



STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

BEVERLY PERDUE
GOVERNOR

EUGENE CONTI
SECRETARY

September 21, 2010

MEMORANDUM TO: Mr. J. Wally Bowman , PE
Division Five Engineer

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

SUBJECT: Wake County, US 401 (Rolesville Bypass) from SR 2226 to NC 96; T.I.P.
Number R-2814B; Federal Aid Project No. STP-401(4); State Project 8.1403001

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

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

PSH/gyb

Attachment

Cc: W/attachment
Mr. Randy Garris, P.E. State Contract Officer
Mr. Chris Murray, Division Environmental Officer

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

PROJECT COMMITMENTS

US 401 (Rolesville Bypass) from SR 2226
To NC 96
Wake County
Federal-Aid Project STP-401(4)
State Project 8.1403001
WBS Element 34506.1.1
TIP Project R-2814B

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

Commitments Developed Through Project Development and Design

No new commitments were developed for the Section B permit modification. See R-2814 permit greensheet dated August 2009. All these commitments still apply.

Commitments Developed Through Permitting

Commitments listed below are commitments that differ from original permits or condition language has changed slightly. Original conditions still apply.

Natural Environment Unit

Debiting 2,873 linear feet of stream restoration from Marks Creek, Phase II, Mitigation Site (AID 8008-02072), described in the September 2001 "Stream and Wetland Mitigation Plan, Marks Creek, Phase II, Wake County, North Carolina".

This has been completed.

NCDOT will debit 2.49 acres of Riverine Wetland Restoration, 1.96 acres of Non-Riverine Wetland Restoration, and 3.05 acres Riverine Wetland Preservation from the Jefferey's Warehouse Mitigation Site.

This has been completed

Compensatory mitigation for impacts to Neuse Riparian Buffers is required. The mitigation requirements include 752,085 square feet of Zone 1 Buffers and 233,240 square feet of Zone 2 Buffers. We understand that you have chosen to debit mitigation from the Wiggins Mill Mitigation Site in order to satisfy the wetland mitigation requirements of R-2814 A and B.

This has been completed

Compensatory mitigation shall be provided by the Ecosystem Enhancement Program (EEP), as outlined in the letter dated May 27, 2009 from William D. Gilmore, R-2814B Permit Modification
Green Sheet
September 2010

EEP Director; pursuant to the EEP Memorandum of Agreement (MOA) between the State of North Carolina and the US Army Corps of Engineers signed on July 22, 2003, the EEP will provide 2,538 linear feet of restoration equivalent warm-water stream channel in the Upper Neuse River basin (Hydrologic Cataloging Unit 03020201) in accordance with Section X of the MOA. The NCDOT shall, within 30 days of the issue date of this permit, certify that sufficient funds have been provided to EEP to complete the required mitigation, pursuant to Paragraph V. of the MOA.

This has been completed.

Natural Environment Unit, Division 5, Hydraulics Unit and Roadway Design Unit

When final design plans are completed of R-2814 Sections C & D, a modification to the 401 Water Quality Certification and the Neuse River Riparian Buffer Certification shall be submitted with five copies and fees to the NC Division of Water Quality. Final designs shall reflect all appropriate avoidance, minimization, and mitigation for impacts to wetlands, streams, and other surface waters and buffers. No construction activities that impact any waters, streams, surface waters, or buffers located in R-2814 Section C and D shall begin until after the permittee applies for, and receives a written modification of the 401 Water Quality Certification and the Neuse River Riparian Buffer Authorization from the NC Division of Water Quality.

Hydraulics Unit

For project sites impacting waters classified by the NC Environmental Management Commission as High Quality Waters (HQW), or Water Supply I or II (WSI, WSII), (i.e., Cedar Fork Creek, Perry Creek, and their tributaries in Section B), stormwater shall be directed to vegetated buffer areas, grass-lined ditches or other means appropriate to the site for the purpose of pre-treating stormwater runoff prior to discharging directly into streams. Mowing of existing vegetated buffers is strongly discouraged.

Roadside Environmental Unit

The permittee shall use Design Standards in Sensitive Watersheds [15A NCAC 4B.0124(a)-(e)] in areas draining to WS-II HQW waters (i.e., Cedar Fork Creek, Perry Creel and their tributaries in Section B). However, due to the size of the project, NCDOT shall not be required to meet 15A NCAC 4B.0124(a) regarding the maximum amount of uncovered areas. Temporary cover (wheat, millet, or similar annual grain) or permanent herbaceous cover shall be planted on all bare soil within 15 business days of ground disturbing activities to provide erosion control.

Tall fescue shall not be used in the establishment of temporary or permanent groundcover within riparian zones. For the establishment of permanent herbaceous cover, erosion control matting shall be used in conjunction with appropriate seeding on disturbed soils within the riparian area and on disturbed steep slopes with the following exception. Erosion control matting is not necessary if the area is contained by perimeter

erosion control devices such as silt fence, temporary sediment ditches, basins, ect. Matting should be secured in place with staples, stakes, or wherever possible, live stakes of native trees. Erosions control matting placed in riparian areas shall not contain a nylon mesh grid, which can impinge and entrap small animals. For the establishment of temporary groundcover within riparian areas, hydroseeding along with wood or cellulose based hydro mulch applied from a fertilizer- and limestone-free tank is allowable at the appropriate rate in conjunction with erosion control measures. Discharging hydroseed mixtures and wood or cellulose mulch into surface waters is prohibited. Riparian areas are defined as a distance 25 feet landward from top of stream bank.

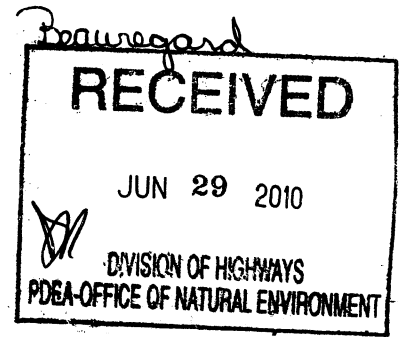
Division 5

At locations where ponds will be drained, proper measures will be taken to drain the pond with limited impact to upstream and downstream channel stability as well as to native aquatic species. Proper measures will be taken to avoid sediment release and/or sediment accumulation downstream as a result of pond draining. If typical pond draining techniques will create significant disturbance to native aquatic species, additional measures such as collection and relocation may be necessary to prevent a significant fish kill. NCDOT shall consult with NC Wildlife Resources staff to determine if there are any sensitive species, and the most appropriate measures to limit impacts to these species. The permittee shall observe any natural channel re-establishment, or utilize natural channel construction techniques, to ensure that the jurisdictional stream channel above and below the drained pond remains stable, and that additional impacts occur within the natural steam channel as a result of draining the pond.



REPLY TO
ATTENTION OF:

DEPARTMENT OF THE ARMY
WILMINGTON DISTRICT, CORPS OF ENGINEERS
69 DARLINGTON AVENUE
WILMINGTON, NORTH CAROLINA 28403-1343



June 25, 2010

Regulatory Division

SUBJECT: Action ID 2008-01316; TIP No. R-2814

Gregory J. Thorpe, Ph.D
North Carolina Department of Transportation
Division of Highways
1598 Mail Service Center
Raleigh, North Carolina 27699-1598

Dear Dr. Thorpe:

Reference the Department of the Army permit issued to the North Carolina Department of Transportation on July 14, 2009, to authorize the discharge of fill material into waters of the United States, for construction of the Sections A, B, C and D of the US 401 Widening and Rolesville Bypass (TIP R-2814). The project location is an 18.5 mile corridor along and to the east of existing US 401, from SR 2044 (Ligon Mill Road) southeast of Rolesville, in Wake County, to SR 1700 (Fox Park Road) southeast of Louisburg, in Franklin County, North Carolina. Authorization for Section B was based on preliminary design. Also, please reference your May 14, 2010 letter, requesting modification of the permit to reflect the final design for Section B of this project.

The final design results in relatively minor changes in permanent impacts to streams and wetlands, some decreases and some increases, with a net decrease of 0.14 acres of wetlands, and 268 linear feet of stream. The increased impacts are necessary because of several factors related to the final design, including required bank stabilization, and a required sewer line relocation.

We have reviewed the requested modification, and determined that it is appropriate and reasonable, and that no public notice is required for this modification. Therefore, the permit is hereby modified to include the changes listed and shown in the modified drawings in the May 14, 2010 modification request, for a net decrease in permanent wetland impacts of 0.14 acres, and net decrease in permanent stream impacts of 268 linear feet in Section B. Total impacts for all four sections will now be 5.96 acres of permanent impacts to 404 wetlands, 4,768 linear feet of permanent impact to streams, 0.03 acre of temporary impact to wetlands, and 204 linear feet of temporary impact to streams. There is a net reduction of 0.12 acres of mitigable impacts to 404 wetlands, and a net decrease of 268 linear feet of impacts to streams requiring mitigation; therefore, special conditions ~~k~~_l and ~~l~~_m are modified as follows:

l ~~k~~ NCDOT shall provide compensatory mitigation for the unavoidable impacts to 4.25 acres of wetlands, associated with Sections A and B of TIP R-2814, by debiting 2.48 acres of riverine and 1.77 acres of non-riverine wetland restoration, and 3.05 acres of riverine wetland

preservation, from the Jeffreys Warehouse Mitigation Site (aka JALO), described in the September 17, 2004 "Jeffreys Warehouse Conceptual Mitigation Plan, Wayne County, North Carolina".

m J) NCDOT shall provide compensatory mitigation for the unavoidable impacts to 2,873 linear feet of warm-water streams with more than minimal aquatic function, associated with Sections A and B of TIP R-2814, as follows:

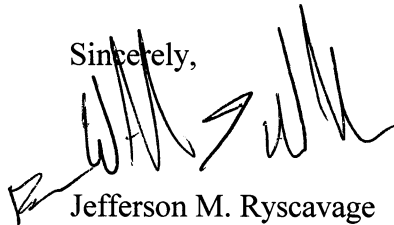
1. By debiting 2,873 linear feet of stream restoration from the Marks Creek, Phase II, Mitigation Site (AID 2008-02072), described in the September 2001 "Stream and Wetland Mitigation Plan, Marks Creek, Phase II, Wake County, North Carolina".

2. Compensatory mitigation shall be provided by the Ecosystem Enhancement Program (EEP), as outlined in the letter dated May 27, 2009 from William D. Gilmore, EEP Manager. Pursuant to the EEP Memorandum of Agreement (MOA) between the State of North Carolina and the US Army Corps of Engineers signed on July 22, 2003, the EEP will provide 2,538 linear feet of restoration equivalent warm water stream channel in the Upper Neuse River basin (Hydrologic Cataloging Unit 03020201) in accordance with Section X of the MOA. The NCDOT shall, within 30 days of the issue date of this permit, certify that sufficient funds have been provided to EEP to complete the required mitigation, pursuant to Paragraph V. of the MOA.

All other conditions of the permit, including the permit expiration date of December 31, 2014, remain applicable.

Should you have any questions, please call Mr. Eric Alsmeyer at (919) 554-4884, extension 23.

Sincerely,



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

Copies Furnished:

Mr. Brian Wrenn
Division of Water Quality
North Carolina Department of
Environment and Natural Resources
1650 Mail Service Center
Raleigh, NC 27699-1650

Mr. Clarence Coleman
Federal Highway Administration
310 New Bern Ave., Rm 410
Raleigh, North Carolina 27601-1442

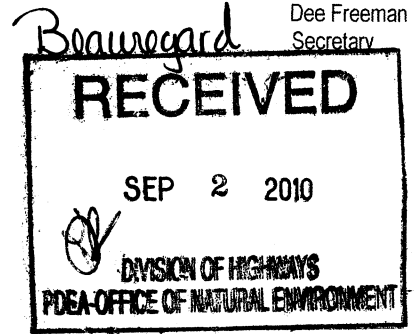
NC-EEP
1652 Mail Service Center
Raleigh, NC 27699-1652



North Carolina Department of Environment and Natural Resources

Division of Water Quality
Coleen H. Sullins
Director

Beverly Eaves Perdue
Governor



August 30, 2010

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

Subject: CORRECTION to Modification to the 401 Water Quality Certification Pursuant to Section 401 of the Federal Clean Water Act, NEUSE BUFFER RULES, and ISOLATED WETLANDS PERMIT Pursuant to IWGP100000 with ADDITIONAL CONDITIONS for Proposed improvements to US 401 in Wake County, Federal Aid Project No. STP-401(4), State Project No. 81403001, TIP No. R-2814 (B). NCDWQ Project No. 20090104 ver.2.

Dear Dr. Thorpe:

Attached hereto is a modification of Certification No. 3790 issued to The North Carolina Department of Transportation (NCDOT) originally dated June 16, 2009.

If we can be of further assistance, do not hesitate to contact us.

Sincerely,

Coleen H. Sullins
Director

Attachments

cc: Eric Alsmeyer, US Army Corps of Engineers, Raleigh Field Office
Chris Murray, Division 5 Environmental Officer
Ecosystem Enhancement Program
Rachelle Beauregard, NCDOT NEU
File Copy

**Modification to the 401 Water Quality Certification Pursuant to Section 401 of the Federal Clean Water Act,
NEUSE BUFFER RULES, and ISOLATED WETLANDS PERMIT Pursuant to IWGP100000 with
ADDITIONAL CONDITIONS**

THIS CERTIFICATION is issued in conformity with the requirements of Section 401 Public Laws 92-500 and 95-217 of the United States and subject to the North Carolina Division of Water Quality (NCDWQ) Regulations in 15 NCAC 2H .0500 and 15A NCAC 2B.0233 and ISOLATED WETLANDS PERMIT Pursuant to IWGP100000 . This certification authorized the NCDOT to impact 2.68 acres of jurisdictional wetlands, 1.58 acres of isolated wetlands, 3,824 linear feet of jurisdictional streams and 496,980 square feet of protected riparian buffers in Wake County. The project shall be constructed pursuant to the modification dated received May 19, 2010. The corrected revised authorized impacts are as described below:

Revised Final Section B Stream Impacts in the Neuse River Basin

Site	Permanent Fill in Intermittent Stream (linear ft)	Temporary Impacts to Intermittent Stream (linear ft)	Bank Stabilization to Intermittent Stream (linear ft)	Permanent Fill in Perennial Stream (linear ft)	Temporary Impacts to Perennial Stream (linear ft)	Bank Stabilization to Perennial Stream (linear ft)	Total Stream Impact (linear ft)	Stream Impacts Requiring Mitigation (linear ft)
1	243	18	0	0	0	0	261	0
4	0	0	0	95	10	20	125	0
6	0	0	0	0	25	14	39	0
7	0	0	0	321	66	47	434	368
7-Utility	0	0	0	0	3	0	3	0
8	0	0	0	355	18	153	526	508
9	0	0	0	610	20	0	630	610
11	0	0	0	0	10	0	10	0
12	258	0	0	0	0	0	258	0
16	0	0	0	189	23	135	347	324
18	36	14	33	0	0	0	83	0
Total	537	32	33	1570	175	369	2716	1810

Total Revised Section B Stream Impact: 2716 linear feet.

Revised Final Section B Wetland Impacts in the Neuse River Basin

Site	Permanent Fill (ac)	Excavation (ac)	Mechanized Clearing (ac)	Total Wetland Impact (ac)	Mitigation Ratio	Wetland Mitigation Required (ac)
2	0.17	<0.01	0.02	0.19	1:1	0.19
3	0.22	0	<0.01	0.22	1:1	0.22
4	0.24	<0.01	0.01	0.25	1:1	0.25
5	0	0.01	0	0.01	2:1	0.02
7	0.65	0.10	0.09	0.84	1:1	0.84
7-Utility	<0.01	0	0.02	0.02	1:1	0.02
13	0.19	0	0	0.19	2:1	0.38
14	0.36	<0.01	0.06	0.42	2:1	0.84
17	0.38	0	0	0.38	1:1	0.38
Total	2.21	0.11	0.20	2.52		3.14

Total Revised Section B Wetland Impact: 2.52 acres.

Final Section B Isolated Wetland Impacts in the Neuse River Basin

Site	Permanent Fill (ac)	Total Wetland Impact (ac)	Mitigation Ratio	Wetland Mitigation Required (ac)
15	1.58	1.58	1:1	1.58
Total	1.58	1.58		1.58

Total Section B Isolated Wetland Impact: 1.58 acres.

Final Section B Open Water (Ponds) Impacts in the Neuse River Basin

Site	Fill in Open Waters (ac)
5	1.53
9	1.31
11	7.29
Total	10.13

Total Revised Section B Open Water Impact: 10.13 acres.

Final Section B Neuse Riparian Buffer Impacts

Site	Zone 1 Impact (sq ft)	minus Wetlands in Zone 1 (sq ft)	= Zone 1 Buffers (not wetlands) (sq ft)	Zone 1 Buffer Mitigation Required (using 3:1 ratio)	Zone 2 Impact (sq ft)	minus Wetlands in Zone 2 (sq ft)	= Zone 2 Buffers (not wetlands) (sq ft)	Zone 2 Buffer Mitigation Required (using 1.5:1 ratio)
1	13743	0	13743	41229	9262	0	9262	13893
2	0	0	0	0	6	6	0	0
5	24086	3937	20149	60447	16852	1399	15453	23180
6	856	0	856	N/A	0	0	0	N/A
7	31468	26830	4638	13914	16685	8158	8527	12790
7-Utility	208	0	208	N/A	835	0	835	N/A
8	28702	0	28702	86106	15200	0	15200	22800
9	53503	0	53503	160509	31621	0	31621	47432
10	2133	0	2133	6399	4772	0	4772	7158
11	25288	0	25288	75864	14205	0	14205	21307
12	17088	0	17088	51264	15041	0	15041	22562
15	19154	16637	2517	7551	15890	8113	7777	11665
16	19724	0	19724	59172	10366	0	10366	15549
18	3475	0	3475	N/A	1585	0	1585	N/A
Totals	239428	47404	192024	562455	152320	17676	134644	198336

* n/a = Total for road crossing site is less than 1/3 acre and 150 linear feet of impact, no mitigation required

Total Revised Section B Buffer Impact: 391,748 square feet.

Note: Revised impact tables for Section B replace the preliminary section B impacts in the original Water Quality Certification. No changes have been made for Section A in this modification.

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

This approval is only valid for the purpose and design that you submitted in your modified application dated received May 19, 2010. All the authorized activities and conditions of certification associated with the original Water Quality Certification dated June 16, 2009 still apply except where superceded by this certification. Should your project change, you are required to notify NCDWQ and submit a new application. If the property is sold, the new owner must be given a copy of this Certification and approval letter, and is thereby responsible for complying with all the conditions. If any additional wetland impacts, or stream impacts, for this project (now or in the future) exceed one acre or 150 linear feet, respectively, additional compensatory mitigation may be required as described in 15A NCAC 2H .0506 (h) (6) and (7). Additional buffer impacts may require compensatory mitigation as described in 15A NCAC.0242. For this approval to remain valid, you are required to comply with all the conditions listed below. In addition, you should obtain all other federal, state or local permits before proceeding with your project including (but not limited to) Sediment and Erosion control, Coastal Stormwater, Non-discharge and Water Supply watershed regulations. This Certification shall expire on the same day as the expiration date of the corresponding Corps of Engineers Permit. **This corrected approval replaces the one issued May 26, 2010.**

Conditions of Certification:

1. When final design plans are completed for R-2814 Sections C & D, a modification to the 401 Water Quality Certification and the Neuse River Riparian Buffer Certification shall be submitted with five copies and fees to the NC Division of Water Quality. Final designs shall reflect all appropriate avoidance, minimization, and mitigation for impacts to wetlands, streams, and other surface waters, and buffers. No construction activities that impact any wetlands, streams, surface waters, or buffers located in R-2814 Section C and D shall begin until after the permittee applies for, and receives a written modification of the 401 Water Quality Certification and the Neuse River Riparian Buffer Authorization from the NC Division of Water Quality.
2. Compensatory mitigation for 2,371 linear feet of impact to perennial streams is required. We understand that you have chosen to debit mitigation from the Marks Creek Mitigation Bank. This certification gives approval to the debiting of 2,371 linear feet of stream mitigation from the Marks Creek Mitigation Site in order to satisfy the stream mitigation requirements of R-2814 A and B.
3. Compensatory mitigation for impacts to jurisdictional and isolated wetlands is required. The mitigation requirement includes 3.37 acres of jurisdictional wetlands and 1.58 acres of isolated wetlands. We understand that you have chosen to debit mitigation from the Jefferey's Warehouse Mitigation Bank. This certification gives approval to debiting following wetland acres from the Jefferey's Warehouse Mitigation Site in order to satisfy the wetland mitigation requirements of R-2814 A and B:
 - Riverine Wetland Restoration: 2.49 acres
 - Non-Riverine Wetland Restoration: 1.96 acres
 - Riverine Wetland Preservation: 3.05 acres
4. Compensatory mitigation for impacts to Neuse Riparian Buffers is required. The mitigation requirement includes 744,690 square feet of Zone 1 Buffers and 245,057 square feet of Zone 2 Buffers.
 - (a) We understand that you have chosen to debit mitigation from the Wiggins Mill Mitigation Bank. This certification gives approval to the debiting of 985,325 square feet of Neuse Buffer from the Wiggins Mill Mitigation Site in order to partially satisfy the riparian buffer mitigation requirements of R-2814 A and B.
 - (b) We understand that you have chosen to perform the 4,422 square feet of remaining compensatory mitigation for impacts to protected buffers through use of the North Carolina Ecosystem Enhancement Program (EEP). Mitigation for unavoidable impacts to Neuse Riparian Buffers shall be provided in the Neuse River Basin and done in accordance with 15A NCAC 2B.0233. EEP has indicated in a letter dated May 11, 2010 that they will assume responsibility for satisfying the remaining compensatory mitigation requirements of 4,422 square feet for the above-referenced project, in accordance with the Tri-Party MOA signed on July 22, 2003 and the Dual-Party MOA signed on April 12, 2004.
5. At locations where ponds will be drained, proper measures will be taken to drain the pond with limited impact to upstream and downstream channel stability as well as to native aquatic species. Proper measures will be taken to avoid sediment release and/or sediment accumulation downstream as a result of pond draining. If typical pond draining techniques will create significant disturbance to native aquatic species, additional measures such as collection and relocation may be necessary to prevent a significant fish kill. NCDOT shall consult with NC Wildlife Resources staff to determine if there are any sensitive species, and the most appropriate measures to limit impacts to these species. The permittee shall observe any natural channel re-establishment, or utilize natural channel construction techniques, to ensure that the jurisdictional stream channel above and below the drained pond remains stable, and that no additional impacts occur within the natural stream channel as a result of draining the pond.

6. Prior to the pre-construction meeting, the permittee shall provide written verification that the final construction drawings comply with the permit drawings contained in the application dated received May 19, 2010. Any deviations from the approved drawings are not authorized unless approved by the NC Division of Water Quality.

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

8. If multiple pipes or barrels are required, they shall be designed to mimic natural stream cross section as closely as possible including pipes or barrels at flood plain elevation and/or sills where appropriate. Widening the stream channel should be avoided. Stream channel widening at the inlet or outlet end of structures typically decreases water velocity causing sediment deposition that requires increased maintenance and disrupts aquatic life passage.

9. Riprap shall not be placed in the active thalweg channel or placed in the streambed in a manner that precludes aquatic life passage. Bioengineering boulders or structures should be properly designed, sized and installed.

10. For all streams being impacted due to site dewatering activities, the site shall be graded to its preconstruction contours and revegetated with appropriate native species.

11. For project sites impacting waters classified by the NC Environmental Management Commission as High Quality Waters (HQW), or Water Supply I or II (WSI, WSII), (i.e., Cedar Fork Creek, Perry Creek, and their tributaries in Section B), stormwater shall be directed to vegetated buffer areas, grass-lined ditches or other means appropriate to the site for the purpose of pre-treating storm water runoff prior to discharging directly into streams. Mowing of existing vegetated buffers is strongly discouraged.

12. The permittee shall use /Design Standards in Sensitive Watersheds/[15A NCAC 4B.0124(a)-(e)] in areas draining to WS-II, HQW waters (i.e., Cedar Fork Creek, Perry Creek and their tributaries). However, due to the size of the project, NC DOT shall not be required to meet 15A NCAC 4B .0124(a) regarding the maximum amount of uncovered acres. Temporary cover (wheat, millet, or similar annual grain) or permanent herbaceous cover shall be planted on all bare soil within 15 business days of ground disturbing activities to provide erosion control.

13. Tall fescue shall not be used in the establishment of temporary or permanent groundcover within riparian areas. For the establishment of permanent herbaceous cover, erosion control matting shall be used in conjunction with appropriate seeding on disturbed soils within the riparian area and on disturbed steep slopes with the following exception. Erosion control matting is not necessary if the area is contained by perimeter erosion control devices such as silt fence, temporary sediment ditches, basins, etc. Matting should be secured in place with staples, stakes, or wherever possible, live stakes of native trees. Erosion control matting placed in riparian areas shall not contain a nylon mesh grid, which can impinge and entrap small animals. For the establishment of temporary groundcover within riparian areas, hydroseeding along with wood or cellulose based hydro mulch applied from a fertilizer- and limestone-free tank is allowable at the appropriate rate in conjunction with the erosion control measures. Discharging hydroseed mixtures and wood or cellulose mulch into surface waters is prohibited. Riparian areas are defined as a distance 25 feet landward from top of stream bank.

14. All riparian buffers impacted by the placement of temporary fill or clearing activities shall be restored to the preconstruction contours and revegetated. Maintained buffers shall be permanently revegetated with non-woody species by the end of the growing season following completion of construction. For the purpose of this condition, maintained buffer areas are defined as areas within the transportation corridor that will be subject to regular NCDOT maintenance activities including mowing. The area with non-maintained buffers shall be permanently revegetated with native woody species before the next growing season following completion of construction. However, due to the size of the project, NC DOT shall not be required to meet 15A NCAC 4B .0124(a) regarding the maximum amount of uncovered acres.

15. All stormwater runoff shall be directed as sheetflow through stream buffers at nonerosive velocities, unless otherwise approved by this certification.

16. Pursuant to NCAC15A 2B.0233(6), sediment and erosion control devices shall not be placed in Zone 1 of any Neuse Buffer without prior approval by NCDWQ. At this time, NCDWQ has approved no sediment and erosion control devices in Zone 1, outside of the approved project impacts, anywhere on this project. Moreover, sediment and erosion control devices shall be allowed in Zone 2 of the buffers provided that Zone 1 is not compromised and that discharge is released as diffuse flow.
17. If concrete is used during construction, a dry work area shall be maintained to prevent direct contact between curing concrete and stream water. Water that inadvertently contacts uncured concrete shall not be discharged to surface waters due to the potential for elevated pH and possible aquatic life and fish kills.
18. During the construction of the project, no staging of equipment of any kind is permitted in waters of the U.S., or protected riparian buffers.
19. The dimension, pattern and profile of the stream above and below the crossing shall not be modified. Disturbed floodplains and streams shall be restored to natural geomorphic conditions.
20. The use of rip-rap above the Normal High Water Mark shall be minimized. Any rip-rap placed for stream stabilization shall be placed in stream channels in such a manner that it does not impede aquatic life passage.
21. All work in or adjacent to stream waters shall be conducted in a dry work area. Approved BMP measures from the most current version of NCDOT Construction and Maintenance Activities manual such as sandbags, rock berms, cofferdams and other diversion structures shall be used to prevent excavation in flowing water.
22. Heavy equipment shall be operated from the banks rather than in the stream channel in order to minimize sedimentation and reduce the introduction of other pollutants into the stream.
23. All mechanized equipment operated near surface waters must be regularly inspected and maintained to prevent contamination of stream waters from fuels, lubricants, hydraulic fluids, or other toxic materials.
24. No rock, sand or other materials shall be dredged from the stream channel except where authorized by this certification.
25. Discharging hydroseed mixtures and washing out hydroseeders and other equipment in or adjacent to surface waters is prohibited.
26. The permittee and its authorized agents shall conduct its activities in a manner consistent with State water quality standards (including any requirements resulting from compliance with §303(d) of the Clean Water Act) and any other appropriate requirements of State and Federal law. If NCDWQ determines that such standards or laws are not being met (including the failure to sustain a designated or achieved use) or that State or federal law is being violated, or that further conditions are necessary to assure compliance, NCDWQ may reevaluate and modify this certification.
27. All fill slopes located in jurisdictional wetlands shall be placed at slopes no flatter than 3:1, unless otherwise authorized by this certification.
28. A copy of this Water Quality Certification shall be maintained on the construction site at all times. In addition, the Water Quality Certification and all subsequent modifications, if any, shall be maintained with the Division Engineer and the on-site project manager.
29. The outside buffer, wetland or water boundary located within the construction corridor approved by this authorization shall be clearly marked by highly visible fencing prior to any land disturbing activities. Impacts to areas within the fencing are prohibited unless otherwise authorized by this certification.
30. The issuance of this certification does not exempt the Permittee from complying with any and all statutes, rules, regulations, or ordinances that may be imposed by other government agencies (i.e. local, state, and federal) having jurisdiction, including but not limited to applicable buffer rules, stormwater management rules, soil erosion and sedimentation control requirements, etc.
31. The Permittee shall report any violations of this certification to the Division of Water Quality within 24 hours of discovery.

32. Upon completion of the project (including any impacts at associated borrow or waste sites), the NCDOT Division Engineer shall complete and return the enclosed "Certification of Completion Form" to notify NCDWQ when all work included in the 401 Certification has been completed.

33. Native woody riparian vegetation (i.e., trees and shrubs native to your geographic region) must be reestablished within the construction limits of the project by the end of the growing season following completion of construction.

34. There shall be no excavation from, or waste disposal into, jurisdictional wetlands or waters associated with this permit without appropriate modification. Should waste or borrow sites, or access roads to waste or borrow sites, be located in wetlands or streams, compensatory mitigation will be required since that is a direct impact from road construction activities.

35. Erosion and sediment control practices must be in full compliance with all specifications governing the proper design, installation and operation and maintenance of such Best Management Practices in order to protect surface waters standards:

- a. The erosion and sediment control measures for the project must be designed, installed, operated, and maintained in accordance with the most recent version of the *North Carolina Sediment and Erosion Control Planning and Design Manual*.
- b. The design, installation, operation, and maintenance of the sediment and erosion control measures must be such that they equal, or exceed, the requirements specified in the most recent version of the *North Carolina Sediment and Erosion Control Manual*. The devices shall be maintained on all construction sites, borrow sites, and waste pile (spoil) projects, including contractor-owned or leased borrow pits associated with the project.
- c. For borrow pit sites, the erosion and sediment control measures must be designed, installed, operated, and maintained in accordance with the most recent version of the *North Carolina Surface Mining Manual*.
- d. The reclamation measures and implementation must comply with the reclamation in accordance with the requirements of the Sedimentation Pollution Control Act.

36. Sediment and erosion control measures shall not be placed in wetlands or waters unless otherwise approved by this Certification.

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

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

This the 30th day of August 2010

DIVISION OF WATER QUALITY



 Coleen H. Sullins
Director

NCDWQ Project No.: _____ County: _____

Applicant: _____

Project Name: _____

Date of Issuance of 401 Water Quality Certification: _____

Certificate of Completion

Upon completion of all work approved within the 401 Water Quality Certification or applicable Buffer Rules, and any subsequent modifications, the applicant is required to return this certificate to the 401 Transportation Permitting Unit, North Carolina Division of Water Quality, 1650 Mail Service Center, Raleigh, NC, 27699-1650. This form may be returned to NCDWQ by the applicant, the applicant's authorized agent, or the project engineer. It is not necessary to send certificates from all of these.

Applicant's Certification

I, _____, hereby state that, to the best of my abilities, due care and diligence was used in the observation of the construction such that the construction was observed to be built within substantial compliance and intent of the 401 Water Quality Certification and Buffer Rules, the approved plans and specifications, and other supporting materials.

Signature: _____ Date: _____

Agent's Certification

I, _____, hereby state that, to the best of my abilities, due care and diligence was used in the observation of the construction such that the construction was observed to be built within substantial compliance and intent of the 401 Water Quality Certification and Buffer Rules, the approved plans and specifications, and other supporting materials.

Signature: _____ Date: _____

Engineer's Certification

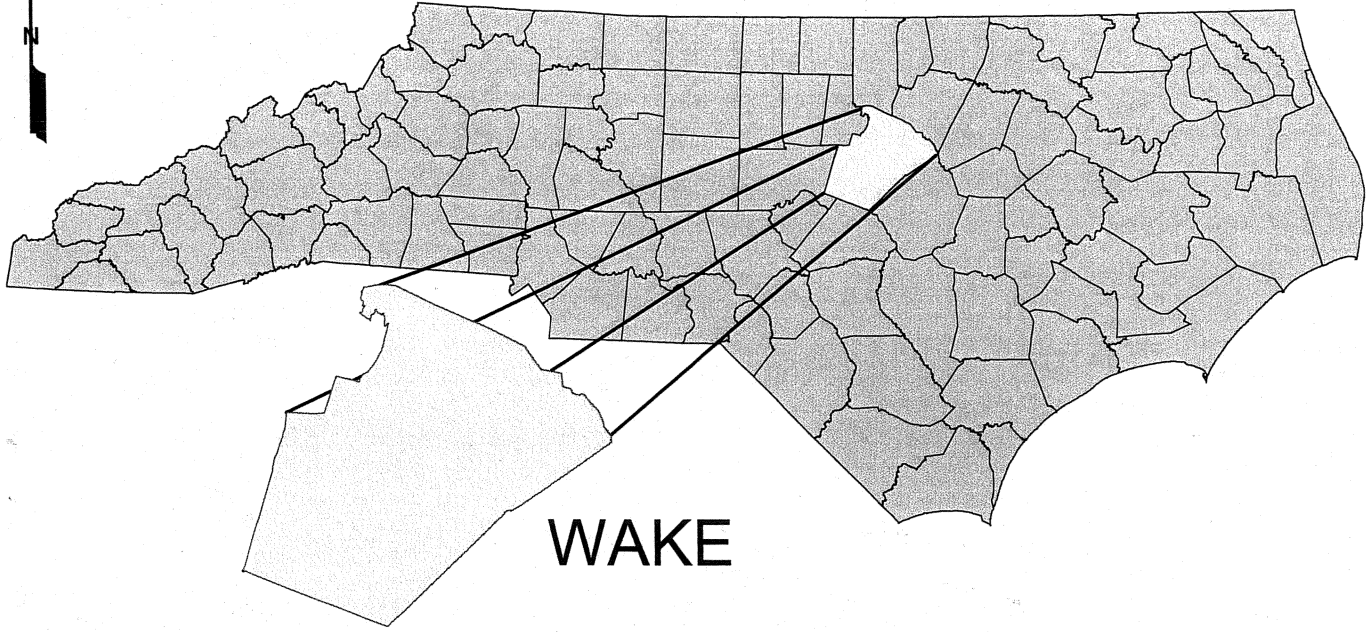
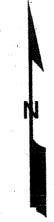
_____ Partial _____ Final

I, _____, as a duly registered Professional Engineer in the State of North Carolina, having been authorized to observe (periodically, weekly, full time) the construction of the project, for the Permittee hereby state that, to the best of my abilities, due care and diligence was used in the observation of the construction such that the construction was observed to be built within substantial compliance and intent of the 401 Water Quality Certification and Buffer Rules, the approved plans and specifications, and other supporting materials.

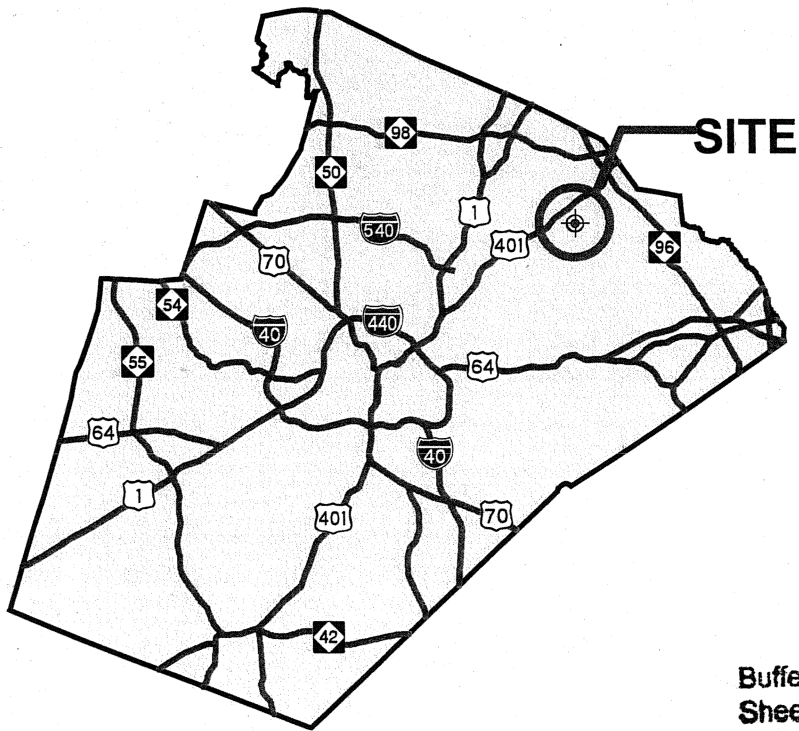
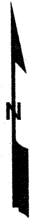
Signature _____ Registration No. _____

Date _____

NORTH CAROLINA



WAKE

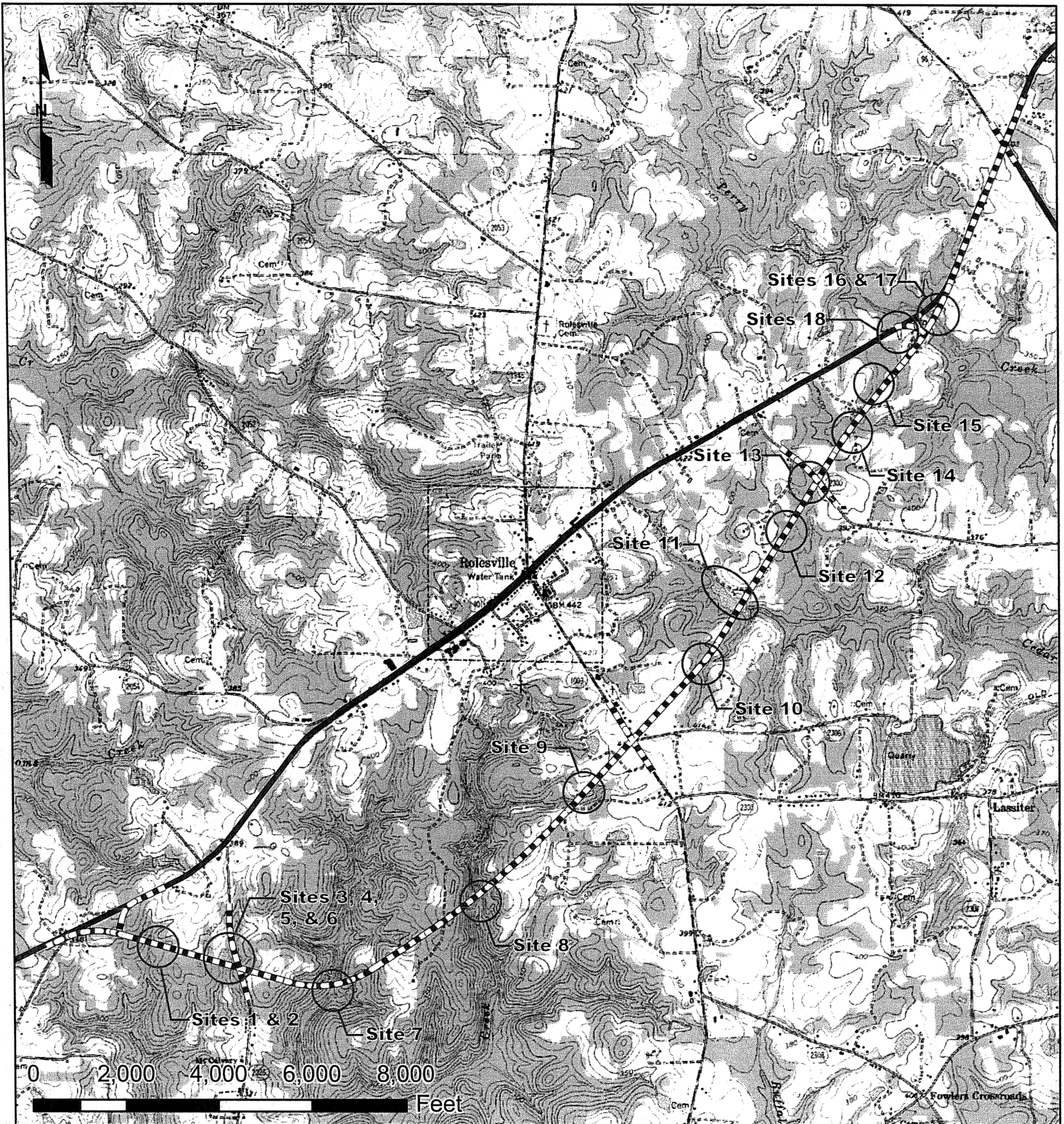


Buffer Drawing
Sheet 1 of 20

BUFFER VICINITY MAP

NCDOT
DIVISION OF HIGHWAYS
WAKE COUNTY
PROJECT: 34506.1.1 (R-2814B)
US 401 ROLESVILLE BYPASS
FROM SR 2225, LOUISBURY ROAD
TO NC 96, ZEBULON ROAD

NOVEMBER 2009



1 inch = 3,000 feet

BUFFER LOCATION MAP

NCDOT
 DIVISION OF HIGHWAYS
 WAKE COUNTY
 PROJECT: 34506.1.1 (R-2814B)
 US 401 ROLESVILLE BYPASS
 FROM SR 2225, LOUISBURY ROAD
 TO NC 96, ZEBULON ROAD

NOVEMBER 2009

Source: USGS 7.5 Minute Quadrangle, Rolesville, NC

Buffer Drawing
 Sheet 2 of 20

PROP. NO.	PROPERTY OWNER NAME	PROP. OWNER ADDRESS
7	Neuse Baptist Church	8700 Capital Blvd., Raleigh, NC 27587
8	Alexander Family investments, LLC	906 Washington St., Cary, NC 27511
9	Scarboro , E. Walter and Claire P.	9412 Louisburg Rd., Wake Forest, NC 27587
12	Bobby L. Murray Heirs (J Brent King Exec.)	PO Box 40639, Raleigh, NC 27629
13	Spencer, Pulley Heirs	9412 Louisburg Rd., Wake Forest, NC 27587
14	Scarboro , E. Walter and Claire P.	9412 Louisburg Rd., Wake Forest, NC 27587
20	Shearon, Cameron E. & Beverly W.	4325 Galax Dr., Raleigh, NC 27612
21	Mitchell F. Rabil Family Irrevocable Trust	3321 Gondola Dr., Lexington KY, 40513
22	Shearon, Cameron E. & Beverly W.	4325 Galax Dr., Raleigh, NC 27612
34	Scarboro Family Limited Partnership	PO Box 84, Rolesville, NC 27571
35	Wall, Joe	7317 Pulley Town Rd., Wake Forest, NC 27587
36	Wall, Joe	7318 Pulley Town Rd., Wake Forest, NC 27587
38	Bobbie Joe Wall & Vickie D. Wall	7309 Pulley Town Rd. Wake Forest, NC 27587
39	The SBJ Growth, L.P	PO Box 19067, Raleigh, NC
51	Bartholomew, Michael	PO BOX 573, Rolesville, NC 27571
52	Bartholomew, Richard C & Shirley B.	PO BOX 6, Rolesville, NC 27571
54	Keith, Jerry W. and Mary P	1124 Louisburg Rd., Wake Forest, NC 27587
54A	Bartholomew, Richard C. & Shirley B.	PO BOX 6, Rolesville, NC 27571
55	Stell, Meith & Mary Sue Et. Al.	1132 Louisburg Rd., Wake Forest, NC 27587
57	Sylvania Frazier & Lula Barnes McGhee	2725 Wait Ave., Wake Forest, NC 27857

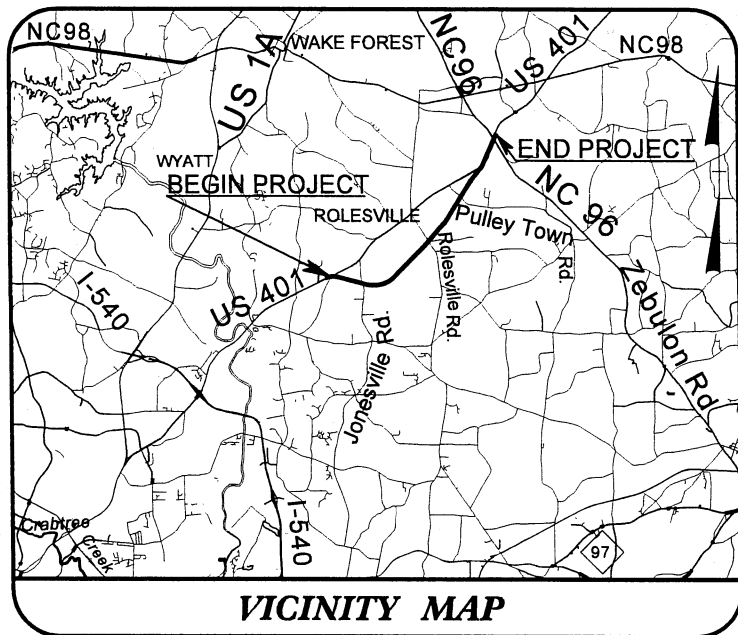
N.C. DEPT. OF TRANSPORTATION
 DIVISION OF HIGHWAYS
 WAKE COUNTY
 PROJECT: 34506.1.1 (R-2814B)
 2/22/2010

Buffer Drawing
 Sheet 3 of 20

TIP PROJECT: R-2814B

CONTRACT:

See Sheet 1-A For Index of Sheets



VICINITY MAP

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

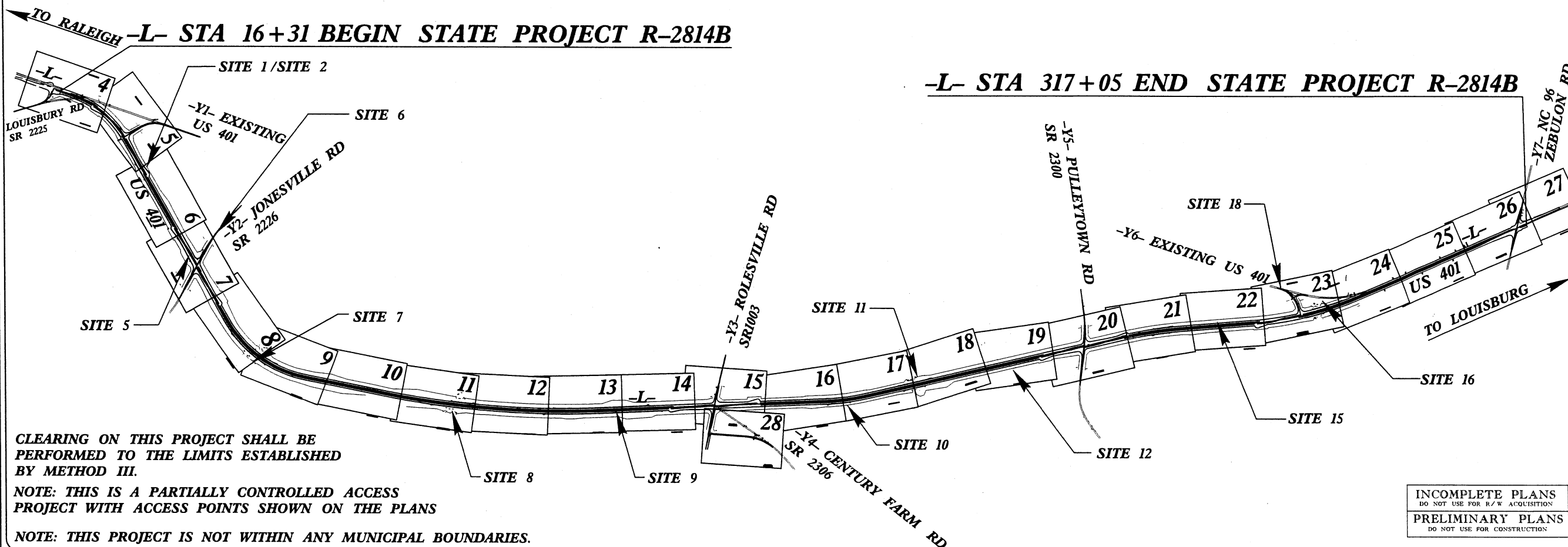
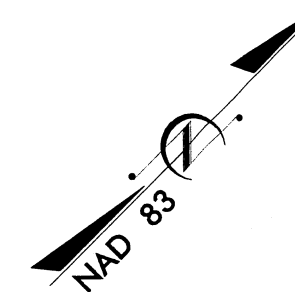
WAKE COUNTY

**LOCATION: US 401 ROLESVILLE BYPASS FROM SR 2225,
LOUISBURY ROAD TO NC 96, ZEBULON ROAD**

BUFFER IMPACTS

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	R-2814B	1	
STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION	
34506.1.1	STP-401(4)	PE	

Buffer Drawing
Sheet 6 of 20

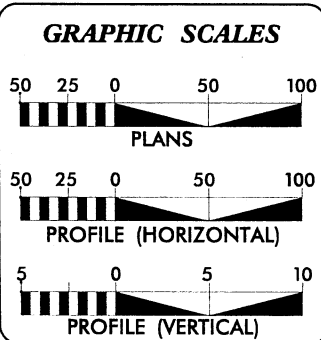


CLEARING ON THIS PROJECT SHALL BE PERFORMED TO THE LIMITS ESTABLISHED BY METHOD III.

NOTE: THIS IS A PARTIALLY CONTROLLED ACCESS PROJECT WITH ACCESS POINTS SHOWN ON THE PLANS

NOTE: THIS PROJECT IS NOT WITHIN ANY MUNICIPAL BOUNDARIES.

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION



DESIGN DATA

ADT 2030 =	24600
ADT =	
DHV =	55 %
D =	13 %
T =	7 % *
V =	60 MPH
* TTST 2	DUAL 5

PROJECT LENGTH

LENGTH ROADWAY F.A. PROJECT STP-401(4) =	5.696 MILES
TOTAL LENGTH TIP PROJECT R-2814B =	5.696 MILES

PERMIT DRAWINGS PREPARED BY:

RK&K
RUMMEL, KLEPPER & KAHL, LLP
900 RIDGEFIELD DRIVE, SUITE 350
RALEIGH, NORTH CAROLINA 27609
NC LICENSE NO. P-0112

FOR THE DIVISION OF HIGHWAYS

2006 STANDARD SPECIFICATIONS

RIGHT OF WAY DATE:	JS GOODNIGHT PROJECT ENGINEER
APRIL 17, 2009	
LETTING DATE:	TD GOINS PROJECT DESIGN ENGINEER
APRIL 19, 2011	

HYDRAULICS ENGINEER

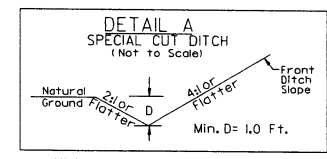
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ROADWAY DESIGN ENGINEER

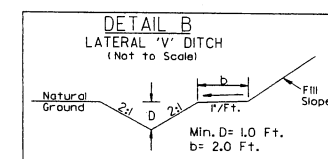
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**DIVISION OF HIGHWAYS
STATE OF NORTH CAROLINA**

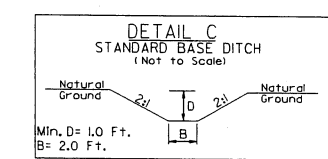
STATE HIGHWAY DESIGN ENGINEER P.E.



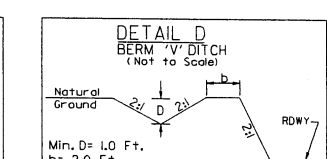
Y1 STA. 16+50 TO STA. 20+50 LT
 Y3 STA. 23+50 TO STA. 24+35 LT
 Y4 STA. 10+45 TO STA. 13+00 RT
 Y4 STA. 20+00 TO STA. 22+29 LT
 Y4 STA. 20+50 TO STA. 22+20 RT
 Y5 STA. 21+17 TO STA. 26+90 LT
 Y6 STA. 15+08 TO STA. 17+00 RT
 Y6 STA. 18+25 TO STA. 20+79 LT
 Y8 STA. 10+52 TO STA. 12+55 RT



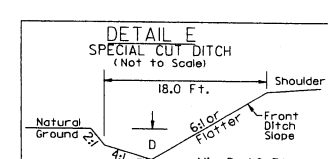
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 L STA. 97+50 TO STA. 98+50 RT
 L STA. 139+50 TO STA. 143+00 RT
 L STA. 190+75 TO STA. 191+50 LT
 L STA. 237+00 TO STA. 239+00 RT
 L STA. 257+25 TO STA. 258+25 RT
 L STA. 261+50 TO STA. 263+50 RT
 L STA. 279+50 TO STA. 281+25 RT
 L STA. 285+50 TO STA. 286+50 RT
 L STA. 305+70 TO STA. 308+50 LT
 L STA. 319+35 TO STA. 321+00 RT
 L STA. 319+75 TO STA. 320+50 LT
 Y5 STA. 16+56 TO STA. 18+65 LT
 Y5 STA. 18+97 TO STA. 19+28 LT
 Y5 STA. 25+40 TO STA. 26+00 RT



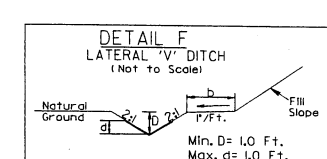
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 L STA. 100+44 TO STA. 101+00 LT
 Y6 STA. 14+94 TO STA. 15+05 RT



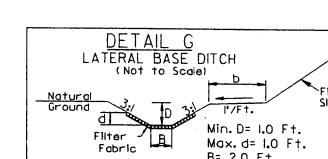
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 L STA. 39+50 TO STA. 41+00 LT
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 L STA. 70+50 TO STA. 75+00 LT
 L STA. 95+00 TO STA. 97+50 RT
 L STA. 99+50 TO STA. 106+00 RT
 L STA. 109+50 TO STA. 113+50 LT
 L STA. 119+50 TO STA. 123+00 RT
 L STA. 180+00 TO STA. 190+00 LT
 L STA. 205+00 TO STA. 217+50 LT
 L STA. 233+00 TO STA. 237+00 RT
 Y6 STA. 14+95 TO STA. 17+85 RT



L STA. 24+50 TO STA. 25+00 RT
 L STA. 29+00 TO STA. 29+50 RT
 L STA. 29+70 TO STA. Y1 23+50 LT
 L STA. 41+00 TO STA. 41+50 LT
 L STA. 196+00 TO STA. 196+50 LT
 L STA. 195+00 TO STA. 197+50 RT
 L STA. 235+00 TO STA. 237+00 RT
 L STA. 239+50 TO STA. 240+00 LT
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 L STA. 321+00 TO STA. 323+50 RT

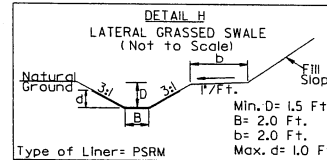


L STA. 23+00 TO STA. 25+00 LT
 L STA. 32+00 TO STA. 32+40 LT
 L STA. 41+50 TO STA. 42+00 LT
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 L STA. 133+50 TO STA. 135+50 RT
 L STA. 190+00 TO STA. 190+75 LT
 L STA. 202+80 TO STA. 205+00 LT
 L STA. 250+00 TO STA. 252+00 LT
 L STA. 284+88 TO STA. 287+50 LT
 L STA. 298+01 TO STA. 300+50 LT
 Y2 STA. 21+50 TO STA. 22+05 LT
 Y3 STA. 21+20 TO STA. 22+20 RT

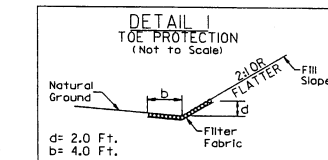


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 L STA. 145+00 TO STA. 147+50 RT
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 L STA. 201+50 TO STA. 202+45 LT

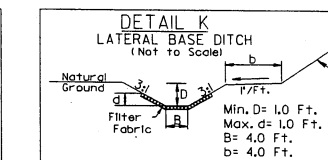
Buffer Drawing
 Sheet 2 of 20



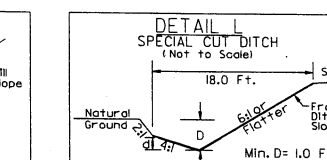
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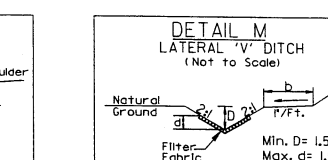
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 L STA. 138+50 TO STA. 142+00 LT
 L STA. 147+20 TO STA. 151+00 RT
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 L STA. 244+75 TO STA. 207+00 LT
 L STA. 229+00 LT TO STA. Y5 19+00 RT



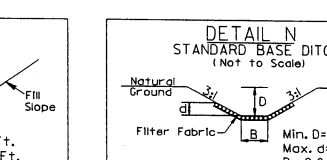
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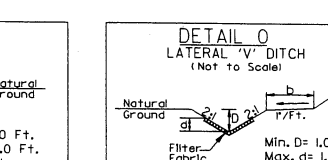
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 L STA. 249+00 TO STA. 250+00 LT
 L STA. 250+00 TO STA. 250+50 RT



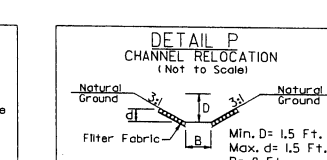
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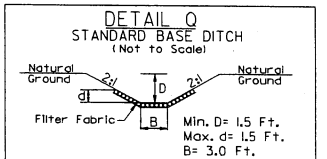
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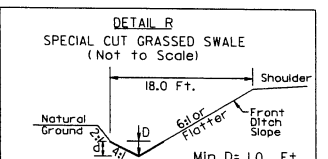
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 L STA. 286+50 TO STA. 287+00 RT
 L STA. 298+00 TO STA. 299+00 RT



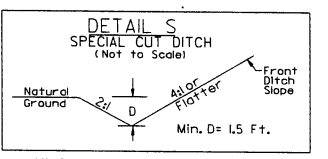
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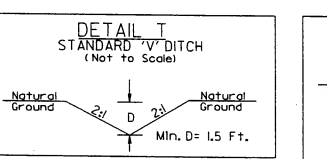
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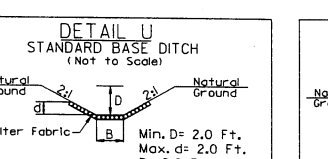
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 L STA. 124+50 TO STA. 128+50 RT



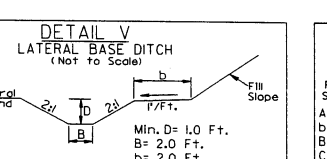
Y3 STA. 21+00 TO STA. 22+20 LT
 Y4 STA. 10+45 TO STA. 12+50 LT



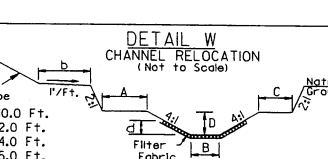
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 Y3 STA. 25+05 TO STA. 26+50 LT



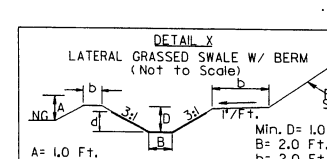
Y3 STA. 22+20 TO STA. 22+40 RT



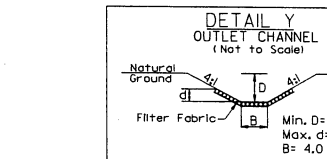
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 L STA. 134+00 TO STA. 138+00 LT
 L STA. 137+00 TO STA. 138+50 RT
 L STA. 217+50 TO STA. 221+00 LT
 L STA. 224+50 TO STA. 227+00 LT
 L STA. 239+00 TO STA. 246+15 RT
 L STA. 251+50 TO STA. 257+25 RT
 L STA. 276+00 TO STA. 278+00 RT
 Y5 STA. 17+50 TO STA. 18+75 RT
 Y7 STA. 17+50 TO STA. 19+30 RT



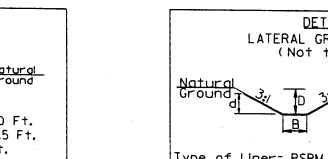
L STA. 147+50 TO STA. 150+83 RT



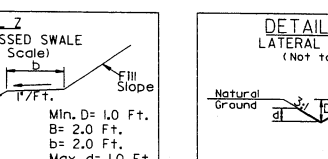
L STA. 143+00 TO STA. 145+00 RT
 L STA. 148+00 TO STA. 149+00 LT
 L STA. 152+50 TO STA. 154+00 LT



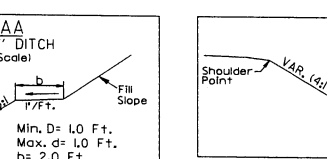
L STA. 38+45 TO STA. 38+48 RT, LINER=CLASS I RIP RAP (BANKS ONLY)
 L STA. 54+73 RT, LINER=CLASS I RIP RAP (BANKS ONLY)
 L STA. 144+24 TO STA. 144+56 LT, LINER=CLASS I RIP RAP (BANKS ONLY)
 Y2 STA. 17+40 RT, LINER=CLASS I RIP RAP (BANKS ONLY), B VARIES 2'-9"
 Y5 STA. 25+40 TO STA. 25+40 RT, LINER=CLASS B RIP RAP



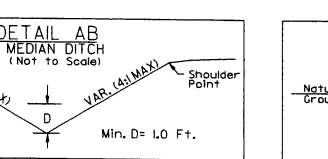
L STA. 148+00 TO STA. 149+00 LT
 L STA. 150+50 TO STA. 154+00 LT
 L STA. 199+80 TO STA. 201+50 LT
 L STA. 281+25 TO STA. 283+50 RT (B=0.0')



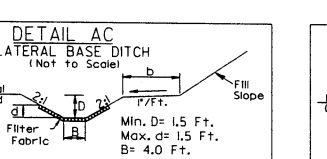
L STA. 198+00 TO STA. 200+30 RT



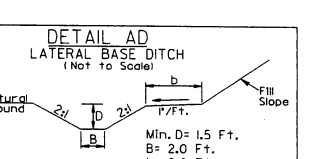
L STA. 200+51.84 TO STA. 201+00
 L STA. 274+00 TO STA. 276+50



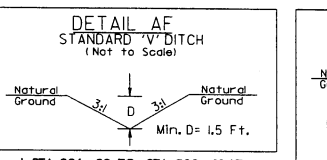
L STA. 200+41 TO STA. 203+50 RT



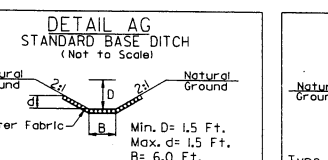
L STA. 221+00 TO STA. 224+50 LT
 L STA. 252+00 TO STA. 257+25 LT
 Y7 STA. 11+50 TO STA. 15+27 RT



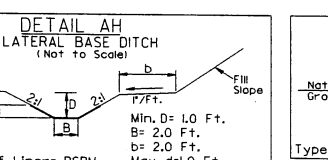
Y5 STA. 18+65 TO STA. 18+97 LT



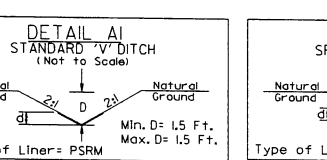
L STA. 296+88 TO STA. 298+01 LT



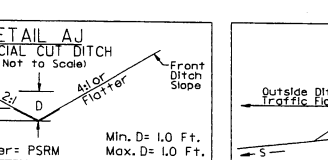
L STA. 54+80 TO STA. 54+81 LT



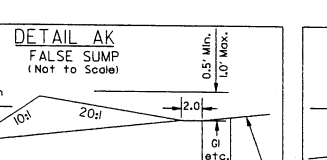
L STA. 138+50 TO STA. 139+50 RT
 L STA. 203+50 TO STA. 206+00 RT
 L STA. 250+50 TO STA. 251+50 RT
 L STA. 278+00 TO STA. 279+50 RT



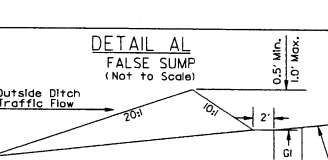
L STA. 290+47 TO STA. 291+00 LT



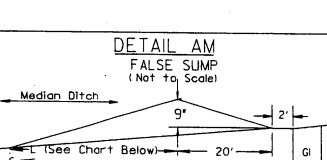
Y3 STA. 22+20 TO STA. 22+61.82 LT
 Y5 STA. 26+00 TO STA. 26+90 RT



Y3 STA. 22+20 TO STA. 22+61.82 LT
 Y5 STA. 26+00 TO STA. 26+90 RT

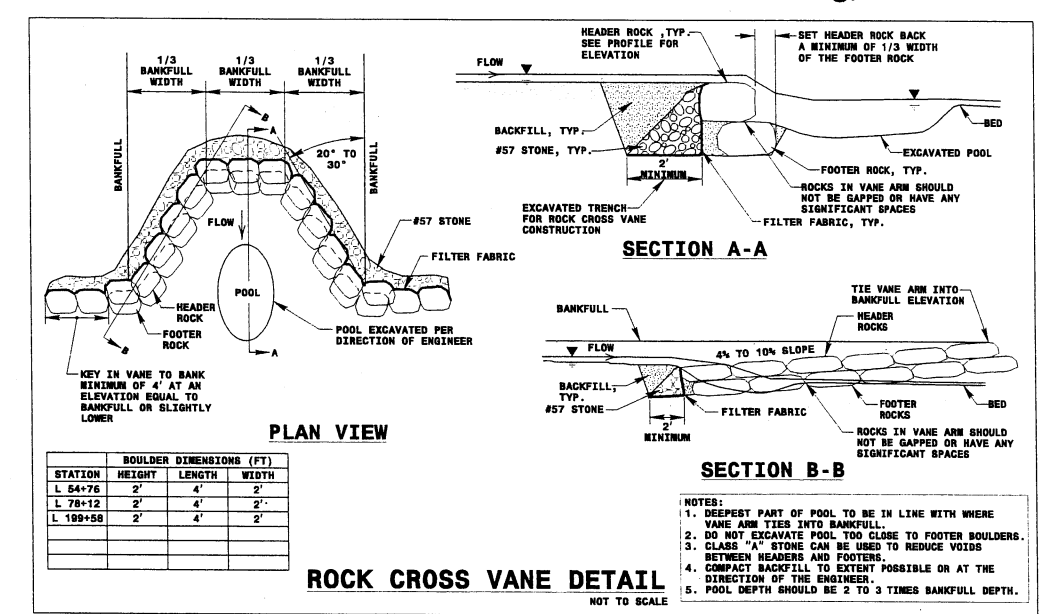
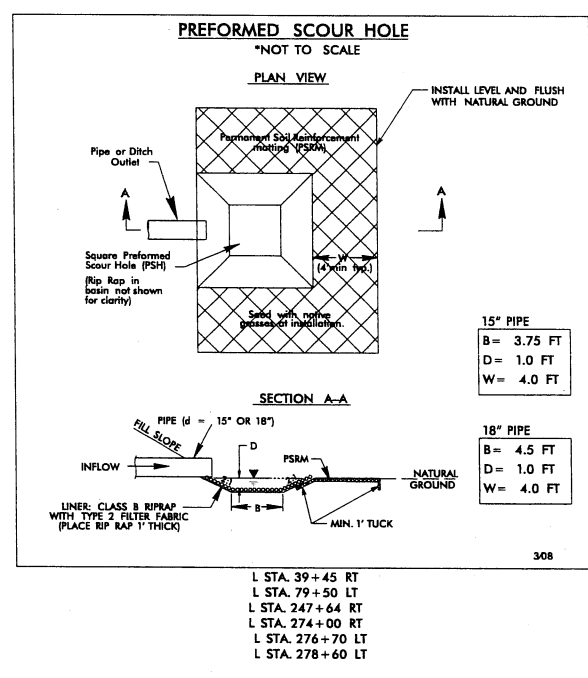
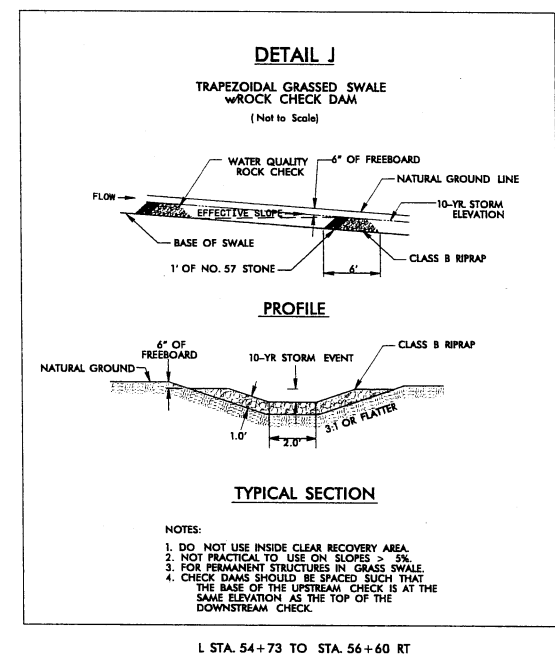
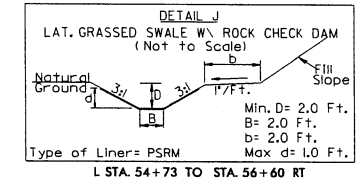


Y3 STA. 22+20 TO STA. 22+61.82 LT
 Y5 STA. 26+00 TO STA. 26+90 RT



Ditch Grade	Ditch Grade	L
0.0% To 2.0%	20'	40'
Over 2.0% To 4.0%	30'	Over 6.0%
		50'

Buffer Drawing
Sheet 8 of 20

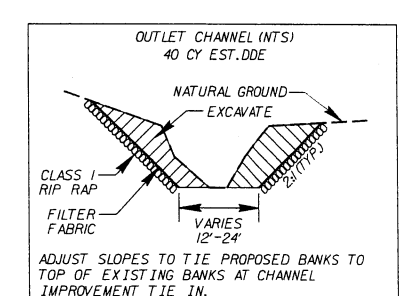
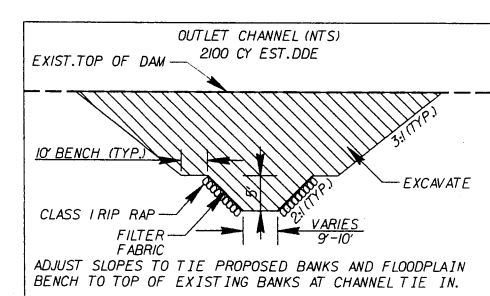
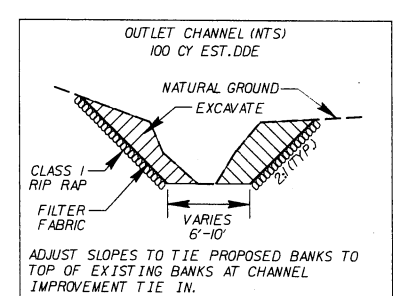
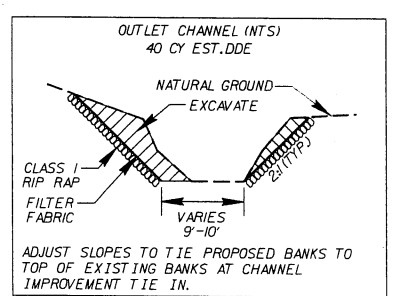
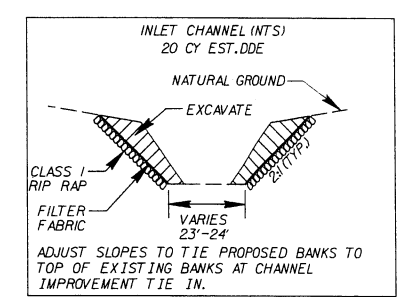
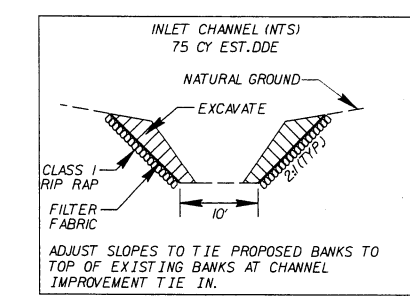
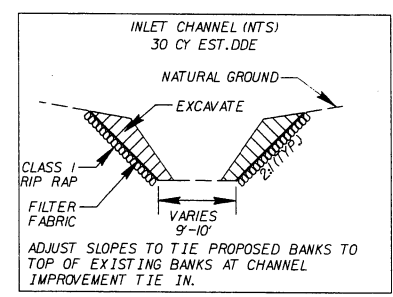
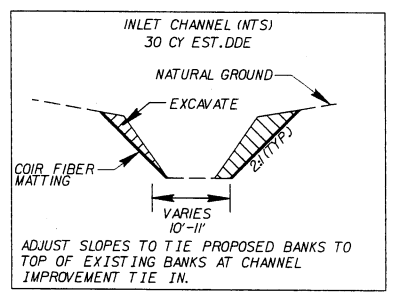
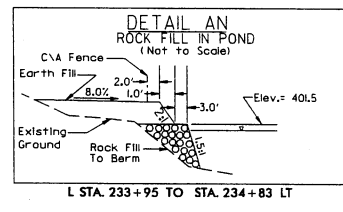


CULVERT INLET/OUTLET DETAILS
HARRIS CREEK TRIBUTARY
-L- STA 77+89

CULVERT INLET/OUTLET DETAILS
HARRIS CREEK
-L- STA 115+74

CULVERT INLET/OUTLET DETAILS
CEDAR FORK
-L- STA 200+04

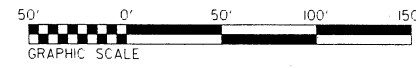
CULVERT INLET/OUTLET DETAILS
PERRY CREEK
-L- STA 275+39



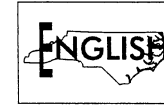
65

70

75



PROJECT REFERENCE NO. R-2814B	SHEET NO. 8
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
INCOMPLETE PLANS DO NOT USE FOR R/W ACQUISITION PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION	

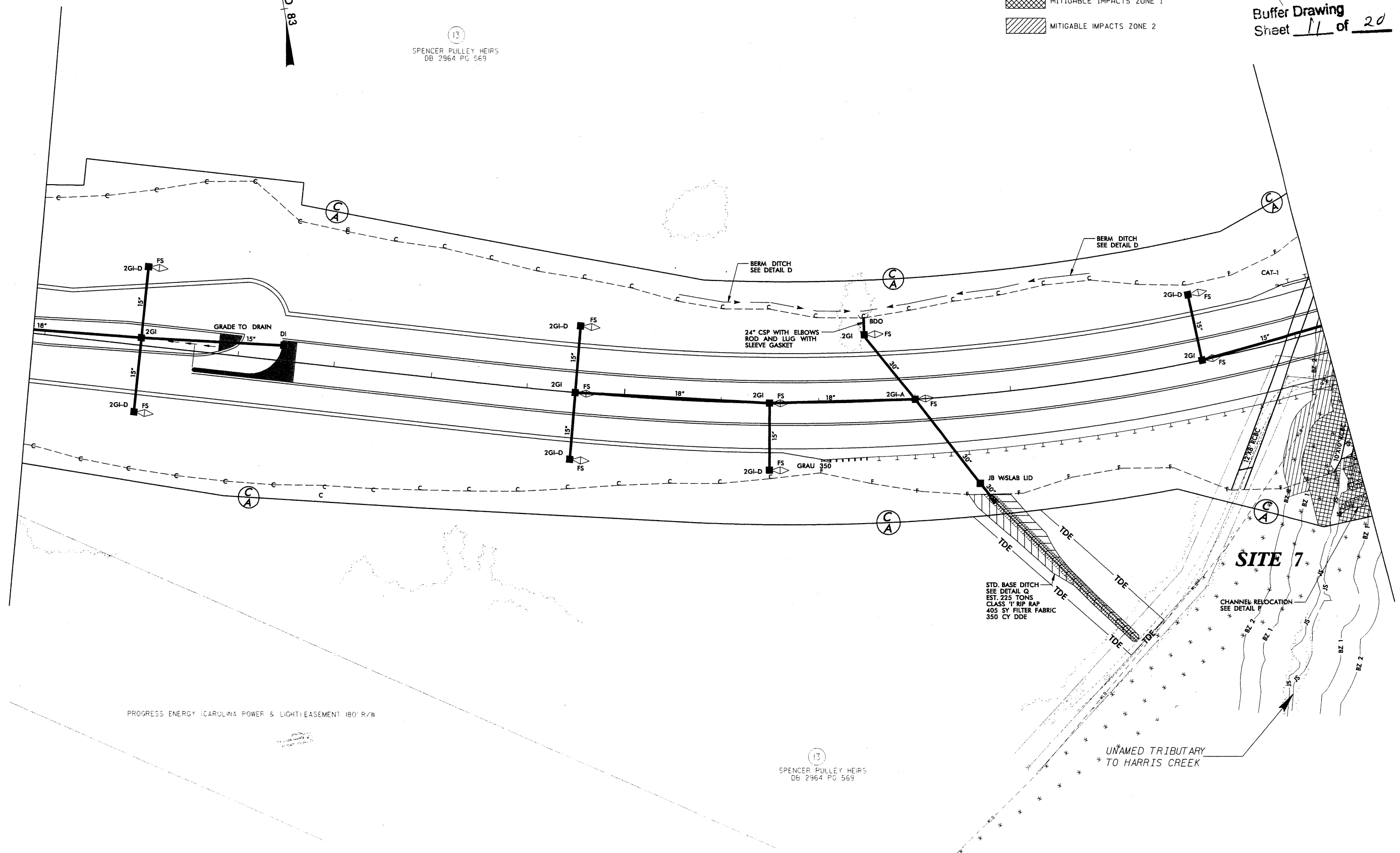


- MITIGABLE IMPACTS ZONE 1
- MITIGABLE IMPACTS ZONE 2

Buffer Drawing
Sheet 11 of 20

13
SPENCER PULLEY HEIRS
DB 2964 PG 569

REVISIONS



PROGRESS ENERGY CAROLINA POWER & LIGHT EASEMENT 180' R/W

13
SPENCER PULLEY HEIRS
DB 2964 PG 569

STD. BASE DITCH
SEE DETAIL Q
EST. 225 TONS
CLASS '1' RIP RAP
405 SY FILTER FABRIC
350 CY DDE

SITE 7

UNAMED TRIBUTARY
TO HARRIS CREEK

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 21:44:30 1/21/2018 11:52:30 AM
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PROJECT REFERENCE NO. R-2814B	SHEET NO. 9
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
INCOMPLETE PLANS DO NOT USE FOR R/W ACQUISITION PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION	

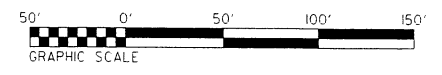
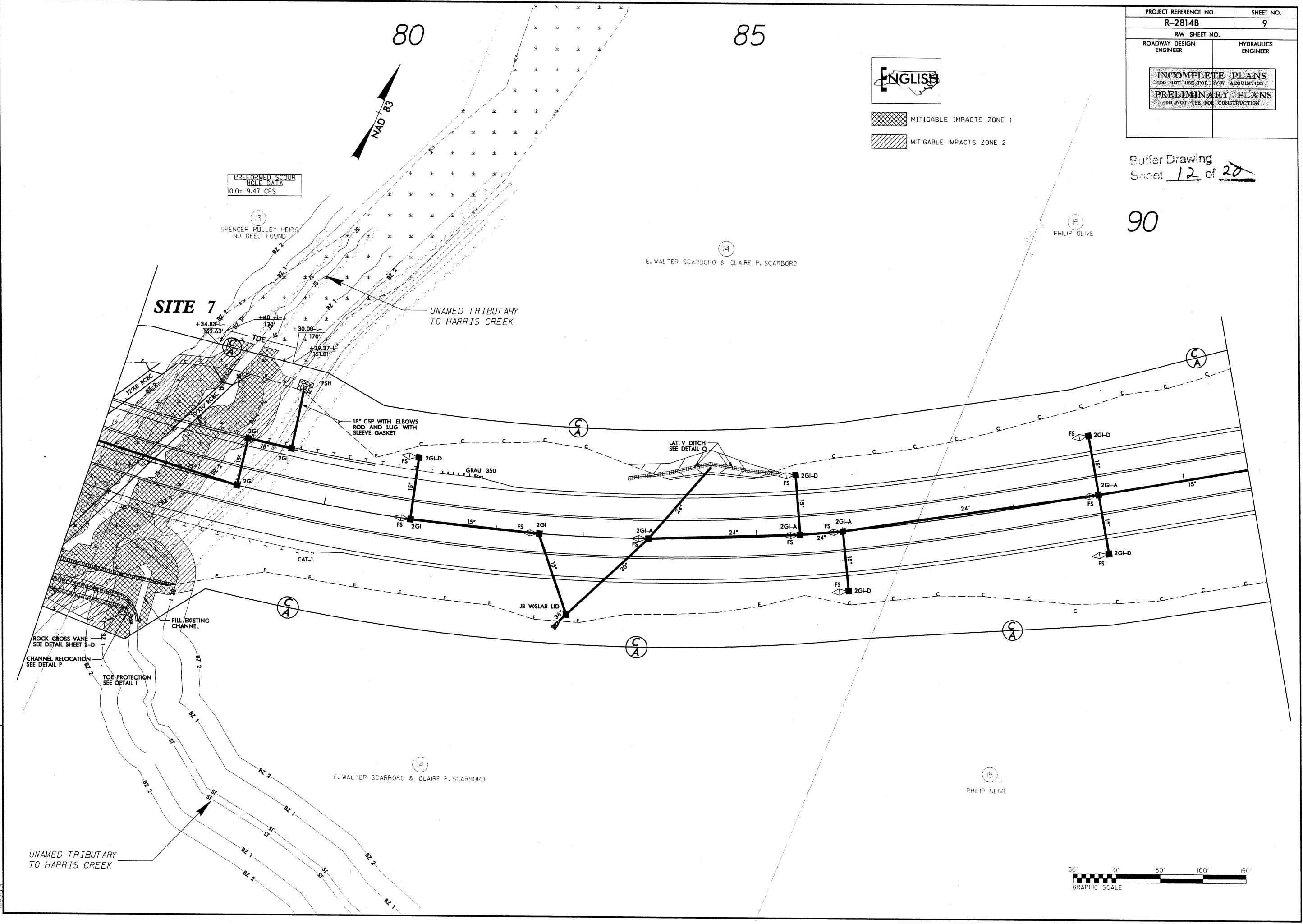
Buffer Drawing
Sheet 12 of 20

90



MITIGABLE IMPACTS ZONE 1
 MITIGABLE IMPACTS ZONE 2

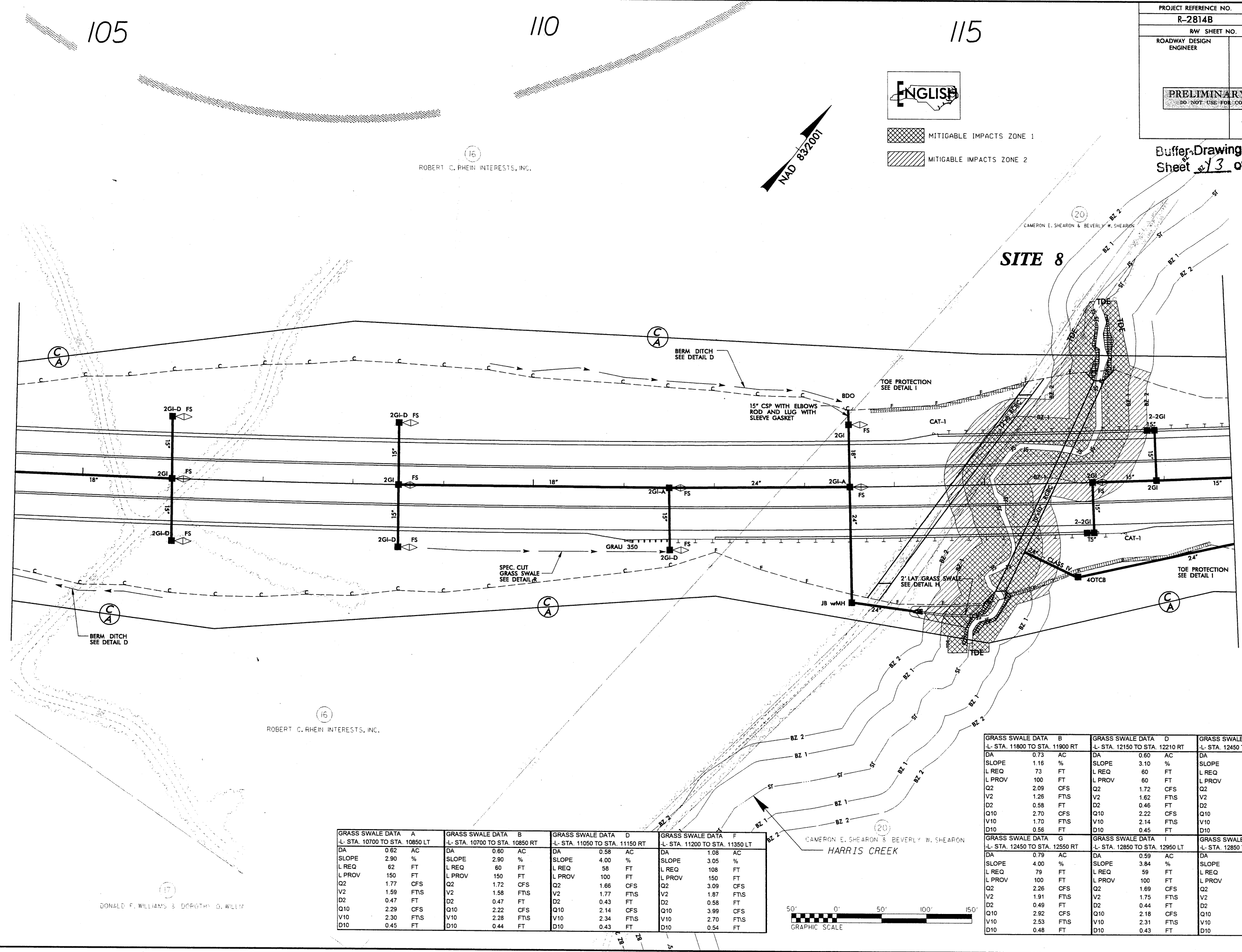
REVISIONS



Buffer Drawing
Sheet 13 of 20



MITIGABLE IMPACTS ZONE 1
MITIGABLE IMPACTS ZONE 2

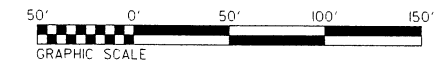


REVISIONS
06/16/09: Added TDE upstream and downstream around the culvert on parcel 20.

GRASS SWALE DATA A		GRASS SWALE DATA B		GRASS SWALE DATA D		GRASS SWALE DATA F	
-L- STA. 10700 TO STA. 10850 LT		-L- STA. 10700 TO STA. 10850 RT		-L- STA. 11050 TO STA. 11150 RT		-L- STA. 11200 TO STA. 11350 LT	
DA	0.62 AC	DA	0.60 AC	DA	0.58 AC	DA	1.08 AC
SLOPE	2.90 %	SLOPE	2.90 %	SLOPE	4.00 %	SLOPE	3.05 %
L REQ	62 FT	L REQ	60 FT	L REQ	58 FT	L REQ	108 FT
L PROV	150 FT	L PROV	150 FT	L PROV	100 FT	L PROV	150 FT
Q2	1.77 CFS	Q2	1.72 CFS	Q2	1.66 CFS	Q2	3.09 CFS
V2	1.59 FTS	V2	1.58 FTS	V2	1.77 FTS	V2	1.87 FTS
D2	0.47 FT	D2	0.47 FT	D2	0.43 FT	D2	0.58 FT
Q10	2.29 CFS	Q10	2.22 CFS	Q10	2.14 CFS	Q10	3.99 CFS
V10	2.30 FTS	V10	2.28 FTS	V10	2.34 FTS	V10	2.70 FTS
D10	0.45 FT	D10	0.44 FT	D10	0.43 FT	D10	0.54 FT

GRASS SWALE DATA B		GRASS SWALE DATA D		GRASS SWALE DATA F	
-L- STA. 11800 TO STA. 11900 RT		-L- STA. 12150 TO STA. 12210 RT		-L- STA. 12450 TO STA. 12550 LT	
DA	0.73 AC	DA	0.60 AC	DA	0.91 AC
SLOPE	1.16 %	SLOPE	3.10 %	SLOPE	4.00 %
L REQ	73 FT	L REQ	60 FT	L REQ	91 FT
L PROV	100 FT	L PROV	60 FT	L PROV	100 FT
Q2	2.09 CFS	Q2	1.72 CFS	Q2	2.60 CFS
V2	1.26 FTS	V2	1.62 FTS	V2	1.98 FTS
D2	0.58 FT	D2	0.46 FT	D2	0.51 FT
Q10	2.70 CFS	Q10	2.22 CFS	Q10	3.36 CFS
V10	1.70 FTS	V10	2.14 FTS	V10	2.62 FTS
D10	0.56 FT	D10	0.45 FT	D10	0.51 FT

GRASS SWALE DATA G		GRASS SWALE DATA I		GRASS SWALE DATA J	
-L- STA. 12450 TO STA. 12550 RT		-L- STA. 12850 TO STA. 12950 LT		-L- STA. 12850 TO STA. 12950 RT	
DA	0.79 AC	DA	0.59 AC	DA	0.39 AC
SLOPE	4.00 %	SLOPE	3.84 %	SLOPE	3.84 %
L REQ	79 FT	L REQ	59 FT	L REQ	39 FT
L PROV	100 FT	L PROV	100 FT	L PROV	100 FT
Q2	2.26 CFS	Q2	1.69 CFS	Q2	1.12 CFS
V2	1.91 FTS	V2	1.75 FTS	V2	1.58 FTS
D2	0.49 FT	D2	0.44 FT	D2	0.38 FT
Q10	2.92 CFS	Q10	2.18 CFS	Q10	1.44 CFS
V10	2.53 FTS	V10	2.31 FTS	V10	2.08 FTS
D10	0.48 FT	D10	0.43 FT	D10	0.37 FT



DONALD F. WILLIAMS & DOROTHY G. WILLIAMS

ROBERT C. RHEIN INTERESTS, INC.

ROBERT C. RHEIN INTERESTS, INC.

CAMERON E. SHEARON & BEVERLY W. SHEARON
HARRIS CREEK

PROJECT REFERENCE NO. R-2814B	SHEET NO. 13
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION	

Buffer Drawing
Sheet 14 of 20



MITIGABLE IMPACTS ZONE 1
MITIGABLE IMPACTS ZONE 2

135

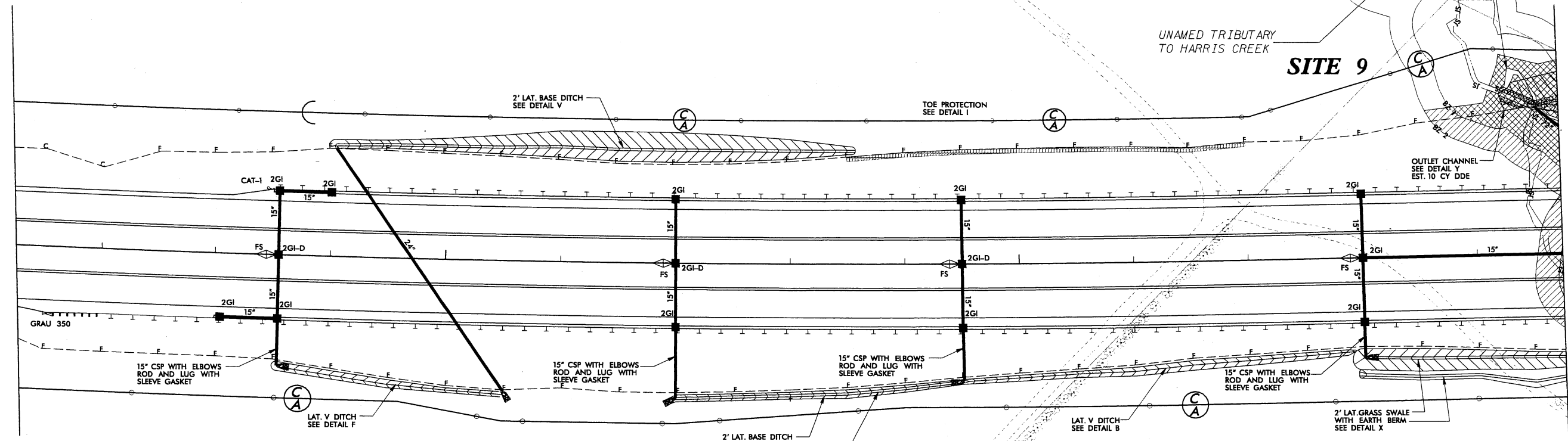
140

19
RUBY L. BYRUM

21
MITCHELL F. RABIL FAMILY
IRREVOCABLE TRUST

UNAMED TRIBUTARY
TO HARRIS CREEK

SITE 9



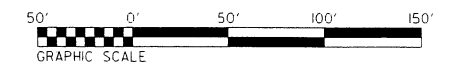
GRAU 350

OUTLET CHANNEL
SEE DETAIL Y
EST. 10 CY DDE

22
CAMERON E. SHEARON
&
BEVERLY W. SHEARON
DB 12256 PG 1051

19
RUBY L. BYRUM

GRASS SWALE DATA		B
-L- STA. 14300 TO STA. 14500 RT		
DA	1.75	AC
SLOPE	0.80	%
L REQ	175	FT
L PROV	200	FT
Q2	5.42	CFS
V2	1.93	FT/S
D2	0.69	FT
Q10	7.02	CFS
V10	2.07	FT/S
D10	0.78	FT



REVISIONS
REVISED NAMES ON PARCEL 22 PER LOCATION AND SURVEY REQUEST 4/23/09 DDL 7/29/09

C:\Users\jsherman\Documents\Drawings\2814B-hydraulic-prm-13.dwg
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11/11/09 11:53:51 AM

145

150

155



(21)
MITCHELL F. RABIL FAMILY
IRREVOCABLE TRUST

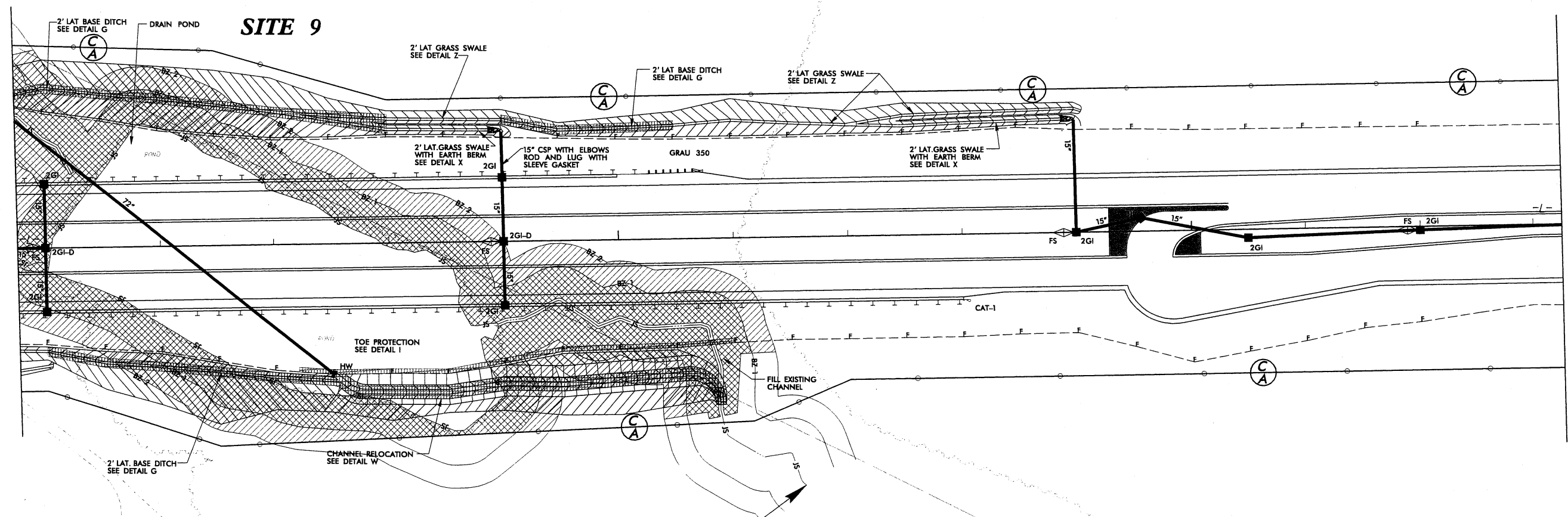


MITIGABLE IMPACTS ZONE 1
MITIGABLE IMPACTS ZONE 2

PROJECT REFERENCE NO. R-2814B	SHEET NO. 14
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION	

Buffer Drawing
Sheet 15 of 20

REVISIONS
REVISED NAMES ON PARCEL 22 PER LOCATION AND SURVEY REQUEST 4/23/09 DDL 7/29/09

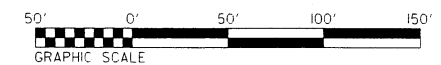


GRASS SWALE DATA D			GRASS SWALE DATA F		
-L- STA. 14800 TO STA. 14900 LT			-L- STA. 15250 TO STA. 15400 LT		
DA	1.00	AC	DA	1.41	AC
SLOPE	2.20	%	SLOPE	0.50	%
L REQ	100	FT	L REQ	141	FT
L PROV	100	FT	L PROV	150	FT
Q2	2.86	CFS	Q2	3.57	CFS
V2	1.75	FT/S	V2	1.45	FT/S
D2	0.48	FT	D2	0.63	FT
Q10	3.70	CFS	Q10	4.63	CFS
V10	2.80	FT/S	V10	1.56	FT/S
D10	0.54	FT	D10	0.72	FT

(22)
CAMERON E. SHEARON
&
BEVERLY W. SHEARON
DB 12258 PG 1051

UNAMED TRIBUTARY
TO HARRIS CREEK

(21)
MITCHELL F. RABIL FAMILY
IRREVOCABLE TRUST



185

190

195

PROJECT REFERENCE NO. R-2814B	SHEET NO. 17
RAW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION	

Buffer Drawing Sheet 16 of 20



33
R.S. WALL HEIRS



MITIGABLE IMPACTS ZONE 1
 MITIGABLE IMPACTS ZONE 2

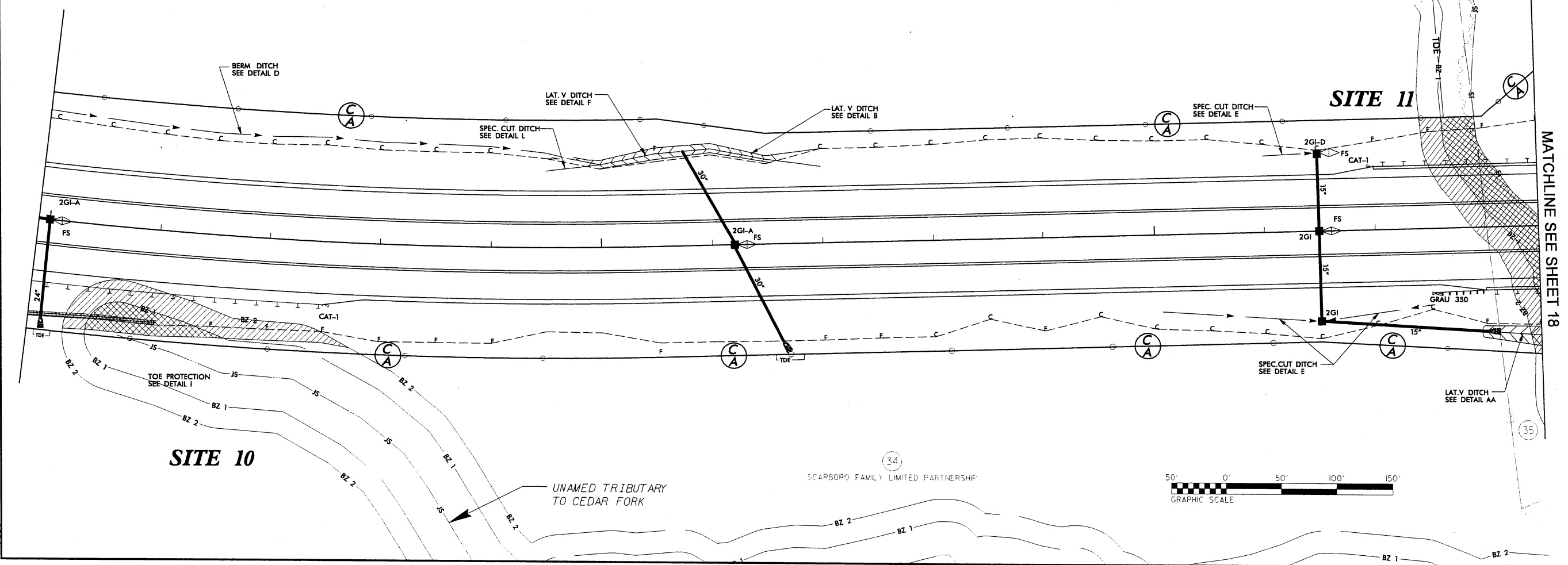
34

SCARBORO FAMILY LIMITED PARTNERSHIP

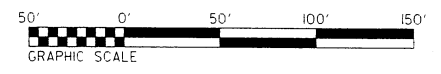
GRASS SWALE DATA B			GRASS SWALE DATA C			GRASS SWALE DATA E			GRASS SWALE DATA G			GRASS SWALE DATA H		
-L- STA. 19550 TO STA. 19600 LT			-L- STA. 19600 TO STA. 19650 LT			-L- STA. 19550 TO STA. 19650 CL			-L- STA. 19500 TO STA. 19550 RT			-L- STA. 19650 TO STA. 19750 RT		
DA	0.73	AC	DA	0.73	AC	DA	0.54	AC	DA	0.42	AC	DA	0.14	AC
SLOPE	1.76	%	SLOPE	2.34	%	SLOPE	1.78	%	SLOPE	3.16	%	SLOPE	0.30	%
L REQ	50	FT	L REQ	23	FT	L REQ	54	FT	L REQ	42	FT	L REQ	14	FT
L PROV	50	FT	L PROV	50	FT	L PROV	100	FT	L PROV	150	FT	L PROV	100	FT
Q2	2.44	CFS	Q2	2.44	CFS	Q2	1.03	CFS	Q2	1.40	CFS	Q2	0.47	CFS
V2	1.94	FT/S	V2	1.97	FT/S	V2	1.38	FT/S	V2	1.92	FT/S	V2	0.60	FT/S
D2	0.50	FT	D2	0.50	FT	D2	0.35	FT	D2	0.38	FT	D2	0.39	FT
Q10	3.15	CFS	Q10	3.15	CFS	Q10	1.33	CFS	Q10	1.81	CFS	Q10	0.60	CFS
V10	2.07	FT/S	V10	2.30	FT/S	V10	1.47	FT/S	V10	2.05	FT/S	V10	0.64	FT/S
D10	0.55	FT	D10	0.52	FT	D10	0.39	FT	D10	0.42	FT	D10	0.43	FT

35
JOE WALL & CRYSTAL H. WALL DB 12/31 PG2556

REVISIONS
REVISED NAMES ON PARCEL 35 PER LOCATION AND SURVEY REQUEST 4/23/09 DDL 7/29/09



MATCHLINE SEE SHEET 18



MATCHLINE A

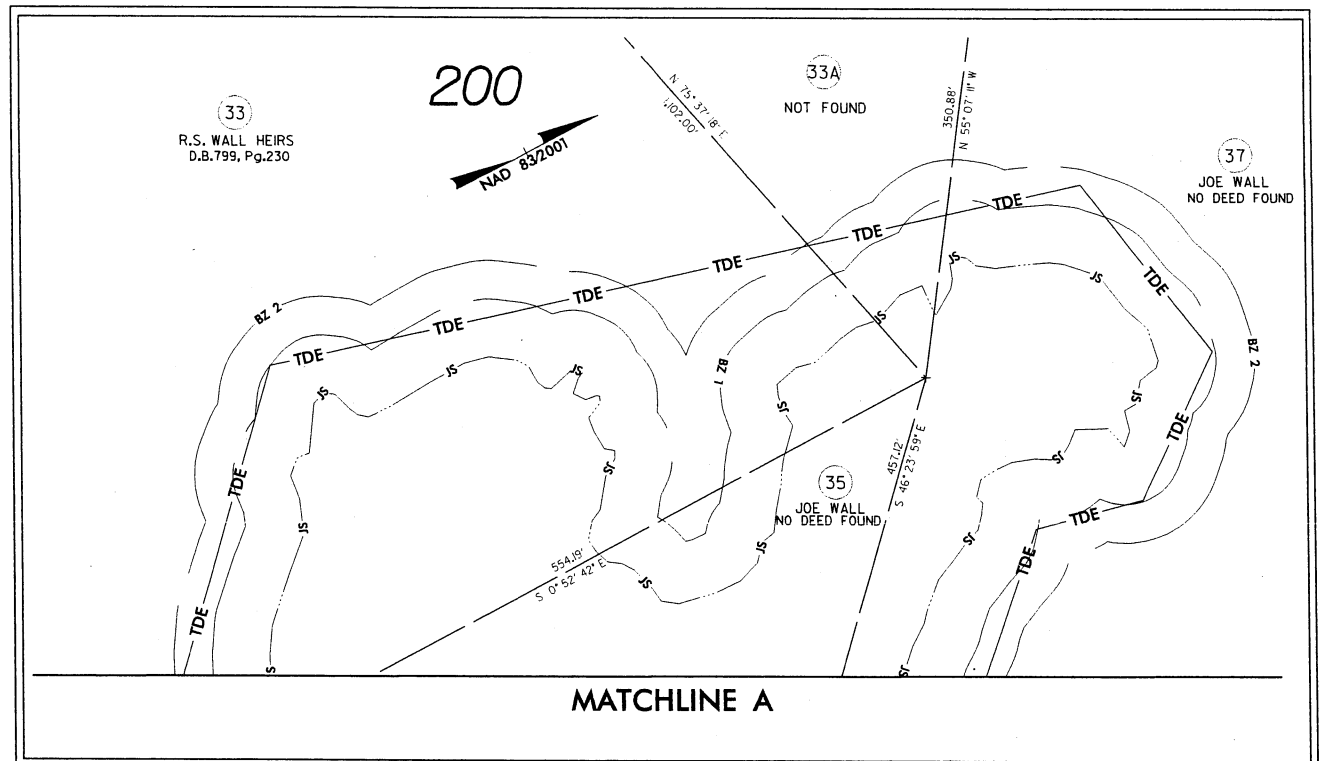
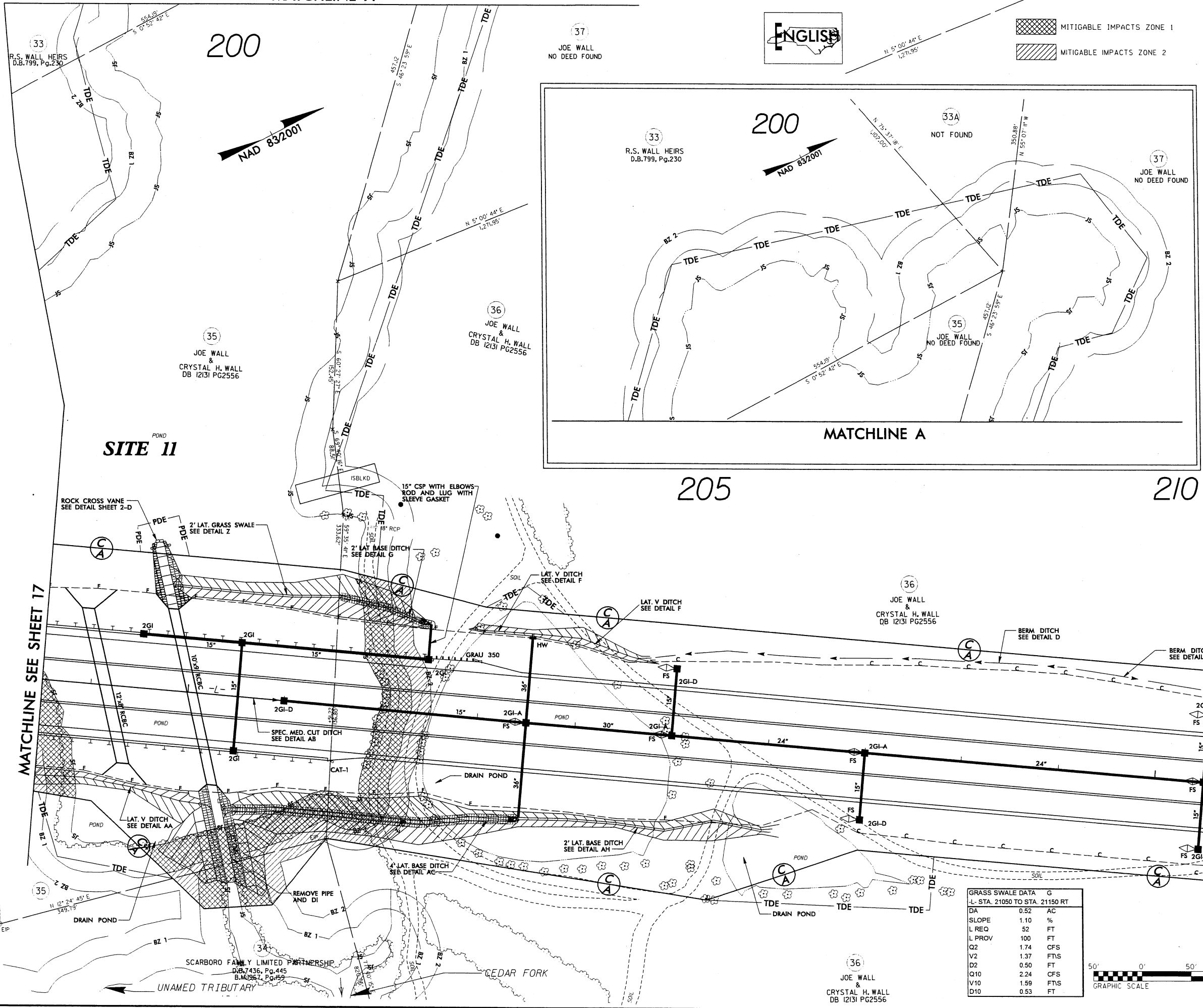
PROJECT REFERENCE NO. R-2814B	SHEET NO. 18
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
Buffer Drawing Sheet 17 of 20	
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION	

GRASS SWALE DATA B	
L- STA. 19980 TO STA. 20150 LT	
DA	0.75 AC
SLOPE	0.40 %
L REQ	75 FT
L PROV	170 FT
Q2	3.22 CFS
V2	1.30 FTS
D2	0.63 FT
Q10	4.16 CFS
V10	1.39 FTS
D10	0.72 FT

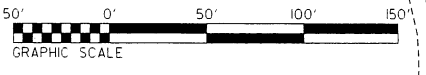
GRASS SWALE DATA D	
L- STA. 20500 TO STA. 20800 LT	
DA	0.88 AC
SLOPE	1.10 %
L REQ	88 FT
L PROV	100 FT
Q2	2.94 CFS
V2	1.70 FTS
D2	0.59 FT
Q10	3.80 CFS
V10	1.82 FTS
D10	0.65 FT

GRASS SWALE DATA E	
L- STA. 20700 TO STA. 20800 RT	
DA	0.51 AC
SLOPE	1.10 %
L REQ	51 FT
L PROV	100 FT
Q2	1.70 CFS
V2	1.36 FTS
D2	0.50 FT
Q10	2.20 CFS
V10	1.58 FTS
D10	0.53 FT

GRASS SWALE DATA F	
L- STA. 21050 TO STA. 21150 LT	
DA	0.44 AC
SLOPE	1.10 %
L REQ	44 FT
L PROV	100 FT
Q2	1.47 CFS
V2	1.31 FTS
D2	0.47 FT
Q10	1.90 CFS
V10	1.53 FTS
D10	0.50 FT



GRASS SWALE DATA G	
L- STA. 21050 TO STA. 21150 RT	
DA	0.52 AC
SLOPE	1.10 %
L REQ	52 FT
L PROV	100 FT
Q2	1.74 CFS
V2	1.37 FTS
D2	0.50 FT
Q10	2.24 CFS
V10	1.59 FTS
D10	0.53 FT



REVISIONS
 REVISED NAMES ON PARCELS 35 AND 36 PER LOCATION AND SURVEY REQUEST 4/23/09 DDL 7/29/09

MATCHLINE SEE SHEET 17

MATCHLINE A

200

200

205

210

SITE 11

33
R.S. WALL HEIRS
D.B.799, Pg.230

37
JOE WALL
NO DEED FOUND

35
JOE WALL
&
CRYSTAL H. WALL
DB 12131 PG2556

36
JOE WALL
&
CRYSTAL H. WALL
DB 12131 PG2556

33A
NOT FOUND

35
JOE WALL
NO DEED FOUND

37
JOE WALL
NO DEED FOUND

36
JOE WALL
&
CRYSTAL H. WALL
DB 12131 PG2556

36
JOE WALL
&
CRYSTAL H. WALL
DB 12131 PG2556

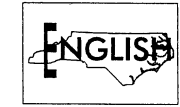
SCARBORO FAMILY LIMITED PARTNERSHIP
D.B.7436, Pg.445
B.M.1367, Pg.155

CEDAR FORK

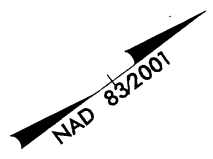
UNAMED TRIBUTARY

215

220



PROJECT REFERENCE NO. R-2814B	SHEET NO. 19
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION	

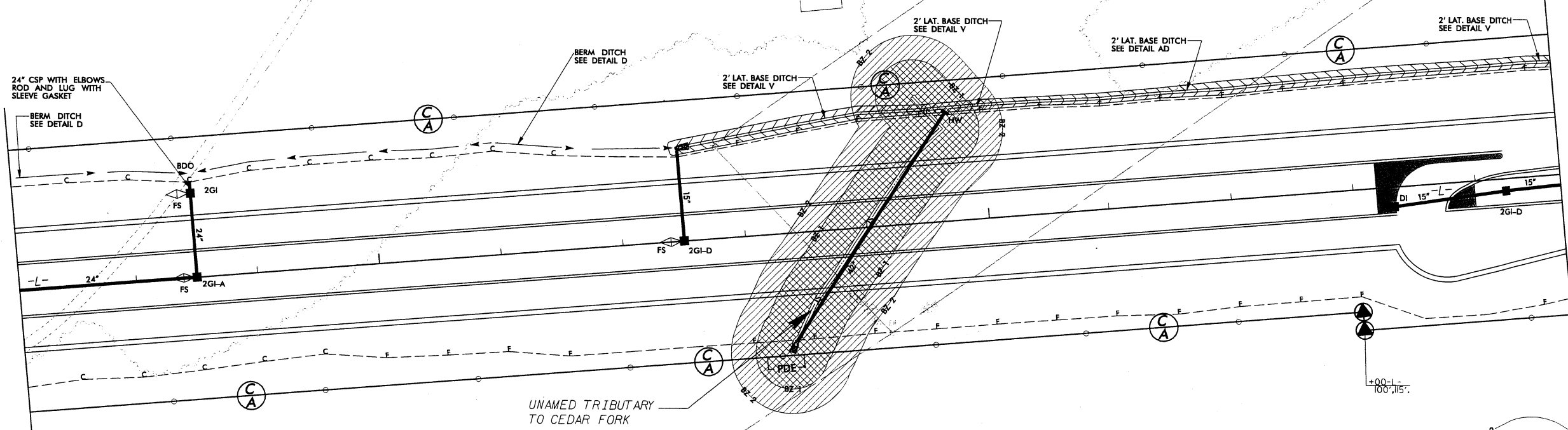


(36)
JOE WALL
CRYSTAL H. WALL
DB 12131 PG2556

GRASS SWALE DATA		H
-L- STA. 21350 TO STA. 21450 LT		
DA	0.49	AC
SLOPE	1.10	%
L REQ	49	FT
L PROV	100	FT
Q2	1.64	CFS
V2	1.35	FT/S
D2	0.49	FT
Q10	2.11	CFS
V10	1.57	FT/S
D10	0.52	FT

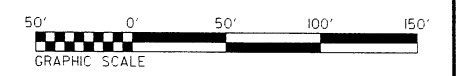
Buffer Drawing
Sheet 18 of 20

REVISIONS
 January 11, 2010: Adjusted R/W CA lines, R/W markers and the proposed woven wire fence on parcel no. 39, MVA.

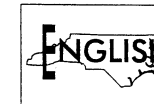




(36)
JOE WALL
&
CRYSTAL H. WALL
DB 12131 PG2556

(39)
THE SBJ GROWTH, L.P.



PROJECT REFERENCE NO. R-2814B	SHEET NO. 22
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION	



 MITIGABLE IMPACTS ZONE 1
 MITIGABLE IMPACTS ZONE 2

Buffer Drawing
Sheet 19 of 22

255

260

(51)
MICHAEL BARTHOLOMEW

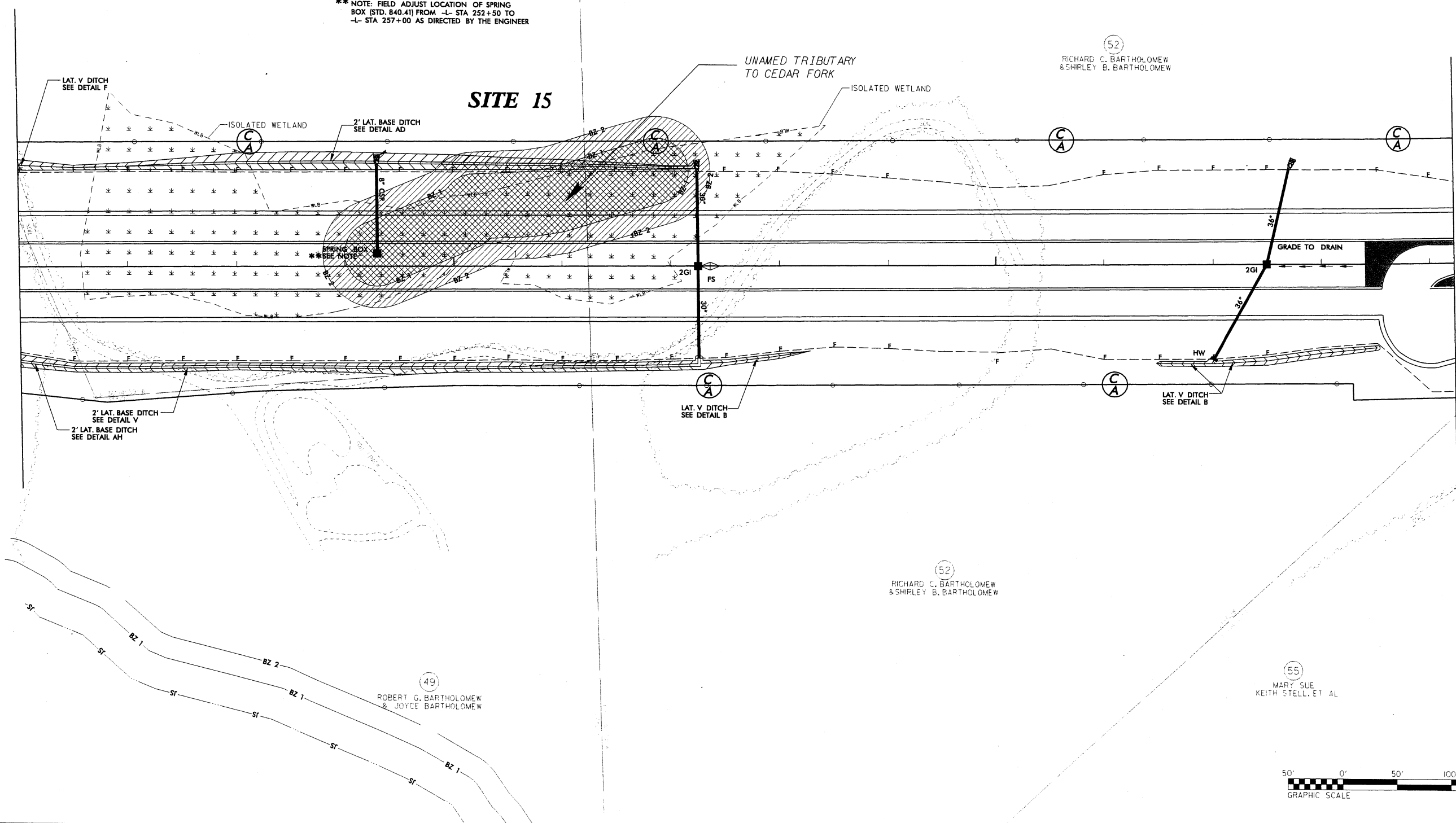


** NOTE: FIELD ADJUST LOCATION OF SPRING
 BOX (STD. 840.41) FROM -L- STA 252+50 TO
 -L- STA 257+00 AS DIRECTED BY THE ENGINEER

SITE 15

UNAMED TRIBUTARY
TO CEDAR FORK

(52)
RICHARD C. BARTHOLOMEW
& SHIRLEY B. BARTHOLOMEW

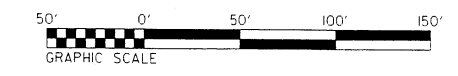


REVISIONS
 January 11, 2010: Adjusted R/W CA lines, R/W markers and the proposed woven wire fence on parcel no. 52, MWA.

(49)
ROBERT C. BARTHOLOMEW
& JOYCE BARTHOLOMEW

(52)
RICHARD C. BARTHOLOMEW
& SHIRLEY B. BARTHOLOMEW

(55)
MARY SUE
KEITH STELL, ET AL



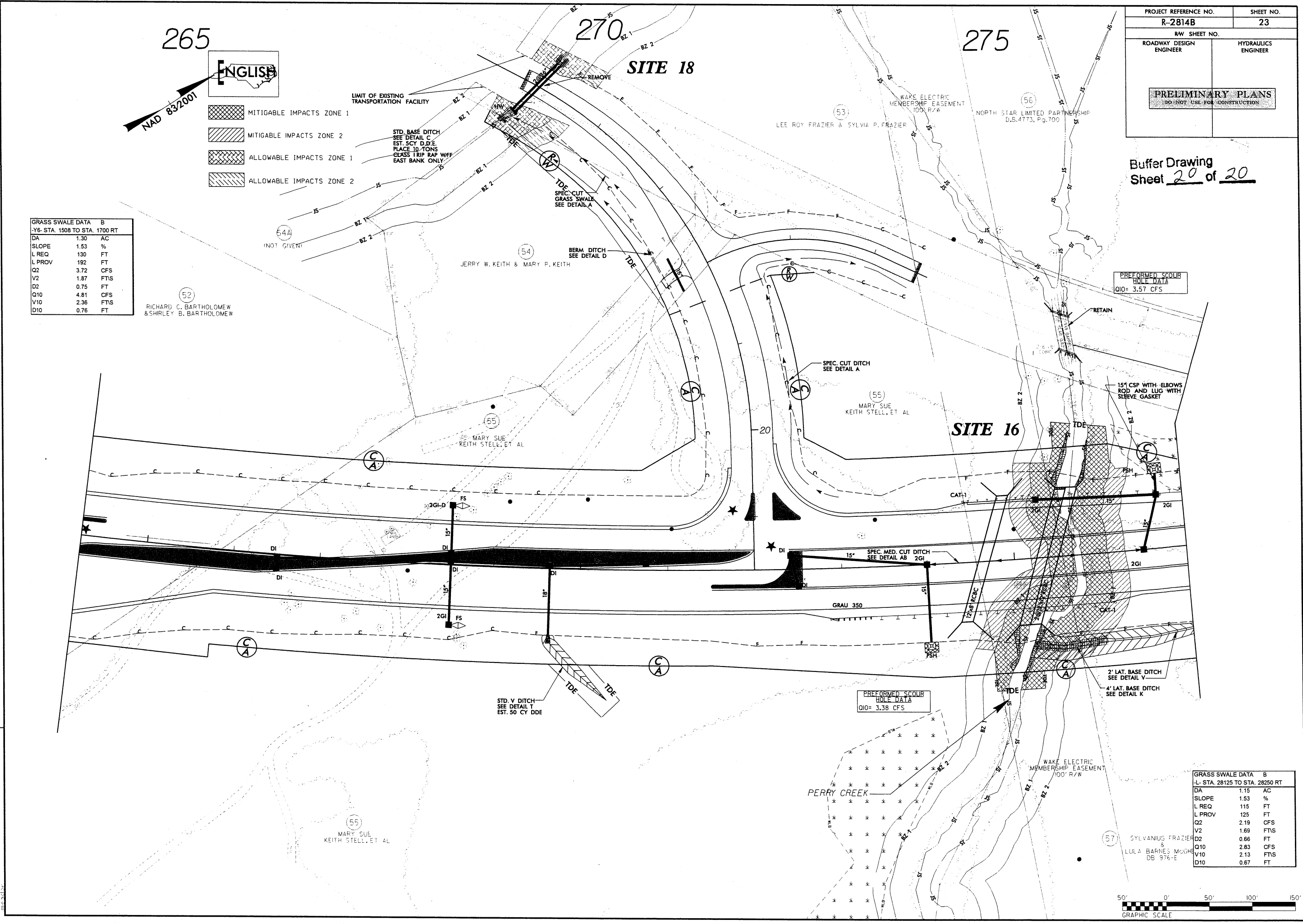
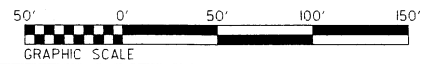
PROJECT REFERENCE NO. R-2814B	SHEET NO. 23
RAW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION	

Buffer Drawing
Sheet 20 of 20

GRASS SWALE DATA B	
-Y6- STA. 1508 TO STA. 1700 RT	
DA	1.30 AC
SLOPE	1.53 %
L REQ	130 FT
L PROV	192 FT
Q2	3.72 CFS
V2	1.87 FT/S
D2	0.75 FT
Q10	4.81 CFS
V10	2.36 FT/S
D10	0.76 FT

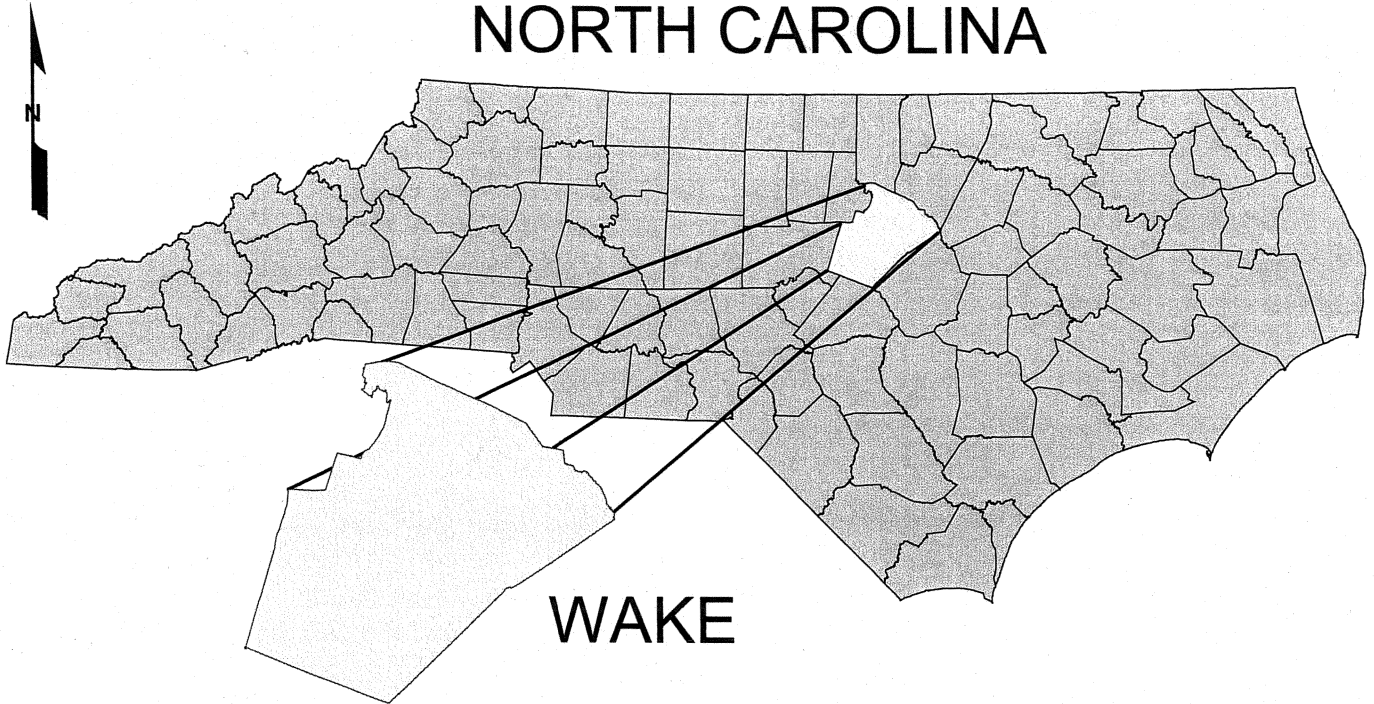
52
RICHARD C. BARTHOLOMEW
& SHIRLEY B. BARTHOLOMEW

GRASS SWALE DATA B	
-L- STA. 28125 TO STA. 28250 RT	
DA	1.15 AC
SLOPE	1.53 %
L REQ	115 FT
L PROV	125 FT
Q2	2.19 CFS
V2	1.69 FT/S
D2	0.66 FT
Q10	2.83 CFS
V10	2.13 FT/S
D10	0.67 FT

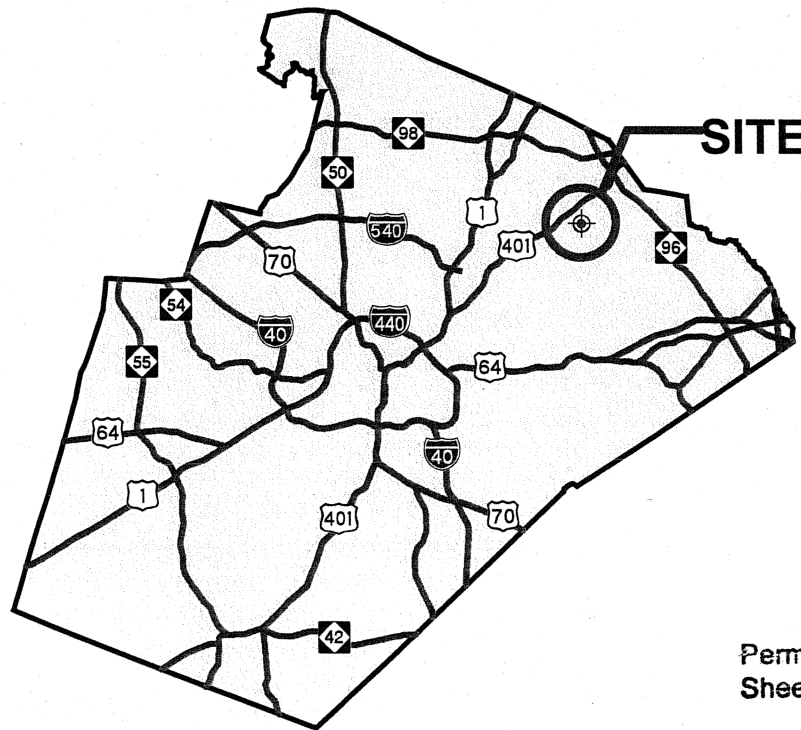


REVISIONS
 January 11, 2010: Adjusted R/W CA lines, R/W markers and the proposed woven wire fence on parcel nos. 52 and 55, NWA.
 January 11, 2010: Adjusted R/W CA lines on parcel no. 55, NWA.

NORTH CAROLINA



WAKE

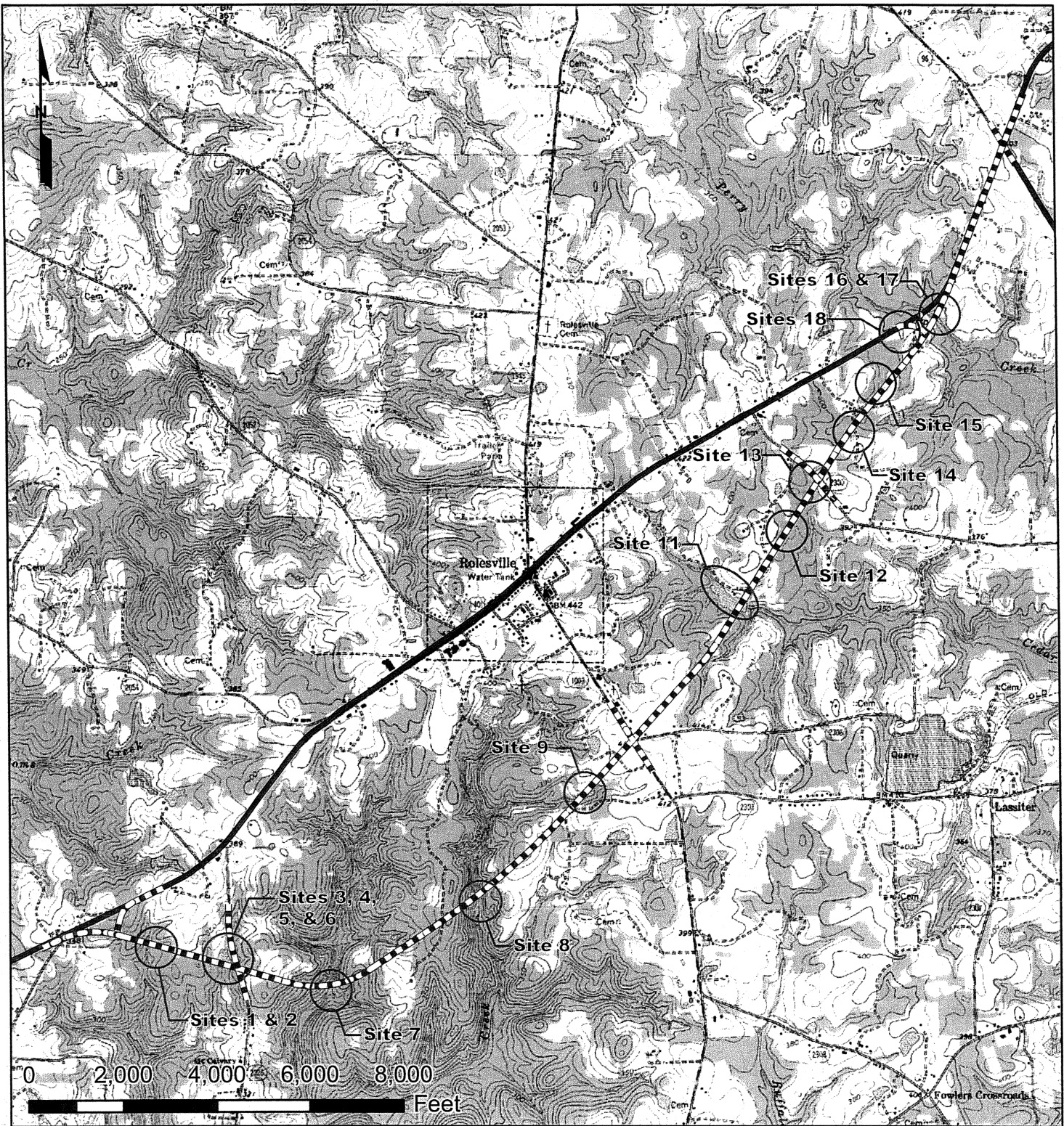


Permit Drawing
Sheet 1 of 64

STREAM AND WETLAND VICINITY MAP

NCDOT
DIVISION OF HIGHWAYS
WAKE COUNTY
PROJECT: 34506.1.1 (R-2814B)
US 401 ROLESVILLE BYPASS
FROM SR 2225, LOUISBURY ROAD
TO NC 96, ZEBULON ROAD

NOVEMBER 2009



1 inch = 3,000 feet

STREAM AND WETLAND LOCATION MAP

NCDOT
 DIVISION OF HIGHWAYS
 WAKE COUNTY
 PROJECT: 34506.1.1 (R-2814B)
 US 401 ROLESVILLE BYPASS
 FROM SR 2225, LOUISBURY ROAD
 TO NC 96, ZEBULON ROAD

NOVEMBER 2009

PROP. NO.	PROPERTY OWNER NAME	PROP. OWNER ADDRESS
7	Neuse Baptist Church	8700 Capital Blvd., Raleigh, NC 27587
8	Alexander Family investments, LLC	906 Washington St., Cary, NC 27511
9	Scarboro, E. Walter and Claire P.	9412 Louisburg Rd., Wake Forest, NC 27587
12	Bobby L. Murray Heirs (J Brent King Exec.)	PO Box 40639, Raleigh, NC 27629
13	Spencer, Pulley Heirs	9412 Louisburg Rd., Wake Forest, NC 27587
14	Scarboro, E. Walter and Claire P.	9412 Louisburg Rd., Wake Forest, NC 27587
20	Shearon, Cameron E. & Beverly W.	4325 Galax Dr., Raleigh, NC 27612
21	Mitchell F. Rabil Family Irrevocable Trust	3321 Gondola Dr., Lexington KY, 40513
22	Shearon, Cameron E. & Beverly W.	4325 Galax Dr., Raleigh, NC 27612
33	R.S. Wall Heirs	1608 Falls Ct., Raleigh, NC 27615
33A	Wall, Alice W.	405 N. Main St., Rolesville, NC 27571
34	Scarboro Family Limited Partnership	PO Box 84, Rolesville, NC 27571
35	Wall, Joe & Crystal H.	7317 Pulley Town Rd., Wake Forest, NC 27587
36	Wall, Joe & Crystal H.	7318 Pulley Town Rd., Wake Forest, NC 27587
37	Wall, Joe	7318 Pulley Town Rd., Wake Forest, NC 27587
38	Bobie Joe Wall & Vickie D. Wall	7309 Pulley Town Rd. Wake Forest, NC 27587
39	The SBJ Growth, L.P	PO Box 19067, Raleigh, NC
49	Bartholomew, Robert G. & Joyce C.	No Known Address
50	Bartholomew, Richard C. & Shirley B.	PO BOX 6, Rolesville, NC 27571
51	Bartholomew, Michael	PO BOX 573, Rolesville, NC 27571
52	Bartholomew, Richard C & Shirley B.	PO BOX 6, Rolesville, NC 27571
54	Keith, Jerry W. and Mary P	1124 Louisburg Rd., Wake Forest, NC 27587
54A	Bartholomew, Richard C. & Shirley B.	PO BOX 6, Rolesville, NC 27571
55	Stell, Meith & Mary Sue Et. Al.	1132 Louisburg Rd., Wake Forest, NC 27587
57	Sylvania Frazier & Lula Barnes McGhee	2725 Wait Ave., Wake Forest, NC 27857

N.C. DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS

WAKE COUNTY
WBS - 34506.1.1 (R-2814B)

2/22/2010

Permit Drawing
Sheet 3 of 64

WETLAND PERMIT IMPACT SUMMARY

Site No.	Station (From/To)	Structure Size / Type	WETLAND IMPACTS				SURFACE WATER IMPACTS							
			Permanent Fill In Wetlands (ac)	Temp. Fill In Wetlands (ac)	Excavation in Wetlands (ac)	Mechanized Clearing in Wetlands (ac)	Hand Clearing in Wetlands (ac)	Permanent SW impacts (ac)	Temp. SW impacts (ac)	Existing Channel Impacts Permanent (ft)	Existing Channel Impacts Temp. (ft)	Natural Stream Design (ft)		
1	-L- 38+11	60" RCP								0.02	<0.01	243	18	
2	-L- 41+07	30" RCP	0.17		<0.01	0.02								
3	-L- 52+50 LT	N/A	0.22			<0.01								
4	-L- 55+00 RT	78" RCP	0.24		<0.01	0.01				<0.01	<0.01	95	10	
4	-L- 55+00 RT	BANK STABILIZATION								<0.01	<0.01	20		
5	-L- 55+00 LT ¹	78" RCP			0.01					1.51				
6	-Y2- 17+31 LT	2@42" RCP									<0.01		17	
6	-Y2- 17+31 RT	2@42" RCP									<0.01		8	
6	-Y2- 17+31 RT	BANK STABILIZATION								<0.01		14		
7	-L- 77+89	10'X10' RCBC	0.65		0.10	0.09				0.12	0.02	321	66	
7	-L- 77+89	BANK STABILIZATION								<0.01		47		
8	-L- 115+74	10'X10' RCBC								0.05	<0.01	355	18	
8	-L- 115+74	BANK STABILIZATION								0.03		153		
9	-L- 147+00 ²	72" RCP								1.31	<0.01	610	20	
11	-L- 200+04 ³	10'X9' RCBC								7.29	<0.01	0	10	
12	-L- 219+03	42" RCP								0.02		258		
13	-L- 229+75	36" RCP	0.19											
14	-L- 246+87	48" RCP	0.36		<0.01	0.06								
15	-L- 255+00 ⁴	30" RCP	1.58											
16	-L- 275+39	2@12'X12' RCBC								0.05	<0.01	189	23	
16	-L- 275+39	BANK STABILIZATION								0.06		135		
17	-L- 277+50 LT	N/A	0.38											
18	-Y6- 15+17	2@36" RCP								<0.01	<0.01	36	14	
18	-Y6- 15+17	BANK STABILIZATION										33		
TOTALS:			3.79	0.00	0.12	0.19	0.00	0.04	10.47	205				

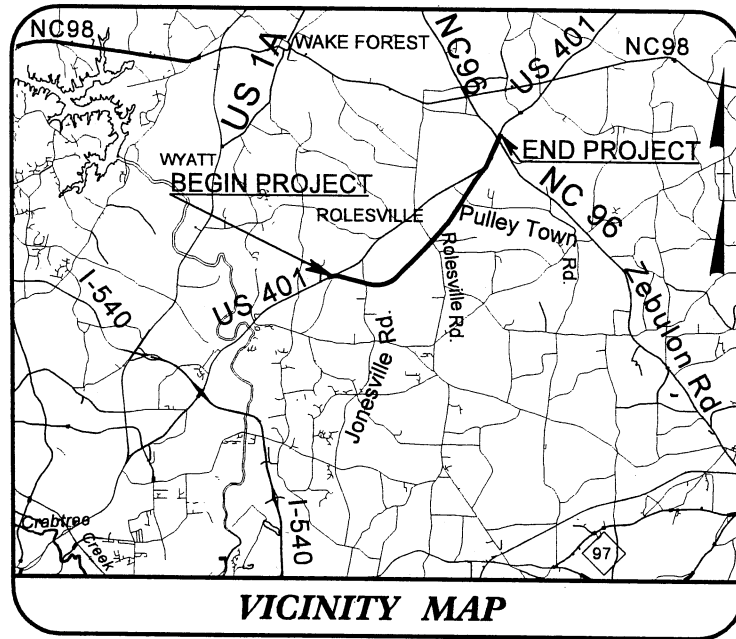
¹ ENTIRE AREA IS IMPACT IN SURFACE WATER (POND)
² IMPACT IN SURFACE WATER (POND) IS 1.25 AC
³ ENTIRE PERMANENT IMPACT AREA IS SURFACE WATER (POND)
⁴ ISOLATED WETLAND TOTAL TAKE (1.58 AC)

NC DEPARTMENT OF TRANSPORTATION
 DIVISION OF HIGHWAYS
 WAKE COUNTY
 WBS - 34506.1.1 (R-2814B)

TIP PROJECT: R-2814B

CONTRACT:

See Sheet 1-A For Index of Sheets



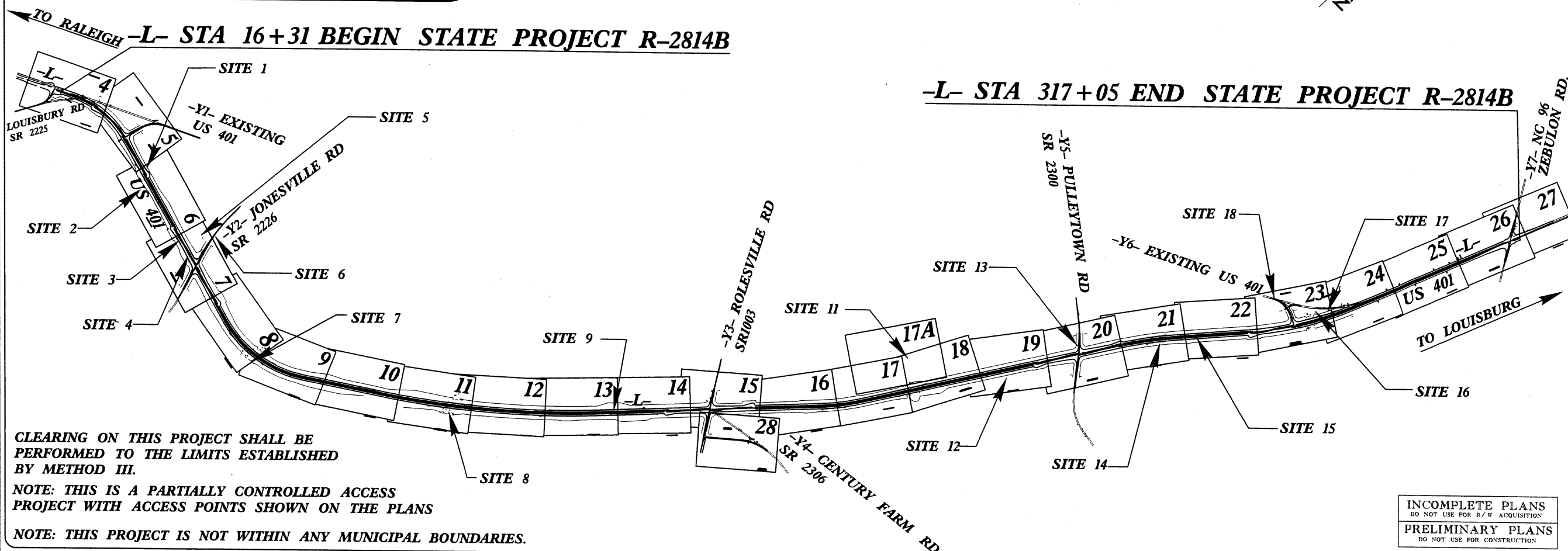
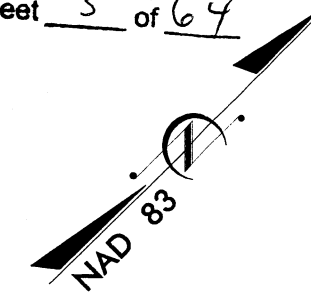
STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

WAKE COUNTY

**LOCATION: US 401 ROLESVILLE BYPASS FROM SR 2225,
LOUISBURY ROAD TO NC 96, ZEBULON ROAD
WETLAND AND STREAM IMPACTS**

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	R-2814B	1	
STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION	
34506.1.1	STP-401(4)	PE	

Permit Drawing
Sheet 5 of 64



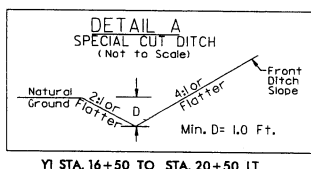
CLEARING ON THIS PROJECT SHALL BE PERFORMED TO THE LIMITS ESTABLISHED BY METHOD III.

NOTE: THIS IS A PARTIALLY CONTROLLED ACCESS PROJECT WITH ACCESS POINTS SHOWN ON THE PLANS

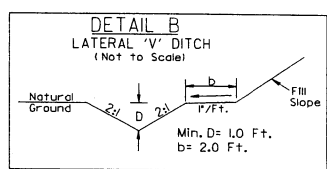
NOTE: THIS PROJECT IS NOT WITHIN ANY MUNICIPAL BOUNDARIES.

**INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION**

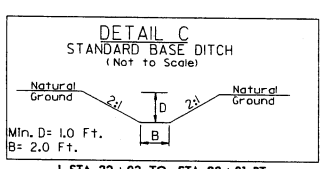
<p>GRAPHIC SCALES</p> <p>50 25 0 50 100 PLANS</p> <p>50 25 0 50 100 PROFILE (HORIZONTAL)</p> <p>5 0 5 10 PROFILE (VERTICAL)</p>	<p>DESIGN DATA</p> <p>ADT 2030 = 24600 ADT = DHV = 55 % D = 13 % T = 7 % * V = 60 MPH * TTST 2 DUAL 5</p>	<p>PROJECT LENGTH</p> <p>LENGTH ROADWAY F.A. PROJECT STP-401(4) = 5.696 MILES TOTAL LENGTH TIP PROJECT R-2814B = 5.696 MILES</p>	<p>PERMIT DRAWINGS PREPARED BY:</p> <p>RK&K RUMMEL, KLEPPER & KAHL, LLP 100 RIDGEFIELD DRIVE, SUITE 300 RALEIGH, NORTH CAROLINA, 27609 NC LICENSE NO. F-0112</p> <p>FOR THE DIVISION OF HIGHWAYS</p> <p>2006 STANDARD SPECIFICATIONS</p> <p>RIGHT OF WAY DATE: APRIL 17, 2009</p> <p>LETTING DATE: APRIL 19, 2011</p> <p>JS GOODNIGHT PROJECT ENGINEER</p> <p>TD GOINS PROJECT DESIGN ENGINEER</p>	<p>HYDRAULICS ENGINEER</p> <p>SIGNATURE: _____ P.E.</p> <p>ROADWAY DESIGN ENGINEER</p> <p>SIGNATURE: _____ P.E.</p>	<p>DIVISION OF HIGHWAYS STATE OF NORTH CAROLINA</p> <p>STATE HIGHWAY DESIGN ENGINEER</p>
--	--	---	---	---	---



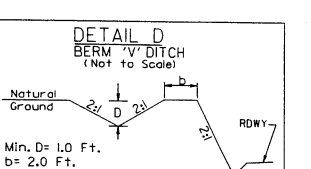
Y1 STA. 16+50 TO STA. 20+50 LT
 Y3 STA. 23+50 TO STA. 24+35 LT
 Y4 STA. 10+45 TO STA. 13+00 RT
 Y4 STA. 20+00 TO STA. 22+29 RT
 Y4 STA. 20+50 TO STA. 22+20 RT
 Y5 STA. 21+17 TO STA. 26+90 LT
 Y6 STA. 18+08 TO STA. 17+00 RT
 Y6 STA. 18+25 TO STA. 20+79 LT
 Y8 STA. 10+52 TO STA. 12+55 RT



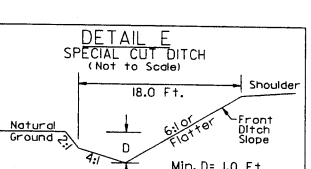
L STA. 32+40 TO STA. 33+00 LT
 L STA. 97+50 TO STA. 98+50 RT
 L STA. 139+50 TO STA. 143+00 RT
 L STA. 190+75 TO STA. 191+50 LT
 L STA. 237+00 TO STA. 239+00 RT
 L STA. 257+25 TO STA. 258+25 RT
 L STA. 261+50 TO STA. 263+50 RT
 L STA. 279+50 TO STA. 281+25 RT
 L STA. 285+50 TO STA. 286+50 RT
 L STA. 305+70 TO STA. 308+50 LT
 L STA. 319+35 TO STA. 321+00 RT
 L STA. 319+75 TO STA. 320+50 LT
 Y5 STA. 16+56 TO STA. 18+65 LT
 Y5 STA. 18+97 TO STA. 19+28 LT
 Y5 STA. 25+40 TO STA. 26+00 RT



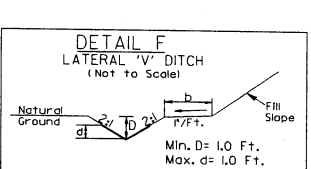
L STA. 22+03 TO STA. 22+81 RT
 L STA. 100+44 TO STA. 101+00 LT
 Y6 STA. 14+94 TO STA. 15+05 RT



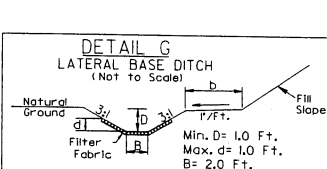
L STA. 28+00 TO STA. 30+35 LT
 L STA. 33+00 TO STA. 34+50 LT
 L STA. 39+50 TO STA. 41+00 LT
 L STA. 42+00 TO STA. 51+50 LT
 L STA. 70+50 TO STA. 75+00 LT
 L STA. 95+00 TO STA. 97+50 RT
 L STA. 99+50 TO STA. 106+00 RT
 L STA. 109+50 TO STA. 113+50 LT
 L STA. 119+50 TO STA. 123+00 RT
 L STA. 180+00 TO STA. 190+00 LT
 L STA. 205+00 TO STA. 217+50 LT
 L STA. 233+00 TO STA. 237+00 RT
 Y6 STA. 14+95 TO STA. 17+85 RT



L STA. 24+50 TO STA. 25+00 RT
 L STA. 29+00 TO STA. 29+50 RT
 L STA. 29+70 TO STA. Y1 23+50 RT
 L STA. 41+00 TO STA. 41+50 LT
 L STA. 196+00 TO STA. 196+50 LT
 L STA. 195+00 TO STA. 197+50 RT
 L STA. 235+00 TO STA. 237+00 RT
 L STA. 239+50 TO STA. 240+00 LT
 L STA. 291+00 TO STA. 291+50 RT
 L STA. 320+50 TO STA. 323+50 LT
 L STA. 321+00 TO STA. 323+50 RT

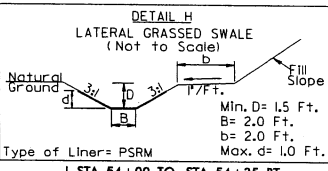


Type of Liner= PSRM
 L STA. 23+00 TO STA. 25+00 LT
 L STA. 32+00 TO STA. 32+40 LT
 L STA. 41+50 TO STA. 42+00 LT
 L STA. 98+50 TO STA. 99+50 RT
 L STA. 133+50 TO STA. 135+50 RT
 L STA. 190+00 TO STA. 190+75 LT
 L STA. 202+80 TO STA. 205+00 LT
 L STA. 250+00 TO STA. 252+00 LT
 L STA. 284+88 TO STA. 287+50 LT
 L STA. 298+01 TO STA. 300+50 LT
 Y2 STA. 21+50 TO STA. 22+05 LT
 Y3 STA. 21+20 TO STA. 22+20 RT

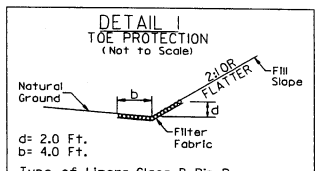


Type of Liner= Class B Rip-Rap
 L STA. 52+00 TO STA. 54+00 RT
 L STA. 145+00 TO STA. 147+50 RT
 L STA. 144+55 TO STA. 148+00 LT
 L STA. 149+00 TO STA. 150+50 LT
 L STA. 201+50 TO STA. 202+45 LT

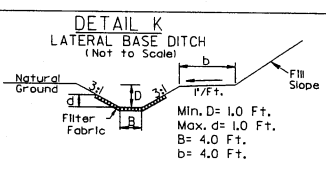
Permit Drawing
 Sheet 6 of 64



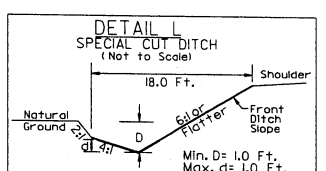
Type of Liner= PSRM
 L STA. 54+00 TO STA. 54+35 RT
 L STA. 114+18 TO STA. 115+02 RT



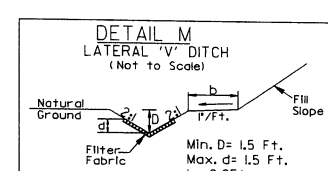
Type of Liner= Class B Rip-Rap
 L STA. 51+50 TO STA. 52+60 LT
 L STA. 77+27 TO STA. 78+60 RT
 L STA. 113+75 TO STA. 115+52 LT
 L STA. 115+20 TO STA. 117+50 RT
 L STA. 138+50 TO STA. 142+00 LT
 L STA. 147+20 TO STA. 151+00 RT
 L STA. 184+50 TO STA. 186+00 RT
 L STA. 244+75 TO STA. 207+00 LT
 L STA. 229+00 LT TO STA. Y5 19+00 RT



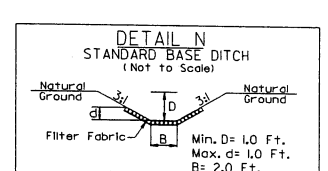
Type of Liner= Class B Rip-Rap
 L STA. 52+21 TO STA. 54+80 LT
 L STA. 275+15 TO STA. 276+00 RT



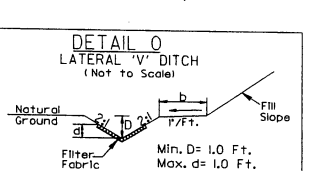
L STA. 21+00 TO STA. 22+00 LT
 L STA. 41+00 TO STA. 41+50 LT
 L STA. 99+00 TO STA. 99+50 RT
 L STA. 189+50 TO STA. 190+00 LT
 L STA. 249+00 TO STA. 250+00 LT
 L STA. 250+00 TO STA. 250+50 RT



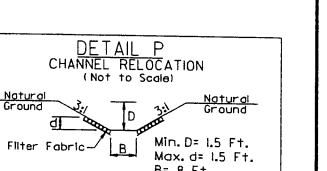
Type of Liner= Class B Rip-Rap
 Y2 STA. 22+05 TO STA. 22+95 LT



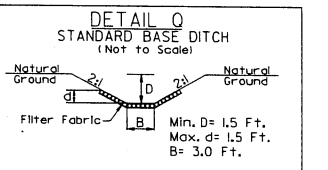
Type of Liner= Class B Rip-Rap
 L STA. 54+80 TO STA. 56+41 LT



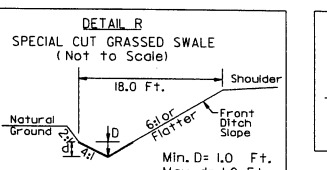
Type of Liner= Class B Rip-Rap
 L STA. 22+81 TO STA. 24+00 RT
 L STA. 41+00 TO STA. 41+50 LT
 L STA. 83+50 TO STA. 85+50 LT
 L STA. 286+50 TO STA. 287+00 RT
 L STA. 298+00 TO STA. 299+00 RT



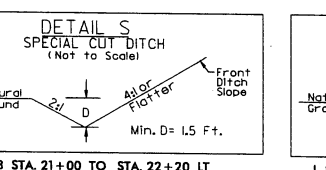
Type of Liner= Class B Rip-Rap
 L STA. 76+97 TO STA. 78+27 RT



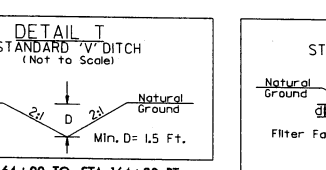
Type of Liner= Class B Rip-Rap
 L STA. 73+67 TO STA. 74+88 LT



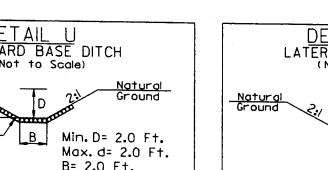
Type of Liner= PSRM
 L STA. 108+50 TO STA. 111+50 RT
 L STA. 124+50 TO STA. 128+50 LT
 L STA. 124+50 TO STA. 128+50 RT



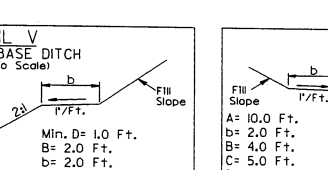
Y3 STA. 21+00 TO STA. 22+20 LT
 Y4 STA. 10+45 TO STA. 12+50 LT



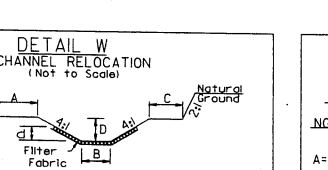
L STA. 164+00 TO STA. 164+20 RT
 L STA. 164+00 TO STA. 164+97 RT
 L STA. 269+65 TO STA. 270+30 RT
 Y3 STA. 25+05 TO STA. 26+50 LT



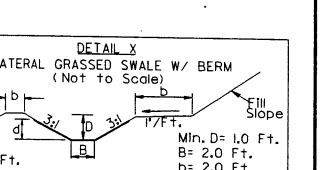
Type of Liner= Class B Rip-Rap
 Y3 STA. 22+20 TO STA. 22+40 RT



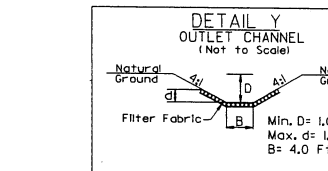
L STA. 30+00 TO STA. 30+32 RT
 L STA. 134+00 TO STA. 138+00 LT
 L STA. 137+00 TO STA. 138+50 RT
 L STA. 217+50 TO STA. 221+00 LT
 L STA. 224+50 TO STA. 227+00 LT
 L STA. 239+00 TO STA. 246+15 RT
 L STA. 251+50 TO STA. 257+25 RT
 L STA. 276+00 TO STA. 278+00 RT
 Y5 STA. 17+50 TO STA. 18+75 RT
 Y7 STA. 17+50 TO STA. 19+30 RT



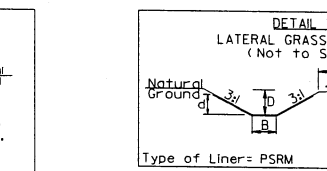
Type of Liner= Class B Rip-Rap
 L STA. 147+50 TO STA. 150+83 RT



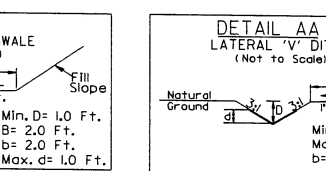
Type of Liner= PSRM
 L STA. 143+00 TO STA. 145+00 RT
 L STA. 148+00 TO STA. 149+00 LT
 L STA. 152+50 TO STA. 154+00 LT



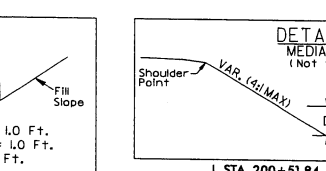
L STA. 38+45 TO STA. 38+48 RT, LINER=CLASS B RIP RAP (BANKS ONLY)
 L STA. 54+73 RT, LINER=CLASS B RIP RAP (BANKS ONLY)
 L STA. 144+24 TO STA. 144+56 LT, LINER=CLASS B RIP RAP (BANKS ONLY)
 Y2 STA. 17+40 RT, LINER=CLASS B RIP RAP (BANKS ONLY), B VARIES 2'-9"
 Y5 STA. 25+40 TO STA. 25+40 RT, LINER=CLASS B RIP RAP



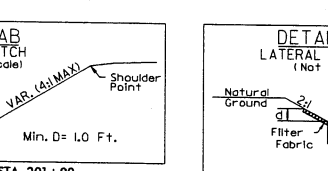
Type of Liner= PSRM
 L STA. 148+00 TO STA. 149+00 LT
 L STA. 150+50 TO STA. 154+00 LT
 L STA. 199+80 TO STA. 201+50 LT
 L STA. 281+25 TO STA. 283+50 RT (B=0.0')



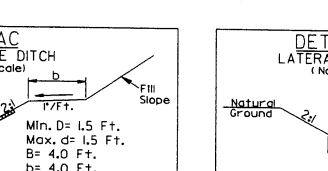
Type of Liner= PSRM
 L STA. 198+00 TO STA. 200+30 RT



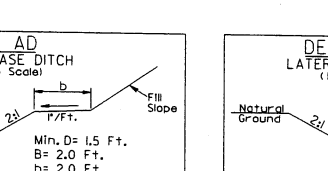
L STA. 200+51.84 TO STA. 201+00
 L STA. 274+00 TO STA. 276+50



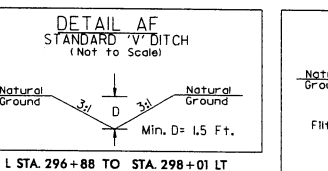
Type of Liner= Class B Rip-Rap
 L STA. 200+41 TO STA. 203+50 RT



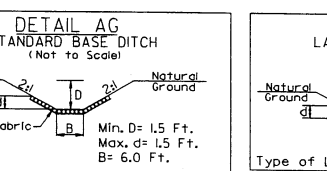
L STA. 221+00 TO STA. 224+50 LT
 L STA. 252+00 TO STA. 257+25 LT
 Y7 STA. 11+50 TO STA. 15+27 RT



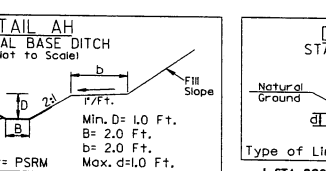
Y5 STA. 18+65 TO STA. 18+97 LT



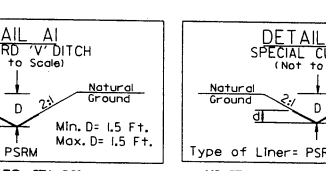
L STA. 296+88 TO STA. 298+01 LT



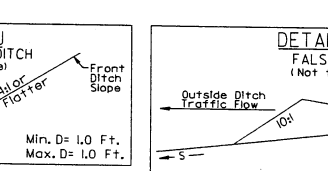
Type of Liner= Class B Rip-Rap
 L STA. 54+80 TO STA. 54+81 LT



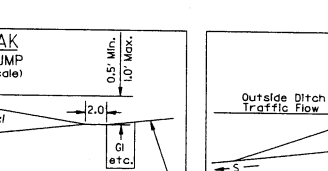
Type of Liner= PSRM
 L STA. 138+50 TO STA. 139+50 RT
 L STA. 203+50 TO STA. 206+00 RT
 L STA. 250+50 TO STA. 251+50 RT
 L STA. 278+00 TO STA. 279+50 RT



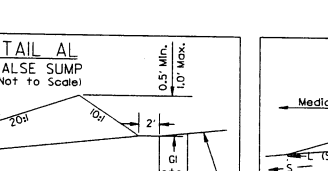
Type of Liner= PSRM
 L STA. 290+47 TO STA. 291+00 LT



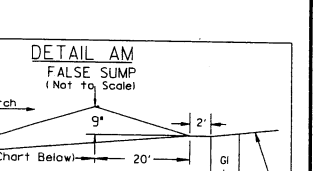
Type of Liner= PSRM
 Y3 STA. 22+20 TO STA. 22+61.82 LT
 Y5 STA. 26+00 TO STA. 26+90 RT



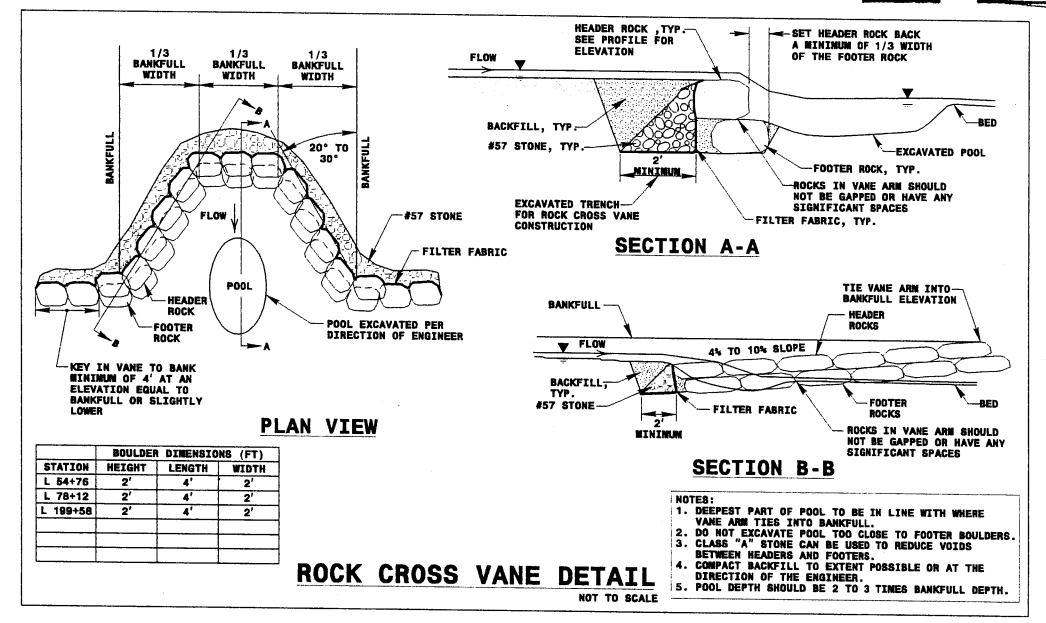
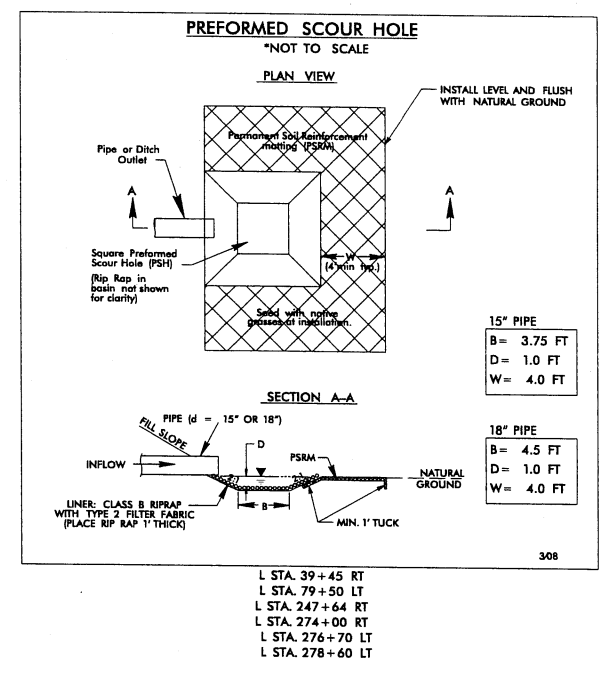
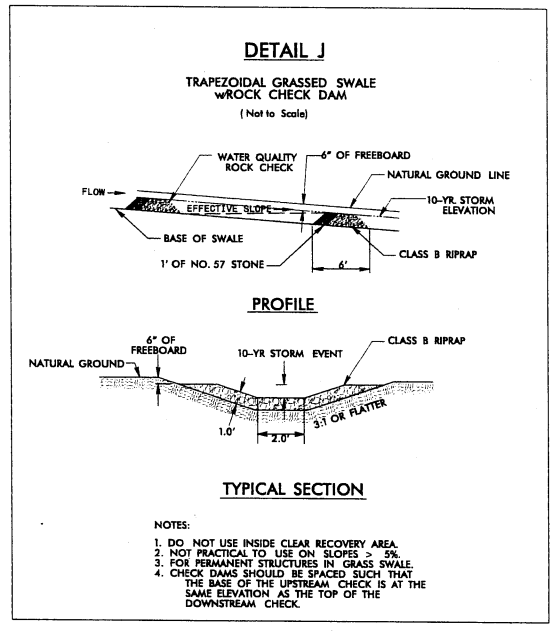
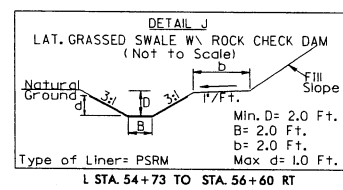
S=Ditch Slope
 Proposed Ditch



S=Ditch Slope
 Proposed Ditch



Ditch Grade	L	Ditch Grade	L
0.0% To 2.0%	20'	Over 4.0% To 6.0%	40'
Over 2.0% To 4.0%	30'	Over 6.0%	50'

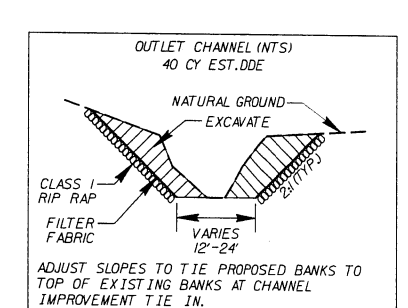
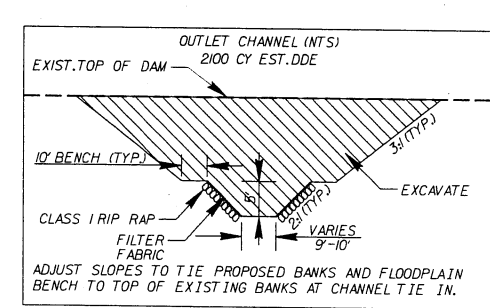
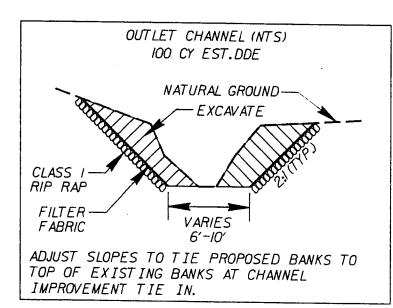
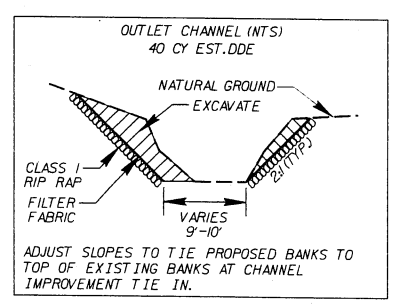
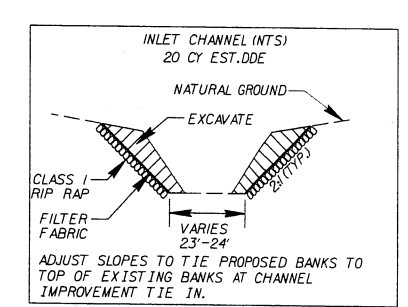
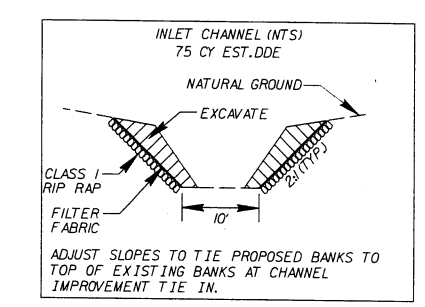
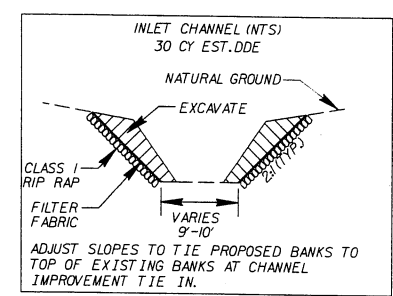
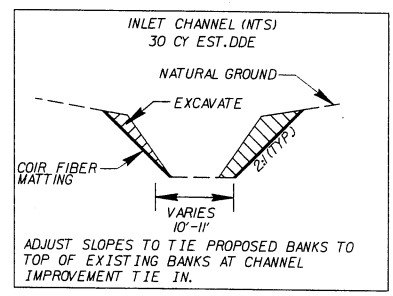
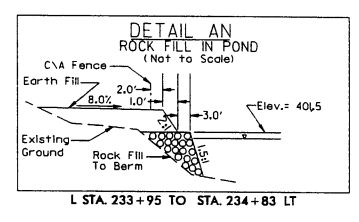


CULVERT INLET/OUTLET DETAILS
HARRIS CREEK TRIBUTARY
-L- STA 77+89

CULVERT INLET/OUTLET DETAILS
HARRIS CREEK
-L- STA 115+74

CULVERT INLET/OUTLET DETAILS
CEDAR FORK
-L- STA 200+04

CULVERT INLET/OUTLET DETAILS
PERRY CREEK
-L- STA 275+39



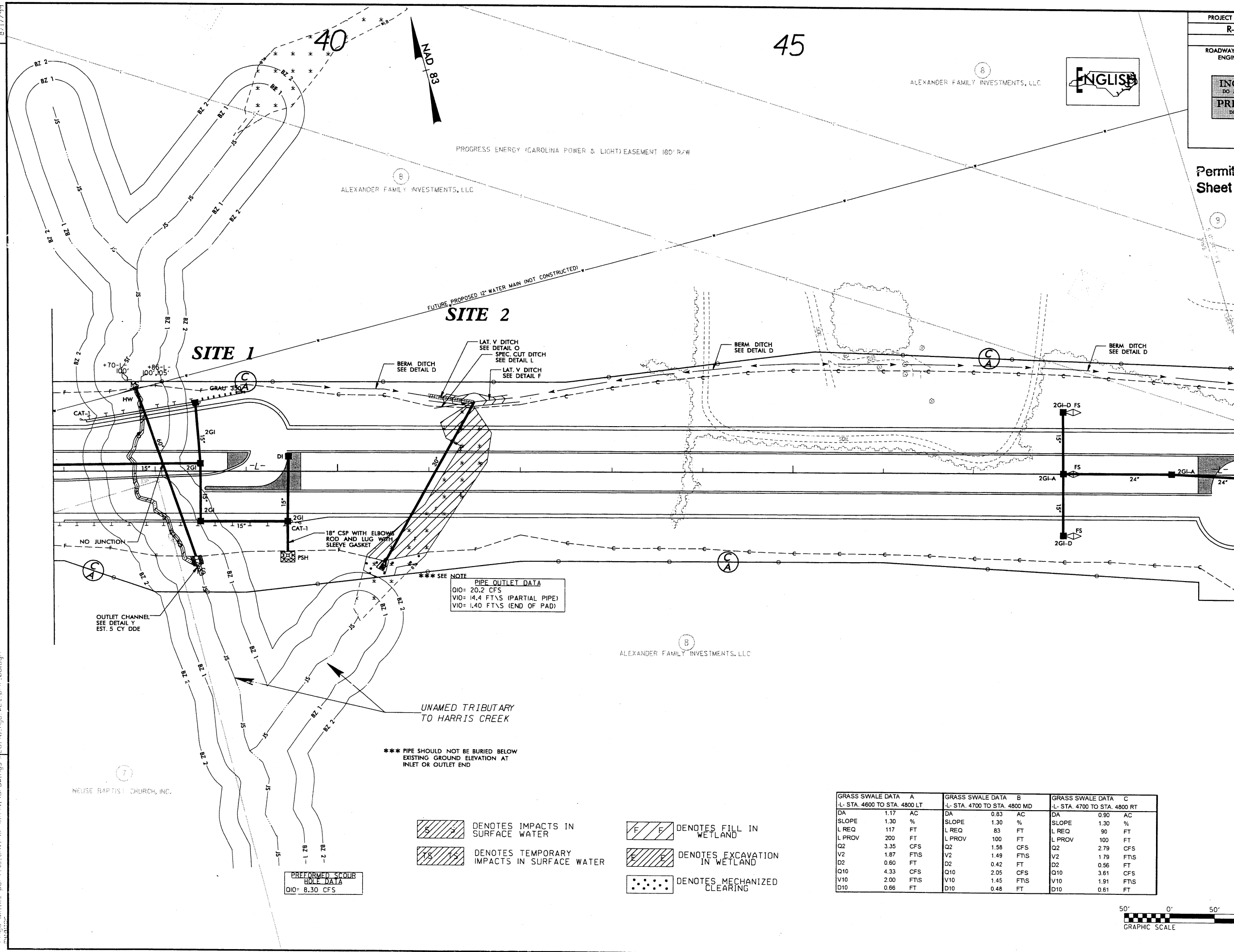
B/17/99

PROJECT REFERENCE NO.		SHEET NO.	
R-2814B		6	
ROADWAY DESIGN ENGINEER		HYDRAULICS ENGINEER	
INCOMPLETE PLANS DO NOT USE FOR A/C ACQUISITION		PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION	

Permit Drawing
Sheet 8 of 64

REVISIONS

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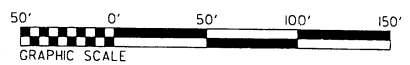
*** SEE NOTE
PIPE OUTLET DATA
 Q10= 20.2 CFS
 V10= 14.4 FT/S (PARTIAL PIPE)
 V10= 1.40 FT/S (END OF PAD)

*** PIPE SHOULD NOT BE BURIED BELOW
 EXISTING GROUND ELEVATION AT
 INLET OR OUTLET END

**PREFORMED SCOUR
 HOLE DATA**
 Q10= 8.30 CFS

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

GRASS SWALE DATA A		GRASS SWALE DATA B		GRASS SWALE DATA C	
L- STA. 4600 TO STA. 4800 LT		L- STA. 4700 TO STA. 4800 MD		L- STA. 4700 TO STA. 4800 RT	
DA	1.17 AC	DA	0.83 AC	DA	0.90 AC
SLOPE	1.30 %	SLOPE	1.30 %	SLOPE	1.30 %
L REQ	117 FT	L REQ	83 FT	L REQ	90 FT
L PROV	200 FT	L PROV	100 FT	L PROV	100 FT
Q2	3.35 CFS	Q2	1.58 CFS	Q2	2.79 CFS
V2	1.87 FT/S	V2	1.49 FT/S	V2	1.79 FT/S
D2	0.60 FT	D2	0.42 FT	D2	0.56 FT
Q10	4.33 CFS	Q10	2.05 CFS	Q10	3.61 CFS
V10	2.00 FT/S	V10	1.45 FT/S	V10	1.91 FT/S
D10	0.66 FT	D10	0.48 FT	D10	0.61 FT



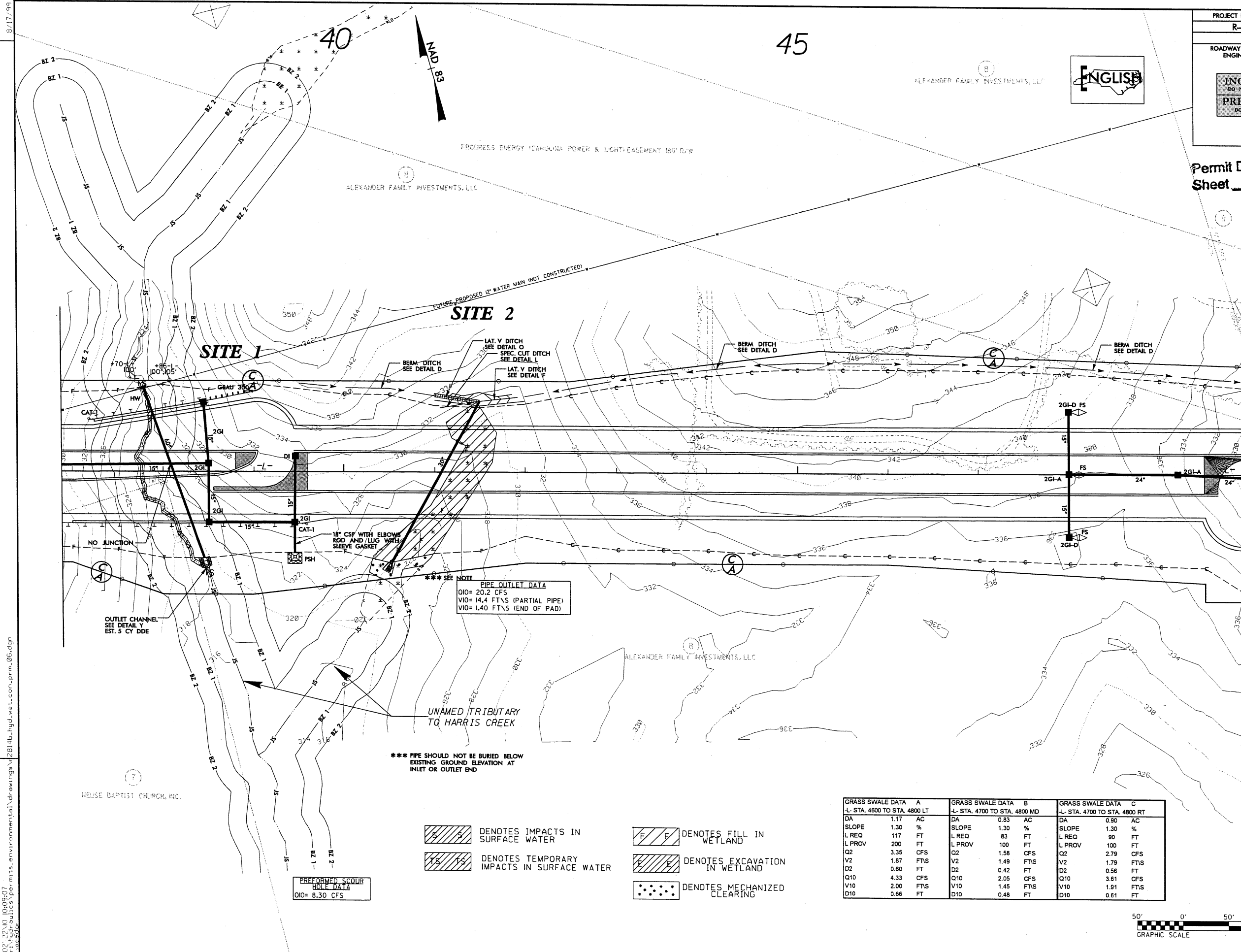
8/17/99

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PROJECT REFERENCE NO. R-2814B	SHEET NO. 6
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
INCOMPLETE PLANS DO NOT USE FOR R/W ACQUISITION PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION	

Permit Drawing
Sheet 9 of 64

REVISIONS



SITE 2

SITE 1

*** SEE NOTE

PIPE OUTLET DATA
 O10= 20.2 CFS
 V10= 14.4 FTNS (PARTIAL PIPE)
 V10= 1.40 FTNS (END OF PAD)

*** PIPE SHOULD NOT BE BURIED BELOW EXISTING GROUND ELEVATION AT INLET OR OUTLET END

DENOTES IMPACTS IN SURFACE WATER

DENOTES TEMPORARY IMPACTS IN SURFACE WATER

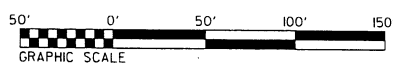
DENOTES FILL IN WETLAND

DENOTES EXCAVATION IN WETLAND

DENOTES MECHANIZED CLEARING

PERFORMED SCOUR HOLE DATA
 O10= 8.30 CFS

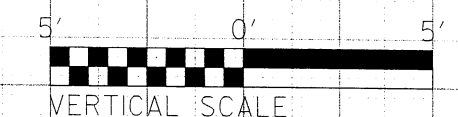
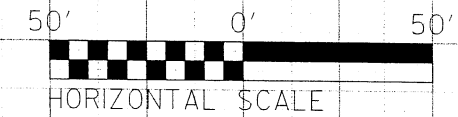
GRASS SWALE DATA A		GRASS SWALE DATA B		GRASS SWALE DATA C	
-L- STA. 4800 TO STA. 4800 LT		-L- STA. 4700 TO STA. 4800 MD		-L- STA. 4700 TO STA. 4800 RT	
DA	1.17 AC	DA	0.83 AC	DA	0.90 AC
SLOPE	1.30 %	SLOPE	1.30 %	SLOPE	1.30 %
L REQ	117 FT	L REQ	83 FT	L REQ	90 FT
L PROV	200 FT	L PROV	100 FT	L PROV	100 FT
Q2	3.35 CFS	Q2	1.58 CFS	Q2	2.79 CFS
V2	1.87 FTNS	V2	1.49 FTNS	V2	1.79 FTNS
D2	0.60 FT	D2	0.42 FT	D2	0.56 FT
Q10	4.33 CFS	Q10	2.05 CFS	Q10	3.61 CFS
V10	2.00 FTNS	V10	1.45 FTNS	V10	1.91 FTNS
D10	0.66 FT	D10	0.48 FT	D10	0.61 FT



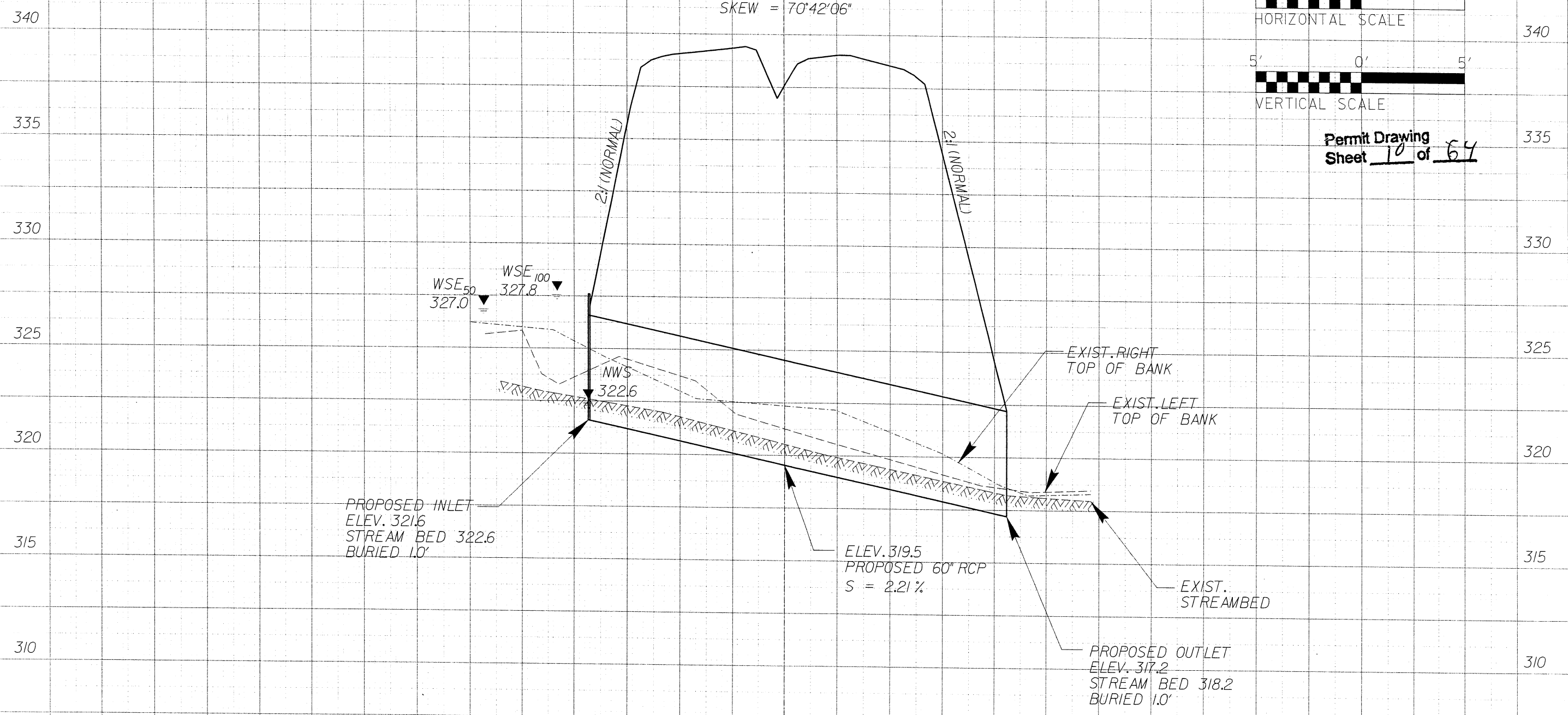
250 200 150 100 50 0 50 100 150 200 250

SITE 1

60" RCP
 $C-L = 38+11$
 PGL ELEV. = 339.24'
 SKEW = 70°42'06"



Permit Drawing
 Sheet 10 of 64



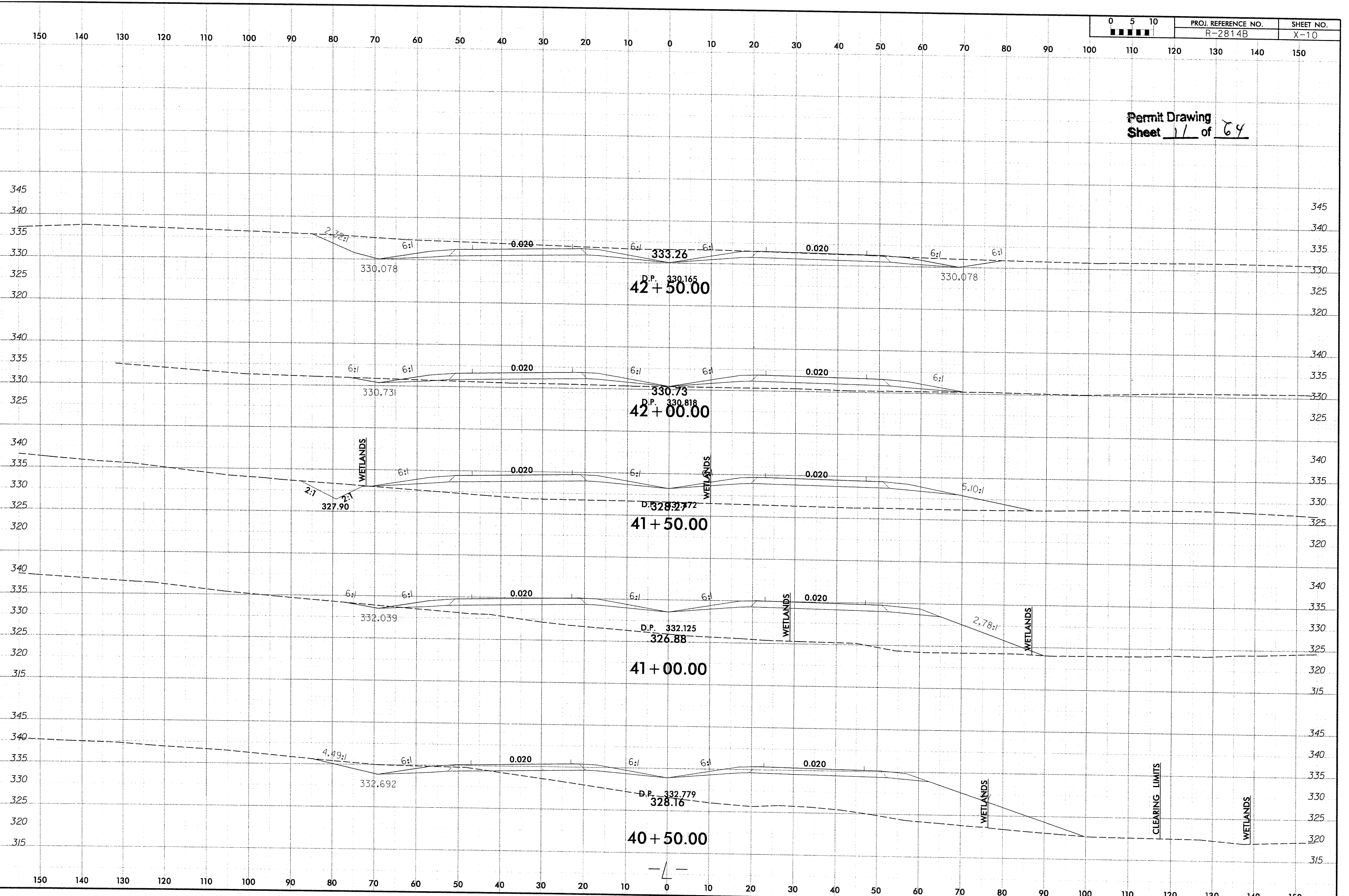
PLANS PREPARED BY :

RK&K

RUMMEL, KLEPPER & KAHL, LLP
 900 RIDGEFIELD DRIVE SUITE 350
 RALEIGH, NORTH CAROLINA 27609-3960
 NC LICENSE NO. F-0112 • (919) 878-9560

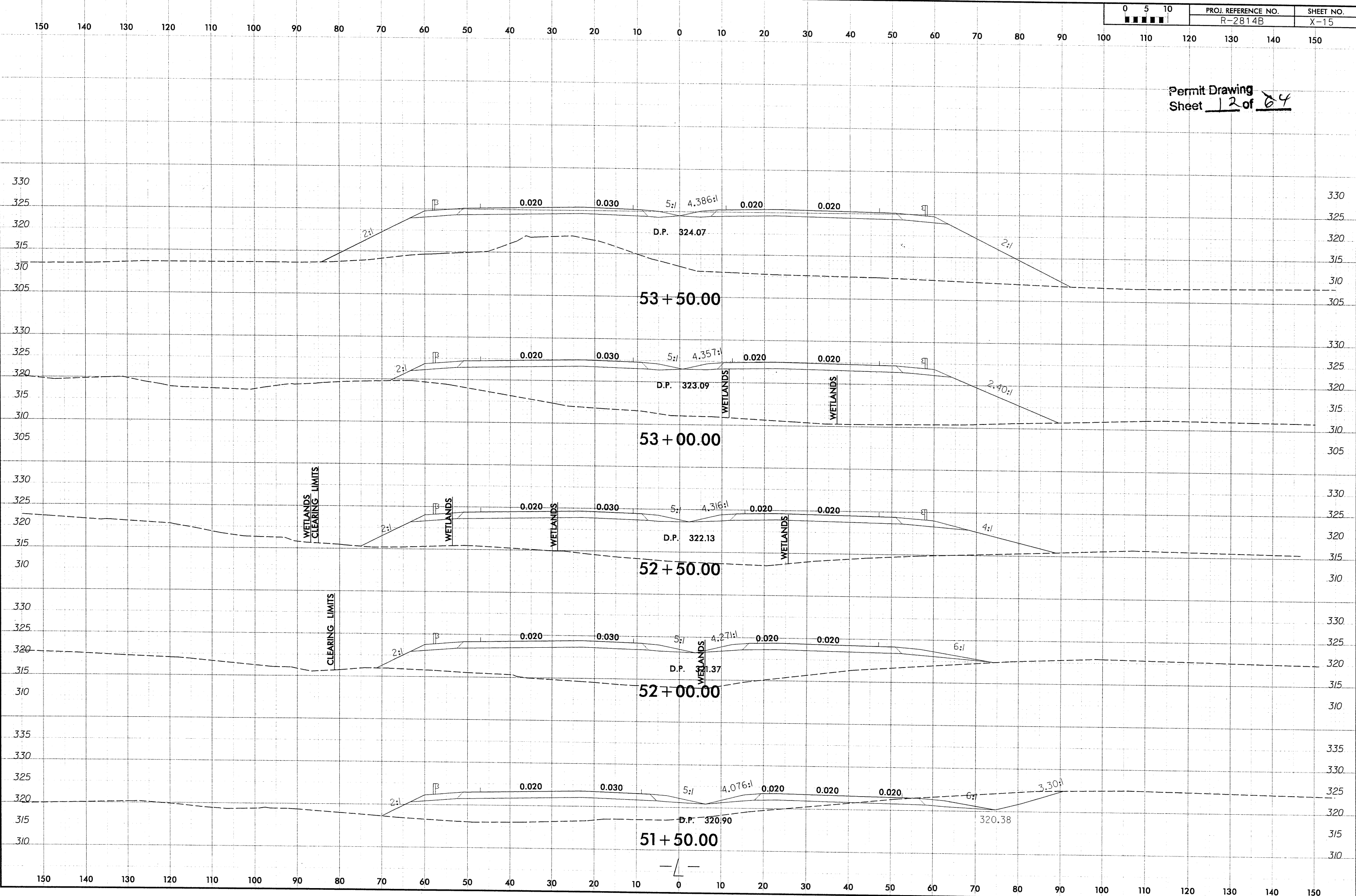
FOR
 DIVISION OF HIGHWAYS

Permit Drawing
Sheet 11 of 64



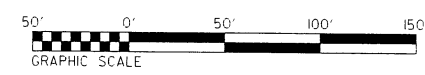


Permit Drawing
Sheet 12 of 64

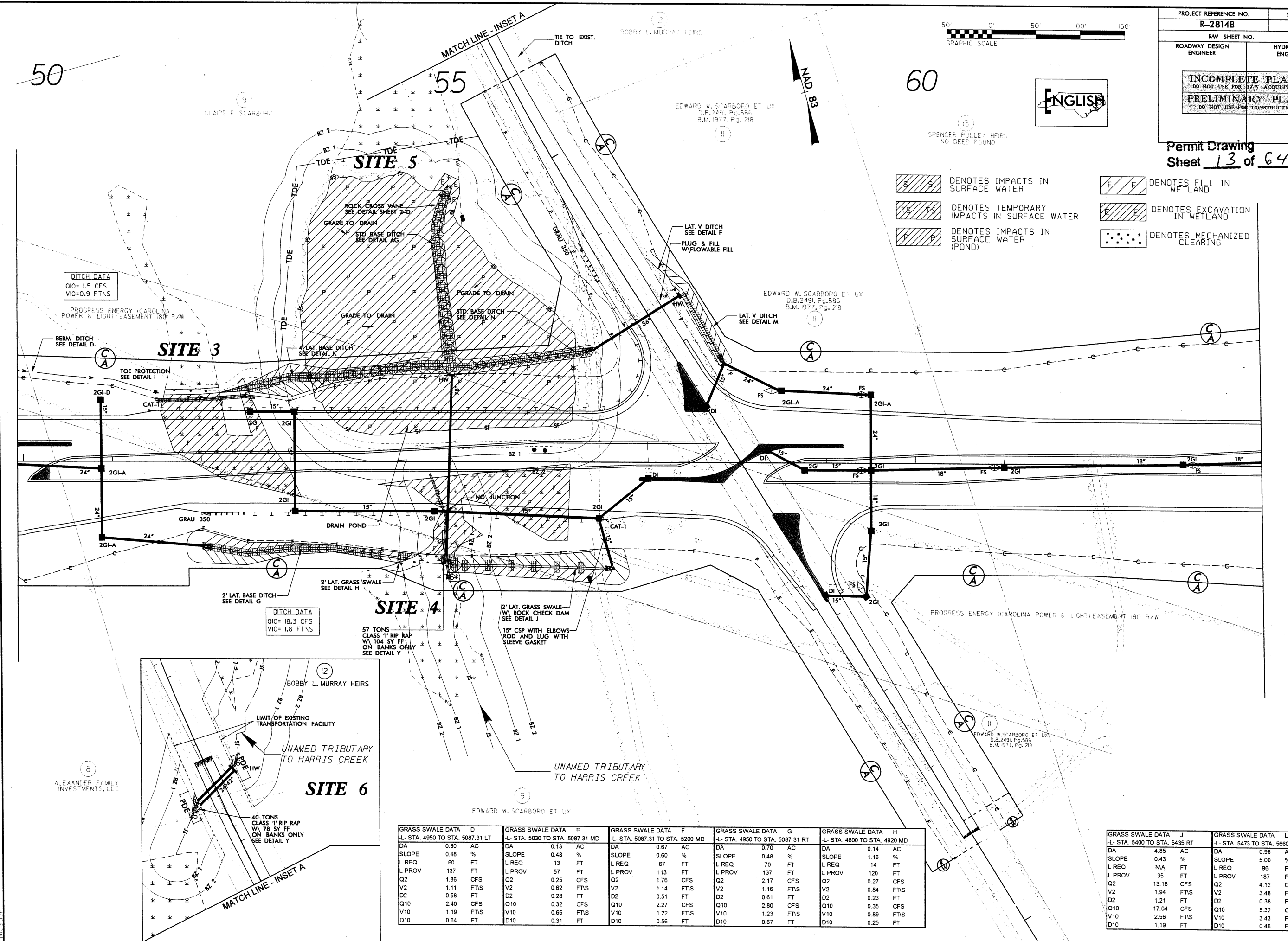


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 12 of 64

Permit Drawing
Sheet 13 of 64

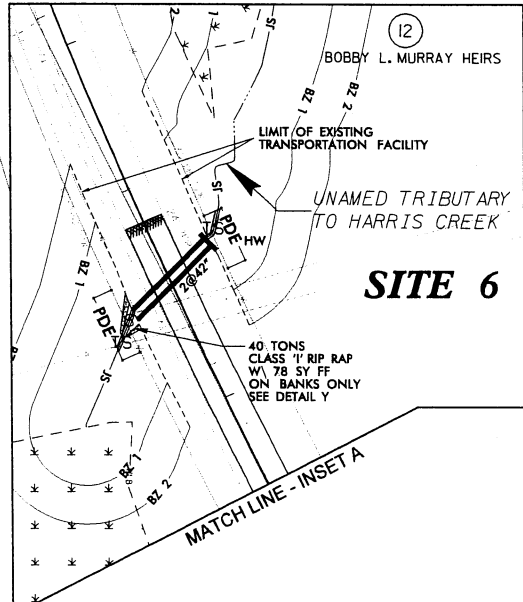


- DENOTES IMPACTS IN SURFACE WATER
- DENOTES TEMPORARY IMPACTS IN SURFACE WATER
- DENOTES IMPACTS IN SURFACE WATER (POND)
- DENOTES FILL IN WETLAND
- DENOTES EXCAVATION IN WETLAND
- DENOTES MECHANIZED CLEARING



DITCH DATA
Q10= 1.5 CFS
V10= 0.9 FT/S

DITCH DATA
Q10= 18.3 CFS
V10= 1.8 FT/S



GRASS SWALE DATA D		GRASS SWALE DATA E		GRASS SWALE DATA F		GRASS SWALE DATA G		GRASS SWALE DATA H	
-L- STA. 4950 TO STA. 5087.31 LT		-L- STA. 5030 TO STA. 5087.31 MD		-L- STA. 5087.31 TO STA. 5200 MD		-L- STA. 4950 TO STA. 5087.31 RT		-L- STA. 4800 TO STA. 4920 MD	
DA	0.60 AC	DA	0.13 AC	DA	0.67 AC	DA	0.70 AC	DA	0.14 AC
SLOPE	0.48 %	SLOPE	0.48 %	SLOPE	0.60 %	SLOPE	0.48 %	SLOPE	1.16 %
L REQ	80 FT	L REQ	13 FT	L REQ	67 FT	L REQ	70 FT	L REQ	14 FT
L PROV	137 FT	L PROV	57 FT	L PROV	113 FT	L PROV	137 FT	L PROV	120 FT
Q2	1.86 CFS	Q2	0.25 CFS	Q2	1.76 CFS	Q2	2.17 CFS	Q2	0.27 CFS
V2	1.11 FT/S	V2	0.62 FT/S	V2	1.14 FT/S	V2	1.16 FT/S	V2	0.84 FT/S
D2	0.58 FT	D2	0.28 FT	D2	0.51 FT	D2	0.61 FT	D2	0.23 FT
Q10	2.40 CFS	Q10	0.32 CFS	Q10	2.27 CFS	Q10	2.80 CFS	Q10	0.35 CFS
V10	1.19 FT/S	V10	0.66 FT/S	V10	1.22 FT/S	V10	1.23 FT/S	V10	0.89 FT/S
D10	0.64 FT	D10	0.31 FT	D10	0.56 FT	D10	0.67 FT	D10	0.25 FT

GRASS SWALE DATA J		GRASS SWALE DATA L	
-L- STA. 5400 TO STA. 5435 RT		-L- STA. 5473 TO STA. 5660 RT	
DA	4.85 AC	DA	0.96 AC
SLOPE	0.43 %	SLOPE	5.00 %
L REQ	NA FT	L REQ	96 FT
L PROV	35 FT	L PROV	187 FT
Q2	13.18 CFS	Q2	4.12 CFS
V2	1.94 FT/S	V2	3.48 FT/S
D2	1.21 FT	D2	0.38 FT
Q10	17.04 CFS	Q10	5.32 CFS
V10	2.56 FT/S	V10	3.43 FT/S
D10	1.19 FT	D10	0.46 FT

REVISIONS

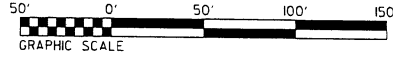
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8/17/09

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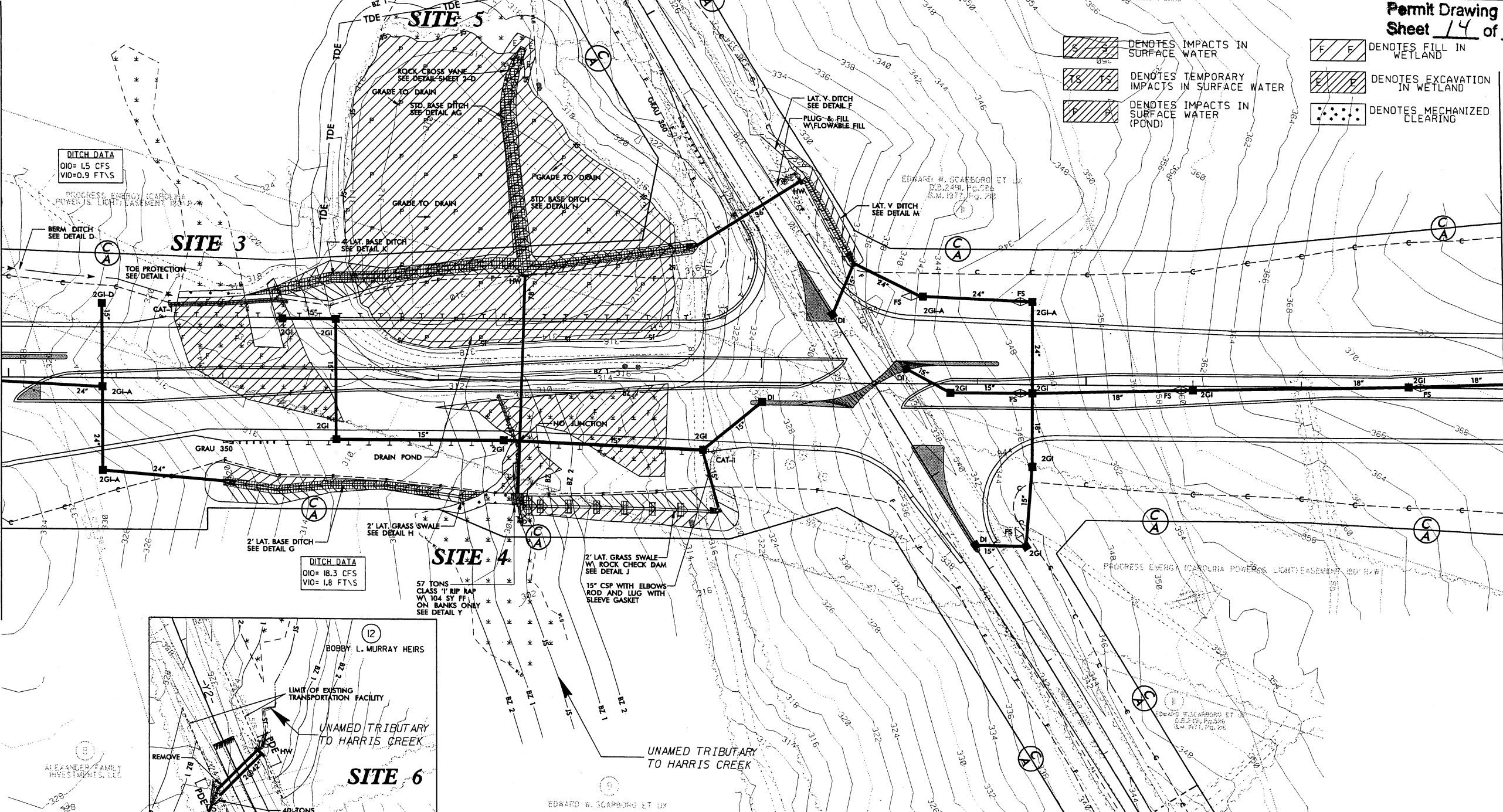
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PROJECT REFERENCE NO. R-2814B	SHEET NO. 7
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
INCOMPLETE PLANS DO NOT USE FOR R/W ACQUISITION PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION	

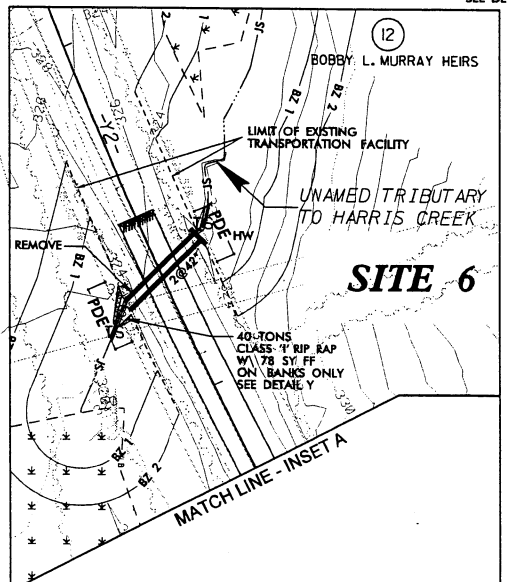
Permit Drawing
Sheet 14 of 64



- DENOTES IMPACTS IN SURFACE WATER
- DENOTES TEMPORARY IMPACTS IN SURFACE WATER
- DENOTES IMPACTS IN SURFACE WATER (POND)
- DENOTES FILL IN WETLAND
- DENOTES EXCAVATION IN WETLAND
- DENOTES MECHANIZED CLEARING

DITCH DATA
Q10= 1.5 CFS
V10=0.9 FTS

DITCH DATA
Q10= 18.3 CFS
V10= 1.8 FTS



GRASS SWALE DATA D			GRASS SWALE DATA E			GRASS SWALE DATA F			GRASS SWALE DATA G			GRASS SWALE DATA H		
-L- STA. 4950 TO STA. 5087.31 LT			-L- STA. 5030 TO STA. 5087.31 MD			-L- STA. 5087.31 TO STA. 5200 MD			-L- STA. 4950 TO STA. 5087.31 RT			-L- STA. 4800 TO STA. 4920 MD		
DA	0.60	AC	DA	0.13	AC	DA	0.67	AC	DA	0.70	AC	DA	0.14	AC
SLOPE	0.48	%	SLOPE	0.48	%	SLOPE	0.60	%	SLOPE	0.48	%	SLOPE	1.16	%
L REQ	60	FT	L REQ	13	FT	L REQ	67	FT	L REQ	70	FT	L REQ	14	FT
L PROV	137	FT	L PROV	57	FT	L PROV	113	FT	L PROV	137	FT	L PROV	120	FT
Q2	1.86	CFS	Q2	0.25	CFS	Q2	1.76	CFS	Q2	2.17	CFS	Q2	0.27	CFS
V2	1.11	FT/S	V2	0.62	FT/S	V2	1.14	FT/S	V2	1.16	FT/S	V2	0.84	FT/S
D2	0.58	FT	D2	0.28	FT	D2	0.51	FT	D2	0.61	FT	D2	0.23	FT
Q10	2.40	CFS	Q10	0.32	CFS	Q10	2.27	CFS	Q10	2.80	CFS	Q10	0.35	CFS
V10	1.19	FT/S	V10	0.66	FT/S	V10	1.22	FT/S	V10	1.23	FT/S	V10	0.89	FT/S
D10	0.64	FT	D10	0.31	FT	D10	0.56	FT	D10	0.67	FT	D10	0.25	FT

GRASS SWALE DATA J			GRASS SWALE DATA L		
-L- STA. 5400 TO STA. 5435 RT			-L- STA. 5473 TO STA. 5660 RT		
DA	4.85	AC	DA	0.96	AC
SLOPE	0.43	%	SLOPE	5.00	%
L REQ	NA	FT	L REQ	96	FT
L PROV	35	FT	L PROV	187	FT
Q2	13.18	CFS	Q2	4.12	CFS
V2	1.94	FT/S	V2	3.48	FT/S
D2	1.21	FT	D2	0.38	FT
Q10	17.04	CFS	Q10	5.32	CFS
V10	2.56	FT/S	V10	3.43	FT/S
D10	1.19	FT	D10	0.46	FT

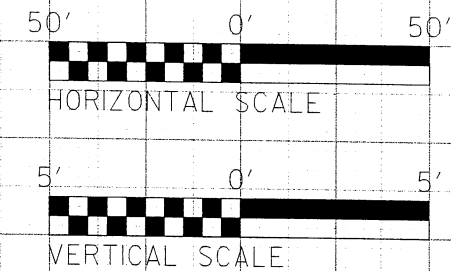
REVISIONS

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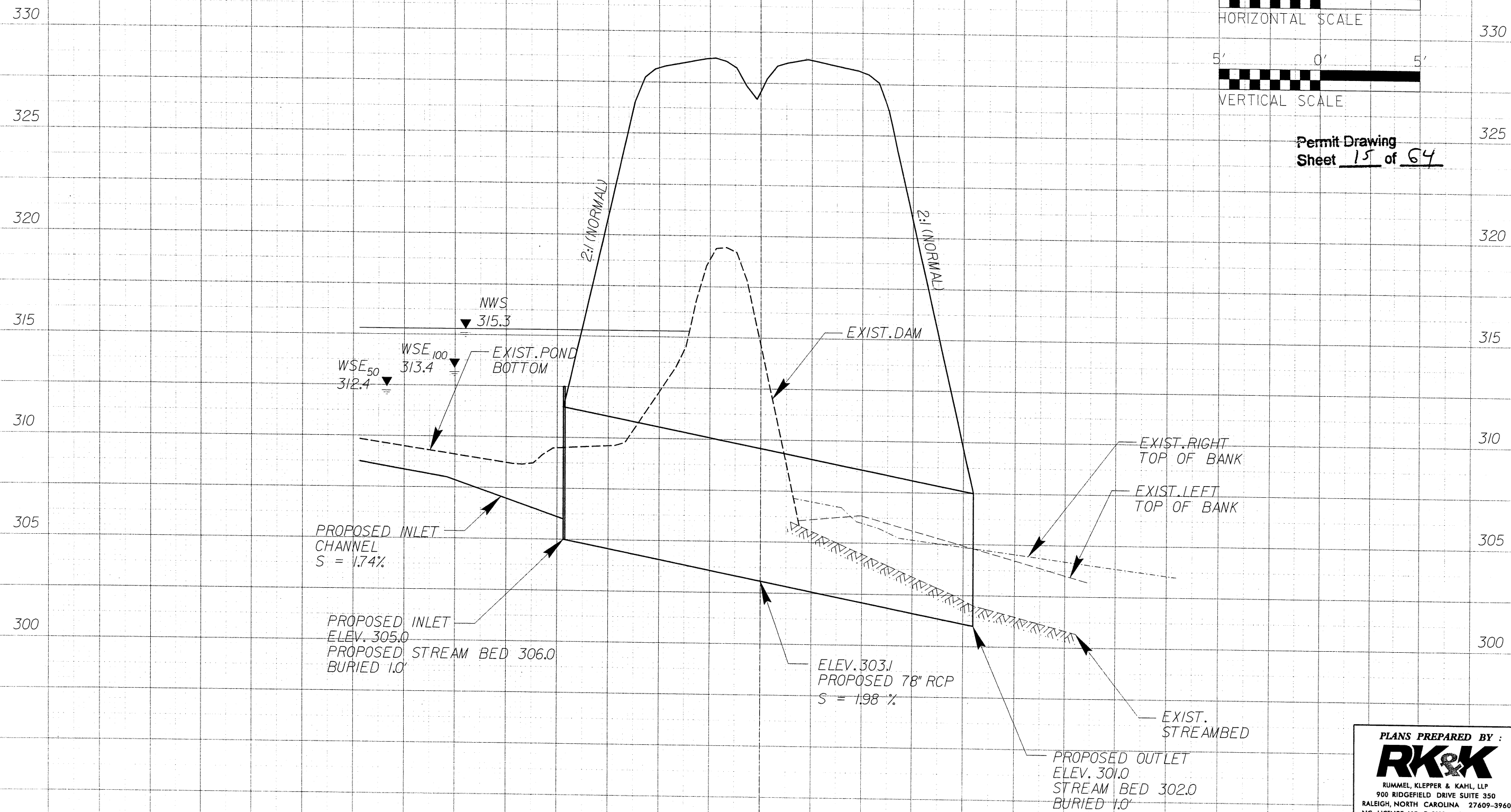
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SITE 4 & 5

78" RCP
CL- 54+77
PGL ELEV.= 328.67'
SKEW = 92°14'30"



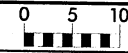
Permit Drawing
Sheet 15 of 64



PLANS PREPARED BY :

RUMMEL, KLEPPER & KAHL, LLP
900 RIDGEFIELD DRIVE SUITE 350
RALEIGH, NORTH CAROLINA 27609-3960
NC LICENSE NO. F-0112 • (919) 878-9560

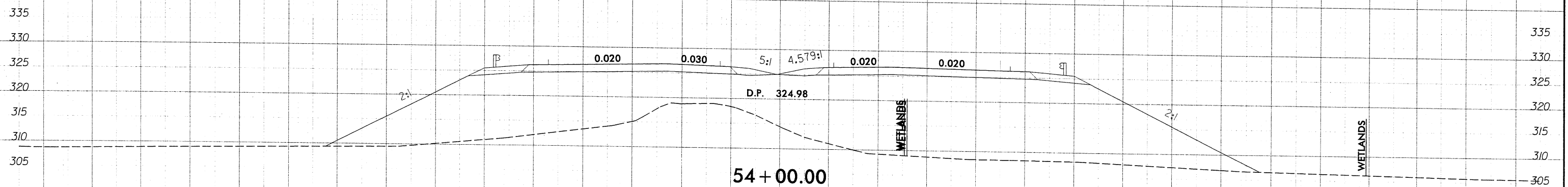
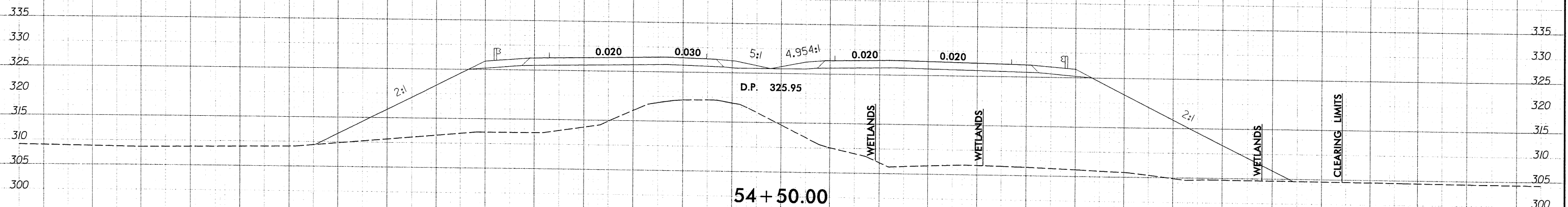
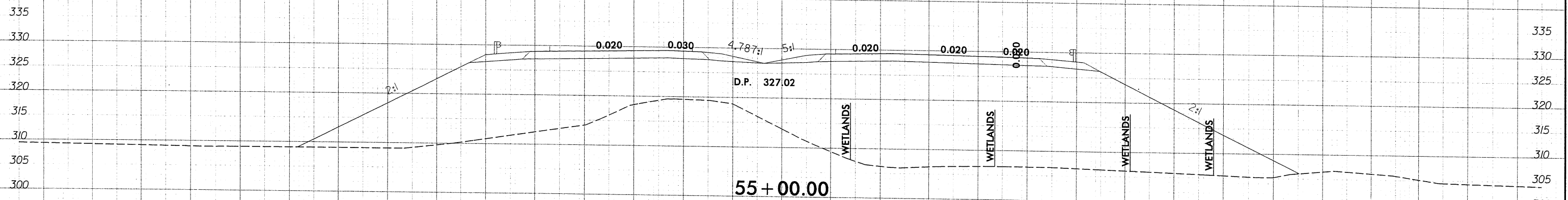
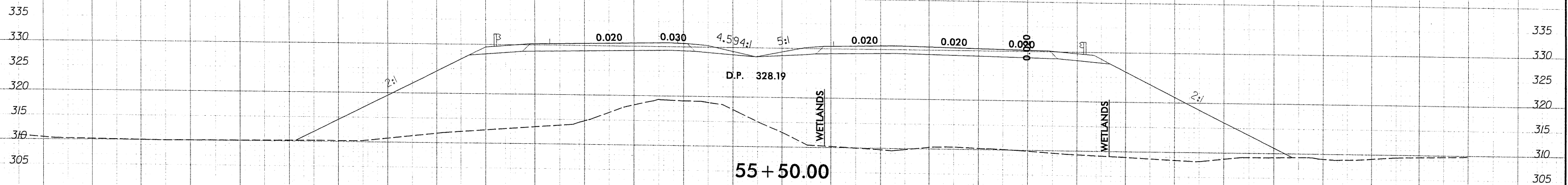
FOR
DIVISION OF HIGHWAYS



PROJ. REFERENCE NO.
R-2814B

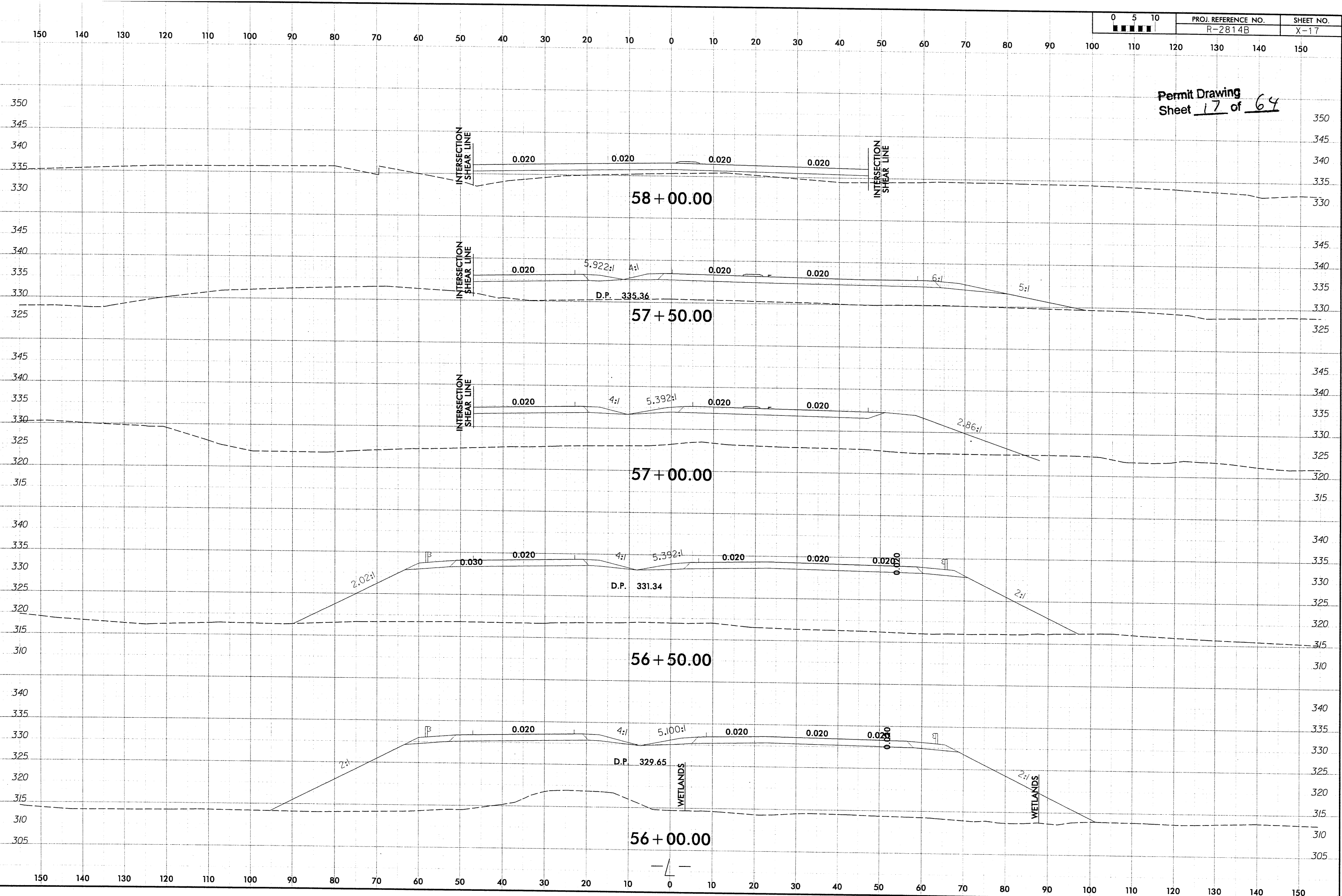
SHEET NO.
X-16

Permit Drawing
Sheet 16 of 64



DATE: 05/20/08
DRAWN BY: J. H. HARRIS, CIVIL ENGINEER
CHECKED BY: J. H. HARRIS, CIVIL ENGINEER

Permit Drawing
Sheet 17 of 64



25.00' Vertical
 1" = 25.00' Vertical
 1" = 100.00' Horizontal

8/17/99
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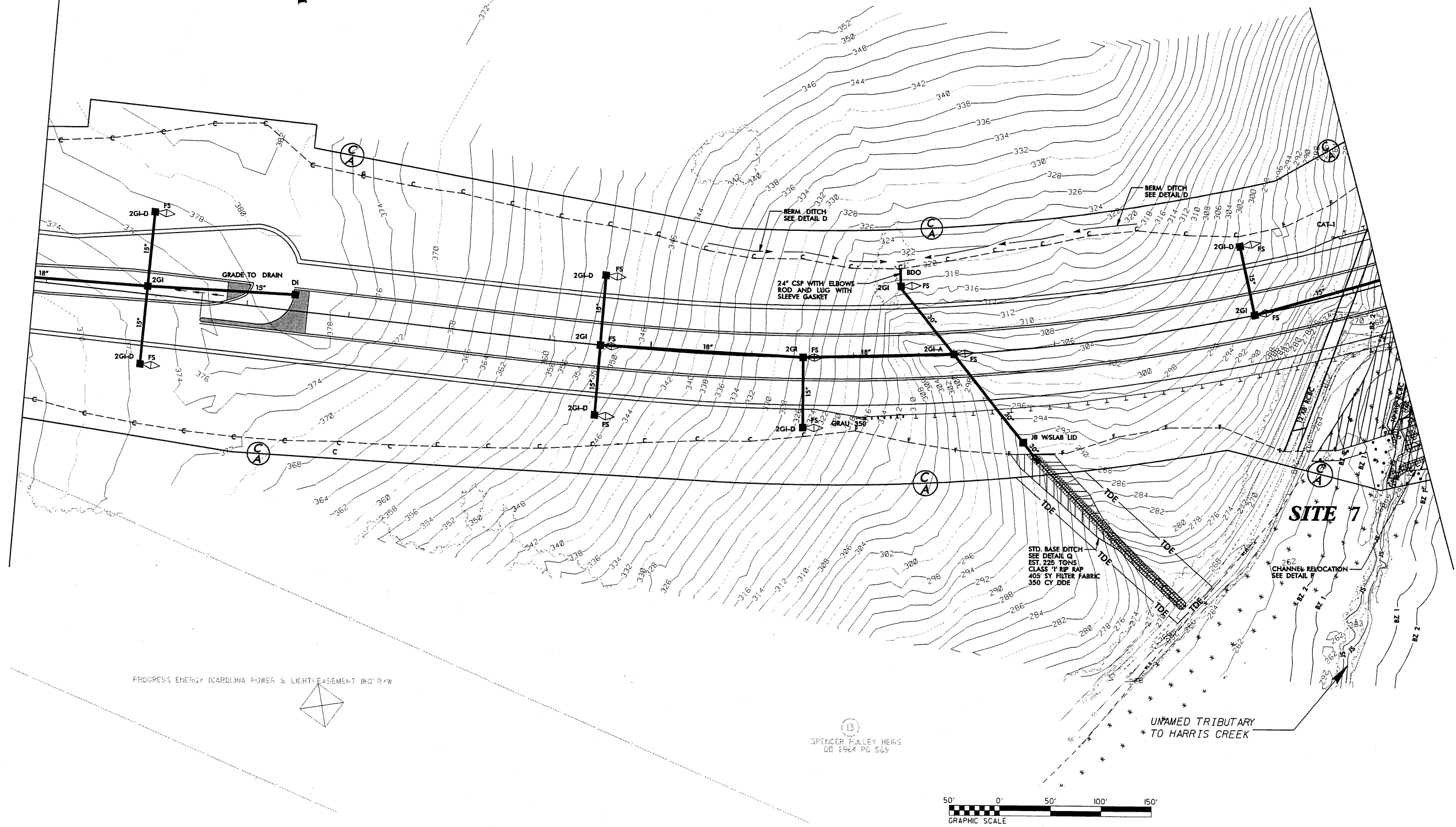
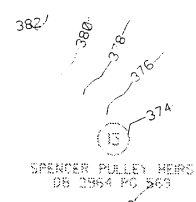
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PROJECT REFERENCE NO. R-2814B	SHEET NO. 8
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
INCOMPLETE PLANS DO NOT USE FOR R/W ACQUISITION PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION	

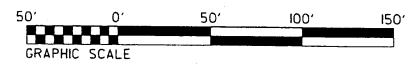
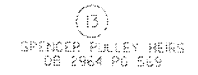
Permit Drawing
Sheet 19 of 64

- DENOTES IMPACTS IN SURFACE WATER
- DENOTES TEMPORARY IMPACTS IN SURFACE WATER
- DENOTES FILL IN WETLAND
- DENOTES EXCAVATION IN WETLAND



REVISIONS

PROGRESS ENERGY (CAROLINA POWER & LIGHT) EASEMENT (R/W)



PROJECT REFERENCE NO. R-2814B	SHEET NO. 9
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
INCOMPLETE PLANS <small>DO NOT USE FOR R/W ACQUISITION</small> PRELIMINARY PLANS <small>DO NOT USE FOR CONSTRUCTION</small>	

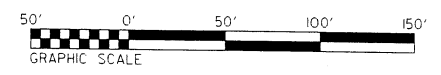
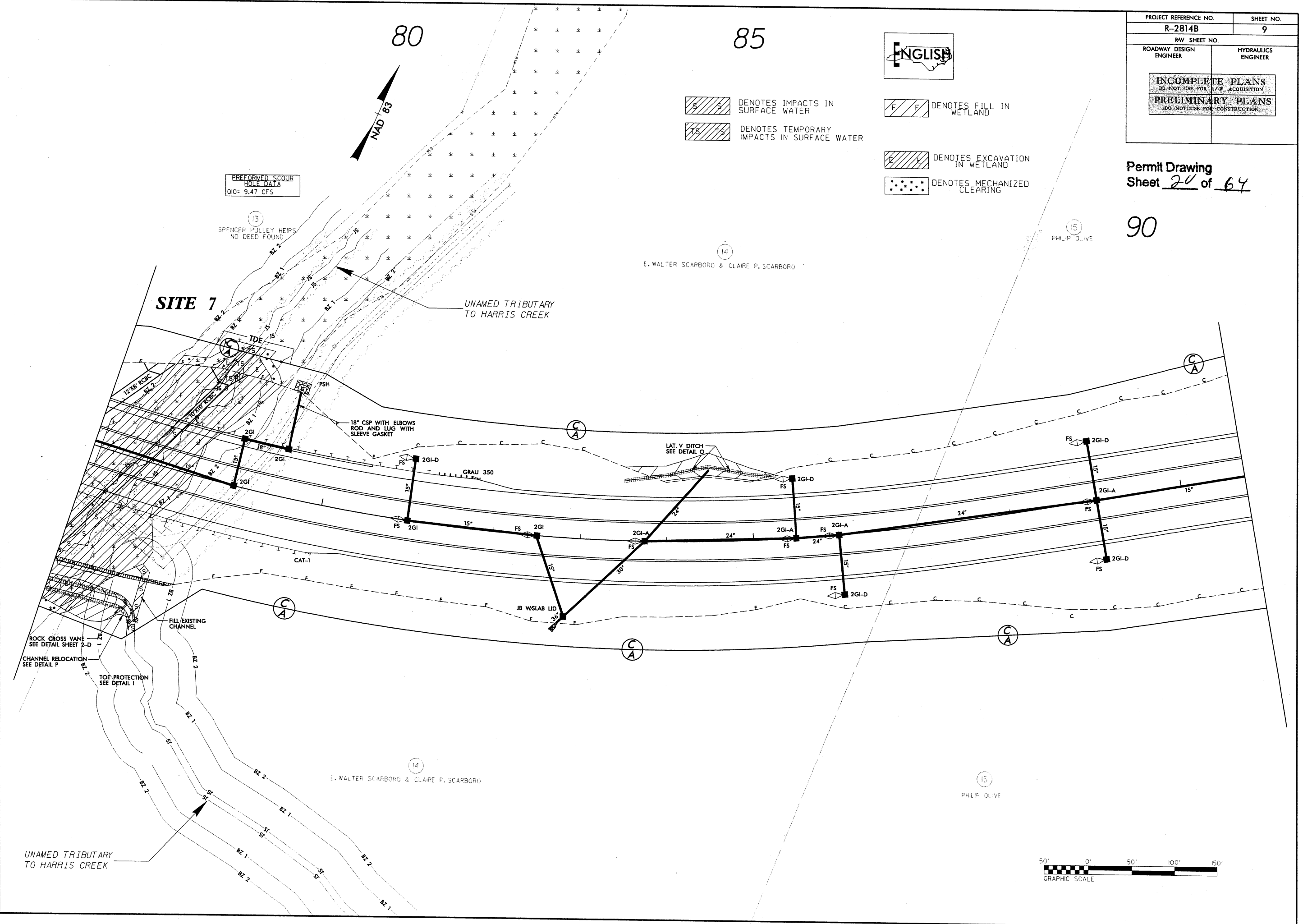
Permit Drawing
Sheet 20 of 64

90



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

REVISIONS



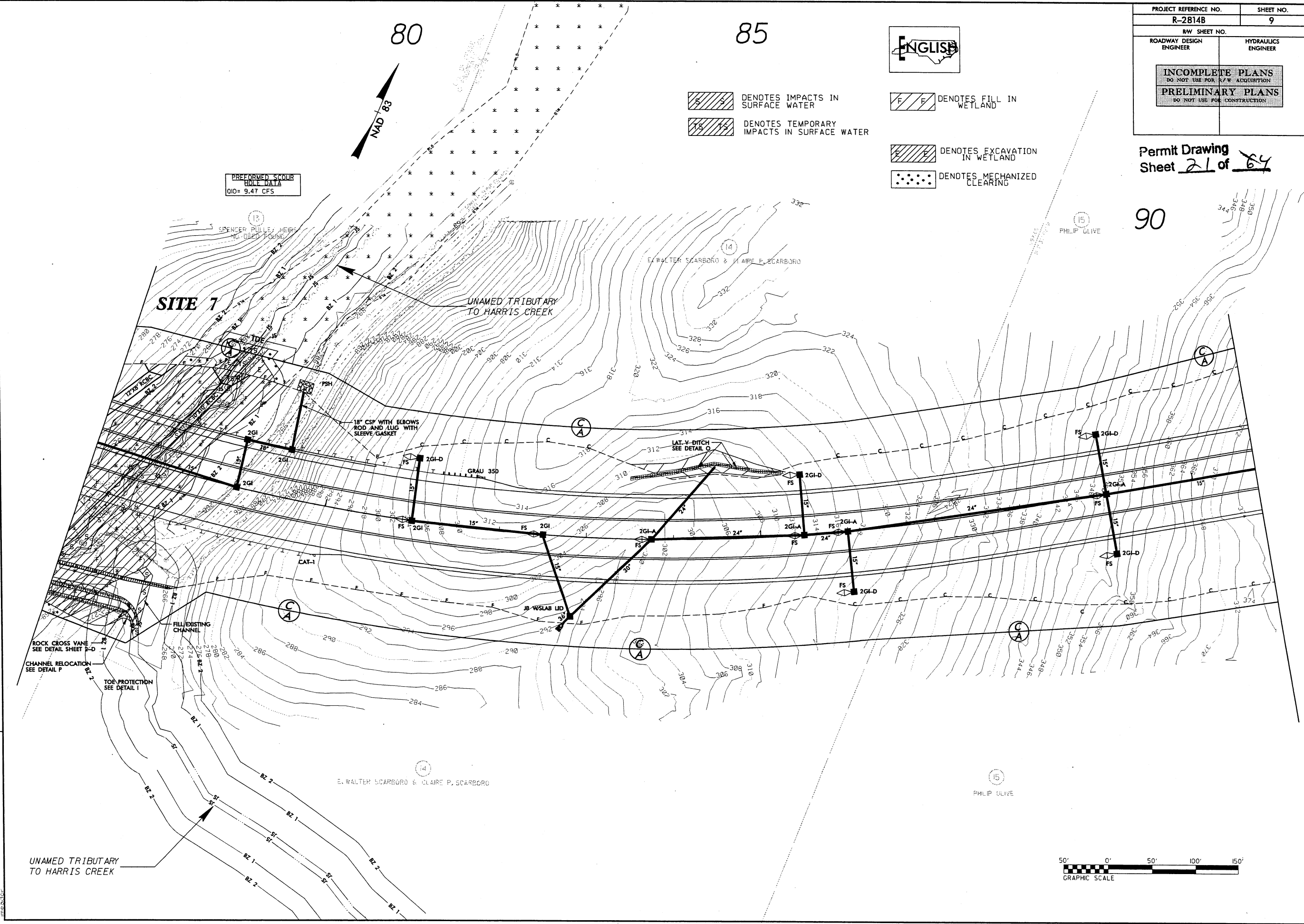
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8/17/99

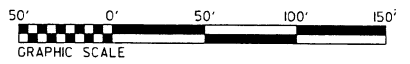
PROJECT REFERENCE NO. R-2814B	SHEET NO. 9
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
INCOMPLETE PLANS DO NOT USE FOR R/W ACQUISITION PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION	

Permit Drawing
Sheet 21 of 64

90



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

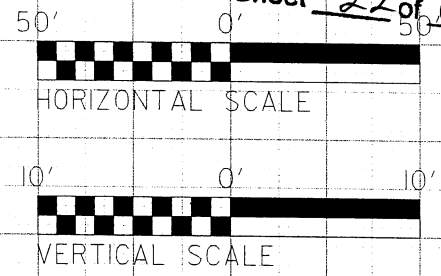


REVISIONS

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UNAMED TRIBUTARY TO HARRIS CREEK

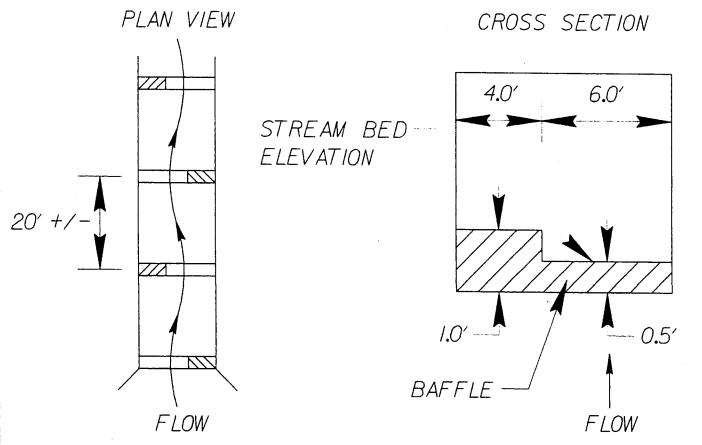
ENGLISH
Permit Drawing
Sheet 22 of 64



SITE 7

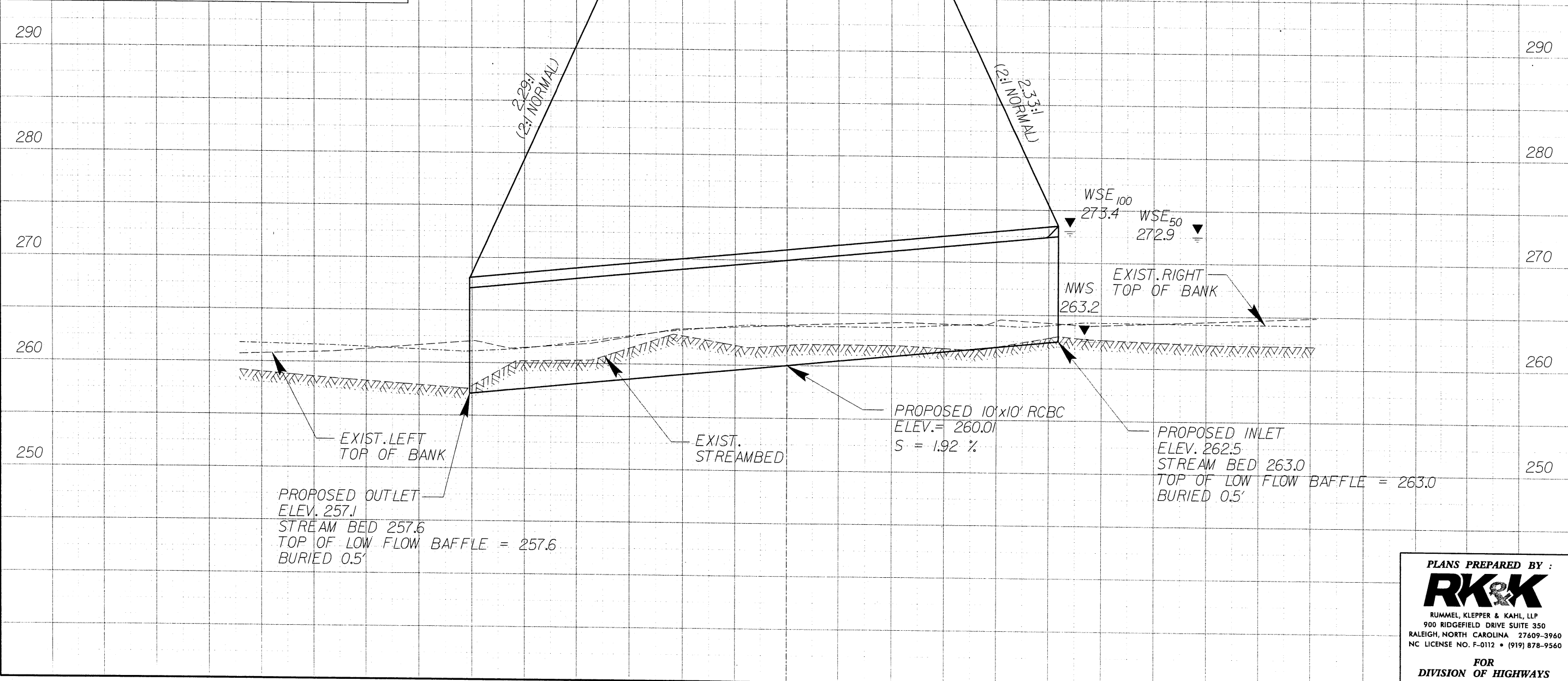
STREAM CULVERT
 C -L- 77+89.00
 PGL ELEV.= 302.06'
 SKEW = 120°00'00"

BAFFLE DETAILS



ALTERNATE BAFFLE SECTIONS TO FORCE STREAM TO MEANDER LEFT TO RIGHT ALONG THE LENGTH OF THE CULVERT.

PLACE BED MATERIAL TO TOP OF BAFFLE ELEVATION. STOCKPILE EXCEVATED BED MATERIAL FROM SITE IF AVAILABLE AND USE IN CULVERT. OTHERWISE, USE CLASS B RIP-RAP

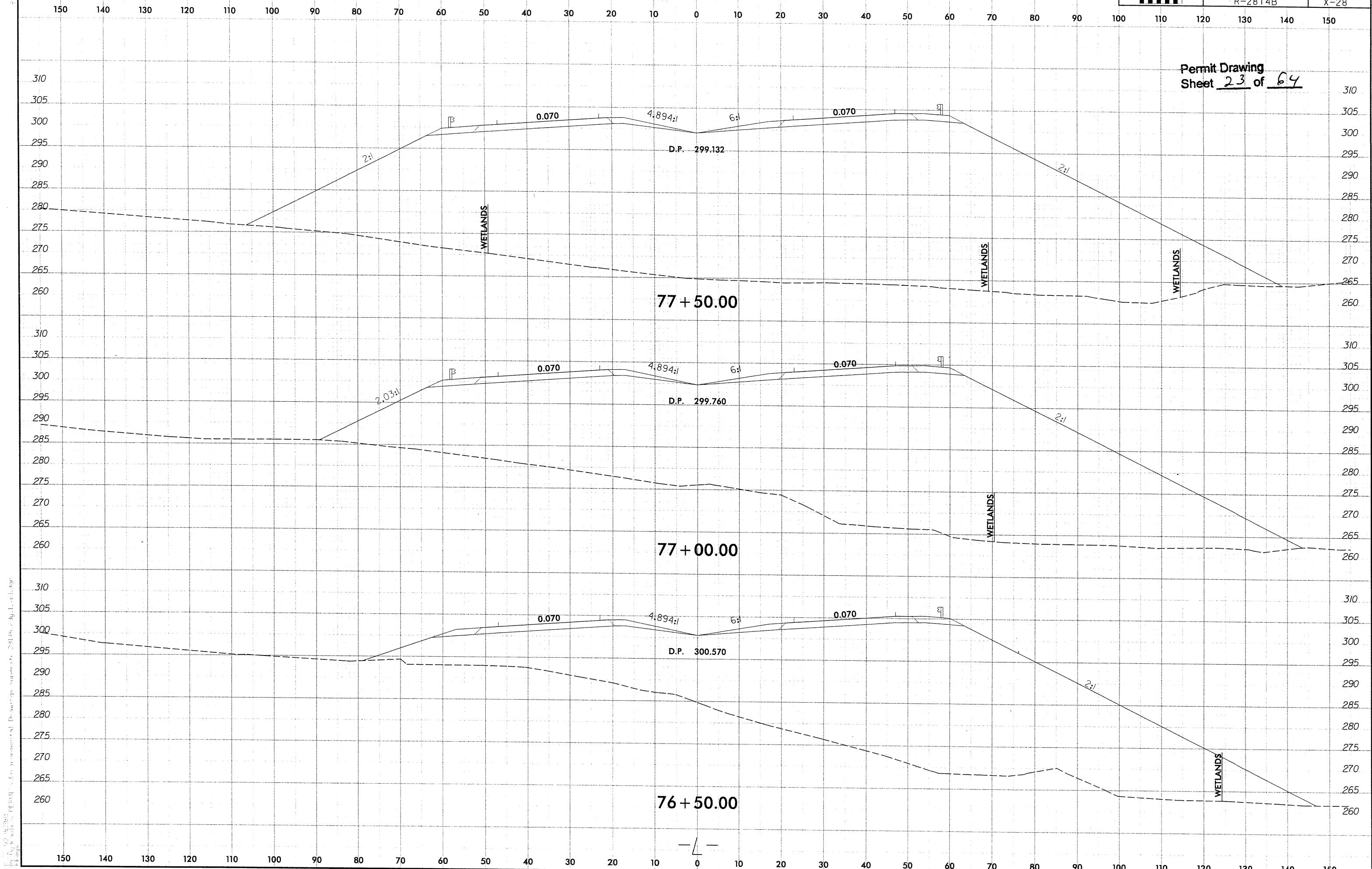


PLANS PREPARED BY :

RK&K

RUMMEL, KLEPPER & KAHL, LLP
 900 RIDGEFIELD DRIVE SUITE 350
 RALEIGH, NORTH CAROLINA 27609-3960
 NC LICENSE NO. F-0112 • (919) 878-9560

FOR
DIVISION OF HIGHWAYS

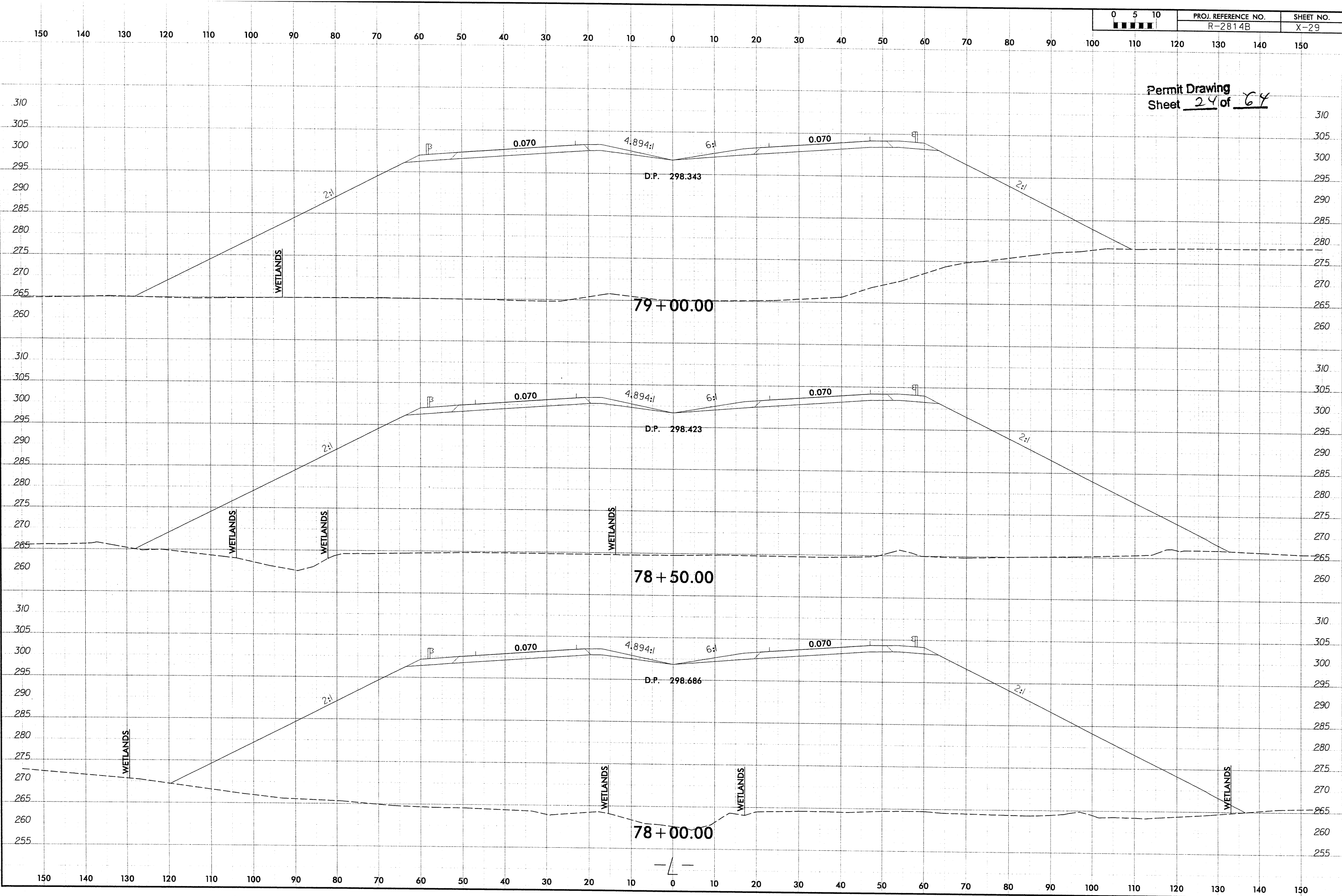


Permit Drawing
Sheet 23 of 64

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Permit Drawing
Sheet 24 of 64



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PROJECT REFERENCE NO. R-2814B		SHEET NO. 11
RW SHEET NO.		
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER	
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION		



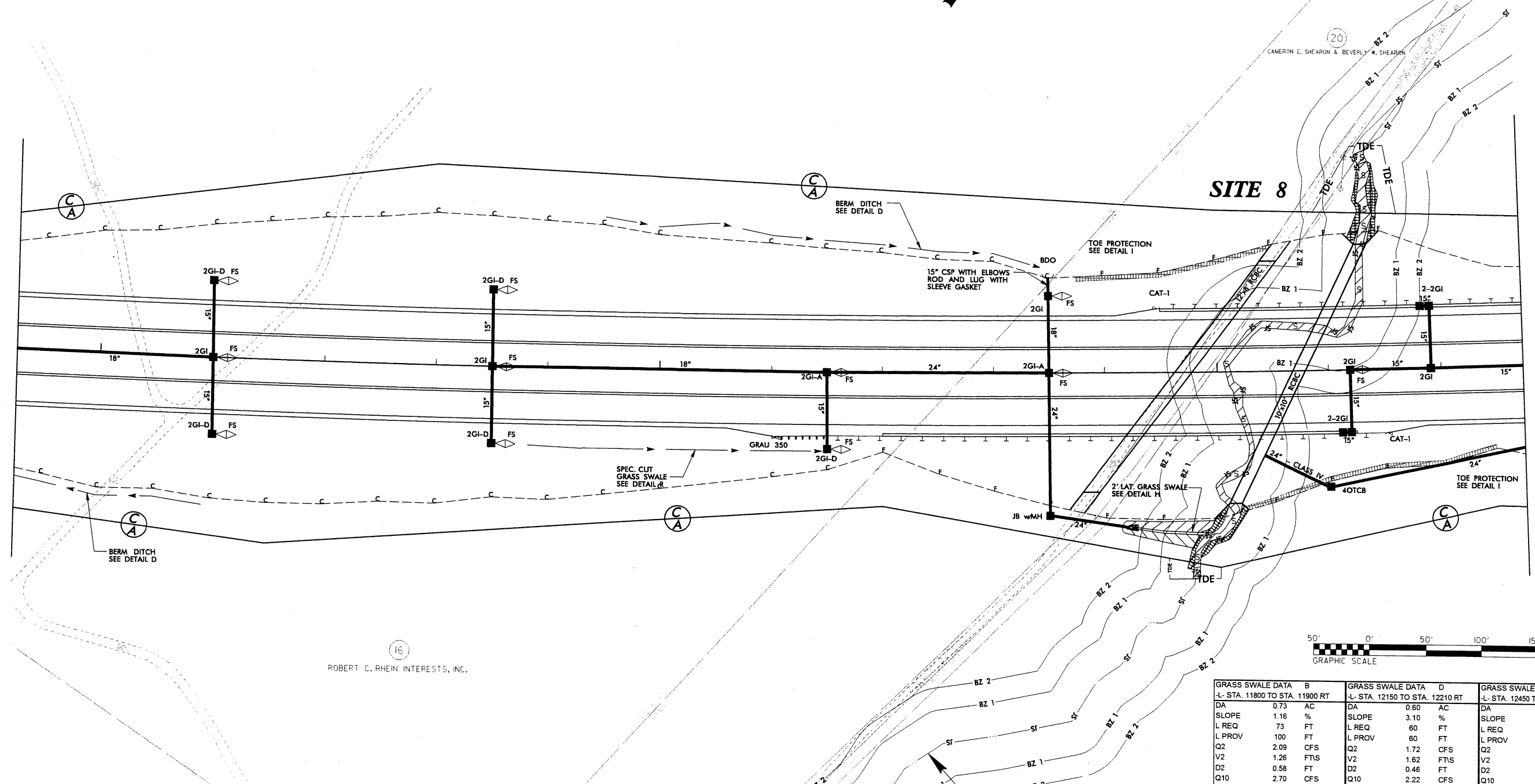
DENOTES IMPACTS IN SURFACE WATER
 DENOTES TEMPORARY IMPACTS IN SURFACE WATER

ROBERT C. RHEIN INTERESTS, INC.

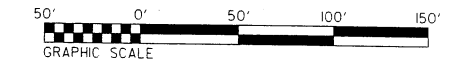


Permit Drawing
Sheet 25 of 64

REVISIONS
 06/16/09: Added TDE upstream and downstream around the culvert on parcel 20.



ROBERT C. RHEIN INTERESTS, INC.



GRASS SWALE DATA A		GRASS SWALE DATA B		GRASS SWALE DATA D		GRASS SWALE DATA F	
-L- STA. 10700 TO STA. 10850 LT		-L- STA. 10700 TO STA. 10850 RT		-L- STA. 11050 TO STA. 11150 RT		-L- STA. 11200 TO STA. 11350 LT	
DA	0.62 AC	DA	0.60 AC	DA	0.58 AC	DA	1.08 AC
SLOPE	2.90 %	SLOPE	2.90 %	SLOPE	4.00 %	SLOPE	3.05 %
L REQ	62 FT	L REQ	60 FT	L REQ	58 FT	L REQ	108 FT
L PROV	150 FT	L PROV	150 FT	L PROV	100 FT	L PROV	150 FT
Q2	1.77 CFS	Q2	1.72 CFS	Q2	1.66 CFS	Q2	3.09 CFS
V2	1.59 FT/S	V2	1.58 FT/S	V2	1.77 FT/S	V2	1.87 FT/S
D2	0.47 FT	D2	0.47 FT	D2	0.43 FT	D2	0.58 FT
Q10	2.29 CFS	Q10	2.22 CFS	Q10	2.14 CFS	Q10	3.99 CFS
V10	2.30 FT/S	V10	2.28 FT/S	V10	2.34 FT/S	V10	2.70 FT/S
D10	0.45 FT	D10	0.44 FT	D10	0.43 FT	D10	0.54 FT

GRASS SWALE DATA B		GRASS SWALE DATA D		GRASS SWALE DATA F	
-L- STA. 11800 TO STA. 11900 RT		-L- STA. 12150 TO STA. 12210 RT		-L- STA. 12450 TO STA. 12550 LT	
DA	0.73 AC	DA	0.60 AC	DA	0.91 AC
SLOPE	1.16 %	SLOPE	3.10 %	SLOPE	4.00 %
L REQ	73 FT	L REQ	60 FT	L REQ	91 FT
L PROV	100 FT	L PROV	60 FT	L PROV	100 FT
Q2	2.09 CFS	Q2	1.72 CFS	Q2	2.60 CFS
V2	1.26 FT/S	V2	1.62 FT/S	V2	1.98 FT/S
D2	0.58 FT	D2	0.46 FT	D2	0.51 FT
Q10	2.70 CFS	Q10	2.22 CFS	Q10	3.36 CFS
V10	1.70 FT/S	V10	2.14 FT/S	V10	2.62 FT/S
D10	0.56 FT	D10	0.45 FT	D10	0.51 FT

GRASS SWALE DATA G		GRASS SWALE DATA I		GRASS SWALE DATA J	
-L- STA. 12450 TO STA. 12550 RT		-L- STA. 12850 TO STA. 12950 LT		-L- STA. 12850 TO STA. 12950 RT	
DA	0.79 AC	DA	0.59 AC	DA	0.39 AC
SLOPE	4.00 %	SLOPE	3.84 %	SLOPE	3.84 %
L REQ	79 FT	L REQ	59 FT	L REQ	39 FT
L PROV	100 FT	L PROV	100 FT	L PROV	100 FT
Q2	2.26 CFS	Q2	1.69 CFS	Q2	1.12 CFS
V2	1.91 FT/S	V2	1.75 FT/S	V2	1.58 FT/S
D2	0.49 FT	D2	0.44 FT	D2	0.38 FT
Q10	2.92 CFS	Q10	2.18 CFS	Q10	1.44 CFS
V10	2.53 FT/S	V10	2.31 FT/S	V10	2.08 FT/S
D10	0.48 FT	D10	0.43 FT	D10	0.37 FT

DONALD F. WILLIAMS & DOROTHY O. WILLIAMS

CAMERON E. SHEARON & BEVERLY W. SHEARON
 HARRIS CREEK

8/17/99

105

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115

PROJECT REFERENCE NO. R-2814B	SHEET NO. 11
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION	



DENOTES IMPACTS IN SURFACE WATER
 DENOTES TEMPORARY IMPACTS IN SURFACE WATER

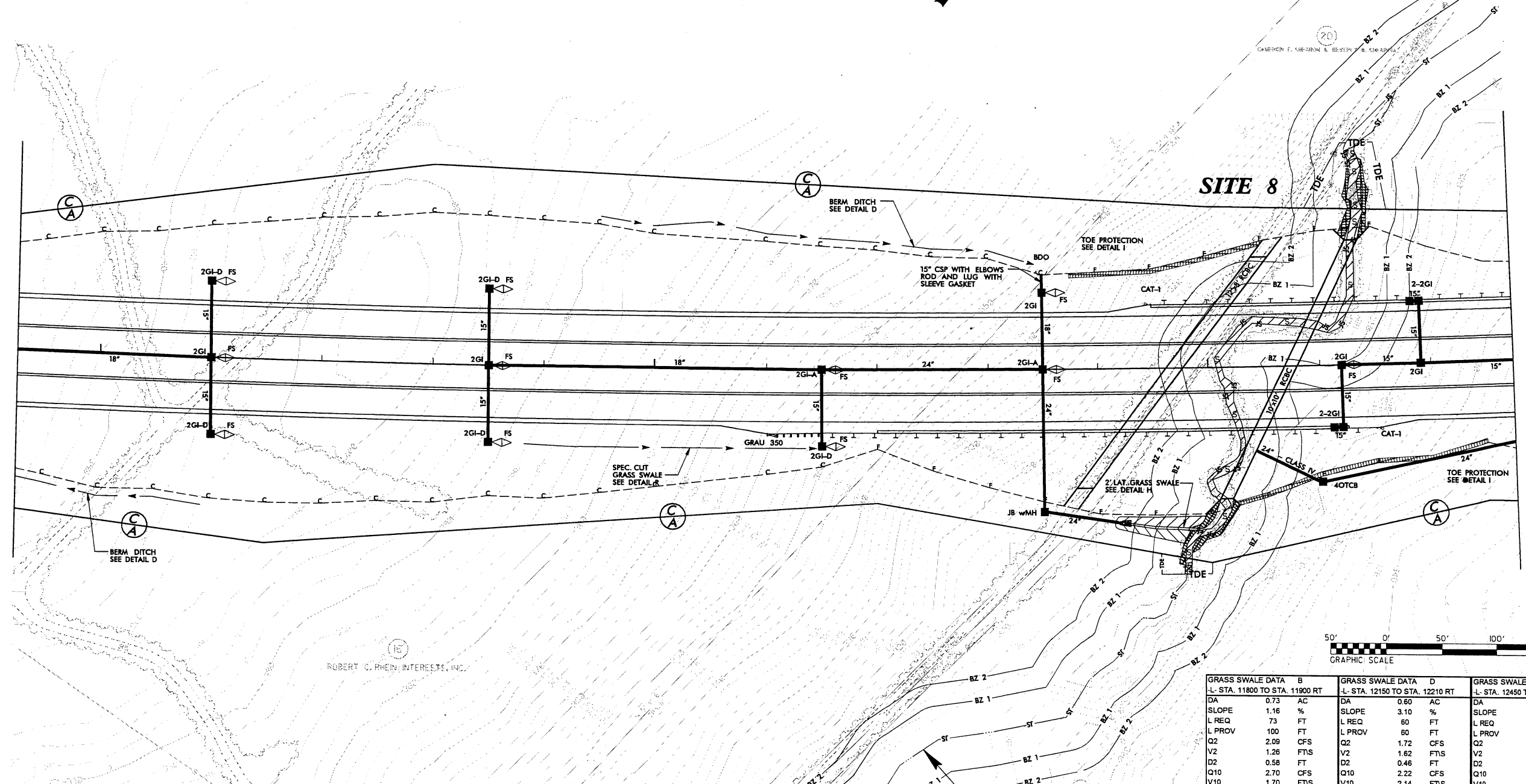
ROBERT C. RHEIN INTERESTS, INC.



Permit Drawing
Sheet 26 of 64

REVISIONS
 06/16/09: Added TDE upstream and downstream around the culvert on parcel 20.

07/22/10 164838
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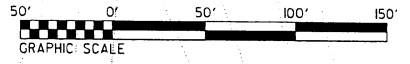
ROBERT C. RHEIN INTERESTS, INC.

DONALD F. WILLIAMS & DOROTHY O. WILLIAMS

GRASS SWALE DATA A		GRASS SWALE DATA B		GRASS SWALE DATA D		GRASS SWALE DATA F	
L- STA. 10700 TO STA. 10850 LT		L- STA. 10700 TO STA. 10850 RT		L- STA. 11050 TO STA. 11150 RT		L- STA. 11200 TO STA. 11350 LT	
DA	0.62 AC	DA	0.60 AC	DA	0.58 AC	DA	1.08 AC
SLOPE	2.90 %	SLOPE	2.90 %	SLOPE	4.00 %	SLOPE	3.05 %
L REQ	62 FT	L REQ	60 FT	L REQ	58 FT	L REQ	108 FT
L PROV	150 FT	L PROV	150 FT	L PROV	100 FT	L PROV	150 FT
Q2	1.77 CFS	Q2	1.72 CFS	Q2	1.66 CFS	Q2	3.09 CFS
V2	1.59 FTS	V2	1.58 FTS	V2	1.77 FTS	V2	1.87 FTS
D2	0.47 FT	D2	0.47 FT	D2	0.43 FT	D2	0.58 FT
Q10	2.29 CFS	Q10	2.22 CFS	Q10	2.14 CFS	Q10	3.99 CFS
V10	2.30 FTS	V10	2.28 FTS	V10	2.34 FTS	V10	2.70 FTS
D10	0.45 FT	D10	0.44 FT	D10	0.43 FT	D10	0.54 FT

GRASS SWALE DATA B		GRASS SWALE DATA D		GRASS SWALE DATA F	
L- STA. 11800 TO STA. 11900 RT		L- STA. 12150 TO STA. 12210 RT		L- STA. 12450 TO STA. 12550 LT	
DA	0.73 AC	DA	0.60 AC	DA	0.91 AC
SLOPE	1.16 %	SLOPE	3.10 %	SLOPE	4.00 %
L REQ	73 FT	L REQ	60 FT	L REQ	91 FT
L PROV	100 FT	L PROV	60 FT	L PROV	100 FT
Q2	2.09 CFS	Q2	1.72 CFS	Q2	2.60 CFS
V2	1.26 FTS	V2	1.62 FTS	V2	1.98 FTS
D2	0.58 FT	D2	0.46 FT	D2	0.51 FT
Q10	2.70 CFS	Q10	2.22 CFS	Q10	3.36 CFS
V10	1.70 FTS	V10	2.14 FTS	V10	2.62 FTS
D10	0.56 FT	D10	0.45 FT	D10	0.51 FT

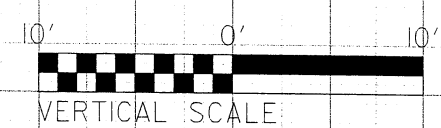
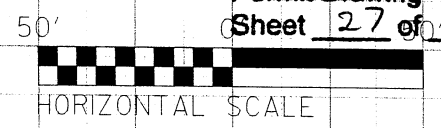
GRASS SWALE DATA G		GRASS SWALE DATA I		GRASS SWALE DATA J	
L- STA. 12450 TO STA. 12550 RT		L- STA. 12850 TO STA. 12950 LT		L- STA. 12850 TO STA. 12950 RT	
DA	0.79 AC	DA	0.59 AC	DA	0.38 AC
SLOPE	4.00 %	SLOPE	3.84 %	SLOPE	3.84 %
L REQ	79 FT	L REQ	59 FT	L REQ	39 FT
L PROV	100 FT	L PROV	100 FT	L PROV	100 FT
Q2	2.26 CFS	Q2	1.69 CFS	Q2	1.12 CFS
V2	1.91 FTS	V2	1.75 FTS	V2	1.58 FTS
D2	0.49 FT	D2	0.44 FT	D2	0.38 FT
Q10	2.92 CFS	Q10	2.18 CFS	Q10	1.44 CFS
V10	2.53 FTS	V10	2.31 FTS	V10	2.08 FTS
D10	0.48 FT	D10	0.43 FT	D10	0.37 FT



HARRIS CREEK



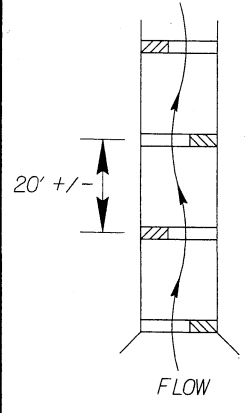
Permit Drawing
Sheet 27 of 64



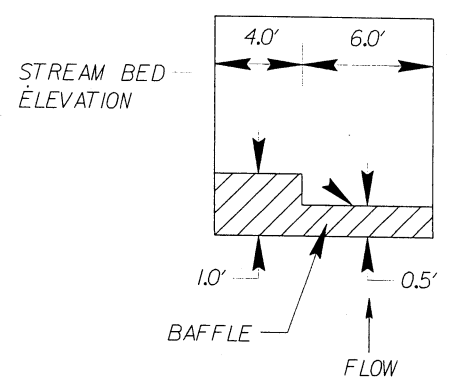
SITE 8

BAFFLE DETAILS

PLAN VIEW



CROSS SECTION



ALTERNATE BAFFLE SECTIONS TO FORCE STREAM TO MEANDER LEFT TO RIGHT ALONG THE LENGTH OF THE CULVERT.

PLACE BED MATERIAL TO TOP OF BAFFLE ELEVATION. STOCKPILE EXCEVATED BED MATERIAL FROM SITE IF AVAILABLE AND USE IN CULVERT. OTHERWISE, USE CLASS B RIP-RAP

STREAM CULVERT
C -L- 115+74.00
PGL ELEV. = 340.31'
SKEW = 117°00'00"

340

340

330

330

320

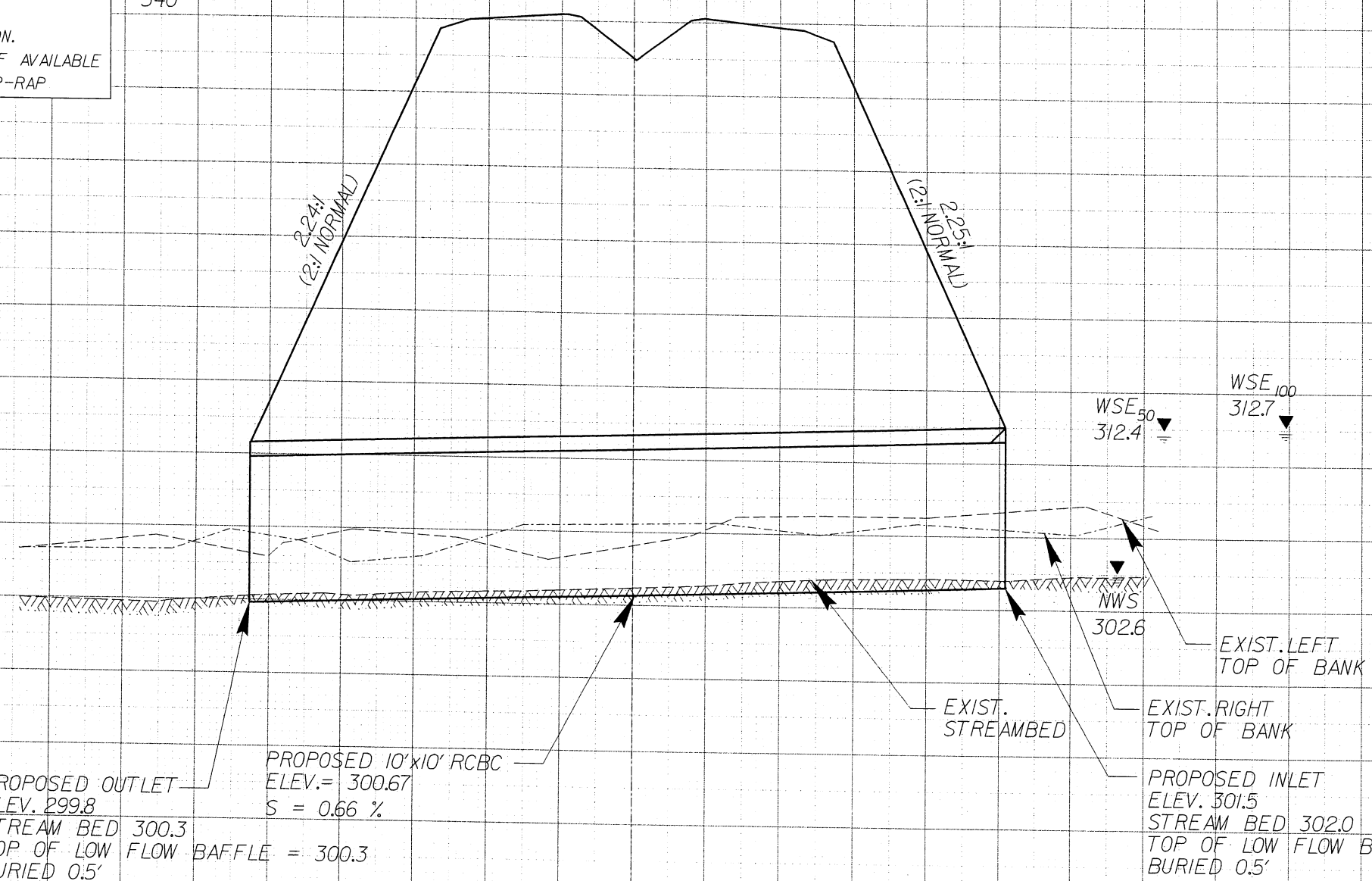
320

310

310

300

300



PROPOSED OUTLET
ELEV. 299.8
STREAM BED 300.3
TOP OF LOW FLOW BAFFLE = 300.3
BURIED 0.5'

PROPOSED 10'x10' RCBC
ELEV. = 300.67
S = 0.66 %

WSE₅₀ 312.4

WSE₁₀₀ 312.7

NWS 302.6

EXIST. LEFT TOP OF BANK

EXIST. RIGHT TOP OF BANK

PROPOSED INLET
ELEV. 301.5
STREAM BED 302.0
TOP OF LOW FLOW BAFFLE = 302.0
BURIED 0.5'

PLANS PREPARED BY :

RK&K

RUMMEL, KLEPPER & KAHL, LLP
900 RIDGEFIELD DRIVE SUITE 350
RALEIGH, NORTH CAROLINA 27609-3960
NC LICENSE NO. F-0112 • (919) 878-9560

FOR
DIVISION OF HIGHWAYS

PROJECT REFERENCE NO. R-2814B	SHEET NO. 13
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION	

Permit Drawing
Sheet 28 of 64



135

140

19
RUBY L. BYRUM

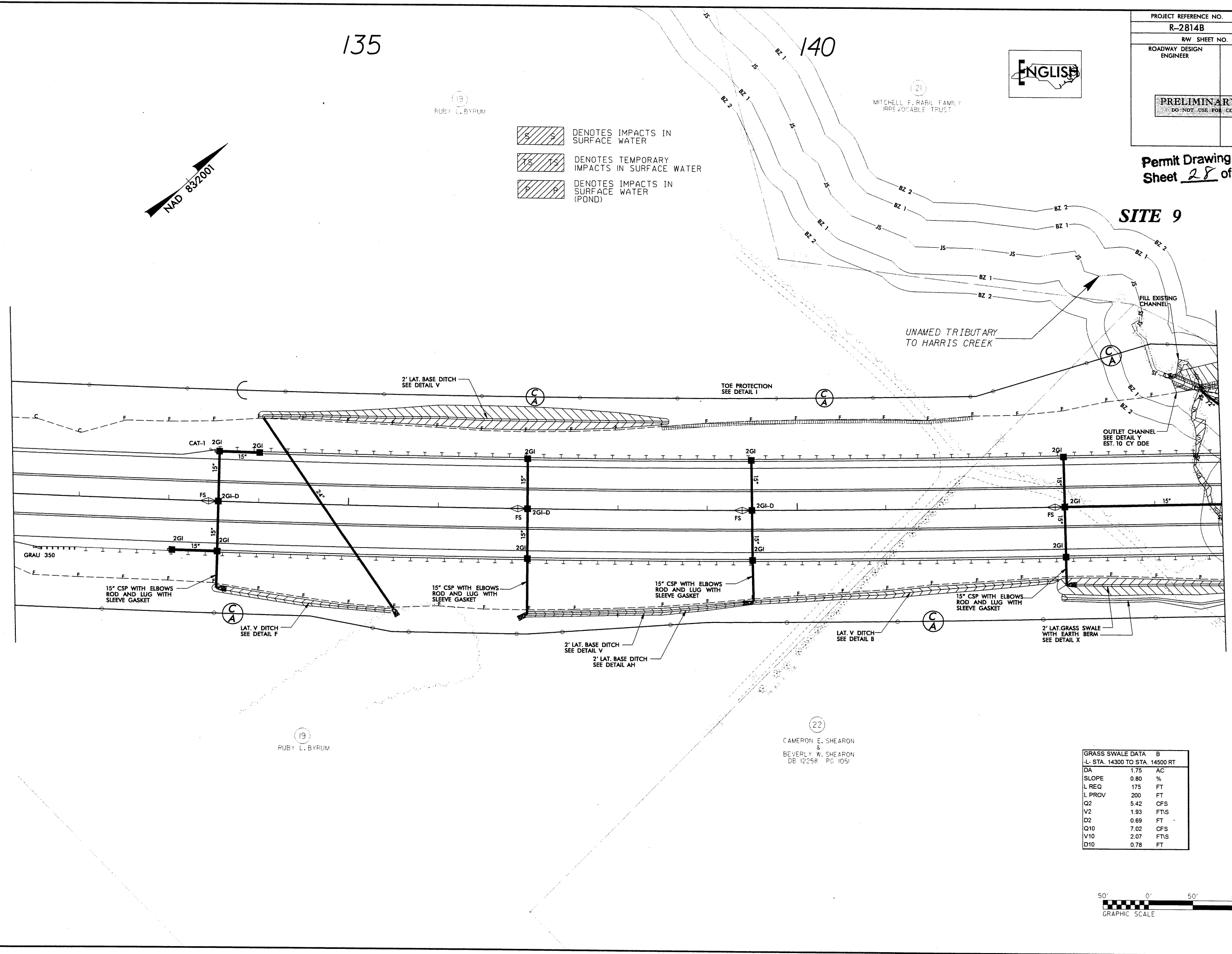
21
MITCHELL F. BABIL FAMILY
IRREVOCABLE TRUST



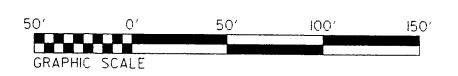
- DENOTES IMPACTS IN SURFACE WATER
- DENOTES TEMPORARY IMPACTS IN SURFACE WATER
- DENOTES IMPACTS IN SURFACE WATER (POND)

SITE 9

REVISIONS
REVISED NAMES ON PARCEL 22 PER LOCATION AND SURVEY REQUEST 4/23/09 DDL 7/29/09



GRASS SWALE DATA B	
L- STA. 14300 TO STA. 14500 RT	
DA	1.75 AC
SLOPE	0.80 %
L REQ	175 FT
L PROV	200 FT
Q2	5.42 CFS
V2	1.93 FT/S
D2	0.68 FT
Q10	7.02 CFS
V10	2.07 FT/S
D10	0.78 FT



19
RUBY L. BYRUM

22
CAMERON E. SHEARON &
BEVERLY W. SHEARON
DE 1225R PG 1051

PROJECT REFERENCE NO. R-2814B	SHEET NO. 13
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION	

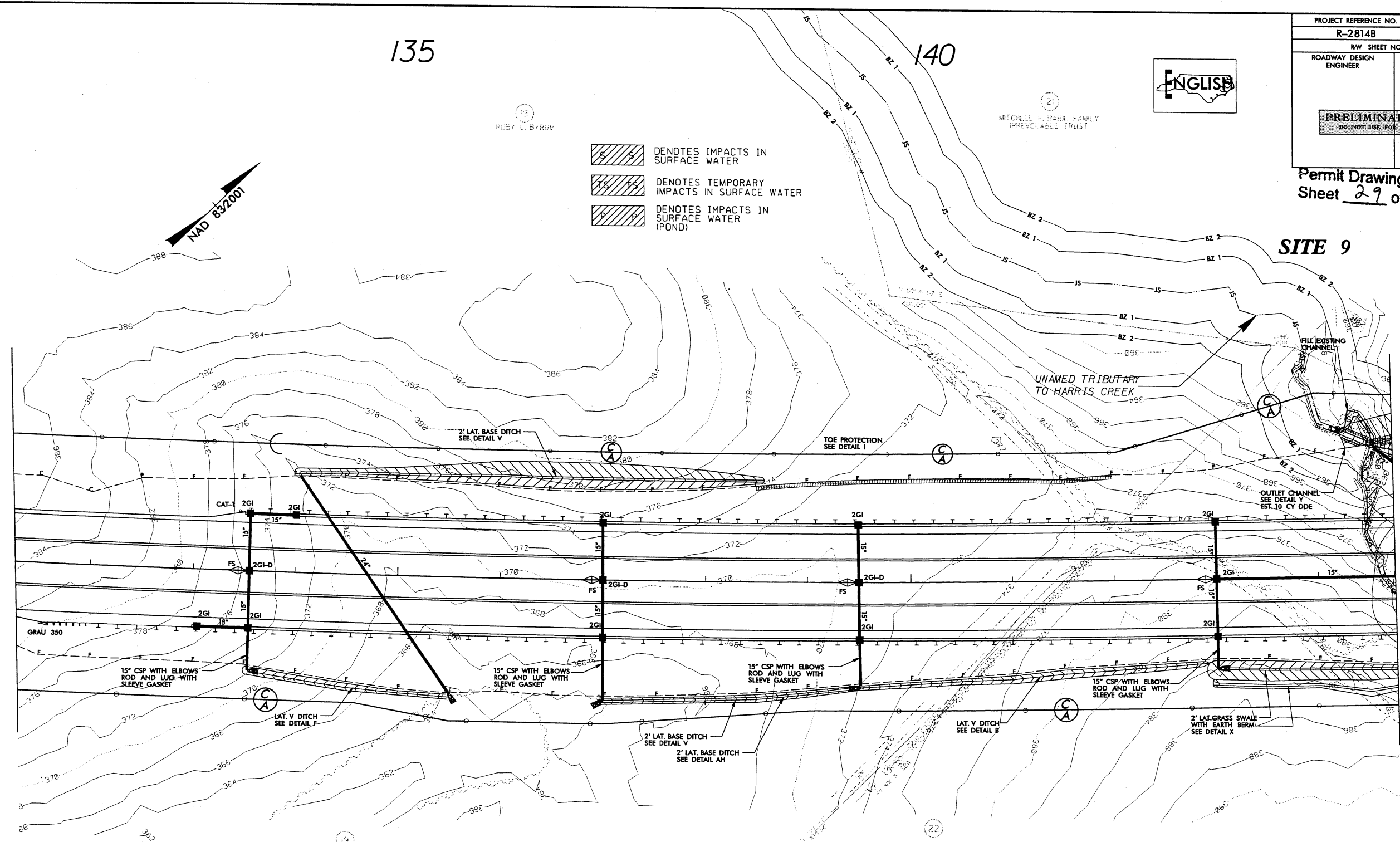
Permit Drawing
Sheet 29 of 64



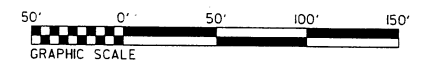
- DENOTES IMPACTS IN SURFACE WATER
- DENOTES TEMPORARY IMPACTS IN SURFACE WATER
- DENOTES IMPACTS IN SURFACE WATER (POND)

REVISIONS
 REVISED NAMES ON PARCEL 22 PER LOCATION AND SURVEY REQUEST 4/23/09 DDL 7/29/09

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GRASS SWALE DATA B	
L- STA. 14300 TO STA. 14500 RT	
DA	1.75 AC
SLOPE	0.80 %
L REQ	175 FT
L PROV	200 FT
Q2	5.42 CFS
V2	1.93 FT/S
D2	0.69 FT
Q10	7.02 CFS
V10	2.07 FT/S
D10	0.78 FT



22
CAMERON E. SHEARON
&
BEVERLY W. SHEARON
DB 12256 PG 10/1

19
RUBY L. BYRUM

13
RUBY L. BYRUM

21
MITCHELL P. RADE, FAMILY
IRREVOCABLE TRUST

145

150

155



(21)
MITCHELL F. RABIL FAMILY
IRREVOCABLE TRUST

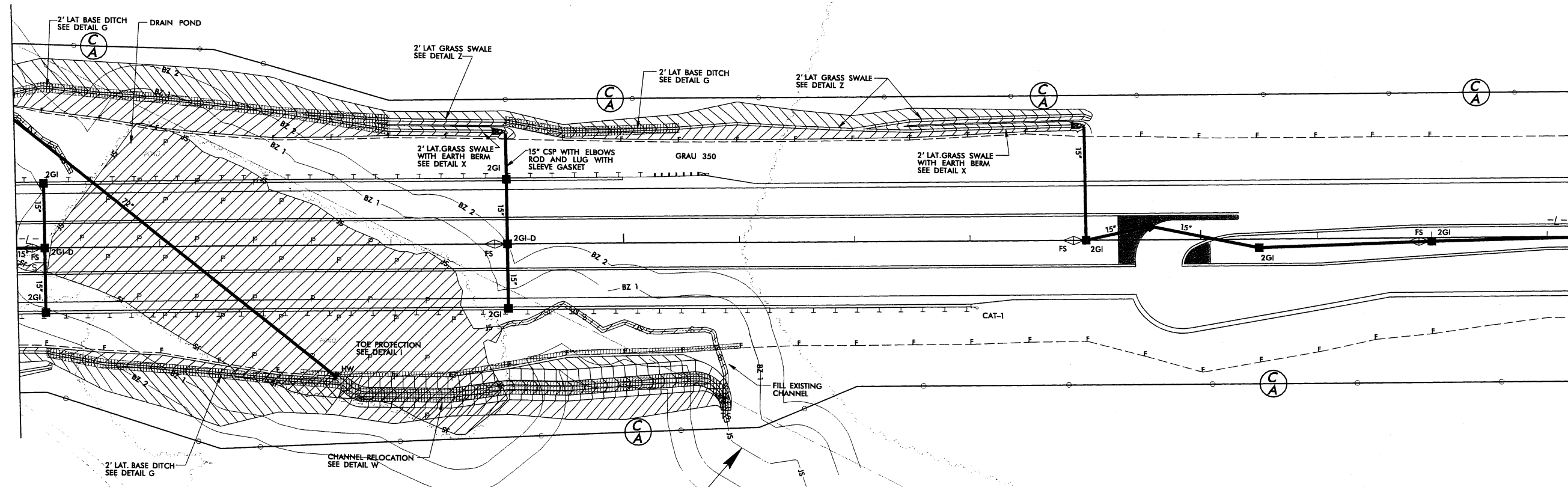


PROJECT REFERENCE NO. R-2814B	SHEET NO. 14
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION	

Permit Drawing
Sheet 30 of 64

- DENOTES IMPACTS IN SURFACE WATER
- DENOTES TEMPORARY IMPACTS IN SURFACE WATER
- DENOTES IMPACTS IN SURFACE WATER (POND)

SITE 9

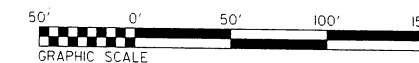


(22)
CAMERON E. SHEARON
&
BEVERLY W. SHEARON
DB 12258 PG 1051

(21)
MITCHELL F. RABIL FAMILY
IRREVOCABLE TRUST

GRASS SWALE DATA D			GRASS SWALE DATA F		
L- STA. 14800 TO STA. 14900 LT			L- STA. 15250 TO STA. 15400 LT		
DA	1.00	AC	DA	1.41	AC
SLOPE	2.20	%	SLOPE	0.50	%
L REQ	100	FT	L REQ	141	FT
L PROV	100	FT	L PROV	150	FT
Q2	2.86	CFS	Q2	3.57	CFS
V2	1.75	FT/S	V2	1.45	FT/S
D2	0.48	FT	D2	0.63	FT
Q10	3.70	CFS	Q10	4.63	CFS
V10	2.80	FT/S	V10	1.56	FT/S
D10	0.54	FT	D10	0.72	FT

UNAM TRIBUTARY
TO HARRIS CREEK



REVISIONS
REVISED NAMES ON PARCEL 22 PER LOCATION AND SURVEY REQUEST 4/23/09 DDL 7/29/09

145 150 155
21
22
ENGLISH
MITCHELL F. RABIL FAMILY IRREVOCABLE TRUST
CAMERON E. SHEARON & BEVERLY W. SHEARON DB 12258 PG 1051
UNAM TRIBUTARY TO HARRIS CREEK
50' 0' 50' 100' 150'
GRAPHIC SCALE

145

150

155



MITCHELL F. RABE FAMILY
IRREVOCABLE TRUST

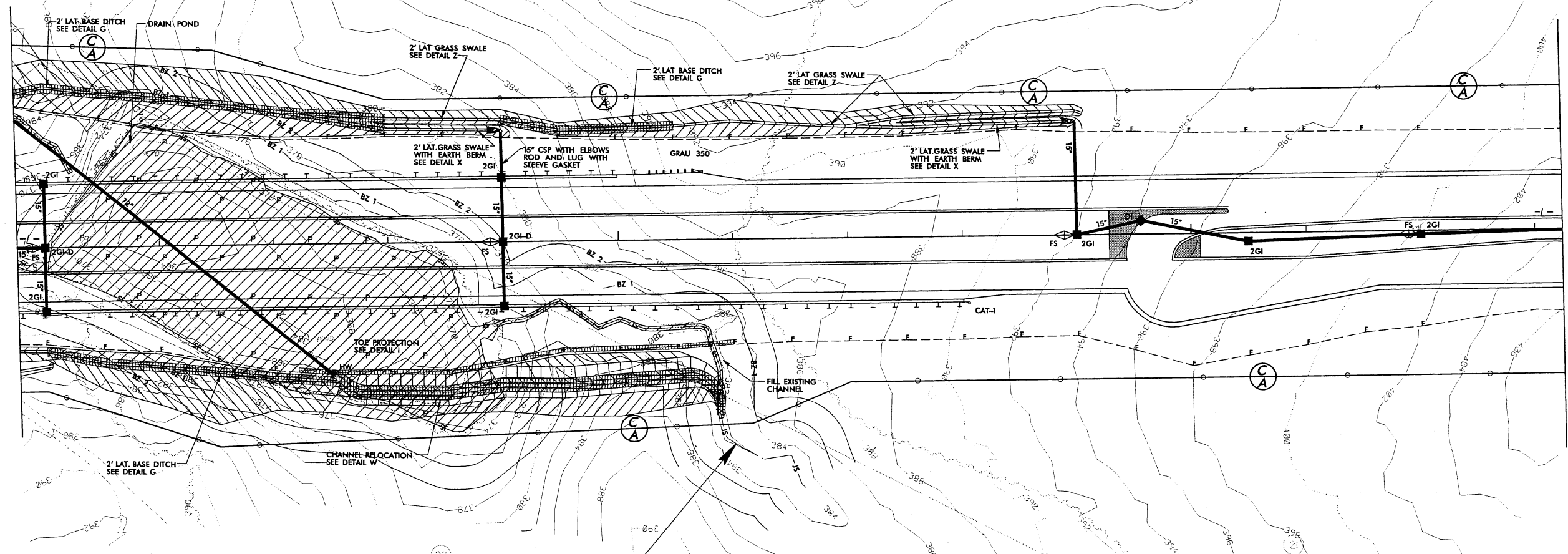


PROJECT REFERENCE NO. R-2814B	SHEET NO. 14
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION	

Permit Drawing
Sheet 31 of 64

- DENOTES IMPACTS IN SURFACE WATER
- DENOTES TEMPORARY IMPACTS IN SURFACE WATER
- DENOTES IMPACTS IN SURFACE WATER (POND)

SITE 9



GRASS SWALE DATA D		GRASS SWALE DATA F	
L-STA. 14800 TO STA. 14900 LT		L-STA. 15250 TO STA. 15400 LT	
DA	1.00 AC	DA	1.41 AC
SLOPE	2.20 %	SLOPE	0.50 %
L REQ	100 FT	L REQ	141 FT
L PROV	100 FT	L PROV	150 FT
Q2	2.86 CFS	Q2	3.57 CFS
V2	1.75 FT/S	V2	1.45 FT/S
D2	0.48 FT	D2	0.63 FT
Q10	3.70 CFS	Q10	4.63 CFS
V10	2.80 FT/S	V10	1.56 FT/S
D10	0.54 FT	D10	0.72 FT

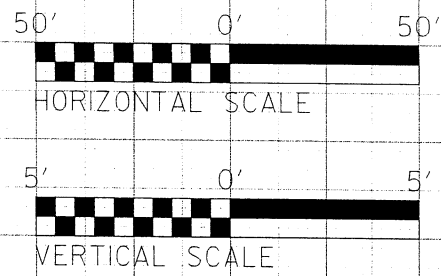
CAMERON E. SHEARUM
&
BEVERLY W. SHEARUM
UP 12298 PG 1051
**UNAMED TRIBUTARY
TO HARRIS CREEK**

MITCHELL F. RABE FAMILY
IRREVOCABLE TRUST



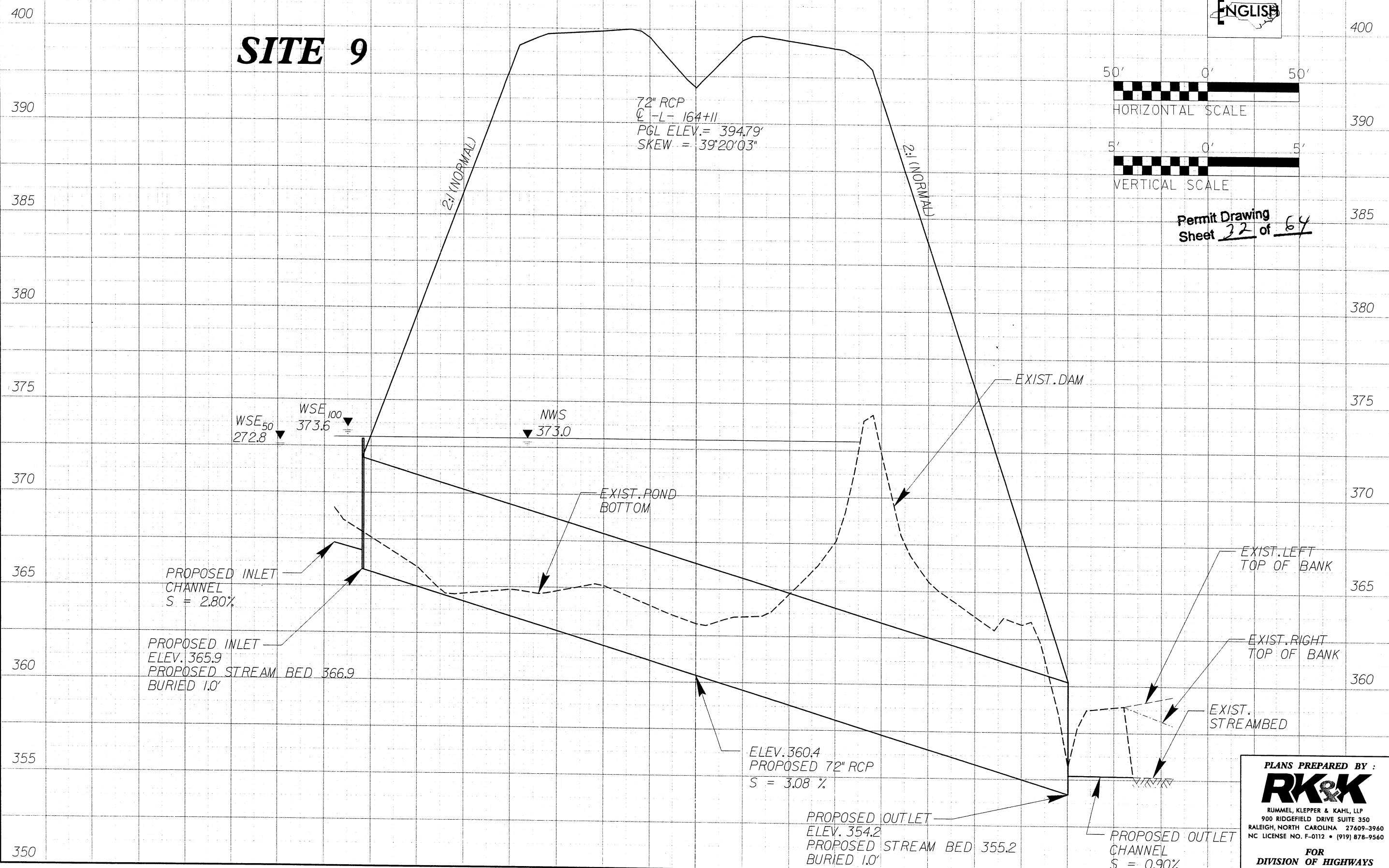
REVISIONS
REVISED NAMES ON PARCEL 22 PER LOCATION AND SURVEY REQUEST 4/23/09 DDL 7/29/09

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msb



Permit Drawing
Sheet 22 of 64

250 200 150 100 50 0 50 100 150 200 250



PLANS PREPARED BY :

RK&K

RUMMEL, KLEPPER & KAHL, LLP
900 RIDGEFIELD DRIVE SUITE 350
RALEIGH, NORTH CAROLINA 27609-3960
NC LICENSE NO. F-0112 • (919) 878-9560

FOR
DIVISION OF HIGHWAYS

8/17/95

35

190

195

PROJECT REFERENCE NO. R-2814B		SHEET NO. 17	
RDW SHEET NO.		HYDRAULICS ENGINEER	
ROADWAY DESIGN ENGINEER		HYDRAULICS ENGINEER	
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION			



DENOTES IMPACTS IN SURFACE WATER (POND)

Permit Drawing Sheet 37 of 64

33
R.S. WALL HERE

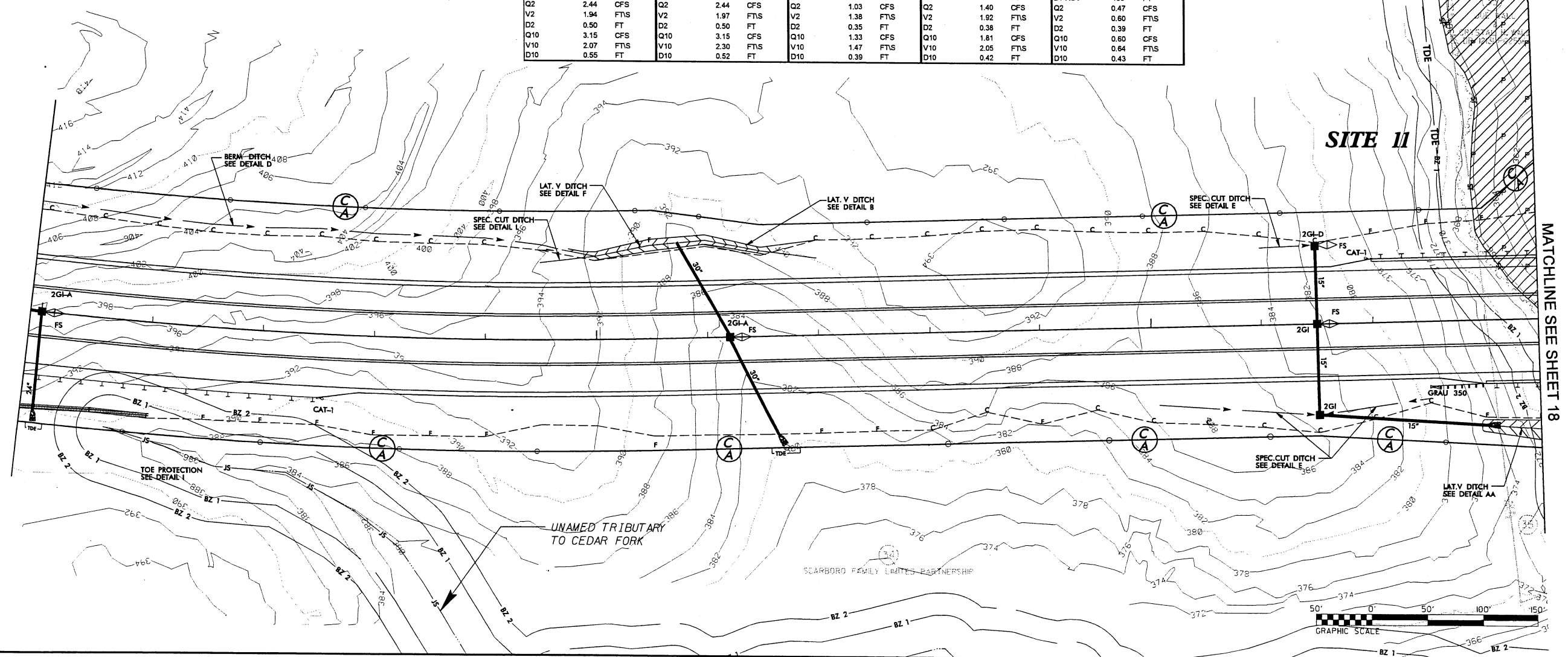
34
SCARBORO FAMILY LIMITED PARTNERSHIP

GRASS SWALE DATA B L- STA. 19550 TO STA. 19600 LT		GRASS SWALE DATA C L- STA. 19600 TO STA. 19650 LT		GRASS SWALE DATA E L- STA. 19550 TO STA. 19650 CL		GRASS SWALE DATA G L- STA. 19500 TO STA. 19650 RT		GRASS SWALE DATA H L- STA. 19650 TO STA. 19750 RT	
DA	0.73 AC	DA	0.73 AC	DA	0.54 AC	DA	0.42 AC	DA	0.14 AC
SLOPE	1.76 %	SLOPE	2.34 %	SLOPE	1.78 %	SLOPE	3.16 %	SLOPE	0.30 %
L REQ	50 FT	L REQ	23 FT	L REQ	54 FT	L REQ	42 FT	L REQ	14 FT
L PROV	50 FT	L PROV	50 FT	L PROV	100 FT	L PROV	150 FT	L PROV	100 FT
Q2	2.44 CFS	Q2	2.44 CFS	Q2	1.03 CFS	Q2	1.40 CFS	Q2	0.47 CFS
V2	1.94 FT/S	V2	1.97 FT/S	V2	1.38 FT/S	V2	1.92 FT/S	V2	0.60 FT/S
D2	0.50 FT	D2	0.50 FT	D2	0.35 FT	D2	0.38 FT	D2	0.39 FT
Q10	3.15 CFS	Q10	3.15 CFS	Q10	1.33 CFS	Q10	1.81 CFS	Q10	0.60 CFS
V10	2.07 FT/S	V10	2.30 FT/S	V10	1.47 FT/S	V10	2.05 FT/S	V10	0.64 FT/S
D10	0.55 FT	D10	0.52 FT	D10	0.39 FT	D10	0.42 FT	D10	0.43 FT

REVISIONS

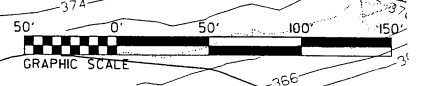
REVISED NAMES ON PARCEL 35 PER LOCATION AND SURVEY REQUEST 4/23/09 DDL 7/29/09

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SITE II

MATCHLINE SEE SHEET 18

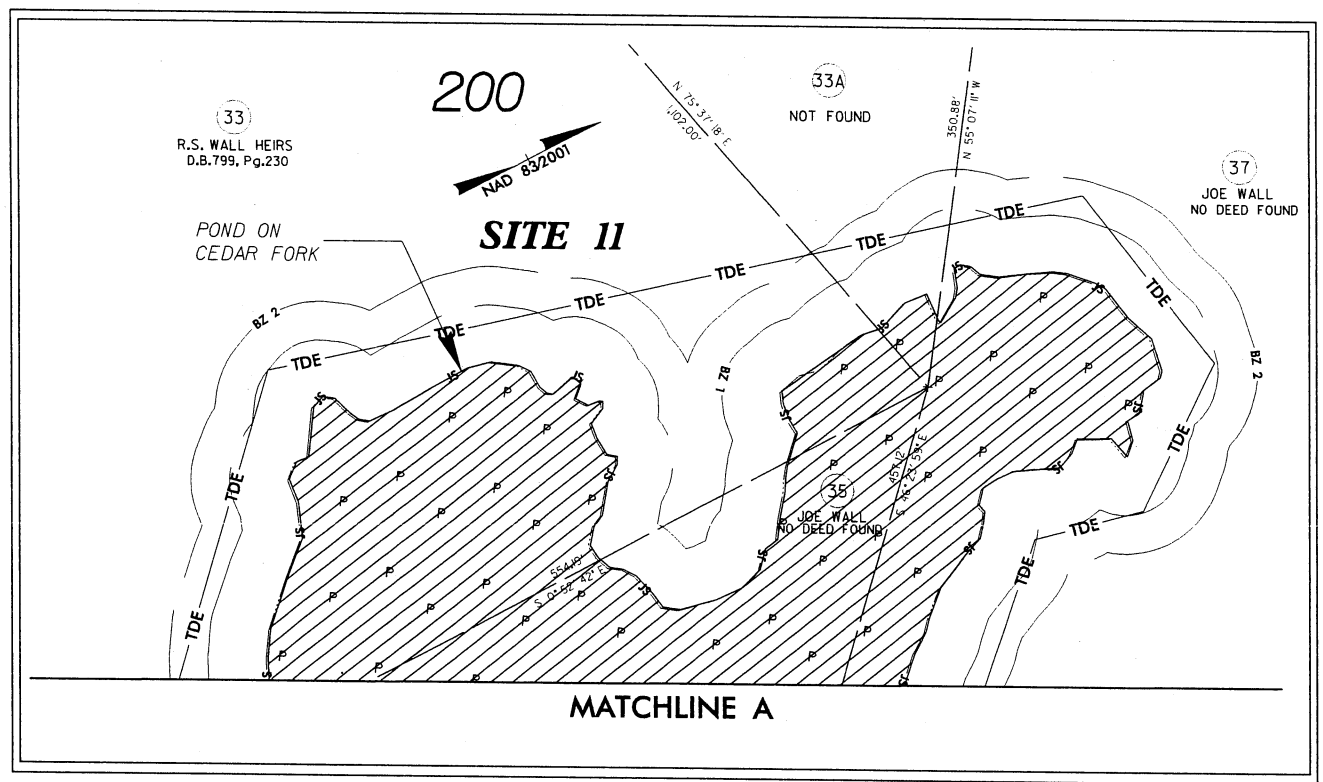


MATCHLINE A

PROJECT REFERENCE NO. R-2814B	SHEET NO. 18
ROADWAY DESIGN ENGINEER PERMIT DRAWING	HYDRAULICS ENGINEER
PRELIMINARY PLANS <small>DO NOT USE FOR CONSTRUCTION</small>	

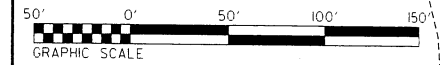
Permit Drawing
Sheet **35** of **64**

DENOTES TEMPORARY IMPACTS IN SURFACE WATER
 DENOTES IMPACTS IN SURFACE WATER (POND)

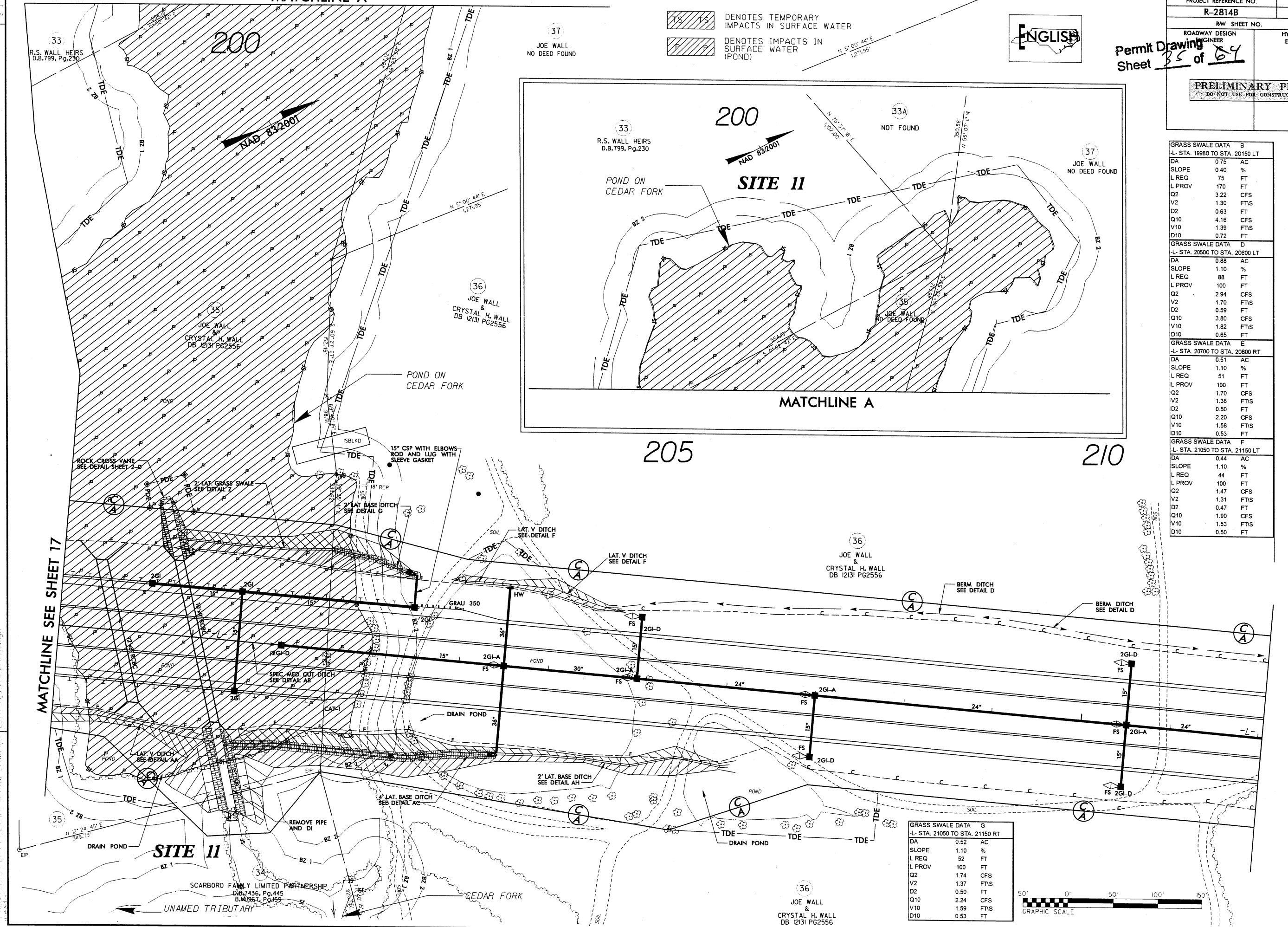


GRASS SWALE DATA B	
-L- STA. 19980 TO STA. 20150 LT	
DA	0.75 AC
SLOPE	0.40 %
L REQ	75 FT
L PROV	170 FT
Q2	3.22 CFS
V2	1.30 FTS
D2	0.63 FT
Q10	4.16 CFS
V10	1.39 FTS
D10	0.72 FT
GRASS SWALE DATA D	
-L- STA. 20500 TO STA. 20600 LT	
DA	0.88 AC
SLOPE	1.10 %
L REQ	88 FT
L PROV	100 FT
Q2	2.94 CFS
V2	1.70 FTS
D2	0.59 FT
Q10	3.80 CFS
V10	1.82 FTS
D10	0.65 FT
GRASS SWALE DATA E	
-L- STA. 20700 TO STA. 20800 RT	
DA	0.51 AC
SLOPE	1.10 %
L REQ	51 FT
L PROV	100 FT
Q2	1.70 CFS
V2	1.36 FTS
D2	0.50 FT
Q10	2.20 CFS
V10	1.58 FTS
D10	0.53 FT
GRASS SWALE DATA F	
-L- STA. 21050 TO STA. 21150 LT	
DA	0.44 AC
SLOPE	1.10 %
L REQ	44 FT
L PROV	100 FT
Q2	1.47 CFS
V2	1.31 FTS
D2	0.47 FT
Q10	1.90 CFS
V10	1.53 FTS
D10	0.50 FT

GRASS SWALE DATA G	
-L- STA. 21050 TO STA. 21150 RT	
DA	0.52 AC
SLOPE	1.10 %
L REQ	52 FT
L PROV	100 FT
Q2	1.74 CFS
V2	1.37 FTS
D2	0.50 FT
Q10	2.24 CFS
V10	1.59 FTS
D10	0.53 FT



REVISIONS
REVISED NAMES ON PARCELS 35 AND 36 PER LOCATION AND SURVEY REQUEST 4/23/09 DDL 7/29/09



MATCHLINE SEE SHEET 17

33
R.S. WALL HEIRS
D.B.799, Pg.230

37
JOE WALL
NO DEED FOUND

33
R.S. WALL HEIRS
D.B.799, Pg.230

33A
NOT FOUND

37
JOE WALL
NO DEED FOUND

36
JOE WALL
&
CRYSTAL H. WALL
DB 12131 PG2556

35
JOE WALL
&
CRYSTAL H. WALL
DB 12131 PG2556

36
JOE WALL
&
CRYSTAL H. WALL
DB 12131 PG2556

35
11 12° 28' 45" E
349.75

SITE 11

SCARBORO FAMILY LIMITED PARTNERSHIP
D.B.7436, Pg.445
B.M.1967, Pg.159

36
JOE WALL
&
CRYSTAL H. WALL
DB 12131 PG2556

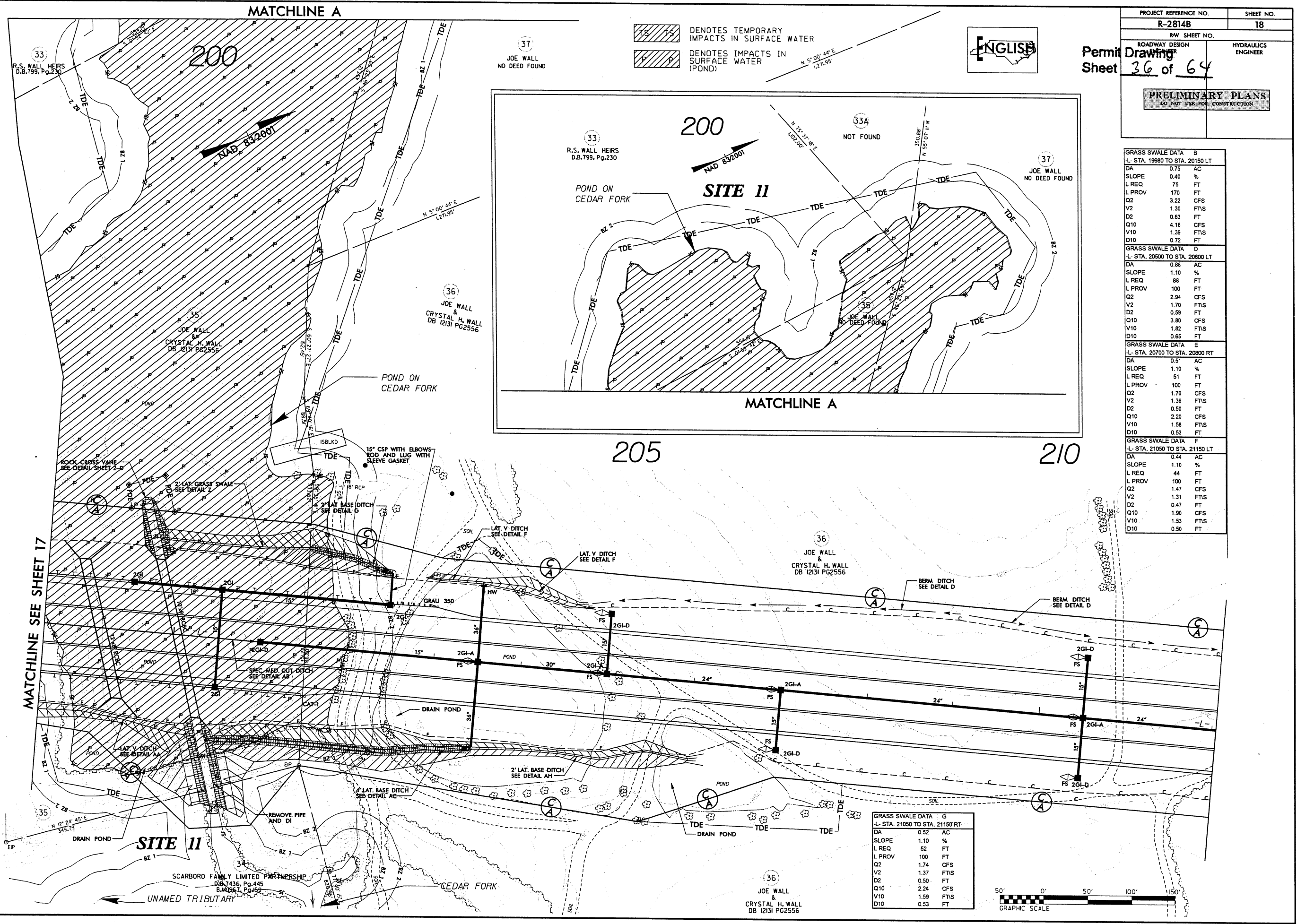
UNAMED TRIBUTARY

CEEDAR FORK

8/17/99

REVISIONS
REVISED NAMES ON PARCELS 35 AND 36 PER LOCATION AND SURVEY REQUEST 4/23/09 DDL 7/29/09

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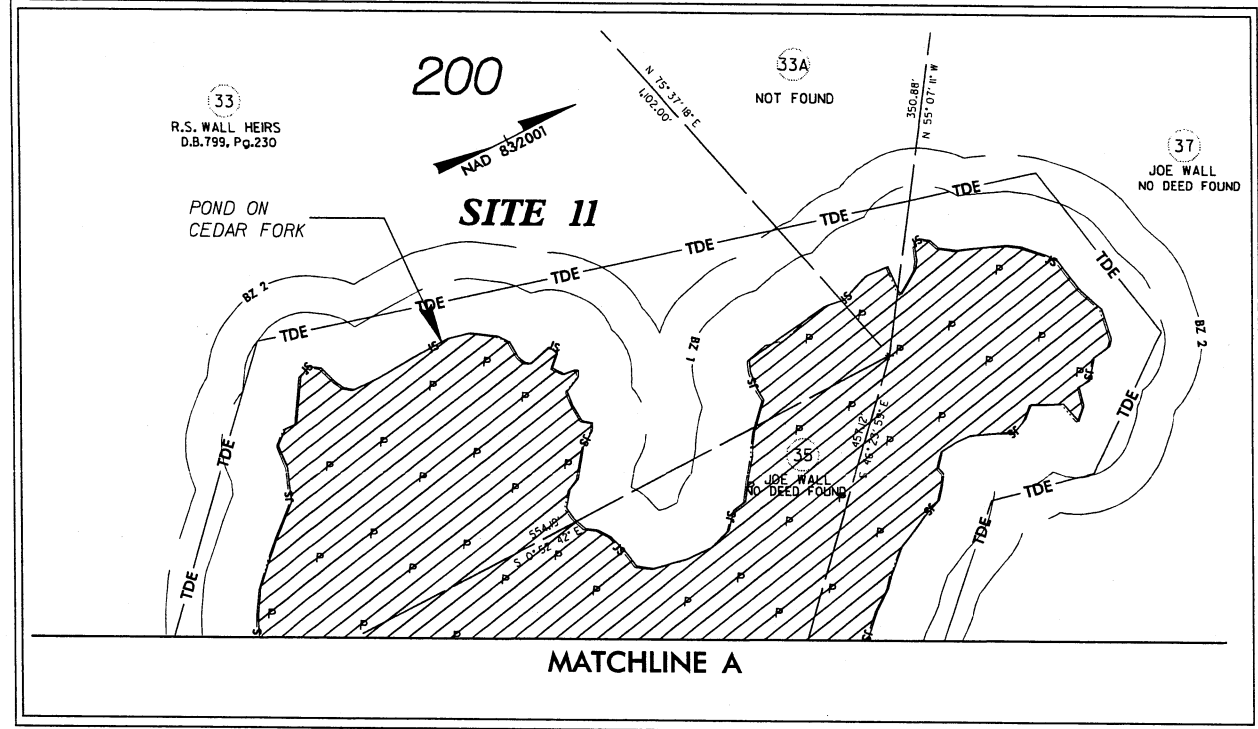


DENOTES TEMPORARY IMPACTS IN SURFACE WATER
 DENOTES IMPACTS IN SURFACE WATER (POND)



Permit Sheet
 Drawing 36 of 64

PROJECT REFERENCE NO. R-2814B	SHEET NO. 18
ROADWAY DESIGN DRAWING	HYDRAULICS ENGINEER
PRELIMINARY PLANS <small>DO NOT USE FOR CONSTRUCTION</small>	



GRASS SWALE DATA B
-L- STA. 19980 TO STA. 20150 LT

DA	0.75	AC
SLOPE	0.40	%
L REQ	75	FT
L PROV	170	FT
Q2	3.22	CFS
V2	1.30	FT/S
D2	0.63	FT
Q10	4.16	CFS
V10	1.39	FT/S
D10	0.72	FT

GRASS SWALE DATA D
-L- STA. 20500 TO STA. 20600 LT

DA	0.88	AC
SLOPE	1.10	%
L REQ	88	FT
L PROV	100	FT
Q2	2.94	CFS
V2	1.70	FT/S
D2	0.59	FT
Q10	3.80	CFS
V10	1.82	FT/S
D10	0.65	FT

GRASS SWALE DATA E
-L- STA. 20700 TO STA. 20800 RT

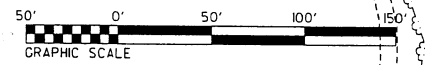
DA	0.51	AC
SLOPE	1.10	%
L REQ	51	FT
L PROV	100	FT
Q2	1.70	CFS
V2	1.36	FT/S
D2	0.50	FT
Q10	2.20	CFS
V10	1.58	FT/S
D10	0.53	FT

GRASS SWALE DATA F
-L- STA. 21050 TO STA. 21150 LT

DA	0.44	AC
SLOPE	1.10	%
L REQ	44	FT
L PROV	100	FT
Q2	1.47	CFS
V2	1.31	FT/S
D2	0.47	FT
Q10	1.90	CFS
V10	1.53	FT/S
D10	0.50	FT

GRASS SWALE DATA G
-L- STA. 21050 TO STA. 21150 RT

DA	0.52	AC
SLOPE	1.10	%
L REQ	52	FT
L PROV	100	FT
Q2	1.74	CFS
V2	1.37	FT/S
D2	0.50	FT
Q10	2.24	CFS
V10	1.59	FT/S
D10	0.53	FT



MATCHLINE SEE SHEET 17

SITE II

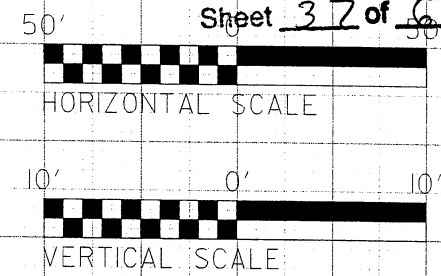
SCARBORO FAMILY LIMITED PARTNERSHIP
 DB 7436, Pg. 445
 B.M. 1967, Pg. 452

CEDAR FORK
 UNAMED TRIBUTARY

36
 JOE WALL &
 CRYSTAL H. WALL
 DB 12131 PG2556

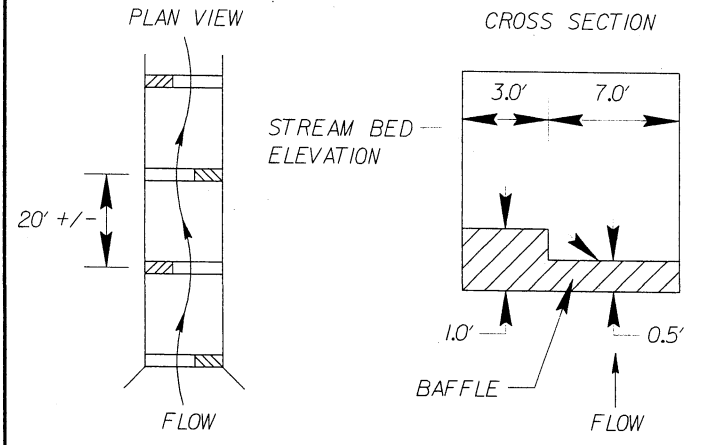


Permit Drawing
Sheet 37 of 54

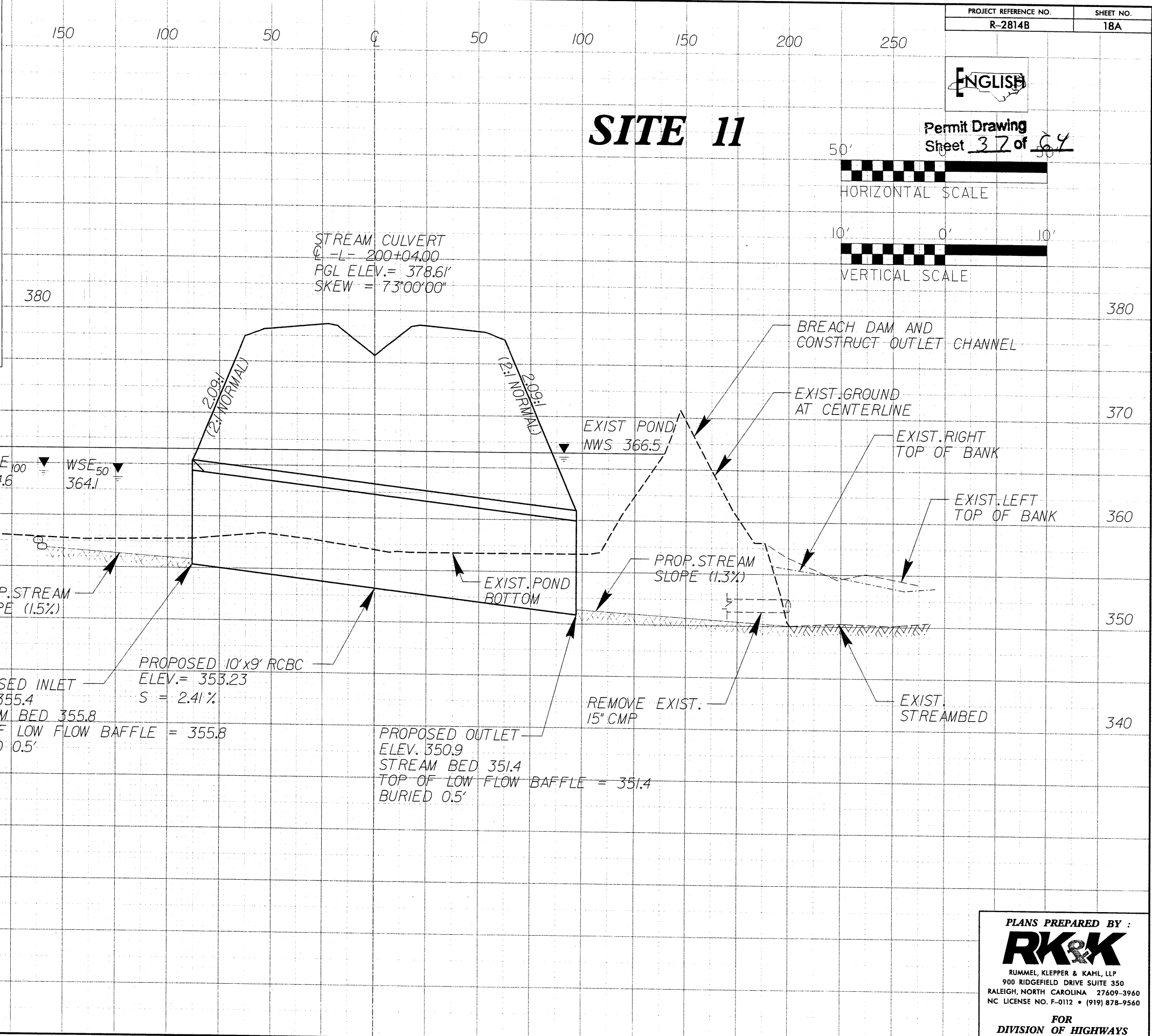


SITE 11

BAFFLE DETAILS

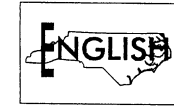


ALTERNATE BAFFLE SECTIONS TO FORCE STREAM TO MEANDER LEFT TO RIGHT ALONG THE LENGTH OF THE CULVERT.
PLACE BED MATERIAL TO TOP OF BAFFLE ELEVATION. STOCKPILE EXCEVATED BED MATERIAL FROM SITE IF AVAILABLE AND USE IN CULVERT. OTHERWISE, USE CLASS B RIP-RAP



215

220



PROJECT REFERENCE NO. R-2814B	SHEET NO. 19
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION	



(36)
JOE WALL
&
CRYSTAL H. WALL
DB 12131 PG2556

GRASS SWALE DATA		H
L- STA.	21350 TO STA.	21450 LT
DA	0.49	AC
SLOPE	1.10	%
L REQ	49	FT
L PROV	100	FT
Q2	1.64	CFS
V2	1.35	FT/S
D2	0.49	FT
Q10	2.11	CFS
V10	1.57	FT/S
D10	0.52	FT

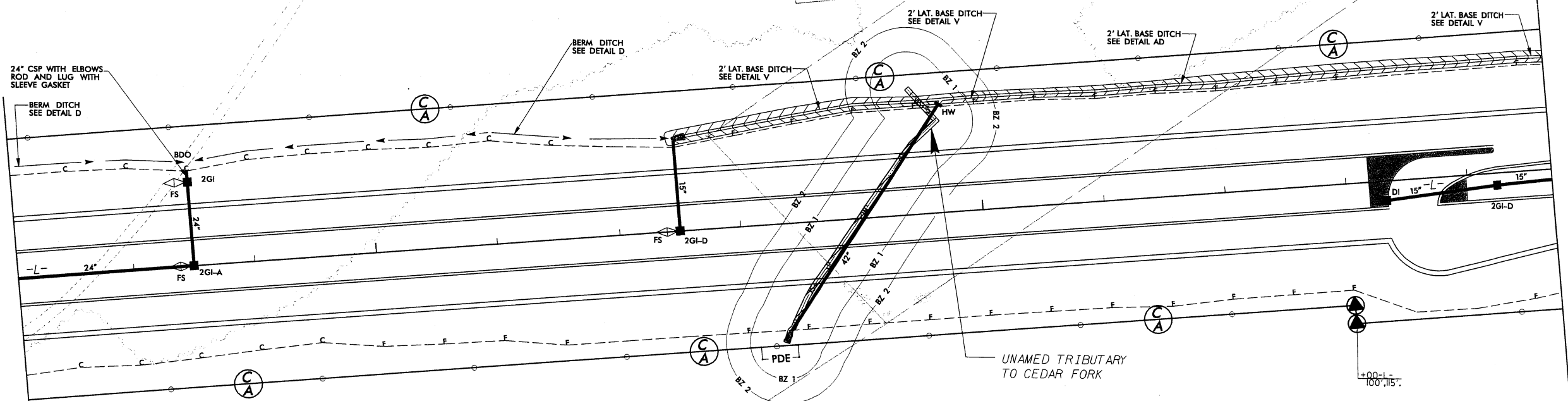
DENOTES IMPACTS IN SURFACE WATER

Permit Drawing
Sheet 38 of 64

(38)
BOBBIE JOE WALL & VICKIE D. WALL

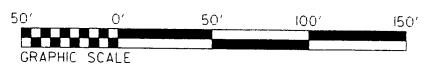
SITE 12

REVISIONS
 January 11, 2010: Adjusted R/W CA lines, R/W markers and the proposed woven wire fence on parcel no. 39, MWA.



(36)
JOE WALL
&
CRYSTAL H. WALL
DB 12131 PG2556

(39)
THE SBJ GROWTH, L.P.



8/17/99

215

220



PROJECT REFERENCE NO. R-2814B	SHEET NO. 19
R/W SHEET NO. ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION	



35
JOE WALL & CRYSTAL H. WALL OF 1031 P02556

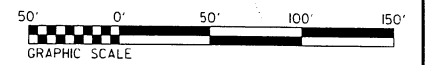
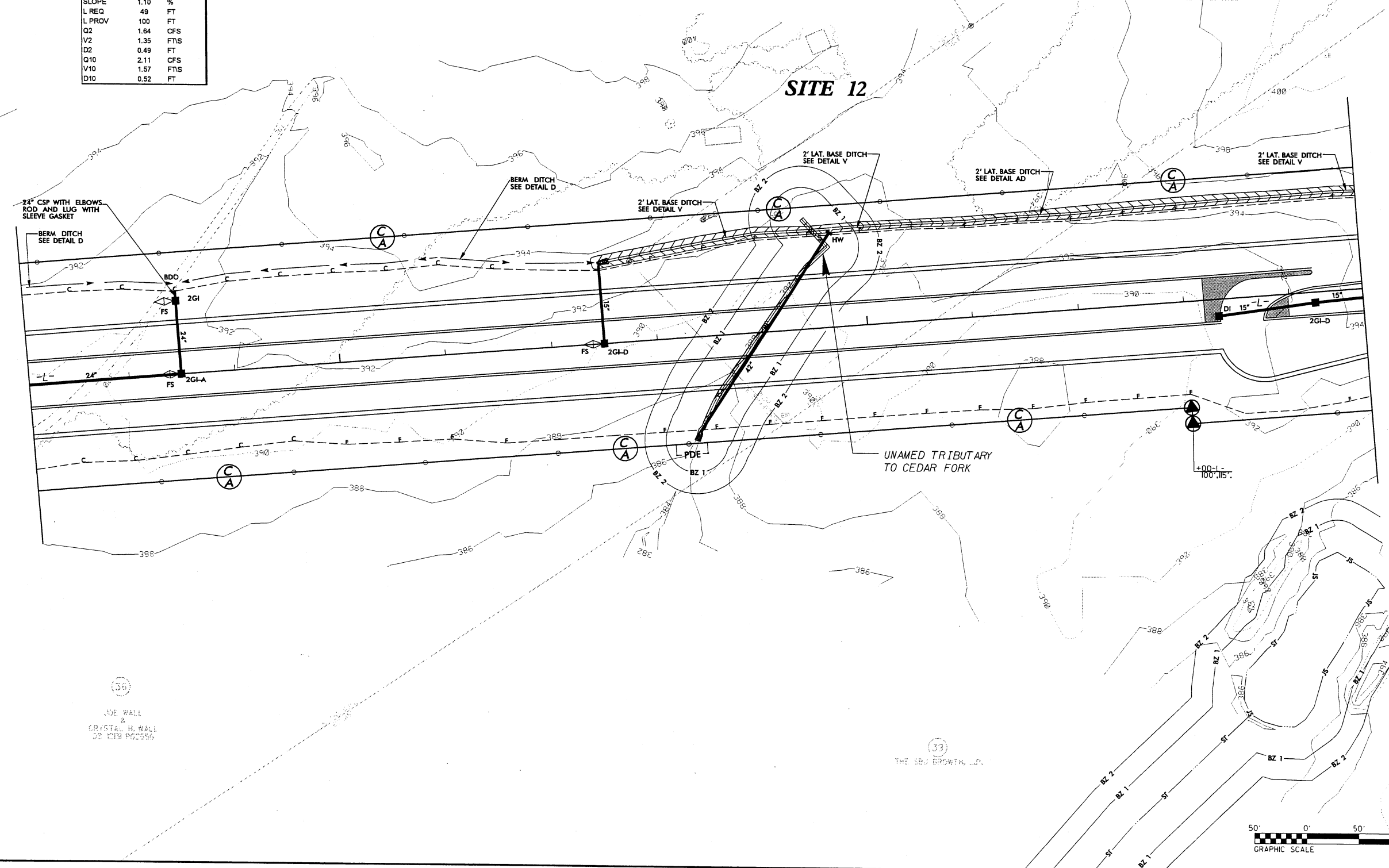
DENOTES IMPACTS IN SURFACE WATER

GRASS SWALE DATA		H
L- STA. 21350 TO STA. 21450 LT		
DA	0.49	AC
SLOPE	1.10	%
L REQ	49	FT
L PROV	100	FT
Q2	1.64	CFS
V2	1.35	FT/S
D2	0.49	FT
Q10	2.11	CFS
V10	1.57	FT/S
D10	0.52	FT

Permit Drawing Sheet 39 of 64

REVISIONS
January 11, 2010: Adjusted R/W CA lines, R/W markers and the proposed woven wire fence on parcel no. 39, 11A.

02/22/10 10:34:53
C:\Hydra\autocad\per_mits\environmental\drawings\2814b_hyd_wet_con-prm_19.dgn
19.dgn



225

BOBBIE JOE WAHALL VICKIE D. WALL

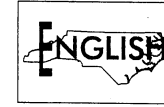
230

THE SBJ GROWTH, L.P.

235

THE SBJ GROWTH, L.P.

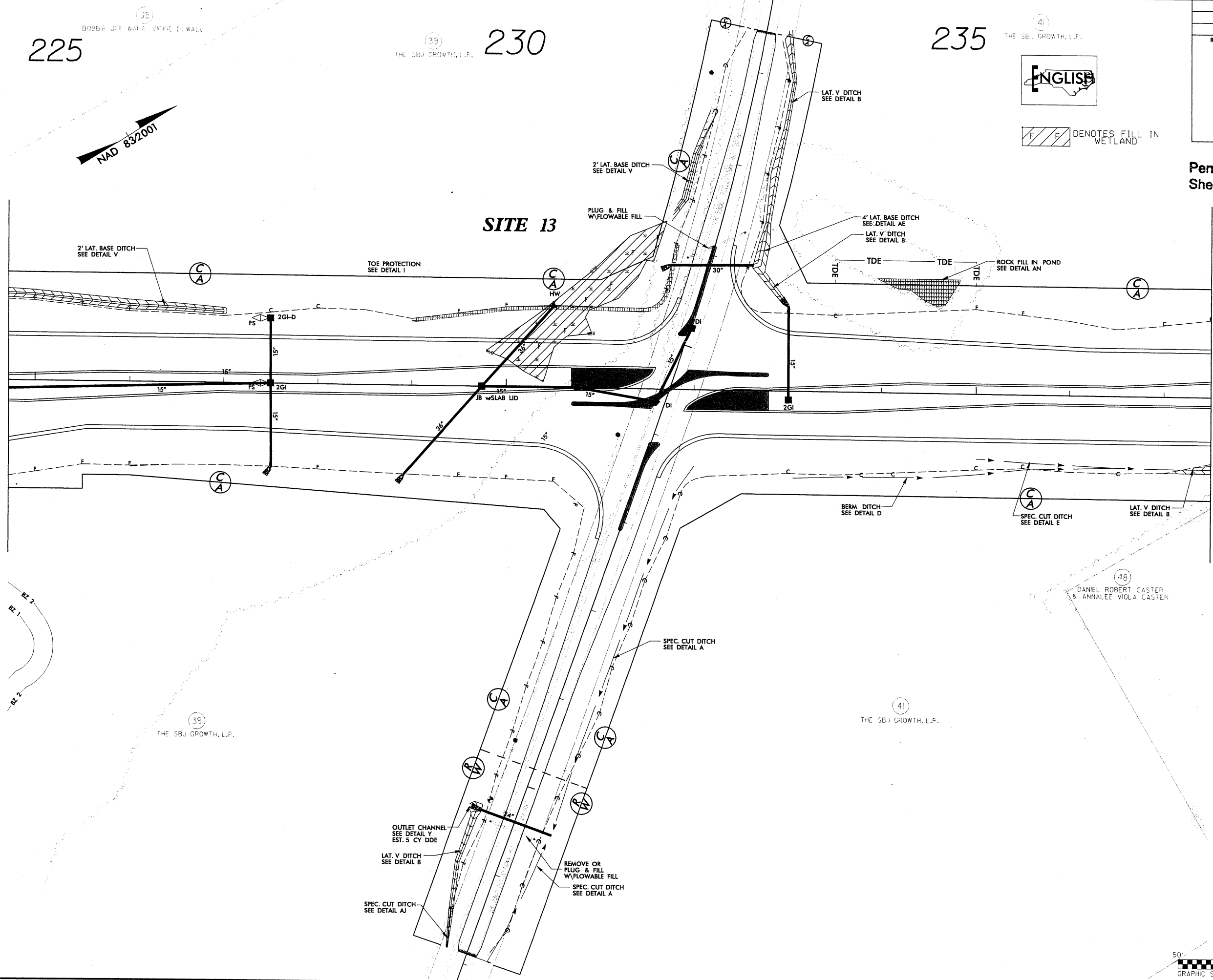
PROJECT REFERENCE NO. R-2814B		SHEET NO. 20	
RAW SHEET NO.			
ROADWAY DESIGN ENGINEER		HYDRAULICS ENGINEER	
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION			



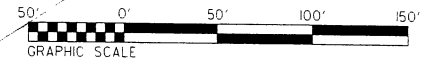
F F DENOTES FILL IN WETLAND

Permit Drawing
Sheet 40 of 64

SITE 13



REVISIONS
 January 11, 2010: Adjusted R/W CA lines, R/W markers and the proposed woven wire fence on parcel no. 39, NNA.



8/17/94

225

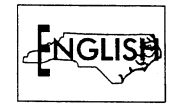
230

235



PROJECT REFERENCE NO. R-2814B	SHEET NO. 20
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION	

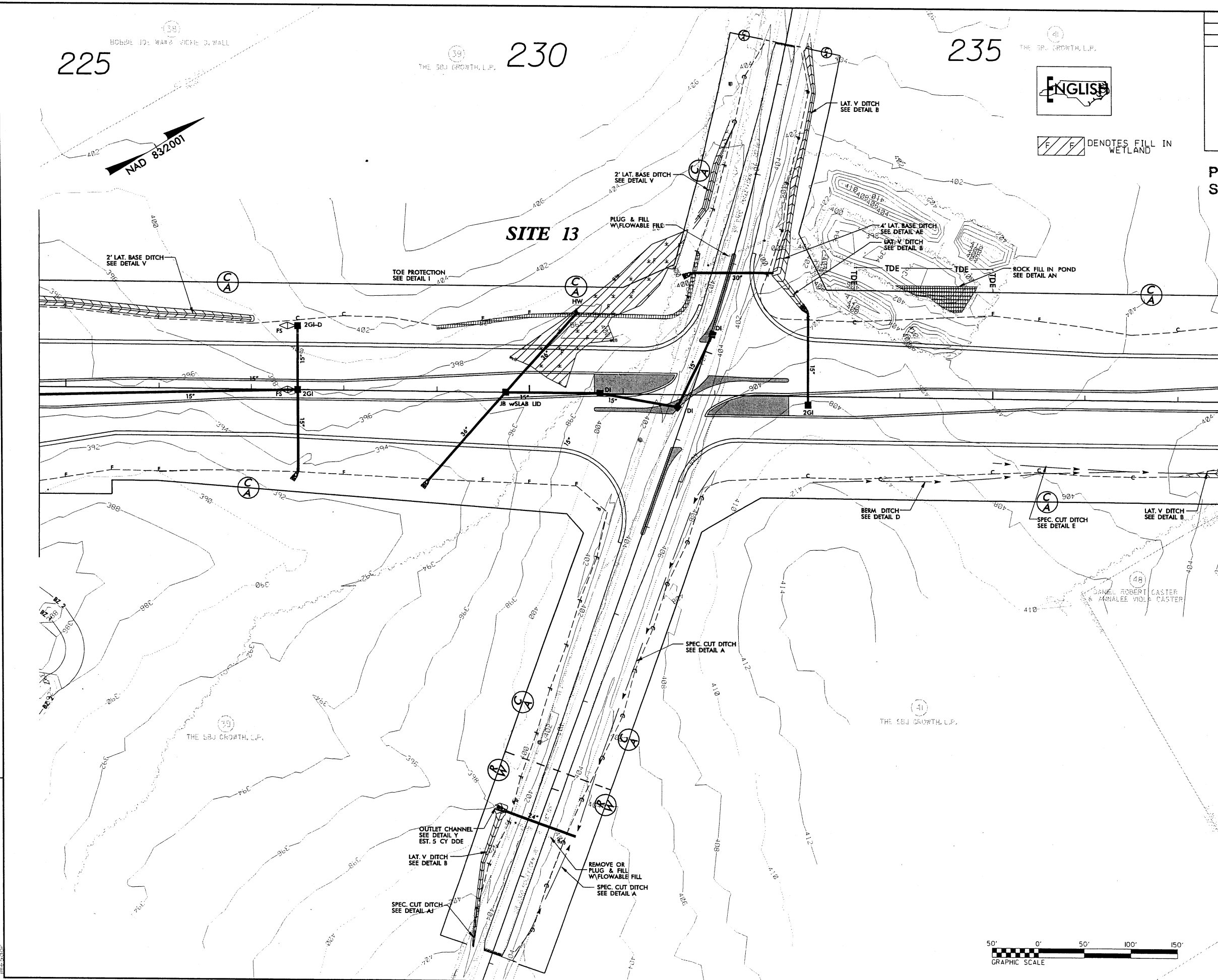
Permit Drawing
Sheet 41 of 64



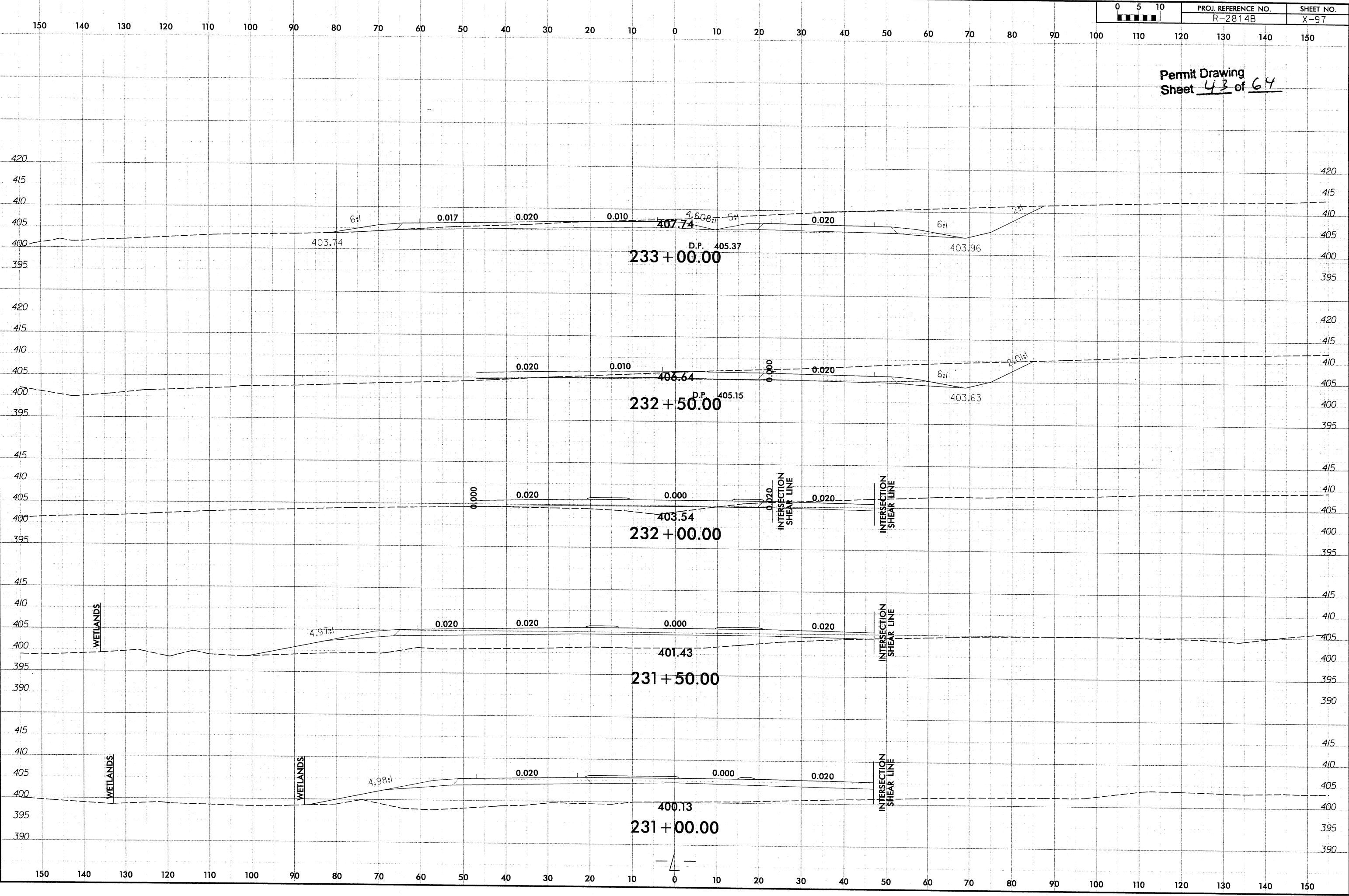
DENOTES FILL IN WETLAND

REVISIONS
January 11, 2010: Adjusted R/W CA lines, R/W markers and the proposed woven wire fence on parcel no. 39, MVA

02/22/10: JUS56/06
P2: High Quality's permits_environmental\vdw-arwings\12814b_hyd_wet_con-prm_20.dgn
msw



Permit Drawing
Sheet 43 of 64



11/05/08
 R. H. HARRIS, P.E.
 PROJECT: Environmental Drawings
 SHEET: 43 of 64

240

245

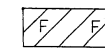
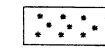
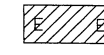
250

PROJECT REFERENCE NO. R-2814B	SHEET NO. 21
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION	



(41)
THE SBJ GROWTH, L.P.

(49)
ROBERT G. BARTHOLOMEW
& JOYCE BARTHOLOMEW

-  DENOTES FILL IN WETLAND
-  DENOTES MECHANIZED CLEARING
-  DENOTES EXCAVATION IN WETLAND

Permit Drawing
Sheet 44 of 64

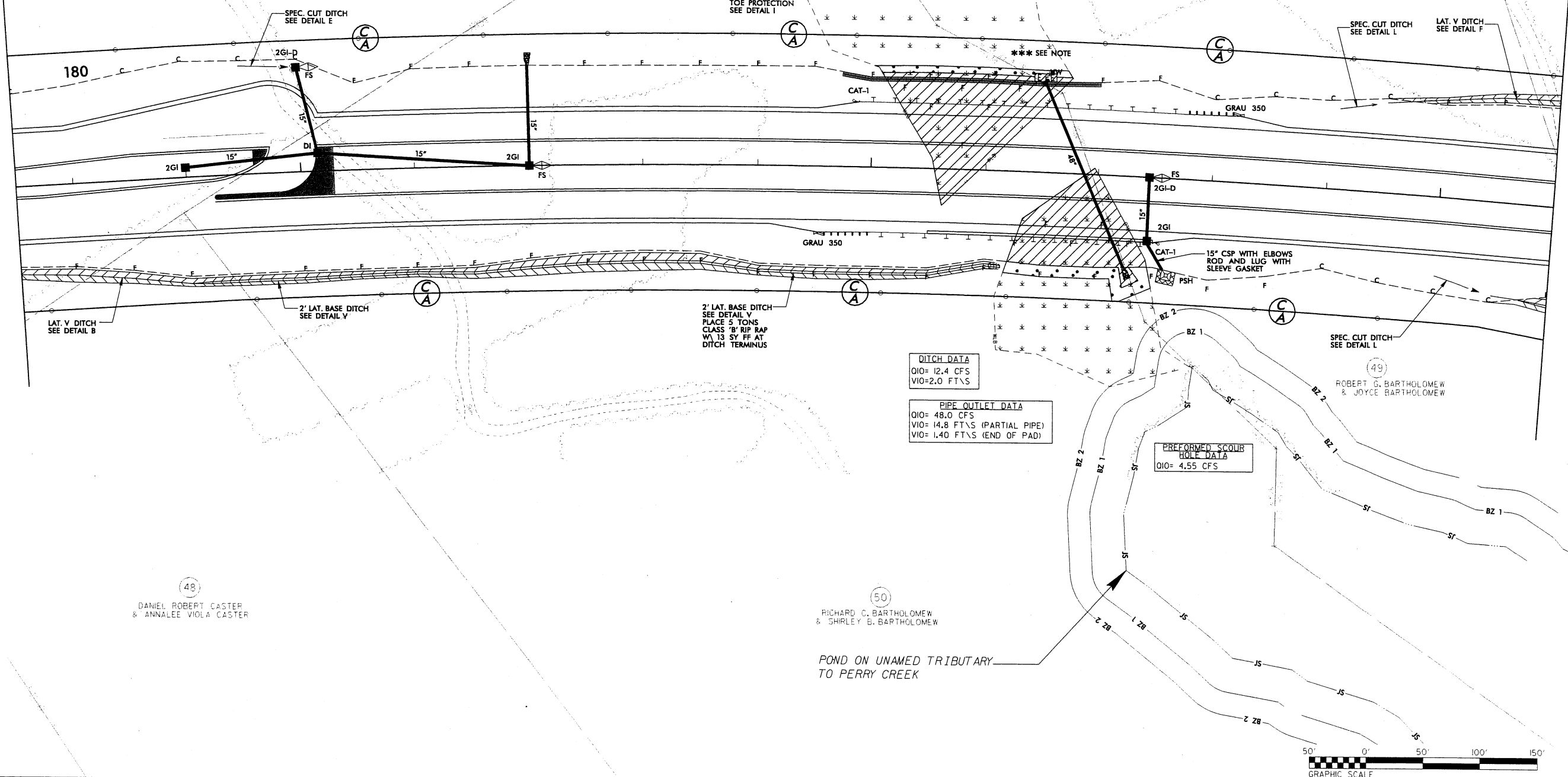
*** NOTE: THE INLET INVERT OF THE PROPOSED PIPE AT -L- 246+87 SHOULD BE SET TO 385.3 TO MAINTAIN NORMAL WATER LEVEL IN THE EXISTING WETLAND. THE INLET INVERT OF THE PIPE SHOULD NOT BE FIELD ADJUSTED. DO NOT BURY OUTLET OF PIPE BELOW EXISTING GROUND.

SITE 14

(50)
RICHARD C. BARTHOLOMEW
& SHIRLEY B. BARTHOLOMEW

(51)
ROBERT G. BARTHOLOMEW
& JOYCE BARTHOLOMEW

REVISIONS
REVISED PARCELS 49 AND 50 PER LOCATION AND SURVEY REQUEST 4/23/09 DDL 7/29/09



DITCH DATA
Q10= 12.4 CFS
V10= 2.0 FT/S

PIPE OUTLET DATA
Q10= 48.0 CFS
V10= 14.8 FT/S (PARTIAL PIPE)
V10= 1.40 FT/S (END OF PAD)

PREFORMED SCOUR HOLE DATA
Q10= 4.55 CFS

2' LAT. BASE DITCH
SEE DETAIL V
PLACE 5 TONS
CLASS 'B' RIP RAP
W/ 13 SY FF AT
DITCH TERMINUS

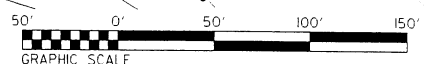
2' LAT. BASE DITCH
SEE DETAIL Y

LAT. V DITCH
SEE DETAIL B

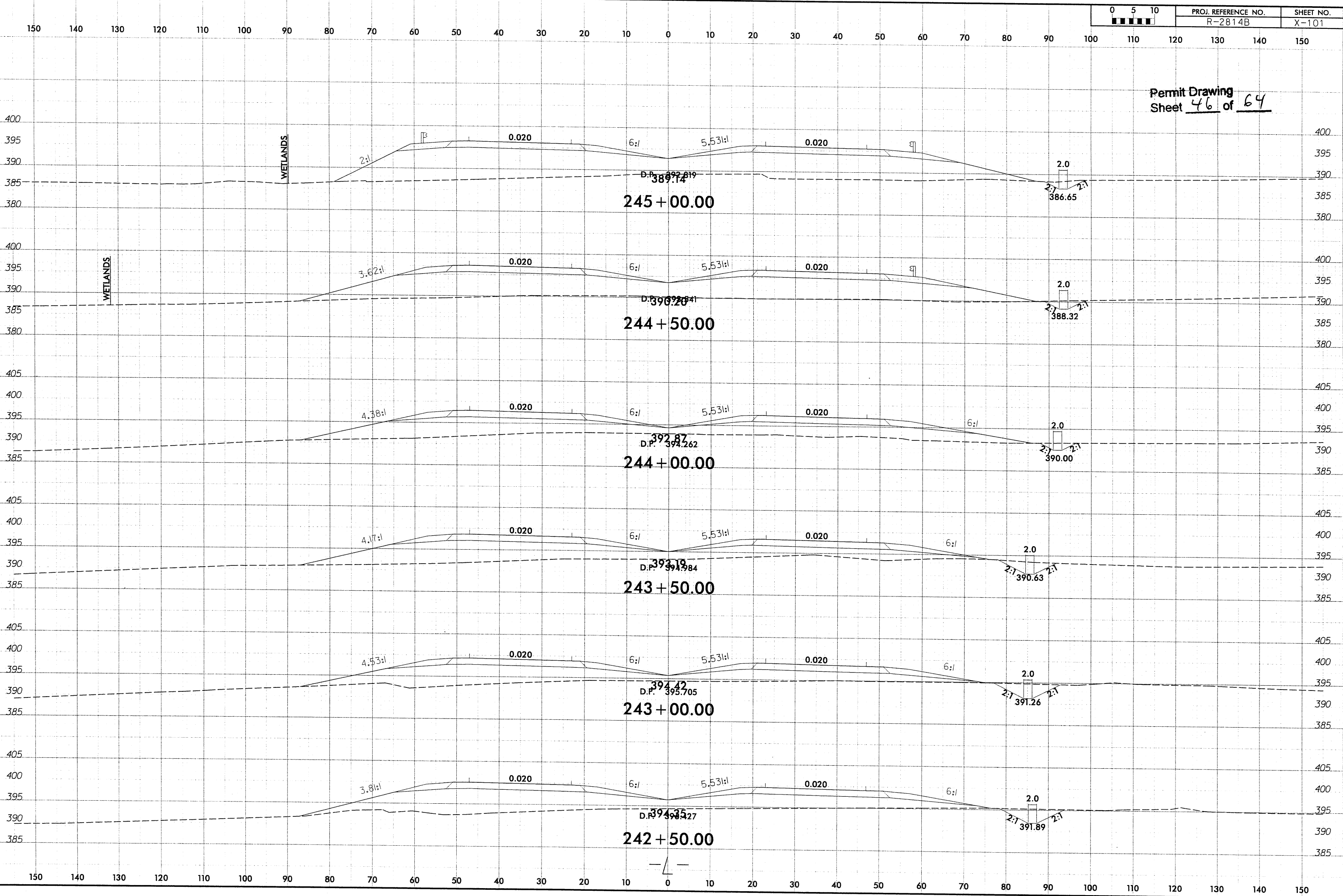
(48)
DANIEL ROBERT CASTER
& ANNALEE VIOLA CASTER

(50)
RICHARD C. BARTHOLOMEW
& SHIRLEY B. BARTHOLOMEW

POND ON UNAMED TRIBUTARY
TO PERRY CREEK



Permit Drawing
Sheet 46 of 64



11/20/09 10:06:00
 P:\Highways\Projects\Environmental Drawings\supersn\243ab.dwg 1 - plot.dgn
 Page

PROJECT REFERENCE NO. R-2814B	SHEET NO. 22
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION	

255

260

MICHAEL BARTHOLOMEW

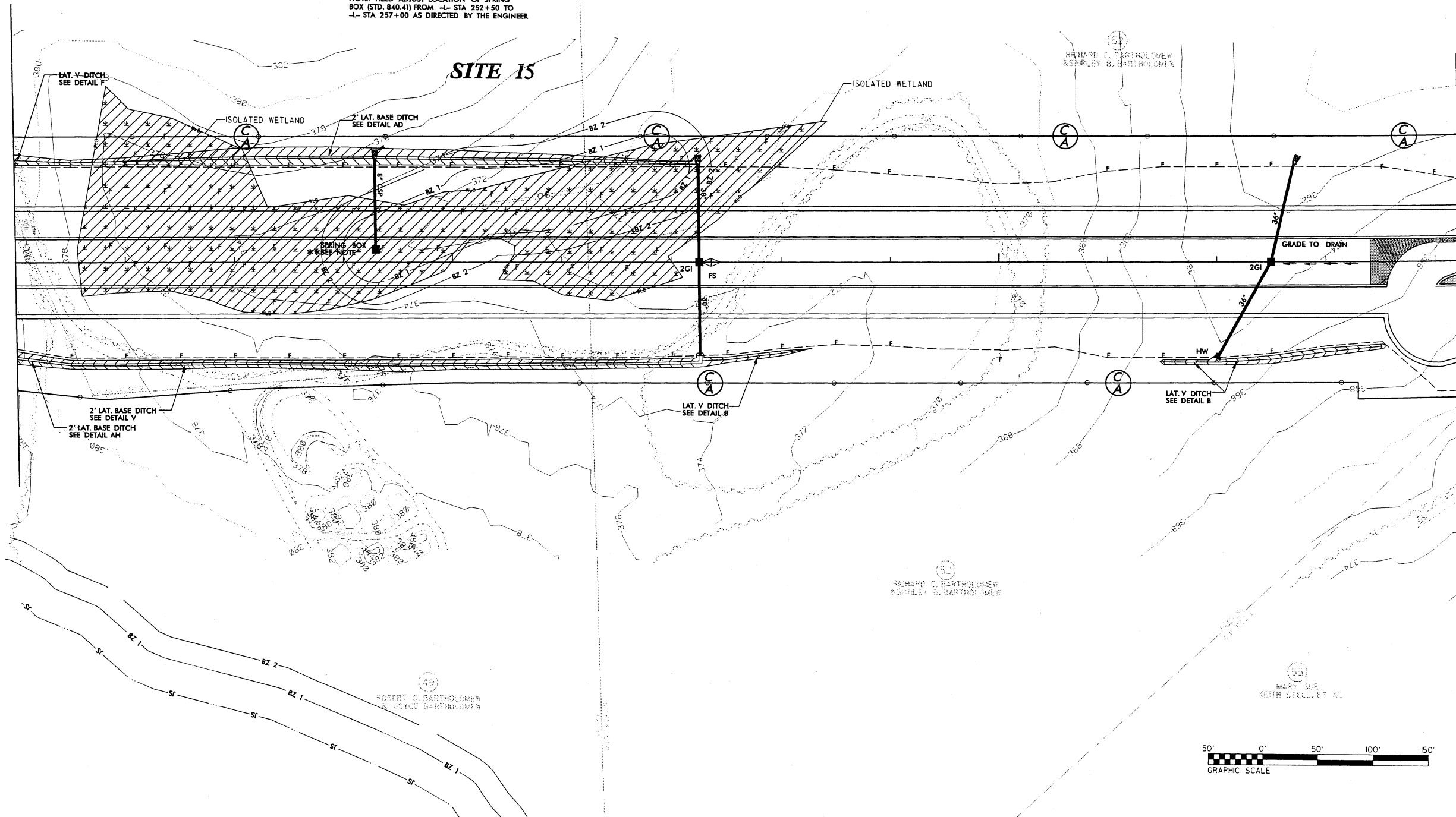


DENOTES FILL IN WETLAND

Permit Drawing
Sheet 49 of 64

** NOTE: FIELD ADJUST LOCATION OF SPRING BOX (STD. 840.41) FROM -L- STA 252+50 TO -L- STA 257+00 AS DIRECTED BY THE ENGINEER

SITE 15

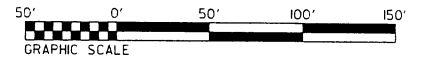


RICHARD C. BARTHOLOMEW & SHARLEY B. BARTHOLOMEW

RICHARD C. BARTHOLOMEW & SHARLEY B. BARTHOLOMEW

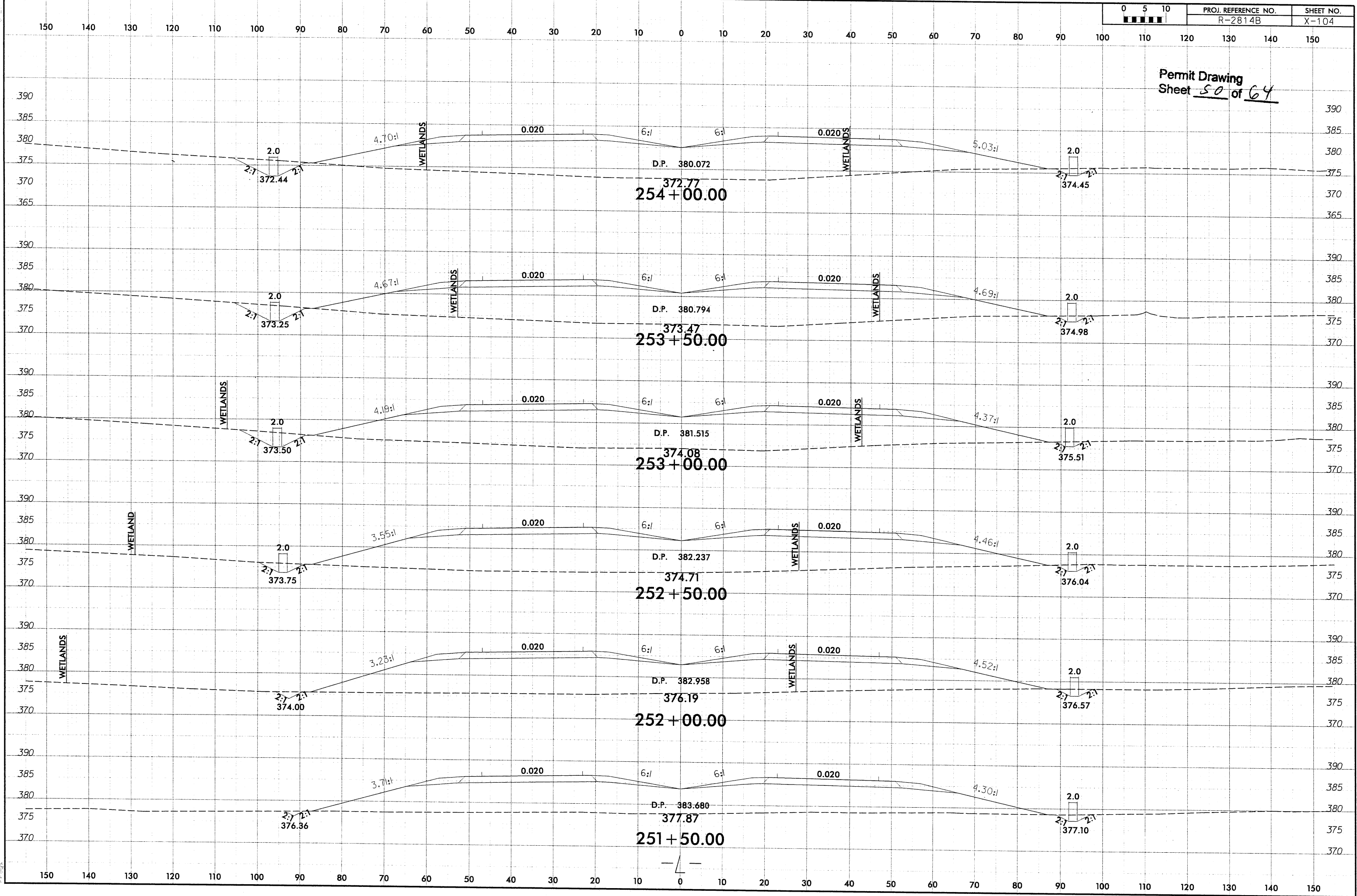
ROBERT G. BARTHOLOMEW & JOYCE BARTHOLOMEW

MARY SUE KEITH STELL, ET AL



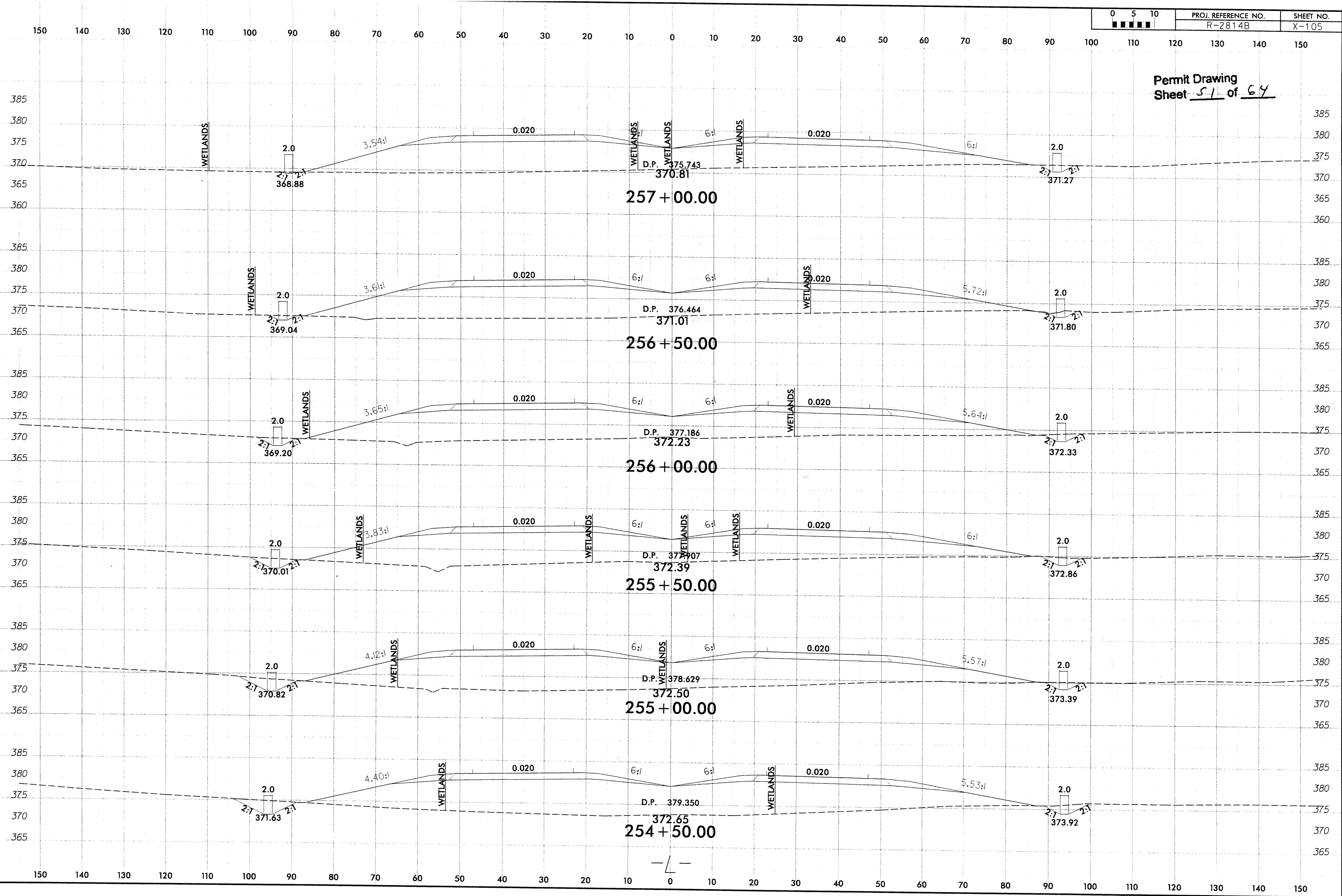
REVISIONS
 January 11, 2010: Adjusted R/W CA lines, R/W markers and the proposed woven wire fence on parcel no. 52. MNA.
 02/22/2010: [0440]21
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 m.sador

Permit Drawing
Sheet 50 of 64



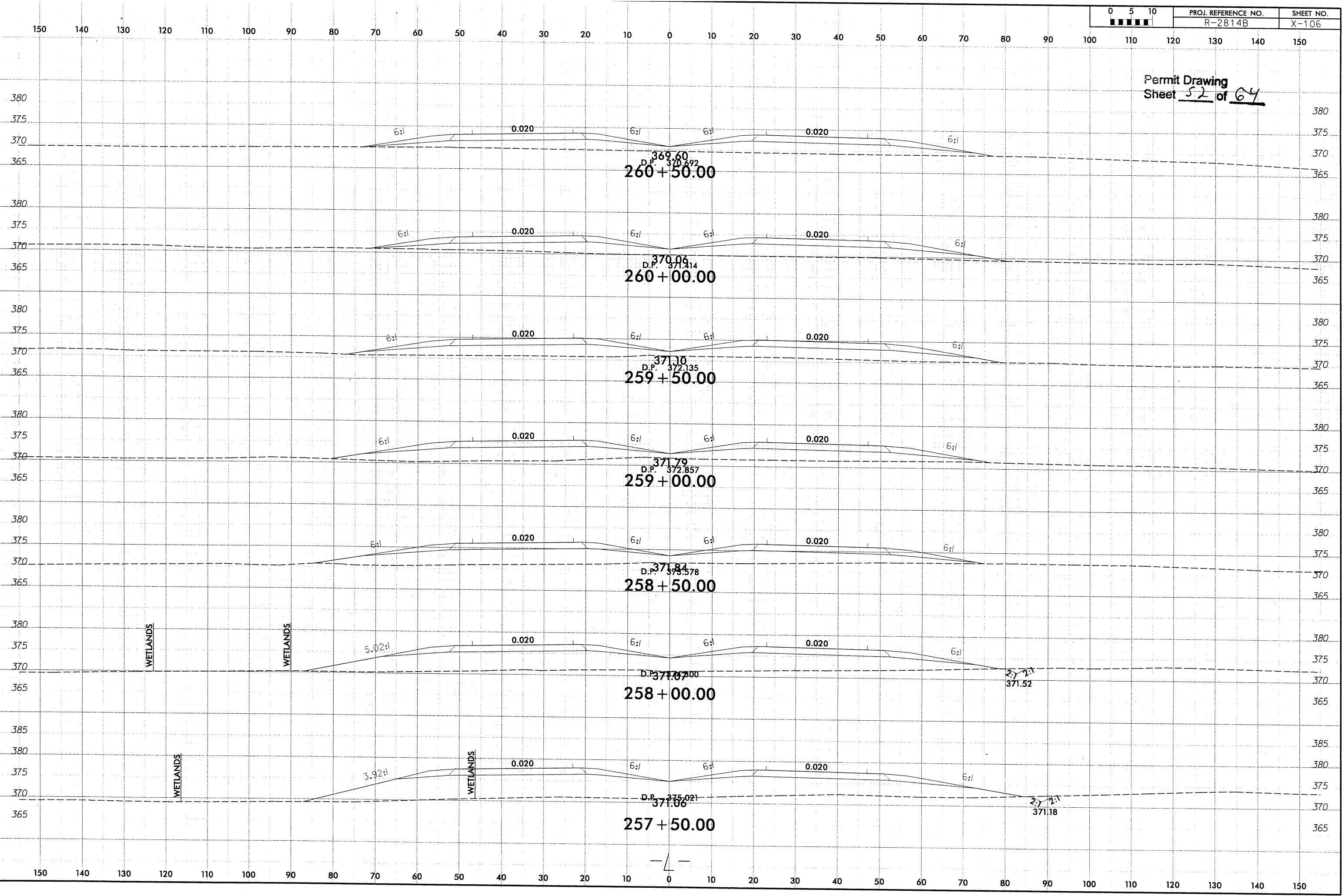
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 370 375 380 385 390
 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

Permit Drawing
Sheet 51 of 64



254+50.00
 255+00.00
 255+50.00
 256+00.00
 256+50.00
 257+00.00

Permit Drawing
Sheet 52 of 64



11/20/05 10:30 AM
 21 Hwy 101 S, Fairfield, CA 94503
 Environmental Design Associates, Inc.

PROJECT REFERENCE NO. R-2814B	SHEET NO. 23
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION	

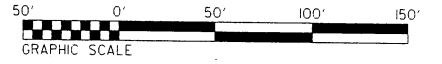
Permit Drawing
Sheet 53 of 64

GRASS SWALE DATA		B
-Y6- STA. 1508 TO STA. 1700 RT		
DA	1.30	AC
SLOPE	1.53	%
L REQ	130	FT
L PROV	192	FT
Q2	3.72	CFS
V2	1.87	FT/S
D2	0.75	FT
Q10	4.81	CFS
V10	2.36	FT/S
D10	0.76	FT

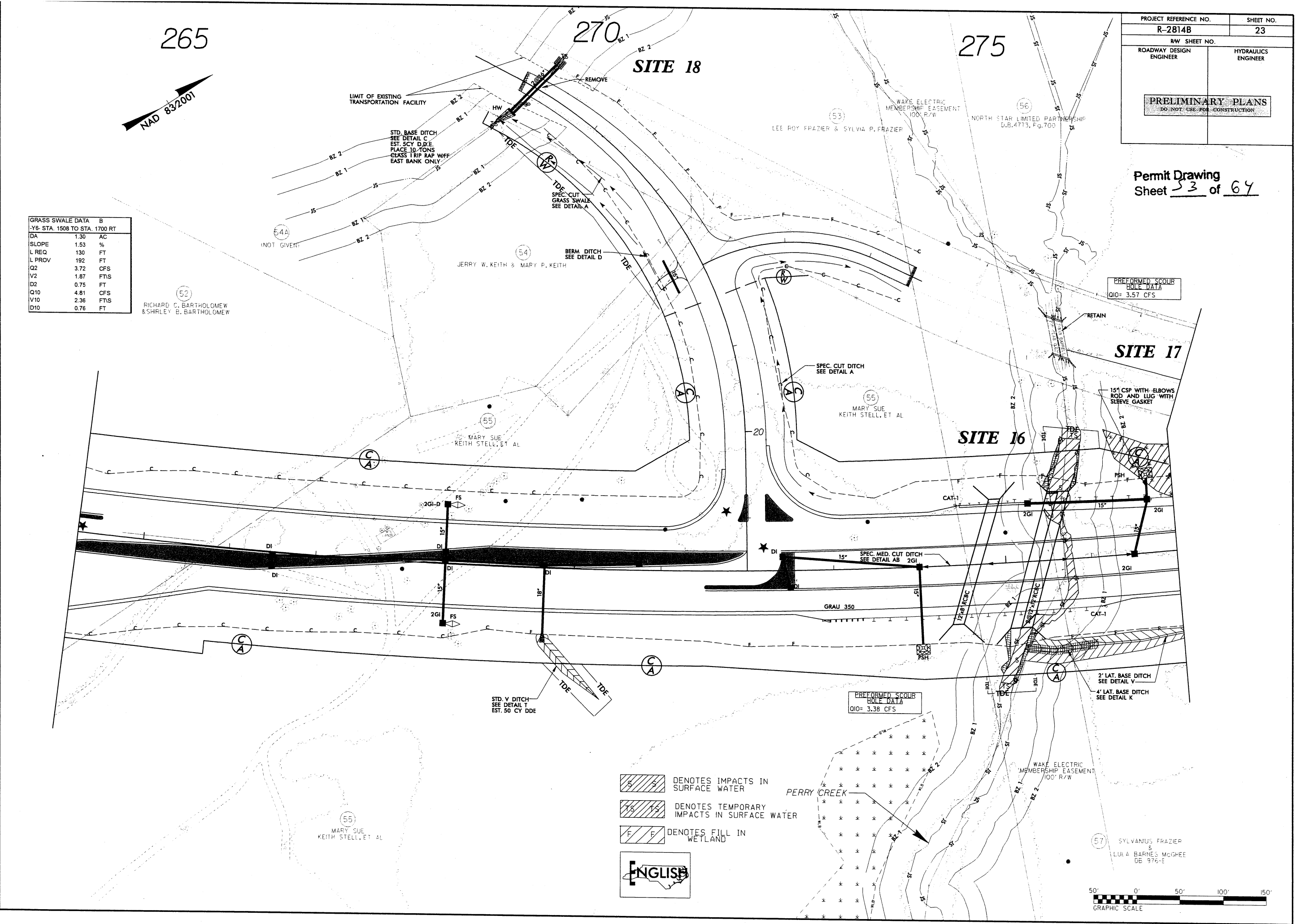
52
RICHARD C. BARTHOLOMEW
& SHIRLEY B. BARTHOLOMEW

PREFORMED SCOUR
HOLE DATA
Q10= 3.57 CFS

PREFORMED SCOUR
HOLE DATA
Q10= 3.38 CFS



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



REVISIONS
 January 11, 2010: Ad Justed R/W CA lines, R/W markers and the proposed woven wire fence on parcel nos. 52 and 55, MNA.
 2-January 11, 2010: Ad Justed TDE lines on parcel no. 55, MNA.

January 11, 2010: Adjusted R/W CA lines, R/W markers and the proposed woven wire fence on parcel nos. 52 and 55, NWA.
 January 12, 2010: Adjusted R/W CA lines on parcel no. 55, NWA.

02-22-10 11:54:20
 C:\p\hydraulics\permits\environmental\drawings\2\January11-2010-Adj Justified T.D.B.-lines on parcel no. 55, NWA.mxd
 mcdor

REVISIONS

GRASS SWALE DATA		B
Y6- STA. 1508 TO STA. 1700 RT		
DA	1.30	AC
SLOPE	1.53	%
L REQ	130	FT
L PROV	192	FT
Q2	3.72	CFS
V2	1.87	FT/S
D2	0.75	FT
Q10	4.81	CFS
V10	2.36	FT/S
D10	0.76	FT

265

270

275

SITE 18

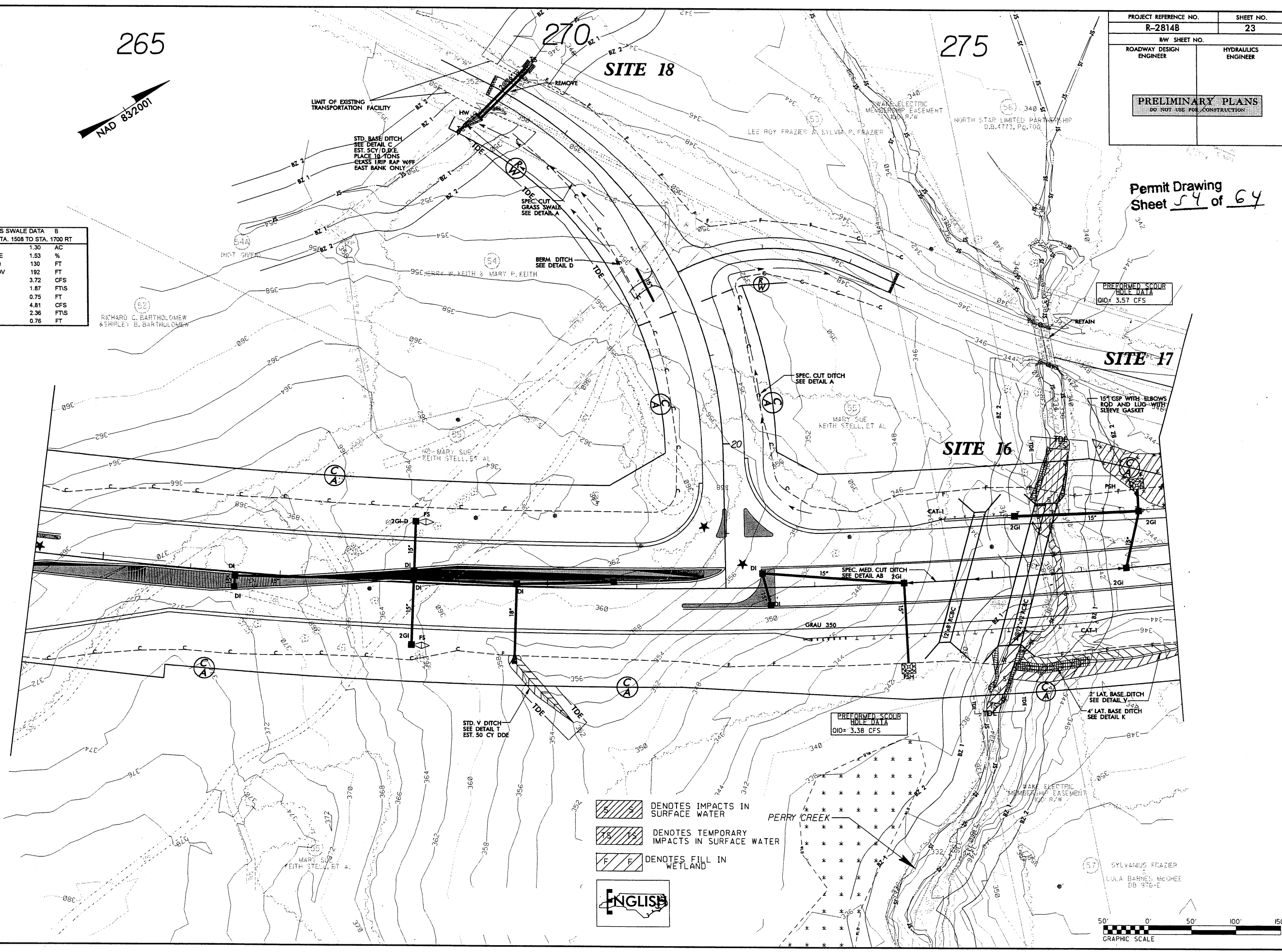
SITE 17

SITE 16

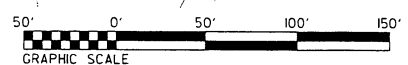
Permit Drawing
 Sheet 54 of 64

PROJECT REFERENCE NO. R-2814B	SHEET NO. 23
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
 DO NOT USE FOR CONSTRUCTION



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

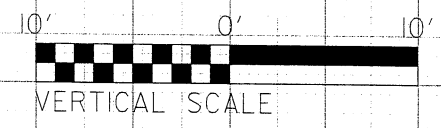
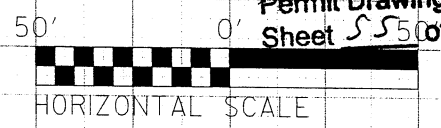


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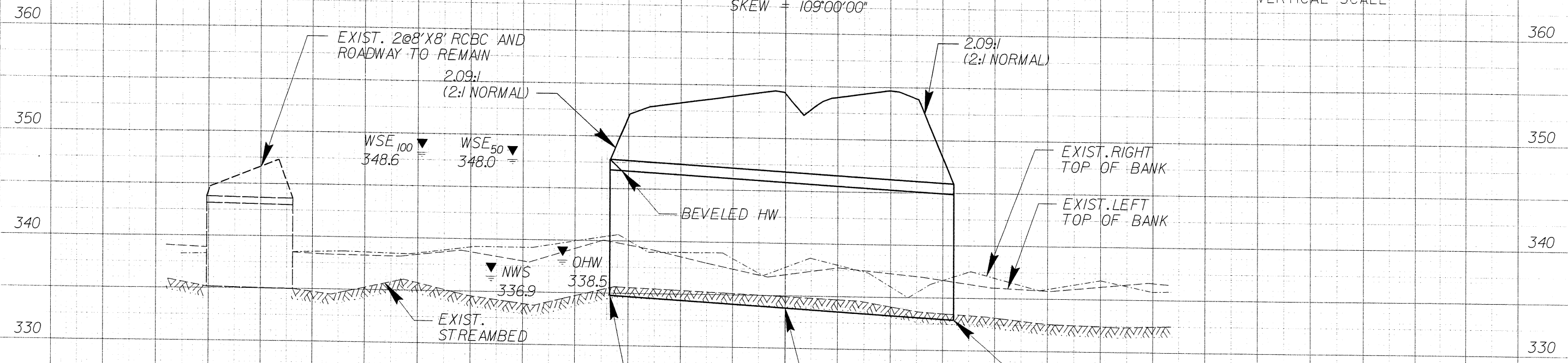
SITE 16



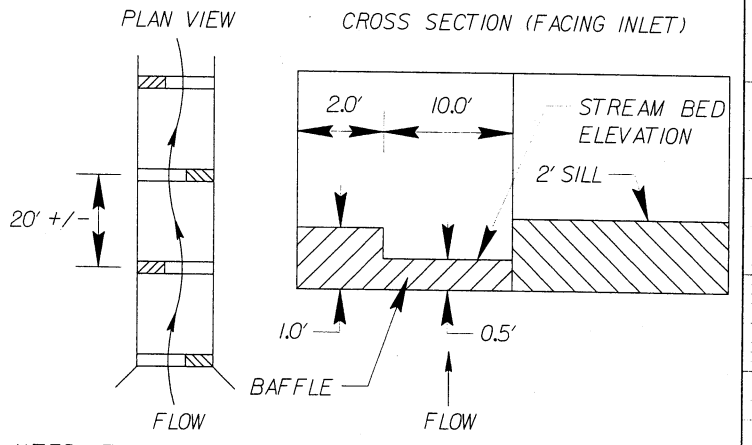
Permit Drawing
Sheet 55 of 64



CL -L- 275+39.00
ELEV. = 353.95'
SKEW = 109°00'00"



BAFFLE DETAILS
CROSS SECTION (FACING INLET)



ALTERNATE BAFFLE SECTIONS TO FORCE STREAM TO MEANDER LEFT TO RIGHT ALONG THE LENGTH OF THE CULVERT. SILL AT INLET END ONLY

PLACE BED MATERIAL TO TOP OF BAFFLE ELEVATION.
STOCKPILE EXCAVATED BED MATERIAL FROM SITE IF AVAILABLE AND USE IN CULVERT. OTHERWISE, USE CLASS B RIP-RAP

PLANS PREPARED BY :

RK&K

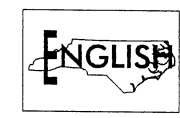
RUMMEL, KLEPPER & KAHL, LLP
900 RIDGEFIELD DRIVE SUITE 350
RALEIGH, NORTH CAROLINA 27609-3960
NC LICENSE NO. F-0112 • (919) 878-9560

FOR
DIVISION OF HIGHWAYS

DEED TO MICHAEL L. MANSFIELD & LALRIE L. MANSFIELD
 DB 12592 PG 781
 BM 2005 PG 2274-2276
 BM 2005 PG 262-264
 BM 2006 PG 1924-1925

280

285



PROJECT REFERENCE NO. R-2814B	SHEET NO. 24
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION	

MICHAEL L. MANSFIELD & LALRIE L. MANSFIELD
 DB 12592 PG 781
 BM 2005 PG 2274-2276
 BM 2005 PG 262-264
 BM 2006 PG 1924-1925

JAMES T. DANIEL & JOANNE T. DANIEL
 D.P.L. REG. PG. 38A

DENOTES FILL IN WETLAND

Permit Drawing
 sheet 56 of 64

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PREFORMED SCOUR HOLE DATA
 Q10= 4.10 CFS

SITE 17

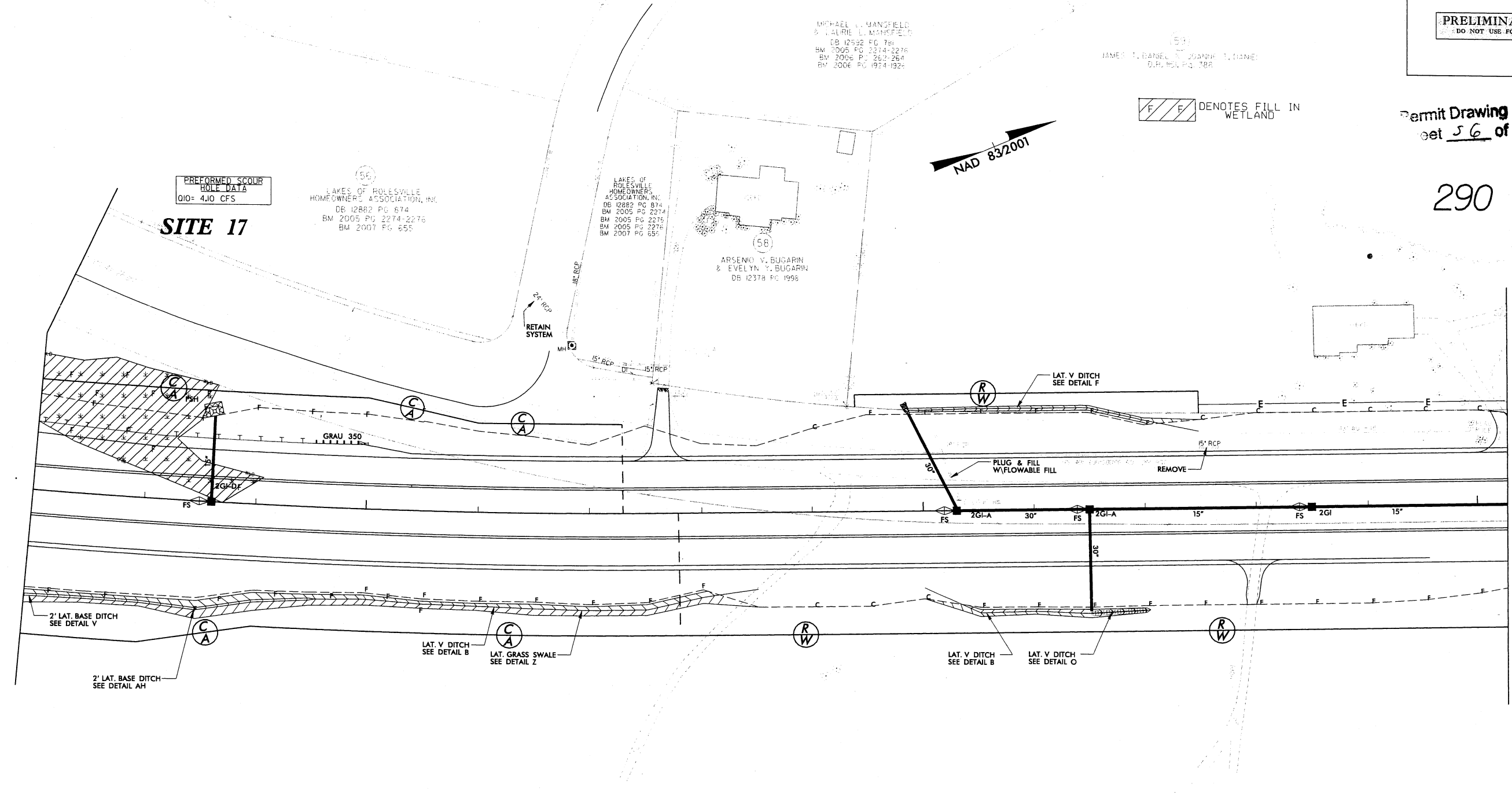
LAKES OF ROLESVILLE HOMEOWNERS ASSOCIATION, INC.
 DB 12882 PG 874
 BM 2005 PG 2274-2276
 BM 2007 PG 655

LAKES OF ROLESVILLE HOMEOWNERS ASSOCIATION, INC.
 DB 12882 PG 874
 BM 2005 PG 2274-2276
 BM 2005 PG 2276
 BM 2007 PG 655

ARSENIO V. BUGARIN & EVELYN Y. BUGARIN
 DB 12378 PG 1998

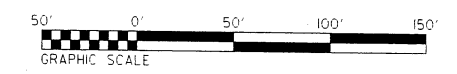


REVISIONS
 REVISED NAMES ON PARCEL 57 PER LOCATION AND SURVEY REQUEST 4/23/09 DDL 7/29/09



GRASS SWALE DATA B		
L- STA.	28125 TO STA.	28250 RT
DA	1.15	AC
SLOPE	1.53	%
L REQ	115	FT
L PROV	125	FT
Q2	2.19	CFS
V2	1.69	FT/S
D2	0.66	FT
Q10	2.83	CFS
V10	2.13	FT/S
D10	0.67	FT

SILVANIUS PRADIER & LULA BARNE'S MOORE
 DB 974-E

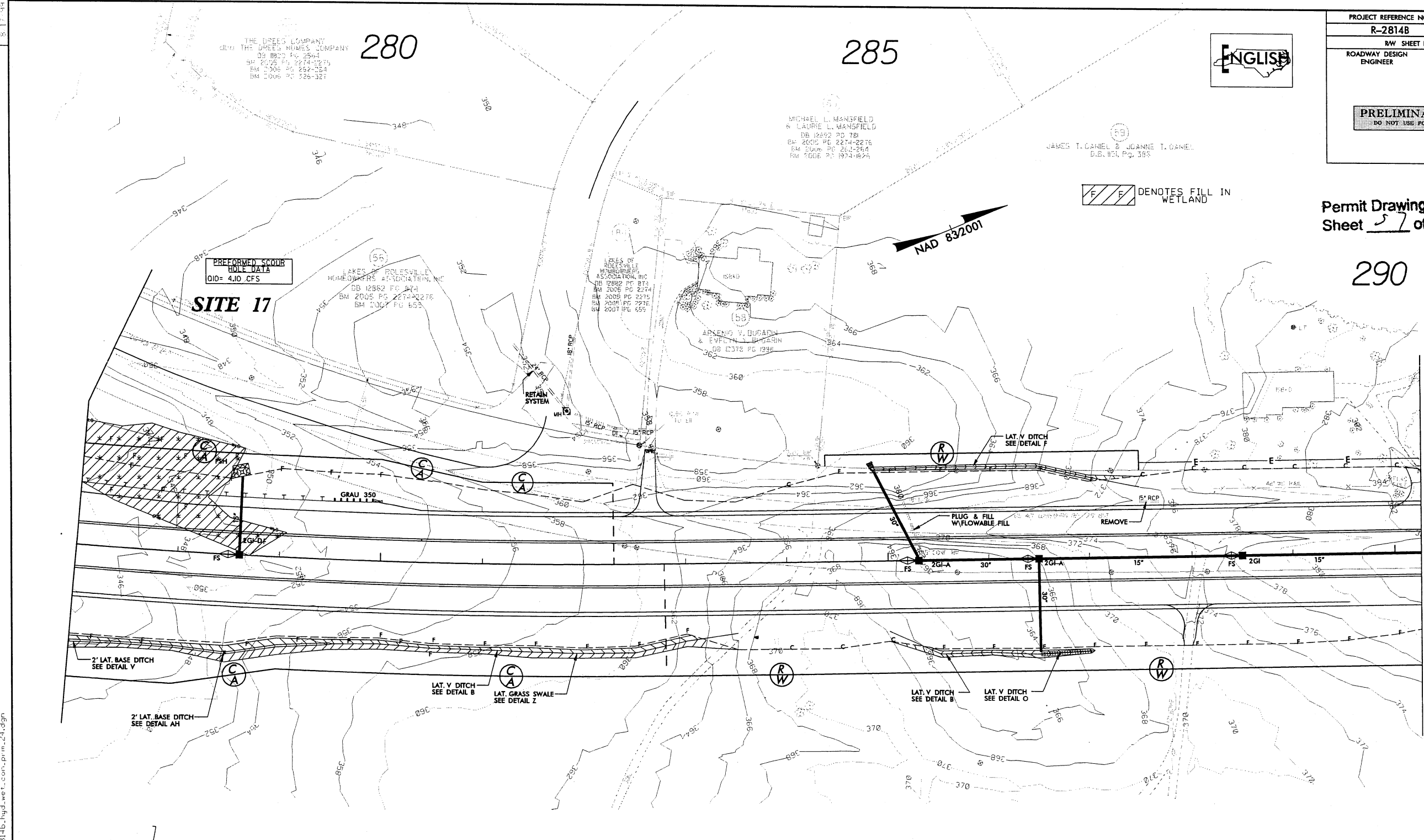


PROJECT REFERENCE NO.	SHEET NO.
R-2814B	24
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
PRELIMINARY PLANS	
DO NOT USE FOR CONSTRUCTION	



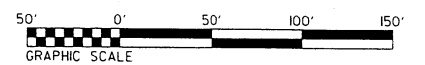
Permit Drawing
Sheet 57 of 64

290



GRASS SWALE DATA B		
L- STA. 28125 TO STA. 28250 RT		
DA	1.15	AC
SLOPE	1.53	%
L REQ	115	FT
L PROV	125	FT
Q2	2.19	CFS
V2	1.69	FT/S
D2	0.66	FT
Q10	2.83	CFS
V10	2.13	FT/S
D10	0.67	FT

SILVANUS FRAZER
LULA BARNES MCOWEE
DB 715-E



REVISIONS
 REVISED NAMES ON PARCEL 57 PER LOCATION AND SURVEY REQUEST 4/23/09 DOL 7/29/09

02/23/10 10:44:52
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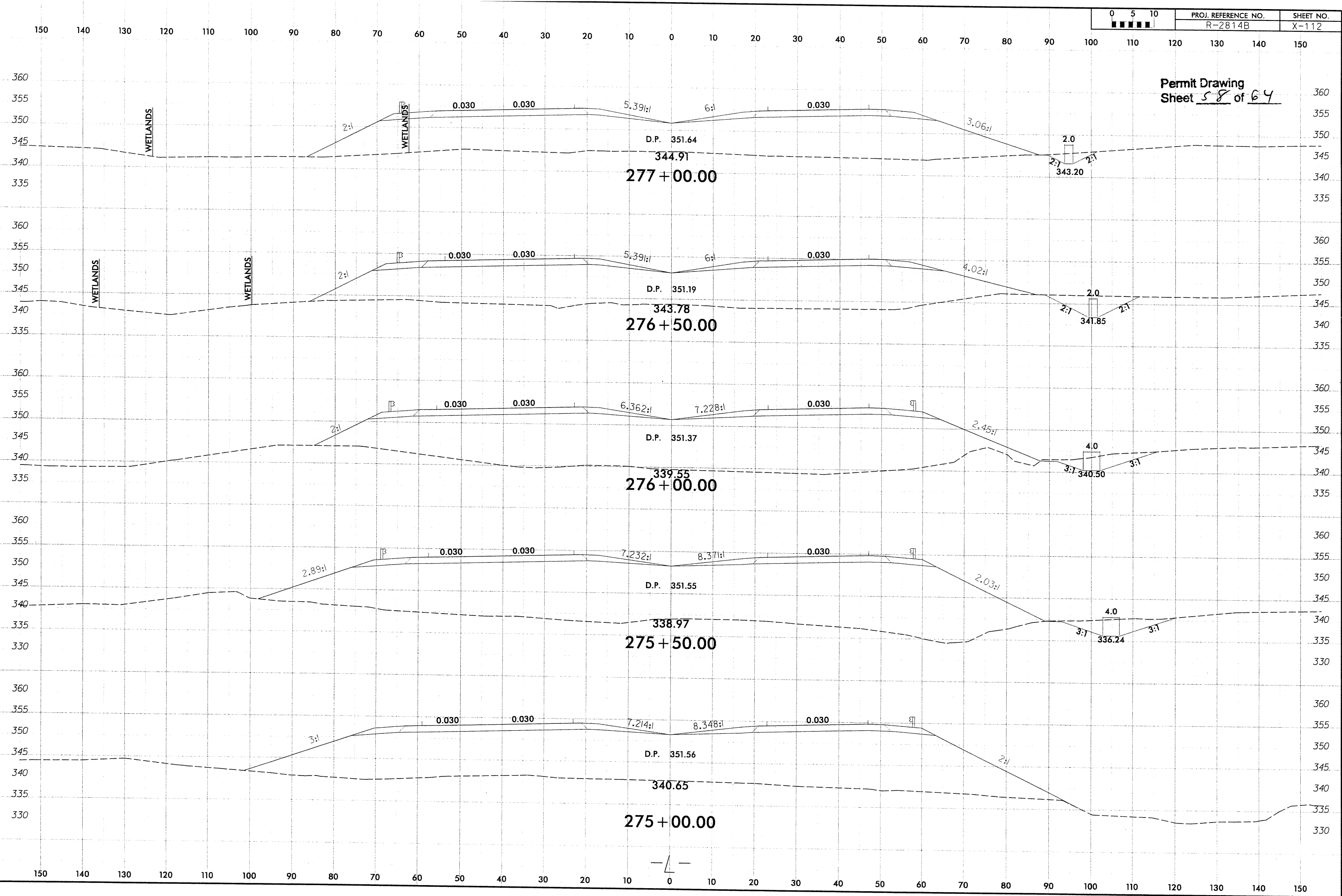
THE DAVIS COMPANY
 CIVIL THE DAVIS HAMES COMPANY
 DB 1822 PG 284
 BM 2025 PG 2274-2275
 BM 2006 PG 252-254
 BM 2006 PG 226-321

MICHAEL L. MANSFIELD
 & LAURIE L. MANSFIELD
 DB 12692 PG 781
 BM 2000 PG 2274-2276
 BM 2006 PG 241-244
 BM 2006 PG 1974-1974

JAMES T. DANIEL & JOANNE T. DANIEL
 D.B. 104 PG 385

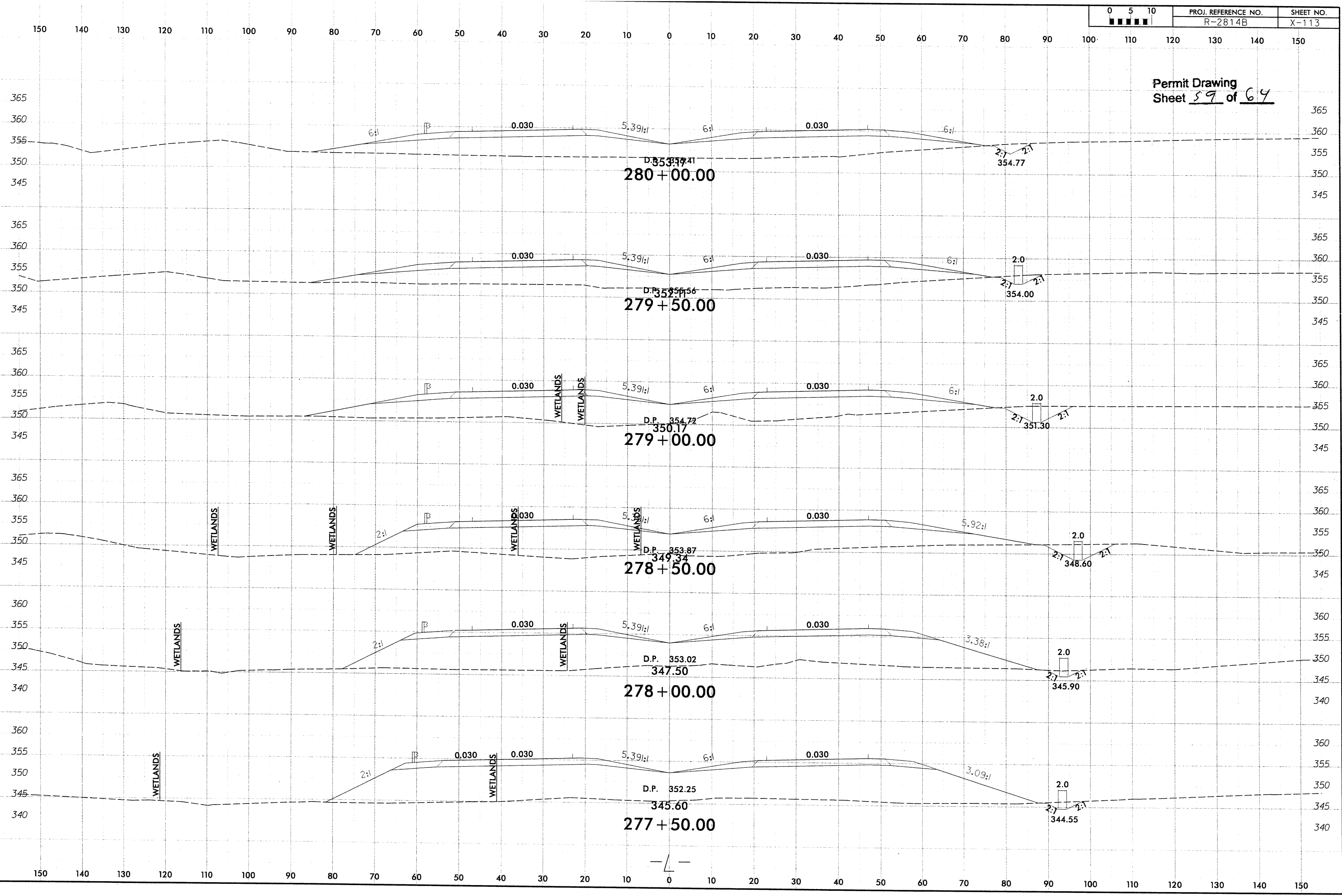
DENOTES FILL IN WETLAND

Permit Drawing
Sheet 58 of 64



1. 2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18. 19. 20. 21. 22. 23. 24. 25. 26. 27. 28. 29. 30. 31. 32. 33. 34. 35. 36. 37. 38. 39. 40. 41. 42. 43. 44. 45. 46. 47. 48. 49. 50. 51. 52. 53. 54. 55. 56. 57. 58. 59. 60. 61. 62. 63. 64. 65. 66. 67. 68. 69. 70. 71. 72. 73. 74. 75. 76. 77. 78. 79. 80. 81. 82. 83. 84. 85. 86. 87. 88. 89. 90. 91. 92. 93. 94. 95. 96. 97. 98. 99. 100. 101. 102. 103. 104. 105. 106. 107. 108. 109. 110. 111. 112. 113. 114. 115. 116. 117. 118. 119. 120. 121. 122. 123. 124. 125. 126. 127. 128. 129. 130. 131. 132. 133. 134. 135. 136. 137. 138. 139. 140. 141. 142. 143. 144. 145. 146. 147. 148. 149. 150.

Permit Drawing
Sheet 59 of 64

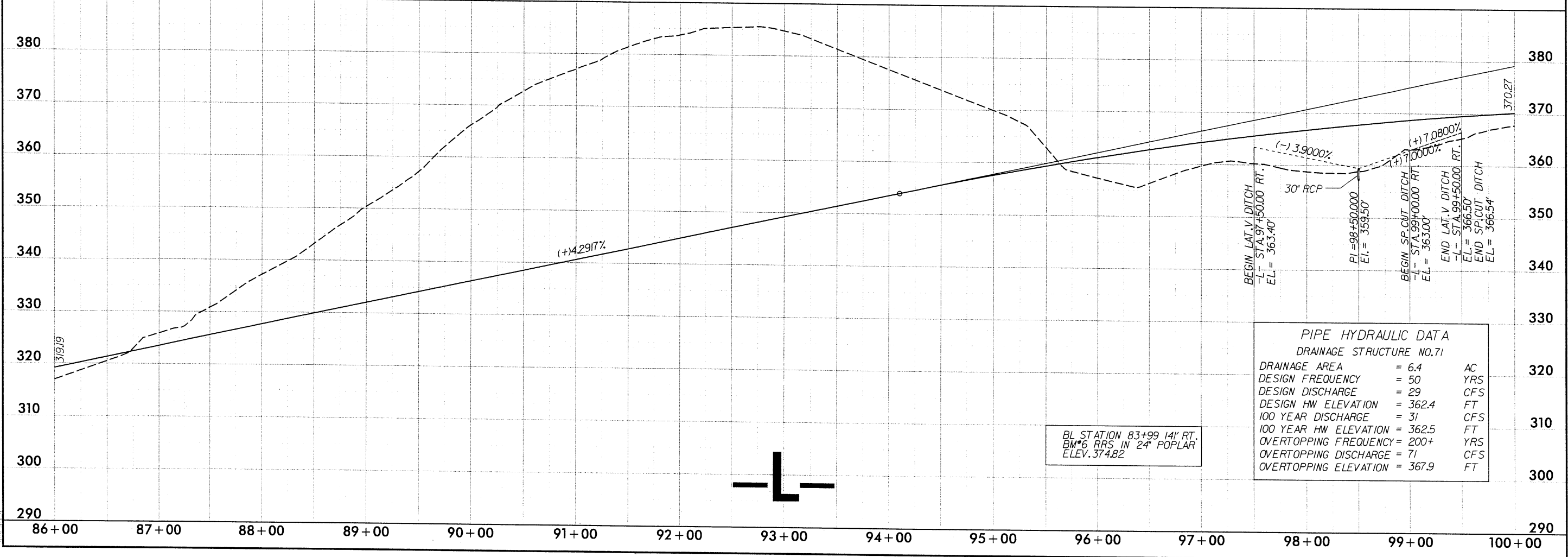
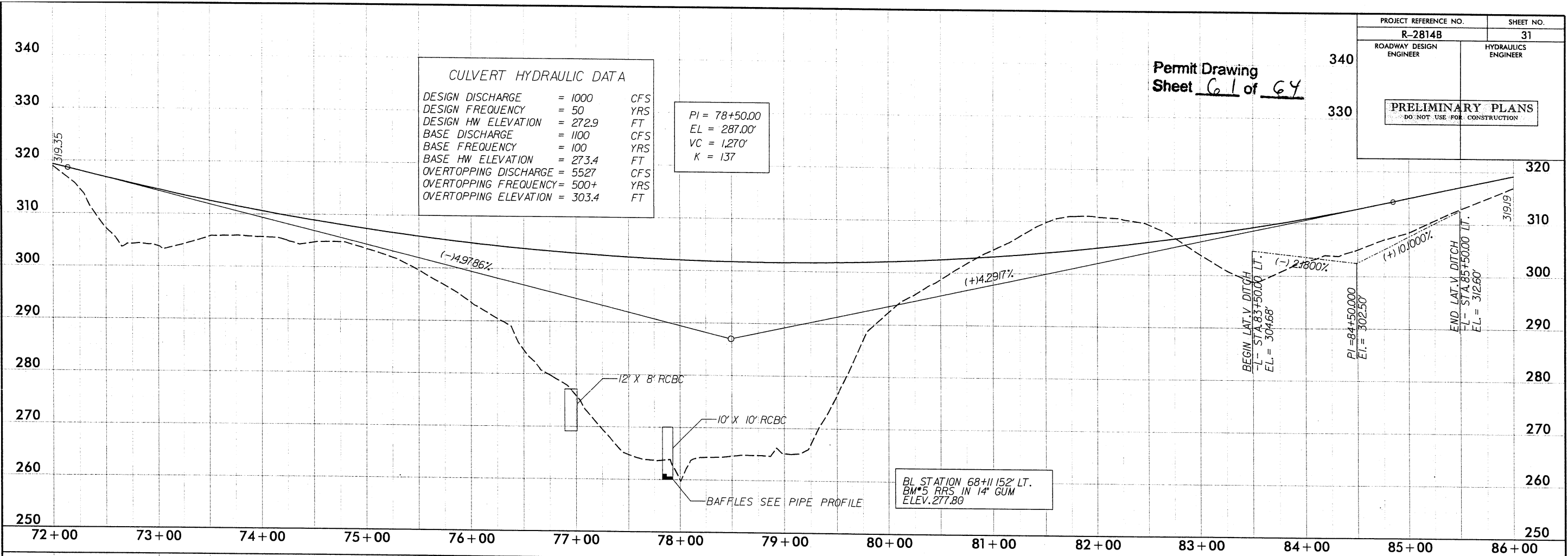


11/15/2011 10:53 AM
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 11/15/2011 10:53 AM
 C:\Users\jgallagher\Documents\Projects\2011\20110115\20110115.dwg

Permit Drawing
Sheet 61 of 64

| CULVERT HYDRAULIC DATA | | |
|------------------------|---------|-----|
| DESIGN DISCHARGE | = 1000 | CFS |
| DESIGN FREQUENCY | = 50 | YRS |
| DESIGN HW ELEVATION | = 272.9 | FT |
| BASE DISCHARGE | = 1100 | CFS |
| BASE FREQUENCY | = 100 | YRS |
| BASE HW ELEVATION | = 273.4 | FT |
| OVERTOPPING DISCHARGE | = 5527 | CFS |
| OVERTOPPING FREQUENCY | = 500+ | YRS |
| OVERTOPPING ELEVATION | = 303.4 | FT |

PI = 78+50.00
EL = 287.00'
VC = 1,270'
K = 137

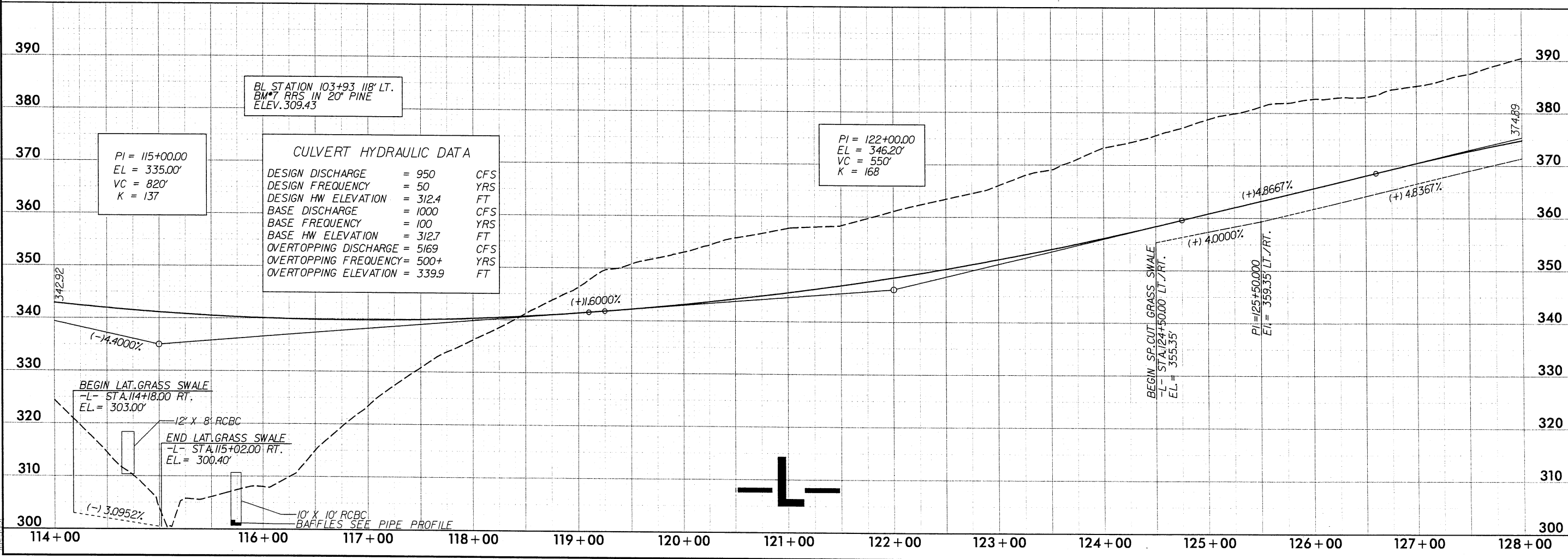
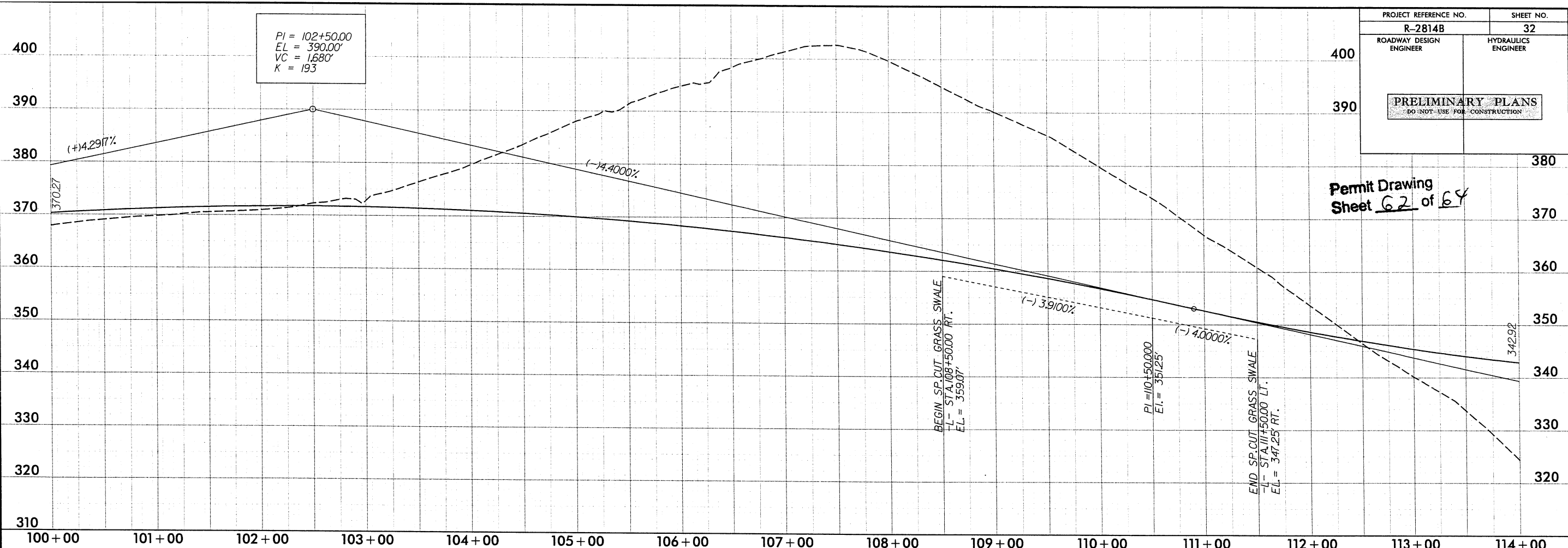


BL STATION 83+99.14' RT.
BM#6 RRS IN 24' POPLAR
ELEV. 374.82

| PIPE HYDRAULIC DATA
DRAINAGE STRUCTURE NO.71 | | |
|---|---------|-----|
| DRAINAGE AREA | = 6.4 | AC |
| DESIGN FREQUENCY | = 50 | YRS |
| DESIGN DISCHARGE | = 29 | CFS |
| DESIGN HW ELEVATION | = 362.4 | FT |
| 100 YEAR DISCHARGE | = 31 | CFS |
| 100 YEAR HW ELEVATION | = 362.5 | FT |
| OVERTOPPING FREQUENCY | = 200+ | YRS |
| OVERTOPPING DISCHARGE | = 71 | CFS |
| OVERTOPPING ELEVATION | = 367.9 | FT |



Permit Drawing Sheet 62 of 64



BL STATION 103+93.118' LT.
BM #7 RRS IN 20" PINE
ELEV. 309.43

PI = 115+00.00
EL = 335.00'
VC = 820'
K = 137

CULVERT HYDRAULIC DATA

| | | |
|-----------------------|---------|-----|
| DESIGN DISCHARGE | = 950 | CFS |
| DESIGN FREQUENCY | = 50 | YRS |
| DESIGN HW ELEVATION | = 312.4 | FT |
| BASE DISCHARGE | = 1000 | CFS |
| BASE FREQUENCY | = 100 | YRS |
| BASE HW ELEVATION | = 312.7 | FT |
| OVERTOPPING DISCHARGE | = 5169 | CFS |
| OVERTOPPING FREQUENCY | = 500+ | YRS |
| OVERTOPPING ELEVATION | = 339.9 | FT |

PI = 122+00.00
EL = 346.20'
VC = 550'
K = 168

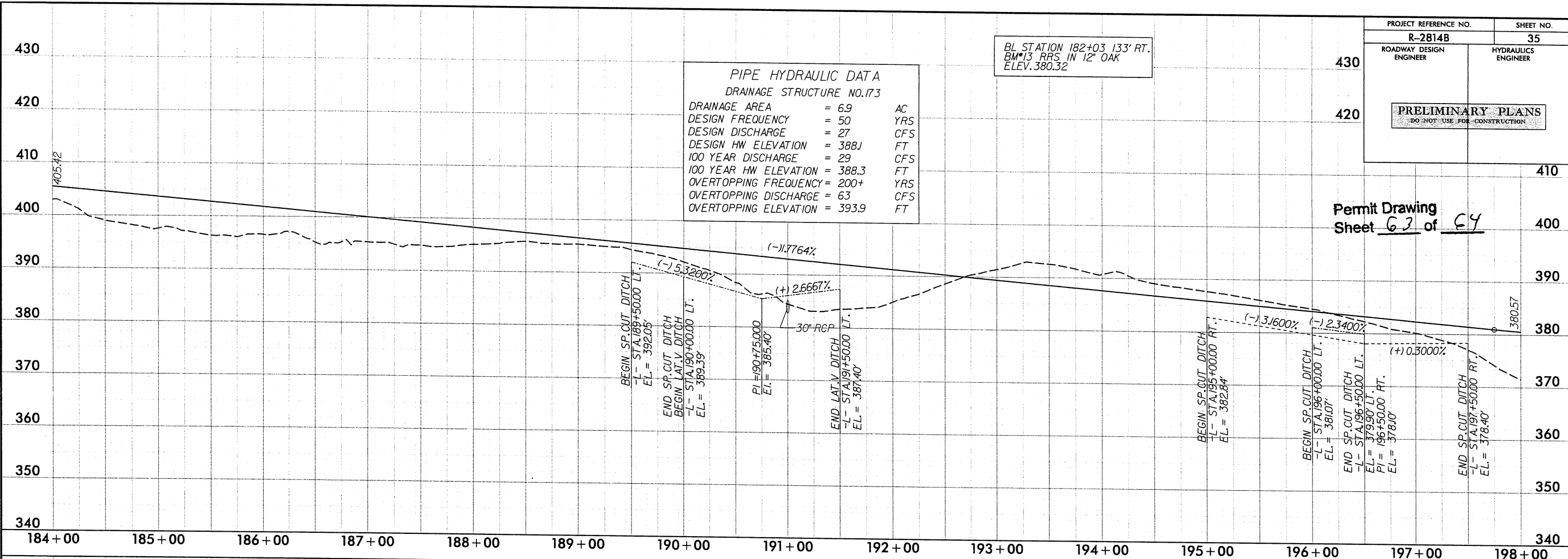
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 1749427.dwg
 1749427.dwg

PIPE HYDRAULIC DATA
DRAINAGE STRUCTURE NO.173

| | | |
|-----------------------|---------|-----|
| DRAINAGE AREA | = 6.9 | AC |
| DESIGN FREQUENCY | = 50 | YRS |
| DESIGN DISCHARGE | = 27 | CFS |
| DESIGN HW ELEVATION | = 388.1 | FT |
| 100 YEAR DISCHARGE | = 29 | CFS |
| 100 YEAR HW ELEVATION | = 388.3 | FT |
| OVERTOPPING FREQUENCY | = 200+ | YRS |
| OVERTOPPING DISCHARGE | = 63 | CFS |
| OVERTOPPING ELEVATION | = 393.9 | FT |

BL STATION 182+03 133' RT.
BM#13 RRS IN 12" OAK
ELEV.380.32

Permit Drawing
Sheet 63 of 64

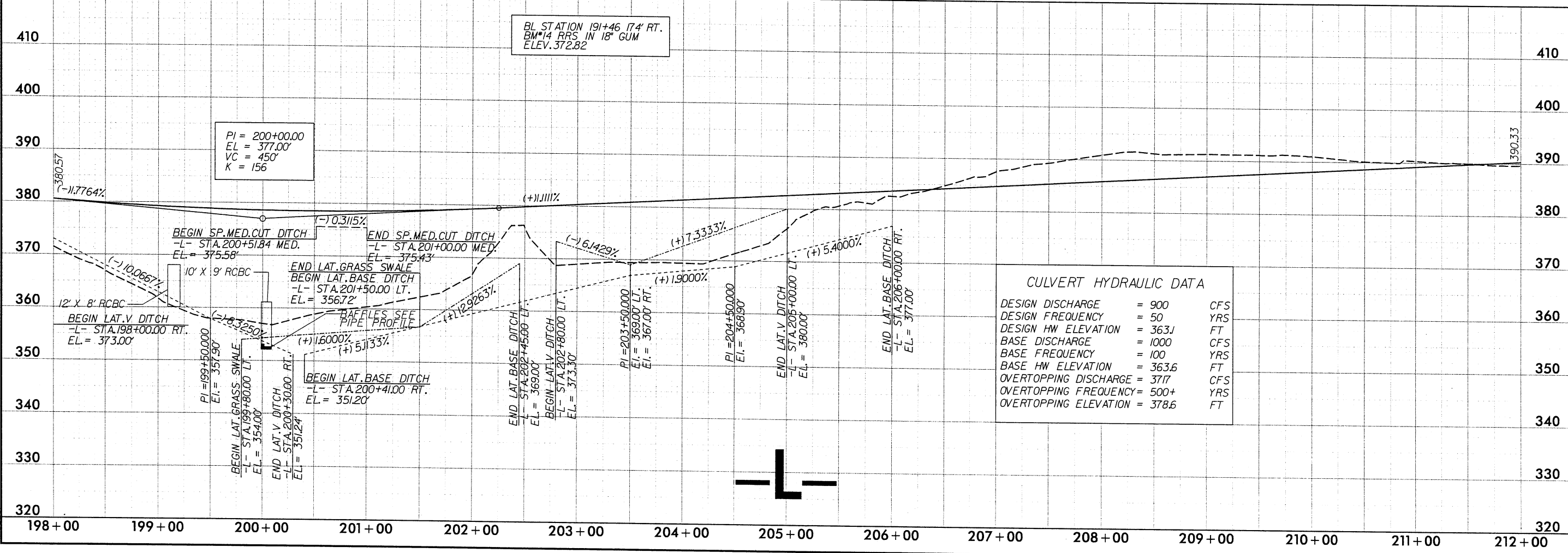


BL STATION 191+46 174' RT.
BM#14 RRS IN 18" GUM
ELEV.372.82

PI = 200+00.00
EL = 377.00'
VC = 450'
K = 156

CULVERT HYDRAULIC DATA

| | | |
|-----------------------|---------|-----|
| DESIGN DISCHARGE | = 900 | CFS |
| DESIGN FREQUENCY | = 50 | YRS |
| DESIGN HW ELEVATION | = 363.1 | FT |
| BASE DISCHARGE | = 1000 | CFS |
| BASE FREQUENCY | = 100 | YRS |
| BASE HW ELEVATION | = 363.6 | FT |
| OVERTOPPING DISCHARGE | = 3717 | CFS |
| OVERTOPPING FREQUENCY | = 500+ | YRS |
| OVERTOPPING ELEVATION | = 378.6 | FT |



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 User: j284848

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

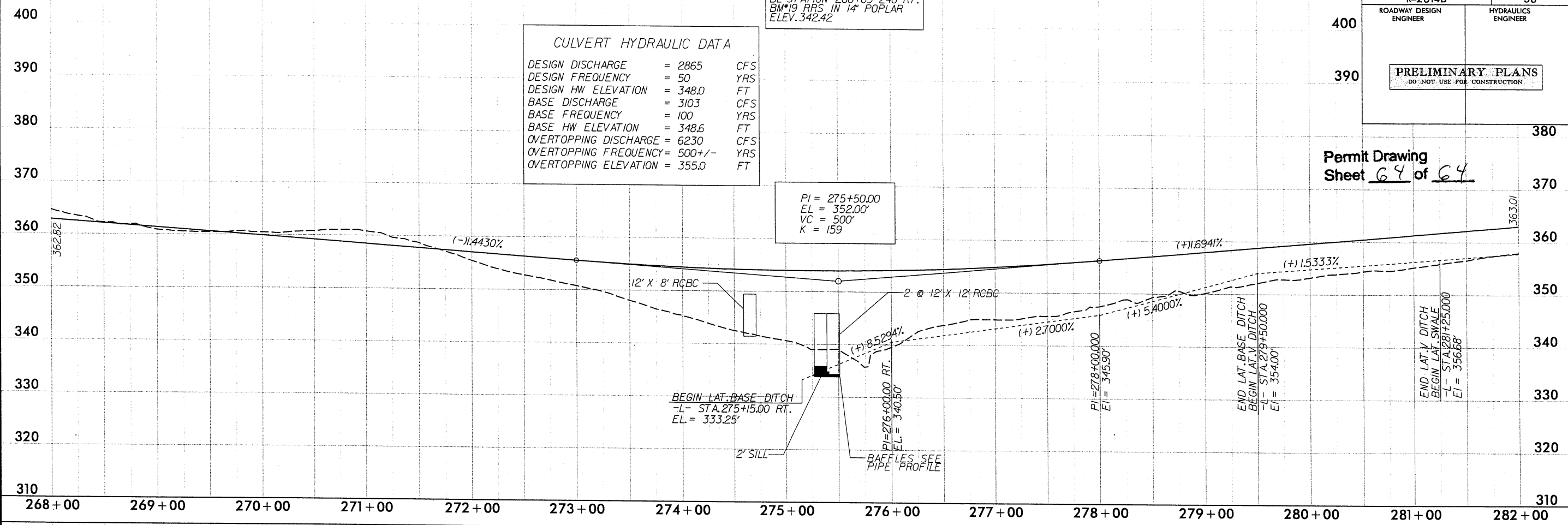
Permit Drawing
Sheet 64 of 64

CULVERT HYDRAULIC DATA

| | | |
|-----------------------|----------|-----|
| DESIGN DISCHARGE | = 2865 | CFS |
| DESIGN FREQUENCY | = 50 | YRS |
| DESIGN HW ELEVATION | = 348.0 | FT |
| BASE DISCHARGE | = 3103 | CFS |
| BASE FREQUENCY | = 100 | YRS |
| BASE HW ELEVATION | = 348.6 | FT |
| OVERTOPPING DISCHARGE | = 6230 | CFS |
| OVERTOPPING FREQUENCY | = 500+/- | YRS |
| OVERTOPPING ELEVATION | = 355.0 | FT |

BL STATION 266+09 246' RT.
BM*19 RRS IN 14' POPLAR
ELEV. 342.42

PI = 275+50.00
EL = 352.00'
VC = 500'
K = 159



BL STATION 278+32 69' LT.
BL5 STATION 30+04 69' LT.
BM*20 RRS IN 12' PINE
ELEV. 376.09

PI = 292+75.00
EL = 393.60'
VC = 1,200'
K = 432

