



STATE OF NORTH CAROLINA  
DEPARTMENT OF TRANSPORTATION

BEVERLY PERDUE  
GOVERNOR

EUGENE CONTI  
SECRETARY

April 27, 2010

MEMORANDUM TO: Mr. Tim Johnson, PE  
Division Eight Engineer

FROM: Philip S. Harris, III, P.E., Unit Head *E. P. Fushk*  
Natural Environment Unit  
Project Development and Environmental Analysis Branch

SUBJECT: Lee County, US 421-NC 87 Sanford Bypass from existing US 421 northwest of Sanford to existing NC 87 southeast of Sanford (R-2417C) and from west of SR 1400 to west of US 1-15-501 (R-2417AA); T.I.P. Number R-2417C and R-2417AA; Federal-Aid Project STPNHF-421(2); WBS No. 34431.1.1

Attached are the modifications to the U.S. Army Corps of Engineers Section 404 Individual Permit 404 and N.C. Division of Water Quality Section 401 Individual Water Quality Certification for the above referenced project. All environmental permits have been received for the construction of this project.

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

PSH/gyb  
Attachment

Cc: W/attachment  
Mr. Randy Garris, P.E. State Contract Officer  
Mr. Art C. King, Division Environmental Officer  
Ms. Beth Harmon, EEP

Cc: W/o attachment (see website for attachments)  
Mr. Majed Alghandour, P. E., Programming and TIP  
Mr. Jay Bennett, P.E., Roadway Design  
Dr. David Chang, P.E., Hydraulics  
Mr. Art McMillan, P.E., Highway Design  
Mr. Tom Koch, P.E., Structure Design  
Mr. Mark Staley, Roadside Environmental  
Mr. John F. Sullivan, FHWA  
Mr. Ron Hancock, P.E., State Roadway Construction Engineer  
Mr. Mike Robinson, P.E., State Bridge Construction Engineer  
Mr. Eric Midkiff, P.E., PDEA Central Region Unit Head

## PROJECT COMMITMENTS

US 421-NC 87  
Sanford Bypass  
From existing US 421 northwest of Sanford  
to existing NC 87 southeast of Sanford (R-2417C) and  
from west of SR 1400 to west of US 1-15-501 (R-2417AA)  
Lee County  
Federal-Aid Project STPNHF-421(2)  
State Project 8.T540402  
WBS Element 34431.1.1  
TIP Projects R-2417C and R-2417AA

Current status, changes or additions to the project commitments as shown in the environmental document for the project are printed in *italics*.

### **Commitments Developed Through Project Development and Design**

#### **Roadside Environmental Unit**

NCDOT best management practices for protection of surface waters will be followed during construction of this project to prevent siltation of nearby streams.

*This is a standard NCDOT procedure.*

High Quality Water (HQW) erosion control measures will be utilized for portions of the project west of SR 1415 in order to minimize the project's effect on streams located in the North Carolina Wildlife Resources Commission (NCWRC) proposed critical habitat for the Cape Fear Shiner (see Section V-A-4-a of the environmental assessment).

*This project commitment does not apply to R-2417C; this commitment will be implemented during construction of portions of the project west of SR 1415 (R-2417AA).*

#### **Structure Design Unit**

1.2 meter (4-foot) wide shoulders and 1,372 mm (54-inch) handrails are proposed on both sides of the proposed bridge carrying SR 1002 (Lower Moncure Road) over the proposed bypass. US Bike Route 1 and the Carolina Connection Bicycle Highway are both signed along SR 1002 at its crossing with the proposed bypass.

*This project commitment does not apply to R-2417C; the subject bridge is located on another portion of the proposed bypass (R-2417BA). The recommended shoulder width and handrail height have been included on design plans for that project.*

## **Hydraulics Unit/Structure Design Unit**

Required drainage for the proposed dual bridges over Big Buffalo Creek will be studied during the design phase of the project, and if practical and safe, deck drains for the proposed bridges will be designed not to discharge directly into the creek.

*This environmental commitment does not apply to R-2417C; the subject bridge is located on R-2417AA. This commitment will be implemented during final design for project R-2417AA.*

## **Project Development and Environmental Analysis Branch**

Archaeological field surveys will be conducted along the preferred alternative for the project prior to completion of the final environmental document.

*Archaeological field surveys within the preferred corridor for the project have been completed and a report documenting the results of these surveys was sent to the State Historic Preservation Office for review and comment. No archaeological sites potentially eligible for the National Register of Historic Places were found within the preferred corridor. In a letter dated December 5, 1997, the State Historic Preservation Office concurred that no additional archaeological work is required for this project.*

## **Project Development and Environmental Analysis Branch/Roadway Design Unit**

Noise barriers are likely at three potential locations. This determination is based on traffic noise studies performed to date for the proposed project. If during final design conditions substantially change, the abatement measures might not be provided. NCDOT will monitor new development in the vicinity of the proposed bypass until the date of the design public hearing. A final decision on the installation of noise abatement measures will be made upon completion of the public involvement process (see Section V-J-5 of the environmental assessment).

*The potential noise barrier locations are located along another section of the proposed bypass (TIP Project R-2417 AB). A noise barrier was recommended at one of the potential locations in the design noise report and was constructed.*

NCDOT will provide local governments with information regarding the location of the noise impact area for the proposed bypass (see Section V-J of the environmental assessment) for their use in land-use planning.

*Copies of the environmental assessment for this project were provided to local officials. This document contained information regarding the location of the noise impact area for the proposed bypass. In addition, design noise reports were prepared for other sections of the bypass (R-2417AA and R-2417AB). These reports were also provided to local officials.*

## **Roadway Design Unit/Design Services Unit**

Project construction will not involve the use of San-Lee Park property or result in noise impacts to the park (see Section V-C-4 of the environmental assessment).

*San-Lee Park is located along another section of the proposed bypass (R-2417BB). The property boundaries for San-Lee Park were incorrectly shown on the preliminary mapping for the project. A minor adjustment in the alignment for the bypass was made from what was shown at the design public hearing prior to right of way acquisition in order to avoid the park. The project will not involve the use of San-Lee Park property.*

## **Project Development and Environmental Analysis Branch/Roadway Design Unit**

NCDOT will coordinate with local officials as the proposed project progresses regarding the status of the county's greenway plan, and a possible greenway which might cross the proposed bypass within Section A. Currently, the county does not have an approved greenway plan.

*Lee County has not completed its greenway plan; however, two planned greenways will cross the proposed bypass along other projects (R-2417AA and R-2417BA). These greenways are located along Big Buffalo and Little Buffalo Creeks. NCDOT has coordinated with the City of Sanford regarding these proposed greenways. These greenways were planned following completion of environmental studies for the proposed bypass and were not addressed in the environmental document. NCDOT will continue to coordinate with the City as both projects progress.*

## **Commitments Developed Through 404/401 Permitting for R-2417C**

In addition to the original special conditions, the following conditions shall be adhered to:

### **Natural Environment Unit**

404 Condition:

1. Special Condition b shall be modified to include: "The permittee shall mitigate for the additional 0.79 acres of unavoidable impacts to wetlands, and for the additional 259 linear feet of impact to important streams, associated with Section R-2417C of the project. Mitigation shall be provided by the North Carolina Ecosystem Enhancement Program (EEP) within the Cape Fear River Basin (Cataloging Unit 03030004). The EEP will provide 1.58 acres of riparian wetland credits and 518 linear feet of warm water stream credits, pursuant to Section X of Amendment Number 2 to the Memorandum of Agreement (MOA) signed 8 March 2007."

*Action completed*



2. The permittee and current and subsequent property owners shall maintain the Sandy Creek, Blue Tract, and Deaton Mitigation sites in their natural conditions, as altered by in the mitigation plans, in perpetuity. Prohibited activities within the mitigation sites specifically include, but are not limited to: the construction or placement of roads, walkways, buildings, signs, or structures of any kind (i.e., billboards, interior fences, etc.); filling, grading, excavation, leveling, or any other earth moving activity or activity that may alter the drainage patterns on the property; the cutting, mowing, destruction, removal, or other damage of any vegetation; disposal or storage of any debris, trash, garbage, or other waste material; except as may be authorized by the mitigation plans, or subsequent modifications that are approved by the Corps of Engineers. In addition, the permittee shall take no action, whether on or off the mitigation properties, which will adversely impact the wetlands or streams on the mitigation properties, except specifically authorized by this permit, or subsequent modifications that are approved by the Corps of Engineers.

401 Condition:

1. Compensatory mitigation for 4,234 linear feet of streams and 3.97 acres of impacts to riverine wetlands is required. We understand that you have chosen to perform compensatory mitigation for impacts to wetlands through the North Carolina Ecosystem Enhancement Program (EEP) and that the EEP has agreed to implement the mitigation for the project. EEP has indicated in a letter dated October 22, 2008, that they will assume responsibility for satisfying the federal Clean Water Act compensatory mitigation requirements for the above referenced project, in accordance with the Tri-Party MOA signed on July 22, 2003, and the Dual-Party MOA signed on April 12, 2004.

*Action completed*

**Division 8**

404 Condition:

1. Special Condition ff shall be modified to read: "The permittee shall schedule a preconstruction meeting between its representatives, the contractor's representatives, and the Corps of Engineers, Wilmington Regulatory Field Office, prior to any work within jurisdictional waters and wetlands within Section R-2417C to ensure that there is a mutual understanding of all of the terms and conditions contained within this Department of the Army Permit. The permittee shall notify the Corps of Engineers Project Manager a minimum of thirty (30) days in advance of the scheduled meetings in order to provide that individual with ample opportunity to schedule and participate in the required meetings. One copy of the final half-size construction drawings shall be furnished to the Corps of Engineers Project Manager prior to the pre-construction meeting."

401 Conditions:

1. The natural rock energy dissipator proposed at Permit Site #16 (Permit Drawing Sheet 14 of 31) shall be constructed per Detail Sheet 2-K. Rock used to construct the dissipator and associated "rock sill" shall be constructed so that low flow passage of water or aquatic life is impeded.
2. A natural rock energy dissipator (Detail Sheet 2-K) is proposed on the stream bank, in a level area for constructability (per NCDOT staff) at Permit Site #2 (Permit Drawing Sheet 16 of 31, -YRPC-). The dissipator is designed such that storm flows will be directed upstream once they exit the dissipator. NCDOT is advised that if the stream destabilizes in this area due to backwater or other conditions caused by the dissipator alignment, corrective actions to stabilize the stream will be required.
3. Two (2) ditch lines are proposed on the stream banks at Permit Site #2 (Permit Drawing 16 of 31, -YRPC-) which discharge into the stream at nearly right angles. NCDOT is advised that if stream bank destabilization occurs as a result of the ditch line alignments, corrective actions to stabilize the stream will be required.
4. The stream is relocated to a ditch line at Permit Site #13 (Permit Drawing 24 of 31) and then conveyed into the natural stream. The ditch line appears to discharge to the natural stream at nearly a right angle. NCDOT is advised that if stream bank destabilization occurs as a result of the ditch line alignment, corrective actions to stabilize the stream will be required.
5. Two (2) overflow culverts will be installed at Permit Site #5 (Permit Drawing 26 of 31). An "overflow channel" is depicted on the outlet end of the overflow culverts. Per NCDOT staff, no excavation or other earthwork will be required to tie the "overflow channel" into the existing stream. If excavation or other earthwork is required, on the streambanks or in the stream, to provide a connection from the overflow channel to the stream, a detail shall be provided to ensure that no additional jurisdictional impacts will be incurred and the stream will remain stable.
6. Class B riprap is proposed for the channel relocation at Permit Site 14 (Permit Drawing 28 of 31) and the outfall from the associated ditch line. Riprap shall not be placed in the active thalweg channel or placed in the streambed in a manner that precludes aquatic life passage. Bioengineering boulders or structures should be properly designed, sized and installed. In addition, riprap shall be of sufficient size such that it is not carried downstream by normal stream flow.

7. At locations where ponds will be drained, proper measures will be taken to drain the pond with limited impact to upstream and downstream channel stability as well as to native aquatic species. Proper measures will be taken to avoid sediment release and/or sediment accumulation downstream as a result of pond draining. If typical pond draining techniques will create significant disturbance to native aquatic species, additional measures such as collection and relocation may be necessary to prevent a significant fish kill. NCDOT shall consult with the NC Wildlife Resources Commission Staff to determine if there are any sensitive species, and the most appropriate measures to limit impacts to these species.

### **Hydraulics Unit**

#### 401 Condition:

1. A sill shall be placed on one of the box culverts to maintain the natural stream dimension at Permit Sites 2 (Permit Drawing 16 of 31) and 7 (Permit Drawing 30 of 31).

### **Hydraulics Unit/Division 8**

#### 401 Condition for R-2417C and R-2417AA:

1. Placement of culverts and other structures in waters, streams and wetlands shall be below the elevation of the streambed by one (1) foot for all culverts with a diameter greater than 48 inches and 20 percent of the culvert diameter for culverts having a diameter of less than 48 inches, to allow for low flow passage of water and aquatic life. Design and placement of culverts and other structures, including temporary erosion control measures, shall not be conducted in a manner that may result in disequilibrium of wetlands or streambeds or banks, adjacent to or upstream and downstream of the above structures. The applicant is required to provide evidence that the equilibrium is being maintained if requested in writing by DWQ. If this condition is unable to be met due to bedrock or other limiting features encountered during construction, please contact the NCDWQ for guidance on how to proceed and to determine whether or not a modification to this certification will be required.

### **Commitments Developed Through 404/401 Permitting for R-2417AA**

In addition to the original special conditions, the following conditions shall be adhered to:

## Natural Environment Unit

### 404 Condition:

1. The permittee and current and subsequent property owners shall maintain the Sandy Creek, Blue Tract, and Deaton Mitigation sites in their natural conditions, as altered by in the mitigation plans, in perpetuity. Prohibited activities within the mitigation sites specifically include, but are not limited to: the construction or placement of roads, walkways, buildings, signs, or structures of any kind (i.e., billboards, interior fences, etc.); filling, grading, excavation, leveling, or any other earth moving activity or activity that may alter the drainage patterns on the property; the cutting, mowing, destruction, removal, or other damage of any vegetation; disposal or storage of any debris, trash, garbage, or other waste material; except as may be authorized by the mitigation plans, or subsequent modifications that are approved by the Corps of Engineers. In addition, the permittee shall take no action, whether on or off the mitigation properties, which will adversely impact the wetlands or streams on the mitigation properties, except specifically authorized by this permit, or subsequent modifications that are approved by the Corps of Engineers.

### 401 Condition:

1. Compensatory mitigation for 1.59 acres of riverine wetlands and 1,314 linear feet of streams are required. We understand that you have chosen to perform compensatory mitigation for impacts to wetlands and streams through the North Carolina Ecosystem Enhancement Program (EEP). EEP has agreed to implement the mitigation for 1.58 acres of riverine wetlands and 1,130 linear feet of stream as per a letter dated May 4, 2009. DWQ is requiring mitigation for all riverine wetland impacts and all perennial stream impacts (exceeding 150 linear feet of impact per stream, including riprap bank stabilization). Therefore, prior to wetland and stream impacts, NCDOT must provide documentation demonstrating EEP's ability to provide the remaining mitigation which is required for this project (0.01 acres of wetland impact and 184 linear feet of stream impact).

*Action completed*

## Division 8

### 404 Condition:

1. Special Condition ff shall be modified to read: "The permittee shall schedule a preconstruction meeting between its representatives, the contractor's representatives, and the Corps of Engineers, Wilmington Regulatory Field Office, prior to any work within jurisdictional waters and wetlands within Section R-2417AA to ensure that there is a mutual understanding of all of the terms and conditions contained within this Department of the Army Permit. The permittee

shall notify the Corps of Engineers Project Manager a minimum of thirty (30) days in advance of the scheduled meetings in order to provide that individual with ample opportunity to schedule and participate in the required meetings. One copy of the final half-size construction drawings shall be furnished to the Corps of Engineers Project Manager prior to the pre-construction meeting.”

401 Conditions:

1. At Permit Site #1, a 24” culvert discharges to Patterson Creek at an approximate 90 degree angle. NCDOT is advised that if stream bank destabilization occurs as a result of this alignment, corrective actions to stabilize the stream will be required.
2. At Permit Site #2b, a ditch ties into Patterson Creek such that storm flows will be directed upstream once they exit the ditchline. NCDOT is advised that if the stream destabilizes in this area due to backwater or other conditions caused by the ditchline alignment, corrective actions to stabilize the stream will be required.
3. At Permit Sites #4 and #7, ditches tie into the streams at an approximate 90 degree angle. NCDOT is advised that if stream bank destabilization occurs as a result of this alignment, corrective actions to stabilize the stream will be required.
4. All portions of the proposed project draining to 303(d) listed watersheds that are impaired due to biological criteria exceedances, specifically Big Buffalo Creek, shall not discharge stormwater directly to surface waters. Stormwater shall be treated using appropriate best management practices (e.g., vegetated conveyances, constructed wetlands, detention ponds, etc.) prior to discharging to surface waters.

**Hydraulics Unit/Division 8**

401 Condition for R-2417C and R-2417AA:

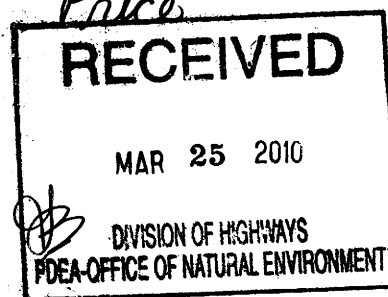
2. Placement of culverts and other structures in waters, streams and wetlands shall be below the elevation of the streambed by one (1) foot for all culverts with a diameter greater than 48 inches and 20 percent of the culvert diameter for culverts having a diameter of less than 48 inches, to allow for low flow passage of water and aquatic life. Design and placement of culverts and other structures, including temporary erosion control measures, shall not be conducted in a manner that may result in disequilibrium of wetlands or streambeds or banks, adjacent to or upstream and downstream of the above structures. The applicant is required to provide evidence that the equilibrium is being maintained if requested in writing by DWQ. If this condition is unable to be met due to bedrock or other limiting features encountered during construction, please contact the NCDWQ for guidance on how to proceed and to determine whether or not a modification to this certification will be required.



REPLY TO  
ATTENTION OF:

DEPARTMENT OF THE ARMY  
WILMINGTON DISTRICT, CORPS OF ENGINEERS  
P.O. BOX 1890  
WILMINGTON, NORTH CAROLINA 28402-1890

March 18, 2010



Regulatory Division

Subject: Action ID No. SAW-2002-20899

Gregory J. Thorpe, Ph.D.  
Environmental Management Director  
Project Development & Environmental Analysis  
1598 Mail Service Center  
Raleigh, North Carolina 27699-1598

Dear Dr. Thorpe:

I am responding to your requests dated July 24, 2009 and November 6, 2009 for modifications to the existing Department of the Army (DA) permit issued May 8, 2002, with modifications for the individual sections issued through March 25, 2009 for the construction of the Sanford Bypass (U.S. 421/NC 87 from west of SR 1400 to west of U.S. 1/15/501) in Lee County, North Carolina. Your November 6, 2009 letter is requesting additional impacts associated with a lengthening of a service road at Site 9 to accommodate access for an adjacent property owner. Your July 24, 2009 letter is requesting a permit extension and approval of final design for Section AA.

The referenced Section 404 permit authorized permanent impacts to 11.06 acres of jurisdictional wetlands, 23,640 linear feet of tributaries and 6.32 acres of open water. Due to access problems, conditions in the field and required stabilization measures, permanent impacts for Section C have increased by 0.04 acres of jurisdictional wetlands and Section AA has increased by 0.20 acres of jurisdictional wetlands and 169 linear feet of tributaries and temporary impacts increased to 477 linear feet of tributaries. Coupled with impacts in the previously issued permit and modifications, the total permanent impacts authorized for R-2417, are 12.03 acres of jurisdictional wetlands, 24,209 linear feet of tributaries and 6.32 acres of open water. All impacts described in the March 25, 2009 permit modification for Section C are valid with the addition of 0.04 acres of jurisdictional wetlands at Site 9. The authorized impact areas for Section AA are described in the table below and depicted on the attached plans:

Site Number	Station Number	Impact Type	Permanent Wetland Impacts (acres)	Permanent Open Water Impacts (acres)	Permanent Tributary Impacts (linear feet)	Temporary Tributary Impacts (linear feet)
1	L 22+30/26+80 (LT)	Roadway embankment	0.04			
1	L 23+32 (RT)	Bank Stabilization			10	20
2	L 33+00/33+65 (LT)	Roadway embankment	0.42			
2a	L 33+00/33+65 (LT)	42" CMP w/52" STL suppl			816	14
2b	L 33+00/33+65 (RT)	42" CMP w/52" STL suppl			274	15
3	L 35+20/36+30 (RT)	Roadway embankment	0.12			
4	L 52+08 (LT/RT) & L 63+00 (RT)	Bank Stabilization			44	57
5	L 87+90 (LT/RT)	54" RCP			265	47
5	L 87+90 (LT/RT)	Bank Stabilization			30	
6	L 120+20 (LT)	36" RCP			140	55
6	L 120+57 (LT/RT)	8' by 6' RCBC			216	83
6	L 120+57 (LT/RT)	Bank Stabilization			104	
7	L 142+67 (LT/RT)	8' by 6' RCBC			351	66
8	L 153+50/160+00 (RT)	54" RCP	0.82			
9	L 177+29 (LT/RT)	(2) 9' by 7" RCBC	0.18		375	60
9	L 177+29 (LT/RT)	Bank Stabilization			50	
9	L 178+82 (LT)	54" RCP			80	30
10	L 194+60/196+10 (LT/RT)	36" RCP		0.66		
10	L 195+65 (RT)	36" RCP			16	30
<b>Total Permanent Impacts</b>			<b>1.58</b>	<b>0.66</b>	<b>2771</b>	<b>477</b>


The referenced Section 404 permit is scheduled to expire on December 31, 2013. Two sections remain to be constructed and require a time extension until January 31, 2015 to complete construction on these remaining sections.

I have determined that the proposed project modifications described above are not contrary to the public interest and therefore, the DA permit is hereby modified with the attached Special Conditions.

Please note that all unmodified terms and conditions of your original Department of the Army permit and all previous modifications shall remain in effect.

Should you have any questions, please contact Ms. Kimberly Garvey, Wilmington Field Office, Regulatory Division, at telephone (910) 251-4482.

Sincerely,



~~FOR~~ Jefferson M. Ryscavage  
Colonel, U. S. Army  
District Commander

Enclosure

Copies furnished (with enclosures):

Mr. Greg Price  
NCDOT, PDEA ✓  
1548 Mail Service Center  
Raleigh, North Carolina, 27699-1548

Mr. Brian Wrenn  
NCDENR DWQ  
1650 Mail Service Center  
Raleigh, NC 27699-1650

Mr. Travis W. Wilson  
NC Wildlife Resource Commission  
1142 I-85 Service Rd.  
Creedmoor, North Carolina 27522

Mr. Pete Benjamin  
U.S. Fish and Wildlife Service  
Raleigh Field Office  
Post Office Box 33726  
Raleigh, North Carolina 27636-3726



Mr. Chris Militcher  
United States Environmental Protection Agency  
c/o Federal Highway Administration  
310 New Bern Avenue  
Raleigh, North Carolina 27601

Mr. Art King  
Division Environmental Officer, Division 8  
North Carolina Department of Transportation  
P.O. Box 1067  
Aberdeen, North Carolina 28315

## **SPECIAL CONDITIONS; SAW-2002-20899**

1. Failure to institute and carry out the details of the following special conditions below will result in a directive to cease all ongoing and permitted work within waters of the United States, including wetlands, associated with the permitted project, or such other remedies and/or fines as the U.S. Army Corps of Engineers District Commander or his authorized representatives may seek.
2. In accordance with 33 U.S.C. 1341 (d), all conditions of the North Carolina Division of Water Quality 401 Certification are incorporated as part of the Department of the Army permit. Therefore, they are not listed as special conditions. The following Special Conditions will be added to the permit.
3. All work authorized by this permit must be prepared in strict compliance with the attached plans, which are part of this permit.
4. Special Condition b shall be modified to include: "The permittee shall mitigate for the additional 0.79 acres of unavoidable impacts to wetlands, and for the additional 259 linear feet of impact to important streams, associated with section R-2417C of the project. Mitigation shall be provided by the North Carolina Ecosystem Enhancement Program (NCEEP) within the Cape Fear River Basin (Cataloging Unit 03030004). The EEP will provide 1.58 acres of riparian wetland credits and 518 linear feet of warm water stream credits, pursuant to Section X of Amendment Number 2 to the Memorandum of Agreement (MOA) signed 8 March 2007."
5. The permittee and current and subsequent property owners shall maintain the Sandy Creek, Blue Tract, and Deaton Mitigation sites in their natural condition, as altered by work in the mitigation plans, in perpetuity. Prohibited activities within the mitigation sites specifically include, but are not limited to: the construction or placement of roads, walkways, buildings, signs, or structures of any kind (i.e., billboards, interior fences, etc.); filling, grading, excavation, leveling, or any other earth moving activity or activity that may alter the drainage patterns on the property; the cutting, mowing, destruction, removal, or other damage of any vegetation; disposal or storage of any debris, trash, garbage, or other waste material; except as may be authorized by the mitigation plans, or subsequent modifications that are approved by the Corps of Engineers. In addition, the permittee shall take no action, whether on or off the mitigation properties, which will adversely impact the wetlands or streams on the mitigation properties, except as specifically authorized by this permit, or subsequent modifications that are approved by the Corps of Engineers.
6. The permittee shall not sell or otherwise convey any interest in the mitigation properties used to satisfy mitigation requirements for this permit, to any third party, without written approval from the Wilmington Corps of Engineers.
7. Any sale, lease, or other conveyance of the wetland mitigation site properties shall include restrictions on the use of the properties as described in Special Condition 5 above, which conditions shall be enforced by the NCDOT. Such restrictions shall include language providing for third party enforcement rights in favor of the Corps. Such restrictions must be approved by the Corps prior to conveyance.

8. Special Condition ff shall be modified to read: “The permittee shall schedule a preconstruction meeting between its representatives, the contractor’s representatives, and the Corps of Engineers, Wilmington Regulatory Field Office, prior to any work within jurisdictional waters and wetlands within Section R-2417AA to ensure that there is a mutual understanding of all of the terms and conditions contained within this Department of the Army Permit. The permittee shall notify the Corps of Engineers Project Manager a minimum of thirty (30) days in advance of the scheduled meetings in order to provide that individual with ample opportunity to schedule and participate in the required meetings. One copy of the final half-size construction drawings shall be furnished to the Corps of Engineers Project Manager prior to the pre-construction meeting.”
9. The time limit for completing the work authorized ends on December 31, 2015. If you find that you need more time to complete the authorized activity, submit your request for a time extension to this office for consideration at least one month before the above date is reached.
10. The permittee shall employ “High Quality Waters” sediment and erosion control measures for all portions of the project west of SR 1415.
11. Prior to commencing construction within jurisdictional waters of the United States for any section, the permittee shall forward the latest version of the project construction drawings for that section to the Corps of Engineers Project Manager, Wilmington Field Office. Half-size drawings are acceptable.
12. Except as authorized by this permit or any USACE approved modification to this permit, no excavation, fill, or mechanized land-clearing activities shall take place at any time in the construction or maintenance of this project, within waters or wetlands, or shall any activities take place that cause the degradation of waters or wetlands. There shall be no excavation from, waste disposal into, or degradation of, jurisdictional wetlands or waters associated with this permit without appropriate modification of this permit, including appropriate compensatory mitigation. This prohibition applies to all borrow and fill activities connected with this project. In addition, except as specified in the plans attached to this permit, no excavation, fill or mechanized land-clearing activities shall take place at any time in the construction or maintenance of this project, in such a manner as to impair normal flows and circulation patterns within, into, or out of waters or wetlands or to reduce the reach of waters or wetlands.
13. To ensure that all borrow and waste activities occur on high ground and do not result in loss or the degradation of adjacent wetlands and streams, except as authorized by this permit, the permittee shall require its contractors and/or agents to identify all areas to be used to borrow material, or to dispose of dredged, fill, or waste material. The permittee shall ensure that all such areas comply with the preceding condition (#12) of this permit, and shall require and maintain documentation of the location and characteristics of all borrow and disposal sites associated with this project. This information will include data regarding soils, vegetation and hydrology sufficient to clearly demonstrate compliance with the preceding condition (#12). All information will be available to the Corps of Engineers upon request. NCDOT shall require its contractors to complete and execute reclamation plans for each waste and borrow site and provide written documentation that the reclamation plans have been implemented and all work is completed. This documentation will be provided to the Corps of Engineers within 30 days of the completion of the reclamation work.

14. Design and placement of culverts and other structures including temporary erosion control measures shall not be conducted in a manner that may result in disequilibrium of wetlands or streambeds or banks, adjacent to, upstream or downstream of the structures. Culverts shall be placed so that the openings match the natural stream channel wherever possible. Riprap armoring of streams at culvert outlets shall be minimized, including riprap placed above the ordinary high water elevation, in favor of bioengineering techniques such as bank sloping, erosion control matting and revegetation with deep-rooted, woody plants.

15. The permittee shall ensure that the construction design plans for this project do not deviate from the permit plans attached to this authorization. Written verification shall be provided that the final construction drawings comply with the attached permit drawings prior to any active construction in waters of the United States, including wetlands. Any deviation in the construction design plans will be brought to the attention of the Corps of Engineers Project Manager, Wilmington Regulatory Field Office prior to any active construction in waters or wetlands.

16. The permittee shall require its contractors and/or agents to comply with the terms and conditions of this permit in the construction and maintenance of this project, and shall provide each of its contractors and/or agents associated with the construction or maintenance of this project with a copy of this permit and any authorized modifications. Copies of this permit and any modifications authorized by the USACE shall be available for review at the construction site at all times. All violations, including non-compliance of these conditions, of the authorized permit shall be reported to the District Engineer within 24 hours of the violation.

17. This permit does not authorize temporary placement or double handling of excavated or fill material within waters or wetlands outside the permitted area.

18. The permittee shall use appropriate sediment and erosion control practices which equal or exceed those outlined in the most recent version of the "North Carolina Sediment and Erosion Control Planning and Design Manual" to assure compliance with the appropriate turbidity water quality standard. Erosion and sediment control practices must be in full compliance with all specifications governing the proper design, installation and operation and maintenance of such Best Management Practices in order to assure compliance with the appropriate turbidity water quality standards. This shall include, but is not limited to, the immediate installation of silt fencing or similar appropriate devices around all areas subject to soil disturbance or the movement of earthen fill, and the immediate stabilization of all disturbed areas. Additionally, the project must remain in full compliance with all aspects of the Sedimentation Pollution Control Act of 1973 (North Carolina General Statutes Chapter 113A Article 4). Adequate sedimentation and erosion control measures must be implemented prior to any ground disturbing activities to minimize impacts to downstream aquatic resources. These measures must be inspected and maintained regularly, especially following rainfall events. All fill material must be adequately stabilized at the earliest practicable date to prevent sediment from entering into adjacent waters or wetlands.

19. The permittee shall remove all sediment and erosion control measures placed in wetlands or waters, and shall restore natural grades in those areas, prior to project completion.

20. The permittee shall take measures to prevent live or fresh concrete from coming into contact with any surface waters until the concrete has hardened.

21. The permittee shall install barrier fencing or other acceptable forms of barrier around all wetlands that are not to be disturbed to make them readily visible and prevent construction equipment from inadvertently entering and disturbing the wetland areas that are to remain undisturbed.

22. All mechanized equipment will be regularly inspected and maintained to prevent contamination of waters and wetlands from fuels, lubricants, hydraulic fluids, or other toxic materials. No equipment staging or storage of construction material will occur in wetlands. Hydro-seeding equipment will not be discharged or washed out into any surface waters or wetlands. In the event of a spill of petroleum products or any other hazardous waste, the permittee shall immediately report it to the N.C. Division of Water Quality at (919) 733-5083 or (800) 662-7956 and provisions of the North Carolina Oil Pollution and Hazardous Substances Control Act will be followed.

23. If the permittee discovers any previously unknown historic or archeological sites while accomplishing the authorized work, he shall immediately stop work and notify the Wilmington District Engineer who will initiate the required State/Federal coordination.

24. The permittee shall maintain the authorized work in good condition and in conformance with the terms and conditions of this permit. The permittee is not relieved of this requirement if he abandons the permitted activity without transferring it to a third party.

25. Unless otherwise authorized by this permit, all fill material placed in waters or wetlands shall be generated from an upland source and will be clean and free of any pollutants except in trace quantities. Metal products, organic materials (including debris from land clearing activities), or unsightly debris will not be used.

26. This Department of the Army permit does not obviate the need to obtain other Federal, State, or local authorizations required by law.

27. In issuing this permit, the Federal Government does not assume any liability for:

- a. Damages to the permitted project or uses thereof as a result of other permitted or unpermitted activities or from natural causes.
- b. Damages to the permitted project or uses thereof as a result of current or future Federal activities initiated on behalf of the general public.
- c. Damages to other permitted or un-permitted activities or structures caused by the authorized activity.
- d. Design and construction deficiencies associated with the permitted work.
- e. Damage claims associated with any future modification, suspension, or revocation of this permit.



November 3, 2009

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

Dear Dr. Thorpe:

Subject: EEP Mitigation Acceptance Letter:

R-2417C, US 421/NC 87 (Sanford Bypass) from east of NC 42 to near SR 1138, Lee County

The purpose of this letter is to notify you that the Ecosystem Enhancement Program (EEP) will provide the compensatory riparian wetland mitigation for the subject project. Based on the information supplied by you on November 3, 2009, the impacts are located in CU 03030004 of the Cape Fear River Basin in the Southern Piedmont (SP) Eco-Region, and are as follows:

Cape Fear 03030004 SP	Stream			Wetlands			Buffer (Sq. Ft.)	
	Cold	Cool	Warm	Riparian	Non-Riparian	Coastal Marsh	Zone 1	Zone 2
Impacts (feet/acres)	0	0	0	0.04	0	0	0	0
Mitigation Units (Credits-up to 2:1)	0	0	0	0.08	0	0	0	0

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

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

Sincerely,

William D. Gilmore, P.E.  
EEP Director

cc: Ms. Kimberly Garvey, USACE – Wilmington Regulatory Field Office  
Mr. Brian Wrenn, Division of Water Quality, Wetlands/401 Unit  
File: R-2417C - 2

*Restoring... Enhancing... Protecting Our State*





November 3, 2009

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

Dear Dr. Thorpe:

Subject: EEP Mitigation Acceptance Letter:

R-2417C, US 421/NC 87 (Sanford Bypass) from east of NC 42 to near SR 1138, Lee County

The purpose of this letter is to notify you that the Ecosystem Enhancement Program (EEP) will provide the compensatory riparian wetland mitigation for the subject project. Based on the information supplied by you on November 3, 2009, the impacts are located in CU 03030004 of the Cape Fear River Basin in the Southern Piedmont (SP) Eco-Region, and are as follows:

Cape Fear 03030004 SP	Stream			Wetlands			Buffer (Sq. Ft.)	
	Cold	Cool	Warm	Riparian	Non-Riparian	Coastal Marsh	Zone 1	Zone 2
Impacts (feet/acres)	0	0	0	0.04	0	0	0	0
Mitigation Units (Credits-up to 2:1)	0	0	0	0.08	0	0	0	0

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

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

Sincerely,

William D. Gilmore, P.E.  
 EEP Director

cc: Ms. Kimberly Garvey, USACE – Wilmington Regulatory Field Office  
 Mr. Brian Wrenn, Division of Water Quality, Wetlands/401 Unit  
 File: R-2417C - 2

*Restoring... Enhancing... Protecting Our State*





November 5, 2009

Ms. Kimberly Garvey  
 U. S. Army Corps of Engineers  
 Wilmington Regulatory Field Office  
 Post Office Box 1890  
 Wilmington, North Carolina 28402-1890

Dear Ms. Garvey:

Subject: EEP Mitigation Acceptance Letter:

**R-2417AA**, US 421/NC 87 (Sanford Bypass) from west of SR 1400 to near US 1/15/501, Lee County;  
 Cape Fear River Basin (Cataloging Unit 03030003); Southern Piedmont (SP) Eco-Region

The purpose of this letter is to notify you that the Ecosystem Enhancement Program (EEP) will provide the stream and riparian wetland mitigation for the unavoidable impact associated with the above referenced project. This mitigation acceptance letter replaces the mitigation acceptance letter issued on May 4, 2009. Based on the information supplied by the NCDOT on November 3, 2009, the impacts are located in CU 03030003 of the Cape Fear River Basin in the Southern Piedmont (SP) Eco-Region, and the anticipated mitigation credits needed to offset the impacts are as follows:

Cape Fear 03030003 SP	Stream			Wetlands			Buffer (Sq. Ft.)	
	Cold	Cool	Warm	Riparian	Non-Riparian	Coastal Marsh	Zone 1	Zone 2
Impacts (feet/acres)	0	0	15 (2:1) 184 (1:1)	0.20	0	0	0	0
Mitigation Units Credits-up to 2:1 Credits at 1:1	0	0	30 184	0.40	0	0	0	0

Mitigation associated with this project will be provided in accordance with Section X of Amendment No. 2 to the Memorandum of Agreement between the N. C. Department of Environment and Natural Resources, the N. C. Department of Transportation, and the U. S. Army Corps of Engineers fully executed on March 8, 2007 (Tri-Party MOA). EEP commits to implement sufficient stream and riparian wetland mitigation in the appropriate cataloging unit in the amount listed in the above table to offset the impacts associated with this project by the end of the MOA year in which this project is permitted. If the above referenced impact amounts are revised, then this mitigation acceptance letter will no longer be valid and a new mitigation acceptance letter will be required from EEP.

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

Sincerely,

William D. Gilmore, P.E.  
 EEP Director

cc: Mr. Gregory J. Thorpe, Ph.D., NCDOT-PDEA  
 Mr. Brian Wrenn, Division of Water Quality, Wetlands/401 Unit  
 File: R-2417AA Revised

*Restoring... Enhancing... Protecting Our State*







November 5, 2009

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

Dear Dr. Thorpe:

Subject: EEP Mitigation Acceptance Letter:

**R-2417AA**, US 421/NC 87 (Sanford Bypass) from west of SR 1400 to near US 1/15/501,  
Lee County

The purpose of this letter is to notify you that the Ecosystem Enhancement Program (EEP) will provide the stream and riparian wetland mitigation for the subject project. This mitigation acceptance letter replaces the mitigation acceptance letter issued on May 4, 2009. Based on the information supplied by you on November 3, 2009, the impacts are located in CU 03030003 of the Cape Fear River Basin in the Southern Piedmont (SP) Eco-Region, and are as follows:

Cape Fear 03030003 SP	Stream			Wetlands			Buffer (Sq. Ft.)	
	Cold	Cool	Warm	Riparian	Non-Riparian	Coastal Marsh	Zone 1	Zone 2
Impacts (feet/acres)	0	0	15 (at 2:1) 184 (at 1:1)	0.20	0	0	0	0
Mitigation Units Credits-up to 2:1 Credits at 1:1	0	0	30 (2:1) 184 (1:1)	0.40	0	0	0	0

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

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

Sincerely,

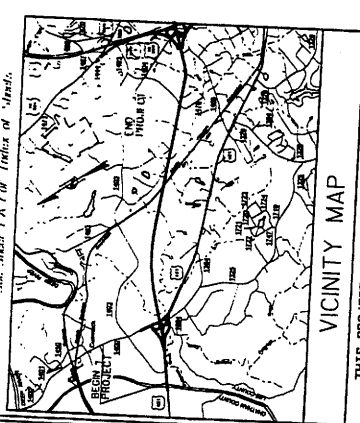
William D. Gilmore, P.E.  
EEP Director

cc: Ms. Kimberly Garvey, USACE – Wilmington Regulatory Field Office  
Mr. Brian Wrenn, Division of Water Quality, Wetlands/401 Unit  
File: R-2417AA

*Restoring... Enhancing... Protecting Our State*



# TIP PROJECT: R-2417AA



STATE OF NORTH CAROLINA  
DIVISION OF HIGHWAYS

**LEE COUNTY**

LOCATION: US 421 - NC 87 SANFORD BYPASS FROM WEST OF SR 1400 TO WEST OF US 1-15-501

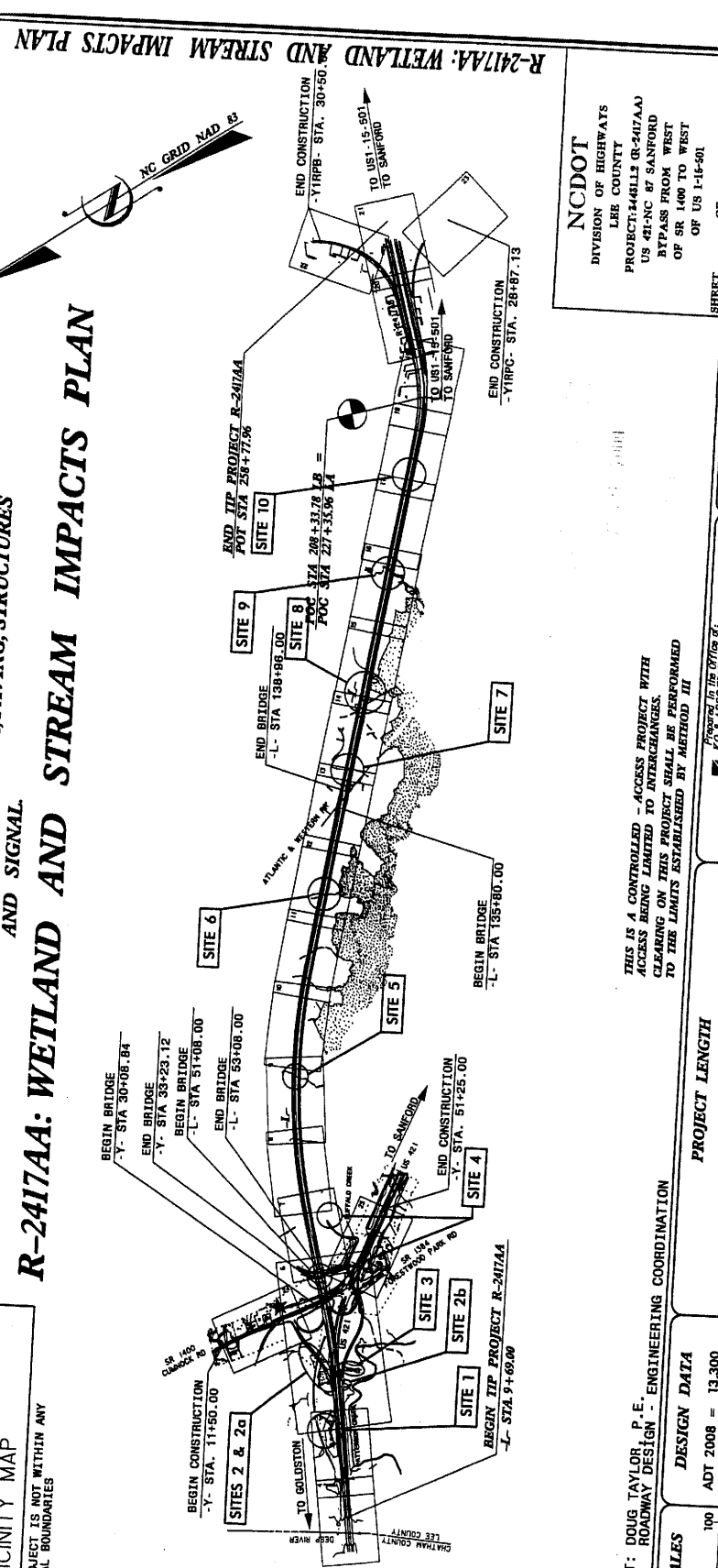
TYPE OF WORK: GRADING, DRAINAGE, PAVING, STRUCTURES AND SIGNAL

## R-2417AA: WETLAND AND STREAM IMPACTS PLAN

STATE	N.C.	PROJECT NUMBER	R-2417AA
FED. PROJECT NO.	34431.1.2	P.A. NUMBER	SIP-NHE-421(2)
STATE PROJECT NO.	34431.2.2	P.E. NO.	RW
DATE		DATE	

Permit Drawing Sheet 5 of 11

LEGEND:  
★ PROPOSED SIGNAL



**CONTRACT:**

NCDOT CONTACT: DOUG TAYLOR, P.E.  
ROADWAY DESIGN - ENGINEERING COORDINATION

**GRAPHIC SCALES**

PLANS: 1" = 100'

PROFILE (HORIZONTAL): 1" = 20'

**DESIGN DATA**

ADT 2008 = 13,300  
ADT 2028 = 20,800  
DHW = 10 %  
D = 60 %  
T = 9 %  
V = 70 MPH  
\* TST 5% DUAL 4%

**PROJECT LENGTH**

LENGTH ROADWAY TIP PROJECT R-2417AA = 4.29 MI  
LENGTH STRUCTURES TIP PROJECT R-2417AA = 0.98 MI  
TOTAL LENGTH OF TIP PROJECT R-2417AA = 4.37 MI

THIS IS A CONTROLLED - ACCESS PROJECT WITH ACCESS BEING LIMITED TO INTERCHANGES. CLEARING ON THIS PROJECT SHALL BE PERFORMED TO THE LIMITS ESTABLISHED BY METHOD III

Prepared in the Office of  
**AC & ASSOCIATES, P.C.**  
A Professional Engineering Firm  
1101 UNIVERSITY DRIVE, SUITE 200  
CARRBORO, NC 27581  
252-337-8800

REGISTERED PROFESSIONAL ENGINEER  
No. 18987

RIGHT OF WAY DATE: February 17, 2006

PROJECT ENGINEER: David C. Weller, P.E.

HYDRAULICS ENGINEER

ROADWAY DESIGN

**NCDOT**  
DIVISION OF HIGHWAYS  
LEE COUNTY  
PROJECT: R-2417AA (R-2417AA)  
US 421-NC 87 SANFORD BYPASS FROM WEST OF SR 1400 TO WEST OF US 1-15-501

SHEET OF

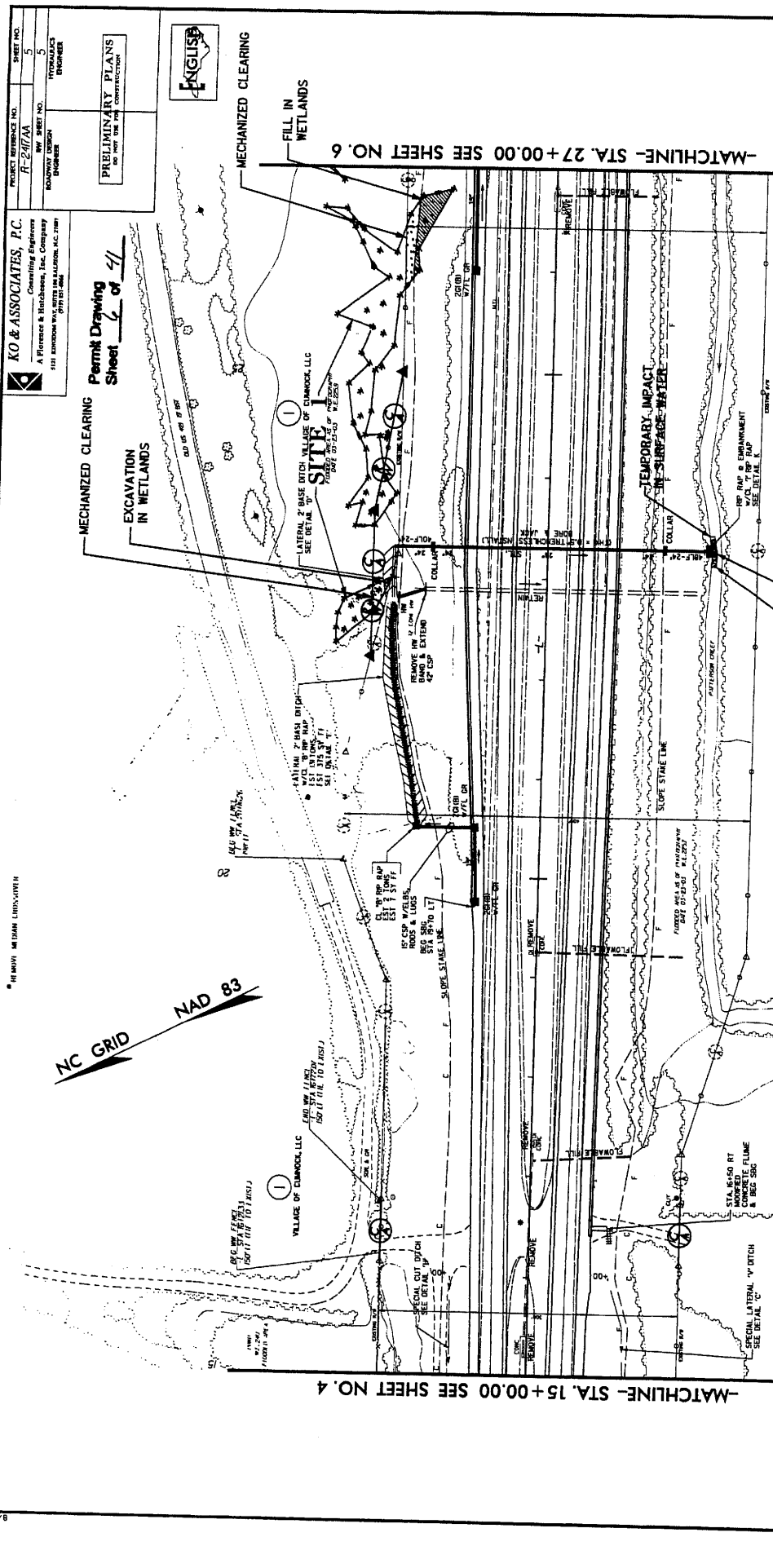
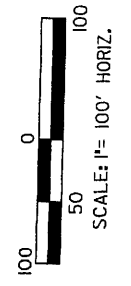
DIVISION OF HIGHWAYS  
STATE OF NORTH CAROLINA

NCDOT  
 DIVISION OF HIGHWAYS  
 LEE COUNTY  
 PROJECT: 448LL3 (R-247AA)  
 US 421-NC 87 SANFORD  
 BYPASS FROM WEST  
 OF SR 1400 TO WPCT

**LEGEND**

	WETLAND
	WETLAND FILLING
	WETLAND EXCAVATION
	WETLAND MECHANIZATION
	TEMPORARY IMPACTS IN SURFACE WATER
	IMPACTS IN SURFACE WATER

**PLAN VIEW  
SITE 1**



**KO & ASSOCIATES, P.C.**  
 Consulting Engineers  
 A Florence & Hitchcock, Inc. Company  
 931 REDWOOD WALKWAY IN WALKER, N.C. 27889  
 (704) 757-5666

PROJECT REFERENCE NO. R-247AA  
 SHEET NO. 5  
 PRELIMINARY PLANS FOR THE CONSTRUCTION OF HIGHWAYS

Permit Drawing  
 Sheet **6** of **41**

VILLAGE OF CUMMOC, LLC  
 LATERAL 2" BASE DITCH  
 SEE DETAIL 'G'

MECHANIZED CLEARING

EXCAVATION IN WETLANDS

FILL IN WETLANDS

TEMPORARY IMPACT IN SURFACE WATER

IMPACT IN SURFACE WATER (BANK STABILIZATION)

MECHANIZED CLEARING

MECHANIZED CLEARING

-MATCHLINE- STA. 15+00.00 SEE SHEET NO. 4

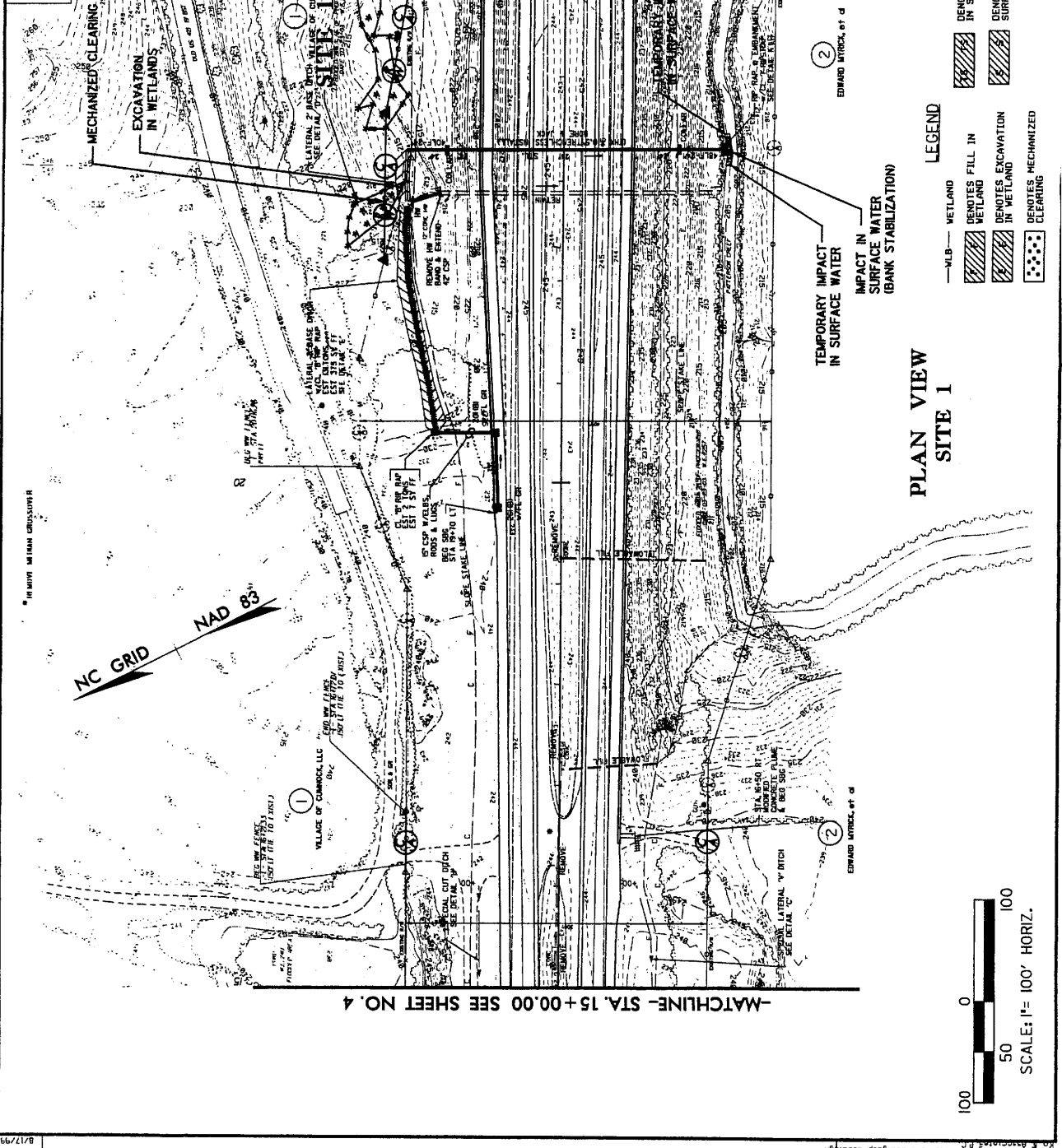
-MATCHLINE- STA. 27+00.00 SEE SHEET NO. 6

PROJECT REFERENCE NO. R-2477AA  
 SHEET NO. 5  
 HYDRAULICS ENGINEER

PRELIMINARY PLANS  
 Permit Drawing  
 Sheet 7 of 41

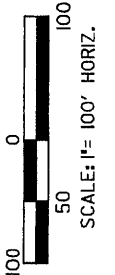


KO & ASSOCIATES, P.C.  
 Consulting Engineers  
 A Florence & Hutchinson, Inc. Company  
 312 S. BROADWAY, FLORENCE, S.C. 29502



PLAN VIEW  
 SITE 1

- LEGEND**
- W/LB— WETLAND
  - [Hatched pattern] DENOTES FILL IN WETLAND
  - [Hatched pattern] DENOTES EXCAVATION IN WETLAND
  - [Dotted pattern] DENOTES MECHANIZED CLEARING
  - [Hatched pattern] DENOTES TEMPORARY IMPACTS IN SURFACE WATER
  - [Hatched pattern] DENOTES IMPACTS IN SURFACE WATER



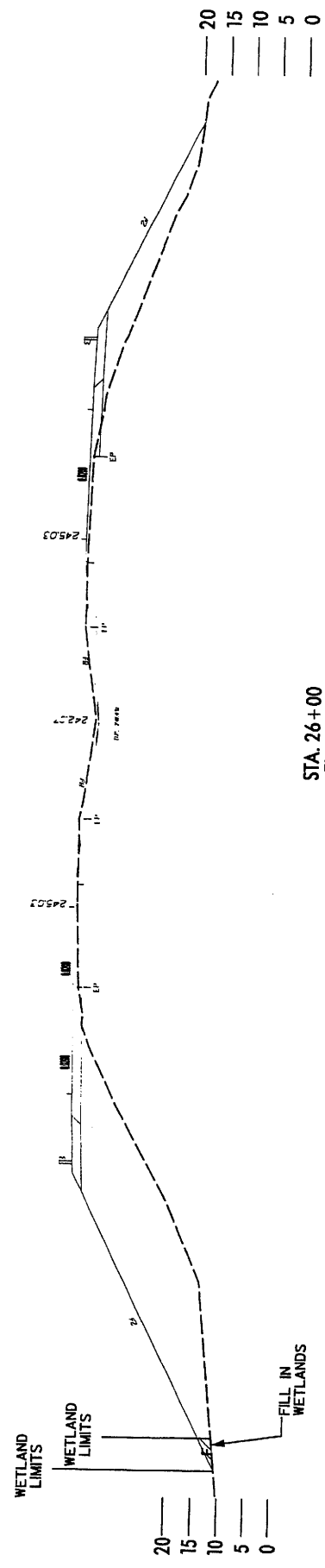
**NC DOT**  
 DIVISION OF HIGHWAYS  
 LEE COUNTY  
 PROJECT: 4461L3 (R-2477AA)  
 US 421-NC 87 SANFORD  
 BYPASS FROM WEST  
 OF SR 1400 TO WEST  
 OF US 1-16-601

12-2-06 Parcel 1 & 2 Name Change  
 12-2-06 Added CA to existing access points - parcels 1 & 2  
 8/17/93

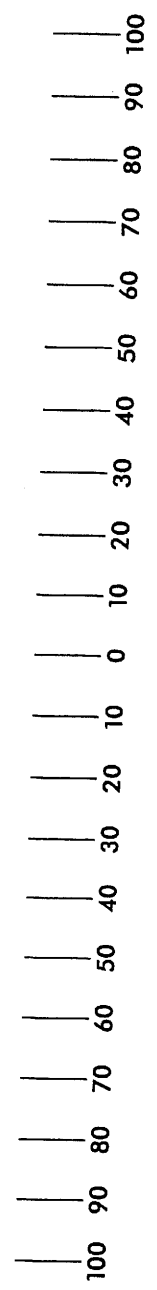
PROJECT REFERENCE NO. **R-2417AA**  
 SHEET NO. **1-11PL**  
 ROADWAY DESIGN ENGINEER  
 PRELIMINARY PLANS  
 NOT FOR CONSTRUCTION



Permit Drawing  
 Sheet 3 of 41



STA. 26+00  
 EL = 205.00



**LEGEND**  
 — WLB — WETLAND  
 [Hatched Box] DENOTES FILL IN WETLAND

**NC DOT**  
 DIVISION OF HIGHWAYS  
 LEE COUNTY  
 PROJECT: 34431.12 (R-2417AA)  
 BYPASS FROM WEST  
 OF SR 1400 TO WEST

**TYPICAL X-SECTIONS  
 SITE 1**

**KO & ASSOCIATES, P.C.**  
 Consulting Engineers  
 A Florence & Hattness, Inc. Company  
 5111 LEXINGTON WOODS DRIVE, SUITE 100  
 FARMINGHAM, VA 22031  
 PHONE: (540) 868-0200  
 FAX: (540) 868-0201  
 WWW.KOASSOCIATES.COM

PROJECT REFERENCE NO. 17-ZH/AA  
 DRAWING NO. 20  
 PROJECT DESCRIPTION  
 HIGHWAY CONSTRUCTION  
 SHEET NO. 20

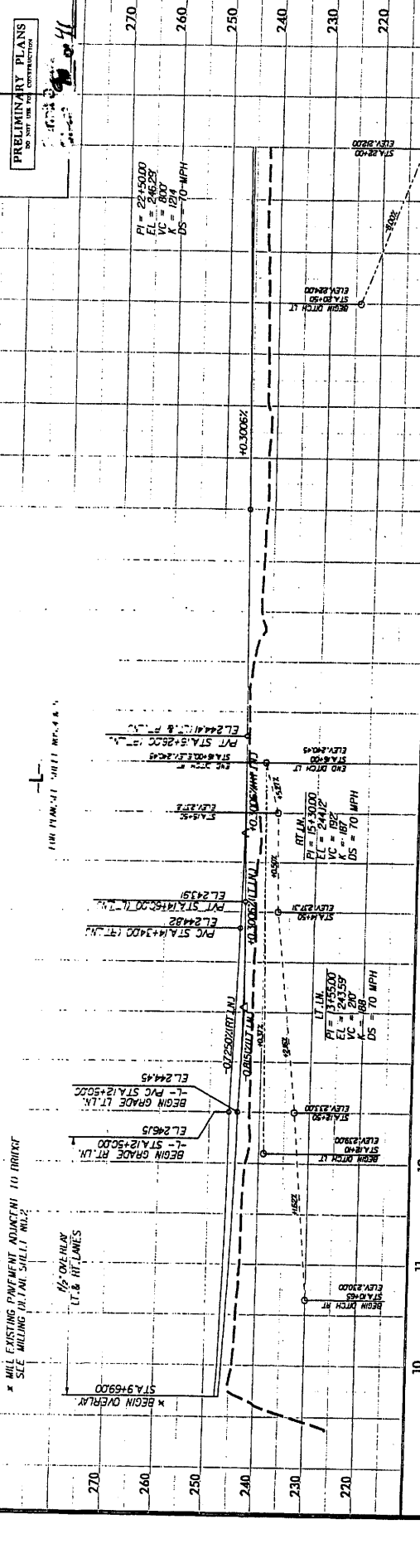
PRELIMINARY PLANS  
 FOR THE PROPOSED  
 44'

SEE PLAN SEE SHEET NOS. 5 & 6  
 RT LN  
 PI = 151+30.00  
 EL = 244.12  
 VC = 127  
 DS = 7.0 MPH

RT LN  
 PI = 145.00  
 EL = 243.59  
 VC = 207  
 DS = 7.0 MPH

RT LN  
 PI = 135.00  
 EL = 243.59  
 VC = 207  
 DS = 7.0 MPH

RT LN  
 PI = 22+50.00  
 EL = 246.25  
 VC = 660  
 DS = 7.0 MPH



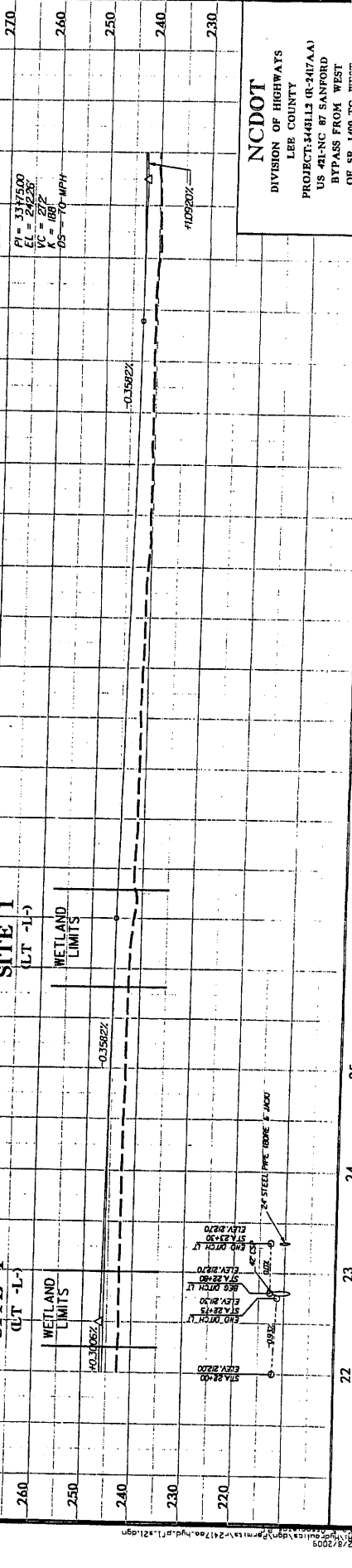
PIPE HYDRAULIC DATA	
STA 1-1 - 31+50	
DRAINAGE AREA	7300 AC
DESIGN FREQUENCY	50% TFS
DESIGN DISCHARGE	500 CFS
DESIGN HW ELEVATION	252.07
10 YEAR DISCHARGE	7239 CFS
10 YEAR HW ELEVATION	250.98
OVERTOPPING FREQUENCY	50% TFS
OVERTOPPING DISCHARGE	56 CFS
OVERTOPPING ELEVATION	249.22 FT
INVERT	251.33
PIPE DIA.	24"

PIPE HYDRAULIC DATA	
STA 1-1 - 31+50	
DRAINAGE AREA	7300 AC
DESIGN FREQUENCY	50% TFS
DESIGN DISCHARGE	500 CFS
DESIGN HW ELEVATION	252.07
10 YEAR DISCHARGE	7239 CFS
10 YEAR HW ELEVATION	250.98
OVERTOPPING FREQUENCY	50% TFS
OVERTOPPING DISCHARGE	56 CFS
OVERTOPPING ELEVATION	249.22 FT
INVERT	251.33
PIPE DIA.	24"

PIPE HYDRAULIC DATA	
STA 1-1 - 23+30	
DRAINAGE AREA	350 AC
DESIGN FREQUENCY	50% TFS
DESIGN DISCHARGE	400 CFS
DESIGN HW ELEVATION	230.07
10 YEAR DISCHARGE	850 CFS
10 YEAR HW ELEVATION	228.07
OVERTOPPING FREQUENCY	50% TFS
OVERTOPPING DISCHARGE	40 CFS
OVERTOPPING ELEVATION	226.07 FT
INVERT	230.00
PIPE DIA.	24"

PIPE HYDRAULIC DATA	
STA 1-1 - 23+30	
DRAINAGE AREA	350 AC
DESIGN FREQUENCY	50% TFS
DESIGN DISCHARGE	400 CFS
DESIGN HW ELEVATION	230.07
10 YEAR DISCHARGE	850 CFS
10 YEAR HW ELEVATION	228.07
OVERTOPPING FREQUENCY	50% TFS
OVERTOPPING DISCHARGE	40 CFS
OVERTOPPING ELEVATION	226.07 FT
INVERT	230.00
PIPE DIA.	24"

PIPE HYDRAULIC DATA	
STA 1-1 - 23+30	
DRAINAGE AREA	350 AC
DESIGN FREQUENCY	50% TFS
DESIGN DISCHARGE	400 CFS
DESIGN HW ELEVATION	230.07
10 YEAR DISCHARGE	850 CFS
10 YEAR HW ELEVATION	228.07
OVERTOPPING FREQUENCY	50% TFS
OVERTOPPING DISCHARGE	40 CFS
OVERTOPPING ELEVATION	226.07 FT
INVERT	230.00
PIPE DIA.	24"



NCDOT  
 DIVISION OF HIGHWAYS  
 LEE COUNTY  
 PROJECT: 44112 (R-247AA)  
 US 421-NC 87 SANFORD  
 BYPASS FROM WEST  
 OF SD 1,000' TO WEST

PROJECT REFERENCE NO. R-2417AA  
 SHEET NO. 10 OF 41  
 ROADWAY DESIGN ENGINEER  
 PRELIMINARY PLANS FOR THE CONSTRUCTION OF HIGHWAYS



Permit Drawing  
 Sheet 10 of 41

**LEGEND**

- NLB — WETLAND
- ▨ DENOTES FILL IN WETLAND EXCAVATION IN WETLAND
- ▩ DENOTES IMPACTS IN SURFACE WATER
- ▧ DENOTES TEMPORARY IMPACTS IN SURFACE WATER
- ▦ DENOTES MECHANIZED CLEARING

NC GRID NAD 83

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

**NCDOT**  
 DIVISION OF HIGHWAYS  
 LEE COUNTY  
 PROJECT: 4461L3 (R-2417AA)  
 US 421-NC 87 SANFORD  
 BYPASS FROM WEST  
 OF SR 1400 TO WEST

**KO & ASSOCIATES, P.C.**  
 Consulting Engineers  
 A. Fletcher & Hutchinson, Inc. Company  
 2101 GARDNER WAY, SUITE 100  
 WILSON, N.C. 27157  
 (704) 751-1100

TEMPORARY IMPACT IN SURFACE WATER

IMPACTS IN SURFACE WATER

MECHANIZED CLEARING

FILL IN WETLAND

EXCAVATION IN WETLAND

MECHANIZED CLEARING

MECHANIZED CLEARING

MECHANIZED CLEARING

MECHANIZED CLEARING

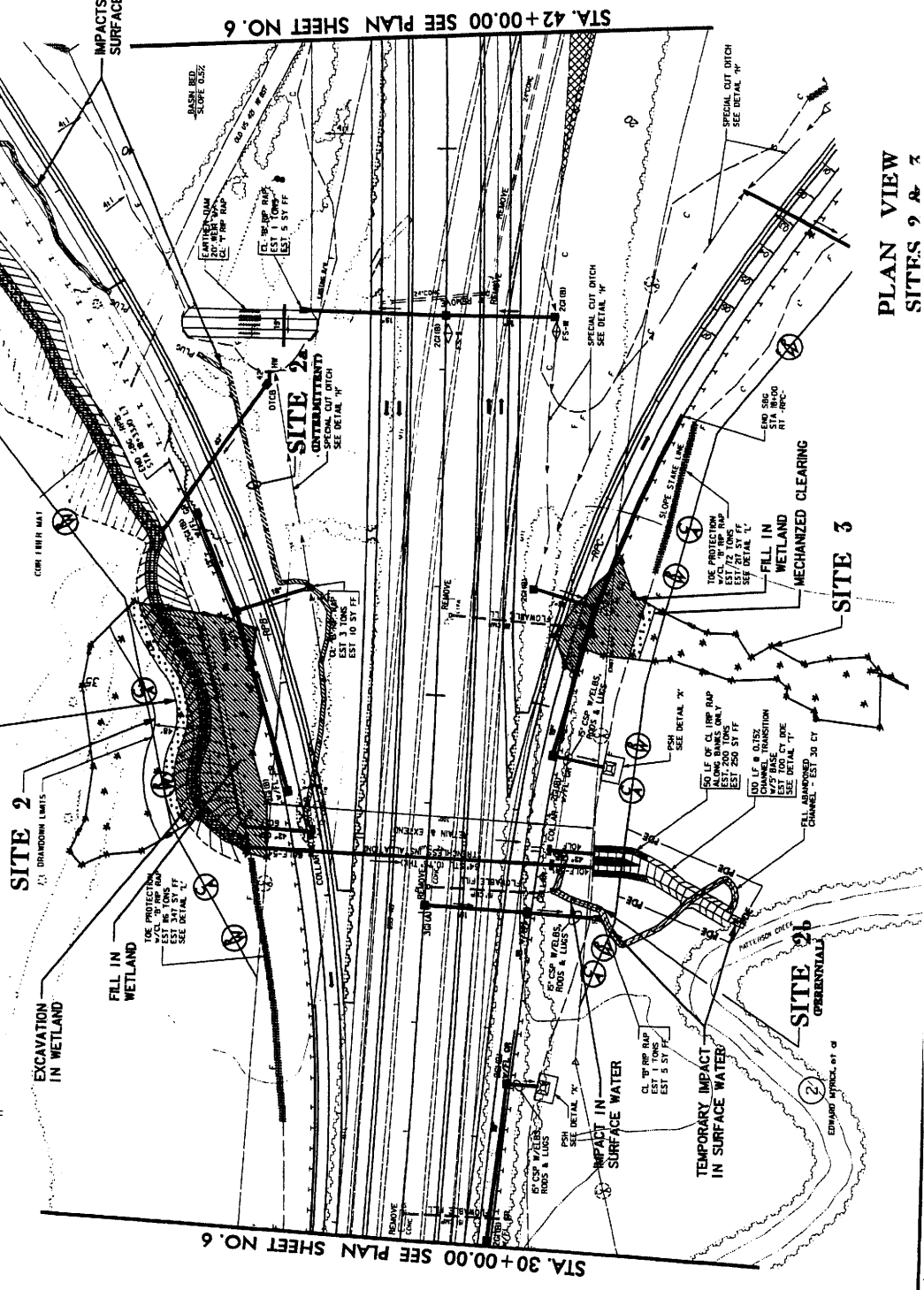
MECHANIZED CLEARING

MECHANIZED CLEARING

MECHANIZED CLEARING

MECHANIZED CLEARING

MECHANIZED CLEARING



PLAN VIEW  
 SITES 2 & 3

PROJECT REFERENCE NO. R-217/7A  
 SHEET NO. 6A  
 DRAWING NUMBER  
 PRELIMINARY PLANS  
 FOR THE CONSTRUCTION

KO & ASSOCIATES, P.C.  
 Consulting Engineers  
 A Finestra & Frischmeyer, Inc. Company  
 111 SHEDDEN WING ROAD IN BALDWIN, N.C. 27007  
 (704) 211-1111

VELOCITY CHANNEL CHANNEL W/  
 GLASS RIB RAP  
 U.S. 1446 LINGS  
 EST. 11' TO 12' W/  
 SFF DETAIL 'L'

VELOCITY CHANNEL CHANNEL W/  
 GLASS RIB RAP  
 U.S. 1446 LINGS  
 EST. 11' TO 12' W/  
 SFF DETAIL 'L'

VELOCITY CHANNEL CHANNEL W/  
 GLASS RIB RAP  
 U.S. 1446 LINGS  
 EST. 11' TO 12' W/  
 SFF DETAIL 'L'

VELOCITY CHANNEL CHANNEL W/  
 GLASS RIB RAP  
 U.S. 1446 LINGS  
 EST. 11' TO 12' W/  
 SFF DETAIL 'L'

VELOCITY CHANNEL CHANNEL W/  
 GLASS RIB RAP  
 U.S. 1446 LINGS  
 EST. 11' TO 12' W/  
 SFF DETAIL 'L'

VELOCITY CHANNEL CHANNEL W/  
 GLASS RIB RAP  
 U.S. 1446 LINGS  
 EST. 11' TO 12' W/  
 SFF DETAIL 'L'

VELOCITY CHANNEL CHANNEL W/  
 GLASS RIB RAP  
 U.S. 1446 LINGS  
 EST. 11' TO 12' W/  
 SFF DETAIL 'L'

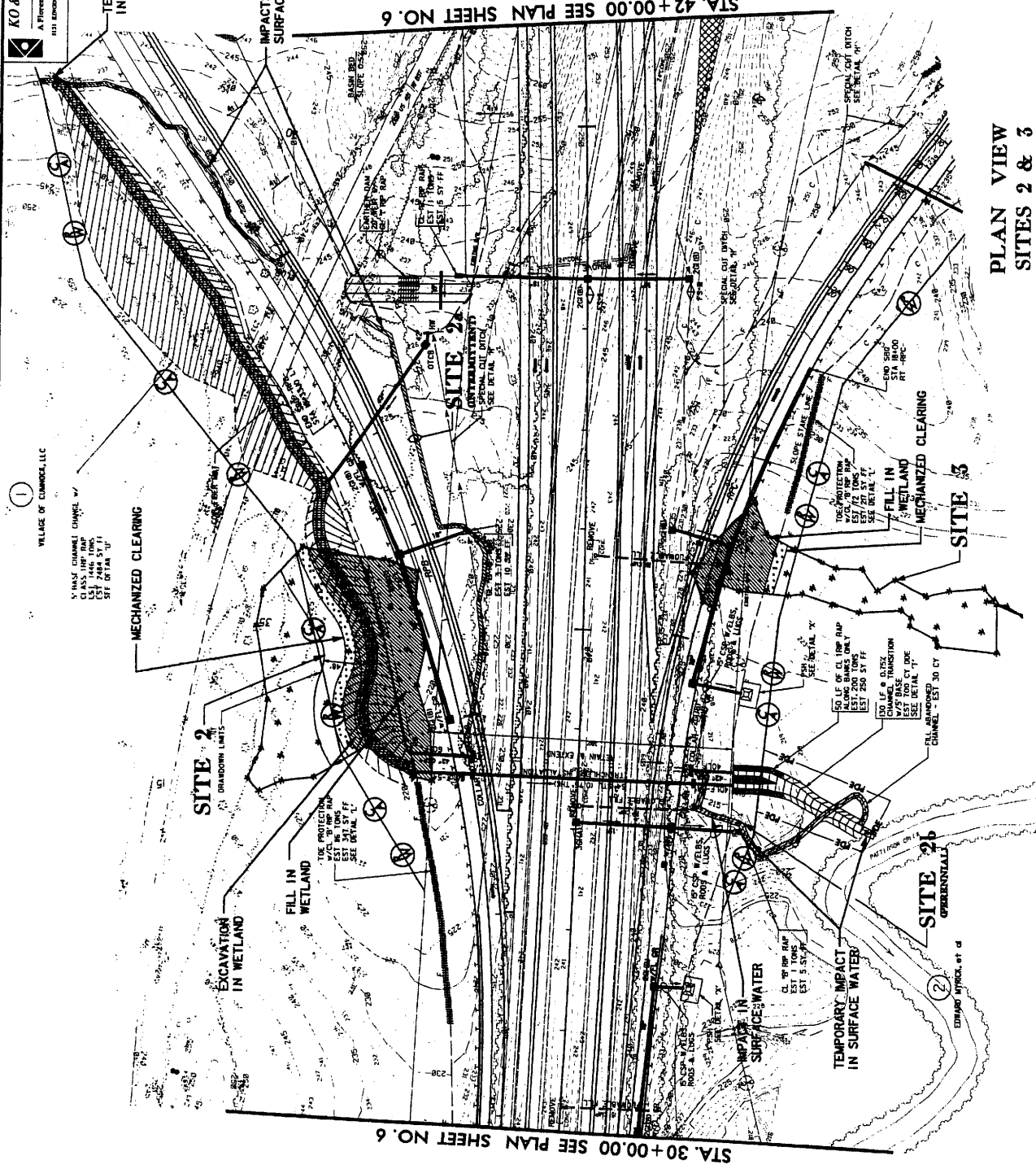
Permit Drawing  
 Sheet 11 of 41  
**ENGLISH**

LEGEND  
 -MLB- WETLAND  
 DENOTES FILL IN WETLAND  
 DENOTES EXCAVATION IN WETLAND  
 DENOTES IMPACTS IN SURFACE WATER  
 DENOTES TEMPORARY IMPACTS IN SURFACE WATER  
 DENOTES MECHANIZED CLEARING

NC GRID  
 NAD 83

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

NC DOT  
 DIVISION OF HIGHWAYS  
 LEE COUNTY  
 PROJECT: 146115 (R-347A.A)  
 BYPASS FROM WEST OF SR 1400 TO WEST OF 11C 1-1C.00



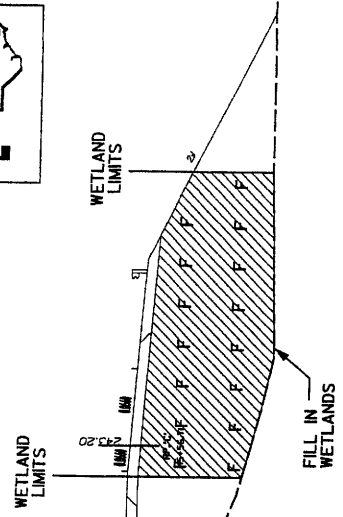
PLAN VIEW  
 SITES 2 & 3



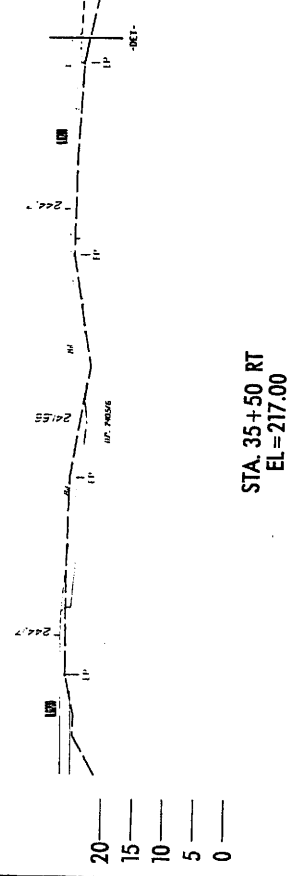
PROJECT REFERENCE NO. **R-2417AA**  
 SHEET NO. **283-XPL**  
 ROADWAY DESIGN ENGINEER  
 HYDRAULICS ENGINEER  
 PRELIMINARY PLANS  
 NOT FOR USE IN CONSTRUCTION



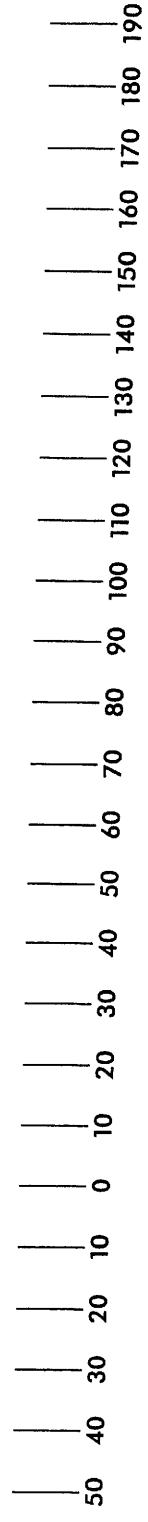
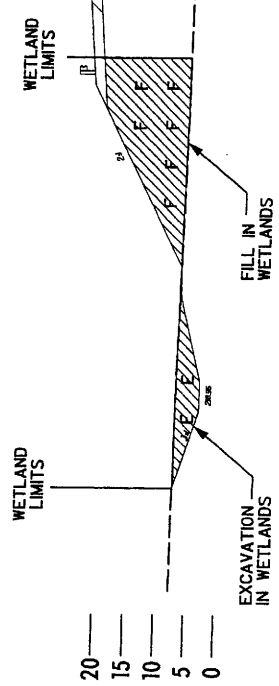
Permit Drawing  
 Sheet **12** of **41**



STA. 35+50 RT  
 EL=217.00



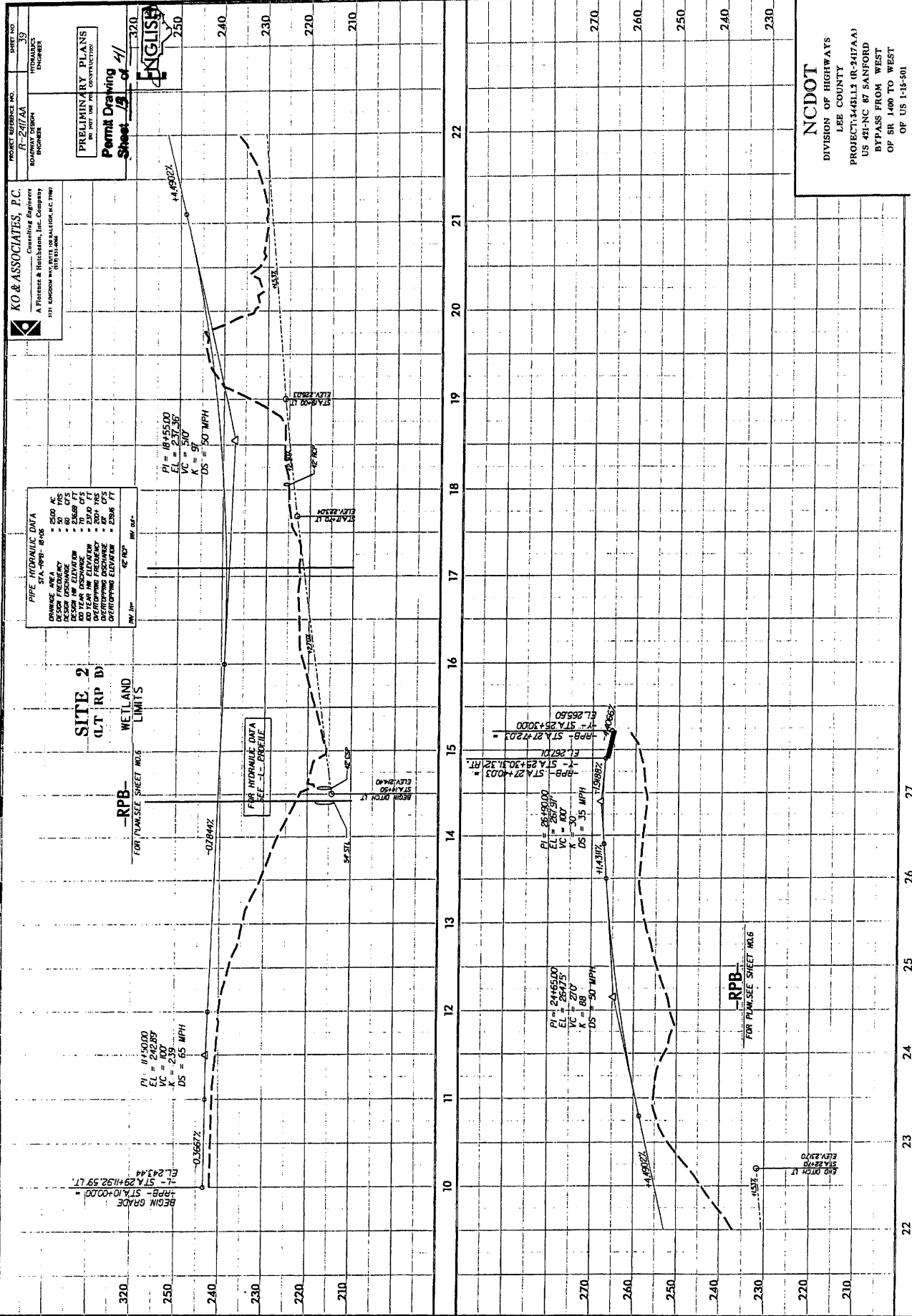
STA. 35+00 LT  
 EL=216.00



**LEGEND**  
 --- WLB --- WETLAND LIMITS  
 [Hatched with 'F'] DENOTES FILL IN WETLAND  
 [Hatched with 'E'] DENOTES EXCAVATION IN WETLAND

**TYPICAL X-SECTIONS  
 SITES 2 & 3**

**NC DOT**  
 DIVISION OF HIGHWAYS  
 LEE COUNTY  
 PROJECT: 34431.12 (R-2417AA)  
 US 421-NC 87 SANFORD  
 BYPASS FROM WEST  
 OF SR 1400 TO WEST  
 OF US 1-15-501



PROJECT REFERENCE NO. R-247AAA  
 SHEET NO. 39  
 PROJECT ENGINEER  
 PERMIT DRAWING  
 SHEET 13 of 41  
 ENGLISH

**KO & ASSOCIATES, P.C.**  
 Consulting Engineers  
 A Florence & Hutchinson, Inc. Company  
 131 LINDSEY WAY, SUITE 100, RALPHA, N.C. 27640  
 919.519.6666

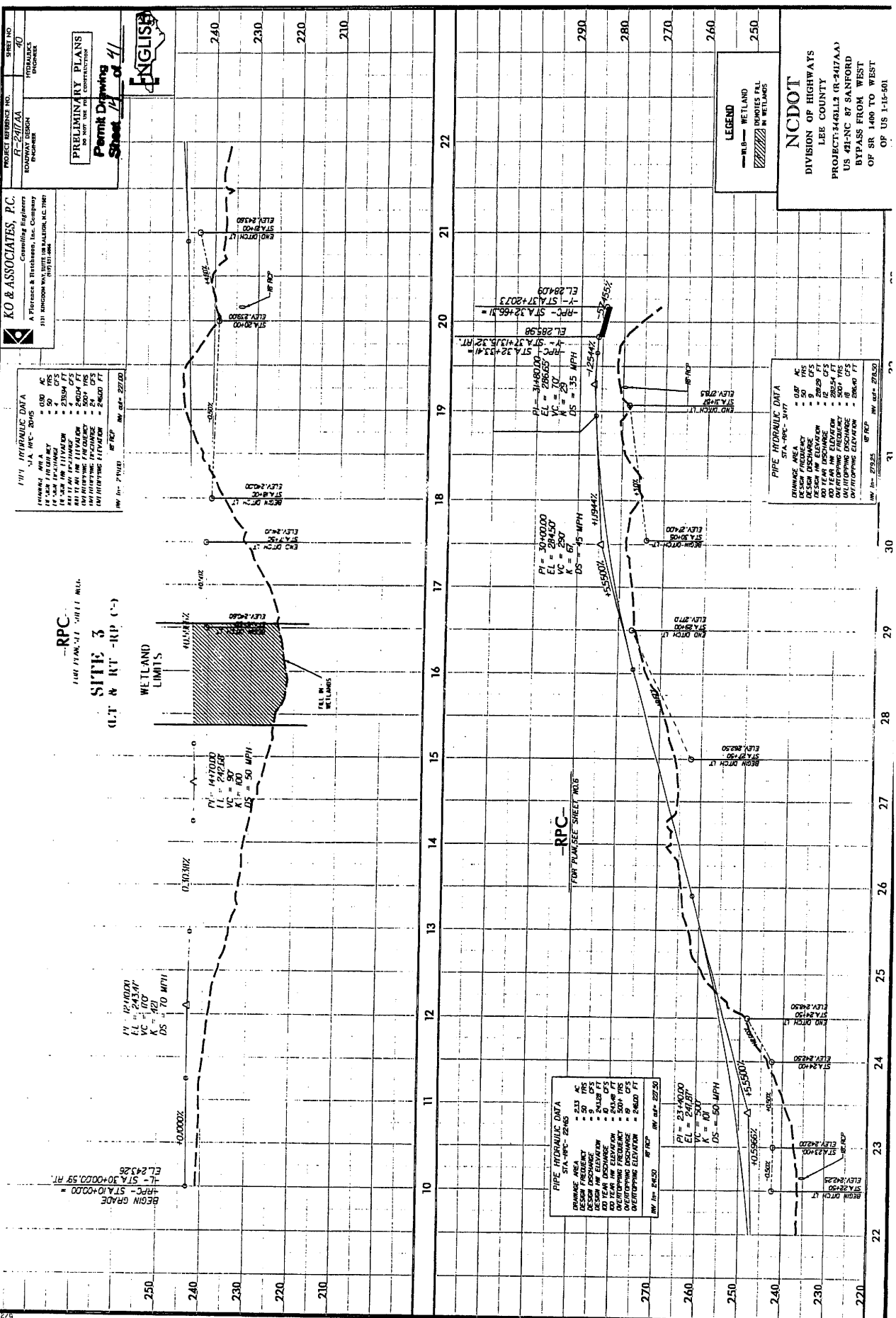
**FOR HYDRAULIC DATA**

DESIGN AREA	2500 AC
DESIGN FREQ	1% FFS
DESIGN HW ELEVATION	8.588 FT
DESIGN FLOW	70 CFS
DESIGN VELOCITY	2.00 FFS
DEVELOPING FREQUENCY	200 FFS
DEVELOPING DISCHARGE	87 CFS
DEVELOPING VELOCITY	2.56 FFS
DEVELOPING ELEVATION	8.586 FT

**SITE 2 (L.T. RP D)**  
 WETLAND LIMITS

**FOR HYDRAULIC DATA**  
 SEE L.T. ENROUTE

**NC DOT**  
 DIVISION OF HIGHWAYS  
 LEE COUNTY  
 PROJECT: 144113 (R-247AAA)  
 US 491-NC BY SANFORD  
 BYPASS FROM WEST  
 OF SR 1400 TO WEST  
 OF US 1-15-90



**PROJECT RESOURCES**  
 PROJECT NO. F-242AA  
 ENGINEER  
 SHERIDAN ENGINEERS

**PRELIMINARY PLANS**  
 PERMIT DRAWING  
 SHEET 12 of 11  
**ENGLISH**

**KO & ASSOCIATES, P.C.**  
 Consulting Engineers  
 A Florence & Fischbein, Inc. Company  
 3111 KINGDOM WAY, SUITE 100, WILMINGTON, NC 28409  
 PHONE: 919-739-3333

- 1717 HYDRAULIC DATA**
- CHANNEL: 40' WPC - 2005
  - BANK: 4' ASH
  - BOTTOM: 4' S.S.
  - DESIGN DISCHARGE: 2264 CFS
  - DESIGN VELOCITY: 2.50 FT/SEC
  - DESIGN WIND VELOCITY: 150 MPH
  - DESIGN WIND FREQUENCY: 100%
  - DESIGN WIND ELEVATION: 2650 FT
  - DESIGN WIND SPEED: 100 MPH
  - DESIGN WIND DIRECTION: 180 DEGREES
  - DESIGN WIND PERIOD: 30 SECONDS

**RPC**  
**SITE 3**  
**C.T. & RT - RP (-)**

**LEGEND**

- W/LB - WETLAND
- W/LB - WETLAND
- W/LB - WETLAND
- W/LB - WETLAND
- W/LB - WETLAND

**NC DOT**  
 DIVISION OF HIGHWAYS  
 LEE COUNTY  
 PROJECT: R44813 (R-347AA)  
 US 421-NC 87 SANFORD  
 BYPASS FROM WEST  
 OF US 1-15-801

- PIPE HYDRAULIC DATA**  
 STA. 10+00 - 10+50
- DRAINAGE AREA: 1.00 AC
  - DESIGN DISCHARGE: 2264 CFS
  - DESIGN WIND VELOCITY: 150 MPH
  - DESIGN WIND FREQUENCY: 100%
  - DESIGN WIND ELEVATION: 2650 FT
  - DESIGN WIND SPEED: 100 MPH
  - DESIGN WIND DIRECTION: 180 DEGREES
  - DESIGN WIND PERIOD: 30 SECONDS

PROJECT REFERENCE NO. **66**  
 SHEET NO. **66**  
 DRAWING NO. **R-2417AA**  
 HYDRAULICS ENGINEER

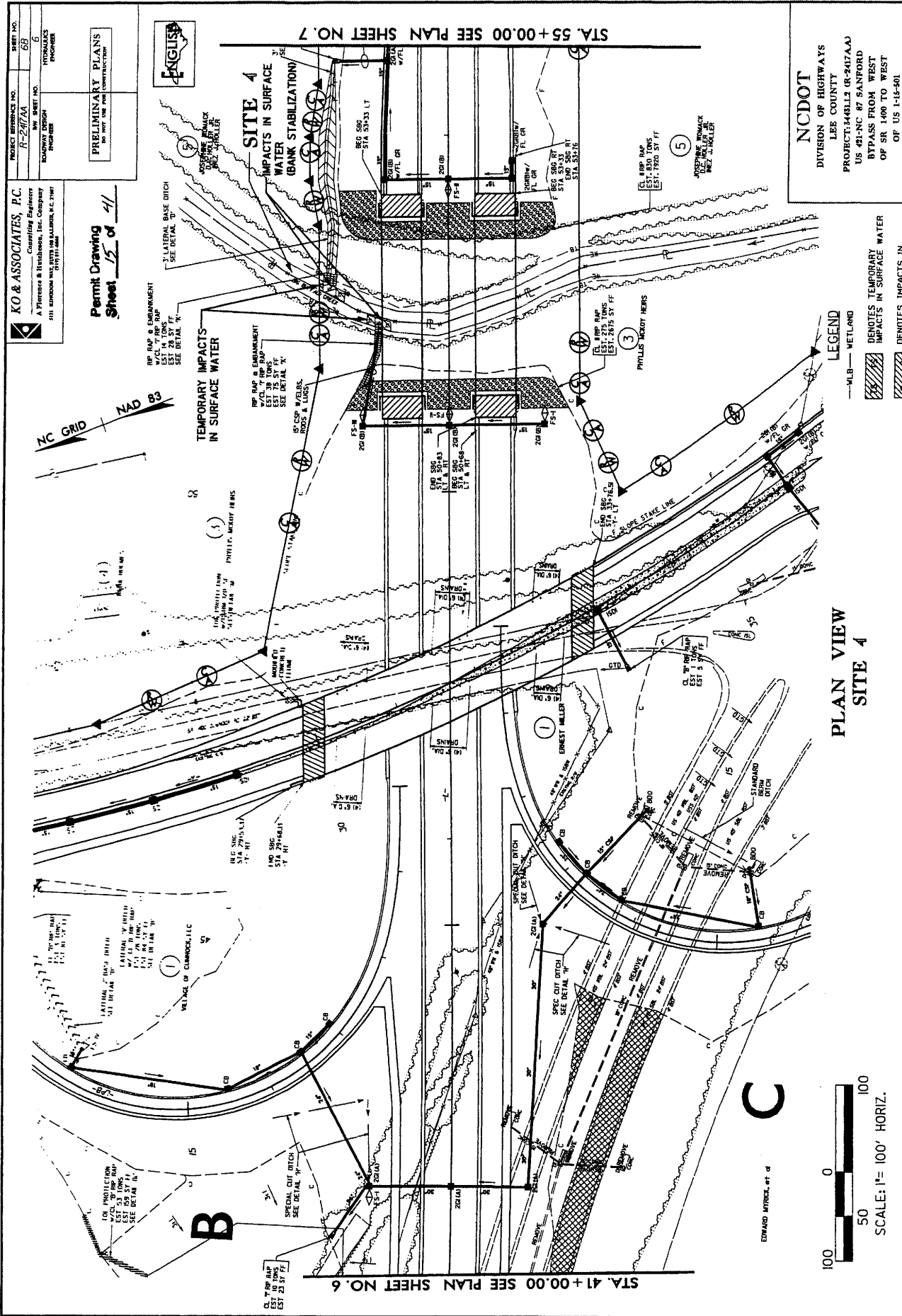
**PRELIMINARY PLANS**  
 DO NOT USE FOR CONSTRUCTION

**KO & ASSOCIATES, P.C.**  
 Consulting Engineers  
 A Florence & Irwin, Inc. Company  
 511 SADDON RD., SUITE 200, FLORENCE, N.C. 27931  
 (919) 417-1111

Permit Drawing  
 Sheet 15 of 41



**NCDOT**  
 DIVISION OF HIGHWAYS  
 LEE COUNTY  
 PROJECT: 448112 (R-2417AA)  
 US 41-NC 87 SANFORD  
 BYPASS FROM WEST  
 OF SR 1400 TO WEST  
 OF US 1-16-80



PLAN VIEW  
 SITE 4

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

STA. 41+00.00 SEE PLAN SHEET NO. 6

STA. 55+00.00 SEE PLAN SHEET NO. 7

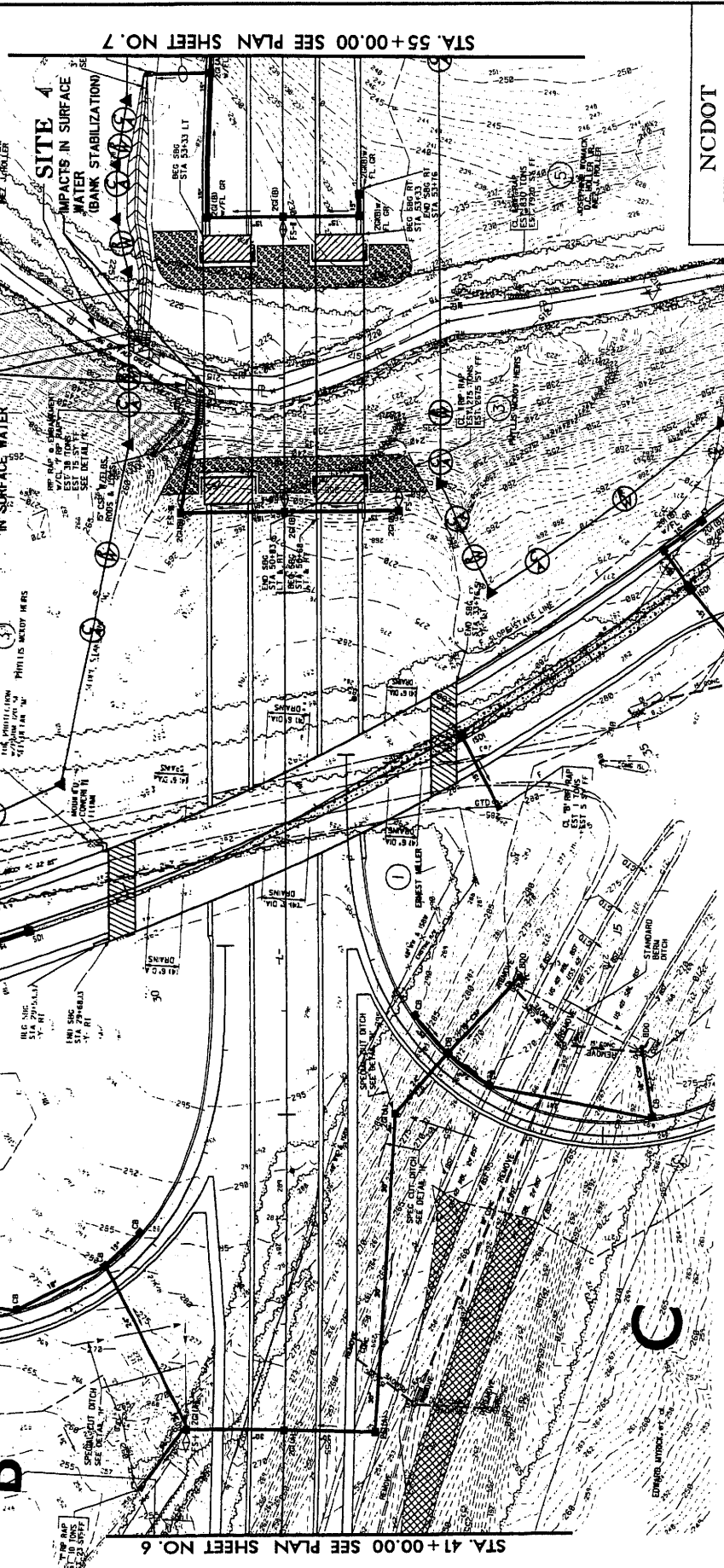
EDWARD WYCKEL, et al

8/17/2005

PROJECT REFERENCE NO. **R-217/AA**  
 SHEET NO. **6**  
 TOTAL SHEETS **6**  
 PRELIMINARY PLANS  
 DO NOT USE FOR CONSTRUCTION

**KO & ASSOCIATES, P.C.**  
 Consulting Engineers  
 A Florence & Hetchings, Inc. Company  
 2125 KENNEDY WAY, SUITE 100, RALPHA, N.C. 27687  
 (919) 511-5100

Permit Drawing  
 Sheet **16** of **41**



**NC DOT**  
 DIVISION OF HIGHWAYS  
 LEE COUNTY  
 PROJECT: 146113 (R-217/AA)  
 US 41-NC BY SANFORD  
 BYPASS FROM WEST  
 OF SR 1400 TO WEST  
 OF US 1-15-601  
 1/6 4/1

**LEGEND**  
 -MLB- METLAND  
 DENOTES TEMPORARY IMPACTS IN SURFACE WATER  
 REMOTES IMPACTS IN SURFACE WATER

**PLAN VIEW**  
**SITE 4**

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

STA. 55 + 00.00 SEE PLAN SHEET NO. 7

STA. 41 + 00.00 SEE PLAN SHEET NO. 6

DATE: 05/27/2015  
TIME: 10:54:30 AM  
DRAWN BY: J. W. SMITH  
CHECKED BY: J. W. SMITH  
PROJECT NO. 13-247(A)

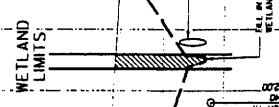
SHEET NO. 29  
TOTAL SHEETS 43  
PROJECT REFERENCE NO. 13-247(A)  
ROAD DESIGNER: J. W. SMITH  
CADD: J. W. SMITH

**KO & ASSOCIATES, P.C.**  
Compiling Engineer  
A. Florence & Associates, Inc. Company  
310 E. BROADWAY, SUITE 2000, RALEIGH, NC 27601  
(919) 771-3100

**PRELIMINARY PLANS**  
DO NOT USE FOR  
CONSTRUCTION  
**Permit Drawing**  
Sheet 23 of 41

- 2007 DELINEATION AREA**
- | STATION | TYPE | MARKER |
|---------|------|--------|
| 243.75  | W    | 5" PVC |
| 245.00  | W    | 5" PVC |
| 246.25  | W    | 5" PVC |
| 247.50  | W    | 5" PVC |
| 248.75  | W    | 5" PVC |
| 250.00  | W    | 5" PVC |
| 251.25  | W    | 5" PVC |
| 252.50  | W    | 5" PVC |
| 253.75  | W    | 5" PVC |
| 255.00  | W    | 5" PVC |
| 256.25  | W    | 5" PVC |
- CONTRACT: 13-247(A)  
DATE: 05/27/2015  
TIME: 10:54:30 AM  
DRAWN BY: J. W. SMITH  
CHECKED BY: J. W. SMITH

**SITE 5**  
(G.T. & RT. 1-1)



RIGHT OF WAY  
ELEV. 280.50  
STATION 85+00

RIGHT OF WAY  
ELEV. 280.50  
STATION 86+00

RIGHT OF WAY  
ELEV. 280.50  
STATION 87+00

RIGHT OF WAY  
ELEV. 280.50  
STATION 88+00

RIGHT OF WAY  
ELEV. 280.50  
STATION 89+00

RIGHT OF WAY  
ELEV. 280.50  
STATION 90+00

RIGHT OF WAY  
ELEV. 280.50  
STATION 91+00

RIGHT OF WAY  
ELEV. 280.50  
STATION 92+00

RIGHT OF WAY  
ELEV. 280.50  
STATION 93+00

RIGHT OF WAY  
ELEV. 280.50  
STATION 94+00

RIGHT OF WAY  
ELEV. 280.50  
STATION 95+00

RIGHT OF WAY  
ELEV. 280.50  
STATION 96+00

RIGHT OF WAY  
ELEV. 280.50  
STATION 97+00

RIGHT OF WAY  
ELEV. 280.50  
STATION 98+00

RIGHT OF WAY  
ELEV. 280.50  
STATION 99+00

RIGHT OF WAY  
ELEV. 280.50  
STATION 100+00

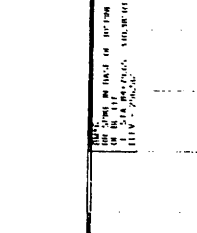
RIGHT OF WAY  
ELEV. 280.50  
STATION 101+00

RIGHT OF WAY  
ELEV. 280.50  
STATION 102+00

RIGHT OF WAY  
ELEV. 280.50  
STATION 103+00

RIGHT OF WAY  
ELEV. 280.50  
STATION 104+00

RIGHT OF WAY  
ELEV. 280.50  
STATION 105+00



PI = 251.0000  
 EL = 251.0000  
 VC = 300  
 K = 803  
 DS = 70 MPH  
 16' 8" R.C.C. ✓

FOR PLAN, SEE SHEET 2030 & T

RIGHT OF WAY  
ELEV. 280.50  
STATION 94+00

RIGHT OF WAY  
ELEV. 280.50  
STATION 95+00

RIGHT OF WAY  
ELEV. 280.50  
STATION 96+00

RIGHT OF WAY  
ELEV. 280.50  
STATION 97+00

RIGHT OF WAY  
ELEV. 280.50  
STATION 98+00

RIGHT OF WAY  
ELEV. 280.50  
STATION 99+00

RIGHT OF WAY  
ELEV. 280.50  
STATION 100+00

RIGHT OF WAY  
ELEV. 280.50  
STATION 101+00

RIGHT OF WAY  
ELEV. 280.50  
STATION 102+00

RIGHT OF WAY  
ELEV. 280.50  
STATION 103+00

RIGHT OF WAY  
ELEV. 280.50  
STATION 104+00

RIGHT OF WAY  
ELEV. 280.50  
STATION 105+00

**NC DOT**  
DIVISION OF HIGHWAYS  
LEE COUNTY  
PROJECT: 13-247(A)  
US 41-NC 87 SANFORD  
BYPASS FROM WEST  
OF SR 1400 TO WEST  
OF US 1-15-03

LEGEND  
 -WB- WETLAND  
 REMOTES ALL  
 WETLANDS

RIGHT OF WAY  
ELEV. 280.50  
STATION 94+00

RIGHT OF WAY  
ELEV. 280.50  
STATION 95+00

RIGHT OF WAY  
ELEV. 280.50  
STATION 96+00

RIGHT OF WAY  
ELEV. 280.50  
STATION 97+00

RIGHT OF WAY  
ELEV. 280.50  
STATION 98+00

RIGHT OF WAY  
ELEV. 280.50  
STATION 99+00

RIGHT OF WAY  
ELEV. 280.50  
STATION 100+00

RIGHT OF WAY  
ELEV. 280.50  
STATION 101+00

RIGHT OF WAY  
ELEV. 280.50  
STATION 102+00

RIGHT OF WAY  
ELEV. 280.50  
STATION 103+00

RIGHT OF WAY  
ELEV. 280.50  
STATION 104+00

RIGHT OF WAY  
ELEV. 280.50  
STATION 105+00

PROJECT REFERENCE NO. **R-247AA** SHEET NO. **9**

REV. SHEET NO. **9**

DATE: **11/15/05**

BY: **W. H. HARRIS**

FOR: **CONSTRUCTION**

OWNER: **UNIVERSITY OF NORTH CAROLINA**

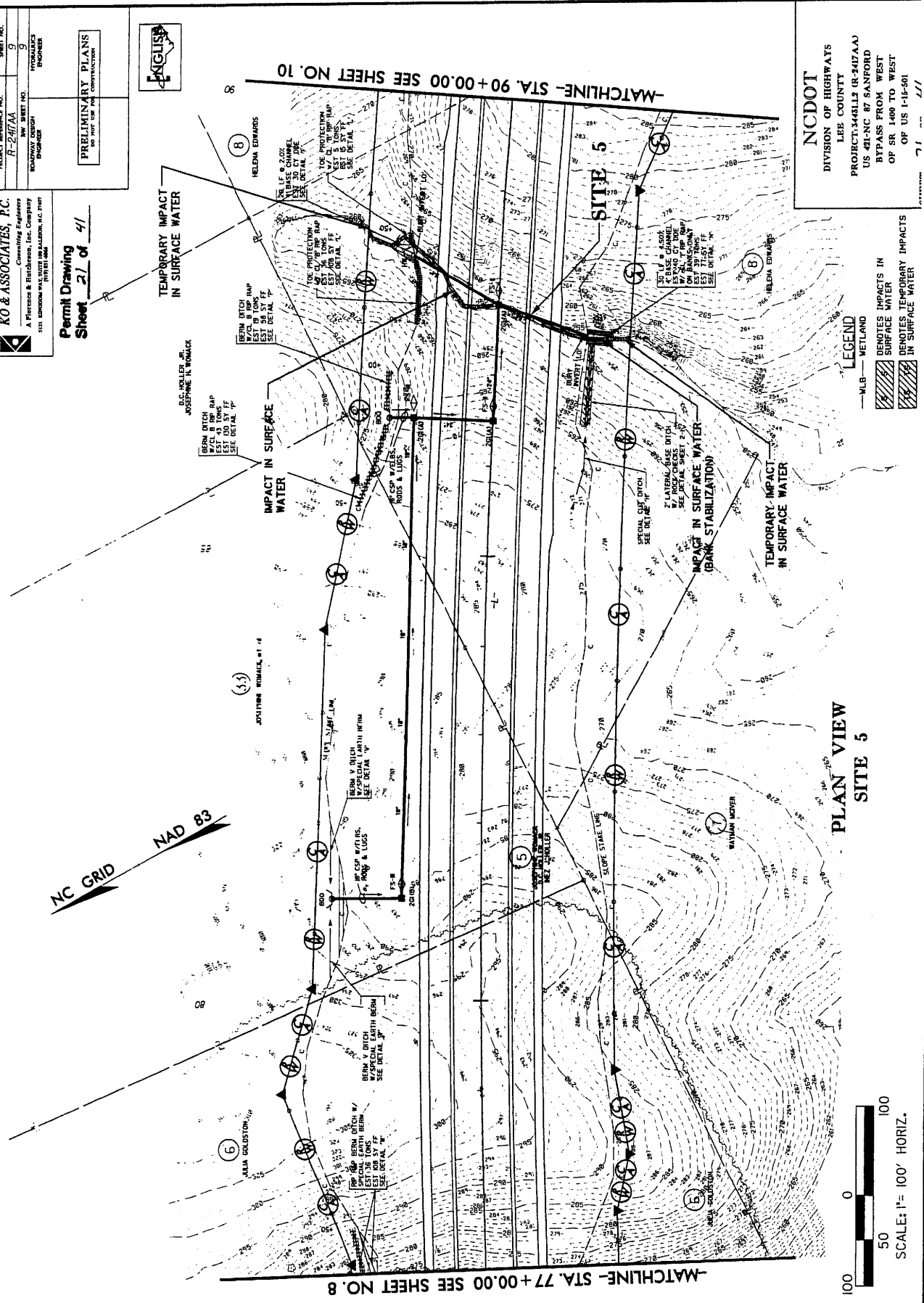
**PRELIMINARY PLANS**  
DO NOT USE FOR CONSTRUCTION

**KO & ASSOCIATES, P.C.**  
Consulting Engineers  
A Fletcher & Brantcomb, Inc. Company  
5111 LINDSEY WAY, SUITE 100, RALPHAM, N.C. 27647  
919.851.4646

**Permit Drawing**  
Sheet **27** of **41**



**NC DOT**  
DIVISION OF HIGHWAYS  
LEE COUNTY  
PROJECT: WELLS (R-247AA)  
US 42-NC 87 SANFORD  
BYPASS FROM WEST  
OF SR 1400 TO WEST  
OF US 1-16-501



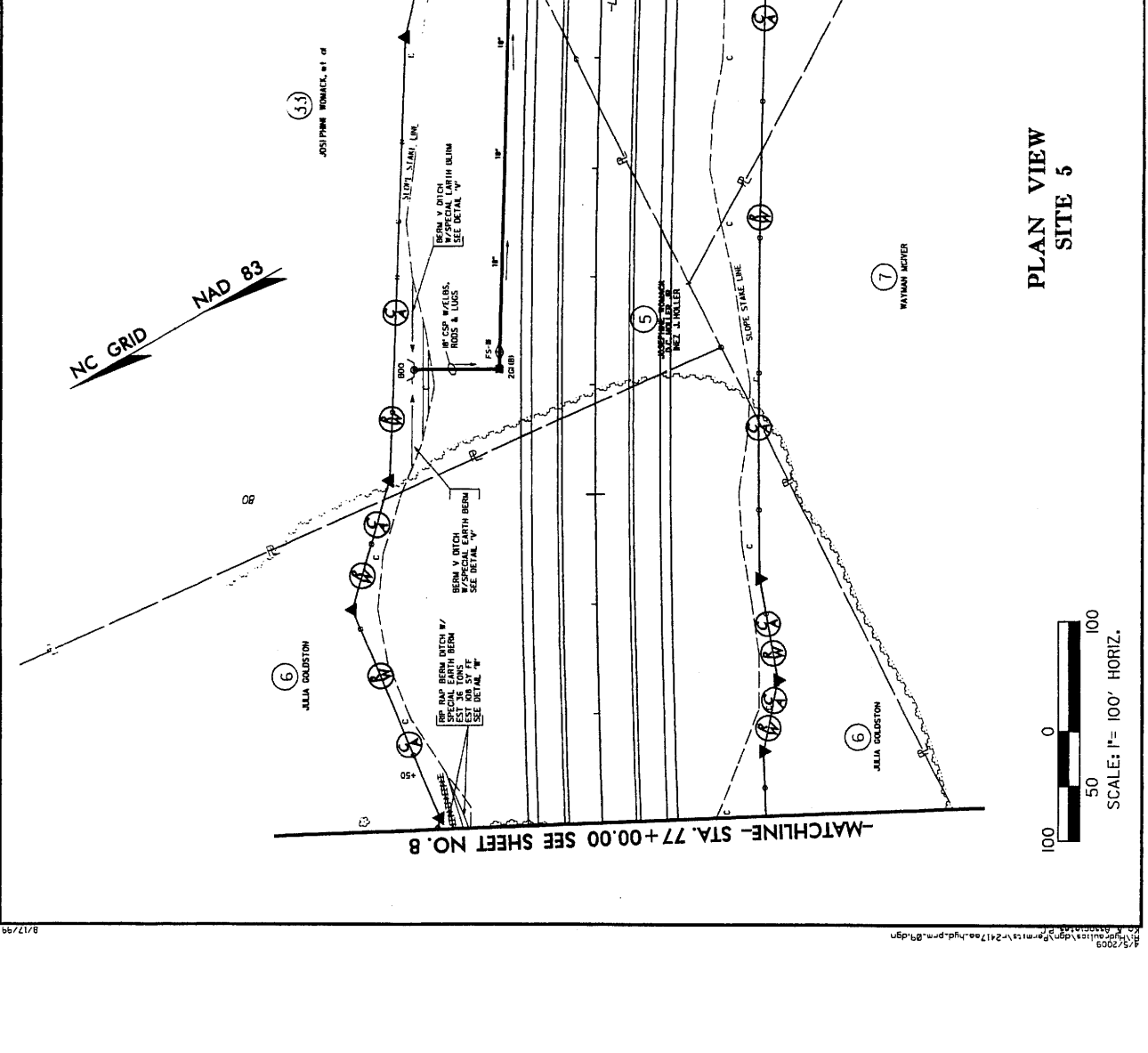
PROJECT REFERENCE NO. R-2477AA  
 SHEET NO. 9  
 PRELIMINARY PLANS  
 FOR THE  
 CONSTRUCTION OF  
 BYPASS FROM WEST  
 OF SR 1400 TO WEST  
 OF US 1-15-90

PERMIT DRAWING  
 SHEET 20 OF 41

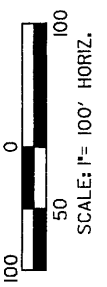
KO & ASSOCIATES, P.C.  
 CONSULTING ENGINEERS  
 A Pittman & Harshbarger, Inc. Company  
 111 SANDHURST WAY, SUITE 100, RALEIGH, N.C. 27607  
 (919) 871-0000



NCDOT  
 DIVISION OF HIGHWAYS  
 LEE COUNTY  
 PROJECT: 44813 (R-2477AA)  
 US 41-NC 87 SANFORD  
 BYPASS FROM WEST  
 OF SR 1400 TO WEST  
 OF US 1-15-90



PLAN VIEW  
 SITE 5



LEGEND  
 -MLB- WETLAND  
 [Hatched pattern] REMOTES IMPACTS IN SURFACE WATER  
 [Hatched pattern] REMOTES TEMPORARY IMPACTS IN SURFACE WATER



PROJECT REFERENCE NO. **R-2477AA**  
 SHEET NO. **7**  
 HYDRAULICS ENGINEER

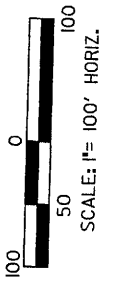
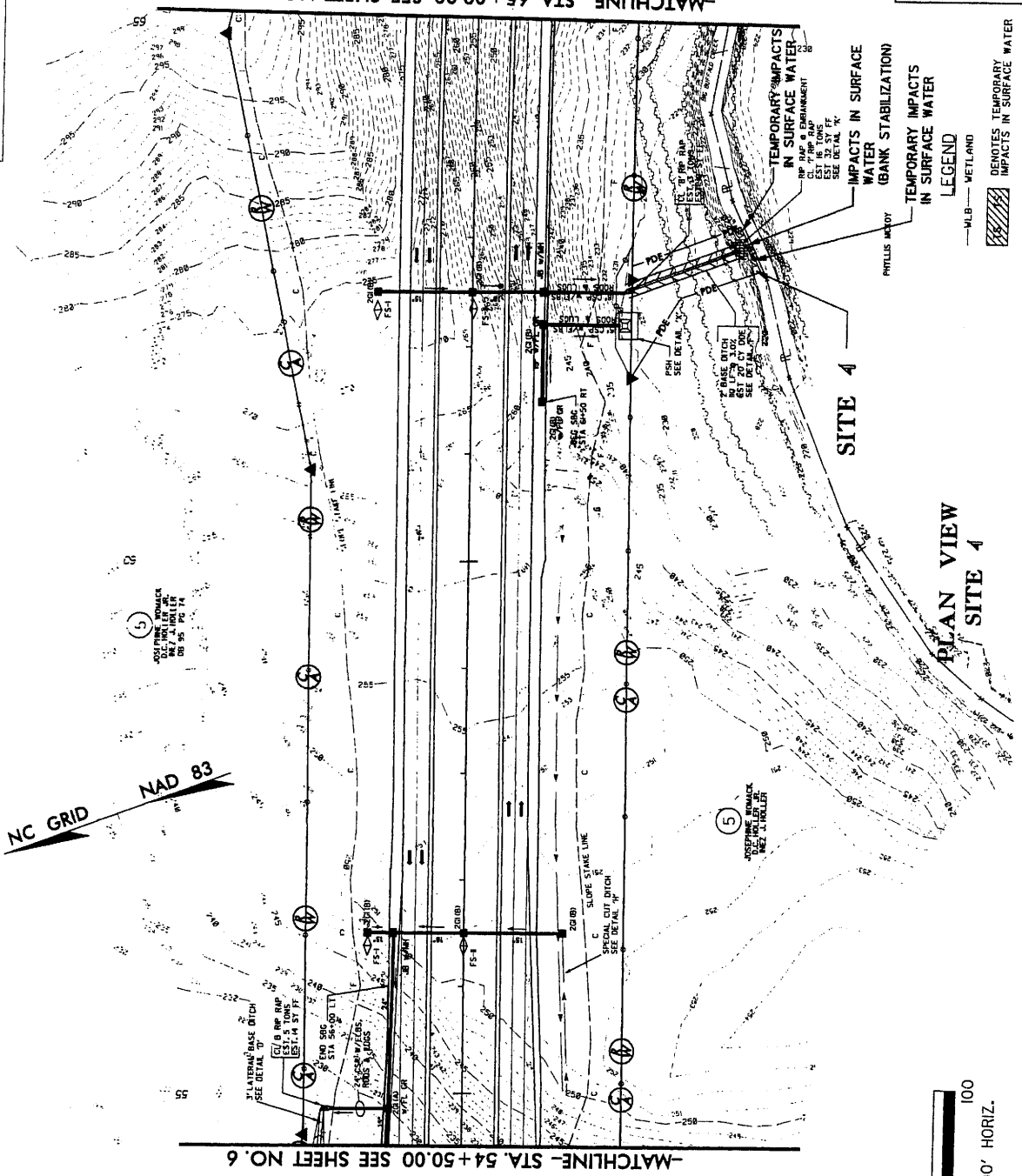
**KO & ASSOCIATES, P.C.**  
 Consulting Engineers  
 A Florence & Franchese, Inc. Company  
 1111 KANAWHA WAY, SUITE 300 BALBOON, N.C. 27007  
 (919) 887-6866

**PRELIMINARY PLANS**  
 DO NOT BE USED FOR CONSTRUCTION



Permit Drawing  
 Sheet 19 of 41

**NC DOT**  
 DIVISION OF HIGHWAYS  
 LER COUNTY  
 PROJECT: 1448LL3 (R-2477AA)  
 US 421-NC 87 SANFORD  
 BYPASS FROM WEST  
 OF SR 1400 TO WEST



-MATCHLINE- STA. 54+50.00 SEE SHEET NO. 6

-MATCHLINE- STA. 65+00.00 SEE SHEET NO. 8

**LEGEND**  
 ---WLB--- WETLAND  
 DENOTES TEMPORARY IMPACTS IN SURFACE WATER

**SITE 4**

**PLAN VIEW SITE 4**

PROJECT REFERENCE NO. R-2417A  
 SHEET NO. 7  
 ROADWAY DESIGN ENGINEER  
 HYDRAULICS ENGINEER

PRELIMINARY PLANS  
 AS PER THE SUBMITTAL

**KO & ASSOCIATES, P.C.**  
 Consulting Engineers  
 A Florence & Hitchcock, Inc. Company  
 3151 BROADBANK HWY. SUITE 100A, RALEIGH, NC 27604  
 (919) 876-1200

Permit Drawing  
 Sheet 7/9 of 41

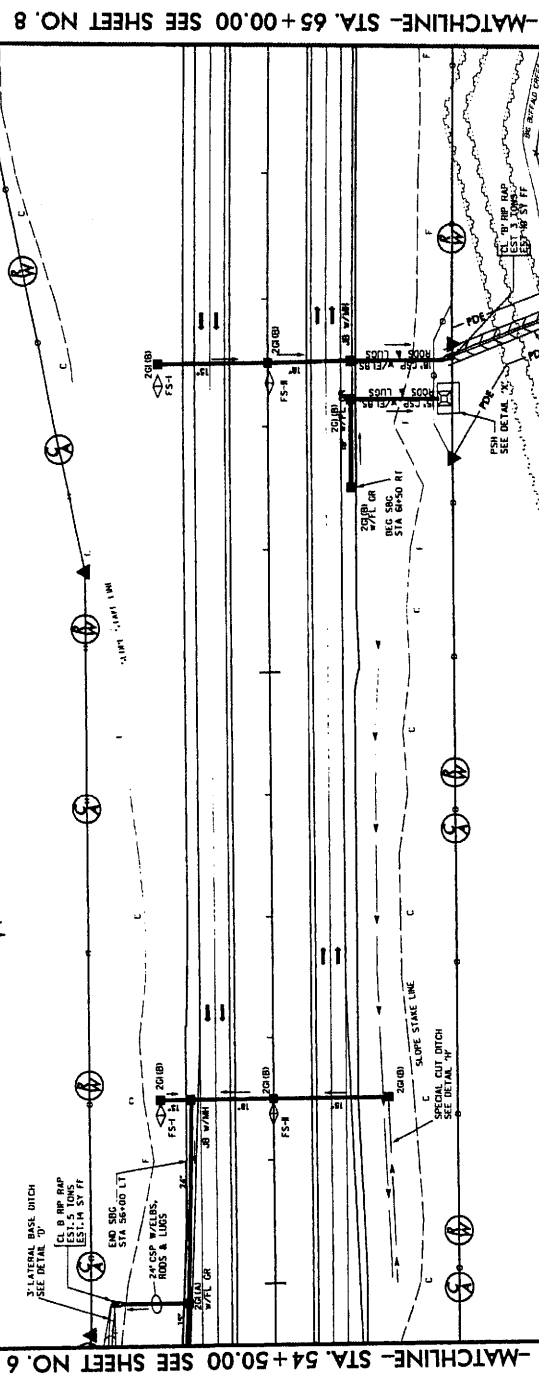


**NCDOT**  
 DIVISION OF HIGHWAYS  
 LEE COUNTY  
 PROJECT: 346112 (R-2417A)  
 US 41-NC BY SANFORD  
 BYPASS FROM WEST  
 OF SR 1400 TO WEST  
 OF US 1-15-90  
 SHEET 19 OF 41

NC GRID NAD 83

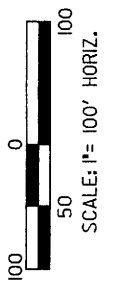
(1)  
 SOLI TRAIL WINDMILL  
 20' W/10' N/10' E  
 DB: 95, PC: 14

(5)  
 ROSEBANK MANOR  
 100' W/10' N/10' E  
 DB: 2, HOLLER



SITE 4

PLAN VIEW  
 SITE 4



LEGEND  
 ---W/LB--- WETLAND  
 DENOTES TEMPORARY IMPACTS IN SURFACE WATER  
 DENOTES IMPACTS IN SURFACE WATER

**NC DOT**  
 DIVISION OF HIGHWAYS  
 LEE COUNTY  
 PROJECT: 144312 (R-247AA)  
 US 421-NC 87 SANFORD  
 BYPASS FROM WEST  
 OF US 1-15-01

PROJECT REFERENCE NO.  
 R-247AA  
 PERMIT ENGINEER  
 ENGINEER

SHEET NO.  
 27  
 TOTAL SHEETS  
 UNKNOWN

PRELIMINARY PLANS  
 FOR THE USE OF THE CONTRACTOR

Permit Drawing  
 Sheet 27 of 41

**KO & ASSOCIATES, P.C.**  
 Consulting Engineers  
 A Florence & Hitchcock, Inc. Company  
 1111 EDITION WAY SUITE 100 WILMINGTON, N.C. 28403  
 (910) 762-2200

NOT TO SCALE UNLESS OTHERWISE NOTED  
 ALL DIMENSIONS ARE IN FEET AND INCHES  
 UNLESS OTHERWISE NOTED

1" = 40' HORIZ.  
 1" = 10' VERT.

1" = 40' HORIZ.  
 1" = 10' VERT.

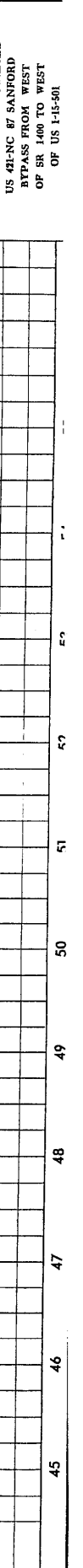
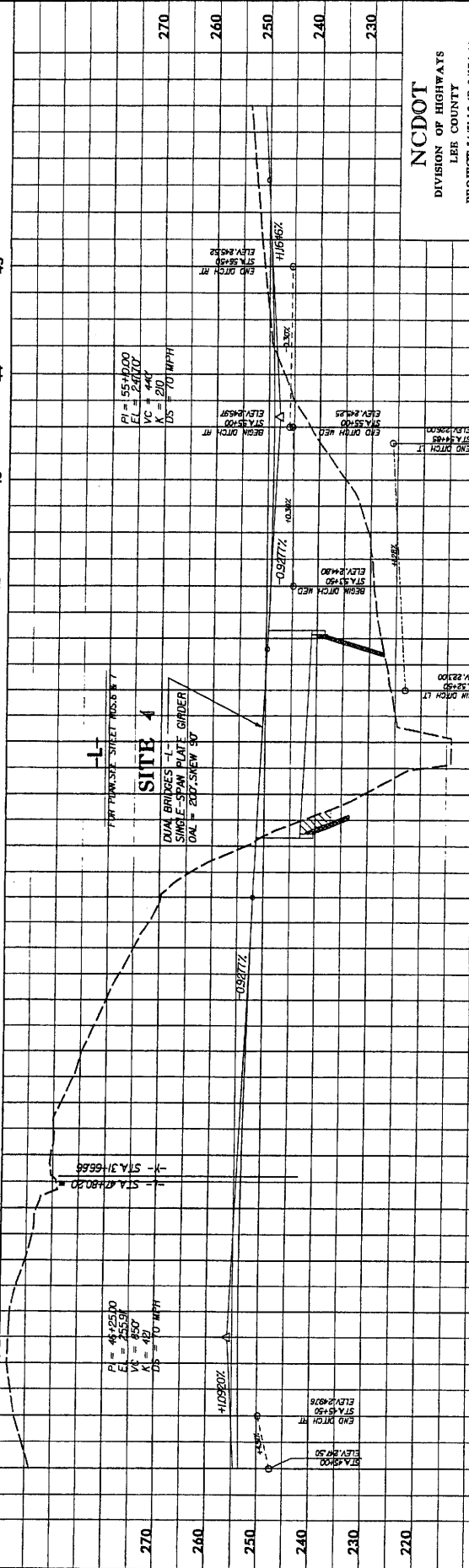
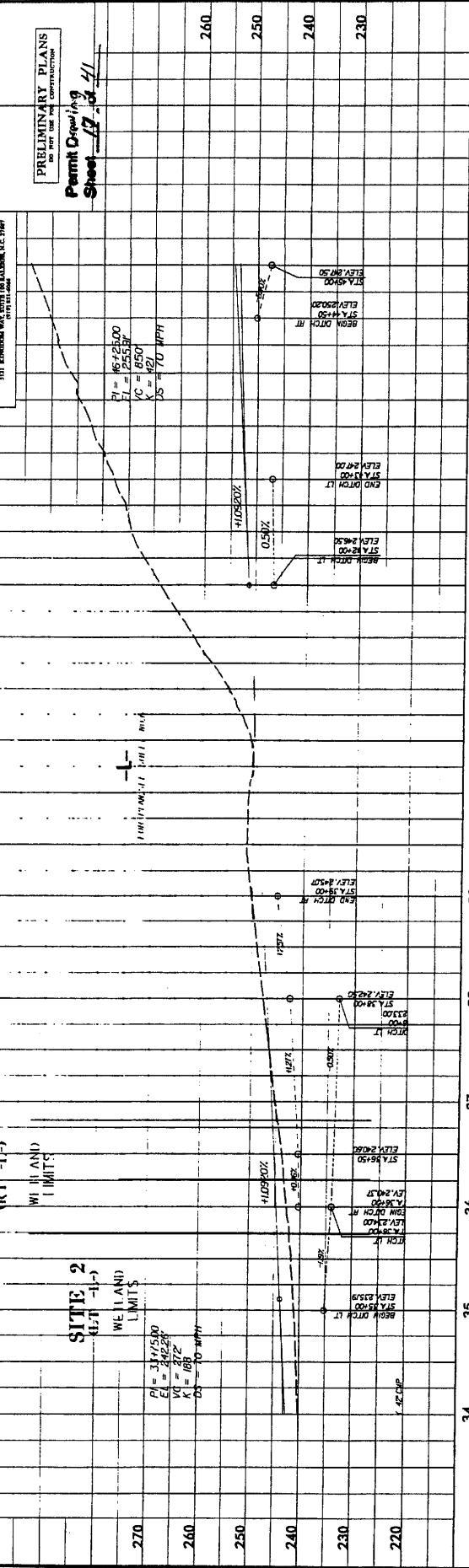
**SITE 3**  
 (RT -1-)  
 WEILAND LIMITS

**SITE 2**  
 (RT -1-)  
 WEILAND LIMITS

**SITE 4**  
 (RT -1-)  
 WEILAND LIMITS

**SITE 5**  
 (RT -1-)  
 WEILAND LIMITS

**SITE 6**  
 (RT -1-)  
 WEILAND LIMITS



11/17/2008  
 5:28/99

**KO & ASSOCIATES, P.C.**  
 Consulting Engineers  
 A Professional Corporation  
 1111 BROADWAY, SUITE 200, RALEIGH, N.C. 27601  
 (919) 877-0000

PROJECT REFERENCE NO. R-247/AA  
 SHEET NO. 7  
 PRELIMINARY PLANS  
 DO NOT USE FOR CONSTRUCTION



Permit Drawing  
 Sheet 13 of 41

**NC DOT**  
 DIVISION OF HIGHWAYS  
 LEE COUNTY  
 PROJECT: 1448112 (R-247/AA)  
 US 491-NC #7 SANFORD  
 BYPASS FROM WEST  
 OF SR 1400 TO WEST  
 OF US 1-15-00

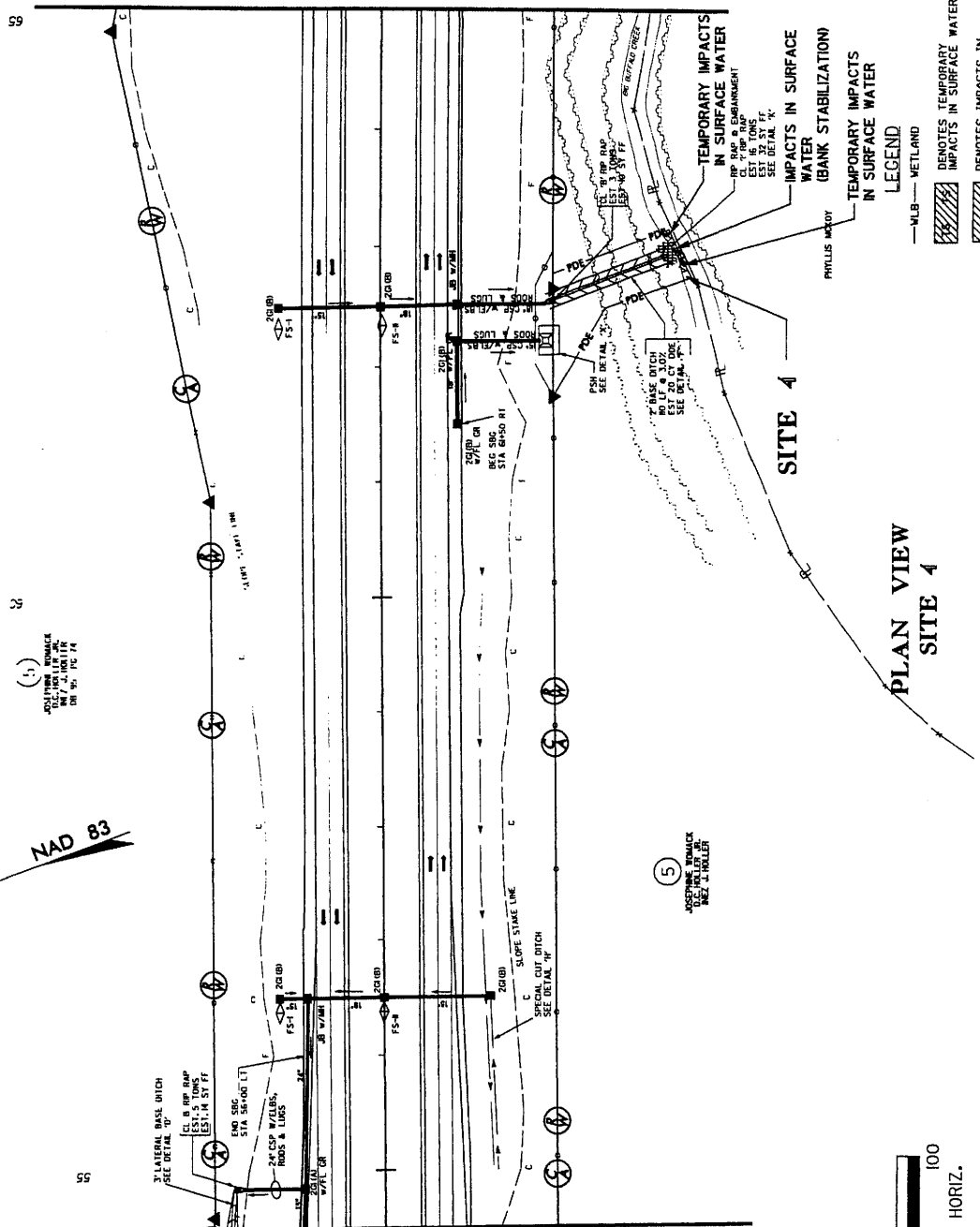
NC GRID  
 NAD 83

(1)  
 JOSEPHINE WIMACK  
 1000 W. HUNTER ST.  
 DENVER, CO 80202  
 (303) 733-1111

(5)  
 JOSEPHINE WIMACK  
 1000 W. HUNTER ST.  
 DENVER, CO 80202  
 (303) 733-1111

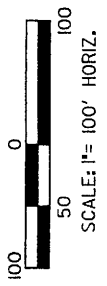
-MATCHLINE- STA. 65+00.00 SEE SHEET NO. 8

-MATCHLINE- STA. 54+50.00 SEE SHEET NO. 6



SITE 4

PLAN VIEW  
 SITE 4



LEGEND  
 ---MLB--- WETLAND  
 [Hatched pattern] DENOTES TEMPORARY IMPACTS IN SURFACE WATER  
 [Hatched pattern] DENOTES IMPACTS IN SURFACE WATER

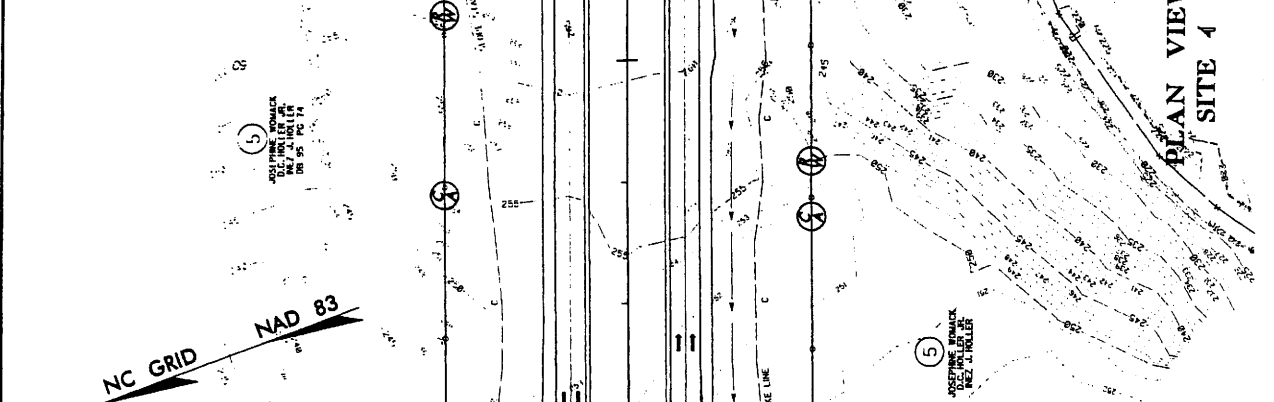
PROJECT REFERENCE NO. **R-2417AA**  
SHEET NO. **19**  
CONSULTING ENGINEER  
PRELIMINARY PLANS  
FOR THE PROPOSED CONSTRUCTION

**KO & ASSOCIATES, P.C.**  
Consulting Engineers  
A Florence & Hitchens, Inc. Company  
2111 KENNEDY WAY, SUITE 300 W. SALEM, N.C. 27158  
919.329.2111

Permit Drawing  
Sheet **19** of **41**  
**ENGUS**

PROJECT REFERENCE NO. **R-2417AA**  
SHEET NO. **19**  
CONSULTING ENGINEER  
PRELIMINARY PLANS  
FOR THE PROPOSED CONSTRUCTION

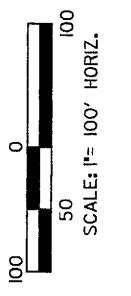
PROJECT REFERENCE NO. **R-2417AA**  
SHEET NO. **19**  
CONSULTING ENGINEER  
PRELIMINARY PLANS  
FOR THE PROPOSED CONSTRUCTION



NC GRID **NAD 83**

**NC DOT**  
DIVISION OF HIGHWAYS  
LEE COUNTY  
PROJECT: 3441L2 (R-2417AA)  
US 421-NC BY SANFORD  
BYPASS FROM WEST  
OF SR 1400 TO WEST  
OF US 1-15-001

TEMPORARY IMPACTS IN SURFACE WATER  
TEMPORARY IMPACTS IN SURFACE WATER  
WATER BANK STABILIZATION  
TEMPORARY IMPACTS IN SURFACE WATER  
LEGEND  
--- WLB --- WETLAND  
DENOTES TEMPORARY IMPACTS IN SURFACE WATER  
INDICATES IMPACTS IN SURFACE WATER



**KO & ASSOCIATES, P.C.**  
 Consulting Engineers  
 A Firm of K. H. Johnson, Inc. Company  
 2101 LONDON ROAD, FAYETTEVILLE, NC 27803  
 (717) 331-1000

PROJECT REFERENCE NO. R-2417AA  
 SHEET NO. 9  
 HYDRAULICS ENGINEER

ROADWAY DESIGN ENGINEER

Permit Drawing  
 Sheet 20 of 41

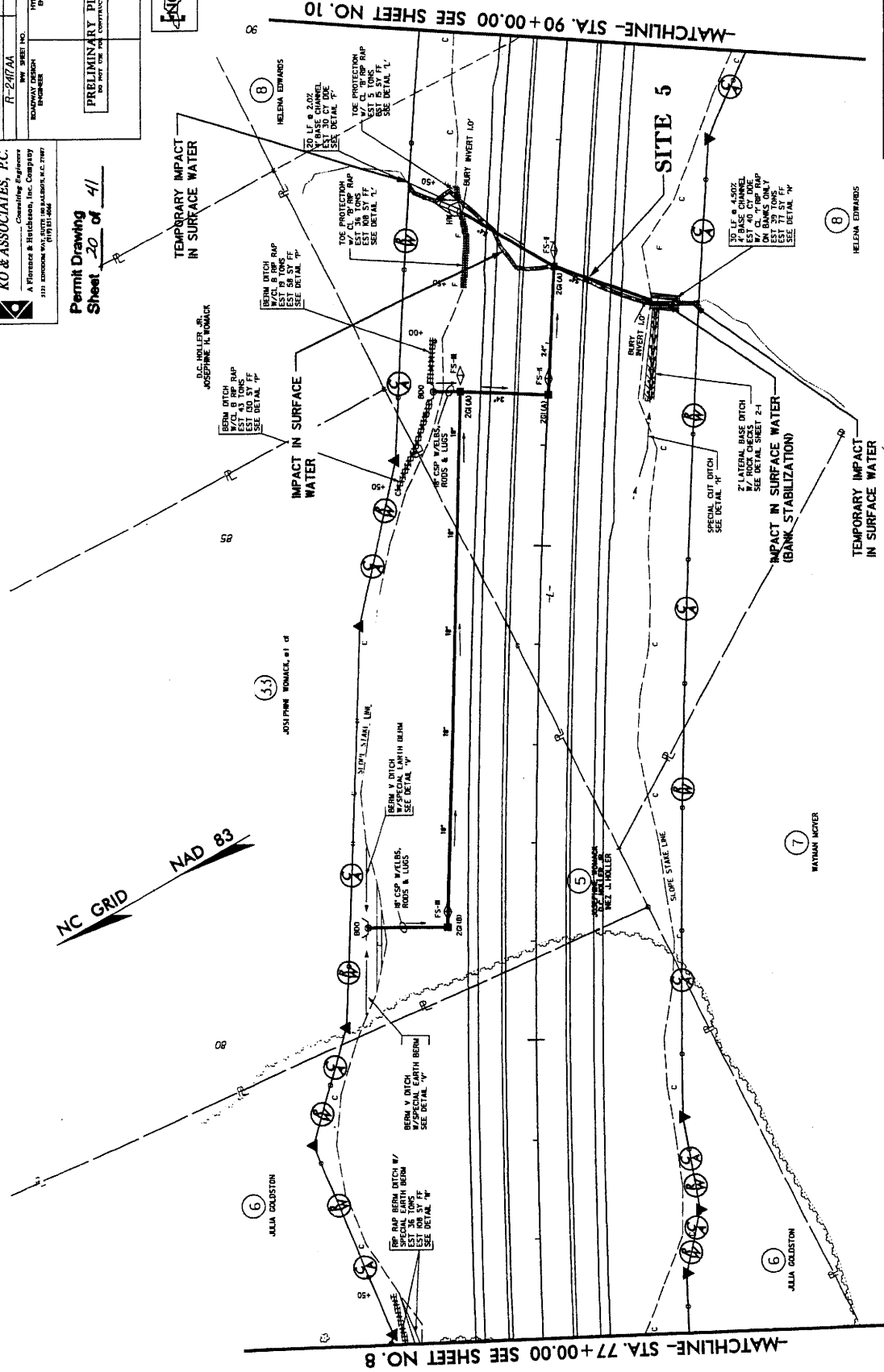
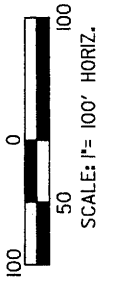


**NCDOT**  
 DIVISION OF HIGHWAYS  
 LEE COUNTY  
 PROJECT: 344B12 (R-2417AA)  
 US 41-NC BY SANFORD  
 BYPASS FROM WEST  
 OF SR 1400 TO WEST  
 OF US 1-16-90I

**LEGEND**

- VLB- WETLAND
- Denotes IMPACTS IN SURFACE WATER
- Denotes TEMPORARY IMPACTS IN SURFACE WATER

**PLAN VIEW SITE 5**



**NC GRID NAD 83**

**KO & ASSOCIATES, P.C.**  
 Consulting Engineers  
 A Florence & Hitchcock, Inc. Company  
 121 SANDHURST WAY, SUITE 200, LENOIR, N.C. 27559  
 (919) 755-1111

**Permit Drawing**  
**Sheet 21 of 41**

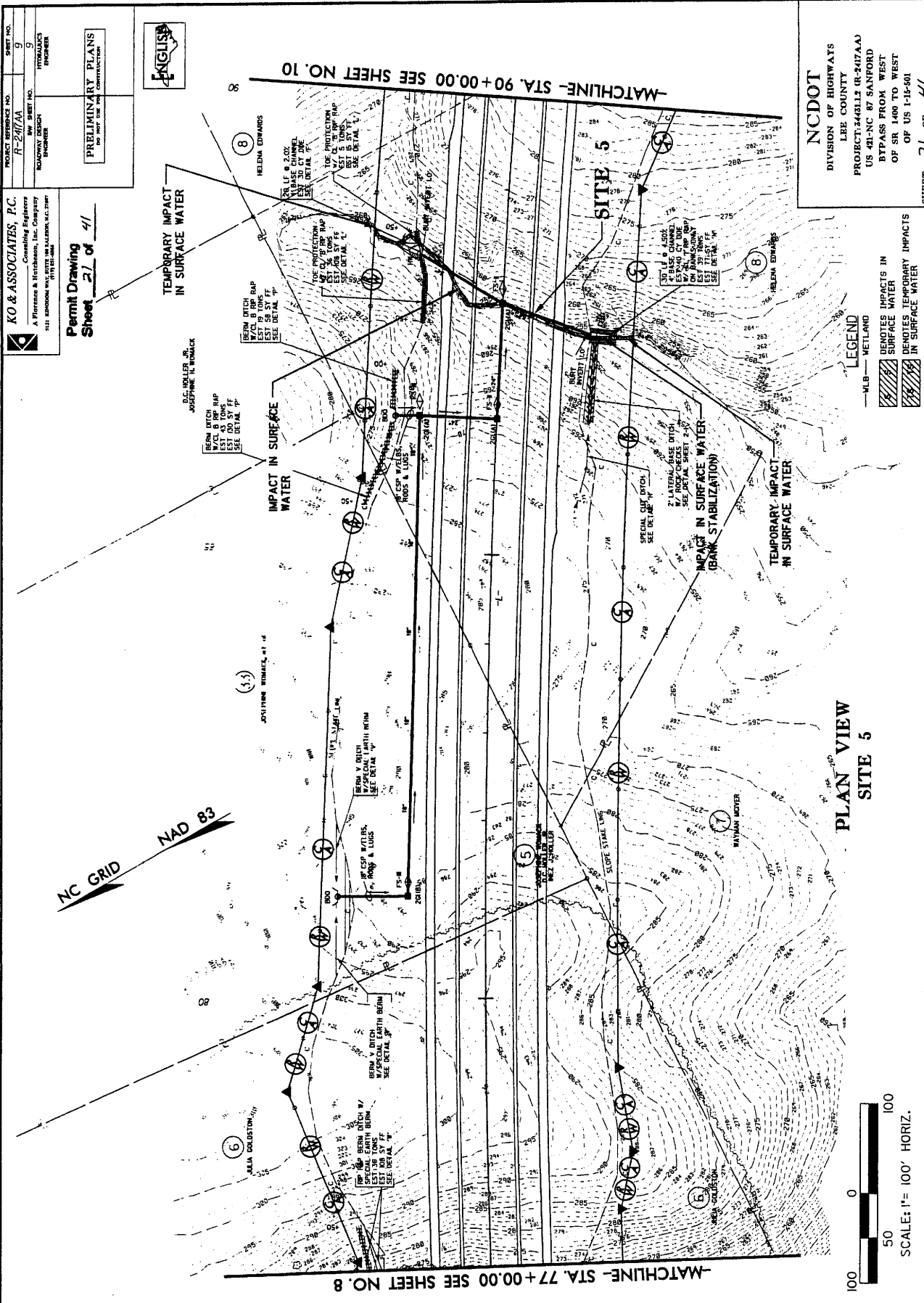
**PROJECT REFERENCE NO.** R-2111AA  
**SHEET NO.** 9  
**HYDRAULICS ENGINEER**

**PRELIMINARY PLANS**  
 DO NOT USE FOR CONSTRUCTION



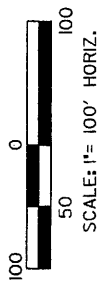
**NCDOT**  
 DIVISION OF HIGHWAYS  
 LEE COUNTY  
 PROJECT: 348313 (R-247AA)  
 US 421-NC 87 SANFORD  
 BYPASS FROM WEST  
 OF SR 1400 TO WEST  
 OF US 1-15-501

NC GRID NAD 83

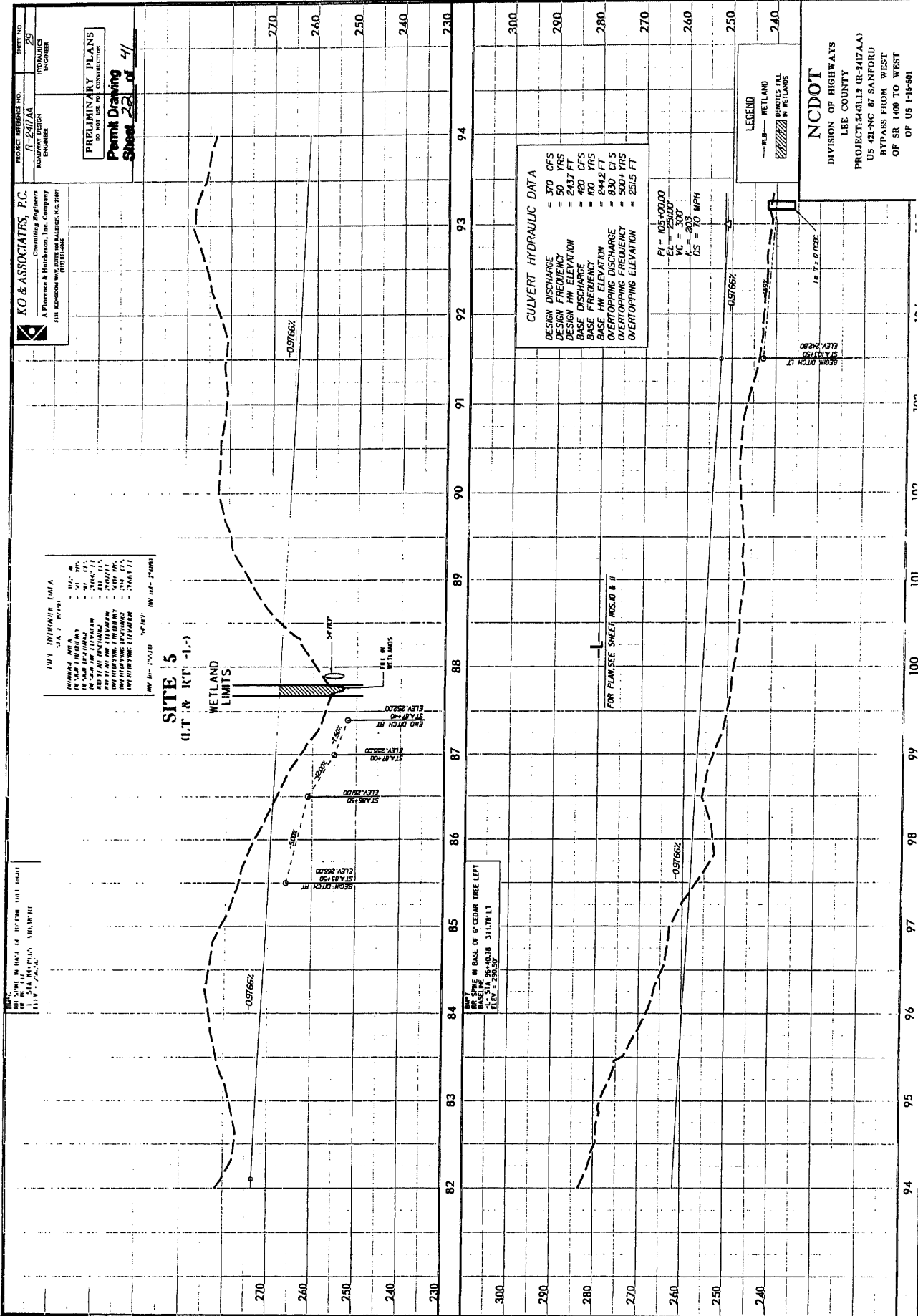


**LEGEND**  
 ---MLB--- METLAND  
 DENOTES IMPACTS IN SURFACE WATER  
 DENOTES TEMPORARY IMPACTS IN SURFACE WATER

**PLAN VIEW**  
**SITE 5**



REVISIONS  
 17-6-06 Changed Parcel No. 5 to Parcel No. 23 - Revised Owner Name  
 8/17/99



PROJECT REFERENCE NO. R-2417AA  
 ROADWAY DESIGN ENGINEER  
 ROADWAYS ENGINEER

PERMIT NO. 29  
 PRELIMINARY PLANS  
 SHEET 22 of 41  
 Permit Drawing

KO & ASSOCIATES, P.C.  
 Consulting Engineers  
 A Florence & Blochman, Inc. Company  
 311 KENNEDY STREET, SUITE 200  
 FARMERSVILLE, N.C. 27834

THIS DRAWING IS A PART OF THE PROJECT AND IS NOT TO BE REPRODUCED OR COPIED IN ANY MANNER WITHOUT THE WRITTEN PERMISSION OF KO & ASSOCIATES, P.C.

**SITE 5**  
 (LT & RT-1-)

WETLAND LIMITS

54' NET  
 3.0' DIA  
 ALL IN WETLANDS

BRIDGE IN BASE OF 6" CEDAR TREE LEFT  
 BACKSPE 86+40.78 31.17' W LT  
 ELEV. 275.50'

CULVERT HYDRAULIC DATA	
DESIGN DISCHARGE	= 370 CFS
DESIGN FREQUENCY	= 50 YRS
DESIGN FLOW ELEVATION	= 283.7 FT
DESIGN DISCHARGE	= 400 CFS
DESIGN FREQUENCY	= 100 YRS
DESIGN FLOW ELEVATION	= 284.9 FT
OVERTOPPING DISCHARGE	= 830 CFS
OVERTOPPING FREQUENCY	= 500+ YRS
OVERTOPPING ELEVATION	= 291.5 FT

PI = 105+00.00  
 EI = 2510.00'  
 VC = 300'  
 L = 503'  
 US = 7.0 MPH

LEGEND  
 --- WETLAND LIMITS  
 [Symbol] BRIDGE

**NC DOT**  
 DIVISION OF HIGHWAYS  
 LEE COUNTY  
 PROJECT: 3481L2 (R-2417AA)  
 US 421-NC BY SANFORD  
 BYPASS FROM WEST  
 OF SR 1400 TO WEST  
 OF US 1-15-90

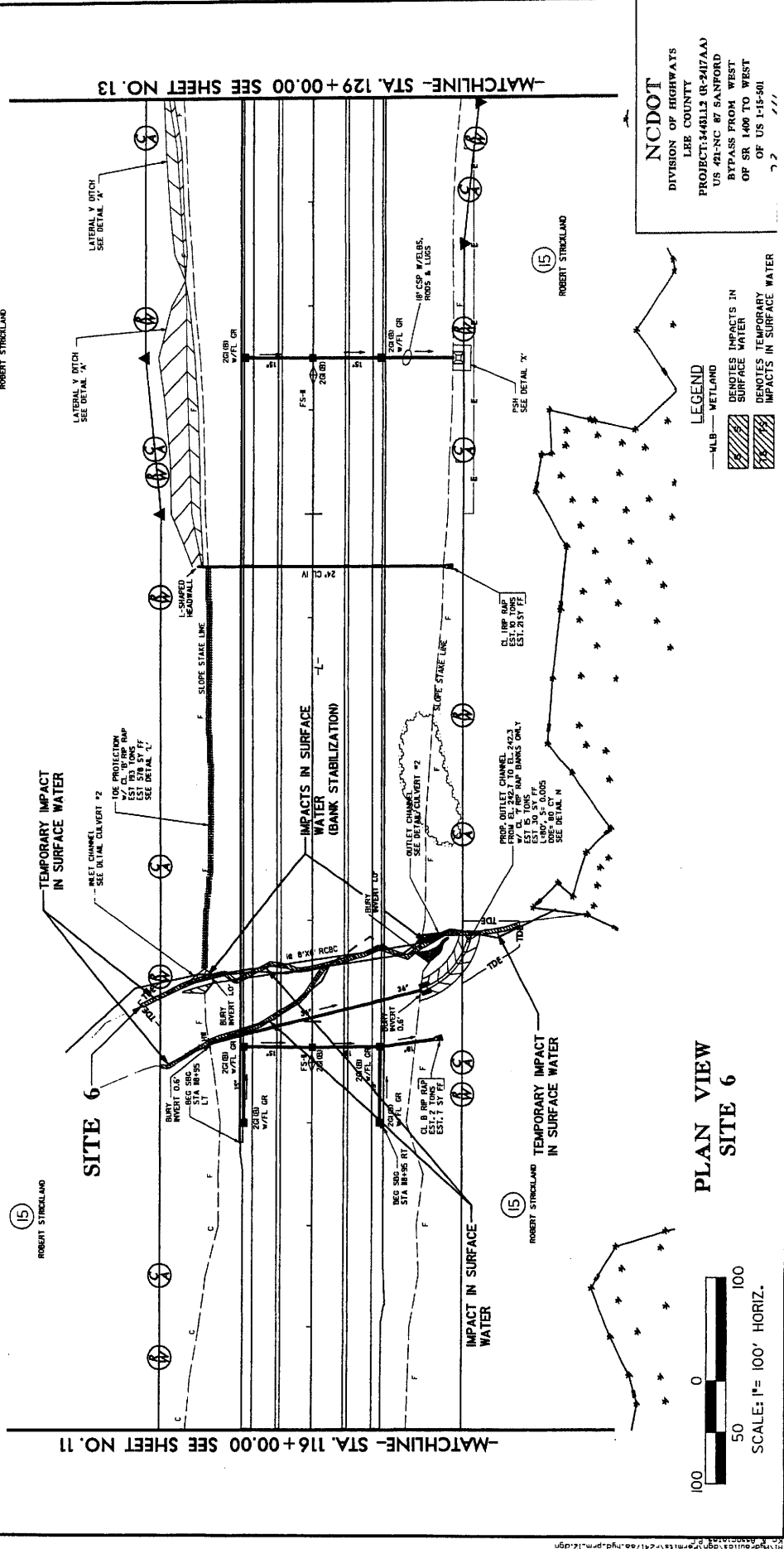


PROJECT REFERENCE NO. R-2117A  
 SHEET NO. 1/2  
 HIGHWAY DESIGN ENGINEER  
 HYDRAULICS ENGINEER

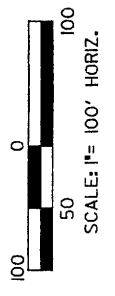
**KO & ASSOCIATES, P.C.**  
 Consulting Engineers  
 A Florence & Hetcheson, Inc. Company  
 113 MIDWOOD AVENUE, WELLSBORO, N.C. 27888  
 (703) 233-1111

Permit Drawing  
 Sheet 23 of 41

NC GRID NAD 83



PLAN VIEW  
 SITE 6



**LEGEND**  
 -4LB- WETLAND  
 DENOTES IMPACTS IN SURFACE WATER  
 DENOTES TEMPORARY IMPACTS IN SURFACE WATER

**NC DOT**  
 DIVISION OF HIGHWAYS  
 LEE COUNTY  
 PROJECT: 348L13 (R-2417AA)  
 US 421-NC 87 SANFORD  
 BYPASS FROM WEST  
 OF SR 1400 TO WEST  
 OF US 1-15-501  
 7 2  
 7 7

PROJECT REFERENCE NO. R-2417AA  
 SHEET NO. 12  
 DRAWING TITLE: PRELIMINARY PLANS  
 DO NOT USE FOR CONSTRUCTION

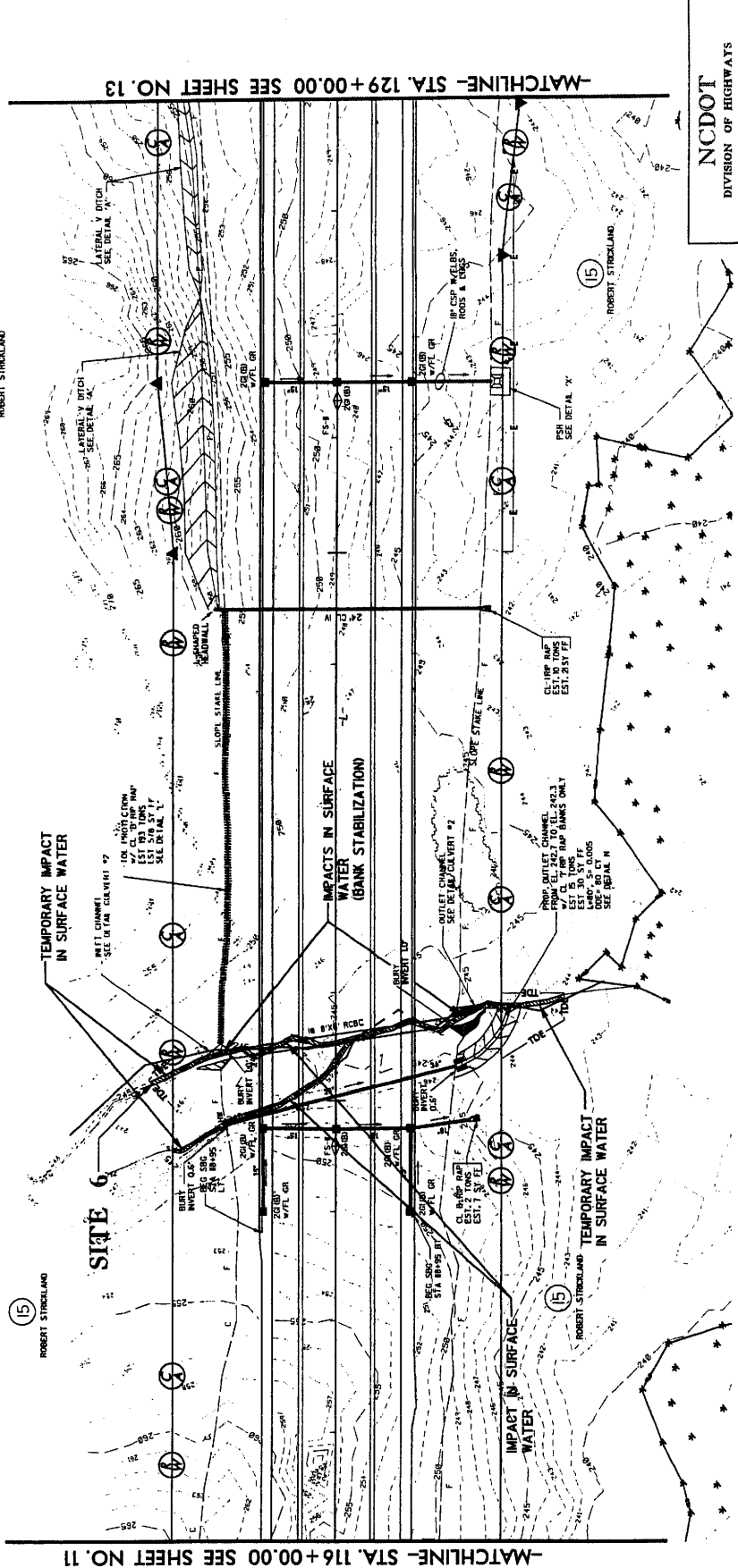
**KO & ASSOCIATES, P.C.**  
 CONSULTING ENGINEERS  
 A Florence & Franchese, Inc. Company  
 1311 SANDHILL AVENUE, SUITE 300, RALEIGH, NC 27608  
 (919) 871-2000

Permit Drawing  
 Sheet 24 of 27



NC GRID NAD 83

**NC DOT**  
 DIVISION OF HIGHWAYS  
 LEE COUNTY  
 PROJECT: 44113 (R-2417AA)  
 US 421-NC 87 SANFORD  
 BYPASS FROM WEST  
 OF SR 1400 TO WEST  
 OF US 1-15-501



**LEGEND**  
 -MLB- WETLAND  
 [Hatched Pattern] DENOTES IMPACTS IN SURFACE WATER  
 [Hatched Pattern] DENOTES TEMPORARY IMPACTS IN SURFACE WATER

**PLAN VIEW**  
**SITE 6**

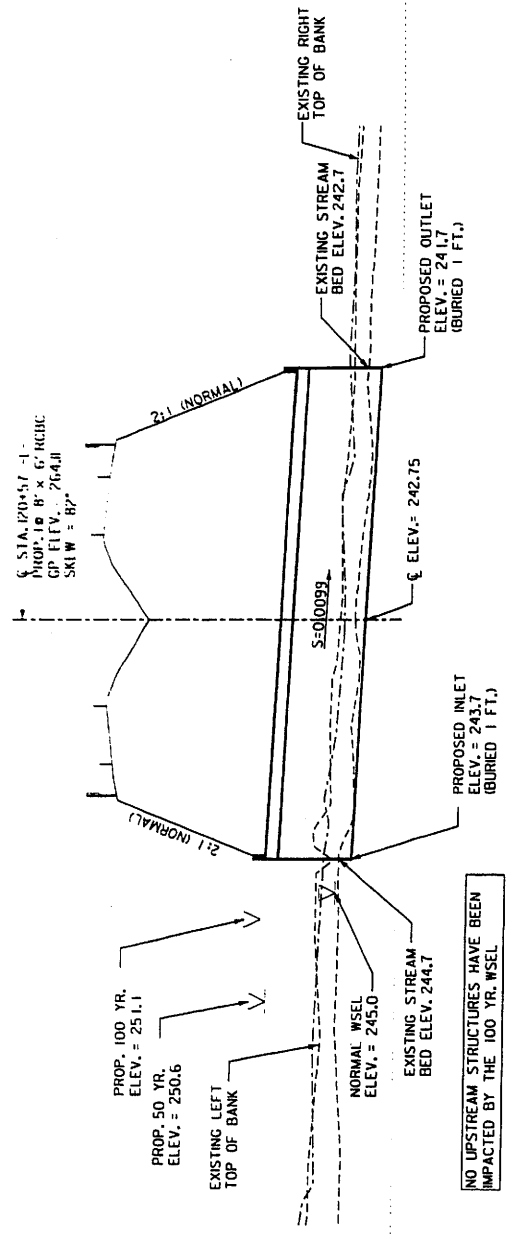
100 0 50 100  
 SCALE: 1"= 100' HORIZ.



**NCDOT**  
 DIVISION OF HIGHWAYS  
 LEE COUNTY  
 PROJECT: 34431.1.2 (R-2417AA)  
 US 421-NC 87 SANFORD  
 BYPASS FROM WEST  
 OF SR 1400 TO WEST  
 OF US 1-15-501

PROJECT REFERENCE NO. **A-2417AA**  
 DRAWING DESIGNER **SB/PAS**  
 ENGINEER  
 PRELIMINARY PLANS  
 DO NOT USE FOR CONSTRUCTION

Permit Drawing  
 Sheet 25 of 41



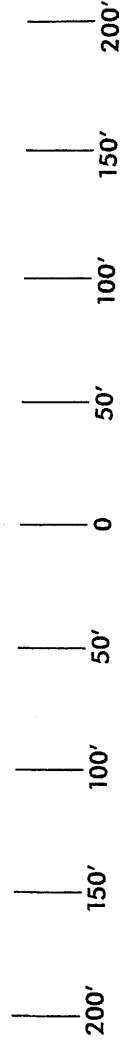
260

250

240

230

220



**PROFILE ALONG STRUCTURE**  
**SITE 6**

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

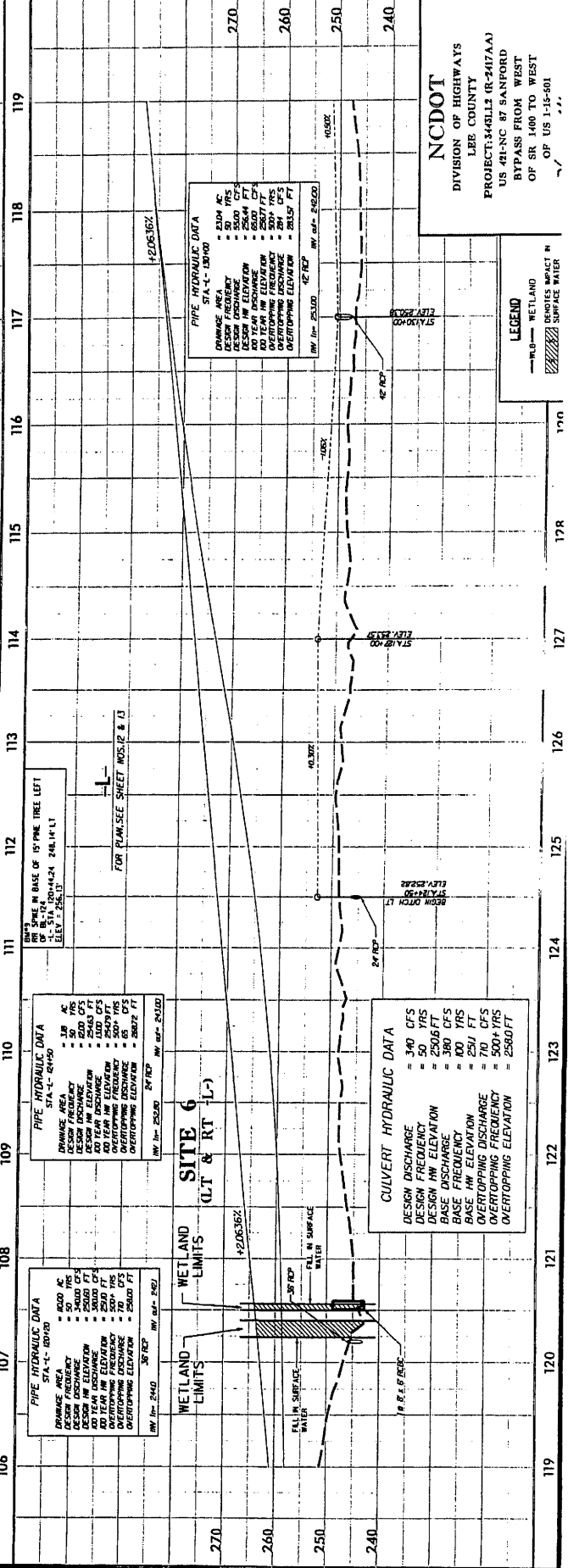
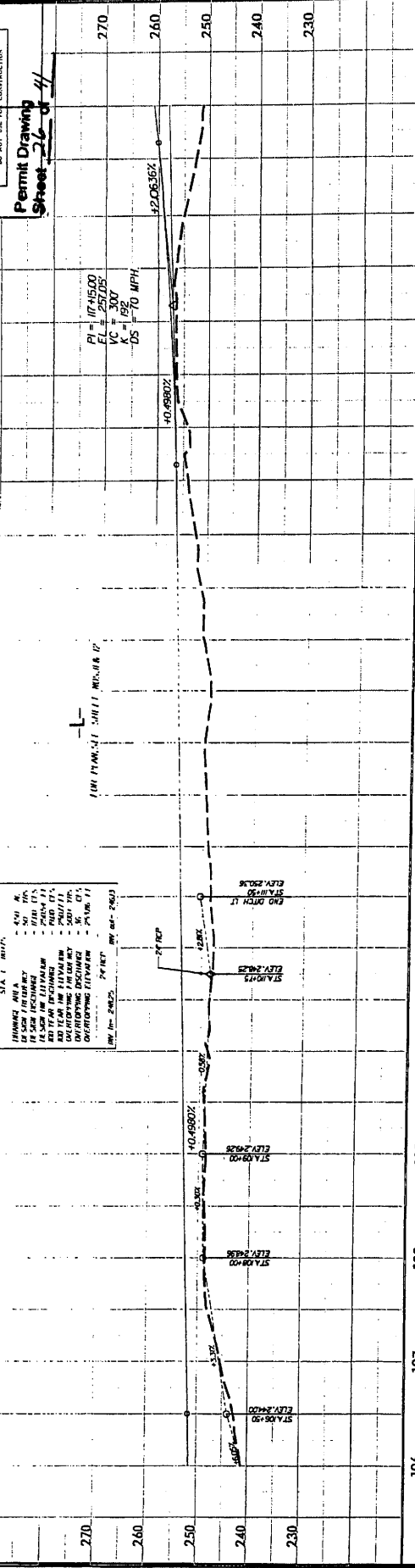
**KO & ASSOCIATES, P.C.**  
 Consulting Engineers  
 A Purcell & Brinkman, Inc. Company  
 117 KENDRICK WAY, SUITE 100, RALEIGH, N.C. 27607  
 (919) 876-1100

PROJECT REFERENCE NO. **R-2473A**  
 ROADWAY DESIGN  
 ENGINEER  
 HYDRAULIC ENGINEER

SHEET NO. **10**

**PRELIMINARY PLANS**  
 CONSTRUCTION

**Permit Drawing**  
 Sheet **26 of 44**



**PIPE HYDRAULIC DATA**  
 STA. 106+400

PIPE AREA	= 340 CFS
DESIGN FREQUENCY	= 50 YRS
DESIGN HW ELEVATION	= 2505 FT
DESIGN DISCHARGE	= 360 CFS
BASE FREQUENCY	= 100 YRS
BASE HW ELEVATION	= 2500 FT
BASE DISCHARGE	= 250 CFS
OVERTOPPING DISCHARGE	= 500 CFS
OVERTOPPING ELEVATION	= 2580 FT

**PIPE HYDRAULIC DATA**  
 STA. 107+000

PIPE AREA	= 340 CFS
DESIGN FREQUENCY	= 50 YRS
DESIGN HW ELEVATION	= 2505 FT
DESIGN DISCHARGE	= 360 CFS
BASE FREQUENCY	= 100 YRS
BASE HW ELEVATION	= 2500 FT
BASE DISCHARGE	= 250 CFS
OVERTOPPING DISCHARGE	= 500 CFS
OVERTOPPING ELEVATION	= 2580 FT

**PIPE HYDRAULIC DATA**  
 STA. 108+000

PIPE AREA	= 340 CFS
DESIGN FREQUENCY	= 50 YRS
DESIGN HW ELEVATION	= 2505 FT
DESIGN DISCHARGE	= 360 CFS
BASE FREQUENCY	= 100 YRS
BASE HW ELEVATION	= 2500 FT
BASE DISCHARGE	= 250 CFS
OVERTOPPING DISCHARGE	= 500 CFS
OVERTOPPING ELEVATION	= 2580 FT

**PIPE HYDRAULIC DATA**  
 STA. 109+000

PIPE AREA	= 340 CFS
DESIGN FREQUENCY	= 50 YRS
DESIGN HW ELEVATION	= 2505 FT
DESIGN DISCHARGE	= 360 CFS
BASE FREQUENCY	= 100 YRS
BASE HW ELEVATION	= 2500 FT
BASE DISCHARGE	= 250 CFS
OVERTOPPING DISCHARGE	= 500 CFS
OVERTOPPING ELEVATION	= 2580 FT

**PIPE HYDRAULIC DATA**  
 STA. 110+000

PIPE AREA	= 340 CFS
DESIGN FREQUENCY	= 50 YRS
DESIGN HW ELEVATION	= 2505 FT
DESIGN DISCHARGE	= 360 CFS
BASE FREQUENCY	= 100 YRS
BASE HW ELEVATION	= 2500 FT
BASE DISCHARGE	= 250 CFS
OVERTOPPING DISCHARGE	= 500 CFS
OVERTOPPING ELEVATION	= 2580 FT

**NCDOT**  
 DIVISION OF HIGHWAYS  
 LEE COUNTY  
 PROJECT: 346LL3 (R-2473A)  
 US 421-NC 87 SANFORD  
 BYPASS FROM WEST  
 OF SR 1400 TO WEST  
 OF US 1-15-501

**LEGEND**

- WETLAND
- DESIGNS IMPACT IN SURFACE WATER

PROJECT REFERENCE NO. R-2417AA  
 SHEET NO. 14  
 HYDRAULICS ENGINEER

PROJECT REFERENCE NO. R-2417AA  
 SHEET NO. 14  
 HYDRAULICS ENGINEER

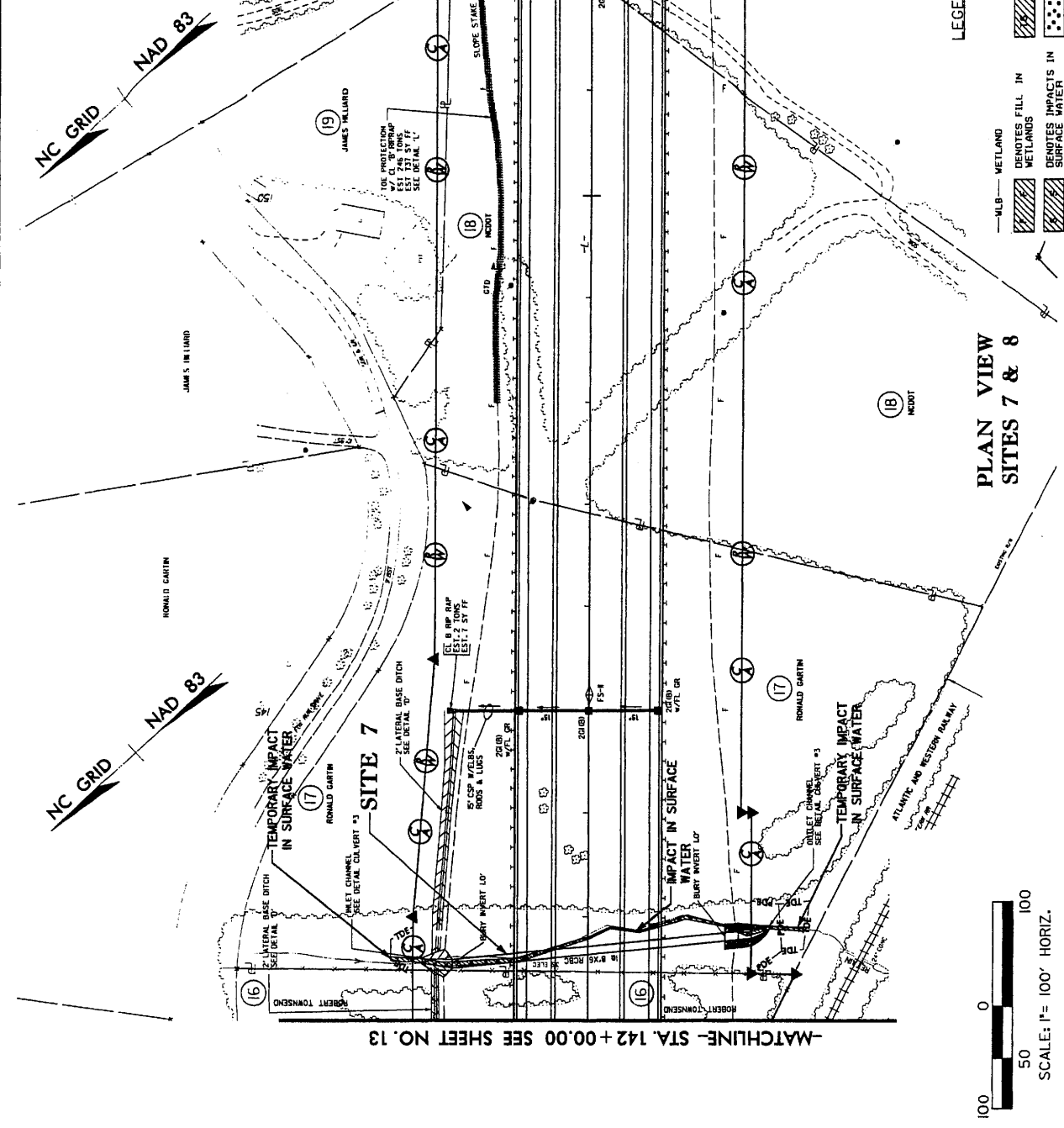
PRELIMINARY PLANS  
 DO NOT USE FOR CONSTRUCTION

Permit Drawing  
 Sheet 27 of 41



KO & ASSOCIATES, P.C.  
 Consulting Engineers  
 A Parsons & Brinckerhoff, Inc. Company  
 511 BROADWAY, SUITE 2000, CHARLOTTE, N.C. 28202  
 (704) 375-1200

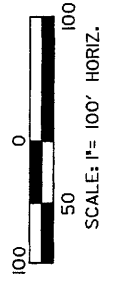
NCDOT  
 DIVISION OF HIGHWAYS  
 LEE COUNTY  
 PROJECT: 346113 (R-2417AA)  
 US 41-NC 87 SANFORD  
 BYPASS FROM WEST  
 OF SR 1400 TO WEST  
 OF US 1-15-501



LEGEND

- WETLAND
- WETLAND FILL IN
- TEMPORARY IMPACTS IN SURFACE WATER
- DENOTES MECHANIZED CLEARING
- DENOTES TEMPORARY IMPACTS IN SURFACE WATER
- DENOTES MECHANIZED CLEARING

PLAN VIEW  
 SITES 7 & 8



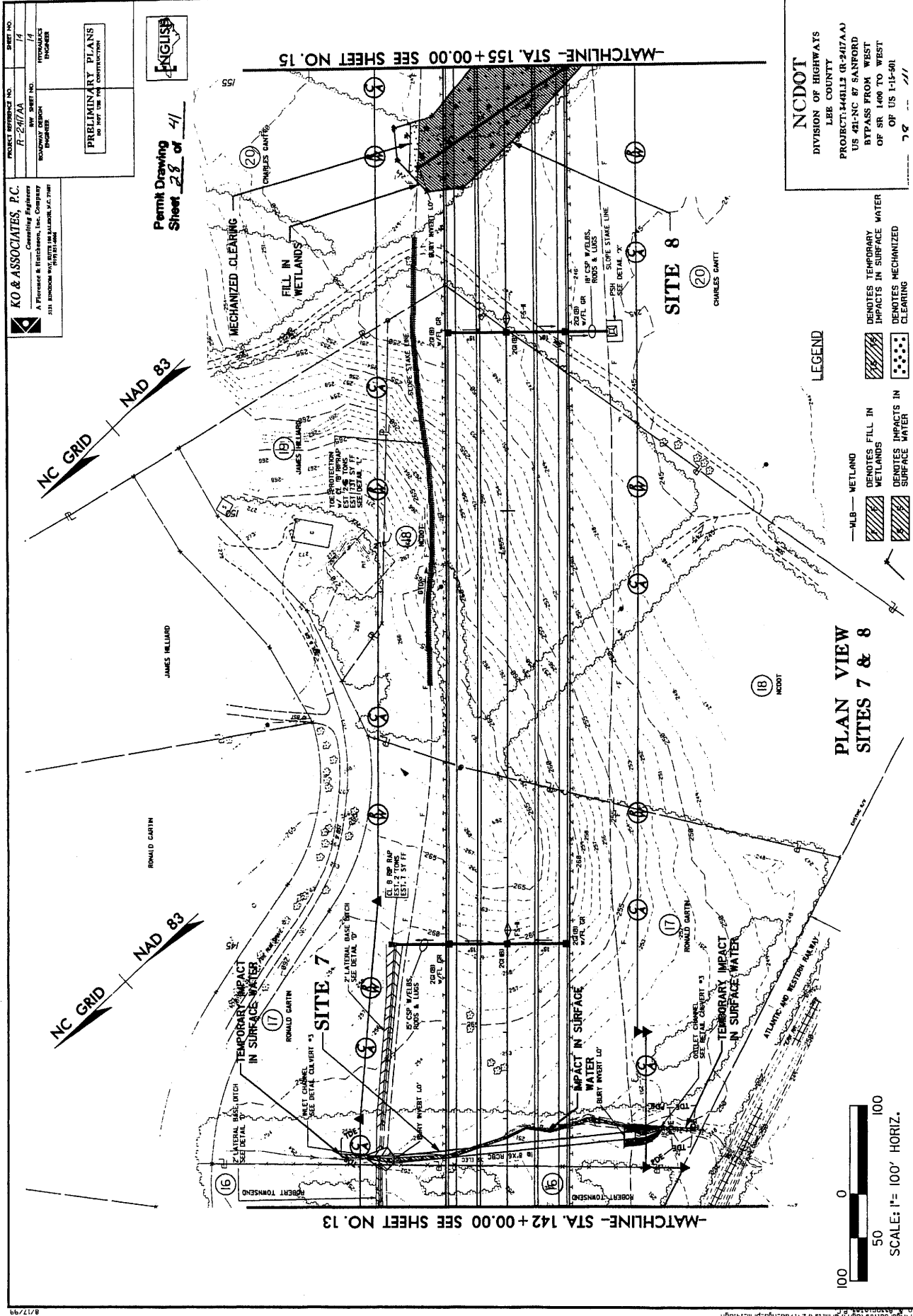
PROJECT REFERENCE NO. SHEET NO.  
 A-2417(A) 17  
 ROADWAY WORK HYDRAULICS ENGINEER  
 PRELIMINARY PLANS  
 DO NOT USE FOR CONSTRUCTION

**KO & ASSOCIATES, P.C.**  
 Consulting Engineers  
 A Fluorize & Hatchcock, Inc. Company  
 3121 BROADWAY AVE. SUITE 100 WILMINGTON, N.C. 28403  
 910.351.1000



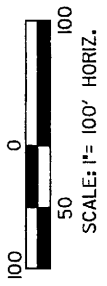
Permit Drawing  
 Sheet 28 of 41

**NC DOT**  
 DIVISION OF HIGHWAYS  
 LEE COUNTY  
 PROJECT: M481L3 (R-2417AA)  
 US 421-NC R7 SANFORD  
 BYPASS FROM WEST  
 OF RR 1408 TO WEST  
 OF US 1-15-90



**PLAN VIEW  
 SITES 7 & 8**

- LEGEND**
- WB— WETLAND
  - ▨ DENOTES FILL IN WETLANDS
  - ▨ DENOTES TEMPORARY IMPACTS IN SURFACE WATER
  - ▨ DENOTES MECHANIZED CLEANING
  - ▨ DENOTES IMPACTS IN SURFACE WATER
  - ▨ DENOTES MECHANIZED CLEANING

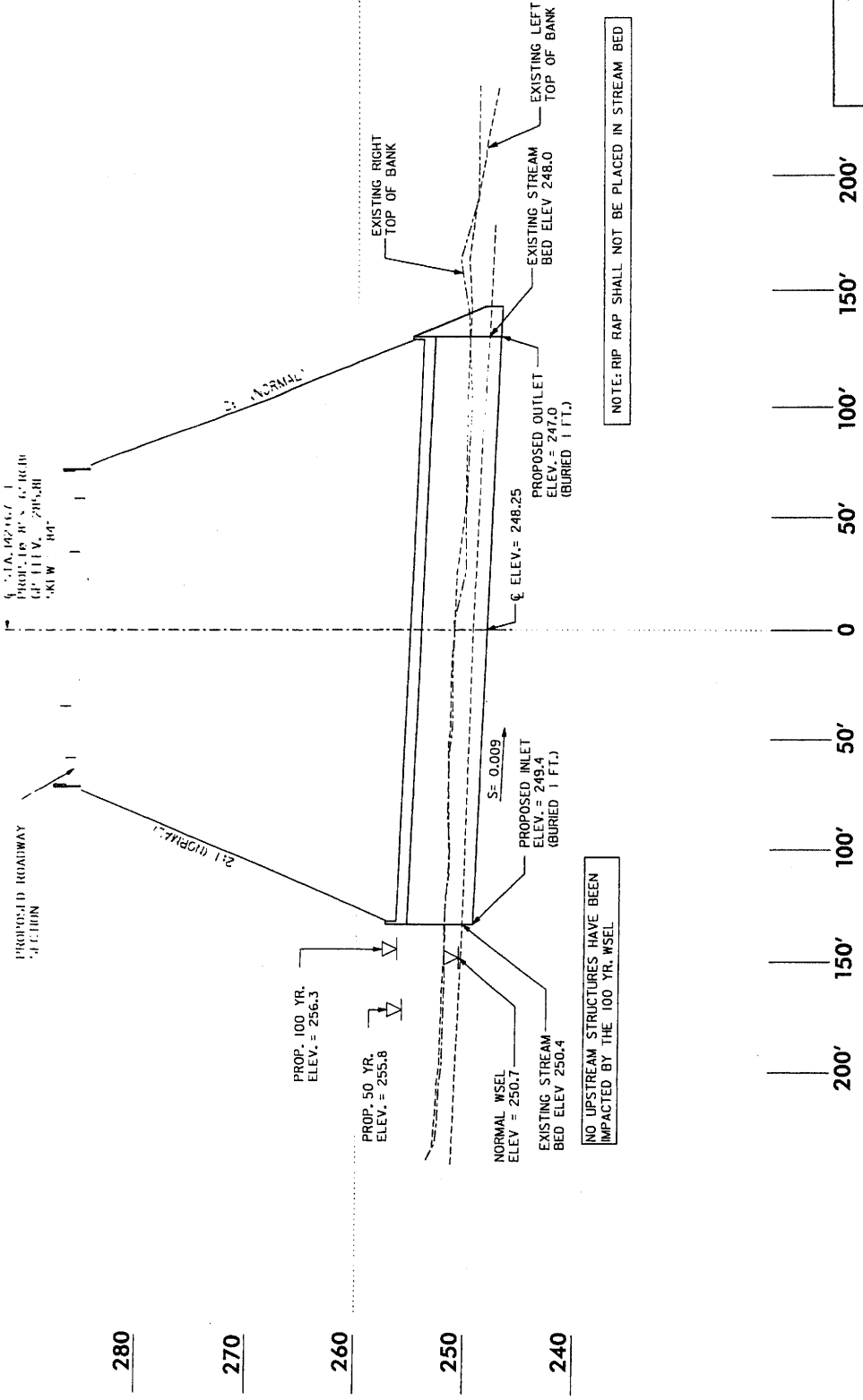


PROJECT REFERENCE NO. R-2417AA  
 HYDRAULICS ENGINEER  
 PRELIMINARY PLANS  
 DO NOT USE FOR CONSTRUCTION

Permit Drawing  
 Sheet 29 of 41



NCDOT  
 DIVISION OF HIGHWAYS  
 LEE COUNTY  
 PROJECT: 3448L2 (R-2417AA)  
 US 421-NC 87 SANFORD  
 BYPASS FROM WEST  
 OF SR 1400 TO WEST  
 OF US 1-15-501



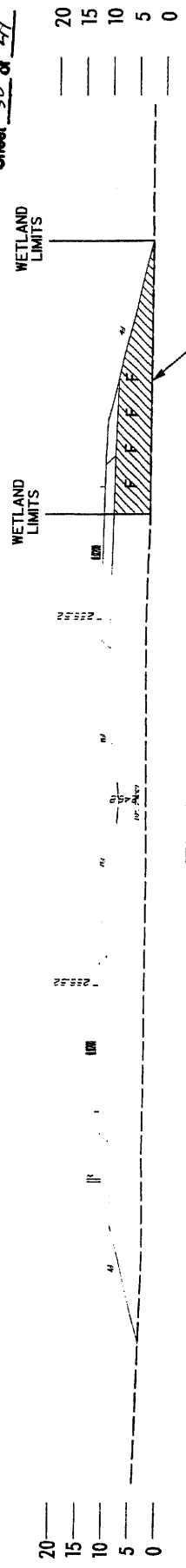
PROFILE ALONG STRUCTURE  
 SITE 7

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

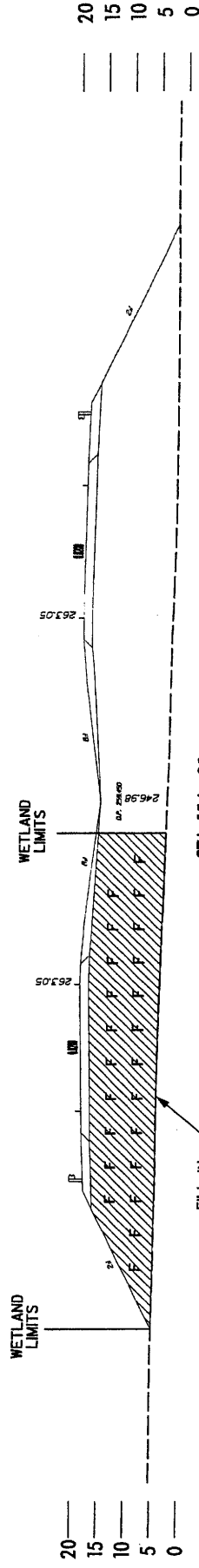
PROJECT NUMBER: 11-2417AA  
 SHEET NO. 8-2171  
 ROADWAY DESIGN ENGINEER  
 PROFESSIONAL ENGINEER  
 PRELIMINARY PLANS  
 DO NOT USE FOR CONSTRUCTION



Permit Drawing  
 Sheet 30 of 21



STA. 158+00 RT  
 EL=244.00



STA. 154+00  
 EL=244.00

**LEGEND**

- WLB --- WETLAND
- DENOTES FILL IN WETLAND

**TYPICAL X-SECTIONS  
 SITE 8**

**NC DOT**  
 DIVISION OF HIGHWAYS  
 LEE COUNTY  
 PROJECT: 344311.2 (R-2417AA)  
 US 421-NC 87 SANFORD  
 BYPASS FROM WEST  
 OF SR 1400 TO WEST  
 OF US 1-15-501



PROJECT REFERENCE NO. **12-2417AA**  
 ROADWAY DESIGN  
 WORKSHEET

**KO & ASSOCIATES, P.C.**  
 Consulting Engineers  
 A Pittman & Hatcher, Inc. Company  
 911 KENDRICK PALM DRIVE WILMINGTON, N.C. 28407  
 (910) 771-1111

SHEET NO. **31**  
 PRELIMINARY PLANS  
 IN PREPARATION FOR CONSTRUCTION  
**Permit Drawing**  
**Sheet 31 of 41**

**CULVERT HYDRAULIC DATA**  
 DESIGN DISCHARGE = 300 CFS  
 DESIGN FREQUENCY = 50 YRS  
 DESIGN HW ELEVATION = 255.6 FT  
 BASE DISCHARGE = 340 CFS  
 BASE FREQUENCY = 100 YRS  
 BASE HW ELEVATION = 256.3 FT  
 DESIGN DISCHARGE = 300 CFS  
 DESIGN FREQUENCY = 50 YRS  
 OVERTOPPING ELEVATION = 260.0 FT

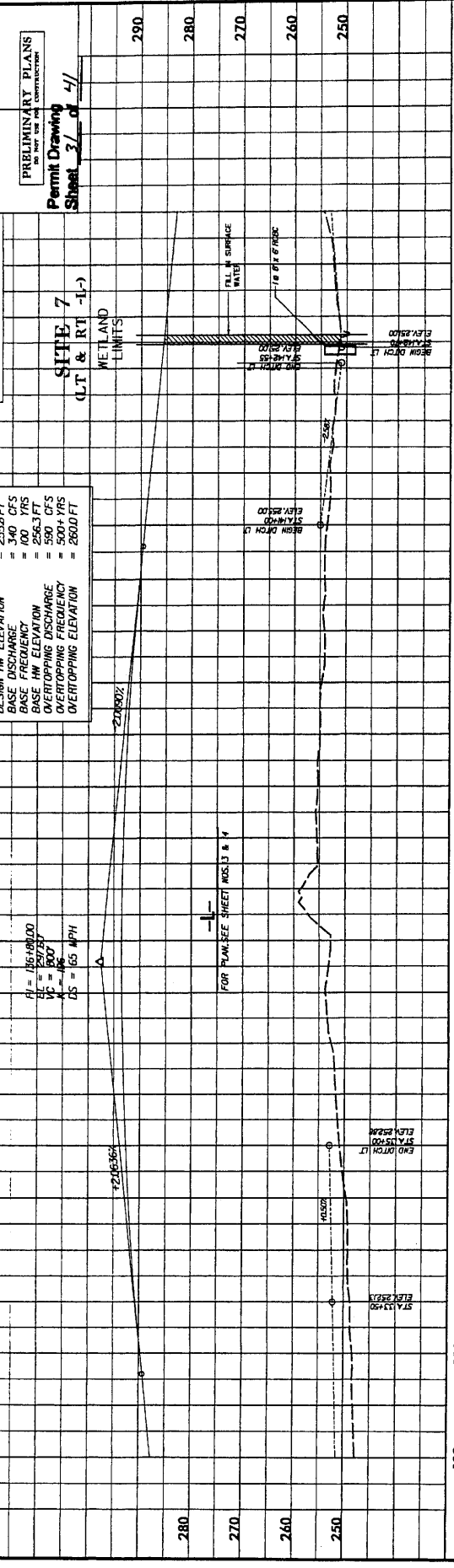
HW 10' PIPE IN BASE OF 12" PIPE TREE RIGHT  
 STA. 134+35.80 294.46 RT  
 STA. 134+36.00 294.46 RT  
 STA. 134+36.20 294.46 RT  
 STA. 134+36.40 294.46 RT  
 STA. 134+36.60 294.46 RT  
 STA. 134+36.80 294.46 RT  
 STA. 134+37.00 294.46 RT  
 STA. 134+37.20 294.46 RT  
 STA. 134+37.40 294.46 RT  
 STA. 134+37.60 294.46 RT  
 STA. 134+37.80 294.46 RT  
 STA. 134+38.00 294.46 RT

PI = 186.49000  
 VE = 297.27  
 VP = 190.07  
 VS = 185.4974

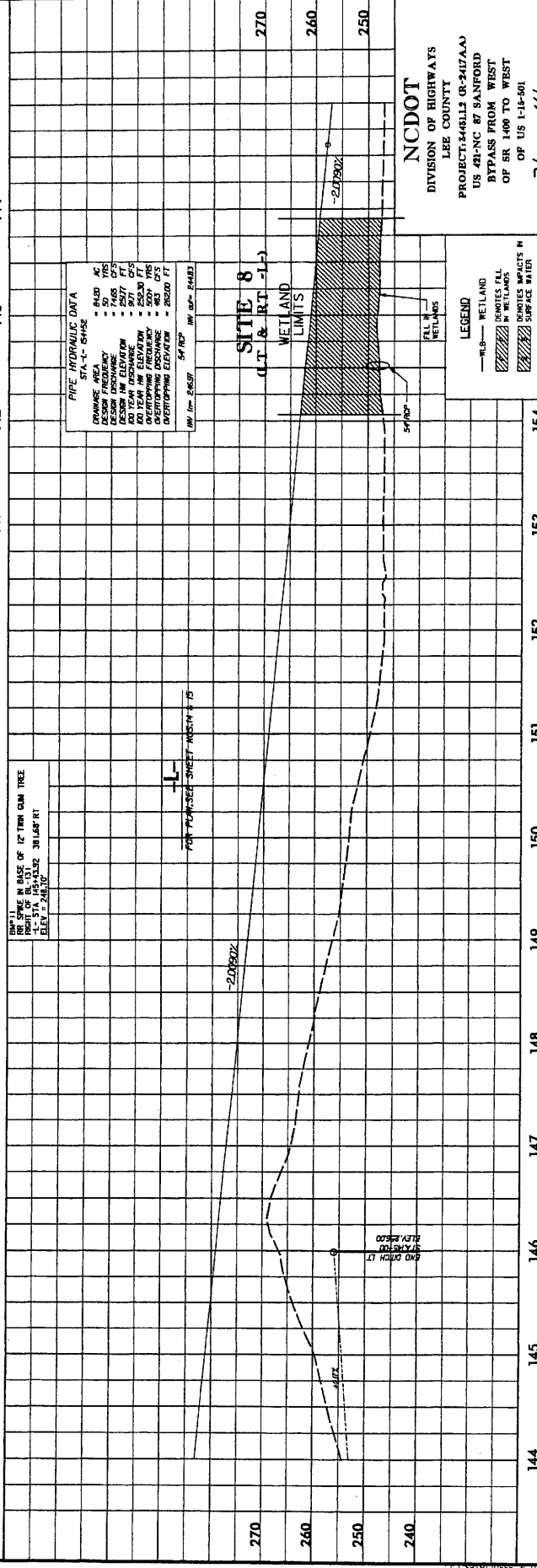
FOR PLAN/SEE SHEET NOS. 3 & 4

STA. 133+50  
 STA. 134+50  
 STA. 135+50  
 STA. 136+50  
 STA. 137+50  
 STA. 138+50  
 STA. 139+50  
 STA. 140+50  
 STA. 141+50  
 STA. 142+50  
 STA. 143+50  
 STA. 144+50

280  
270  
260  
250



270  
260  
250  
240



270  
260  
250  
240

**PIPE HYDRAULIC DATA**

DRAWING AREA	= 64.00 AC
DESIGN DISCHARGE	= 300 CFS
DESIGN FREQUENCY	= 50 YRS
DESIGN HW ELEVATION	= 255.6 FT
100 YEAR HW ELEVATION	= 256.3 FT
100 YEAR OVERTOPPING ELEVATION	= 260.0 FT
BASE DISCHARGE	= 340 CFS
BASE FREQUENCY	= 100 YRS
BASE HW ELEVATION	= 256.3 FT
BASE OVERTOPPING ELEVATION	= 260.0 FT

**SITE 8**  
 (LT & RT -L-)

WETLAND LIMITS

LEGEND

- WETLAND
- DESIGN FILL IN WETLANDS
- EXISTING IMPACTS IN SURFACE WATER

**NC DOT**  
 DIVISION OF HIGHWAYS  
 LEE COUNTY  
 PROJECT: 848L13 (R-2417AA)  
 US 421-NC BY SANFORD  
 BYPASS FROM WEST  
 OF SR 1400 TO WEST  
 OF US 1-16-501

DATE: 11/11/09  
 DRAWN BY: J. H. HARRIS  
 CHECKED BY: J. H. HARRIS  
 IN CHARGE: J. H. HARRIS

PROJECT REFERENCE NO. R-2417AA  
 SHEET NO. 15  
 HIGHWAY DESIGN ENGINEER  
 HYDRAULICS ENGINEER

**KO & ASSOCIATES, P.C.**  
 Consulting Engineers  
 A Flanders & Hancham, Inc. Company  
 1311 DUNDON WAY  
 RALEIGH, NC 27615

PRELIMINARY PLANS  
 DO NOT USE FOR CONSTRUCTION

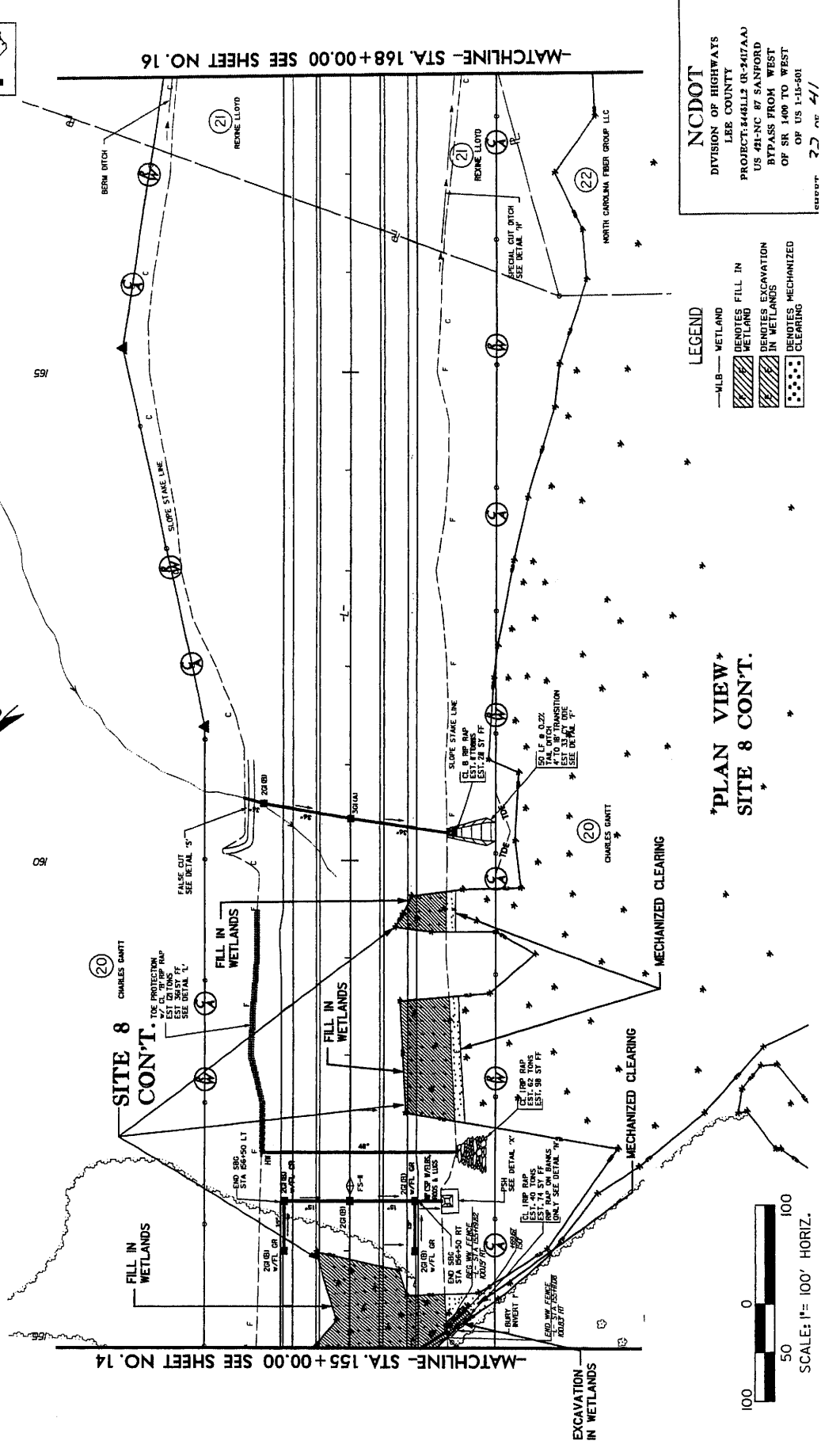
Permit Drawing  
 Sheet 32 of 41



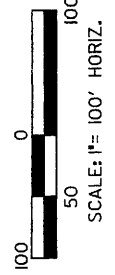
**NC DOT**  
 DIVISION OF HIGHWAYS  
 LEE COUNTY  
 PROJECT: 844112 (R-2417AA)  
 US 41-NC BY SANFORD  
 BYPASS FROM WEST  
 OF SR 1400 TO WEST  
 OF US 1-15-501

**LEGEND**  
 -MLB- WETLAND  
 DENOTES FILL IN WETLAND  
 DENOTES EXCAVATION IN WETLANDS  
 DENOTES MECHANIZED CLEARING

NC GRID NAD 83



PLAN VIEW  
 SITE 8 CONT.



PROJECT REFERENCE NO. **17-2173A**  
 SHEET NO. **16**  
 ROADWAY WORK  
 HYDRAULICS ENGINEER

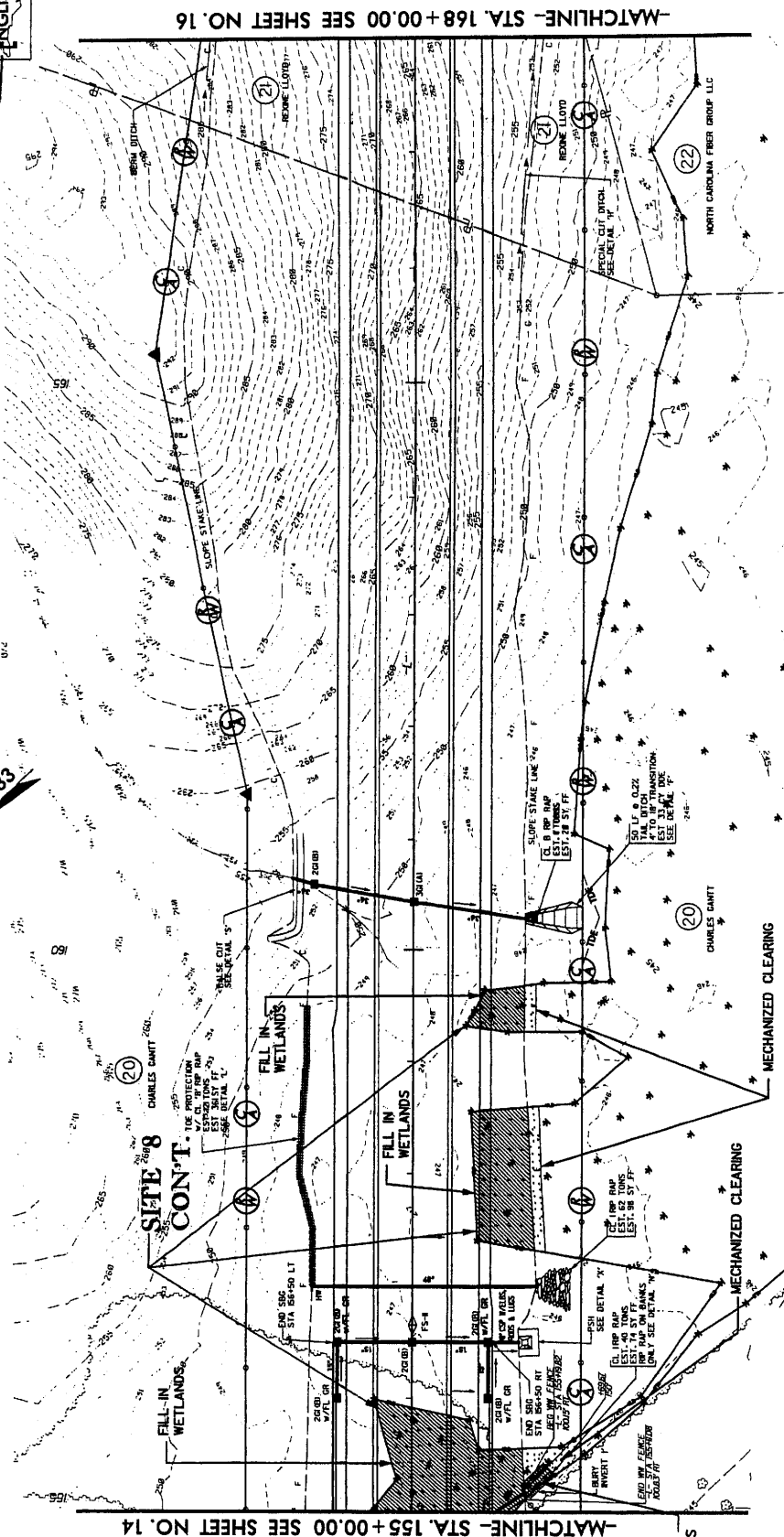
**KO & ASSOCIATES, P.C.**  
 Consulting Engineers  
 A. Florence & Hatchedown, Inc. Company  
 3111 BROADWAY, SUITE 100, RALEIGH, N.C. 27607  
 (919) 877-1111

PRELIMINARY PLANS  
 FOR THE STATE OF NORTH CAROLINA

Permit Drawing  
 Sheet 33 of 41



NC GRID  
 NAD 83



-MATCHLINE- STA. 155+00.00 SEE SHEET NO. 14

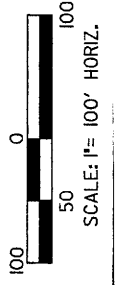
-MATCHLINE- STA. 168+00.00 SEE SHEET NO. 16

**NC DOT**  
 DIVISION OF HIGHWAYS  
 LEBB COUNTY  
 PROJECT: 346L13 GR-347AAJ  
 US 41-NC 87 SANFORD  
 BYPASS FROM WEST  
 OF SR 1400 TO WEST  
 OF US 1-15-501

**LEGEND**

- MLB - WETLAND
- Denotes FILL IN WETLAND
- Denotes EXCAVATION IN WETLANDS
- Denotes MECHANIZED CLEARING

\*PLAN VIEW\*  
 \*SITE 8 CONT.\*



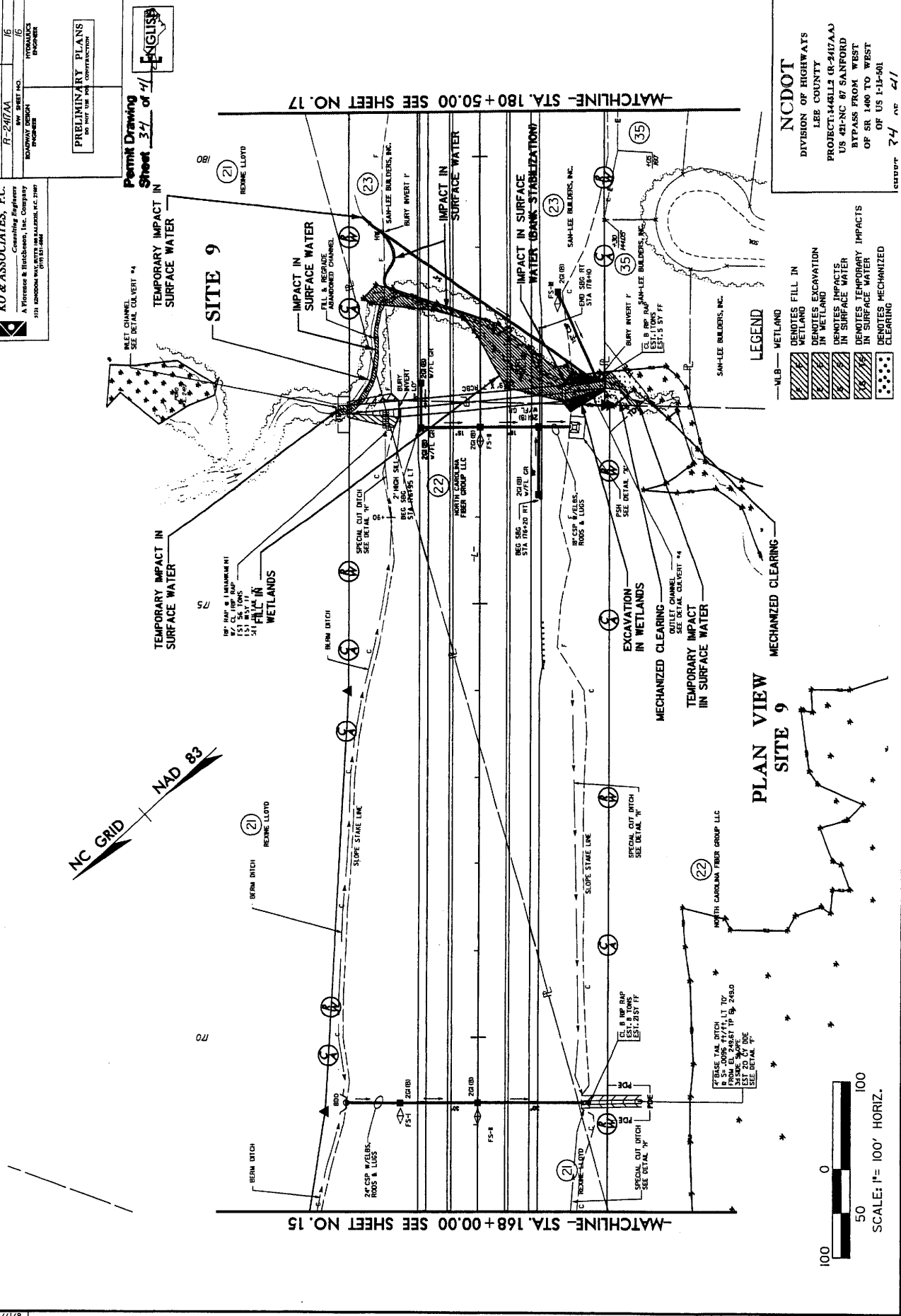
PROJECT REFERENCE NO. **F-2417AA** SHEET NO. **16**  
 RW SHEET NO. **16**  
 HYDRAULICS  
 ROADWAY DESIGN  
 NOTES

**KO & ASSOCIATES, P.C.**  
 Consulting Engineers  
 1100 W. HARRIS STREET, SUITE 200  
 RALEIGH, NC 27603  
 TEL: 919.876.8800 FAX: 919.876.8801

PRELIMINARY PLANS  
 DO NOT USE FOR  
 CONSTRUCTION

Permit Drawing  
 Sheet 34 of 41

NC GRID NAD 83



**LEGEND**

- MLB - WETLAND
- Denotes FILL IN WETLAND
- Denotes EXCAVATION IN WETLAND
- Denotes IMPACTS IN SURFACE WATER
- Denotes TEMPORARY IMPACTS IN SURFACE WATER
- Denotes MECHANIZED CLEARING

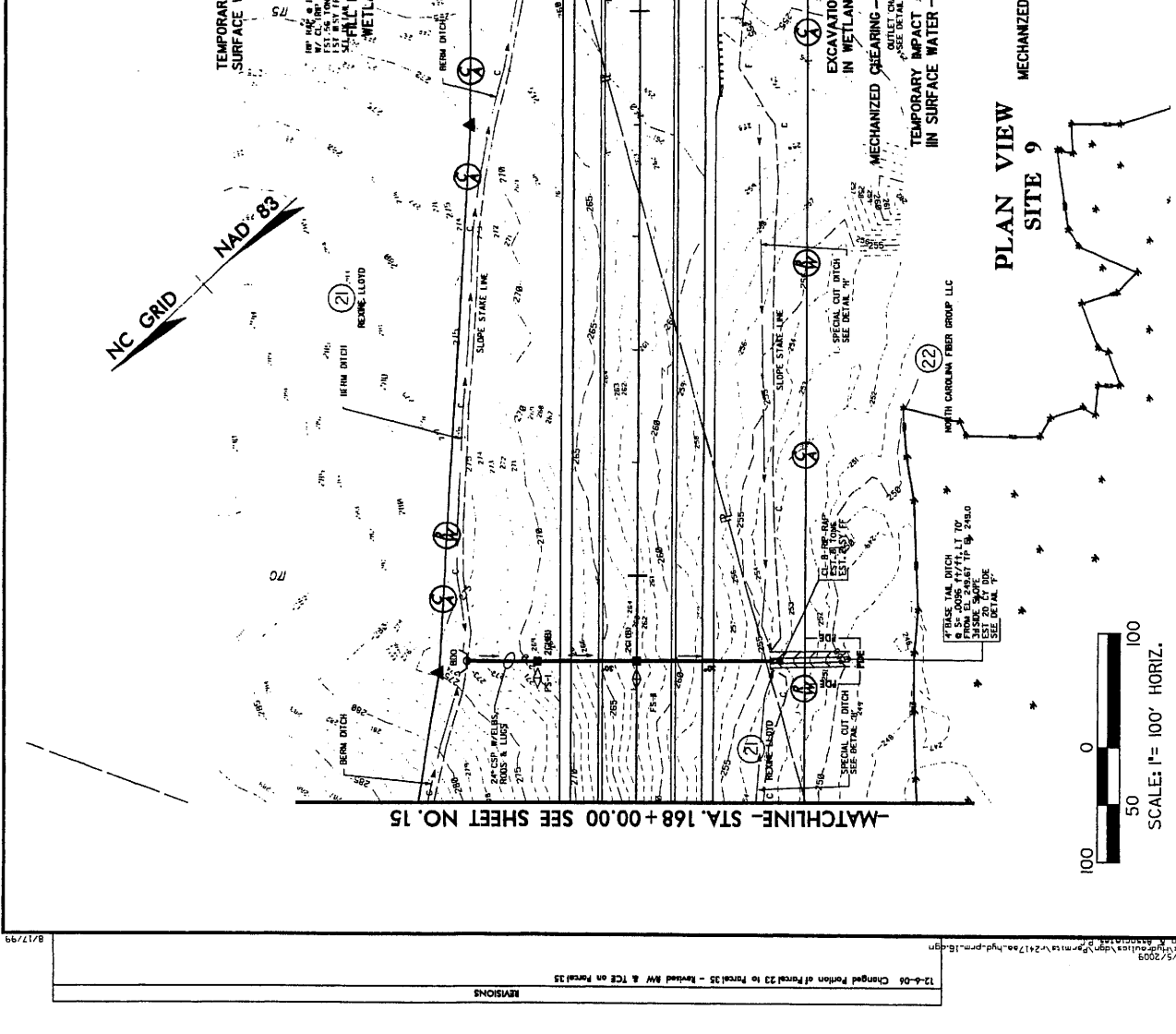
**NC DOT**  
 DIVISION OF HIGHWAYS  
 LEE COUNTY  
 PROJECT: 146113 (R-2417AA)  
 US 421-NC 87 SANFORD  
 BYPASS FROM WEST  
 OF SR 1400 TO WEST  
 OF US 1-15-00  
 DRAWING NO. **74** OF **41**

PROJECT REFERENCE NO. R-2417AA  
 SHEET NO. 16  
 DATE: 10/15/2009  
 ENGINEER: [Signature]

**KO & ASSOCIATES, P.C.**  
 Consulting Engineers  
 A Florence & Hitchcock, Inc. Company  
 3711 KENDRICK WAY, SUITE 100 BALDWIN, N.C. 27007  
 (919) 351-0000

PRELIMINARY PLANS  
 FOR PERMITS AND CONSTRUCTION

Permit Drawing  
 Sheet 35 of 41

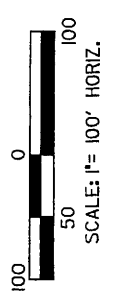


**LEGEND**

[Symbol]	WETLAND
[Symbol]	WETLAND EXCAVATION
[Symbol]	WETLAND FILL
[Symbol]	DENOTES IMPACTS IN SURFACE WATER
[Symbol]	DENOTES TEMPORARY IMPACTS IN SURFACE WATER
[Symbol]	DENOTES MECHANIZED CLEARING

**NCDOT**  
 DIVISION OF HIGHWAYS  
 LEE COUNTY  
 PROJECT: 348LLI (R-2417AA)  
 US 421-NC 87 SANFORD  
 BYPASS FROM WEST  
 OF SR 1400 TO WEST  
 OF US 1-15-001

**PLAN VIEW SITE 9**

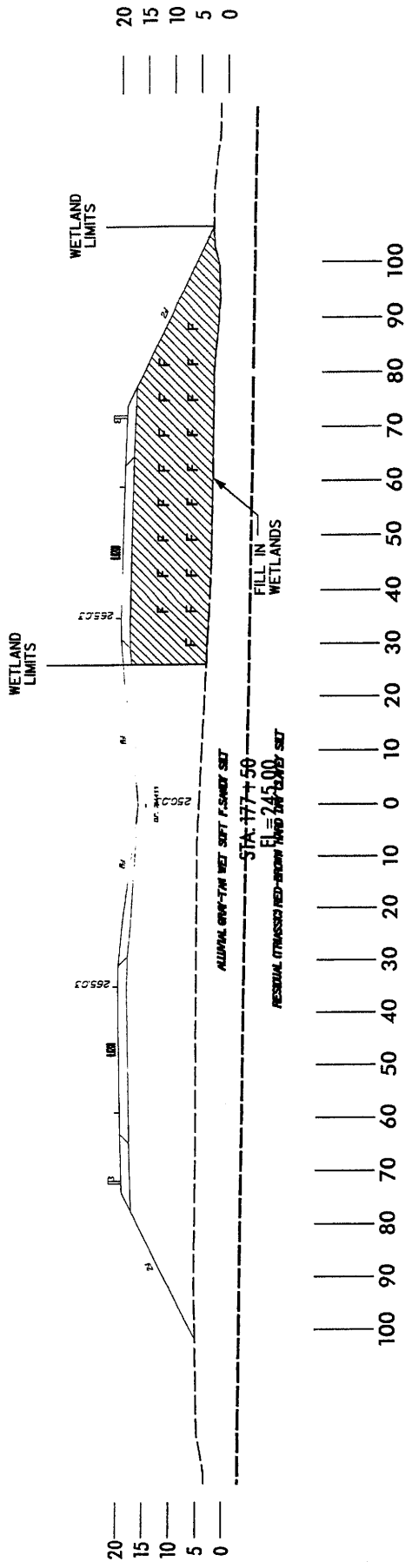


REVISIONS  
 12-0-08 Changed Portion of Parcel 23 to Parcel 35 - Revised MW & TCE on Parcel 35  
 4/5/2009  
 8/17/99



PROJECT REFERENCE NO. R-2417AA  
 ROADWAY DESIGN ENGINEER  
 SHEET NO. 9-1FL  
 HYDRAULICS ENGINEER  
 PRELIMINARY PLANS  
 NO PART SET CONTRACT NO.

Permit Drawing  
 Sheet 36 of 41



**LEGEND**

- WLB — WETLAND
- ▨ DENOTES FILL IN WETLAND

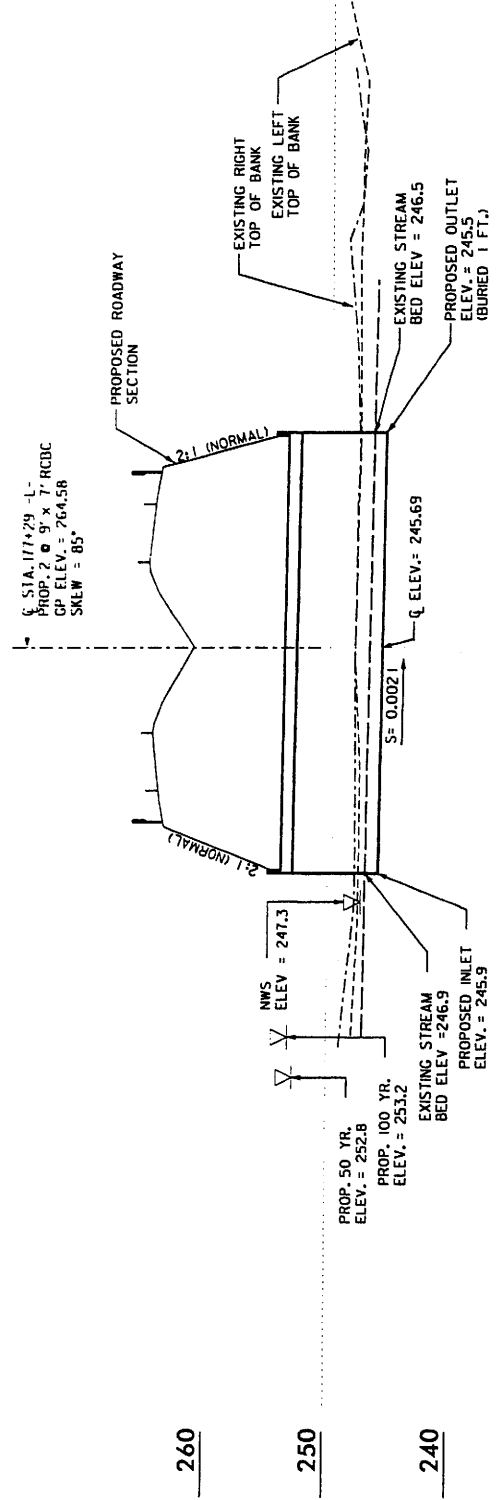
TYPICAL X-SECTIONS  
 SITE 9

NCDOT  
 DIVISION OF HIGHWAYS  
 LEE COUNTY  
 PROJECT: 144311.2 (R-2417AA)  
 US 421-NC 87 SANFORD  
 BYPASS FROM WEST  
 OF SR 1400 TO WEST  
 OF US 1-15-501

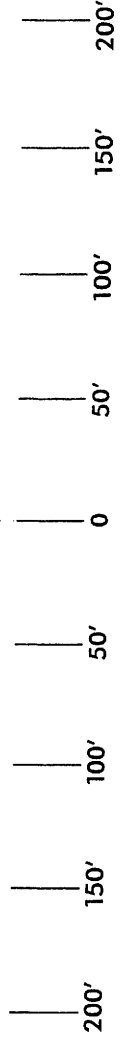
PROJECT REFERENCE NO. **R-2417AA**  
 DRAWING REGION **S9-PAS**  
 DRAWING NUMBER **PERMITTER**

**PRELIMINARY PLANS**  
 DO NOT USE FOR CONSTRUCTION

Permit Drawing  
 Sheet 37 of 41



NO UPSTREAM STRUCTURES HAVE BEEN IMPACTED BY THE 100 YR. WSEL



PROFILE ALONG STRUCTURE  
 SITE 9

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



NCDOT  
 DIVISION OF HIGHWAYS  
 LEE COUNTY  
 PROJECT: 34431.12 (R-2417AA)  
 US 421-NC 87 SANFORD  
 BYPASS FROM WEST  
 OF SR 1400 TO WEST  
 OF US 1-15-501

PROJECT REFERENCE NO. R-2477AA  
 SHEET NO. 32

PRELIMINARY PLANS  
 DO NOT BE USED FOR CONSTRUCTION

Permit Drawing  
 Sheet 32 of 44

KO & ASSOCIATES, P.C.  
 A Florence & Harborside, Inc. Company  
 511 S. WILSON ST. SUITE 100 WILSON, N.C. 27158  
 (919) 351-5200

DATE: 03/11/2014  
 TIME: 09:31:18 AM

SITE 8 CONT.  
 (RT -1-)

PIPE HYDRAULIC DATA  
 STA - L- 187+00  
 DRAINAGE AREA = 57.00 AC  
 DESIGN FREQENCY = 50 YRS  
 DESIGN HW ELEVATION = 63.00 FT  
 DESIGN HW ELEVATION = 63.00 FT  
 100 YEAR DESIGN FREQ = 5000 CFS  
 100 YEAR HW ELEVATION = 63.00 FT  
 OVERTOPPING FREQENCY = 5000 YRS  
 OVERTOPPING ELEVATION = 63.00 FT

WETLAND LIMITS

PI = 199.0000  
 EL = 253.007  
 VC = 280'  
 K = 190  
 OS = 70 MPH

FOR PAVEMENT SHEET NO. 8

FOR PAVEMENT SHEET NO. 9

ST. 187+00  
 ELEV. 254.97  
 RR SPIKE IN BASE OF 12" PINE TREE  
 FOUND IN 187+38 254.97 FT  
 ELEV = 254.97'

WETLAND LIMITS

PI = 106+50.00  
 EL = 252.807  
 VC = 440'  
 K = 100  
 OS = 70 MPH

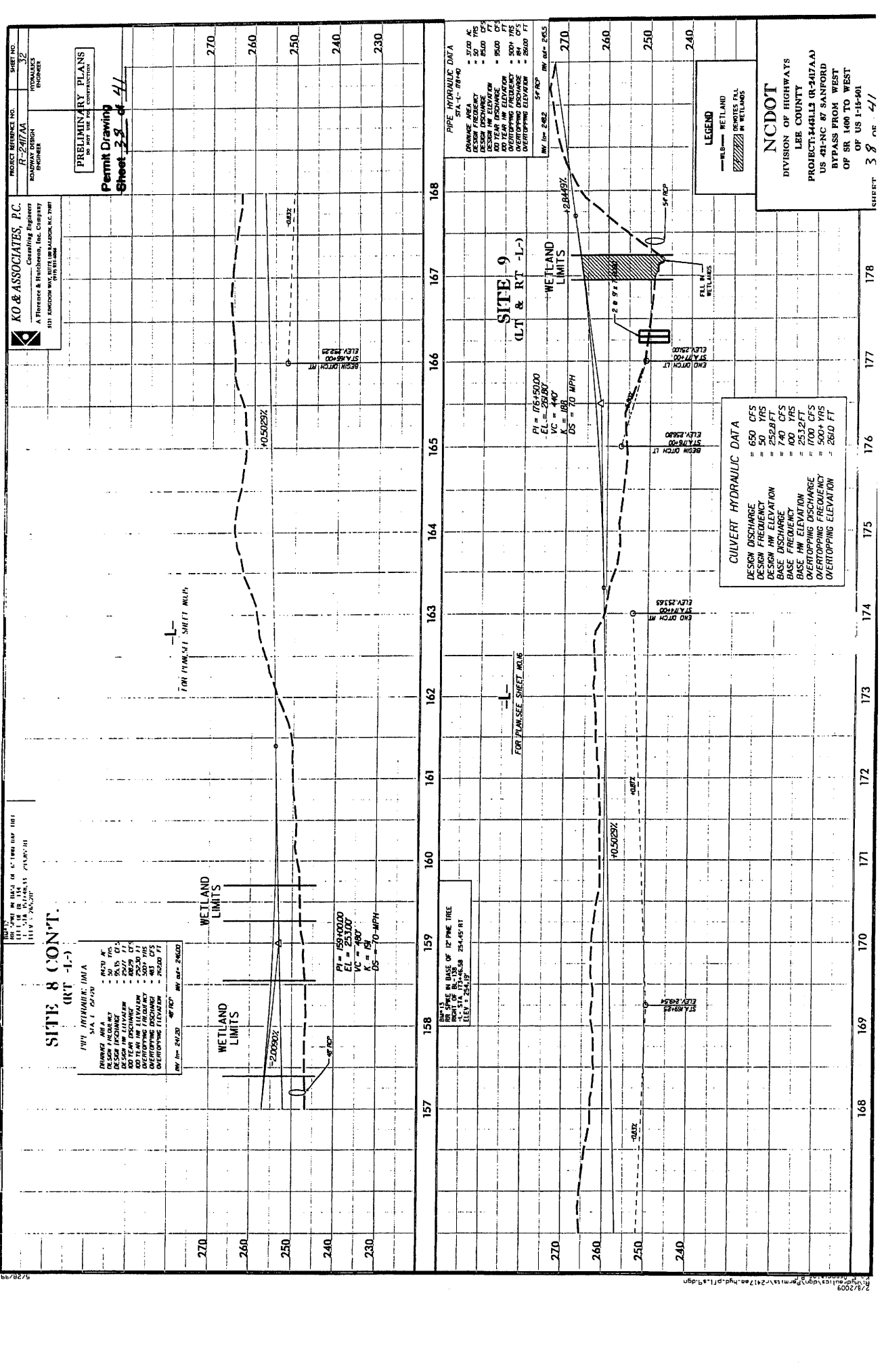
FOR PAVEMENT SHEET NO. 9

WETLAND LIMITS

CULVERT HYDRAULIC DATA  
 DESIGN DISCHARGE = 650 CFS  
 DESIGN FREQENCY = 50 YRS  
 DESIGN HW ELEVATION = 252.8 FT  
 BASE DISCHARGE = 740 CFS  
 BASE FREQENCY = 100 YRS  
 BASE HW ELEVATION = 253.2 FT  
 OVERTOPPING DISCHARGE = 6000 CFS  
 OVERTOPPING FREQENCY = 500 YRS  
 OVERTOPPING ELEVATION = 260.0 FT

LEGEND  
 WETLAND  
 WETLAND  
 WETLAND

NC DOT  
 DIVISION OF HIGHWAYS  
 LEE COUNTY  
 PROJECT: 3481L3 (R-3477AA)  
 BYPASS FROM WEST  
 OF SR 1400 TO WEST  
 OF US 1-15-401  
 SHEET 32 OF 44





PROJECT REFERENCE NO. **17-0-05**  
 PROJECT NO. **17-0-05**  
 SHEET NO. **10**  
 DESIGNER: **HYDRAULICS ENGINEER**

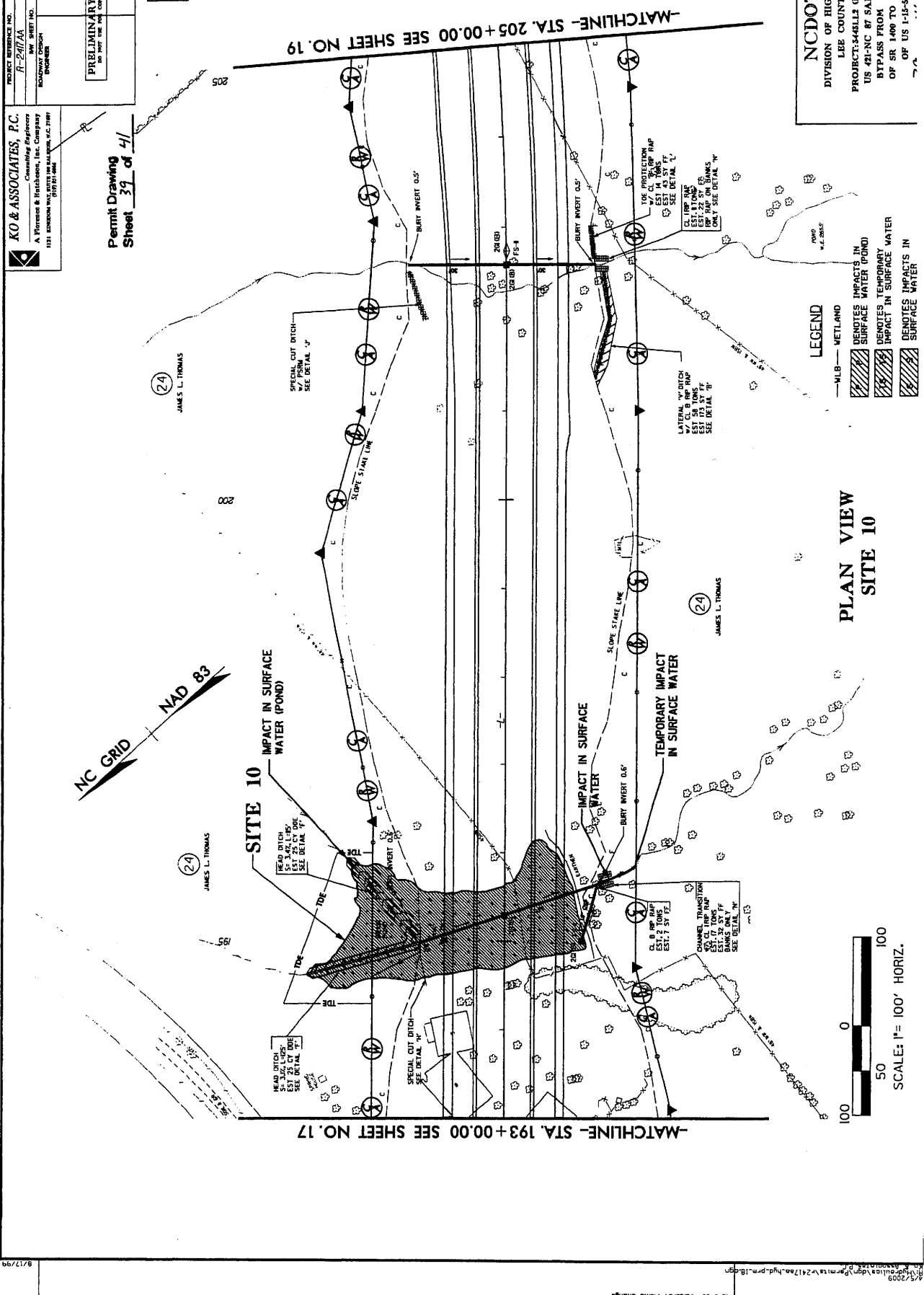
**KO & ASSOCIATES, P.C.**  
 Consulting Engineers  
 A. Florence & H. H. H. Co., Inc. Company  
 1121 KENNEDY HWY. SUITE 100, WILSON, N.C. 27157  
 (919) 231-1000

**PRELIMINARY PLANS**  
 TO BE USED FOR PERMITS ONLY



Permit Drawing  
 Sheet 37 of 41

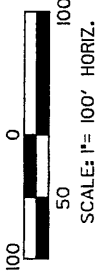
**NC DOT**  
 DIVISION OF HIGHWAYS  
 LEE COUNTY  
 PROJECT: 546113 (R-2417AA)  
 US 421-NC BY SANFORD  
 BYPASS FROM WEST  
 OF SR 1400 TO WEST  
 OF US 1-15-001



**LEGEND**

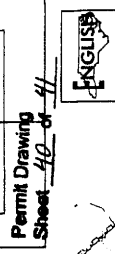
- MLB - WETLAND
- IMPACT IN SURFACE WATER (POND)
- IMPACT IN SURFACE WATER
- TEMPORARY IMPACT IN SURFACE WATER
- IMPACT IN SURFACE WATER

**PLAN VIEW  
 SITE 10**



PROJECT REFERENCE NO. R-2417AA  
 SHEET NO. 18  
 HYDRAULICS ENGINEER

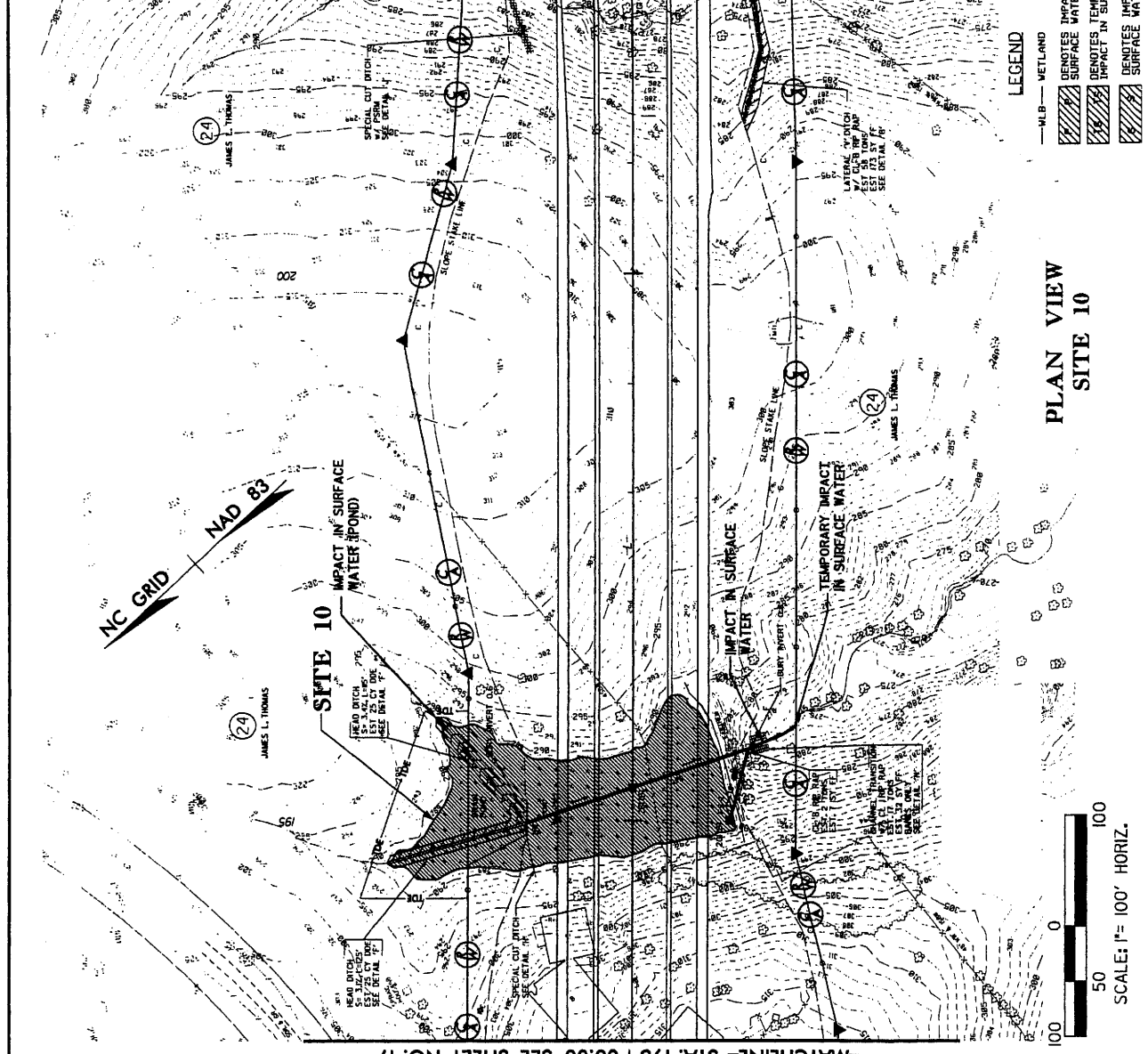
PRELIMINARY PLANS  
 DO NOT USE FOR CONSTRUCTION  
 Permit Drawing  
 Sheet 18 of 41



**KO & ASSOCIATES, P.C.**  
 Consulting Engineers  
 A Florence & Hitchcock, Inc. Company  
 511 JUNCTION OF STATE ST. & W. 10TH ST.  
 FLORENCE, S.C. 29502

PROJECT REFERENCE NO. R-2417AA  
 SHEET NO. 18  
 HYDRAULICS ENGINEER

**NC DOT**  
 DIVISION OF HIGHWAYS  
 LEE COUNTY  
 PROJECT: 3445113 (R-2417AA)  
 US 41-NC 87 SANFORD  
 BYPASS FROM WEST  
 OF SR 1400 TO WEST  
 OF US 1-15-501



**LEGEND**

- HLB — WETLAND
- ▨ DENOTES IMPACTS IN SURFACE WATER (POND)
- ▨ DENOTES TEMPORARY IMPACT IN SURFACE WATER
- ▨ DENOTES IMPACTS IN SURFACE WATER

**PLAN VIEW  
 SITE 10**

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

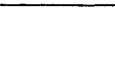
PROJECT REFERENCE NO. R-2417AA  
 SHEET NO. 18  
 HYDRAULICS ENGINEER

PRELIMINARY PLANS  
 DO NOT USE FOR CONSTRUCTION  
 Permit Drawing  
 Sheet 18 of 41



PROJECT REFERENCE NO. R-2417AA  
 SHEET NO. 18  
 HYDRAULICS ENGINEER

PRELIMINARY PLANS  
 DO NOT USE FOR CONSTRUCTION  
 Permit Drawing  
 Sheet 18 of 41



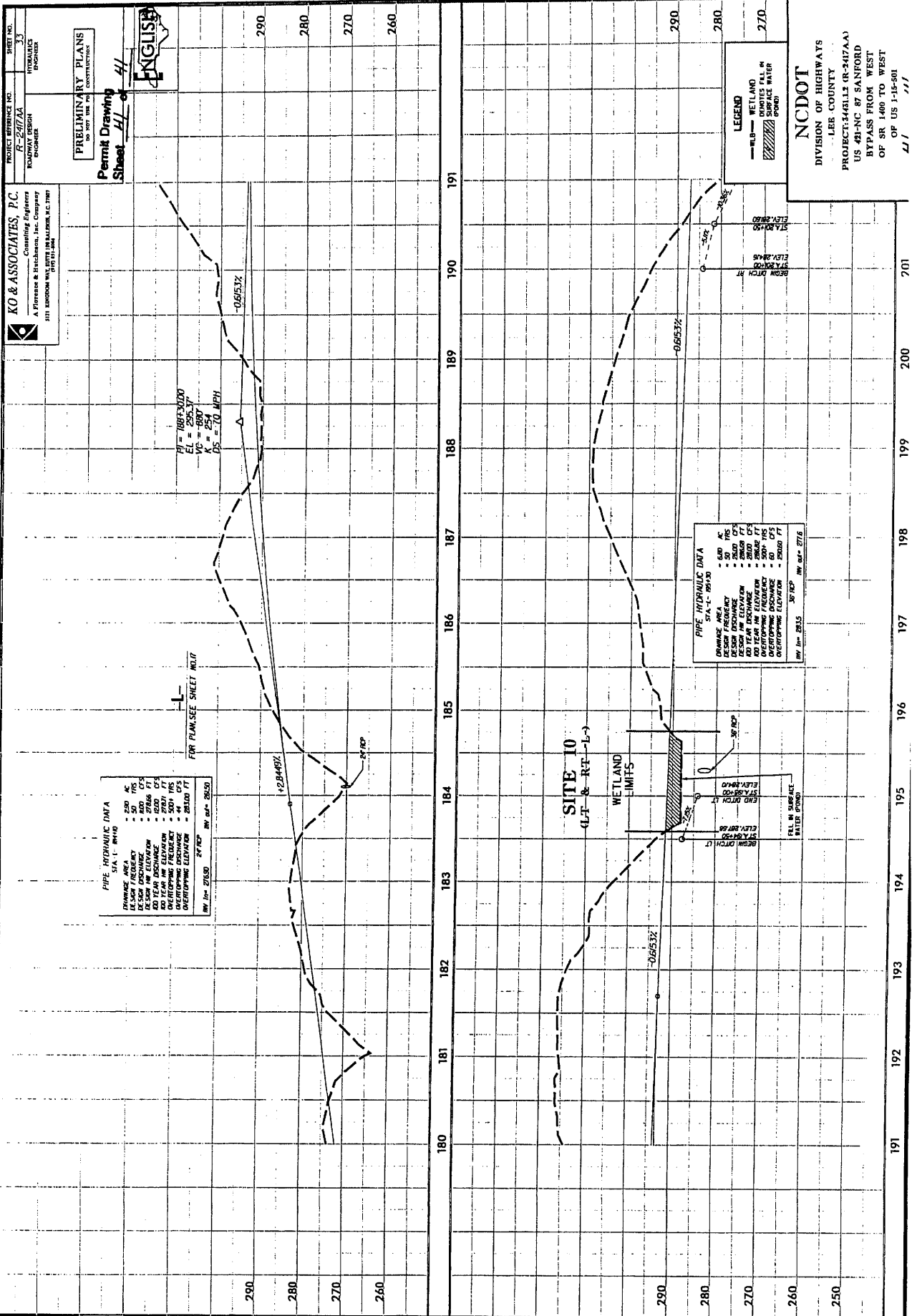
**NC DOT**  
 DIVISION OF HIGHWAYS  
 LEE COUNTY  
 PROJECT: 3445113 (R-2417AA)  
 US 41-NC 87 SANFORD  
 BYPASS FROM WEST  
 OF SR 1400 TO WEST  
 OF US 1-15-501

**LEGEND**

- HLB — WETLAND
- ▨ DENOTES IMPACTS IN SURFACE WATER (POND)
- ▨ DENOTES TEMPORARY IMPACT IN SURFACE WATER
- ▨ DENOTES IMPACTS IN SURFACE WATER

**PLAN VIEW  
 SITE 10**

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



PROJECT REFERENCE NO. R-2417AA  
 HYDRAULICS ENGINEER

PROJECT REFERENCE NO. R-2417AA  
 ROADWAY DESIGN ENGINEER

PROJECT REFERENCE NO. R-2417AA  
 PERMIT DRAWING SHEET 41 OF 41

PROJECT REFERENCE NO. R-2417AA  
 PERMIT DRAWING SHEET 41 OF 41

PRELIMINARY PLANS  
 SHEET 41 OF 41

PERMIT DRAWING SHEET 41 OF 41

PERMIT DRAWING SHEET 41 OF 41

PERMIT DRAWING SHEET 41 OF 41

ENGLISH

ENGLISH

ENGLISH

ENGLISH

PI = 1887.2000  
 EL = 295.37  
 VC = 200'  
 DS = 7.0 MPH

PI = 1887.2000  
 EL = 295.37  
 VC = 200'  
 DS = 7.0 MPH

PI = 1887.2000  
 EL = 295.37  
 VC = 200'  
 DS = 7.0 MPH

PI = 1887.2000  
 EL = 295.37  
 VC = 200'  
 DS = 7.0 MPH

FOR PLAN, SEE SHEET 40/1

FOR PLAN, SEE SHEET 40/1

FOR PLAN, SEE SHEET 40/1

FOR PLAN, SEE SHEET 40/1

PIPE HYDRAULIC DATA

PIPE HYDRAULIC DATA

PIPE HYDRAULIC DATA

PIPE HYDRAULIC DATA

WETLAND LIMITS

WETLAND LIMITS

WETLAND LIMITS

WETLAND LIMITS

LEGEND

LEGEND

LEGEND

LEGEND

LEGEND

LEGEND

LEGEND

LEGEND

LEGEND

LEGEND

LEGEND

LEGEND

LEGEND

LEGEND

LEGEND

LEGEND

LEGEND

LEGEND

LEGEND

LEGEND

LEGEND

LEGEND

LEGEND

LEGEND

LEGEND

LEGEND

LEGEND

LEGEND

LEGEND

LEGEND

LEGEND

LEGEND

LEGEND

LEGEND

LEGEND

LEGEND

LEGEND

LEGEND

LEGEND

LEGEND

STATE PROJECT NUMBER	R-2417AA
DATE	1
PROJECT NUMBER	3443112
PROJECT NAME	SR-NHF-421(B)
PROJECT TYPE	P.E.
PROJECT CLASSIFICATION	3443122
PROJECT STATUS	RW

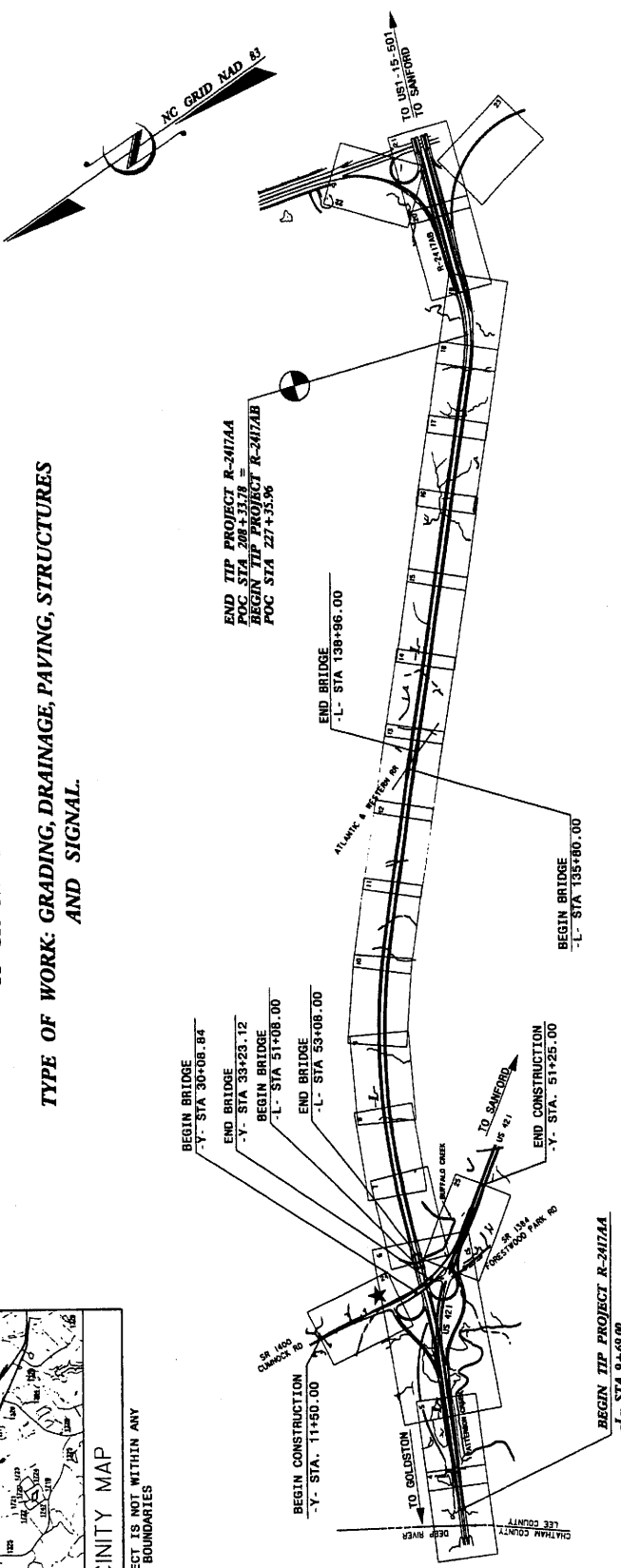
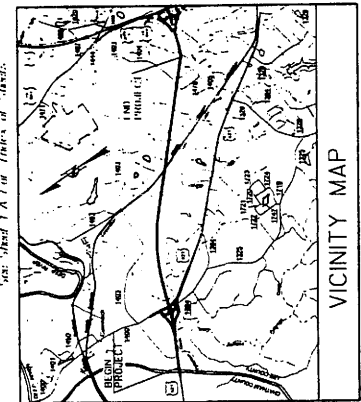
LEGEND:  
★ PROPOSED SIGNAL

STATE OF NORTH CAROLINA  
DIVISION OF HIGHWAYS

# LEE COUNTY

LOCATION: US 421 - NC 87 SANFORD BYPASS FROM WEST  
OF SR 1400 TO WEST OF US 1-15-501

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



THIS IS A CONTROLLED - ACCESS PROJECT WITH ACCESS BEING LIMITED TO INTERCHANGES. CLEARING ON THIS PROJECT SHALL BE PERFORMED TO THE LIMITS ESTABLISHED BY METHOD III

Prepared in the Office of  
**KO & ASSOCIATES, P.C.**  
A Premier & Hitchcock, Inc. Company  
101 Cannon Street, Suite 100  
Charlotte, NC 28202

RIGHT OF WAY DATE:  
February 17, 2006

LETTING DATE:  
May 20, 2008

HYDRAULICS ENGINEER

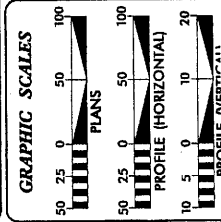
SIGNATURE  
ROADWAY DESIGN ENGINEER

PROJECT DESIGN ENGINEER

David C. Wollac, P.E.  
PROJECT ENGINEER

PROJECT LENGTH	3.66 MI
LENGTH ROADWAY TIP PROJECT R-2417AA	0.89 MI
LENGTH STRUCTURES TIP PROJECT R-2417AA	0.00 MI
TOTAL LENGTH OF TIP PROJECT R-2417AA	3.76 MI

DESIGN DATA	
ADT 2008	= 13,200
ADT 2028	= 20,800
DHV	= 10 %
D	= 60 % *
T	= 9 % *
V	= 70 MPH
* TTST	5% DUAL 4%



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

PRELIMINARY PLANS  
DO NOT USE FOR CONSTRUCTION



## TIP PROJECT: R-2417AA

## CONTRACT:

Note: Not to Scale  
 \*S.U.E. = Subsurface Utility Engineering

STATE OF NORTH CAROLINA  
 DIVISION OF HIGHWAYS

CONVENTIONAL PLAN SHEET SYMBOLS

PROJECT NUMBER: R-2017A  
 SHEET NO. 1-8

**BOUNDARIES AND PROPERTY:**

- State Line
- County Line
- Township Line
- City Line
- Reservation Line
- Property Line
- Existing Iron Pin
- Property Corner
- Property Monument
- Parcel/Sequence Number
- Existing Fence Line
- Proposed Woven Wire Fence
- Proposed Chain Link Fence
- Proposed Barbed Wire Fence
- Existing Wetland Boundary
- Proposed Wetland Boundary
- Existing Endangered Animal Boundary
- Existing Endangered Plant Boundary

**BUILDINGS AND OTHER CULTURE:**

- Gas Pump Vent or UG Tank Cap
- Well
- Small Mine
- Foundation
- Area Outline
- Cemetery
- Building
- School
- Church
- Dam

**HYDROLOGY:**

- Stream or Body of Water
- Hydro, Pool or Reservoir
- Jurisdictional Stream
- Buffer Zone 1
- Buffer Zone 2
- Flow Arrow
- Disappearing Stream
- Spring
- Wetland
- Proposed Lateral, Tail, Head Ditch
- False Sump

**RAILROADS:**

- Standard Gauge
- RR Signal Milepost
- Switch
- RR Abandoned
- RR Dismantled

**RIGHT OF WAY:**

- Baseline Control Point
- Existing Right of Way Marker
- Existing Right of Way Line
- Proposed Right of Way Line
- Proposed Right of Way Line with Iron Pin and Cap Marker
- Proposed Right of Way Line with Concrete or Granite Marker
- Existing Control of Access
- Proposed Control of Access
- Existing Easement Line
- Proposed Temporary Construction Easement
- Proposed Temporary Drainage Easement
- Proposed Permanent Drainage Easement
- Proposed Permanent Utility Easement

**ROADS AND RELATED FEATURES:**

- Existing Edge of Pavement
- Existing Curb
- Proposed Slope Stakes Cut
- Proposed Slope Stakes Fill
- Proposed Wheel Chair Ramp
- Existing Metal Guardrail
- Proposed Guardrail
- Existing Cable Guidrail
- Proposed Cable Guidrail
- Equality Symbol
- Pavement Removal

**VEGETATION:**

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

**EXISTING STRUCTURES:**

- MAJOR:
  - Bridge, Tunnel or Box Culvert
  - Bridge Wing Wall, Head Wall and End Wall
- MINOR:
  - Head and End Wall
  - Pipe Culvert
  - Footbridge
  - Drainage Box: Catch Basin, DI or JB
  - Paved Ditch Gutter
  - Storm Sewer Manhole
  - Storm Sewer

**UTILITIES:**

- POWER:
  - Existing Power Pole
  - Proposed Power Pole
  - Existing Joint Use Pole
  - Proposed Joint Use Pole
  - Power Manhole
  - Power Line Tower
  - Power Transformer
  - UG Power Cable Hand Hole
  - H-Frame Pole
  - Recorded UG Power Line
  - Designated UG Power Line (S.U.E.)\*
- TELEPHONE:
  - Existing Telephone Pole
  - Proposed Telephone Pole
  - Telephone Manhole
  - Telephone Booth
  - Telephone Pedestal
  - Telephone Cell Tower
  - UG Telephone Cable Hand Hole
  - Recorded UG Telephone Cable
  - Designated UG Telephone Cable (S.U.E.)\*
  - Recorded UG Telephone Conduit
  - Designated UG Telephone Conduit (S.U.E.)\*
  - Recorded UG Fiber Optics Cable
  - Designated UG Fiber Optics Cable (S.U.E.)\*

**WATER:**

- Water Manhole
- Water Meter
- Water Valve
- Water Hydrant
- Recorded UG Water Line
- Designated UG Water Line (S.U.E.)\*
- Above Ground Water Line

**TV:**

- TV Satellite Dish
- TV Pedestal
- TV Tower
- UG TV Cable Hand Hole
- Recorded UG TV Cable
- Designated UG TV Cable (S.U.E.)\*
- Recorded UG Fiber Optic Cable
- Designated UG Fiber Optic Cable (S.U.E.)\*

**GAS:**

- Gas Valve
- Gas Meter
- Recorded UG Gas Line
- Designated UG Gas Line (S.U.E.)\*
- Above Ground Gas Line

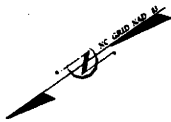
**SANITARY SEWER:**

- Sanitary Sewer Manhole
- Sanitary Sewer Cleanout
- UG Sanitary Sewer Line
- Above Ground Sanitary Sewer
- Recorded SS Forced Main Line
- Designated SS Forced Main Line (S.U.E.)\*

**MISCELLANEOUS:**

- Utility Pole
- Utility Pole with Base
- Utility Located Object
- Utility Traffic Signal Box
- Utility Unknown UG Line
- UG Tank; Water, Gas, Oil
- AG Tank; Water, Gas, Oil
- UG Test Hole (S.U.E.)\*
- Abandoned According to Utility Records
- End of Information

# SURVEY CONTROL SHEET R-2417AA



-L- STA 209+33.78 END STATE PROJECT 3443111  
LOCALIZED PROJECT COORDINATES  
N = 642150.7956  
E = 1941009.8737

NCGS "CUMNOCK2"  
LOCALIZED PROJECT COORDINATES  
N = 911851.3920  
E = 1925183.1080

NCGS "CUMNOCK2"  
LOCALIZED PROJECT COORDINATES  
N = 911851.3920  
E = 1925183.1080

TO GOLDSTON  
US 421

TO SANFORD  
US 421

ATLANTIC & WESTERN RR

CUMNOCK RD SR 1600

-L- STA 12+50.00 BEGIN STATE PROJECT 3443111  
LOCALIZED PROJECT COORDINATES  
N = 653278.3128  
E = 1925183.1080

**DATUM DESCRIPTION**

THE LOCALIZED COORDINATE SYSTEM DEVELOPED FOR THIS PROJECT IS BASED ON THE STATE PLANE COORDINATES ESTABLISHED BY NCSS FOR MONUMENT "CUMNOCK2" WITH NAD 83 STATE PLANE GRID COORDINATES OF NORTHING: 651651295874 EASTING: 192826524461 THE AVERAGE COMBINED GRID FACTOR USED ON THIS PROJECT (GROUND TO GRID) IS: 0.999893545

THE NC LAMBERT GRID BEARING AND LOCALIZED HORIZONTAL GROUND DISTANCE FROM "CUMNOCK 2" TO -L- START ION 12+50.00 IS N 62°10'15.20" W 3485.223'

ALL LINEAR DIMENSIONS ARE LOCALIZED HORIZONTAL DISTANCES VERTICAL DATUM USED IS NAVD 29

**NOTES:**

THE CONTROL DATA FOR THIS PROJECT CAN BE FOUND ELECTRONICALLY BY SELECTING "PROJECT CONTROL DATA AT:"  
[HTTP://WWW.DOH.DOT.STATE.NC.US/PRECONSTRUCT/HIGHWAY/LOCATION/PROJECT](http://www.doh.dot.state.nc.us/preconstruct/highway/location/project)

SITE CALIBRATION INFORMATION HAS NOT BEEN PROVIDED FOR THIS PROJECT. IF FURTHER INFORMATION IS NEEDED, PLEASE CONTACT THE LOCATION AND SURVEYS UNIT.

INDICATES GEODETIC CONTROL MONUMENTS USED OR SET FOR HORIZONTAL PROJECT CONTROL BY THE NC DOT LOCATION AND SURVEYS UNIT.

NETWORK ESTABLISHED FROM EXISTING NCSS MAD83 MONUMENTATION.

**NOTES**

THE CONTROL DATA FOR THIS PROJECT CAN BE FOUND ELECTRONICALLY BY SELECTING "PROJECT CONTROL DATA AT:"  
[HTTP://WWW.DOH.DOT.STATE.NC.US/PRECONSTRUCT/HIGHWAY/LOCATION/PROJECT/](http://www.doh.dot.state.nc.us/preconstruct/highway/location/project/)

THE FILES TO BE FOUND ARE AS FOLLOWS:  
R2417AA\_Is.conf+01.050308.txt

NOTE: DRAWING NOT TO SCALE

# SURVEY CONTROL SHEET R-2417AA

BY POINT	DESC.	NORTH	EAST	ELEVATION	L STATION	OFFSET
184	BL-184	631259.7684	1927922.8774	278.26	43+81.82	6.66 RT
BY POINT	DESC.	NORTH	EAST	ELEVATION	Y STATION	OFFSET
141	BY-141	631259.7684	1927922.8774	278.26	43+81.82	192.28 RT
142	BY-142	630716.5280	1929259.8578	288.85	43+23.31	49.28 RT
143	BY-143	649383.9630	1929676.4438	258.46		OUTSIDE PROJECT LIMITS
BY1 POINT	DESC.	NORTH	EAST	ELEVATION	Y STATION	OFFSET
144	BY1-144	633171.8842	1928577.5129	269.85	17+78.46	9.57 RT
186	BL-186	649784.6748	1929415.5528	288.82	48+14.47	6.87 LT
141	BY-141	631259.7684	1929380.7418	288.84	37+85.44	195.32 RT
BY2 POINT	DESC.	NORTH	EAST	ELEVATION	L STATION	OFFSET
145	BY2-145	647248.1890	1935851.1848	288.99	134+35.15	148.28 LT
128	BL-128	649784.6748	1935886.7128	295.42	137+73.62	12.85 LT
146	BY2-146	646529.1528	1935911.5268	292.91	141+14.93	201.82 RT

### DATUM DESCRIPTION

THE LOCALIZED COORDINATE SYSTEM DEVELOPED FOR THIS PROJECT IS BASED ON THE STATE PLANE COORDINATES ESTABLISHED BY MOCS FOR MONUMENT "CUMMUCK2"

WITH MAD 83 STATE PLANE GRID COORDINATES OF NORTHING=651651285(FH) EASTING=1928265244(FH)

THE AVERAGE COMBINED GRID FACTOR USED ON THIS PROJECT (GROUND TO GRID) IS: 0.999869545

THE NAD 83 STATE PLANE GRID BEARING AND LOCALIZED HORIZONTAL GROUND DISTANCE FROM "CUMMUCK 2" TO L- STATION 72+5000 IS N 62°10'15.20" W 3485.223

ALL LINEAR DIMENSIONS ARE LOCALIZED HORIZONTAL DISTANCES  
VERTICAL DATUM USED IS MVD 29

### NOTES

1. THE CONTROL DATA FOR THIS PROJECT CAN BE FOUND ELECTRONICALLY BY SELECTING "PROJECT CONTROL DATA" FROM THE MENU AT [HTTP://WWW.DOHDORSET.STATE.NJ.US/PRECONSTRUCT/HIGHWAY/LOCATION/PROJECT/](http://www.doh.dorset.state.nj.us/precstruct/highway/location/project/)

2. THE FILES TO BE FOUND ARE AS FOLLOWS:  
R241700\_Is.control\_050308.txt

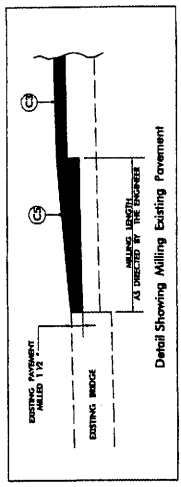
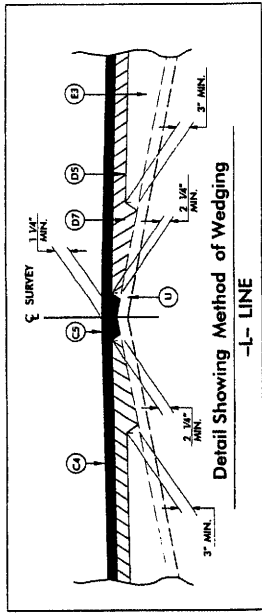
IMB	DESCRIPTION	ELEVATION	X	Y
IMB 001	IMB 001	296.18	110.00	110.00
IMB 002	IMB 002	296.18	110.00	110.00
IMB 003	IMB 003	296.18	110.00	110.00
IMB 004	IMB 004	296.18	110.00	110.00
IMB 005	IMB 005	296.18	110.00	110.00
IMB 006	IMB 006	296.18	110.00	110.00
IMB 007	IMB 007	296.18	110.00	110.00
IMB 008	IMB 008	296.18	110.00	110.00
IMB 009	IMB 009	296.18	110.00	110.00
IMB 010	IMB 010	296.18	110.00	110.00
IMB 011	IMB 011	296.18	110.00	110.00
IMB 012	IMB 012	296.18	110.00	110.00
IMB 013	IMB 013	296.18	110.00	110.00
IMB 014	IMB 014	296.18	110.00	110.00
IMB 015	IMB 015	296.18	110.00	110.00
IMB 016	IMB 016	296.18	110.00	110.00
IMB 017	IMB 017	296.18	110.00	110.00
IMB 018	IMB 018	296.18	110.00	110.00
IMB 019	IMB 019	296.18	110.00	110.00
IMB 020	IMB 020	296.18	110.00	110.00
IMB 021	IMB 021	296.18	110.00	110.00
IMB 022	IMB 022	296.18	110.00	110.00
IMB 023	IMB 023	296.18	110.00	110.00
IMB 024	IMB 024	296.18	110.00	110.00
IMB 025	IMB 025	296.18	110.00	110.00
IMB 026	IMB 026	296.18	110.00	110.00
IMB 027	IMB 027	296.18	110.00	110.00
IMB 028	IMB 028	296.18	110.00	110.00
IMB 029	IMB 029	296.18	110.00	110.00
IMB 030	IMB 030	296.18	110.00	110.00
IMB 031	IMB 031	296.18	110.00	110.00
IMB 032	IMB 032	296.18	110.00	110.00
IMB 033	IMB 033	296.18	110.00	110.00
IMB 034	IMB 034	296.18	110.00	110.00
IMB 035	IMB 035	296.18	110.00	110.00
IMB 036	IMB 036	296.18	110.00	110.00
IMB 037	IMB 037	296.18	110.00	110.00
IMB 038	IMB 038	296.18	110.00	110.00
IMB 039	IMB 039	296.18	110.00	110.00
IMB 040	IMB 040	296.18	110.00	110.00
IMB 041	IMB 041	296.18	110.00	110.00
IMB 042	IMB 042	296.18	110.00	110.00
IMB 043	IMB 043	296.18	110.00	110.00
IMB 044	IMB 044	296.18	110.00	110.00
IMB 045	IMB 045	296.18	110.00	110.00
IMB 046	IMB 046	296.18	110.00	110.00
IMB 047	IMB 047	296.18	110.00	110.00
IMB 048	IMB 048	296.18	110.00	110.00
IMB 049	IMB 049	296.18	110.00	110.00
IMB 050	IMB 050	296.18	110.00	110.00
IMB 051	IMB 051	296.18	110.00	110.00
IMB 052	IMB 052	296.18	110.00	110.00
IMB 053	IMB 053	296.18	110.00	110.00
IMB 054	IMB 054	296.18	110.00	110.00
IMB 055	IMB 055	296.18	110.00	110.00
IMB 056	IMB 056	296.18	110.00	110.00
IMB 057	IMB 057	296.18	110.00	110.00
IMB 058	IMB 058	296.18	110.00	110.00
IMB 059	IMB 059	296.18	110.00	110.00
IMB 060	IMB 060	296.18	110.00	110.00
IMB 061	IMB 061	296.18	110.00	110.00
IMB 062	IMB 062	296.18	110.00	110.00
IMB 063	IMB 063	296.18	110.00	110.00
IMB 064	IMB 064	296.18	110.00	110.00
IMB 065	IMB 065	296.18	110.00	110.00
IMB 066	IMB 066	296.18	110.00	110.00
IMB 067	IMB 067	296.18	110.00	110.00
IMB 068	IMB 068	296.18	110.00	110.00
IMB 069	IMB 069	296.18	110.00	110.00
IMB 070	IMB 070	296.18	110.00	110.00
IMB 071	IMB 071	296.18	110.00	110.00
IMB 072	IMB 072	296.18	110.00	110.00
IMB 073	IMB 073	296.18	110.00	110.00
IMB 074	IMB 074	296.18	110.00	110.00
IMB 075	IMB 075	296.18	110.00	110.00
IMB 076	IMB 076	296.18	110.00	110.00
IMB 077	IMB 077	296.18	110.00	110.00
IMB 078	IMB 078	296.18	110.00	110.00
IMB 079	IMB 079	296.18	110.00	110.00
IMB 080	IMB 080	296.18	110.00	110.00
IMB 081	IMB 081	296.18	110.00	110.00
IMB 082	IMB 082	296.18	110.00	110.00
IMB 083	IMB 083	296.18	110.00	110.00
IMB 084	IMB 084	296.18	110.00	110.00
IMB 085	IMB 085	296.18	110.00	110.00
IMB 086	IMB 086	296.18	110.00	110.00
IMB 087	IMB 087	296.18	110.00	110.00
IMB 088	IMB 088	296.18	110.00	110.00
IMB 089	IMB 089	296.18	110.00	110.00
IMB 090	IMB 090	296.18	110.00	110.00
IMB 091	IMB 091	296.18	110.00	110.00
IMB 092	IMB 092	296.18	110.00	110.00
IMB 093	IMB 093	296.18	110.00	110.00
IMB 094	IMB 094	296.18	110.00	110.00
IMB 095	IMB 095	296.18	110.00	110.00
IMB 096	IMB 096	296.18	110.00	110.00
IMB 097	IMB 097	296.18	110.00	110.00
IMB 098	IMB 098	296.18	110.00	110.00
IMB 099	IMB 099	296.18	110.00	110.00
IMB 100	IMB 100	296.18	110.00	110.00

PROJECT REFERENCE NO. **9** SHEET NO. **2**

**KO & ASSOCIATES, P.C.**  
 Consulting Engineers  
 A Florence & Hitchcock, Inc. Company  
 131 KENNEDY WAY, SUITE 100A, RALEIGH, N.C. 27601  
 (919) 871-3000

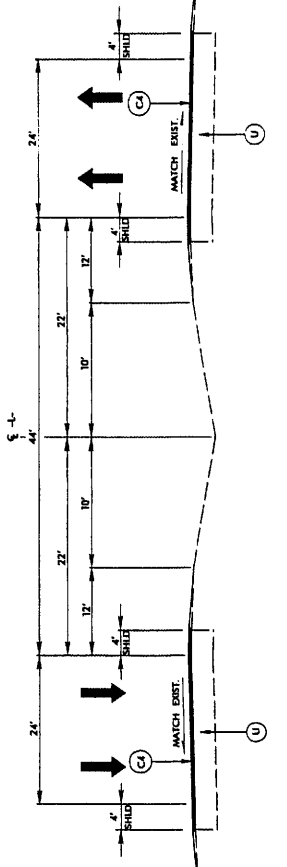
**R-2171A**  
 HIGHWAY DESIGN  
 ENGINEER

**PRELIMINARY PLANS**  
 DO NOT USE FOR CONSTRUCTION



**PAVEMENT SCHEDULE**

C1	PROP. APPROX. 3" ASPHALT CONCRETE SURFACE COURSE TYPE S9-5B, AT AN AVERAGE RATE OF 168 LBS. PER SQ. YD. IN EACH OF TWO LAYERS.	E3	PROP. VAR. DEPTH ASPHALT CONC. IN MASS COURSE TYPE B25-0C, TO BE PLACED IN LAYERS NOT LESS THAN 3" IN DEPTH OR GREATER THAN 5 1/2" IN DEPTH.
C2	PROP. VAR. DEPTH ASPHALT CONCRETE SURFACE COURSE TYPE S9-5B, AT AN AVERAGE RATE OF 120 LBS. PER SQ. YD. PER 1" DEPTH, TO BE PLACED IN LAYERS NOT TO EXCEED 1 1/2" IN DEPTH.	J1	PROP. 8" AGGREGATE MASS COURSE.
C3	PROP. APPROX. 1 1/2" ASPHALT CONCRETE SURFACE COURSE TYPE S9-5C, AT AN AVERAGE RATE OF 168 LBS. PER SQ. YD.	J2	PROP. 8" AGGREGATE MASS COURSE.
C4	PROP. APPROX. 3" ASPHALT CONCRETE SURFACE COURSE TYPE S9-5C, AT AN AVERAGE RATE OF 168 LBS. PER SQ. YD. IN EACH OF TWO LAYERS.	J3	PROP. 10" AGGREGATE BASE COURSE.
C5	PROP. VAR. DEPTH ASPHALT CONCRETE SURFACE COURSE TYPE S9-5C, AT AN AVERAGE RATE OF 120 LBS. PER SQ. YD. PER 1" DEPTH, TO BE PLACED IN LAYERS NOT TO EXCEED 1 1/2" IN DEPTH.	J4	PROP. VAR. DEPTH AGGREGATE BASE COURSE.
D1	PROP. APPROX. 2 1/2" ASPHALT CONCRETE INTERMEDIATE COURSE, TYPE 119-0B, AT AN AVERAGE RATE OF 285 LBS. PER SQ. YD.	K1	BASE TO BE TREATED WITH LINE TO A DEPTH OF 8", AT A RATE OF 20 LBS. PER SQ. YD. AS DIRECTED BY THE ENGINEER.
D2	PROP. APPROX. 3 1/2" ASPHALT CONCRETE INTERMEDIATE COURSE, TYPE 119-0B, AT AN AVERAGE RATE OF 389 LBS. PER SQ. YD.	R1	OR BASE TO BE TREATED WITH CEMENT TO A DEPTH OF 7", AT A RATE OF 55 LBS. PER SQ. YD. AS DIRECTED BY THE ENGINEER.
D3	PROP. VAR. DEPTH ASPHALT CONCRETE INTERMEDIATE COURSE TYPE 119-0B, AT AN AVERAGE RATE OF 114 LBS. PER SQ. YD. PER 1" DEPTH, TO BE PLACED IN LAYERS NOT LESS THAN 2 1/4" IN DEPTH OR GREATER THAN 4" IN DEPTH.	R2	2'-6" CONCRETE CURB AND GUTTER.
D4	PROP. APPROX. 3" ASPHALT CONCRETE INTERMEDIATE COURSE, TYPE 119-0C, AT AN AVERAGE RATE OF 342 LBS. PER SQ. YD.	R3	PROP. 5" MONOLITHIC CONCRETE ISLAND (SURFACE MOUNTED)
D5	PROP. APPROX. 3 1/2" ASPHALT CONCRETE INTERMEDIATE COURSE, TYPE 119-0C, AT AN AVERAGE RATE OF 389 LBS. PER SQ. YD.	R3	PROP. SHOULDER BERM GUTTER.
D6	PROP. APPROX. 4" ASPHALT CONCRETE INTERMEDIATE COURSE, TYPE 119-0C, AT AN AVERAGE RATE OF 455 LBS. PER SQ. YD.	T	EARTH MATERIAL.
D7	PROP. VAR. DEPTH ASPHALT CONCRETE INTERMEDIATE COURSE TYPE 119-0C, AT AN AVERAGE RATE OF 148 LBS. PER SQ. YD. PER 1" DEPTH, TO BE PLACED IN LAYERS NOT LESS THAN 2 1/4" IN DEPTH OR GREATER THAN 4" IN DEPTH.	U	EXISTING PAVEMENT.
E1	PROP. APPROX. 3" ASPHALT CONCRETE BASE COURSE, TYPE B25-0C, AT AN AVERAGE RATE OF 342 LBS. PER SQ. YD.	W	VARIABLE DEPTH ASPHALT PAVEMENT (SEE STANDARD WEDGING DETAIL)
E2	PROP. APPROX. 8" ASPHALT CONCRETE BASE COURSE TYPE B25-0C, AT AN AVERAGE RATE OF 455 LBS. PER SQ. YD. IN EACH OF TWO LAYERS.		



**TYPICAL SECTION NO. 1**

USE TYPICAL SECTION NO. 1 AS FOLLOWS:

-L- STA 9+49.00 TO -L- STA 12+50.00



PROJECT REFERENCE NO. R-2417AA  
 ROADWAY DESIGN  
 SHEET NO. 2-A  
 PAVEMENT DESIGN  
 SURVEYOR

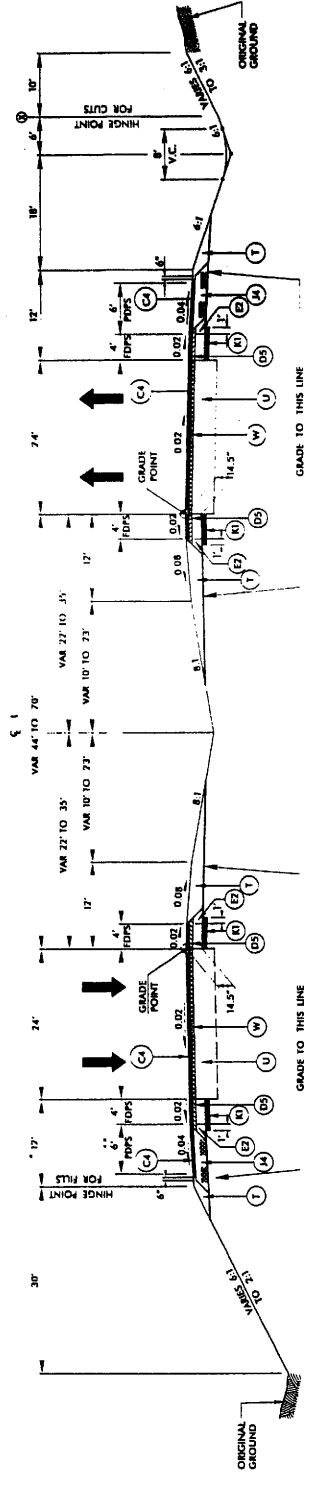
**PRELIMINARY PLANS**  
 DO NOT USE FOR CONSTRUCTION

**KO & ASSOCIATES, P.C.**  
 Consulting Engineers  
 & Planners  
 1311 GARDNER WAY, SUITE 100, BALTIMORE, M.D. 21287  
 (410) 951-2400

(K) WHEN THESE DISTANCES INDICATE SLOPES OUTSIDE THE LIMITS 2:1 TO 6:1, THE DISTANCE BECOMES VARIABLE AND THE MAXIMUM OF MINIMUM SLOPE MAINTAINED.

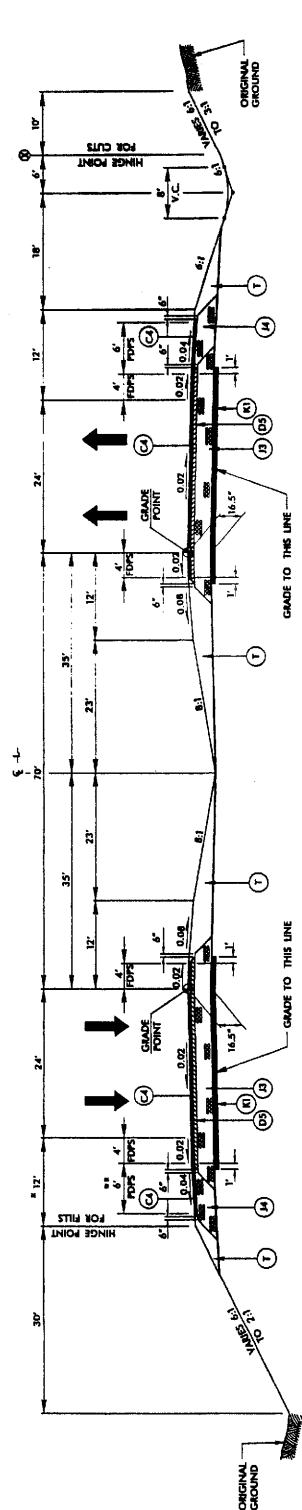
PAVEMENT SCHEDULE	DESCRIPTION OF PAVEMENT SCHEDULE
C1	3" 59.5B
C2	VAL DEPTH 59.5B
C3	1 1/2" 59.5C
C4	3" 59.5C
C5	VAL DEPTH 59.5C
D1	2 1/2" 119.0B
D2	3 1/2" 119.0B
D3	VAL DEPTH 119.0B
D4	3" 119.0C
D5	3 1/2" 119.0C
D6	4" 119.0C
D7	VAL DEPTH 119.0C
E1	3" 825.0C
E2	8" 825.0C
E3	VAL DEPTH 825.0C
J1	6" ABC
Z2	8" ABC
Z3	10" ABC
J4	VAL DEPTH ABC
K1	8" LINE STABILIZATION OR
K2	7" CEMENT STABILIZATION
R1	2'-4" CURB & GUTTER
R2	6" MONOLITHIC CONC ISLAND (REF'D IN)
R3	CONC SHOULDER BERM GUTTER
T	EARTH MATERIAL
U	EXIST PAVEMENT
W	WEDGING

NOTE: TYPICAL SECTIONS SHOWN ARE FOR TANGENT SECTIONS ONLY. SEE PLANS FOR CURVED SECTIONS. ALL DIMENSIONS ARE IN FEET UNLESS OTHERWISE NOTED. WHEN WEDGING SURFACE AND INTERMEDIATE COURSES, DO NOT INTERCHANGE COURSE TYPES. ALL PAVEMENT EDGE SLOPES ARE 1:1 UNLESS SHOWN OTHERWISE. ALL SLOPES SLOPES PARALLEL TO PAVEMENT SURFACE SLOPES. POPE - FULL DEPTH PAVED SHOULDER. POPE - ADD 3'-0" WITH GUARDRAIL. #8 IN AREA OF GUARDRAIL PAVE TO FACE OF GUARDRAIL (SEE DETAIL).



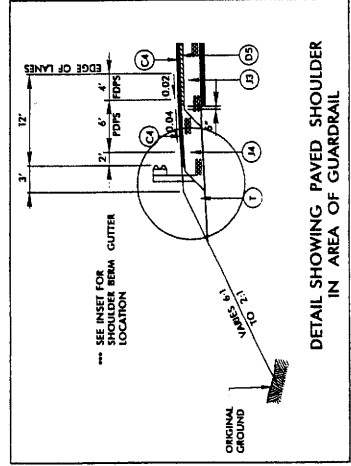
**TYPICAL SECTION NO. 2**  
 -L-LINE

USE TYPICAL SECTION NO. 2 AS FOLLOWS:  
 -L- STA. 12+50.00 TO -L- STA. 34+50.00

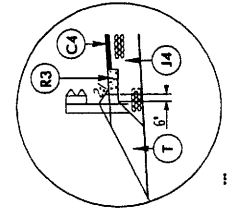


**TYPICAL SECTION NO. 3**  
 -L-LINE

USE TYPICAL SECTION NO. 3 AS FOLLOWS:  
 -L- STA. 34+50.00 TO -L- STA. 50+43.00 (APPROACH SLAB)  
 -L- STA. 51+35.00 (APPROACH SLAB) TO -L- STA. 75+55.00 (APPROACH SLAB)  
 -L- STA. 137+21.00 (APPROACH SLAB) TO -L- STA. 208+32.78



**DETAIL SHOWING PAVED SHOULDER IN AREA OF GUARDRAIL**



**INSET SHOWING SHOULDER BERM GUTTER**

**KO & ASSOCIATES, P.C.**  
 Consulting Engineers  
 A Florence & Hedges, Inc. Company  
 131 KINGDOM WILDLIFE WALKER, N.C. 27607  
 (704) 272-1500

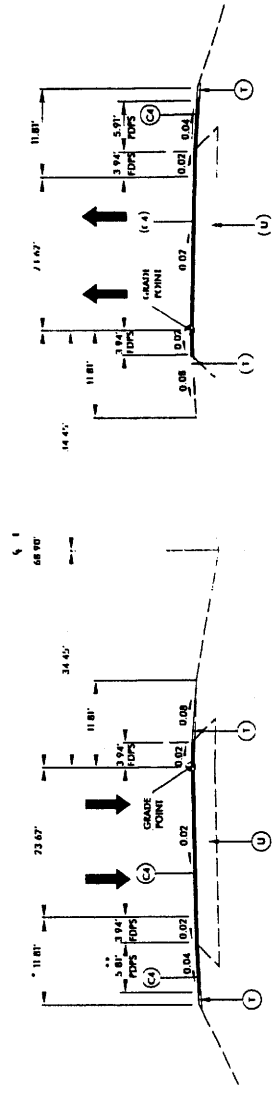
PROJECT NUMBER AND SHEET NO.  
**R-207/A** **C-10**  
 ROADWAY DESIGN ENGINEER  
 PAVEMENT DESIGN ENGINEER

**PRELIMINARY PLANS**  
 NOT FOR USE AND CONSTRUCTION

PAVEMENT SCHEDULE	DESCRIPTION
C1	3" S1.5B
C2	VAL DEPTH S1.5B
C3	1 1/2" S1.5C
C4	3" S1.5C
C5	VAL DEPTH S1.5C
D1	2 1/2" H19.0B
D2	3 1/2" H19.0B
D3	VAL DEPTH H19.0B
D4	3" H19.0C
D5	3 1/2" H19.0C
D6	4" H19.0C
D7	VAL DEPTH H19.0C
E1	3" B25.0C
E2	8" B25.0C
E3	VAL DEPTH B25.0C
J1	5" ABC
J2	8" ABC
J3	10" ABC
J4	VAL DEPTH ABC
K1	8" LIME STABILIZATION
K2	7" CEMENT STABILIZATION
R1	2-1/2" CURB & GUTTER
R2	5" MONOLITHIC CONC ISLAND (KEYED IN)
R3	CONC. SHOULDER BERM GUTTER
T	EARTH MATERIAL
U	EXIST. PAVEMENT
W	WEDGINGS

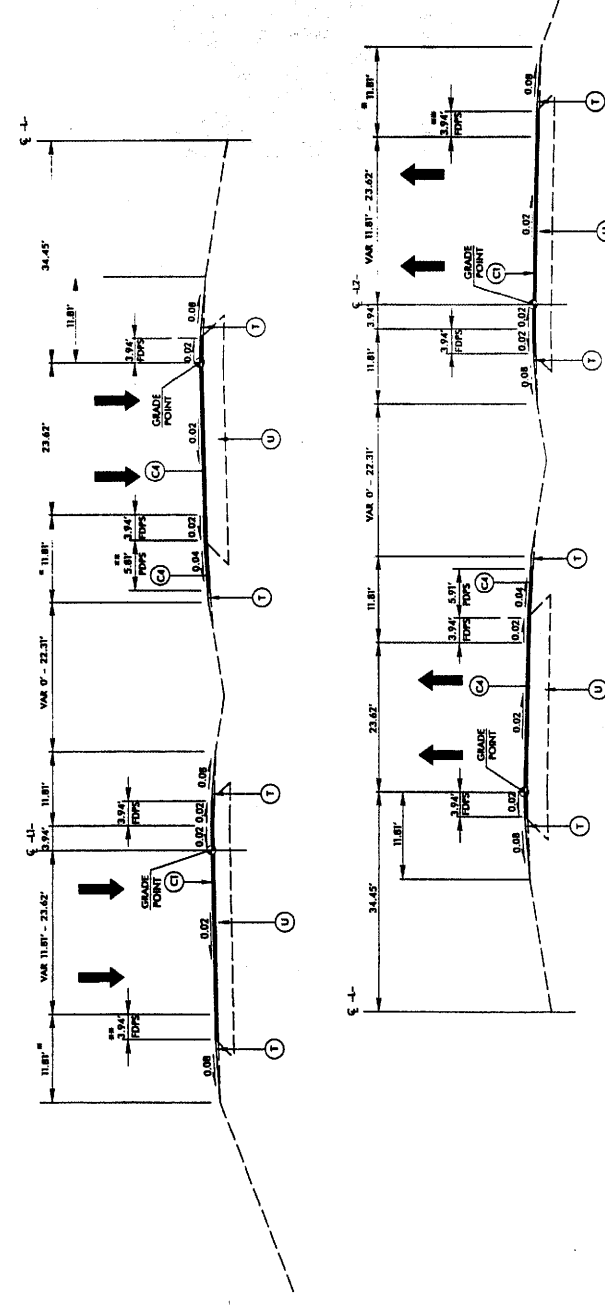
NOTE: SEE SHEET 2 FOR DETAILED DESCRIPTION OF PAVEMENT SCHEDULE

NOTES:  
 TYPICAL SECTIONS SHOWN ARE FOR TANGENT SECTIONS ONLY. SEE PLANS FOR INTERSECTIONS AND OVERPASS/UNDERPASS SECTIONS.  
 ADDITIONAL WEDGINGS AT INTERSECTIONS: MAINLINE SHOULDER = 0.05, WHEN WEDGING SURFACE AND INTERMEDIATE COURSES, DO NOT INTERCHANGE COURSE TYPE.  
 ALL PAVEMENT EDGE SLOPES ARE 1:1 UNLESS SHOWN OTHERWISE.  
 ALL CURBAGE SLOPES PARALLEL TO PAVEMENT SURFACE SLOPES.  
 POPS - FULL DEPTH PAVED SHOULDER  
 POPS - 10" MONOLITHIC CONC ISLAND  
 POPS - ADD 3" W/TH CURBAGE



**TYPICAL SECTION NO. 4**  
 -1-LINE

USE TYPICAL SECTION NO. 4 AS FOLLOWS:  
 -L- STA. 227+35.96 LA. TO -L- STA. 236+64.30 LT.  
 -L- STA. 227+35.96 LA. TO -L- STA. 232+32.52 RT.



**TYPICAL SECTION NO. 5**  
 -1-LINE

USE TYPICAL SECTION NO. 5 AS FOLLOWS:  
 -L- STA. 236+64.30 LA. TO -L- STA. 258+77.96 LT.  
 -L- STA. 232+32.52 LA. TO -L- STA. 258+77.96 RT.

PROJECT REFERENCE NO. **R-2477AA**  
 ROADWAY DESIGN ENGINEER

SHEET NO. **2-C**  
 PAVEMENT DESIGN ENGINEER

**PRELIMINARY PLANS**  
 (DO NOT SCALE)

**KO & ASSOCIATES, P.C.**  
 Consulting Engineers  
 A. Florence & Fletcher, Inc. Company  
 1111 KENDRICK AVENUE, SUITE 100  
 OAKVILLE, ONTARIO, CANADA

9. WHEN THESE DIMENSIONS INDICATE SLOPE'S ORIGIN IS THE LINES 2 TO 4, THE DISTANT 1 BEING'S VARIANT AND THE MAXIMUM OR MINIMUM SLOPE MAINTAINED.

PAVEMENT SCHEDULE	
C1	3" 59.5B
C2	VAL DEPTH 59.5B
C3	1 1/2" 59.5C
C4	3" 59.5C
C5	VAL DEPTH 59.5C
D1	2 1/2" 19.0B
D2	3 1/2" 19.0B
D3	VAL DEPTH 19.0B
D4	3" 19.0C
D5	3 1/2" 19.0C
D6	4" 19.0C
D7	VAL DEPTH 19.0C
E1	3" 82.0C
E2	8" 82.0C
E3	VAL DEPTH 82.0C
F1	6" ARC
F2	8" ARC
F3	10" ARC
F4	VAL DEPTH ARC
R1	8" LIME STABILIZATION ON
R2	7" CEMENT STABILIZATION
R3	2'-2" CURB & GUTTER
R4	4" MONOLITHIC CONC ISLAND (RETD IN)
R5	CONC SHOULDER BEAM GUTTER
T	EARTH MATERIAL
U	EST. PAVEMENT
W	WEDGING

NOTE: SEE SHEET 3 FOR DETAILED DESCRIPTION OF PAVEMENT SCHEDULE

NOTE: TYPICAL SECTIONS SHOWN ARE FOR TANGENT SECTIONS ONLY. SEE PLANS AND STANDARD DRAWINGS FOR SUPERELEVATION DETAILS AND LANE WIDENING DETAILS. INTERCHANGE, INTERCHANGE, INTERCHANGE, INTERCHANGE, INTERCHANGE COURSE TYPES.

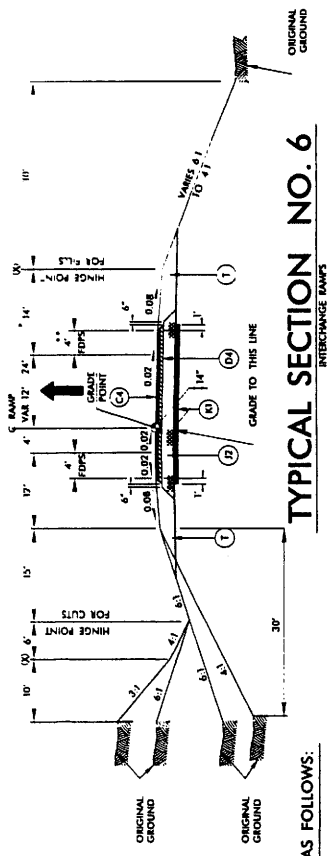
ALL PAVEMENT SLOPES ARE 1% UNLESS SHOWN OTHERWISE

ALL SURGRADE SLOPES PARALLEL TO PAVEMENT SURFACE SLOPES

FDS - FULL DEPTH PAVED SHOULDER

FDS - FULL DEPTH PAVED SHOULDER WITH FULL DEPTH SHOULDER

\*\* IN AREA OF GUARDRAIL, PAVE TO FACE OF GUARDRAIL (SEE DETAIL)



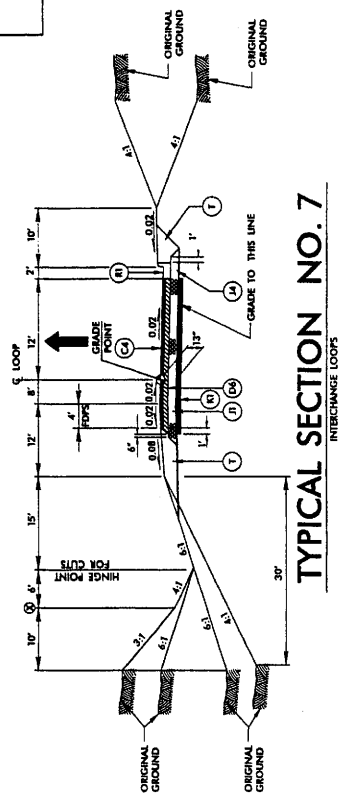
**TYPICAL SECTION NO. 6**  
 INTERCHANGE RAMP

USE TYPICAL SECTION NO. 6 AS FOLLOWS:

-HP- STA. 14+00.00 TO -HP- STA. 27+40.03

-HC- STA. 14+00.00 TO -HC- STA. 27+40.03

-PC- STA. 10+00.00 TO -PC- STA. 15+77.10



**TYPICAL SECTION NO. 7**  
 INTERCHANGE LOOPS

USE TYPICAL SECTION NO. 7 AS FOLLOWS:

-LP- STA. 13+10.28 TO -LP- STA. 17+91.70

-JC- STA. 12+28.92 TO -JC- STA. 19+20.82

PROJECT REFERENCE NO. R-2417.5A  
 SHEET NO. 2-D  
 ROADWAY DESIGN ENGINEER  
 PAVEMENT DESIGN ENGINEER

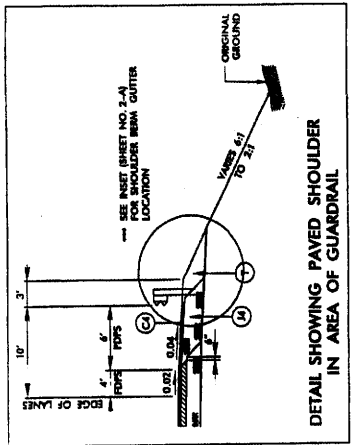
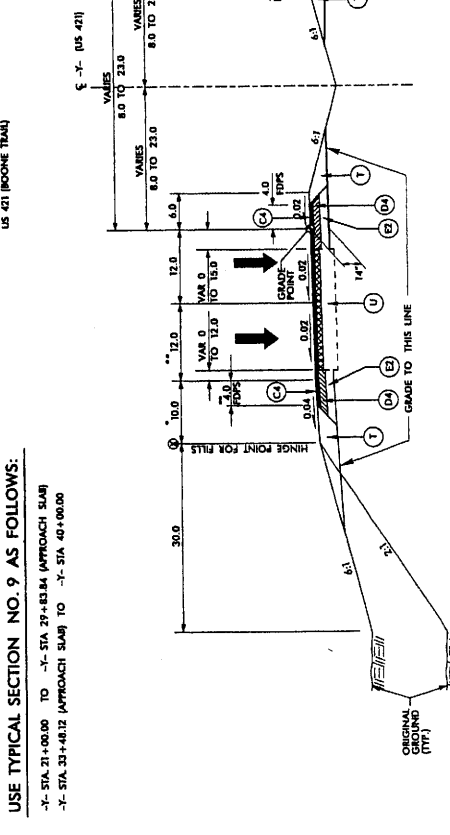
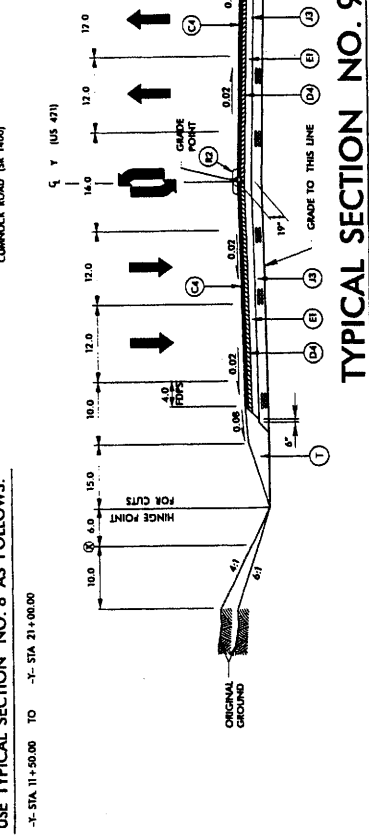
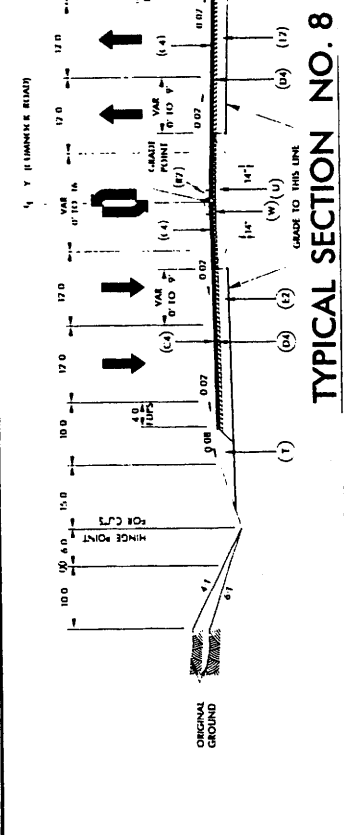
**KO & ASSOCIATES, P.C.**  
 Consulting Engineers  
 A Fluorine & Hatchers, Inc. Company  
 1511 BROADWAY NEW YORK, N.Y. 10019  
 (212) 691-1000

**PRELIMINARY PLANS**  
 FOR THE PROJECT

PAVEMENT SCHEDULE	DESCRIPTION
C1	3" 59.5B
C2	VAL DEPTH 59.5B
C3	1 1/2" 59.5C
C4	3" 59.5C
C5	VAL DEPTH 59.5C
D1	2 1/2" 119.0B
D2	3 1/2" 119.0B
D3	VAL DEPTH 119.0B
D4	3" 119.0C
D5	3 1/2" 119.0C
D6	4" 119.0C
D7	VAL DEPTH 119.0C
E1	3" 825.0C
E2	8" 825.0C
E3	VAL DEPTH 825.0C
F1	4" ARC
F2	8" ARC
F3	10" ARC
F4	VAL DEPTH ARC
K1	8" LINE STABILIZATION OR CEMENT STABILIZATION
K2	7" CEMENT STABILIZATION
R1	2'-4" CURB & GUTTER
R2	6" MONOLITHIC CONIC BEARD (SEE D1) IN
R3	CONIC SHOULDER BEHIND GUTTER
T	EARTH MATERIAL
U	EXIST. PAVEMENT
W	WEDGING

NOTE: SEE SHEET 2 FOR DETAILED DESCRIPTION OF PAVEMENT SCHEDULE  
 ALL PAVEMENT SECTIONS SHOWN ARE FOR TYPICAL SECTIONS ONLY. SEE PLANS AND STANDARD DRAWINGS FOR SUPERELEVATION DETAILS AND LAKE ADJUSTMENTS AT INTERSECTIONS. MINIMUM OVERLAY = 0.05.  
 WHEN WEDGING SURFACE AND INTERMEDIATE COURSES, DO NOT INTERCHANGE COURSE TYPE.  
 ALL SURFACE SLOPES ARE 1:1 UNLESS SHOWN OTHERWISE.  
 ALL SURFACE SLOPES PARALLEL TO PAVEMENT SURFACE SLOPES.  
 POPS - FULL DEPTH PAVED SHOULDER  
 POPS - PARTIAL DEPTH PAVED SHOULDER  
 POPS - FULL DEPTH PAVED SHOULDER  
 \*\* IN AREA OF GUARDRAIL, MOVE TO FACE OF GUARDRAIL (SEE DETAIL)

X WHEN THESE DISTANCE IS INDICATED WITHIN THE LIMITS 7' TO 6', THE DISTANCE IS BEHIND THE MAINS VARIANT AND THE MINIMUM SLOPE MAINTAINED.



**TYPICAL SECTION NO. 10**

USE TYPICAL SECTION NO. 10 AS FOLLOWS:

-X- STA. 40+00.00 TO -X- STA. 49+00.00

US 421 (BOONE TRAIL)

**TYPICAL SECTION NO. 9**

USE TYPICAL SECTION NO. 9 AS FOLLOWS:

-X- STA. 21+00.00 TO -X- STA. 27+43.34 (APPROACH SLAB)  
 -X- STA. 33+48.12 (APPROACH SLAB) TO -X- STA. 40+00.00

US 421 (BOONE TRAIL)

**TYPICAL SECTION NO. 8**

USE TYPICAL SECTION NO. 8 AS FOLLOWS:

-X- STA. 11+50.00 TO -X- STA. 21+00.00

CUMMACK ROAD (SR 1400)







**KO & ASSOCIATES, P.C.**  
 Consulting Engineers  
 A Florence & Hatcher, Inc. Company  
 1311 WINSTON WAY, SUITE 100, WILSON, N.C. 27157  
 (704) 751-1000

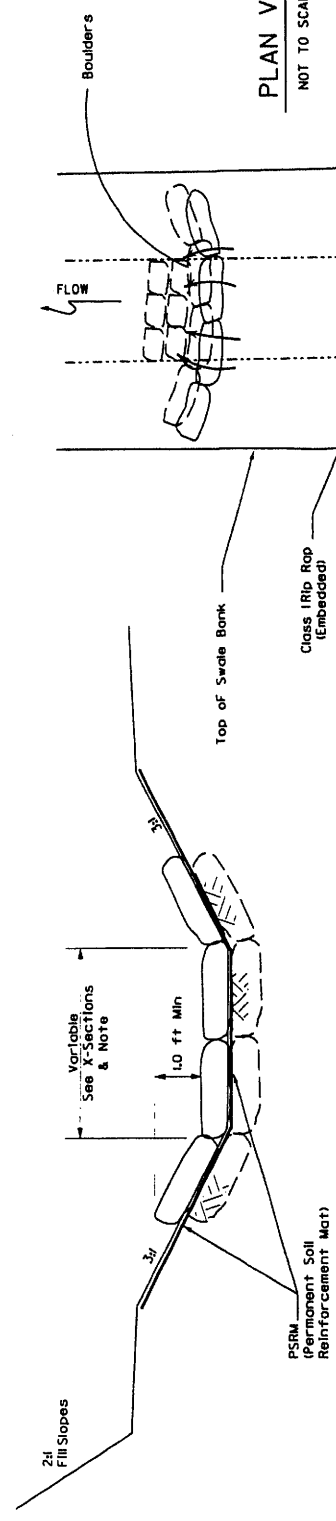
PROJECT REFERENCE NO.  
 R-2817AA

SHEET NO.  
 2-1

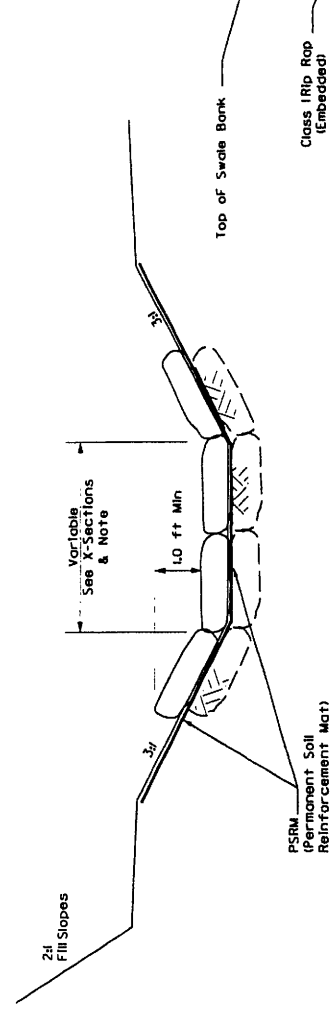
# LATERAL SWALE/DITCH W/ROCK CHECKS

PRELIMINARY PLANS  
 DO NOT USE FOR CONSTRUCTION.

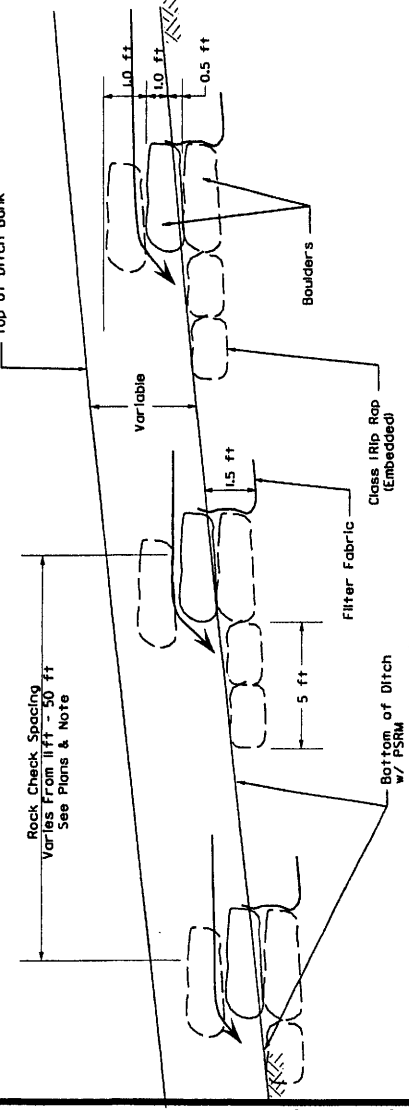
LOCATIONS			
STATION	ALIGN	SIDE	REMARKS
86+50 - 87+00	-L-	RT	12' SPACING
87+00 - 87+50	-L-	RT	13' SPACING



PLAN VIEW  
 NOT TO SCALE



TYPICAL CROSS SECTION  
 NOT TO SCALE



PROFILE  
 NOT TO SCALE

NOTE:  
 BOULDERS SHOULD BE ANGULAR AND OBLONG WITH APPROXIMATE DIMENSIONS OF 0.5m x 0.45m x 0.45m. BOULDERS SHOULD BE PLACED TOGETHER WITH MINIMAL VOIDS. STAGGER BOULDER JOINTS.  
 ROCK CHECK SPACING IS DEPENDENT ON DITCH GRADES AT 1' DROP INTERVALS OR SLOPE CONTROL. DITCH WIDTHS VARY. WIDEN TO EXTENT PRACTICAL WITHIN R/W LIMITS. SEE X-SECTIONS.

**NCDOT**  
 DIVISION OF HIGHWAYS  
 LEE COUNTY  
 PROJECT: 346113 (R-2417A.A)  
 US 401-NC BY SANFORD  
 BYPASS FROM WEST  
 OF SR 1400 TO WEST  
 OF US 1-15-501

SHEET



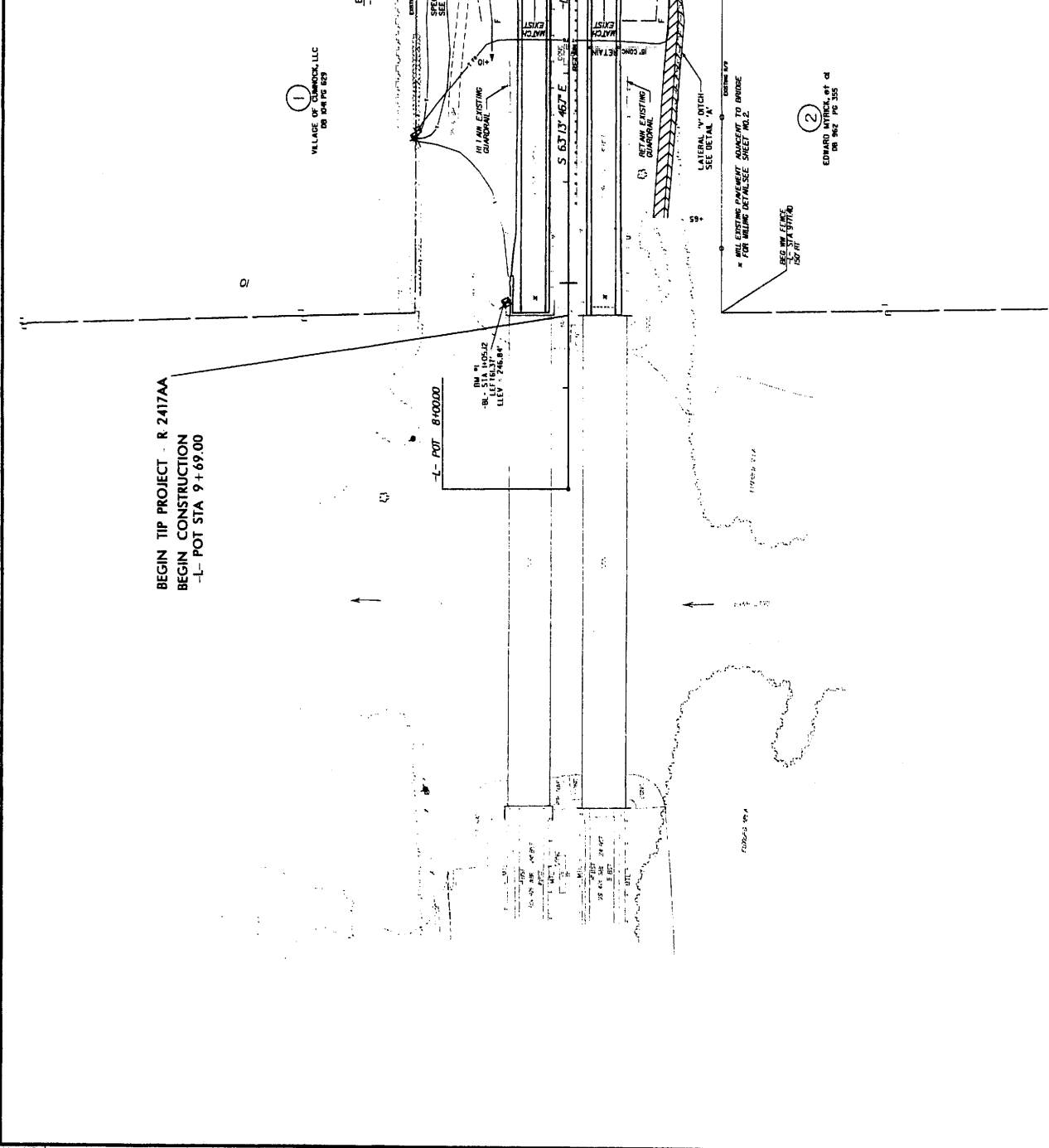
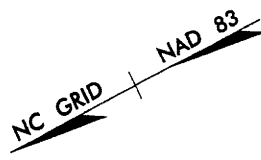
**LEGEND**

▭ PAVED SHOULDER

PROJECT REFERENCE NO. R-2417AA  
 SHEET NO. 4  
 ROADWAY DESIGN ENGINEER  
 HYDRAULICS ENGINEER

**PRELIMINARY PLANS**  
 DO NOT USE FOR CONSTRUCTION

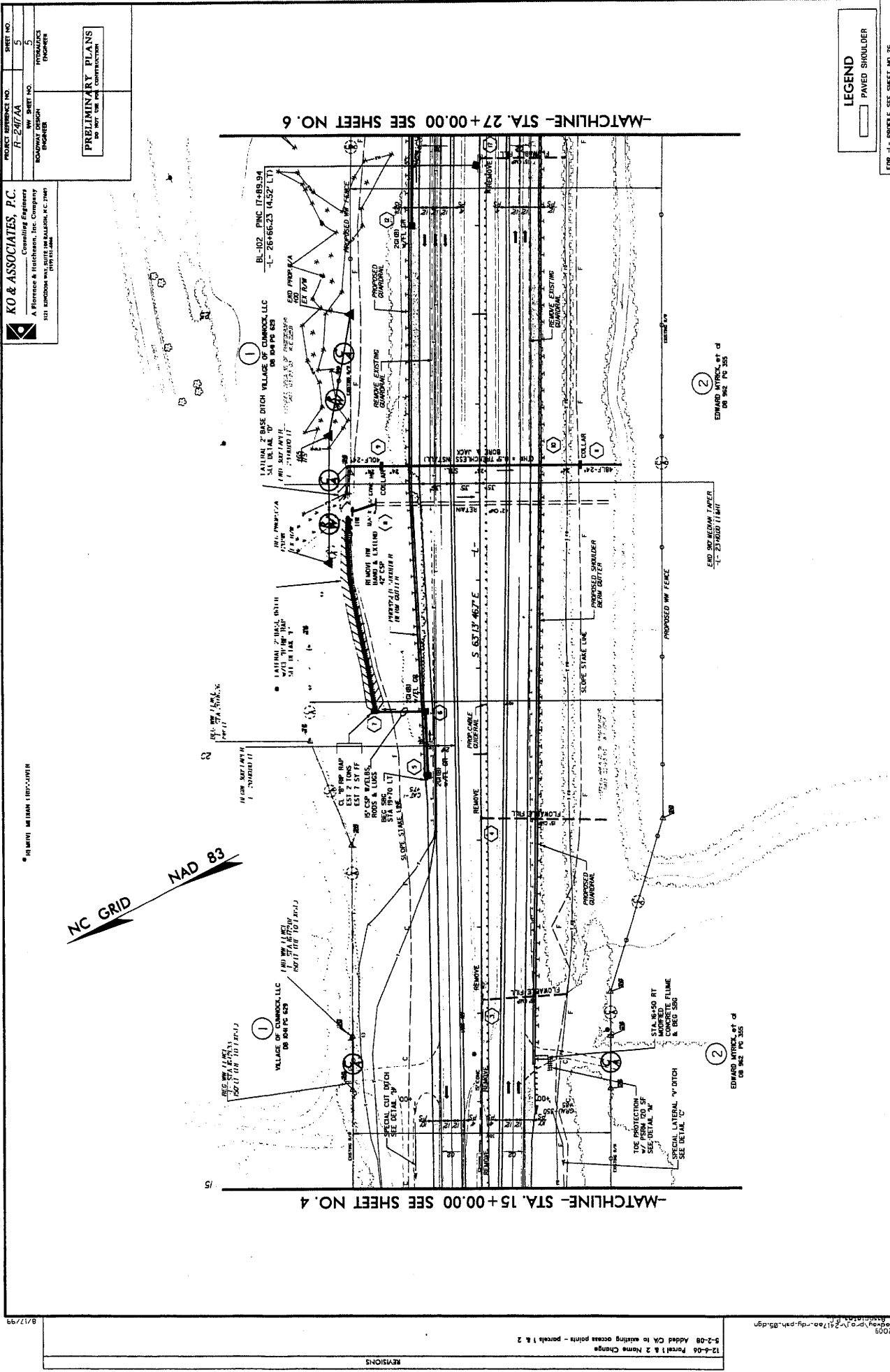
**KO & ASSOCIATES, P.C.**  
 Consulting Engineers  
 A Florence & Hineson, Inc. Company  
 1121 EDWARDS WAY, SUITE 100, SAULSBURY, N.C. 27884  
 703.731.0400



12-0-06 Parcel 1 & 2 Name Change  
 REVISIONS  
 8/17/99

K & Associates, P.C. \Project\2417aa\rdy\psh-b\1.dgn  
 7/3/2009

**LEGEND**  
 PAVED SHOULDER



**PROJECT REFERENCE NO.**  
R-2477AA

**SHEET NO.**  
5

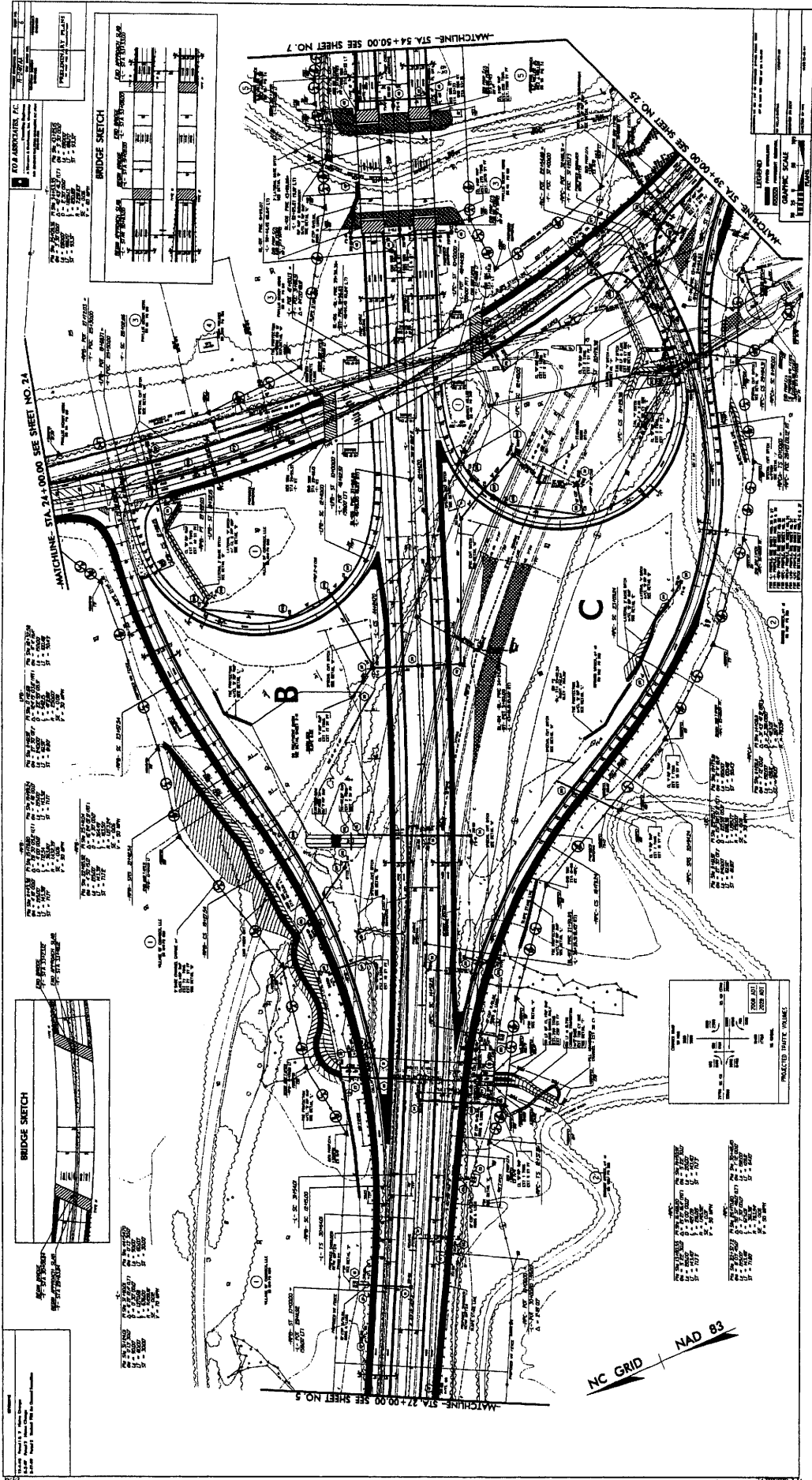
**PRELIMINARY PLANS**  
DO NOT USE FOR CONSTRUCTION


**KO & ASSOCIATES, P.C.**  
 Consulting Engineers  
 A Florence & Harshbarger, Inc. Company  
 101 SANDHORN WAY, SUITE 108, RALEIGH, N.C. 27607  
 (919) 871-0000

**REVISIONS**

12-4-04 Parcel 1 & 2 Name Change  
 5-2-08 Added CA to existing access points - parcels 1 & 2

8/17/99



**LEGEND**  
 PAVED SHOULDER

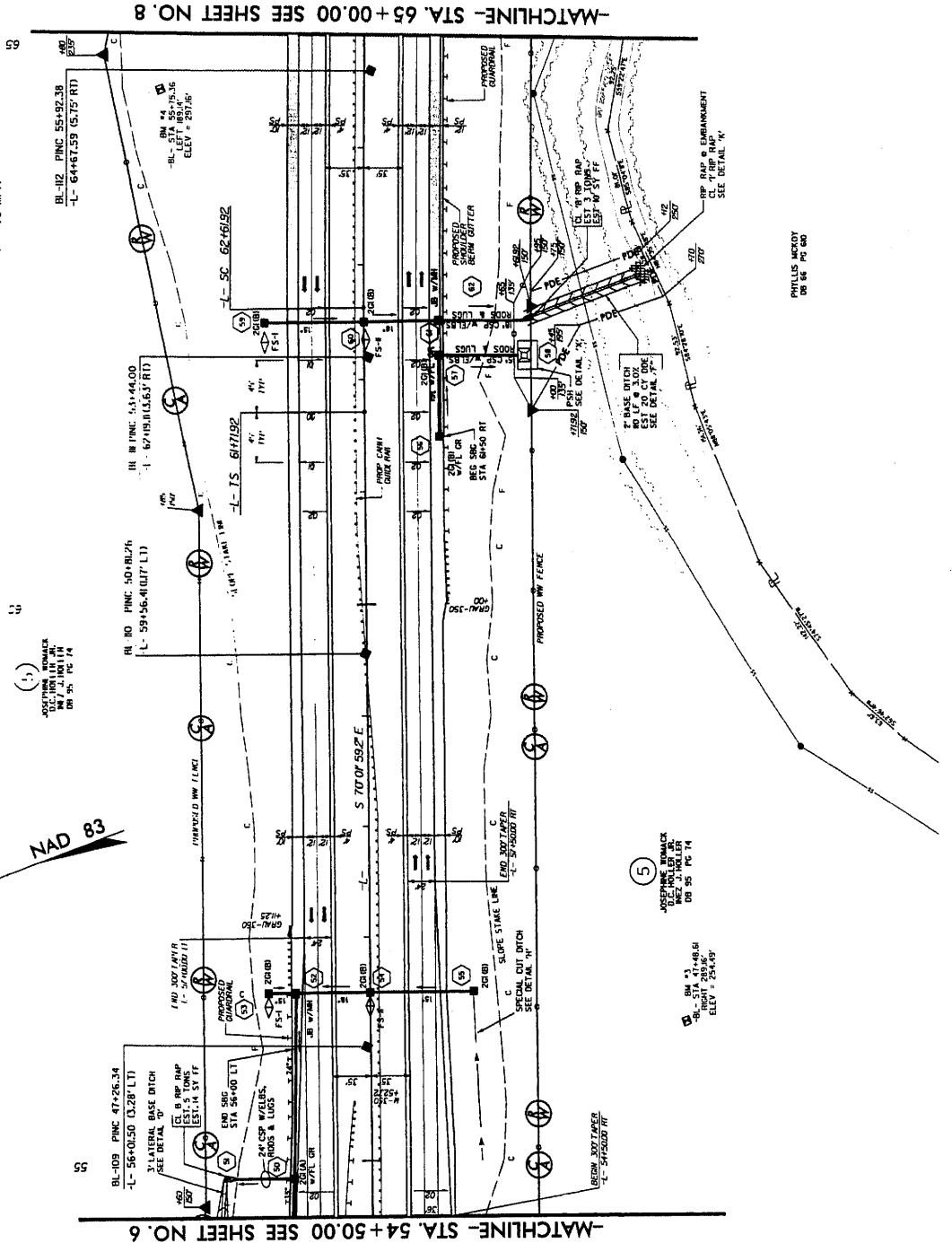
PROJECT REFERENCE NO. <b>R-2417AA</b>	SHEET NO. <b>7</b>
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

**PRELIMINARY PLANS**  
 DO NOT USE FOR CONSTRUCTION

**KO & ASSOCIATES, P.C.**  
 Consulting Engineers  
 A Florence & Hitchcock, Inc. Company  
 1121 S. WILSON RD.  
 WILSON, N.C. 27897

**L-1**  
 P/S NO. 62+31.92 PI STA. 65+33.81  
 I/S = 0.17% SLOPE  
 O = 4485.60  
 L = 2271.89  
 R = 11459.6'  
 SE = 114.59°  
 V = 70 MPH

**NC GRID NAD 83**



PHYLIS MCROY  
 DB 06 PC 80

**5**  
 JOSEPHINE BRIDGEMAN  
 W/2 J. HOLLER  
 DB 05 PC 14

**6**  
 B.M. #1  
 BL- STA 47+48.61  
 ELEV = 254.93'

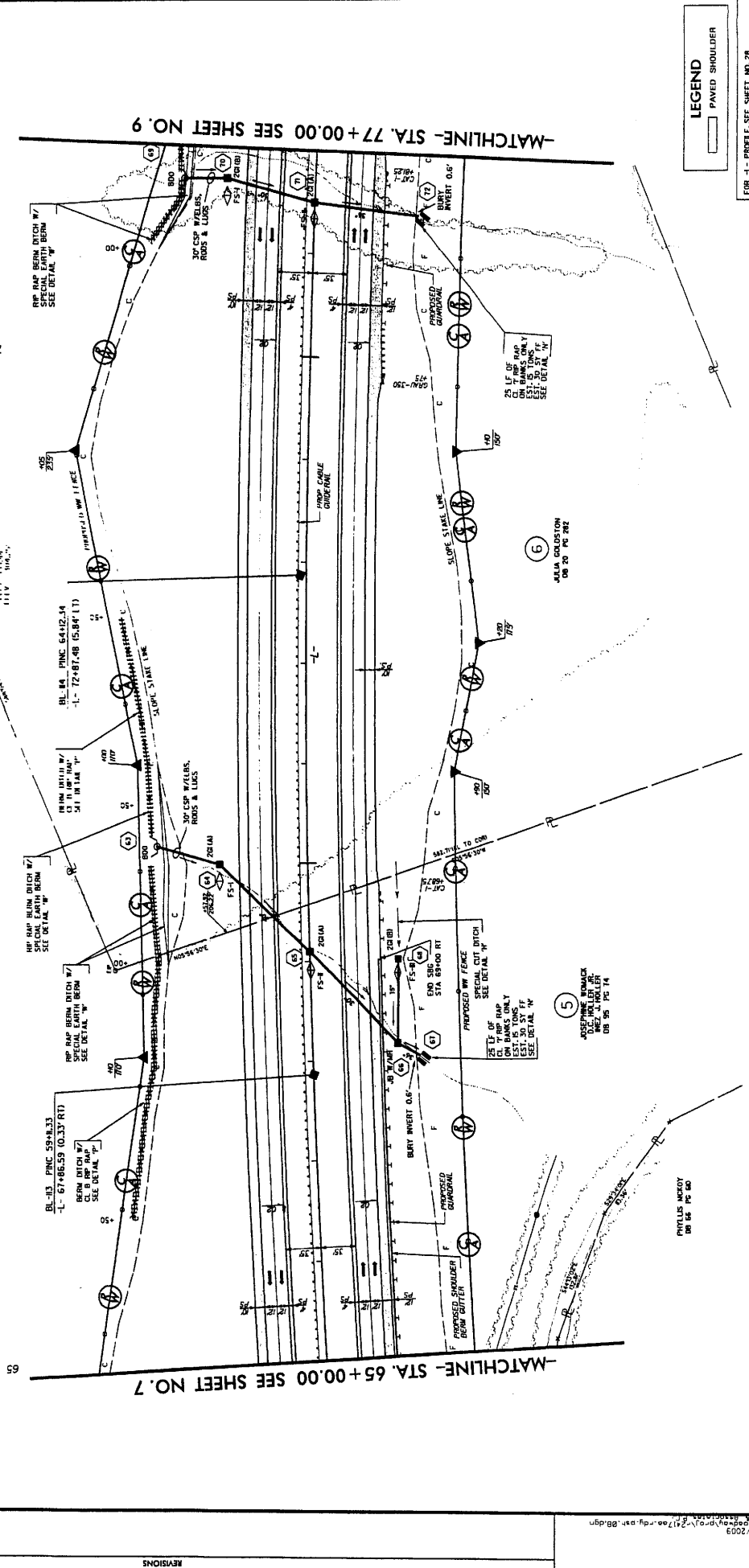
PROJECT REFERENCE NO. <b>R-247AA</b>	SHEET NO. <b>8</b>
ROADWAY DESIGN ENGINEER	HYDRAULIC ENGINEER

**KO & ASSOCIATES, P.C.**  
 Consulting Engineers  
 A Florence & Henderson, Inc. Company  
 1317 SANDHURST WAY, SUITE 200  
 FLORENCE, S.C. 29507

**PRELIMINARY PLANS**  
 DO NOT USE FOR CONSTRUCTION

- I 14' 0" R/W
- II 12' 0" R/W
- III 10' 0" R/W
- IV 8' 0" R/W
- V 6' 0" R/W
- VI 4' 0" R/W
- VII 2' 0" R/W

**NC GRID NAD 83**



**LEGEND**  
 [Symbol] PAVED SHOULDER

FOR A- PROFILE SEE SHEET NO. 28  
 FOR B- PROFILE SEE SHEET NO. 29

B/17/99

REVISIONS

7/9/2009  
 10:00 AM  
 10:00 AM  
 10:00 AM



PROJECT REFERENCE NO.	R-2417AA
PROJECT SHEET NO.	10
ENGINEER	HYDRAULICS ENGINEER

**PRELIMINARY PLANS**  
DO NOT USE FOR CONSTRUCTION

**KO & ASSOCIATES, P.C.**  
Consulting Engineers  
A Florence & Hershenson, Inc. Company  
1313 KENNEDY HWY. SUITE 300  
WILMINGTON, N.C. 28405  
(910) 771-2000

11' NG 85+33.81 (RT)  
 22' 25' 40.59' (RT)  
 33' 52' 53.00'  
 44' 48' 54.00'  
 55' 27' 18.57'  
 66' 11' 49.56'  
 77' 00' 00.00'  
 88' 00' 00.00'  
 99' 00' 00.00'  
 100' 00' 00.00'  
 110 MPH

(11)

**NC GRID NAD 83**

1110' N TOWER  
 IN 121' TO 840'  
 1111' TOWER  
 1112' TOWER  
 1113' TOWER

(9)

(8)

(7)

(6)

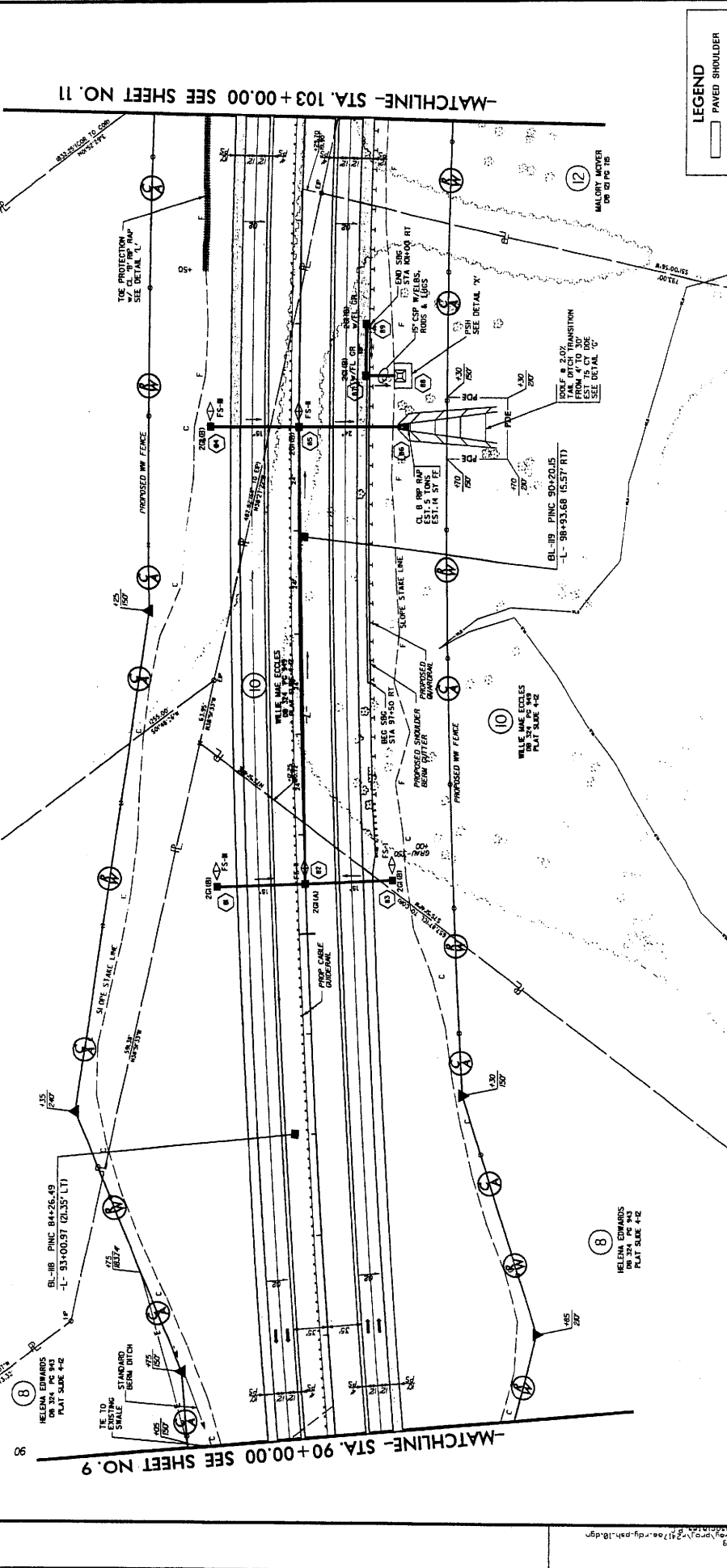
(5)

(4)

(3)

(2)

(1)



PROJECT REFERENCE NO.	R-2417AA
PROJECT SHEET NO.	10
ENGINEER	HYDRAULICS ENGINEER

**PRELIMINARY PLANS**  
DO NOT USE FOR CONSTRUCTION

**KO & ASSOCIATES, P.C.**  
Consulting Engineers  
A Florence & Hershenson, Inc. Company  
1313 KENNEDY HWY. SUITE 300  
WILMINGTON, N.C. 28405  
(910) 771-2000

11' NG 85+33.81 (RT)  
 22' 25' 40.59' (RT)  
 33' 52' 53.00'  
 44' 48' 54.00'  
 55' 27' 18.57'  
 66' 11' 49.56'  
 77' 00' 00.00'  
 88' 00' 00.00'  
 99' 00' 00.00'  
 100' 00' 00.00'  
 110 MPH

(11)

**NC GRID NAD 83**

1110' N TOWER  
 IN 121' TO 840'  
 1111' TOWER  
 1112' TOWER  
 1113' TOWER

(9)

(8)

(7)

(6)

(5)

(4)

(3)

(2)

(1)

**LEGEND**

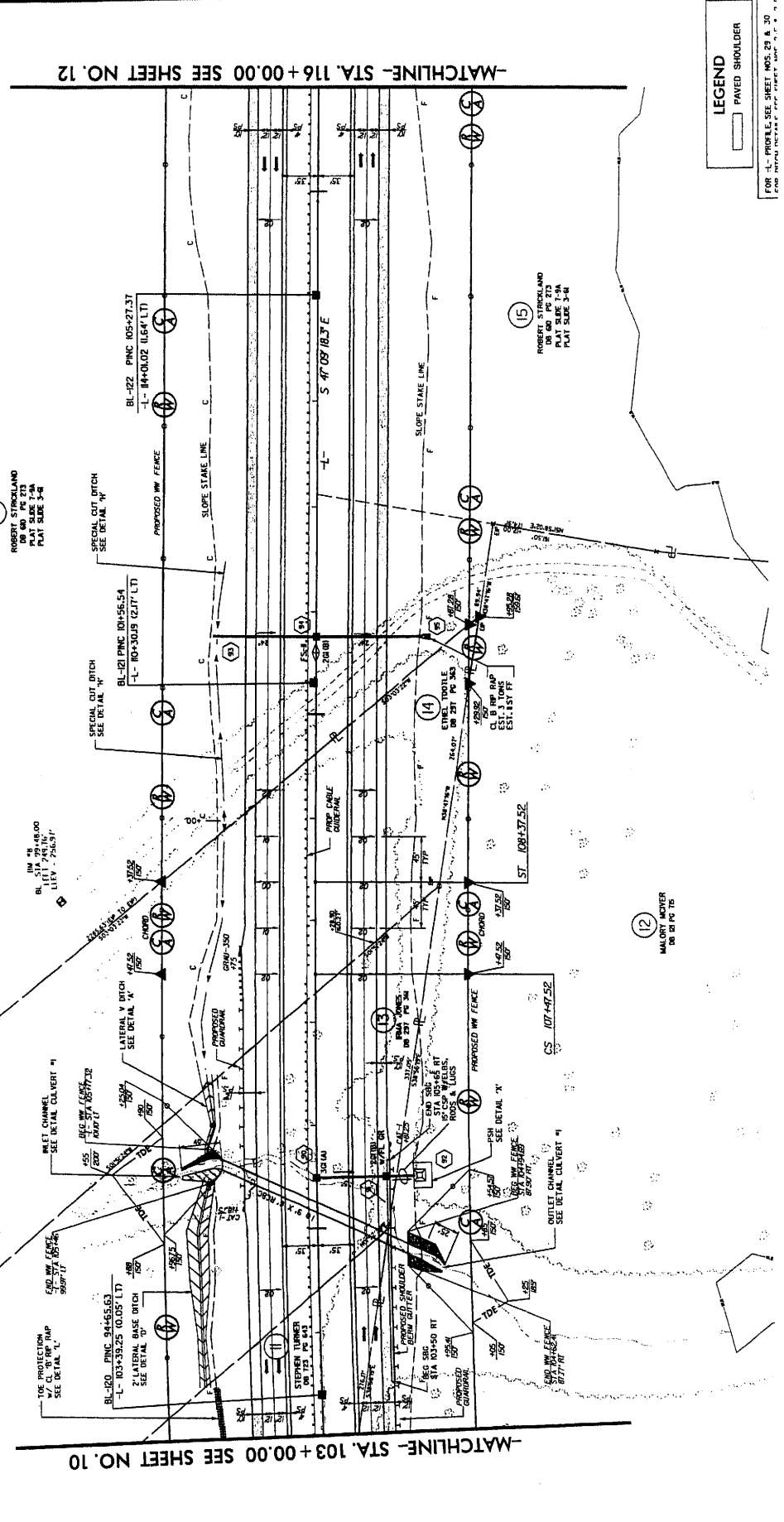
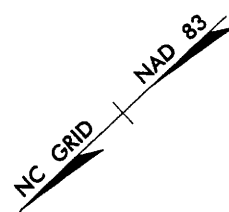
- PAVED SHOULDER

FOR -L- PROFILE, SEE SHEET NO. 29

PROJECT REFERENCE NO. R-247AA  
 SHEET NO. II  
 HYDRAULICS ENGINEER

PRELIMINARY PLANS  
 NO PART USE FOR CONSTRUCTION

KO & ASSOCIATES, P.C.  
 Consulting Engineers  
 A Florence & Hinchey, Inc. Company  
 111 KANAWHA WAY, SUITE 200, KANAWHA, W.V. 26049



LEGEND  
 PAVED SHOULDER

- 1 P.S. 100
- 2 P.S. 100
- 3 P.S. 100
- 4 P.S. 100
- 5 P.S. 100
- 6 P.S. 100
- 7 P.S. 100
- 8 P.S. 100
- 9 P.S. 100
- 10 P.S. 100
- 11 P.S. 100
- 12 P.S. 100
- 13 P.S. 100
- 14 P.S. 100
- 15 P.S. 100
- 16 P.S. 100
- 17 P.S. 100
- 18 P.S. 100
- 19 P.S. 100
- 20 P.S. 100
- 21 P.S. 100
- 22 P.S. 100
- 23 P.S. 100
- 24 P.S. 100
- 25 P.S. 100
- 26 P.S. 100
- 27 P.S. 100
- 28 P.S. 100
- 29 P.S. 100
- 30 P.S. 100
- 31 P.S. 100
- 32 P.S. 100
- 33 P.S. 100
- 34 P.S. 100
- 35 P.S. 100
- 36 P.S. 100
- 37 P.S. 100
- 38 P.S. 100
- 39 P.S. 100
- 40 P.S. 100
- 41 P.S. 100
- 42 P.S. 100
- 43 P.S. 100
- 44 P.S. 100
- 45 P.S. 100
- 46 P.S. 100
- 47 P.S. 100
- 48 P.S. 100
- 49 P.S. 100
- 50 P.S. 100
- 51 P.S. 100
- 52 P.S. 100
- 53 P.S. 100
- 54 P.S. 100
- 55 P.S. 100
- 56 P.S. 100
- 57 P.S. 100
- 58 P.S. 100
- 59 P.S. 100
- 60 P.S. 100
- 61 P.S. 100
- 62 P.S. 100
- 63 P.S. 100
- 64 P.S. 100
- 65 P.S. 100
- 66 P.S. 100
- 67 P.S. 100
- 68 P.S. 100
- 69 P.S. 100
- 70 P.S. 100

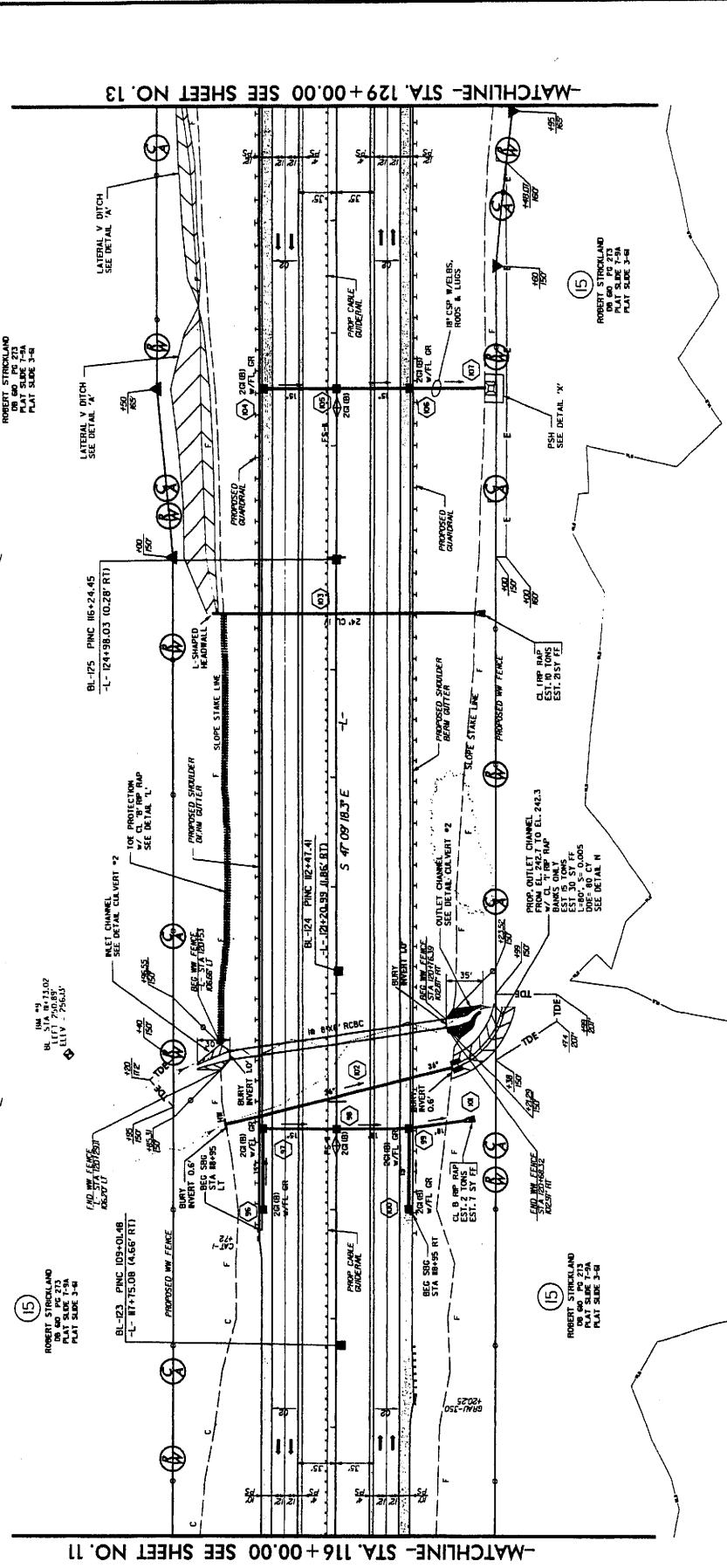


PROJECT REFERENCE NO. R-2417AA  
 HWY SHEET NO. 12  
 HYDRAULICS  
 ROADWAY DESIGN  
 DIVISION

**KO & ASSOCIATES, P.C.**  
 Consulting Engineers  
 & Architects  
 7111 LANTANA WAY, SUITE 200  
 FORT LAUDERDALE, FL 33309

**PRELIMINARY PLANS**  
 DO NOT USE FOR CONSTRUCTION

NC GRID NAD 83



-MATCHLINE- STA. 116 + 00.00 SEE SHEET NO. 11

-MATCHLINE- STA. 129 + 00.00 SEE SHEET NO. 13

**LEGEND**  
 [Symbol] PAVED SHOULDER

FOR "L" PROFILE SEE SHEET NO. 30  
 FOR "R" PROFILE SEE SHEET NO. 31 & 32

8/11/99

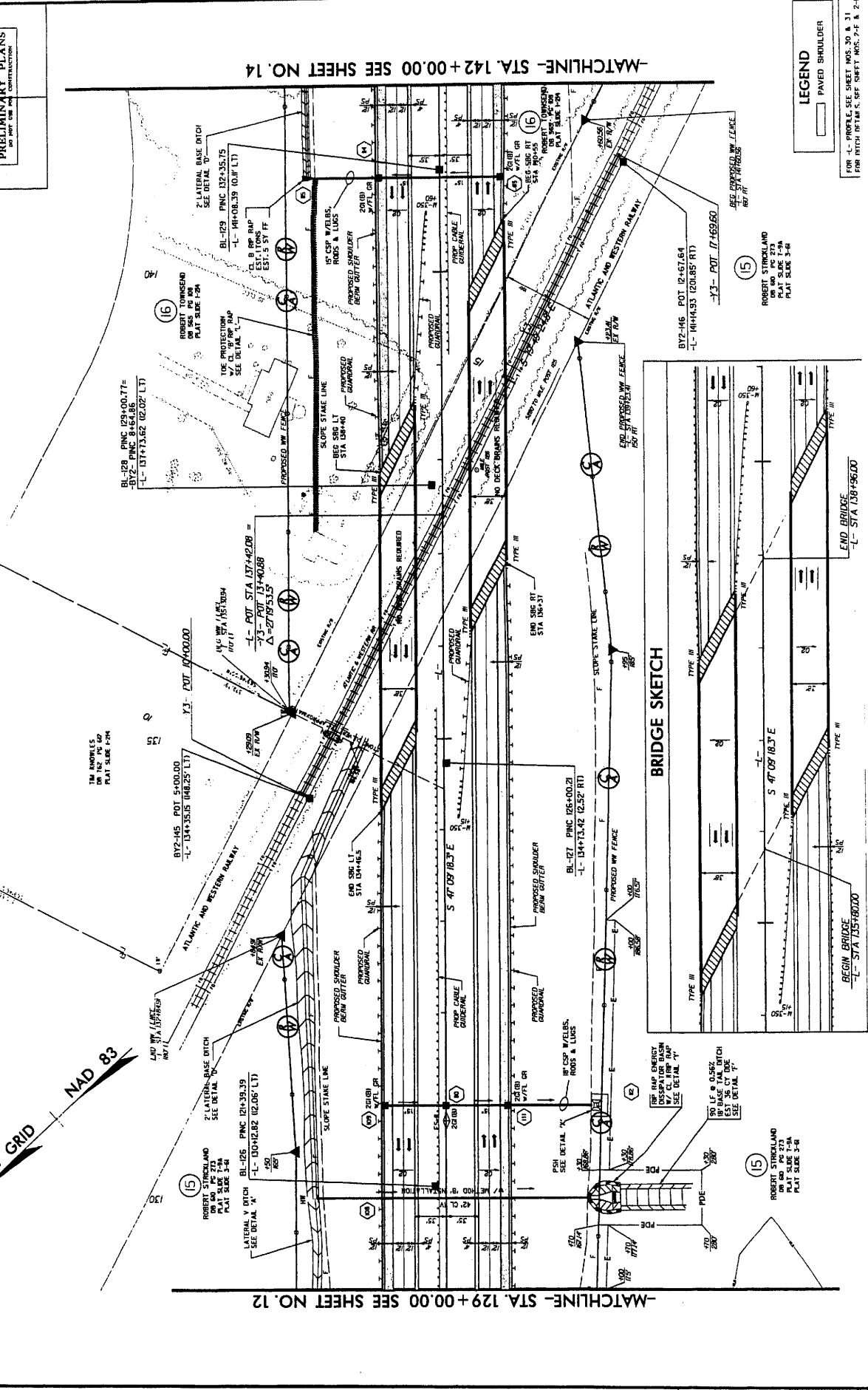
REVISIONS

7/20/99

**KO & ASSOCIATES, P.C.**  
 Consulting Engineers  
 A Florence & Hirschman, Inc. Company  
 111 KINGDOM WAY, SUITE 100, WASHINGTON, N.C. 27683  
 PHONE: 919.488.1111

PROJECT REFERENCE NO. R-2474A  
 SHEET NO. 13  
 HYDRAULICS ENGINEER

**PRELIMINARY PLANS**  
 FOR THE PROPOSED BRIDGE

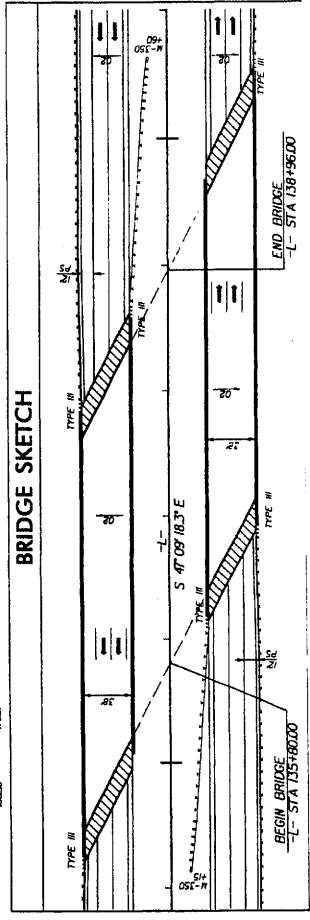



**LEGEND**  
 [Symbol] PAVED SHOULDER

FOR -L- PROFILE, SEE SHEET NOS. 30 & 31  
 FOR RITCH DETAIL S, SEE SHEET NOS. 7-F & 2-F

-MATCHLINE- STA. 142+00.00 SEE SHEET NO. 14

-MATCHLINE- STA. 129+00.00 SEE SHEET NO. 12

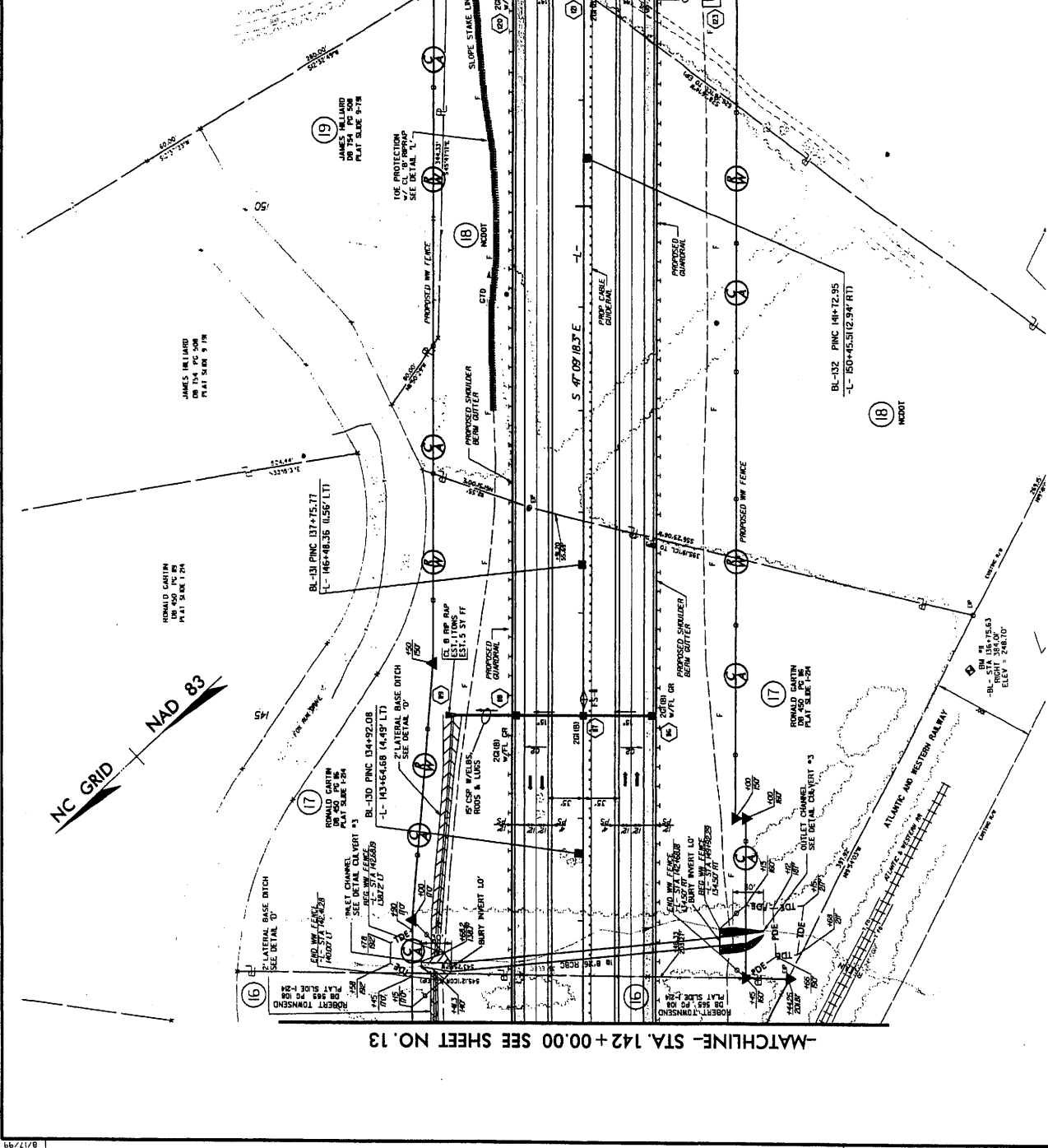


**LEGEND**  
 PAVED SHOULDER

**KO & ASSOCIATES, P.C.**  
 Consulting Engineers  
 A Florence & Houchens, Inc. Company  
 1171 BROADWAY WILMINGTON, NC 28401  
 (910) 343-1100

**PROJECT REFERENCE NO.** R-2477AA  
**HW SHEET NO.** 14  
**HYDRAULICS ENGINEER**

**PRELIMINARY PLANS**  
 DO NOT USE FOR CONSTRUCTION



**LEGEND**  
 [Symbol] PAVED SHOULDER

**-MATCHLINE- STA. 168+00.00 SEE SHEET NO. 16**

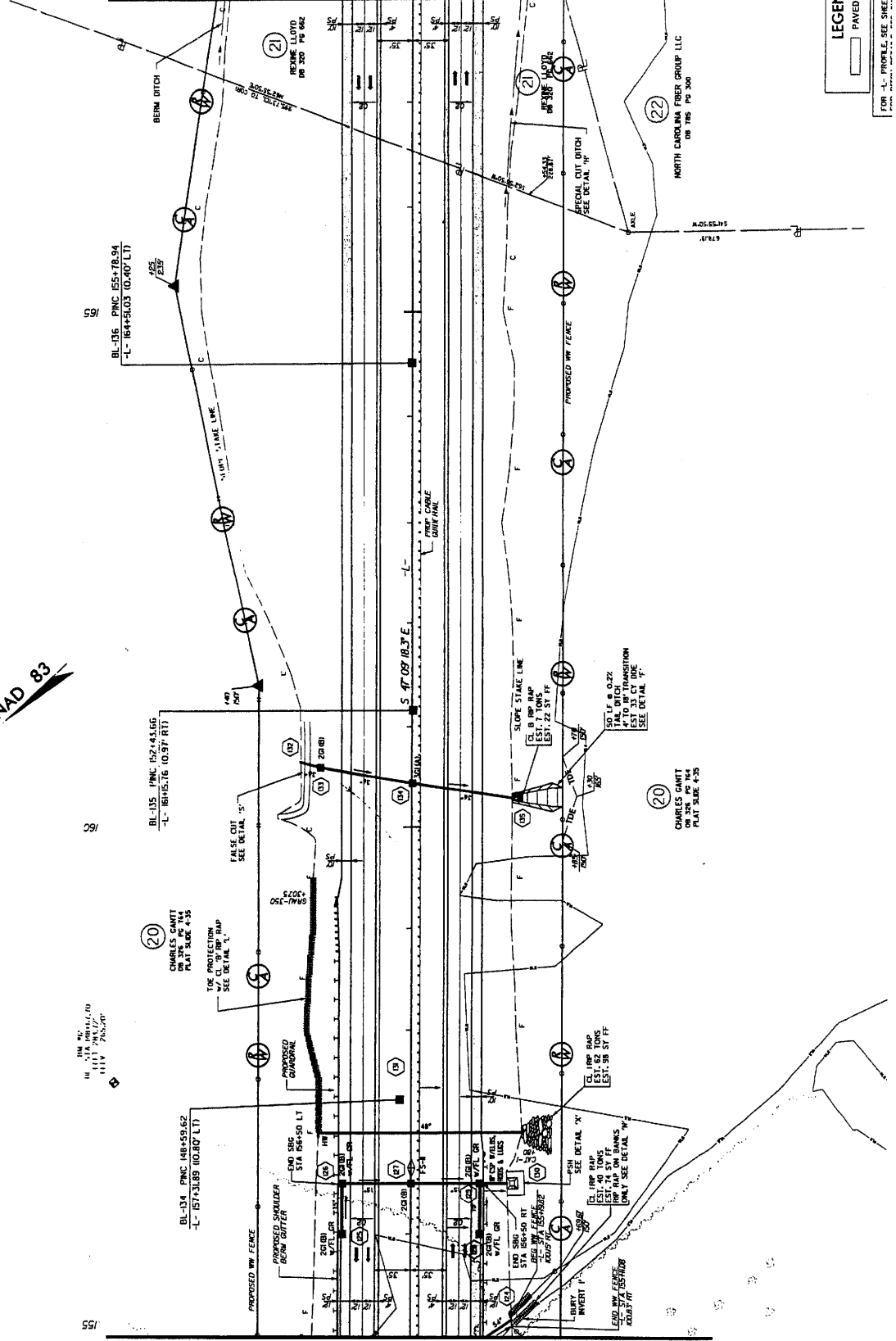
**-MATCHLINE- STA. 155+00.00 SEE SHEET NO. 14**

**NC GRID NAD 83**

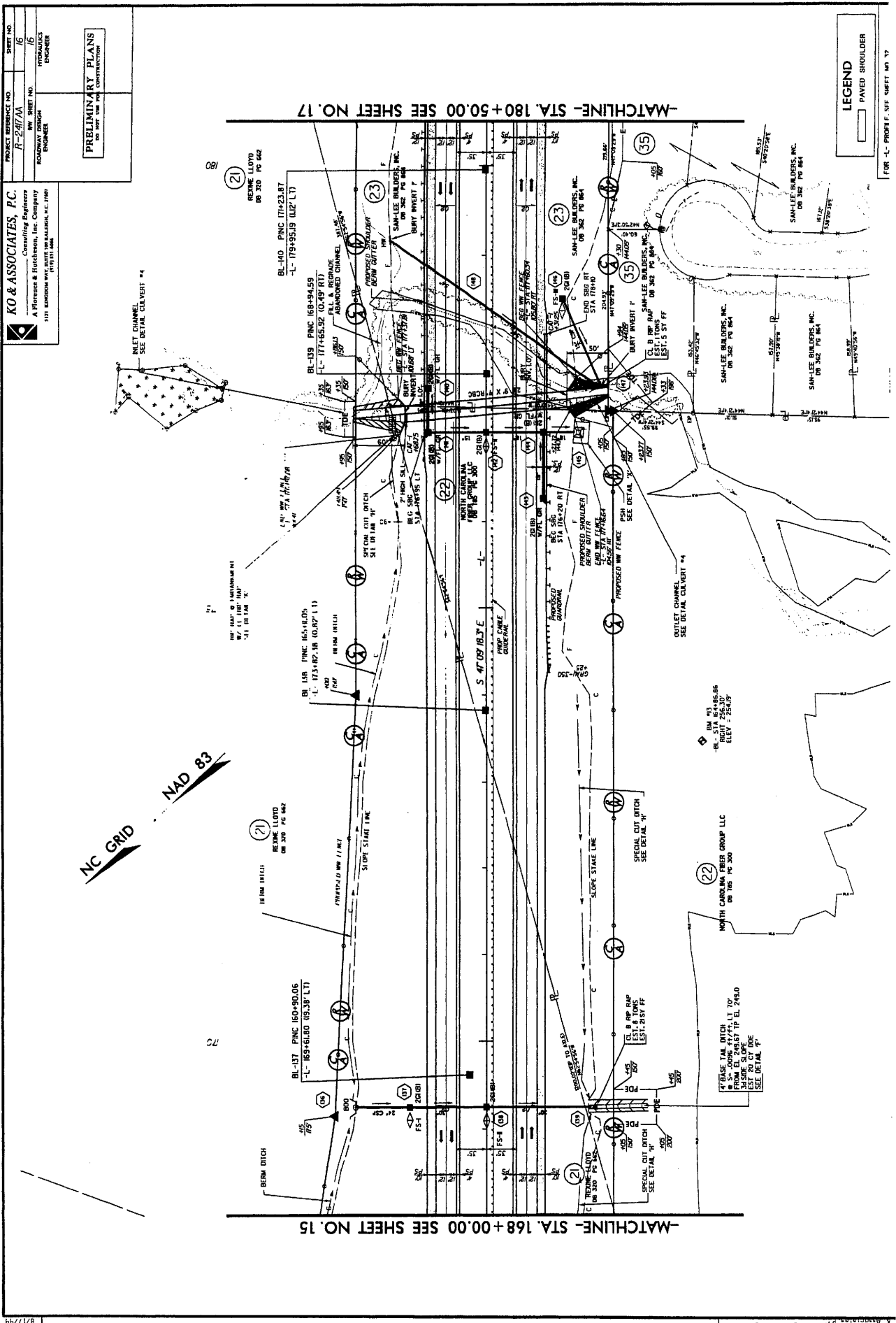
**PRELIMINARY PLANS**  
 DO NOT USE FOR CONSTRUCTION

PROJECT REFERENCE NO. <b>R-247/AA</b>	SHEET NO. <b>15</b>
RHW SHEET NO. <b>15</b>	HYDRAULICS SOURCE
ROADWAY DESIGN SOURCE	

**KO & ASSOCIATES, P.C.**  
 Consulting Engineers  
 A Florence & Franchi Company  
 2111 KENNEDY WALK SUITE 100 WILSON, N.C. 27157  
 (919) 751-2888



LEGEND  
PAVED SHOULDER



**KO & ASSOCIATES, P.C.**  
Consulting Engineers  
A Florence & Hutchison, Inc. Company  
1371 BRIDGEMAN WAY, SUITE 100, WILMINGTON, N.C. 28401  
(910) 343-1100

PROJECT REFERENCE NO.  
**R-2417A**  
SHEET NO.  
**10**  
ROADWAY DESIGN  
ENGINEER

PRELIMINARY PLANS  
FOR POST CONSTRUCTION

NC GRID NAD 83

-MATCHLINE- STA. 180+50.00 SEE SHEET NO. 17

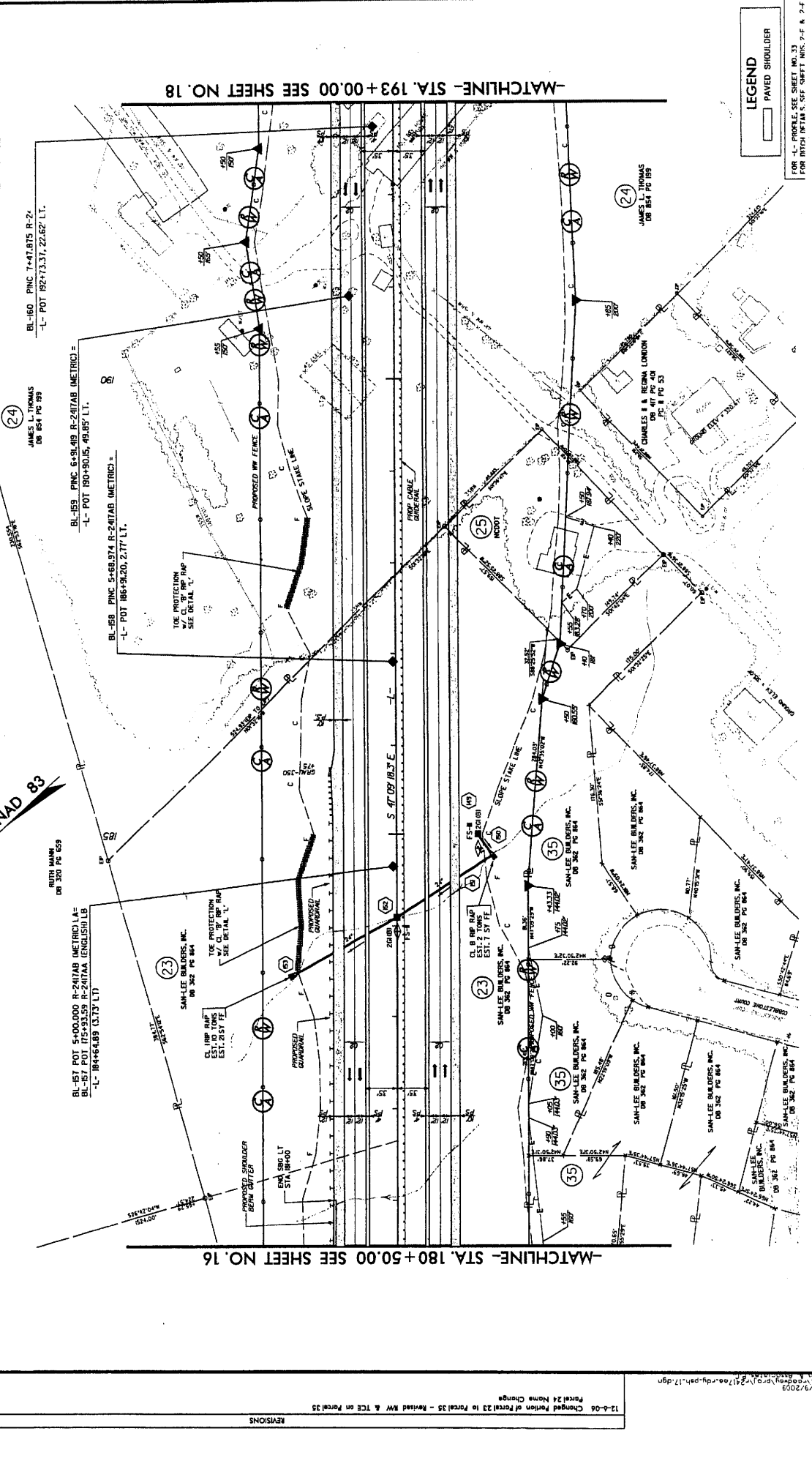
-MATCHLINE- STA. 168+00.00 SEE SHEET NO. 15

PROJECT NUMBER NO. **R-2417A**  
 SHEET NO. **17**  
 HYDRAULICS  
 ENGINEER

**KO & ASSOCIATES, P.C.**  
 Consulting Engineers  
 A Florence & Hitchcock, Inc. Company  
 ROADWAY DESIGN  
 ENGINEER  
 311 KENDRICK WY. SUITE 100A WILSON, N.C. 27157  
 (919) 271-1234

**PRELIMINARY PLANS**  
 (AS SHOWN ON THIS SHEET)

**NC GRID**  
**NAD 83**



**LEGEND**  
 PAVED SHOULDER

FOR MATCH WITH S. SEE SHEET NOS. 7-F & 7-F

8/17/99

12-6-06 Changed Portion of Parcel 23 to Parcel 35 - Revised MW & TCE on Parcel 35  
 Parcel 24 Name Change  
 7/9/2009

REVISIONS

LEGEND  
PAVED SHOULDER

-MATCHLINE- STA. 205+00.00 SEE SHEET NO. 19

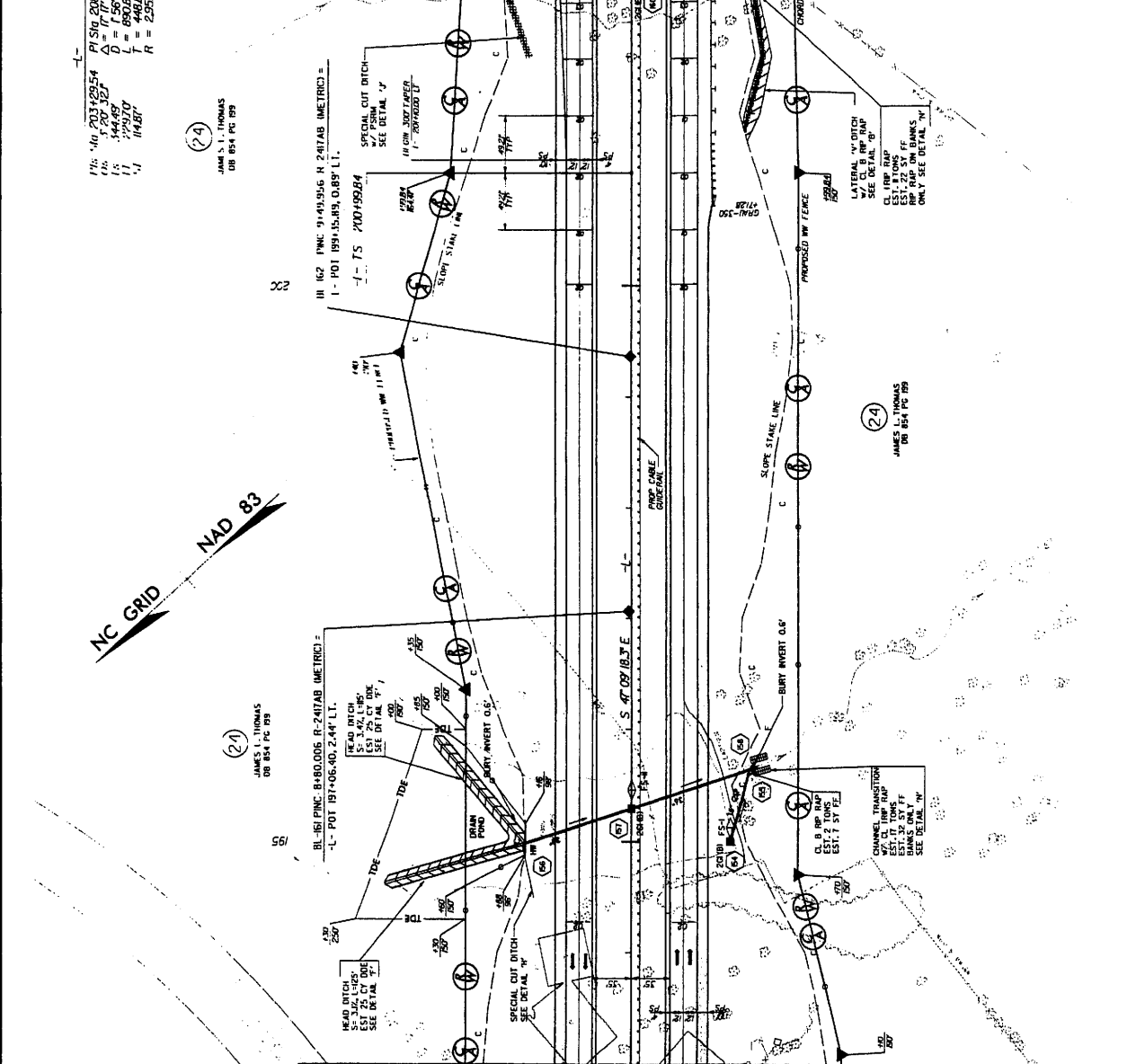
-MATCHLINE- STA. 193+00.00 SEE SHEET NO. 17

PROJECT REFERENCE NO. R-241AA	SHEET NO. 18
BY SHEET NO. ENGINEER	DATE 1/15
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

**KO & ASSOCIATES, P.C.**  
Civil Engineering  
A Florence & Henderson, Inc. Company  
1111 RANDOLPH WY. SUITE 100  
RALEIGH, N.C. 27601

PI = 401,295.54  
PI SA = 208,493.14  
 $\Delta = 117,077.17$  (LT)  
D = 1,562.55  
L = 948.87  
T = 1,436.7  
R = 2,592.75

JAMES L. THOMAS  
DB 854 PG 199



REVISIONS

12-06 Parcel 24 Name Change

8/17/99

1/3/2009

PROJECT REFERENCE NO.	R-2417AA	SHEET NO.	19
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER		

**KO & ASSOCIATES, P.C.**  
 Consulting Engineers  
 A Florence & Hatcher, Inc. Company  
 3111 KINGDOM WAY, SUITE 100, RALEIGH, N.C. 27607  
 (919) 871-1000

JOHN DAVENPORT ■  
 DR 435 PG 39  
 DR 433 PG 20  
 PC 3 PG 25

PAUL KELLY ■  
 DR 445 PG 44  
 DR 443 PG 25  
 PC 3 PG 25

**MATCHLINE - STA. 235 + 00.00 SEE SHEET NO. 20**

**NC GRID NAD 83**

SCALE WAS DESIGNED AND CONSTRUCTED USING METRIC UNITS. ALL DIMENSIONS FOR THE R-2417AA SECTION HAVE BEEN CONVERTED TO THE ENGLISH EQUIVALENT.

JOHN DAVENPORT ■  
 DR 435 PG 39  
 DR 433 PG 20  
 PC 3 PG 25

R.W. JR. & RUTH LONG ■  
 DR 3 PG 25  
 PC 3 PG 25

-L2-  
 PLS STN 3+486.65 PLS STA 8+468.95  
 $\Delta S = 14.38' (0.2' LT)$  PLS STA 7+116.95  
 $O = 1.54' (0.8' LT)$  PLS STA 229.66  
 $L = 769.05'$  LT = 153.12'  
 $R = 3,000.82'$  ST = 76.56'

PAUL KELLY ■  
 DR 445 PG 44  
 DR 443 PG 25  
 PC 3 PG 25

II SC 02+65.82  
 I L STA 229+127.3400' II

-L- POC 208+33.78 LB = B (R-2417AA)  
 -L- POC 227+35.96 LA (R-2417AB)

PAUL KELLY ■  
 DR 445 PG 44  
 DR 443 PG 25  
 PC 3 PG 25


PAUL KELLY ■  
 DR 445 PG 44  
 DR 443 PG 25  
 PC 3 PG 25

PAUL KELLY ■  
 DR 445 PG 44  
 DR 443 PG 25  
 PC 3 PG 25

-L2- PC 0+00.00 =  
 -L2- STA 227+3596.3807' IV

JAMES L. THOMAS ■  
 DR 244 PG 89

**MATCHLINE - STA. 205 + 00.00 SEE SHEET NO. 18**

**LEGEND**  


FOR "L" PROFILE, SEE SHEET NO. 14  
 FOR "LA" PROFILE, SEE SHEET NO. 36  
 FOR "LT" PROFILE, SEE SHEET NO. 37





PROJECT REFERENCE NO. R-2417AA  
 SHEET NO. 21

**KO & ASSOCIATES, P.C.**  
 Consulting Engineers  
 A Florence & Robinson, Inc. Company  
 4111 LONDON WALK, SUITE 100, RALEIGH, N.C. 27607  
 (919) 881-6888

**PRELIMINARY PLANS**  
 FOR THE CONSTRUCTION OF  
 ROADWAY IMPROVEMENTS

NC GRID NAD 83

MATCHLINE - STA. 20+00.00  
 SEE SHEET 22

BL-204 (LINE 22) (BL 17)  
 THRU STA. 20+00.00  
 $P = 11.14$   
 $\Delta = 46.28$   
 $D = 64.50$   
 $L = 50.95$   
 $R = 1200.00$

END CONSTRUCTION  
 -L1- POT 31723.92  
 TIE TO EXIST. PAVEMENT

MATCHLINE - STA. 249+00.00  
 SEE SHEET 20

END CONSTRUCTION  
 -L2- POT 28+652.2  
 TIE TO EXIST. PAVEMENT

-TIRPC-  
 $PI Sig 17462.0$   
 $\Delta = 76.34$   
 $D = 2156.53$   
 $L = 1385.47$   
 $R = 1755.25$

R-2417AA WAS DESIGNED AND CONSTRUCTED USING METRIC UNITS. ALL DIMENSIONS FOR THIS PLAN HAVE BEEN CONVERTED TO THE ENGLISH EQUIVALENT.

**LEGEND**  
 PAVED SHOULDER

FOR -L- PROFILE, SEE SHEET NOS. 35 & 37  
 FOR -L2- PROFILE, SEE SHEET NOS. 34 & 36  
 FOR -TIRPC- PROFILE, SEE SHEET NOS. 44 & 45  
 FOR DITCH DETAILS, SEE SHEET NOS. 2-1 & 2-2

B/17/99

REVISIONS

9/2009  
 R-2417AA-01-1-2017-00-rdg-psh-21.dwg

PROJECT REFERENCE NO. R-2417AB  
 SHEET NO. 22  
 HYDRAULICS ENGINEER

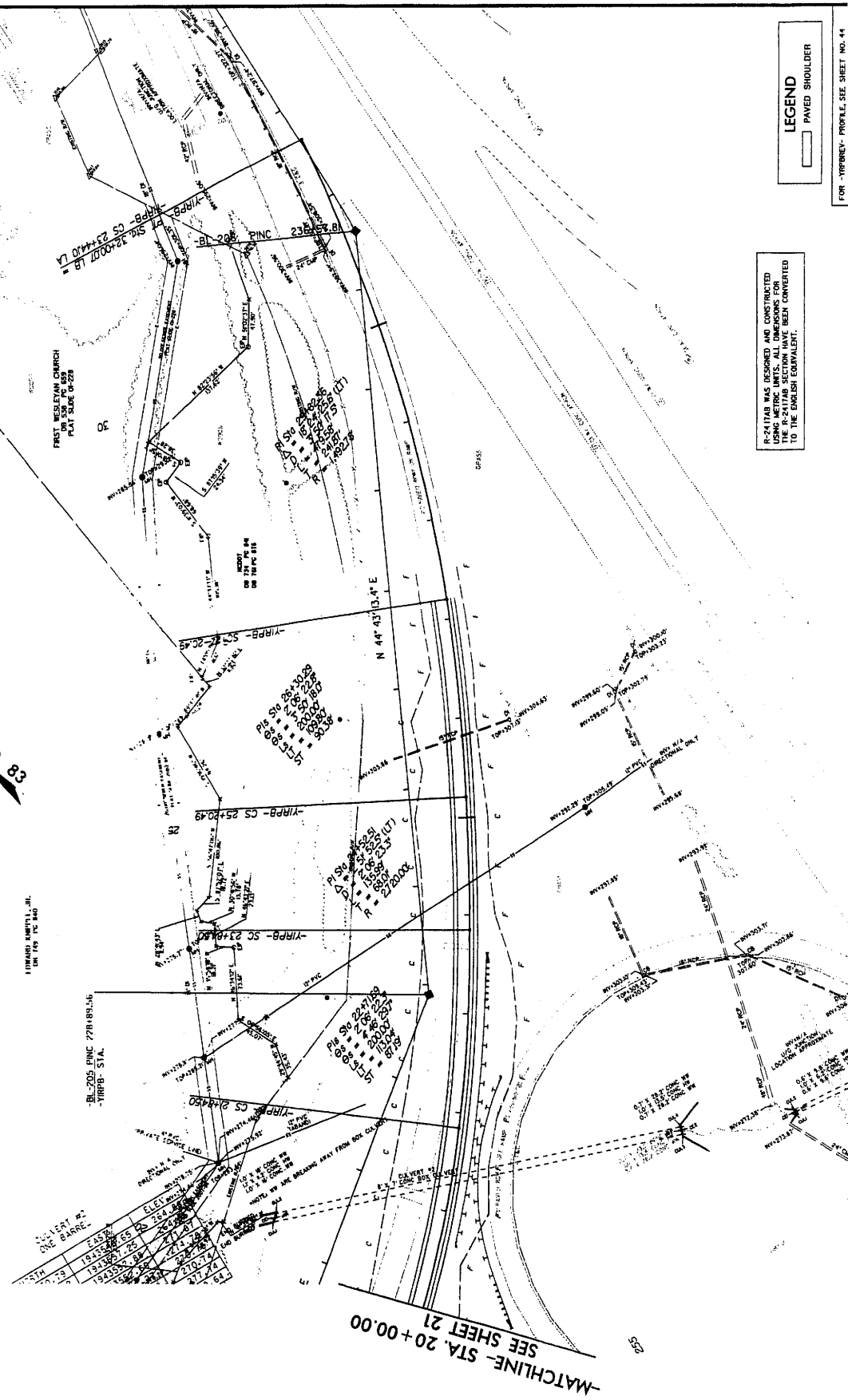
PROJECT REFERENCE NO. R-2417AB  
 SHEET NO. 22  
 HYDRAULICS ENGINEER

**PRELIMINARY PLANS**  
 FOR THE PROPOSED  
 CONSTRUCTION

**KO & ASSOCIATES, P.C.**  
 Consulting Engineers  
 A Florence & Horchless, Inc. Company  
 1311 RANDOLPH WILKINSON DRIVE, SUITE 100, RALEIGH, N.C. 27601  
 (919) 876-1100

**PRELIMINARY PLANS**  
 FOR THE PROPOSED  
 CONSTRUCTION

NC GRID  
 NAD 83



R-2417AB WAS DESIGNED AND CONSTRUCTED USING METRIC UNITS. ALL DIMENSIONS FOR THIS PROJECT HAVE BEEN CONVERTED TO THE ENGLISH EQUIVALENT.

**LEGEND**  
 PAVED SHOULDER

FORM - YIRPBREV - PROFILE, SEE SHEET NO. 44

8/17/99

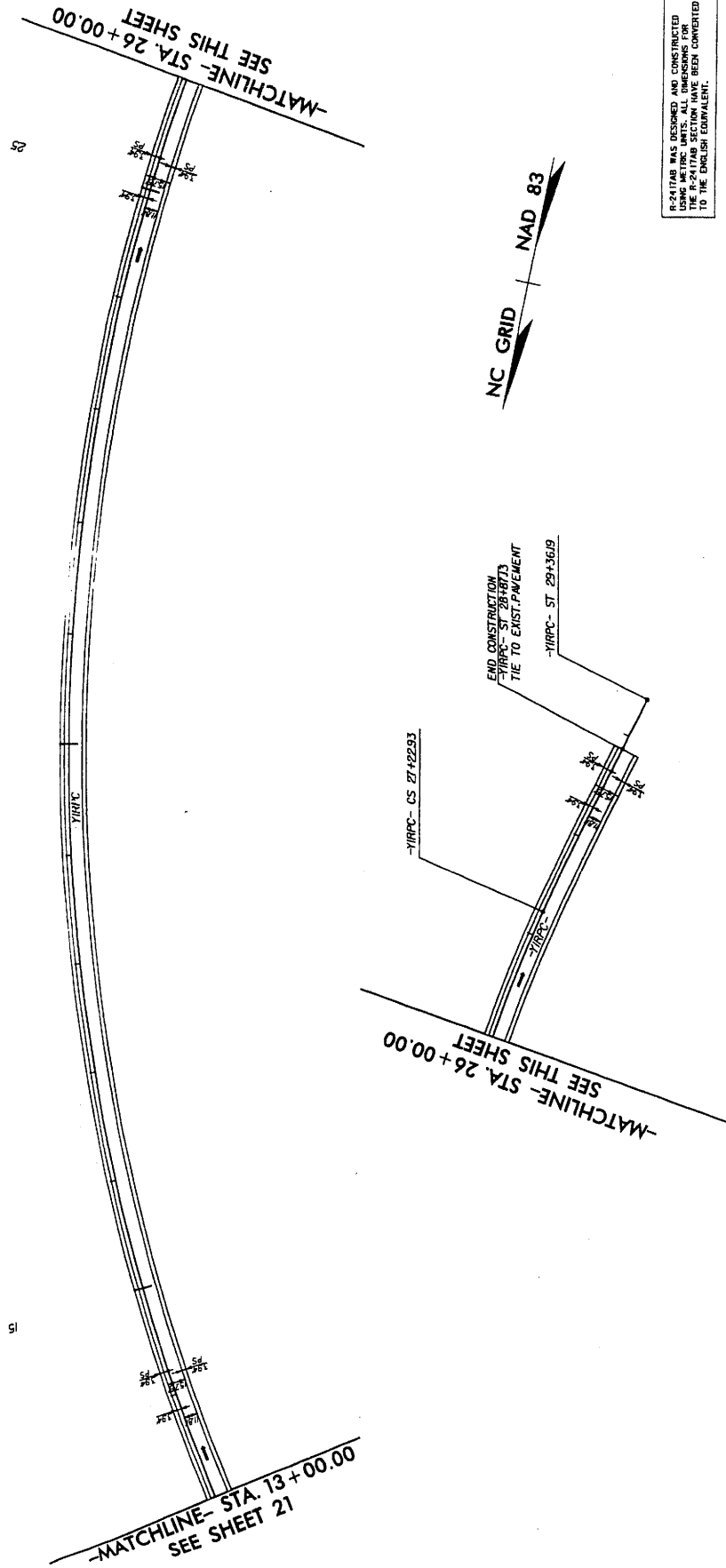
REVISIONS

9/2003  
 V:\Projects\99\2417\road\psh.22.dwg  
 10/17/99

PROJECT REFERENCE NO. R-2417AA	SHEET NO. 23
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
<b>PRELIMINARY PLANS</b> NOT FOR CONSTRUCTION	

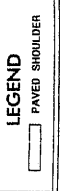
**KO & ASSOCIATES, P.C.**  
 Consulting Engineers  
 A Florence & Hitchcock, Inc. Company  
 3111 Landon Road, Suite 200  
 Charlotte, NC 28217

YIPVY  
 11' 50" (10.43) TO  
 11' 00" (10.33) (RT)  
 11' 00" (10.33) (LT)  
 11' 00" (10.33) (ST)  
 11' 00" (10.33) (RT)  
 11' 00" (10.33) (LT)



R-2417AA WAS DESIGNED AND CONSTRUCTED USING METRIC UNITS. ALL DIMENSIONS FOR THE R-2417AA SECTION HAVE BEEN CONVERTED TO THE ENGLISH EQUIVALENT.

-YIPVY-  
 PI STA. 17+462.10    PLS STA. 27+940.04  
 Δ = 16.74 (0.33) (RT)    CS = 21.52 (50.7)  
 Δ = 16.74 (0.33) (LT)    LT = 142.20  
 L = 23.45 (56.4)    T = 1.385 (4')  
 R = 1755.25'    ST = 711'



FOR -YIPVY- PROFILE, SEE SHEET NO. 45 & 46  
 FOR -YIPVY- IN-TAKE, SEE SHEET NO. 45 & 46

8/17/99

REVISIONS

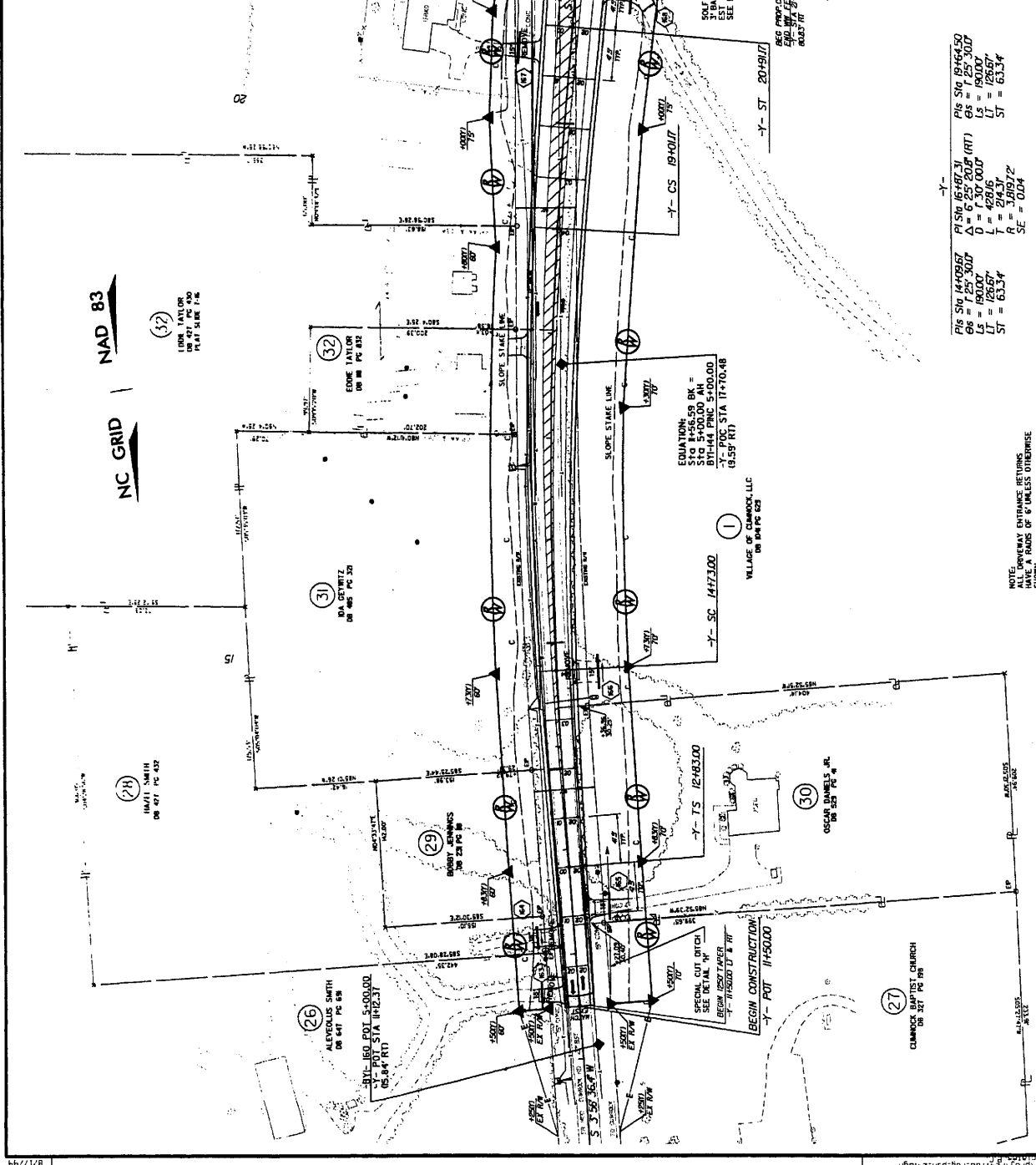
3/2009  
 R:\Roadway\2417\2417001.dwg, pld, 23.dwg

PROJECT REFERENCE NO. R-24/FAA  
 SHEET NO. 24  
 DATE 11/15/11  
 DRAWN BY J. H. HARRIS  
 CHECKED BY J. H. HARRIS  
 ENGINEER

**KO & ASSOCIATES, P.C.**  
 Civil/Structural Engineers  
 A Fluorine & Hatchers, Inc. Company  
 1131 LANSFORD WALL STREET, SUITE 100, SAUNDERS, N.C. 27087  
 (704) 911-9100

PRELIMINARY PLANS  
 DO NOT USE FOR CONSTRUCTION

LEGEND  
 [Symbol] PAVED SHOULDER



Y-  
 PIS STA 14+00.00 PIS STA 19+64.50  
 OS = 1.25' 30.00 OS = 1.25' 30.00  
 LS = 100.00' LS = 100.00'  
 ST = 63.34' ST = 63.34'  
 R = 244.37' R = 244.37'  
 SE = 3.61972' SE = 0.04'

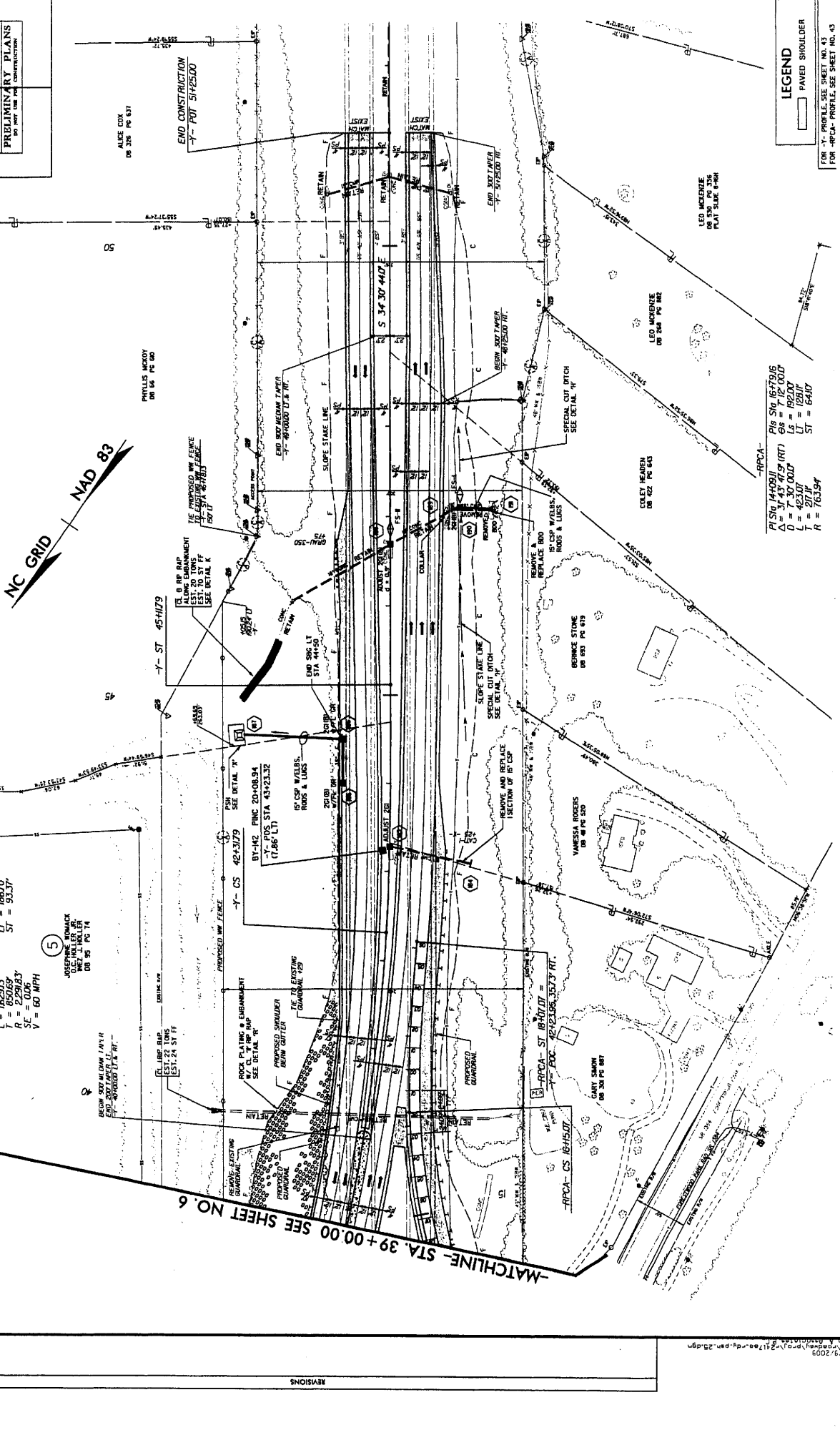
NOTE: DIMENSIONS IN BRACKETED AREAS ARE UNLESS OTHERWISE SHOWN.

**KO & ASSOCIATES, P.C.**  
 Consulting Engineers  
 A Pittman & Hershman, Inc. Company  
 111 JACKSON WALKER DR. ALBANY, N.C. 27610  
 (919) 711-0842

PROJECT REFERENCE NO. **R-247AA**  
 SHEET NO. **25**  
 R/W SHEET NO. **21**  
 ROAD DESIGN: **ROADWAY**  
 SURVEYING: **ENGINEER**

**INCOMPLETE PLANS**  
 DO NOT USE FOR CONSTRUCTION

**PRELIMINARY PLANS**  
 DO NOT USE FOR CONSTRUCTION



**LEGEND**  
 [Symbol] PAVED SHOULDER

FOR 3" PROFILE SEE SHEET NO. 43  
 FOR 4" PROFILE SEE SHEET NO. 43

$PI\ S10\ 34+53.35$      $PI\ S10\ 43+25.15$   
 $\Delta = 47\ 43\ 41.3'$  (LT)     $OS = 3\ 30\ 00.0'$   
 $D = 2\ 30\ 00.0'$      $LS = 280.00'$   
 $T = 85.06'$      $ST = 93.37'$   
 $R = 2291.83'$   
 $SE = 0.06$   
 $V = 60\ MPH$

JOSEPH B. BOMACK  
 D.C. HALLER  
 D.S. 95 PC 14

$PI\ S10\ 14+09.11$      $PI\ S10\ 16+79.66$   
 $\Delta = 31\ 43\ 47.9'$  (RT)     $OS = 7\ 12\ 00.0'$   
 $D = 300.00'$      $LS = 120.00'$   
 $T = 20.71'$      $ST = 64.10'$   
 $R = 763.94'$

**-MATCHLINE- STA. 39+00.00 SEE SHEET NO. 6**

PROJECT REFERENCE NO. R-2477AA  
 ROADWAY DESIGN ENGINEER  
 HYDRAULICS ENGINEER

PRELIMINARY PLANS  
 NO. NOT FOR CONSTRUCTION

FOR PLANS SEE SHEET NOS. 4 & 5

\* MILL EXISTING PAVEMENT ADVANTAGE TO BRIDGE  
 SEE MILLING DETAIL SHEET NO. 2

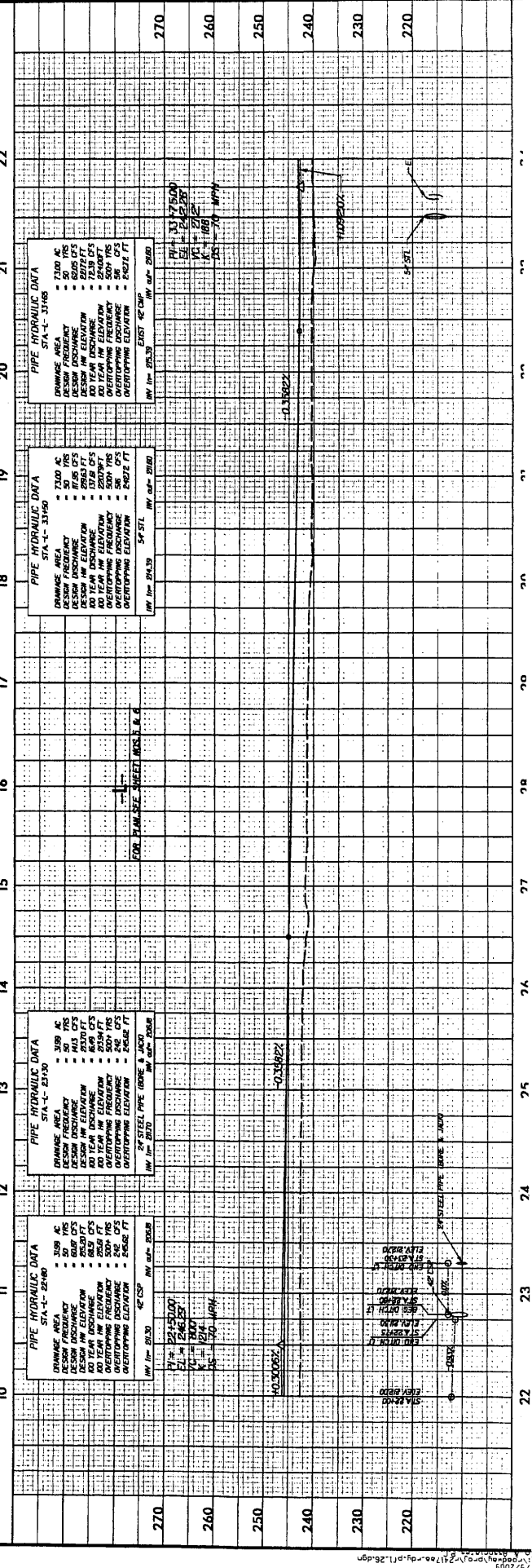
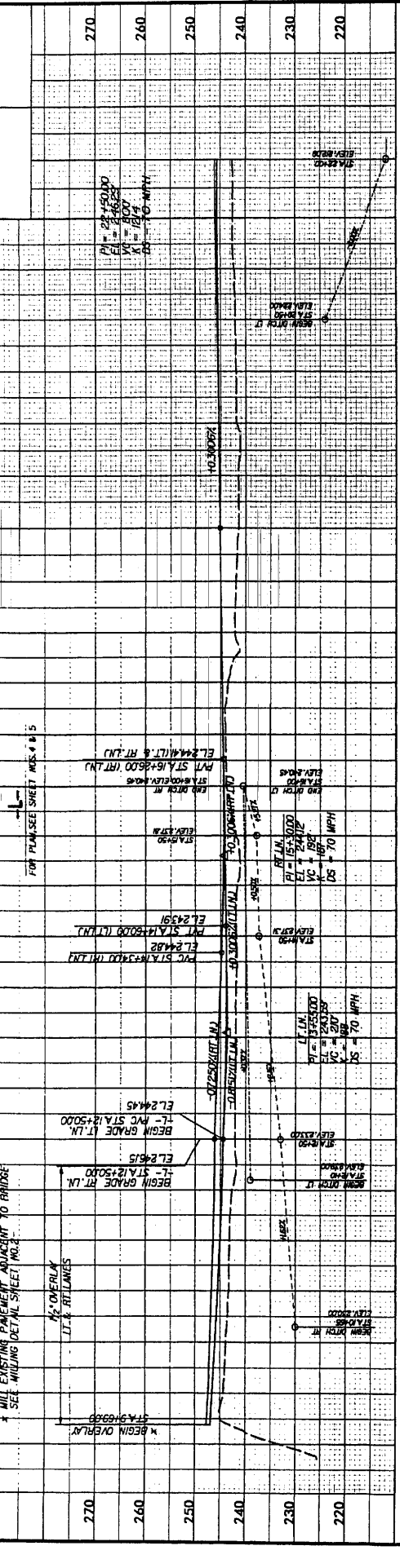
\* BEGIN OVERLAY  
 STA. 9+63.82

\* BEGIN OVERLAY  
 STA. 12+50.00

\* BEGIN OVERLAY  
 STA. 12+50.00

\* BEGIN OVERLAY  
 STA. 12+50.00

\* BEGIN OVERLAY  
 STA. 12+50.00



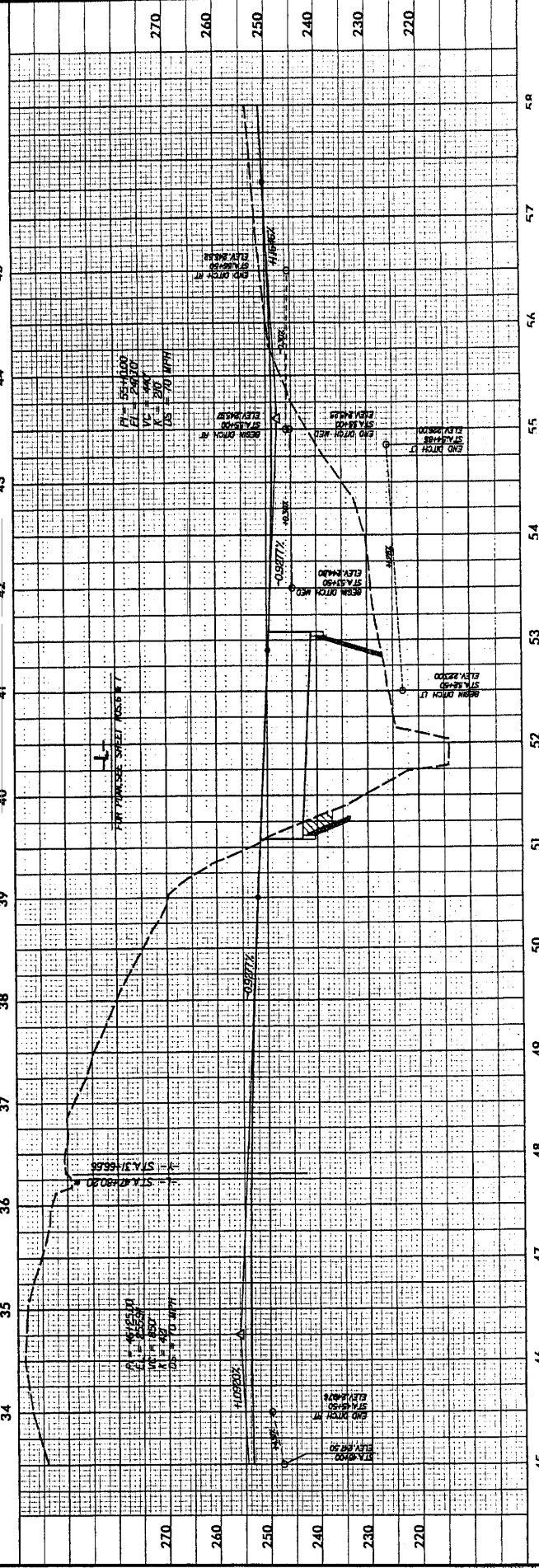
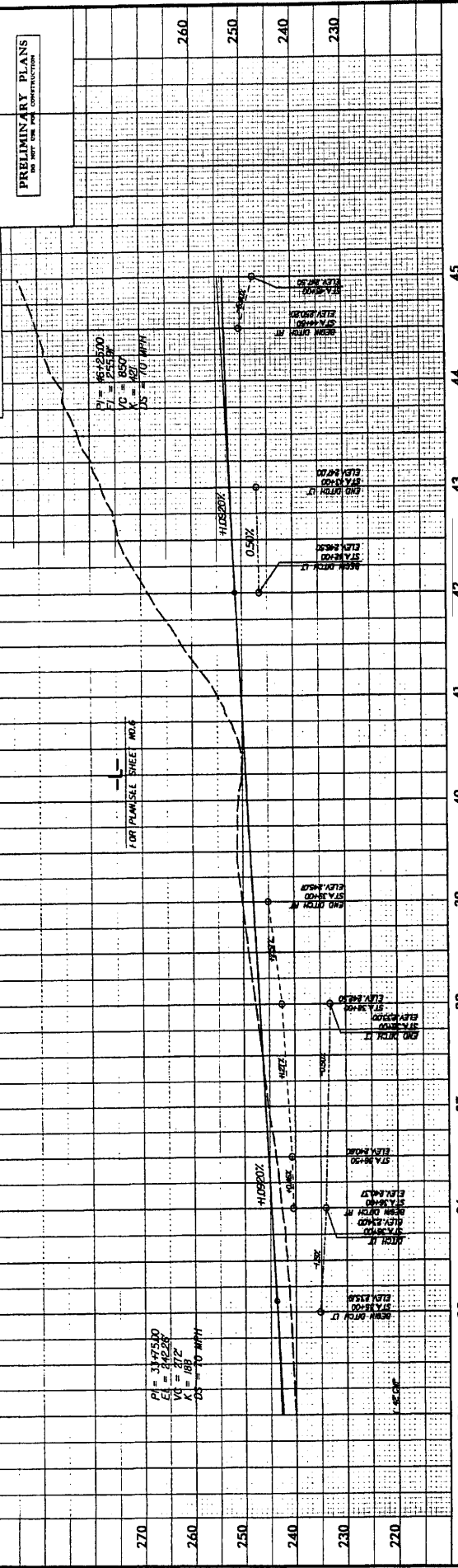
PROJECT REFERENCE NO. R-2417AA  
 CONTRACTOR  
 ENGINEER

**KO & ASSOCIATES, P.C.**  
 511 LINDEN WALKER DRIVE, SUITE 100, FARMINGTON, CT 06031  
 TEL: 860-646-1111 FAX: 860-646-1112

DATE: 08/11/09  
 DRAWN BY: J. J. COLE  
 CHECKED BY: J. J. COLE  
 APPROVED BY: J. J. COLE

SCALE: 1" = 40' HORIZ. 1" = 10' VERT.  
 SHEET NO. 27

**PRELIMINARY PLANS**  
 DO NOT USE FOR CONSTRUCTION





5/29/99

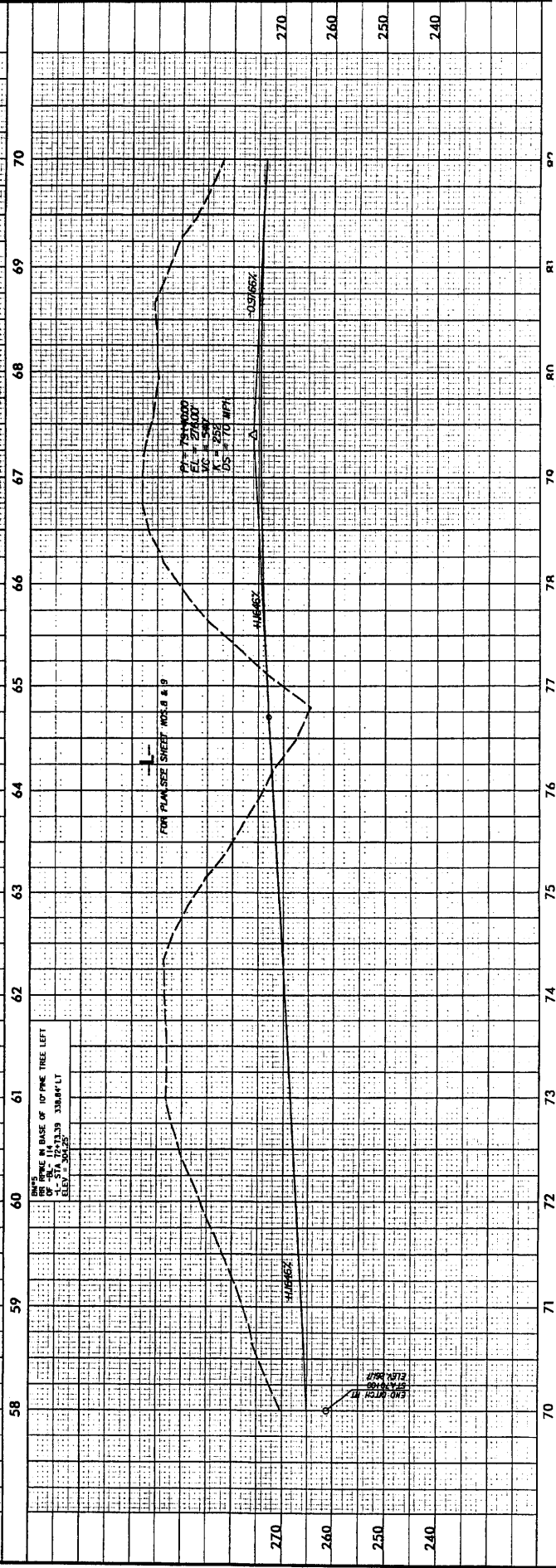
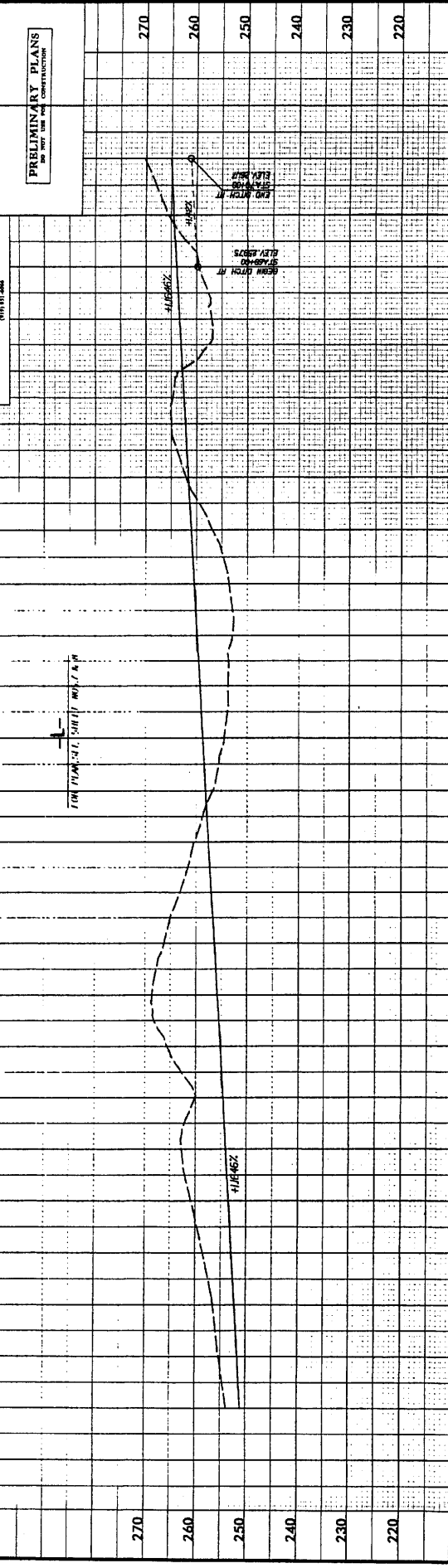
PROJECT REFERENCE NO. **A-2311(A)**  
 ROAD DISTRICT **1000**  
 ENGINEER **RYAN**

**KO & ASSOCIATES, P.C.**  
 Consulting Engineers  
 A Florence & Hershman, Inc. Company  
 101 LINDSEY WALKER DRIVE, WALKER, N.C. 27891  
 (704) 765-1100

DATE **05/29/99**  
 SHEET NO. **28**  
 TOTAL SHEETS **30**

PRELIMINARY PLANS  
 DO NOT USE FOR CONSTRUCTION

SEE SHEET 27 FOR THE PREVIOUS PLAN SHEET TO THE LEFT  
 THIS PLAN SHEET CONTAINS THE  
 111' 0" OF THE  
 111' 0" OF THE



**KO & ASSOCIATES, P.C.**  
 Consulting Engineers  
 A Division of Bertchman, Inc. Company  
 111 S. Madison Street, Chicago, IL 60601  
 (312) 467-1200

**PRELIMINARY PLANS**  
 DO NOT USE FOR CONSTRUCTION

7/17/17 HYDRAULIC DATA  
 STA. 1+87.50  
 DRAINAGE AREA = 37.7 AC  
 DESIGN FLOOD FREQ. = 50 YRS  
 DESIGN FLOOD FLOW = 2837 CFS  
 DESIGN FLOOD ELEVATION = 262.42 FT  
 DESIGN FLOOD VELOCITY = 60 MPH  
 DESIGN FLOOD WAVELENGTH = 1000 FT  
 DESIGN FLOOD PERIOD = 300 YRS  
 DESIGN FLOOD DURATION = 200 YRS  
 DESIGN FLOOD FREQUENCY = 500+ YRS  
 OVERTOPPING ELEVATION = 268.5 FT

HW 10' = 255.00 54" RCP HW 8" = 250.00

FOR PANSSE SHEET NOS. 2 & 3



54" RCP

24" RCP

24" RCP

24" RCP

24" RCP

24" RCP

24" RCP

24" RCP

24" RCP

24" RCP

24" RCP

24" RCP

24" RCP

24" RCP

24" RCP

24" RCP

24" RCP

24" RCP

24" RCP

24" RCP

24" RCP

24" RCP

24" RCP

24" RCP

24" RCP

24" RCP

24" RCP

24" RCP

24" RCP

24" RCP

24" RCP

24" RCP

24" RCP

24" RCP

24" RCP

24" RCP

24" RCP

24" RCP

24" RCP

24" RCP

24" RCP

24" RCP

24" RCP

24" RCP

24" RCP

24" RCP

24" RCP

24" RCP

24" RCP

24" RCP

24" RCP

24" RCP

24" RCP

24" RCP

24" RCP

24" RCP

24" RCP

24" RCP

24" RCP

24" RCP

24" RCP

24" RCP

24" RCP

24" RCP

24" RCP

24" RCP

24" RCP

24" RCP

24" RCP

24" RCP

24" RCP

24" RCP

24" RCP

24" RCP

24" RCP

24" RCP

24" RCP

24" RCP

24" RCP

24" RCP

24" RCP

24" RCP

24" RCP

24" RCP

24" RCP

24" RCP

24" RCP

24" RCP

24" RCP

24" RCP

24" RCP

24" RCP

24" RCP

24" RCP

24" RCP

24" RCP

24" RCP

24" RCP

24" RCP

24" RCP

24" RCP

24" RCP

24" RCP

24" RCP

24" RCP

24" RCP

24" RCP

24" RCP

24" RCP

24" RCP

24" RCP

24" RCP

24" RCP

24" RCP

24" RCP

24" RCP

24" RCP

24" RCP

24" RCP

24" RCP

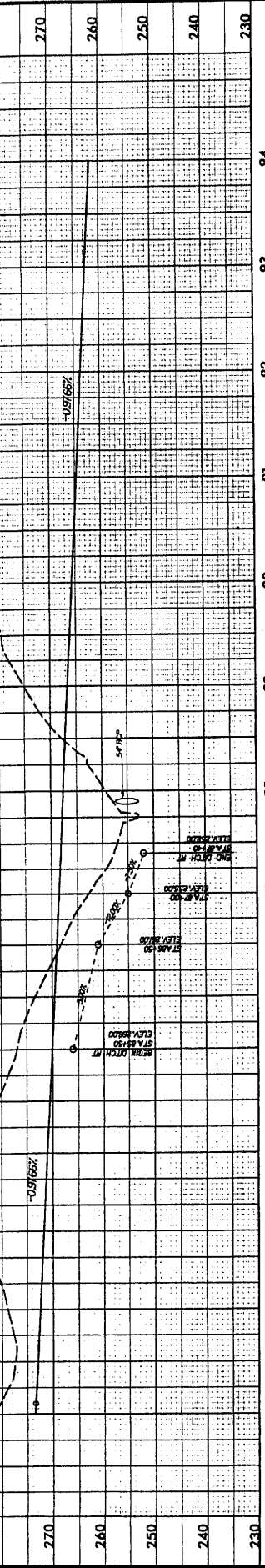
24" RCP

24" RCP

24" RCP

24" RCP

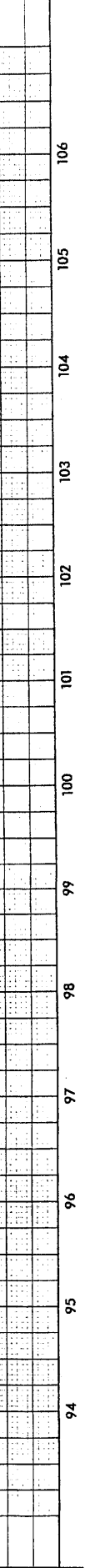
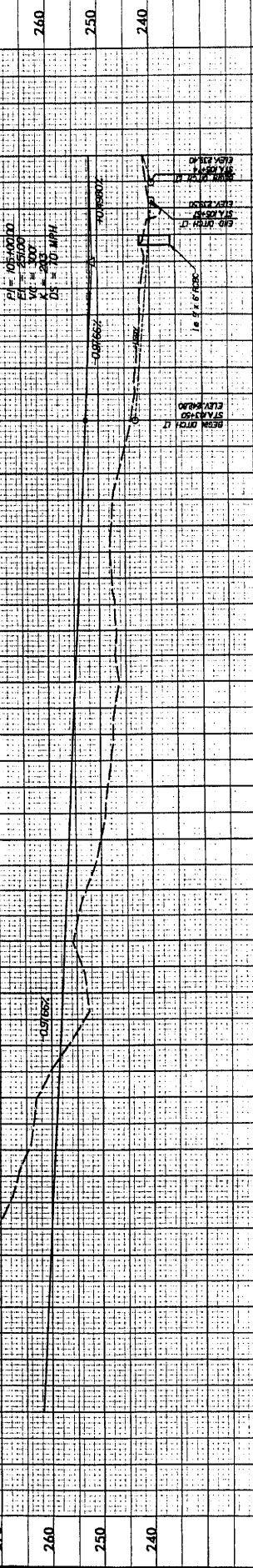
24" RCP



**CULVERT HYDRAULIC DATA**

DESIGN DISCHARGE	= 370 CFS
DESIGN FREQUENCY	= 50 YRS
DESIGN HW ELEVATION	= 263.7 FT
BASE DISCHARGE	= 400 YFS
BASE HW ELEVATION	= 244.2 FT
OVERTOPPING DISCHARGE	= 830 CFS
OVERTOPPING FREQUENCY	= 500+ YFS
OVERTOPPING ELEVATION	= 259.5 FT

$P1 = 105.2010$   
 $V1 = 25.00$   
 $K1 = 2.3$   
 $D1 = 70 MPH$



PROJECT REFERENCE NO. R-2/17AA  
 HYDRAULICS ENGINEER

**KO & ASSOCIATES, P.C.**  
 Consulting Engineers  
 A Florence & Brackbill, Inc. Company  
 1311 KINGSWAY WEST, SUITE 100  
 RICHMOND, VIRGINIA 23131

DATE: 08/21/13  
 DRAWN BY: JMM  
 CHECKED BY: JMM  
 IN CHARGE: JMM

THIS SHEET IS ONE OF 17 SHEETS IN THIS PROJECT  
 SEE SHEET R-2/17AA-1 THROUGH R-2/17AA-17

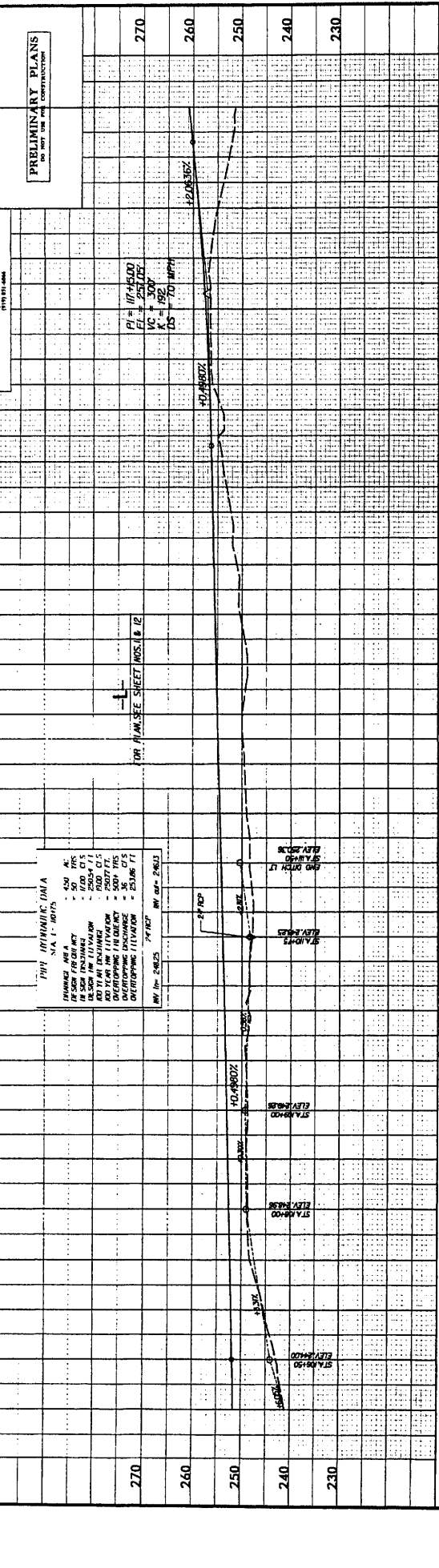
THIS HYDRAULIC DATA  
 STA. 1+000.00  
 DRAINAGE AREA = 430 AC  
 DESIGN FREQ. = 50 YRS  
 DESIGN DISCHARGE = 1700 CFS  
 DESIGN HW ELEVATION = 250.0 FT  
 10 YEAR DISCHARGE = 2000 CFS  
 10 YEAR HW ELEVATION = 250.7 FT  
 OVERTOPPING FREQ. = 500+ YRS  
 OVERTOPPING DISCHARGE = 2500 CFS  
 OVERTOPPING ELEVATION = 251.8 FT  
 INV. IN 2500 24' RCP INV. OFF. 286.3

THIS HYDRAULIC DATA  
 STA. 1+075.00  
 DRAINAGE AREA = 430 AC  
 DESIGN FREQ. = 50 YRS  
 DESIGN DISCHARGE = 1700 CFS  
 DESIGN HW ELEVATION = 250.0 FT  
 10 YEAR DISCHARGE = 2000 CFS  
 10 YEAR HW ELEVATION = 250.7 FT  
 OVERTOPPING FREQ. = 500+ YRS  
 OVERTOPPING DISCHARGE = 2500 CFS  
 OVERTOPPING ELEVATION = 251.8 FT  
 INV. IN 2400 36" RCP INV. OFF. 282.1

THIS HYDRAULIC DATA  
 STA. 1+150.00  
 DRAINAGE AREA = 430 AC  
 DESIGN FREQ. = 50 YRS  
 DESIGN DISCHARGE = 1700 CFS  
 DESIGN HW ELEVATION = 250.0 FT  
 10 YEAR DISCHARGE = 2000 CFS  
 10 YEAR HW ELEVATION = 250.7 FT  
 OVERTOPPING FREQ. = 500+ YRS  
 OVERTOPPING DISCHARGE = 2500 CFS  
 OVERTOPPING ELEVATION = 251.8 FT  
 INV. IN 2500 24' RCP INV. OFF. 286.3

THIS HYDRAULIC DATA  
 STA. 1+225.00  
 DRAINAGE AREA = 430 AC  
 DESIGN FREQ. = 50 YRS  
 DESIGN DISCHARGE = 1700 CFS  
 DESIGN HW ELEVATION = 250.0 FT  
 10 YEAR DISCHARGE = 2000 CFS  
 10 YEAR HW ELEVATION = 250.7 FT  
 OVERTOPPING FREQ. = 500+ YRS  
 OVERTOPPING DISCHARGE = 2500 CFS  
 OVERTOPPING ELEVATION = 251.8 FT  
 INV. IN 2500 24' RCP INV. OFF. 286.3

THIS HYDRAULIC DATA  
 STA. 1+300.00  
 DRAINAGE AREA = 430 AC  
 DESIGN FREQ. = 50 YRS  
 DESIGN DISCHARGE = 1700 CFS  
 DESIGN HW ELEVATION = 250.0 FT  
 10 YEAR DISCHARGE = 2000 CFS  
 10 YEAR HW ELEVATION = 250.7 FT  
 OVERTOPPING FREQ. = 500+ YRS  
 OVERTOPPING DISCHARGE = 2500 CFS  
 OVERTOPPING ELEVATION = 251.8 FT  
 INV. IN 2500 24' RCP INV. OFF. 286.3



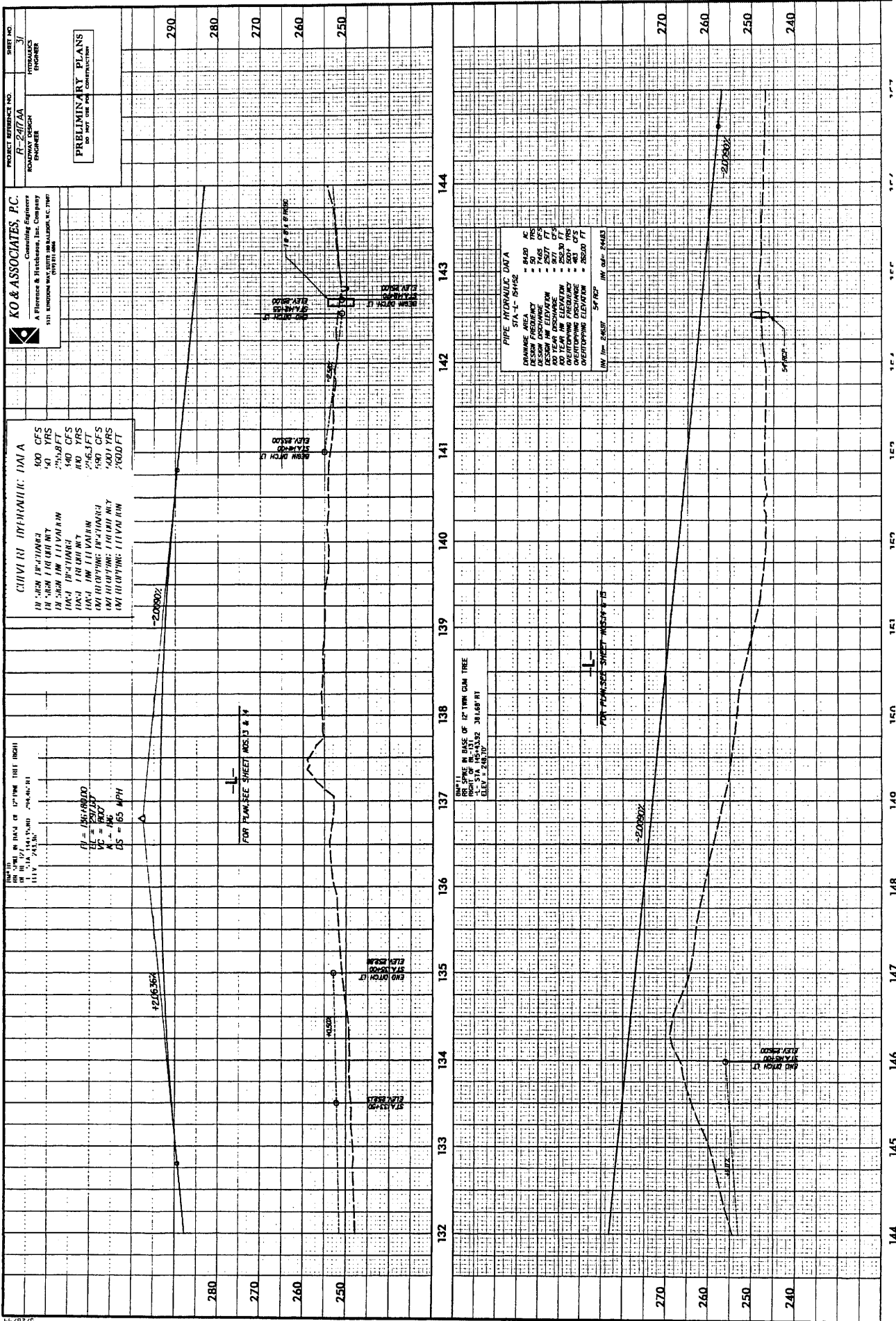
PRELIMINARY PLANS  
 DO NOT USE FOR CONSTRUCTION

270  
260  
250  
240  
230

119 118 117 116 115 114 113 112 111 110 109 108 107 106

120 121 122 123 124 125 126 127 128 129 130 131 132

66/82/5



PROJECT REFERENCE NO. R-2477A  
 ROADWAY DESIGN ENGINEER

SHIRT NO. 3/  
 HYDRAULICS ENGINEER

**KO & ASSOCIATES, P.C.**  
 Consulting Engineers  
 A Florence & Hitchcock, Inc. Company  
 511 LONDON AVE. SUITE 100  
 CHARLOTTE, NC 28202

**PRELIMINARY PLANS**  
 DO NOT USE FOR CONSTRUCTION

**CURVED HYDRAULIC DATA**  
 10' CURV. DISTANCE 100 CFS  
 10' CURV. DIST. 100' RADIUS 40' VRS  
 10' CURV. DIST. 100' RADIUS 400' CFS  
 10' CURV. DIST. 100' RADIUS 400' VRS  
 10' CURV. DIST. 100' RADIUS 200' CFS  
 10' CURV. DIST. 100' RADIUS 200' VRS  
 10' CURV. DIST. 100' RADIUS 100' CFS  
 10' CURV. DIST. 100' RADIUS 100' VRS  
 10' CURV. DIST. 100' RADIUS 50' CFS  
 10' CURV. DIST. 100' RADIUS 50' VRS

FOR PUMP-SEE SHEET NOS. 3 & 4

FOR PUMP-SEE SHEET NOS. 5 & 6

FOR PUMP-SEE SHEET NOS. 7 & 8

FOR PUMP-SEE SHEET NOS. 9 & 10

PIPE HYDRAULIC DATA  
 RANGE STA. 1+00 TO 1+100  
 DESIGN FREQUENCY 50 VRS  
 DESIGN DISCHARGE 7665 CFS  
 DESIGN VELOCITY 5.0 FT/SEC  
 AD. YEAR DISCHARGE 5071 CFS  
 AD. YEAR VELOCITY 3.5 FT/SEC  
 AD. YEAR IN. ELEVATION 2530 FT  
 OVERTOPPING DISCHARGE 801 CFS  
 OVERTOPPING VELOCITY 2500 FT  
 WIND SPEED 54 MPH WIND DIR. 240 DEG

FOR PUMP-SEE SHEET NOS. 11 & 12

FOR PUMP-SEE SHEET NOS. 13 & 14

FOR PUMP-SEE SHEET NOS. 15 & 16

FOR PUMP-SEE SHEET NOS. 17 & 18

132 133 134 135 136 137 138 139 140 141 142 143 144

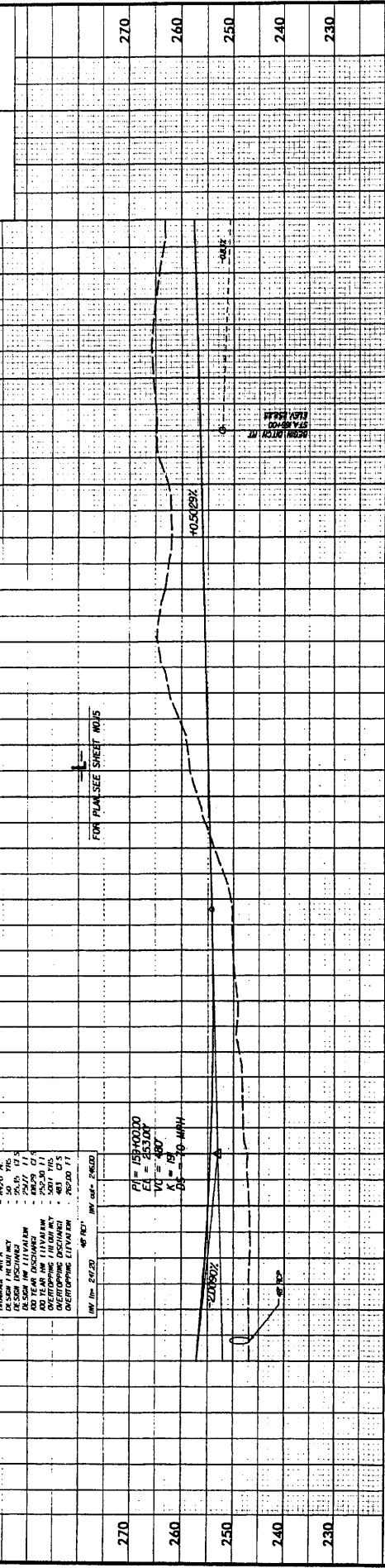
240 250 260 270 280 290

1/2/2008

PROJECT REFERENCE NO. **R-2477AA** SHEET NO. **32**  
**HYDRAULICS ENGINEER**

**KO & ASSOCIATES, P.C.**  
 Consulting Engineers  
 A Florence & Hitchcock, Inc. Company  
 5111 KENNEDY WOODWAY, SUITE 200  
 WYOMING, WY 82007

**PRELIMINARY PLANS**  
 DO NOT USE FOR CONSTRUCTION



LIMIT 12 IN BASE OF 12 PINE TREE  
 111.4' 25.00'  
 111.4' 25.00'

LIMIT 13 IN BASE OF 12 PINE TREE  
 111.4' 25.00'  
 111.4' 25.00'

**PIPE HYDRAULIC DATA**  
 DRAINAGE AREA: 3700 AC  
 DESIGN FLOW: 50 CFS  
 DESIGN DISCHARGE: 8600 CFS  
 100 YEAR HW ELEVATION: 253.00 FT  
 50 YEAR HW ELEVATION: 253.00 FT  
 OVERTOPPING DISCHARGE: 84 CFS  
 OVERTOPPING ELEVATION: 260.00 FT

**PIPE HYDRAULIC DATA**  
 DRAINAGE AREA: 3700 AC  
 DESIGN FLOW: 50 CFS  
 DESIGN DISCHARGE: 8600 CFS  
 100 YEAR HW ELEVATION: 253.00 FT  
 50 YEAR HW ELEVATION: 253.00 FT  
 OVERTOPPING DISCHARGE: 84 CFS  
 OVERTOPPING ELEVATION: 260.00 FT

**CULVERT HYDRAULIC DATA**  
 DESIGN DISCHARGE: 650 CFS  
 DESIGN FLOW: 2928 FT  
 DESIGN HW ELEVATION: 240 CFS  
 BASE DISCHARGE: 100 YRS  
 BASE HW ELEVATION: 253.2 FT  
 OVERTOPPING DISCHARGE: 1700 CFS  
 OVERTOPPING ELEVATION: 261.0 FT

**PIPE HYDRAULIC DATA**  
 DRAINAGE AREA: 3700 AC  
 DESIGN FLOW: 50 CFS  
 DESIGN DISCHARGE: 8600 CFS  
 100 YEAR HW ELEVATION: 253.00 FT  
 50 YEAR HW ELEVATION: 253.00 FT  
 OVERTOPPING DISCHARGE: 84 CFS  
 OVERTOPPING ELEVATION: 260.00 FT

**PIPE HYDRAULIC DATA**  
 DRAINAGE AREA: 3700 AC  
 DESIGN FLOW: 50 CFS  
 DESIGN DISCHARGE: 8600 CFS  
 100 YEAR HW ELEVATION: 253.00 FT  
 50 YEAR HW ELEVATION: 253.00 FT  
 OVERTOPPING DISCHARGE: 84 CFS  
 OVERTOPPING ELEVATION: 260.00 FT

**PIPE HYDRAULIC DATA**  
 DRAINAGE AREA: 3700 AC  
 DESIGN FLOW: 50 CFS  
 DESIGN DISCHARGE: 8600 CFS  
 100 YEAR HW ELEVATION: 253.00 FT  
 50 YEAR HW ELEVATION: 253.00 FT  
 OVERTOPPING DISCHARGE: 84 CFS  
 OVERTOPPING ELEVATION: 260.00 FT

**PIPE HYDRAULIC DATA**  
 DRAINAGE AREA: 3700 AC  
 DESIGN FLOW: 50 CFS  
 DESIGN DISCHARGE: 8600 CFS  
 100 YEAR HW ELEVATION: 253.00 FT  
 50 YEAR HW ELEVATION: 253.00 FT  
 OVERTOPPING DISCHARGE: 84 CFS  
 OVERTOPPING ELEVATION: 260.00 FT

**PIPE HYDRAULIC DATA**  
 DRAINAGE AREA: 3700 AC  
 DESIGN FLOW: 50 CFS  
 DESIGN DISCHARGE: 8600 CFS  
 100 YEAR HW ELEVATION: 253.00 FT  
 50 YEAR HW ELEVATION: 253.00 FT  
 OVERTOPPING DISCHARGE: 84 CFS  
 OVERTOPPING ELEVATION: 260.00 FT

**PIPE HYDRAULIC DATA**  
 DRAINAGE AREA: 3700 AC  
 DESIGN FLOW: 50 CFS  
 DESIGN DISCHARGE: 8600 CFS  
 100 YEAR HW ELEVATION: 253.00 FT  
 50 YEAR HW ELEVATION: 253.00 FT  
 OVERTOPPING DISCHARGE: 84 CFS  
 OVERTOPPING ELEVATION: 260.00 FT

**PIPE HYDRAULIC DATA**  
 DRAINAGE AREA: 3700 AC  
 DESIGN FLOW: 50 CFS  
 DESIGN DISCHARGE: 8600 CFS  
 100 YEAR HW ELEVATION: 253.00 FT  
 50 YEAR HW ELEVATION: 253.00 FT  
 OVERTOPPING DISCHARGE: 84 CFS  
 OVERTOPPING ELEVATION: 260.00 FT

**PIPE HYDRAULIC DATA**  
 DRAINAGE AREA: 3700 AC  
 DESIGN FLOW: 50 CFS  
 DESIGN DISCHARGE: 8600 CFS  
 100 YEAR HW ELEVATION: 253.00 FT  
 50 YEAR HW ELEVATION: 253.00 FT  
 OVERTOPPING DISCHARGE: 84 CFS  
 OVERTOPPING ELEVATION: 260.00 FT

**PIPE HYDRAULIC DATA**  
 DRAINAGE AREA: 3700 AC  
 DESIGN FLOW: 50 CFS  
 DESIGN DISCHARGE: 8600 CFS  
 100 YEAR HW ELEVATION: 253.00 FT  
 50 YEAR HW ELEVATION: 253.00 FT  
 OVERTOPPING DISCHARGE: 84 CFS  
 OVERTOPPING ELEVATION: 260.00 FT

**PIPE HYDRAULIC DATA**  
 DRAINAGE AREA: 3700 AC  
 DESIGN FLOW: 50 CFS  
 DESIGN DISCHARGE: 8600 CFS  
 100 YEAR HW ELEVATION: 253.00 FT  
 50 YEAR HW ELEVATION: 253.00 FT  
 OVERTOPPING DISCHARGE: 84 CFS  
 OVERTOPPING ELEVATION: 260.00 FT

**PIPE HYDRAULIC DATA**  
 DRAINAGE AREA: 3700 AC  
 DESIGN FLOW: 50 CFS  
 DESIGN DISCHARGE: 8600 CFS  
 100 YEAR HW ELEVATION: 253.00 FT  
 50 YEAR HW ELEVATION: 253.00 FT  
 OVERTOPPING DISCHARGE: 84 CFS  
 OVERTOPPING ELEVATION: 260.00 FT

**PIPE HYDRAULIC DATA**  
 DRAINAGE AREA: 3700 AC  
 DESIGN FLOW: 50 CFS  
 DESIGN DISCHARGE: 8600 CFS  
 100 YEAR HW ELEVATION: 253.00 FT  
 50 YEAR HW ELEVATION: 253.00 FT  
 OVERTOPPING DISCHARGE: 84 CFS  
 OVERTOPPING ELEVATION: 260.00 FT

FOR PLAN SEE SHEET NO. 15

FOR PLAN SEE SHEET NO. 15

FOR PLAN SEE SHEET NO. 15

FOR PLAN SEE SHEET NO. 15

FOR PLAN SEE SHEET NO. 15

FOR PLAN SEE SHEET NO. 15

FOR PLAN SEE SHEET NO. 15

FOR PLAN SEE SHEET NO. 15

FOR PLAN SEE SHEET NO. 15

FOR PLAN SEE SHEET NO. 15

FOR PLAN SEE SHEET NO. 15

FOR PLAN SEE SHEET NO. 15

FOR PLAN SEE SHEET NO. 15

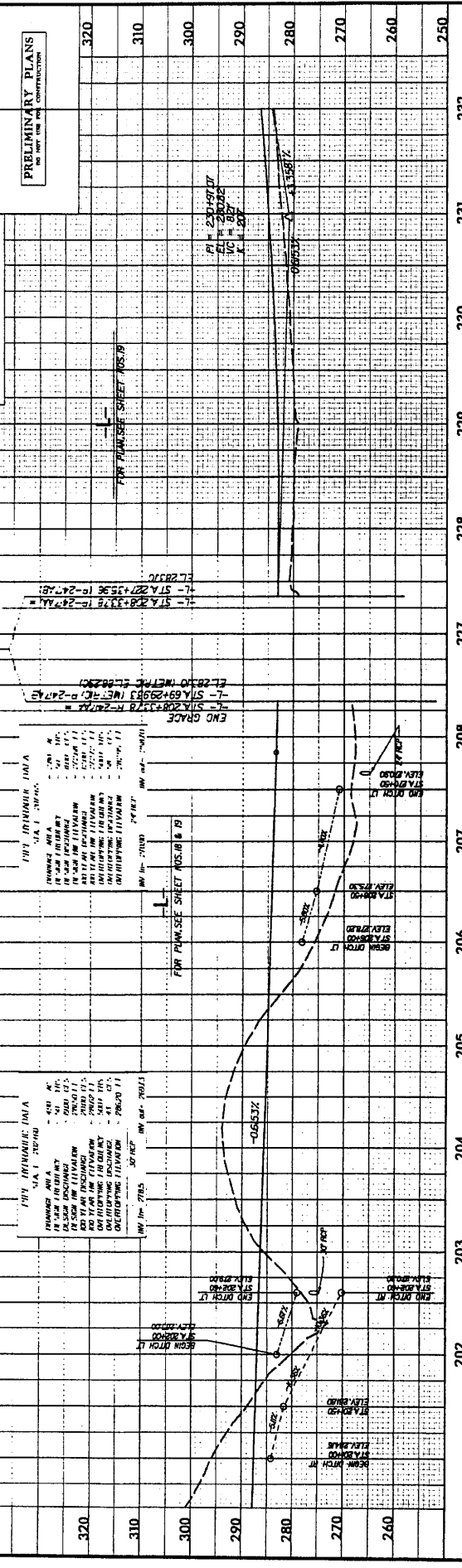




PROJECT REFERENCE NO. R-247AA  
 SHEET NO. 34  
 HYDRAULICS ENGINEER

PRELIMINARY PLANS  
 NO PART USE FOR CONSTRUCTION

KO & ASSOCIATES, P.C.  
 Consulting Engineers  
 A Florence & Hitchcock, Inc. Company  
 571 ENDRUSH BLVD., SUITE 100  
 WASHINGTON, D.C. 20007



320  
310  
300  
290  
280  
270  
260  
250

202 203 204 205 206 207 208 209 210 211 212 213 214 215 216 217 218 219 220 221 222 223 224 225 226 227 228 229 230 231 232 233 234 235 236 237 238 239 240 241 242 243 244 245 246 247 248 249 250

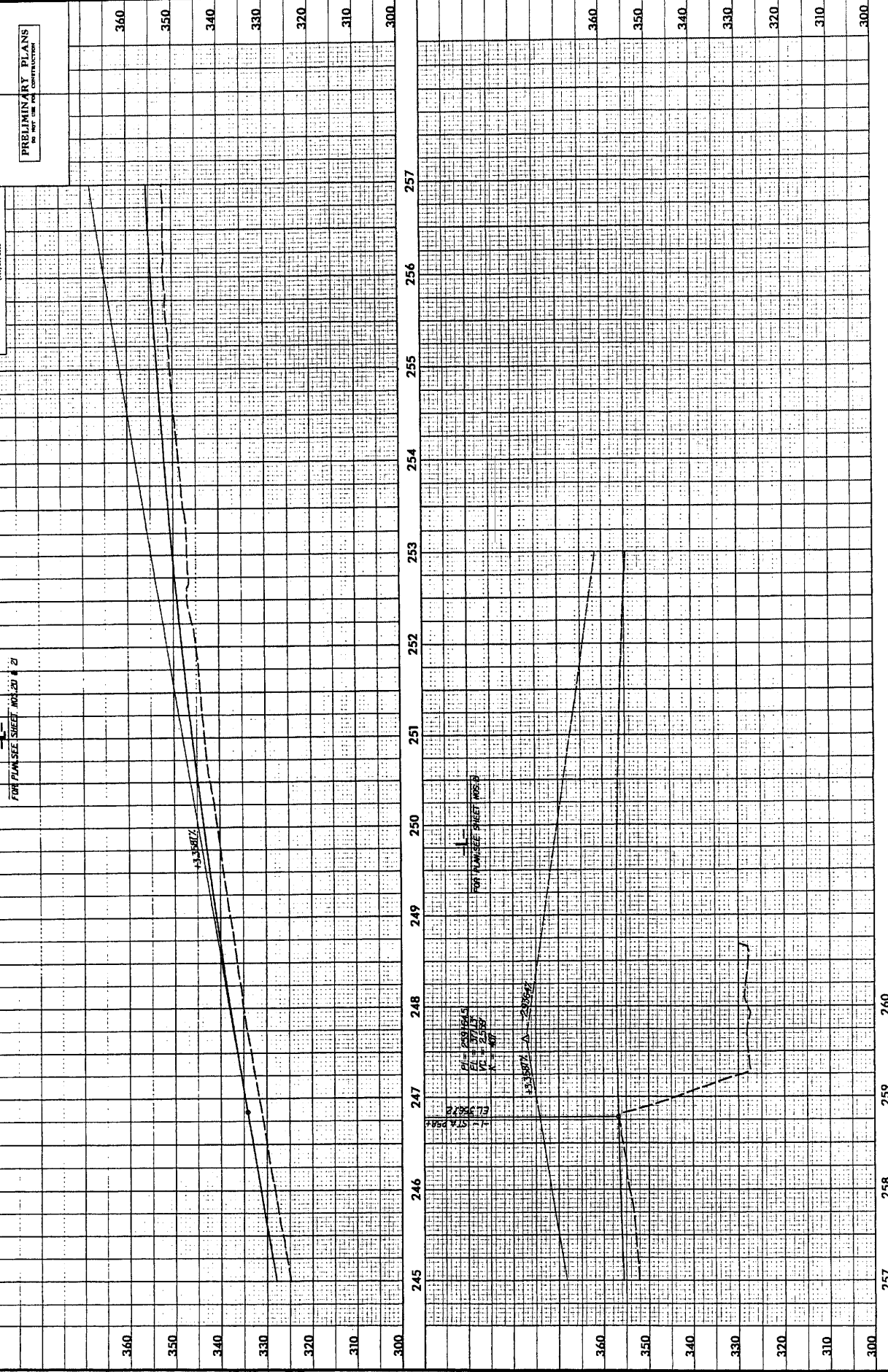
PROJECT REFERENCE NO. R-2472AA  
 ROADWAY DESIGN ENGINEER

**KO & ASSOCIATES, P.C.**  
 Consulting Engineers  
 A Pierce & Hitchcock, Inc. Company  
 5111 RICHMOND HWY. SUITE 1000 BALTIMORE, MD 21286



PRELIMINARY PLANS  
 NOT FOR CONSTRUCTION

SHEET NO. 35



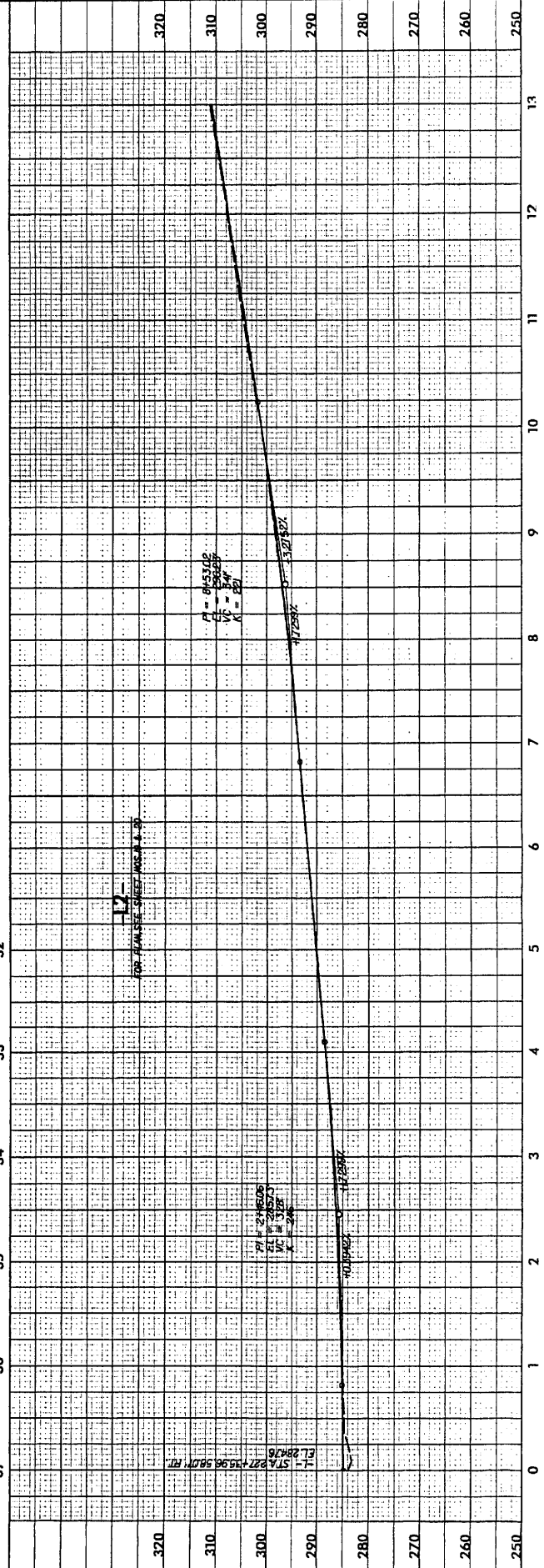
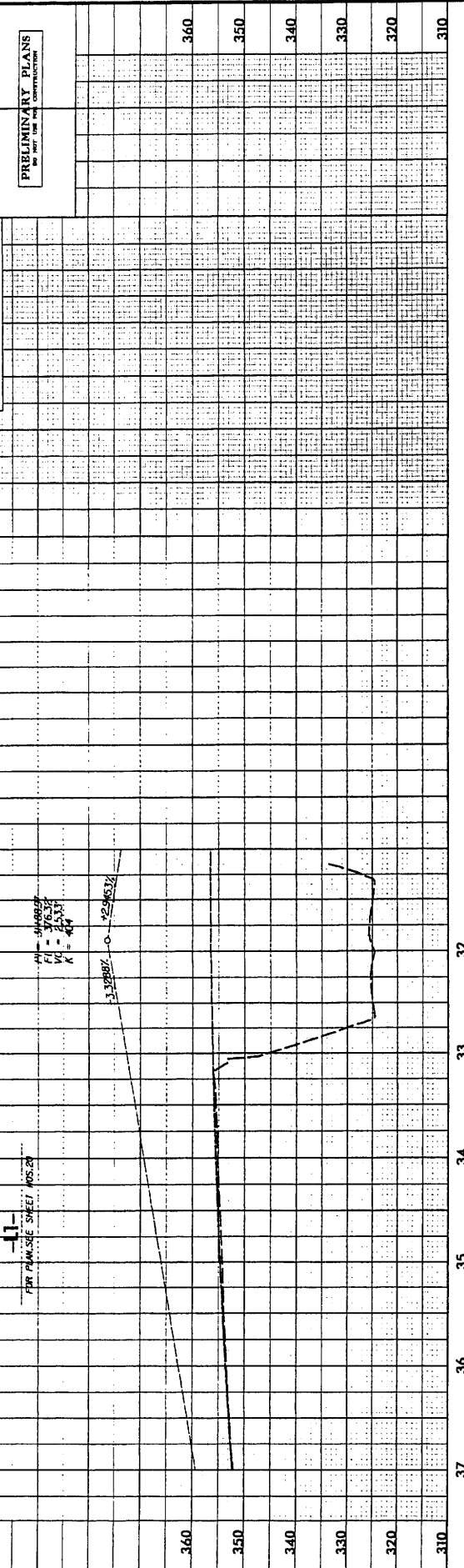


PROJECT REFERENCE NO. R-247AA  
 ROADWAY DESIGN  
 HYDRAULICS  
 DIVISION

SHEET NO. 37

PRELIMINARY PLANS  
 NOT FOR USE FOR CONSTRUCTION

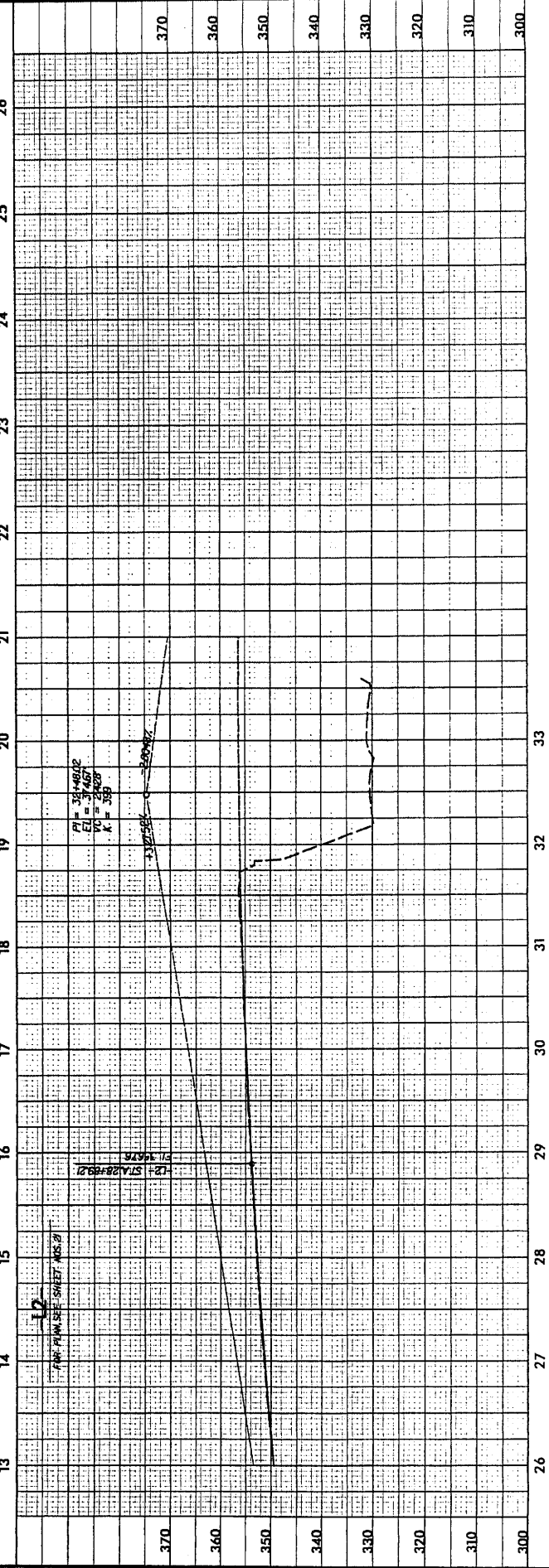
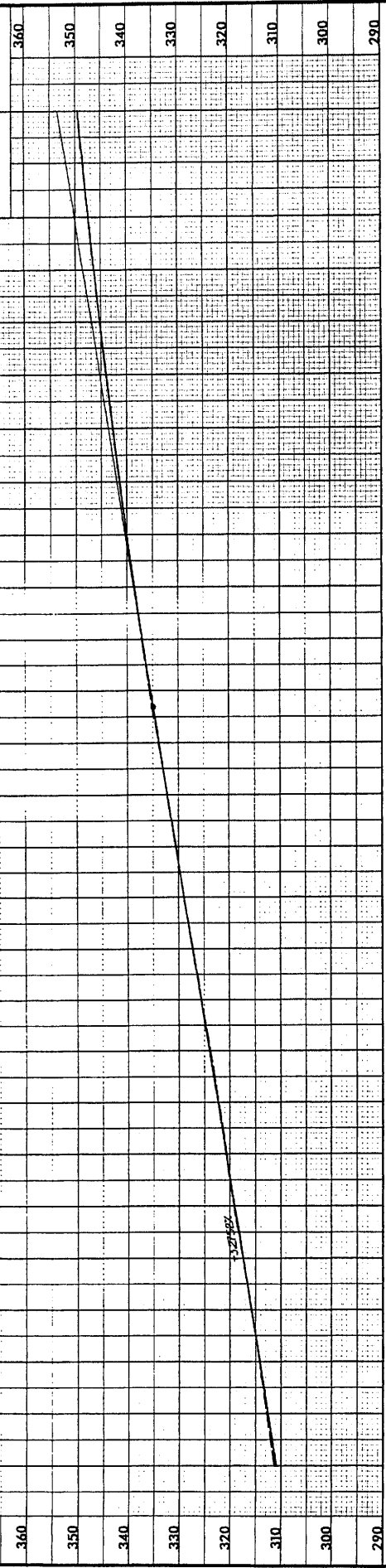
KO & ASSOCIATES, P.C.  
 A Professional Consulting Engineers  
 & Architects, Inc. Company  
 5111 LINDEN BLVD., SUITE 100  
 DALLAS, TEXAS 75241



PROJECT REFERENCE NO. **R-277/01**  
 SHEET NO. **38**  
 PROFESSIONAL ENGINEER  
 PRELIMINARY PLANS  
 DO NOT USE FOR CONSTRUCTION

**KO & ASSOCIATES, P.C.**  
 Consulting Engineers  
 A Fluor & Hatchinson, Inc. Company  
 5171 LINDROD WAY, SUITE 100 FALLS CHURCH, N.C. 27647  
 (919) 551-8888

**-12-**  
 FOR PLAN SEE SHEET NOS. 20 & 21

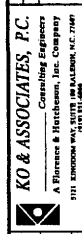


$P1 = 15+46.02$   
 $EL = 374.67$   
 $VC = 28.00$   
 $L = 56.00$

$P1 = 28+76.00$   
 $EL = 354.76$   
 $L2 = 57.42$   
 $L1 = 28.58$

**-12-**  
 FOR PLAN SEE SHEET NOS. 21

PROJECT REFERENCE NO. R-247AA  
 SHEET NO. 39  
 HIGHWAY DESIGN ENGINEER  
 PROVAJACKS ENGINEER



**KO & ASSOCIATES, P.C.**  
 A Purcell & Hutchinson, Inc. Company  
 111 E. BROADWAY, SUITE 1000  
 NEW YORK, N.Y. 10038

**PRELIMINARY PLANS**  
 FOR THE NEW BRIDGE

**PIPE HYDRAULIC DATA**  
 STA. 195+00 TO 205+00  
 DRAINAGE AREA = 2500 AC  
 DESIGN FREQUENCY = 50 YRS  
 DESIGN INLET ELEVATION = 216.89 FT  
 ROAD YEAR DISCHARGE = 70 CFS  
 DESIGN PIPE DIAMETER = 30" Ø  
 OVERFLOWING FREQUENCY = 200 YRS  
 OVERFLOWING DISCHARGE = 67 CFS  
 OVERFLOWING ELEVATION = 218.86 FT

**PIPE HYDRAULIC DATA**  
 STA. 195+00 TO 205+00  
 DRAINAGE AREA = 2500 AC  
 DESIGN FREQUENCY = 50 YRS  
 DESIGN INLET ELEVATION = 216.89 FT  
 ROAD YEAR DISCHARGE = 70 CFS  
 DESIGN PIPE DIAMETER = 30" Ø  
 OVERFLOWING FREQUENCY = 200 YRS  
 OVERFLOWING DISCHARGE = 67 CFS  
 OVERFLOWING ELEVATION = 218.86 FT

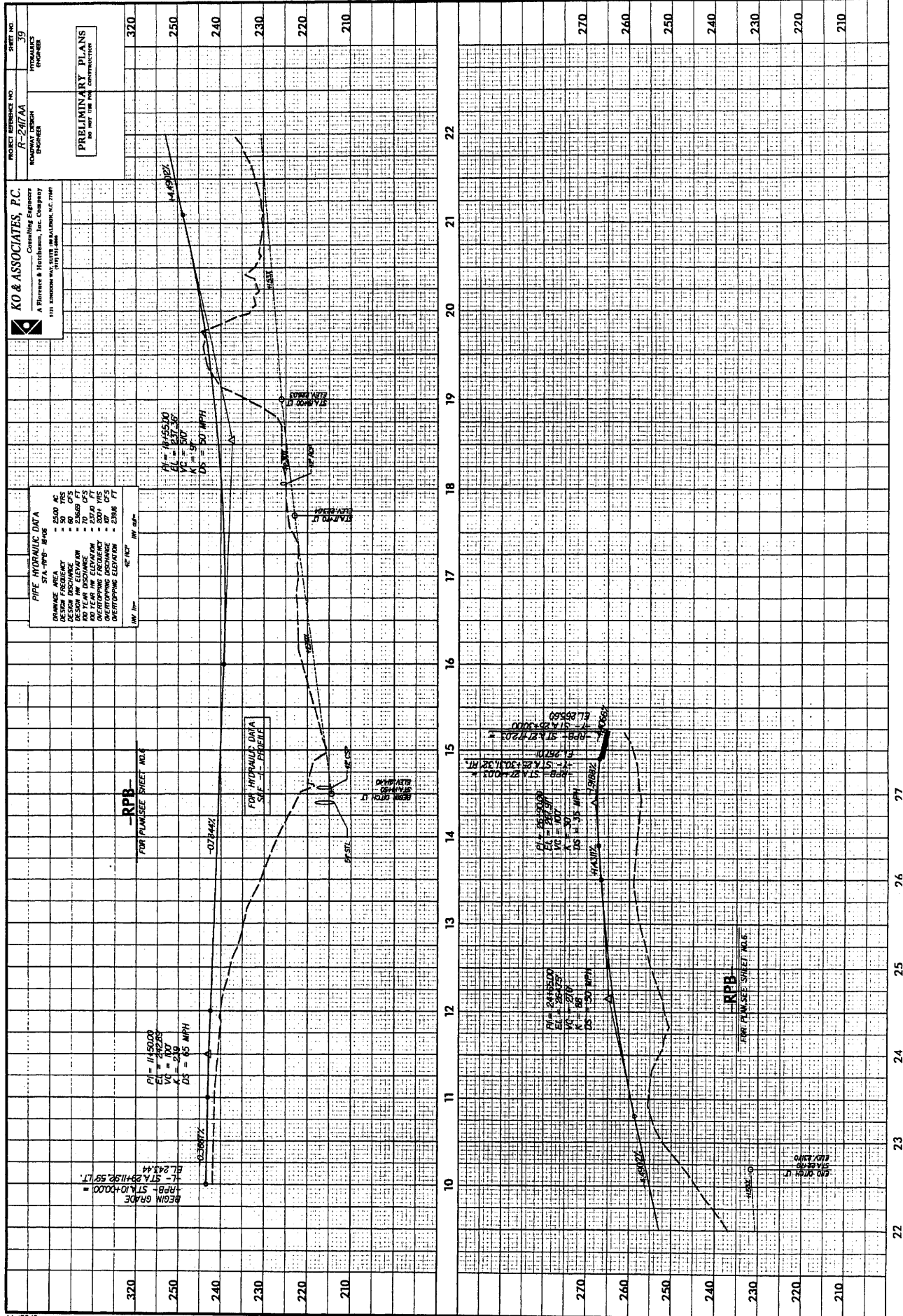
PI = 11+500.00  
 VI = 407  
 K = 240  
 DS = 65 MPH

BEIN GRADE  
 RPB STA 10+00.00 =  
 STA 29+11.92 59' LT.  
 EL. 243.44

**-RPB-**  
 FOR PLANS SEE SHEET NO. 3

FOR HYDRAULIC DATA  
 SEE SHEET NO. 3

**RPB**  
 FOR PLANS SEE SHEET NO. 6



65/82/5

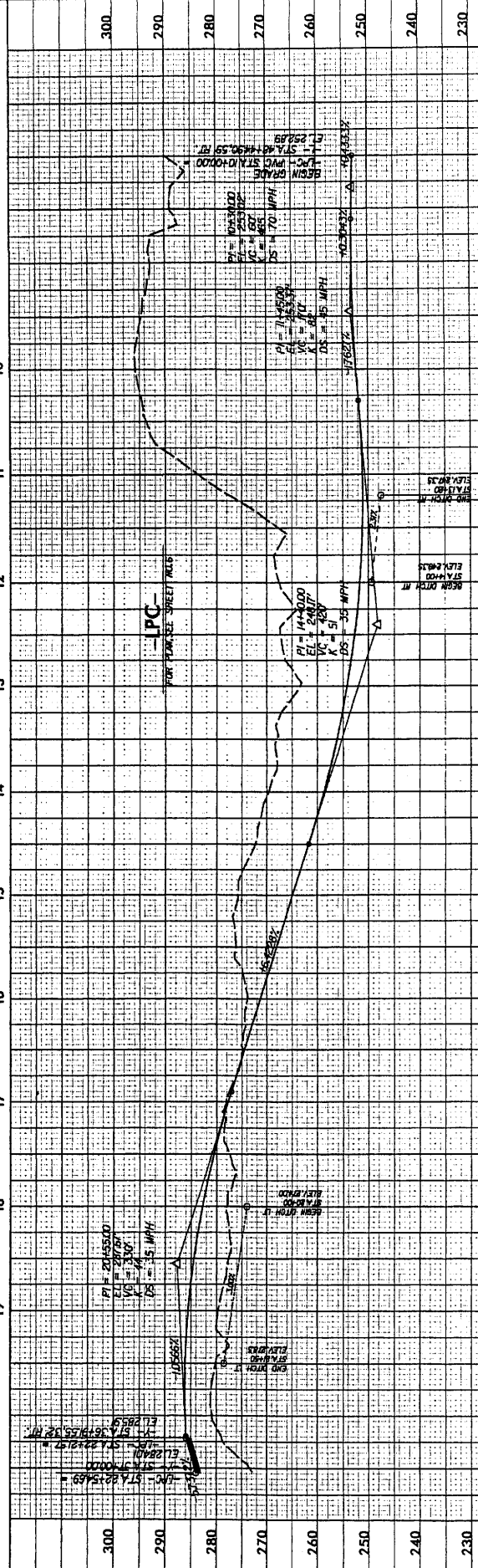
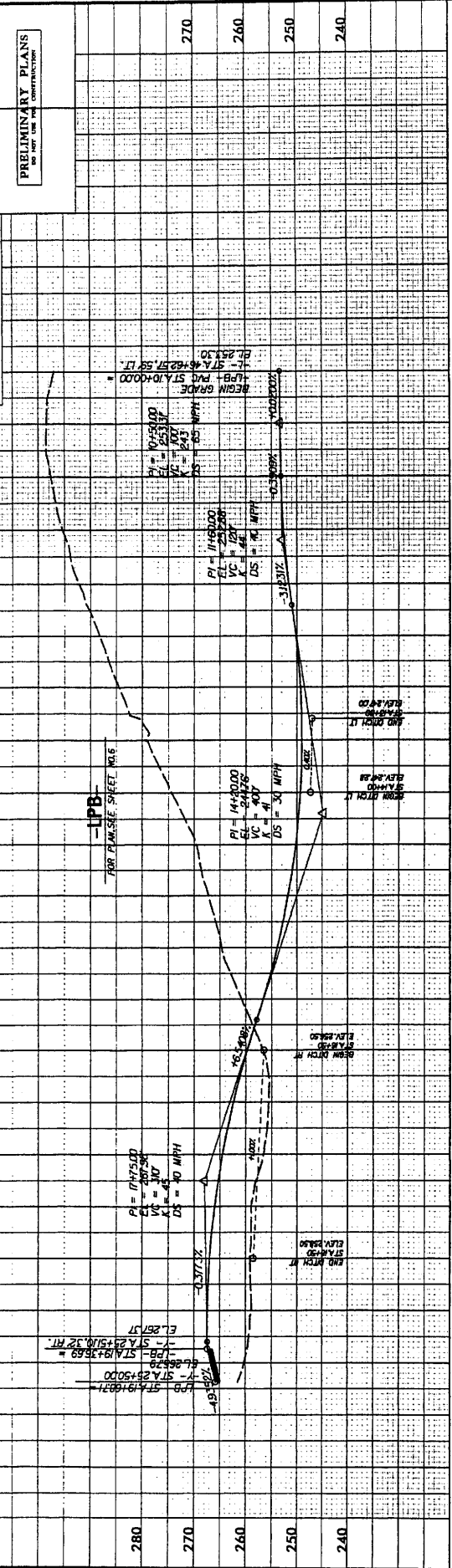
6002/6/1



PROJECT REFERENCE NO. R-2417AA  
 SHEET NO. 41  
 PROPOSED  
 HIGHWAY DESIGN  
 DRAWING

**KO & ASSOCIATES, P.C.**  
 Consulting Engineers  
 1111 S. UNIVERSITY AVENUE, SUITE 100  
 TAMPA, FLORIDA 33606  
 (813) 288-1000

**PRELIMINARY PLANS**  
 DO NOT USE FOR CONSTRUCTION



280  
270  
260  
250  
240  
230

300  
290  
280  
270  
260  
250  
240  
230

10 11 12 13 14 15 16 17 18 19 20 21 22



PROJECT REFERENCE NO. R-2417AA  
 ROADWAY DESIGN  
 HYDRAULICS  
 SHEET NO. 42

**KO & ASSOCIATES, P.C.**  
 Consulting Engineers  
 A Florence & Harborside, Inc. Company  
 321 KENNEDY PARKWAY  
 RICHMOND, VA 23134

**PRELIMINARY PLANS**  
 DO NOT USE FOR CONSTRUCTION

FOR PLANSHEET SHEETS 403 & 404

PI = 15125.00  
 EI = 274.46  
 VI = 2.50  
 K = 256  
 DS = TO MH

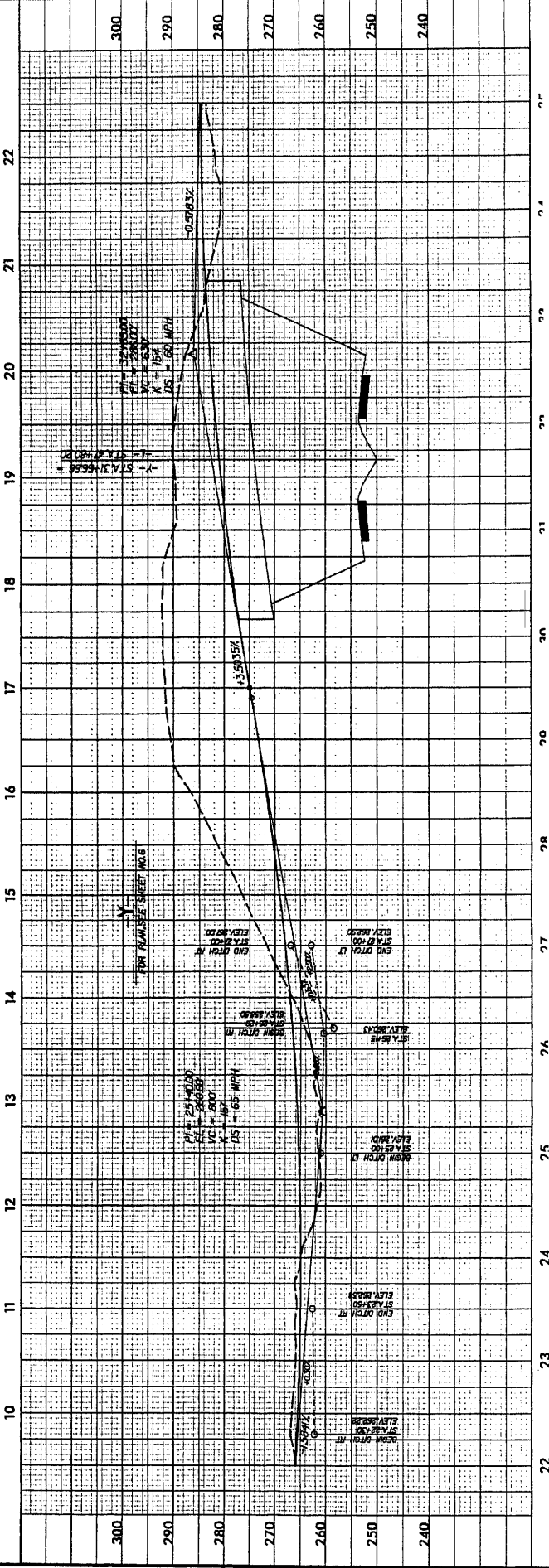
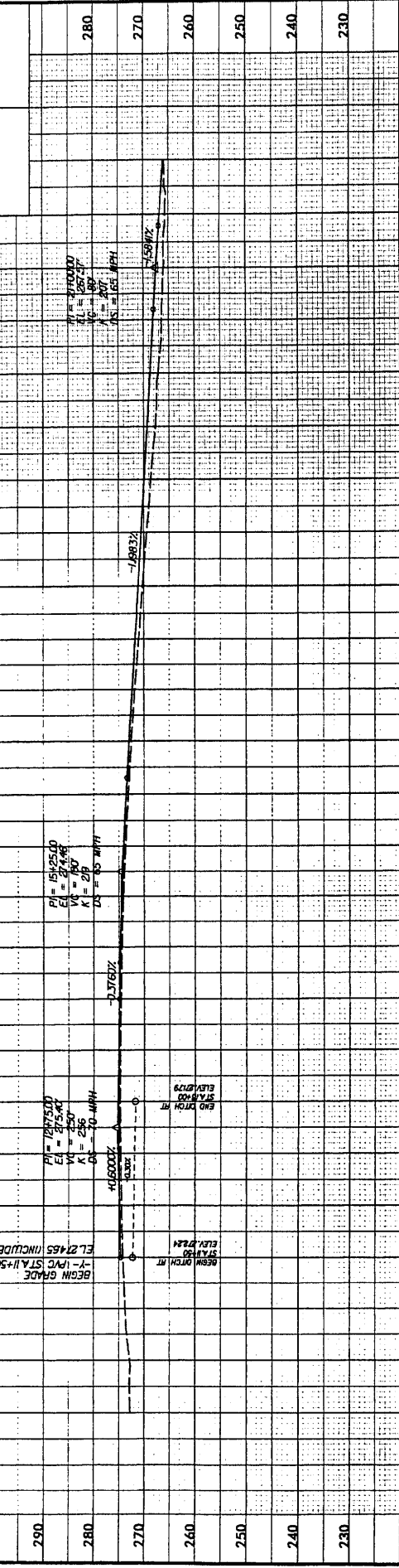
PI = 27100.00  
 EI = 257.27  
 VI = 2.50  
 K = 257  
 DS = 1.62 MPH

PI = 25400.00  
 EI = 240.00  
 VI = 2.50  
 K = 257  
 DS = 1.62 MPH

PI = 25400.00  
 EI = 240.00  
 VI = 2.50  
 K = 257  
 DS = 1.62 MPH

PI = 25400.00  
 EI = 240.00  
 VI = 2.50  
 K = 257  
 DS = 1.62 MPH

PI = 25400.00  
 EI = 240.00  
 VI = 2.50  
 K = 257  
 DS = 1.62 MPH



PROJECT REFERENCE NO. R-247AA  
 SHEET NO. 43  
 HYDRAULICS  
 ROUTINE DESIGN  
 DRAWING

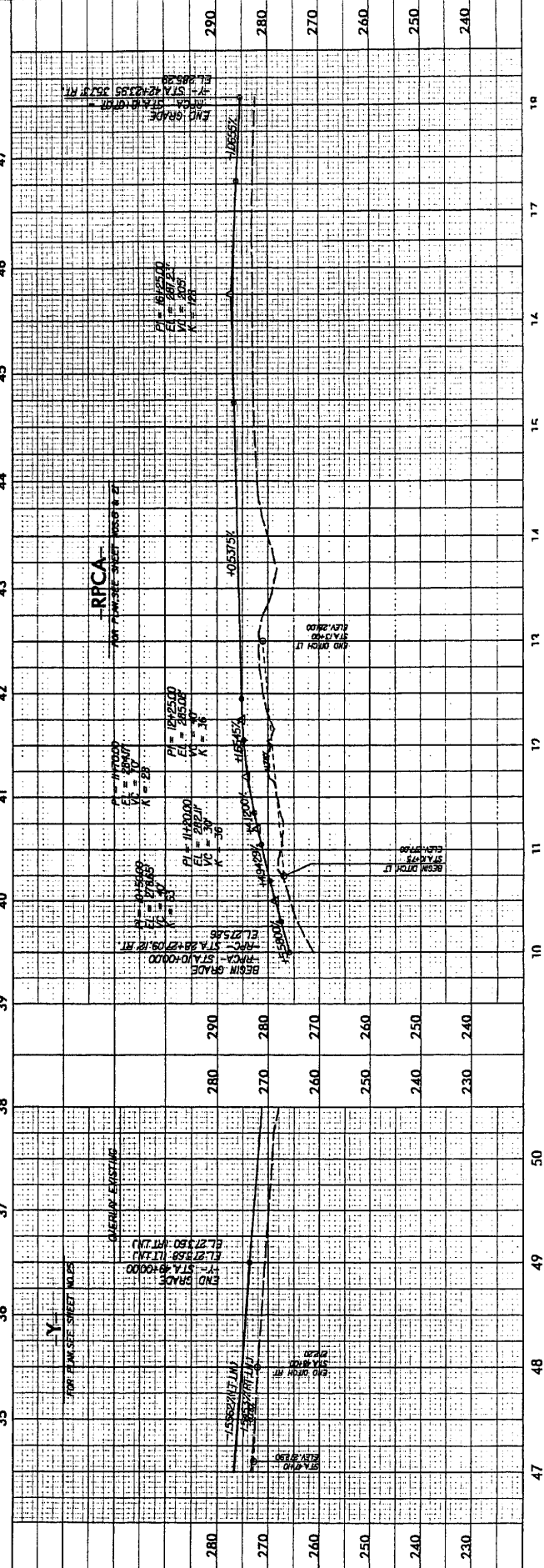
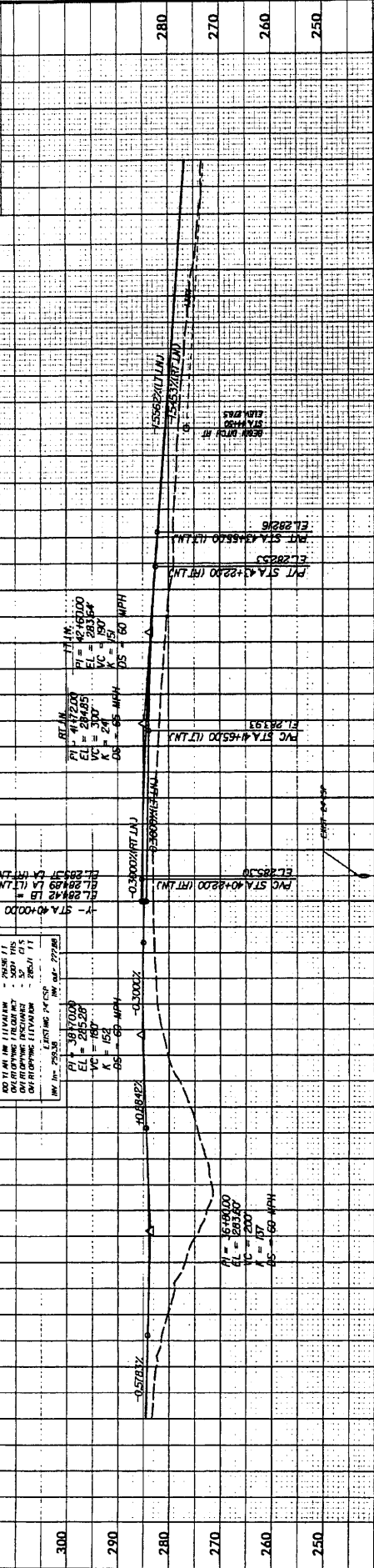
**KO & ASSOCIATES, P.C.**  
 Consulting Engineers  
 A Professional Corporation  
 5111 LINDSEY BLVD., SUITE 200  
 FORT WORTH, TEXAS 76105

**PRELIMINARY PLANS**  
 DO NOT USE FOR CONSTRUCTION

PROPERTY INFORMATION DATA

PROPERTY	VALUE
OWNER	STATE OF TEXAS
PROJECT	STATE HIGHWAY 114
SECTION	FROM STA 40+00 TO STA 47+00
DATE	NOVEMBER 2009
SCALE	AS SHOWN
DESIGNER	KO & ASSOCIATES, P.C.
CHECKER	[Signature]
DATE OF DESIGN	NOVEMBER 2009
DATE OF CHECK	NOVEMBER 2009
DATE OF APPROVAL	NOVEMBER 2009
DATE OF RECORD	NOVEMBER 2009
DATE OF AS-BUILT	NOVEMBER 2009
DATE OF FINAL	NOVEMBER 2009
DATE OF CLOSURE	NOVEMBER 2009
DATE OF REMOVAL	NOVEMBER 2009
DATE OF RECONSTRUCTION	NOVEMBER 2009
DATE OF REPAIR	NOVEMBER 2009
DATE OF MAINTENANCE	NOVEMBER 2009
DATE OF INSPECTION	NOVEMBER 2009
DATE OF SURVEY	NOVEMBER 2009
DATE OF PHOTOGRAPHY	NOVEMBER 2009
DATE OF VIDEOGRAPHY	NOVEMBER 2009
DATE OF GROUND PENETRATING RADAR	NOVEMBER 2009
DATE OF THERMOGRAPHY	NOVEMBER 2009
DATE OF ULTRASONIC TESTING	NOVEMBER 2009
DATE OF MOISTURE MEASUREMENT	NOVEMBER 2009
DATE OF TEMPERATURE MEASUREMENT	NOVEMBER 2009
DATE OF SOUNDING	NOVEMBER 2009
DATE OF SCOUR MEASUREMENT	NOVEMBER 2009
DATE OF CHANNEL MEASUREMENT	NOVEMBER 2009
DATE OF VELOCITY MEASUREMENT	NOVEMBER 2009
DATE OF SEDIMENT MEASUREMENT	NOVEMBER 2009
DATE OF WATER QUALITY MEASUREMENT	NOVEMBER 2009
DATE OF FISH AND WILDLIFE SURVEY	NOVEMBER 2009
DATE OF HISTORIC ARCHITECTURE SURVEY	NOVEMBER 2009
DATE OF CULTURAL RESOURCE SURVEY	NOVEMBER 2009
DATE OF PALEONTOLOGICAL SURVEY	NOVEMBER 2009
DATE OF ARCHAEOLOGICAL SURVEY	NOVEMBER 2009
DATE OF GEOLOGICAL SURVEY	NOVEMBER 2009
DATE OF SOIL MEASUREMENT	NOVEMBER 2009
DATE OF ROCK MEASUREMENT	NOVEMBER 2009
DATE OF VEGETATION SURVEY	NOVEMBER 2009
DATE OF AIR QUALITY MEASUREMENT	NOVEMBER 2009
DATE OF NOISE MEASUREMENT	NOVEMBER 2009
DATE OF VIBRATION MEASUREMENT	NOVEMBER 2009
DATE OF ELECTROMAGNETIC INTERFERENCE SURVEY	NOVEMBER 2009
DATE OF RADIATION MEASUREMENT	NOVEMBER 2009
DATE OF CLIMATE MEASUREMENT	NOVEMBER 2009
DATE OF HYDROLOGICAL SURVEY	NOVEMBER 2009
DATE OF HYDROLOGIC MODELING	NOVEMBER 2009
DATE OF HYDROLOGIC DATA COLLECTION	NOVEMBER 2009
DATE OF HYDROLOGIC DATA ANALYSIS	NOVEMBER 2009
DATE OF HYDROLOGIC DATA INTERPRETATION	NOVEMBER 2009
DATE OF HYDROLOGIC DATA PRESENTATION	NOVEMBER 2009
DATE OF HYDROLOGIC DATA ARCHIVING	NOVEMBER 2009
DATE OF HYDROLOGIC DATA RESTORATION	NOVEMBER 2009
DATE OF HYDROLOGIC DATA PRESERVATION	NOVEMBER 2009
DATE OF HYDROLOGIC DATA RECOVERY	NOVEMBER 2009
DATE OF HYDROLOGIC DATA REUSE	NOVEMBER 2009
DATE OF HYDROLOGIC DATA DISSEMINATION	NOVEMBER 2009
DATE OF HYDROLOGIC DATA EVALUATION	NOVEMBER 2009
DATE OF HYDROLOGIC DATA IMPROVEMENT	NOVEMBER 2009
DATE OF HYDROLOGIC DATA PROTECTION	NOVEMBER 2009
DATE OF HYDROLOGIC DATA SECURITY	NOVEMBER 2009
DATE OF HYDROLOGIC DATA PRIVACY	NOVEMBER 2009
DATE OF HYDROLOGIC DATA ACCESSIBILITY	NOVEMBER 2009
DATE OF HYDROLOGIC DATA INTEROPERABILITY	NOVEMBER 2009
DATE OF HYDROLOGIC DATA REUSABILITY	NOVEMBER 2009
DATE OF HYDROLOGIC DATA DURABILITY	NOVEMBER 2009
DATE OF HYDROLOGIC DATA RELIABILITY	NOVEMBER 2009
DATE OF HYDROLOGIC DATA VALIDITY	NOVEMBER 2009
DATE OF HYDROLOGIC DATA ACCURACY	NOVEMBER 2009
DATE OF HYDROLOGIC DATA COMPLETENESS	NOVEMBER 2009
DATE OF HYDROLOGIC DATA TIMELINESS	NOVEMBER 2009
DATE OF HYDROLOGIC DATA AVAILABILITY	NOVEMBER 2009
DATE OF HYDROLOGIC DATA USABILITY	NOVEMBER 2009
DATE OF HYDROLOGIC DATA UNDERSTANDABILITY	NOVEMBER 2009
DATE OF HYDROLOGIC DATA CREDIBILITY	NOVEMBER 2009
DATE OF HYDROLOGIC DATA CONFIDENCE	NOVEMBER 2009
DATE OF HYDROLOGIC DATA TRUSTWORTHINESS	NOVEMBER 2009
DATE OF HYDROLOGIC DATA INTEGRITY	NOVEMBER 2009
DATE OF HYDROLOGIC DATA AUTHORITY	NOVEMBER 2009
DATE OF HYDROLOGIC DATA RESPONSIBILITY	NOVEMBER 2009
DATE OF HYDROLOGIC DATA ACCOUNTABILITY	NOVEMBER 2009
DATE OF HYDROLOGIC DATA TRANSPARENCY	NOVEMBER 2009
DATE OF HYDROLOGIC DATA OPENNESS	NOVEMBER 2009
DATE OF HYDROLOGIC DATA HONESTY	NOVEMBER 2009
DATE OF HYDROLOGIC DATA FAIRNESS	NOVEMBER 2009
DATE OF HYDROLOGIC DATA EQUITY	NOVEMBER 2009
DATE OF HYDROLOGIC DATA JUSTICE	NOVEMBER 2009
DATE OF HYDROLOGIC DATA MORALITY	NOVEMBER 2009
DATE OF HYDROLOGIC DATA ETHICS	NOVEMBER 2009
DATE OF HYDROLOGIC DATA INTEGRITY	NOVEMBER 2009
DATE OF HYDROLOGIC DATA HONESTY	NOVEMBER 2009
DATE OF HYDROLOGIC DATA FAIRNESS	NOVEMBER 2009
DATE OF HYDROLOGIC DATA EQUITY	NOVEMBER 2009
DATE OF HYDROLOGIC DATA JUSTICE	NOVEMBER 2009
DATE OF HYDROLOGIC DATA MORALITY	NOVEMBER 2009
DATE OF HYDROLOGIC DATA ETHICS	NOVEMBER 2009

FOR PLANS SEE SHEET NOS. 4 & 35



PROJECT REFERENCE NO.  
R-247AA

PROJECT  
ROADWAY  
CONTRACT  
NO. 007 USE FOR  
CONTRACTORS

PROJECT NO.  
44

PROFESSIONAL  
ENGINEER

**KO & ASSOCIATES, P.C.**  
A FLORENCE & FULTON COMPANY  
101 FLORENCEVILLE ROAD, SUITE 100, FLORENCE, SC 29502  
(803) 781-2200

**PRELIMINARY PLANS**  
DO NOT USE FOR  
CONSTRUCTION

**-YIRPB-**  
FOR PLAN SEE SHEET NOS. 20, 21 & 22

$PV = 645740$   
 $L = 341.57$   
 $VC = 7.40$

$(+128087) - 0 - (-111337)$

$PV = 115007$   
 $L = 40$

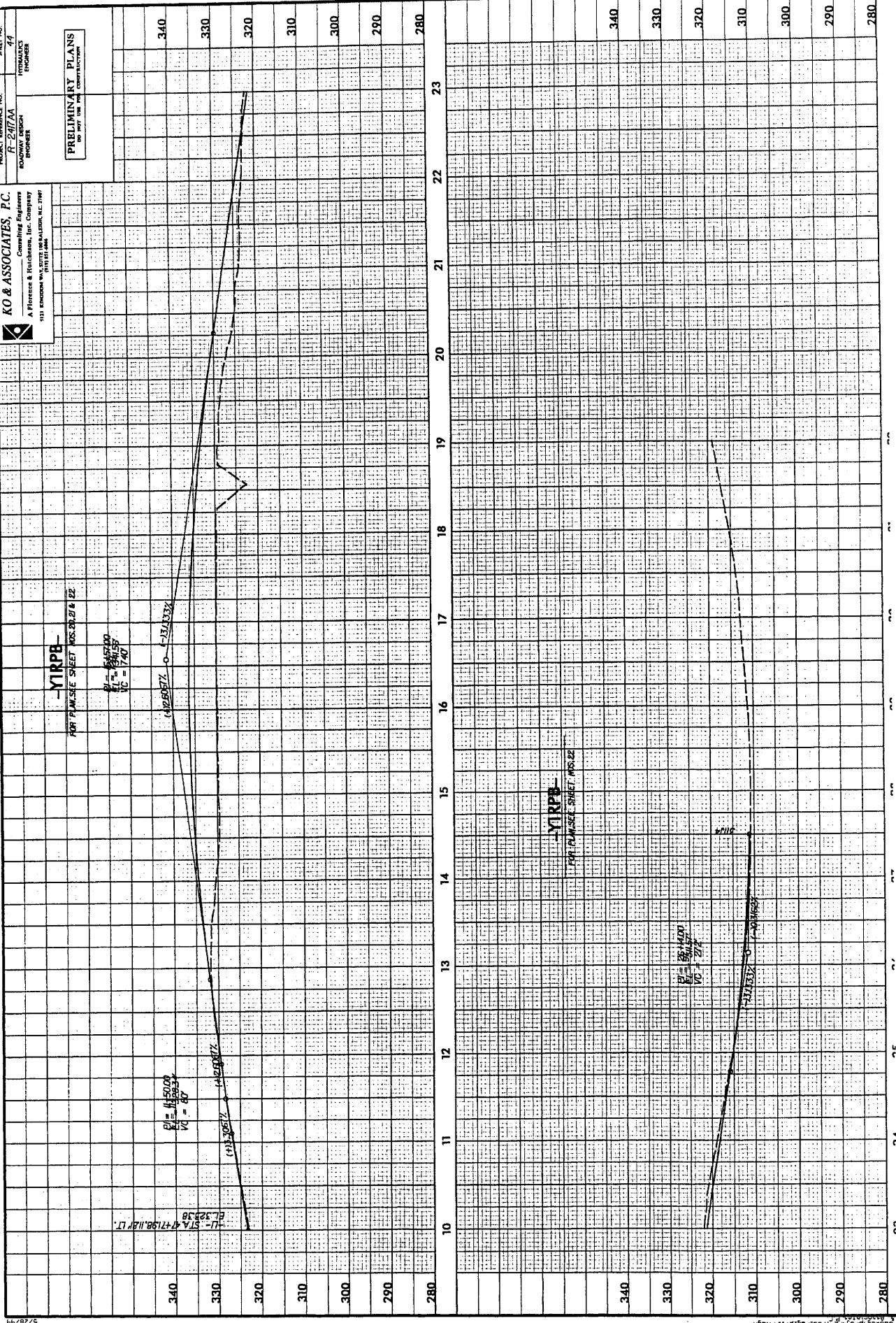
$(+13067) - 0 - (-12607)$

**-YIRPB-**  
FOR PLAN SEE SHEET NOS. 22

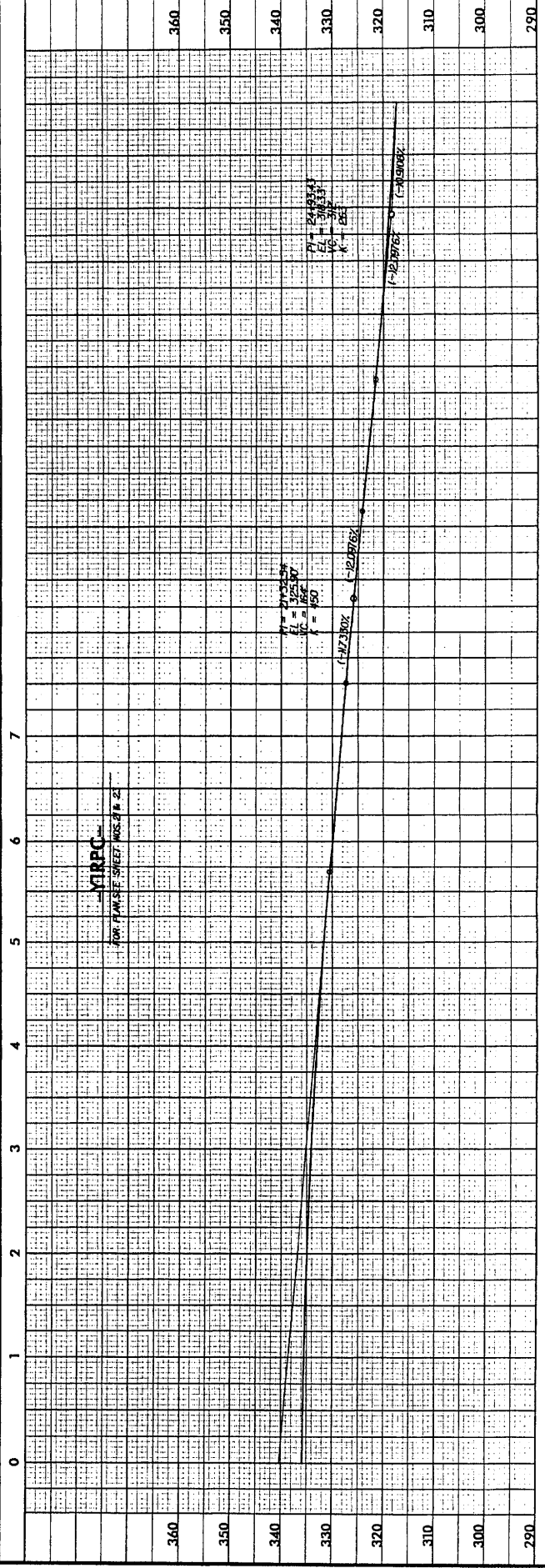
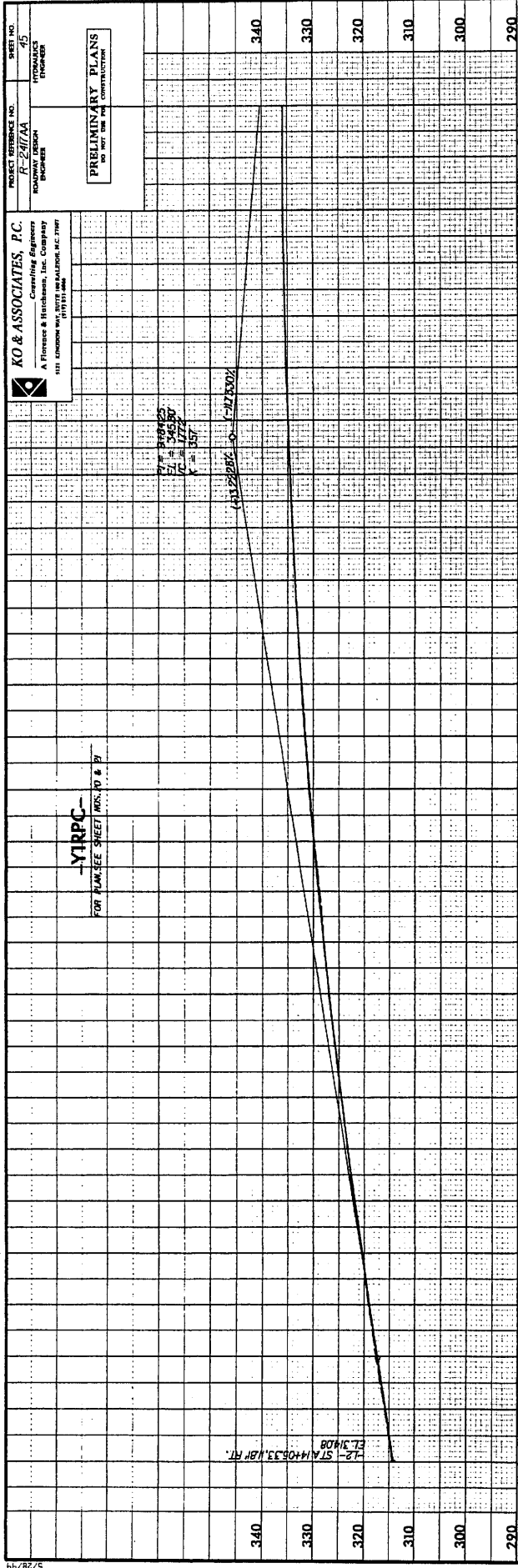
$PV = 186140$   
 $L = 27$   
 $VO = 27$

$(+1183) - 0 - (-10362)$

STATIONING  
ST. 47198.118 FT.





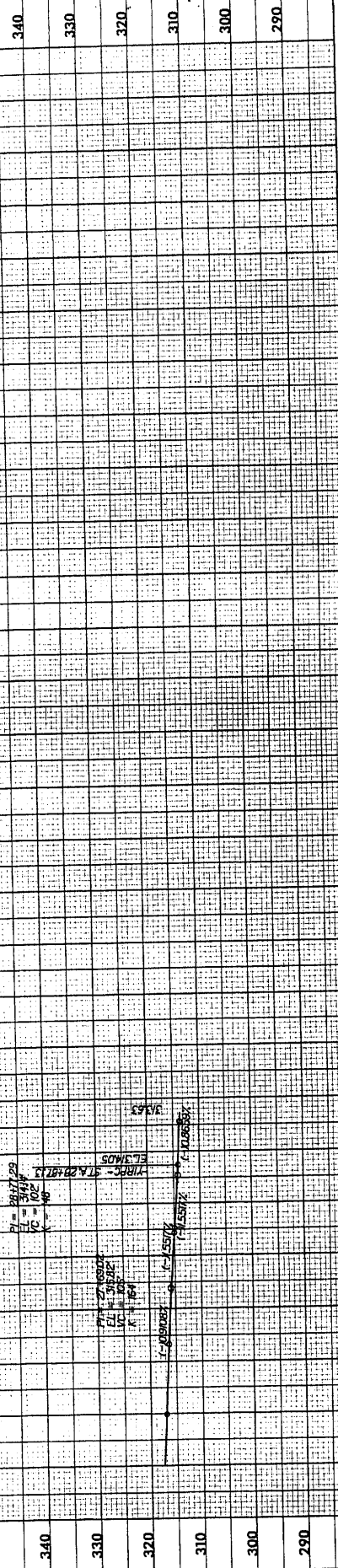


PROJECT REFERENCE NO. R-2017AA  
 ROADWAY DESIGN  
 SHEET NO. 46

**KO & ASSOCIATES, P.C.**  
 Consulting Engineers  
 A Florence & Hirschman, Inc. Company  
 111 KENNEDY BLVD., SUITE 200  
 FARMINGDALE, N.Y. 11735

PRELIMINARY PLANS  
 DO NOT USE FOR CONSTRUCTION

**YINPC**  
 FOR PLANS SET SHEET MS.23







North Carolina Department of Environment and Natural Resources

Beverly Eaves Perdue, Governor

Dee Freeman, Secretary

April 1, 2010

Dr. Greg Thorpe, PhD., Manager  
Project Development and Environmental Analysis Branch  
North Carolina Department of Transportation  
1548 Mail Service Center  
Raleigh, North Carolina, 27699-1548

**Subject: Seventh Modification to the 401 Water Quality Certification Pursuant to Section 401 of the Federal Clean Water Act with ADDITIONAL CONDITIONS for the US 421/NC 87 (Sanford Bypass) from East of NC 42 to NC 87 near SR 1138 in Lee County, Federal Aid Project No. STPNHF-421(2), State Project No. 8.T540402, TIP R-2417AA, DWQ Project No. 00-1432**

Dear Dr. Thorpe:

Attached hereto is a modification of Certification No. 3378 issued to The North Carolina Department of Transportation (NCDOT) and dated April 10, 2002. This modification is being issued to correct the TIP project number from R-2417C to R-2471AA. No other modifications are being made to this certification.

**All authorized activities and conditions of the original Water Quality Certification *modification* (dated September 15, 2009), and all other previous and subsequent modifications still apply except where superseded by this certification.**

If we can be of further assistance, please do not hesitate to contact Polly Lespinasse at (704) 663-1699.

Sincerely,

for Coleen H. Sullins  
Director

Attachments

cc: Kimberly Garvey, US Army Corps of Engineers, Wilmington Office  
David Wainwright, NCDWQ Transportation Permitting Unit  
Greg Price, NCDOT PDEA  
Sonia Gregory, NCDWQ Transportation Permitting Unit  
File Copy

Price  
**RECEIVED**  
APR 13 2010  
DIVISION OF HIGHWAYS  
OFFICE OF NATURAL ENVIRONMENT

**Modification to the 401 Water Quality Certification Pursuant to Section 401 of the Federal Clean Water Act with ADDITIONAL CONDITIONS**

**THIS CERTIFICATION** is issued in conformity with the requirements of Section 401 Public Laws 92-500 and 95-217 of the United States and subject to the North Carolina Division of Water Quality (DWQ) Regulations in 15 NCAC 2H .0500. This certification authorizes the NCDOT to **additionally** impact 3,248 linear feet of jurisdictional streams, 1.59 acres of jurisdictional wetlands, and 0.66 acres of surface waters in Lee County as listed below. The project shall be constructed pursuant to the modification received August 7, 2009. The authorized impacts are as described below:

**Stream Impacts in the Cape Fear River Basin**

Permit Site No. and Station No. /Stream Name	Permanent Fill in Intermittent Stream (linear ft)	Temporary Fill in Intermittent Stream (linear ft)	Permanent Fill in Perennial Stream (linear ft)	Temporary Fill in Perennial Stream (linear ft)	Total Stream Impact (linear feet)	Stream Impacts Requiring Mitigation (linear ft)
Site #1, Station No. 23+32(RT)/Patterson Creek			10	20	30	0
Site #2a, Station No. 33+00/33+65(LT)/UT to Patterson Creek	816	14			830	0
Site #2b, Station No. 33+00/33+65(RT)/UT to Patterson Creek			274	15	289	274
Site #4, Station No. 52+08(LT/RT) and 63+00(RT)/Big Buffalo Creek			44	57	101	0
Site #5, Station No. 87+90 (LT/RT)/UT to Big Buffalo Creek			295	47	342	295
Site #6, Station No. 120+20(LT)/UT to Buffalo Creek	140	55			195	0
Site #6, Station No. 120+57(LT/RT)/UT to Buffalo Creek			320	83	403	320
Site #7, Station No. 142+67(LT/RT)/UT to Big Buffalo Creek	351	66			417	0
Site #9, Station No. 177+29(LT/RT)/UT to Big Buffalo Creek			425	60	485	425
Site #9, Station No. 178+82(LT)/UT to Big Buffalo Creek	80	30			110	0
Site #10, Station No. 195+65(RT)/UT to Big Buffalo Creek	16	30			46	0

UT = Unnamed Tributary

**Total Stream Impacts for Project: 3,248 linear feet  
Total Stream Impacts Requiring Mitigation: 1,314 linear feet**

**Riverine and Non-Riverine Wetland Impacts in the Cape Fear River Basin**

Permit Site No./Station No.	Wetland Type (Riverine or Non-Riverine)	Permanent Fill (acres)	Excavation (acres)	Mechanized Clearing (acres)	Hand Clearing (acres)	Total Acres
Site #1, Station No. 22+30/26+80(LT)	Riverine	0.02	0.01	0.02		0.05
Site #2, Station No. 33+00/33+65(LT)	Riverine	0.16	0.21	0.05		0.42
Site #3, Station No. 35+20/36+30(RT)	Riverine	0.11		0.01		0.12
Site #8, Station No. 153+50/160+00(RT)	Riverine	0.73	0.01	0.08		0.82
Site #9, Station No. 177+29(LT/RT)	Riverine	0.12	0.03	0.03		0.18

Total Riverine Wetland Impacts for Project: 1.59 acres  
Total Riverine Wetland Impacts Requiring Mitigation: 1.59 acres

### Open Water (Ponds) Impacts in the Cape Fear River Basin

Permit Site No./ Station No.	Permanent Fill in Open Waters (ac)	Temporary Fill in Open Waters (ac)	Total Fill in Open Waters (ac)
Site #10, Station No. 194+60/196+10(LT/RT)	0.66		0.66

Total Open Water Impacts for Project: 0.66 acres

The application provides adequate assurance that the discharge of fill material into the waters of the Cape Fear River Basin in conjunction with the proposed development will not result in a violation of applicable Water Quality Standards and discharge guidelines. Therefore, the State of North Carolina certifies that this activity will not violate the applicable portions of Sections 301, 302, 303, 306, 307 of PL 92-500 and PL 95-217 if conducted in accordance with the application and conditions hereinafter set forth.

This approval is only valid for the purpose and design that you submitted in your modification application dated received August 7, 2009. Should your project change, you are required to notify the DWQ and submit a new application. If the property is sold, the new owner must be given a copy of this Certification and approval letter, and is thereby responsible for complying with all the conditions.

If any additional wetland or stream impacts, for this project (now or in the future) exceed one acre or 150 linear feet, respectively, additional compensatory mitigation may be required as described in 15A NCAC 2H .0506 (h) (6) and (7). For this approval to remain valid, you are required to comply with all the conditions listed below. In addition, you should obtain all other federal, state or local permits before proceeding with your project including (but not limited to) Sediment and Erosion control, Coastal Storm Water, Non-discharge and Water Supply watershed regulations. This Certification shall expire on the same day as the expiration date of the corresponding Corps of Engineers Permit.

#### Conditions of Certification:

1. At Permit Site #1, a 24" culvert discharges to Patterson Creek at an approximate 90 degree angle. NCDOT is advised that if stream bank destabilization occurs as a result of this alignment, corrective actions to stabilize the stream will be required.
2. At Permit Site #2b, a ditch ties into Patterson Creek such that storm flows will be directed upstream once they exit the ditchline. NCDOT is advised that if the stream destabilizes in this area due to backwater or other conditions caused by the ditchline alignment, corrective actions to stabilize the stream will be required.
3. At Permit Sites #4 and #7, ditches tie into the streams at an approximate 90 degree angle. NCDOT is advised that if stream bank destabilization occurs as a result of this alignment, corrective actions to stabilize the stream will be required.
4. Compensatory mitigation for impacts to 1.59 acres of riverine wetlands and 1,314 linear feet of stream are required. We understand that you have chosen to perform compensatory mitigation for impacts to wetlands and streams through the North Carolina Ecosystem Enhancement Program (EEP). EEP has agreed to implement the mitigation for 1.58 acres of riverine wetlands and 1,130 linear feet of stream as per a letter, dated May 4, 2009. DWQ is requiring mitigation for all riverine wetland impacts and all perennial stream impacts (exceeding 150 linear feet of impact per stream, including riprap bank stabilization). Therefore, prior to wetland and stream impacts, NCDOT must provide documentation demonstrating EEP's ability to provide the remaining mitigation which is required for this project (0.01 acres of wetland impact and 184 linear feet of stream impact).

5. **All portions of the proposed project draining to 303(d) listed watersheds that are impaired due to biological criteria exceedances, specifically Big Buffalo Creek, shall not discharge stormwater directly to surface waters. Stormwater shall be treated using appropriate best management practices (e.g., vegetated conveyances, constructed wetlands, detention ponds, etc.) prior to discharging to surface waters.**
6. Bridge deck drains should not discharge directly into the stream. Stormwater shall be directed across the bridge and pre-treated through site-appropriate means (grassed swales, pre-formed scour holes, vegetated buffers, etc.) before entering the stream. Please refer to the most current version of Stormwater Best Management Practices.
7. All bridge construction shall be performed from the existing bridge, temporary work bridges, temporary causeways, or floating or sunken barges. If work conditions require barges, they shall be floated into position and then sunk. The barges shall not be sunk and then dragged into position. Under no circumstances should barges be dragged along the bottom of the surface water.
8. The post-construction removal of any temporary bridge structures must return the project site to its preconstruction contours and elevations. The impacted areas shall be revegetated with appropriate native species.
9. If multiple pipes or barrels are required, they shall be designed to mimic natural stream cross section as closely as possible including pipes or barrels at flood plain elevation and/or sills where appropriate. Widening the stream channel should be avoided. Stream channel widening at the inlet or outlet end of structures typically decreases water velocity causing sediment deposition that requires increased maintenance and disrupts aquatic life passage.
10. At locations where ponds will be drained, proper measures will be taken to drain the pond with limited impact to upstream and downstream channel stability as well as to native aquatic species. Proper measures will be taken to avoid sediment release and/or sediment accumulation downstream as a result of pond draining. If typical pond draining techniques will create significant disturbance to native aquatic species, additional measures such as collection and relocation may be necessary to prevent a significant fish kill. NCDOT shall consult with the NC Wildlife Resources Commission Staff to determine if there are any sensitive species, and the most appropriate measures to limit impacts to these species.
11. Riprap shall not be placed in the active thalweg channel or placed in the streambed in a manner that precludes aquatic life passage. Bioengineering boulders or structures should be properly designed, sized and installed. In addition, riprap shall be of sufficient size such that it is not carried downstream by normal stream flow.
12. Placement of culverts and other structures in waters, streams and wetlands shall be below the elevation of the streambed by one (1) foot for all culverts with a diameter greater than 48 inches and 20 percent of the culvert diameter for culverts having a diameter of less than 48 inches, to allow for low flow passage of water and aquatic life. Design and placement of culverts and other structures, including temporary erosion control measures, shall not be conducted in a manner that may result in disequilibrium of wetlands or streambeds or banks, adjacent to or upstream and downstream of the above structures. The applicant is required to provide evidence that the equilibrium is being maintained if requested in writing by DWQ. If this condition is unable to be met due to bedrock or other limiting features encountered during construction, please contact the NCDWQ for guidance on how to proceed and to determine whether or not a modification to this certification will be required.
13. The outside buffer, wetland or water boundary located within the construction corridor approved by this authorization shall be clearly marked by highly visible fencing prior to any land disturbing activities. Impacts to areas within the fencing are prohibited unless otherwise authorized by this Certification.

14. During construction of the project, no staging of equipment, of any kind, is permitted in waters of the U.S. or protected riparian buffers.
15. The Permittee shall ensure that the final design drawings adhere to the certification and to the drawings submitted for approval.
16. If concrete is used during construction, a dry work area shall be maintained to prevent direct contact between curing concrete and surface waters. Water that inadvertently contacts uncured concrete shall not be discharged to surface waters due to the potential for elevated pH and possible aquatic life and fish kills.
17. The dimension, pattern and profile of the stream above and below the crossing shall not be modified. Disturbed floodplains and streams should be restored to natural geomorphic conditions.
18. All work in or adjacent to stream waters shall be conducted in a dry work area. Approved BMP measures from the most current version of the NCDOT Construction and Maintenance Activities Manual such as sandbags, rock berms, cofferdams and other diversion structures shall be used to prevent excavation in flowing water.
19. Heavy equipment shall be operated from the banks rather than in the stream channel in order to minimize sedimentation and reduce the introduction of other pollutants into the stream.
20. All mechanized equipment operated near surface waters must be regularly inspected and maintained to prevent contamination of stream waters from fuels, lubricants, hydraulic fluids, or other toxic materials.
21. No rock, sand or other materials shall be dredged from the stream channel except where authorized by this Certification.
22. Discharging hydroseed mixtures and washing out hydroseeders and other equipment in or adjacent to surface waters is prohibited.
23. Native riparian vegetation must be re-established within the construction limits of the project by the end of the growing season following completion of construction.
24. There shall be no excavation from, or waste disposal into, jurisdictional wetlands or waters associated this permit without appropriate modification. Should waste or borrow sites be located in wetlands or streams, compensatory mitigation will be required since that is a direct impact from road construction activities.
25. Erosion and sediment control practices must be in full compliance with all specifications governing the proper design, installation and operation and maintenance of such Best Management Practices in order to protect surface water standards:
  - a. The erosion and sediment control measures for the project must be designed, installed, operated and maintained in accordance with the most recent version of the *North Carolina Sediment and Erosion Control Planning and Design Manual*.
  - b. The design, installation, operation, and maintenance of the sediment and erosion control measures must be such that they equal, or exceed, the requirements specified in the most recent version of the *North Carolina Sediment and Erosion Control Manual*. The devices shall be maintained on all construction sites, borrow sites, and waste pile (spoil) projects, including contractor-owned or leased borrow pits associated with the project.
  - c. For borrow pit sites, the erosion and sediment control measures must be designed, installed, operated and maintained in accordance with the most recent version of the *North Carolina Surface Mining Manual*.
  - d. The reclamation measures and implementation must comply with the reclamation in accordance with the requirements of the Sedimentation Pollution Control Act.



26. Sediment and erosion control measures shall not be placed in wetlands or waters unless otherwise approved by this Certification.
27. The issuance of this certification does not exempt the Permittee from complying with any and all statutes, rules, regulations or ordinances that may be imposed by other governmental agencies (i.e., local, state, and federal) having jurisdiction, including but not limited to, applicable buffer rules, stormwater management rules, soil erosion and sedimentation control requirements, etc.
28. The Permittee shall report any violations of this certification to the Division of Water Quality within 24 hours of discovery.
29. A copy of this Water Quality Certification shall be posted on the construction site at all times. In addition, the Water Quality Certification and all subsequent modifications, if any, shall be maintained with the Division Engineer and the on-site project manager.
30. Upon completion of the project, the NCDOT Division Engineer shall complete and return the enclosed "Certification of Completion Form" to notify DWQ when all work included in the 401 Certification has been completed.
31. The permittee and its authorized agents shall conduct its activities in a manner consistent with State Water Quality Standards [including any requirements resulting from compliance with 303(d) of the Clean Water Act] and any other appropriate requirements of State and Federal law. If DWQ determines that such standards or laws are not being met (including the failure to sustain a designated or achieved use), that State or Federal law is being violated, or that further conditions are necessary to assure compliance, DWQ may re-evaluate and modify this certification.

Violations of any condition herein set forth may result in revocation of this Certification and may result in criminal and/or civil penalties. This Certification shall become null and void unless the above conditions are made conditions of the Federal 404 and/or Coastal Area Management Act Permit. This Certification shall expire upon the expiration of the 404 or CAMA permit.

If this Certification is unacceptable to you have the right to an adjudicatory hearing upon written request within sixty (60) days following receipt of this Certification. This request must be in the form of a written petition conforming to Chapter 150B of the North Carolina General Statutes and filed with the Office of Administrative Hearings, 6714 Mail Service Center, Raleigh, N.C. 27699-6714. If modifications are made to an original Certification, you have the right to an adjudicatory hearing on the modifications upon written request within sixty (60) days following receipt of the Certification. Unless such demands are made, this Certification shall be final and binding.

This the 1<sup>st</sup> day of April 2010

DIVISION OF WATER QUALITY



Coleen H. Sullins  
Director



North Carolina Department of Environment and Natural Resources

Beverly Eaves Perdue, Governor

*Price*  
**RECEIVED**  
JAN 4 2010  
DIVISION OF HIGHWAYS  
PDEA OFFICE OF NATURAL ENVIRONMENT

Dee Freeman, Secretary

December 9, 2009

Dr. Greg Thorpe, Ph.D., Manager  
Project Development and Environmental Analysis Branch  
North Carolina Department of Transportation  
1598 Mail Service Center  
Raleigh, North Carolina, 27699-1548

**Subject: Eighth Modification to the 401 Water Quality Certification Pursuant to Section 401 of the Federal Clean Water Act with ADDITIONAL CONDITIONS for the US 421/NC 87 (Sanford Bypass) from East of NC 42 to NC 87 near SR 1138 in Lee County, Federal Aid Project No. STPNHF-421(2), State Project No. 8.T540402, TIP R-2417C, DWQ Project No. 00-1432**

Dear Dr. Thorpe:

Attached hereto is a modification of Certification No. 3378 issued to The North Carolina Department of Transportation (NCDOT) and dated April 10, 2002. This modification is applicable only to the additional proposed activities. **All authorized activities and conditions of the original certification associated with the original Water Quality Certification, dated April 10, 2002, and all subsequent modifications still apply except where superceded by this certification.**

If we can be of further assistance, please do not hesitate to contact Polly Lespinasse at (704) 663-1699.

Sincerely,

for Coleen H. Sullins  
Director

Attachments

cc: Kimberly Garvey, US Army Corps of Engineers, Wilmington Office  
Polly Lespinasse, DWQ Mooresville Regional Office  
Ken Averitte, DWQ Fayetteville Regional Office  
Greg Price, PDEA, NCDOT  
File Copy

610 East Center Avenue, Suite 301, Mooresville, North Carolina 28115  
Phone: 704-663-1699 \ FAX: 704-663-6040 \ Internet: www.enr.state.nc.us.

**Modification to the 401 Water Quality Certification Pursuant to Section 401 of the Federal Clean Water Act with ADDITIONAL CONDITIONS**

**THIS CERTIFICATION** is issued in conformity with the requirements of Section 401 Public Laws 92-500 and 95-217 of the United States and subject to the North Carolina Division of Water Quality (DWQ) Regulations in 15 NCAC 2H .0500. This certification authorizes the NCDOT to **additionally impact 0.04 acres of jurisdictional wetlands** in Lee County as listed below. The project shall be constructed pursuant to the modification received November 18, 2009. The authorized impacts are as described below:

**Stream Impacts in the Cape Fear River Basin**

<b>Permit Site No. and Station No. /Stream Name</b>	<b>Permanent Fill in Intermittent Stream (linear ft)</b>	<b>Temporary Fill in Intermittent Stream (linear ft)</b>	<b>Permanent Fill in Perennial Stream (linear ft)</b>	<b>Temporary Fill in Perennial Stream (linear ft)</b>	<b>Total Stream Impact (linear feet)</b>	<b>Stream Impacts Requiring Mitigation (linear ft)</b>
Site #2, Station No. 13+00 +/- -YRPC-/ Carrs Creek			312		312	312
Site #2, Station No. 613+28 +/- LREV/ Carrs Creek			540		540	540
Site #2, Station No. 12+28, 151' RT, YRPC (utility impact)/ Carrs Creek			10		10	10
Site #3, Station No. 18+67, 171' RT, YRPB (utility impact)/ Carrs Creek			10		10	10
Site #4, Station No. 18+20 -YRPB-LT/ UT to Carrs Creek				80	80	0
Site #4, Station No. 19+84 -YRPB-LT/ UT to Carrs Creek				42	42	0
Site #4, Station No. 11+63, 128.3' RT, YRPD (utility impact)/ UT Carrs Creek			10		10	10
Site #4, Station No. 11+63, 141' RT, YRPD (utility impact)/ UT Carrs Creek			10		10	10
Site #5, Station No. 19+18 +/- -YRPB-/ UT to Carrs Creek			252		252	252
Site #5, Station No. 19+58 - YRPB-/ UT to Carrs Creek	143				143	0
Site #5, Station No. 19+94 +/- -Y-LT/ UT to Carrs Creek			175	117	292	175
Site #5, Station No. 7+69, 142' RT, YRPD (utility impact)/ UT Carrs Creek			20		20	20
Site #6, Station No. 10+50 -YRPD-/ UT to Carrs Creek			393	33	426	393
Site #6, Station No. 6+25 - YRPA-/ UT to Carrs Creek			305		305	305
Site #7, Station No. 13+62 -Front-/ UT to Carrs Creek			121	117	238	121
Site #8, Station No. 643+75 -LREV-RT/ UT to Carrs Creek	442	32			474	0

Site #10, Station No. 26+50-I9FLY-/ UT to Carrs Creek			120	105	225	120
Site #11, Station No. 19+68 -I9DFLY-/ UT to Carrs Creek			700		700	700
Site #11, Station No. 678+00 -LREV-LT/ UT to Carrs Creek			690	15	705	690
Site #13, Station No. 690+00 -LREV-LT/ UT to Carrs Creek	266				266	0
Site #14, Station No. 45+25 -Y-RT/ UT to Carrs Creek	107	43			150	0
Site #16, Station No. 589+17 to 593+67 LREV RT/ UT to Carrs Creek			566	11	577	566

Total Stream Impacts for Project: 5,192 linear feet  
Total Stream Impacts Requiring Mitigation: 4,234 linear feet

Riverine and Non-Riverine Wetland Impacts in the Cape Fear River Basin

Permit Site No./Station No.	Wetland Type (Riverine or Non-Riverine)	Permanent Fill (acres)	Temporary Fill (acres)	Mechanized Clearing (acres)	Hand Clearing (acres)	Total Acres
Site #1/YRPC 10+97LT to 12+71RT	Riverine	0.41		0.02		0.43
Site #1/YRPC 11+75, 171'RT (utility impact)	Riverine	0.006				0.006
Site #3/613+00 +/- - LREV-	Riverine	0.06				0.06
Site #3/26+64 +/- - Y- to 22+35 +/- -Y-LT	Riverine	0.43				0.43
Site #5/20+20 +/- - Y-RT	Riverine	0.03	0.01	0.01		0.05
Site #8/643+75 - LREV-RT	Riverine	0.09		<0.01		0.10
Site #9/649+80 - LREV-	Riverine	0.15	0.02	<0.01		0.15
Site #10/26+50 - I9FLY-	Riverine	0.23				0.23
Site #10/20+00 - I9FLY-	Riverine	0.02				0.02
Site #15/LREV RT 574+76 to 583+84	Riverine	2.18		0.23		2.41
Site #16/LREV RT 589+17 to 593+67	Riverine	0.11		0.01		0.12

Total Riverine Wetland Impacts for Project: 4.01 acres  
Total Riverine Wetland Impacts Requiring Mitigation: 4.01 acres

Open Water (Ponds) Impacts in the Cape Fear River Basin

Permit Site No./ Station No.	Permanent Fill in Open Waters (ac)	Temporary Fill in Open Waters (ac)	Total Fill in Open Waters (ac)
Site #10/665+00 -LREV-	2.83		2.83
Site #12/680+00 -LREV-LT	0.03		0.03
Total	2.86		2.86

### Total Open Water Impacts for Project: 2.86 acres

The application provides adequate assurance that the discharge of fill material into the waters of the Cape Fear River Basin in conjunction with the proposed development will not result in a violation of applicable Water Quality Standards and discharge guidelines. Therefore, the State of North Carolina certifies that this activity will not violate the applicable portions of Sections 301, 302, 303, 306, 307 of PL 92-500 and PL 95-217 if conducted in accordance with the application and conditions hereinafter set forth.

This approval is only valid for the purpose and design that you submitted in your modification application dated received November 18, 2009. Should your project change, you are required to notify the DWQ and submit a new application. If the property is sold, the new owner must be given a copy of this Certification and approval letter, and is thereby responsible for complying with all the conditions.

If any additional wetland or stream impacts, for this project (now or in the future) exceed one acre or 150 linear feet, respectively, additional compensatory mitigation may be required as described in 15A NCAC 2H .0506 (h) (6) and (7). For this approval to remain valid, you are required to comply with all the conditions listed below. In addition, you should obtain all other federal, state or local permits before proceeding with your project including (but not limited to) Sediment and Erosion control, Coastal Storm Water, Non-discharge and Water Supply watershed regulations. This Certification shall expire on the same day as the expiration date of the corresponding Corps of Engineers Permit.

#### Conditions of Certification:

1. Placement of culverts and other structures in waters, streams and wetlands shall be below the elevation of the streambed by one (1) foot for all culverts with a diameter greater than 48 inches and 20 percent of the culvert diameter for culverts having a diameter of less than 48 inches, to allow for low flow passage of water and aquatic life. Design and placement of culverts and other structures, including temporary erosion control measures, shall not be conducted in a manner that may result in disequilibrium of wetlands or streambeds or banks, adjacent to or upstream and downstream of the above structures. The applicant is required to provide evidence that the equilibrium is being maintained if requested in writing by DWQ. If this condition is unable to be met due to bedrock or other limiting features encountered during construction, please contact the NCDWQ for guidance on how to proceed and to determine whether or not a modification to this certification will be required.
2. Compensatory mitigation for 4,234 linear feet of streams and 4.01 acres of impacts to riverine wetlands is required. We understand that you have chosen to perform compensatory mitigation for impacts to wetlands through the North Carolina Ecosystem Enhancement Program (EEP) and that the EEP has agreed to implement the mitigation for the project. EEP has indicated in letters dated October 22, 2008, and November 3, 2009, that they will assume responsibility for satisfying the federal Clean Water Act compensatory mitigation requirements for the above referenced project, in accordance with the Tri-Party MOA signed on July 22, 2003, and the Dual-Party MOA signed on April 12, 2004.
3. Due to the possibility that compaction and/or other site alterations might prevent the temporary wetland impact areas from re-attaining jurisdictional wetland status, the permittee shall schedule an agency field meeting with the NC Division of Water Quality to determine if the wetland areas temporarily impacted by this project have re-attained jurisdictional wetland status. If the temporarily impacted wetland areas have not re-attained jurisdictional wetland status, NC Division of Water Quality shall determine if compensatory wetland mitigation will be required.
4. The outside buffer, wetland or water boundary located within the construction corridor approved by this authorization shall be clearly marked by highly visible fencing prior to any land disturbing activities. Impacts to areas within the fencing are prohibited unless otherwise authorized by this Certification.
5. During construction of the project, no staging of equipment, of any kind, is permitted in waters of the U.S. or protected riparian buffers.

6. The Permittee shall ensure that the final design drawings adhere to the certification and to the drawings submitted for approval.
7. If concrete is used during construction, a dry work area shall be maintained to prevent direct contact between curing concrete and surface waters. Water that inadvertently contacts uncured concrete shall not be discharged to surface waters due to the potential for elevated pH and possible aquatic life and fish kills.
8. The dimension, pattern and profile of the stream above and below the crossing shall not be modified. Disturbed floodplains and streams should be restored to natural geomorphic conditions.
9. All work in or adjacent to stream waters shall be conducted in a dry work area. Approved BMP measures from the most current version of the NCDOT Construction and Maintenance Activities Manual such as sandbags, rock berms, cofferdams and other diversion structures shall be used to prevent excavation in flowing water.
10. Heavy equipment shall be operated from the banks rather than in the stream channel in order to minimize sedimentation and reduce the introduction of other pollutants into the stream.
11. All mechanized equipment operated near surface waters must be regularly inspected and maintained to prevent contamination of stream waters from fuels, lubricants, hydraulic fluids, or other toxic materials.
12. No rock, sand or other materials shall be dredged from the stream channel except where authorized by this Certification.
13. Discharging hydroseed mixtures and washing out hydroseeders and other equipment in or adjacent to surface waters is prohibited.
14. Native riparian vegetation must be re-established within the construction limits of the project by the end of the growing season following completion of construction.
15. There shall be no excavation from, or waste disposal into, jurisdictional wetlands or waters associated this permit without appropriate modification. Should waste or borrow sites be located in wetlands or streams, compensatory mitigation will be required since that is a direct impact from road construction activities.
16. Erosion and sediment control practices must be in full compliance with all specifications governing the proper design, installation and operation and maintenance of such Best Management Practices in order to protect surface water standards:
  - a. The erosion and sediment control measures for the project must be designed, installed, operated and maintained in accordance with the most recent version of the *North Carolina Sediment and Erosion Control Planning and Design Manual*.
  - b. The design, installation, operation, and maintenance of the sediment and erosion control measures must be such that they equal, or exceed, the requirements specified in the most recent version of the *North Carolina Sediment and Erosion Control Manual*. The devices shall be maintained on all construction sites, borrow sites, and waste pile (spoil) projects, including contractor-owned or leased borrow pits associated with the project.
  - c. For borrow pit sites, the erosion and sediment control measures must be designed, installed, operated and maintained in accordance with the most recent version of the *North Carolina Surface Mining Manual*.
  - d. The reclamation measures and implementation must comply with the reclamation in accordance with the requirements of the Sedimentation Pollution Control Act.
17. Sediment and erosion control measures shall not be placed in wetlands or waters unless otherwise approved by this Certification.

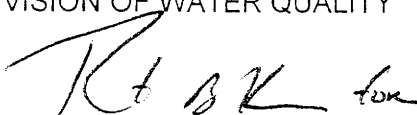
18. The issuance of this certification does not exempt the Permittee from complying with any and all statutes, rules, regulations or ordinances that may be imposed by other governmental agencies (i.e., local, state, and federal) having jurisdiction, including but not limited to, applicable buffer rules, stormwater management rules, soil erosion and sedimentation control requirements, etc.
19. The Permittee shall report any violations of this certification to the Division of Water Quality within 24 hours of discovery.
20. A copy of this Water Quality Certification shall be posted on the construction site at all times. In addition, the Water Quality Certification and all subsequent modifications, if any, shall be maintained with the Division Engineer and the on-site project manager.
21. Upon completion of the project, the NCDOT Division Engineer shall complete and return the enclosed "Certification of Completion Form" to notify DWQ when all work included in the 401 Certification has been completed.
22. The permittee and its authorized agents shall conduct its activities in a manner consistent with State Water Quality Standards [including any requirements resulting from compliance with 303(d) of the Clean Water Act] and any other appropriate requirements of State and Federal law. If DWQ determines that such standards or laws are not being met (including the failure to sustain a designated or achieved use), that State or Federal law is being violated, or that further conditions are necessary to assure compliance, DWQ may re-evaluate and modify this certification.

Violations of any condition herein set forth may result in revocation of this Certification and may result in criminal and/or civil penalties. This Certification shall become null and void unless the above conditions are made conditions of the Federal 404 and/or Coastal Area Management Act Permit. This Certification shall expire upon the expiration of the 404 or CAMA permit.

If this Certification is unacceptable to you have the right to an adjudicatory hearing upon written request within sixty (60) days following receipt of this Certification. This request must be in the form of a written petition conforming to Chapter 150B of the North Carolina General Statutes and filed with the Office of Administrative Hearings, 6714 Mail Service Center, Raleigh, N.C. 27699-6714. If modifications are made to an original Certification, you have the right to an adjudicatory hearing on the modifications upon written request within sixty (60) days following receipt of the Certification. Unless such demands are made, this Certification shall be final and binding.

This, the 9<sup>th</sup> day of December 2009

DIVISION OF WATER QUALITY

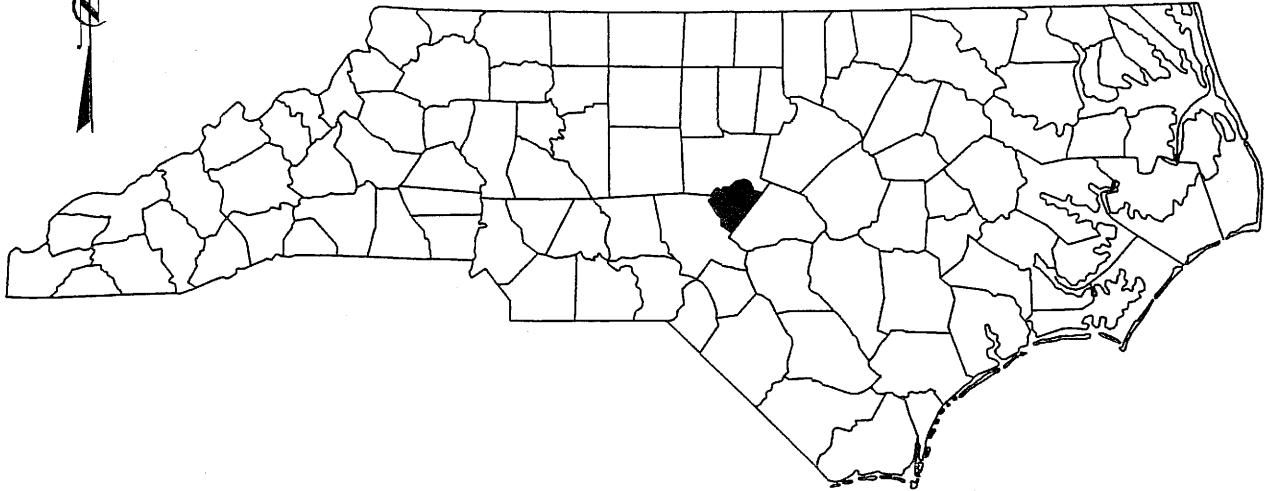


Coleen H. Sullins  
Director

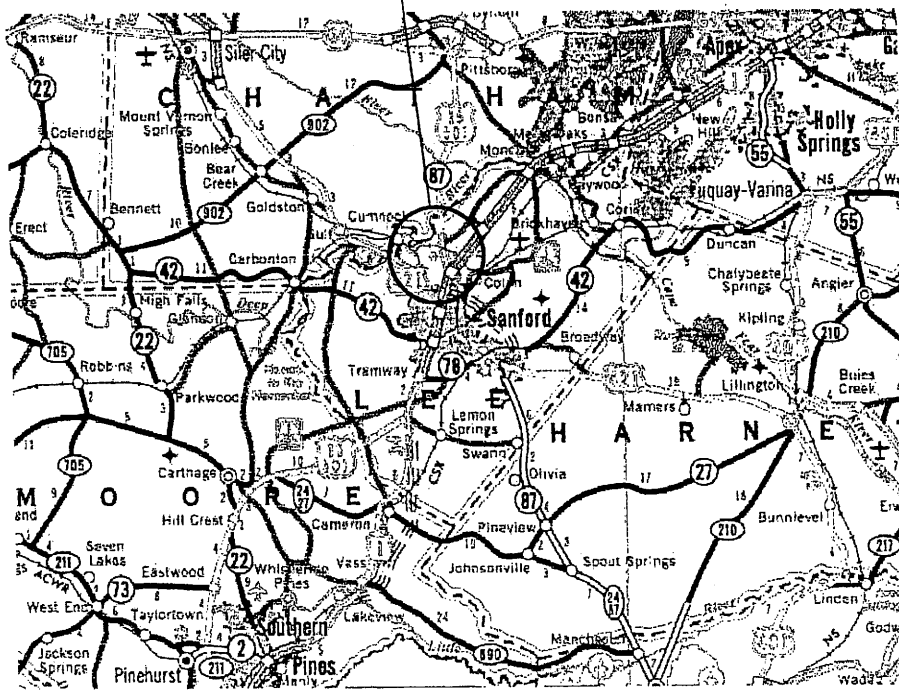
WQC No. 3378

One  
North Carolina  
*Naturally*

# NORTH CAROLINA



## SITE



## VICINITY MAP

**NCDOT**  
DIVISION OF HIGHWAYS  
LEE COUNTY  
PROJECT: 34431.1.2 (R-2417AA)  
US 421-NC 87 SANFORD  
BYPASS FROM WEST  
OF SR 140 TO WEST  
OF US 1-15-501



# SUMMARY OF AFFECTED PROPERTY OWNERS

TRACT NO.	PROPERTY OWNER	ADDRESS	SITE NO.
①	ERNEST MILLER	PO BOX 20561 GREENSBORO NC 27330	1 & 2
②	ERNEST MILLER	PO BOX 20561 GREENSBORO NC 27330	3
③	PHYLLIS McKOY HEIRS	3707 CRAIGHOLM CT CHARLOTTE NC 28262	4
⑤	JOSEPHINE WOMACK D.C. HOLLER JR & INEZ J. HOLLER	710 ERWIN RD SANFORD NC 27330  PO BOX 399 SANFORD NC 27331	4
⑧	HELENA EDWARDS	115 180TH ST JAMAICA NY 11434	5
⑮	ROBERT STRICKLAND	2394 COTTON RD SANFORD NC 27330	6
⑰	RONALD GARTIN	4240 FOX RUN DR SANFORD NC 27330	7
⑳	CHARLES GANTT	1606 LORD ASHLEY DR SANFORD NC 27330	8
㉑	REXINE LLOYD	511 MAPLEWOOD DR SANFORD NC 27330	9
㉓	SAN-LEE BUILDERS	PO BOX 3367 SANFORD NC 27331	9
㉔	ROGER & LILLIAN THOMAS	3212 GREEN VALLEY DR SANFORD NC 27330	10

4/23/2009 11:54:47 AM \\p1m1515v-2417aa\_11yd.prm\_tch.dgn



**NCDOT**  
 DIVISION OF HIGHWAYS  
 LEE COUNTY  
 PROJECT: 34431.12 (R-2417AA)  
 US 421-NC 87 SANFORD  
 BYPASS FROM WEST  
 OF SR 1400 TO WEST  
 OF US 1-15-501

SHEET **2** OF **41**

**WETLAND PERMIT IMPACT SUMMARY**

Site No.	Station (From/To)	Structure Size / Type	WETLAND IMPACTS						SURFACE WATER IMPACTS					
			Permanent Fill In Wetlands (ac)	Temp. Fill In Wetlands (ac)	Excavation in Wetlands (ac)	Mechanized Clearing in Wetlands (ac)	Hand Clearing in Wetlands (ac)	Permanent SW impacts (ac)	Temp. SW impacts (ac)	Existing Channel Impacts Permanent (ft)	Existing Channel Impacts Temp. (ft)	Natural Stream Design (ft)		
1	-L- 22+30/26+80 (LT)	Roadway Embankment	0.02	< 0.01	< 0.01	0.02	---	---	---	---	---	---	---	---
	-L- 23+32 (RT)	Bank Stabilization	---	---	---	---	---	---	---	---	---	---	---	---
2	-L- 33+00/33+65 (LT)	Roadway Embankment	0.16	---	0.21	0.05	---	---	---	---	---	---	---	---
2a**	-L- 33+00/33+65 (LT)	42" CMP w/ 54" STL Suppl	---	---	---	---	---	---	---	---	---	---	---	---
2b	-L- 33+00/33+65 (RT)	42" CMP w/ 54" STL Suppl	---	---	---	---	---	---	---	---	---	---	---	---
3	-L- 35+20/36+30 (RT)	Roadway Embankment	0.11	---	---	0.01	---	---	---	---	---	---	---	---
4	-L- 52+08 (LT/RT) & L- 63+00 (RT)	Bank Stabilization	---	---	---	---	---	---	---	---	---	---	---	---
5	-L- 87+90 (LT/RT)	54" RCP	---	---	---	---	---	---	---	---	---	---	---	---
		Bank Stabilization	---	---	---	---	---	---	---	---	---	---	---	---
6**	-L- 120+20 (LT)	36" RCP	---	---	---	---	---	---	---	---	---	---	---	---
6	-L- 120+57 (LT/RT)	8' x 6' RCBC	---	---	---	---	---	---	---	---	---	---	---	---
		Bank Stabilization	---	---	---	---	---	---	---	---	---	---	---	---
7**	-L- 142+67 (LT/RT)	8' x 6' RCBC	---	---	---	---	---	---	---	---	---	---	---	---
8	-L- 153+50/160+00 (RT)	54" RCP	0.73	---	0.01	0.08	---	---	---	---	---	---	---	---
9	-L- 177+29 (LT/RT)	(2) 9' x 7' RCBC	0.12	---	0.03	0.03	---	---	---	---	---	---	---	---
		Bank Stabilization	---	---	---	---	---	---	---	---	---	---	---	---
9**	-L- 178+82 (LT)	54" RCP	---	---	---	---	---	---	---	---	---	---	---	---
10	-L- 194+60/196+10 (LT/RT)	---	---	---	---	---	---	---	---	---	---	---	---	---
10**	-L- 195+65 (RT)	36" RCP	---	---	---	---	---	---	---	---	---	---	---	---
<b>TOTALS:</b>			<b>1.14</b>		<b>0.25</b>	<b>0.19</b>				<b>0.91</b>	<b>0.04</b>	<b>2771</b>	<b>477</b>	

\*\* Intermittent Stream - No Mitigation Required

Perennial & Intermittent Total - Mitigation Req'd: 1130 ft  
 Perennial & Intermittent Total - Bank Stabilization: 238 ft  
 \*\* Intermittent Total - Not Requiring Mitigation: 1403 ft

**NOTES:**

SITE 2 - ADDITIONAL IMPACT DUE TO DRAWDOWN = 0.10 AC.  
 SITE 4 - ADDITIONAL IMPACT DUE TO TEMPORARY CONSTRUCTION BENTS [2 @ 55' x 5'] = 0.01 AC (550 SF).  
 SITE 8 - ADDITIONAL IMPACT DUE TO TOTAL TAKE AT -L- STA 154+00 LT = 0.02 AC.

**WETLAND PERMIT IMPACT SUMMARY**

Site No.	ORIGINAL PERMIT IMPACTS					PERMIT MODIFICATION IMPACTS						
	Fill In Wetlands (ac)	Mechanized Clearing (Method III) (ac)	Fill In SW (Natural) (ac)	Fill In SW (Pond) (ac)	Existing Channel Impacted (ft)	Permanent Fill In Wetlands (ac)	Excavation In Wetlands (ac)	Mechanized Clearing in Wetlands (ac)	Fill In SW (Pond) (ac)	Temp. SW impacts (ac)	Existing Channel Impacts Permanent (ft)	Existing Channel Impacts Temp. (ft)
1	0.05					0.02	<0.01	0.02			10*	20
2	0.05				561**	0.16	0.21	0.05			816**	14
3	0.13					0.11		0.01			274	15
4											44*	57
5					377						265	47
6					322						30*	83
7					190**						140**	55
8	0.96				331**	0.73	0.01	0.08			104*	66
9	0.19				417	0.12	0.03	0.03			375	60
10				0.54	345**				0.66		80**	30
TOTALS:	1.38			0.54	2602	1.14	0.25	0.19	0.66	0.00	2771	477

**NOTES:**

- \* Bank stabilization requiring no mitigation
- \*\* Intermittent stream requiring no mitigation

Mitigatable stream impacts for original permit = 1116 linear feet  
 Mitigatable stream impacts for permit modification = 1130 linear feet  
 Mitigatable wetland impacts for original permit = 1.38 acres  
 Mitigatable wetland impacts for permit modification = 1.58 acres

NC DEPARTMENT OF TRANSPORTATION  
 DIVISION OF HIGHWAYS

LEE COUNTY  
 WBS - 34431.1.1 (R-2417AA)

*4 of 41*

SHEET

4/14/2009

09/08/09

See Sheet 1-A For Index of Sheets

STATE OF NORTH CAROLINA  
DIVISION OF HIGHWAYS

**LEE COUNTY**

LOCATION: US 421 - NC 87 SANFORD BYPASS FROM WEST OF SR 1400 TO WEST OF US 1-15-501

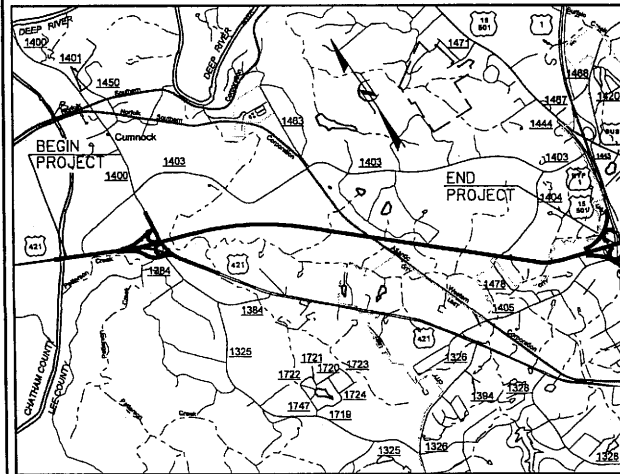
TYPE OF WORK: GRADING, DRAINAGE, PAVING, STRUCTURES AND SIGNAL.

**R-2417AA: WETLAND AND STREAM IMPACTS PLAN**

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	R-2417AA	1	
STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION	
34431.1.2	STP-NHF-421(2)	P.E.	
34431.2.2	STP-NHF-421(2)	RW	

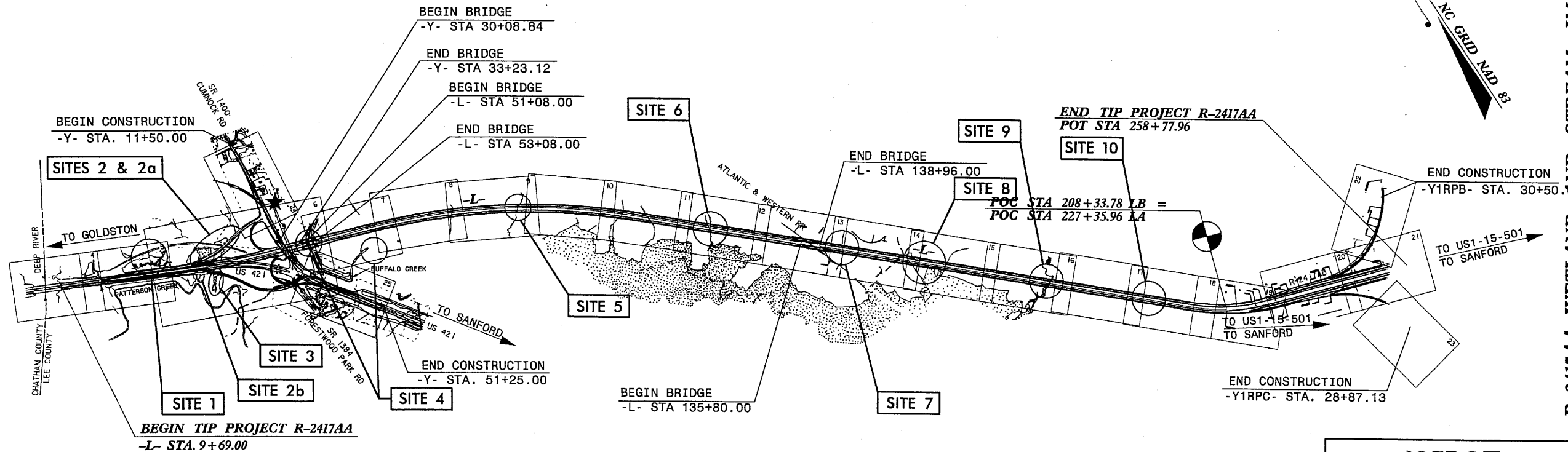
Permit Drawing Sheet 5 of 41

LEGEND:  
★ PROPOSED SIGNAL



VICINITY MAP

THIS PROJECT IS NOT WITHIN ANY MUNICIPAL BOUNDARIES

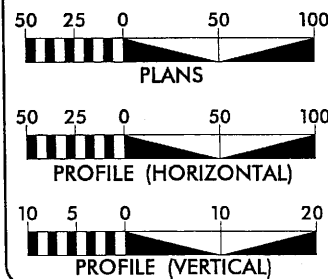


NCDOT  
DIVISION OF HIGHWAYS  
LEE COUNTY  
PROJECT: 34431.1.2 (R-2417AA)  
US 421-NC 87 SANFORD BYPASS FROM WEST OF SR 1400 TO WEST OF US 1-15-501  
SHEET OF

NCDOT CONTACT: DOUG TAYLOR, P.E.  
ROADWAY DESIGN - ENGINEERING COORDINATION

THIS IS A CONTROLLED - ACCESS PROJECT WITH ACCESS BEING LIMITED TO INTERCHANGES.  
CLEARING ON THIS PROJECT SHALL BE PERFORMED TO THE LIMITS ESTABLISHED BY METHOD III

GRAPHIC SCALES



DESIGN DATA

ADT 2008 = 13,300  
ADT 2028 = 20,800  
DHV = 10 %  
D = 60 %  
T = 9 % \*  
V = 70 MPH  
\* TTST 5% DUAL 4%

PROJECT LENGTH

LENGTH ROADWAY TIP PROJECT R-2417AA = 4.259 MI.  
LENGTH STRUCTURES TIP PROJECT R-2417AA = 0.098 MI.  
TOTAL LENGTH OF TIP PROJECT R-2417AA = 4.357 MI.

Prepared in the Office of:  
**KO & ASSOCIATES, P.C.**  
Consulting Engineers  
A Florence & Hatcheson, Inc. Company  
5121 KINGDOM WAY, SUITE 100 RALEIGH, N.C. 27607  
(919) 871-6666

2006 STANDARD SPECIFICATIONS

RIGHT OF WAY DATE:  
February 17, 2006

LETTING DATE:  
February 16, 2010

David C. Waller, P.E.  
PROJECT ENGINEER

Michael A. Young, P.E.  
PROJECT DESIGN ENGINEER

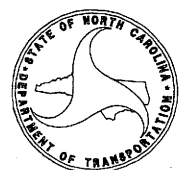
HYDRAULICS ENGINEER

SIGNATURE: P.E.

ROADWAY DESIGN ENGINEER

SIGNATURE: P.E.

DIVISION OF HIGHWAYS  
STATE OF NORTH CAROLINA



STATE HIGHWAY DESIGN ENGINEER

TIP PROJECT: R-2417AA

CONTRACT:

4/2/2009 R:\Hydraulics\dgn\Permits\2417aa\hyd\_prm\_sites.dgn Ko & Associates, P.C.

R-2417AA: WETLAND AND STREAM IMPACTS PLAN

8/17/99

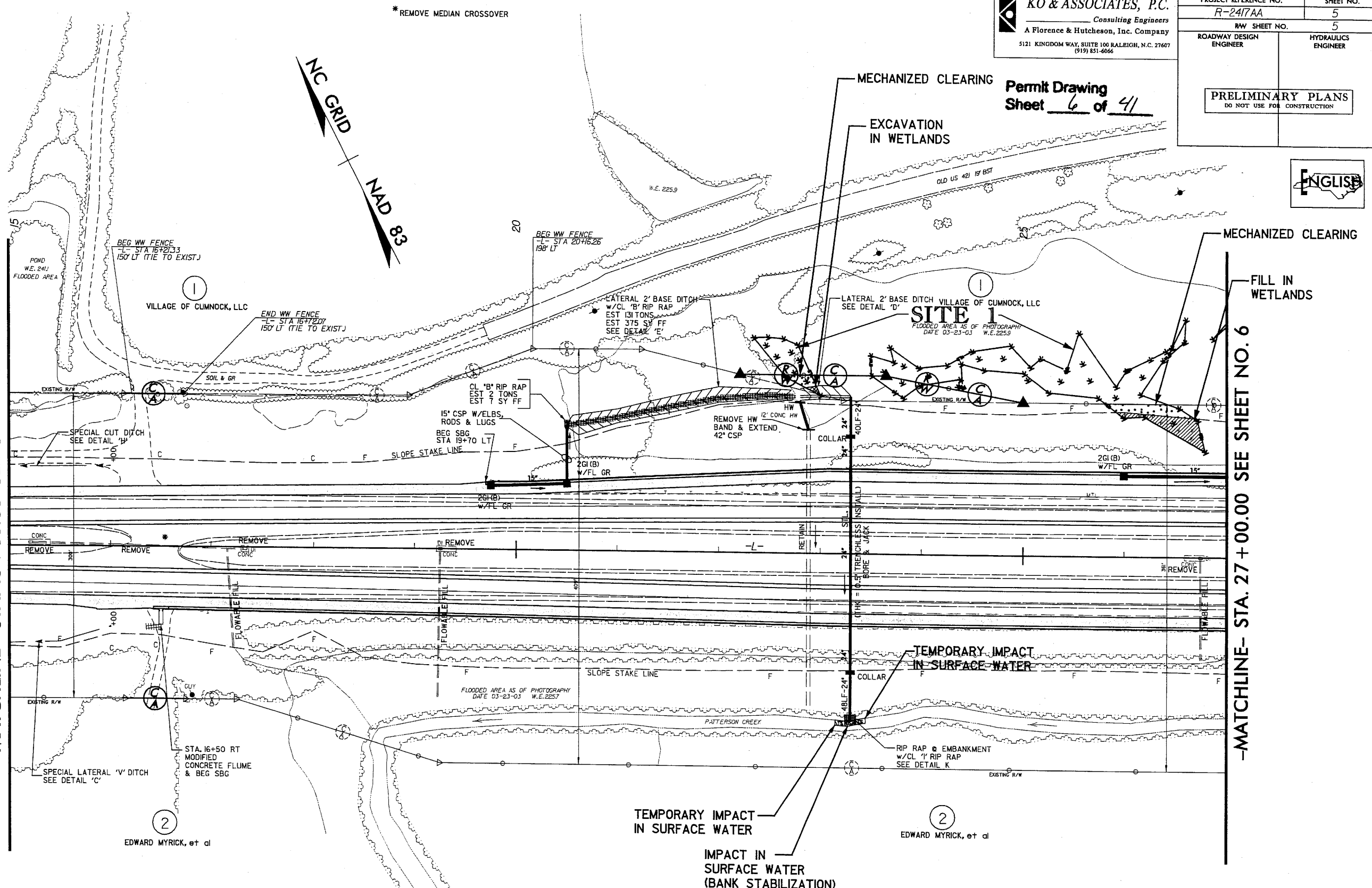
**KO & ASSOCIATES, P.C.**  
 Consulting Engineers  
 A Florence & Hutcheson, Inc. Company  
 5121 KINGDOM WAY, SUITE 100 RALEIGH, N.C. 27607  
 (919) 851-6666

PROJECT REFERENCE NO. R-2417AA	SHEET NO. 5
RAW SHEET NO. 5	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION	

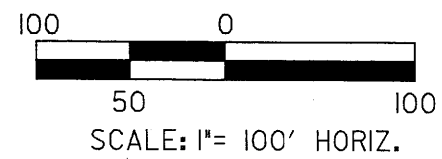


-MATCHLINE- STA. 15 + 00.00 SEE SHEET NO. 4

-MATCHLINE- STA. 27 + 00.00 SEE SHEET NO. 6



**PLAN VIEW  
SITE 1**



**LEGEND**

—WLB—	WETLAND		DENOTES TEMPORARY IMPACTS IN SURFACE WATER
	DENOTES FILL IN WETLAND		DENOTES IMPACTS IN SURFACE WATER
	DENOTES EXCAVATION IN WETLAND		DENOTES MECHANIZED CLEARING

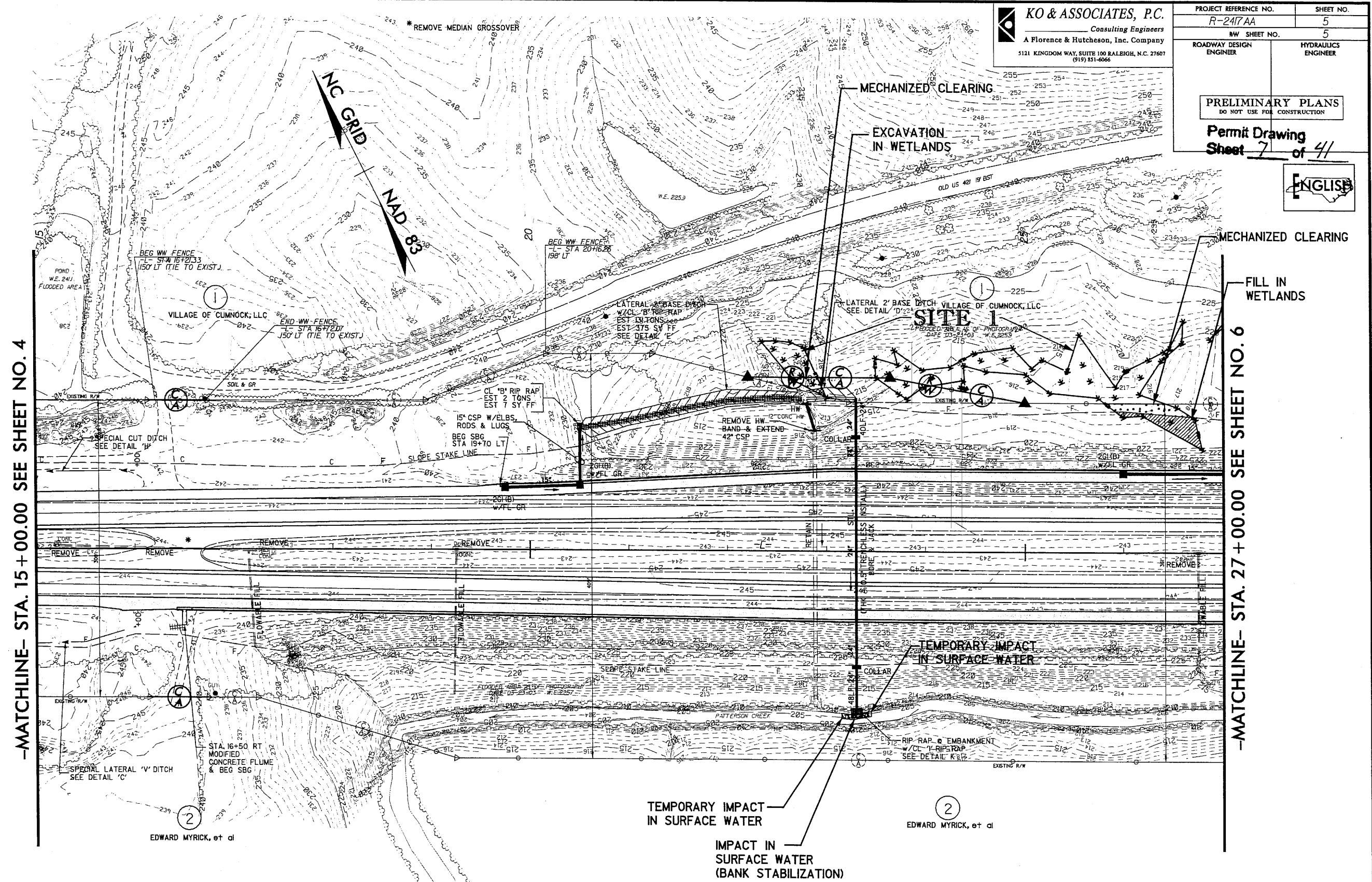
**NCDOT**  
 DIVISION OF HIGHWAYS  
 LEE COUNTY  
 PROJECT: 3445L1.2 (R-2417AA)  
 US 421-NC 87 SANFORD  
 BYPASS FROM WEST  
 OF SR 1400 TO WEST  
 OF US 1-15-501  
 SHEET 6 OF 41

4/5/2009 8:17:09 AM C:\Users\edmyr\Documents\Projects\2417\2417\_001.dgn

12-6-06 Parcel 1 & 2 Name Change  
 5-2-08 Added CA to existing access points - parcels 1 & 2  
 4/1/2009 R:\Hydro\Utilities\gdn\Permits\R-2417\ee\_hyd\_prm\_05.dgn  
 KO & Associates, P.C.

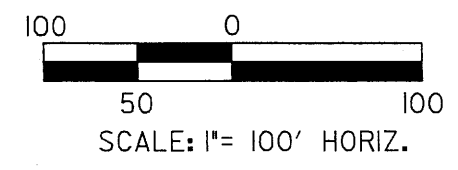
**KO & ASSOCIATES, P.C.**  
 Consulting Engineers  
 A Florence & Hutcheson, Inc. Company  
 5121 KINGDOM WAY, SUITE 100 RALEIGH, N.C. 27607  
 (919) 851-6666

PROJECT REFERENCE NO. R-2417AA	SHEET NO. 5
NW SHEET NO. 5	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
<b>PRELIMINARY PLANS</b> DO NOT USE FOR CONSTRUCTION	
<b>Permit Drawing</b> Sheet 7 of 41	



-MATCHLINE- STA. 15 + 00.00 SEE SHEET NO. 4

-MATCHLINE- STA. 27 + 00.00 SEE SHEET NO. 6



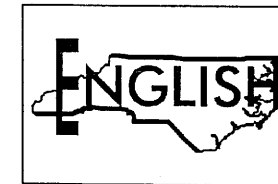
**PLAN VIEW**  
**SITE 1**

**LEGEND**

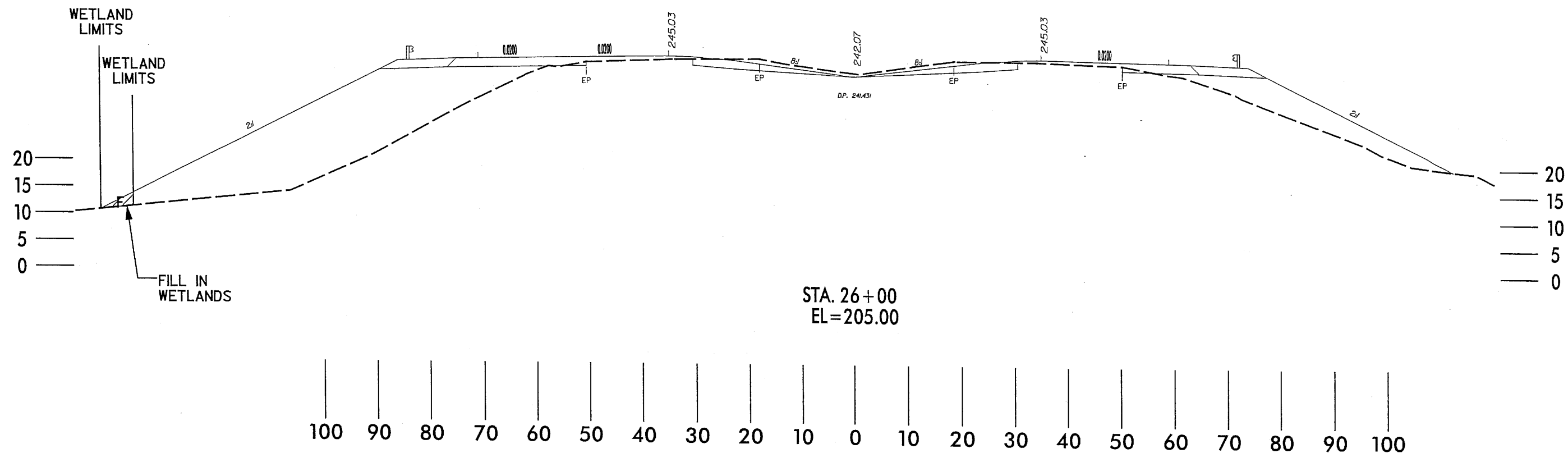
—WLB— WETLAND	DENOTES TEMPORARY IMPACTS IN SURFACE WATER
DENOTES FILL IN WETLAND	DENOTES IMPACTS IN SURFACE WATER
DENOTES EXCAVATION IN WETLAND	DENOTES MECHANIZED CLEARING

**NCDOT**  
 DIVISION OF HIGHWAYS  
 LEE COUNTY  
 PROJECT: 54431.12 (R-2417AA)  
 US 421-NC 87 SANFORD  
 BYPASS FROM WEST  
 OF SR 1400 TO WEST  
 OF US 1-15-501  
 SHEET 7 OF 41

PROJECT REFERENCE NO. R-2417AA	SHEET NO. 1-XPL
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION	



Permit Drawing  
Sheet 8 of 41



**LEGEND**

- WLB — WETLAND
- DENOTES FILL IN WETLAND

TYPICAL X-SECTIONS  
SITE 1

**NCDOT**  
DIVISION OF HIGHWAYS  
LEE COUNTY  
PROJECT: 34431.1.2 (R-2417AA)  
US 421-NC 87 SANFORD  
BYPASS FROM WEST  
OF SR 1400 TO WEST  
OF US 1-15-501  
SHEET 8 OF 41

2/9/2005 8:49:40 AM C:\Users\jcs\Documents\Projects\Permits\R2417\00\_01\01\_01\01\_01.dgn



5/28/99

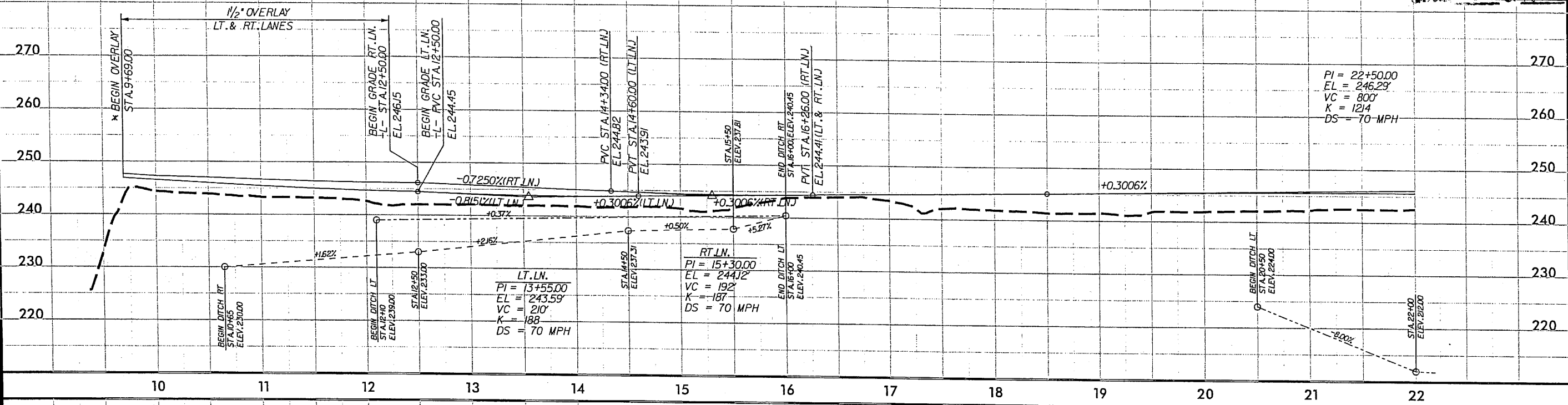
BM# 1  
PK NAIL IN END OF SOUTHEAST WINGWALL  
OF BRIDGE OVER DEEP RIVER (NBL)  
-L- STA 9+80.82 60.44' LT  
ELEV = 246.84'

**KO & ASSOCIATES, P.C.**  
Consulting Engineers  
A Florence & Hutcheson, Inc. Company  
5121 KINGDOM WAY, SUITE 100 RALEIGH, N.C. 27607  
(919) 851-6965

PROJECT REFERENCE NO. R-2417AA  
SHEET NO. 26  
ROADWAY DESIGN ENGINEER  
HYDRAULICS ENGINEER  
**PRELIMINARY PLANS**  
DO NOT USE FOR CONSTRUCTION

\* MILL EXISTING PAVEMENT ADJACENT TO BRIDGE  
SEE MILLING DETAIL SHEET NO. 2-

-L-  
FOR PLAN, SEE SHEET NOS. 4 & 5



PI = 22+50.00  
EL = 246.29'  
VC = 800'  
K = 1214  
DS = 70 MPH

PIPE HYDRAULIC DATA  
STA -L- 22+80

DRAINAGE AREA	= 31.99 AC
DESIGN FREQUENCY	= 50 YRS
DESIGN DISCHARGE	= 60.87 CFS
DESIGN HW ELEVATION	= 215.20 FT
100 YEAR DISCHARGE	= 68.51 CFS
100 YEAR HW ELEVATION	= 215.61 FT
OVERTOPPING FREQUENCY	= 500+ YRS
OVERTOPPING DISCHARGE	= 242 CFS
OVERTOPPING ELEVATION	= 245.62 FT

42" CSP  
INV In= 211.30 INV out= 206.18

PIPE HYDRAULIC DATA  
STA -L- 23+30

DRAINAGE AREA	= 31.99 AC
DESIGN FREQUENCY	= 50 YRS
DESIGN DISCHARGE	= 14.13 CFS
DESIGN HW ELEVATION	= 213.70 FT
100 YEAR DISCHARGE	= 16.49 CFS
100 YEAR HW ELEVATION	= 213.94 FT
OVERTOPPING FREQUENCY	= 500+ YRS
OVERTOPPING DISCHARGE	= 242 CFS
OVERTOPPING ELEVATION	= 245.62 FT

24" STEEL PIPE (BORE & JACK)  
INV In= 211.70 INV out= 206.18

PIPE HYDRAULIC DATA  
STA -L- 33+50

DRAINAGE AREA	= 73.00 AC
DESIGN FREQUENCY	= 50 YRS
DESIGN DISCHARGE	= 117.95 CFS
DESIGN HW ELEVATION	= 219.63 FT
100 YEAR DISCHARGE	= 137.61 CFS
100 YEAR HW ELEVATION	= 220.79 FT
OVERTOPPING FREQUENCY	= 500+ YRS
OVERTOPPING DISCHARGE	= 516 CFS
OVERTOPPING ELEVATION	= 242.72 FT

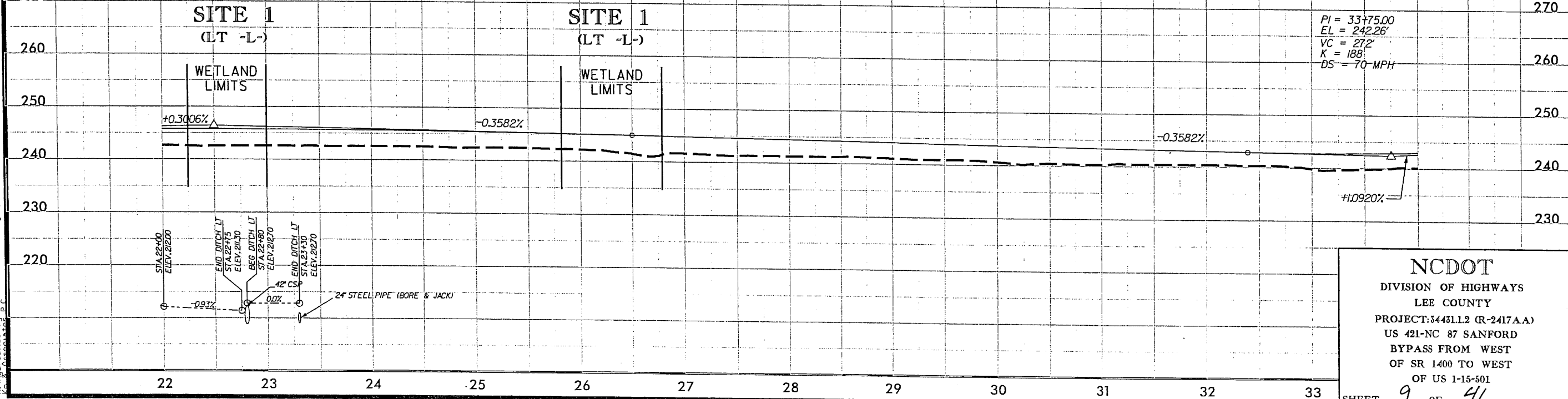
54" STL  
INV In= 214.39 INV out= 211.60

PIPE HYDRAULIC DATA  
STA -L- 33+65

DRAINAGE AREA	= 73.00 AC
DESIGN FREQUENCY	= 50 YRS
DESIGN DISCHARGE	= 62.05 CFS
DESIGN HW ELEVATION	= 221.72 FT
100 YEAR DISCHARGE	= 72.39 CFS
100 YEAR HW ELEVATION	= 224.00 FT
OVERTOPPING FREQUENCY	= 500+ YRS
OVERTOPPING DISCHARGE	= 516 CFS
OVERTOPPING ELEVATION	= 242.72 FT

EXIST 42" CMP  
INV In= 215.39 INV out= 211.60

-L-  
FOR PLAN, SEE SHEET NOS. 5 & 6



PI = 33+75.00  
EL = 242.26'  
VC = 272'  
K = 188  
DS = 70 MPH

**NCDOT**  
DIVISION OF HIGHWAYS  
LEE COUNTY  
PROJECT: 34451.12 (R-2417AA)  
US 421-NC 87 SANFORD  
BYPASS FROM WEST  
OF SR 1400 TO WEST  
OF US 1-15-501  
SHEET 9 OF 41

2/18/2009 10:54:00 AM C:\p0001\es\p0001\Permit\2417\ea\_hyd.plt...s21.dgn

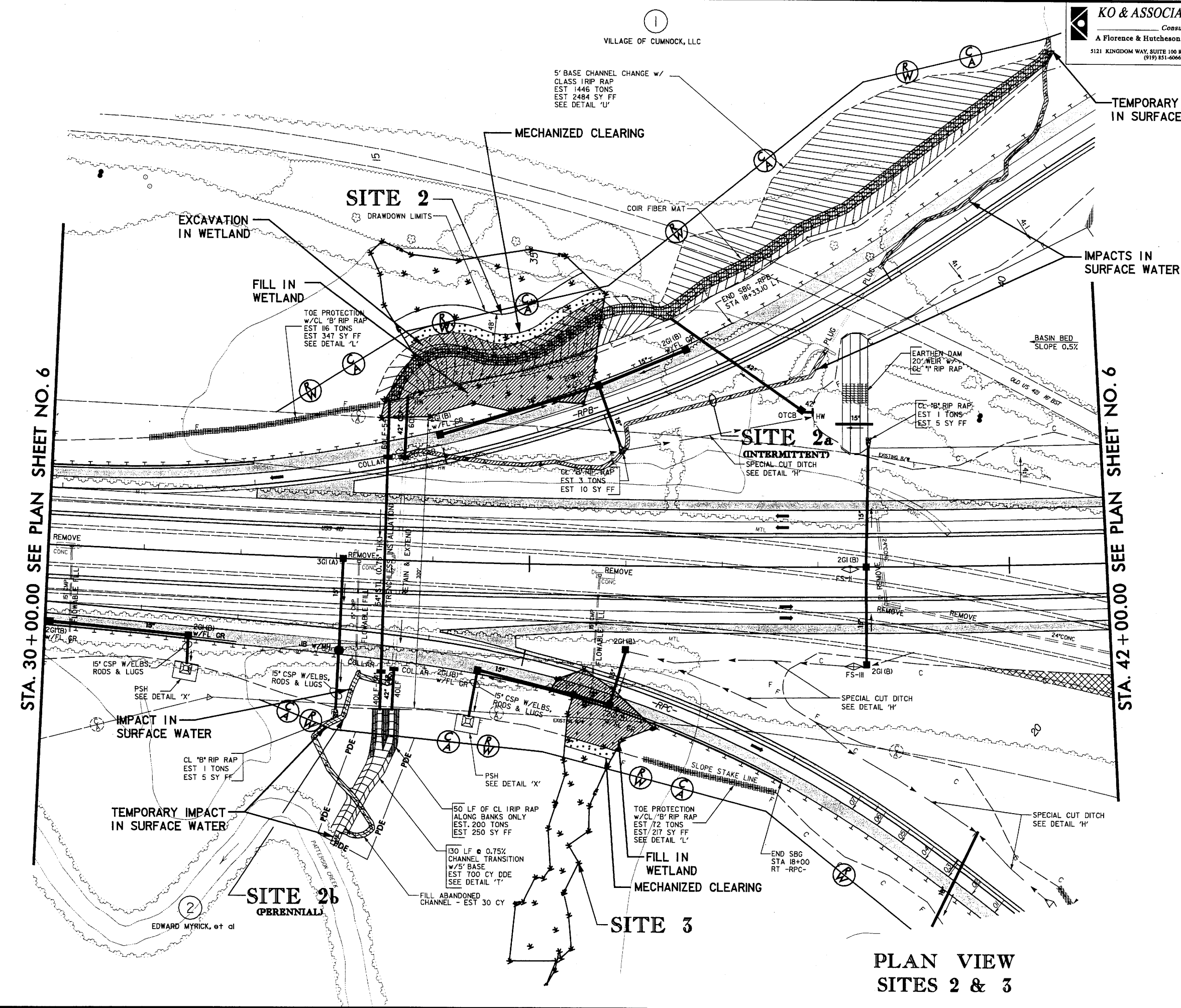


8/17/99  
 4/9/2009  
 R:\Hydraulics\Drawings\Permits\2417\ee\_hyd.prm\_06a.dgn

**KO & ASSOCIATES, P.C.**  
 Consulting Engineers  
 A Florence & Hutcheson, Inc. Company  
 5121 KINGDOM WAY, SUITE 100 RALEIGH, N.C. 27607  
 (919) 851-6066

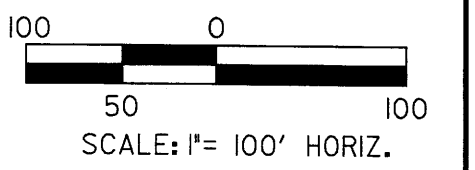
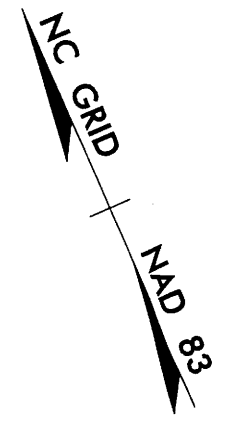
PROJECT REFERENCE NO. R-2417AA	SHEET NO. 6A
RW SHEET NO. 6	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
<b>PRELIMINARY PLANS</b> DO NOT USE FOR CONSTRUCTION	

Permit Drawing Sheet **10** of **41**



**LEGEND**

—WLB—	WETLAND
	DENOTES FILL IN WETLAND
	DENOTES EXCAVATION IN WETLAND
	DENOTES IMPACTS IN SURFACE WATER
	DENOTES TEMPORARY IMPACTS IN SURFACE WATER
	DENOTES MECHANIZED CLEARING



**PLAN VIEW**  
**SITES 2 & 3**

**NCDOT**  
 DIVISION OF HIGHWAYS  
 LEE COUNTY  
 PROJECT: 34431.12 (R-2417AA)  
 US 421-NC 87 SANFORD  
 BYPASS FROM WEST  
 OF SR 1400 TO WEST  
 OF US 1-15-501  
 SHEET **10** OF **41**

8/17/99  
 4/9/2009  
 R:\Hydro\Projects\Permits\2417\ee\_hyd\_prm\_06a.dgn  
 KO & ASSOCIATES, P.C.

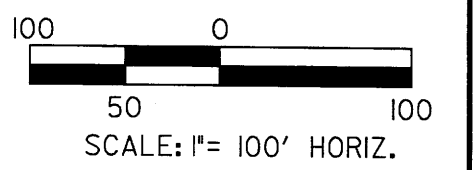
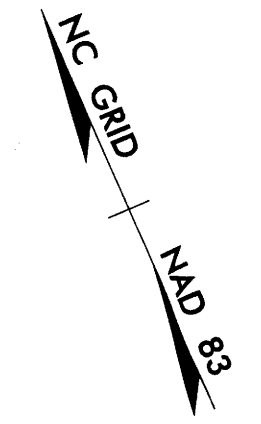
**KO & ASSOCIATES, P.C.**  
 Consulting Engineers  
 A Florence & Hutcheson, Inc. Company  
 5121 KINGDOM WAY, SUITE 100 RALEIGH, N.C. 27607  
 (919) 851-6666

PROJECT REFERENCE NO. R-2417AA	SHEET NO. 6A
HW SHEET NO. 6	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
<b>PRELIMINARY PLANS</b> DO NOT USE FOR CONSTRUCTION	

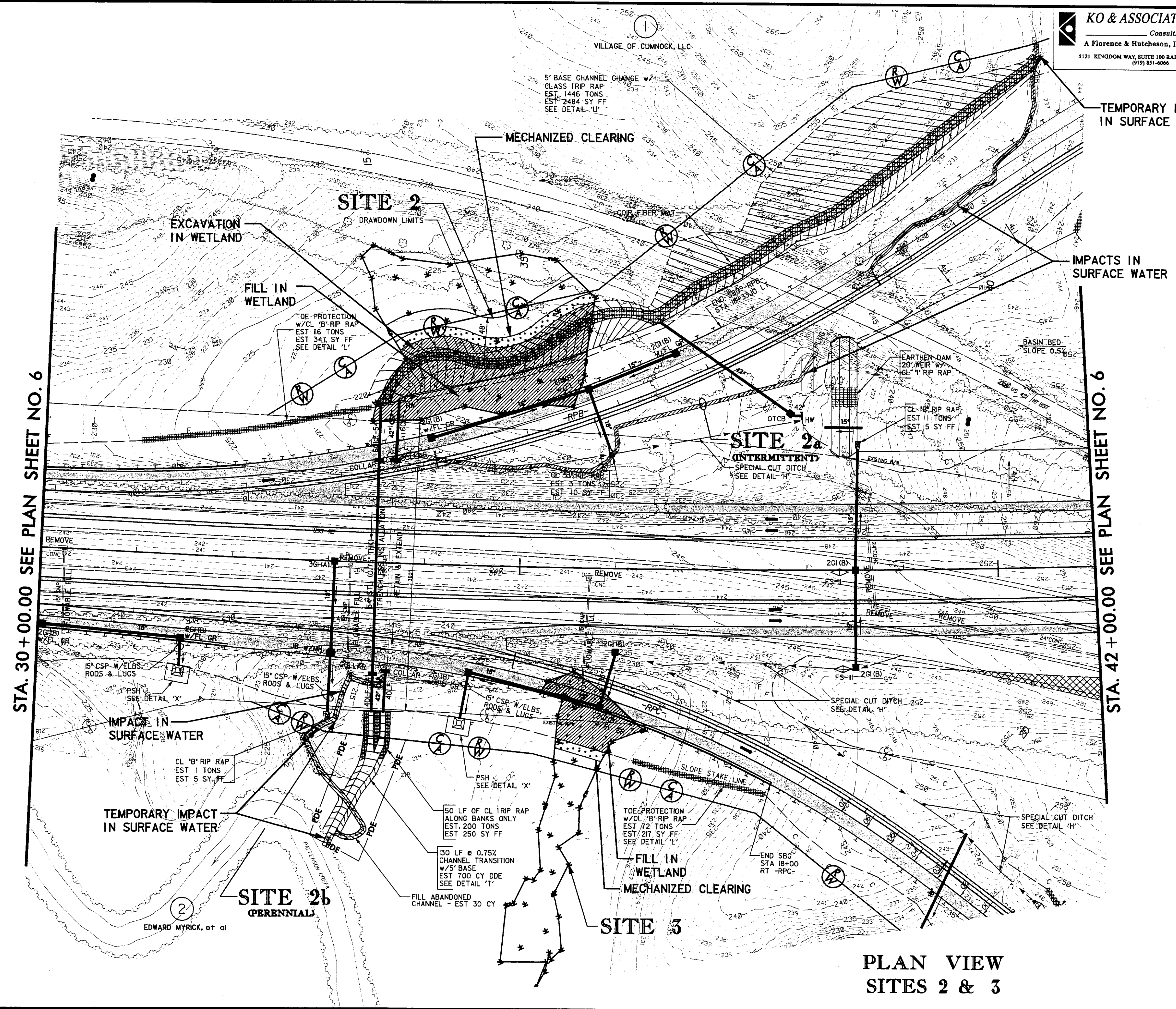
Permit Drawing  
 Sheet **11** of **41**

**LEGEND**

—WLB—	WETLAND
	DENOTES FILL IN WETLAND
	DENOTES EXCAVATION IN WETLAND
	DENOTES IMPACTS IN SURFACE WATER
	DENOTES TEMPORARY IMPACTS IN SURFACE WATER
	DENOTES MECHANIZED CLEARING

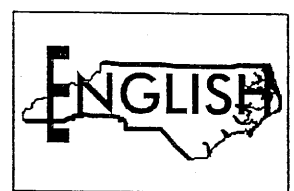


**NC DOT**  
 DIVISION OF HIGHWAYS  
 LEE COUNTY  
 PROJECT: 34431.1.2 (R-2417AA)  
 US 421-NC 87 SANFORD  
 BYPASS FROM WEST  
 OF SR 1400 TO WEST  
 OF US 1-15-501  
 SHEET **11** OF **41**

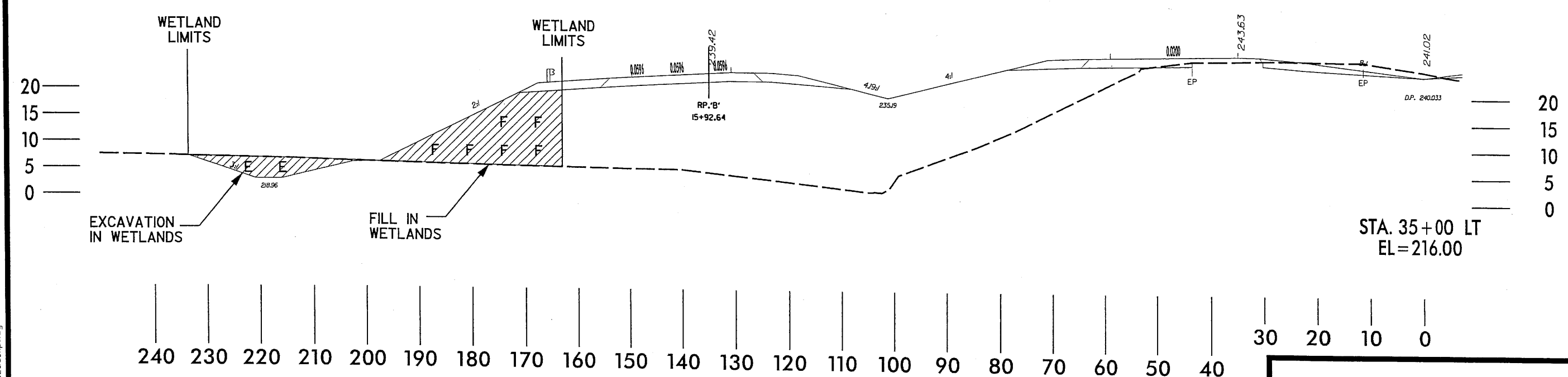
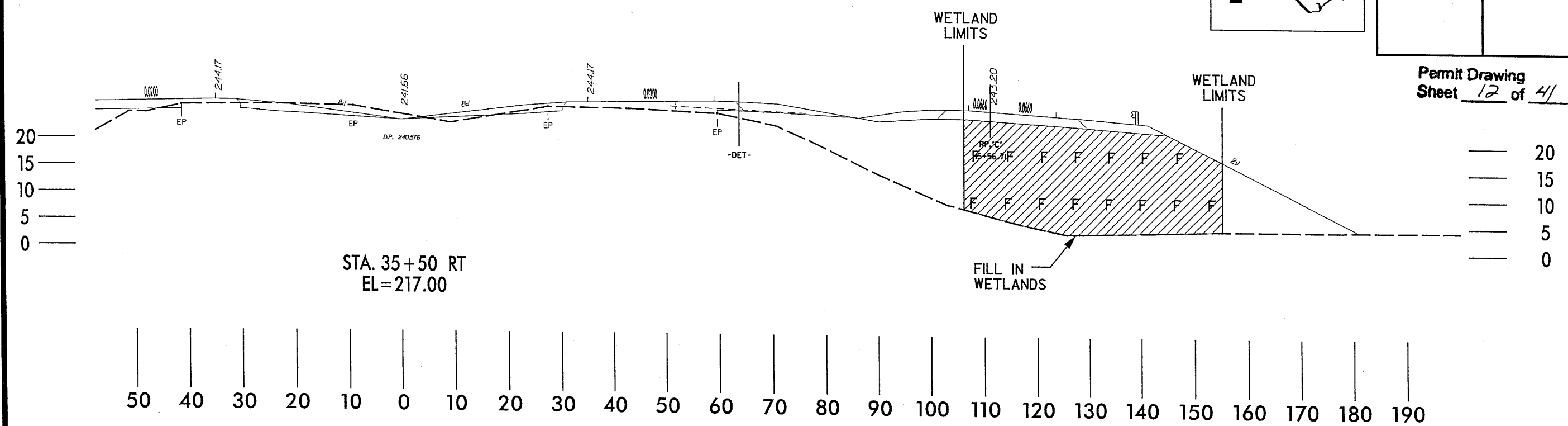


**PLAN VIEW**  
**SITES 2 & 3**

PROJECT REFERENCE NO. R-2417AA	SHEET NO. 2&3-XPL
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION	



Permit Drawing  
Sheet 12 of 41



**LEGEND**

- WLB — WETLAND
- DENOTES FILL IN WETLAND
- DENOTES EXCAVATION IN WETLAND

**TYPICAL X-SECTIONS  
SITES 2 & 3**

**NCDOT**  
DIVISION OF HIGHWAYS  
LEE COUNTY  
PROJECT: 34431.12 (R-2417AA)  
US 421-NC 87 SANFORD  
BYPASS FROM WEST  
OF SR 1400 TO WEST  
OF US 1-15-501

SHEET 12 OF 41

2/8/2009 8:14:00 AM C:\pdr-culica\vdgn\Permits\122417aa-site2&3.xpl.dgn

5/28/95

**KO & ASSOCIATES, P.C.**  
 Consulting Engineers  
 A Florence & Hutcheson, Inc. Company  
 5121 KINGDOM WAY, SUITE 100 RALEIGH, N.C. 27607  
 (919) 851-6066

PROJECT REFERENCE NO. <b>R-2417AA</b>	SHEET NO. <b>39</b>
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS  
DO NOT USE FOR CONSTRUCTION

Permit Drawing  
Sheet **13** of **41**

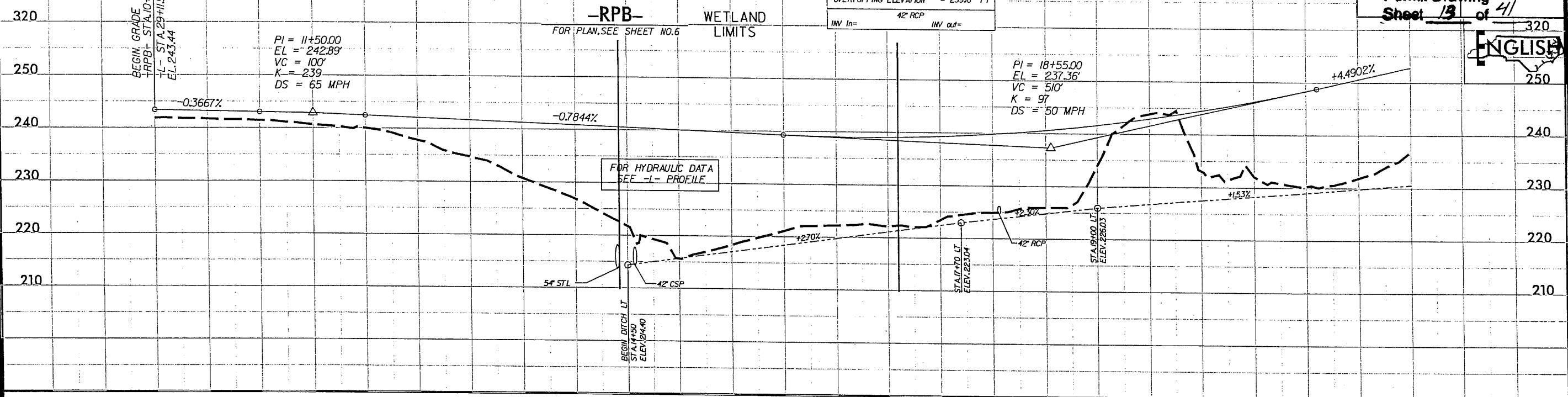
**ENGLISH**

PIPE HYDRAULIC DATA	
STA - RPB - 18+06	
DRAINAGE AREA	= 25.00 AC
DESIGN FREQUENCY	= 50 YRS
DESIGN DISCHARGE	= 60 CFS
DESIGN HW ELEVATION	= 236.69 FT
100 YEAR DISCHARGE	= 70 CFS
100 YEAR HW ELEVATION	= 237.10 FT
OVERTOPPING FREQUENCY	= 200+ YRS
OVERTOPPING DISCHARGE	= 107 CFS
OVERTOPPING ELEVATION	= 239.16 FT

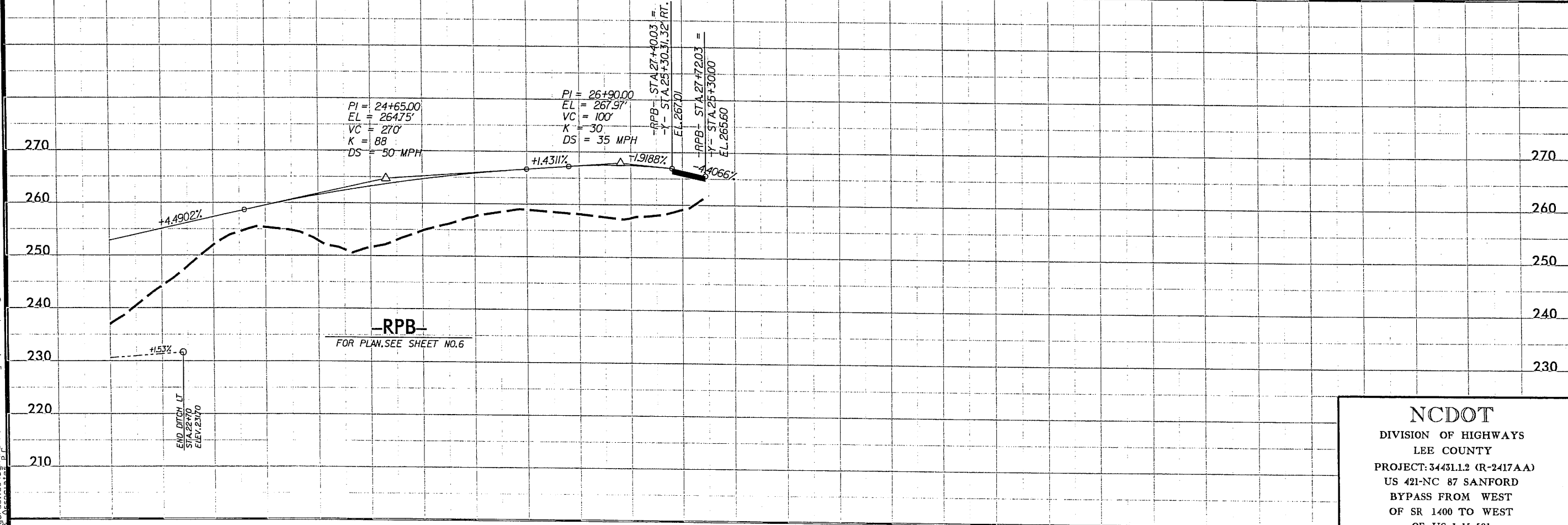
INV In = 42" RCP      INV out =

**SITE 2**  
**(LT RPB)**

WETLAND LIMITS



10      11      12      13      14      15      16      17      18      19      20      21      22



22      23      24      25      26      27

**NC DOT**  
 DIVISION OF HIGHWAYS  
 LEE COUNTY  
 PROJECT: 34431.1.2 (R-2417AA)  
 US 421-NC 87 SANFORD  
 BYPASS FROM WEST  
 OF SR 1400 TO WEST  
 OF US 1-15-501  
 SHEET **13** OF **41**

2/8/2009 8:00 AM C:\Users\perry\Documents\Projects\2417aa-hyd.pfl\_s2rpb.dgn

5/28/99

**KO & ASSOCIATES, P.C.**  
 Consulting Engineers  
 A Florence & Hutcheson, Inc. Company  
 5121 KINGDOM WAY, SUITE 100 RALEIGH, N.C. 27607  
 (919) 851-6066

PROJECT REFERENCE NO. R-2417AA	SHEET NO. 40
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

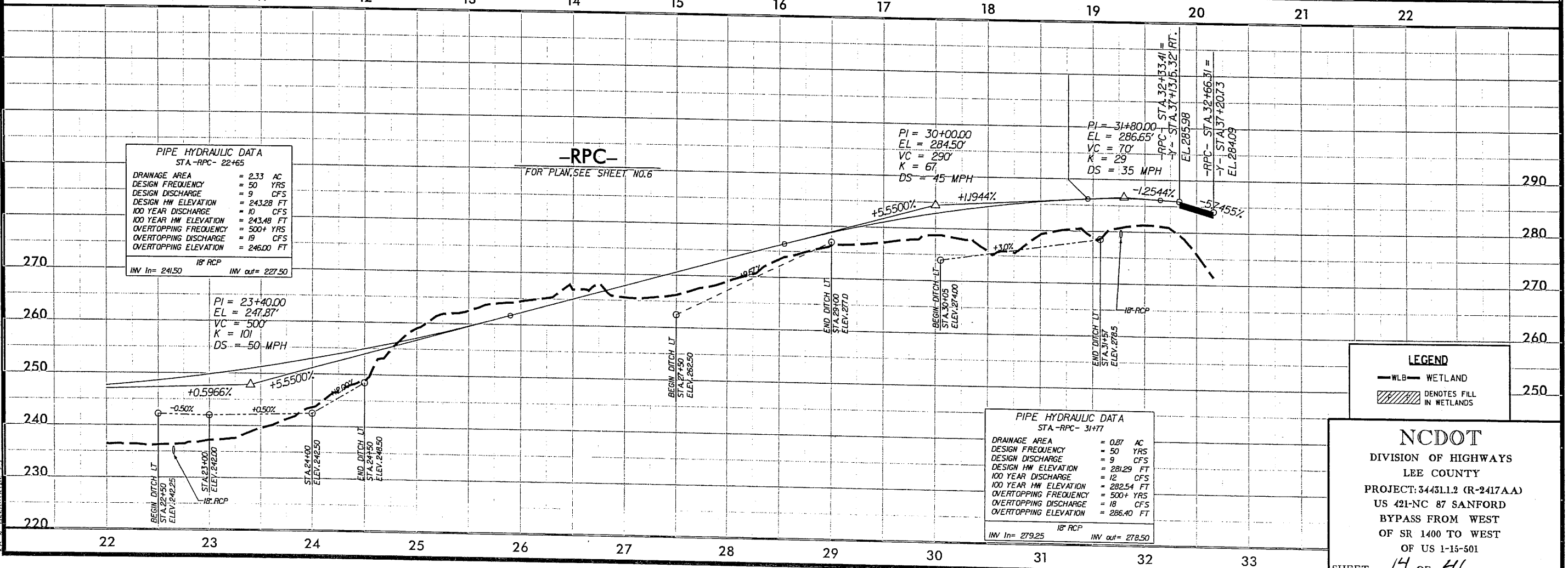
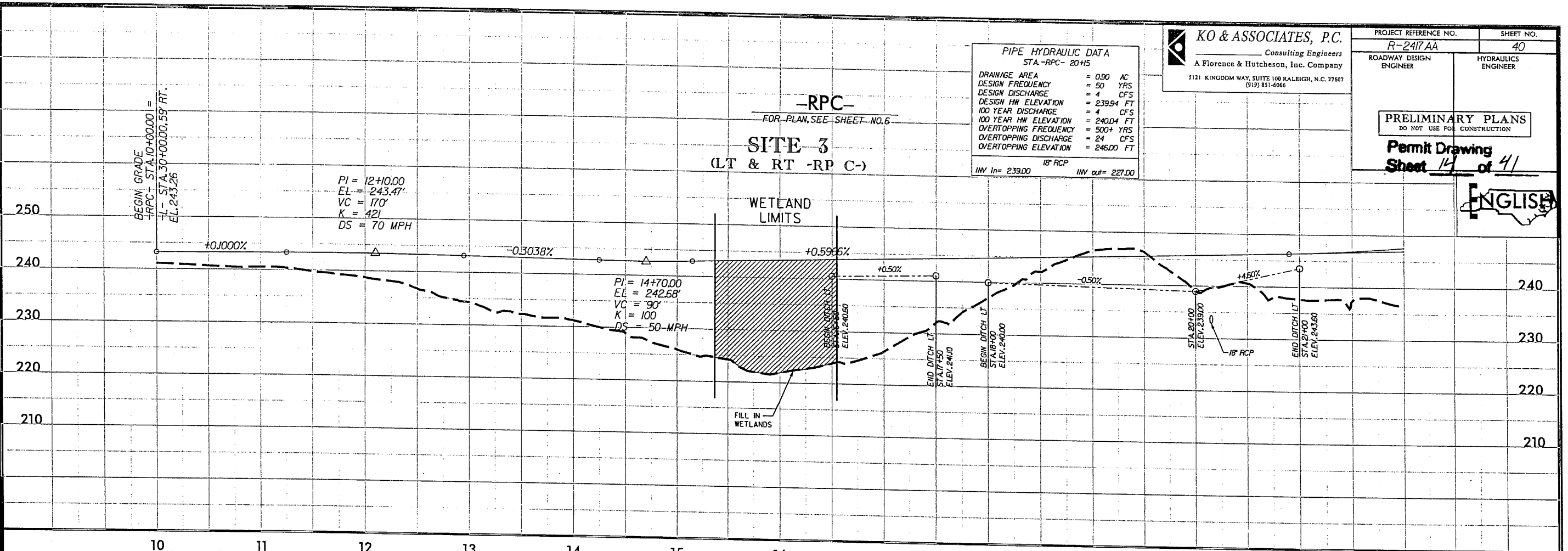
**PRELIMINARY PLANS**  
 DO NOT USE FOR CONSTRUCTION  
**Permit Drawing**  
 Sheet 14 of 41



**PIPE HYDRAULIC DATA**  
 STA-RPC- 20+5

DRAINAGE AREA	= 0.90 AC
DESIGN FREQUENCY	= 50 YRS
DESIGN DISCHARGE	= 4 CFS
DESIGN HW ELEVATION	= 239.94 FT
100 YEAR DISCHARGE	= 4 CFS
100 YEAR HW ELEVATION	= 240.04 FT
OVERTOPPING FREQUENCY	= 500+ YRS
OVERTOPPING DISCHARGE	= 24 CFS
OVERTOPPING ELEVATION	= 246.00 FT

18" RCP  
 INV In= 239.00    INV out= 227.00



**PIPE HYDRAULIC DATA**  
 STA-RPC- 22+65

DRAINAGE AREA	= 2.33 AC
DESIGN FREQUENCY	= 50 YRS
DESIGN DISCHARGE	= 9 CFS
DESIGN HW ELEVATION	= 243.28 FT
100 YEAR DISCHARGE	= 10 CFS
100 YEAR HW ELEVATION	= 243.48 FT
OVERTOPPING FREQUENCY	= 500+ YRS
OVERTOPPING DISCHARGE	= 19 CFS
OVERTOPPING ELEVATION	= 246.00 FT

18" RCP  
 INV In= 241.50    INV out= 227.50

**PIPE HYDRAULIC DATA**  
 STA-RPC- 31+77

DRAINAGE AREA	= 0.87 AC
DESIGN FREQUENCY	= 50 YRS
DESIGN DISCHARGE	= 9 CFS
DESIGN HW ELEVATION	= 281.29 FT
100 YEAR DISCHARGE	= 12 CFS
100 YEAR HW ELEVATION	= 282.54 FT
OVERTOPPING FREQUENCY	= 500+ YRS
OVERTOPPING DISCHARGE	= 18 CFS
OVERTOPPING ELEVATION	= 286.40 FT

18" RCP  
 INV In= 279.25    INV out= 278.50

**LEGEND**

- WLB — WETLAND
- ▨ DENOTES FILL IN WETLANDS

**NCDOT**  
 DIVISION OF HIGHWAYS  
 LEE COUNTY  
 PROJECT: 54431.1.2 (R-2417AA)  
 US 421-NC 87 SANFORD  
 BYPASS FROM WEST  
 OF SR 1400 TO WEST  
 OF US 1-15-501  
 SHEET 14 OF 41

2/8/2009 R:\Hydraulics\Permits\R-2417\ee\_hud\_pfl\_s3rpc.dgn

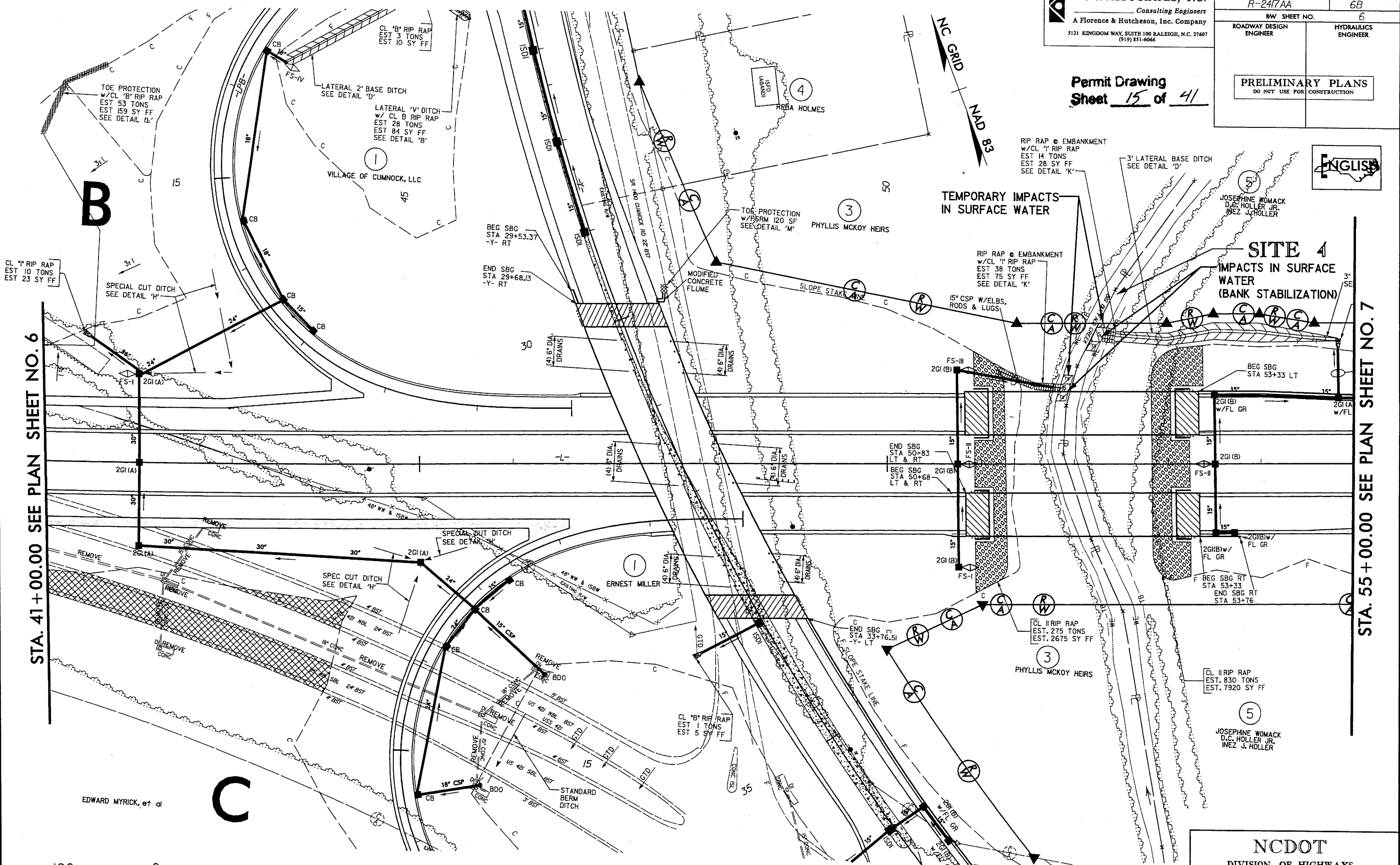


8/17/99

**KO & ASSOCIATES, P.C.**  
Consulting Engineers  
A Florence & Hutcheson, Inc. Company  
5121 KINGDOM WAY, SUITE 100 RALEIGH, N.C. 27607  
(919) 851-6066

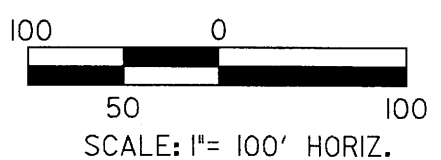
PROJECT REFERENCE NO. R-2417AA	SHEET NO. 6B
RW SHEET NO. 6	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION	

Permit Drawing  
Sheet 15 of 41



STA. 41+00.00 SEE PLAN SHEET NO. 6

STA. 55+00.00 SEE PLAN SHEET NO. 7



### PLAN VIEW SITE 4

#### LEGEND

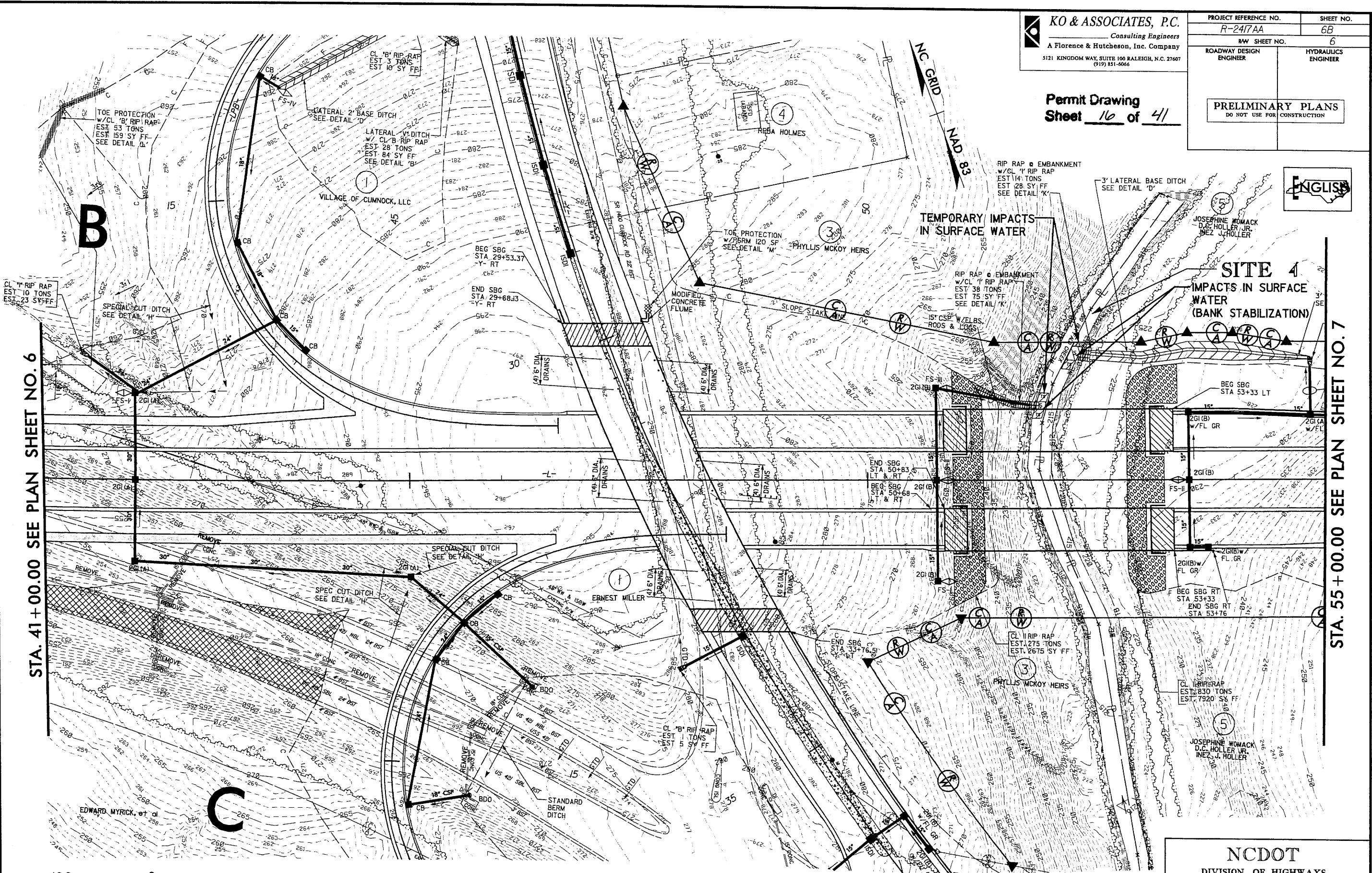
- WLB— WETLAND
- DENOTES TEMPORARY IMPACTS IN SURFACE WATER
- DENOTES IMPACTS IN SURFACE WATER

**NCDOT**  
DIVISION OF HIGHWAYS  
LEE COUNTY  
PROJECT: 34431.12 (R-2417AA)  
US 421-NC 87 SANFORD  
BYPASS FROM WEST  
OF SR 1400 TO WEST  
OF US 1-15-501  
SHEET 15 OF 41

4/6/2009 8:51 AM C:\projects\2417aa\hyd\_prm\_06b.dgn

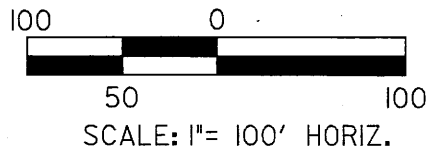
PROJECT REFERENCE NO. R-2417AA	SHEET NO. 6B
RW SHEET NO. 6	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
<b>PRELIMINARY PLANS</b> DO NOT USE FOR CONSTRUCTION	

Permit Drawing  
 Sheet 16 of 41



STA. 41+00.00 SEE PLAN SHEET NO. 6

STA. 55+00.00 SEE PLAN SHEET NO. 7



**PLAN VIEW  
 SITE 4**

- LEGEND**
- WLB — WETLAND
  - DENOTES TEMPORARY IMPACTS IN SURFACE WATER
  - DENOTES IMPACTS IN SURFACE WATER

**NCDOT**  
 DIVISION OF HIGHWAYS  
 LEE COUNTY  
 PROJECT: 3445L1.2 (R-2417AA)  
 US 421-NC 87 SANFORD  
 BYPASS FROM WEST  
 OF SR 1400 TO WEST  
 OF US 1-15-501  
 SHEET 16 OF 41

5/28/99

3/17/2009 R:\Hydro\Projects\Permits\2417\ee\_hyd\_pf1\_s2cont3&4.dgn KO & Associates, P.C.

### SITE 3 (RT -L-)

WETLAND LIMITS

### SITE 2 (LT -L-)

WETLAND LIMITS

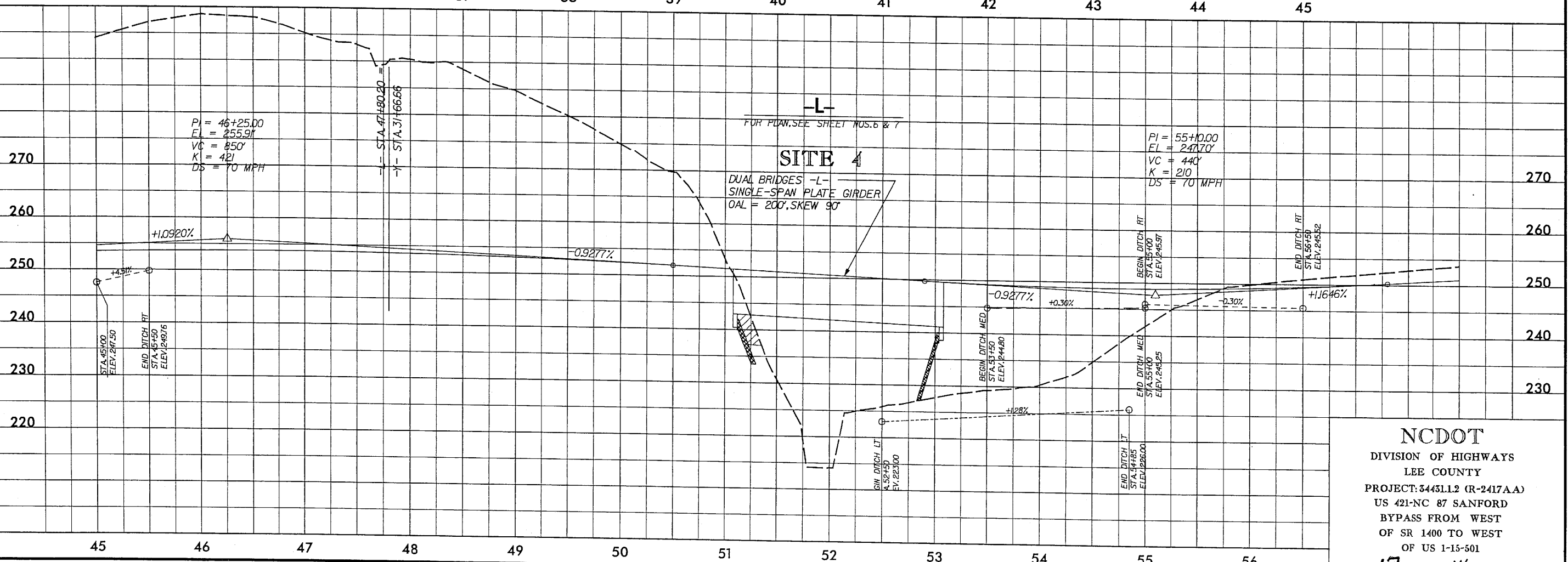
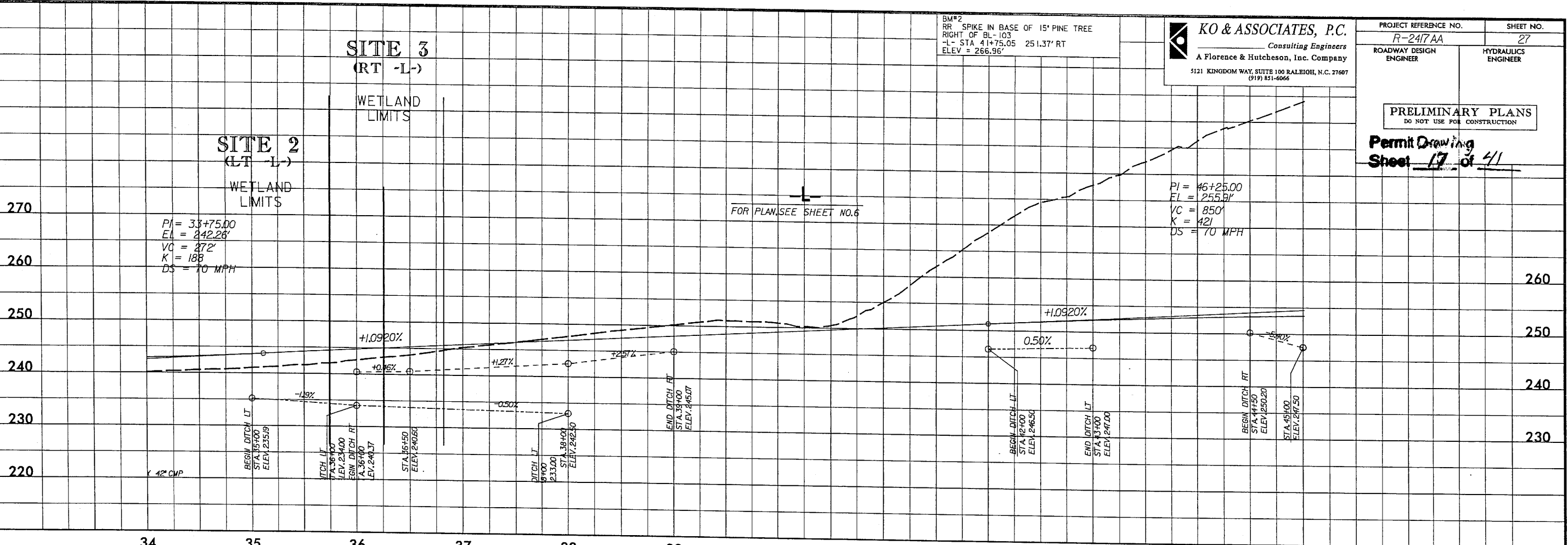
BM#2  
RR SPIKE IN BASE OF 15' PINE TREE  
RIGHT OF BL-103  
-L- STA 41+75.05 251.37' RT  
ELEV = 266.96'

**KO & ASSOCIATES, P.C.**  
Consulting Engineers  
A Florence & Hutcheson, Inc. Company  
5121 KINGDOM WAY, SUITE 100 RALEIGH, N.C. 27607  
(919) 851-6066

PROJECT REFERENCE NO. R-2417AA	SHEET NO. 27
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS  
DO NOT USE FOR CONSTRUCTION

Permit Drawing  
Sheet 17 of 41



**NCDOT**  
DIVISION OF HIGHWAYS  
LEE COUNTY  
PROJECT: 3443L12 (R-2417AA)  
US 421-NC 87 SANFORD  
BYPASS FROM WEST  
OF SR 1400 TO WEST  
OF US 1-15-501

SHEET 17 OF 41






8/17/99

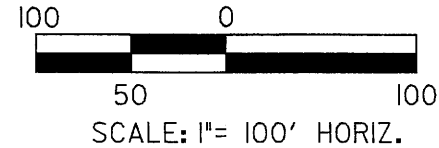
**KO & ASSOCIATES, P.C.**  
 Consulting Engineers  
 A Florence & Hutcheson, Inc. Company  
 5121 KINGDOM WAY, SUITE 100 RALEIGH, N.C. 27607  
 (919) 851-6066

PROJECT REFERENCE NO. R-2417AA	SHEET NO. 7
RW SHEET NO. 7	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION	

Permit Drawing  
 Sheet 19 of 41 

-MATCHLINE- STA. 54 + 50.00 SEE SHEET NO. 6

-MATCHLINE- STA. 65 + 00.00 SEE SHEET NO. 8





NCG GRID  
 NAD 83

5  
 JOSEPHINE WOMACK  
 D.C. HOLLER JR.  
 INEZ J. HOLLER  
 DB 95 PG 74

5  
 JOSEPHINE WOMACK  
 D.C. HOLLER JR.  
 INEZ J. HOLLER

SITE 4

PLAN VIEW  
SITE 4

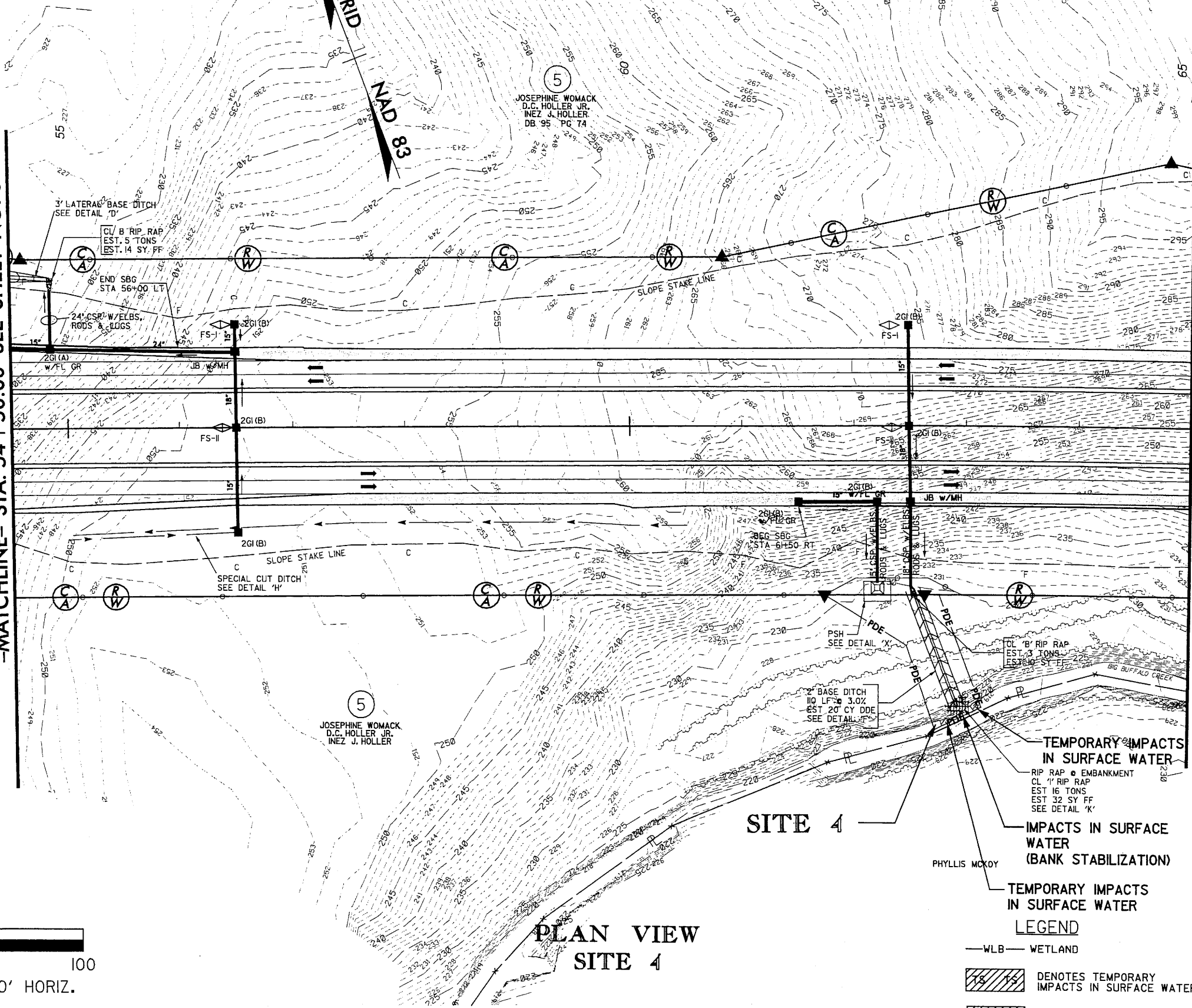
- LEGEND**
- WLB — WETLAND
  -  DENOTES TEMPORARY IMPACTS IN SURFACE WATER
  -  DENOTES IMPACTS IN SURFACE WATER

TEMPORARY IMPACTS IN SURFACE WATER  
 RIP RAP EMBANKMENT  
 CL 1' RIP RAP  
 EST 16 TONS  
 EST 32 SY FF  
 SEE DETAIL 'K'

IMPACTS IN SURFACE WATER  
 (BANK STABILIZATION)

TEMPORARY IMPACTS IN SURFACE WATER

PHYLLIS MCKOY



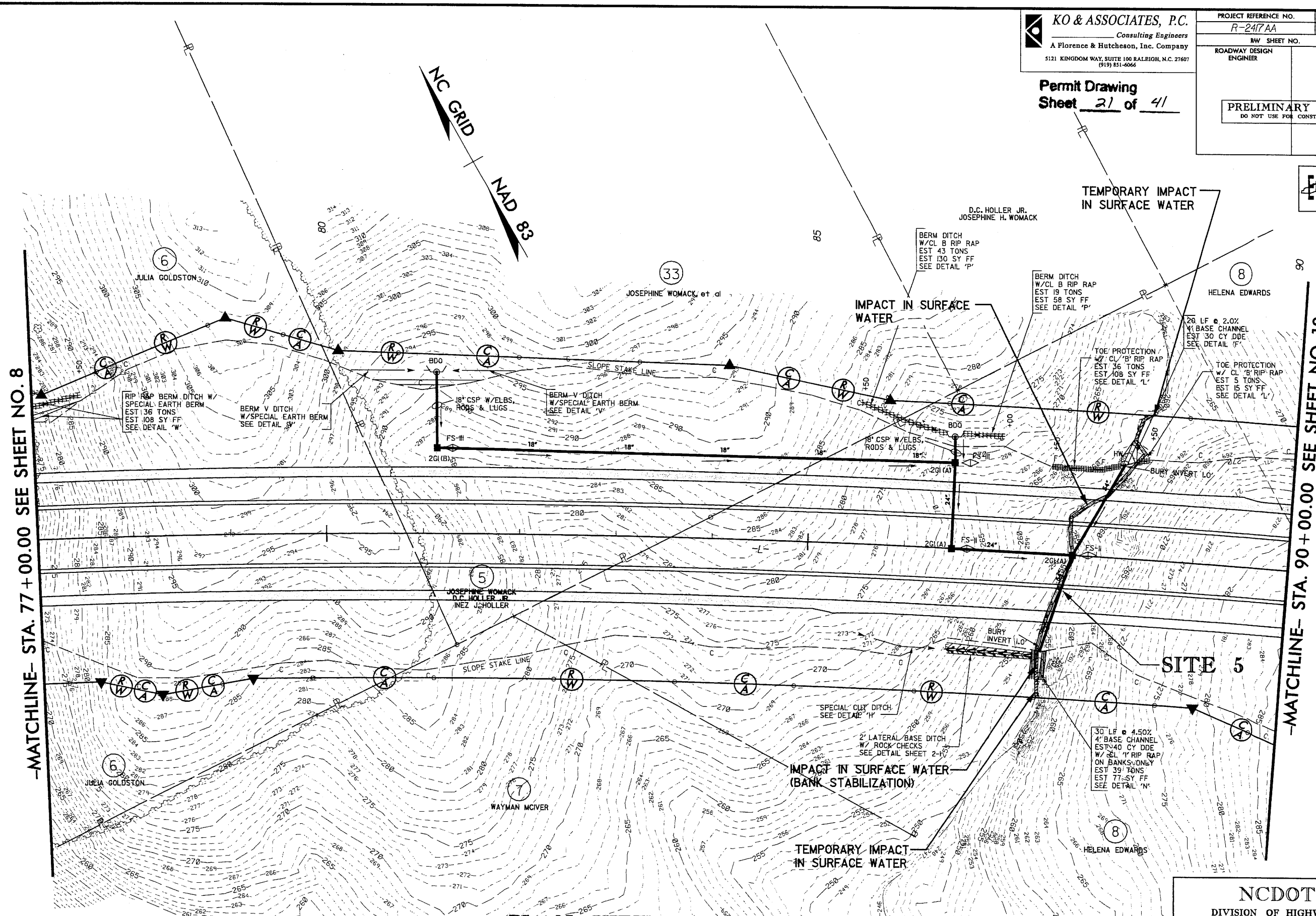
4/6/2009 R:\Hydro\Projects\Permits\R-2417\ee\_hyd.prm-07.dgn

**NCDOT**  
 DIVISION OF HIGHWAYS  
 LEE COUNTY  
 PROJECT: 3443L1.2 (R-2417AA)  
 US 421-NC 87 SANFORD  
 BYPASS FROM WEST  
 OF SR 1400 TO WEST  
 OF US 1-15-501  
 SHEET 19 OF 41



PROJECT REFERENCE NO. R-2417AA	SHEET NO. 9
RW SHEET NO. 9	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION	

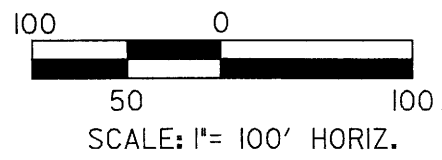
Permit Drawing  
 Sheet 21 of 41



-MATCHLINE- STA. 77 + 00.00 SEE SHEET NO. 8

-MATCHLINE- STA. 90 + 00.00 SEE SHEET NO. 10

**PLAN VIEW  
 SITE 5**



**LEGEND**

—WLB—	WETLAND
	DENOTES IMPACTS IN SURFACE WATER
	DENOTES TEMPORARY IMPACTS IN SURFACE WATER

**NCDOT**  
 DIVISION OF HIGHWAYS  
 LEE COUNTY  
 PROJECT: 34431.12 (R-2417AA)  
 US 421-NC 87 SANFORD  
 BYPASS FROM WEST  
 OF SR 1400 TO WEST  
 OF US 1-15-501  
 SHEET 21 OF 41

12-6-06 Changed Parcel No. 5 to Parcel No. 33 - Revised Owner Name

4/5/2009 10:55:00 AM C:\Users\jg\Documents\Projects\2417\2417\_00\_hyd.prm.09.dgn

5/28/99

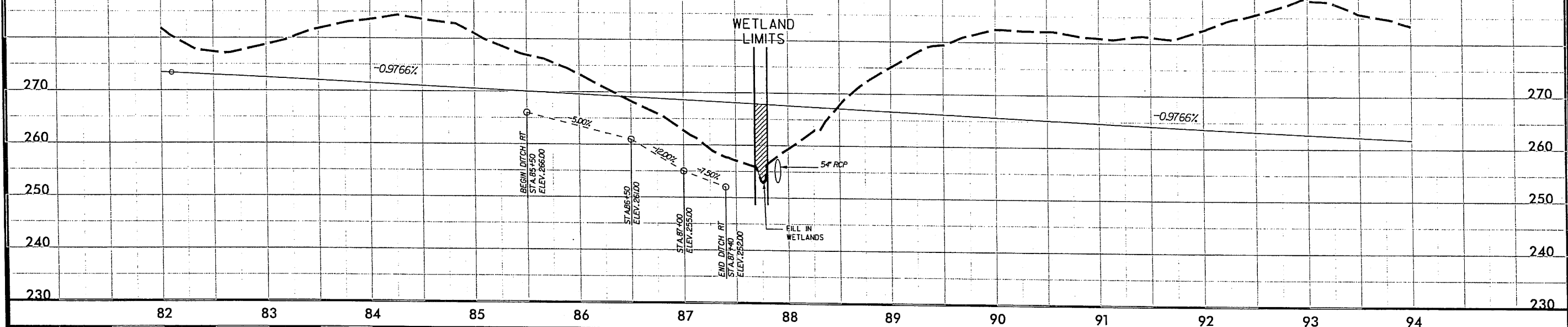
BM#6  
RR SPIKE IN BASE OF 10" PINE TREE RIGHT  
OF BL-111  
-L- STA 84+79.65 310.38' RT  
ELEV = 256.56'

**KO & ASSOCIATES, P.C.**  
Consulting Engineers  
A Florence & Hutcheson, Inc. Company  
5121 KINGDOM WAY, SUITE 100 RALEIGH, N.C. 27607  
(919) 851-6066

PROJECT REFERENCE NO. **R-2417AA** SHEET NO. **29**  
ROADWAY DESIGN ENGINEER HYDRAULICS ENGINEER  
**PRELIMINARY PLANS**  
DO NOT USE FOR CONSTRUCTION  
**Permit Drawing**  
Sheet **22** of **41**

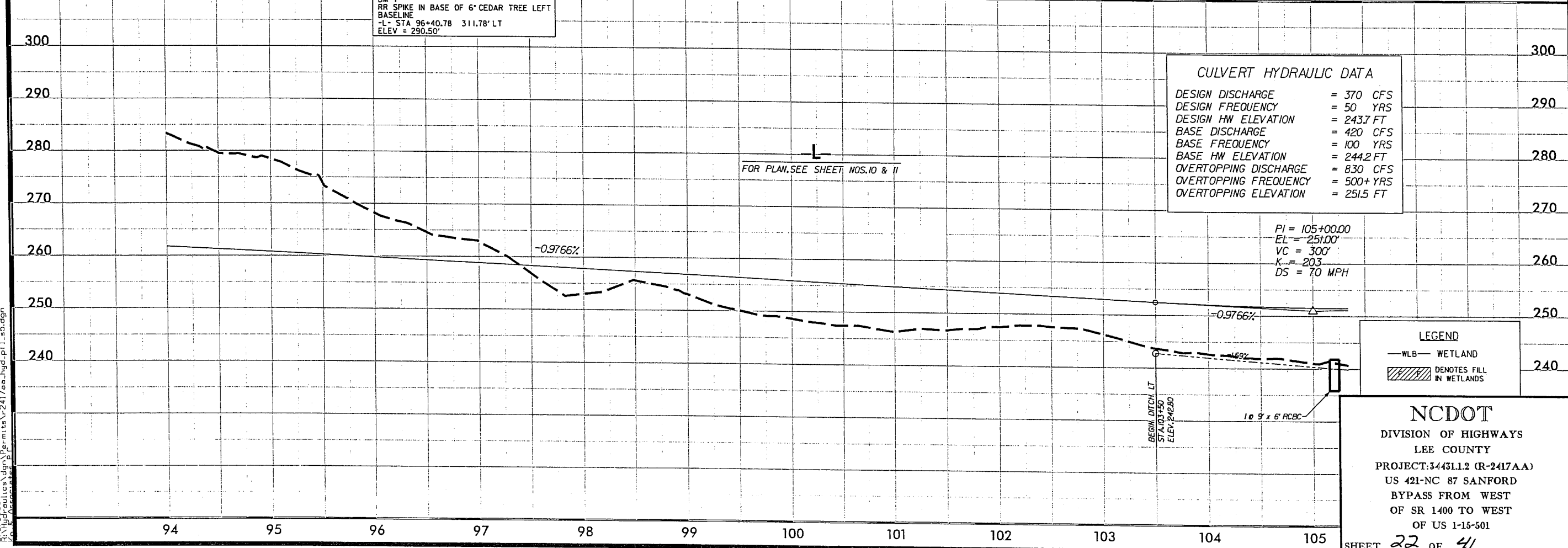
**PIPE HYDRAULIC DATA**  
STA.-L- 87+90  
DRAINAGE AREA = 3172 AC  
DESIGN FREQUENCY = 50 YRS  
DESIGN DISCHARGE = 90 CFS  
DESIGN HW ELEVATION = 260.42 FT  
100 YEAR DISCHARGE = 100 CFS  
100 YEAR HW ELEVATION = 260.77 FT  
OVERTOPPING FREQUENCY = 500+ YRS  
OVERTOPPING DISCHARGE = 204 CFS  
OVERTOPPING ELEVATION = 266.63 FT  
5" RCP  
INV In= 255.00 INV out= 250.80

**SITE 5**  
(LT & RT -L-)



BM#7  
RR SPIKE IN BASE OF 6" CEDAR TREE LEFT  
BASELINE  
-L- STA 96+40.78 311.78' LT  
ELEV = 290.50'

**CULVERT HYDRAULIC DATA**  
DESIGN DISCHARGE = 370 CFS  
DESIGN FREQUENCY = 50 YRS  
DESIGN HW ELEVATION = 243.7 FT  
BASE DISCHARGE = 420 CFS  
BASE FREQUENCY = 100 YRS  
BASE HW ELEVATION = 244.2 FT  
OVERTOPPING DISCHARGE = 830 CFS  
OVERTOPPING FREQUENCY = 500+ YRS  
OVERTOPPING ELEVATION = 251.5 FT



**LEGEND**  
-WLB- WETLAND  
DENOTES FILL IN WETLANDS

**NCDOT**  
DIVISION OF HIGHWAYS  
LEE COUNTY  
PROJECT: 34431.1.2 (R-2417AA)  
US 421-NC 87 SANFORD  
BYPASS FROM WEST  
OF SR 1400 TO WEST  
OF US 1-15-501  
SHEET **22** OF **41**

2/10/2009 R:\Hydraulics\dgn\Permits\2417ae\_hyd\_pfl.s5.dgn

8/17/99

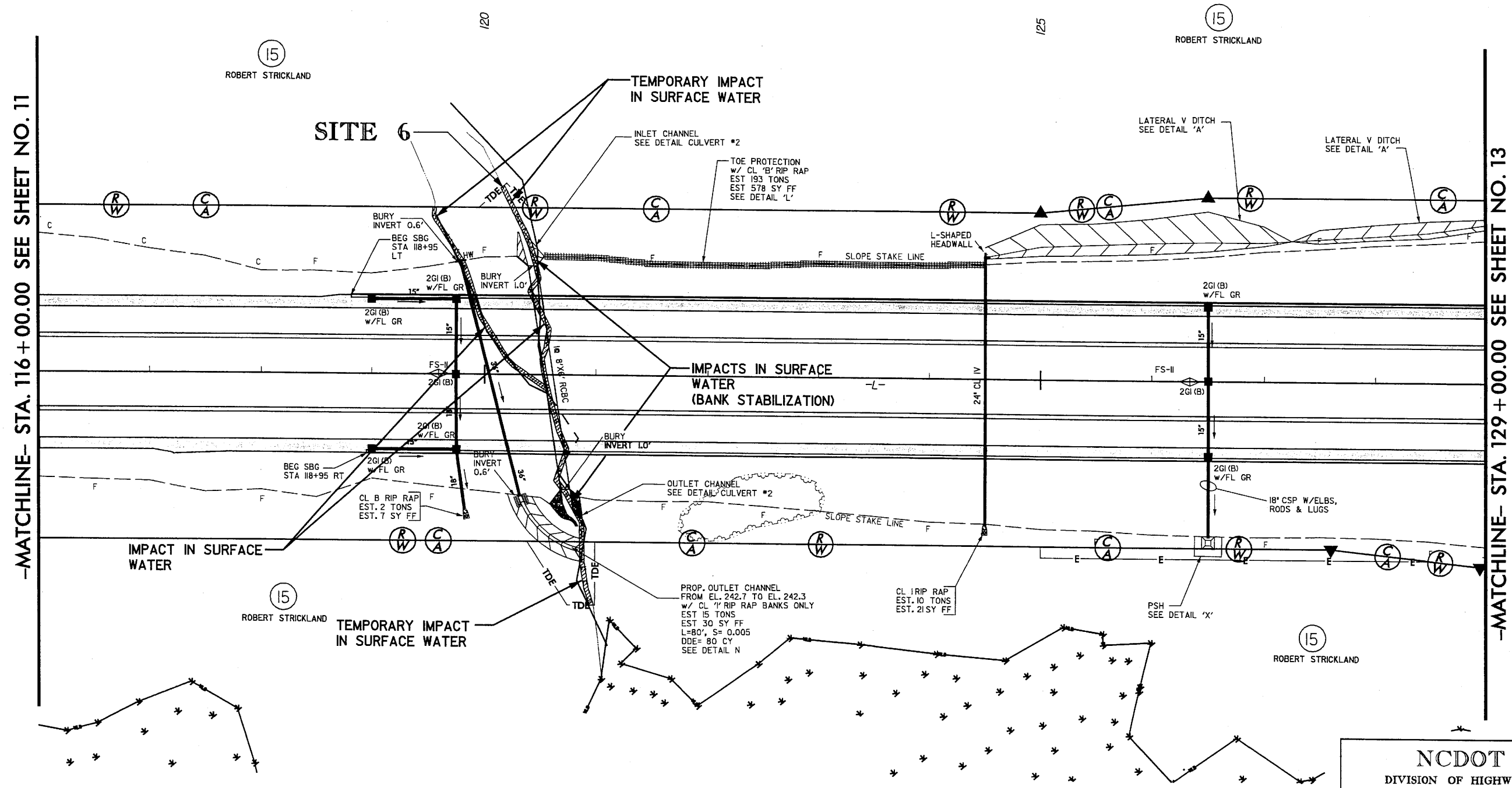
**KO & ASSOCIATES, P.C.**  
Consulting Engineers  
A Florence & Hutcheson, Inc. Company  
5121 KINGDOM WAY, SUITE 100 RALEIGH, N.C. 27607  
(919) 851-6066

PROJECT REFERENCE NO. R-2417AA	SHEET NO. 12
RW SHEET NO. 12	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION	

Permit Drawing  
Sheet 23 of 41

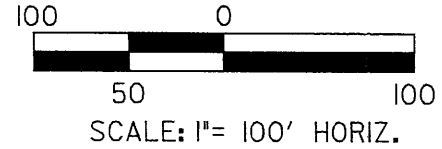


NC GRID  
NAD 83



-MATCHLINE- STA. 116+00.00 SEE SHEET NO. 11

-MATCHLINE- STA. 129+00.00 SEE SHEET NO. 13



PLAN VIEW  
SITE 6

**LEGEND**

	WLB WETLAND
	DENOTES IMPACTS IN SURFACE WATER
	DENOTES TEMPORARY IMPACTS IN SURFACE WATER

**NCDOT**  
DIVISION OF HIGHWAYS  
LEE COUNTY  
PROJECT: 34451.12 (R-2417AA)  
US 421-NC 87 SANFORD  
BYPASS FROM WEST  
OF SR 1400 TO WEST  
OF US 1-15-501  
SHEET 23 OF 41

4/5/2009 11:54:12 AM V:\dgn\Permits\2417\ee\_hyd\_perm\_12.dgn  
KO & ASSOCIATES, P.C.

8/17/99

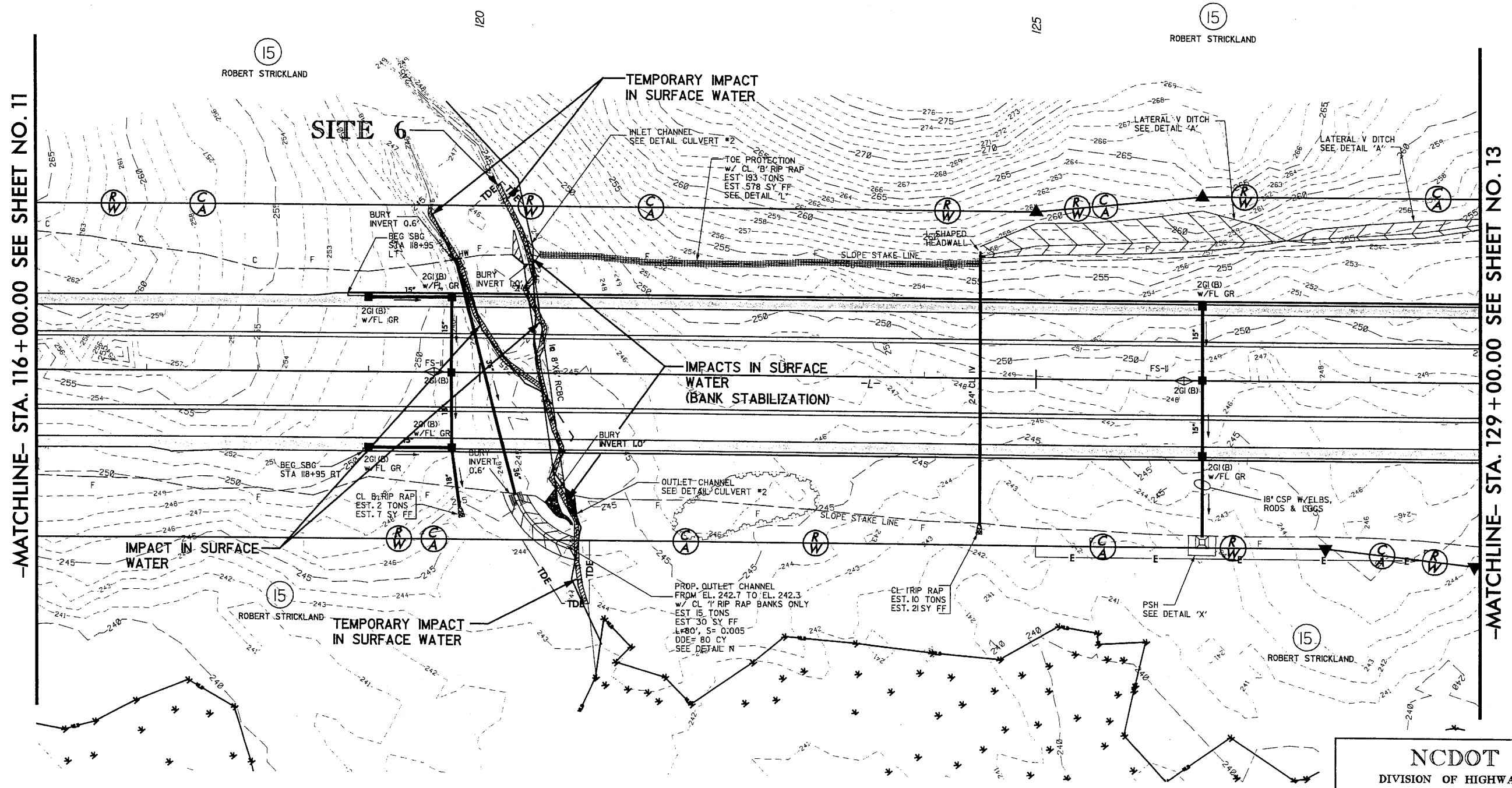
**KO & ASSOCIATES, P.C.**  
Consulting Engineers  
A Florence & Hutcheson, Inc. Company  
5121 KINGDOM WAY, SUITE 100 RALEIGH, N.C. 27607  
(919) 851-6066

PROJECT REFERENCE NO. R-2417AA	SHEET NO. 12
RW SHEET NO. 12	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION	

Permit Drawing  
Sheet 24 of 41

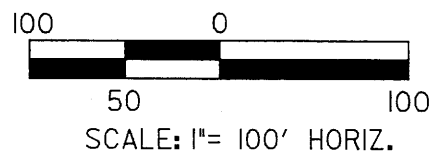


NC GRID  
NAD 83



-MATCHLINE- STA. 116 + 00.00 SEE SHEET NO. 11

-MATCHLINE- STA. 129 + 00.00 SEE SHEET NO. 13



PLAN VIEW  
SITE 6

**LEGEND**

	WETLAND
	DENOTES IMPACTS IN SURFACE WATER
	DENOTES TEMPORARY IMPACTS IN SURFACE WATER

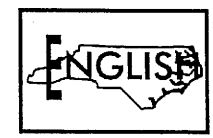
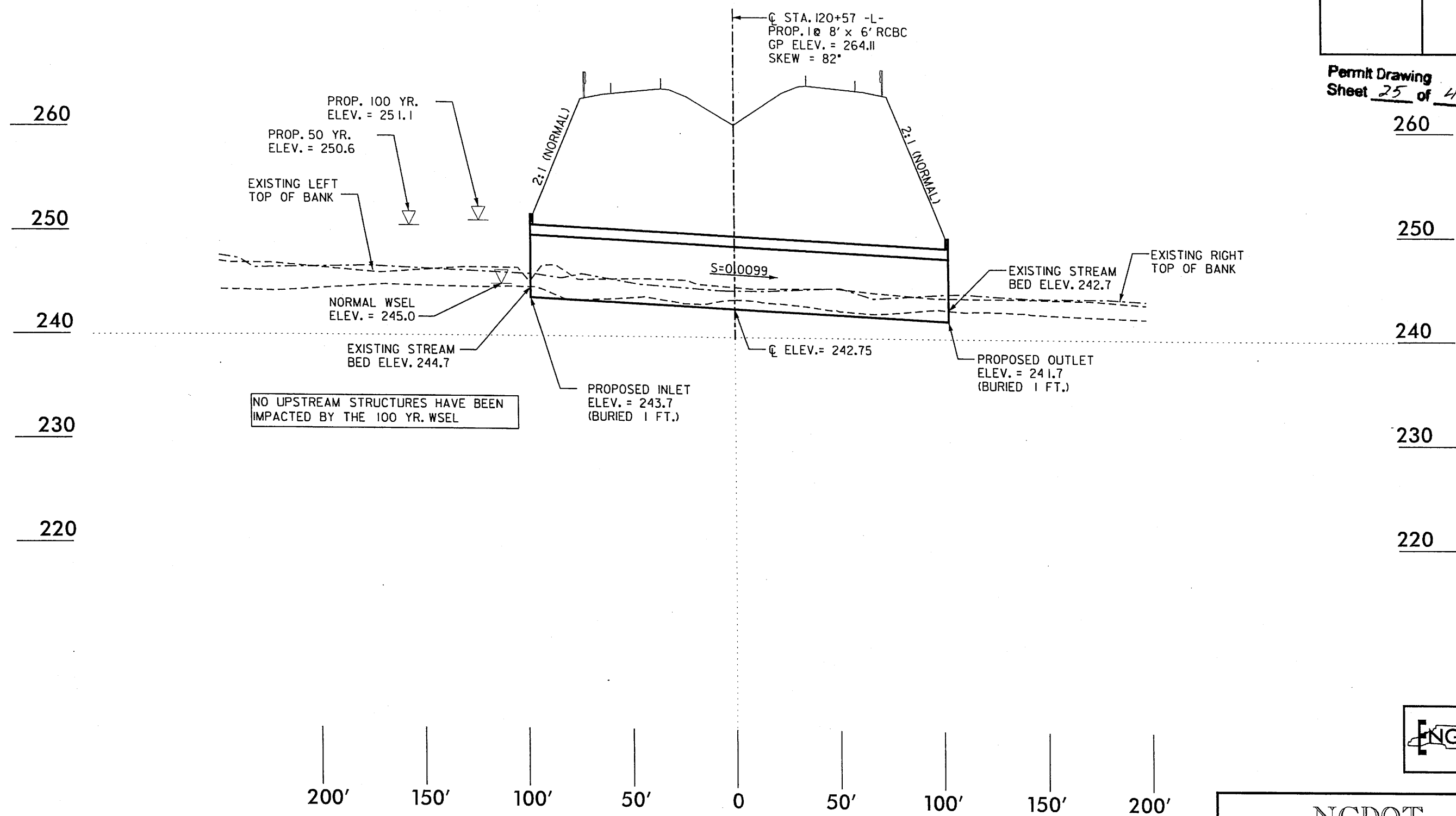
**NC DOT**  
DIVISION OF HIGHWAYS  
LEE COUNTY  
PROJECT: 34431.12 (R-2417AA)  
US 421-NC 87 SANFORD  
BYPASS FROM WEST  
OF SR 1400 TO WEST  
OF US 1-15-501  
SHEET 24 OF 41

4/5/2008  
R:\Projects\Lee\Permits\2417aa\_hyd\_perm.dwg  
KO & ASSOCIATES, P.C.



PROJECT REFERENCE NO. R-2417AA	SHEET NO. S6-PAS
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION	

Permit Drawing  
Sheet 25 of 41



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

PROFILE ALONG STRUCTURE  
SITE 6

NCDOT  
 DIVISION OF HIGHWAYS  
 LEE COUNTY  
 PROJECT: 34431.1.2 (R-2417AA)  
 US 421-NC 87 SANFORD  
 BYPASS FROM WEST  
 OF SR 1400 TO WEST  
 OF US 1-15-501  
 SHEET 25 OF 41 5/5/06

R:\Hydraulics\dgn\Permits\2417aa\_hyd\_pf las\_12.dgn  
 2/8/2009 7:58:17 PM



5/28/99

BM#8  
RR SPIKE IN BASE OF 12" MAPLE TREE LEFT  
OF BASELINE  
-L- STA 108+17.37 248.26' LT  
ELEV = 256.97'

**KO & ASSOCIATES, P.C.**  
Consulting Engineers  
A Florence & Hutcheson, Inc. Company  
5121 KINGDOM WAY, SUITE 100 RALEIGH, N.C. 27607  
(919) 851-6066

PROJECT REFERENCE NO. R-2417AA  
SHEET NO. 30  
ROADWAY DESIGN ENGINEER  
HYDRAULICS ENGINEER

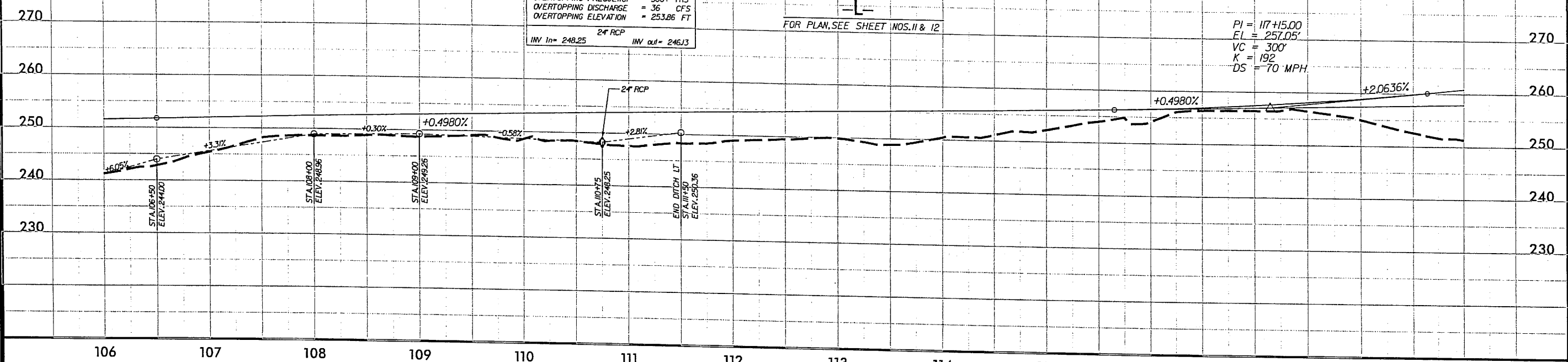
PRELIMINARY PLANS  
DO NOT USE FOR CONSTRUCTION

Permit Drawing  
Sheet 26 of 41

**PIPE HYDRAULIC DATA**  
STA -L- 110+75  
DRAINAGE AREA = 4.50 AC  
DESIGN FREQUENCY = 50 YRS  
DESIGN DISCHARGE = 17.00 CFS  
DESIGN HW ELEVATION = 250.54 FT  
100 YEAR DISCHARGE = 19.00 CFS  
100 YEAR HW ELEVATION = 250.77 FT  
OVERTOPPING FREQUENCY = 500+ YRS  
OVERTOPPING DISCHARGE = 36 CFS  
OVERTOPPING ELEVATION = 253.86 FT  
24" RCP  
INV In= 248.25 INV out= 246.13

-L-  
FOR PLAN, SEE SHEET NOS. 11 & 12

PI = 117+15.00  
EI = 257.05'  
VC = 300'  
K = 192  
DS = -70 MPH

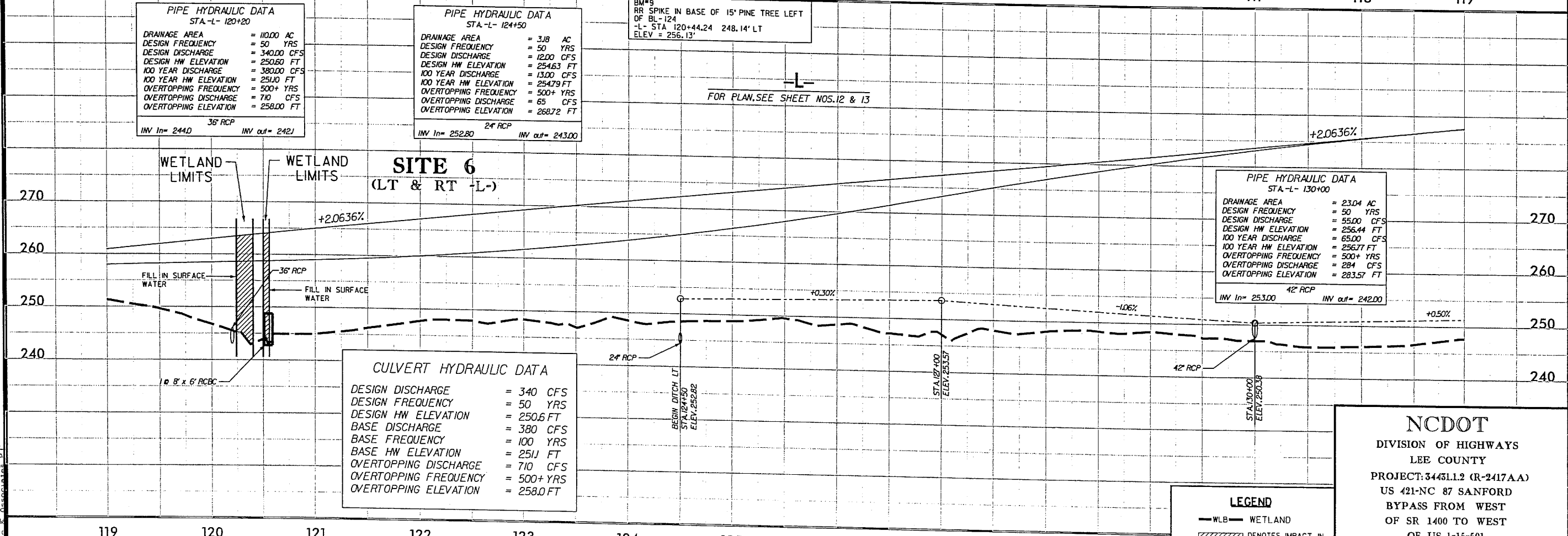


**PIPE HYDRAULIC DATA**  
STA -L- 120+20  
DRAINAGE AREA = 10.00 AC  
DESIGN FREQUENCY = 50 YRS  
DESIGN DISCHARGE = 340.00 CFS  
DESIGN HW ELEVATION = 250.60 FT  
100 YEAR DISCHARGE = 380.00 CFS  
100 YEAR HW ELEVATION = 251.00 FT  
OVERTOPPING FREQUENCY = 500+ YRS  
OVERTOPPING DISCHARGE = 710 CFS  
OVERTOPPING ELEVATION = 258.00 FT  
36" RCP  
INV In= 244.0 INV out= 242.1

**PIPE HYDRAULIC DATA**  
STA -L- 124+50  
DRAINAGE AREA = 3.18 AC  
DESIGN FREQUENCY = 50 YRS  
DESIGN DISCHARGE = 12.00 CFS  
DESIGN HW ELEVATION = 254.63 FT  
100 YEAR DISCHARGE = 13.00 CFS  
100 YEAR HW ELEVATION = 254.79 FT  
OVERTOPPING FREQUENCY = 500+ YRS  
OVERTOPPING DISCHARGE = 65 CFS  
OVERTOPPING ELEVATION = 268.72 FT  
24" RCP  
INV In= 252.80 INV out= 243.00

BM#9  
RR SPIKE IN BASE OF 15" PINE TREE LEFT  
OF BL - 124  
-L- STA 120+44.24 248.14' LT  
ELEV = 256.13'

-L-  
FOR PLAN, SEE SHEET NOS. 12 & 13



**PIPE HYDRAULIC DATA**  
STA -L- 130+00  
DRAINAGE AREA = 23.04 AC  
DESIGN FREQUENCY = 50 YRS  
DESIGN DISCHARGE = 55.00 CFS  
DESIGN HW ELEVATION = 256.44 FT  
100 YEAR DISCHARGE = 65.00 CFS  
100 YEAR HW ELEVATION = 256.77 FT  
OVERTOPPING FREQUENCY = 500+ YRS  
OVERTOPPING DISCHARGE = 284 CFS  
OVERTOPPING ELEVATION = 283.57 FT  
42" RCP  
INV In= 253.00 INV out= 242.00

**CULVERT HYDRAULIC DATA**  
DESIGN DISCHARGE = 340 CFS  
DESIGN FREQUENCY = 50 YRS  
DESIGN HW ELEVATION = 250.6 FT  
BASE DISCHARGE = 380 CFS  
BASE FREQUENCY = 100 YRS  
BASE HW ELEVATION = 251.0 FT  
OVERTOPPING DISCHARGE = 710 CFS  
OVERTOPPING FREQUENCY = 500+ YRS  
OVERTOPPING ELEVATION = 258.0 FT

**LEGEND**  
-WLB- WETLAND  
DENOTES IMPACT IN SURFACE WATER

**NCDOT**  
DIVISION OF HIGHWAYS  
LEE COUNTY  
PROJECT: 3443L12 (R-2417AA)  
US 421-NC 87 SANFORD  
BYPASS FROM WEST  
OF SR 1400 TO WEST  
OF US 1-15-501

SHEET 26 OF 41

2/4/2009 8:45:00 AM C:\Users\j... \Documents\Permits\2417\ee\_hyd\_pfl\_s6.dgn

B/17/99

**KO & ASSOCIATES, P.C.**  
 Consulting Engineers  
 A Florence & Hutcheson, Inc. Company  
 5121 KINGDOM WAY, SUITE 100 RALEIGH, N.C. 27607  
 (919) 851-6066

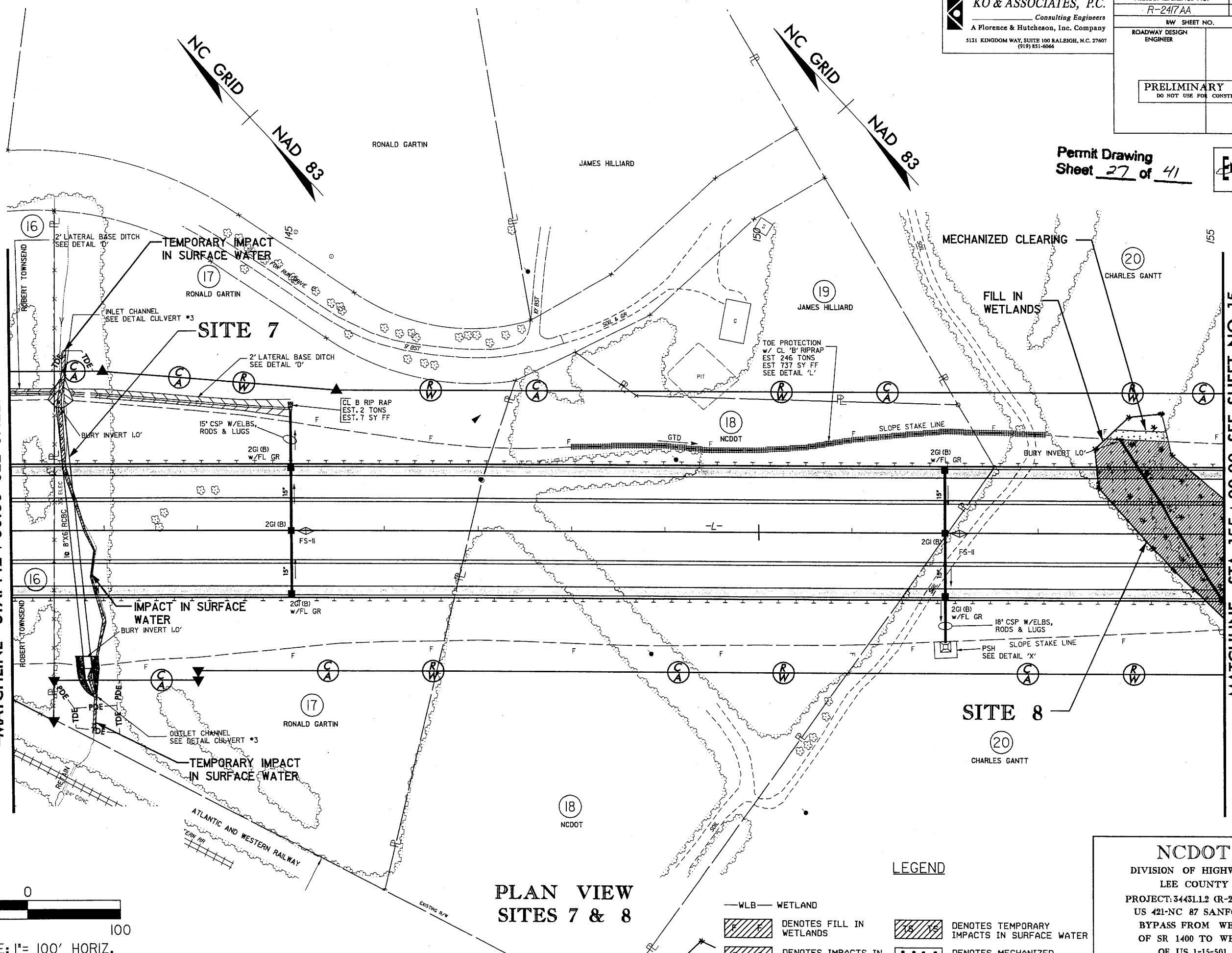
PROJECT REFERENCE NO. R-2417AA	SHEET NO. 14
R/W SHEET NO. 14	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
<b>PRELIMINARY PLANS</b> DO NOT USE FOR CONSTRUCTION	

Permit Drawing  
 Sheet 27 of 41

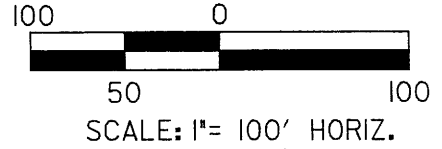


-MATCHLINE- STA. 142 + 00.00 SEE SHEET NO. 13

-MATCHLINE- STA. 155 + 00.00 SEE SHEET NO. 15



**PLAN VIEW  
 SITES 7 & 8**



**LEGEND**

- WLB— WETLAND
- DENOTES FILL IN WETLANDS
- DENOTES MECHANIZED CLEARING
- DENOTES IMPACTS IN SURFACE WATER
- DENOTES TEMPORARY IMPACTS IN SURFACE WATER

**NCDOT**  
 DIVISION OF HIGHWAYS  
 LEE COUNTY  
 PROJECT: 3443L12 (R-2417AA)  
 US 421-NC 87 SANFORD  
 BYPASS FROM WEST  
 OF SR 1400 TO WEST  
 OF US 1-15-501  
 SHEET 27 OF 41

4/5/2009 R:\Hydro\Lee\Permits\2417\ee\_hyd\_perm\_14.dgn KO & Associates, P.C.

8/17/99

**KO & ASSOCIATES, P.C.**  
Consulting Engineers  
A Florence & Hutcheon, Inc. Company  
5121 KINGDOM WAY, SUITE 100 RALEIGH, N.C. 27607  
(919) 851-6066

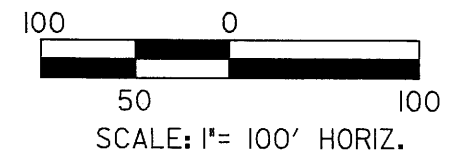
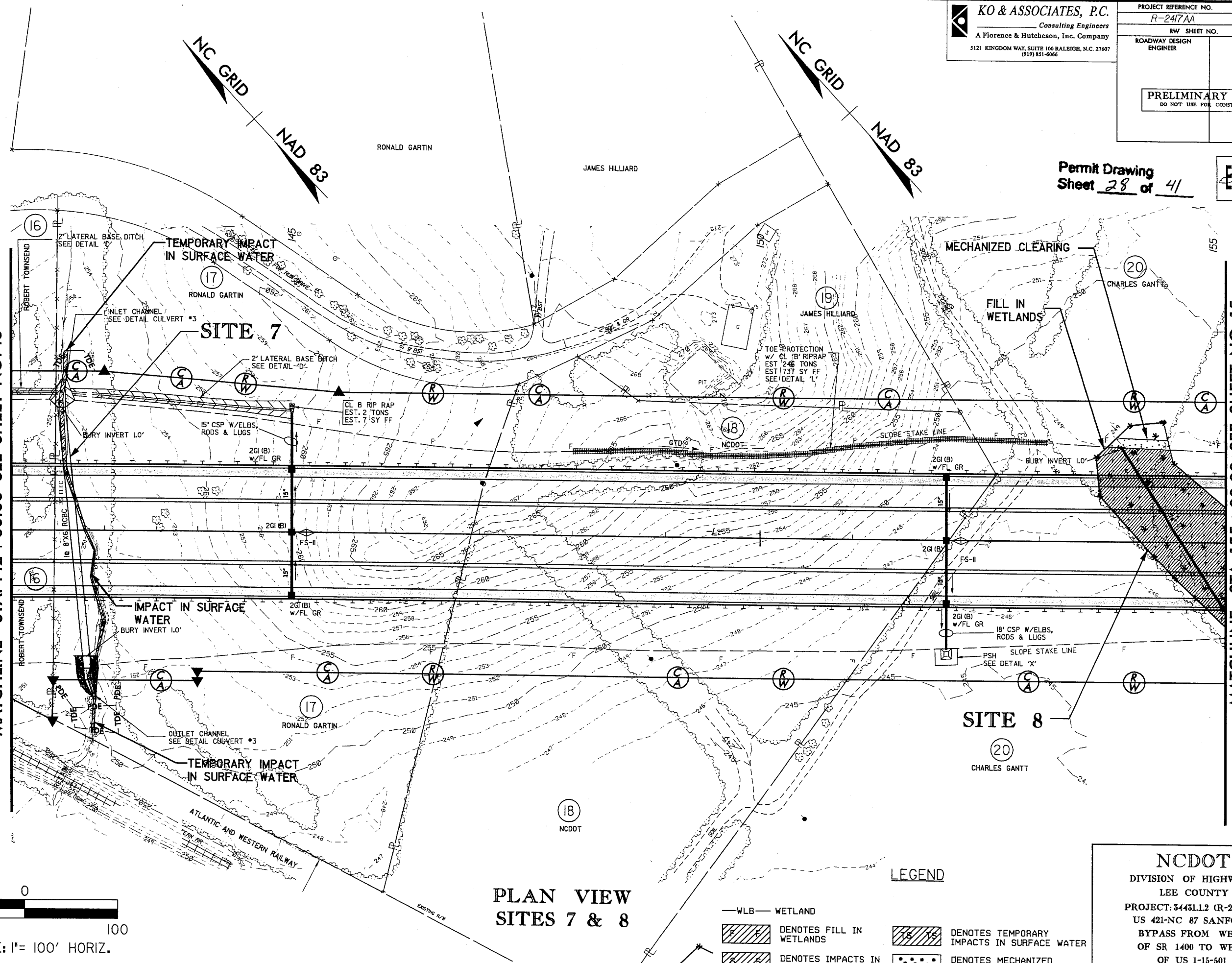
PROJECT REFERENCE NO. R-2417AA	SHEET NO. 14
RW SHEET NO. 14	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
<b>PRELIMINARY PLANS</b> DO NOT USE FOR CONSTRUCTION	

Permit Drawing  
Sheet 28 of 41



-MATCHLINE- STA. 142+00.00 SEE SHEET NO. 13

-MATCHLINE- STA. 155+00.00 SEE SHEET NO. 15



### PLAN VIEW SITES 7 & 8

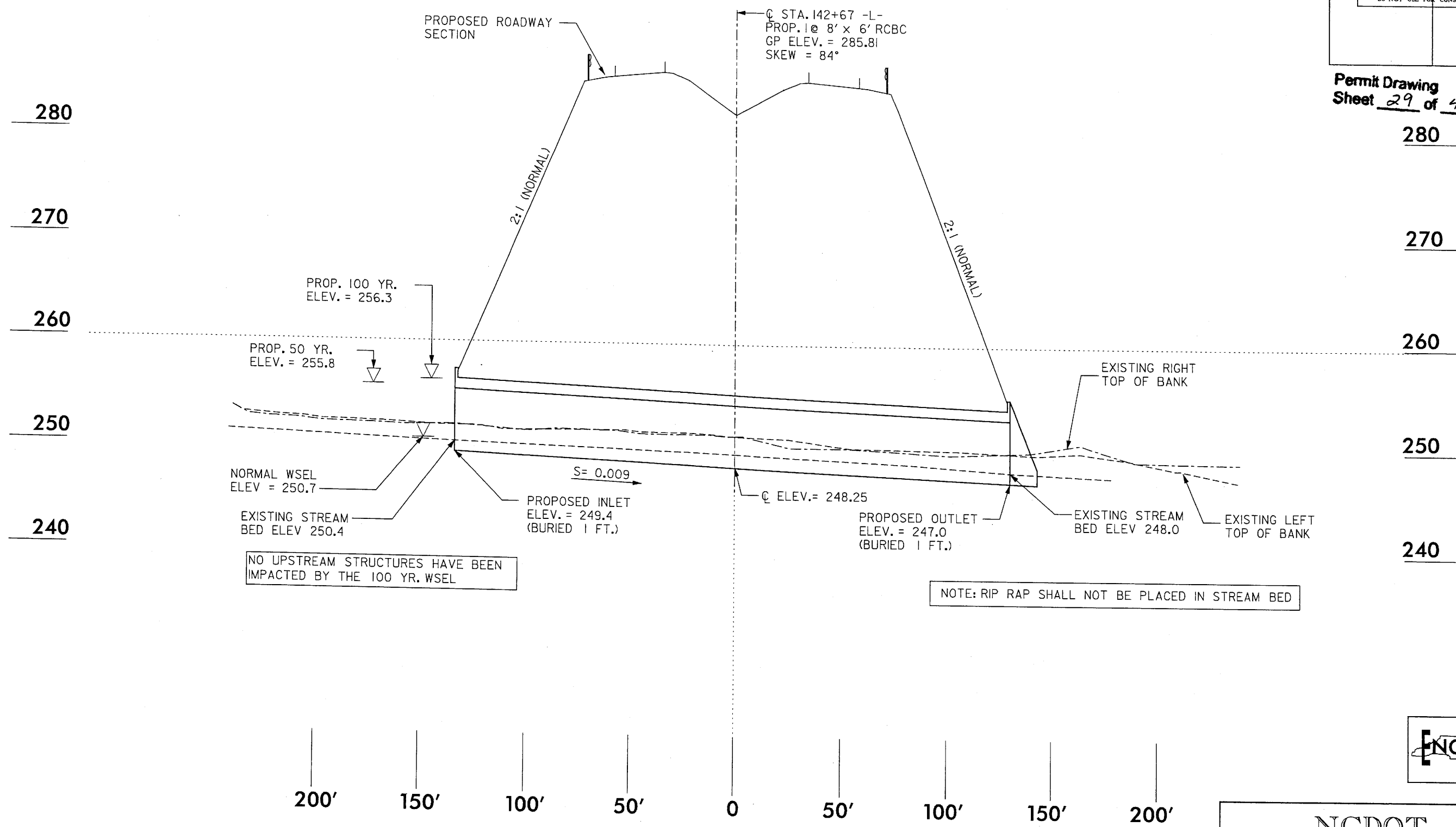
- LEGEND**
- WLB — WETLAND
  - DENOTES FILL IN WETLANDS
  - DENOTES IMPACTS IN SURFACE WATER
  - DENOTES TEMPORARY IMPACTS IN SURFACE WATER
  - DENOTES MECHANIZED CLEARING

**NCDOT**  
DIVISION OF HIGHWAYS  
LEE COUNTY  
PROJECT: 54451.12 (R-2417AA)  
US 421-NC 87 SANFORD  
BYPASS FROM WEST  
OF SR 1400 TO WEST  
OF US 1-15-501  
SHEET 28 OF 41

4/5/2009 10:58:11 AM C:\ncdot\projects\2417aa\hyd\prrm\_14.dgn

PROJECT REFERENCE NO. R-2417AA	SHEET NO. S7-PAS
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION	

Permit Drawing  
Sheet 29 of 41  
280



NO UPSTREAM STRUCTURES HAVE BEEN IMPACTED BY THE 100 YR. WSEL

NOTE: RIP RAP SHALL NOT BE PLACED IN STREAM BED



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

**PROFILE ALONG STRUCTURE  
SITE 7**

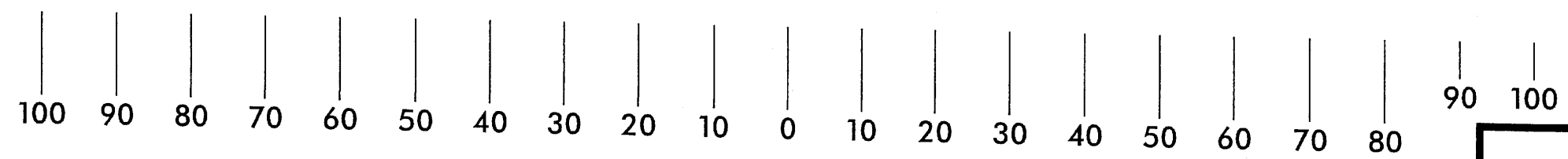
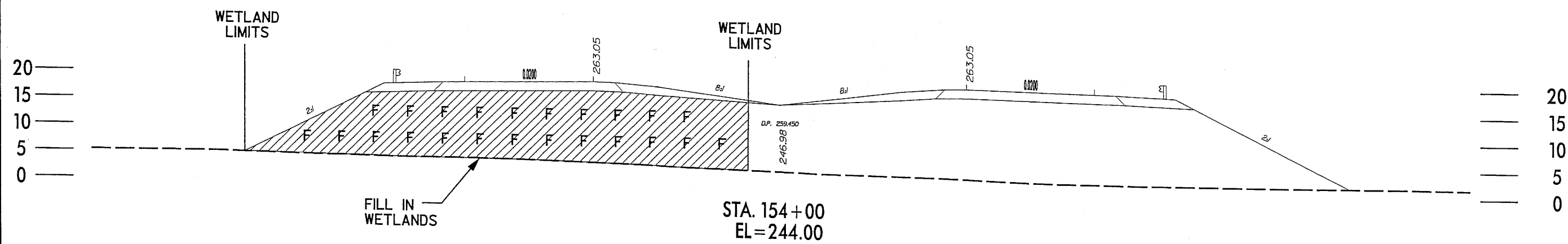
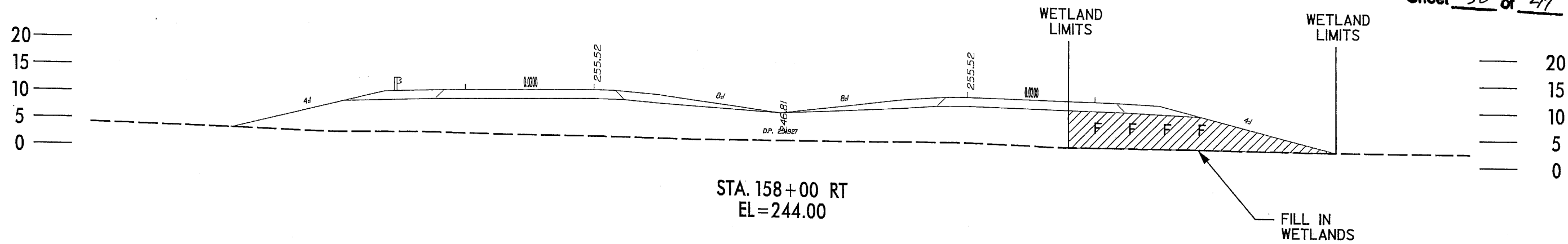
**NCDOT**  
DIVISION OF HIGHWAYS  
LEE COUNTY  
PROJECT: 34431.1.2 (R-2417AA)  
US 421-NC 87 SANFORD  
BYPASS FROM WEST  
OF SR 1400 TO WEST  
OF US 1-15-501  
SHEET 29 OF 41 5/5/06

R:\Hydraulics\dgn\Permits\2417aa\_hyd\_pflas\_14.dgn 4/5/2009 12:16:58 PM

PROJECT REFERENCE NO. R-2417AA	SHEET NO. 8-XPL
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION	



Permit Drawing  
Sheet 30 of 41



**LEGEND**

- WLB — WETLAND
- DENOTES FILL IN WETLAND

TYPICAL X-SECTIONS  
SITE 8

**NCDOT**  
DIVISION OF HIGHWAYS  
LEE COUNTY  
PROJECT: 34431.12 (R-2417AA)  
US 421-NC 87 SANFORD  
BYPASS FROM WEST  
OF SR 1400 TO WEST  
OF US 1-15-501  
SHEET 30 OF 41

2/8/2008 R:\highways\design\Permits\R2417\ee\_site8\_xpl.dgn

5/28/99

BM\*10  
RR SPIKE IN BASE OF 12' PINE TREE RIGHT  
OF BL-127  
L- STA. 134+35.80 294.46' RT  
ELEV = 243.36'

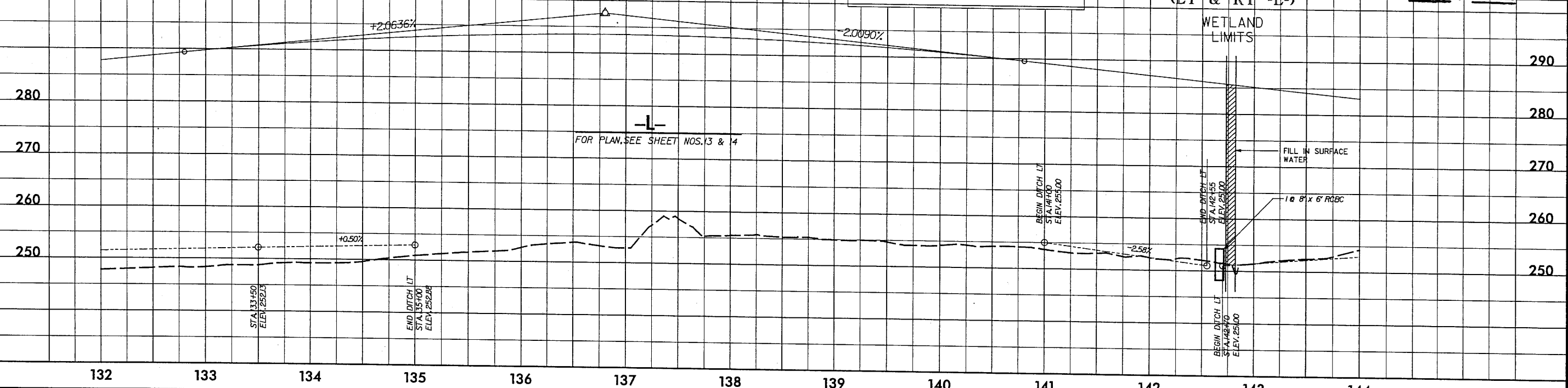
CULVERT HYDRAULIC DATA	
DESIGN DISCHARGE	= 300 CFS
DESIGN FREQUENCY	= 50 YRS
DESIGN HW ELEVATION	= 255.8 FT
BASE DISCHARGE	= 340 CFS
BASE FREQUENCY	= 100 YRS
BASE HW ELEVATION	= 256.3 FT
OVERTOPPING DISCHARGE	= 590 CFS
OVERTOPPING FREQUENCY	= 500+ YRS
OVERTOPPING ELEVATION	= 260.0 FT

**KO & ASSOCIATES, P.C.**  
Consulting Engineers  
A Florence & Hutcheson, Inc. Company  
5121 KINGDOM WAY, SUITE 100 RALEIGH, N.C. 27607  
(919) 851-6066

PROJECT REFERENCE NO. R-2417AA	SHEET NO. 31
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS  
DO NOT USE FOR CONSTRUCTION  
Permit Drawing  
Sheet 31 of 41

PI = 136+80.00  
EL = 297.67  
VC = 800'  
K = 196  
DS = 165 MPH



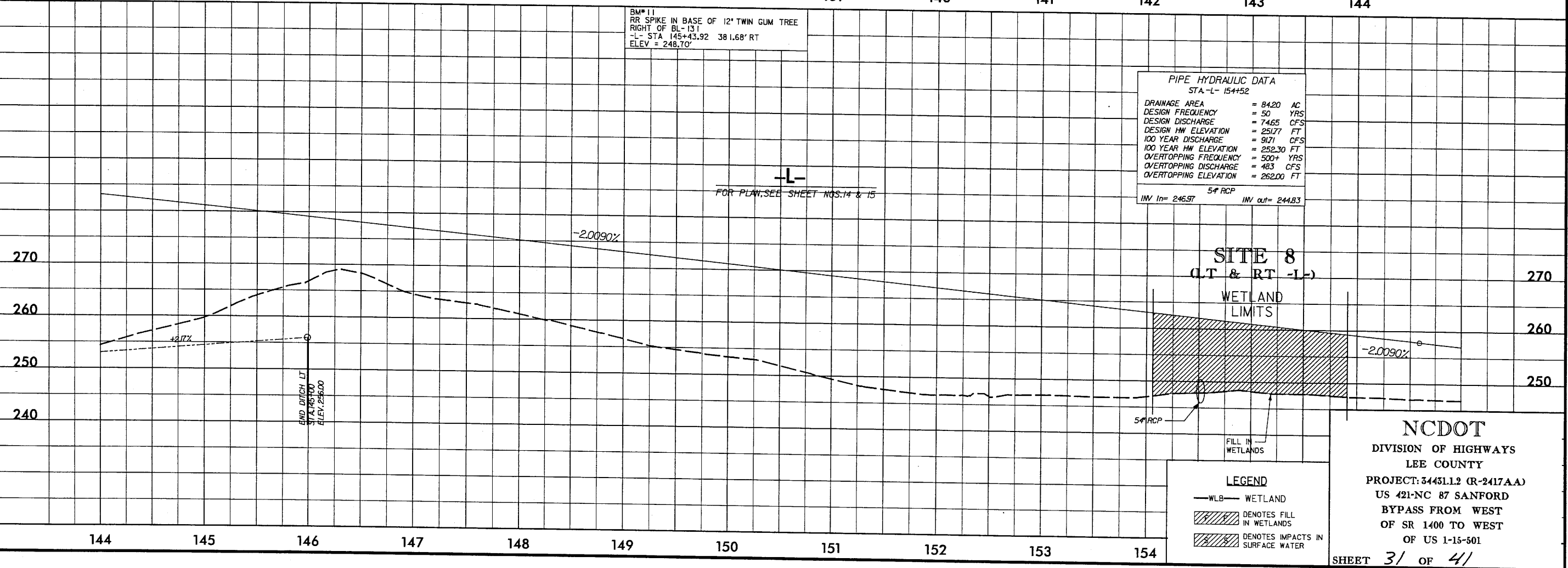
-L-  
FOR PLAN, SEE SHEET NOS. 13 & 14

**SITE 7**  
(LT & RT -L-)  
WETLAND LIMITS

BM\*11  
RR SPIKE IN BASE OF 12' TWIN GUM TREE  
RIGHT OF BL-131  
L- STA. 145+43.92 381.68' RT  
ELEV = 248.70'

PIPE HYDRAULIC DATA STA. -L- 154+52	
DRAINAGE AREA	= 8420 AC
DESIGN FREQUENCY	= 50 YRS
DESIGN DISCHARGE	= 7465 CFS
DESIGN HW ELEVATION	= 251.77 FT
100 YEAR DISCHARGE	= 9171 CFS
100 YEAR HW ELEVATION	= 252.30 FT
OVERTOPPING FREQUENCY	= 500+ YRS
OVERTOPPING DISCHARGE	= 483 CFS
OVERTOPPING ELEVATION	= 262.00 FT

5' RCP  
IN/ in = 246.97    IN/ out = 244.83



-L-  
FOR PLAN, SEE SHEET NOS. 14 & 15

**SITE 8**  
(LT & RT -L-)  
WETLAND LIMITS

**LEGEND**

- WLB- WETLAND
- [Hatched Box] DENOTES FILL IN WETLANDS
- [Hatched Box] DENOTES IMPACTS IN SURFACE WATER

**NCDOT**  
DIVISION OF HIGHWAYS  
LEE COUNTY  
PROJECT: 34431.12 (R-2417AA)  
US 421-NC 87 SANFORD  
BYPASS FROM WEST  
OF SR 1400 TO WEST  
OF US 1-15-501  
SHEET 31 OF 41

4/5/2009 11:03:45 AM d:\projects\2417aa\hyd.pfl\_s7&8.dgn

8/17/99

**KO & ASSOCIATES, P.C.**  
Consulting Engineers  
A Florence & Hutcheson, Inc. Company  
5121 KINGDOM WAY, SUITE 100 RALEIGH, N.C. 27607  
(919) 851-6066

PROJECT REFERENCE NO. R-2417AA	SHEET NO. 15
RW SHEET NO. 15	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
<b>PRELIMINARY PLANS</b> DO NOT USE FOR CONSTRUCTION	

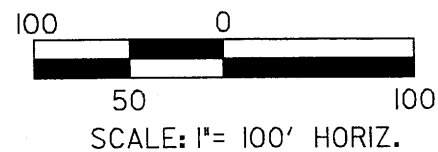
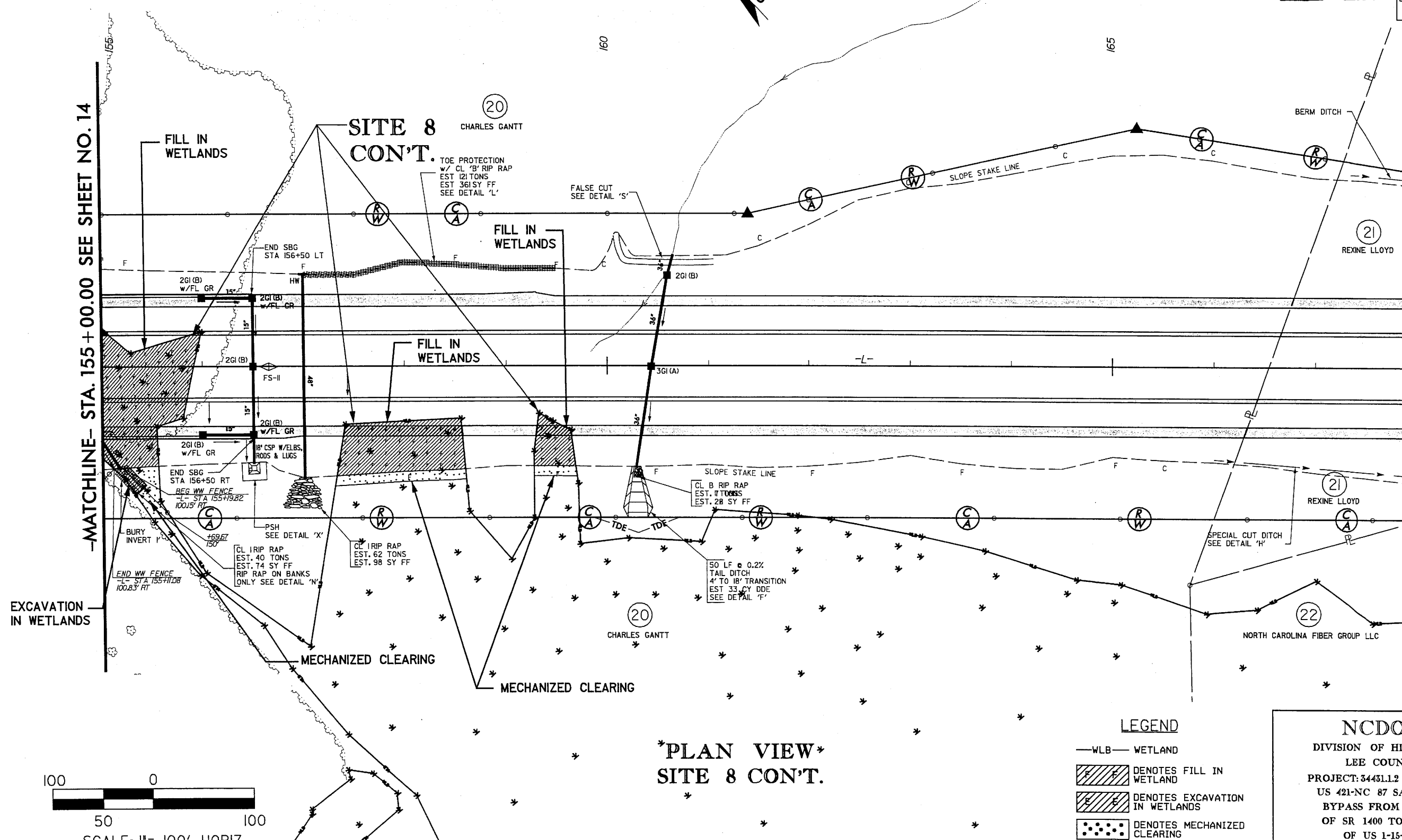
Permit Drawing  
Sheet 32 of 41



NC GRID  
NAD 83

-MATCHLINE- STA. 155 + 00.00 SEE SHEET NO. 14

-MATCHLINE- STA. 168 + 00.00 SEE SHEET NO. 16



**\*PLAN VIEW\***  
**SITE 8 CON'T.**

**LEGEND**

- WLB — WETLAND
- DENOTES FILL IN WETLAND
- DENOTES EXCAVATION IN WETLANDS
- DENOTES MECHANIZED CLEARING

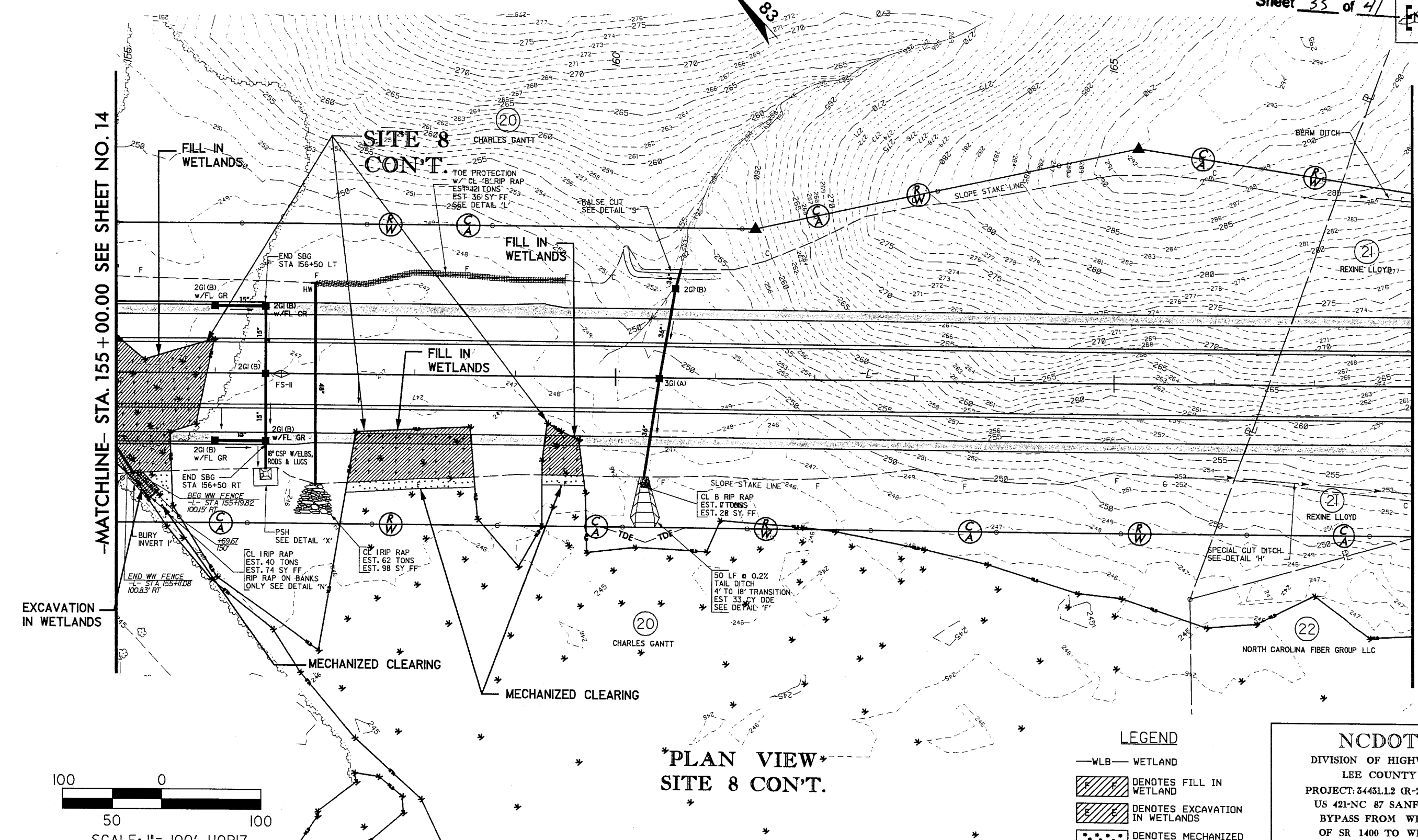
**NCDOT**  
DIVISION OF HIGHWAYS  
LEE COUNTY  
PROJECT: 34451.1.2 (R-2417AA)  
US 421-NC 87 SANFORD  
BYPASS FROM WEST  
OF SR 1400 TO WEST  
OF US 1-15-501  
SHEET 32 OF 41

K:\52008\52008.dgn\Permits\2417\ee\_hyd-prm\_15.dgn



PROJECT REFERENCE NO. R-2417AA	SHEET NO. 15
RW SHEET NO. 15	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION	

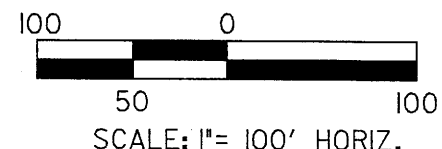
Permit Drawing  
 Sheet 33 of 41



-MATCHLINE- STA. 155 + 00.00 SEE SHEET NO. 14

-MATCHLINE- STA. 168 + 00.00 SEE SHEET NO. 16

**\*PLAN VIEW\***  
**SITE 8 CON'T.**



**LEGEND**

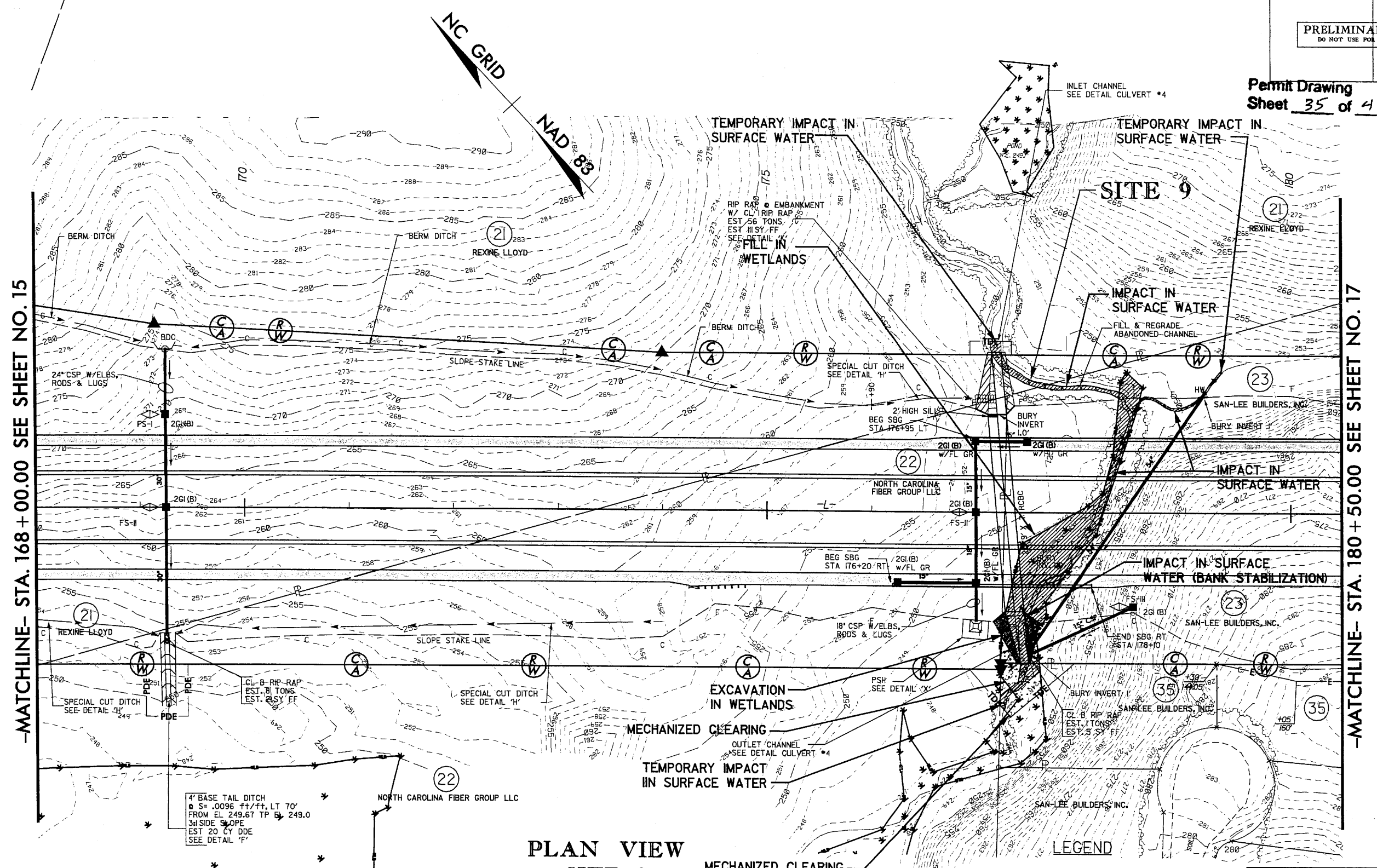
	WETLAND
	DENOTES FILL IN WETLAND
	DENOTES EXCAVATION IN WETLANDS
	DENOTES MECHANIZED CLEARING

**NCDOT**  
 DIVISION OF HIGHWAYS  
 LEE COUNTY  
 PROJECT: 3443L1.2 (R-2417AA)  
 US 421-NC 87 SANFORD  
 BYPASS FROM WEST  
 OF SR 1400 TO WEST  
 OF US 1-15-501  
 SHEET 33 OF 41





8/17/99

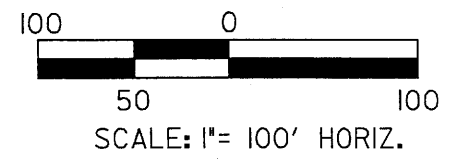


-MATCHLINE- STA. 168 + 00.00 SEE SHEET NO. 15

-MATCHLINE- STA. 180 + 50.00 SEE SHEET NO. 17

REVISIONS  
 12-6-06 Changed Portion of Parcel 23 to Parcel 35 - Revised RW & TCE on Parcel 35

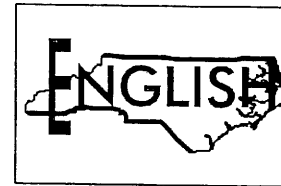
6/5/2009 jusa\jdr\Permits\R-2417\so\_hyd.prm\_16.dgn  
 KO & ASSOCIATES, P.C.



**PLAN VIEW  
 SITE 9**

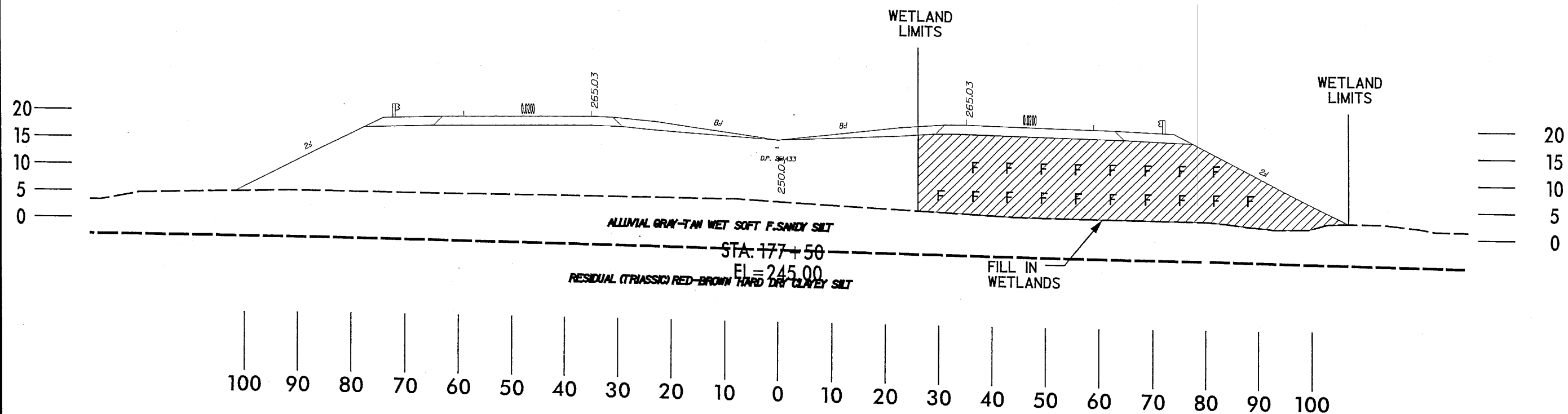
- LEGEND**
- WLB- WETLAND
  - [Hatched Box] DENOTES FILL IN WETLAND
  - [Hatched Box] DENOTES EXCAVATION IN WETLAND
  - [Hatched Box] DENOTES IMPACTS IN SURFACE WATER
  - [Hatched Box] DENOTES TEMPORARY IMPACTS IN SURFACE WATER
  - [Dotted Box] DENOTES MECHANIZED CLEARING

**NCDOT**  
 DIVISION OF HIGHWAYS  
 LEE COUNTY  
 PROJECT: 3445L12 (R-2417AA)  
 US 421-NC 87 SANFORD  
 BYPASS FROM WEST  
 OF SR 1400 TO WEST  
 OF US 1-15-501  
 SHEET 35 OF 41



PROJECT REFERENCE NO. <i>R-2417AA</i>	SHEET NO. <i>9-XPL</i>
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION	

Permit Drawing  
Sheet *36* of *41*



**LEGEND**

- WLB — WETLAND
- DENOTES FILL IN WETLAND

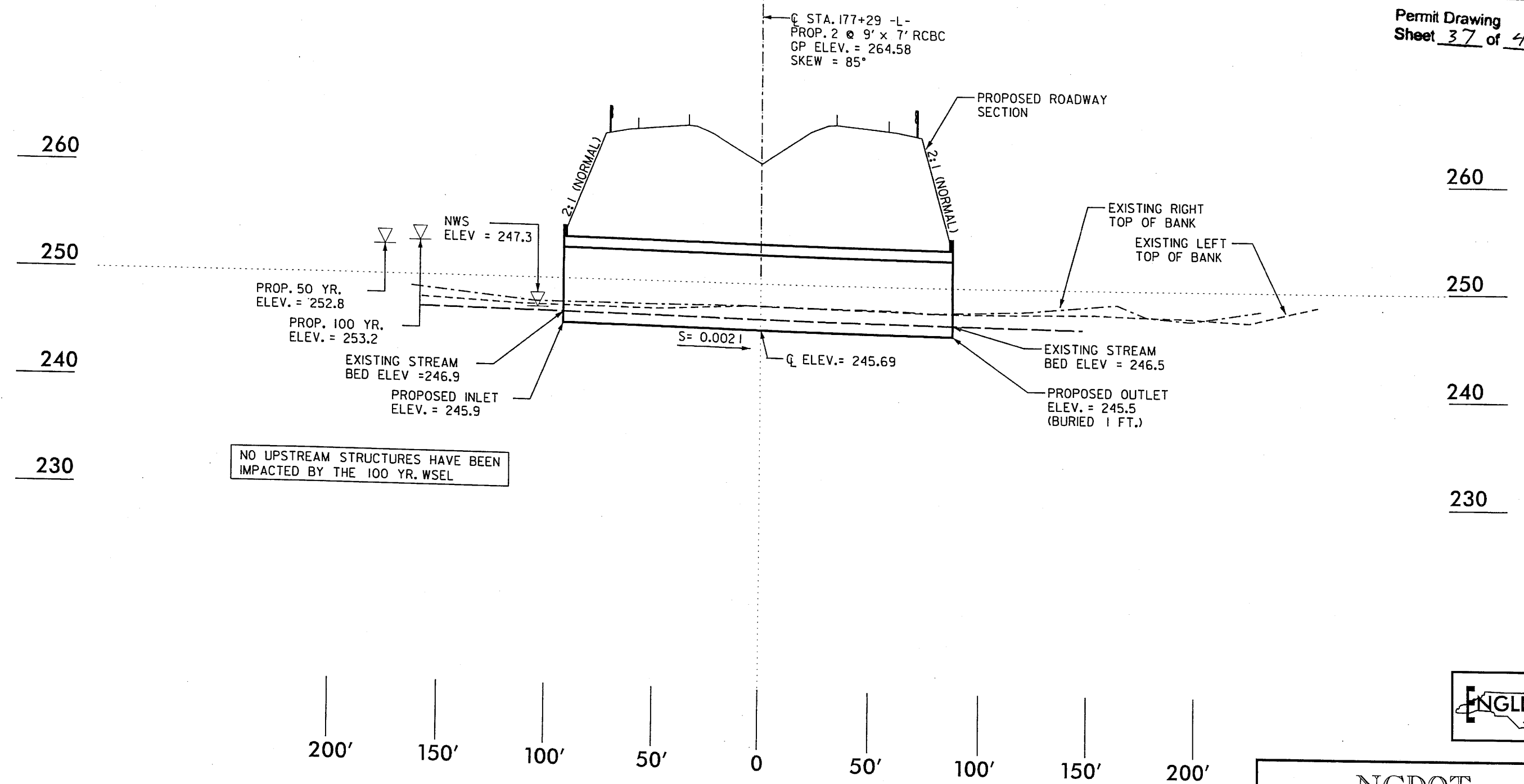
TYPICAL X-SECTIONS  
SITE 9

NCDOT  
DIVISION OF HIGHWAYS  
LEE COUNTY  
PROJECT: 34431.1.2 (R-2417AA)  
US 421-NC 87 SANFORD  
BYPASS FROM WEST  
OF SR 1400 TO WEST  
OF US 1-15-501

8/12/2009 10:45:13 AM C:\Users\jgordon\Documents\Projects\2417\00\Site9\XPL.dgn

PROJECT REFERENCE NO. <b>R-2417AA</b>	SHEET NO. <b>S9-PAS</b>
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
<b>PRELIMINARY PLANS</b> DO NOT USE FOR CONSTRUCTION	

Permit Drawing  
Sheet 37 of 41



NO UPSTREAM STRUCTURES HAVE BEEN IMPACTED BY THE 100 YR. WSEL

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

**PROFILE ALONG STRUCTURE  
SITE 9**



**NCDOT**  
DIVISION OF HIGHWAYS  
LEE COUNTY  
PROJECT: 34431.1.2 (R-2417AA)  
US 421-NC 87 SANFORD  
BYPASS FROM WEST  
OF SR 1400 TO WEST  
OF US 1-15-501  
SHEET 37 OF 41 5/5/06

R:\Hydraulics\dgn\Permits\2417aa\_hyd\_pf\ios\_16.dgn  
2/8/2009 8:00:33 PM

5/28/99

BM#12  
RR SPIKE IN BASE OF 6" TWIN OAK TREE  
LEFT OF BL-134  
L- STA 157+48.33 293.85' RT  
ELEV = 265.20'

**KO & ASSOCIATES, P.C.**  
Consulting Engineers  
A Florence & Hutcheson, Inc. Company  
5121 KINGDOM WAY, SUITE 100 RALEIGH, N.C. 27607  
(919) 851-6066

PROJECT REFERENCE NO. R-2417AA SHEET NO. 32  
ROADWAY DESIGN ENGINEER HYDRAULICS ENGINEER

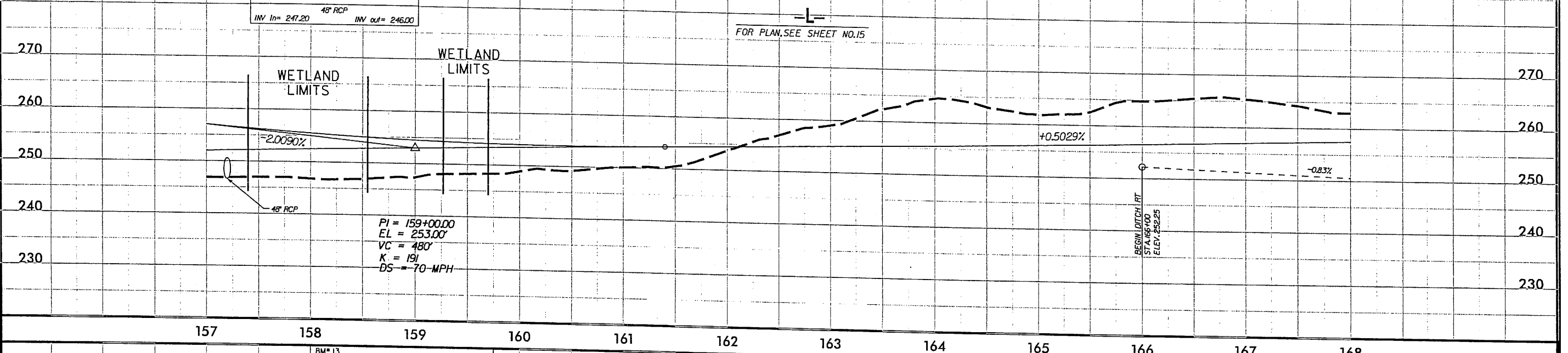
PRELIMINARY PLANS  
DO NOT USE FOR CONSTRUCTION

Permit Drawing  
Sheet 38 of 41

### SITE 8 CON'T. (RT -L-)

PIPE HYDRAULIC DATA STA -L- 157+20	
DRAINAGE AREA	= 84.20 AC
DESIGN FREQUENCY	= 50 YRS
DESIGN DISCHARGE	= 95.35 CFS
DESIGN HW ELEVATION	= 250.77 FT
100 YEAR DISCHARGE	= 108.29 CFS
100 YEAR HW ELEVATION	= 252.30 FT
OVERTOPPING FREQUENCY	= 500+ YRS
OVERTOPPING DISCHARGE	= 483 CFS
OVERTOPPING ELEVATION	= 262.00 FT

48" RCP  
INV In= 247.20 INV out= 246.00

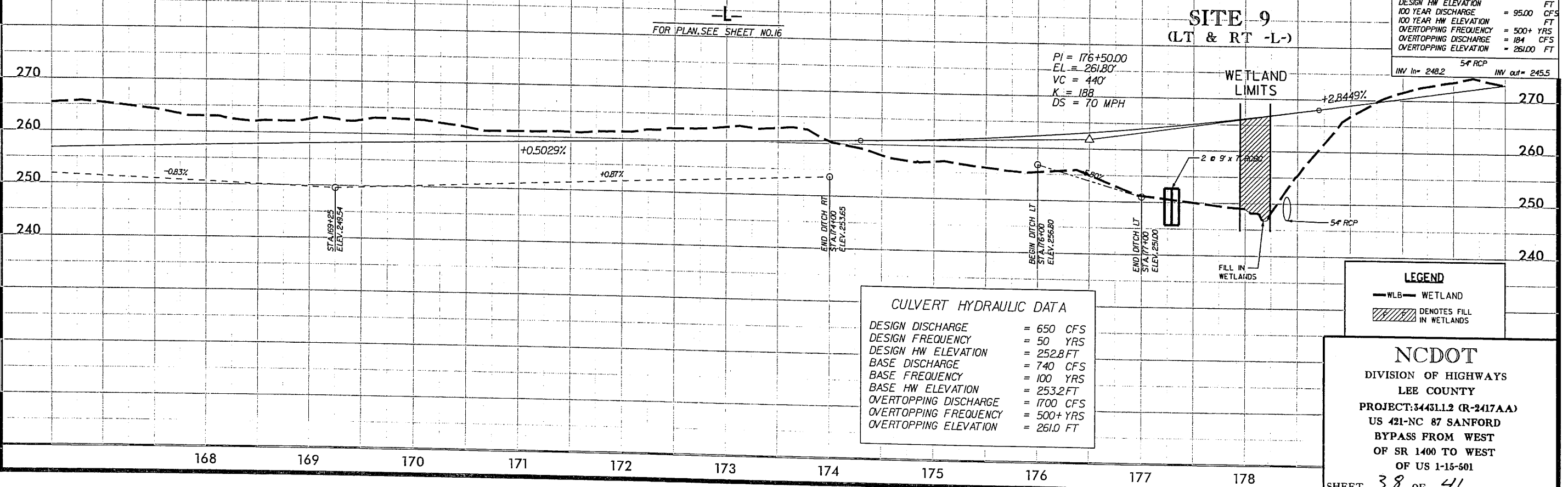


BM#13  
RR SPIKE IN BASE OF 12" PINE TREE  
RIGHT OF BL-138  
L- STA 173+46.58 254.45' RT  
ELEV = 254.19'

### SITE 9 (LT & RT -L-)

PIPE HYDRAULIC DATA STA -L- 178+40	
DRAINAGE AREA	= 37.00 AC
DESIGN FREQUENCY	= 50 YRS
DESIGN DISCHARGE	= 85.00 CFS
DESIGN HW ELEVATION	= 95.00 FT
100 YEAR DISCHARGE	= 95.00 CFS
100 YEAR HW ELEVATION	= 95.00 FT
OVERTOPPING FREQUENCY	= 500+ YRS
OVERTOPPING DISCHARGE	= 184 CFS
OVERTOPPING ELEVATION	= 261.00 FT

54" RCP  
INV In= 248.2 INV out= 245.5



CULVERT HYDRAULIC DATA	
DESIGN DISCHARGE	= 650 CFS
DESIGN FREQUENCY	= 50 YRS
DESIGN HW ELEVATION	= 252.8 FT
BASE DISCHARGE	= 740 CFS
BASE FREQUENCY	= 100 YRS
BASE HW ELEVATION	= 253.2 FT
OVERTOPPING DISCHARGE	= 1700 CFS
OVERTOPPING FREQUENCY	= 500+ YRS
OVERTOPPING ELEVATION	= 261.0 FT

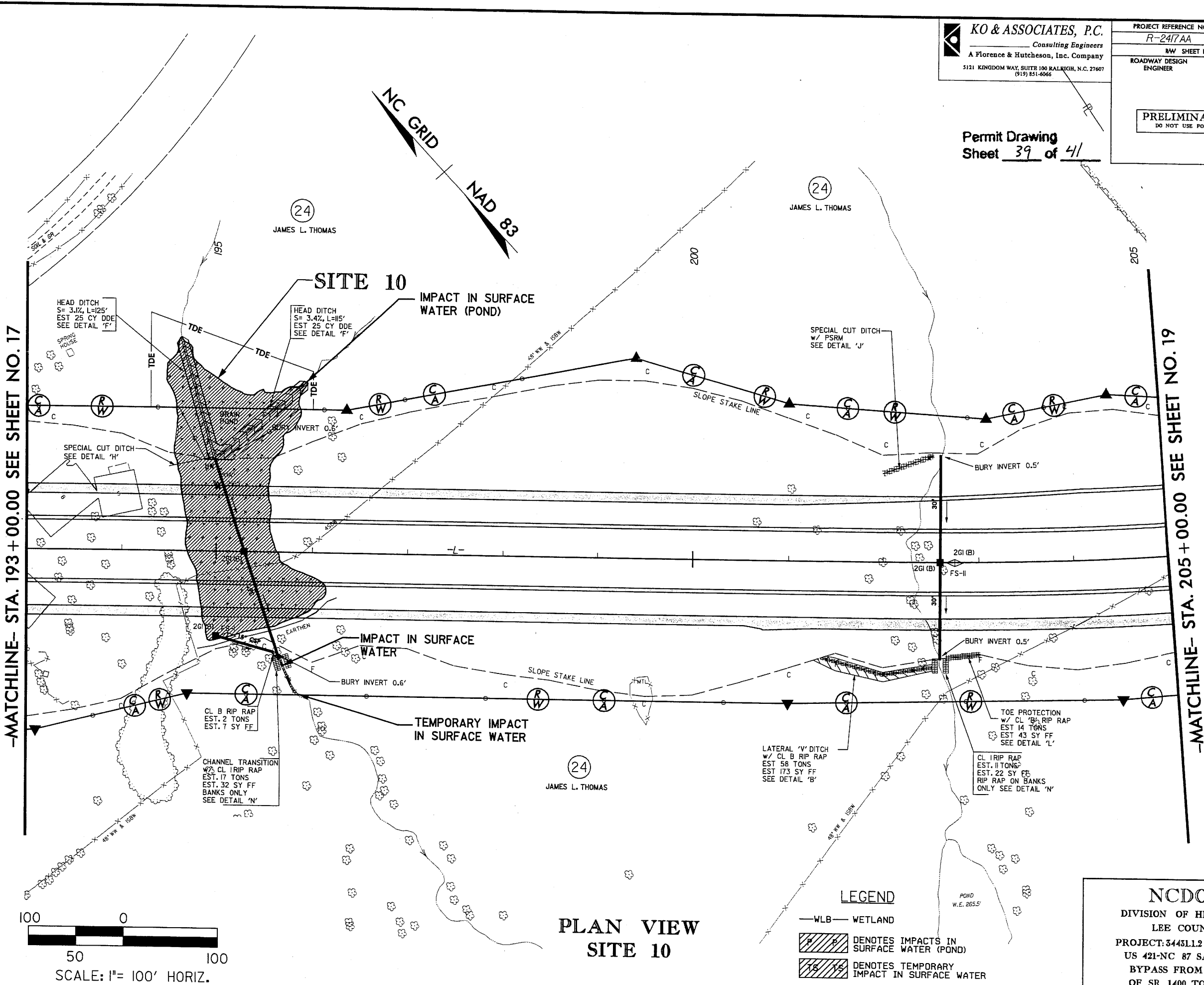
**LEGEND**  
— WLB — WETLAND  
DENOTES FILL IN WETLANDS

**NC DOT**  
DIVISION OF HIGHWAYS  
LEE COUNTY  
PROJECT: 34451.12 (R-2417AA)  
US 421-NC 87 SANFORD  
BYPASS FROM WEST  
OF SR 1400 TO WEST  
OF US 1-15-501  
SHEET 38 OF 41

2/8/2009 8:51:00 AM C:\Users\jld\Documents\Projects\2417\241700\_hyd-pl-1.s9.dgn

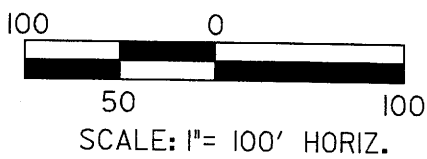
PROJECT REFERENCE NO. R-2417AA	SHEET NO. 18
R/W SHEET NO. 18	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION	

Permit Drawing  
 Sheet 39 of 41



-MATCHLINE- STA. 193 + 00.00 SEE SHEET NO. 17

-MATCHLINE- STA. 205 + 00.00 SEE SHEET NO. 19



**PLAN VIEW  
 SITE 10**

**LEGEND**

	WETLAND
	DENOTES IMPACTS IN SURFACE WATER (POND)
	DENOTES TEMPORARY IMPACT IN SURFACE WATER
	DENOTES IMPACTS IN SURFACE WATER

**NCDOT**  
 DIVISION OF HIGHWAYS  
 LEE COUNTY  
 PROJECT: 3443L1.2 (R-2417AA)  
 US 421-NC 87 SANFORD  
 BYPASS FROM WEST  
 OF SR 1400 TO WEST  
 OF US 1-15-501  
 SHEET 39 OF 41

REVISIONS

T2-6-06 Parcel 24 Name Change

4/5/2009 R:\Hydrolics\adgn\Permits\R-2417aa\_hyd-prm-18.dgn KO & Associates, P.C.

8/17/99



8/17/99

**KO & ASSOCIATES, P.C.**  
 Consulting Engineers  
 A Florence & Hutcheson, Inc. Company  
 5121 KINGDOM WAY, SUITE 100 RALPHIGH, N.C. 27607  
 (919) 851-6066

PROJECT REFERENCE NO. R-2417AA	SHEET NO. 18
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS  
DO NOT USE FOR CONSTRUCTION

Permit Drawing  
Sheet 40 of 41



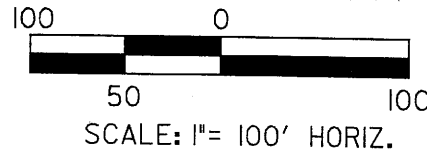
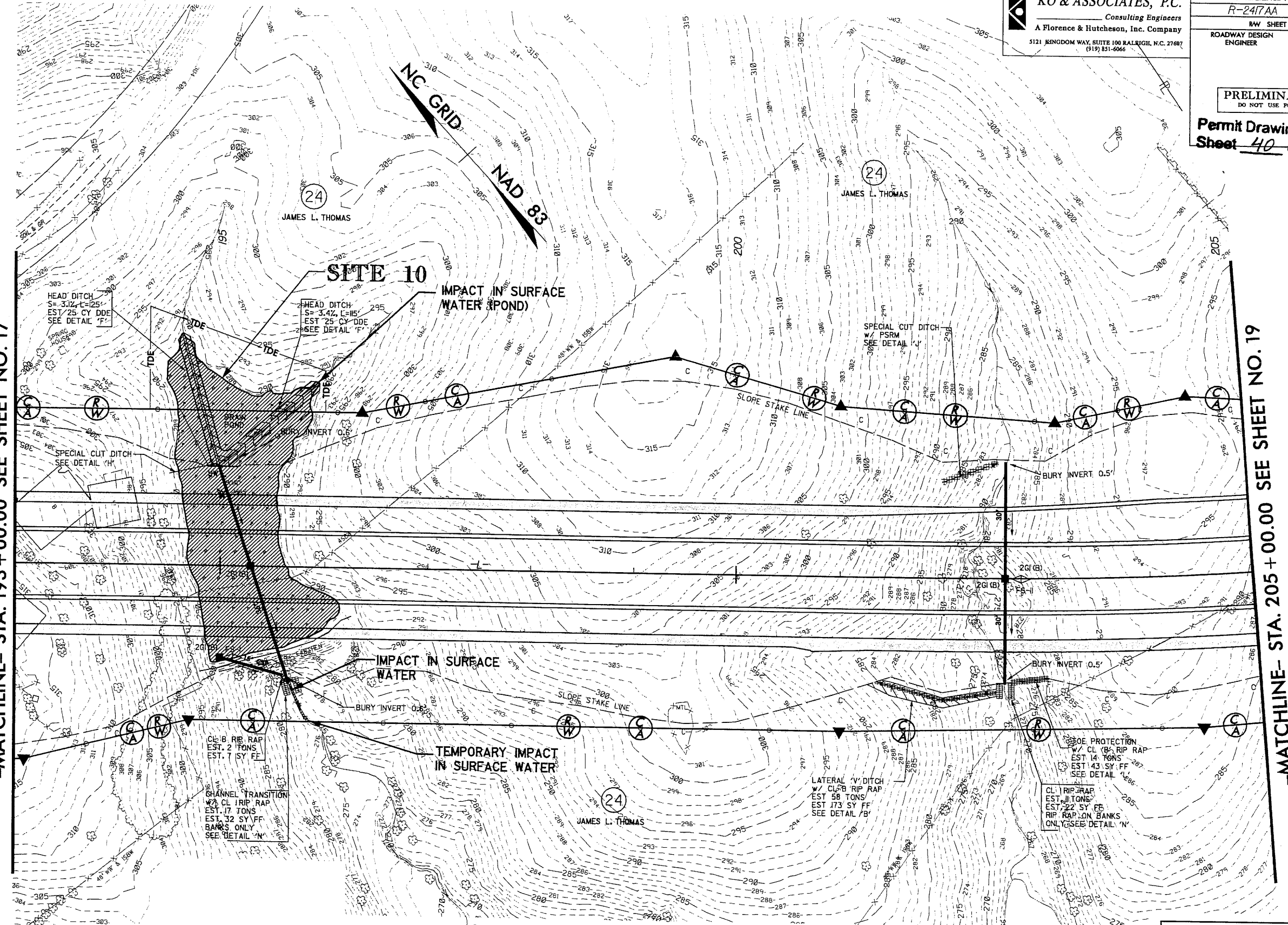
REVISIONS

12-6-06 Parcel 24 Name Change

4/5/2009  
 R:\Hydraulics\den\Permits\2417aa\_hyd\_perm\_18.dgn  
 KO & ASSOCIATES, P.C.

-MATCHLINE- STA. 193+00.00 SEE SHEET NO. 17

-MATCHLINE- STA. 205+00.00 SEE SHEET NO. 19



**PLAN VIEW  
SITE 10**

- LEGEND**
- WLB— WETLAND
  - DENOTES IMPACTS IN SURFACE WATER (POND)
  - DENOTES TEMPORARY IMPACT IN SURFACE WATER
  - DENOTES IMPACTS IN SURFACE WATER

**NCDOT**  
 DIVISION OF HIGHWAYS  
 LEE COUNTY  
 PROJECT: 3443LL2 (R-2417AA)  
 US 421-NC 87 SANFORD  
 BYPASS FROM WEST  
 OF SR 1400 TO WEST  
 OF US 1-15-501

SHEET 40 OF 41

5/28/99

**KO & ASSOCIATES, P.C.**  
 Consulting Engineers  
 A Florence & Hutcheson, Inc. Company  
 5121 KINGDOM WAY, SUITE 100 RALEIGH, N.C. 27607  
 (919) 851-6066

PROJECT REFERENCE NO. R-247AA	SHEET NO. 33
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS  
 DO NOT USE FOR CONSTRUCTION

Permit Drawing  
 Sheet 41 of 41

ENGLISH

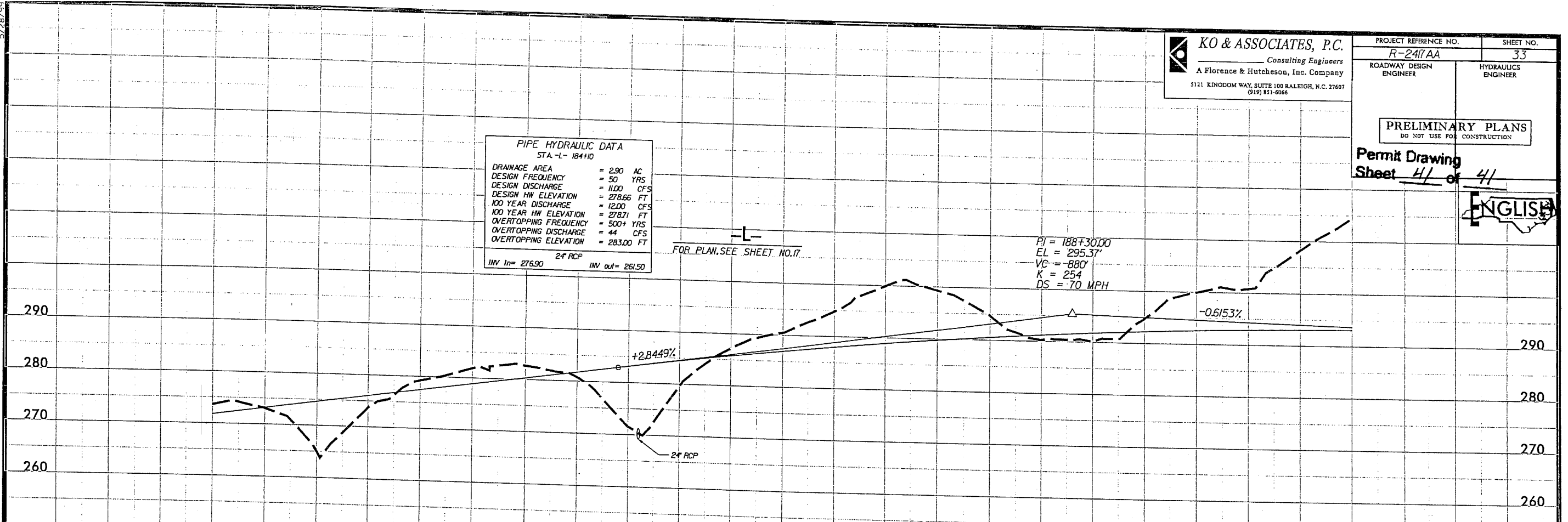
**PIPE HYDRAULIC DATA**  
 STA.-L- 184+10

DRAINAGE AREA	= 2.90 AC
DESIGN FREQUENCY	= 50 YRS
DESIGN DISCHARGE	= 11.00 CFS
DESIGN HW ELEVATION	= 278.66 FT
100 YEAR DISCHARGE	= 12.00 CFS
100 YEAR HW ELEVATION	= 278.71 FT
OVERTOPPING FREQUENCY	= 500+ YRS
OVERTOPPING DISCHARGE	= 44 CFS
OVERTOPPING ELEVATION	= 283.00 FT

24" RCP  
 INV In= 276.90    INV out= 261.50

FOR PLAN, SEE SHEET NO. 17

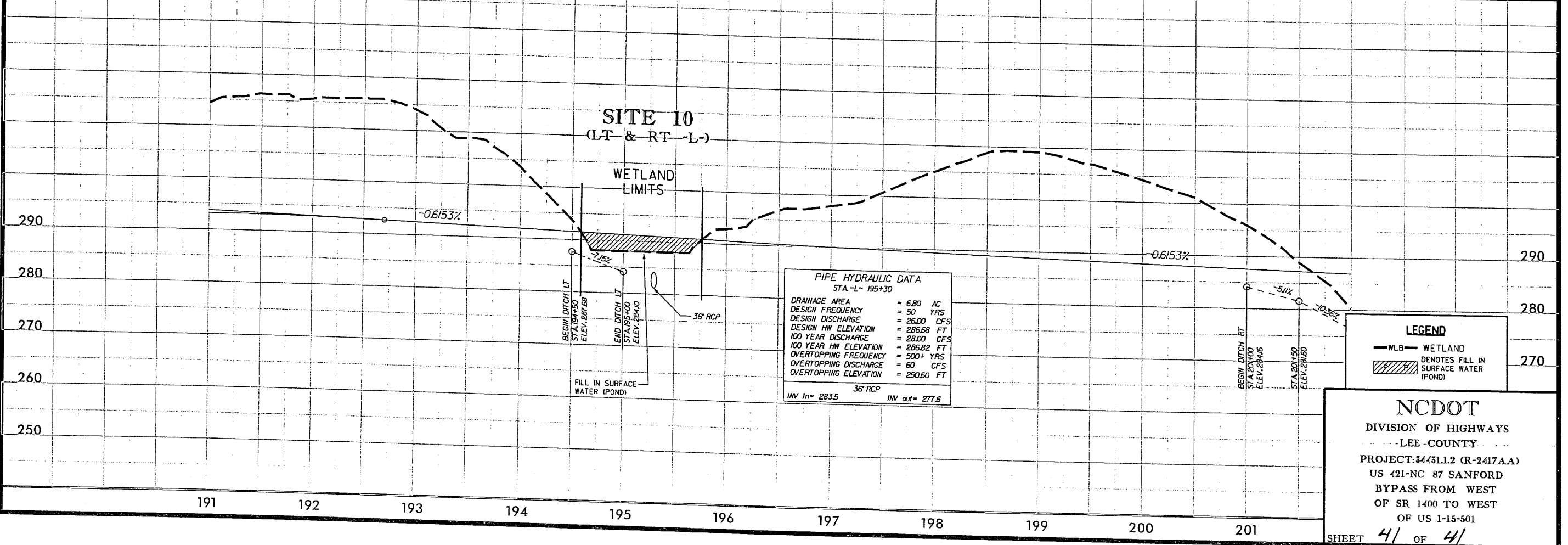
PI = 188+30.00  
 EL = 295.37'  
 VC = 880'  
 K = 254  
 OS = 70 MPH



180      181      182      183      184      185      186      187      188      189      190      191

**SITE 10**  
 (LT & RT -L-)

WETLAND LIMITS



**PIPE HYDRAULIC DATA**  
 STA.-L- 195+30

DRAINAGE AREA	= 6.80 AC
DESIGN FREQUENCY	= 50 YRS
DESIGN DISCHARGE	= 26.00 CFS
DESIGN HW ELEVATION	= 286.68 FT
100 YEAR DISCHARGE	= 28.00 CFS
100 YEAR HW ELEVATION	= 286.82 FT
OVERTOPPING FREQUENCY	= 500+ YRS
OVERTOPPING DISCHARGE	= 60 CFS
OVERTOPPING ELEVATION	= 290.60 FT

36" RCP  
 INV In= 283.5    INV out= 277.6

**LEGEND**

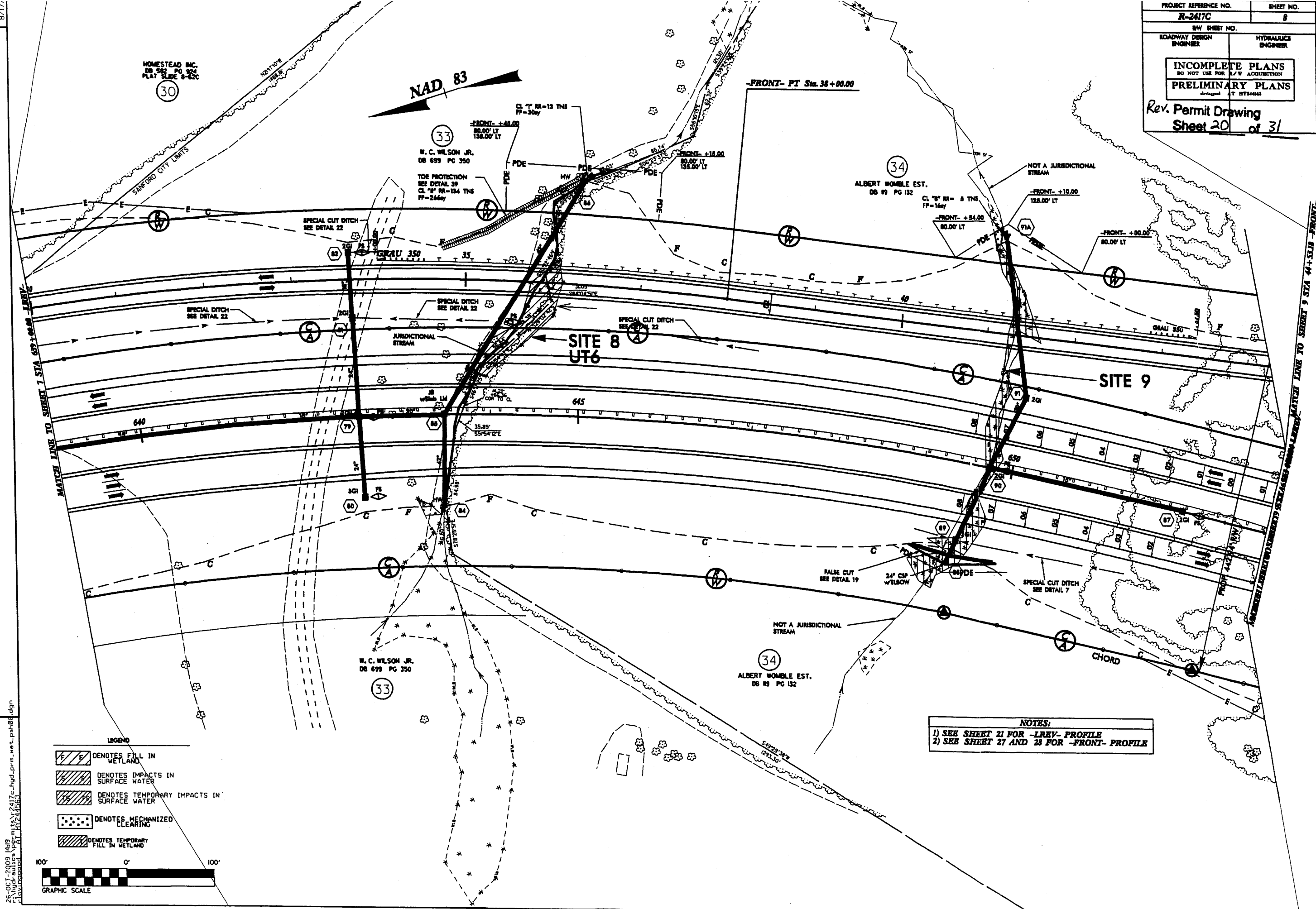
— WLB —	WETLAND
▨	DENOTES FILL IN SURFACE WATER (POND)

**NC DOT**  
 DIVISION OF HIGHWAYS  
 - LEE COUNTY -  
 PROJECT: 34431.12 (R-247AA)  
 US 421-NC 87 SANFORD  
 BYPASS FROM WEST  
 OF SR 1400 TO WEST  
 OF US 1-15-501  
 SHEET 41 OF 41

2/8/2009  
 R:\Hydro\Projects\Permits\R-247AA\hyd.pfl.s10.dgn

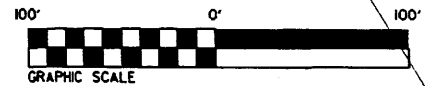


PROJECT REFERENCE NO. <b>R-2417C</b>	SHEET NO. <b>8</b>
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICE ENGINEER
<b>INCOMPLETE PLANS</b> DO NOT USE FOR R/W ACQUISITION	
<b>PRELIMINARY PLANS</b> designed AT BT34444	
Rev. Permit Drawing <b>Sheet 20 of 31</b>	



**LEGEND**

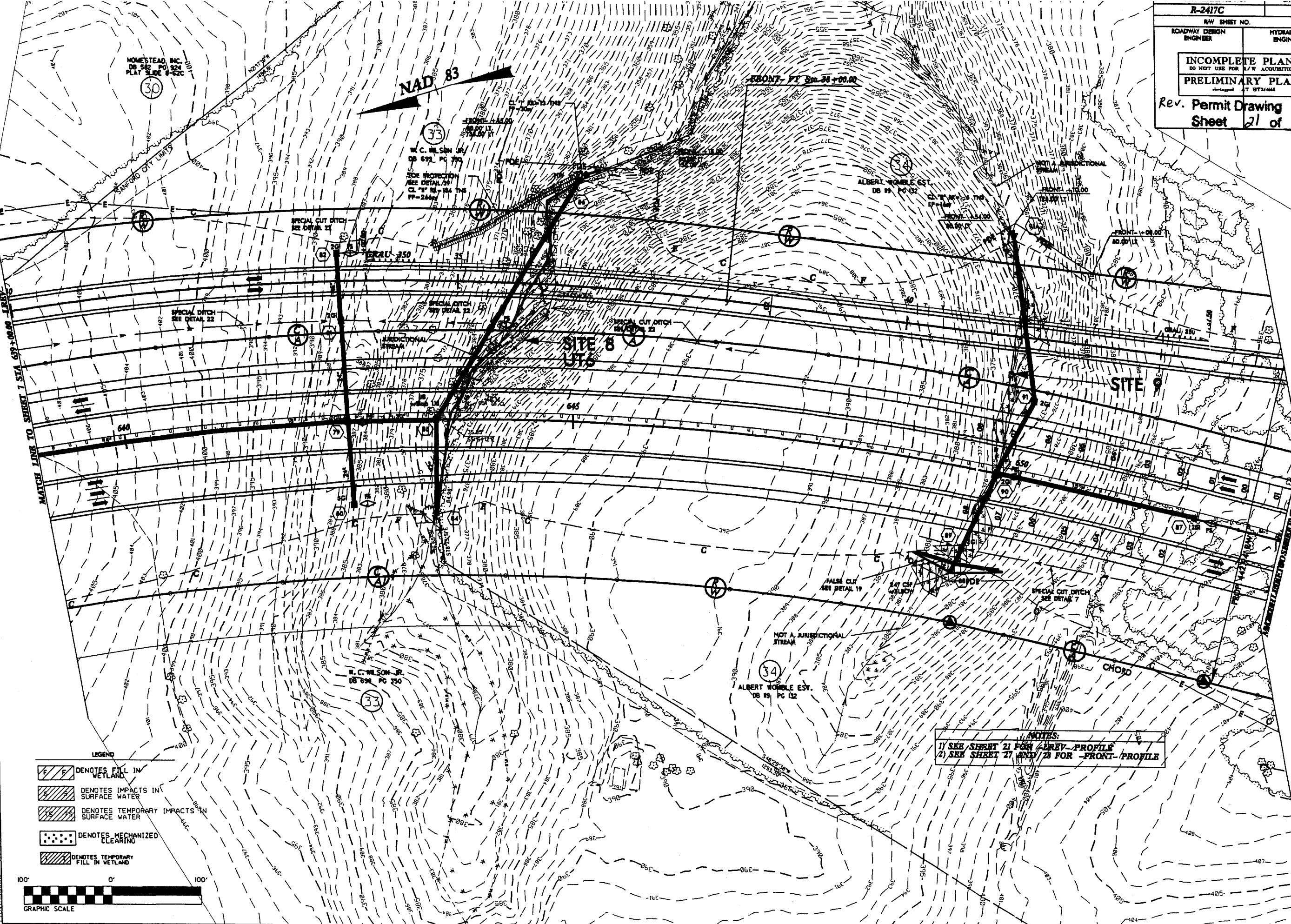
	DENOTES FILL IN WETLAND
	DENOTES IMPACTS IN SURFACE WATER
	DENOTES TEMPORARY IMPACTS IN SURFACE WATER
	DENOTES MECHANIZED CLEARING
	DENOTES TEMPORARY FILL IN WETLAND



**NOTES:**  
 1) SEE SHEET 21 FOR -REV- PROFILE  
 2) SEE SHEET 27 AND 28 FOR -FRONT- PROFILE

26-OCT-2009 4:49 PM  
 P:\Hydr-eulics\p\2417c-hyd-prm-wet-psh08.dgn  
 User: jh...

R-2417C		8
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER	
<b>INCOMPLETE PLANS</b> DO NOT USE FOR P/W ACQUISITION <b>PRELIMINARY PLANS</b>		
Rev. Permit Drawing Sheet 21 of 31		



- LEGEND**
- DENOTES FILL IN WETLAND
  - DENOTES IMPACTS IN SURFACE WATER
  - DENOTES TEMPORARY IMPACTS IN SURFACE WATER
  - DENOTES MECHANIZED CLEARING
  - DENOTES TEMPORARY FILL IN WETLAND



**NOTES:**  
 1) SEE SHEET 21 FOR LREV-PROFILE  
 2) SEE SHEET 27 AND 28 FOR -FRONT-PROFILE

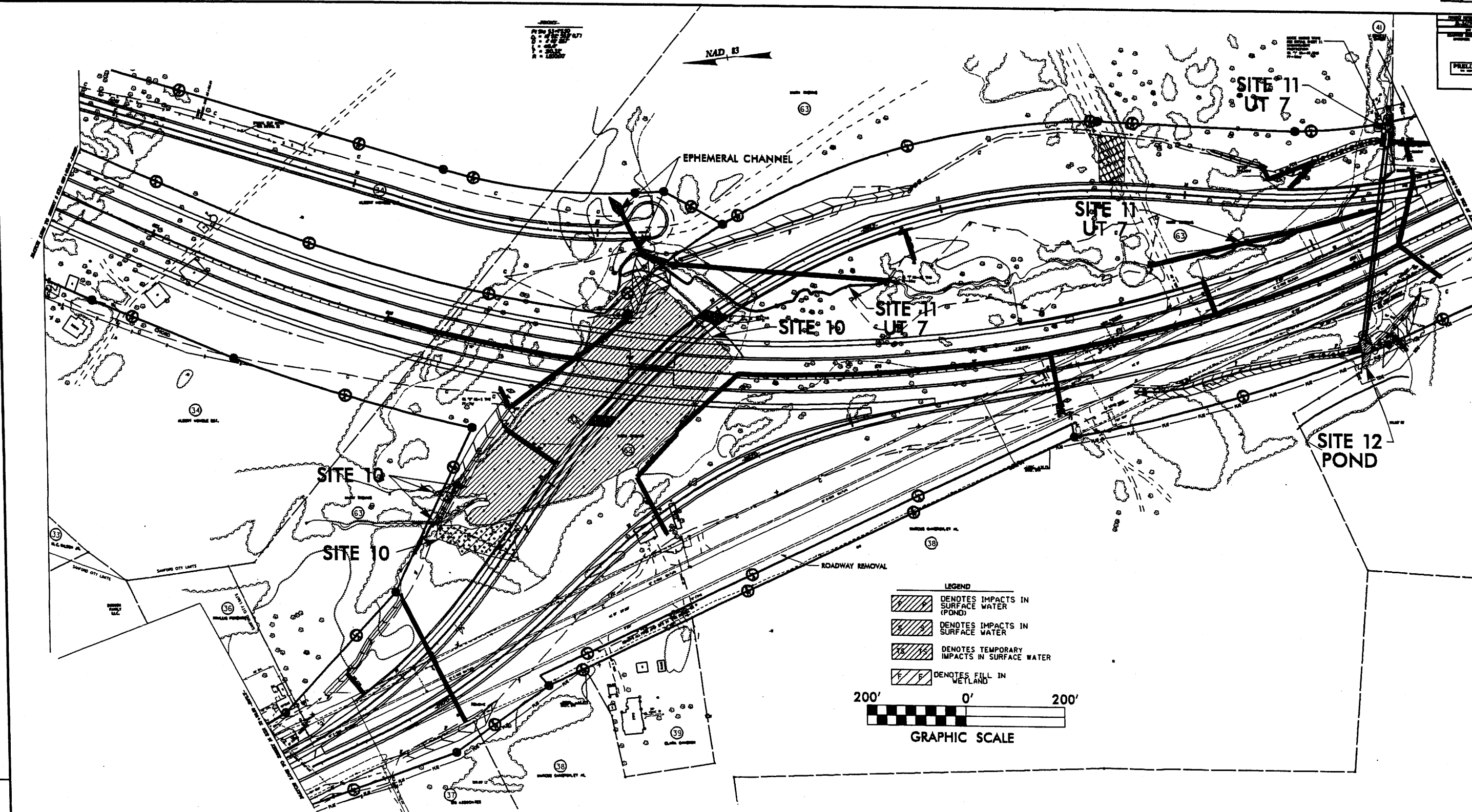
25-OCT-2009 14:22  
 F:\hydrolites\permits\2417c\_hyd\_perm\_wet.pak081.dgn  
 L:\data\2417c

REVISIONS

MATCH LINE TO SHEET 7 STA 69+00.00 -RKY-

MATCH LINE TO SHEET 9 STA 44+51.18 -FRONT-

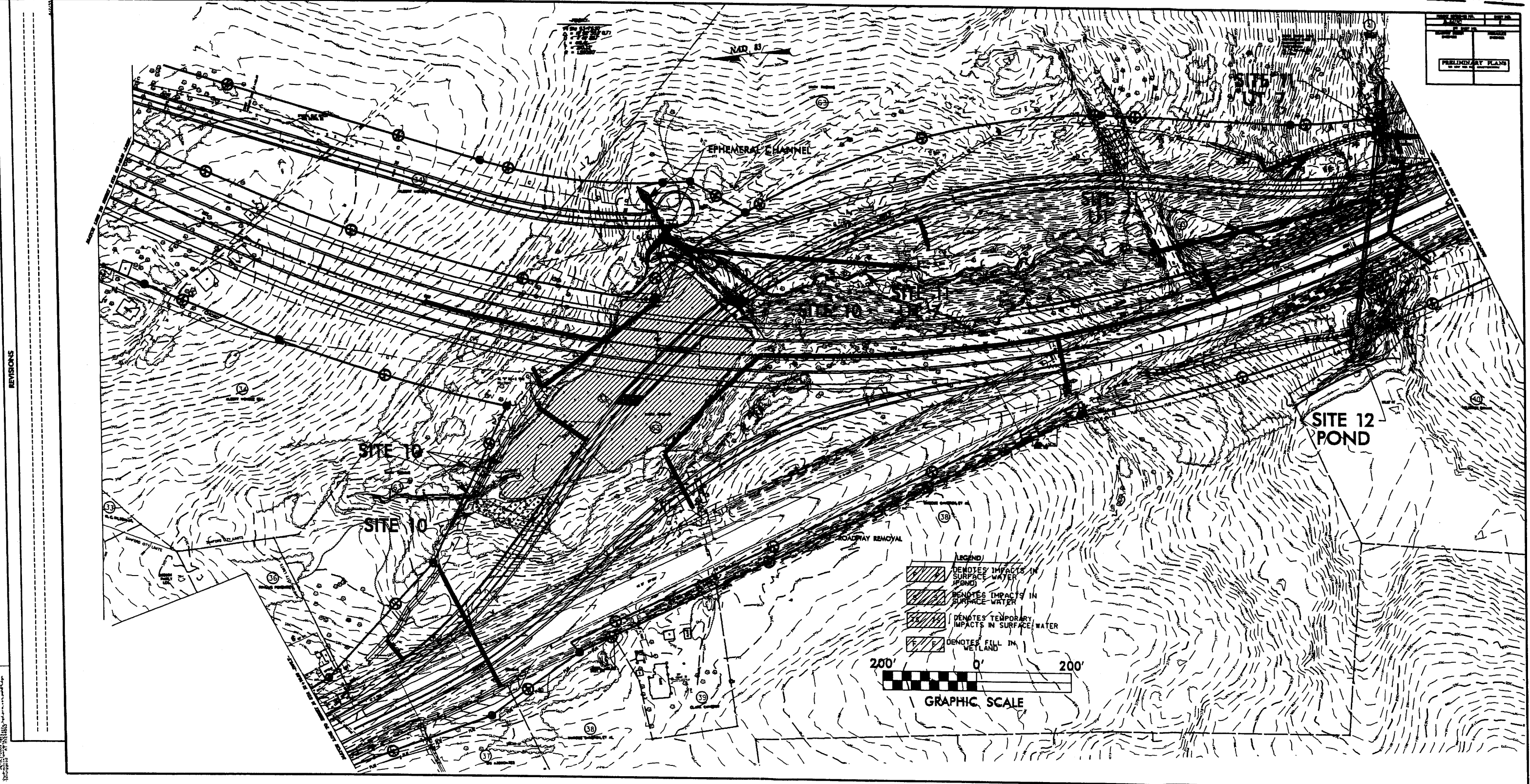
DATE	BY	CHKD	APP'D
PRELIMINARY PLANS			



REVISIONS

DATE: 10/15/2010  
BY: [illegible]  
CHKD: [illegible]  
APP'D: [illegible]

PRELIMINARY PLANS	



REVISIONS

DATE: 01/15/2010  
BY: [illegible]  
CHECKED BY: [illegible]