STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

MICHAEL F. EASLEY
GOVERNOR

LYNDO TIPPETT
SECRETARY

August 11, 2005

NC Department of Environment and Natural Resources
Division of Water Quality-Stormwater Management
943 Washington Square Mall
Washington, NC 27889

Attention: Mr. Bill Moore

Subject: **Stormwater Permit Request for Improvements to US 17.** Improvements to US 17 from US 13-17 south of Windsor to the Chowan River. Bertie County. State Project No. 6019001T. USAID 200411606. TIP No. R-2404A; $420.00 Debit WBS 34424.1.1.

The North Carolina Department of Transportation (NCDOT) proposes to improve US 17 in Bertie County, North Carolina. Bertie County falls under the jurisdiction of the Coastal Area Management Act (CAMA). The NCDOT is applying for a CAMA Major Development Permit, a Clean Water Act (CWA) §404 Department of the Army Permit, and a North Carolina CWA §401 Water Quality Certification.

A stormwater application form and one copy of the project permit drawings are provided with this request. Please review this project for authorization by your division.

Thank you for your assistance with this important matter. Any assistance you can provide in expediting the review of this project is greatly appreciated. If you have any questions concerning this project, please feel free to contact Mr. Chris Rivenbark at (919) 715-1460.

Sincerely,

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

CC:

Mr. John Hennessy, DWQ Raleigh
Mr. Travis Wilson, NCWRC
Mr. Gary Jordan, USFWS
Mr. Jay Bennett, P.E., Roadway Design
Mr. Omar Sultan, Programming and TIP
Mr. Art McMillan, P.E., Highway Design
Dr. David Chang, P.E., Hydraulics
Mr. Greg Perfetti, P.E., Structure Design
Mr. Mark Staley, Roadside Environmental
Mr. John Sullivan, FHWA
Mr. Don Conner, P.E., Division Engineer
Mr. Clay Willis, DEO
Mr. David Franklin, USACE, Wilmington
Ms. Stacy Baldwin, P.E., Planning Engineer
Ms. Cathy Brittingham, DCM
Mr. Bill Arrington, DCM

AILING ADDRESS:
DEPARTMENT OF TRANSPORTATION
OJECT DEVELOPMENT AND ENVIRONMENTAL ANALYSIS
48 MAIL SERVICE CENTER
LEIGH NC 27699-1548

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

LOCATION:
TRANSPORTATION BUILDING
1 SOUTH WILMINGTON STREET
RALEIGH NC

OFFICE USE ONLY		
Date Received	Fee Paid	Permit Number

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

STORMWATER MANAGEMENT PERMIT APPLICATION FORM

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
LINEAR ROADWAY PROJECT
This form may be photocopied for use as an original.

DWQ Stormwater Management Plan Review:
A complete stormwater management plan submittal includes this application form, a supplement form for each BMP proposed (see Section V), design calculations, and plans and specifications showing all road and BMP details.

I. PROJECT INFORMATION

NCDOT Project Number: C 201236 County: BERTIE

Project Name: R-2404 A WINDSOR BYPASS

Project Location: WINDSOR

Contact Person: JONATHAN HENDERSON Phone: (919) 785-1118 Fax: (919) 785-1187

Receiving Stream Name: CASHIE RIVER River Basin: ROANOKE Class: C

Proposed linear feet of project: 50,656 ft (9.59 mi)

Proposed Structural BMP and Road Station *(attach a list of station and BMP type if more room is needed)*:

Type of proposed project: *(check all that apply)*:

☒ New ☒ Widening ☐ 2 lane* ☒ 4 lane* ☐ Curb and Gutter ☐ Bridge Replacement
☐ Other *(Describe)*

**2 lane and 4 lane imply that roadside ditches are used unless Curb and Gutter is also checked.*

II. REQUIRED ITEMS CHECKLIST

Initial in the space provided below to indicate the following design requirements have been met and supporting documentation is attached. Supporting documentation shall, at a minimum, consist of a brief narrative description including (1) the scope of the project, (2) how the items below are met, (3) how the proposed best management practices minimize water quality impacts, and (4) any significant constraints and/or justification for not meeting a, b, c and d to the maximum extent practicable.

Designer's Initials

JRH a. The amount of impervious surface has been minimized as much as possible.
JRH b. The runoff from the impervious areas has been diverted away from surface waters as much as possible.
JRH c. Best Management Practices are employed which minimize water quality impacts.
JRH d. Vegetated roadside ditches are 3:1 slope or flatter.

III. OPERATION AND MAINTENANCE AGREEMENT

I acknowledge and agree by my initials below that the North Carolina Department of Transportation is responsible for the implementation of the four maintenance items listed. I agree to notify DWQ of any operational problems with the BMP's that would impact water quality or prior to making any changes to the system or responsible party.

Maintenance Engineer's Initials

SDP a. BMP's shall be inspected and maintained in good working order.

SDB b. Eroded areas shall be repaired and reseeded as needed.

SDB c. Stormwater collection systems, including piping, inlets, and outlets, shall be maintained to insure proper functioning.

Maintenance Engineer's Name: STERLING D. Baker

Title: Division Maintenance Engineer

IV. APPLICATION CERTIFICATION

I, *(print or type name)* Gregory J. Thorpe of PD & EA Branch, certify that the information included on this permit application form is, to the best of my knowledge, correct and that the project will be constructed in conformance with the approved plans and that the proposed project complies with the requirements of 15A NCAC 2H .1000.

Title: Environmental Management Director

Address: 1598 Mail Service Center, Raleigh NC 27699-1598

Signature: [signature] Date: 8/11/05

V. SUPPLEMENT FORMS

The applicable state stormwater management permit supplement form(s) listed below must be submitted for each BMP specified for this project. Contact the Stormwater and General Permits Unit at (919) 733-5083 for the status and availability of these forms.

Form SWU-102	Wet Detention Basin Supplement
Form SWU-103	Infiltration Basin Supplement
Form SWU-104	Low Density Supplement
Form SWU-105	Curb Outlet System Supplement
Form SWU-106	Off-Site System Supplement
Form SWU-107	Underground Infiltration Trench Supplement
Form SWU-108	Neuse River Basin Supplement
Form SWU-109	Innovative Best Management Practice Supplement
Form SWU-110	Extended Dry Detention Basin Supplement

Pre Formed Scour Holes (PSH)

41+25 -L-	45+00 -L-	154+64 -L- X 2
172+85 -L- X 2	196+00 -L-	301+00 -L-
342+38 -L-	371+00 -L-	375+48 -L-
380+50 -L-	428+00 -L-	433+00 -L-
339+25 -L-	444+00 -L-	452+50 -L-
458+50 -L-	464+50 -L-	470+50 -L-
473+50 -L-	28+10 -Y6-	33+14 -Y6-
28+05 -Y4RPB-		

Dry Detention Basin

4+00 -Y4LPD-

STORMWATER MANAGEMENT PLAN

WINDSOR BYPASS

R-2404A

1.0 PURPOSE

The purpose of this Stormwater Management Plan (SMP) is to document the design process used to develop the stormwater management for the Windsor Bypass (R-2404A) for the North Carolina Department of Transportation (NCDOT). This SMP describes the stormwater management and control features included in the hydraulic design for the Project. This Plan and the associated design have been prepared in general accordance with NCDOT Standards and the North Carolina Department of Environment and Natural Resources (NCDENR) Stormwater Best Management Practices manual.

2.0 CONTACT INFORMATION

Contractor: The Contractor of the site and the person to contact for construction issues is:

Barnhill Contracting Company
Attn.: Allen Barnhill, P.E.
P.O. Box 1529
Tarboro, NC 27886
Telephone: (252) 823-1021
FAX: (252) 823-0137

Engineer: For questions regarding this Plan, please contact the following:

HDR Engineering, Inc. of the Carolinas
Attn.: Jonathan Henderson, P.E.
3733 National Drive, Suite 207
Raleigh, NC 27612
Telephone: (919) 785-1118
FAX: (919) 785-1187

3.0 PROJECT DESCRIPTION

The project consists of constructing the Windsor Bypass (R-2404A) from the US 13/17 intersection southwest of Windsor, North Carolina to the beginning of the 5-lane section of US 17 northeast of Windsor. Project work includes grading, paving, structures, ramps, loop, drainage components, and shoulder construction. The project includes 2.3 miles of existing road widening and 7.3 miles of new alignment, including a 1700 foot bridge over the Cashie River and its adjacent wetlands and interchanges with US 13 and Wakelon Road.

4.0 SITE BACKGROUND INFORMATION

The Windsor Bypass is located in the Inner Coastal Plain Physiographic Region within the Roanoke River Basin. The topography is relatively flat throughout most of the project area. From the beginning of the project through the Cashie River bridges the topography is generally shallow slopes and ridges grading down to streams and the flood plain of the Cashie River. From the Cashie River to the end of the project, the terrain becomes primarily flat pine plantations.

The major environmental feature on the project is the Cashie River and its adjacent flood plain and extensive bottomland wetland system. This large wetland spans almost the entire flood plain of the river. In addition to this crossing, a culvert will be extended along an unnamed tributary of the Cashie River near the beginning of the project. One other feature, a small perennial stream, will be piped through the US 13 interchange.

The Windsor Bypass will be constructed through residential and commercial areas, managed pine plantations and wetlands, and the environmentally sensitive areas described above. All streams within the Project area are classified as Class C by NCDENR. The Cashie River is listed on the 2004 draft 303(d) list due to mercury contamination in fish. Bertie County is also one of the twenty coastal counties under jurisdiction of CAMA. Therefore, a State Stormwater permit is required for this project.

The following commitments related to stormwater management have been made based on the Record of Decision for the Environmental Impact Statement for this project and the requirements of the scope of work:

- The Cashie River and the adjacent bottomland wetlands will be bridged entirely.
- Roadway grades will be set in order to avoid using roadway drainage ditches in designated wetlands.

These commitments are in addition to the standard commitments for Coastal Area Management Act and Clean Water Act Section 404 permits and 401 certification conditions.

5.0 BMP Evaluation Criteria

Best management practices (BMPs) were evaluated at all outfall locations in order to limit any impacts from the increase in stormwater from the project. NCDCM and NCDENR regulations for stormwater management were followed during design. During the evaluation, the following conditions were considered:

- The proximity of the location to surface waters and wetlands.
- The slope and consistency of the topography between the outfall and the environmentally sensitive area.
- The pre- and post-project stormwater flow at the outfall location.
- The proximity of the BMP to the roadway and any potential safety hazards involved.
- Access and maintenance issues critical to the continued operation and success of the BMP.
- Existence of natural, non-jurisdictional channels or structures for use in routing stormwater flows.

6.0 BMP EVALUATION

The following steps were followed to determine the applicability of using BMPs at each location:

- All ditches and medians were designed to comply with NCDENR grass swale design criteria if possible.
- Determine if there is a significant change in pre- and post-project stormwater flows.
- BMPs were evaluated in the following sequence:
    - Infiltration
    - Wet detention
    - Dry detention
    - Level spreader with vegetative buffer
- For low flow outlets and small pipes (15" or 18"), the use of a pre-formed scour hole was evaluated based on topography and flows.

Based on this evaluation, BMPs were chosen for each environmentally sensitive location, as well as across the entire Project as described in Section 7.

7.0 Pre- and Post-construction Stormwater Analysis

The pre- and post-construction runoff rates were analyzed for major outfall locations where the outlet channel receives the runoff in close proximity to the project. The US 13/17 interchange was analyzed because it met these criteria and the additional impervious surfaces created by the interchange warranted additional analysis. Initial analysis revealed a slight increase in post construction runoff. As a result of this increase, and in an effort to reduce environmental impacts, a dry detention basin was added inside loop A at the US 13/17 interchange. The addition of this dry detention basin, as well as maintaining

wetlands internal to the interchange, actually resulted in a decrease in the post construction runoff by approximately seven percent. The Wakelon Road interchange, which is located in an area dominated by wetlands, was not analyzed since there is no common receiving channel and stormwater will flow into these existing wetlands, which provide natural storage and infiltration.

The existing character of the basins throughout the project are primarily wetlands. These wetland areas have been maintained to the maximum extent practical, such as retaining them internal to the interchanges. This provides both pre- and post-construction storage for runoff. The project area consists of large drainage basins and the addition of two or four lanes of impervious pavement does not significantly impact post-construction discharges or velocities.

8.0 DESIGN DETAILS

The following sections describe the BMPs used at each environmentally sensitive area along the Project. The entire stormwater drainage system was designed to outlet frequently at relatively low velocities in order to avoid indirect impacts on the aquatic environment. BMPs were evaluated at each outfall location based on the criteria described in Section 6.0.

8.1 General BMP Design

Throughout the Project, median and roadside ditches have been designed to meet the grass-swale design criteria described in the NCDENR Stormwater Manual. Only two ditches do not meet these criteria due to site constraints such as topography or right-of-way not allowing for the minimum 3:1 side-slopes. Off-site stormwater is passed through the Project without treatment.

On-site stormwater was treated by grass swale, dry detention, and pre-formed scour holes. In general, preformed scour holes were used in areas of flat topography and adjacent to wetlands where the flows were

relatively low. The following sections address specific areas where BMP design differed from the general approach.

8.2 Site 1 - Culvert Extension @ Sta 44+55 -L-

This is the location of the culvert extension on the unnamed tributary of the Cashie River. In addition, two ponds adjacent and within the roadway widening will be drained for the construction of the project. These ponds will not be filled, and therefore will provide some detention of off-site stormwater prior to it entering this UT. No on-site stormwater will be routed through this area. Rather, it will outlet into a preformed scour hole on the downstream side of the road in order to obtain sheet flow prior to entering the adjacent wetland.

8.3 Site 4 - Interchange with US 13

This location has the greatest amount of impervious surface on the project due to the ramps and loops associated with the routing of traffic from US 13 and US 17. A slight increase in post-construction runoff compared to pre-construction was calculated for this site. Therefore, the area within Loop D was evaluated for BMP implementation. Due to the relatively low water table compared to the rest of the site, along with the clay loam soils in the area, it was determined that the area could be used as a dry detention basin. The stormwater from most of the interchange and the entire bridge is routed to the detention basin and then discharged to the stream channel at low velocity. Maintenance access is provided from King Street (-Y4-) located adjacent to the basin. Infiltration and wet detention were evaluated for this site, however the soil conditions and adjacent roadway would not allow for these BMPs. Wet detention internal to the interchange increases hazards to the traveling public.

8.4 Site 6 - Cashie River Bridges

The dual structures over the Cashie River and adjacent wetlands are 1700 feet long. Deck drains are required for this length of bridge in order to

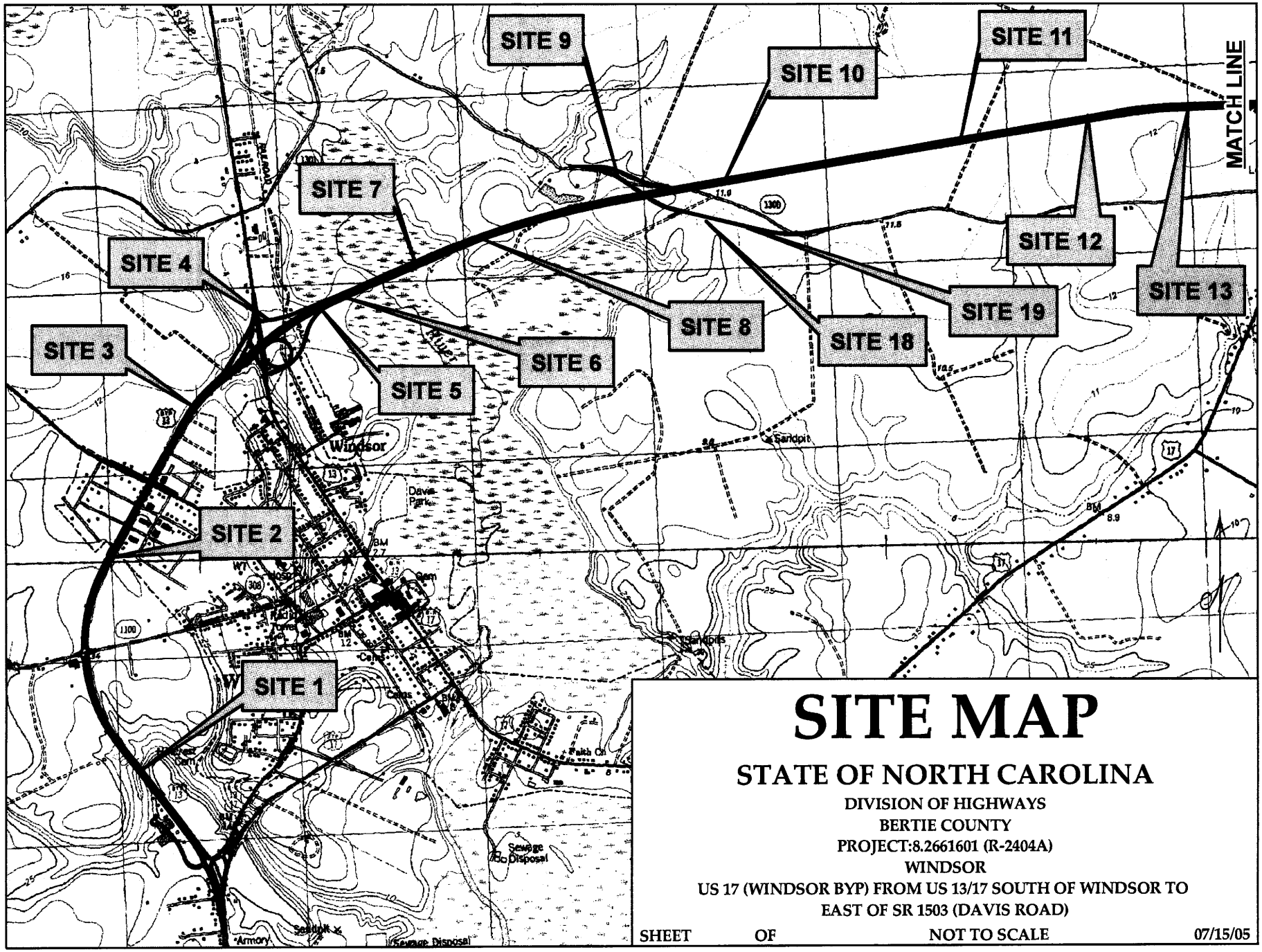
prevent water from spreading into the lanes during the design storm event. The deck drains have been designed to discharge into the forested wetlands at least 100 feet from the 30-foot CAMA buffer on the Cashie River. This will allow adequate treatment of the deck drain discharge prior to entering a surface water feature. Four inch diameter deck drains have been spaced at 6-foot intervals which to reduce discharge during a storm event. The remainder of the bridge stormwater will be collected on the southwest end and discharged into preformed scour holes located on either side of the approach to the bridge. The scour holes will discharge into a vegetated filter strip equidistant from the adjacent waters.

8.5 Managed Pine Farm Wetlands

Throughout the extensive managed pine wetlands, on-site stormwater has been routed through wetland equalizer pipes that are designed to retain the hydrology of the existing wetlands. These pipes will be 36 inches in diameter and embedded 1 foot into the existing ground. Stormwater entering these pipes will flow in both directions and outlet on both sides of the road at extremely low velocities. The onsite stormwater will have already been treated through grass swales in the roadway median.

9.0 CONCLUSION

The proposed stormwater management system is designed to be an integrated approach of appropriate BMPs that effectively control and treat on-site stormwater for this facility. This plan is consistent with both Federal and State regulations and NCDOT guidance. More details regarding the individual stormwater structures and BMPs are provided in the attached computations, including dry detention basins design.



SITE MAP

STATE OF NORTH CAROLINA

DIVISION OF HIGHWAYS

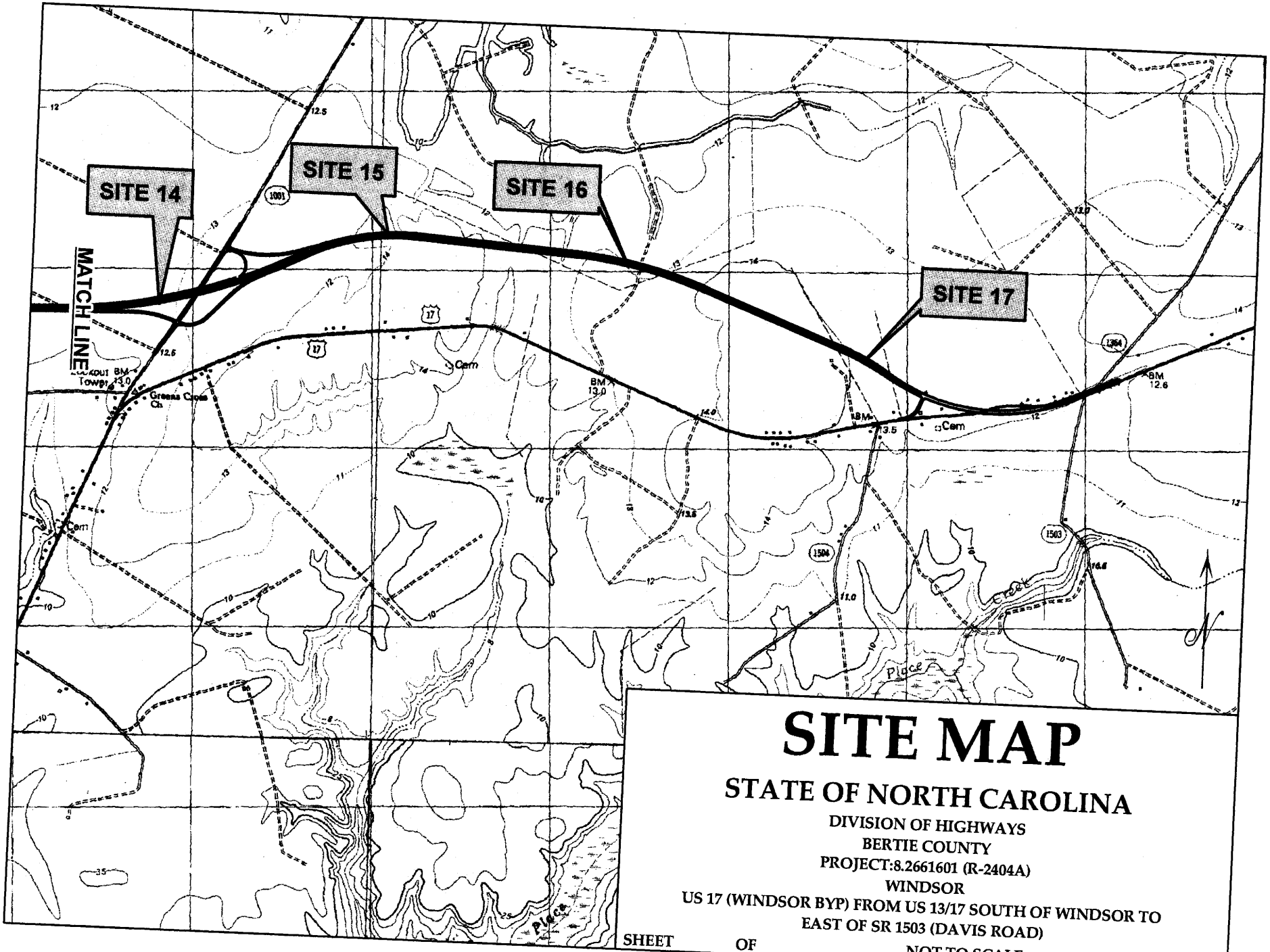
BERTIE COUNTY

PROJECT:8.2661601 (R-2404A)

WINDSOR

US 17 (WINDSOR BYP) FROM US 13/17 SOUTH OF WINDSOR TO EAST OF SR 1503 (DAVIS ROAD)

SHEET OF NOT TO SCALE 07/15/05



SITE MAP

STATE OF NORTH CAROLINA

DIVISION OF HIGHWAYS
BERTIE COUNTY
PROJECT:8.2661601 (R-2404A)
WINDSOR
US 17 (WINDSOR BYP) FROM US 13/17 SOUTH OF WINDSOR TO
EAST OF SR 1503 (DAVIS ROAD)

SHEET OF NOT TO SCALE 07/15/05

REVISIONS

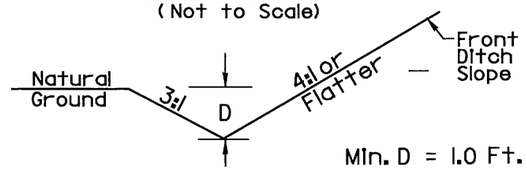
PROJECT REFERENCE NO.	SHEET NO.
R-2404A	DETAILS
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

HDR Engineering, Inc. of the Carolinas
3733 National Drive, Suite 207 Raleigh, N.C. 27612

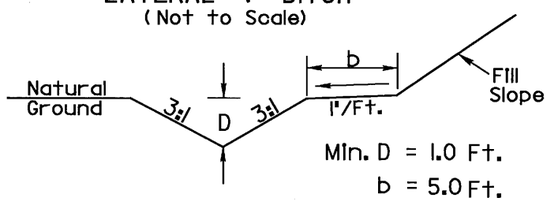
BARNHILL CONTRACTING COMPANY

DETAIL A
SPECIAL CUT DITCH
(Not to Scale)



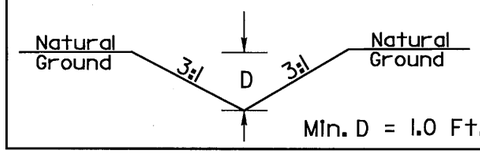
Min. D = 1.0 Ft.

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



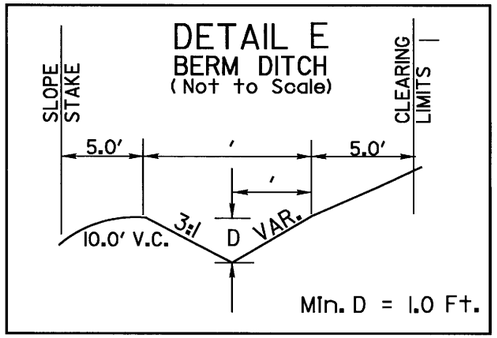
Min. D = 1.0 Ft.
b = 5.0 Ft.

DETAIL C
'V' TAIL DITCH
(Not to Scale)



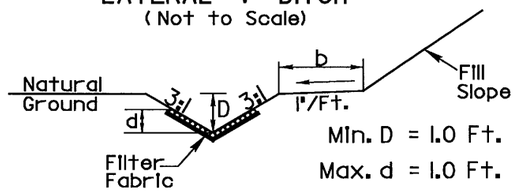
Min. D = 1.0 Ft.

DETAIL E
BERM DITCH
(Not to Scale)



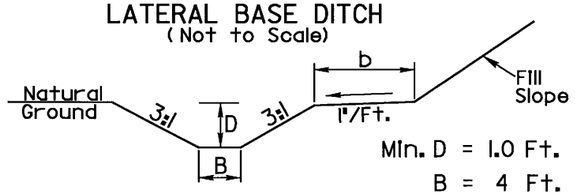
Min. D = 1.0 Ft.

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



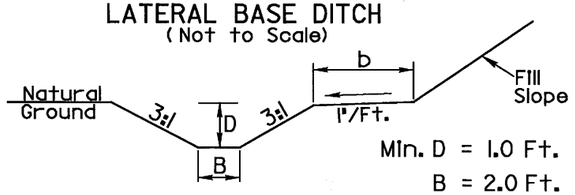
Min. D = 1.0 Ft.
Max. d = 1.0 Ft.
b = 5.0 Ft.
Type of Liner = CLASS 'B' RIP RAP

DETAIL G
LATERAL BASE DITCH
(Not to Scale)



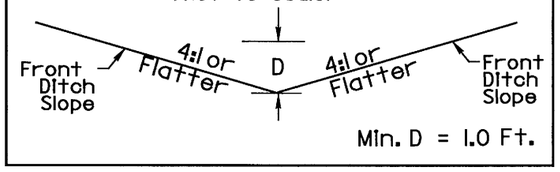
Min. D = 1.0 Ft.
B = 4 Ft.
b = 5.0 Ft.

DETAIL J
LATERAL BASE DITCH
(Not to Scale)



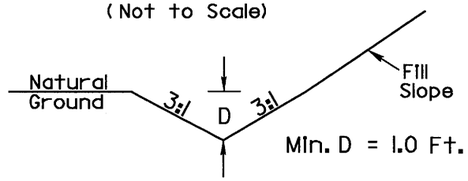
Min. D = 1.0 Ft.
B = 2.0 Ft.
b = 5.0 Ft.

DETAIL L
SPECIAL DITCH GRADE
(Not to Scale)



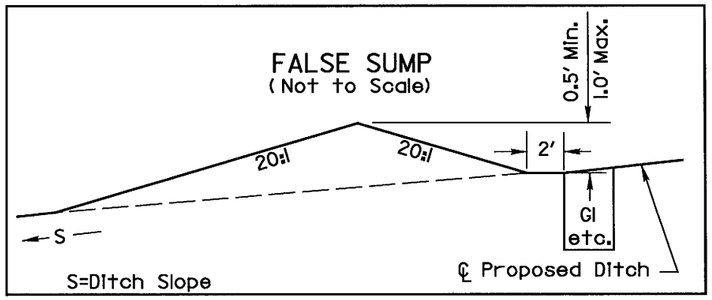
Min. D = 1.0 Ft.

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



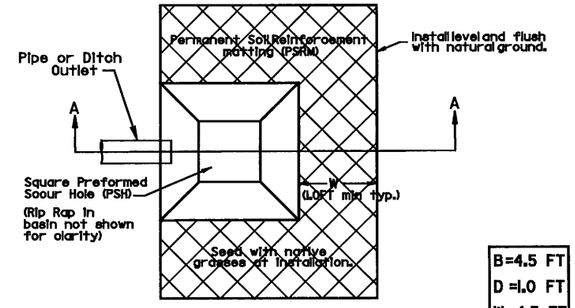
Min. D = 1.0 Ft.

FALSE SUMP
(Not to Scale)



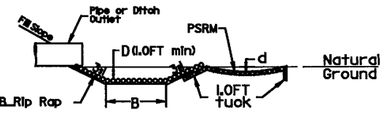
PREFORMED SCOUR HOLE

PLAN VIEW



B=4.5 FT
D =1.0 FT
W=4.5 FT
d =1.0 FT

SECTION A-A



HDR | ONE COMPANY *Many Solutions™*

Project: R-2404 A	Computed: JRR	Date: 4/11/05	
Subject: -Y4LPD- DETENTION BASIN	Checked:	Date:	
Task: STORAGE VOLUME FOR 1" STORM	Page: 1	of: 4	
Job #:	No:		

DRAINAGE AREA

7+00 -LPD- OUTLET = 0.39 AC
11+85 -LPD- OUTLET = 1.57 AC
31+50 -Y4- OUTLET = 7.19 AC
133+30 -L- OUTLET = 0.17 AC
LOOP = 4.16 AC

TOTAL DA = 13.48 AC

IMPERVIOUS AREA

LOOP D PAVEMENT = 0.85 AC
Y4 PAVEMENT = 0.27 AC
-L- PAVEMENT = 0.41 AC

TOTAL IMPERVIOUS AREA = 1.53 AC

% IMPERVIOUS

1.53 AC / 13.48 AC = 0.1135 = 11.4%

RUNOFF VOLUME ("SIMPLE METHOD" - SCHUELER (1987))

$R_V = 0.05 + 0.009(I)$
$= 0.05 + 0.009(11.4)$
$= 0.152$

R_V = RUNOFF COEFFICIENT (STORM RUNOFF / STORM RAINFALL)
I = PERCENT IMPERVIOUS

VOLUME TO BE CONTAINED

VOLUME = (DESIGN RAINFALL)(R_V)(DA)
$= (1\ IN)(\frac{1}{12}\ ft/IN)(0.152)(13.48\ AC)$
$= 0.171\ AC\text{-}ft = 7{,}437\ ft^3$
$= (7437)(1.20)$ (SEDIMENT STORAGE)
$= 8924\ ft^3$

STORAGE VOLUME REQUIRED = 9,000 ft^3

CALCULATION OF Q_p (RATIONAL)

$Q_p = CIA$

RATIONAL C VALUE

$1.53 \text{ AC} \times 0.9 = 1.38$

$11.95 \text{ AC} \times 0.35 = 4.18$

$\frac{1.38 + 4.18}{13.48} = 0.41 \Rightarrow C = 0.41$

INTENSITY (I)

10-YR INTENSITY FOR WILMINGTON = 5.9 IN/HR

$Q_p = (0.41)(5.9)(13.48)$

$Q_p = 32.6 \text{ CFS}$

CALCULATION OF T_p

$P = 4.16 \text{ IN}$ (10-YR, 6-HR PRECIPITATION)

$CN = 70$

$S = \frac{1000}{CN} - 10$ (STORAGE)

$= \frac{1000}{70} - 10$

$= 4.23$

$Q^* = \frac{(P - 0.2(S))^2}{P + 0.8(S)}$ (DEPTH OF RUNOFF)

$= \frac{(4.16 - 0.2(4.23))^2}{4.16 + 0.8(4.23)}$

$Q^* = 1.44 \text{ IN}$

$T_p = VOL / 1.39 Q_p$

$= \frac{(1.44 \text{ IN})(13.48 \text{ AC})}{(1.39)(32.6 \text{ CFS})} \cdot \frac{1 \text{ FT}}{12 \text{ IN}} \cdot \frac{43560 \text{ ft}^2}{1 \text{ AC}} \cdot \frac{1 \text{ MIN}}{60 \text{ SEC}}$

$T_p = 26 \text{ MIN}$

R-2404A - Proposed Dry Detention Basin -Y4LPD-

April 2005 JRR

Reservoir Routing Hydrograph
Inflow Hydrograph:

Qp(cfs)=	32.6
Tp(min)=	26
dT(min.)=	2

Stage- Storage

Ks=	15371
b=	1.14

Initial Stage

(ft)	0

Results of Storm on Reservoir

Results of Storm on Reservoir	
Norm surf. Area(ac.)=	0.00
Max surf. Area(ac.)=	0.47
Peak Stage(ft)=	3.22
Rise(ft)=	3.22
Peak Outflow(cfs)=	7.25
Treatment Storage (cf)=	43536
Max storage (cf)=	58093

Required Storage: (Includes 20% sediment storage)
9000 cubic feet at 0.62 above invert of pond

Outflow Devices:

Culvert:

NN=	1
D(in)=	3
Cd=	0.6
Inv(ft)=	0

Weir1:

L(ft)=	2
Zcr(ft)=	2.50
Cw=	3

Weir2:

L(ft)=	10
Zcr(ft.)=	3.00
Cw=	3

Weir3:

L(ft)=	300
Zcr(ft.)=	4
Cw=	3

Barrel:

N=	1
Db(in)=	18
Cd=	0.6

Drawdown Time:

Stage after 2 days	0.38
Stage after 5 days	0.01

Head above barrel	1
Driving Q (cfs)	13

RESERVOIR #1 | **OUTFLOWS:**

TIME (min)	INFLOW (cfs)	STORAGE (cu ft)	STAGE (ft)	OUTFLOW (cfs)	CULVERT (cfs)	WEIR1 (cfs)	WEIR2 (cfs)	WEIR3 (cfs)	TOTAL WEIR	BARREL (cfs)	Rbspwy (cfs)
0	0	0.0	0.00	0.0	0.00	0.0	0.0	0.0	0.0	0.0	0.0
2	0	0.0	0.00	0.0	0.00	0.0	0.0	0.0	0.0	0.0	0.0
4	2	56.8	0.01	0.0	0.00	0.0	0.0	0.0	0.0	0.0	0.0
6	4	280.6	0.03	0.0	0.00	0.0	0.0	0.0	0.0	0.0	0.0
8	7	772.0	0.07	0.0	0.01	0.0	0.0	0.0	0.0	0.0	0.0
10	11	1615.7	0.14	0.0	0.03	0.0	0.0	0.0	0.0	0.0	0.0
12	14	2875.4	0.23	0.0	0.07	0.0	0.0	0.0	0.1	0.1	0.1
14	18	4590.1	0.35	0.1	0.11	0.0	0.0	0.0	0.1	0.1	0.1
16	22	6771.4	0.49	0.1	0.14	0.0	0.0	0.0	0.1	0.1	0.1
18	26	9405.9	0.65	0.1	0.17	0.0	0.0	0.0	0.2	0.2	0.2
20	28	12454.3	0.83	0.2	0.20	0.0	0.0	0.0	0.2	0.2	0.2
22	31	15852.3	1.03	0.2	0.22	0.0	0.0	0.0	0.2	0.2	0.2
24	32	19515.2	1.23	0.2	0.25	0.0	0.0	0.0	0.2	0.2	0.2
26	33	23342.8	1.44	0.2	0.27	0.0	0.0	0.0	0.3	0.3	0.3
28	32	27224.9	1.65	0.3	0.29	0.0	0.0	0.0	0.3	0.3	0.3
30	31	31048.4	1.86	0.3	0.31	0.0	0.0	0.0	0.3	0.3	0.3
32	29	34703.0	2.05	0.3	0.33	0.0	0.0	0.0	0.3	0.3	0.3
34	26	38088.3	2.22	0.3	0.34	0.0	0.0	0.0	0.3	0.3	0.3
36	23	41150.7	2.38	0.3	0.35	0.0	0.0	0.0	0.4	0.4	0.4
38	21	43916.1	2.52	0.4	0.37	0.0	0.0	0.0	0.4	0.4	0.4
40	19	46413.0	2.64	0.4	0.37	0.3	0.0	0.0	0.7	0.7	0.7
42	17	48665.0	2.76	0.7	0.38	0.8	0.0	0.0	1.2	1.2	1.2
44	16	50659.4	2.86	1.2	0.39	1.3	0.0	0.0	1.7	1.7	1.7
46	14	52400.7	2.94	1.7	0.40	1.8	0.0	0.0	2.2	2.2	2.2
48	13	53902.7	3.02	2.2	0.40	2.2	0.1	0.0	2.7	2.7	2.7
50	12	55183.1	3.08	2.7	0.41	2.7	0.7	0.0	3.7	3.7	3.7
52	11	56252.9	3.13	3.7	0.41	3.0	1.4	0.0	4.9	4.9	4.9
54	10	57065.7	3.17	4.9	0.41	3.3	2.1	0.0	5.9	5.9	5.9
56	9	57621.7	3.20	5.9	0.41	3.5	2.7	0.0	6.6	6.6	6.6
58	8	57950.2	3.22	6.6	0.41	3.6	3.0	0.0	7.0	7.0	7.0
60	7	58092.7	3.22	7.0	0.42	3.7	3.1	0.0	7.2	7.2	7.2
62	6	58092.1	3.22	7.2	0.42	3.7	3.1	0.0	7.2	7.2	7.2
64	6	57987.0	3.22	7.2	0.41	3.6	3.0	0.0	7.1	7.1	7.1
66	5	57809.3	3.21	7.1	0.41	3.6	2.9	0.0	6.9	6.9	6.9
68	5	57583.4	3.20	6.9	0.41	3.5	2.6	0.0	6.5	6.5	6.5
70	4	57327.6	3.19	6.5	0.41	3.4	2.4	0.0	6.2	6.2	6.2
72	4	57054.8	3.17	6.2	0.41	3.3	2.1	0.0	5.9	5.9	5.9
74	3	56774.0	3.16	5.9	0.41	3.2	1.9	0.0	5.5	5.5	5.5
76	3	56491.6	3.14	5.5	0.41	3.1	1.6	0.0	5.2	5.2	5.2
78	3	56211.5	3.13	5.2	0.41	3.0	1.4	0.0	4.8	4.8	4.8
80	3	55936.5	3.12	4.8	0.41	2.9	1.2	0.0	4.5	4.5	4.5
82	2	55668.2	3.10	4.5	0.41	2.8	1.0	0.0	4.2	4.2	4.2
84	2	55407.5	3.09	4.2	0.41	2.7	0.8	0.0	4.0	4.0	4.0
86	2	55154.9	3.08	4.0	0.41	2.6	0.7	0.0	3.7	3.7	3.7
88	2	54910.4	3.07	3.7	0.40	2.6	0.5	0.0	3.5	3.5	3.5
90	2	54673.9	3.06	3.5	0.40	2.5	0.4	0.0	3.3	3.3	3.3
92	1	54444.9	3.04	3.3	0.40	2.4	0.3	0.0	3.1	3.1	3.1

94	1	54222.9	3.03	3.1	0.40	2.3	0.2	0.0	2.9	2.9	2.9
96	1	54007.3	3.02	2.9	0.40	2.3	0.1	0.0	2.8	2.8	2.8
98	1	53797.3	3.01	2.8	0.40	2.2	0.0	0.0	2.6	2.6	2.6
100	1	53592.0	3.00	2.6	0.40	2.1	0.0	0.0	2.5	2.5	2.5
102	1	53389.9	2.99	2.5	0.40	2.1	0.0	0.0	2.5	2.5	2.5
104	1	53189.3	2.98	2.5	0.40	2.0	0.0	0.0	2.4	2.4	2.4
106	1	52986.7	2.97	2.4	0.40	1.9	0.0	0.0	2.3	2.3	2.3
108	1	52782.7	2.96	2.3	0.40	1.9	0.0	0.0	2.3	2.3	2.3
110	1	52578.2	2.95	2.3	0.40	1.8	0.0	0.0	2.2	2.2	2.2
112	1	52373.9	2.94	2.2	0.40	1.8	0.0	0.0	2.2	2.2	2.2
114	0	52170.5	2.93	2.2	0.40	1.7	0.0	0.0	2.1	2.1	2.1
116	0	51968.5	2.92	2.1	0.39	1.6	0.0	0.0	2.0	2.0	2.0
118	0	51768.4	2.91	2.0	0.39	1.6	0.0	0.0	2.0	2.0	2.0
120	0	51570.4	2.90	2.0	0.39	1.5	0.0	0.0	1.9	1.9	1.9
122	0	51375.1	2.89	1.9	0.39	1.5	0.0	0.0	1.9	1.9	1.9
124	0	51182.6	2.88	1.9	0.39	1.4	0.0	0.0	1.8	1.8	1.8
126	0	50993.1	2.87	1.8	0.39	1.4	0.0	0.0	1.8	1.8	1.8
128	0	50806.8	2.86	1.8	0.39	1.3	0.0	0.0	1.7	1.7	1.7
130	0	50623.9	2.85	1.7	0.39	1.3	0.0	0.0	1.7	1.7	1.7
132	0	50444.4	2.85	1.7	0.39	1.2	0.0	0.0	1.6	1.6	1.6
134	0	50268.5	2.84	1.6	0.39	1.2	0.0	0.0	1.6	1.6	1.6
136	0	50096.1	2.83	1.6	0.39	1.1	0.0	0.0	1.5	1.5	1.5
138	0	49927.4	2.82	1.5	0.39	1.1	0.0	0.0	1.5	1.5	1.5
140	0	49762.2	2.81	1.5	0.39	1.0	0.0	0.0	1.4	1.4	1.4
142	0	49600.7	2.80	1.4	0.39	1.0	0.0	0.0	1.4	1.4	1.4
144	0	49442.7	2.80	1.4	0.39	1.0	0.0	0.0	1.4	1.4	1.4
146	0	49288.3	2.79	1.4	0.39	0.9	0.0	0.0	1.3	1.3	1.3
148	0	49137.4	2.78	1.3	0.38	0.9	0.0	0.0	1.3	1.3	1.3
150	0	48990.0	2.77	1.3	0.38	0.9	0.0	0.0	1.2	1.2	1.2
152	0	48846.0	2.77	1.2	0.38	0.8	0.0	0.0	1.2	1.2	1.2
154	0	48705.3	2.76	1.2	0.38	0.8	0.0	0.0	1.2	1.2	1.2
156	0	48567.9	2.75	1.2	0.38	0.8	0.0	0.0	1.1	1.1	1.1
158	0	48433.7	2.75	1.1	0.38	0.7	0.0	0.0	1.1	1.1	1.1
160	0	48302.7	2.74	1.1	0.38	0.7	0.0	0.0	1.1	1.1	1.1
162	0	48174.7	2.73	1.1	0.38	0.7	0.0	0.0	1.1	1.1	1.1
164	0	48049.8	2.73	1.1	0.38	0.6	0.0	0.0	1.0	1.0	1.0
166	0	47927.7	2.72	1.0	0.38	0.6	0.0	0.0	1.0	1.0	1.0
168	0	47808.5	2.71	1.0	0.38	0.6	0.0	0.0	1.0	1.0	1.0
170	0	47692.1	2.71	1.0	0.38	0.6	0.0	0.0	1.0	1.0	1.0
172	0	47578.3	2.70	1.0	0.38	0.5	0.0	0.0	0.9	0.9	0.9
174	0	47467.2	2.70	0.9	0.38	0.5	0.0	0.0	0.9	0.9	0.9
176	0	47358.6	2.69	0.9	0.38	0.5	0.0	0.0	0.9	0.9	0.9
178	0	47252.4	2.69	0.9	0.38	0.5	0.0	0.0	0.9	0.9	0.9
180	0	47148.7	2.68	0.9	0.38	0.5	0.0	0.0	0.8	0.8	0.8
182	0	47047.3	2.68	0.8	0.38	0.4	0.0	0.0	0.8	0.8	0.8
184	0	46948.1	2.67	0.8	0.38	0.4	0.0	0.0	0.8	0.8	0.8
186	0	46851.2	2.67	0.8	0.38	0.4	0.0	0.0	0.8	0.8	0.8
188	0	46756.3	2.66	0.8	0.38	0.4	0.0	0.0	0.8	0.8	0.8
190	0	46663.5	2.66	0.8	0.38	0.4	0.0	0.0	0.8	0.8	0.8
192	0	46572.7	2.65	0.8	0.38	0.4	0.0	0.0	0.7	0.7	0.7
194	0	46483.8	2.65	0.7	0.37	0.3	0.0	0.0	0.7	0.7	0.7
196	0	46396.8	2.64	0.7	0.37	0.3	0.0	0.0	0.7	0.7	0.7
198	0	46311.6	2.64	0.7	0.37	0.3	0.0	0.0	0.7	0.7	0.7
200	0	46228.1	2.64	0.7	0.37	0.3	0.0	0.0	0.7	0.7	0.7
202	0	46146.4	2.63	0.7	0.37	0.3	0.0	0.0	0.7	0.7	0.7
204	0	46066.3	2.63	0.7	0.37	0.3	0.0	0.0	0.6	0.6	0.6
206	0	45987.7	2.62	0.6	0.37	0.3	0.0	0.0	0.6	0.6	0.6
208	0	45910.8	2.62	0.6	0.37	0.2	0.0	0.0	0.6	0.6	0.6
210	0	45835.3	2.62	0.6	0.37	0.2	0.0	0.0	0.6	0.6	0.6
212	0	45761.2	2.61	0.6	0.37	0.2	0.0	0.0	0.6	0.6	0.6
214	0	45688.5	2.61	0.6	0.37	0.2	0.0	0.0	0.6	0.6	0.6
216	0	45617.2	2.60	0.6	0.37	0.2	0.0	0.0	0.6	0.6	0.6
218	0	45547.2	2.60	0.6	0.37	0.2	0.0	0.0	0.6	0.6	0.6
220	0	45478.5	2.60	0.6	0.37	0.2	0.0	0.0	0.6	0.6	0.6
222	0	45411.0	2.59	0.6	0.37	0.2	0.0	0.0	0.5	0.5	0.5
224	0	45344.6	2.59	0.5	0.37	0.2	0.0	0.0	0.5	0.5	0.5
226	0	45279.4	2.59	0.5	0.37	0.2	0.0	0.0	0.5	0.5	0.5
228	0	45215.3	2.58	0.5	0.37	0.1	0.0	0.0	0.5	0.5	0.5
230	0	45152.3	2.58	0.5	0.37	0.1	0.0	0.0	0.5	0.5	0.5
232	0	45090.3	2.58	0.5	0.37	0.1	0.0	0.0	0.5	0.5	0.5
234	0	45029.3	2.58	0.5	0.37	0.1	0.0	0.0	0.5	0.5	0.5
236	0	44969.3	2.57	0.5	0.37	0.1	0.0	0.0	0.5	0.5	0.5
238	0	44910.2	2.57	0.5	0.37	0.1	0.0	0.0	0.5	0.5	0.5
240	0	44852.0	2.57	0.5	0.37	0.1	0.0	0.0	0.5	0.5	0.5
242	0	44794.7	2.56	0.5	0.37	0.1	0.0	0.0	0.5	0.5	0.5
244	0	44738.3	2.56	0.5	0.37	0.1	0.0	0.0	0.5	0.5	0.5
246	0	44682.6	2.56	0.5	0.37	0.1	0.0	0.0	0.5	0.5	0.5
248	0	44627.7	2.56	0.5	0.37	0.1	0.0	0.0	0.4	0.4	0.4
250	0	44573.6	2.55	0.4	0.37	0.1	0.0	0.0	0.4	0.4	0.4

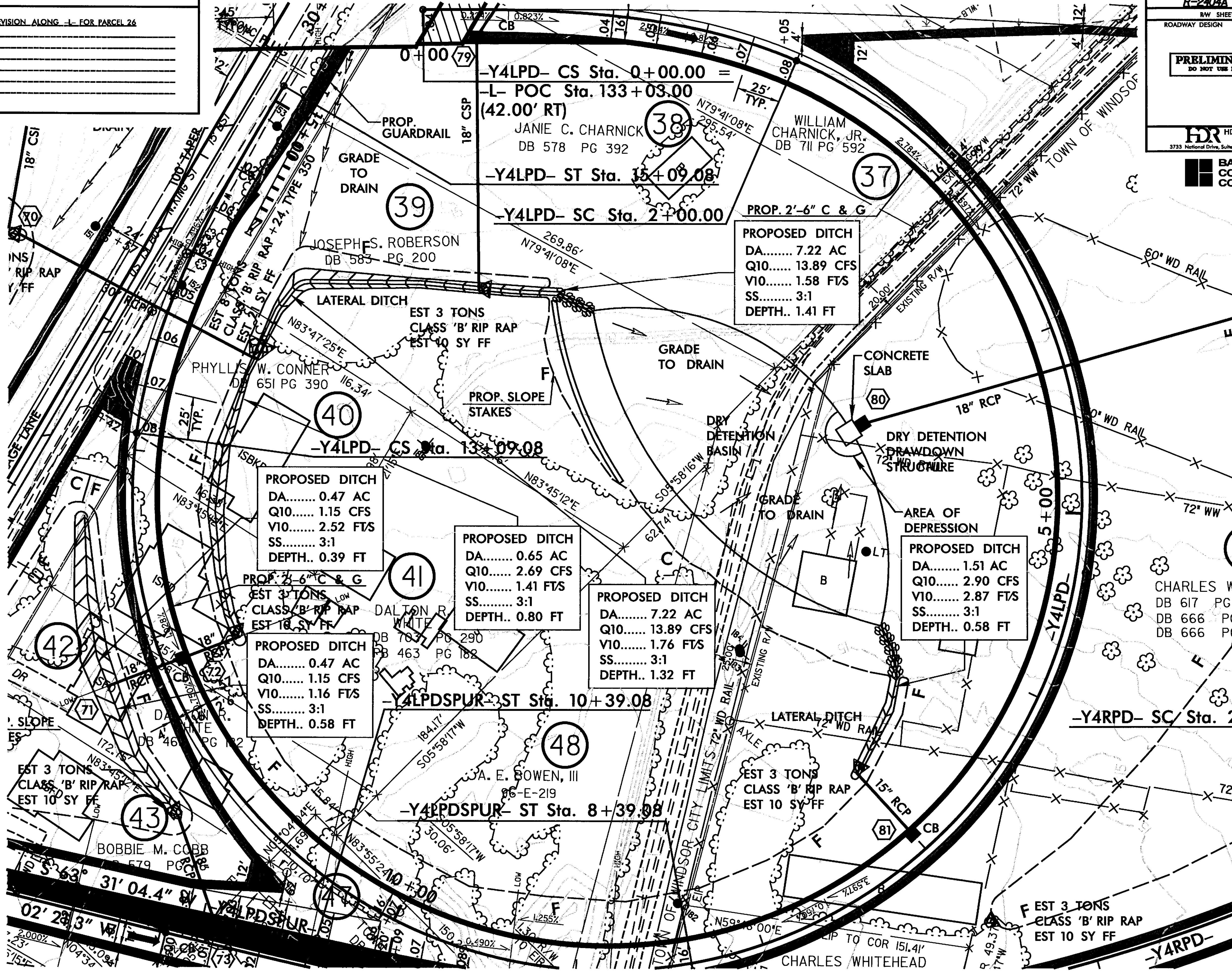
REVISIONS
5-18-05 R\W REVISION ALONG -L- FOR PARCEL 26

PROJECT REFERENCE NO.	SHEET NO.
R-2404A	DETENTION
R/W SHEET NO.	
ROADWAY DESIGN	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

HDR Engineering, Inc. of the Carolinas
3733 National Drive, Suite 207 Raleigh, N.C. 27612

BARNHILL CONTRACTING COMPANY



-Y4LPD- CS Sta. 0+00.00 =
-L- POC Sta. 133+03.00
(42.00' RT)
JANIE C. CHARNICK
DB 578 PG 392
-Y4LPD- ST Sta. 15+09.08
-Y4LPD- SC Sta. 2+00.00
WILLIAM CHARNICK, JR.
DB 711 PG 592
PROP. GUARDRAIL
GRADE TO DRAIN
JOSEPH S. ROBERSON
DB 583 PG 200
LATERAL DITCH
EST 3 TONS
CLASS 'B' RIP RAP
EST 10 SY FF
PHYLLIS W. CONNER
DB 651 PG 390
PROP. SLOPE STAKES
PROP. 2'-6" C & G
PROPOSED DITCH
DA........ 7.22 AC
Q10...... 13.89 CFS
V10...... 1.58 FT/S
SS......... 3:1
DEPTH.. 1.41 FT
CONCRETE SLAB
18" RCP
DRY DETENTION BASIN
DRY DETENTION DRAWDOWN STRUCTURE
-Y4LPD- CS Sta. 13+09.08
PROPOSED DITCH
DA........ 0.47 AC
Q10....... 1.15 CFS
V10....... 2.52 FT/S
SS......... 3:1
DEPTH.. 0.39 FT
PROPOSED DITCH
DA........ 0.65 AC
Q10....... 2.69 CFS
V10....... 1.41 FT/S
SS......... 3:1
DEPTH.. 0.80 FT
PROPOSED DITCH
DA........ 7.22 AC
Q10....... 13.89 CFS
V10....... 1.76 FT/S
SS......... 3:1
DEPTH.. 1.32 FT
PROPOSED DITCH
DA........ 1.51 AC
Q10....... 2.90 CFS
V10....... 2.87 FT/S
SS......... 3:1
DEPTH.. 0.58 FT
PROPOSED DITCH
DA........ 0.47 AC
Q10....... 1.15 CFS
V10....... 1.16 FT/S
SS......... 3:1
DEPTH.. 0.58 FT
AREA OF DEPRESSION
GRADE TO DRAIN
DALTON R. WHITE
DB 703 PG 290
PB 463 PG 182
CHARLES WH
DB 617 PG
DB 666 PG
DB 666 PG
-Y4LPDSPUR- ST Sta. 10+39.08
-Y4LPDSPUR- ST Sta. 8+39.08
A. E. BOWEN, III
96-E-219
LATERAL DITCH
-Y4RPD- SC Sta. 2
15" RCP
CB
BOBBIE M. COBB
TOWN OF WINDSOR CITY LIMITS
72" WD RAIL
60" WD RAIL
72" WW
TOWN OF WINDSOR
EXISTING R/W
N59°18'00"E
EIP TO COR 151.41'
CHARLES WHITEHEAD
-Y4RPD-
-Y4LPD-
-Y4LPDSPUR-
S 63° 31' 04.4"

PROJECT REFERENCE NO.	SHEET NO.
R-2404A	2-J

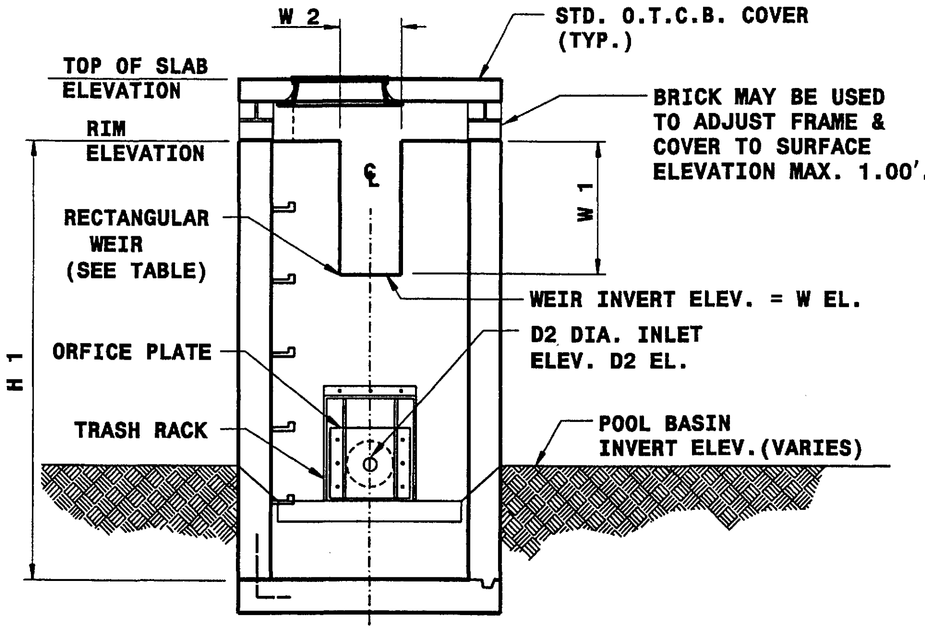
R/W SHEET NO.

ROADWAY DESIGN ENGINEER — HYDRAULICS ENGINEER

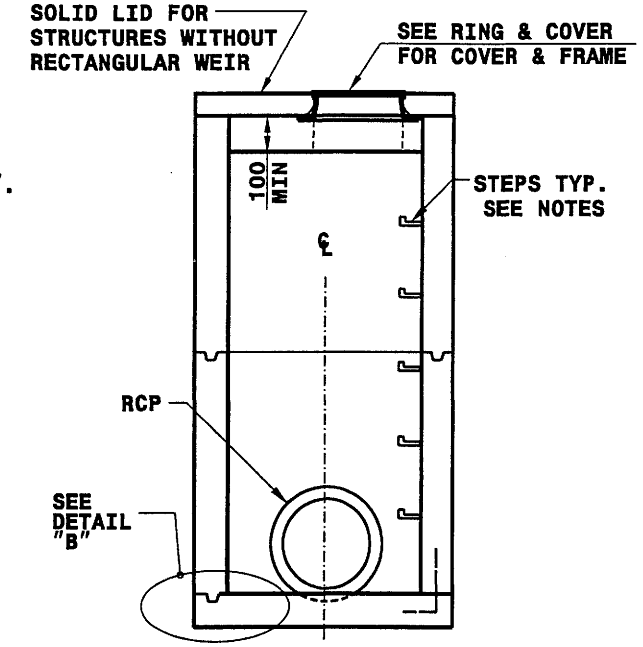
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

HDR Engineering, Inc. of the Carolinas
3733 National Drive, Suite 207 Raleigh, N.C. 27612

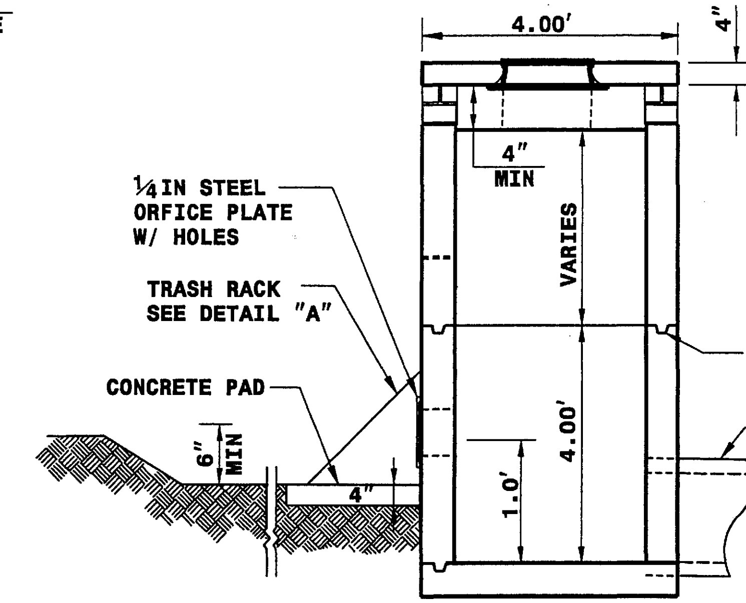
BARNHILL CONTRACTING COMPANY



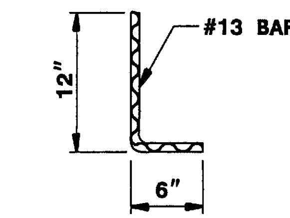
ELEVATION OF STRUCTURE SIDE 1



ELEVATION OF STRUCTURE SIDE 2

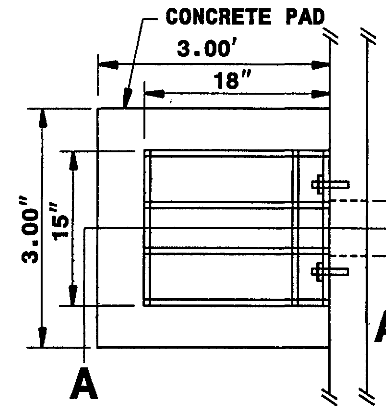


ELEVATION OF STRUCTURE SIDE 3

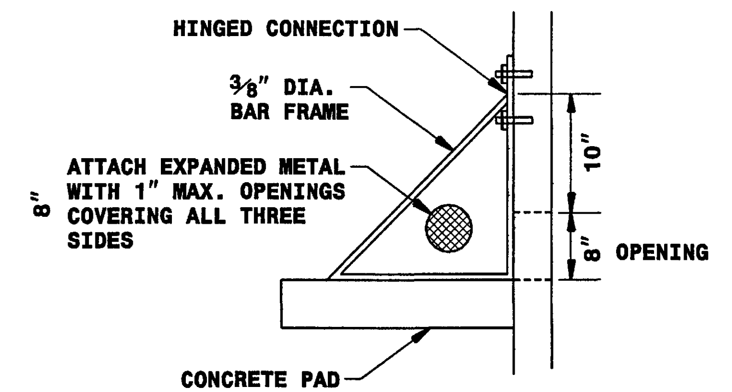


DOWEL

MINIMUM DIMENSIONS FOR DRY DETENTION BASIN DRAWDOWN STRUCTURE													
QUANTITIES FOR CONCRETE DETERMINED FROM NCDOT STANDARD 840.04													
							WEIR DIMENSIONS			DRAWDOWN ORIFICE			POOL BASIN INVERT
STATION	PIPE D	OUTLET PIPE INVERT	BOX HEIGHT H1	RIM ELEVATION	TOP OF SLAB ELEV.	REMARKS	W1	W2	W EL	D2	NO. OF HOLES	D2 EL	INV.EL.
-Y4LPD-	18"	8.00	4.00	12.00	8.50	OTCB	0.50'	2.00'	11.50	3"	1	9.00	9.00



PLAN VIEW

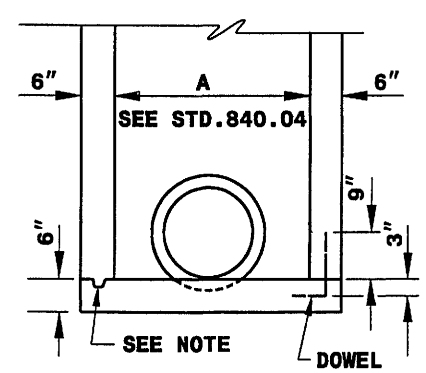


SECTION A-A

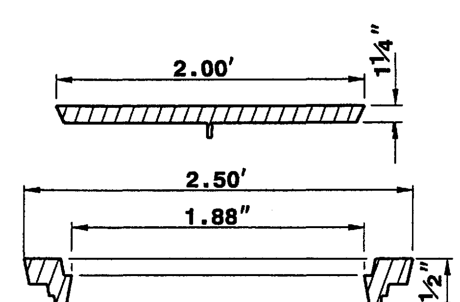
DETAIL A - EXTENDED DETENTION TRASH RACK

GENERAL NOTES:

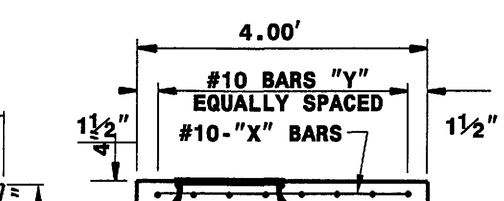
* CLASS 'B' CONCRETE TO BE USED THROUGHOUT. PRECAST CONCRETE STRUCTURES TO BE SUBMITTED FOR APPROVAL.
* OPTIONAL CONSTRUCTION - MONOLITHIC POUR, 2" KEYWAY, OR #13 BAR DOWELS AT 12" CENTERS, AS DIRECTED BY ENGINEER.
* FORMS ARE TO BE USED FOR THE CONSTRUCTION OF THE BOTTOM SLAB.
* IF REINFORCED CONCRETE PIPE IS SET IN BASE SLAB OF BOX, ADD TO BASE AS SHOWN ON STANDARD 840.00.
* ALL DRAWDOWN STRUCTURES OVER 3' IN DEPTH TO BE PROVIDED WITH STEPS 14" ON CENTERS. STEPS SHALL BE INSTALLED IN ACCORDANCE WITH STANDARD 840.66.
* FOR 8.0' IN HEIGHT OR LESS USE 6" WALLS AND BOTTOM SLAB. OVER 8.0' TO 16.0' IN HEIGHT USE 8" WALLS AND BOTTOM SLAB. ADJUST QUANTITIES ACCORDINGLY.



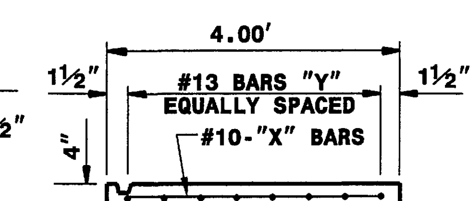
DETAIL 'B'



RING & COVER



TOP SLAB



BOTTOM SLAB

7/15/2005 9:44:47 AM

HDR | ONE COMPANY *Many Solutions™*

Project: R-2404 A	Computed: JRR	Date: 4/11/05	
Subject: -Y4LPD- DETENTION BASIN	Checked:	Date:	
Task: STORAGE VOLUME FOR 1" STORM	Page: 1	of: 4	
Job #:	No:		

DRAINAGE AREA

7+00 -LPD- OUTLET = 0.39 AC
11+85 -LPD- OUTLET = 1.57 AC
31+50 -Y4- OUTLET = 7.19 AC
133+30 -L- OUTLET = 0.17 AC
LOOP = 4.16 AC

TOTAL DA = 13.48 AC

IMPERVIOUS AREA

LOOP D PAVEMENT = 0.85 AC
Y4 PAVEMENT = 0.27 AC
-L- PAVEMENT = 0.41 AC

TOTAL IMPERVIOUS AREA = 1.53 AC

% IMPERVIOUS

$1.53\ AC / 13.48\ AC = 0.1135 = 11.4\%$

RUNOFF VOLUME ("SIMPLE METHOD" - SCHUELER (1987))

$R_V = 0.05 + 0.009(I)$
$= 0.05 + 0.009(11.4)$
$= 0.152$

R_V = RUNOFF COEFFICIENT (STORM RUNOFF / STORM RAINFALL)
I = PERCENT IMPERVIOUS

VOLUME TO BE CONTAINED

VOLUME = (DESIGN RAINFALL)(R_V)(DA)
$= (1\ IN)(\frac{1}{12}\ ft/IN)(0.152)(13.48\ AC)$
$= 0.171\ AC\text{-}ft = 7{,}437\ ft^3$
$= (7437)(1.20)$ (SEDIMENT STORAGE)
$= 8924\ ft^3$

STORAGE VOLUME REQUIRED = 9,000 ft^3

HDR | ONE COMPANY *Many Solutions*℠

Project: R-2404 A	Computed: JRR	Date: 4/11/05	
Subject: -Y4LPD- DETENTION BASIN	Checked:	Date:	
Task: DESIGN	Page: 2	of: 4	
Job #:	No:		

CALCULATION OF Q_p (RATIONAL)

$Q_p = CIA$

RATIONAL C VALUE

$1.53 \text{ AC} \times 0.9 = 1.38$

$11.95 \text{ AC} \times 0.35 = 4.18$

$\frac{1.38 + 4.18}{13.48} = 0.41 \Rightarrow C = 0.41$

INTENSITY (I)

10-YR INTENSITY FOR WILMINGTON = 5.9 IN/HR

$Q_p = (0.41)(5.9)(13.43)$

$Q_p = 32.6 \text{ CFS}$

CALCULATION OF T_p

$P = 4.16 \text{ IN}$ (10-YR, 6-HR PRECIPITATION)

$CN = 70$

$S = \frac{1000}{CN} - 10$ (STORAGE)

$= \frac{1000}{70} - 10$

$= 4.23$

$Q^* = \frac{(P - 0.2(S))^2}{P + 0.8(S)}$ (DEPTH OF RUNOFF)

$= \frac{(4.16 - 0.2(4.23))^2}{4.16 + 0.8(4.23)}$

$Q^* = 1.44 \text{ IN}$

$T_p = VOL / 1.39 Q_p$

$= \frac{(1.44 \text{ IN})(13.43 \text{ AC})}{(1.39)(32.6 \text{ CFS})} \cdot \frac{1 \text{ FT}}{12 \text{ IN}} \cdot \frac{43560 \text{ ft}^2}{1 \text{ AC}} \cdot \frac{1 \text{ MIN}}{60 \text{ SEC}}$

$T_p = 26 \text{ MIN}$

R-2404A - Proposed Dry Detention Basin -Y4LPD-

April 2005 JRR

Reservoir Routing Hydrograph

Inflow Hydrograph:

Qp(cfs)=	32.6
Tp(min)=	26
dT(min.)=	2

Stage- Storage

Ks=	15371
b=	1.14

Initial Stage

(ft)	0

Results of Storm on Reservoir

Results of Storm on Reservoir	
Norm surf. Area(ac.)=	0.00
Max surf. Area(ac.)=	0.47
Peak Stage(ft)=	3.22
Rise(ft)=	3.22
Peak Outflow(cfs)=	7.25
Treatment Storage (cf)=	43536
Max storage (cf)=	58093

Required Storage: (Includes 20% sediment storage)

9000 cubic feet at 0.62 above invert of pond

Outflow Devices:

Culvert:

NN=	1
D(in)=	3
Cd=	0.6
Inv(ft)=	0

Weir1:

L(ft)=	2
Zcr(ft)=	2.50
Cw=	3

Weir2:

L(ft)=	10
Zcr(ft.)=	3.00
Cw=	3

Weir3:

L(ft)=	300
Zcr(ft.)=	4
Cw=	3

Barrel:

N=	1
Db(in)=	18
Cd=	0.6

Drawdown Time:

Stage after 2 days	0.38
Stage after 5 days	0.01

Head above barrel	1
Driving Q (cfs)	13

RESERVOIR #1 **OUTFLOWS:**

TIME (min)	INFLOW (cfs)	STORAGE (cu ft)	STAGE (ft)	OUTFLOW (cfs)	CULVERT (cfs)	WEIR1 (cfs)	WEIR2 (cfs)	WEIR3 (cfs)	TOTAL WEIR	BARREL (cfs)	Rbspwy (cfs)
0	0	0.0	0.00	0.0	0.00	0.0	0.0	0.0	0.0	0.0	0.0
2	0	0.0	0.00	0.0	0.00	0.0	0.0	0.0	0.0	0.0	0.0
4	2	56.8	0.01	0.0	0.00	0.0	0.0	0.0	0.0	0.0	0.0
6	4	280.6	0.03	0.0	0.00	0.0	0.0	0.0	0.0	0.0	0.0
8	7	772.0	0.07	0.0	0.01	0.0	0.0	0.0	0.0	0.0	0.0
10	11	1615.7	0.14	0.0	0.03	0.0	0.0	0.0	0.0	0.0	0.0
12	14	2875.4	0.23	0.0	0.07	0.0	0.0	0.0	0.1	0.1	0.1
14	18	4590.1	0.35	0.1	0.11	0.0	0.0	0.0	0.1	0.1	0.1
16	22	6771.4	0.49	0.1	0.14	0.0	0.0	0.0	0.1	0.1	0.1
18	26	9405.9	0.65	0.1	0.17	0.0	0.0	0.0	0.2	0.2	0.2
20	28	12454.3	0.83	0.2	0.20	0.0	0.0	0.0	0.2	0.2	0.2
22	31	15852.3	1.03	0.2	0.22	0.0	0.0	0.0	0.2	0.2	0.2
24	32	19515.2	1.23	0.2	0.25	0.0	0.0	0.0	0.2	0.2	0.2
26	33	23342.8	1.44	0.2	0.27	0.0	0.0	0.0	0.3	0.3	0.3
28	32	27224.9	1.65	0.3	0.29	0.0	0.0	0.0	0.3	0.3	0.3
30	31	31048.4	1.86	0.3	0.31	0.0	0.0	0.0	0.3	0.3	0.3
32	29	34703.0	2.05	0.3	0.33	0.0	0.0	0.0	0.3	0.3	0.3
34	26	38088.3	2.22	0.3	0.34	0.0	0.0	0.0	0.3	0.3	0.3
36	23	41150.7	2.38	0.3	0.35	0.0	0.0	0.0	0.4	0.4	0.4
38	21	43916.1	2.52	0.4	0.37	0.0	0.0	0.0	0.4	0.4	0.4
40	19	46413.0	2.64	0.4	0.37	0.3	0.0	0.0	0.7	0.7	0.7
42	17	48665.0	2.76	0.7	0.38	0.8	0.0	0.0	1.2	1.2	1.2
44	16	50659.4	2.86	1.2	0.39	1.3	0.0	0.0	1.7	1.7	1.7
46	14	52400.7	2.94	1.7	0.40	1.8	0.0	0.0	2.2	2.2	2.2
48	13	53902.7	3.02	2.2	0.40	2.2	0.1	0.0	2.7	2.7	2.7
50	12	55183.1	3.08	2.7	0.41	2.7	0.7	0.0	3.7	3.7	3.7
52	11	56252.9	3.13	3.7	0.41	3.0	1.4	0.0	4.9	4.9	4.9
54	10	57065.7	3.17	4.9	0.41	3.3	2.1	0.0	5.9	5.9	5.9
56	9	57621.7	3.20	5.9	0.41	3.5	2.7	0.0	6.6	6.6	6.6
58	8	57950.2	3.22	6.6	0.41	3.6	3.0	0.0	7.0	7.0	7.0
60	7	58092.7	3.22	7.0	0.42	3.7	3.1	0.0	7.2	7.2	7.2
62	6	58092.1	3.22	7.2	0.42	3.7	3.1	0.0	7.2	7.2	7.2
64	6	57987.0	3.22	7.2	0.41	3.6	3.0	0.0	7.1	7.1	7.1
66	5	57809.3	3.21	7.1	0.41	3.6	2.9	0.0	6.9	6.9	6.9
68	5	57583.4	3.20	6.9	0.41	3.5	2.6	0.0	6.5	6.5	6.5
70	4	57327.6	3.19	6.5	0.41	3.4	2.4	0.0	6.2	6.2	6.2
72	4	57054.8	3.17	6.2	0.41	3.3	2.1	0.0	5.9	5.9	5.9
74	3	56774.0	3.16	5.9	0.41	3.2	1.9	0.0	5.5	5.5	5.5
76	3	56491.6	3.14	5.5	0.41	3.1	1.6	0.0	5.2	5.2	5.2
78	3	56211.5	3.13	5.2	0.41	3.0	1.4	0.0	4.8	4.8	4.8
80	3	55936.5	3.12	4.8	0.41	2.9	1.2	0.0	4.5	4.5	4.5
82	2	55668.2	3.10	4.5	0.41	2.8	1.0	0.0	4.2	4.2	4.2
84	2	55407.5	3.09	4.2	0.41	2.7	0.8	0.0	4.0	4.0	4.0
86	2	55154.9	3.08	4.0	0.41	2.6	0.7	0.0	3.7	3.7	3.7
88	2	54910.4	3.07	3.7	0.40	2.6	0.5	0.0	3.5	3.5	3.5
90	2	54673.9	3.06	3.5	0.40	2.5	0.4	0.0	3.3	3.3	3.3
92	1	54444.9	3.04	3.3	0.40	2.4	0.3	0.0	3.1	3.1	3.1

94	1	54222.9	3.03	3.1	0.40	2.3	0.2	0.0	2.9	2.9	2.9
96	1	54007.3	3.02	2.9	0.40	2.3	0.1	0.0	2.8	2.8	2.8
98	1	53797.3	3.01	2.8	0.40	2.2	0.0	0.0	2.6	2.6	2.6
100	1	53592.0	3.00	2.6	0.40	2.1	0.0	0.0	2.5	2.5	2.5
102	1	53389.9	2.99	2.5	0.40	2.1	0.0	0.0	2.5	2.5	2.5
104	1	53189.3	2.98	2.5	0.40	2.0	0.0	0.0	2.4	2.4	2.4
106	1	52986.7	2.97	2.4	0.40	1.9	0.0	0.0	2.3	2.3	2.3
108	1	52782.7	2.96	2.3	0.40	1.9	0.0	0.0	2.3	2.3	2.3
110	1	52578.2	2.95	2.3	0.40	1.8	0.0	0.0	2.2	2.2	2.2
112	1	52373.9	2.94	2.2	0.40	1.8	0.0	0.0	2.2	2.2	2.2
114	0	52170.5	2.93	2.2	0.40	1.7	0.0	0.0	2.1	2.1	2.1
116	0	51968.5	2.92	2.1	0.39	1.6	0.0	0.0	2.0	2.0	2.0
118	0	51768.4	2.91	2.0	0.39	1.6	0.0	0.0	2.0	2.0	2.0
120	0	51570.4	2.90	2.0	0.39	1.5	0.0	0.0	1.9	1.9	1.9
122	0	51375.1	2.89	1.9	0.39	1.5	0.0	0.0	1.9	1.9	1.9
124	0	51182.6	2.88	1.9	0.39	1.4	0.0	0.0	1.8	1.8	1.8
126	0	50993.1	2.87	1.8	0.39	1.4	0.0	0.0	1.8	1.8	1.8
128	0	50806.8	2.86	1.8	0.39	1.3	0.0	0.0	1.7	1.7	1.7
130	0	50623.9	2.85	1.7	0.39	1.3	0.0	0.0	1.7	1.7	1.7
132	0	50444.4	2.85	1.7	0.39	1.2	0.0	0.0	1.6	1.6	1.6
134	0	50268.5	2.84	1.6	0.39	1.2	0.0	0.0	1.6	1.6	1.6
136	0	50096.1	2.83	1.6	0.39	1.1	0.0	0.0	1.5	1.5	1.5
138	0	49927.4	2.82	1.5	0.39	1.1	0.0	0.0	1.5	1.5	1.5
140	0	49762.2	2.81	1.5	0.39	1.0	0.0	0.0	1.4	1.4	1.4
142	0	49600.7	2.80	1.4	0.39	1.0	0.0	0.0	1.4	1.4	1.4
144	0	49442.7	2.80	1.4	0.39	1.0	0.0	0.0	1.4	1.4	1.4
146	0	49288.3	2.79	1.4	0.39	0.9	0.0	0.0	1.3	1.3	1.3
148	0	49137.4	2.78	1.3	0.38	0.9	0.0	0.0	1.3	1.3	1.3
150	0	48990.0	2.77	1.3	0.38	0.9	0.0	0.0	1.2	1.2	1.2
152	0	48846.0	2.77	1.2	0.38	0.8	0.0	0.0	1.2	1.2	1.2
154	0	48705.3	2.76	1.2	0.38	0.8	0.0	0.0	1.2	1.2	1.2
156	0	48567.9	2.75	1.2	0.38	0.8	0.0	0.0	1.1	1.1	1.1
158	0	48433.7	2.75	1.1	0.38	0.7	0.0	0.0	1.1	1.1	1.1
160	0	48302.7	2.74	1.1	0.38	0.7	0.0	0.0	1.1	1.1	1.1
162	0	48174.7	2.73	1.1	0.38	0.7	0.0	0.0	1.1	1.1	1.1
164	0	48049.8	2.73	1.1	0.38	0.6	0.0	0.0	1.0	1.0	1.0
166	0	47927.7	2.72	1.0	0.38	0.6	0.0	0.0	1.0	1.0	1.0
168	0	47808.5	2.71	1.0	0.38	0.6	0.0	0.0	1.0	1.0	1.0
170	0	47692.1	2.71	1.0	0.38	0.6	0.0	0.0	1.0	1.0	1.0
172	0	47578.3	2.70	1.0	0.38	0.5	0.0	0.0	0.9	0.9	0.9
174	0	47467.2	2.70	0.9	0.38	0.5	0.0	0.0	0.9	0.9	0.9
176	0	47358.6	2.69	0.9	0.38	0.5	0.0	0.0	0.9	0.9	0.9
178	0	47252.4	2.69	0.9	0.38	0.5	0.0	0.0	0.9	0.9	0.9
180	0	47148.7	2.68	0.9	0.38	0.5	0.0	0.0	0.8	0.8	0.8
182	0	47047.3	2.68	0.8	0.38	0.4	0.0	0.0	0.8	0.8	0.8
184	0	46948.1	2.67	0.8	0.38	0.4	0.0	0.0	0.8	0.8	0.8
186	0	46851.2	2.67	0.8	0.38	0.4	0.0	0.0	0.8	0.8	0.8
188	0	46756.3	2.66	0.8	0.38	0.4	0.0	0.0	0.8	0.8	0.8
190	0	46663.5	2.66	0.8	0.38	0.4	0.0	0.0	0.8	0.8	0.8
192	0	46572.7	2.65	0.8	0.38	0.4	0.0	0.0	0.7	0.7	0.7
194	0	46483.8	2.65	0.7	0.37	0.3	0.0	0.0	0.7	0.7	0.7
196	0	46396.8	2.64	0.7	0.37	0.3	0.0	0.0	0.7	0.7	0.7
198	0	46311.6	2.64	0.7	0.37	0.3	0.0	0.0	0.7	0.7	0.7
200	0	46228.1	2.64	0.7	0.37	0.3	0.0	0.0	0.7	0.7	0.7
202	0	46146.4	2.63	0.7	0.37	0.3	0.0	0.0	0.7	0.7	0.7
204	0	46066.3	2.63	0.7	0.37	0.3	0.0	0.0	0.6	0.6	0.6
206	0	45987.7	2.62	0.6	0.37	0.3	0.0	0.0	0.6	0.6	0.6
208	0	45910.8	2.62	0.6	0.37	0.2	0.0	0.0	0.6	0.6	0.6
210	0	45835.3	2.62	0.6	0.37	0.2	0.0	0.0	0.6	0.6	0.6
212	0	45761.2	2.61	0.6	0.37	0.2	0.0	0.0	0.6	0.6	0.6
214	0	45688.5	2.61	0.6	0.37	0.2	0.0	0.0	0.6	0.6	0.6
216	0	45617.2	2.60	0.6	0.37	0.2	0.0	0.0	0.6	0.6	0.6
218	0	45547.2	2.60	0.6	0.37	0.2	0.0	0.0	0.6	0.6	0.6
220	0	45478.5	2.60	0.6	0.37	0.2	0.0	0.0	0.6	0.6	0.6
222	0	45411.0	2.59	0.6	0.37	0.2	0.0	0.0	0.5	0.5	0.5
224	0	45344.6	2.59	0.5	0.37	0.2	0.0	0.0	0.5	0.5	0.5
226	0	45279.4	2.59	0.5	0.37	0.2	0.0	0.0	0.5	0.5	0.5
228	0	45215.3	2.58	0.5	0.37	0.1	0.0	0.0	0.5	0.5	0.5
230	0	45152.3	2.58	0.5	0.37	0.1	0.0	0.0	0.5	0.5	0.5
232	0	45090.3	2.58	0.5	0.37	0.1	0.0	0.0	0.5	0.5	0.5
234	0	45029.3	2.58	0.5	0.37	0.1	0.0	0.0	0.5	0.5	0.5
236	0	44969.3	2.57	0.5	0.37	0.1	0.0	0.0	0.5	0.5	0.5
238	0	44910.2	2.57	0.5	0.37	0.1	0.0	0.0	0.5	0.5	0.5
240	0	44852.0	2.57	0.5	0.37	0.1	0.0	0.0	0.5	0.5	0.5
242	0	44794.7	2.56	0.5	0.37	0.1	0.0	0.0	0.5	0.5	0.5
244	0	44738.3	2.56	0.5	0.37	0.1	0.0	0.0	0.5	0.5	0.5
246	0	44682.6	2.56	0.5	0.37	0.1	0.0	0.0	0.5	0.5	0.5
248	0	44627.7	2.56	0.5	0.37	0.1	0.0	0.0	0.4	0.4	0.4
250	0	44573.6	2.55	0.4	0.37	0.1	0.0	0.0	0.4	0.4	0.4

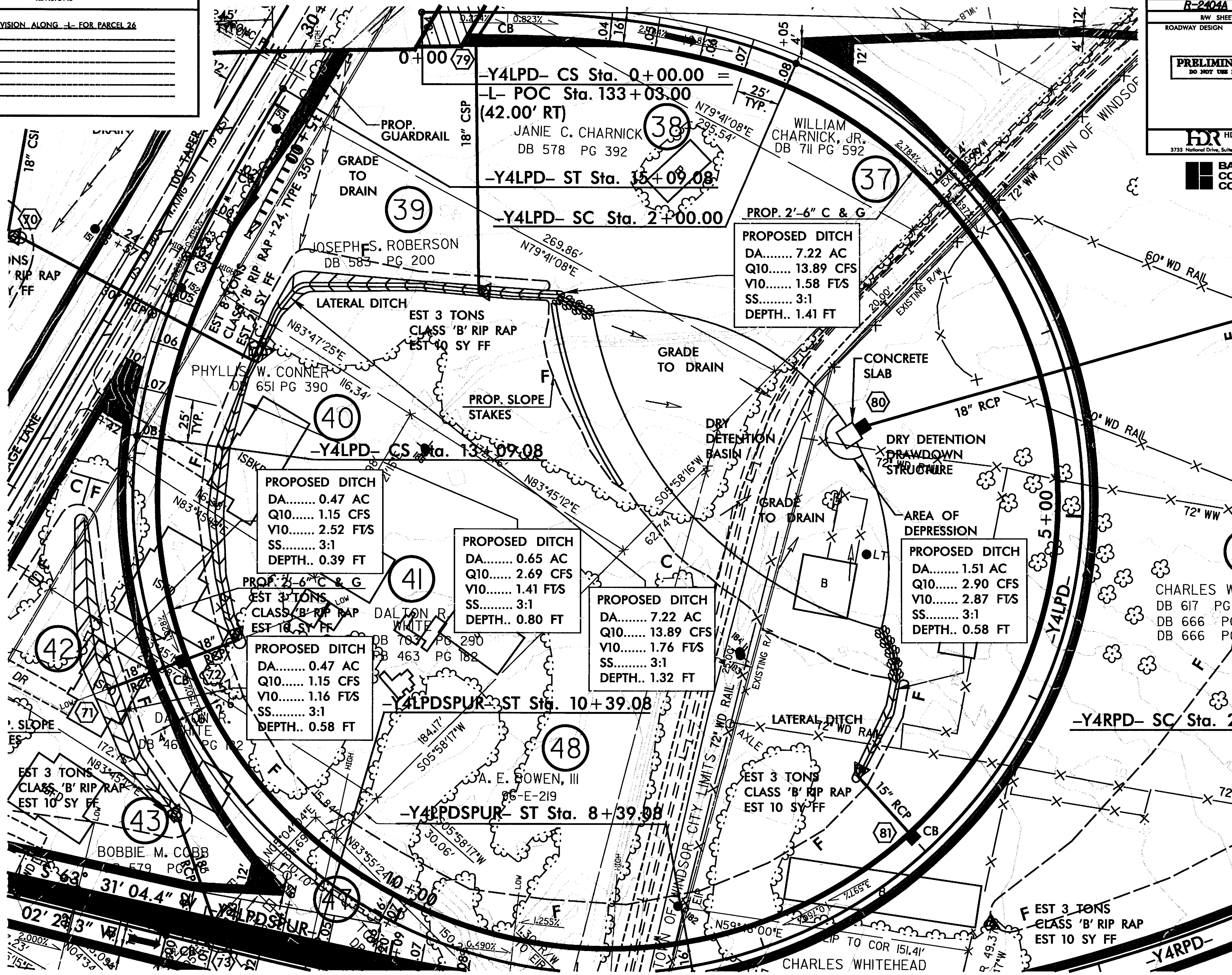
REVISIONS
5-18-05 R\W REVISION ALONG -L- FOR PARCEL 26

PROJECT REFERENCE NO.	SHEET NO.
R-2404A	DETENTION
R/W SHEET NO.	
ROADWAY DESIGN	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

HDR Engineering, Inc. of the Carolinas
3733 National Drive, Suite 207 Raleigh, N.C. 27612

BARNHILL CONTRACTING COMPANY



8/3/2005 9:54:53 AM

PROJECT REFERENCE NO.	SHEET NO.
R-2404A	2-J

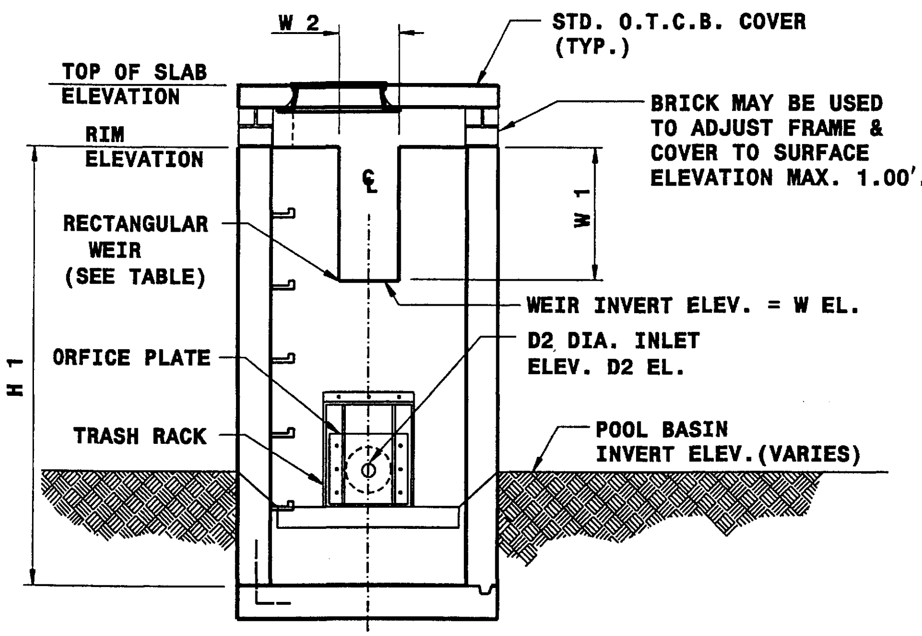
R/W SHEET NO.

ROADWAY DESIGN ENGINEER — HYDRAULICS ENGINEER

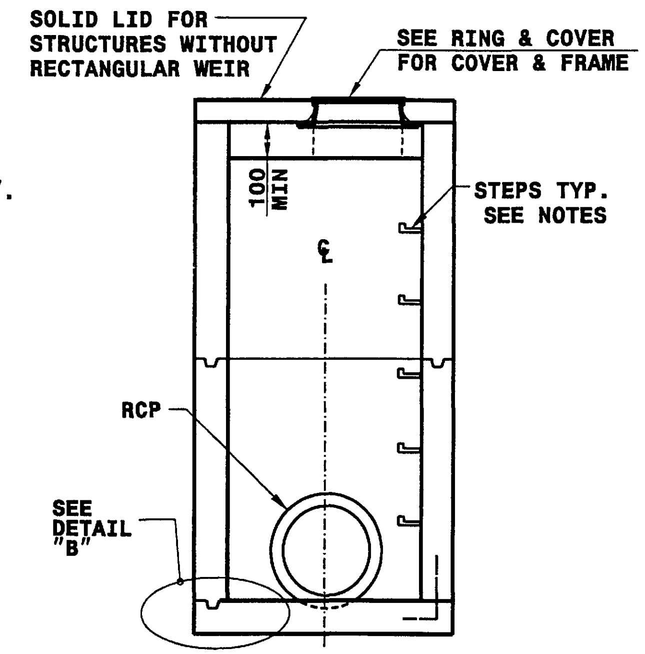
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

HDR Engineering, Inc. of the Carolinas
3733 National Drive, Suite 207 Raleigh, N.C. 27612

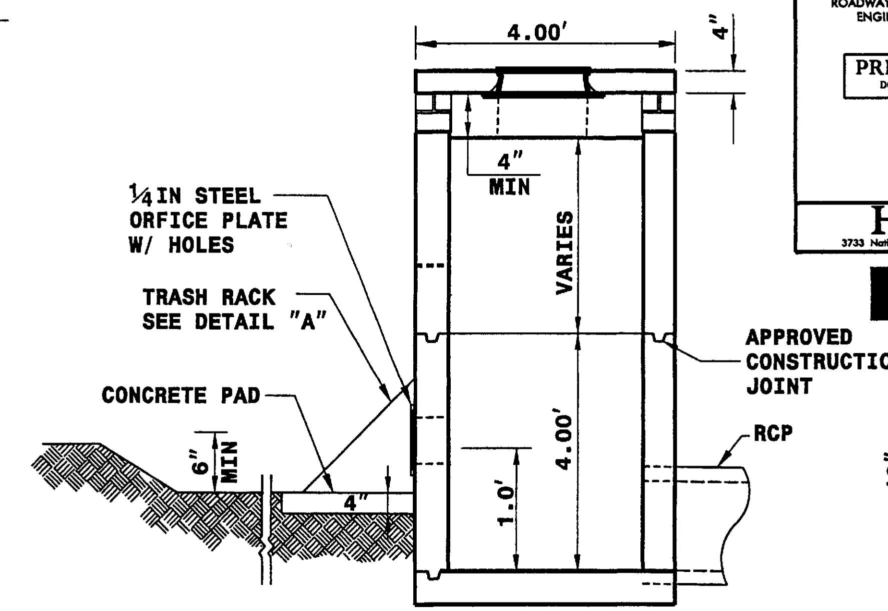
BARNHILL CONTRACTING COMPANY



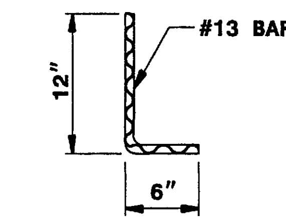
ELEVATION OF STRUCTURE SIDE 1



ELEVATION OF STRUCTURE SIDE 2

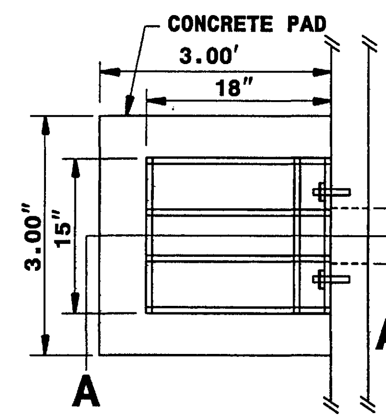


ELEVATION OF STRUCTURE SIDE 3

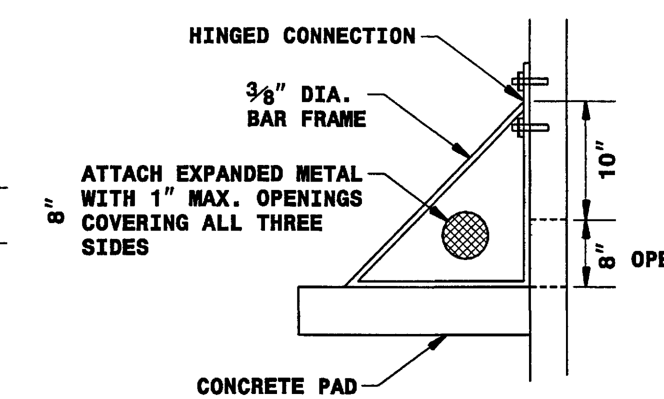


DOWEL

MINIMUM DIMENSIONS FOR DRY DETENTION BASIN DRAWDOWN STRUCTURE													
QUANTITIES FOR CONCRETE DETERMINED FROM NCDOT STANDARD 840.04													
							WEIR DIMENSIONS			DRAWDOWN ORIFICE			POOL BASIN INVERT
STATION	PIPE D	OUTLET PIPE INVERT	BOX HEIGHT H1	RIM ELEVATION	TOP OF SLAB ELEV.	REMARKS	W1	W2	W EL	D2	NO. OF HOLES	D2 EL	INV.EL.
-Y4LPD-	18"	8.00	4.00	12.00	8.50	OTCB	0.50'	2.00'	11.50	3"	1	9.00	9.00



PLAN VIEW

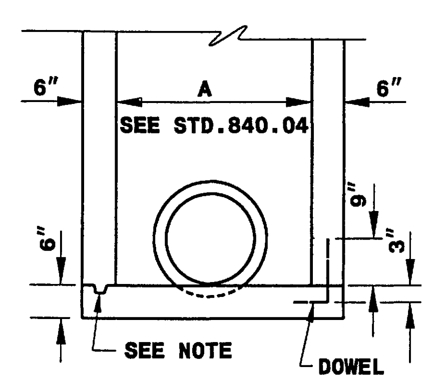


SECTION A-A

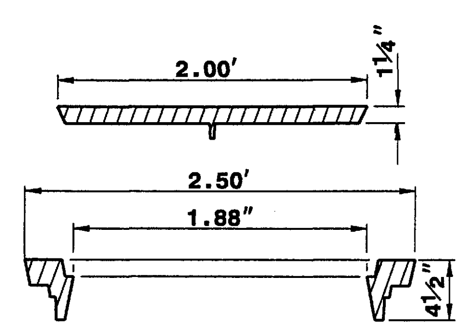
DETAIL A - EXTENDED DETENTION TRASH RACK

GENERAL NOTES:

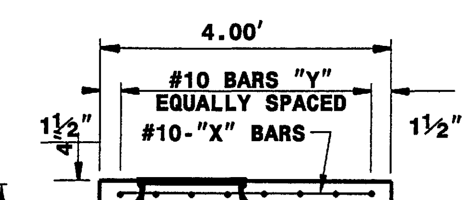
* CLASS 'B' CONCRETE TO BE USED THROUGHOUT. PRECAST CONCRETE STRUCTURES TO BE SUBMITTED FOR APPROVAL.
* OPTIONAL CONSTRUCTION - MONOLITHIC POUR, 2" KEYWAY, OR #13 BAR DOWELS AT 12" CENTERS, AS DIRECTED BY ENGINEER.
* FORMS ARE TO BE USED FOR THE CONSTRUCTION OF THE BOTTOM SLAB.
* IF REINFORCED CONCRETE PIPE IS SET IN BASE SLAB OF BOX, ADD TO BASE AS SHOWN ON STANDARD 840.00.
* ALL DRAWDOWN STRUCTURES OVER 3' IN DEPTH TO BE PROVIDED WITH STEPS 14" ON CENTERS. STEPS SHALL BE INSTALLED IN ACCORDANCE WITH STANDARD 840.66.
* FOR 8.0' IN HEIGHT OR LESS USE 6" WALLS AND BOTTOM SLAB. OVER 8.0' TO 16.0' IN HEIGHT USE 8" WALLS AND BOTTOM SLAB. ADJUST QUANTITIES ACCORDINGLY.



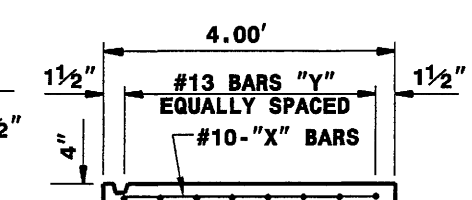
DETAIL 'B'



RING & COVER



TOP SLAB



BOTTOM SLAB

7/5/2005 9:44:47 AM

REVISIONS

PROJECT REFERENCE NO. R-2514 | SHEET NO. A1

PRELIMINARY PLANS — NOT FOR CONSTRUCTION

INCOMPLETE PLANS — NOT FOR BIDDING

GRAPHIC SCALE
50 25 0 50 100
FEET

SEE STRUCTURE SUBSURFACE REPORT -L- OVER -Y4-
FOR BORINGS CB-76 THRU CB-79

NAD 83

MATCH SHEET 13 STA 118+00.00 -L-

MATCH SHEET 13 STA 144+80.00 -L-

CB-65 CB-66 CB-67 CB-68 CB-69 CB-70 CB-71 CB-72 CB-73 CB-74 CB-75 CB-76 CB-77 CB-78 CB-79 CB-80 CB-81 CB-86 CB-87 CB-88 CB-89 CB-90 CB-91 CB-92

A

B

NCDOT
BORING LOG

SHEET 1 OF 2

PROJECT NO. 34424.1.1	ID. R-2404A	COUNTY BERTIE	GEOLOGIST Charles Ray
SITE DESCRIPTION US 17 (Windsor Bypass) from US 13-17 TO EAST OF SR 1503 (Davis Drive)			GROUND WATER (ft)
BORING NO. CB-80	BORING LOCATION 12+00	OFFSET 0ft CL	ALIGNMENT -Y4LPD- — 0 HR. 3.7
COLLAR ELEV. 10.7 ft	NORTHING 829,117	EASTING 2,605,341	24 HR. 4.4
TOTAL DEPTH 40.5 ft	DRILL MACHINE CME 45B ATV	DRILL METHOD Mud Rotary	HAMMER TYPE Manual
DATE STARTED 7/6/04	COMPLETED 7/6/04	CORE BARREL TYPE N/A	SURFACE WATER DEPTH N/A

ELEV. (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 20 40 60 80 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
					Land Surface				10.7 / 0.00
9.7	1.0								
		2	3	2	5		M		Brown, SILTY, v.f. to f. SAND w/organics. Loose. Yorktown Formation.
7.2	3.5								7.2 / 3.5
		3	4	7	11		W		Tan, poorly graded, v.f. SAND w/trace silt. Med. dense.
4.7	6.0								2.7 / 8.0
		7	8	10	18		W		Tan, well graded, v.f. to cse. SAND w/gravel. Loose.
2.2	8.5								-2.3 / 13.0
		3	3	1	4		M		Green, SILTY, v.f. to f. SANDY CLAY w/med. to high plasticity. Soft to stiff. Shell fragments in lower portion of strata.
-3.3	14.0								
		2	1	1	2		M		
-8.3	19.0								
		2	2	4	6		M		
-13.3	24.0								
		2	3	4	7		M		
-18.3	29.0								
		3	4	6	10		M		

NCDOT SHEET 1 OF 2
BORING LOG

SHEET 2 OF 2

PROJECT NO. 34424.1.1	ID. R-2404A	COUNTY BERTIE	GEOLOGIST Charles Ray
SITE DESCRIPTION US 17 (Windsor Bypass) from US 13-17 TO EAST OF SR 1503 (Davis Drive)			GROUND WATER (ft)
BORING NO. CB-80	BORING LOCATION 12+00	OFFSET 0ft CL	ALIGNMENT -Y4LPD- — 0 HR. 3.7
COLLAR ELEV. 10.7 ft	NORTHING 829,117	EASTING 2,605,341	24 HR. 4.4
TOTAL DEPTH 40.5 ft	DRILL MACHINE CME 45B ATV	DRILL METHOD Mud Rotary	HAMMER TYPE Manual
DATE STARTED 7/6/04	COMPLETED 7/6/04	CORE BARREL TYPE N/A	SURFACE WATER DEPTH N/A

ELEV. (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 20 40 60 80 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
					CONTINUED FROM PREVIOUS PAGE				
-23.3	34.0								
		3	3	5	8		M		Green, SILTY, v.f. to f. SANDY CLAY w/med. to high plasticity. Soft to stiff. Shell fragments in lower portion of strata.
-28.3	39.0								
		4	5	7	12		M		-29.8 / 40.5
									Boring Terminated at Elevation -29.8 ft in SILTY, v.f. to f. SANDY CLAY. Yorktown Formation

NCDOT
BORING LOG

SHEET 1 OF 1

ROJECT NO. 34424.1.1	ID. R-2404A	COUNTY BERTIE	GEOLOGIST Charles Ray
SITE DESCRIPTION US 17 (Windsor Bypass) from US 13-17 TO EAST OF SR 1503 (Davis Drive)			GROUND WATER (ft)
BORING NO. CB-81	BORING LOCATION 14+40	OFFSET 0ft CL	ALIGNMENT -Y4LPD-	0 HR. 2.5
COLLAR ELEV. 13.1 ft	NORTHING 829,042	EASTING 2,605,560	24 HR. NM
TOTAL DEPTH 30.0 ft	DRILL MACHINE CME 45B ATV	DRILL METHOD Mud Rotary	HAMMER TYPE Manual
DATE STARTED 7/8/04	COMPLETED 7/8/04	CORE BARREL TYPE N/A	SURFACE WATER DEPTH N/A

ELEV. (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 20 40 60 80 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
					Land Surface				13.1 0.00
12.1	1.0	3	6	8	14		M		Tan brown, SILTY, v.f. to f. SANDY CLAY w/med. plasticity. Stiff. Yorktown Formation.
9.6	3.5	8	11	13	24		M		10.1 3.0
7.1	6.0	7	11	11	22		Sat.		Brown, poorly graded, v.f. to f. SAND. Med. dense. Grain size increases w/depth.
4.6	8.5	1	3	4	7		Sat.		5.1 8.0
-0.4	13.5	2	2	2	4		Sat.		Tan, well graded, v.f. to cse. SAND w/trace gravel. Loose.
-5.4	18.5	4	7	8	15		Sat.		-4.9 18.0
-10.4	23.5	1	2	3	5		M		Gray, poorly graded, v.f. to f. SAND. Med. dense.
-15.4	28.5	2	3	4	7		M		-8.9 22.0
									Green, SILTY, v.f. to f. SANDY CLAY w/med. plasticity and shell fragments. Med. Stiff.
									-16.9 30.0
									Boring Terminated at Elevation -16.9 ft in SILTY, v.f. to f. SANDY CLAY. Yorktown Formation

NCDOT Sheet 113
BORING LOG

SHEET 1 OF 1

PROJECT NO. 34424.1.1	ID. R-2404A	COUNTY BERTIE	GEOLOGIST Charles Ray
SITE DESCRIPTION US 17 (Windsor Bypass) from US 13-17 TO EAST OF SR 1503 (Davis Drive)			GROUND WATER (ft)
BORING NO. CB-82	BORING LOCATION 22+50	OFFSET 0ft CL	ALIGNMENT -Y4LPD-	0 HR. 7.1
COLLAR ELEV. 18.8 ft	NORTHING 828,716	EASTING 2,605,182	24 HR. NM
TOTAL DEPTH 12.0 ft	DRILL MACHINE Powerprobe	DRILL METHOD Direct Push	HAMMER TYPE N/A
DATE STARTED 6/17/04	COMPLETED 6/17/04	CORE BARREL TYPE N/A	SURFACE WATER DEPTH N/A

ELEV. (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 20 40 60 80 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
					Land Surface				18.8 0.00
									18.3 Tan, SILTY, v.f. to f. SAND. Med. dense. Moist. Topsoil. 0.5
									Gray to dark brown, SILTY grading to CLAYEY, v.f. to f. SAND. Med. dense. Moist. Yorktown Formation.
									13.8 5.0
12.8	6.0					CS-36			Dark brown, CLAYEY, v.f. to f. SANDY SILT w/organics. Stiff. Low plasticity.
									10.8 8.0
									Brown, SILTY, v.f. to f. SANDY CLAY. Soft. High plasticity.
									8.8 10.0
									Gray, poorly graded, v.f. to f. SAND. Loose.
									6.8 12.0
									Boring Terminated at Elevation 6.8 ft in poorly graded, v.f. to f. SAND. Yorktown Formation

NCDOT
BORING LOG

SHEET 1 OF 1

PROJECT NO. 34424.1.1	ID. R-2404A	COUNTY BERTIE	GEOLOGIST Tom Stetler
SITE DESCRIPTION US 17 (Windsor Bypass) from US 13-17 TO EAST OF SR 1503 (Davis Drive)			GROUND WATER (ft)
BORING NO. CB-83	BORING LOCATION 27+85	OFFSET 16ft RT	ALIGNMENT -Y4RPD-	0 HR. 6.0
COLLAR ELEV. 22.8 ft	NORTHING 828,474	EASTING 2,605,185	24 HR. 4.6
TOTAL DEPTH 10.0 ft	DRILL MACHINE CME 45B ATV	DRILL METHOD HSA	HAMMER TYPE Manual
DATE STARTED 6/17/04	COMPLETED 6/17/04	CORE BARREL TYPE N/A	SURFACE WATER DEPTH N/A

ELEV. (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 20 40 60 80 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
					Land Surface				22.8 0.00
21.8	1.0								Topsoil. 22.0 0.8
		4	4	2	6		M		Light gray, CLAYEY, f. to v.f. SAND. Clay content increases with depth. Loose. Yorktown Formation. 19.8 3.0
19.3	3.5								
		3	6	7	13		M		Light to dark brownish gray, poorly graded, f. to v.f. SAND. Med. dense. Trace cse. sands.
16.8	6.0								
		3	1	2	3		M		15.8 7.0
14.3	8.5								Dark brown, SILTY, v.f. SANDY CLAY. V. soft. High plasticity.
		3	1	13	14		Sat.		13.3 9.5
									12.8 10.0 Light gray, well graded, v.f. to f./cse. SAND. Med. dense. Boring Terminated at Elevation 12.8 ft in well graded, v.f. to f./cse. SAND. Yorktown Formation

NCDOT BORE DT 14-049 WINDSOR BYPASS-CAT.IN.GPJ NC_DOT.GDT 8/24/04

NCDOT Sheet 114
BORING LOG

SHEET 1 OF 1

PROJECT NO. 34424.1.1	ID. R-2404A	COUNTY BERTIE	GEOLOGIST Tom Stetler
SITE DESCRIPTION US 17 (Windsor Bypass) from US 13-17 TO EAST OF SR 1503 (Davis Drive)			GROUND WATER (ft)
BORING NO. CB-84	BORING LOCATION 25+00	OFFSET 0ft CL	ALIGNMENT -Y4RPD-	0 HR. 5.5
COLLAR ELEV. 18.4 ft	NORTHING 828,598	EASTING 2,605,442	24 HR. 5.0
TOTAL DEPTH 10.0 ft	DRILL MACHINE CME 45B ATV	DRILL METHOD HSA	HAMMER TYPE Manual
DATE STARTED 6/17/04	COMPLETED 6/17/04	CORE BARREL TYPE N/A	SURFACE WATER DEPTH N/A

ELEV. (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 20 40 60 80 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
					Land Surface				18.4 0.00
									18.1 Topsoil. 0.3
17.4	1.0								
		5	5	3	8				Light gray, CLAYEY to SILTY, v.f. SAND. Orange-brown mottling. Organic fragments throughout. Loose. Yorktown Formation.
14.9	3.5								
		3	4	4	8				12.9 5.5
12.4	6.0								Light gray, SILTY CLAY. Plastic. Stiff. Moist.
		7	9	8	17				11.4 7.0
9.9	8.5								Light gray, poorly graded, f. to v.f. SAND. Med. dense to loose. Moist to Sat.
		4	5	4	9	CS-37			8.4 10.0
									Boring Terminated at Elevation 8.4 ft in poorly graded, v.f. to f. SAND. Yorktown Formation

NCDOT
BORING LOG

SHEET 1 OF 1

PROJECT NO. 34424.1.1	ID. R-2404A	COUNTY BERTIE	GEOLOGIST Tom Stetler
SITE DESCRIPTION US 17 (Windsor Bypass) from US 13-17 TO EAST OF SR 1503 (Davis Drive)			GROUND WATER (ft)
BORING NO. CB-85	BORING LOCATION 22+00	OFFSET 0ft CL	ALIGNMENT -Y4RPD- — 0 HR. 5.4
COLLAR ELEV. 16.6 ft	NORTHING 828,763	EASTING 2,605,691	24 HR. NM
TOTAL DEPTH 10.0 ft	DRILL MACHINE Hand Auger	DRILL METHOD Hand Auger	HAMMER TYPE N/A
DATE STARTED 6/23/04	COMPLETED 6/23/04	CORE BARREL TYPE N/A	SURFACE WATER DEPTH N/A

ELEV. (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 20 40 60 80 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
					Land Surface				16.6 0.00
									16.1 Topsoil. 0.5
									Dark brown, SILTY, f. to v.f. SAND, moderately organic. Loose. Well graded. Moist.
14.6	2.0								14.6 2.0
						CS-43			Light brownish gray, SILTY, f. to v.f. SAND. Trace clay. Med. stiff. Moist. Yorktown Formation.
							▽		11.6 5.0
									Light brown to tan, f. to v.f. SAND. Poorly graded. Minor iron oxide staining. Loose. Sat. @ 6ft..
									6.6 10.0
									Boring Terminated at Elevation 6.6 ft in poorly graded, v.f. to f. SAND. Yorktown Formation

NCDOT
BORING LOG

Sheet 115

SHEET 1 OF 1

PROJECT NO. 34424.1.1	ID. R-2404A	COUNTY BERTIE	GEOLOGIST Tom Stetler
SITE DESCRIPTION US 17 (Windsor Bypass) from US 13-17 TO EAST OF SR 1503 (Davis Drive)			GROUND WATER (ft)
BORING NO. CB-86	BORING LOCATION 20+00	OFFSET 0ft CL	ALIGNMENT -Y4RPD- — 0 HR. 5.1
COLLAR ELEV. 15.7 ft	NORTHING 828,920	EASTING 2,605,813	24 HR. NM
TOTAL DEPTH 10.0 ft	DRILL MACHINE Hand Auger	DRILL METHOD Hand Auger	HAMMER TYPE NA/
DATE STARTED 6/23/04	COMPLETED 6/23/04	CORE BARREL TYPE N/A	SURFACE WATER DEPTH N/A

ELEV. (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 20 40 60 80 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
					Land Surface				15.7 0.00
									15.2 Topsoil. 0.5
11.7	4.0					CS-44	▽		Dark brown grading to orange tan, f. to v.f. SAND. Poorly graded. Some zones w/trace silt and cse. sand. Loose. Moist to Sat. at 5ft. Yorktown Formation.
									5.7 10.0
									Boring Terminated at Elevation 5.7 ft in poorly graded, v.f. to f. SAND. Yorktown Formation

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

BERTIE COUNTY

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	R-2404A	1	

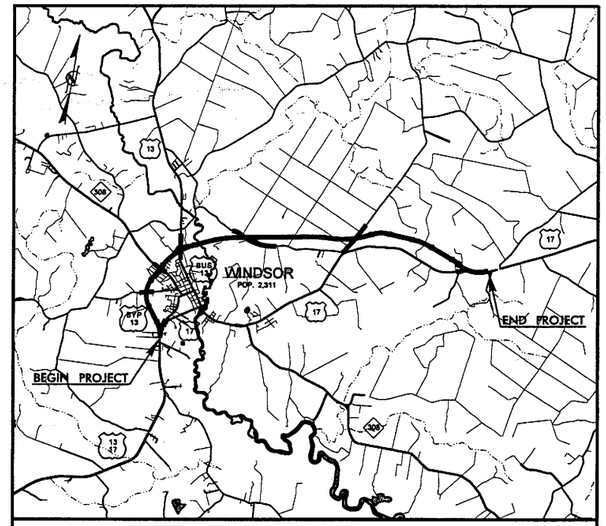
STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION
C201236		CONTRACT NO.
6.01900IT &		PLANNING &
34424.1.1		PE
34424.3.7		CONST.

See Sheet 1-A For Index of Sheets

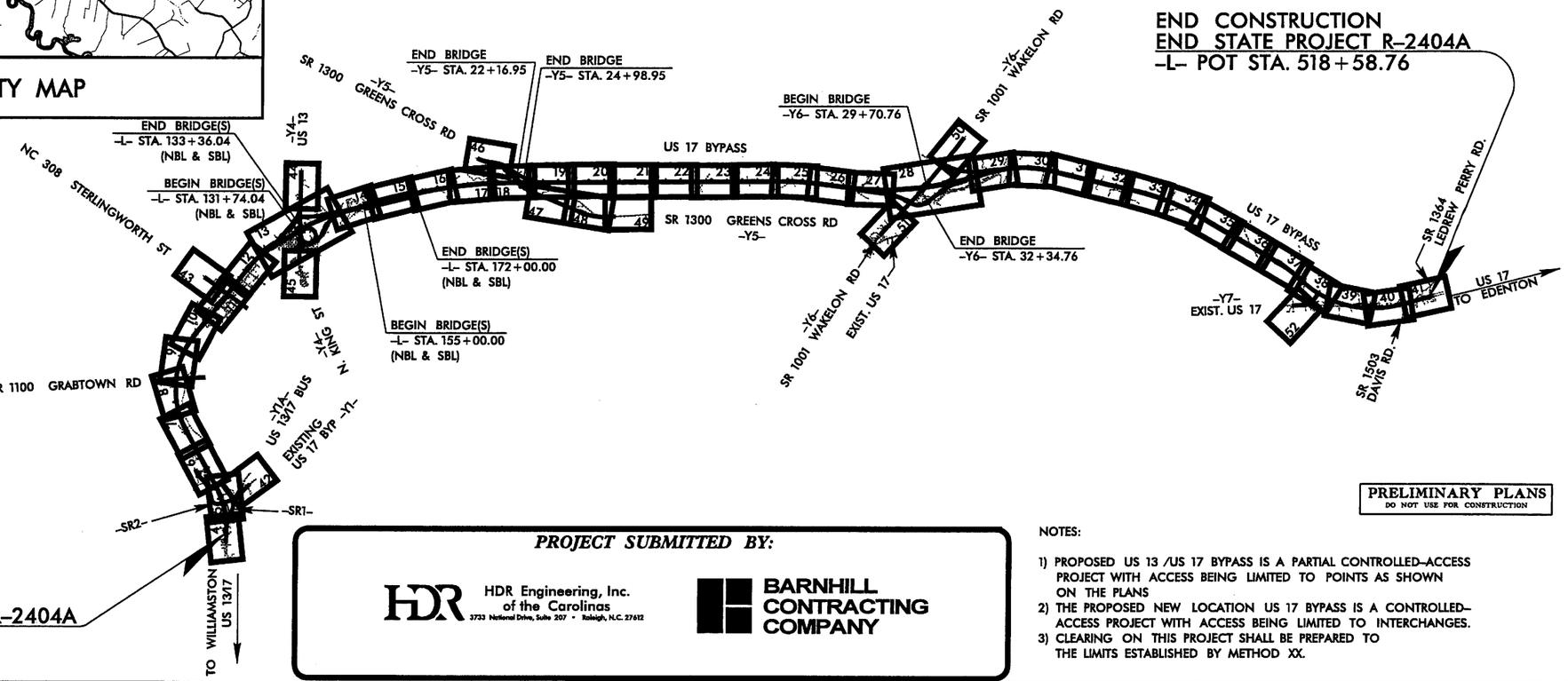
LOCATION: *US 17 (WINDSOR BYPASS) FROM US 13/17, SOUTH OF WINDSOR, TO EAST OF SR 1503 (DAVIS ROAD)*

TYPE OF WORK: *DESIGN–BUILD AS SPECIFIED IN THE SCOPES OF WORK CONTAINED IN THE DESIGN–BUILD PACKAGE*

N.C. GRID NAD 83



VICINITY MAP



PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

PROJECT SUBMITTED BY:

HDR Engineering, Inc. of the Carolinas
3733 National Drive, Suite 207 • Raleigh, N.C. 27612

BARNHILL CONTRACTING COMPANY

NOTES:

1) PROPOSED US 13 /US 17 BYPASS IS A PARTIAL CONTROLLED–ACCESS PROJECT WITH ACCESS BEING LIMITED TO POINTS AS SHOWN ON THE PLANS
2) THE PROPOSED NEW LOCATION US 17 BYPASS IS A CONTROLLED–ACCESS PROJECT WITH ACCESS BEING LIMITED TO INTERCHANGES.
3) CLEARING ON THIS PROJECT SHALL BE PREPARED TO THE LIMITS ESTABLISHED BY METHOD XX.

GRAPHIC SCALES

PLANS 50 0 50 100

PROFILE (HORIZONTAL) 50 0 50 100

PROFILE (VERTICAL) 10 0 10 20

DESIGN DATA

ADT 2004	=	12,500
ADT 2025	=	21,300
DHV	=	12 %
D	=	55 %
T	=	12 % *
V	=	70 mph (NEW LOC.)

* TTST 8% DUAL 4%
Functional Class: Freeway

PROJECT LENGTH

LENGTH ROADWAY TIP PROJECT R–2404A	=	9.241 MILES
LENGTH ROADWAY TIP PROJECT R–2404A	=	0.353 MILES
TOTAL LENGTH STATE PROJECT R–2404A	=	9.594 MILES

Prepared In the Office of:
DIVISION OF HIGHWAYS
1000 Birch Ridge Dr., NC, 27610

2002 STANDARD SPECIFICATIONS

LETTING DATE: DECEMBER 23, 2004

NCDOT CONTACT:

RODGER ROCHELLE, PE
STATE ALTERNATIVE DELIVERY SYSTEMS ENGINEER

DESIGN–BUILD PROJECT ENGINEER

HYDRAULICS ENGINEER

SIGNATURE: P.E.

ROADWAY DESIGN ENGINEER

SIGNATURE: P.E.

DIVISION OF HIGHWAYS STATE OF NORTH CAROLINA

STATE DESIGN ENGINEER P.E.

DEPARTMENT OF TRANSPORTATION FEDERAL HIGHWAY ADMINISTRATION

APPROVED
DIVISION ADMINISTRATOR *DATE*

PROJECT: C201236

R–2404A

7/15/2005 9:35:12 AM
r:\R-2404A\proj\R2404A_rdy_tsh.dgn

R-2404A	2
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	PAVEMENT DESIGN ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

HDR Engineering, Inc. of the Carolinas
3733 National Drive, Suite 207 Raleigh, N.C. 27612

BARNHILL CONTRACTING COMPANY

PAVEMENT SCHEDULE

C1	PROP. APPROX. 3.0" ASPHALT CONCRETE SURFACE COURSE, TYPE S9.5B, AT AN AVERAGE RATE OF 168 Lbs PER SQUARE YARD IN EACH OF TWO LAYERS.
C2	PROP. APPROX. 3.0" ASPHALT CONCRETE SURFACE COURSE, TYPE S9.5C, AT AN AVERAGE RATE OF 168 Lbs PER SQUARE YARD IN EACH OF TWO LAYERS.
C3	PROP. VAR. DEPTH ASPHALT CONCRETE SURFACE COURSE, TYPE S9.5B, AT AN AVERAGE RATE OF 112 LBS. PER SQ. YD. PER 1" DEPTH. TO BE PLACED IN LAYERS NOT TO EXCEED 1.5" IN DEPTH.
C4	PROP. VAR. DEPTH ASPHALT CONCRETE SURFACE COURSE, TYPE S9.5C, AT AN AVERAGE RATE OF 112 LBS. PER SQ. YD. PER 1" DEPTH. TO BE PLACED IN LAYERS NOT TO EXCEED 1.5" IN DEPTH.
D1	PROP. APPROX. 2.5" ASPHALT CONCRETE INTERMEDIATE COURSE, TYPE I19.0B, AT AN AVERAGE RATE OF 285 Lbs PER SQUARE YARD IN ONE LAYER.
D2	PROP. APPROX. 3.0" ASPHALT CONCRETE INTERMEDIATE COURSE, TYPE I19.0C, AT AN AVERAGE RATE OF 342 Lbs PER SQUARE YARD IN ONE LAYER.
D3	PROP. APPROX. 4.0" ASPHALT CONCRETE INTERMEDIATE COURSE, TYPE I19.0C, AT AN AVERAGE RATE OF 456 Lbs PER SQUARE YARD IN ONE LAYER.
D4	PROP. VAR. DEPTH ASPHALT CONCRETE INTERMEDIATE COURSE, TYPE I19.0C, AT AN AVERAGE RATE OF 114 LBS. PER SQ. YD. PER 1" DEPTH, TO BE PLACED IN LAYERS NOT LESS THAN 2.25" IN DEPTH OR OR GREATER THAN 4" IN DEPTH
E1	PROP. APPROX. 4.0" ASPHALT CONCRETE BASE COURSE, TYPE B25.0B, AT AN AVERAGE RATE OF 456 Lbs PER SQUARE YARD IN ONE LAYER.
E2	PROP. APPROX. 4.0" ASPHALT CONCRETE BASE COURSE, TYPE B25.0C, AT AN AVERAGE RATE OF 456 Lbs PER SQUARE YARD IN ONE LAYER.
E3	PROP. APPROX. 4.5" ASPHALT CONCRETE BASE COURSE, TYPE B25.0B, AT AN AVERAGE RATE OF 513 Lbs PER SQUARE YARD IN ONE LAYER.
E4	PROP. APPROX. 5.5" ASPHALT CONCRETE BASE COURSE, TYPE B25.0B, AT AN AVERAGE RATE OF 627 Lbs PER SQUARE YARD IN ONE LAYER.
E5	PROP. APPROX. 5.5" ASPHALT CONCRETE BASE COURSE, TYPE B25.0C, AT AN AVERAGE RATE OF 627 Lbs PER SQUARE YARD IN ONE LAYER.
E6	PROP. VAR. DEPTH ASPHALT CONCRETE BASE COURSE, TYPE B25.0B, AT AN AVERAGE RATE OF 114 LBS. PER SQ. YD. PER 1" DEPTH. TO BE PLACED IN LAYERS NOT LESS THAN 3" IN DEPTH OR GREATER THAN 5.5" IN DEPTH
E7	PROP. VAR. DEPTH ASPHALT CONCRETE BASE COURSE, TYPE B25.0C, AT AN AVERAGE RATE OF 114 LBS. PER SQ. YD. PER 1" DEPTH. TO BE PLACED IN LAYERS NOT LESS THAN 3" IN DEPTH OR GREATER THAN 5.5" IN DEPTH
R1	2'-6" CONCRETE CURB AND GUTTER
T	EARTH MATERIAL.
U	EXISTING PAVEMENT.
V	MILLING EXISTING ASPHALT PAVEMENT, 0" TO 3" DEPTH
W1	VARIABLE DEPTH ASPHALT PAVEMENT (SEE STANDARD WEDGING DETAIL SHEET 2-A)
W2	VARIABLE DEPTH ASPHALT PAVEMENT (SEE STANDARD WEDGING DETAIL SHEET 2-A)
W3	VARIABLE DEPTH ASPHALT PAVEMENT (SEE STANDARD WEDGING DETAIL SHEET 2-A)

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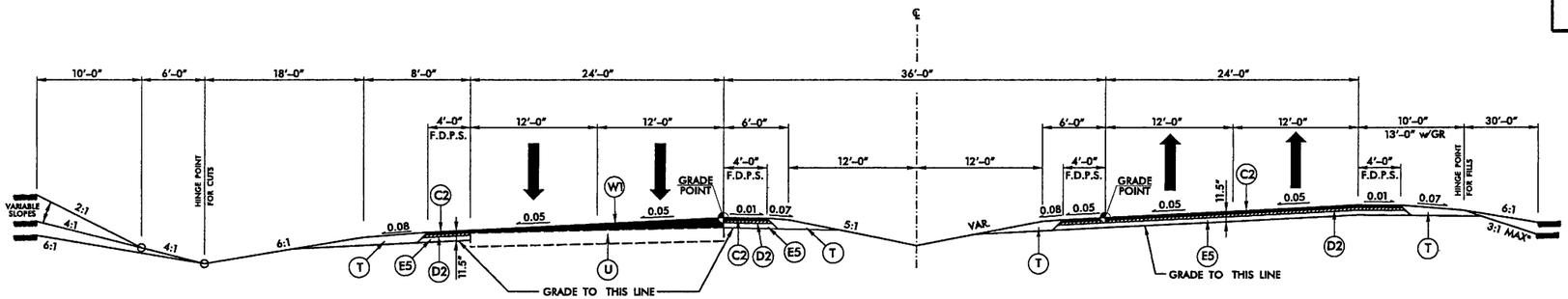
R-2404A	2-A
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	PAVEMENT DESIGN ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

HDR Engineering, Inc. of the Carolinas
3733 National Drive, Suite 207 Raleigh, N.C. 27612

BARNHILL CONTRACTING COMPANY



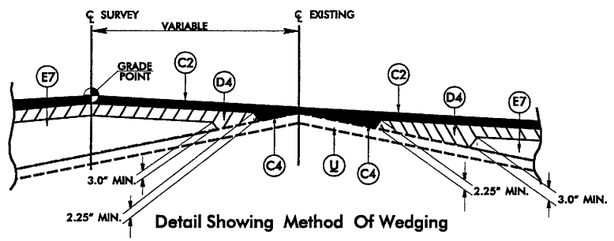
TYPICAL SECTION NO. 1

LINE	TO	FROM
-L-	12+00.00	28+52.50

USE MILLING TRANSITION DETAIL FOR STA. 12+00 TO 13+50

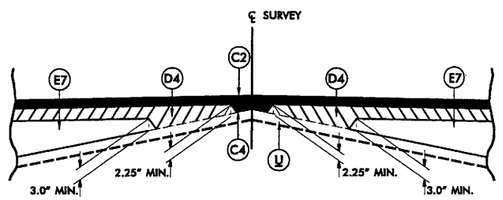
*ADD USABLE SHOULDER WIDTH WIDENING FOR FILL SLOPES STEEPER THAN 4:1.

PAVEMENT SCHEDULE	
C1	PROP. 3.0" SURFACE COURSE, TYPE S9.5B
C2	PROP. 3.0" SURFACE COURSE, TYPE S9.5C
C3	PROP. VARIABLE DEPTH BASE COURSE, TYPE S9.5B
C4	PROP. VARIABLE DEPTH BASE COURSE, TYPE S9.5C
D1	PROP. 2.5" INTERMEDIATE COURSE, TYPE I19.0B
D2	PROP. 3.0" INTERMEDIATE COURSE, TYPE I19.0C
D3	PROP. 4.0" INTERMEDIATE COURSE, TYPE I19.0C
D4	PROP. VARIABLE DEPTH INTERMEDIATE COURSE, TYPE I19.0C
E1	PROP. 4.0" BASE COURSE, TYPE B25.0B
E2	PROP. 4.0" BASE COURSE, TYPE B25.0C
E3	PROP. 4.5" BASE COURSE, TYPE B25.0B
E4	PROP. 5.5" BASE COURSE, TYPE B25.0B
E5	PROP. 5.5" BASE COURSE, TYPE B25.0C
E6	PROP. VARIABLE DEPTH BASE COURSE, TYPE B25.0B
E7	PROP. VARIABLE DEPTH BASE COURSE, TYPE B25.0C
R1	2'-6" CONCRETE CURB AND GUTTER
T	EARTH MATERIAL.
U	EXISTING PAVEMENT.
V	MILLING EXISTING ASPHALT PAVEMENT, 0" TO 3" DEPTH.
W1	WEDGE (SEE STANDARD WEDGING DETAIL 1, THIS SHEET)
W2	WEDGE (SEE STANDARD WEDGING DETAIL 2, THIS SHEET)
W3	WEDGE (SEE STANDARD WEDGING DETAIL 3, THIS SHEET)



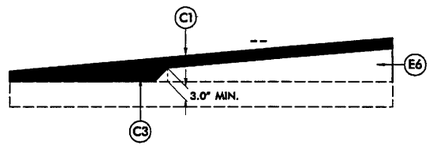
Detail Showing Method Of Wedging

STANDARD WEDGING DETAIL 1



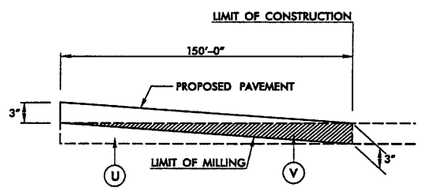
Detail Showing Method of Wedging

STANDARD WEDGING DETAIL 2

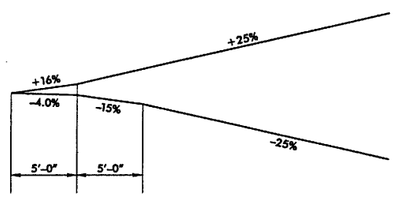


Wedging Detail For Resurfacing

STANDARD WEDGING DETAIL 3



MILLING TRANSITION DETAIL



STANDARD DRIVEWAY PROFILE

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PAVEMENT SCHEDULE

C1	PROP. 3.0" SURFACE COURSE, TYPE S9.5B
C2	PROP. 3.0" SURFACE COURSE, TYPE S9.5C
C3	PROP. VARIABLE DEPTH BASE COURSE, TYPE S9.5B
C4	PROP. VARIABLE DEPTH BASE COURSE, TYPE S9.5C
D1	PROP. 2.5" INTERMEDIATE COURSE, TYPE I19.0B
D2	PROP. 3.0" INTERMEDIATE COURSE, TYPE I19.0C
D3	PROP. 4.0" INTERMEDIATE COURSE, TYPE I19.0C
D4	PROP. VARIABLE DEPTH INTERMEDIATE COURSE, TYPE I19.0C
E1	PROP. 4.0" BASE COURSE, TYPE B25.0B
E2	PROP. 4.0" BASE COURSE, TYPE B25.0C
E3	PROP. 4.5" BASE COURSE, TYPE B25.0B
E4	PROP. 5.5" BASE COURSE, TYPE B25.0B
E5	PROP. 5.5" BASE COURSE, TYPE B25.0C
E6	PROP. VARIABLE DEPTH BASE COURSE, TYPE B25.0B
E7	PROP. VARIABLE DEPTH BASE COURSE, TYPE B25.0C
R1	2'-6" CONCRETE CURB AND GUTTER
T	EARTH MATERIAL.
U	EXISTING PAVEMENT.
V	MILLING EXISTING ASPHALT PAVEMENT, 0" TO 3" DEPTH.
W1	WEDGE (SEE STANDARD WEDGING DETAIL 1, THIS SHEET)
W2	WEDGE (SEE STANDARD WEDGING DETAIL 2, THIS SHEET)
W3	WEDGE (SEE STANDARD WEDGING DETAIL 3, THIS SHEET)

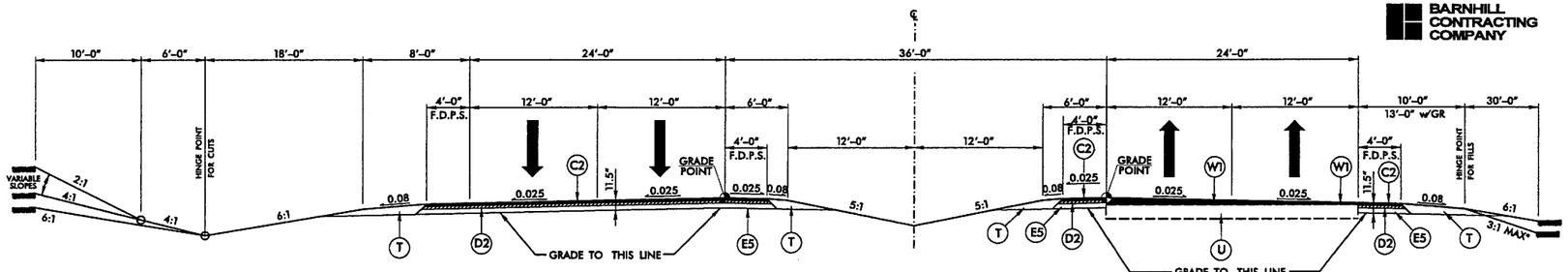
*ADD USABLE SHOULDER WIDTH WIDENING FOR FILL SLOPES STEEPER THAN 4:1.

R-2404A	2-B
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	PAVEMENT DESIGN ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

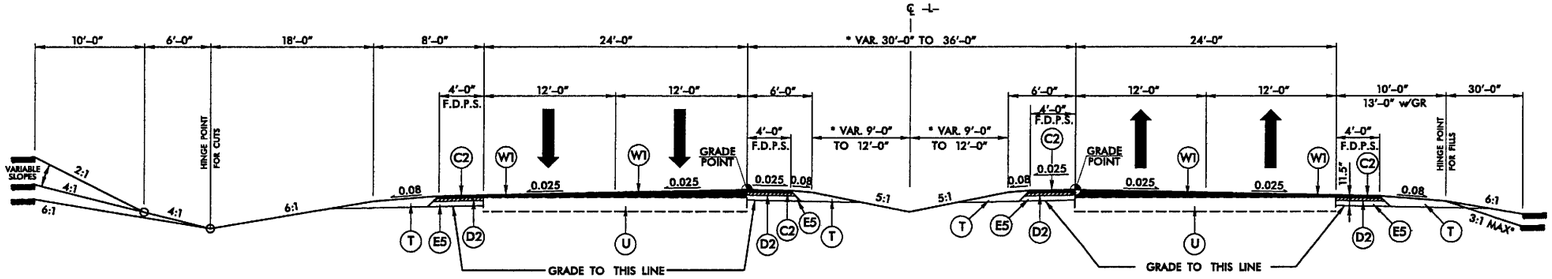
HDR Engineering, Inc. of the Carolinas
3733 National Drive, Suite 207 Raleigh, N.C. 27612

BARNHILL CONTRACTING COMPANY



TYPICAL SECTION NO. 2

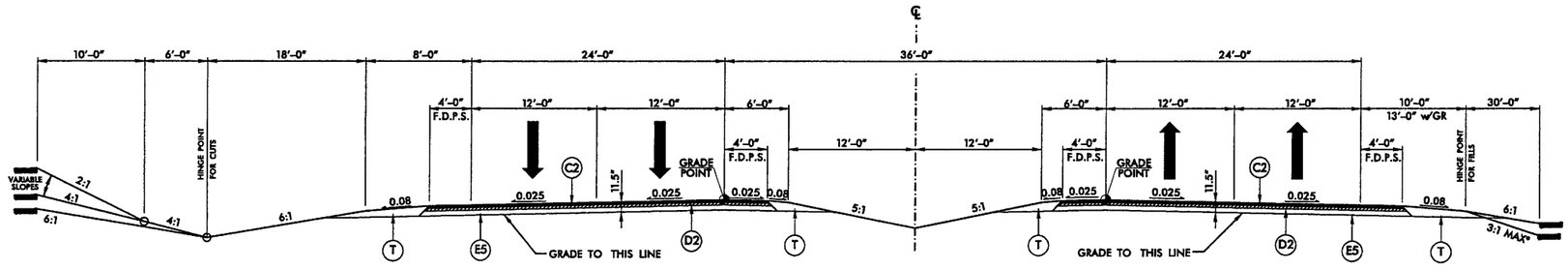
LINE	FROM	TO
-L-	28+52.50	86+40.00



TYPICAL SECTION NO. 3

LINE	FROM	TO
-L-	86+40.00	119+40.00

* SEE PLANS FOR TRANSITION LOCATIONS



TYPICAL SECTION NO. 4

LINE	FROM	TO
-L-	119+40.00	139+00.00

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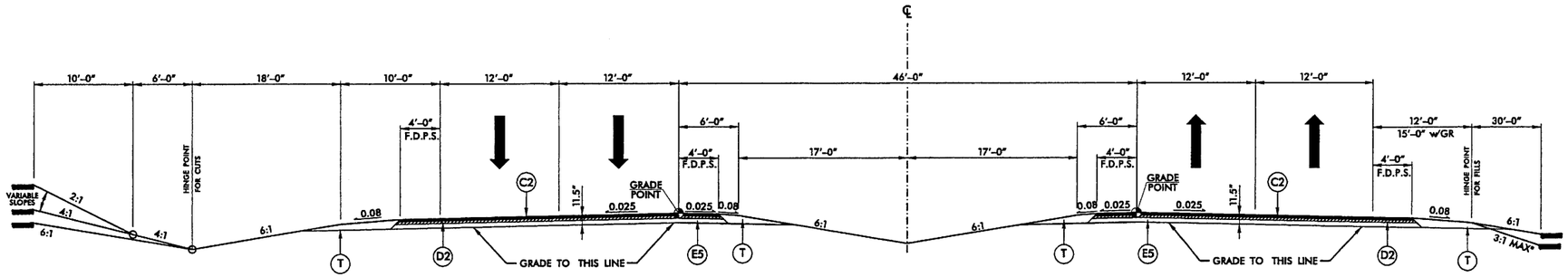
R-2404A	2-C
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	PAVEMENT DESIGN ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

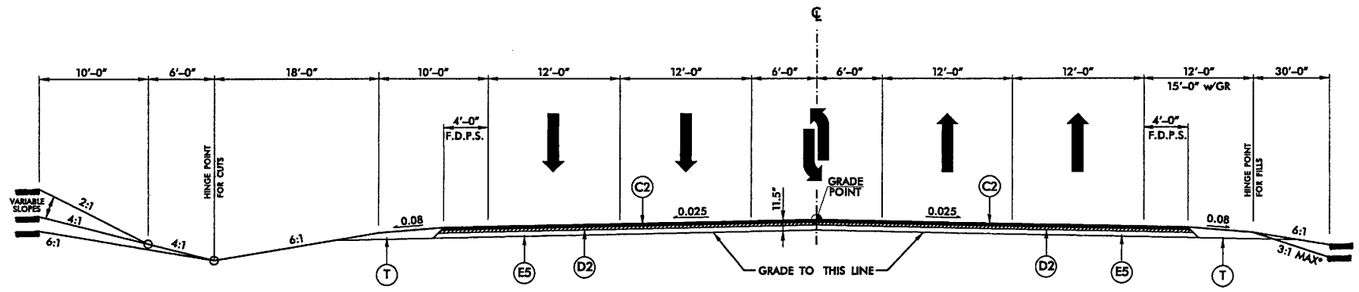
HDR Engineering, Inc. of the Carolinas
3733 National Drive, Suite 207 Raleigh, N.C. 27612

BARNHILL CONTRACTING COMPANY



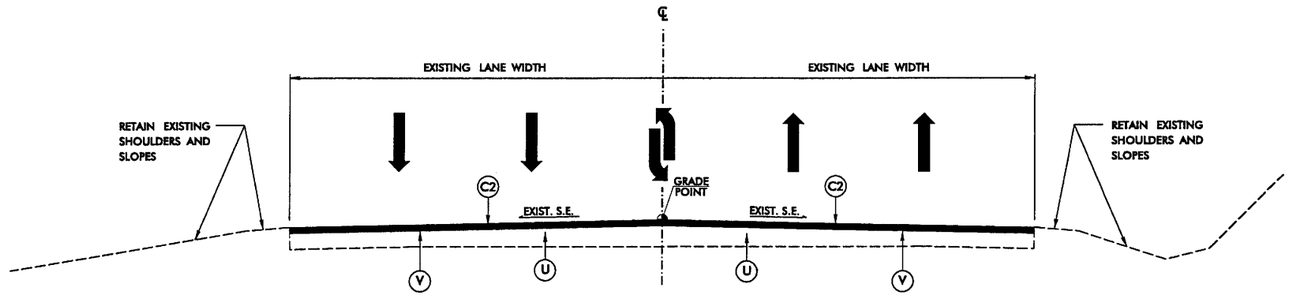
TYPICAL SECTION NO. 5

LINE	FROM	TO
-L-	139+00.00	478+75.00



TYPICAL SECTION NO. 6

LINE	FROM	TO
-L-	478+75.00	512+68.83



TYPICAL SECTION NO. 7

LINE	FROM	TO
-L-	512+68.83	518+58.76

USE MILLING TRANSITION DETAIL FOR STA. 517+08.76 TO 518+58.76

*ADD USABLE SHOULDER WIDTH WIDENING FOR FILL SLOPES STEEPER THAN 4:1.

PAVEMENT SCHEDULE	
C1	PROP. 3.0" SURFACE COURSE, TYPE S9.5B
C2	PROP. 3.0" SURFACE COURSE, TYPE S9.5C
C3	PROP. VARIABLE DEPTH BASE COURSE, TYPE S9.5B
C4	PROP. VARIABLE DEPTH BASE COURSE, TYPE S9.5C
D1	PROP. 2.5" INTERMEDIATE COURSE, TYPE I19.0B
D2	PROP. 3.0" INTERMEDIATE COURSE, TYPE I19.0C
D3	PROP. 4.0" INTERMEDIATE COURSE, TYPE I19.0C
D4	PROP. VARIABLE DEPTH INTERMEDIATE COURSE, TYPE I19.0C
E1	PROP. 4.0" BASE COURSE, TYPE B25.0B
E2	PROP. 4.0" BASE COURSE, TYPE B25.0C
E3	PROP. 4.5" BASE COURSE, TYPE B25.0B
E4	PROP. 5.5" BASE COURSE, TYPE B25.0B
E5	PROP. 5.5" BASE COURSE, TYPE B25.0C
E6	PROP. VARIABLE DEPTH BASE COURSE, TYPE B25.0B
E7	PROP. VARIABLE DEPTH BASE COURSE, TYPE B25.0C
R1	2'-6" CONCRETE CURB AND GUTTER
T	EARTH MATERIAL.
U	EXISTING PAVEMENT.
V	MILLING EXISTING ASPHALT PAVEMENT, 0" TO 3" DEPTH.
W1	WEDGE (SEE STANDARD WEDGING DETAIL 1, THIS SHEET)
W2	WEDGE (SEE STANDARD WEDGING DETAIL 2, THIS SHEET)
W3	WEDGE (SEE STANDARD WEDGING DETAIL 3, THIS SHEET)

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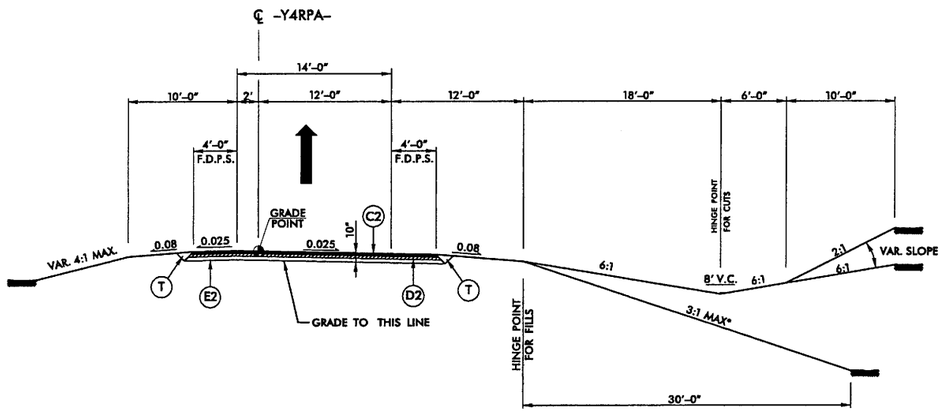
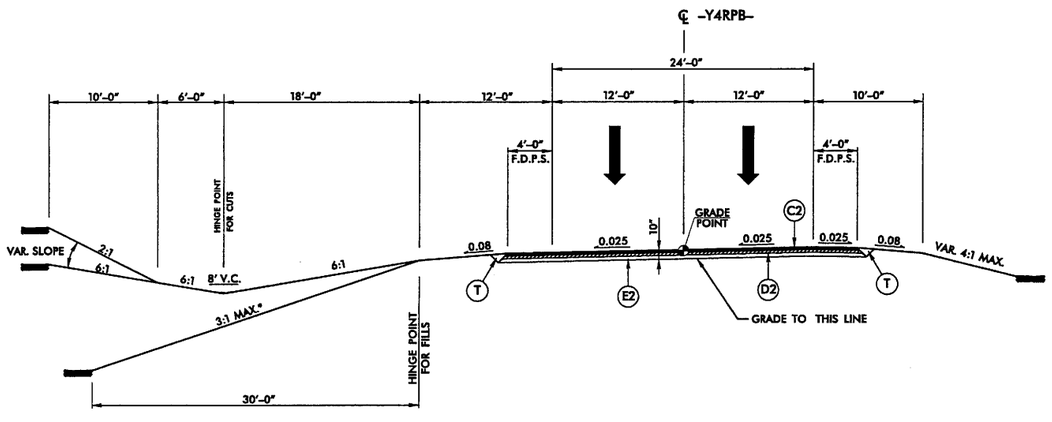
PAVEMENT SCHEDULE	
C1	PROP. 3.0" SURFACE COURSE, TYPE S9.5B
C2	PROP. 3.0" SURFACE COURSE, TYPE S9.5C
C3	PROP. VARIABLE DEPTH BASE COURSE, TYPE S9.5B
C4	PROP. VARIABLE DEPTH BASE COURSE, TYPE S9.5C
D1	PROP. 2.5" INTERMEDIATE COURSE, TYPE I19.0B
D2	PROP. 3.0" INTERMEDIATE COURSE, TYPE I19.0C
D3	PROP. 4.0" INTERMEDIATE COURSE, TYPE I19.0C
D4	PROP. VARIABLE DEPTH INTERMEDIATE COURSE, TYPE I19.0C
E1	PROP. 4.0" BASE COURSE, TYPE B25.0B
E2	PROP. 4.0" BASE COURSE, TYPE B25.0C
E3	PROP. 4.5" BASE COURSE, TYPE B25.0B
E4	PROP. 5.5" BASE COURSE, TYPE B25.0B
E5	PROP. 5.5" BASE COURSE, TYPE B25.0C
E6	PROP. VARIABLE DEPTH BASE COURSE, TYPE B25.0B
E7	PROP. VARIABLE DEPTH BASE COURSE, TYPE B25.0C
R1	2'-6" CONCRETE CURB AND GUTTER
T	EARTH MATERIAL.
U	EXISTING PAVEMENT.
V	MILLING EXISTING ASPHALT PAVEMENT, 0" TO 3" DEPTH.
W1	WEDGE (SEE STANDARD WEDGING DETAIL 1, THIS SHEET)
W2	WEDGE (SEE STANDARD WEDGING DETAIL 2, THIS SHEET)
W3	WEDGE (SEE STANDARD WEDGING DETAIL 3, THIS SHEET)

*ADD USABLE SHOULDER WIDTH WIDENING FOR FILL SLOPES STEEPER THAN 4:1.



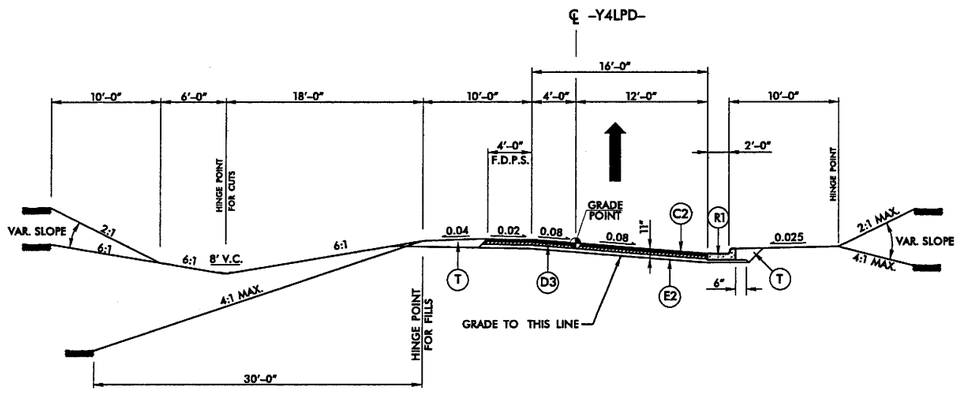
TYPICAL SECTION NO. 8

LINE	FROM	TO
-Y4RPA-	13+73.81	23+00.25



TYPICAL SECTION NO. 9

LINE	FROM	TO
-Y4RPB-	14+95.55	26+71.66



TYPICAL SECTION NO. 10

LINE	FROM	TO
-Y4LPD-	2+26.88	13+14.25

R-2404A	2-D
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	PAVEMENT DESIGN ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

HDR Engineering, Inc. of the Carolinas
3733 National Drive, Suite 207 Raleigh, N.C. 27612

BARNHILL CONTRACTING COMPANY

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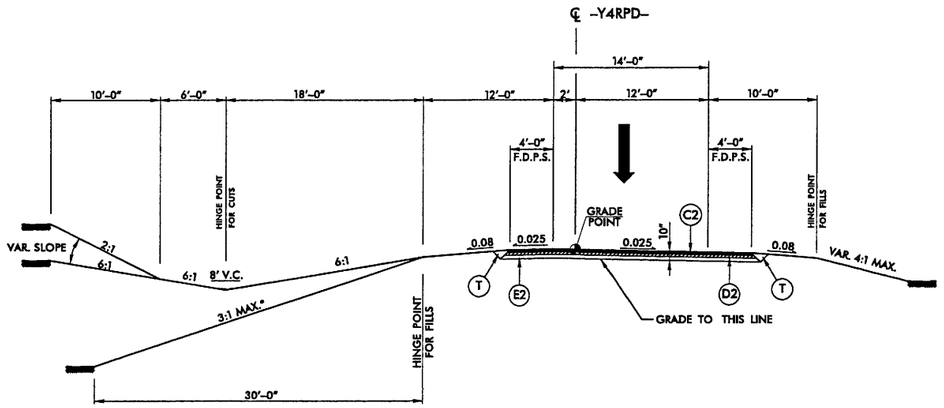
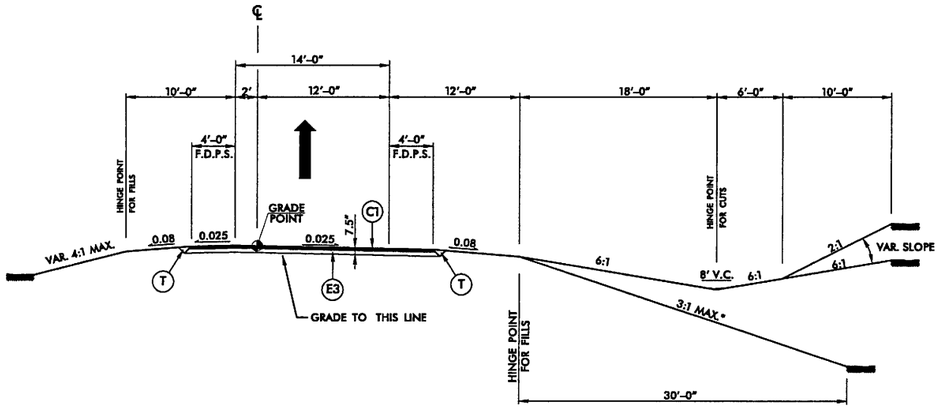
PAVEMENT SCHEDULE	
C1	PROP. 3.0" SURFACE COURSE, TYPE S9.5B
C2	PROP. 3.0" SURFACE COURSE, TYPE S9.5C
C3	PROP. VARIABLE DEPTH BASE COURSE, TYPE S9.5B
C4	PROP. VARIABLE DEPTH BASE COURSE, TYPE S9.5C
D1	PROP. 2.5" INTERMEDIATE COURSE, TYPE I19.0B
D2	PROP. 3.0" INTERMEDIATE COURSE, TYPE I19.0C
D3	PROP. 4.0" INTERMEDIATE COURSE, TYPE I19.0C
D4	PROP. VARIABLE DEPTH INTERMEDIATE COURSE, TYPE I19.0C
E1	PROP. 4.0" BASE COURSE, TYPE B25.0B
E2	PROP. 4.0" BASE COURSE, TYPE B25.0C
E3	PROP. 4.5" BASE COURSE, TYPE B25.0B
E4	PROP. 5.5" BASE COURSE, TYPE B25.0B
E5	PROP. 5.5" BASE COURSE, TYPE B25.0C
E6	PROP. VARIABLE DEPTH BASE COURSE, TYPE B25.0B
E7	PROP. VARIABLE DEPTH BASE COURSE, TYPE B25.0C
R1	2'-6" CONCRETE CURB AND GUTTER
T	EARTH MATERIAL.
U	EXISTING PAVEMENT.
V	MILLING EXISTING ASPHALT PAVEMENT, 0" TO 3" DEPTH.
W1	WEDGE (SEE STANDARD WEDGING DETAIL 1, THIS SHEET)
W2	WEDGE (SEE STANDARD WEDGING DETAIL 2, THIS SHEET)
W3	WEDGE (SEE STANDARD WEDGING DETAIL 3, THIS SHEET)

*ADD USABLE SHOULDER WIDTH WIDENING FOR FILL SLOPES STEEPER THAN 4:1.



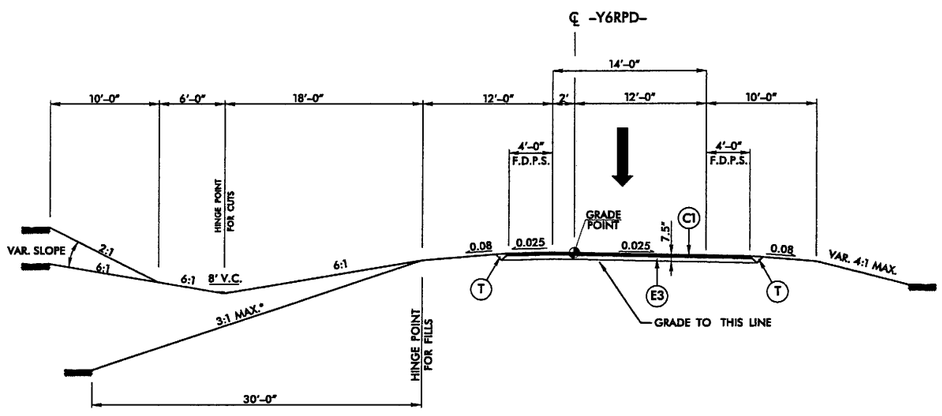
TYPICAL SECTION NO. 11

LINE	FROM	TO
–Y4RPD–	12+85.21	28+72.60



TYPICAL SECTION NO. 12

LINE	FROM	TO
–Y6RPA–	12+99.94	27+60.66
–Y6RPC–	14+56.28	27+92.53



TYPICAL SECTION NO. 13

LINE	FROM	TO
–Y6RPD–	14+48.62	30+67.61

R-2404A | 2-E
R/W SHEET NO.

ROADWAY DESIGN ENGINEER | PAVEMENT DESIGN ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

HDR Engineering, Inc. of the Carolinas
3733 National Drive, Suite 207 Raleigh, N.C. 27612

BARNHILL CONTRACTING COMPANY

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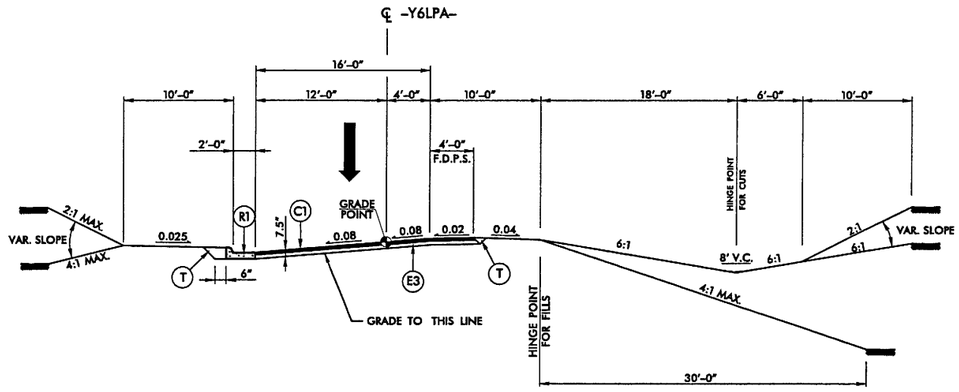
PAVEMENT SCHEDULE

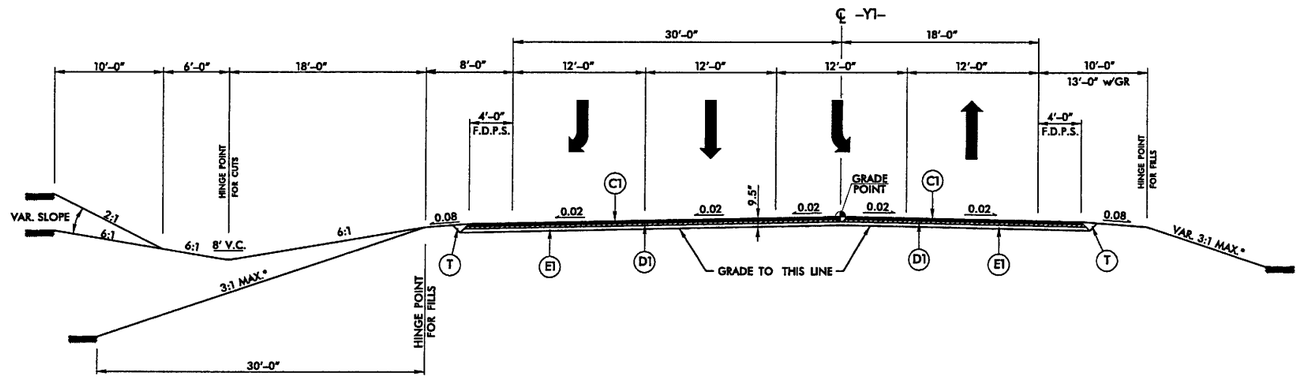
C1	PROP. 3.0" SURFACE COURSE, TYPE S9.5B
C2	PROP. 3.0" SURFACE COURSE, TYPE S9.5C
C3	PROP. VARIABLE DEPTH BASE COURSE, TYPE S9.5B
C4	PROP. VARIABLE DEPTH BASE COURSE, TYPE S9.5C
D1	PROP. 2.5" INTERMEDIATE COURSE, TYPE I19.0B
D2	PROP. 3.0" INTERMEDIATE COURSE, TYPE I19.0C
D3	PROP. 4.0" INTERMEDIATE COURSE, TYPE I19.0C
D4	PROP. VARIABLE DEPTH INTERMEDIATE COURSE, TYPE I19.0C
E1	PROP. 4.0" BASE COURSE, TYPE B25.0B
E2	PROP. 4.0" BASE COURSE, TYPE B25.0C
E3	PROP. 4.5" BASE COURSE, TYPE B25.0B
E4	PROP. 5.5" BASE COURSE, TYPE B25.0B
E5	PROP. 5.5" BASE COURSE, TYPE B25.0C
E6	PROP. VARIABLE DEPTH BASE COURSE, TYPE B25.0B
E7	PROP. VARIABLE DEPTH BASE COURSE, TYPE B25.0C
R1	2'-6" CONCRETE CURB AND GUTTER
T	EARTH MATERIAL.
U	EXISTING PAVEMENT.
V	MILLING EXISTING ASPHALT PAVEMENT, 0" TO 3" DEPTH.
W1	WEDGE (SEE STANDARD WEDGING DETAIL 1, THIS SHEET)
W2	WEDGE (SEE STANDARD WEDGING DETAIL 2, THIS SHEET)
W3	WEDGE (SEE STANDARD WEDGING DETAIL 3, THIS SHEET)

*ADD USABLE SHOULDER WIDTH WIDENING FOR FILL SLOPES STEEPER THAN 4:1.



TYPICAL SECTION NO. 14

LINE	FROM	TO
–Y6LPA–	1+93.89	9+26.61



TYPICAL SECTION NO. 15

LINE	FROM	TO
–Y1–	10+42.00	19+50.00

R-2404A | 2-F
R/W SHEET NO.

ROADWAY DESIGN ENGINEER | PAVEMENT DESIGN ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

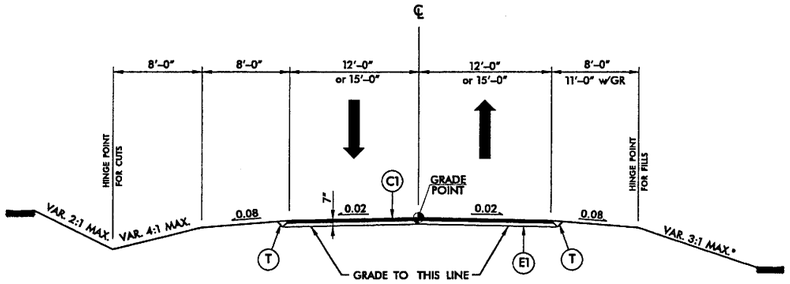
HDR Engineering, Inc. of the Carolinas
3733 National Drive, Suite 207 Raleigh, N.C. 27612

BARNHILL CONTRACTING COMPANY

7/15/2005 9:40:24 AM r:\R-2404A\proj\R2404A_rdy_typ.dgn

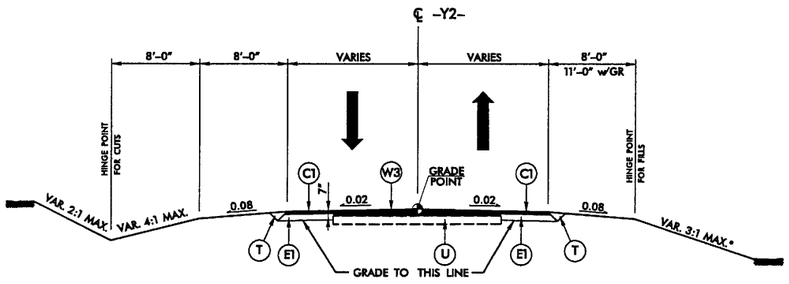
PAVEMENT SCHEDULE	
C1	PROP. 3.0" SURFACE COURSE, TYPE S9.5B
C2	PROP. 3.0" SURFACE COURSE, TYPE S9.5C
C3	PROP. VARIABLE DEPTH BASE COURSE, TYPE S9.5B
C4	PROP. VARIABLE DEPTH BASE COURSE, TYPE S9.5C
D1	PROP. 2.5" INTERMEDIATE COURSE, TYPE I19.0B
D2	PROP. 3.0" INTERMEDIATE COURSE, TYPE I19.0C
D3	PROP. 4.0" INTERMEDIATE COURSE, TYPE I19.0C
D4	PROP. VARIABLE DEPTH INTERMEDIATE COURSE, TYPE I19.0C
E1	PROP. 4.0" BASE COURSE, TYPE B25.0B
E2	PROP. 4.0" BASE COURSE, TYPE B25.0C
E3	PROP. 4.5" BASE COURSE, TYPE B25.0B
E4	PROP. 5.5" BASE COURSE, TYPE B25.0B
E5	PROP. 5.5" BASE COURSE, TYPE B25.0C
E6	PROP. VARIABLE DEPTH BASE COURSE, TYPE B25.0B
E7	PROP. VARIABLE DEPTH BASE COURSE, TYPE B25.0C
R1	2'-6" CONCRETE CURB AND GUTTER
T	EARTH MATERIAL.
U	EXISTING PAVEMENT.
V	MILLING EXISTING ASPHALT PAVEMENT, 0" TO 3" DEPTH.
W1	WEDGE (SEE STANDARD WEDGING DETAIL 1, THIS SHEET)
W2	WEDGE (SEE STANDARD WEDGING DETAIL 2, THIS SHEET)
W3	WEDGE (SEE STANDARD WEDGING DETAIL 3, THIS SHEET)

*ADD USABLE SHOULDER WIDTH WIDENING FOR FILL SLOPES STEEPER THAN 4:1.



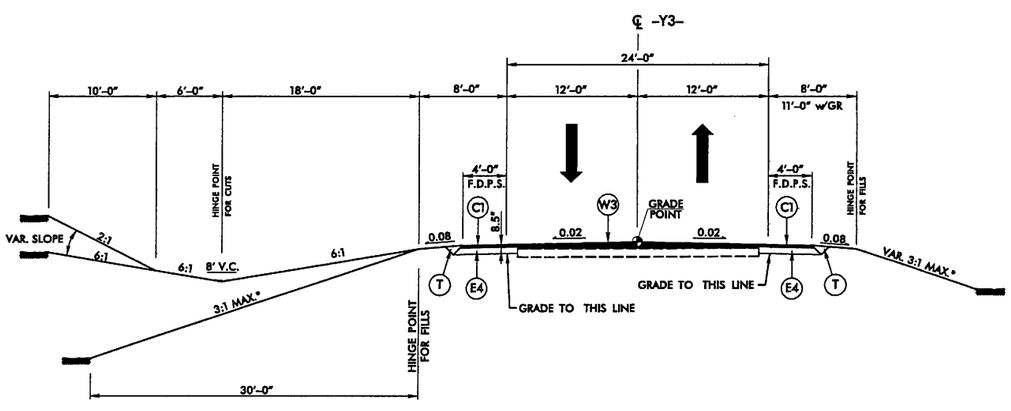
TYPICAL SECTION NO. 16

LINE	FROM	TO
-Y1A-	10+12.39	12+35.31
-SR1-	10+18.09	16+45.00
-SR2-	10+00.00	25+42.72



TYPICAL SECTION NO. 17

LINE	FROM	TO
-Y2-	15+77.84	17+43.29
-Y2-	18+28.65	20+00.00



TYPICAL SECTION NO. 18

LINE	FROM	TO
-Y3-	11+16.81	19+05.49
-Y3-	19+83.58	24+65.75

R-2404A	2-G
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	PAVEMENT DESIGN ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

HDR Engineering, Inc. of the Carolinas
3733 National Drive, Suite 207 Raleigh, N.C. 27612

BARNHILL CONTRACTING COMPANY

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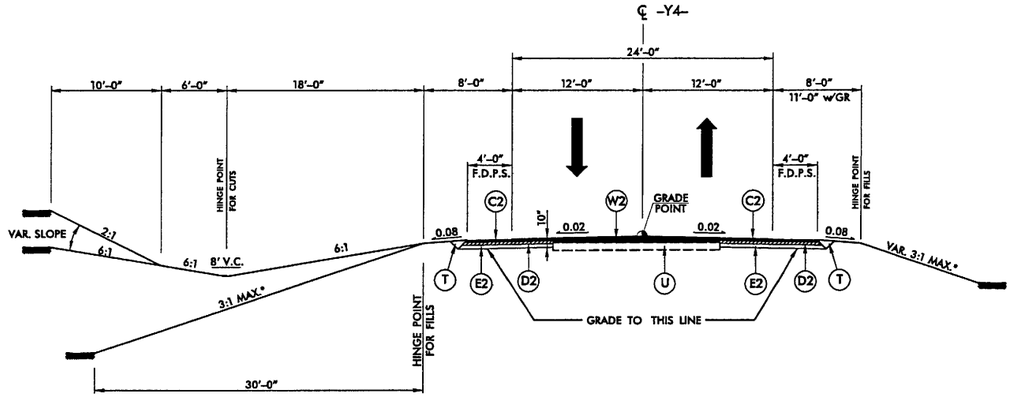
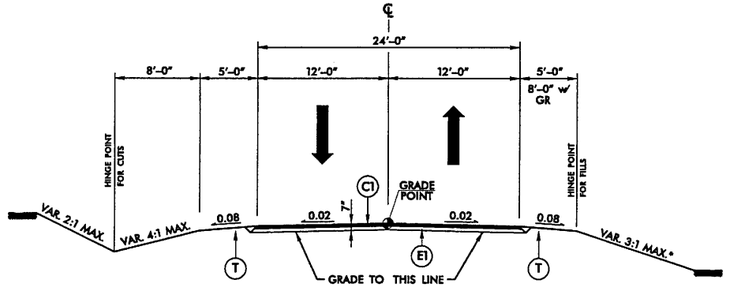
C1	PROP. 3.0" SURFACE COURSE, TYPE S9.5B
C2	PROP. 3.0" SURFACE COURSE, TYPE S9.5C
C3	PROP. VARIABLE DEPTH BASE COURSE, TYPE S9.5B
C4	PROP. VARIABLE DEPTH BASE COURSE, TYPE S9.5C
D1	PROP. 2.5" INTERMEDIATE COURSE, TYPE I19.0B
D2	PROP. 3.0" INTERMEDIATE COURSE, TYPE I19.0C
D3	PROP. 4.0" INTERMEDIATE COURSE, TYPE I19.0C
D4	PROP. VARIABLE DEPTH INTERMEDIATE COURSE, TYPE I19.0C
E1	PROP. 4.0" BASE COURSE, TYPE B25.0B
E2	PROP. 4.0" BASE COURSE, TYPE B25.0C
E3	PROP. 4.5" BASE COURSE, TYPE B25.0B
E4	PROP. 5.5" BASE COURSE, TYPE B25.0B
E5	PROP. 5.5" BASE COURSE, TYPE B25.0C
E6	PROP. VARIABLE DEPTH BASE COURSE, TYPE B25.0B
E7	PROP. VARIABLE DEPTH BASE COURSE, TYPE B25.0C
R1	2'-6" CONCRETE CURB AND GUTTER
T	EARTH MATERIAL.
U	EXISTING PAVEMENT.
V	MILLING EXISTING ASPHALT PAVEMENT, 0" TO 3" DEPTH.
W1	WEDGE (SEE STANDARD WEDGING DETAIL 1, THIS SHEET)
W2	WEDGE (SEE STANDARD WEDGING DETAIL 2, THIS SHEET)
W3	WEDGE (SEE STANDARD WEDGING DETAIL 3, THIS SHEET)

*ADD USABLE SHOULDER WIDTH WIDENING FOR FILL SLOPES STEEPER THAN 4:1.



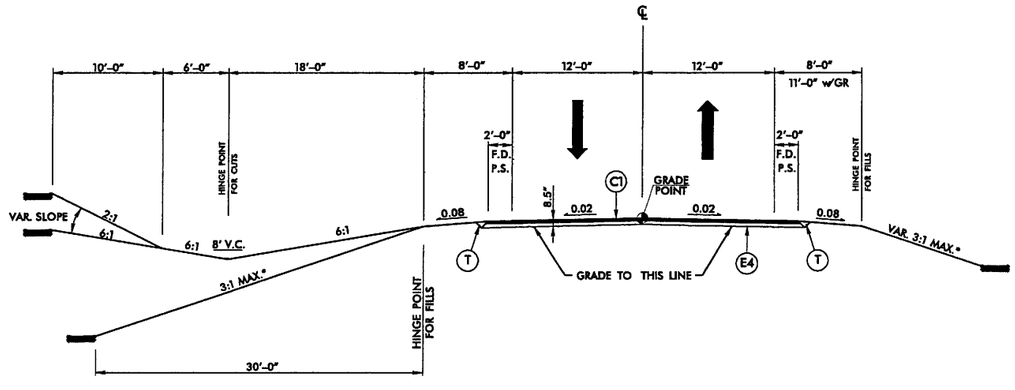
TYPICAL SECTION NO. 19

LINE	FROM	TO
-Y4-	20+00.00	39+43.51



TYPICAL SECTION NO. 20

LINE	FROM	TO
-Y5-	11+00.00	57+66.18



TYPICAL SECTION NO.21

LINE	FROM	TO
-Y6-	16+00.00	45+00.00

R-2404A | 2-H
R/W SHEET NO.

ROADWAY DESIGN ENGINEER | PAVEMENT DESIGN ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

HDR Engineering, Inc. of the Carolinas
3733 National Drive, Suite 207 Raleigh, N.C. 27612

BARNHILL CONTRACTING COMPANY

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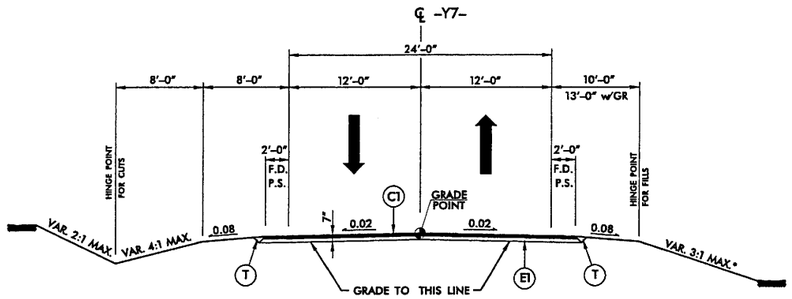
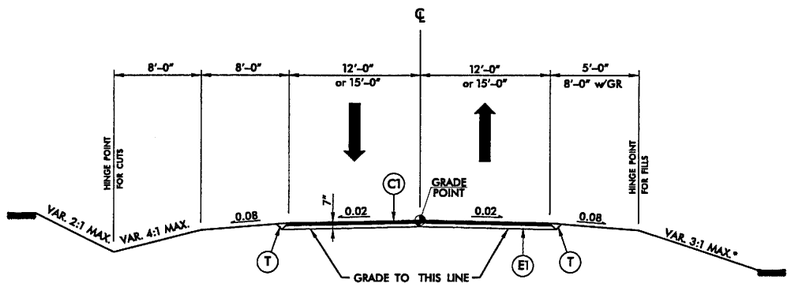
C1	PROP. 3.0" SURFACE COURSE, TYPE S9.5B
C2	PROP. 3.0" SURFACE COURSE, TYPE S9.5C
C3	PROP. VARIABLE DEPTH BASE COURSE, TYPE S9.5B
C4	PROP. VARIABLE DEPTH BASE COURSE, TYPE S9.5C
D1	PROP. 2.5" INTERMEDIATE COURSE, TYPE I19.0B
D2	PROP. 3.0" INTERMEDIATE COURSE, TYPE I19.0C
D3	PROP. 4.0" INTERMEDIATE COURSE, TYPE I19.0C
D4	PROP. VARIABLE DEPTH INTERMEDIATE COURSE, TYPE I19.0C
E1	PROP. 4.0" BASE COURSE, TYPE B25.0B
E2	PROP. 4.0" BASE COURSE, TYPE B25.0C
E3	PROP. 4.5" BASE COURSE, TYPE B25.0B
E4	PROP. 5.5" BASE COURSE, TYPE B25.0B
E5	PROP. 5.5" BASE COURSE, TYPE B25.0C
E6	PROP. VARIABLE DEPTH BASE COURSE, TYPE B25.0B
E7	PROP. VARIABLE DEPTH BASE COURSE, TYPE B25.0C
R1	2'-6" CONCRETE CURB AND GUTTER
T	EARTH MATERIAL.
U	EXISTING PAVEMENT.
V	MILLING EXISTING ASPHALT PAVEMENT, 0" TO 3" DEPTH.
W1	WEDGE (SEE STANDARD WEDGING DETAIL 1, THIS SHEET)
W2	WEDGE (SEE STANDARD WEDGING DETAIL 2, THIS SHEET)
W3	WEDGE (SEE STANDARD WEDGING DETAIL 3, THIS SHEET)

*ADD USABLE SHOULDER WIDTH WIDENING FOR FILL SLOPES STEEPER THAN 4:1.



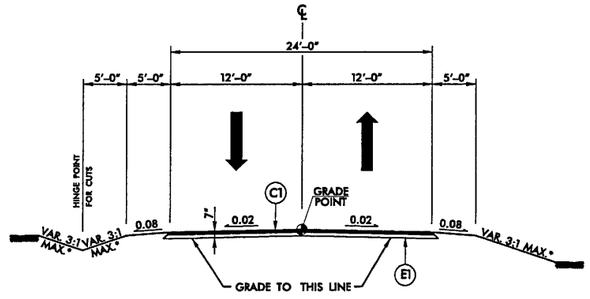
TYPICAL SECTION NO. 22

LINE	FROM	TO
-Y7-	10+30.00	16+92.40



TYPICAL SECTION NO. 23

LINE	FROM	TO
-SR1-	10+18.09	16+45.00
-SR2-	10+00.00	25+42.72



TYPICAL SECTION NO. 24

LINE	FROM	TO
-Y5DET-	10+00.00	30+07.67
-Y6DET-	10+00.00	50+79.11

R-2404A | 2-1
RW SHEET NO.

ROADWAY DESIGN ENGINEER | PAVEMENT DESIGN ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

HDR Engineering, Inc. of the Carolinas
3733 National Drive, Suite 207 Raleigh, N.C. 27612

BARNHILL CONTRACTING COMPANY

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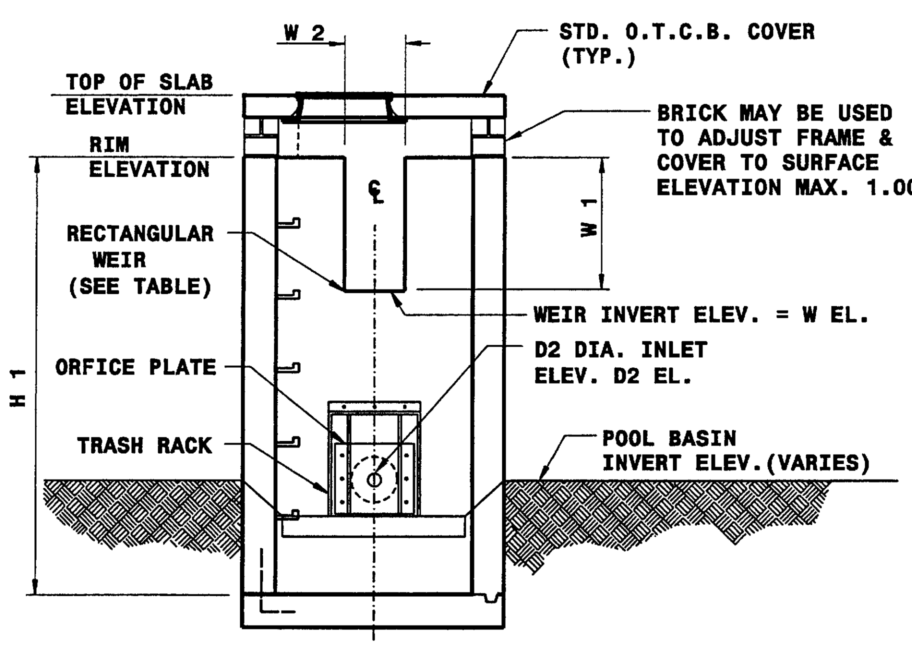
R-2404A	2-J
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

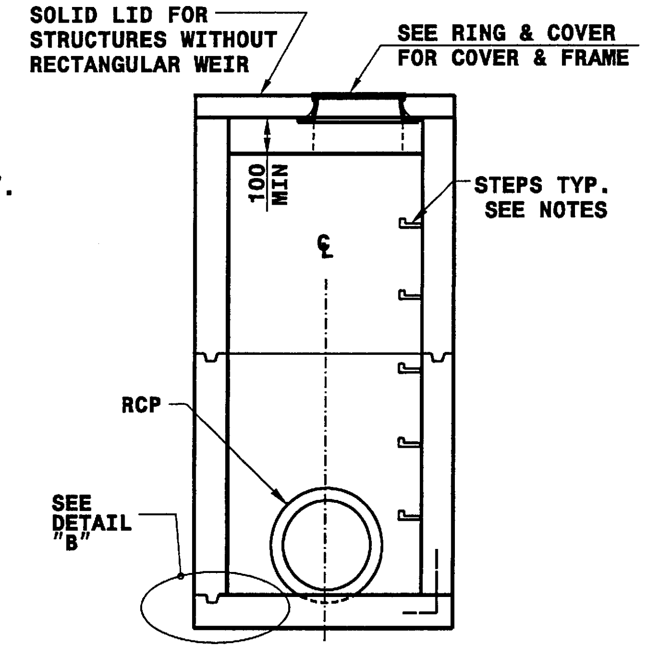
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

HDR Engineering, Inc. of the Carolinas
3733 National Drive, Suite 207 Raleigh, N.C. 27612

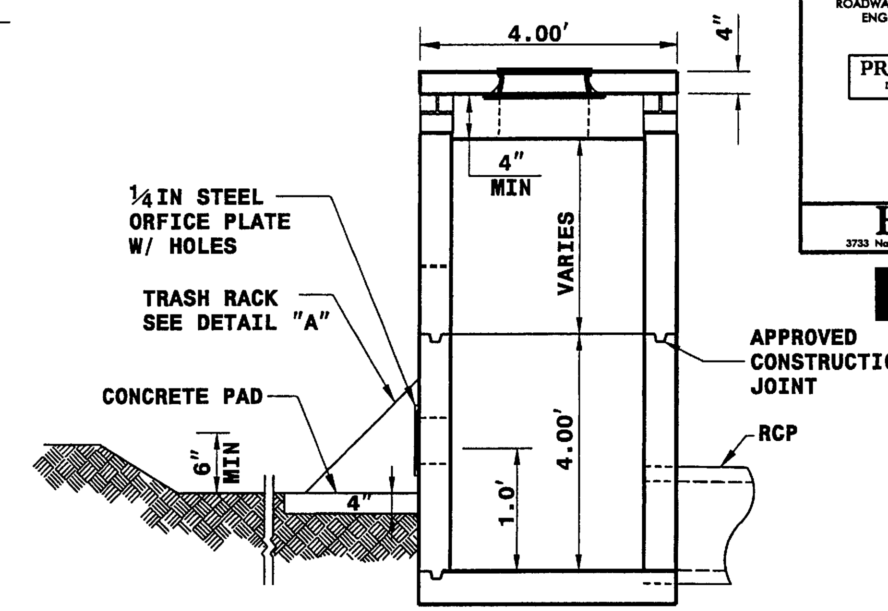
BARNHILL CONTRACTING COMPANY



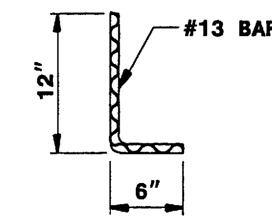
ELEVATION OF STRUCTURE SIDE 1



ELEVATION OF STRUCTURE SIDE 2

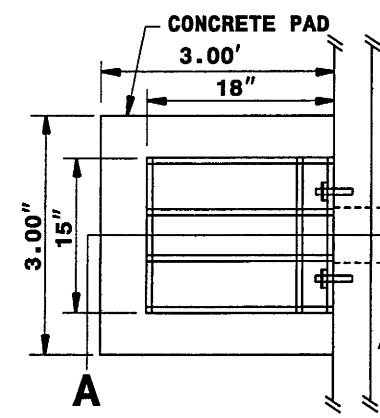


ELEVATION OF STRUCTURE SIDE 3

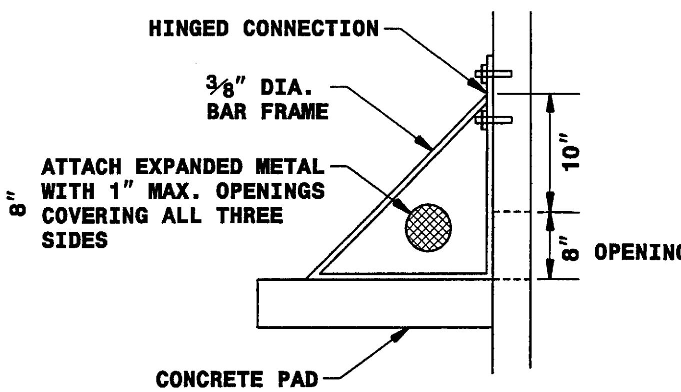


DOWEL

MINIMUM DIMENSIONS FOR DRY DETENTION BASIN DRAWDOWN STRUCTURE													
QUANTITIES FOR CONCRETE DETERMINED FROM NCDOT STANDARD 840.04													
							WEIR DIMENSIONS			DRAWDOWN ORIFICE			POOL BASIN INVERT
STATION	PIPE D	OUTLET PIPE INVERT	BOX HEIGHT H1	RIM ELEVATION	TOP OF SLAB ELEV.	REMARKS	W1	W2	W EL	D2	NO. OF HOLES	D2 EL	INV.EL.
-Y4LPD-	18"	8.00	4.00	12.00	8.50	OTCB	0.50'	2.00'	11.50	3"	1	9.00	9.00



PLAN VIEW

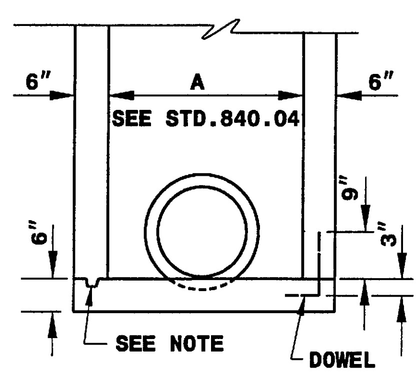


SECTION A-A

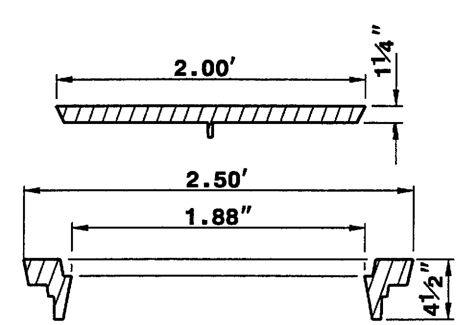
DETAIL A - EXTENDED DETENTION TRASH RACK

GENERAL NOTES:

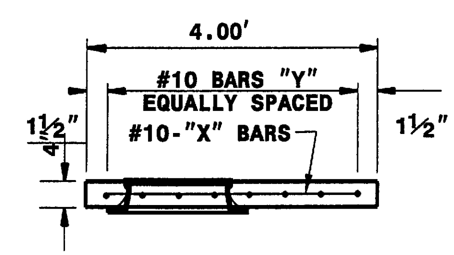
* CLASS 'B' CONCRETE TO BE USED THROUGHOUT. PRECAST CONCRETE STRUCTURES TO BE SUBMITTED FOR APPROVAL.
* OPTIONAL CONSTRUCTION - MONOLITHIC POUR, 2" KEYWAY, OR #13 BAR DOWELS AT 12" CENTERS, AS DIRECTED BY ENGINEER.
* FORMS ARE TO BE USED FOR THE CONSTRUCTION OF THE BOTTOM SLAB.
* IF REINFORCED CONCRETE PIPE IS SET IN BASE SLAB OF BOX, ADD TO BASE AS SHOWN ON STANDARD 840.00.
* ALL DRAWDOWN STRUCTURES OVER 3' IN DEPTH TO BE PROVIDED WITH STEPS 14" ON CENTERS. STEPS SHALL BE INSTALLED IN ACCORDANCE WITH STANDARD 840.66.
* FOR 8.0' IN HEIGHT OR LESS USE 6" WALLS AND BOTTOM SLAB. OVER 8.0' TO 16.0' IN HEIGHT USE 8" WALLS AND BOTTOM SLAB. ADJUST QUANTITIES ACCORDINGLY.



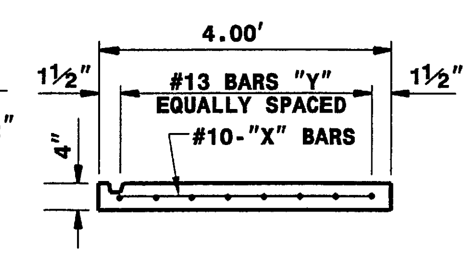
DETAIL 'B'



RING & COVER



TOP SLAB



BOTTOM SLAB

7/15/2005 9:44:47 AM

PROJECT REFERENCE NO.	SHEET NO.
R-2404A	4

R/W SHEET NO.

ROADWAY DESIGN ENGINEER | HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

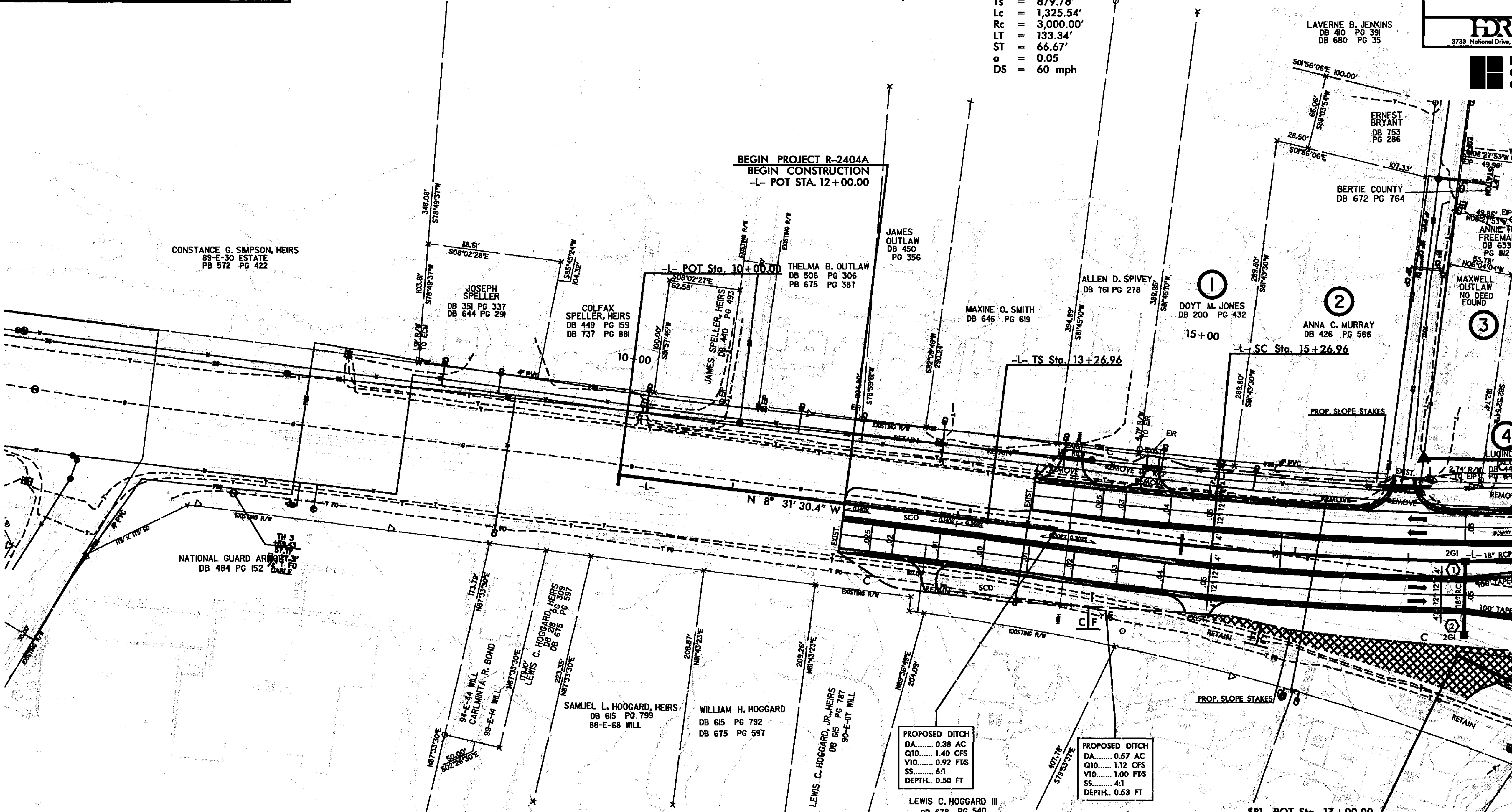
HDR Engineering, Inc. of the Carolinas
3733 National Drive, Suite 207 Raleigh, N.C. 27612

BARNHILL CONTRACTING COMPANY

REVISIONS

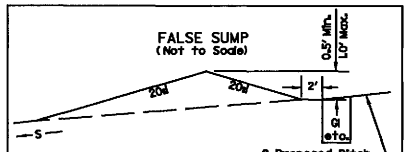
-L-

PI	=	22+06.75
Δ	=	29° 08' 08.4" (LT)
Dc	=	1°54' 35.5"
θs	=	1°54' 35.5"
Ls	=	200.00'
Ts	=	879.78'
Lc	=	1,325.54'
Rc	=	3,000.00'
LT	=	133.34'
ST	=	66.67'
e	=	0.05
DS	=	60 mph

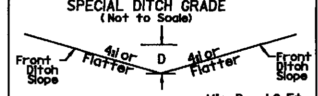


NAD 83
BEGIN PROJECT R-2404A
BEGIN CONSTRUCTION
-L- POT STA. 12+00.00
-L- POT Sta. 10+00.00
-L- TS Sta. 13+26.96
-L- SC Sta. 15+26.96
-SR1- POT Sta. 17+00.00
N 8° 31' 30.4" W
CONSTANCE G. SIMPSON, HEIRS
89-E-30 ESTATE
PB 572 PG 422
JOSEPH SPELLER
DB 351 PG 337
DB 644 PG 291
COLFAX SPELLER, HEIRS
DB 449 PG 159
DB 737 PG 881
JAMES SPELLER, HEIRS
DB 440 PG 493
THELMA B. OUTLAW
DB 506 PG 306
PB 675 PG 387
JAMES OUTLAW
DB 450 PG 356
MAXINE O. SMITH
DB 646 PG 619
ALLEN D. SPIVEY
DB 761 PG 278
DOYT M. JONES
DB 200 PG 432
ANNA C. MURRAY
DB 426 PG 566
LAVERNE B. JENKINS
DB 410 PG 391
DB 680 PG 35
ERNEST BRYANT
DB 753 PG 286
BERTIE COUNTY
DB 672 PG 764
ANNIE R. FREEMAN
DB 633 PG 812
MAXWELL OUTLAW
NO DEED FOUND
NATIONAL GUARD ARMORY
DB 484 PG 152
CARLMINTA R. BOND
94-E-14 WILL
99-E-14 WILL
LEWIS C. HOGGARD, HEIRS
DB 218 PG 309
DB 675 PG 597
SAMUEL L. HOGGARD, HEIRS
DB 615 PG 799
88-E-68 WILL
WILLIAM H. HOGGARD
DB 615 PG 792
DB 675 PG 597
LEWIS C. HOGGARD, JR., HEIRS
DB 615 PG 787
90-E-117 WILL
LEWIS C. HOGGARD III
DB 678 PG 540
HATTIE REBECCA KING
92-E-114 WILL
JOE SPELLER
DB 783 PG 402
ASHLEY D. WYNNE
DB 528 PG 750
MATCH LINE STA. 18+00 -L- SEE SHEET NO. 5
PROP. SLOPE STAKES
EXISTING R/W
RETAIN
REMOVE
SCD
2GI
-L- 18" RCP
100' TAPER
JURISDICTIONAL STREAM INTERMITTENT
PROPOSED DITCH
DA....... 0.38 AC
Q10...... 1.40 CFS
V10...... 0.92 FT/S
SS........ 6:1
DEPTH.. 0.50 FT
PROPOSED DITCH
DA....... 0.57 AC
Q10...... 1.12 CFS
V10...... 1.00 FT/S
SS........ 4:1
DEPTH.. 0.53 FT
2GI(B) Sta. 17+50 RT D.A.= 0.22 Ac Grate El= 29.41 ft Invert= 26.41 ft Depth= 3.0
2GI(B) Sta. 17+50 M D.A.= 1.14 Ac Grate El= 28.67 ft Invert= 25.67 ft Depth= 3.0

FALSE SUMP
(Not to Scale)

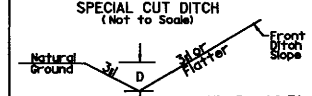


DETAIL L
SPECIAL DITCH GRADE
(Not to Scale)



12+00 -L- TO 14+00 -L- MEDIAN

DETAIL A
SPECIAL CUT DITCH
(Not to Scale)



13+00 -L- TO 14+50 -L- RT.

PAVEMENT TO BE OBLITERATED

NOTES: SEE SHEET NO. 53 FOR -L- PROFILE.
ALL DRIVEWAY RADII ARE 20' UNLESS OTHERWISE NOTED.
DO NOT PLACE ROCK IN BED OF JURISDICTIONAL STREAMS.

8/1/2005 10:29:13 AM
404d\hydro\Redline_plansheets\R2404A_hyl_Redline_psh_04.dgn

REVISIONS

PROJECT REFERENCE NO.	SHEET NO.
R-2404A	5
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

HDR Engineering, Inc. of the Carolinas
3733 National Drive, Suite 207 Raleigh, N.C. 27612

BARNHILL CONTRACTING COMPANY

-L-

PI	=	22+06.75
Δ	=	29° 08' 08.4" (LT)
Dc	=	1° 54' 35.5"
θs	=	1° 54' 35.5"
Ls	=	200.00'
Ts	=	879.78'
Lc	=	1,325.54'
Rc	=	3,000.00'
LT	=	133.34'
ST	=	66.67'
e	=	0.05
DS	=	60 mph

-SR2-

PI	=	23+55.09
Δ	=	95° 56' 22.3" (LT)
Dc	=	28° 38' 52.4"
L	=	334.89'
T	=	221.89'
R	=	200.00'
e	=	0.04

-SR2-

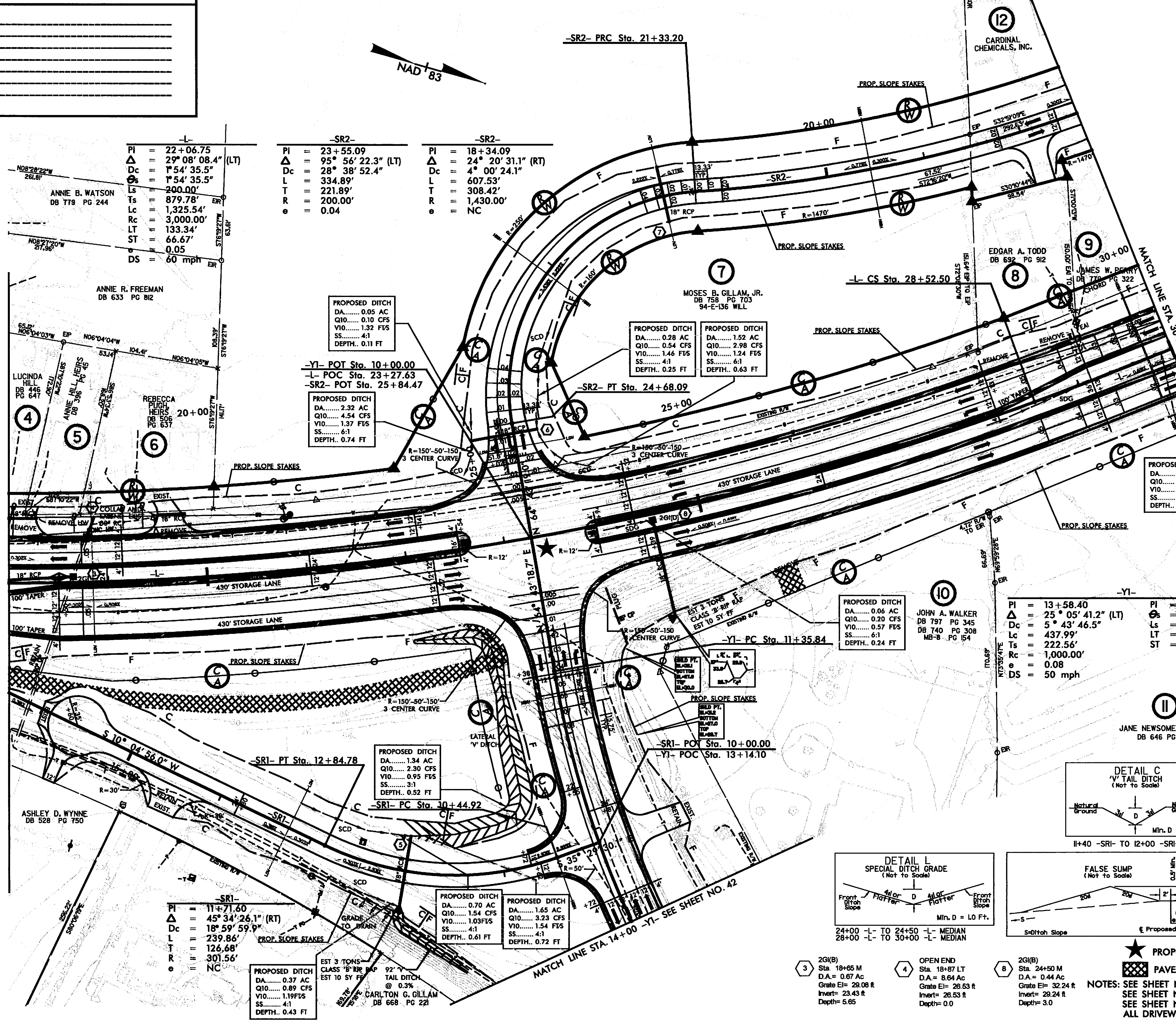
PI	=	18+34.09
Δ	=	24° 20' 31.1" (RT)
Dc	=	4° 00' 24.1"
L	=	607.53'
T	=	308.42'
R	=	1,430.00'
e	=	NC

-Y1-

PI	=	13+58.40	PI	=	16+15.84
Δ	=	25° 05' 41.2" (LT)	θs	=	3° 36' 34.7"
Dc	=	5° 43' 46.5"	Ls	=	126.00'
Lc	=	437.99'	LT	=	84.02'
Ts	=	222.56'	ST	=	42.02'
Rc	=	1,000.00'			
e	=	0.08			
DS	=	50 mph			

-SR1-

PI	=	11+71.60
Δ	=	45° 34' 26.1" (RT)
Dc	=	18° 59' 59.9"
L	=	239.86'
T	=	126.68'
R	=	301.56'
e	=	NC



DETAIL A SPECIAL CUT DITCH (Not to Scale)
Min. D = 1.0 Ft.
10+50 -SR1- TO 12+00 -SR1- RT.
12+00 -SR1- TO 13+25 -SR1- RT.
12+00 -SR1- TO 13+00 -SR1- LT
22+50 -L- LT TO 24+70 -SR2- RT
24+78 -SR2- LT TO 24+00 -L- LT
23+50 -SR2- LT TO 24+78 -SR2- LT
24+50 -SR2- RT TO 24+78 -SR2- RT

DETAIL C 'V' TAIL DITCH (Not to Scale)
Min. D = 1.0 Ft.
11+40 -SR1- TO 12+00 -SR1- LT

DETAIL B LATERAL 'V' DITCH (Not to Scale)
Min. D = 1.0 Ft. b = 5.0 Ft.
22+00 -L- TO 12+80 -Y1- RT

DETAIL L SPECIAL DITCH GRADE (Not to Scale)
Min. D = 1.0 Ft.
24+00 -L- TO 24+50 -L- MEDIAN
28+00 -L- TO 30+00 -L- MEDIAN

FALSE SUMP (Not to Scale)
S=Ditch Slope

3 — 2GI(B) Sta. 18+65 M; D.A.= 0.67 Ac; Grate El= 29.08 ft; Invert= 23.43 ft; Depth= 5.65

4 — OPEN END Sta. 18+87 LT; D.A.= 8.64 Ac; Grate El= 26.53 ft; Invert= 26.53 ft; Depth= 0.0

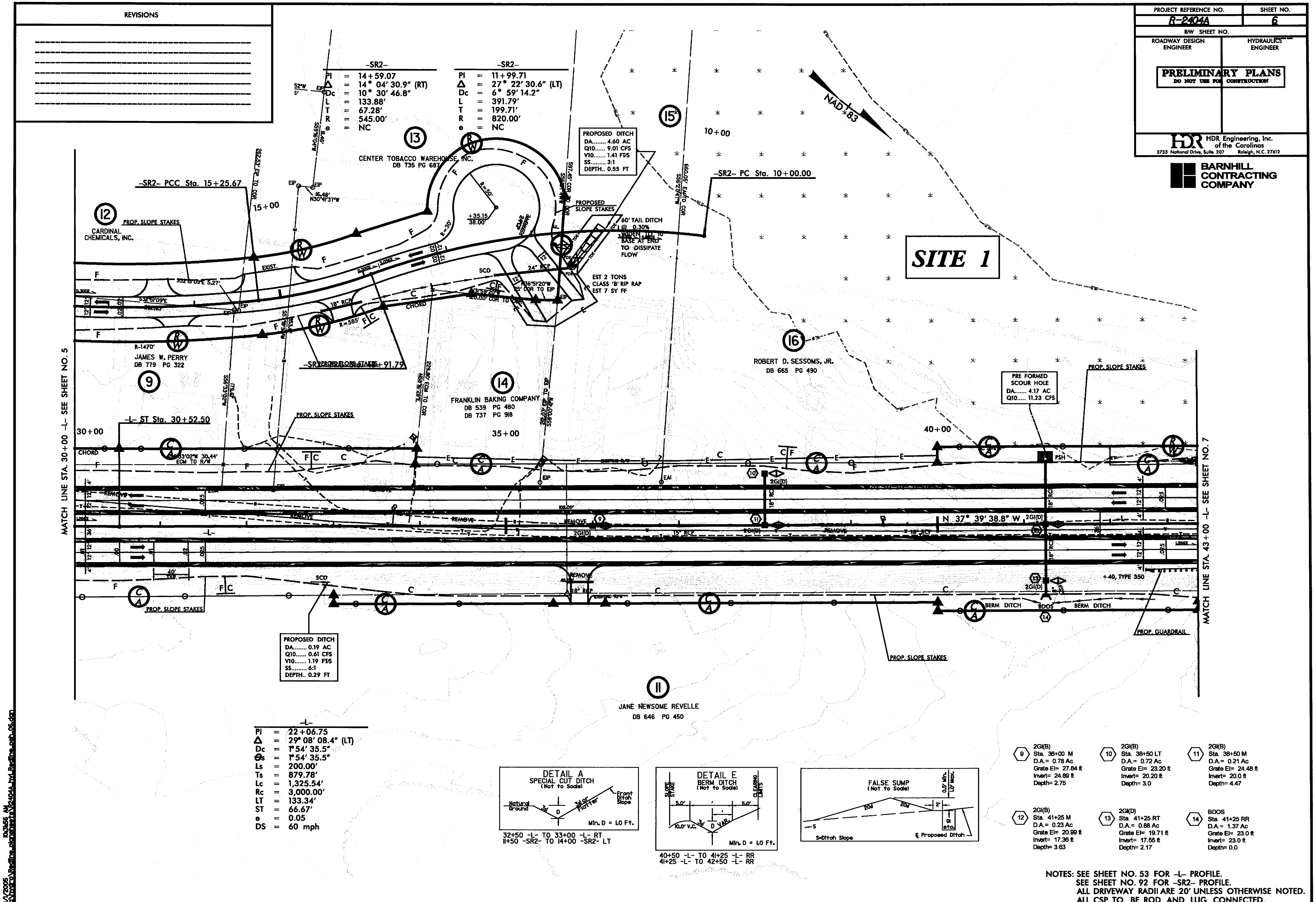
8 — 2GI(B) Sta. 24+50 M; D.A.= 0.44 Ac; Grate El= 32.24 ft; Invert= 29.24 ft; Depth= 3.0

★ PROPOSED TRAFFIC SIGNAL

PAVEMENT TO BE OBLITERATED

NOTES: SEE SHEET NO. 53 FOR -L- PROFILE.
SEE SHEET NO. 91 FOR -SR1- & -Y1- PROFILE
SEE SHEET NO. 92 FOR -SR2- PROFILE
ALL DRIVEWAY RADII ARE 20' UNLESS OTHERWISE NOTED.

8/3/2005 9:41:01 AM
R2404a\hydro\Redline_plansheets\R2404A_hyd_Redline_psh_05.dgn


REVISIONS
PROJECT REFERENCE NO. R-2404A
SHEET NO. 6
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION
HDR Engineering, Inc. of the Carolinas
3733 National Drive, Suite 207 Raleigh, N.C. 27612
BARNHILL CONTRACTING COMPANY
SITE 1
NAD 83
-SR2-
PI = 14+59.07
Δ = 14° 04' 30.9" (RT)
Dc = 10° 30' 46.8"
L = 133.88'
T = 67.28'
R = 545.00'
e = NC
-SR2-
PI = 11+99.71
Δ = 27° 22' 30.6" (LT)
Dc = 6° 59' 14.2"
L = 391.79'
T = 199.71'
R = 820.00'
e = NC
CENTER TOBACCO WAREHOUSE, INC.
DB 735 PG 687
PROPOSED DITCH
DA....... 4.60 AC
Q10...... 9.01 CFS
V10...... 1.41 FT/S
SS....... 3:1
DEPTH.. 0.55 FT
-SR2- PCC Sta. 15+25.67
-SR2- PC Sta. 10+00.00
15+00
10+00
CARDINAL CHEMICALS, INC.
PROP. SLOPE STAKES
PROPOSED SLOPE STAKES
60' TAIL DITCH @ 0.30% WIDEN TO BASE AT END TO DISSIPATE FLOW
EST 2 TONS CLASS 'B' RIP RAP EST 7 SY FF
JAMES W. PERRY
DB 779 PG 322
FRANKLIN BAKING COMPANY
DB 539 PG 480
DB 737 PG 918
ROBERT D. SESSOMS, JR.
DB 665 PG 490
PRE FORMED SCOUR HOLE
DA....... 4.17 AC
Q10...... 11.23 CFS
-L- ST Sta. 30+52.50
30+00
35+00
40+00
N 37° 39' 38.8" W
MATCH LINE STA. 30+00 -L- SEE SHEET NO. 5
MATCH LINE STA. 43+00 -L- SEE SHEET NO. 7
BERM DITCH
PROP. GUARDRAIL
PROPOSED DITCH
DA....... 0.19 AC
Q10...... 0.61 CFS
V10...... 1.19 FT/S
SS....... 6:1
DEPTH.. 0.29 FT
JANE NEWSOME REVELLE
DB 646 PG 450
-L-
PI = 22+06.75
Δ = 29° 08' 08.4" (LT)
Dc = 1°54' 35.5"
Ds = 1°54' 35.5"
Ls = 200.00'
Ts = 879.78'
Lc = 1,325.54'
Rc = 3,000.00'
LT = 133.34'
ST = 66.67'
e = 0.05
DS = 60 mph
DETAIL A
SPECIAL CUT DITCH
(Not to Scale)
Natural Ground
Front Ditch Slope
Min. D = 1.0 Ft.
32+50 -L- TO 33+00 -L- RT
11+50 -SR2- TO 14+00 -SR2- LT
DETAIL E
BERM DITCH
(Not to Scale)
Min. D = 1.0 Ft.
40+50 -L- TO 41+25 -L- RR
41+25 -L- TO 42+50 -L- RR
FALSE SUMP
(Not to Scale)
S=Ditch Slope
℄ Proposed Ditch
9 2GI(B) Sta. 36+00 M D.A.= 0.78 Ac Grate El= 27.64 ft Invert= 24.89 ft Depth= 2.75
10 2GI(B) Sta. 38+50 LT D.A.= 0.72 Ac Grate El= 23.20 ft Invert= 20.20 ft Depth= 3.0
11 2GI(B) Sta. 38+50 M D.A.= 0.21 Ac Grate El= 24.48 ft Invert= 20.0 ft Depth= 4.47
12 2GI(B) Sta. 41+25 M D.A.= 0.23 Ac Grate El= 20.99 ft Invert= 17.36 ft Depth= 3.63
13 2GI(D) Sta. 41+25 RT D.A.= 0.88 Ac Grate El= 19.71 ft Invert= 17.55 ft Depth= 2.17
14 BDOS Sta. 41+25 RR D.A.= 1.37 Ac Grate El= 23.0 ft Invert= 23.0 ft Depth= 0.0
NOTES: SEE SHEET NO. 53 FOR -L- PROFILE.
SEE SHEET NO. 92 FOR -SR2- PROFILE.
ALL DRIVEWAY RADII ARE 20' UNLESS OTHERWISE NOTED.
ALL CSP TO BE ROD AND LUG CONNECTED.

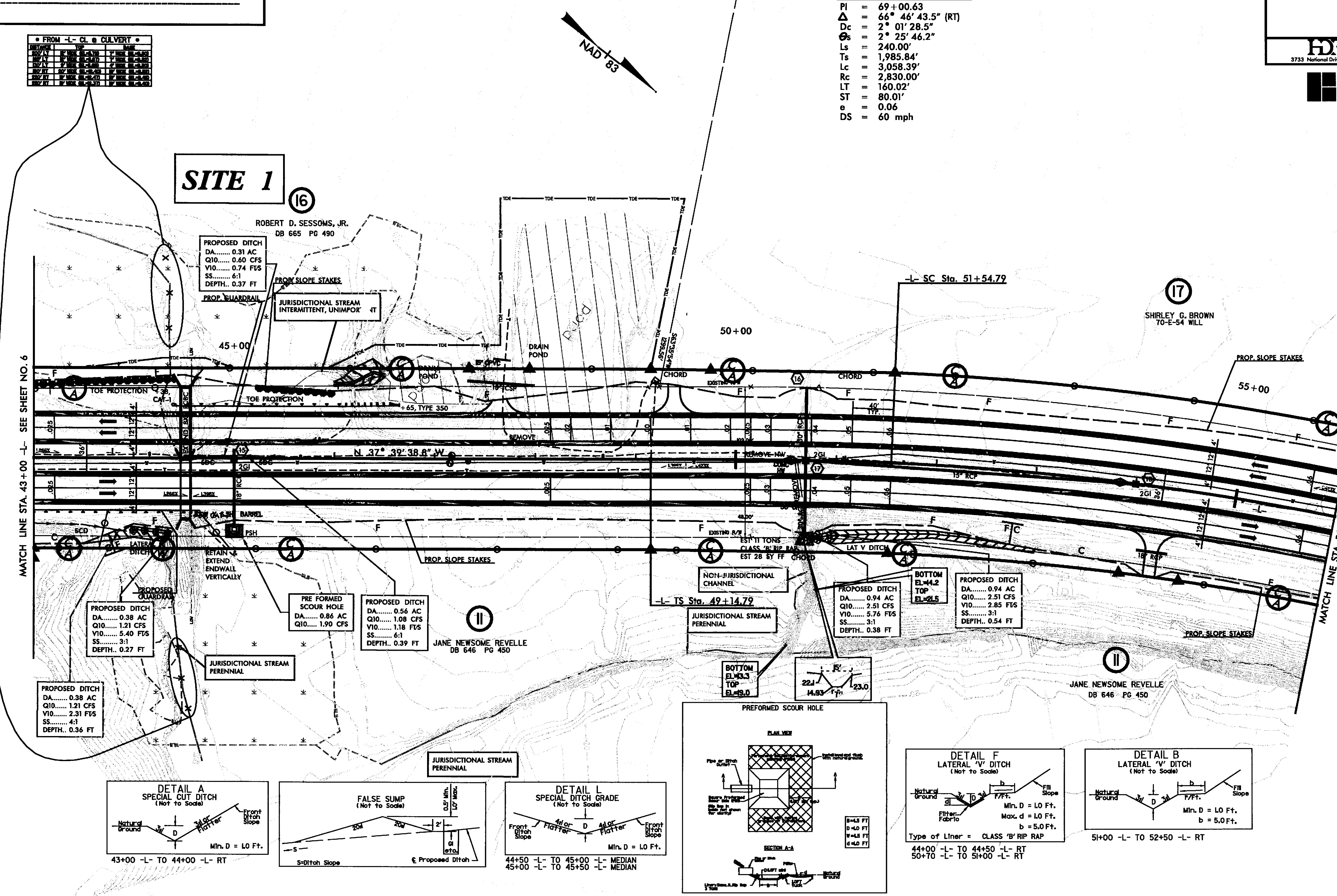
REVISIONS

PROJECT REFERENCE NO.	SHEET NO.
R-2404A	7
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

HDR Engineering, Inc. of the Carolinas
3733 National Drive, Suite 207 Raleigh, N.C. 27612

BARNHILL CONTRACTING COMPANY



NAD 83
-L-
PI = 69+00.63
Δ = 66° 46' 43.5" (RT)
Dc = 2° 01' 28.5"
θs = 2° 25' 46.2"
Ls = 240.00'
Ts = 1,985.84'
Lc = 3,058.39'
Rc = 2,830.00'
LT = 160.02'
ST = 80.01'
e = 0.06
DS = 60 mph
FROM -L- CL @ CULVERT
SITE 1
ROBERT D. SESSOMS, JR.
DB 665 PG 490
PROPOSED DITCH
DA........ 0.31 AC
Q10....... 0.60 CFS
V10....... 0.74 FT/S
SS........ 6:1
DEPTH.. 0.37 FT
PROP. SLOPE STAKES
PROP. GUARDRAIL
JURISDICTIONAL STREAM
INTERMITTENT, UNIMPORTANT
45+00
50+00
55+00
DRAIN POND
-L- SC Sta. 51+54.79
SHIRLEY G. BROWN
70-E-54 WILL
TOE PROTECTION
CHORD
REMOVE
N 37° 39' 38.8" W
15" RCP
18" RCP
2GI
BARREL
RETAIN & EXTEND ENDWALL VERTICALLY
PSH
PROPOSED GUARDRAIL
PRE FORMED SCOUR HOLE
DA........ 0.86 AC
Q10....... 1.90 CFS
PROPOSED DITCH
DA........ 0.56 AC
Q10....... 1.08 CFS
V10....... 1.18 FT/S
SS........ 6:1
DEPTH.. 0.39 FT
PROPOSED DITCH
DA........ 0.38 AC
Q10....... 1.21 CFS
V10....... 5.40 FT/S
SS........ 3:1
DEPTH.. 0.27 FT
PROPOSED DITCH
DA........ 0.38 AC
Q10....... 1.21 CFS
V10....... 2.31 FT/S
SS........ 4:1
DEPTH.. 0.36 FT
JURISDICTIONAL STREAM
PERENNIAL
JANE NEWSOME REVELLE
DB 646 PG 450
EST 11 TONS
CLASS 'B' RIP RAP
EST 28 SY FF
NON-JURISDICTIONAL CHANNEL
-L- TS Sta. 49+14.79
LAT V DITCH
PROPOSED DITCH
DA........ 0.94 AC
Q10....... 2.51 CFS
V10....... 5.76 FT/S
SS........ 3:1
DEPTH.. 0.38 FT
BOTTOM
EL=14.2
TOP
EL=21.5
PROPOSED DITCH
DA........ 0.94 AC
Q10....... 2.51 CFS
V10....... 2.85 FT/S
SS........ 3:1
DEPTH.. 0.54 FT
BOTTOM
EL=13.3
TOP
EL=19.0
PREFORMED SCOUR HOLE
PLAN VIEW
SECTION A-A
MATCH LINE STA. 43+00 -L- SEE SHEET NO. 6
MATCH LINE STA. 56+00 -L- SEE SHEET NO. 8
DETAIL A
SPECIAL CUT DITCH
(Not to Scale)
Natural Ground
3:1
3:1 or Flatter
Front Ditch Slope
Min. D = 1.0 Ft.
43+00 -L- TO 44+00 -L- RT
FALSE SUMP
(Not to Scale)
S=Ditch Slope
℄ Proposed Ditch
DETAIL L
SPECIAL DITCH GRADE
(Not to Scale)
Front Ditch Slope
4:1 or Flatter
Min. D = 1.0 Ft.
44+50 -L- TO 45+00 -L- MEDIAN
45+00 -L- TO 45+50 -L- MEDIAN
DETAIL F
LATERAL 'V' DITCH
(Not to Scale)
Natural Ground
Filter Fabric
Fill Slope
Min. D = 1.0 Ft.
Max. d = 1.0 Ft.
b = 5.0 Ft.
Type of Liner = CLASS 'B' RIP RAP
44+00 -L- TO 44+50 -L- RT
50+70 -L- TO 51+00 -L- RT
DETAIL B
LATERAL 'V' DITCH
(Not to Scale)
Natural Ground
Fill Slope
Min. D = 1.0 Ft.
b = 5.0 Ft.
51+00 -L- TO 52+50 -L- RT

15 — 2GI(B)
Sta. 45+00 M
D.A.= 0.86 Ac
Grate El= 18.20 ft
Invert= 15.20 ft
Depth= 3.0

16 — OPEN END
Sta. 50+70 LT
D.A.= 12.23 Ac
Grate El= 23.62 ft
Invert= 23.62 ft
Depth= 0.0

17 — 2GI(B)
Sta. 50+70 M
D.A.= 0.46 Ac
Grate El= 24.95 ft
Invert= 20.03 ft
Depth= 4.92

18 — 2GI(B)
Sta. 54+00 M
D.A.= 0.83 Ac
Grate El= 29.56 ft
Invert= 26.81 ft
Depth= 2.75

NOTES: SEE SHEET NO. 54 FOR -L- PROFILE.
ALL DRIVEWAY RADII ARE 20' UNLESS OTHERWISE NOTED.
DO NOT PLACE ROCK IN BED OF JURISDICTIONAL STREAMS.

8/3/2005
9:46:58 AM

REVISIONS

PROJECT REFERENCE NO.	SHEET NO.
R-2404A	8
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

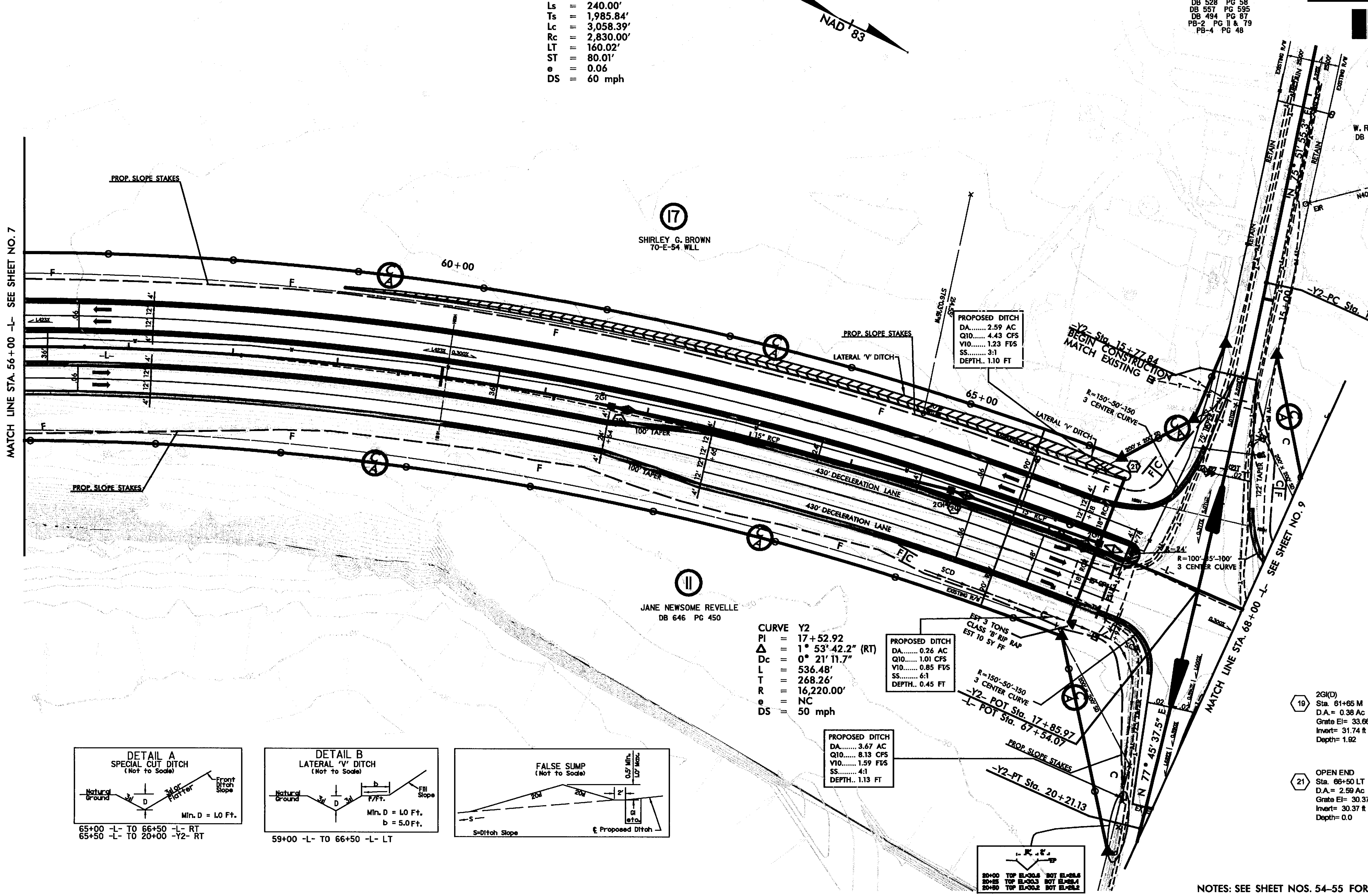
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

HDR Engineering, Inc. of the Carolinas
3733 National Drive, Suite 207 Raleigh, N.C. 27612

BARNHILL CONTRACTING COMPANY

-L-

PI	=	69+00.63
Δ	=	66° 46' 43.5" (RT)
Dc	=	2° 01' 28.5"
θs	=	2° 25' 46.2"
Ls	=	240.00'
Ts	=	1,985.84'
Lc	=	3,058.39'
Rc	=	2,830.00'
LT	=	160.02'
ST	=	80.01'
e	=	0.06
DS	=	60 mph



BELL BROTHERS, INC.
DB 494 PG 79
DB 528 PG 58
DB 557 PG 595
DB 494 PG 87
PB-2 PG II & 79
PB-4 PG 48

PROPOSED DITCH
DA........ 2.59 AC
Q10....... 4.43 CFS
V10....... 1.23 FT/S
SS........ 3:1
DEPTH.. 1.10 FT

PROPOSED DITCH
DA........ 0.26 AC
Q10....... 1.01 CFS
V10....... 0.85 FT/S
SS........ 6:1
DEPTH.. 0.45 FT

PROPOSED DITCH
DA........ 3.67 AC
Q10....... 8.13 CFS
V10....... 1.59 FT/S
SS........ 4:1
DEPTH.. 1.13 FT

CURVE Y2

PI	=	17+52.92
Δ	=	1° 53' 42.2" (RT)
Dc	=	0° 21' 11.7"
L	=	536.48'
T	=	268.26'
R	=	16,220.00'
e	=	NC
DS	=	50 mph

65+00 -L- TO 66+50 -L- RT
65+50 -L- TO 20+00 -Y2- RT

59+00 -L- TO 66+50 -L- LT

19 — 2GI(D)
Sta. 61+65 M
D.A.= 0.38 Ac
Grate El= 33.66 ft
Invert= 31.74 ft
Depth= 1.92

20 — 2GI(B)
Sta. 65+00 M
D.A.= 0.22 Ac
Grate El= 34.14 ft
Invert= 30.39 ft
Depth= 3.74

21 — OPEN END
Sta. 66+50 LT
D.A.= 2.59 Ac
Grate El= 30.37 ft
Invert= 30.37 ft
Depth= 0.0

22 — 2GI(B)
Sta. 66+50 M
D.A.= 0.21 Ac
Grate El= 33.72 ft
Invert= 29.63 ft
Depth= 4.08

NOTES: SEE SHEET NOS. 54-55 FOR -L- PROFILE.
ALL DRIVEWAY RADII ARE 20' UNLESS OTHERWISE NOTED.

8/1/2005
10:33:09 AM

REVISIONS

PROJECT REFERENCE NO.	SHEET NO.
R-2404A	9
R/W SHEET NO.	
ROADWAY DESIGN	HYDRAULICS ENGINEER

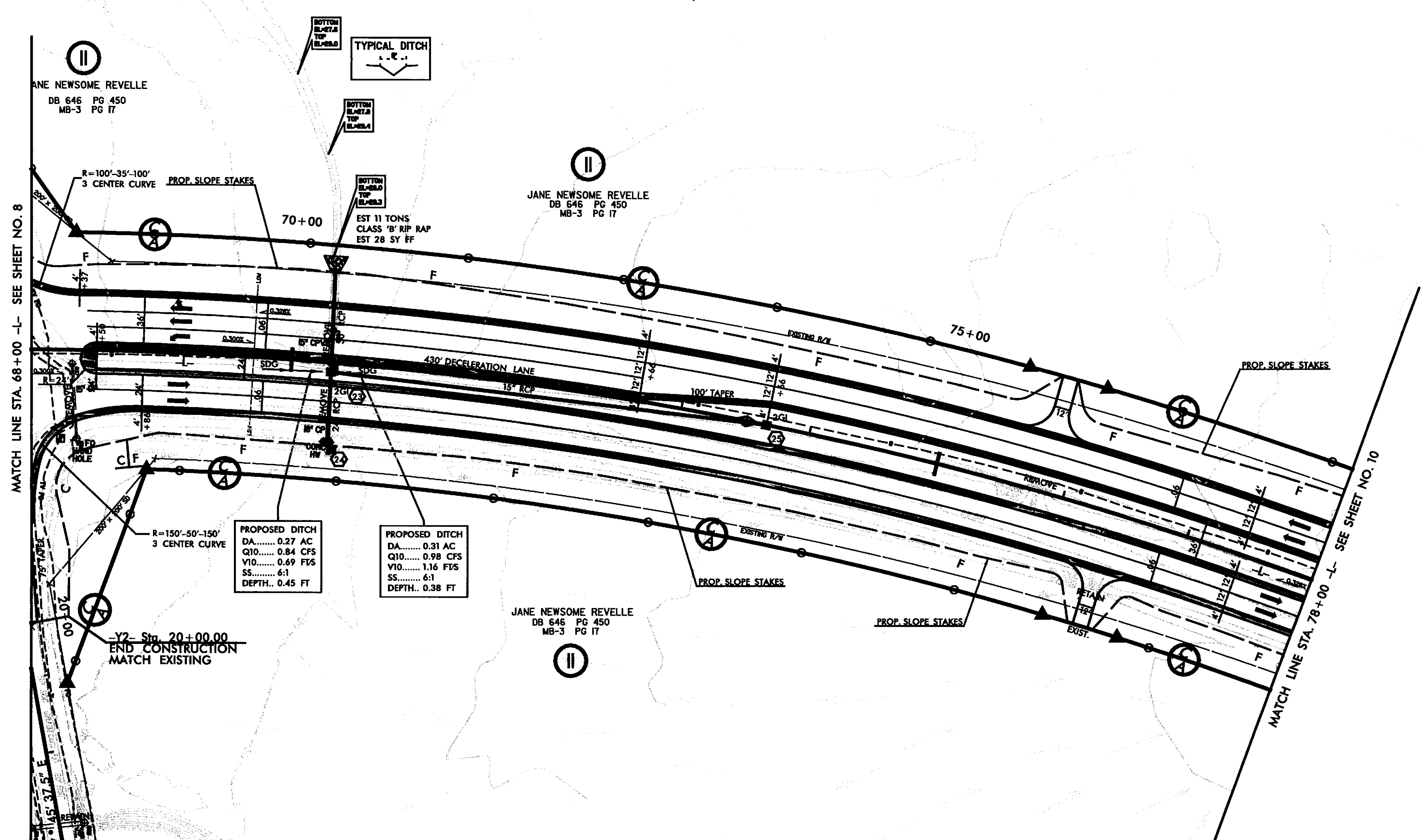
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

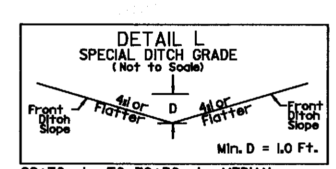
HDR Engineering, Inc. of the Carolinas
3733 National Drive, Suite 207 Raleigh, N.C. 27612

BARNHILL CONTRACTING COMPANY

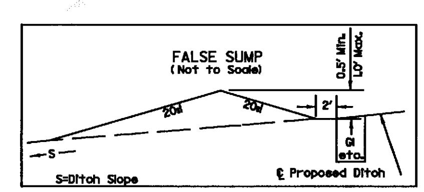
-L-

PI	=	69+00.63
Δ	=	66° 46' 43.5" (RT)
Dc	=	2° 01' 28.5"
θs	=	2° 25' 46.2"
Ls	=	240.00'
Ts	=	1,985.84'
Lc	=	3,058.39'
Rc	=	2,830.00'
LT	=	160.02'
ST	=	80.01'
e	=	0.06
DS	=	60 mph





69+70 -L- TO 70+30 -L- MEDIAN
70+30 -L- TO 70+50 -L- MEDIAN



(23) 2GI(B)
Sta. 70+30 M
D.A.= 0.57 Ac
Grate El= 32.51 ft
Invert= 28.15 ft
Depth= 4.36

(24) OPEN END
Sta. 70+30 RT
D.A.= 3.5 Ac
Grate El= 28.26 ft
Invert= 28.26 ft
Depth= 0.0

(25) 2GI(B)
Sta. 73+66 M
D.A.= 0.93 Ac
Grate El= 32.41 ft
Invert= 29.66 ft
Depth= 2.75

NOTES: SEE SHEET NO. 55 FOR -L- PROFILE.
SEE SHEET NO. 74 FOR -Y2- PROFILE.
ALL DRIVEWAY RADII ARE 20' UNLESS OTHERWISE NOTED.

8/2/2005 10:33:39 AM

PROJECT REFERENCE NO.	SHEET NO.
R-2404A	10
R/W SHEET NO.	
ROADWAY DESIGN	HYDRAULICS ENGINEER

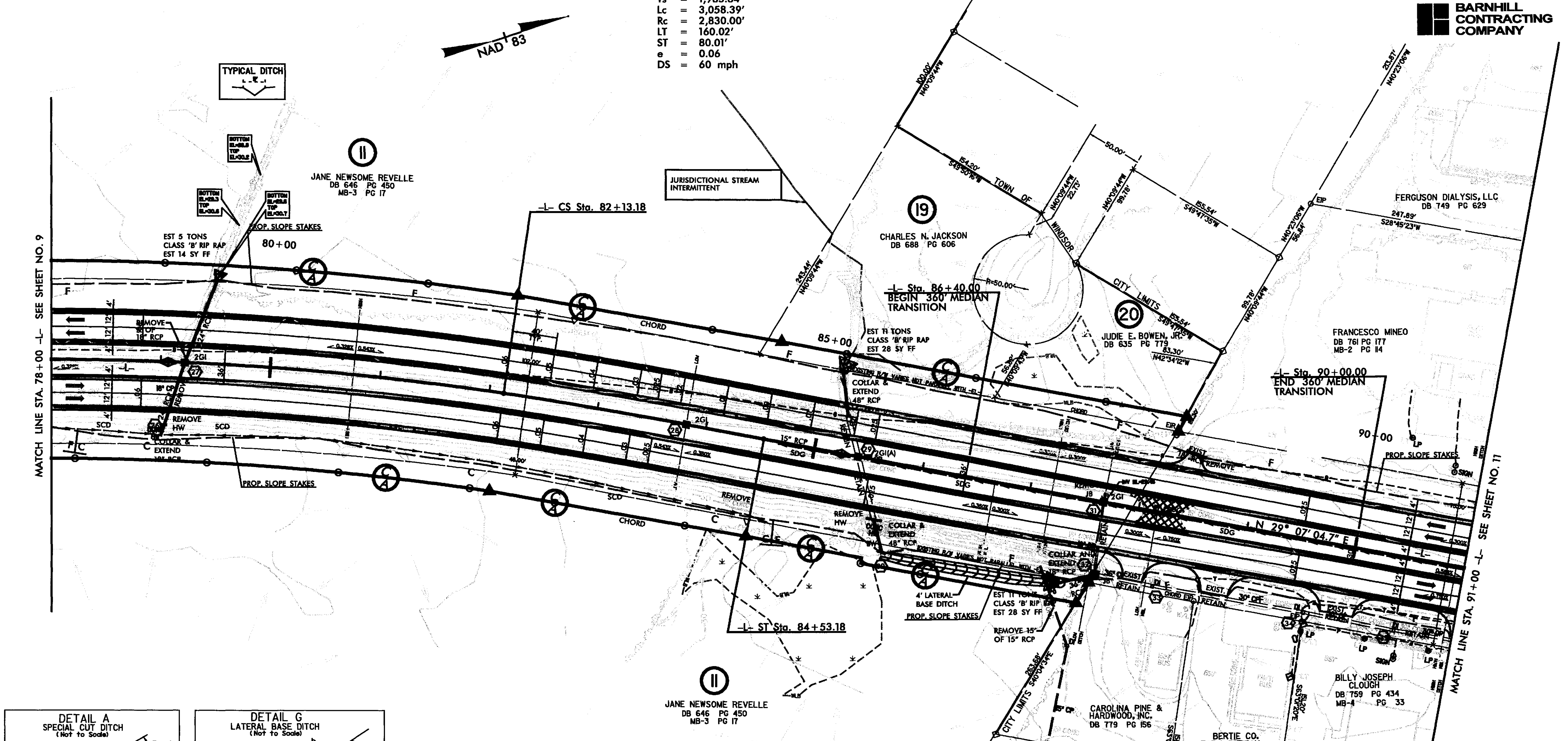
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

HDR Engineering, Inc. of the Carolinas
3733 National Drive, Suite 207 Raleigh, N.C. 27612

BARNHILL CONTRACTING COMPANY

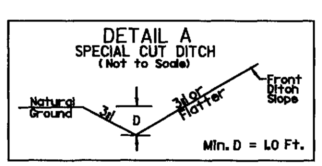
REVISIONS

-L-
PI = 69+00.63
Δ = 66° 46' 43.5" (RT)
Dc = 2° 01' 28.5"
θs = 2° 25' 46.2"
Ls = 240.00'
Ts = 1,985.84'
Lc = 3,058.39'
Rc = 2,830.00'
LT = 160.02'
ST = 80.01'
e = 0.06
DS = 60 mph

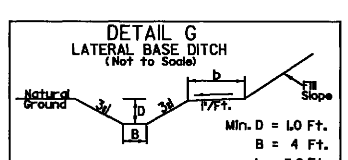


NAD 83
TYPICAL DITCH
JANE NEWSOME REVELLE
DB 646 PG 450
MB-3 PG 17
CHARLES N. JACKSON
DB 688 PG 606
JUDIE E. BOWEN, JR.
DB 635 PG 779
FERGUSON DIALYSIS, LLC
DB 749 PG 629
FRANCESCO MINEO
DB 761 PG 177
MB-2 PG 114
BILLY JOSEPH CLOUGH
DB 759 PG 434
MB-4 PG 33
CAROLINA PINE & HARDWOOD, INC.
DB 779 PG 156
BERTIE CO. FARM BUREAU
DB 581 PG 409
MB-4 PG 4
JURISDICTIONAL STREAM INTERMITTENT
-L- CS Sta. 82+13.18
-L- ST Sta. 84+53.18
-L- Sta. 86+40.00 BEGIN 360' MEDIAN TRANSITION
-L- Sta. 90+00.00 END 360' MEDIAN TRANSITION
N 29° 07' 04.7" E
MATCH LINE STA. 78+00 -L- SEE SHEET NO. 9
MATCH LINE STA. 91+00 -L- SEE SHEET NO. 11
EST 5 TONS CLASS 'B' RIP RAP EST 14 SY FF
EST 11 TONS CLASS 'B' RIP RAP EST 28 SY FF
PROP. SLOPE STAKES
TOWN OF WINDSOR CITY LIMITS
4' LATERAL BASE DITCH

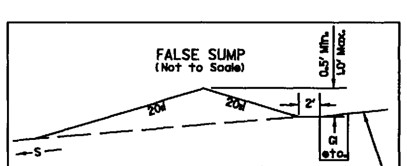
SITE 2

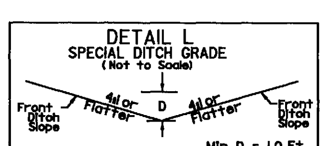


78+00 -L- TO 79+00 -L- RT
79+00 -L- TO 80+50 -L- RT
80+50 -L- TO 84+00 -L- RT
84+00 -L- TO 84+69 -L- RT



85+55 -L- TO 87+45 -L- RT



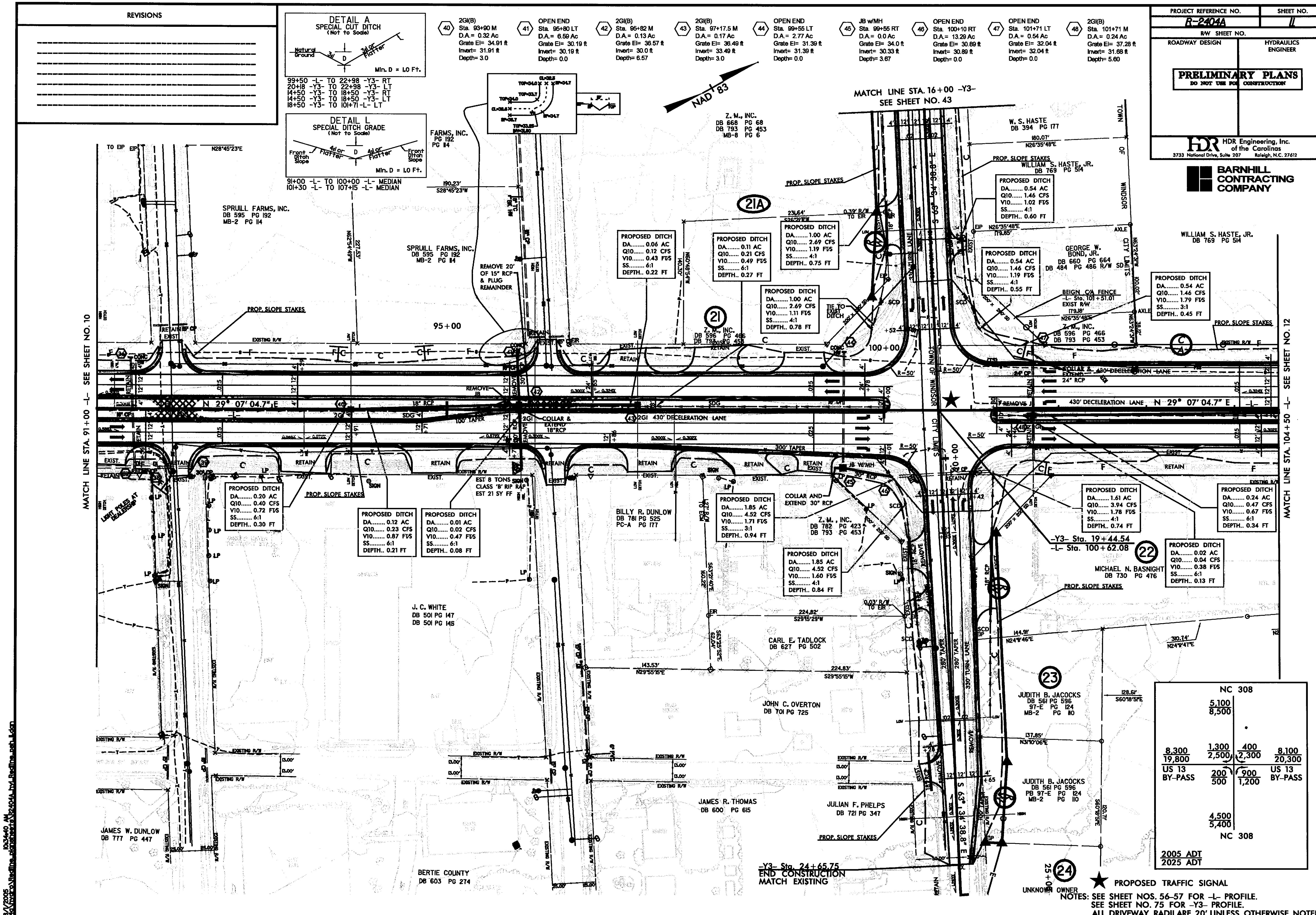


84+70 -L- TO 85+34 -L- MEDIAN

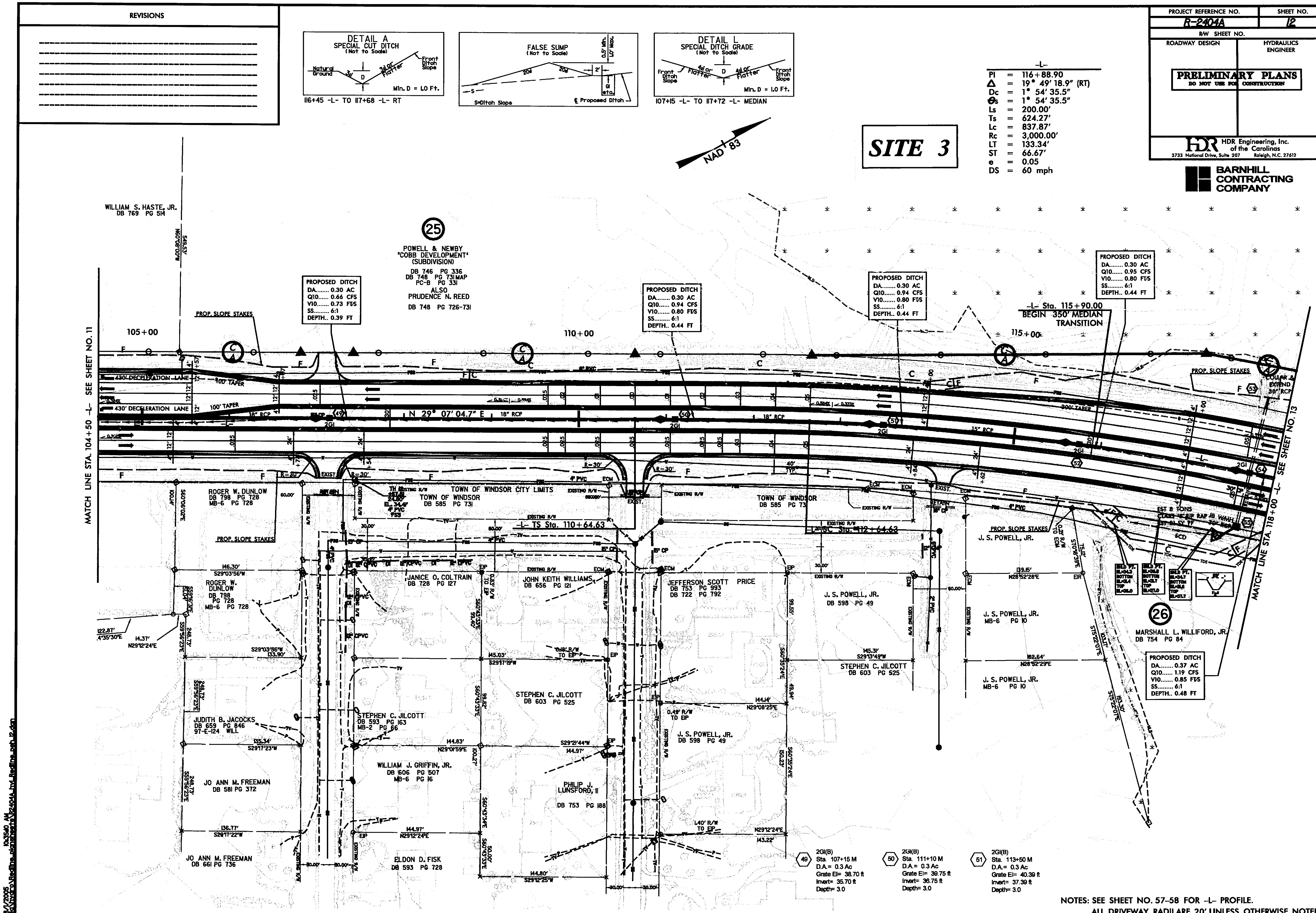
No.	Type	Sta.	D.A.	Grate El	Invert	Depth
26	OPEN END	79+00 RT	3.02 Ac	29.84 ft	29.84 ft	0.0
27	2GI(B)	79+21 M	0.23 Ac	34.23 ft	29.35 ft	4.88
28	2GI(B)	83+82 M	0.58 Ac	33.77 ft	30.77 ft	3.0
29	2GI(A)	85+34 M	0.15 Ac	34.13 ft	25.95 ft	8.18
30	OPEN END	85+55 RT	76.64 Ac	26.50 ft	26.50 ft	0.0
31	2GI(B)	87+67 M	0.27 Ac	34.48 ft	31.48 ft	3.0
32	JB w/ Slab	87+72 RT	0.0 Ac	31.93 ft	27.16 ft	4.77
33	2GI(B)	88+25 RT	0.22 Ac	31.80 ft	27.60 ft	4.20
34	2GI(B)	89+64 RT	0.21 Ac	31.62 ft	27.52 ft	4.10
35	2GI(B)	90+48 RT	0.2 Ac	31.38 ft	27.97 ft	3.41

NOTES: SEE SHEET NO. 55-56 FOR -L- PROFILE.
ALL DRIVEWAY RADII ARE 20' UNLESS OTHERWISE NOTED.
DO NOT PLACE ROCK IN BED OF JURISDICTIONAL STREAMS.

8/1/2005



REVISIONS
PROJECT REFERENCE NO. R-2404A
SHEET NO. 11
R/W SHEET NO.
ROADWAY DESIGN
HYDRAULICS ENGINEER
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION
HDR Engineering, Inc. of the Carolinas
3733 National Drive, Suite 207 Raleigh, N.C. 27612
BARNHILL CONTRACTING COMPANY
DETAIL A
SPECIAL CUT DITCH
(Not to Scale)
Natural Ground
3:1
D
4:1 or Flatter
Min. D = 1.0 Ft.
99+50 -L- TO 22+98 -Y3- RT
20+18 -Y3- TO 22+98 -Y3- LT
14+50 -Y3- TO 18+50 -Y3- RT
14+50 -Y3- TO 18+50 -Y3- LT
18+50 -Y3- TO 101+71 -L- LT
DETAIL L
SPECIAL DITCH GRADE
(Not to Scale)
Front Ditch Slope
4:1 or Flatter
D
Min. D = 1.0 Ft.
91+00 -L- TO 100+00 -L- MEDIAN
101+30 -L- TO 107+15 -L- MEDIAN
40 2GI(B) Sta. 93+90 M D.A.= 0.32 Ac Grate El= 34.91 ft Invert= 31.91 ft Depth= 3.0
41 OPEN END Sta. 95+80 LT D.A.= 6.59 Ac Grate El= 30.19 ft Invert= 30.19 ft Depth= 0.0
42 2GI(B) Sta. 95+82 M D.A.= 0.13 Ac Grate El= 36.57 ft Invert= 30.0 ft Depth= 6.57
43 2GI(B) Sta. 97+17.5 M D.A.= 0.17 Ac Grate El= 36.49 ft Invert= 33.49 ft Depth= 3.0
44 OPEN END Sta. 99+55 LT D.A.= 2.77 Ac Grate El= 31.39 ft Invert= 31.39 ft Depth= 0.0
45 JB w/MH Sta. 99+55 RT D.A.= 0.0 Ac Grate El= 34.0 ft Invert= 30.33 ft Depth= 3.67
46 OPEN END Sta. 100+10 RT D.A.= 13.29 Ac Grate El= 30.89 ft Invert= 30.89 ft Depth= 0.0
47 OPEN END Sta. 101+71 LT D.A.= 0.54 Ac Grate El= 32.04 ft Invert= 32.04 ft Depth= 0.0
48 2GI(B) Sta. 101+71 M D.A.= 0.24 Ac Grate El= 37.28 ft Invert= 31.68 ft Depth= 5.60
NAD 83
MATCH LINE STA. 16+00 -Y3- SEE SHEET NO. 43
MATCH LINE STA. 91+00 -L- SEE SHEET NO. 10
MATCH LINE STA. 104+50 -L- SEE SHEET NO. 12
SPRUILL FARMS, INC. DB 595 PG 192 MB-2 PG 114
Z. M., INC. DB 668 PG 68 DB 793 PG 453 MB-8 PG 6
W. S. HASTE DB 394 PG 177
WILLIAM S. HASTE, JR. DB 769 PG 514
GEORGE W. BOND, JR. DB 660 PG 664 DB 484 PG 486 R/W SD
Z. M., INC. DB 596 PG 466 DB 793 PG 453
BILLY R. DUNLOW DB 781 PG 525 PC-A PG 177
Z. M., INC. DB 782 PG 423 DB 793 PG 453
J. C. WHITE DB 501 PG 147 DB 501 PG 145
CARL E. TADLOCK DB 627 PG 502
JOHN C. OVERTON DB 701 PG 725
JAMES R. THOMAS DB 600 PG 615
JULIAN F. PHELPS DB 721 PG 347
JAMES W. DUNLOW DB 777 PG 447
BERTIE COUNTY DB 603 PG 274
MICHAEL N. BASNIGHT DB 730 PG 476
JUDITH B. JACOCKS DB 561 PG 596 97-E PG 124 MB-2 PG 110
JUDITH B. JACOCKS DB 561 PG 596 PB 97-E PG 124 MB-2 PG 110
UNKNOWN OWNER
TOWN OF WINDSOR CITY LIMITS
N 29° 07' 04.7" E
430' DECELERATION LANE
-Y3- Sta. 19+44.54 -L- Sta. 100+62.08
-Y3- Sta. 24+65.75 END CONSTRUCTION MATCH EXISTING
PROP. SLOPE STAKES
PROPOSED DITCH
NC 308
5,100 / 8,500
8,300 / 19,800
1,300 / 2,500
400 / 2,300
8,100 / 20,300
US 13 BY-PASS
200 / 500
900 / 1,200
US 13 BY-PASS
4,500 / 5,400
NC 308
2005 ADT
2025 ADT
★ PROPOSED TRAFFIC SIGNAL
NOTES: SEE SHEET NOS. 56-57 FOR -L- PROFILE.
SEE SHEET NO. 75 FOR -Y3- PROFILE.
ALL DRIVEWAY RADII ARE 20' UNLESS OTHERWISE NOTED.
8/1/2005


REVISIONS
PROJECT REFERENCE NO. R-2404A
SHEET NO. 12
R/W SHEET NO.
ROADWAY DESIGN
HYDRAULICS ENGINEER
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION
HDR Engineering, Inc. of the Carolinas
3733 National Drive, Suite 207 Raleigh, N.C. 27612
BARNHILL CONTRACTING COMPANY
DETAIL A
SPECIAL CUT DITCH
(Not to Scale)
Min. D = 1.0 Ft.
116+45 -L- TO 117+68 -L- RT
FALSE SUMP
(Not to Scale)
S=Ditch Slope
℄ Proposed Ditch
DETAIL L
SPECIAL DITCH GRADE
(Not to Scale)
Min. D = 1.0 Ft.
107+15 -L- TO 117+72 -L- MEDIAN
NAD 83
SITE 3
-L-
PI = 116+88.90
Δ = 19° 49' 18.9" (RT)
Dc = 1° 54' 35.5"
θs = 1° 54' 35.5"
Ls = 200.00'
Ts = 624.27'
Lc = 837.87'
Rc = 3,000.00'
LT = 133.34'
ST = 66.67'
e = 0.05
DS = 60 mph
WILLIAM S. HASTE, JR.
DB 769 PG 514
25
POWELL & NEWBY
"COBB DEVELOPMENT"
(SUBDIVISION)
DB 746 PG 336
DB 748 PG 73 (MAP
PC-B PG 331
ALSO
PRUDENCE N. REED
DB 748 PG 726-731
PROPOSED DITCH
DA....... 0.30 AC
Q10...... 0.66 CFS
V10...... 0.73 FT/S
SS......... 6:1
DEPTH... 0.39 FT
PROPOSED DITCH
DA....... 0.30 AC
Q10...... 0.94 CFS
V10...... 0.80 FT/S
SS......... 6:1
DEPTH... 0.44 FT
PROPOSED DITCH
DA....... 0.30 AC
Q10...... 0.94 CFS
V10...... 0.80 FT/S
SS......... 6:1
DEPTH... 0.44 FT
PROPOSED DITCH
DA....... 0.30 AC
Q10...... 0.95 CFS
V10...... 0.80 FT/S
SS......... 6:1
DEPTH... 0.44 FT
-L- Sta. 115+90.00
BEGIN 350' MEDIAN TRANSITION
105+00
110+00
115+00
PROP. SLOPE STAKES
430' DECELERATION LANE
100' TAPER
N 29° 07' 04.7" E
18" RCP
15" RCP
MATCH LINE STA. 104+50 -L- SEE SHEET NO. 11
MATCH LINE STA. 118+00 -L- SEE SHEET NO. 13
COLLAR & EXTEND 30" RCP
TOWN OF WINDSOR CITY LIMITS
TOWN OF WINDSOR
DB 585 PG 731
TOWN OF WINDSOR
DB 585 PG 731
-L- TS Sta. 110+64.63
-L- SC Sta. 112+64.63
ROGER W. DUNLOW
DB 798 PG 728
MB-6 PG 728
ROGER W. DUNLOW
DB 798 PG 728
MB-6 PG 728
JANICE O. COLTRAIN
DB 728 PG 127
JOHN KEITH WILLIAMS
DB 656 PG 121
JEFFERSON SCOTT PRICE
DB 753 PG 993
DB 722 PG 792
J. S. POWELL, JR.
DB 598 PG 49
J. S. POWELL, JR.
J. S. POWELL, JR.
MB-6 PG 10
J. S. POWELL, JR.
MB-6 PG 10
26
MARSHALL L. WILLIFORD, JR.
DB 754 PG 84
PROPOSED DITCH
DA....... 0.37 AC
Q10...... 1.19 CFS
V10...... 0.85 FT/S
SS......... 6:1
DEPTH... 0.48 FT
STEPHEN C. JILCOTT
DB 603 PG 525
STEPHEN C. JILCOTT
DB 603 PG 525
STEPHEN C. JILCOTT
DB 593 PG 163
MB-2 PG 66
JUDITH B. JACOCKS
DB 659 PG 646
97-E-124 WILL
JO ANN M. FREEMAN
DB 581 PG 372
JO ANN M. FREEMAN
DB 661 PG 736
WILLIAM J. GRIFFIN, JR.
DB 606 PG 507
MB-6 PG 16
PHILIP J. LUNSFORD, II
DB 753 PG 188
J. S. POWELL, JR.
DB 598 PG 49
ELDON D. FISK
DB 593 PG 728
49 2GI(B) Sta. 107+15 M D.A.= 0.3 Ac Grate El= 38.70 ft Invert= 35.70 ft Depth= 3.0
50 2GI(B) Sta. 111+10 M D.A.= 0.3 Ac Grate El= 39.75 ft Invert= 36.75 ft Depth= 3.0
51 2GI(B) Sta. 113+50 M D.A.= 0.3 Ac Grate El= 40.39 ft Invert= 37.39 ft Depth= 3.0
NOTES: SEE SHEET NO. 57-58 FOR -L- PROFILE.
ALL DRIVEWAY RADII ARE 20' UNLESS OTHERWISE NOTED.
8/1/2005
10:35:40 AM

REVISIONS

PROJECT REFERENCE NO.	SHEET NO.
R-2404A	14
R/W SHEET NO.	
ROADWAY DESIGN	HYDRAULICS ENGINEER

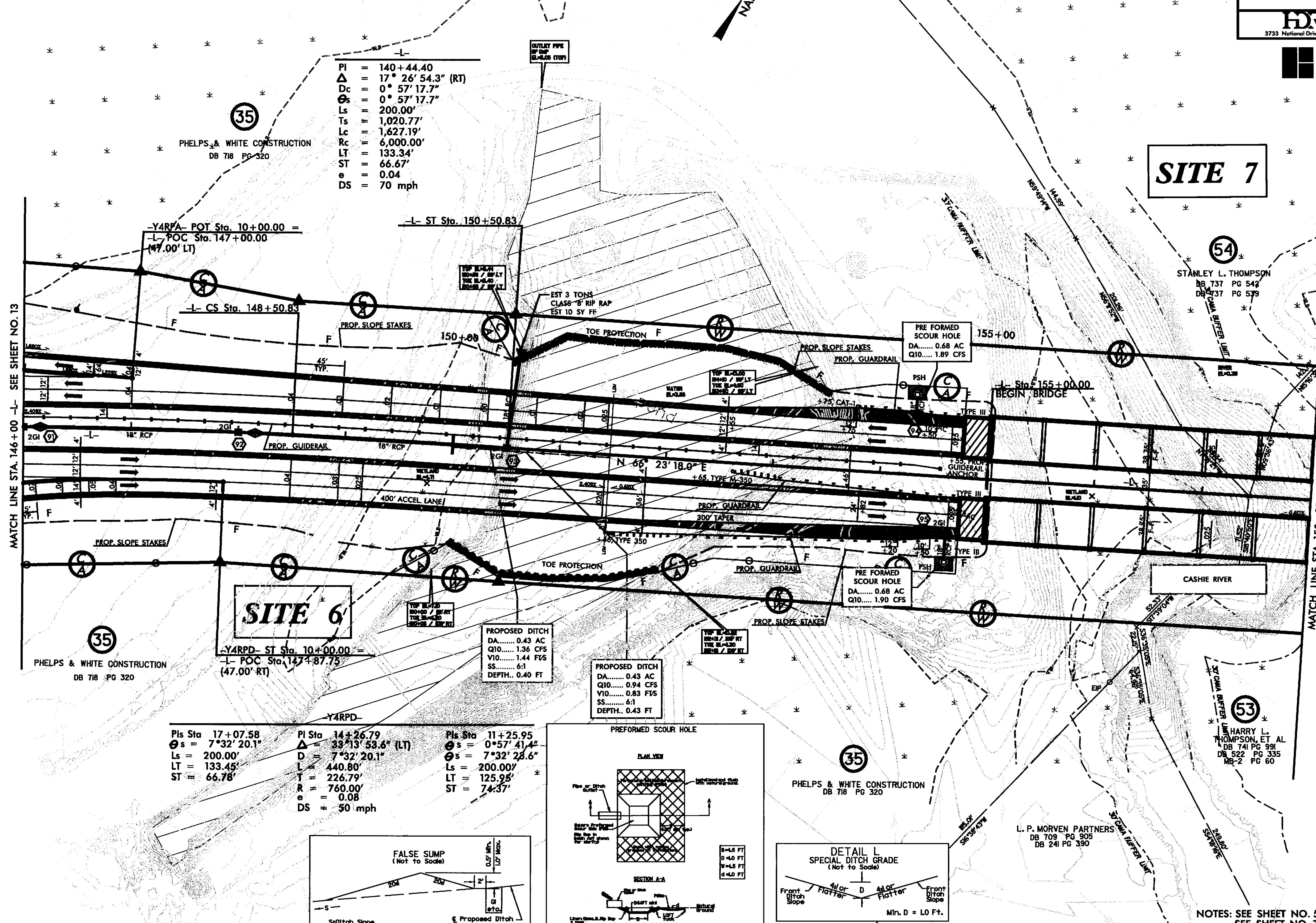
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

HDR Engineering, Inc. of the Carolinas
3733 National Drive, Suite 207 Raleigh, N.C. 27612

BARNHILL CONTRACTING COMPANY

91	92	93
2GI(B) Sta. 146+00 D.A.= 0.47 Ac Grate El= 16.92 ft Invert= 13.92 ft Depth= 3.0	2GI(B) Sta. 148+00 D.A.= 0.38 Ac Grate El= 14.46 ft Invert= 11.46 ft Depth= 3.0	2GI(B) Sta. 150+50 D.A.= 0.43 Ac Grate El= 12.60 ft Invert= 9.60 ft Depth= 3.0

94	95
2GI(B)w/ FL GR Sta. 154+30 LT D.A.= 0.68 Ac Grate El= 16.22 ft Invert= 13.22 ft Depth= 3.0	2GI(B)w/ FL GR Sta. 154+55 RT D.A.= 0.68 Ac Grate El= 16.34 ft Invert= 13.34 ft Depth= 3.0



NAD 83
-L-
PI = 140+44.40
Δ = 17° 26' 54.3" (RT)
Dc = 0° 57' 17.7"
θs = 0° 57' 17.7"
Ls = 200.00'
Ts = 1,020.77'
Lc = 1,627.19'
Rc = 6,000.00'
LT = 133.34'
ST = 66.67'
e = 0.04
DS = 70 mph
35
PHELPS & WHITE CONSTRUCTION
DB 718 PG 320
SITE 7
54
STANLEY L. THOMPSON
DB 737 PG 542
DB 737 PG 539
-Y4RPA- POT Sta. 10+00.00 =
-L- POC Sta. 147+00.00
(47.00' LT)
-L- ST Sta. 150+50.83
-L- CS Sta. 148+50.83
OUTLET PIPE
EST 3 TONS CLASS 'B' RIP RAP EST 10 SY FF
PROP. SLOPE STAKES
TOE PROTECTION
150+00
155+00
PRE FORMED SCOUR HOLE
DA....... 0.68 AC
Q10..... 1.89 CFS
PROP. GUARDRAIL
-L- Sta. 155+00.00
BEGIN BRIDGE
MATCH LINE STA. 146+00 -L- SEE SHEET NO. 13
MATCH LINE STA. 158+00 -L- SEE SHEET NO. 15
18" RCP
PROP. GUIDERAIL
N 66° 23' 18.0" E
400' ACCEL. LANE
300' TAPER
PROP. GUARDRAIL
TYPE 350
TYPE III
CASHIE RIVER
SITE 6
PRE FORMED SCOUR HOLE
DA....... 0.68 AC
Q10..... 1.90 CFS
PROPOSED DITCH
DA....... 0.43 AC
Q10...... 1.36 CFS
V10...... 1.44 FT/S
SS........ 6:1
DEPTH.. 0.40 FT
PROPOSED DITCH
DA....... 0.43 AC
Q10...... 0.94 CFS
V10...... 0.83 FT/S
SS........ 6:1
DEPTH.. 0.43 FT
-Y4RPD- ST Sta. 10+00.00 =
-L- POC Sta. 147+87.75
(47.00' RT)
35
PHELPS & WHITE CONSTRUCTION
DB 718 PG 320
53
HARRY L. THOMPSON, ET AL
DB 741 PG 991
DB 522 PG 335
MB-2 PG 60
35
PHELPS & WHITE CONSTRUCTION
DB 718 PG 320
L. P. MORVEN PARTNERS
DB 709 PG 905
DB 241 PG 390
30' CAMA BUFFER LIMIT
-Y4RPD-
PIs Sta 17+07.58
θs = 7°32' 20.1"
Ls = 200.00'
LT = 133.45'
ST = 66.78'
PI Sta 14+26.79
Δ = 33°13' 53.6" (LT)
D = 7°32' 20.1"
L = 440.80'
T = 226.79'
R = 760.00'
e = 0.08
DS = 50 mph
PIs Sta 11+25.95
θs = 0°57' 41.4"
θs = 7°32' 28.6"
Ls = 200.00'
LT = 125.95'
ST = 74.37'
FALSE SUMP
(Not to Scale)
S=Ditch Slope
℄ Proposed Ditch
PREFORMED SCOUR HOLE
PLAN VIEW
SECTION A-A
DETAIL L
SPECIAL DITCH GRADE
(Not to Scale)
Front Ditch Slope
4:1 or Flatter
D
Min. D = 1.0 Ft.
150+00 -L- TO 151+47 -L- MEDIAN

NOTES: SEE SHEET NO. 59-60 FOR -L- PROFILE
SEE SHEET NO. 77 FOR -Y4RPA- PROFILE.
SEE SHEET NO. 79 FOR -Y4RPD- PROFILE.
SEE SHEET NO. 2-J FOR STRUCTURE DETAIL.
DO NOT PLACE ROCK IN BED OF JURISDICTIONAL STREAMS.

8/1/2005 10:36:27 AM

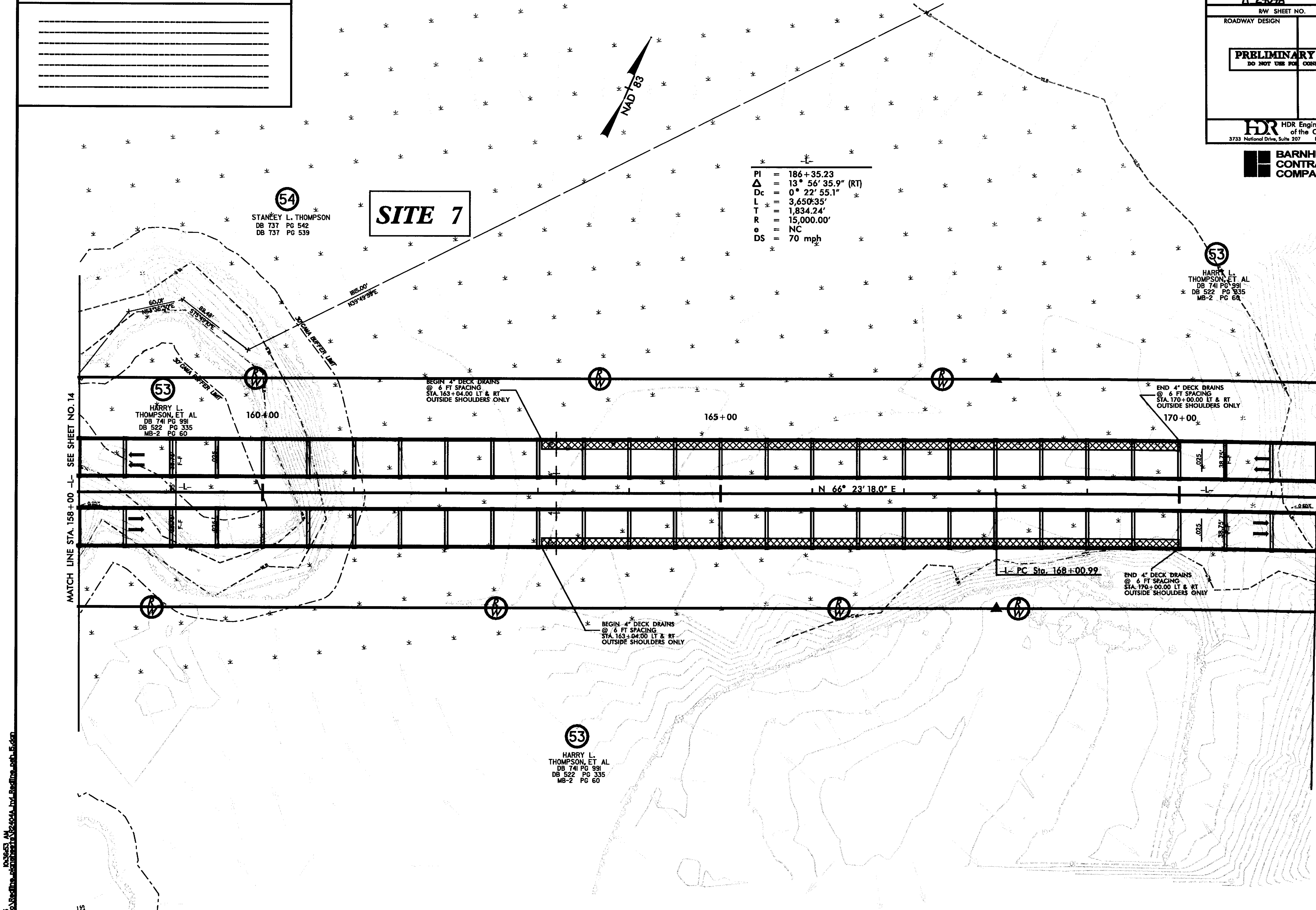
PROJECT REFERENCE NO.	SHEET NO.
R-2404A	15
R/W SHEET NO.	
ROADWAY DESIGN	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

HDR Engineering, Inc. of the Carolinas
3733 National Drive, Suite 207 Raleigh, N.C. 27612

BARNHILL CONTRACTING COMPANY

REVISIONS



SITE 7
NAD 83
-L-
PI = 186+35.23
Δ = 13° 56' 35.9" (RT)
Dc = 0° 22' 55.1"
L = 3,650.35'
T = 1,834.24'
R = 15,000.00'
e = NC
DS = 70 mph
54
STANLEY L. THOMPSON
DB 737 PG 542
DB 737 PG 539
53
HARRY L. THOMPSON, ET AL
DB 741 PG 991
DB 522 PG 335
MB-2 PG 60
1815.00'
N39°49'39"E
30' CAMA BUFFER LIMIT
BEGIN 4" DECK DRAINS @ 6 FT SPACING STA. 163+04.00 LT & RT OUTSIDE SHOULDERS ONLY
END 4" DECK DRAINS @ 6 FT SPACING STA. 170+00.00 LT & RT OUTSIDE SHOULDERS ONLY
160+00
165+00
170+00
N 66° 23' 18.0" E
-L- PC Sta. 168+00.99
MATCH LINE STA. 158+00 -L- SEE SHEET NO. 14
MATCH LINE STA. 171+50 -L- SEE SHEET NO. 16

NOTES: SEE SHEET NO. 60 FOR -L- PROFILE.

8/1/2005 10:36:53 AM

REVISIONS

PROJECT REFERENCE NO.	SHEET NO.
R-2404A	16
RW SHEET NO.	
ROADWAY DESIGN	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

HDR Engineering, Inc. of the Carolinas
3733 National Drive, Suite 207 Raleigh, N.C. 27612

BARNHILL CONTRACTING COMPANY

-L-
PI = 186+35.23
Δ = 13° 56' 35.9" (RT)
Dc = 0° 22' 55.1"
L = 3,650.35'
T = 1,834.24'
R = 15,000.00'
e = NC
DS = 70 mph

NAD 83

(96) 2GI(B)w/ FL GR
Sta. 172+38 LT
D.A.= 0.04 Ac
Grate El= 26.74 ft
Invert= 23.74 ft
Depth= 3.0

(97) 2GI(B)w/ FL GR
Sta. 172+86 LT
D.A.= 0.16 Ac
Grate El= 27.05 ft
Invert= 21.76 ft
Depth= 5.29

(98) 2GI(B)w/ FL GR
Sta. 172+38 RT
D.A.= 0.04 Ac
Grate El= 26.74 ft
Invert= 23.74 ft
Depth= 3.0

(99) 2GI(B)
Sta. 172+86 M
D.A.= 0.26 Ac
Grate El= 25.32 ft
Invert= 22.32 ft
Depth= 3.0

(100) 2GI(B)w/ FL GR
Sta. 172+86 RT
D.A.= 0.2 Ac
Grate El= 27.05 ft
Invert= 23.22 ft
Depth= 3.83

(101) 2GI(D)
Sta. 175+00 M
D.A.= 0.66 Ac
Grate El= 26.62 ft
Invert= 24.45 ft
Depth= 2.17

(102) 2GI(B)
Sta. 181+15 M
D.A.= 0.25 Ac
Grate El= 29.74 ft
Invert= 26.74 ft
Depth= 3.0

SITE 8

(53) HARRY L. THOMPSON, ET AL
DB 741 PG 991
DB 522 PG 335
MB-2 PG 60

PROPOSED DITCH
DA..... 0.05 AC
Q10..... 0.10 CFS
V10..... 0.51 FT/S
SS..... 6:1
DEPTH.. 0.18 FT

-L- Sta. 172+00.00
END BRIDGE

PRE FORMED SCOUR HOLE
DA..... 0.20 AC
Q10..... 0.99 CFS

PROP. SLOPE STAKES

175+00

180+00

2GI W/D FLAT GRATE (96)

18" RCP

2GI W/ FLAT GRATE

PROP. GUARDRAIL

+25, TYPE 350

15:1

PROP. GUARDRAIL

W-35 TYPE M-350

16:1 TAPER

+45 PROP. GUIDERAIL ANCHOR

TYPE III BARRICADE

2GI W/ FLAT GRATE

PROP. CABLE GUIDERAIL

2GI

LATERAL 'V' DITCH

EST 3 TONS CLASS 'B' RIP RAP
EST 10 SY FF

PROP. SLOPE STAKES

PRE FORMED SCOUR HOLE
DA..... 0.20 AC
Q10..... 0.99 CFS

PROPOSED DITCH
DA..... 3.15 AC
Q10..... 6.95 CFS
V10..... 2.62 FT/S
SS..... 3:1
DEPTH.. 0.94 FT

PROPOSED DITCH
DA..... 3.15 AC
Q10..... 6.95 CFS
V10..... 3.62 FT/S
SS..... 3:1
DEPTH.. 0.80 FT

EST 3 TONS CLASS 'B' RIP RAP
EST 10 SY FF

PROP. SLOPE STAKES

DITCH STOPS AND BEGINS LOW AREA

(53) HARRY L. THOMPSON, ET AL
DB 741 PG 991
DB 522 PG 335
MB-2 PG 60

MATCH LINE STA. 171+50 -L- SEE SHEET NO. 15

MATCH LINE STA. 184+50 -L- SEE SHEET NO. 17

PREFORMED SCOUR HOLE

PLAN VIEW

SECTION A-A

D=4.5 FT
D 4.0 FT
W=4.5 FT
d 4.0 FT

FALSE SUMP
(Not to Scale)

S=Ditch Slope

℄ Proposed Ditch

DETAIL L
SPECIAL DITCH GRADE
(Not to Scale)

Front Ditch Slope

4H or Flatter

Min. D = 1.0 Ft.

I72+50 -L- TO I72+86 -L- MEDIAN

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

Natural ground

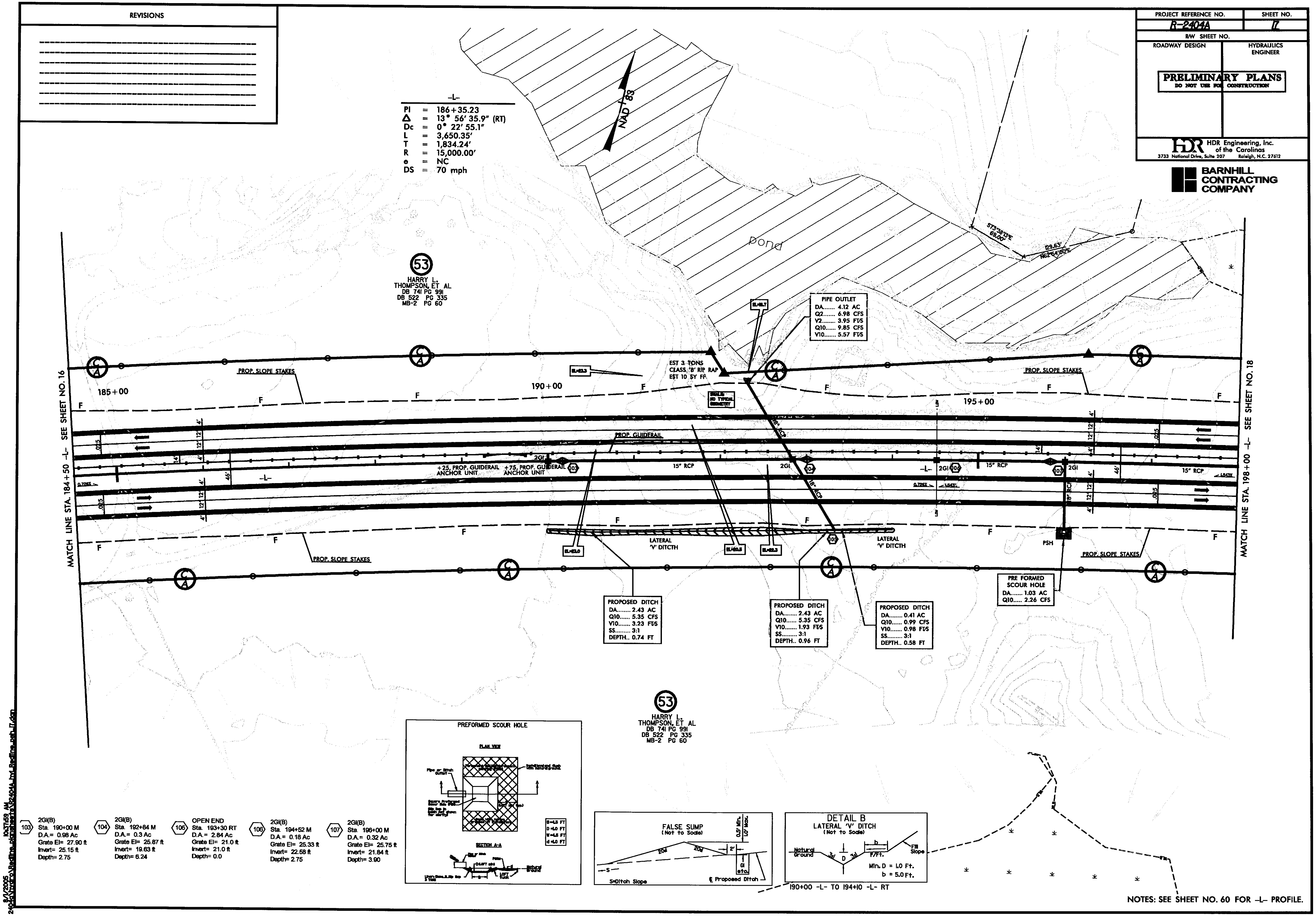
Fill Slope

Min. D = 1.0 Ft.
b = 5.0 Ft.

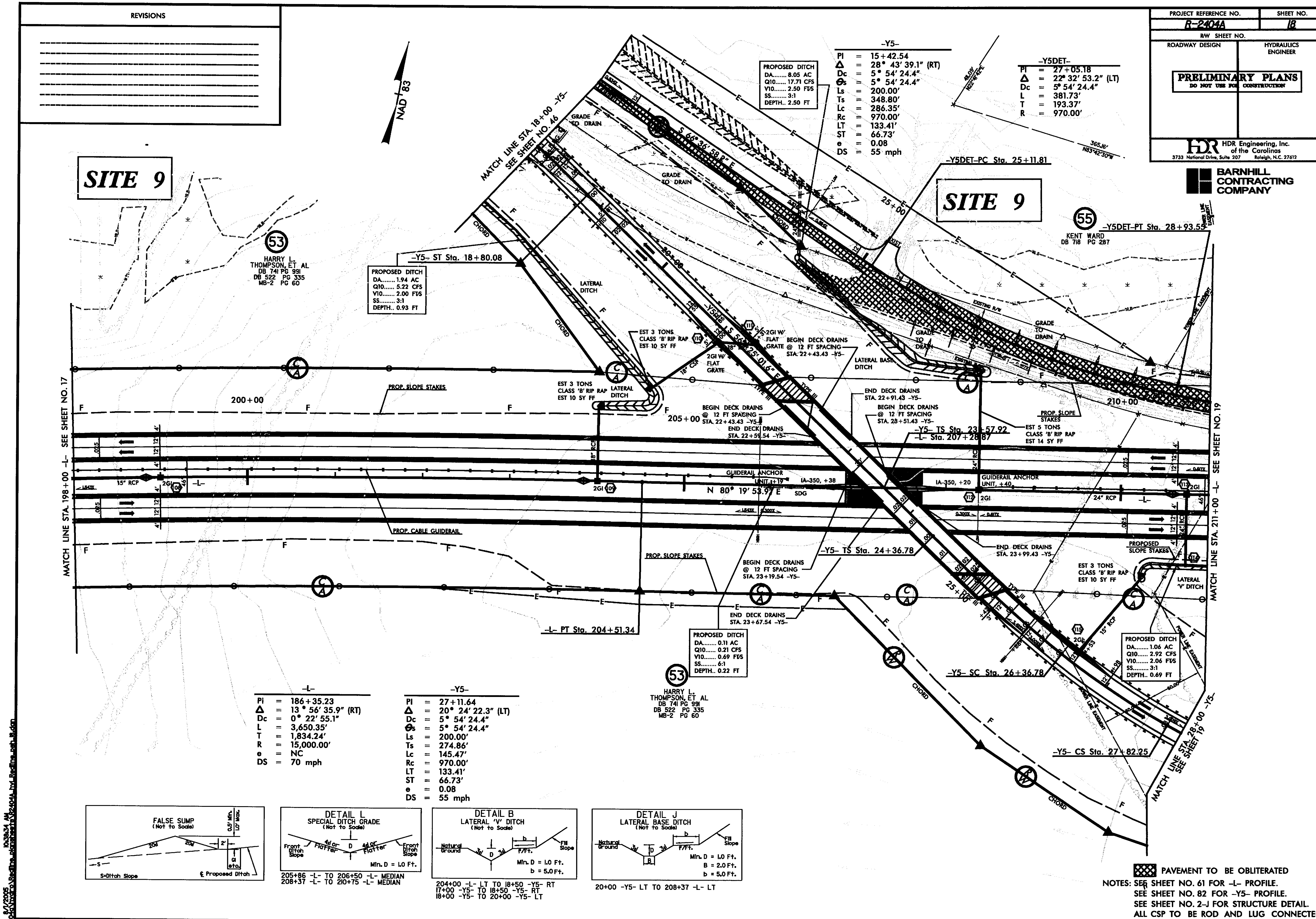
I73+46 -L- TO I75+00 -L- RT

NOTES: SEE SHEET NO. 60-61 FOR -L- PROFILE.
SEE SHEET NO. 2-J FOR STRUCTURE DETAIL.
ALL CSP TO BE ROD AND LUG CONNECTED.

8/1/2005
10:37:25 AM
2404a_roadway_standards_20040401.dgn
2404a hyd Roadway Alignment



REVISIONS
PROJECT REFERENCE NO.
R-2404A
SHEET NO.
17
R/W SHEET NO.
ROADWAY DESIGN
HYDRAULICS ENGINEER
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION
HDR Engineering, Inc. of the Carolinas
3733 National Drive, Suite 207 Raleigh, N.C. 27612
BARNHILL CONTRACTING COMPANY
-L-
PI = 186+35.23
Δ = 13° 56' 35.9" (RT)
Dc = 0° 22' 55.1"
L = 3,650.35'
T = 1,834.24'
R = 15,000.00'
e = NC
DS = 70 mph
NAD 83
Pond
53
HARRY L. THOMPSON, ET AL
DB 741 PG 991
DB 522 PG 335
MB-2 PG 60
PIPE OUTLET
DA....... 4.12 AC
Q2....... 6.98 CFS
V2....... 3.95 FT/S
Q10...... 9.85 CFS
V10...... 5.57 FT/S
EST 3 TONS CLASS 'B' RIP RAP
EST 10 SY FF.
PROP. SLOPE STAKES
185+00
190+00
195+00
MATCH LINE STA. 184+50 -L- SEE SHEET NO. 16
MATCH LINE STA. 198+00 -L- SEE SHEET NO. 18
PROP. GUIDERAIL
+25, PROP. GUIDERAIL ANCHOR UNIT
+75, PROP. GUIDERAIL ANCHOR UNIT
15" RCP
18" RCP
2GI
LATERAL 'V' DITCH
PSH
PROPOSED DITCH
DA....... 2.43 AC
Q10...... 5.35 CFS
V10...... 3.23 FT/S
SS....... 3:1
DEPTH.. 0.74 FT
PROPOSED DITCH
DA....... 2.43 AC
Q10...... 5.35 CFS
V10...... 1.93 FT/S
SS....... 3:1
DEPTH.. 0.96 FT
PROPOSED DITCH
DA....... 0.41 AC
Q10...... 0.99 CFS
V10...... 0.98 FT/S
SS....... 3:1
DEPTH.. 0.58 FT
PRE FORMED SCOUR HOLE
DA....... 1.03 AC
Q10...... 2.26 CFS
PREFORMED SCOUR HOLE
PLAN VIEW
SECTION A-A
FALSE SUMP (Not to Scale)
S=Ditch Slope
℄ Proposed Ditch
DETAIL B
LATERAL 'V' DITCH (Not to Scale)
Natural Ground
Fill Slope
Min. D = 1.0 Ft.
b = 5.0 Ft.
190+00 -L- TO 194+10 -L- RT
103 2GI(B) Sta. 190+00 M D.A.= 0.98 Ac Grate El= 27.90 ft Invert= 25.15 ft Depth= 2.75
104 2GI(B) Sta. 192+84 M D.A.= 0.3 Ac Grate El= 25.87 ft Invert= 19.63 ft Depth= 6.24
105 OPEN END Sta. 193+30 RT D.A.= 2.84 Ac Grate El= 21.0 ft Invert= 21.0 ft Depth= 0.0
106 2GI(B) Sta. 194+52 M D.A.= 0.18 Ac Grate El= 25.33 ft Invert= 22.58 ft Depth= 2.75
107 2GI(B) Sta. 196+00 M D.A.= 0.32 Ac Grate El= 25.75 ft Invert= 21.84 ft Depth= 3.90
NOTES: SEE SHEET NO. 60 FOR -L- PROFILE.
8/1/2005



REVISIONS
PROJECT REFERENCE NO. R-2404A
SHEET NO. 18
RW SHEET NO.
ROADWAY DESIGN
HYDRAULICS ENGINEER
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION
HDR Engineering, Inc. of the Carolinas
3733 National Drive, Suite 207 Raleigh, N.C. 27612
BARNHILL CONTRACTING COMPANY
NAD 83
SITE 9
SITE 9
MATCH LINE STA. 18+00 -Y5- SEE SHEET NO. 46
MATCH LINE STA. 198+00 -L- SEE SHEET NO. 17
MATCH LINE STA. 211+00 -L- SEE SHEET NO. 19
MATCH LINE STA. 28+00 -Y5- SEE SHEET 19
53
HARRY L. THOMPSON, ET AL
DB 741 PG 991
DB 522 PG 335
MB-2 PG 60
55
KENT WARD
DB 718 PG 287
-Y5- ST Sta. 18+80.08
-Y5DET-PC Sta. 25+11.81
-Y5DET-PT Sta. 28+93.55
-Y5- TS Sta. 23+57.92
-L- Sta. 207+28.87
-Y5- TS Sta. 24+36.78
-L- PT Sta. 204+51.34
-Y5- SC Sta. 26+36.78
-Y5- CS Sta. 27+82.25
N 80° 19' 53.9" E
S 66° 36' 58.8" E
PROPOSED DITCH
DA........ 8.05 AC
Q10....... 17.71 CFS
V10....... 2.50 FT/S
SS......... 3:1
DEPTH.. 2.50 FT
PROPOSED DITCH
DA........ 1.94 AC
Q10....... 5.22 CFS
V10....... 2.00 FT/S
SS......... 3:1
DEPTH.. 0.93 FT
PROPOSED DITCH
DA........ 0.11 AC
Q10....... 0.21 CFS
V10....... 0.69 FT/S
SS......... 6:1
DEPTH.. 0.22 FT
PROPOSED DITCH
DA........ 1.06 AC
Q10....... 2.92 CFS
V10....... 2.06 FT/S
SS......... 3:1
DEPTH.. 0.69 FT
GRADE TO DRAIN
LATERAL DITCH
CHORD
EST 3 TONS CLASS 'B' RIP RAP EST 10 SY FF
EST 5 TONS CLASS 'B' RIP RAP EST 14 SY FF
BEGIN DECK DRAINS @ 12 FT SPACING STA. 22+43.43 -Y5-
END DECK DRAINS STA. 22+91.43 -Y5-
BEGIN DECK DRAINS @ 12 FT SPACING STA. 23+51.43 -Y5-
END DECK DRAINS STA. 22+59.54 -Y5-
BEGIN DECK DRAINS @ 12 FT SPACING STA. 23+19.54 -Y5-
END DECK DRAINS STA. 23+67.54 -Y5-
END DECK DRAINS STA. 23+99.43 -Y5-
LATERAL BASE DITCH
LATERAL 'V' DITCH
PROP. SLOPE STAKES
PROPOSED SLOPE STAKES
PROP. CABLE GUIDERAIL
GUIDERAIL ANCHOR UNIT, +19
GUIDERAIL ANCHOR UNIT, +40
IA-350, +38
IA-350, +20
SDG
EXISTING R/W
15" RCP
18" RCP
24" RCP
18" CSP
2GI W/ FLAT GRATE
200+00
205+00
210+00
25+00

-L-

PI	=	186+35.23
Δ	=	13° 56' 35.9" (RT)
Dc	=	0° 22' 55.1"
L	=	3,650.35'
T	=	1,834.24'
R	=	15,000.00'
e	=	NC
DS	=	70 mph

-Y5-

PI	=	27+11.64
Δ	=	20° 24' 22.3" (LT)
Dc	=	5° 54' 24.4"
θs	=	5° 54' 24.4"
Ls	=	200.00'
Ts	=	274.86'
Lc	=	145.47'
Rc	=	970.00'
LT	=	133.41'
ST	=	66.73'
e	=	0.08
DS	=	55 mph

-Y5-

PI	=	15+42.54
Δ	=	28° 43' 39.1" (RT)
Dc	=	5° 54' 24.4"
θs	=	5° 54' 24.4"
Ls	=	200.00'
Ts	=	348.80'
Lc	=	286.35'
Rc	=	970.00'
LT	=	133.41'
ST	=	66.73'
e	=	0.08
DS	=	55 mph

-Y5DET-

PI	=	27+05.18
Δ	=	22° 32' 53.2" (LT)
Dc	=	5° 54' 24.4"
L	=	381.73'
T	=	193.37'
R	=	970.00'

FALSE SUMP (Not to Scale)

DETAIL L — SPECIAL DITCH GRADE (Not to Scale). Min. D = 1.0 Ft.
205+86 -L- TO 206+50 -L- MEDIAN
208+37 -L- TO 210+75 -L- MEDIAN

DETAIL B — LATERAL 'V' DITCH (Not to Scale). Min. D = 1.0 Ft. b = 5.0 Ft.
204+00 -L- LT TO 18+50 -Y5- RT
17+00 -Y5- TO 18+50 -Y5- RT
18+00 -Y5- TO 20+00 -Y5- LT

DETAIL J — LATERAL BASE DITCH (Not to Scale). Min. D = 1.0 Ft. B = 2.0 Ft. b = 5.0 Ft.
20+00 -Y5- LT TO 208+37 -L- LT

PAVEMENT TO BE OBLITERATED

NOTES: SEE SHEET NO. 61 FOR -L- PROFILE.
SEE SHEET NO. 82 FOR -Y5- PROFILE.
SEE SHEET NO. 2-J FOR STRUCTURE DETAIL.
ALL CSP TO BE ROD AND LUG CONNECTED.

PROJECT REFERENCE NO.	SHEET NO.
R-2404A	19
R/W SHEET NO.	
ROADWAY DESIGN	HYDRAULICS ENGINEER

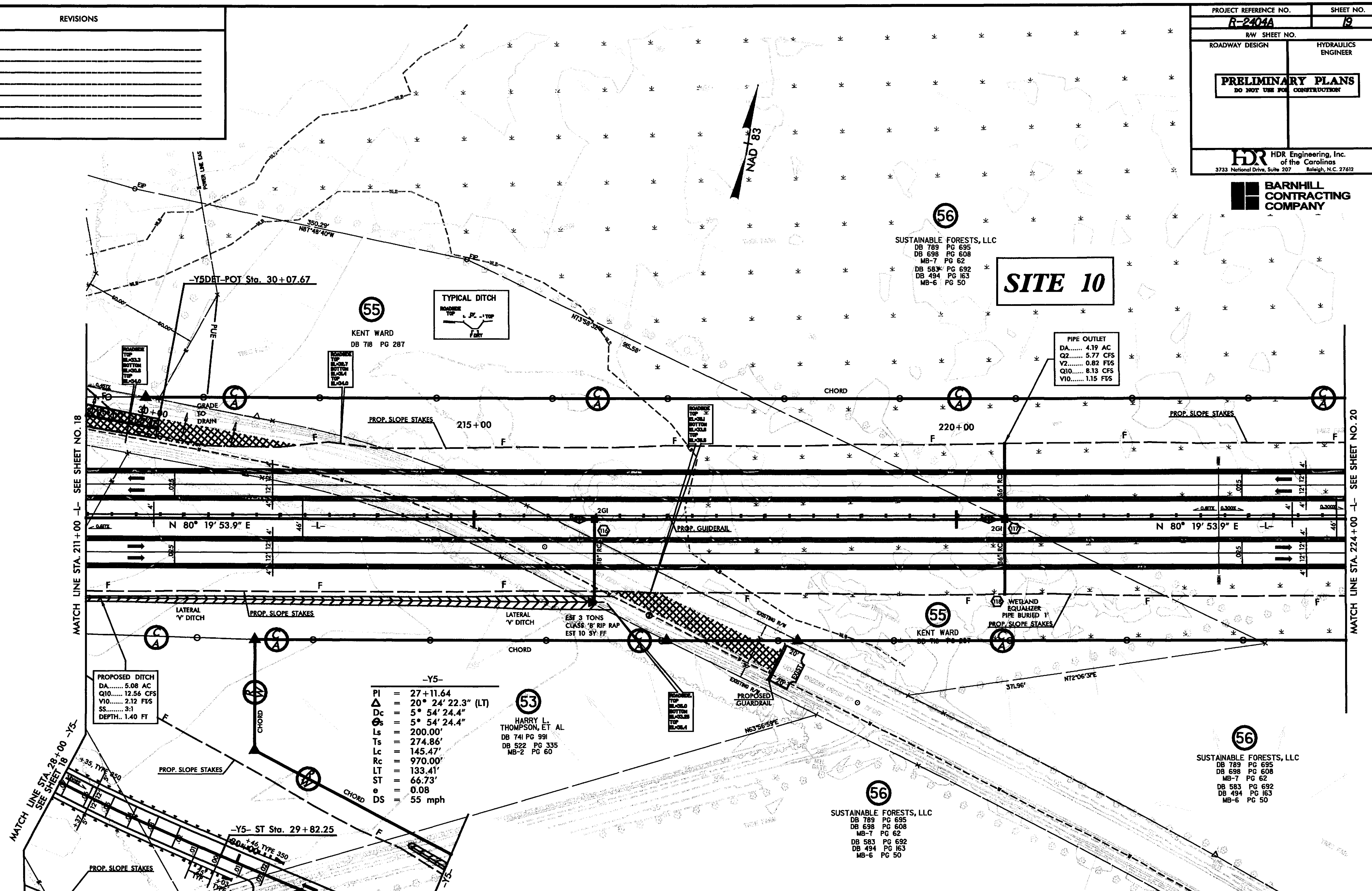
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

HDR Engineering, Inc. of the Carolinas
3733 National Drive, Suite 207 Raleigh, N.C. 27612

BARNHILL CONTRACTING COMPANY

REVISIONS

SITE 10



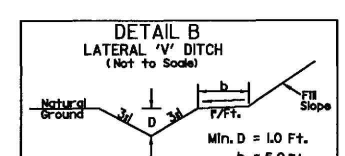
NAD 83
56
SUSTAINABLE FORESTS, LLC
DB 789 PG 695
DB 698 PG 608
MB-7 PG 62
DB 583 PG 692
DB 494 PG 163
MB-6 PG 50
55
KENT WARD
DB 718 PG 287
-Y5DET-POT Sta. 30+07.67
TYPICAL DITCH
PIPE OUTLET
DA....... 4.19 AC
Q2....... 5.77 CFS
V2....... 0.82 FT/S
Q10...... 8.13 CFS
V10...... 1.15 FT/S
CHORD
PROP. SLOPE STAKES
215+00
220+00
GRADE TO DRAIN
N 80° 19' 53.9" E
-L-
PROP. GUIDERAIL
2GI
36" RC
LATERAL 'V' DITCH
EST 3 TONS CLASS 'B' RIP RAP EST 10 SY FF
EXISTING R/W
WETLAND EQUALIZER PIPE BURIED 1'
PROPOSED GUARDRAIL
MATCH LINE STA. 211+00 -L- SEE SHEET NO. 18
MATCH LINE STA. 224+00 -L- SEE SHEET NO. 20
PROPOSED DITCH
DA........ 5.08 AC
Q10....... 12.56 CFS
V10....... 2.12 FT/S
SS......... 3:1
DEPTH.. 1.40 FT
53
HARRY L. THOMPSON, ET AL
DB 741 PG 991
DB 522 PG 335
MB-2 PG 60
MATCH LINE STA. 28+00 -Y5- SEE SHEET 18
-Y5- ST Sta. 29+82.25
N 64° 52' 23.7" E
-Y5- POT Sta. 30+73.07
-Y5DRIVE- POT Sta. 12+82.57
-Y5DRIVE- POT Sta. 10+00.00
MATCH LINE STA. 32+00 -Y5- SEE SHEET 47

-Y5-		
PI	=	27+11.64
Δ	=	20° 24' 22.3" (LT)
Dc	=	5° 54' 24.4"
θs	=	5° 54' 24.4"
Ls	=	200.00'
Ts	=	274.86'
Lc	=	145.47'
Rc	=	970.00'
LT	=	133.41'
ST	=	66.73'
e	=	0.08
DS	=	55 mph

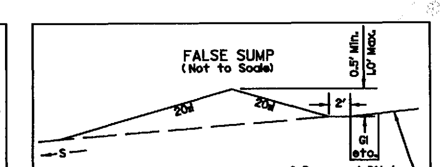
116 — 2GI(B), Sta. 216+25 M, D.A.= 0.45 Ac, Grate El= 38.74 ft, Invert= 35.74 ft, Depth= 3.0

117 — 2GI(B), Sta. 220+50 M, D.A.= 0.23 Ac, Grate El= 40.27 ft, Invert= 34.98 ft, Depth= 5.29

118 — OPEN END, Sta. 220+50 RT, D.A.= 3.96 Ac, Grate El= 35.23 ft, Invert= 35.23 ft, Depth= 0.0



210+75 -L- TO 216+25 -L- RT



PAVEMENT TO BE OBLITERATED

NOTES: SEE SHEET NO. 62 FOR -L- PROFILE.
SEE SHEET NO. 82 FOR -Y5- PROFILE.

PROJECT REFERENCE NO.	SHEET NO.
R-2404A	20

R/W SHEET NO.

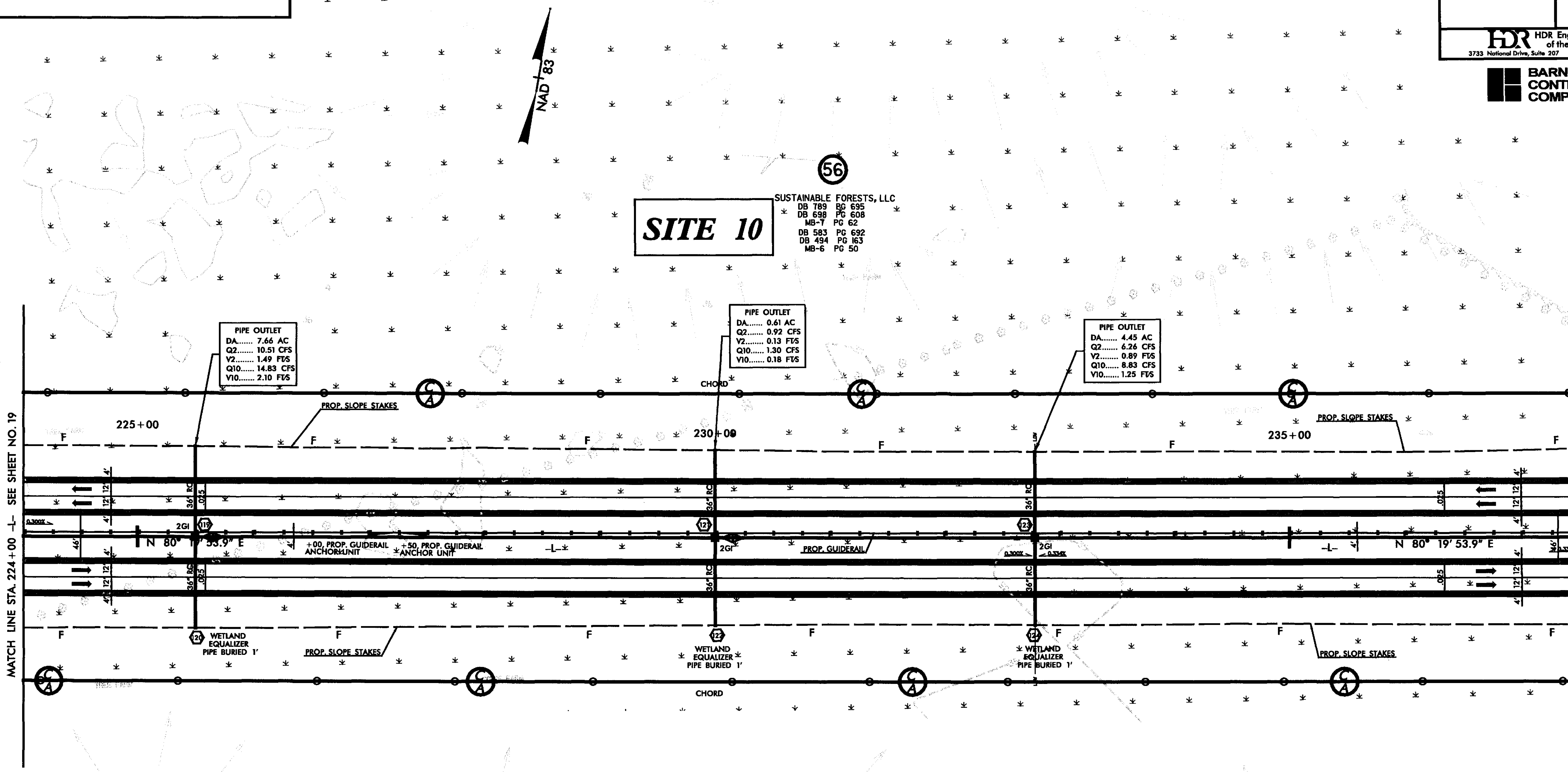
ROADWAY DESIGN — HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

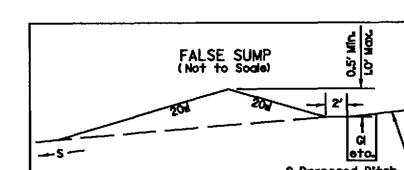
HDR Engineering, Inc. of the Carolinas
3733 National Drive, Suite 207 Raleigh, N.C. 27612

BARNHILL CONTRACTING COMPANY

REVISIONS



NAD 83
SITE 10
56
SUSTAINABLE FORESTS, LLC
DB 789 PG 695
DB 698 PG 608
MB-7 PG 62
DB 583 PG 692
DB 494 PG 163
MB-6 PG 50
PIPE OUTLET
DA....... 7.66 AC
Q2....... 10.51 CFS
V2....... 1.49 FT/S
Q10...... 14.83 CFS
V10...... 2.10 FT/S
PIPE OUTLET
DA....... 0.61 AC
Q2....... 0.92 CFS
V2....... 0.13 FT/S
Q10...... 1.30 CFS
V10...... 0.18 FT/S
PIPE OUTLET
DA....... 4.45 AC
Q2....... 6.26 CFS
V2....... 0.89 FT/S
Q10...... 8.83 CFS
V10...... 1.25 FT/S
CHORD
PROP. SLOPE STAKES
225+00
230+00
235+00
MATCH LINE STA. 224+00 -L- SEE SHEET NO. 19
MATCH LINE STA. 237+50 -L- SEE SHEET NO. 21
N 80° 19' 53.9" E
+00, PROP. GUIDERAIL ANCHOR UNIT
+50, PROP. GUIDERAIL ANCHOR UNIT
PROP. GUIDERAIL
-L-
2GI
36" RCP
WETLAND EQUALIZER PIPE BURIED 1'
56
SUSTAINABLE FORESTS, LLC
DB 789 PG 695
DB 698 PG 608
MB-7 PG 62
DB 583 PG 692
DB 494 PG 163
MB-6 PG 50



(119) 2GI(B)
Sta. 225+50 M
D.A.= 0.3 Ac
Grate El= 40.15 ft
Invert= 34.54 ft
Depth= 5.61

(120) OPEN END
Sta. 225+50 RT
D.A.= 7.36 Ac
Grate El= 34.55 ft
Invert= 34.55 ft
Depth= 0.0

(121) 2GI(B)
Sta. 230+00 M
D.A.= 0.48 Ac
Grate El= 38.86 ft
Invert= 34.19 ft
Depth= 4.68

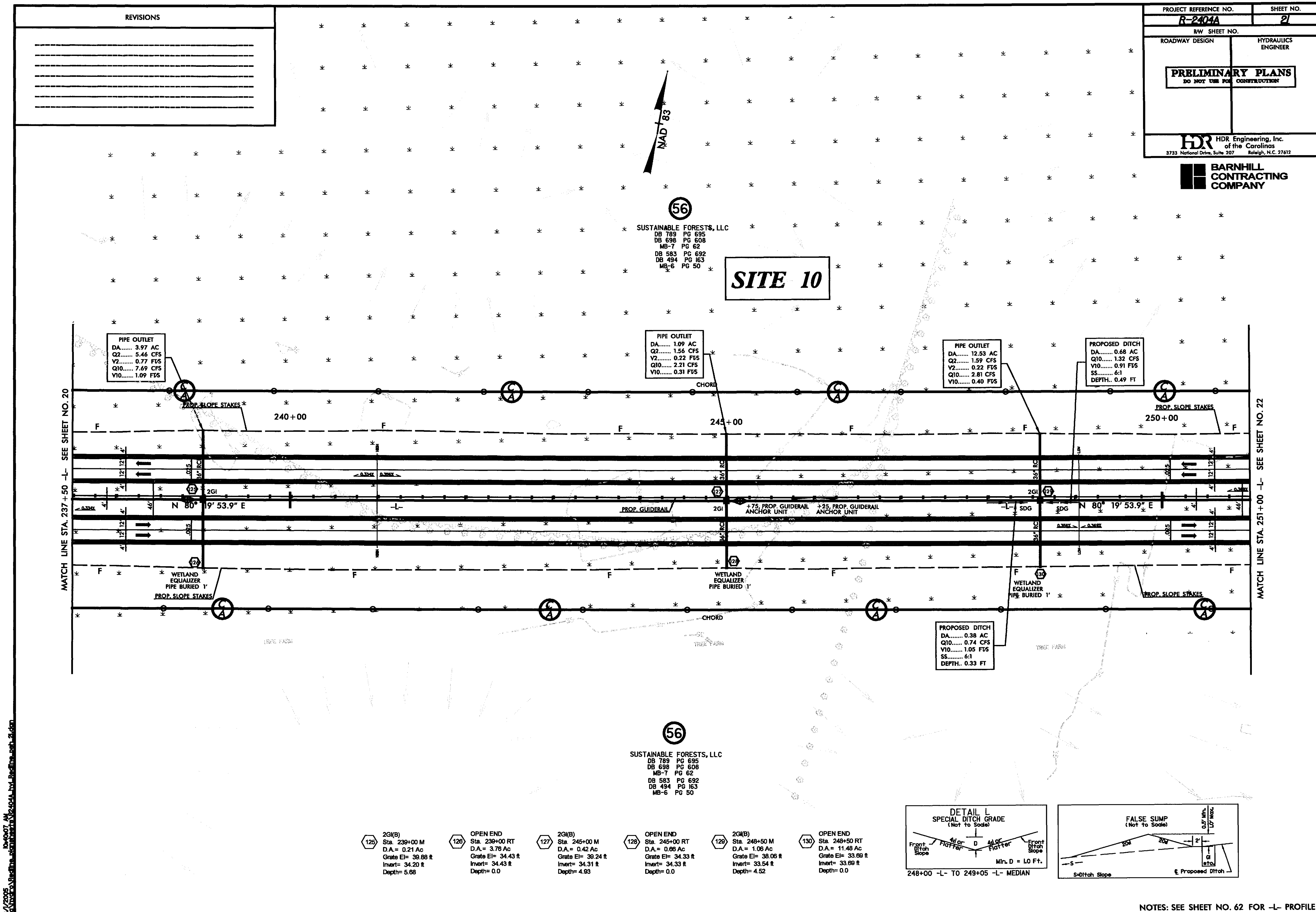
(122) OPEN END
Sta. 230+00 RT
D.A.= 0.13 Ac
Grate El= 34.24 ft
Invert= 34.24 ft
Depth= 0.0

(123) 2GI(B)
Sta. 232+79 M
D.A.= 0.95 Ac
Grate El= 38.55 ft
Invert= 33.99 ft
Depth= 4.56

(124) OPEN END
Sta. 232+79 RT
D.A.= 3.5 Ac
Grate El= 34.01 ft
Invert= 34.01 ft
Depth= 0.0

NOTES: SEE SHEET NO. 61-62 FOR -L- PROFILE.

8/1/2005


REVISIONS
PROJECT REFERENCE NO. R-2404A
SHEET NO. 21
R/W SHEET NO.
ROADWAY DESIGN
HYDRAULICS ENGINEER
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION
HDR Engineering, Inc. of the Carolinas
3733 National Drive, Suite 207 Raleigh, N.C. 27612
BARNHILL CONTRACTING COMPANY
NAD '83
56
SUSTAINABLE FORESTS, LLC
DB 789 PG 695
DB 698 PG 608
MB-7 PG 62
DB 583 PG 692
DB 494 PG 163
MB-6 PG 50
SITE 10
PIPE OUTLET
DA....... 3.97 AC
Q2....... 5.46 CFS
V2....... 0.77 FT/S
Q10...... 7.69 CFS
V10...... 1.09 FT/S
PIPE OUTLET
DA....... 1.09 AC
Q2....... 1.56 CFS
V2....... 0.22 FT/S
Q10...... 2.21 CFS
V10...... 0.31 FT/S
PIPE OUTLET
DA....... 12.53 AC
Q2....... 1.59 CFS
V2....... 0.22 FT/S
Q10...... 2.81 CFS
V10...... 0.40 FT/S
PROPOSED DITCH
DA....... 0.68 AC
Q10...... 1.32 CFS
V10...... 0.91 FT/S
SS....... 6:1
DEPTH.. 0.49 FT
CHORD
PROP. SLOPE STAKES
240+00
245+00
250+00
MATCH LINE STA. 237+50 -L- SEE SHEET NO. 20
MATCH LINE STA. 251+00 -L- SEE SHEET NO. 22
N 80° 19' 53.9" E
-L-
2GI
36" RCP
PROP. GUIDERAIL
+75 PROP. GUIDERAIL ANCHOR UNIT
+25 PROP. GUIDERAIL ANCHOR UNIT
SDG
WETLAND EQUALIZER PIPE BURIED 1'
PROP. SLOPE STAKES
CHORD
PROPOSED DITCH
DA....... 0.38 AC
Q10...... 0.74 CFS
V10...... 1.05 FT/S
SS....... 6:1
DEPTH.. 0.33 FT
TREE FARM
56
SUSTAINABLE FORESTS, LLC
DB 789 PG 695
DB 698 PG 608
MB-7 PG 62
DB 583 PG 692
DB 494 PG 163
MB-6 PG 50
125 2GI(B) Sta. 239+00 M D.A.= 0.21 Ac Grate El= 39.88 ft Invert= 34.20 ft Depth= 5.68
126 OPEN END Sta. 239+00 RT D.A.= 3.76 Ac Grate El= 34.43 ft Invert= 34.43 ft Depth= 0.0
127 2GI(B) Sta. 245+00 M D.A.= 0.42 Ac Grate El= 39.24 ft Invert= 34.31 ft Depth= 4.93
128 OPEN END Sta. 245+00 RT D.A.= 0.66 Ac Grate El= 34.33 ft Invert= 34.33 ft Depth= 0.0
129 2GI(B) Sta. 248+50 M D.A.= 1.06 Ac Grate El= 38.06 ft Invert= 33.54 ft Depth= 4.52
130 OPEN END Sta. 248+50 RT D.A.= 11.48 Ac Grate El= 33.69 ft Invert= 33.69 ft Depth= 0.0
DETAIL L
SPECIAL DITCH GRADE
(Not to Scale)
Front Ditch Slope
4:1 or Flatter
D
4:1 or Flatter
Front Ditch Slope
Min. D = 1.0 Ft.
248+00 -L- TO 249+05 -L- MEDIAN
FALSE SUMP
(Not to Scale)
0.5' Min. 1.0' Max.
20:1
20:1
2'
S
S=Ditch Slope
℄ Proposed Ditch
NOTES: SEE SHEET NO. 62 FOR -L- PROFILE.
8/1/2005
10:40:07 AM

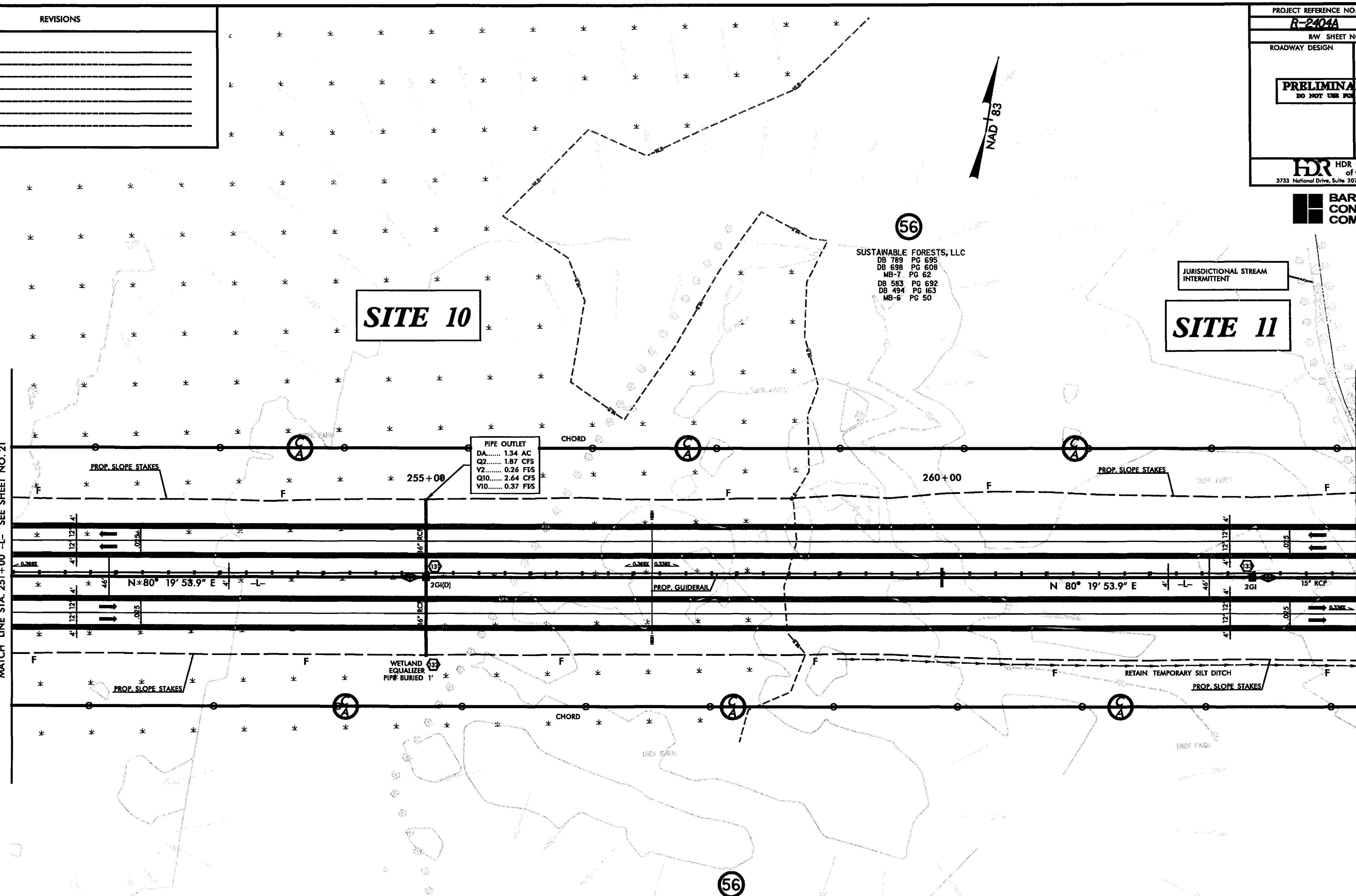
PROJECT REFERENCE NO.	SHEET NO.
R-2404A	22
R/W SHEET NO.	REVISIONS
ROADWAY DESIGN	HYDRAULICS ENGINEER

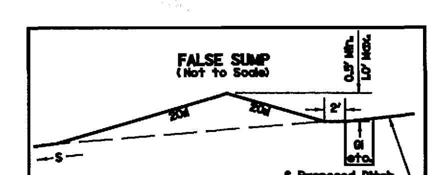
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

HDR Engineering, Inc. of the Carolinas
3733 National Drive, Suite 207 Raleigh, N.C. 27612

BARNHILL CONTRACTING COMPANY

REVISIONS





131	132	133
2GI(D)	OPEN END	2GI(B)
Sta. 255+00 M	Sta. 255+00 RT	Sta. 263+00 M
D.A.= 0.23 Ac	D.A.= 1.11 Ac	D.A.= 0.61 Ac
Grate El= 39.95 ft	Grate El= 35.57 ft	Grate El= 38.98 ft
Invert= 35.53 ft	Invert= 35.57 ft	Invert= 35.98 ft
Depth= 4.43	Depth= 0.0	Depth= 3.0

NOTES: SEE SHEET NO. 62-63 FOR -L- PROFILE
DO NOT PLACE ROCK IN BED OF JURISDICTIONAL STREAMS.

8/1/2005 10:40:32 AM
2404a\hydro\Redline_plansheets\R2404A_hyd_Redline_psh_22.dgn

REVISIONS

PROJECT REFERENCE NO.	SHEET NO.
R-2404A	23
R/W SHEET NO.	
ROADWAY DESIGN	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

HDR Engineering, Inc. of the Carolinas
3733 National Drive, Suite 207 Raleigh, N.C. 27612

BARNHILL CONTRACTING COMPANY

56
SUSTAINABLE FORESTS, LLC
DB 789 PG 695
DB 698 PG 608
MB-7 PG 62
DB 583 PG 692
DB 494 PG 163
MB-6 PG 50

NAD 83

SITE 12

SITE 11

TYPICAL DITCH

PROPOSED DITCH
DA..... 18.55 AC
Q10..... 7.5 CFS
V10..... 1.59 FT/S
SS..... 3:1
DEPTH.. 1.25 FT

PROPOSED DITCH
DA..... 0.16 AC
Q10..... 0.31 CFS
V10..... 0.51 FT/S
SS..... 6:1
DEPTH.. 0.32 FT

PROPOSED DITCH
DA..... 0.37 AC
Q10..... 0.72 CFS
V10..... 0.78 FT/S
SS..... 6:1
DEPTH.. 0.39 FT

PIPE OUTLET
DA..... 2.36 AC
Q2..... 3.35 CFS
V2..... 0.47 FT/S
Q10..... 4.72 CFS
V10..... 0.67 FT/S

MATCH LINE STA. 264+00 -L- SEE SHEET NO. 22

MATCH LINE STA. 277+50 -L- SEE SHEET NO. 24

LATERAL 'V' DITCH

EST 3 TONS CLASS 'B' RIP RAP
EST 10 SY FF

EST 11 TONS CLASS 'B' RIP RAP
EST 28 SY FF

PROP. SLOPE STAKES

CHORD

263+00

270+00

275+00

+00, PROP. GUIDERAIL ANCHOR UNIT

+00, PROP. GUIDERAIL ANCHOR UNIT

PROP. GUIDERAIL

N 80° 19' 53.9" E

15" RCP

2GI

36" RCP

RETAIN TEMPORARY SILT DITCH

WETLAND EQUALIZER PIPE BURIED 1'

24" CMP

INV=1.36

JURISDICTIONAL STREAM INTERMITTENT

TREE FARM

(134) 2GI(B)
Sta. 264+50 M
D.A.= 0.53 Ac
Grate El= 38.80 ft
Invert= 30.85 ft
Depth= 7.95

(135) OPEN END
Sta. 264+73 RT
D.A.= 98.98 Ac
Grate El= 31.10 ft
Invert= 31.10 ft
Depth= 0.0

(136) 2GI(B)
Sta. 268+00 M
D.A.= 0.32 Ac
Grate El= 39.30 ft
Invert= 36.30 ft
Depth= 3.0

(137) 2GI(B)
Sta. 271+00 M
D.A.= 0.53 Ac
Grate El= 40.20 ft
Invert= 37.45 ft
Depth= 2.75

(138) 2GI(B)
Sta. 276+00 M
D.A.= 0.53 Ac
Grate El= 41.52 ft
Invert= 38.49 ft
Depth= 5.04

(139) OPEN END
Sta. 276+00 RT
D.A.= 1.49 Ac
Grate El= 36.64 ft
Invert= 36.04 ft
Depth= 0.0

DETAIL B
LATERAL 'V' DITCH
(Not to Scale)
Natural Ground
Fill Slope
Min. D = 1.0 Ft.
b = 5.0 Ft.

DETAIL L
SPECIAL DITCH GRADE
(Not to Scale)
4:1 or Flatter
Front Ditch Slope
Min. D = 1.0 Ft.
264+00 -L- TO 264+71 -L- MEDIAN
264+25 -L- TO 268+40 -L- LT

FALSE SUMP
(Not to Scale)
0.5' Min.
1.0' Max.
2%
S=Ditch Slope
℄ Proposed Ditch

NOTES: SEE SHEET NO. 63 FOR -L- PROFILE.
DO NOT PLACE ROCK IN BED OF JURISDICTIONAL STREAMS.

8/4/2005
10:46:06 AM
2404A_TIP\Roadway\Redline_plans\r2404A_hyl_Redline_psh_23.dgn

PROJECT REFERENCE NO.	SHEET NO.
R-2404A	24
R/W SHEET NO.	

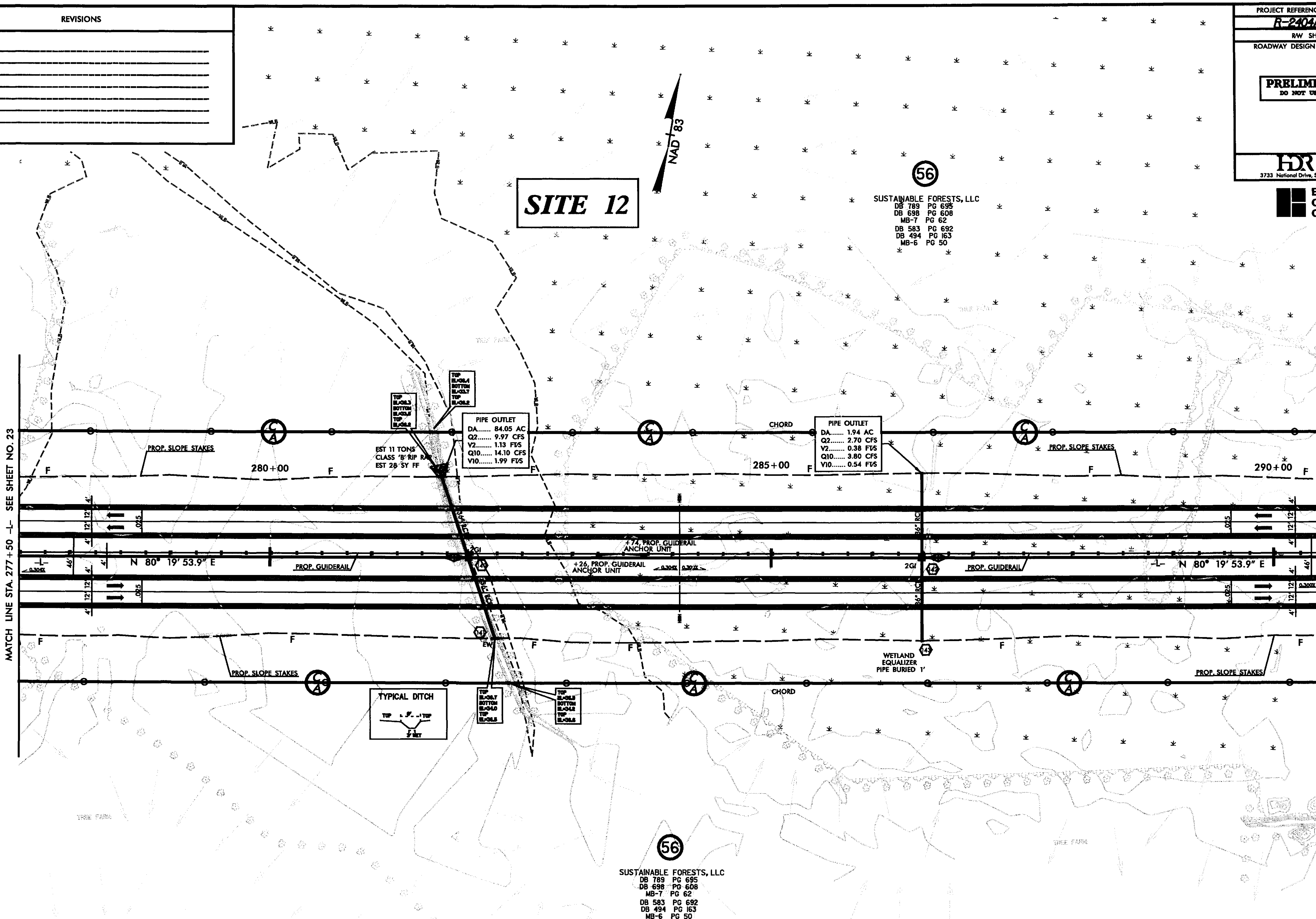
ROADWAY DESIGN | HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

HDR Engineering, Inc. of the Carolinas
3733 National Drive, Suite 207 Raleigh, N.C. 27612

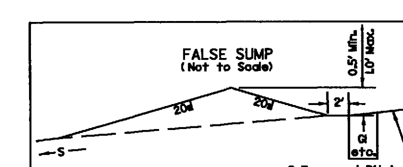
BARNHILL CONTRACTING COMPANY

REVISIONS

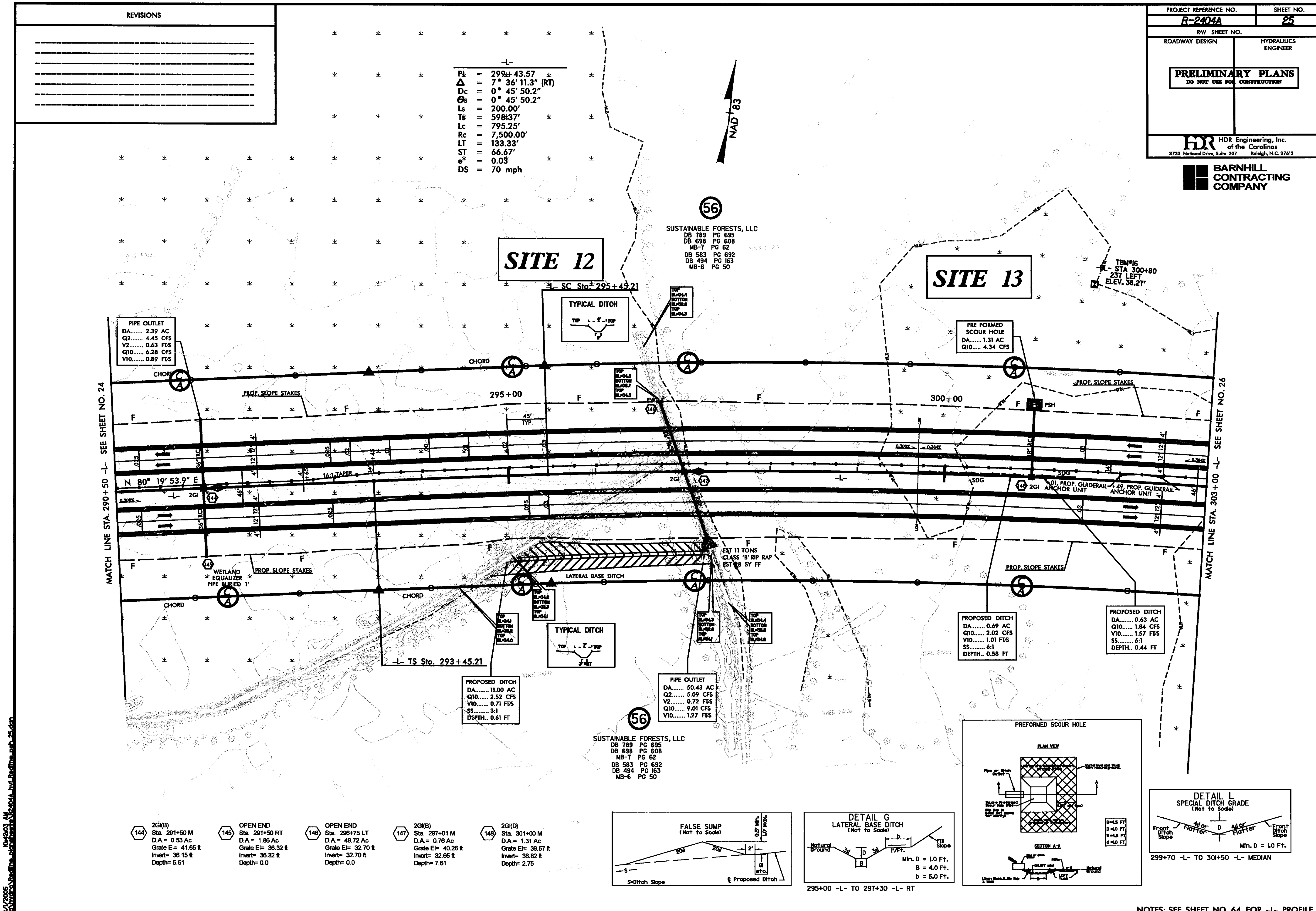


SITE 12
NAD '83
56
SUSTAINABLE FORESTS, LLC
DB 789 PG 695
DB 698 PG 608
MB-7 PG 62
DB 583 PG 692
DB 494 PG 163
MB-6 PG 50
MATCH LINE STA. 277+50 -L- SEE SHEET NO. 23
MATCH LINE STA. 290+50 -L- SEE SHEET NO. 25
PIPE OUTLET
DA....... 84.05 AC
Q2....... 9.97 CFS
V2....... 1.13 FT/S
Q10...... 14.10 CFS
V10...... 1.99 FT/S
EST 11 TONS
CLASS 'B' RIP RAP
EST 28 SY FF
CHORD
PIPE OUTLET
DA....... 1.94 AC
Q2....... 2.70 CFS
V2....... 0.38 FT/S
Q10...... 3.80 CFS
V10...... 0.54 FT/S
PROP. SLOPE STAKES
280+00
285+00
290+00
N 80° 19' 53.9" E
PROP. GUIDERAIL
+74, PROP. GUIDERAIL ANCHOR UNIT
+26, PROP. GUIDERAIL ANCHOR UNIT
2GI
WETLAND EQUALIZER PIPE BURIED 1'
TYPICAL DITCH
56
SUSTAINABLE FORESTS, LLC
DB 789 PG 695
DB 698 PG 608
MB-7 PG 62
DB 583 PG 692
DB 494 PG 163
MB-6 PG 50

140	2GI(B)	Sta. 281+98 M D.A.= 0.22 Ac Grate El= 42.29 ft Invert= 33.90 ft Depth= 8.39
141	OPEN END	Sta. 282+24 RT D.A.= 83.83 Ac Grate El= 34.0 ft Invert= 34.0 ft Depth= 0.0
142	2GI(B)	Sta. 286+50 M D.A.= 0.26 Ac Grate El= 42.27 ft Invert= 35.10 ft Depth= 7.18
143	OPEN END	Sta. 286+50 RT D.A.= 1.68 Ac Grate El= 35.37 ft Invert= 35.37 ft Depth= 0.0



NOTES: SEE SHEET NO. 63-64 FOR -L- PROFILE



REVISIONS
PROJECT REFERENCE NO.
R-2404A
SHEET NO.
25
R/W SHEET NO.
ROADWAY DESIGN
HYDRAULICS ENGINEER
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION
HDR Engineering, Inc. of the Carolinas
3733 National Drive, Suite 207 Raleigh, N.C. 27612
BARNHILL CONTRACTING COMPANY
-L-
PI = 299+43.57
Δ = 7° 36' 11.3" (RT)
Dc = 0° 45' 50.2"
θs = 0° 45' 50.2"
Ls = 200.00'
T = 598.37'
Lc = 795.25'
Rc = 7,500.00'
LT = 133.33'
ST = 66.67'
e = 0.05
DS = 70 mph
NAD 83
56
SUSTAINABLE FORESTS, LLC
DB 789 PG 695
DB 698 PG 608
MB-7 PG 62
DB 583 PG 692
DB 494 PG 163
MB-6 PG 50
SITE 12
SITE 13
-L- SC Sta. 295+45.21
-L- TS Sta. 293+45.21
TYPICAL DITCH
TBM#16
-L- STA 300+80
237 LEFT
ELEV. 38.27'
PIPE OUTLET
DA....... 2.39 AC
Q2....... 4.45 CFS
V2....... 0.63 FT/S
Q10...... 6.28 CFS
V10...... 0.89 FT/S
PRE FORMED SCOUR HOLE
DA....... 1.31 AC
Q10...... 4.34 CFS
CHORD
PROP. SLOPE STAKES
295+00
300+00
45' TYP.
16:1 TAPER
N 80° 19' 53.9" E
SDG
PSH
2GI
49, PROP. GUIDERAIL ANCHOR UNIT
01, PROP. GUIDERAIL ANCHOR UNIT
MATCH LINE STA. 290+50 -L- SEE SHEET NO. 24
MATCH LINE STA. 303+00 -L- SEE SHEET NO. 26
WETLAND EQUALIZER PIPE BURIED 1'
EST 11 TONS CLASS 'B' RIP RAP EST 28 SY FF
LATERAL BASE DITCH
PROPOSED DITCH
DA....... 0.69 AC
Q10...... 2.02 CFS
V10...... 1.01 FT/S
SS....... 6:1
DEPTH.. 0.58 FT
PROPOSED DITCH
DA....... 0.63 AC
Q10...... 1.84 CFS
V10...... 1.57 FT/S
SS....... 6:1
DEPTH.. 0.44 FT
PROPOSED DITCH
DA....... 11.00 AC
Q10...... 2.52 CFS
V10...... 0.71 FT/S
SS....... 3:1
DEPTH.. 0.61 FT
PIPE OUTLET
DA....... 50.43 AC
Q2....... 5.09 CFS
V2....... 0.72 FT/S
Q10...... 9.01 CFS
V10...... 1.27 FT/S
144 2GI(B) Sta. 291+50 M D.A.= 0.53 Ac Grate El= 41.65 ft Invert= 36.15 ft Depth= 5.51
145 OPEN END Sta. 291+50 RT D.A.= 1.86 Ac Grate El= 36.32 ft Invert= 36.32 ft Depth= 0.0
146 OPEN END Sta. 296+75 LT D.A.= 49.72 Ac Grate El= 32.70 ft Invert= 32.70 ft Depth= 0.0
147 2GI(B) Sta. 297+01 M D.A.= 0.76 Ac Grate El= 40.26 ft Invert= 32.65 ft Depth= 7.61
148 2GI(D) Sta. 301+00 M D.A.= 1.31 Ac Grate El= 39.57 ft Invert= 36.82 ft Depth= 2.75
FALSE SUMP (Not to Scale)
S=Ditch Slope
℄ Proposed Ditch
DETAIL G
LATERAL BASE DITCH (Not to Scale)
Natural Ground
Fill Slope
Min. D = 1.0 Ft.
B = 4.0 Ft.
b = 5.0 Ft.
295+00 -L- TO 297+30 -L- RT
PREFORMED SCOUR HOLE
PLAN VIEW
SECTION A-A
DETAIL L
SPECIAL DITCH GRADE (Not to Scale)
Front Ditch Slope
4:1 or Flatter
Min. D = 1.0 Ft.
299+70 -L- TO 301+50 -L- MEDIAN
NOTES: SEE SHEET NO. 64 FOR -L- PROFILE.
8/1/2005

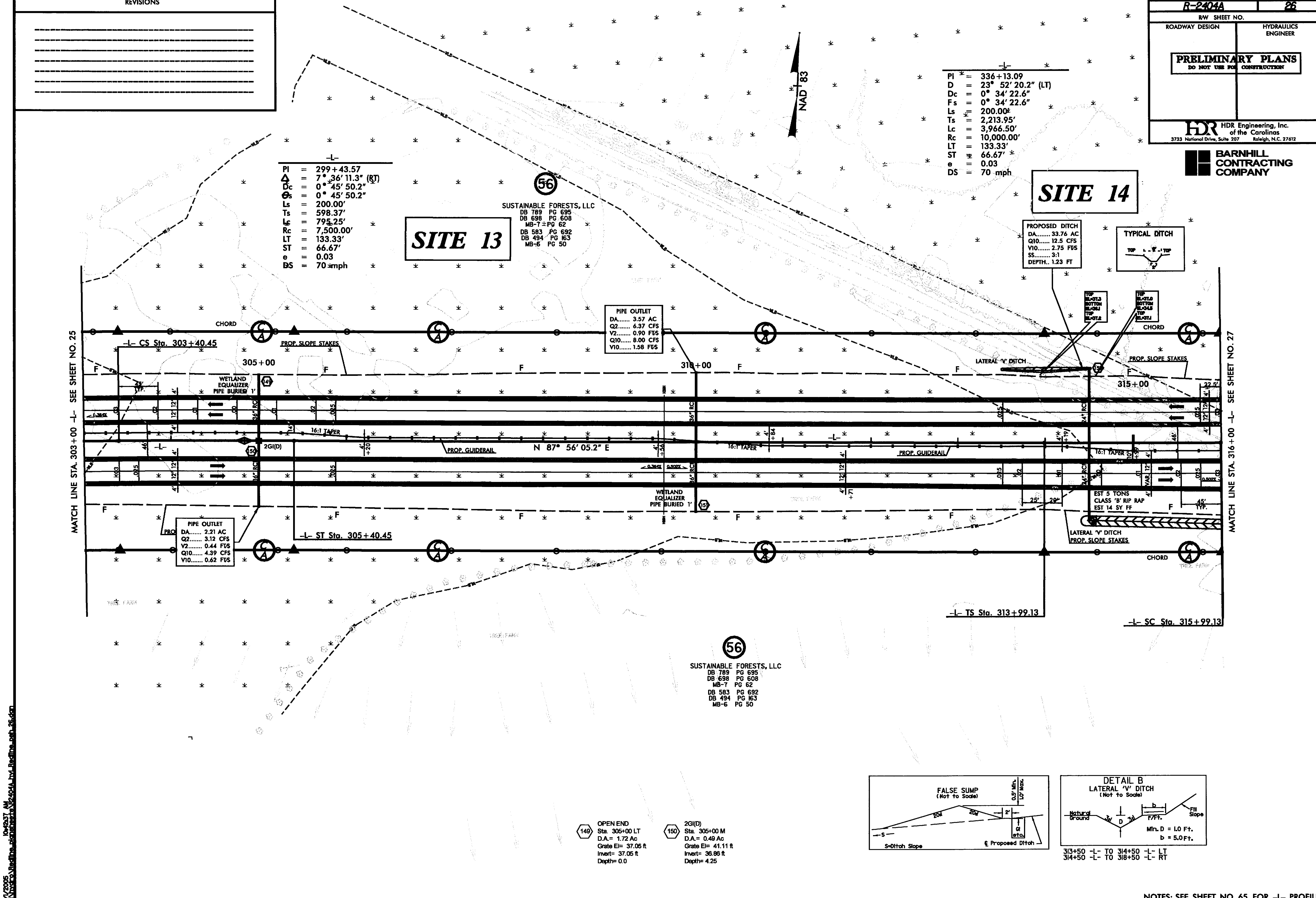
PROJECT REFERENCE NO.	SHEET NO.
R-2404A	26
R/W SHEET NO.	
ROADWAY DESIGN	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

HDR Engineering, Inc. of the Carolinas
3733 National Drive, Suite 207 Raleigh, N.C. 27612

BARNHILL CONTRACTING COMPANY

REVISIONS



SITE 13
SITE 14
NAD 83
-L-
PI = 299+43.57
Δ = 7° 36' 11.3" (RT)
Dc = 0° 45' 50.2"
Θs = 0° 45' 50.2"
Ls = 200.00'
Ts = 598.37'
Lc = 795.25'
Rc = 7,500.00'
LT = 133.33'
ST = 66.67'
e = 0.03
DS = 70 mph
-L-
PI = 336+13.09
D = 23° 52' 20.2" (LT)
Dc = 0° 34' 22.6"
Fs = 0° 34' 22.6"
Ls = 200.00'
Ts = 2,213.95'
Lc = 3,966.50'
Rc = 10,000.00'
LT = 133.33'
ST = 66.67'
e = 0.03
DS = 70 mph
SUSTAINABLE FORESTS, LLC
DB 789 PG 695
DB 698 PG 608
MB-7 PG 62
DB 583 PG 692
DB 494 PG 163
MB-6 PG 50
PROPOSED DITCH
DA........ 33.76 AC
Q10....... 12.5 CFS
V10....... 2.75 FPS
SS........ 3:1
DEPTH.. 1.23 FT
TYPICAL DITCH
PIPE OUTLET
DA....... 3.57 AC
Q2....... 6.37 CFS
V2....... 0.90 FPS
Q10...... 8.00 CFS
V10...... 1.58 FPS
PIPE OUTLET
DA....... 2.21 AC
Q2....... 3.12 CFS
V2....... 0.44 FPS
Q10...... 4.39 CFS
V10...... 0.62 FPS
CHORD
-L- CS Sta. 303+40.45
PROP. SLOPE STAKES
305+00
310+00
315+00
WETLAND EQUALIZER PIPE BURIED 1'
N 87° 56' 05.2" E
PROP. GUIDERAIL
16:1 TAPER
2GI(D)
LATERAL 'V' DITCH
EST 5 TONS CLASS 'B' RIP RAP EST 14 SY FF
-L- ST Sta. 305+40.45
-L- TS Sta. 313+99.13
-L- SC Sta. 315+99.13
MATCH LINE STA. 303+00 -L- SEE SHEET NO. 25
MATCH LINE STA. 316+00 -L- SEE SHEET NO. 27
OPEN END
Sta. 305+00 LT
D.A.= 1.72 Ac
Grate El= 37.05 ft
Invert= 37.05 ft
Depth= 0.0
2GI(D)
Sta. 305+00 M
D.A.= 0.49 Ac
Grate El= 41.11 ft
Invert= 36.86 ft
Depth= 4.25
FALSE SUMP (Not to Scale)
S=Ditch Slope
℄ Proposed Ditch
DETAIL B
LATERAL 'V' DITCH (Not to Scale)
Natural Ground
Fill Slope
Min. D = 1.0 Ft.
b = 5.0 Ft.
313+50 -L- TO 314+50 -L- LT
314+50 -L- TO 318+50 -L- RT

NOTES: SEE SHEET NO. 65 FOR -L- PROFILE.

8/1/2005

REVISIONS

PROJECT REFERENCE NO.	SHEET NO.
R-2404A	27

R/W SHEET NO.

ROADWAY DESIGN | HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

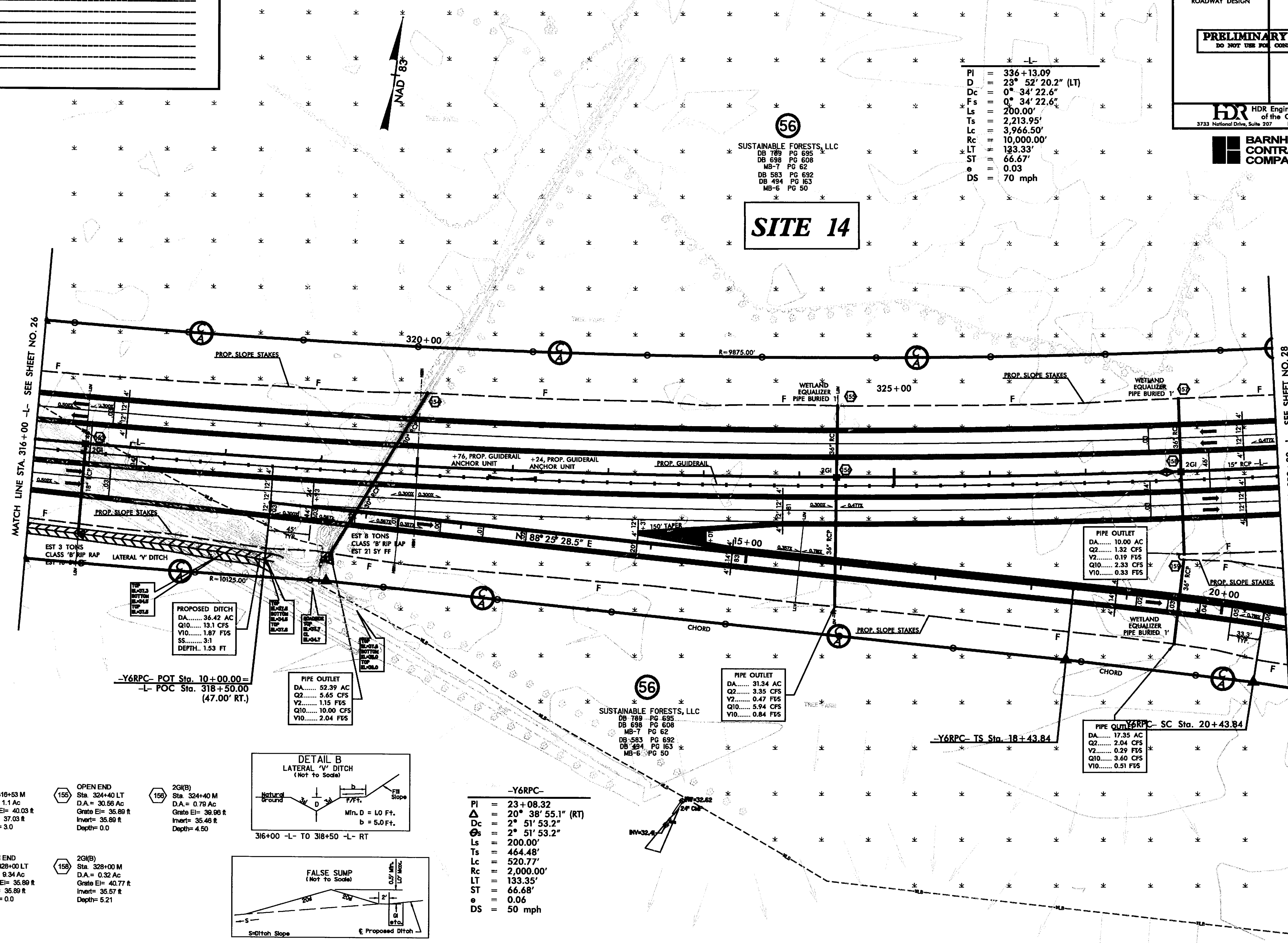
HDR Engineering, Inc. of the Carolinas
3733 National Drive, Suite 207 Raleigh, N.C. 27612

BARNHILL CONTRACTING COMPANY

SITE 14

-L-

PI	=	336+13.09
D	=	23° 52' 20.2" (LT)
Dc	=	0° 34' 22.6"
Fs	=	0° 34' 22.6"
Ls	=	200.00'
Ts	=	2,213.95'
Lc	=	3,966.50'
Rc	=	10,000.00'
LT	=	133.33'
ST	=	66.67'
e	=	0.03
DS	=	70 mph



DETAIL B
LATERAL 'V' DITCH
(Not to Scale)
Natural Ground; Fill Slope; Min. D = 1.0 Ft.; b = 5.0 Ft.
316+00 -L- TO 318+50 -L- RT

FALSE SUMP
(Not to Scale)
S=Ditch Slope; ℄ Proposed Ditch

-Y6RPC-

PI	=	23+08.32
Δ	=	20° 38' 55.1" (RT)
Dc	=	2° 51' 53.2"
Θs	=	2° 51' 53.2"
Ls	=	200.00'
Ts	=	464.48'
Lc	=	520.77'
Rc	=	2,000.00'
LT	=	133.35'
ST	=	66.68'
e	=	0.06
DS	=	50 mph

153 — 2GI(B)
Sta. 316+53 M
D.A.= 1.1 Ac
Grate El= 40.03 ft
Invert= 37.03 ft
Depth= 3.0

155 — OPEN END
Sta. 324+40 LT
D.A.= 30.56 Ac
Grate El= 35.89 ft
Invert= 35.89 ft
Depth= 0.0

156 — 2GI(B)
Sta. 324+40 M
D.A.= 0.79 Ac
Grate El= 39.96 ft
Invert= 35.46 ft
Depth= 4.50

157 — OPEN END
Sta. 328+00 LT
D.A.= 9.34 Ac
Grate El= 35.89 ft
Invert= 35.89 ft
Depth= 0.0

158 — 2GI(B)
Sta. 328+00 M
D.A.= 0.32 Ac
Grate El= 40.77 ft
Invert= 35.57 ft
Depth= 5.21

NOTES: SEE SHEET NO. 65-66 FOR -L- PROFILE.

8/1/2005 10:43:03 AM
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PROJECT REFERENCE NO.	SHEET NO.
R-2404A	29

R/W SHEET NO.

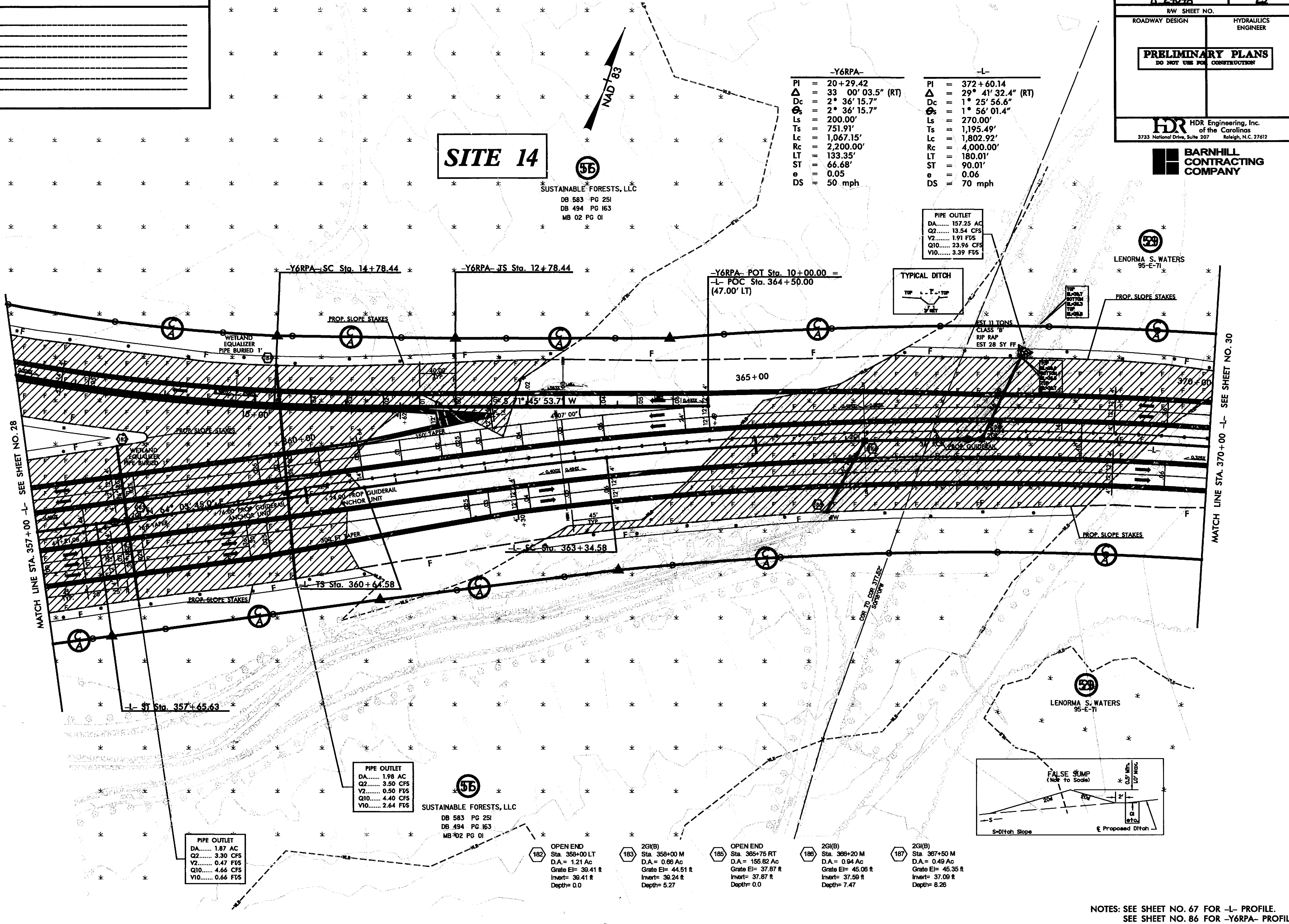
ROADWAY DESIGN — HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

HDR Engineering, Inc. of the Carolinas
3733 National Drive, Suite 207 Raleigh, N.C. 27612

BARNHILL CONTRACTING COMPANY

REVISIONS



-Y6RPA-	
PI	= 20+29.42
Δ	= 33° 00' 03.5" (RT)
Dc	= 2° 36' 15.7"
θs	= 2° 36' 15.7"
Ls	= 200.00'
Ts	= 751.91'
Lc	= 1,067.15'
Rc	= 2,200.00'
LT	= 133.35'
ST	= 66.68'
e	= 0.05
DS	= 50 mph

-L-	
PI	= 372+60.14
Δ	= 29° 41' 32.4" (RT)
Dc	= 1° 25' 56.6"
θs	= 1° 56' 01.4"
Ls	= 270.00'
Ts	= 1,195.49'
Lc	= 1,802.92'
Rc	= 4,000.00'
LT	= 180.01'
ST	= 90.01'
e	= 0.06
DS	= 70 mph

PIPE OUTLET
DA....... 157.25 AC
Q2....... 13.54 CFS
V2....... 1.91 FT/S
Q10...... 23.96 CFS
V10...... 3.39 FT/S

PIPE OUTLET
DA....... 1.98 AC
Q2....... 3.50 CFS
V2....... 0.50 FT/S
Q10...... 4.40 CFS
V10...... 2.64 FT/S

PIPE OUTLET
DA....... 1.87 AC
Q2....... 3.30 CFS
V2....... 0.47 FT/S
Q10...... 4.66 CFS
V10...... 0.66 FT/S

No.	Type	Sta.	D.A.	Grate El	Invert	Depth
182	OPEN END	358+00 LT	1.21 Ac	39.41 ft	39.41 ft	0.0
183	2GI(B)	358+00 M	0.66 Ac	44.51 ft	39.24 ft	5.27
185	OPEN END	365+75 RT	155.62 Ac	37.87 ft	37.87 ft	0.0
186	2GI(B)	366+20 M	0.94 Ac	45.06 ft	37.59 ft	7.47
187	2GI(B)	367+50 M	0.49 Ac	45.35 ft	37.09 ft	8.26

NOTES: SEE SHEET NO. 67 FOR -L- PROFILE.
SEE SHEET NO. 86 FOR -Y6RPA- PROFILE.

8/1/2005

PROJECT REFERENCE NO.	SHEET NO.
R-2404A	30
R/W SHEET NO.	

ROADWAY DESIGN | HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

HDR Engineering, Inc. of the Carolinas
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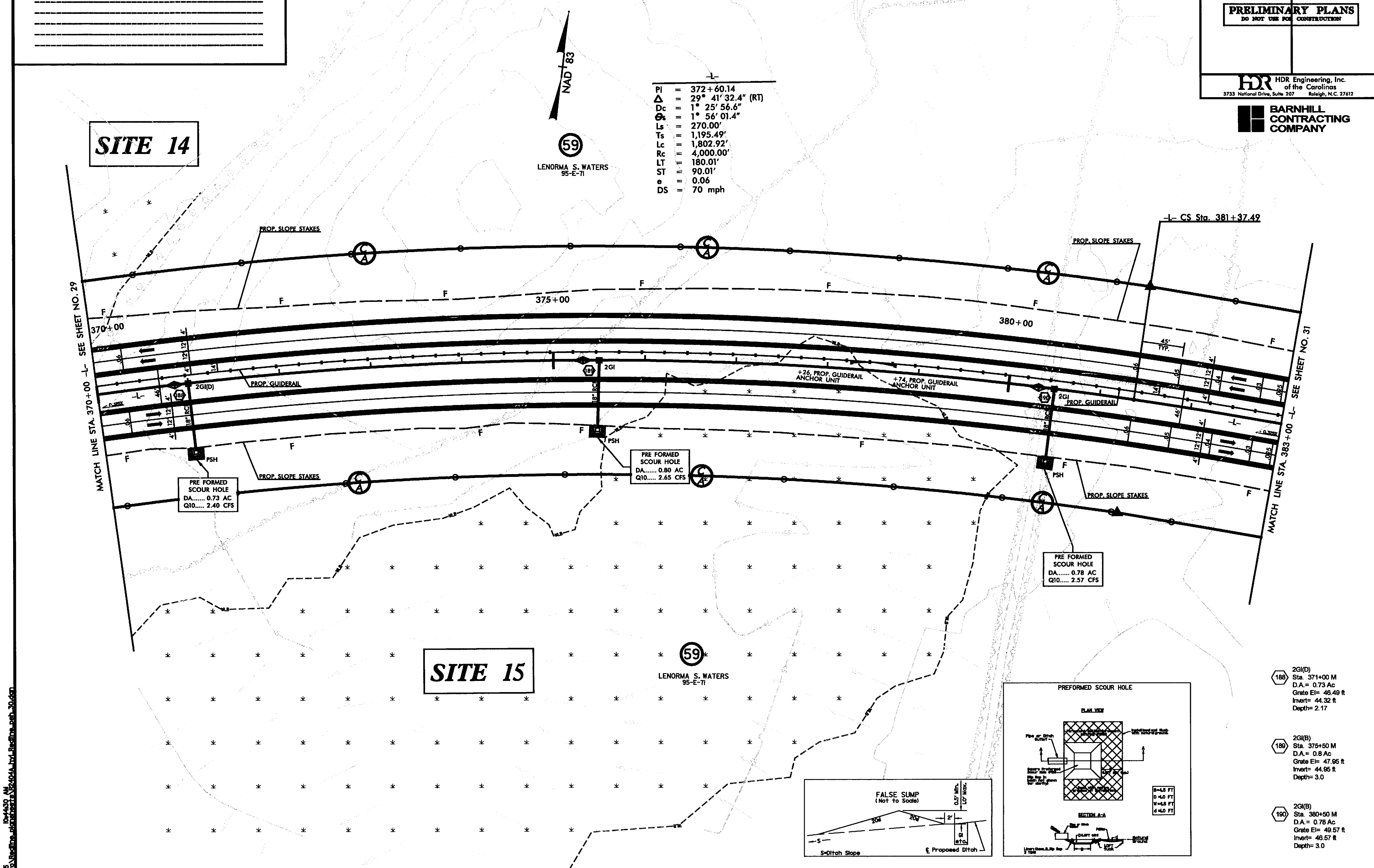
REVISIONS



SITE 14
SITE 15
NAD 83
59
LENORMA S. WATERS
95-E-71
-L-
PI = 372+60.14
Δ = 29° 41' 32.4" (RT)
Dc = 1° 25' 56.6"
θs = 1° 56' 01.4"
Ls = 270.00'
Ts = 1,195.49'
Lc = 1,802.92'
Rc = 4,000.00'
LT = 180.01'
ST = 90.01'
e = 0.06
DS = 70 mph
-L- CS Sta. 381+37.49
PROP. SLOPE STAKES
PROP. GUIDERAIL
+26, PROP. GUIDERAIL ANCHOR UNIT
+74, PROP. GUIDERAIL ANCHOR UNIT
375+00
380+00
370+00
MATCH LINE STA. 370+00 -L- SEE SHEET NO. 29
MATCH LINE STA. 383+00 -L- SEE SHEET NO. 31
2GI(D)
2GI
PSH
PRE FORMED SCOUR HOLE
DA....... 0.73 AC
Q10..... 2.40 CFS
PRE FORMED SCOUR HOLE
DA....... 0.80 AC
Q10..... 2.65 CFS
PRE FORMED SCOUR HOLE
DA....... 0.78 AC
Q10..... 2.57 CFS
45' TYP.
FALSE SUMP
(Not to Scale)
S=Ditch Slope
℄ Proposed Ditch
PREFORMED SCOUR HOLE
PLAN VIEW
SECTION A-A

188 2GI(D)
Sta. 371+00 M
D.A.= 0.73 Ac
Grate El= 46.49 ft
Invert= 44.32 ft
Depth= 2.17

189 2GI(B)
Sta. 375+50 M
D.A.= 0.8 Ac
Grate El= 47.95 ft
Invert= 44.95 ft
Depth= 3.0

190 2GI(B)
Sta. 380+50 M
D.A.= 0.78 Ac
Grate El= 49.57 ft
Invert= 46.57 ft
Depth= 3.0

NOTES: SEE SHEET NOS. 68 FOR -L- PROFILE

REVISIONS

PROJECT REFERENCE NO.	SHEET NO.
R-2404A	31
R/W SHEET NO.	
ROADWAY DESIGN	HYDRAULICS ENGINEER

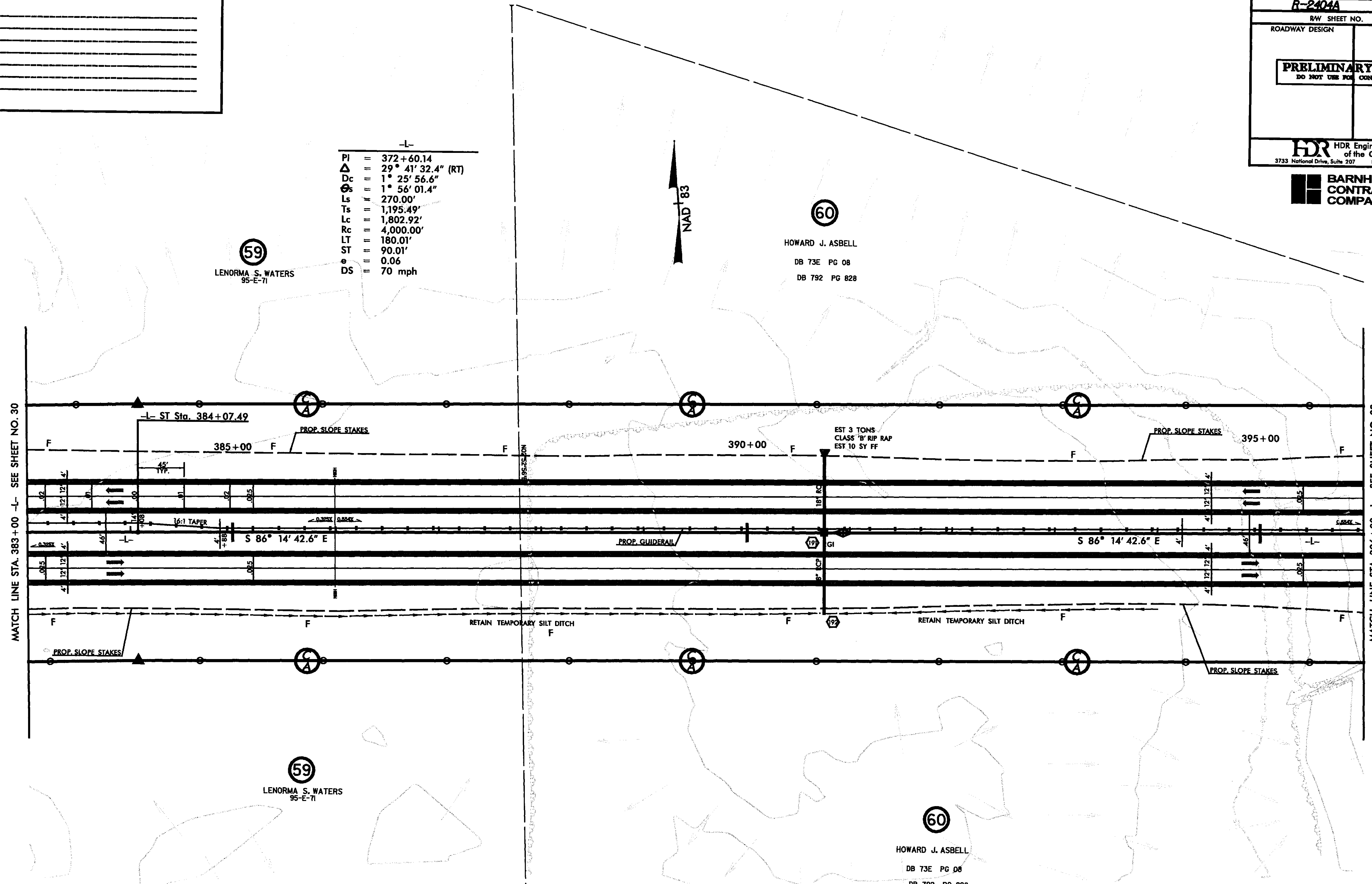
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

HDR Engineering, Inc.
of the Carolinas
3733 National Drive, Suite 207 Raleigh, N.C. 27612

BARNHILL CONTRACTING COMPANY

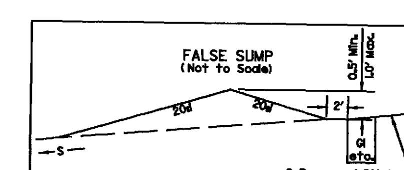
-L-

PI	=	372+60.14
Δ	=	29° 41' 32.4" (RT)
Dc	=	1° 25' 56.6"
θs	=	1° 56' 01.4"
Ls	=	270.00'
Ts	=	1,195.49'
Lc	=	1,802.92'
Rc	=	4,000.00'
LT	=	180.01'
ST	=	90.01'
e	=	0.06
DS	=	70 mph



191 2GI(B)
Sta. 390+75 M
D.A.= 0.5 Ac
Grate El= 49.33 ft
Invert= 45.37 ft
Depth= 3.95

192 OPEN END
Sta. 390+75 R
D.A.= 0.1 Ac
Grate El= 45.60 ft
Invert= 45.60 ft
Depth= 0.0



NOTES: SEE SHEET NO. 68 FOR -L- PROFILE

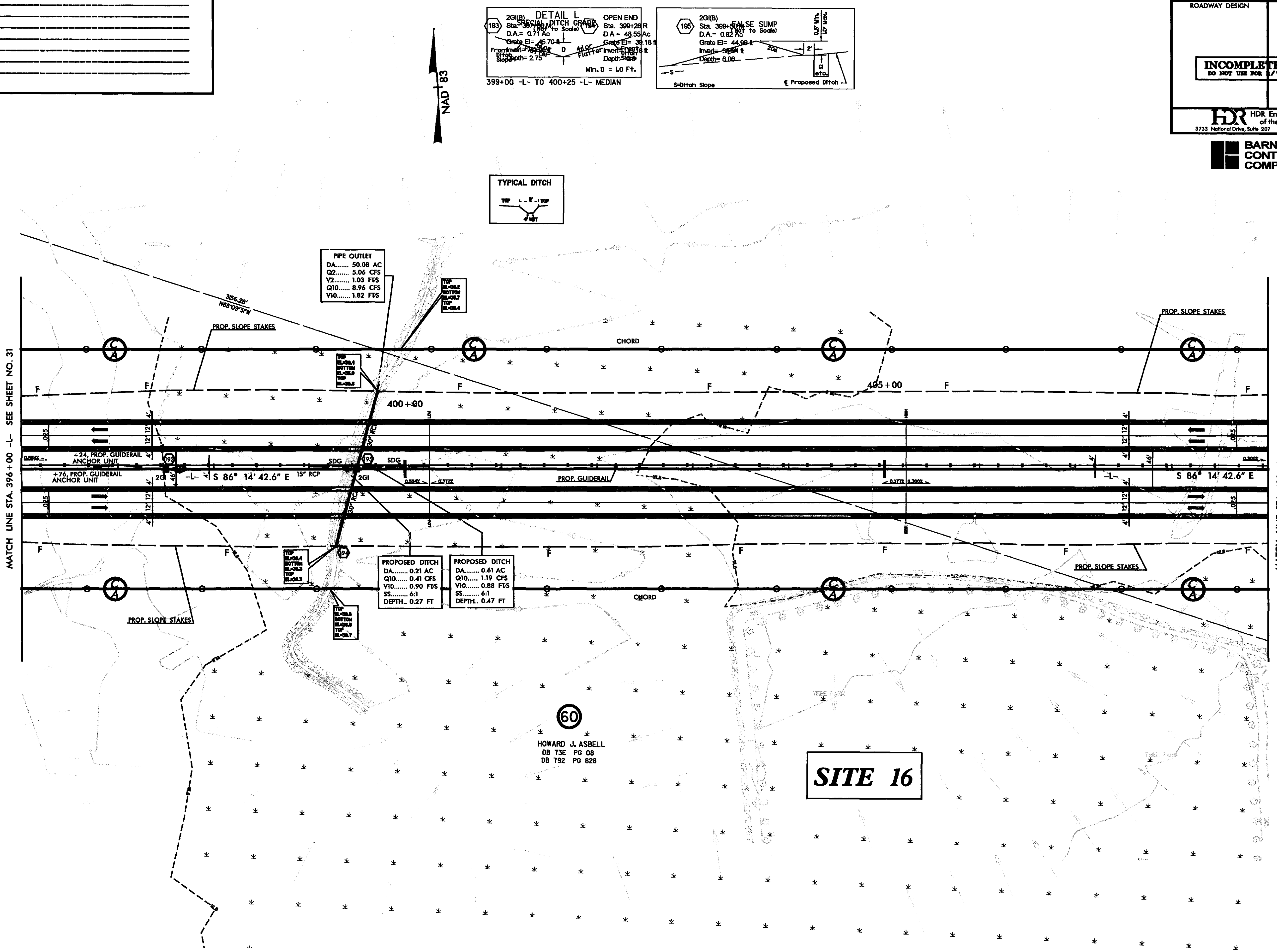
REVISIONS

PROJECT REFERENCE NO.	SHEET NO.
R-2404A	32
R/W SHEET NO.	
ROADWAY DESIGN	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

HDR Engineering, Inc. of the Carolinas
3733 National Drive, Suite 207 Raleigh, N.C. 27612

BARNHILL CONTRACTING COMPANY



DETAIL L
SPECIAL DITCH GRADE
(Not to Scale)
2GI(B)
Sta. 397+36 M
D.A.= 0.71 Ac
Grate El= 45.70 ft
Depth= 2.75
Front Ditch Slope
4:1 or Flatter
D
Min. D = 1.0 Ft.
OPEN END
Sta. 399+26 R
D.A.= 48.55 Ac
Grate El= 39.18 ft
399+00 -L- TO 400+25 -L- MEDIAN
2GI(B)
Sta. 399+50 M
FALSE SUMP
(Not to Scale)
D.A.= 0.82 Ac
Grate El= 44.96 ft
Depth= 6.06
0.5' Min.
1.0' Max.
2'
GI etc.
S=Ditch Slope
℄ Proposed Ditch
NAD 83
TYPICAL DITCH
PIPE OUTLET
DA....... 50.08 AC
Q2....... 5.06 CFS
V2....... 1.03 FT/S
Q10...... 8.96 CFS
V10...... 1.82 FT/S
3156.28'
N68°09'31"W
PROP. SLOPE STAKES
CHORD
400+00
405+00
+24, PROP. GUIDERAIL ANCHOR UNIT
+76, PROP. GUIDERAIL ANCHOR UNIT
SDG
2GI
-L- S 86° 14' 42.6" E
15" RCP
30" RCP
PROP. GUIDERAIL
PROPOSED DITCH
DA....... 0.21 AC
Q10...... 0.41 CFS
V10...... 0.90 FT/S
SS....... 6:1
DEPTH.. 0.27 FT
PROPOSED DITCH
DA....... 0.61 AC
Q10...... 1.19 CFS
V10...... 0.88 FT/S
SS....... 6:1
DEPTH.. 0.47 FT
MATCH LINE STA. 396+00 -L- SEE SHEET NO. 31
MATCH LINE STA. 409+00 -L- SEE SHEET NO. 33
60
HOWARD J. ASBELL
DB T3E PG 08
DB 792 PG 828
SITE 16

NOTES: SEE SHEET NOS. 68-69 FOR -L- PROFILE

REVISIONS

PROJECT REFERENCE NO.	SHEET NO.
R-2404A	33

R/W SHEET NO.

ROADWAY DESIGN — HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

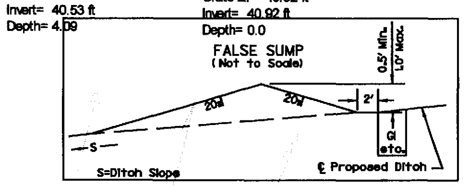
HDR Engineering, Inc. of the Carolinas
3733 National Drive, Suite 207 Raleigh, N.C. 27612

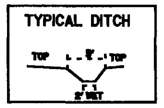
BARNHILL CONTRACTING COMPANY

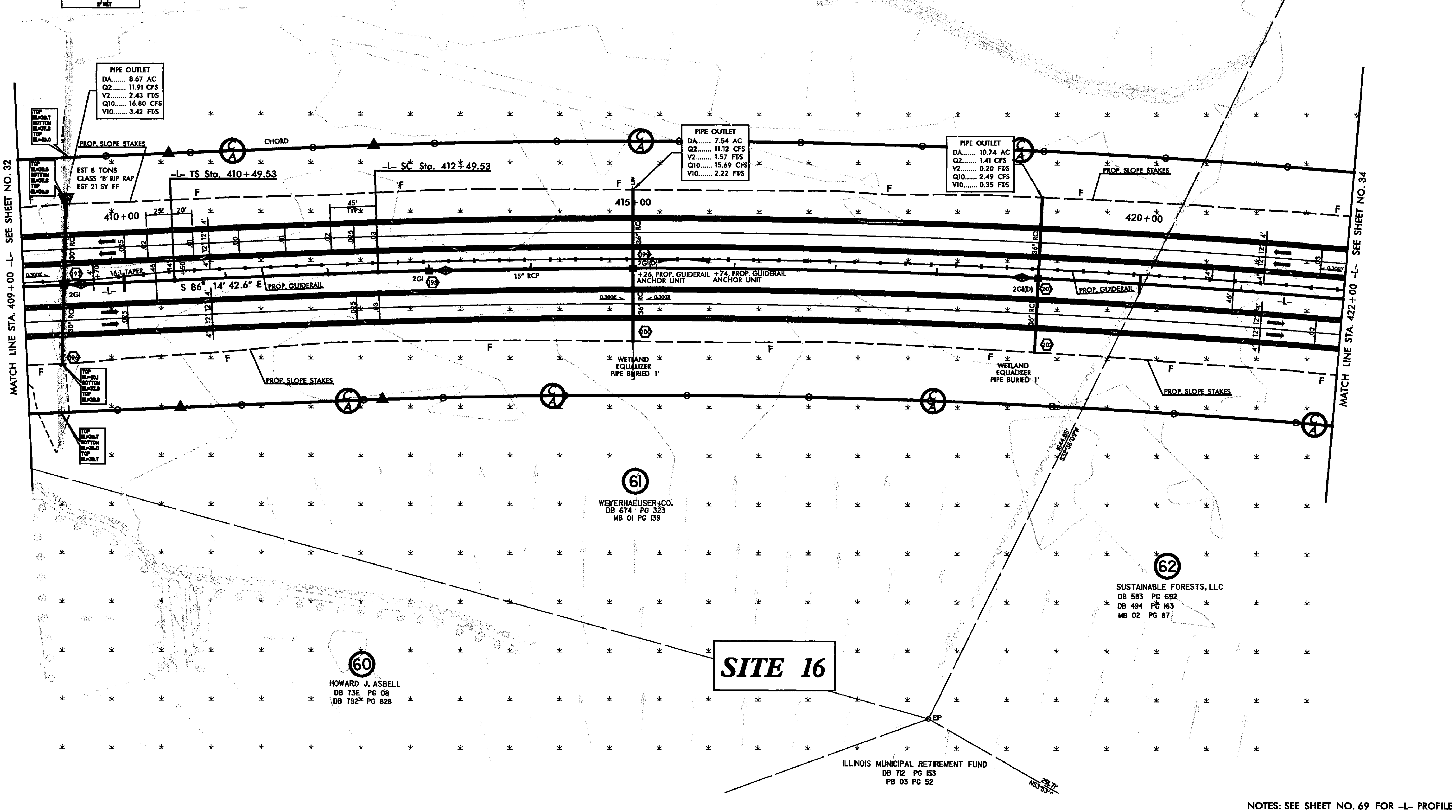
196	197	198	199	200	201	202
OPEN END	2GI(B)	2GI(B)	2GI(D)	OPEN END	2GI(D)	OPEN END
Sta. 409+35 R	Sta. 409+40 M	Sta. 413+00 M	Sta. 415+00 M	Sta. 415+00 R	Sta. 419+00 M	Sta. 419+00 R
D.A.= 8.23 Ac	D.A.= 0.44 Ac	D.A.= 0.53 Ac	D.A.= 0.32 Ac	D.A.= 6.69 Ac	D.A.= 0.74 Ac	D.A.= 10.0 Ac
Grate El= 37.90 ft	Grate El= 45.14 ft	Grate El= 44.15 ft	Grate El= 43.99 ft	Grate El= 40.55 ft	Grate El= 44.62 ft	Grate El= 40.92 ft
Invert= 37.90 ft	Invert= 38.63 ft	Invert= 41.40 ft	Invert= 40.33 ft	Invert= 40.55 ft	Invert= 40.53 ft	Invert= 40.92 ft
Depth= 0.0	Depth= 6.51	Depth= 2.75	Depth= 3.66	Depth= 0.0	Depth= 4.09	Depth= 0.0

-L-

PI = 423+73.43
Δ = 17° 23' 44.5" (RT)
Dc = 0° 42' 58.3"
θs = 0° 42' 58.3"
Ls = 200.00'
Ts = 1,323.90'
Lc = 2,228.90'
Rc = 8,000.00'
LT = 133.33'
ST = 66.67'
e = 0.03
DS = 70 mph







NAD 83
61
WEYERHAEUSER CO.
DB 674 PG 323
MB 01 PG 139
PIPE OUTLET
DA....... 8.67 AC
Q2....... 11.91 CFS
V2....... 2.43 FT/S
Q10...... 16.80 CFS
V10...... 3.42 FT/S
PIPE OUTLET
DA....... 7.54 AC
Q2....... 11.12 CFS
V2....... 1.57 FT/S
Q10...... 15.69 CFS
V10...... 2.22 FT/S
PIPE OUTLET
DA....... 10.74 AC
Q2....... 1.41 CFS
V2....... 0.20 FT/S
Q10...... 2.49 CFS
V10...... 0.35 FT/S
CHORD
PROP. SLOPE STAKES
EST 8 TONS
CLASS 'B' RIP RAP
EST 21 SY FF
-L- TS Sta. 410+49.53
-L- SC Sta. 412+49.53
410+00
415+00
420+00
S 86° 14' 42.6" E
PROP. GUIDERAIL
15" RCP
+26, PROP. GUIDERAIL ANCHOR UNIT
+74, PROP. GUIDERAIL ANCHOR UNIT
WETLAND EQUALIZER PIPE BURIED 1'
MATCH LINE STA. 409+00 -L- SEE SHEET NO. 32
MATCH LINE STA. 422+00 -L- SEE SHEET NO. 34
61
WEYERHAEUSER CO.
DB 674 PG 323
MB 01 PG 139
62
SUSTAINABLE FORESTS, LLC
DB 583 PG 692
DB 494 PG 163
MB 02 PG 87
60
HOWARD J. ASBELL
DB 73E PG 08
DB 792 PG 828
SITE 16
EIP
ILLINOIS MUNICIPAL RETIREMENT FUND
DB 712 PG 153
PB 03 PG 52

NOTES: SEE SHEET NO. 69 FOR -L- PROFILE

8/1/2005 10:45:45 AM

PROJECT REFERENCE NO.	SHEET NO.
R-2404A	34

R/W SHEET NO.

ROADWAY DESIGN | HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

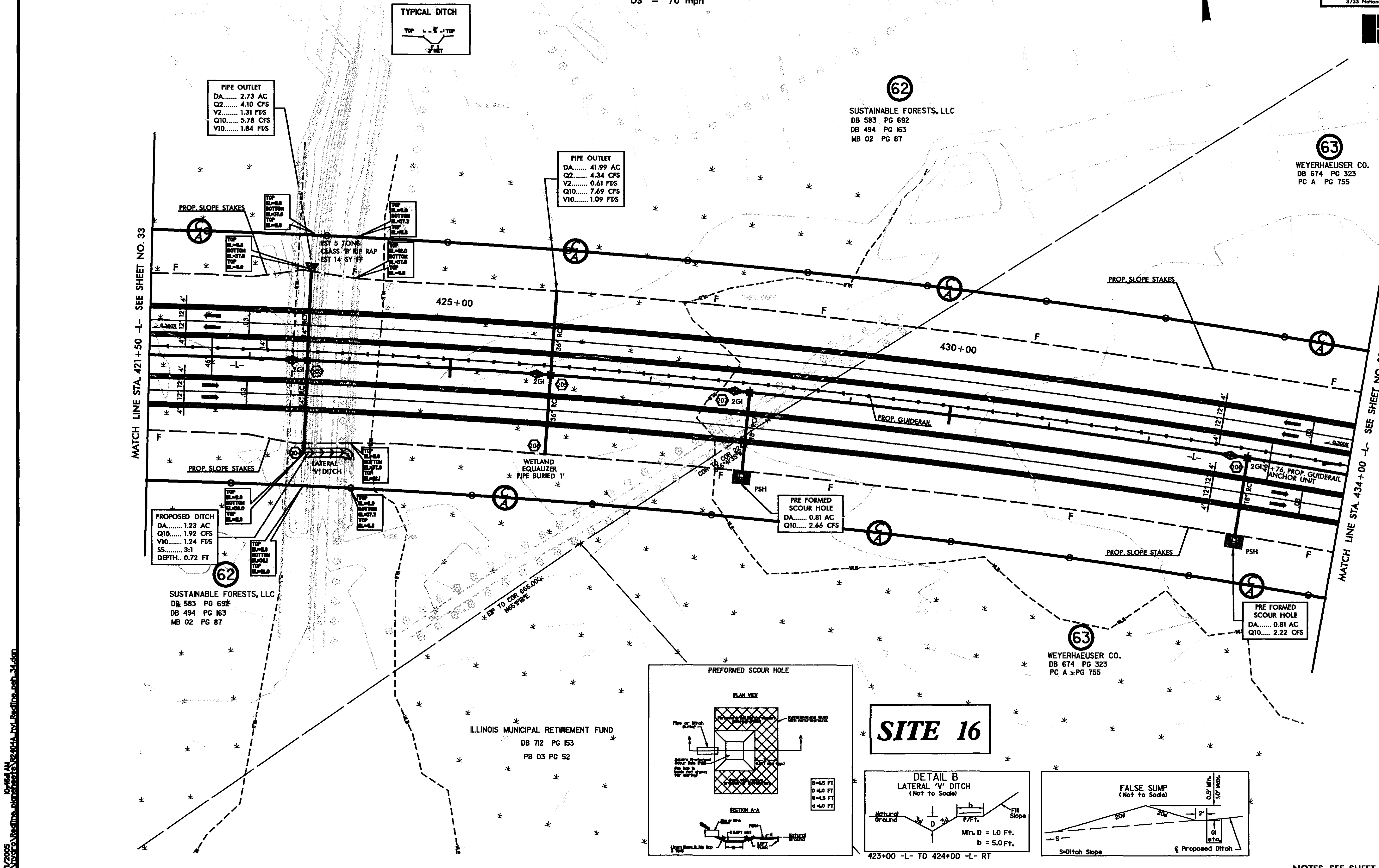
HDR Engineering, Inc. of the Carolinas
3733 National Drive, Suite 207 Raleigh, N.C. 27612

BARNHILL CONTRACTING COMPANY

REVISIONS

-L-

PI	=	423+73.43
Δ	=	17° 23' 44.5" (RT)
Dc	=	0° 42' 58.3"
θs	=	0° 42' 58.3"
Ls	=	200.00'
Ts	=	1,323.90'
Lc	=	2,228.90'
Rc	=	8,000.00'
LT	=	133.33'
ST	=	66.67'
e	=	0.03
DS	=	70 mph



NAD 83
TYPICAL DITCH
PIPE OUTLET
DA....... 2.73 AC
Q2....... 4.10 CFS
V2....... 1.31 FT/S
Q10...... 5.78 CFS
V10...... 1.84 FT/S
PIPE OUTLET
DA....... 41.99 AC
Q2....... 4.34 CFS
V2....... 0.61 FT/S
Q10...... 7.69 CFS
V10...... 1.09 FT/S
62
SUSTAINABLE FORESTS, LLC
DB 583 PG 692
DB 494 PG 163
MB 02 PG 87
63
WEYERHAEUSER CO.
DB 674 PG 323
PC A PG 755
PROP. SLOPE STAKES
EST 5 TONS CLASS 'B' RIP RAP
EST 14 SY FF
425+00
430+00
MATCH LINE STA. 421+50 -L- SEE SHEET NO. 33
MATCH LINE STA. 434+00 -L- SEE SHEET NO. 35
PROP. GUIDERAIL
+76 PROP. GUIDERAIL ANCHOR UNIT
LATERAL 'V' DITCH
WETLAND EQUALIZER PIPE BURIED 1'
PRE FORMED SCOUR HOLE
DA....... 0.81 AC
Q10...... 2.66 CFS
PRE FORMED SCOUR HOLE
DA....... 0.81 AC
Q10...... 2.22 CFS
PSH
PROPOSED DITCH
DA....... 1.23 AC
Q10...... 1.92 CFS
V10...... 1.24 FT/S
SS....... 3:1
DEPTH.. 0.72 FT
SUSTAINABLE FORESTS, LLC
DB 583 PG 692
DB 494 PG 163
MB 02 PG 87
WEYERHAEUSER CO.
DB 674 PG 323
PC A PG 755
ILLINOIS MUNICIPAL RETIREMENT FUND
DB 712 PG 153
PB 03 PG 52
PREFORMED SCOUR HOLE
PLAN VIEW
SECTION A-A
SITE 16
DETAIL B
LATERAL 'V' DITCH
(Not to Scale)
Natural Ground
Fill Slope
Min. D = 1.0 Ft.
b = 5.0 Ft.
423+00 -L- TO 424+00 -L- RT
FALSE SUMP
(Not to Scale)
S=Ditch Slope
℄ Proposed Ditch

Structure	Type	Sta.	D.A.	Grate El	Invert	Depth
203	2GI(B)	423+60 M	0.39 Ac	45.94 ft	38.40 ft	7.54
204	OPEN END	423+60 R	2.34 Ac	38.0 ft	38.0 ft	0.0
205	2GI(B)	426+00 M	0.32 Ac	46.72 ft	40.89 ft	5.83
206	OPEN END	426+00 RT	41.67 Ac	40.99 ft	40.99 ft	0.0
207	2GI(B)	428+00 M	0.81 Ac	47.32 ft	44.32 ft	3.0
208	2GI(B)	433+00 M	0.81 Ac	48.82 ft	45.82 ft	3.0

NOTES: SEE SHEET NOS. 69-70 FOR -L- PROFILE

PROJECT REFERENCE NO.	SHEET NO.
R-2404A	35

R/W SHEET NO.

ROADWAY DESIGN — HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

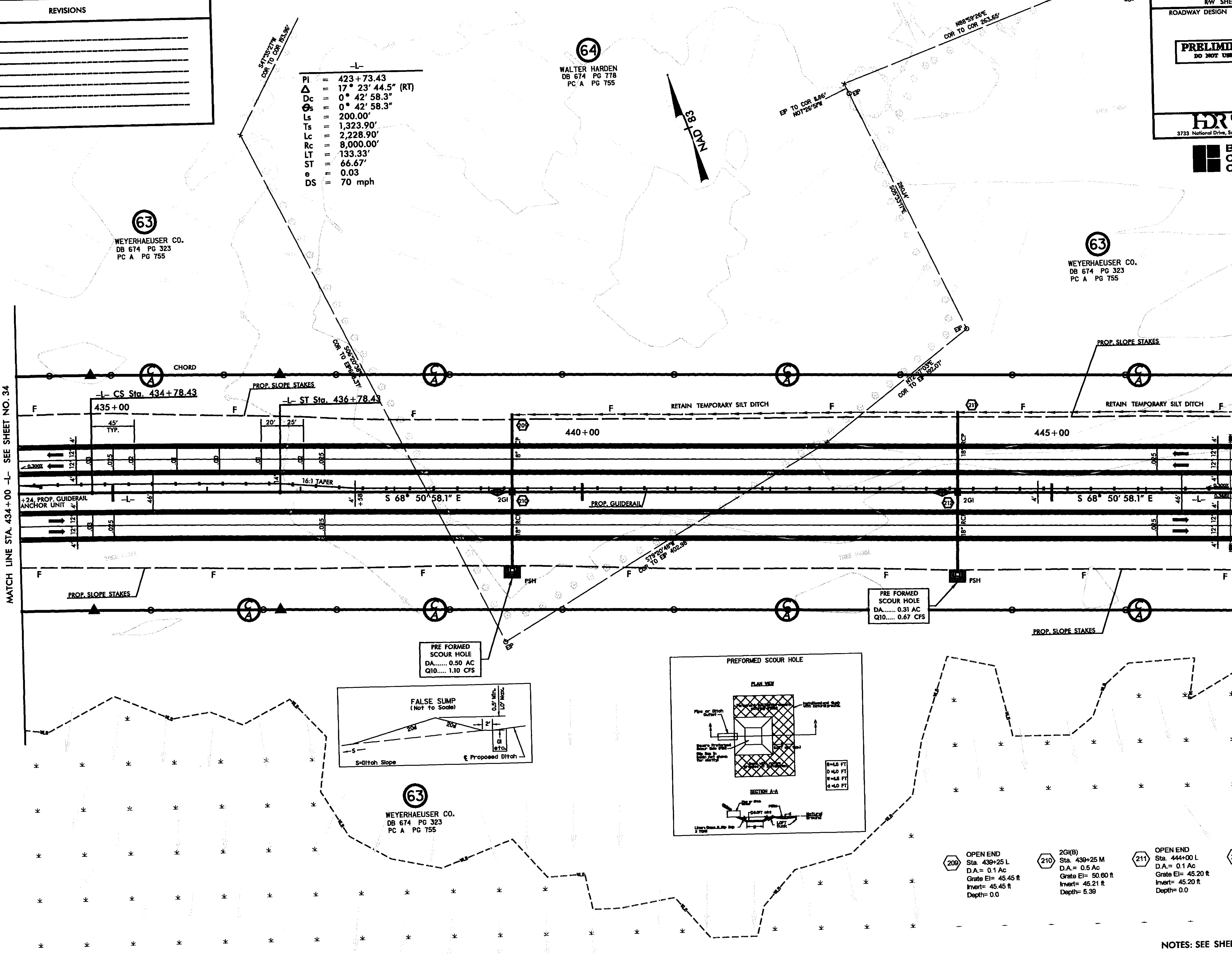
HDR Engineering, Inc. of the Carolinas
3733 National Drive, Suite 207 Raleigh, N.C. 27612

BARNHILL CONTRACTING COMPANY

REVISIONS

-L-

PI	=	423+73.43
Δ	=	17° 23′ 44.5″ (RT)
Dc	=	0° 42′ 58.3″
θs	=	0° 42′ 58.3″
Ls	=	200.00′
Ts	=	1,323.90′
Lc	=	2,228.90′
Rc	=	8,000.00′
LT	=	133.33′
ST	=	66.67′
e	=	0.03
DS	=	70 mph



64 WALTER HARDEN DB 674 PG 778 PC A PG T55
63 WEYERHAEUSER CO. DB 674 PG 323 PC A PG T55
NAD 83
CHORD
-L- CS Sta. 434+78.43
-L- ST Sta. 436+78.43
435+00
440+00
445+00
45′ TYP.
PROP. SLOPE STAKES
RETAIN TEMPORARY SILT DITCH
16:1 TAPER
+24, PROP. GUIDERAIL ANCHOR UNIT
S 68° 50′ 58.1″ E
PROP. GUIDERAIL
PSH
MATCH LINE STA. 434+00 -L- SEE SHEET NO. 34
MATCH LINE STA. 447+00 -L- SEE SHEET NO. 36
PRE FORMED SCOUR HOLE DA...... 0.50 AC Q10..... 1.10 CFS
PRE FORMED SCOUR HOLE DA...... 0.31 AC Q10..... 0.67 CFS
FALSE SUMP (Not to Scale)
S=Ditch Slope
℄ Proposed Ditch
PREFORMED SCOUR HOLE
PLAN VIEW
SECTION A-A

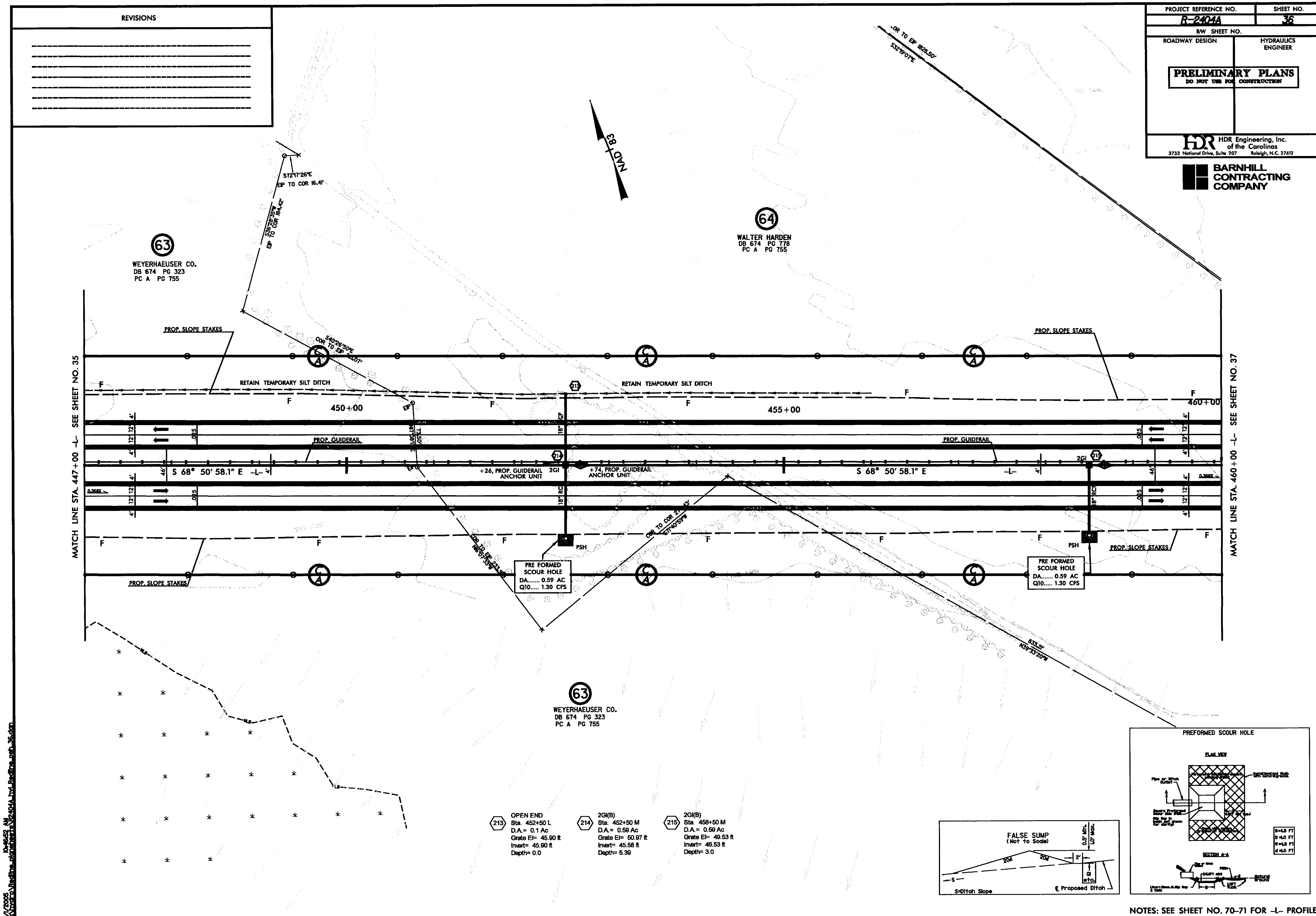
209 OPEN END Sta. 439+25 L D.A.= 0.1 Ac Grate El= 45.45 ft Invert= 45.45 ft Depth= 0.0

210 2GI(B) Sta. 439+25 M D.A.= 0.5 Ac Grate El= 50.60 ft Invert= 45.21 ft Depth= 5.39

211 OPEN END Sta. 444+00 L D.A.= 0.1 Ac Grate El= 45.20 ft Invert= 45.20 ft Depth= 0.0

212 2GI(B) Sta. 444+00 M D.A.= 0.31 Ac Grate El= 51.30 ft Invert= 44.88 ft Depth= 6.42

NOTES: SEE SHEET NO. 70 FOR -L- PROFILE.



REVISIONS
PROJECT REFERENCE NO. R-2404A
SHEET NO. 36
R/W SHEET NO.
ROADWAY DESIGN
HYDRAULICS ENGINEER
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION
HDR Engineering, Inc. of the Carolinas
3733 National Drive, Suite 207 Raleigh, N.C. 27612
BARNHILL CONTRACTING COMPANY
NAD 83
63
WEYERHAEUSER CO.
DB 674 PG 323
PC A PG 755
64
WALTER HARDEN
DB 674 PG 778
PC A PG 755
S72°17'26"E
EIP TO COR 16.41'
COR TO EIP 1828.50'
S32°19'01"E
PROP. SLOPE STAKES
RETAIN TEMPORARY SILT DITCH
450+00
455+00
460+00
PROP. GUIDERAIL
S 68° 50' 58.1" E -L-
+26, PROP. GUIDERAIL ANCHOR UNIT
+74, PROP. GUIDERAIL ANCHOR UNIT
2GI
18" RCP
PSH
PRE FORMED SCOUR HOLE
DA...... 0.59 AC
Q10..... 1.30 CFS
MATCH LINE STA. 447+00 -L- SEE SHEET NO. 35
MATCH LINE STA. 460+00 -L- SEE SHEET NO. 37
833.21'
N39°33'20"W
63
WEYERHAEUSER CO.
DB 674 PG 323
PC A PG 755
213 OPEN END
Sta. 452+50 L
D.A.= 0.1 Ac
Grate El= 45.90 ft
Invert= 45.90 ft
Depth= 0.0
214 2GI(B)
Sta. 452+50 M
D.A.= 0.59 Ac
Grate El= 50.97 ft
Invert= 45.58 ft
Depth= 5.39
215 2GI(B)
Sta. 458+50 M
D.A.= 0.59 Ac
Grate El= 49.53 ft
Invert= 46.53 ft
Depth= 3.0
FALSE SUMP (Not to Scale)
S=Ditch Slope
℄ Proposed Ditch
PREFORMED SCOUR HOLE
PLAN VIEW
SECTION A-A
NOTES: SEE SHEET NO. 70-71 FOR -L- PROFILE.
8/1/2005

REVISIONS

PROJECT REFERENCE NO.	SHEET NO.
R-2404A	37
R/W SHEET NO.	
ROADWAY DESIGN	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

HDR Engineering, Inc. of the Carolinas
3733 National Drive, Suite 207 Raleigh, N.C. 27612

BARNHILL CONTRACTING COMPANY

-L-

PI	=	468+50.60
D	=	11° 12′ 34.4″ (RT)
Dc	=	1° 21′ 51.1″
Fs	=	1° 21′ 51.1″
Ls	=	200.00′
Ts	=	512.20′
Lc	=	621.70′
Rc	=	4,200.00′
LT	=	133.34′
ST	=	66.67′
e	=	0.04
DS	=	60 mph

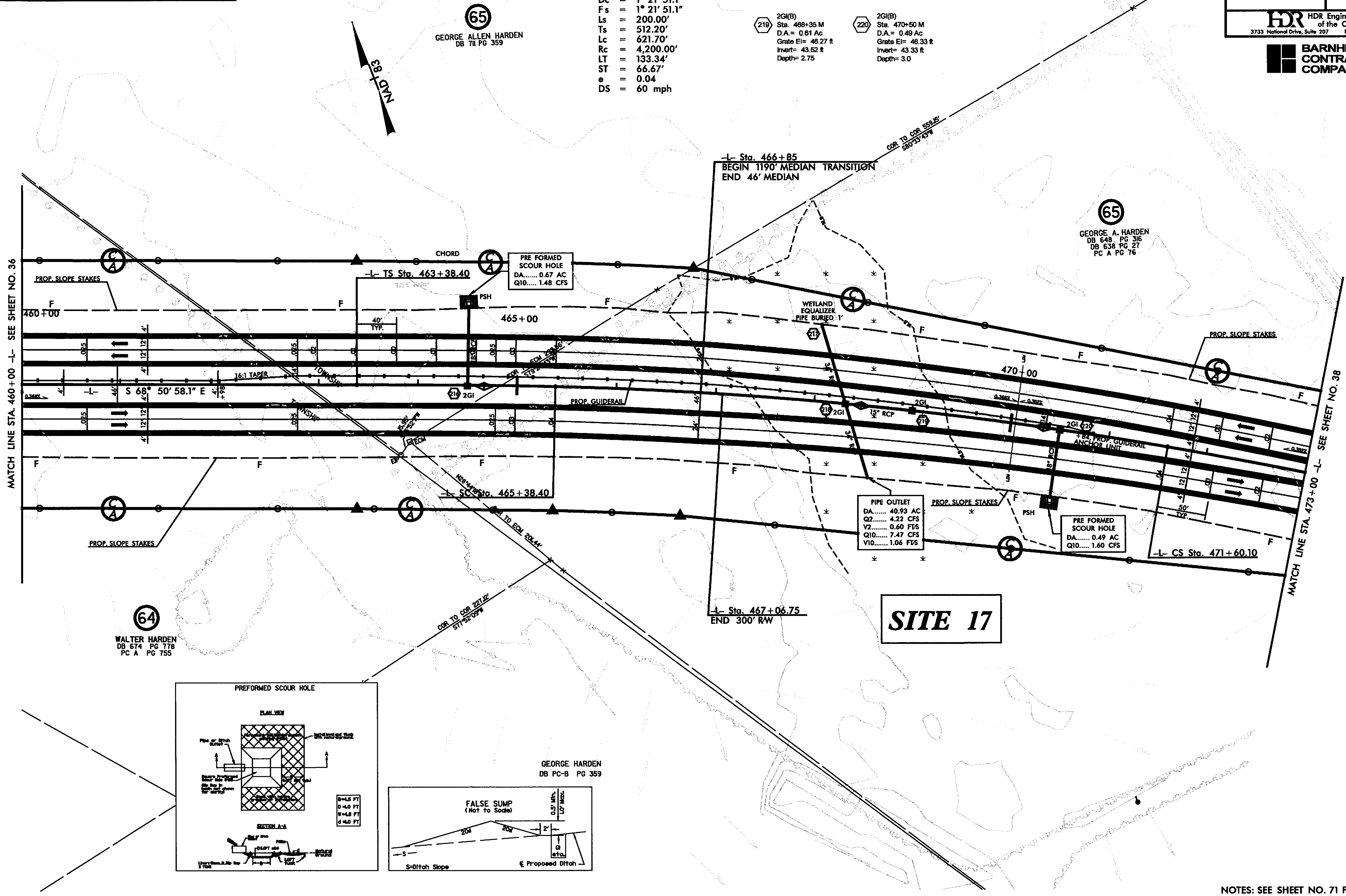
216 2GI(B) Sta. 464+50 M D.A.= 0.67 Ac Grate El= 47.36 ft Invert= 44.36 ft Depth= 3.0

217 OPEN END Sta. 468+00 L D.A.= 40.01 Ac Grate El= 42.03 ft Invert= 42.03 ft Depth= 0.0

218 2GI(B) Sta. 469+00 M D.A.= 0.31 Ac Grate El= 46.16 ft Invert= 41.66 ft Depth= 4.50

219 2GI(B) Sta. 468+35 M D.A.= 0.61 Ac Grate El= 46.27 ft Invert= 43.52 ft Depth= 2.75

220 2GI(B) Sta. 470+50 M D.A.= 0.49 Ac Grate El= 46.33 ft Invert= 43.33 ft Depth= 3.0



65
GEORGE ALLEN HARDEN
DB 711 PG 359
NAD 83
CHORD
PRE FORMED SCOUR HOLE
DA....... 0.67 AC
Q10...... 1.48 CFS
-L- TS Sta. 463+38.40
PROP. SLOPE STAKES
460+00
465+00
470+00
16:1 TAPER
S 68° 50′ 58.1″ E
PROP. GUIDERAIL
-L- Sta. 466+85
BEGIN 1190′ MEDIAN TRANSITION
END 46′ MEDIAN
COR TO COR 559.15′
WETLAND EQUALIZER PIPE BURIED 1′
15″ RCP
+84 PROP. GUIDERAIL ANCHOR UNIT
65
GEORGE A. HARDEN
DB 648 PG 316
DB 638 PG 27
PC A PG 76
-L- SC Sta. 465+38.40
PIPE OUTLET
DA....... 40.93 AC
Q2....... 4.22 CFS
V2....... 0.60 FT/S
Q10...... 7.47 CFS
V10...... 1.06 FT/S
PRE FORMED SCOUR HOLE
DA....... 0.49 AC
Q10...... 1.60 CFS
-L- CS Sta. 471+60.10
-L- Sta. 467+06.75
END 300′ R/W
SITE 17
MATCH LINE STA. 460+00 -L- SEE SHEET NO. 36
MATCH LINE STA. 473+00 -L- SEE SHEET NO. 38
64
WALTER HARDEN
DB 674 PG 778
PC A PG 755
COR TO COR 227.22′
PREFORMED SCOUR HOLE
PLAN VIEW
SECTION A-A
GEORGE HARDEN
DB PC-B PG 359
FALSE SUMP
(Not to Scale)
S=Ditch Slope
℄ Proposed Ditch

NOTES: SEE SHEET NO. 71 FOR -L- PROFILE.

8/1/2005

REVISIONS

PROJECT REFERENCE NO.	SHEET NO.
R-2404A	38
R/W SHEET NO.	
ROADWAY DESIGN	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

HDR Engineering, Inc. of the Carolinas
3733 National Drive, Suite 207 Raleigh, N.C. 27612

BARNHILL CONTRACTING COMPANY

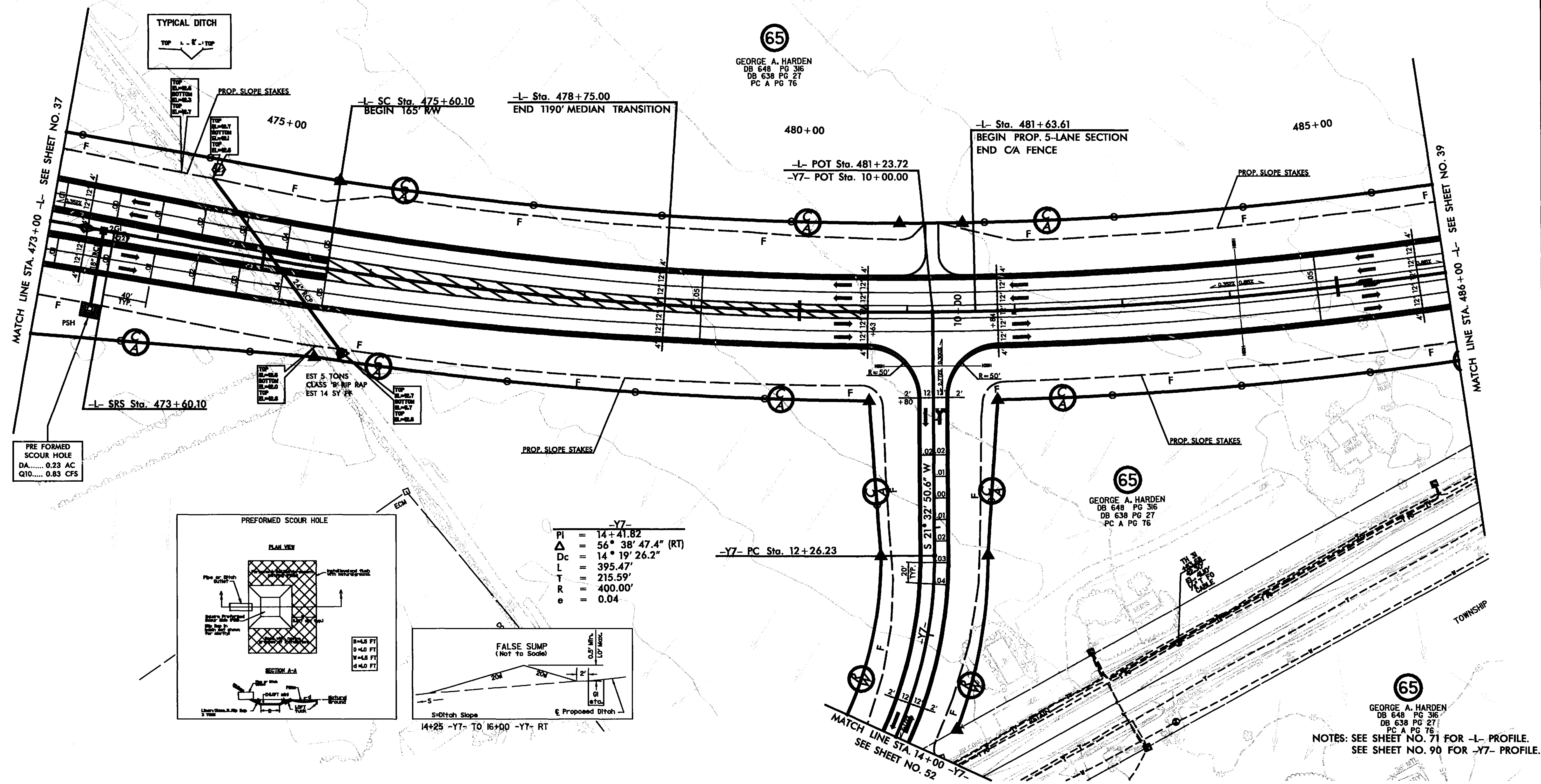
221 2GI(B)
Sta. 473+50 M
D.A.= 0.23 Ac
Grate El= 47.85 ft
Invert= 44.85 ft
Depth= 3.0

-L-

PI	=	493+65.10
D	=	57° 06' 40.2" (LT)
Dc	=	1° 38' 13.3"
Fs	=	1° 38' 13.3"
Ls	=	200.00'
Ts	=	2,005.00'
Lc	=	3,288.72'
Rc	=	3,500.00'
LT	=	133.34'
ST	=	66.67'
e	=	0.05
DS	=	60 mph

-Y7-

PI	=	14+41.82
Δ	=	56° 38' 47.4" (RT)
Dc	=	14° 19' 26.2"
L	=	395.47'
T	=	215.59'
R	=	400.00'
e	=	0.04



NAD 83
TYPICAL DITCH
PROP. SLOPE STAKES
-L- SC Sta. 475+60.10
BEGIN 165' R/W
-L- Sta. 478+75.00
END 1190' MEDIAN TRANSITION
475+00
480+00
485+00
65
GEORGE A. HARDEN
DB 648 PG 316
DB 638 PG 27
PC A PG 76
-L- Sta. 481+63.61
BEGIN PROP. 5-LANE SECTION
END C/A FENCE
-L- POT Sta. 481+23.72
-Y7- POT Sta. 10+00.00
MATCH LINE STA. 473+00 -L- SEE SHEET NO. 37
MATCH LINE STA. 486+00 -L- SEE SHEET NO. 39
PSH
-L- SRS Sta. 473+60.10
PRE FORMED SCOUR HOLE
DA....... 0.23 AC
Q10...... 0.83 CFS
EST 5 TONS
CLASS 'B' RIP RAP
EST 14 SY FF
PROP. SLOPE STAKES
R=50'
S 21° 32' 50.6" W
-Y7- PC Sta. 12+26.23
PROP. SLOPE STAKES
65
GEORGE A. HARDEN
DB 648 PG 316
DB 638 PG 27
PC A PG 76
PREFORMED SCOUR HOLE
PLAN VIEW
SECTION A-A
FALSE SUMP
(Not to Scale)
S=Ditch Slope
℄ Proposed Ditch
14+25 -Y7- TO 16+00 -Y7- RT
MATCH LINE STA. 14+00 -Y7-
SEE SHEET NO. 52
TOWNSHIP
65
GEORGE A. HARDEN
DB 648 PG 316
DB 638 PG 27
PC A PG 76

NOTES: SEE SHEET NO. 71 FOR -L- PROFILE.
SEE SHEET NO. 90 FOR -Y7- PROFILE.

REVISIONS

PROJECT REFERENCE NO.	SHEET NO.
R-2404A	39
R/W SHEET NO.	
ROADWAY DESIGN	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

HDR Engineering, Inc. of the Carolinas
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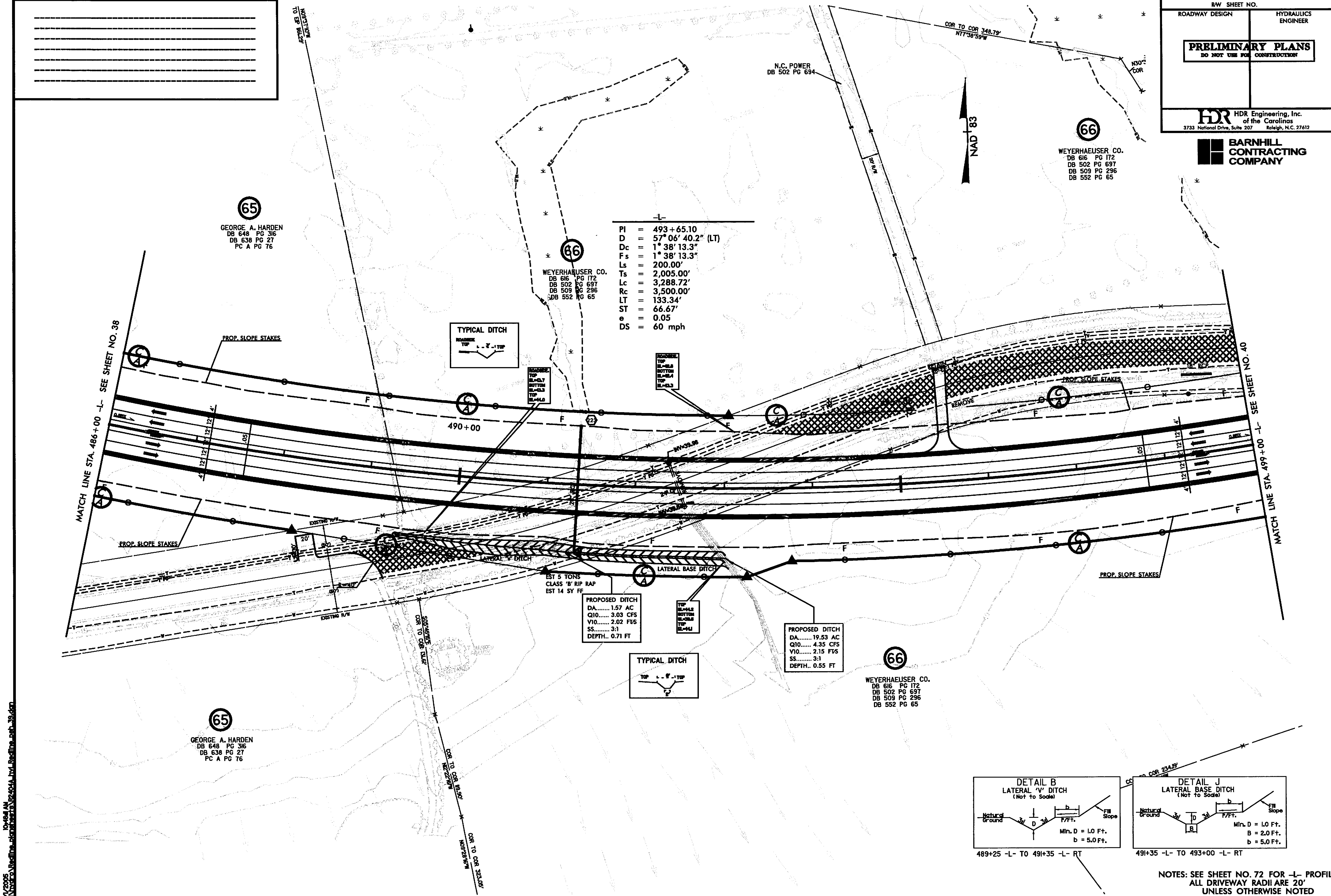
BARNHILL CONTRACTING COMPANY



NAD 83
N.C. POWER
DB 502 PG 694
COR TO COR 348.79'
N77°38'59"W
66
WEYERHAEUSER CO.
DB 616 PG 172
DB 502 PG 697
DB 509 PG 296
DB 552 PG 65
65
GEORGE A. HARDEN
DB 648 PG 316
DB 638 PG 27
PC A PG 76
-L-
PI = 493+65.10
D = 57° 06' 40.2" (LT)
Dc = 1° 38' 13.3"
Fs = 1° 38' 13.3"
Ls = 200.00'
Ts = 2,005.00'
Lc = 3,288.72'
Rc = 3,500.00'
LT = 133.34'
ST = 66.67'
e = 0.05
DS = 60 mph
TYPICAL DITCH
PROP. SLOPE STAKES
MATCH LINE STA. 486+00 -L- SEE SHEET NO. 38
MATCH LINE STA. 499+00 -L- SEE SHEET NO. 40
490+00
REMOVE
EXISTING R/W
LATERAL 'V' DITCH
LATERAL BASE DITCH
EST 5 TONS
CLASS 'B' RIP RAP
EST 14 SY FF
PROPOSED DITCH
DA........ 1.57 AC
Q10....... 3.03 CFS
V10....... 2.02 FT/S
SS......... 3:1
DEPTH.. 0.71 FT
PROPOSED DITCH
DA........ 19.53 AC
Q10....... 4.35 CFS
V10....... 2.15 FT/S
SS......... 3:1
DEPTH.. 0.55 FT
COR TO COR 85.90'
COR TO COR 323.05'
COR TO COR 234.19'
DETAIL B
LATERAL 'V' DITCH
(Not to Scale)
Natural Ground
Fill Slope
Min. D = 1.0 Ft.
b = 5.0 Ft.
489+25 -L- TO 491+35 -L- RT
DETAIL J
LATERAL BASE DITCH
(Not to Scale)
Natural Ground
Fill Slope
Min. D = 1.0 Ft.
B = 2.0 Ft.
b = 5.0 Ft.
491+35 -L- TO 493+00 -L- RT

NOTES: SEE SHEET NO. 72 FOR -L- PROFILE.
ALL DRIVEWAY RADII ARE 20'
UNLESS OTHERWISE NOTED

8/1/2005

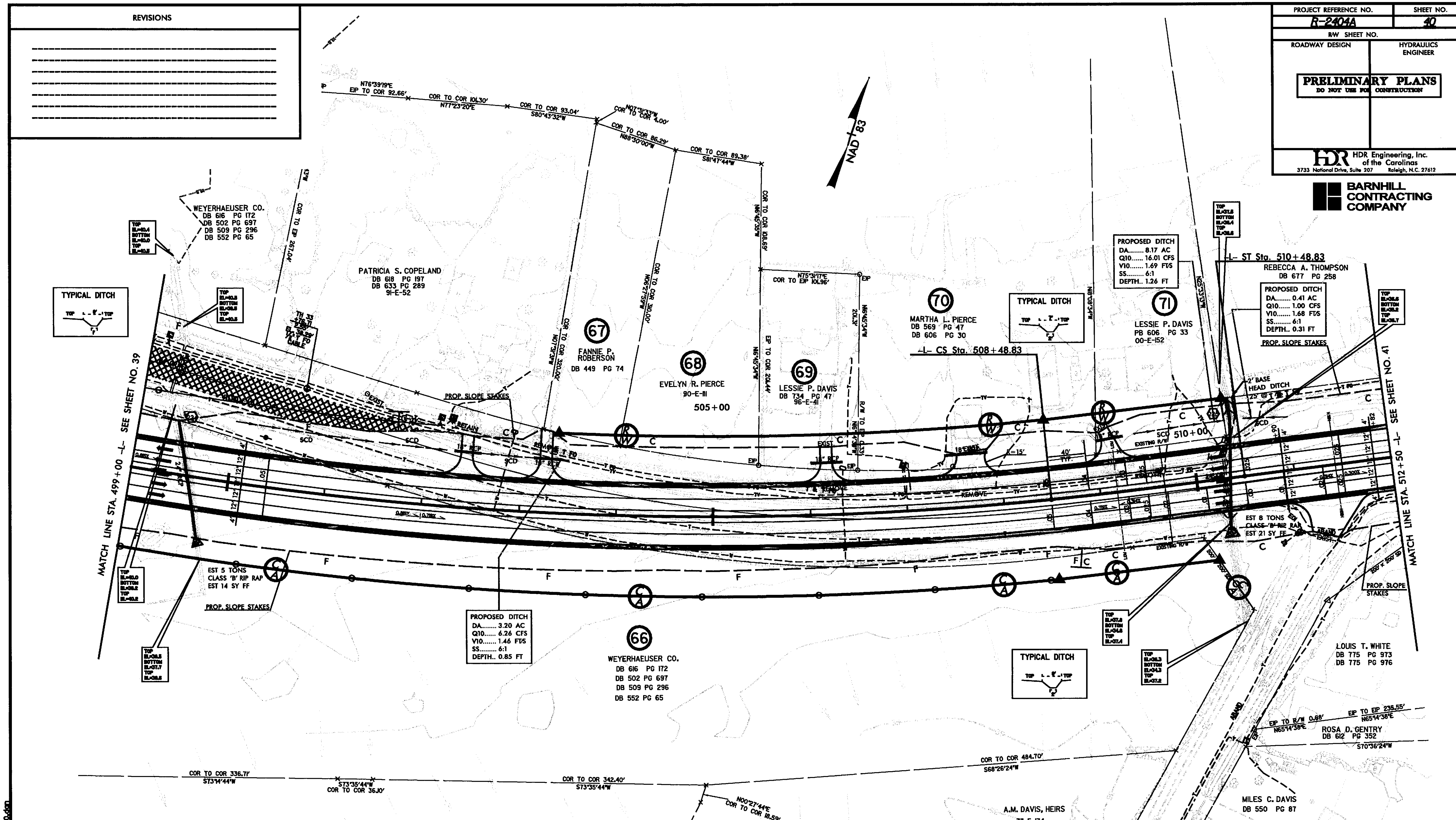
REVISIONS

PROJECT REFERENCE NO.	SHEET NO.
R-2404A	40
R/W SHEET NO.	
ROADWAY DESIGN	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

HDR Engineering, Inc. of the Carolinas
3733 National Drive, Suite 207 Raleigh, N.C. 27612

BARNHILL CONTRACTING COMPANY



NAD 83
WEYERHAEUSER CO.
DB 616 PG 172
DB 502 PG 697
DB 509 PG 296
DB 552 PG 65
PATRICIA S. COPELAND
DB 618 PG 197
DB 633 PG 289
91-E-52
FANNIE P. ROBERSON
DB 449 PG 74
EVELYN R. PIERCE
90-E-111
LESSIE P. DAVIS
DB 734 PG 47
96-E-41
MARTHA L. PIERCE
DB 569 PG 47
DB 606 PG 30
LESSIE P. DAVIS
PB 606 PG 33
00-E-152
REBECCA A. THOMPSON
DB 677 PG 258
LOUIS T. WHITE
DB 775 PG 973
DB 775 PG 976
ROSA D. GENTRY
DB 612 PG 352
MILES C. DAVIS
DB 550 PG 87
A.M. DAVIS, HEIRS
77-E-134
-L- CS Sta. 508+48.83
-L- ST Sta. 510+48.83
505+00
510+00
MATCH LINE STA. 499+00 -L- SEE SHEET NO. 39
MATCH LINE STA. 512+50 -L- SEE SHEET NO. 41
TYPICAL DITCH
PROP. SLOPE STAKES
EST 5 TONS CLASS 'B' RIP RAP EST 14 SY FF
EST 8 TONS CLASS 'B' RIP RAP EST 21 SY FF
2' BASE HEAD DITCH
PROPOSED DITCH
DA........ 3.20 AC
Q10...... 6.26 CFS
V10...... 1.46 FT/S
SS......... 6:1
DEPTH.. 0.85 FT
PROPOSED DITCH
DA........ 8.17 AC
Q10...... 16.01 CFS
V10...... 1.69 FT/S
SS......... 6:1
DEPTH.. 1.26 FT
PROPOSED DITCH
DA........ 0.41 AC
Q10...... 1.00 CFS
V10...... 1.68 FT/S
SS......... 6:1
DEPTH.. 0.31 FT
COR TO COR 336.71'
S73°14'44"W
COR TO COR 342.40'
S73°35'44"W
COR TO COR 484.70'
S68°26'24"W

11,400 US 17		11,400 US 17
<100		<100
	100 SR 1503	

2025 ADT

DETAIL A
SPECIAL CUT DITCH
(Not to Scale)
Min. D = 1.0 Ft.
500+00 -L- TO 503+50 -L- LT
509+18 -L- TO 511+00 -L- LT

DETAIL K
STANDARD BASE DITCH
(Not to Scale)
Min. D = 1.0 Ft.
B = 2.0 Ft.
510+40 LT

NOTES: SEE SHEET NO. 72 FOR -L- PROFILE.
ALL DRIVEWAY RADII ARE 20' UNLESS OTHERWISE NOTED.

8/1/2005

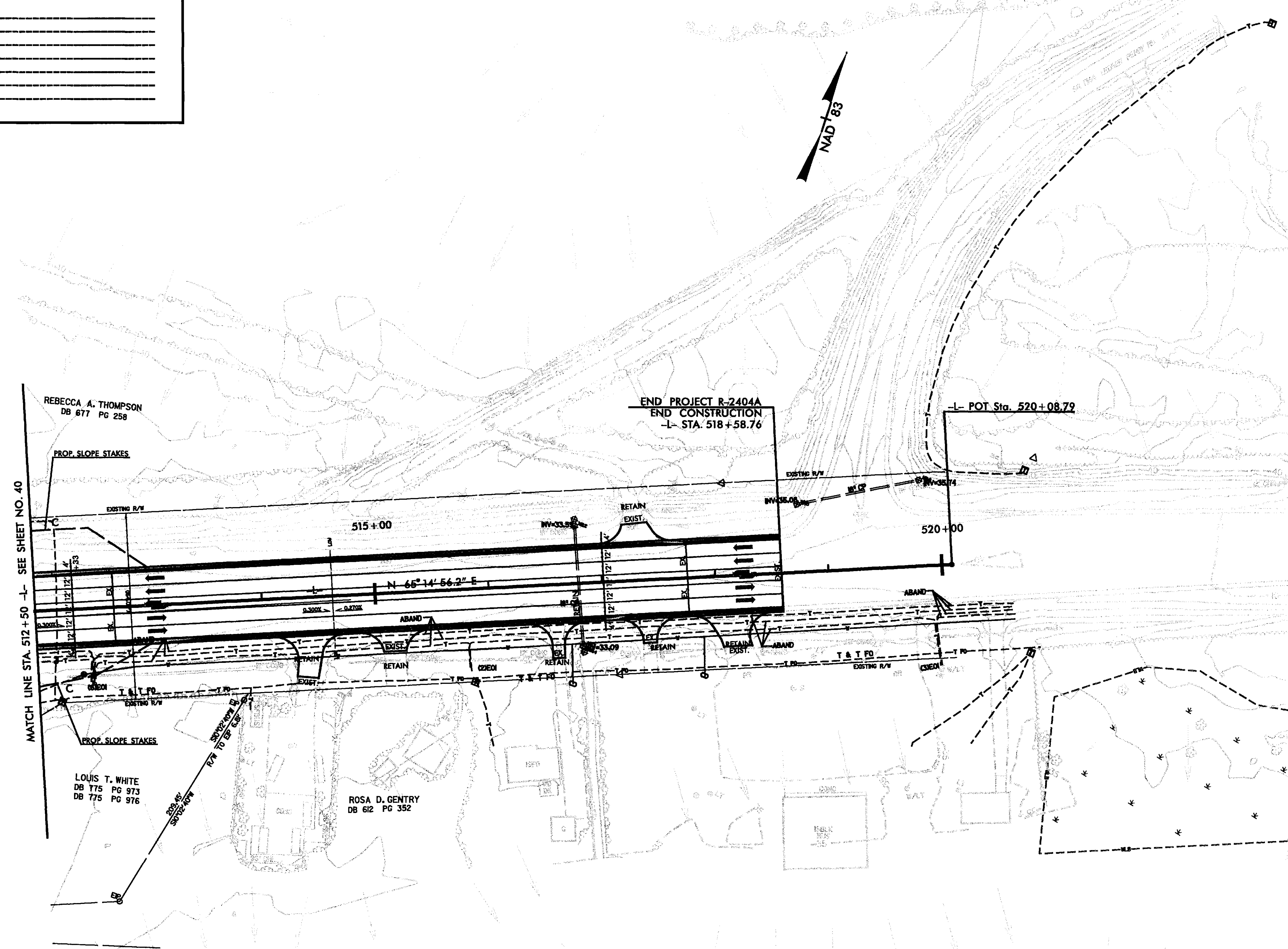
REVISIONS

PROJECT REFERENCE NO.	SHEET NO.
R-2404A	41
R/W SHEET NO.	
ROADWAY DESIGN	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

HDR Engineering, Inc. of the Carolinas
3733 National Drive, Suite 207 Raleigh, N.C. 27612

BARNHILL CONTRACTING COMPANY



NOTES: SEE SHEET NO. 73 FOR -L- PROFILE.
ALL DRIVEWAY RADII ARE 20'
UNLESS OTHERWISE NOTED.

REVISIONS

PROJECT REFERENCE NO.	SHEET NO.
R-2404A	42
R/W SHEET NO.	REVISIONS
ROADWAY DESIGN	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

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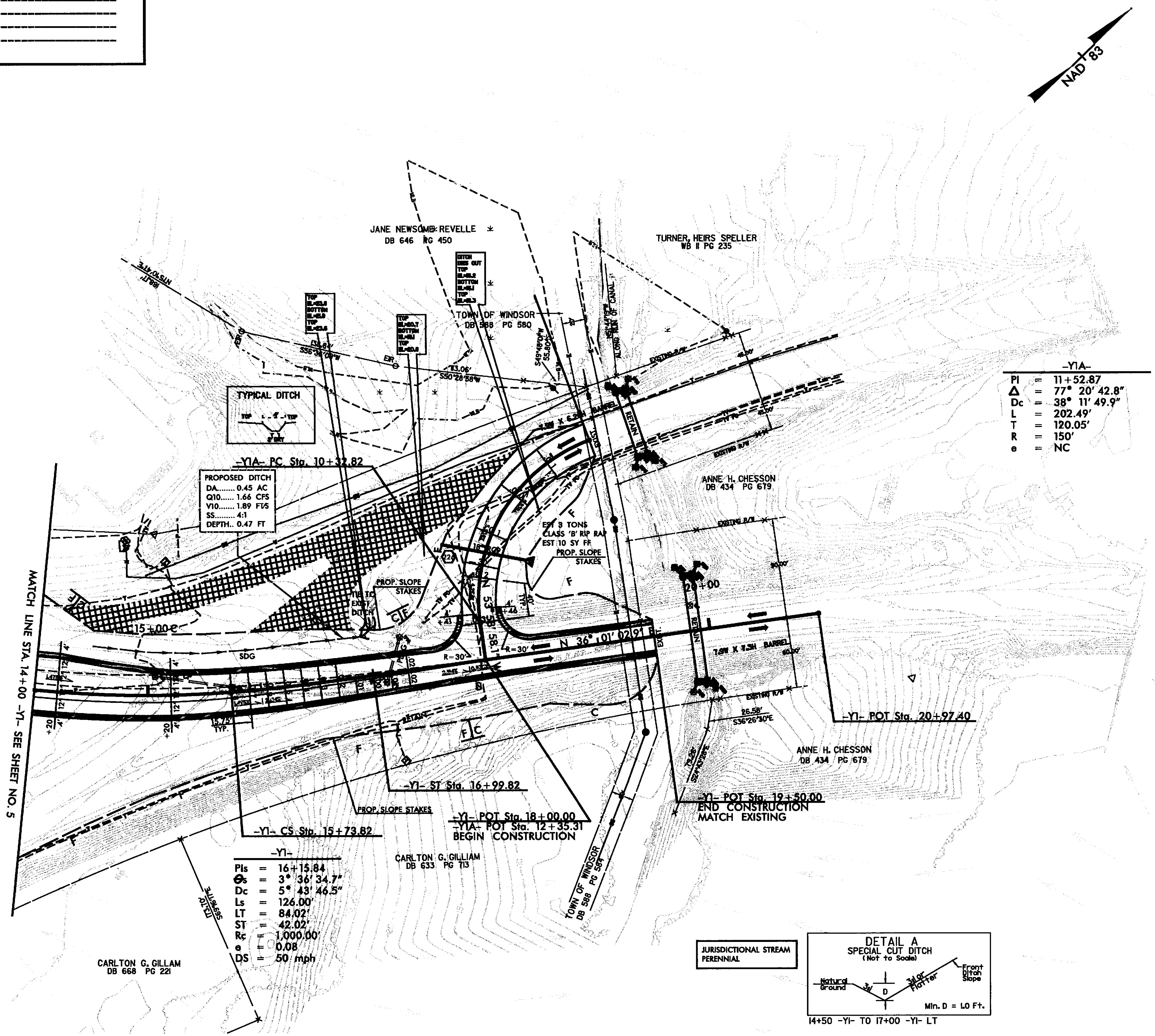
BARNHILL CONTRACTING COMPANY



-Y1A-

PI	=	11+52.87
Δ	=	77° 20' 42.8"
Dc	=	38° 11' 49.9"
L	=	202.49'
T	=	120.05'
R	=	150'
e	=	NC

-Y1-

PIs	=	16+15.84
θs	=	3° 36' 34.7"
Dc	=	5° 43' 46.5"
Ls	=	126.00'
LT	=	84.02'
ST	=	42.02'
Rc	=	1,000.00'
e	=	0.08
DS	=	50 mph

JURISDICTIONAL STREAM PERENNIAL

DETAIL A
SPECIAL CUT DITCH
(Not to Scale)

Natural Ground — 3:1 — D — 3:1 or Flatter — Front Ditch Slope

Min. D = 1.0 Ft.

14+50 -Y1- TO 17+00 -Y1- LT

PAVEMENT TO BE OBLITERATED

NOTES: SEE SHEET NO. 74 FOR -Y1- PROFILE.
SEE SHEET NO. 91 FOR -Y1A- PROFILE.
DO NOT PLACE ROCK IN BED OF JURISDICTIONAL STREAMS.

8/1/2005
10:49:24 AM

PROJECT REFERENCE NO.	SHEET NO.
R-2404A	43

R/W SHEET NO.

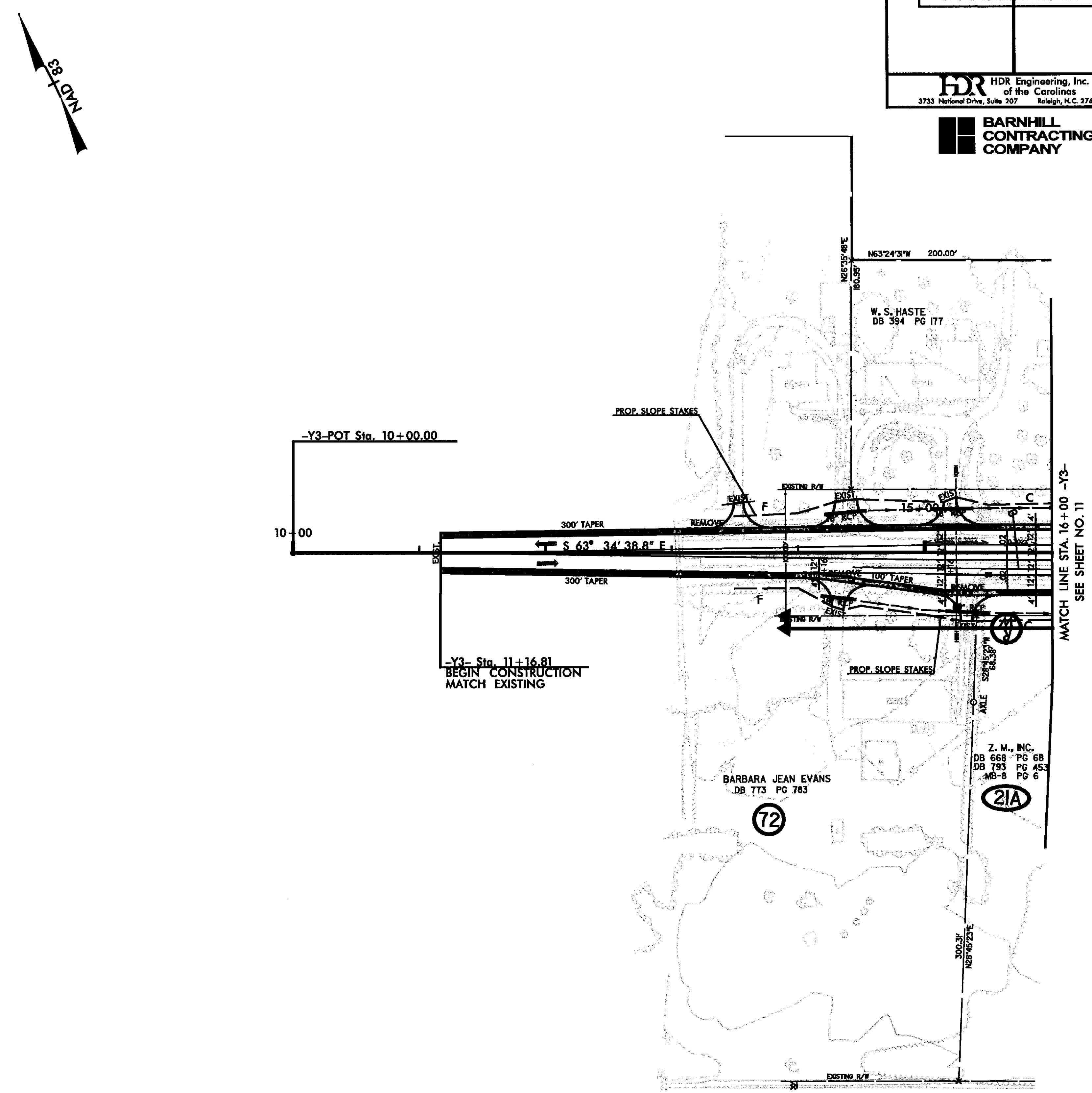
ROADWAY DESIGN | HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

HDR Engineering, Inc. of the Carolinas
3733 National Drive, Suite 207 Raleigh, N.C. 27612

BARNHILL CONTRACTING COMPANY

REVISIONS



NOTES: SEE SHEET NO. 75 FOR -Y3- PROFILE.
ALL DRIVEWAY RADII ARE 20'
UNLESS OTHERWISE NOTED.

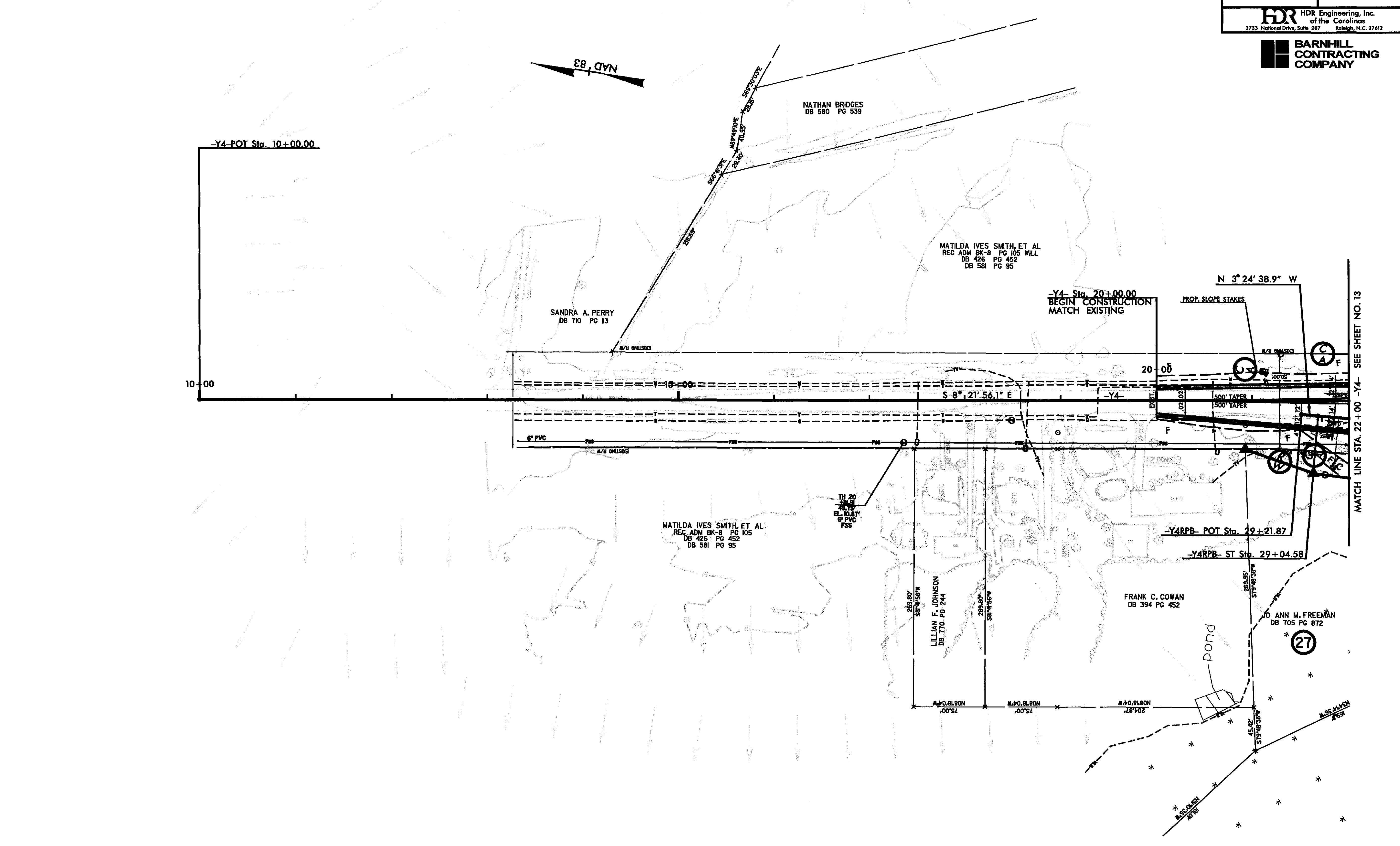
REVISIONS

PROJECT REFERENCE NO.	SHEET NO.
R-2404A	44
RW SHEET NO.	
ROADWAY DESIGN	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

HDR Engineering, Inc. of the Carolinas
3733 National Drive, Suite 207 Raleigh, N.C. 27612

BARNHILL CONTRACTING COMPANY



NOTES: SEE SHEET NO. 76 FOR -Y4- PROFILE.

8/1/2005
10:50:46 AM

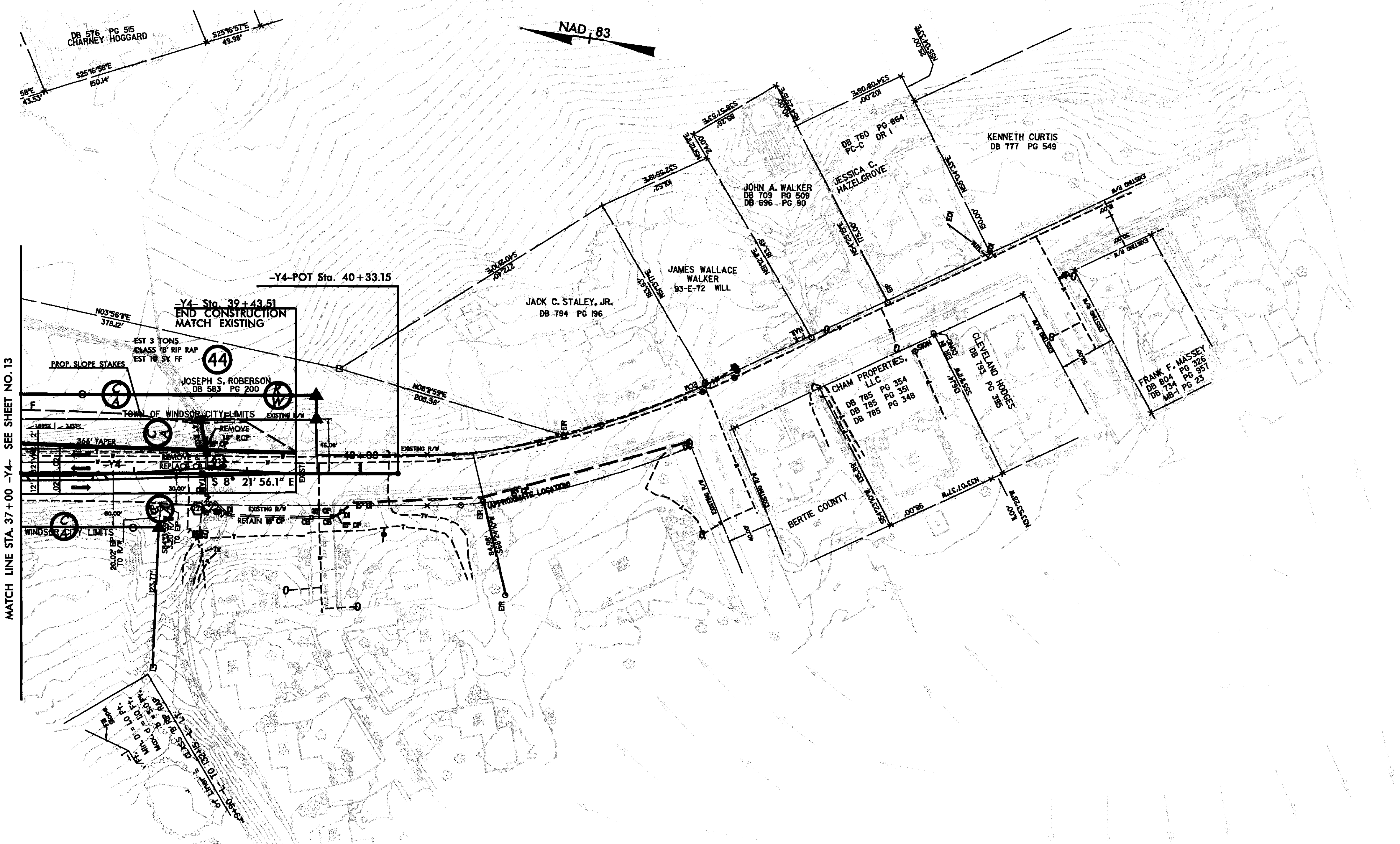
REVISIONS

PROJECT REFERENCE NO.	SHEET NO.
R-2404A	45
R/W SHEET NO.	
ROADWAY DESIGN	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

HDR Engineering, Inc. of the Carolinas
3733 National Drive, Suite 207 Raleigh, N.C. 27612

BARNHILL CONTRACTING COMPANY



CBw/ TYPE F
227 Sta. 38+65 LT
D.A.= 0.48 Ac
Grate El= 29.78 ft
Invert= 22.63 ft
Depth= 7.15

OPEN END
228 Sta. 38+65 RT
D.A.= 6.49 Ac
Grate El= 24.16 ft
Invert= 24.16 ft
Depth= 0.0

NOTES: SEE SHEET NO. 76 FOR -Y4- PROFILE.

8/1/2005 10:51:58 AM

REVISIONS

PROJECT REFERENCE NO.	SHEET NO.
R-2404A	46
R/W SHEET NO.	
ROADWAY DESIGN	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

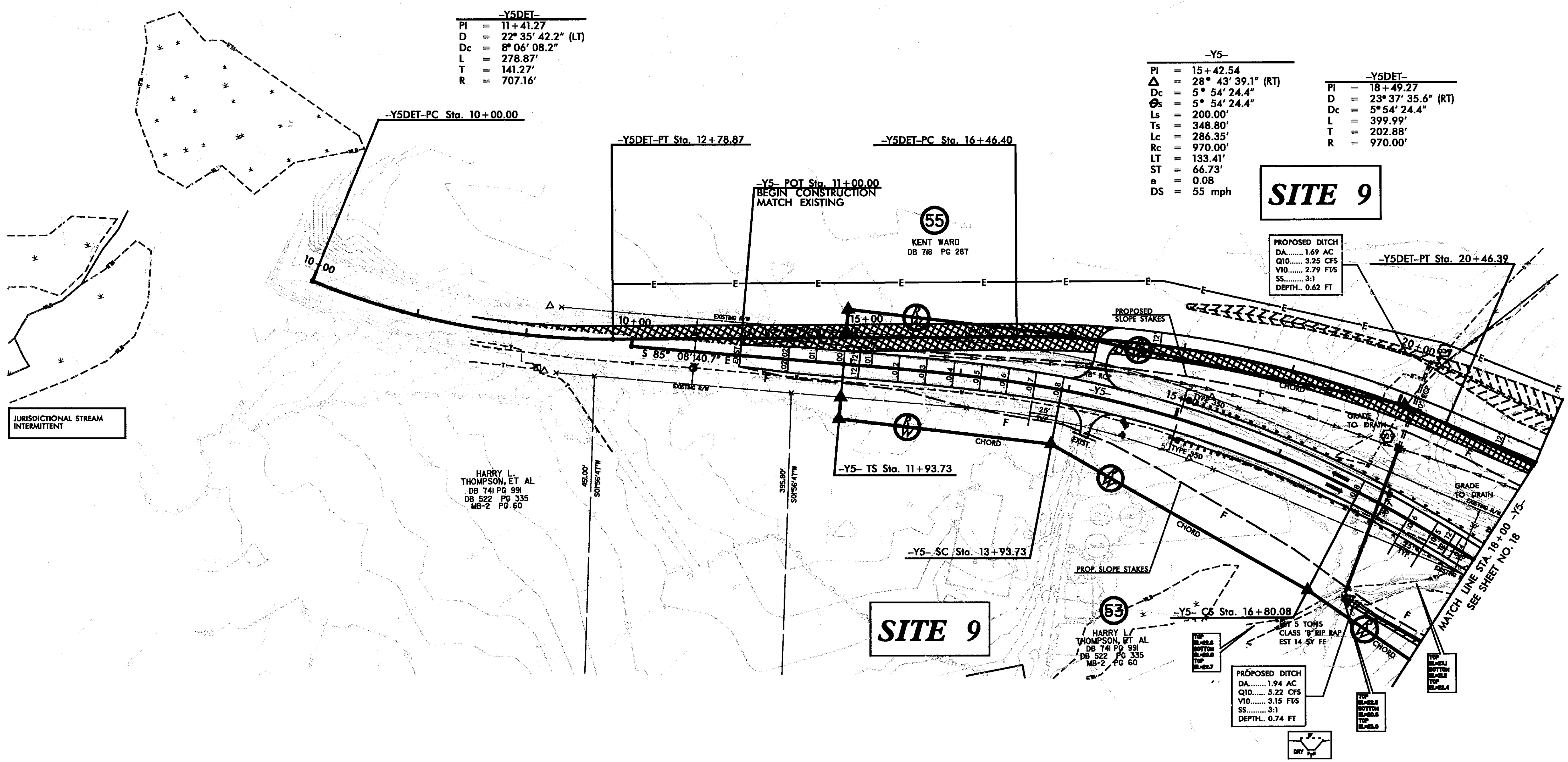
HDR Engineering, Inc. of the Carolinas
3733 National Drive, Suite 207 Raleigh, N.C. 27612

BARNHILL CONTRACTING COMPANY

NAD 83

229 2GI(B)
Sta. 16+93 LT
D.A.= 0.93 Ac
Grate El= 33.90 ft
Invert= 22.30 ft
Depth= 11.60

234 OPEN END
Sta. 20+15 LT
D.A.= 50.49 Ac
Grate El= 24.33 ft
Invert= 24.33 ft
Depth= 0.0



-Y5DET-
PI = 11+41.27
D = 22° 35' 42.2" (LT)
Dc = 8° 06' 08.2"
L = 278.87'
T = 141.27'
R = 707.16'
-Y5-
PI = 15+42.54
Δ = 28° 43' 39.1" (RT)
Dc = 5° 54' 24.4"
θs = 5° 54' 24.4"
Ls = 200.00'
Ts = 348.80'
Lc = 286.35'
Rc = 970.00'
LT = 133.41'
ST = 66.73'
e = 0.08
DS = 55 mph
-Y5DET-
PI = 18+49.27
D = 23° 37' 35.6" (RT)
Dc = 5° 54' 24.4"
L = 399.99'
T = 202.88'
R = 970.00'
SITE 9
-Y5DET-PC Sta. 10+00.00
-Y5DET-PT Sta. 12+78.87
-Y5DET-PC Sta. 16+46.40
-Y5- POT Sta. 11+00.00
BEGIN CONSTRUCTION
MATCH EXISTING
55
KENT WARD
DB 718 PG 287
PROPOSED DITCH
DA........ 1.69 AC
Q10....... 3.25 CFS
V10....... 2.79 FT/S
SS......... 3:1
DEPTH.. 0.62 FT
-Y5DET-PT Sta. 20+46.39
PROPOSED SLOPE STAKES
S 85° 08' 40.7" E
JURISDICTIONAL STREAM INTERMITTENT
HARRY L. THOMPSON, ET AL
DB 741 PG 991
DB 522 PG 335
MB-2 PG 60
-Y5- TS Sta. 11+93.73
-Y5- SC Sta. 13+93.73
PROP. SLOPE STAKES
CHORD
GRADE TO DRAIN
MATCH LINE STA. 18+00 -Y5-
SEE SHEET NO. 18
SITE 9
53
HARRY L. THOMPSON, ET AL
DB 741 PG 991
DB 522 PG 335
MB-2 PG 60
-Y5- CS Sta. 16+80.08
EST 5 TONS
CLASS 'B' RIP RAP
EST 14 SY FF
PROPOSED DITCH
DA........ 1.94 AC
Q10....... 5.22 CFS
V10....... 3.15 FT/S
SS......... 3:1
DEPTH.. 0.74 FT
DRY

NOTES: SEE SHEET NO. 82 FOR -Y5- PROFILE.
ALL DRIVEWAY RADII ARE 20' UNLESS OTHERWISE NOTED.
DO NOT PLACE ROCK IN BED OF JURISDICTIONAL STREAMS.

8/1/2005

PROJECT REFERENCE NO.	SHEET NO.
R-2404A	47
R/W SHEET NO.	
ROADWAY DESIGN	HYDRAULICS ENGINEER

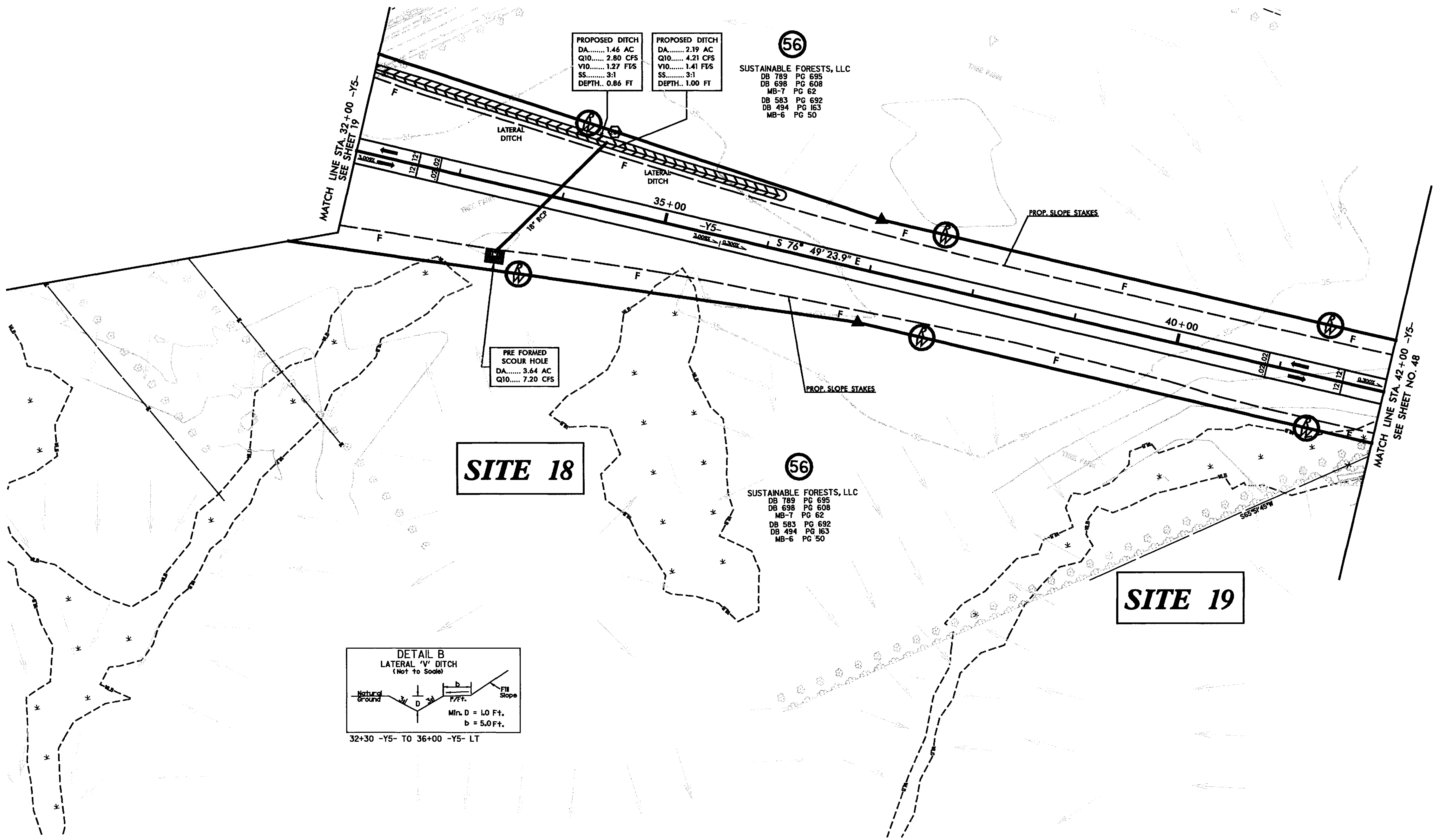
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

HDR Engineering, Inc. of the Carolinas
3733 National Drive, Suite 207 Raleigh, N.C. 27612

BARNHILL CONTRACTING COMPANY

REVISIONS

NAD 83



PROPOSED DITCH
DA........ 1.46 AC
Q10...... 2.80 CFS
V10....... 1.27 FT/S
SS......... 3:1
DEPTH.. 0.86 FT
PROPOSED DITCH
DA........ 2.19 AC
Q10...... 4.21 CFS
V10....... 1.41 FT/S
SS......... 3:1
DEPTH.. 1.00 FT
56
SUSTAINABLE FORESTS, LLC
DB 789 PG 695
DB 698 PG 608
MB-7 PG 62
DB 583 PG 692
DB 494 PG 163
MB-6 PG 50
MATCH LINE STA. 32+00 -Y5-
SEE SHEET 19
LATERAL DITCH
LATERAL DITCH
18" RCP
35+00
-Y5-
S 76° 49' 23.9" E
40+00
PROP. SLOPE STAKES
PROP. SLOPE STAKES
PRE FORMED SCOUR HOLE
DA....... 3.64 AC
Q10..... 7.20 CFS
SITE 18
56
SUSTAINABLE FORESTS, LLC
DB 789 PG 695
DB 698 PG 608
MB-7 PG 62
DB 583 PG 692
DB 494 PG 163
MB-6 PG 50
MATCH LINE STA. 42+00 -Y5-
SEE SHEET NO. 48
SITE 19
DETAIL B
LATERAL 'V' DITCH
(Not to Scale)
Natural Ground
D
b
F/Ft.
Fill Slope
Min. D = 1.0 Ft.
b = 5.0 Ft.
32+30 -Y5- TO 36+00 -Y5- LT

NOTES: SEE SHEET NO. 83 FOR -Y5- PROFILE.

8/1/2005

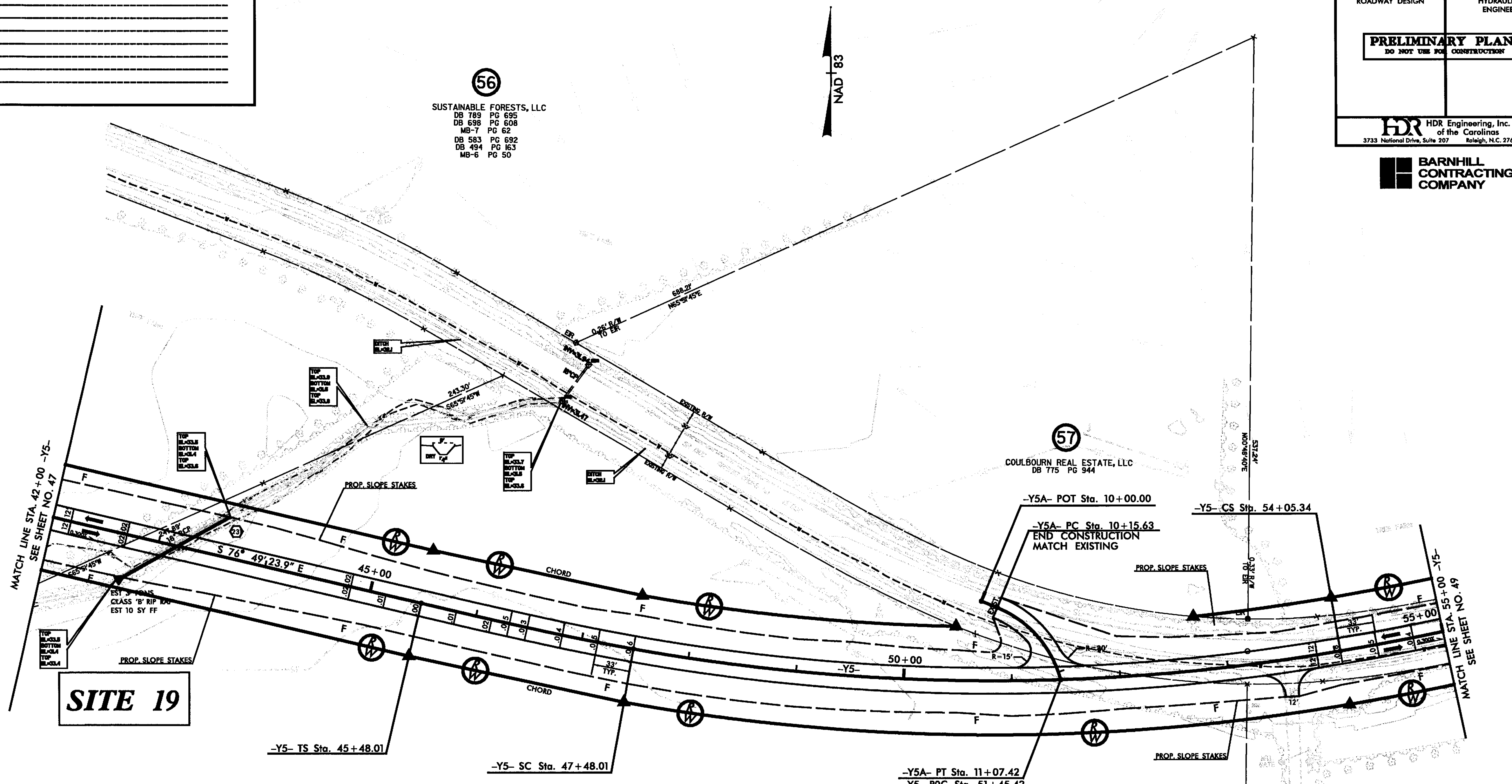
REVISIONS

PROJECT REFERENCE NO.	SHEET NO.
R-2404A	48
R/W SHEET NO.	
ROADWAY DESIGN	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

HDR Engineering, Inc. of the Carolinas
3733 National Drive, Suite 207 Raleigh, N.C. 27612

BARNHILL CONTRACTING COMPANY



NAD 83
56
SUSTAINABLE FORESTS, LLC
DB 789 PG 695
DB 698 PG 608
MB-7 PG 62
DB 583 PG 692
DB 494 PG 163
MB-6 PG 50
688.29'
N65°5'45"E
0.26' R/W TO EIR
EXISTING R/W
243.30'
S65°5'45"W
57
COULBOURN REAL ESTATE, LLC
DB 775 PG 944
537.24'
N00°48'40"E
MATCH LINE STA. 42+00 -Y5-
SEE SHEET NO. 47
S 76° 49' 23.9" E
45+00
50+00
55+00
-Y5-
CHORD
PROP. SLOPE STAKES
EST 10 SY FF
-Y5A- POT Sta. 10+00.00
-Y5A- PC Sta. 10+15.63
END CONSTRUCTION
MATCH EXISTING
-Y5- CS Sta. 54+05.34
R=15'
R=20'
33' TYP.
MATCH LINE STA. 55+00 -Y5-
SEE SHEET NO. 49
SITE 19
-Y5- TS Sta. 45+48.01
-Y5- SC Sta. 47+48.01
-Y5A- PT Sta. 11+07.42
-Y5- POC Sta. 51+45.42
57
COULBOURN REAL ESTATE, LLC
DB 775 PG 944
S00°48'40"W

-Y5-

PI	=	50+84.29
Δ	=	25° 51' 12.2" (LT)
Dc	=	3° 00' 56.0"
θs	=	3° 00' 56.0"
Ls	=	200.00'
Ts	=	536.28'
Lc	=	657.33'
Rc	=	1,900.00'
LT	=	133.35'
ST	=	66.68'
e	=	0.06
DS	=	55 mph

-Y5A-

PI	=	10+65.05
Δ	=	52° 35' 28.9" (RT)
Dc	=	57° 17' 44.8"
L	=	91.79'
T	=	49.41'
R	=	100.00'
e	=	NC

NOTES: SEE SHEET NO. 83 FOR -Y5- PROFILE.
ALL DRIVEWAY RADII ARE 20'
UNLESS OTHERWISE NOTED.

8/1/2005 10:52:43 AM

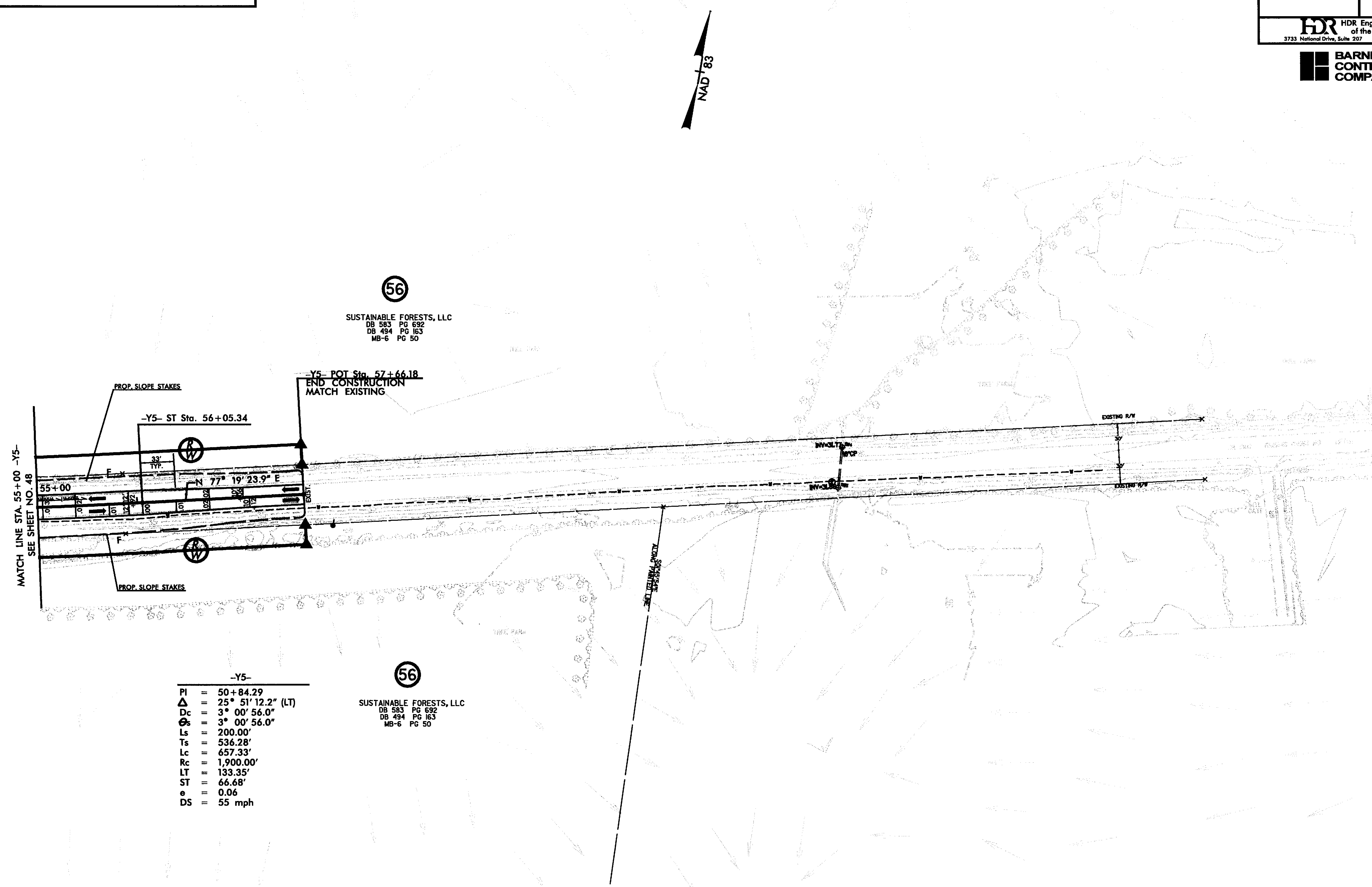
REVISIONS

PROJECT REFERENCE NO.	SHEET NO.
R-2404A	49
R/W SHEET NO.	
ROADWAY DESIGN	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

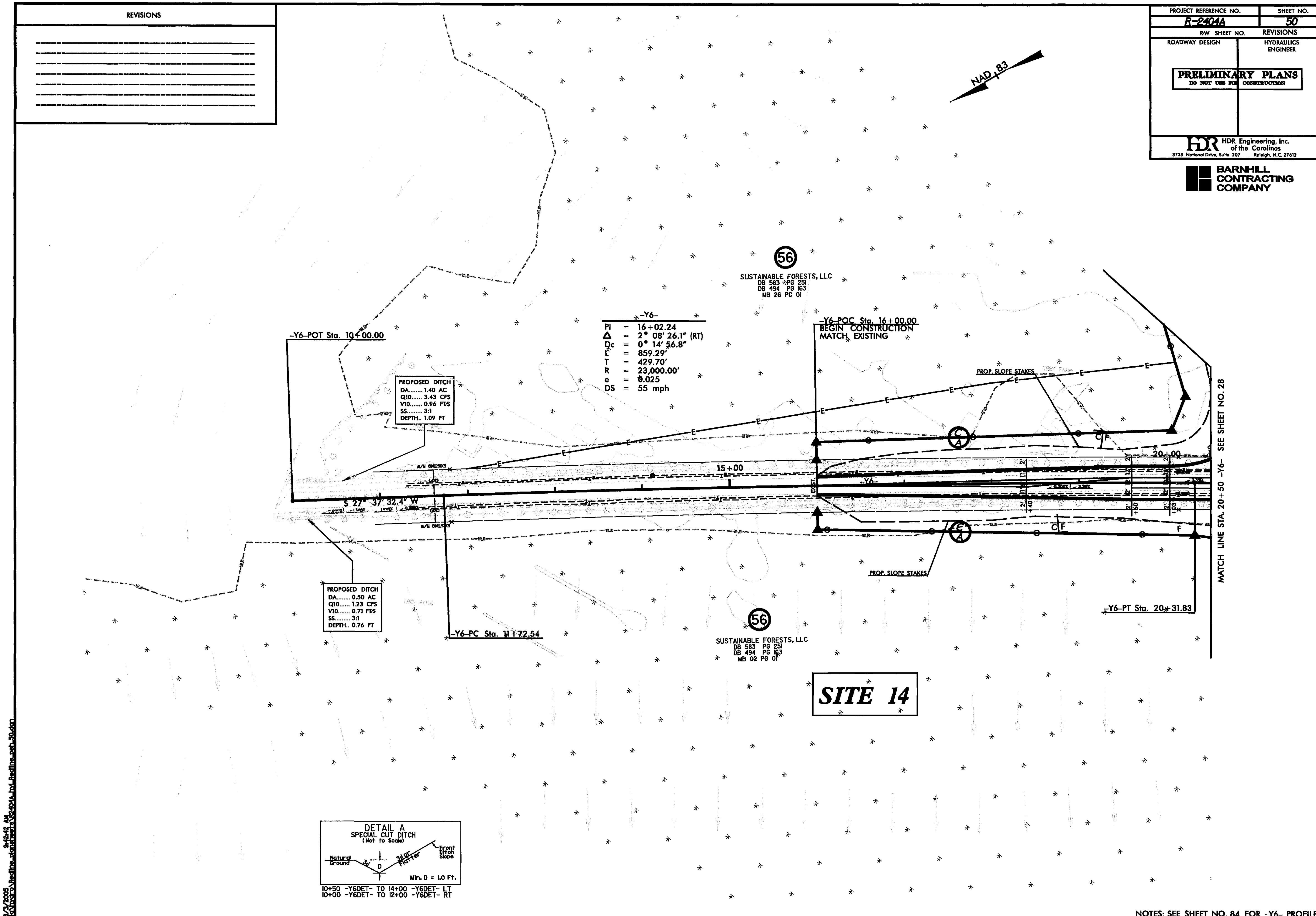
HDR Engineering, Inc. of the Carolinas
3733 National Drive, Suite 207 Raleigh, N.C. 27612

BARNHILL CONTRACTING COMPANY



-Y5-		
PI	=	50+84.29
Δ	=	25° 51' 12.2" (LT)
Dc	=	3° 00' 56.0"
θs	=	3° 00' 56.0"
Ls	=	200.00'
Ts	=	536.28'
Lc	=	657.33'
Rc	=	1,900.00'
LT	=	133.35'
ST	=	66.68'
e	=	0.06
DS	=	55 mph

NOTES: SEE SHEET NO. 83 FOR -Y5- PROFILE.



REVISIONS
PROJECT REFERENCE NO.
SHEET NO.
R-2404A
50
R/W SHEET NO.
REVISIONS
ROADWAY DESIGN
HYDRAULICS ENGINEER
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION
HDR Engineering, Inc. of the Carolinas
3733 National Drive, Suite 207 Raleigh, N.C. 27612
BARNHILL CONTRACTING COMPANY
NAD 83
56
SUSTAINABLE FORESTS, LLC
DB 583 PG 251
DB 494 PG 163
MB 26 PG 01
-Y6-
PI = 16+02.24
Δ = 2° 08' 26.1" (RT)
Dc = 0° 14' 56.8"
L = 859.29'
T = 429.70'
R = 23,000.00'
e = 0.025
DS = 55 mph
-Y6-POT Sta. 10+00.00
-Y6-POC Sta. 16+00.00
BEGIN CONSTRUCTION
MATCH EXISTING
PROPOSED DITCH
DA........ 1.40 AC
Q10...... 3.43 CFS
V10...... 0.96 FT/S
SS......... 3:1
DEPTH.. 1.09 FT
PROP. SLOPE STAKES
15+00
20+00
-Y6-
S 27° 37' 32.4" W
MATCH LINE STA. 20+50 -Y6- SEE SHEET NO. 28
PROPOSED DITCH
DA........ 0.50 AC
Q10...... 1.23 CFS
V10...... 0.71 FT/S
SS......... 3:1
DEPTH.. 0.76 FT
PROP. SLOPE STAKES
-Y6-PT Sta. 20+31.83
-Y6-PC Sta. 11+72.54
56
SUSTAINABLE FORESTS, LLC
DB 583 PG 251
DB 494 PG 163
MB 02 PG 01
SITE 14
DETAIL A
SPECIAL CUT DITCH
(Not to Scale)
Natural Ground
3:1
D
3:1 or Flatter
Front Ditch Slope
Min. D = 1.0 Ft.
10+50 -Y6DET- TO 14+00 -Y6DET- LT
10+00 -Y6DET- TO 12+00 -Y6DET- RT
NOTES: SEE SHEET NO. 84 FOR -Y6- PROFILE.

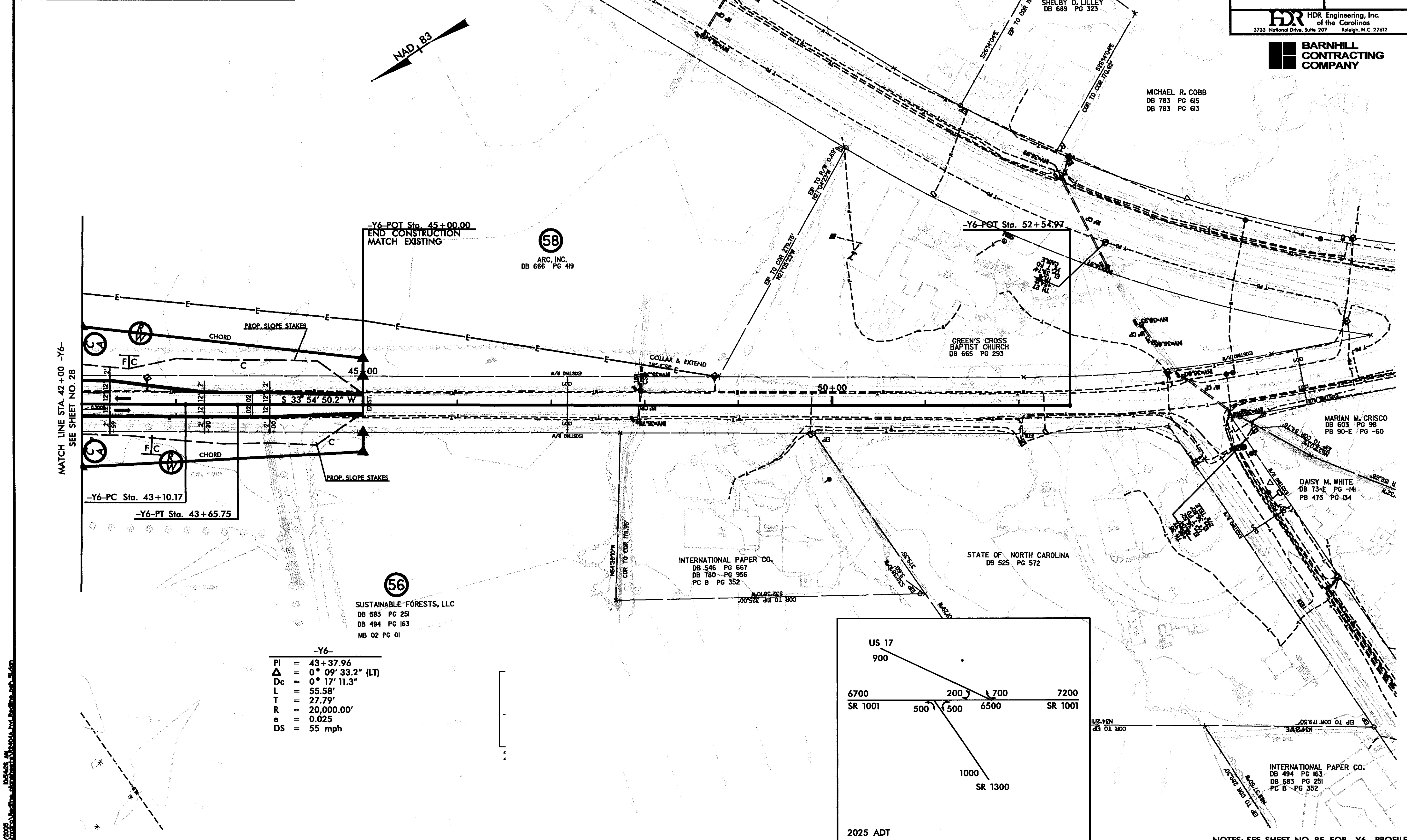
REVISIONS

PROJECT REFERENCE NO.	SHEET NO.
R-2404A	51
R/W SHEET NO.	REVISIONS
ROADWAY DESIGN	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

HDR Engineering, Inc. of the Carolinas
3733 National Drive, Suite 207 Raleigh, N.C. 27612

BARNHILL CONTRACTING COMPANY



NAD 83
JR&P ENTERPRISES, INC.
DB 717 PG 953
SHELBY D. LILLEY
DB 689 PG 323
MICHAEL R. COBB
DB 783 PG 615
DB 783 PG 613
-Y6-POT Sta. 45+00.00
END CONSTRUCTION
MATCH EXISTING
58
ARC, INC.
DB 666 PG 419
-Y6-POT Sta. 52+54.97
GREEN'S CROSS BAPTIST CHURCH
DB 665 PG 293
PROP. SLOPE STAKES
CHORD
COLLAR & EXTEND
45+00
50+00
S 33° 54' 50.2" W
MATCH LINE STA. 42+00 -Y6-
SEE SHEET NO. 28
MARIAN M. CRISCO
DB 603 PG 98
PB 90-E PG -60
DAISY M. WHITE
DB 73-E PG -141
PB 473 PG 134
-Y6-PC Sta. 43+10.17
-Y6-PT Sta. 43+65.75
INTERNATIONAL PAPER CO.
DB 546 PG 667
DB 780 PG 956
PC B PG 352
STATE OF NORTH CAROLINA
DB 525 PG 572
56
SUSTAINABLE FORESTS, LLC
DB 583 PG 251
DB 494 PG 163
MB 02 PG 01
-Y6-
PI = 43+37.96
Δ = 0° 09' 33.2" (LT)
Dc = 0° 17' 11.3"
L = 55.58'
T = 27.79'
R = 20,000.00'
e = 0.025
DS = 55 mph
US 17
900
6700
200
700
7200
SR 1001
500
500
6500
SR 1001
1000
SR 1300
2025 ADT
INTERNATIONAL PAPER CO.
DB 494 PG 163
DB 583 PG 251
PC B PG 352

NOTES: SEE SHEET NO. 85 FOR -Y6- PROFILE.

REVISIONS

PROJECT REFERENCE NO.	SHEET NO.
R-2404A	52
R/W SHEET NO.	
ROADWAY DESIGN	HYDRAULICS ENGINEER

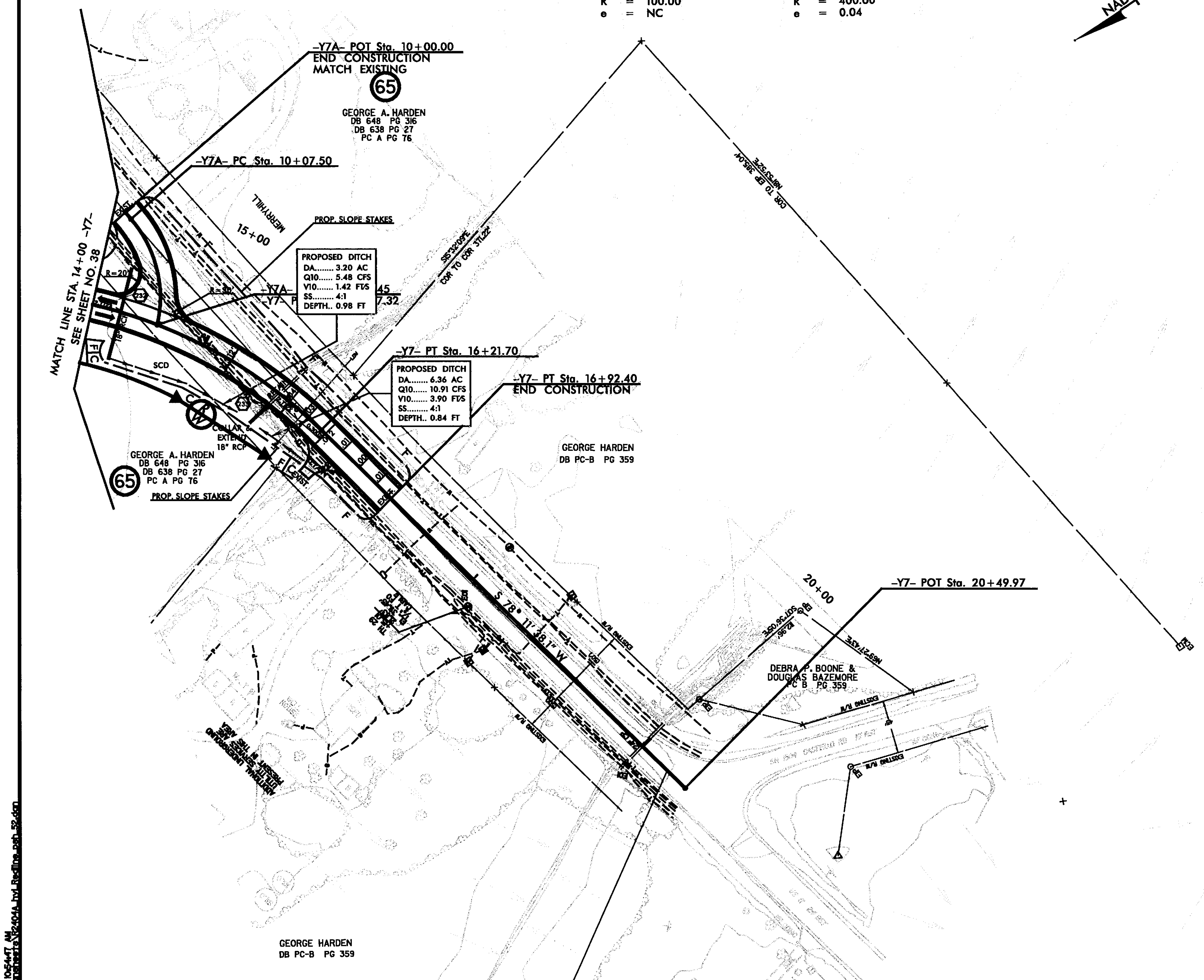
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

HDR Engineering, Inc. of the Carolinas
3733 National Drive, Suite 207 Raleigh, N.C. 27612

BARNHILL CONTRACTING COMPANY

-Y7A-		
PI	=	10+58.89
Δ	=	54° 24' 16.1" (RT)
Dc	=	57° 17' 44.8"
L	=	94.95'
T	=	51.40'
R	=	100.00'
e	=	NC

-Y7-		
PI	=	14+41.82
Δ	=	56° 38' 47.4" (RT)
Dc	=	14° 19' 26.2"
L	=	395.47'
T	=	215.59'
R	=	400.00'
e	=	0.04



DETAIL A
SPECIAL CUT DITCH
(Not to Scale)
Natural Ground
D
Front Slope
Min. D = 1.0 Ft.
14+25 -Y7- TO 16+00 -Y7- RT

NOTES: SEE SHEET NO. 90 FOR -Y7- PROFILE.
ALL DRIVEWAY RADII ARE 20' UNLESS OTHERWISE NOTED.

8/1/2005
10:54:47 AM

REVISIONS

PROJECT REFERENCE NO.	SHEET NO.
R-2304A	Y5DET-1
R/W SHEET NO.	
ROADWAY DESIGN	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

HDR Engineering, Inc. of the Carolinas
3733 National Drive, Suite 207 Raleigh, N.C. 27612

BARNHILL CONTRACTING COMPANY

NAD 83

–Y5DET–
PI = 11+41.27
D = 22° 35' 42.2" (LT)
Dc = 8° 06' 08.2"
L = 278.87'
T = 141.27'
R = 707.16'
e = 0.08
DS = 55 mph

–Y5–
PI = 15+42.54
Δ = 28° 43' 39.1" (RT)
Dc = 5° 54' 24.4"
Ds = 5° 54' 24.4"
Ls = 200.00'
Ts = 348.80'
Lc = 286.35'
Rc = 970.00'
LT = 133.41'
ST = 66.73'
e = 0.08
DS = 55 mph

–Y5DET–
PI = 18+49.27
D = 23° 37' 35.6" (RT)
Dc = 5° 54' 24.4"
L = 399.99'
T = 202.88'
R = 970.00'
e = 0.08
DS = 55 mph

–Y5DET–PC Sta. 10+00.00

–Y5DET–PT Sta. 12+78.87

–Y5– POT Sta. 11+00.00
BEGIN CONSTRUCTION
MATCH EXISTING

–Y5DET–PC Sta. 16+46.40

SITE 9

PROPOSED DITCH
DA..... 1.69 AC
Q10..... 3.25 CFS
V10..... 2.79 FT/S
SS..... 3:1
DEPTH.. 0.62 FT

LATERAL 'V' DITCH

MATCH LINE STA. 20+00 –Y5DET– SEE SHEET NO. Y5DET-2

55 KENT WARD
DB 718 PG 287

SDG
EXISTING R/W

10+00

11+00

CHORD

N 89° 45' 26.2" E

S 85° 08' 46.7" E

–Y5–
15+00

–Y5– TS Sta. 11+93.73

–Y5– SC Sta. 13+93.73

–Y5– CS Sta. 16+80.08

HARRY L. THOMPSON, ET AL
DB 741 PG 991
DB 522 PG 335
MB-2 PG 60

451.00'
S01°56'47"W

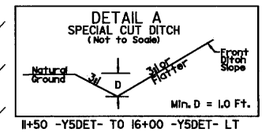
395.80'
S01°56'47"W

S73°38'13"E
69.23'

JURISDICTIONAL STREAM
INTERMITTENT

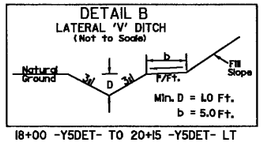
SITE 9

DETAIL A
SPECIAL CUT DITCH
(Not to Scale)

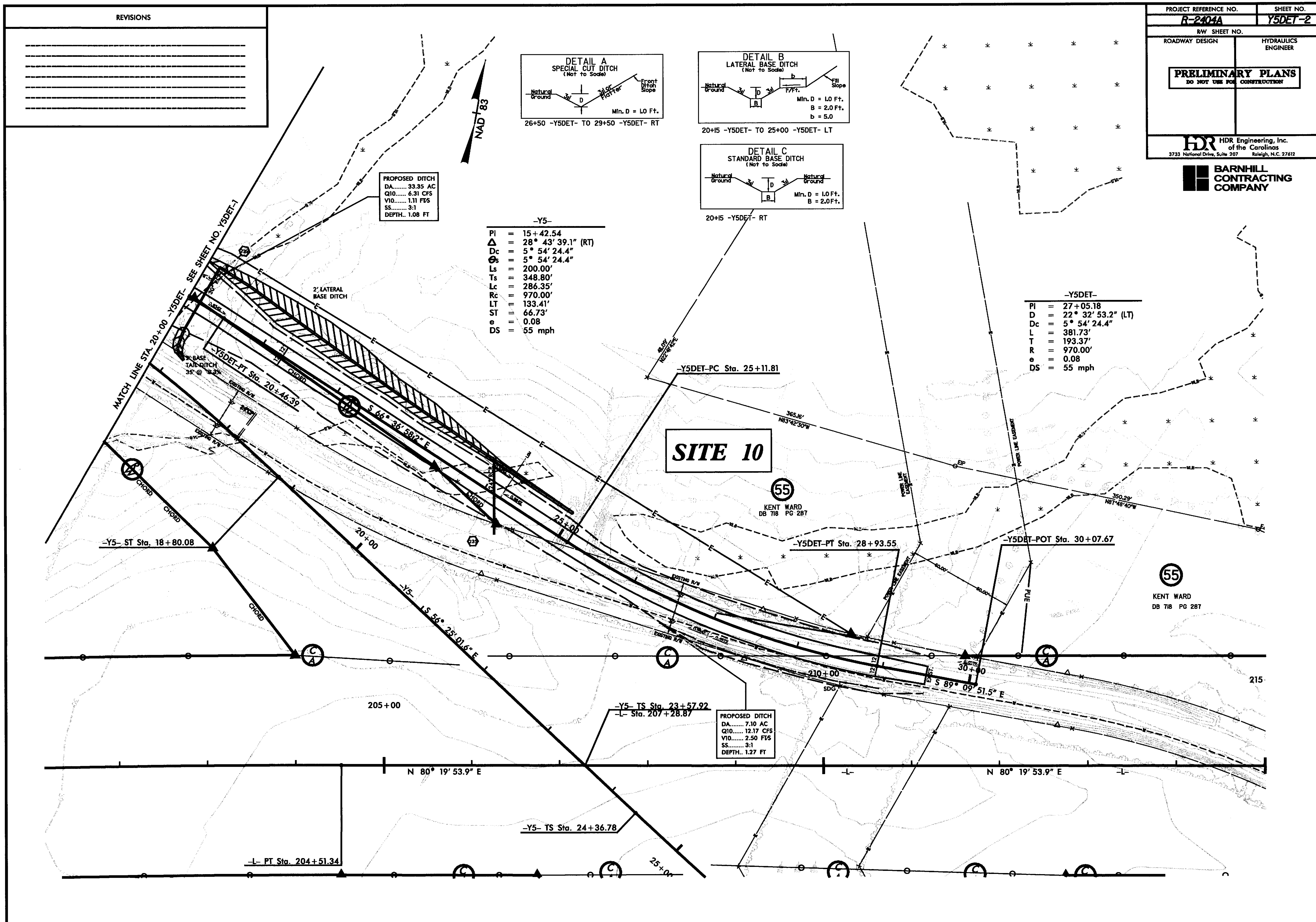


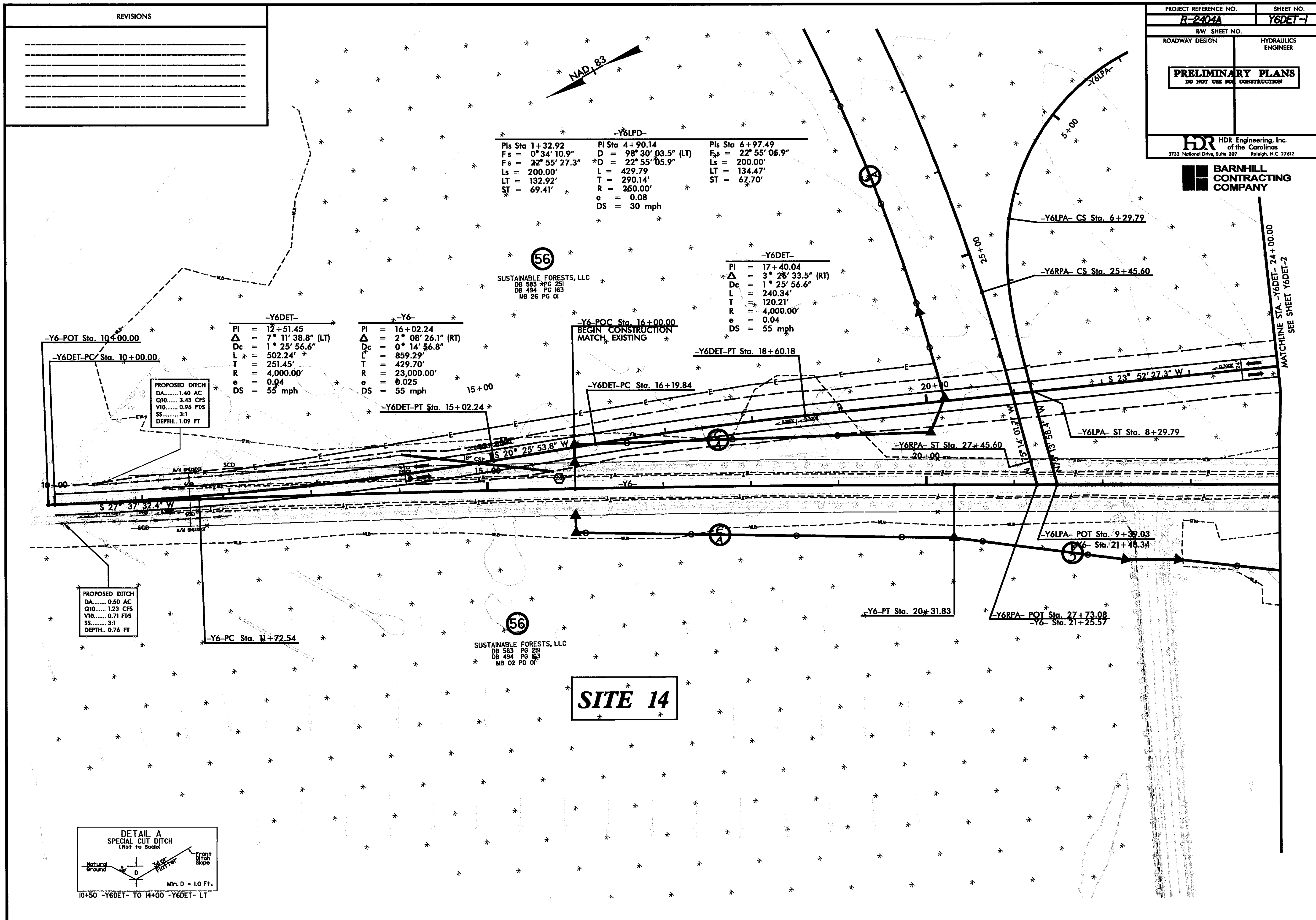
II+50 –Y5DET– TO 16+00 –Y5DET– LT

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



18+00 –Y5DET– TO 20+15 –Y5DET– LT


REVISIONS
PROJECT REFERENCE NO.
R-2404A
SHEET NO.
Y5DET-2
R/W SHEET NO.
ROADWAY DESIGN
HYDRAULICS ENGINEER
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION
HDR Engineering, Inc. of the Carolinas
3733 National Drive, Suite 207 Raleigh, N.C. 27612
BARNHILL CONTRACTING COMPANY
DETAIL A
SPECIAL CUT DITCH
(Not to Scale)
Natural Ground
Front Ditch Slope
3:1 or Flatter
Min. D = 1.0 Ft.
26+50 -Y5DET- TO 29+50 -Y5DET- RT
DETAIL B
LATERAL BASE DITCH
(Not to Scale)
Natural Ground
Fill Slope
Min. D = 1.0 Ft.
B = 2.0 Ft.
b = 5.0
20+15 -Y5DET- TO 25+00 -Y5DET- LT
DETAIL C
STANDARD BASE DITCH
(Not to Scale)
Natural Ground
Min. D = 1.0 Ft.
B = 2.0 Ft.
20+15 -Y5DET- RT
NAD 83
PROPOSED DITCH
DA....... 33.35 AC
Q10...... 6.31 CFS
V10...... 1.11 FPS
SS......... 3:1
DEPTH.. 1.08 FT
-Y5-
PI = 15+42.54
Δ = 28° 43' 39.1" (RT)
Dc = 5° 54' 24.4"
Ds = 5° 54' 24.4"
Ls = 200.00'
Ts = 348.80'
Lc = 286.35'
Rc = 970.00'
LT = 133.41'
ST = 66.73'
e = 0.08
DS = 55 mph
-Y5DET-
PI = 27+05.18
D = 22° 32' 53.2" (LT)
Dc = 5° 54' 24.4"
L = 381.73'
T = 193.37'
R = 970.00'
e = 0.08
DS = 55 mph
MATCH LINE STA. 20+00 -Y5DET- SEE SHEET NO. Y5DET-1
2' LATERAL BASE DITCH
-Y5DET-PT Sta. 20+46.39
-Y5DET-PC Sta. 25+11.81
S 66° 36' 58.2" E
SITE 10
55
KENT WARD
DB 718 PG 287
-Y5DET-PT Sta. 28+93.55
-Y5DET-POT Sta. 30+07.67
-Y5- ST Sta. 18+80.08
-Y5- S 56° 25' 01.6" E
S 89° 09' 51.5" E
-Y5- TS Sta. 23+57.92
-L- Sta. 207+28.87
PROPOSED DITCH
DA....... 7.10 AC
Q10...... 12.17 CFS
V10...... 2.50 FPS
SS......... 3:1
DEPTH.. 1.27 FT
205+00
210+00
215
20+00
25+00
30+00
N 80° 19' 53.9" E
-L-
-Y5- TS Sta. 24+36.78
-L- PT Sta. 204+51.34
POWER LINE EASEMENT
PUE
365.16'
350.29'
EIP
CHORD
EXISTING R/W


REVISIONS
PROJECT REFERENCE NO.
SHEET NO.
R-2404A
Y6DET-1
R/W SHEET NO.
ROADWAY DESIGN
HYDRAULICS ENGINEER
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION
HDR Engineering, Inc. of the Carolinas
3733 National Drive, Suite 207 Raleigh, N.C. 27612
BARNHILL CONTRACTING COMPANY
NAD 83
-Y6LPD-
PIs Sta 1+32.92
Fs = 0° 34' 10.9"
Fs = 22° 55' 27.3"
Ls = 200.00'
LT = 132.92'
ST = 69.41'
PI Sta 4+90.14
D = 98° 30' 03.5" (LT)
D = 22° 55' 05.9"
L = 429.79
T = 290.14'
R = 250.00'
e = 0.08
DS = 30 mph
PIs Sta 6+97.49
Fs = 22° 55' 05.9"
Ls = 200.00'
LT = 134.47'
ST = 67.70'
56
SUSTAINABLE FORESTS, LLC
DB 583 PG 251
DB 494 PG 163
MB 26 PG 01
-Y6DET-
PI = 17+40.04
Δ = 3° 28' 33.5" (RT)
Dc = 1° 25' 56.6"
L = 240.34'
T = 120.21'
R = 4,000.00'
e = 0.04
DS = 55 mph
-Y6DET-
PI = 12+51.45
Δ = 7° 11' 38.8" (LT)
Dc = 1° 25' 56.6"
L = 502.24'
T = 251.45'
R = 4,000.00'
e = 0.04
DS = 55 mph
-Y6-
PI = 16+02.24
Δ = 2° 08' 26.1" (RT)
Dc = 0° 14' 56.8"
L = 859.29'
T = 429.70'
R = 23,000.00'
e = 0.025
DS = 55 mph
-Y6-POT Sta. 10+00.00
-Y6DET-PC Sta. 10+00.00
PROPOSED DITCH
DA........1.40 AC
Q10...... 3.43 CFS
V10...... 0.96 FT/S
SS........ 3:1
DEPTH.. 1.09 FT
-Y6DET-PT Sta. 15+02.24
15+00
-Y6-POC Sta. 16+00.00
BEGIN CONSTRUCTION
MATCH EXISTING
-Y6DET-PT Sta. 18+60.18
-Y6DET-PC Sta. 16+19.84
S 20° 25' 53.8" W
S 27° 37' 32.4" W
S 23° 52' 27.3" W
20+00
25+00
5+00
-Y6LPA-
-Y6LPA- CS Sta. 6+29.79
-Y6RPA- CS Sta. 25+45.60
-Y6LPA- ST Sta. 8+29.79
-Y6RPA- ST Sta. 27+45.60
MATCHLINE STA. -Y6DET- 24+00.00
SEE SHEET Y6DET-2
-Y6-
10+00
SCD
-Y6LPA- POT Sta. 9+39.03
-Y6- Sta. 21+48.34
-Y6-PT Sta. 20+31.83
-Y6RPA- POT Sta. 27+73.08
-Y6- Sta. 21+25.57
PROPOSED DITCH
DA........ 0.50 AC
Q10...... 1.23 CFS
V10...... 0.71 FT/S
SS........ 3:1
DEPTH.. 0.76 FT
-Y6-PC Sta. 11+72.54
56
SUSTAINABLE FORESTS, LLC
DB 583 PG 251
DB 494 PG 163
MB 02 PG 01
SITE 14
DETAIL A
SPECIAL CUT DITCH
(Not to Scale)
Natural Ground
D
3:1 or Flatter
Front Ditch Slope
Min. D = 1.0 Ft.
10+50 -Y6DET- TO 14+00 -Y6DET- LT

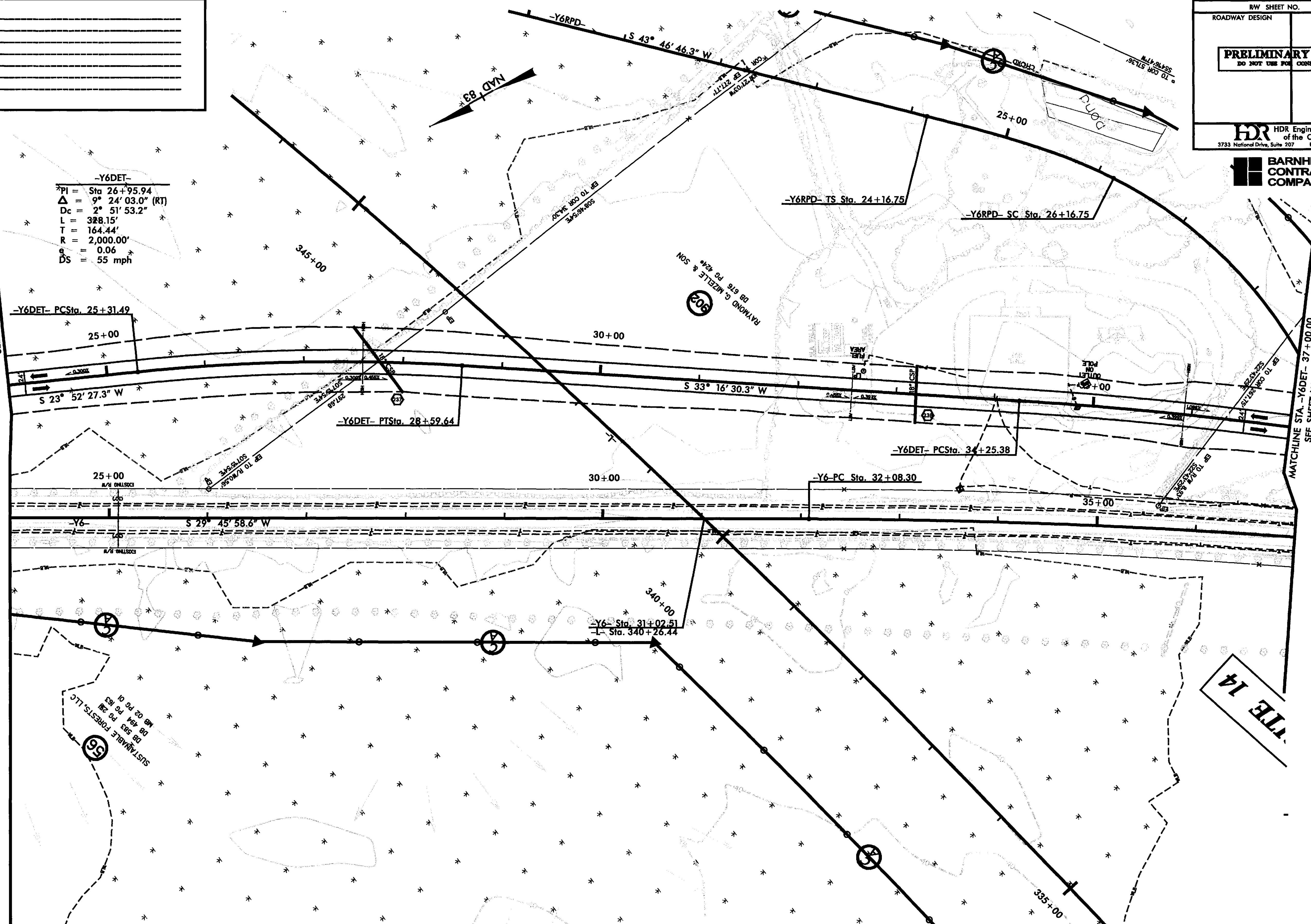
PROJECT REFERENCE NO.	SHEET NO.
R-2404A	Y6DET-2
R/W SHEET NO.	
ROADWAY DESIGN	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

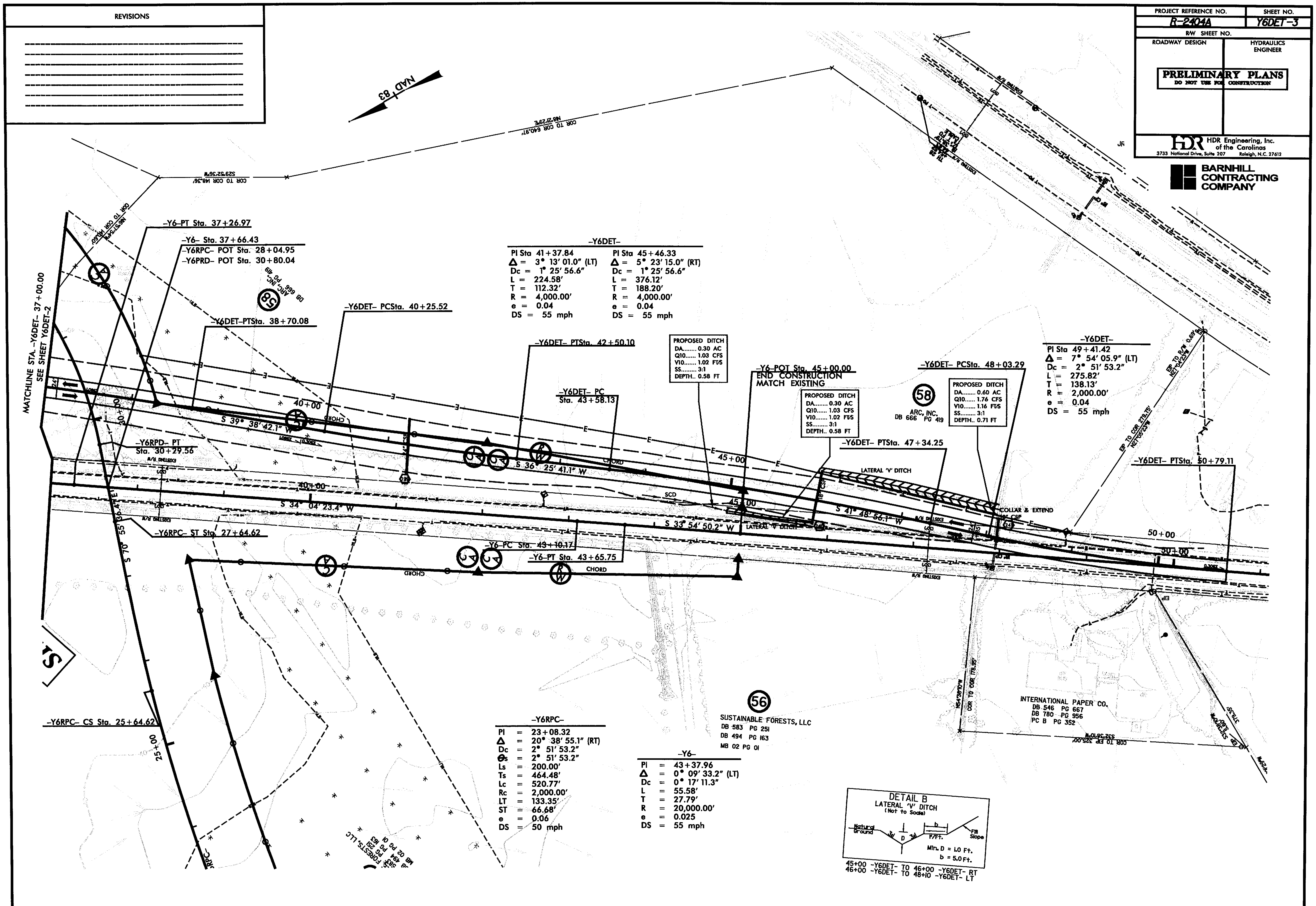
HDR Engineering, Inc. of the Carolinas
3733 National Drive, Suite 207 Raleigh, N.C. 27612

BARNHILL CONTRACTING COMPANY

REVISIONS



-Y6DET-
PI = Sta 26+95.94
Δ = 9° 24' 03.0" (RT)
Dc = 2° 51' 53.2"
L = 328.15'
T = 164.44'
R = 2,000.00'
e = 0.06
DS = 55 mph
NAD 83
-Y6RPD- S 43° 46' 46.3" W
-Y6RPD- TS Sta. 24+16.75
-Y6RPD- SC Sta. 26+16.75
25+00
MATCHLINE STA. -Y6DET- 24+00.00 SEE SHEET Y6DET-1
MATCHLINE STA. -Y6DET- 37+00.00 SEE SHEET Y6DET-2
-Y6DET- PCSta. 25+31.49
-Y6DET- PTSta. 28+59.64
-Y6DET- PCSta. 34+25.38
S 23° 52' 27.3" W
S 33° 16' 30.3" W
30+00
345+00
340+00
335+00
RAYMOND G. MIZELLE & SON DB 676 PG 424
902
FUEL AREA
-Y6- S 29° 45' 58.6" W
-Y6-PC Sta. 32+08.30
35+00
-Y6- Sta. 31+02.51
-L- Sta. 340+26.44
SUSTAINABLE FORESTS, LLC DB 583 PG 238 DB 494 PG 163 MB 02 PG 01
56



REVISIONS
PROJECT REFERENCE NO.
R-2404A
SHEET NO.
Y6DET-3
R/W SHEET NO.
ROADWAY DESIGN
HYDRAULICS ENGINEER
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION
HDR Engineering, Inc. of the Carolinas
3733 National Drive, Suite 207 Raleigh, N.C. 27612
BARNHILL CONTRACTING COMPANY
NAD 83
MATCHLINE STA. -Y6DET- 37+00.00
SEE SHEET Y6DET-2
-Y6-PT Sta. 37+26.97
-Y6- Sta. 37+66.43
-Y6RPC- POT Sta. 28+04.95
-Y6RPD- POT Sta. 30+80.04
-Y6DET-PTSta. 38+70.08
-Y6DET- PCSta. 40+25.52
-Y6DET- PTSta. 42+50.10
-Y6DET- PC
Sta. 43+58.13
-Y6RPD- PT
Sta. 30+29.56
-Y6RPC- ST Sta. 27+64.62
-Y6-PC Sta. 43+10.17
-Y6-PT Sta. 43+65.75
-Y6-POT Sta. 45+00.00
END CONSTRUCTION
MATCH EXISTING
-Y6DET- PTSta. 47+34.25
-Y6DET- PCSta. 48+03.29
-Y6DET- PTSta. 50+79.11
-Y6RPC- CS Sta. 25+64.62
S 39° 38' 42.1" W
S 36° 25' 41.1" W
S 34° 04' 23.4" W
S 33° 54' 50.2" W
S 41° 48' 56.1" W
CHORD
LATERAL 'V' DITCH
COLLAR & EXTEND
SCD
-Y6DET-
PI Sta 41+37.84
Δ = 3° 13' 01.0" (LT)
Dc = 1° 25' 56.6"
L = 224.58'
T = 112.32'
R = 4,000.00'
e = 0.04
DS = 55 mph
PI Sta 45+46.33
Δ = 5° 23' 15.0" (RT)
Dc = 1° 25' 56.6"
L = 376.12'
T = 188.20'
R = 4,000.00'
e = 0.04
DS = 55 mph
-Y6DET-
PI Sta 49+41.42
Δ = 7° 54' 05.9" (LT)
Dc = 2° 51' 53.2"
L = 275.82'
T = 138.13'
R = 2,000.00'
e = 0.04
DS = 55 mph
PROPOSED DITCH
DA....... 0.30 AC
Q10...... 1.03 CFS
V10...... 1.02 FT/S
SS........ 3:1
DEPTH.. 0.58 FT
PROPOSED DITCH
DA....... 0.30 AC
Q10...... 1.03 CFS
V10...... 1.02 FT/S
SS........ 3:1
DEPTH.. 0.58 FT
PROPOSED DITCH
DA....... 0.60 AC
Q10...... 1.76 CFS
V10...... 1.16 FT/S
SS........ 3:1
DEPTH.. 0.71 FT
58
ARC, INC.
DB 666 PG 419
56
SUSTAINABLE FORESTS, LLC
DB 583 PG 251
DB 494 PG 163
MB 02 PG 01
INTERNATIONAL PAPER CO.
DB 546 PG 667
DB 780 PG 956
PC B PG 352
-Y6RPC-
PI = 23+08.32
Δ = 20° 38' 55.1" (RT)
Dc = 2° 51' 53.2"
θs = 2° 51' 53.2"
Ls = 200.00'
Ts = 464.48'
Lc = 520.77'
Rc = 2,000.00'
LT = 133.35'
ST = 66.68'
e = 0.06
DS = 50 mph
-Y6-
PI = 43+37.96
Δ = 0° 09' 33.2" (LT)
Dc = 0° 17' 11.3"
L = 55.58'
T = 27.79'
R = 20,000.00'
e = 0.025
DS = 55 mph
DETAIL B
LATERAL 'V' DITCH
(Not to Scale)
Natural Ground
Fill Slope
Min. D = 1.0 Ft.
b = 5.0 Ft.
45+00 -Y6DET- TO 46+00 -Y6DET- RT
46+00 -Y6DET- TO 48+10 -Y6DET- LT
40+00
45+00
50+00
25+00