attachment B

COPY

Section 404/NEPA Merger Project Team Meeting Agreement

Concurrence Point No. 4. : Avoidance and minimization

Project Name/Description: Greensboro Western Urban Loop from north of I-85 near Groomtown Road to north of Bryan Boulevard, Guilford County, NC, TIP Project U-2524 A & B AID 199403906

Avoidance and minimization measures include:

- 1) Re-location of Long Branch in open channel to the maximum extent practicable.
- 2) Avoidance of Wetland W1 near I-40.
- 3) Planting of 50 foot wooded buffers on each side of all stream relocations where allowable considering design constraints and safety.

The Project Team has concurred on this date of June 15, 2000 with the avoidance and minimization measures taken to date, as shown on the preliminary design presented on this date, as indicated by the signatures below.

USACE

Eric C. Alamy

NCDOT

CD Sharer

USEPA

USFWS

NCDWQ

John E. Hennessy

NCWRC

Daniel L.

NCDCR

FHWA

Felix D. H.

ATTACHMENT B

COPY

Section 404/NEPA Merger Project Team Meeting Agreement

Concurrence Point No. 4 : Avoidance and minimization

Project Name/Description: Greensboro Western Urban Loop from north of I-85 near Groomtown Road to north of Bryan Boulevard, Guilford County, NC, TIP Project U-2524 A & B; AID 199403906

Avoidance and minimization measures include:

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- 2) Avoidance of Wetland W1 near I-40.
- 3) Planting of 50 foot wooded buffers on each side of all stream relocations where allowable considering design constraints and safety.

The Project Team has concurred on this date of June 15, 2000
with the avoidance and minimization measures taken to date, as shown on the preliminary design presented on this date, as indicated by the signatures below.

USACE

NCDOT

USEPA

Kathryn H. Matthews

USFWS

NCDWQ

NCWRC

NCDOR

FHWA

Attachment B

Section 404/NEPA Merger Project Team Meeting Agreement

COPY

Concurrence Point No. 4. : Avoidance and minimization

Project Name/Description: Greensboro Western Urban Loop from north of I-85 near Groomtown Road to north of Bryan Boulevard, Guilford County, NC, TIP Project U-2524 A & B; AID 199403906

Avoidance and minimization measures include:

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- 2) Avoidance of Wetland W1 near I-40.
- 3) Planting of 50 foot wooded buffers on each side of all stream relocations where allowable considering design constraints and safety.

The Project Team has concurred on this date of June 15, 2000
with the avoidance and minimization measures taken to date, as shown on the preliminary design presented on this date, as indicated by the signatures below.

USACE _____

NCDOT _____

USEPA _____

USFWS _____

NCDWQ _____

NCWRC _____

NCDCR April Montgomery

FHWA _____

Attachment B

COPY

Section 404/NEPA Merger Project Team Meeting Agreement

Concurrence Point No. 4 : Avoidance and minimization

Project Name/Description: Greensboro Western Urban Loop from north of I-85 near
Groomtown Road to north of Bryan Boulevard, Guilford County, NC, TIP Project
U-2524 A & B; AID 199403906

Avoidance and minimization measures include:

- 1) Re-location of Long Branch in open channel to the maximum extent practicable.
- 2) Avoidance of Wetland W1 near I-40.
- 3) Planting of 50 foot wooded buffers on each side of all stream relocations where allowable considering design constraints and safety.

The Project Team has concurred on this date of June 15, 2000
with the avoidance and minimization measures taken to date, as shown on the preliminary
design presented on this date, as indicated by the signatures below.

USACE

NCDOT

USEPA

USFWS

Thomas McCartney

NCDWQ

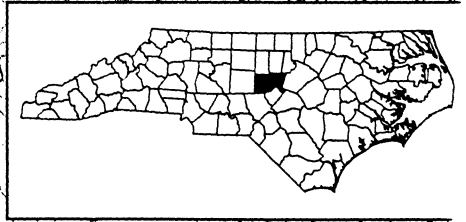
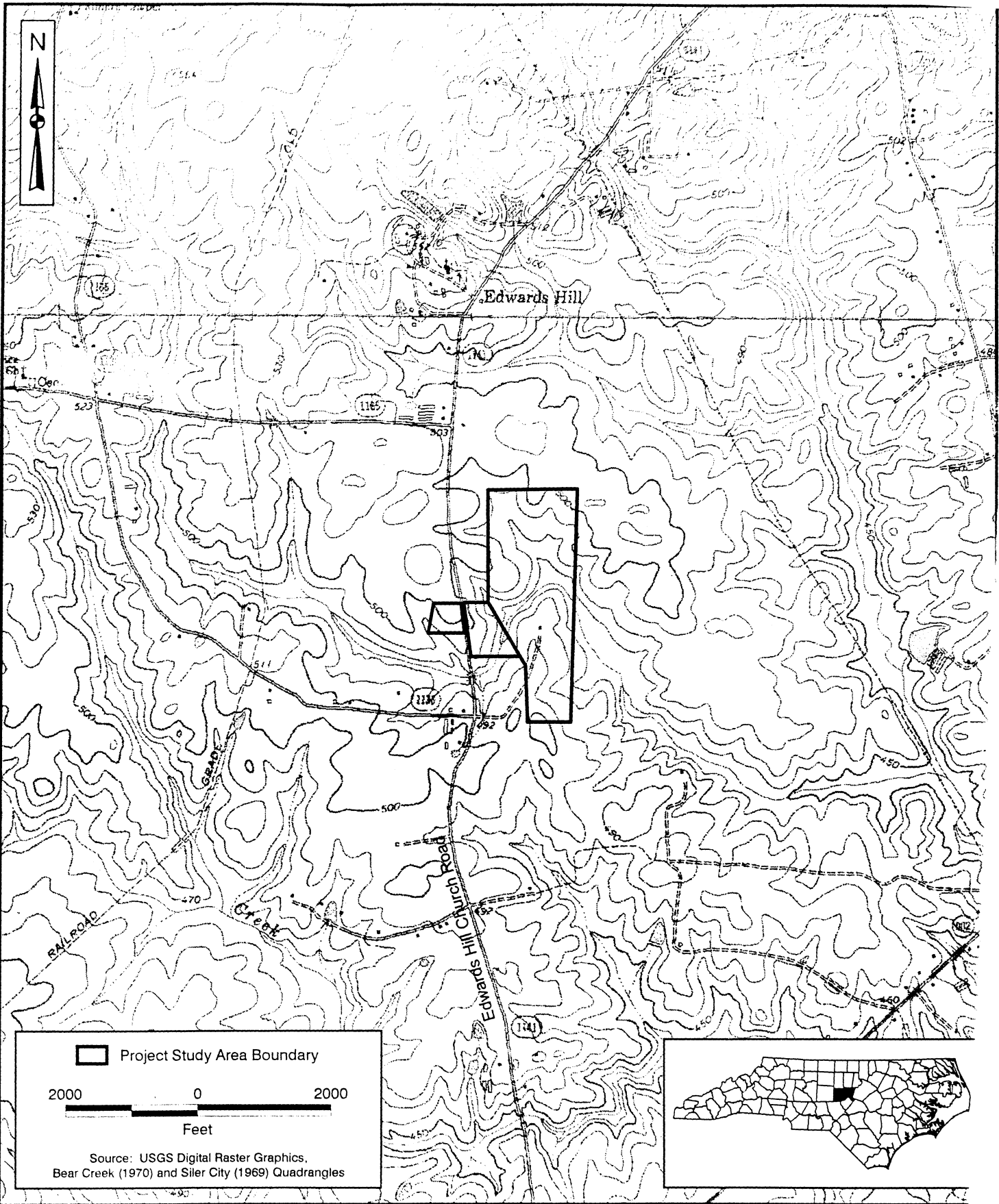
NCWRC

NCDCR

FHWA

Attachment B

Attachment C

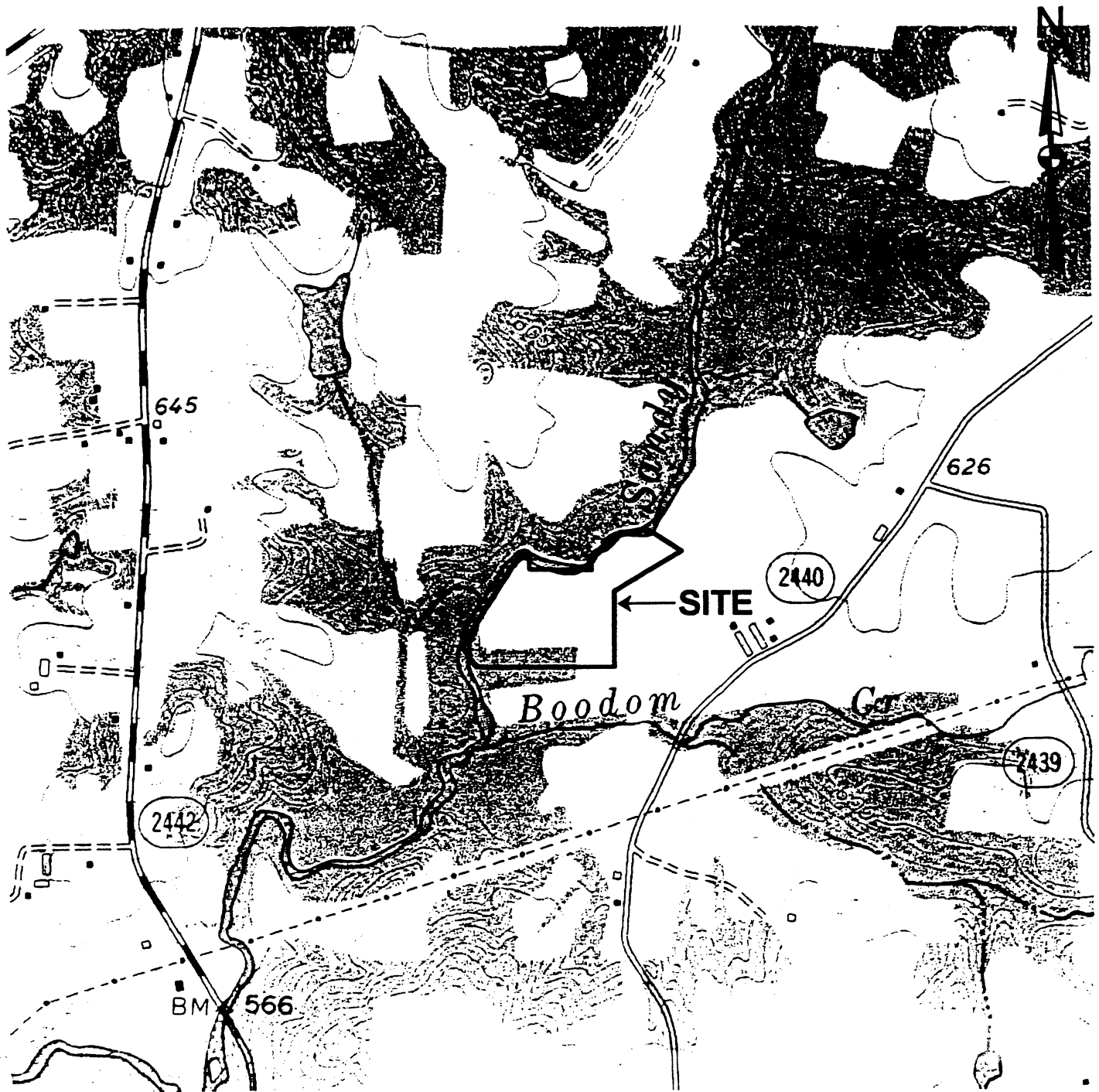


Environmental
Services, Inc.

Project Location Map
UT Bear Creek Mitigation Plan
Chatham County, North Carolina

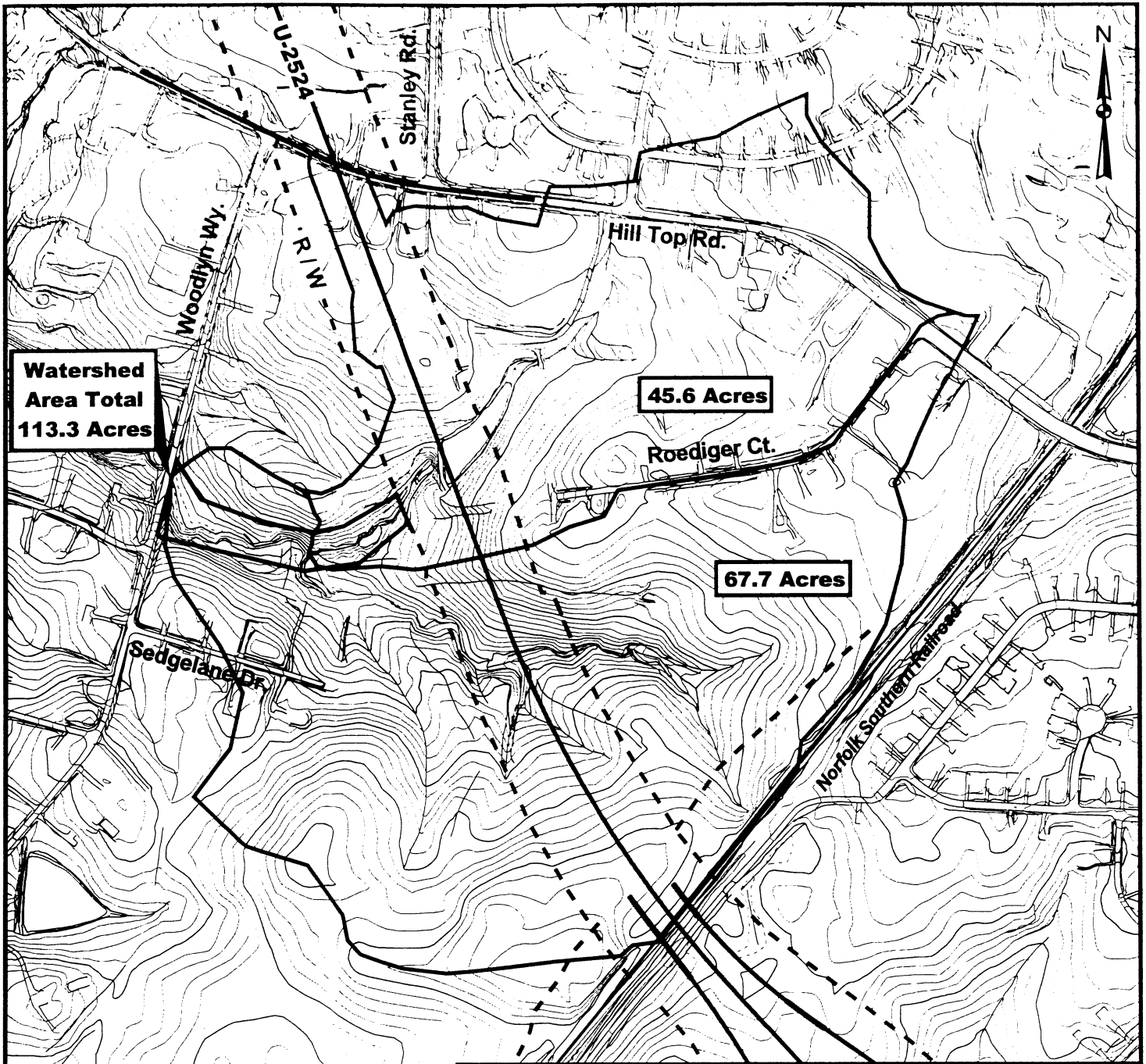
ATTACHMENT C

Figure:	1
Project:	ER02026.01
Date:	June 2003



SOURCE: U.S. GEOLOGICAL SURVEY MAPS;
7.5 MINUTE QUADRANGLE, GRAYS CHAPEL NC 1974

2000 0 2000 Feet



- Legend**
- Approximate Site Boundary
 - Watershed Boundaries
 - ROW
 - Proposed Greensboro Western Urban Loop Alignment



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

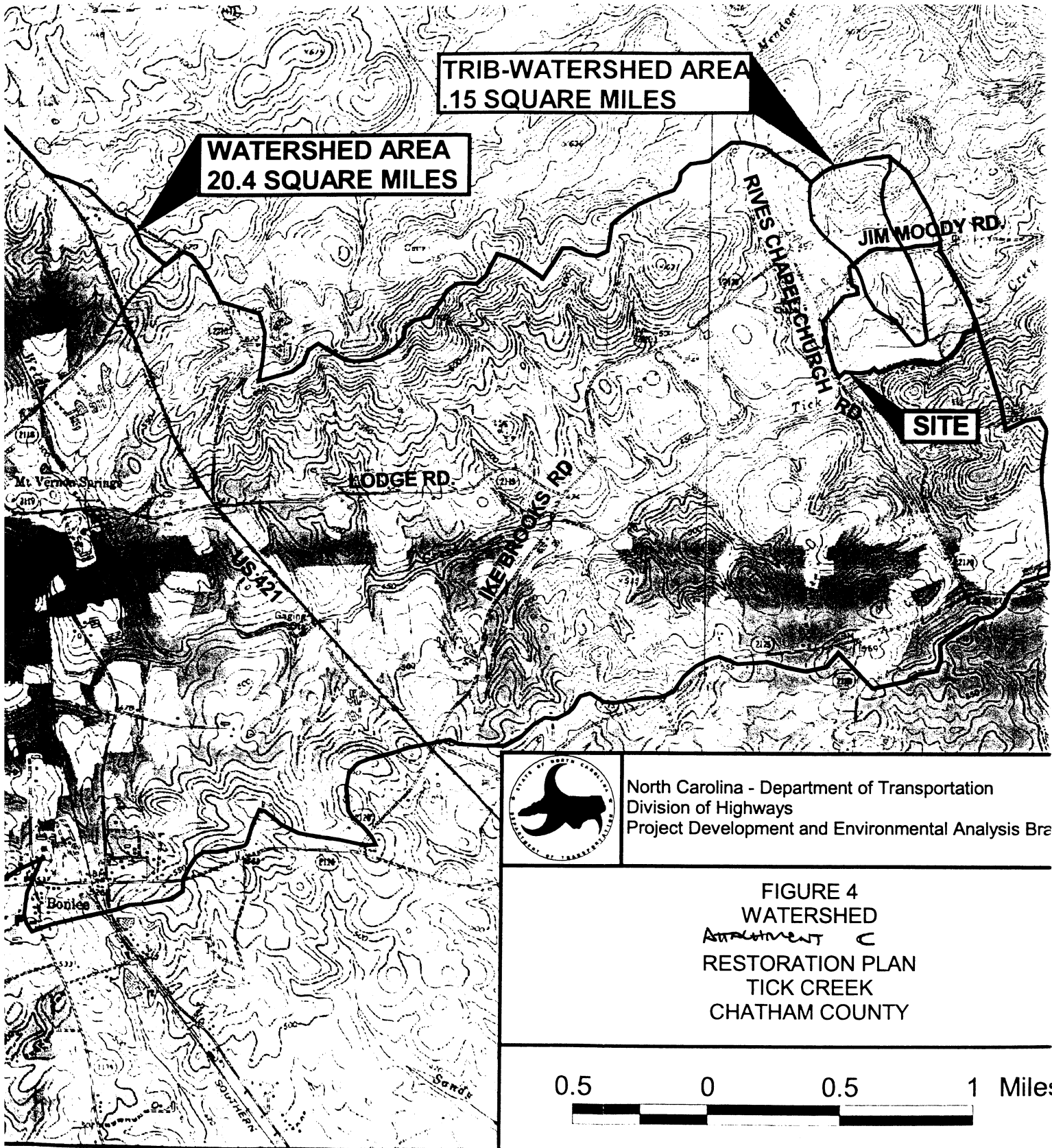
FIGURE 3 SITE MAP

ATTACHMENT C

Woodlyn Way Stream Mitigation Plan
Greensboro Western Urban Loop, Guilford County

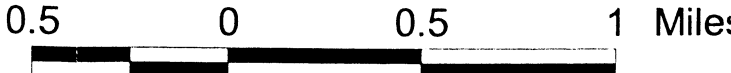
500 0 500 1000 Feet

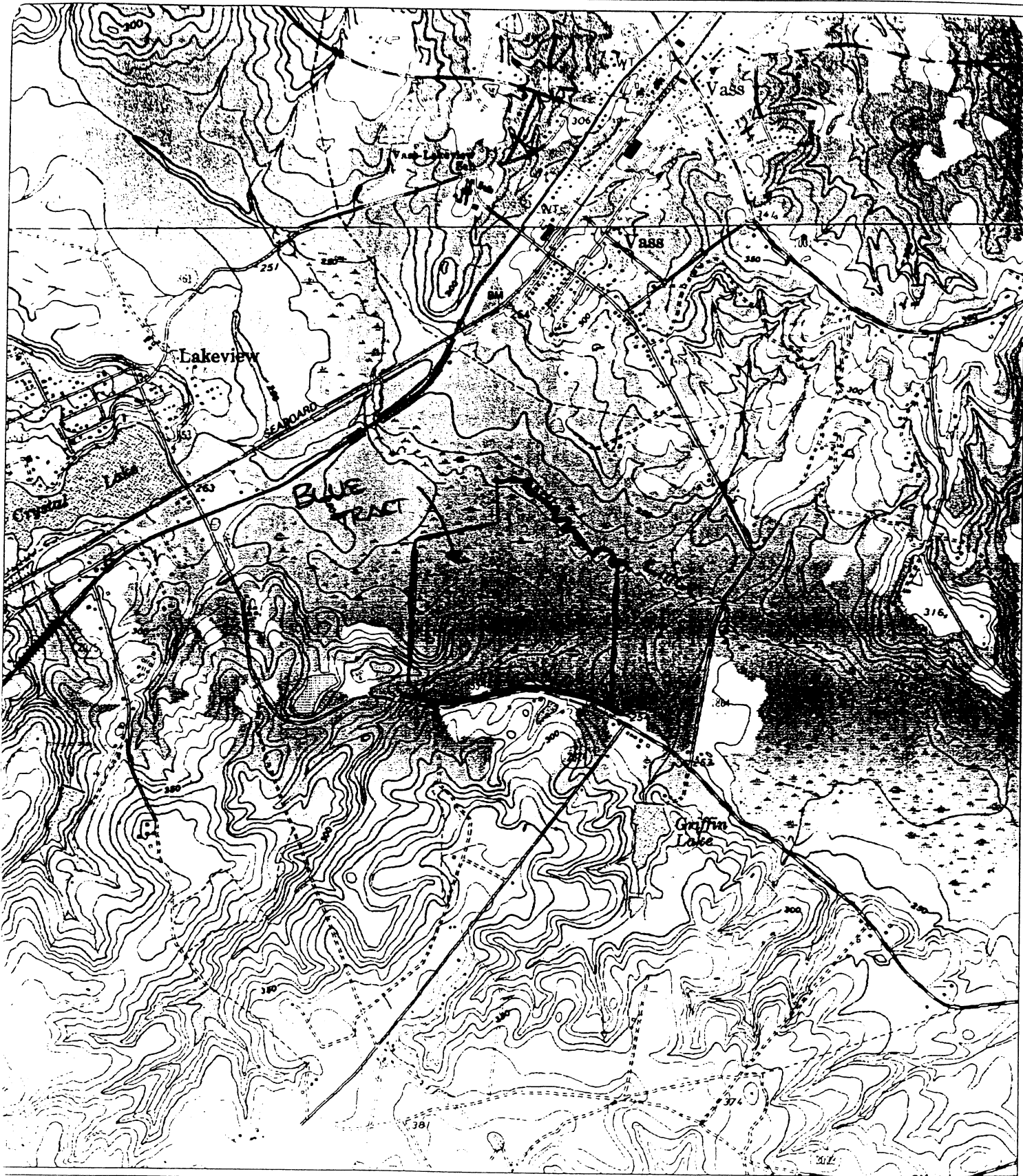
SGS Quadrangles:
NC, 1969, Photoinspected 1988;
NE, NC, 1970 Photoinspected 1980.



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

FIGURE 4
WATERSHED
Attachment C
RESTORATION PLAN
TICK CREEK
CHATHAM COUNTY





USGS Quads:
Niagara and
Vass

1" = 2,000'



ATTACHMENT C
Blue Tract Vicinity Map
ACTION ID 991403906

2000 0 2000 Feet

A graphic scale bar with three segments. The first segment is labeled '2000', the middle segment is labeled '0', and the third segment is labeled '2000 Feet'.



Appendix D

RANDLEMAN BUFFER ADDENDUM

The purpose of this addendum is to provide the N.C. Division of Water Quality (NCDWQ) with the information needed to evaluate the impacts of the project on the Randleman Basin Riparian Buffer areas. In addition, we are presenting material in this addendum to illustrate that the project has been designed to comply with the Randleman Lake Water Supply Watershed: Protection and Maintenance of Riparian Areas (15A NCAC 02B .0250). Therefore, we request that the NCDWQ issue an Authorization Certificate for the proposed use.

The North Carolina Department of Transportation (NCDOT) proposes to construct a portion of the Greensboro Western Urban Loop. The proposed project involves construction of a four- to eight-lane freeway on new location. The majority of the proposed project lies in Hydrologic Unit 03030003.

Coordination with personnel from NCDWQ and City of Greensboro

The personnel from NCDOT Hydraulics Unit met with representatives from NCDWQ Winston-Salem Regional office on October 18, 2000 to discuss Randleman Buffer Rules. In an attached e-mail from Mr. Larry Coble of NCDWQ, the NCDOT had met the minimum criteria for Randleman Buffer Rules. Mr. Coble stated that the NCDOT needed to receive official approval from local governments regarding compliance with Randlemen Buffer Rules.

The NCDOT contacted the City of Greensboro regarding compliance with Randleman Rules. The City of Greensboro reviewed the drainage plans and “offer(ed) only a few recommendations” to the NCDOT with respect to Randleman Buffer Rules. A copy of this letter from the City of Greensboro, dated June 14, 2001, and a copy of NCDOT’s response to recommendations, have been attached to this permit application.

Since the coordination with NCDWQ field personnel and City of Greensboro staff, the NCDOT has met with NCDWQ central office staff to review the project. Coordination with NCDWQ staff occurred in June 2003. The NCDOT Hydraulics Unit and Project Development and Environmental Development staff reviewed and discussed the design and location of the structures with NCDWQ personnel to accomplish this goal as practicably as possible

Randleman Buffer Rule Impacts

Due to the nature of this project, impacts to the riparian buffer of Reddick’s Creek, Bull Run, Long Branch and their unnamed tributaries, as well as unnamed tributaries of Hickory Creek, are unavoidable.

The NCDOT has minimized impacts to the streams and adjacent buffers by relocating streams in several areas and providing on-site buffer areas for these relocated streams. Vegetation to be planted includes black willow (*Salix nigra*), silky dogwood (*Cornus amomum*), green ashe (*Fraxinus pennsylvanica*), sycamore (*Plantus accidentalis*), tulip poplar (*Liriodendron tuliperifera*), and river birch (*Betula nigra*). Calculations for impacts to the

buffer, available on-site mitigation and compensatory mitigation needs are presented in the attached tables (Tables 1A-6A).

The NCDOT's avoidance and minimization of impacts to streams and wetlands (which are discussed previously in the "Mitigation" section of the Section 404/401 permit application) by default represent avoidance and minimization of impacts to buffers. Drainage flowing in the general direction of the regulated buffers was handled so the 50-foot buffer zone would not be directly impacted. It was the goal of the NCDOT to have the project designed so that the effects of the drainage would not result in water quality impacts to the waters of the Randleman sub basin as required by the Randleman Basin regulations. Total impacts to buffers are 20.46 acres to Zone 1 and 11.79 acres to Zone 2.

The NCDOT will provide on-site buffer at several impact sites, including Site 7 in Section AB Part I, Site 3 in Section AB and Sites 1 and 3 in Section AC), through the stream relocations proposed at these sites. The NCDOT will provide 2.36 acres of Zone 1 on-site buffer mitigation and 1.58 acres of Zone 2 buffer mitigation.

Within the Section 404/401 permit package is a summary of the NCDOT proposal to handle stormwater discharges on TIP No. U-2524 AB Part I and notations for handling stormwater are found on the permit drawings for TIP No. U-2524 AB/AC.

Compensatory Mitigation for Buffer Impacts

The NCDOT has applied the appropriate ratios of 3 and 1.5 to buffer impacts minus the on-site mitigation. The total amount of buffer mitigation required for the proposed project is 60.26 acres (2624925.6 feet²). Based on a cost of 0.97 cents per square foot, the NCDOT will pay \$ 2,546,177.83 to the WRP to provide the necessary buffer mitigation for this project.

Table 1A . Impacts to Randleman Buffer for TIP No. U-2524 ABI

Site No.	Road Crossing	Parallel	Zone 1 (acres)	Zone 2 (acres)	On-Site Mitigation Zone 1 (acres)	On-Site Mitigation Zone 2 (acres)	Total Impact Zone 1 (acres)	Total Impact Zone 2 (acres)
7		x	2.10	1.40	1.30	0.86	0.80	0.54
	x		0.80	0.80			0.80	0.80
	x		0.30	0.20			0.30	0.20
17		x	0.80	0.50			0.80	0.50
25	x		0.40	0.30			0.40	0.30
28		x	1.80	1.30			1.80	1.30
Total			6.20	4.50	1.30	0.86	4.90	3.64

Table 2A. Mitigation Requirements for TIP No. U-2524 ABI

Site No.	Zone 1 (acres)	Zone 2 (acres)	Total Mitigation (acres)
7	5.61	2.81	8.42
17	2.40	0.75	3.15
25	1.20	0.45	1.65
28	5.40	1.95	7.35
Total	14.61	5.96	20.57

Table 3A. Impacts to Randleman Buffer Rules for TIP No. U-2524 AB

Site No.	Road Crossing	Parallel	Zone 1 (acres)	Zone 2 (acres)	On-Site Mitigation Zone 1 (acres)	On-Site Mitigation Zone 2 (acres)	Total Impact Zone 1 (acres)	Total Impact Zone 2 (acres)
3		x	1.35	0.92	0.67	0.44	0.68	0.48
4	x		0.65	0.34			0.65	0.34
6	x		0.42	0.23			0.42	0.23
7	x		0.59	0.04			0.59	0.04
10	x	x	1.03	0.30			1.03	0.30
Total			4.04	1.83	0.67	0.44	3.37	1.39

July 2003

Table 4A. Mitigation Requirements for TIP No. U-2524 AB

Site No.	Zone 1 (acres)	Zone 2 (acres)	Total Mitigation (acres)
3	2.04	0.72	2.76
4	1.95	0.51	2.46
6	1.26	0.35	1.61
7	1.77	0.06	1.83
10	3.09	0.45	3.54
Total	10.11	2.09	12.2

Table 5A. Impacts to Randleman Buffer Rules for TIP No. U-2524 AC

Site No.	Road Crossing	Parallel	Zone 1 (acres)	Zone 2 (acres)	On-Site Mitigation Zone 1 (acres)	On-Site Mitigation Zone 2 (acres)	Total Impact Zone 1 (acres)	Total Impact Zone 2 (acres)
1	x		0.93	0.61	0.32	0.22	0.61	0.39
2 (p)	x		0.54	0.36			0.54	0.36
2 (t)	x		0.62	0.39			0.62	0.39
3	x		0.50	0.28	0.07	0.05	0.43	0.23
6	x		0.40	0.25			0.40	0.25
7	x		0.52	0.29			0.52	0.29
8			2.74	1.05			2.74	1.05
11	x		0.36	0.24			0.36	0.24
1BA	x		0.49	0.32			0.49	0.32
2BA	x		3.11	1.68	1.21	0.74	3.11	1.68
Total			10.22	5.46	1.61	1.01	9.82	5.20

Note: Site 8 is a temporary impact involving the draining of a pond during construction of the road project.

July 2003

Table 6A. Mitigation Requirements for TIP No. U-2524 AC

Site No.	Zone 1 (acres)	Zone 2 (acres)	Total Mitigation (acres)
1	1.83	0.59	2.42
2 (p)	1.62	0.54	2.16
2 (I)	1.86	0.59	2.45
3	1.29	0.35	1.64
6	1.20	0.38	1.58
7	1.56	0.44	2.00
11	1.08	0.36	1.44
1BA	1.47	0.48	1.95
2BA	9.33	2.52	11.85
Total	21.24	6.25	27.49

Note: Site 8 is a temporary impact involving the draining of a pond during construction of the road project; the "impact" was not considered for compensatory mitigation purposes.

July 2003

Appendix E

DRAFT VERSION 2

02/26/02

OFFICE USE ONLY: Date Received _____ Request # _____

State of North Carolina, Department of Environment and Natural Resources, Division of Water Quality

"General" Major Variance Application Form –

From the Randleman Lake Water Supply Watershed: Protection and Maintenance of Riparian Areas Rule (Randleman Buffer Rule) for PUBLIC ROAD CONSTRUCTION, IMPROVEMENT & MAINTENANCE ACTIVITIES (As approved by the Water Quality Committee of the Environmental Management Commission on February 14, 2002)

NOTE:

To constitute a complete application, all of the information requested in this form must be provided. Incomplete applications will be returned to the applicant. The original and two copies of the completed "General" Variance Application Form and any attachments must be sent to the DWQ 401/Wetlands Certification Unit, 1650 Mail Service Center, Raleigh, NC 27699-1650, (919) 733-1786 and one copy needs to be sent to the Piedmont Triad Regional Water Authority (PTRWA), 2216 W. Meadowview Rd., Wilmington Bldg., Suite 204, Greensboro, NC 27407, (336) 547-8437 to constitute a complete submittal. This form may be photocopied for use as an original.

Part 1: General Information

(Please include attachments if the room provided is insufficient.)

1. Applicant's name (the Division Engineer, project manager, person responsible for project):

GREG THORPE, PH.D., DIRECTOR NCDOT PDEA

2. Print Owner/Signing Official (person legally responsible for the property and its compliance)

Name: GREG THORPE, Ph.D.
Title: DIRECTOR
Street address: 1548 MAIL SERVICE CENTER
City, State, Zip: RALEIGH, NC 27699-1548
Telephone: (919) 733-3141
Fax: (919) 733-9794

3. Contact person who can answer questions about the proposed project:

Name: PHILLIP TODD
Telephone: (919) 715-1467
Fax: (919) 715-1522
Email: PTODD@DOT.STATE.NC.US

4. Project Name (Subdivision, facility, or establishment name - consistent with project name on plans, specifications, letters, operation and maintenance agreements, etc.):

GREENSBORO WESTERN URBAN LOOP (TIP # U-2524 AB7AC)

5. Project Location:

Street address: _____
City, State, Zip: _____
County: GUILFORD

2/26/02

Latitude/longitude: _____

6. Directions to site from nearest major intersection (Also, attach an 8 1/2 x 11 copy of the portion of the USGS topographic map and soil survey indicating the location and boundaries of the site):

BETWEEN I-40 & I-85, SOUTHWEST QUADRANT
OF GREENSBORO

7. Stream to be impacted by the proposed activity:

Stream name (for unnamed streams label as "UT" to the nearest named stream):

SEE ATTACHED
Stream classification [as identified within the Schedule of Classifications 15A NCAC 2B .0311 (Cape Fear River Basin)]: SEE ATTACHED

8. Which of the following permits/approvals will be required or have been received already for this project?

Required:	Received:	Date received:	Permit Type:
_____	_____	_____	401 Certification/404 Permit
_____	_____	_____	Others (specify) _____

Part 2: Proposed Activity

(Please include attachments if the room provided is insufficient.)

1. Description of proposed activity [Also, please attach a map of sufficient detail (such as construction or site plans) to accurately delineate the boundaries of the land to be utilized in carrying out the activity, the location and dimension of any disturbance in the riparian buffers associated with the activity, and the extent of riparian buffers on the land. **Include the area of buffer impact in ft² for each zones.**]

SEE ATTACHED

2. State reasons why this plan for the proposed activity cannot be practically accomplished, reduced or reconfigured to better minimize or eliminate disturbance to the riparian buffers:

SEE ATTACHED

3. If sheet flow of concentrated runoff cannot be achieved prior to entering the buffers, then please provide information on any on-site stormwater management facilities (e.g., grassed swales, extended detention wetlands, etc.) that will be used to control nutrients and attenuate flow (attach construction details and site locations of these plans):

SEE ATTACHED

2/26/02

4. How do you intend to provide mitigation if required under Condition No. 7 of the variance? (Attach a Mitigation Plan if you intend to satisfy the mitigation requirement through the restoration of riparian buffers.)

SEE ATTACHED

5. Please provide an explanation of the following:
(1) The practical difficulties or hardships that would result from the strict application of this Rule.

SEE ATTACHED

- (2) How these difficulties or hardships result from conditions that are unique to the property involved.

SEE ATTACHED

Part 3: Agent Authorization

If you wish to designate submittal authority to another individual or firm so that they may provide information on your behalf, please complete this section:

Designated agent (individual or firm): _____
Mailing address: _____
City, State, Zip: _____
Telephone: _____
Fax: _____
Email: _____

Part 4: Applicant's Certification

I, _____ (print or type name of person listed in Part I, Item 2), certify that the information included on this permit application form is correct, that the project will be constructed in conformance with the approved plans and that the deed restrictions in accordance with Part 5 of this form will be recorded with all required permit conditions.

Signature: _____
Date: _____
Title: _____

“General” Major Variance Application for Randleman Buffer Rules

Part 1: General Information

7.

Site No.	Stream Name	Best Usage Classification	Stream Index No.
7	UT Hickory Creek	WS IV *	17-8.5-(1)
28	UT Hickory Creek	WS IV *	17-8.5-(1)

Part 2: Proposed Activity

1. The NCDOT proposes to construct the ultimate roadway design for the I-85 Bypass/ Western Urban Loop. The project for which the variance is requested is TIP No. U-2524 AB/AC, which is a project to construct a freeway on new location from north of existing I-85 to I-40. The western terminus of this project connects to I-40 while the western southern terminus of the project connects with TIP No. I-2402, the southern loop of the I-85 Greensboro Bypass (see attached map, Figures 1-3). TIP No. I-2402 is currently under construction, and its 401 Water Quality Certification (WQC) and Section 404 Permit were issued in December 1998 and May 1999, respectively. Those permits approved both the design of an “interim” portion of I-2402 and the “ultimate” design of the intersection of TIP Nos. U-2524 and I-2402. The “interim” design is incorporated into the “ultimate” design. The “Randleman Rules” (15A N.C.A.C. 2B .0248 - .0251) became effective April 1, 1999, after the 401 WQC was issued.

There are two areas of concern for complying with the Randleman Buffer Rules; Site 7 and Site 28. These areas are noted on the attached plan views and corresponding summary sheet of buffer impacts. Each area is located near the connection TIP Nos. I-2402 and U-2524. The design of the project in those areas was approved in the 401/404 permits for TIP No. I-2402.

Site 7 is a parallel impact with the NCDOT relocating the stream channel along its side fill slopes. There will be a vegetated buffer, and the NCDOT has minimized its impact to the stream and by relocating the stream as much as it can. There are two areas as NCDOT relocates the channel, at its beginning and the end, where the buffer requirement of 50 feet will not be met. Generally speaking, the NCDOT believes it can mitigate on-site for some of the buffer impacts at this site. Impacts to buffers total 2.10 acres for Zone 1 and 1.40 acres for Zone 2.

Site 28 is a parallel impact with the NCDOT relocating the stream channel along its side fill slopes. This site violates the buffer rules because the NCDOT cannot relocate the stream channel to provide the required 50 feet buffer along each side of the stream reach. Impacts to buffers total 1.80 acres for Zone 1 and 1.30 acres for Zone 2.

2. The proposed activity cannot be practically accomplished, reduced or reconfigured to better minimize or eliminate disturbance to the riparian buffers than they already have. There are several reasons. First, Sites 7 and 28 were part of the design for ultimate design for TIP No. I-2402 and construction will be completed for this section in September 2003. Impacts to these sites were approved under the Section 404 and 401 WQC permits issued for this project, prior to the enactment of the Randleman Buffer Rules. However, the sites were not impacted by the on-going construction of the “interim design” for TIP No. I-2402 and have subsequently been included with the proposed construction of TIP No. U-2524AB.

The proposed project has been positioned parallel to the two streams. Sufficient buffer area was not included as part of the roadway design to relocate the streams. The design was completed in the mid 1990s when streams were relocated on-site as a minimization technique for impacts to surface waters. The requirement for 50 foot buffers was not a policy guideline or a rule at this time.

Second, there are topographical constraints affecting the “ultimate” design that preclude full compliance with the Randleman Buffer Rules. To relocate the stream at Site 28 and provide the required buffer, a considerable amount of earth would have to be moved and as reflected on the attached cross sections.

At Site 28, the existing stream channel has a relatively broad, low valley with a low valley slope and a Rosgen stream classification of “E”. Notable characteristics are a relatively high entrenchment ratio (10.3), low average slope (0.012), high belt width (average of 51.3 feet) and high meander width ratio (8.3). Ideally, if the NCDOT was not constrained by the location of the road project and topographic restrictions, the NCDOT would construct a Rosgen stream type which should be present based on the existing conditions, an “E” channel. To comply with the buffer rules (i.e., providing the appropriate buffer and Rosgen “E” stream type), the NCDOT would have to move a considerable amount of earth (10,800 cubic yards and \$ 21,500 to remove the material) and purchase additional right of way (\$91,300). Cost of strict compliance to the buffer rule would total \$ 112,800.

The NCDOT proposes to minimize impacts to the stream reach and buffer by relocating the stream with a narrower valley with a higher valley slope; a Rosgen stream classification of “C”. The notable characteristics of the proposed relocated reach are a low entrenchment ratio (4.85), increased slope (0.0178), lower belt width (average of 21.0 feet) and considerably reduced meander ratio (2.5) when compared to existing conditions (see attached morphological table for Site 28). This relocation does not achieve the 50 foot required buffer along the stream reach.

The NCDOT has attempted to construct stream relocations in similar conditions involving the movement of a considerable amount of earth to relocate the stream channel (examples are TIP No. X-2D and U-2528 AA). The NCDOT has attempted to relocate the 2,100 feet of a stream channel on TIP No. X-2D on three separate occasions, and the relocation is still not stabilized. Three times the NCDOT has taken steps to attempt

stabilization of the relocated stream at a cost of over \$650,000. A fourth time attempt to stabilize the stream is currently underway. It is anticipated that the cost will rise to \$900,000.

Typically, these extensive cuts to re-create the floodplain, flood prone area and thalweg result in placing the stream on unsuitable, unstable material. The soil material may be saprolite or clay. The result is an unstable stream channel having the tendency to downcut thereby increasing the amount of sediment in the stream. The soil material is also sterile, lowering the potential success of establishing vegetation on the site correlating to success of the stream relocation work.

The NCDOT has taken measures to minimize impacts to the stream by proposing to relocate the stream with a Rosgen stream classification of "C" with a series of cross vanes to prevent downcutting and reduce velocities. This stream relocation attempts to minimize impacts to the buffers, minimize the amount of earth moved and to maximize the amount of buffer between the stream and road project as practicable. The NCDOT believes it can relocate this type of stream based on topography and a review of reference reaches.

3. As noted earlier, the NCDOT designed the project in the 1990's, and in some areas, there is not adequate land to treat stormwater discharges to the extent prescribed by the Randleman Buffer Rules. The NCDOT has taken steps to minimize road discharges where practicable by installing pre-formed scour holes to allow for treatment of road discharges. These pre-formed scour holes were not originally part of the design for the roadway project but have been included to comply with Randleman Buffer Rules. A list of treatment areas which meet the Randleman Buffer Rules is attached to this variance request.

However, there are several areas where it is not practicable to adequately treat the stormwater discharges from the road. Treatment cannot occur at other locations because of site conditions or other limiting circumstances. A complete list of areas not complying with the Randleman Buffer Rules attached to this variance request.

4. The NCDOT believes compensatory mitigation will be required for impacts at Site 7 and 28 to the buffer. At Site 7, the NCDOT will impact 3.17 acres (12,840 meters²) of Zone 1 and 2.40 acres (9,691 meters²) of Zone 2.

The NCDOT will restore several acres of buffer by implementing the on-site stream mitigation. At Site 7, the NCDOT will restore 1.30 acres (5,272 meters²) of Zone 1 and 0.86 acres (3,461 meters²) of Zone 2. Therefore, subtracting the on-site mitigation from the impacts, the NCDOT will need to mitigate for 1.87 acres of impacts to Zone 1 buffers and 1.54 acres of Zone 2 buffers. Buffer mitigation, using the appropriate ratios, required at Site 7 is 5.61 acres for Zone 1 buffer impacts and 2.81 acres for Zone 2 buffer impacts for a total mitigation requirement of 8.42 acres (366,755 feet²).

Anticipated impacts to the buffer at Site 28 total 1.80 acres in Zone 1 and 1.30 acres in Zone 2. Mitigation required is 5.40 acres for Zone 1 buffer impacts and 1.95 acres for Zone 2 buffer impacts for a total mitigation requirement of 7.35 acres (320,166 feet²).

The first option in providing mitigation for these buffer impacts is paying into the NC Wetland Restoration Program (NCWRP). Mitigation needs total 15.77 acres (686,921 feet²) for Sites 7 and 28. Based on NCWRP figures for buffer mitigation (0.97 cents per square foot), the NCDOT would pay to the NCWRP \$666,313.37.

A second option is to provide mitigation at the Groometown Road Mitigation Site. This mitigation site will treat stormwater discharge from Groometown Road and provide additional treatment of discharge from the Urban Loop (TIP No. U-2524 AB). A mitigation plan for this site has been attached to this variance request.

5. (1) There are several difficulties and hardships which would result from the strict application of this Rule. These difficulties include (a) the constructed interim designed roadway project, (b) the purchase of additional right of way; and (c) topographic constraints. The "ultimate" design of the interchange connecting TIP Nos. U-2524AB and I-2402 overlaps with the "interim" design of TIP No. I-2402 which is already under construction and will be completed in September 2003. Both the interim and ultimate designs were permitted in 1999 in the Section 404 and 401 WQC permits for TIP No. I-2402. Strict application of this Rule would force NCDOT to abandon project TIP No. U-2524AB in its current form, and necessitate an extensive redesign to avoid buffer impacts which would likely require delaying a needed project and purchasing additional right of way. TIP No. U-2524AB and I-2402 would not be able to intersect with each other as envisioned in the approved permits Section 404 and 401 WQC permits for TIP No. I-2402.

Finally, if a Rosgen "E/C" stream channel is constructed at Site 28 on the described topographical constraints, the result will be large cuts in the earth and the placement of the relocated stream on soils which are unsuitable for construction. The NCDOT has attempted to construct projects in such conditions on other projects. The NCDOT has tried numerous times to stabilize these reaches (three times on TIP No. X-2D upon which a fourth attempt will be made). A considerable amount of money has been spent trying to stabilize these reaches using natural stream channel techniques.

(2) The difficulties and hardships resulting from strict application of the buffer rules are unique to this project. The NCDOT cannot move the alignment of the road project itself to negotiate around these topographical restraints because the construction of the interim design is nearing completion. Both the interim and ultimate designs were specifically sanctioned in the Section 404 and 401 WQC permits for TIP No. I-2402, which were issued prior to enactment of the Randleman Buffer Rules.

6 21 2003

SUBJECT: Stormwater Management Plan for U-2524AB Part1, Guilford County.
Greensboro – Western Loop from North of I-85 near Groometown
Road to North of High Point Road

ROADWAY DESCRIPTION:

The U-2524AB1 project goal is to provide a connection between the new Greensboro Bypass and existing I-40. The project is primarily a new interchange at the Greensboro bypass and the I-40 connector. There are three existing box culverts located on the project that are to be retained and extended. All three culverts are on Unnamed Tributaries to Hickory Creek. There are two other jurisdictional streams that are being relocated and several wetland sites that will be impacted.

ENVIRONMENTAL DESCRIPTION:

The Tributaries to Hickory Creek are in the Cape Fear River Basin and are a part of the Randleman Reservoir Watershed. The stream classification for Hickory Creek is WS-IV. The unnamed tributaries to Hickory Creek are not specified on the DENR Stream Classification List. There are four sites that appear on the soils map. There are a total of fifteen permitted sites on the project, with impacts totaling 1399 m (4590 ft.) of stream with 575 m (1887 ft.) of relocated stream utilizing Natural Channel Design, 10.86 ha (26.84 Ac.) of wetlands, and 4.34 ha (10.74 ac.) of Randleman Reservoir Riparian Buffers.

BEST MANAGEMENT PRACTICES AND MAJOR STRUCTURES:

Best Management Practices (BMP's) utilized on this project consist of grassed swales and preformed scour holes.

The following summarizes the locations of each BMP:

Grassed Swales

-I40SBREV-

Station 12+00 to 15+40 Lt.
Station 15+80 to 17+00 Rt.
Station 19+00 to 19+40 Lt.
Station 20+00 to 21+00 Lt.

-I1140NB-

Station 13+40 to 15+90 Lt.
Station 19+00 to 22+00 Lt.
Station 20+60 to 20+90 Rt.

-CSLIP-

Station 17+00 to 18+00 Lt.
Station 17+00 to 18+20 Rt.
Station 18+80 to 19+60 Rt.
Station 18+80 to 19+80 Lt.

RANDLEMAN BUFFER VARIANCE
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-CSLIP- cont.

Station 20+20 to 22+30 Lt.
Station 21+80 to 24+40 Rt.
Station 24+80 to 26+10 Lt.
Station 26+10 to 27+50 Lt.
Station 28+40 to 29+40 Rt.

-I1SLIP2-

Station 11+20 to 13+00 Lt.
Station 13+00 to 15+00 Lt.

-I1RPB1-

Station 14+60 to 15+60 Lt.
Station 14+60 to 15+70 Rt.

-I1FLY-

Station 12+20 to 13+50 Lt. & Rt.
Station 21+90 to 20+50 Rt.

-LoopC-

Station 12+81 Lt.

Preformed Scour Holes

Station 31+20 -CSLIP- Rt.
Station 31+88 -CSLIP- Rt.
Station 32+20 -CSLIP- Rt.
Station 31+28 -I40SBREV- Rt.
Station 32+08 -I40SBREV- Rt.

Some outlets are not fitted with BMP's due to site conditions or other circumstances. They are summarized below:

-I40SBREV-

- Station 11+60 Rt. – Natural ground falls at 12%; therefore, no preformed scour hole used. There is limited room for any other BMP.
- Station 18+80 Lt. – This system empties into an existing ditch. Other ways of outletting this system were investigated, but elevation constraints would not allow.
- Station 24+20 Lt. – This system ties into the existing system on the new I-85. Rerouting this system was investigated; however, due to elevation constraints we could not provide treatment for this water.
- Station 28+68 Rt. – A Preformed Scour Hole was investigated for this outlet; however, there is not enough room between the fill slope and the stream bank to fit the PSH properly.

- Station 30+05 Rt. – This system outlet is a 600mm (24”) pipe. Per design guidelines, the maximum pipe diameter for a preformed scour hole is 450mm (18”). Other methods were investigated, but there is limited space.

- I1I40NB- Station 18+60 Lt. – This system outlets into an existing system. Rerouting this water was investigated; however, due to elevation constraints, no other alternative was feasible.
- CSLIP- Station 25+48 and 25+88 Rt. – These pipes empty into an existing roadside ditch on a small service road. There is no room for any other BMP.
- I1FLY- Station 19+00 Lt. – This system empties into an existing ditch with no room for any other BMP.
- I1RPA- Station 11+60 to 14+50 Rt. – These pipes empty into an existing ditch with no room for any other BMP.

Major Structures

Station 31+70 –L- (Tributary to Hickory Creek) Existing 1 @ 2.7m x 1.5m (9 ft. x 5 ft.) reinforced concrete box culvert is to be retained and extended on the outlet end.

Station 11+75 –LoopC- (Tributary to Hickory Creek) Existing 1 @ 2.4m x 1.5m (8 ft. x 5 ft.) reinforced concrete box culvert will be retained and extended on the inlet end.

Station 25+35 –CSLIP- (Tributary to Hickory Creek) Existing 1 @ 2.4m x 1.8m (8 ft. x 6 ft.) reinforced concrete box culvert is to be retained and extended on the outlet end.

**Natural Channel Design Summary
Unnamed Tributary to Meadow Creek (Site 7)
TIP No. U-2524AB1
State Project No. 8.U492101
Guilford County, North Carolina**

Prepared by Mulkey Engineers and Consultants

May 2003

This natural channel design summary is presented to the North Carolina Department of Transportation (NCDOT) as part of on-site compensatory mitigation for the proposed construction of the Greensboro Western Loop. The proposed roadway extends from north of I-85 near Groometown Road to north of High Point Road on new location. An unnamed tributary (UT) to Hickory Creek, situated immediately east of SR 1497 (Wiley Davis Road) and north of existing I-85, will be relocated westward from its existing location outside of the proposed fill limits. The UT has been identified as a perennial stream and is part of the Cape Fear River Subbasin 03-06-08 (USGS Hydrologic Unit 03030002). A morphological table, complete with existing channel, reference reach, and proposed reach characteristics is attached. In addition, proposed design and detail sheets are also included with this summary. The project is within the Piedmont physiographic province.

The headwaters associated with the UT to Hickory Creek originate at the intersection of SR 1497 (Wiley Davis Road) and McCuiston Road. The UT flows in a southerly direction approximately 1.7 mi (2.7 km) before converging with Hickory Creek, then another 5.0 mi (8.0 km) to the southwest to unite with the Deep River. The drainage area at the project site is approximately 0.08 sq. mi (0.2 sq. km). It is considered urban with primarily residential development. The proposed project will require the stream to be relocated due to existing fill slope design requirements. Overall stream length will be reduced and slope will be increased in order to correctly align the new channel with its modified valley type.

Existing Channel

A 200-foot (61-meter) section of the single thread channel associated with the UT to Hickory Creek was surveyed during March 2003. This section was located near Sta. 10+20 -40SBREV- Right, near the northern terminus of the proposed project area. The surveyed reach exhibited channel characteristics similar to an E4/5b stream type, as noted by the Rosgen Classification of Natural Rivers. The E4/5 stream type exhibits low to moderate sinuosities, gentle to moderately steep channel gradients, and very low channel width/depth ratios. This stream type is generally stable due to the influence of riparian vegetation and planform resistance. Bank erosion and bedload transport rates are typically high and the ratio of bedload to total sediment load often exceeds 50%. These stream types are very sensitive to disturbance and tend to make significant adverse channel adjustments to changes streambank vegetation and in flow regime and sediment supply from the watershed (Rosgen and Silvey, 1998). However, the existing channel at this location classes out as an E type but it is in a state of instability. The channel is incised with a bank height ratio of around 1.3 with headcuts spaced throughout the reach. Only one pool was found in the reach, which was dominated by runs. The UT exhibited a bankfull cross sectional area of 4.0 sq. ft (0.37 sq. m), an average slope of 0.015ft/ft, and a D50 of 2.0 mm. A detailed summary of existing channel conditions is presented in attached morphological table.

Reference Reach

Due to the existing, unstable condition of the UT, a stable stream (UT Varnals Creek) outside of the project area was selected as the reference reach. This channel was selected based on its watershed components, stream type, and other general characteristics. The reference reach channel is situated in Alamance County and classifies as a B4a. It exhibits a drainage area of 0.24 sq. mi (0.62 sq. km) and a bankfull cross sectional area of 7.9 sq. ft. Based on surveys, the channel is stable and exhibits very low bank height ratios. Its valley characteristics are very comparable with the existing channel. Little to no bank erosion was noted during the survey. A detailed summary of reference conditions are also presented in the attached morphological table.

Proposed Channel

The proposed channel was based on dimensionless ratios derived from the reference reach survey and data interpretation. The bankfull width will be increased from 4.1 ft (1.25 m) to 9.0 ft (2.7 m) and the bankfull mean depth will be reduced from 1.0 ft (0.30 m) to 0.7 ft (0.21 m). As a result, the width/depth ratio will increase to approximately 13 from the existing 4.3 ratio. A decrease in the bankfull mean velocity will occur with the new channel. The design stream will exhibit additional floodprone area; however, minimal pattern will be provided due to site constraints. Slopes will be actually decrease due to a change in the valley; however, an excess energy will be dissipated via step/pool morphology characteristic with the B stream type. Rock cross vanes will be the primary method influencing the step/pool morphology. These cross vanes will be established throughout the channel in riffle sections and used to provide grade control, center the thalweg, and protect the stream banks on both sides of the new channel until vegetation is established. The cross vanes will also decrease shear stresses throughout the reach. The riparian zone adjacent to the channel will be planted with native vegetation conducive to wetter, floodplain areas.

Proposed channel stabilization characteristics are presented on the attached detail sheet. It is anticipated that the riparian zone will be planted with native trees and shrubs above bankfull depth and herbaceous species within the channel.

Sediment Transport

Based on pebble counts and bar samples taken along the existing channel, the D50 averages 2.0 mm and the D84 averages approximately 17.0 mm. The existing channel exhibits a critical shear stress of 0.67 lbs/ft² which may entrain up to a 40 mm particle. Based on the design, the proposed channel will exhibit a critical shear stress of 0.28 lbs/ft² entraining up to a 18 mm particle. This reduction in entrainment will further reduce degradation. In addition, cross vanes will be installed throughout the riffle sections to further reduce the possibility of additional channel degradation.

References

North Carolina Department of Environment and Natural Resources (NCDENR), 1998. Yadkin/Pee Dee Basinwide Water Quality Management Plan.

Rosgen, D. and L. Silvey, 1998. Field Guide for Stream Classification. Wildland Hydrology, Inc.

Appendix B

Morphological Measurement Table (Site 7)

Variables	Existing Channel	Proposed Reach	USGS Station	Reference Reach
1. Stream type	E4/5b	B4/5c	N/A	B4/1a
2. Drainage area	18.5 Ac.	52 Ac.		154 Ac.
3. Bankfull width	4.1 ft.	9.0 ft.		9.7 ft.
4. Bankfull mean depth	1.0 ft.	0.7 ft.		0.8 ft.
5. Width/depth ratio	4.3	13		12.7
6. Bankfull cross-sectional area	4.0 sq. ft.	6.3 sq. ft.		7.9 sq. ft.
7. Bankfull mean velocity	5.4 ft/s	3.43 ft/s		5.23 ft/s
8. Bankfull discharge, cfs	21.6 cfs	21.6 cfs		41.3 cfs
9. Bankfull max depth	1.4 ft.	1.0 ft.		1.1 ft.
10. Width of floodprone area	35 ft.	13.5ft.		26.2 ft.
11. Entrenchment ratio	8.5	1.5		2.7
12. Meander length	Range: 60-112 ft. Avg: 88 ft.	N/A		59 ft.
13. Ratio of meander length to bankfull width	21.5	N/A		6
14. Radius of curvature	Range: 11.8-36 ft. Avg:24.6 ft.	N/A		13.4 ft.
15. Ratio of radius of curvature to bankfull width	6	N/A		1.4
16. Belt width	Range: 11.5-27 ft. Avg:20 ft.	N/A		15 ft.
17. Meander width ratio	4.9	N/A		1.5
18. Sinuosity (stream length/valley length)	1.2	1.0		1.2
19. Valley slope	1.90%	0.74%		4.58%
20. Average slope	1.54%	0.74%		4.05%
21. Pool slope	0.00%	0.07%		0.47%
22. Ratio of pool slope to average slope	0	0.1		0.1
23. Maximum pool depth	1.9 ft.	2.0 ft.		1.6 ft.
24. Ratio of pool depth to average bankfull depth	1.9	3.0		1.9
25. Pool width	5.4 ft.	12.2 ft.		12.0 ft.
26. Ratio of pool width to bankfull width	1.35	1.4		1.2
27. Pool to pool spacing	**	50 ft.		34.5 ft.
28. Ratio of pool to pool spacing to bankfull width	**	5.5		3.5

** Only one pool was found in the existing channel; therefore, we cannot calculate pool to pool spacing

Natural Channel Design Summary
Unnamed Tributary to Meadow Creek (Site 28)
TIP No. U-2524AB1
State Project No. 8.U492101
Guilford County, North Carolina

Prepared by Mulkey Engineers and Consultants

May 2003

This natural channel design summary is presented to the North Carolina Department of Transportation (NCDOT) as part of on-site compensatory mitigation for the proposed construction of the Greensboro Western Loop. The proposed roadway extends from north of I-85 near Groometown Road to north of High Point Road on new location. An unnamed tributary (UT) to Hickory Creek, situated immediately west of SR 1117 (Holden Road) and south of Roberts Court Road, will be relocated southward from its existing location outside of the proposed fill limits. The UT has been identified as a perennial stream and is part of the Cape Fear River Subbasin 03-06-08 (USGS Hydrologic Unit 03030002). A morphological table, complete with existing channel, reference reach, and proposed reach characteristics is attached. In addition, proposed design and detail sheets are also included with this summary. The project is within the Piedmont physiographic province.

The headwaters associated with the UT to Hickory Creek originate at the intersection of SR 1117 (Holden Road) and SR 1392 (Drummond Road). The UT flows in a westerly direction approximately 1.0 mi (1.6 km) before converging with Hickory Creek, then another 5.0 mi (8.0 km) to the southwest to unite with the Deep River. The drainage area at the project site is approximately 0.10 sq. mi (0.26 sq. km). It is considered urban with primarily residential development. The proposed project will require the stream to be relocated due to existing fill slope design requirements. Overall stream length will be reduced and slope will be increased in order to correctly align the new channel with its modified valley type.

Existing Channel

A 1600-foot (488-meter) section of the single thread channel associated with the UT to Hickory Creek was surveyed during March 2003. This section was located near Sta. 29+20 -40SBREV- Right, near the eastern terminus of the proposed project area. The surveyed reach exhibited channel characteristics similar to an E4/1 stream type, as noted by the Rosgen Classification of Natural Rivers. The E4 stream type exhibits low to moderate sinuities, gentle to moderately steep channel gradients, and very low channel width/depth ratios. This stream type is generally stable due to the influence of riparian vegetation and planform resistance. Bank erosion and bedload transport rates are typically high and the ratio of bedload to total sediment load often exceeds 50%. These stream types are very sensitive to disturbance and tend to make significant adverse channel adjustments to changes streambank vegetation and in flow regime and sediment supply from the watershed (Rosgen and Silvey, 1998). The existing channel at this location classes out as an E type and it is in a state of relative stability. The channel has previously incised but has reestablished a small floodplain at a lower elevation. Due to recent ice storms, there was a large amount of woody debris in the channel creating localized instability. Significant bedrock was noted in several areas along the existing channel which is helping prevent further incision. The UT exhibited a bankfull cross sectional area of 5.6 sq. ft (0.52 sq. m), an average slope of 0.012ft/ft, and a D50 of

2.5mm. A detailed summary of existing channel conditions is presented in attached morphological table.

Reference Reach

Even though the existing channel is relatively stable, a stable stream (UT Lake Jeanette) outside of the project area was selected as the reference reach. This channel was selected based on its watershed components, stream type, and other general characteristics. The reference reach channel is situated in Guilford County and classifies as a C4. It exhibits a drainage area of 0.25 sq. mi (0.65 sq. km) and a bankfull cross sectional area of 7.7 sq. ft. Based on surveys, the channel is stable and exhibits very low bank height ratios. Its valley characteristics are very comparable with the existing channel. Little to no bank erosion was noted during the survey. A detailed summary of reference conditions are also presented in the attached morphological table.

Proposed Channel

The proposed channel was based on dimensionless ratios derived from the reference reach survey, existing channel survey, and data interpretation. The bankfull width will be increased from 6.3 ft (1.92 m) to 8.5 ft (2.6 m) and the bankfull mean depth will be reduced from 0.9 ft (0.27 m) to 0.66 ft (0.20 m). As a result, the width/depth ratio will increase to approximately 13 from the existing 7.0 ratio. A decrease in the bankfull mean velocity will occur with the new channel. The design stream will exhibit additional floodprone area to aid in stress reduction in the channel. Slopes will be increased due to a change in the valley; however, an excess energy will be dissipated via riffle/pool morphology characteristic and planform associated with the C stream type. Rock cross vanes will be the primary method influencing the riffle/pool morphology. These cross vanes will be established throughout the channel in riffle sections and used to provide grade control, center the thalweg, and protect the stream banks on both sides of the new channel until vegetation is established. The cross vanes will also decrease shear stresses throughout the reach. The riparian zone adjacent to the channel will be planted with native vegetation conducive to wetter, floodplain areas.

Proposed channel stabilization characteristics are presented on the attached detail sheet. It is anticipated that the riparian zone will be planted with native trees and shrubs above bankfull depth and herbaceous species within the channel.

Sediment Transport

Based on pebble counts and bar samples taken along the existing channel, the D50 averages 2.5 mm and the D84 averages approximately 30.0 mm. The existing channel exhibits a critical shear stress of 0.54 lbs/ft² which may entrain up to a 35 mm particle. Based on the design, the proposed channel will exhibit a critical shear stress of 0.59 lbs/ft² entraining up to a 38 mm particle. This increase in entrainment will not induce degradation as the active bed sample produced a D84 of 40mm. In addition, cross vanes will be installed throughout the riffle sections to further reduce the possibility of additional channel degradation.

References

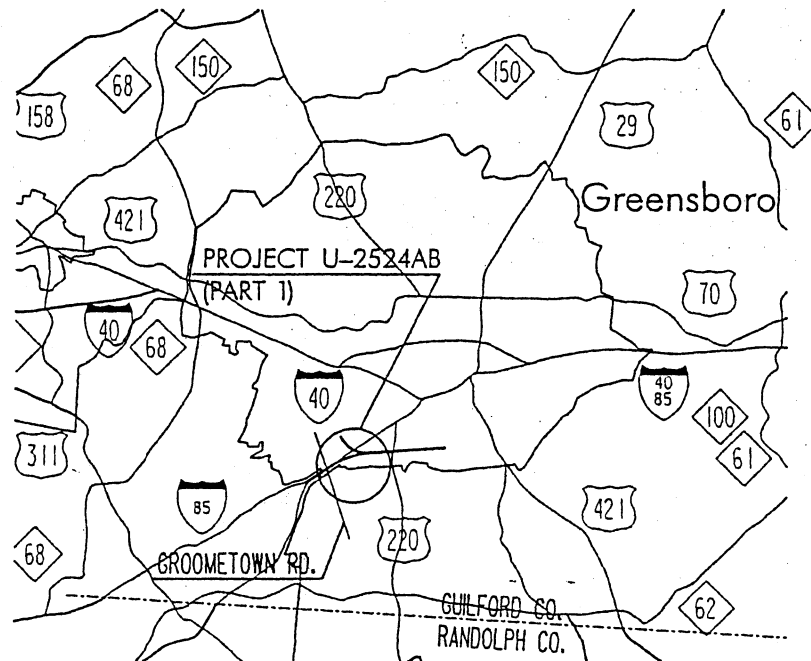
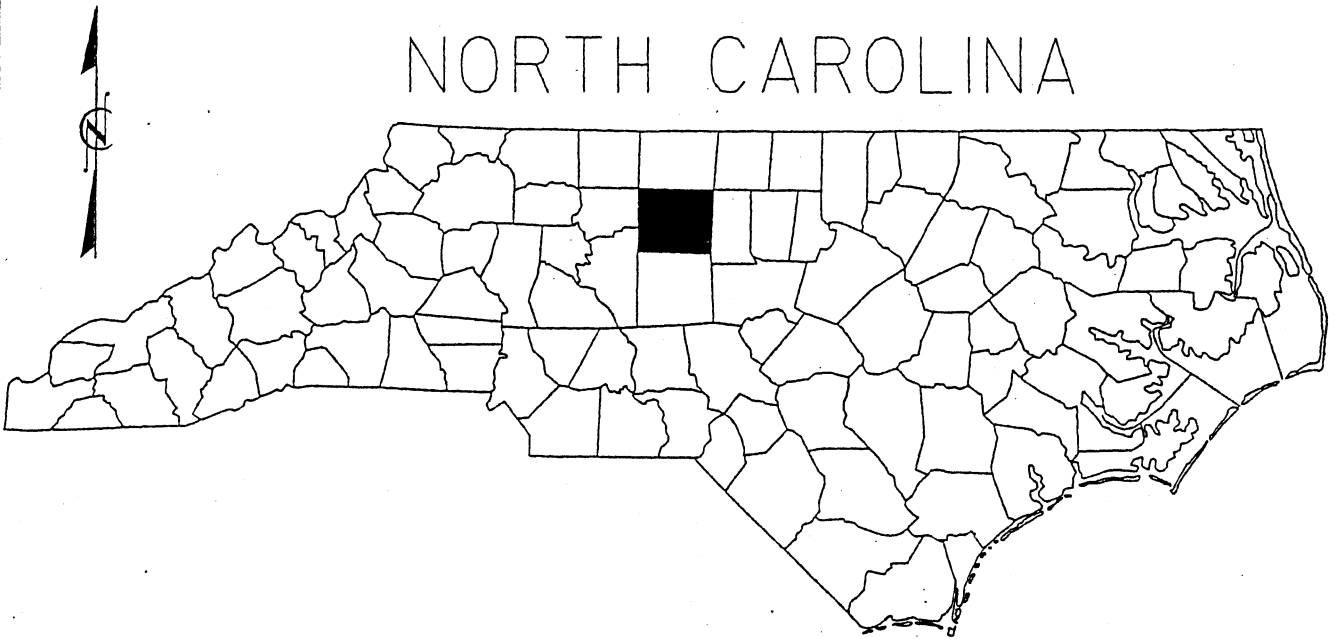
North Carolina Department of Environment and Natural Resources (NCDENR), 1998. Yadkin/Pee Dee Basinwide Water Quality Management Plan.

Rosgen, D. and L. Silvey, 1998. Field Guide for Stream Classification. Wildland Hydrology, Inc.

Appendix B

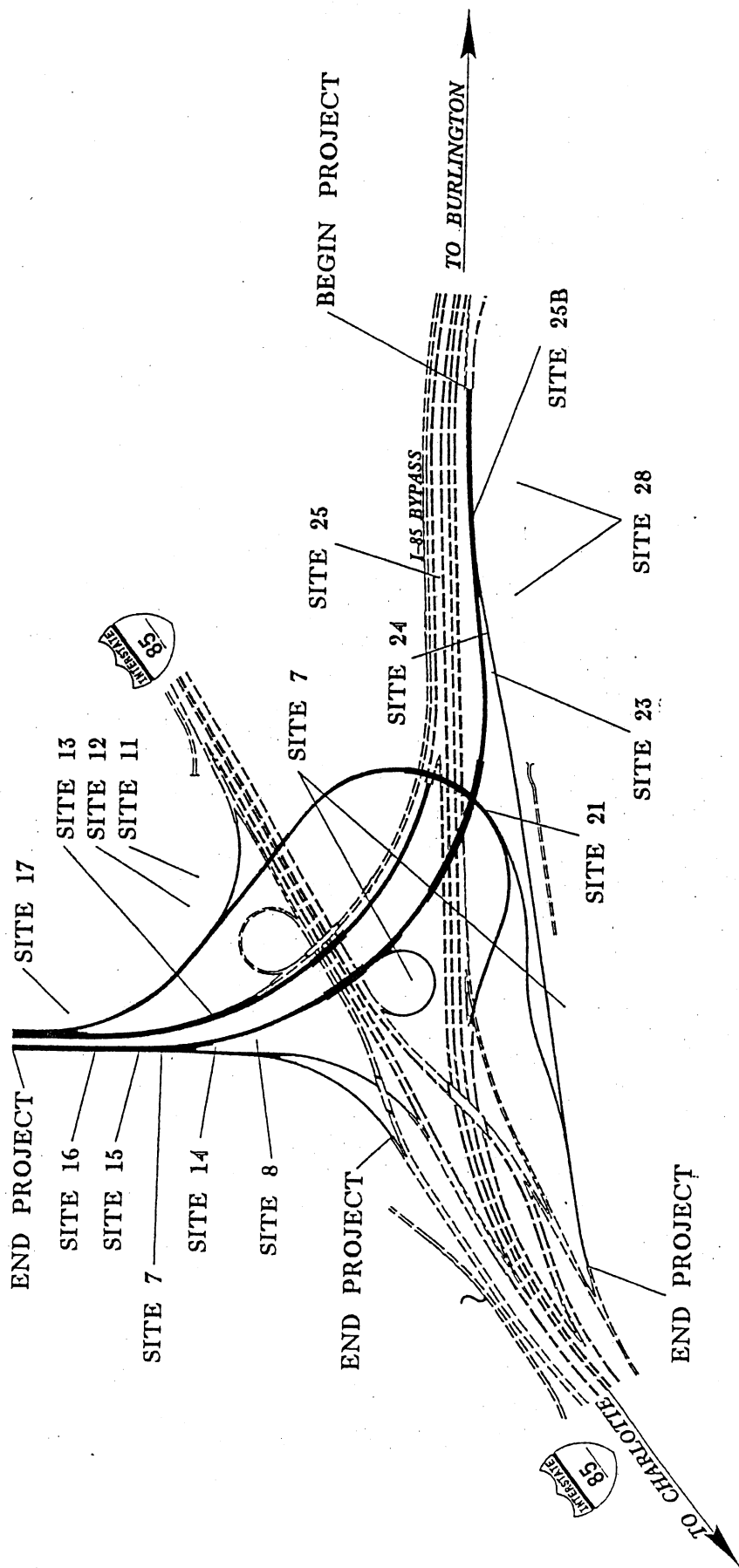
Morphological Measurement Table (Site 28)

Variables	Existing Channel	Proposed Reach	USGS Station	Reference Reach
1. Stream type	E4	C4	N/A	C4
2. Drainage area	57Ac. - 75Ac.	57Ac. - 75Ac.		160 Ac.
3. Bankfull width	6.3 ft.	8.5 ft.		9.5 ft.
4. Bankfull mean depth	0.9 ft.	0.66 ft.		0.8 ft.
5. Width/depth ratio	7	13		11.7
6. Bankfull cross-sectional area	5.6 sq. ft.	5.6 sq. ft.		7.7 sq. ft.
7. Bankfull mean velocity	4.06 ft/s	3.9 - 4.0 ft/s		4.55 ft/s
8. Bankfull discharge, cfs	22.7 cfs	22.7 cfs		35 cfs
9. Bankfull max depth	1.5 ft.	1.1 ft.		1.3 ft.
10. Width of floodprone area	65 ft.	Range: 32 - 56 ft. Avg: 41.3 ft.		36 ft.
11. Entrenchment ratio	10.3	4.85		3.8
12. Meander length	Range: 85-150 ft. Avg: 120 ft.	Range: 43-114.5 ft. Avg: 73 ft.		Range: 29-69 ft. Avg: 50.2 ft.
13. Ratio of meander length to bankfull width	19	8.6		5.3
14. Radius of curvature	Range: 10.2-36 ft. Avg: 22 ft.	Range: 19-49 ft. Avg: 29.8 ft.		Range: 5.3-22 ft. Avg: 9.7 ft.
15. Ratio of radius of curvature to bankfull width	3.5	3.5		1.02
16. Belt width	Range: 46-63 ft. Avg: 52.5 ft.	Range: 11.8-35 ft. Avg: 21.0 ft.		Range: 26-40 ft. Avg: 33 ft.
17. Meander width ratio	8.3	2.5		3.5
18. Sinuosity (stream length/valley length)	1.35	1.02		1.35
19. Valley slope	1.60%	1.85%		0.76%
20. Average slope	1.20%	U/S: 1.78% D/S: 1.66%		0.57%
21. Pool slope	0.26%	0.35%		Range: 0.012-0.13%. Avg: 0.047%
22. Ratio of pool slope to average slope	0.22	0.2		0.082
23. Maximum pool depth	2.3 ft.	2.0 ft.		2.9 ft.
24. Ratio of pool depth to average bankfull depth	2.56	3.0		3.6
25. Pool width	8.9 ft.	12.2 ft.		10.5
26. Ratio of pool width to bankfull width	1.41	1.4		1.1
27. Pool to pool spacing	58.5 ft.	Range: 24-63 ft. Avg: 39.4 ft.		Range: 20.7-54.8 ft. Avg: 40.2 ft.
28. Ratio of pool to pool spacing to bankfull width	9.3	Range: 2.8-7.4 Avg: 4.5		Range: 2.2-5.8 Avg: 4.23



VICINITY MAPS

NCDOT
DIVISION OF HIGHWAYS
GUILFORD COUNTY
PROJECT: 8.U492101 (U-2524AB)
GREENSBORO - WESTERN LOOP FROM
NORTH OF I-85 NEAR GROOMETOWN
TO NORTH OF HIGH POINT ROAD
SHEET OF 5 / 15 / 03



SITE MAP

NCDOT

DIVISION OF HIGHWAYS

GUILFORD COUNTY

PROJECT: 8.U492101 (U-2524AB)

GREENSBORO - WESTERN LOOP FROM
NORTH OF I-85 NEAR GROOMETOWN
TO NORTH OF HIGH POINT ROAD

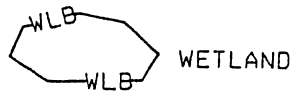
SHEET OF

5/15/03

BUFFER

LEGEND

—WLB— WETLAND BOUNDARY



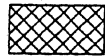
WETLAND



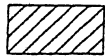
ALLOWABLE IMPACTS ZONE 1



ALLOWABLE IMPACTS ZONE 2



MITIGABLE IMPACTS ZONE 1



MITIGABLE IMPACTS ZONE 2

—BZ— RIPARIAN BUFFER ZONE

—BZ1— RIPARIAN BUFFER ZONE 1
30 ft (9.2m)

—BZ2— RIPARIAN BUFFER ZONE 2
20 ft (6.1m)

— — — 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

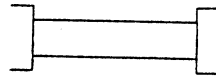
—▽— WATER SURFACE

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x x x x
x x x x
LIVE STAKES

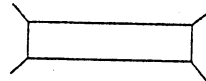


BOULDER

— — — CORE FIBER ROLLS



PROPOSED BRIDGE



PROPOSED BOX CULVERT



PROPOSED PIPE CULVERT

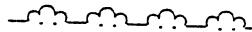
(DASHED LINES DENOTE
EXISTING STRUCTURES)

12"-48"
PIPES

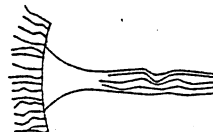
54" PIPES
& ABOVE



SINGLE TREE



WOODS LINE



DRAINAGE INLET



ROOTWAD

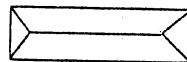
RIP RAP



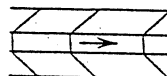
ADJACENT PROPERTY OWNER
OR PARCEL NUMBER
IF AVAILABLE



PREFORMED SCOUR HOLE (PSH)



LEVEL SPREADER (LS)



GRASS SWALE

NCDOT

DIVISION OF HIGHWAYS

GUILFORD COUNTY

PROJECT: 8.U492101 (U-2524AB)

GREENSBORO - WESTERN LOOP FROM
NORTH OF I-85 NEAR GROOMETOWN
TO NORTH OF HIGH POINT ROAD

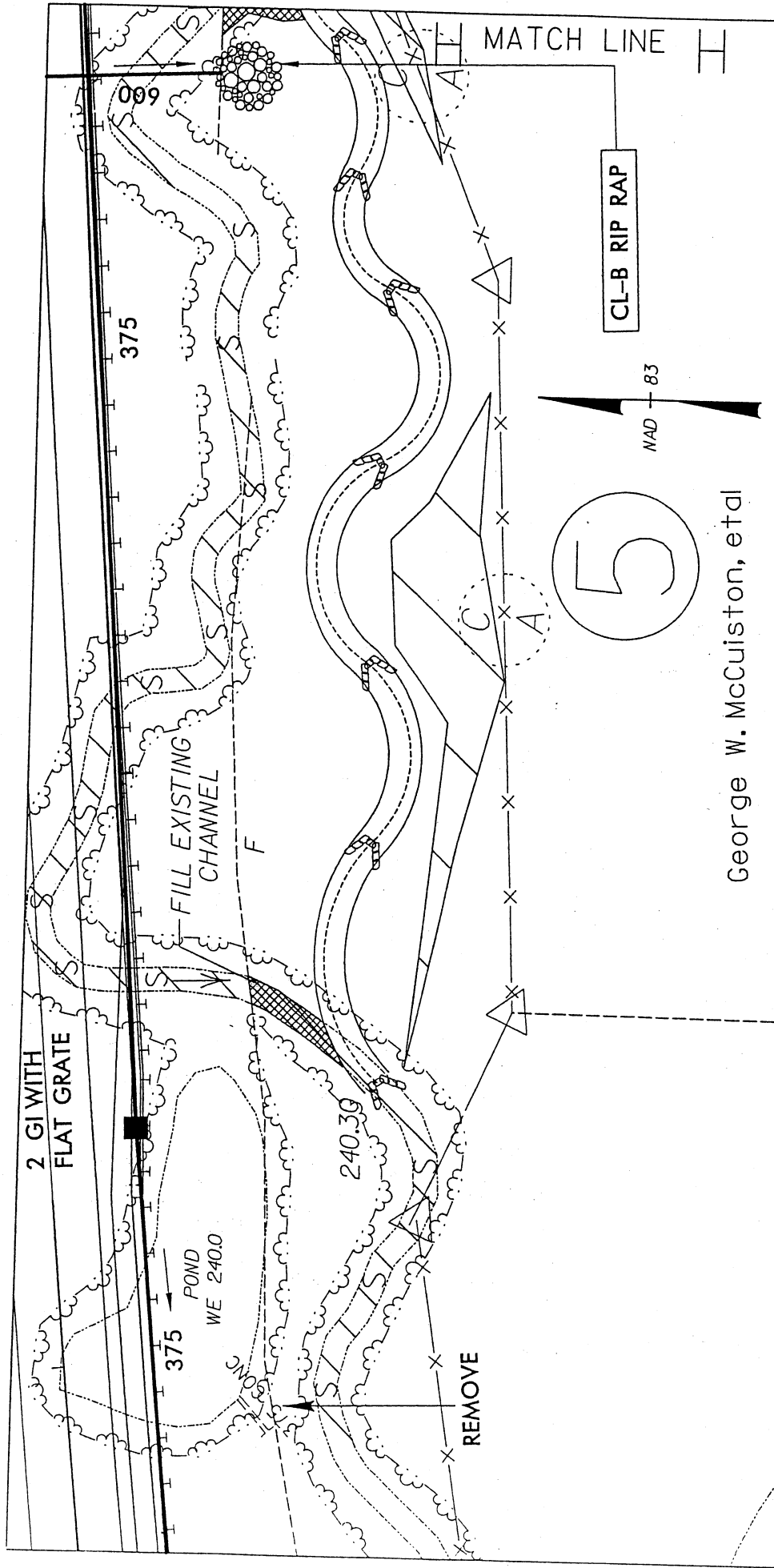
SHEET OF

5 / 15 / 03

WETLAND LEGEND

	WETLAND BOUNDARY		PROPOSED BRIDGE
	WETLAND		PROPOSED BOX CULVERT
	DENOTES FILL IN WETLAND		PROPOSED PIPE CULVERT
	DENOTES FILL IN SURFACE WATER	(DASHED LINES DENOTE EXISTING STRUCTURES)	
	DENOTES FILL IN SURFACE WATER (POND)	12"-48" PIPES	
	DENOTES TEMPORARY FILL IN WETLAND	54" PIPES & ABOVE	
	DENOTES EXCAVATION IN WETLAND		SINGLE TREE
	DENOTES TEMPORARY FILL IN SURFACE WATER		WOODS LINE
	DENOTES MECHANIZED CLEARING		DRAINAGE INLET
	FLOW DIRECTION		ROOTWAD
	TOP OF BANK		RIP RAP
	EDGE OF WATER		ADJACENT PROPERTY OWNER OR PARCEL NUMBER IF AVAILABLE
	PROP. LIMIT OF CUT		PREFORMED SCOUR HOLE
	PROP. LIMIT OF FILL		LEVEL SPREADER (LS)
	PROP. RIGHT OF WAY		DITCH / GRASS SWALE
	NATURAL GROUND		
	PROPERTY LINE		
	TEMP. DRAINAGE EASEMENT		
	PERMANENT DRAINAGE EASEMENT		
	EXIST. ENDANGERED ANIMAL BOUNDARY		
	EXIST. ENDANGERED PLANT BOUNDARY		
	WATER SURFACE		
	LIVE STAKES		
	BOULDER		
	CORE FIBER ROLLS		

NCDOT
DIVISION OF HIGHWAYS
GUILFORD COUNTY
 PROJECT: 8.U492101 (U-2524AB)
 GREENSBORO - WESTERN LOOP FROM
 NORTH OF I-85 NEAR GROOMETOWN
 TO NORTH OF HIGH POINT ROAD
 SHEET OF 5 / 15 / 03



PLAN VIEW
STREAM
RESTORATION
SITE 28
SCALE = 1:500

NCDOT

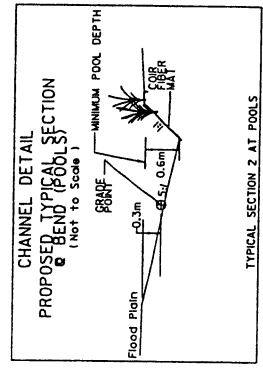
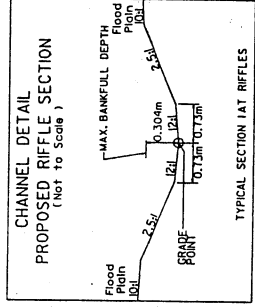
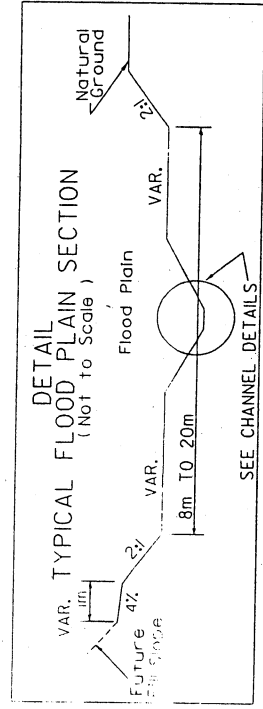
DIVISION OF HIGHWAYS
GUILFORD COUNTY

PROJECT: 8.U492101 (U-2524AB)
GREENSBORO - WESTERN LOOP FROM
NORTH OF I-85 NEAR GROOMETOWN
TO NORTH OF HIGH POINT ROAD

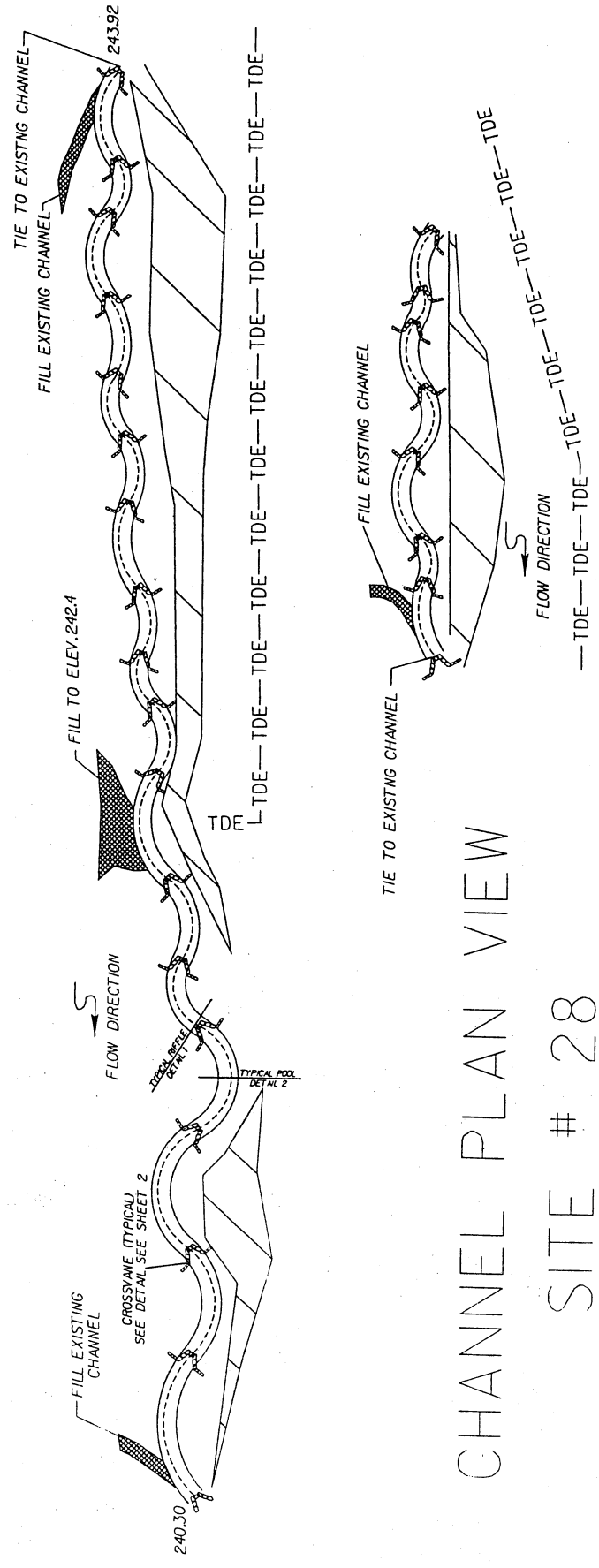
SHEET OF 5/15/03



NATURAL CHANNEL DESIGN TYPICALS



QUANTITIES
 DDE = 2000m³
 BOULDERS = 400 EACH
 COIR MAT = 260m²
 GEOTEXTILE FABRIC = 350m²



CHANNEL PLAN VIEW

SITE # 28

CHANNEL ALIGNMENT DATA & PROFILE INFORMATION

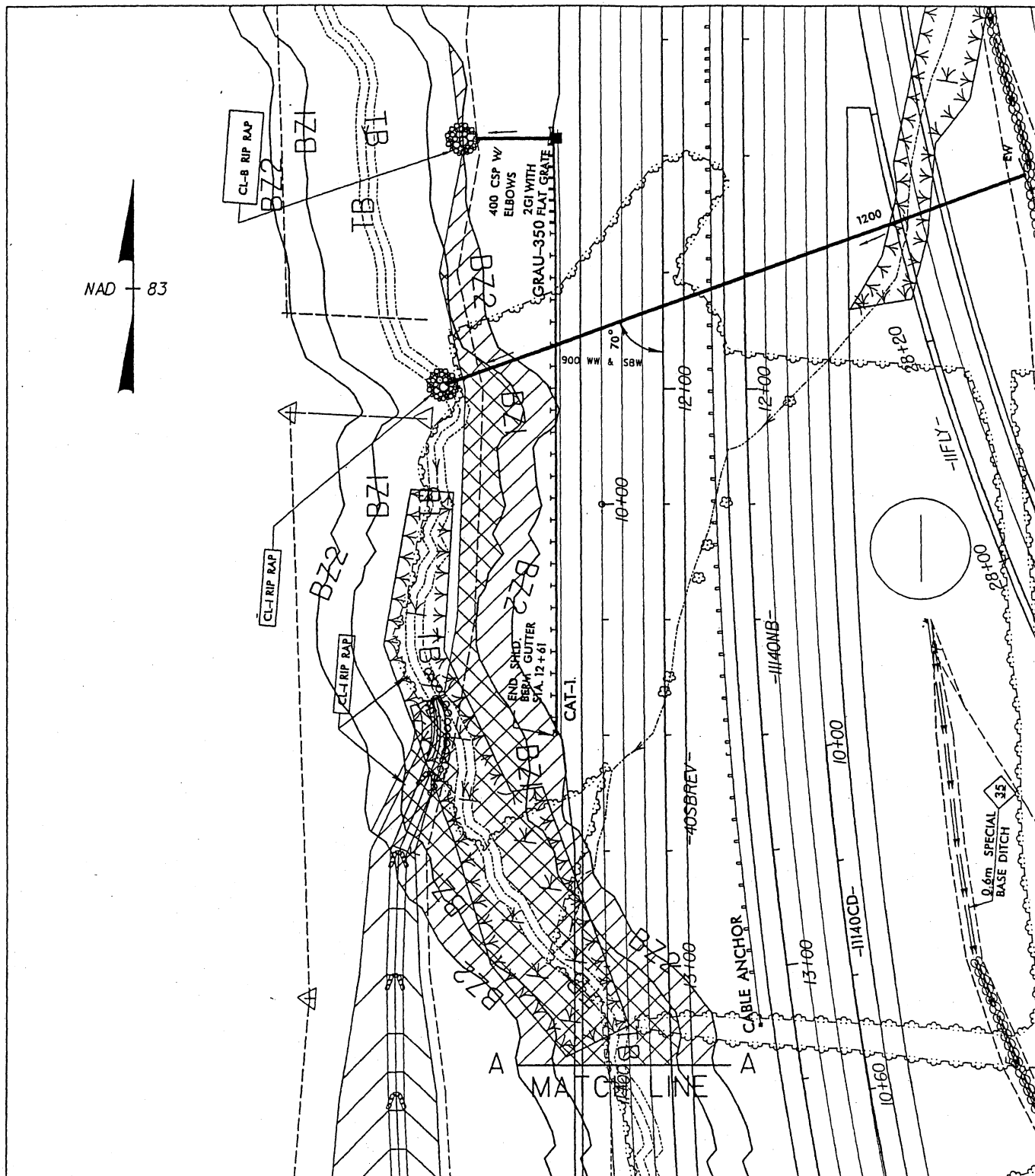
SITE # 28



PROJECT REFERENCE NO. 1	SHEET NO. 1
DATE 12-22-2011	DATE 12-22-2011
PROJECT LOCATION	PROJECT LOCATION
PRELIMINARY PLANS	PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION	DO NOT USE FOR CONSTRUCTION
INCOMPLETE PLANS	INCOMPLETE PLANS
DO NOT USE FOR CONSTRUCTION	DO NOT USE FOR CONSTRUCTION

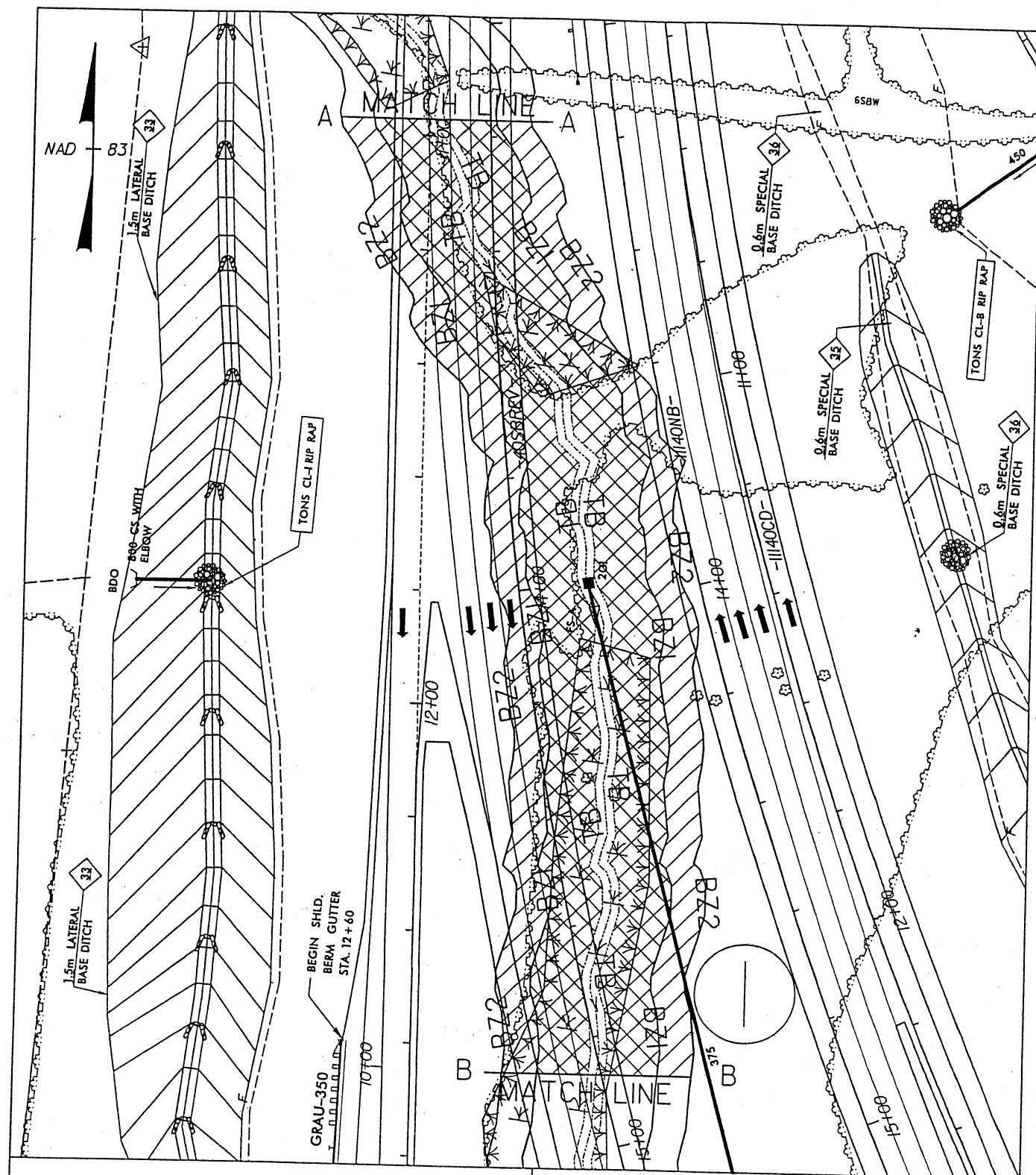
STA (+405BREV)	OFFSET FROM 405BREV	RADIUS	L _c	INVERT (THALWEG)	BANKFULL (FLOODPLAIN)
PC 29+42.7	38.0m RT.			240.30	240.40
PI 29+42.9	29.9m RT.	15.0m	21.7m		
PC/PT 29+42.5	39.1m RT.			240.66	240.96
PI 29+49.8	46.6m RT.	11.0m	16.3m		
PC/PT 29+51.4	39.4m RT.			240.93	241.23
PI 29+61.2	29.8m RT.	10.0m	19.2m		
PC/PT 29+74.0	41.7m RT.			241.25	241.55
PI 29+80.4	53.6m RT.	8.5m	17.1m		
PC/PT 29+88.5	42.7m RT.			241.53	241.83
PI 29+92.3	37.4m RT.	7.0m	10.6m		
PC/PT 29+98.0	40.8m RT.			241.71	242.01
PI 30+04.3	44.4m RT.	9.5m	12.3m		
PC/PT 30+09.5	39.4m RT.			241.91	242.21
PI 30+16.9	32.5m RT.	11.0m	16.4m		
PC/PT 30+24.0	38.3m RT.			242.18	242.48
PI 30+30.0	42.5m RT.	8.0m	10.6m		
PC/PT 30+34.5	38.0m RT.			242.36	242.66
PI 30+37.8	35.2m RT.	6.5m	7.5m		
PC/PT 30+41.5	37.2m RT.			242.48	242.78
PI 30+46.3	39.3m RT.	9.5m	9.4m		
PC/PT 30+50.8	36.7m RT.			242.64	242.94
PI 30+56.7	32.8m RT.	12.0m	12.7m		
PC/PT 30+62.9	36.2m RT.			242.85	243.15
PI 30+67.9	38.4m RT.	9.0m	9.7m		
PC/PT 30+72.3	35.3m RT.			243.00	243.30

STA (+405BREV)	OFFSET FROM 405BREV	RADIUS	L _c	INVERT (THALWEG)	BANKFULL (FLOODPLAIN)
PI 30+76.0	32.7m RT.	7.5m	8.2m		
PC/PT 30+80.0	34.4m RT.			243.14	243.44
PI 30+86.3	37.5m RT.	12.0m	12.4m		
PC/PT 30+92.0	33.6m RT.			243.35	243.65
PI 30+97.9	29.9m RT.	9.0m	11.8m		
PC/PT 31+03.5	34.3m RT.			243.54	243.84
PI 31+06.9	38.1m RT.	6.5m	8.8m		
PC/PT 31+11.0	35.3m RT.			243.69	243.99
PI 31+17.3	31.6m RT.	10.0m	12.1m		
PC/PT 31+22.9	35.9m RT.			243.90	244.20
PI 31+28.4	31.4m RT.	12.0m	11.0m		
PC/PT 31+34.0	33.4m RT.			244.50	244.80
PI 31+39.4	34.7m RT.	6.0m	6.5m		
PC/PT 31+43.8	32.1m RT.			244.61	244.91
PI 31+49.3	26.9m RT.	9.0m	13.2m		
PC/PT 31+55.8	32.2m RT.			244.85	245.15
PI 31+60.5	36.4m RT.	7.0m	9.6m		
PC/PT 31+75.0	32.9m RT.			245.02	245.32
PI 31+79.4	29.9m RT.	8.5m	9.4m		
PC/PT 31+84.2	32.1m RT.			245.18	245.48
PI 31+86.3	33.7m RT.	6.0m	5.0m		
PC/PT 31+88.9	32.9m RT.			245.27	245.57
PI 31+93.5	32.0m RT.	9.0m	8.9m		
PT 31+97.0	35.0m RT.			245.45	245.75



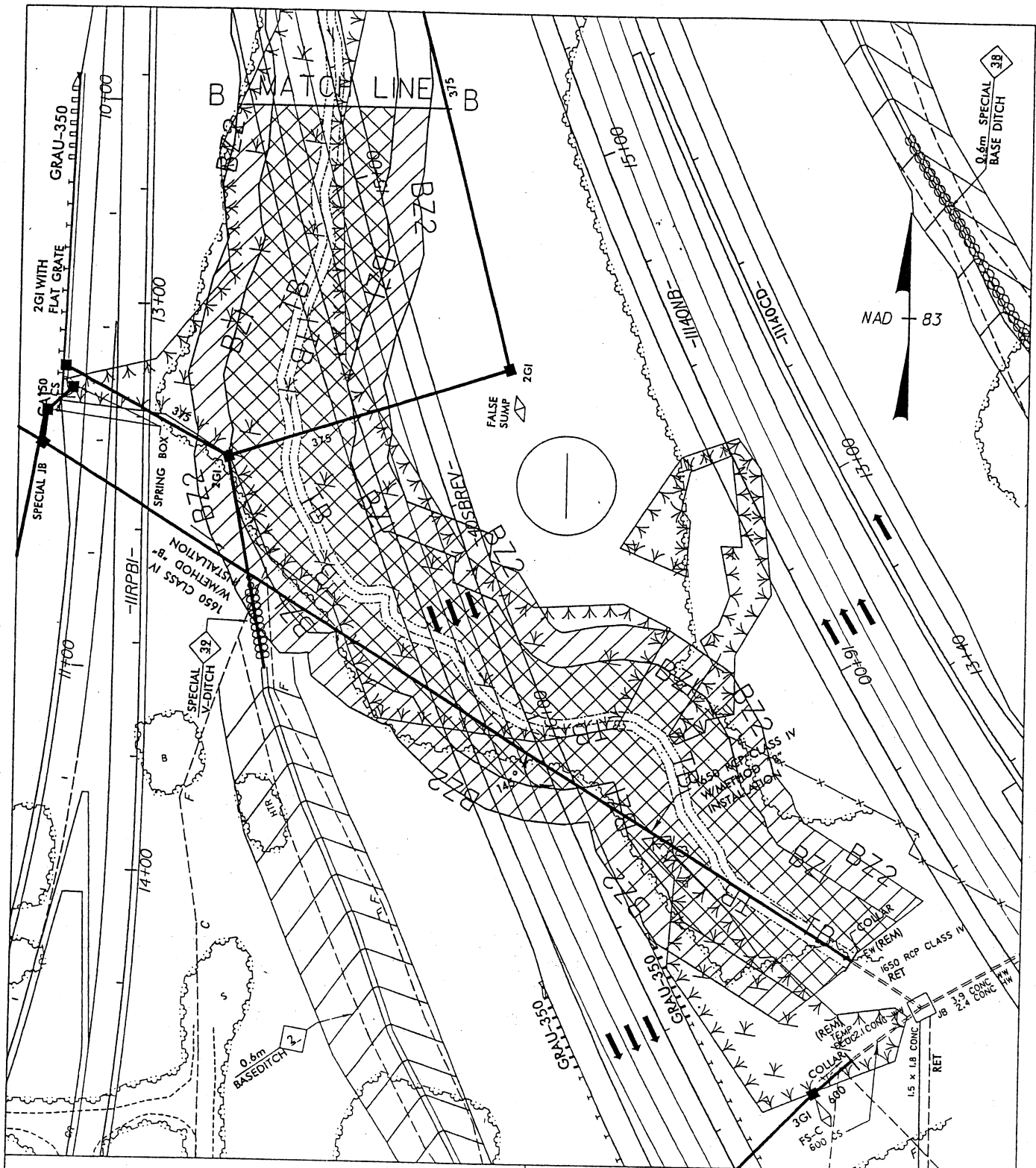
PLAN VIEW
 BUFFER
 IMPACTS
 SITE 7
 SCALE = 1:1000

NCDOT
 DIVISION OF HIGHWAYS
 GUILFORD COUNTY
 PROJECT: 8.U492101 (U-2524AB)
 GREENSBORO - WESTERN LOOP FROM
 NORTH OF I-85 NEAR GROOMETOWN
 TO NORTH OF HIGH POINT ROAD
 SHEET OF 5 / 15 / 03



PLAN VIEW
 BUFFER
 IMPACTS
 SITE 7
 SCALE = 1:1000

DIVISION OF HIGHWAYS
 GUILFORD COUNTY
 PROJECT: 8.U492101 (U-2524AB)
 GREENSBORO - WESTERN LOOP FROM
 NORTH OF I-85 NEAR GROOMETOWN
 TO NORTH OF HIGH POINT ROAD
 SHEET OF 5 / 15 / 03



PLAN VIEW
 BUFFER
 IMPACTS
 SITE 7
 SCALE = 1:1000

DIVISION OF HIGHWAYS
 GUILFORD COUNTY
 PROJECT: 8.U492101 (U-2524AB)
 GREENSBORO - WESTERN LOOP FROM
 NORTH OF I-85 NEAR GROOMETOWN
 TO NORTH OF HIGH POINT ROAD
 SHEET OF 6 / 24 / 03

NAD 83

PROPOSED
BUFFERS

CL-B RIP RAP

CL-I RIP RAP

CL-I RIP RAP

400 CSP W/
ELBOWS
2G1 WITH
GRAU-350 FLAT GRATE

END SHLD.
BEH. GUTTER
STA. 12+61

CAT-1

MATCH LINE

CABLE ANCHOR

-1140NB-

10+00

13+00

10+60

12+00

12+00

12+00

900 WW & SBW

70°

12+00

12+00

12+00

12+00

12+00

12+00

12+00

12+00

-11FLY-

28+00

28+20

28+00

28+00

28+00

28+00

28+00

28+00

28+00

0.6m SPECIAL
BASE DITCH

35'

PLAN VIEW
STREAM
IMPACTS
SITE 7

SCALE = 1:1000

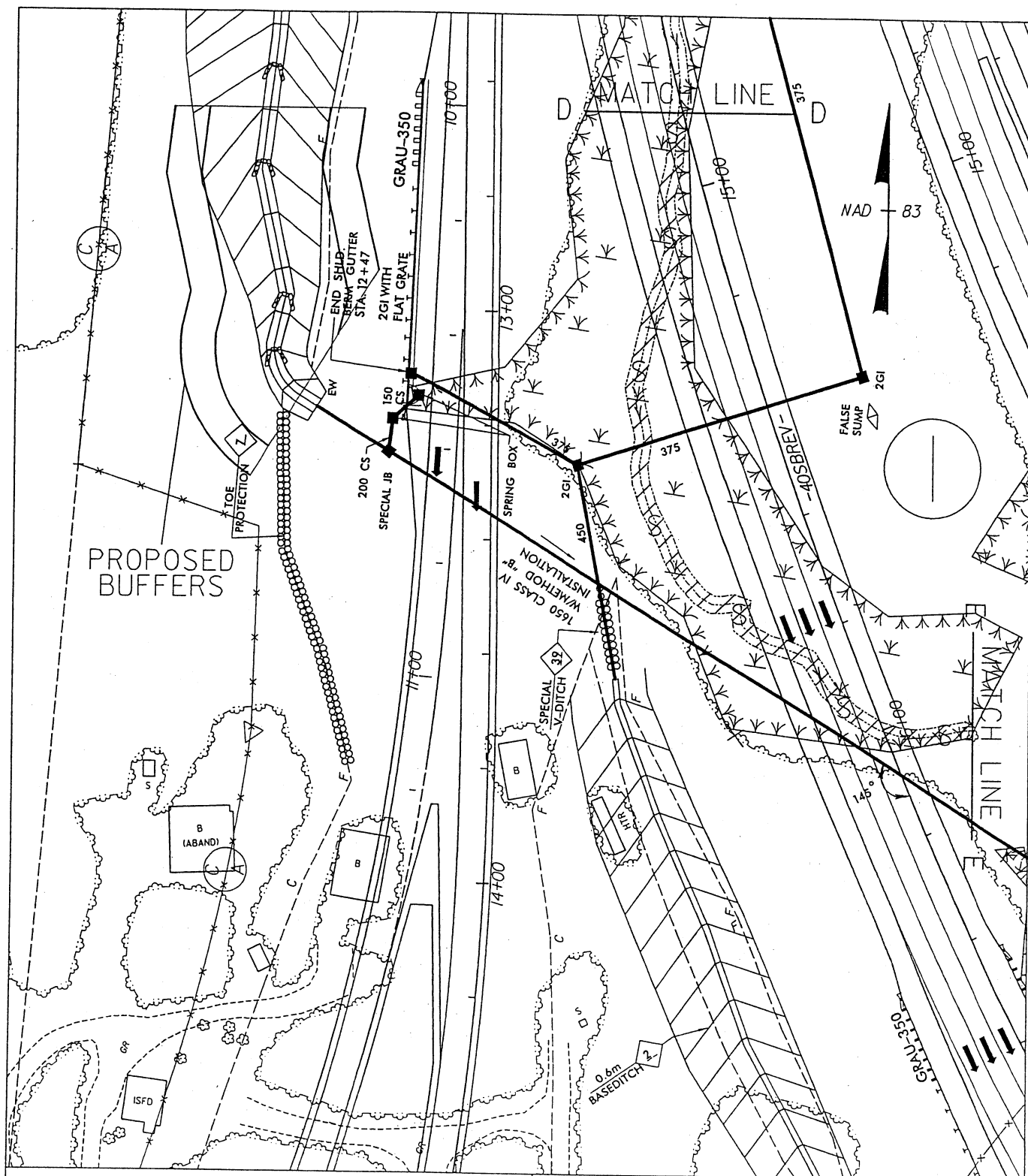
NCDOT

DIVISION OF HIGHWAYS
GUILFORD COUNTY

PROJECT: 8.U492101 (U-2524AB)
GREENSBORO - WESTERN LOOP FROM
NORTH OF I-85 NEAR GROOMETOWN
TO NORTH OF HIGH POINT ROAD

SHEET OF

6 / 26 / 03



PLAN VIEW

STREAM

IMPACTS

SITE 7

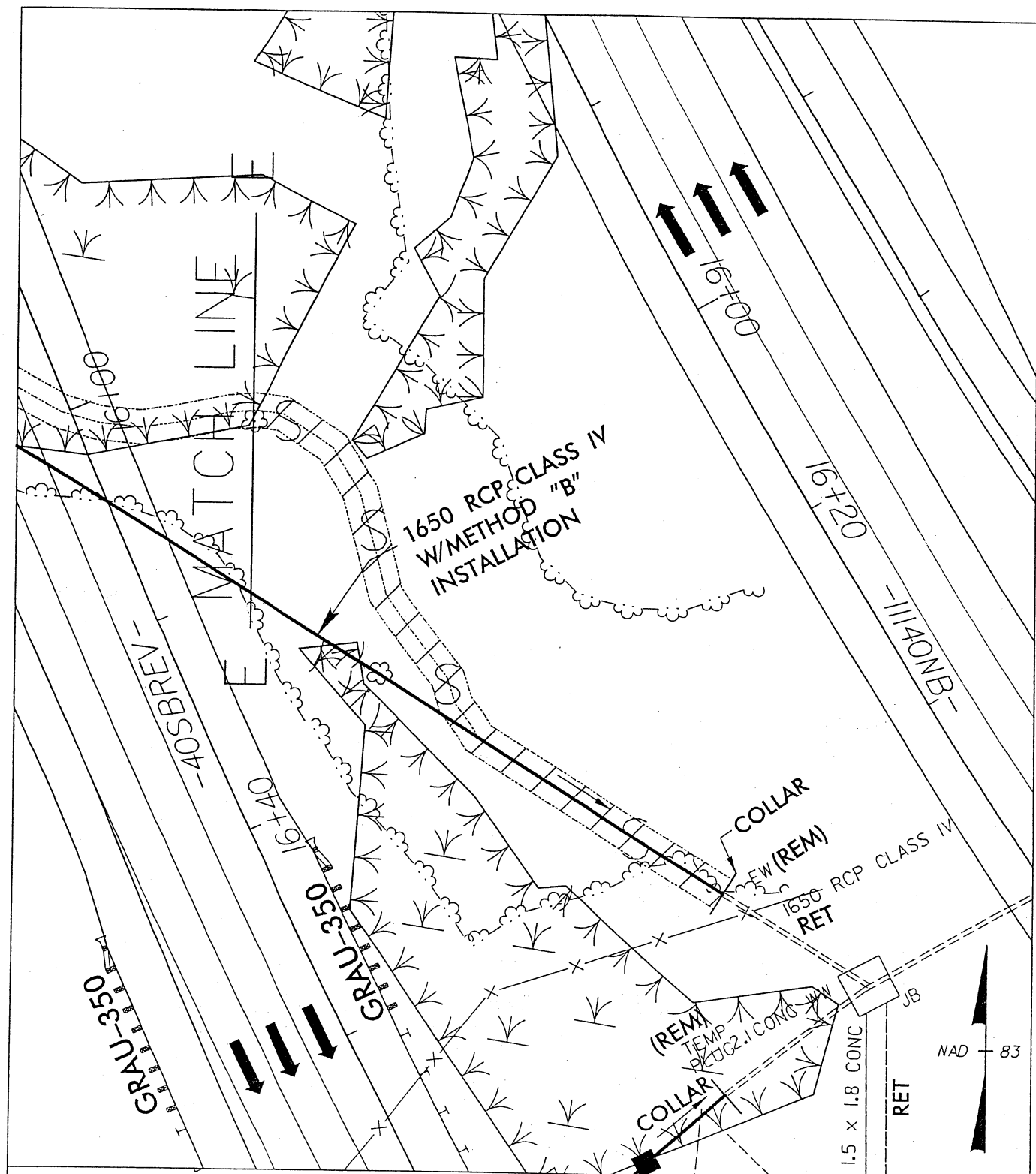
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DIVISION OF HIGHWAYS
GUILFORD COUNTY

PROJECT: 8.U492101 (U-2524AB)
GREENSBORO - WESTERN LOOP FROM
NORTH OF I-85 NEAR GROOMETOWN
TO NORTH OF HIGH POINT ROAD

SHEET OF

6 / 26 / 03



PLAN VIEW

STREAM

IMPACTS

SITE 7

SCALE = 1:500

NCDOT

DIVISION OF HIGHWAYS

GUILFORD COUNTY

PROJECT: 8.U492101 (U-2524AB)

GREENSBORO - WESTERN LOOP FROM
NORTH OF I-85 NEAR GROOMETOWN

TO NORTH OF HIGH POINT ROAD

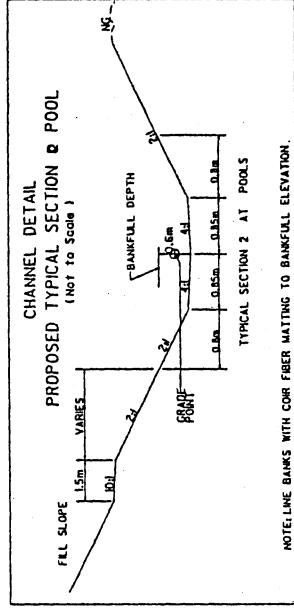
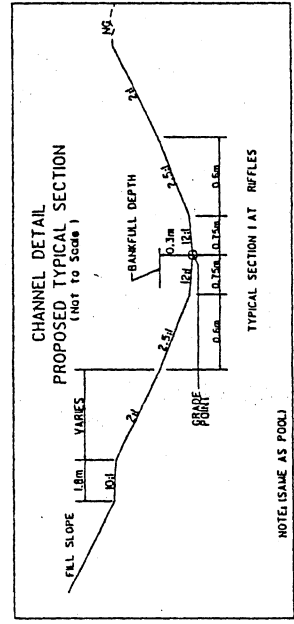
SHEET

OF

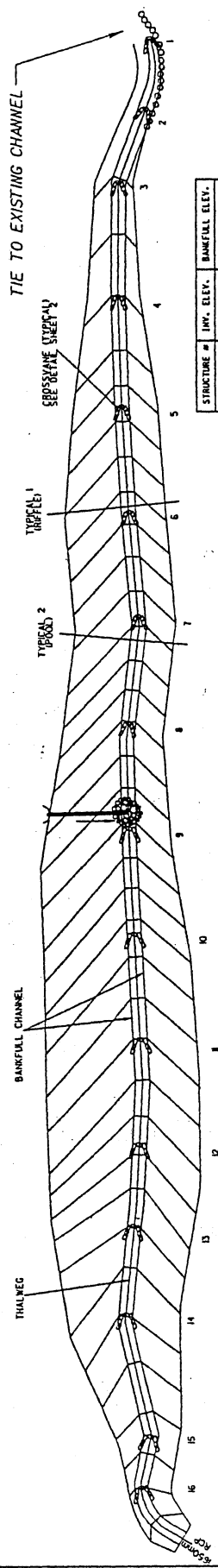
6 / 26 / 03



NATURAL CHANNEL DESIGN TYPICALS



QUANTITIES
DOE = 1050m²
BOULDERS = 230 EACH (230 TONS)
CORR MAT = 1200m²
GEOTEXTILE FABRIC = 220m²



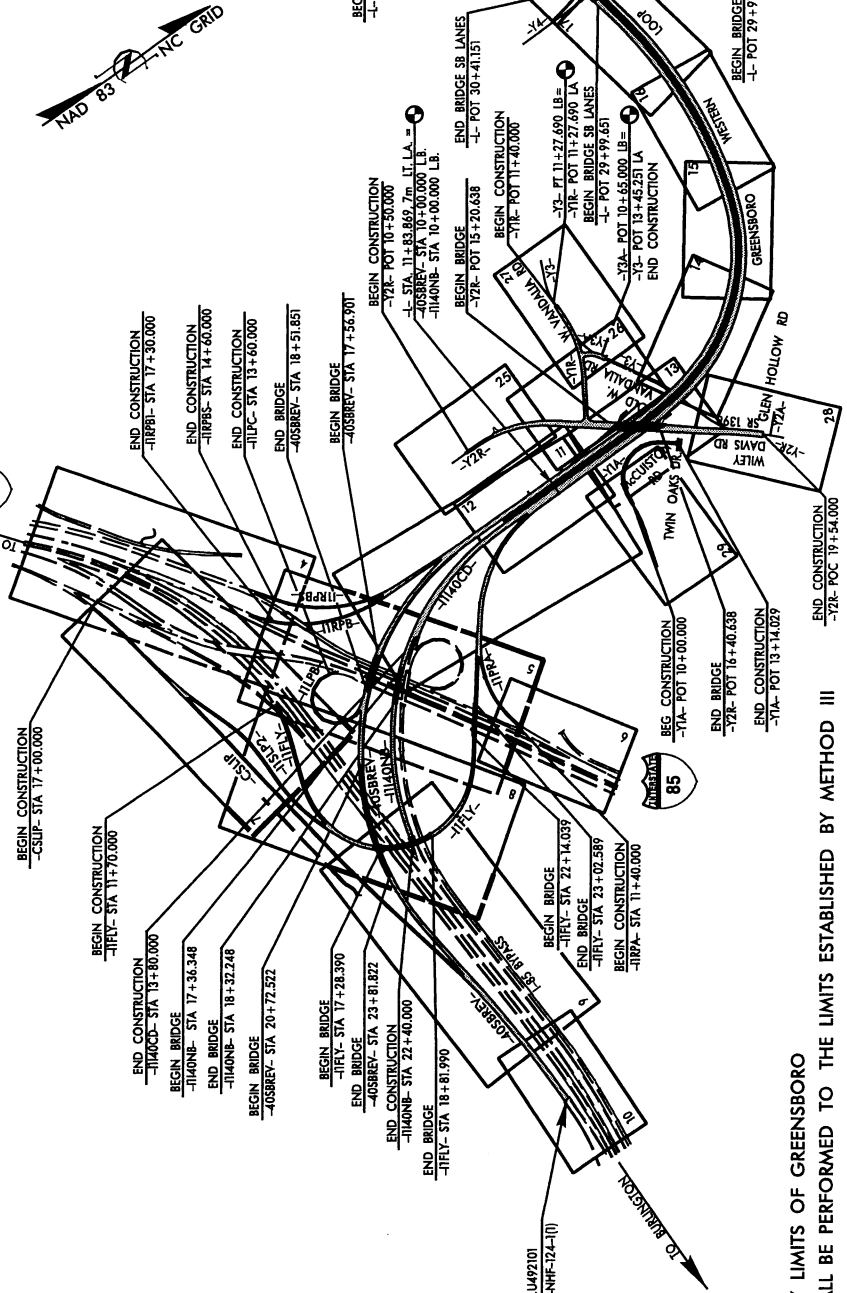
STRUCTURE #	INT. ELEV.	BANKFULL ELEV.
1	248.75m	249.05m
2	248.55m	248.85m
3	248.54m	248.84m
4	248.38m	248.68m
5	248.23m	248.53m
6	248.09m	248.39m
7	247.94m	248.24m
8	247.79m	248.09m
9	247.64m	247.94m
10	247.49m	247.79m
11	247.34m	247.64m
12	247.20m	247.50m
13	247.05m	247.35m
14	246.90m	247.20m
15	246.75m	247.05m
16	246.60m	246.90m

CHANNEL PLAN VIEW

SITE # 7


U-2524AB

PROJECT: 6.498025T




GRAPHIC SCALES


PLANS



PROFILE (HORIZONTAL)



PROFILE (VERTICAL)



DESIGN	I-2402AA
ADT 2003	= 60,810
ADT 2023	= 95,760
DHV	= 10 %
D	= 60 %
T	= 24 % *
V	= 110 km/h
* TTST	18% DUAL 6 %

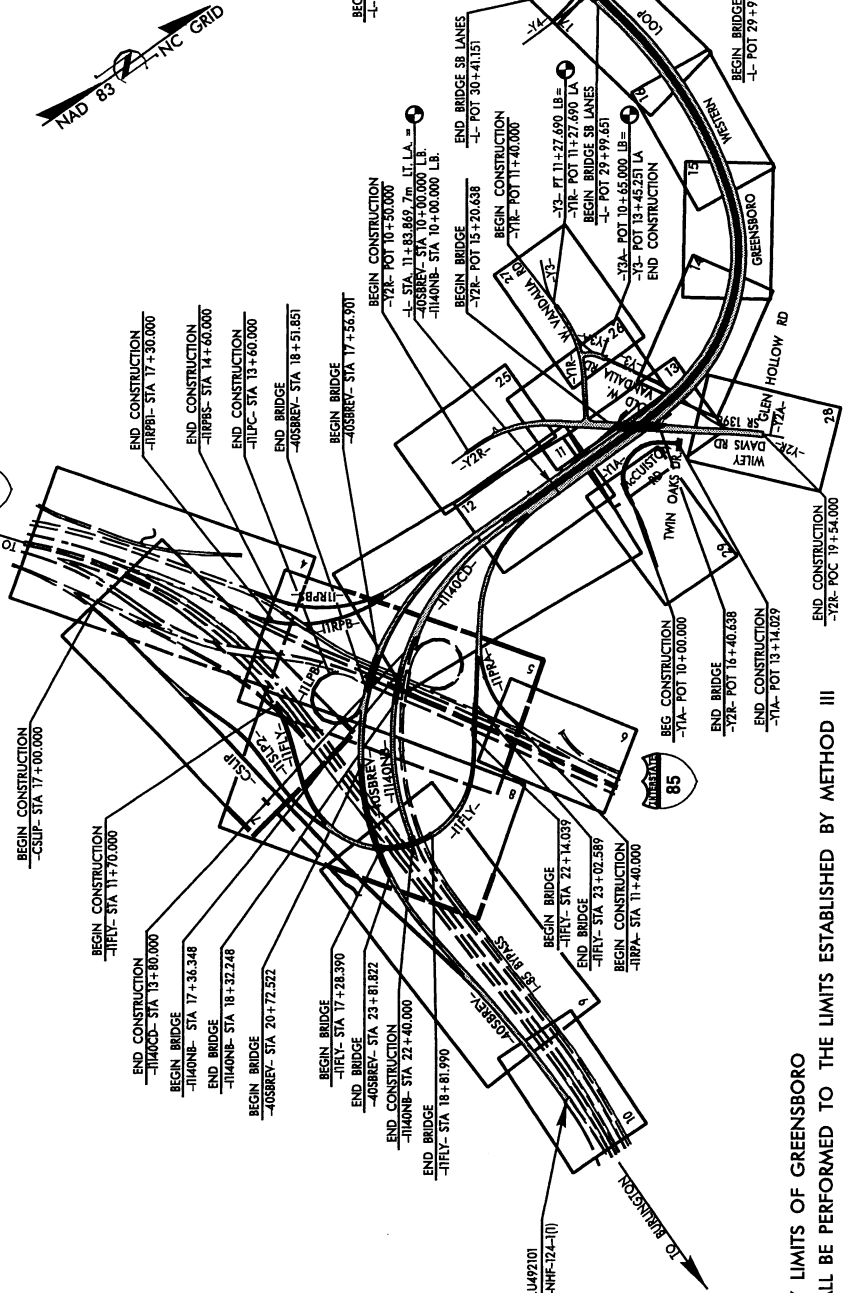
U-2524AB	
ADT 2003 = 40,800	
ADT 2023 = 65,000	
DHV = 10 %	
D = 60 %	
T = 14 % *	
V = 110 km/h	
* TTST 9 %	DUAL 5 %

ST 18% DUAL 6 %

ST 9 % DUAL 5 %

**LOCATION: GREENSBORO WESTERN LOOP FROM
NORTH OF I-85 NEAR GROOMETOWN
TO NORTH OF HIGH POINT RD.**

TYPE OF WORK: GRADING, DRAINAGE, PAVING, STRUCTURES, CULVERTS, SIGNING, SIGNALS, NOISE WALLS, RETAINING WALLS & ITS



PROJECT LENGTH

LENGTH ROADWAY F.A. PROJECT STP-NHF-124-1(I)	6.283	KM.
LENGTH STRUCTURES F.A. PROJECT STP-NHF-124-1(I)	0.486	KM.
TOTAL LENGTH STATE PROJECT 8 I492101	6.769	KM.

NOTE: SB LANE USED TO DETERMINE PROJECT LENGTH

PLANS PREPARED BY:
FLORENCE & HUTCHESON, INC. *DIVISION*

2002 STANDARD SPECIFICATIONS

<u>RIGHT OF WAY DATE:</u> SEPTEMBER 30, 1996 (1-2402AA)	<u>RIGHT OF WAY DATE:</u> JUNE 7, 2000 (U-2524AB)
<u>LETTING DATE:</u> NOVEMBER 18, 2003	

NCDOT CONTACT:

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

STATE DESIGN ENGINEER
DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

APPROVED
DIVISION ADMINISTRATOR

DATE



ALL DIMENSIONS IN
THESE PLANS ARE IN METERS
AND/OR MILLIMETERS
UNLESS OTHERWISE SHOWN

STATE	FLAKE PRODUCT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	U-2524AB	1	
STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION	
8.UA92101	STP-NHF-124-(I)	P.E., RW	
8.UA92301	STP-NHF-85-3(I)(S)	P.E., RW	
6.498025T	STP-NHF-124-(I)	CONST.	

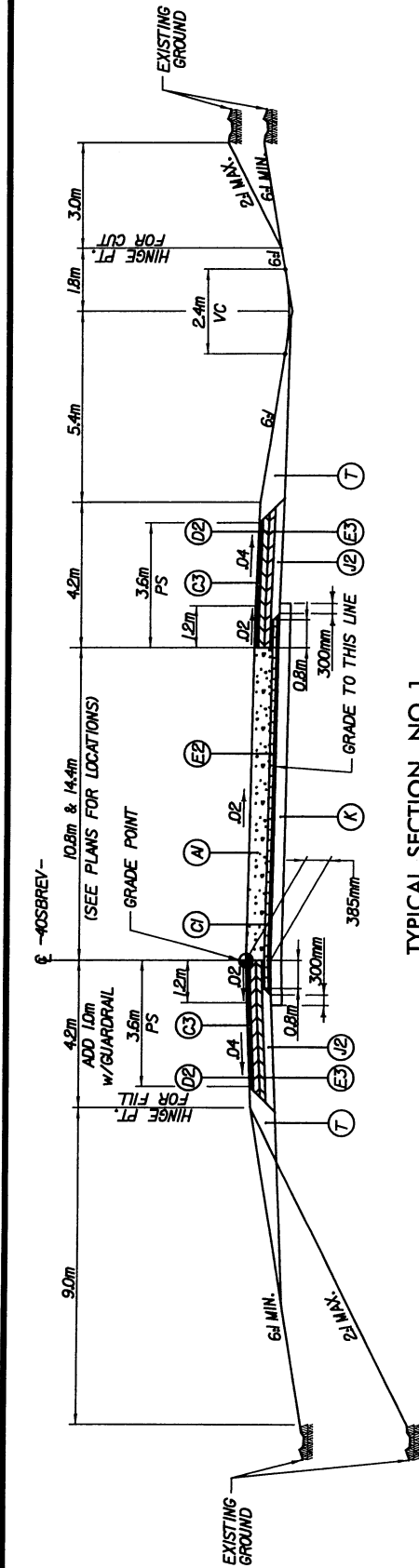


ROADWAY DESIGN ENGINEER



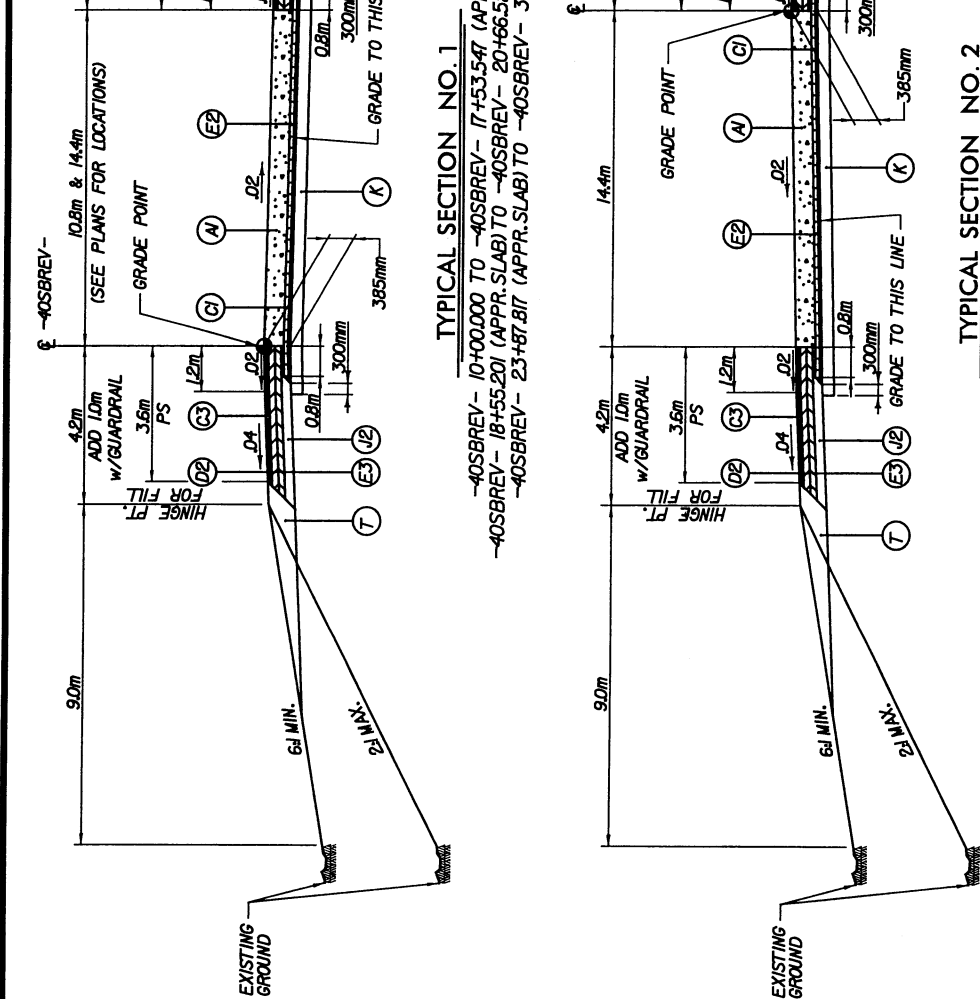
HYDRAULIC DESIGN ENGINEER

P.E.



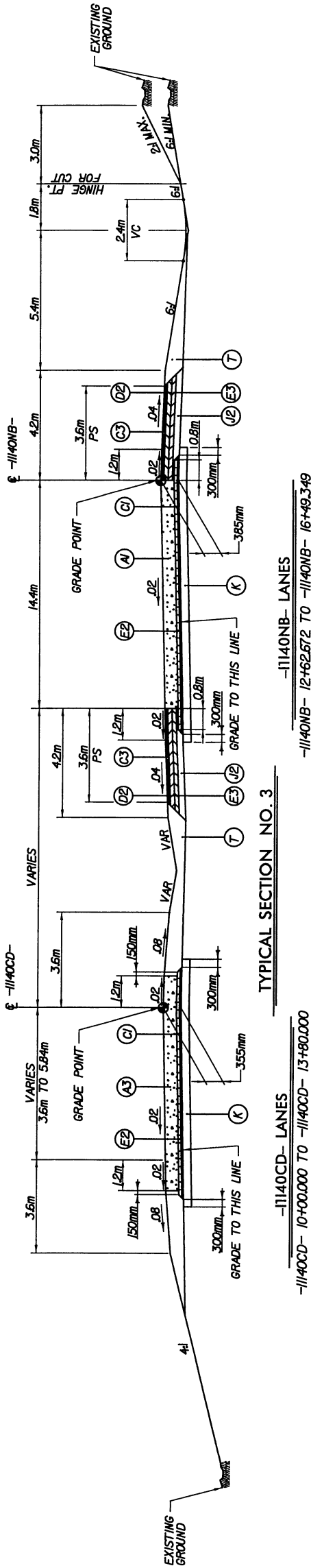
TYPICAL SECTION NO. 1

-40SBREV- 10+00.000 TO -40SBREV- 17+53.547 (APPR.SLAB)
-40SBREV- 18+55.201 (APPR.SLAB) TO -40SBREV- 20+66.527 (APPR.SLAB)
-40SBREV- 23+87.817 (APPR.SLAB) TO -40SBREV- 32+60.000



TYPICAL SECTION NO. 2

-11140NB- 10+00.000 TO -11140NB- 12+62.672



TYPICAL SECTION NO. 3

-11140CD- 10+00.000 TO -11140CD- 13+80.000



-11140NB- LANES

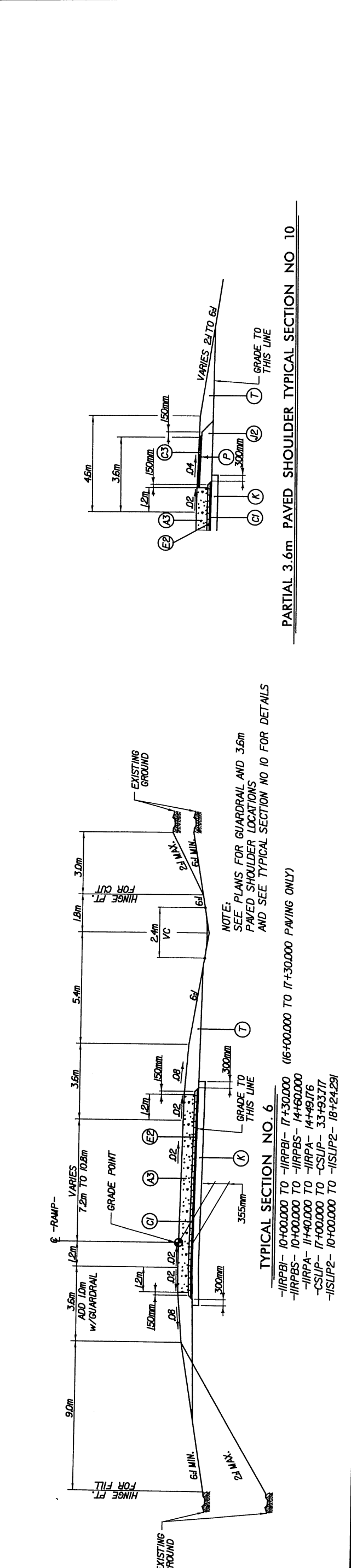
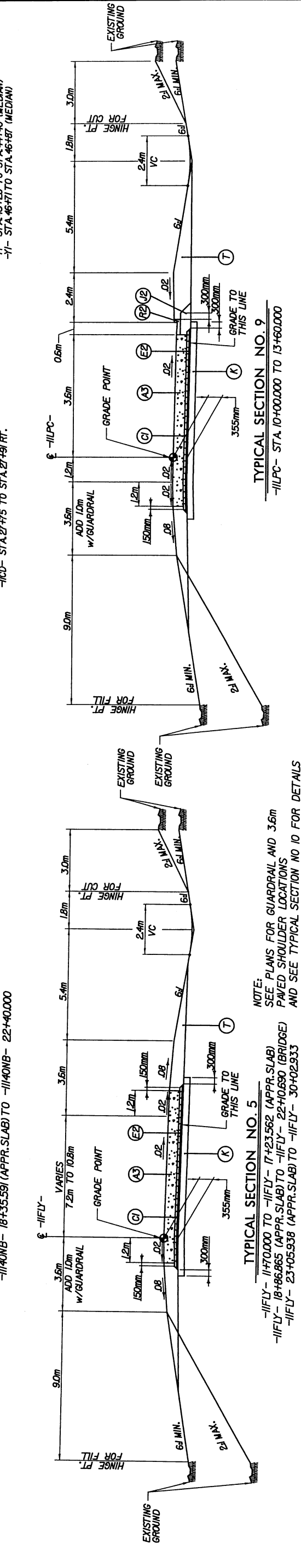
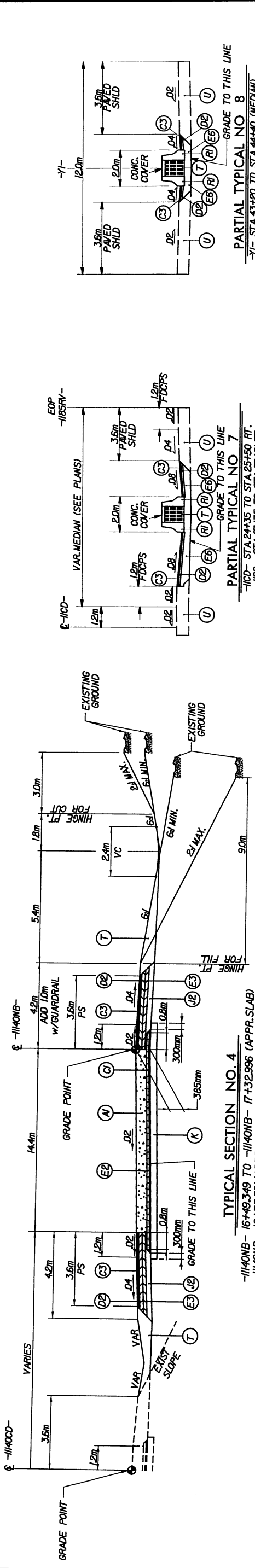
-11140NB- 12+62.672 TO -11140NB- 16+49.349

PAVEMENT SCHEDULE

ITEM	DESCRIPTION	ITEM	DESCRIPTION	ITEM	DESCRIPTION
A1	280mm PORTLAND CEMENT CONCRETE PAVEMENT THROUGH LANES (WITH DOWELS)	D1	PROP. APPROX. 110mm ASPHALT CONCRETE INTERMEDIATE COURSE, TYPE I19.OB, AT AN AVERAGE RATE OF 249.5 kg PER SQ. METER	E5	VAR. DEPTH ASPHALT CONCRETE BASE COURSE, TYPE B25.OB, AT AN AVERAGE RATE OF 2.45 kg PER SQ. METER PER 1 mm DEPTH, TO BE PLACED IN LAYERS NOT LESS THAN 75mm IN DEPTH OR GREATER THAN 140mm IN DEPTH
A2	280mm DEPTH PORTLAND CEMENT CONCRETE PAVEMENT; MISC AREAS, (WITHOUT DOWELS)	D2	PROP. APPROX. 110mm ASPHALT CONCRETE INTERMEDIATE COURSE, TYPE I19.OC, AT AN AVERAGE RATE OF 249.5 kg PER SQ. METER	E6	VAR. DEPTH ASPHALT CONCRETE BASE COURSE, TYPE B25.OC, AT AN AVERAGE RATE OF 2.45 kg PER SQ. METER PER 1 mm DEPTH, TO BE PLACED IN LAYERS NOT LESS THAN 75mm IN DEPTH OR GREATER THAN 140mm IN DEPTH
A3	250mm PORTLAND CEMENT CONCRETE PAVEMENT THROUGH LANES (WITH DOWELS)	D3	PROP. APPROX. 55mm ASPHALT CONCRETE INTERMEDIATE COURSE, TYPE I19.OB, AT AN AVERAGE RATE OF 134.75 kg PER SQ. METER	J1	PROP. 150mm AGGREGATE BASE COURSE
A4	250mm DEPTH PORTLAND CEMENT CONCRETE PAVEMENT; MISC AREAS, (WITHOUT DOWELS)	D4	VAR. DEPTH ASPHALT CONCRETE BASE COURSE, TYPE I19.OB, AT AN AVERAGE RATE OF 2.45 kg PER SQ. METER PER 1 mm DEPTH, TO BE PLACED IN LAYERS NOT LESS THAN 55mm IN DEPTH OR GREATER THAN 110mm IN DEPTH	J2	PROP. VAR. DEPTH AGGREGATE BASE COURSE
C1	PROP. APPROX. 30mm ASPHALT CONCRETE SURFACE COURSE, TYPE S9.5B, AT AN AVERAGE RATE OF 72 kg PER SQ. METER	E1	PROP. APPROX. 110mm ASPHALT CONCRETE BASE COURSE, TYPE B25.OB, AT AN AVERAGE RATE OF 249.5 kg PER SQ. METER	K	SUBBASE TO BE TREATED WITH LIME TO A DEPTH OF 200mm, AT A RATE OF 11kg PER SQ. METER AS DIRECTED BY THE ENGINEER OR
C2	PROP. APPROX. 70mm ASPHALT CONCRETE SURFACE COURSE, S9.5B, AT AN AVERAGE RATE OF 168 kg PER SQ. METER	E2	PROP. APPROX. 75mm ASPHALT CONCRETE BASE COURSE, TYPE B25.OB, AT AN AVERAGE RATE OF 183.75 kg PER SQ. METER	W1	VARIABLE DEPTH ASPHALT PAVING (SEE WEDGING DETAIL 1)
C3	PROP. APPROX. 70mm ASPHALT CONCRETE SURFACE COURSE, S9.5C, AT AN AVERAGE RATE OF 168 kg PER SQ. METER	E3	PROP. APPROX. 100mm ASPHALT CONCRETE BASE COURSE, TYPE B25.OC, AT AN AVERAGE RATE OF 245.0 kg PER SQ. METER	W2	VARIABLE DEPTH ASPHALT PAVING (SEE WEDGING DETAIL 2)
C4	VAR. DEPTH ASPHALT CONCRETE SURFACE COURSE, TYPE S9.5B, AT AN AVERAGE RATE OF 2.40 kg PER SQ. METER PER 1 mm DEPTH, TO BE PLACED IN LAYERS NOT LESS THAN 25mm IN DEPTH OR GREATER THAN 40mm IN DEPTH	E4	PROP. APPROX. 150mm ASPHALT CONCRETE BASE COURSE, TYPE B25.OB, AT AN AVERAGE RATE OF 367.5 kg PER SQ. METER	U	EXISTING PAVEMENT
		P	PRIME COAT	T	EARTH MATERIAL

NOTE: ALL PAVEMENT EDGE SLOPES ARE 1:1 UNLESS OTHERWISE NOTED. SHOULDER ROLLOVER NOT TO EXCEED 0.06 (TYP). SEE PLANS FOR LOCATION OF ACCELERATION AND DECELERATION LANES.

PAVEMENT SCHEDULE											
ITEM	DESCRIPTION	ITEM	DESCRIPTION	ITEM	DESCRIPTION	ITEM	DESCRIPTION	ITEM	DESCRIPTION	ITEM	DESCRIPTION
A1	280mm PORTLAND CEM CONC	C3	70mm S9.5C	E1	110mm B25.0B	J1	150mm ABC	R3	EXPRESSWAY GUTTER		
A2	280mm PORTLAND CEM CONC	C4	VAR DEPTH S9.5B	E2	75mm B25.0B	J2	VAR DEPTH ABC	T	EARTH MATERIAL		
A3	250mm PORTLAND CEM CONC	D1	110mm I19.0B	E3	100mm B25.0C	K	STABILIZATION	U	EXISTING PAVEMENT		
A4	250mm PORTLAND CEM CONC	D2	110mm I19.0C	E4	150mm B25.0B	P	PRIME COAT		VAR DEPTH ASPHALT PAVEMENT (SEE WEDGING DETAIL W1)		
C1	30mm S9.5B	D3	55mm I19.0B	E5	VAR DEPTH B25.0B	R1	SINGLE FACE BARRIER		VAR DEPTH ASPHALT PAVEMENT (SEE WEDGING DETAIL W2)		
C2	70mm S9.5B	D4	VAR DEPTH I19.0B	E6	VAR DEPTH B25.0C	R2	750mm CURB & GUTTER				
<div><div><div>FLORENCE & HUTCHESON, INC. CONSULTING ENGINEERS 6540 CENTERVIEW DR., SUITE 316 RALEIGH, NC 27606</div><div>PLANS PREPARED BY:</div></div><div></div><div><p>NOTE: ALL PAVEMENT EDGE SLOPES ARE 1H UNLESS OTHERWISE NOTED. SHOULDER ROLLOVER NOT TO EXCEED 0.06 (TYP).</p></div></div>											
PROJECT REFERENCE NO.		U-2524AB		SHEET NO.		2-A		ROADWAY DESIGN ENGINEER		PAVEMENT DESIGN ENGINEER	



PAVEMENT SCHEDULE									
ITEM	DESCRIPTION	ITEM	DESCRIPTION	ITEM	DESCRIPTION	ITEM	DESCRIPTION	ITEM	DESCRIPTION
A1	280mm PORTLAND CEM CONC	C3	70mm S9.5C	E1	110mm B25.0B	J1	150mm ABC	R3	EXPRESSWAY GUTTER
A2	280mm PORTLAND CEM CONC	C4	VAR DEPTH S9.5B	E2	75mm B25.0B	J2	VAR DEPTH ABC	T	EARTH MATERIAL
A3	250mm PORTLAND CEM CONC	D1	110mm I19.0B	E3	100mm B25.0C	K	STABILIZATION	U	EXISTING PAVEMENT
A4	250mm PORTLAND CEM CONC	D2	110mm I19.0C	E4	150mm B25.0B	P	PRIME COAT	W1	VAR DEPTH ASPHALT PAVEMENT (SEE WEDGING DETAIL W1)
C1	30mm S9.5B	D3	55mm I19.0B	E5	VAR DEPTH B25.0B	R1	SINGLE FACE BARRIER	W2	VAR DEPTH ASPHALT PAVEMENT (SEE WEDGING DETAIL W2)
C2	70mm S9.5B	D4	VAR DEPTH I19.0B	E6	VAR DEPTH B25.0C	R2	750mm CURB & GUTTER		

PLANS PREPARED BY:
FH FLORENCE & HUTCHESON, INC.
CONSULTING ENGINEERS
5640 CENTERVIEW DR. SUITE 306
RALEIGH, NC 27606

PROJECT REFERENCE NO.
U-2524AB

SHEET NO.
2-B

ROADWAY DESIGN
ENGINEER

PAVEMENT DESIGN
ENGINEER

U-2524AB R/W SHEET NO. 2

PAVEMENT DESIGN
ENGINEER

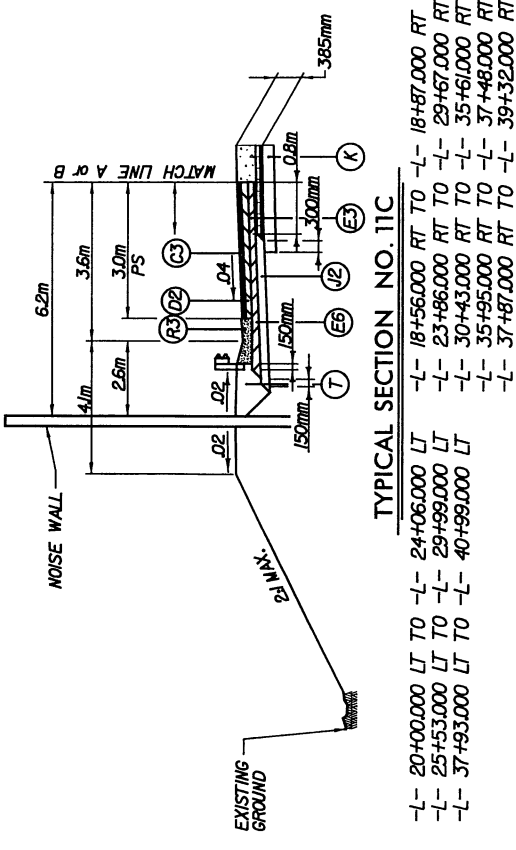
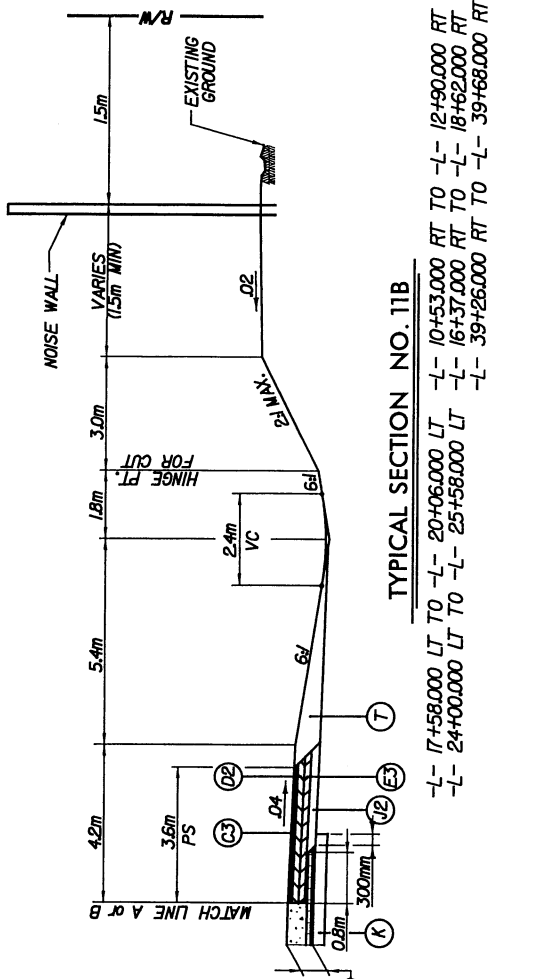
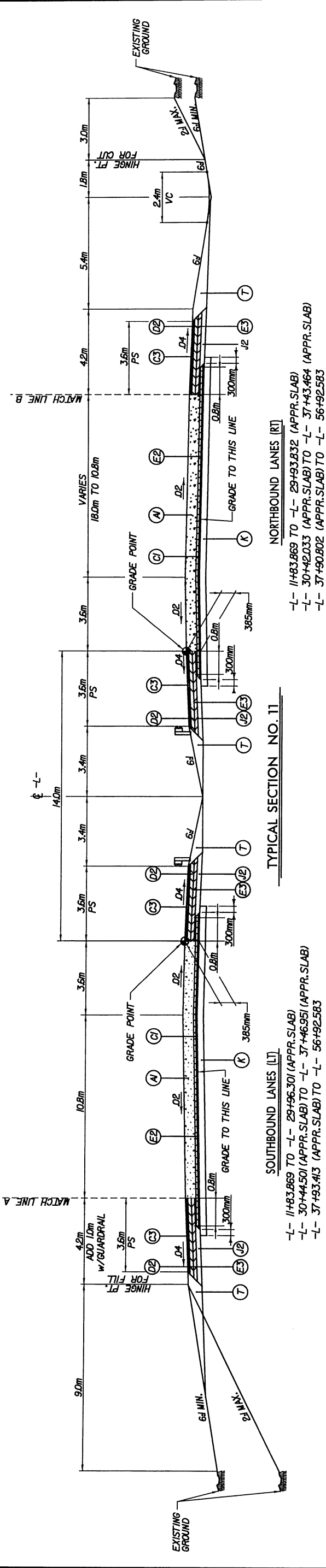
U-2524AB R/W SHEET NO. 2

PAVEMENT DESIGN
ENGINEER


NOTE: ALL PAVEMENT EDGE SLOPES ARE 1/4
UNLESS OTHERWISE NOTED.
SHOULDER ROLLOVER NOT TO EXCEED 0.06 (TYP).


SEAL
2003

PAVEMENT DESIGN
ENGINEER
JAMES J. JAMES



PAVEMENT SCHEDULE									
ITEM	DESCRIPTION	ITEM	DESCRIPTION	ITEM	DESCRIPTION	ITEM	DESCRIPTION	ITEM	DESCRIPTION
A1	280mm PORTLAND CEM CONC	C3	70mm S9.5C	E1	110mm B25.0B	J1	150mm ABC	R3	EXPRESSWAY GUTTER
A2	280mm PORTLAND CEM CONC	C4	VAR DEPTH S9.5B	E2	75mm B25.0B	J2	VAR DEPTH ABC	T	EARTH MATERIAL
A3	250mm PORTLAND CEM CONC	D1	110mm I19.0B	E3	100mm B25.0C	K	STABILIZATION	U	EXISTING PAVEMENT
A4	250mm PORTLAND CEM CONC	D2	110mm I19.0C	E4	150mm B25.0B	P	PRIME COAT	W1	VAR DEPTH ASPHALT PAVEMENT (SEE WEDGING DETAIL W1)
C1	30mm S9.5B	D3	55mm I19.0B	E5	VAR DEPTH B25.0B	R1	SINGLE FACE BARRIER	W2	VAR DEPTH ASPHALT PAVEMENT (SEE WEDGING DETAIL W2)
C2	70mm S9.5B	D4	VAR DEPTH I19.0B	E6	VAR DEPTH B25.0C	R2	750mm CURB & GUTTER		

**FLORENCE & HUTCHERSON, INC.**
CONSULTING ENGINEERS
6640 CENTERVIEW DR. SUITE 316
RALEIGH, NC 27606



PLANS PREPARED BY:

PROJECT REFERENCE NO.
U-2524AB

R / W SHEET NO.
PAVEMENT DESIGN
ENGINEER

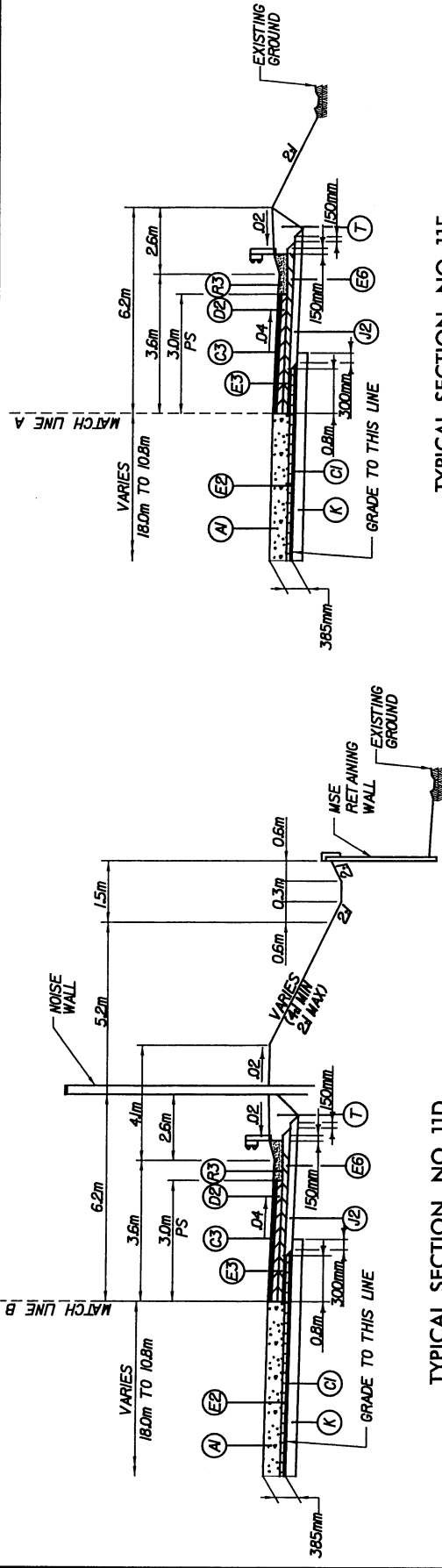
SHEET NO.
2-C

PAVEMENT DESIGN
ENGINEER

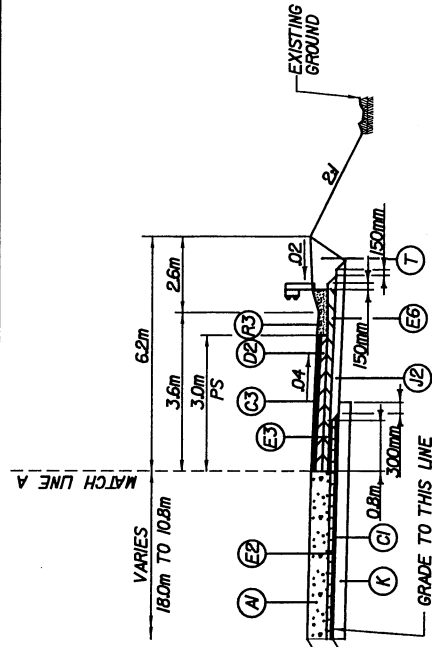
SEAL
2003

REGISTERED PROFESSIONAL ENGINEER
STATE OF NORTH CAROLINA
JAMES J. JONES

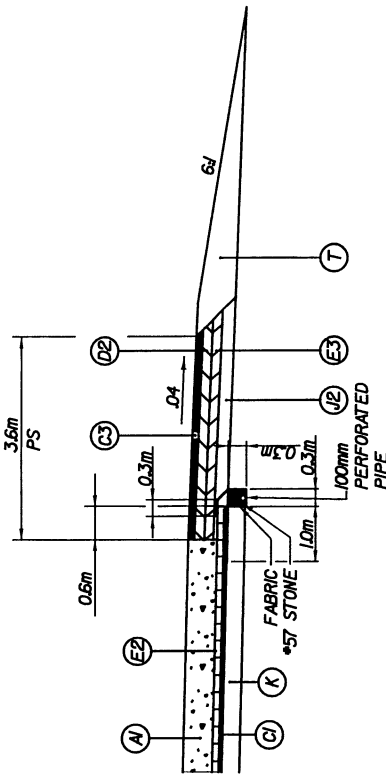
NOTE: ALL PAVEMENT EDGE SLOPES ARE 1:1
UNLESS OTHERWISE NOTED.
SHOULDER ROLLOVER NOT TO EXCEED 0.06 (TYP).



TYPICAL SECTION NO. 11D
-L- 19+06.000 RT TO -L- 23+86.000 RT

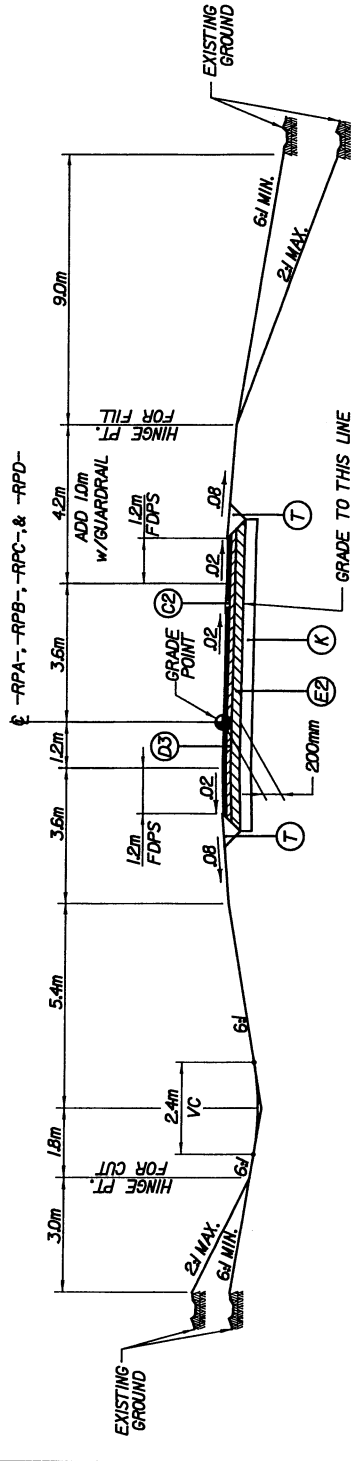


TYPICAL SECTION NO. 11E
-L- 30+51.524 LT TO -L- 34+00.000 LT



TYPICAL SHOULDER DRAIN DETAIL

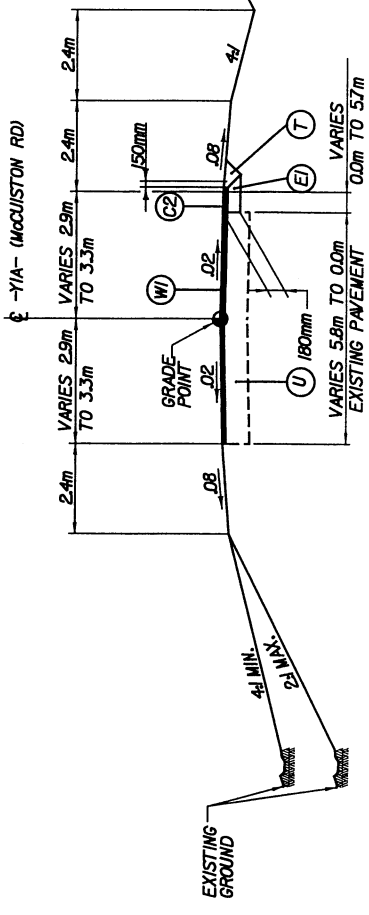
- L- 11+84 TO -L- 29+85 LT
- L- 30+50 TO -L- 34+00 LT
- L- 42+60 TO -L- 45+00 LT
- L- 43+40 TO -L- 51+60 LT
- L- 29+20 TO -L- 29+90 LT MED
- L- 30+50 TO -L- 37+45 LT MED
- L- 37+95 TO -L- 56+93 LT MED
- L- 14+40 TO -L- 29+95 RT MED
- L- 30+45 TO -L- 34+00 RT MED
- L- 42+60 TO -L- 51+40 RT MED
- L- 55+80 TO -L- 56+93 RT MED
- L- 11+84 TO -L- 14+40 RT
- L- 29+40 TO -L- 29+90 RT
- L- 30+40 TO -L- 37+40 RT
- L- 37+85 TO -L- 56+92 RT



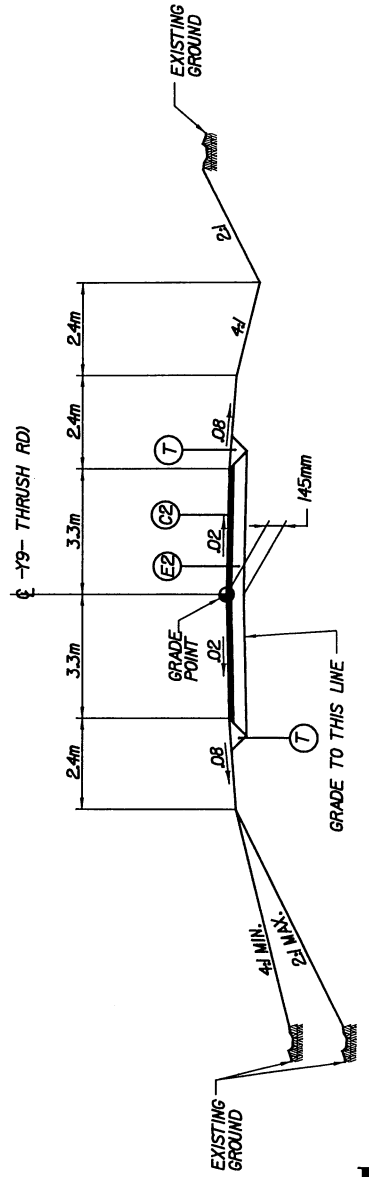
TYPICAL SECTION NO. 12

- RPA- 11+74.883 TO -RPA- 12+20.000
- RPB- 11+37.900 TO -RPB- 12+20.000
- RPC- 11+40.375 TO -RPC- 11+80.000
- RPD- 11+60.076 TO -RPD- 11+80.000

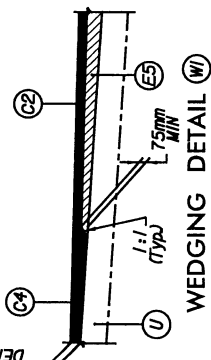
NOTE: 4:1 MAX SLOPES IN INTERCHANGE AREA



TYPICAL SECTION NO. 13
-Y1A- 10+00.000 TO -Y1A- 10+60.000



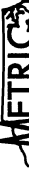
TYPICAL SECTION NO. 14
-Y9- 10+35.474 TO -Y9- 11+10.000



WEDGING DETAIL (W1)
-Y1A- 10+00.000 TO -Y1A- 10+60.000

PAVEMENT SCHEDULE									
ITEM	DESCRIPTION	ITEM	DESCRIPTION	ITEM	DESCRIPTION	ITEM	DESCRIPTION	ITEM	DESCRIPTION
A1	280mm PORTLAND CEM CONC	C3	70mm \$9.5C	E1	110mm B25.0B	J1	150mm ABC	R3	EXPRESSWAY GUTTER
A2	280mm PORTLAND CEM CONC	C4	VAR DEPTH \$9.5B	E2	75mm B25.0B	J2	VAR DEPTH ABC	T	EARTH MATERIAL
A3	250mm PORTLAND CEM CONC	D1	110mm I19.0B	E3	100mm B25.0C	K	STABILIZATION	U	EXISTING PAVEMENT
A4	250mm PORTLAND CEM CONC	D2	110mm I19.0C	E4	150mm B25.0B	P	PRIME COAT	W1	VAR DEPTH ASPHALT PAVEMENT (SEE WEDGING DETAIL W1)
C1	30mm \$9.5B	D3	55mm I19.0B	E5	VAR DEPTH B25.0B	R1	SINGLE FACE BARRIER	W2	VAR DEPTH ASPHALT PAVEMENT (SEE WEDGING DETAIL W2)
C2	70mm \$9.5B	D4	VAR DEPTH I19.0B	E6	VAR DEPTH B25.0C	R2	750mm CURB & GUTTER		

PLANS PREPARED BY:
FLORENCE & HUTCHESON INC.
 CONSULTING ENGINEERS
 5540 CENTERVIEW DR. SUITE 316
 RALEIGH, NC 27606



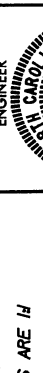
**NOTE: ALL PAVEMENT EDGE SLOPES ARE 1/4
UNLESS OTHERWISE NOTED.
SHOULDER ROLLOVER NOT TO EXCEED 0.06 (TYP).**

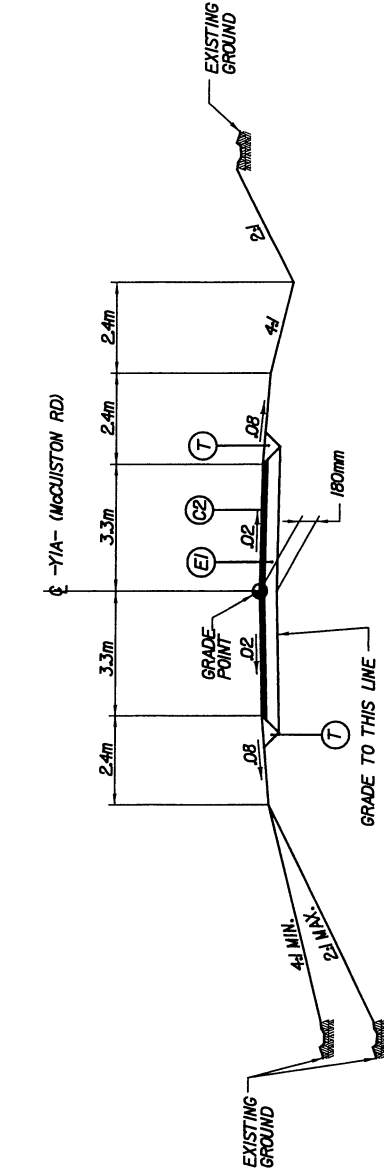
PROJECT REFERENCE NO. U-25744B

R / W SHEET NO. 2-D

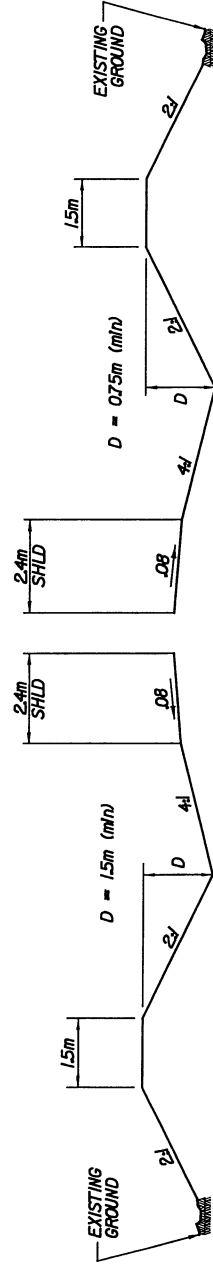
ROADWAY DESIGN ENGINEER

PAVEMENT DESIGN ENGINEER





TYPICAL SECTION NO. 15
-Y/A- 10+60.000 TO -Y/A- 12+99.977

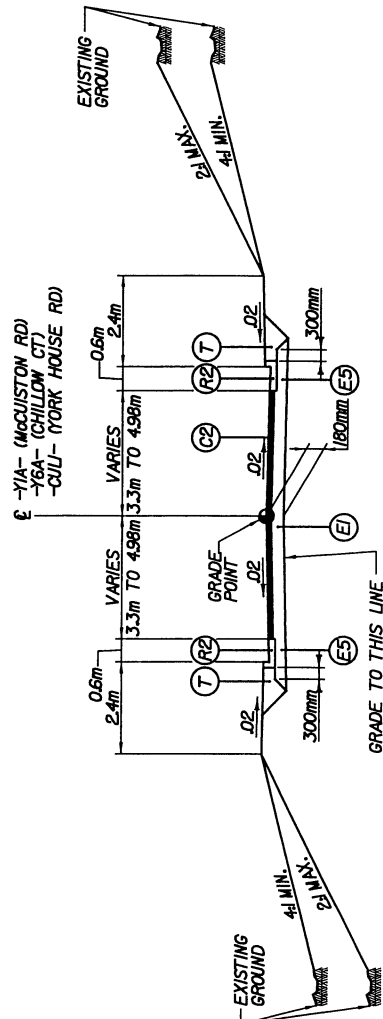


TYPICAL SECTION NO. 15A

FALSE CUT
-Y1A- 11+40.000 LT TO -Y1A- 12+60.000 LT

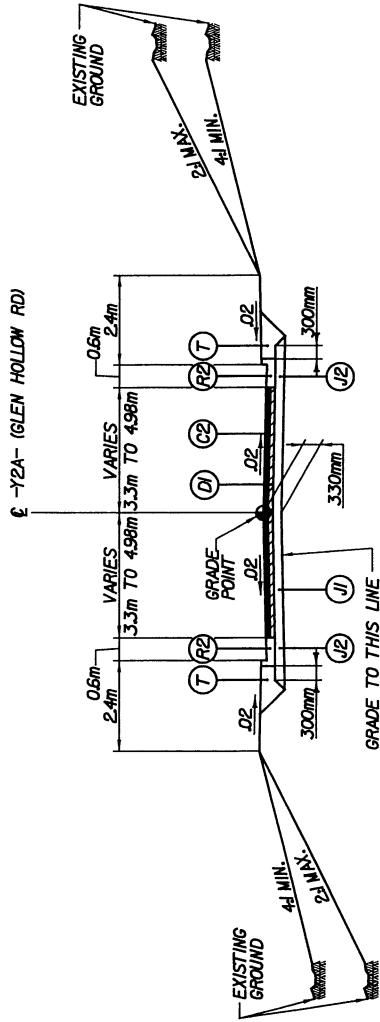
TYPICAL SECTION NO. 15B

FALSE CUT
-Y|A- 11+40.000 RT TO -Y|A- 12+00.000 RT

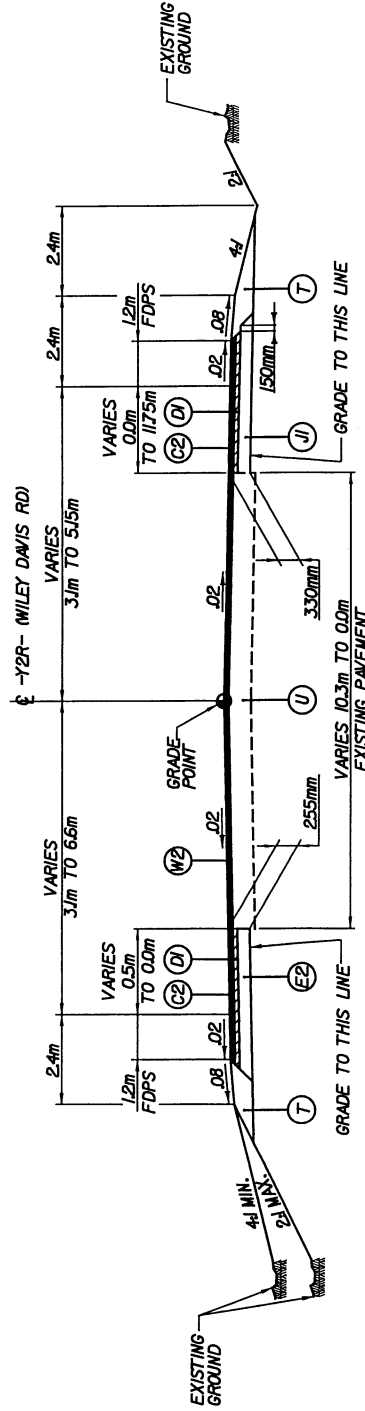


TYPICAL SECTION NO. 16

-Y1A- 12+99.977 TO -Y1A- 13+14.029
-Y6A- 10+28.887 TO -Y6A- 11+07.187
 (-CULL- RADIUS PT) -L- 33+01.226, 53.593m RT

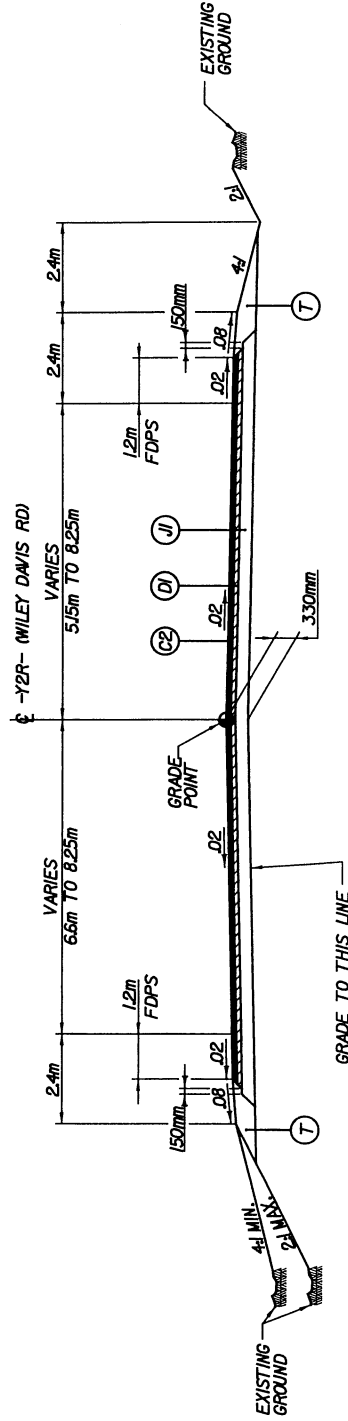


TYPICAL SECTION NO.17
-Y2A- 10+16.729 TO -Y2A- 10+65.000



TYPICAL SECTION NO. 18

-Y2R- 10+50,000 T0 -Y2R- 11+30,000



TYPICAL SECTION NO. 19

-Y2R- 11+30.000 T0 -Y2R- 13+65.087

PAVEMENT SCHEDULE									
ITEM	DESCRIPTION	ITEM	DESCRIPTION	ITEM	DESCRIPTION	ITEM	DESCRIPTION	ITEM	DESCRIPTION
A1	280mm PORTLAND CEM CONC	C3	70mm S9.5C	E1	110mm B25.0B	J1	150mm ABC	R3	EXPRESSWAY GUTTER
A2	280mm PORTLAND CEM CONC	C4	VAR DEPTH S9.5B	E2	75mm B25.0B	J2	VAR DEPTH ABC	T	EARTH MATERIAL
A3	250mm PORTLAND CEM CONC	D1	110mm I19.0B	E3	100mm B25.0C	K	STABILIZATION	U	EXISTING PAVEMENT
A4	250mm PORTLAND CEM CONC	D2	110mm I19.0C	E4	150mm B25.0B	P	PRIME COAT	W1	VAR DEPTH ASPHALT PAVEMENT (SEE WEDGING DETAIL W1)
C1	30mm S9.5B	D3	55mm I19.0B	E5	VAR DEPTH B25.0B	R1	SINGLE FACE BARRIER	W2	VAR DEPTH ASPHALT PAVEMENT (SEE WEDGING DETAIL W2)
C2	70mm S9.5B	D4	VAR DEPTH I19.0B	E6	VAR DEPTH B25.0C	R2	750mm CURB & GUTTER		

PLANS PREPARED BY:
FH
FLORENCE & HUTCHESON, INC.
CONSULTING ENGINEERS
5540 COUNTRYVIEW DR., SUITE 305
RALEIGH, NC 27606

METRIX
ROADWAY DESIGN
ENGINEER
R / W SHEET NO.
U-2524AB

PROJECT REFERENCE NO.
U-2524AB

SHEET NO.
2-E

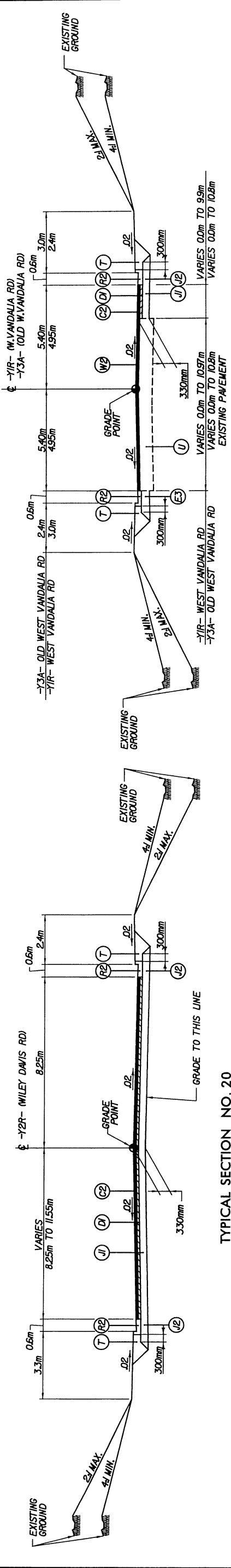
SEAL
2003

REGISTERED PROFESSIONAL ENGINEER
JAMES

STATE OF NORTH CAROLINA

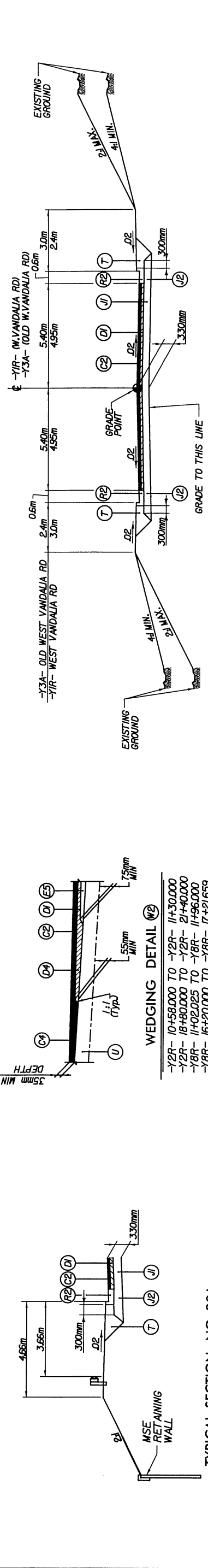
EXPIRATION DATE 12/31/2003

NOTES: ALL PAVEMENT EDGE SLOPES ARE 1:4
UNLESS OTHERWISE NOTED.
SHOULDER ROLLOVER NOT TO EXCEED 0.06 (TYP).



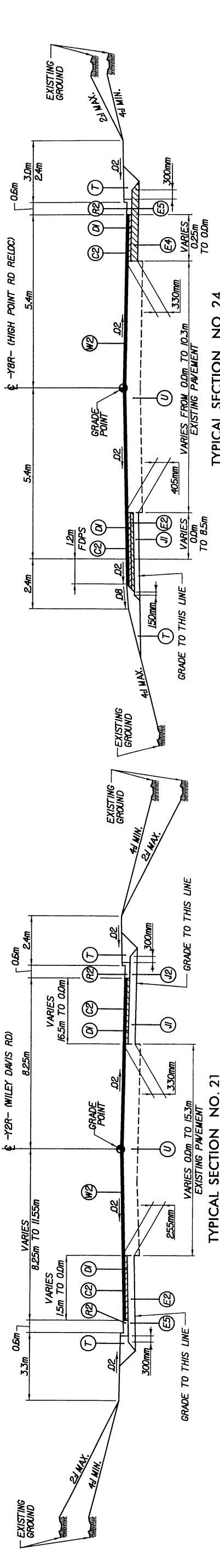
TYPICAL SECTION NO. 22

-Y1R- 11+49.377 TO -Y1R- 12+50.000
-Y1R- 12+50.000 TO -Y1R- 14+30.000
-Y3A- 10+40.000 TO -Y3A- 10+61.723



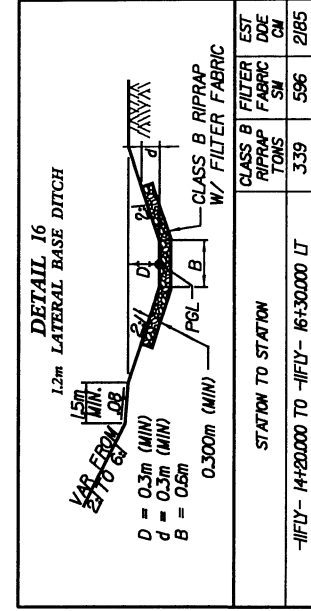
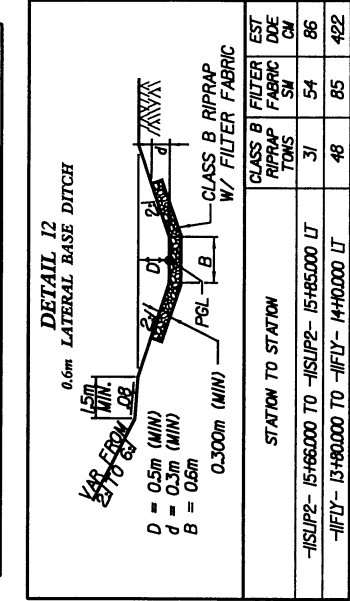
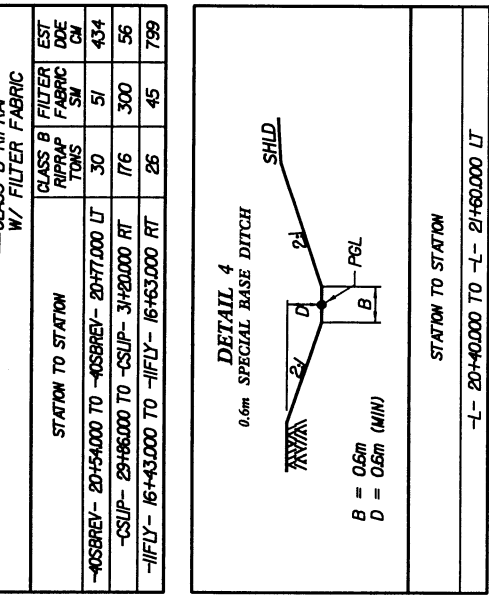
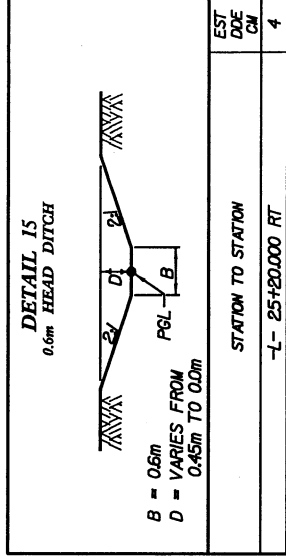
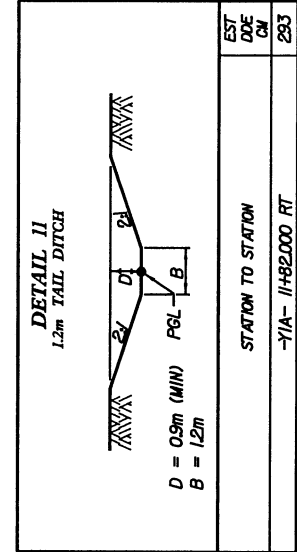
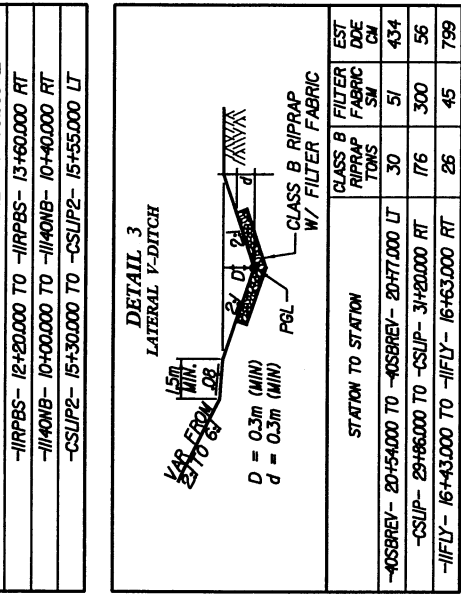
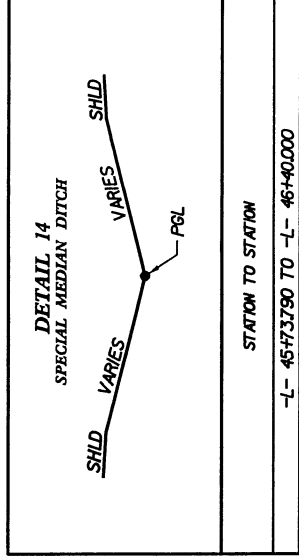
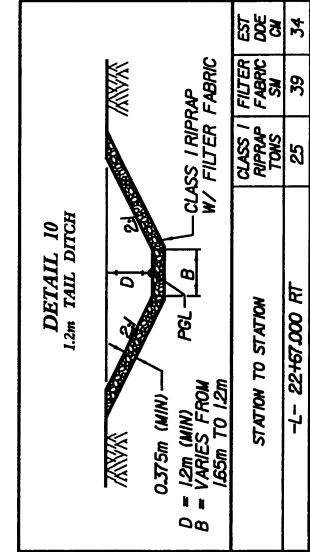
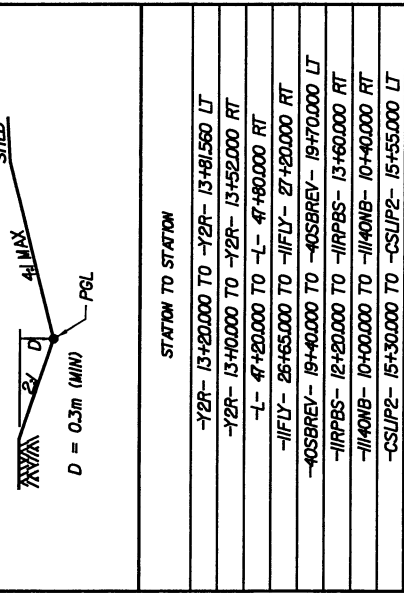
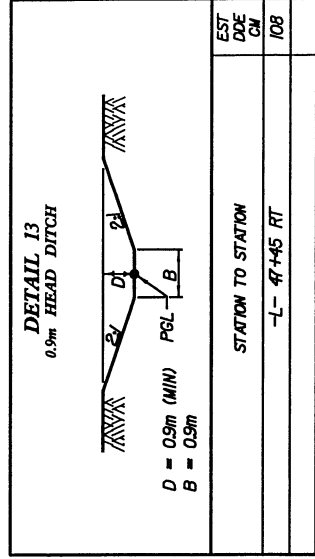
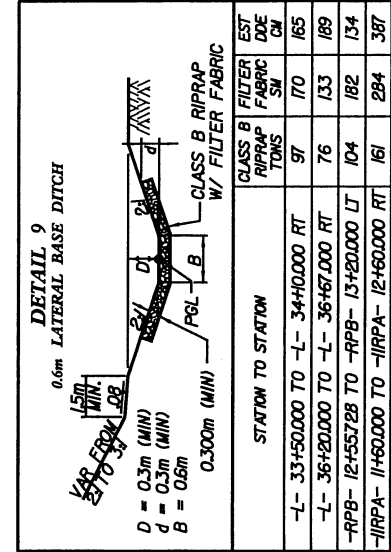
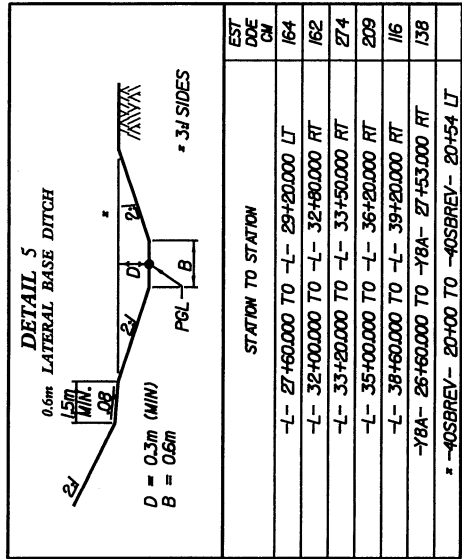
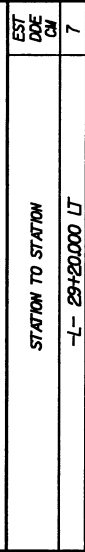
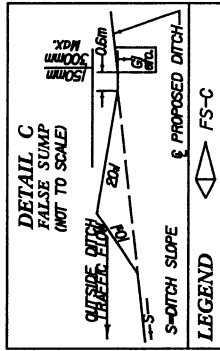
TYPICAL SECTION NO. 24

-Y8R- 11+02.025 TO -Y8R- 11+96.000



TYPICAL SECTION NO. 22

-Y1R- 11+49.377 TO -Y1R- 12+50.000
-Y1R- 12+50.000 TO -Y1R- 14+30.000
-Y3A- 10+40.000 TO -Y3A- 10+61.723





PLANS PREPARED BY:
FLORENCE & HUTCHESON, INC.
CONSULTING ENGINEERS
5540 CRYSTALVIEW DR., SUITE 300
RALEIGH, NC 27606



PROJECT REFERENCE NO.

U-2524AB

SHEET NO.

2-J

R / W SHEET NO.

ROADWAY DESIGN

HYDRAULICS

ENGINEER



CONSTREV.

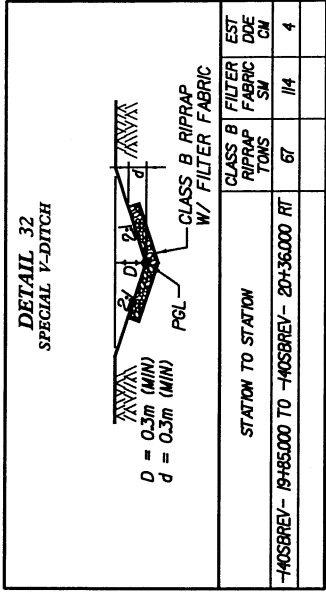
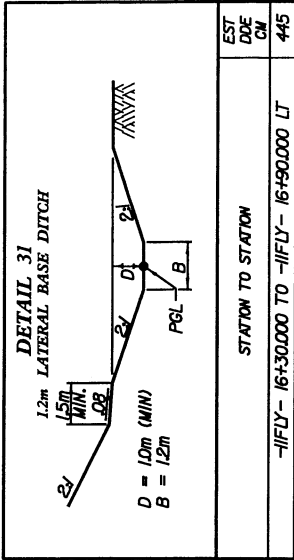
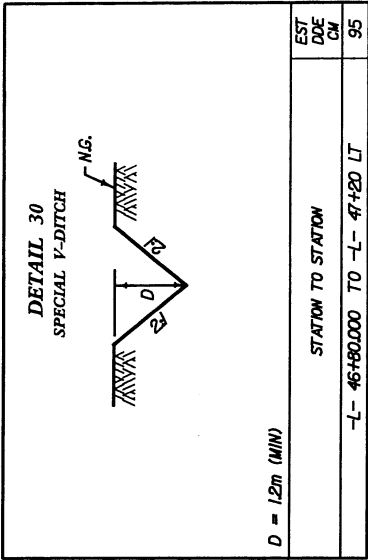
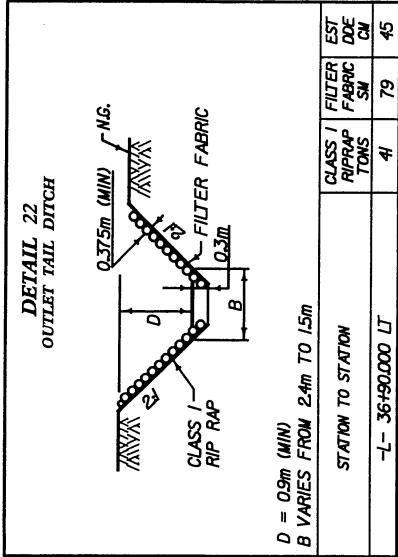
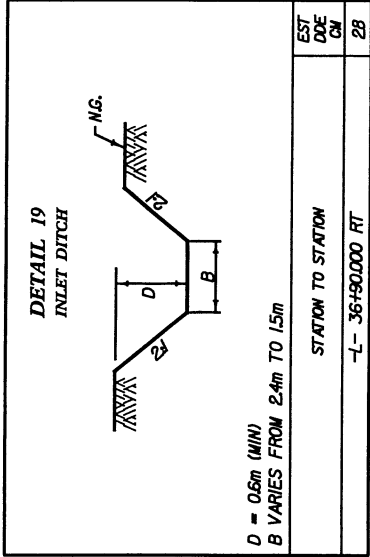
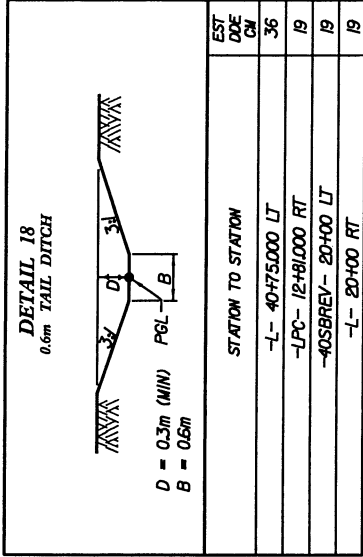
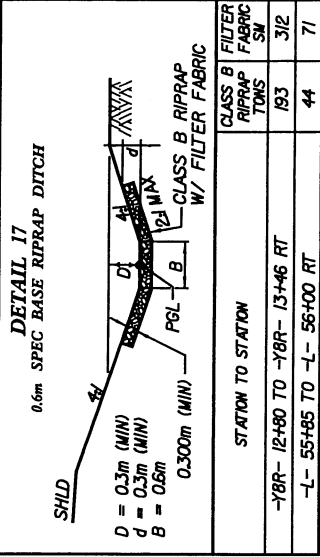
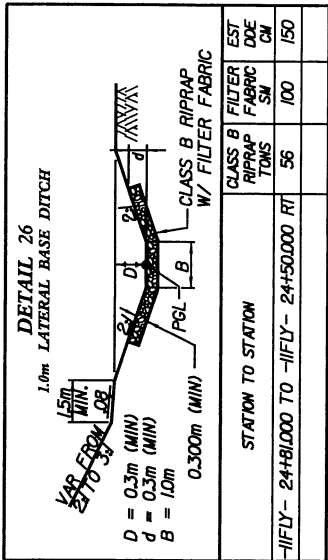
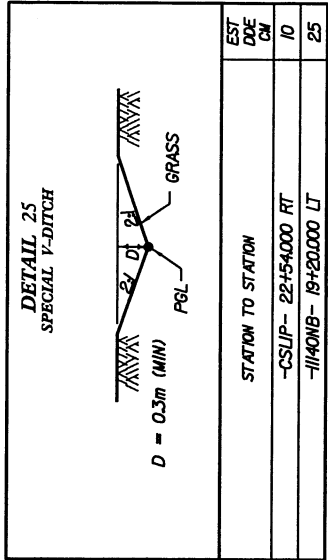
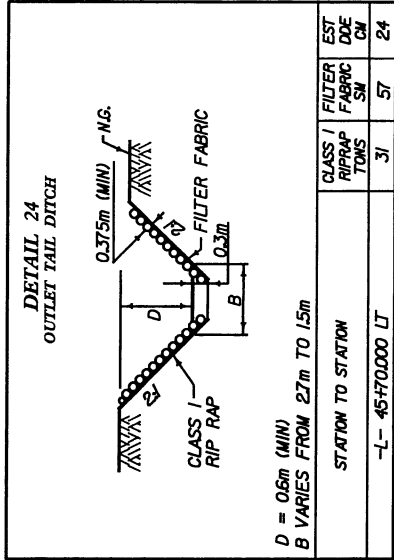
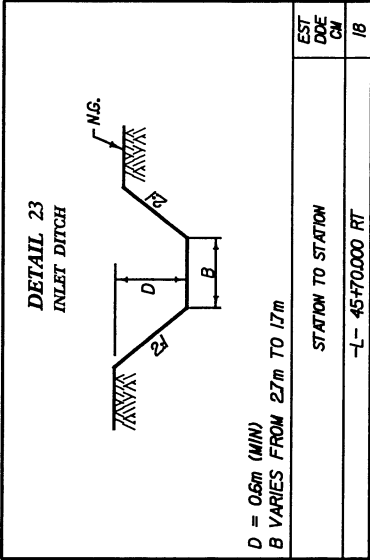
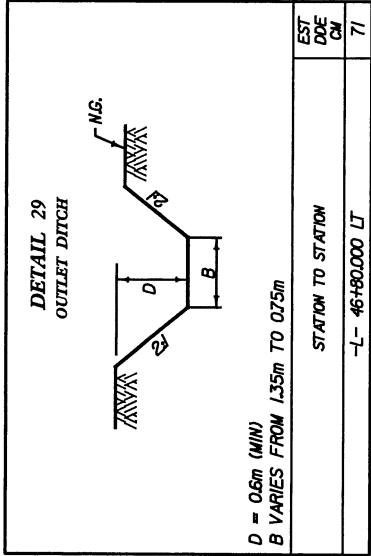
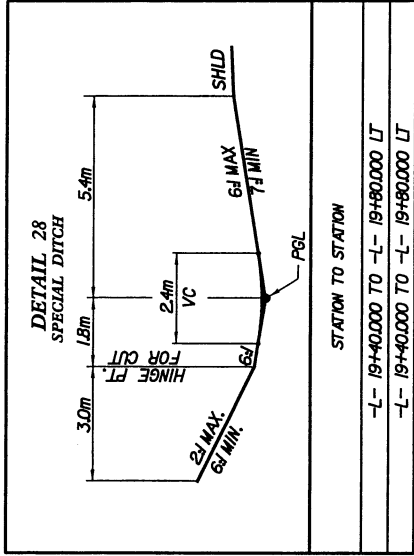
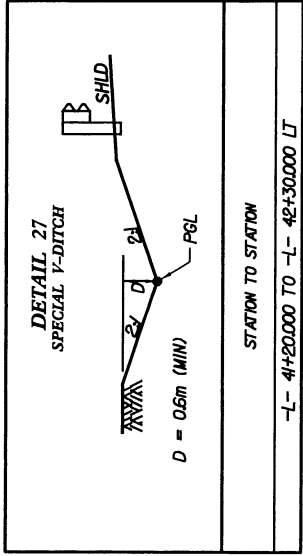
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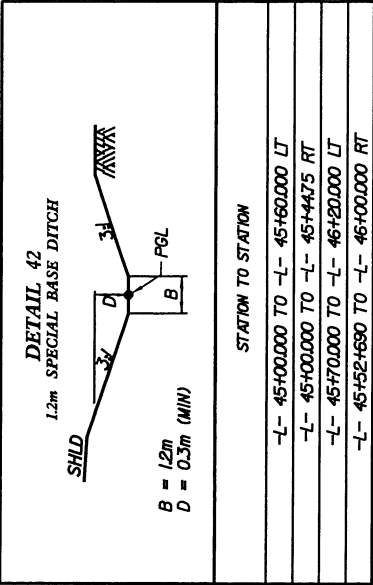
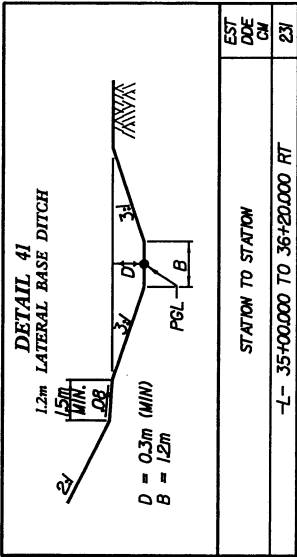
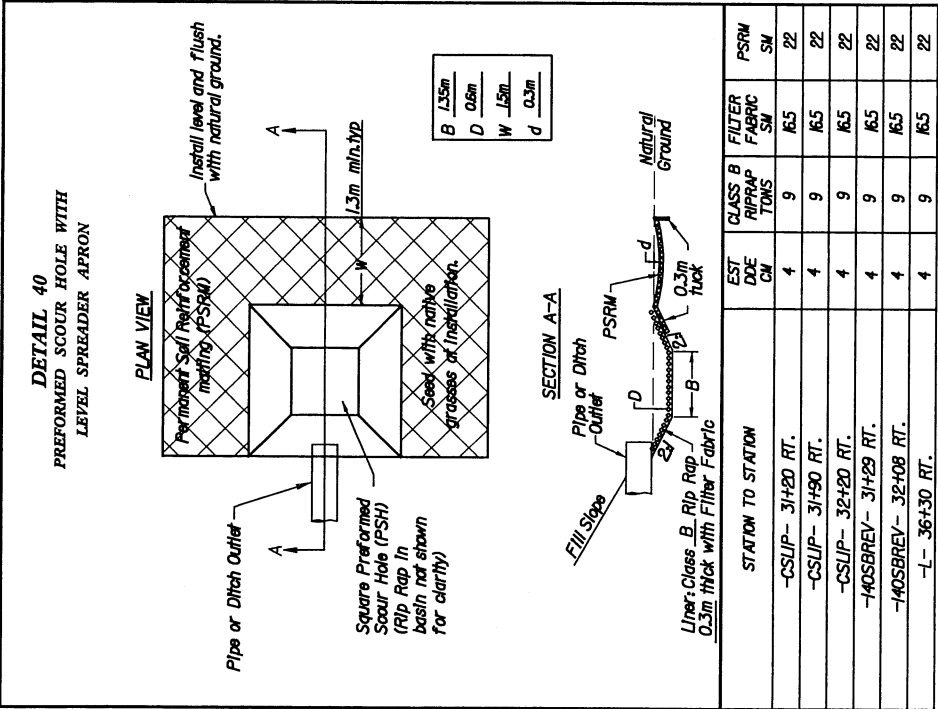
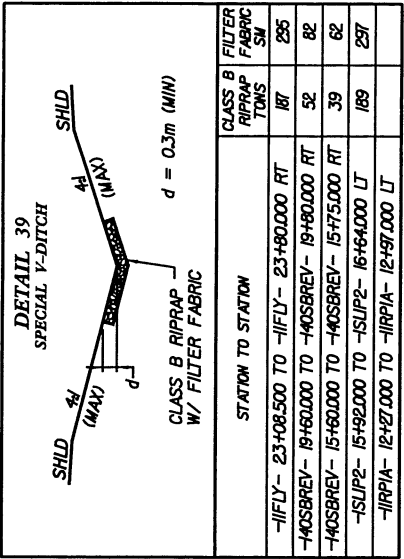
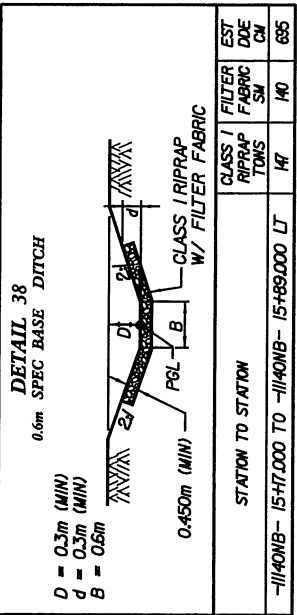
ROADWAY DESIGN

ENGINEER

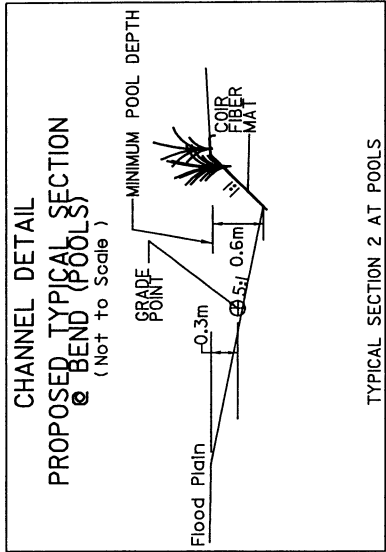
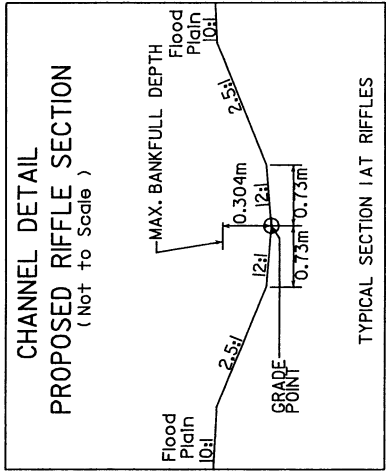
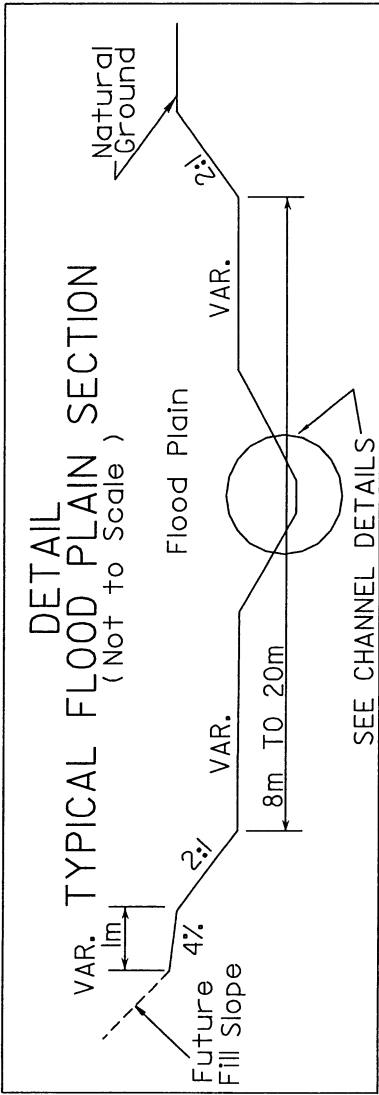
HYDRAULICS

ENGINEER

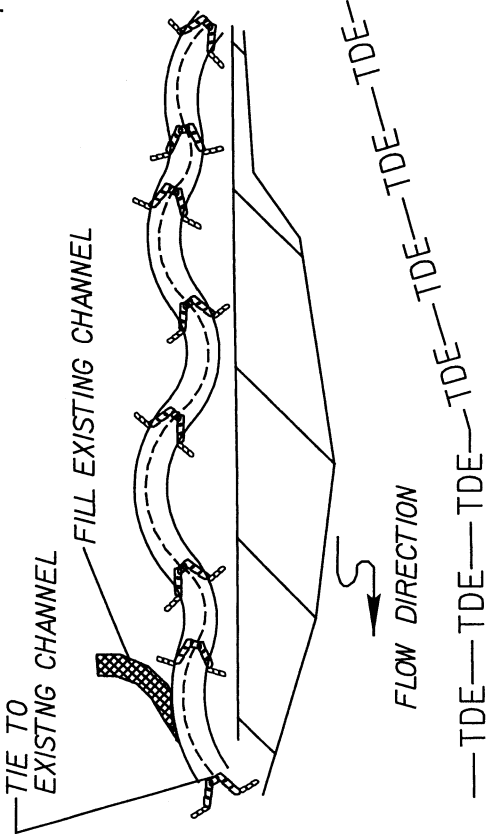
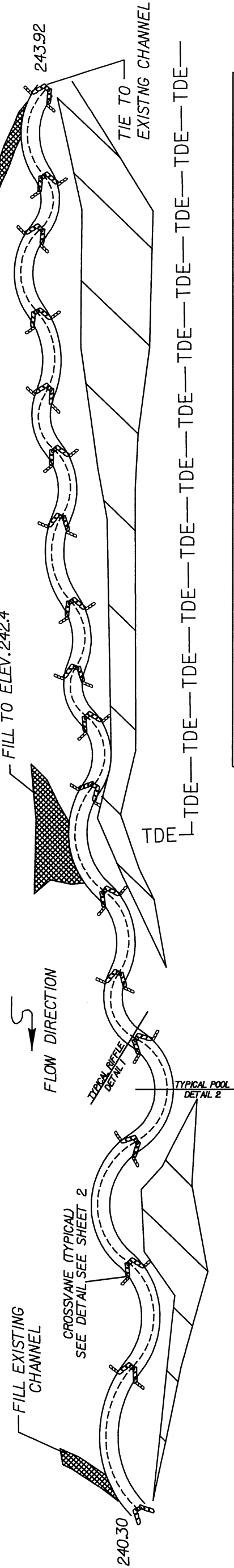




NATURAL CHANNEL DESIGN TYPICALS



QUANTITIES
DDE = 21000m³
BOULDERS = 400 EACH
COIR MAT = 260m²
GEOTEXTILE FABRIC = 350m²



CHANNEL PLAN VIEW
SITE # 2

CHANNEL ALIGNMENT DATA & PROFILE INFORMATION - SITE # 28											
STATION (40SBREV)	OFFSET (40SBREV)	L _c	RAD.	INVERT (THALWEG) (m)	BANKFULL (FLOODPLAIN) (m)	STATION (40SBREV)	OFFSET (40SBREV)	L _c	RAD.	INVERT (THALWEG) (m)	BANKFULL (FLOODPLAIN) (m)
PC 29+22.7	38.0m RT.			240.30	240.60	P1 30+76.0	32.7m RT.			243.14	243.44
P1 29+42.5	29.9m RT.	9.0m	21.7m			PC/PT 30+80.0	34.4m RT.	9.0m	12.4m		
PC/PT 29+49.8	39.1m RT.			240.66	240.96	P1 30+86.3	37.5m RT.			243.35	243.65
P1 29+57.4	46.6m RT.	9.5m	16.3m			PC/PT 30+92.0	33.6m RT.	6.0m	11.8m		
PC/PT 29+67.2	39.4m RT.			240.93	241.23	P1 30+97.9	29.9m RT.			243.54	243.84
P1 29+74.0	29.8m RT.	8.0m	19.2m			PC/PT 31+03.5	34.9m RT.	8.5m	6.5m		
PC/PT 29+80.4	41.7m RT.			241.25	241.55	P1 31+06.9	38.1m RT.			243.69	243.99
P1 29+88.5	53.6m RT.	9.5m	17.1m			PC/PT 31+11.0	35.3m RT.	6.0m	11.0m		
PC/PT 29+92.3	42.7m RT.			241.53	241.83	P1 31+17.3	31.6m RT.			243.90	244.20
P1 29+98.0	37.4m RT.	11.0m	16.4m			PC/PT 31+22.9	35.9m RT.	12.0m	9.4m		
PC/PT 30+04.3	40.8m RT.			241.71	242.01	P1 31+42.4	31.4m RT.			244.50	244.80
P1 30+09.5	44.4m RT.	7.0m	9.7m			PC/PT 31+49.0	33.4m RT.	12.0m	5.0m		
PC/PT 30+16.9	39.4m RT.			241.91	242.21	P1 31+51.4	34.7m RT.			244.61	244.91
P1 30+24.0	32.5m RT.	8.5m	10.6m			PC/PT 31+53.9	32.1m RT.	9.0m	8.5m		
PC/PT 30+30.0	38.3m RT.			242.18	242.48	P1 31+65.9	32.2m RT.			244.85	245.15
P1 30+34.5	42.5m RT.	15.0m	12.3m			PC/PT 31+70.5	36.4m RT.	6.5m	8.2m		
PC/PT 30+37.8	38.0m RT.			242.36	242.66	P1 31+75.0	32.9m RT.			245.02	245.32
P1 30+41.5	35.2m RT.	11.0m	10.6m			PC/PT 31+79.4	29.9m RT.	10.0m	8.8m		
PC/PT 30+46.3	37.2m RT.			242.48	242.78	P1 31+84.2	32.1m RT.			245.18	245.48
P1 30+50.8	39.3m RT.	10.0m	7.5m			PC/PT 31+86.3	33.7m RT.	9.0m	12.1m		
PC/PT 30+56.7	36.7m RT.			242.64	242.94	P1 31+88.9	32.9m RT.			245.27	245.57
P1 30+62.9	32.8m RT.	6.5m	9.4m			PC/PT 31+93.5	32.0m RT.	7.0m	13.2m		
PC/PT 30+67.9	36.2m RT.			242.85	243.15	P1 31+97.0	35.0m RT.			245.45	245.75
P1 29+32.9	38.4m RT.	12.0m	12.7m			PT 31+60.3	26.9m RT.		9.6m		
PC/PT 30+72.3	35.3m RT.			243.00	243.30						

NOTE: SEE SHEET 9 & 10 FOR PLAN VIEW.

UNDERCUT DETAILS

PLANS PREPARED BY:

FLORENCE & HUTCHESON, INC.

CONSULTING ENGINEERS

6540 CENTERVIEW DR., SUITE 318

RALPHIGH, NC 27606

PROJECT REFERENCE NO.

U-2524A3

SHEET NO.

2-O

PLAN

VIEW

SHEET NO.

R/W

ENGINEER

ROADWAY DESIGN

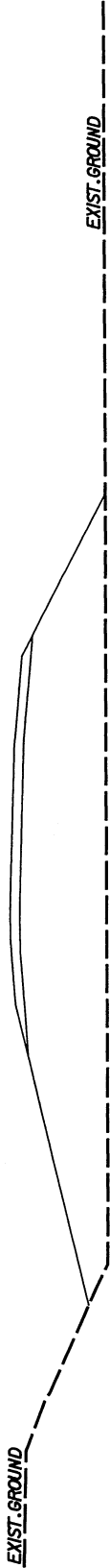
SEAL

2003

CAROLINA PROFESSIONAL ENGINEERS

PAUL JAMES

NOTE: DETAIL ARE NOT TO SCALE

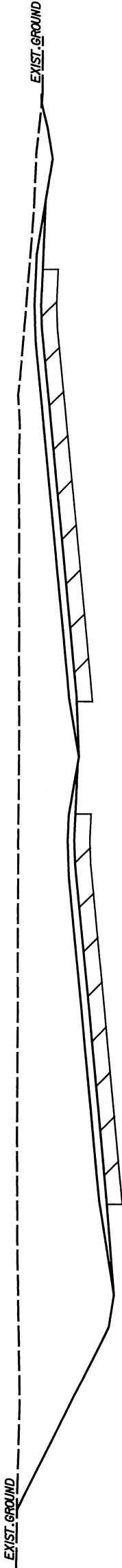


UNDERCUT UNSUITABLE ARTIFICIAL FILL SOILS IN SUBGRADE

DETAIL FOR UNDERCUTTING 1

- 40SBREV- 20+50.000 TO -40SBREV- 21+25.000
- CSLIP- 18+60.000 TO -CSLIP- 19+80.000
- 1/SLIP2- 10+00.000 TO -1/SLIP2- 10+85.000

THE EXTENT OF UNDERCUT IS INDICATED ON THE ACCOMPANYING PLANS, PROFILES, AND CROSS-SECTIONS. THE DEPTH OF UNDERCUT WILL BE DETERMINED BY THE PRESENCE OF SUITABLE SOILS. RECOMMEND THAT THE UNDERCUT BE WASTED.



UNDERCUT HIGHLY PLASTIC SOILS IN SUBGRADE

DETAIL FOR UNDERCUTTING 2

- L- 18+40.000 TO -L- 19+80.000
- L- 39+40.000 TO -L- 40+20.000

RECOMMENDED THAT HIGHLY PLASTIC SOILS BE UNDERCUT TO A DEPTH OF 0.90 METERS BELOW SUBGRADE ELEVATION, OR TO SUITABLE SOILS, WHICHEVER IS LESS. THE UNDERCUT SHOULD EXTEND OUTWARD 0.3 METERS FROM THE EDGE OF THE PAVED SHOULDER. RECOMMENDED THAT THE UNDERCUT MATERIAL BE USED AT THE DISCRETION OF THE RESIDENT ENGINEER IN DEEP EMBANKMENTS NOT WITHIN 2 METERS OF PROPOSED SUBGRADE ELEVATION.

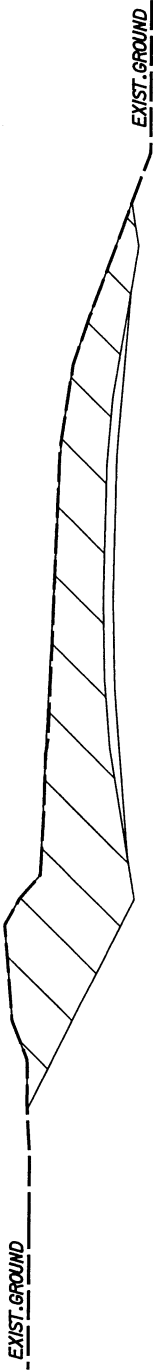


UNSUITABLE UNCLASSIFIED EXCAVATION OF HIGHLY PLASTIC SOILS

DETAIL FOR UNDERCUTTING 3

- L- 13+00.000 TO -L- 14+00.000
- L- 18+40.000 TO -L- 19+80.000
- L- 39+40.000 TO -L- 40+60.000
- L- 52+10.000 TO -L- 54+40.000

RECOMMENDED THAT HIGHLY PLASTIC SOILS IN THE FOLLOWING UNCLASSIFIED EXCAVATION AREAS BE USED AT THE DISCRETION OF THE RESIDENT ENGINEER IN DEEP EMBANKMENTS NOT WITHIN 2 METERS OF PROPOSED SUBGRADE ELEVATION.



UNDER-CUT

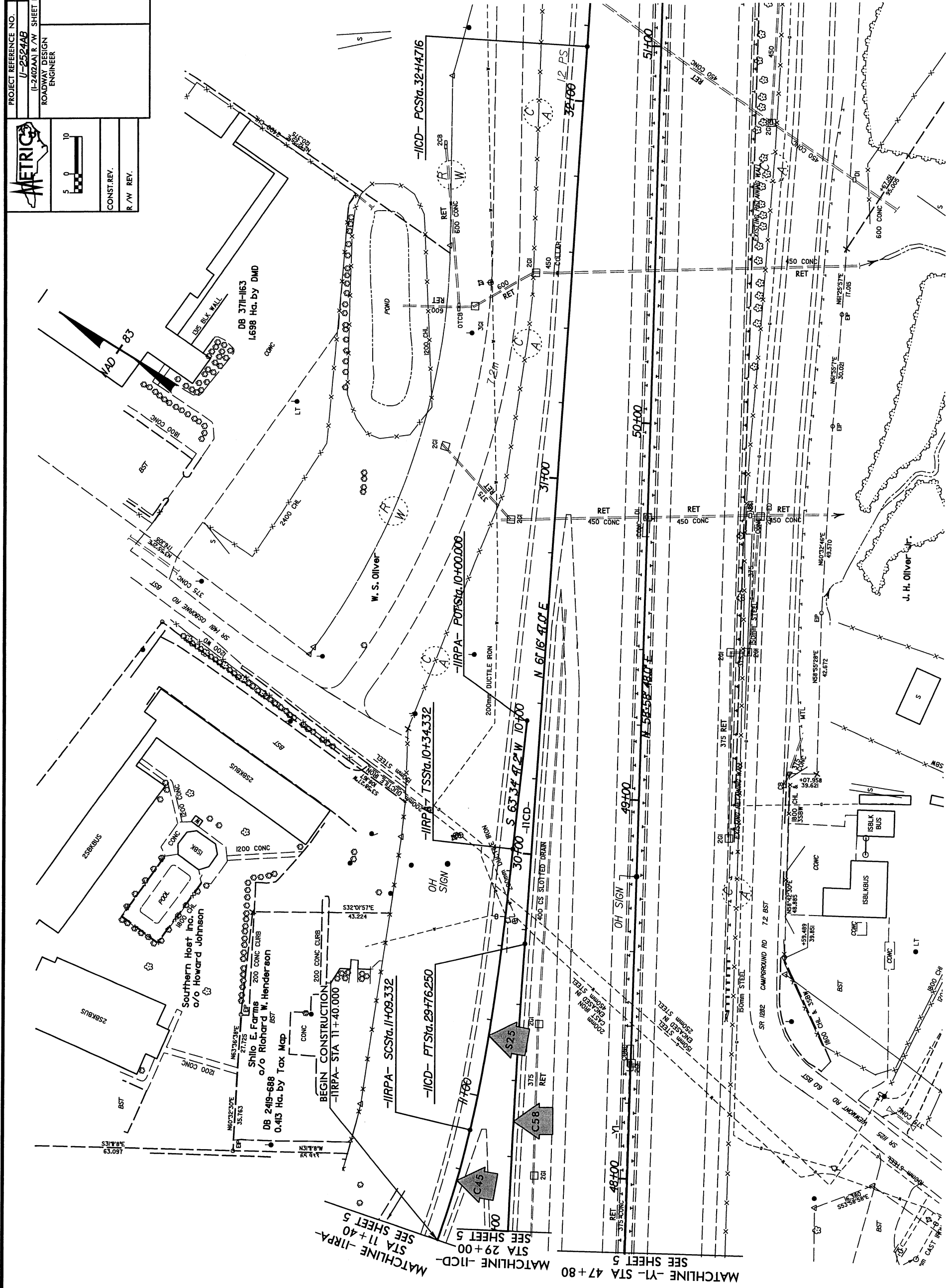


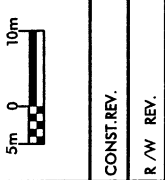
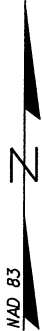
UNSUITABLE UNCLASSIFIED EXCAVATION OF ARTIFICIAL FILL SOILS

DETAIL FOR UNDERCUTTING 4

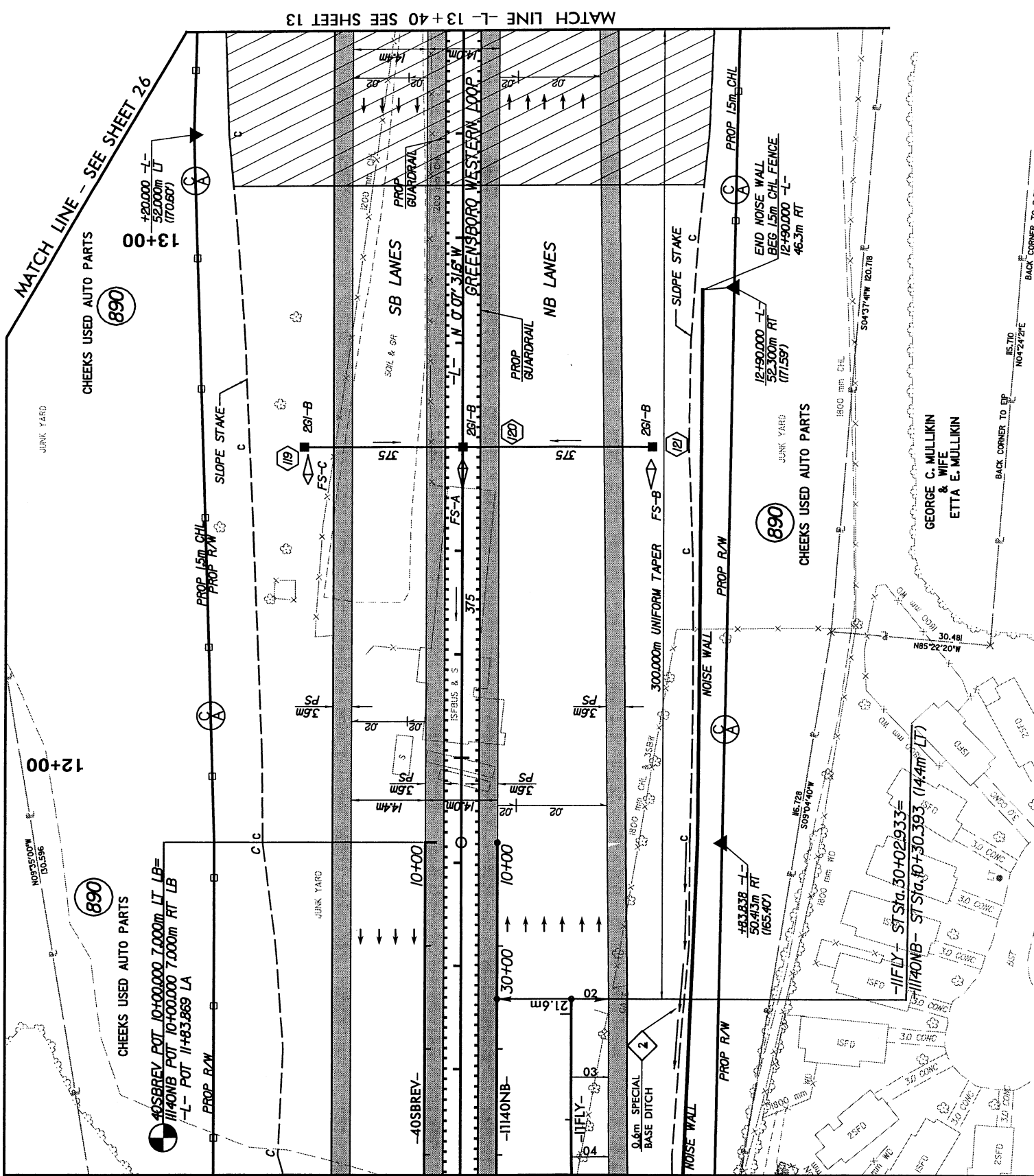
- CSLIP- 18+60.000 TO -CSLIP- 19+80.000
- 1/SLIP2- 10+00.000 TO -1/SLIP2- 10+85.000

RECOMMENDED THAT UNSUITABLE FILL SOILS IN THE FOLLOWING UNCLASSIFIED EXCAVATION AREA BE WASTED.





MATCH LINE - SEE SHEET 25



MATCH LINE -L- 11 + 20 SEE SHEET 11

MATCH LINE -L- 13 + 40 SEE SHEET 13

-IIFLY-	
PIS= 25+81.443	PI= 27+74.99
96= 458' 21.5"	Δo= 42' 20' 51.2" (RT)
Ls= 75.000	Lo= 321.50
LT= 50.09	To= 168.496
ST= 25.008	Ro= 435.000
X6= 74.944	Eo= 31.483
Y6= 21.54	SE= .07
P6= 0.539	
K6= 37.461	
-IIFLY-	
PIS= 29+52.951	PI= 27+74.99
96= 458' 21.5"	Δo= 42' 20' 51.2" (RT)
Ls= 75.000	Lo= 321.50
LT= 50.09	To= 168.496
ST= 25.008	Ro= 435.000
X6= 74.944	Eo= 31.483
Y6= 21.54	SE= .07
P6= 0.539	
K6= 37.461	


DATUM DESCRIPTION

THE LOCALIZED COORDINATE SYSTEM DEVELOPED FOR THIS PROJECT IS BASED ON THE STATE PLANE COORDINATES ESTABLISHED BY NCGRS FOR MONUMENT "ROYAL".
WITH NAD 83 STATE PLANE GRID COORDINATES OF
NORTHING: 260,629.697m EASTING: 536,004.482m
THE AVERAGE COMBINED GRID FACTOR USED ON THIS PROJECT (GROUND TO GRID) IS: 0.99994019
THE N.C. LAMBERT GRID BEARING AND
LOCALIZED HORIZONTAL GROUND DISTANCE FROM
"ROYAL" TO -L- STATION 10+00.000 IS
S 19°-10'-46.9" W 10,062.638m
ALL LINEAR DIMENSIONS ARE LOCALIZED HORIZONTAL DISTANCES
VERTICAL DATUM USED IS NGVD 1929 BASED ON
NCGRS MONUMENTS "TOWN" AND "COCKY".

SEE SHEET 34 FOR -40SBREV- PROFILE
SEE SHEET 38 FOR -11140NB- PROFILE
SEE SHEET 43 FOR -IIFLY- PROFILE
SEE SHEET 51 FOR -L- PROFILE
SEE SHEETS 2-1 THRU 2-K FOR DRAINAGE DETAILS
SEE SHEETS 2-X THRU 2-AM FOR NOISE WALL PROFILES

LEGEND
UNDERCUT EXCAVATION, SEE CROSS SECTIONS
& SHEET 2-O FOR DETAILS



 UNDERCUT EXCAVATION, SEE CROSS SECTIONS & SHEET 2-O FOR DETAILS

LEGEND

UNDERCUT EXCAVATION, SEE CROSS SECTIONS
& SHEET 2-O FOR DETAILS


PIS =	16755670
$\Delta_1 =$	209537
R1 =	4607
L1 =	1820000m
R2 =	555000m
E2 =	6° 47' 39"
L2 =	90000
S.T. =	39.537
P _g =	0.327
<hr/>	
P1 =	15772021
$\Delta_1 =$	62550.5 (LT)
R1 =	53152
L1 =	1200000
E1 =	177
SE =	.05
<hr/>	
PIS =	1488273
$\Delta_1 =$	543
R1 =	60004
L1 =	30004
S.T. =	89.987
E1 =	125
P _g =	0.281
K _g =	44598

$P.L. = 12+27.838$	$P.L. = 15+35.174$
$\Delta = 122^{\circ} 41' 40.5''$ (RT)	$\Delta = 122^{\circ} 42''$ (RT)
$L_o = 224.850$	$L_o = 25.480$ m
$T_o = 192.63$	$T_o = 42.91$ m
$R_o = 105.000$	$R_o = 396.240$ m


PJ. = 12+27.838
 Δ = 12° 4' 40.5" (RT)
 Lg = 224.850
 Tg = 192.163
 Rg = 105.000
 Eg = 113.978
 SE = .04

2	3/19/01	REV NAME - PARCEL 25
1	11/16/00	REV DEDICATED ROW

FILE: I:\2524ab-1\plans\12524ABSH14.PSH
DATE: 04/02/2003 02:37:44 PM




PLANS PREPARED BY:
FLORENCE & HUTCHESON, INC.
CONSULTING ENGINEERS
5640 CENTURYWAY DR. SUITE 316
RALEIGH, NC 27606



PROJECT REFERENCE NO.
U-2524AB
SHEET NO. 6
ROADWAY DESIGN ENGINEER

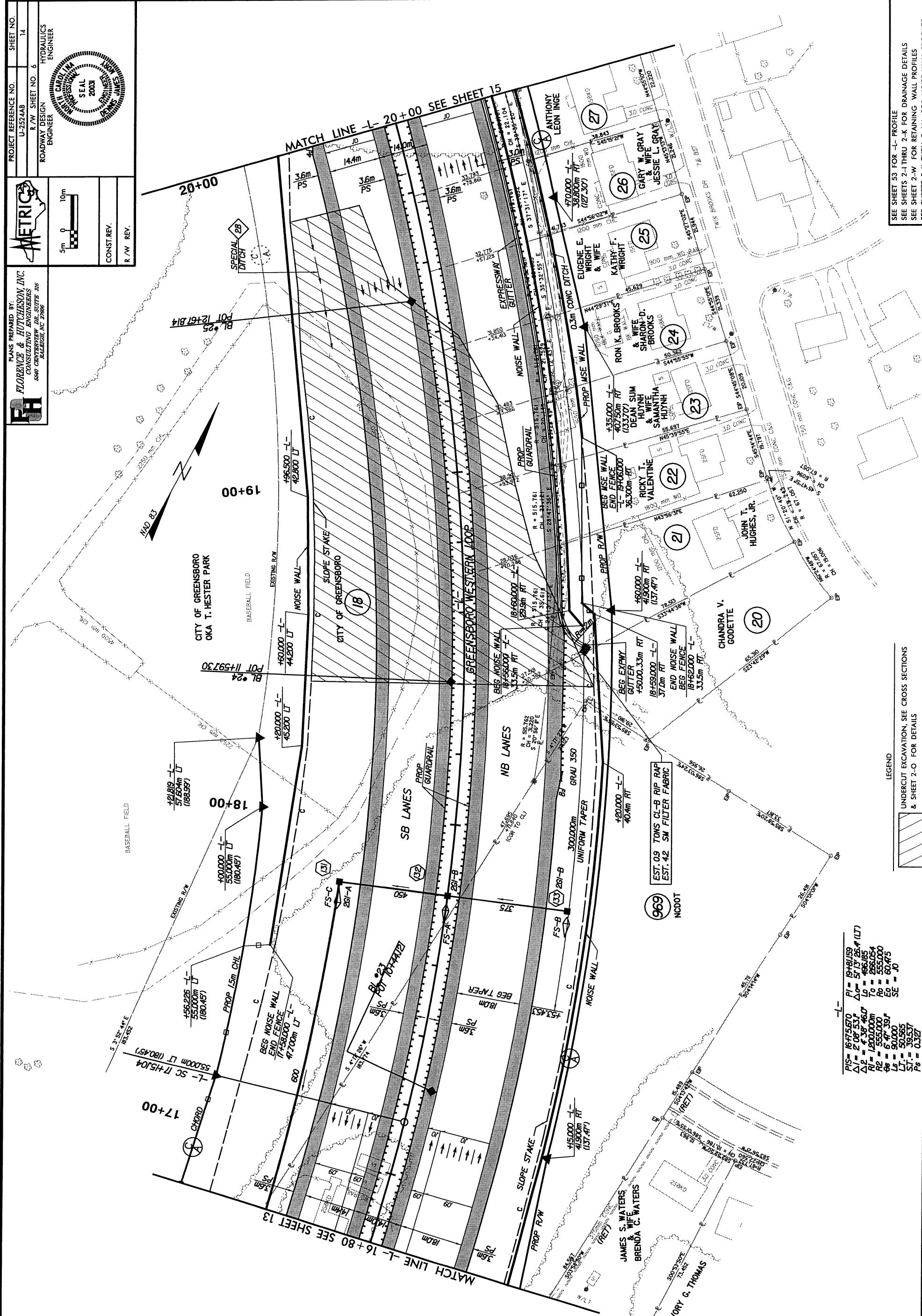
SHEET NO.
14
R/W SHEET NO. 6
HYDRAULICS ENGINEER



CONST. REV.

R/W REV.

5m 0 10m




969 NCDOT

EST. 0.9 TONS CL-B RIP RAP
EST. 4.2 SM FILTER FABRIC

PIS = 16715.670	PI = 19181.159
ΔI = 2108.537	ΔP = 5718.284 (LT)
ΔP = 438.460	ΔP = 5718.284
R1 = 1200.000m	T = 288.000
R2 = 555.000	R0 = 555.000
ΔE = 6' 4" 39"	E = 60.475
L = 80.000	SE = 10
LT = 30.565	
ST = 39.537	
Pe = 0.327	

LEGEND


UNDERCUT EXCAVATION, SEE CROSS SECTIONS & SHEET 2-O FOR DETAILS



SEE SHEET 53 FOR -L- PROFILE
SEE SHEETS 2-1 THRU 2-K FOR DRAINAGE DETAILS
SEE SHEET 2-W FOR RETAINING WALL PROFILES
SEE SHEETS 2-X THRU 2-AM FOR NOISE WALL PROFILES

1	11/16/00	REV DEDICATED ROW
2	3/19/01	REV NAME - PARCELS 47, 49, 54 & 55

FILE: I:\2524AB-Plan\12524ABSH16.PSH
DATE: 04/02/03 02:39:51 PM



PLANS PREPARED BY:
FLORENCE & HUTCHESON, INC.
CONSULTING ENGINEERS
5640 CENTURYVIEW DR., SUITE 316
DALLAS, TX 75206

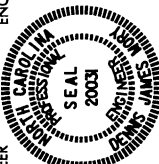
PROJECT REFERENCE NO.
U-2524AB

R/W SHEET NO. 8

ROADWAY DESIGN ENGINEER

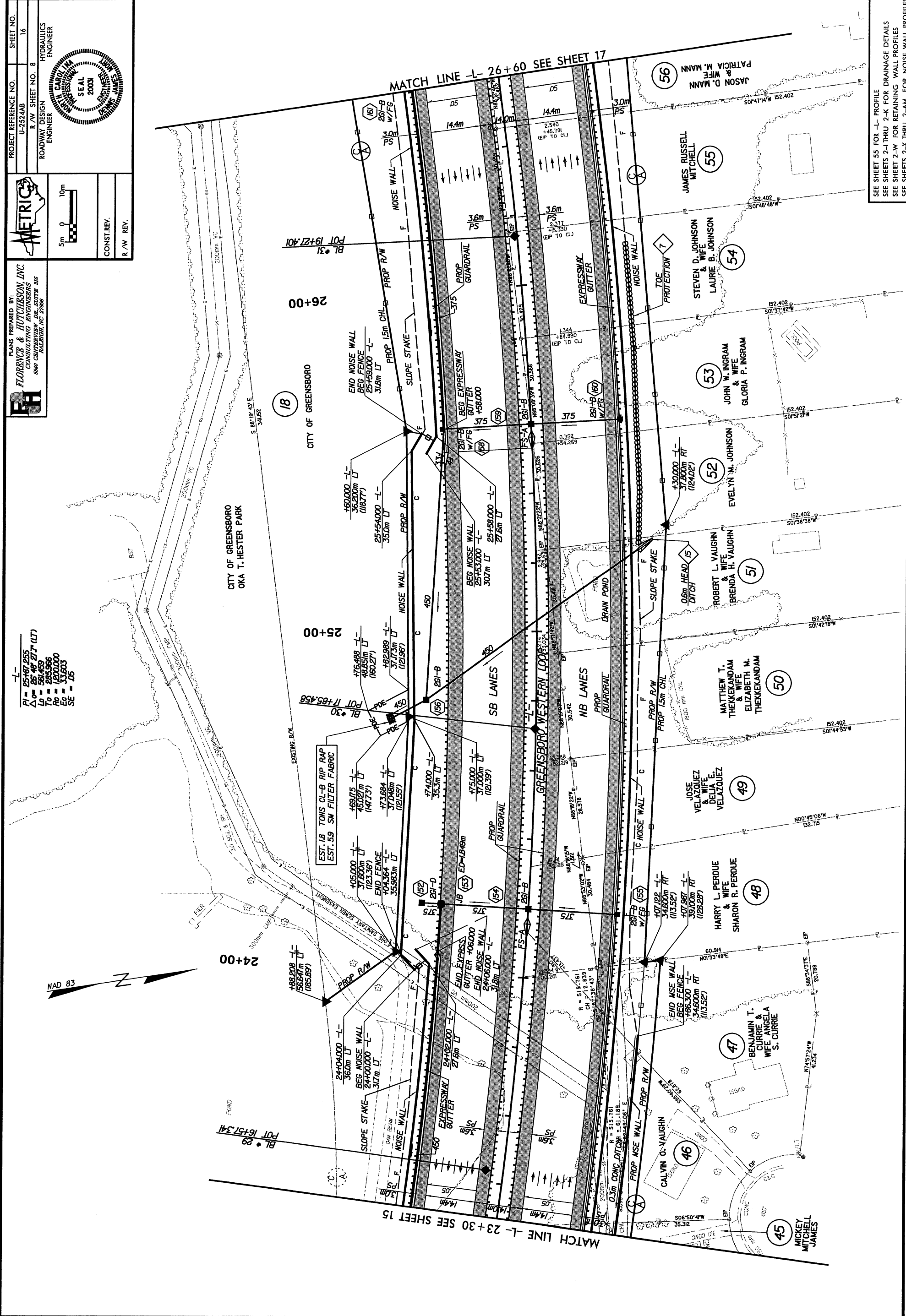
SHEET NO. 16

HYDRAULICS ENGINEER



CONST. REV.

R/W REV.



SEE SHEET 55 FOR -L- PROFILE
SEE SHEETS 2-I THRU 2-K FOR DRAINAGE DETAILS
SEE SHEET 2-W FOR RETAINING WALL PROFILES
SEE SHEETS 2-X THRU 2-AM FOR NOISE WALL PROFILES

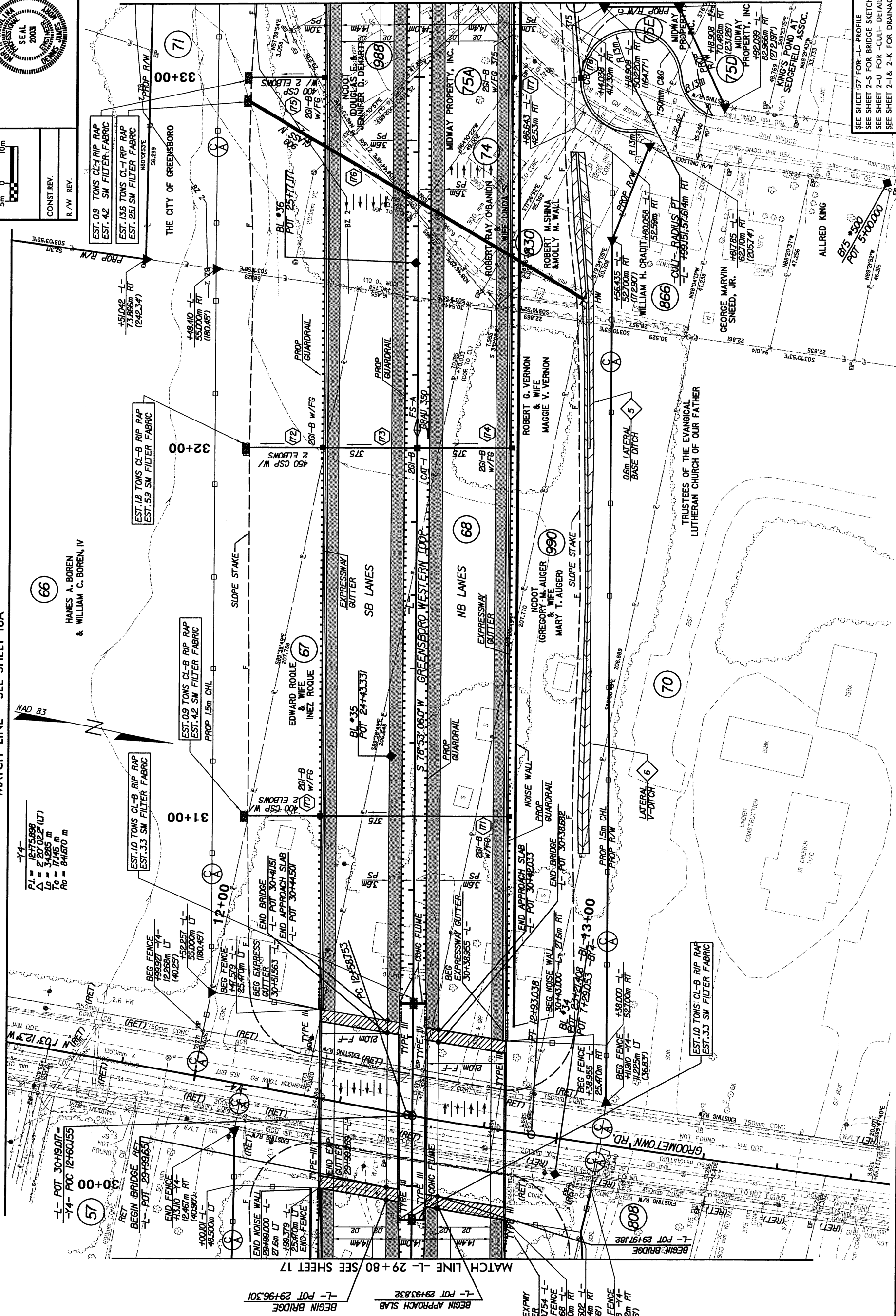
3	2/18/02	REV ROW - - PARCEL 57
2	7/5/01	REV PROP R/W - - PARCELS 66 & 71 ADDED SHEET 10A
1	3/19/01	REV NAME - - PARCEL 66

FILE: I:\2524ab-Plans\2524ABSH18.PSH
DATE: 06/30/2003 02:40:22 PM

FH
PLANS PREPARED BY:
FLORENCE & HUTCHESON, INC.
CONSULTING ENGINEERS
5540 CENTERVIEW DR., SUITE 316
RALEIGH, NC 27606

5m 0 10m

MATCH LINE SEE SHEET 18A



MATCH LINE -L- 33+20 SEE SHEET 19

SEE SHEET 57 FOR 2-L PROFILE
SEE SHEET 2-S FOR BRIDGE SKETCH
SEE SHEET 2-U FOR -CUL1- DETAIL
SEE SHEET 2-I & 2-K FOR DRAINAGE DETAILS
SEE SHEETS 2-X THRU 2-AM FOR WALL PROFILES

4	11/06/01	REV PROP R/W - PARCEL 959, 85
3	7/05/01	REV PROP R/W - PARCEL 71
2	4/05/01	COMBINE PARCEL 84 W/ 85
1	3/19/01	REV NAME - PARCEL 84
5	2/15/02	ADD PARCELS 842 & 849
		ACQUIRED BY NC DOT

FILE: T:\11252448-Plan\11252448SH19.PSH
DATE: 02/14/03 03:45:24 PM

PLANS PREPARED BY:
FIORINCE & HUTCHISON, INC.
CONSULTING ENGINEERS
6540 CONVENTVIEW DR. SUITE 305
RALEIGH, NC 27606

PROJECT REFERENCE NO. U-2524AB

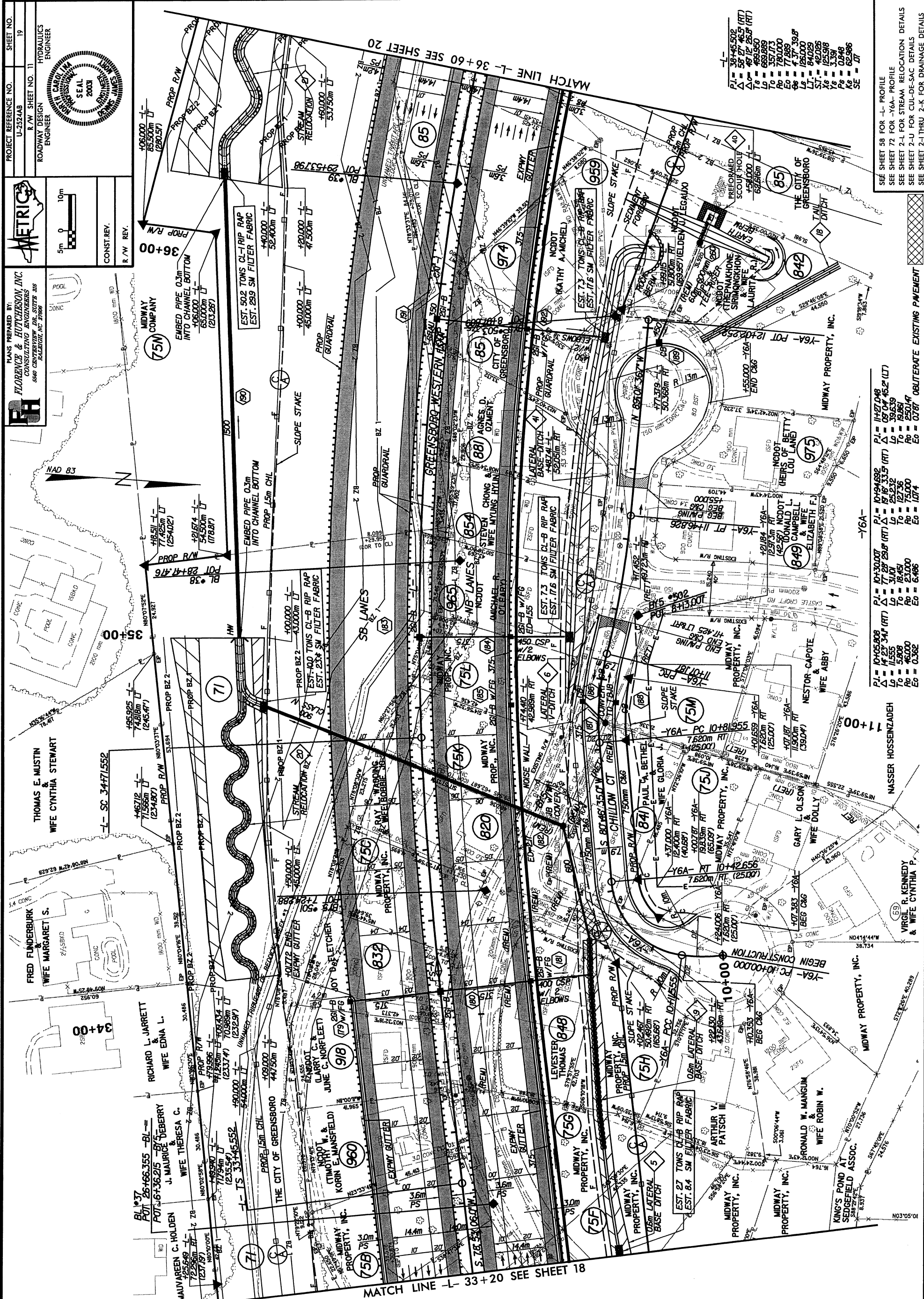
R/W SHEET NO. 11

ROADWAY DESIGN ENGINEER

HYDRAULICS ENGINEER

CONST. REV.

R/W REV.

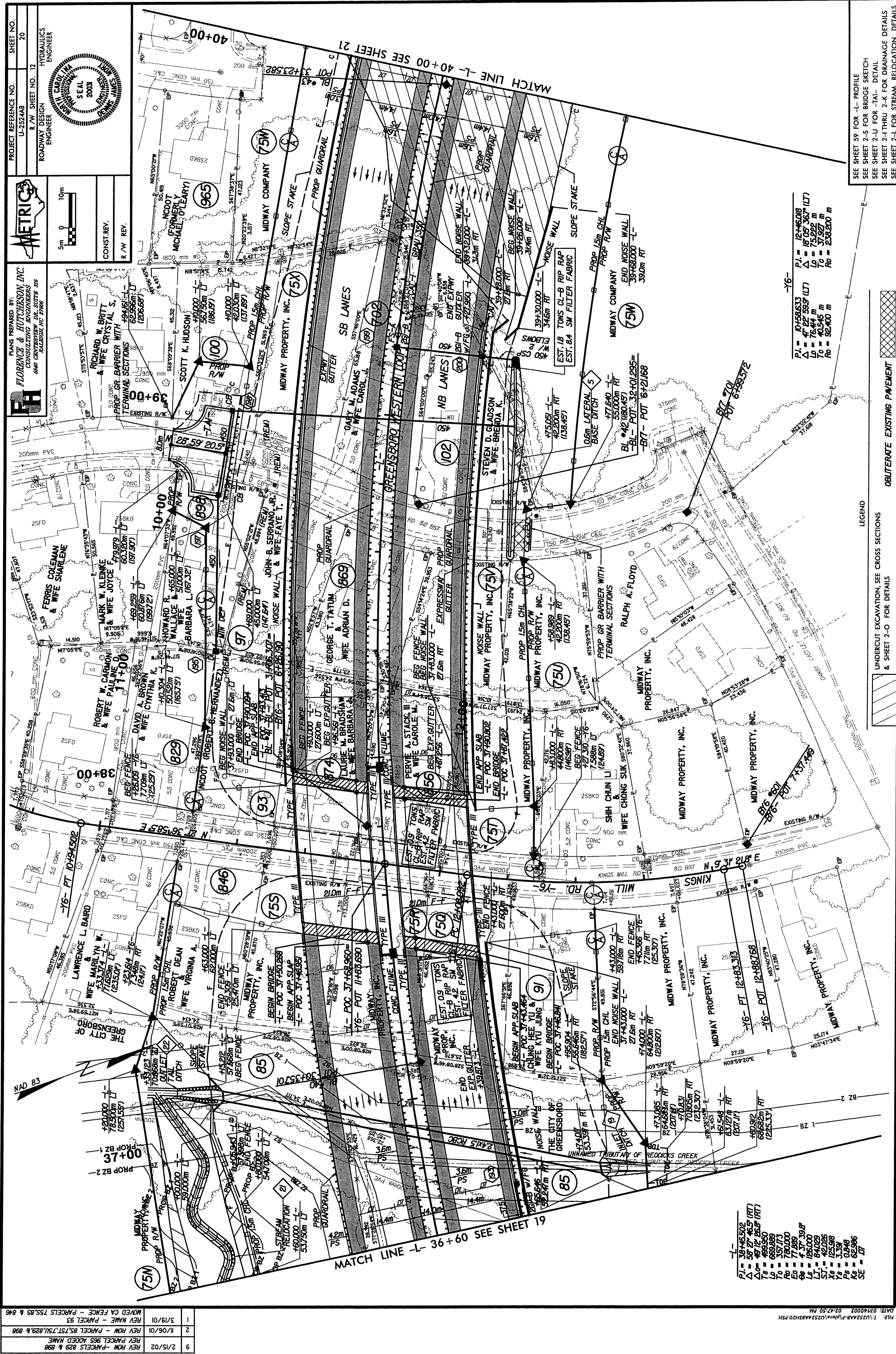


L-1	PI= 38+45.502
Δ	Δ= 38+27.465 (RT)
Δ	Δ= 47+12.265 (RT)
L-2	PI= 49+93.889
Δ	Δ= 357.73
Δ	Δ= 77.889
Δ	Δ= 437.398
Δ	Δ= 126.000
Δ	Δ= 84.029
Δ	Δ= 42.026
Δ	Δ= 125.918
Δ	Δ= 3.391
Δ	Δ= 0.248
Δ	Δ= 62.986
Δ	Δ= 0.0

SEE SHEET 58 FOR -L- PROFILE
SEE SHEET 72 FOR -Y6A- PROFILE
SEE SHEET 2-L FOR STREAM RELOCATION DETAILS
SEE SHEET 2-L FOR CUL-DE-SAC DETAILS
SEE SHEET 2-1 THRU 2-K FOR DRAINAGE DETAILS

P1= 10+05.908	P1= 10+30.007	P1= 10+94.692	P1= 11+27.048
Δ= 11+52.347 (RT)	Δ= 11+57.298 (RT)	Δ= 11+63.335 (RT)	Δ= 11+64.462 (LT)
Δ= 11+53	Δ= 11+53	Δ= 11+53	Δ= 11+53
Δ= 11+53	Δ= 11+53	Δ= 11+53	Δ= 11+53
Δ= 11+53	Δ= 11+53	Δ= 11+53	Δ= 11+53
Δ= 11+53	Δ= 11+53	Δ= 11+53	Δ= 11+53
Δ= 11+53	Δ= 11+53	Δ= 11+53	Δ= 11+53
Δ= 11+53	Δ= 11+53	Δ= 11+53	Δ= 11+53

NASSER HOSSEINZADEH
VIRGIL R. KENNEDY & WIFE CYNTHIA P.



SEE SHEET 59 FOR -L- PROFILE
SEE SHEET 2-S FOR BRIDGE SKETCH
SEE SHEET 2-U FOR -TAL- DETAIL
SEE SHEET 2-I THRU 2-K FOR DRAINAGE DETAILS
SEE SHEET 2-L FOR STREAM RELOCATION DETAILS

LEGEND
UNDERCUT EXCAVATION, SEE CROSS SECTIONS
& SHEET 2-O FOR DETAILS

OBLITERATE EXISTING PAVEMENT

TABLE 1: DATA

PI	=	38+45.502
Δ	=	50° 27' 46.5" (RT)
Δ	=	46° 12' 55.5" (RT)
L	=	499.950
Lo	=	699.999
Lo	=	357.173
Ro	=	780.000
Ro	=	77.289
Δ	=	4° 37' 39.8"
L	=	125.000
L	=	64.029
Δ	=	42.025
Lo	=	125.996
Lo	=	3.359
Ro	=	0.048
Ro	=	62.886
SE	=	UT

TABLE 2: DATA

PI	=	12+46.018
Δ	=	18° 05' 35.7" (LT)
Δ	=	75.222 m
Lo	=	76.414 m
Lo	=	40.545 m
Ro	=	238.200 m

PLANS PREPARED BY:
FLORENCE & HUTCHERSON, INC.
CONSULTING ENGINEERS
6840 CENTURVIEW DR., SUITE 316
DALLAS, TX 75248

PROJECT REFERENCE NO.
U-2524AB

SHEET NO.
20

R/W SHEET NO. 12

HYDRAULICS
ENGINEER

ROADWAY DESIGN
ENGINEER

CONST. REV.
R/W REV.

SEAL
2003

REGISTERED PROFESSIONAL ENGINEER
STATE OF TEXAS
NO. 12524AB

TABLE 3: REVISIONS

1	3/19/01	REV NAME - PARCEL 93
2	11/06/01	REV NAME - PARCEL 85, 75, 75U, 829, & 898
3	2/15/02	REV NAME - PARCELS 829 & 898

3	9/04/01	REV RETENTION POND REV
2	11/22/00	DELETED - DWYI-
1	11/22/00	ADDED RETENTION POND

FILE: I:\02540b-A\plan\12524485\21.FSH
DATE: 06/20/2003 02:41:57 PM

PLANS PREPARED BY:
FH FLORENCE & HUTCHESON, INC.
CONSULTING ENGINEERS
5540 CENTERVIEW DR. SUITE 316
BALA CREEK, NC 27006

PROJECT REFERENCE NO. U-2524B
SHEET NO. 21
R/W SHEET NO. 13
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER

CONST. REV. R/W REV.

SEE SHEET 30
MATCH LINE -Y8R- 13+20

PLAN
PI = 38+45.502
Δ = 58.27' 45.5' (RT)
Δ = 48.12' 25.5' (RT)
L = 663.889
T = 70.000
R = 800.000 m
SE = NC

PI = 144.883
Δ = 17.27' 53.9' (LT)
Δ = 27.12' 59.4'
L = 663.889
T = 70.000
R = 800.000 m
SE = NC

PI = 1334.432
Δ = 17.27' 53.9' (RT)
Δ = 27.12' 59.4'
L = 663.889
T = 70.000
R = 800.000 m
SE = NC

SEE SHEET 31
MATCH LINE -Y8R- 15+20

PI = 38+45.502
Δ = 58.27' 45.5' (RT)
Δ = 48.12' 25.5' (RT)
L = 663.889
T = 70.000
R = 800.000 m
SE = NC

PI = 144.883
Δ = 17.27' 53.9' (LT)
Δ = 27.12' 59.4'
L = 663.889
T = 70.000
R = 800.000 m
SE = NC

PI = 1334.432
Δ = 17.27' 53.9' (RT)
Δ = 27.12' 59.4'
L = 663.889
T = 70.000
R = 800.000 m
SE = NC

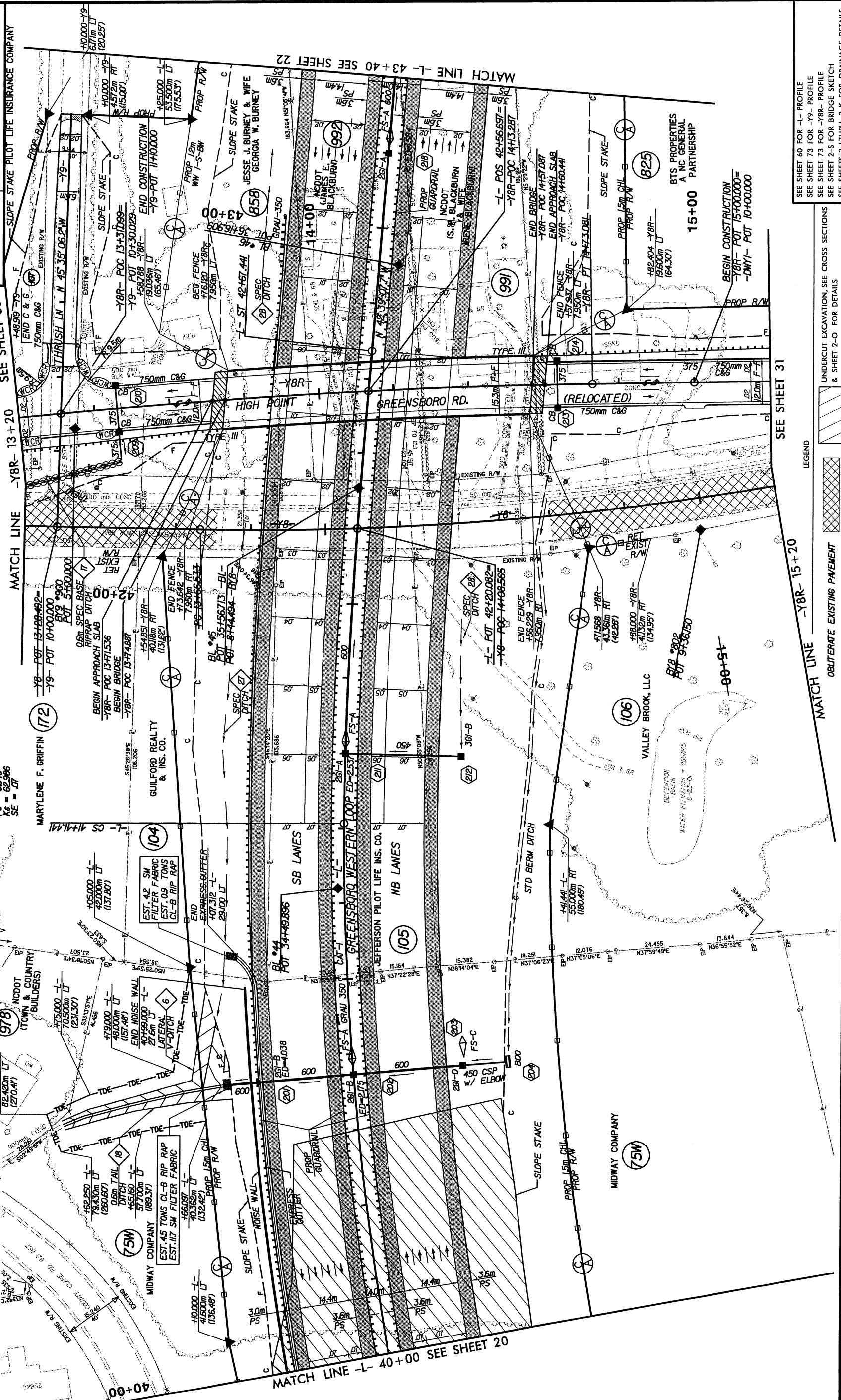
SEE SHEET 31
MATCH LINE -Y8R- 15+20

PI = 38+45.502
Δ = 58.27' 45.5' (RT)
Δ = 48.12' 25.5' (RT)
L = 663.889
T = 70.000
R = 800.000 m
SE = NC

PI = 144.883
Δ = 17.27' 53.9' (LT)
Δ = 27.12' 59.4'
L = 663.889
T = 70.000
R = 800.000 m
SE = NC

PI = 1334.432
Δ = 17.27' 53.9' (RT)
Δ = 27.12' 59.4'
L = 663.889
T = 70.000
R = 800.000 m
SE = NC

SEE SHEET 31
MATCH LINE -Y8R- 15+20



SEE SHEET 60 FOR -L- PROFILE
SEE SHEET 73 FOR -Y9- PROFILE
SEE SHEET 73 FOR -Y8R- PROFILE
SEE SHEET 2-5 FOR BRIDGE SKETCH
SEE SHEETS 2-1 THRU 2-K FOR DRAINAGE DETAILS

UNDERCUT EXCAVATION, SEE CROSS SECTIONS
& SHEET 2-O FOR DETAILS

LEGEND

OBSTITUTE EXISTING PAVEMENT

SEE SHEET 31
MATCH LINE -Y8R- 15+20

2	2/30/02	REV PARCEL 117, NAME CHANGE
1	8/07/02	REV ROW PARCEL 123 ADDED SHEET 23A

FILE: f:\025240b-0\p00m\025240b5123a.p00
DATE: 06/02/03 02:46:23 PM

PLANS PREPARED BY:
FLORENCE & HUTCHESON, INC.
CONSULTING ENGINEERS
5500 CENTERVIEW DR. SUITE 300
RALEIGH, NC 27606

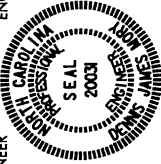


PROJECT REFERENCE NO.
U-2524AB
R/W SHEET NO.

SHEET NO.
23A

ROADWAY DESIGN
ENGINEER

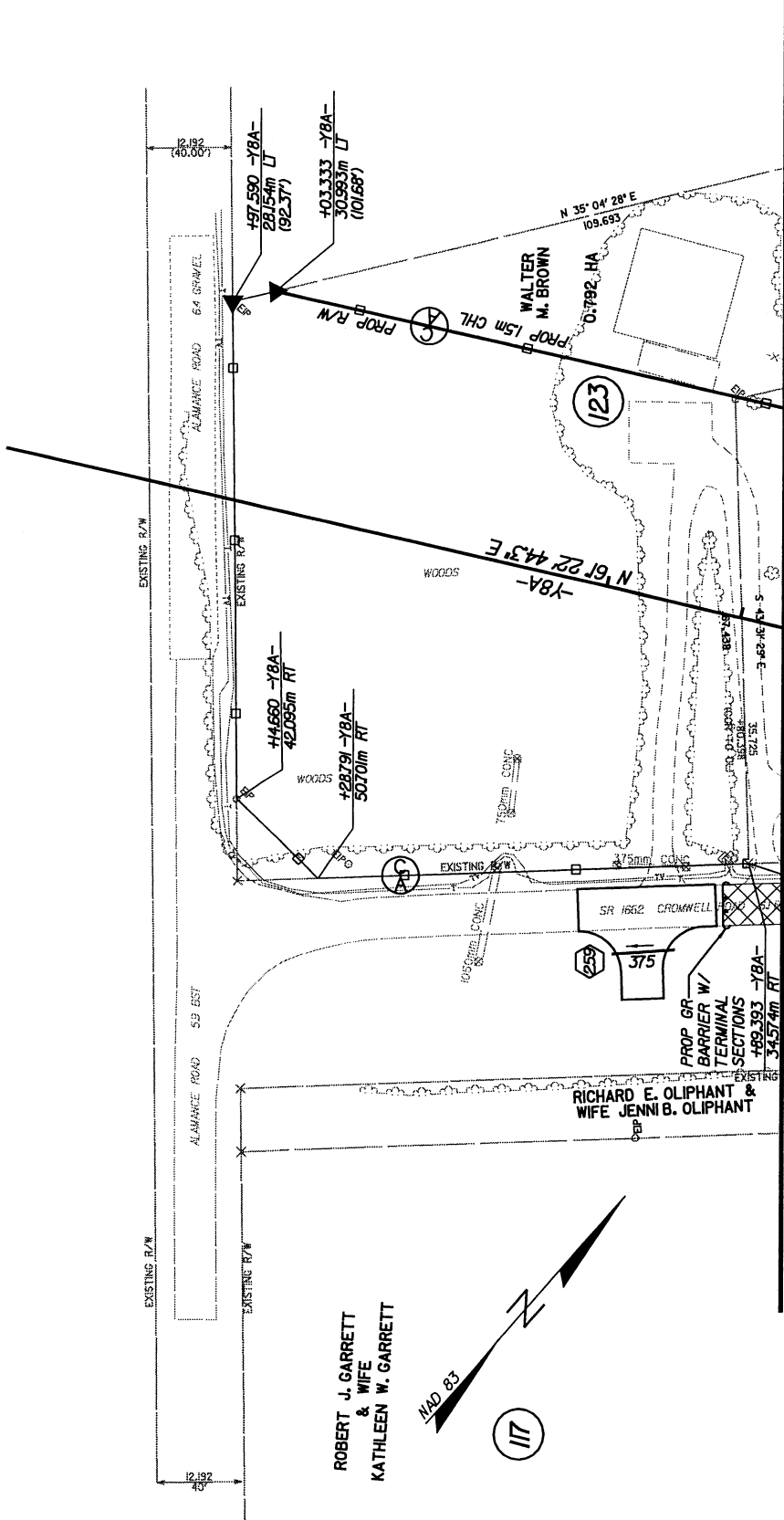
HYDRAULICS
ENGINEER



CONST. REV.

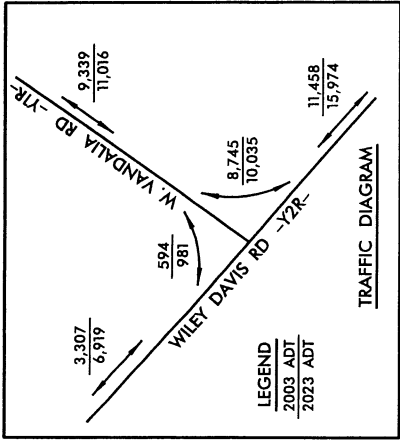
R / W

REV.



MATCH LINE SEE SHEET 23

2	3/19/01	REV NAME - PARCEL 17 EXTEND EASEMENT ON -Y3-
1	11/16/00	REV DEDICATED ROW MOVED DRIVEWAY - PARCEL 16



PLANS PREPARED BY:

FLORENCE & HUTCHESON, INC.

CONSULTING ENGINEERS

4540 CONVENTVIEW DR. SUITE 316

RALPHIGH, NC 27606

PROJECT REFERENCE NO.

U-2524AB

SHEET NO.

26

R/W SHEET NO.

18

ROADWAY DESIGN ENGINEER

HYDRAULICS ENGINEER

CONST. REV.

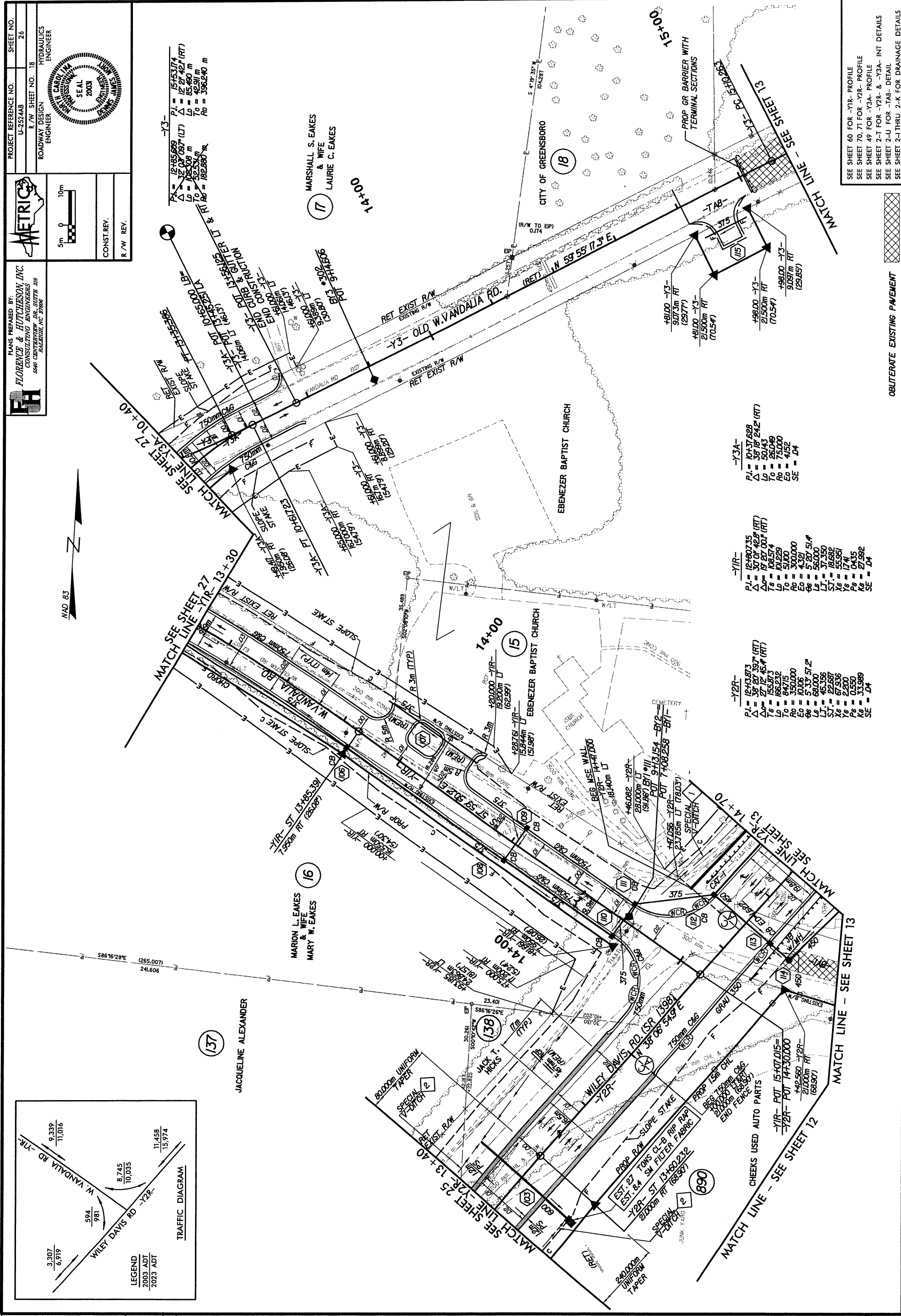
R/W REV.

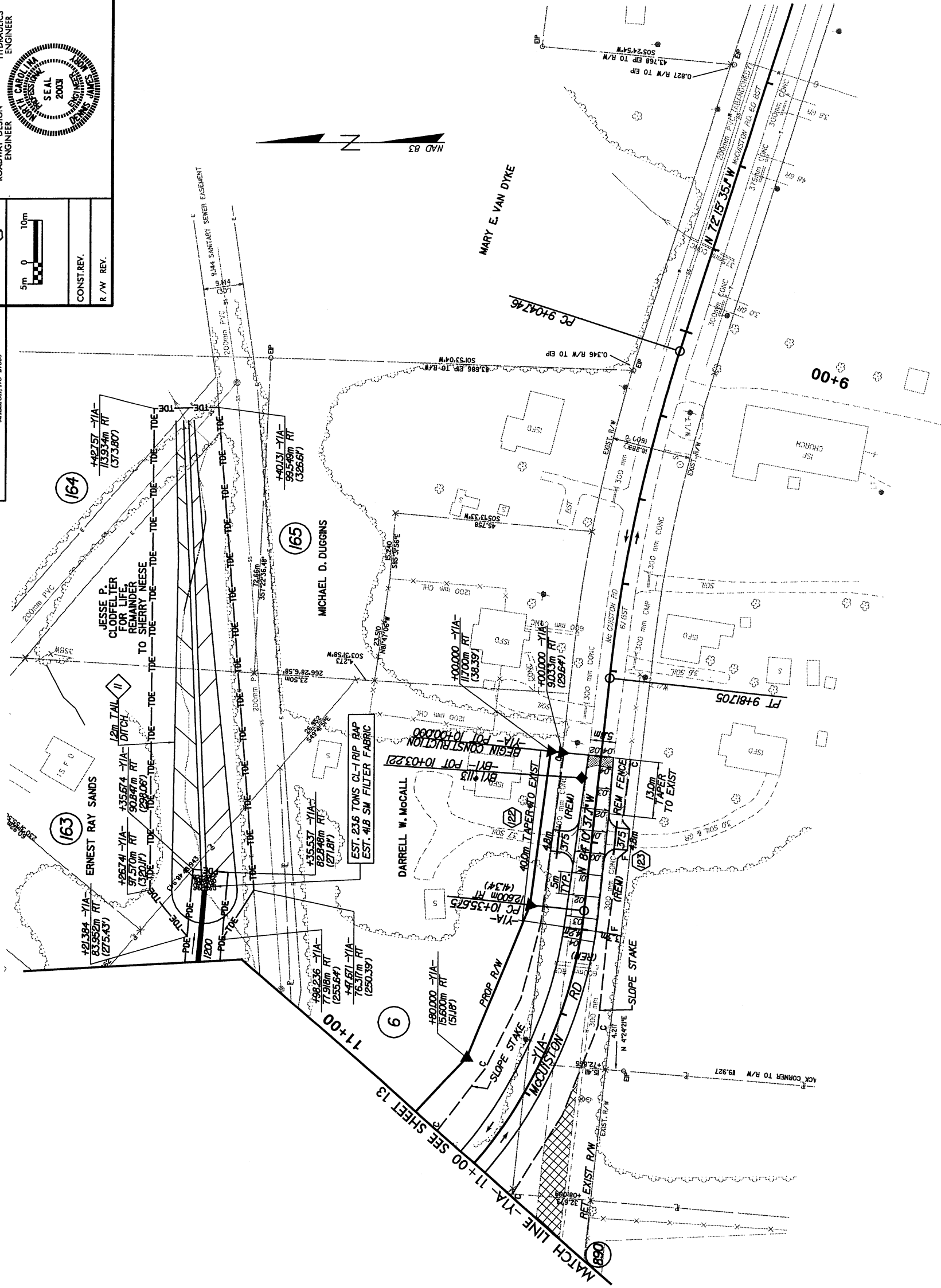
5m

10m

SEE SHEET 60 FOR -Y1R- PROFILE
SEE SHEET 70.71 FOR -Y2R- PROFILE
SEE SHEET 49 FOR -Y3A- PROFILE
SEE SHEET 2-T FOR -Y2R- & -Y3A- INT DETAILS
SEE SHEET 2-J FOR -TAB- DETAIL
SEE SHEET 2-I THRU 2-K FOR DRAINAGE DETAILS

OBLETERATE EXISTING PAVEMENT






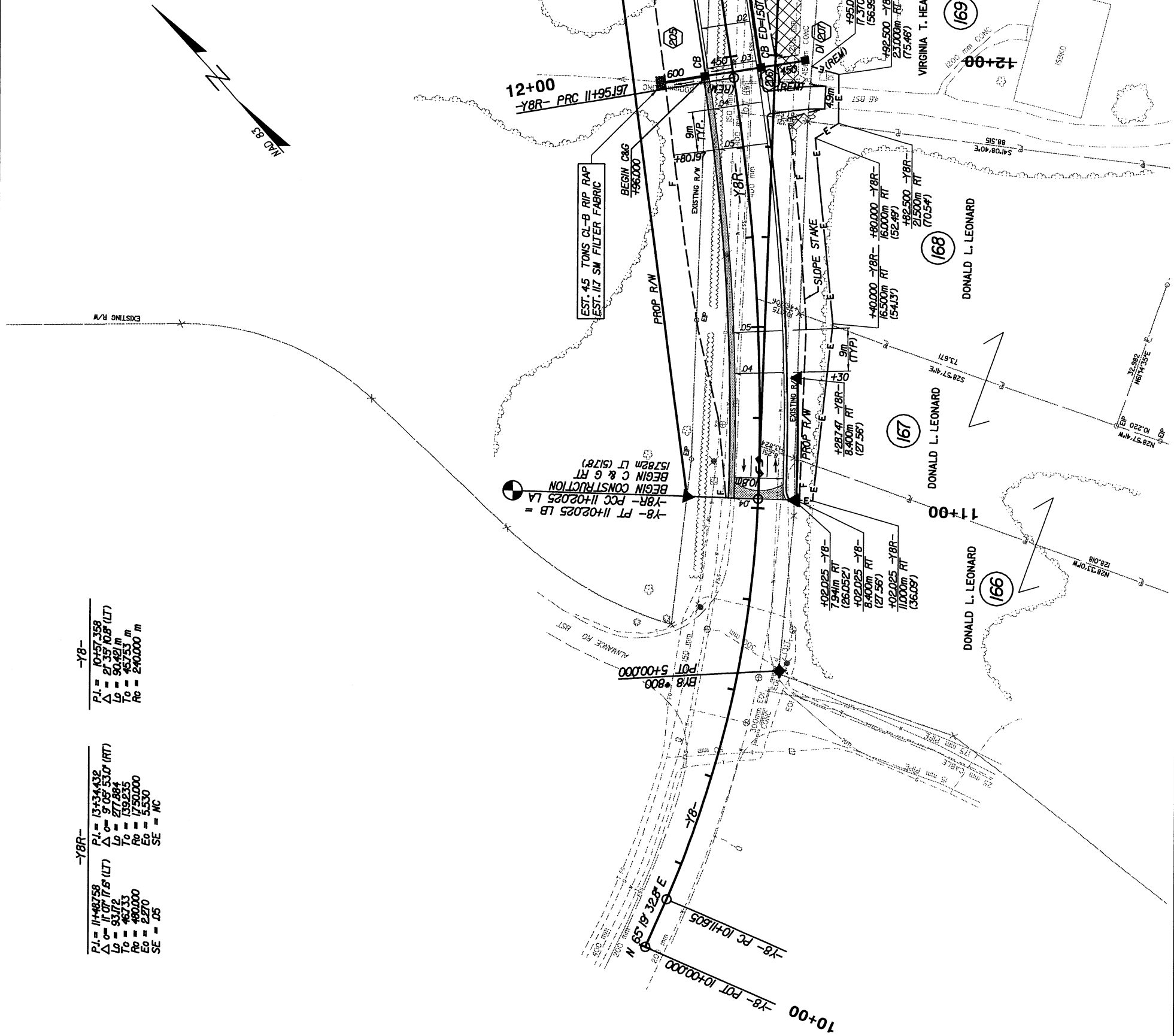


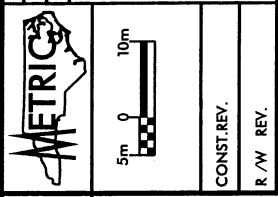
$\Delta I = 127.438$	$PI = 9.443\ 365$
$\Delta I = 127.415\ (RT)$	$\Delta = 11.55\ 026\ (LT)$
$Lo = 224.850$	$Lo = 76.559$
$To = 192.163$	$To = 38.619$
$Ro = 105.000$	$Ro = 370.000$
$EO = 113.978$	$EO = 2.010$
$SE = .04$	

OBLITERATE EXISTING PAVEMENT

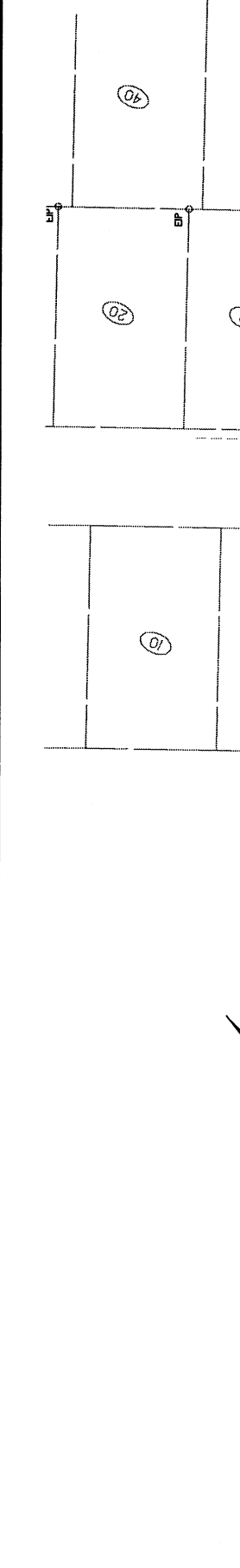
SEE SHEET 71 FOR -Y1A- PROFILE
SEE SHEET 2-1 THRU 2-K FOR DRAINAGE DETAILS

 <p>FLORENCE & HUTCHESON, INC. CONSULTING ENGINEERS 5540 CENTERVIEW DR. SUITE 315 RALEIGH, NC 27606</p>		<p>PLANS PREPARED BY:</p>			<p>CONST. REV.</p>	<p>R / W REV.</p>	
		<p>PROJECT NO.</p>					<p>ROADWAY DESIGN ENGINEER</p>
		<p>U-25244B</p>					
		<p>SHEET NO. 30</p>					





PLANS PREPARED BY:
FH FLORENCE & HUTCHESON, INC.
CONSULTING ENGINEERS
5540 CENTREVILLE DR. SUITE 306
RALEIGH, NC 27606



-Y13D- USED FOR
RIGHT OF WAY
STAKING ONLY
SEE SHEETS T-1 THRU T-12
FOR TRACKWORK

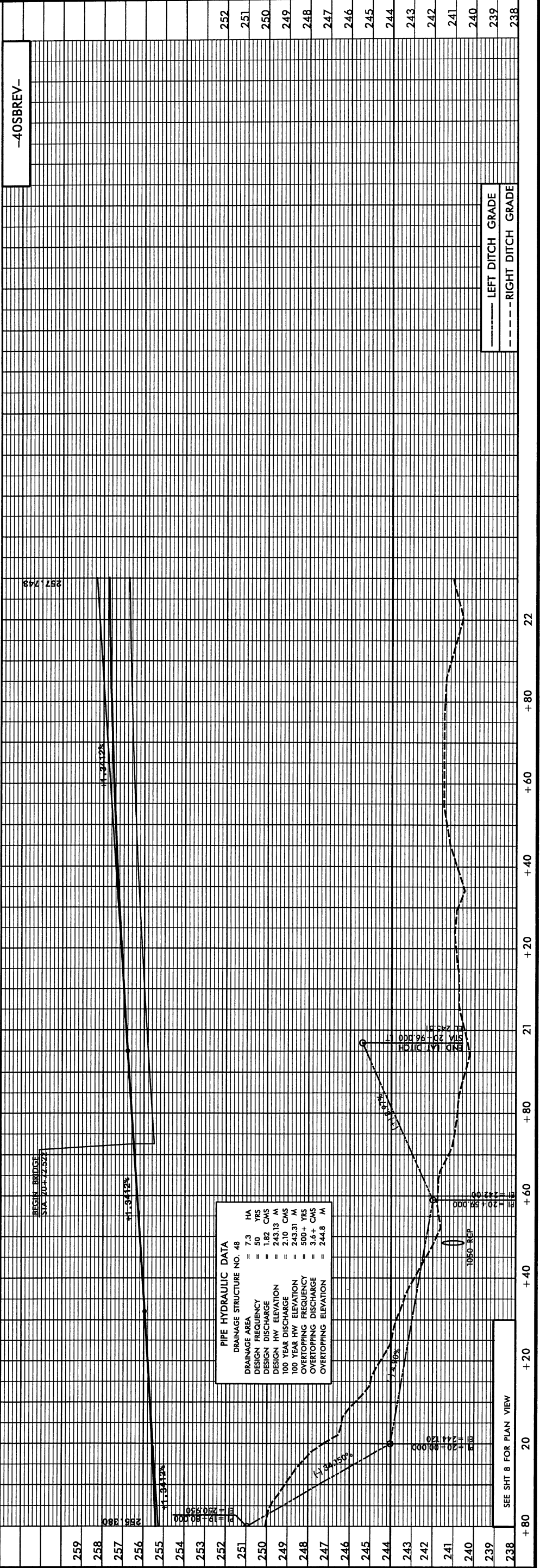
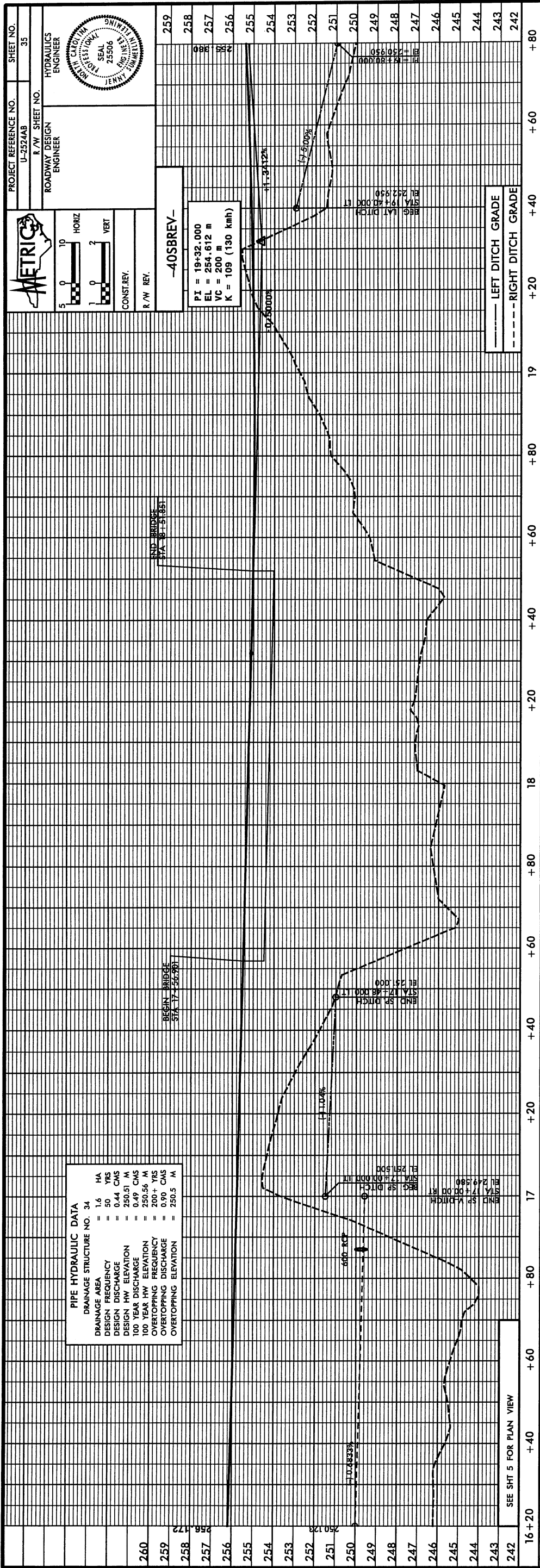
PILOT'S RIDGE SUBDIVISION
FUTURE PHASE IV
NOT RECORDED
PRELIMINARY ONLY

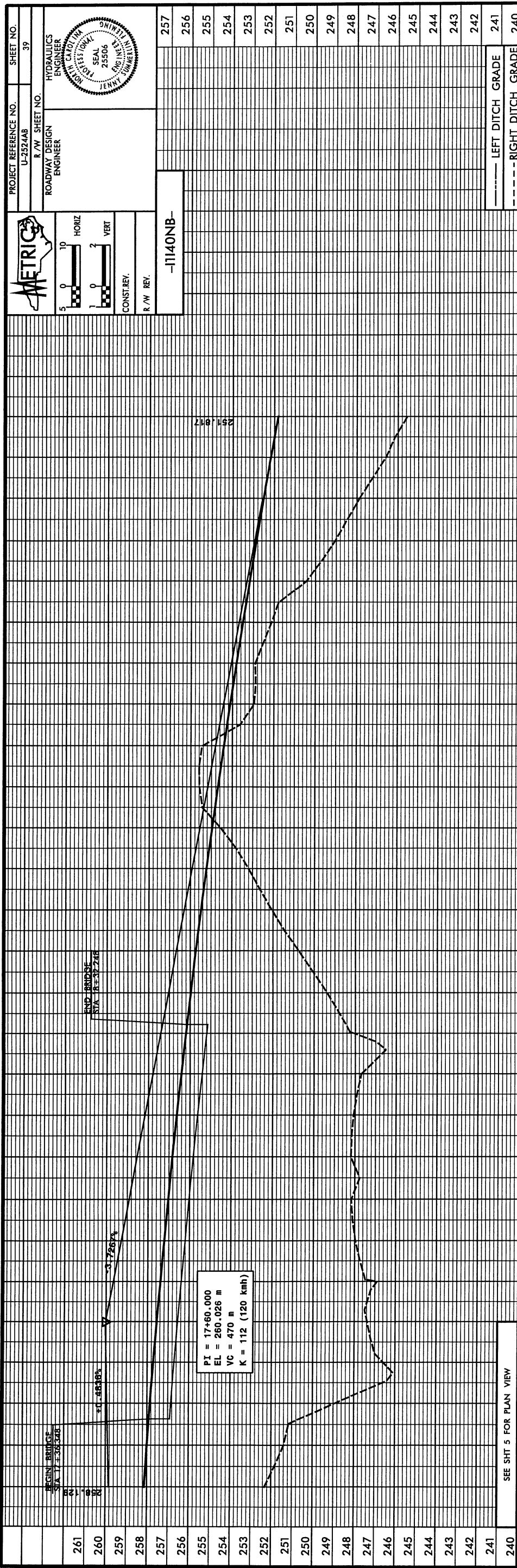
MATCH LINE -Y13- 15+95 SEE SHEET 23

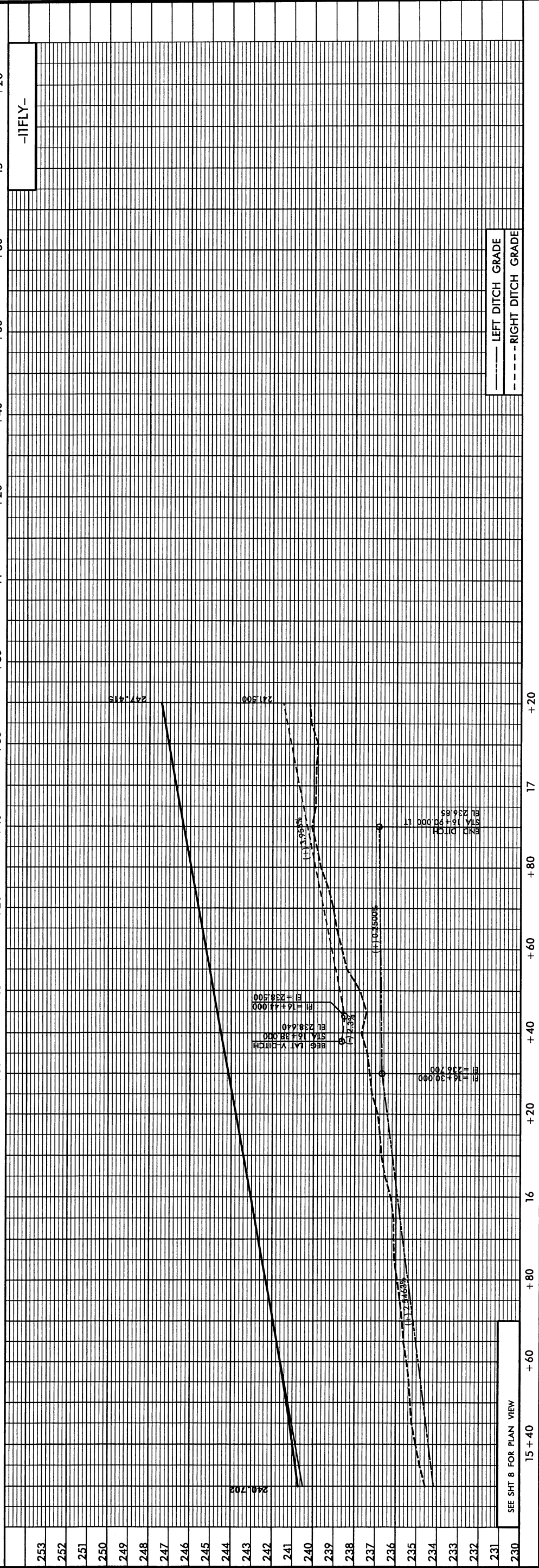
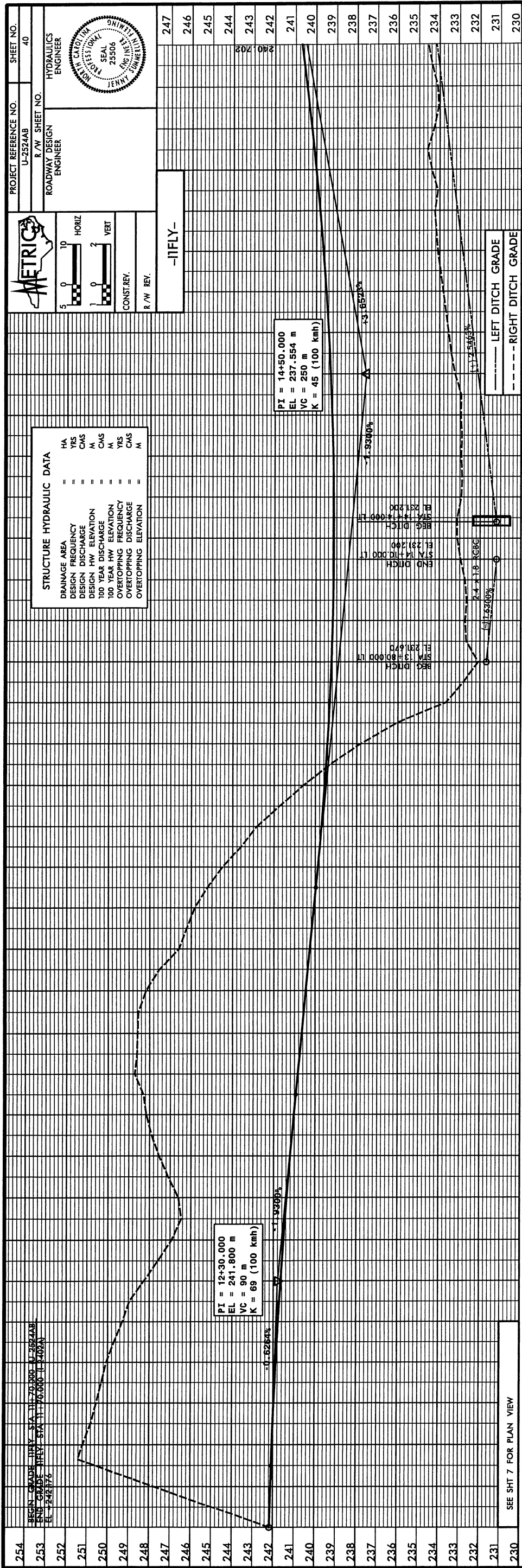
-Y13D-	
PI= 14+71.986	PI= 17+05.435
Δ= 9°08'36.0" (LT)	Δ= 9°08'36.0" (RT)
Δθ= 2°51'49.8" (LT)	Δθ= 2°51'49.8" (RT)
Δθ= 2°51'46.8" (ENGLISH)	Δθ= 2°51'46.8" (ENGLISH)
L= 30.487	L= 30.487
T= 15.248	T= 15.248
AP= 60.000 (CHORD)	AP= 60.000 (CHORD)
EO= 0.81	EO= 0.81
ES= 3.07' 23.1"	ES= 3.07' 23.1"
L= 66.500	L= 66.500
LT= 44.540	LT= 44.540
ST= 22.713	ST= 22.713
X= 18.480	X= 18.480
Y= 13.082	Y= 13.082
PE= 31.947	PE= 31.947
SE= 0.089m (3 1/2 INCH)	SE= 0.089m (3 1/2 INCH)

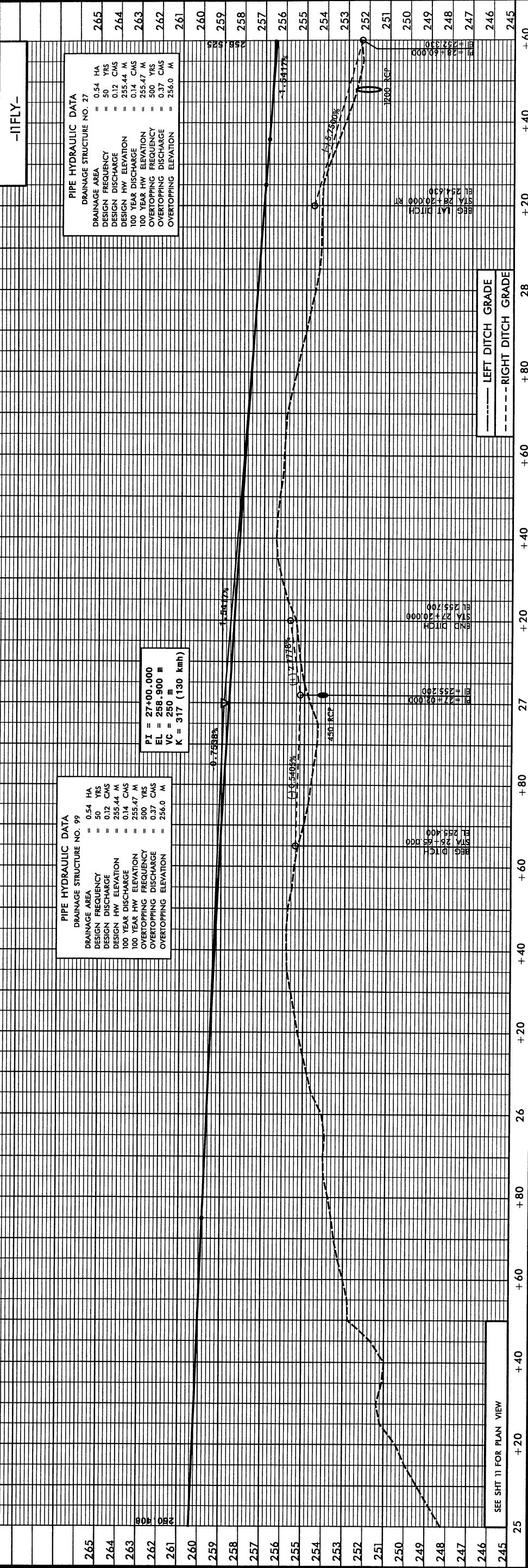
PILOT LIFE INSURANCE COMPANY

(179)










5/09/99

PROJECT REFERENCE NO.
U-2524AB

SHEET NO.
43



ROADWAY DESIGN
ENGINEER

R/W

SHEET NO.

HYDRAULICS
ENGINEER

PROFESSIONAL
SEAL
25506

ENGINEER
JERRY DUMMETT

CONST. REV.

R/W REV.

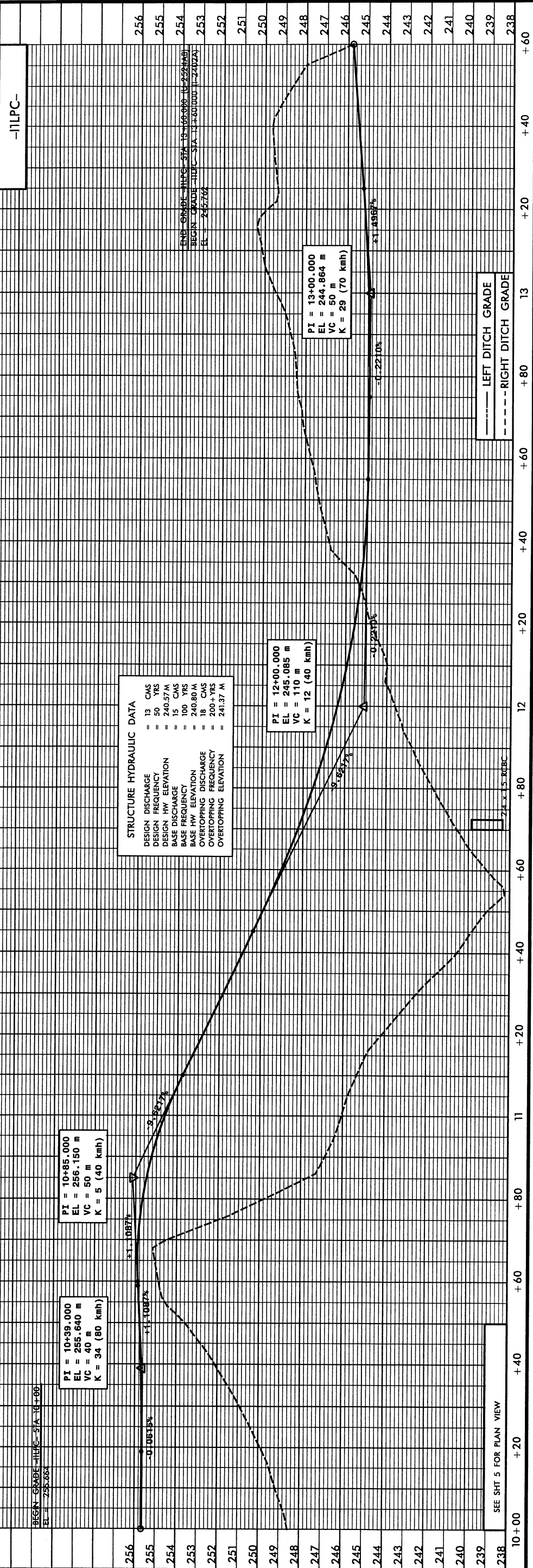
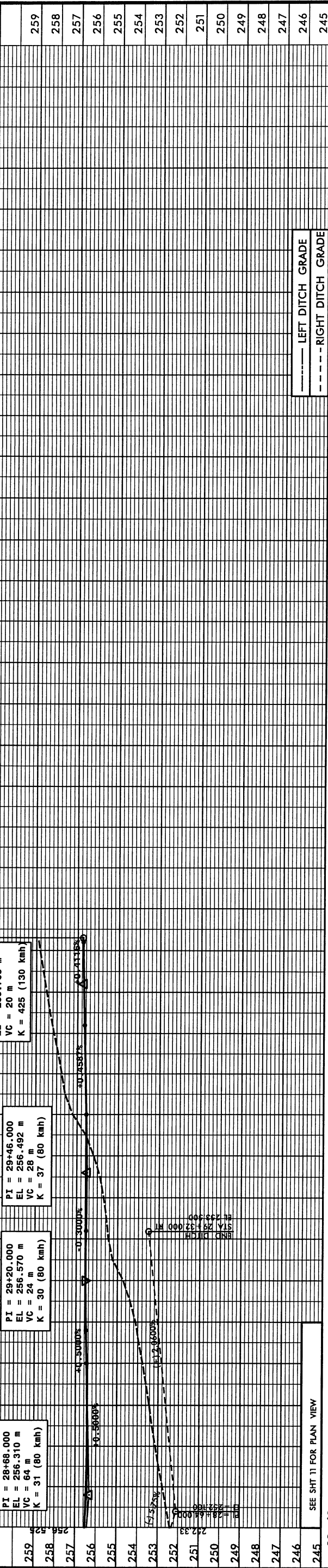
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HORIZ

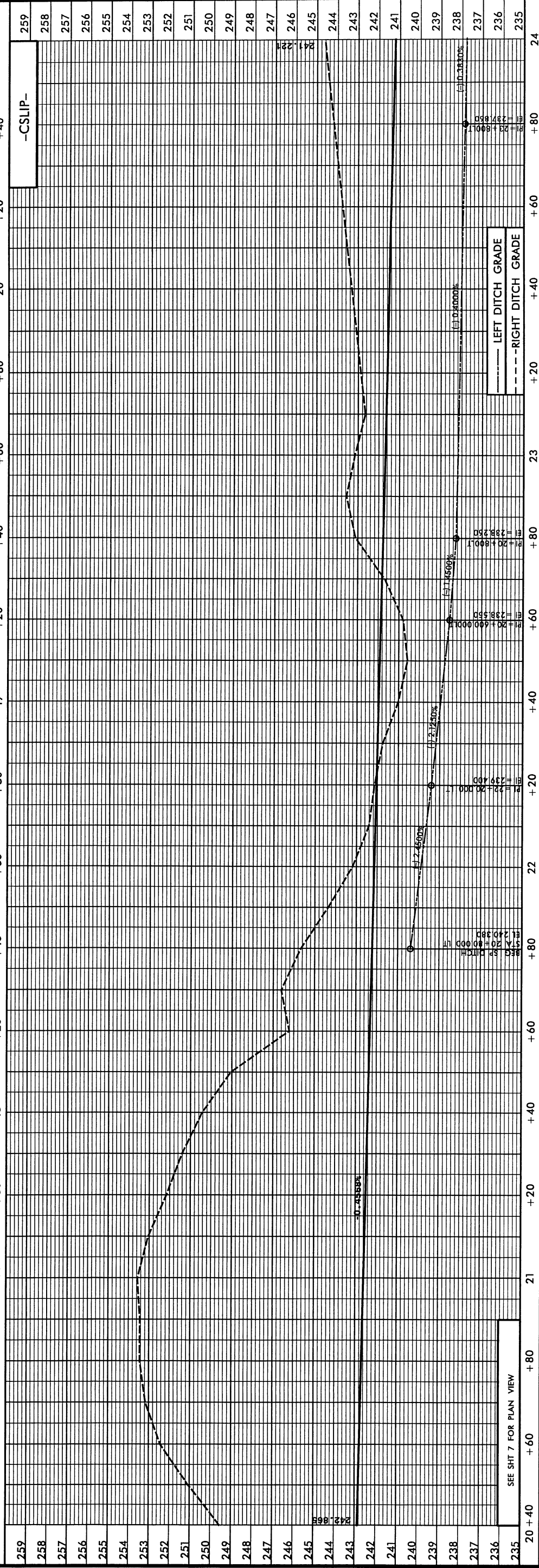
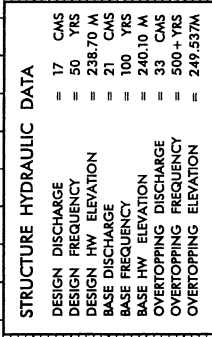
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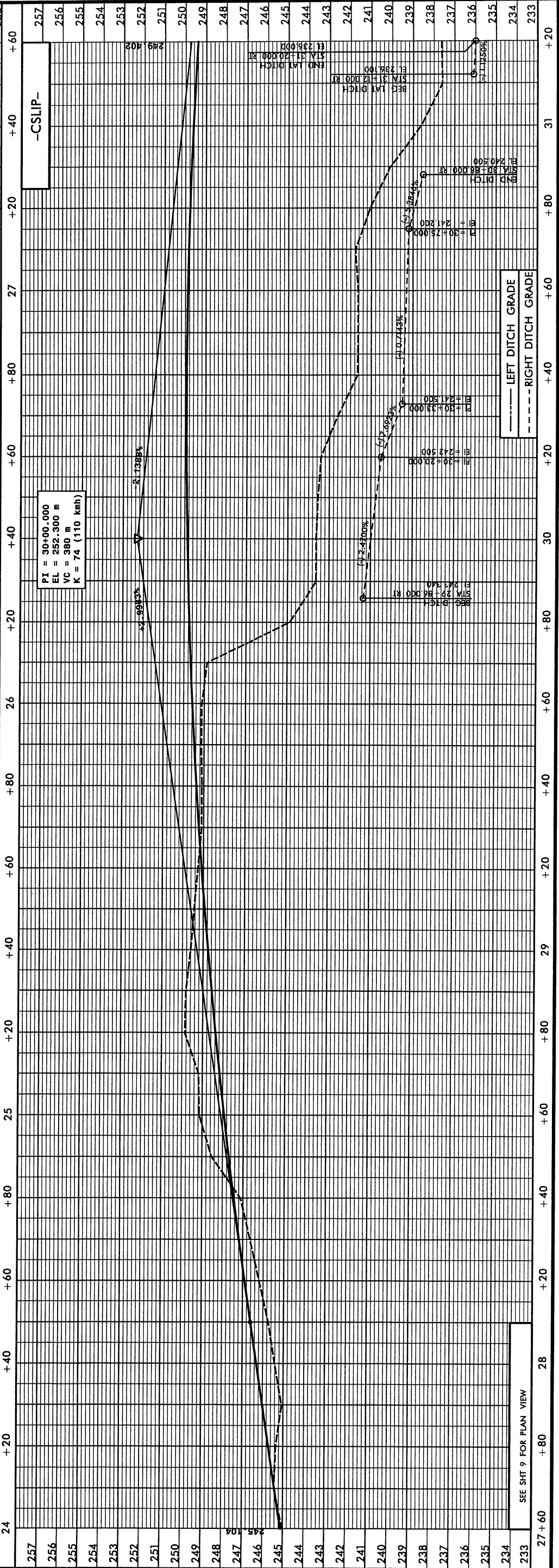
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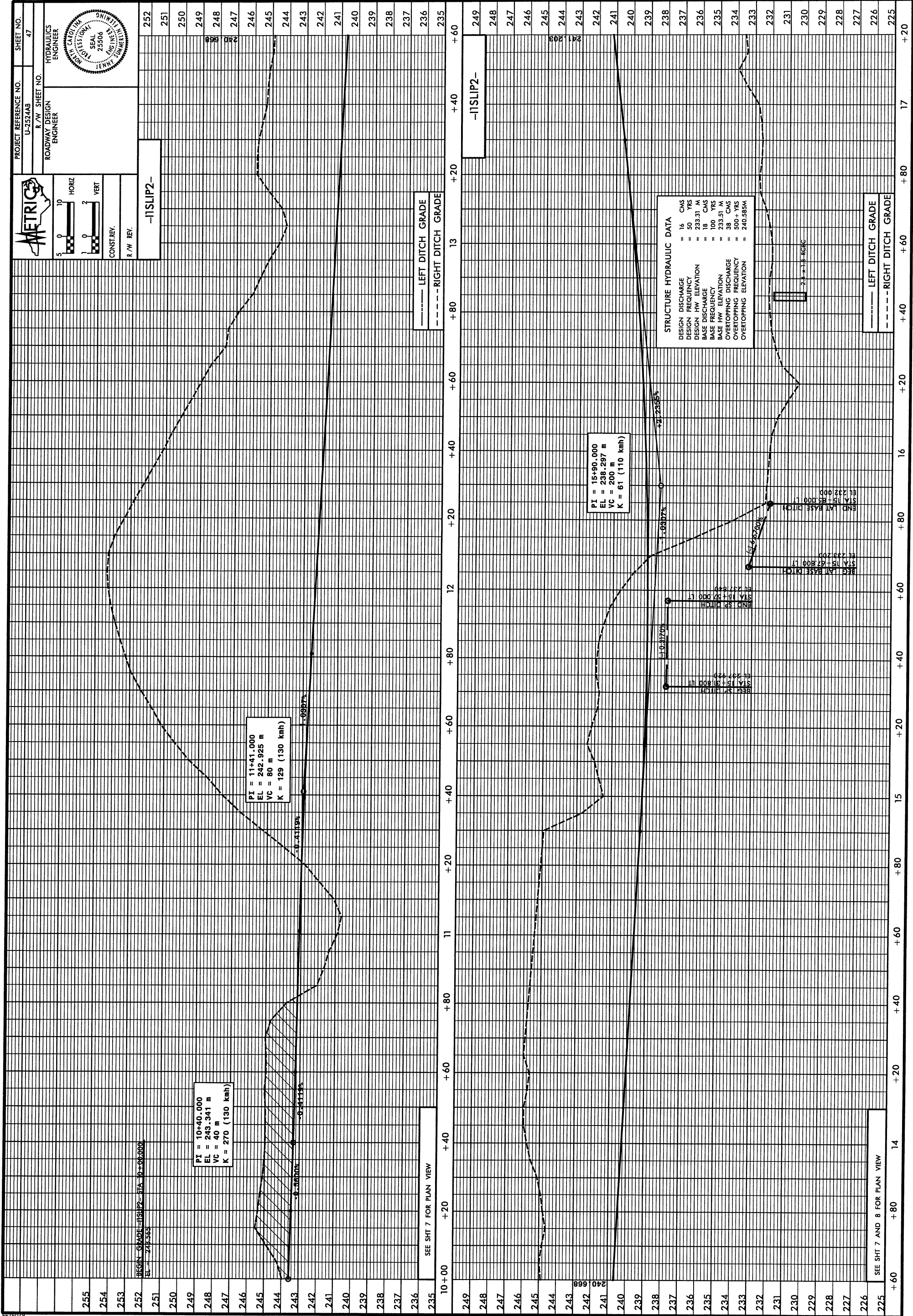
-11FLY-

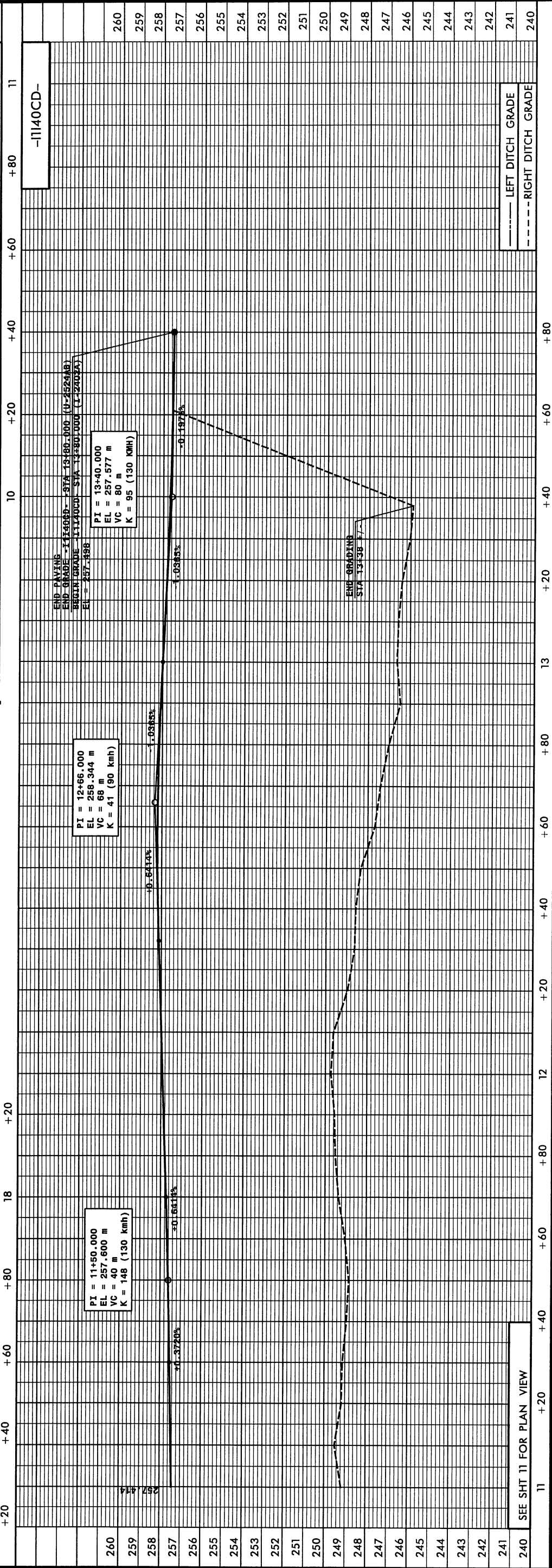
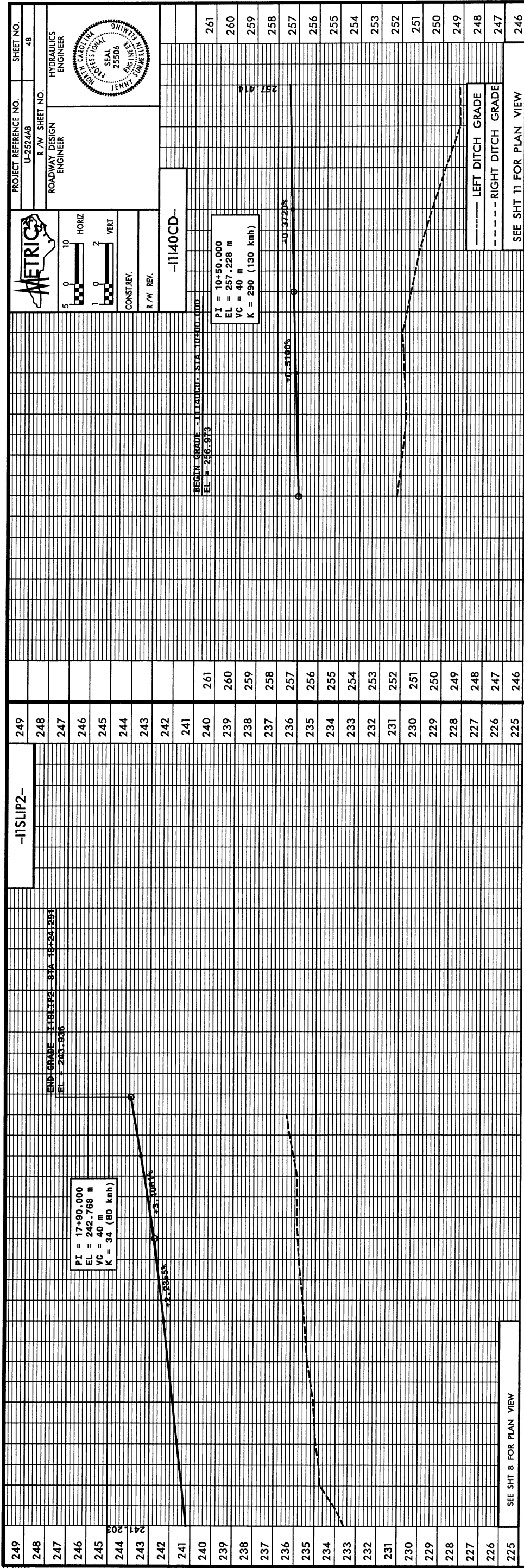


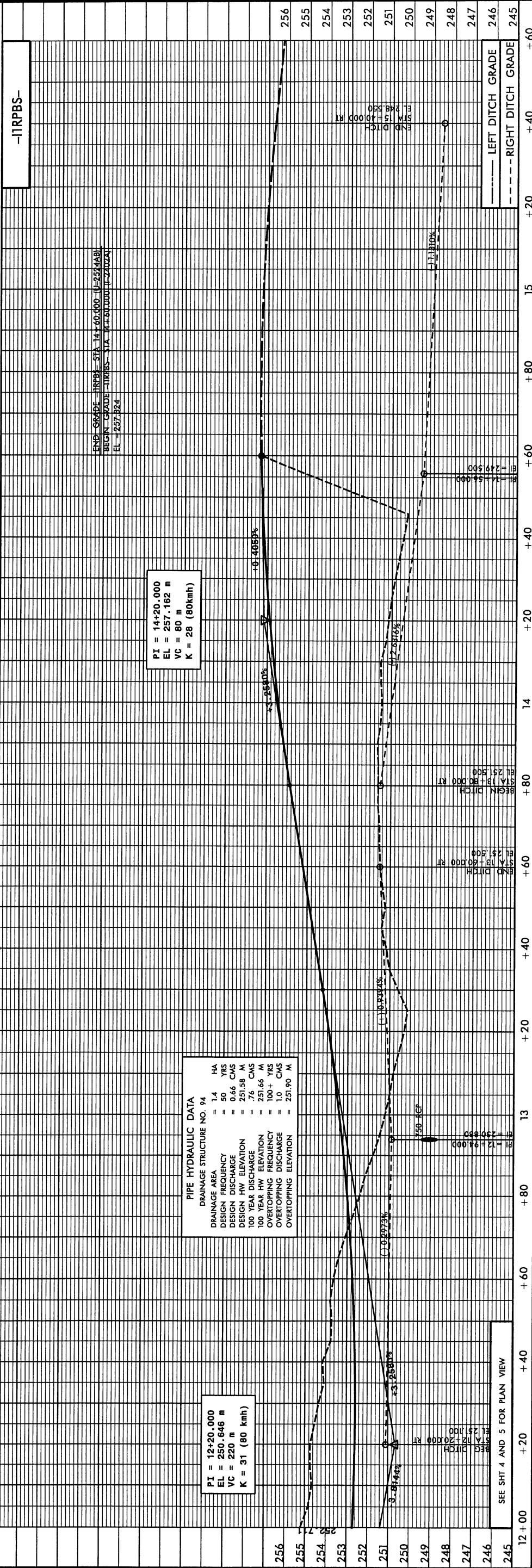
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DATE: 02/01/2003 08:27:08 AM

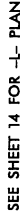












PIPE DATA SUMMARY			
DRAINAGE AREA (HECTARES)	= 4.4	YRS	
DESIGN FREQUENCY	= 50	CMS	
DESIGN DISCHARGE	= 0.03	CMS	
DESIGN HW ELEVATION	= 260.81	m	
100 YR DISCHARGE	= 1.08	CMS	
100 YR HW ELEVATION	= 260.99	m	
OVERTOPPING FREQUENCY	= 500+	YRS	
OVERTOPPING DISCHARGE	= 500+	CMS	
OVERTOPPING ELEVATION	= 262.4	m	

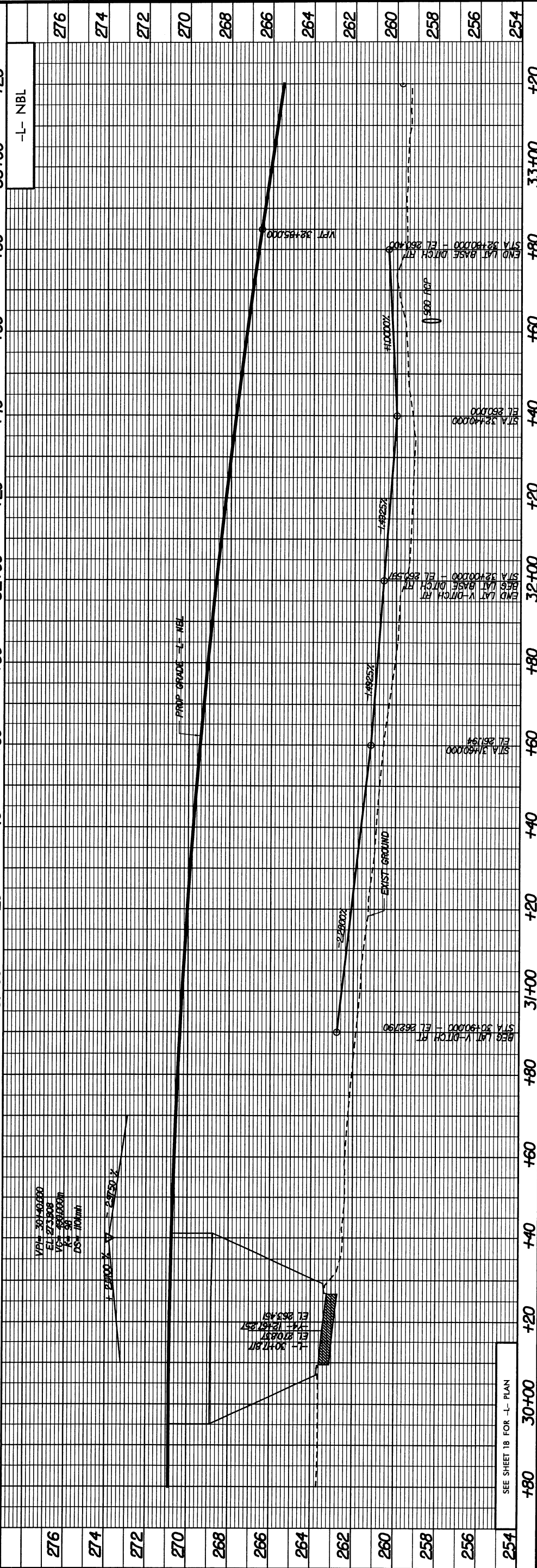
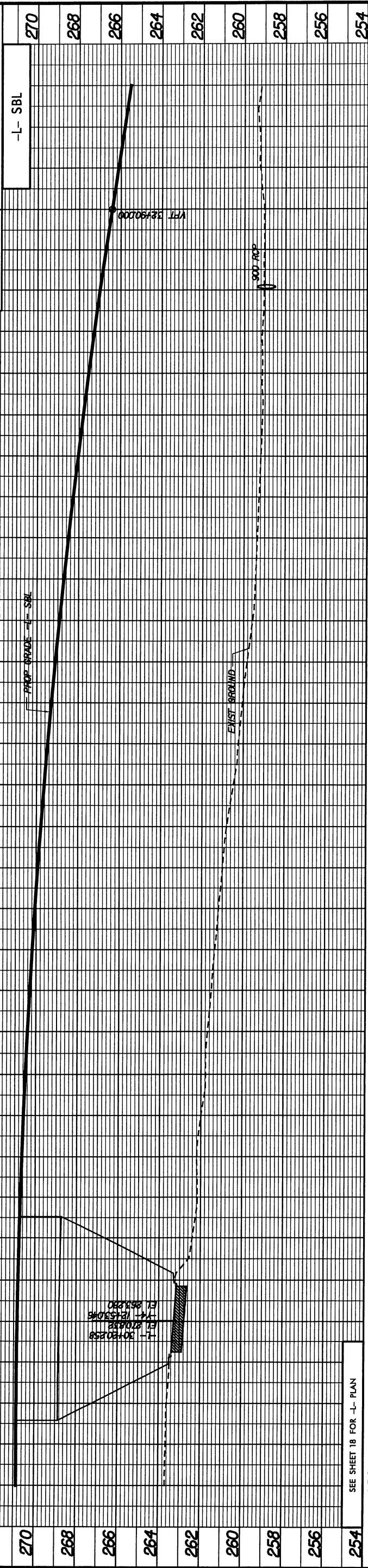
PLANS PREPARED BY:
FLORENCE & HUTCHESON, INC.
CONSULTING ENGINEERS
6640 CRYSTALVIEW DR., SUITE 316
RALEIGH, NC 27606

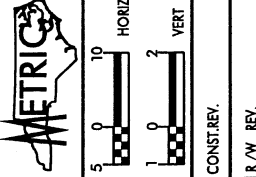


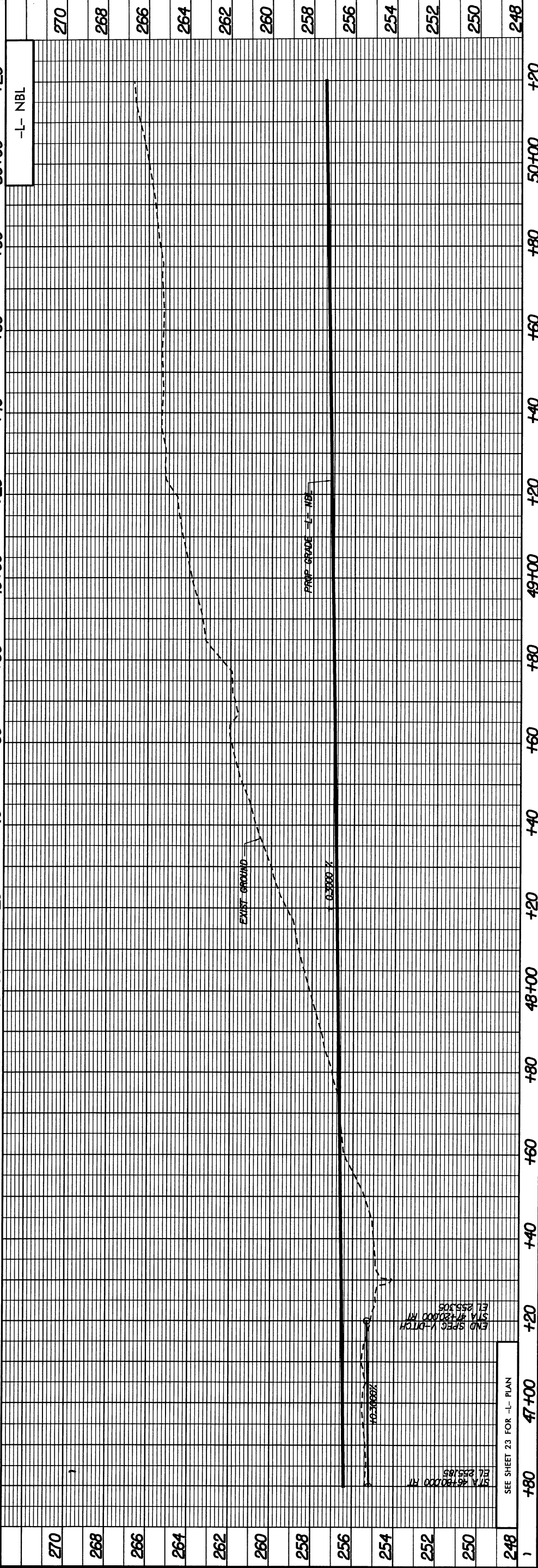
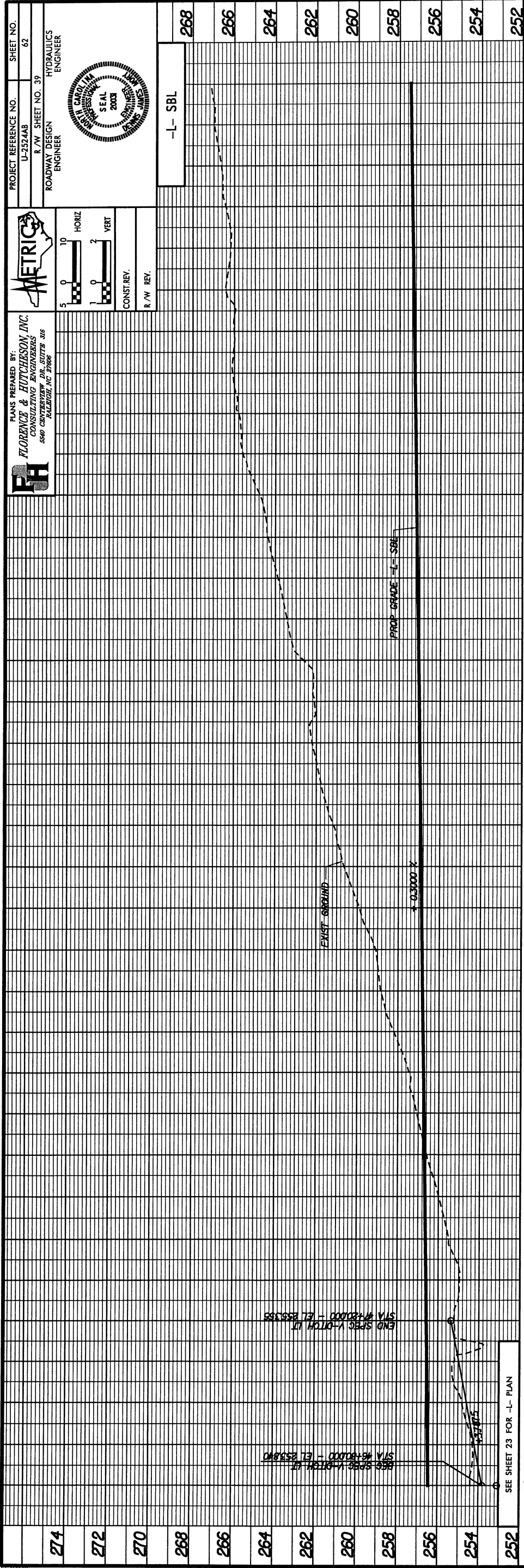
PROJECT REFERENCE NO. U-2524AB
SHEET NO. 57
R/W SHEET NO. 34
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER



CONST. REV.
R/W REV.

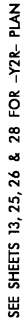






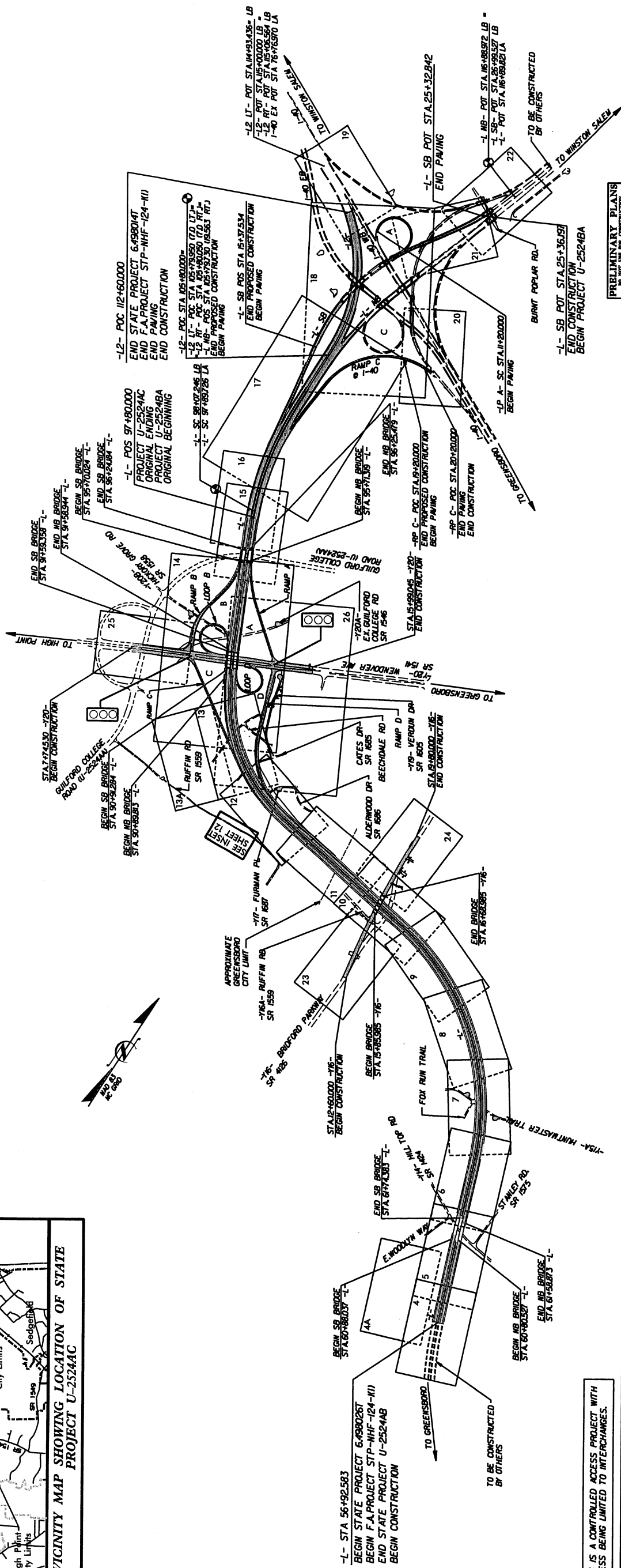
SEAL
2003

REGISTERED PROFESSIONAL ENGINEER
STATE OF NORTH CAROLINA
DAVID J. JAMES



U-2524AC

PROJECT: 6.498026T



GRAPHIC SCALES

PLANS

5 0 10

PROFILE (HORIZONTAL)

5 0 10

PROFILE (VERTICAL)

1 0 2

DESIGN DATA

ADT 2004 = 40,500-43,600
ADT 2024 = 65,600-71,000

DHV = 10%
D = 60%
T = 14% *
V = 110 km/h

* TTST 9% DUAL 5

NOTE: SOUTHBOUND LANE USED TO CALCULATE PROJECT LENGTH.

G & O GREENHORNE & O'MARA, INC.
5565 CENTERVIEW DRIVE, SUITE 107
RALEIGH, NORTH CAROLINA 27606
(919) 851-1999
FOR THE NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

2002 STANDARD SPECIFICATIONS

RIGHT OF WAY DATE:

SEPTEMBER 19, 2000

LETTING DATE:

SEPTEMBER 16, 2003

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

HYDRAULICS ENGINEER

P.F.

SIGNATURE:

ROADWAY DESIGN

ENGINEER

PE

SIGNATURE: _____

G&O
GREENHORNE & O'MARA, INC.
5565 CENTERVIEW DRIVE, SUITE 107
RALEIGH, NORTH CAROLINA 27606
(919) 851-1993



CONST. REV.

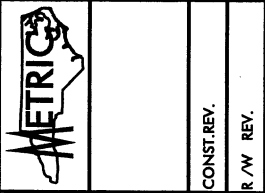
R / W REV.

PROJECT REFERENCE NO.	SHEET NO.
U-2524AC	I-A
R / W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION	

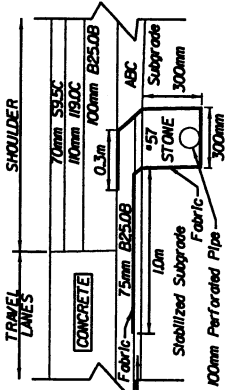
PAVEMENT SCHEDULE	
A1	200 mm PORTLAND CEMENT CONCRETE PAVEMENT.
A2	360 mm PORTLAND CEMENT CONCRETE PAVEMENT
C1	PROP. APPROX. 30 mm ASPHALT CONC. SURFACE COURSE, TYPE S9.5B, AT AN AVERAGE RATE OF 72 kg PER SQ. METER.
C2	PROP. APPROX. 60 mm ASPHALT CONC. SURFACE COURSE, TYPE S9.5B, AT AN AVERAGE RATE OF 72 kg PER SQ. METER IN EACH OF TWO LAYERS.
C3	PROP. APPROX. 70 mm ASPHALT CONC. SURFACE COURSE, TYPE S9.5B, AT AN AVERAGE RATE OF 84 kg PER SQ. METER IN EACH OF TWO LAYERS.
C4	PROP. APPROX. 10 mm ASPHALT CONC. SURFACE COURSE, TYPE S9.5B, AT AN AVERAGE RATE OF 240 kg PER SQ. METER PER 1 mm DEPTH TO BE PLACED IN LAYERS NOT LESS THAN 25 mm IN DEPTH OR GREATER THAN 40 mm IN DEPTH.
C5	PROP. APPROX. 70 mm ASPHALT CONC. SURFACE COURSE, TYPE S9.5C, AT AN AVERAGE RATE OF 84 kg PER SQ. METER IN EACH OF TWO LAYERS.
D5	PROP. APPROX. 10 mm ASPHALT CONC. INTERMEDIATE COURSE, TYPE I9.0B, AT AN AVERAGE RATE OF 240 kg PER SQ. METER PER 1 mm DEPTH TO BE PLACED IN LAYERS NOT LESS THAN 25 mm IN DEPTH OR GREATER THAN 40 mm IN DEPTH.
D1	PROP. APPROX. 55 mm ASPHALT CONC. INTERMEDIATE COURSE, TYPE I9.0B, AT AN AVERAGE RATE OF 154.75 kg PER SQ. METER.
D2	PROP. APPROX. 70 mm ASPHALT CONC. INTERMEDIATE COURSE, TYPE I9.0B, AT AN AVERAGE RATE OF 175 kg PER SQ. METER.
D3	PROP. APPROX. 10 mm ASPHALT CONC. INTERMEDIATE COURSE, TYPE I9.0B, AT AN AVERAGE RATE OF 289.5 kg PER SQ. METER.
D4	PROP. APPROX. 10 mm ASPHALT CONC. INTERMEDIATE COURSE, TYPE I9.0B, AT AN AVERAGE RATE OF 245 kg PER SQ. METER PER 1 mm DEPTH TO BE PLACED IN LAYERS NOT LESS THAN 55 mm OR GREATER THAN 100 mm IN DEPTH.
D5	PROP. APPROX. 10 mm ASPHALT CONC. INTERMEDIATE COURSE, TYPE I9.0C, AT AN AVERAGE RATE OF 289.5 kg PER SQ. METER.
D6	PROP. APPROX. 10 mm ASPHALT CONC. INTERMEDIATE COURSE, TYPE I9.0C, AT AN AVERAGE RATE OF 245 kg PER SQ. METER PER 1 mm DEPTH TO BE PLACED IN LAYERS NOT LESS THAN 55 mm OR GREATER THAN 100 mm IN DEPTH.
E1	PROP. APPROX. 75 mm ASPHALT CONC. BASE COURSE, TYPE B25.0B, AT AN AVERAGE RATE OF 183.75 kg PER SQ. METER.

PAVEMENT SCHEDULE	
E2	PROP. APPROX. 100 mm ASPHALT CONC. BASE COURSE, TYPE B25.0C, AT AN AVERAGE RATE OF 245 kg PER SQ. METER PER 1 mm DEPTH TO BE PLACED IN LAYERS NOT LESS THAN 75 mm IN DEPTH OR GREATER THAN 140 mm IN DEPTH.
E3	PROP. APPROX. 100 mm ASPHALT CONC. BASE COURSE, TYPE B25.0C, AT AN AVERAGE RATE OF 245 kg PER SQ. METER IN EACH OF TWO LAYERS.
E4	PROP. APPROX. 160 mm ASPHALT CONC. BASE COURSE, TYPE B25.0C, AT AN AVERAGE RATE OF 156 kg PER SQ. METER IN EACH OF TWO LAYERS.
E5	PROP. APPROX. 180 mm ASPHALT CONC. BASE COURSE, TYPE B25.0C, AT AN AVERAGE RATE OF 220.5 kg PER SQ. METER IN EACH OF TWO LAYERS.
E6	PROP. APPROX. 100 mm ASPHALT CONC. BASE COURSE, TYPE B25.0C, AT AN AVERAGE RATE OF 245 kg PER SQ. METER PER 1 mm DEPTH TO BE PLACED IN LAYERS NOT LESS THAN 75 mm IN DEPTH OR GREATER THAN 140 mm IN DEPTH.
J1	PROP. 150 mm AGGREGATE BASE COURSE.
J2	PROP. 200 mm AGGREGATE BASE COURSE.
J3	PROP. 250 mm AGGREGATE BASE COURSE
J4	PROP. VARIABLE DEPTH AGGREGATE BASE COURSE
K	SUBGRADE STABILIZATION
P	PRIME COAT
R1	750mm CONCRETE CURB AND GUTTER
R2	450mm CONCRETE CURB AND GUTTER
R3	CONCRETE EXPRESSWAY GUTTER
R4	MEDIAN BARRIER
R5	SINGLE FACED CONCRETE BARRIER
T	EARTH MATERIAL
U	EXISTING PAVEMENT
W	VARIABLE DEPTH ASPHALT PAVEMENT (SEE WEDGING DETAIL)

NOTE: ALL PAVEMENT EDGE SLOPES ARE 4% UNLESS OTHERWISE INDICATED.



PROJECT REFERENCE NO.	SHEET NO.
U-2524AC	2
R/W SHEET NO.	PAVEMENT DESIGN ENGINEER
ROADWAY DESIGN ENGINEER	
PRELIMINARY PLANS	DO NOT USE FOR CONSTRUCTION
CONST. REV.	
R/W REV.	



SHOULDER DRAIN DETAIL

G & GREENHORNE & O'MARA, INC.
5565 CENTERVIEW DRIVE, SUITE 107
RALEIGH, NORTH CAROLINA 27606
(919) 851-2929

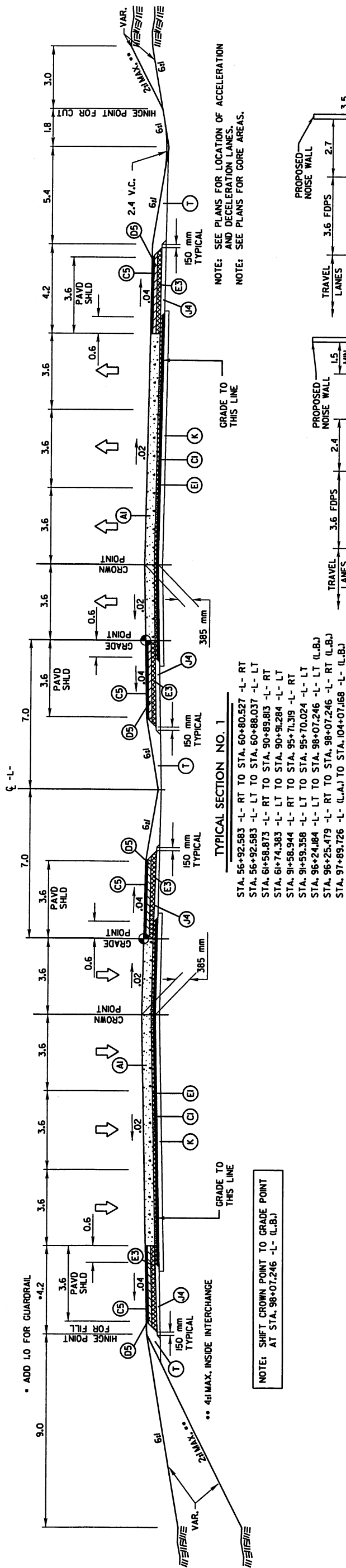
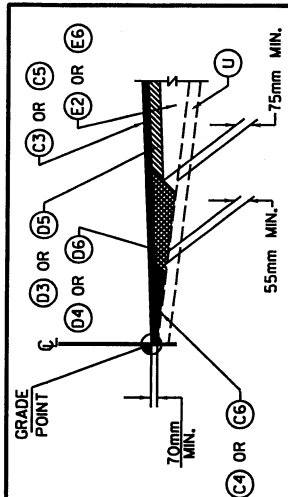
L-LEFT OUTSIDE SHOULDER DRAINS

STATION	OUTLETS	STATION	OUTLETS
56+93 TO 60+55	56+93, 57+80 (CB), 59+20 (CB), 60+10, 61+00	56+93 TO 61+00	57+00 (CB), 57+80 (CB), 59+20 (CB), 60+10, 61+00
61+45 TO 63+90	61+45, 62+60, 63+70 (CB), 63+90	61+90 TO 62+60	61+90, 62+80, 63+70 (CB), 64+55 (CB)
76+80 TO 85+25	77+36 (201), 79+68 (201), 80+12 (201), 80+40 (201), 81+30 (201), 82+55 (201), 83+26 (201), 83+85 (201), 84+55 (201), 85+25 (201)		65+50, 66+50, 67+50, 68+50, 69+40 (201), 71+20, 72+20, 73+20 (201), 74+20, 75+20, 76+25 (201), 77+20 (201), 78+00, 78+60, 79+70 (201), 80+55 (CB), 81+60, 82+60
85+60 TO 90+15	86+60, 86+60, 87+60, 88+80, 90+00		92+70, 93+60, 94+60
90+35 TO 90+80	90+35, 90+80 (CB)		95+20 TO 95+60
91+65 TO 95+00	91+65 (CB), 92+80, 93+90, 95+00		96+30 TO 97+70
95+55 TO 95+70	95+70		96+30, 96+65 (CB), 97+70
96+35 TO 97+70	96+67 (CB), 97+70		

L-RIGHT INSIDE (MEDIAN) SHOULDER DRAINS

STATION	OUTLETS	STATION	OUTLETS	
56+93 TO 60+55	57+00 (201), 57+80 (201), 59+20 (201)	56+93 TO 60+80	57+00 (201), 57+80 (201), 59+20 (201)	
61+40 TO 62+60	63+70 (201), 64+55 (201), 65+50 (201), 66+40 (201), 70+20 (201), 74+00 (201), 75+00 (201), 75+90 (201), 76+25 (201), 77+30 (201), 79+68 (201), 81+30 (201)	61+70 TO 64+55	63+70 (201), 64+55 (201)	
92+70 TO 95+70	94+70 (201), 95+50 (201)	76+70 TO 90+80	77+30 (201), 79+70 (201), 81+30 (201)	
96+35 TO 96+67	96+67 (201)	83+30 (201), 85+80 (201), 87+60 (201)	91+70 TO 95+65	91+70 (CB), 94+70 (201), 95+50 (201)
		96+30 TO 97+70	96+67 (201), 97+70	

DETAIL SHOWING METHOD OF WEDGING (W)

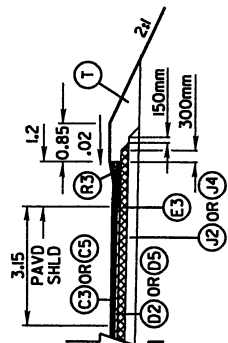


NOTE: SEE PLANS FOR LOCATION OF ACCELERATION AND DECELERATION LANES.
NOTE: SEE PLANS FOR GORE AREAS.

TYPICAL SECTION NO. 1A

USE IN CONJUNCTION WITH TYPICAL SECTION NOS. 1 & 3 FOR OUTSIDE SHOULDERS WITH CURB & GUTTER

- STA. 57+00.000 -L- LT TO STA. 60+99.990 -L- LT
- STA. 57+80.000 -L- RT TO STA. 60+59.033 -L- RT
- STA. 61+46.921 -L- RT TO STA. 64+55.000 -L- RT
- STA. 61+95.878 -L- LT TO STA. 64+95.500 -L- LT
- STA. 80+55.000 -L- LT TO STA. 81+09.000 -L- LT
- STA. 90+79.000 -L- LT TO STA. 90+87.809 -L- LT
- STA. 91+62.108 -L- LT TO STA. 91+70.000 -L- RT
- STA. 91+62.651 -L- LT TO STA. 91+71.000 -L- LT
- STA. 96+25.275 -L- LT TO STA. 96+66.000 -L- LT
- STA. 96+31.098 -L- RT TO STA. 98+39.000 -L- RT
- STA. 0+63.998 -RP B- RT TO STA. 2+60.000 -RP B- RT



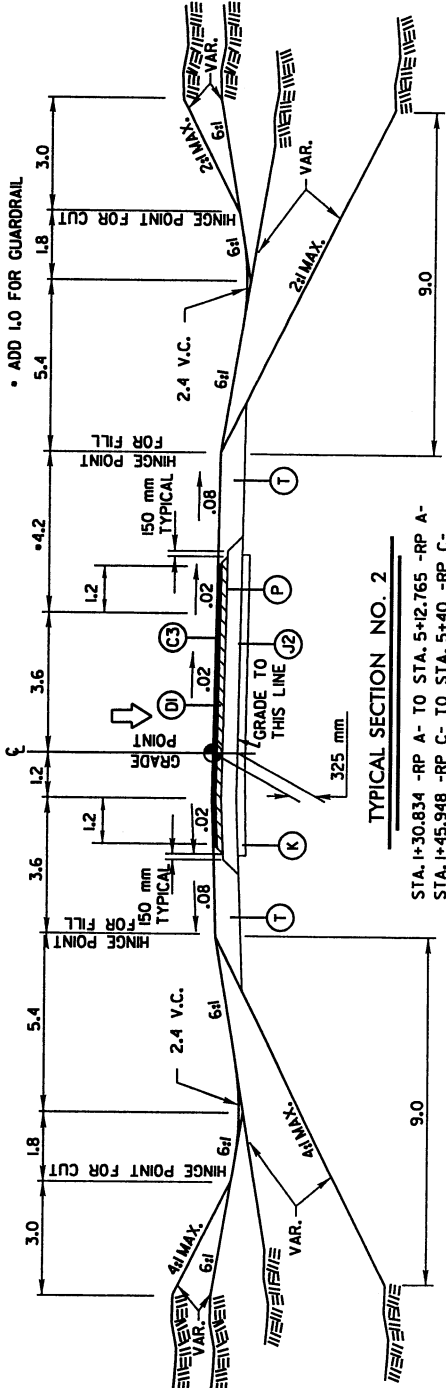
DETAILS OF NOISE WALL PLACEMENT

- EXPRESSWAY GUTTER BEGINS AT -L- STA. 79+69.000 RT.

- STA. 80+46.000 -L- RT TO STA. 83+71.478 -L- RT
- STA. 0+00.000 -RP D- RT TO STA. 6+50.000 -RP D- RT



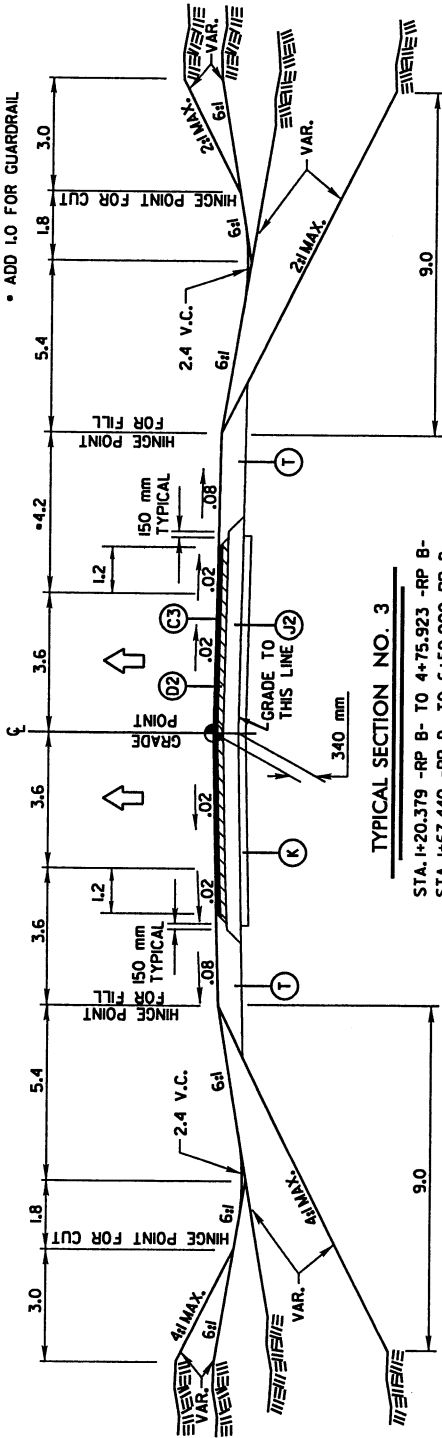
PROJECT REFERENCE NO.	SHEET NO.
U-2524AC	2-A
R / W SHEET NO.	PAVEMENT DESIGN ENGINEER
ROADWAY DESIGN ENGINEER	PAVEMENT DESIGN ENGINEER
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION	
CONST. REV.	
R / W REV.	



TYPICAL SECTION NO. 2

STA. 1+30.834 -RP A- TO STA. 5+12.765 -RP A-
STA. 1+45.948 -RP C- TO STA. 5+40 -RP C-

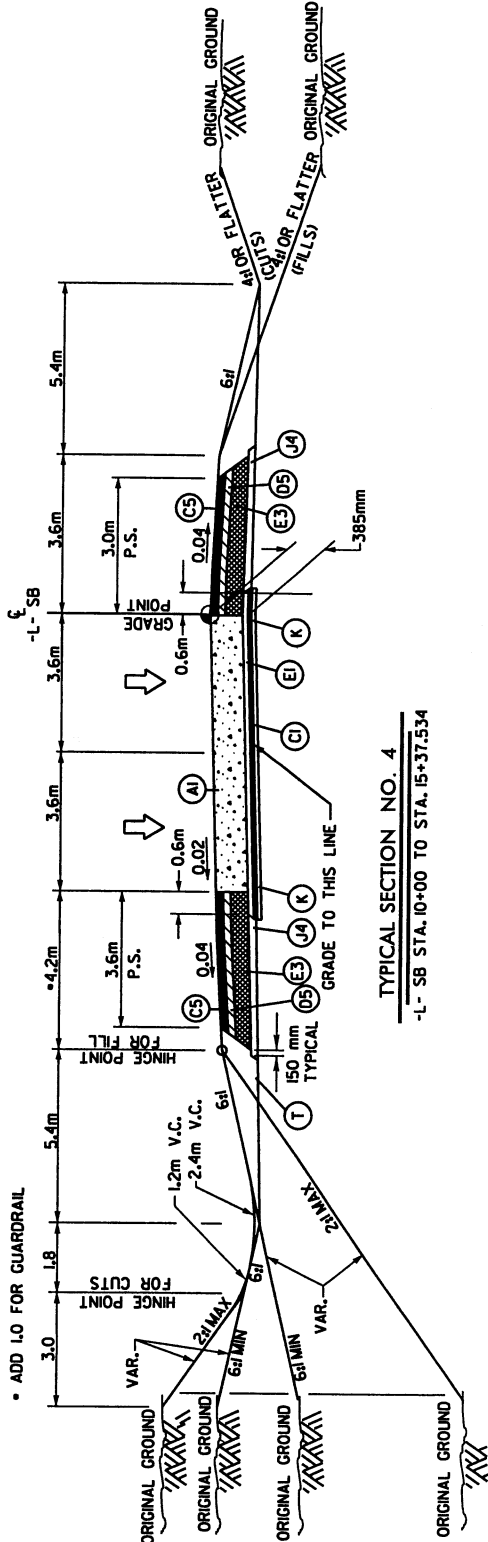
NOTE: SEE PLANS FOR GORE AREAS AND LOCATION OF INTERSECTION TURNOUTS.



TYPICAL SECTION NO. 3

STA. 1+20.379 -RP B- TO 4+75.923 -RP B-
STA. 1+67.440 -RP D- TO 6+50.000 RP D-

NOTE: SEE PLANS FOR GORE AREAS AND LOCATION OF INTERSECTION TURNOUTS.



TYPICAL SECTION NO. 4

-L- SB STA. 10+00 TO STA. 15+37.534

ABBREVIATED PAVEMENT SCHEDULE	
A1	280 mm PORTLAND CEMENT CONCRETE PAVEMENT.
A2	360 mm PORTLAND CEMENT CONCRETE PAVEMENT
C1	30 mm ASPH.CONC. SURF. COURSE. TYPE S9.5B.
C2	60 mm ASPH.CONC. SURF. COURSE. TYPE S9.5B
C3	70 mm ASPH.CONC. SURF. COURSE. TYPE S9.5B
C4	VAR. DEPTH ASPH.CONC. SURF. COURSE. TYPE S9.5B
C5	70 mm ASPH.CONC. SURF. COURSE. TYPE S9.5C
C6	VAR. DEPTH ASPH.CONC. SURF. COURSE. TYPE S9.5C
D1	55 mm ASPH.CONC. INTER. COURSE. TYPE I9.0B
D2	70 mm ASPH.CONC. INTER. COURSE. TYPE I9.0B
D3	100 mm ASPH.CONC. INTER. COURSE. TYPE I9.0B
D4	VAR. DEPTH ASPH.CONC. INTER. COURSE. TYPE I9.0B
D5	100 mm ASPH.CONC. INTER. COURSE. TYPE I9.0C
D6	VAR. DEPTH ASPH.CONC. INTER. COURSE. TYPE I9.0C
E1	75 mm ASPH.CONC. BASE COURSE. TYPE B25.0B
E2	VAR. DEPTH ASPH.CONC. BASE COURSE. TYPE B25.0B
E3	100 mm ASPH.CONC. BASE COURSE. TYPE B25.0C.
E4	160 mm ASPH.CONC. BASE COURSE. TYPE B25.0C
E5	180 mm ASPHALT CONC. BASE COURSE. TYPE B25.0C
E6	VAR. DEPTH ASPH.CONC. BASE COURSE. TYPE B25.0C
J1	150 mm AGGREGATE BASE COURSE.
J2	200 mm AGGREGATE BASE COURSE.
J3	250 mm AGGREGATE BASE COURSE
J4	VARIABLE DEPTH AGGREGATE BASE COURSE
K	SUBGRADE STABILIZATION
P	PRIME COAT
R1	750mm CONCRETE CURB AND GUTTER
R2	450mm CONCRETE CURB AND GUTTER
R3	CONCRETE EXPRESSWAY GUTTER
R4	MEDIAN BARRIER
R5	SINGLE FACED CONCRETE BARRIER
T	EARTH MATERIAL
U	EXISTING PAVEMENT
W	VAR. DEPTH ASPH. PAVEMENT (SEE WEDGING DETAIL)

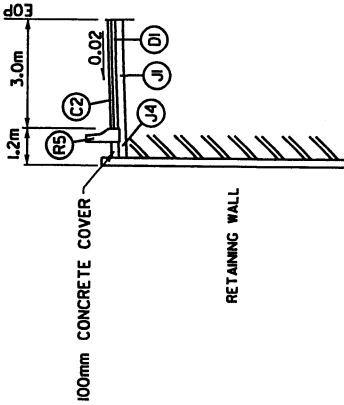
NOTE: ALL PAVEMENT EDGE SLOPES ARE 4% UNLESS OTHERWISE INDICATED.

GREENHORNE & O'MARA, INC.
5565 CENTERVIEW DRIVE, SUITE 107
RALEIGH, NORTH CAROLINA 27606
(919) 891-1991

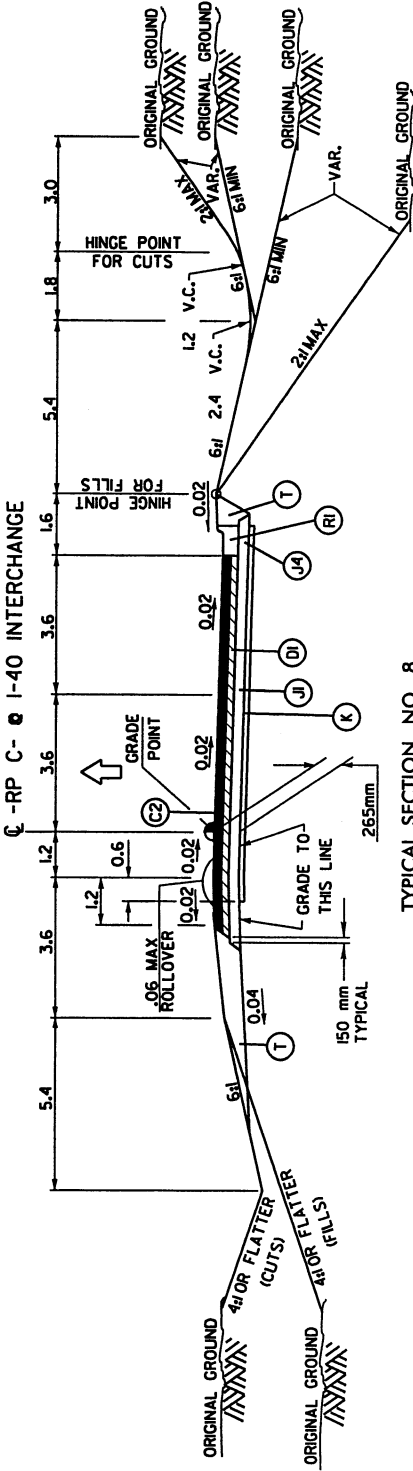


PROJECT REFERENCE NO.	SHEET NO.
U-2524AC	2-C
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	PAVEMENT DESIGN ENGINEER
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION	
CONST. REV.	
R/W REV.	

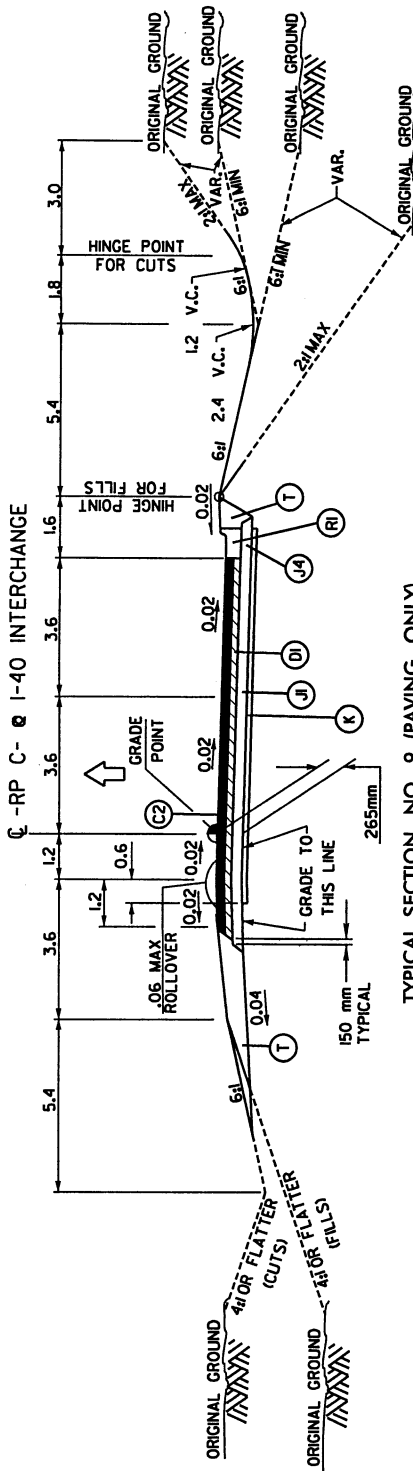
ABBREVIATED PAVEMENT SCHEDULE	
A1	280 mm PORTLAND CEMENT CONCRETE PAVEMENT.
A2	360 mm PORTLAND CEMENT CONCRETE PAVEMENT
C1	30 mm ASPH.CONC. SURF. COURSE, TYPE S95B.
C2	60 mm ASPH.CONC. SURF. COURSE, TYPE S95B.
C3	70 mm ASPH.CONC. SURF. COURSE, TYPE S95B
C4	VAR. DEPTH ASPH.CONC. SURF. COURSE, TYPE S95B
C5	70 mm ASPH.CONC. SURF. COURSE, TYPE S95C
C6	VAR. DEPTH ASPH.CONC. SURF. COURSE, TYPE S95C
D1	55 mm ASPH.CONC. INTER. COURSE, TYPE I910B
D2	70 mm ASPH.CONC. INTER. COURSE, TYPE I910B
D3	10 mm ASPH.CONC. INTER. COURSE, TYPE I910B
D4	VAR. DEPTH ASPH.CONC. INTER. COURSE, TYPE I910B
D5	10 mm ASPH.CONC. INTER. COURSE, TYPE I910C
D6	VAR. DEPTH ASPH.CONC. INTER. COURSE, TYPE I910C
E1	75 mm ASPH.CONC. BASE COURSE, TYPE B250B
E2	VAR. DEPTH ASPH.CONC. BASE COURSE, TYPE B250B
E3	100 mm ASPH.CONC. BASE COURSE, TYPE B250C.
E4	60 mm ASPH.CONC. BASE COURSE, TYPE B250C
E5	180 mm ASPHALT CONC. BASE COURSE, TYPE B250C
E6	VAR. DEPTH ASPH.CONC. BASE COURSE, TYPE B250C
J1	150 mm AGGREGATE BASE COURSE.
J2	200 mm AGGREGATE BASE COURSE.
J3	250 mm AGGREGATE BASE COURSE
J4	VARIABLE DEPTH AGGREGATE BASE COURSE
K	SUBGRADE STABILIZATION
P	PRIME COAT
R1	750mm CONCRETE CURB AND GUTTER
R2	450mm CONCRETE CURB AND GUTTER
R3	CONCRETE EXPRESSWAY GUTTER
R4	MEDIAN BARRIER
R5	SINGLE FACED CONCRETE BARRIER
T	EARTH MATERIAL
U	EXISTING PAVEMENT
W	VAR. DEPTH ASPH. PAVEMENT (SEE WEDGING DETAIL)



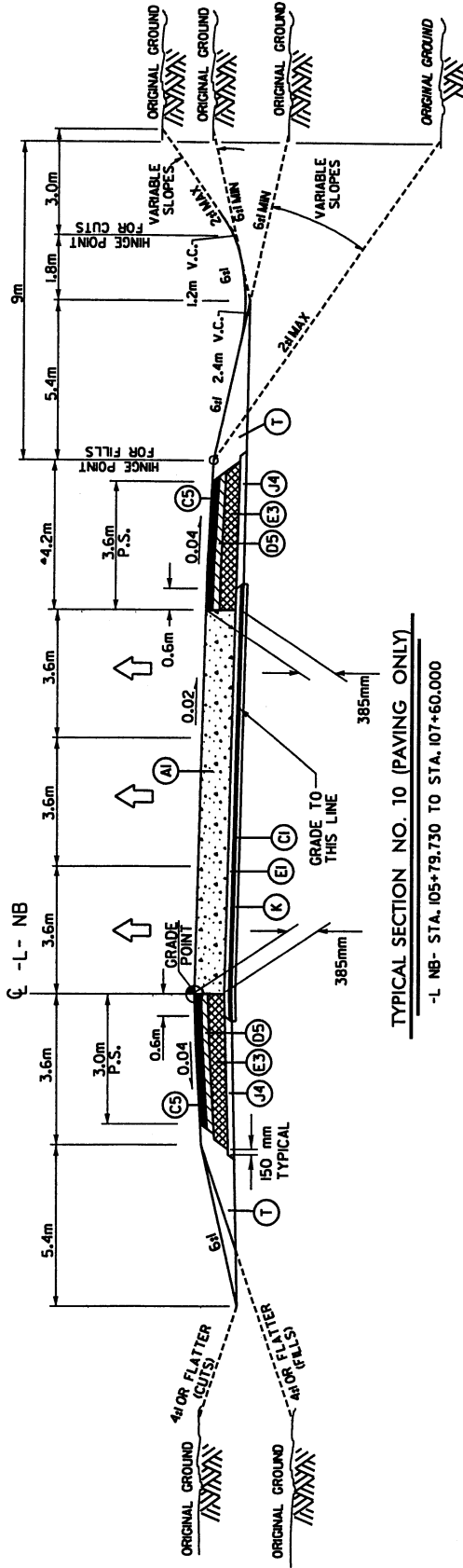
TYPICAL SECTION NO. 8A
RAMP -C- @ I-40 STA. 17+85: TO STA. 19+00: L.T.



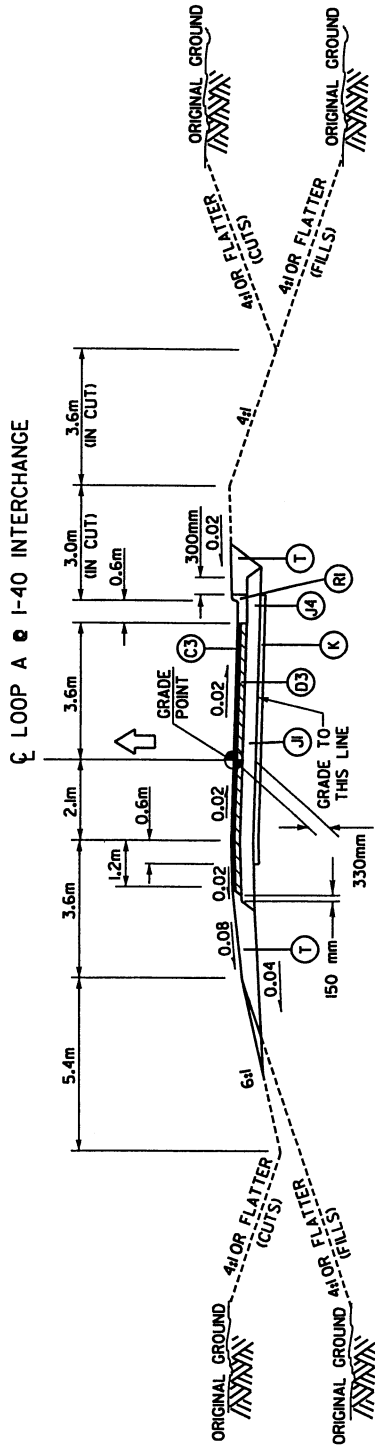
TYPICAL SECTION NO. 8
RAMP -C- @ I-40 STA. 13+08 TO STA. 19+20: 0.000



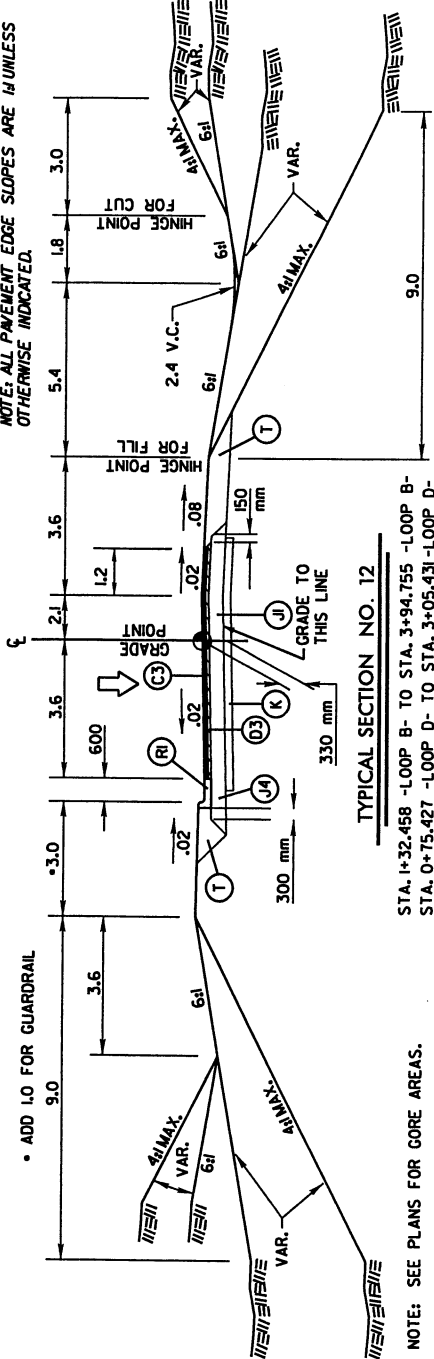
TYPICAL SECTION NO. 9 (PAVING ONLY)
RAMP -C- @ I-40 STA. 19+20: 0.000 TO STA. 20+20: 0.000



TYPICAL SECTION NO. 10 (PAVING ONLY)
-L NB- STA. 105+79.730 TO STA. 107+60: 0.000



TYPICAL SECTION NO. 11 (PAVING ONLY)
-LOOP A- STA. 11+20: 0.000 TO STA. 14+32: 417



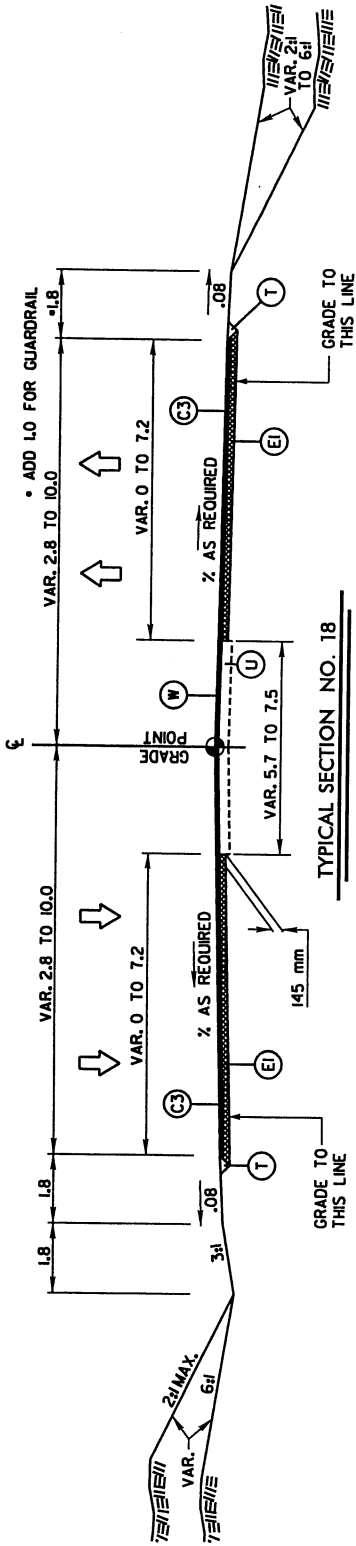
TYPICAL SECTION NO. 12
STA. 1+32: 458 - LOOP B- TO STA. 3+94: 755 - LOOP D-
STA. 0+15: 427 - LOOP D- TO STA. 3+05: 431 - LOOP D-

NOTE: SEE PLANS FOR CORE AREAS.

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



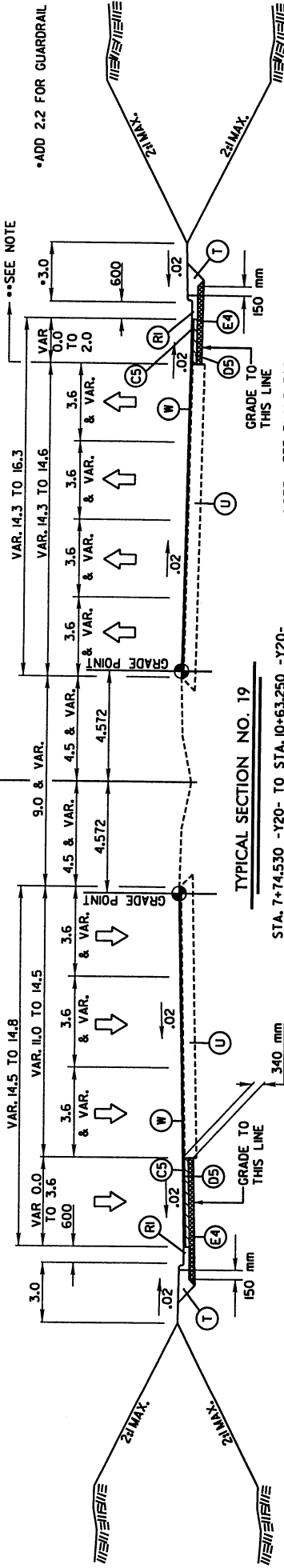
PROJECT REFERENCE NO.	SHEET NO.
U-2524C	2-E
R/WY SHEET NO.	PAVEMENT DESIGN ENGINEER
ROADWAY DESIGN ENGINEER	PAVEMENT DESIGN ENGINEER
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION	
CONST. REV.	
R/WY REV.	



TYPICAL SECTION NO. 18

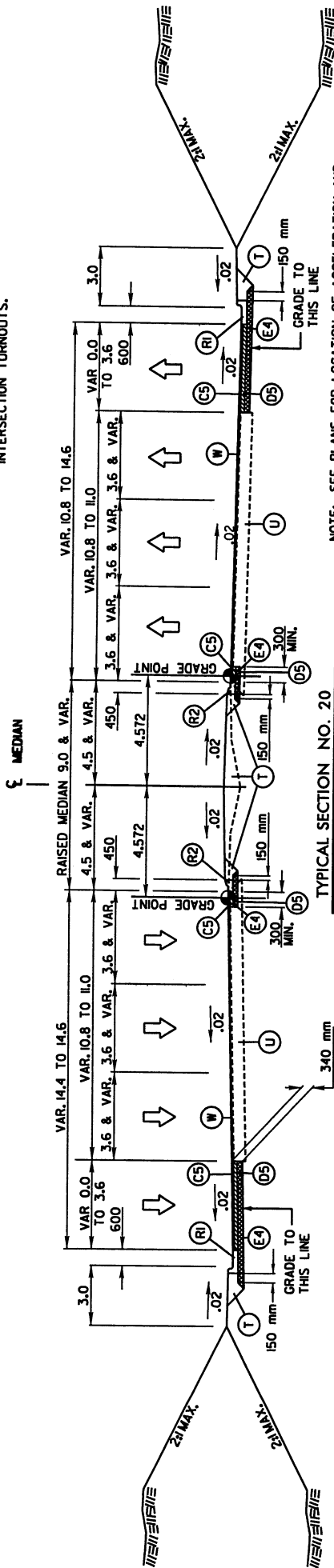
STA. 10+00.000 -Y15A- TO STA. 10+27.540 -Y15A-
STA. 10+00.000 -Y15B- TO STA. 10+40.363 -Y15B-
STA. 10+00.000 -Y16A- TO STA. 10+32.424 -Y16A-
STA. 10+00.000 -Y20A- TO STA. 10+25.112 -Y20A-
STA. 10+00.000 -Y20B- TO STA. 10+25.112 -Y20B-

NOTE: SEE PLANS FOR LOCATION OF CUL-DE-SACS.



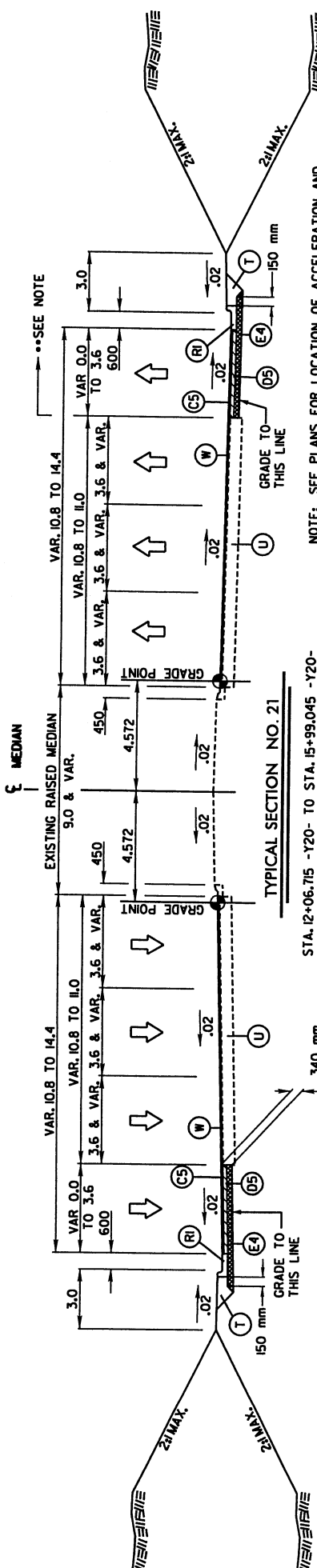
TYPICAL SECTION NO. 19

STA. 7+74.530 -Y20- TO STA. 10+63.250 -Y20-
** EXISTING CURB & GUTTER TO BE UTILIZED FROM
STA. 7+74.530 -Y20- TO STA. 9+28.080 -Y20- RT SIDE



TYPICAL SECTION NO. 20

STA. 10+63.250 -Y20- TO STA. 12+06.715 -Y20-



TYPICAL SECTION NO. 21

STA. 12+06.715 -Y20- TO STA. 15+99.045 -Y20-
** EXISTING CURB & GUTTER TO BE UTILIZED FROM
STA. 13+52.880 -Y20- TO STA. 13+94.840 -Y20- RT SIDE
STA. 14+87.000 -Y20- TO STA. 15+99.045 -Y20- RT SIDE

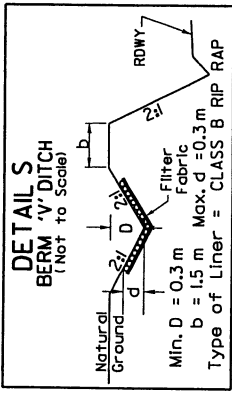
NOTE: SEE PLANS FOR LOCATION OF ACCELERATION AND DECELERATION LANES.

NOTE: SEE PLANS FOR GORE AREAS, LOCATION OF TURN LANES, AND LOCATION OF INTERSECTION TURNOUTS.

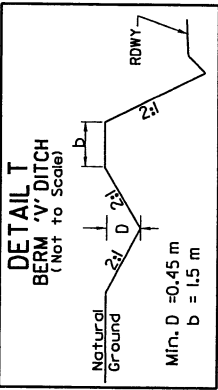
ABBREVIATED PAVEMENT SCHEDULE
A1 280 mm PORTLAND CEMENT CONCRETE PAVEMENT.
A2 360 mm PORTLAND CEMENT CONCRETE PAVEMENT
C1 30 mm ASPH.COMC.SURF.COURSE.TYPE S95B.
C2 60 mm ASPH.COMC.SURF.COURSE.TYPE S95B
C3 70 mm ASPH.COMC.SURF.COURSE.TYPE S95B
C4 VAR.DEPTH ASPH.COMC.SURF.COURSE.TYPE S95B
C5 70 mm ASPH.COMC.SURF.COURSE.TYPE S95C
C6 VAR.DEPTH ASPH.COMC.SURF.COURSE.TYPE S95C
D1 55 mm ASPH.COMC.INTER.COURSE.TYPE I90B
D2 70 mm ASPH.COMC.INTER.COURSE.TYPE I90B
D3 110 mm ASPH.COMC.INTER.COURSE.TYPE I90B
D4 VAR.DEPTH ASPH.COMC.INTER.COURSE.TYPE I90B
D5 110 mm ASPH.COMC.INTER.COURSE.TYPE I90C
D6 VAR.DEPTH ASPH.COMC.INTER.COURSE.TYPE I90C
E1 75 mm ASPH.COMC.BASE COURSE.TYPE B250B
E2 VAR.DEPTH ASPH.COMC.BASE COURSE.TYPE B250B
E3 100 mm ASPH.COMC.BASE COURSE.TYPE B250C.
E4 160 mm ASPH.COMC.BASE COURSE.TYPE B250C
E5 180 mm ASPHALT COMC.BASE COURSE.TYPE B250C
E6 VAR.DEPTH ASPH.COMC.BASE COURSE.TYPE B250C
J1 150 mm AGGREGATE BASE COURSE.
J2 200 mm AGGREGATE BASE COURSE.
J3 250 mm AGGREGATE BASE COURSE
J4 VARIABLE DEPTH AGGREGATE BASE COURSE
K SUBGRADE STABILIZATION
P PRIME COAT
R1 750mm CONCRETE CURB AND GUTTER
R2 450mm CONCRETE CURB AND GUTTER
R3 CONCRETE EXPRESSWAY GUTTER
R4 MEDIAN BARRIER
R5 SINGLE FACED CONCRETE BARRIER
T EARTH MATERIAL
U EXISTING PAVEMENT
W VAR.DEPTH ASPH.PAVEMENT (SEE WEDGING DETAIL)

NOTE: ALL PAVEMENT EDGE SLOPES ARE UNLESS OTHERWISE INDICATED.

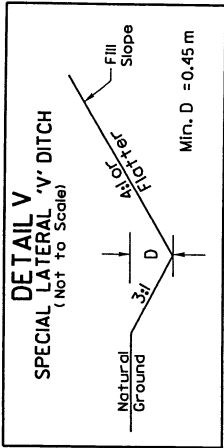
DRAINAGE DETAILS



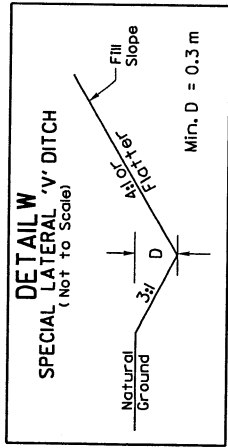
-L- STA. 75+87 TO STA. 76+00 RT.



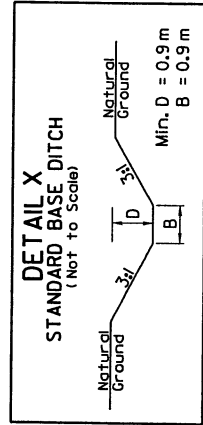
-L- STA. 76+00 TO STA. 76+70 RT.



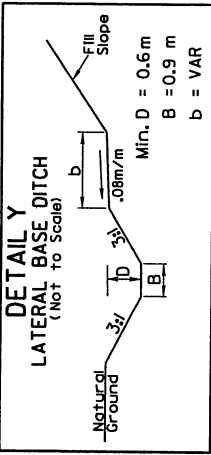
-L- STA. 92+40 TO STA. 93+66 RT.



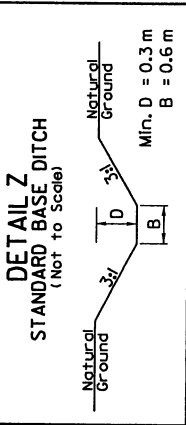
-L- STA. 87+10 TO STA. 89+40 RT.
-RP D- STA. 3+25 TO STA. 5+00 LT.



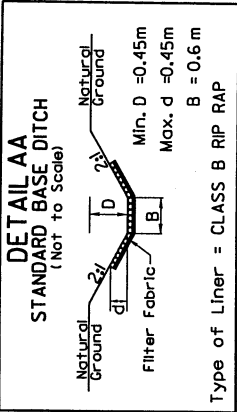
-RP C- STA. 0+61 TO STA. 0+75 LT.



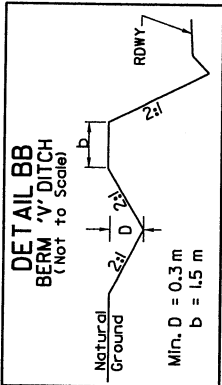
-L- STA. 86+74 RT. 10 -L- STA. 87+25 RT.



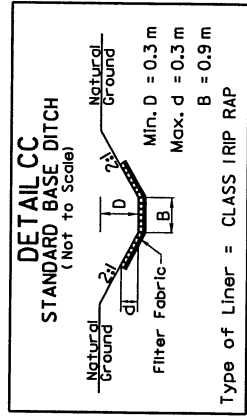
-RP A- STA. 2+90 RT.
-RP D- STA. 2+40 RT.



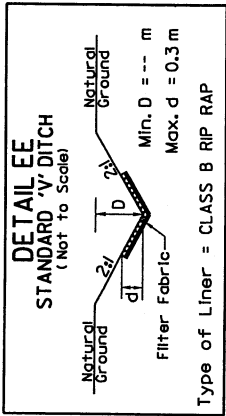
-RP D- STA. 3+50 RT.



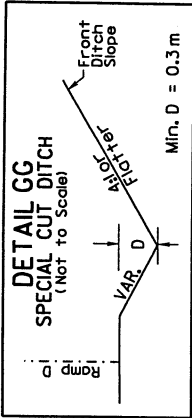
-Y20- STA. 12+74 TO STA. 13+70 LT.



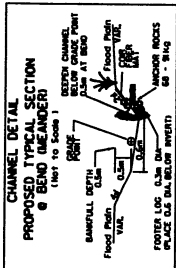
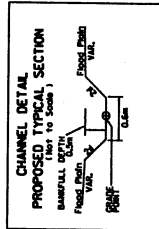
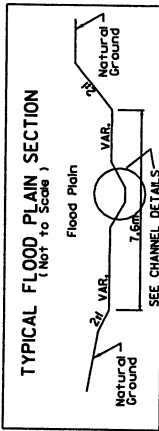
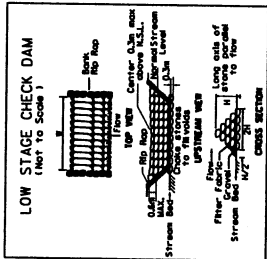
-RP B- STA. 2+55 LT.



-L- STA. 96+77 RT.

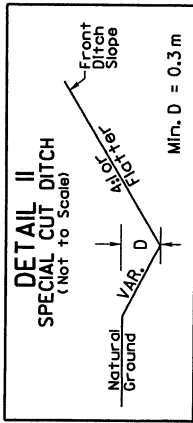


-Y19- STA. 10+87 TO STA. 12+50 LT.

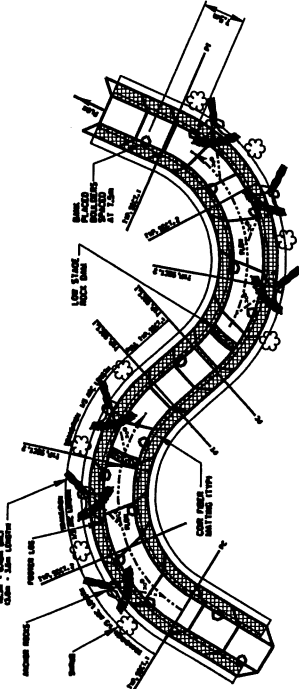


NOTES:

NUMBER OF ROOTTADS INSTALLED TO BE DETERMINED ON SITE
NUMBER OF LOW STAGE CHECK DAMS TO BE DETERMINED ON SITE
ROOTTADS TO BE SPACED 4x DIAMETER OF ROOT BASE
FOOTER LOG ANCHOR ROCK TO BE PLACED ON THE DOWNSTREAM END
OF EACH ROOTTAD. ANCHOR ROCK IS LEANING AGAINST THE LOG ON
THE SIDE AWAY FROM THE CHANNEL.
WHEN BACKFILLING OVER AND AROUND FOOTER LOGS, ROOTTAD LOGS
AND ROOTTADS FIRMLY SECURE ALL COMPONENTS INCLUDING
JOINTS, CONNECTIONS AND GAPS.
PLANTINGS SHOULD BE PLACED ABOVE BANKFULL DEPTH



-RP D- STA. 5+80 TO STA. 6+60 LT.



CHANNEL PLAN VIEW

SEE ROADWAY STANDARD DRAWINGS 868.01 AND 868.04 FOR THICKNESS OF STONE IN DRAINAGE DITCHES.

N.C. DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
GUILFORD COUNTY
PROJECT # U992101 (U-2394AC)
GREENSBORO-WESTERN LOOP

REVISIONS

82

82

G&G GREENHORNE & O'MARA, INC.
5565 CENTERVIEW DRIVE, SUITE 107
RALEIGH, NORTH CAROLINA 27605
(919) 851-1999



PROJECT REFERENCE NO. **U-25214C** SHEET NO. **21**
R/W SHEET NO. **U-25214C**
ROADWAY DESIGN ENGINEER
PRELIMINARY PLANS
NO NOT BE USED FOR CONSTRUCTION



CONST. REV.

R/W REV.

-L- TS 82+51.478

MATCHLINE -L- STA. 83+40.000
SEE SHEET NO. 2-J

-L-

N 8° 26' 10.3" W

-L-

N 8° 26' 10.3" W

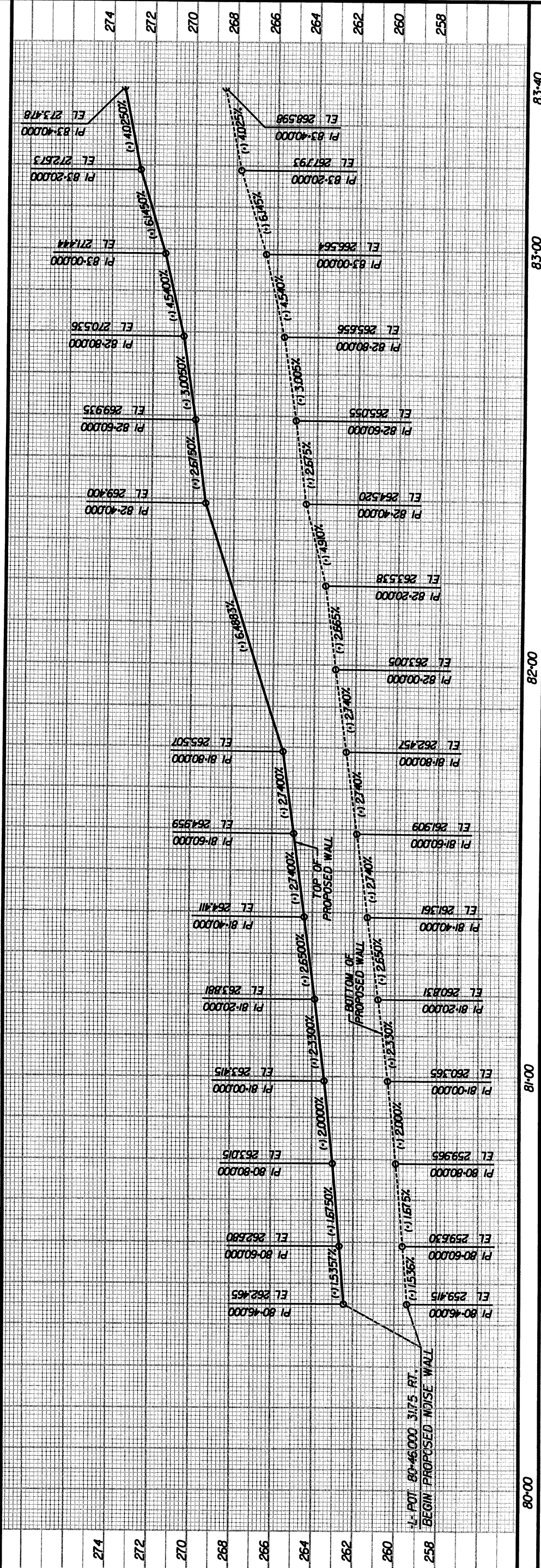
-L- POT 80+46.000 317.5 RT.
BEGIN PROPOSED NOISE WALL

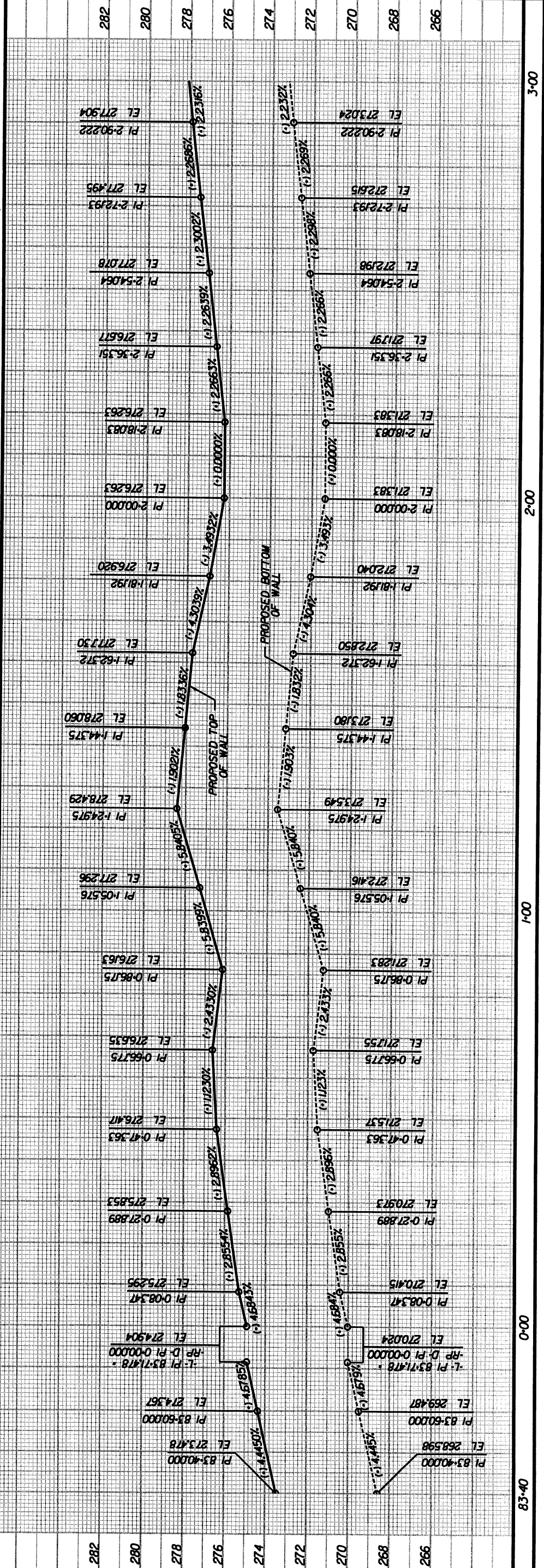
PROPOSED NOISE WALL

1.95
-00.840

PROP EXPRESSWAY GUTTER

NOTE: SEE SHEET 2 FOR TYPICAL SECTION
SHOWING PLACEMENT OF NOISE WALL IN
RELATION TO EXPRESSWAY GUTTER.





REVISIONS

GREENHORNE & O'MARA, INC.
5565 CENTERVIEW DRIVE, SUITE 107
RALEIGH, NORTH CAROLINA 27606
(919) 851-1999



PROJECT REFERENCE NO. **U-2524AC**
SHEET NO. **2-K**
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION



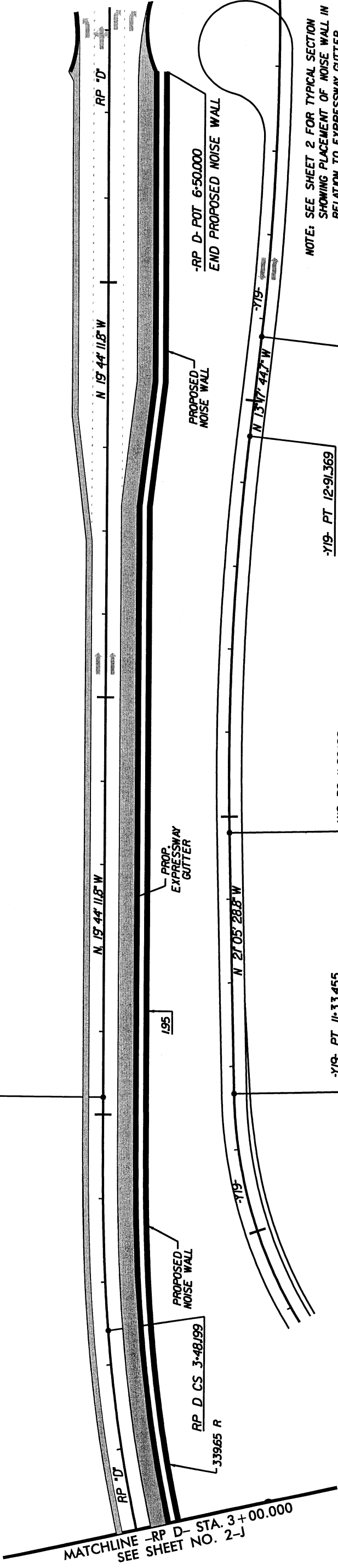
CONST. REV.
R/W REV.

RP D ST 4+04.99

5

4

6

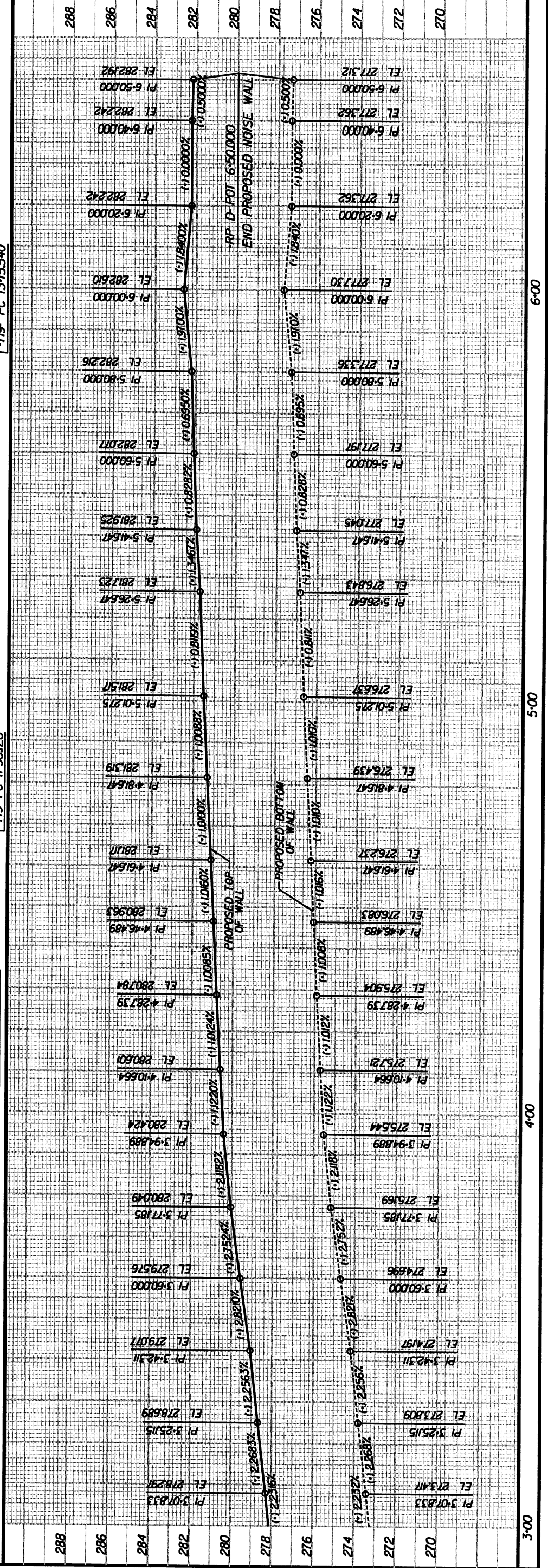


NOTE: SEE SHEET 2 FOR TYPICAL SECTION
SHOWING PLACEMENT OF NOISE WALL IN
RELATION TO EXPRESSWAY GUTTER.

-Y19- PT 12+91.369

-Y19- PC 11+96.128

-Y19- PT 11+33.455



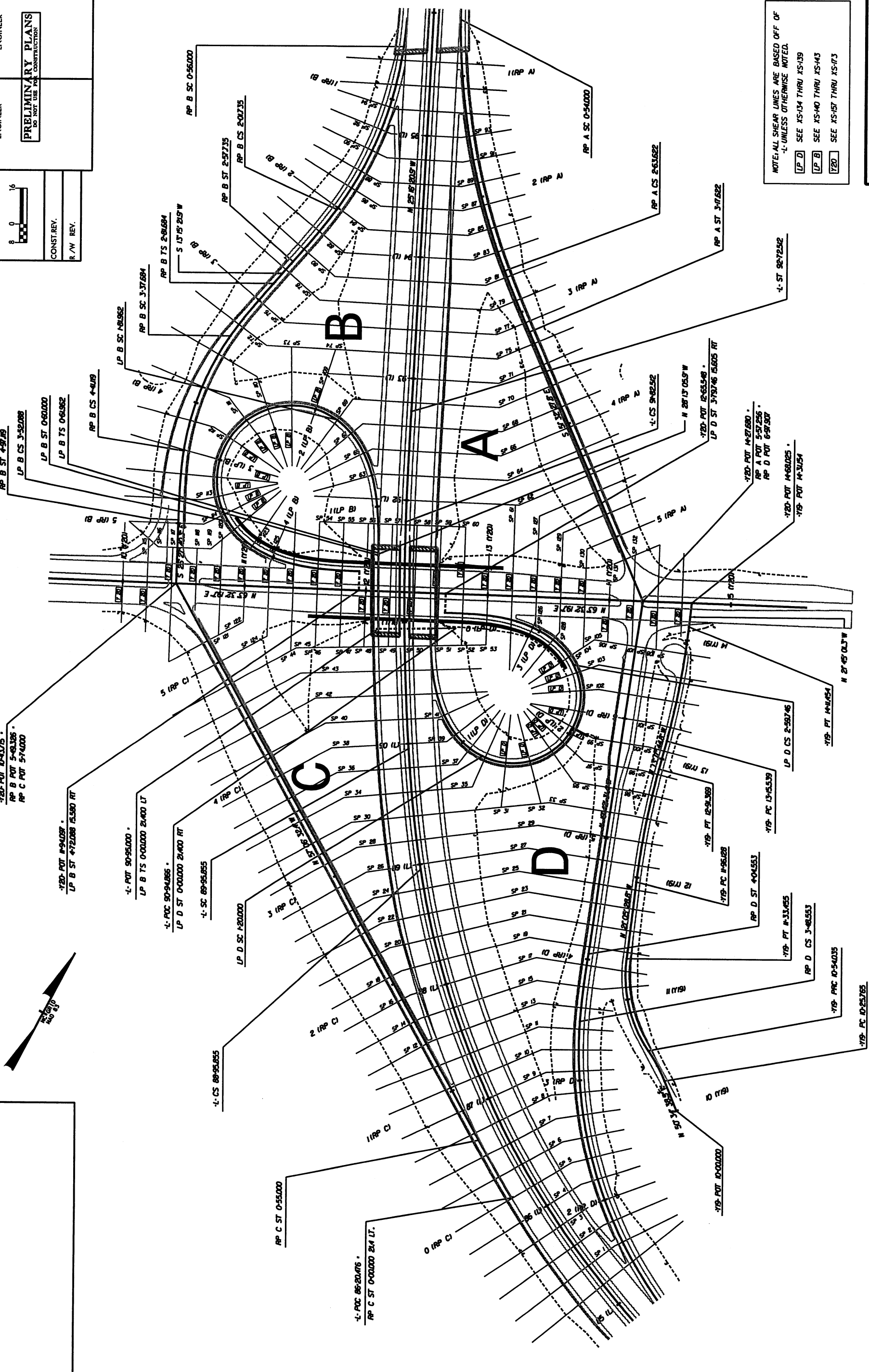
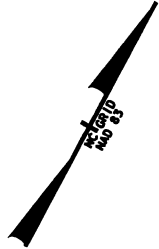
REVISIONS

GREENHORNE & O'MARA, INC.
5565 CENTERVIEW DRIVE, SUITE 107
RALEIGH, NORTH CAROLINA 27605
(919) 854-1993



PROJECT REFERENCE NO. **U-2524AC**
SHEET NO. **2-M**
R/W SHEET NO. **HYDRAULICS ENGINEER**
ROADWAY DESIGN ENGINEER
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

CONST. REV.
R/W REV.



NOTE: ALL SHEAR LINES ARE BASED OFF OF
-L- UNLESS OTHERWISE NOTED.
[LP D] SEE XS-134 THRU XS-139
[LP B] SEE XS-140 THRU XS-143
[Z20] SEE XS-157 THRU XS-173

DETAIL SHOWING SHEAR POINT
LAYOUT

REVISIONS

-L-
PI STA 54+16.916 PLS STA 56+20.591
Δ = 16' 40" 55.3' (RT) GS = 2' 40" 02.0' (RT)
L = 337.741 LS = 108.000
T = 170.074 ST = 36.008
R = 1160.000 LT = 72.008
e = 0.06

MATCHLINE C - C
SEE SHEET NO. 4-A

GREENHORNE & O'MARA, INC.
5565 CENTERVIEW DRIVE, SUITE 107
RALEIGH, NORTH CAROLINA 27606
(919) 851-1995

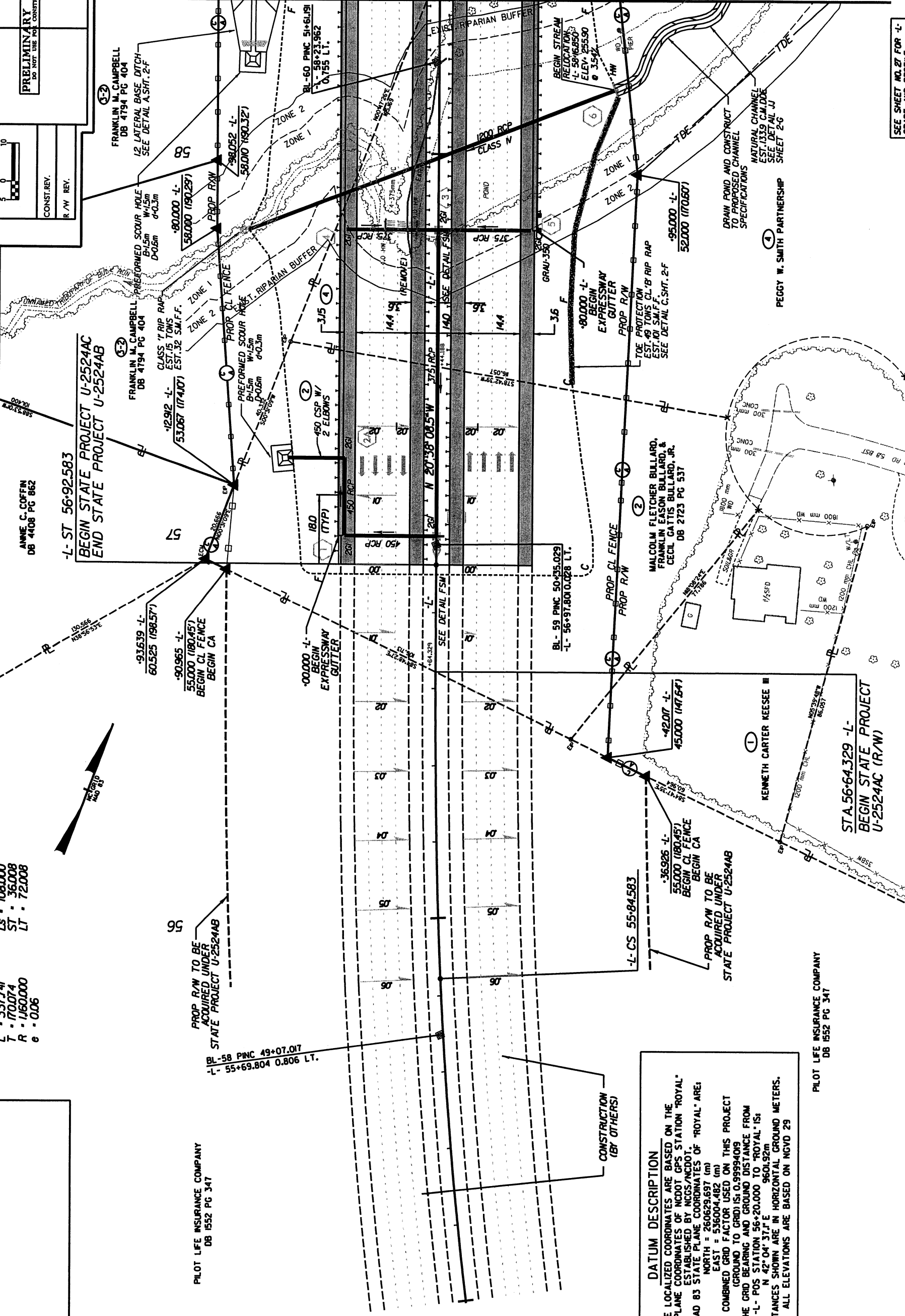
METRIC

CONST. REV.
R/W REV.

PROJECT REFERENCE NO. U-2524AC
SHEET NO. 4

R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION



DATUM DESCRIPTION
THE LOCALIZED COORDINATES ARE BASED ON THE STATE PLANE COORDINATES OF NC DOT GPS STATION "ROYAL" THE NAD 83 STATE PLANE COORDINATES OF "ROYAL" ARE:
NORTH = 260629.697 (m)
EAST = 536004.482 (m)
THE COMBINED GRID FACTOR USED ON THIS PROJECT (GROUND TO GRID) IS 0.9999409
THE GRID BEARING AND GROUND DISTANCE FROM -L- POS STATION 56+20.000 TO "ROYAL" IS:
N 42° 04' 37.7" E 9601.92m
ALL DISTANCES SHOWN ARE IN HORIZONTAL GROUND METERS.
ALL ELEVATIONS ARE BASED ON NGVD 29

PILOT LIFE INSURANCE COMPANY
DB 1552 PG 347

STA 56+64.329 -L-
BEGIN STATE PROJECT
U-2524AC (R/W)

KENNETH CARTER KEESEE III

-L- CS 55+84.583
PROP R/W TO BE
ACQUIRED UNDER
STATE PROJECT U-2524AB

-L- 36.926 -L-
55,000 (180,451)
BEGIN CL FENCE
BEGIN CA

MALCOLM FLETCHER BULLARD,
FRANKLIN EASON BULLARD, JR.,
CECIL CATTIS BULLARD, JR.
DB 2723 PG 537

BL- 59 PNC 50+35.029
-L- 56+97.801 0.028 LT.

SEE DETAIL FSU

SEE DETAIL FSU

SEE DETAIL FSU

BL- 58 PNC 49+07.017
-L- 55+69.804 0.806 LT.

PILOT LIFE INSURANCE COMPANY
DB 1552 PG 347

PROP R/W TO BE
ACQUIRED UNDER
STATE PROJECT U-2524AB

-L- 90.965 -L-
55,000 (180,451)
BEGIN CL FENCE
BEGIN CA

-L- 93.639 -L-
60,525 (198,571)

-L- ST 56+92.583
BEGIN STATE PROJECT U-2524AC
END STATE PROJECT U-2524AB

ANNE C. COFFIN
DB 4408 PG 862

FRANKLIN M. CAMPBELL
DB 4794 PG 404

FRANKLIN M. CAMPBELL
DB 4794 PG 404

FRANKLIN M. CAMPBELL
DB 4794 PG 404

NATURAL CHANNEL
EST. 1339 C.M. DDE
SEE DETAIL J
SHEET 2-6

DRAIN POND AND CONSTRUCT
TO PROPOSED CHANNEL
SPECIFICATIONS

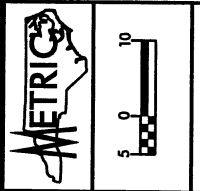
PEGGY W. SMITH PARTNERSHIP

SEE SHEET NO. 27 FOR -L-
GRADE AND PROFILE.

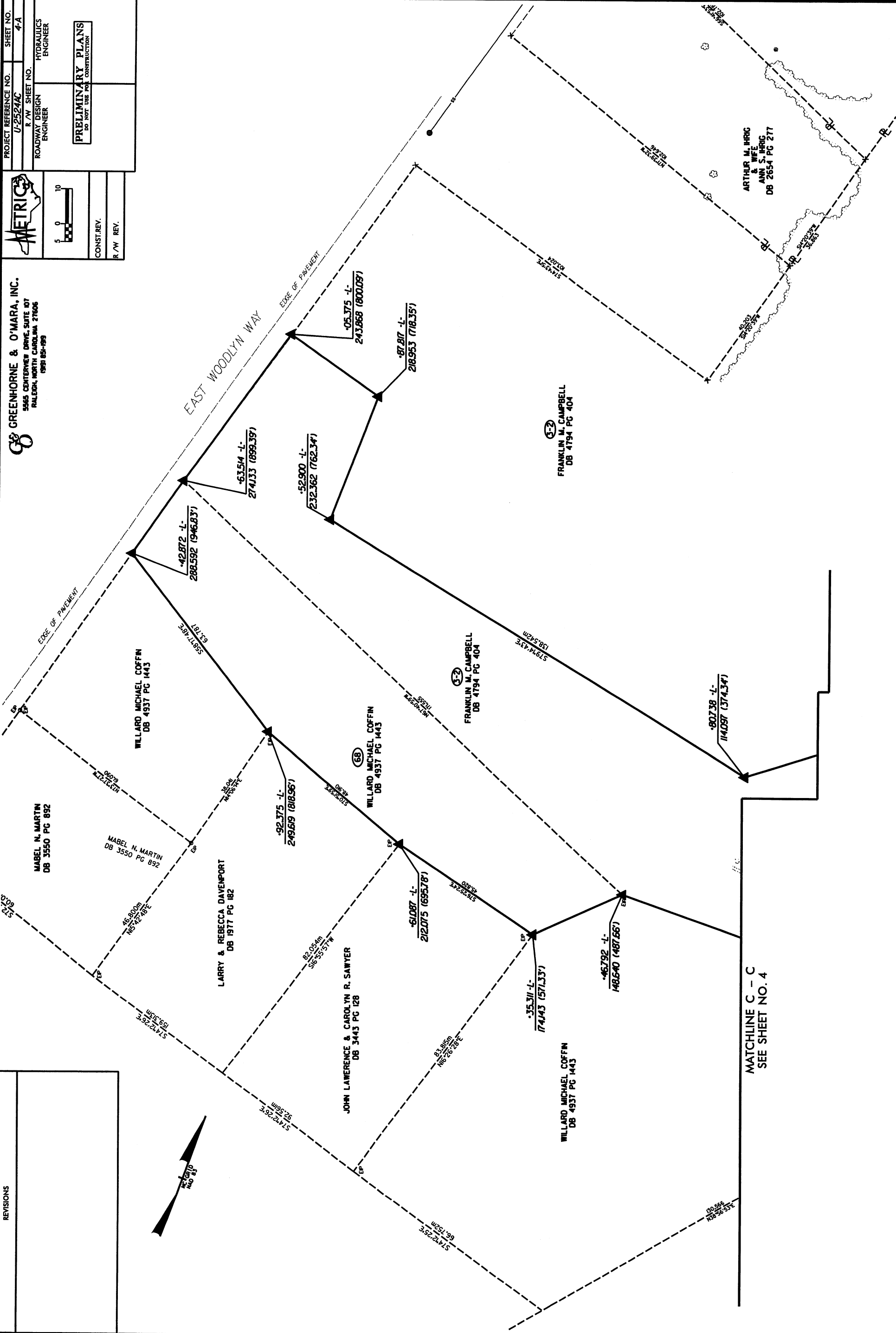
MATCHLINE -L- STA. 58+40.000 SEE SHEET NO. 5

REVISIONS

GREENHORNE & O'MARA, INC.
5565 CENTERVIEW DRIVE, SUITE 107
RALEIGH, NORTH CAROLINA 27606
(919) 853-1995



PROJECT REFERENCE NO.	SHEET NO.
U-2524C	4-A
R/WY. SHEET NO.	HYDRAULICS ENGINEER
ROADWAY DESIGN ENGINEER	
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION	
CONST. REV.	R/WY. REV.



METRIC
5565 CENTERVIEW DRIVE, SUITE 107
RALEIGH, NORTH CAROLINA 27606
(919) 853-1999

200m

W/LT

SOIL

1000

POOL

DECK

CONC

GEORGE E. WYER & WIFE

DON E. CATO
DB 4561 PG 1484

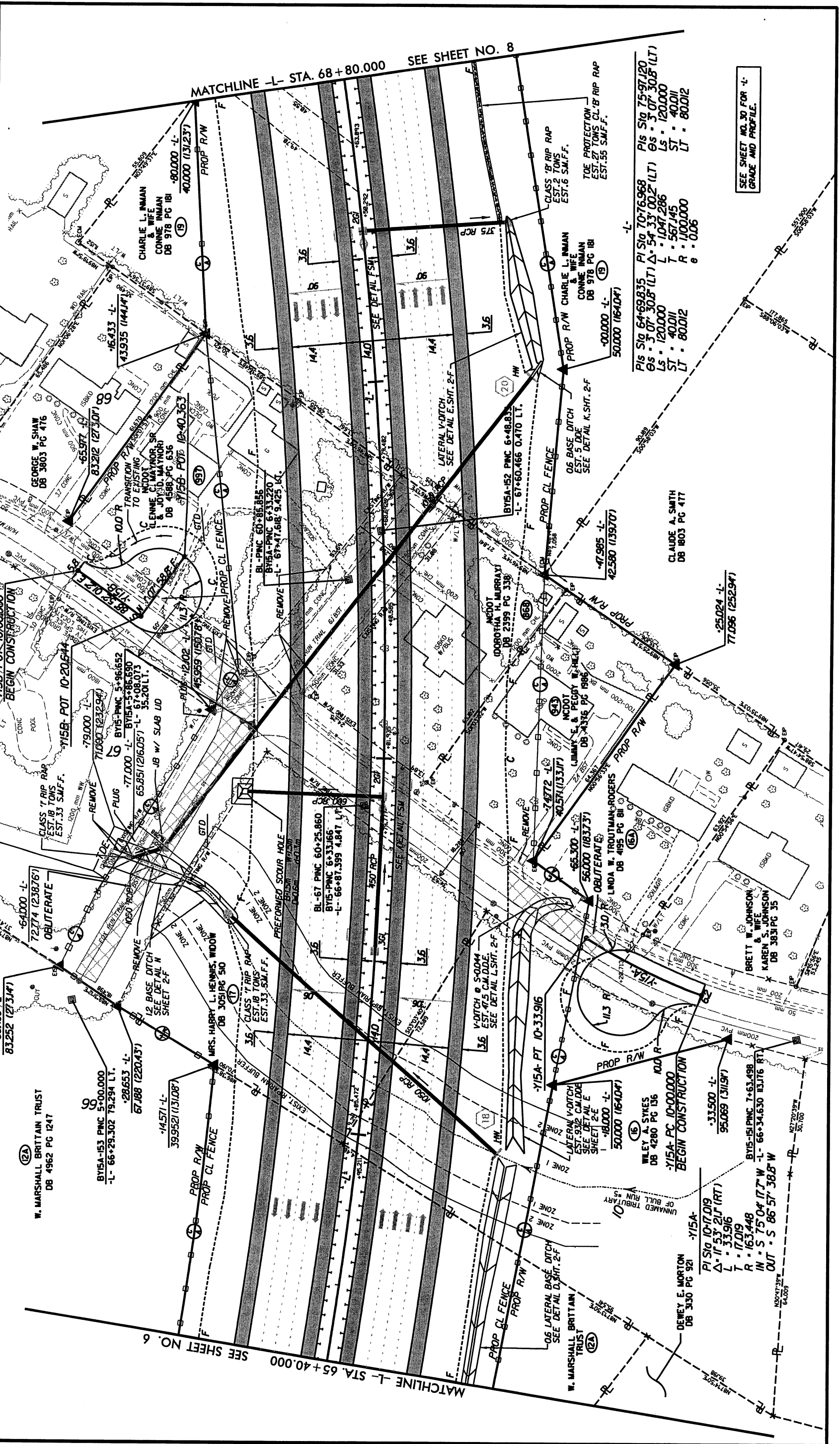
9

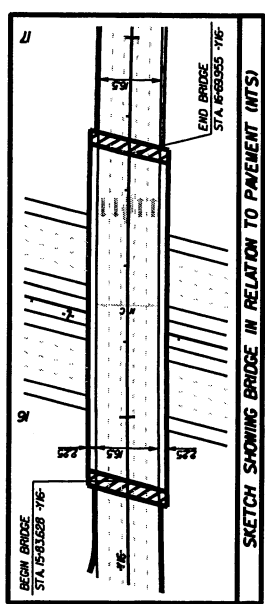
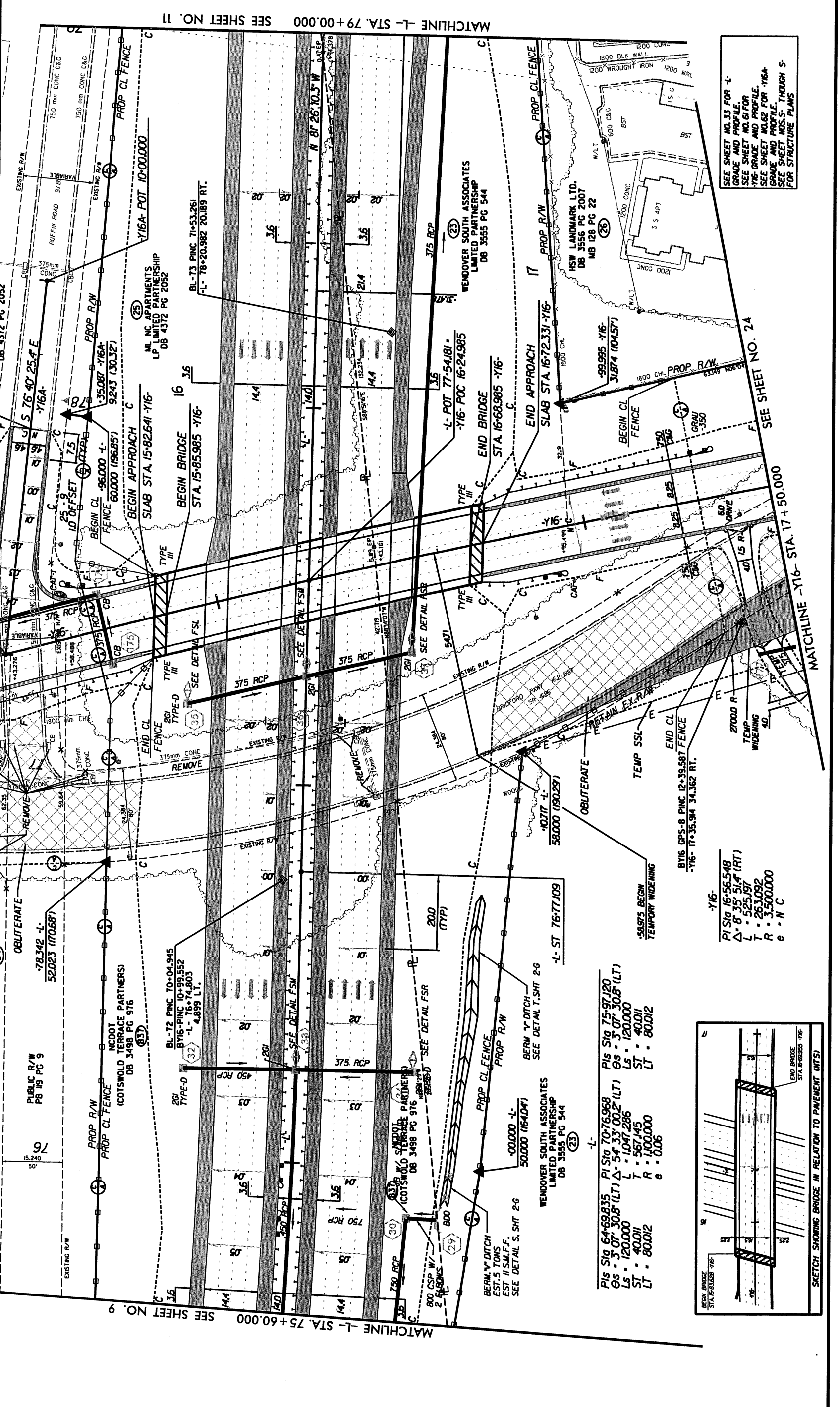
CONST. REV.

R/W REV.

PISIG 12-50.443
 Δ - 19' 30" 43.2" (LT)
 L - 133767
 T - 67538
 R - 392800







REVISIONS

PROJECT REFERENCE NO. U-2524C

SHEET NO. 11

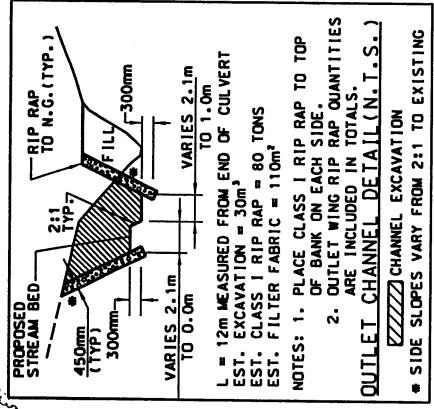


R/W SHEET NO. ROADWAY DESIGN ENGINEER

HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

CONST. REV.
R/W REV.



MATCHLINE L- STA. 79+00.00 SEE SHEET NO. 10

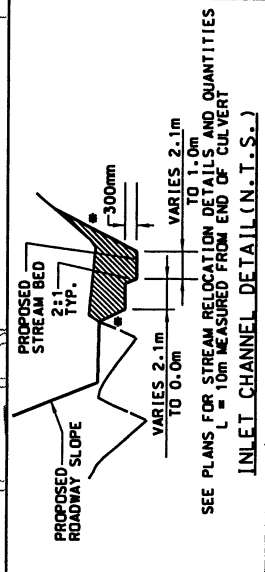
MATCHLINE L- STA. 82+40.00 SEE SHEET NO. 12

ML NC APARTMENTS
LP LIMITED PARTNERSHIP
DB 4372 PG 2052

ML NC APARTMENTS
LP LIMITED PARTNERSHIP
DB 4372 PG 2052

WENDOVER SOUTH ASSOCIATES
LIMITED PARTNERSHIP
DB 3555 PG 344

SEE PLANS FOR STREAM RELOCATION DETAILS AND QUANTITIES
INLET CHANNEL DETAIL (N.T.S.)



SEE SHEET NO. 14 FOR L-
GRADE AND PROFILE.
SEE SHEET NOS. C THOUGH C
FOR CULVERT PLANS

(2) SUSAN C. TRUSTEE JAMES A. & FRE

INTER VIV
DB 4498

SEE SHI

40.000

8 STA. 8

TECHLINE

1

PROJECT REFERENCE NO.

U-2524C

SHEET NO.

13

R/W SHEET NO.

ROADWAY DESIGN

HYDRAULICS

ENGINEER

PRELIMINARY PLANS

DO NOT USE FOR CONSTRUCTION

CONST. REV.

R/W REV.

GREENHORNE & O'MARA, INC.

5665 CENTERVIEW DRIVE, SUITE 107

RALEIGH, NORTH CAROLINA 27606

(919) 851-099

METRIC

LOGO

SEE SHEET NO. 13A

MATCH LINE B - B

PLS STA 0+18.336

GS - 2.07' 30.8" (RT)

LS - 55.000

ST - 18.336

LT - 36.669

R - 741.400

PLS STA 83+715.76

GS - 7.09' 43.1" (RT)

LS - 180.000

ST - 60.089

LT - 120.098

R - 720.098

PLS STA 86+720.65

GS - 5.57' 14.4" (RT)

LS - 100.000

ST - 42.191

LT - 57.880

R - 720.000

PLS STA 89+380.46

GS - 5.24' 40.5" (RT)

LS - 100.000

ST - 42.191

LT - 57.880

R - 720.000

RP C ST 0+55.000

CLASS 'B' RIP RAP

EST. 2 TONS

EST. 6 SM.F.F.

RP C ST 0+55.000

CLASS 'B' RIP RAP

EST. 2 TONS

EST. 6 SM.F.F.

RP C ST 0+55.000

CLASS 'B' RIP RAP

EST. 2 TONS

EST. 6 SM.F.F.

RP C ST 0+55.000

CLASS 'B' RIP RAP

EST. 2 TONS

EST. 6 SM.F.F.

RP C ST 0+55.000

CLASS 'B' RIP RAP

EST. 2 TONS

EST. 6 SM.F.F.

RP C ST 0+55.000

CLASS 'B' RIP RAP

EST. 2 TONS

EST. 6 SM.F.F.

RP C ST 0+55.000

CLASS 'B' RIP RAP

EST. 2 TONS

EST. 6 SM.F.F.

RP C ST 0+55.000

CLASS 'B' RIP RAP

EST. 2 TONS

EST. 6 SM.F.F.

REVISIONS

NOTE: CLEAR & GRADE ENTIRE INTERCHANGE QUADRANT AREAS.

SEE SHEET NO. 35 FOR 'L' GRADE AND PROFILE.

SEE SHEET NO. 52 FOR RAMP 'C' GRADE AND PROFILE.

SEE SHEET NO. 53 FOR RAMP 'D' GRADE AND PROFILE.

RAMP D

PLS STA 0+32.721

GS - 6.05' 56.9" (RT)

LS - 56.000

ST - 23.329

LT - 32.721

R - 350.000

R2 - 350.000

PLS STA 2+11.222

GS - 4.47' 50.1" (RT)

LS - 292.199

ST - 195.222

LT - 1.30' 54.9"

R - 350.000

R2 - 350.000

PLS STA 3+66.877

GS - 4.35' 01.2" (RT)

LS - 56.000

ST - 18.578

LT - 37.346

R - 350.000

R2 - 350.000

RP D STA 3+60.000

CLASS 'B' RIP RAP

EST. 2 TONS

EST. 6 SM.F.F.

RP D STA 3+60.000

CLASS 'B' RIP RAP

EST. 2 TONS

EST. 6 SM.F.F.

RP D STA 3+60.000

CLASS 'B' RIP RAP

EST. 2 TONS

EST. 6 SM.F.F.

RP D STA 3+60.000

CLASS 'B' RIP RAP

EST. 2 TONS

EST. 6 SM.F.F.

RP D STA 3+60.000

CLASS 'B' RIP RAP

EST. 2 TONS

EST. 6 SM.F.F.

RP D STA 3+60.000

CLASS 'B' RIP RAP

EST. 2 TONS

EST. 6 SM.F.F.

RP D STA 3+60.000

CLASS 'B' RIP RAP

EST. 2 TONS

EST. 6 SM.F.F.


RP D STA 3+60.000

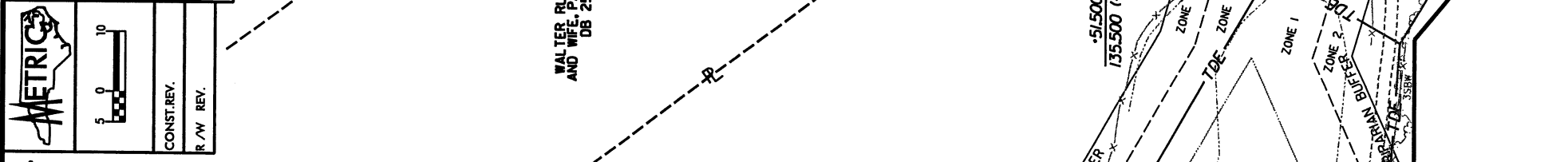
CLASS 'B' RIP RAP

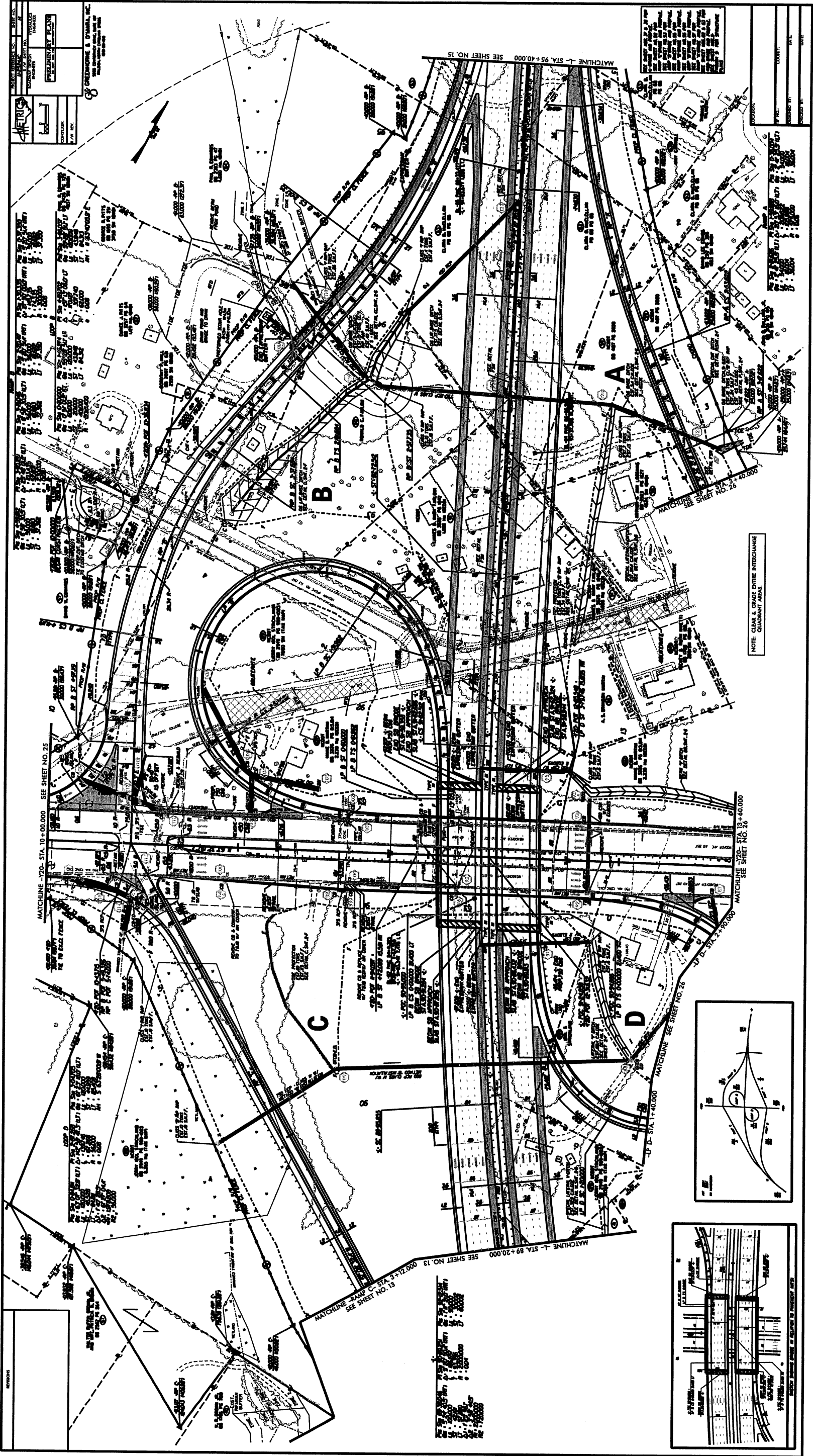
EST. 2 TONS

EST. 6 SM.F.F.

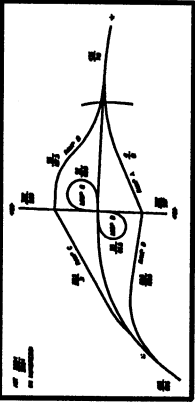
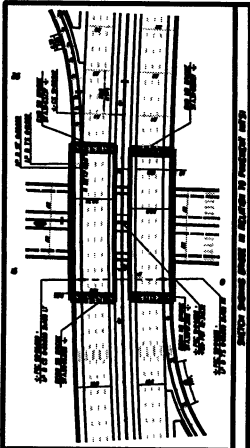
GREENHORNE & O'MARA, INC.
5565 CENTERVIEW DRIVE, SUITE 107
RALEIGH, NORTH CAROLINA 27606
(919) 851-0993

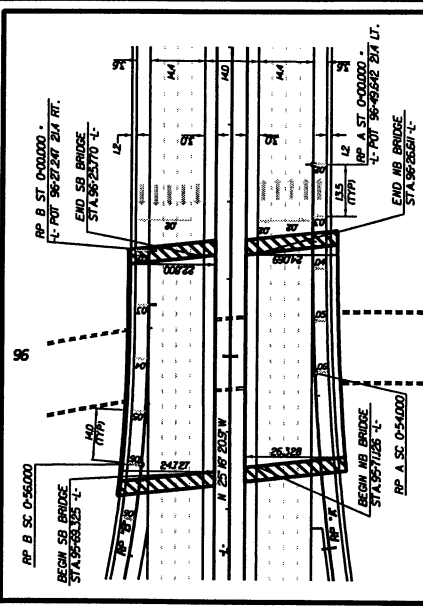
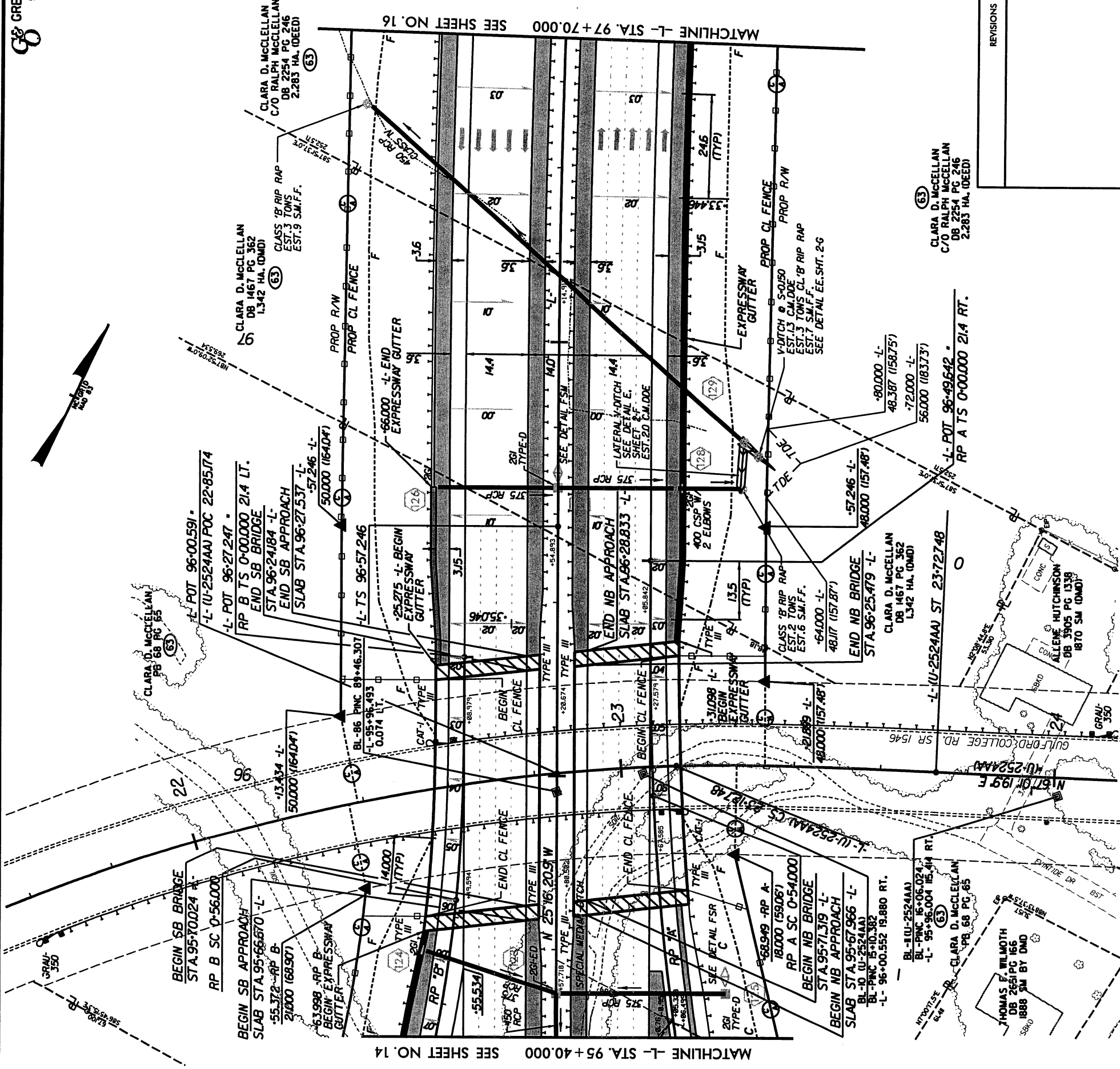
	CONST. REV.
	R / W REV.



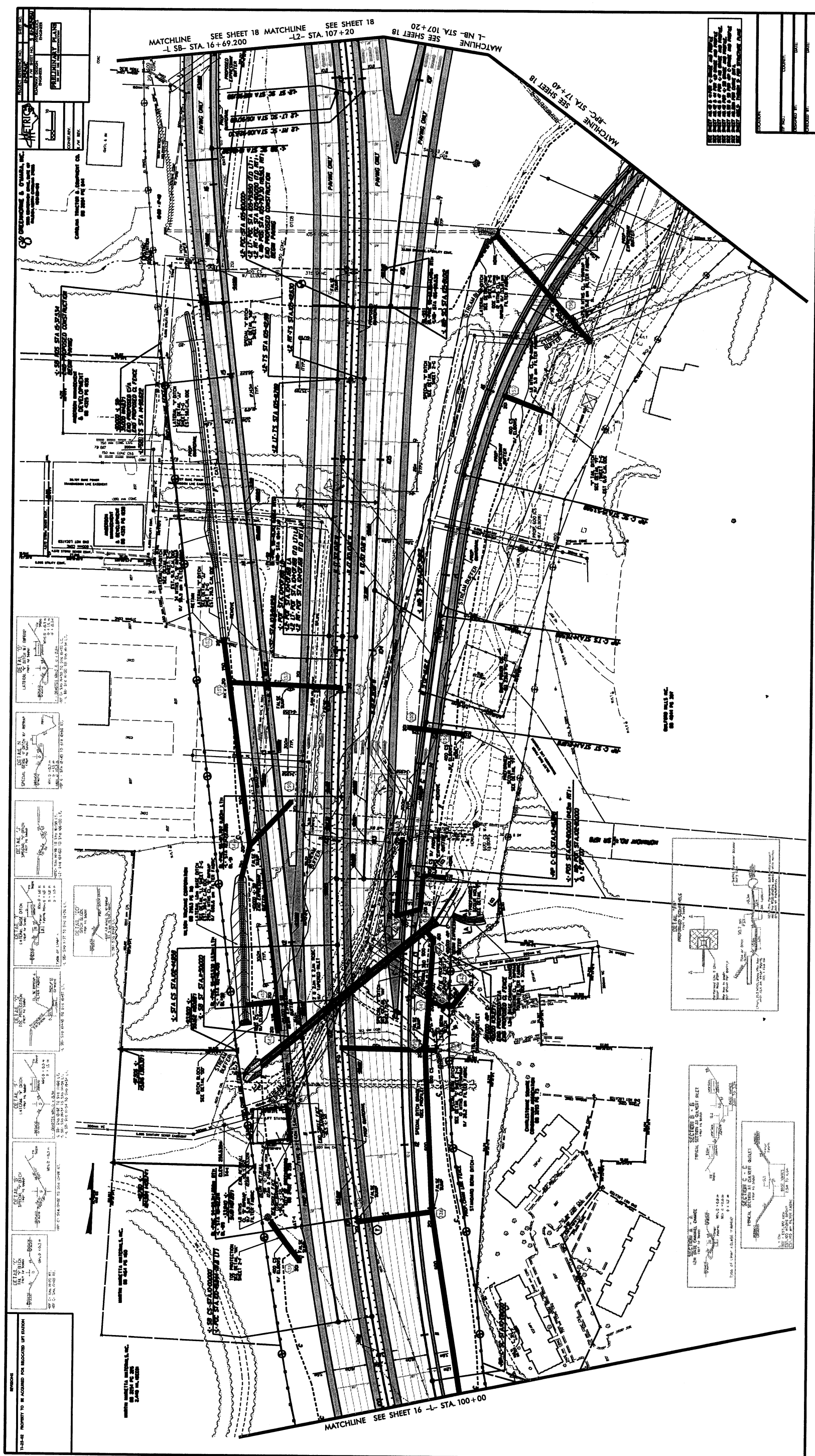


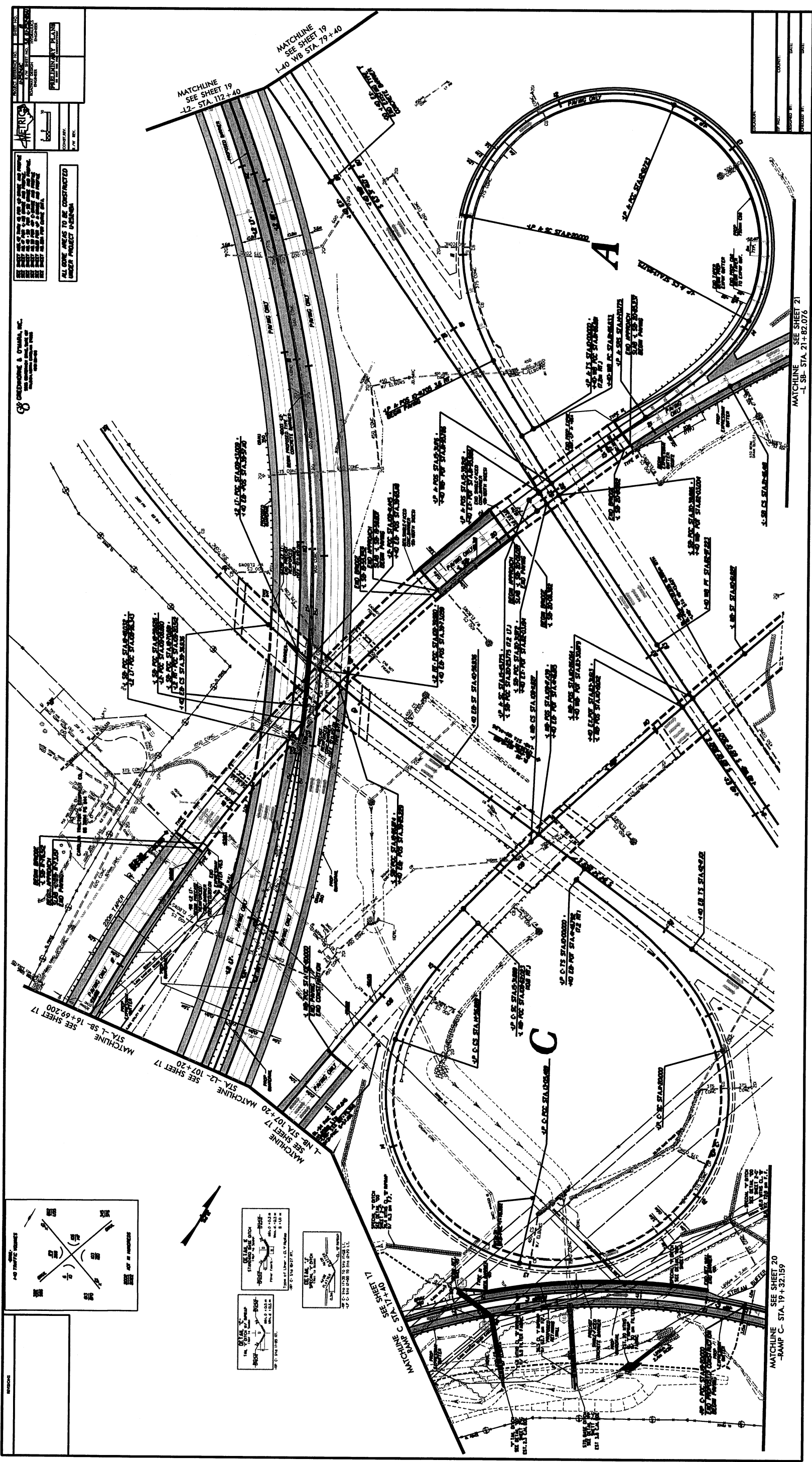
NOTE: CLEAR & GRADE ENTIRE INTERCHANGE
SUBSTANTIAL AREA





SKETCH SHOWING BRIDGE IN RELATION TO PAVEMENT (INTS)







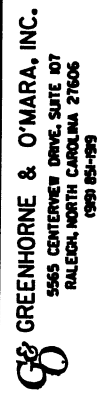
G&O GREENHORNE & O'MARA, INC.
5565 CENTERVIEW DRIVE, SUITE 107
RALEIGH, NORTH CAROLINA 27605
(919) 855-1993



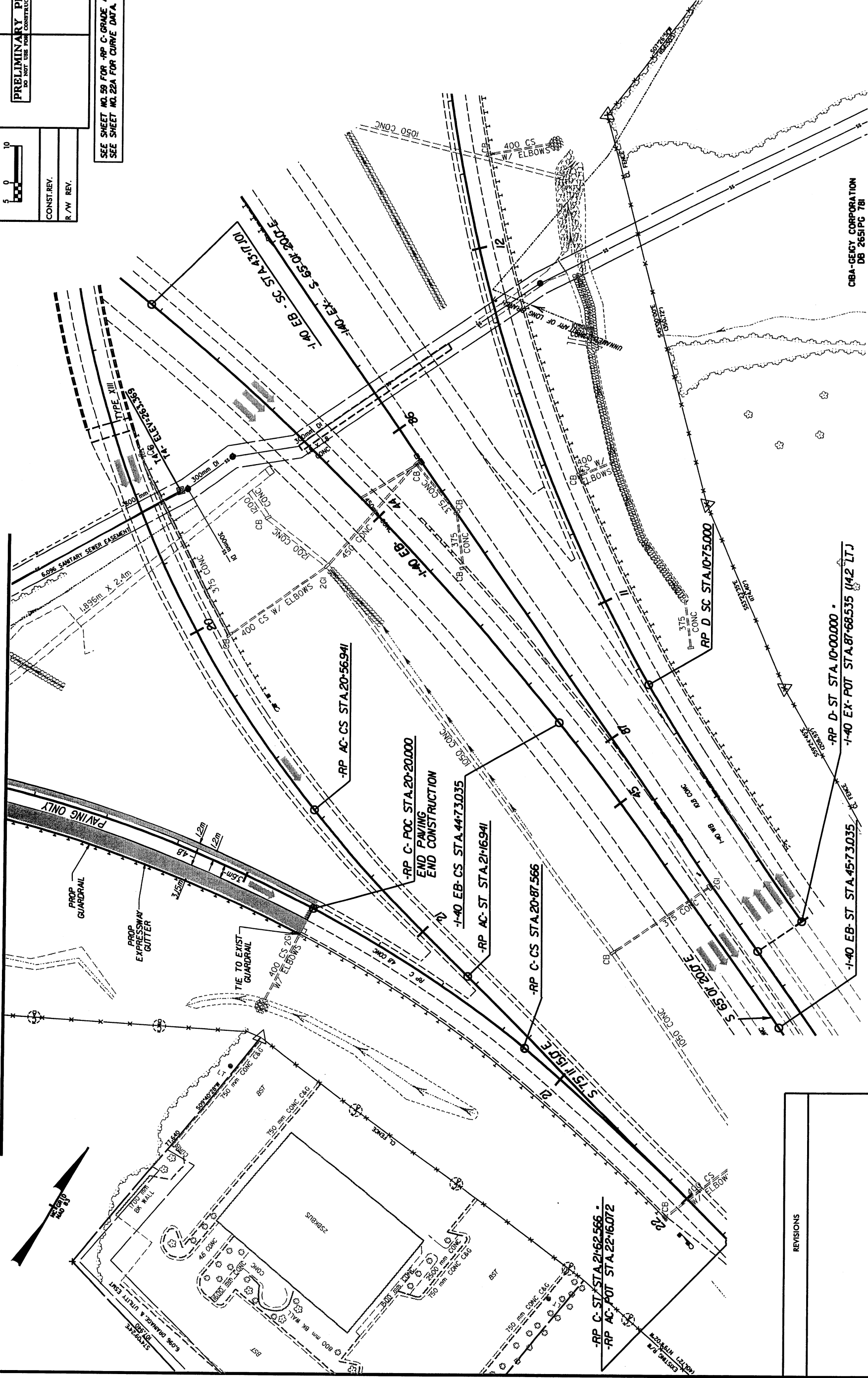
REVISIONS

	PROJECT REFERENCE NO. <u>U-2524C</u>		SHEET NO. <u>20</u>
	R/W SHEET NO. <u>910 U-2524BA</u>		
	ROADWAY DESIGN ENGINEER		HYDRAULICS ENGINEER
		<div style="border: 1px solid black; padding: 5px; text-align: center;"> PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION </div>	
CONST. REV.			
R / W REV.			

SEE SHEET NO. 59 FOR -R- C-GRADE AND PROFILE
SEE SHEET NO. 22A FOR CURVE DATA.



MATCHLINE
SEE SHEET 18
RAMP C STA. 19+32.159



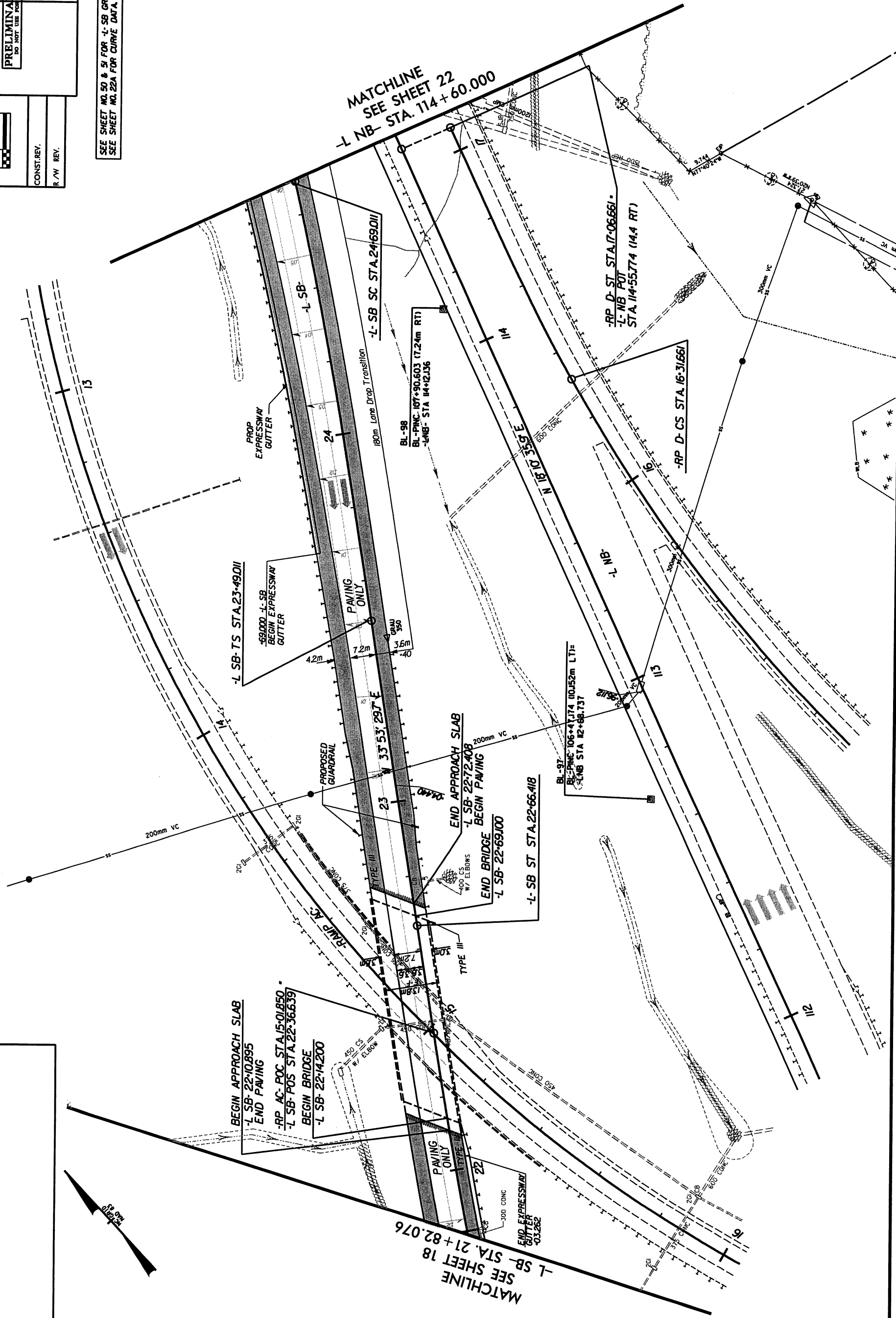
REVISIONS

-RP D-ST STA 10+00.000 -
-I-40 EX- POT STA 87+68.535 (42 LTJ

-I-40 EB-ST STA. 45+73.035

CIBA-GEIGY CORPORATION
DB 2651PG 78I

SEE SHEET NO. 50 & 51 FOR -L- SB GRADE AND PROFILE.
SEE SHEET NO. 22A FOR CURVE DATA.




SEE SHEET NO. 51 FOR -L- SB GRADE AND PROFILE.
SEE SHEET NO. 22A FOR CURVE DATA.



DI: PC STA. 10/1970 PROCTER & GAMBLE MANUFACTURING COMPANY DB 4089 PC 1300

REVISIONS

 GREENHORNE & O'MARA, INC.
5565 CENTERVIEW DRIVE, SUITE 107
RALEIGH, NORTH CAROLINA 27605
(919) 891-1959



PROJECT REFERENCE NO.
U-2524AC

R/W SHEET NO.
ROADWAY DESIGN
ENGINEER

SHEET NO.
22A

HYDRAULICS
ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION



I-40 INTERCHANGE CURVE DATA

-L- SB

Pls Sta 10+50.013 Θs = 3° 01' 51.2" Ls = 150.000 Lt = 100.015 St = 50.013	Pls Sta 15+78.641 Θs = 3° 55' 43.9" Ls = 120.000 Lt = 80.020 St = 40.018	Pls Sta 18+90.823 Δ = 34° 33' 38.1 (RT) Ls = 527.796 Lt = 272.202 R = 875.000 e = SEE PLANS	Pls Sta 21+86.436 Θs = 3° 55' 43.9" Ls = 120.000 Lt = 80.020 St = 40.018	Pls Sta 24+290.36 Θs = 4° 26' 08.9" Ls = 120.000 Lt = 80.025 St = 40.023	Pls Sta 25+15.3349 Δ = 6° 50' 36.0 (LT) Ls = 92.565 Lt = 46.338 R = 775.000 e = 0.06	Pls Sta 26+01.599 Θs = 4° 26' 08.9" Ls = 120.000 Lt = 80.025 St = 40.023
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RAMP A

Pls Sta 11+05.720 Θs = 5° 26' 15.9" Ls = 100.000 Lt = 66.706 St = 33.365	Pls Sta 13+46.887 Δ = 45° 08' 56.5 (RT) Ls = 394.000 Lt = 207.869 R = 500.000 e = SEE PLANS	Pls Sta 15+53.024 Θs = 3° 26' 55.9" Ls = 60.000 Lt = 40.008 St = 20.007	Pls Sta 16+89.976 Θs = 2° 57' 48.9" Ls = 60.000 Lt = 40.006 St = 20.005	Pls Sta 17+84.961 Δ = 14° 44' 03.4 (RT) Ls = 149.154 Lt = 74.991 R = 580.000 e = 0.05	Pls Sta 18+79.129 Θs = 2° 57' 48.9" Ls = 60.000 Lt = 40.006 St = 20.005
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RAMP AC

Pls Sta 9+45.139 Θs = 7° 26' 15.9" Ls = 60.000 Lt = 40.0075 St = 20.0069 e = SEE PLANS	Pls Sta 10+20.905 Δ = 12° 43' 47.0 (RT) Ls = 111.0678 Lt = 53.7135 R = 500.000 e = SEE PLANS	Pls Sta 12+45.588 Θs = 4° 31' 24.1" Ls = 60.000 Lt = 40.0131 St = 20.0119	Pls Sta 14+84.042 Δ = 59° 47' 25.5 (LT) Ls = 396.5451 Lt = 218.4674 R = 380.000 e = SEE PLANS	Pls Sta 16+82.132 Θs = 4° 31' 24.1" Ls = 60.000 Lt = 40.0131 St = 20.0119	Pls Sta 18+68.596 Θs = 5° 43' 46.5" Ls = 60.000 Lt = 40.0210 St = 20.0191 e = 0.06	Pls Sta 19+75.039 Δ = 32° 09' 20.0 (LT) Ls = 168.3661 Lt = 86.4645 R = 300.0000 e = 0.06	Pls Sta 20+76.960 Θs = 5° 43' 46.5" Ls = 60.000 Lt = 40.0210 St = 20.0191	Pls Sta 23+50.943 Θs = 1° 57' 51.9" Ls = 60.000 Lt = 40.0025 St = 20.0022 e = 0.04	Pls Sta 24+18.608 Δ = 6° 14' 11.2 (RT) Ls = 60.000 Lt = 47.6673 R = 875.0000 St = 20.0022	Pls Sta 24+86.184 Θs = 1° 57' 51.9" Ls = 60.000 Lt = 40.0025 St = 20.0022
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140 EB

Pls Sta 33+57.216 Δ = 7° 14' 26.9 (RT) Ls = 113.284 Lt = 56.717 R = 886.400 e = SEE PLANS	Pls Sta 34+43.790 Θs = 5° 52' 34.1" Ls = 90.000 Lt = 60.008 St = 30.007	Pls Sta 37+85.762 Δ = 30° 41' 44.9 (LT) Ls = 309.981 Lt = 158.807 R = 578.600 e = SEE PLANS	Pls Sta 39+76.977 Θs = 5° 56' 29.4" Ls = 120.000 Lt = 80.045 St = 40.041	Pls Sta 42+83.783 Δ = 11° 54' 11.0" Ls = 100.000 Lt = 66.682 St = 33.347 e = SEE PLANS	Pls Sta 43+95.350 Δ = 11° 54' 44.9 (RT) Ls = 155.934 Lt = 78.249 R = 750.000 e = SEE PLANS
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140 WB

Pls Sta 78+17.852 Δ = 1° 28' 39.0 (RT) Ls = 130.391 Lt = 65.199 R = 500.000 e = N/C	Pls Sta 82+32.032 Δ = 1° 28' 39.0 (LT) Ls = 130.391 Lt = 65.199 R = 500.000 e = SEE PLANS
--	--

LOOP A

Pls Sta 10+81.986 Θs = 43° 39' 37.4" Ls = 120.000 St = 43.020 Δ1 = 0° 38' 21.2" Δ2 = 43° 01' 13.7" R1 = 4992.800 R2 = 80.000	Pls Sta 12+17.918 Δ = 10° 30' 06.3 (RT) Ls = 141.723 Lt = 91.918 R = 80.000 e = 0.08	Pls Sta 13+50.584 Δ = 95° 00' 27.5 (RT) Ls = 134.052 Lt = 88.861 R = 88.000 e = SEE PLANS	Pls Sta 14+21.310 Θs = 25° 51' 26.5" Ls = 75.000 Lt = 50.588 St = 25.535	Pls Sta 15+20.780 Θs = 2° 26' 07.8" Ls = 75.000 Lt = 50.005 St = 25.004
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LOOP C

Pls Sta 10+81.945 Θs = 38° 11' 49.9" Ls = 120.000 Lt = 81.945 St = 41.774	Pls Sta 12+70.039 Δ = 118° 05' 08.4 (RT) Ls = 185.489 Lt = 150.039 R = 90.000 e = 0.08	Pls Sta 14+06.121 Δ = 96° 23' 05.1 (RT) Ls = 151.401 Lt = 100.633 R = 90.000 e = 0.08	Pls Sta 14+83.815 Θs = 25° 18' 57.7" Ls = 75.000 St = 26.925 Δ1 = 1° 24' 41.9" Δ2 = 23° 54' 15.4" R1 = 1489.2000 R2 = 90.000
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RAMP D

Pls Sta 10+50.019 Θs = 4° 56' 21.4" Ls = 75.000 Lt = 50.0195 St = 25.0177	Pls Sta 13+98.769 Δ = 7° 19' 13.1 (RT) Ls = 556.661 Lt = 323.7686 R = 435.0000 e = 0.06	Pls Sta 16+56.679 Θs = 4° 56' 21.4" Ls = 75.000 Lt = 50.0195 St = 25.0177
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-L- NB

Pls Sta 10+39.487 Θs = 3° 42' 40.3" Ls = 75.000 St = 35.539 Δ1 = 1° 33' 45.0" Δ2 = 2° 08' 55.3" R1 = 1375.000 R2 = 100.000	Pls Sta 12+11.782 Δ = 15° 34' 38.8 (RT) Ls = 27.878 Lt = 136.782 R = 100.0000 e = 0.05	Pls Sta 13+17.881 Θs = 2° 08' 54.9" Ls = 75.000 Lt = 50.004 St = 25.003	Pls Sta 15+28.618 Θs = 6° 08' 19.8" Ls = 60.000 Lt = 50.030 St = 25.027 e = 0.07	Pls Sta 18+88.134 Δ = 87° 24' 48.4 (RT) Ls = 531.978 Lt = 334.546 R = 350.0000	Pls Sta 21+2.593 Θs = 6° 08' 19.8" Ls = 75.000 Lt = 50.030 St = 25.027
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RAMP C e 1-40

Pls Sta 106+41.829 Θs = 6° 08' 19.8" Ls = 150.000 Lt = 100.060 St = 50.055	Pls Sta 110+35.010 Δ = 52° 14' 29.6 (LT) Ls = 638.251 Lt = 343.241 R = 700.000 e = SEE PLANS	Pls Sta 113+80.074 Θs = 6° 08' 19.8" Ls = 150.000 Lt = 100.060 St = 50.055
--	---	--

-L2- LT.

-L2- RT.

-L2-

-L-

REVISIONS

-Y16-
PI Sta 12+38.489
 $\Delta = 12' 12" 00.2' (LT)$
L = 54.889
T = 27.549
R = 257.780
e = 0.04
PI Sta 16+56.548
 $\Delta = 8' 35' 51.4' (RT)$
L = 525.197
T = 263.092
R = 3,500.000
e = N C

GREENHORNE & O'MARA, INC.
5565 CENTERVIEW DRIVE, SUITE 407
RALEIGH, NORTH CAROLINA 27606
(919) 851-1999



PROJECT REFERENCE NO.
U-2524AC

SHEET NO.
23

R/W SHEET NO.
ROADWAY DESIGN
ENGINEER

HYDRAULICS
ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

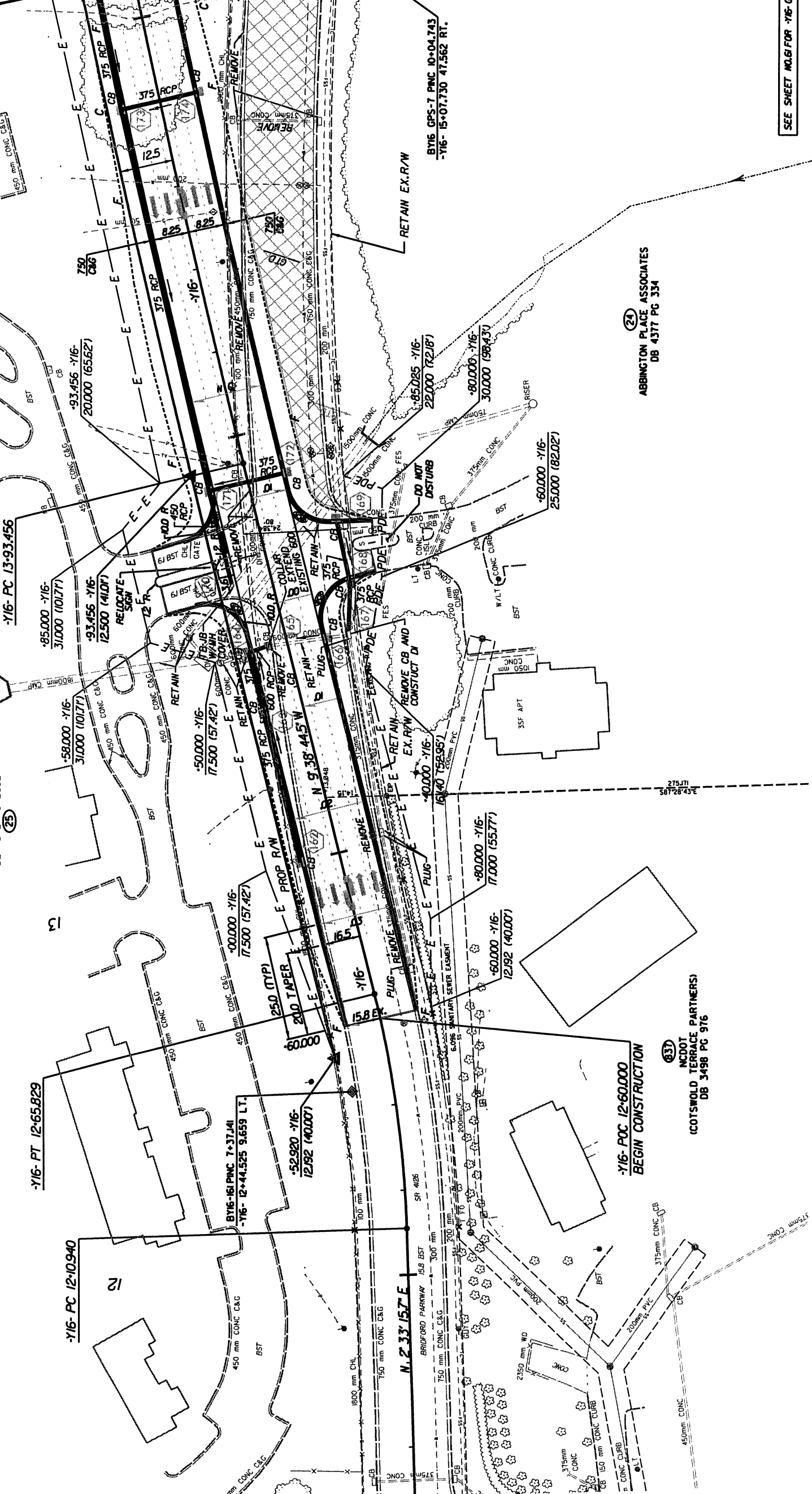
CONST. REV.

R/W REV.



ML NC APARTMENTS
LP LIMITED PARTNERSHIP
DB 4372 PG 2052

MATCHLINE -Y16- STA. 15+10.000
SEE SHEET NO. 10



ABBINGTON PLACE ASSOCIATES
DB 4377 PG 334

(COTSWOLD TERRACE PARTNERS)
DB 3498 PG 976

SEE SHEET NO. 6 FOR -Y16- GRADE AND PROFILE.

REVISIONS

GREENHORNE & O'MARA, INC.
5565 CENTERVIEW DRIVE, SUITE 107
RALEIGH, NORTH CAROLINA 27606
(919) 851-0993

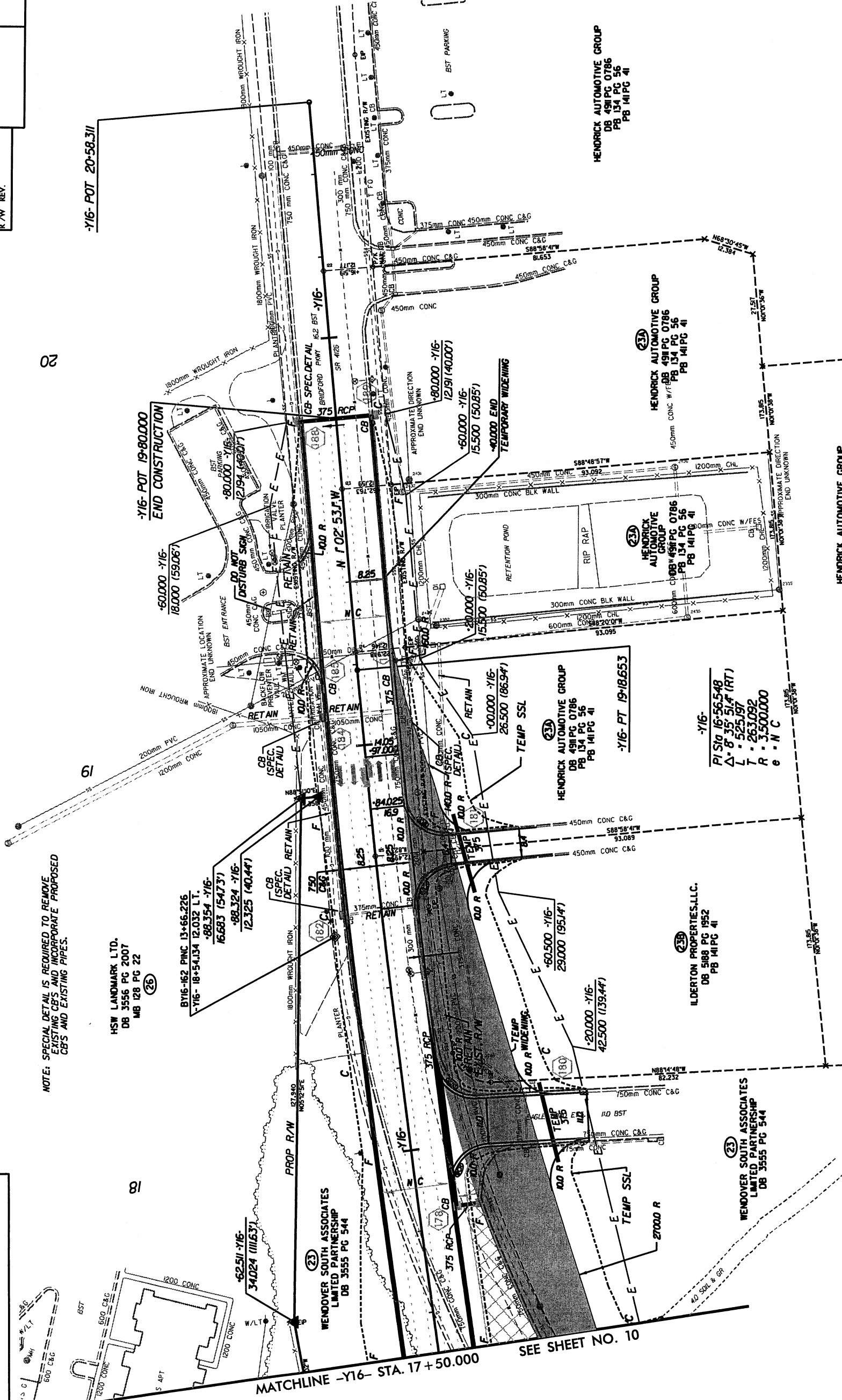


PROJECT REFERENCE NO. **U-2524AC**
SHEET NO. **24**
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

CONST. REV.
R/W REV.



NOTE: SPECIAL DETAIL IS REQUIRED TO REMOVE EXISTING CBS AND INCORPORATE PROPOSED CBS AND EXISTING PIPES.



MATCHLINE -Y16- STA. 17+50.00

SEE SHEET NO. 10

SEE SHEET NO. 62 FOR -Y16- GRADE AND PROFILE.


PROJECT NUMBER: 100-000000-01

SHEET NO. 10

PROPOSED

PRELIMINARY PLAN

DATE: 10/1/2010



GOLDER ASSOCIATES, INC.

1000 WEST 10TH AVENUE, SUITE 1000

DENVER, COLORADO 80202

TEL: 303.733.1000

FAX: 303.733.1001

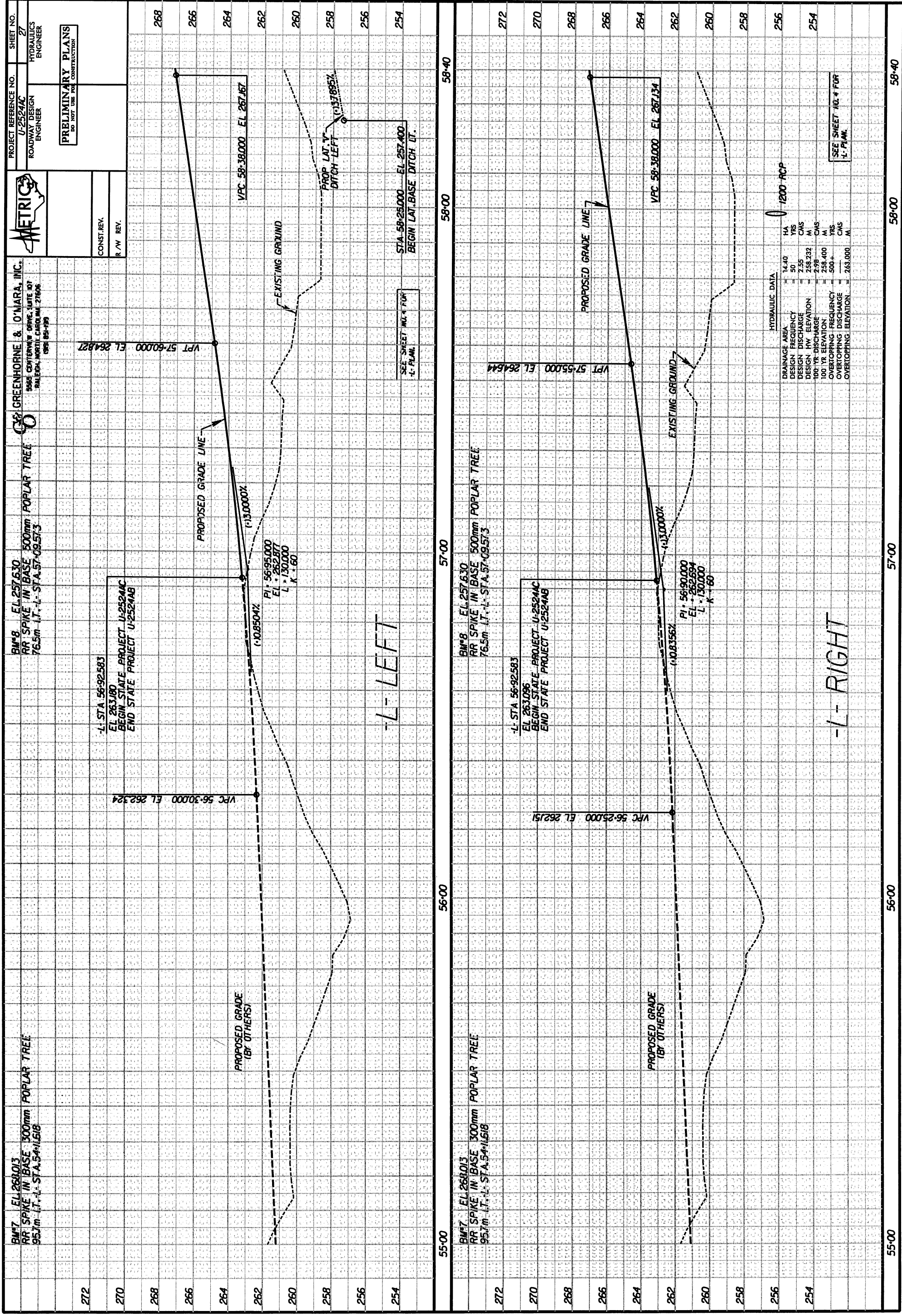
WWW.GOLDER.COM

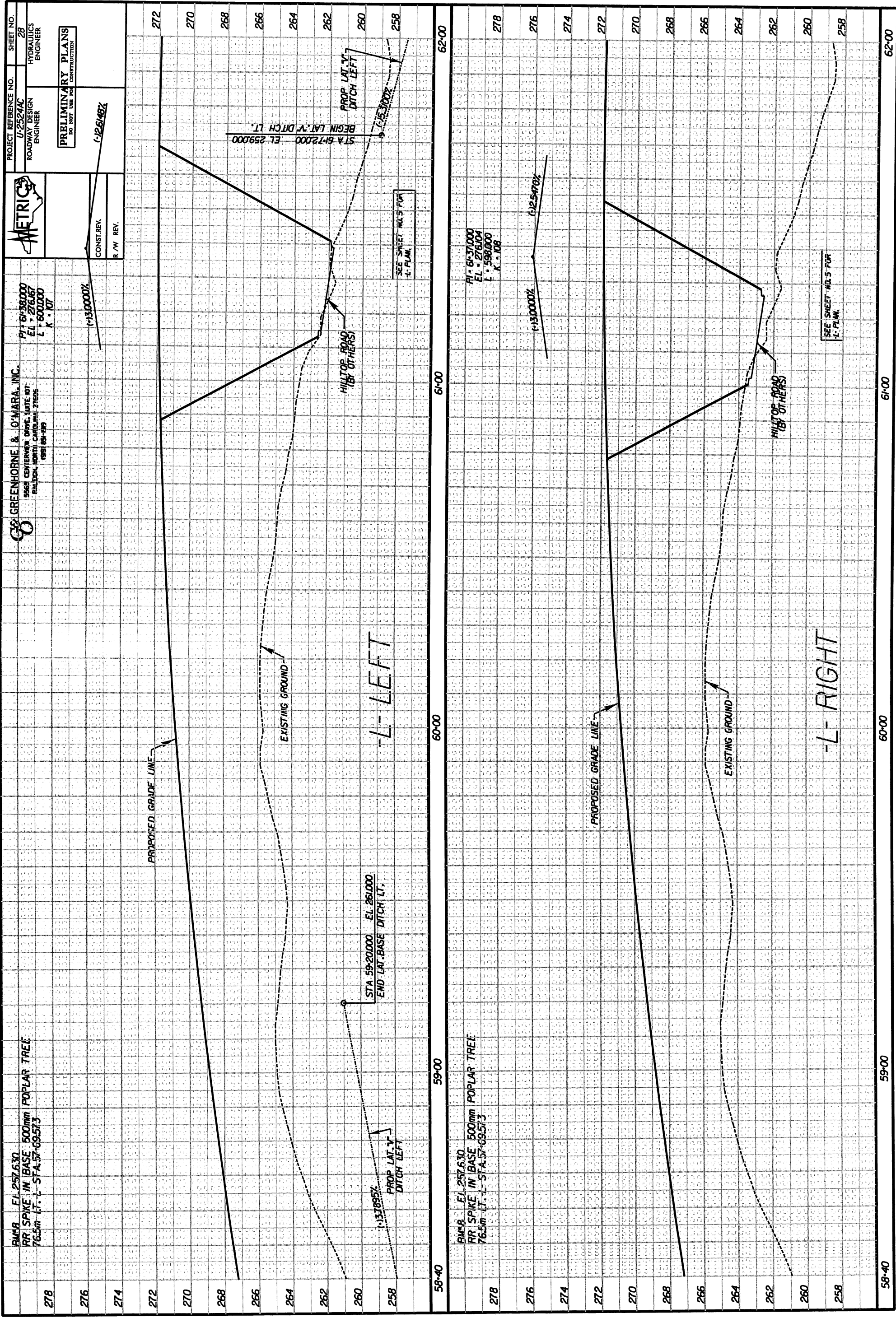
INTERCHANGES

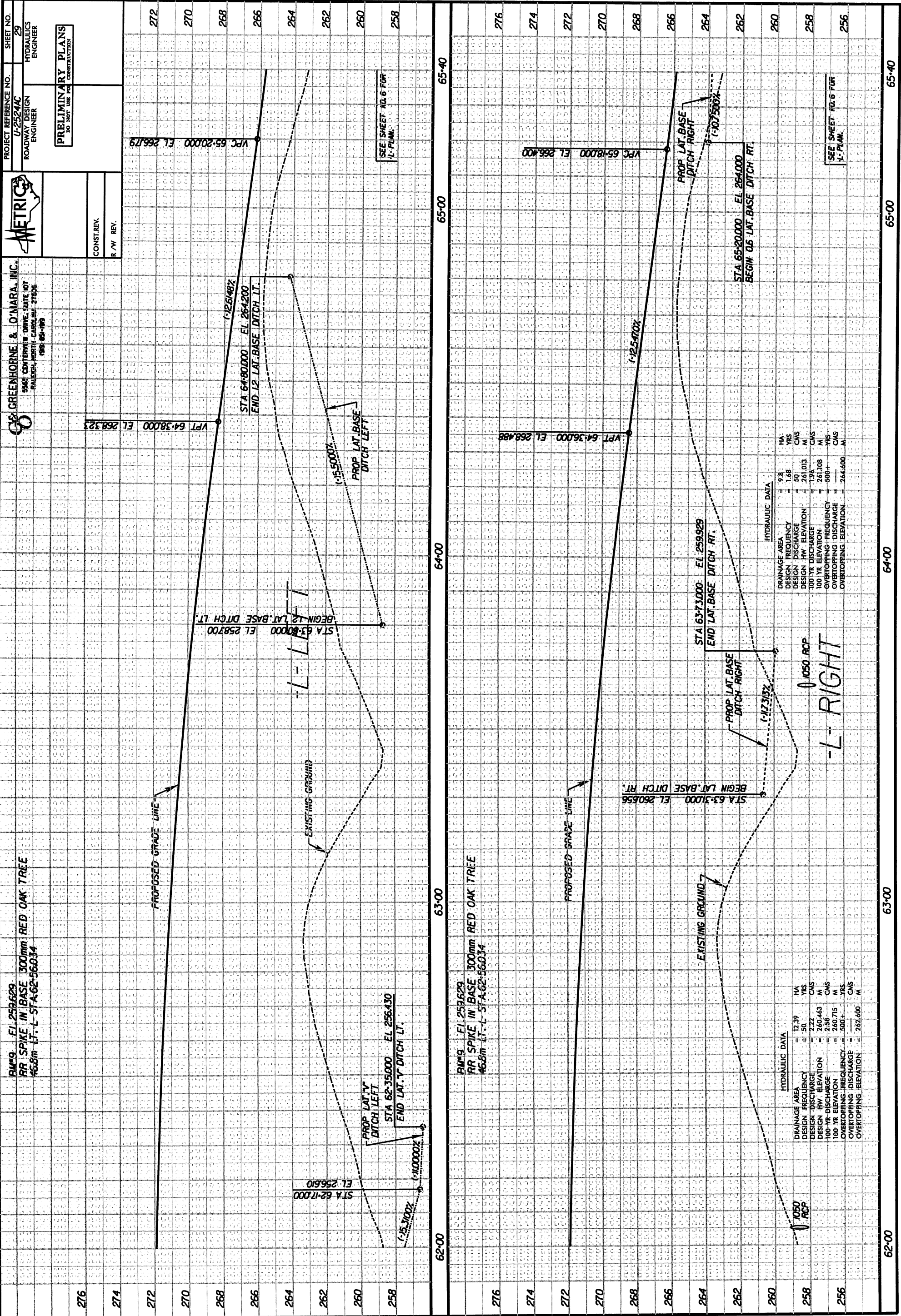
NOTE: CLEAR & GRADE ENTIRE INTERCHANGE QUADRANT AREA.

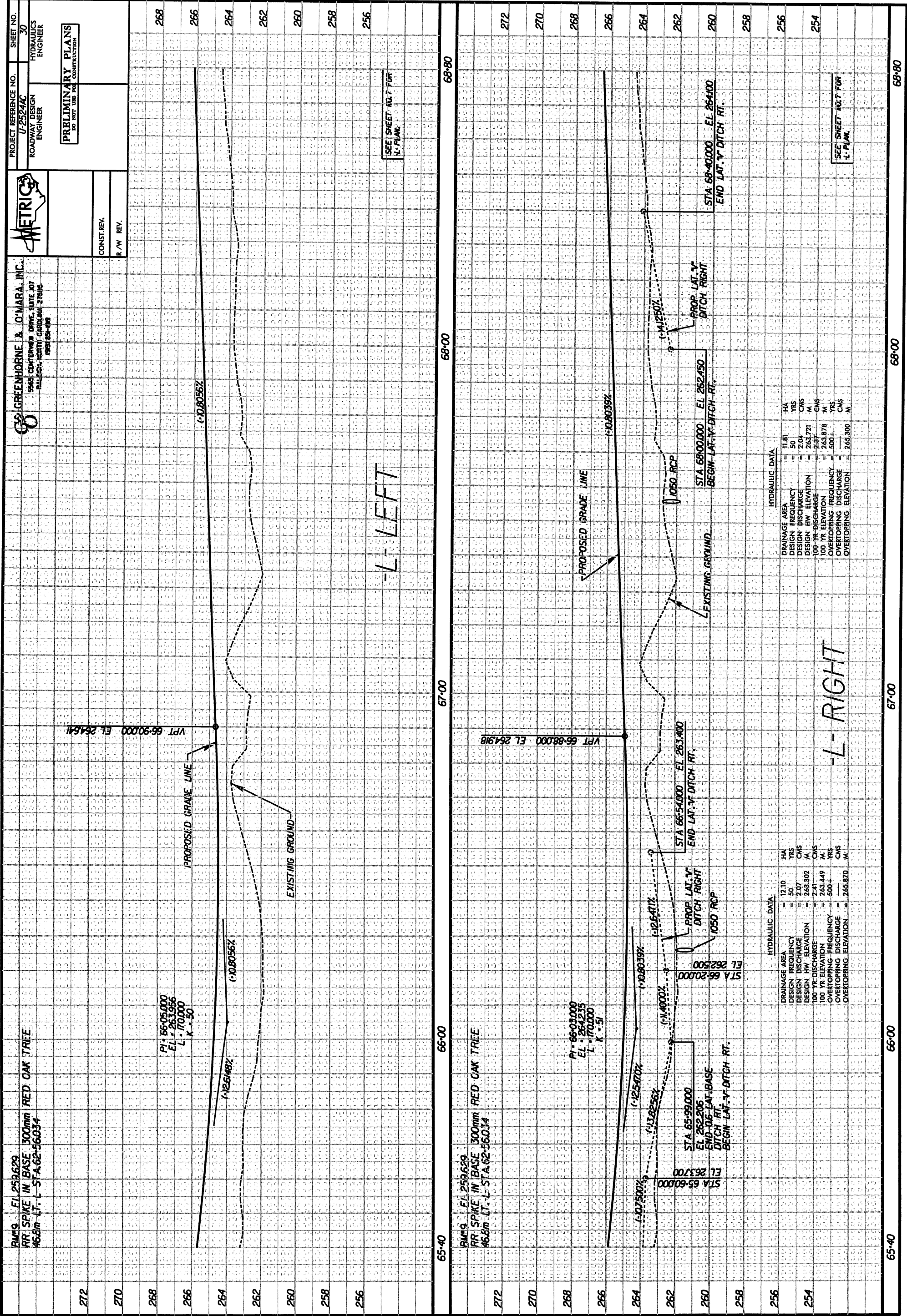
NOTE: REMOVE ALL EXISTING DRIVEWAY PILES WITHIN THE PROPOSED R/W ON THIS SHEET UNLESS OTHERWISE NOTED.

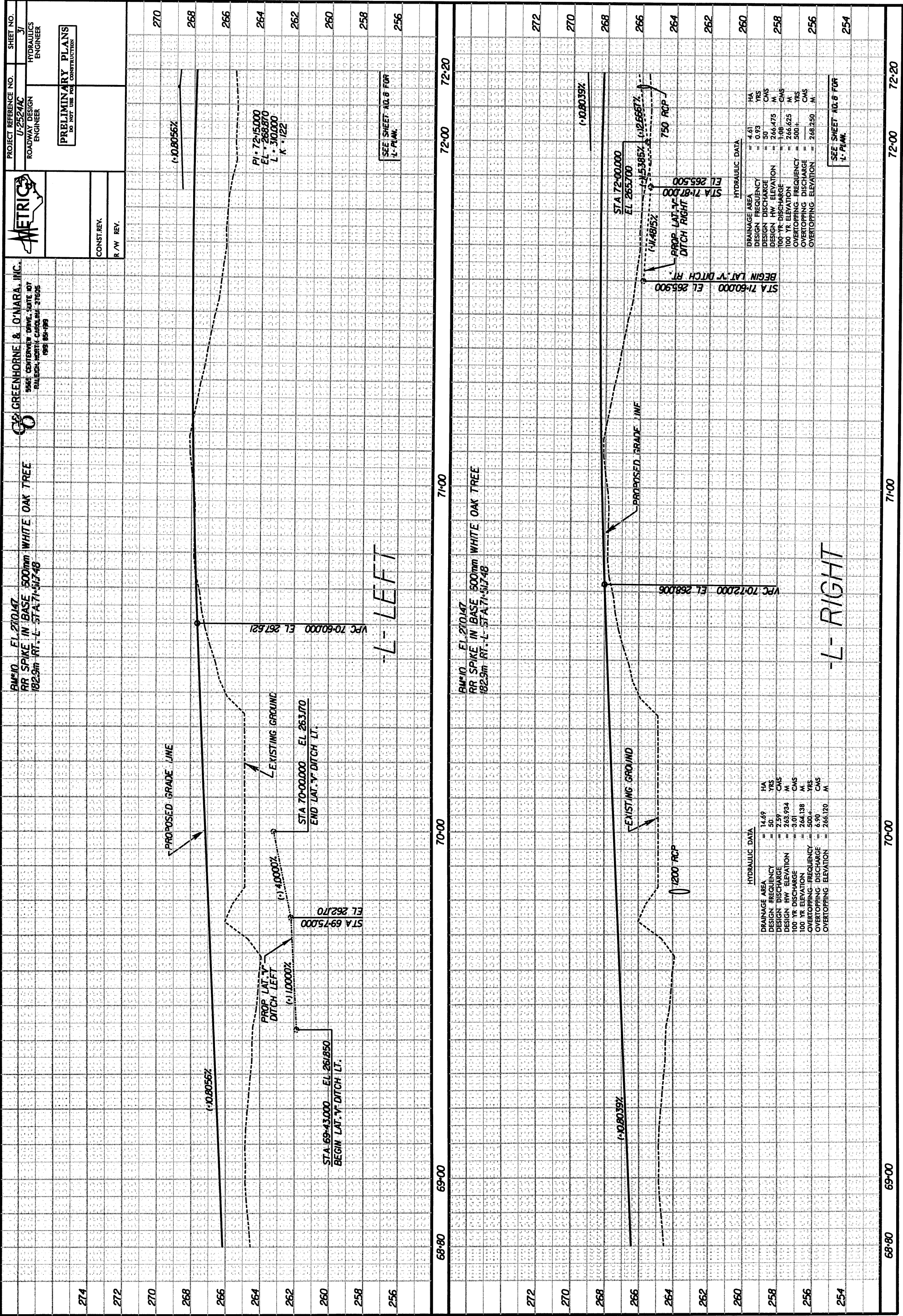
STATION	EXISTING ELEVATION	PROPOSED ELEVATION	REMARKS
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1+45.00	1005.00	1005.00	
1+50.00	1010.00	1010.00	
1+55.00	1015.00	1015.00	
1+60.00	1020.00	1020.00	
1+65.00	1025.00	1025.00	
1+70.00	1030.00	1030.00	
1+75.00	1035.00	1035.00	
1+80.00	1040.00	1040.00	
1+85.00	1045.00	1045.00	
1+90.00	1050.00	1050.00	
1+95.00	1055.00	1055.00	
2+00.00	1060.00	1060.00	END OF CURVE

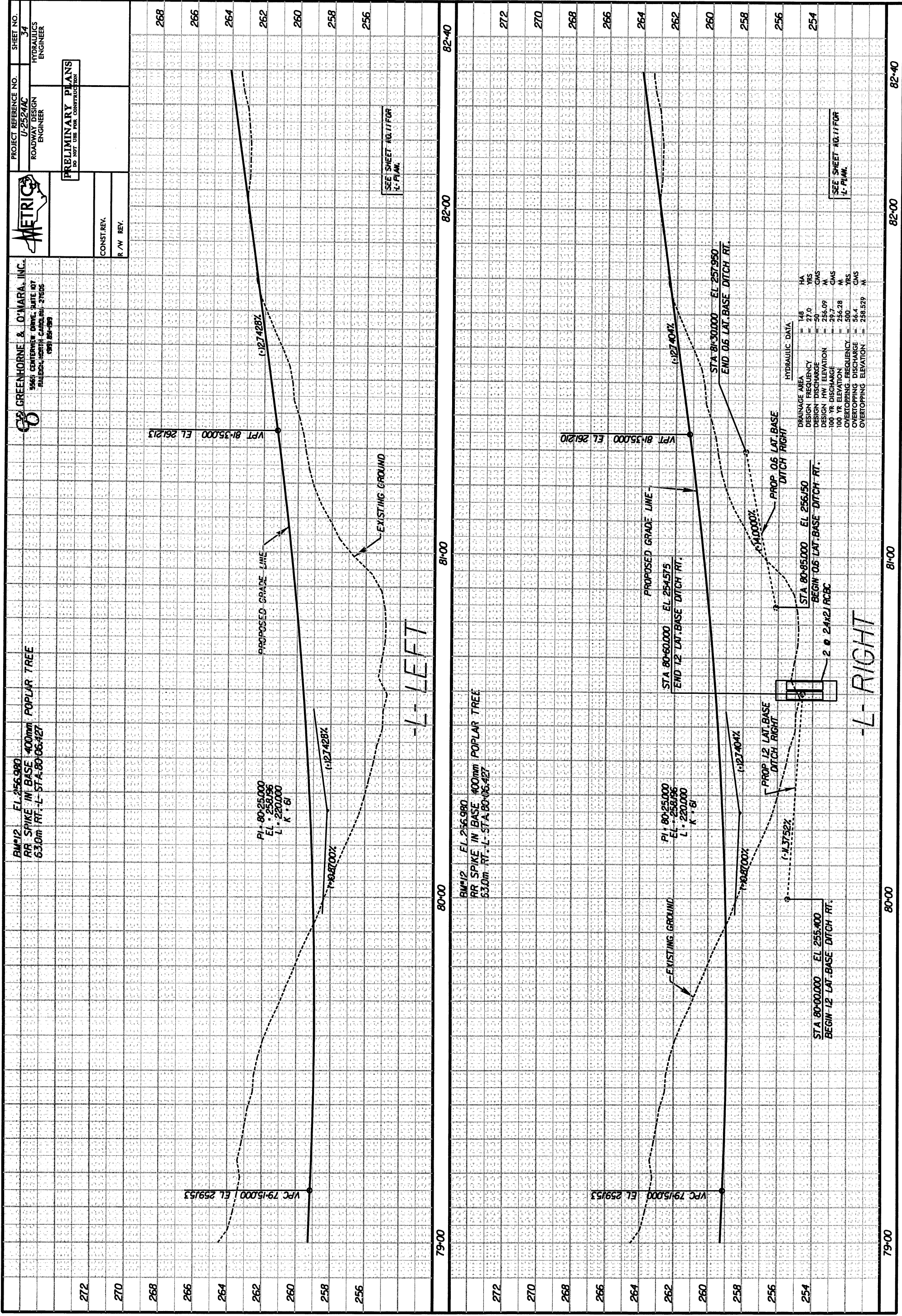


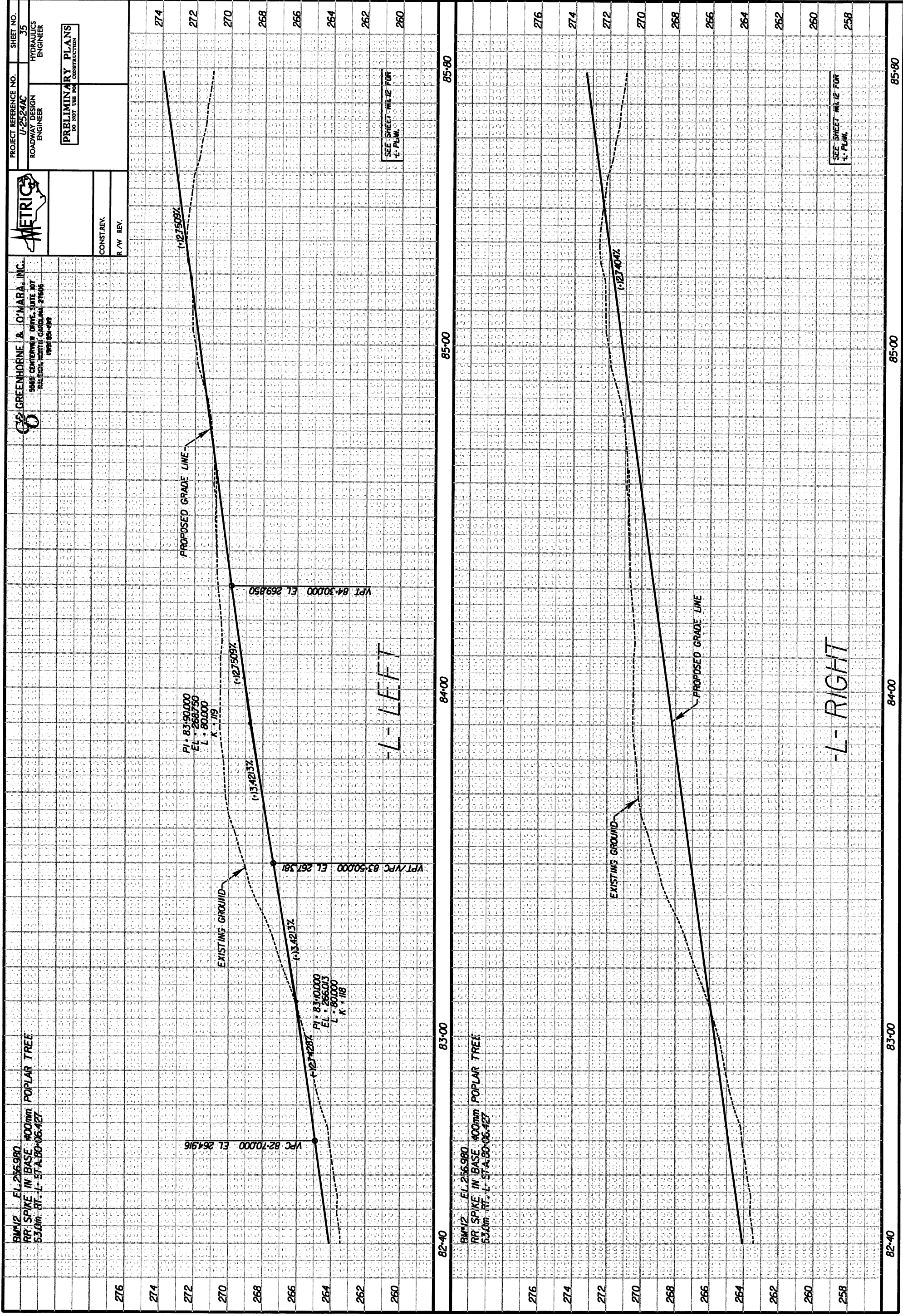


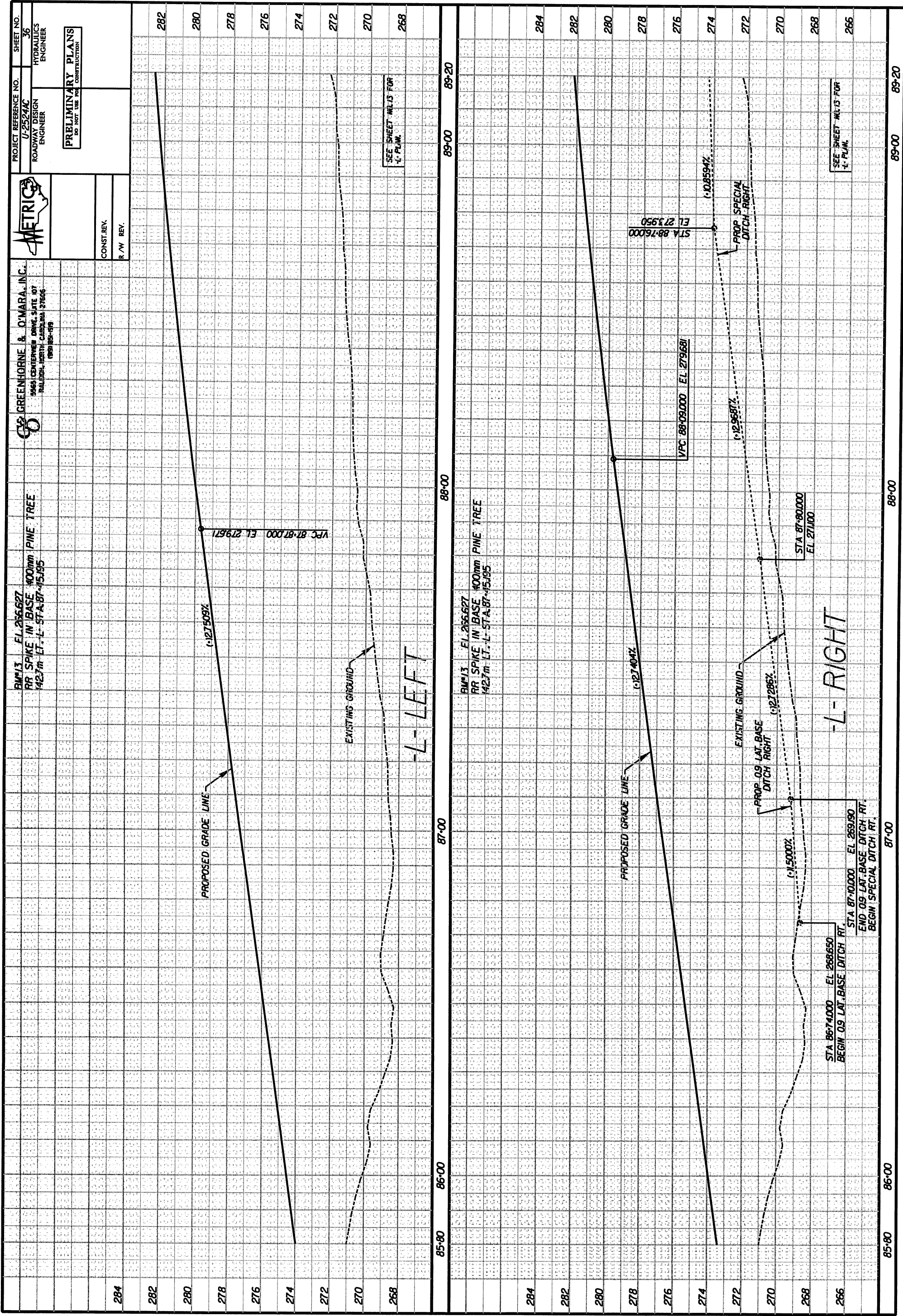


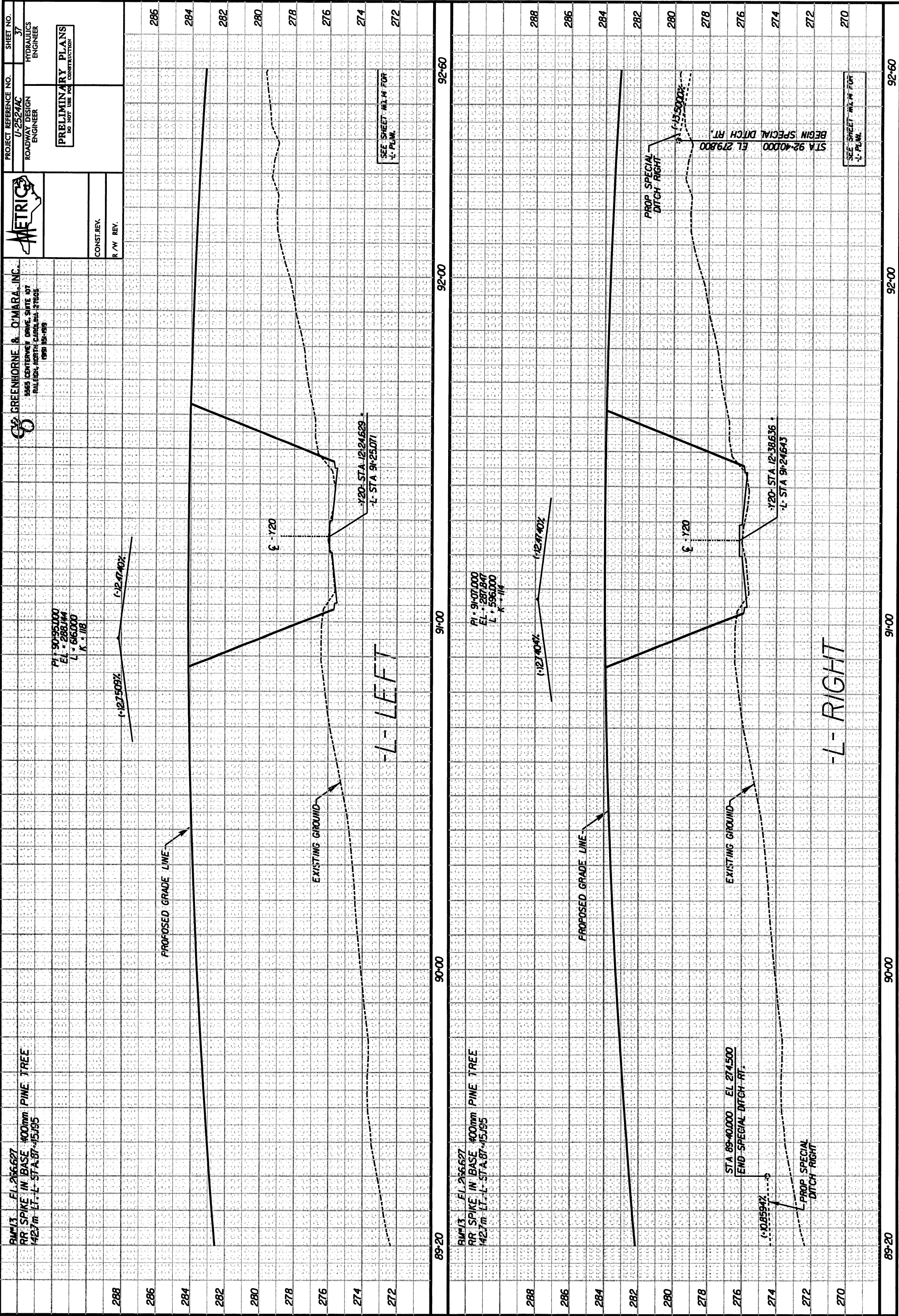


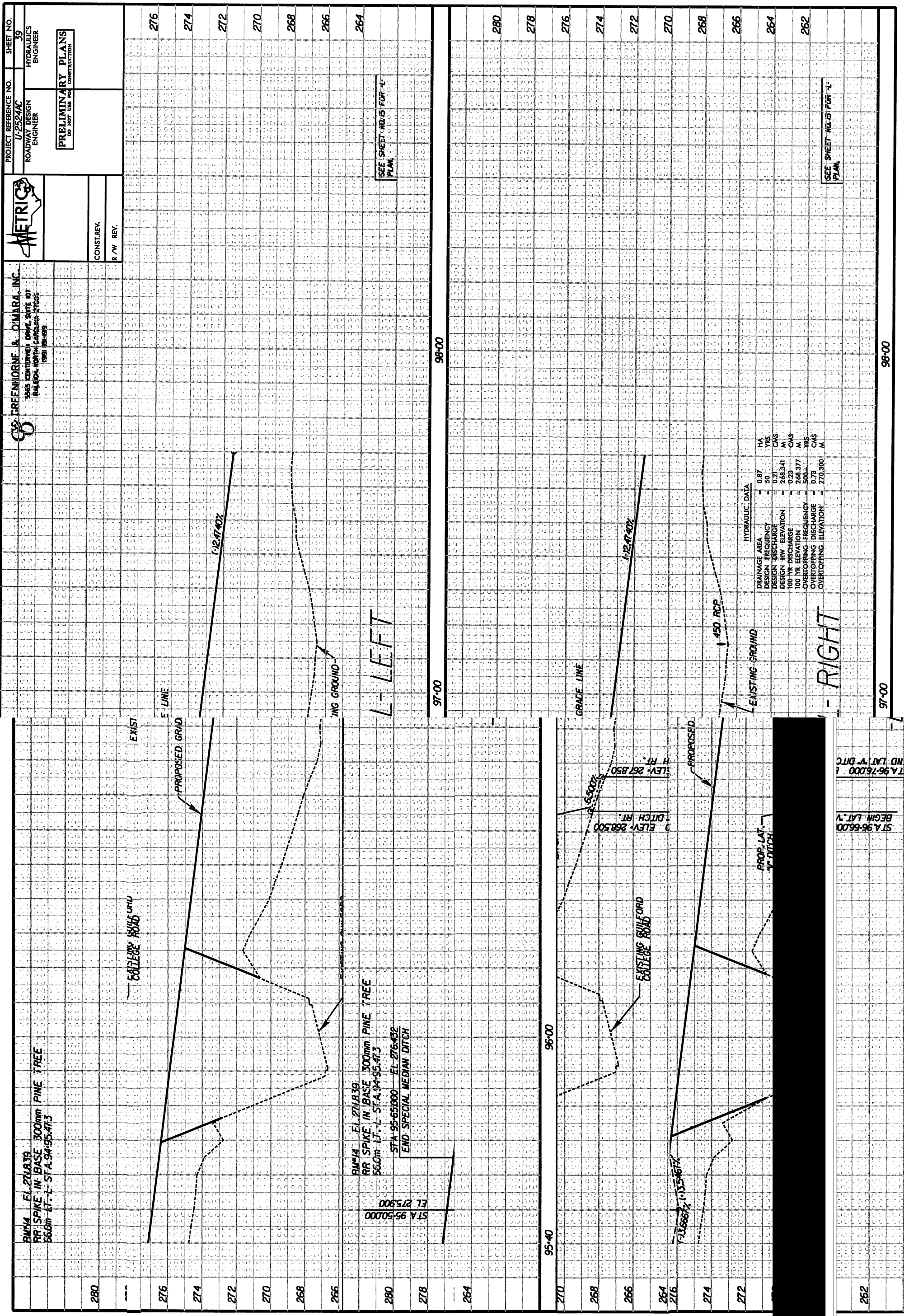


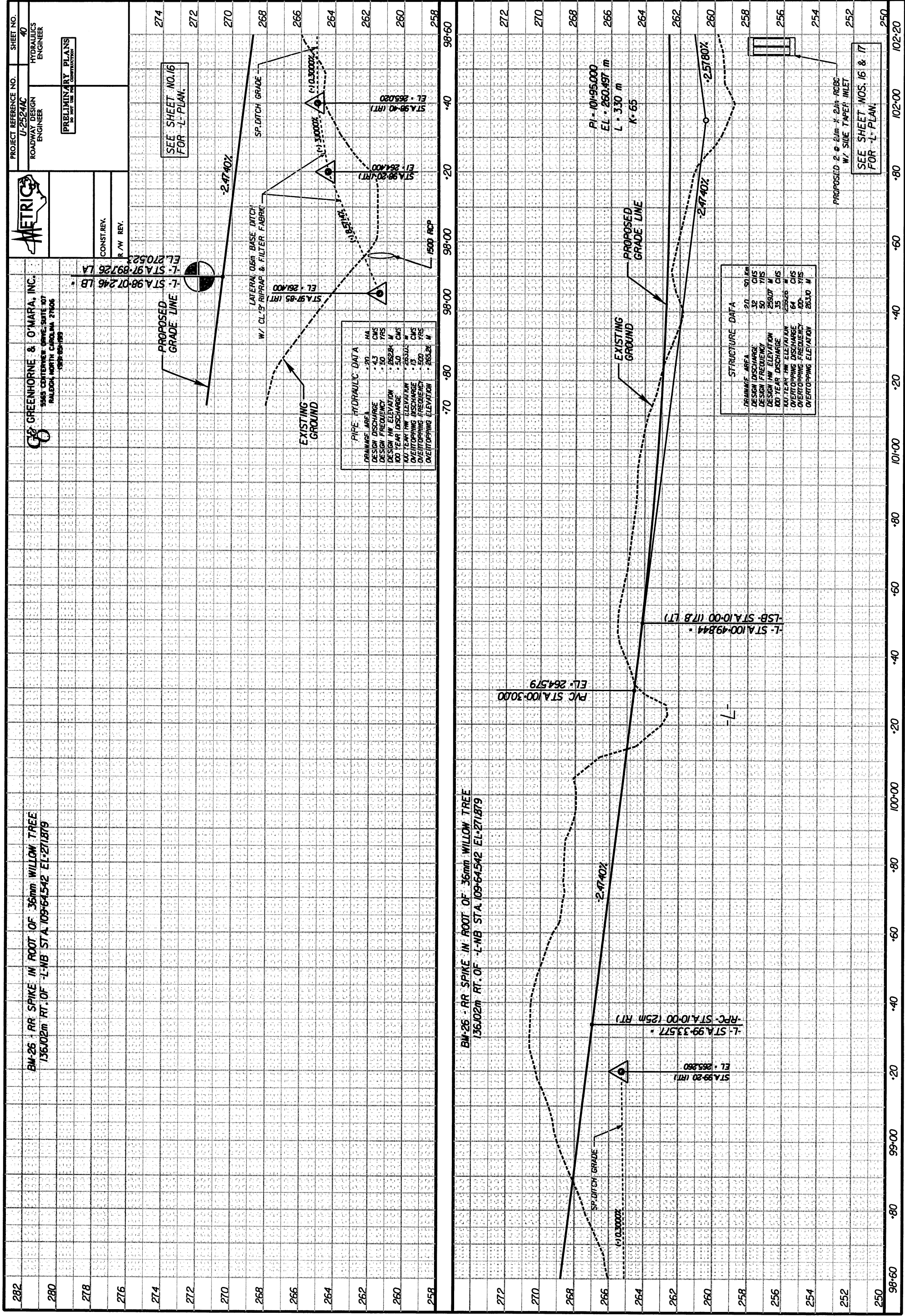


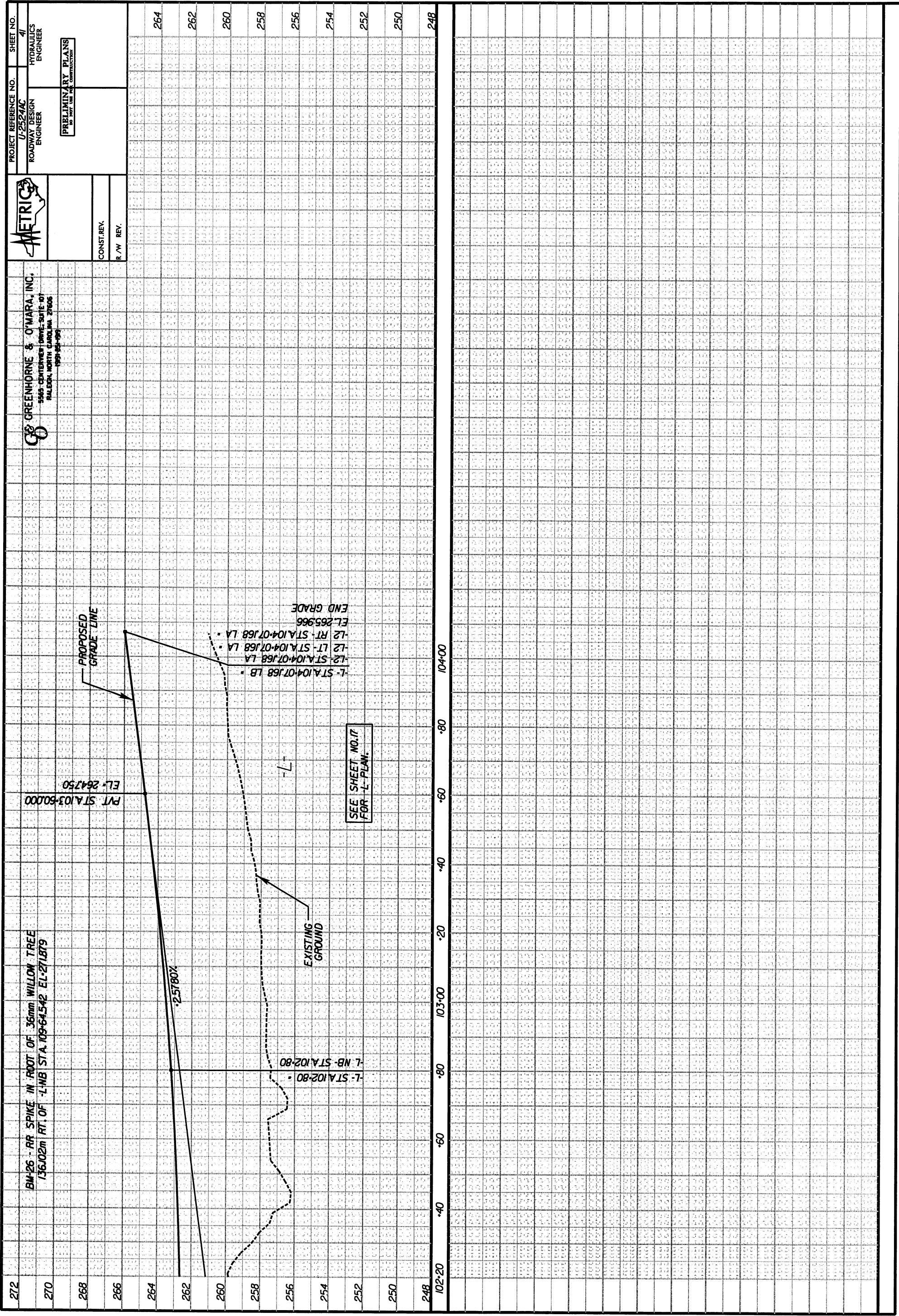


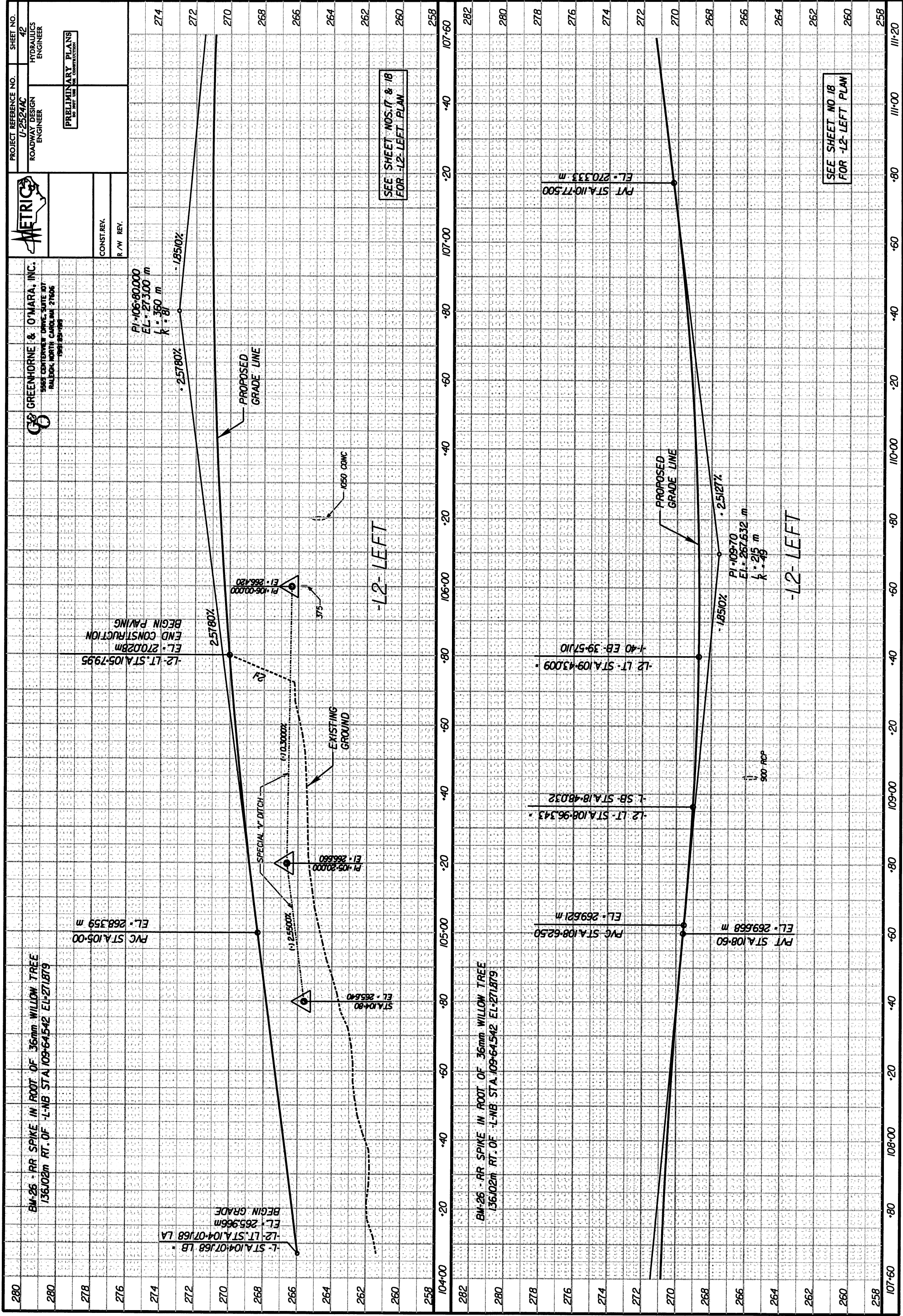


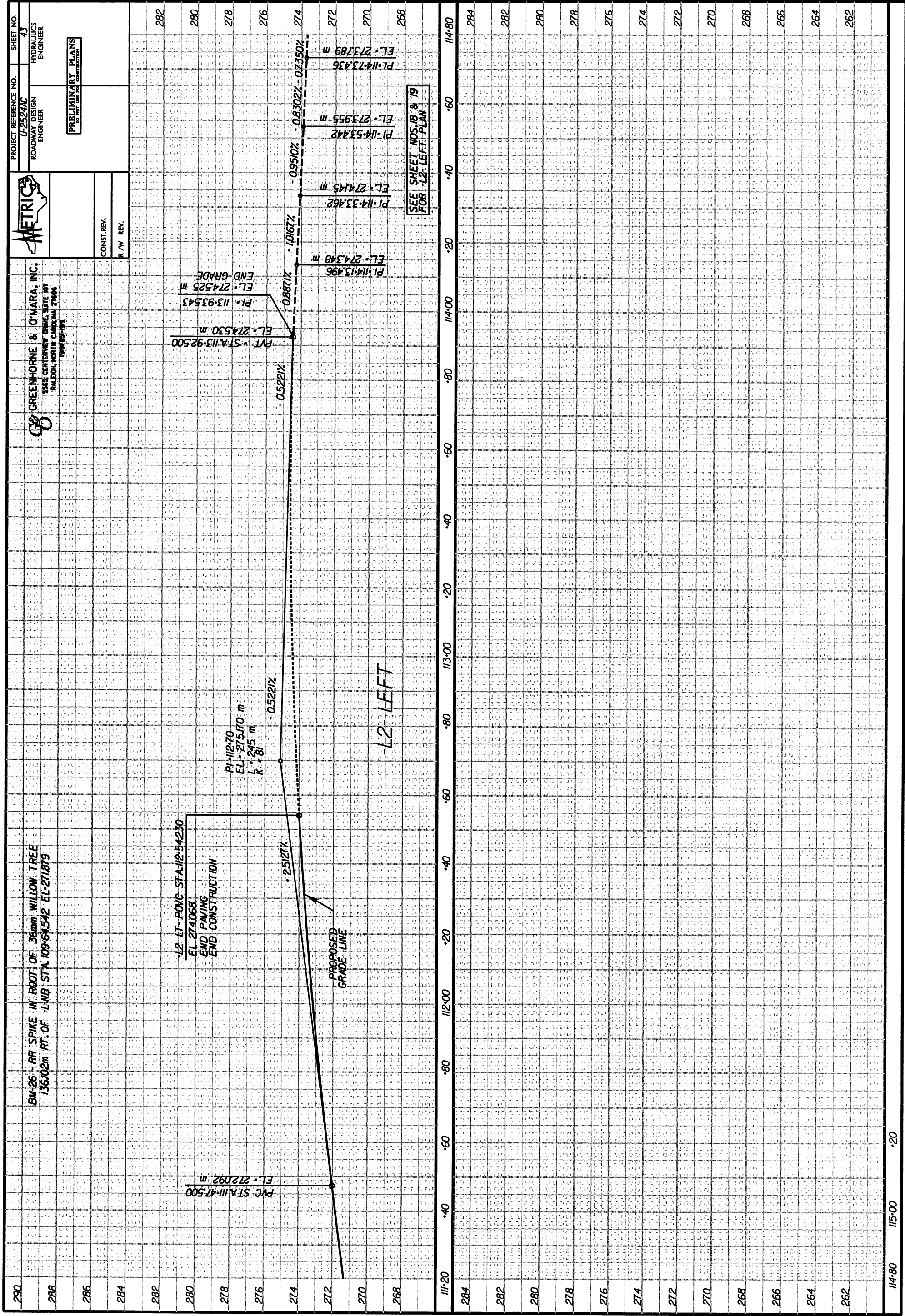


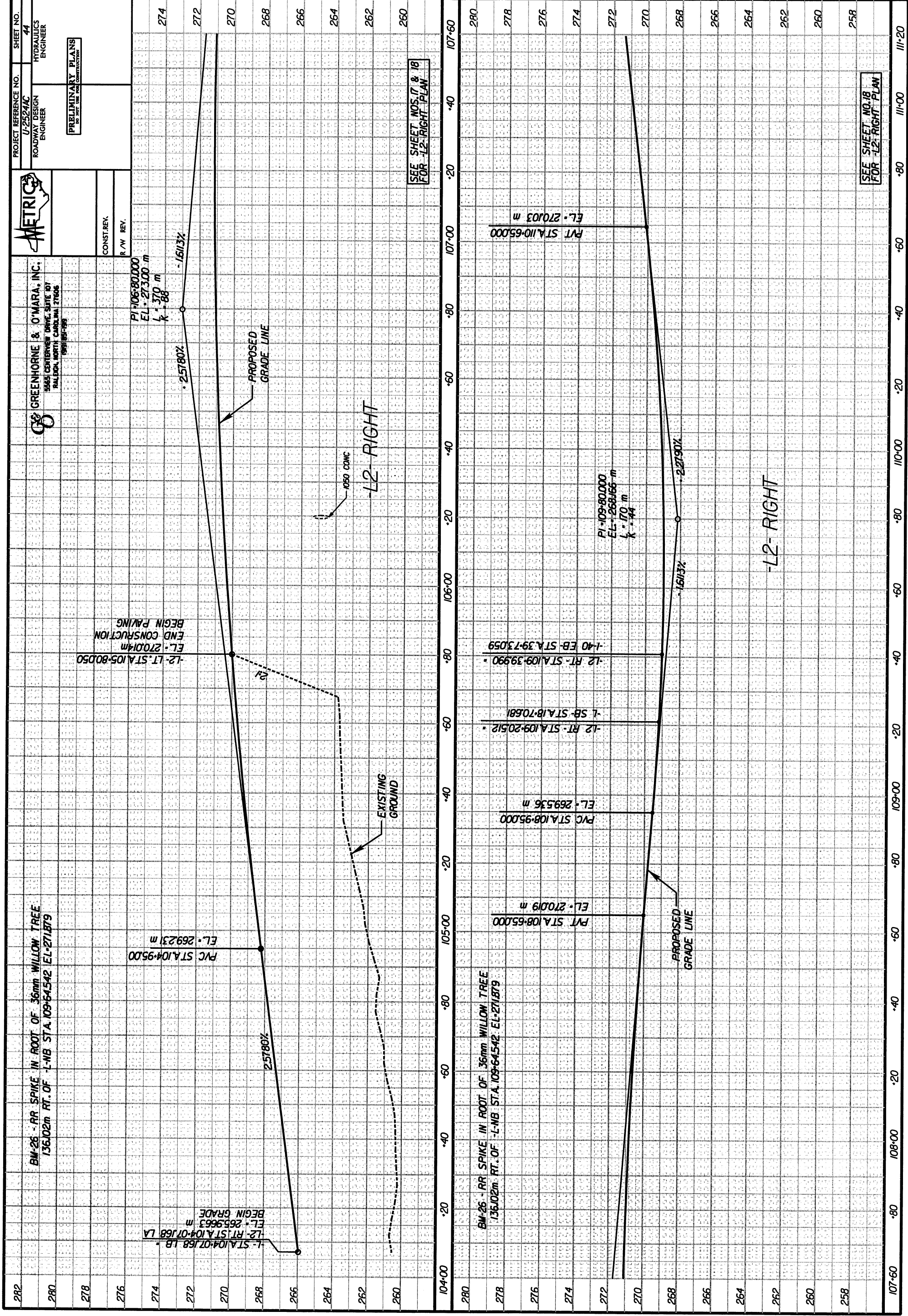


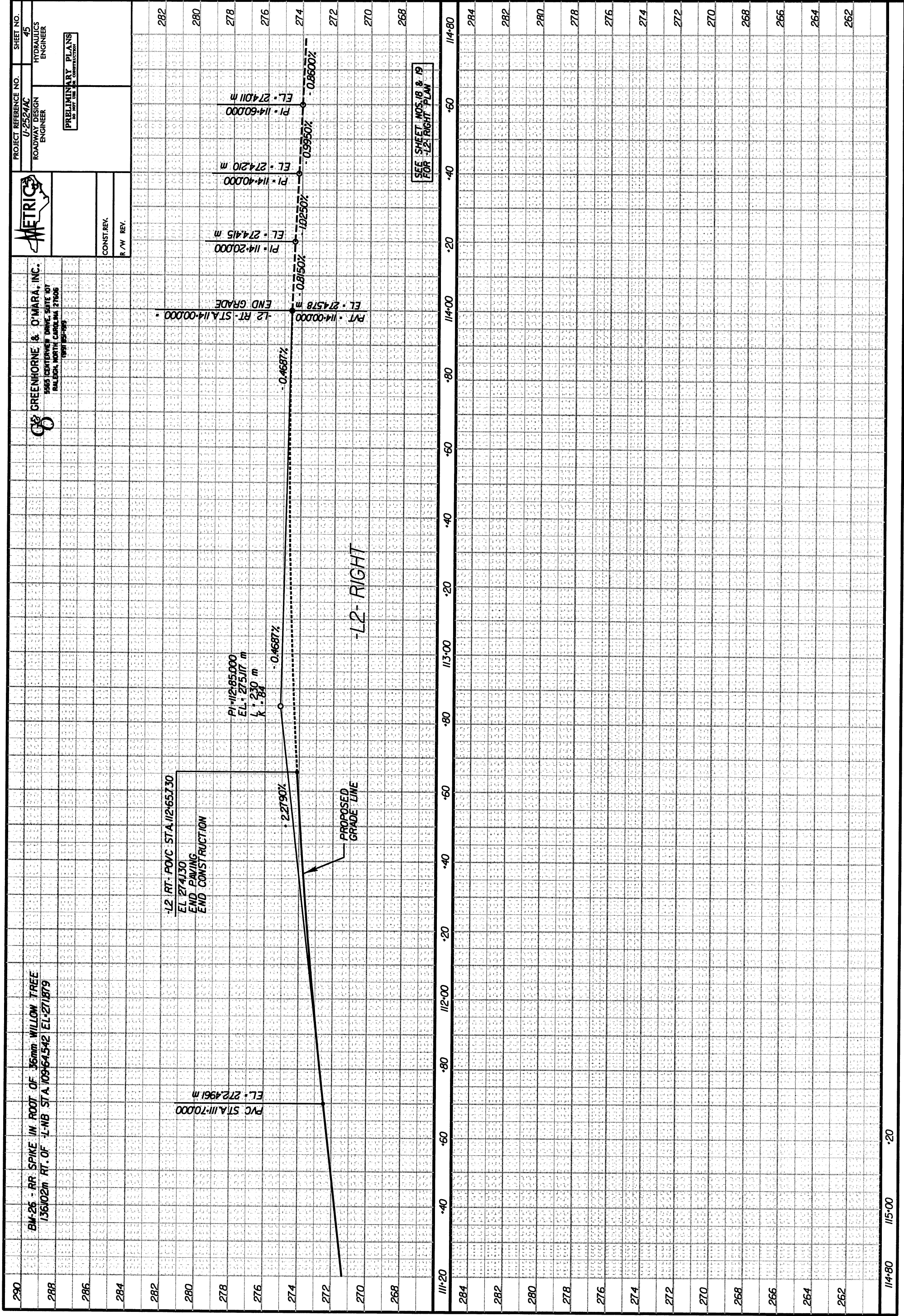


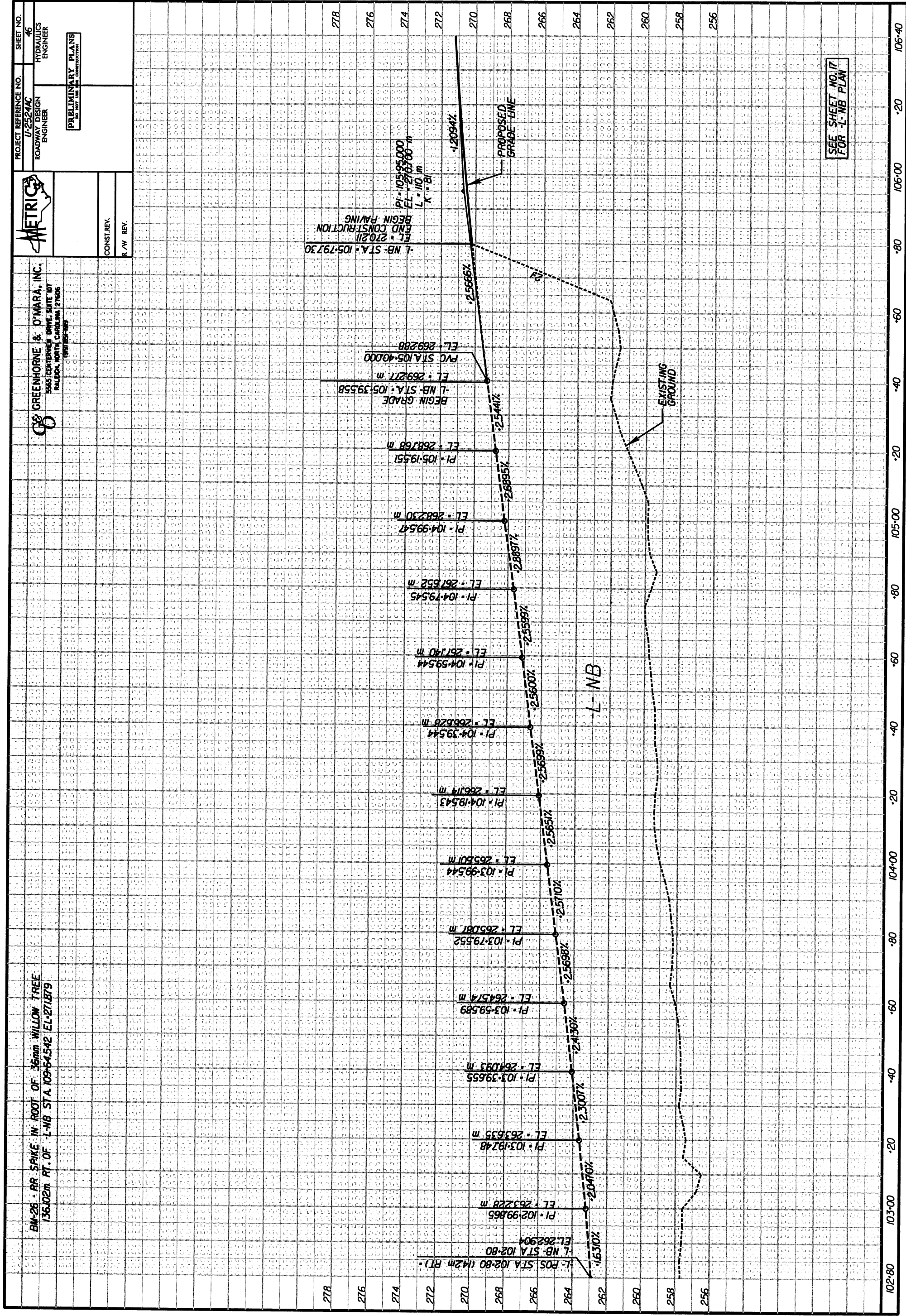


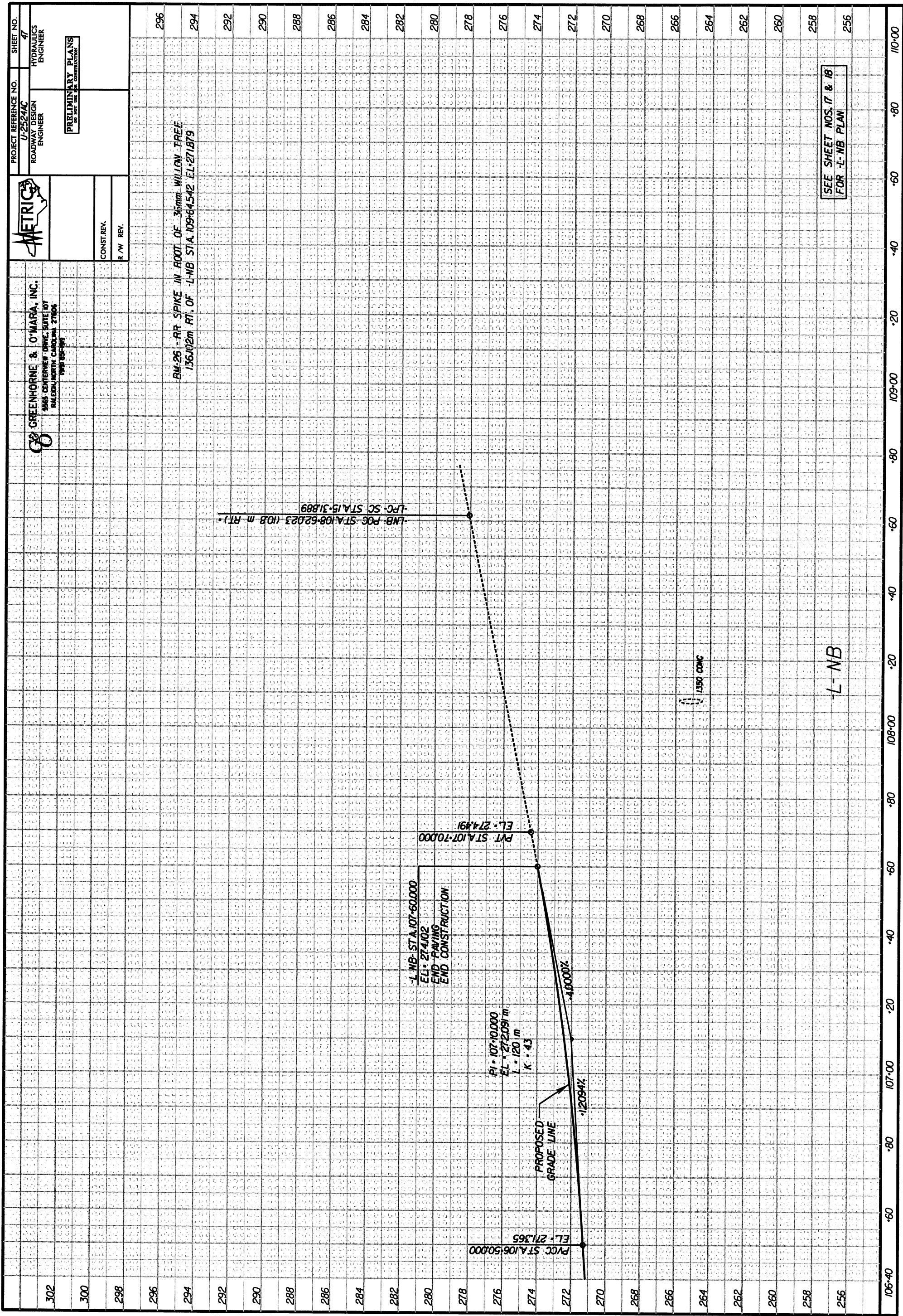


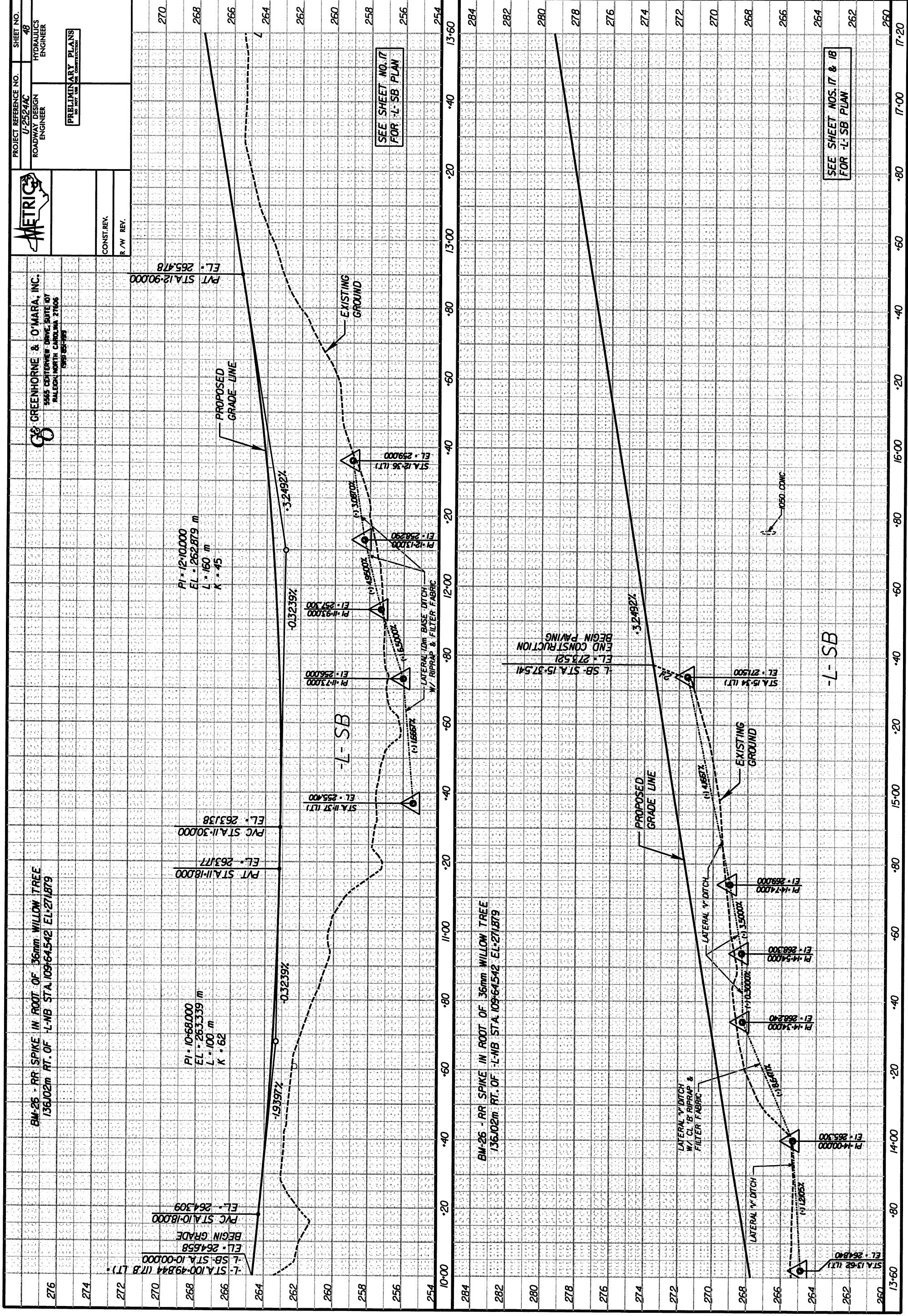


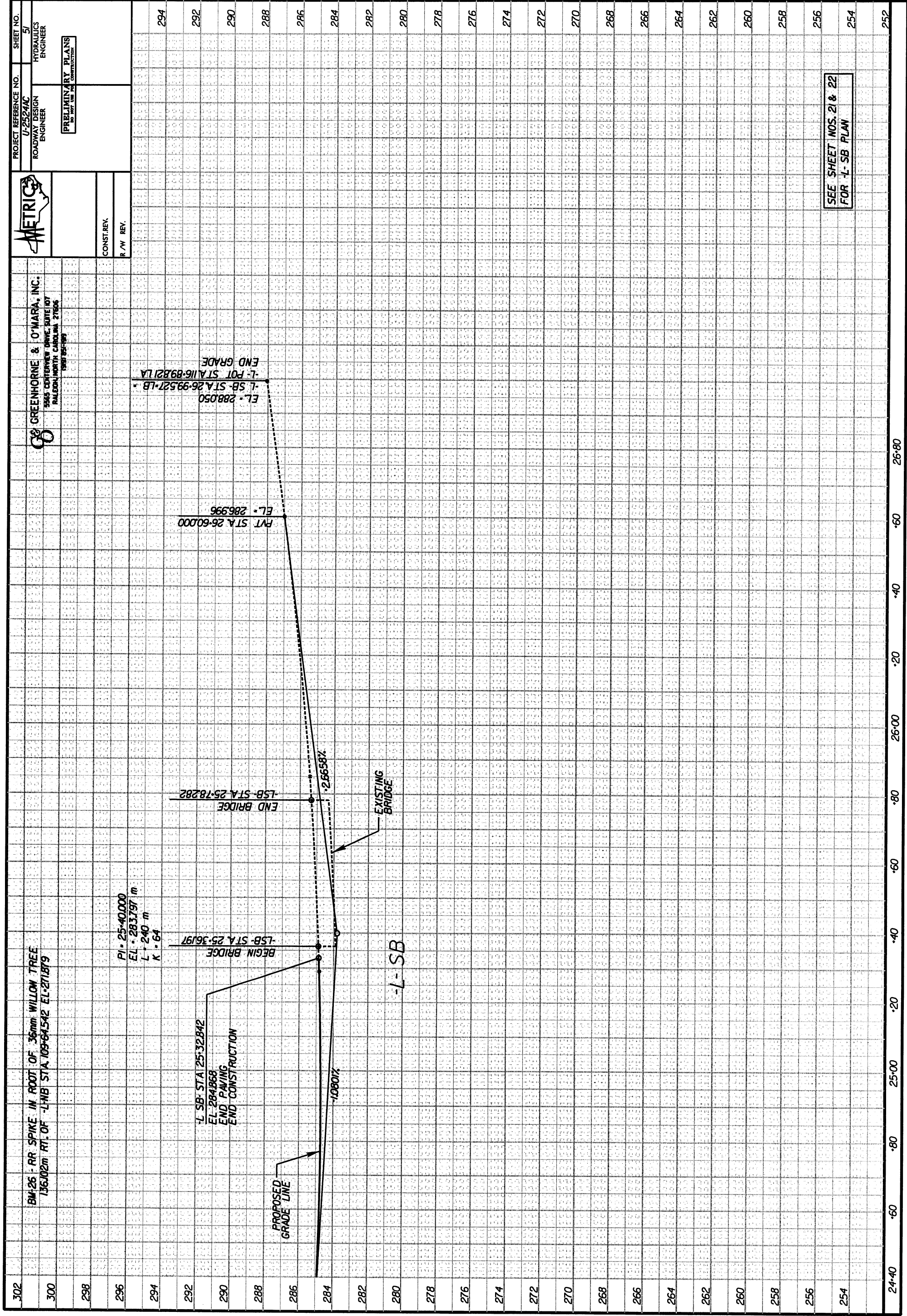












BUM 13 EL 266.627
RR SPIKE IN BASE 400mm PINE TREE
423m LT-L STA 87+55.95

L-83+71.478 -
RP DT 0+00.000 21.400 RT
EL 266.827

PI 0+80.000
EL 268.456
L 42.000
K 183

VPC 0+59.000 EL 268.028
VPT 1+01.000 EL 268.932
1+20.163%

PROPOSED GRADE LINE

1+2.2653%

0+600 RCP

HYDRAULIC DATA	
DRAINAGE AREA	= 1.07
DESIGN FREQUENCY	= 50
DESIGN DISCHARGE	= 0.32
DESIGN HW ELEVATION	= 270.190
100 YR DISCHARGE	= 0.34
100 YR ELEVATION	= 270.208
OVERTOPPING FREQUENCY	= 500+
OVERTOPPING DISCHARGE	= 0.88
OVERTOPPING ELEVATION	= 271.897

STA 3+25.000 EL 269.400
BEGIN SPECIAL DITCH LT

RAMP "D"

SEE SHEET NOS. 12.15 & 25 FOR
RAMP "D" PLAN

0+00

1+00

2+00

3+00

3+40

BUM 13 EL 266.627
RR SPIKE IN BASE 400mm PINE TREE
423m LT-L STA 87+55.95

PI 3+80.000
EL 275.252
L 60.000
K 48

STA 5+01.000 EL 275.200
END SPECIAL DITCH LT

PROP SPECIAL
DITCH LEFT

PROPOSED GRADE LINE

1+10.09%

VPC 5+65.000 EL 277.122

6+00

RAMP "D"

PI 6+00.000
EL 277.476
L 70.000
K 46

PROPOSED GRADE LINE

RAMP "D"

SEE SHEET NOS. 12.15 & 25 FOR
RAMP "D" PLAN

STA 6+00.000 EL 276.300
BEGIN SPECIAL DITCH LT

VPT 6+35.000 EL 277.301

STA 5+60.000 EL 276.000
END SPECIAL DITCH LT

PROP SPECIAL
DITCH RIGHT

3+40

4+00

5+00

PROJECT REFERENCE NO.
U-2524AC
ROADWAY DESIGN
ENGINEER



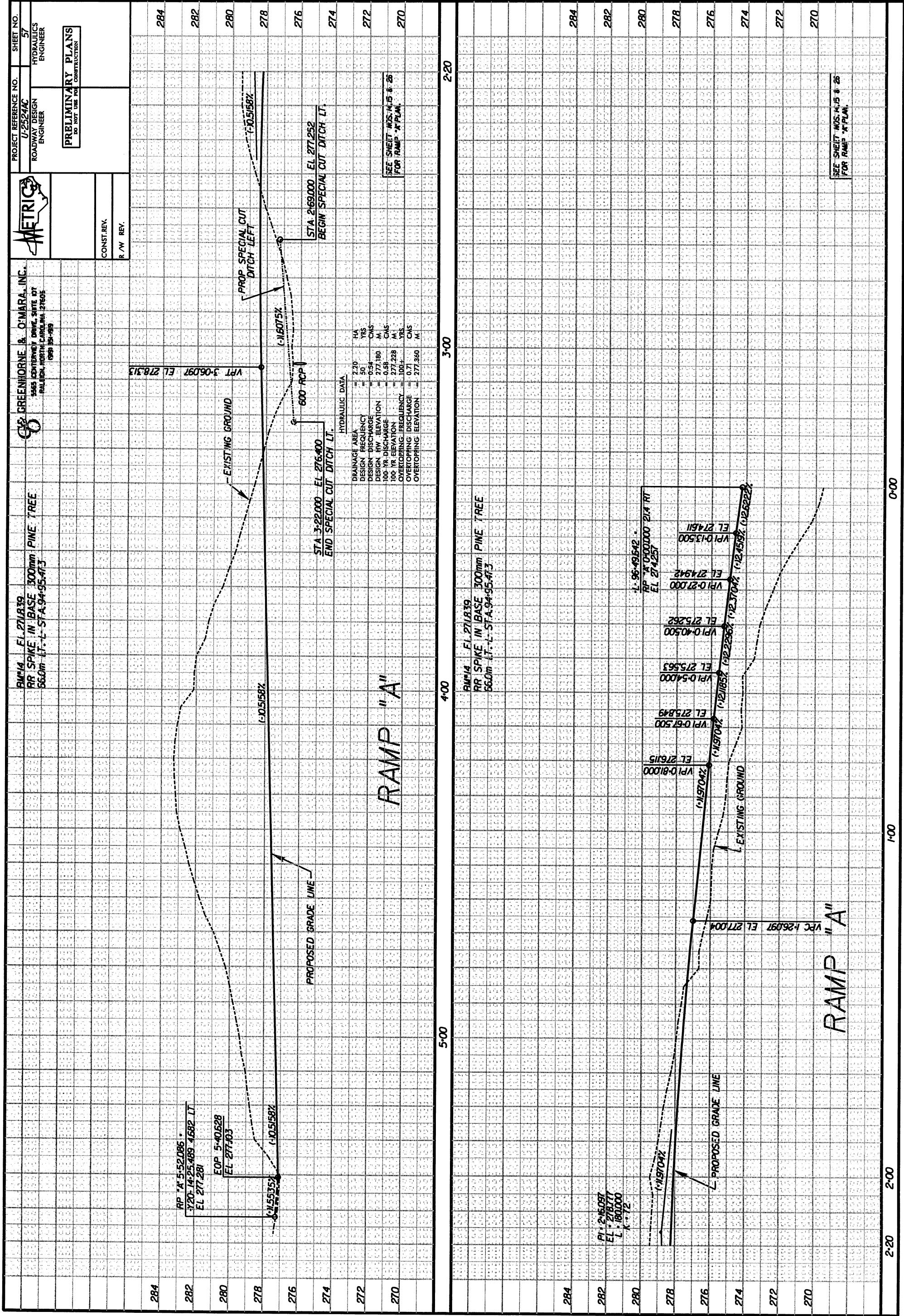
GREENHORNE & O'MARA, INC.
3665 CENTURIES DRIVE, SUITE 107
BALDWIN, NORTH CAROLINA 27606
(919) 854-9195

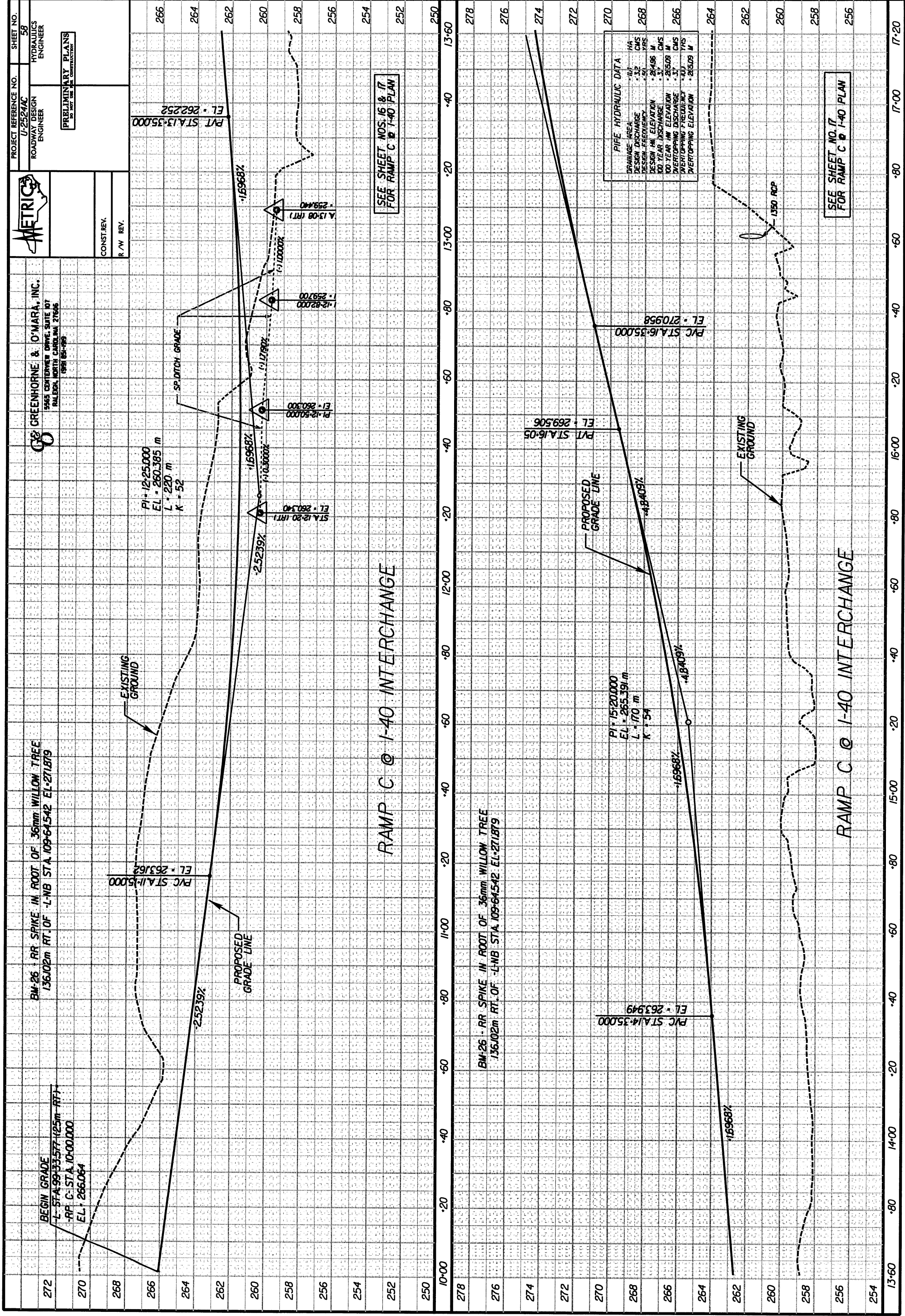
SHEET NO.
53
HYDRAULICS
ENGINEER

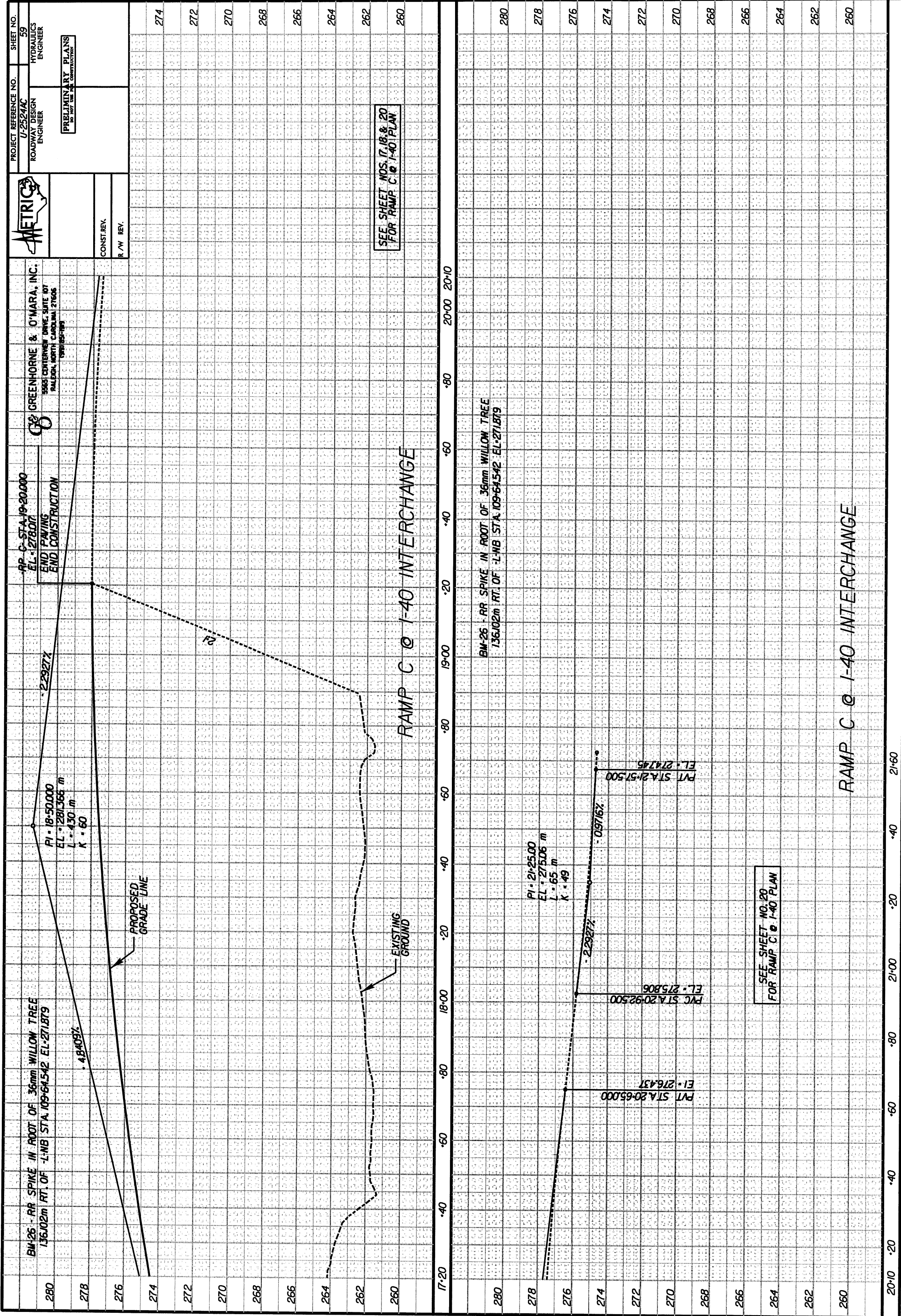
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

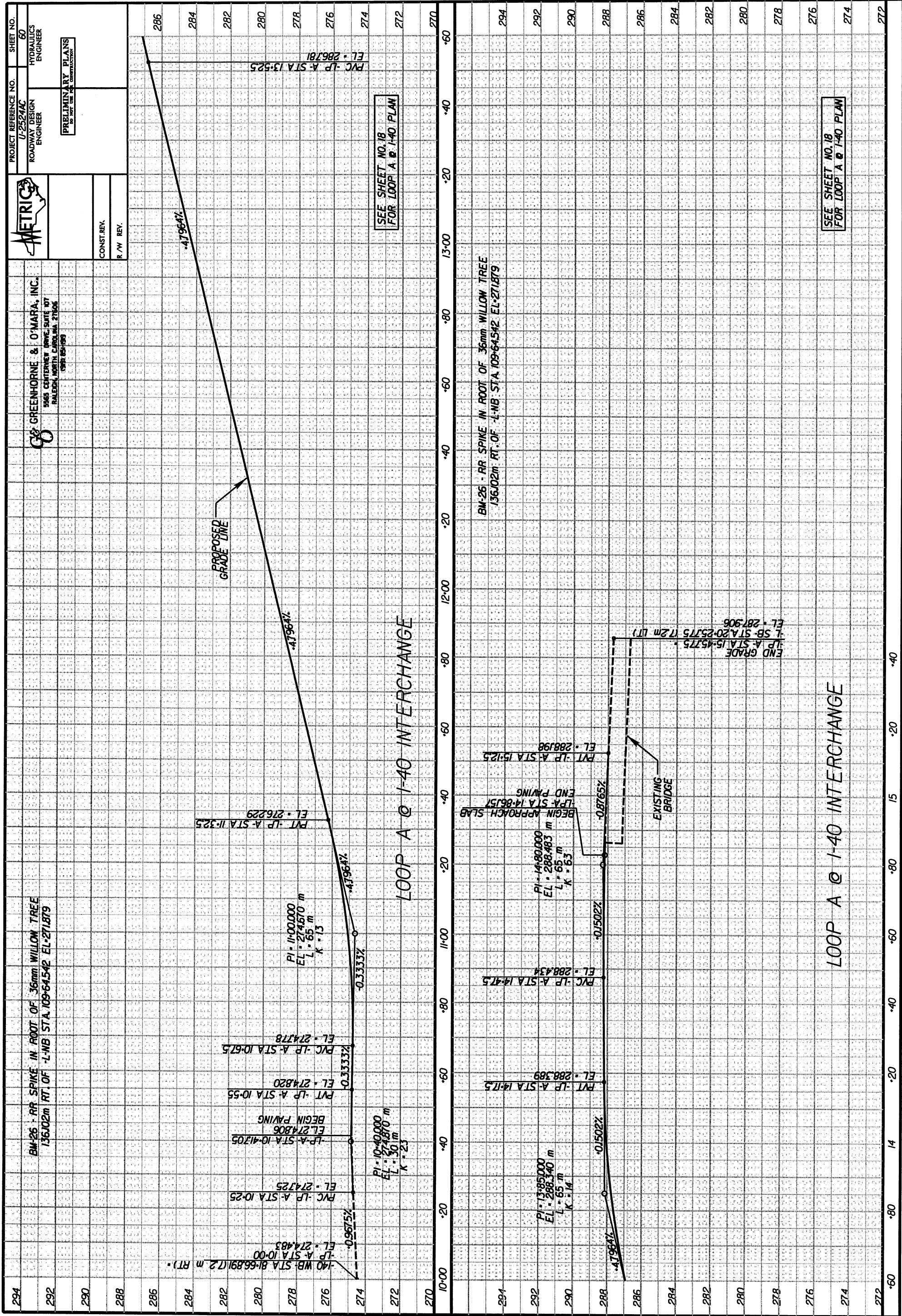
CONST. REV.

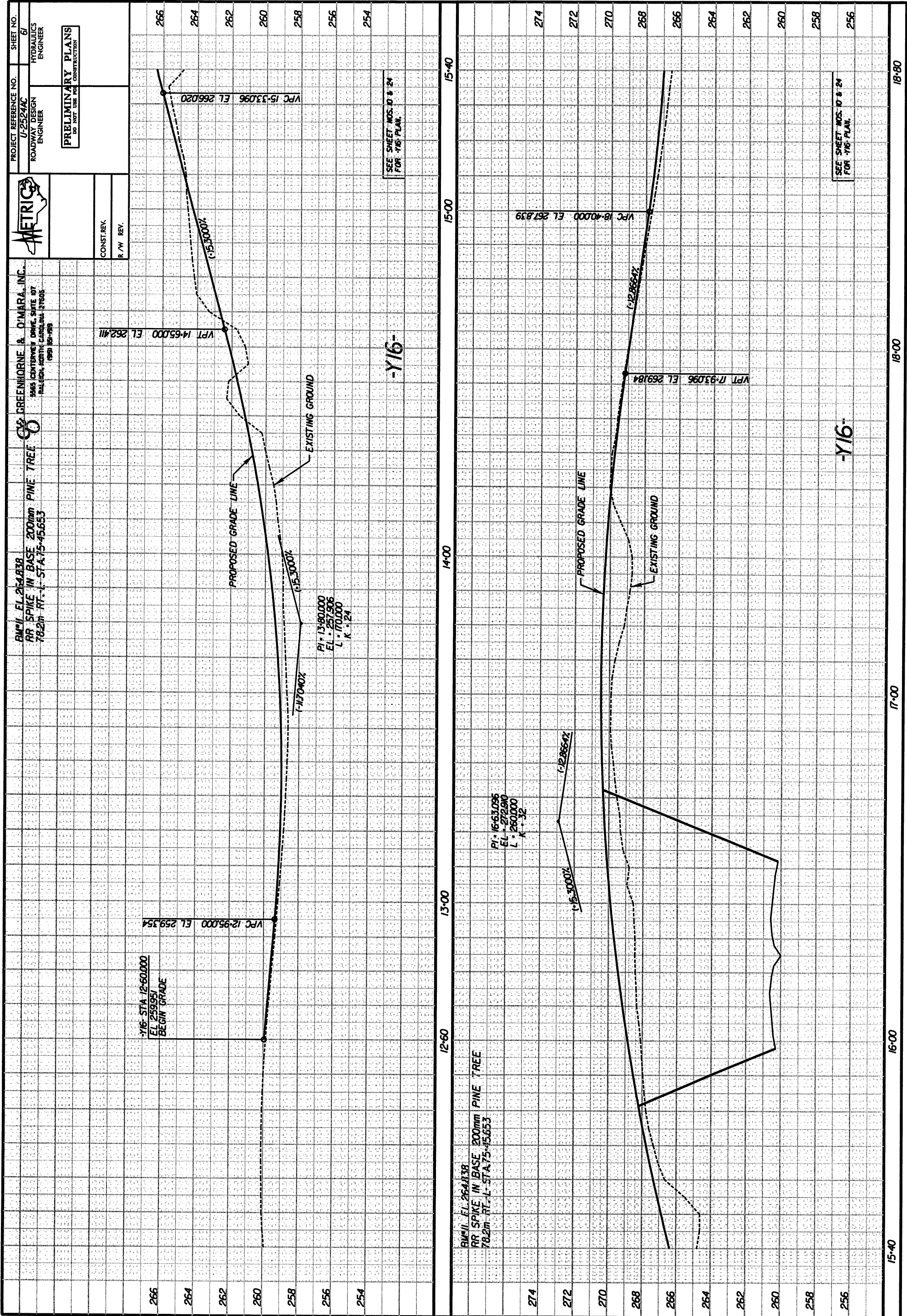
R / W REV.

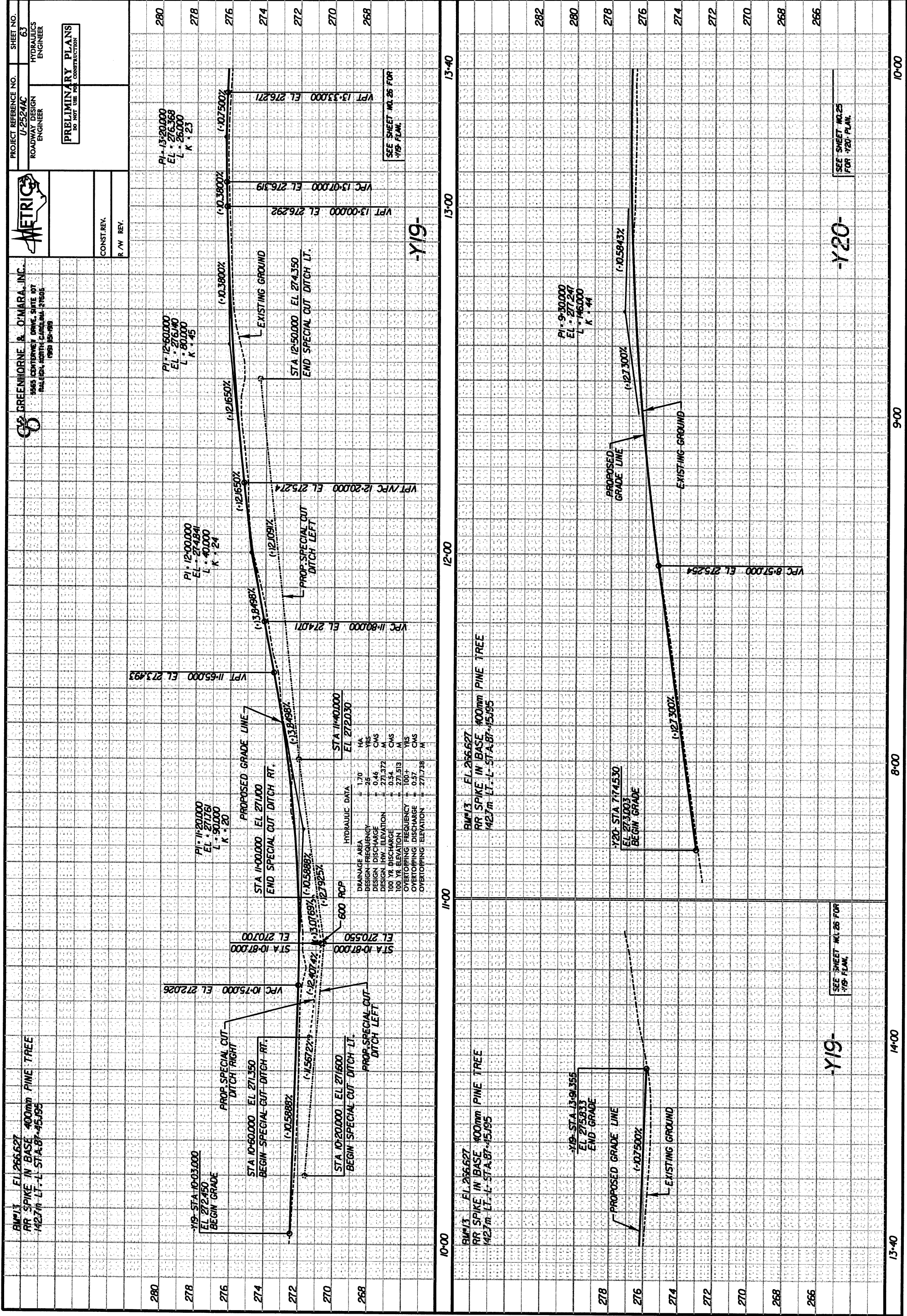












G&O GREENHORNE & O'MARA, INC.
5565 CENTERVIEW DRIVE, SUITE 107
RALEIGH, NORTH CAROLINA 27606
(919) 851-1919

GUILFORD COUNTY

GREENSBORO WESTERN LOOP FROM NORTH OF NORFOLK SOUTHERN RAILROAD TO I-40 INTERCHANGE

INDEX OF CROSS-SECTIONS

-L-	I THRU 153
-L2-	154 THRU 189
-L SB-	190 THRU 205
-L NB-	206
LOOP "D"	207 THRU 212
LOOP "B"	213 THRU 216
RAMP "C" (I-40)	217 THRU 233
LOOP "A" (I-40)	234 THRU 238
-Y16-	239 THRU 248
-Y16A-	249
-Y15A-, -Y15B- & -Y17-	250
-Y19-	251
-Y20-	252 THRU 268
-Y20A- & -Y20B-	269

PRELIMINARY PLANS

DO NOT USE FOR CONSTRUCTION