STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

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April 21, 2004

U.S. Army Corps of Engineers
Wilmington Regulatory Field Office
P.O. Box 1890
Wilmington, NC 28402-1890

ATTN.: Mr. David Timpy
NCDOT Coordinator

Dear Sir:

Subject: **Response to USACE Comments for Application for Individual Section 404 and 401 permits** for the US 17 widening from SR 1327/1410 north of Jacksonville to SR 1330/1439 south of Belgrade/Maysville in Onslow County, North Carolina Federal Aid Project No. NHF-17(7) State Project No. 8.T190301, WBS Element 34442.1.1

On February 12, 2003 the NCDOT applied for an Individual Section 404 permit and 401 water quality certification to fill 31.10 acres of wetlands and 774.27 feet of stream to construct the TIP Project R-2514A. On March 17, 2004 the USACE issued an official letter requesting more information so that they could complete their review of the proposed project. This letter will address the comments made in the official letter submitted by the USACE.

Corp Comment

1. The Environmental Assessment (EA) states that the total wetland impacts for the proposed project will be 25.57 acres. The permit application states the proposed wetland impacts are 31.10 acres but does not address the increase of 5.83 acres of wetland impacts. Please provide a tabular summary of the wetland impacts on a site by site basis that lists the estimated wetland impacts of the EA and the permit application. In addition, please provide the rationale for the differences in the wetland impacts at each site.

DOT Response

Total wetland impacts have increased since the original permit application was submitted from 31.10 acres to 32.18 acres. An additional 0.24 acres of excavation at site 16 was inadvertently left off of the summary sheet impacts. An additional 0.87 acres of impacts to wetlands are composed of the four-wetland impact sites that calculated using the Boussinesq 5% equation. The addition of the 0.87 acres of drainage impacts and 0.24 acres excavation at site 16 add up to more than 32.18. This discrepancy is due to rounding.

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The EA does not include a breakdown of wetland impacts on a site by site basis. Therefore, the NCDOT is unable to provide a table with a tabular summary of wetland impacts on a site by site basis that lists impacts in the EA compared with the permit application.

Impacts have also increased due to drainage impacts to wetlands that are now quantified as impacts but were not required at the time of the EA. The drainage impacts at sites 6, 12, 13 and 39 that were calculated using the Boussinesq 5% equation were not included in the original total and are now included in the total. Sites 3, 4A, 10, 16, 23, 24, 24A, 43, 51, 52 and 65 were also considered impacts due to drainage. These sites will have ditches running through the wetlands and due to the small size of these wetlands, NCDOT decided to quantify the entire wetland as an impact. The total amount of drainage impacts to wetlands on this project total 1.59 acres.

Project impacts have increased due to the widening of the proposed right of way. The impacts estimated in the EA were based on a 100-foot right of way, however the project will use a 180-200 foot right of way. Impacts have also increased because two new wetlands were added as part of the Wetland Delineation Update after the EA was finalized. Site 64A was not included as part of the original delineation. The wetland boundary for Site 6 was modified in September of 2003. Impacts at these two sites total 0.68 acres.

Corp Comment:
2. The total stream impacts for the proposed project have increased without rationale being provided in your permit application. In response to a request by the North Carolina Division of Water Quality (DWQ) for detailed information on the stream impacts of this project, the stream impacts described in the EA were clarified (FONSI, page 9) to state that the project crosses three intermittent and two perennial streams with a total stream impact of 610 linear feet (estimate is based on pipe lengths listed on Page 9, Table 4-9A). Based on the permit application, the total stream impacts associated with proposed project are 774.27 feet. The rationale of the apparent increase of 164.27 feet of stream impacts has not been addressed. Accordingly, please provide a tabular summary of the stream impacts on a site by site basis that list the stream impacts of the project described in the EA and proposed in the permit application.

DOT Response:
The EA does not include a breakdown of stream impacts on a site by site basis. Therefore, the NCDOT is unable to provide a table with a tabular summary of streams impacts on a site by site basis that lists impacts in the EA compared with impacts in the permit application. Impacts have increased due to the widening of the proposed right of way. The impacts estimated in the EA were based on a 100-foot right of way; however, the project will use a 180-200 foot right of way

Corp Comment:
3. Based on information in the permit application, it is not clear if the stream impacts associated with the proposed project are correct. In addition, the proposed compensatory mitigation for the unavoidable stream impacts may also be incorrect. Specifically, jurisdictional streams listed in Table 2, page 6 appear to conflict with those inspected by this office on July 21, 2003 and December 2, 2002. It is requested that Table 2 be supplemented to include the project station

number and all the streams, including ephemeral, intermittent, perennial, and non-jurisdictional, which exist on this project. Pending review of this information, another field meeting may be needed to confirm the jurisdictional stream determinations, stream impacts and required compensatory mitigation for stream impacts for this project.

DOT Response:

The September 2003 Wetland Delineation Report, including stream determinations and agency verifications, was reviewed to ensure that the impacts and mitigation requirements reported in the permit application are correct, and no discrepancies were found. All jurisdictional streams were identified during the wetland delineation and were verified by the USACE on July 31, 2003 and are included in the table below. There are no streams depicted on the USGS topography map or the Onslow County Soil Survey in the project area that have not been identified and verified. Since the July 2003 JD will not expire until July 2008, the NCDOT does not believe re-verifications are necessary.

Table 2 Revised – Surface Water Impacts

Site	Station Number	Stream Name and Intermittent (I) or Perennial (P)	Mitigation Ratio	Fill in Streams (acres)	Existing Channel impacted (feet)	DWQ Class	DWQ Index number
New River Basin							
2	106+01-106+04LT	UnT to Northeast Creek (I)	1:1	0.007	52.49	CNSW	UnT to 19-16
4A	107+70LT	UnT to Northeast Creek (I)	1:1	0.002	9.84	CNSW	UnT to 19-16
10	112+10 – 112+77	UnT to Northeast Creek (P)	2:1	0.032	314.96	CNSW	UnT to 19-16
10A	112+08 LT				6.56	CNSW	UnT to 19-16
New River Basin Impacts				0.041	383.85		
White Oak River Basin							
37	160+40 – 162+10RT	Starky's Creek (P)	2:1	0.022	134.51	C	20-10
37A	161+38 LT				59.05	C	20-10
38	162+52 – 169+43 RT	UnT to Starky's Creek (I)	(no mitigation required)	0.005	65.62	C	UnT to 20-10
38A	163+77 – 163+96 RT	UnT to Starky's Creek (I)	1:1	0	65.62	C	UnT to 20-10
53	179+13 – 179+30 LT	UnT to Starky's Creek (I)	1:1	0.002	65.62	C	UnT to 20-10
54	181+51 – 182+79 CN	Starky's Creek (P)	2:1	0	0	C	20-10
55	181+70 182+70 LT					C	20-10

56	182+97 – 185+66 LT					C	20-10
57	183+00 – 185+05 CN					C	20-10
58	183+07 – 185+67 RT					C	20-10
White Oak River Basin Impacts				0.029	390.42		
Total Impacts				**0.070**	**774.27**		

Corp Comment:
4. The permit application, page 10, provides a project description that states the proposed project includes two additional 12-foot lanes in each direction with a 46-foot grass median and "minimum" right of way of 200 feet. It appears from the permit drawings the ROW is 300 meters. Please confirm the ROW width proposed and confirm the associated wetland and stream impacts are correctly estimated based on this width.

DOT Response:

According to the NCDOT's Design Services Branch and the ½ size plans submitted with the permit application, the ROW varies between 180 feet (55m) and 200 feet (60 m).

Corp Comment:
5. The wetland impacts due to drainage by the proposed lateral special ditches have been estimated using the Boussinesq Equation and DRAINMOD models but it is not clear if all the wetland impacts due to drainage are included in the total wetland impacts associated with this project. Table 3 of the permit application lists the linear footage of drainage impacts at four wetland sites, including Wetland Sites 6, 12, 13, and 39. The approximate acreages of these impacts, based on the Boussinesq Equation, are shown on the respective permit drawings at each site. Please revise Table 3 to show the amount wetland impacts, in acreage, at all the wetland sites were drainage impacts have been estimated, including those listed on Sheet 78 of the permit drawings but not listed in Table 3. In addition, please footnote the Table to indicate the method used at each site. Lastly, please provide this office a copy of the "Ditch Impact Study" report dated August 2003.

DOT Response:
The total project impacts (32.18) have been recalculated to account for drainage impacts of 0.87 acres at sites 6, 12, 13, 39. Table 3 has been revised to show the amount of wetland impacts in acres and is included below. Impacts calculated using Boussinesq 5% shown in Table 3 take into account excavation in wetlands already accounted for as impacts. With the exception of impacts calculated with Boussinesq 5%, impacts shown in Table 3 depict the maximum amount of acreage that would be drained due to ditches. Drained wetland impacts included in the permit application cover letter were inadvertently left off of the permit drawings summary sheet. Drainage impacts depicted on the permit drawings and summary sheet were derived using the Boussinesq Equation for 5% of the growing season. A copy of the Drainage report is attached to this letter.

Table 3 Revised – Special Ditch Impacts				
	5% of Growing Season		12.5% of Growing Season	
Site Number	Boussinesq Drainage Impact in acres*	DRAINMOD Maximum Drainage Impact in acres	Boussinesq Drainage Impact in acres	DRAINMOD Maximum Drainage Impact in acres
6	0.60	1.24	1.49	4.68
12	0.04	0.24	0.28	0.55
13	0.22	1.01	1.49	2.20
39	0.01	1.29	2.00	2.60
TOTALS	**0.87**	**3.79**	**5.26**	**10.03**

*Calculations used as final impacts.

Corp Comment:

6. The permit drawings show excavation of an adjacent wetland at most of the stormwater outlets. Drainage impacts on wetlands at these sites should be addressed and included in the total wetland impacts unless it is found that these activities will not result in permanent wetland impacts. Rationale should be provided in those cases where excavation is found not to cause a permanent impact to the adjacent wetland.

DOT Response:

All areas of excavation in wetlands have been accounted for in the permit drawing impact summary table. This includes excavation in wetlands for proposed roadway cut ditches and required tail ditches at pipe outlets.

Corp Comment:

7. The proposed mechanized clearing limits shown on the permit drawings indicate an approximate mechanized clearing limit of 3 meters. Please confirm that this is consistent with the wetland, permit drawing sheet 78 of 81, dated 1/16/04. Please clarify the proposed mechanized clearing methods and limits and confirm the associated wetland impacts. Typically, the NCDOT projects are constructed with a 10-foot mechanized clearing limit. Please provide rationale for the proposed non-typical clearing limit.

DOT Response:

The permit drawings and determined impacts reflect Method III Clearing which requires 3m (10 ft) of mechanized clearing in wetlands for the majority of the project. In areas where additional easements for construction purposes (tail ditch improvements, phasing of box culverts, etc.) in wetlands are required, mechanized clearing impact widths/dimensions will exceed the standard 3m (10 ft) and have been included as impacts.

Corp Comment:

8. Wetland impacts associated with PSF's constructed in wetlands will result in permanent wetland impacts. Based on our review of the permit application, these impacts are not included in the total wetland impacts associated with this project. Please provide a summary of all the proposed PSF's that list each PSF by station number and the associated wetland and stream impact. Based on our experiences with the Smith Creek Parkway Project (U-92AB), PSF's may not be the best method to dissipate flows for this project and may pose major constructability

problems and recommend that NCDOT Division 3 be consulted regarding the constructability of PSF structures on this project.

DOT Response:
The NCDOT will remove all PSHs from wetlands and replace them with Rip Rap to prevent erosion. John Hennessy, DWQ, agreed to this decision in a conversation on March 31, 2004.

Corp Comment:
9. The permit application proposes to replace the existing bridge over Starkys Creek, Wetland Site 55 and 56, with a cored-slab bridge by using top down construction methods and remove the existing bridge by utilizing temporary work pads constructed in wetlands but within the footprint of the proposed permanent impacts. Based on the permit drawings 61-64 dated April 8, 2003, it is not clear if the permanent fill for the temporary work pads and access roads, including all the temporary pipes and box culverts, is needed for removal of the existing bridge. Although we fully support the proposal to use top down construction methods, we feel removal of the existing bridge can be accomplished without incurring permanent wetland impacts (and associated compensatory mitigation) associated with the work pads and access roads. Moreover, as stated on page 10 of the permit application, the Division of Coastal Management letter dated November 25, 1999 prohibits construction staging areas in wetlands as a condition of its consistency determination. Thus, we highly recommend that the proposed work pads and access roads be replaced with a work bridge that will only result in temporary wetland impacts. We also recommend that the NCDOT Division 3 be consulted on the proposed removal and replacement methods for this bridge. Lastly, it is not clear from the information provided how or where the existing US 17 traffic will be detoured during construction. The traffic detour plan should also be provided.

DOT Response:
According to Area Bridge Construction Engineer, Mike Robinson, the removal of the existing bridge's interior bents on this project cannot be performed utilizing top down construction. The physical size and weight of the existing interior bents requires that the bents be removed in pieces. In order to break the bents into pieces, shattering methods must be used. A project almost identical to this one was the widening of US-17 over Southwest Creek, south of Jacksonville. On that project, the bents were pulled over, broken into pieces, and removed from the site. Since the bents must be pulled over, a temporary bridge to provide access would not be appropriate since it would not be able to absorb the impact of the falling bent. Also, breaking into pieces would be better accomplished on two separate temporary rock work pads. The temporary rock work pads would only be required for removal of the existing interior bents. All other aspects of construction including removal of the existing superstructure and the construction of the new bridges can be accomplished utilizing top down construction. The temporary work pads will be constructed on top of fabric to facilitate removal. The duration of the temporary work pads would be short, as the removal of the interior bents would take no more than 2-3 weeks. If this method of construction is not allowed, the only other practical method of removal is to completely surround the interior bents with sheet piling, dewater the cofferdam, shatter or saw the bents into manageable pieces, and remove the resulting debris and sheeting.

This method would also be impractical for top down construction although it could be accomplished from a work bridge.

There will be no staging of equipment in wetlands, only access and temporary construction structures.

The traffic will be shifted using cross-overs inside the median. The impact of these cross-overs (Detours) have been shown on the plans since the early stages of the project design and can be seen on sheets 28 and 29 of roadway plans. The construction activity should not interfere with the traffic flow.

Corp Comment:
9-Continued
Please be advised that on February 6, 1990, the DA and the U.S. Environmental Protection Agency signed a memorandum of agreement (MOA) establishing procedures to determine the type and level of mitigation necessary to comply with the Clean Water Act Section 404(b)(1) Guidelines. This MOA provides for first, avoiding impacts to waters and wetlands through the selection of the least damaging, practicable alternative; second, taking appropriate and practicable steps to reduce impacts on waters and wetlands; and finally, compensating for any remaining unavoidable impacts to the maximum practicable extent. To enable us to process your application in full compliance with this MOA, we request that you provide the following additional information or clarifications:

a. The proposed project utilizes side slopes of 4:1 at each wetland site. Typically the NCDOT proposes 3:1 side slope or flatter side slopes at wetland sites to minimize the wetland impacts associated with a proposed project. Please provide the rationale for proposed fill slopes flatter than 3:1 along wetland sites.

DOT Response:
The project was designed with 4:1 side slopes to improve safety. Side slopes of 4:1 do not require a guardrail because they are considered recoverable for an errant motorist. However, side slopes of 3:1 are considered traversable, but not recoverable. These steeper slopes require either guardrail protection or an additional minimum ten-foot clear runout area beyond the clear zone. Due to the additional three feet of shoulder width required for guardrail installation and the low fill heights, any reduction in construction limits would be minimal.

Corp Comment:
b. The permit application cites a letter from the United States Fish and Wildlife Service (USFWS) dated November 16, 1999 that concurs with NCDOT's determination of "No Effect". The USFWS also states that this concurrence is contingent on any changes in the project plans. Please be advised that we have not received written confirmation from the USFWS that the NCDOT has satisfied the requirements of Section 7 of the Endangered Species Act (ESA). Please provide supporting documentation for all the ESA determinations that have not been coordinated with this office thus far, including all the ESA determinations since November 1999.

DOT Response:
There have been no major changes to the project plans since the NCDOT received concurrence from the USFWS on November 16,1999. However since the 1999 concurrence the bald eagle, West Indian Manatee and the golden sedge have been added to the list of federally protected species that occur in Onslow County. NCDOT biologists have determined that habitat for the bald eagle, West Indian Manatee, and the golden sedge is not present in the project area. Based on an April 7, 2004 phone conversation with Gary Jordan of the USFWS, this will have no effect on all of the federally protected species known to occur in Onslow County.

Corp Comment:
c. Based on the permit application, the cultural resource issues have not been fully resolved. Please be advised that have not received written confirmation from the NC SHPO that the NCDOT has satisfied the requirements of Section 106 of the HPA. Therefore, we recommend that the NCDOT contact the North Carolina State Historic Preservation Officer (SHPO) regarding the remaining requirements pursuant to Section 106 of the Historic Preservation Act (HPA). Please provide supporting documentation for Section 106 determinations regarding the Nelson Deppe House (including any SHPO comments on roadway design plans in the vicinity of the Nelson Deppe House) and the Hoffman Forest/Deppe Lookout Tower and Equipment Headquarters. Lastly, please provide a copy of the archeological survey study, referenced on page 9 of the permit application, that indicates that no archeological resources were found in the project area.

DOT Response:
The SHPO Concurrence Form for Assessments of Effects dated August 31, 1999 was included in Appendix A of the permit application. The form states that there is "No effect" on the Hoffman Forest/ Deppe Lookout Tower and there is "No Adverse Effect to the Nelson Deppe House". On April 5, 2004 representatives from the NCDOT meet with representatives of SHPO. The result of the meeting was the conclusion that the project is Not Likely to Adversely Effect the Nelson Deppe House.

The archeological report has been completed, and received final approval from SHPO on April 8, 2004. A copy of the final approval letter and the final archeological report is attached to this letter.

Corp Comment:
d. All invert elevations for pipes in wetlands should be shown on the permit drawings. In addition, the pipe dimensions and hydraulic flow directions should be clearly shown on the permit drawings to ensure that the width, slope, and vertical elevation of each pipe approximate the width, slope, and elevation of the existing stream that is being replaced, as much as practicable. Please provide this information, either with revised drawings or a tabular summary, for each stream that is being replaced with a pipe or culvert.

DOT Response:
Please refer to the ½ size plans included in the permit application. Inverts for all drainage structures and pipes are reflected in the drainage summary table in the ½ size plans and begin on

sheet 3-A. All open end cross pipes, box culverts, and bridges are reflected at their respective elevations on the profile sheets that begin on sheet 34 of the ½ size plans.

Corp Comment:
e. All proposed rip-rap in wetlands should be clearly labeled. The use of rip-rap at all wetland and stream sites should be minimized to reduce impacts to the existing wetlands and streams. Bioengineering techniques, to minimize wetland impacts, should be considered as a bank stabilization measure in lieu of rip-rap.

DOT Response:
All proposed riprap in wetlands on the permit plan views is labeled. Based on the conference call with USACE on 3/26/04, no further action required.

Corp Comment:
f. The permit drawings and construction plans could be further clarified by adding the associated construction design plan sheet number(s) to the title block of each permit drawing and/or add the permit drawing and wetland site number to the corresponding construction plan sheet. This is requested to assist our compliance inspections, NCDOT Division 3 personnel, and the NCDOT construction contractors during construction of this project.

DOT Response:
Station numbers are shown on permit drawings as well as on the half size plans. These numbers are used as a cross-reference between the two sets of drawings. Implementing the ½ size sheet # and permit sheet # reference would require wholesale protocol change within the Hydraulics, Roadway Design and Design Services Units.

Corp Comment:
g. The permit application indicates that stream forms and stream ratings have not been completed for this project. Please provide the completed USACE stream forms for each stream to this office. We recommend that DWQ be contacted regarding its requirements for stream information. Our forms are available from our website at www.saw.usace.army.mil/WETLANDS/Permits.html.

DOT Response:
USACE Stream forms have been filled out for every jurisdictional stream that will be impacted by the proposed project and copies are included with this letter. The DWQ stream forms are used to determine if a stream is jurisdictional. Since stream jurisdictional status has been determined, no DWQ stream forms will be prepared.

Corp Comment:
h. The permit application, page 9, states that Essential Fish Habitat (EFH) impacts are not anticipated. Although we concur with this finding, we recommend that you reference the appropriate EFH guidance provided to the NCDOT by the NMFS and contact the National Marine Fisheries Service (NMFS), pursuant to its letter dated November 15, 2000, regarding its EFH requirements and that the NMFS confirm this finding.

DOT Response:
Through email communication on March 23, 2004, Fritz Rhode confirmed that the project would not impact any Essential Fish Habitat. According to Appendix 6 of the EFH guidance published February 1999, EFH in the South Atlantic is defined as estuarine or marine areas. No estuarine or marine areas are located in the project area. No water bodies in the project area are on the list water bodies that EFH species are found, published by the NMFS.

Corp Comment:
i. The permit application, page 10, states "there is no detailed flood insurance study involvement with any of the major stream crossings on this project" and that "compliance with FEMA will not be required". This appears to be inconsistent with the EA, page 34. Please clarify this statement.

DOT Response:
The widening of existing US 17 from two lanes to four lanes under R-2514A will impact three major stream crossings. The first major crossing at –L- Sta. 112+07 is a tributary to Northeast Creek, which is located upstream (outside the limits), of the FEMA Detailed Flood Insurance Study for Northeast Creek. The first crossing involves replacing a perched single barrel 6' x 4' box culvert with a single barrel 7' x 7' box culvert. Starky's Creek is crossed by the second and third major crossings at –L- Sta. 161+33.5 and –L- Sta. 182+87.4. At –L- Sta. 161+33.5, a double barrel 7' x 6' box culvert is proposed to replace the existing perched double 10' x 4' box culvert. At –L- Sta. 182+87.4, dual bridges with three spans of 46' for a total length of 138' are proposed to replace the existing 111' of bridge over Starky's Creek. Both of these crossings of Starky's Creek are designated as FEMA Flood Hazard Zone A. Zone A implies the approximate area of the 100 year flood, but no base (100 yr.) flood elevations and flood hazard factors have been determined. All three of the proposed replacement structures will provide equal or greater hydraulic conveyance than the respective existing structures, which will match or decrease ("no rise") the 100-year water surface elevations for each of these crossings. Therefore, since there is no FEMA Detailed Flood Insurance Study Involvement with any of the three major stream crossings, coordination with FEMA for compliance will not be required.

Corp Comment:
j. The permit application, page 10, makes reference to the consistency determination made by the North Carolina Division of Coastal Management (DCM) in its letter dated November 24, 1999. As you have stated, this consistency also stipulates conditions that must be met. It is not clear based on the permit application how these conditions have been met. Please provide this information for each DCM consistency condition.

DOT Response:
The conditions of the CAMA consistency are listed below and followed by NCDOT's compliance with the conditions.

- *An acceptable mitigation plan to compensate for unavoidable wetland losses is developed.*
  The NCDOT intends to use EEP to provide compensatory mitigation.

- *If rare plant species will be negatively impacted by the proposed project, the NC Plant Conservation Program should be consulted in order to determine whether transplantation or other forms of mitigation would be desirable.*

  Karen Lynch, Biologist for the NCDOT, contacted the NC Plant Conservation on November 21, 2003 and March 15, 2004 to investigate whether transplantation of rare plant species would be required. To date the NCDOT has not received a response.
- *A 401 Water Quality Certification is received from DWQ prior to the onset on construction.*

  The NCDOT has applied for a 401 Water Quality Certification. Construction will not begin before the Water Quality Certification is received.
- *Sedimentation and Erosion Control requirements and the Memorandum of Agreement between the NCDOT and the DLQ must be adhered to.*

  This is a standard commitment for all NCDOT projects.
- *Borrow and waste areas are not allowed in wetlands.*

  This is a standard commitment for all NCDOT projects.
- *Construction staging areas are situated in uplands specially, not in wetland areas.*

  This is a standard commitment for all NCDOT projects.
- *Best management practices for the protection of surface waters will be strictly followed.*

  This is a standard commitment for all NCDOT projects.
- *All necessary DENR permits and/or approvals as indicated in the Intergovernmental Review dated October 25, 1999 are obtained and adhered to.*

  In a letter dated November 24, 1999, DCM determined that R-2514A is consistent with the North Carolina Coastal Management Program. The NCDOT submitted the Stormwater Permit Application to DENR on July 22, 2003. This application was included in the original application. The NCDOT has applied for a 401 Water Quality Certification. Construction will not begin before the Water Quality Certification has been received.

Corp Comment:

k. The permit application, page 12 addresses the indirect and cumulative effects of the proposed project. The report enclosed with the permit application entitled "Qualitative Indirect and Cumulative Effects Assessment" dated February 6, 2004 should be referenced in the application. It is also recommended that the summary of findings stated in the permit application, apparently based on this report, be clarified.

DOT Response:

A Qualitative Indirect and Cumulative Effects (ICE) Report was completed for the NCDOT in February 2004 and was included with the original application. A summary of the findings is included in the Executive Summary of the report.

Corp Comment:

l. The permit application and drawings show both Metric and English units but often only one unit is used. Please revise the permit application and drawings to show both English and Metric units. Please note that this office prefers English units.

DOT Response:
A summary sheet is included in the permit drawings that show English units. It is NCDOT's policy to use only English units in permit applications. Somehow an English summary sheet was inadvertently omitted from this application.

Corp Comment:
m. The permit application, page 13 lists the commitments of the FONSI but does not state how these commitments have been satisfied except for the Stormwater Management Plan dated September 2003. Please indicate how each FONSI commitment has been satisfied.

DOT Response:
The conditions of the FONSI are listed below and followed by NCDOT's compliance with the conditions.

- *The North Carolina Plant Conservation Program will be given the opportunity to survey the right-of-way for any state listed (specifically Solidago verna, Xyris difformis var. floridanum, and Polygala hookeri) or other rare species.*
  Karen Lynch, Biologist for the NCDOT, contacted the NC Plant Conservation on November 21, 2003 and March 15, 2004 to investigate whether transplantation of rare plant species would be required. To date the NCDOT has not received a response.

- *A Sediment and Erosion Control plan will be prepared for the project in accordance with the NCAC Title 15A, Chapter 4 and will follow erosion and sediment control measures set forth in the NCDOT Erosion and Sediment Control Guidelines for Contract Construction (January 1995) as applicable.*
  A copy of the sediment and erosion control plan has been prepared and is included with this letter.

- *Borrow and waste areas for the project will not be allowed in wetlands without the appropriate permits.*
  This is a standard commitment for all NCDOT projects.

- *Construction staging areas will not be allowed in wetlands.*
  This is a standard commitment for all NCDOT projects.

- *NCDOT Best Management Practices for Protection of Surface Waters will be implemented as applicable.*
  This is a standard commitment for all NCDOT projects.

- *Three major drainage structures are located within the project area. One bridge and two box culverts will be replaced in accordance with NCDOT Guidelines for Drainage Studies. The bridge over the lower reach of Starky's Creek at Site Nos. 54 through 58 (station 182+80) and will be replaced with dual structures approximately 135 feet long. An existing double RCBC which conveys the upper reach of Starky's Creek at Site Nos. 37 and 37A (station 161+00) will be replaced with a double RCBC approximately 131 feet long. Also an*

existing RCBC which conveys an unnamed tributary to Northeast Creek at Site Nos. 10 and 10A (station 112+10) will be replaced with a RCBC approximately 136 feet long.

The bridge over Starkeys Creek will be replaced with dual structures that are 138-foot long bridge. The existing double RCBC at site 37 and 37A will be replaced with a double 7' by 6' RCBC, 138 ft long. The existing RCBC at site 10 and 10A will be replaced with a single 7' by 7' RCBC, 138 ft long.

- *Stormwater drainage design will be addressed during the Design Phase and will be included as part of the construction plans and documents.*

  A copy of the Stormwater Management Plan (September 2003) was included in the original application.

- *A Confederate soldier's gravesite is located in the southwest quadrant of the intersection of Deppe Loop Road and US 17. The proposed right-of-way at this intersection will be adjusted to avoid any impacts to the gravesite.*

  The gravesites located in the southeast quadrant of the intersection of Deppe Loop Road and US 17 have been moved.

Corp Comment:

n. The permit application, page 14 discusses the Interagency Permit Review meeting on April 24, 2003. Several discussion items during this meeting do not appear on this list that need to be satisfactorily addressed. Specifically, discussion on independent utility (question by NCDWQ), re-alignment of the project between stations 107+50 and 109+00 (suggested by the USACE), the need to excavate at Wetland Site 14 (concern by NCDWQ), and conservation measures that must be taken for the spring-flowering goldenrod (Solidago verna) to meet the DCM consistency requirements (comment by CAMA). One item that was not addressed but should have been is an off-deck drainage system for the Starkys Creek Bridge. Please coordinate with the DWQ Water Quality Section regarding this potential requirement.

DOT Response:

The permit application stated that R-2514A is in compliance with 23 CFR Part 771.111(f). The meeting minutes from the April 24, 2003 Interagency Permit Review meeting were reviewed and there is no record of discussion regarding independent utility. However, in section 2.4, page 6 of the EA covers independent utility. The EA reads that at an interagency meeting held January 21, 1999 to evaluate the status of TIP Project No. R-2514 and to request separating "A" section for independent study. All agencies in attendance concurred with NCDOT's proposal to process TIP Project No R-2514A as a Federal Environmental Assessment. The document also states that the project does not preclude the consideration of alternatives along the remainder of the TIP Project No R-2514 project corridor, especially the alternatives being considered in the Belgrade/ Maysville area.

The NCDOT looked at the request to realign the road between stations 107+50 and 109+00. We discovered that the realignment will affect almost 4000 feet (3/4 of a mile) of the proposed alignment of the project. This shift will affect the wetlands on the north side on the road. It will

also severely impact parcels that we were not impacting before. NCDOT would also have to relocate a large business near station 109+00.

In order to maintain existing drainage patterns and avoid hydraulic trespass, it was necessary to excavate a new roadway ditch down to the proposed 24 inch cross pipe at site 14. Without this proposed excavation the NCDOT would have been unable to achieve the hydraulic capacity of the proposed 15-inch outlet pipe and provide positive drainage for the proposed 2 GI in the median at –L- Sta. 123+40. In addition, without the proposed earth dam right of –L- Sta. 123+20, water from one drainage sub-basin would be have been diverted into an adjacent drainage basin that did not receive this water before.

As noted previously in this letter, Karen Lynch contacted "The North Carolina Plant Conservation Program" through email on November 21, 2003 and March 15, 2004 about conducting surveys for spring-flowering goldenrod and any other state listed species. To date the North Carolina Plant Conservation Program has not responded.

A note that describes the locations of the proposed bridge deck drains is in the upper left-hand corner of the permit plan view sheet 62 of 81. The deck drains will be placed in the first and last span of the proposed three span dual bridges, which are not over open water. The deck drains will not be placed in the center span over the surface waters of Starky's Creek.

Corp Comment:
o. The proposed project constitutes Segment A of TIP Project No. R-2514. Based on correspondence in the EA and on discussions at the interagency meeting held on April 24, 2003, agency concurrence was provided on avoidance and minimization during several meetings held on both R-2514A and R-2514B. Please provide documentation (i.e. meeting minutes or concurrence forms) that supports the agency concurrence on avoidance and minimization that pertain to R-2514A and the wetland and stream impacts associated with each alternative considered.

DOT Response:
A copy of Concurrence Point 2 meeting minutes, held on December 8, 1999, are included with this letter. The purpose of this meeting was to discuss alternatives that would avoid and minimize impacts. The avoidance measures that were agreed upon included widening to the east using the previously disturbed railroad right-of-way. By widening to the east, impacts to the historic Hoffman Forest Headquarters were avoided, and longitudinal encroachments to Starky's Creek and other high quality wetlands were avoided. Minimization measures included the use of the previously developed right-of-way and bridging of the lower limits of Starky's Creek.

Corp Comment:
p. The permit application, page 15 states compensatory mitigation will be provided by the EEP. We concur with this proposal pending a final determination regarding the availability of on-site compensatory mitigation. The permit application references the study report "On-Site Mitigation Feasibility Analysis (June 2003) that indicates that onsite mitigation is not preferable to the NCDOT. Please submit a copy of this report for our review to this office. Should we

concur with your on-site mitigation determination offsite mitigation to compensate for the unavoidable impacts associated with this project may be appropriate and should be provided by the EEP in accordance with the EEP Memorandum of Agreement (MOA) between the State of North Carolina and the US Army Corps of Engineers signed on July 22, 2003.

DOT Response:
A copy of the On-Site Mitigation Feasibility Analysis is attached to this letter. It should be noted that onsite mitigation was determined to not be feasible because of the extensive drainage system of the Hofmann Forest and the somewhat poorly drained classification of Rains soil.

If you have any questions or need additional information please call Mr. Brett Feulner at (919) 715-1488.

Sincerely,

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

cc: Mr. David Franklin, Corps of Engineers, Wilmington Field Office
Mr. Bill Arrington, DCM (Morehead City)
Ms. Cathy Brittingham, DCM (Raleigh)
Mr. Garland Pardue, Ph.D., USFWS (Raleigh)
Mr. John F. Sullivan III, P.E., FHWA
Mr. John Hennessy, NCDENR, Division of Water Quality
Mr. Calvin Leggett, P.E. Program Development Branch
Mr. Art McMillian, P.E., Highway Design Branch
Mr. David Chang, P.E., Hydraulics Unit
Mr. Greg Perfetti, P.E., Structure Design Unit
Mr. Jay Bennett, P.E., Roadway Design Unit
Mr. Mason Herndon, Division 3 Environmental Officer
Mr. H. Allen Pope, P.E., Division 3 Engineer

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ROADWAY DESIGN BY:

TAYLOR• WISEMAN & TAYLOR

ENGINEERS • SURVEYORS •PLANNERS
G.P.S.• SUBSURFACE UTILITY ENGINEERING
3500 REGENCY PARKWAY, SUITE H, CARY, N.C. 27511
TELEPHONE NO. (919)297-0085 FAX NO. (919)297-0090

METRIC

5 0 10

CONST. REV.

R/W REV.

PROJECT REFERENCE NO.	SHEET NO.
R-2514A	12
R/W SHEET NO.	

ROADWAY DESIGN ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 022392 ENGINEER JAMES H. JATKO

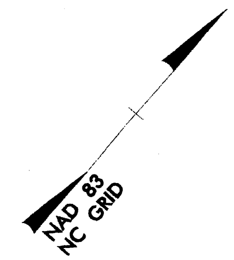
HYDRAULICS ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 19776 ENGINEER RAY D. LOVINGGOOD

8 APR 04

HYDRAULIC DESIGN:

TranSystems Corporation 4917 Waters Edge Drive, Suite 235 Raleigh, NC 27606 (919) 233-8125

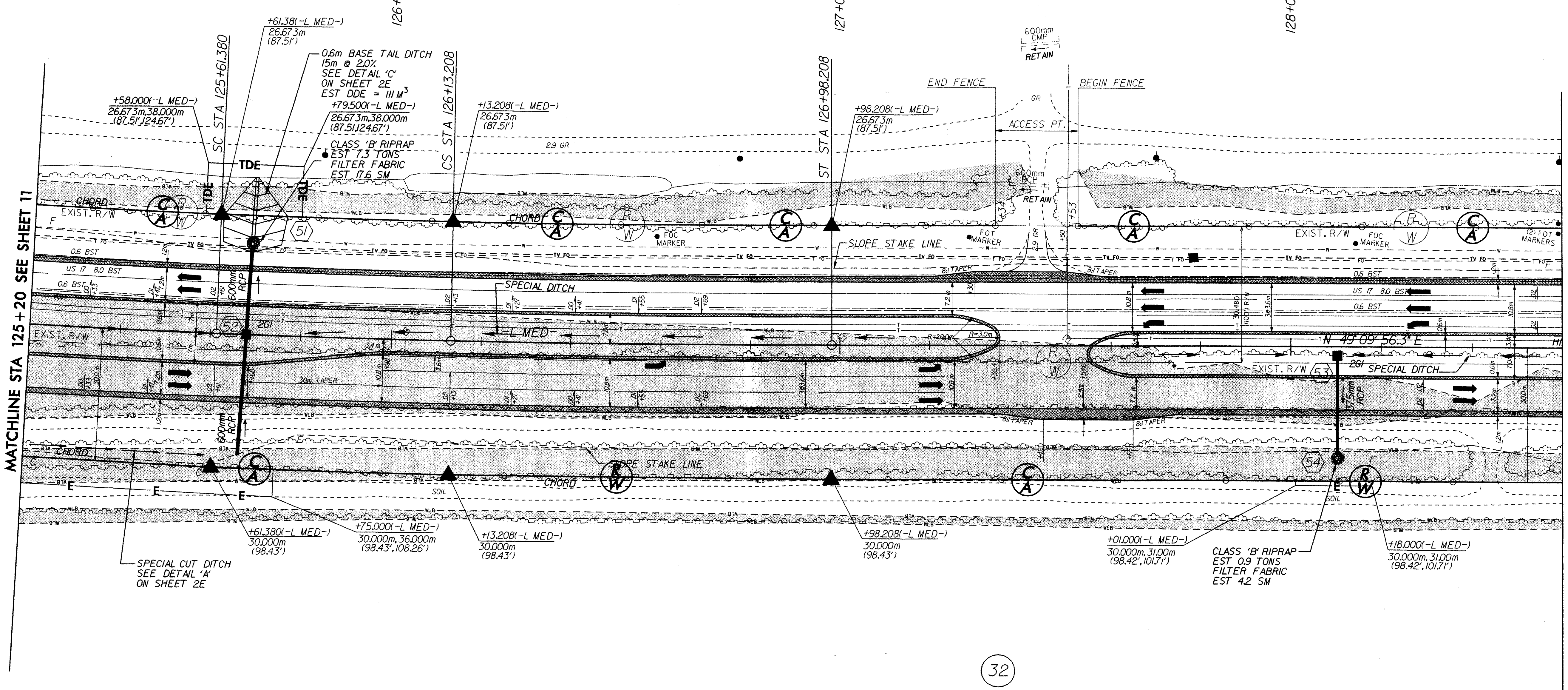


(32)

THE ENDOWMENT FUND OF NC STATE
UNIVERSITY ET AL. (HOFMANN FOREST).

DB. 170, PG. 263
DB 516 PG 408

HISTORIC PROPERTY



(32)

THE ENDOWMENT FUND OF NC STATE
UNIVERSITY ET AL. (HOFMANN FOREST).

DB. 170, PG. 263
DB 516 PG 408

HISTORIC PROPERTY

-L MED-

PIs Sta 125+33.047	PI Sta 125+87.295	PIs Sta 126+41.543
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Ls = 85.000	L = 51.829	Ls = 85.000
LT = 56.668	T = 25.915	LT = 56.668
ST = 28.334	R = 2,200.000	ST = 28.334
	SE = 0.02	

SEE SHEET NO. 2E FOR ALL DRIVEWAY DETAILS.

SEE SHEET NO. 2E FOR ALL DITCH DETAILS.

SEE SHEET NO. 42 FOR NBL & SBL GRADES AND PROFILES AND ALL DITCH GRADES AND PROFILES.

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ROADWAY DESIGN BY:

TAYLOR• WISEMAN & TAYLOR

ENGINEERS • SURVEYORS •PLANNERS
G.P.S.• SUBSURFACE UTILITY ENGINEERING

3500 REGENCY PARKWAY, SUITE H, CARY, N.C. 27511
TELEPHONE NO. (919)297-0085 FAX NO. (919)297-0090

METRIC

5 0 10

CONST. REV.

R /W REV.

PROJECT REFERENCE NO.	SHEET NO.
R-2514A	22
R /W SHEET NO.	

ROADWAY DESIGN ENGINEER

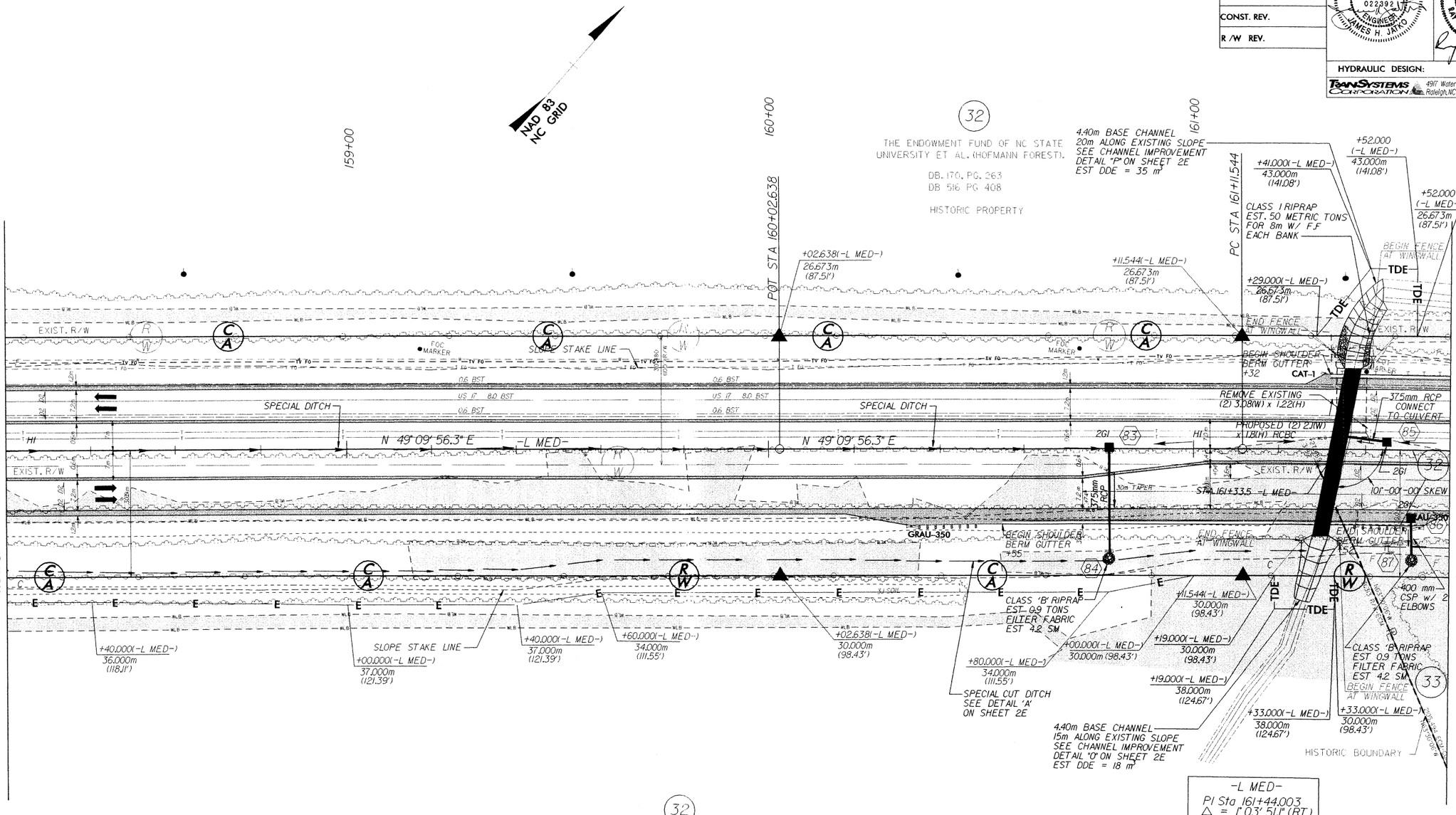
NORTH CAROLINA PROFESSIONAL SEAL 022392 ENGINEER JAMES H. JAFFO
4/15/2024

HYDRAULICS ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 19778 ENGINEER RAY Q. LOVINGOOD
8 Apr 24

HYDRAULIC DESIGN:

TRANSYSTEMS CORPORATION 4917 Waters Edge Drive, Suite 235 Raleigh, NC 27606 (919) 233-8125



32
THE ENDOWMENT FUND OF NC STATE UNIVERSITY ET AL. (HOFMANN FOREST).
DB. 170, PG. 263
DB 516 PG 408
HISTORIC PROPERTY

SEE SHEET C- THROUGH SHEET C- FOR CULVERT DETAILS

SEE SHEET NO.2E FOR ALL DRIVEWAY DETAILS.

SEE SHEET NO.2E FOR ALL DITCH DETAILS.

SEE SHEET NO. 52 FOR NBL & SBL GRADES AND PROFILES AND ALL DITCH GRADES AND PROFILES.

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ROADWAY DESIGN BY:
TAYLOR• WISEMAN & TAYLOR
ENGINEERS • SURVEYORS •PLANNERS
G.P.S. • SUBSURFACE UTILITY ENGINEERING
3500 REGENCY PARKWAY, SUITE H, CARY, N.C. 27511
TELEPHONE NO. (919)297-0085 FAX NO. (919)297-0090

METRIC

5 0 10

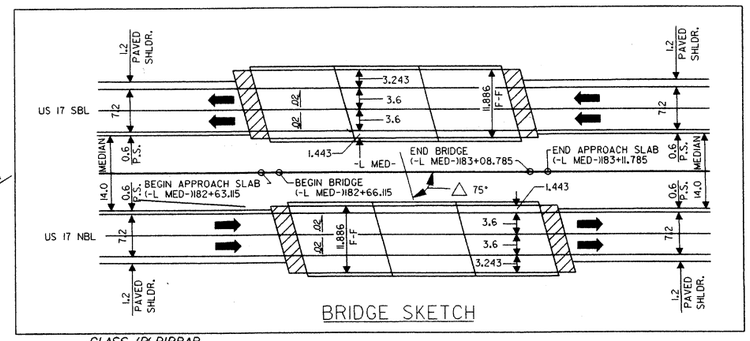
CONST. REV.
R /W REV.

PROJECT REFERENCE NO.	SHEET NO.
R-2514A	29
R /W SHEET NO.	

ROADWAY DESIGN ENGINEER
NORTH CAROLINA PROFESSIONAL SEAL 022392 ENGINEER JAMES H. LATKO

HYDRAULICS ENGINEER
NORTH CAROLINA PROFESSIONAL SEAL 19775 ENGINEER R. Y. LOWINGSOOD
12 APR 04

HYDRAULIC DESIGN:
TRANSYSTEMS CORPORATION 4917 Waters Edge Drive, Suite 235 Raleigh, NC 27606 (919) 233-8125



SEE SHEET S- THROUGH SHEET S- FOR ALL STRUCTURE DETAILS.

SEE SHEET NO.2E FOR ALL DRIVEWAY DETAILS.

SEE SHEET NO.2E FOR ALL DITCH DETAILS.

SEE SHEET NO. 59 FOR NBL & SBL GRADES AND PROFILES AND ALL DITCH GRADES AND PROFILES.

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North Carolina Department of Cultural Resources
State Historic Preservation Office

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

Division of Historical Resources
David L. S. Brook, Director

April 8, 2004

MEMORANDUM

TO: Gregory J. Thorpe, Ph.D., Director
Project Development and Environmental Analysis Branch
NCDOT Division of Highways

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

SUBJECT: Archaeological Survey, Widening of US 17, Segment 1, Between Jacksonville and New Bern, NCDOT Division 3, R-2514A, Onslow County, GS 94-0013

Thank you for your letter of April 2, 2004, transmitting the archaeological survey report by Erica Sanborn and Lawrence Abbott of New South Associates, Inc. for the above project.

During the course of the survey, no prehistoric or historic archaeological sites were located within the project area. Due to the disturbed and wet nature of the project area and the absence of cultural material, the authors have recommended that no further archaeological investigation be conducted in connection with this segment of the project. We concur with this recommendation since the project will not involve significant archaeological resources.

When the preferred alternative has been selected for the remaining segment of this project (R-2514B), we recommend that consultation take place regarding appropriate archaeological investigations.

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

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

cc: √ Matt Wilkerson, NCDOT
Lawrence Abbott, New South Associates, Inc.

Subject: Meeting Minutes from the Interagency Permit Review Meeting on April 24, 2003 for R-2514A in Onslow County

Team Members:

Dave Timpy-USACE	(present)
John Hennessy-NCDWQ	(present)
Travis Wilson-NCWRC	(present)
Gary Jordan-USFWS	(absent)
Chris Militscher-EPA	(present)
Rachelle Beauregard-PD&EA	(present)
Ron Sechler-NMF	(absent)
Cathy Brittingham-CAMA	(present)
Bill Arrington-CAMA	(absent)
Jay Twisdale-NCDOT Hydraulics	(present)

Participants:
Ray Lovinggood, Transystems, Hydraulics
Zak Hamidi, NCDOT, Design Services
Bart Duke, NCDOT, Structure Design
Steve Champion, NCDOT, Structure Design
Elizabeth Lusk, NCDOT, PD&EA
Brett Feulner, NCDOT, PD&EA
Kim Leight, RK&K

Dave suggested that the adjacent property owners reflected on the Roadway Plans and the Permit Drawings should be checked to ensure that they are correct and agree.

Dave noted that most of the proposed pipes appeared to be the same size as the existing pipes. Jay responded by explaining that the current character (land use) of the adjacent tracts is not anticipated to change since the majority of the adjoining tracts is owned by Hoffman Forest (Historic Property owned by NCSU), Weyerhaeuser Timberlands, and Great Eastern Timber Company (Tree Farms). Therefore, pipe sizes primarily remained the same or very close to the same. No further action was determined to be necessary.

Dave noted that he was pleased that all jurisdictional streams were labeled.

Dave offered that all proposed work should be contained in PDE or ROW. Jay responded to a specific area (Site 3, Permit Plan View Sheet 7 of 79) in question and explained that this area is reflected as drained wetlands since it will be a small remnant after construction of the road. Jay also confirmed that all proposed work is enclosed in either PDE or ROW. It was agreed that no further action will be required.

Dave also noted and Rachelle confirmed that ESI is currently updating the wetland delineation.

Dave suggested that on site mitigation should be pursued first possibly on the West Side of existing US 17. Dave as well as John also agreed that on site mitigation should be pursued first and the area between the proposed roadway footprint and the old rail road bed as well as the old rail road bed itself (East side of roadway), should also be investigated. Kim stated that the Board of Trustees for Hoffman Forest (Historic Property) seemed reluctant when approached about the potential loss of additional property for use of the old railroad bed area as mitigation. Kim also mentioned that the Trustees suggested that a wetland mitigation bank in Hoffman might be an option.

John requested that all pipes/box culverts should be buried appropriately. Jay responded by stating that four of the jurisdictional crossings where pipes or box culverts are proposed, as replacement structures will be buried appropriately. Two of the remaining 600mm pipes will not be buried since jurisdictional status begins at the existing pipe outlets. The remaining crossing is a bridge. No further action was deemed necessary.

John requested that all special ditches that run through or that are adjacent to wetlands will need to be assessed for limit of impact due to drainage impacts. Additional discussion to occur between John and Elizabeth concerning ditches that are adjacent to wetlands.

Chris asked about the significance of the water courses right of –L- Sta. 107+10 +/- in front of an existing mobile home (Parcel 22, Permit Plan View Sheet 7 of 79). Jay responded by stating that the watercourses immediately in front of the mobile home are small swales to drain the yard and the larger drainage ditch that they tie into is ephemeral. No further action necessary.

Dave offered that in a conversation with Ron Elmore several years ago, Ron mentioned that approximately 28 acres of the existing railroad bed could possibly be used as on site mitigation.

Travis stated that there should be no adjustment of stream widths and that no rip rap should be placed in the bed of jurisdictional streams. He also mentioned that all jurisdictional stream culvert inverts should be buried a minimum of 20% of culvert diameter or 1' for aquatic passage.

Dave stated that DOT needs to demonstrate that Avoidance and Minimization has been addressed. Cathy provided a copy of a memorandum dated December 9, 1999 that confirmed that A&M had been addressed for this section of R-2514.

John asked about velocities entering wetlands from storm drainage pipe outlets. Jay responded that preformed scour holes have been placed at all pipe outlets that empty into wetlands. David Chang asked if we could provide a general statement in the Storm Management Plan that addresses anticipated outlet velocities based on the use of preformed scour holes instead of adding velocities at each occurrence. Considering the flat slopes of proposed pipes due to the flat topography in this part of the state, velocities will generally be low. John agreed that this would be sufficient. A note will be added to the Stormwater Management Plan.

Cathy Brittingham reminded NCDOT that in a letter dated 11/24/99, DCM determined that TIP No. R-2514A: "...is consistent with the North Carolina Coastal Management Program (NCCMP) provided all state and local authorizations are obtained and the conditions therein are met, and provided that the following conditions are met....." NCDOT staff made additional copies of the 11/24/99 DCM letter at the meeting. Especially notable conditions within the 11/24/99 DCM

letter include Condition 1 regarding mitigation and Condition 2 regarding conservation measures for the spring-flowering goldenrod. Cathy urged NCDOT to submit a proposed mitigation plan for approval by the resource agencies as soon as possible to prevent delays of the construction letting date (February 2004). Cathy also encouraged NCDOT to implement the requested conservation measures for spring-flowering goldenrod.

Review of Half–Size Plan Sheets

Plan Sheet 4: No Comments

Plan Sheet 5: No Comments

Plan Sheets 6 and 7: John asked that widening to the West be investigated from approximately –L- Sta. 107+50 lt. to 109+00 lt. PD&EA (Ron Elmore) and Design Services (Zak Hamidi) will address this issue.

Plan Sheet 8: John, Travis, Dave and others reviewed the proposed single barrel replacement box culvert. Dave asked if the proposed box could be skewed to avoid the proposed channel change at the entrance. Jay responded that two separate tributaries converge at the entrance of the existing box culvert and that the box has been placed to accommodate both of these existing tributaries and emulate existing conditions. Dave acknowledged that he had not noticed the other smaller tributary and agreed with the design. Jay explained that this proposed box culvert will be buried one foot and will be much better than the existing perched box culvert. No other comments were made. No additional action required.

Plan Sheet 9: No comments

Plan Sheet 10 (Permit Plan View Site 13A, Sheet 16 of 79): John asked about the proposed excavation in wetlands reflected within the limits of the improvements to the existing tail ditch left of 119+57 –L- +/-. Jay responded that the excavation is a result of improving the slopes of the existing tail ditch.

Plan Sheet 11 through 21: No comments.

Plan Sheet 22: John asked if the proposed double barrel box culvert will have a proposed sill in one of the barrels. Jay responded that due the proposed box culvert width being very close to the existing channel width that a sill was not required. John agreed and added that he thought that considering the low velocities that the channel will more than likely adjust back to existing conditions without a sill. No further action required.

Plan Sheet 23 through 26: No comments

Plan Sheet 27: Dave noted that the wetland boundaries on this plan sheet left of Station 177+00 +/- do not agree with the limits reflected on the Permit Plan View for this area. Jay responded that the boundaries reflected on the Permit Plan View are correct and the plans will be revised to agree.

Plan Sheet 28: No Comments

Plan Sheet 29: John noted that the proposed bridges were slightly longer than the existing bridge. No further discussion or action was determined to be necessary.

Plan Sheet 30 through 33: No Comments

Post Meeting Activities

8/28/03	Additional impacts to four areas (Sites 6, 12, 13, and 39) where wetlands will remain immediately beyond the proposed back slope of proposed roadway cut ditches have been determined using Boussinesq's equation and have been reflected on the impact summary sheets.
9/10/03	Received updated wetland delineations and stream classification calls, which have been incorporated and reflected accordingly on the permit drawings and impact summary sheets

North Carolina Department of Cultural Resources
State Historic Preservation Office

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

Division of Historical Resources
David L. S. Brook, Director

April 8, 2004

MEMORANDUM

TO: Gregory J. Thorpe, Ph.D., Director
Project Development and Environmental Analysis Branch
NCDOT Division of Highways

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

SUBJECT: Archaeological Survey, Widening of US 17, Segment 1, Between Jacksonville and New Bern, NCDOT Division 3, R-2514A, Onslow County, GS 94-0013

Thank you for your letter of April 2, 2004, transmitting the archaeological survey report by Erica Sanborn and Lawrence Abbott of New South Associates, Inc. for the above project.

During the course of the survey, no prehistoric or historic archaeological sites were located within the project area. Due to the disturbed and wet nature of the project area and the absence of cultural material, the authors have recommended that no further archaeological investigation be conducted in connection with this segment of the project. We concur with this recommendation since the project will not involve significant archaeological resources.

When the preferred alternative has been selected for the remaining segment of this project (R-2514B), we recommend that consultation take place regarding appropriate archaeological investigations.

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

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

cc: √ Matt Wilkerson, NCDOT
Lawrence Abbott, New South Associates, Inc.

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

MICHAEL F. EASLEY
GOVERNOR

LYNDO TIPPETT
SECRETARY

April 2, 2004

Mr. David Brook, Administrator
State Historic Preservation Office
4617 Mail Service Center
Raleigh, North Carolina 27699-4617

Dear Mr. Brook,

Re: An Archaeological Survey for the Widening of US 17, Segment 1, Between Jacksonville and New Bern, Onslow County, North Carolina, NCDOT TIP R-2514A, Division 3, State Project No. 8.T190301, Federal Aid Project No. NHF-17(7), ER 96-8827.

Enclosed please find two copies of the manuscript prepared by our archaeology consultants reporting the results of our investigation in regards to the above-referenced project. Site identification and evaluation were done in compliance with Sections 106 and 110 of the National Historic Preservation Act (1966, as amended), the National Forest Management Act (1976, as amended), the Archaeological Resources Protection Act (1979, as amended), and the guidelines issued by the Advisory Council on Historic Preservation.

No significant cultural resources were located nor were any archaeological sites recorded or revisited that meet the criteria for the National Register of Historic Places (NRHP) as listed at 36CFR60.4. The report concludes that the proposed project will not impact any archaeological sites that are on or are eligible for inclusion on the NRHP. Therefore, a finding of no effect is appropriate as far as archaeological resources are concerned.

In reference to your memo of May 15, 1996, once the preferred alternative has been chosen for the remainder of this project (i.e. R-2514B), further consultation shall take place on the extent and type of survey appropriate to the project areas. Thank you for your assistance in this matter. Should you have any questions concerning this project, please contact either myself at (919) 715-1561 or Mr. Paul J. Mohler, NCDOT Archaeologist, at (919) 715-1555.

Regards,

Matt Wilkerson

Matt Wilkerson
Archaeology Supervisor
Office of Human Environment

MTW/pjm

Enclosures (2 copies of report)

cc: Ron Lucas, FHwA (one copy of report); Kenneth L. Rago, USFS (three copies of report)
Paul J. Mohler, OHE (two copies of report); Brett Feulner, ONE (one copy of report)
Stacy Baldwin, PDEA; John Conforti, PDEA

MAILING ADDRESS:
NC DEPARTMENT OF TRANSPORTATION
OFFICE OF HUMAN ENVIRONMENT
1583 MAIL SERVICE CENTER
RALEIGH NC 27699-1583

TELEPHONE: 919-715-1500
FAX: 919-715-1522

WEBSITE: WWW.NCDOT.ORG

LOCATION:
PARKER LINCOLN BUILDING
2728 CAPITAL BOULEVARD, SUITE 168
RALEIGH, NC 27604

An Archaeological Survey for the Widening of US 17, Segment 1, Between Jacksonville and New Bern, Onslow County, North Carolina

NCDOT TIP R-2514A

New South Associates
6150 East Ponce de Leon Avenue
Stone Mountain, Georgia 30083

An Archaeological Survey for the Widening of US 17, Segment 1, Between Jacksonville and New Bern, Onslow County, North Carolina

NCDOT TIP R-2514A

FEDERAL AID PROJECT NUMBER NHF-17(7)

Report submitted to:
Wilbur Smith Associates
333 Fayetteville Street Mall
Suite 1450
Raleigh, NC 27602-2478

Submitted by:
New South Associates
6150 Ponce de Leon Avenue
Stone Mountain, GA 30083

-and-

P.O. Box 481
Mebane, NC 27302

Lawrence E. Abbott, Jr., Principal Investigator

Erica E. Sanborn, Author

New South Associates Technical Report Number 694

January 5, 2000

Management Summary

New South Associates conducted an archaeological survey of Segment 1 of the proposed widening of US 17 in Onslow County, North Carolina. This project was partially funded by the North Carolina Department of Transportation (TIP # R-2514A), with remaining funding by the Federal Highway Administration. This highway improvement is a federal aid project (#NHF-17(7)) and is subject to compliance with the National Historic Preservation Act. This report was prepared to fulfill the Federal Highway Administration's procedures for compliance with Section 106 of that act. The area in which the widening is proposed extends from north of Jacksonville to south of Belgrade/Mayesville along US 17 southeast to the abandoned Seaboard railroad bed. Most of this area had been disturbed by borrowing of soil in order to raise the grade of both the old railroad grade and US 17 as it presently exists. Areas not effected by this disturbance were wet. No archaeological sites were noted within the area proposed for widening. No additional archaeological work is recommended for the survey area. In addition, the abandoned railroad grade can provide little additional information concerning late nineteenth-early twentieth century railroad construction and does not meet any of the criteria for listing on the National Register of Historic Places. As a result, no additional documentation of the railroad grade is recommended.

INTRODUCTION

New South Associates conducted an archaeological survey of Segment 1 of the US 17 widening between Jacksonville and New Bern, in Onslow County, North Carolina on November 4 and 5, 1999 for Wilbur Smith Associates (Figure 1). Ms. Erica E. Sanborn performed the field work on these days. The project area covers the area southeast of US 17 to the abandoned Seaboard railroad bed from the end of the four-lane portion of US 17, northeast of Kellum, to 200 feet northeast of Spring Hill Road (SR 1439), northeast of Deppe. The length of Segment 1 is approximately 5.9 miles, its width ranges from 50 to 100 feet, and covers approximately 36.5 acres.

This survey was undertaken to identify and assess any archaeological resources effected by widening US 17 southeast to the abandoned Seaboard railroad bed. Most of the area was either wet, or disturbed as a result of borrowing in order to raise the grade of the presently existing US 17 and the railroad bed. No archaeological resources were located by the survey. The railroad track was dismantled when it was abandoned. As a result, the abandoned railroad grade can provide little additional information concerning late nineteenth-early twentieth century railroad construction.

ENVIRONMENTAL SETTING

US 17 is located within the Lower Coastal Plain of the North Carolina Piedmont within the Riverbend Formation (Barnhill 1992, Brown 1985). Limestone and marl comprise the underlying rock of the Riverbend Formation. The Wicomico Surface covers Segment 1 of the US 17 widening project and is Pleistocene in age. Poorly drained soils (Muckalee loam, Rains fine sandy loam, and Pantego mucky loam) associated with White Oak Pocosin comprise most of the project area. Better drained Lynchburg fine sandy loam, Goldsboro fine sandy loam, and Craven fine sandy loam are found in the vicinity of creeks located at the northeast and southwest ends of Segment 1. The severely disturbed Goldsboro-Urban land complex is found in the vicinity of the gravel mining operation located southwest of Starkey's Creek.

White Oak Pocosin dominates the project area (Figures 2 and 3). It is predominantly a pine plantation. Natural pocosins are dominated by dense stands of pine and broadleaf, small trees or shrub which limit the availability of sunlight to plant species near the ground (Sharitz and Gibbons 1982). Atlantic white cedar, cypress, and black gum were dominant species during initial European settlement of the Coastal Plain. Presently, pond pine dominates in natural pocosins, with red and sweet bay, swamp ironwood, sweet gallberry, dahoon holly, pepperbush, fetterbush, and zenobia

Figure 1
Project Vicinity

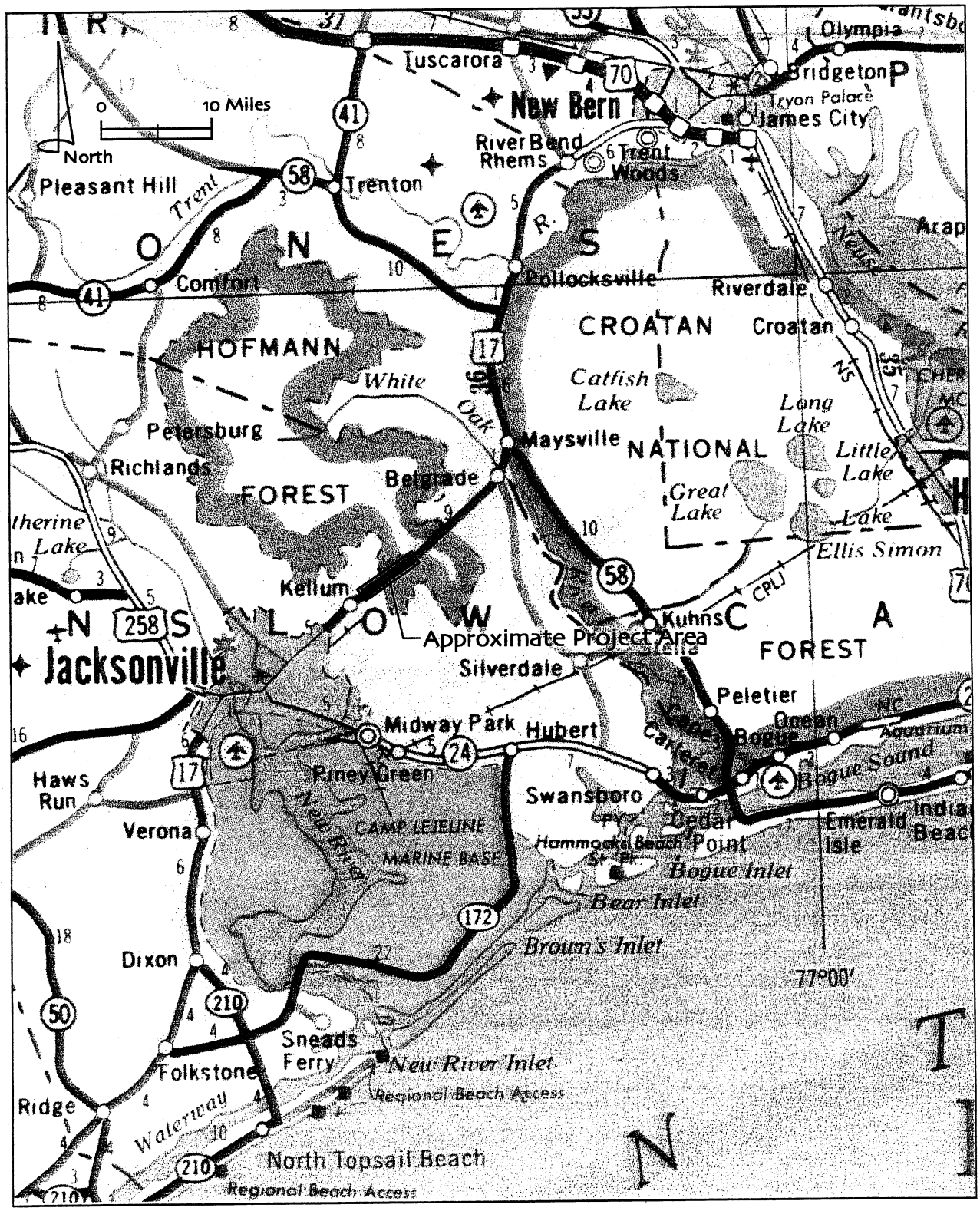


Figure 2
Project Area and Survey Coverage, 1 of 2

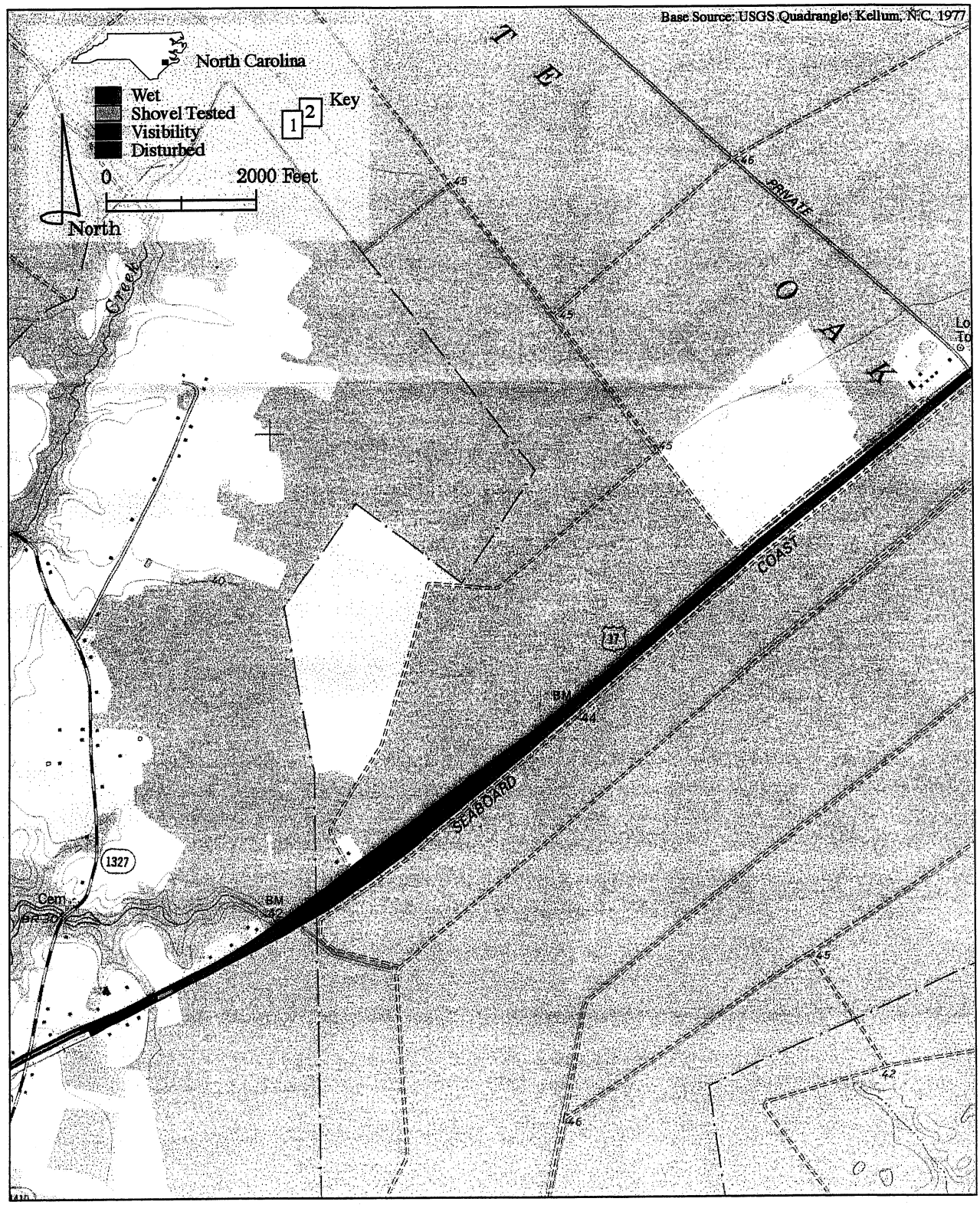
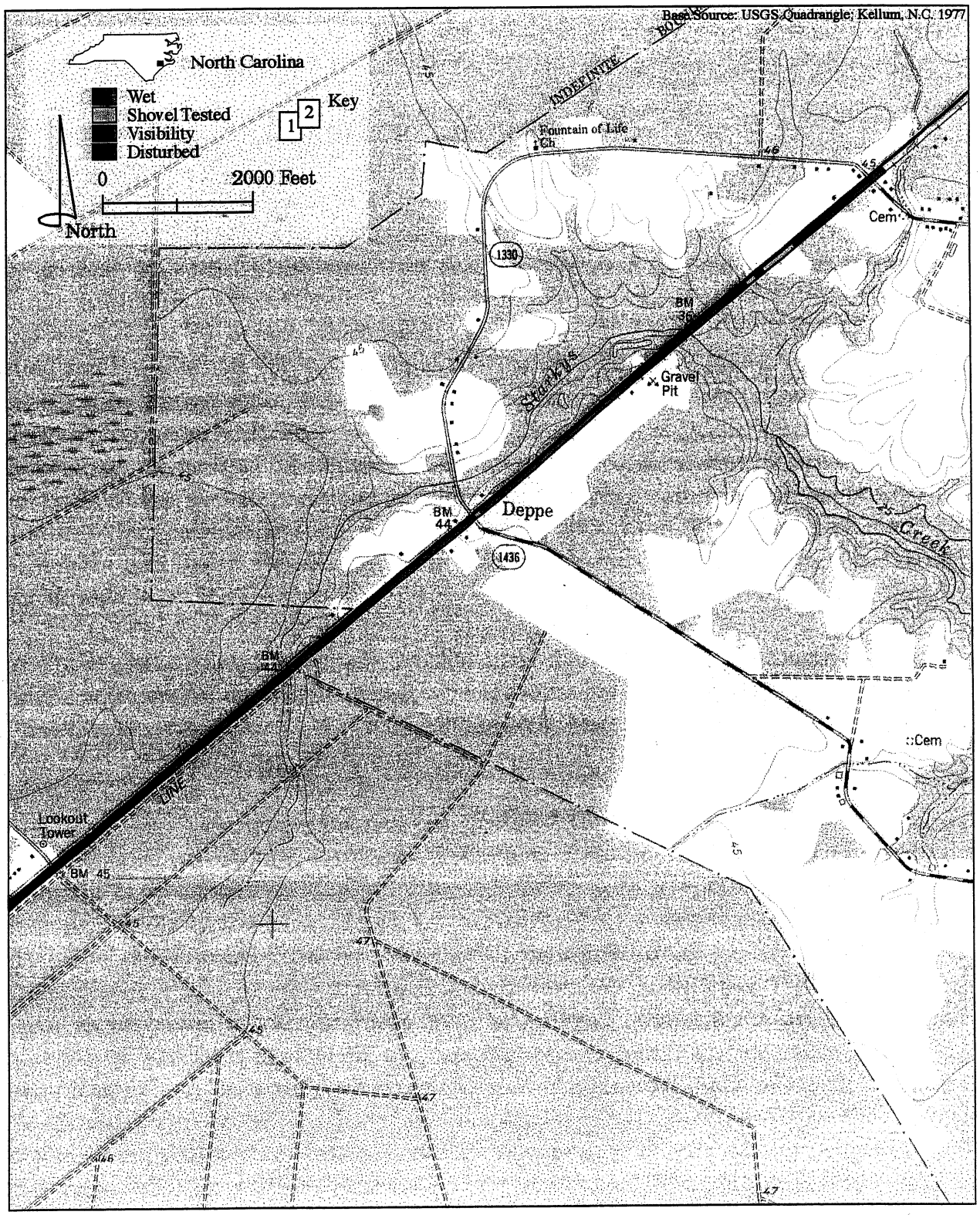


Figure 3
Project Area and Survey Coverage, 2 of 2



represented in the understory. Only one named creek, Starky's Creek, is found within the northeast portion of the project area. Creeks and rivers in the northeast end of the project area drain into the White Oak River, while those in the southwest portion drain into the New River. The elevation of the project area ranges from 30 to 45 feet amsl.

CULTURAL BACKGROUND

Phelps (1983) and Reid et al. (1995) have summarized the prehistory of eastern North Carolina. The following discussion draws heavily from their work. Work at Cactus Hill, a Coastal Plain site in the southern Virginia Coastal Plain suggests that human habitation of the Atlantic Coastal Plain may date to 15,000 B.C. (McAvoy and McAvoy 1997). The earliest uncontested occupation of this part of North Carolina is called the PaleoIndian Stage, and dates to 12,000 to 8,000 B.C. This stage is usually identified by the presence of fluted projectile points, and includes other formal tools knapped on one or both faces. Sites dating to this period typically consist of isolated fluted projectile points. The environment was much cooler than it is presently. The groups from this period practiced hunting and gathering. Hunting probably focused on now-extinct megafauna (mammoth, mastodon, and ground sloth) supplemented by elk, moose and deer. Residences were likely temporary and focused on gathering specific resources.

The Archaic Stage dates to B.C. 8,000-1,000. During the Archaic, the environment became warmer. Modern fauna replaced megafauna in the diet of Archaic groups. The Archaic is separated into Early (B.C. 8,000-6,000), Middle (B.C. 6,000-3,000) and Late (B.C. 3,000-1,000) periods. These distinctions are based on changes in projectile point form through time (Coe 1964). Population density is thought to have increased over time. As a result, territories became constricted. This is thought to have resulted in more intensive use of local resources, ultimately resulting in the use of horticulture during the Late Archaic.

The beginning of the production of ceramics dates to the Late Archaic. Production of ceramic vessels may be related to territory constriction limiting access to soapstone for vessel production (Sassaman 1993, 1996). Radiocarbon dates as early as B.C. 2905-2875 (Abbott et al. 1999) indicate that ceramics may have been produced for much, if not all, of the Late Archaic in the southern Coastal Plain of North Carolina. The earliest group of radiocarbon dates is associated with marl/limestone tempered net-impressed, simple-stamped, and cord-marked pottery (Hamp's Landing Series) and range from B.C. 2125 to 1870 (Hargrove 1993, Jones et al. 1997; Abbott et al. 1999). Of this cluster of dates, one ranging from B.C. 2035-1870 was recovered from 31On190, on

Topsail Island (Jones et al. 1997). In addition, one date associated with a Thom's Creek vessel in Columbus County ranges from 2025-1880 B.C. (Abbott et al. 1999).

The Woodland Stage spans from B.C. 1,000 to 1,500 A.D. Like the Archaic Stage, the Woodland is divided into Early (B.C. 1,000-500), Middle (B.C. 500-500 A.D.) and Late (500-1,500 A.D.) Periods. Grog tempered Hanover ceramics associated with the Early Woodland period in the central North Carolina Coastal Plain are represented by one radiocarbon date of B.C. 760-415 in Columbus County (Abbott et al. 1999). In addition, a thermoluminescence (TL) date of B.C. 684-184 for a sand tempered Cape Fear sherd (Herbert 1997) indicates that it was produced during the Early/Middle Woodland interface. A number of Middle Woodland radiocarbon dates are associated with grog or clay tempered sherds. These range from B.C. 415-A.D. 825. A recent Late Woodland TL date for a sand tempered sherd (Herbert 1997) suggests that these ceramics were produced during the Late Woodland period. In addition, shell-tempered White Oak ceramics are associated with estuarine Late Woodland sites in the central North Carolina Coastal Plain.

Horticulture developed into agriculture during the Woodland Stage. However, in the central North Carolina Coastal Plain, there is little evidence for agriculture. Two Late Woodland house patterns were excavated at the Uniflite Site (31On^{V}33), in Onslow County (Loftfield 1979). The dietary remains were almost exclusively fish and shellfish, indicating that estuarine resources were the primary source of food at this site. In addition, the appearance of large shell middens at Middle and Late Woodland sites indicates an increased use of shell fish in the prehistoric diet at this time (Loftfield 1981). Residences were probably seasonal, and were established along the sounds and in the estuaries. Hunting and gathering remained the important subsistence activity in the region throughout the Woodland Stage.

By A.D. 1,500 historic Native American groups were probably established within the project area. Shell-tempered Oak Island ceramics are thought to be associated with the influx of Algonkian/Iroquoian groups found further north (Mathis 1999). These sites also produce large quantities of shell fish remains. The Tuscarora were an important historic Amerindian group who settled in the New Bern area. Hostilities between European settlers and the Tuscarora resulted in the Tuscarora War (1711-1714). With the end of the Tuscarora War, most of the Tuscarora moved to Virginia and then New York, though those that remained neutral during the war remained in North Carolina until 1802 (Swanton 1987 [1946]:199).

The first European colonists in Onslow County settled Town Point at present-day Camp Lejeune. Onslow Precinct was established from New Hanover Precinct in 1731, just after North Carolina was purchased by the English Crown from the Lord Proprietors (Powell 1989:85). Johnston was the first county seat, and was platted in 1742 (Sharpe 1966). It was located along the New River. A hurricane in 1752 destroyed the town. As a result, a new county seat was established upstream of Johnston, and was called "Wantlands". The first courthouse was built in 1756 at Wantlands. "Wantlands" became Jacksonville in 1842, in order to honor Andrew Jackson.

The primary cash "crop" in Onslow County was pine (Littleton 1981). Sap and resin harvested from these trees were converted into turpentine, tar and pitch and exported to England for use in their naval fleet. In addition, cedars and live oaks were harvested for their lumber (Harmon and Snedeker 1989). Corn was the primary agricultural product, with wheat, rice, flax, indigo, and hemp represented. However, much of the area of Onslow County was wet and swampy. As a result, relatively little of the acreage in the county has ever been placed in cultivation. The extent of these wet areas is reflected in the placement of the early road system, which followed the higher, better drained ground. Not until the advent of the Atlantic railroad in the late nineteenth century were the pocosins directly traversed.

The Coast was the focus of North Carolina's direct involvement during the early portion of the Civil War. Salt works were established along Onslow County's coast, and the numerous inlets provided refuge for blockade runners. After the Civil War, plantations were replaced by sharecropping and tenancy in the agricultural areas of Onslow County. During the postbellum period, the production of tar and pitch, and cotton provided cash for the area. However, naval stores remained the economic mainstay of the region, well into the twentieth century. This emphasis is reflected in the rail system that was established in the late nineteenth-early twentieth centuries. The rail system found northeast of Kellum was established between 1892 and 1895 by the New Bern & Norfolk Rail Road Company (Brown 1960). The rail line cut across White Oak pocosin (Jurney et al. 1923, U.S. Post Office Department 1923). Numerous lumber rail lines terminated at the Atlantic Coast Rail Road, providing an efficient means to transport lumber and naval stores out of White Oak pocosin. Present-day US 17 was built paralleling the Atlantic Coast Rail Road by 1938 (North Carolina State Highway and Public Works Commission 1938) as part of an extensive road building effort funded in the late 1920's with state bonds (Powell 1989:476).

By 1934, Dr. J. V. Hofmann, in conjunction with the North Carolina Forestry Foundation, Inc., purchased White Oak pocosin, establishing Hofmann State Forest (Mr.

Harold C. Blanchard, November 12, 1999, personal communication). The purpose of this forest was to provide a teaching laboratory for students at North Carolina State University. A CCC camp was established in 1936-1937 at the location of the present-day Hofmann State Forest headquarters along US 17. A 12 week summer camp for the students and forestry research has been conducted at the site as part of its primary mission. In 1945 buildings were relocated from Camp Butner to Hofmann Forest. The forest used the proceeds from timber sales to pay its mortgage. Since paying its mortgage in 1989, timber sales provide supplemental income for scholarships.

Small family-based timber operations have been replaced by large, multiregional timber and paper corporations. At the same time, the establishment of Camp Lejeune along the New River has resulted in an increase in the number of service industry jobs available in the area. As a result, individual participation in service industries associated with Jacksonville and Camp Lejeune during the middle and late twentieth century has become more important to the economy of the area as the forestry industry has consolidated. However, forestry products remain an important part of the economic life of Onslow County to the present.

METHODS

Background research was conducted at the Office of State Archaeology, the Survey and Planning Branch, the North Carolina State Library, and the North Carolina State Archives, Division of Archives and History, as well as the Wilson Library at the University of North Carolina in Chapel Hill. A pedestrian survey of the entire project area was undertaken. Because most of the project area (87.4%) was within the White Oak Pocosin, most of the area was wet (30.3 acres, or 83.0% of Segment 1). Disturbed areas (5.4 acres, or 14.8% of the project area) showed gullying and rilling. This is a result of borrowing activities associated with raising the grade of the Seaboard railroad bed and US 17. Areas with 60% visibility or better comprised one tenth of an acre (less than 0.1% of the project area). Six shovel tests were excavated in areas that were not wet, were relatively undisturbed, or lacked surface visibility (0.7 acres, or 1.9% of Segment 1). Shovel tests were placed at 30 m intervals in cases where there was more than 45 meters of contiguous area to be shovel tested. The shovel tests were 30 cm across and excavated according to their natural soil stratigraphy to the subsoil. Subsoil within the project area was a grey or brownish yellow silty clay that ranged from 19 to 40 cm below surface. Soil within the shovel tests was screened through 1/4 inch hardware cloth, and a record of the stratigraphy was made. Representative areas along Segment 1 were photographed in order to show the extent of disturbance in the project area and document the abandoned railroad bed.

PREVIOUS RESEARCH

Background research at the Office of State Archaeology, North Carolina Division of Archives and History indicates that no archaeological sites had been recorded between US 17 and the abandoned Seaboard railroad bed within the Kellum Quadrangle. No formal archaeological surveys have been made of the area within the Kellum Quadrangle. However, eleven prehistoric sites (31On111, 31On114-31On116, 31On122, 31On131, 31On180-182, 31On206, and 31On279) have been reported within this area. One of these sites (31On279) is listed as a Archaic temporary camp, two (31On114 and 31On115) contain pottery, and one (31On131) contains lithics. Artifacts are not described for the remaining sites.

Three of the sites (31On114-116) are located at the confluence of Little Northeast Creek and a rank three unnamed drainage. The remaining eight sites are located at the edge of the upland flats overlooking rank two or larger creeks. The location of sites along the larger creeks may be related to the relatively dramatic change (between 5 and 25 feet) in elevation at the juncture of the upland flats and larger creeks. The smaller, unnamed drainages are generally associated with elevation changes of less than five feet, resulting in poorly drained, wet areas. The areas at the large elevational changes tend to be well-drained, and are better suited to habitation sites than those along the rank one streams. One of the sites (31On131) is located within the White Oak River drainage. The other ten sites are located in the New River basin.

Reid et al. (1995) conducted an archaeological survey of the Greater Sandy Run Acquisition Area at Camp Lejeune. Their background research showed that sites were found more often on well-drained soils consisting of fine sand and sandy loams found around the pocosins and drainages. They modeled low, medium, and high probability areas for archaeological sites based on soil types. Hydric (wet) soils were considered to be low probability areas. Baymeade, Marvyn, Norfolk, Onslow, and Wando soil types were considered to be high probability areas. The remaining soil types which were not hydric were considered to be medium probability areas. A total of 9,312 acres encompassed medium and high probability areas. Twenty-two archaeological sites were found by the survey. Three of these sites were cemeteries, three historic, three both historic and prehistoric, and 13 prehistoric. All but one of these sites (95.5%) were located on moderate probability soils. The remaining site (4.5% of the total sites found) was located on a high probability soil. However, 92 percent of the total acreage surveyed was located on moderate probability soils, while eight percent were high probability soils. The similarity of the relative composition of soil types and archaeological sites may indicate that all anhydric (well-drained) soil types are, in essence, high probability areas in the central Coastal Plain.

SURVEY RESULTS

No archaeological resources were found within the project area. Occasional railroad ties were noted in the area between US 17 and the abandoned Seaboard railroad bed. These ties were approximately eight inches square. The railroad ties and hardware have been removed from this portion of the railroad bed, probably when it was abandoned. The railroad bed, itself, consists of four cm of river gravel with occasional river cobbles overlying the sandy silt borrowed from the area adjacent to the railroad bed. The railroad bed ranges from one to five feet above the existing ground surface, and is approximately 10 feet wide.

SUMMARY AND RESULTS

Most of Segment 1 of the US 17 widening between Jacksonville and New Bern was wet or disturbed. No archaeological resources were identified along Segment 1. Baseline documentation of the portion of the abandoned Seaboard railroad bed within Segment 1 has been made. Because the railroad track has been dismantled, this part of the railroad can provide only very limited information concerning late nineteenth-early twentieth century railroad construction techniques in North Carolina, and the Southeast in general. Further documentation of the railroad bed is unlikely to provide additional information about this portion of Seaboard railroad. The railroad bed is not associated with events that contributed to the broad patterns of history (criteria A), with the lives of persons of historical significance (criteria B), has no distinctive artistic or architectural merit (criteria C), nor is likely to contribute information significant to the study of history (criteria D). Because it meets none of the criteria for placement on the National Register of Historic Places, this portion of the railroad bed is recommended as not eligible to the National Register of Historic Places. There are no properties in the project area that are eligible for the National Register of Historic Places. As a result, no further work is recommended for Segment 1 of the US 17 widening between Jacksonville and New Bern.

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WILBUR
SMITH
ASSOCIATES
ENGINEERS • PLANNERS

MEMORANDUM

DATE: December 9, 1999

TO: Attendees

ATTENDEES: Mr. Ron Elmore - NCDOT PD&EA Branch
Ms. Gail Grimes - NCDOT PD&EA Branch
Mr. Brian Yamamoto - NCDOT PD&EA Branch
Mr. Ted Bisterfeld - EPA
Mr. Tre' Dugal - Wilbur Smith Associates

FROM: Tre' Dugal - Wilbur Smith Associates TD

SUBJECT: US 17 Widening from North of Jacksonville to South of New Bern
Onslow and Jones Counties, North Carolina, TIP No. R-2514,
State Project No. 8.T190301, Federal Aid Project No. NHF-17 (7),
(WSA Project No. 297420)

A meeting on the above subject project was held at 3:30 p.m., Wednesday, December 8, 1999, in Room 470, NCDOT Transportation Building. The purpose of this meeting was to present the additional alternatives that avoid and minimize impacts to National Register properties in the vicinity of Pollocksville to Mr. Bisterfeld as part of the requirements of Concurrence Point No. 2 of the NEPA/404 Process. This project is currently at Concurrence Point No. 2 in the NEPA/404 Process in accordance with previous steering committee agreement on "reasonable and feasible" alternatives to be studied (1/29/97 letter from Corps of Engineers). EPA agrees that Concurrence Point No. 1 has already been satisfied.

After discussing and evaluating the additional alternatives, Mr. Bisterfeld stated it may not be necessary to carry Alternate 4C from the Trent River to the north end of the project (Jones/Craven County Line) and Alternate 4I through detailed study. ***Mr. Bisterfeld concurs with the elimination of these alternatives only if everyone on the Team agrees that these alternates need not be carried forward.***

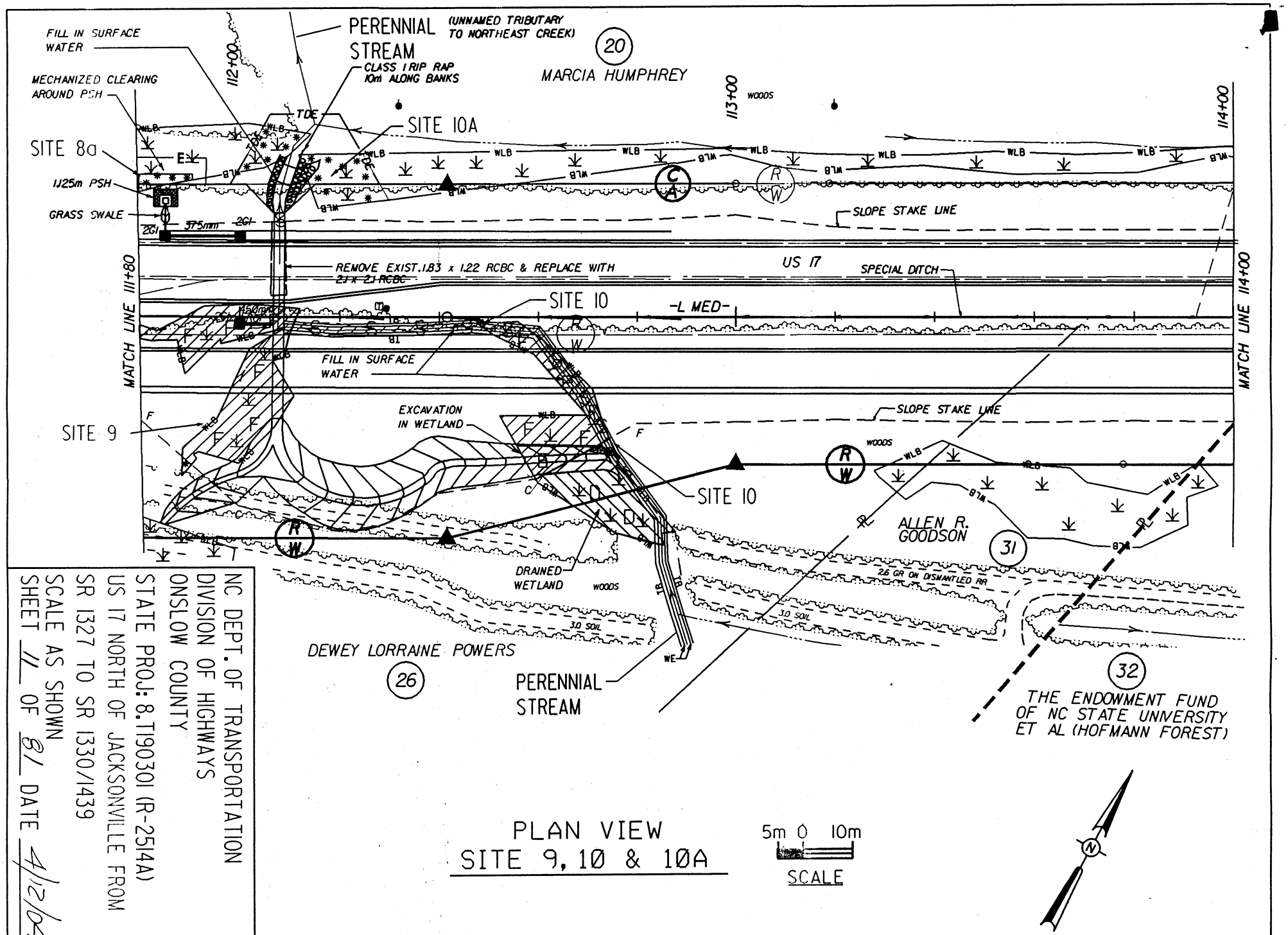
A meeting will be held on Thursday, December 16, 1999 with the remaining members of the NEPA/404 Merger Team to reach concurrence on the alternatives to be carried forward.

Also at the meeting, avoidance and minimization for R-2514A (Segment 1 south of Belgrade/Maysville) were discussed. It was agreed upon that avoidance measures included the widening to the east using the previously disturbed railroad right-of-way adjacent to the existing alignment. By widening to the east, impacts to the historic Hofmann Forest Headquarters complex and longitudinal encroachment to Starkys Creek and other high quality wetlands were avoided. Minimization measures included the use of the previously developed railroad right-of-way and bridging of the lower limits of Starkys Creek.

This is my understanding of the discussions during the aforementioned meeting. *Please sign and date if you concur with the above statements.*

T. Bisterfeld 12/9/99
Mr. Ted Bisterfeld, EPA Date

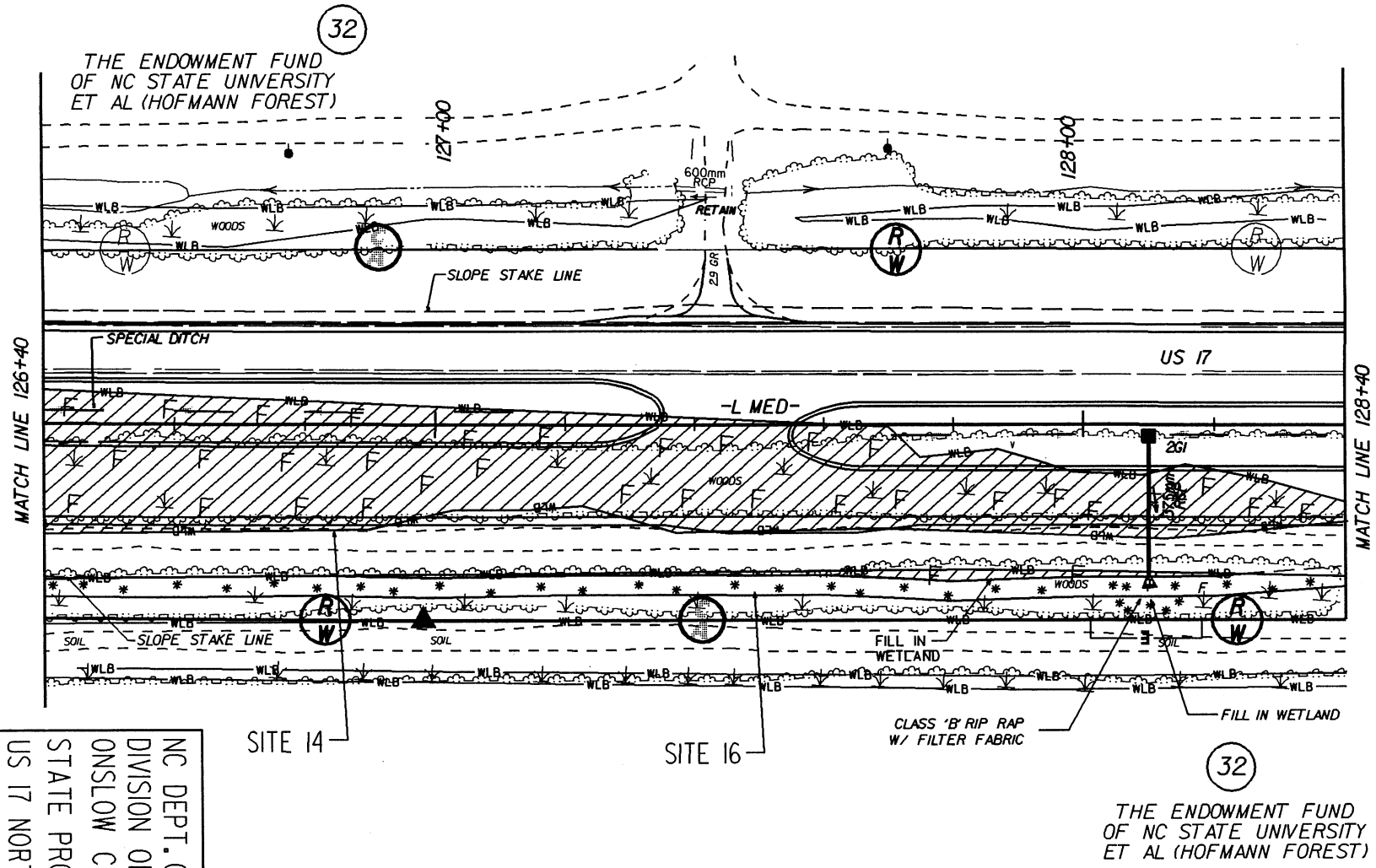
Gail Grimes 12/9/99
Ms. Gail Grimes, NCDOT PD&EA Date



PLAN VIEW
SITE 9, 10 & 10A

5m 0 10m
SCALE

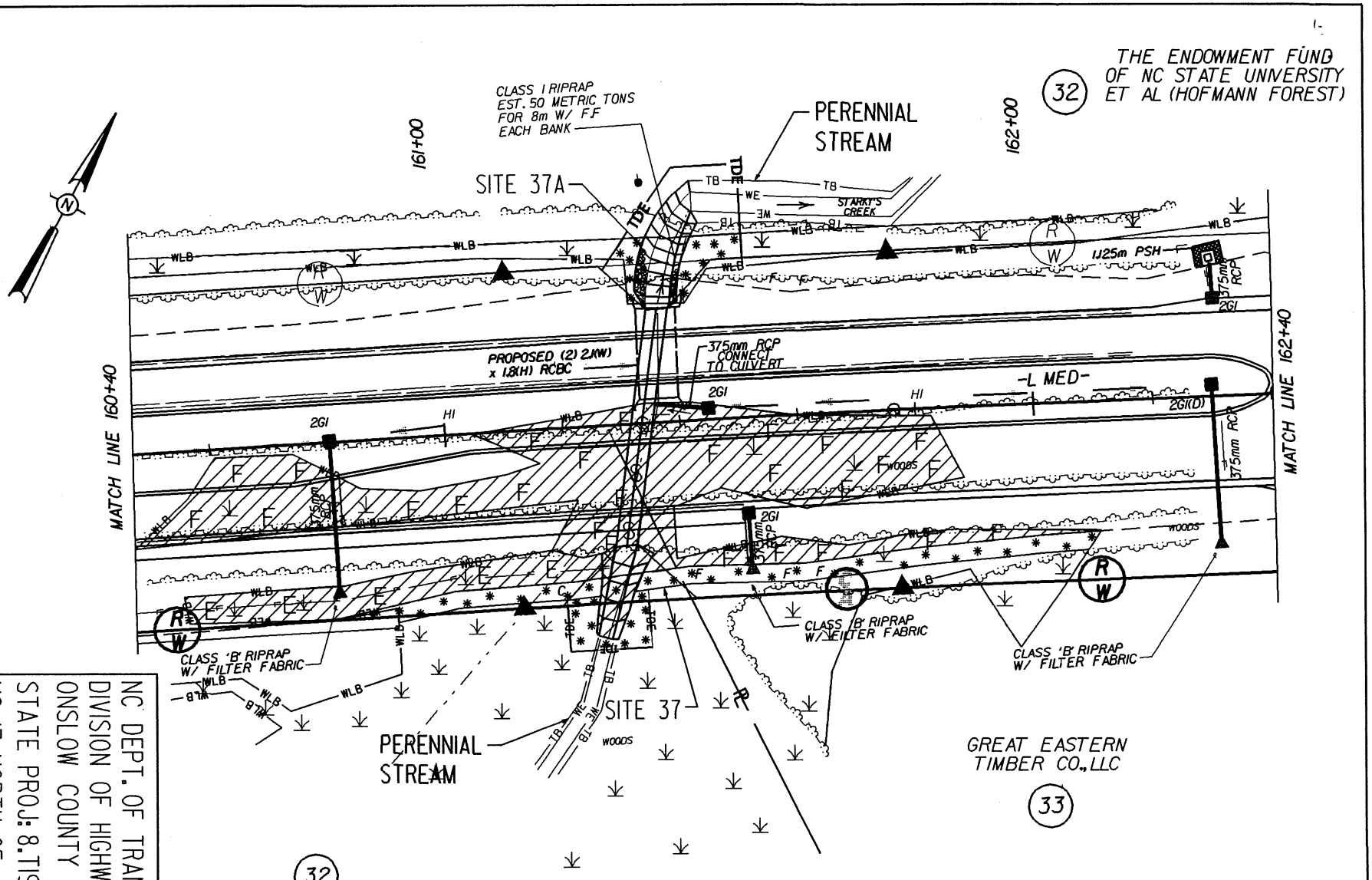
NC DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
ONSLOW COUNTY
STATE PROJ: 8.T190301 (R-2514A)
US 17 NORTH OF JACKSONVILLE FROM
SR 1327 TO SR 1330/1439
SCALE AS SHOWN
SHEET 11 OF 81 DATE 4/12/04



PLAN VIEW
SITE 14 & 16

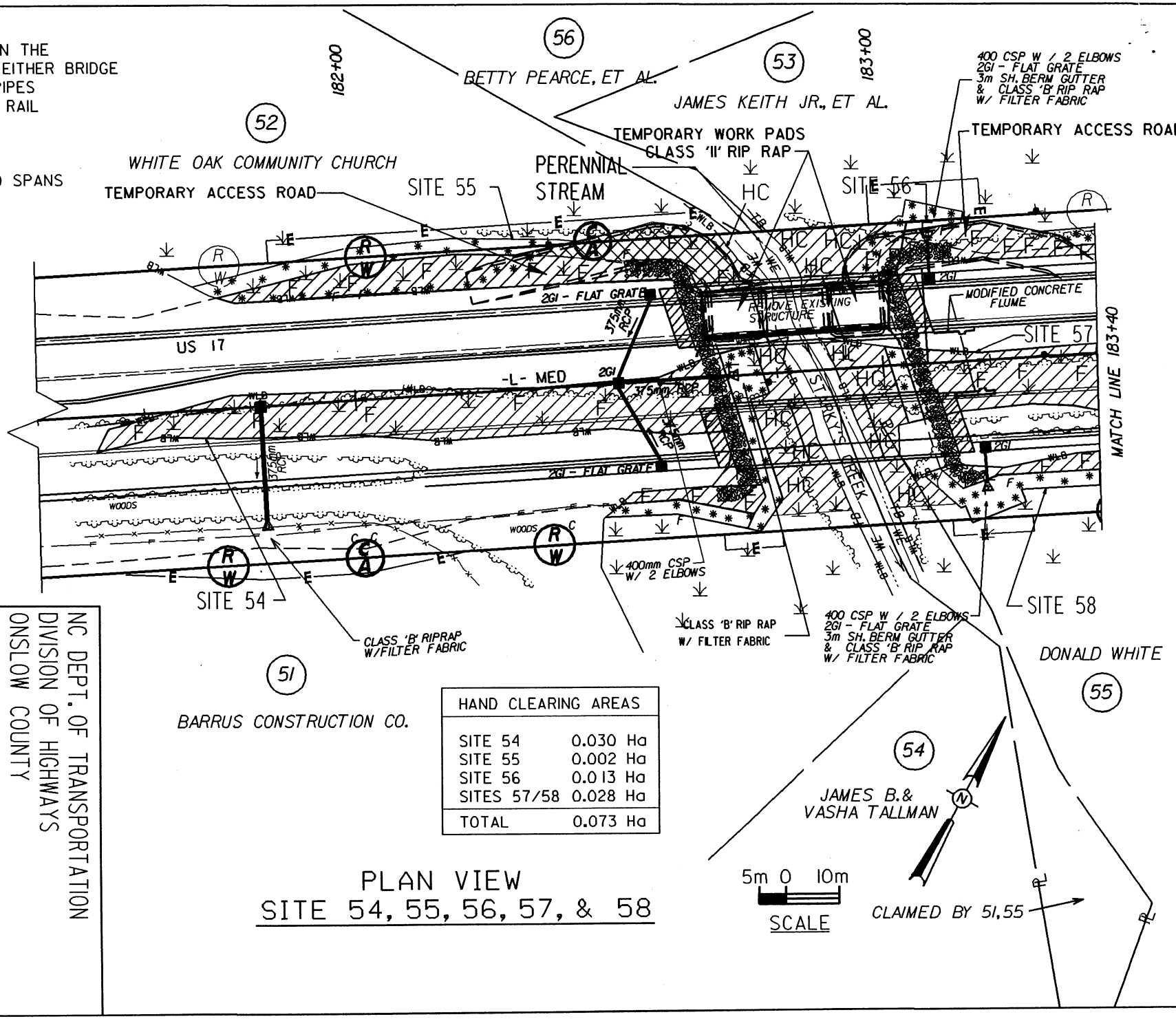
5m 0 10m
SCALE

NC DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
ONSLOW COUNTY
STATE PROJ: 8.T190301 (R-2514A)
US 17 NORTH OF JACKSONVILLE FROM
SR 1327 TO SR 1330/1439
SCALE AS SHOWN
SHEET 22 OF 81 DATE 04/01/04



NC DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
ONSLOW COUNTY
STATE PROJ: 8.T190301 (R-2514A)
US 17 NORTH OF JACKSONVILLE FROM
SR 1327 TO SR 1330/1439
SCALE AS SHOWN
SHEET 46 OF 81 DATE 04/01/04

DECK DRAINS:
NO DECK DRAINS IN THE
CENTER SPAN OF EITHER BRIDGE
USE 102mm DIA PIPES
THROUGH BARRIER RAIL
AT 1.8m CNTS
ON BOTH SIDES
OF EACH BRIDGE
ONLY ON THE END SPANS



HAND CLEARING AREAS	
SITE 54	0.030 Ha
SITE 55	0.002 Ha
SITE 56	0.013 Ha
SITES 57/58	0.028 Ha
TOTAL	0.073 Ha

PLAN VIEW
SITE 54, 55, 56, 57, & 58

NC DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
ONSLOW COUNTY
STATE PROJ: 8.T190301 (R-2514A)
US 17 NORTH OF JACKSONVILLE FROM
SR 1327 TO SR 1330/1439
SCALE AS SHOWN
SHEET 62 OF 81 DATE 04/01/04

PLAN VIEW
SITE 56, 57, 58, 60, & 61

NC DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
ONSLOW COUNTY
STATE PROJ: 8.TI90301 (R-2514A)
US 17 NORTH OF JACKSONVILLE FROM
SR 1327 TO SR 1330/1439
SCALE AS SHOWN
SHEET 65 OF 81 DATE 04/01/04

WETLAND PERMIT IMPACT SUMMARY

Site No.	Station (From/To)	Structure Size / Type	WETLAND IMPACTS					SURFACE WATER IMPACTS			
			Fill In Wetlands (Hectares)	Temp. Fill In Wetlands (Hectares)	Excavation In Wetlands (Hectares)	Mechanized Clearing (Method III) (Hectares)	Drained Wetlands (Hectares)	Fill In SW (Natural) (Hectares)	Temp. Fill In SW (Hectares)	Existing Channel Impacted (Meters)	Natural Stream Design (Meters)
1	105+66 - 105+99 RT	900 mm RCP	0.031		0.015	0.009					
2	106+01 - 106+04 LT	900 mm RCP						0.003		16	
3	106+98 - 107+26 RT		0.039		0.005		0.016				
4	107+48 - 107+63 CL		0.005								
4A	107+70 LT	600mm RCP	0.099				0.007	0.001		3	
5	107+60 - 111+40 RT		0.099			0.007					
6	107+61 - 110+64 RT		0.049		0.096	0.086	0.243				
7	110+58 - 111+65 RT		0.244								
8	111+26 - 111+73 LT		0.003		0.008	0.010					
8A	111+80 - 111+88 LT					0.002					
9	111+66 - 112+12 RT	2.1 x 2.1 RCBC	0.049								
10	112+10 - 112+77 RT	(same culvert as site 9)	0.023		0.006		0.022	0.013		96	
10A	112+08 LT	(same culvert as site 9)			0.001	0.021		0.000		2	
11	114+23 - 114+43 RT		0.005			0.004					
12	114+54 - 116+69 RT	450 RCP	0.344		0.010	0.064	0.017				
12A	114+60 - 114+90 LT	(same pipe as site 12)			0.003	0.004					
13	116+81 - 119+83 RT	750 RCP	0.521		0.070	0.083	0.088				
13A	119+48 - 119+66 LT	(same pipe as site 13)			0.003	0.005					
14	120+08 - 129+26 RT	600 RCP	1.930		0.024	0.122					
15	124+48 - 125+75 RT	(same pipe as site 14)			0.011	0.029					
15A	125+57 - 125+79 LT	(same pipe as site 14)			0.004	0.007					
16	125+80 - 142+50 RT		0.093		0.470	0.330	0.134				
17	*Not Used*										
TOTALS:			3.534	0	0.726	0.782	0.528	0.017	0	117	0

NCDOT

DIVISION OF HIGHWAYS
ONSLOW COUNTY
PROJECT 8.T190301 (R-2514A)
US 17 NORTH OF
JACKSONVILLE
TO SOUTH OF BELGRADE

WETLAND PERMIT IMPACT SUMMARY

Site No.	Station (From/To)	Structure Size / Type	WETLAND IMPACTS					SURFACE WATER IMPACTS			
			Fill In Wetlands (Hectares)	Temp. Fill In Wetlands (Hectares)	Excavation In Wetlands (Hectares)	Mechanized Clearing (Method III) (Hectares)	Drained Wetlands (Hectares)	Fill In SW (Natural) (Hectares)	Temp. Fill In SW (Hectares)	Existing Channel Impacted (Meters)	Natural Stream Design (Meters)
18	129+35 - 132+32 RT	375 mm RCP	0.331								
19	132+47 - 132+64 LT	900 mm RCP			0.005	0.006					
20	132+60 - 132+63 CL		0.002		0.000	0.000					
21	133+56 - 147+60 RT		1.856								
21A	136+00 - 136+15 LT	600 mm RCP			0.002	0.006					
21B	140+54 - 140+69 LT	600 mm RCP			0.001	0.005					
22	144+20 - 145+00 RT	600 mm RCP			0.031	0.015					
22A	144+30 - 144+45 LT	600 mm RCP			0.001	0.003					
23	145+22 - 146+97 RT	375 mm RCP			0.041	0.007	0.040				
24	147+05 - 148+64 RT	600 mm RCP			0.028	0.016	0.015				
24A	148+20 - 148+35 LT	600 mm RCP			0.002	0.010	0.000				
25	149+06 - 150+63 RT		0.111		0.000	0.000					
25A	149+02 - 150+33 RT					0.016					
26	150+55 - 151+05 RT		0.001			0.011					
27	*Not Used*										
28	150+68 - 151+37 RT		0.042								
29	151+41 - 153+07 RT					0.031					
30	151+84 - 152+76 RT		0.110								
31	153+13 - 153+51 RT		0.009								
32	153+32 - 153+49 RT		0.000			0.003					
33	154+40 - 156+76 RT		0.155								
34	156+97 - 157+18 RT				0.008						
TOTALS:			2.616	0	0.119	0.131	0.055	0	0	0	0

NCDOT

DIVISION OF HIGHWAYS
ONSLOW COUNTY
PROJECT 8.T190301 (R-2514A)
US 17 NORTH OF
JACKSONVILLE
TO SOUTH OF BELGRADE

Form Revised 3/22/01 File: g:\ra00\02201\cad\permits\WetlandPermitSummaryM.xls 9/30/03

WETLAND PERMIT IMPACT SUMMARY

Site No.	Station (From/To)	Structure Size / Type	WETLAND IMPACTS					SURFACE WATER IMPACTS						
			Fill In Wetlands (Hectares)	Temp. Fill In Wetlands (Hectares)	Excavation In Wetlands (Hectares)	Mechanized Clearing (Method III) (Hectares)	Drained Wetlands (Hectares)	Fill In SW (Natural) (Hectares)		Temp. Fill In SW (Hectares)	Existing Channel Impacted (Meters)		Natural Stream Design (Meters)
35	156+92 - 160+40 RT		0.308										
36	159+14 - 160+35 RT				0.099								
37	160+40 - 162+10 RT	2 @ 2.1w x 1.8h RCBC	0.192		0.039	0.043		0.009			41		
37A	161+38 LT	(same culvert as site 37)				0.010					18		
38	162+52 - 169+43 RT		0.814					0.002	*		20	*	
38A	163+77 - 163+96 RT				0.003	0.017					20		
39	162+52 - 169+26 RT	600 mm RCP	0.156		0.274	0.204	0.002						
40	164+76 - 167+38 LT		0.004			0.059							
41	168+24 - 168+64 LT					0.004							
42	169+59 - 170+34 LT					0.007							
43	170+35 - 173+39 RT				0.039	0.000	0.018						
44	171+69 - 174+29 CL		0.290										
45	173+58 - 174+25 LT	600 mm RCP	0.016			0.042							
46	173+70 - 176+59 RT				0.101	0.008							
47	174+56 - 174+82 CL		0.023										
48	174+56 - 175+48 LT	600 mm RCP	0.019		0.010	0.074							
49	175+08 - 176+91 RT		0.074										
50	*Not Used*												
51	176+61 - 176+83 LT		0.002		0.008		0.007						
52	177+07 - 177+88 LT	0.9m Base Tail Ditch	0.016		0.044	0.075	0.034						
53	179+13 - 179+30 LT	0.9m Base Tail Ditch						0.001			20		
54	181+51 - 182+79 CN	Bridge	0.117			0.022							
TOTALS:			2.031	0	0.618	0.566	0.061	0.011		0	120		0

* No Mitigation Required (Intermittent Stream in Site 38)

NCDOT

DIVISION OF HIGHWAYS
ONSLOW COUNTY
PROJECT 8.T190301 (R-2514A)
US 17 NORTH OF
JACKSONVILLE
TO SOUTH OF BELGRADE

Form Revised 3/22/01 File: g:\ra00\02201\cad\permits\WetlandPermitSummaryM.xls 4/5/04

WETLAND PERMIT IMPACT SUMMARY

Site No.	Station (From/To)	Structure Size / Type	WETLAND IMPACTS						SURFACE WATER IMPACTS			
			Fill In Wetlands (Hectares)		Temp. Fill In Wetlands (Hectares)	Excavation In Wetlands (Hectares)	Mechanized Clearing (Method III) (Hectares)	Drained Wetlands (Hectares)	Fill In SW (Natural) (Hectares)	Temp. Fill In SW (Hectares)	Existing Channel Impacted (Meters)	Natural Stream Design (Meters)
55	181+70 - 182+70 LT	Bridge	0.064	*			0.020					
56	182+97 - 185+66 LT	Bridge	0.040	*			0.054					
57	183+00 - 185+05 CN	Bridge	0.191				0.004					
58	183+07 - 185+67 RT		0.067				0.082					
59	*Not Used*											
60	185+20 - 192+33 RT		0.208									
61	185+23 - 185+57 CN		0.013									
62	185+40 - 188+36 RT		0.054			0.004						
63	185+80 - 186+13 RT						0.005					
64	188+44 - 192+19 RT	600 mm RCP	0.081			0.014	0.016					
64A	192+76 - 193+31 LT		0.015			0.011	0.020					
65	193+65 - 193+77 RT					0.001		0.008				
66	193+88 - 195+54 RT		0.126			0.071	0.035					
67	195+28 - 195+75 LT	600 mm & 900 mm RCP	0.002			0.006	0.017					
68	196+77 - 197+44 RT		0.009				0.025					
SHEET TOTALS:			0.871		0	0.108	0.278	0.008	0	0	0	0
PROJECT TOTALS:			9.052		0	1.571	1.757	0.652	0.028	0	237	0

* SITE 55 - 0.064 ha INCLUDES 0.022 ha OF FILL FOR TEMPORARY ACCESS ROAD AND WORK PAD.

* SITE 56 - 0.0398 ha INCLUDES 0.019 ha OF FILL FOR TEMPORARY ACCESS ROAD AND WORK PAD.

NCDOT

DIVISION OF HIGHWAYS
ONSLOW COUNTY
PROJECT 8.T190301 (R-2514A)
US 17 NORTH OF
JACKSONVILLE
TO SOUTH OF BELGRADE

Form Revised 3/22/01 File: g:\ra00\02201\cad\permits\WetlandPermitSummaryM.xls 4/5/04

WETLAND PERMIT IMPACT SUMMARY

Site No.	Station (From/To)	Structure Size / Type	WETLAND IMPACTS					SURFACE WATER IMPACTS			
			Fill In Wetlands (Acres)	Temp. Fill In Wetlands (Acres)	Excavation In Wetlands (Acres)	Mechanized Clearing (Method III) (Acres)	Drained Wetlands (Acres)	Fill In SW (Natural) (Acres)	Temp. Fill In SW (Acres)	Existing Channel Impacted (Feet)	Natural Stream Design (Feet)
1	105+66 - 105+99 RT	36" RCP	0.076		0.038	0.022					
2	106+01 - 106+04 LT	36" RCP						0.008		52	
3	106+98 - 107+26 RT		0.096		0.014		0.041				
4	107+48 - 107+63 CL		0.011								
4A	107+70 LT	24" RCP	0.244				0.017	0.001		10	
5	107+60 - 111+40 RT		0.244			0.017					
6	107+61 - 110+64 RT		0.121		0.236	0.212	0.601				
7	110+58 - 111+65 RT		0.604								
8	111+26 - 111+73 LT		0.007		0.019	0.024					
8A	111+80 - 111+88 LT					0.006					
9	111+66 - 112+12 RT	7' x 7' RCBC	0.122								
10	112+10 - 112+77 RT	(same culvert as site 9)	0.057		0.014		0.054	0.031		315	
10A	112+08 LT	(same culvert as site 9)			0.003	0.051		0.001		7	
11	114+23 - 114+43 RT		0.013			0.010					
12	114+54 - 116+69 RT	18" RCP	0.851		0.024	0.158	0.042				
12A	114+60 - 114+90 LT	(same pipe as site 12)			0.008	0.010					
13	116+81 - 119+83 RT	30" RCP	1.288		0.172	0.204	0.219				
13A	119+48 - 119+66 LT	(same pipe as site 13)			0.008	0.012					
14	120+08 - 129+26 RT	24" RCP	4.768		0.060	0.301					
15	124+48 - 125+75 RT	(same pipe as site 14)			0.026	0.073					
15A	125+57 - 125+79 LT	(same pipe as site 14)			0.010	0.017					
16	125+80 - 142+50 RT		0.230		1.162	0.816	0.331				
17	*Not Used*										
TOTALS:			8.73	0	1.79	1.93	1.30	0.04	0	384	0

ENGLISH

NCDOT

DIVISION OF HIGHWAYS
ONSLOW COUNTY
PROJECT 8.T190301 (R-2514A)
US 17 NORTH OF
JACKSONVILLE
TO SOUTH OF BELGRADE

Form Revised 3/22/01 File: g:\ra00\02201\cad\permits\WetlandPermitSummaryM.xls

WETLAND PERMIT IMPACT SUMMARY

Site No.	Station (From/To)	Structure Size / Type	WETLAND IMPACTS					SURFACE WATER IMPACTS			
			Fill In Wetlands (Acres)	Temp. Fill In Wetlands (Acres)	Excavation In Wetlands (Acres)	Mechanized Clearing (Method III) (Acres)	Drained Wetlands (Acres)	Fill In SW (Natural) (Acres)	Temp. Fill In SW (Acres)	Existing Channel Impacted (Feet)	Natural Stream Design (Feet)
18	129+35 - 132+32 RT	15" RCP	0.818								
19	132+47 - 132+64 LT	36" RCP			0.013	0.014					
20	132+60 - 132+63 CL		0.004								
21	133+56 - 147+60 RT		4.587								
21A	136+00 - 136+15 LT	24" RCP			0.006	0.015					
21B	140+54 - 140+69 LT	24" RCP			0.002	0.013					
22	144+20 - 145+00 RT	24" RCP			0.076	0.037					
22A	144+30 - 144+45 LT	24" RCP			0.001	0.008					
23	145+22 - 146+97 RT	15" RCP			0.101	0.019	0.098				
24	147+05 - 148+64 RT	24" RCP			0.069	0.040	0.037				
24A	148+20 - 148+35 LT	24" RCP			0.004	0.024					
25	149+06 - 150+63 RT		0.273								
25A	149+02 - 150+33 RT					0.040					
26	150+55 - 151+05 RT		0.002			0.027					
27	*Not Used*										
28	150+68 - 151+37 RT		0.103								
29	151+41 - 153+07 RT					0.077					
30	151+84 - 152+76 RT		0.271								
31	153+13 - 153+51 RT		0.022								
32	153+32 - 153+49 RT		0.001			0.008					
33	154+40 - 156+76 RT		0.383								
34	156+97 - 157+18 RT				0.021						
TOTALS:			6.46	0	0.29	0.32	0.14	0	0	0	0

ENGLISH

NCDOT

DIVISION OF HIGHWAYS
ONSLOW COUNTY
PROJECT 8.T190301 (R-2514A)
US 17 NORTH OF
JACKSONVILLE
TO SOUTH OF BELGRADE

WETLAND PERMIT IMPACT SUMMARY

Site No.	Station (From/To)	Structure Size / Type	WETLAND IMPACTS					SURFACE WATER IMPACTS					
			Fill In Wetlands (Acres)	Temp. Fill In Wetlands (Acres)	Excavation In Wetlands (Acres)	Mechanized Clearing (Method III) (Acres)	Drained Wetlands (Acres)	Fill In SW (Natural) (Acres)		Temp. Fill In SW (Acres)	Existing Channel Impacted (Feet)		Natural Stream Design (Feet)
35	156+92 - 160+40 RT		0.760										
36	159+14 - 160+35 RT				0.245								
37	160+40 - 162+10 RT	2 @ 7' w x 6' h RCBC	0.475		0.097	0.107		0.021			135		
37A	161+38 LT	(same culvert as site 37)				0.025					59		
38	162+52 - 169+43 RT		2.012					0.005	*		66	*	
38A	163+77 - 163+96 RT				0.008	0.043					66		
39	162+52 - 169+26 RT	24" RCP	0.387		0.677	0.503	0.006						
40	164+76 - 167+38 LT		0.011			0.147							
41	168+24 - 168+64 LT					0.010							
42	169+59 - 170+34 LT					0.017							
43	170+35 - 173+39 RT				0.097		0.045						
44	171+69 - 174+29 CL		0.716										
45	173+58 - 174+25 LT	24" RCP	0.038			0.105							
46	173+70 - 176+59 RT				0.250	0.020							
47	174+56 - 174+82 CL		0.057										
48	174+56 - 175+48 LT	24" RCP	0.047		0.026	0.183							
49	175+08 - 176+91 RT		0.183										
50	*Not Used*												
51	176+61 - 176+83 LT		0.006		0.019		0.018						
52	177+07 - 177+88 LT	3.0' Base Tail Ditch	0.039		0.108	0.186	0.083						
53	179+13 - 179+30 LT	3.0' Base Tail Ditch									66		
54	181+51 - 182+79 CN	Bridge	0.288			0.053							
TOTALS:			5.02	0	1.53	1.40	0.15	0.03		0	392		0

* No Mitigation Required (Intermittent Stream in Site 38)

ENGLISH

NCDOT

DIVISION OF HIGHWAYS
ONSLOW COUNTY
PROJECT 8.T190301 (R-2514A)
US 17 NORTH OF
JACKSONVILLE
TO SOUTH OF BELGRADE

WETLAND PERMIT IMPACT SUMMARY

Site No.	Station (From/To)	Structure Size / Type	WETLAND IMPACTS						SURFACE WATER IMPACTS			
			Fill In Wetlands (Acres)		Temp. Fill In Wetlands (Acres)	Excavation In Wetlands (Acres)	Mechanized Clearing (Method III) (Acres)	Drained Wetlands (Acres)	Fill In SW (Natural) (Acres)	Temp. Fill In SW (Acres)	Existing Channel Impacted (Feet)	Natural Stream Design (Feet)
55	181+70 - 182+70 LT	Bridge	0.158	*			0.049					
56	182+97 - 185+66 LT	Bridge	0.098	*			0.134					
57	183+00 - 185+05 CN	Bridge	0.472				0.011					
58	183+07 - 185+67 RT		0.166				0.202					
59	*Not Used*											
60	185+20 - 192+33 RT		0.513									
61	185+23 - 185+57 CN		0.033									
62	185+40 - 188+36 RT		0.134			0.011						
63	185+80 - 186+13 RT						0.013					
64	188+44 - 192+19 RT	24" RCP	0.200			0.035	0.040					
64A	192+76 - 193+31 LT		0.038			0.028	0.049					
65	193+65 - 193+77 RT					0.002		0.019				
66	193+88 - 195+54 RT		0.312			0.177	0.086					
67	195+28 - 195+75 LT	24" & 36" RCP	0.004			0.014	0.043					
68	196+77 - 197+44 RT		0.023				0.061					
SHEET TOTALS:			2.152		0	0.267	0.687	0.019	0	0	0	0
PROJECT TOTALS:			22.37			3.88	4.34	1.59	0.07	0.00	776	

* SITE 55 - 0.16 ac. INCLUDES 0.05 ac. OF FILL FOR TEMPORARY ACCESS ROAD AND WORK PAD.

* SITE 56 - 0.10 ac. INCLUDES 0.05 ac. OF FILL FOR TEMPORARY ACCESS ROAD AND WORK PAD.

ENGLISH

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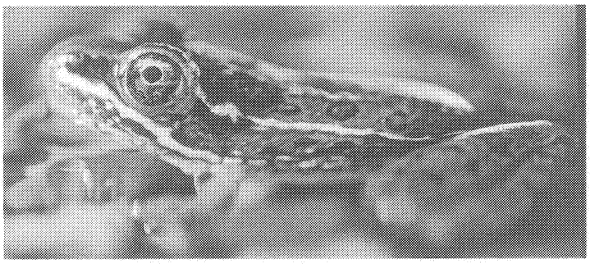
DIVISION OF HIGHWAYS
ONSLOW COUNTY
PROJECT 8.T190301 (R-2514A)
US 17 NORTH OF
JACKSONVILLE
TO SOUTH OF BELGRADE

US 17 WIDENING
From SR 1327/1410 North of Jacksonville to SR 1330/1439 South of Belgrade/Maysville

Onslow County, North Carolina
Federal Aid Project No. NHF-17(7)
State Project No. 8.T190301
T.I.P. No. R-2514A

ON-SITE MITIGATION REVIEW



Prepared for: North Carolina Department of Transportation

Prepared by: Rummel, Klepper & Kahl, LLP
Consulting Engineers
5800 Faringdon Place, Suite 105
Raleigh, NC 27609
(919) 878-9560

I. Introduction

The proposed project will consist of widening the existing two-lane roadway to a four-lane divided roadway with two 3.6-meter (12-foot) travel lanes in each direction divided by a 14-meter (46-foot) median. Limiting access to one per property will provide partial control of access. The primary purpose being to up-grade this section of US 17 to a modern, high speed, multi-lane facility.

The documentation for this project in the form of an Environmental Assessment (EA), a Finding of No Significant Impact (FONSI), and associated background studies have been completed. All documents and findings were presented to resource agencies such as the U. S. Army Corps of Engineers (COE) and N. C. Department of Cultural Resources (SHPO); as well as to local citizens and government bodies. A permit from the COE will be required for this project under the provisions of Section 404 of the Clean Water Act. A Section 401 Water Quality Certification will also be required.

II. Jurisdictional Impacts

Unavoidable impacts will occur to jurisdictional areas as a result of the proposed project. These impacts are as follows:

Jurisdictional Stream Impacts

♦ Starky's Creek (perennial) -	Extend existing RCBC -	8 m (26 feet)

Jurisdictional Waters of the U.S. Impacts

♦ PF04 (palustrine, forested, needle-leaved evergreen) -	0.9 ha (2.2 ac)
♦ PF04/1 (palustrine, forested, needle-leaved evergreen/broad-leaved deciduous)	1.5 ha (3.7 ac)
♦ PF01 (palustrine, forested, broad-leaved deciduous) -	1.0 ha (2.5 ac)
Total	9.9 ha (24.5 ac)

III. On-Site Mitigation Opportunities

There were no opportunities for stream restoration found in the project right-of-way. Near Kellum Loop Road, US 17 crosses over an unnamed tributary to Northeast Creek and north of the Town of Deppe, US 17 crosses over Starkey's Creek. The banks of both streams appeared to be stable and vegetated. Due to the minor length of jurisdictional stream impacts (< 150 feet), no compensatory mitigation is required for the A-segment of the proposed widening.

The unavoidable impacts to Waters of the U.S. total 3.4 ha (8.4 ac) for the A-segment of the proposed widening. Compensatory mitigation is recommended for these unavoidable losses. Limited opportunities are available for mitigation in the project vicinity for in-kind mitigation (See Figure 2). Because restoration of wetlands within silvicultural areas or enhancement of pre-ditching hydrology in these areas may not be compatible with efficient timber production practices, mitigation options in these areas may not be compatible with efficient timber production practices.

Considering the 10.29 km (6.4 mi) A-section of R-2514 in two smaller segments, the first segment (See Figure 1) begins at SR 1327 (Kellum Loop Road) and extends to the Town of Deppe. This segment passes through the Hofman Forest for approximately 4.8 km (3 mi). On the southeastern side of the existing highway an abandoned CSX railbed parallels the highway. Located to the east of this railroad bed is a forest road used to maintain the loblolly pine plantation that parallels the existing railroad bed. The distance from existing US 17 to the railroad bed varies. Approximately 0.8 km (0.5-mi) north of Kellum Loop Road the railroad bed gradually angles away from, and then back to the existing highway for approximately 1.6 km (1 mi), where it resumes a close parallel alignment with the highway. At its farthest distance from the highway, the railroad bed is approximately 92 m (300 ft) away. The alignment for the remainder of the project is approximately 23 m (75 ft) from the highway.

On the east side of the forest road a ditch has been constructed to improve drainage in the loblolly pine plantation. Wetland mitigation may be possible on some of the loblolly pine plantation areas east of the proposed alignment by filling the ditch and reducing the rate of drainage from these areas. The entire length of this forest road was surveyed

and the drained loblolly pine plantation areas appear from the soil color and topography to be drained pocosin or bottomland areas, and a probable wetland restoration candidate. However, in talking with Dr. E. Carlyle Franklin, the Faculty Representative to the North Carolina Forestry Foundation that manages the Hofman Forest, it was learned that the Foundation would probably not view the conversion of productive forest land to mitigation sites favorably. Dr. Franklin did suggest that mitigation for the highway could be obtained from a wetland mitigation bank being developed by the Foundation in the Hofman Forest, approximately 7.2 km (4.5 mi) northwest of the southern terminus of this project, on the southeastern side of SR 1938 (Quaker Bridge Road). He indicated that the Mitigation Banking Instrument (MBI) is expected to be signed in January 2002, and that there would be 60 credits immediately available for sale. Dr. Franklin's contact information is as follows:

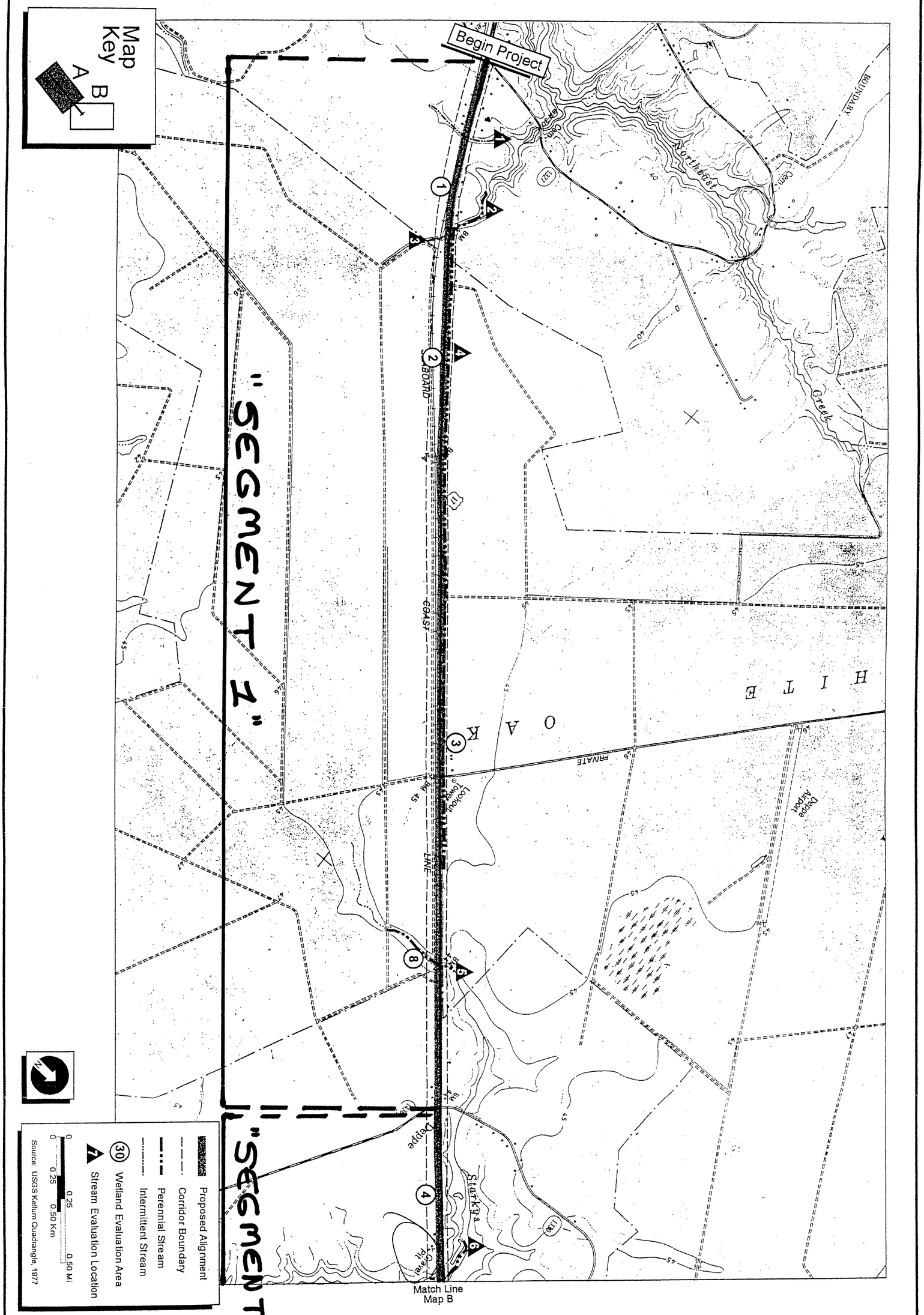
Dr. Carlyle Franklin
N.C. State University
Department of Forestry, Box 8006
Raleigh, N.C. 27695
Telephone: 919-513-3852
E-mail: Carlyle_Franklin@ncsu.edu

The second segment (See Figure 1) begins at the Town of Deppe and extends northward to SR 1330 (Deppe Loop Road), no wetland restoration opportunities were found within the proposed right-of-way.

IV. Conclusion

While compensatory mitigation opportunities exist along the proposed widening of existing US 17, trustees of Hofman Forest are not expected to be agreeable in allowing the purchase of additional right-of-way. Therefore, off-site resources such as the planned bank in Hofman Forest or the Clay Hills Farms Mitigation Site should be utilized. In addition, the North Carolina Wetland Restoration Program (WRP) may be available to mitigate impacts in HU 03020106.

ER98006.01/WetA.cdr



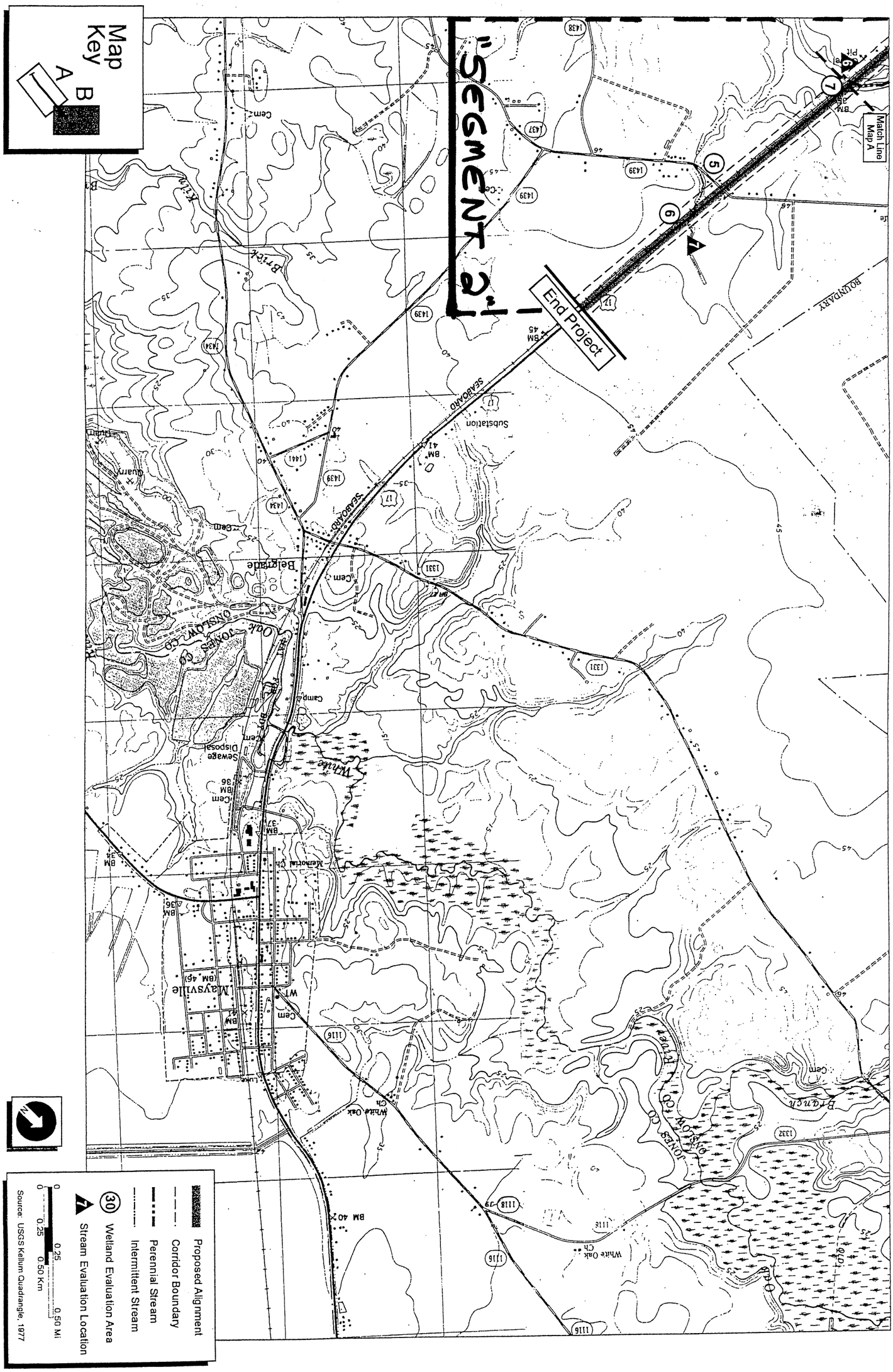
Environmental Services, Inc.

WILBUR SMITH ASSOCIATES

Wetland and Stream Evaluation
US 17, SR-1327 to South of Belgrade
Onslow County, North Carolina
(R-2514-A)

Figure:	1
Project:	ER98006.01
Date:	October 1998

ER98006.01/WetB.cdr



Environmental Services, Inc.

WILBUR SMITH ASSOCIATES

Wetland and Stream Evaluation
US 17, SR-1327 to South of Belgrade
Onslow County, North Carolina
(R-2514-A)

Figure:	2
Project:	ER98006.01
Date:	October 1998

FIGURE 2

Abandoned railroad located east of US 17, south of SR 1330 (Deppe Loop Rd.) crossing.

FIGURE 2

Footbridge crossing ditch in Hoffman Forest on east side of US 17.

FIGURE 2

Ditch located on east side of abandoned railroad along US 17.

USACE AID#_____ DWQ #_____ Site #____ (indicate on attached map)

(1) Site 2

STREAM QUALITY ASSESSMENT WORKSHEET

Provide the following information for the stream reach under assessment:

1. Applicant's name: NCDOT
2. Evaluator's name: BMH
3. Date of evaluation: 3/17/04
4. Time of evaluation: 10:30
5. Name of stream: UT to NE Creek
6. River basin: New River
7. Approximate drainage area: ~~2~~ Site 2
8. Stream order: 1st
9. Length of reach evaluated: 100 Ft.
10. County: Onslow
11. Site coordinates (if known): _____
12. Subdivision name (if any): —
13. Location of reach under evaluation (note nearby roads and landmarks and attach map identifying stream(s) location): US 17
14. Proposed channel work (if any): Culvert
15. Recent weather conditions: Rain w/in 24 hrs
16. Site conditions at time of visit: _____
17. Identify any special waterway classifications known: ___Section 10 ___Tidal Waters ___Essential Fisheries Habitat ___Trout Waters ___Outstanding Resource Waters ___ Nutrient Sensitive Waters ___Water Supply Watershed ____(I-IV)
18. Is there a pond or lake located upstream of the evaluation point? YES NO If yes, estimate the water surface area: _____
19. Does channel appear on USGS quad map? YES (NO)
20. Does channel appear on USDA Soil Survey? YES (NO)
21. Estimated watershed land use: 40% Residential 10% Commercial ___% Industrial ___% Agricultural ___% Forested 50% Cleared / Logged ___% Other (_____)
22. Bankfull width: 2-3Ft
23. Bank height (from bed to top of bank): 4Ft
24. Channel slope down center of stream: ✓Flat (0 to 2%) ___Gentle (2 to 4%) ___Moderate (4 to 10%) ___Steep (>10%)
25. Channel sinuosity: ✓Straight ___Occasional bends ___Frequent meander ___Very sinuous ___Braided channel

Instructions for completion of worksheet (located on page 2): Begin by determining the most appropriate ecoregion based on location, terrain, vegetation, stream classification, etc. Every characteristic must be scored using the same ecoregion. Assign points to each characteristic within the range shown for the ecoregion. Page 3 provides a brief description of how to review the characteristics identified in the worksheet. Scores should reflect an overall assessment of the stream reach under evaluation. If a characteristic cannot be evaluated due to site or weather conditions, enter 0 in the scoring box and provide an explanation in the comment section. Where there are obvious changes in the character of a stream under review (e.g., the stream flows from a pasture into a forest), the stream may be divided into smaller reaches that display more continuity, and a separate form used to evaluate each reach. The total score assigned to a stream reach must range between 0 and 100, with a score of 100 representing a stream of the highest quality.

Total Score (from reverse): 35 **Comments:** Int / No Mitigation

Evaluator's Signature _____ **Date** 3/17/04

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STREAM QUALITY ASSESSMENT WORKSHEET

	#	CHARACTERISTICS	ECOREGION POINT RANGE			SCORE
			Coastal	Piedmont	Mountain	
PHYSICAL	1	**Presence of flow / persistent pools in stream** (no flow or saturation = 0; strong flow = max points)	0 – 5	0 – 4	0 – 5	4
	2	**Evidence of past human alteration** (extensive alteration = 0; no alteration = max points)	0 – 6	0 – 5	0 – 5	0
	3	**Riparian zone** (no buffer = 0; contiguous, wide buffer = max points)	0 – 6	0 – 4	0 – 5	2
	4	**Evidence of nutrient or chemical discharges** (extensive discharges = 0; no discharges = max points)	0 – 5	0 – 4	0 – 4	4
	5	**Groundwater discharge** (no discharge = 0; springs, seeps, wetlands, etc. = max points)	0 – 3	0 – 4	0 – 4	0
	6	**Presence of adjacent floodplain** (no floodplain = 0; extensive floodplain = max points)	0 – 4	0 – 4	0 – 2	0
	7	**Entrenchment / floodplain access** (deeply entrenched = 0; frequent flooding = max points)	0 – 5	0 – 4	0 – 2	1
	8	**Presence of adjacent wetlands** (no wetlands = 0; large adjacent wetlands = max points)	0 – 6	0 – 4	0 – 2	0
	9	**Channel sinuosity** (extensive channelization = 0; natural meander = max points)	0 – 5	0 – 4	0 – 3	1
	10	**Sediment input** (extensive deposition = 0; little or no sediment = max points)	0 – 5	0 – 4	0 – 4	4
	11	**Size & diversity of channel bed substrate** (fine, homogenous = 0; large, diverse sizes = max points)	NA*	0 – 4	0 – 5	0
STABILITY	12	**Evidence of channel incision or widening** (deeply incised = 0; stable bed & banks = max points)	0 – 5	0 – 4	0 – 5	0
	13	**Presence of major bank failures** (severe erosion = 0; no erosion, stable banks = max points)	0 – 5	0 – 5	0 – 5	3
	14	**Root depth and density on banks** (no visible roots = 0; dense roots throughout = max points)	0 – 3	0 – 4	0 – 5	3
	15	**Impact by agriculture, livestock, or timber production** (substantial impact = 0; no evidence = max points)	0 – 5	0 – 4	0 – 5	4
HABITAT	16	**Presence of riffle-pool/ripple-pool complexes** (no riffles/ripples or pools = 0; well-developed = max points)	0 – 3	0 – 5	0 – 6	3
	17	**Habitat complexity** (little or no habitat = 0; frequent, varied habitats = max points)	0 – 6	0 – 6	0 – 6	2
	18	**Canopy coverage over streambed** (no shading vegetation = 0; continuous canopy = max points)	0 – 5	0 – 5	0 – 5	2
	19	**Substrate embeddedness** (deeply embedded = 0; loose structure = max)	NA*	0 – 4	0 – 4	/
BIOLOGY	20	**Presence of stream invertebrates** (see page 4) (no evidence = 0; common, numerous types = max points)	0 – 4	0 – 5	0 – 5	1
	21	**Presence of amphibians** (no evidence = 0; common, numerous types = max points)	0 – 4	0 – 4	0 – 4	1
	22	**Presence of fish** (no evidence = 0; common, numerous types = max points)	0 – 4	0 – 4	0 – 4	0
	23	**Evidence of wildlife use** (no evidence = 0; abundant evidence = max points)	0 – 6	0 – 5	0 – 5	0
		Total Points Possible	100	100	100	
		TOTAL SCORE (also enter on first page)				35

* These characteristics are not assessed in coastal streams.

USACE AID#_____ DWQ #_____ Site #____ (indicate on attached map)

Site 4 Site 4A

STREAM QUALITY ASSESSMENT WORKSHEET

Provide the following information for the stream reach under assessment:

1. Applicant's name: NCDOT
2. Evaluator's name: RM-7
3. Date of evaluation: 3/17/04
4. Time of evaluation: 10:40
5. Name of stream: UT to NE Creek
6. River basin: New River
7. Approximate drainage area: Site 4A
8. Stream order: 1st
9. Length of reach evaluated: 100 Ft
10. County: Onslow
11. Site coordinates (if known):
12. Subdivision name (if any):
13. Location of reach under evaluation (note nearby roads and landmarks and attach map identifying stream(s) location):
14. Proposed channel work (if any): Culvert
15. Recent weather conditions: Rain within 24 hrs
16. Site conditions at time of visit:
17. Identify any special waterway classifications known: ___Section 10 ___Tidal Waters ___Essential Fisheries Habitat ___Trout Waters ___Outstanding Resource Waters ___ Nutrient Sensitive Waters ___Water Supply Watershed ____(I-IV)
18. Is there a pond or lake located upstream of the evaluation point? YES (NO) If yes, estimate the water surface area:
19. Does channel appear on USGS quad map? YES (NO)
20. Does channel appear on USDA Soil Survey? YES (NO)
21. Estimated watershed land use: 45% Residential ___% Commercial ___% Industrial ___% Agricultural 55% Forested ___% Cleared / Logged ___% Other (_____)
22. Bankfull width: Not Observed
23. Bank height (from bed to top of bank): 5-7 Ft
24. Channel slope down center of stream: ✓ Flat (0 to 2%) ___Gentle (2 to 4%) ___Moderate (4 to 10%) ___Steep (>10%)
25. Channel sinuosity: ___Straight ✓ Occasional bends ___Frequent meander ___Very sinuous ___Braided channel

Instructions for completion of worksheet (located on page 2): Begin by determining the most appropriate ecoregion based on location, terrain, vegetation, stream classification, etc. Every characteristic must be scored using the same ecoregion. Assign points to each characteristic within the range shown for the ecoregion. Page 3 provides a brief description of how to review the characteristics identified in the worksheet. Scores should reflect an overall assessment of the stream reach under evaluation. If a characteristic cannot be evaluated due to site or weather conditions, enter 0 in the scoring box and provide an explanation in the comment section. Where there are obvious changes in the character of a stream under review (e.g., the stream flows from a pasture into a forest), the stream may be divided into smaller reaches that display more continuity, and a separate form used to evaluate each reach. The total score assigned to a stream reach must range between 0 and 100, with a score of 100 representing a stream of the highest quality.

Total Score (from reverse): 33 **Comments:** Int

Evaluator's Signature _____ **Date** 3/17/04

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STREAM QUALITY ASSESSMENT WORKSHEET

	#	CHARACTERISTICS	ECOREGION POINT RANGE			SCORE
			Coastal	Piedmont	Mountain	
PHYSICAL	1	**Presence of flow / persistent pools in stream** (no flow or saturation = 0; strong flow = max points)	0–5	0–4	0–5	4
	2	**Evidence of past human alteration** (extensive alteration = 0; no alteration = max points)	0–6	0–5	0–5	1
	3	**Riparian zone** (no buffer = 0; contiguous, wide buffer = max points)	0–6	0–4	0–5	0
	4	**Evidence of nutrient or chemical discharges** (extensive discharges = 0; no discharges = max points)	0–5	0–4	0–4	4
	5	**Groundwater discharge** (no discharge = 0; springs, seeps, wetlands, etc. = max points)*	0–3	0–4	0–4	2
	6	**Presence of adjacent floodplain*** (no floodplain = 0; extensive floodplain = max points)*	0–4	0–4	0–2	0
	7	**Entrenchment / floodplain access** (deeply entrenched = 0; frequent flooding = max points)	0–5	0–4	0–2	32
	8	**Presence of adjacent wetlands** (no wetlands = 0; large adjacent wetlands = max points)*	0–6	0–4	0–2	0
	9	**Channel sinuosity** (extensive channelization = 0; natural meander = max points)	0–5	0–4	0–3	1
	10	**Sediment input** (extensive deposition = 0; little or no sediment = max points)	0–5	0–4	0–4	4
	11	**Size & diversity of channel bed substrate** (fine, homogenous = 0; large, diverse sizes = max points)	NA*	0–4	0–5	2
STABILITY	12	**Evidence of channel incision or widening** (deeply incised = 0; stable bed & banks = max points)	0–5	0–4	0–5	2
	13	**Presence of major bank failures** (severe erosion = 0; no erosion, stable banks = max points)	0–5	0–5	0–5	32
	14	**Root depth and density on banks** (no visible roots = 0; dense roots throughout = max points)	0–3	0–4	0–5	1
	15	**Impact by agriculture, livestock, or timber production** (substantial impact = 0; no evidence = max points)	0–5	0–4	0–5	4
HABITAT	16	**Presence of riffle-pool/ripple-pool complexes** (no riffles/ripples or pools = 0; well-developed = max points)	0–5	0–5	0–6	1
	17	**Habitat complexity** (little or no habitat = 0; frequent, varied habitats = max points)	0–6	0–6	0–6	1
	18	**Canopy coverage over streambed** (no shading vegetation = 0; continuous canopy = max points)	0–5	0–5	0–5	0
	19	**Substrate embeddedness** (deeply embedded = 0; loose structure = max)	NA*	0–4	0–4	
BIOLOGY	20	**Presence of stream invertebrates** (see page 4) (no evidence = 0; common, numerous types = max points)	0–4	0–5	0–5	1
	21	**Presence of amphibians** (no evidence = 0; common, numerous types = max points)	0–4	0–4	0–4	2
	22	**Presence of fish** (no evidence = 0; common, numerous types = max points)	0–4	0–4	0–4	1
	23	**Evidence of wildlife use** (no evidence = 0; abundant evidence = max points)	0–6	0–5	0–5	0
Total Points Possible			100	100	100	
TOTAL SCORE (also enter on first page)						33

* These characteristics are not assessed in coastal streams.

USACE AID#_____ DWQ #_____ Site #____ (indicate on attached map)

10 Average of both sides

STREAM QUALITY ASSESSMENT WORKSHEET

Provide the following information for the stream reach under assessment:

1. Applicant's name: NCDOT
2. Evaluator's name: BM
3. Date of evaluation: 3/17/04
4. Time of evaluation: 11:15
5. Name of stream: UT to NE Creek
6. River basin: New River
7. Approximate drainage area: Site 10
8. Stream order: 1st
9. Length of reach evaluated: 100 Ft
10. County: Onslow
11. Site coordinates (if known):
12. Subdivision name (if any):
13. Location of reach under evaluation (note nearby roads and landmarks and attach map identifying stream(s) location):
14. Proposed channel work (if any): Culvert
15. Recent weather conditions: Rain w/in 24 hrs
16. Site conditions at time of visit:
17. Identify any special waterway classifications known: ___Section 10 ___Tidal Waters ___Essential Fisheries Habitat ___Trout Waters ___Outstanding Resource Waters ___ Nutrient Sensitive Waters ___Water Supply Watershed ____(I-IV)
18. Is there a pond or lake located upstream of the evaluation point? YES (NO) If yes, estimate the water surface area:
19. Does channel appear on USGS quad map? (YES) NO
20. Does channel appear on USDA Soil Survey? YES (NO)
21. Estimated watershed land use: ___% Residential ___% Commercial ___% Industrial ___% Agricultural 100% Forested ___% Cleared / Logged ___% Other (_____)
22. Bankfull width: 4
23. Bank height (from bed to top of bank): 8-10 Ft
24. Channel slope down center of stream: ___Flat (0 to 2%) ___Gentle (2 to 4%) ___Moderate (4 to 10%) ✓Steep (>10%)
25. Channel sinuosity: ___Straight ✓Occasional bends ___Frequent meander ___Very sinuous ___Braided channel

Instructions for completion of worksheet (located on page 2): Begin by determining the most appropriate ecoregion based on location, terrain, vegetation, stream classification, etc. Every characteristic must be scored using the same ecoregion. Assign points to each characteristic within the range shown for the ecoregion. Page 3 provides a brief description of how to review the characteristics identified in the worksheet. Scores should reflect an overall assessment of the stream reach under evaluation. If a characteristic cannot be evaluated due to site or weather conditions, enter 0 in the scoring box and provide an explanation in the comment section. Where there are obvious changes in the character of a stream under review (e.g., the stream flows from a pasture into a forest), the stream may be divided into smaller reaches that display more continuity, and a separate form used to evaluate each reach. The total score assigned to a stream reach must range between 0 and 100, with a score of 100 representing a stream of the highest quality.

Total Score (from reverse): 25 **Comments:**

Evaluator's Signature BM **Date** 3/17/04

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STREAM QUALITY ASSESSMENT WORKSHEET

	#	CHARACTERISTICS	ECOREGION POINT RANGE			SCORE
			Coastal	Piedmont	Mountain	
PHYSICAL	1	**Presence of flow / persistent pools in stream** (no flow or saturation = 0; strong flow = max points)	0 – 5	0 – 4	0 – 5	5
	2	**Evidence of past human alteration** (extensive alteration = 0; no alteration = max points)	0 – 6	0 – 5	0 – 5	0
	3	**Riparian zone** (no buffer = 0; contiguous, wide buffer = max points)	0 – 6	0 – 4	0 – 5	4
	4	**Evidence of nutrient or chemical discharges** (extensive discharges = 0; no discharges = max points)	0 – 5	0 – 4	0 – 4	0
	5	**Groundwater discharge** (no discharge = 0; springs, seeps, wetlands, etc. = max points)	0 – 3	0 – 4	0 – 4	1
	6	**Presence of adjacent floodplain** (no floodplain = 0; extensive floodplain = max points)	0 – 4	0 – 4	0 – 2	0
	7	**Entrenchment / floodplain access** (deeply entrenched = 0; frequent flooding = max points)	0 – 5	0 – 4	0 – 2	0
	8	**Presence of adjacent wetlands** (no wetlands = 0; large adjacent wetlands = max points)	0 – 6	0 – 4	0 – 2	0
	9	**Channel sinuosity** (extensive channelization = 0; natural meander = max points)	0 – 5	0 – 4	0 – 3	0
	10	**Sediment input** (extensive deposition = 0; little or no sediment = max points)	0 – 5	0 – 4	0 – 4	5
	11	**Size & diversity of channel bed substrate** (fine, homogenous = 0; large, diverse sizes = max points)	NA*	0 – 4	0 – 5	/
STABILITY	12	**Evidence of channel incision or widening** (deeply incised = 0; stable bed & banks = max points)	0 – 6	0 – 4	0 – 5	0
	13	**Presence of major bank failures** (severe erosion = 0; no erosion, stable banks = max points)	0 – 5	0 – 5	0 – 5	0
	14	**Root depth and density on banks** (no visible roots = 0; dense roots throughout = max points)	0 – 3	0 – 4	0 – 5	1
	15	**Impact by agriculture, livestock, or timber production** (substantial impact = 0; no evidence = max points)	0 – 5	0 – 4	0 – 5	2
HABITAT	16	**Presence of riffle-pool/ripple-pool complexes** (no riffles/ripples or pools = 0; well-developed = max points)	0 – 5	0 – 5	0 – 6	1
	17	**Habitat complexity** (little or no habitat = 0; frequent, varied habitats = max points)	0 – 6	0 – 6	0 – 6	1
	18	**Canopy coverage over streambed** (no shading vegetation = 0; continuous canopy = max points)	0 – 5	0 – 5	0 – 5	2
	19	**Substrate embeddedness** (deeply embedded = 0; loose structure = max)	NA*	0 – 4	0 – 4	/
BIOLOGY	20	**Presence of stream invertebrates** (see page 4) (no evidence = 0; common, numerous types = max points)	0 – 4	0 – 5	0 – 5	1
	21	**Presence of amphibians** (no evidence = 0; common, numerous types = max points)	0 – 4	0 – 4	0 – 4	1
	22	**Presence of fish** (no evidence = 0; common, numerous types = max points)	0 – 4	0 – 4	0 – 4	1
	23	**Evidence of wildlife use** (no evidence = 0; abundant evidence = max points)	0 – 6	0 – 5	0 – 5	0
Total Points Possible			100	100	100	
TOTAL SCORE (also enter on first page)						

* These characteristics are not assessed in coastal streams.

USACE AID#_____ DWQ #_____ Site #____ (indicate on attached map)

37 to Pink

STREAM QUALITY ASSESSMENT WORKSHEET

Provide the following information for the stream reach under assessment:

1. Applicant's name: NCDOT
2. Evaluator's name: BM7
3. Date of evaluation: 3/17/04
4. Time of evaluation: 11:30
5. Name of stream: Starkys Creek
6. River basin: White Oak
7. Approximate drainage area: Site 37
8. Stream order: 1st
9. Length of reach evaluated: ~ 100 Ft
10. County: Onslow
11. Site coordinates (if known):
12. Subdivision name (if any):
13. Location of reach under evaluation (note nearby roads and landmarks and attach map identifying stream(s) location): US 17
14. Proposed channel work (if any): Culvert
15. Recent weather conditions: Rain w/in 24 hrs
16. Site conditions at time of visit:
17. Identify any special waterway classifications known: ___Section 10 ___Tidal Waters ___Essential Fisheries Habitat ___Trout Waters ___Outstanding Resource Waters ___ Nutrient Sensitive Waters ___Water Supply Watershed ____(I-IV)
18. Is there a pond or lake located upstream of the evaluation point? YES (NO) If yes, estimate the water surface area:
19. Does channel appear on USGS quad map? (YES) NO
20. Does channel appear on USDA Soil Survey? (YES) NO
21. Estimated watershed land use: ___% Residential ___% Commercial ___% Industrial ___% Agricultural 100 % Forested ___% Cleared / Logged ___% Other (_____)
22. Bankfull width: None observed
23. Bank height (from bed to top of bank): 2-5 Ft
24. Channel slope down center of stream: ✓ Flat (0 to 2%) ___Gentle (2 to 4%) ___Moderate (4 to 10%) ___Steep (>10%)
25. Channel sinuosity: ✓ Straight ___Occasional bends ___Frequent meander ___Very sinuous ___Braided channel

Instructions for completion of worksheet (located on page 2): Begin by determining the most appropriate ecoregion based on location, terrain, vegetation, stream classification, etc. Every characteristic must be scored using the same ecoregion. Assign points to each characteristic within the range shown for the ecoregion. Page 3 provides a brief description of how to review the characteristics identified in the worksheet. Scores should reflect an overall assessment of the stream reach under evaluation. If a characteristic cannot be evaluated due to site or weather conditions, enter 0 in the scoring box and provide an explanation in the comment section. Where there are obvious changes in the character of a stream under review (e.g., the stream flows from a pasture into a forest), the stream may be divided into smaller reaches that display more continuity, and a separate form used to evaluate each reach. The total score assigned to a stream reach must range between 0 and 100, with a score of 100 representing a stream of the highest quality.

Total Score (from reverse): 64 **Comments:**

Evaluator's Signature _____ **Date** 3/17/04

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STREAM QUALITY ASSESSMENT WORKSHEET

	#	CHARACTERISTICS	ECOREGION POINT RANGE: Coastal	Piedmont	Mountains	SCORE
HYDROLOGY	1	Presence of flow / persistent pools in stream (no flow or saturation = 0; strong flow = max points)	0 – 5	0 – 4	0 – 5	4
	2	Evidence of past human alteration (extensive alteration = 0; no alteration = max points)	0 – 6	0 – 5	0 – 5	1
	3	Riparian zone (no buffer = 0; continuous, wide buffer = max points)	0 – 6	0 – 4	0 – 5	6
	4	Evidence of nutrients or chemical discharges (extensive discharges = 0; no discharges = max points)	0 – 5	0 – 4	0 – 4	3 4
	5	Groundwater discharge (no discharge = 0; springs, seeps, wetlands, etc. = max points)	0 – 3	0 – 3	0 – 3	2
	6	Presence of adjacent floodplain (no floodplain = 0; extensive floodplain = max points)	0 – 4	0 – 4	0 – 2	2
	7	Entrenchment / floodplain access (deeply entrenched = 0; frequent flooding = max points)	0 – 5	0 – 4	0 – 2	1
	8	Presence of adjacent wetlands (no wetlands = 0; large adjacent wetlands = max points)	0 – 6	0 – 4	0 – 2	5
STABILITY	9	Channel sinuosity (straight channel = 0; meandering stream = max points)	0 – 5	0 – 4	0 – 3	1
	10	Sediment input (extensive deposition = 0; little or no sediment = max points)	0 – 5	0 – 4	0 – 4	4
	11	Size & diversity of channel bed substrate (fine, homogenous = 0; large, diverse sizes = max points)	N/A*	0 – 4	0 – 5	
	12	Evidence of channel incision or widening (deeply incised = 0; stable bed & banks = max points)	0 – 5	0 – 4	0 – 5	3
	13	Presence of major bank failures (extensive failure = 0; no erosion, stable banks = max points)	0 – 5	0 – 5	0 – 5	5
	14	Root depth and density on banks (no visible roots = 0; deep roots throughout = max points)	0 – 5	0 – 4	0 – 5	3
	15	Impact by agriculture, livestock, or other production (substantial impact = 0; no evidence = max points)	0 – 5	0 – 4	0 – 5	4
HABITAT	16	Presence of riffle-pool / ripple-pool complexes (no riffles, ripples or pools = 0; well-developed = max points)	0 – 5	0 – 5	0 – 6	0
	17	Habitat complexity (little or no habitat = 0; frequent, varied habitats = max points)	0 – 6	0 – 6	0 – 6	2
	18	Canopy coverage over streambed (no shading vegetation = 0; continuous canopy = max points)	0 – 5	0 – 5	0 – 5	5
	19	Substrate embeddedness (deeply embedded = 0; loose structure = max)	N/A*	0 – 4	0 – 4	
BIOLOGY	20	Presence of macroinvertebrates (see page 4) (no evidence = 0; common, numerous types = max points)	0 – 4	0 – 3	0 – 5	2
	21	Presence of amphibians (no evidence = 0; common, numerous types = max points)	0 – 2	0 – 2	0 – 4	2
	22	Presence of fish (no evidence = 0; common, numerous types = max points)	0 – 4	0 – 4	0 – 4	3
	23	Evidence of wildlife use (no evidence = 0; abundant evidence = max points)	0 – 6	0 – 5	0 – 5	5
		Total Points Possible	100	100	100	64
		TOTAL SCORE (also enter on first page)				

* These characteristics are not assessed in coastal streams.

USACE AID#_____ DWQ #_____ Site #____ (indicate on attached map)

3S

STREAM QUALITY ASSESSMENT WORKSHEET

Provide the following information for the stream reach under assessment:

1. Applicant's name: NC DOT
2. Evaluator's name: BJT
3. Date of evaluation: 3/17/04
4. Time of evaluation: 11:50
5. Name of stream: UT to Starkey
6. River basin: White Oak
7. Approximate drainage area: Site 3S
8. Stream order: 1
9. Length of reach evaluated: ~ 100 ft
10. County: Onslow
11. Site coordinates (if known): _____
12. Subdivision name (if any): _____
13. Location of reach under evaluation (note nearby roads and landmarks and attach map identifying stream(s) location): US 17
14. Proposed channel work (if any): Trail Ditch
15. Recent weather conditions: Rain w/in 24hrs
16. Site conditions at time of visit: _____
17. Identify any special waterway classifications known: ___Section 10 ___Tidal Waters ___Essential Fisheries Habitat ___Trout Waters ___Outstanding Resource Waters ___ Nutrient Sensitive Waters ___Water Supply Watershed ____(I-IV)
18. Is there a pond or lake located upstream of the evaluation point? YES NO If yes, estimate the water surface area: _____
19. Does channel appear on USGS quad map? YES (NO)
20. Does channel appear on USDA Soil Survey? YES (NO)
21. Estimated watershed land use: ___% Residential ___% Commercial ___% Industrial ___% Agricultural 100% Forested ___% Cleared / Logged ___% Other (_____)
22. Bankfull width: None Observed
23. Bank height (from bed to top of bank): 4-5 ft
24. Channel slope down center of stream: ✓ Flat (0 to 2%) ___Gentle (2 to 4%) ___Moderate (4 to 10%) ___Steep (>10%)
25. Channel sinuosity: ___Straight ✓ Occasional bends ___Frequent meander ___Very sinuous ___Braided channel

Instructions for completion of worksheet (located on page 2): Begin by determining the most appropriate ecoregion based on location, terrain, vegetation, stream classification, etc. Every characteristic must be scored using the same ecoregion. Assign points to each characteristic within the range shown for the ecoregion. Page 3 provides a brief description of how to review the characteristics identified in the worksheet. Scores should reflect an overall assessment of the stream reach under evaluation. If a characteristic cannot be evaluated due to site or weather conditions, enter 0 in the scoring box and provide an explanation in the comment section. Where there are obvious changes in the character of a stream under review (e.g., the stream flows from a pasture into a forest), the stream may be divided into smaller reaches that display more continuity, and a separate form used to evaluate each reach. The total score assigned to a stream reach must range between 0 and 100, with a score of 100 representing a stream of the highest quality.

Total Score (from reverse): 42 **Comments:** _____

Evaluator's Signature _____ **Date** 3/17/04

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STREAM QUALITY ASSESSMENT WORKSHEET

	#	CHARACTERISTICS	ECOREGION POINT RANGE			SCORE
			Coastal	Piedmont	Mountain	
PHYSICAL	1	Presence of flow / persistent pools in stream (no flow or saturation = 0; strong flow = max points)	0 – 5	0 – 4	0 – 5	3
	2	Evidence of past human alteration (extensive alteration = 0; no alteration = max points)	0 – 6	0 – 5	0 – 5	0
	3	Riparian zone (no buffer = 0; contiguous, wide buffer = max points)	0 – 6	0 – 4	0 – 5	3
	4	Evidence of nutrient or chemical discharges (extensive discharges = 0; no discharges = max points)	0 – 5	0 – 4	0 – 4	2
	5	Groundwater discharge (no discharge = 0; springs, seeps, wetlands, etc. = max points)	0 – 3	0 – 4	0 – 4	3
	6	Presence of adjacent floodplain (no floodplain = 0; extensive floodplain = max points)	0 – 4	0 – 4	0 – 2	2
	7	Entrenchment / floodplain access (deeply entrenched = 0; frequent flooding = max points)	0 – 5	0 – 4	0 – 2	2
	8	Presence of adjacent wetlands (no wetlands = 0; large adjacent wetlands = max points)	0 – 6	0 – 4	0 – 2	3
	9	Channel sinuosity (extensive channelization = 0; natural meander = max points)	0 – 5	0 – 4	0 – 3	1
	10	Sediment input (extensive deposition = 0; little or no sediment = max points)	0 – 5	0 – 4	0 – 4	5
	11	Size & diversity of channel bed substrate (fine, homogenous = 0; large, diverse sizes = max points)	NA*	0 – 4	0 – 5	/
STABILITY	12	Evidence of channel incision or widening (deeply incised = 0; stable bed & banks = max points)	0 – 5	0 – 4	0 – 5	2
	13	Presence of major bank failures (severe erosion = 0; no erosion, stable banks = max points)	0 – 5	0 – 5	0 – 5	5
	14	Root depth and density on banks (no visible roots = 0; dense roots throughout = max points)	0 – 3	0 – 4	0 – 5	3
	15	Impact by agriculture, livestock, or timber production (substantial impact = 0; no evidence = max points)	0 – 5	0 – 4	0 – 5	2
HABITAT	16	Presence of riffle-pool/ripple-pool complexes (no riffles/ripples or pools = 0; well-developed = max points)	0 – 3	0 – 5	0 – 6	0
	17	Habitat complexity (little or no habitat = 0; frequent, varied habitats = max points)	0 – 6	0 – 6	0 – 6	1
	18	Canopy coverage over streambed (no shading vegetation = 0; continuous canopy = max points)	0 – 5	0 – 5	0 – 5	2
	19	Substrate embeddedness (deeply embedded = 0; loose structure = max)	NA*	0 – 4	0 – 4	/
BIOLOGY	20	Presence of stream invertebrates (see page 4) (no evidence = 0; common, numerous types = max points)	0 – 4	0 – 5	0 – 5	1
	21	Presence of amphibians (no evidence = 0; common, numerous types = max points)	0 – 4	0 – 4	0 – 4	1
	22	Presence of fish (no evidence = 0; common, numerous types = max points)	0 – 4	0 – 4	0 – 4	—
	23	Evidence of wildlife use (no evidence = 0; abundant evidence = max points)	0 – 6	0 – 5	0 – 5	1
		Total Points Possible	100	100	100	
		TOTAL SCORE (also enter on first page)				42

* These characteristics are not assessed in coastal streams.

USACE AID#_____ DWQ #_____ Site #____ (indicate on attached map)

53

STREAM QUALITY ASSESSMENT WORKSHEET

Provide the following information for the stream reach under assessment:

1. Applicant's name: NCDOT
2. Evaluator's name: BMZ
3. Date of evaluation: 3/17/04
4. Time of evaluation: 12:15
5. Name of stream: UT to Stuckey Creek
6. River basin: White Oak
7. Approximate drainage area: Site 53
8. Stream order: 1
9. Length of reach evaluated: ~100 Ft
10. County: Bladen
11. Site coordinates (if known):
12. Subdivision name (if any):
13. Location of reach under evaluation (note nearby roads and landmarks and attach map identifying stream(s) location):
14. Proposed channel work (if any): Base Tail Ditch
15. Recent weather conditions: Rain w/ in 24hrs
16. Site conditions at time of visit:
17. Identify any special waterway classifications known: ___Section 10 ___Tidal Waters ___Essential Fisheries Habitat ___Trout Waters ___Outstanding Resource Waters ___ Nutrient Sensitive Waters ___Water Supply Watershed ____(I-IV)
18. Is there a pond or lake located upstream of the evaluation point? YES (NO) If yes, estimate the water surface area:
19. Does channel appear on USGS quad map? YES (NO)
20. Does channel appear on USDA Soil Survey? YES (NO)
21. Estimated watershed land use: ___% Residential ___% Commercial ___% Industrial ___% Agricultural ___% Forested ___% Cleared / Logged ___% Other (_____)
22. Bankfull width: 6 Ft
23. Bank height (from bed to top of bank): 3 Ft
24. Channel slope down center of stream: ✓Flat (0 to 2%) ___Gentle (2 to 4%) ___Moderate (4 to 10%) ___Steep (>10%)
25. Channel sinuosity: ✓Straight ___Occasional bends ___Frequent meander ___Very sinuous ___Braided channel

Instructions for completion of worksheet (located on page 2): Begin by determining the most appropriate ecoregion based on location, terrain, vegetation, stream classification, etc. Every characteristic must be scored using the same ecoregion. Assign points to each characteristic within the range shown for the ecoregion. Page 3 provides a brief description of how to review the characteristics identified in the worksheet. Scores should reflect an overall assessment of the stream reach under evaluation. If a characteristic cannot be evaluated due to site or weather conditions, enter 0 in the scoring box and provide an explanation in the comment section. Where there are obvious changes in the character of a stream under review (e.g., the stream flows from a pasture into a forest), the stream may be divided into smaller reaches that display more continuity, and a separate form used to evaluate each reach. The total score assigned to a stream reach must range between 0 and 100, with a score of 100 representing a stream of the highest quality.

Total Score (from reverse): 29 **Comments:** Intermittent

Evaluator's Signature _____ **Date** 3/17/04

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STREAM QUALITY ASSESSMENT WORKSHEET

	#	CHARACTERISTICS	ECOREGION POINT RANGE			SCORE
			Coastal	Piedmont	Mountain	
PHYSICAL	1	Presence of flow / persistent pools in stream (no flow or saturation = 0; strong flow = max points)	0 – 5	0 – 4	0 – 5	1
	2	Evidence of past human alteration (extensive alteration = 0; no alteration = max points)	0 – 6	0 – 5	0 – 5	1
	3	Riparian zone (no buffer = 0; contiguous, wide buffer = max points)	0 – 6	0 – 4	0 – 5	2
	4	Evidence of nutrient or chemical discharges (extensive discharges = 0; no discharges = max points)	0 – 5	0 – 4	0 – 4	~~3~~ 2
	5	Groundwater discharge (no discharge = 0; springs, seeps, wetlands, etc. = max points)	0 – 3	0 – 4	0 – 4	1
	6	Presence of adjacent floodplain (no floodplain = 0; extensive floodplain = max points)	0 – 4	0 – 4	0 – 2	0
	7	Entrenchment / floodplain access (deeply entrenched = 0; frequent flooding = max points)	0 – 5	0 – 4	0 – 2	0
	8	Presence of adjacent wetlands (no wetlands = 0; large adjacent wetlands = max points)	0 – 6	0 – 4	0 – 2	0
	9	Channel sinuosity (extensive channelization = 0; natural meander = max points)	0 – 5	0 – 4	0 – 3	0
	10	Sediment input (extensive deposition = 0; little or no sediment = max points)	0 – 5	0 – 4	0 – 4	1
	11	Size & diversity of channel bed substrate (fine, homogenous = 0; large, diverse sizes = max points)	NA*	0 – 4	0 – 5	1
STABILITY	12	Evidence of channel incision or widening (deeply incised = 0; stable bed & banks = max points)	0 – 5	0 – 4	0 – 5	2
	13	Presence of major bank failures (severe erosion = 0; no erosion, stable banks = max points)	0 – 5	0 – 5	0 – 5	5
	14	Root depth and density on banks (no visible roots = 0; dense roots throughout = max points)	0 – 3	0 – 4	0 – 5	2
	15	Impact by agriculture, livestock, or timber production (substantial impact = 0; no evidence = max points)	0 – 5	0 – 4	0 – 5	5
HABITAT	16	Presence of riffle-pool/ripple-pool complexes (no riffles/ripples or pools = 0; well-developed = max points)	0 – 3	0 – 5	0 – 6	0
	17	Habitat complexity (little or no habitat = 0; frequent, varied habitats = max points)	0 – 6	0 – 6	0 – 6	1
	18	Canopy coverage over streambed (no shading vegetation = 0; continuous canopy = max points)	0 – 5	0 – 5	0 – 5	2
	19	Substrate embeddedness (deeply embedded = 0; loose structure = max)	NA*	0 – 4	0 – 4	—
BIOLOGY	20	Presence of stream invertebrates (see page 4) (no evidence = 0; common, numerous types = max points)	0 – 4	0 – 5	0 – 5	2
	21	Presence of amphibians (no evidence = 0; common, numerous types = max points)	0 – 4	0 – 4	0 – 4	2
	22	Presence of fish (no evidence = 0; common, numerous types = max points)	0 – 4	0 – 4	0 – 4	0
	23	Evidence of wildlife use (no evidence = 0; abundant evidence = max points)	0 – 6	0 – 5	0 – 5	0
		Total Points Possible	100	100	100	
		TOTAL SCORE (also enter on first page)				

* These characteristics are not assessed in coastal streams.

USACE AID#_____ DWQ #_____ Site #____ (indicate on attached map)

(1) (2) Site 2

STREAM QUALITY ASSESSMENT WORKSHEET

Provide the following information for the stream reach under assessment:

1. Applicant's name: NCDOT
2. Evaluator's name: BMT
3. Date of evaluation: 3/17/04
4. Time of evaluation: 10:30
5. Name of stream: UT to NE Creek
6. River basin: New River
7. Approximate drainage area: 2 Site 2
8. Stream order: 1st
9. Length of reach evaluated: 100 F.
10. County: Onslow
11. Site coordinates (if known):
12. Subdivision name (if any): —
13. Location of reach under evaluation (note nearby roads and landmarks and attach map identifying stream(s) location): US 17
14. Proposed channel work (if any): Culvert
15. Recent weather conditions: Rain w/in 24 hrs
16. Site conditions at time of visit:
17. Identify any special waterway classifications known: ___Section 10 ___Tidal Waters ___Essential Fisheries Habitat ___Trout Waters ___Outstanding Resource Waters ___ Nutrient Sensitive Waters ___Water Supply Watershed ____(I-IV)
18. Is there a pond or lake located upstream of the evaluation point? YES NO If yes, estimate the water surface area:
19. Does channel appear on USGS quad map? YES (NO)
20. Does channel appear on USDA Soil Survey? YES (NO)
21. Estimated watershed land use: 40% Residential 10% Commercial ___% Industrial ___% Agricultural ___% Forested 50% Cleared / Logged ___% Other (_____)
22. Bankfull width: 2-3 Ft
23. Bank height (from bed to top of bank): 4 Ft
24. Channel slope down center of stream: ✓Flat (0 to 2%) ___Gentle (2 to 4%) ___Moderate (4 to 10%) ___Steep (>10%)
25. Channel sinuosity: ✓Straight ___Occasional bends ___Frequent meander ___Very sinuous ___Braided channel

Instructions for completion of worksheet (located on page 2): Begin by determining the most appropriate ecoregion based on location, terrain, vegetation, stream classification, etc. Every characteristic must be scored using the same ecoregion. Assign points to each characteristic within the range shown for the ecoregion. Page 3 provides a brief description of how to review the characteristics identified in the worksheet. Scores should reflect an overall assessment of the stream reach under evaluation. If a characteristic cannot be evaluated due to site or weather conditions, enter 0 in the scoring box and provide an explanation in the comment section. Where there are obvious changes in the character of a stream under review (e.g., the stream flows from a pasture into a forest), the stream may be divided into smaller reaches that display more continuity, and a separate form used to evaluate each reach. The total score assigned to a stream reach must range between 0 and 100, with a score of 100 representing a stream of the highest quality.

Total Score (from reverse): 35 **Comments:** Int / No Mitigation

Evaluator's Signature _____ **Date** 3/17/04

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STREAM QUALITY ASSESSMENT WORKSHEET

	#	CHARACTERISTICS	ECOREGION POINT RANGE			SCORE
			Coastal	Piedmont	Mountain	
PHYSICAL	1	**Presence of flow / persistent pools in stream** (no flow or saturation = 0; strong flow = max points)	0 – 5	0 – 4	0 – 5	4
	2	**Evidence of past human alteration** (extensive alteration = 0; no alteration = max points)	0 – 6	0 – 5	0 – 5	0
	3	**Riparian zone** (no buffer = 0; contiguous, wide buffer = max points)	0 – 6	0 – 4	0 – 5	2
	4	**Evidence of nutrient or chemical discharges** (extensive discharges = 0; no discharges = max points)	0 – 5	0 – 4	0 – 4	4
	5	**Groundwater discharge** (no discharge = 0; springs, seeps, wetlands, etc. = max points)	0 – 3	0 – 4	0 – 4	0
	6	**Presence of adjacent floodplain** (no floodplain = 0; extensive floodplain = max points)	0 – 4	0 – 4	0 – 2	0
	7	**Entrenchment / floodplain access** (deeply entrenched = 0; frequent flooding = max points)	0 – 5	0 – 4	0 – 2	1
	8	**Presence of adjacent wetlands** (no wetlands = 0; large adjacent wetlands = max points)	0 – 6	0 – 4	0 – 2	0
	9	**Channel sinuosity** (extensive channelization = 0; natural meander = max points)	0 – 5	0 – 4	0 – 3	1
	10	**Sediment input** (extensive deposition= 0; little or no sediment = max points)	0 – 5	0 – 4	0 – 4	4
	11	**Size & diversity of channel bed substrate** (fine, homogenous = 0; large, diverse sizes = max points)	NA*	0 – 4	0 – 5	0
STABILITY	12	**Evidence of channel incision or widening** (deeply incised = 0; stable bed & banks = max points)	0 – 5	0 – 4	0 – 5	0
	13	**Presence of major bank failures** (severe erosion = 0; no erosion, stable banks = max points)	0 – 5	0 – 5	0 – 5	3
	14	**Root depth and density on banks** (no visible roots = 0; dense roots throughout = max points)	0 – 3	0 – 4	0 – 5	3
	15	**Impact by agriculture, livestock, or timber production** (substantial impact =0; no evidence = max points)	0 – 5	0 – 4	0 – 5	4
HABITAT	16	**Presence of riffle-pool/ripple-pool complexes** (no riffles/ripples or pools = 0; well-developed = max points)	0 – 3	0 – 5	0 – 6	3
	17	**Habitat complexity** (little or no habitat = 0; frequent, varied habitats = max points)	0 – 6	0 – 6	0 – 6	2
	18	**Canopy coverage over streambed** (no shading vegetation = 0; continuous canopy = max points)	0 – 5	0 – 5	0 – 5	2
	19	**Substrate embeddedness** (deeply embedded = 0; loose structure = max)	NA*	0 – 4	0 – 4	/
BIOLOGY	20	**Presence of stream invertebrates** (see page 4) (no evidence = 0; common, numerous types = max points)	0 – 4	0 – 5	0 – 5	1
	21	**Presence of amphibians** (no evidence = 0; common, numerous types = max points)	0 – 4	0 – 4	0 – 4	1
	22	**Presence of fish** (no evidence = 0; common, numerous types = max points)	0 – 4	0 – 4	0 – 4	0
	23	**Evidence of wildlife use** (no evidence = 0; abundant evidence = max points)	0 – 6	0 – 5	0 – 5	0
		Total Points Possible	100	100	100	
		TOTAL SCORE (also enter on first page)				35

* These characteristics are not assessed in coastal streams.

USACE AID#_____ DWQ #_____ Site #____ (indicate on attached map)

STREAM QUALITY ASSESSMENT WORKSHEET

Provide the following information for the stream reach under assessment:

1. Applicant's name: NCDOT
2. Evaluator's name: RM
3. Date of evaluation: 3/17/04
4. Time of evaluation: 10 AM
5. Name of stream: UT to NE Creek
6. River basin: New River
7. Approximate drainage area: Site 4A
8. Stream order: 1st
9. Length of reach evaluated: 100 Ft
10. County: Onslow
11. Site coordinates (if known): _____
12. Subdivision name (if any): _____
13. Location of reach under evaluation (note nearby roads and landmarks and attach map identifying stream(s) location): _____
14. Proposed channel work (if any): Culvert
15. Recent weather conditions: Rain within 24 hrs
16. Site conditions at time of visit: _____
17. Identify any special waterway classifications known: ___Section 10 ___Tidal Waters ___Essential Fisheries Habitat ___Trout Waters ___Outstanding Resource Waters ___ Nutrient Sensitive Waters ___Water Supply Watershed ____(I-IV)
18. Is there a pond or lake located upstream of the evaluation point? YES (NO) If yes, estimate the water surface area: _____
19. Does channel appear on USGS quad map? YES (NO)
20. Does channel appear on USDA Soil Survey? YES (NO)
21. Estimated watershed land use: 45% Residential ___% Commercial ___% Industrial ___% Agricultural 55% Forested ___% Cleared / Logged ___% Other (_____)
22. Bankfull width: Not observed
23. Bank height (from bed to top of bank): 5-7 F
24. Channel slope down center of stream: ✓ Flat (0 to 2%) ___Gentle (2 to 4%) ___Moderate (4 to 10%) ___Steep (>10%)
25. Channel sinuosity: ___Straight ✓ Occasional bends ___Frequent meander ___Very sinuous ___Braided channel

Instructions for completion of worksheet (located on page 2): Begin by determining the most appropriate ecoregion based on location, terrain, vegetation, stream classification, etc. Every characteristic must be scored using the same ecoregion. Assign points to each characteristic within the range shown for the ecoregion. Page 3 provides a brief description of how to review the characteristics identified in the worksheet. Scores should reflect an overall assessment of the stream reach under evaluation. If a characteristic cannot be evaluated due to site or weather conditions, enter 0 in the scoring box and provide an explanation in the comment section. Where there are obvious changes in the character of a stream under review (e.g., the stream flows from a pasture into a forest), the stream may be divided into smaller reaches that display more continuity, and a separate form used to evaluate each reach. The total score assigned to a stream reach must range between 0 and 100, with a score of 100 representing a stream of the highest quality.

Total Score (from reverse): 33 **Comments:** Int

Evaluator's Signature _____ **Date** 3/17/04

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STREAM QUALITY ASSESSMENT WORKSHEET

	#	CHARACTERISTICS	ECOREGION POINT RANGE			SCORE
			*Coastal	Piedmont	Mountain	
PHYSICAL	1	**Presence of flow/persistent pools in stream** (no flow or saturation = 0; strong flow = max points)	0–5	0–4	0–5	4
	2	**Evidence of past human alteration** (extensive alteration = 0; no alteration = max points)	0–6	0–5	0–5	1
	3	**Riparian zone** (no buffer = 0; contiguous, wide buffer = max points)	0–6	0–4	0–5	0
	4	**Evidence of nutrient or chemical discharges** (extensive discharges = 0; no discharges = max points)	0–5	0–4	0–4	4
	5	**Groundwater discharge** (no discharge = 0; springs, seeps, wetlands, etc. = max points)	0–3	0–4	0–4	2
	6	**Presence of adjacent floodplain** (not floodplain = 0; extensive floodplain = max points)	0–4	0–4	0–2	0
	7	**Entrenchment / floodplain access** (deeply entrenched = 0; frequent flooding = max points)	0–5	0–4	0–2	32
	8	**Presence of adjacent wetlands** (no wetlands = 0; large, adjacent wetlands = max points)	0–6	0–4	0–2	0
	9	**Channel sinuosity** (extensive channelization = 0; natural meander = max points)	0–5	0–4	0–3	1
	10	**Sediment input** (extensive deposition = 0; little or no sediment = max points)	0–5	0–4	0–4	4
	11	**Size & diversity of channel bed substrate** (fine, homogenous = 0; large, diverse sizes = max points)	NA*	0–4	0–5	2
STABILITY	12	**Evidence of channel incision or widening** (deeply incised = 0; stable bed & banks = max points)	0–5	0–4	0–5	2
	13	**Presence of major bank failures** (severe erosion = 0; no erosion, stable banks = max points)	0–5	0–5	0–5	3
	14	**Root depth and density on banks** (no visible roots = 0; dense roots throughout = max points)	0–3	0–4	0–5	1
	15	**Impact by agriculture, livestock, or timber production** (substantial impact = 0; no evidence = max points)	0–5	0–4	0–5	4
HABITAT	16	**Presence of riffle-pool/ripple-pool complexes** (no riffles/ripples or pools = 0; well-developed = max points)	0–3	0–5	0–6	1
	17	**Habitat complexity** (little or no habitat = 0; frequent, varied habitats = max points)	0–6	0–6	0–6	1
	18	**Canopy coverage over streambed** (no shading vegetation = 0; continuous canopy = max points)	0–5	0–5	0–5	0
	19	**Substrate embeddedness** (deeply embedded = 0; loose structure = max)	NA*	0–4	0–4	
BIOLOGY	20	**Presence of stream invertebrates** (see page 4) (no evidence = 0; common, numerous types = max points)	0–4	0–5	0–5	1
	21	**Presence of amphibians** (no evidence = 0; common, numerous types = max points)	0–4	0–4	0–4	2
	22	**Presence of fish** (no evidence = 0; common, numerous types = max points)	0–4	0–4	0–4	1
	23	**Evidence of wildlife use** (no evidence = 0; abundant evidence = max points)	0–6	0–5	0–5	0
		Total Points Possible	100	100	100	
		TOTAL SCORE (also enter on first page)				33

* These characteristics are not assessed in coastal streams.

USACE AID#_____ DWQ #_____ Site #____ (indicate on attached map)

10 Average of Both Sides

STREAM QUALITY ASSESSMENT WORKSHEET

Provide the following information for the stream reach under assessment:

1. Applicant's name: NCDOT
2. Evaluator's name: BM
3. Date of evaluation: 3/17/04
4. Time of evaluation: 11:15
5. Name of stream: UT to NE Creek
6. River basin: New River
7. Approximate drainage area: Site 10
8. Stream order: 1st
9. Length of reach evaluated: 100 Ft
10. County: Onslow
11. Site coordinates (if known):
12. Subdivision name (if any):
13. Location of reach under evaluation (note nearby roads and landmarks and attach map identifying stream(s) location):
14. Proposed channel work (if any): Culvert
15. Recent weather conditions: Rain w/in 24 hrs
16. Site conditions at time of visit:
17. Identify any special waterway classifications known: ___Section 10 ___Tidal Waters ___Essential Fisheries Habitat ___Trout Waters ___Outstanding Resource Waters ___ Nutrient Sensitive Waters ___Water Supply Watershed ____(I-IV)
18. Is there a pond or lake located upstream of the evaluation point? YES (NO) If yes, estimate the water surface area:
19. Does channel appear on USGS quad map? (YES) NO
20. Does channel appear on USDA Soil Survey? YES (NO)
21. Estimated watershed land use: ___% Residential ___% Commercial ___% Industrial ___% Agricultural 100% Forested ___% Cleared / Logged ___% Other (_____)
22. Bankfull width: 9
23. Bank height (from bed to top of bank): 5-8 Ft
24. Channel slope down center of stream: ___Flat (0 to 2%) ___Gentle (2 to 4%) ___Moderate (4 to 10%) ✓Steep (>10%)
25. Channel sinuosity: ____Straight ✓Occasional bends ___Frequent meander ___Very sinuous ___Braided channel

Instructions for completion of worksheet (located on page 2): Begin by determining the most appropriate ecoregion based on location, terrain, vegetation, stream classification, etc. Every characteristic must be scored using the same ecoregion. Assign points to each characteristic within the range shown for the ecoregion. Page 3 provides a brief description of how to review the characteristics identified in the worksheet. Scores should reflect an overall assessment of the stream reach under evaluation. If a characteristic cannot be evaluated due to site or weather conditions, enter 0 in the scoring box and provide an explanation in the comment section. Where there are obvious changes in the character of a stream under review (e.g., the stream flows from a pasture into a forest), the stream may be divided into smaller reaches that display more continuity, and a separate form used to evaluate each reach. The total score assigned to a stream reach must range between 0 and 100, with a score of 100 representing a stream of the highest quality.

Total Score (from reverse): 25 **Comments:**

Evaluator's Signature BM **Date** 3/17/04

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STREAM QUALITY ASSESSMENT WORKSHEET

	#	CHARACTERISTICS	ECOREGION POINT RANGE			SCORE
			Coastal	Piedmont	Mountain	
PHYSICAL	1	**Presence of flow / persistent pools in stream** (no flow, or saturation = 0; strong flow = max points)	0–5	0–4	0–5	5
	2	**Evidence of past human alteration** (extensive alteration = 0; no alteration = max points)	0–6	0–5	0–5	0
	3	**Riparian zone** (no buffer = 0; contiguous, wide buffer = max points)	0–6	0–4	0–5	4
	4	**Evidence of nutrient or chemical discharges** (extensive discharges = 0; no discharges = max points)	0–5	0–4	0–4	0
	5	**Groundwater discharge** (no discharge = 0; springs, seeps, wetlands, etc. = max points)	0–3	0–4	0–4	1
	6	**Presence of adjacent floodplain** (no floodplain = 0; extensive floodplain = max points)	0–4	0–4	0–2	0
	7	**Entrenchment / floodplain access** (deeply entrenched = 0; frequent flooding = max points)	0–5	0–4	0–2	0
	8	**Presence of adjacent wetlands** (no wetlands = 0; large, adjacent wetlands = max points)	0–6	0–4	0–2	0
	9	**Channel sinuosity** (extensive channelization = 0; natural meander = max points)	0–5	0–4	0–3	0
	10	**Sediment input** (extensive deposition = 0; little or no sediment = max points)	0–5	0–4	0–4	5
	11	**Size & diversity of channel bed substrate** (fine, homogenous = 0; large, diverse sizes = max points)	NA*	0–4	0–5	/
STABILITY	12	**Evidence of channel incision or widening** (deeply incised = 0; stable bed & banks = max points)	0–5	0–4	0–5	0
	13	**Presence of major bank failures** (severe erosion = 0; no erosion, stable banks = max points)	0–5	0–5	0–5	0
	14	**Root depth and density on banks** (no visible roots = 0; dense roots throughout = max points)	0–3	0–4	0–5	1
	15	**Impact by agriculture, livestock, or timber production** (substantial impact = 0; no evidence = max points)	0–5	0–4	0–5	2
HABITAT	16	**Presence of riffle-pool/ripple-pool complexes** (no riffles/ripples or pools = 0; well-developed = max points)	0–3	0–5	0–6	1
	17	**Habitat complexity** (little or no habitat = 0; frequent, varied habitats = max points)	0–6	0–6	0–6	1
	18	**Canopy coverage over streambed** (no shading vegetation = 0; continuous canopy = max points)	0–5	0–5	0–5	2
	19	**Substrate embeddedness** (deeply embedded = 0; loose structure = max)	NA*	0–4	0–4	/
BIOLOGY	20	**Presence of stream invertebrates** (see page 4) (no evidence = 0; common, numerous types = max points)	0–4	0–5	0–5	1
	21	**Presence of amphibians** (no evidence = 0; common, numerous types = max points)	0–4	0–4	0–4	1
	22	**Presence of fish** (no evidence = 0; common, numerous types = max points)	0–4	0–4	0–4	1
	23	**Evidence of wildlife use** (no evidence = 0; abundant evidence = max points)	0–6	0–5	0–5	0
		Total Points Possible	100	100	100	
		TOTAL SCORE (also enter on first page)				

* These characteristics are not assessed in coastal streams.

USACE AID#_____ DWQ #_____ Site #____ (indicate on attached map)

37

STREAM QUALITY ASSESSMENT WORKSHEET

Provide the following information for the stream reach under assessment:

1. Applicant's name: N/A
2. Evaluator's name: G/A
3. Date of evaluation: 3/17/04
4. Time of evaluation: 11:30
5. Name of stream: Stokys Creek
6. River basin: White Oak
7. Approximate drainage area: Site 37
8. Stream order: 1st
9. Length of reach evaluated: 100 ft
10. County: Onslow
11. Site coordinates (if known):
12. Subdivision name (if any):
13. Location of reach under evaluation (note nearby roads and landmarks and attach map identifying stream(s) location): US 17
14. Proposed channel work (if any): Culvert
15. Recent weather conditions: Rain w/in 24 hrs
16. Site conditions at time of visit:
17. Identify any special waterway classifications known: ___Section 10 ___Tidal Waters ___Essential Fisheries Habitat ___Trout Waters ___Outstanding Resource Waters ___ Nutrient Sensitive Waters ___Water Supply Watershed ____(I-IV)
18. Is there a pond or lake located upstream of the evaluation point? YES (NO) If yes, estimate the water surface area:
19. Does channel appear on USGS quad map? (YES) NO
20. Does channel appear on USDA Soil Survey? (YES) NO
21. Estimated watershed land use: ___% Residential ___% Commercial ___% Industrial ___% Agricultural 100 % Forested ___% Cleared / Logged ___% Other (_____)
22. Bankfull width: Not Defined
23. Bank height (from bed to top of bank): 2-5 ft
24. Channel slope down center of stream: ✓ Flat (0 to 2%) ___Gentle (2 to 4%) ___Moderate (4 to 10%) ___Steep (>10%)
25. Channel sinuosity: ✓ Straight ___Occasional bends ___Frequent meander ___Very sinuous ___Braided channel

Instructions for completion of worksheet (located on page 2): Begin by determining the most appropriate ecoregion based on location, terrain, vegetation, stream classification, etc. Every characteristic must be scored using the same ecoregion. Assign points to each characteristic within the range shown for the ecoregion. Page 3 provides a brief description of how to review the characteristics identified in the worksheet. Scores should reflect an overall assessment of the stream reach under evaluation. If a characteristic cannot be evaluated due to site or weather conditions, enter 0 in the scoring box and provide an explanation in the comment section. Where there are obvious changes in the character of a stream under review (e.g., the stream flows from a pasture into a forest), the stream may be divided into smaller reaches that display more continuity, and a separate form used to evaluate each reach. The total score assigned to a stream reach must range between 0 and 100, with a score of 100 representing a stream of the highest quality.

Total Score (from reverse): 64 **Comments:**

Evaluator's Signature _____ **Date** 3/17/04

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STREAM QUALITY ASSESSMENT WORKSHEET

	#	CHARACTERISTICS	ECOREGION POINT RANGE			SCORE
			*Coastal	Piedmont	Mountain	
PHYSICAL	1	**Presence of flow / persistent pools in stream** (no flow or saturation = 0; strong flow = max points)	0 – 5	0 – 4	0 – 5	4
	2	**Evidence of past human alteration** (extensive alteration = 0; no alteration = max points)	0 – 6	0 – 5	0 – 5	1
	3	**Riparian zone** (no buffer = 0; contiguous, wide buffer = max points)	0 – 6	0 – 4	0 – 5	6
	4	**Evidence of nutrient or chemical discharges** (extensive discharges = 0; no discharges = max points)	0 – 5	0 – 4	0 – 4	3 4
	5	**Groundwater discharge** (no discharge = 0; springs, seeps, wetlands, etc. = max points)	0 – 3	0 – 4	0 – 4	2
	6	**Presence of adjacent floodplain** (no floodplain = 0; extensive floodplain = max points)	0 – 4	0 – 4	0 – 2	2
	7	**Entrenchment / floodplain access** (deeply entrenched = 0; frequent flooding = max points)	0 – 5	0 – 4	0 – 2	1
	8	**Presence of adjacent wetlands** (no wetlands = 0; large adjacent wetlands = max points)	0 – 6	0 – 4	0 – 2	5
	9	**Channel sinuosity** (extensive channelization = 0; natural meanders = max points)	0 – 5	0 – 4	0 – 3	1
	10	**Sediment input** (extensive deposition = 0; little or no sediment = max points)	0 – 5	0 – 4	0 – 4	4
	11	**Size & diversity of channel bed substrate** (fine, homogenous = 0; large, diverse sizes = max points)	*NA	0 – 4	0 – 5	
STABILITY	12	**Evidence of channel incision or widening** (deeply incised = 0; stable bed & banks = max points)	0 – 5	0 – 4	0 – 5	3
	13	**Presence of major bank failures** (severe erosion = 0; no erosion, stable banks = max points)	0 – 5	0 – 5	0 – 5	
	14	**Root depth and density on banks** (no visible roots = 0; dense roots throughout = max points)	0 – 3	0 – 4	0 – 5	4
	15	**Impact by agriculture, livestock, or timber production** (substantial impact = 0; no evidence = max points)	0 – 5	0 – 4	0 – 5	4
HABITAT	16	**Presence of riffle-pool/ripple-pool complexes** (no riffles/ripples or pools = 0; well-developed = max points)	0 – 3	0 – 5	0 – 6	0
	17	**Habitat complexity** (little or no habitat = 0; frequent, varied habitats = max points)	0 – 6	0 – 6	0 – 6	2
	18	**Canopy coverage over streambed** (no shading vegetation = 0; continuous canopy = max points)	0 – 5	0 – 5	0 – 5	5
	19	**Substrate embeddedness** (deeply embedded = 0; loose structure = max)	NA*	0 – 4	0 – 4	
BIOLOGY	20	**Presence of stream invertebrates** (see page 4) (no evidence = 0; common, numerous types = max points)	0 – 4	0 – 5	0 – 5	2
	21	**Presence of amphibians** (no evidence = 0; common, numerous types = max points)	0 – 4	0 – 4	0 – 4	2
	22	**Presence of fish** (no evidence = 0; common, numerous types = max points)	0 – 4	0 – 4	0 – 4	3
	23	**Evidence of wildlife use** (no evidence = 0; abundant evidence = max points)	0 – 6	0 – 5	0 – 5	5
Total Points Possible			100	100	100	64
TOTAL SCORE (also enter on first page)						

* These characteristics are not assessed in coastal streams.

USACE AID#_____ DWQ #_____ Site #____ (indicate on attached map)

3S

STREAM QUALITY ASSESSMENT WORKSHEET

Provide the following information for the stream reach under assessment:

1. Applicant's name: NC DOT
2. Evaluator's name: BH
3. Date of evaluation: 3/17/04
4. Time of evaluation: 11:50
5. Name of stream: UT to Starkey
6. River basin: White Oak
7. Approximate drainage area: Site 3S
8. Stream order: 1
9. Length of reach evaluated: ~ 100 ft
10. County: Onslow
11. Site coordinates (if known): _____
12. Subdivision name (if any): _____
13. Location of reach under evaluation (note nearby roads and landmarks and attach map identifying stream(s) location): US 17
14. Proposed channel work (if any): Tail Ditch
15. Recent weather conditions: Rain w/in 24hrs
16. Site conditions at time of visit: _____
17. Identify any special waterway classifications known: ___Section 10 ___Tidal Waters ___Essential Fisheries Habitat ___Trout Waters ___Outstanding Resource Waters ___ Nutrient Sensitive Waters ___Water Supply Watershed ____(I-IV)
18. Is there a pond or lake located upstream of the evaluation point? YES NO If yes, estimate the water surface area: _____
19. Does channel appear on USGS quad map? YES (NO)
20. Does channel appear on USDA Soil Survey? YES (NO)
21. Estimated watershed land use: ___% Residential ___% Commercial ___% Industrial ___% Agricultural 100% Forested ___% Cleared / Logged ___% Other (_____)
22. Bankfull width: None Observed
23. Bank height (from bed to top of bank): 4-5 Ft
24. Channel slope down center of stream: ✓ Flat (0 to 2%) ___Gentle (2 to 4%) ___Moderate (4 to 10%) ___Steep (>10%)
25. Channel sinuosity: ___Straight ✓ Occasional bends ___Frequent meander ___Very sinuous ___Braided channel

Instructions for completion of worksheet (located on page 2): Begin by determining the most appropriate ecoregion based on location, terrain, vegetation, stream classification, etc. Every characteristic must be scored using the same ecoregion. Assign points to each characteristic within the range shown for the ecoregion. Page 3 provides a brief description of how to review the characteristics identified in the worksheet. Scores should reflect an overall assessment of the stream reach under evaluation. If a characteristic cannot be evaluated due to site or weather conditions, enter 0 in the scoring box and provide an explanation in the comment section. Where there are obvious changes in the character of a stream under review (e.g., the stream flows from a pasture into a forest), the stream may be divided into smaller reaches that display more continuity, and a separate form used to evaluate each reach. The total score assigned to a stream reach must range between 0 and 100, with a score of 100 representing a stream of the highest quality.

Total Score (from reverse): 42 **Comments:** _____

Evaluator's Signature _____ **Date** 3/17/04

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STREAM QUALITY ASSESSMENT WORKSHEET

	#	CHARACTERISTICS	ECOREGION POINT RANGE			SCORE
			*Coastal	*Piedmont	Mountain	
PHYSICAL	1	**Presence of flow/persistent pools in stream** (no flow or saturation = 0; strong flow = max points)	0—5	0—4	0—5	3
	2	**Evidence of past human alteration** (extensive alteration = 0; no alteration = max points)	0—6	0—5	0—5	0
	3	**Riparian zone** (no buffer = 0; contiguous, wide buffer = max points)	0—6	0—4	0—5	3
	4	**Evidence of nutrient or chemical discharges** (extensive discharges = 0; no discharges = max points)	0—5	0—4	0—4	2
	5	**Groundwater discharge** (no discharge = 0; springs, seeps, wetlands, etc. = max points)	0—3	0—4	0—4	3
	6	**Presence of adjacent floodplain** (no floodplain = 0; extensive floodplain = max points)	0—4	0—4	0—2	2
	7	**Entrenchment/floodplain access** (deeply entrenched = 0; frequent flooding = max points)	0—5	0—4	0—2	2
	8	**Presence of adjacent wetlands** (no wetlands = 0; large, adjacent wetlands = max points)	0—6	0—4	0—2	3
	9	**Channel sinuosity** (extensive channelization = 0; natural meander = max points)	0—5	0—4	0—3	1
	10	**Sediment input** (extensive deposition = 0; little or no sediment = max points)	0—5	0—4	0—4	5
	11	**Size & diversity of channel bed substrate** (fine, homogenous = 0; large, diverse sizes = max points)	NA*	0—4	0—5	/
STABILITY	12	**Evidence of channel incision or widening** (deeply incised = 0; stable bed & banks = max points)	0—5	0—4	0—5	2
	13	**Presence of major bank failures** (severe erosion = 0; no erosion, stable banks = max points)	0—5	0—5	0—5	/
	14	**Root depth and density on banks** (no visible roots = 0; dense roots throughout = max points)	0—3	0—4	0—5	3
	15	**Impact by agriculture, livestock, or timber production** (substantial impact = 0; no evidence = max points)	0—5	0—4	0—5	2
HABITAT	16	**Presence of riffle-pool/ripple-pool complexes** (no riffles/ripples or pools = 0; well-developed = max points)	0—3	0—5	0—6	0
	17	**Habitat complexity** (little or no habitat = 0; frequent, varied habitats = max points)	0—6	0—6	0—6	1
	18	**Canopy coverage over streambed** (no shading vegetation = 0; continuous canopy = max points)	0—5	0—5	0—5	2
	19	**Substrate embeddedness** (deeply embedded = 0; loose structure = max)	NA*	0—4	0—4	/
BIOLOGY	20	**Presence of stream invertebrates** (see page 4) (no evidence = 0; common, numerous types = max points)	0—4	0—5	0—5	1
	21	**Presence of amphibians** (no evidence = 0; common, numerous types = max points)	0—4	0—4	0—4	1
	22	**Presence of fish** (no evidence = 0; common, numerous types = max points)	0—4	0—4	0—4	/
	23	**Evidence of wildlife use** (no evidence = 0; abundant evidence = max points)	0—6	0—5	0—5	1
		Total Points Possible	100	100	100	
		TOTAL SCORE (also enter on first page)				42

* These characteristics are not assessed in coastal streams.

USACE AID#_____ DWQ #_____ Site #____ (indicate on attached map)

53

STREAM QUALITY ASSESSMENT WORKSHEET

Provide the following information for the stream reach under assessment:

1. Applicant's name: NCDOT
2. Evaluator's name: BMH
3. Date of evaluation: 3/17/04
4. Time of evaluation: 12:15
5. Name of stream: UT to Stuckey Creek
6. River basin: White Oak
7. Approximate drainage area: Site 53
8. Stream order: 1
9. Length of reach evaluated: ~100 Ft
10. County: Bladen
11. Site coordinates (if known):
12. Subdivision name (if any):
13. Location of reach under evaluation (note nearby roads and landmarks and attach map identifying stream(s) location):
14. Proposed channel work (if any): Base Tail Ditch
15. Recent weather conditions: Rain w/ in 24hrs
16. Site conditions at time of visit:
17. Identify any special waterway classifications known: ___Section 10 ___Tidal Waters ___Essential Fisheries Habitat ___Trout Waters ___Outstanding Resource Waters ___ Nutrient Sensitive Waters ___Water Supply Watershed ____(I-IV)
18. Is there a pond or lake located upstream of the evaluation point? YES (NO) If yes, estimate the water surface area:
19. Does channel appear on USGS quad map? YES (NO)
20. Does channel appear on USDA Soil Survey? YES (NO)
21. Estimated watershed land use: ___% Residential ___% Commercial ___% Industrial ___% Agricultural ___% Forested ___% Cleared / Logged ___% Other (_____)
22. Bankfull width: 6 Ft
23. Bank height (from bed to top of bank): 3 Ft
24. Channel slope down center of stream: ✓Flat (0 to 2%) ___Gentle (2 to 4%) ___Moderate (4 to 10%) ___Steep (>10%)
25. Channel sinuosity: ✓Straight ___Occasional bends ___Frequent meander ___Very sinuous ___Braided channel

Instructions for completion of worksheet (located on page 2): Begin by determining the most appropriate ecoregion based on location, terrain, vegetation, stream classification, etc. Every characteristic must be scored using the same ecoregion. Assign points to each characteristic within the range shown for the ecoregion. Page 3 provides a brief description of how to review the characteristics identified in the worksheet. Scores should reflect an overall assessment of the stream reach under evaluation. If a characteristic cannot be evaluated due to site or weather conditions, enter 0 in the scoring box and provide an explanation in the comment section. Where there are obvious changes in the character of a stream under review (e.g., the stream flows from a pasture into a forest), the stream may be divided into smaller reaches that display more continuity, and a separate form used to evaluate each reach. The total score assigned to a stream reach must range between 0 and 100, with a score of 100 representing a stream of the highest quality.

Total Score (from reverse): 29 **Comments:** Intermittent

Evaluator's Signature _____ **Date** 3/17/04

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STREAM QUALITY ASSESSMENT WORKSHEET

	#	CHARACTERISTICS	ECOREGION POINT RANGE			SCORE
			Coastal	Piedmont	Mountain	
PHYSICAL STABILITY	1	**Presence of flow / persistent pools in stream** (no flow or saturation = 0; strong flow = max points)	0 – 5	0 – 4	0 – 5	1
	2	**Evidence of past human alteration** (extensive alteration = 0; no alteration = max points)	0 – 6	0 – 5	0 – 5	1
	3	**Riparian zone** (no buffer = 0; contiguous, wide buffer = max points)	0 – 6	0 – 4	0 – 5	2
	4	**Evidence of nutrient or chemical discharges** (extensive discharges = 0; no discharges = max points)	0 – 5	0 – 4	0 – 4	2
	5	**Groundwater discharge** (no discharge = 0; springs, seeps, wetlands, etc. = max points)	0 – 3	0 – 4	0 – 4	1
	6	**Presence of adjacent floodplain** (no floodplain = 0; extensive floodplain = max points)	0 – 4	0 – 4	0 – 2	0
	7	**Entrenchment / floodplain access** (deeply entrenched = 0; frequent flooding = max points)	0 – 5	0 – 4	0 – 2	0
	8	**Presence of adjacent wetlands** (no wetlands = 0; large, adjacent wetlands = max points)	0 – 6	0 – 4	0 – 2	0
	9	**Channel sinuosity** (extensive channelization = 0; natural meander = max points)	0 – 5	0 – 4	0 – 3	0
	10	**Sediment input** (extensive deposition = 0; little or no sediment = max points)	0 – 5	0 – 4	0 – 4	1
	11	**Size & diversity of channel bed substrate** (fine, homogenous = 0; large, diverse sizes = max points)	NA*	0 – 4	0 – 5	1
	12	**Evidence of channel incision or widening** (deeply incised = 0; stable bed & banks = max points)	0 – 5	0 – 4	0 – 5	2
	13	**Presence of major bank failures** (severe erosion = 0; no erosion, stable banks = max points)	0 – 5	0 – 5	0 – 5	5
	14	**Root depth and density on banks** (no visible roots = 0; dense roots throughout = max points)	0 – 3	0 – 4	0 – 5	2
	15	**Impact by agriculture, livestock, or timber production** (substantial impact = 0; no evidence = max points)	0 – 5	0 – 4	0 – 5	5
HABITAT	16	**Presence of riffle-pool/ripple-pool complexes** (no riffles/ripples or pools = 0; well-developed = max points)	0 – 3	0 – 5	0 – 6	0
	17	**Habitat complexity** (little or no habitat = 0; frequent, varied habitats = max points)	0 – 6	0 – 6	0 – 6	1
	18	**Canopy coverage over streambed** (no shading vegetation = 0; continuous canopy = max points)	0 – 5	0 – 5	0 – 5	2
	19	**Substrate embeddedness** (deeply embedded = 0; loose structure = max)	NA*	0 – 4	0 – 4	—
BIOLOGY	20	**Presence of stream invertebrates** (see page 4) (no evidence = 0; common, numerous types = max points)	0 – 4	0 – 5	0 – 5	2
	21	**Presence of amphibians** (no evidence = 0; common, numerous types = max points)	0 – 4	0 – 4	0 – 4	2
	22	**Presence of fish** (no evidence = 0; common, numerous types = max points)	0 – 4	0 – 4	0 – 4	0
	23	**Evidence of wildlife use** (no evidence = 0; abundant evidence = max points)	0 – 6	0 – 5	0 – 5	0
		Total Points Possible	100	100	100	
		TOTAL SCORE (also enter on first page)				

* These characteristics are not assessed in coastal streams.

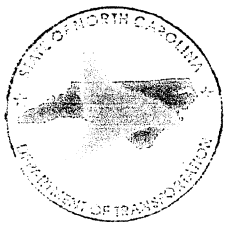
TECHNICAL MEMORANDUM

DITCH IMPACT STUDY

US 17

ONSLOW COUNTY, NORTH CAROLINA

TRAFFIC IMPROVEMENT PROJECT (TIP) NO. R-2514A



NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

PROJECT DEVELOPMENT AND ENVIRONMENTAL ANALYSIS BRANCH

RALEIGH, NORTH CAROLINA

AUGUST 2003

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TECHNICAL MEMORANDUM

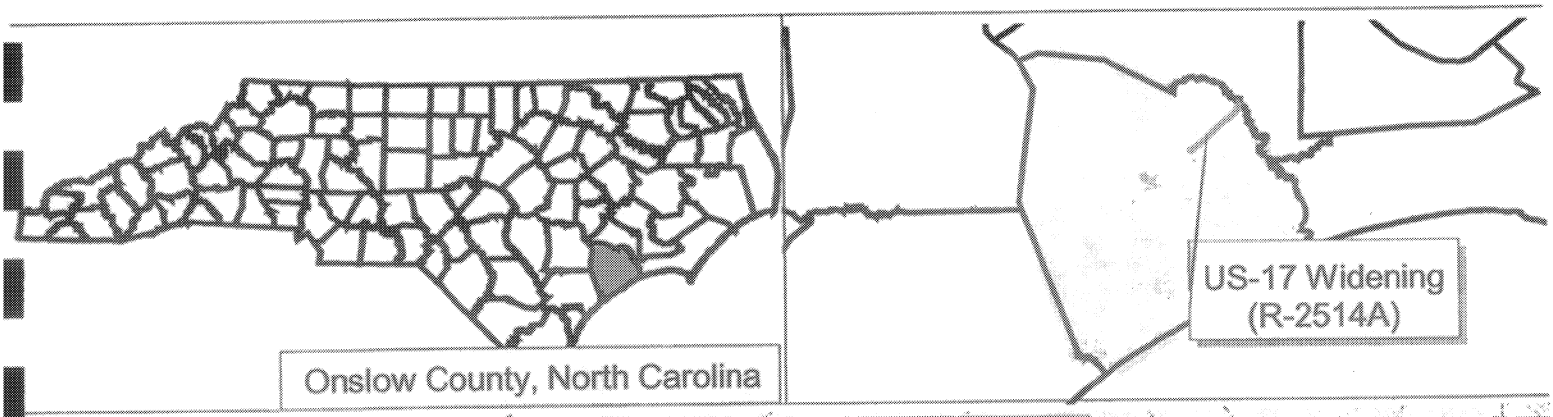
DITCH IMPACT STUDY
US 17 WIDENING (R-2514A)
ONSLOW COUNTY, NORTH CAROLINA

1.0 INTRODUCTION

The North Carolina Department of Transportation (NCDOT) is proposing to widen US 17 into a multilane facility in Onslow and Jones Counties, North Carolina. The improvements to US 17 are anticipated to occur from SR 1327/SR 1410 to SR 1330/SR 1439 north of Jacksonville, North Carolina. The total length of the R-2514A project extends 15.8 miles. The current study, which is focused on 4 locations (Site 6, Station 107+80 to 109+20; Site 12, Station 114+60 to 115+00; Site 13, Station 118+00 to 119+60; Site 39, station 163+40 to Station 166+40), has been undertaken to evaluate the drainage impact caused by special[1] ditches (hereafter referred to as the "project ditches") constructed adjacent to the proposed, widened facility. The results of this modeling effort will be used to determine the amount of wetlands that will be permanently impacted by the project ditches through impacts to the wetland hydroperiod. This impact will be considered cumulative with other filling, excavation, and mechanized clearing activities within jurisdictional areas and is expected to be considered in the Section 404 and Section 401 permit applications. EcoScience Corporation (ESC) has been retained to estimate the drainage influence of the project ditches, as well as determine the amount of jurisdictional wetlands that will be impacted due to these drainage influences. The station numbers, locations and details of the ditches were provided by NCDOT to ESC personnel. The drainage impacts estimated by ESC will be interpreted by NCDOT and included in the Section 404 permit application.

Specifically, the goal of this study is to compare the output of two models to estimate the linear distance from the edge of the project ditch where the potential exists for drainage impacts to occur within jurisdictional wetlands. As requested by NCDOT, results from the Boussinesq Equation were compared to results generated by the hydraulic model DRAINMOD.

[1]Special ditches generally parallel the road corridor and are designed to induce a groundwater withdrawal gradient within adjacent fill material. The withdrawal gradient is intended to protect the roadway's substrate from underlying water.



0.4 0 0.4 0.8 1.2 1.6 2 2.4 2.8 3.2 Miles

Deppe Road (SR 1438)

Site 39
Station 163 to 166.4

Kellum Loop Road (SR 1522)

Site 13
Station 118-120

Site 12
Station 114.5 to 115

Site 6
Station 107.5-109

N

Site Location

Ditch Impact Study
US-17 Widening
(R-2514A)
Onslow County, North Carolina

Drawn By: MTC	Date: Aug 2003
Chkd By: APS	Project No: 02-113.24
SCALE:	

2.0 METHODS

MODEL DESCRIPTIONS

The Boussinesq Equation represents a two dimensional general flow equation for unconfined aquifers. The equation has been applied in the past to predict the decline in elevation of the water table near a pumping well as time progresses. The equation is based primarily on hydraulic conductivity, drainable porosity, and the saturated thickness of the aquifer. One form of the equation is as follows:

$$X = (K\, h_0\, t/f)^{1/2} / F(D,H)$$

Where:

K = hydraulic conductivity (in/hr)
h_0 = depth to aquiclude (in)
t = duration (hours)
f = drainable porosity (dimensionless ratio)
F(D,H) = profiles (graphs) relating ditch depth, water table depth, and depth to the aquiclude(h_0)
X = wetland impact distance (in)

DRAINMOD was originally developed to simulate the performance of agricultural drainage and water table control systems on sites with shallow water table conditions. DRAINMOD predicts water balances in the soil-water regime at the midpoint between two drains of equal elevation. The model is capable of calculating hourly values for water table depth, surface runoff, subsurface drainage, infiltration, and actual evapotranspiration over long periods referenced to measured climatological data. The reliability of DRAINMOD has been tested for a wide range of soil, crop, and climatological conditions. Results of tests in North Carolina (Skaggs, 1982), Ohio (Skaggs *et al.* 1981), Louisiana (Gayle *et al.* 1985; Fouss *et al.* 1987), Florida (Rogers 1985), Michigan (Belcher and Merva 1987), and Belgium (Susanto *et al.* 1987) indicate that the model can be used to reliably predict water table elevations and drain flow rates. DRAINMOD has also been used to evaluate wetland hydrology by Skaggs *et al.* (1993). Methods for evaluating water balance equations and equation variables are discussed in detail in Skaggs (1980).

DRAINMOD was modified for application in wetland studies by adding a counter that accumulates the number of events wherein the water table rises above a specified depth and remains above that threshold depth for a given duration during the growing season. Important inputs into the DRAINMOD model include rainfall data, soil and surface storage parameters, evapotranspiration rates, ditch depth and spacing, and hydraulic conductivity values.

MODEL APPLICATION

In this study, the Boussinesq Equation was applied to ditches in the study to predict where the linear distance of a drawdown in the groundwater exceeds 1 foot for 5- and 12.5-percent of the growing season. These percentages were selected based upon guidance from the U.S. Army Corps of Engineers Wetland Delineation Manual (DOA 1987). The equation is solved for the wetland impact distance with data for the following variables: 1) equivalent hydraulic conductivity; 2) drainable porosity; 3) an estimated depth to the aquiclude; 4) the time duration of the drawdown; 5) target water table depth (1 foot below the soil surface); and 6) average ditch depth.

The dominant soil types along the project ditches were determined based upon the Onslow County soil survey (USDA 1992) then verified in the field. The Rains series consists of poorly drained soils on uplands, formed in moderately fine textured sediments with slopes less than 2 percent. The Goldsboro series consists of moderately well drained soils, moderately fine textured with slopes ranging from 0 to 2 percent. Equivalent hydraulic conductivity (K) was estimated by calculating a weighted average of published conductivity data (Skaggs *et al.* 1986). Field measured saturated hydraulic conductivity for the Rains series, cross referenced with values provided by the Natural Resources Conservation Service (NRCS) Map Unit User Files (MUUF) computer model (Baumer *et al.* 1994), were used to verify the published values (Skaggs *et al.* 1986). The soil layer depths were obtained from descriptions in the Onslow County soil survey then verified in the field. For each of the soils, drainable porosity was calculated using the water depth to drained-volume relationship provided by MUUF. The drainable porosities were cross-referenced with published data (Skaggs *et al.* 1986) for depths between 0 and 1 foot for the Rains and Goldsboro series. The depth to the mid- to lower portions of each soils' Bt layer were estimated to mark the beginning of the restrictive layer, or the depth to aquiclude, because no abrupt increase in clay percentage could be determined in the field (He *et al.* 2002). The depth to aquiclude was then correlated to published values for both the Rains and Goldsboro series (Skaggs *et al.* 1986).

The time variable, t, is based on a 5- and 12.5-percent of the Onslow County growing season, 11 and 27 days respectively. For the purpose of this study, the growing season is defined as the period between April 8 and November 5 (USDA 1992). Values for the function F(D,H), defined as a function of ditch depth, water table depth, and depth to the aquiclude, were taken from plotted numerical solutions to the Boussinesq Equation (Skaggs 1976), where $D=d / h_0$ and $H= h/ h_0$. The variable d is defined as the ditch elevation above aquiclude. The variable h is equal to the height after drawdown for the water above the aquiclude at distance X from the ditch. For the purposes of this analysis, h was defined as the distance between the aquiclude and a point 1 foot below the surface, or 43 inches. The variable h_0 is the distance from the surface to the aquiclude or 55 inches. Therefore, H for each site was determined to be 0.78. Average ditch depths at each site were provided by NCDOT.

DRAINMOD was used to model the zone of wetland loss resulting from the addition of the project ditches. This zone was derived by determining the threshold drain spacing of parallel ditches that would result in the area adjacent to the ditches meeting the wetland hydrology criterion in just over half of the years simulated. Ditches spaced any closer than this threshold distance would result in the entire area between the ditches experiencing a loss of wetland hydrology. If ditches were spaced any further apart than the threshold distance, there would be a strip between the ditches which would still meet the wetland hydrology criteria. Since only one ditch exists, areas outside of half of the threshold distance are predicted to have wetland hydrology. Therefore half of this threshold spacing provides a safe-side estimate of the drainage effect that the project ditch will have. This application of the model recognizes that the water table midway between ditches spaced at the threshold spacing will be lower (i.e., the soil at that point will be drier) than would be the case at the same distance from a single ditch (i.e., at a distance of one-half the threshold spacing from a single ditch). A second ditch parallel to a project ditch at the threshold distance would cut off seepage from the zone beyond the threshold distance and permit greater water table drawdown at the midpoint than would occur if this second ditch were not there. Therefore the width of the strip of land that would experience

hydrologic conversion from wetland to upland hydraulic conditions would be less than a distance equal to one-half the threshold spacings. One-half the threshold spacing is the ditch effect reported in Tables 1 and 2.

Wetland hydrology is defined for DRAINMOD as groundwater within 12 inches of the ground surface for 11 (5-percent) and 27 (12.5-percent) consecutive days during the growing season. Wetland hydrology is achieved in the model if target hydroperiods are met for one half of the years modeled (i.e. 23 out of 45 years). Additional inputs for soil parameters and relationships derived from soil water characteristic data such as the water table depth/volume drained/upflux relationship, Green-ampt parameters, and the water content/matric suction relationship were obtained from NRCS data utilizing the MUUF computer program for the Goldsboro soil series and from published values (Skaggs *et al.* 1986) for the Rains series. Hydraulic conductivities and ditch depth were calculated as described above. Surface depressional storage was estimated from published ranges (Skaggs *et al.* 1994 and Skaggs 1980) after visiting the sites. Drainage coefficients for the ditches were calculated based on NCDOT ditch details, design plans, and formulas provided with DRAINMOD. Weather data for a 45-year period was obtained for the New Bern airport. Missing measurements were estimated from data for the same date in the previous year. Potential evapotranspiration rates were calculated based on Thornthwaite's method and adjusted using monthly factors derived from more reliable average values for crop evapotranspiration known from Washington County. The DRAINMOD simulation was conducted for the time period from 1949 through 1993.

3.0 RESULTS AND CONCLUSIONS

Both the Boussinesq Equation and DRAINMOD have an ability to support different ditch morphology and features, suggesting that use of these methods in evaluation of drainage impacts from highway ditches is applicable with proper data inputs that fully reflect the differences between highway ditches and agricultural ditches. Performing a comparison of output from both methods is recommended because output can be considered to predict the lower and upper limits of a range of drainage influence that is likely to occur in real world conditions. The results are presented in Tables 1 and 2.

The largest range of lateral ditch influences was predicted for Site 6 at 12.5 percent of the growing season (120.2 to 992.5 feet; Table 2). Site 6 is the only site characterized by Goldsboro soils, which is a moderately well drained soil as compared to the Rains soil series. Drier sites are expected to exhibit a larger DRAINMOD threshold spacing due to more rapid drainage as compared to sites with a poorer drained soil, and even the smallest change can potentially reduce the likelihood of a drier site from staying saturated for extended periods of time (27 days in this case). When the saturation period is reduced (such as 5 percent of the growing season), the reported values between Boussinesq Equation and DRAINMOD are very similar (73.8 to 39.8 feet, a 20-foot difference; Table 1) lending increased confidence in reported values for this growing season period.

The range of influence was relatively narrower for the poorly drained Rains series when comparing results from the Boussinesq Equation and DRAINMOD. Differences between the two methods ranged from 3.1 to 9 feet for 5 percent of the growing season and 23.8 to 34 feet for 12.5 percent of the growing season at individual Rains soil sites (Tables 1 and 2). The range of lateral influence at all Rains soil sites varied from 25.4 to 90.2 feet. Ditch depth does exhibit

Table 1. Results for 5% of the Growing Season

Site Number	Primary Soil Type	Average Lateral Hydraulic Conductivity (in/hour)	Drainable Porosity, f	Average Ditch Depth (ft)	Ditch Elevation Above Aquiclude, d (in)	D	F(D,H)	Boussinesq Drainage Impact (ft)	DRAINMOD Maximum Drainage Impact (ft)
6	Goldsboro	2.6	0.03092	2.3	27	0.49	1.2	76.7	96.8
12	Rains	1.36	0.053	1.5	37	0.67	2.0	25.4	34.4
13	Rains	1.36	0.053	1.9	32	0.58	1.4	36.3	41.0
39	Rains	1.36	0.053	2.3	27	0.49	1.2	42.4	45.5

Table 2. Results for 12.5% of the Growing Season

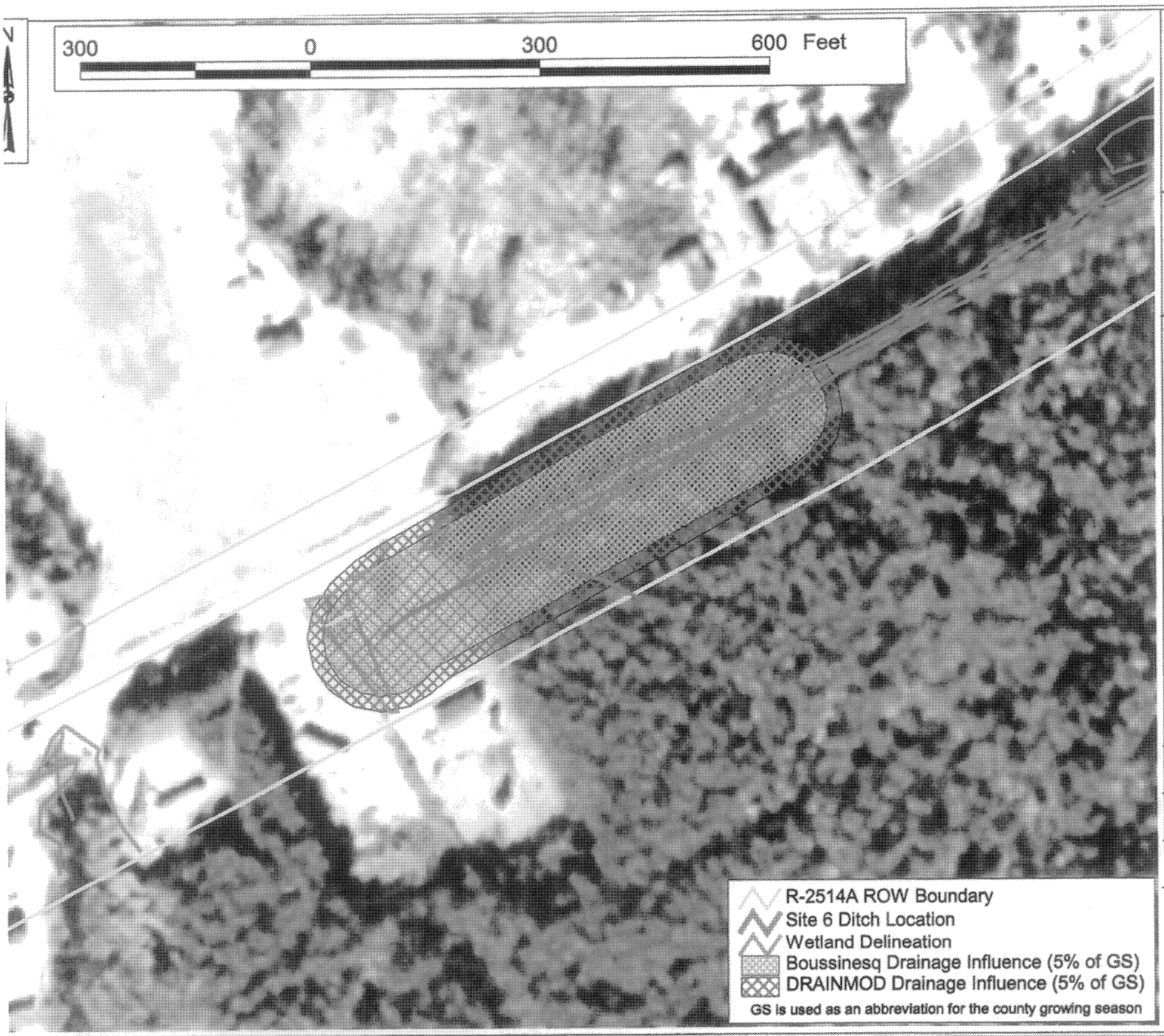
Site Number	Primary Soil Type	Average Lateral Hydraulic Conductivity (in/hour)	Drainable Porosity, f	Average Ditch Depth (ft)	Ditch Elevation Above Aquiclude, d (in)	D	F(D,H)	Boussinesq Drainage Impact (ft)	DRAINMOD Maximum Drainage Impact (ft)
6	Goldsboro	2.6	0.03092	2.3	27	0.49	1.2	120.2	992.5
12	Rains	1.36	0.053	1.5	37	0.67	2.0	39.8	73.8
13	Rains	1.36	0.053	1.9	32	0.58	1.4	56.9	83.5
39	Rains	1.36	0.053	2.3	27	0.49	1.2	66.4	90.2

an influence on the zone of lateral hydrologic influence at Rains soil sites. Impacts increase from 11.1 to 26.6 feet when ditch depths increase by 0.8 feet (from 1.5 feet to 2.3 feet in depth), depending on the growing season and the modeling method employed.

This application of the Boussinesq Equation includes several simplifying assumptions. The equation does not consider the fluctuation of the water table (hydroperiod) from evapotranspiration (ET) and precipitation due to site specific weather. Additionally, the Boussinesq Equation requires that different lateral hydraulic conductivities (K) for separate soil layers be combined to one weighted average for use in the equation. Likewise the equation also assumes a constant drainable porosity (f). Drainable porosity and saturated hydraulic conductivity are more realistically considered a function of hydraulic head which varies vertically.

DRAINMOD more fully assesses wetland hydroperiods. DRAINMOD considers variability in rainfall, evapotranspiration, hydraulic conductivities, drainable porosity and other hydrologic parameters. DRAINMOD simulations predict the ditch spacing required to lower the water table below 12 inches of the surface for 5- to 12.5-percent of the growing season. As discussed earlier, this spacing is a safe-side estimate of the effect of a single ditch. These results suggest that actual impacts to the wetland hydroperiod will be less than the values reported in Tables 1 and 2. Results are graphically shown in Figures 2A through 2H

In summary, two different methods were used to simulate the drainage impact of the special ditches on the wetland hydroperiod within jurisdictional systems adjacent to US 17 in Onslow County. The Boussinesq Equation and DRAINMOD model were utilized to predict the lateral extent of the ditch impact on ground or surface water within one foot of the land surface for various jurisdictional thresholds (*i.e.* 5- or 12.5-percent of the growing season). The predicted lateral effects for each ditch reported indicate the probable range of potential impacts. The predicted lateral effects for the ditches range from 25.4 to 992.5 feet.



EcoScience

Prepared For:

Project:

US-17 Widening
Ditch Impact Stud

Onslow County,
North Carolina

Figure Name
Site 6
Ditch Influence
Predictions
5% of the
Growing Season

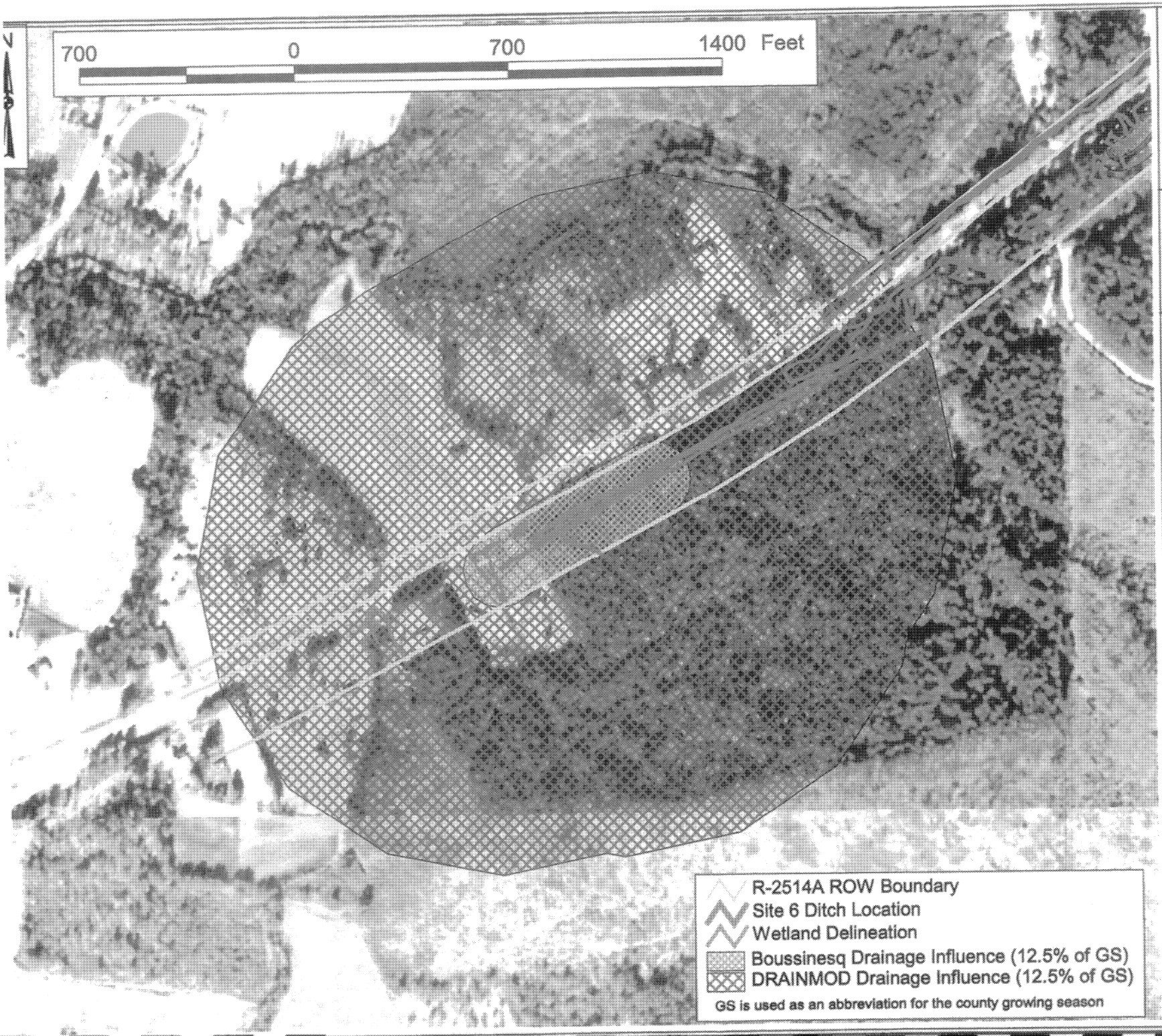
DRAINMOD versu
the
Boussinesq
Equation

Drawn By:	Date:
MTC	Aug 20(
Chkd By:	Project N
DO	02-113.2

SCALE:
1:2000

FIGURE

2A



EcoScience

Prepared For:

Project:

US-17 Widening
Ditch Impact Stud

Onslow County,
North Carolina

Figure Name
Site 6
Ditch Influence
Predictions
12.5% of the
Growing Season

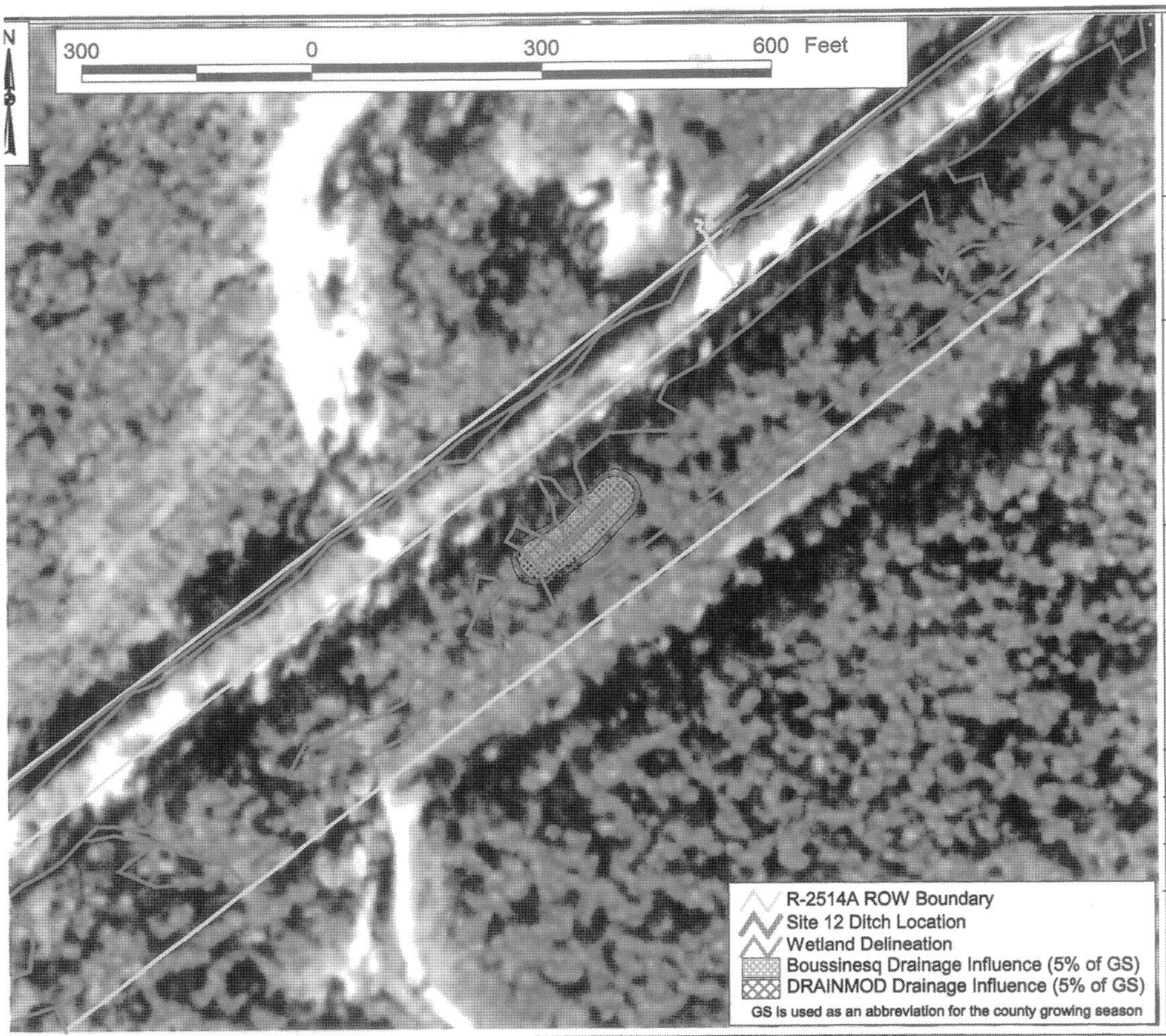
DRAINMOD versu
the
Boussinesq
Equation

Drawn By:	Date:
MTC	Aug 20(
Chkd By:	Project N
DO	02-113.:

SCALE:
1:5000

FIGURE

2B



EcoScience

Prepared For:

Project:

US-17 Widening
Ditch Impact Stud

Onslow County,
North Carolina

Figure Name
Site 12
Ditch Influence
Predictions
5% of the
Growing Season

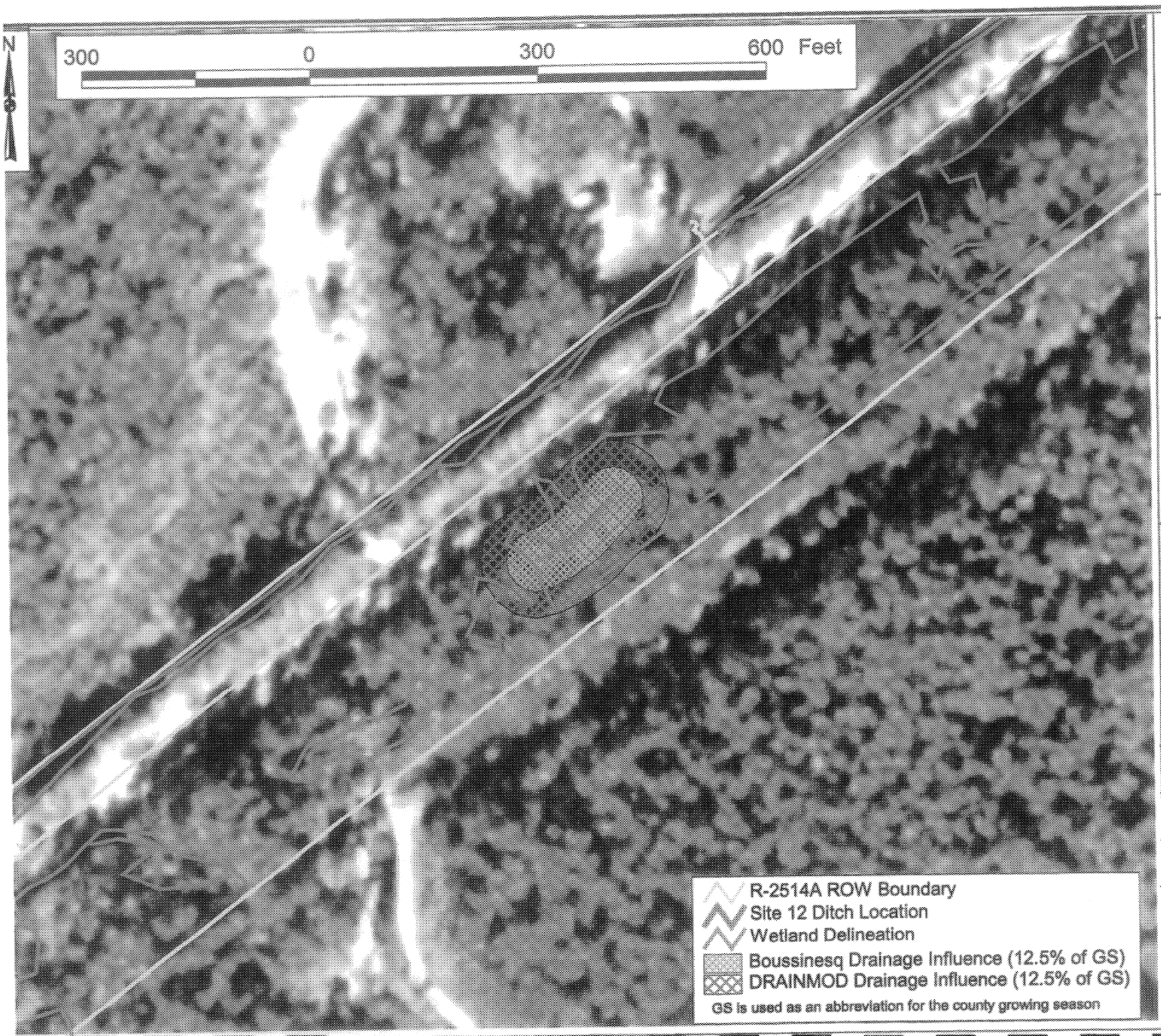
DRAINMOD versu
the
Boussinesq
Equation

Drawn By:	Date:
MTC	Aug 200
Chkd By:	Project N
DO	02-113.2

SCALE:
1:2000

FIGURE

2C



EcoScience

Prepared For:

Project:

US-17 Widening
Ditch Impact Stud

Onslow County,
North Carolina

Figure Name
Site 12
Ditch Influence
Predictions
12.5% of the
Growing Seasor

DRAINMOD versu
the
Boussinesq
Equation

Drawn By:	Date:
MTC	Aug 20
Chkd By:	Project N
DO	02-113.

SCALE:
1:2000

FIGURE

2D

EcoScience

Prepared For:

Project:

US-17 Widening
Ditch Impact Stud

Onslow County,
North Carolina

Figure Name
Site 13
Ditch Influence
Predictions
5% of the
Growing Seasor

DRAINMOD versu
the
Boussinesq
Equation

Drawn By:	Date:
MTC	Aug 20
Chkd By:	Project N
DO	02-113.

SCALE:
1:2000

FIGURE

2E

EcoScience

Prepared For:

Project:

US-17 Widening
Ditch Impact Study

Onslow County,
North Carolina

Figure Name
Site 13
Ditch Influence
Predictions
12.5% of the
Growing Season

DRAINMOD versus
the
Boussinesq
Equation

Drawn By:	Date:
MTC	Aug 200
Chkd By:	Project N
DO	02-113.2

SCALE:
1:2000

FIGURE

2F

EcoScience

Prepared For:

Project:

US-17 Widening
Ditch Impact Stud

Onslow County,
North Carolina

Figure Name
Site 39
Ditch Influence
Predictions
5% of the
Growing Season

DRAINMOD versi
the
Boussinesq
Equation

Drawn By:	Date:
MTC	Aug 20
Chkd By:	Project
DO	02-113.

SCALE:
1:2000

FIGURE

2G

EcoScience

Prepared For:

Project:

US-17 Widening
Ditch Impact Stud

Onslow County,
North Carolina

Figure Name
Site 39
Ditch Influence
Predictions
12.5% of the
Growing Seasor

DRAINMOD versu
the
Boussinesq
Equation

Drawn By:	Date:
MTC	Aug 20
Chkd By:	Project I
DO	02-113.

SCALE:
1:2000

FIGURE

2H

4.0 REFERENCES

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TIP PROJECT: R-2514A

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

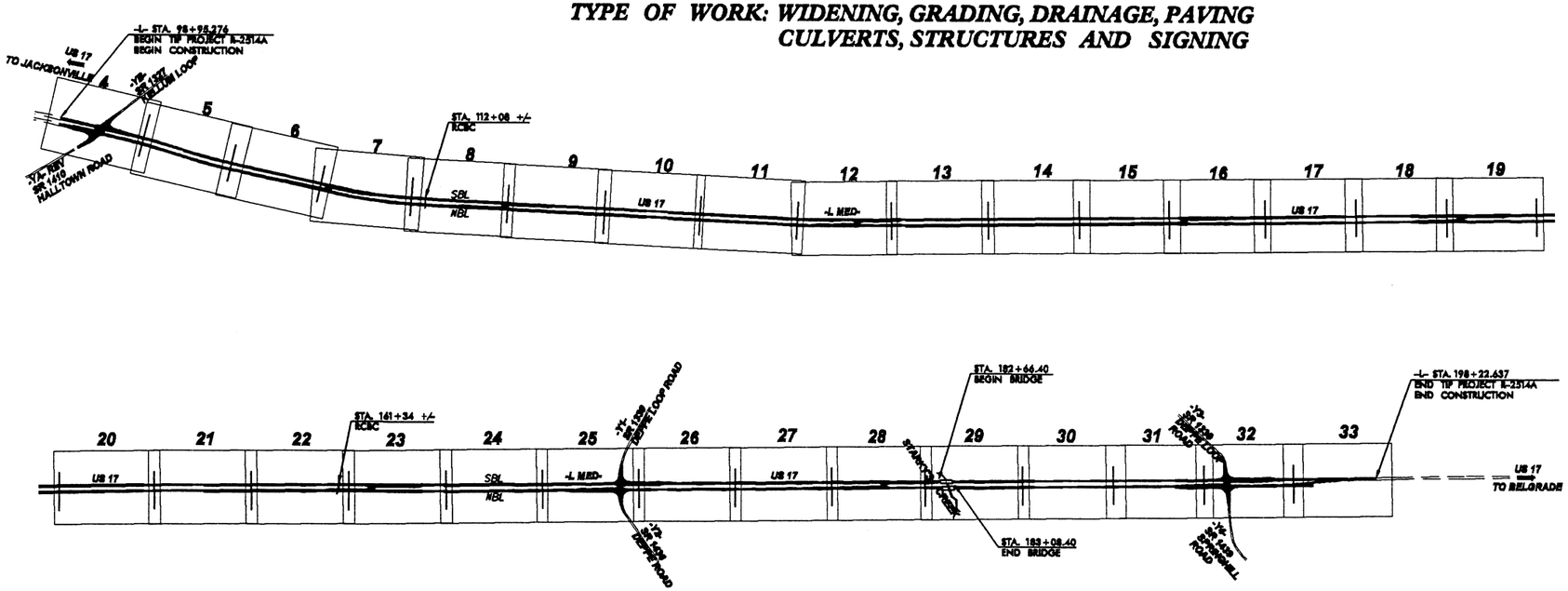
PLAN FOR PROPOSED
HIGHWAY EROSION CONTROL

ONSLOW COUNTY

LOCATION: US 17 NORTH OF JACKSONVILLE FROM SR 1327 /SR 1410 TO SR 1330 /SR 1439 SOUTH OF BELGRADE

TYPE OF WORK: WIDENING, GRADING, DRAINAGE, PAVING CULVERTS, STRUCTURES AND SIGNING

NAD 83 NC GRID



ALL DIMENSIONS IN THESE PLANS ARE IN METERS UNLESS OTHERWISE SHOWN

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	R-2514A	EC-1	

STATE PROJ. NO.	F. A. PROJ. NO.	DESCRIPTION

EROSION AND SEDIMENT CONTROL MEASURES

Std. #	Description	Symbol
	Reforestation	
1630.03	Temporary Silt Ditch	TSD
1630.05	Temporary Diversion	TD
1605.01	Temporary Silt Fence	
1606.01	Special Sediment Control Fence	
1622.01	Temporary Berms and Slope Drains	
1630.01	Riser Basin	
1630.02	Silt Basin Type B	
1633.01	Temporary Rock Silt Check Type-A	
1633.02	Temporary Rock Silt Check Type-B	
1634.01	Temporary Rock Sediment Dam Type-A	
1634.02	Temporary Rock Sediment Dam Type-B	
1635.01	Rock Pipe Inlet Sediment Trap Type-A	
1635.02	Rock Pipe Inlet Sediment Trap Type-B	
1636.01	Rock Silt Screen	
1630.04	Stilling Basin	
	Rock Inlet Sediment Trap:	
1632.01	Type A	A - OR - A
1632.02	Type B	B - OR - B
1632.03	Type C	C - OR - C

THIS PROJECT CONTAINS EROSION CONTROL PLANS FOR CLEARING AND GRUBBING PHASE OF CONSTRUCTION.

ENVIRONMENTALLY SENSITIVE AREA(S) EXIST ON THIS PROJECT

Refer To E. C. Special Provisions for Special Considerations.

GRAPHIC SCALE

0
PLANS
0
PROFILE (HORIZONTAL)
0
PROFILE (VERTICAL)

ROADSIDE ENVIRONMENTAL UNIT
DIVISION OF HIGHWAYS
STATE OF NORTH CAROLINA

Prepared In the Office of:

ROADSIDE ENVIRONMENTAL UNIT

1 South Wilmington St.
Raleigh, NC 27611

2002 STANDARD SPECIFICATIONS

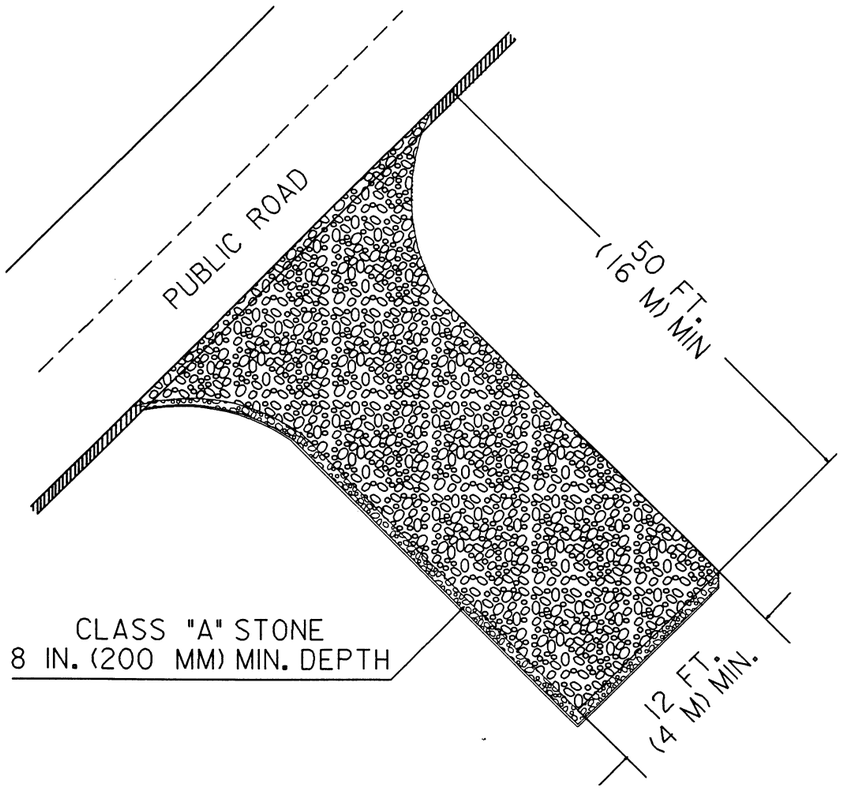
Roadway Standard Drawings

The following roadway metric standards as appear in "Roadway Standard Drawings" – Roadway Design Unit – N. C. Department of Transportation – Raleigh, N. C., dated January, 2002 and the latest revison thereto are applicable to this project and by reference hereby are considered a part of these plans.

1605.01	Temporary Silt Fence	1632.03	Rock Inlet Sediment Trap Type C
1606.01	Special Sediment Control Fence	1633.01	Temporary Rock Silt Check Type A
1622.01	Temporary Berms and Slope Drains	1633.02	Temporary Rock Silt Check Type B
1630.02	Silt Basin Type B	1634.02	Temporary Rock Sediment Dam Type B
1630.03	Temporary Silt Ditch	1635.01	Rock Pipe Inlet Sediment Trap Type A
1630.04	Stilling Basin		
1630.05	Temporary Diversion		

PROJ. REFERENCE NO.	SHEET NO.	TOTAL SHEETS
R-2514A	EC-2	
STATE PROJECT NO.	F.A. PROJ. NO.	DESCRIPTION

TEMPORARY GRAVEL CONSTRUCTION ENTRANCE



NOTES:

1. TURNING RADIUS SUFFICIENT TO ACCOMODATE LARGE TRUCKS SHALL BE PROVIDED.
2. ENTRANCE(S) SHOULD BE LOCATED TO PROVIDE FOR UTILIZATION BY ALL CONSTRUCTION VEHICLES.
3. MUST BE MAINTAINED IN A CONDITION WHICH WILL PREVENT TRACKING OR DIRECT FLOW OF MUD ONTO STREETS. PERIODIC TOPDRESSING WITH STONE WILL BE NECESSARY.
4. ANY MATERIAL TRACKED ONTO THE ROADWAY MUST BE CLEANED UP IMMEDIATELY.
5. GRAVEL CONSTRUCTION ENTRANCE SHALL BE LOCATED AT ALL POINTS OF INGRESS AND EGRESS UNTIL SITE IS STABILIZED. FREQUENT CHECKS OF THE DEVICE AND TIMELY MAINTENANCE MUST BE PROVIDED.
6. NUMBER AND LOCATION OF CONSTRUCTION ENTRANCES TO BE DETERMINED BY THE ENGINEER

NOTE: FILTER FABRIC TO BE PLACED BENEATH STONE

PROJECT REFERENCE NO.	SHEET NO.
R-2514A	EC-3CONST. 4
R /W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
CONST. REV.	
R /W REV.	

METRIC 5 0 10

NOTE: PLACE TEMPORARY ROCK SEDIMENT DAMS TYPE- B AND TEMPORARY ROCK SILT CHECKS TYPE-A AT DRAINAGE OUTLETS.

CLEARING AND GRUBBING EROSION CONTROL FOR CONSTRUCTION SHEET 4

-YB-
PI Sta 0+45.665
△ = 6°09'01.5" (RT)
L = 91.243
T = 45.665
R = 850.000
SE = NC

DATUM DESCRIPTION

THE LOCALIZED COORDINATE SYSTEM DEVELOPED FOR THIS PROJECT IS BASED ON THE STATE PLANE COORDINATES ESTABLISHED BY NGS FOR MONUMENT " CIRCLE "
WITH NAD 83 STATE PLANE GRID COORDINATES OF NORTHING: 119408.619 (m) EASTING: 780141.766 (m)
THE AVERAGE COMBINED GRID FACTOR USED ON THIS PROJECT (GROUND TO GRID) IS: 0.99988000
THE NC LAMBERT GRID BEARING AND LOCALIZED HORIZONTAL GROUND DISTANCE FROM " CIRCLE " TO -L MED- POT STATION 98+95.276 IS N89°54'12"E 918.852(m)
ALL LINEAR DIMENSIONS ARE LOCALIZED HORIZONTAL DISTANCES
VERTICAL DATUM USED IS NGVD 29

NAD 83 NC GRID

JONES DB 1176, PG 77

MARIE RIGGS DB 1160, PG 847

WOODROW HUMPHREY DB. 258, PG.291

MARIE RIGGS DB 1160, PG 847

FRANK COLLINS DB 285 PG 607

RUSSELL KELLUM DB. 722, PG. 328

-L MED- POT STA. 98+95.276
BEGIN STATE PROJECT R2514-A

-L MED- POT STA. 99+00.000
BEGIN RESURFACING

4.0 x 2.0 x 1

R2514-A PINC 1+97.273
BY2 PINC 5+00.000
BY1 PINC 8+28.405
POT 100+36.31 -L MED- (0.8 LT)

BEGIN FENCE +39.900 (-L MED-)

-L MED- STA 100+44.492=
-YB- PC STA 0+00.000

PC STA 0+25.343

-L MED- STA 100+44.942=
-YA-REV STA 0+00.000

TS STA 100+80.000
END RESURFACING BEGIN GRADE

-YB- STA 1+10.000
END CONSTRUCTION

-YB- STA 1+00.000
END GRADE

PT STA 0+91.243

BEGIN FENCE +91.243(-YB-)

END FENCE +00(-YB-)

SPECIAL CUT DITCH SEE DETAIL 'A' ON SHEET 2D SLOPE STAKE LINE

SPECIAL CUT DITCH SEE DETAIL 'A' ON SHEET 2D RT STA 0+85.028

SPECIAL LATERAL DITCH SEE DETAIL 'B' ON SHEET 2D EST. DDE = 2.40 M³

CLASS 'B' RIPRAP EST 0.9 TONS FILTER FABRIC EST 42 SY

CLASS 'B' RIP RAP EST 4.5 TONS FILTER FABRIC EST 117 SY

NOTE: CLEAN OUT EXISTING DITCH

CLEAN AND RETAIN

REMOVE DI & APPROX. 2m OF 375 RCP - INSTALL 2GI

REMOVE 7m 600mm RCP COLLAR AND EXTEND WITH 600mm RCP

REMOVE AND REPLACE W/ 600 RCP

-YA-REV STA 1+30.000
END CONSTRUCTION

-YA-REV
PI Sta 0+55.328
△ = 13°40'43.4" (RT)
L = 59.685
T = 29.985
R = 250.000
SE = NC

GROUT FULL W/ FLOWABLE FILL

SLOPE STAKE LINE

FILL W/ FLOWABLE FILL

SPECIAL DITCH SEE DETAIL 'A' ON SHEET 2D

0.6 BASE HEAD DITCH SEE DETAIL 'C' EST DDE = 1.6 M³

-L MED-
PI Sta 101+36.668
θs = 21°10"
Ls = 85.000
LT = 56.668
ST = 28.335

-L MED-
PI Sta 101+97.526
△ = 2°04'13.6" (RT)
L = 65.045
T = 32.526
R = 1,800.000
SE = 0.03

PI Sta 102+58.380
θs = 21°10"
Ls = 85.000
LT = 56.668
ST = 28.335

SR 1327 / SR 1410 TRAFFIC DATA
SR 1327 980 1400 2005 ADT 2025 ADT
US 17 6,650 27,400 220 300 560 800 US 17 20,050 29,600
340 500 1400 2000
SR 1410 1890 3000

CDW HOLDINGS, INC DB 1654, PG 166 MB 40, PG 43

WEYERHAEUSER CO. DB. 788, PG. 355 MB 24, PG. 1, SLIDE C-349

JOHN KELLUM DB 435, PG 395

JOHN KELLUM DB 258, PG 417

BOBBY MORTON DB. 384 PG. 260

BOBBY MORTON DB 638, PG 174

BOBBY MORTON DB. 638, PG. 174 DB. 384 PG. 260 DB. 1221 PG. 147

MATCHLINE STA. 102+00 SEE SHEET 5

SEE SHEET NO. 2D FOR ALL DITCH DETAILS.

SEE SHEET NO. 2D FOR ALL DRIVEWAY DETAILS.

SEE SHEET NO. 34 FOR NBL & SBL GRADES AND PROFILES AND ALL DITCH GRADES AND PROFILES.

SEE SHEET NO. 63 FOR -YA- & -YB- GRADES AND PROFILES AND ALL DITCH GRADES AND PROFILES.

NOTE:
PLACE TEMPORARY ROCK SEDIMENT DAMS TYPE- B AND TEMPORARY ROCK SILT CHECKS TYPE-A AT DRAINAGE OUTLETS.

CLEARING AND GRUBBING EROSION CONTROL FOR CONSTRUCTION SHEET 5

METRIC

5 0 10

PROJECT REFERENCE NO.	SHEET NO.
	EC-4/CONST. 5
R /W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

CONST. REV.

R /W REV.

MATCHLINE STA. 102+00 SEE SHEET 4

MATCHLINE 105+20 SEE SHEET 6

NAD 83 MC GRID

CS STA 102+30.045

ST STA 103+15.045

TS STA 103+25.045

CS STA 104+10.045

CS STA 104+81.025

PC STA 0+00.000

DET-1 7.50m LT

11 JOSEPH MORTON, ET AL. DB.1294, PG. 971

13 FERDINARD DAMIANO DB 718, PG 317

14 W. R. WILLIS DB 1496, PG 279

16 DONALD MORTON DB 754, PG 591

8 BOBBY MORTON DB. 638 PG. 174 DB. 384 PG. 260 DB. 1221 PG. 147

12 WOODROW HUMPHREY DB 426, PG 154 DB 367, PG 76 DB 439, PG 502

15 BENJAMIN GIBSON DB 769, PG 871 DB 426, PG 147 DB 533, PG 662

17 PEGGY GIBSON DB 1097, PG 811

12m BASE TAIL DITCH CLEANOUT 44m @ 0.00% SEE DETAIL 'J' ON SHEET 2D EST 45 M³

+32.489(-L MED-) 41.284m (135.45')

+42.565(-L MED-) 53.390m (175.16')

+67.500(-L MED-) 58.000m (190.29')

+67.500(-L MED-) 44.155m (144.73')

+30.045(-L MED-) 30.000m (98.43')

+25.045(-L MED-) 30.000m (98.43')

+15.045(-L MED-) 30.000m (98.43')

+10.045(-L MED-) 30.000m (98.43')

+81.025(-L MED-) 30.000m (98.43')

-L MED-

PIs Sta 103+81.713	PI Sta 104+45.539	PIs Sta 105+09.359
Θs = 1° 21' 10.1"	Δ = 2° 15' 33.7" (LT)	Θs = 1° 21' 10.1"
Ls = 85.000	L = 70.980	Ls = 85.000
LT = 56.668	T = 35.495	LT = 56.668
ST = 28.335	R = 1,800.000	ST = 28.335
	SE = 0.03	

DET-1
PI Sta 0+41.90
Δ = 3° 08' 45.3" (RT)
L = 82.360
T = 41.190
R = 1,500.000
SE = 0.02

SPECIAL CUT DITCH SEE DETAIL 'A' ON SHEET 2D

CLASS 'B' RIPRAP EST 4.5 TONS FILTER FABRIC EST 117 SM

INSTALL TEE WITH 300mm OPEN END REMOVE AS CONSTRUCTION PHASING ALLOWS

REMOVE AND REPLACE WITH 450mm RCP

300mm TEMPORARY CROSS PIPE GROUT FULL WITH FLOWABLE FILL AS CONSTRUCTION PHASING ALLOWS

SLOPE STAKE LINE

SPECIAL DITCH

SEE SHEET NO. 2D FOR ALL DITCH DETAILS.

SEE SHEET NO. 2D FOR ALL DRIVEWAY DETAILS.

SEE SHEET NO. 35 FOR NBL & SBL GRADES AND PROFILES AND ALL DITCH GRADES AND PROFILES.

NOTE:
PLACE TEMPORARY ROCK SEDIMENT DAMS TYPE- B AND TEMPORARY ROCK SILT CHECKS TYPE-A AT DRAINAGE OUTLETS.

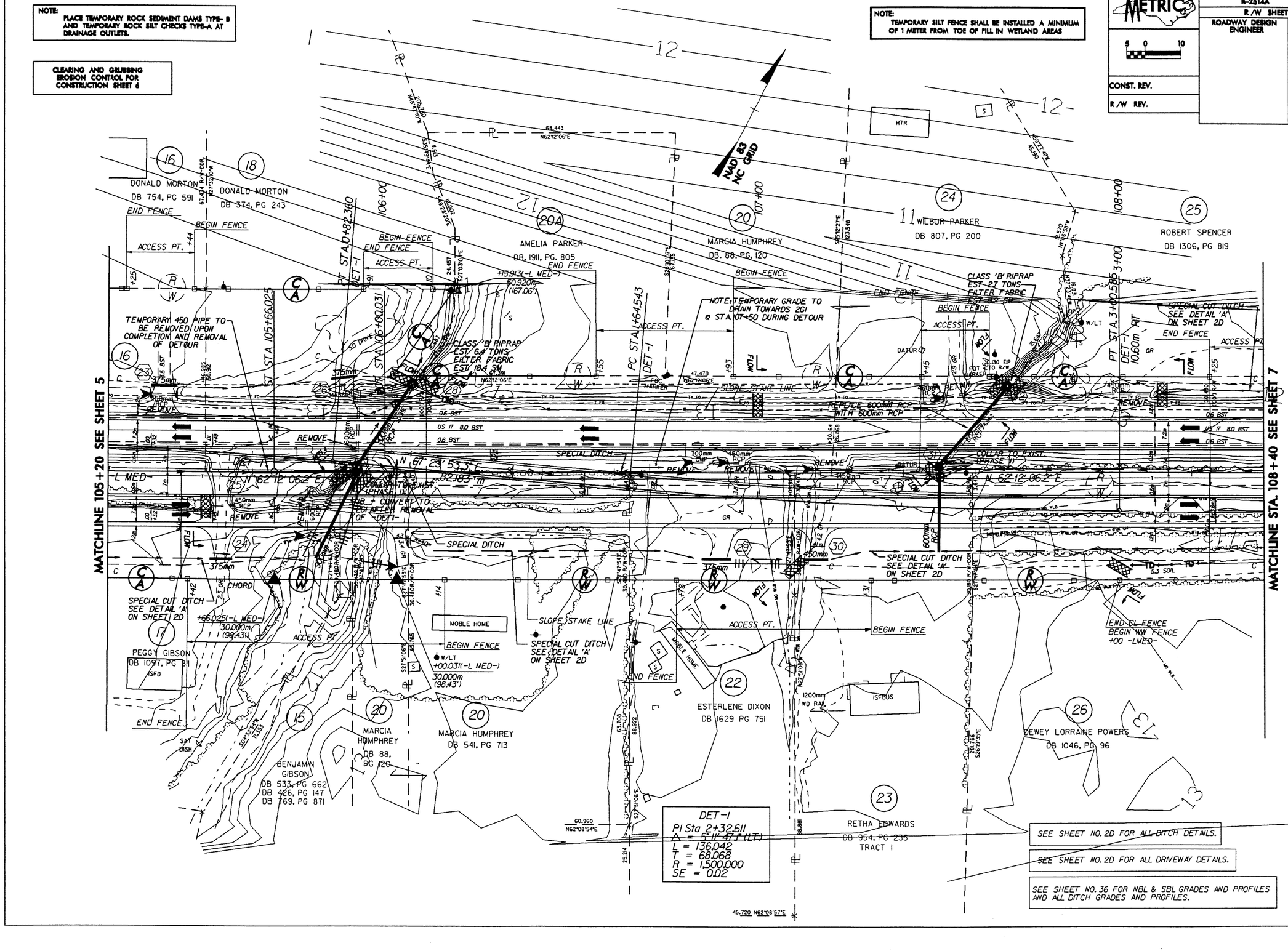
CLEARING AND GRUBBING
EROSION CONTROL FOR CONSTRUCTION SHEET 6

NOTE:
TEMPORARY SILT FENCE SHALL BE INSTALLED A MINIMUM OF 1 METER FROM TOE OF FILL IN WETLAND AREAS

METRIC

5 0 10

PROJECT REFERENCE NO.	SHEET NO.
R-2514A	EC-5CONST. 6
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
CONST. REV.	
R/W REV.	



NOTE:
PLACE TEMPORARY ROCK SEDIMENT DAMS TYPE- II AND TEMPORARY ROCK SILT CHECKS TYPE-A AT DRAINAGE OUTLETS.

CLEARING AND GRUBBING
EROSION CONTROL FOR
CONSTRUCTION SHEET 7

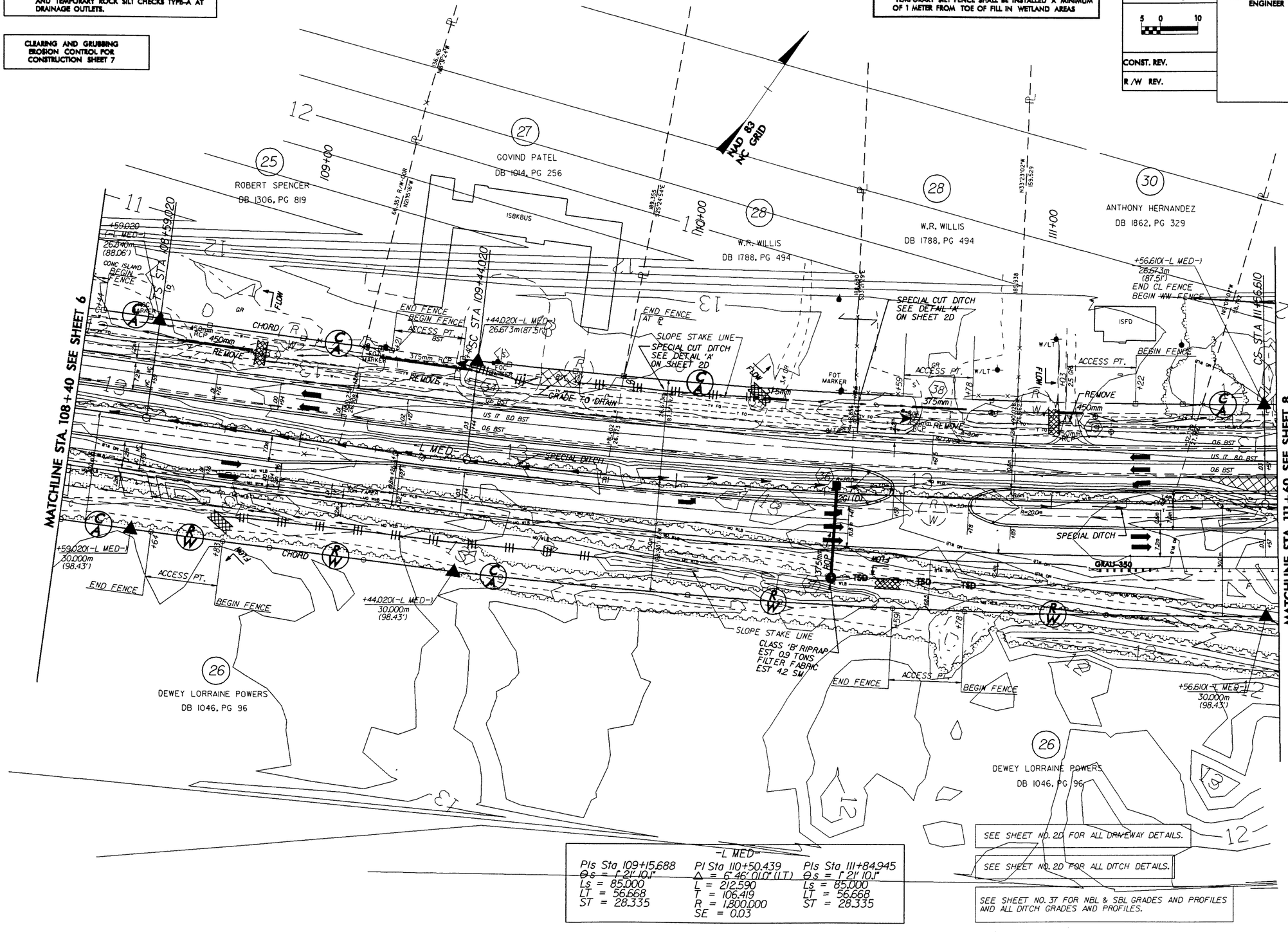
NOTE:
TEMPORARY SILT FENCE SHALL BE INSTALLED A MINIMUM OF 1 METER FROM TOE OF FILL IN WETLAND AREAS

METRIC

5 0 10

CONST. REV.	
R /W REV.	

PROJECT REFERENCE NO.	SHEET NO.
R-2514A	EC-6CONST. 7
R /W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER



NOTE:
PLACE TEMPORARY ROCK SEDIMENT DAMS TYPE- B AND TEMPORARY ROCK SILT CHECKS TYPE-A AT DRAINAGE OUTLETS.

CLEARING AND GRUBBING EROSION CONTROL FOR CONSTRUCTION SHEET 8

ENVIRONMENTALLY SENSITIVE AREA SEE PROJECT SPECIAL PROVISIONS

NOTE:
TEMPORARY SILT FENCE SHALL BE INSTALLED A MINIMUM OF 1 METER FROM TOE OF FILL IN WETLAND AREAS

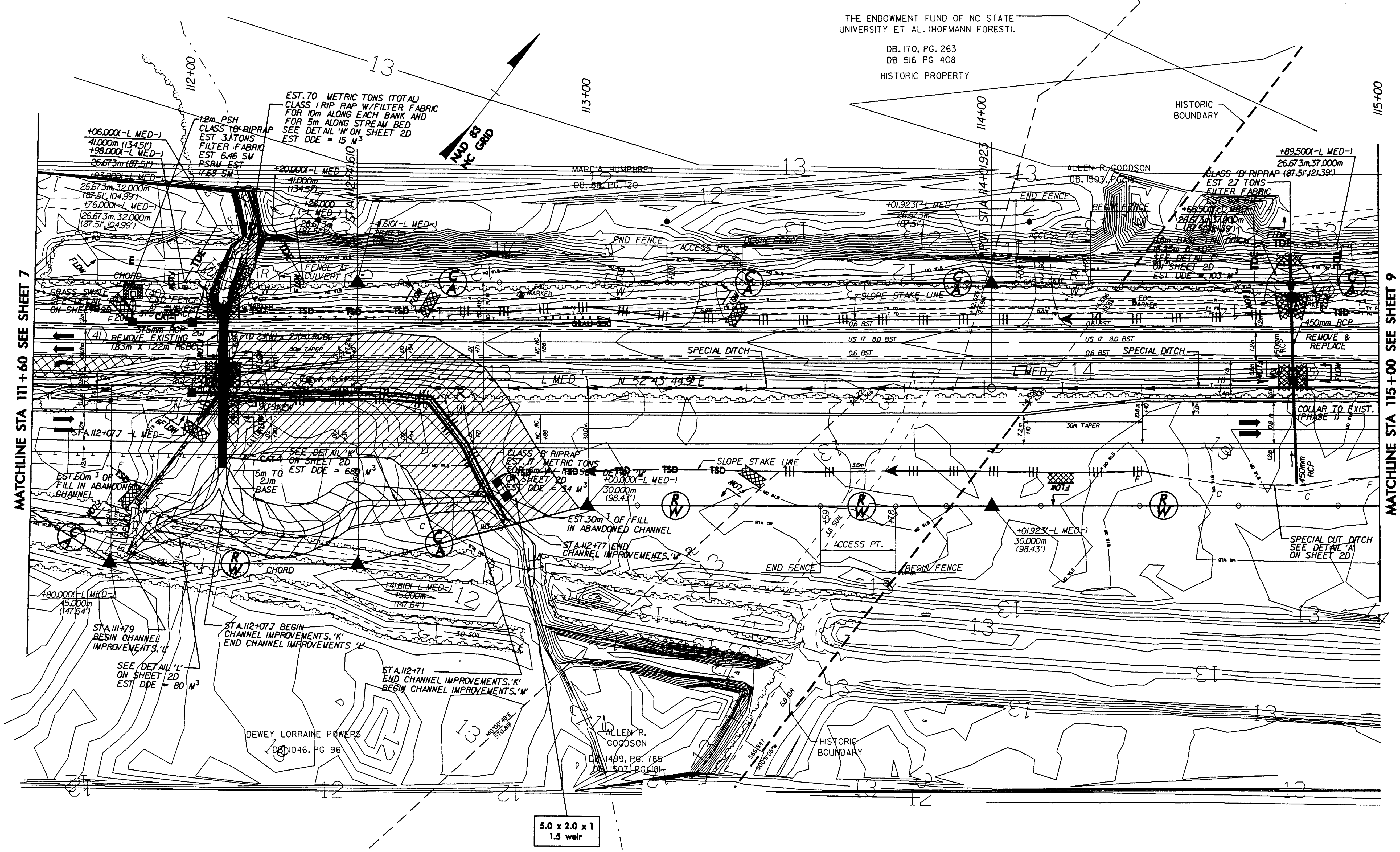
PROJECT REFERENCE NO.	SHEET NO.
R-2514A	EC-7/CONST. 8
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

METRIC

5 0 10

CONST. REV.

R/W REV.



MATCHLINE STA 111+60 SEE SHEET 7
MATCHLINE STA 115+00 SEE SHEET 9
112+00
113+00
114+00
115+00
NAD 83 NC GRID
THE ENDOWMENT FUND OF NC STATE UNIVERSITY ET AL. (HOFMANN FOREST).
DB. 170, PG. 263
DB 516 PG 408
HISTORIC PROPERTY
HISTORIC BOUNDARY
MARCIA HUMPHREY
DB. 88, PG. 120
ALLEN R. GOODSON
DB. 1507, PG. 181
EST. 70 METRIC TONS (TOTAL) CLASS I RIP RAP W/FILTER FABRIC FOR 10m ALONG EACH BANK AND FOR 5m ALONG STREAM BED SEE DETAIL 'N' ON SHEET 2D EST DDE = 15 M3
1.2m PSH CLASS 'B' RIPRAP EST 3.1 TONS FILTER FABRIC EST 6.46 SM PSRM EST 17.68 SM
END FENCE
BEGIN FENCE
ACCESS PT.
SLOPE STAKE LINE
SPECIAL DITCH
L MED
N 52 43' 44.9" E
US 17 8.0 BST
0.6 BST
30m TAPER
GRASS SWALE SEE DETAIL ON SHEET
375mm RCP
REMOVE EXISTING 1.83m X 1.22m RCBC
SEE DETAIL 'K' ON SHEET 2D EST DDE = 68 M3
CLASS 'B' RIPRAP EST 17 METRIC TONS
EST DDE = 34 M3
EST 60m3 OF FILL IN ABANDONED CHANNEL
EST 30m3 OF FILL IN ABANDONED CHANNEL
STA 112+77 END CHANNEL IMPROVEMENTS 'M'
STA 112+07.7 -L MED-
STA 111+79 BEGIN CHANNEL IMPROVEMENTS 'L'
STA 112+07.7 BEGIN CHANNEL IMPROVEMENTS 'K' END CHANNEL IMPROVEMENTS 'L'
SEE DETAIL 'L' ON SHEET 2D EST DDE = 80 M3
STA 112+71 END CHANNEL IMPROVEMENTS 'K' BEGIN CHANNEL IMPROVEMENTS 'M'
CLASS 'B' RIPRAP EST 2.7 TONS FILTER FABRIC
SEE DETAIL 'C' ON SHEET 2D EST DDE = 103 M3
450mm RCP
REMOVE & REPLACE
COLLAR TO EXIST. (PHASE 1)
SPECIAL CUT DITCH SEE DETAIL 'A' ON SHEET 2D
DEWEY LORRAINE POWERS
DB 1046, PG 96
ALLEN R. GOODSON
DB 1499, PG. 785
DB 1507, PG 181
CHORD
+80.000(-L MED-) 45.000m (147.64')
+41.610(-L MED-) 45.000m (147.64')
+01.923(-L MED-) 30.000m (98.43')
+00.000(-L MED-) 30.000m (98.43')
+89.500(-L MED-) 26.673m 37.000m (87.51' 121.39')

5.0 x 2.0 x 1
1.5 weir

CULVERT CONSTRUCTION SEQUENCE STA. 112+07.7 –L MED–

METRIC

5 0 10

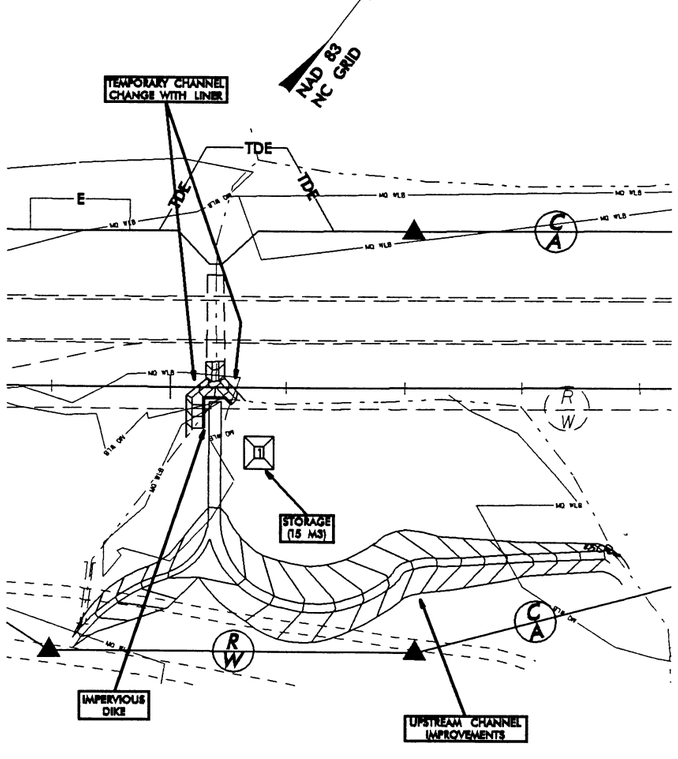
PROJECT REFERENCE NO.	SHEET NO.
R-2514A	EC-8CONST. 8
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

CONST. REV.

R/W REV.

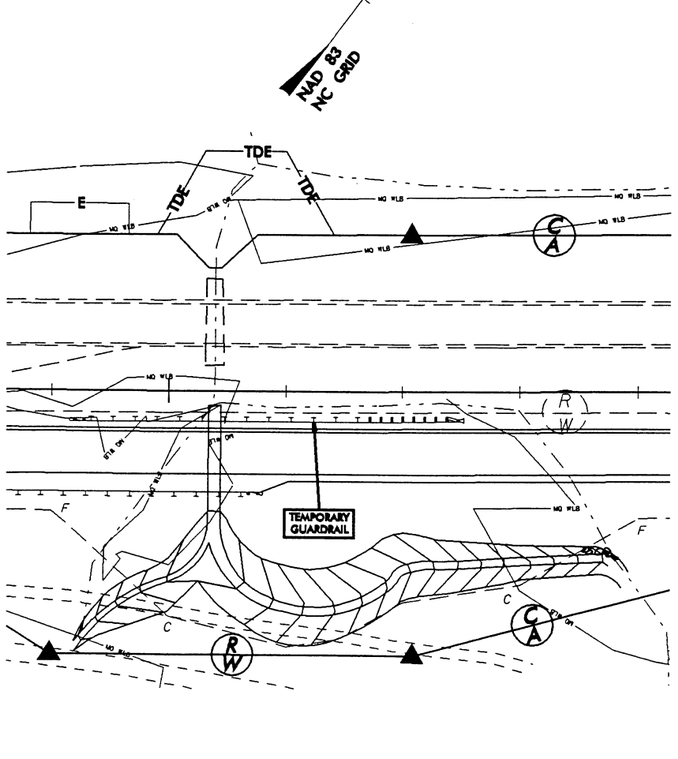
PHASE I

1. CONSTRUCT STILLING BASIN 1 (15 M3).
2. CONSTRUCT TEMPORARY CHANNEL CHANGE WITH LINER (0.6M BASE, 2:1 SIDE SLOPES, 0.5M DEPTH) AND IMPERVIOUS DIKE.
3. CONSTRUCT 18M OF 1@2.1M X 2.1M RCBC, HEADWALL, AND WINGWALLS AT INLET.
4. CONSTRUCT UPSTREAM CHANNEL IMPROVEMENTS.



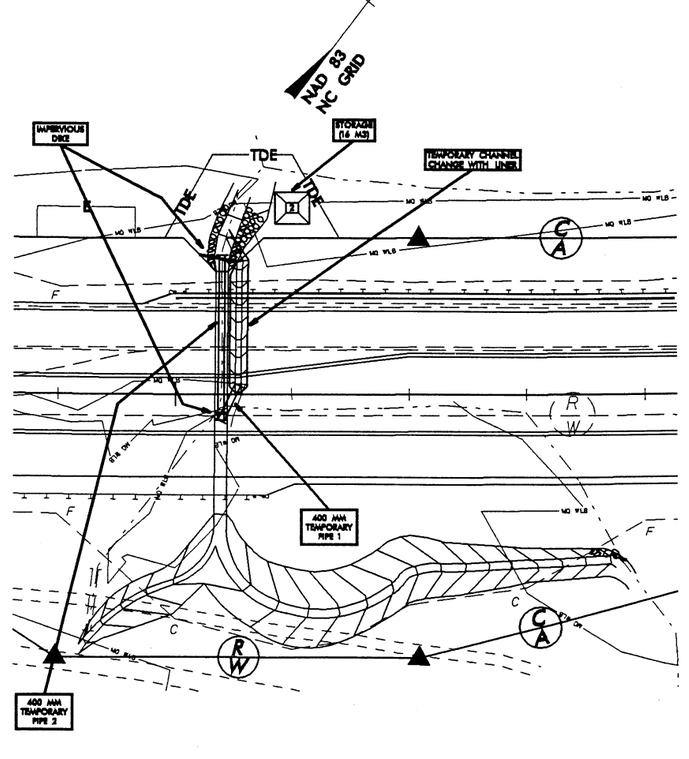
PHASE II

5. REMOVE PHASE I IMPERVIOUS DIKE.
6. DIVERT FLOW THROUGH UPSTREAM CHANNEL IMPROVEMENTS.
7. REMOVE STILLING BASIN 1 AND CONSTRUCT NORTH BOUND LANES.
8. INSTALL TEMPORARY GUARDRAIL AND DIVERT TRAFFIC TO NORTH BOUND LANES.



PHASE III

9. CONSTRUCT STILLING BASIN 2 (16 M3).
10. CONSTRUCT TEMPORARY CHANNEL CHANGE WITH LINER (0.6M BASE, 2:1 SIDE SLOPES, 0.5M DEPTH) AND IMPERVIOUS DIKES.
11. INSTALL 400MM TEMPORARY PIPE 1.
12. REMOVE EXISTING CULVERT.
13. CONSTRUCT FLOOR FOR PHASE III OF 1@2.1M X 2.1M RCBC (APPROXIMATE LENGTH OF 24M).
14. INSTALL 400MM TEMPORARY PIPE 2 AFTER FLOOR CURES.
15. REMOVE 400MM TEMPORARY PIPE 1 AND TEMPORARY CHANNEL CHANGE WITH LINER.
16. COMPLETE REMAINING SECTION OF 1@2.1M X 2.1M RCBC.
17. DIVERT WATER THROUGH CULVERT.
18. COMPLETE ROADWAY.



NOTE:
PLACE TEMPORARY ROCK SEDIMENT DAMS TYPE- B AND TEMPORARY ROCK SILT CHECKS TYPE-A AT DRAINAGE OUTLETS.

CLEARING AND GRUBBING EROSION CONTROL FOR CONSTRUCTION SHEET 9

NOTE:
TEMPORARY SILT FENCE SHALL BE INSTALLED A MINIMUM OF 1 METER FROM TOE OF FILL IN WETLAND AREAS

METRIC

5 0 10

CONST. REV.
R /W REV.

PROJECT REFERENCE NO.	SHEET NO.
R-2514A	EC-9CONST. 9
R /W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

32

THE ENDOWMENT FUND OF NC STATE UNIVERSITY ET AL. (HOFMANN FOREST).

DB. 170, PG. 263
DB 516 PG 408

HISTORIC PROPERTY

ISFD

NAD 83 NC GRID

116+00 117+00 118+00

MATCHLINE STA 115+00 SEE SHEET 8

MATCHLINE STA 118+40 SEE SHEET 10

BEGIN FENCE
END FENCE
ACCESS PT.
GATE
RETAIN
GR
FOC MARKER
SLOPE STAKE LINE
TSD
FLOW
MOT-1
8d TAPER
30m TAPER
SPECIAL DITCH
SOIL
+40.000(-L MED-)
26.673m
(87.51')
+40.000(-L MED-)
30.000m
(98.43')
SPECIAL CUT DITCH SEE DETAIL 'A' ON SHEET 2D

SEE SHEET NO. 2D FOR ALL DRIVEWAY DETAILS.

SEE SHEET NO. 2D FOR ALL DITCH DETAILS.

SEE SHEET NO. 39 FOR NBL & SBL GRADES AND PROFILES AND ALL DITCH GRADES AND PROFILES.

32

THE ENDOWMENT FUND OF NC STATE UNIVERSITY ET AL. (HOFMANN FOREST).

DB. 170, PG. 263
DB 516 PG 408

HISTORIC PROPERTY

NOTE:
PLACE TEMPORARY ROCK SEDIMENT DAMS TYPE- B AND TEMPORARY ROCK SILT CHECKS TYPE-A AT DRAINAGE OUTLETS.

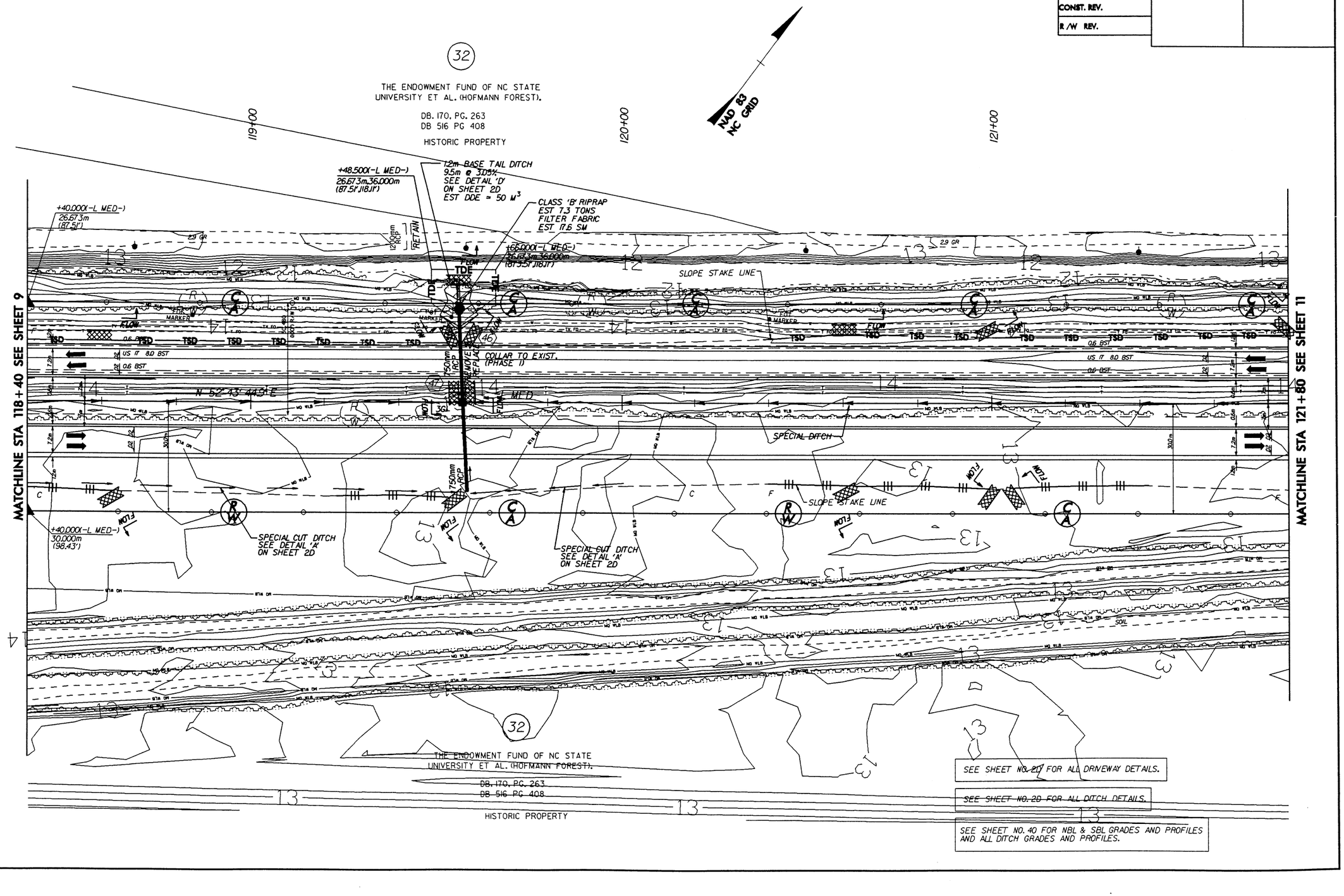
CLEARING AND GRUBBING EROSION CONTROL FOR CONSTRUCTION SHEET 10

NOTE:
TEMPORARY SILT FENCE SHALL BE INSTALLED A MINIMUM OF 1 METER FROM TOE OF FILL IN WETLAND AREAS

METRIC
5 0 10

CONST. REV.	
R /W REV.	

PROJECT REFERENCE NO.	SHEET NO.
R-2514A	EC-10CONST. 10
R /W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER



NOTE:
PLACE TEMPORARY ROCK SEDIMENT DAMS TYPE- B AND TEMPORARY ROCK SILT CHECKS TYPE-A AT DRAINAGE OUTLETS.

CLEARING AND GRUBBING EROSION CONTROL FOR CONSTRUCTION SHEET 11

METRIC

5 0 10

CONST. REV.

R /W REV.

PROJECT REFERENCE NO.	SHEET NO.
R-2514A	EC-11CONST. 11
R /W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

NAD 83
NC GRID

122+00 123+00 124+00 125+00

32

THE ENDOWMENT FUND OF NC STATE UNIVERSITY ET AL. (HOFMANN FOREST).

DB. 170, PG. 263
DB 516 PG 408

HISTORIC PROPERTY

MATCHLINE STA 121+80. SEE SHEET 10

MATCHLINE STA 125+20 SEE SHEET 12

TS STA 124476.380

+90.000(-L MED-)
26.673m
(87.5ft)

+76.380(-L MED-)
26.673m
(87.5ft)

2.9 GR

SLOPE STAKE LINE

FLOW

CHORD

SPECIAL DITCH

0.6 BST

US 17 8.0 BST

L MED=

N 52° 13' 44.9" E

375mm RCP

EARTH DAM SEE DETAIL 'I' ON SHEET 2D INSTALL PRIOR TO EXCAVATING DITCHES

CLASS 'B' RIPRAP W/ FILTER FABRIC

TDE

SOIL

+90.000 (-L MED-)
30.000m
(98.43')

+80.000(-L MED-)
30.000m
(98.43')

+07.000(-L MED-)
30.000m
(98.43')

+07.000(-L MED-)
37.000m
(121.39')

+30.000(-L MED-)
34.000m
(111.55')

+30.000(-L MED-)
30.000m
(98.43')

+90.000(-L MED-)
33.000m
(108.27')

+45.000(-L MED-)
33.000m, 36.000m
(108.27', 118.11')

+76.380(-L MED-)
30.000m
(98.43')

SPECIAL CUT DITCH SEE DETAIL 'A' ON SHEET 2D

THE ENDOWMENT FUND OF NC STATE UNIVERSITY ET AL. (HOFMANN FOREST).

DB. 170, PG. 263
DB 516 PG 408

HISTORIC PROPERTY

-L MED-

Pls Sta 125+33.047	PI Sta 125+87.295	Pls Sta 126+41.543
Θs = 1°06' 24.1"	Δ = 1°20' 59.3" (LT)	Θs = 1°06' 24.1"
Ls = 85.000	L = 51.829	Ls = 85.000
LT = 56.668	T = 25.915	LT = 56.668
ST = 28.334	R = 2,200.000	ST = 28.334
	SE = 0.02	

SEE SHEET NO. 2D FOR ALL DRIVEWAY DETAILS.

SEE SHEET NO. 2D FOR ALL DITCH DETAILS.

SEE SHEET NO. 41 FOR NBL & SBL GRADES AND PROFILES AND ALL DITCH GRADES AND PROFILES.

NOTE:
PLACE TEMPORARY ROCK SEDIMENT DAMS TYPE- B AND TEMPORARY ROCK SILT CHECKS TYPE-A AT DRAINAGE OUTLETS.

CLEARING AND GRUBBING EROSION CONTROL FOR CONSTRUCTION SHEET 12

NOTE:
TEMPORARY SILT FENCE SHALL BE INSTALLED A MINIMUM OF 1 METER FROM TOE OF FILL IN WETLAND AREAS

METRIC

5 0 10

PROJECT REFERENCE NO.	SHEET NO.
R-2514A	EC-12/CONST. 12
R /W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
CONST. REV.	
R /W REV.	

NAD 83
NC GRID

32
THE ENDOWMENT FUND OF NC STATE UNIVERSITY ET AL. (HOFMANN FOREST).
DB. 170, PG. 263
DB 516 PG 408
HISTORIC PROPERTY

126+00 127+00 128+00

SC STA 125+61.380 SS STA 126+13.208 SS STA 126+98.208

+61.380(-L MED-) 26.67.3m (87.51')
0.6m BASE TAIL DITCH 15m @ 2.0% SEE DETAIL 'C' ON SHEET 2D EST DDE = 11 M³
+58.000(-L MED-) 26.67.3m,38.000m (87.51',124.67')
+79.500(-L MED-) 26.67.3m,38.000m (87.51',124.67')
+13.208(-L MED-) 26.67.3m (87.51')
CLASS 'B' RIPRAP EST 7.3 TONS FILTER FABRIC EST 11.8 SM
600mm CMP RETAIN
END FENCE
BEGIN FENCE
ACCESS PT.
+98.208(-L MED-) 26.67.3m (87.51')
SLOPE STAKE LINE
SPECIAL DITCH
N 49°09'56.3" E
12m PSH CLASS 'B' RIPRAP EST 31 TONS FILTER FABRIC EST 6.48 SM PSRM EST 17.68 SM
+61.380(-L MED-) 30.000m (98.43')
+75.000(-L MED-) 30.000m, 36.000m (98.43', 108.26')
+13.208(-L MED-) 30.000m (98.43')
+98.208(-L MED-) 30.000m (98.43')
+011.000(-L MED-) 30.000m, 31.00m (98.42', 101.71')
+18.000(-L MED-) 30.000m, 31.00m (98.42', 101.71')
SPECIAL CUT DITCH SEE DETAIL 'A' ON SHEET 2D

MATCHLINE STA 125+20 SEE SHEET 11

MATCHLINE STA 128+60 SEE SHEET 13

-L MED-

PIs Sta 125+33.047	PI Sta 125+87.295	PIs Sta 126+41.543
Θs = 1°06' 24.7"	Δ = 1°20' 59.3" (LT)	Θs = 1°06' 24.7"
Ls = 85.000	L = 51.829	Ls = 85.000
LT = 56.668	T = 25.915	LT = 56.668
ST = 28.334	R = 2,200.000	ST = 28.334
	SE = 0.02	

32
THE ENDOWMENT FUND OF NC STATE UNIVERSITY ET AL. (HOFMANN FOREST).
DB. 170, PG. 263
DB 516 PG 408
HISTORIC PROPERTY

SEE SHEET NO. 2D FOR ALL DRIVEWAY DETAILS.
SEE SHEET NO. 2D FOR ALL DITCH DETAILS.
SEE SHEET NO. 42 FOR NBL & SBL GRADES AND PROFILES AND ALL DITCH GRADES AND PROFILES.

NOTE:
PLACE TEMPORARY ROCK SEDIMENT DAMS TYPE- II AND TEMPORARY ROCK SILT CHECKS TYPE-A AT DRAINAGE OUTLETS.

CLEARING AND GRUBBING EROSION CONTROL FOR CONSTRUCTION SHEET 13

METRIC
5 0 10

PROJECT REFERENCE NO.	SHEET NO.
R-2514A	EC-13/CONST. 13
R /W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
CONST. REV.	
R /W REV.	

NAD 83 NC GRID

32
THE ENDOWMENT FUND OF NC STATE UNIVERSITY ET AL. (HOFMANN FOREST).
DB. 170, PG. 263
DB 516 PG 408
HISTORIC PROPERTY

129+00 | 130+00 | 131+00 | 132+00

POT STA 129+02.638
+02.638(-L MED-)
26.673m
(87.51')

29 GR

MATCHLINE STA 128+60 SEE SHEET 12

MATCHLINE STA 132+00 SEE SHEET 14

SPECIAL DITCH

N 49°09'56.3" E

L MED

47 SOIL

+02.638(-L MED-)
30.000m
(98.43')

CLASS 'B' RIPRAP
EST. 0.9 TONS
FILTER FABRIC
EST. 4.2 SM

+40.000(-L MED-)
30.000m
(98.43')

SLOPE STAKE LINE

SPECIAL CUT DITCH
SEE DETAIL 'A'
ON SHEET 2D

+60.000(-L MED-)
33.000m
(108.27')

32
THE ENDOWMENT FUND OF NC STATE UNIVERSITY ET AL. (HOFMANN FOREST).
DB. 170, PG. 263
DB 516 PG 408
HISTORIC PROPERTY

SEE SHEET NO. 3D FOR ALL DRIVEWAY DETAILS.

SEE SHEET NO. 2D FOR ALL DITCH DETAILS.

SEE SHEET NO. 43 FOR NBL & SBL GRADES AND PROFILES AND ALL DITCH GRADES AND PROFILES.

NOTE:
PLACE TEMPORARY ROCK SEDIMENT DAMS TYPE- B AND TEMPORARY ROCK SILT CHECKS TYPE-A AT DRAINAGE OUTLETS.

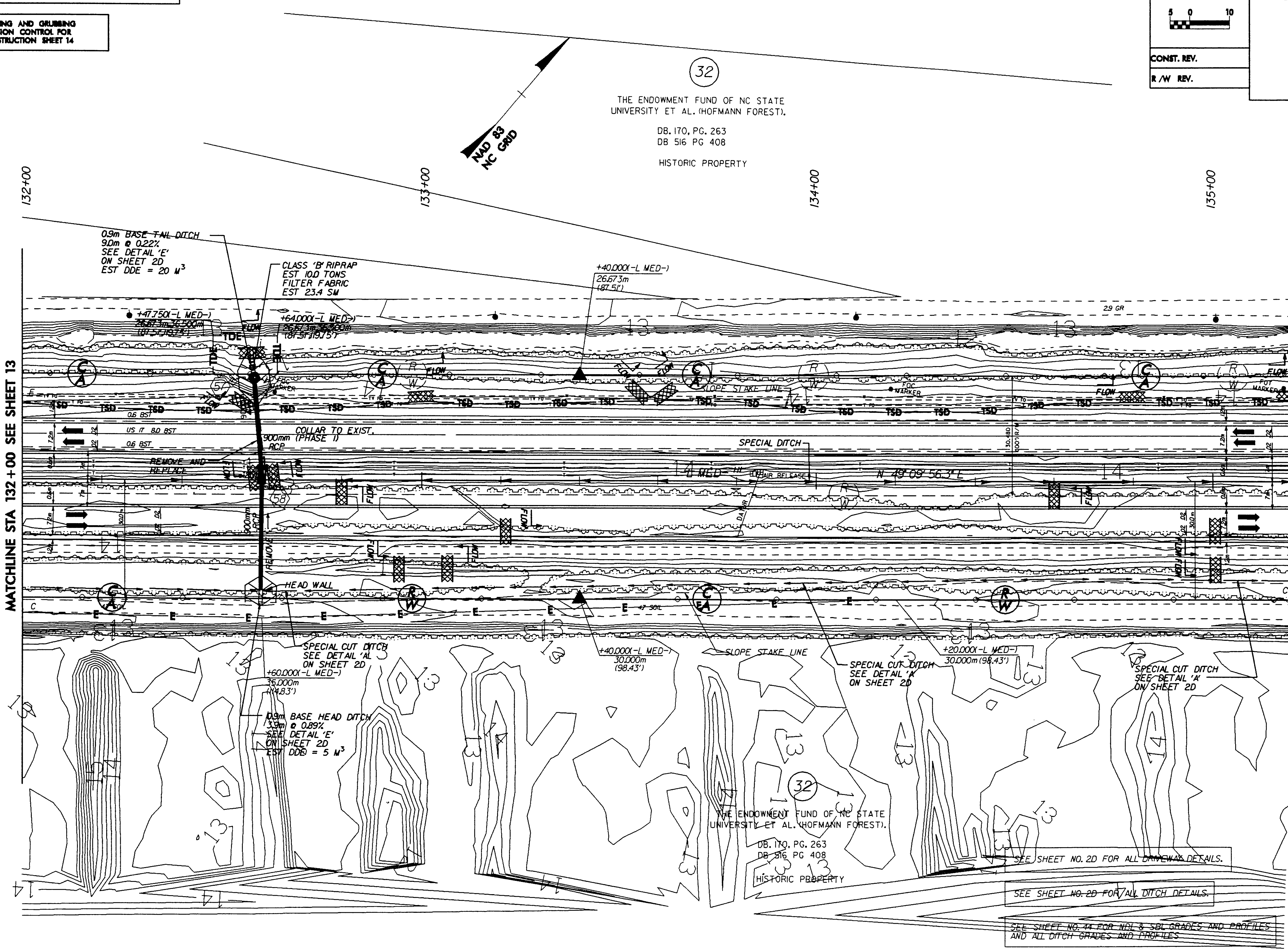
CLEARING AND GRUBBING EROSION CONTROL FOR CONSTRUCTION SHEET 14

PROJECT REFERENCE NO.	SHEET NO.
R-2514A	EC-14/CONST. 14
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

METRIC

CONST. REV.

R/W REV.



PROJECT REFERENCE NO.	SHEET NO.
R-2514A	EC-15/CONST. 15
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

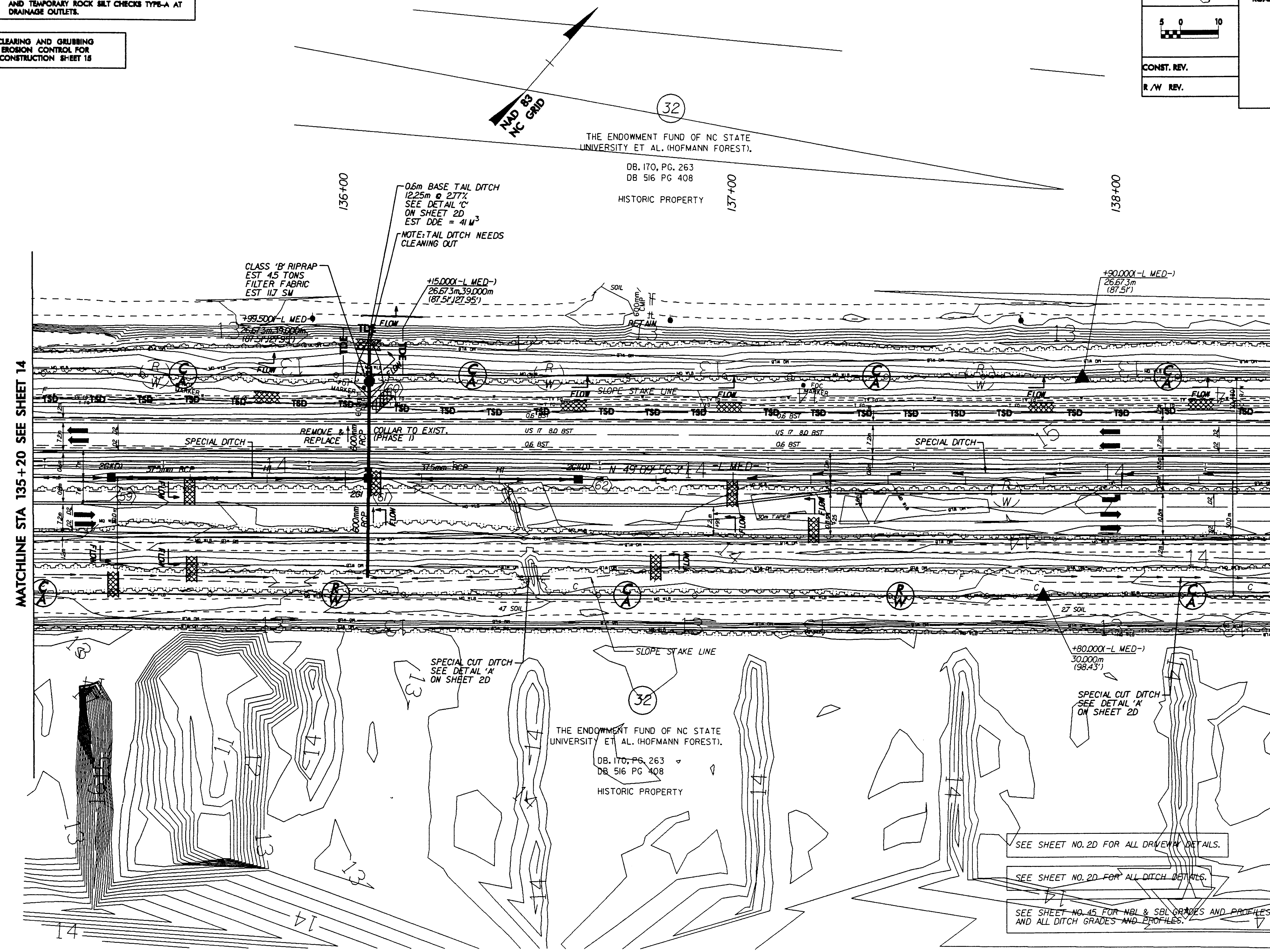
METRIC

CONST. REV.

R/W REV.

NOTE: PLACE TEMPORARY ROCK SEDIMENT DAMS TYPE-B AND TEMPORARY ROCK SILT CHECKS TYPE-A AT DRAINAGE OUTLETS.

CLEARING AND GRUBBING EROSION CONTROL FOR CONSTRUCTION SHEET 15



NOTE:
PLACE TEMPORARY ROCK SEDIMENT DAMS TYPE- B AND TEMPORARY ROCK SILT CHECKS TYPE-A AT DRAINAGE OUTLETS.

CLEARING AND GRUBBING EROSION CONTROL FOR CONSTRUCTION SHEET 16

METRIC

5 0 10

CONST. REV.

R /W REV.

PROJECT REFERENCE NO.	SHEET NO.
R-2514A	EC-16CONST. 16
R /W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

MATCHLINE STA 138+40 SEE SHEET 15

MATCHLINE STA 141+80 SEE SHEET 17

NAD 83
NC GRID

139+00

140+00

141+00

THE ENDOWMENT FUND OF NC STATE UNIVERSITY ET AL. (HOFMANN FOREST).
DB. 170, PG. 263
DB 516 PG 408
HISTORIC PROPERTY

CLASS 'B' RIPRAP
EST 4.5 TONS
FILTER FABRIC
EST 117 SM

+54.500(-L MED-)
26.673m 36.750m
(87.51' 120.57')

+68.500(-L MED-)
26.673m 36.750m
(81.51' 120.57')

0.6m BASE TAIL DITCH
9.0m @ 0.333%
SEE DETAIL 'C'
ON SHEET 2D
EST DDE = 5 M³

SLOPE STAKE LINE

SPECIAL DITCH

N 49° 09' 56.3" E

L MED

+40.000(-L MED-)
30.090m
(98.43')

+60.000(-L MED-)
31.000m
(101.71')

SPECIAL CUT DITCH
SEE DETAIL 'A'
ON SHEET 2D

+20.000(-L MED-)
32.000m (104.99')

+00.000(-L MED-)
32.000m
(104.99')

+60.000(-L MED-)
34.000m
(111.55')

0.6m BASE HEAD DITCH
3.0m @ 0.303%
SEE DETAIL 'C'
ON SHEET 2D
EST DDE = 3 M³

SPECIAL CUT DITCH
SEE DETAIL 'A'
ON SHEET 2D

SEE SHEET NO. 2D FOR ALL DRIVEWAY DETAILS.

SEE SHEET NO. 2D FOR ALL DITCH DETAILS.

SEE SHEET NO. 46 FOR NBL & SBL GRADES AND PROFILES AND ALL DITCH GRADES AND PROFILES.

NOTE:
PLACE TEMPORARY ROCK SEDIMENT DAMS TYPE- B AND TEMPORARY ROCK SILT CHECKS TYPE-A AT DRAINAGE OUTLETS.

CLEARING AND GRUBBING
EROSION CONTROL FOR
CONSTRUCTION SHEET 17

METRIC

5 0 10

CONST. REV.

R /W REV.

PROJECT REFERENCE NO.	SHEET NO.
R-2514A	EC-17/CONST. 17
R /W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

MATCHLINE STA 141+80 SEE SHEET 16

MATCHLINE STA 145+00 SEE SHEET 18

142+00 143+00 144+00 145+00

NAD 83
NC GRID

32

THE ENDOWMENT FUND OF NC STATE UNIVERSITY ET AL. (HOFMANN FOREST).

DB. 170, PG. 263
DB 516 PG 408

HISTORIC PROPERTY

+40.000(-L MED-)
26.673m
(87.54')

+30.500(-L MED-)
26.673m 36.250m
(87.54' 118.93')

+45.500(-L MED-)
26.673m 36.250m
(87.54' 118.93')

CLASS 'B' RIPRAP
EST 45 TONS
FILTER FABRIC
EST 117 SM

0.6m BASE TAIL DITCH
10.5m @ 0.381%
SEE DETAIL 'C'
ON SHEET 2D
EST DDE = 6 M³

TOE

FLOW

SLOPE STAKE LINE

SPECIAL DITCH

N 49°09'56.3"E

L MED

+00.000(-L MED-)
30.000m
(98.43')

CLASS 'B' RIPRAP
EST 0.9 TONS
FILTER FABRIC
EST 4.2 SM

+40.000(-L MED-)
30.000m
(98.43')

SLOPE STAKE LINE

SPECIAL CUT DITCH
SEE DETAIL 'A'
ON SHEET 2D

0.6m BASE HEAD DITCH
3.0m @ 0.333%
SEE DETAIL 'C'
ON SHEET 2D
EST DDE = 3 M³

+60.000(-L MED-)
32.000m (104.99')

+60.000(-L MED-)
30.000m (98.43')

SEE SHEET NO. 2D FOR ALL DRIVEWAY DETAILS.

SEE SHEET NO. 2D FOR ALL DITCH DETAILS.

SEE SHEET NO. 47 FOR NBL & SBL GRADES AND PROFILES AND ALL DITCH GRADES AND PROFILES.

32

THE ENDOWMENT FUND OF NC STATE UNIVERSITY ET AL. (HOFMANN FOREST).

DB. 170, PG. 263
DB 516 PG 408

HISTORIC PROPERTY

NOTE:
PLACE TEMPORARY ROCK SEDIMENT DAMS TYPE- B AND TEMPORARY ROCK SILT CHECKS TYPE-A AT DRAINAGE OUTLETS.

CLEARING AND GRUBBING EROSION CONTROL FOR CONSTRUCTION SHEET 18

METRIC

5 0 10

CONST. REV.

R /W REV.

PROJECT REFERENCE NO.	SHEET NO.
R-2514A	EC-18CONST. 18
R /W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

NAD 83 NC GRID

32

THE ENDOWMENT FUND OF NC STATE UNIVERSITY ET AL. (HOFMANN FOREST).

DB. 170, PG. 263
DB 516 PG 408

HISTORIC PROPERTY

145+00 146+00 147+00 148+00

MATCHLINE STA 145+00 SEE SHEET 17

MATCHLINE STA 148+20 SEE SHEET 19

END FENCE

BEGIN FENCE

ACCESS PT.

RET AW 450mm RCP

+90.000(-L MED-)
26.673m (87.54')

SLOPE STAKE LINE

SPECIAL DITCH

N 49°09'56.3"E

2GI(D) 69

70

+50.000(-L MED-)
30.000m (98.43')

SPECIAL CUT DITCH SEE DETAIL 'A' ON SHEET 2D

CLASS 'B' RIPRAP
EST. 89 TONS
FILTER FABRIC
EST. 42 SM

+90.000(-L MED-)
30.000m (98.43')

US 17 80 BST

OB BST

SEE SHEET NO. 2D FOR ALL DRIVEWAY DETAILS.

SEE SHEET NO. 2D FOR ALL DITCH DETAILS.

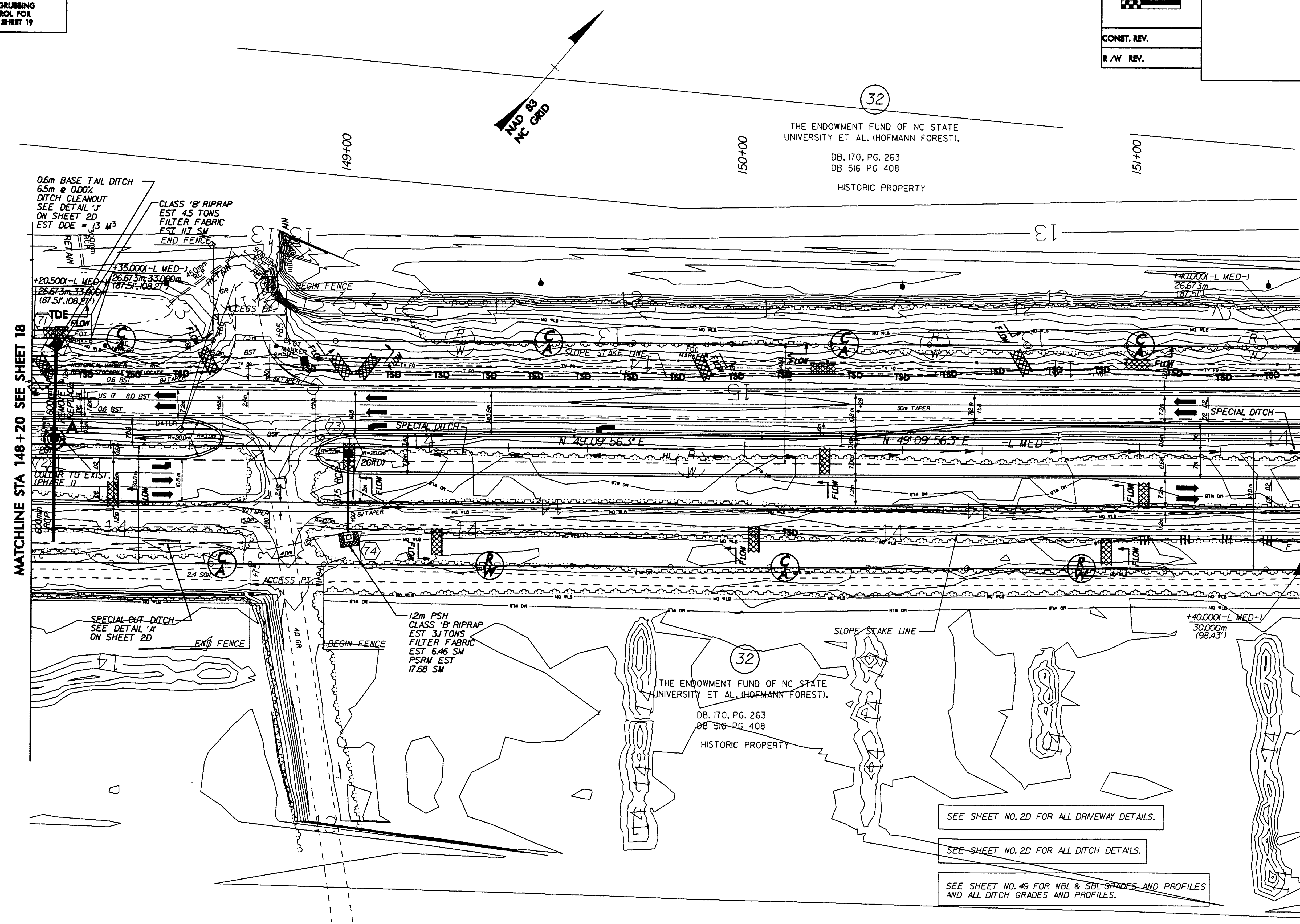
SEE SHEET NO. 48 FOR NBL & SBL GRADES AND PROFILES AND ALL DITCH GRADES AND PROFILES.

NOTE:
PLACE TEMPORARY ROCK SEDIMENT DAMS TYPE- B AND TEMPORARY ROCK SILT CHECKS TYPE-A AT DRAINAGE OUTLETS.

CLEARING AND GRUBBING EROSION CONTROL FOR CONSTRUCTION SHEET 19

NOTE:
TEMPORARY SILT FENCE SHALL BE INSTALLED A MINIMUM OF 1 METER FROM TOE OF FILL IN WETLAND AREAS

METRIC	PROJECT REFERENCE NO.	SHEET NO.
	R-2514A	EC-19/CONST. 19
	R/W SHEET NO.	
5 0 10	ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
CONST. REV.		
R/W REV.		



SEE SHEET NO. 2D FOR ALL DRIVEWAY DETAILS.

SEE SHEET NO. 2D FOR ALL DITCH DETAILS.

SEE SHEET NO. 49 FOR NBL & SBL GRADES AND PROFILES AND ALL DITCH GRADES AND PROFILES.

NOTE:
PLACE TEMPORARY ROCK SEDIMENT DAMS TYPE- B AND TEMPORARY ROCK SILT CHECKS TYPE-A AT DRAINAGE OUTLETS.

CLEARING AND GRUBBING EROSION CONTROL FOR CONSTRUCTION SHEET 20

METRIC

5 0 10

PROJECT REFERENCE NO.	SHEET NO.
R-2514A	EC-20CONST. 20
R /W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

CONST. REV.

R /W REV.

NAD 83 NC GRID

152+00 153+00 154+00

THE ENDOWMENT FUND OF NC STATE UNIVERSITY ET AL. (HOFMANN FOREST).
DB. 170. PG. 263
DB 516 PG 408
HISTORIC PROPERTY

MATCHLINE STA 151+40 SEE SHEET 19

MATCHLINE STA 154+80 SEE SHEET 21

SPECIAL DITCH

SLOPE STAKE LINE

CLASS 'B' RIPRAP
EST 18 TONS
FILTER FABRIC
EST 5.9 SM

SPECIAL CUT DITCH SEE DETAIL 'A' ON SHEET 2D

END FENCE

ACCESS PT.

SEE SHEET NO. 2D FOR ALL DRIVEWAY DETAILS.

SEE SHEET NO. 2D FOR ALL DITCH DETAILS.

SEE SHEET NO. 50 FOR NBL & SBL GRADES AND PROFILES AND ALL DITCH GRADES AND PROFILES.

NOTE:
PLACE TEMPORARY ROCK SEDIMENT DAMS TYPE- B AND TEMPORARY ROCK SILT CHECKS TYPE-A AT DRAINAGE OUTLETS.

CLEARING AND GRUBBING EROSION CONTROL FOR CONSTRUCTION SHEET 21

METRIC

5 0 10

CONST. REV.

R /W REV.

PROJECT REFERENCE NO.	SHEET NO.
R-2514A	EC-21/CONST. 21
R /W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

NAD 83
NC GRID

155+00 156+00 157+00 158+00

THE ENDOWMENT FUND OF NC STATE UNIVERSITY ET AL. (HOFMANN FOREST).
DB. 170, PG. 263
DB 516 PG 408
HISTORIC PROPERTY

MATCHLINE STA 154+80 SEE SHEET 20

MATCHLINE STA 158+20 SEE SHEET 22

+90.000(-L MED-)
26.673m
(87.5ft)

SLOPE STAKE LINE

SPECIAL DITCH

JAM RELEASE

N 49° 09' 54" E

L MED

US 17 8.0 BST

0.6 BST

30m TAPER

FLOW

ACCESS PT.

BEGIN FENCE

SPECIAL CUT DITCH SEE DETAIL 'A' ON SHEET 2D

+90.000(-L MED-)
30.000m
(98.43')

CLASS 'B' RIPRAP EST 0.9 TONS
FILTER FABRIC EST 4.2 SM

+80.000(-L MED-)
35.000m
(114.83')

+20.000(-L MED-)
36.000m
(118.11')

SPECIAL CUT DITCH SEE DETAIL 'A' ON SHEET 2D

THE ENDOWMENT FUND OF NC STATE UNIVERSITY ET AL. (HOFMANN FOREST).
DB. 170, PG. 263
DB 516 PG 408
HISTORIC PROPERTY

SEE SHEET NO. 2D FOR ALL DRIVEWAY DETAILS.

SEE SHEET NO. 2D FOR ALL DITCH DETAILS.

SEE SHEET NO. 51 FOR NBL & SBL GRADES AND PROFILES AND ALL DITCH GRADES AND PROFILES.

PROJECT REFERENCE NO.	SHEET NO.
R-2514A	EC-22/CONST. 22
R /W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

METRIC

5 0 10

CONST. REV.

R /W REV.

NOTE:
PLACE TEMPORARY ROCK SEDIMENT DAMS TYPE- B AND TEMPORARY ROCK SILT CHECKS TYPE-A AT DRAINAGE OUTLETS.

CLEARING AND GRUBBING
EROSION CONTROL FOR CONSTRUCTION SHEET 22

NOTE:
TEMPORARY SILT FENCE SHALL BE INSTALLED A MINIMUM OF 1 METER FROM TOE OF FILL IN WETLAND AREAS

NAD 83 NC GRID

MATCHLINE STA 158+20 SEE SHEET 21

MATCHLINE STA 161+60 SEE SHEET 23

159+00

160+00

161+00

PC STA 160+02.638

PT STA 161+11.544

THE ENDOWMENT FUND OF NC STATE UNIVERSITY ET AL. (HOFMANN FOREST).
DB. 170, PG. 263
DB 516 PG 408
HISTORIC PROPERTY

N 49°09'56.3" E

SLOPE STAKE LINE

SPECIAL DITCH

+40.000(-L MED-)
36.000m
(118.11')

+00.000(-L MED-)
37.000m
(121.39')

+40.000(-L MED-)
37.000m
(121.39')

+60.000(-L MED-)
34.000m
(111.55')

+02.638(-L MED-)
30.000m
(98.43')

+80.900(-L MED-)
34.000m
(111.55')

+00.000(-L MED-)
30.000m (98.43')

+11.544(-L MED-)
30.000m
(98.43')

+19.000(-L MED-)
30.000m
(98.43')

+19.000(-L MED-)
38.000m
(124.67')

+33.000(-L MED-)
38.000m
(124.67')

+33.000(-L MED-)
30.000m
(98.43')

+02.638(-L MED-)
26.673m
(87.5')

+11.544(-L MED-)
26.673m
(87.5')

+29.000(-L MED-)
26.673m
(87.5')

+41.000(-L MED-)
43.000m
(141.08')

+52.000
(-L MED-)
43.000m
(141.08')

+52.000
(-L MED-)
26.673m
(87.5')

CLASS I RIPRAP
EST. 50 METRIC TONS
FOR 8m W/ F.F
EACH BANK

BEGIN FENCE AT WINGWALL

END FENCE AT WINGWALL

REMOVE EXISTING
(2) 3.08(W) x 1.22(H)
PROPOSED (2) 2.1(W) x 1.2(H) RCBC

375mm RCP
CONNECT
TO CULVERT

400 mm
CSP w/ 2
ELBOWS

CLASS 'B' RIPRAP
EST. 09 TONS
FILTER FABRIC
EST 42 SM

CLASS 'B' RIPRAP EST 3.7 TONS
FILTER FABRIC EST 6.46 SM
PSRM EST 17.68 SM

SPECIAL CUT DITCH
SEE DETAIL 'A'
ON SHEET 2D

4.4m BASE CHANNEL
15m ALONG EXISTING SLOPE
SEE CHANNEL IMPROVEMENT
DETAIL 'C'
EST DDE = 18 M³

4.8m BASE CHANNEL
28m ALONG EXISTING SLOPE
SEE CHANNEL IMPROVEMENT
DETAIL 'F'
EST DDE = 35 M³

CLASS I RIPRAP
EST. 50 METRIC TONS
FOR 8m W/ F.F
EACH BANK

HISTORIC BOUNDARY

-L MED-
PI Sta 161+44.003
Δ = 03° 51' (RT)
L = 64.915
T = 32.459
R = 3,495.000
SE = NC

SEE SHEET C- THROUGH SHEET C- FOR CULVERT DETAILS

SEE SHEET NO. 2D FOR ALL DRIVEWAY DETAILS.

SEE SHEET NO. 2D FOR ALL DITCH DETAILS.

SEE SHEET NO. 52 FOR NBL & SBL GRADES AND PROFILES AND ALL DITCH GRADES AND PROFILES.

CULVERT CONSTRUCTION SEQUENCE STA. 161+33.5 –L MED–

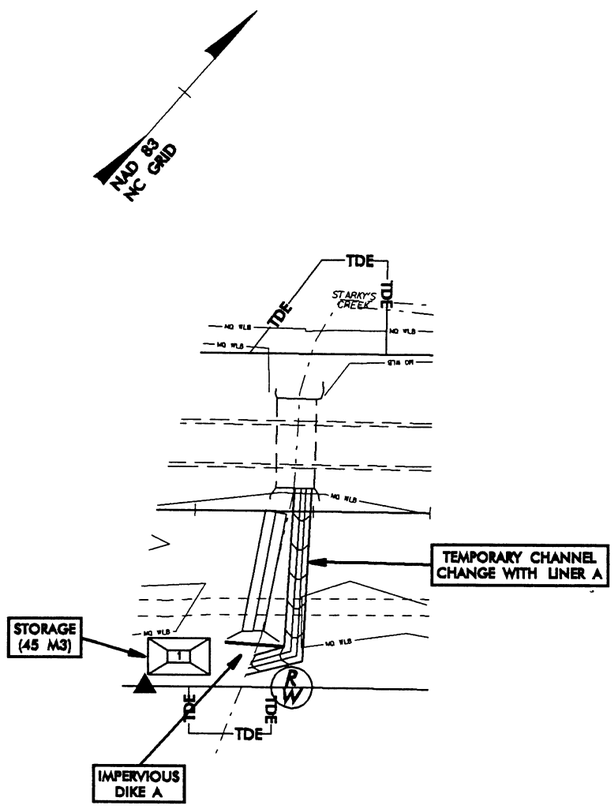
METRIC

5 0 10

PROJECT REFERENCE NO.	SHEET NO.
R-2514A	EC-23/CONST.22
R /W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
CONST. REV.	
R /W REV.	

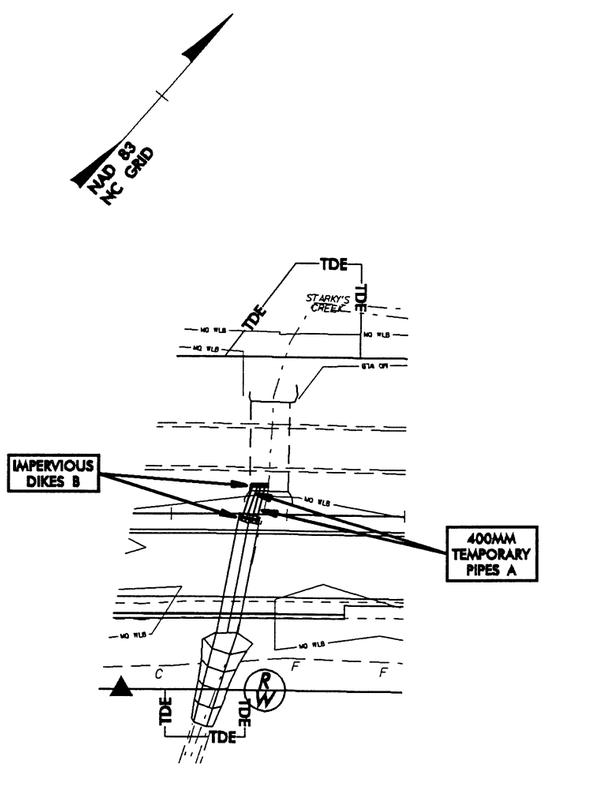
PHASE I

1. CONSTRUCT STILLING BASIN 1 (45 M3).
2. CONSTRUCT TEMPORARY CHANNEL CHANGE WITH LINER A (0.9M BASE, 2:1 SIDE SLOPES, 0.5M DEEP), AND IMPERVIOUS DIKE A, DIVERTING FLOW THROUGH CHANNEL.
3. CONSTRUCT PHASE I SECTION OF CULVERT.



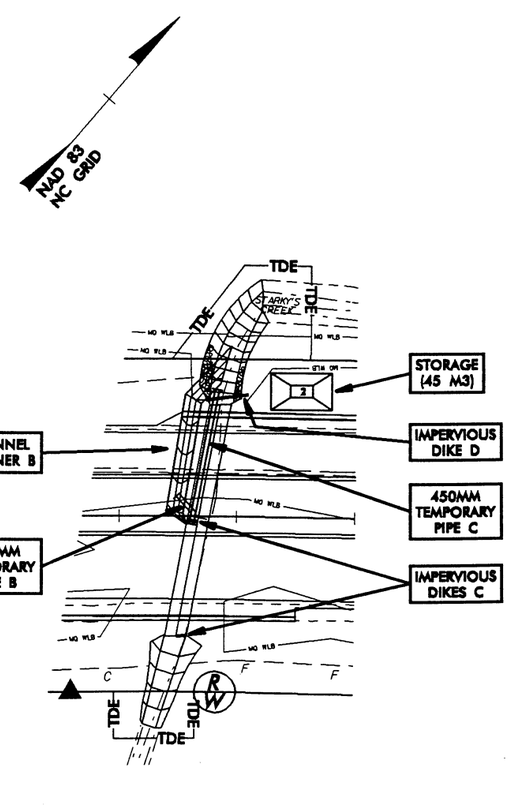
PHASE II

4. CONSTRUCT IMPERVIOUS DIKES B AND 400MM TEMPORARY PIPES A.
5. REMOVE IMPERVIOUS DIKE A AND TEMPORARY CHANNEL CHANGE A.
6. CONSTRUCT UPSTREAM CHANNEL IMPROVEMENTS.
7. REMOVE STILLING BASIN 1 AND CONSTRUCT NORTH BOUND LANES.
8. SHIFT TRAFFIC TO NORTH BOUND LANES.



PHASE III

9. CONSTRUCT STILLING BASIN 2 (45 M3).
10. CONSTRUCT TEMPORARY CHANNEL CHANGE WITH LINER B (0.9M BASE, 2:1 SIDE SLOPES, 0.6M DEEP).
11. REMOVE TEMPORARY PIPES A AND IMPERVIOUS DIKES B.
12. CONSTRUCT IMPERVIOUS DIKES C AND D, AND INSTALL 450MM TEMPORARY PIPE B, DIVERTING FLOW TO TEMPORARY CHANNEL CHANGE B.
13. REMOVE EXISTING CULVERT AND BUILD REMAINDER OF THE FLOOR OF THE PROPOSED CULVERT.
14. REMOVE TEMPORARY CHANNEL CHANGE B AND TEMPORARY PIPE B, AND INSTALL 450MM TEMPORARY PIPE C.
15. COMPLETE CONSTRUCTION OF THE PROPOSED CULVERT.
16. REMOVE IMPERVIOUS DIKES C AND D, AND TEMPORARY PIPE C.
17. CONSTRUCT DOWNSTREAM CHANNEL IMPROVEMENTS.
18. COMPLETE ROADWAY.



PROJECT REFERENCE NO.	SHEET NO.
R-2514A	EC-24/CONST. 23
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

METRIC

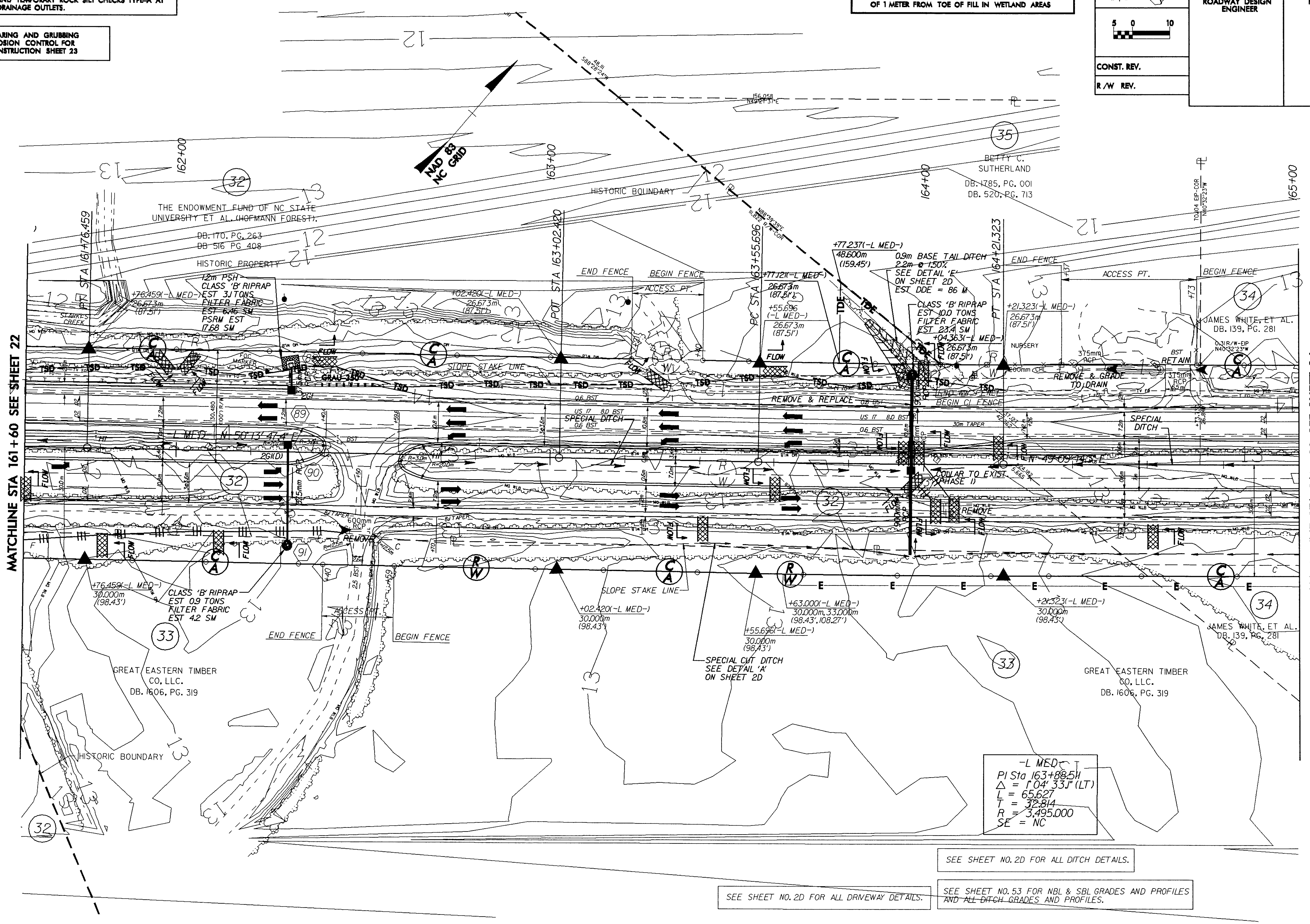
CONST. REV.

R/W REV.

NOTE:
PLACE TEMPORARY ROCK SEDIMENT DAMS TYPE- B AND TEMPORARY ROCK SILT CHECKS TYPE-A AT DRAINAGE OUTLETS.

CLEARING AND GRUBBING EROSION CONTROL FOR CONSTRUCTION SHEET 23

NOTE:
TEMPORARY SILT FENCE SHALL BE INSTALLED A MINIMUM OF 1 METER FROM TOE OF FILL IN WETLAND AREAS



SEE SHEET NO. 2D FOR ALL DITCH DETAILS.

SEE SHEET NO. 2D FOR ALL DRIVEWAY DETAILS.

SEE SHEET NO. 53 FOR NBL & SBL GRADES AND PROFILES AND ALL DITCH GRADES AND PROFILES.

NOTE:
PLACE TEMPORARY ROCK SEDIMENT DAMS TYPE- B AND TEMPORARY ROCK SILT CHECKS TYPE-A AT DRAINAGE OUTLETS.

CLEARING AND GRUBBING EROSION CONTROL FOR CONSTRUCTION SHEET 24

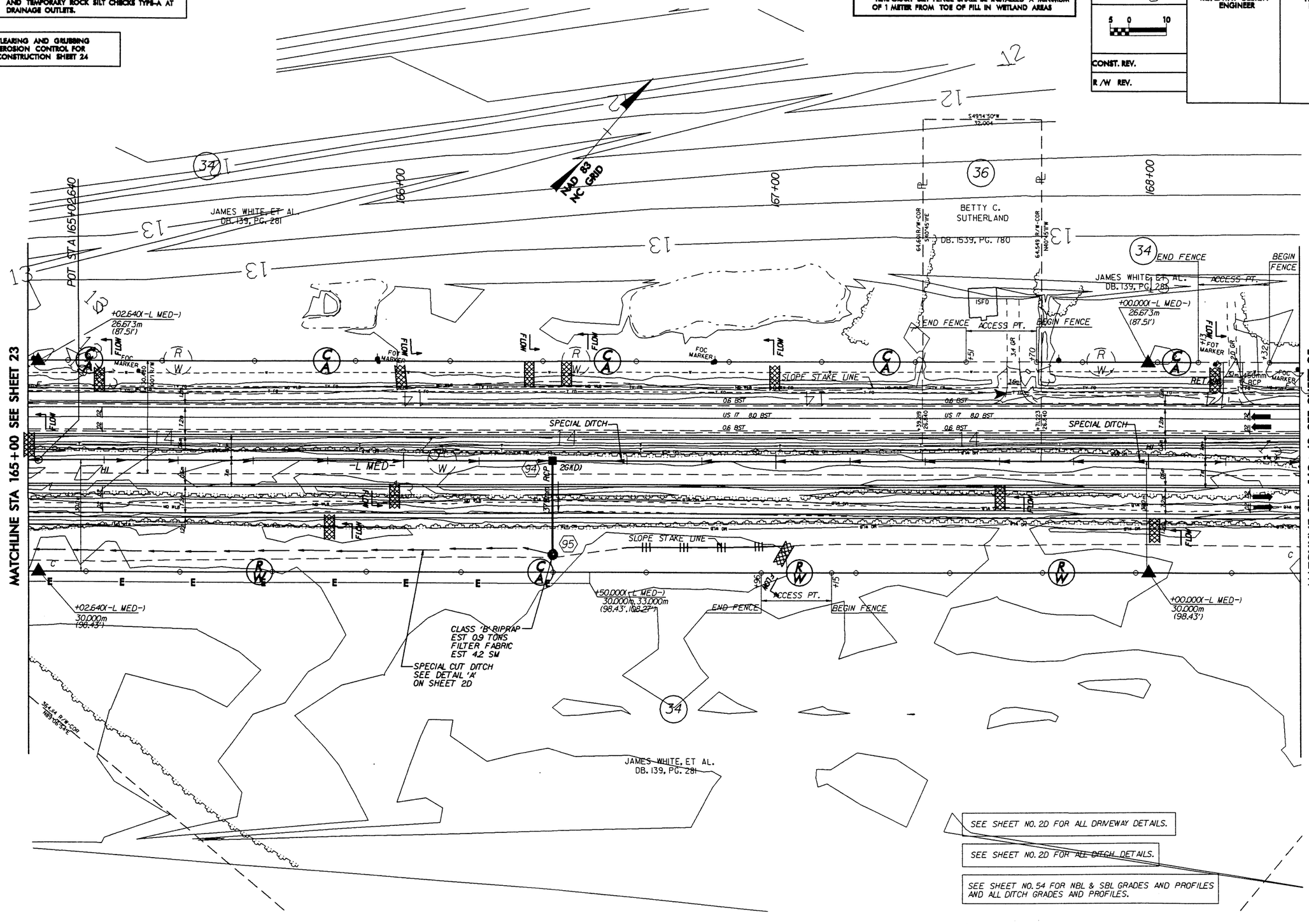
NOTE:
TEMPORARY SILT FENCE SHALL BE INSTALLED A MINIMUM OF 1 METER FROM TOE OF FILL IN WETLAND AREAS

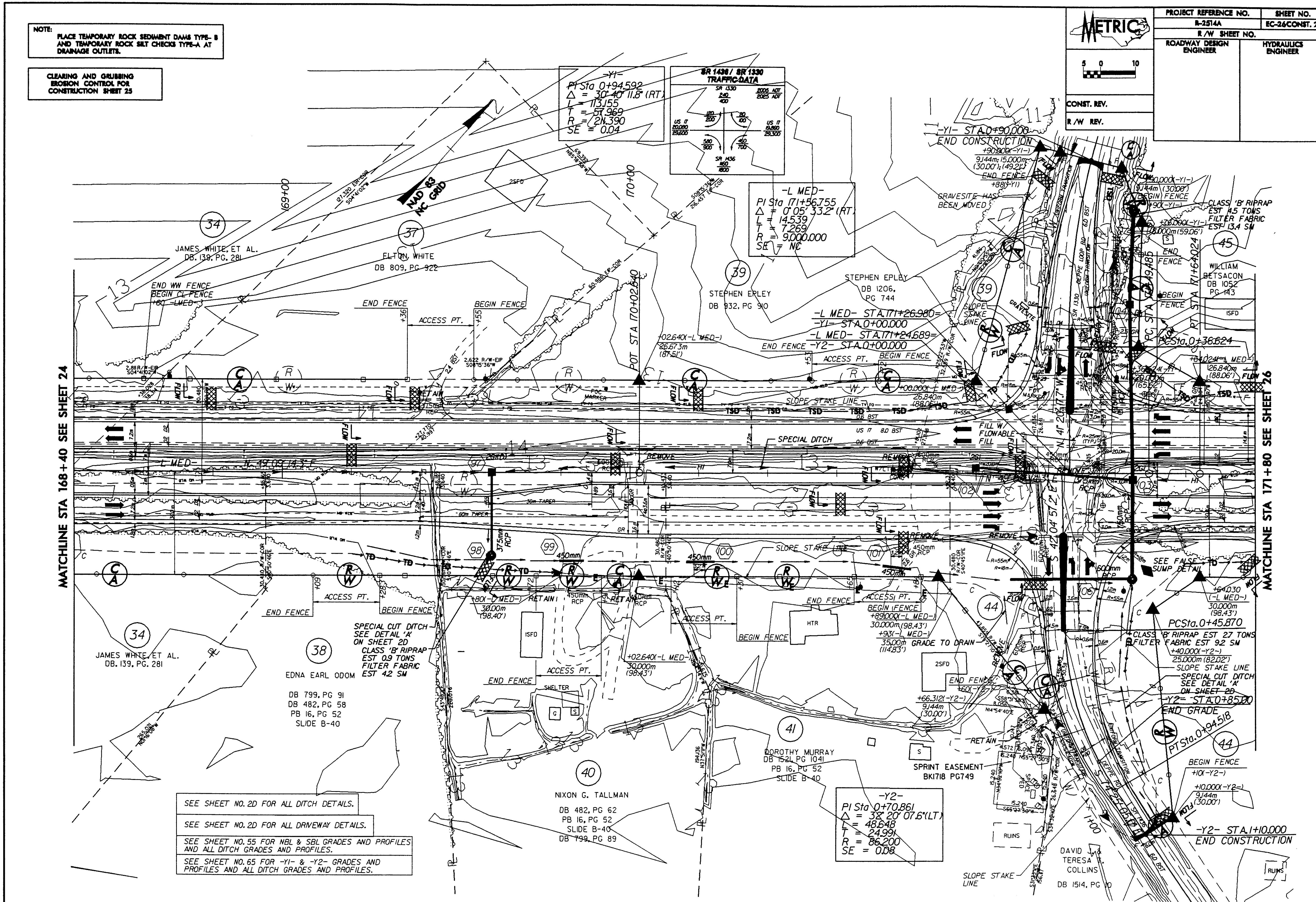
METRIC
5 0 10

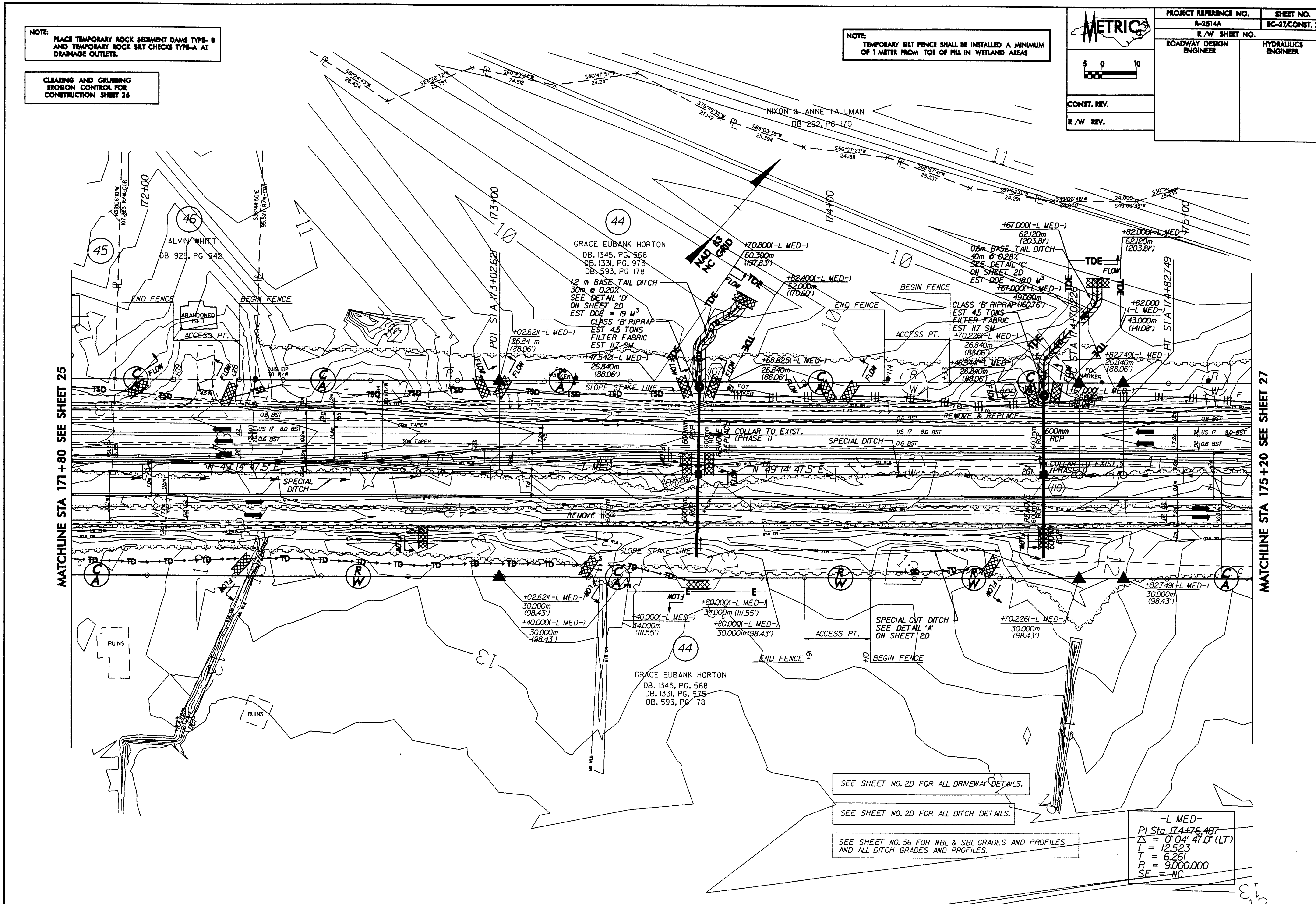
PROJECT REFERENCE NO.	SHEET NO.
R-2514A	EC-25CONST. 24
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

CONST. REV.

R/W REV.




NOTE:
PLACE TEMPORARY ROCK SEDIMENT DAMS TYPE- B AND TEMPORARY ROCK SILT CHECKS TYPE-A AT DRAINAGE OUTLETS.
CLEARING AND GRUBBING EROSION CONTROL FOR CONSTRUCTION SHEET 25
PROJECT REFERENCE NO. R-2514A
SHEET NO. EC-26CONST. 25
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
METRIC
CONST. REV.
R/W REV.
-Y1-
PI Sta 0+94.592
Δ = 30° 40' 11.8" (RT)
L = 113.155
T = 57.969
R = 211.390
SE = 0.04
SR 1436 / SR 1330 TRAFFIC DATA
-L MED-
PI Sta 171+56.755
Δ = 0° 05' 33.2" (RT)
L = 14.539
T = 7.269
R = 9,000.000
SE = NC
NAD 83 NC GRID
169+00
170+00
JAMES WHITE, ET AL. DB. 139, PG. 281
ELTON WHITE DB 809, PG 922
STEPHEN EPLEY DB 932, PG 910
STEPHEN EPLEY DB 1206, PG 744
WILLIAM BETSACON DB 1052 PG 143
-L MED- STA.171+26.980= -Y1- STA.0+00.000
-L MED- STA.171+24.689= -Y2- STA.0+00.000
-Y1- STA.0+90.000 END CONSTRUCTION
POT STA 170+02.640
MATCHLINE STA 168+40 SEE SHEET 24
MATCHLINE STA 171+80 SEE SHEET 26
EDNA EARL ODOM DB 799, PG 91 DB 482, PG 58 PB 16, PG 52 SLIDE B-40
NIXON G. TALLMAN DB 482, PG 62 PB 16, PG 52 SLIDE B-40 DB 799, PG 89
DOROTHY MURRAY DB 1521, PG 1041 PB 16, PG 52 SLIDE B-40
SPRINT EASEMENT BK1718 PG749
DAVID & TERESA COLLINS DB 1514, PG 70
-Y2-
PI Sta 0+70.861
Δ = 32° 20' 07.6" (LT)
L = 48.648
T = 24.991
R = 86.200
SE = 0.08
-Y2- STA.1+10.000 END CONSTRUCTION
-Y2- STA.0+85.00 END GRADE
SPECIAL CUT DITCH SEE DETAIL 'A' ON SHEET 2D CLASS 'B' RIPRAP EST 0.9 TONS FILTER FABRIC EST 4.2 SM
CLASS 'B' RIPRAP EST 2.7 TONS FILTER FABRIC EST 9.2 SM
CLASS 'B' RIPRAP EST 4.5 TONS FILTER FABRIC EST 13.4 SM
SEE SHEET NO. 2D FOR ALL DITCH DETAILS.
SEE SHEET NO. 2D FOR ALL DRIVEWAY DETAILS.
SEE SHEET NO. 55 FOR NBL & SBL GRADES AND PROFILES AND ALL DITCH GRADES AND PROFILES.
SEE SHEET NO. 65 FOR -Y1- & -Y2- GRADES AND PROFILES AND ALL DITCH GRADES AND PROFILES.


NOTE:
PLACE TEMPORARY ROCK SEDIMENT DAMS TYPE- B AND TEMPORARY ROCK SILT CHECKS TYPE-A AT DRAINAGE OUTLETS.
CLEARING AND GRUBBING EROSION CONTROL FOR CONSTRUCTION SHEET 26
NOTE:
TEMPORARY SILT FENCE SHALL BE INSTALLED A MINIMUM OF 1 METER FROM TOE OF FILL IN WETLAND AREAS
METRIC
PROJECT REFERENCE NO.
R-2514A
SHEET NO.
EC-27/CONST. 26
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
CONST. REV.
R/W REV.
MATCHLINE STA 171+80 SEE SHEET 25
MATCHLINE STA 175+20 SEE SHEET 27
NIXON & ANNE TALLMAN
DB 292, PG 170
ALVIN WHITT
DB 925, PG 942
GRACE EUBANK HORTON
DB. 1345, PG. 568
DB. 1331, PG. 975
DB. 593, PG 178
NAD 83 NC GRID
1.2 m BASE TAIL DITCH
30m @ 0.20%
SEE DETAIL 'D'
ON SHEET 2D
EST DDE = 19 M3
CLASS 'B' RIPRAP
EST 4.5 TONS
FILTER FABRIC
EST 117 SM
0.5m BASE TAIL DITCH
40m @ 0.28%
SEE DETAIL 'C'
ON SHEET 2D
EST DDE = 18.0 M3
CLASS 'B' RIPRAP
EST 4.5 TONS
FILTER FABRIC
EST 117 SM
END FENCE
BEGIN FENCE
ACCESS PT.
ABANDONED 1SFD
SLOPE STAKE LINE
REMOVE & REPLACE
COLLAR TO EXIST. (PHASE I)
SPECIAL DITCH
600mm RCP
US 17 8.0 BST
N 49°14' 47.5" E
REMOVE
SPECIAL CUT DITCH
SEE DETAIL 'A'
ON SHEET 2D
RUINS
SEE SHEET NO. 2D FOR ALL DRIVEWAY DETAILS.
SEE SHEET NO. 2D FOR ALL DITCH DETAILS.
SEE SHEET NO. 56 FOR NBL & SBL GRADES AND PROFILES AND ALL DITCH GRADES AND PROFILES.
-L MED-
PI Sta 174+76.487
Δ = 0°04' 47.0" (LT)
L = 12.523
T = 6.261
R = 9,000.000
SE = NC

PROJECT REFERENCE NO.	SHEET NO.
R-2514A	EC-28CONST. 27
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

METRIC

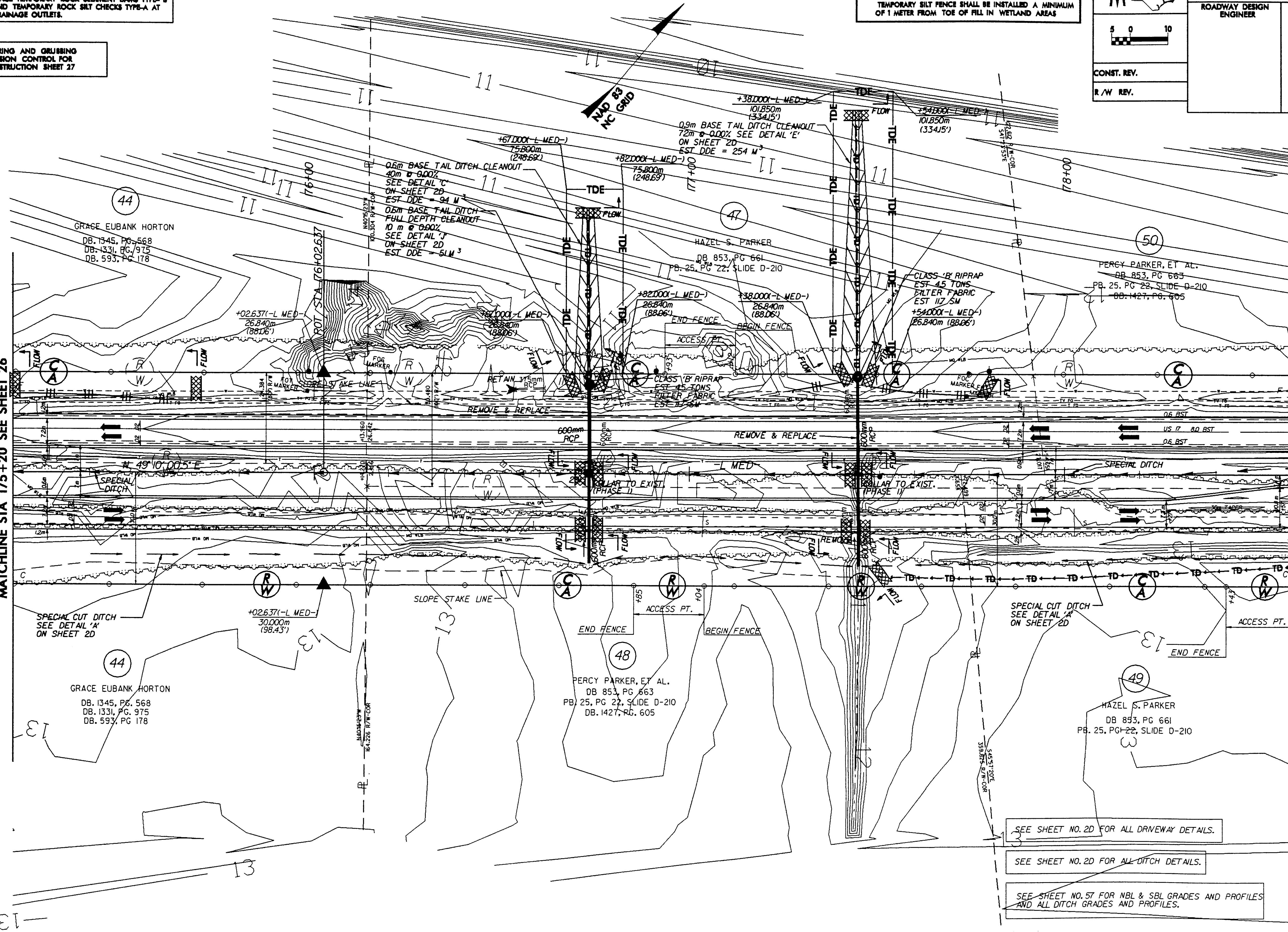
CONST. REV.

R/W REV.

NOTE:
PLACE TEMPORARY ROCK SEDIMENT DAMS TYPE- B AND TEMPORARY ROCK SILT CHECKS TYPE-A AT DRAINAGE OUTLETS.

CLEARING AND GRUBBING EROSION CONTROL FOR CONSTRUCTION SHEET 27

NOTE:
TEMPORARY SILT FENCE SHALL BE INSTALLED A MINIMUM OF 1 METER FROM TOE OF FILL IN WETLAND AREAS



SEE SHEET NO. 2D FOR ALL DRIVEWAY DETAILS.

SEE SHEET NO. 2D FOR ALL DITCH DETAILS.

SEE SHEET NO. 57 FOR NBL & SBL GRADES AND PROFILES AND ALL DITCH GRADES AND PROFILES.

NOTE:
TEMPORARY SILT FENCE SHALL BE INSTALLED A MINIMUM OF 1 METER FROM TOE OF FILL IN WETLAND AREAS

NOTE:
PLACE TEMPORARY ROCK SEDIMENT DAMS TYPE- B AND TEMPORARY ROCK SILT CHECKS TYPE-A AT DRAINAGE OUTLETS.

CLEARING AND GRUBBING EROSION CONTROL FOR CONSTRUCTION SHEET 2B

METRIC

5 0 10

PROJECT REFERENCE NO.	SHEET NO.
R-2514A	EC-29CONST.2B
R /W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
CONST. REV.	
R /W REV.	

MATCHLINE STA 178+60 SEE SHEET 27

MATCHLINE STA 182+00 SEE SHEET 29

NAD 83 NC GRID

5.5 x 2.0 x 1

PERCY PARKER, ET AL.
DB 853, PG 663
PB. 25, PG 22, SLIDE D-210
DB 1427, PG 605

SANITARY SEWER DRAIN FIELD EASEMENT

WHITE OAK COMMUNITY CHURCH
DB 827, PG 666

ISBK CHURCH

0.9m BASE TAIL DITCH
20m @ 0.35%
SEE DETAIL 'E' ON SHEET 2D
EST DDE = 71 M³

+196.00(-L MED-)
47.500m (155.84')

+067.00(-L MED-)
40.500m (133.20')

+178.000(-L MED-)
26.840m (88.06')

+29.000(-L MED-)
26.840m (88.06')

+40.000(-L MED-)
26.840m (88.06')

+85.000(-L MED-)
26.840m, 31.000m (88.06', 101.71')

END FENCE
BEGIN FENCE
CLASS 'B' RIPRAP EST 4.5 TONS
FILTER FABRIC EST 117 SM
ACCESS PT.
GRAVEL PARKING
BST PARKING
END CL FENCE
BEGIN WW FENCE
+40 -LMED-
SLOPE STAKE LINE
REMOVE AND REPLACE
COLLAR TO EXIST. (PHASE II)
SPECIAL DITCH
REMOVE
CONCRETE BARRIER
SPECIAL CUT DITCH SEE DETAIL 'A' ON SHEET 2D
END WW FENCE
BEGIN CL FENCE
+20 -LMED-
BEGIN FENCE
HAZEL S. PARKER
DB 853, PG 661
PB. 25, PG 22, SLIDE D-210
PAVE WITH 60mm S9.5A AND 100mm B25.0B
BARRUS CONSTRUCTION CO.
DB 443, PG 553
CLASS 'B' RIPRAP EST 0.9 TONS
FILTER FABRIC EST 4.2 SM
+00.000(-L MED-)
33.000m (108.27')
ASPHALT MACHINERY
ASPHALT TANK
ISBLK BUS
SBLK BUS
EQUIP IS PORTABLE

SEE SHEET NO. 2D FOR ALL DRIVEWAY DETAILS.

SEE SHEET NO. 2D FOR ALL DITCH DETAILS.

SEE SHEET NO. 5B FOR NBL & SBL GRADES AND PROFILES AND ALL DITCH GRADES AND PROFILES.

NOTE:
TEMPORARY SILT FENCE SHALL BE INSTALLED A MINIMUM OF 1 METER FROM TOE OF FILL IN WETLAND AREAS

NOTE:
UTILIZE TEMPORARY ROCK SILT CHECK TYPE - A AS STILLING BASIN WHERE APPLICABLE.

NOTE:
PLACE TEMPORARY ROCK SEDIMENT DAMS TYPE- B AND TEMPORARY ROCK SILT CHECKS TYPE-A AT DRAINAGE OUTLETS.

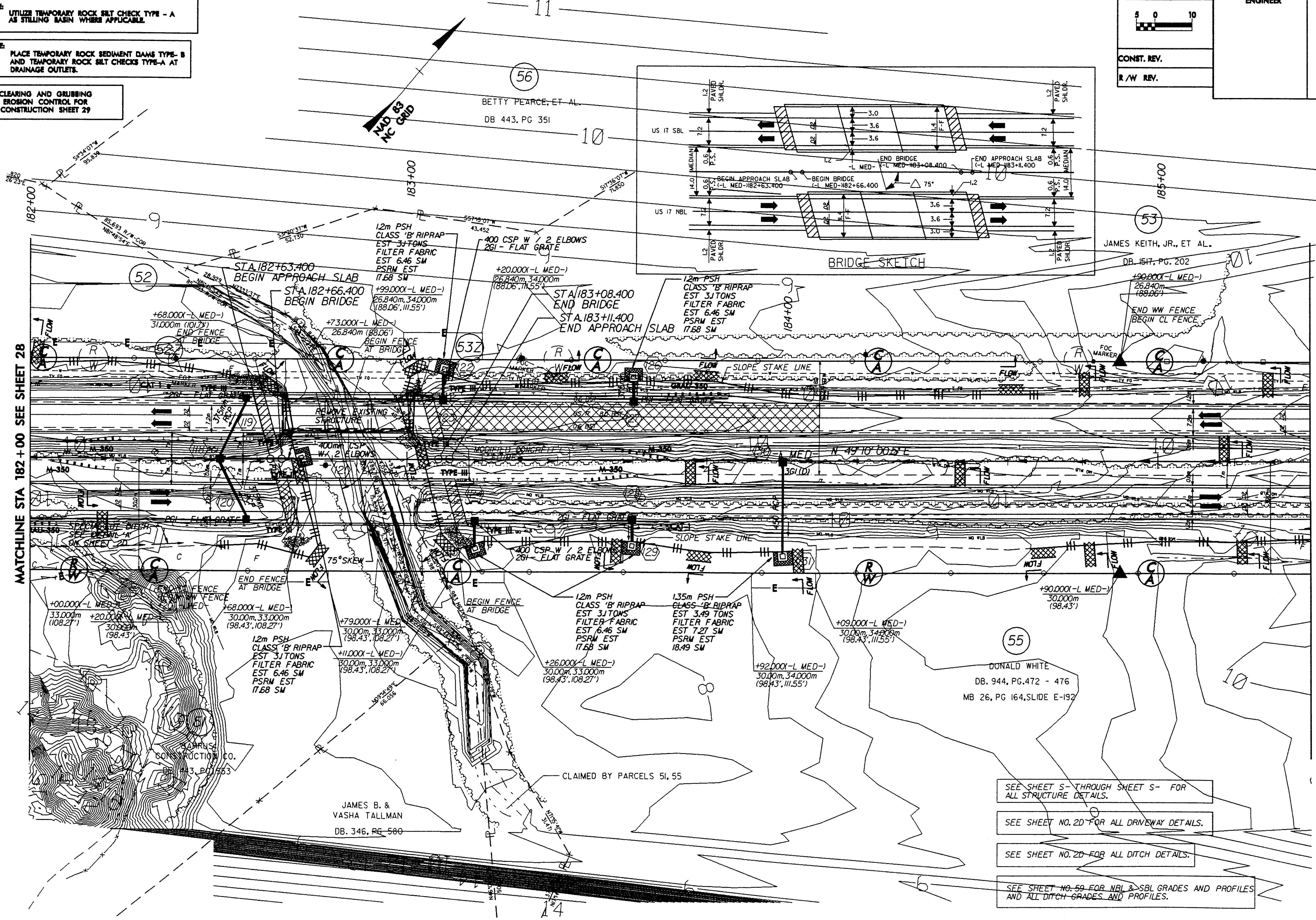
CLEARING AND GRUBBING
EROSION CONTROL FOR
CONSTRUCTION SHEET 29

PROJECT REFERENCE NO.	SHEET NO.
R-2514A	EC-30/CONST.29
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

METRIC

CONST. REV.

R/W REV.



SEE SHEET S- THROUGH SHEET S- FOR ALL STRUCTURE DETAILS.

SEE SHEET NO. 2D FOR ALL DRIVEWAY DETAILS.

SEE SHEET NO. 2D FOR ALL DITCH DETAILS.

SEE SHEET NO. 59 FOR NBL & SBL GRADES AND PROFILES AND ALL DITCH GRADES AND PROFILES.

NOTE:
PLACE TEMPORARY ROCK SEDIMENT DAMS TYPE- B AND TEMPORARY ROCK SILT CHECKS TYPE-A AT DRAINAGE OUTLETS.

CLEARING AND GRUBBING EROSION CONTROL FOR CONSTRUCTION SHEET 30

METRIC

5 0 10

CONST. REV.
R/W REV.

PROJECT REFERENCE NO.	SHEET NO.
R-2514A	EC-31/CONST.30
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

MATCHLINE STA 185+40 SEE SHEET 29

MATCHLINE STA 188+60 SEE SHEET 31

6.0 x 2.0 x 1

NAD 83 NC GRID

186+00 187+00 188+00

JAMES KEITH, JR., ET AL.
DB. 1517, PG. 202

BETTY PEARCE, ET AL.
DB 443, PG 351

DONALD WHITE
DB. 3416, PG 472 - 475
MB 26, PG 164, SLIDE E-192

SPECIAL CUT DITCH SEE DETAIL 'A' ON SHEET 2D

END FENCE

BEGIN FENCE

ACCESS PT.

SLOPE STAKE LINE

SPECIAL DITCH

L MED N 49°10'00.5" E

TYPICAL MEDIAN DITCH

450mm

375mm

+80.000(-L MED-)
30.000m (98.43')

+80.000(-L MED-)
34.000m (111.55')

+40.000(-L MED-)
30.000m (98.43')

+40.000(-L MED-)
34.000m (111.55')

SEE SHEET NO. 2D FOR ALL DRIVEWAY DETAILS.

SEE SHEET NO. 2D FOR ALL DITCH DETAILS.

SEE SHEET NO. 60 FOR NBL & SBL GRADES AND PROFILES AND ALL DITCH GRADES AND PROFILES.

NOTE:
PLACE TEMPORARY ROCK SEDIMENT DAMS TYPE- B AND TEMPORARY ROCK SILT CHECKS TYPE-A AT DRAINAGE OUTLETS.

CLEARING AND GRUBBING
EROSION CONTROL FOR CONSTRUCTION SHEET 31

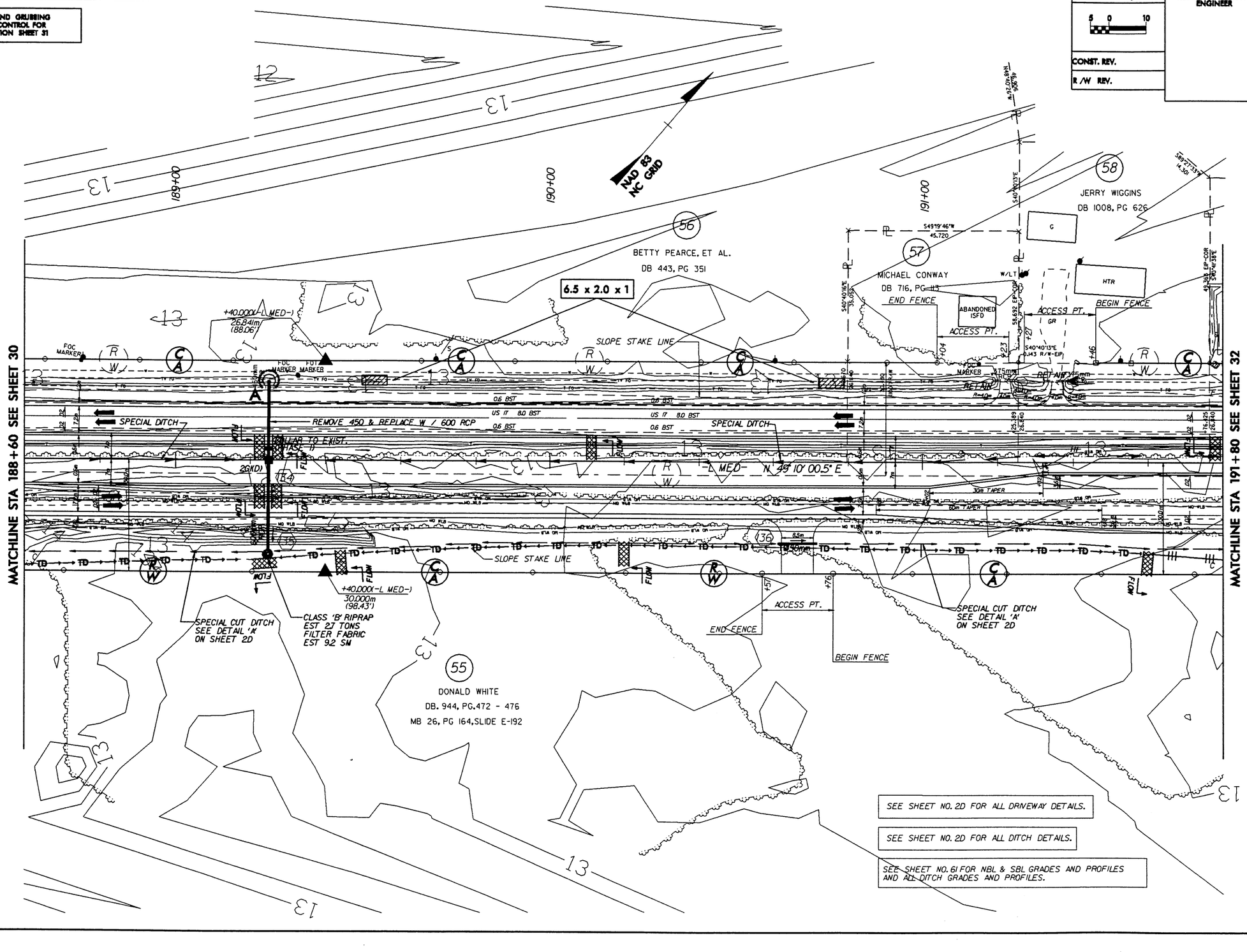
METRIC

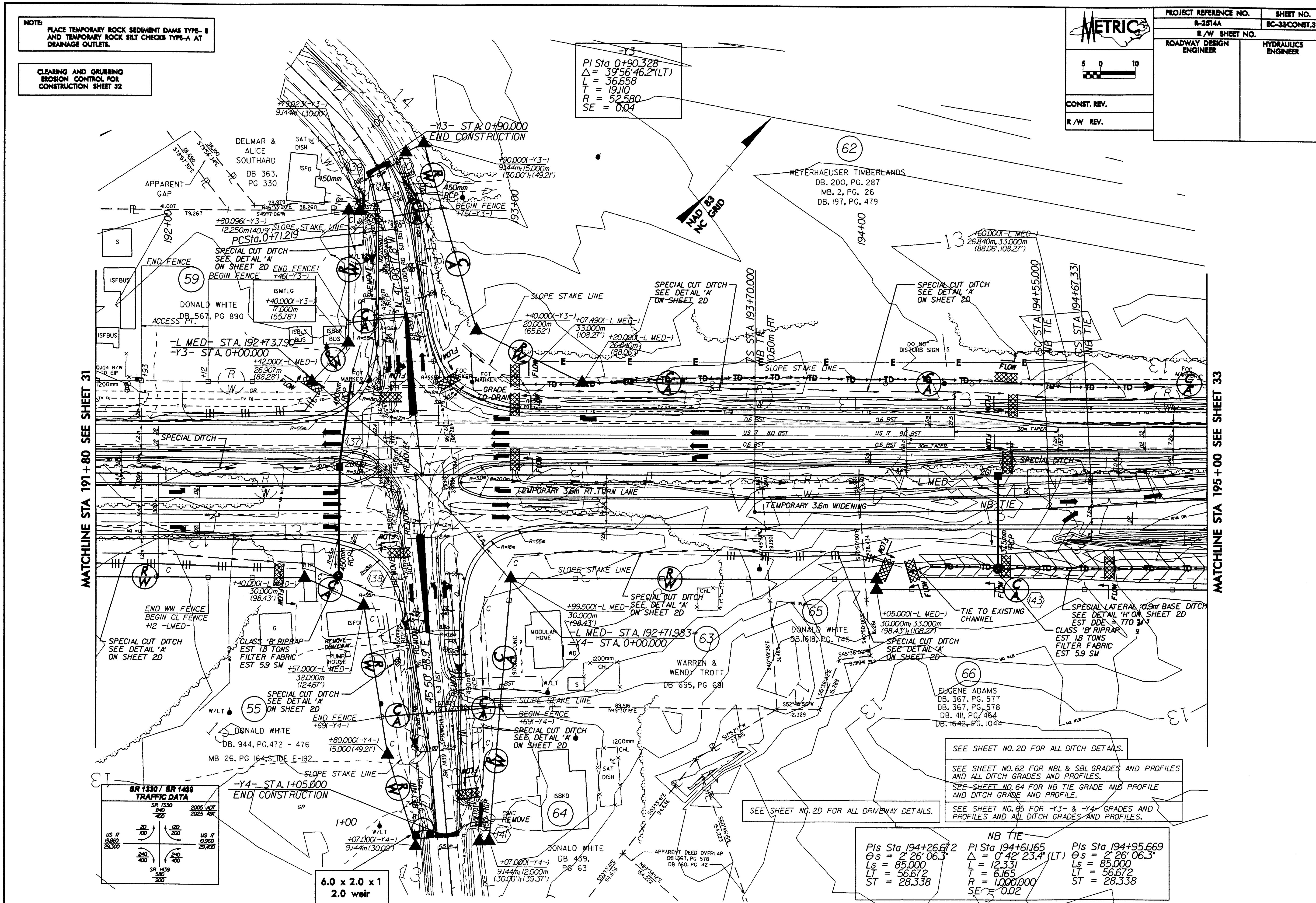
5 0 10

CONST. REV.

R /W REV.

PROJECT REFERENCE NO.	SHEET NO.
R-2514A	EC-32/CONST.31
R /W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER




NOTE:
PLACE TEMPORARY ROCK SEDIMENT DAMS TYPE-B AND TEMPORARY ROCK SILT CHECKS TYPE-A AT DRAINAGE OUTLETS.
CLEARING AND GRUBBING EROSION CONTROL FOR CONSTRUCTION SHEET 32
METRIC
PROJECT REFERENCE NO. R-2514A
SHEET NO. EC-33/CONST.32
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
CONST. REV.
R/W REV.
-Y3-
PI Sta 0+90.328
Δ = 39°56'46.2"(LT)
L = 36.658
T = 19.110
R = 52.580
SE = 0.04
-Y3- STA 0+90.000 END CONSTRUCTION
DELMAR & ALICE SOUTHARD DB 363, PG 330
WEYERHAEUSER TIMBERLANDS DB. 200, PG. 287 MB. 2, PG. 26 DB. 197, PG. 479
NAD 83 NC GRID
DONALD WHITE DB 567, PG 890
-L MED- STA 192+73.790
-Y3- STA 0+00.000
-L MED- STA 192+71.983=
-Y4- STA 0+00.000
MATCHLINE STA 191+80 SEE SHEET 31
MATCHLINE STA 195+00 SEE SHEET 33
SPECIAL CUT DITCH SEE DETAIL 'A' ON SHEET 2D
SLOPE STAKE LINE
TEMPORARY 3.6m RT. TURN LANE
TEMPORARY 3.6m WIDENING
NB TIE
TIE TO EXISTING CHANNEL
CLASS 'B' RIPRAP EST 1.8 TONS FILTER FABRIC EST 5.9 SM
SPECIAL LATERAL 0.9m BASE DITCH SEE DETAIL 'H' ON SHEET 2D
DONALD WHITE DB 1618, PG. 745
WARREN & WENDY TROTT DB 695, PG 691
EUGENE ADAMS DB. 367, PG. 577 DB. 367, PG. 578 DB. 411, PG. 464 DB. 1642, PG. 1044
DONALD WHITE DB. 944, PG. 472 - 476 MB 26, PG 164, SLIDE E-192
-Y4- STA 1+05.000 END CONSTRUCTION
DONALD WHITE DB 439, PG 63
SEE SHEET NO. 2D FOR ALL DITCH DETAILS.
SEE SHEET NO. 62 FOR NBL & SBL GRADES AND PROFILES AND ALL DITCH GRADES AND PROFILES.
SEE SHEET NO. 64 FOR NB TIE GRADE AND PROFILE AND DITCH GRADE AND PROFILE.
SEE SHEET NO. 65 FOR -Y3- & -Y4- GRADES AND PROFILES AND ALL DITCH GRADES AND PROFILES.
SEE SHEET NO. 2D FOR ALL DRIVEWAY DETAILS.
SR 1330 / SR 1439 TRAFFIC DATA
NB TIE
PIs Sta 194+26.672 θs = 2°26'06.3" Ls = 85.000 LT = 56.672 ST = 28.338
PI Sta 194+61.165 Δ = 0°42'23.4"(LT) L = 12.331 T = 6.165 R = 1,000.000 SE = 0.02
PIs Sta 194+95.669 θs = 2°26'06.3" Ls = 85.000 LT = 56.672 ST = 28.338
6.0 x 2.0 x 1 2.0 weir

NOTE:
TEMPORARY SILT FENCE SHALL BE INSTALLED A MINIMUM OF 1 METER FROM TOE OF FILL IN WETLAND AREAS

NOTE:
PLACE TEMPORARY ROCK SEDIMENT DAMS TYPE- B AND TEMPORARY ROCK SILT CHECKS TYPE-A AT DRAINAGE OUTLETS.

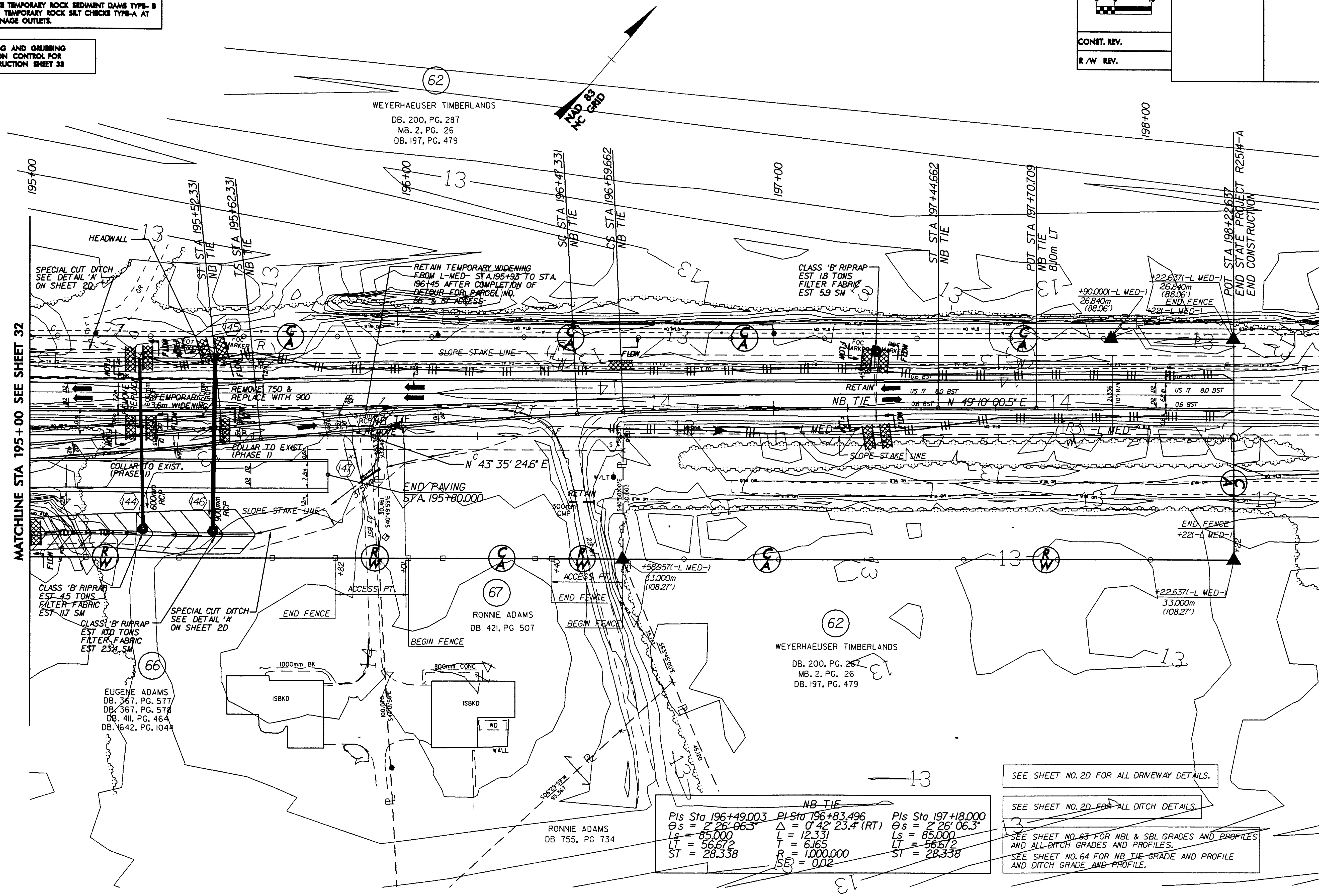
CLEARING AND GRUBBING
EROSION CONTROL FOR
CONSTRUCTION SHEET 33

PROJECT REFERENCE NO.	SHEET NO.
R-2514A	EC-34CONST.33
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

METRIC

CONST. REV.

R/W REV.



NAD 83 NC GRID
(62)
WEYERHAEUSER TIMBERLANDS
DB. 200, PG. 287
MB. 2, PG. 26
DB. 197, PG. 479
195+00
196+00
197+00
198+00
ST STA 195+52.331 NB TIE
TS STA 195+62.331 NB TIE
SC STA 196+47.331 NB TIE
CS STA 196+59.662 NB TIE
ST STA 197+44.662 NB TIE
POT STA 197+70.709 NB TIE 8.10m LT
POT STA 198+22.637 END STATE PROJECT R2514-A END CONSTRUCTION
HEADWALL
SPECIAL CUT DITCH SEE DETAIL 'A' ON SHEET 2D
RETAIN TEMPORARY WIDENING FROM L-MED- STA.195+93 TO STA. 196+45 AFTER COMPLETION OF DETOUR FOR PARCEL NO. 66 & 67 ACCESS
CLASS 'B' RIPRAP EST 18 TONS FILTER FABRIC EST 5.9 SM
+90.000(-L MED-) 26.840m (88.06')
+22.637(-L MED-) 26.840m (88.06') END FENCE +22(-L MED-)
MATCHLINE STA 195+00 SEE SHEET 32
SLOPE STAKE LINE
REMOVE 750 & REPLACE WITH 900
TEMPORARY 3.6m WIDENING
COLLAR TO EXIST. (PHASE I)
N 43° 35' 24.6" E
END PAVING STA. 195+80.000
NB TIE
N 49°10' 00.5" E
US 17 8.0 BST
-L MED-
600mm RCP
900mm RCP
300mm CMP
CLASS 'B' RIPRAP EST 45 TONS FILTER FABRIC EST 117 SM
CLASS 'B' RIPRAP EST 100 TONS FILTER FABRIC EST 234 SM
SPECIAL CUT DITCH SEE DETAIL 'A' ON SHEET 2D
END FENCE
ACCESS PT.
BEGIN FENCE
+58.957(-L MED-) 33.000m (108.27')
+22.637(-L MED-) 33.000m (108.27')
END FENCE +22(-L MED-)
(66)
EUGENE ADAMS
DB. 367, PG. 577
DB. 367, PG. 578
DB. 411, PG. 464
DB. 642, PG. 1044
(67)
RONNIE ADAMS
DB 421, PG 507
1000mm BK
800mm CONC
ISBKD
WD
WALL
(62)
WEYERHAEUSER TIMBERLANDS
DB. 200, PG. 287
MB. 2, PG. 26
DB. 197, PG. 479
RONNIE ADAMS
DB 755, PG 734
NB TIE
PIs Sta 196+49.003 Θs = 2° 26' 06.3" Ls = 85.000 LT = 56.672 ST = 28.338
PI Sta 196+83.496 Δ = 0° 42' 23.4" (RT) L = 12.331 T = 6.165 R = 1,000.000 SE = 0.02
PIs Sta 197+18.000 Θs = 2° 26' 06.3" Ls = 85.000 LT = 56.672 ST = 28.338
SEE SHEET NO. 2D FOR ALL DRIVEWAY DETAILS.
SEE SHEET NO. 2D FOR ALL DITCH DETAILS.
SEE SHEET NO. 63 FOR NBL & SBL GRADES AND PROFILES AND ALL DITCH GRADES AND PROFILES.
SEE SHEET NO. 64 FOR NB TIE GRADE AND PROFILE AND DITCH GRADE AND PROFILE.

PROJECT REFERENCE NO.	SHEET NO.
R-2514A	EC-35/CONST. 4
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

METRIC

CONST. REV.

R/W REV.

DATUM DESCRIPTION

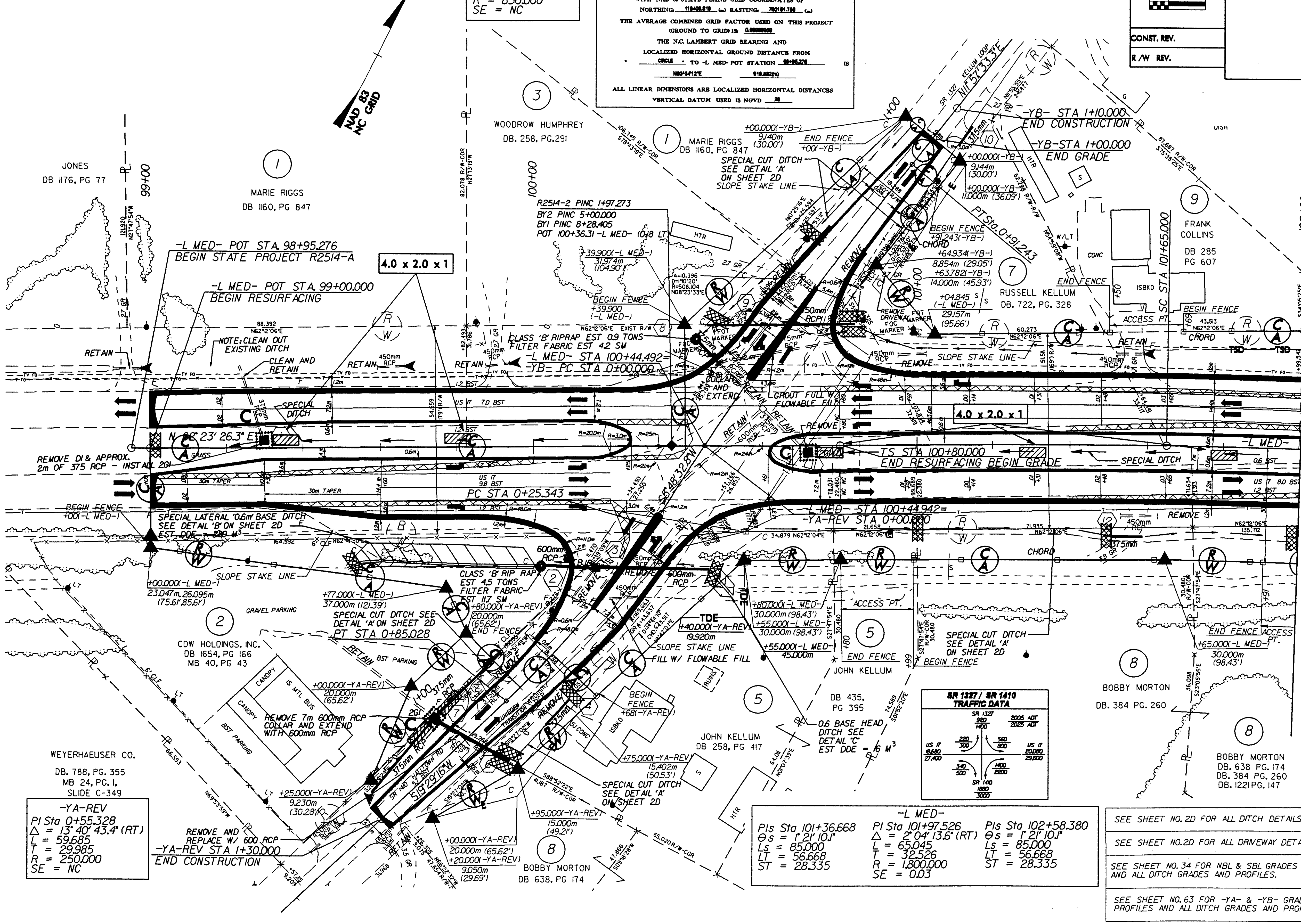
THE LOCALIZIZED COORDINATE SYSTEM DEVELOPED FOR THIS PROJECT IS BASED ON THE STATE PLANE COORDINATES ESTABLISHED BY NCGS FOR MONUMENT "CIRCLE" WITH NAD 83 STATE PLANE GRID COORDINATES OF NORTHING: [illegible] (m) EASTING: [illegible] (m)

THE AVERAGE COMBINED GRID FACTOR USED ON THIS PROJECT (GROUND TO GRID) IS: [illegible]

THE N.C. LAMBERT GRID BEARING AND LOCALIZED HORIZONTAL GROUND DISTANCE FROM "CIRCLE" TO -L MED- POT STATION [illegible] IS [illegible] [illegible](m)

ALL LINEAR DIMENSIONS ARE LOCALIZED HORIZONTAL DISTANCES

VERTICAL DATUM USED IS NGVD 29



-YA-REV
PI Sta 0+55.328
Δ = 13° 40' 43.4" (RT)
L = 59.685
T = 29.985
R = 250.000
SE = NC

-L MED-		
PIs Sta 101+36.668	PI Sta 101+97.526	PIs Sta 102+58.380
Θs = 1° 21' 10.1"	Δ = 2° 04' 13.6" (RT)	Θs = 1° 21' 10.1"
Ls = 85.000	L = 65.045	Ls = 85.000
LT = 56.668	T = 32.526	LT = 56.668
ST = 28.335	R = 1,800.000	ST = 28.335
	SE = 0.03	

SEE SHEET NO. 2D FOR ALL DITCH DETAILS.

SEE SHEET NO. 2D FOR ALL DRIVEWAY DETAILS.

SEE SHEET NO. 34 FOR NBL & SBL GRADES AND PROFILES AND ALL DITCH GRADES AND PROFILES.

SEE SHEET NO. 63 FOR -YA- & -YB- GRADES AND PROFILES AND ALL DITCH GRADES AND PROFILES.

METRIC	PROJECT REFERENCE NO.	SHEET NO.
5 0 10	R-2514A	EC-36/CONST. 5
	R /W SHEET NO.	
CONST. REV.	ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
R /W REV.		

MATCHLINE STA. 102+00 SEE SHEET 4

MATCHLINE 105+20 SEE SHEET 6

NAD 83 NC GRID

ISFD

ISMTLBUS

ISBKD

ISFBUS

11 JOSEPH MORTON, ET AL. DB.1294, PG. 971

13 FERDINARD DAMIANO DB 718, PG 317

14 W. R. WILLIS DB 1496, PG 279

16 DONALD MORTON DB 754, PG 591

8 BOBBY MORTON DB. 638 PG. 174 DB. 384 PG. 260 DB. 1221 PG. 147

12 WOODROW HUMPHREY DB 426, PG 154 DB 367, PG 76 DB 439, PG 502

15 BENJAMIN GIBSON DB 769, PG 871 DB 426, PG 147 DB 533, PG 662

17 PEGGY GIBSON DB 1097, PG 811

CS STA 102+30.045

ST STA 103+15.045

TS STA 103+25.045

SC STA 104+10.045

CS STA 104+81.025

PC STA 0+00.000 DET-1 7.90m LT

103+00

104+00

105+00

0+00

+32.489(-L MED-) 41.284m (135.45')

+42.565(-L MED-) 53.390m (175.16')

+67.500(-L MED-) 58.000m (190.29')

+67.573(-L MED-) 44.115m (144.73')

12m BASE TAIL DITCH CLEANOUT 44m @ 0.00% SEE DETAIL 'A' ON SHEET 2D EXCAVATION = 45 M³

+30.045(-L MED-) 30.000m (98.43')

+25.045(-L MED-) 30.000m (98.43')

+15.045(-L MED-) 30.000m (98.43')

+10.045(-L MED-) 30.000m (98.43')

+81.025(-L MED-) 30.000m (98.43')

-L MED-

PIs Sta 103+81.713	PI Sta 104+45.539	PIs Sta 105+09.359
Θs = 1° 21' 10.1"	Δ = 2° 15' 33.7" (LT)	Θs = 1° 21' 10.1"
Ls = 85.000	L = 70.980	Ls = 85.000
LT = 56.668	T = 35.495	LT = 56.668
ST = 28.335	R = 1,800.000	ST = 28.335
	SE = 0.03	

DET-1

PI Sta 0+41.90
Δ = 3° 08' 45.3" (RT)
L = 82.360
T = 41.190
R = 1,500.000
SE = 0.02

5.0 x 2.0 x 1

6.0 x 2.0 x 1 1.5 weir

SPECIAL CUT DITCH SEE DETAIL 'A' ON SHEET 2D

CLASS 'B' RIPRAP EST 4.5 TONS FILTER FABRIC EST 117 SM

INSTALL TEE WITH 300mm OPEN END REMOVE AS CONSTRUCTION PHASING ALLOWS

REMOVE AND REPLACE WITH 450mm RCP

300mm TEMPORARY CROSS PIPE GROUT FULL WITH FLOWABLE FILL AS CONSTRUCTION PHASING ALLOWS

SLOPE STAKE LINE

BEGIN FENCE

END FENCE

ACCESS PT.

SEE SHEET NO. 2D FOR ALL DITCH DETAILS.

SEE SHEET NO. 2D FOR ALL DRIVEWAY DETAILS.

SEE SHEET NO. 35 FOR NBL & SBL GRADES AND PROFILES AND ALL DITCH GRADES AND PROFILES.

METRIC	PROJECT REFERENCE NO.	SHEET NO.
5 0 10	R-2514A	EC-37/CONST. 6
	R/W SHEET NO.	
CONST. REV.	ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
R/W REV.		

MATCHLINE 105+20 SEE SHEET 5

MATCHLINE STA. 108+40 SEE SHEET 7

NAD 83 NC GRID

DONALD MORTON
DB 754, PG 591

DONALD MORTON
DB 374, PG 243

AMELIA PARKER
DB. 1911, PG. 805

MARCIA HUMPHREY
DB. 88, PG. 120

WILBUR PARKER
DB 807, PG 200

ROBERT SPENCER
DB 1306, PG 819

PEGGY GIBSON
DB 1097, PG 311

BENJAMIN GIBSON
DB 533, PG 662
DB 426, PG 147
DB 769, PG 871

MARCIA HUMPHREY
DB 88, PG 120

MARCIA HUMPHREY
DB 541, PG 713

ESTERLENE DIXON
DB 1629 PG 751

RETHA EDWARDS
DB 954, PG 235
TRACT 1

DEWEY LORRAINE POWERS
DB 1046, PG 96

PT STA 0+82.360 DET-1

PT STA 105+66.025

PT STA 106+00.031

PC STA 1+64.543 DET-1

PT STA 3+00.585 DET-1 1060m RT

TEMPORARY 450 PIPE TO BE REMOVED UPON COMPLETION AND REMOVAL OF DETOUR

NOTE: TEMPORARY GRADE TO DRAIN TOWARDS 2GI @ STA. 107+50 DURING DETOUR

CLASS 'B' RIPRAP EST 6.4 TONS FILTER FABRIC EST 18.4 SM

CLASS 'B' RIPRAP EST 27 TONS FILTER FABRIC EST 9.2 SM

SPECIAL CUT DITCH SEE DETAIL 'A' ON SHEET 2D

REPLACE 600mm RCP WITH 600mm RCP

COLLAR TO EXIST. (PHASE I)

JB - CONVERT TO 2GI AFTER REMOVAL OF -DET1-

SLOPE STAKE LINE

+15.913(-L WED-) 50.920m (167.06')

+66.025(-L WED-) 30.000m (98.43')

+00.031(-L WED-) 30.000m (98.45')

END CL FENCE BEGIN NW FENCE +00 -LWED-

5.0 x 2.0 x 1

4.0 x 2.0 x 1

5.0 x 2.0 x 1 1.5 weir

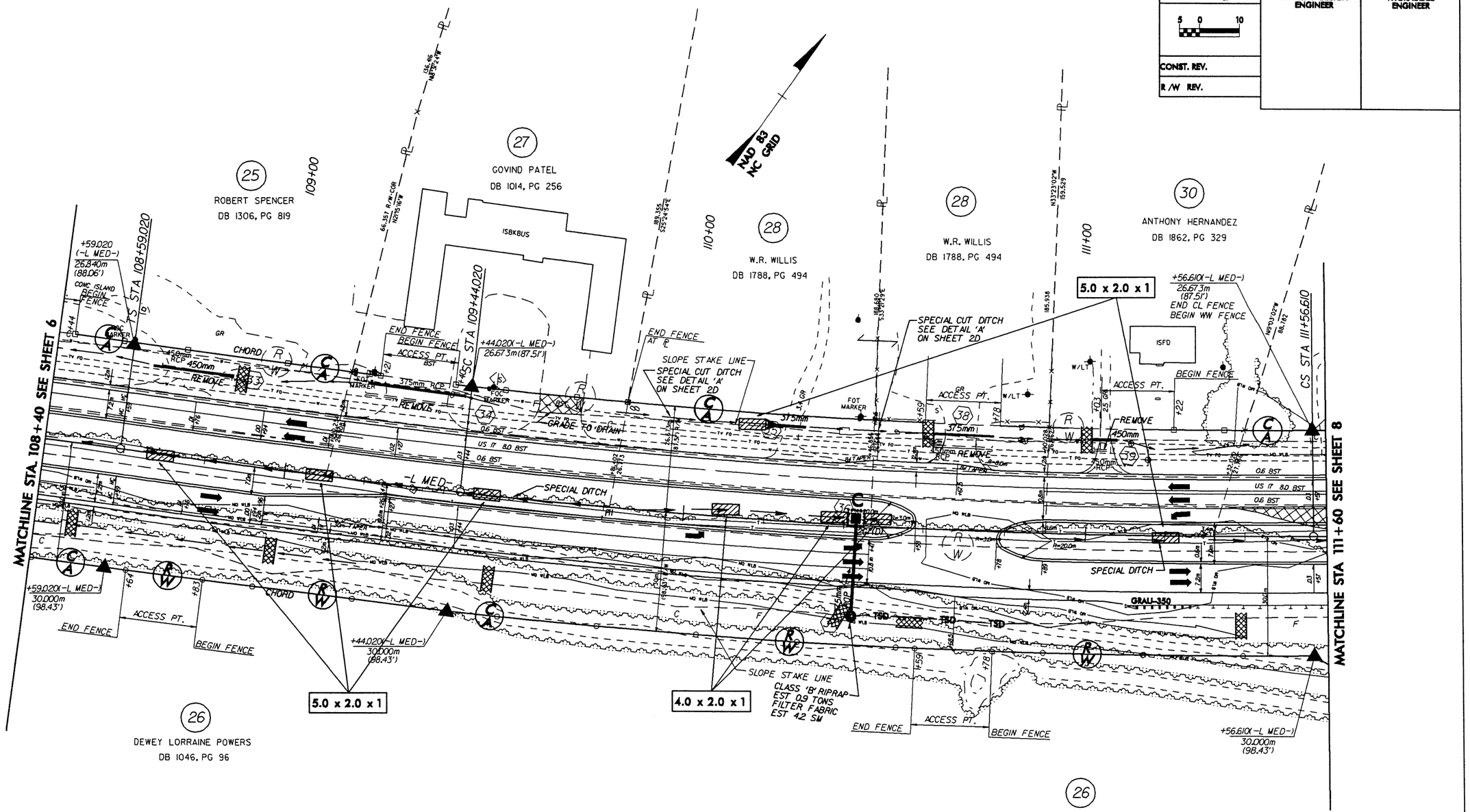
DET-1
PI Sta 2+32.611
Δ = 5° 11' 47.1" (LT)
L = 136.042
T = 68.068
R = 1,500.000
SE = 0.02

SEE SHEET NO. 2D FOR ALL DITCH DETAILS.

SEE SHEET NO. 2D FOR ALL DRIVEWAY DETAILS.

SEE SHEET NO. 36 FOR NBL & SBL GRADES AND PROFILES AND ALL DITCH GRADES AND PROFILES.

METRIC	PROJECT REFERENCE NO.	SHEET NO.
5 0 10	R-2514A	EC-38/CONST. 7
CONST. REV.	R /W SHEET NO.	
R /W REV.	ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

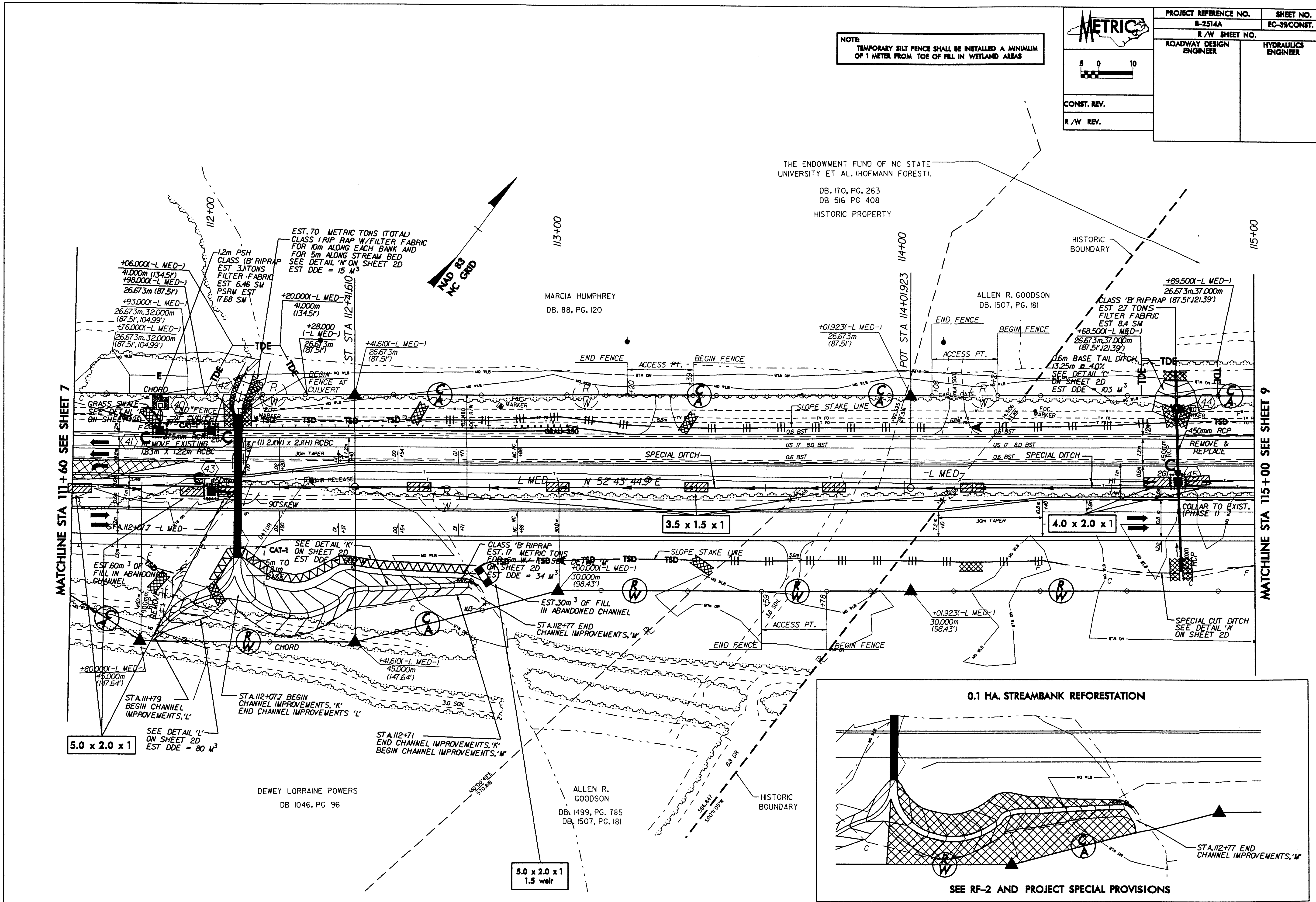


-L MED-		
Pls Sta 109+15.688	Pl Sta 110+50.439	Pls Sta 111+84.945
Θs = 1° 21' 10.1"	△ = 6° 46' 01.0" (LT)	Θs = 1° 21' 10.1"
Ls = 85.000	L = 212.590	Ls = 85.000
LT = 56.668	T = 106.419	LT = 56.668
ST = 28.335	R = 1,800.000	ST = 28.335
	SE = 0.03	

SEE SHEET NO. 2D FOR ALL DRIVEWAY DETAILS.

SEE SHEET NO. 2D FOR ALL DITCH DETAILS.

SEE SHEET NO. 3T FOR NBL & SBL GRADES AND PROFILES AND ALL DITCH GRADES AND PROFILES.


PROJECT REFERENCE NO.
R-2514A
SHEET NO.
EC-39/CONST. 8
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
METRIC
CONST. REV.
R/W REV.
NOTE:
TEMPORARY SILT FENCE SHALL BE INSTALLED A MINIMUM OF 1 METER FROM TOE OF FILL IN WETLAND AREAS
THE ENDOWMENT FUND OF NC STATE UNIVERSITY ET AL. (HOFMANN FOREST).
DB. 170, PG. 263
DB 516 PG 408
HISTORIC PROPERTY
HISTORIC BOUNDARY
MARCIA HUMPHREY
DB. 88, PG. 120
ALLEN R. GOODSON
DB. 1507, PG. 181
NAD 83 NC GRID
MATCHLINE STA 111+60 SEE SHEET 7
MATCHLINE STA 115+00 SEE SHEET 9
112+00
113+00
114+00
115+00
EST. 70 METRIC TONS (TOTAL) CLASS I RIP RAP W/FILTER FABRIC FOR 10m ALONG EACH BANK AND FOR 5m ALONG STREAM BED SEE DETAIL 'N' ON SHEET 2D EST DDE = 15 M³
1.2m PSH CLASS 'B' RIPRAP EST 3.1 TONS FILTER FABRIC EST 6.46 SM PSRM EST 17.68 SM
+06.000(-L MED-) 41.000m (134.51')
+98.000(-L MED-) 26.673m (87.51')
+93.000(-L MED-) 26.673m, 32.000m (87.51', 104.99')
+76.000(-L MED-) 26.673m, 32.000m (87.51', 104.99')
+20.000(-L MED-) 41.000m (134.51')
+28.000 (-L MED-) 26.673m (87.51')
+41.610(-L MED-) 26.673m (87.51')
ST STA 112+41.610
POT STA 114+01.923
+01.923(-L MED-) 26.673m (87.51')
END FENCE
ACCESS PT.
BEGIN FENCE
BEGIN FENCE AT CULVERT
END FENCE AT CULVERT
GRASS SWALE SEE DETAIL 'E' ON SHEET 2D
CHORD
REMOVE EXISTING 1.83m X 1.22m RCBC
(1) 2.1(W) x 2.1(H) RCBC
90° SKEW
STA 112+07.7 -L MED-
SLOPE STAKE LINE
US 17 8.0 BST
0.6 BST
SPECIAL DITCH
-L MED-
N 52°43'44.9" E
3.5 x 1.5 x 1
4.0 x 2.0 x 1
30m TAPER
CLASS 'B' RIPRAP (87.51', 121.39') EST 27 TONS FILTER FABRIC EST 8.4 SM
+89.500(-L MED-) 26.673m, 37.000m
+68.500(-L MED-) 26.673m, 37.000m (87.51', 121.39')
0.6m BASE TAIL DITCH 13.25m @ 4.0% SEE DETAIL 'C' ON SHEET 2D EST DDE = 103 M³
450mm RCP
REMOVE & REPLACE
COLLAR TO EXIST. (PHASE I)
SPECIAL CUT DITCH SEE DETAIL 'A' ON SHEET 2D
SEE DETAIL 'K' ON SHEET 2D EST DDE
CAT-1
CLASS 'B' RIPRAP EST. 17 METRIC TONS FOR 6m W/ ... SEE DETAIL 'M' ON SHEET 2D EST DDE = 34 M³
+00.000(-L MED-) 30.000m (98.43')
EST 30m³ OF FILL IN ABANDONED CHANNEL
STA 112+77 END CHANNEL IMPROVEMENTS 'M'
+01.923(-L MED-) 30.000m (98.43')
EST 60m³ OF FILL IN ABANDONED CHANNEL
+80.000(-L MED-) 45.000m (147.64')
+41.610(-L MED-) 45.000m (147.64')
STA 111+79 BEGIN CHANNEL IMPROVEMENTS 'L'
STA 112+07.7 BEGIN CHANNEL IMPROVEMENTS 'K' END CHANNEL IMPROVEMENTS 'L'
SEE DETAIL 'L' ON SHEET 2D EST DDE = 80 M³
STA 112+71 END CHANNEL IMPROVEMENTS 'K' BEGIN CHANNEL IMPROVEMENTS 'M'
5.0 x 2.0 x 1
5.0 x 2.0 x 1 1.5 weir
DEWEY LORRAINE POWERS
DB 1046, PG 96
ALLEN R. GOODSON
DB 1499, PG. 785
DB 1507, PG. 181
HISTORIC BOUNDARY
0.1 HA. STREAMBANK REFORESTATION
STA 112+77 END CHANNEL IMPROVEMENTS 'M'
SEE RF-2 AND PROJECT SPECIAL PROVISIONS

PROJECT REFERENCE NO.	SHEET NO.
R-2514A	EC-40CONST. 9
R /W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

METRIC

5 0 10

CONST. REV.

R /W REV.

NOTE:
TEMPORARY SILT FENCE SHALL BE INSTALLED A MINIMUM OF 1 METER FROM TOE OF FILL IN WETLAND AREAS

32

THE ENDOWMENT FUND OF NC STATE UNIVERSITY ET AL. (HOFMANN FOREST).

DB. 170, PG. 263
DB 516 PG 408

HISTORIC PROPERTY

ISFD

NAD 83 NC GRID

116+00 117+00 118+00

MATCHLINE STA 115+00 SEE SHEET 8

MATCHLINE STA 118+40 SEE SHEET 10

BEGIN FENCE

END FENCE

ACCESS PT.

RETAIN

GATE

600mm RCP

FOC MARKER

SLOPE STAKE LINE

+40.000(-L MED-)
26.673m
(87.51')

US 17 BD BST

Q6 BST

SPECIAL DITCH

N 52° 43' 44.9" E

L MED

5.0 x 2.0 x 1

4.0 x 2.0 x 1

SLOPE STAKE LINE

+40.000(-L MED-)
30.000m
(98.43')

SPECIAL CUT DITCH
SEE DETAIL 'A'
ON SHEET 2D

SOIL

SEE SHEET NO. 2D FOR ALL DRIVEWAY DETAILS.

SEE SHEET NO. 2D FOR ALL DITCH DETAILS.

SEE SHEET NO. 39 FOR NBL & SBL GRADES AND PROFILES AND ALL DITCH GRADES AND PROFILES.

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THE ENDOWMENT FUND OF NC STATE UNIVERSITY ET AL. (HOFMANN FOREST).

DB. 170, PG. 263
DB 516 PG 408

HISTORIC PROPERTY

NOTE:
TEMPORARY SILT FENCE SHALL BE INSTALLED A MINIMUM OF 1 METER FROM TOE OF FILL IN WETLAND AREAS

METRIC
5 0 10

PROJECT REFERENCE NO.	SHEET NO.
R-2514A	EC-4/CONST. 10
R /W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

CONST. REV.

R /W REV.

(32)

THE ENDOWMENT FUND OF NC STATE
UNIVERSITY ET AL. (HOFMANN FOREST).

DB. 170, PG. 263
DB 516 PG 408

HISTORIC PROPERTY

NAD 83
NC GRID

119+00 120+00 121+00

MATCHLINE STA 118+40 SEE SHEET 9

MATCHLINE STA 121+80 SEE SHEET 11

+48.500(-L MED-)
26.673m,36.000m
(87.5'J18J1')

1.2m BASE TAIL DITCH
9.5m @ 3.05%
SEE DETAIL 'D'
ON SHEET 2D
EST DDE = 50 M³

CLASS 'B' RIPRAP
EST 7.3 TONS
FILTER FABRIC
EST 17.6 SM

+40.000(-L MED-)
26.67.3m
(87.5')

+66.000(-L MED-)
26.673m,36.000m
(87.5'J18J1')

2.9 GR

12.00m RCP RETAINING WALL

TDE

SLOPE STAKE LINE

FO MARKER

30.48m (100') R/W

750mm RCP REMOVE & REPLACE

(46)

COLLAR TO EXIST. (PHASE 1)

(47)

N 52° 43' 44.9" E

-L MED-

36'

SPECIAL DITCH

SLOPE STAKE LINE

+40.000(-L MED-)
30.000m
(98.43')

SPECIAL CUT DITCH
SEE DETAIL 'A'
ON SHEET 2D

SPECIAL CUT DITCH
SEE DETAIL 'A'
ON SHEET 2D

NO WLB

STA ON

SOIL

TSD

0.6 BST

US 17 8.0 BST

5.0 x 2.0 x 1

5.0 x 2.0 x 1

4.0 x 2.0 x 1

(32)

THE ENDOWMENT FUND OF NC STATE
UNIVERSITY ET AL. (HOFMANN FOREST).

DB. 170, PG. 263
DB 516 PG 408

HISTORIC PROPERTY

SEE SHEET NO. 2D FOR ALL DRIVEWAY DETAILS.

SEE SHEET NO. 2D FOR ALL DITCH DETAILS.

SEE SHEET NO. 40 FOR NBL & SBL GRADES AND PROFILES AND ALL DITCH GRADES AND PROFILES.

METRIC	PROJECT REFERENCE NO.	SHEET NO.
5 0 10	R-2514A	EC-42/CONST. 11
	R/W SHEET NO.	
CONST. REV.	ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
R/W REV.		

NAD 83
NC GRID

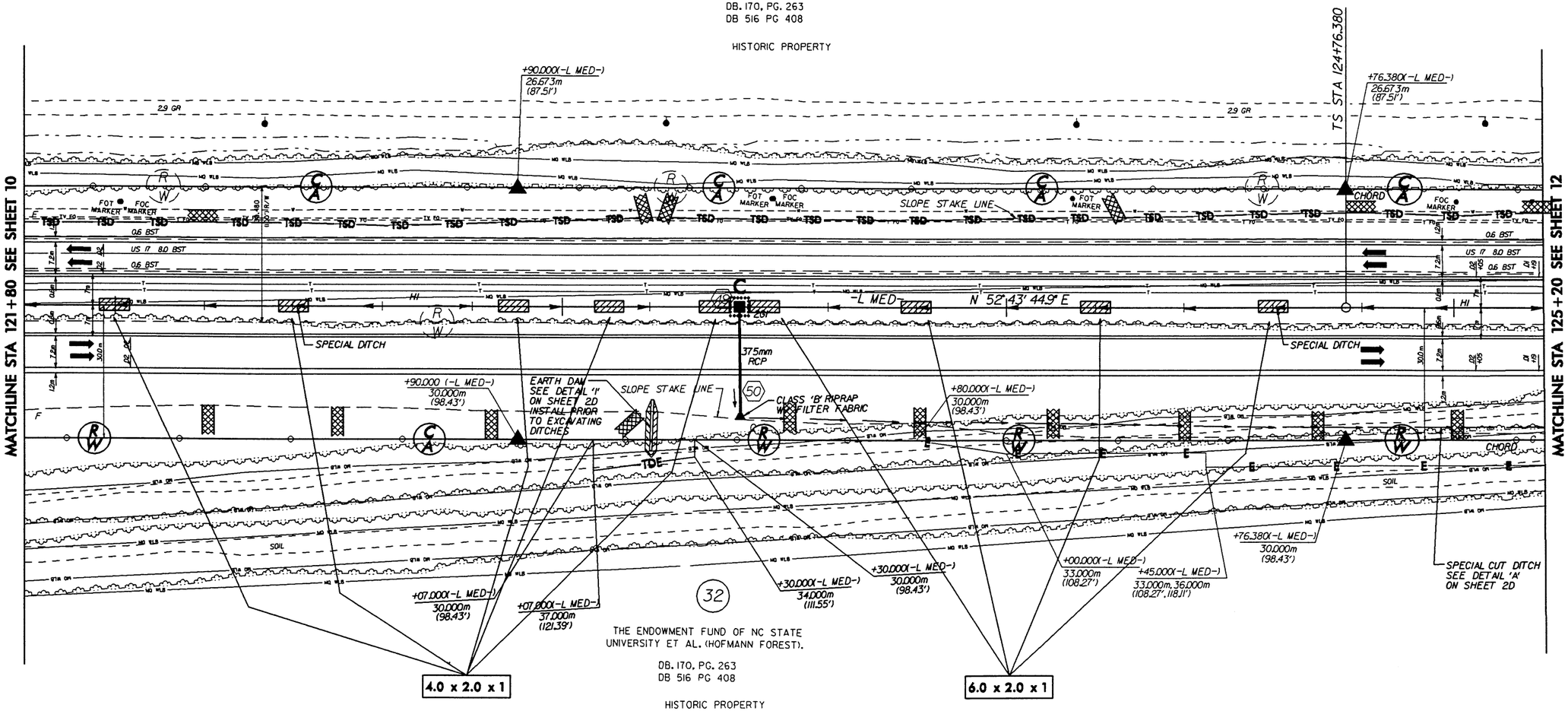
122+00 123+00 124+00 125+00

32

THE ENDOWMENT FUND OF NC STATE UNIVERSITY ET AL. (HOFMANN FOREST).

DB. 170, PG. 263
DB 516 PG 408

HISTORIC PROPERTY



32

THE ENDOWMENT FUND OF NC STATE UNIVERSITY ET AL. (HOFMANN FOREST).

DB. 170, PG. 263
DB 516 PG 408

HISTORIC PROPERTY

-L MED-

PIs Sta 125+33.047	PI Sta 125+87.295	PIs Sta 126+41.543
$\Theta s = 1°06'24.7"$	$\Delta = 1°20'59.3"$ (LT)	$\Theta s = 1°06'24.7"$
Ls = 85.000	L = 51.829	Ls = 85.000
LT = 56.668	T = 25.915	LT = 56.668
ST = 28.334	R = 2,200.000	ST = 28.334
	SE = 0.02	

SEE SHEET NO. 2D FOR ALL DRIVEWAY DETAILS.

SEE SHEET NO. 2D FOR ALL DITCH DETAILS.

SEE SHEET NO. 41 FOR NBL & SBL GRADES AND PROFILES AND ALL DITCH GRADES AND PROFILES.

PROJECT REFERENCE NO.	SHEET NO.
R-2514A	EC-43 CONST. 12
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

METRIC

5 0 10

CONST. REV.

R/W REV.

NOTE:
TEMPORARY SILT FENCE SHALL BE INSTALLED A MINIMUM OF 1 METER FROM TOE OF FILL IN WETLAND AREAS

NAD 83 NC GRID

(32)

THE ENDOWMENT FUND OF NC STATE UNIVERSITY ET AL. (HOFMANN FOREST).

DB. 170, PG. 263
DB 516 PG 408

HISTORIC PROPERTY

MATCHLINE STA 125+20 SEE SHEET 11

MATCHLINE STA 128+60 SEE SHEET 13

126+00 | 127+00 | 128+00

SC STA 125+61.380 | CS STA 126+13.208 | ST STA 126+98.208

+61.38(-L MED-) 26.673m (87.5')

+58.000(-L MED-) 26.673m,38.000m (87.5',124.67')

+79.500(-L MED-) 26.673m,38.000m (87.5',124.67')

+13.208(-L MED-) 26.673m (87.5')

+98.208(-L MED-) 26.673m (87.5')

0.6m BASE TAIL DITCH 15m @ 2.0% SEE DETAIL 'C' ON SHEET 2D EST DDE = 11 M³

CLASS 'B' RIPRAP EST 73 TONS FILTER FABRIC EST 17.6 SM

600mm CMP RETAIN

END FENCE

BEGIN FENCE

ACCESS PT.

SLOPE STAKE LINE

SPECIAL DITCH

N 49° 09' 56.3" E

SPECIAL CUT DITCH SEE DETAIL 'A' ON SHEET 2D

+61.380(-L MED-) 30.000m (98.43')

+75.000(-L MED-) 30.000m, 36.000m (98.43', 108.26')

+13.208(-L MED-) 30.000m (98.43')

+98.208(-L MED-) 30.000m (98.43')

+01.000(-L MED-) 30.000m, 31.00m (98.42', 101.71')

+18.000(-L MED-) 30.000m, 31.00m (98.42', 101.71')

1.2m PSH CLASS 'B' RIPRAP EST 3.1 TONS FILTER FABRIC EST 6.46 SM PSRM EST 17.88 SM

5.0 x 2.0 x 1 | **5.0 x 2.0 x 1** | **5.0 x 2.0 x 1** | **4.0 x 2.0 x 1**

-L MED-

PIs Sta 125+33.047	PI Sta 125+87.295	PIs Sta 126+41.543
Θs = 1° 06' 24.7"	Δ = 1° 20' 59.3" (LT)	Θs = 1° 06' 24.7"
Ls = 85.000	L = 51.829	Ls = 85.000
LT = 56.668	T = 25.915	LT = 56.668
ST = 28.334	R = 2,200.000	ST = 28.334
	SE = 0.02	

(32)

THE ENDOWMENT FUND OF NC STATE UNIVERSITY ET AL. (HOFMANN FOREST).

DB. 170, PG. 263
DB 516 PG 408

HISTORIC PROPERTY

SEE SHEET NO. 2D FOR ALL DRIVEWAY DETAILS.

SEE SHEET NO. 2D FOR ALL DITCH DETAILS.

SEE SHEET NO. 42 FOR NBL & SBL GRADES AND PROFILES AND ALL DITCH GRADES AND PROFILES.

METRIC	PROJECT REFERENCE NO.	SHEET NO.
5 0 10	R-2514A	EC-44CONST. 13
	R /W SHEET NO.	
CONST. REV.	ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
R /W REV.		

NAD 83
NC GRID

32

THE ENDOWMENT FUND OF NC STATE
UNIVERSITY ET AL. (HOFMANN FOREST).

DB. 170, PG. 263
DB 516 PG 408

HISTORIC PROPERTY

129+00 | 130+00 | 131+00 | 132+00

POT STA 129+02.638

+02.638(-L MED-)
26.673m
(87.51')

MATCHLINE STA 128+60 SEE SHEET 12

MATCHLINE STA 132+00 SEE SHEET 14

29 GR

FOC MARKER

SLOPE STAKE LINE

TSD 06 BST US 17 80 BST 06 BST

30m TAPER

N 49°09'56.3"E

SPECIAL DITCH

375mm RCP

-L MED- HI

47 SOIL

CLASS 'B' RIPRAP
EST 0.9 TONS
FILTER FABRIC
EST 4.2 SM

+02.638(-L MED-)
30.000m
(98.43')

+40.000(-L MED-)
30.000m
(98.43')

+60.000(-L MED-)
33.000m
(108.27')

SPECIAL CUT DITCH
SEE DETAIL 'A'
ON SHEET 2D

6.0 x 2.0 x 1

6.0 x 2.0 x 1

32

THE ENDOWMENT FUND OF NC STATE
UNIVERSITY ET AL. (HOFMANN FOREST).

DB. 170, PG. 263
DB 516 PG 408

HISTORIC PROPERTY

SEE SHEET NO. 2D FOR ALL DRIVEWAY DETAILS.

SEE SHEET NO. 2D FOR ALL DITCH DETAILS.

SEE SHEET NO. 43 FOR NBL & SBL GRADES AND PROFILES AND ALL DITCH GRADES AND PROFILES.

METRIC	PROJECT REFERENCE NO.	SHEET NO.
5 0 10	R-2514A	EC-45CONST. 14
	R /W SHEET NO.	
CONST. REV.	ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
R /W REV.		

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THE ENDOWMENT FUND OF NC STATE UNIVERSITY ET AL. (HOFMANN FOREST).

DB. 170, PG. 263
DB 516 PG 408

HISTORIC PROPERTY

NAD 83 NC GRID

132+00 | 133+00 | 134+00 | 135+00

MATCHLINE STA 132+00 SEE SHEET 13

MATCHLINE STA 135+20 SEE SHEET 15

0.9m BASE TAIL DITCH
9.0m @ 0.22%
SEE DETAIL 'E'
ON SHEET 2D
EST DDE = 20 M³

CLASS 'B' RIPRAP
EST 100 TONS
FILTER FABRIC
EST 23.4 SM

+47.750(-L MED-)
26.673m 36.500m
(87.51' 119.75')

+64.000(-L MED-)
26.673m 36.500m
(87.51' 119.75')

+40.000(-L MED-)
26.673m
(87.51')

TDE

TDE

FOC MARKER

SLOPE STAKE LINE

FOC MARKER

FOT MARKER

29 GR

06 BST

US IT 80 BST

06 BST

COLLAR TO EXIST. 900mm (PHASE I) RCP

REMOVE AND REPLACE

SPECIAL DITCH

-L MED- HI

AIR RELEASE

N 49° 09' 56.3" E

900mm RCP

REMOVE

HEAD WALL

SPECIAL CUT DITCH
SEE DETAIL 'A'
ON SHEET 2D

+60.000(-L MED-)
35.000m
(114.83')

+40.000(-L MED-)
30.000m
(98.43')

SLOPE STAKE LINE

SPECIAL CUT DITCH
SEE DETAIL 'A'
ON SHEET 2D

+20.000(-L MED-)
30.000m (98.43')

SPECIAL CUT DITCH
SEE DETAIL 'A'
ON SHEET 2D

6.0 x 2.0 x 1

6.0 x 2.0 x 1

6.0 x 2.0 x 1

0.9m BASE HEAD DITCH
3.9m @ 0.89%
SEE DETAIL 'E'
ON SHEET 2D
EST DDE = 5 M³

32

THE ENDOWMENT FUND OF NC STATE UNIVERSITY ET AL. (HOFMANN FOREST).

DB. 170, PG. 263
DB 516 PG 408

HISTORIC PROPERTY

SEE SHEET NO. 2D FOR ALL DRIVEWAY DETAILS.

SEE SHEET NO. 2D FOR ALL DITCH DETAILS.

SEE SHEET NO. 44 FOR NBL & SBL GRADES AND PROFILES AND ALL DITCH GRADES AND PROFILES

METRIC	PROJECT REFERENCE NO.	SHEET NO.
5 0 10	R-2514A	EC-46CONST. 15
	R /W SHEET NO.	
CONST. REV.	ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
R /W REV.		

NAD 83
NC GRID

32

THE ENDOWMENT FUND OF NC STATE
UNIVERSITY ET AL. (HOFMANN FOREST).

DB. 170, PG. 263
DB 516 PG 408

HISTORIC PROPERTY

136+00

137+00

138+00

0.6m BASE TAIL DITCH
12.25m @ 2.77%
SEE DETAIL 'C'
ON SHEET 2D
EST DDE = 41 M³

NOTE: TAIL DITCH NEEDS CLEANING OUT

CLASS 'B' RIPRAP
EST 4.5 TONS
FILTER FABRIC
EST 117 SM

+15.000(-L MED-)
26.673m,39.000m
(87.5',127.95')

+99.500(-L MED-
26.673m,39.000m
(87.5',127.95')

+90.000(-L MED-)
26.673m
(87.5')

SOIL

600mm RETAIN

TDE

SLOPE STAKE LINE

FOC MARKER

REMOVE & REPLACE 600mm RCP COLLAR TO EXIST. (PHASE 1)

SPECIAL DITCH

375mm RCP

26(10)

N 49° 09' 56.3" E -L MED-

30m TAPER

SPECIAL CUT DITCH
SEE DETAIL 'A'
ON SHEET 2D

+80.000(-L MED-
30.000m
(98.43')

6.0 x 2.0 x 1

4.0 x 2.0 x 1

6.0 x 2.0 x 1

4.0 x 2.0 x 1

5.0 x 2.0 x 1

5.0 x 2.0 x 1

MATCHLINE STA 135+20 SEE SHEET 14

MATCHLINE STA 138+40 SEE SHEET 16

32

THE ENDOWMENT FUND OF NC STATE
UNIVERSITY ET AL. (HOFMANN FOREST).

DB. 170, PG. 263
DB 516 PG 408

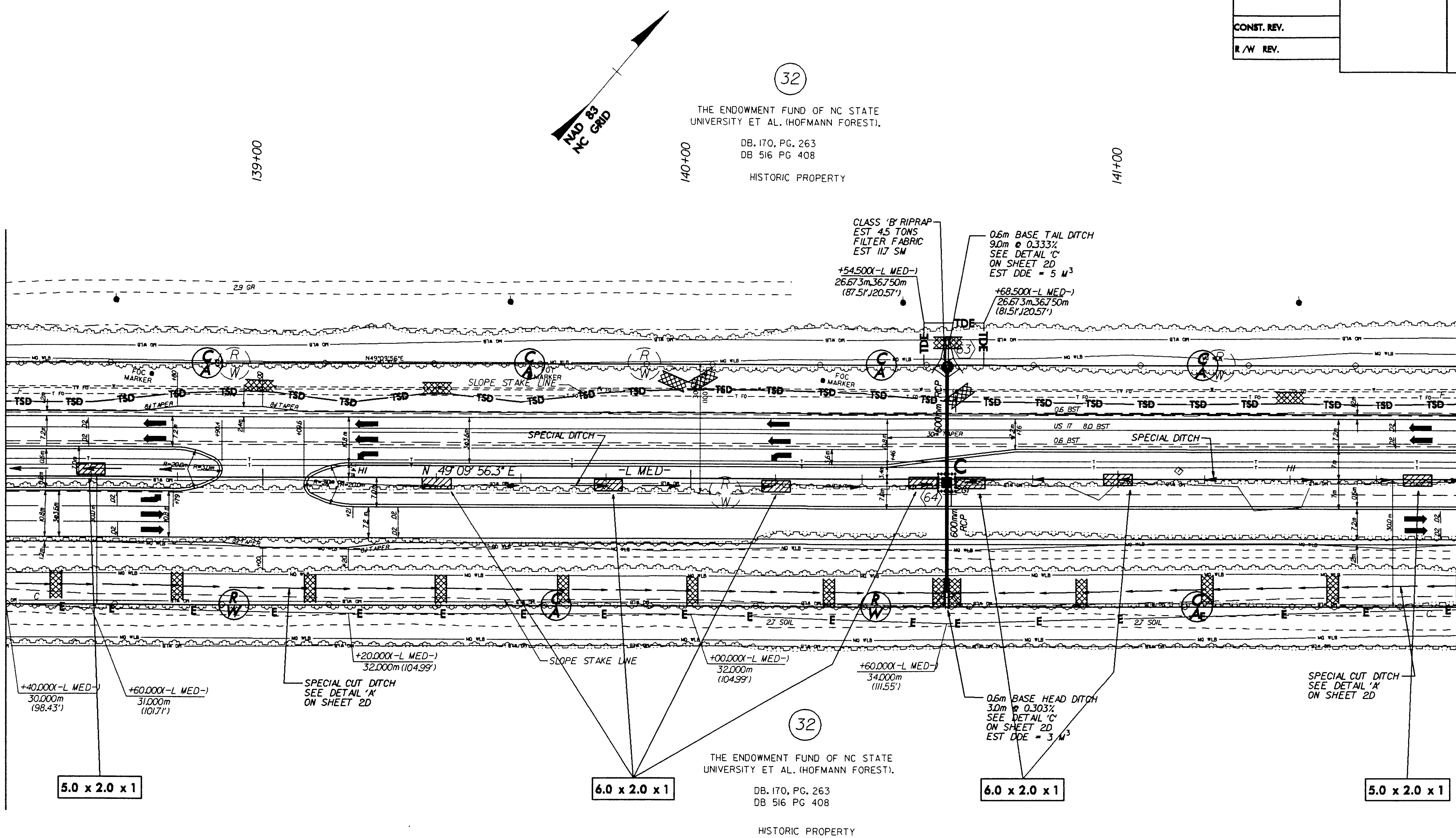
HISTORIC PROPERTY

SEE SHEET NO. 2D FOR ALL DRIVEWAY DETAILS.

SEE SHEET NO. 2D FOR ALL DITCH DETAILS.

SEE SHEET NO. 45 FOR NBL & SBL GRADES AND PROFILES AND ALL DITCH GRADES AND PROFILES.

METRIC	PROJECT REFERENCE NO.	SHEET NO.
	R-2514A	EC-47/CONST. 16
	R/W SHEET NO.	
5 0 10	ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
CONST. REV.		
R/W REV.		



SEE SHEET NO. 2D FOR ALL DRIVEWAY DETAILS.

SEE SHEET NO. 2D FOR ALL DITCH DETAILS.

SEE SHEET NO. 46 FOR NBL & SBL GRADES AND PROFILES AND ALL DITCH GRADES AND PROFILES.

METRIC	PROJECT REFERENCE NO.	SHEET NO.
5 0 10	R-2514A	EC-48/CONST. 17
	R /W SHEET NO.	
CONST. REV.	ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
R /W REV.		

32

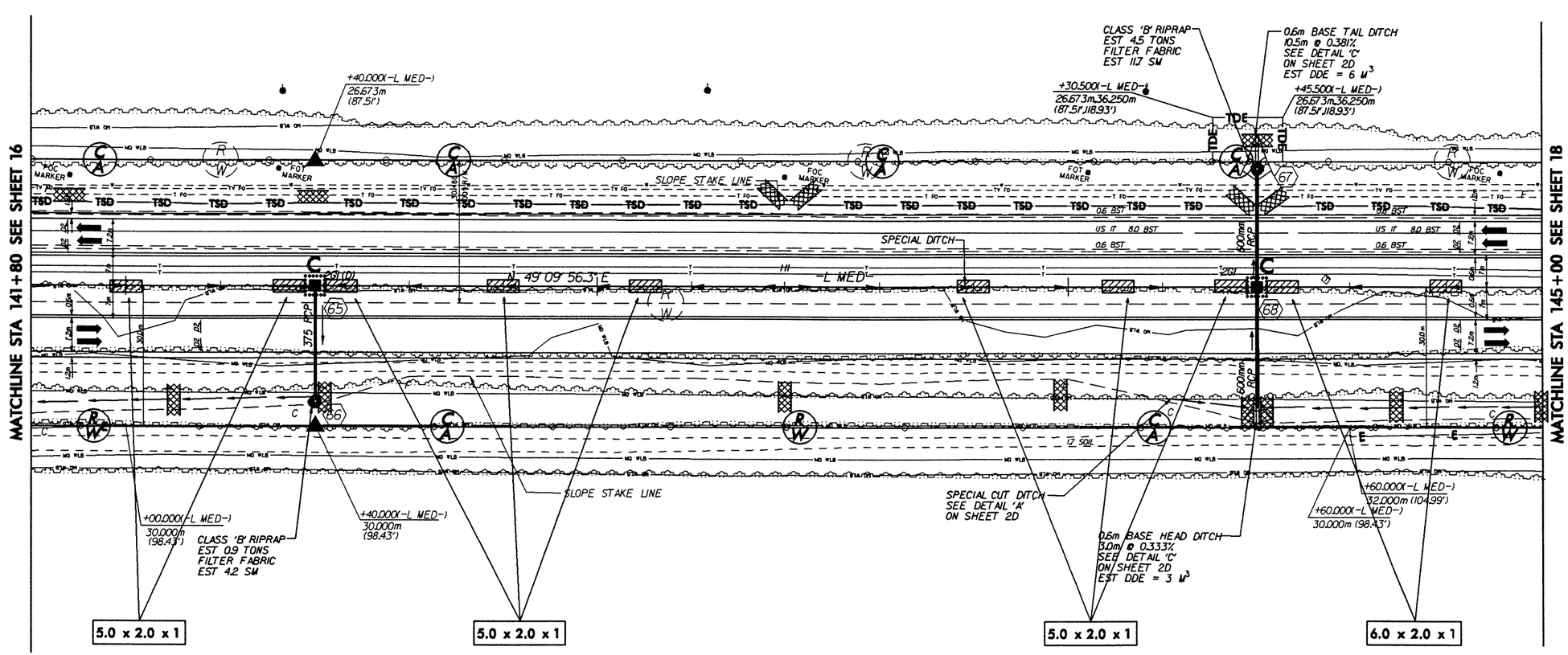
THE ENDOWMENT FUND OF NC STATE UNIVERSITY ET AL. (HOFMANN FOREST).

DB. 170, PG. 263
DB 516 PG 408

HISTORIC PROPERTY

142+00 143+00 144+00 145+00

NAD 83 NC GRID



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THE ENDOWMENT FUND OF NC STATE UNIVERSITY ET AL. (HOFMANN FOREST).

DB. 170, PG. 263
DB 516 PG 408

HISTORIC PROPERTY

SEE SHEET NO. 2D FOR ALL DRIVEWAY DETAILS.

SEE SHEET NO. 2D FOR ALL DITCH DETAILS.

SEE SHEET NO. 47 FOR NBL & SBL GRADES AND PROFILES AND ALL DITCH GRADES AND PROFILES.

METRIC	PROJECT REFERENCE NO.	SHEET NO.
5 0 10	R-2514A	EC-49/CONST. 18
CONST. REV.	R /W SHEET NO.	
R /W REV.	ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

NAD 83 NC GRID

32

THE ENDOWMENT FUND OF NC STATE UNIVERSITY ET AL. (HOFMANN FOREST).

DB. 170, PG. 263
DB 516 PG 408

HISTORIC PROPERTY

145+00

146+00

147+00

148+00

MATCHLINE STA 145+00 SEE SHEET 17

MATCHLINE STA 148+20 SEE SHEET 19

END FENCE

RET AIN 450mm RCP

ACCESS PT.

BEGIN FENCE

RET AIN 450mm RCP

RET AIN 450mm RCP

RET AIN 450mm RCP

+90.000(-L MED-)
26.673m
(87.51')

SLOPE STAKE LINE

SPECIAL DITCH

SPECIAL DITCH

-L MED-

30m TAPER

-50.000(-L MED-)
30.000m (98.43')

SPECIAL CUT DITCH
SEE DETAIL 'A'
ON SHEET 2D

CLASS 'B' RIPRAP
EST 0.9 TONS
FILTER FABRIC
EST 4.2 SM

SLOPE STAKE LINE

+90.000(-L MED-)
30.000m
(98.43')

32

THE ENDOWMENT FUND OF NC STATE UNIVERSITY ET AL. (HOFMANN FOREST).

DB. 170, PG. 263
DB 516 PG 408

HISTORIC PROPERTY

5.0 x 2.0 x 1

5.0 x 2.0 x 1

5.0 x 2.0 x 1

SEE SHEET NO. 2D FOR ALL DRIVEWAY DETAILS.

SEE SHEET NO. 2D FOR ALL DITCH DETAILS.

SEE SHEET NO. 48 FOR NBL & SBL GRADES AND PROFILES AND ALL DITCH GRADES AND PROFILES.

PROJECT REFERENCE NO.	SHEET NO.
R-2514A	EC-50CONST. 19
R /W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

METRIC

5 0 10

CONST. REV.

R /W REV.

NOTE:
TEMPORARY SILT FENCE SHALL BE INSTALLED A MINIMUM OF 1 METER FROM TOE OF FILL IN WETLAND AREAS

NAD 83
NC GRID

149+00

150+00

151+00

32

THE ENDOWMENT FUND OF NC STATE UNIVERSITY ET AL. (HOFMANN FOREST).

DB. 170, PG. 263
DB 516 PG 408

HISTORIC PROPERTY

MATCHLINE STA 148+20 SEE SHEET 18

MATCHLINE STA 151+40 SEE SHEET 20

0.6m BASE TAIL DITCH
6.5m @ 0.00%
DITCH CLEANOUT
SEE DETAIL 'J'
ON SHEET 2D
EST DDE = 13 M³

CLASS 'B' RIPRAP
EST 4.5 TONS
FILTER FABRIC
EST 11.7 SM
END FENCE

+20.500(-L MED-)
26.673m, 33.000m
(87.51', 108.27')

+35.000(-L MED-)
26.673m, 33.000m
(87.51', 108.27')

+40.000(-L MED-)
26.673m
(87.51')

BEGIN FENCE

ACCESS PT.

SLOPE STAKE LINE

HISTORICAL MARKER

US 17 BUS

SPECIAL DITCH

DATUR

COLLAR TO EXIST. (PHASE I)

SPECIAL CUT DITCH
SEE DETAIL 'A'
ON SHEET 2D

END FENCE

BEGIN FENCE

12m PSH
CLASS 'B' RIPRAP
EST 31 TONS
FILTER FABRIC
EST 6.46 SM
PSRM EST
17.68 SM

SLOPE STAKE LINE

+40.000(-L MED-)
30.000m
(98.43')

5.0 x 2.0 x 1

4.0 x 2.0 x 1

6.0 x 2.0 x 1

5.0 x 2.0 x 1

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THE ENDOWMENT FUND OF NC STATE UNIVERSITY ET AL. (HOFMANN FOREST).

DB. 170, PG. 263
DB 516 PG 408

HISTORIC PROPERTY

SEE SHEET NO. 2D FOR ALL DRIVEWAY DETAILS.

SEE SHEET NO. 2D FOR ALL DITCH DETAILS.

SEE SHEET NO. 49 FOR NBL & SBL GRADES AND PROFILES AND ALL DITCH GRADES AND PROFILES.

METRIC

5 0 10

PROJECT REFERENCE NO.	SHEET NO.
R-2514A	EC-51/CONST. 20
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

CONST. REV.

R/W REV.

NAD 83 NC GRID

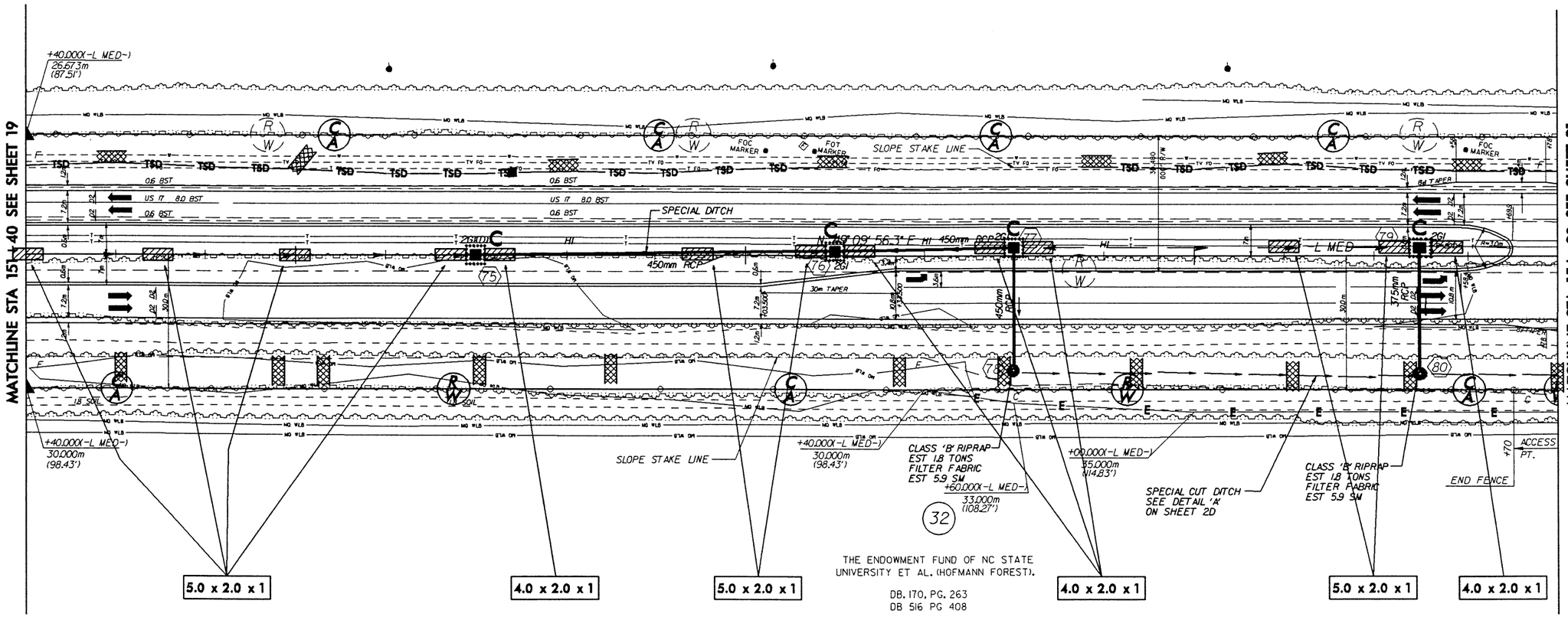
152+00 153+00 154+00

32

THE ENDOWMENT FUND OF NC STATE UNIVERSITY ET AL. (HOFMANN FOREST).

DB. 170, PG. 263
DB 516 PG 408

HISTORIC PROPERTY



32

THE ENDOWMENT FUND OF NC STATE UNIVERSITY ET AL. (HOFMANN FOREST).

DB. 170, PG. 263
DB 516 PG 408

HISTORIC PROPERTY

SEE SHEET NO. 2D FOR ALL DRIVEWAY DETAILS.

SEE SHEET NO. 2D FOR ALL DITCH DETAILS.

SEE SHEET NO. 50 FOR NBL & SBL GRADES AND PROFILES AND ALL DITCH GRADES AND PROFILES.

METRIC	PROJECT REFERENCE NO.	SHEET NO.
5 0 10	R-2514A	EC-52/CONST. 21
	R./W SHEET NO.	
CONST. REV.	ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
R /W REV.		

NAD 83
NC GRID

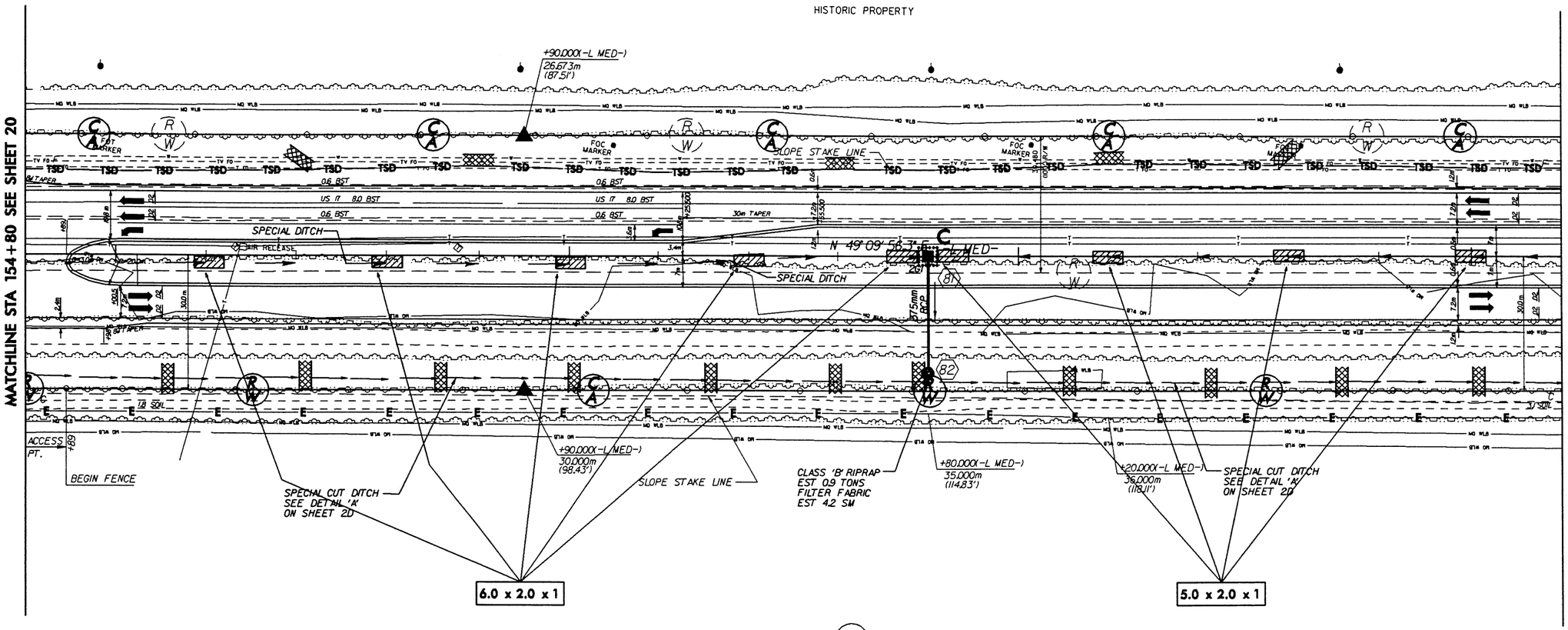
155+00 156+00 157+00 158+00

(32)

THE ENDOWMENT FUND OF NC STATE
UNIVERSITY ET AL. (HOFMANN FOREST).

DB. 170. PG. 263
DB 516 PG 408

HISTORIC PROPERTY



(32)

THE ENDOWMENT FUND OF NC STATE
UNIVERSITY ET AL. (HOFMANN FOREST).

DB. 170. PG. 263
DB 516 PG 408

HISTORIC PROPERTY

SEE SHEET NO. 2D FOR ALL DRIVEWAY DETAILS.

SEE SHEET NO. 2D FOR ALL DITCH DETAILS.

SEE SHEET NO. 5I FOR NBL & SBL GRADES AND PROFILES AND ALL DITCH GRADES AND PROFILES.

PROJECT REFERENCE NO.	SHEET NO.
R-2514A	EC-53CONST. 22
R /W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

METRIC

5 0 10

CONST. REV.

R /W REV.

NOTE:
TEMPORARY SILT FENCE SHALL BE INSTALLED A MINIMUM OF 1 METER FROM TOE OF FILL IN WETLAND AREAS

NAD 83 NC GRID

MATCHLINE STA 158+20 SEE SHEET 21

MATCHLINE STA 161+60 SEE SHEET 23

159+00

160+00

161+00

POT STA 160+02.638

PC STA 161+11.544

6.0 x 2.0 x 1

5.0 x 2.0 x 1

6.0 x 2.0 x 1

4.0 x 2.0 x 1

6.0 x 2.0 x 1

(32)

THE ENDOWMENT FUND OF NC STATE UNIVERSITY ET AL. (HOFMANN FOREST).

DB. 170, PG. 263
DB 516 PG 408

HISTORIC PROPERTY

(33)

HISTORIC BOUNDARY

SPECIAL DITCH

SLOPE STAKE LINE

N 49° 09' 56.3" E

-L MED-

+02.638(-L MED-)
26.673m
(87.51')

+11.544(-L MED-)
26.673m
(87.51')

+52.000
(-L MED-)
43.000m
(141.08')

+52.000
(-L MED-)
26.673m
(87.51')

+41.000(-L MED-)
43.000m
(141.08')

+29.000(-L MED-)
26.673m
(87.51')

CLASS I RIPRAP
EST. 50 METRIC TONS
FOR 8m W/ F.F
EACH BANK

BEGIN FENCE AT WINGWALL

END FENCE AT WINGWALL

BARRY'S CREEK

TDE

FOC MARKER

CAT-1

REMOVE EXISTING
(2) 3.08(W) x 1.22(H)
CMP

375mm RCP
CONNECT
TO CULVERT

PROPOSED (2) 2.1(W)
x 1.80(H) RCBC

L 261

10°-00'-00" SKEW

30m TAPER

STA 161+33.5 -L MED-

375mm RCP

GRAU-350

400 mm
CSP w/ 2
ELBOWS

CLASS 'B' RIPRAP
EST 0.9 TONS
FILTER FABRIC
EST 4.2 SM

+80.000(-L MED-)
34.000m
(111.55')

SPECIAL CUT DITCH
SEE DETAIL 'A'
ON SHEET 2D

4.40m BASE CHANNEL
15m ALONG EXISTING SLOPE
SEE CHANNEL IMPROVEMENT
DETAIL "D"
EST DDE = 18 M³

4.40m BASE CHANNEL
20m ALONG EXISTING SLOPE
SEE CHANNEL IMPROVEMENT
DETAIL "P"
EST DDE = 35 M³

+40.000(-L MED-)
36.000m
(118.11')

+00.000(-L MED-)
37.000m
(121.39')

+40.000(-L MED-)
37.000m
(121.39')

+60.000(-L MED-)
34.000m
(111.55')

+02.638(-L MED-)
30.000m
(98.43')

+00.000(-L MED-)
30.000m (98.43')

+41.544(-L MED-)
30.000m
(98.43')

+19.000(-L MED-)
30.000m
(98.43')

+19.000(-L MED-)
38.000m
(124.67')

+33.000(-L MED-)
38.000m
(124.67')

+33.000(-L MED-)
30.000m
(98.43')

1.2m PSRW
CLASS 'B' RIPRAP EST 3.1 TONS
CLASS 'B' FILTER FABRIC EST 6.46 SM
PSRW EST 17.68 SM

BEGIN FENCE AT WINGWALL

-L MED-
PI Sta 161+44.003
Δ = 1°03' 51.1" (RT)
L = 64.915
T = 32.459
R = 3,495.000
SE = NC

SEE SHEET C- THROUGH SHEET C- FOR CULVERT DETAILS

SEE SHEET NO. 2D FOR ALL DRIVEWAY DETAILS.

SEE SHEET NO. 2D FOR ALL DITCH DETAILS.

SEE SHEET NO. 52 FOR NBL & SBL GRADES AND PROFILES AND ALL DITCH GRADES AND PROFILES.

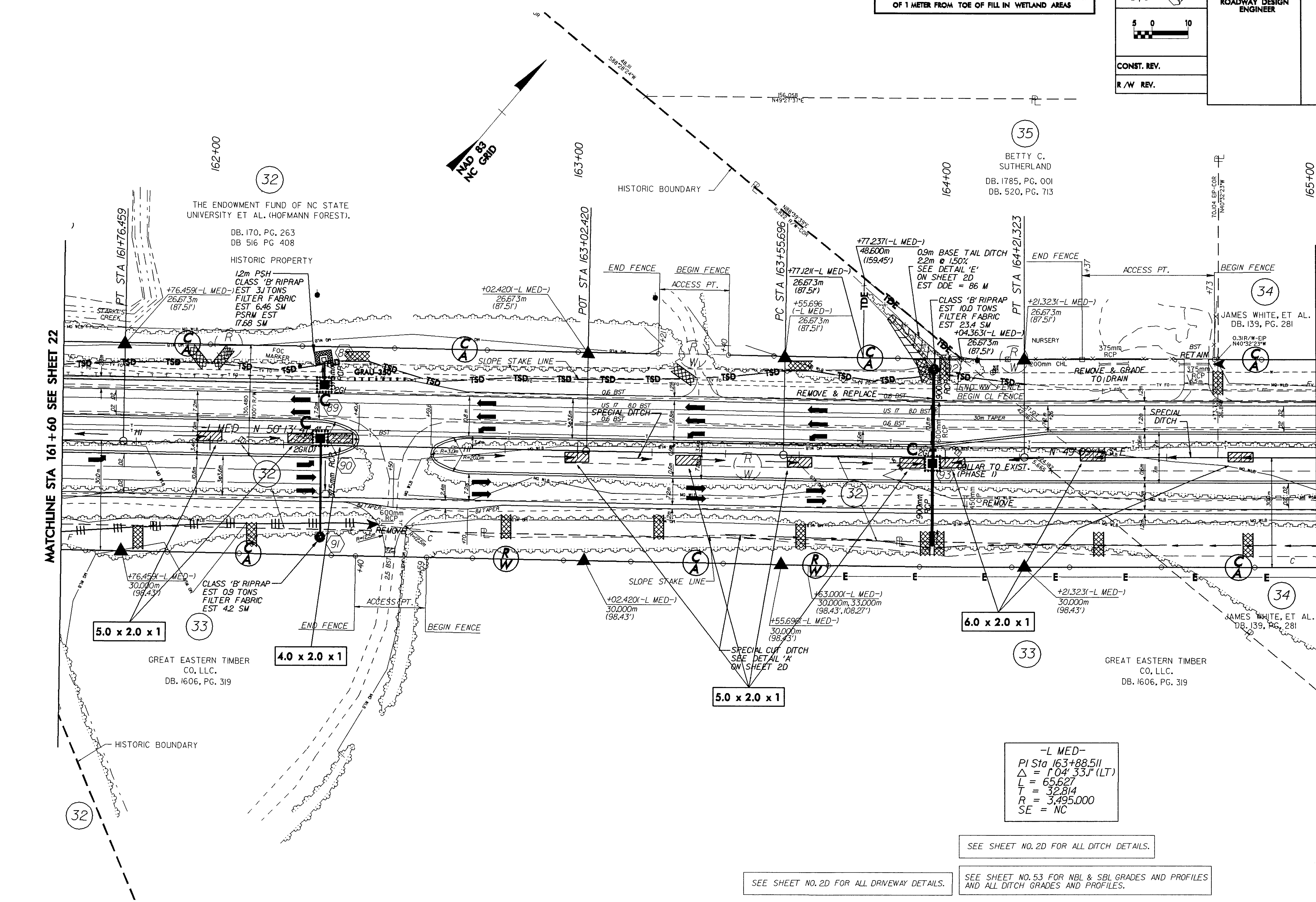
PROJECT REFERENCE NO.	SHEET NO.
R-2514A	EC-54/CONST. 23
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

METRIC

CONST. REV.

R/W REV.

NOTE: TEMPORARY SILT FENCE SHALL BE INSTALLED A MINIMUM OF 1 METER FROM TOE OF FILL IN WETLAND AREAS



NAD 83 NC GRID
MATCHLINE STA 161+60 SEE SHEET 22
MATCHLINE STA 165+00 SEE SHEET 24
162+00
163+00
164+00
165+00
THE ENDOWMENT FUND OF NC STATE UNIVERSITY ET AL. (HOFMANN FOREST).
DB. 170, PG. 263
DB 516 PG 408
HISTORIC PROPERTY
HISTORIC BOUNDARY
BETTY C. SUTHERLAND
DB. 1785, PG. 001
DB. 520, PG. 713
JAMES WHITE, ET AL.
DB. 139, PG. 281
GREAT EASTERN TIMBER CO. LLC.
DB. 1606, PG. 319
PT STA 161+76.459
POT STA 163+02.420
PC STA 163+55.696
PT STA 164+21.323
1.2m PSH
CLASS 'B' RIPRAP
EST 3.1 TONS
FILTER FABRIC
EST 6.46 SM
PSRM EST
17.68 SM
CLASS 'B' RIPRAP
EST 0.9 TONS
FILTER FABRIC
EST 4.2 SM
CLASS 'B' RIPRAP
EST 10.0 TONS
FILTER FABRIC
EST 23.4 SM
0.9m BASE TAIL DITCH
2.2m @ 1.50%
SEE DETAIL 'E'
ON SHEET 2D
EST DDE = 86 M
END FENCE
BEGIN FENCE
ACCESS PT.
SLOPE STAKE LINE
SPECIAL DITCH
REMOVE & REPLACE
REMOVE & GRADE TO DRAIN
SPECIAL CUT DITCH
SEE DETAIL 'A'
ON SHEET 2D
NURSERY
5.0 x 2.0 x 1
4.0 x 2.0 x 1
6.0 x 2.0 x 1
5.0 x 2.0 x 1
-L MED-
PI Sta 163+88.511
Δ = 1°04' 33.1" (LT)
L = 65.627
T = 32.814
R = 3,495.000
SE = NC

SEE SHEET NO. 2D FOR ALL DITCH DETAILS.

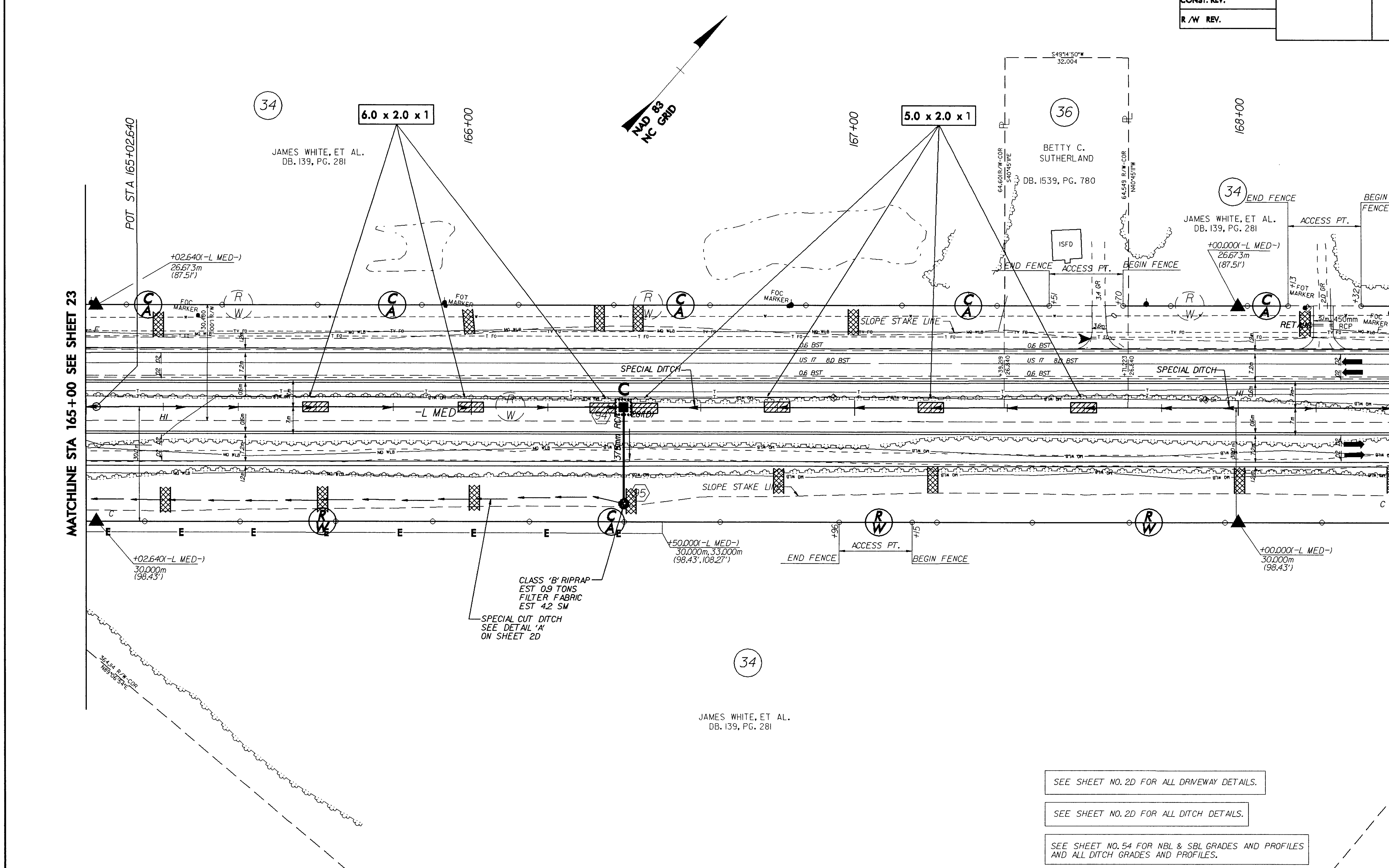
SEE SHEET NO. 2D FOR ALL DRIVEWAY DETAILS.

SEE SHEET NO. 53 FOR NBL & SBL GRADES AND PROFILES AND ALL DITCH GRADES AND PROFILES.

PROJECT REFERENCE NO.	SHEET NO.
R-2514A	EC-55/CONST. 24
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

CONST. REV.

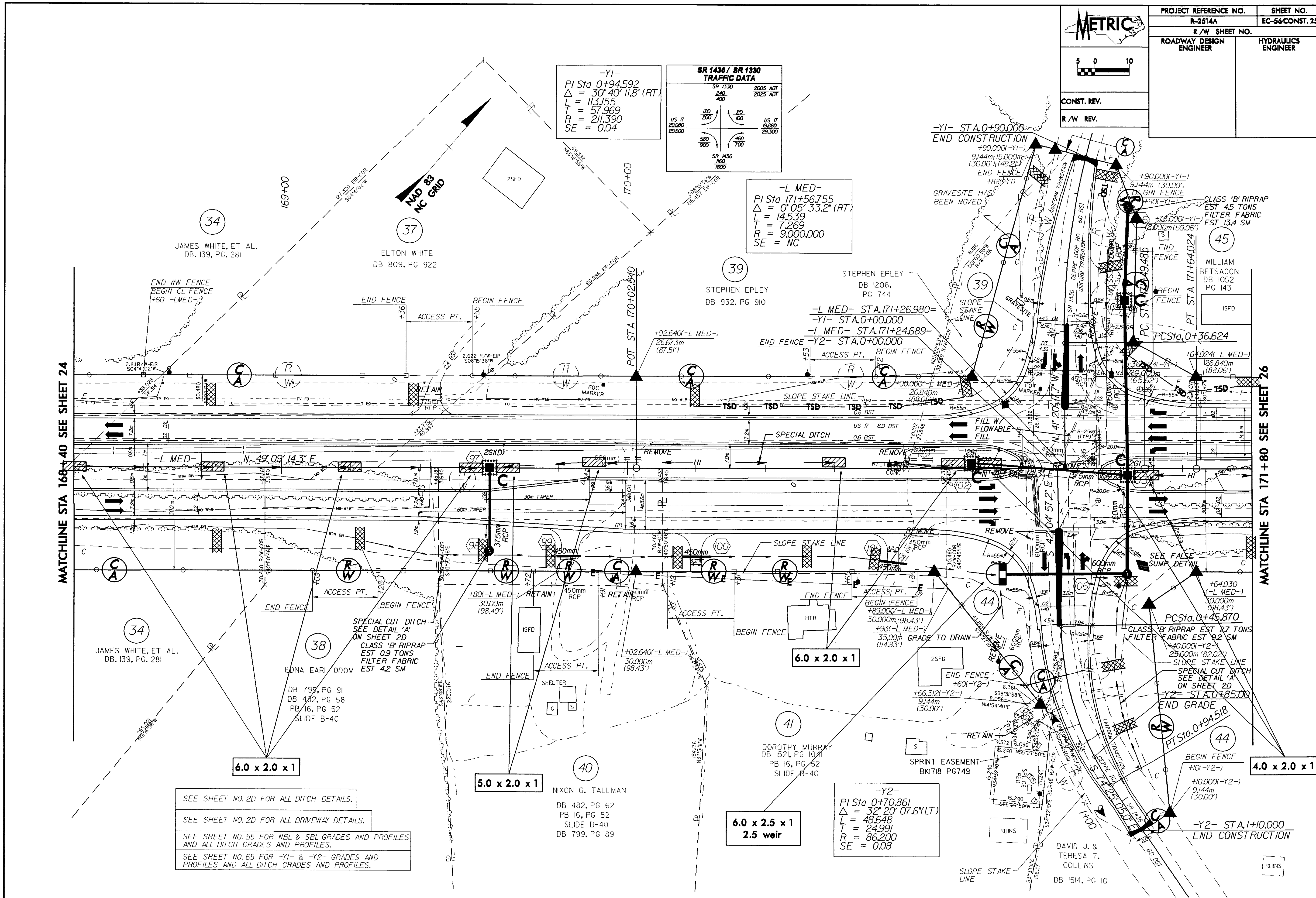
R/W REV.



SEE SHEET NO. 2D FOR ALL DRIVEWAY DETAILS.

SEE SHEET NO. 2D FOR ALL DITCH DETAILS.

SEE SHEET NO. 54 FOR NBL & SBL GRADES AND PROFILES AND ALL DITCH GRADES AND PROFILES.


METRIC
PROJECT REFERENCE NO.
R-2514A
SHEET NO.
EC-56/CONST. 25
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
CONST. REV.
R/W REV.
-Y1-
PI Sta 0+94.592
Δ = 30° 40' 11.8" (RT)
L = 113.155
T = 57.969
R = 211.390
SE = 0.04
SR 1436 / SR 1330 TRAFFIC DATA
2005 ADT
2025 ADT
-L MED-
PI Sta 171+56.755
Δ = 0° 05' 33.2" (RT)
L = 14.539
T = 7.269
R = 9,000.000
SE = NC
-Y2-
PI Sta 0+70.861
Δ = 32° 20' 07.6" (LT)
L = 48.648
T = 24.991
R = 86.200
SE = 0.08
NAD 83 NC GRID
MATCHLINE STA 168+40 SEE SHEET 24
MATCHLINE STA 171+80 SEE SHEET 26
JAMES WHITE, ET AL. DB. 139, PG. 281
ELTON WHITE DB 809, PG 922
STEPHEN EPLEY DB 932, PG 910
STEPHEN EPLEY DB 1206, PG 744
WILLIAM BETSACON DB 1052 PG 143
EDNA EARL ODOM DB 799, PG 91 DB 482, PG 58 PB 16, PG 52 SLIDE B-40
NIXON G. TALLMAN DB 482, PG 62 PB 16, PG 52 SLIDE B-40 DB 799, PG 89
DOROTHY MURRAY DB 1521, PG 1041 PB 16, PG 52 SLIDE B-40
SPRINT EASEMENT BK1718 PG749
DAVID J. & TERESA T. COLLINS DB 1514, PG 10
-Y1- STA 0+90.000 END CONSTRUCTION
-Y2- STA 1+10.000 END CONSTRUCTION
-Y2- STA 0+85.00 END GRADE
-L MED- STA 171+26.980 = -Y1- STA 0+00.000
-L MED- STA 171+24.689 = -Y2- STA 0+00.000
POT STA 170+02.640
PC STA 171+49.485
PT STA 171+64.024
PC Sta 0+36.624
PC Sta 0+45.870
PT Sta 0+94.518
CLASS 'B' RIPRAP EST 4.5 TONS FILTER FABRIC EST 13.4 SM
CLASS 'B' RIPRAP EST 2.7 TONS FILTER FABRIC EST 9.2 SM
SPECIAL CUT DITCH SEE DETAIL 'A' ON SHEET 2D CLASS 'B' RIPRAP EST 0.9 TONS FILTER FABRIC EST 4.2 SM
GRAVESITE HAS BEEN MOVED
FILL W/ FLOWABLE FILL
SPECIAL DITCH
SEE FALSE SUMP DETAIL
GRADE TO DRAIN
6.0 x 2.0 x 1
5.0 x 2.0 x 1
6.0 x 2.5 x 1 2.5 weir
4.0 x 2.0 x 1
SEE SHEET NO. 2D FOR ALL DITCH DETAILS.
SEE SHEET NO. 2D FOR ALL DRIVEWAY DETAILS.
SEE SHEET NO. 55 FOR NBL & SBL GRADES AND PROFILES AND ALL DITCH GRADES AND PROFILES.
SEE SHEET NO. 65 FOR -Y1- & -Y2- GRADES AND PROFILES AND ALL DITCH GRADES AND PROFILES.

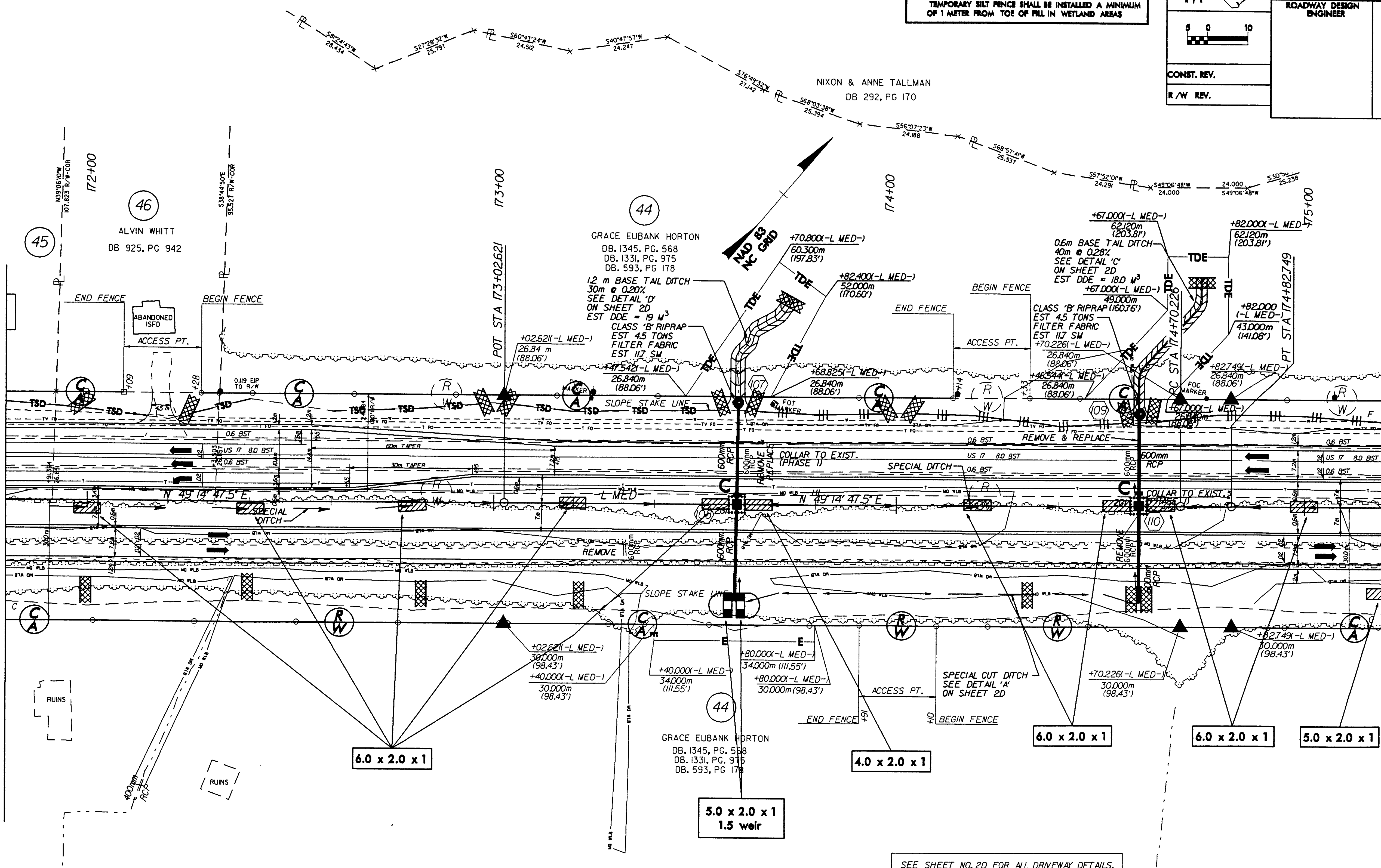
PROJECT REFERENCE NO.	SHEET NO.
R-2514A	EC-67/CONST. 26
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

METRIC

CONST. REV.

R/W REV.

NOTE:
TEMPORARY SILT FENCE SHALL BE INSTALLED A MINIMUM OF 1 METER FROM TOE OF FILL IN WETLAND AREAS

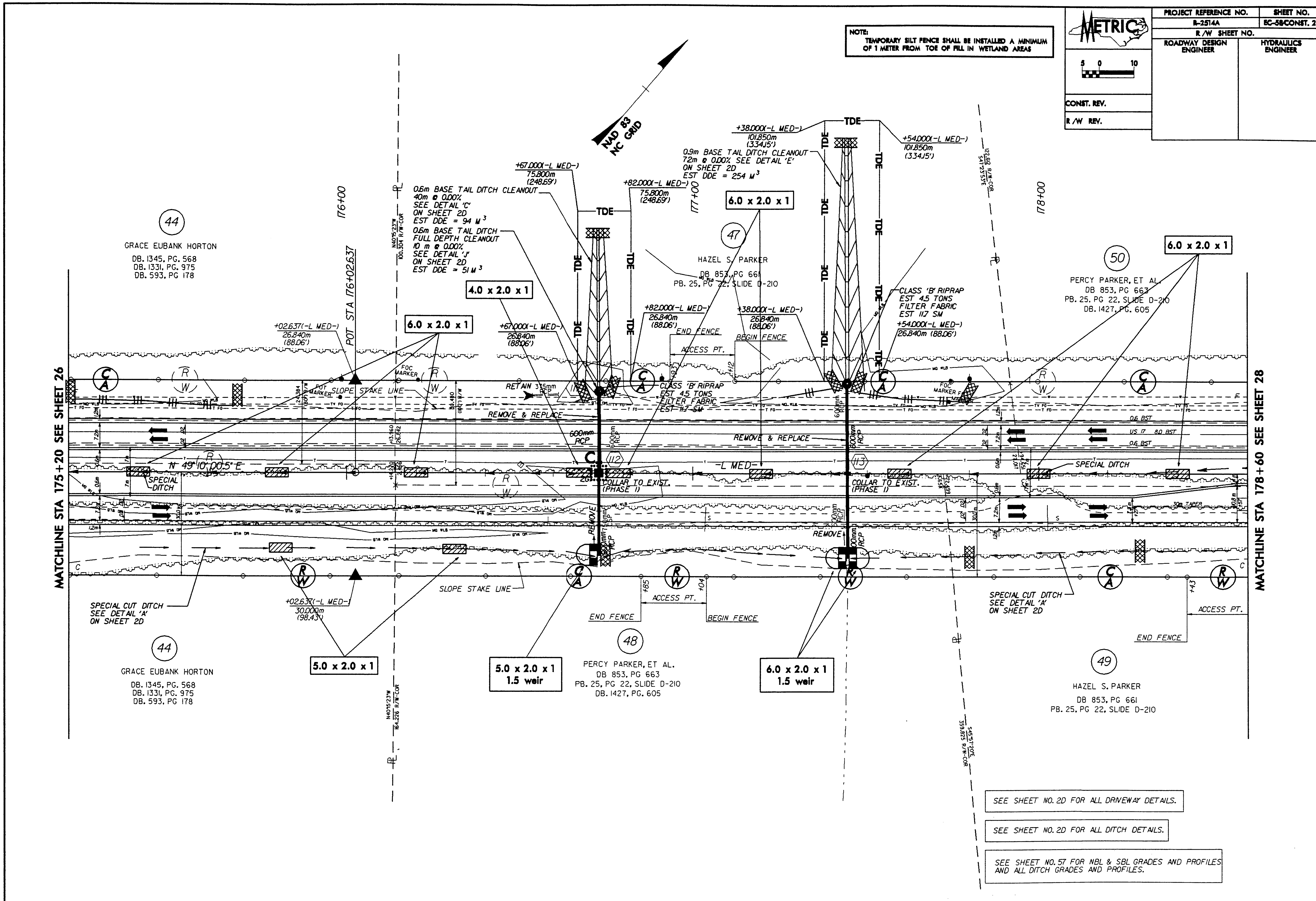


SEE SHEET NO. 2D FOR ALL DRIVEWAY DETAILS.

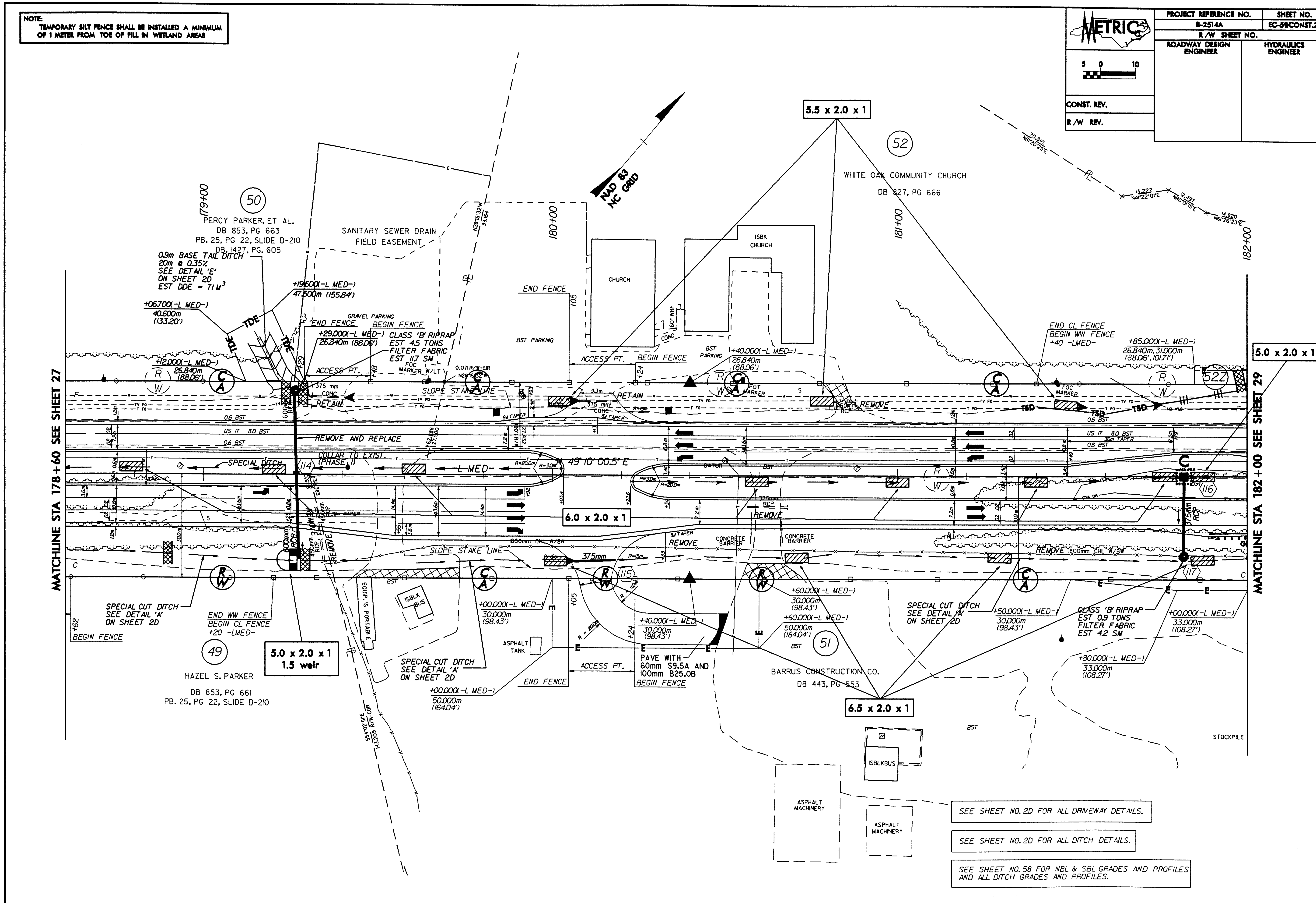
SEE SHEET NO. 2D FOR ALL DITCH DETAILS.

SEE SHEET NO. 56 FOR NBL & SBL GRADES AND PROFILES AND ALL DITCH GRADES AND PROFILES.

-L MED-
PI Sta 174+76.487
Δ = 0°04' 47.0" (LT)
L = 12.523
T = 6.261
R = 9,000.000
SE = NC



PROJECT REFERENCE NO.
R-2514A
SHEET NO.
EC-58/CONST. 27
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
METRIC
5 0 10
CONST. REV.
R/W REV.
NOTE: TEMPORARY SILT FENCE SHALL BE INSTALLED A MINIMUM OF 1 METER FROM TOE OF FILL IN WETLAND AREAS
NAD 83 NC GRID
MATCHLINE STA 175+20 SEE SHEET 26
MATCHLINE STA 178+60 SEE SHEET 28
176+00
177+00
178+00
POT STA 176+02.637
44
GRACE EUBANK HORTON
DB. 1345, PG. 568
DB. 1331, PG. 975
DB. 593, PG 178
47
HAZEL S. PARKER
DB 853, PG 661
PB. 25, PG 22, SLIDE D-210
50
PERCY PARKER, ET AL.
DB 853, PG 663
PB. 25, PG 22, SLIDE D-210
DB. 1427, PG. 605
48
PERCY PARKER, ET AL.
DB 853, PG 663
PB. 25, PG 22, SLIDE D-210
DB. 1427, PG. 605
49
HAZEL S. PARKER
DB 853, PG 661
PB. 25, PG 22, SLIDE D-210
0.6m BASE TAIL DITCH CLEANOUT 40m @ 0.00% SEE DETAIL 'C' ON SHEET 2D EST DDE = 94 M³
0.6m BASE TAIL DITCH FULL DEPTH CLEANOUT 10 m @ 0.00% SEE DETAIL 'J' ON SHEET 2D EST DDE = 51 M³
0.9m BASE TAIL DITCH CLEANOUT 72m @ 0.00% SEE DETAIL 'E' ON SHEET 2D EST DDE = 254 M³
+67.000(-L MED-) 75.800m (248.69')
+82.000(-L MED-) 75.800m (248.69')
+38.000(-L MED-) 101.850m (334.15')
+54.000(-L MED-) 101.850m (334.15')
+02.637(-L MED-) 26.840m (88.06')
+67.000(-L MED-) 26.840m (88.06')
+82.000(-L MED-) 26.840m (88.06')
+38.000(-L MED-) 26.840m (88.06')
+54.000(-L MED-) 26.840m (88.06')
+02.637(-L MED-) 30.000m (98.43')
TDE
4.0 x 2.0 x 1
6.0 x 2.0 x 1
5.0 x 2.0 x 1
5.0 x 2.0 x 1 1.5 weir
6.0 x 2.0 x 1 1.5 weir
CLASS 'B' RIPRAP EST 4.5 TONS FILTER FABRIC EST 11.7 SM
END FENCE
BEGIN FENCE
ACCESS PT.
RETAIN 375mm
SLOPE STAKE LINE
REMOVE & REPLACE
600mm RCP
COLLAR TO EXIST. (PHASE I)
-L MED-
N 49° 10' 00.5" E
SPECIAL DITCH
SPECIAL CUT DITCH SEE DETAIL 'A' ON SHEET 2D
REMOVE
112
113
FOC MARKER
POT MARKER
US 17
SEE SHEET NO. 2D FOR ALL DRIVEWAY DETAILS.
SEE SHEET NO. 2D FOR ALL DITCH DETAILS.
SEE SHEET NO. 57 FOR NBL & SBL GRADES AND PROFILES AND ALL DITCH GRADES AND PROFILES.


NOTE:
TEMPORARY SILT FENCE SHALL BE INSTALLED A MINIMUM OF 1 METER FROM TOE OF FILL IN WETLAND AREAS
METRIC
PROJECT REFERENCE NO.
R-2514A
SHEET NO.
EC-59CONST.28
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
CONST. REV.
R/W REV.
NAD 83 NC GRID
5.5 x 2.0 x 1
52
WHITE OAK COMMUNITY CHURCH
DB 827, PG 666
50
PERCY PARKER, ET AL.
DB 853, PG 663
PB. 25, PG 22, SLIDE D-210
DB 1427, PG. 605
SANITARY SEWER DRAIN FIELD EASEMENT
0.9m BASE TAIL DITCH
20m @ 0.35%
SEE DETAIL 'E' ON SHEET 2D
EST DDE = 71 M³
CHURCH
ISBK CHURCH
BST PARKING
END FENCE
CLASS 'B' RIPRAP
EST 4.5 TONS
FILTER FABRIC
EST 11.7 SM
ACCESS PT.
BEGIN FENCE
END CL FENCE
BEGIN WW FENCE
+40 -LMED-
5.0 x 2.0 x 1
MATCHLINE STA 178+60 SEE SHEET 27
MATCHLINE STA 182+00 SEE SHEET 29
REMOVE AND REPLACE
COLLAR TO EXIST. (PHASE 1)
SPECIAL DITCH
L-MED
N 49°10'00.5" E
6.0 x 2.0 x 1
SLOPE STAKE LINE
CONCRETE BARRIER
REMOVE
SPECIAL CUT DITCH SEE DETAIL 'A' ON SHEET 2D
END WW FENCE
BEGIN CL FENCE
+20 -LMED-
BEGIN FENCE
49
HAZEL S. PARKER
DB 853, PG 661
PB. 25, PG 22, SLIDE D-210
5.0 x 2.0 x 1
1.5 weir
EQUIP. IS PORTABLE
ISBLK BUS
ASPHALT TANK
PAVE WITH 60mm S9.5A AND 100mm B25.0B
51
BARRUS CONSTRUCTION CO.
DB 443, PG 553
6.5 x 2.0 x 1
CLASS 'B' RIPRAP
EST 0.9 TONS
FILTER FABRIC
EST 4.2 SM
STOCKPILE
ASPHALT MACHINERY
SEE SHEET NO. 2D FOR ALL DRIVEWAY DETAILS.
SEE SHEET NO. 2D FOR ALL DITCH DETAILS.
SEE SHEET NO. 58 FOR NBL & SBL GRADES AND PROFILES AND ALL DITCH GRADES AND PROFILES.

NOTE:
TEMPORARY SILT FENCE SHALL BE INSTALLED A MINIMUM OF 1 METER FROM TOE OF FILL IN WETLAND AREAS

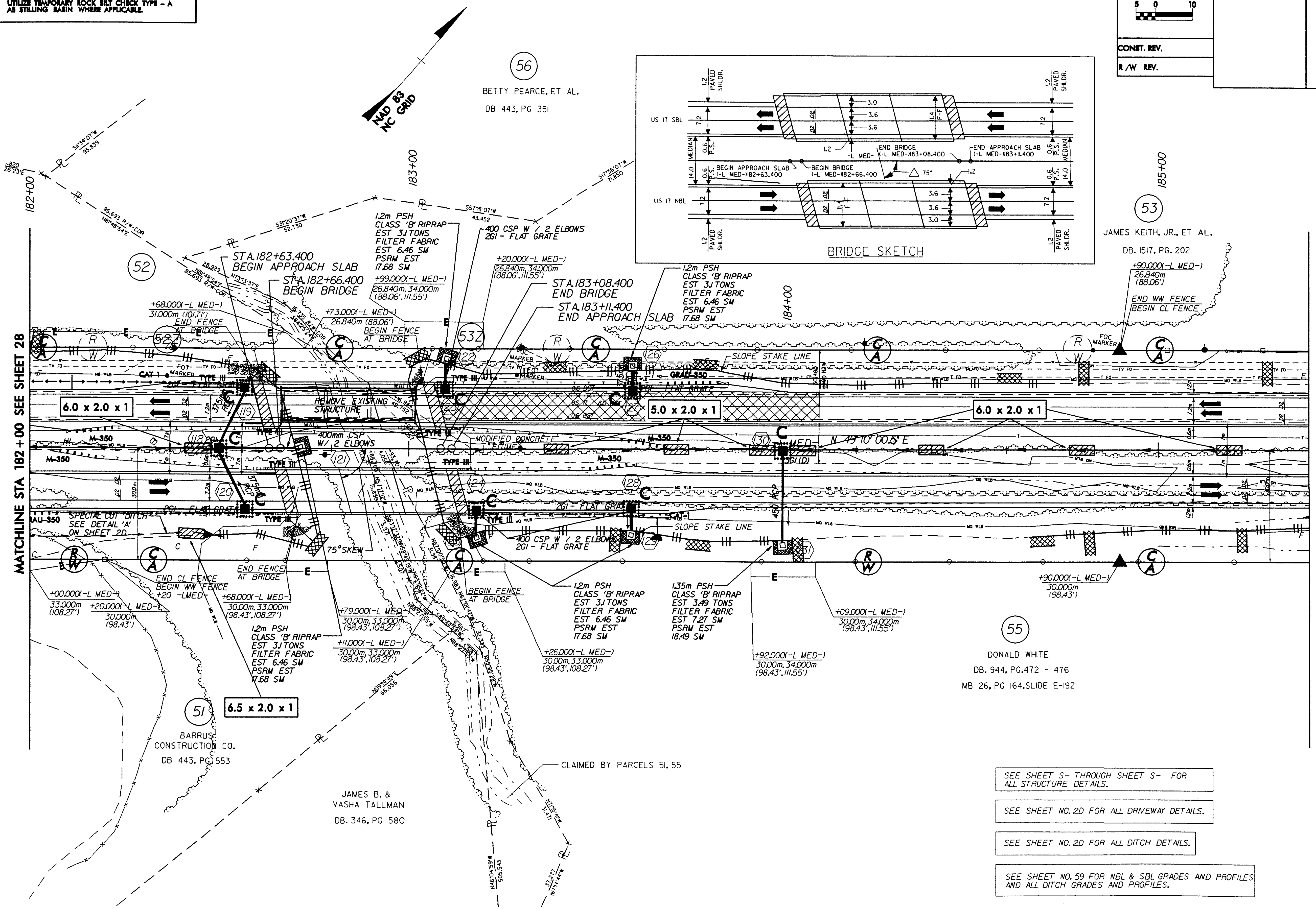
NOTE:
UTILIZE TEMPORARY ROCK SILT CHECK TYPE - A AS STILLING BASIN WHERE APPLICABLE.

PROJECT REFERENCE NO.	SHEET NO.
R-2514A	EC-60CONST.29
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

METRIC

CONST. REV.

R/W REV.



NAD 83 NC GRID
56
BETTY PEARCE, ET AL.
DB 443, PG 351
BRIDGE SKETCH
US 17 SBL
US 17 NBL
BEGIN APPROACH SLAB (-L MED-182+63.400
BEGIN BRIDGE (-L MED-182+66.400
END BRIDGE (-L MED-183+08.400
END APPROACH SLAB (-L MED-183+11.400
53
JAMES KEITH, JR., ET AL.
DB. 1517, PG. 202
52
STA.182+63.400
BEGIN APPROACH SLAB
STA.182+66.400
BEGIN BRIDGE
STA.183+08.400
END BRIDGE
STA.183+11.400
END APPROACH SLAB
1.2m PSH
CLASS 'B' RIPRAP
EST 3.1 TONS
FILTER FABRIC
EST 6.46 SM
PSRM EST
17.68 SM
400 CSP W / 2 ELBOWS
2GI - FLAT GRATE
END WW FENCE
BEGIN CL FENCE
END FENCE AT BRIDGE
BEGIN FENCE AT BRIDGE
6.0 x 2.0 x 1
5.0 x 2.0 x 1
6.5 x 2.0 x 1
REMOVE EXISTING STRUCTURE
SLOPE STAKE LINE
N 49°10'00.5" E
SPECIAL CUT DITCH SEE DETAIL 'A' ON SHEET 2D
75° SKEW
END CL FENCE
BEGIN WW FENCE
1.35m PSH
CLASS 'B' RIPRAP
EST 3.49 TONS
FILTER FABRIC
EST 7.27 SM
PSRM EST
18.49 SM
MATCHLINE STA 182+00 SEE SHEET 28
MATCHLINE STA 185+40 SEE SHEET 30
55
DONALD WHITE
DB. 944, PG.472 - 476
MB 26, PG 164, SLIDE E-192
51
BARRUS CONSTRUCTION CO.
DB 443, PG 553
JAMES B. &
VASHA TALLMAN
DB. 346, PG 580
CLAIMED BY PARCELS 51, 55

SEE SHEET S- THROUGH SHEET S- FOR ALL STRUCTURE DETAILS.

SEE SHEET NO. 2D FOR ALL DRIVEWAY DETAILS.

SEE SHEET NO. 2D FOR ALL DITCH DETAILS.

SEE SHEET NO. 59 FOR NBL & SBL GRADES AND PROFILES AND ALL DITCH GRADES AND PROFILES.

METRIC	PROJECT REFERENCE NO.	SHEET NO.
5 0 10	R-2514A	EC-61CONST.30
	R /W SHEET NO.	
CONST. REV.	ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
R /W REV.		

MATCHLINE STA 185+40 SEE SHEET 29

MATCHLINE STA 188+60 SEE SHEET 31

NAD 83
NC GRID

186+00 187+00 188+00

53
JAMES KEITH, JR., ET AL.
DB. 1517, PG. 202

56
BETTY PEARCE, ET AL.
DB 443, PG 351

55
DONALD WHITE
DB. 944, PG.472 - 476
MB 26, PG 164, SLIDE E-192

6.0 x 2.0 x 1

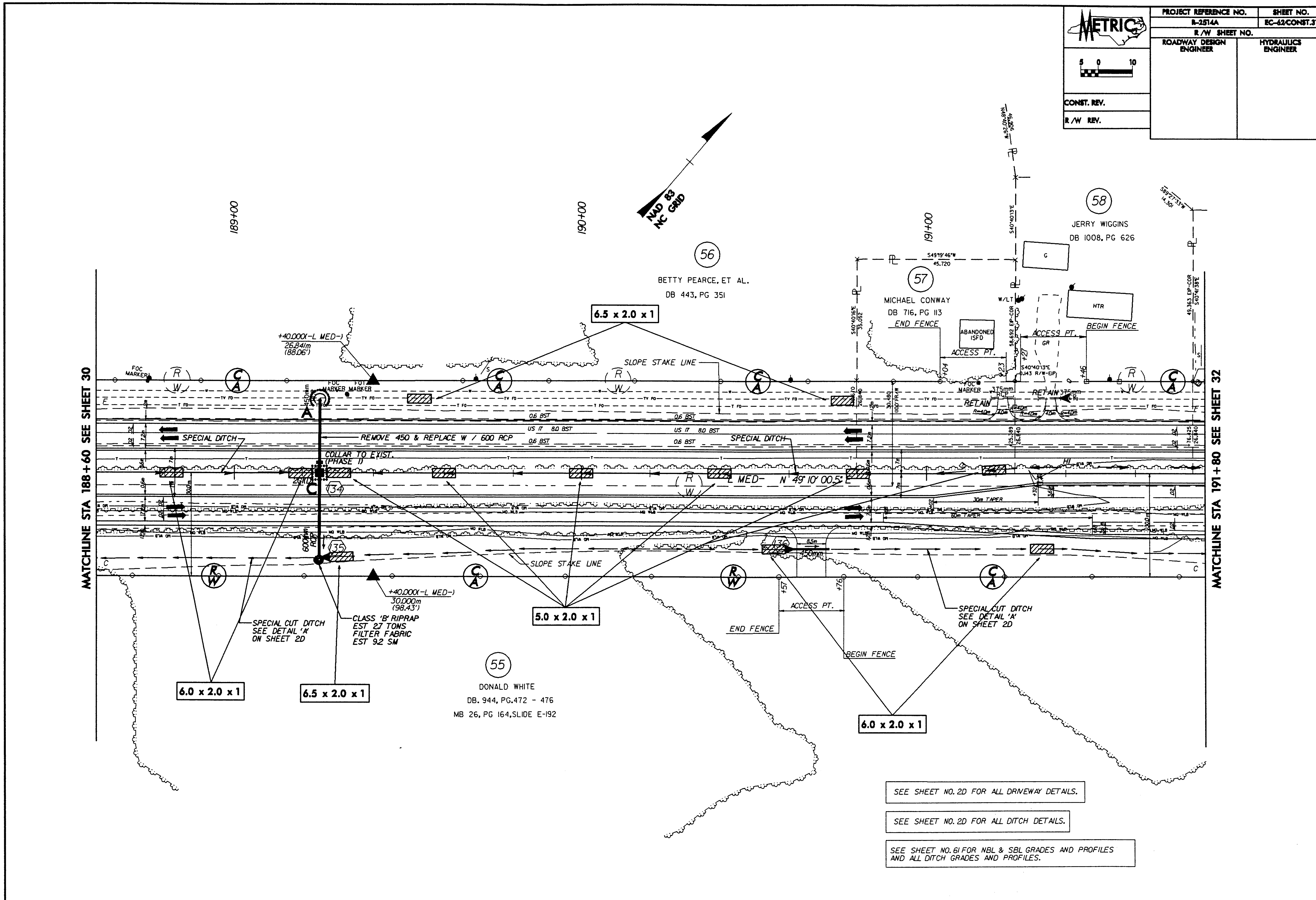
6.5 x 2.0 x 1

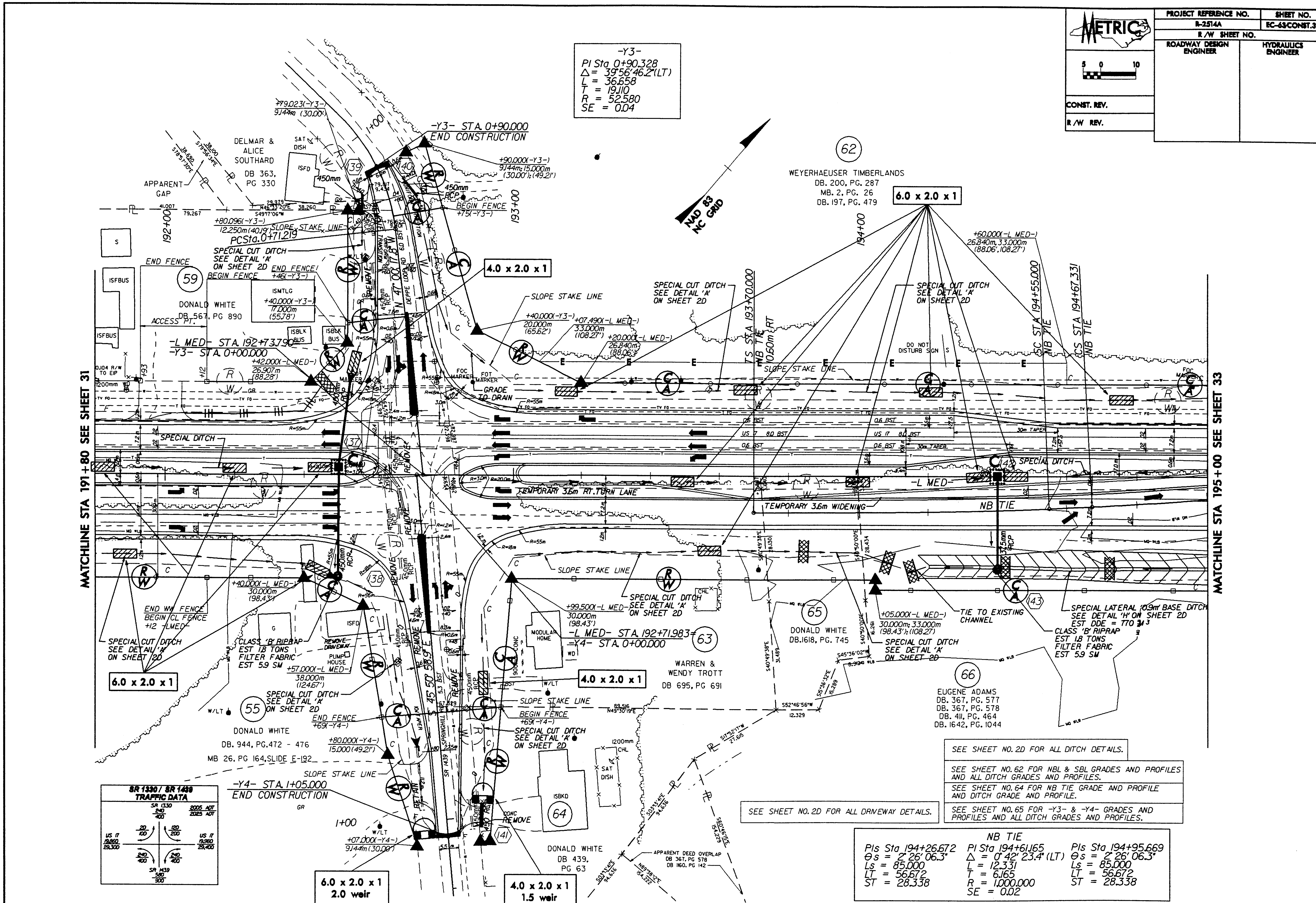
END FENCE
BEGIN FENCE
ACCESS PT.
SPECIAL CUT DITCH SEE DETAIL 'A' ON SHEET 2D
SLOPE STAKE LINE
REMOVE 450mm RCP
FOC MARKER
450mm RCP
375mm RCP
RET-AIN
TYPICAL MEDIAN DITCH
SPECIAL DITCH
L MED
N 49°10'00.5" E
HI
+80.000(-L MED-) 30.000m (98.43')
+80.000(-L MED-) 34.000m (111.55')
+40.000(-L MED-) 30.000m (98.43')
+40.000(-L MED-) 34.000m (111.55')

SEE SHEET NO. 2D FOR ALL DRIVEWAY DETAILS.

SEE SHEET NO. 2D FOR ALL DITCH DETAILS.

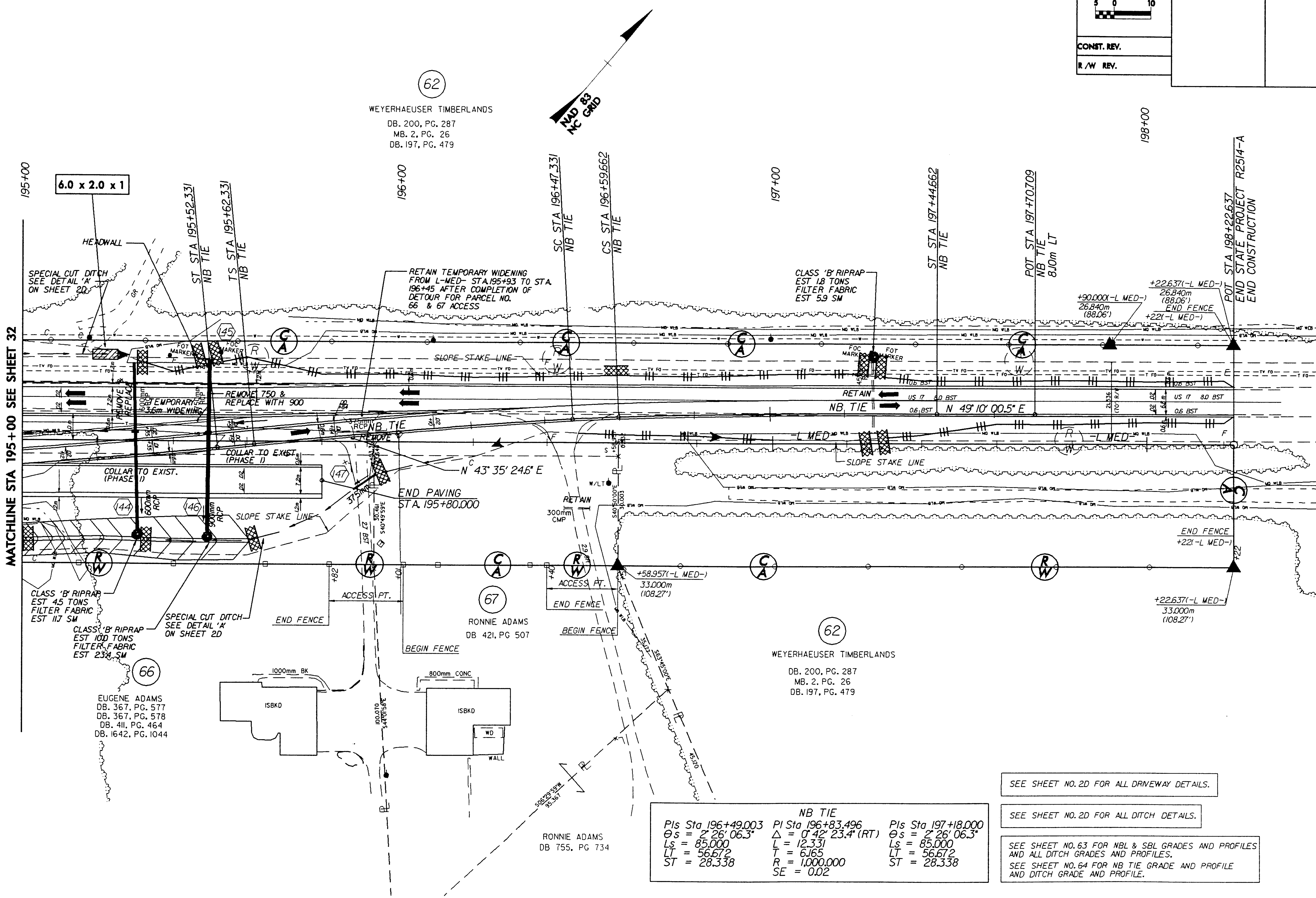
SEE SHEET NO. 60 FOR NBL & SBL GRADES AND PROFILES AND ALL DITCH GRADES AND PROFILES.


METRIC
PROJECT REFERENCE NO.
R-2514A
SHEET NO.
EC-62/CONST.31
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
5 0 10
CONST. REV.
R/W REV.
NAD 83 NC GRID
189+00
190+00
191+00
56
BETTY PEARCE, ET AL.
DB 443, PG 351
57
MICHAEL CONWAY
DB 716, PG 113
58
JERRY WIGGINS
DB 1008, PG 626
55
DONALD WHITE
DB. 944, PG.472 - 476
MB 26, PG 164, SLIDE E-192
MATCHLINE STA 188+60 SEE SHEET 30
MATCHLINE STA 191+80 SEE SHEET 32
6.5 x 2.0 x 1
5.0 x 2.0 x 1
6.0 x 2.0 x 1
6.5 x 2.0 x 1
6.0 x 2.0 x 1
SLOPE STAKE LINE
SPECIAL DITCH
REMOVE 450 & REPLACE W / 600 RCP
COLLAR TO EXIST. (PHASE I)
-L MED- N 49° 10' 00.5" E
+40.000(-L MED-) 26.841m (88.06')
+40.000(-L MED-) 30.000m (98.43')
SPECIAL CUT DITCH SEE DETAIL 'A' ON SHEET 2D
CLASS 'B' RIPRAP EST 27 TONS FILTER FABRIC EST 92 SM
END FENCE
BEGIN FENCE
ACCESS PT.
ABANDONED ISFD
RETAIN
30m TAPER
60m TAPER
SEE SHEET NO. 2D FOR ALL DRIVEWAY DETAILS.
SEE SHEET NO. 2D FOR ALL DITCH DETAILS.
SEE SHEET NO. 61 FOR NBL & SBL GRADES AND PROFILES AND ALL DITCH GRADES AND PROFILES.


METRIC
PROJECT REFERENCE NO.
R-2514A
SHEET NO.
EC-63/CONST.32
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
CONST. REV.
R/W REV.
-Y3-
PI Sta 0+90.328
Δ = 39°56'46.2"(LT)
L = 36.658
T = 19.110
R = 52.580
SE = 0.04
-Y3- STA. 0+90.000
END CONSTRUCTION
NAD 83 NC GRID
62
WEYERHAEUSER TIMBERLANDS
DB. 200, PG. 287
MB. 2, PG. 26
DB. 197, PG. 479
6.0 x 2.0 x 1
4.0 x 2.0 x 1
DELMAR & ALICE SOUTHARD
DB 363, PG 330
APPARENT GAP
59
DONALD WHITE
DB. 567, PG 890
-L MED- STA. 192+73.790
-Y3- STA. 0+00.000
SPECIAL CUT DITCH
SEE DETAIL 'A'
ON SHEET 2D
SLOPE STAKE LINE
END FENCE
BEGIN FENCE
GRADE TO DRAIN
SPECIAL DITCH
TEMPORARY 3.6m RT. TURN LANE
TEMPORARY 3.6m WIDENING
-L MED-
NB TIE
US 17
MATCHLINE STA 191+80 SEE SHEET 31
MATCHLINE STA 195+00 SEE SHEET 33
TS STA 193+70.000 NB TIE 10.60m RT
SC STA 194+55.000 NB TIE
CS STA 194+67.331 NB TIE
-L MED- STA. 192+71.983
-Y4- STA. 0+00.000
63
WARREN & WENDY TROTT
DB 695, PG 691
65
DONALD WHITE
DB.1618, PG. 745
66
EUGENE ADAMS
DB. 367, PG. 577
DB. 367, PG. 578
DB. 411, PG. 464
DB. 1642, PG. 1044
55
DONALD WHITE
DB. 944, PG.472 - 476
MB 26, PG 164, SLIDE E-192
64
DONALD WHITE
DB 439, PG 63
CLASS 'B' RIPRAP
EST 1.8 TONS
FILTER FABRIC
EST 5.9 SM
TIE TO EXISTING CHANNEL
SPECIAL LATERAL 0.9m BASE DITCH
SEE DETAIL 'H' ON SHEET 2D
-Y4- STA. 1+05.000
END CONSTRUCTION
6.0 x 2.0 x 1
2.0 weir
4.0 x 2.0 x 1
1.5 weir
SR 1330 / SR 1439
TRAFFIC DATA
APPARENT DEED OVERLAP
DB 367, PG 578
DB 1160, PG 142
SEE SHEET NO. 2D FOR ALL DITCH DETAILS.
SEE SHEET NO. 62 FOR NBL & SBL GRADES AND PROFILES AND ALL DITCH GRADES AND PROFILES.
SEE SHEET NO. 64 FOR NB TIE GRADE AND PROFILE AND DITCH GRADE AND PROFILE.
SEE SHEET NO. 65 FOR -Y3- & -Y4- GRADES AND PROFILES AND ALL DITCH GRADES AND PROFILES.
SEE SHEET NO. 2D FOR ALL DRIVEWAY DETAILS.
NB TIE
PIs Sta 194+26.672
Θs = 2°26' 06.3"
Ls = 85.000
LT = 56.672
ST = 28.338
PI Sta 194+61.165
Δ = 0°42' 23.4" (LT)
L = 12.331
T = 6.165
R = 1,000.000
SE = 0.02
PIs Sta 194+95.669
Θs = 2°26' 06.3"
Ls = 85.000
LT = 56.672
ST = 28.338

NOTE:
TEMPORARY SILT FENCE SHALL BE INSTALLED A MINIMUM OF 1 METER FROM TOE OF FILL IN WETLAND AREAS

METRIC	PROJECT REFERENCE NO.	SHEET NO.
	R-2514A	EC-64/CONST.33
	R/W SHEET NO.	
5 0 10	ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
CONST. REV.		
R/W REV.		



NAD 83 NC GRID
62
WEYERHAEUSER TIMBERLANDS
DB. 200, PG. 287
MB. 2, PG. 26
DB. 197, PG. 479
195+00
196+00
197+00
198+00
6.0 x 2.0 x 1
HEADWALL
SPECIAL CUT DITCH SEE DETAIL 'A' ON SHEET 2D
ST STA 195+52.331 NB TIE
TS STA 195+62.331 NB TIE
RETAIN TEMPORARY WIDENING FROM L-MED- STA.195+93 TO STA. 196+45 AFTER COMPLETION OF DETOUR FOR PARCEL NO. 66 & 67 ACCESS
SC STA 196+47.331 NB TIE
CS STA 196+59.662 NB TIE
CLASS 'B' RIPRAP EST 1.8 TONS FILTER FABRIC EST 5.9 SM
ST STA 197+44.662 NB TIE
POT STA 197+70.709 NB TIE 8.10m LT
POT STA 198+22.637 END STATE PROJECT R2514-A END CONSTRUCTION
+90.000(-L MED-) 26.840m (88.06')
+22.637(-L MED-) 26.840m (88.06')
END FENCE +22(-L MED-)
MATCHLINE STA 195+00 SEE SHEET 32
SLOPE STAKE LINE
REMOVE 750 & REPLACE WITH 900
TEMPORARY 3.6m WIDENING
REMOVE REPLACE
RETAIN
NB TIE
US 17 8.0 BST
0.6 BST
N 49° 10' 00.5" E
-L MED-
COLLAR TO EXIST (PHASE I)
COLLAR TO EXIST. (PHASE I)
N 43° 35' 24.6" E
END PAVING STA. 195+80.000
SLOPE STAKE LINE
600mm RCP
900mm RCP
300mm CMP
RETAIN
END FENCE +22(-L MED-)
+58.957(-L MED-) 33.000m (108.27')
+22.637(-L MED-) 33.000m (108.27')
CLASS 'B' RIPRAP EST 4.5 TONS FILTER FABRIC EST 11.7 SM
CLASS 'B' RIPRAP EST 10.0 TONS FILTER FABRIC EST 23.4 SM
SPECIAL CUT DITCH SEE DETAIL 'A' ON SHEET 2D
END FENCE
ACCESS PT.
BEGIN FENCE
END FENCE
ACCESS PT.
BEGIN FENCE
66
EUGENE ADAMS
DB. 367, PG. 577
DB. 367, PG. 578
DB. 411, PG. 464
DB. 1642, PG. 1044
67
RONNIE ADAMS
DB. 421, PG 507
62
WEYERHAEUSER TIMBERLANDS
DB. 200, PG. 287
MB. 2, PG. 26
DB. 197, PG. 479
1000mm BK
800mm CONC
1SBKD
1SBKD
WD
WALL
RONNIE ADAMS
DB 755, PG 734

NB TIE

PIs Sta 196+49.003	PI Sta 196+83.496	PIs Sta 197+18.000
θs = 2° 26' 06.3"	Δ = 0° 42' 23.4" (RT)	θs = 2° 26' 06.3"
Ls = 85.000	L = 12.331	Ls = 85.000
LT = 56.672	T = 6.165	LT = 56.672
ST = 28.338	R = 1,000.000	ST = 28.338
	SE = 0.02	

SEE SHEET NO. 2D FOR ALL DRIVEWAY DETAILS.

SEE SHEET NO. 2D FOR ALL DITCH DETAILS.

SEE SHEET NO. 63 FOR NBL & SBL GRADES AND PROFILES AND ALL DITCH GRADES AND PROFILES.
SEE SHEET NO. 64 FOR NB TIE GRADE AND PROFILE AND DITCH GRADE AND PROFILE.

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	R-2514A	RF-1	
STATE PROJ. NO.	F. A. PROJ. NO.	DESCRIPTION	

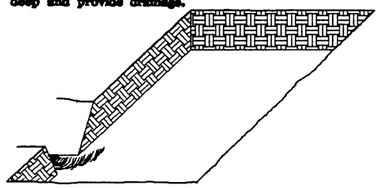
PLANTING DETAILS

SEEDLING / LINER BAREROOT PLANTING DETAIL

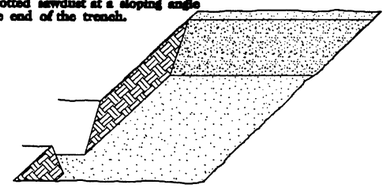
HEALING IN

1. Locate a healing-in site in a shady, well protected area.

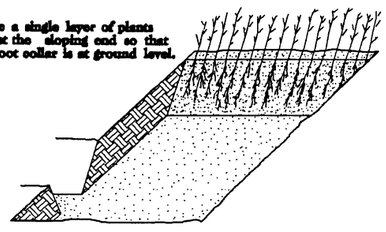
2. Excavate a flat bottom trench 300mm deep and provide drainage.



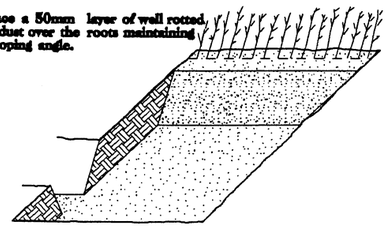
3. Backfill the trench with 50mm well rotted sawdust. Place a 50mm layer of well rotted sawdust at a sloping angle at one end of the trench.



4. Place a single layer of plants against the sloping end so that the root collar is at ground level.

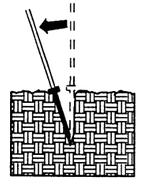


5. Place a 50mm layer of well rotted sawdust over the roots maintaining a sloping angle.

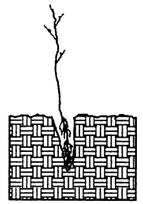


6. Repeat layers of plants and sawdust as necessary and water thoroughly.

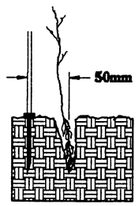
DIBBLE PLANTING METHOD USING THE KBC PLANTING BAR



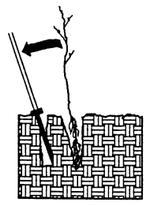
1. Insert planting bar as shown and pull handle toward planter.



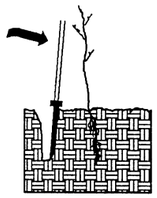
2. Remove planting bar and place seedling at correct depth.



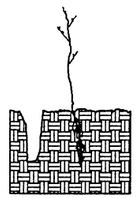
3. Insert planting bar 50mm toward planter from seedling.



4. Pull handle of bar toward planter, firming soil at bottom.



5. Push handle forward firming soil at top.



6. Leave compaction hole open. Water thoroughly.

PLANTING NOTES:

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

KBC PLANTING BAR
Planting bar shall have a blade with a triangular cross section, and shall be 300mm long, 100mm wide and 25mm thick at center.

ROOT PRUNING
All seedlings shall be root pruned, if necessary, so that no roots extend more than 250mm below the root collar.

REFORESTATION

☐ TREE REFORESTATION SHALL BE PLANTED 1.8m TO 3.0m ON CENTER, RANDOM SPACING, AVERAGING 2.5m ON CENTER, APPROXIMATELY 1680 PLANTS PER HECTARE.

REFORESTATION

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

25%	PINUS TAEDA	LOBLOLLY PINE	300mm - 460mm BR
25%	LIRIODENDRON TULIPIFERA	TULIP POPLAR	300mm - 460mm BR
25%	QUERCUS PHELLOS	WILLOW OAK	300mm - 460mm BR
25%	QUERCUS LAURIFOLIA	LAUREL OAK	300mm - 460mm BR

REFORESTATION DETAIL SHEET

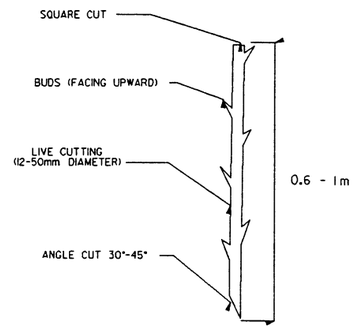
N.C.D.O.T. - ROADSIDE ENVIRONMENTAL UNIT

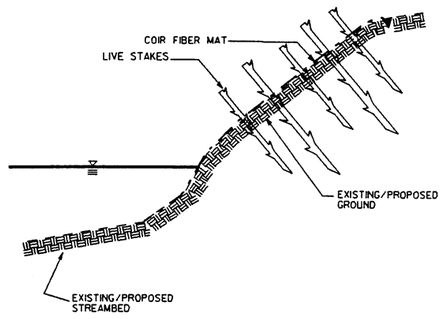
STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	R-2514A	RF-2	
STATE PROJ. NO.	F. A. PROJ. NO.	DESCRIPTION	

PLANTING DETAILS

LIVE STAKES PLANTING DETAIL

LIVE STAKE

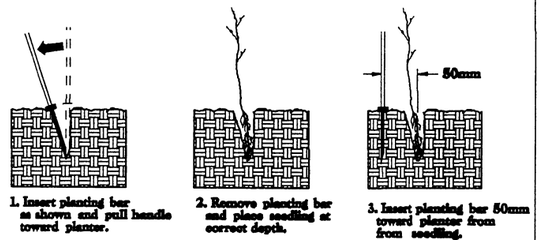




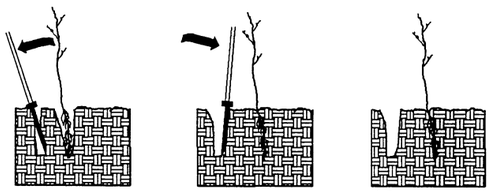
BANK STABILIZATION WITH LIVE STAKES

NOTE:
LIVE STAKES SHALL BE DRIVEN UNTIL APPROXIMATELY 3/4 OF LIVE STAKE IS WITHIN GROUND

BAREROOT PLANTING DETAIL
DIBBLE PLANTING METHOD
USING THE KBC PLANTING BAR



1. Insert planting bar as shown and pull handle toward planter.
2. Remove planting bar and place seedling at correct depth.
3. Insert planting bar 50mm toward planter from from seedling.



4. Pull handle of bar toward planter, firming soil at bottom.
5. Push handle forward firming soil at top.
6. Leave compaction hole open. Water thoroughly.

PLANTING NOTES:

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

KBC PLANTING BAR
Planting bar shall have a blade with a triangular cross section, and shall be 300mm long, 100mm wide and 25mm thick at center.

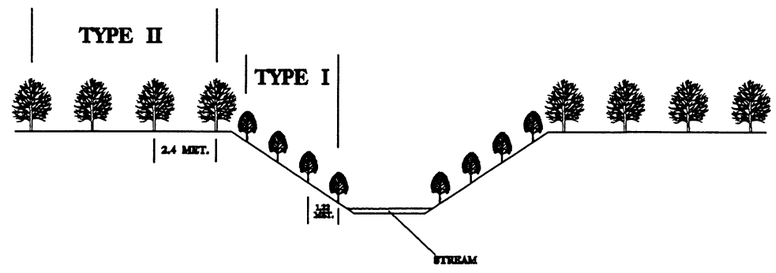
ROOT PRUNING
All seedlings shall be root pruned, if necessary, so that no roots extend more than 250mm below the root collar.

☐ TYPE 1 STREAMBANK REFORESTATION SHALL BE PLANTED 0.9m TO 1.52m ON CENTER, RANDOM SPACING, AVERAGING 1.22m ON CENTER, APPROXIMATELY 6726 PLANTS PER HECTARE.

☐ TYPE 2 STREAMBANK REFORESTATION SHALL BE PLANTED 1.8m TO 3.0m ON CENTER, RANDOM SPACING, AVERAGING 2.4m ON CENTER, APPROXIMATELY 1680 PLANTS PER HECTARE.

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

STREAMBANK REFORESTATION TYPICAL



STREAMBANK REFORESTATION

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

TYPE 1			
50%	SALIX NIGRA	BLACK WILLOW	0.6m to 1m LIVE STAKES
50%	CORNUS AMOMUM	SILKY DOGWOOD	0.6m to 1m LIVE STAKES
TYPE 2			
25%	LIRIODENDRON TULIPIFERA	TULIP POPLAR	300mm - 460mm BR
25%	QUERCUS PHELLOS	WILLOW OAK	300mm - 460mm BR
25%	QUERCUS LAURIFOLIA	LAUREL OAK	300mm - 460mm BR
25%	QUERCUS NIGRA	WATER OAK	300mm - 460mm BR

☐ SEE PLAN SHEETS FOR AREAS TO BE PLANTED

STREAMBANK REFORESTATION DETAIL SHEET

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