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

REPLY TO
ATTENTION OF:

RECEIVED
FEB 9 2009
N.C. TURNPIKE AUTHORITY

February 4, 2008

Regulatory Division

Action ID SAW-2006-20445-232; TIP No: U-4763B

Mr. Steven D. DeWitt, P.E. Chief Engineer
North Carolina Turnpike Authority
1578 Mail Service Center
Raleigh, North Carolina 27699-1578

Dear Mr. DeWitt:

Enclosed is a Department of the Army permit to authorize the discharge of fill material into waters of the United States, for construction of Triangle Parkway toll facility (TIP U-4763B), from NC 540 to I-40, in northwestern Wake County and southern Durham County, North Carolina.

Any deviation in the authorized work will likely require modification of this permit. If a change in the authorized work is necessary, you should promptly submit revised plans to the Corps showing the proposed changes. You may not undertake the proposed changes until the Corps notifies you that your permit has been modified.

Carefully read your permit. The general and special conditions are important. Your failure to comply with these conditions could result in a violation of Federal law. Certain significant conditions require that:

a. You must complete construction before December 31, 2014.

b. You must allow representatives from this office to make periodic visits to your worksite as deemed necessary to assure compliance with permit plans and conditions.

You must notify this office in advance as to when you intend to commence and complete work.

You should address all questions regarding this authorization to Eric Alsmeyer of my Raleigh Regulatory Field Office regulatory staff at (919) 554-4844, extension 23.

Sincerely,

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

Enclosures

Copy Furnished (with enclosures):

Chief, Source Data Unit
NOAA/National Ocean Service
ATTN: Sharon Tear N/CS261
1315 East-West Hwy., Rm 7316
Silver Spring, Maryland 20910-3282

Copies Furnished (with special conditions and plans):

Mr. Ronald J. Mikulak, Chief
Wetlands Regulatory Section
61 Forsyth Street
Atlanta, Georgia 30303

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

Mr. Ron Sechler
National Marine Fisheries Service
Pivers Island
Beaufort, North Carolina 28516

Mr. Doug Huggett
Division of Coastal Management
N.C. Department of Environment
and Natural Resources
400 Commerce Avenue
Morehead City, North Carolina 28557

Mr. David Rackley
National Marine Fisheries Service
219 Fort Johnson Road
Charleston, South Carolina 29412-9110

RECEIVED
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REGULATORY
WILM.FLD.OFC.

DEPARTMENT OF THE ARMY PERMIT

Permittee: NORTH CAROLINA TURNPIKE AUTHORITY

Permit No: 200620445

Issuing Office: USAED, WILMINGTON

NOTE: The term "you" and its derivatives, as used in this permit, means the permittee or any future transferee. The term "this office" refers to the appropriate district or division office of the Corps of Engineers having jurisdiction over the permitted activity or the appropriate official of the office acting under the authority of the commanding officer.

You are authorized to perform work in the accordance with the terms and conditions specified below.

Project Description: Place fill material impacting 1.96 acres of wetlands, including 0.06 acre isolated (non-404) wetlands, and 8,039 linear feet of stream, for construction of Triangle Parkway toll facility (T.I.P. No. U-4763B), crossing Burdens Creek, Kit Creek and their unnamed tributaries.

Project Location: From NC 540 to I-40, in northwestern Wake County and southern Durham County, North Carolina.

Permit Conditions:

General Conditions:

1. The time Limit for completing the work authorized ends on December 31, 2014 If you find that you need more time to complete the authorized activity, submit your request for a time extension to this office for consideration at least one month before the above date is reached.

2. You must maintain the activity authorized by this permit in good condition and in conformance with the terms and conditions of this permit. You are not relieved of this requirement if you abandon the permitted activity, although you may make a good faith transfer to a third party in compliance with General Conditions 4 below. Should you wish to cease to maintain the authorized activity or should you desire to abandon it without a good faith transfer, you must obtain a modification of this permit from this office, which may require restoration of the area.

3. If you discover any previously unknown historic or archeological remains while accomplishing the activity authorized by this permit, you must immediately notify this office of what you have found. We will initiate the Federal and state coordination required to determine if the remains warrant a recovery effort or if the site eligible for listing in the National Register of Historic Places.

4. If you sell the property associate with this permit, you must obtain the signature of the new owner in the space provided and forward a copy of the permit to this office to validate the transfer of this authorization.

5. If a conditioned water quality certification has been issued for your project, you must comply with the conditions specified in the certification as special conditions to this permit. For your convenience, a copy of the certification is attached if it contains such conditions.

6. You must allow representatives from this office to inspect the authorized activity at any time deemed necessary to ensure that it is being or has been accomplished in accordance with the terms and conditions of your permit.

Special Conditions:

*SEE ATTACHED SPECIAL CONDITIONS

Further Information:

1. Congressional Authorities: You have been authorized to undertake the activity described above pursuant to:

( ) Section 10 of the Rivers and Harbors Act of 1899 (33 U.S. C. 403).

(X) Section 404 of the clean Water Act (33 U.S.C. 1344).

( ) Section 103 of the Marine Protection, Research and Sanctuaries Act of 1972 (33 U.S.C. 1413).

2. Limits of this authorization.

a. This permit does not obviate the need to obtain other Federal, state, or local authorizations required by law.

b. This permit does not grant any property rights or exclusive privileges.

c. This permit does not authorize any injury to the property or rights of others.

d. This permit does not authorize interference with any existing or proposed Federal project.

3. Limits of Federal Liability. In issuing this permit, the Federal Government does not assume any liability for the following:

a. Damages to the permitted project or uses thereof as a result of other permitted or unpermitted activities or from natural causes.

b. Damages to the permitted project or uses thereof as a result of current or future activities undertaken by or on behalf of the United states in the public interest.

c. Damages to persons, property, or to other permitted or unpermitted activities or structures caused by the activity authorized by this permit.

d. Design or construction deficiencies associated with the permitted work.

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e. Damage claims associated with any future modification, suspension, or revocation of this permit.

4. Reliance on Applicant's Data: The determination of this office that issuance of this permit is not contrary to the public interest was mad in reliance on the information you provided.

5. Reevaluation of Permit Decision. This office may reevaluate its decision on this permit at any time the circumstances warrant. Circumstances that could require a reevaluation include, but are not limited to, the following:

a. You fail to comply with the terms and conditions of this permit.

b. The information provided by you in support of your permit application proves to have been false, incomplete, or inaccurate (see 4 above).

c. Significant new information surfaces which this office did not consider in reaching the original public interest decision.

Such a reevaluation may result in a determination that it is appropriate to use the suspension, modification, and revocation procedures contained in 33 CFR 325.7 or enforcement procedures such as those contained in 33CFR 326.4 and 326.5. The referenced enforcement procedures provide for the issuance of an administrative order requiring you to comply with the terms and conditions of your permit and for the initiation of legal action where appropriate. You will be required to pay for any corrective measures ordered by this office, and if you fail to comply with such directive, this office may in certain situations (such as those specified in 33 CFR 209.170) accomplish the corrective measure by contract or otherwise and bill you for the cost.

6. Extensions. General condition 1 establishes a time limit for the completion of the activity authorized by this permit. Unless there are circumstances requiring either a prompt completion of the authorized activity or a reevaluation of the public interest decision, the Corps will normally give favorable consideration to a request for an extension of this time limit.

Your signature below, as permittee, indicates that you accept and agree to comply with the terms and conditions of this permit.

1.26.2009

(PERMITTEE) NORTH CAROLINA TURNPIKE AUTHORITY *(DATE)*

This permit becomes effective when the Federal official, designated to act for the Secretary of the Army, has signed below.

5 FEB 2009

(DISTRICT Commander) JEFFERSON M. RYSCAVAGE, COLONEL *(DATE)*

When the structures or work authorized by this permit are still in existence at the time the property is transferred, the terms and conditions of this permit will continue to be binding on the new owner(s) of the property. To validate the transfer of this permit and the associated liabilities associated with compliance with its terms and conditions, have the transferee sign and date below.

(Transferee) *(DATE)*

*U.S. GOVERNMENT PRINTING OFFICE: 1986 – 717-425

SPECIAL CONDITIONS (AID. 200620445; NC Turnpike Authority; Triangle Parkway/TIP U-4763B)

Work Limits

a) All work authorized by this permit must be performed in strict compliance with the attached plans, which are a part of this permit. Any modification to these plans must be approved by the US Army Corps of Engineers (USACE) prior to implementation.

b) Except as authorized by this permit or any USACE approved modification to this permit, no excavation, fill or mechanized land-clearing activities shall take place at any time in the construction or maintenance of this project, within waters or wetlands. This permit does not authorize temporary placement or double handling of excavated or fill material within waters or wetlands outside the permitted area. This prohibition applies to all borrow and fill activities connected with this project.

c) Except as specified in the plans attached to this permit, no excavation, fill or mechanized land-clearing activities shall take place at any time in the construction or maintenance of this project, in such a manner as to impair normal flows and circulation patterns within waters or wetlands or to reduce the reach of waters or wetlands.

Related Laws

d) All mechanized equipment will be regularly inspected and maintained to prevent contamination of waters and wetlands from fuels, lubricants, hydraulic fluids, or other toxic materials. In the event of a spill of petroleum products or any other hazardous waste, the permittee shall immediately report it to the N.C. Division of Water Quality at (919) 733-5083, Ext. 526 or (800) 662-7956 and provisions of the North Carolina Oil Pollution and Hazardous Substances Control Act will be followed.

Project Maintenance

e) The permittee shall advise the Corps in writing prior to beginning the work authorized by this permit and again upon completion of the work authorized by this permit.

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

g) The permittee shall require its contractors and/or agents to comply with the terms and conditions of this permit in the construction and maintenance of this project, and shall provide each of its contractors and/or agents associated with the construction or maintenance of this project with a copy of this permit. A copy of this permit, including all conditions, shall be available at the project site during construction and maintenance of this project

h) The permittee shall employ all sedimentation and erosion control measures necessary to prevent an increase in sedimentation or turbidity within waters and wetlands outside the permit area. This shall include, but is not limited to, the immediate installation of silt fencing or similar appropriate devices around all areas subject to soil disturbance or the movement of earthen fill, and the immediate stabilization of all disturbed areas. Additionally, the project must remain in full compliance with all aspects of the Sedimentation Pollution Control Act of 1973 (North Carolina General Statutes Chapter 113A Article 4).

i) The permittee, upon receipt of a notice of revocation of this permit or upon its expiration before completion of the work will, without expense to the United States and in such time and manner as the Secretary of the Army or his authorized representative may direct, restore the water or wetland to its pre-project condition.

Enforcement

j) Violations of these conditions or violations of Section 404 of the Clean Water Act or Section 10 of the Rivers and Harbors Act must be reported in writing to the Wilmington District U.S. Army Corps of Engineers within 24 hours of the permittee's discovery of the violation.

Design/Build Process

k) When final design plans are completed through the Design/Build Process for this project, any necessary permit modifications shall be submitted to the District Engineer and the North Carolina Division of Water Quality (NCDWQ). If necessary, a public notice will be circulated for review. Final designs shall reflect all appropriate avoidance, minimization and mitigation for impacts within streams and wetlands. Construction within streams and wetlands on portions of the project for which wetland or stream impacts have increased due to final design shall begin only after approval by the District Engineer of the modified impacts.

Culverts

l) All authorized culverts will be installed to allow the passage of low stream flows and the continued movement of fish and other aquatic life as well as to prevent headcutting of the streambed. For all box culverts and for pipes greater than 48 inches in diameter, the bottom of the pipe will be buried at least one foot below the bed of the stream unless burial would be impractical and the Corps of Engineers has waived this requirement. For culverts 48 inches in diameter or smaller, the bottom of the pipe must be buried below the bed of the stream to a depth equal to or greater than 20 percent of the diameter of the culvert. Design and placement of culverts and other structures including temporary erosion control measures shall not be conducted in a manner that may result in disequilibrium of wetlands or streambeds or banks, adjacent to, upstream or downstream of the structures. In order to allow for the continued

movement of bed load and aquatic organisms, existing stream channel widths and depths will be maintained at the inlet and outlet ends of culverts. Riprap armoring of streams at culvert inlets and outlets shall be minimized above the ordinary high water elevation in favor of bioengineering techniques such as bank sloping, erosion control matting and revegetation with deep-rooted, woody plants.

Preconstruction Meeting

m) The permittee shall schedule a preconstruction meeting between its representatives, the contractor's representatives, and the Corps of Engineers, Raleigh Regulatory Field Office, Regulatory Project Manager, prior to any work within jurisdictional waters and wetlands to ensure that there is a mutual understanding of all of the terms and conditions contained within this Department of the Army Permit. The permittee shall provide the USACE, Raleigh Regulatory Field Office, with a copy of the final plans at least two weeks prior to the preconstruction meeting along with a description of any changes that have been made to the project's design, construction methodology or construction timeframe. The permittee shall schedule the preconstruction meeting for a time when the USACE and North Carolina Division of Water Quality (NCDWQ) Project Managers can attend. The permittee shall invite the Corps and NCDWQ Project Managers a minimum of thirty (30) days in advance of the scheduled meeting in order to provide those individuals with ample opportunity to schedule and participate in the required meeting.

Borrow And Waste

n) To ensure that all borrow and waste activities occur on high ground and do not result in the degradation of adjacent wetlands and streams, except as authorized by this permit, the permittee shall require its contractors and/or agents to identify all areas to be used to borrow material, or to dispose of dredged, fill, or waste material. The permittee shall provide the USACE with appropriate maps indicating the locations of proposed borrow or waste sites as soon as the permittee has that information. The permittee will coordinate with the USACE before approving any borrow or waste sites that are within 400 feet of any streams or wetlands. All jurisdictional wetland lines on borrow and waste sites shall be verified by the Corps of Engineers and shown on the approved reclamation plans. The permittee shall ensure that all such areas comply with Condition b) of this permit, and shall require and maintain documentation of the location and characteristics of all borrow and disposal sites associated with this project. This information will include data regarding soils, vegetation and hydrology sufficient to clearly demonstrate compliance with the Condition b). All information will be available to the USACE upon request. The permittee shall require its contractors to complete and execute reclamation plans for each waste and borrow site and provide written documentation that the reclamation plans have been implemented and all work is completed. This documentation will be provided to the Corps of Engineers within 30 days of the completion of the reclamation work.

SPECIAL CONDITIONS (AID. 200620445; NC Turnpike Authority; Triangle Parkway/TIP U-4763B)

EEP Mitigation

o) NCTA will mitigate for 3,797 linear feet of unavoidable permanent impacts to warm water streams with more than minimal function, and the 1.71 acres of impacts to wetlands, through payment to the Ecosystem Enhancement Program (EEP), in the amount determined by EEP sufficient to perform a total of 7,594 linear feet of restoration equivalent warm water stream channel, and 3.11 acres of restoration equivalent riparian wetlands (1.40 acres at 2:1, 0.31 acre at 1:1),, in the Cape Fear River basin (Cataloging Unit 0303002). Construction within jurisdictional areas on the property shall begin only after the NCTA has made full payment to EEP and provided a copy of the payment documentation to the Corps, and EEP has provided written confirmation to the Corps that it agrees to accept responsibility for the mitigation work required, in compliance with the MOU between the North Carolina Department of Environment and Natural Resources and the United States Army Corps of Engineers, Wilmington District, dated November 4, 1998.

Rcvd 12/16/08
98

Michael F. Easley, Governor
William G. Ross Jr., Secretary
North Carolina Department of Environment and Natural Resources

Coleen Sullins, Director
Division of Water Quality

20062045

November 25, 2008

Steven D. DeWitt, P.E., Chief Engineer
North Carolina Turnpike Authoity
1578 Mail Service Center
Raleigh, North Carolina, 27699-1578

Subject: 401 Water Quality Certification Pursuant to Section 401 of the Federal Clean Water Act and ISOLATED WETLANDS PERMIT Pursuant to IWGP100000 with ADDITIONAL CONDITIONS for Proposed Triangle Parkway in Wake and Durham Counties, Federal Aid Project No. NHS-54(7), State Project No. 39942.1.TA1, TIP No. U-4763B.
DWQ Project No. 20080540.

Dear Mr. DeWitt:

Attached hereto is a copy of Water Quality Certification No. 3756 issued to The North Carolina Transit Authority dated November 25, 2008.

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

Sincerely,

Coleen Sullins,
Director

Attachments

cc: Eric Alsmeyer, US Army Corps of Engineers, Raleigh Field Office
Jennifer Harris, NC Turnpike Authority
Dr. Gregory J. Thorpe, NCDOT PDEA
Chris Murray, Division 5 Environmental Officer
Shannon Sweitzer, NC Turnpike Authority
Kathy Matthews, Environmental Protection Agency
Travis Wilson, NC Wildlife Resources Commission
Beth Harmon, Ecosystem Enhancement Program
Stephen Roberts, RK&K Consulting Engineers
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Transportation Permitting Unit
1650 Mail Service Center, Raleigh, North Carolina 27699-1650
2321 Crabtree Boulevard, Suite 250, Raleigh, North Carolina 27604
Phone: 919-733-1786 / FAX 919-733-6893 / Internet: http://h2o.enr.state.nc.us/ncwetlands

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William G. Ross Jr., Secretary
North Carolina Department of Environment and Natural Resources

Coleen Sullins, Director
Division of Water Quality

401 Water Quality Certification Pursuant to Section 401 of the Federal Clean Water Act 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 (DWQ) Regulations in 15 NCAC 2H .0500. This certification authorizes the NC Turnpike Authority to impact 1.973 acres of jurisdictional wetlands and 8079 linear feet of jurisdictional streams in Wake and Durham Counties. The project shall be constructed pursuant to the application dated received March 19, 2008, and additional information received August 6, 2008. The authorized impacts are as described below:

Stream Impacts in the Cape Fear River Basin

Site	Permanent Fill in Intermittent Stream (linear ft)	Temporary Impacts to Intermittent Stream (linear ft)	Permanent Fill in Perennial Stream (linear ft)	Temporary Impacts to Perennial Stream (linear ft)	Total Stream Impact (linear ft)	Stream Impacts Requiring Mitigation (linear ft)
1	0	0	118	77	195	118
2	0	0	326	23	349	326
4	215	11	0	0	226	0
5	175	0	323	119	617	323
6	0	0	1232	77	1309	1232
7	0	0	0	10	10	0
8	209	0	0	0	209	0
9	697	0	557	0	1254	557
10	186	0	0	0	186	0
11	1781	0	743	38	2562	743
12	0	0	163	60	223	163
14	0	0	0	80	80	0
15	0	0	99	178	277	99
16	113	51	0	0	164	0
17	0	0	236	0	236	236
18	143	39	0	0	182	0
Total	**3519**	**101**	**3797**	**662**	**8079**	**3797**

Total Stream Impact for Project: 8,079 linear feet

Wetland Impacts in the Cape Fear River Basin

Site	Permanent Fill (ac)	Temporary Fill (ac)	Excavation (ac)	Mechanized Clearing (ac)	Total Wetland Impact (ac)	Wetland Impacts Requiring Mitigation (ac)
2	0	0	0.02	0.003	0.023	0.023
3	0	0	0.06 (Isolated)	0	0.06 (Isolated)	0.06 (Isolated)
6	1.12	0	0	0	1.12	1.12
12	0.1	0	0.02	0.06	0.19	0.19
13	0.31	0	0	0	0.31	0.31
14	0.08	0.19	0	0	0.27	0.08
Total	**1.61**	**0.19**	**0.1**	**0.063**	**1.913 (404) 0.06 (Isolated)**	**1.723 (404) 0.06 (Isolated)**

Total Wetland Impact for Project: 1.973 acres.

Transportation Permitting Unit
1650 Mail Service Center, Raleigh, North Carolina 27699-1650
2321 Crabtree Boulevard, Suite 250, Raleigh, North Carolina 27604
Phone: 919-733-1786 / FAX 919-733-6893 / Internet: http://h2o.enr.state.nc.us/ncwetlands

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

This approval is only valid for the purpose and design that you submitted in your application dated received March 19, 2008 and additional information dated received November 13, 2008. Should your project change, you are required to notify the DWQ and submit a new application. If the property is sold, the new owner must be given a copy of this Certification and approval letter, and is thereby responsible for complying with all the conditions. If any additional wetland 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). 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.

Conditions of Certification:

1. Compensatory mitigation for 3,797 linear feet of impact to perennial streams is required. We understand that you have chosen to perform compensatory mitigation for impacts to streams through the North Carolina Ecosystem Enhancement Program (EEP), and that the EEP has agreed to implement the mitigation for the project. EEP has indicated in a letter dated November 24, 2008 that they will assume responsibility for satisfying the federal Clean Water Act compensatory mitigation requirements for the above-referenced project, in accordance with the MOU between the NCDENR and US Corps of Engineers, Wilmington District, dated November 4, 1998.

2. Compensatory mitigation for impacts to 1.783 acres of wetlands is required. We understand that you have chosen to perform compensatory mitigation for impacts to 1.723 acres of 404 wetlands through the North Carolina Ecosystem Enhancement Program (EEP), and that the EEP has agreed to implement the mitigation for the project. EEP has indicated in a letter dated November 24, 2008 that they will assume responsibility for satisfying the federal Clean Water Act compensatory mitigation requirements for the above-referenced project, in accordance with the MOU between the NCDENR and US Corps of Engineers, Wilmington District, dated November 4, 1998. The applicant shall secure the mitigation for the remaining 0.06 acres of Isolated wetlands, and submit written proof to DWQ, before construction of the project begins.

3. Due to the possibility that compaction and/or other site alterations might prevent the temporary wetland impact area from re-attaining jurisdictional wetland status, the permittee shall provide an update on the wetland areas at Site 14, within three years after the temporary impact is finished. This update will consist of photographs and a brief report on the progress of this temporarily impacted area in re-attaining wetland jurisdictional status. If the wetland area temporarily impacted by this project has not re-attained jurisdictional wetland status, NC DWQ shall determine if compensatory wetland mitigation will be required.

4. A copy of the final construction drawings shall be furnished to NCDWQ Central Office 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 March 19, 2008. Any deviations from the approved drawings are not authorized unless approved by the NC Division of Water Quality. Also, the Division of Water Quality shall be notified a minimum of 30 days prior to the preconstruction conference.

5. The post-construction removal of any temporary bridge structures must return the project site to its preconstruction contours and elevations. The impacted areas shall be revegetated with appropriate native species.

Transportation Permitting Unit
1650 Mail Service Center, Raleigh, North Carolina 27699-1650
2321 Crabtree Boulevard, Suite 250, Raleigh, North Carolina 27604
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6. Strict adherence to the most recent version of NCDOT's Best Management Practices For Bridge Demolition and Removal approved by the US Army Corps of Engineers is a condition of the 401 Water Quality Certification.

7. Bridge deck drains shall not discharge directly into streams or surface waters. Stormwater shall be directed across the bridge and pre-treated through site-appropriate means (grassed swales, pre-formed scour holes, vegetated buffers, etc.) before entering the stream. Please refer to the most current version of *Stormwater Best Management Practices.*

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. Placement of culverts and other structures in waters, streams, and wetlands 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 down stream of the above structures. The applicant is required to provide evidence that the equilibrium is being maintained if requested in writing by DWQ. If this condition is unable to be met due to bedrock or other limiting features encountered during construction, please contact the NC DWQ for guidance on how to proceed and to determine whether or not a permit modification will be required.

10. 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.

11. For any streams being impacted due to site dewatering activties, the site shall be graded to its preconstruction contours and revegetated with appropriate native species.

12. 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.

13. 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.

14. 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.

15. The use of riprap above the Normal High Water Mark shall be minimized. Any riprap placed for stream stabilization shall be placed in stream channels in such a manner that it does not impede aquatic life passage.

16. 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.

17. 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.

18. 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.

19. No rock, sand or other materials shall be dredged from the stream channel except where authorized by this certification.

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20. Discharging hydroseed mixtures and washing out hydroseeders and other equipment in or adjacent to surface waters is prohibited.

21. A copy of this Water Quality Certification shall be maintained on site at the construction site at all times. In addition, the Water Quality Certification and all subsequent modifications, if any, shall be maintained with the permittee and the on-site project manager.

22. The permittee and its authorized agents shall conduct its activities in a manner consistent with State water quality standards (including any requirements resulting from compliance with §303(d) of the Clean Water Act) and any other appropriate requirements of State and Federal law. If DWQ determines that such standards or laws are not being met (including the failure to sustain a designated or achieved use) or that State or federal law is being violated, or that further conditions are necessary to assure compliance, DWQ may reevaluate and modify this certification.

23. All fill slopes located in jurisdictional wetlands shall be placed at slopes no flatter than 3:1, unless otherwise authorized by this certification.

24. 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.

25. 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.

26. The Permittee shall report any violations of this certification to the Division of Water Quality within 24 hours of discovery.

27. Upon completion of the project (including any impacts at associated borrow or waste site), the project manager shall complete and return the enclosed "Certification of Completion Form" to notify DWQ when all work included in the 401 Certification has been completed.

28. 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.

29. 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.

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

31. The onsite project manager shall schedule monthly review meetings once construction on impact areas begins. These meetings will be scheduled with DWQ and other interested resource agencies (USCOE, WRC, USFWS, NCDOT, etc). At the agencies' discretion, these meetings may be less frequent as project nears completion.

Transportation Permitting Unit
1650 Mail Service Center, Raleigh, North Carolina 27699-1650
2321 Crabtree Boulevard, Suite 250, Raleigh, North Carolina 27604
Phone: 919-733-1786 / FAX 919-733-6893 / Internet: http://h2o.enr.state.nc.us/ncwetlands

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32. 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.

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.

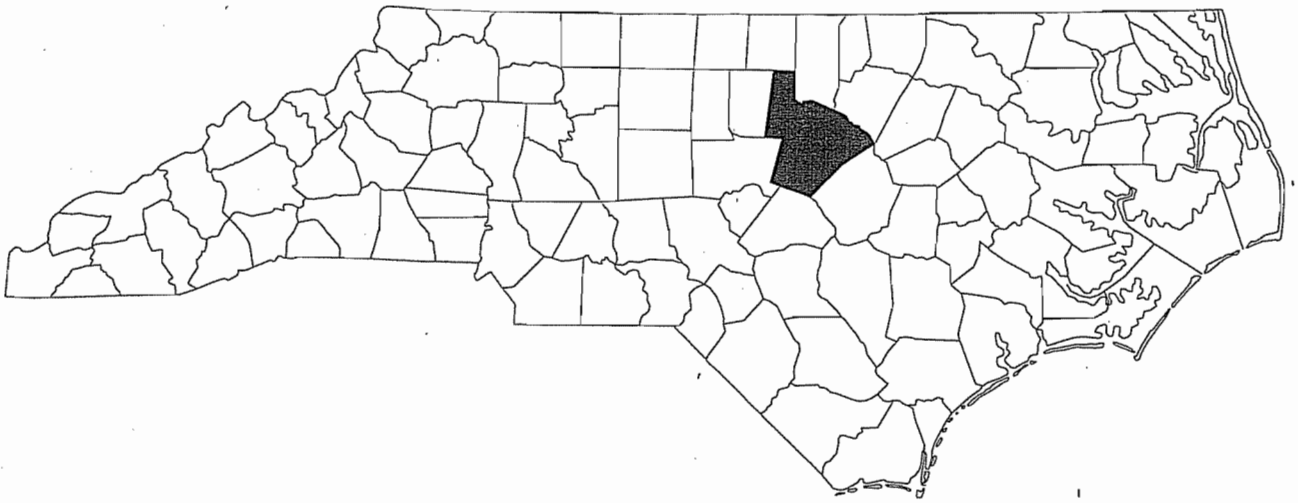
This the 25th day of November 2008

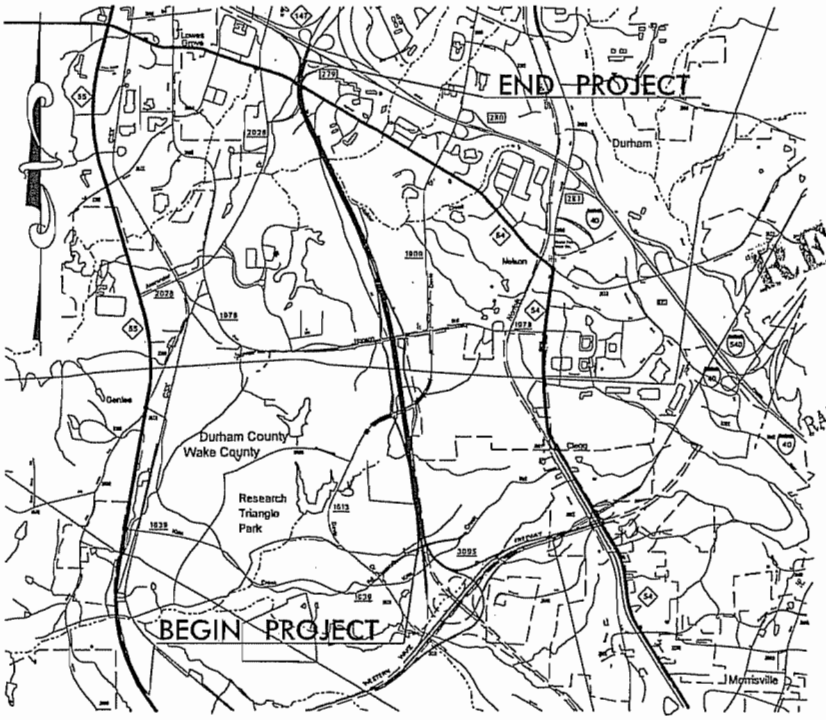
DIVISION OF WATER QUALITY

Coleen Sullins
Director

WQC No. 3756

NORTH CAROLINA





(NOT TO SCALE)

RECEIVED
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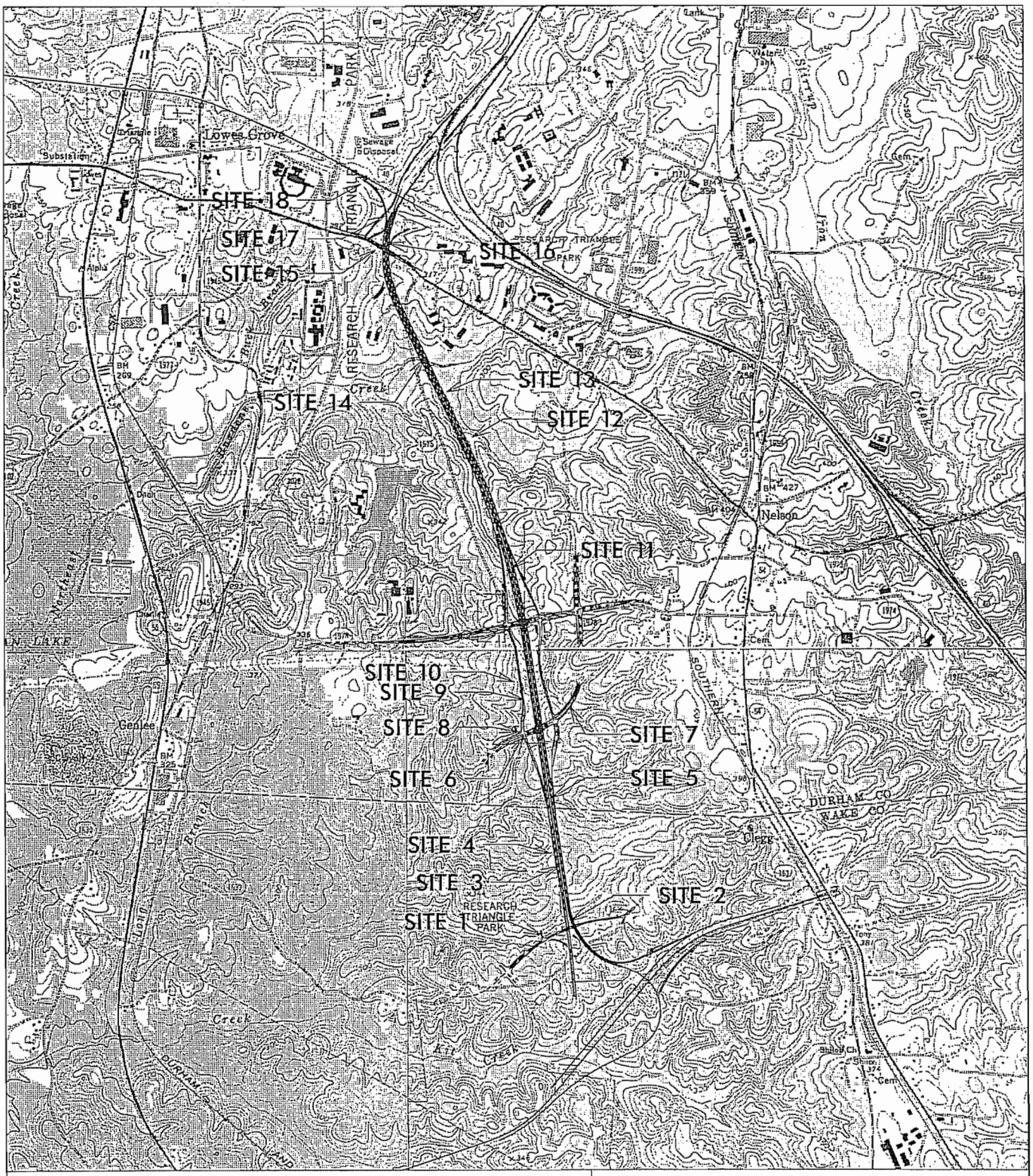
RALEIGH REGULATORY FIELD OFFICE

VICINITY MAP

2006-20145

N.C. TURNPIKE AUTHORITY
WAKE AND DURHAM COUNTIES
PROJECT: U-4763B (TRIANGLE PARKWAY)
EXTENSION OF NC 147 BETWEEN
NC 540 IN WAKE COUNTY AND
I-40 IN DURHAM COUNTY

SHEET 1 OF 105 11/27/2007



TOPO MAP

SCALE: 1" : 5000'

N.C. TURNPIKE AUTHORITY
WAKE AND DURHAM COUNTIES
PROJECT: U-4763B(TRIANGLE PARKWAY)
EXTENSION OF NC 147 BETWEEN
NC 540 IN WAKE COUNTY AND
I-40 IN DURHAM COUNTY

SHEET 2 OF 105

11/27/2007

PROPERTY OWNERS

NAMES AND ADDRESSES

PARCEL NO.	NAMES	ADDRESSES
27	Biogen RTP Reality LLC	PO Box 14627 RTP, NC 27709
26	Nathaniel Mayo Heirs	6601 Kit Creek Rd. Morrisville, NC 27560
31	Biogen RTP Reality LLC	PO Box 14627 RTP, NC 27709
30	Biogen RTP Reality LLC	PO Box 14627 RTP, NC 27709
49	Biogen RTP Reality LLC	PO Box 14627 RTP, NC 27709
53	Gre Keystone Technology Park Two LLC	Suite 115 1100 Cresent St Cary, NC 27511
43	Eisai, Inc	PO Box 14505 RTP, NC 27709
44	RTF	PO Box 12255 RTP, NC 27709
36	RTF	PO Box 12255 RTP, NC 27709
72	RTF	PO Box 12255 RTP, NC 27709

N.C. TURNPIKE AUTHORITY
WAKE AND DURHAM COUNTIES
PROJECT: U-4763B(TRIANGLE PARKWAY)
EXTENSION OF NC 147 BETWEEN
NC 540 IN WAKE COUNTY AND
I-40 IN DURHAM COUNTY

WETLAND PERMIT IMPACT SUMMARY

Site No.	Station (From/To)	Structure Size / Type	WETLAND IMPACTS: Permanent Fill In Wetlands (ac)	WETLAND IMPACTS: Temp. Fill In Wetlands (ac)	WETLAND IMPACTS: Excavation in Wetlands (ac)	WETLAND IMPACTS: Mechanized Clearing in Wetlands (ac)	WETLAND IMPACTS: Hand Clearing in Wetlands (ac)	SURFACE WATER IMPACTS: Permanent SW impacts (ac)	SURFACE WATER IMPACTS: Temp. SW impacts (ac)	SURFACE WATER IMPACTS: Existing Channel Impacts Permanent (ft)	SURFACE WATER IMPACTS: Existing Channel Impacts Temp. (ft)	SURFACE WATER IMPACTS: Natural Stream Design (ft)
		CULVERT										
1	Station 11+28 -Y5DR1-	RCBC (1@ 9' X 7' RCBC)						0.01	0.003	118	77	
2	Station 99+37 -L-	CULVERT	0	0	0.02	0.003	0	0.04	0.007	326	23	
		(1@ 9' X 7' RCBC)										
3	107+51 TO 108+98 -L-	Mainline Roadway	0	0	0.06	0	0					
		(Unnamed Tributary)										
4	118+32 TO 120+30 -L-	Mainline Roadway						0.04	0.002	215	11	
		(Unnamed Tributary)										
5	Station 124+97 -L-	CULVERT						0.08	0.010	498	119	
		(2@ 9' X 8' RCBC)										
6	Station 142+53 -L-	CULVERT	0.71	0	0	0	0	0.14	0.01	1232	77	
		(2@ 7' X 7' RCBC)										
6	Station 26+50 -Y1RPC-	CULVERT	0.41	0	0	0	0					
		(2@ 8' X 7' RCBC)										
TOTALS: SHEET 1			1.120		0.077	0.003		0.310	0.032	2389	307	

N.C. TURNPIKE AUTHORITY
WAKE AND DURHAM COUNTIES
PROJECT: U-4763B (TRIANGLE PARKWAY)
EXTENSION OF NC 147 BETWEEN
NC 540 IN WAKE COUNTY AND
I-40 IN DURHAM COUNTY

WETLAND PERMIT IMPACT SUMMARY

Site No.	Station (From/To)	Structure Size / Type	WETLAND 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)	SURFACE WATER IMPACTS: Permanent SW impacts (ac)	Temp. SW impacts (ac)	Existing Channel Impacts Permanent (ft)	Existing Channel Impacts Temp. (ft)	Natural Stream Design (ft)
7	Station 241+26 -Y1-	EXTENSION OF 54" RCP						0	0.001	0	10	
8	Station 14+64 -SR2-	66" RCP						0.03	0	209	0	
9	17+36 TO 28+09 -SR2-	Mainline Roadway (Unnamed Tributary)						0.11	0	1254	0	
10	21+90 TO 22+45 -SR2-	Mainline Roadway (Unnamed Tributary)						0.02	0	186	0	
11	170+00 TO 191+50 -L-	Mainline Roadway (Unnamed Tributary)						0.243	0.010	2524	38	
12	201+19 TO 202+99 -L-	Mainline Roadway (Unnamed Tributary)	0.10	0	0.04	0.05	0	0.010	0	84	0	
13	207+35 TO 211+47 -L-	Mainline Roadway (Wetlands)	0.31	0	0	0	0					
14	217+69 TO 218+98 -L-	Bridge Pier and Fill (Wetlands)	0.09	0.20	0	0	0	0	0.005	0	37	
TOTALS: SHEET 2			0.500	0.200	0.040	0.050		0.413	0.016	4257	85	
TOTALS: CUMULATIVE			1.620	0.200	0.117	0.053		0.723	0.048	6646	392	

WETLAND PERMIT IMPACT SUMMARY

Site No.	Station (From/To)	Structure Size / Type	WETLAND 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)	SURFACE WATER IMPACTS: Permanent SW impacts (ac)	Temp. SW impacts (ac)	Existing Channel Impacts Permanent (ft)	Existing Channel Impacts Temp. (ft)	Natural Stream Design (ft)
15	Station 20+04 -Y3-	CULVERT						0.02	0.01	99	15	
		RCBC(2@7' X 1-1' RCBC)										
	Station 19+85 -Y3DET-	Temporary Detour						0	0.04	0	163	
		CSP(2@84" wHeadwall)										
16	Station 246+56 -L-	Mainline Roadway						0.01	0.006	113	51	
		(Unnamed Tributary)										
17	Station 15+27 -Y4RPC-	CULVERT						0.04	0	236	0	
		RCBC(2@8' X 6' RCBC)										
18	20+36 TO 20+74 -Y4RPC-	Mainline Roadway						0.01	0.01	143	39	
		(Unnamed Tributary)										
TOTALS: SHEET 3			0	0	0	0		0.080	0.066	591	268	
TOTALS: CUMULATIVE			1.620	0.200	0.117	0.053		0.803	0.114	7237	660	

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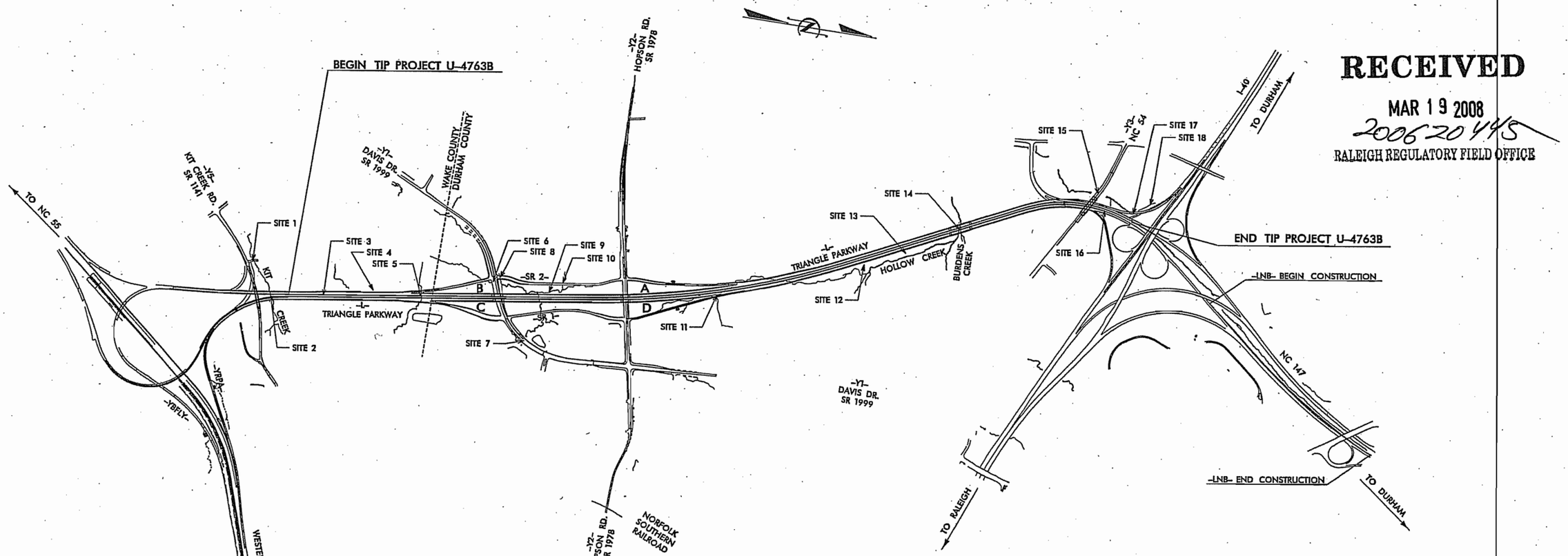


TABLE INFO

Site	Stream	Wetland	Sheet	Site	Stream	Wetland	Sheet
1	at Kit Creek Road	-	14	10	MSCBA	-	34
2	MSA	MWA	14	11	NSD, NSF	-	36, 38, 40
3	-	MWB	14	12	NSD	NWE	40
4	MSBA	-	18	13	-	NWD	43
5	MSB, MSBB	-	22	14	-	NWC, NWH	43, 45
6	MSC, MSCC	MWD, MWF	24, 26	15	NSL	-	9, 47
7	MSCA	-	26	16	NSLA	-	50
8	MSCC	-	24	17	NSL	-	50
9	MSCB	-	34	18	NSLF	-	50, 54

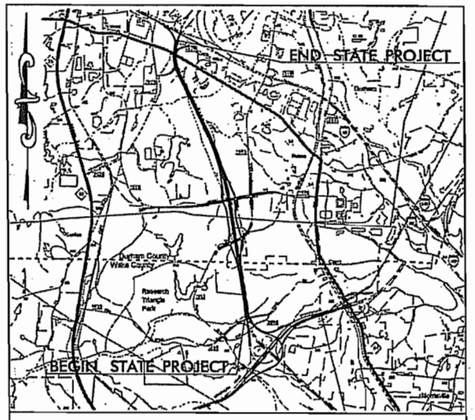
SITE MAP
NOT TO SCALE

N.C. TURNPIKE AUTHORITY
WAKE AND DURHAM COUNTIES
PROJECT: U-4763B(TRIANGLE PARKWAY)
EXTENSION OF NC 147 BETWEEN
NC 540 IN WAKE COUNTY AND
I-40 IN DURHAM COUNTY

TIP: U-4763B

CONTRACT:

See Sheet 1-A For Index of Sheets
See Sheet 1-B For Conventional Symbols



VICINITY MAP
(NOT TO SCALE)

NORTH CAROLINA TURNPIKE AUTHORITY

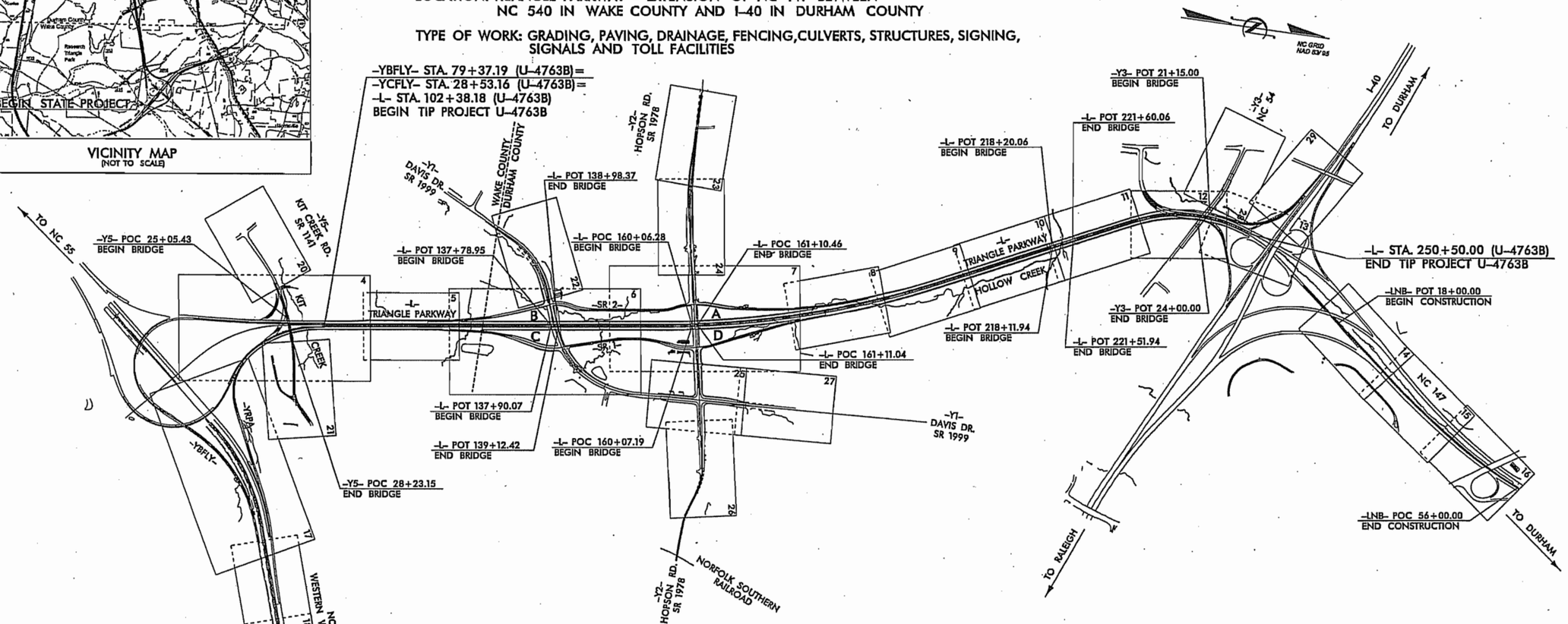
WAKE /DURHAM COUNTIES

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	U-4763B	1	
WBS NO.	F.A. PROJ. NO.	DESCRIPTION	
39942.1.TA1	NHF-54(7)	P.E.	

Sheet 8 of 105

LOCATION: TRIANGLE PARKWAY – EXTENSION OF NC 147 BETWEEN NC 540 IN WAKE COUNTY AND I-40 IN DURHAM COUNTY

TYPE OF WORK: GRADING, PAVING, DRAINAGE, FENCING, CULVERTS, STRUCTURES, SIGNING, SIGNALS AND TOLL FACILITIES



STREAM & WETLAND IMPACTS

THIS PROJECT IS A CONTROLLED ACCESS PROJECT WITH ACCESS LIMITED TO INTERCHANGES.

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

MULKEY
ENGINEERS & CONSULTANTS
PO Box 33187
Raleigh, NC 27636
(919) 851-1818
(919) 851-1838 (FAX)
WWW.MULKEYINC.COM

GRAPHIC SCALE

25' 0 50'
PLANS
25' 0 50'
PROFILE (HORIZONTAL)
5' 0 10'
PROFILE (VERTICAL)

DESIGN DATA

ADT 2010 = 37,000
ADT 2030 = 111,200
DHV = 10%
D = 55%
T = 9% *
V = 70 mph
* (Duals = 6% + TTST = 3%)
Functional Class.: Freeway

PROJECT LENGTH

LENGTH ROADWAY TIP PROJECT U-4763B = 2.698 MILES
LENGTH STRUCTURES TIP PROJECT U-4763B = 0.107 MILES
TOTAL LENGTH TIP PROJECT U-4763B = 2.805 MILES

Prepared in the Office of:
Mulkey Engineers & Consultants
FOR THE NORTH CAROLINA TURNPIKE AUTHORITY

2006 STANDARD SPECIFICATIONS

RIGHT OF WAY DATE: (PRODUCTION)

LETTING DATE: (PRODUCTION)

WILLIS S. HOOD, P.E.
MULKEY E & C PROJECT MANAGER

JOHNNY BANKS
MULKEY E & C PROJECT DESIGN ENGINEER

HYDRAULICS ENGINEER

PE
SIGNATURE:

ROADWAY DESIGN

PE
SIGNATURE:

NORTH CAROLINA TURNPIKE AUTHORITY

NORTH CAROLINA Turnpike Authority

P.E.
STATE HIGHWAY DESIGN ENGINEER

MULKEY ENGINEERS & CONSULTANTS

PROJECT REFERENCE NO.	SHEET NO.
U-4763B	2-K
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

Sheet 9 of 105

STA. 22+15 TO STA. 24+50 -Y5- RT
STA. 32+00 TO STA. 32+91 -Y5- RT
STA. 161+50 TO STA. 166+50 -L- LT
STA. 140+00 TO STA. 145+00 -L- RT
STA. 27+01 TO STA. 28+39 -Y1RPC- RT
STA. 24+44 TO STA. 26+24 -Y3DET- LT
STA. 65+60 TO STA. 66+80 -Y2- LT
STA. 262+00 TO STA. 265+10 -Y1- LT

STA. 237+65 -L- TO STA. 238+33 -L- RT
STA. 240+50 -L- TO STA. 238+33 -L- RT
STA. 16+02 -Y1RPD- TO STA. 17+54 -Y1RPD- RT
STA. 69+50 -YBFLY- RT TO STA. 98+50 -L- RT
STA. 15+20 TO STA. 21+50 RT -YCFLY- RT
STA. 17+33 TO STA. 21+50 LT -YCFLY- LT
STA. 61+50 LT TO STA. 64+50 -YBFLY- LT
STA. 23+50 TO STA. 26+00 -Y1RPD- LT
STA. 22+00 TO STA. 23+50 -Y1RPD- LT
STA. 19+47 TO STA. 22+00 -Y1RPC- LT
STA. 22+50 TO STA. 25+00 -Y1RPC- RT
STA. 26+00 TO STA. 27+00 -Y2RPB- RT
STA. 13+50 TO STA. 14+50 -Y4RPD- RT
STA. 68+50 TO STA. 69+50 -YBFLY- LT
STA. 25+87 TO STA. 26+62 -YCFLY- RT
STA. 24+00 TO STA. 25+59 -YCFLY- RT
STA. 15+01 TO STA. 17+18 -Y3DET- LT
STA. 221+00 TO STA. 224+00 -Y1- LT
STA. 17+52 TO STA. 19+00 -Y5- RT
STA. 19+00 TO STA. 20+22 -Y5- RT
STA. 212+00 TO STA. 212+50 -L- LT
STA. 212+50 TO STA. 213+00 -L- LT
STA. 226+50 TO STA. 227+50 -Y1-LT
STA. 227+50 TO STA. 228+50 -Y1- LT

STA. 12+77 RT. TO STA. 14+51 -Y1RPD- RT

STA. 126+00 -L- TO STA. 126+69 -L- M
STA. 126+69 -L- TO STA. 127+50 -L- M
STA. 228+50 -Y1- TO STA. 227+60 -Y1- M

STA. 217+00 TO STA. 218+00 -L- LT
STA. 17+00 TO STA. 17+50 -Y5- RT
STA. 242+30 TO STA. 245+00 -Y1- RT

STA. 161+50 -L- TO STA. 166+50 -L- RT
STA. 182+00 -L- TO STA. 186+00 -L- RT
STA. 55+70 -Y2- TO STA. 56+85 -Y2- RT
STA. 17+18 -Y3DET- TO STA. 18+88 -Y3DET- LT

STA. 14+80 RT. TO STA. 15+85 -SR1- RT

STA. 18+50 -Y4RPC- LT. +/- LINING: CLASS B RIP RAP

STA. 99+37 -L-

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'

STA. 99+76 M -L-
STA. 107+26 M -L-
STA. 109+36 M -L-
STA. 113+74 M -L-
STA. 118+24 M -L-
STA. 124+24 M -L-
STA. 128+76 M -L-
STA. 133+76 M -L-
STA. 139+45 M -L-
STA. 141+76 M -L-
STA. 143+76 M -L-
STA. 149+76 M -L-
STA. 166+74 M -L-
STA. 171+74 M -L-
STA. 175+24 M -L-
STA. 176+44 M -L-
STA. 178+24 M -L-
STA. 180+24 M -L-
STA. 183+74 M -L-
STA. 188+24 M -L-
STA. 191+74 M -L-
STA. 195+09 M -L-
STA. 198+74 M -L-
STA. 201+74 M -L-
STA. 203+74 M -L-
STA. 205+24 M -L-
STA. 209+74 M -L-
STA. 212+74 M -L-
STA. 215+74 M -L-
STA. 244+91 M -L-
STA. 245+81 M -L-
STA. 247+26 M -L-
STA. 39+65 M -Y2-

STA. 32+91 -Y5- TO STA. 35+00 RT -Y5- RT B=2' D=1.0'
STA. 30+00 -Y5- TO STA. 32+00 -Y5- RT B=2' D=1.0'
STA. 28+50 -Y5- TO STA. 30+00 -Y5- RT B=2' D=1.0'
STA. 28+43 -SR2- TO STA. 31+75 -SR2- LT B=2' D=1.0'
STA. 17+45 -Y1RPC- TO STA. 19+47 -Y1RPC- LT B=2' D=1.0'
STA. 26+00 -Y1RPC- TO STA. 26+99 -Y1RPC- RT B=2' D=1.0'
STA. 201+65 -L- TO STA. 202+75 -L- RT B=4' D=1.0'
STA. 28+80 -SR2- TO STA. 32+10 -SR2- RT B=2' D=1.5'
STA. 220+30 -L- TO STA. 222+50 -L- LT B=2' D=1.5'
STA. 265+10 -Y1- TO STA. 267+25 -Y1- LT B=2' D=1.0'

STA. 18+88 TO STA. 19+35 -Y3DET- LT
STA. 64+50 TO STA. 65+00 -YBFLY- LT
STA. 65+00 TO STA. 66+00 -YBFLY- LT

STA. 14+50 -Y4RPD- RT B=2' LINING: CLASS B RIP RAP
STA. 114+00 -L- RT B=0' LINING: CLASS B RIP RAP
STA. 23+50 -Y1RPD- LT B=2' LINING: CLASS B RIP RAP
STA. 27+10 -Y1RPC- RT B=2' LINING: CLASS B RIP RAP
STA. 227+50 -Y1- LT B=2' LINING: GRASS

STA. 99+50 TO STA. 99+65 -L- RT EST. 14 TONS
STA. 99+70 TO STA. 99+80 -L- RT EST. 14 TONS
STA. 20+00 TO STA. 20+30 -SR2- LT EST. 45 TONS
STA. 28+31 TO STA. 28+70 -SR2- LT EST. 35 TONS
STA. 149+56 TO STA. 149+86 -L- LT EST. 47 TONS
STA. 175+35 TO STA. 176+40 -L- RT EST. 110 TONS
STA. 178+92 TO STA. 179+29 -L- LT EST. 60 TONS
STA. 181+94 TO STA. 183+77 -L- LT EST. 150 TONS
STA. 183+00 TO STA. 183+77 -L- RT EST. 95 TONS
STA. 220+30 TO STA. 220+40 -L- LT EST. 32 TONS
STA. 19+35 TO STA. 19+55 -Y3DET- LT EST. 75 TONS
STA. 13+85 TO STA. 14+17 -SR2- RT EST. 12 TONS

STA. 124+97 -L- LT & RT

STA. 14+50-Y4RPD- TO STA. 15+50-Y4RPD- RT
STA. 23+50 -Y1RPC- TO STA. 25+85 -Y1RPC- LT
STA. 193+00 -L- TO STA. 194+00 -L- LT
STA. 76+20 -YBFLY- TO STA. 78+50 -YBFLY- LT
STA. 222+50 -L- TO STA. 226+00 -L- LT

STA. 13+25 -Y4RPD- B=2' LINING:CLASS B RIP RAP
STA. 113+00 -L- LT B=2' LINING: CLASS B RIP RAP
STA. 139+33 -L- LT B=4', D=1.5' LINING: CLASS B RIP RAP
STA. 26+50 -Y1RPC- LT B=2' LINING: CLASS B RIP RAP
STA. 24+44 -Y3DET- LT B=2' LINING: CLASS B RIP RAP
STA. 270+13 -Y1- RT B=3' LINING: CLASS I RIP RAP (By Others)
STA. 141+50 -L- LT B=4', D=2.0' LINING: CLASS B RIP RAP

STA. 16+80 -Y1RPC- TO STA. 17+45 -Y1RPC- LT B=2'
STA. 166+50 -L- TO STA. 169+50 -L- LT B=2'
STA. 173+00 -L- TO STA. 188+43 -L- LT B=4'
STA. 188+43 -L- TO STA. 190+00 -L- LT B=4'
STA. 170+50 -L- TO STA. 178+00 -L- RT B=4'
STA. 186+00 -L- TO STA. 191+50 -L- RT B=2'
STA. 13+75 -Y4RPC- TO STA. 16+00 -Y4RPC- LT B=2'
STA. 75+47 -YBFLY- TO STA. 75+87 -YBFLY- LT B=2'
STA. 21+94 -SR2- TO STA. 28+43 -SR2- LT B=2'
STA. 240+13 -Y1- TO STA. 240+90 -Y1- LT B=2' b=3'
STA. 267+25 -Y1- TO STA. 269+60 -Y1- LT B=2'
STA. 12+50 -Y1RPD- TO STA. 12+70 -Y1RPD- LT B=2'

STATION	B FT.	D FT.	W FT.	d FT.	CLASS B RIP RAP TONS	DDE FT³	FILTER FABRIC FT²	PSRM FT²
11+73 Y5DR1	5	2	4	1.0	4	90	65	215
205+00 L	5	2	4	1.0	4	90	65	215
212+50 L	5	2	4	1.0	4	90	65	215
217+60 L	5	2	4	1.0	4	90	65	215

STA. 142+53 -L- LT

STA. 255+00 TO STA. 259+25 -Y1- RT LINING: PSRM
STA. 261+75 TO STA. 264+50 -Y1- RT LINING: PSRM
STA. 50+62 TO STA. 52+50 -Y2- LT LINING: PSRM
STA. 202+00 TO STA. 202+85 -L- LT LINING: CLASS B RIP RAP
STA. 17+90 TO STA. 19+40 -Y4RPC- RT LINING: CLASS B RIP RAP
STA. 10+70 TO STA. 12+65 -Y5- RT LINING: PSRM
STA. 42+50 TO STA. 43+50 -YRPA- RT LINING: CLASS B RIP RAP

STA. 16+00 TO STA. 17+50 -Y4RPC- LT B=2.0'
STA. 25+00 TO STA. 26+00 -Y2RPB- RT B=4.0'
STA. 25+50 -Y1RPC- TO STA. 26+00 -Y1RPC- RT B=2.0'
STA. 15+00 TO STA. 21+94 -SR2- LT B=4.0'
STA. 16+00 TO STA. 17+50 -Y4RPC- LT B=2.0'

STA. 229+85 -Y1-

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'

STA. 159+83 M -L-
STA. 217+84 M -L-
STA. 222+74 M -L-
STA. 229+76 M -L-
STA. 233+26 M -L-
STA. 237+49 M -L-
STA. 238+74 M -L-
STA. 240+24 M -L-
STA. 241+24 M -L-
STA. 242+24 M -L-

STA. 205+50 TO STA. 207+75 -L- LT
STA. 178+50 TO STA. 182+00 -L- RT
STA. 269+70 TO STA. 272+00 -Y1- LT (By Others)
STA. 27+00 TO STA. 22+24 -Y2RPA- LT
STA. 14+00 TO STA. 14+25 -Y5A- RT

STA. 48+50 -Y2- TO STA. 49+00 -Y2- RT
STA. 49+00 -Y2- TO STA. 49+50 -Y2- RT
STA. 238+33 -L- TO STA. 240+00 -L- RT
STA. 229+50 -L- TO STA. 230+00 -L- RT
STA. 230+00 -L- TO STA. 230+50 -L- RT
STA. 107+00 -L- TO STA. 107+50 -L- RT
STA. 107+50 -L- TO STA. 108+00 -L- RT
STA. 109+00 -L- TO STA. 109+50 -L- RT
STA. 109+50 -L- TO STA. 110+00 -L- RT
STA. 111+00 -L- TO STA. 114+00 -L- RT
STA. 180+00 -L- TO STA. 180+52 -L- LT
STA. 180+52 -L- TO STA. 181+03 -L- LT
STA. 187+06 -L- TO STA. 187+58 -L- LT
STA. 187+58 -L- TO STA. 188+10 -L- LT
STA. 190+35 -L- TO STA. 190+87 -L- LT
STA. 190+87 -L- TO STA. 191+38 -L- LT
STA. 15+33 -YCFLY- TO STA. 18+00 -YCFLY- RT

STA. 25+00 TO STA. 26+50 -Y2RPA- RT
STA. 35+00 TO STA. 37+00 -Y5- RT
STA. 14+00 TO STA. 14+25 -Y5A- RT

STA. 18+77 TO STA. 21+74 -Y3DET- RT
STA. 23+44 TO STA. 26+11 -Y3DET- RT

STA. 19+83 -Y3DET-

STA. 195+50 TO STA. 201+50 LT -L-

STA. 117+50 TO STA. 120+26 -L- LT

STA. 22+24 TO STA. 21+21 -Y2RPA- LT
STA. 14+40 TO STA. 14+95 -SR2- LT
STA. 24+25 TO STA. 25+00 -Y2RPA- RT

STA. 200+00 TO STA. 204+00 -L- RT ELEV.=270.94
STA. 204+00 TO STA. 208+00 -L- RT ELEV.=269.49
STA. 208+00 TO STA. 212+00 -L- RT ELEV.=268.11
STA. 212+00 TO STA. 214+00 -L- RT ELEV.=268.04

STA. 114+00 -L- TO STA. 116+00 -L- RT

STA. 11+28 -Y5DR1-

STA. 15+26 -Y4RPC-

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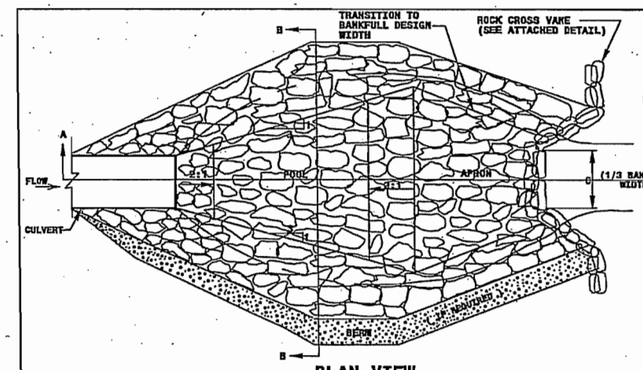
MULKEY
ENGINEERS & CONSULTANTS
PO Box 33127
Raleigh, N.C. 27636
(919) 851-1515
(919) 851-1516 (FAX)
www.mulkeyinc.com

PROJECT REFERENCE NO.	SHEET NO.
U-4763B	2-L
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

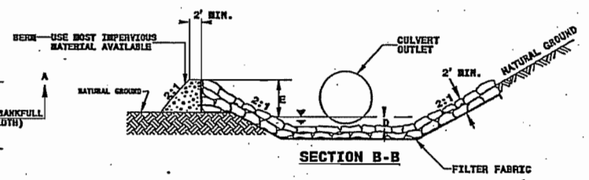
INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

Sheet 10 OF 105



PLAN VIEW



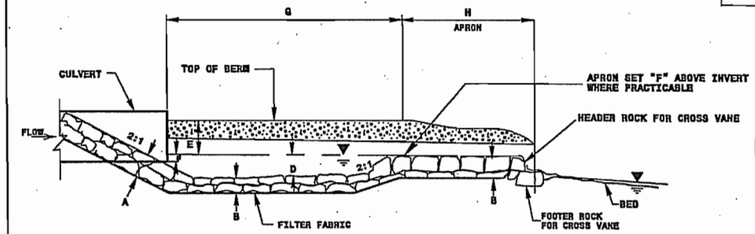
SECTION B-B

DETAIL LL

BASIN NUMBER	STATION	CULVERT SIZE	RIP RAP BASIN A	B	C	D	E	F	G	H
1	73+20+04 RT	2 @ 7'3" RCBC	3.0	2.25	10	4.25	*	1.0	55	28

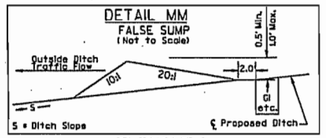
ALL DIMENSIONS APPROXIMATE IN FEET
*NO DIMENSION BECAUSE DISSIPATOR IS IN A DEFINED CHANNEL

NOTE: DISSIPATOR ROCKS SHOULD BE NATIVE STONE OR SHOT ROCK, ANGULAR AND OBLONG WITH AN APPROXIMATE d50 SIZE OF 1.5.

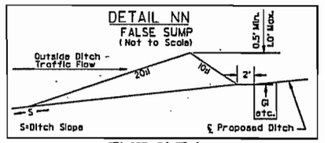


SECTION A-A

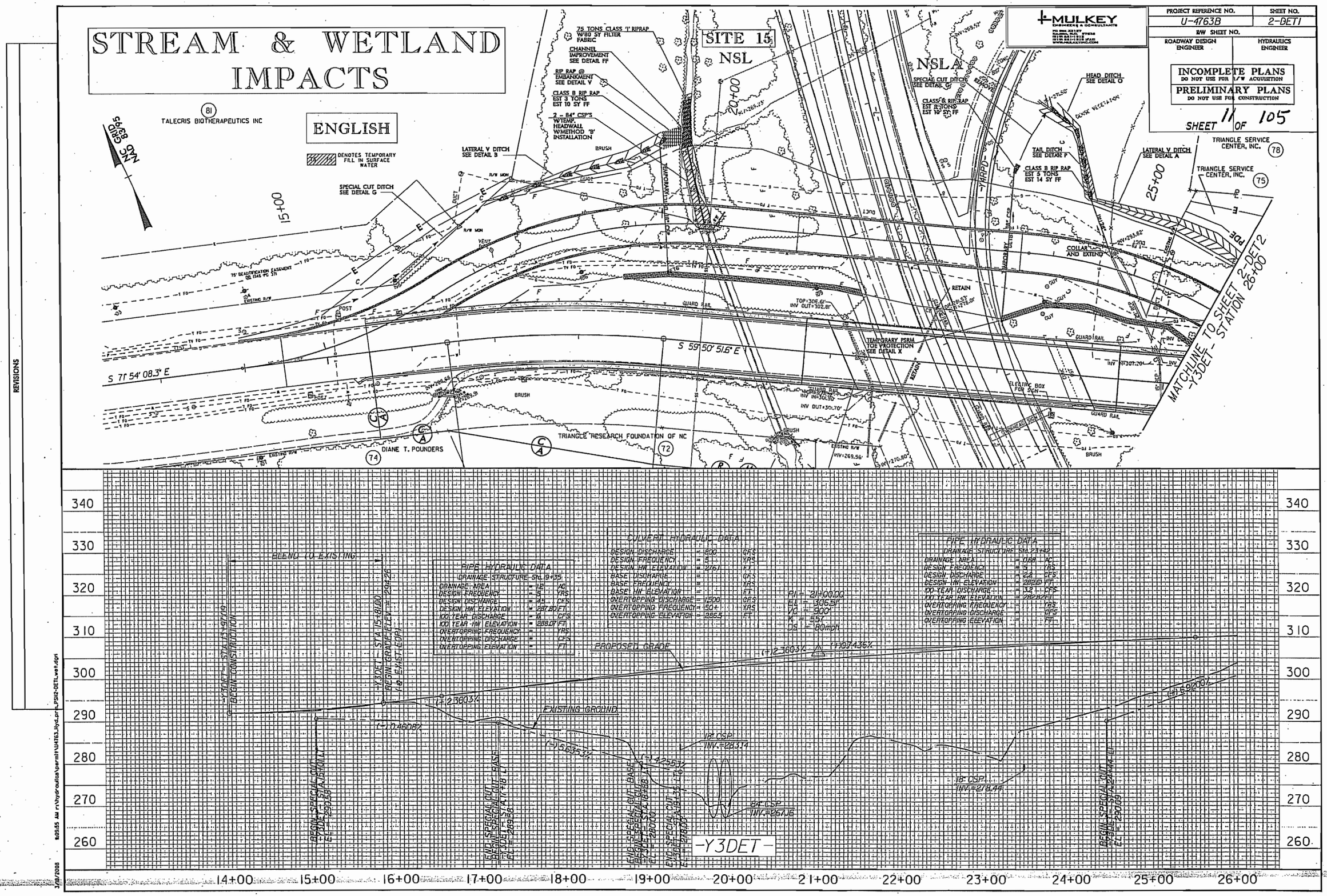
NATURAL ROCK ENERGY DISSIPATOR
(NOT TO SCALE)



STA. 114+24 RT -L-
STA. 229+76 LT -L-
STA. 229+76 RT -L-
STA. 17+58 RT -SR1-
STA. 28+57 RT -SR2-



STA. 107+26 RT -L-
STA. 109+26 RT -L-
STA. 232+26 RT -L-
STA. 15+41 LT -Y4RPD-



STREAM & WETLAND IMPACTS
ENGLISH
SITE 15
NSL
NSLA
MULKEY ENGINEERS & CONSULTANTS
PROJECT REFERENCE NO. U-4763B
SHEET NO. 2-DET1
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION
SHEET 11 OF 105
NC GRID NAD 83/95
TALECRIS BIOTHERAPEUTICS INC
DENOTES TEMPORARY FILL IN SURFACE WATER
75 TONS CLASS 'I' RIPRAP W/80 SY FILTER FABRIC
CHANNEL IMPROVEMENT SEE DETAIL FF
RIP RAP @ EMBANKMENT SEE DETAIL V
CLASS B RIP RAP EST 3 TONS EST 10 SY FF
2 - 84" CSP'S W/TEMP. HEADWALL W/METHOD 'B' INSTALLATION
LATERAL V DITCH SEE DETAIL B
SPECIAL CUT DITCH SEE DETAIL G
HEAD DITCH SEE DETAIL O
TAIL DITCH SEE DETAIL P
CLASS B RIP RAP EST 5 TONS EST 14 SY FF
LATERAL V DITCH SEE DETAIL A
TRIANGLE SERVICE CENTER, INC.
COLLAR AND EXTEND
RETAIN
TEMPORARY PSRM TOE PROTECTION SEE DETAIL X
ELECTRIC BOX FOR SIGN
GUARD RAIL
BRUSH
S 71° 54' 08.3" E
S 59° 50' 51.6" E
TRIANGLE RESEARCH FOUNDATION OF NC
DIANE T. POUNDERS
MATCHLINE TO SHEET 2-DET2 -Y3DET- STATION 26+00
PIPE HYDRAULIC DATA
DRAINAGE STRUCTURE Sta. 19+35
DRAINAGE AREA = 1.2 AC
DESIGN FREQUENCY = 5 YRS
DESIGN DISCHARGE = 45 CFS
DESIGN HW ELEVATION = 287.80 FT
100 YEAR DISCHARGE = 6 CFS
100 YEAR HW ELEVATION = 288.07 FT
OVERTOPPING FREQUENCY = YRS
OVERTOPPING DISCHARGE = CFS
OVERTOPPING ELEVATION = FT
CULVERT HYDRAULIC DATA
DESIGN DISCHARGE = 800 CFS
DESIGN FREQUENCY = 5 YRS
DESIGN HW ELEVATION = 276.1 FT
BASE DISCHARGE = CFS
BASE FREQUENCY = YRS
BASE HW ELEVATION = FT
OVERTOPPING DISCHARGE = 1500 CFS
OVERTOPPING FREQUENCY = 50+ YRS
OVERTOPPING ELEVATION = 286.5 FT
PI = 21+00.00
EL = 306.51
VC = 900'
K = 55'
DS = 80mph
PIPE HYDRAULIC DATA
DRAINAGE STRUCTURE Sta. 23+42
DRAINAGE AREA = 0.68 AC
DESIGN FREQUENCY = 5 YRS
DESIGN DISCHARGE = 2.2 CFS
DESIGN HW ELEVATION = 282.51 FT
100 YEAR DISCHARGE = 3.2 CFS
100 YEAR HW ELEVATION = 282.82 FT
OVERTOPPING FREQUENCY = YRS
OVERTOPPING DISCHARGE = CFS
OVERTOPPING ELEVATION = FT
BLEND TO EXISTING
PROPOSED GRADE
EXISTING GROUND
18" CSP INV.=283.74
84" CSP INV.=267.16
18" CSP INV.=278.44
-Y3DET-
340
330
320
310
300
290
280
270
260
14+00
15+00
16+00
17+00
18+00
19+00
20+00
21+00
22+00
23+00
24+00
25+00
26+00

REVISIONS

STREAM & WETLAND IMPACTS

REVISIONS

PROJECT REFERENCE NO.	SHEET NO.
U-4763B	2-DET1
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

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

SHEET 12 OF 105

MULKEY
ENGINEERS & CONSULTANTS

ENGLISH

SITE 15

NSL

NSL

TAGECRIS BIOTHERAPEUTICS INC (81)

TRIANGLE SERVICE CENTER, INC. (78)

TRIANGLE SERVICE CENTER, INC. (75)

TRIANGLE RESEARCH FOUNDATION OF NC (72)

DIANE J. POUNDERS (74)

DENOTES TEMPORARY FILL IN SURFACE WATER

75 TONS CLASS 'I' RIPRAP W/80 SY FILTER FABRIC

CHANNEL IMPROVEMENT SEE DETAIL FF

RIP RAP @ EMBANKMENT SEE DETAIL V

CLASS B RIP RAP EST 3 TONS EST 10 SY FF

2 - 84" CSP'S W/TEMP. HEADWALL W/METHOD 'B' INSTALLATION

LATERAL V DITCH SEE DETAIL B

SPECIAL CUT DITCH SEE DETAIL G

SPECIAL CUT DITCH SEE DETAIL G

HEAD DITCH SEE DETAIL O

CLASS B RIP RAP EST 25 TONS EST 10 SY FF

TAIL DITCH SEE DETAIL P

CLASS B RIP RAP EST 5 TONS EST 14 SY FF.

LATERAL V DITCH SEE DETAIL A

COLLAR AND EXTEND

RETAIN

TEMPORARY RIPRAP SLOPE PROTECTION SEE DETAIL X

75' BEAUTIFICATION EASEMENT (BK 1746 PG 311)

S 71° 54' 08.3" E

S 59° 50' 51.6" E

MATCHLINE TO SHEET 2-DET2 -Y3DET- STATION 26+00

-Y3DET- STA 15+81.00 BEGIN GRADE ELEV.= 294.26 1@ EXIST. LEDA

BEGIN CONSTRUCTION -Y3DET- STA 15+97.19

BLEND TO EXISTING

PROPOSED GRADE

EXISTING GROUND

(+) 0.46087

(+) 2.36034%

(-) 1.07436%

(+) 6.52001%

PI = 21+00.00
SL = 3065'
VC = 900'
K = 557
DS = 80mph

PIPE HYDRAULIC DATA
DRAINAGE STRUCTURE Sta.19+35

DRAINAGE AREA	= 1.2	AC
DESIGN FREQUENCY	= 5	YRS
DESIGN DISCHARGE	= 4.3	CFS
DESIGN HW ELEVATION	= 287.80	FT
100 YEAR DISCHARGE	= 6	CFS
100 YEAR HW ELEVATION	= 288.07	FT
OVERTOPPING FREQUENCY	=	YRS
OVERTOPPING DISCHARGE	=	CFS
OVERTOPPING ELEVATION	=	FT

CULVERT HYDRAULIC DATA

DESIGN DISCHARGE	= 200	CFS
DESIGN FREQUENCY	= 5	YRS
DESIGN HW ELEVATION	= 276.1	FT
BASE DISCHARGE	=	CFS
BASE FREQUENCY	=	YRS
BASE HW ELEVATION	=	FT
OVERTOPPING DISCHARGE	= 1500	CFS
OVERTOPPING FREQUENCY	= 50+	YRS
OVERTOPPING ELEVATION	= 286.5	FT

PIPE HYDRAULIC DATA
DRAINAGE STRUCTURE Sta.23+42

DRAINAGE AREA	= 0.28	AC
DESIGN FREQUENCY	= 5	YRS
DESIGN DISCHARGE	= 1.8	CFS
DESIGN HW ELEVATION	= 282.61	FT
100 YEAR DISCHARGE	= 3.2	CFS
100 YEAR HW ELEVATION	= 282.82	FT
OVERTOPPING FREQUENCY	=	YRS
OVERTOPPING DISCHARGE	=	CFS
OVERTOPPING ELEVATION	=	FT

18" CSP INV.=282.14

18" CSP INV.=278.49

24" CSP INV.=267.16

-Y3DET-

BEGIN SPECIAL CUT -Y3DET- STA 15+58.38 EL.= 296.58

END SPECIAL CUT -Y3DET- STA 16+68.17 EL.= 285.68

BEGIN SPECIAL CUT -Y3DET- STA 16+68.17 EL.= 285.68

END SPECIAL CUT -Y3DET- STA 18+00.00 EL.= 280.00

BEGIN SPECIAL CUT -Y3DET- STA 22+44.44 EL.= 290.09

340 330 320 310 300 290 280 270 260

14+00 15+00 16+00 17+00 18+00 19+00 20+00 21+00 22+00 23+00 24+00 25+00 26+00

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3/9/2009

SITE 15 -Y3DET- STA 19+83

ENGLISH

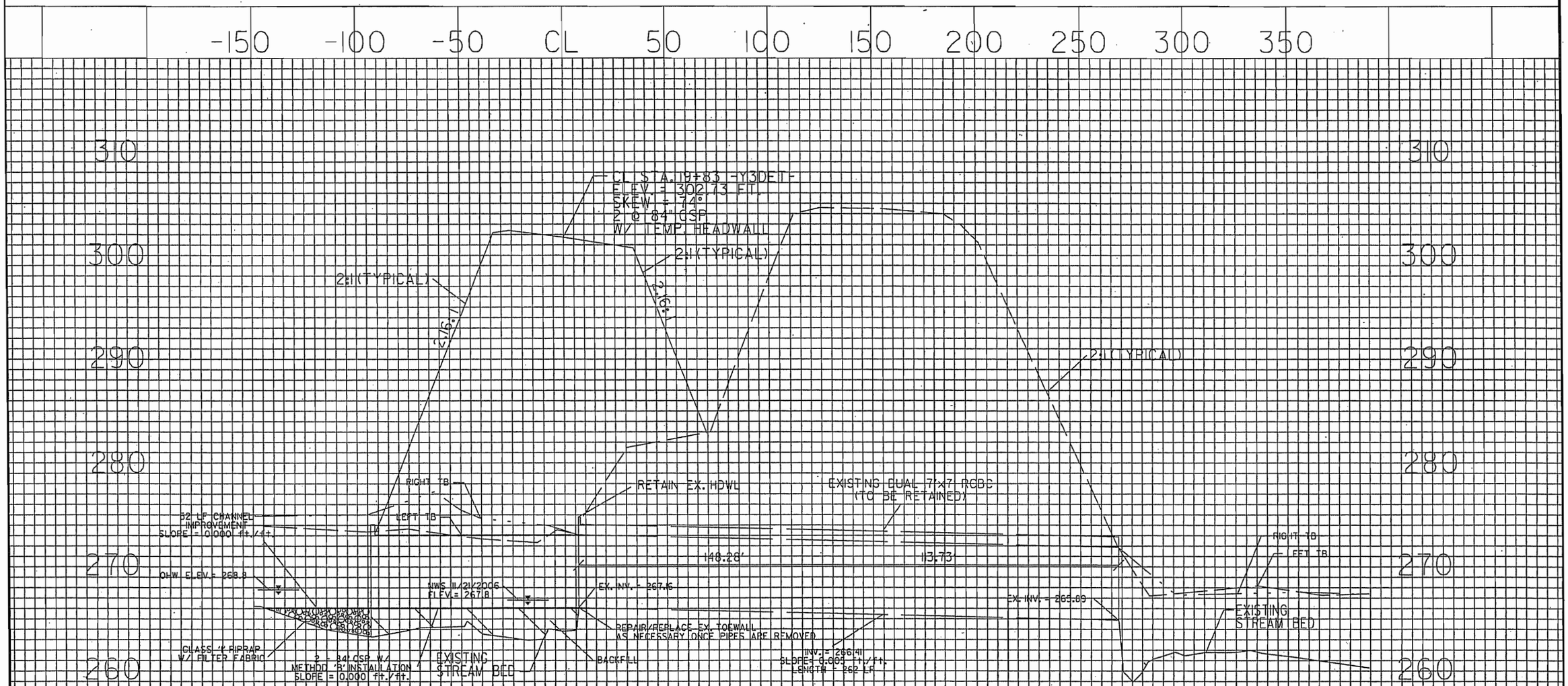
MULKEY ENGINEERS & CONSULTANTS

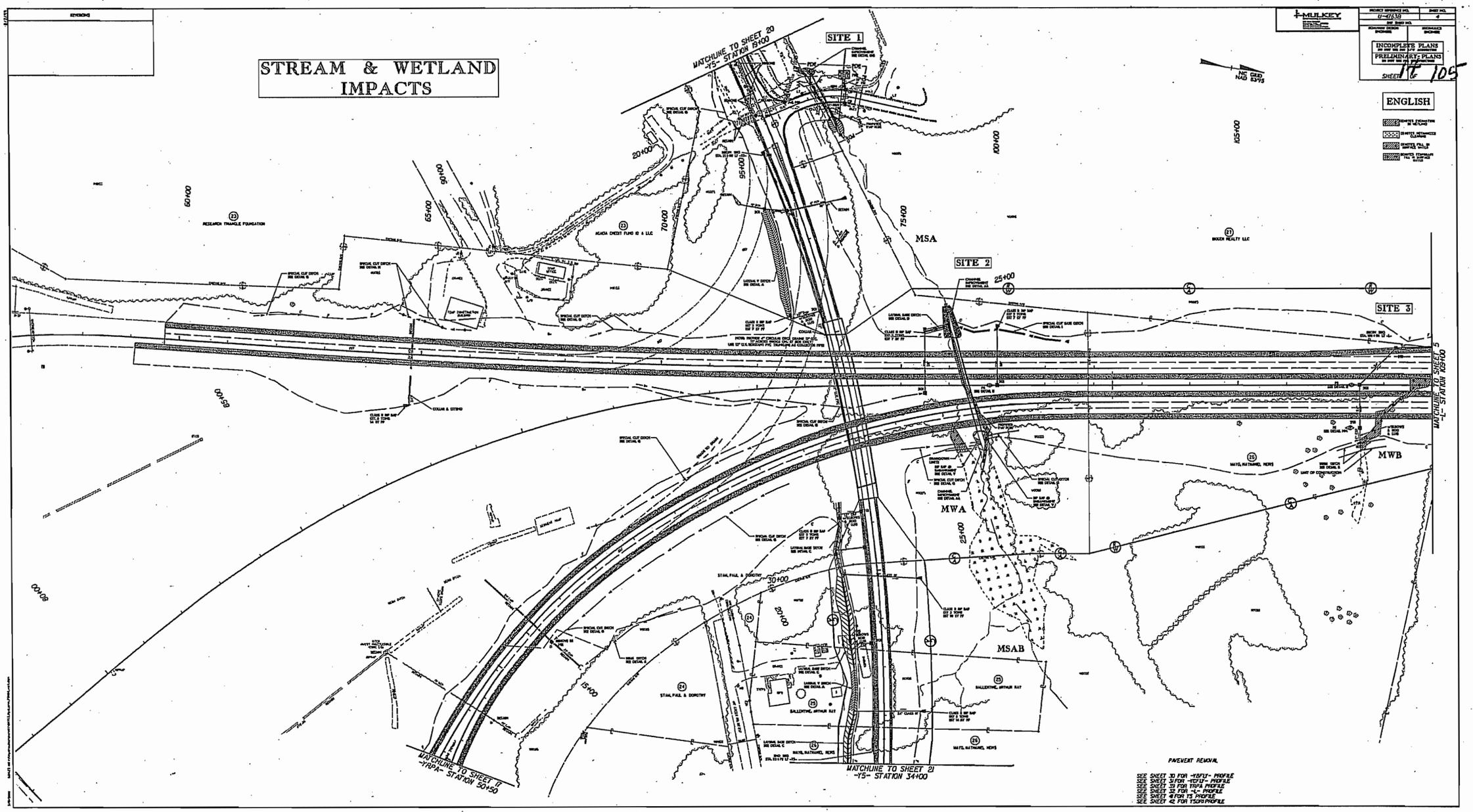
PROJECT REFERENCE NO.	SHEET NO.
U-4763B	
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

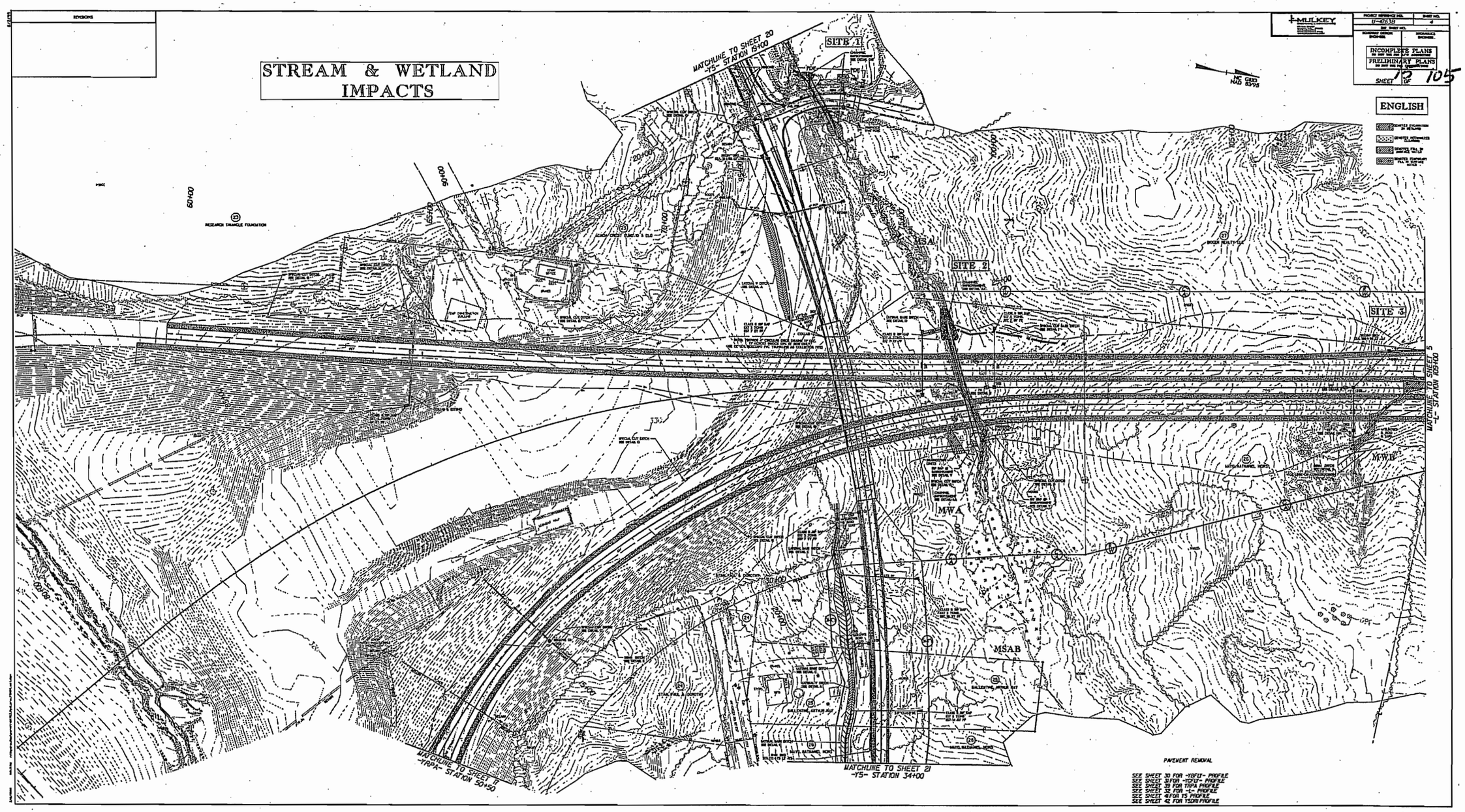
INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

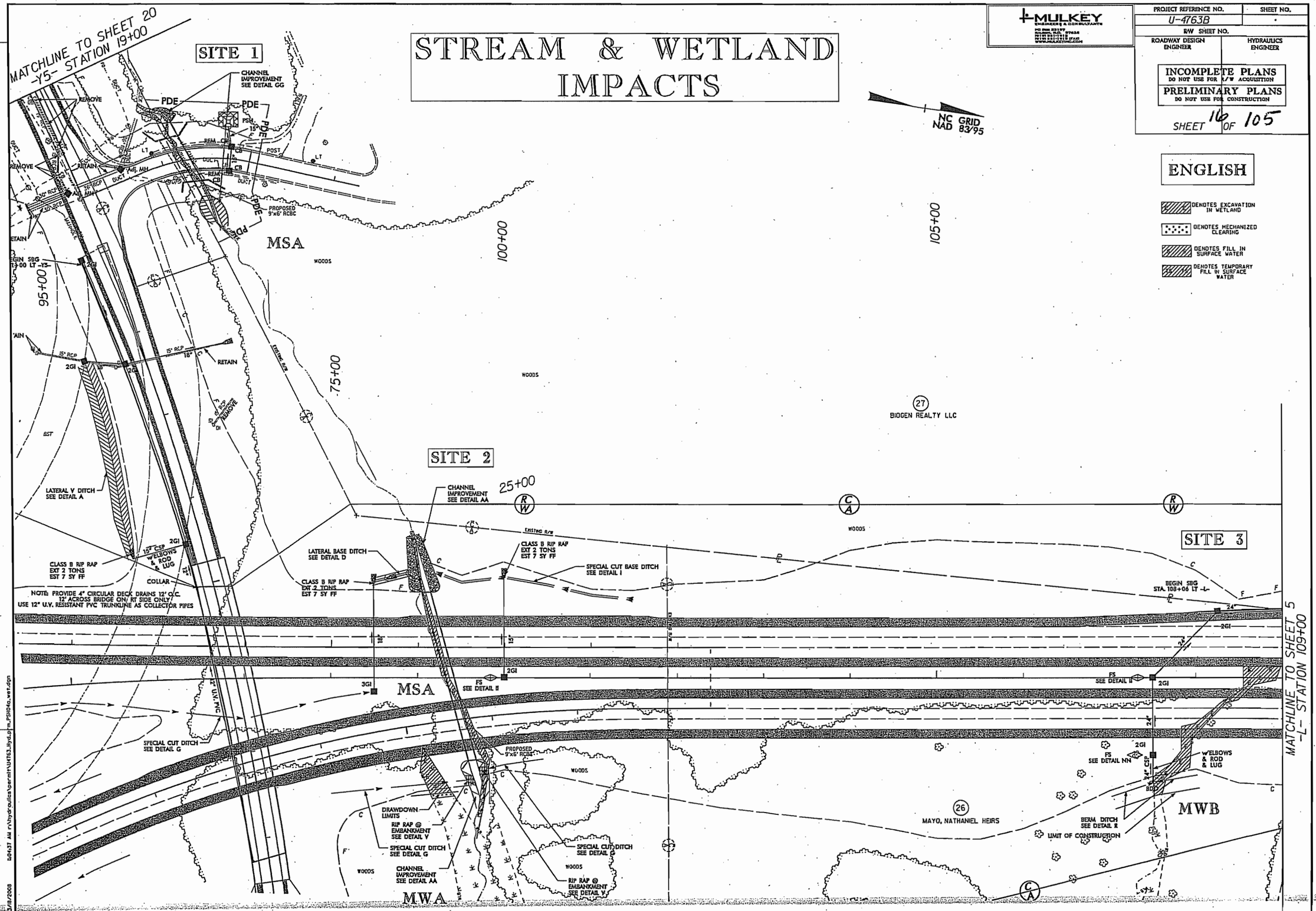
PERMIT DRAWINGS SHEET 13 OF 105




STREAM & WETLAND IMPACTS
MULKEY
INCOMPLETE PLANS
PRELIMINARY PLANS
SHEET 17 OF 105
ENGLISH
MATCHLINE TO SHEET 20 -Y5- STATION 19+00
SITE 1
SITE 2
SITE 3
MSA
MWA
MSAB
MWB
MATCHLINE TO SHEET 5 -L- STATION 109+00
MATCHLINE TO SHEET 21 -Y5- STATION 34+00
MATCHLINE TO SHEET 17 -YRPA- STATION 50+50
PAVEMENT REMOVAL
SEE SHEET 30 FOR -YBFLY- PROFILE
SEE SHEET 31 FOR -YCFLY- PROFILE
SEE SHEET 39 FOR YRPA PROFILE
SEE SHEET 32 FOR -L- PROFILE
SEE SHEET 41 FOR Y5 PROFILE
SEE SHEET 42 FOR Y5CR1 PROFILE


STREAM & WETLAND IMPACTS
MULKEY
U-4763B
4
INCOMPLETE PLANS
PRELIMINARY PLANS
SHEET 15 OF 105
ENGLISH
MATCHLINE TO SHEET 20 -Y5- STATION 19+00
SITE 1
SITE 2
SITE 3
MSA
MWA
MSAB
MWB
MATCHLINE TO SHEET 5 -L- STATION 109+00
MATCHLINE TO SHEET 21 -Y5- STATION 34+00
MATCHLINE TO SHEET 17 -YRPA- STATION 50+50
RESEARCH TRIANGLE FOUNDATION
PAVEMENT REMOVAL
SEE SHEET 30 FOR -YBFLT- PROFILE
SEE SHEET 31 FOR -YCFLT- PROFILE
SEE SHEET 39 FOR YRPA PROFILE
SEE SHEET 32 FOR -L- PROFILE
SEE SHEET 41 FOR Y5 PROFILE
SEE SHEET 42 FOR YSCRI PROFILE

STREAM & WETLAND IMPACTS



MULKEY ENGINEERS & CONSULTANTS

PROJECT REFERENCE NO.	SHEET NO.
U-4763B	
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

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

SHEET 16 OF 105

ENGLISH

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

3/18/2008

STREAM & WETLAND IMPACTS

MULKEY
ENGINEERING & CONSULTANTS

PROJECT REFERENCE NO.	SHEET NO.
U-4763B	
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

SHEET 17 OF 105

NC GRID
NAD 83/95

ENGLISH

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

MATCHLINE TO SHEET 20 -Y5- STATION 19+00

MATCHLINE TO SHEET 5 -L- STATION 109+00

SITE 1

SITE 2

SITE 3

MSA

MWA

MWB

CHANNEL IMPROVEMENT SEE DETAIL GG

REMOVE

PDE

PROPOSED 9'x6' RCBC

RETAIN

Adj. Wid

ZERO DUCT

GRIN SBG -L- STA. 98+60.00 LT -Y5-

15" RCP

18" RCP

2GI

3GI

FS SEE DETAIL II

LATERAL V DITCH SEE DETAIL A

LATERAL BASE DITCH SEE DETAIL D

CLASS B RIP RAP EXT 2 TONS EST 7 SY FF

15" CSP WELDOWS & ROD & LUG

COLLAR

NOTE: PROVIDE 4" CIRCULAR DECK DRAINS 12' O/C 12' ACROSS BRIDGE ON RT SIDE ONLY USE 12" U.V. RESISTANT PVC TRUNKLINE AS COLLECTOR PIPES

SPECIAL CUT BASE DITCH SEE DETAIL I

BEGIN SBG STA. 108+06 LT -L-

SPECIAL CUT DITCH SEE DETAIL G

DRAWDOWN LIMITS

RIP RAP @ EMBANKMENT SEE DETAIL V

CHANNEL IMPROVEMENT SEE DETAIL AA

SEE DETAIL NN

BERM DITCH SEE DETAIL K

LIMIT OF CONSTRUCTION

BIOGEN REALTY LLC

MAYO, NATHANIEL HEIRS

WOODS

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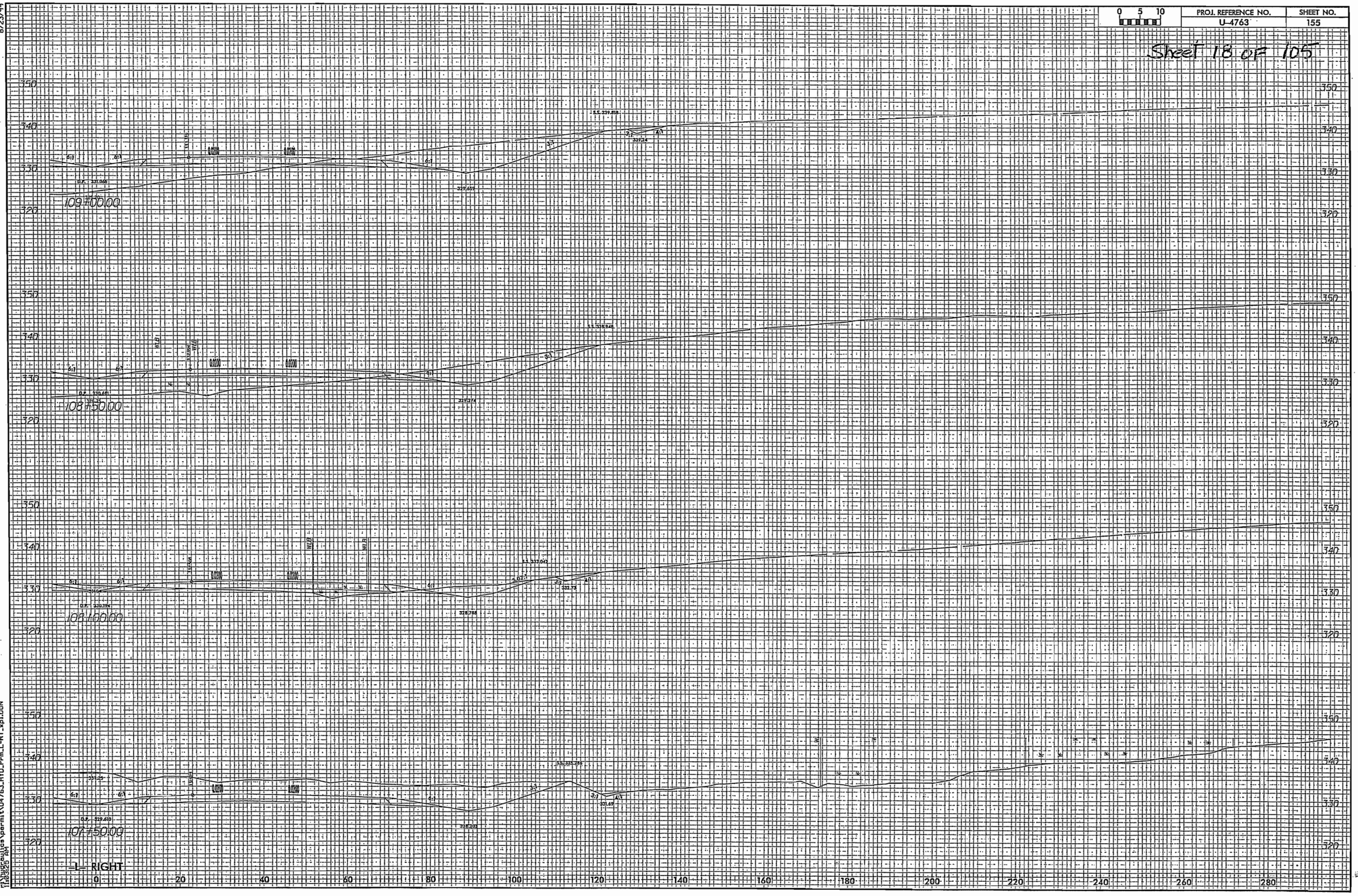
8/23/99

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	U-4763	155

Sheet 18 of 105



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SITE 1 -Y5DR1- STA 11+28

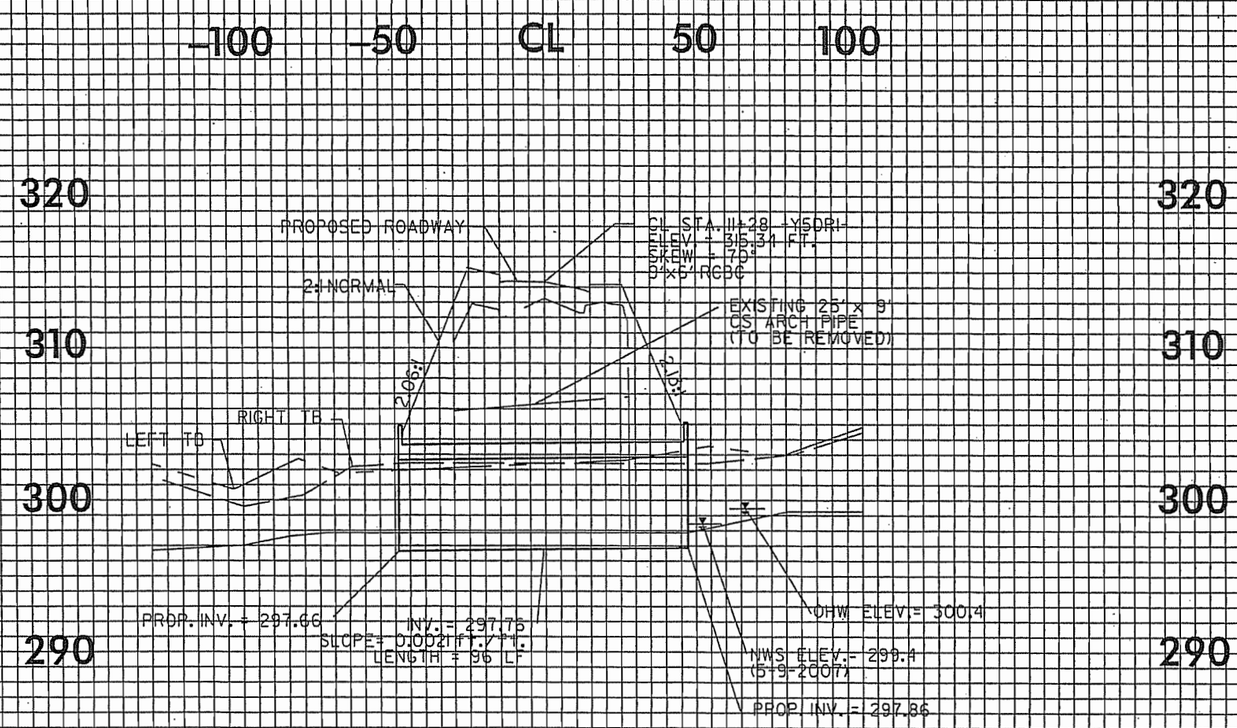
ENGLISH

MULKEY ENGINEERS & CONSULTANTS

PROJECT REFERENCE NO.	SHEET NO.
U-4763B	
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

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

PERMIT DRAWINGS SHEET 19 OF 105



PROFILE ALONG STRUCTURE

SITE 2 -L- STA 99+37

ENGLISH

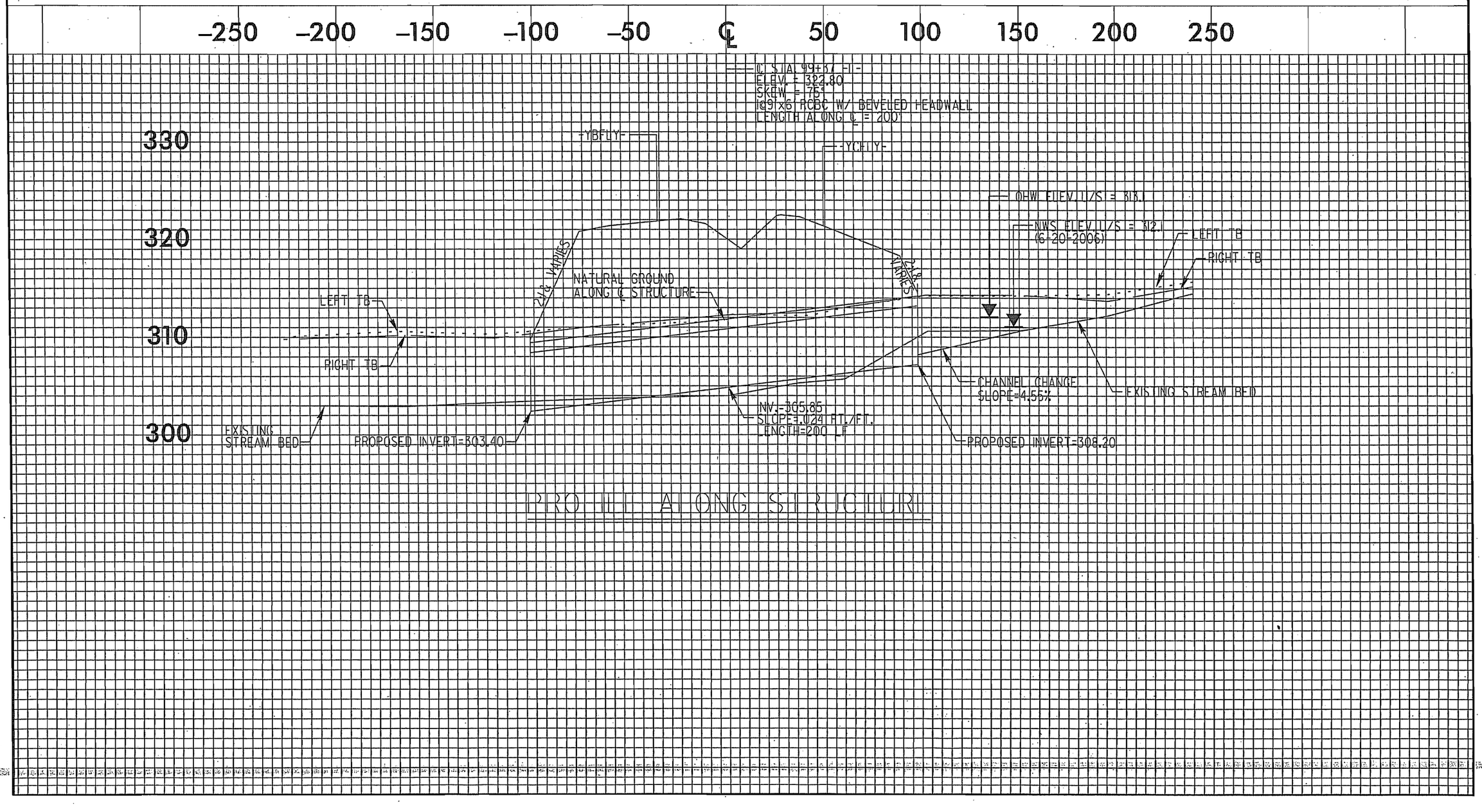
MULKEY
ENGINEERS & CONSULTANTS

PROJECT REFERENCE NO.	SHEET NO.
U-4763B	
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

PERMIT DRAWINGS SHEET 20 OF 105



PROFILE ALONG STRUCTURE

STREAM & WETLAND IMPACTS

MULKEY ENGINEERS & CONSULTANTS

PROJECT REFERENCE NO.	SHEET NO.
U-4763B	5
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

SHEET 21 OF 105

NC GRID NAD 83/95

REVISIONS

MATCHLINE TO SHEET 4 -L- STATION 109+00

MATCHLINE TO SHEET 6 -L- STATION 123+00

110+00 115+00 10+00 120+00

(27) BIOGEN REALTY LLC

(31) BIOGEN REALTY LLC

(26) MAYO, NATHANIEL HEIRS

(28) KCR INVESTORS LLC

WOODS

SITE 4

MSBA

CLASS B RIP RAP EST 5 TONS EST 14 SY FF

24" CSP wELBOWS & ROD & LUG

END SBG STA. 113+00 LT -L-

TAIL DITCH SEE DETAIL P

SPECIAL LATERAL V DITCH SEE DETAIL F

FS SEE DETAIL II

FS SEE DETAIL NN

FS SEE DETAIL MM

BERM DITCH SEE DETAIL R

BERM DITCH SEE DETAIL S

HEAD DITCH SEE DETAIL O

FILL DIRT DLC

-YIRPC-

-YIRPD-

-L-

ENGLISH

DENOTES FILL IN SURFACE WATER

DENOTES TEMPORARY FILL IN SURFACE WATER

SEE SHEET 32 FOR -L- PROFILE
SEE SHEET 45 FOR -YIRPC- PROFILE
SEE SHEET 46 FOR -YIRPD- PROFILE

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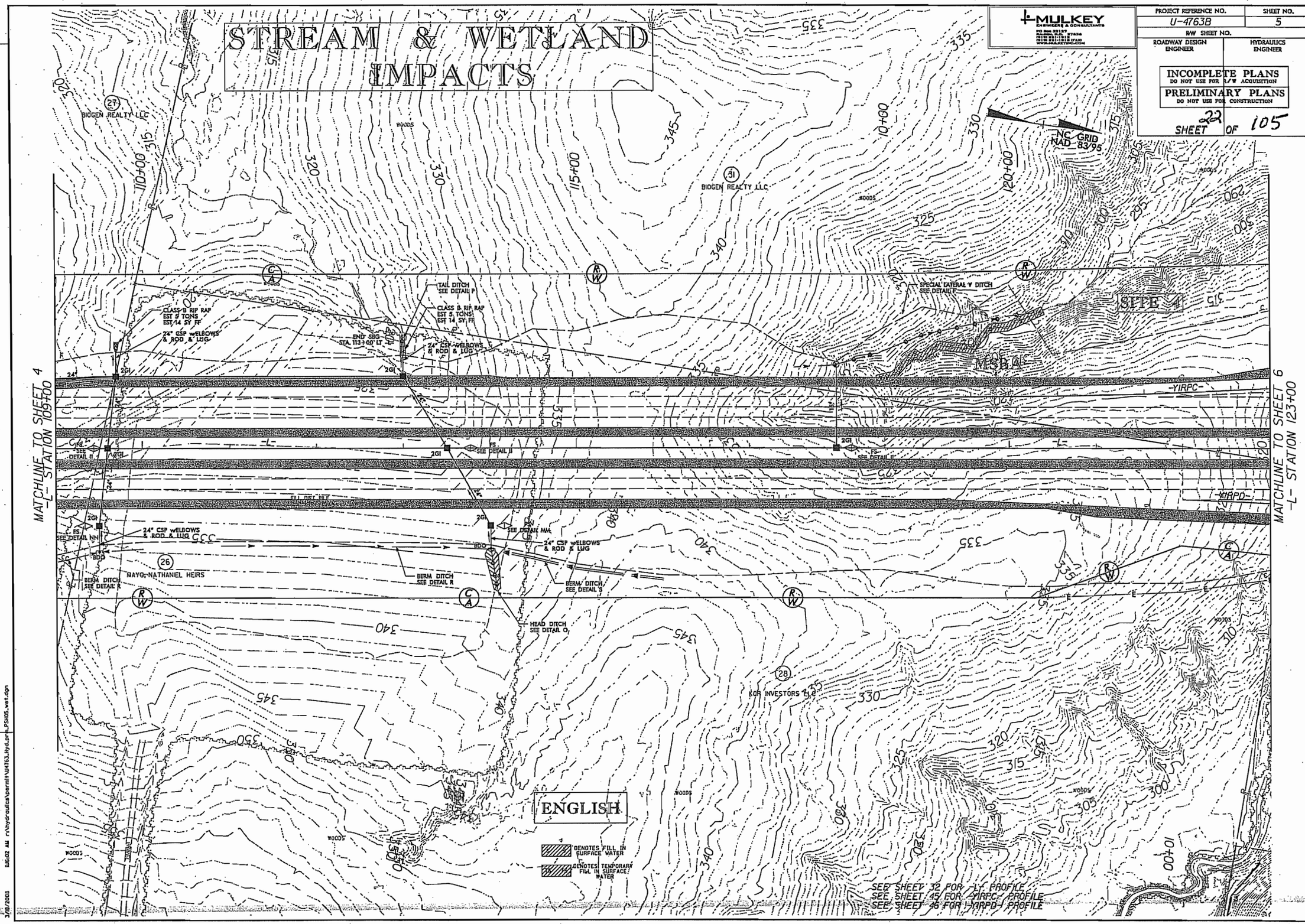
3/18/2008


STREAM & WETLAND IMPACTS
MULKEY ENGINEERS & CONSULTANTS
PROJECT REFERENCE NO. U-4763B
SHEET NO. 5
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION
SHEET 22 OF 105
NC GRID NAD 83/95
BIOGEN REALTY LLC
SITE 4
MSBA
-YIRPC-
-YIRPD-
MATCHLINE TO SHEET 4 -L- STATION 109+00
MATCHLINE TO SHEET 6 -L- STATION 123+00
CLASS B RIP RAP EST 5 TONS EST 14 SY FF
24" CSP w/ELBOWS & ROD & LUG
END SBG STA. 113+00 LT
TAIL DITCH SEE DETAIL P
SPECIAL LATERAL V DITCH SEE DETAIL F
SEE DETAIL II
SEE DETAIL MM
SEE DETAIL NN
BERM DITCH SEE DETAIL R
BERM DITCH SEE DETAIL S
HEAD DITCH SEE DETAIL O
MAYO, NATHANIEL HEIRS
KOR INVESTORS LLC
ENGLISH
DENOTES FILL IN SURFACE WATER
DENOTES TEMPORARY FILL IN SURFACE WATER
SEE SHEET 32 FOR -L- PROFILE
SEE SHEET 45 FOR -YIRPC- PROFILE
SEE SHEET 46 FOR -YIRPD- PROFILE
REVISIONS
3/18/2008 8:56:02 AM r:\hydraulics\permit\U4763_Hyd_prm_PSH05_wet.dgn

STREAM & WETLAND IMPACTS

REVISIONS

MULKEY

PROJECT REFERENCE NO. U-4738 | SHEET NO. 6

INCOMPLETE PLANS

PRELIMINARY PLANS

SHEET NO. 105

ENGLISH

MATCHLINE TO SHEET 22 -Y1- STATION 227+50

MATCHLINE TO SHEET 5 -L- STATION 123+00

MATCHLINE TO SHEET 7 -L- STATION 181+00

SITE 5

SITE 6

SITE 7

SITE 8

SITE 9

MSB

MSBB

MSC

MWF

MWD

MSCB

MSCC

MSCA

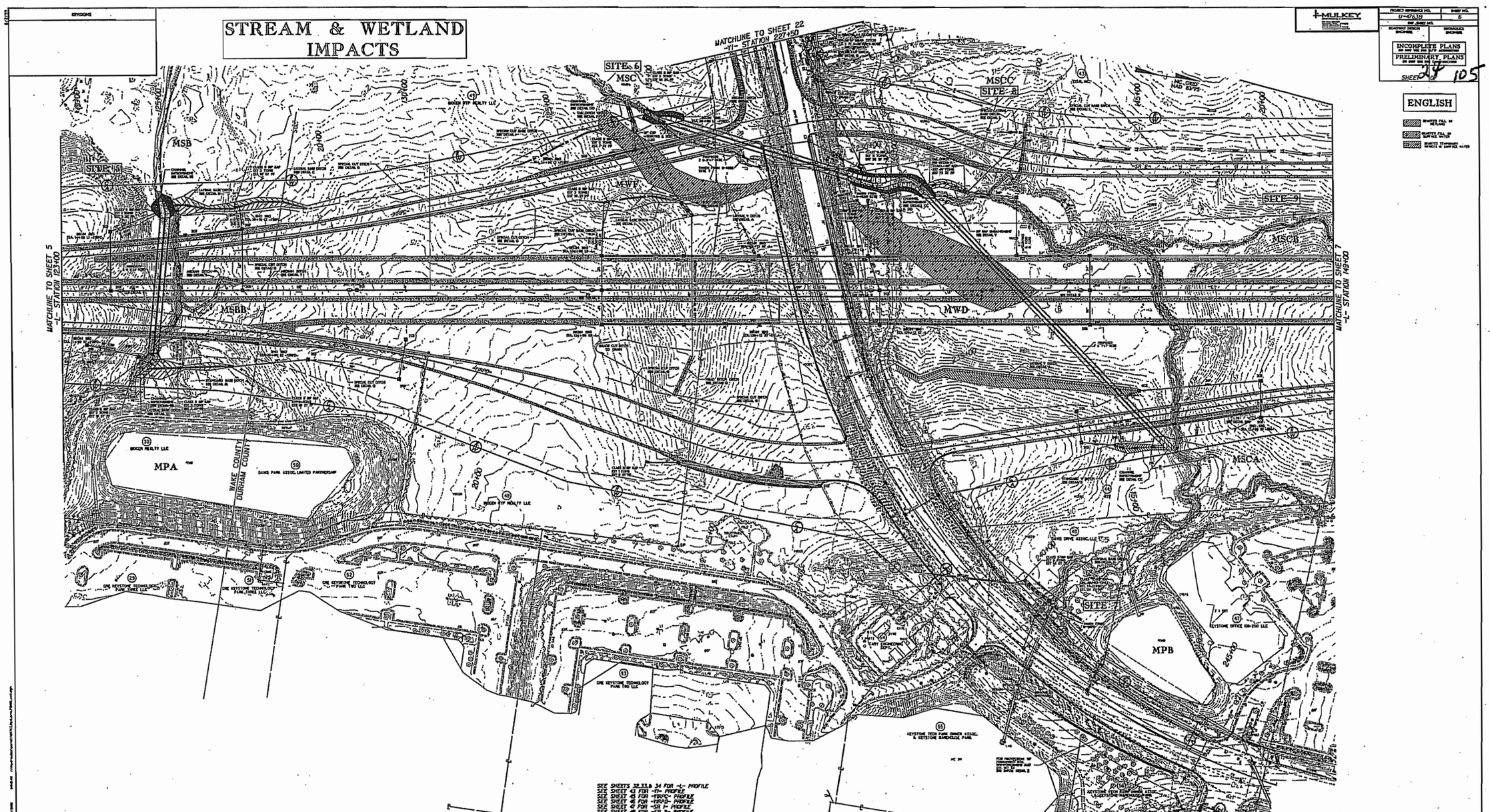
MPA

MPB

WAKE COUNTY
DURHAM COUNTY

SEE SHEETS 32,33,& 34 FOR -L- PROFILE
SEE SHEET 45 FOR -Y1- PROFILE
SEE SHEET 46 FOR -Y2PC- PROFILE
SEE SHEET 47 FOR -Y2PD- PROFILE
SEE SHEET 48 FOR -Y3- PROFILE
SEE SHEET 49 FOR -Y4- PROFILE

STREAM & WETLAND IMPACTS



MULKEY

PROJECT REFERENCE NO.	SHEET NO.
U-4763B	6

INCOMPLETE PLANS

PRELIMINARY PLANS

SHEET 24 OF 105

ENGLISH

STREAM & WETLAND IMPACTS

MULKEY
ENGINEERS & CONSULTANTS
PO Box 33127
Raleigh, N.C. 27636
(919) 851-1918 PHONE
WWW.MULKEYENGR.COM

PROJECT REFERENCE NO.	SHEET NO.
U-4763B	
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

SHEET 25 OF 105

NC GRID
NAD 83/95

ENGLISH

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

SITE 5
MSB

SITE 6
MSC

MWF

MSBB

MPA

MATCHLINE TO SHEET 5 -L- STATION 123+00

MATCHLINE TO SHEET 7 -L- STATION 135+00

15+00 | 20+00 | 25+00 | 130+00 | 135+00

BIOGEN RTP REALTY LLC (49)

KCR INVESTORS LLC (28)

BIOGEN REALTY LLC (30)

DAVIS PARK ASSOC. LIMITED PARTNERSHIP (50)

WAKE COUNTY
DURHAM COUNTY

-YIRPC-
-YIRPD-

CHANNEL IMPROVEMENT SEE DETAIL BB
CLASS B RIP RAP EST 3 TONS EST 10 SY FF
LATERAL BASE DITCH SEE DETAIL C
SPECIAL CUT DITCH SEE DETAIL G
LATERAL BASE DITCH SEE DETAIL D
CLASS B RIP RAP EST 1 TONS EST 5 SY FF
BEGIN SBG STA. 14+55 LT -YIRPC-
15" CSP W/ELBOWS & ROD & LUG
END SBG STA. 18+18 LT -YIRPC-
PROPOSED 2 @ 9'x8' RCBC
MEDIAN DITCH SEE DETAIL T
SPECIAL CUT DITCH SEE DETAIL G
SEE DETAIL II
BEGIN SBG STA. 11+00 RT -YIRPD-
18" CSP W/ELBOWS & ROD & LUG
END SBG STA. 15+00 RT -YIRPD-
STANDARD BASE DITCH SEE DETAIL M
CHANNEL IMPROVEMENT SEE DETAIL BB
CLASS B RIP RAP EST 2 TONS EST 7 SY FF
CLASS B RIP RAP EST 3 TONS EST 10 SY FF
LATERAL BASE DITCH SEE DETAIL D
STEPS
RIPRAP
WOODS
CHANNEL IMPROVEMENT SEE DETAIL DD
TAIL DITCH DITCH SEE DETAIL P
SPECIAL CUT BASE DITCH SEE DETAIL I
BEGIN SBG STA. 24+56 LT -YIRPC-
CLASS B RIP RAP EST 2 TONS EST 7 SY FF
15" CSP W/ELBOWS & ROD & LUG
BEGIN SBG STA. 28+00 LT -YIRPC-
MEDIAN DITCH SEE DETAIL T
PROPOSED 2 @ 8'x7' RCBC
TAKEN FROM U-3826 SITE 7
CLASS B RIP RAP EST 3 TONS EST 10 SY FF
HEAD DITCH SEE DETAIL O
LATERAL V DITCH SEE DETAIL A
LATERAL BASE DITCH SEE DETAIL J
SPECIAL CUT BASE DITCH SEE DETAIL I
SPECIAL CUT DITCH SEE DETAIL G
BEGIN SBG STA. 134+00 LT -L-
BEGIN SBG STA. 138+12 RT -L-
CLASS IV WETLAND MITIGATION
GRADE CUT DITCH TO DRAIN
HEAD DITCH DITCH SEE DETAIL O
CLASS B RIP RAP EST 1 TONS EST 5 SY FF

STREAM & WETLAND IMPACTS

MULKEY
ENGINEERS & CONSULTANTS
PO Box 33727
Raleigh, NC 27636
(919) 851-1815
(919) 851-1918 (FAX)
WWW.MULKEYINC.COM

PROJECT REFERENCE NO.	SHEET NO.
U-4763B	-
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

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

SHEET 26 OF 105

NC GRID
NAD 83/95

ENGLISH

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

SITE 5
MSB
SITE 6
MSC
MSBB
MWF
MPA

CHANNEL IMPROVEMENT SEE DETAIL BB
LATERAL BASE DITCH SEE DETAIL D
CLASS B RIP RAP EST 3 TONS EST. 10 SY FF
LATERAL BASE DITCH SEE DETAIL C
SPECIAL CUT DITCH SEE DETAIL G
SPECIAL CUT BASE DITCH SEE DETAIL I
CHANNEL IMPROVEMENT SEE DETAIL DD
TAIL DITCH DITCH SEE DETAIL P
CLASS B & EST 3 TONS EST 10 SY FF
MEDIAN DITCH SEE DETAIL T
BEGIN SBG STA. 28+00 LT -YIRPC-
15" CSP W/ELBOWS & RODS & JUG
PROPOSED 2 @ 8'-0" X 8'-0" RCBC
TAKEN FROM U-3826 SITE 7
HEAD DITCH SEE DETAIL O
LATERAL V. DITCH SEE DETAIL A
BEGIN SBG STA. 24+56 LT -YIRPC-
BEGIN SBG STA. 144+55 LT -YIRPC-
END SBG STA. 18+18 LT -YIRPC-
BEGIN SBG STA. 134+00 LT -L-
BEGIN SBG STA. 138+12 RT -L-
PROPOSED 4 @ 9'-0" RCBC
MEDIAN DITCH SEE DETAIL S
MEDIAN DITCH SEE DETAIL T
BEGIN SBG STA. 11+00 RT -YIRPC-
END SBG STA. 15+00 RT -YIRPC-
STANDARD BASE DITCH SEE DETAIL M
GRADE CUT DITCH TO DRAIN
HEAD DITCH DITCH SEE DETAIL O
CLASS B RIP RAP EST 1 TONS EST 5 SY FF
LATERAL BASE DITCH SEE DETAIL Q
CLASS B RIP RAP EST 2 TONS EST 7 SY FF
CLASS B RIP RAP EST 3 TONS EST 10 SY FF
CLASS B RIP RAP EST 19 SY FF
RIP RAP
TOPSOIL
SUBSOIL
WOODS
POND
2GI
YIRPC
YIRPD

BIOGEN RTP REALTY LLC (49)
KCR INVESTORS LLC (28)
BIOGEN REALTY LLC (30)
DAVIS PARK ASSOC. LIMITED PARTNERSHIP (50)

WAKE COUNTY
DURHAM COUNTY

MATCHLINE TO SHEET 5
MATCHLINE TO SHEET 7

STREAM & WETLAND IMPACTS

MULKEY
ENGINEERS & CONSULTANTS
PO BOX 1207, RALEIGH, NC 27602
PHONE: 919-847-2157 FAX: 919-847-7638
WWW.MULKEYENGINEERS.COM

PROJECT REFERENCE NO.	SHEET NO.
U-4763B	
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

SHEET 27 OF 105

ENGLISH

DENOTES FILL IN WETLAND

DENOTES FILL IN SURFACE WATER

DENOTES TEMPORARY IMPACTS IN SURFACE WATER

MATCHLINE TO SHEET 22 -Y1- STATION 227+50

MATCHLINE TO SHEET 7 -L- STATION 149+00

SITE 8 MSCC

SITE 9 MSCB

SITE 6 MWD

MSC

MSCB

MWD

-SR 2-

-SR 1-

EISAI, INC.

NC GRID NAD 83/95

15+00

145+00

20+00

230+00

235+00

151+00

CLASS B RIP RAP EST 11 TONS EST 20 SY FF

TAIL DITCH SEE DETAIL F CLASS I RIP RAP EST 40 TONS EST 75 SY FF

CHANNEL IMPROVEMENT SEE DETAILS CC & DD

RIP RAP EMBANKMENT SEE DETAIL V

SPECIAL CUT BASE DITCH SEE DETAIL J

SPECIAL LATERAL BASE DITCH SEE DETAIL L

TRADE CUT DITCH TO DRAIN

REMOVE 44 LF OF 12" HDPE

50' OF HEAD DITCH

10' CSC 2 FT BASE W/3:1 SIDES SEE DETAIL G

SPECIAL CUT DITCH SEE DETAIL G

TAKEN FROM U-4826

TAKEN FROM U-4826 SITE 7

BEGIN RETAINING WALL -Y1- STA 233+60.41

BEGIN SBG 138+12 RT -L-

BEGIN SBG STA. 139+12 RT -L-

BEGIN SBG STA. 14+00 RT -SR1-

END SBG STA. 17+80 RT -SR1-

END RETAINING WALL -Y1- STA 234+24.21

RETAINING WALL STA 233+60.41

LATERAL V DITCH SEE DETAIL A

PROPOSED 2 @ 7'x7' RCBC

STANDARD V DITCH SEE DETAIL B

CHANNEL IMPROVEMENT SEE DETAIL CC

CUT DITCH WL G

DITCH A

401 END EXPRESSWAY GUTTER

WOODS

RTF

FS SEE DETAIL II

FS SEE DETAIL MM

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STREAM & WETLAND IMPACTS

MULKEY
ENGINEERS & CONSULTANTS

PROJECT REFERENCE NO.	SHEET NO.
U-4763B	-
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

SHEET 28 OF 105

ENGLISH

DENOTES FILL IN WETLAND

DENOTES FILL IN SURFACE WATER

DENOTES TEMPORARY IMPACTS IN SURFACE WATER

MATCHLINE TO SHEET 22 -Y1- STATION 227+50

MATCHLINE TO SHEET 7 -L- STATION 149+00

NC GRID NAD 83/95

SITE 8

SITE 9

SITE G

EISAI, INC.

MWD

MSC

MSCC

MSCB

TAKEN FROM U-4826 SITE 7

CLASS B RIP RAP EST 11 TONS EST 28 SY FF

TAIL DITCH SEE DETAIL E

CLASS I RIB RAP EST 40 TONS EST 75 SY FF

CHANNEL IMPROVEMENT SEE DETAILS CC & DD

RIP RAP EMBANKMENT SEE DETAIL V

BEGIN RETAINING WALL -Y1- STA. 227+50

BEGIN SBG STA. 138+12 RT -L-

BEGIN SBG STA. 139+12 RT -L-

END RETAINING WALL -Y1- STA. 231+24.27

RETAINING WALL STA. 233+60.41

PROPOSED 2 @ 7'X7' RCBC

LATERAL V DITCH SEE DETAIL A

STANDARD V DITCH SEE DETAIL B

CHANNEL IMPROVEMENT SEE DETAIL CC

REMOVE 44 LF OF 12" HDPE

30' FF HEAD DITCH W/ CLASS 2 FL BASE W/ 2:1 SIDES SEE DETAIL D

SPECIAL CUT DITCH SEE DETAIL G

GRADE CUT DITCH TO DRAIN

SPECIAL LATERAL BASE DITCH SEE DETAIL L

SPECIAL CUT BASE DITCH SEE DETAIL J

CUT DITCH -L- G

DITCH -A-

RETAINING WALL #1 SEE SHEET 22

END SBG STA. 134+80 RT -SR1-

END SBG STA. 142+80 RT -SR1-

FS SEE DETAIL II

FS SEE DETAIL III

FS SEE DETAIL IIIA

2 - 24" w/ELBOWS & ROD & LUG

2 - 18" w/ELBOWS & ROD & LUG

WOODS

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STREAM & WETLAND IMPACTS

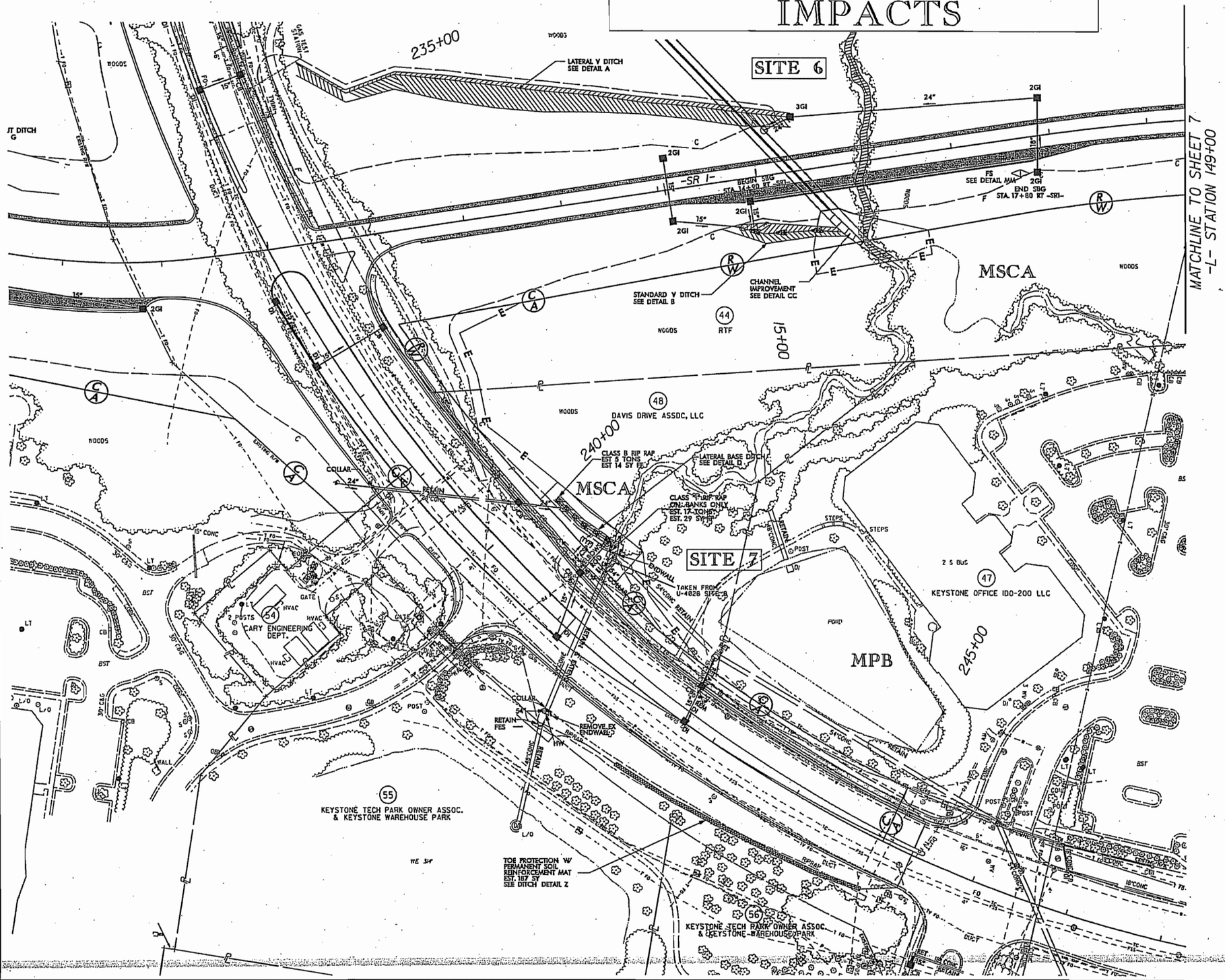
MULKEY ENGINEERS & CONSULTANTS

PROJECT REFERENCE NO.	SHEET NO.
U-4763B	-
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

SHEET 29 OF 105



NC GRID
NAD 83/95

ENGLISH

DENOTES FILL IN SURFACE WATER

DENOTES TEMPORARY IMPACTS IN SURFACE WATER

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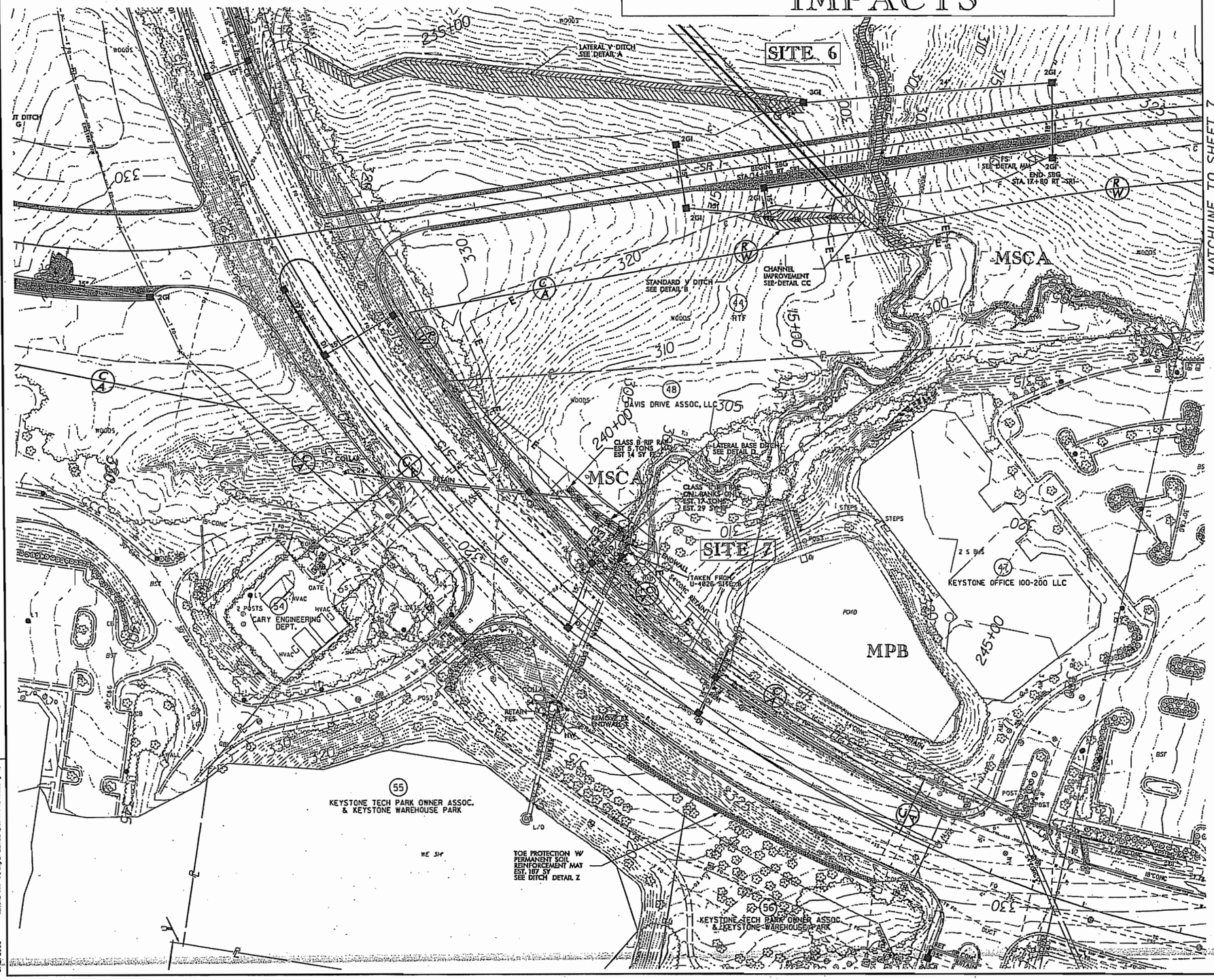
STREAM & WETLAND IMPACTS

MULKEY ENGINEERS & CONSULTANTS

PROJECT REFERENCE NO.	SHEET NO.
U-4763B	
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

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

SHEET 30 OF 105



ENGLISH

DENOTES FILL IN SURFACE WATER

DENOTES TEMPORARY IMPACTS IN SURFACE WATER

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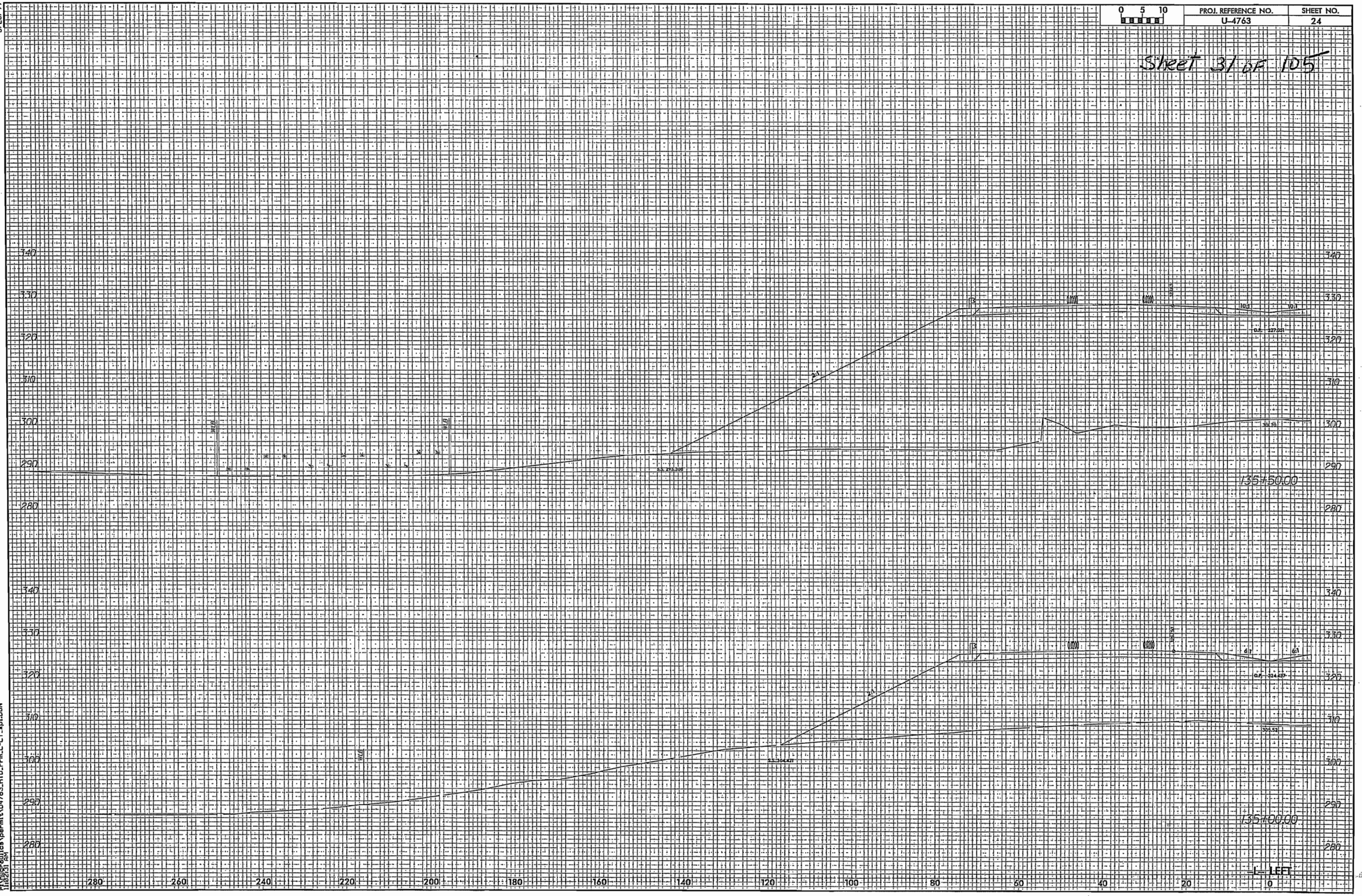

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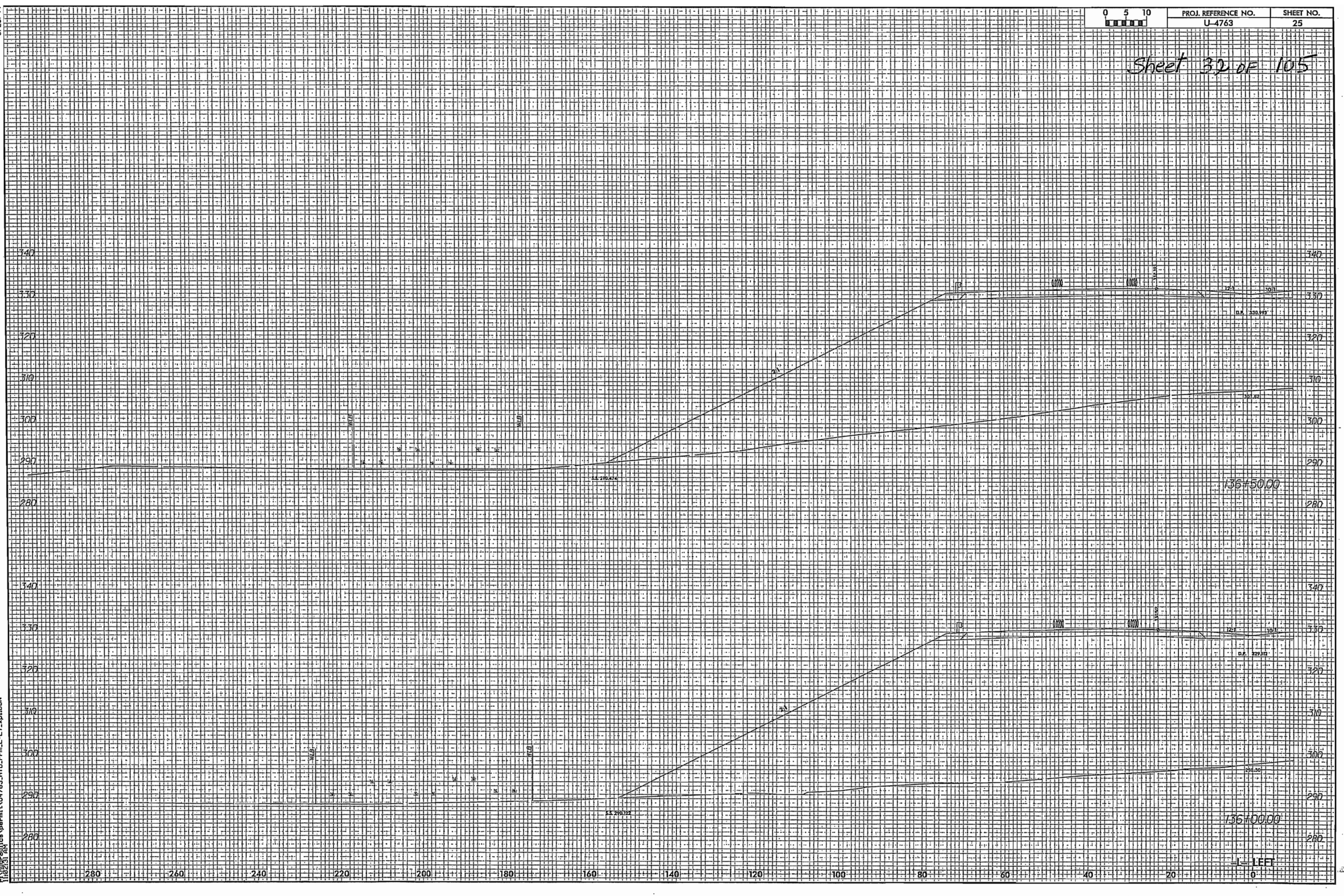

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PROJ. REFERENCE NO.
U-4763
SHEET NO.
25
Sheet 32 of 105
136+50.00
136+00.00
-L- LEFT

8/23/99

PROJ. REFERENCE NO.	SHEET NO.
U-4763	26

Sheet 33 of 105

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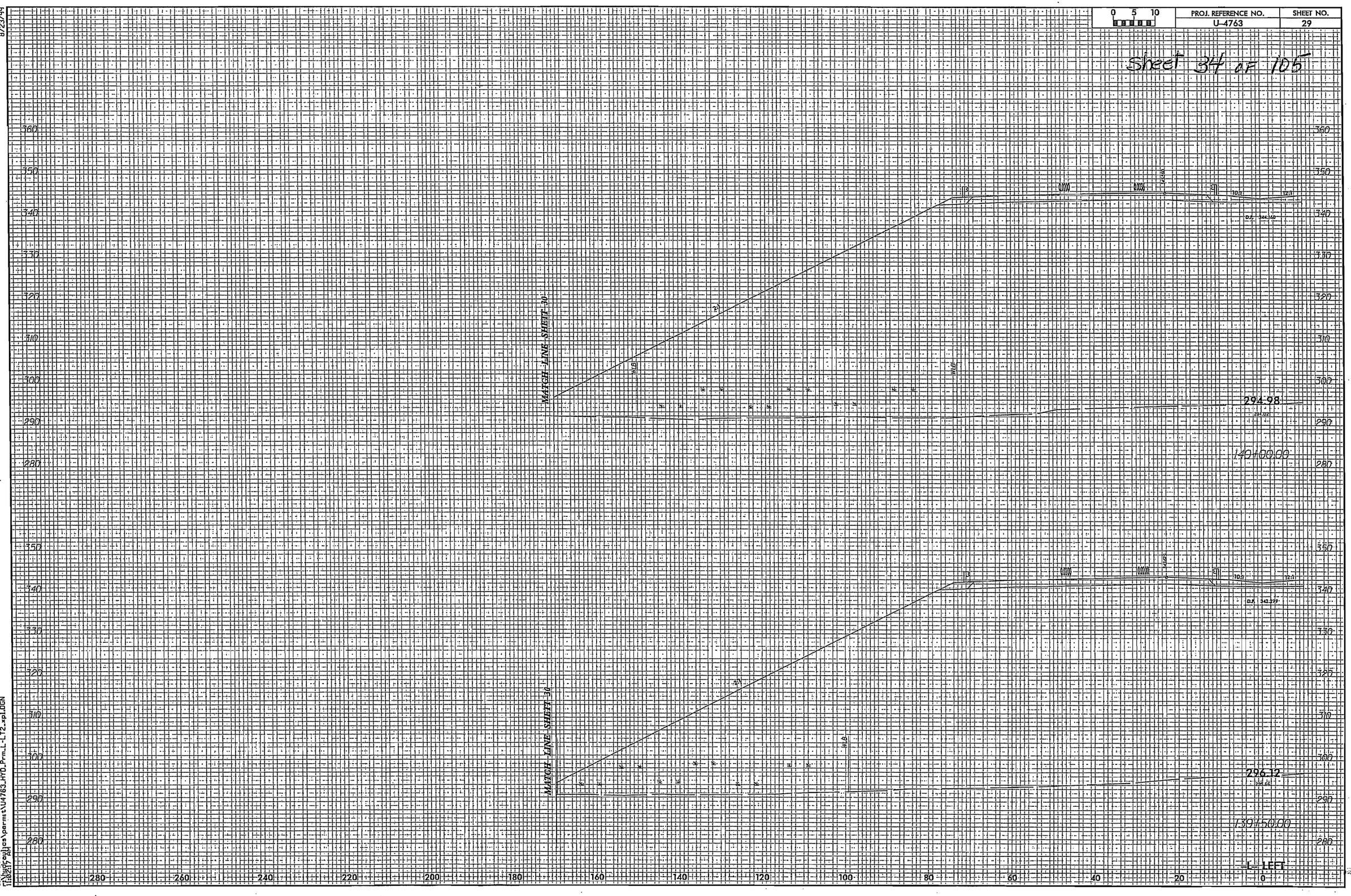

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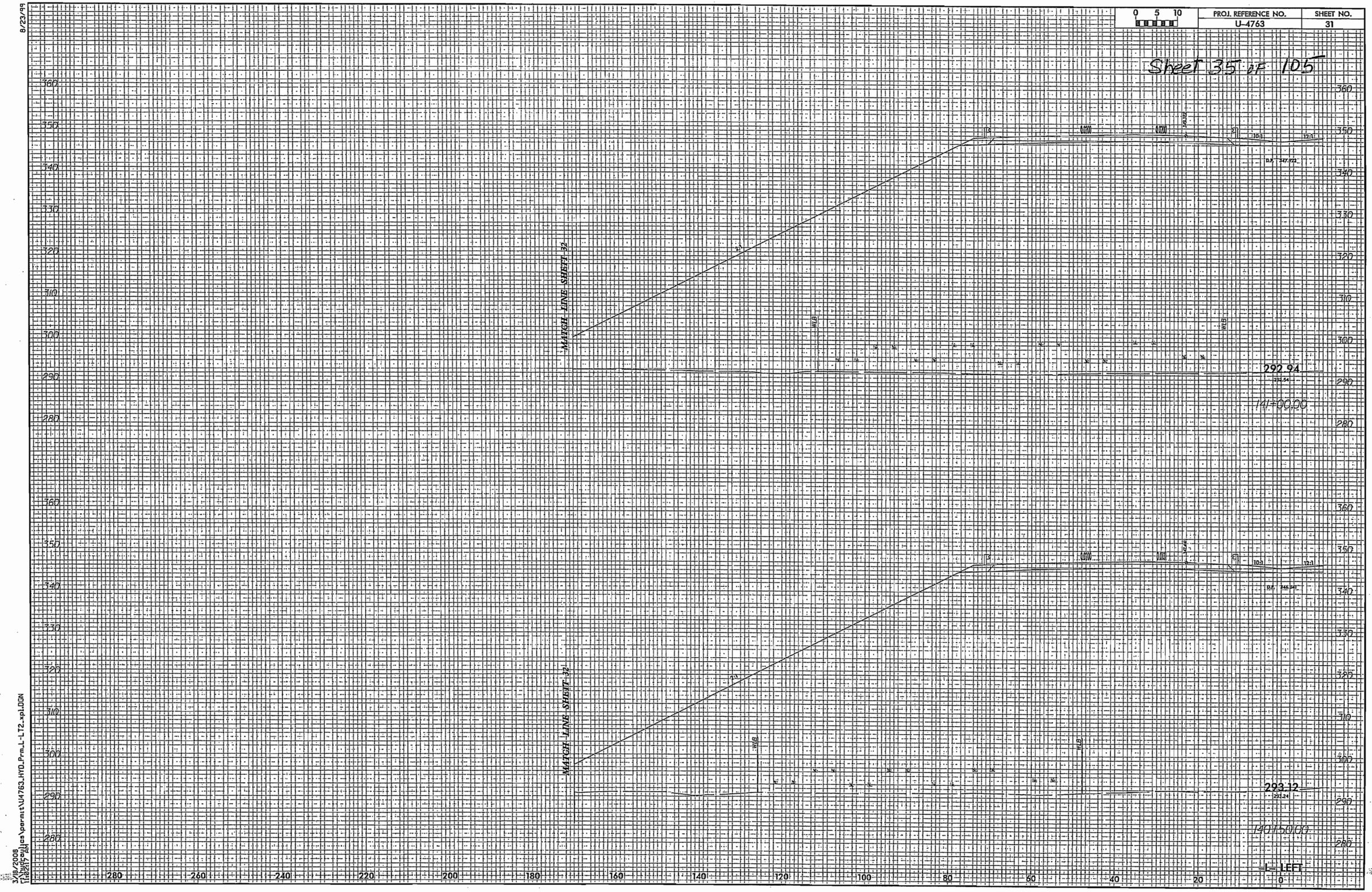

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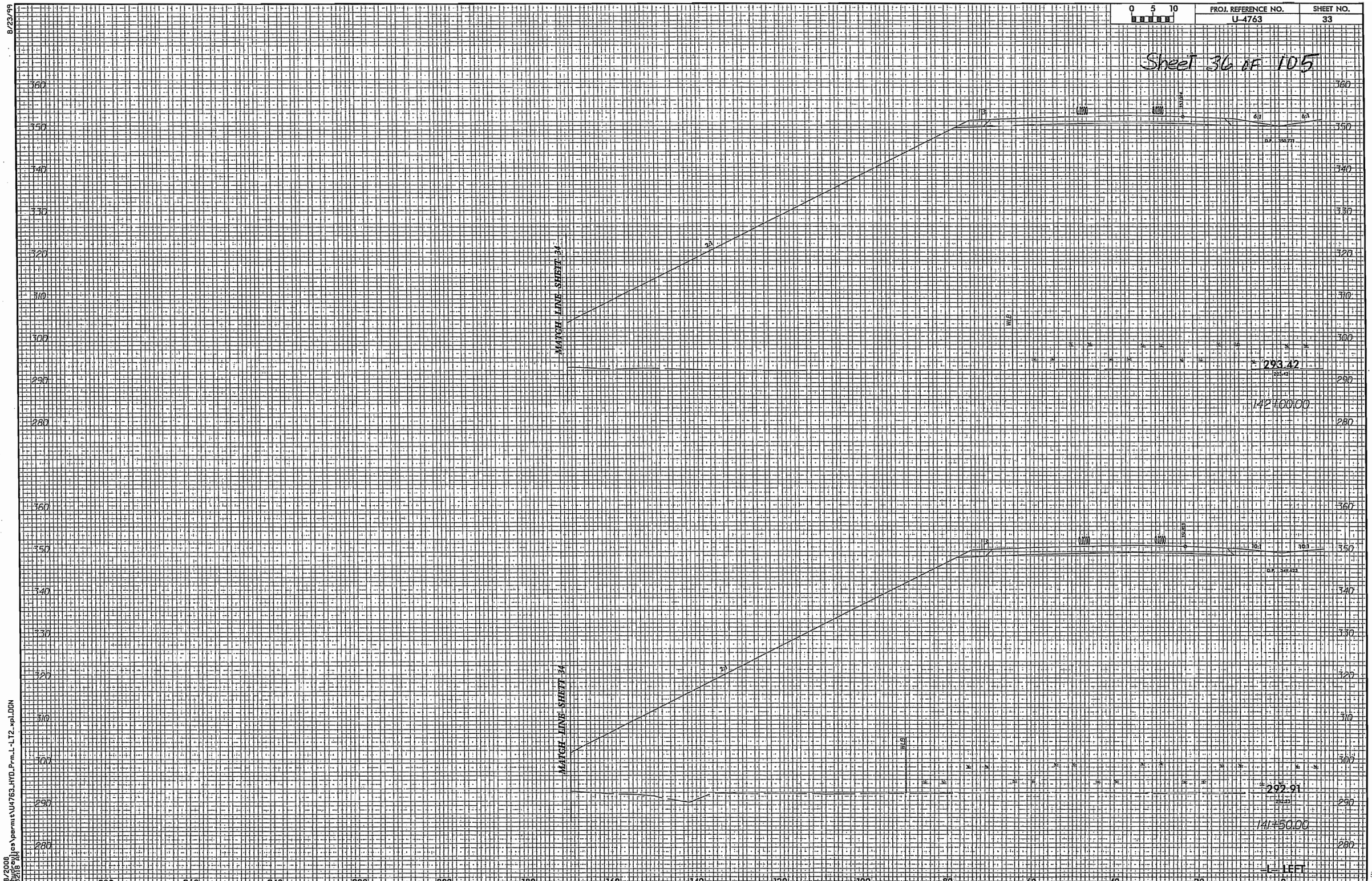
PROJ. REFERENCE NO.
U-4763
SHEET NO.
31
Sheet 35 of 105
MATCH LINE SHEET 32
WLB
292.94
141+00.00
293.12
140+50.00
-L- LEFT



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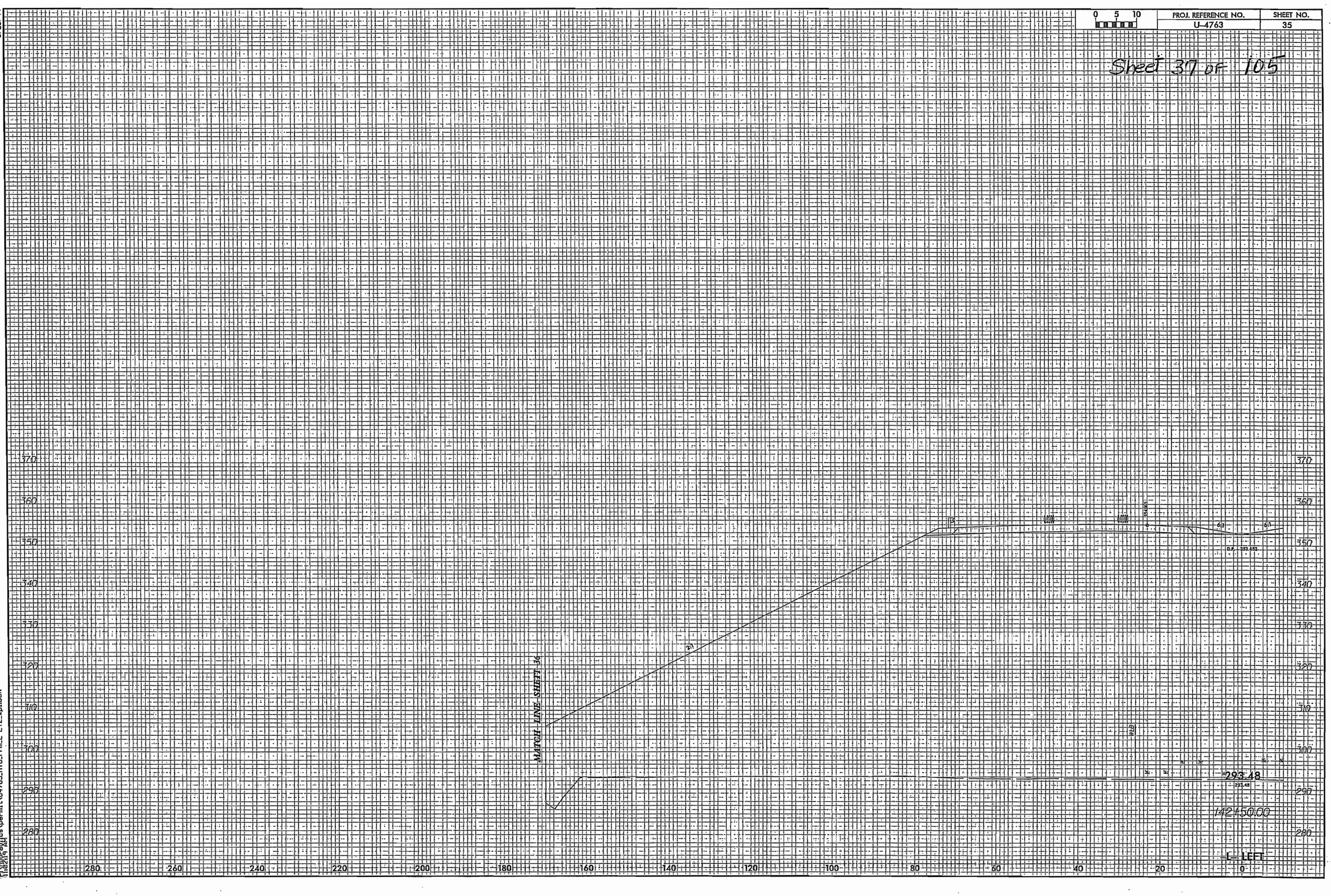

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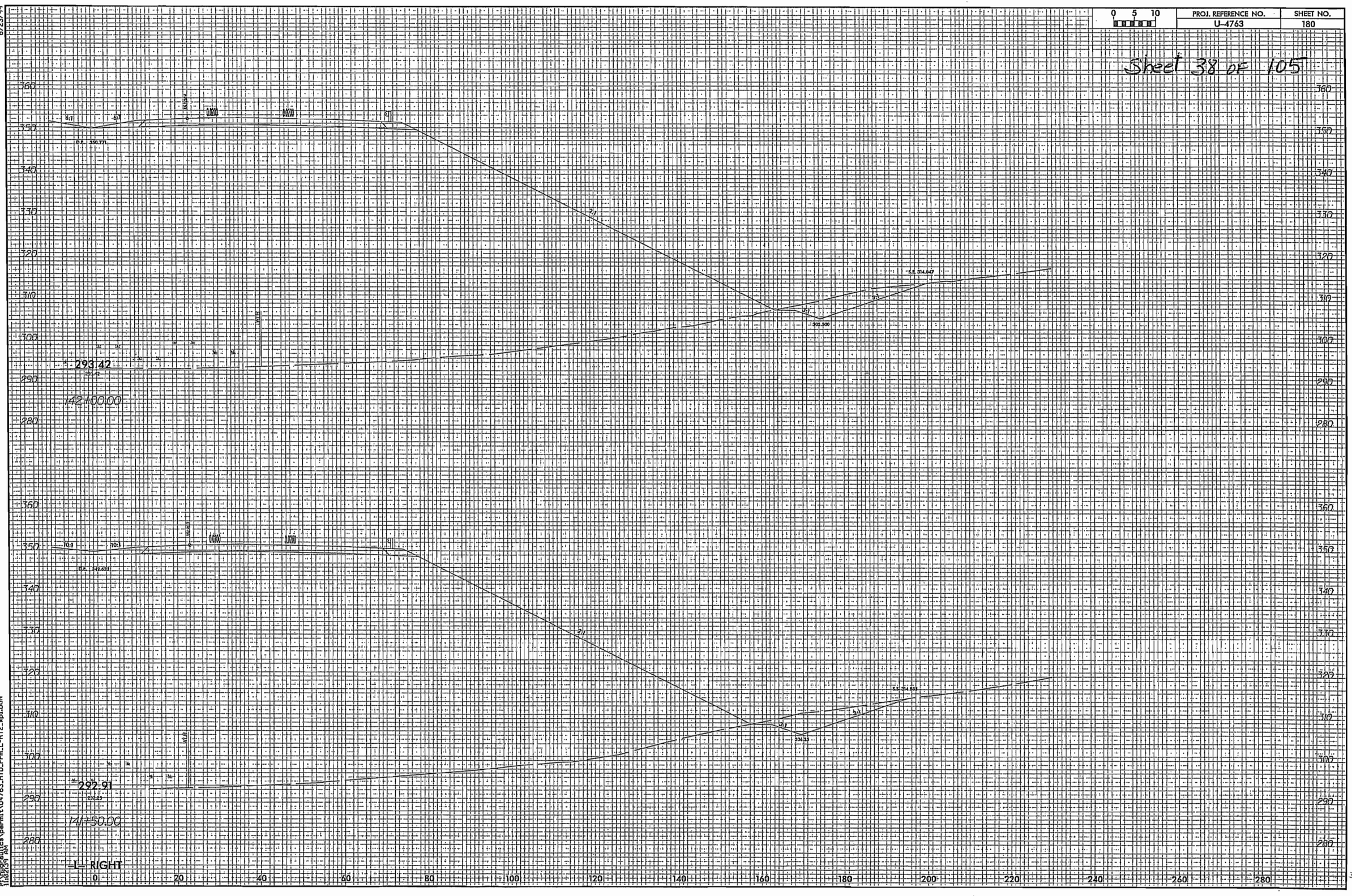
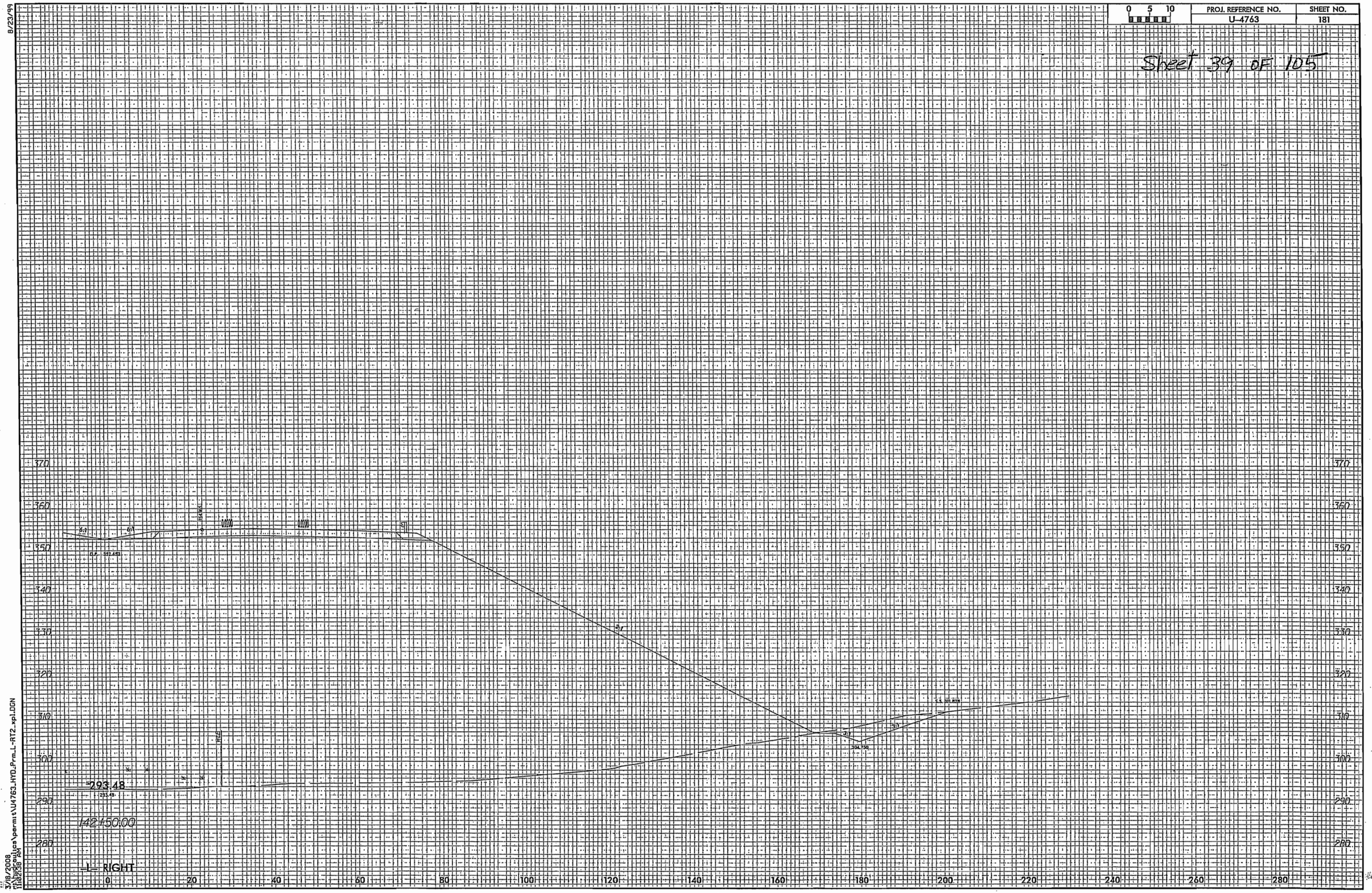


PROJ. REFERENCE NO.
U-4763
SHEET NO.
180
Sheet 38 of 105
0 5 10
293.42
142+00.00
292.91
141+50.00
L- RIGHT
0
20
40
60
80
100
120
140
160
180
200
220
240
260
280
360
350
340
330
320
310
300
290
280



0 5 10
PROJ. REFERENCE NO.
U-4763
SHEET NO.
181
Sheet 39 OF 105
8/23/99
370
360
350
340
330
320
310
300
290
280
293.48
142+50.00
-L- RIGHT
0
20
40
60
80
100
120
140
160
180
200
220
240
260
280
3/18/2008
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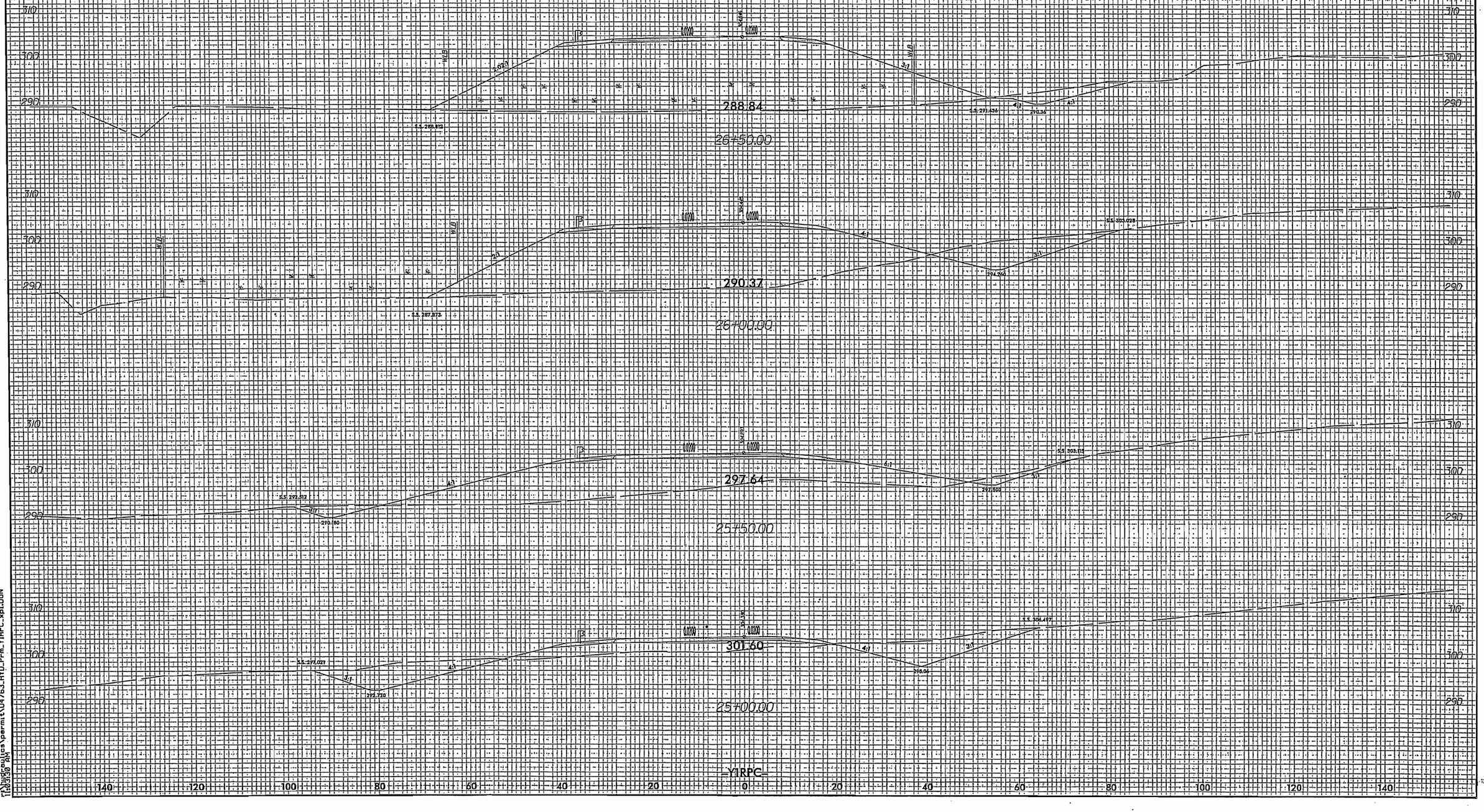
8/23/99

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	U-4763	322

Sheet 40 of 105



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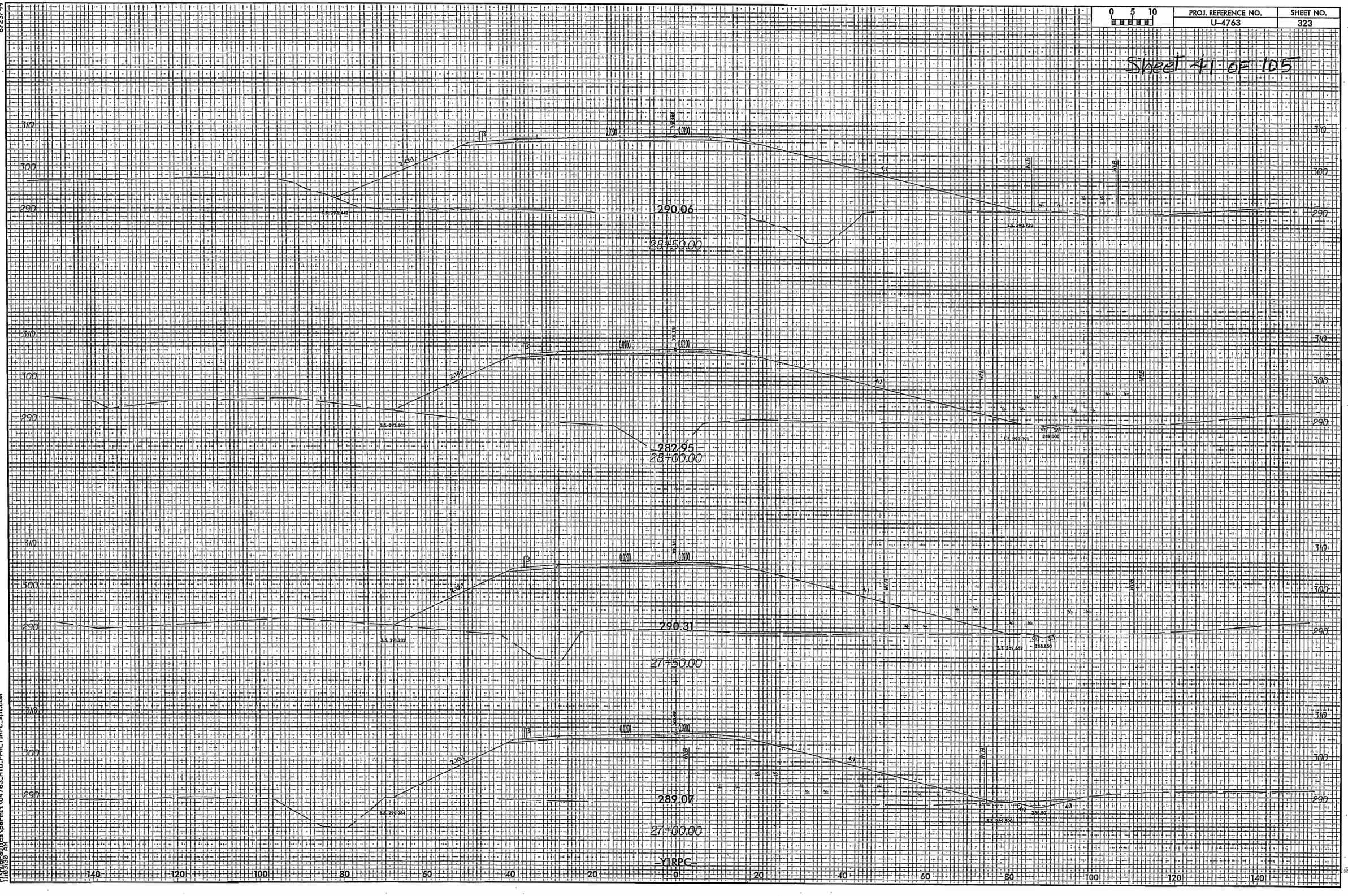
8/23/99

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	U-4763	323

Sheet 41 OF 105



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SITE 5 -L- STA 124+97

ENGLISH

U-4763B

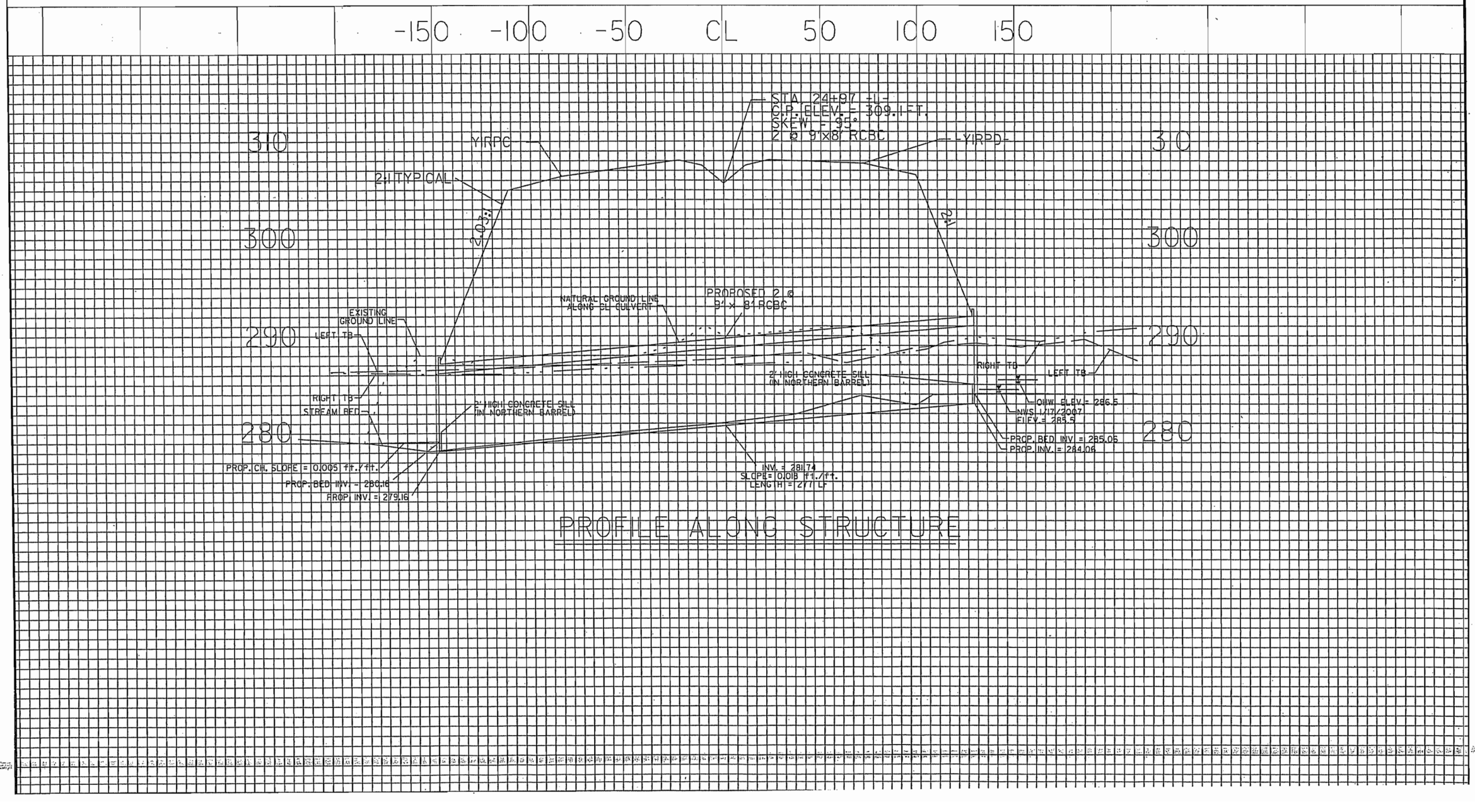
R/W SHEET NO.

ROADWAY DESIGN ENGINEER | HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

PERMIT DRAWINGS SHEET 42 OF 105



PROFILE ALONG STRUCTURE

SITE 6 –L– STA 142+53

ENGLISH

MULKEY
ENGINEERS & CONSULTANTS
PO Box 33127
Raleigh, N.C. 27636
(919) 851-1212
(919) 851-1212 (FAX)
WWW.MULKEYINC.COM

U-4763B

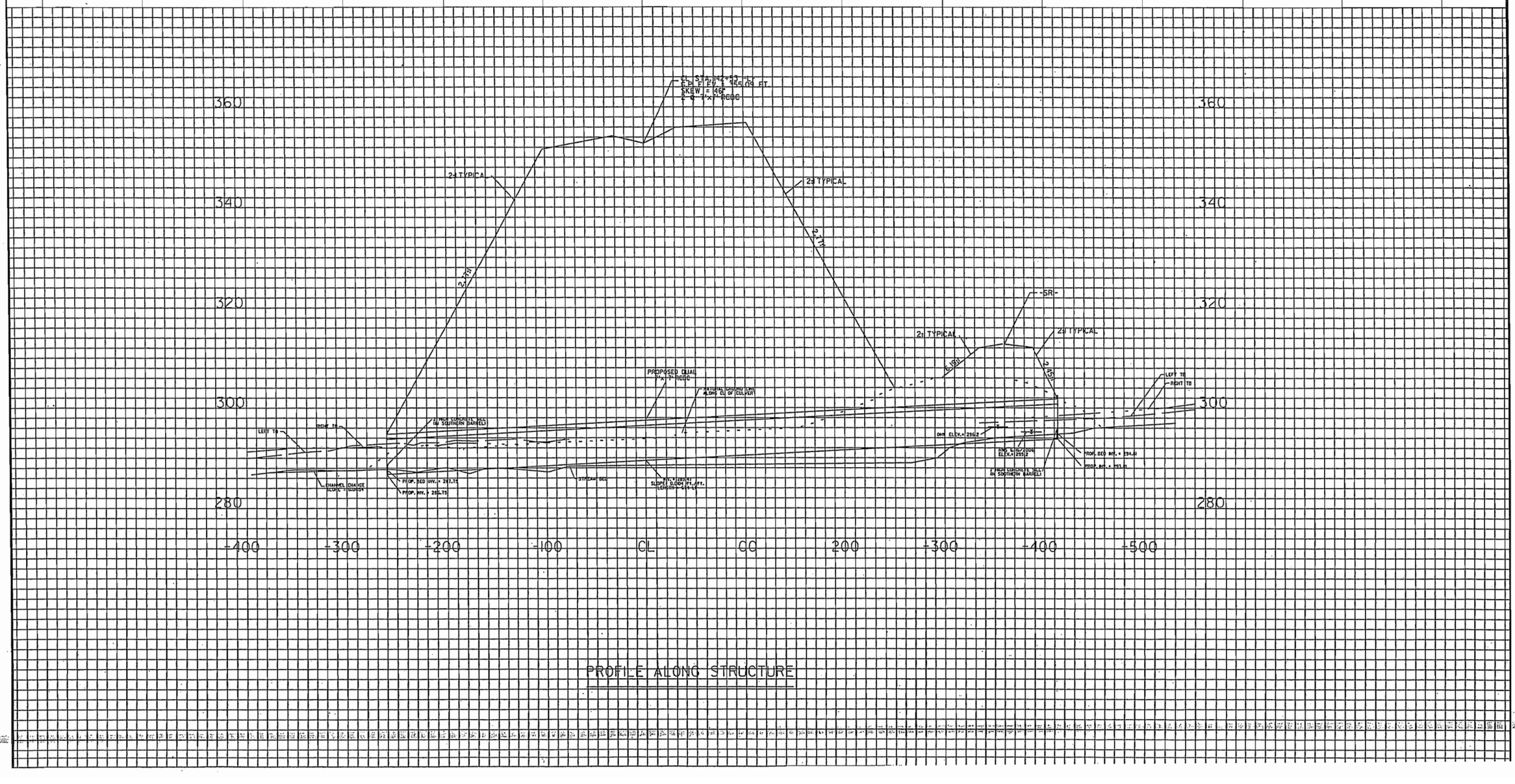
R/W SHEET NO.

ROADWAY DESIGN ENGINEER | HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

PERMIT DRAWINGS SHEET 43 OF 105



PROFILE ALONG STRUCTURE

SITE 6 -Y1- STA 229+85

ENGLISH

MULKEY
ENGINEERS & CONSULTANTS

U-4763B

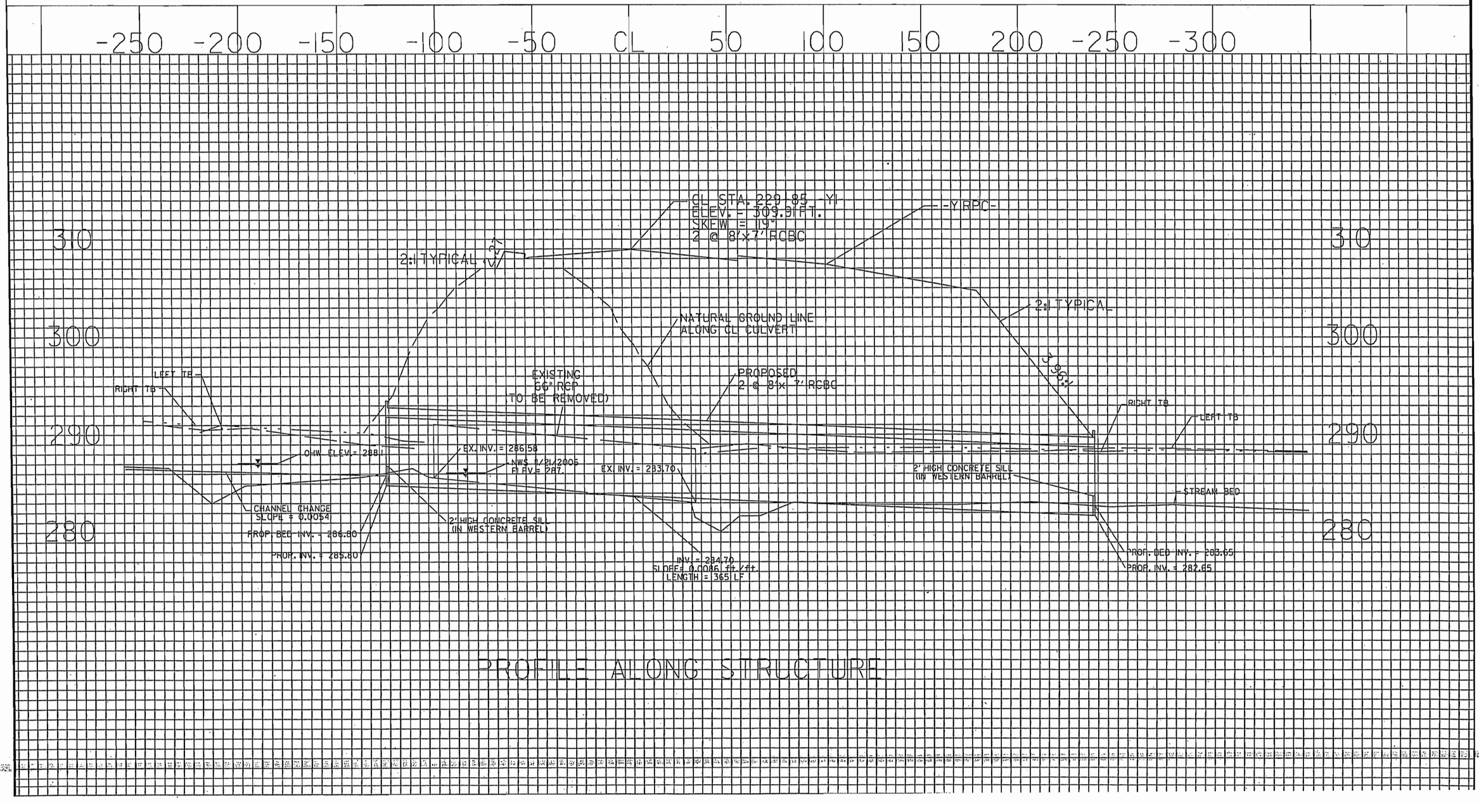
RW SHEET NO.

ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

PERMIT DRAWINGS SHEET 44 OF 105



PROFILE ALONG STRUCTURE

SITE 8 –SR2– STA 14+65

ENGLISH

PERMIT DRAWINGS SHEET 45 OF 105

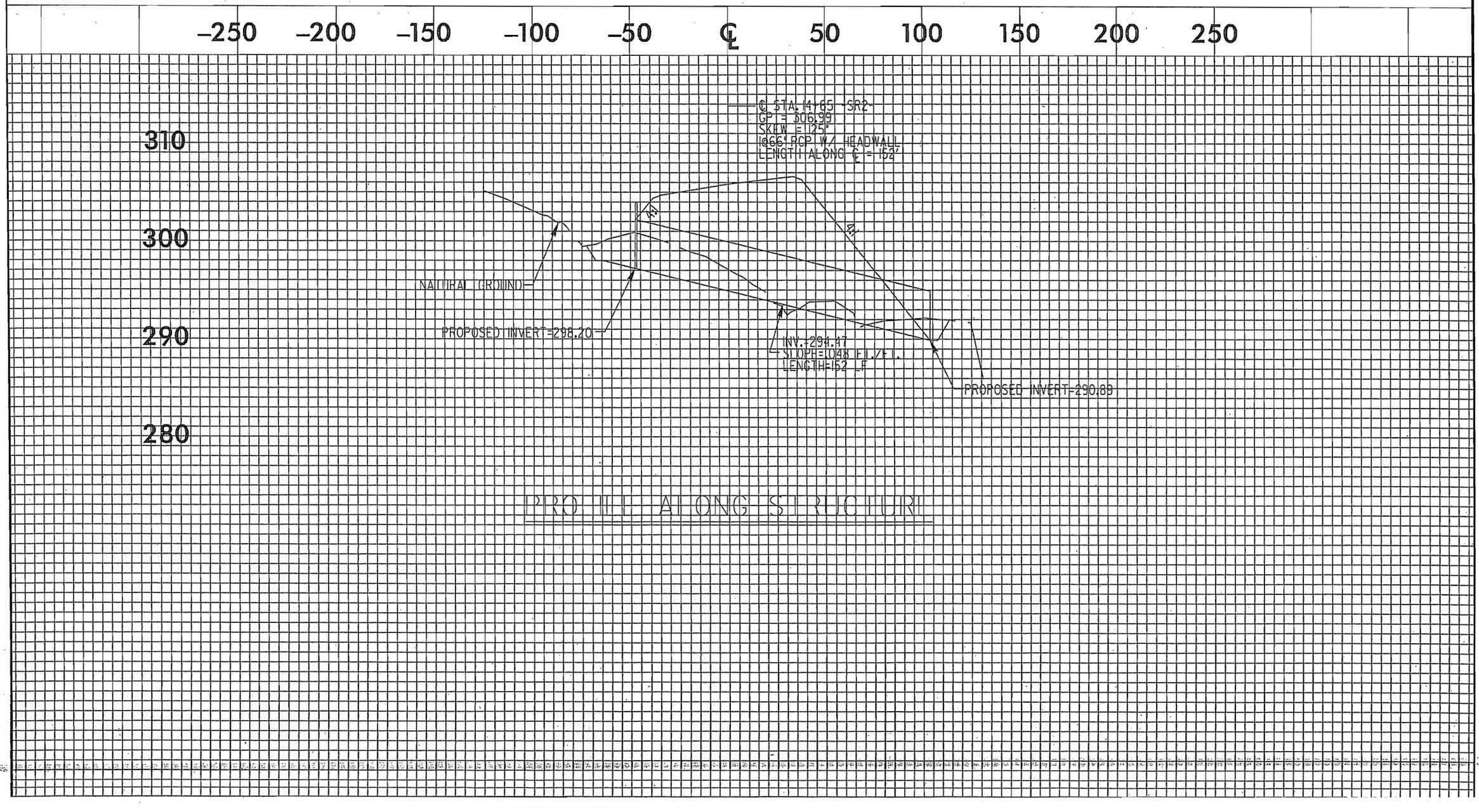
U-4763B

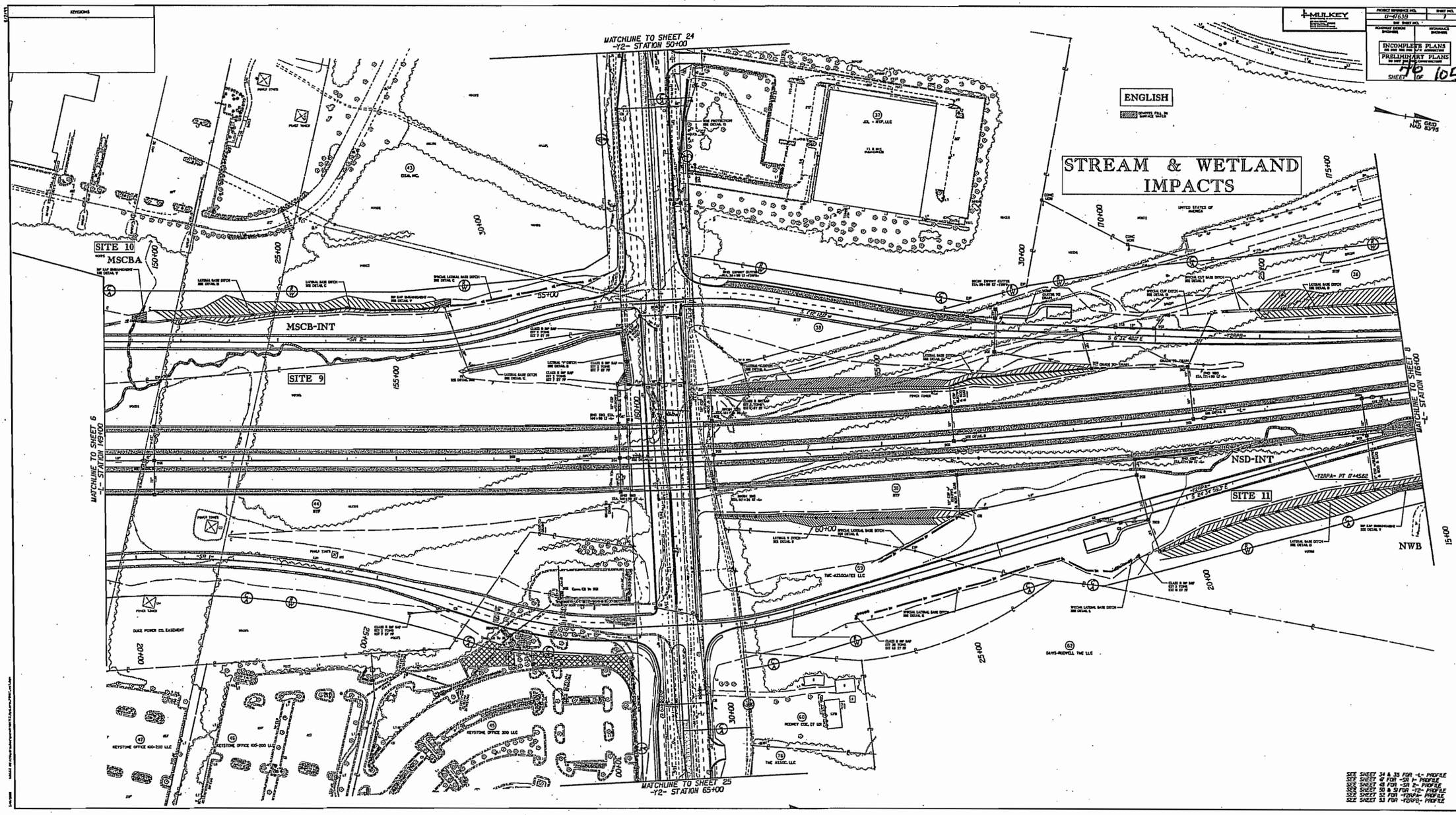
R/W SHEET NO.

ROADWAY DESIGN ENGINEER | HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION





MULKEY
U-4763B
INCOMPLETE PLANS
PRELIMINARY PLANS
SHEET 46 OF 105
ENGLISH
STREAM & WETLAND IMPACTS
MATCHLINE TO SHEET 24 -Y2- STATION 50+00
MATCHLINE TO SHEET 25 -Y2- STATION 65+00
MATCHLINE TO SHEET 6 -L- STATION 149+00
MATCHLINE TO SHEET 8 -L- STATION 176+00
SITE 10
MSCBA
MSCB-INT
SITE 9
NSD-INT
SITE 11
NWB
SEE SHEET 34 & 35 FOR -L- PROFILE
SEE SHEET 47 FOR -SR 1- PROFILE
SEE SHEET 48 FOR -SR 2- PROFILE
SEE SHEET 50 & 51 FOR -Y2- PROFILE
SEE SHEET 52 FOR -Y2RPA- PROFILE
SEE SHEET 53 FOR -Y2RPB- PROFILE

MULKEY

PROJECT REFERENCE NO. U-4838 | SHEET NO. 7

INCOMPLETE PLANS
DO NOT USE FOR CONSTRUCTION

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

SHEET 42 OF 105

ENGLISH

STREAM & WETLAND IMPACTS

MATCHLINE TO SHEET 24 -Y2- STATION 50+00

MATCHLINE TO SHEET 6 -L- STATION 169+00

MATCHLINE TO SHEET 8 -L- STATION 176+00

MATCHLINE TO SHEET 25 -Y2- STATION 65+00

SITE 10
MSCBA

MSCB-INT

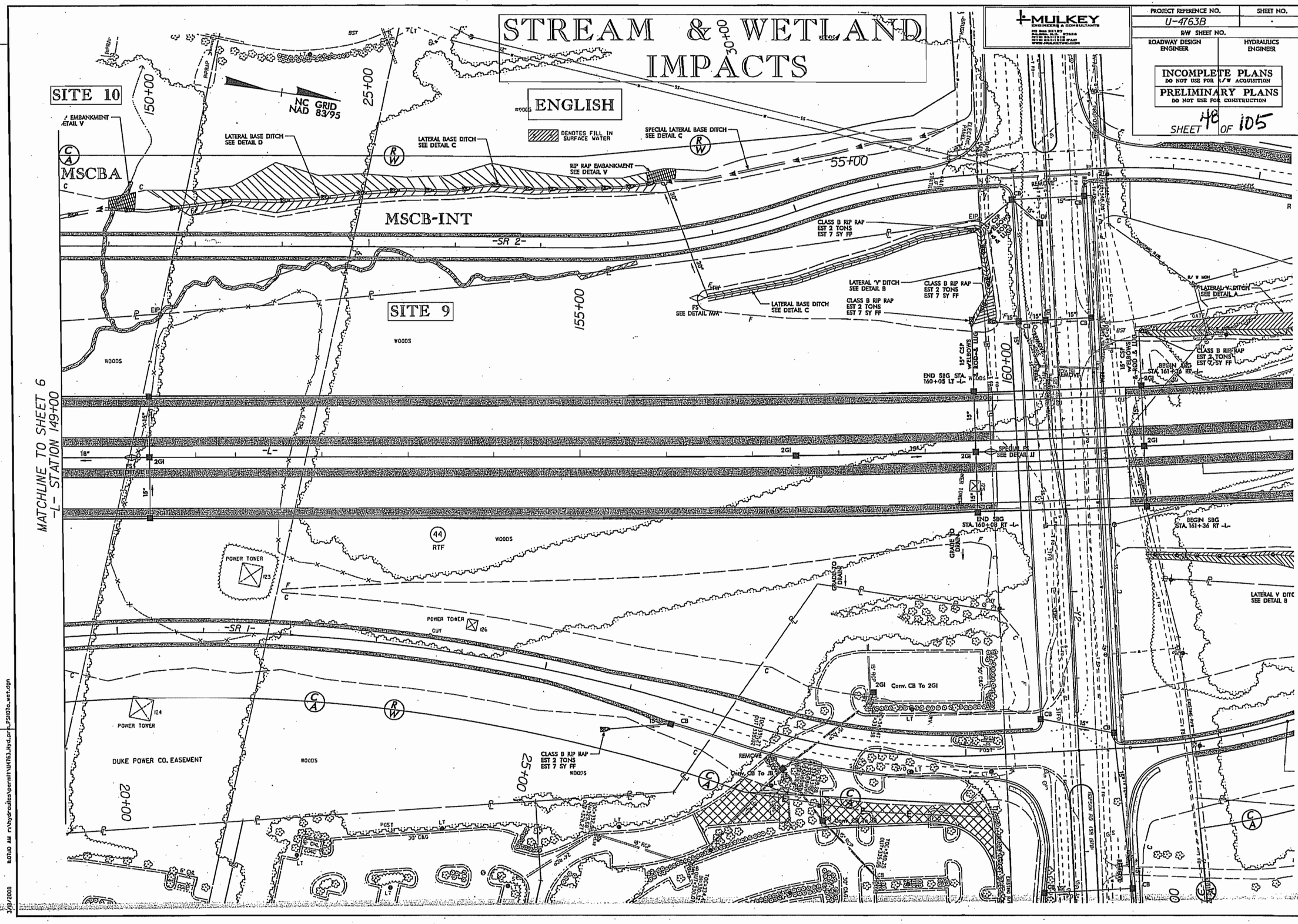
SITE 9

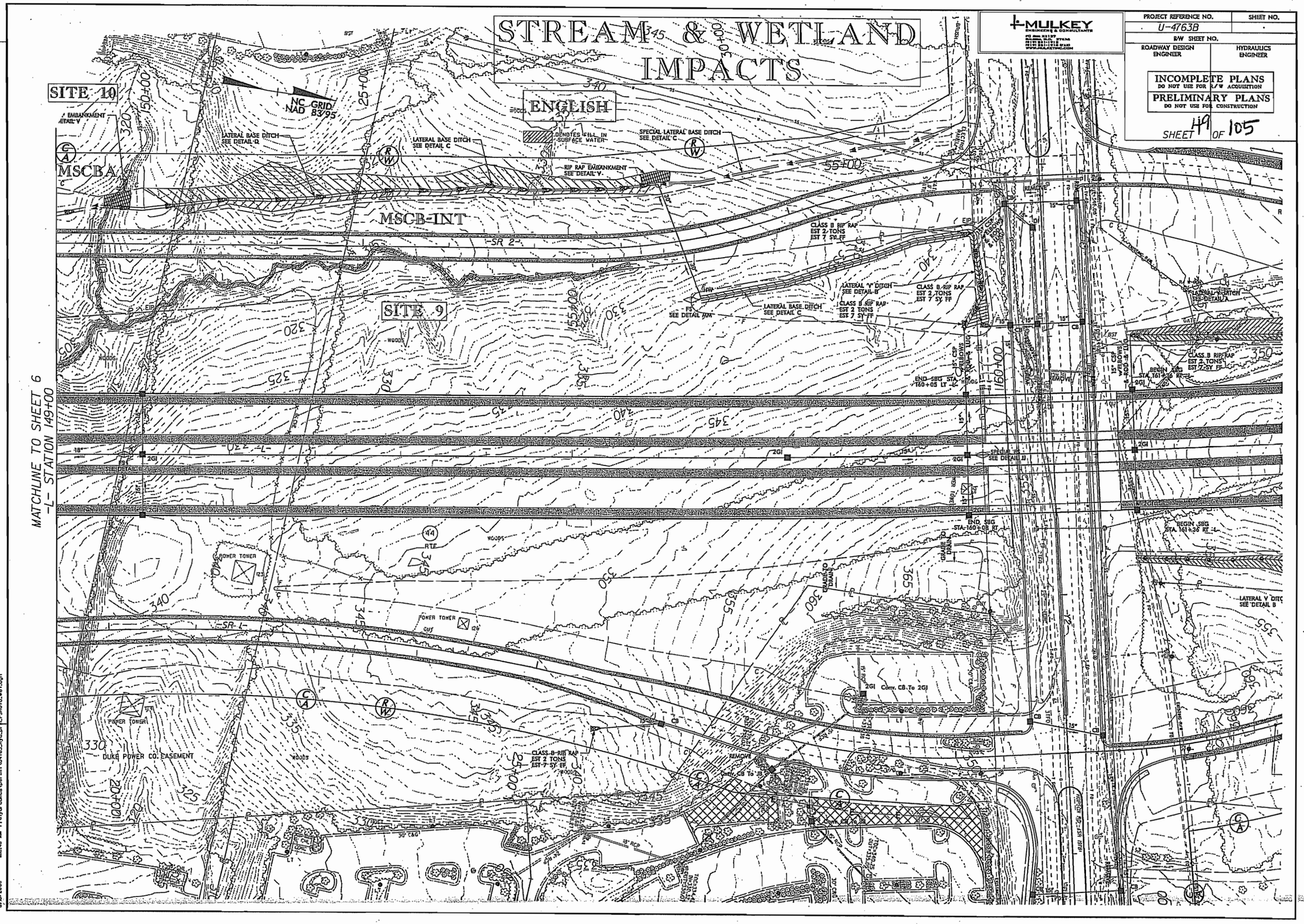
NSD-INT

SITE 11

NWB

SEE SHEET 34 & 35 FOR -L- PROFILE
SEE SHEET 47 FOR -SA L- PROFILE
SEE SHEET 48 FOR -SA R- PROFILE
SEE SHEET 50 & 51 FOR -Y2- PROFILE
SEE SHEET 52 FOR -Y2RPA- PROFILE
SEE SHEET 53 FOR -Y2RPB- PROFILE


STREAM & WETLAND IMPACTS
MULKEY
PROJECT REFERENCE NO.
U-4763B
SHEET NO.
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION
SHEET 48 OF 105
ENGLISH
DENOTES FILL IN SURFACE WATER
SITE 10
SITE 9
MSCBA
MSCB-INT
NC GRID NAD 83/95
MATCHLINE TO SHEET 6
-L- STATION 149+00
150+00
155+00
160+00
25+00
20+00
55+00
30+00
LATERAL BASE DITCH SEE DETAIL D
LATERAL BASE DITCH SEE DETAIL C
SPECIAL LATERAL BASE DITCH SEE DETAIL C
RIP RAP EMBANKMENT SEE DETAIL V
CLASS B RIP RAP EST 2 TONS EST 7 SY FF
LATERAL 'V' DITCH SEE DETAIL B
LATERAL V DITCH SEE DETAIL A
LATERAL V DITCH SEE DETAIL B
END SBG STA. 160+05 LT -L-
END SBG STA. 160+08 RT -L-
BEGIN SBG STA. 161+36 RT -L-
SPECIAL FS SEE DETAIL JJ
POWER TOWER
DUKE POWER CO. EASEMENT
WOODS
-SR 2-
-SR 1-
-L-
-Y2-
Conv. CB To 2GI
Conv. CB To JB
REMOVE
GRADE TO DRAIN
RTF
3/18/2008
R:\DTAD AM r:\hydraulics\permit\U4763_Hyd_prj_PSH07a_wet.dgn


STREAM & WETLAND IMPACTS
MULKEY ENGINEERS & CONSULTANTS
PROJECT REFERENCE NO.
U-4763B
SHEET NO.
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION
SHEET 49 OF 105
ENGLISH
DENOTES FILL IN SURFACE WATER
SITE 10
SITE 9
MSCBA
MSCB-INT
NC GRID NAD 83/95
LATERAL BASE DITCH SEE DETAIL D
LATERAL BASE DITCH SEE DETAIL C
SPECIAL LATERAL BASE DITCH SEE DETAIL C
RIP RAP EMBANKMENT SEE DETAIL V
CLASS B RIP RAP EST 2 TONS EST 7 SY FF
LATERAL 'V' DITCH SEE DETAIL B
LATERAL BASE DITCH SEE DETAIL C
SEE DETAIL MM
END SBG STA 160+05 LT
BEGIN SBG STA 161+36 RT
END SBG STA 160+08 RT
LATERAL V DITCH SEE DETAIL B
POWER TOWER
DUKE POWER CO. EASEMENT
MATCHLINE TO SHEET 6
-L- STATION 149+00
3/18/2008
8:18:46 AM r:\hydraulics\permit\U4763_Hyd_prn_PSH07a_wet.dgn

MULKEY
ENGINEERS & CONSULTANTS

PROJECT REFERENCE NO.	SHEET NO.
U-4763B	
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

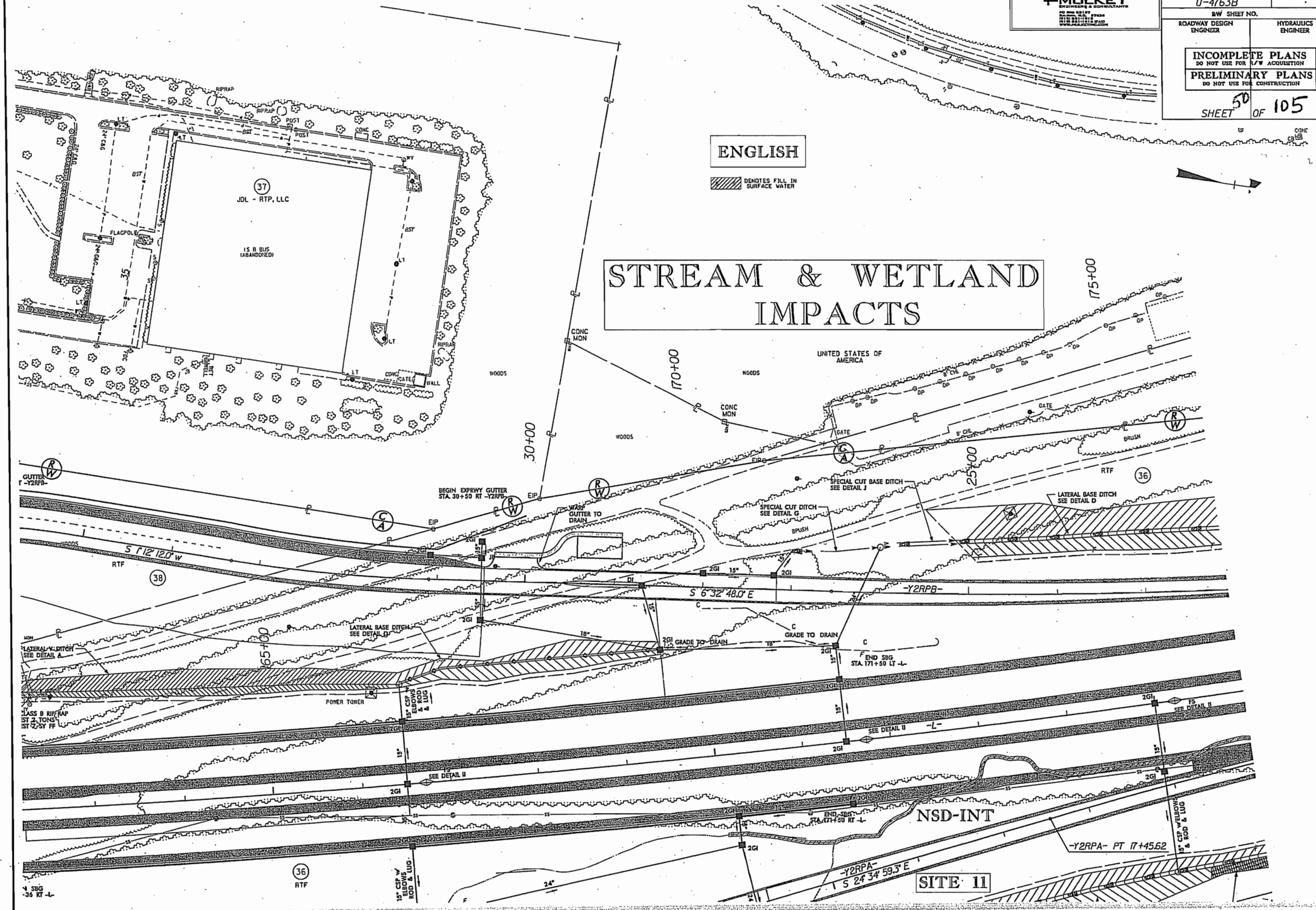
INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

SHEET 50 OF 105

ENGLISH

DENOTES FILL IN SURFACE WATER

STREAM & WETLAND IMPACTS



MULKEY
ENGINEERS & CONSULTANTS

PROJECT REFERENCE NO.	SHEET NO.
U-4763B	
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

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

SHEET 51 OF 105

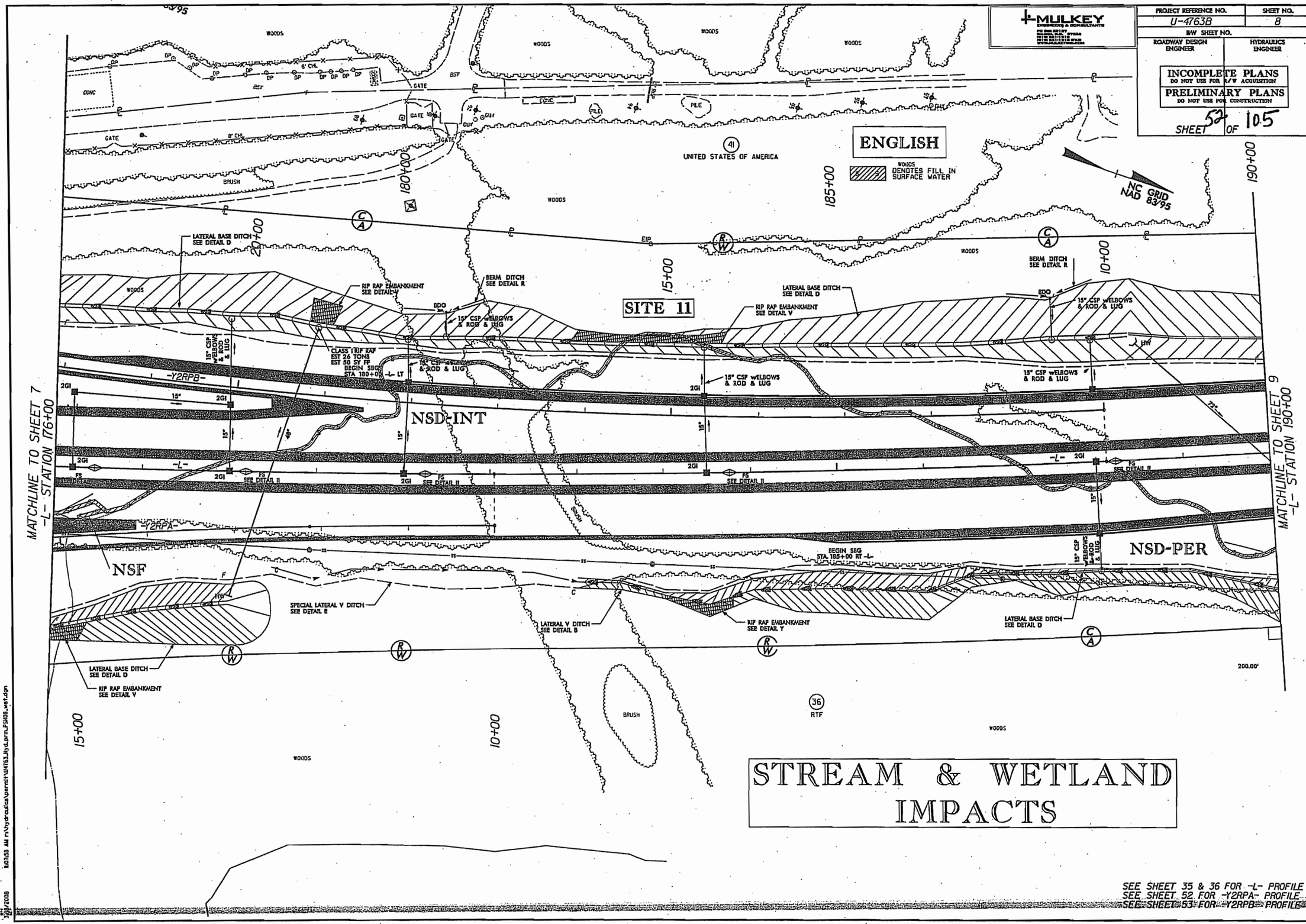
STREAM & WETLAND IMPACTS

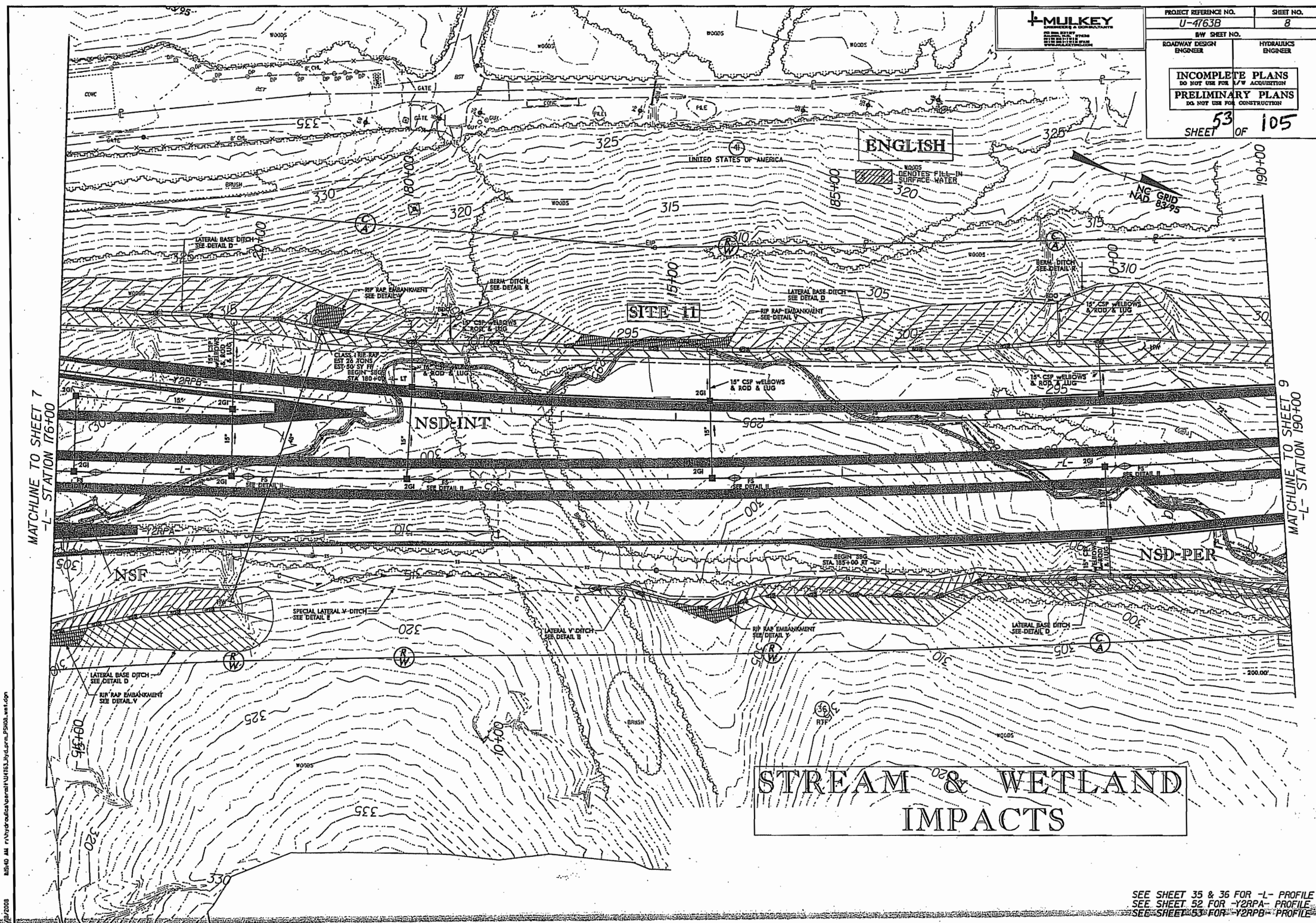
ENGLISH

DENOTES FILL IN SURFACE WATER

NSD-INT

SITE 11


MULKEY
PROJECT REFERENCE NO.
U-4763B
SHEET NO.
8
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION
SHEET 52 OF 105
ENGLISH
WOODS
DENOTES FILL IN SURFACE WATER
NC GRID NAD 83/95
UNITED STATES OF AMERICA
SITE 11
NSD-INT
NSD-PER
NSF
MATCHLINE TO SHEET 7 -L- STATION 176+00
MATCHLINE TO SHEET 9 -L- STATION 190+00
LATERAL BASE DITCH SEE DETAIL D
RIP RAP EMBANKMENT SEE DETAIL V
BERM DITCH SEE DETAIL R
15" CSP WELBOWS & ROD & LUG
CLASS I RIP RAP EST 26 TONS EST 50 SY FF BEGIN SBG STA 180+00 -L- LT
BEGIN SBG STA. 185+00 RT -L-
SPECIAL LATERAL V DITCH SEE DETAIL E
LATERAL V DITCH SEE DETAIL B
RIP RAP EMBANKMENT SEE DETAIL Y
-Y2RPB-
-Y2RPA-
-L-
BRUSH
WOODS
RTF
200.00'
STREAM & WETLAND IMPACTS
SEE SHEET 35 & 36 FOR -L- PROFILE
SEE SHEET 52 FOR -Y2RPA- PROFILE
SEE SHEET 53 FOR -Y2RPB- PROFILE


MULKEY
PROJECT REFERENCE NO.
U-4763B
SHEET NO.
8
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION
SHEET 53 OF 105
ENGLISH
UNITED STATES OF AMERICA
DENOTES FILL IN SURFACE WATER
NC GRID NAD 83/95
SITE 11
NSD-INT
NSF
NSD-PER
MATCHLINE TO SHEET 7 -L- STATION 176+00
MATCHLINE TO SHEET 9 -L- STATION 190+00
LATERAL BASE DITCH SEE DETAIL D
RIP RAP EMBANKMENT SEE DETAIL V
BERM DITCH SEE DETAIL R
15" CSP WELBOWS & ROD & LUG
CLASS I RIP RAP EST 26 TONS EST 50 SY FF BEGIN SBG STA 180+00
SPECIAL LATERAL V DITCH SEE DETAIL E
LATERAL V DITCH SEE DETAIL B
RIP RAP EMBANKMENT SEE DETAIL Y
BEGIN SBG STA 185+00 RT -L-
STREAM & WETLAND IMPACTS
SEE SHEET 35 & 36 FOR -L- PROFILE
SEE SHEET 52 FOR -Y2RPA- PROFILE
SEE SHEET 53 FOR -Y2RPB- PROFILE

PROJECT REFERENCE NO.	SHEET NO.
U-4763B	9
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS — NOT FOR CONSTRUCTION

PRELIMINARY PLANS — DO NOT USE FOR CONSTRUCTION

SHEET 54 OF 105

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NC GRID NAD 83/95

MATCHLINE -L- STA. 190+00 SEE SHEET 8

MATCHLINE -L- STA. 204+00 SEE SHEET 10

195+00

200+00

(11) UNITED STATES OF AMERICA

(39) UNITED STATES OF AMERICA

(36) RTF

(6-1) BASF CORPORATION DIVISION

SITE 11

SITE 12

LATERAL V DITCH SEE DETAIL A

LATERAL BASE DITCH SEE DETAIL C

LATERAL BASE DITCH SEE DETAIL D

LATERAL BASE DITCH SEE DETAIL E

SPECIAL CUT BASE DITCH SEE DETAIL I

SPECIAL CUT DITCH SEE DETAIL H

SPECIAL CONCRETE SWALE SEE DETAIL KK

PROP. NOISE WALL

2 TONS CL B RIPRAP W/7 SY FIL FAB

1 TONS CL B RIPRAP W/5 SY FIL FAB

570 TONS CL I RIPRAP W/120 SY FIL FAB RIPRAP ON BANKS ONLY

5 TONS CL B RIPRAP W/14 SY FIL FAB

RIPRAP EMBANKMENT SEE DETAIL Y 134 TONS CL I RIPRAP W/89 SY FIL FAB

3 TONS CL B RIPRAP W/11 SY FIL FAB

2 ELBOWS W/ROD AND LUG

FS SEE DETAIL II

CONC MON

ENGLISH

DENOTES FILL IN WETLAND

DENOTES MECHANIZED CLEARING

DENOTES EXCAVATION IN WETLAND

DENOTES TEMPORARY IMPACTS IN SURFACE WATER

DENOTES IMPACTS IN SURFACE WATER

NOTE: PROPOSED DITCH IN WETLANDS (SITE 12) LESS THAN 1' DEEP. THEREFORE, NO DRAW DOWN OF THE EXISTING WETLAND WILL OCCUR

FOR -L- PROFILE SEE SHT. 36

FOR DITCH DETAILS SEE SHT. 2-O

FOR RETAINING WALL ENVELOPE SEE SHT. 2-O

PLANS PREPARED BY :
RUMMEL • KLEPPER & KAHL, LLP
consulting engineers
900 Ridgefield Drive Suite 350
RALEIGH, NORTH CAROLINA 27609-3960
(919) 878-9560
FOR
THE NORTH CAROLINA TURNPIKE AUTHORITY

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NOV 12 2008
RALEIGH REGULATORY FIELD OFFICE

PROJECT REFERENCE NO.	SHEET NO.
U-4763B	9
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS DO NOT USE FOR RIGHT OF WAY ACQUISITION
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION

SHEET 55 OF 105

MATCHLINE -L- STA. 190+00 SEE SHEET 8

MATCHLINE -L- STA. 204+00 SEE SHEET 10

UNITED STATES OF AMERICA (11)

UNITED STATES OF AMERICA (39)

195+00

200+00

NC GRID NAD 83/95

LATERAL V DITCH SEE DETAIL A

LATERAL BASE DITCH SEE DETAIL C

LATERAL BASE DITCH SEE DETAIL D

LATERAL BASE DITCH SEE DETAIL Z

PROP. NOISE WALL

SPECIAL CUT BASE DITCH SEE DETAIL I

SPECIAL CUT DITCH SEE DETAIL H

SPECIAL CONCRETE SWALE, 310 SEE DETAIL KK

2 TONS CL B RIPRAP W/7 SY FIL FAB

2 ELBOWS W/ROD AND LUG

1 TONS CL B RIPRAP W/8 SY FIL FAB

2 TONS CL B RIPRAP W/2 SY FIL FAB

170 TONS CL I RIPRAP W/120 SY FIL FAB
RIPRAP ON BANKS ONLY

5 TONS CL B RIPRAP W/14 SY FIL FAB

RIPRAP EMBANKMENT SEE DETAIL Y
134 TONS CL I RIPRAP W/89 SY FIL FAB

3 TONS CL B RIPRAP W/11 SY FIL FAB

SEE DETAIL I

SEE DETAIL II

SITE 11

SITE 12

NOTE: PROPOSED DITCH IN WETLANDS (SITE 12) LESS THAN 1' DEEP. THEREFORE, NO DRAW DOWN OF THE EXISTING WETLAND WILL OCCUR

ENGLISH

RTF (36)

BASF CORPORATION DIVISION (64)

DENOTES FILL IN WETLAND

DENOTES MECHANIZED CLEARING

DENOTES EXCAVATION IN WETLAND

DENOTES TEMPORARY IMPACTS IN SURFACE WATER

DENOTES IMPACTS IN SURFACE WATER

FOR -L- PROFILE SEE SHT. 36
FOR DITCH DETAILS SEE SHT. 2-O
FOR RETAINING WALL ENVELOPE SEE SHT. 2-O

PLANS PREPARED BY :
RUMMEL • KLEPPER & KAHL, LLP
consulting engineers
900 Ridgefield Drive Suite 350
RALEIGH, NORTH CAROLINA 27609-3960
(919) 876-9560
FOR:
THE NORTH CAROLINA TURNPIKE AUTHORITY

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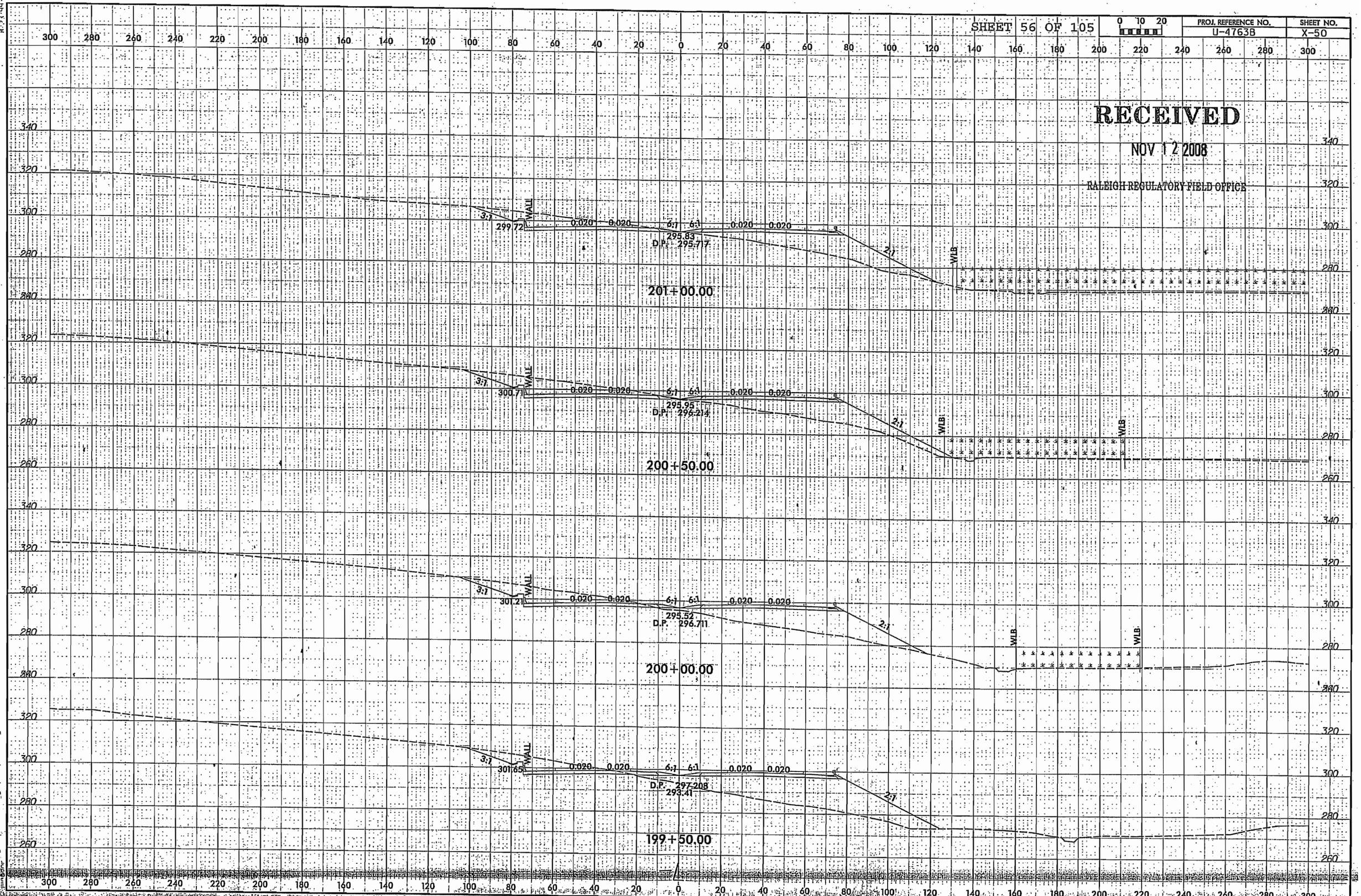
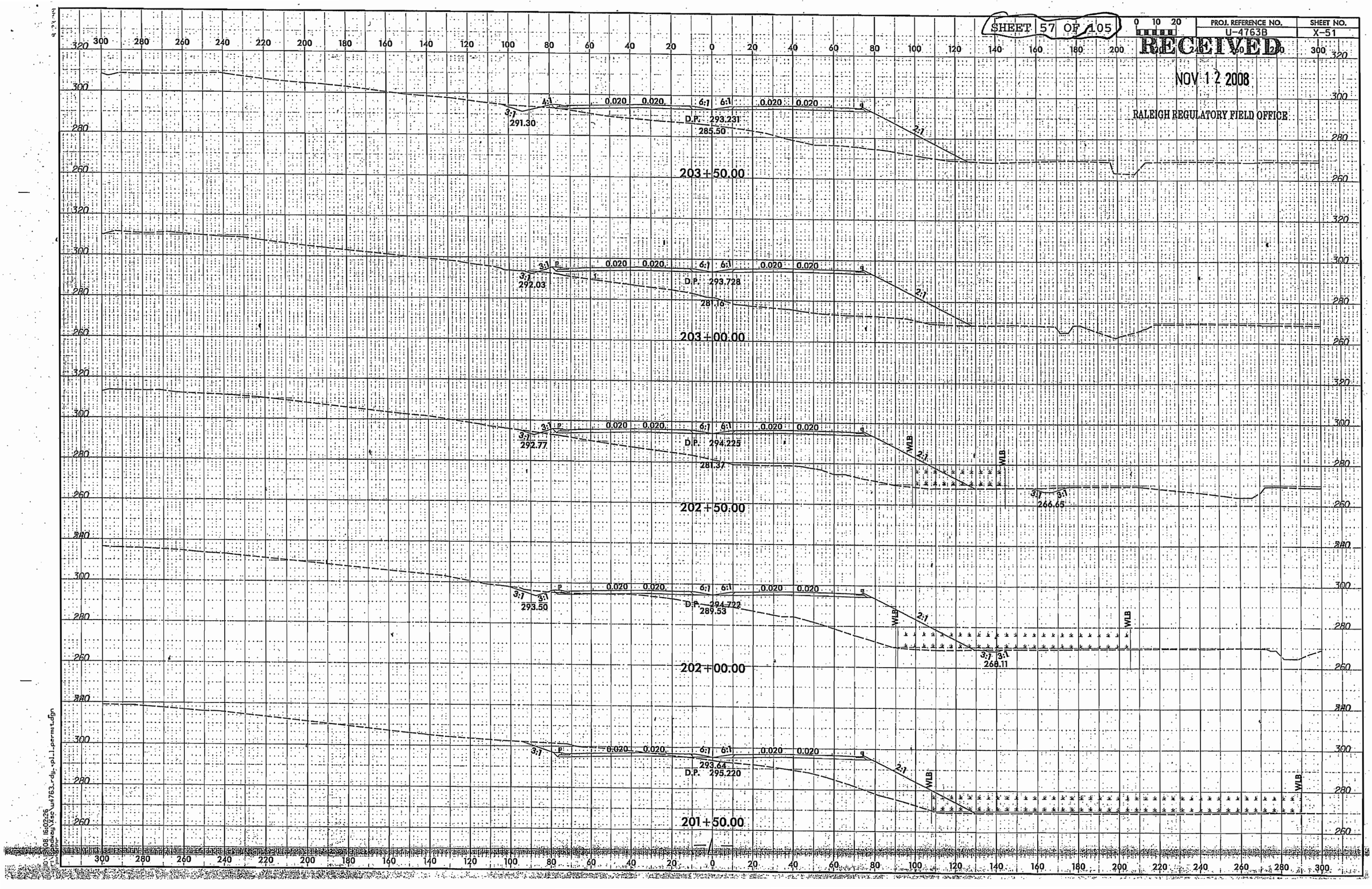

SHEET 56 OF 105
PROJ. REFERENCE NO.
U-4763B
SHEET NO.
X-50
RECEIVED
NOV 12 2008
RALEIGH REGULATORY FIELD OFFICE
201+00.00
299.72
295.83
D.P. 295.717
200+50.00
300.71
295.95
D.P. 296.214
200+00.00
301.21
295.52
D.P. 296.711
199+50.00
301.65
D.P. 297.208
293.41
WALL
WLB
3:1
2:1
6:1
0.020


SHEET 57 OF 105
PROJ. REFERENCE NO.
U-4763B
SHEET NO.
X-51
RECEIVED
NOV 12 2008
RALEIGH REGULATORY FIELD OFFICE
203+50.00
D.P. 293.231
285.50
291.30
203+00.00
D.P. 293.728
281.16
292.03
202+50.00
D.P. 294.225
281.37
292.77
266.65
202+00.00
D.P. 294.722
289.53
293.50
268.11
201+50.00
D.P. 295.220
293.64
0.020
6:1
3:1
2:1
WLB

SITE 11 –L– STA 189+90

ENGLISH

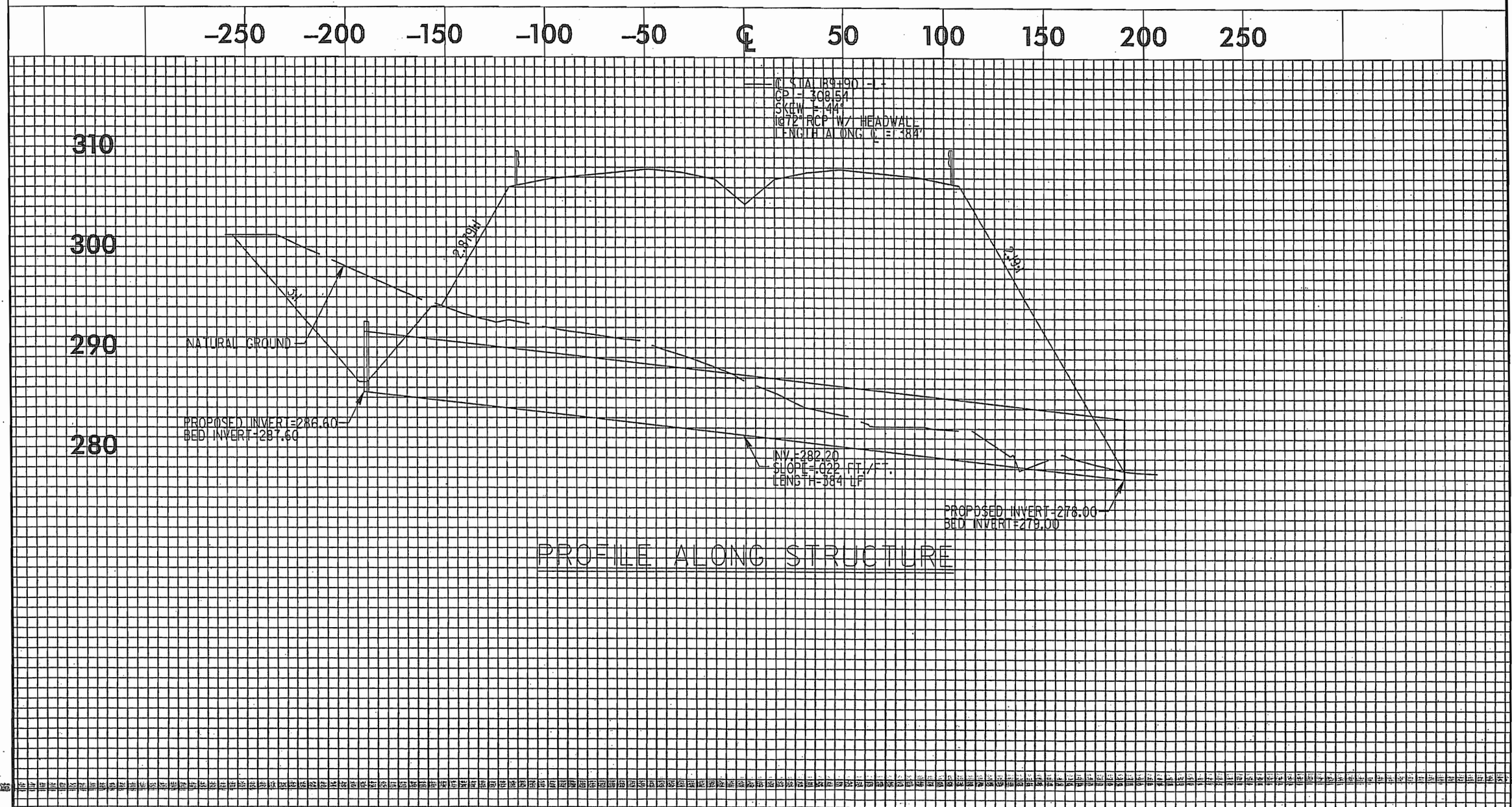
MULKEY
ENGINEERING & CONSULTANTS

PROJECT REFERENCE NO.	SHEET NO.
U-4763B	
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

PERMIT DRAWINGS SHEET 58 OF 105



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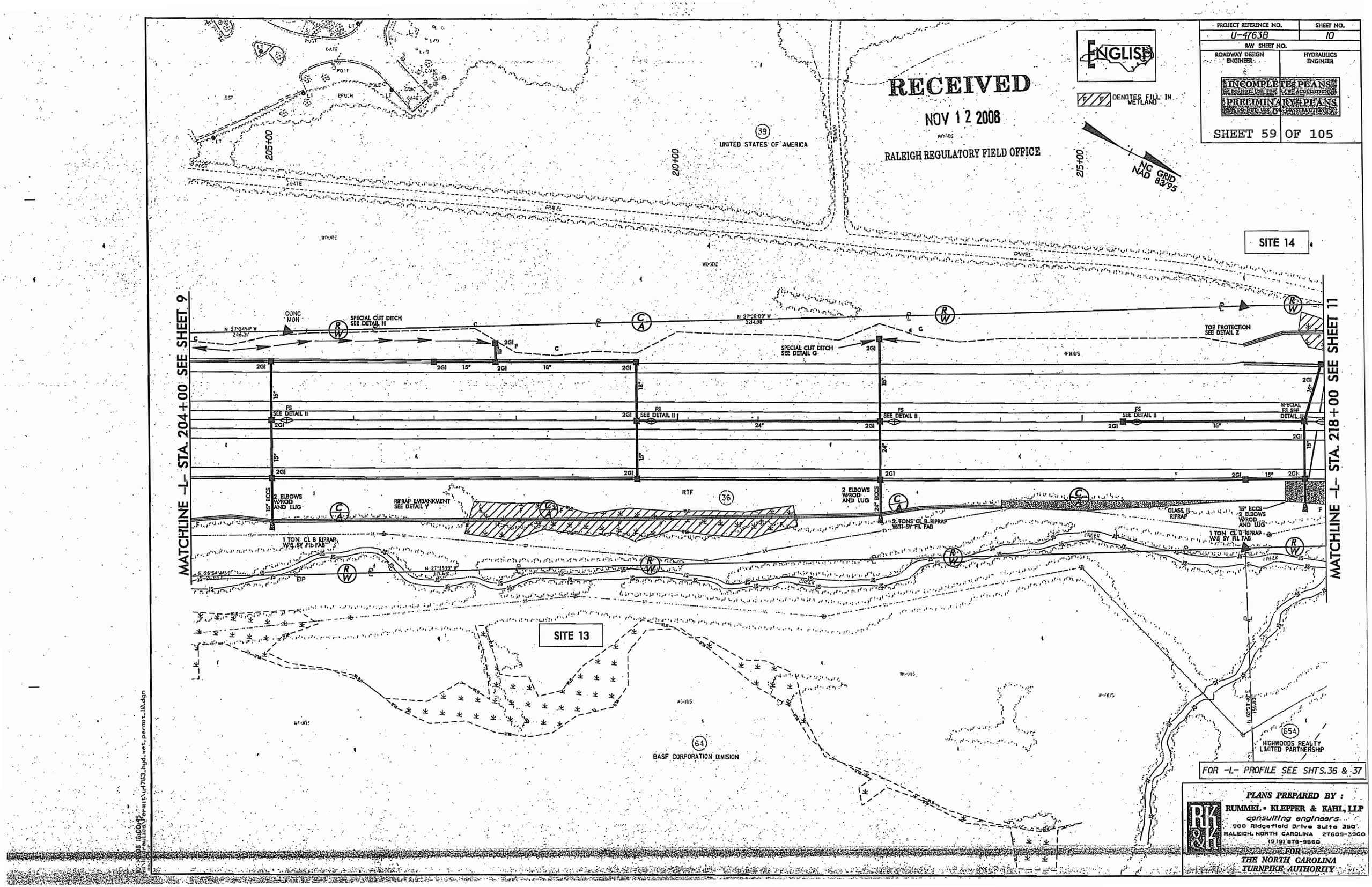
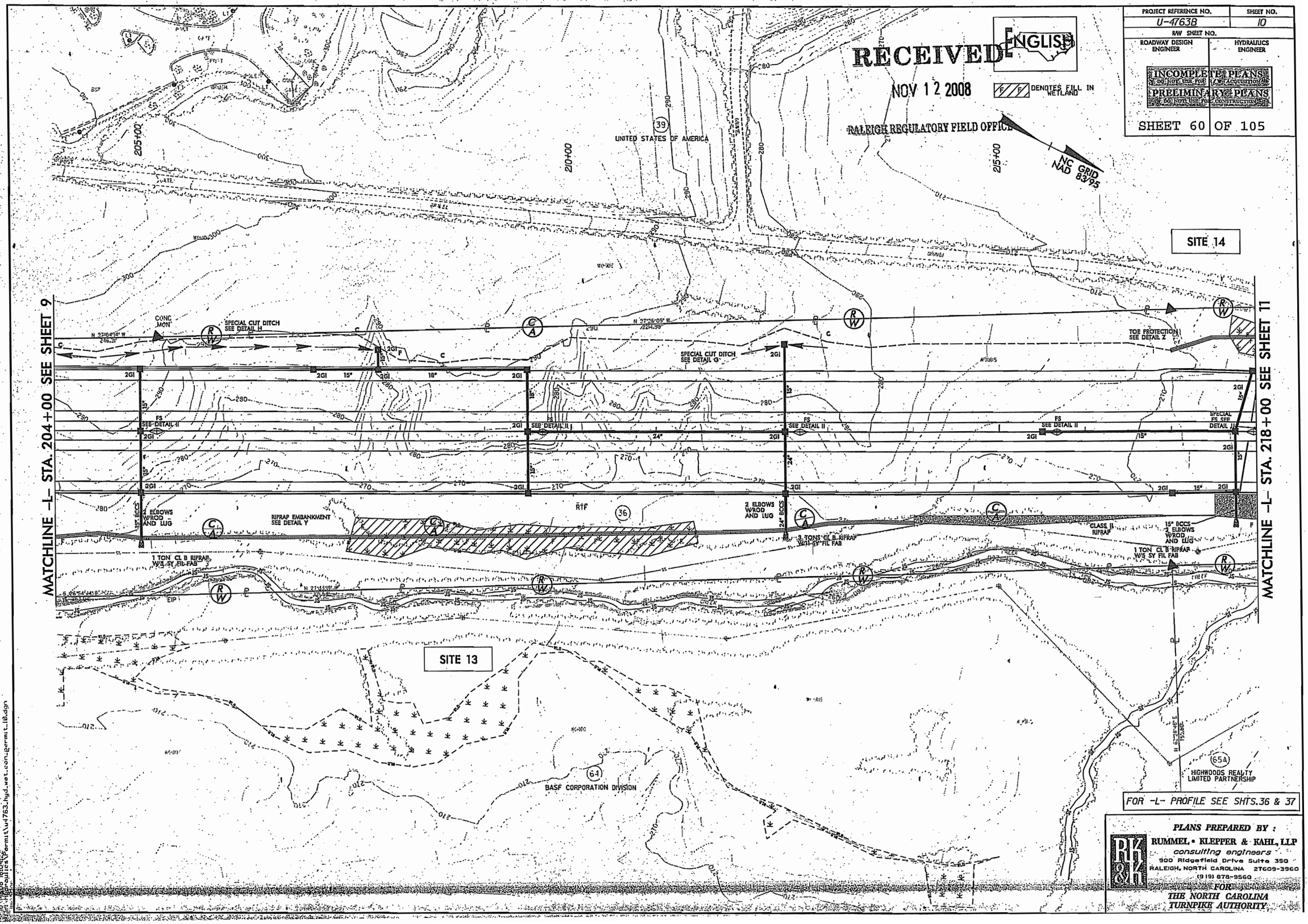
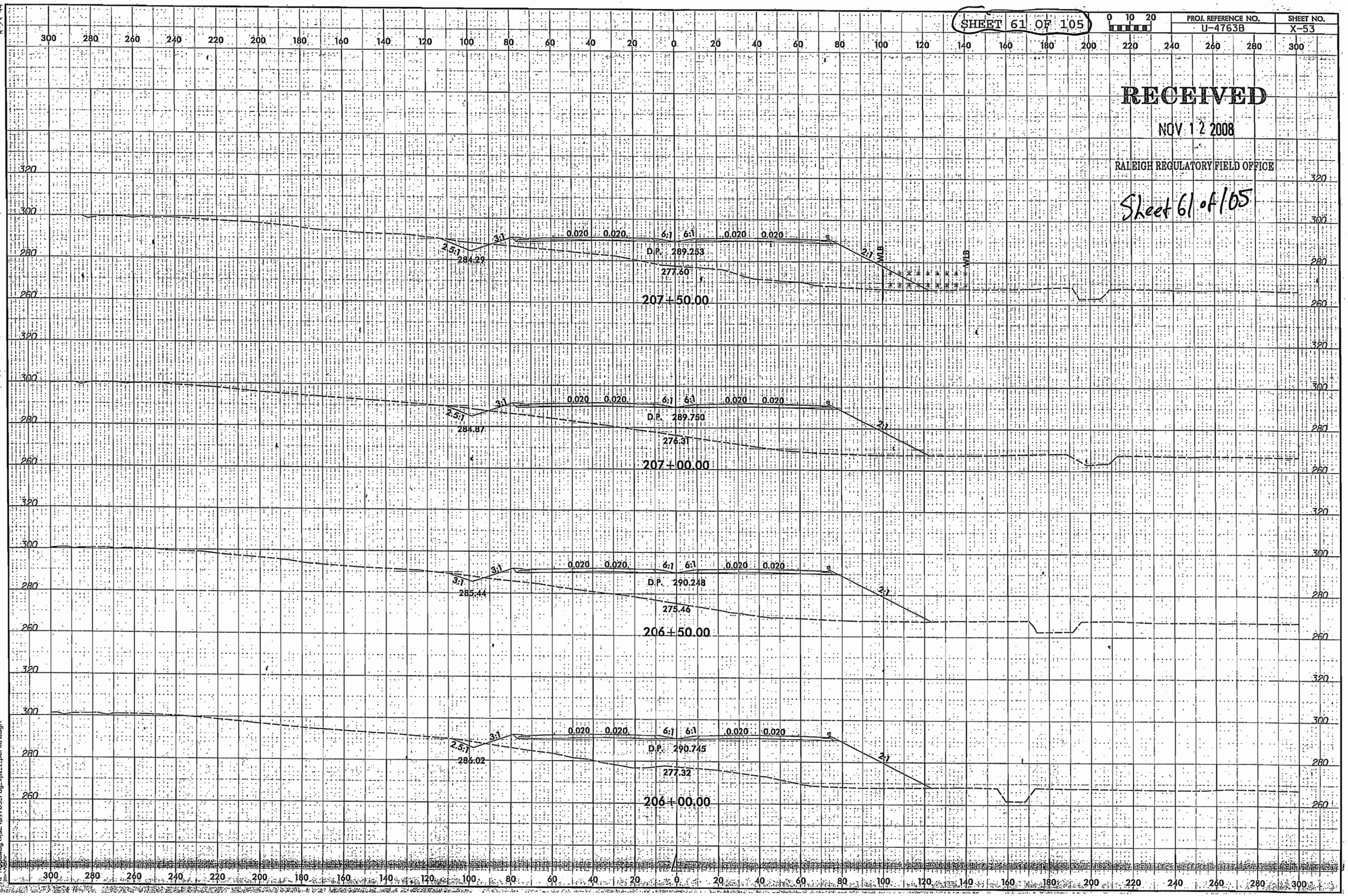
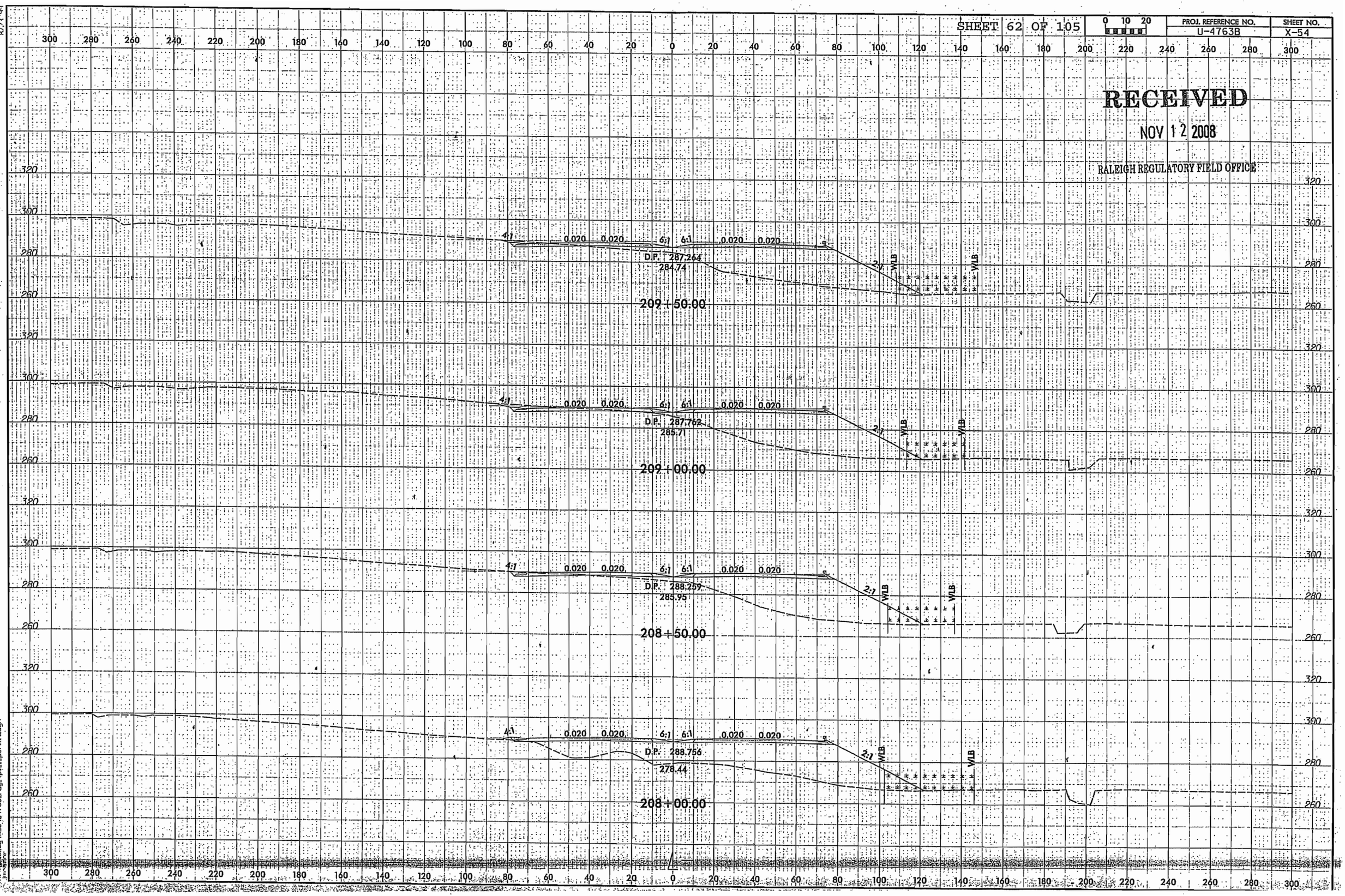

PROJECT REFERENCE NO.
U-4763B
SHEET NO.
10
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION
SHEET 59 OF 105
RECEIVED
NOV 12 2008
RALEIGH REGULATORY FIELD OFFICE
ENGLISH
DENOTES FILL IN WETLAND
NC GRID NAD 83/95
UNITED STATES OF AMERICA
205+00
210+00
215+00
SITE 14
SITE 13
MATCHLINE -L- STA. 204+00 SEE SHEET 9
MATCHLINE -L- STA. 218+00 SEE SHEET 11
CONC MON
SPECIAL CUT DITCH SEE DETAIL H
SPECIAL CUT DITCH SEE DETAIL G
TOE PROTECTION SEE DETAIL Z
FS SEE DETAIL II
2 ELBOWS W/ROD AND LUG
RIPRAP EMBANKMENT SEE DETAIL Y
RTF
3 TONS CL B RIPRAP W/11 SY FIL FAB
1 TON CL B RIPRAP W/5 SY FIL FAB
CLASS II RIPRAP
15" BCCS 2 ELBOWS W/ROD AND LUG
BASF CORPORATION DIVISION
HIGHWOODS REALTY LIMITED PARTNERSHIP
FOR -L- PROFILE SEE SHTS.36 & 37
PLANS PREPARED BY :
RUMMEL • KLEPPER & KAHL, LLP
consulting engineers
900 Ridgefield Drive Suite 350
RALEIGH, NORTH CAROLINA 27609-3960
(919) 878-9560
FOR
THE NORTH CAROLINA TURNPIKE AUTHORITY


PROJECT REFERENCE NO.
U-4763B
SHEET NO.
10
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION
SHEET 60 OF 105
RECEIVED
NOV 12 2008
RALEIGH REGULATORY FIELD OFFICE
ENGLISH
DENOTES FILL IN WETLAND
NC GRID NAD 83/95
SITE 14
SITE 13
MATCHLINE -L- STA. 204+00 SEE SHEET 9
MATCHLINE -L- STA. 218+00 SEE SHEET 11
UNITED STATES OF AMERICA
BASF CORPORATION DIVISION
HIGHWOODS REALTY LIMITED PARTNERSHIP
SPECIAL CUT DITCH SEE DETAIL H
SPECIAL CUT DITCH SEE DETAIL G
TOE PROTECTION SEE DETAIL Z
RIPRAP EMBANKMENT SEE DETAIL Y
2 ELBOWS W/ROD AND LUG
1 TON CL B RIPRAP W/5 SY FIL FAB
3 TONS CL B RIPRAP W/11 SY FIL FAB
CLASS II RIPRAP
FOR -L- PROFILE SEE SHTS.36 & 37
PLANS PREPARED BY :
RUMMEL • KLEPPER & KAHL, LLP
consulting engineers
900 Ridgefield Drive Suite 350
RALEIGH, NORTH CAROLINA 27609-3960
(919) 878-9560
FOR
THE NORTH CAROLINA TURNPIKE AUTHORITY


SHEET 61 OF 105
PROJ. REFERENCE NO.
U-4763B
SHEET NO.
X-53
RECEIVED
NOV 12 2008
RALEIGH REGULATORY FIELD OFFICE
Sheet 61 of 105
207+50.00
D.P. 289.253
284.29
277.60
207+00.00
D.P. 289.750
284.87
276.31
206+50.00
D.P. 290.248
285.44
275.46
206+00.00
D.P. 290.745
286.02
277.32
0.020
6:1
3:1
2.5:1
2:1
WLB

PROJ. REFERENCE NO.	SHEET NO.
U-4763B	X-54

RECEIVED
NOV 12 2008
RALEIGH REGULATORY FIELD OFFICE



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PROJ. REFERENCE NO.	SHEET NO.
U-4763B	X-55

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NOV 12 2008
RALEIGH REGULATORY FIELD OFFICE

300 280 260 240 220 200 180 160 140 120 100 80 60 40 20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300

320 300 280 260

6:1 6:1 0.020 0.020 6:1 6:1 0.020 0.020 2:1

283.34

D.P. 285.276

271.47

211+50.00

5.69:1 6:1 0.020 0.020 6:1 6:1 0.020 0.020 2:1 WLB WLB

283.83

D.P. 285.773

274.73

211+00.00

3:1 6:1 0.020 0.020 6:1 6:1 0.020 0.020 2:1 WLB WLB

284.33

D.P. 286.270

275.71

210+50.00

3:1 6:1 0.020 0.020 6:1 6:1 0.020 0.020 2:1 WLB WLB

284.83

D.P. 286.767

274.00

210+00.00

320 300 280 260

300 280 260 240 220 200 180 160 140 120 100 80 60 40 20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300

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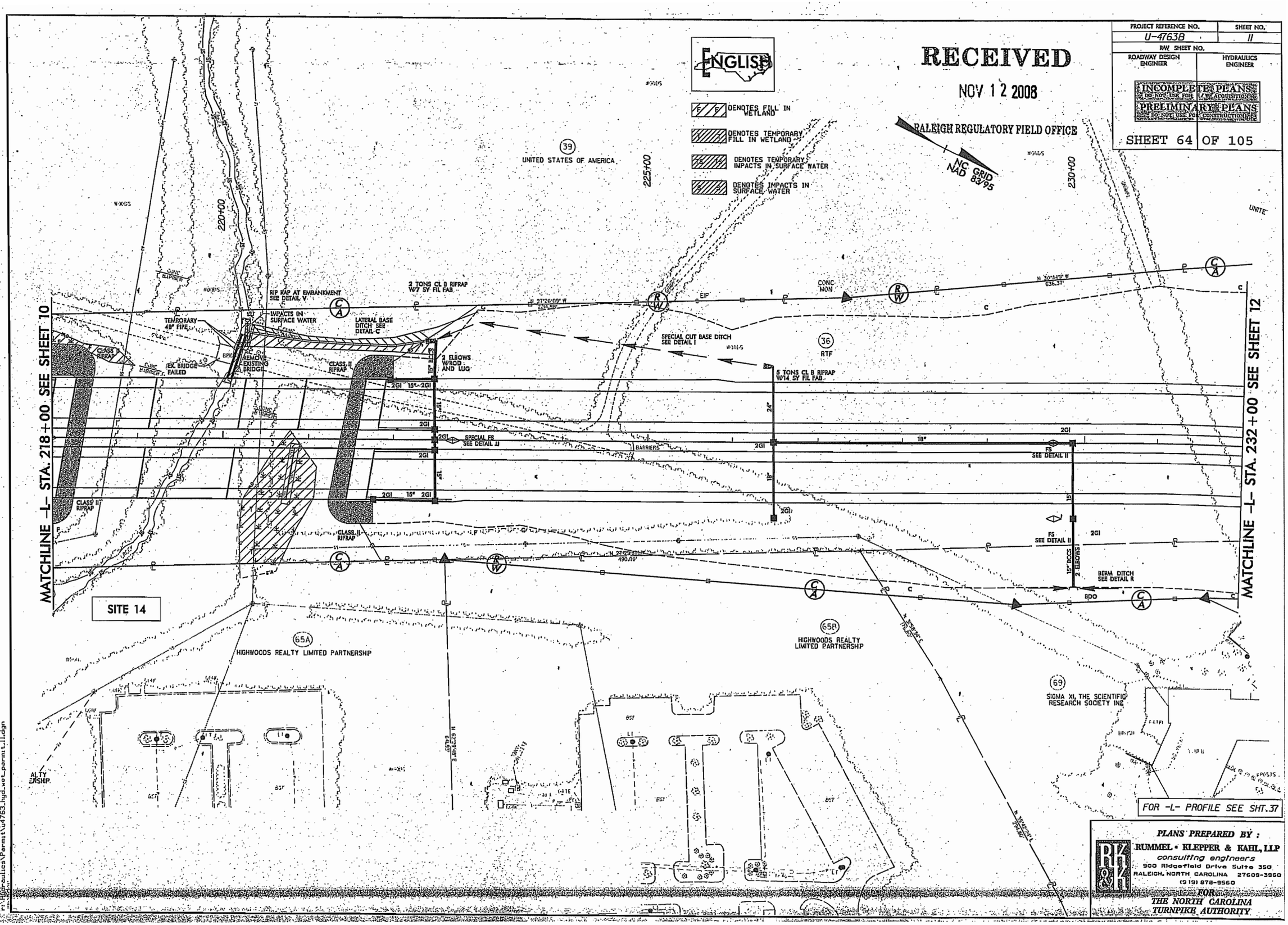

PROJECT REFERENCE NO.
U-4763B
SHEET NO.
11
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION
SHEET 64 OF 105
RECEIVED
NOV 12 2008
RALEIGH REGULATORY FIELD OFFICE
ENGLISH
DENOTES FILL IN WETLAND
DENOTES TEMPORARY FILL IN WETLAND
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
DENOTES IMPACTS IN SURFACE WATER
NC GRID NAD 83/95
MATCHLINE -L- STA. 218+00 SEE SHEET 10
MATCHLINE -L- STA. 232+00 SEE SHEET 12
220+00
225+00
230+00
39
UNITED STATES OF AMERICA
36
RTF
65A
HIGHWOODS REALTY LIMITED PARTNERSHIP
65B
HIGHWOODS REALTY LIMITED PARTNERSHIP
69
SIGMA XI, THE SCIENTIFIC RESEARCH SOCIETY INC
SITE 14
TEMPORARY 48" PIPE
RIP RAP AT EMBANKMENT SEE DETAIL V
IMPACTS IN SURFACE WATER
LATERAL BASE DITCH SEE DETAIL C
2 TONS CL B RIPRAP W/7 SY FIL FAB
2 ELBOWS W/ROD AND LUG
SPECIAL CUT BASE DITCH SEE DETAIL I
5 TONS CL B RIPRAP W/14 SY FIL FAB
SPECIAL FS SEE DETAIL JJ
FS SEE DETAIL II
BERM DITCH SEE DETAIL R
REMOVE EXISTING BRIDGE
EX. BRIDGE FAILED
CLASS II RIPRAP
CONC MON
BARRIERS
FOR -L- PROFILE SEE SHT.37
PLANS PREPARED BY :
RUMMEL • KLEPPER & KAHL, LLP
consulting engineers
900 Ridgefield Drive Suite 350
RALEIGH, NORTH CAROLINA 27609-3960
(919) 878-9560
FOR
THE NORTH CAROLINA TURNPIKE AUTHORITY

PROJECT REFERENCE NO.	SHEET NO.
U-4763B	11
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

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

SHEET 65 OF 105

RECEIVED
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RALEIGH REGULATORY FIELD OFFICE

ENGLISH

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

NC GRID NAD 83/95

MATCHLINE -L- STA. 218+00 SEE SHEET 10

MATCHLINE -L- STA. 232+00 SEE SHEET 12

SITE 14

(39) UNITED STATES OF AMERICA

(65A) HIGHWOODS REALTY LIMITED PARTNERSHIP

(65B) HIGHWOODS REALTY LIMITED PARTNERSHIP

(36) RTF

(69) SIGMA XI, THE SCIENTIFIC RESEARCH SOCIETY INC

TEMPORARY 48" PIPE

IMPACTS IN SURFACE WATER

LATERAL BASE DITCH SEE DETAIL C

RIP RAP AT EMBANKMENT SEE DETAIL V

2 TONS CL B RIPRAP W/7 SY FIL FAB

5 TONS CL B RIPRAP W/14 SY FIL FAB

SPECIAL CUT BASE DITCH SEE DETAIL I

REMOVE EXISTING BRIDGE

EX. BRIDGE FAILED

CLASS II RIPRAP

2 ELBOWS W/ROD AND LUG

SPECIAL FS SEE DETAIL JJ

FS SEE DETAIL II

15" BCCS 2 ELBOWS

BERM DITCH SEE DETAIL R

CONC. VON

FOR -L- PROFILE SEE SHT. 37

PLANS PREPARED BY :
RUMMEL • KLEPPER & KAHL, LLP
consulting engineers
900 Ridgefield Drive Suite 350
RALEIGH, NORTH CAROLINA 27609-3960
(919) 878-9560

FOR THE NORTH CAROLINA TURNPIKE AUTHORITY

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PROJ. REFERENCE NO.	SHEET NO.
U-4763B	X-58

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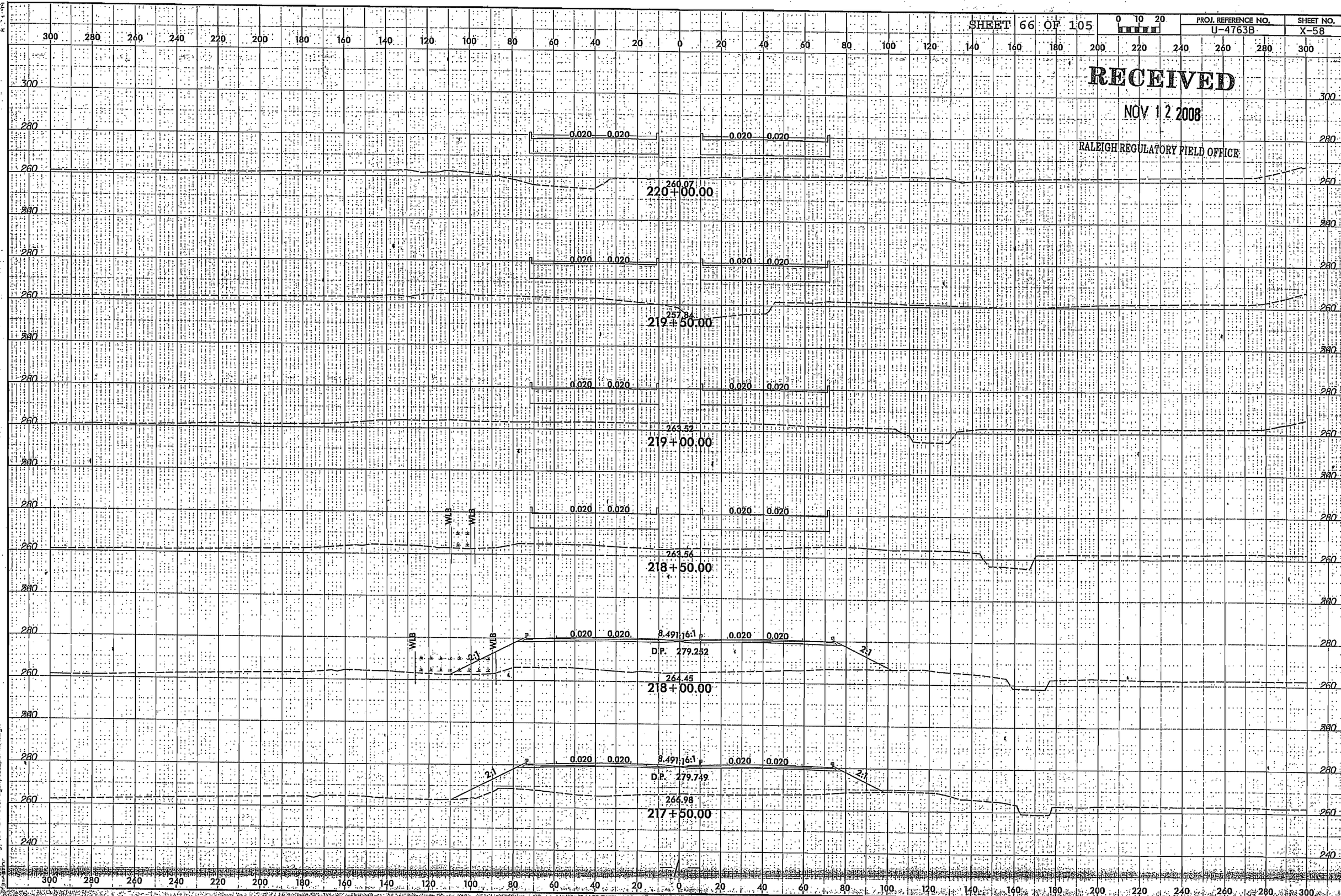

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PROJ. REFERENCE NO.	SHEET NO.
U-4763B	X-59

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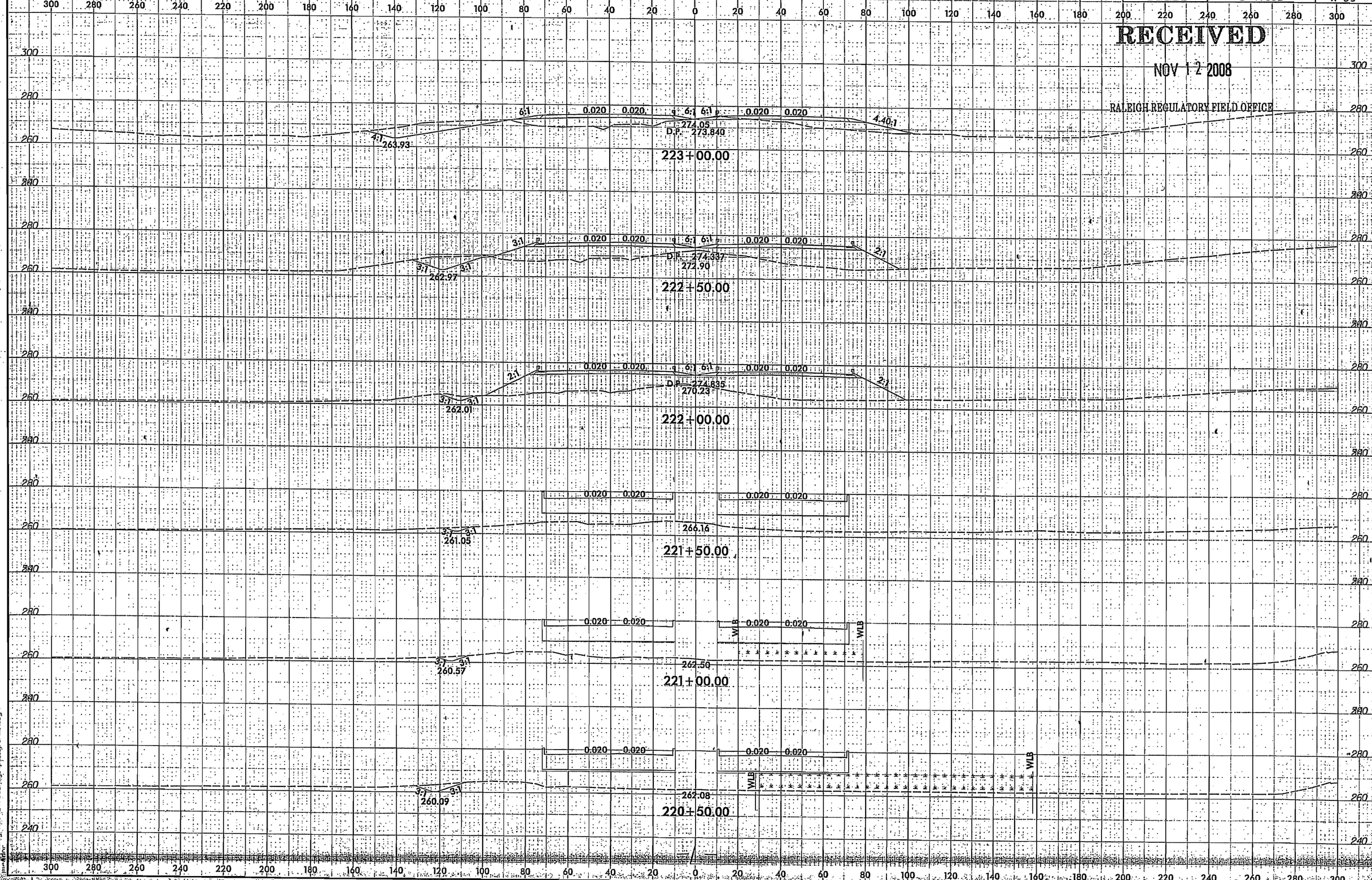

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RECEIVED
NOV 12 2008
RALEIGH REGULATORY FIELD OFFICE

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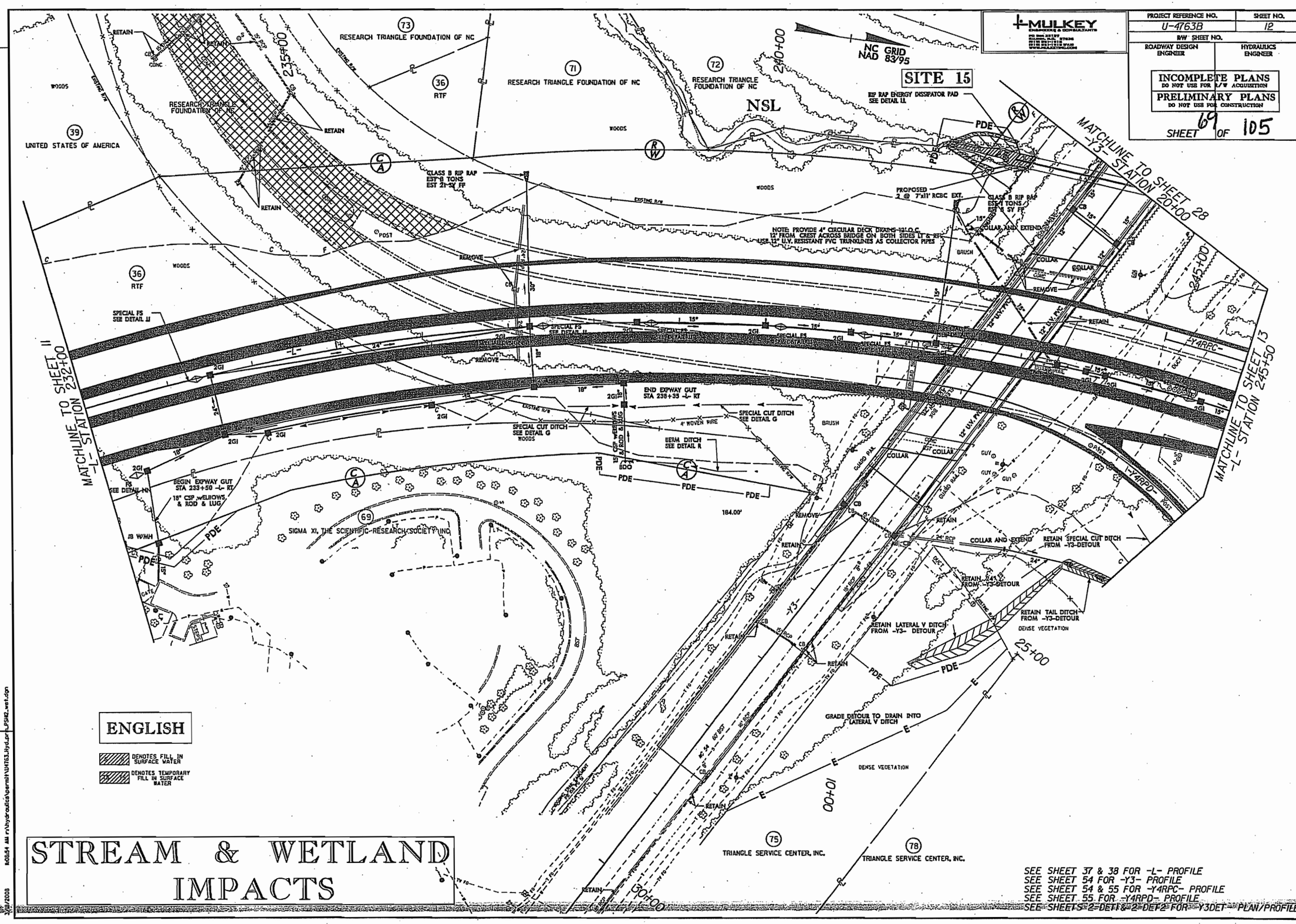
MULKEY
PROJECT REFERENCE NO.
U-4763B
SHEET NO.
12
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION
SHEET 69 OF 105
SITE 15
NC GRID NAD 83/95
NSL
RESEARCH TRIANGLE FOUNDATION OF NC
UNITED STATES OF AMERICA
SIGMA XI, THE SCIENTIFIC RESEARCH SOCIETY INC
TRIANGLE SERVICE CENTER, INC.
MATCHLINE TO SHEET 28 -Y3- STATION 20+00
MATCHLINE TO SHEET 13 -L- STATION 245+50
MATCHLINE TO SHEET 11 -L- STATION 232+00
RIP RAP ENERGY DISSIPATOR PAD SEE DETAIL LL
CLASS B RIP RAP EST 8 TONS EST 21 SY FF
PROPOSED 2 @ 7'x11' RCBC EXT.
NOTE: PROVIDE 4" CIRCULAR DECK DRAINS 12' O.C. 12' FROM CREST ACROSS BRIDGE ON BOTH SIDES LT & RT. USE 12" U.V. RESISTANT PVC TRUNKLINES AS COLLECTOR PIPES
END EXPWAY GUT STA 238+35 -L- RT
SPECIAL CUT DITCH SEE DETAIL G
BERM DITCH SEE DETAIL R
BEGIN EXPWAY GUT STA 233+50 -L- RT
18" CSP WELBOWS & ROD & LUG
COLLAR AND EXTEND
RETAIN SPECIAL CUT DITCH FROM -Y3-DETOUR
RETAIN 24" FROM -Y3-DETOUR
RETAIN TAIL DITCH FROM -Y3-DETOUR
RETAIN LATERAL V DITCH FROM -Y3- DETOUR
GRADE DETOUR TO DRAIN INTO LATERAL V DITCH
DENSE VEGETATION
ENGLISH
DENOTES FILL IN SURFACE WATER
DENOTES TEMPORARY FILL IN SURFACE WATER
STREAM & WETLAND IMPACTS
SEE SHEET 37 & 38 FOR -L- PROFILE
SEE SHEET 54 FOR -Y3- PROFILE
SEE SHEET 54 & 55 FOR -Y4RPC- PROFILE
SEE SHEET 55 FOR -Y4RPD- PROFILE
SEE SHEETS 2-DET1 & 2-DET2 FOR -Y3DET- PLAN/PROFILE
REVISIONS

MULKEY
ENGINEERS & CONSULTANTS
RALEIGH, NORTH CAROLINA 27609
PHONE (919) 851-1417
FAX (919) 851-1419
WWW.MULKEYINC.COM

PROJECT REFERENCE NO.	SHEET NO.
U-4763B	12
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

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

SHEET 70 OF 105

NC GRID NAD 83/95

SITE 15

NSL

MATCHLINE TO SHEET 11 -L- STATION 232+00

MATCHLINE TO SHEET 13 -L- STATION 245+50

MATCHLINE TO SHEET 28 -L- STATION 20+00

RESEARCH TRIANGLE FOUNDATION OF NC

UNITED STATES OF AMERICA

SIGMA XI, THE SCIENTIFIC RESEARCH SOCIETY, INC.

TRIANGLE SERVICE CENTER, INC.

RIP RAP ENERGY DISSIPATOR PAD SEE DETAIL LL

PROPOSED 2 @ 7'x11' RCBC EXT.

CLASS B RIP RAP EST. 8 TONS, EST. 21 SY

NOTE: PROVIDE 4" CIRCULAR DECK DRAINS @ 40'-0" C-C 15' FROM CREST ACROSS BRIDGE ON BOTH SIDES (± 8 EA) USE 12" UV RESISTANT PVC TRUNKLINES AS COLLECTOR PIPES

SPECIAL FS SEE DETAIL JJ

REMOVE

ENG. BORWAY CUT STA 239+33 -L- RT

SPECIAL CUT DITCH SEE DETAIL G

BERM DITCH SEE DETAIL R

BEGIN EXPWAY CUT STA 233+50 -L- RT

18" CSP w/ELBOWS & ROD & LUG

SEE DETAIL NN

JB WALL

CATE

COLLAR

COLLAR AND EXTEND

RETAIN SPECIAL CUT DITCH FROM -Y3- DETOUR

RETAIN -L- FROM -Y3- DETOUR

RETAIN TAIL DITCH FROM -Y3- DETOUR

RETAIN LATERAL V DITCH FROM -Y3- DETOUR

DENSE VEGETATION

GRADE DETOUR TO DRAIN INTO LATERAL V DITCH

ENGLISH

DENOTES FILL IN SURFACE WATER

DENOTES TEMPORARY FILL IN SURFACE WATER

STREAM & WETLAND IMPACTS

SEE SHEET 37 & 38 FOR -L- PROFILE
SEE SHEET 54 FOR -Y3- PROFILE
SEE SHEET 54 & 55 FOR -Y4RPC- PROFILE
SEE SHEET 55 FOR -Y4RPD- PROFILE
SEE SHEETS 2-DET1 & 2-DET2 FOR -Y3DET- PLAN/PROFILE

REVISIONS

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SITE 15 -Y3- STA 20+04

ENGLISH

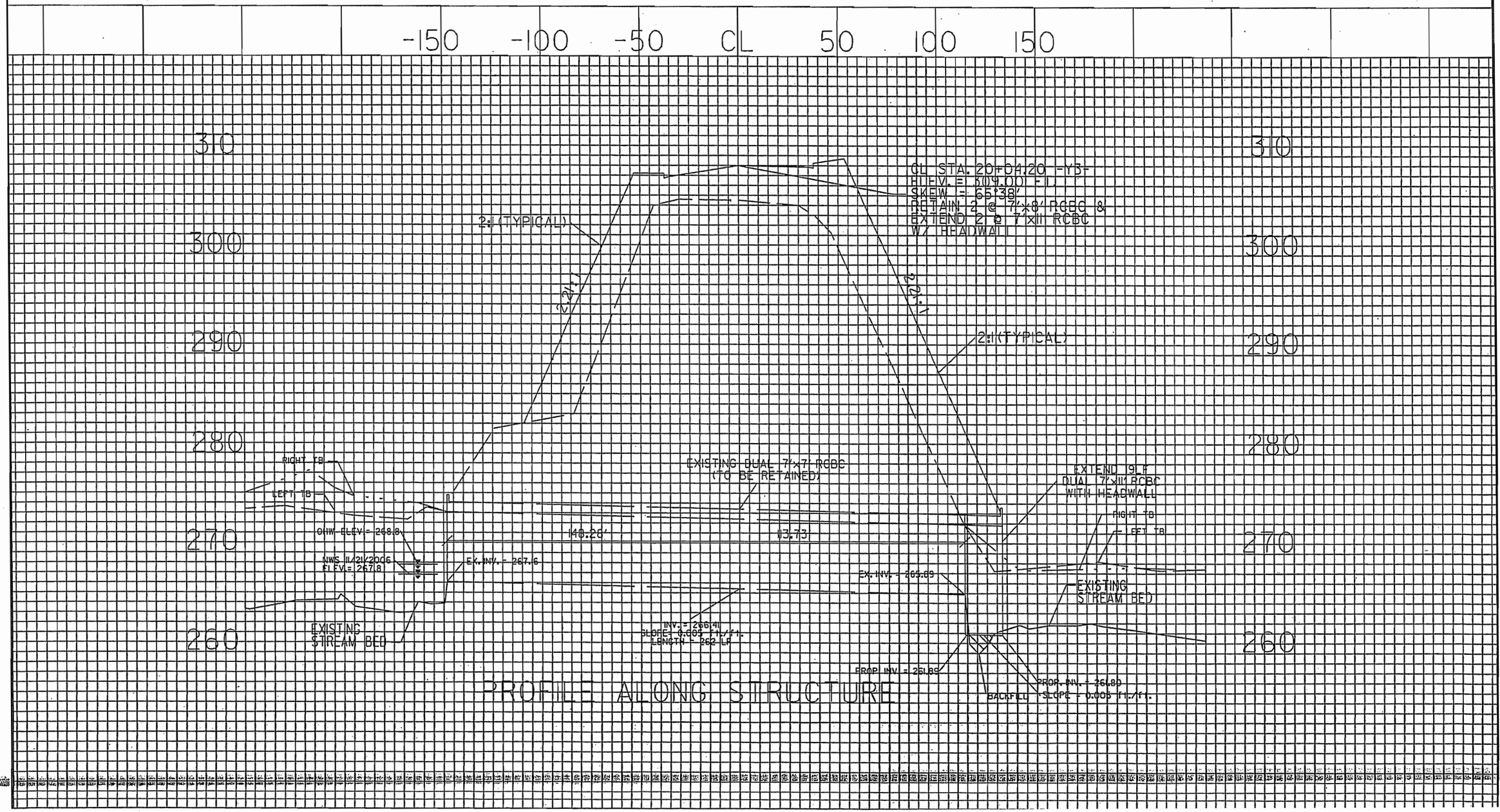
MULKEY ENGINEERS & CONSULTANTS

PROJECT REFERENCE NO.	SHEET NO.
U-4763B	
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

PERMIT DRAWINGS SHEET 71 OF 105



PROFILE ALONG STRUCTURE

STREAM & WETLAND IMPACTS

MULKEY ENGINEERS & CONSULTANTS

PROJECT REFERENCE NO.	SHEET NO.
U-4763B	13
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

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

SHEET 72 OF 105

REVISIONS

ENGLISH

DENOTES FILL IN SURFACE WATER

DENOTES TEMPORARY FILL IN SURFACE WATER

SITE 16

SITE 17

SITE 18

NC GRID NAD 83/95

MATCHLINE TO SHEET 12 -L- STATION 245+50

MATCHLINE TO SHEET 29 -Y4RPC- STATION 20+00

(81) TALECRIS BIOTHERAPEUTICS INC

(78) TRIANGLE SERVICE CENTER, INC.

(75) TRIANGLE SERVICE CENTER, INC.

BEGIN EXP CUT STA: 246+00

END EXP CUT STA: 249+50 -L-

CLASS B RIP RAP EST 2 TONS EST 7 SY FF

CLASS I RIP RAP ON BANKS ONLY EST 40 TONS EST 75 SY FF

CLASS I RIP RAP ON BANKS ONLY EST 26 TONS EST 50 SY FF

CLASS B RIP RAP EST 5 TONS EST 14 SY FF

RIP-RAP ENERGY DISSIPATER PAD SEE DETAIL U

CHANNEL IMPROVEMENT SEE DETAIL HH

LATERAL BASE DITCH SEE DETAIL G

SPECIAL CUT BASE DITCH SEE DETAIL J

SPECIAL CUT DITCH SEE DETAIL I

TOE PROTECTION SEE DETAIL Q

RETAIN HEAD DITCH FROM -Y3- DETOUR

COLLAR AND EXTEND

RETAIN AND EXTEND

PROPOSED 2 @ 8'x5' RCBC

15" CSP wELBOWS & ROD & LUG

24" CSP wELBOWS & ROD & LUG

18" CSP wELBOWS & ROD & LUG

REMOVE

REMOVE HW

RETAIN

RETAIN DI

SEE SHEET 38 FOR -L- PROFILE
SEE SHEET 54 & 55 FOR -Y4RPC- PROFILE
SEE SHEET 55 FOR -Y4RPD- PROFILE

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STREAM & WETLAND IMPACTS

MULKEY
ENGINEERS & CONSULTANTS

PROJECT REFERENCE NO.	SHEET NO.
U-4763B	13
R/W SHEET NO.	

ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

SHEET 73 OF 105

REVISIONS

SITE 16

SITE 17

SITE 18

TALECRIS BIOTHERAPEUTICS INC

NC GRID NAD 83/95

MATCHLINE TO SHEET 12 -L- STATION 245+50

MATCHLINE TO SHEET 29 -Y4RPC- STATION 20+00

NSLA

NSLE

ENGLISH

DENOTES FILL IN SURFACE WATER

DENOTES TEMPORARY FILL IN SURFACE WATER

CHANNEL IMPROVEMENT SEE DETAIL HH

LATERAL BASE DITCH SEE DETAIL D

SPECIAL CUT BASE DITCH SEE DETAIL J

TOE PROTECTION SEE DETAIL Q

BEGIN SBG STA: 13+60 -Y4RPC-

END SBG STA: 16+00 -Y4RPC-

PROPOSED 2 @ 9'x6' RCBC

RIP RAP ENERGY DISSIPATER PAD SEE DETAIL U

CLASS B RIP RAP EST 5 TONS EST 14 SY FF

24" CSP w/ELBOWS & ROD & LUG

15" CSP w/ELBOWS & ROD & LUG

CLASS I RIP RAP ON BANKS ONLY EST 40 TONS EST 75 SY FF

BEGIN EXP CUT STA: 238+00 -L-

END EXP CUT STA: 249+50 -L-

CLASS B RIP RAP EST 7 TONS EST 7 SY FF

CLASS I RIP RAP ON BANKS ONLY EST 26 TONS EST 50 SY FF

CLASS B RIP RAP EST 6 TONS EST 14 SY FF

CLASS B RIP RAP EST 2 TONS EST 7 SY FF

RETAIN HEAD DITCH FROM -F3- DETOUR

SPECIAL CUT DITCH SEE DETAIL I

DENSE VEGETATION

COLLAR AND EXTEND

RETAIN DT

TRIANGLE SERVICE CENTER, INC.

OVERHEAD SIGN

SEE SHEET 38 FOR -L- PROFILE
SEE SHEET 54 & 55 FOR -Y4RPC- PROFILE
SEE SHEET 55 FOR -Y4RPD- PROFILE

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SITE 16 –L– STA 246+56

ENGLISH

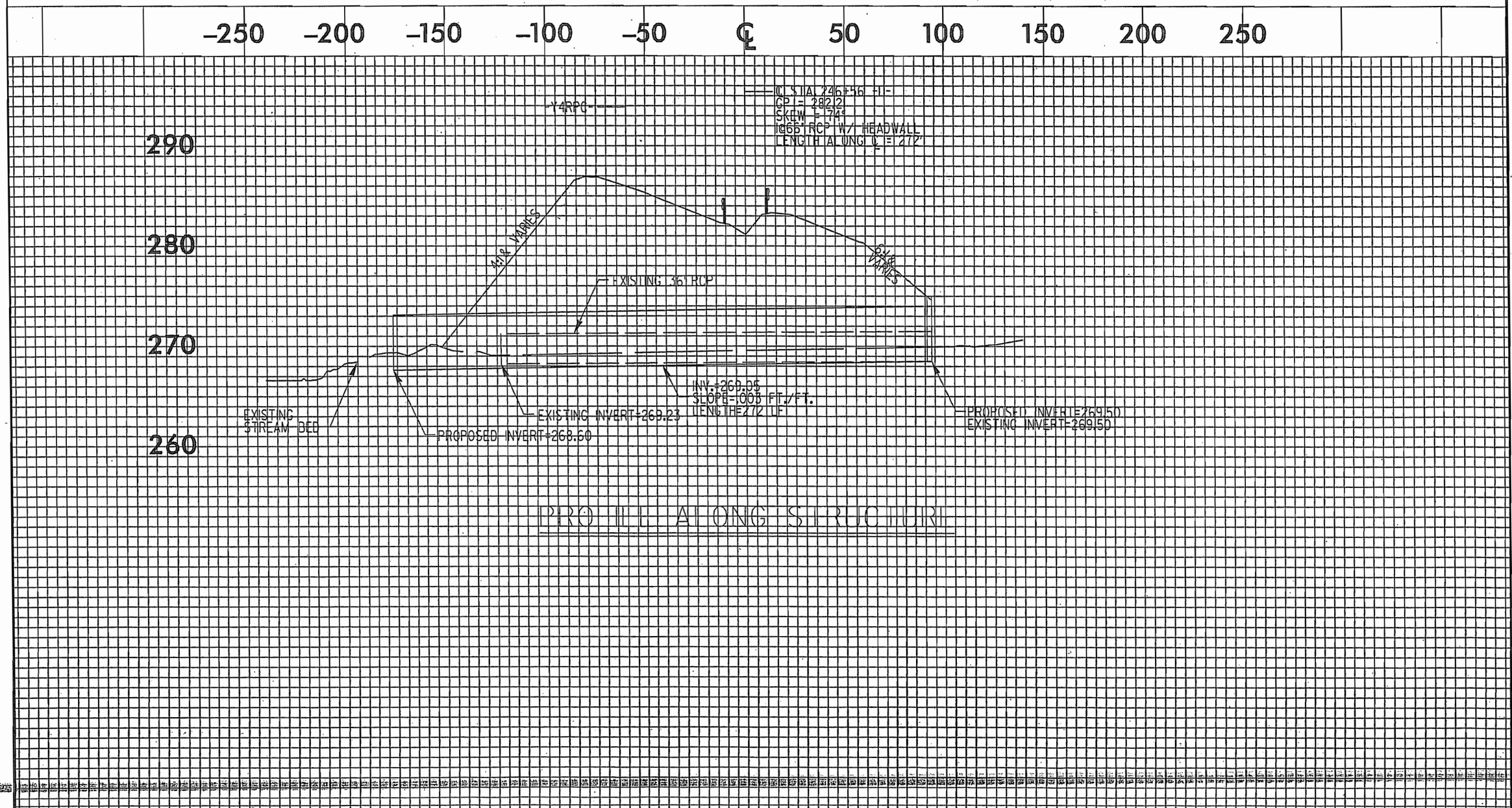
MULKEY
ENGINEERS & CONSULTANTS

PROJECT REFERENCE NO.	SHEET NO.
U-4763B	
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

PERMIT DRAWINGS SHEET 74 OF 105



PROFILE ALONG STRUCTURE

SITE 17 -Y4RPC- STA 15+26

ENGLISH

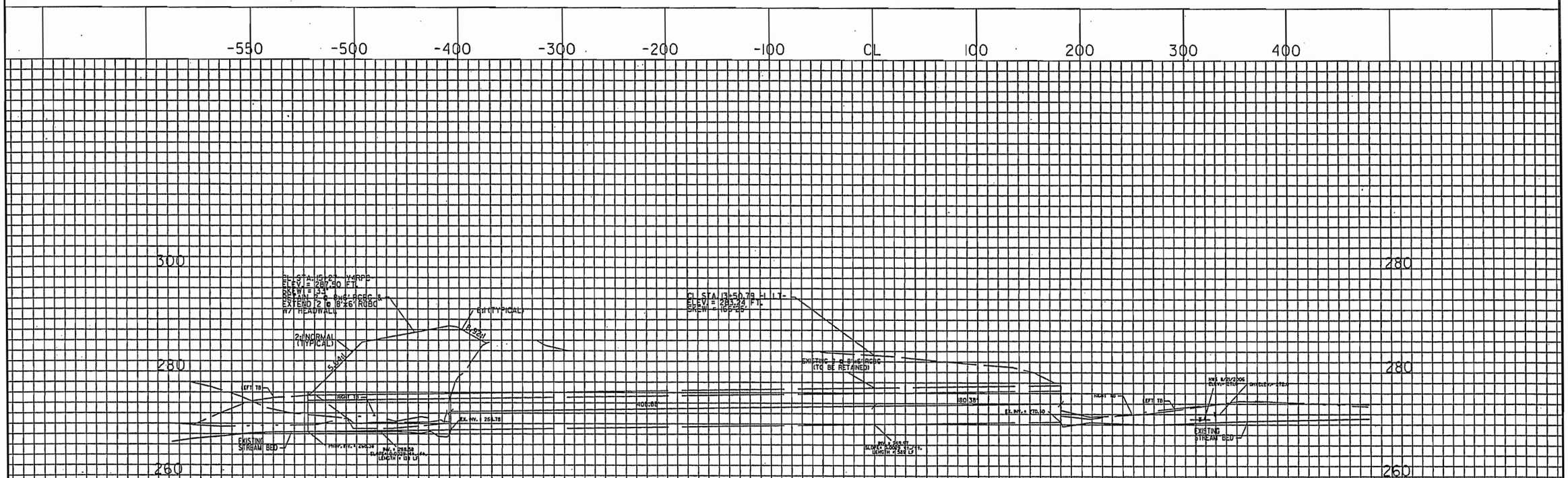
MULKEY ENGINEERS & CONSULTANTS

PROJECT REFERENCE NO.	SHEET NO.
U-4763B	
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

PERMIT DRAWINGS SHEET 75 OF 105



PROFILE ALONG STRUCTURE

STREAM & WETLAND IMPACTS

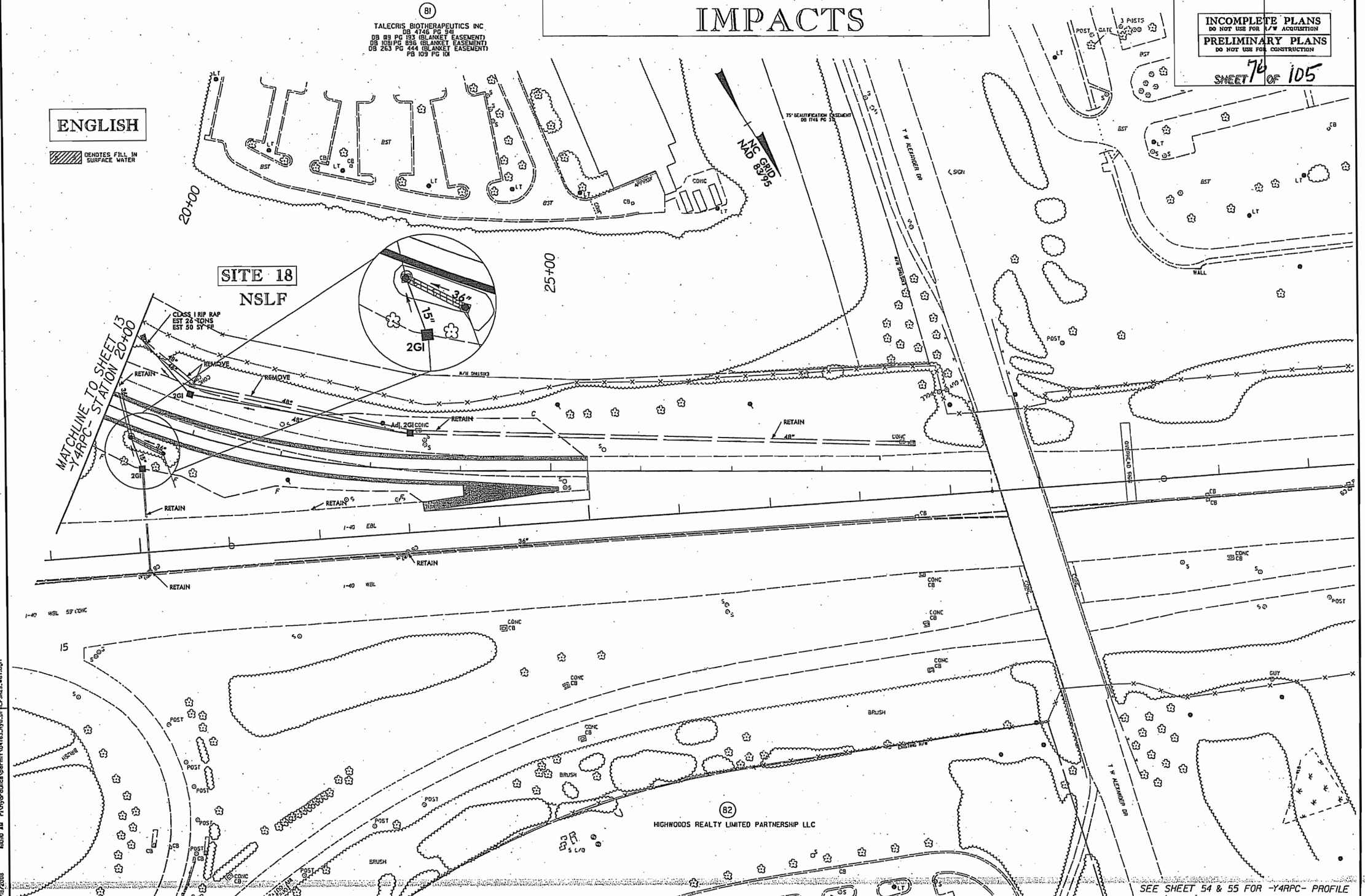
MULKEY ENGINEERS & CONSULTANTS

PROJECT REFERENCE NO.	SHEET NO.
U-4763B	29
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

SHEET 76 OF 105



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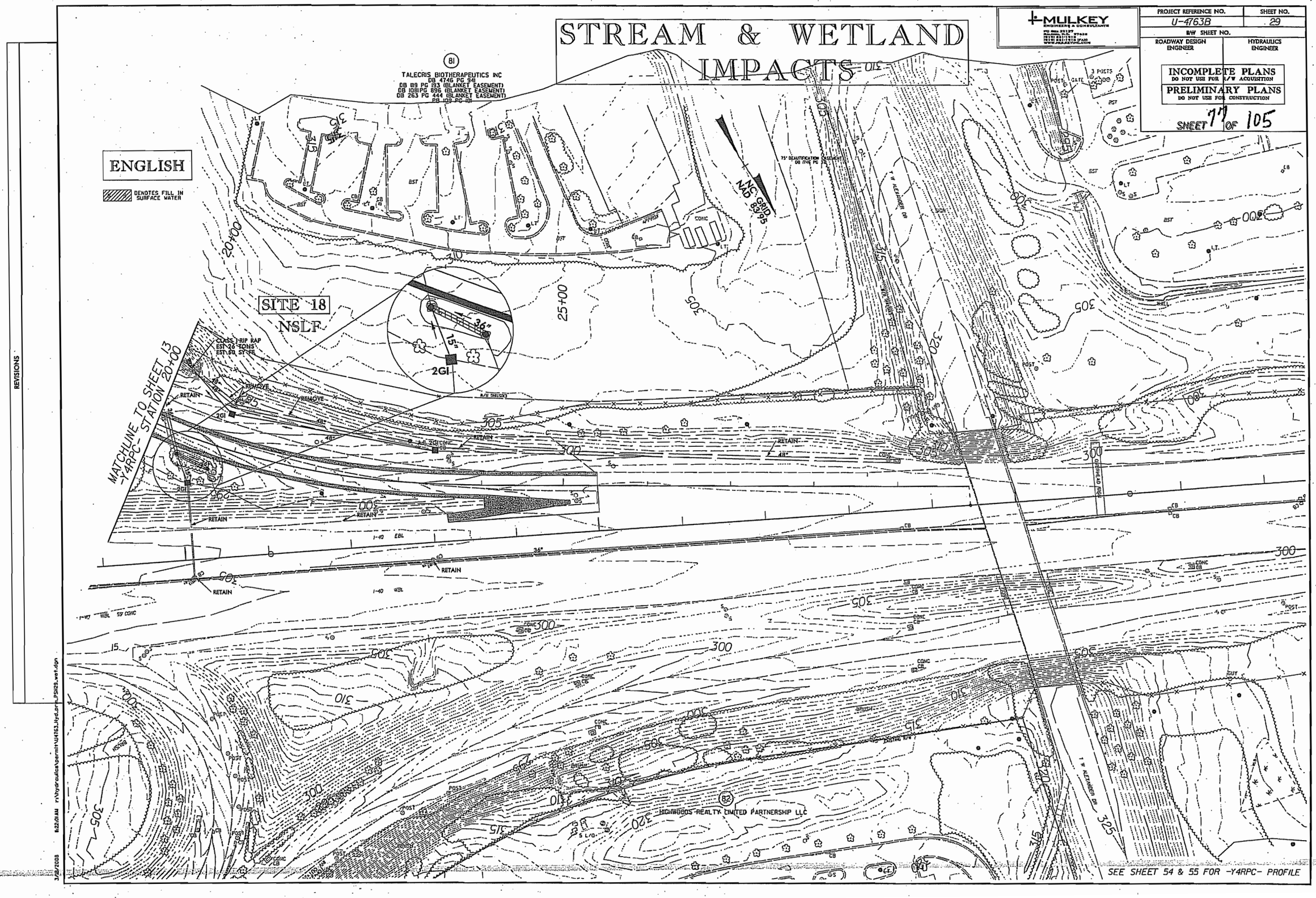

STREAM & WETLAND IMPACTS
MULKEY ENGINEERS & CONSULTANTS
PROJECT REFERENCE NO.
U-4763B
SHEET NO.
29
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION
SHEET 77 OF 105
ENGLISH
DENOTES FILL IN SURFACE WATER
TALECRIS BIOTHERAPEUTICS INC
DB 4746 PG 941
DB 1119 PG 193 (BLANKET EASEMENT)
DB 1081 PG 896 (BLANKET EASEMENT)
DB 263 PG 444 (BLANKET EASEMENT)
NC GRID NAD 83/95
SITE 18
NSLF
CLASS I RIP RAP
EST 26 TONS
EST 50 SY FE
MATCHLINE TO SHEET 13 -Y4RPC- STATION 20+00
2GI
36"
15"
RETAIN
REMOVE
I-40 EBL
I-40 WBL
HIGHWOODS REALTY LIMITED PARTNERSHIP LLC
SEE SHEET 54 & 55 FOR -Y4RPC- PROFILE
REVISIONS

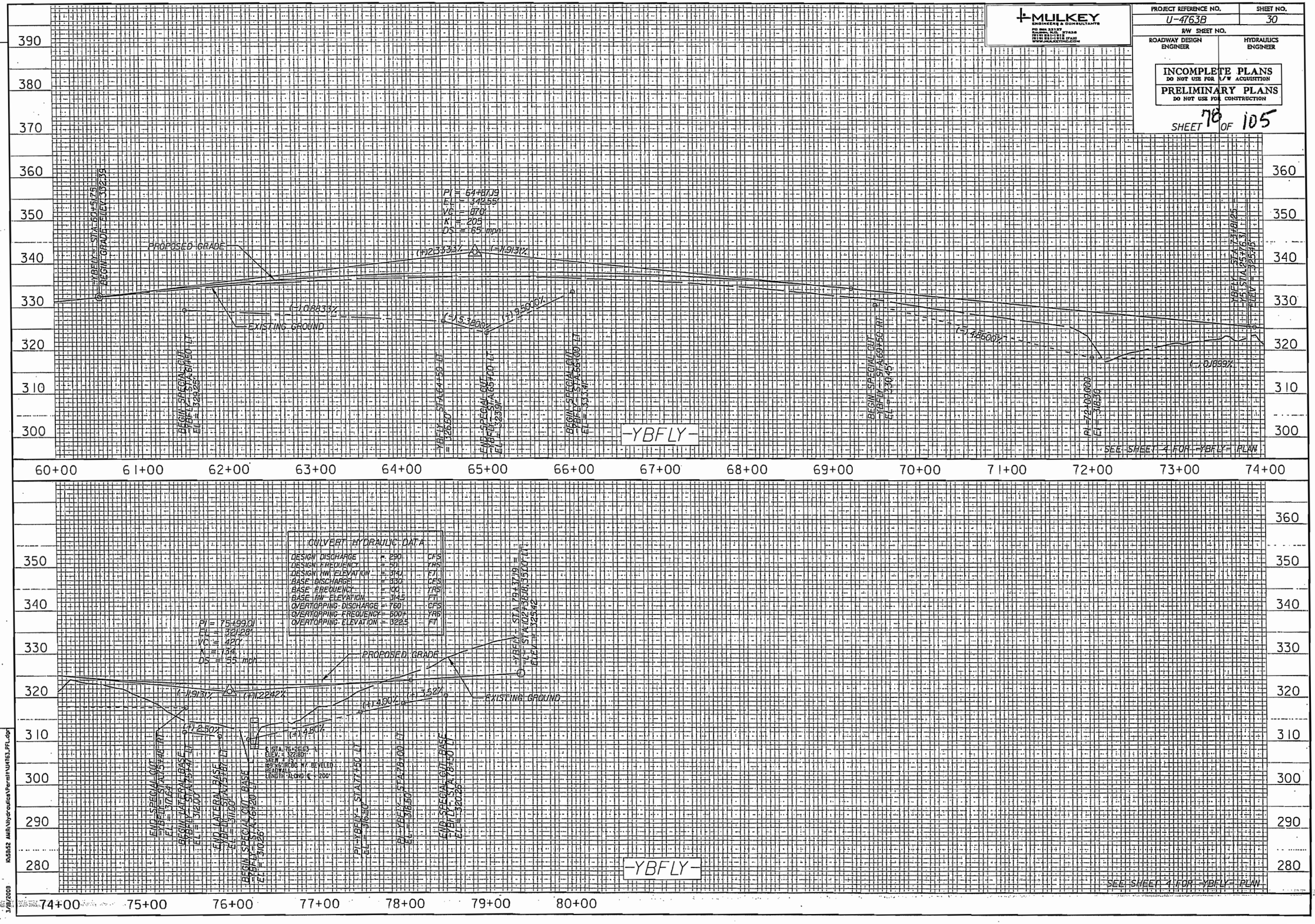
MULKEY ENGINEERS & CONSULTANTS

PROJECT REFERENCE NO.	SHEET NO.
U-4763B	30
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

SHEET 78 OF 105



REVISIONS

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3/18/2008

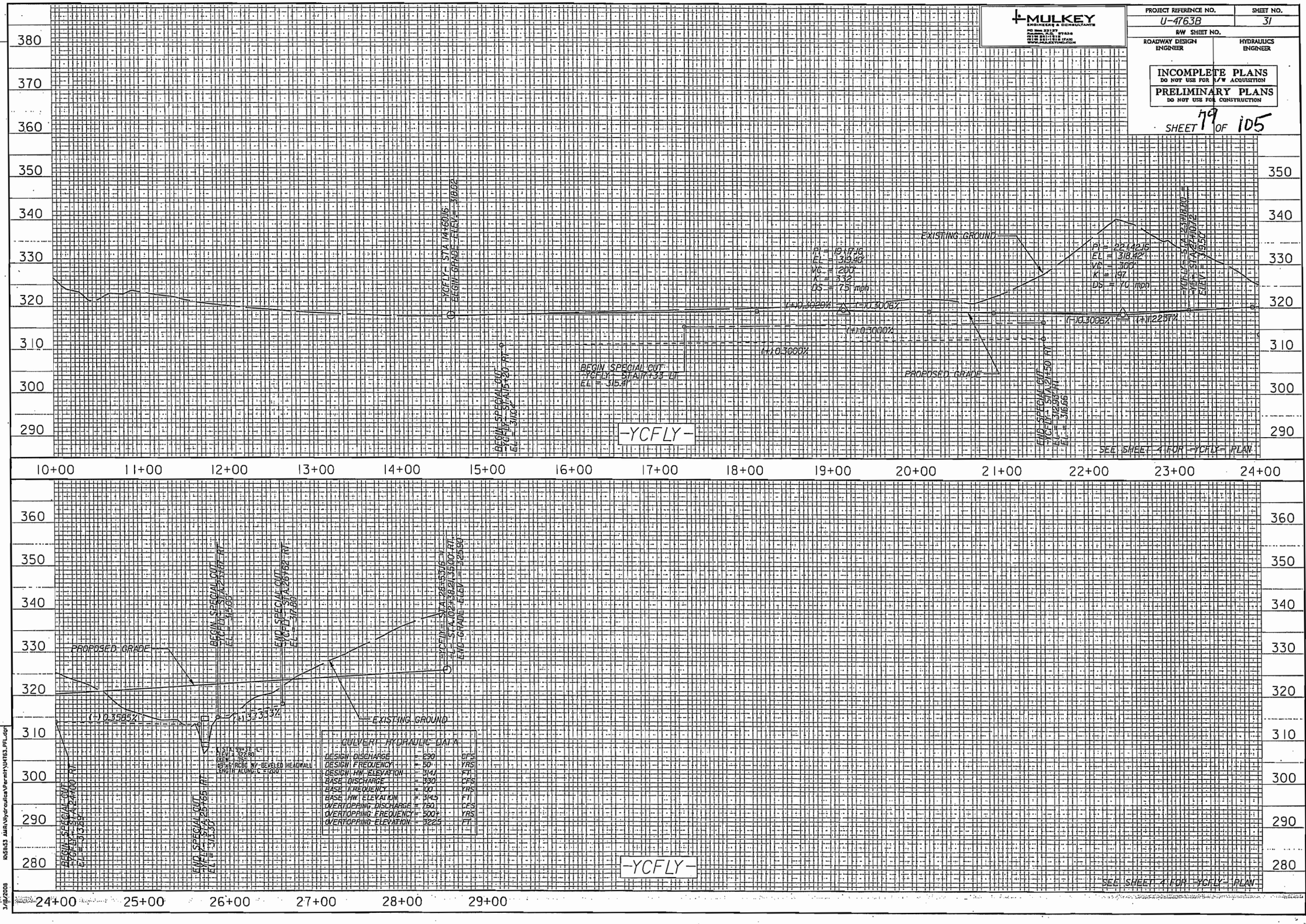
MULKEY ENGINEERS & CONSULTANTS

PROJECT REFERENCE NO.	SHEET NO.
U-4763B	31
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

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

SHEET 79 OF 105

REVISIONS



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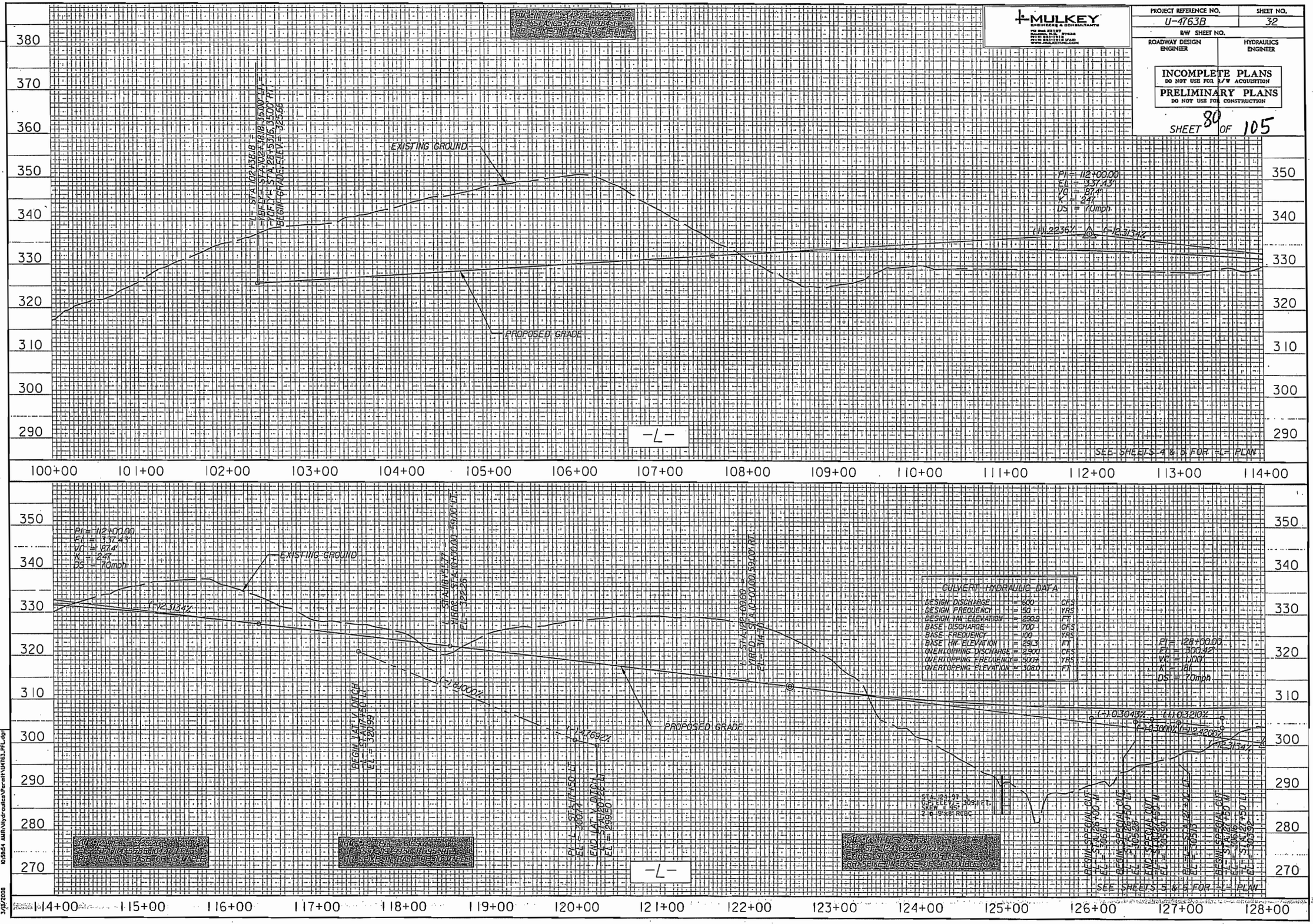
3/18/2008



REVISIONS

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3/18/2008

MULKEY
ENGINEERS & CONSULTANTS
PO BOX 52157
RALEIGH, N.C. 27612
PH 919.851.1112
FAX 919.851.1119
WWW.MULKEY.COM

PROJECT REFERENCE NO.	SHEET NO.
U-4763B	33
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

SHEET 81 OF 105

REVISIONS

380
370
360
350
340
330
320
310
300
290

PBL=5-ES=324.00
ES-SEL=0.40 @ 2.0% RT
SEL=320.76
TIRPD-SPAIG164 @ 6.9% RT
PRS-SPIKE IN BASE OF 30" PINE

PBL=5-ES=322.22
ES-SEL=0.40 @ 2.0% RT
SEL=320.62
TIRPD-SPAIG164 @ 6.9% RT
PRS-SPIKE IN BASE OF 8" DAP OAK

PROPOSED GRADE

EXISTING GROUND

PI STA 128+00.00
EL = 300.42'
VC = 1100'
K = 181
DS = 70mph

(P) 37620X

"L" STA 130+72.22
VC = STA 132+22.22
EL = 339.70

(P) 37620X

(P) 37500Z

BEGIN LAT. DITCH
STA 140+00 RT
EL = 308.50

PIPE HYDRAULIC DATA
DRAINAGE STRUCTURE STA 135+92

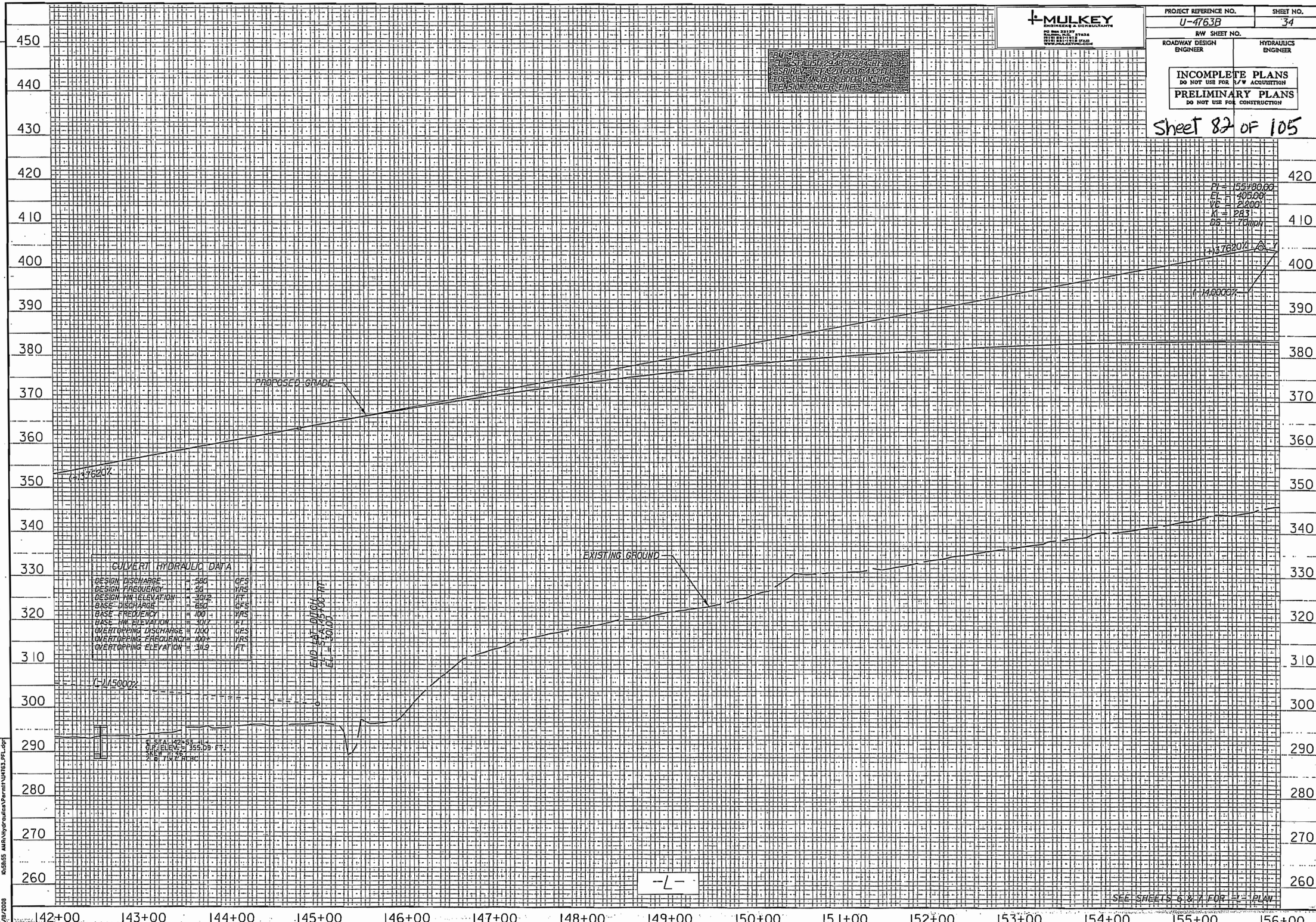
DRAINAGE AREA	= 1.2	AC
DESIGN FREQUENCY	= 50	YRS
DESIGN DISCHARGE	= 191	CFS
DESIGN HW ELEVATION	= 306.3	FT
100 YEAR DISCHARGE	= 191	CFS
100 YEAR HW ELEVATION	= 306.4	FT
OVERTOPPING FREQUENCY	= 100	YRS
OVERTOPPING DISCHARGE	= 50	CFS
OVERTOPPING ELEVATION	= 308.5	FT

-L-

30" RCP CLASS IV
INV.= 296.92

SEE SHEET 6 FOR -L- PLAN

128+00 129+00 130+00 131+00 132+00 133+00 134+00 135+00 136+00 137+00 138+00 139+00 140+00 141+00 142+00



MULKEY
ENGINEERS & CONSULTANTS
PROJECT REFERENCE NO.
U-4763B
SHEET NO.
34
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION
Sheet 82 of 105
REVISIONS
PI = 155+80.00
EL = 405.00'
VC = 2200'
K = 283
DS = 70mph
(+)3.7620%
(-)4.0000%
PROPOSED GRADE
EXISTING GROUND
CULVERT HYDRAULIC DATA
DESIGN DISCHARGE = 580 CFS
DESIGN FREQUENCY = 50 YRS
DESIGN HW ELEVATION = 301.2 FT
BASE DISCHARGE = 650 CFS
BASE FREQUENCY = 100 YRS
BASE HW ELEVATION = 301.7 FT
OVERTOPPING DISCHARGE = 1100 CFS
OVERTOPPING FREQUENCY = 100+ YRS
OVERTOPPING ELEVATION = 311.9 FT
END LAT DITCH
EL = 301.00
(-)1.5000%
SEE SHEETS 6 & 7 FOR -L- PLAN
-L-
450
440
430
420
410
400
390
380
370
360
350
340
330
320
310
300
290
280
270
260
142+00
143+00
144+00
145+00
146+00
147+00
148+00
149+00
150+00
151+00
152+00
153+00
154+00
155+00
156+00

MULKEY
ENGINEERS & CONSULTANTS
PO Box 33127
Raleigh, NC 27636
(919) 851-1112
(919) 851-1119 (FAX)
www.mulkey-inc.com

PROJECT REFERENCE NO.	SHEET NO.
U-4763B	35
R/W SHEET NO.	

ROADWAY DESIGN ENGINEER | HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

SHEET 83 OF 105

REVISIONS

10/5/05 N:\Hydraulics\Permit\U4763_PFL.dgn
3/8/2006

PI = 155+80.00
EL = 1405.00'
VC = 2200'
K = 283
DS = 70mph

-4.0000%

BM #125 EL = 1383.68
STA 156+04 24.5' RT
BM #126 EL = 1404.63
STA 160+40 30' RT
PK SPIKE IN BASE OF 12" BEECH

EL = STA 160+56.74 =
V/2 = 57.74 27.13/2
EL = 379.41

PROPOSED GRADE

BEGIN LAT V DITCH
EL = STA 160+50
EL = 353.20 RT
EL = 350.51 LT

L=109.180'

L=57.600'

L=128.133'

EXISTING GROUND

END LAT V DITCH
EL = STA 166+50 RT
EL = 325.00

END LAT V DITCH
BEGIN LAT BASE DITCH
EL = STA 166+50 LT
EL = 345.72

END LAT BASE DITCH
EL = STA 169+50 LT
EL = 387.28

SEE SHEET 7 FOR -L- PLAN

156+00 157+00 158+00 159+00 160+00 161+00 162+00 163+00 164+00 165+00 166+00 167+00 168+00 169+00 170+00

410 400 390 380 370 360 350 340 330 320

BM #127 EL = 1373.18
STA 173+66.24 20.0' LT
BM #128 EL = 1404.63
STA 170+40 30' RT
PK SPIKE IN BASE OF 12" BEECH

BM #129 EL = 1383.68
STA 168+04 24.5' RT
BM #130 EL = 1404.63
STA 164+66 30' RT
PK SPIKE IN BASE OF 12" BEECH

PROPOSED GRADE

PI = 176+61.25
EL = 321.75
VC = 548'
K = 182
DS = 70mph

PIPE HYDRAULIC DATA
DRAINAGE STRUCTURE Sta.178+41

DRAINAGE AREA	= 29	AC
DESIGN FREQUENCY	= 50	YRS
DESIGN DISCHARGE	= 90	CFS
DESIGN HW ELEVATION	= 3089	FT
100 YEAR DISCHARGE	= 95	CFS
100 YEAR HW ELEVATION	= 3091	FT
OVERTOPPING FREQUENCY	= 500+	YRS
OVERTOPPING DISCHARGE	= 25	CFS
OVERTOPPING ELEVATION	= 2842	FT

L=0.3000%

L=1.4100000%

L=0.0994%

L=1.3900%

L=1.4030%

L=0.3400%

L=1.0300%

L=1.3400%

L=1.4850%

L=1.3050%

L=1.2000%

EXISTING GROUND

BEGIN LAT BASE DITCH
EL = STA 170+50 RT
EL = 319.00

BEGIN LAT BASE DITCH
EL = STA 172+50 LT
EL = 322.70
EL = 318.40

BEGIN LAT V DITCH
EL = STA 176+00 RT
EL = 304.25

PI = 176+56.06
EL = 304.58

48" RCP
INV = 302.72

END LAT BASE DITCH
EL = STA 178+50 RT
EL = 304.13

BEGIN LATERAL LAT V
EL = STA 178+50 RT
EL = 313.26

END LAT BASE DITCH
BEGIN LAT BASE DITCH
EL = STA 179+00 LT
EL = 300.80

END LATERAL LAT V
BEGIN LAT BASE DITCH
EL = STA 182+00 RT
EL = 302.38

END LAT BASE DITCH
EL = STA 182+50 LT
EL = 302.38

YARPA EL = 3134
L = STA 180+05.00
STA 180+40.00 5.00 RT

PI = L STA 183+00 RT
EL = 300.13

PI = L STA 181+00 LT
EL = 293.79

SEE SHEETS 7 & 8 FOR -L- PLAN

170+00 171+00 172+00 173+00 174+00 175+00 176+00 177+00 178+00 179+00 180+00 181+00 182+00 183+00 184+00

360 350 340 330 320 310 300 290 280

PROJECT REFERENCE NO.	SHEET NO.
U-4763B	36
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

SHEET 84 OF 105

-L-

RECEIVED
NOV 12 2008
RALEIGH REGULATORY FIELD OFFICE

BM #23 EL = 284.33'
-L- STA.189+96.29 116.02 RT.
RR SPIKE IN BASE OF 8" SWEET GUM

PI = 188+50.00
EL = 309.93'
VC = 300'
K = 506
DS = > 80mph

BM #24 EL = 329.12'
-L- STA.196+43.68 32278 LT.
RR SPIKE IN BASE OF 15" PINE

PROPOSED GRADE
EXISTING GROUND

(-)0.4018%
(-)0.9944%
(-)0.8767%
(-)0.5013%
(-)3.1000%
(-)4.7200%
(+)2.3555%
(-)0.5000%
(-)3.9333 %
(-)1.9667 %

PI -L- STA 184+50 LT
EL = 289.59

END LAT. V DITCH
BEGIN BASE DITCH
-L- STA.186+00 RT
EL = 297.50

PI -L- STA.188+00 RT
EL = 291.30

END BASE DITCH
BEGIN LAT DITCH
-L- STA.188+43 LT
EL = 287.62

PI -L- STA.190+50 RT
EL = 279.50

END LAT DITCH
-L- STA.191+50 RT
EL = 279.00

END LAT DITCH
-L- STA.194+00 LT
EL = 300.74

BEGIN CONC SWALE
-L- STA.195+50 LT
EL = 311.40

PI -L- STA.197+00 LT
EL = 305.50

BM #25 EL = 270.22'
-L- STA.202+76.15 206.57 RT.
RR SPIKE IN BASE OF 13" OAK

BM #26 EL = 268.03'
-L- STA.208+44.04 197.29 RT.
RR SPIKE IN BASE OF 16" SWEET GUM

(-)1.9667 %
(-)0.9000 %
(-)1.0000 %
(-)1.9600 %
(-)1.4667 %
(+)1.0000%
(-)5.7000%
(-)0.9944%
(-)1.1556 %
(-)2.3868%

PI -L- STA 198+50 LT
EL = 302.55

PI -L- STA 200+00 LT
EL = 301.20

PI -L- STA 200+50 LT
EL = 300.70

END CONC SWALE
-L- STA.201+00 LT
EL = 299.72

BEGIN SPEC CUT DITCH
-L- STA.202+00 LT
EL = 293.50

BEGIN DITCH
-L- STA.201+69 RT
EL = 268.90

END DITCH
-L- STA.202+88 RT
EL = 266.60

PI -L- STA.203+50 LT
EL = 291.30

PI -L- STA.204+50 LT
EL = 292.50

PI -L- STA.205+50 LT
EL = 286.60

END SPEC CUT DITCH
-L- STA.207+75 LT
EL = 284.00

ALONG ℄ DITCH

FOR -L- PLAN SEE SHTS.8 THRU 10

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PROJECT REFERENCE NO.	SHEET NO.
U-4763B	37
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

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

SHEET 85 OF 105

-L-

BRIDGE HYDRAULIC DATA

DRAINAGE STRUCTURE Sta.219+86

DRAINAGE AREA	= 2.9	SQ.MI.
DESIGN FREQUENCY	= 50	YRS
DESIGN DISCHARGE	= 2650	CFS
DESIGN ELEVATION	= 266.7	FT
100 YEAR DISCHARGE	= 2960	CFS
100 YEAR ELEVATION	= 267.2	FT
OVERTOPPING FREQUENCY	= 500+	YRS
OVERTOPPING DISCHARGE	= 17000	CFS
OVERTOPPING ELEVATION	= 274.4	FT

BM #27 EL = 260.74'
-L- STA.219+90.34 90.66 LT.
SE BRIDGE BOLT, EAST SIDE RAIL

BM #28 EL = 281.47'
-L- STA.225+88.24 227.96 RT.
RR SPIKE IN BASE OF 16" PINE

(-) 4.68% (-) 0.30% (-)0.9944% (+) 0.9583% (+)1.9200% (+) 1.0271% (+) 5.7848%

PROPOSED GRADE

EXISTING GROUND

BEGIN SPECIAL CUT
-L- STA.212+00 LT
EL = 282.84'

PI -L- STA.212+50 LT
EL = 280.56

END SPECIAL CUT
-L- STA.213+00 LT
EL = 280.65

BEGIN LT. BASE DITCH
-L- STA.220+36 LT
EL = 259.90

PI -L- STA.221+50 LT
EL = 261.05

END LT. BASE DITCH
BEGIN SPECIAL CUT
-L- STA.223+00 LT
EL = 269.33'

PI -L- STA.225+21 LT
EL = 266.28

212+00 213+00 214+00 215+00 216+00 217+00 218+00 219+00 220+00 221+00 222+00 223+00 224+00 225+00 226+00

320 310 300 290 280 270 260 250 240 230

EXISTING GROUND

PROPOSED GRADE

PI = 227+50.00
EL = 271.15'
VC = 600'
K = 199
DS = 73mph

(-)0.9944% (+)2.0225%

END SPECIAL CUT DITCH
-L- STA.226+00 LT
EL = 270.11'

PI = 233+45.00
EL = 283.18'
VC = 450'
K = 277
DS = 72mph

(+)2.0225% (+)0.4000%

PI = 240+10.00
EL = 285.84'
VC = 360'
K = 514
DS = > 80mph

(+)0.4000%

BEGIN SPECIAL CUT
-L- STA.237+65 RT
EL = 278.00'

(-) 2.6324%

END SPECIAL CUT
-L- STA.236+33 RT
EL = 278.91'

(+) 0.5023%

FOR -L- PLAN SEE SHTS.10 THRU 12

226+00 227+00 228+00 229+00 230+00 231+00 232+00 233+00 234+00 235+00 236+00 237+00 238+00 239+00 240+00

320 310 300 290 280 270 260 250 240 230

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MULKEY
ENGINEERS & CONSULTANTS
PO BOX 50177
RALEIGH, NC 27650
(919) 851-1912
(919) 851-1918 (FAX)
WWW.MULKEYINC.COM

PROJECT REFERENCE NO.	SHEET NO.
U-4763B	38
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

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

Sheet 86 OF 105

REVISIONS

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3/9/2009

370 360 350 340 330 320 310 300 290 280 270 260 250 240 230 220 210 200 190

PROPOSED GRADE

℄ STA 241+35.41 =
YARD1 STA 10+00.00, 47.00' RT.
EL = 285.79

℄ STA 242+19.15
YD3 STA 22+51.87
EL = 285.38

PI = 244+00.00
EL = 283.00'
VC = 120'
K = 47.2
DS = 70mph

℄ STA 244+36.83 =
YARD2 STA 10+00.00, 47.00' LT.
EL = 283.31

(+)0.4711%

(-)0.5004%

PI = 248+50.00
EL = 285.42'
VC = 238'
K = 249
DS = 70mph

(+)0.4711%

(-)0.4900%

℄ STA 250+12.00
ENDGRAD ELEV = 284.14

(+)0.5023%

BEGIN SPECIAL CUT
℄ STA 240+50 RT
EL = 277.30'

℄ STA 242+19.91 =
YARD1 STA 22+45.18'
EL = 285.38

(-)0.5004%

PIPE HYDRAULIC DATA

DRAINAGE STRUCTURE	STM246250	
DRAINAGE AREA	= 10.1	AC
DESIGN FREQUENCY	= 50	YRS
DESIGN DISCHARGE	= 140	CFS
DESIGN HW ELEVATION	= 274.15	FT
100 YEAR DISCHARGE	= 150	CFS
100 YEAR HW ELEVATION	= 274.18	FT
OVERTOPPING FREQUENCY	= 500+	YRS
OVERTOPPING DISCHARGE	= 215	CFS
OVERTOPPING ELEVATION	= 284.2	FT

60" RCP
INV.=269.19

EXISTING GROUND

-L-

SEE SHEETS 12 & 13 FOR -L- PLAN

240+00 241+00 242+00 243+00 244+00 245+00 246+00 247+00 248+00 249+00 250+00 251+00 252+00 253+00 254+00

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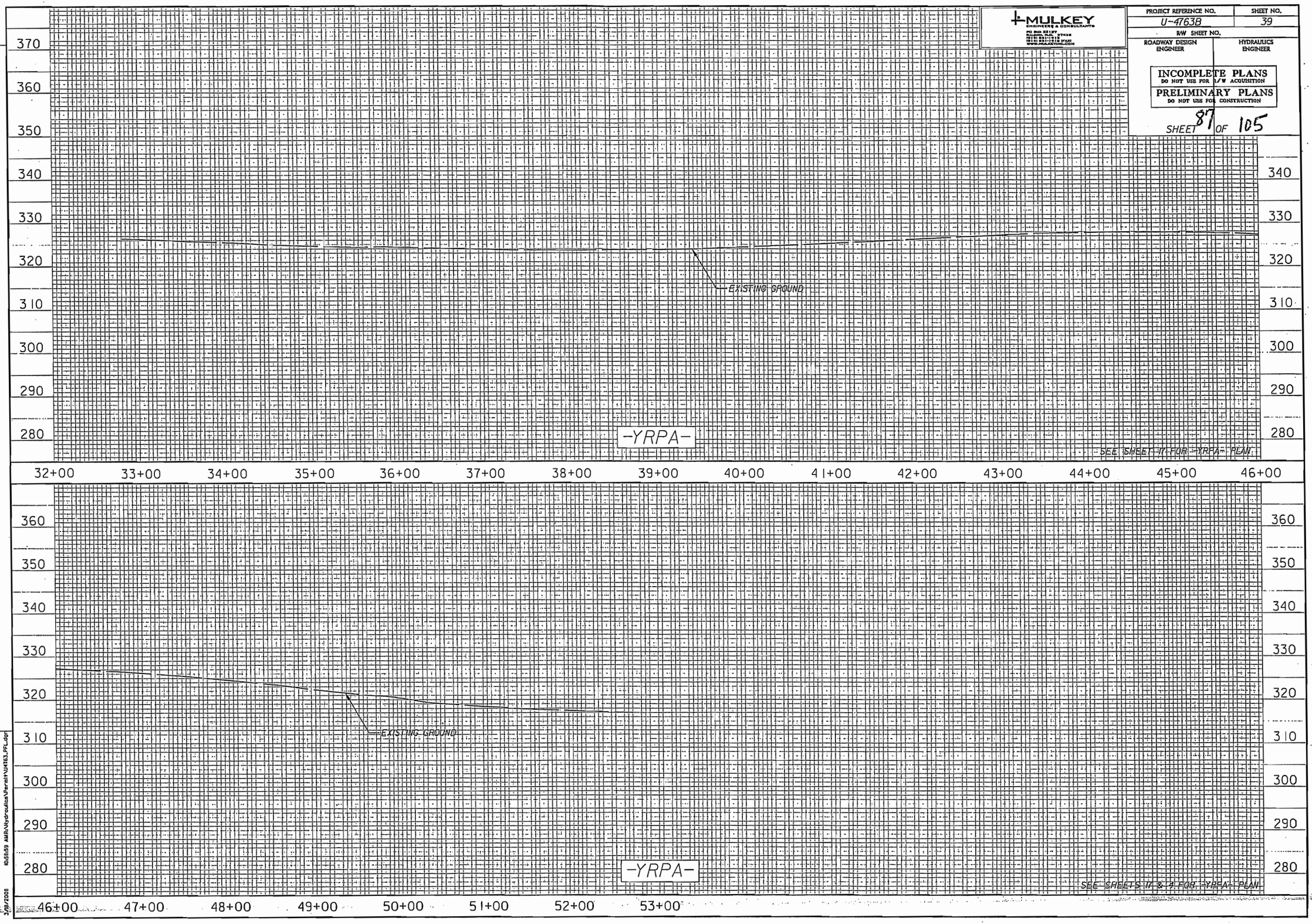
PROJECT REFERENCE NO.	SHEET NO.
U-4763B	39
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

SHEET 87 OF 105

REVISIONS



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3/28/2008

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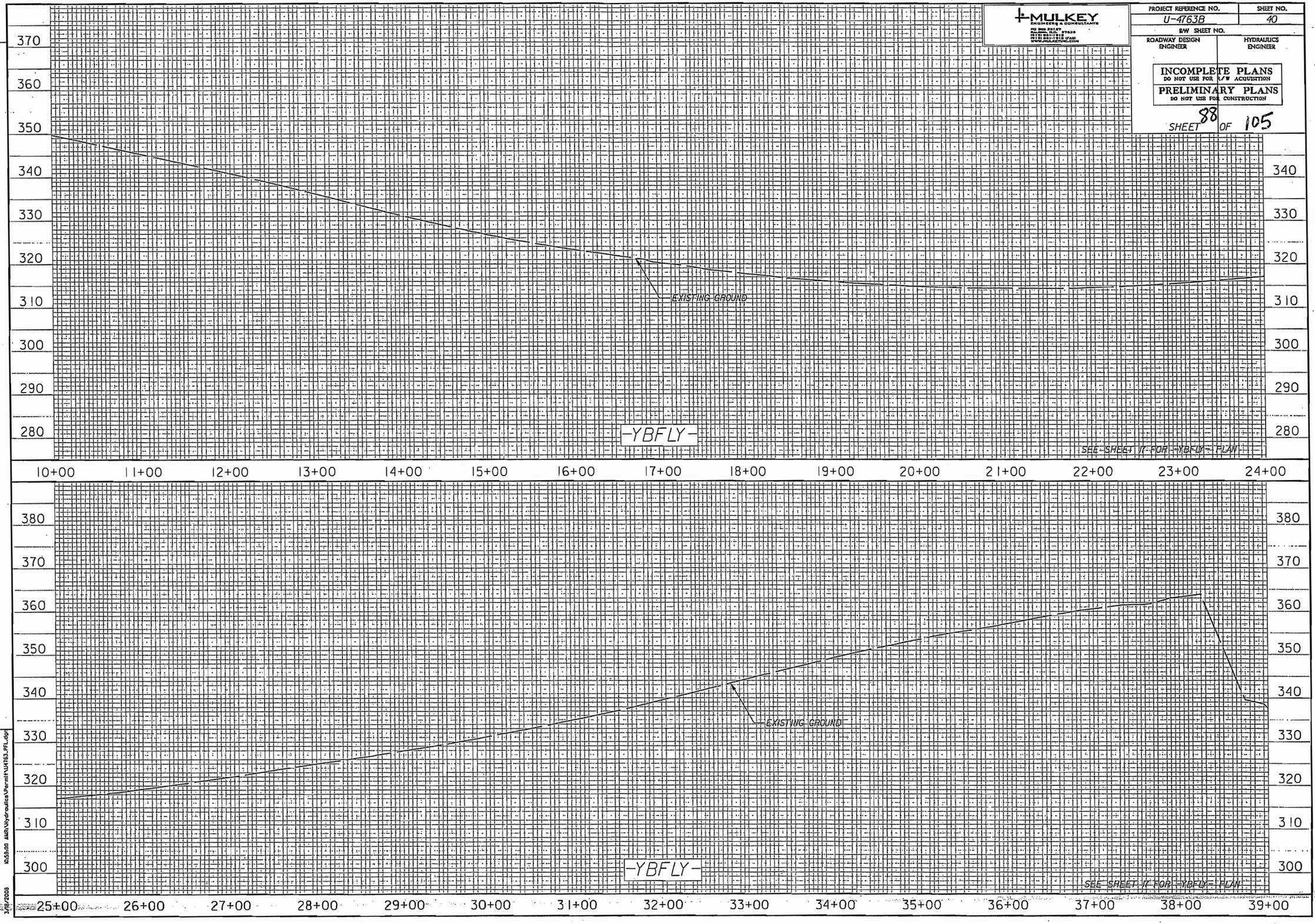
PROJECT REFERENCE NO.	SHEET NO.
U-4763B	40
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

SHEET 88 OF 105

REVISIONS



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3/8/2008

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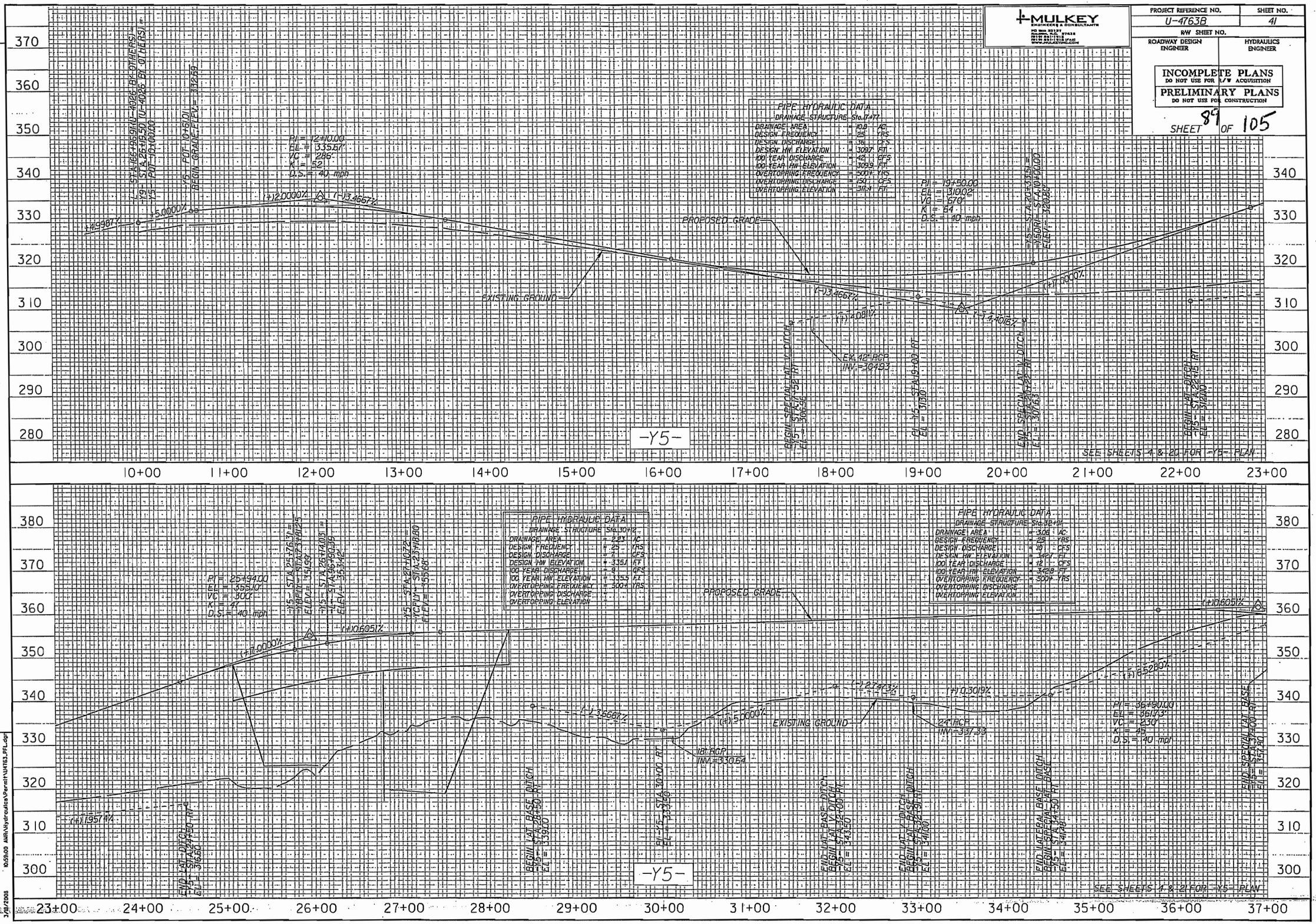
PROJECT REFERENCE NO.	SHEET NO.
U-4763B	41
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

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

SHEET 89 OF 105



REVISIONS

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PROJECT REFERENCE NO.	SHEET NO.
U-4763B	42
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

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

SHEET 90 OF 105

REVISIONS

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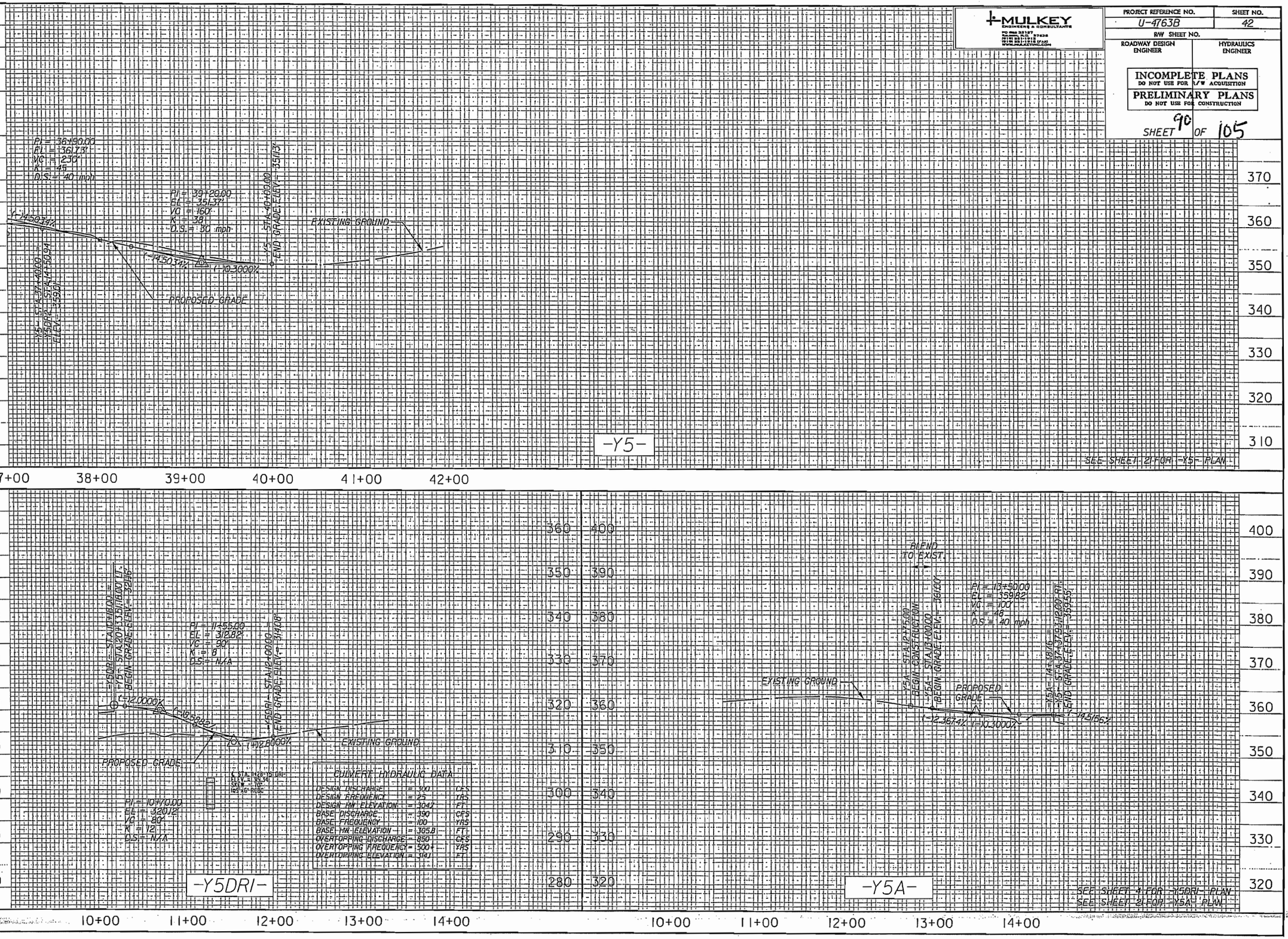
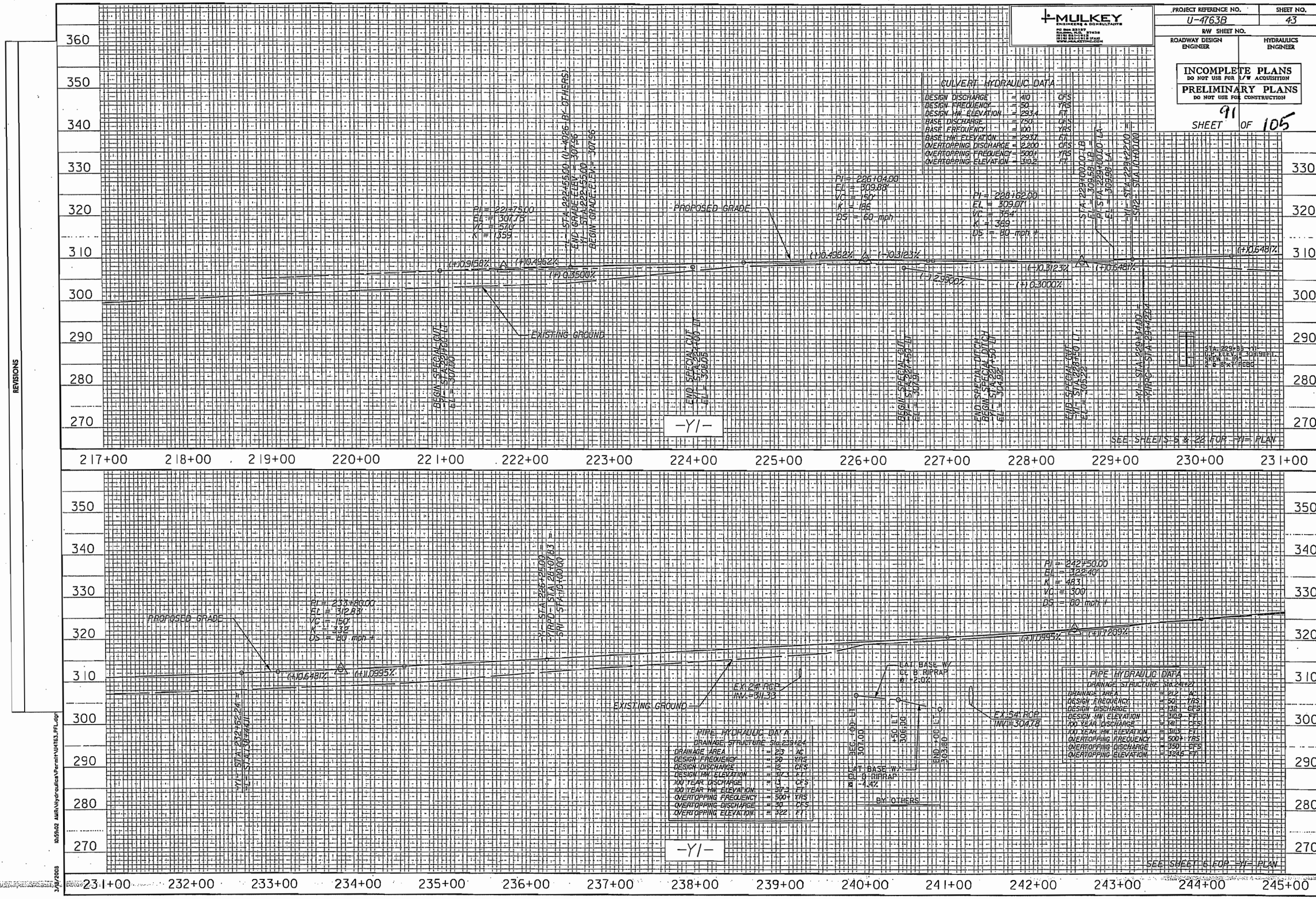
3/18/2008





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PROJECT REFERENCE NO.
U-4763B
SHEET NO.
43
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION
SHEET 91 OF 105
CULVERT HYDRAULIC DATA
DESIGN DISCHARGE = 410 CFS
DESIGN FREQUENCY = 50 YRS
DESIGN HW ELEVATION = 293.4 FT
BASE DISCHARGE = 750 CFS
BASE FREQUENCY = 100 YRS
BASE HW ELEVATION = 293.7 FT
OVERTOPPING DISCHARGE = 2,200 CFS
OVERTOPPING FREQUENCY = 500+ YRS
OVERTOPPING ELEVATION = 310.2 FT
PI = 221+75.00
EL = 307.75'
VC = 570'
K = 1359
PROPOSED GRADE
PI = 226+04.00
EL = 309.88'
VC = 150'
K = 186
DS = 60 mph
PI = 228+62.00
EL = 309.07'
VC = 354'
K = 369
DS = 80 mph +
(+)0.9158%
(+)0.4962%
(+)0.3500%
(+)0.4962%
(-)0.3123%
(-)2.9900%
(-)0.3123%
(+)0.3000%
(+)0.6481%
(+)0.6481%
EXISTING GROUND
BEGIN SPECIAL CUT
END SPECIAL CUT
BEGIN SPECIAL DITCH
END SPECIAL DITCH
-Y1-
SEE SHEETS 6 & 22 FOR -Y1- PLAN
PI = 233+80.00
EL = 312.83'
VC = 150'
K = 332
DS = 80 mph +
PROPOSED GRADE
PI = 242+50.00
EL = 322.40'
K = 483
VC = 300
DS = 80 mph +
(+)0.6481%
(+)1.0995%
(+)1.0995%
(+)1.7209%
EXISTING GROUND
EX. 24" RCP
INV. = 311.33
EX. 54" RCP
INV. = 304.78
LAT BASE W/ CL B RIPRAP
BY OTHERS
PIPE HYDRAULIC DATA
DRAINAGE STRUCTURE Sta. 239+24
DRAINAGE AREA = 2.3 AC
DESIGN FREQUENCY = 50 YRS
DESIGN DISCHARGE = 12 CFS
DESIGN HW ELEVATION = 317.3 FT
100 YEAR DISCHARGE = 13 CFS
100 YEAR HW ELEVATION = 317.3 FT
OVERTOPPING FREQUENCY = 500+ YRS
OVERTOPPING DISCHARGE = 30 CFS
OVERTOPPING ELEVATION = 322 FT
PIPE HYDRAULIC DATA
DRAINAGE STRUCTURE Sta. 241+27
DRAINAGE AREA = 21.2 AC
DESIGN FREQUENCY = 50 YRS
DESIGN DISCHARGE = 132 CFS
DESIGN HW ELEVATION = 310.9 FT
100 YEAR DISCHARGE = 141 CFS
100 YEAR HW ELEVATION = 311.3 FT
OVERTOPPING FREQUENCY = 500+ YRS
OVERTOPPING DISCHARGE = 350 CFS
OVERTOPPING ELEVATION = 324.6 FT
-Y1-
SEE SHEET 6 FOR -Y1- PLAN
REVISIONS

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PROJECT REFERENCE NO.	SHEET NO.
U-4763B	44
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

SHEET 17 OF 105

REVISIONS

-Y1-

PI = 254+76.00
EL = 345.43'
VC = 280'
K = 452
DS = 80 mph

-L- STA 254+40.00 (U-4026 BY OTHERS)
END GRADE ELEV = 344.15'

-L- STA 254+40.00
BEGIN GRADE ELEV = 343.96'

(+)1.16%

(-)1.16%

(+)1.35%

PROPOSED GRADE

EXISTING GROUND

SEE SHEETS 8 & 25 FOR -Y1- PLAN

-Y1-

PI = 260+55.00
EL = 353.48'
VC = 690'
K = 149
DS = 55 mph

(+)1.35%

(-)2.88%

-L- STA 260+00.93
EL = 347.01

-Y1- STA 260+09.22

-L- STA 263+50.11
EL = 340.08

-Y1- STA 263+50.11
EL = 339.05

-L- STA 265+40.00
EL = 333.05

-Y1- STA 265+40.00
EL = 333.05

(-)1.22%

(-)1.18%

-L- STA 267+82.37
EL = 332.49

-Y1- STA 267+82.37
END GRADE ELEV = 332.49

-L- STA 267+82.37
BEGIN GRADE ELEV = 332.49

(-)2.88%

PROPOSED GRADE

EXISTING GROUND DITCH

BEGIN LATERAL V-DITCH
-Y1- STA 263+50.11
EL = 340.08

END LATERAL V-DITCH
-Y1- STA 265+40.00
EL = 333.05

PI -Y1- STA 266+87.57
EL = 329.96

+00 LT
325.30

150 LT
321.80

200 LT
319.10

63 LT
316.50

30 LT
316.50

LAT V @ +0.37%

BY OTHERS FROM STA 266+87.57 -Y1- TO STA 272+00.00

SEE SHEETS 25 & 27 FOR -Y1- PLAN

380 370 360 350 340 330 320 310 300 290

245+00 246+00 247+00 248+00 249+00 250+00 251+00 252+00 253+00 254+00 255+00 256+00 257+00 258+00 259+00

259+00 260+00 261+00 262+00 263+00 264+00 265+00 266+00 267+00 268+00 269+00 270+00 271+00 272+00 273+00

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PROJECT REFERENCE NO.	SHEET NO.
U-4763B	45
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

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

SHEET 93 OF 105

REVISIONS

PI = 13+00.00
EL = 315.10'
VC = 250'
K = 1191
DS = 80+ mph

-YIRPC- STA: 10+00.00 =
-YIPT- STA: 15+77.59 LT
BEGIN GRADE ELEV = 322.02

(-)2.3062%
(-)2.516%
(-)2.516%
(-)0.1303%

PI = 16+20.00
EL = 307.05'
VC = 280'
K = 127
DS = 55 mph

PROPOSED GRADE
EXISTING GROUND
(+)0.5929%
(-)1.0292%
(+)1.6529%
(+)1.8467%

BEGIN LAT. BASE DITCH
-YIRPC- STA: 16+80 LT
EL = 283.00

-YIRPC- STA: 17+45 LT
EL = 286.11

END LAT. BASE DITCH
-YIRPC- STA: 19+44 LT
EL = 299.36

END SPECIAL CUT
BEGIN SPECIAL CUT
-YIRPC- STA: 20+42 RT
EL = 300.01

END SPECIAL CUT
-YIRPC- STA: 20+60 RT
EL = 300.01

SEE SHEETS 5 & 6 FOR -YIRPC- PLAN

-YIRPC-

10+00 11+00 12+00 13+00 14+00 15+00 16+00 17+00 18+00 19+00 20+00 21+00 22+00 23+00

330 320 310 300 290 280 270 260

RDY
YIRPC
1000.000000
250
50

PIPE HYDRAULIC DATA
DRAINAGE STRUCTURE Sta.26+74

DRAINAGE AREA	=	15 AC
DESIGN FREQUENCY	=	50 YRS
DESIGN DISCHARGE	=	21 CFS
DESIGN HW ELEVATION	=	290.8 FT
100 YEAR DISCHARGE	=	22 CFS
100 YEAR HW ELEVATION	=	290.8 FT
OVERTOPPING FREQUENCY	=	500+ YRS
OVERTOPPING DISCHARGE	=	88 CFS
OVERTOPPING ELEVATION	=	301.4 FT

PI = 26+25.00
EL = 304.00'
VC = 222'
K = 100
DS = 50 mph

PROPOSED GRADE
EXISTING GROUND
(-)0.3034%
(+)1.907%
(+)1.907%
(+)1.999%
(-)3.0894%
(-)1.900%
(-)1.900%
(-)3.7969%
(+)1.0357%

-YIRPC- STA: 28+49.03 = -YIRPC-
END GRADE ELEV = 309.09

101' RCP
INV.= 288.10

BEGIN SPECIAL CUT
-YIRPC- STA: 23+20 LT
EL = 300.36

BEGIN SPECIAL CUT
-YIRPC- STA: 25+50 RT
EL = 297.60

END SPECIAL CUT
-YIRPC- STA: 25+87 LT
EL = 288.40

BEGIN LAT. BASE DITCH
-YIRPC- STA: 26+00 RT
EL = 290.26

END LAT. BASE DITCH
BEGIN LAT. DITCH
-YIRPC- STA: 26+93 RT
EL = 288.50

END LAT. Y DITCH
-YIRPC- STA: 28+39 RT
EL = 288.00

-YIRPC-

SEE SHEET 6 FOR -YIRPC- PLAN

24+00 25+00 26+00 27+00 28+00 29+00

340 330 320 310 300 290 280 270 260

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3/8/2008

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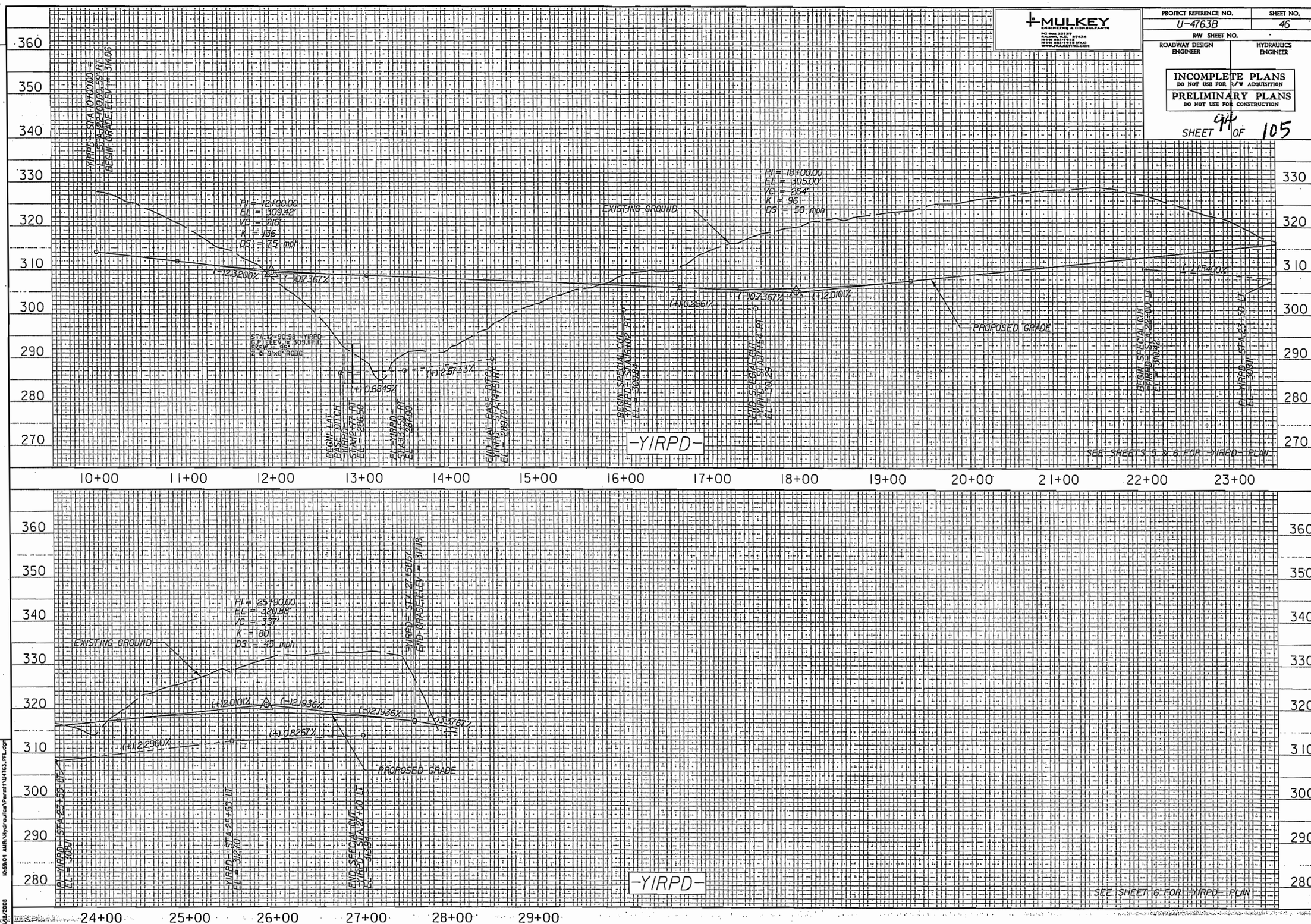
PROJECT REFERENCE NO.	SHEET NO.
U-4763B	46
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

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

SHEET 94 OF 105



REVISIONS

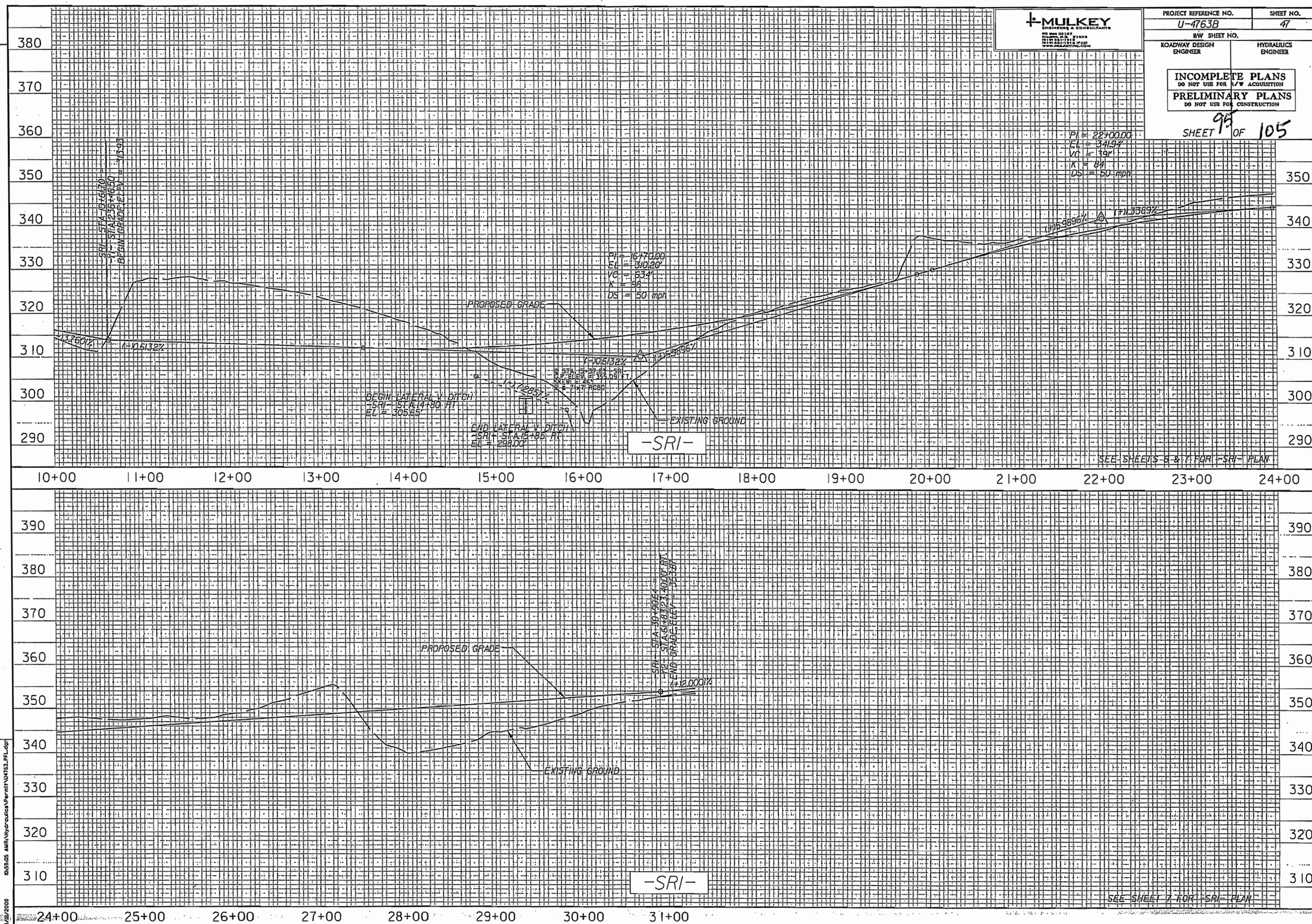
10:59:04 AMR:\Hydraulics\Permit\U4763_PFL.dgn
3/18/2008

MULKEY ENGINEERS & CONSULTANTS

PROJECT REFERENCE NO.	SHEET NO.
U-4763B	47
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

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

SHEET 95 OF 105



REVISIONS

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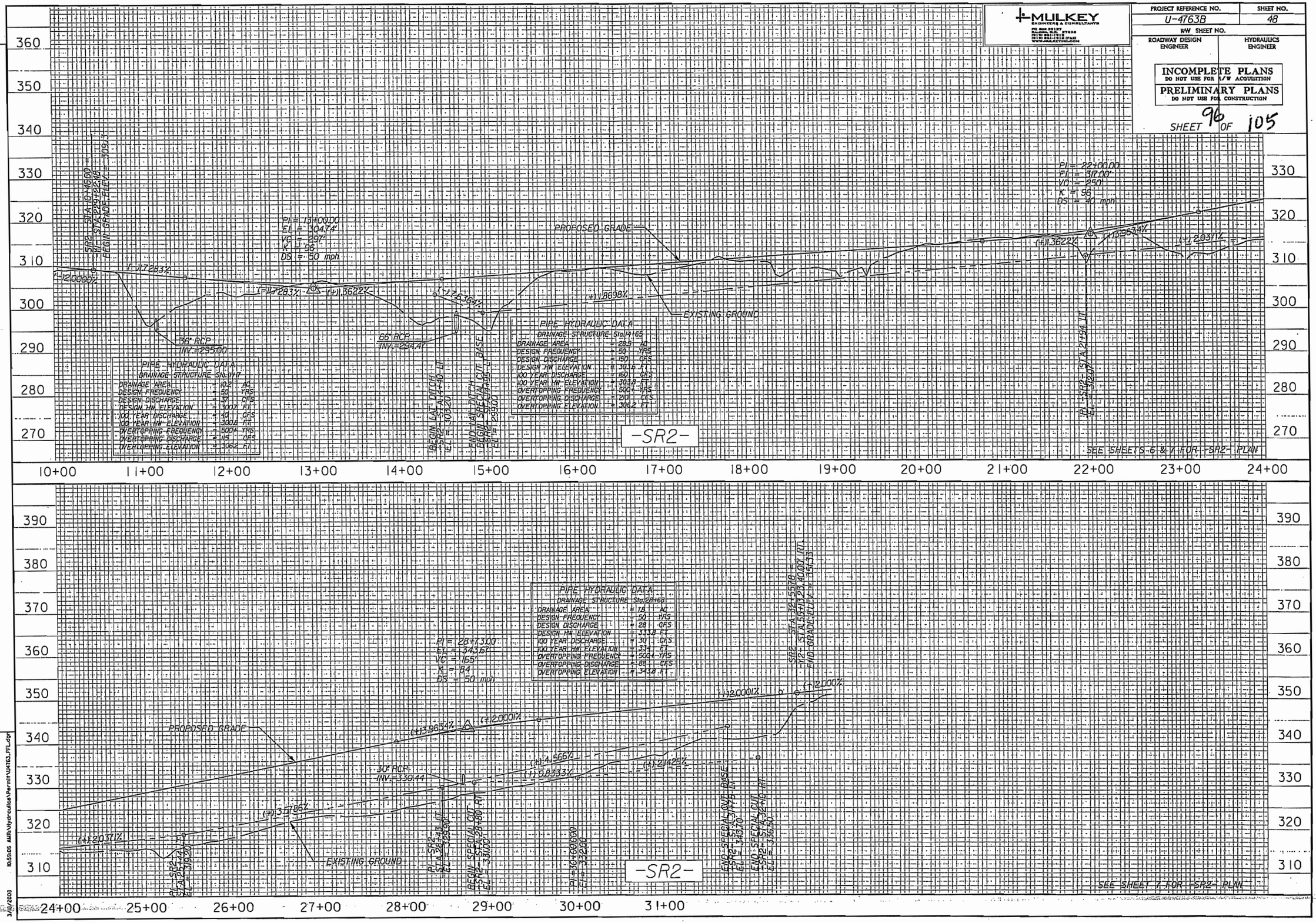
3/18/2008

MULKEY ENGINEERS & CONSULTANTS

PROJECT REFERENCE NO.	SHEET NO.
U-4763B	48
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

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

SHEET 96 OF 105



REVISIONS

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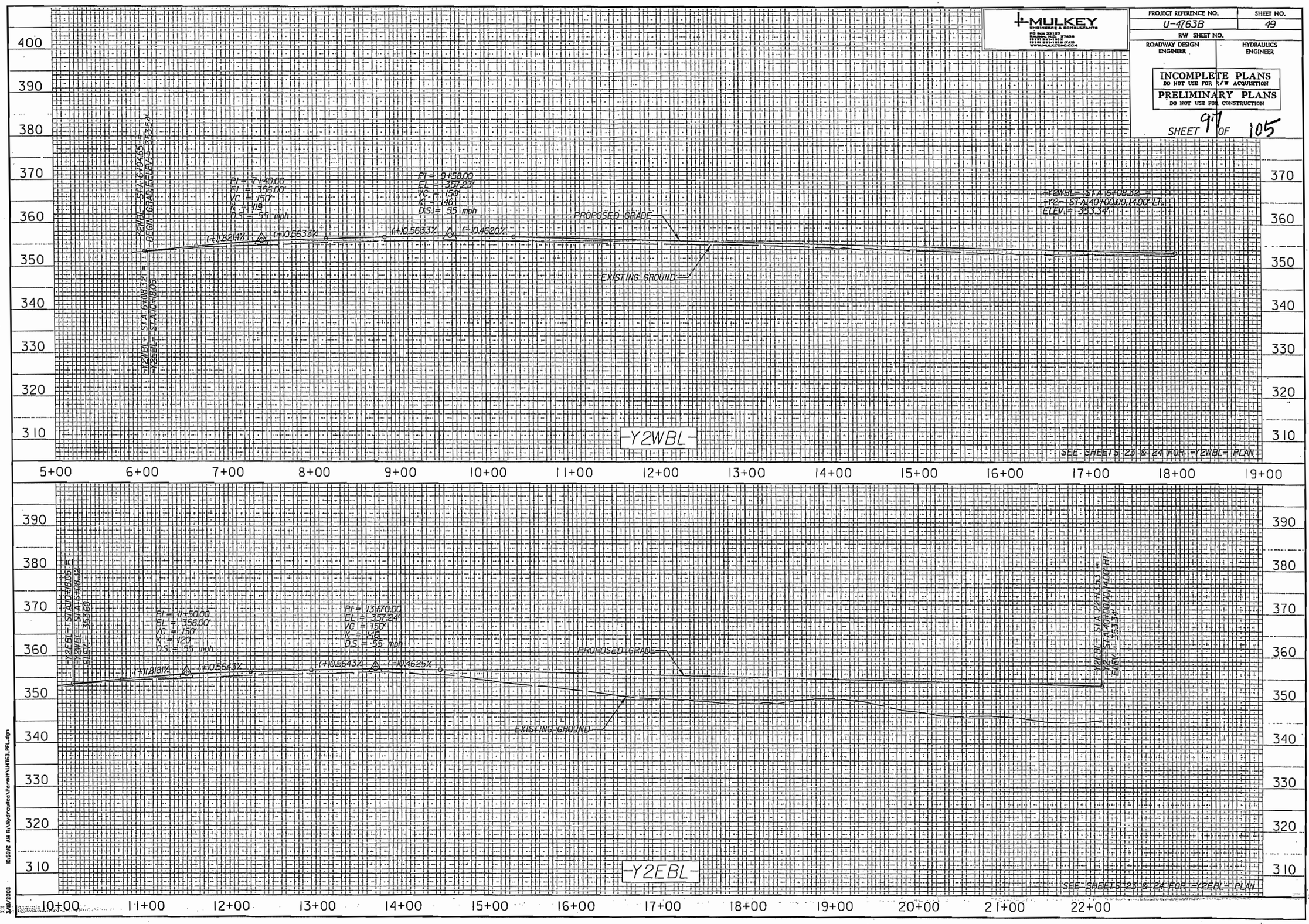
3/18/2008

MULKEY ENGINEERS & CONSULTANTS

PROJECT REFERENCE NO.	SHEET NO.
U-4763B	49
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

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

SHEET 97 OF 105



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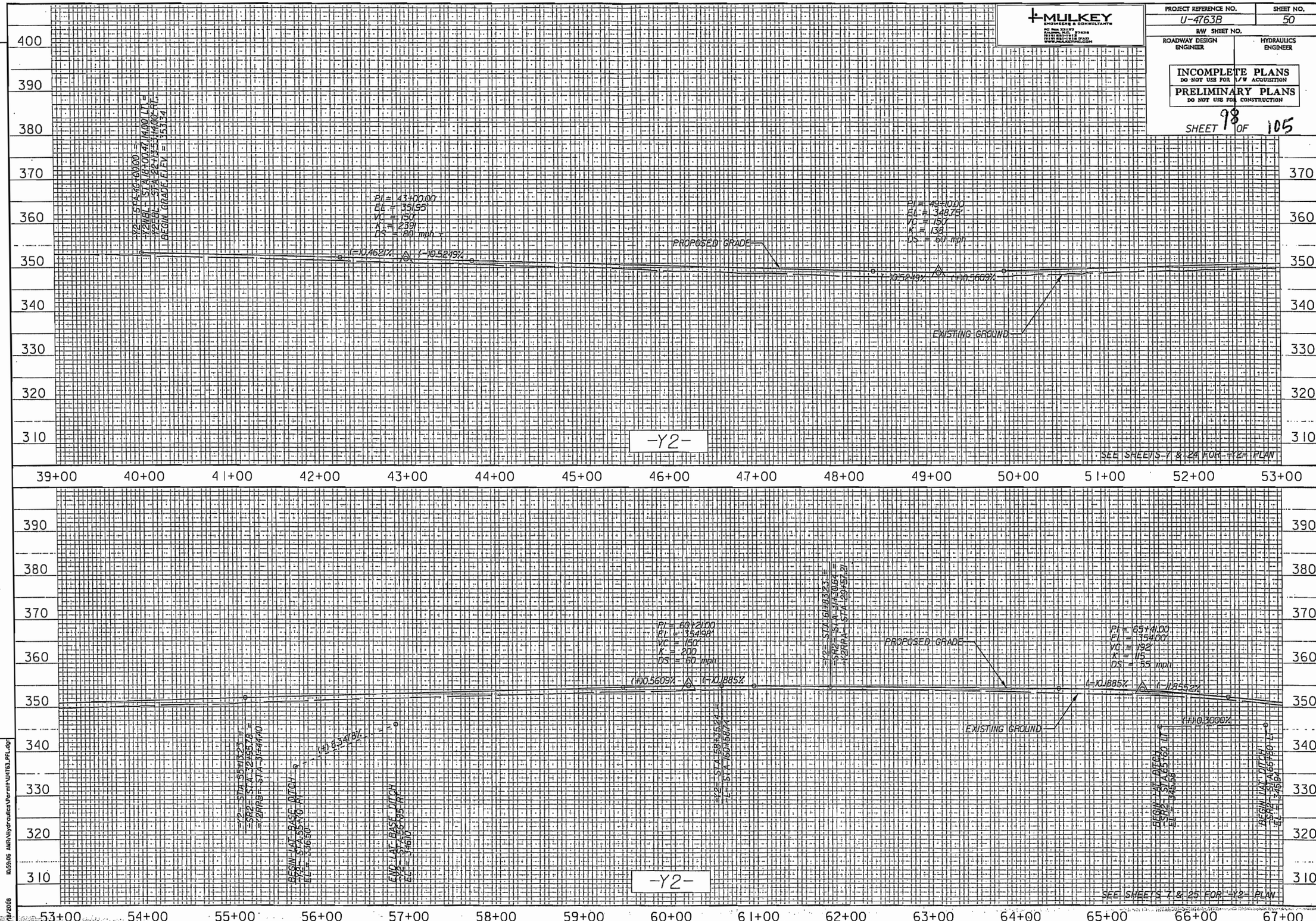
MULKEY ENGINEERS & CONSULTANTS

PROJECT REFERENCE NO.	SHEET NO.
U-4763B	50
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

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

SHEET 98 OF 105



REVISIONS

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3/18/2008

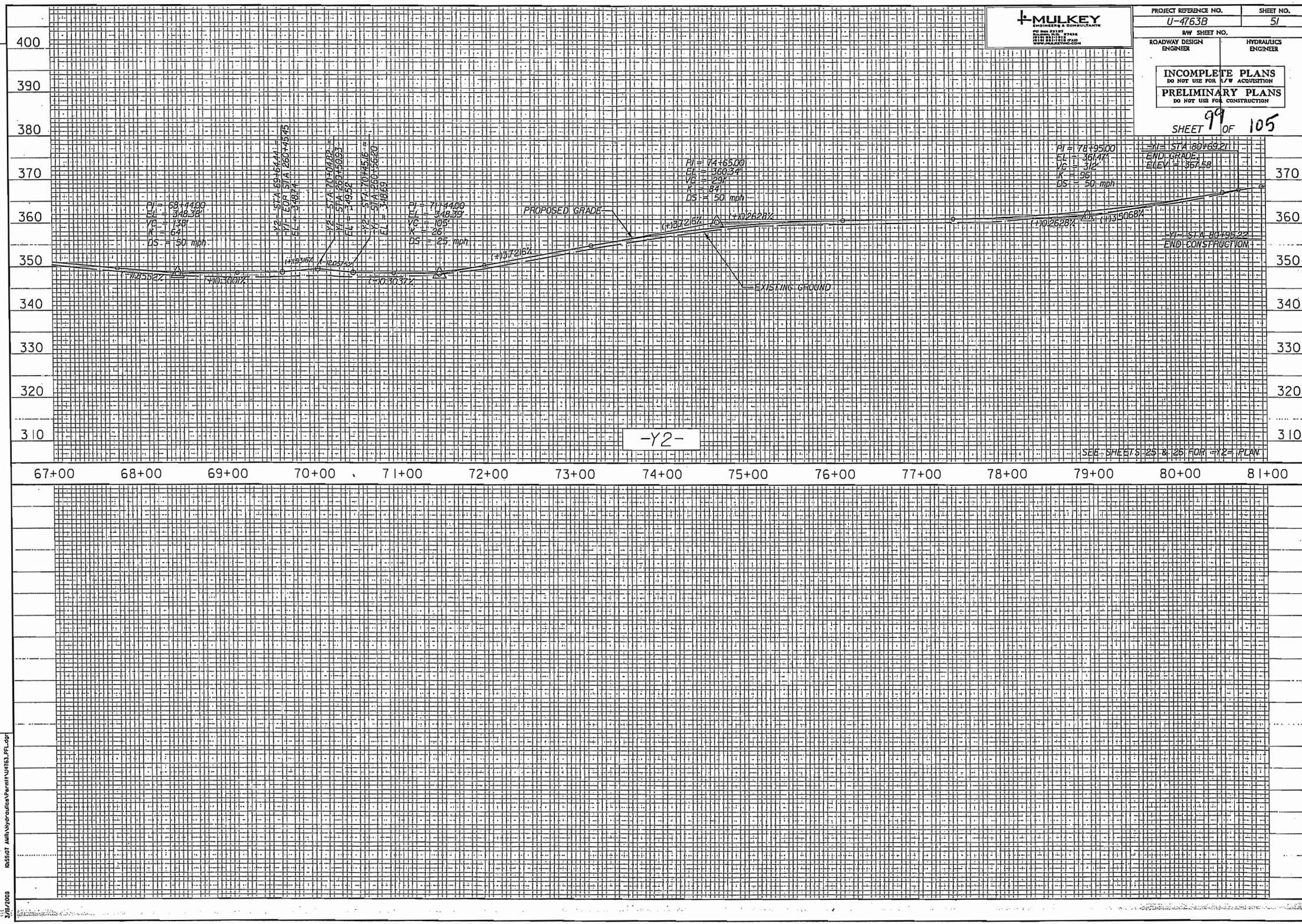
MULKEY ENGINEERS & CONSULTANTS

PROJECT REFERENCE NO.	SHEET NO.
U-4763B	51
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

SHEET 99 OF 105



REVISIONS

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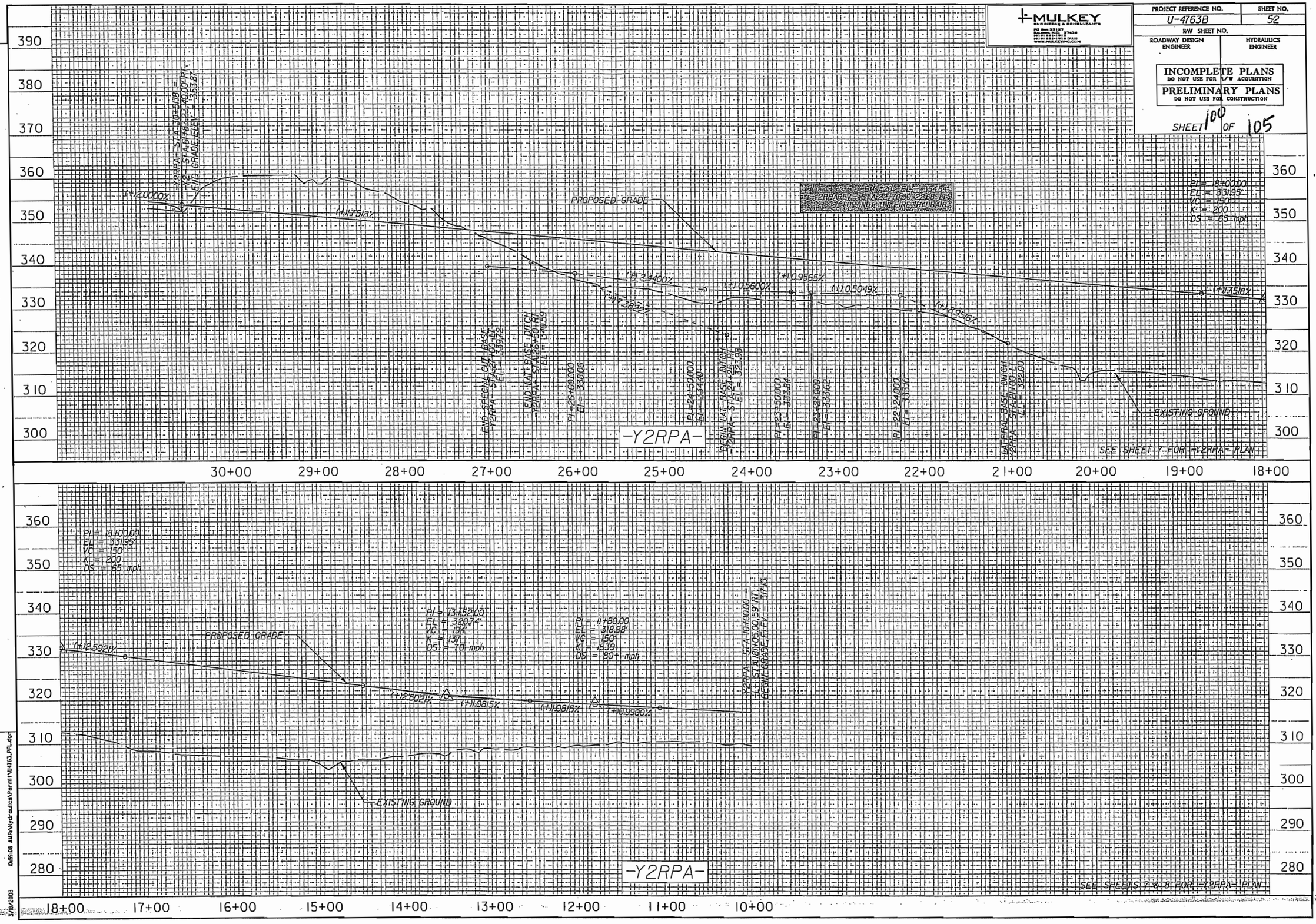
MULKEY ENGINEERS & CONSULTANTS

PROJECT REFERENCE NO.	SHEET NO.
U-4763B	52
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

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

SHEET 100 OF 105



REVISIONS

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3/18/2008

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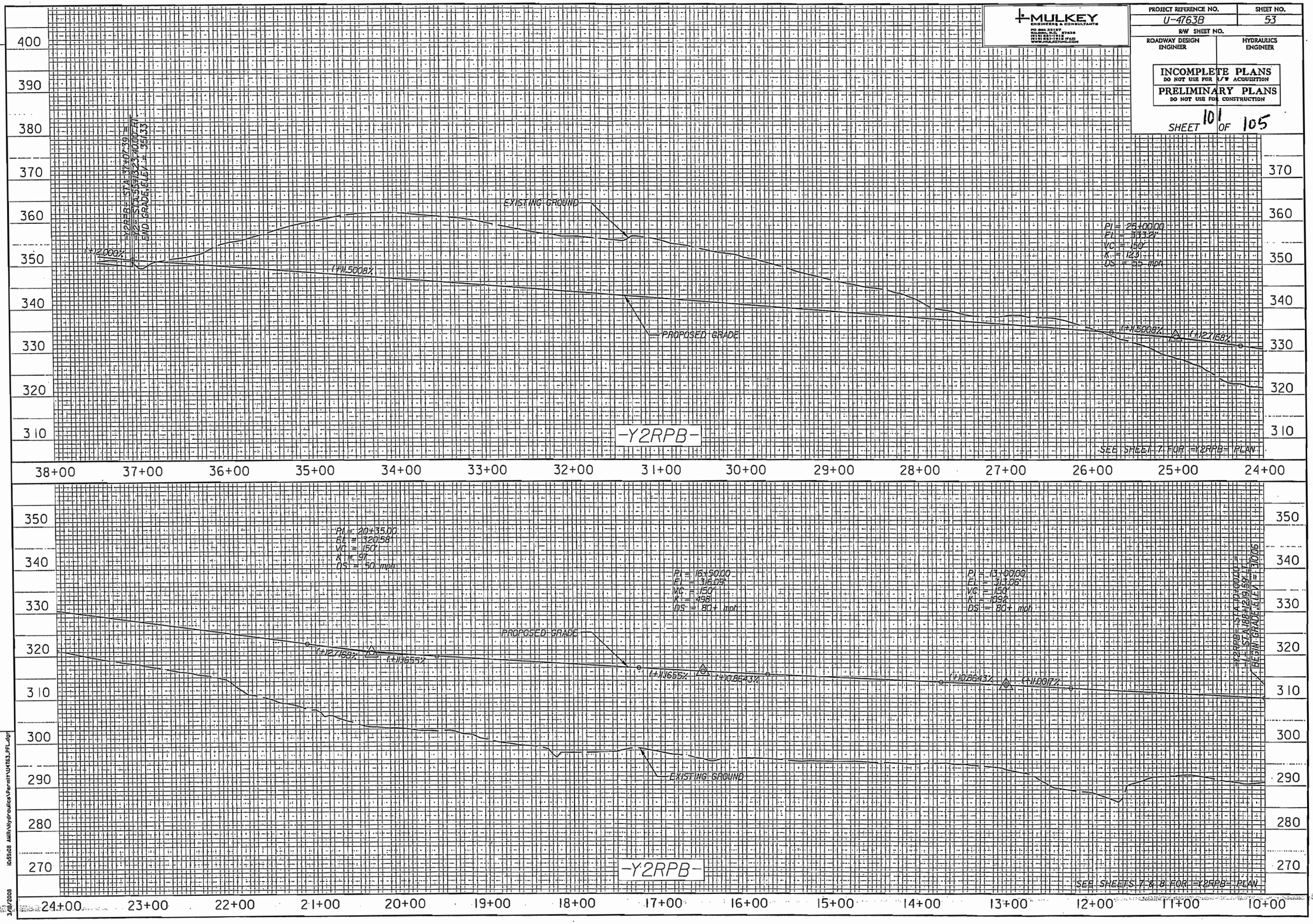
PROJECT REFERENCE NO.	SHEET NO.
U-4763B	53
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

SHEET 101 OF 105

REVISIONS



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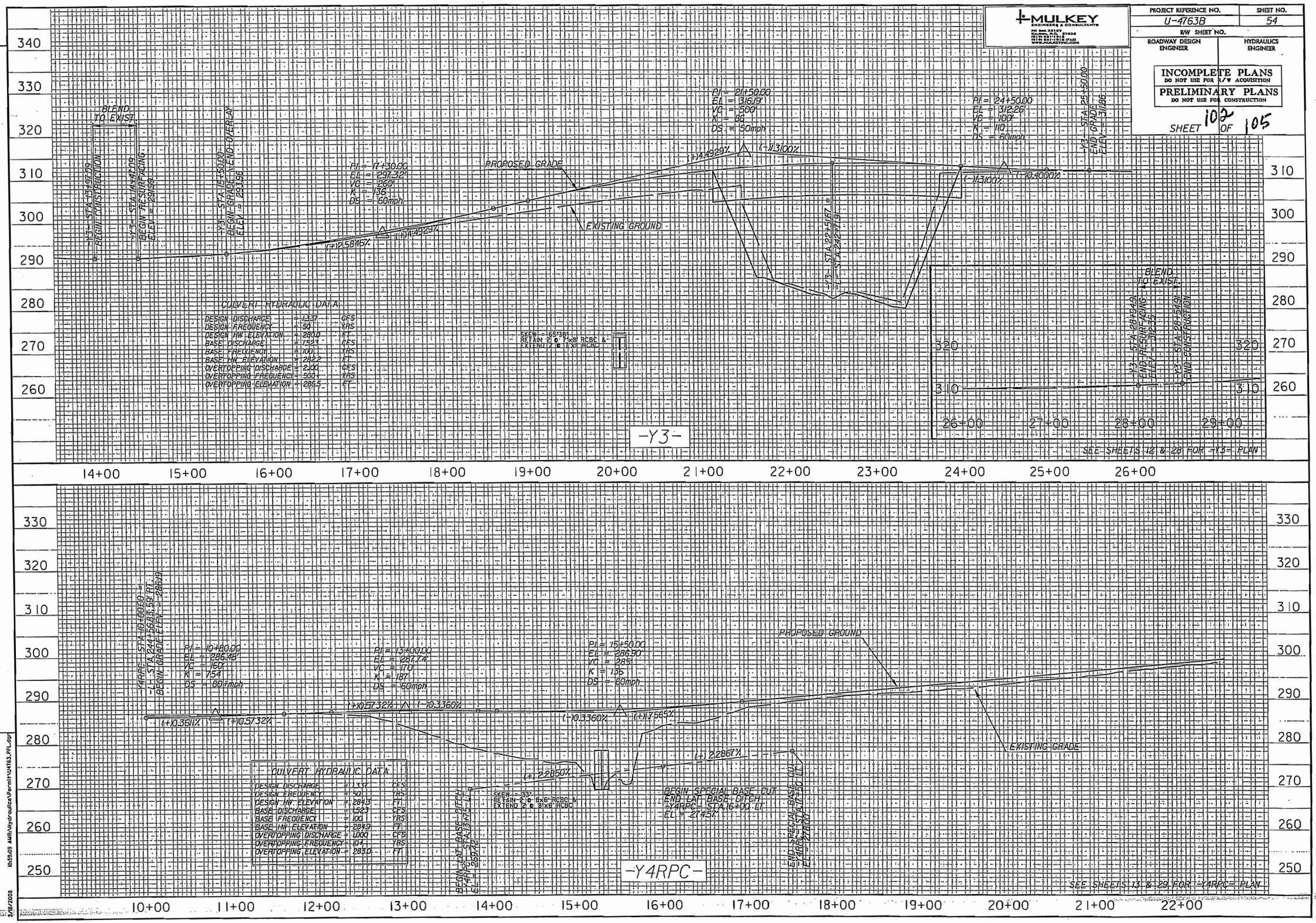
3/18/2008

MULKEY ENGINEERS & CONSULTANTS

PROJECT REFERENCE NO.	SHEET NO.
U-4763B	54
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

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

SHEET 102 OF 105



REVISIONS

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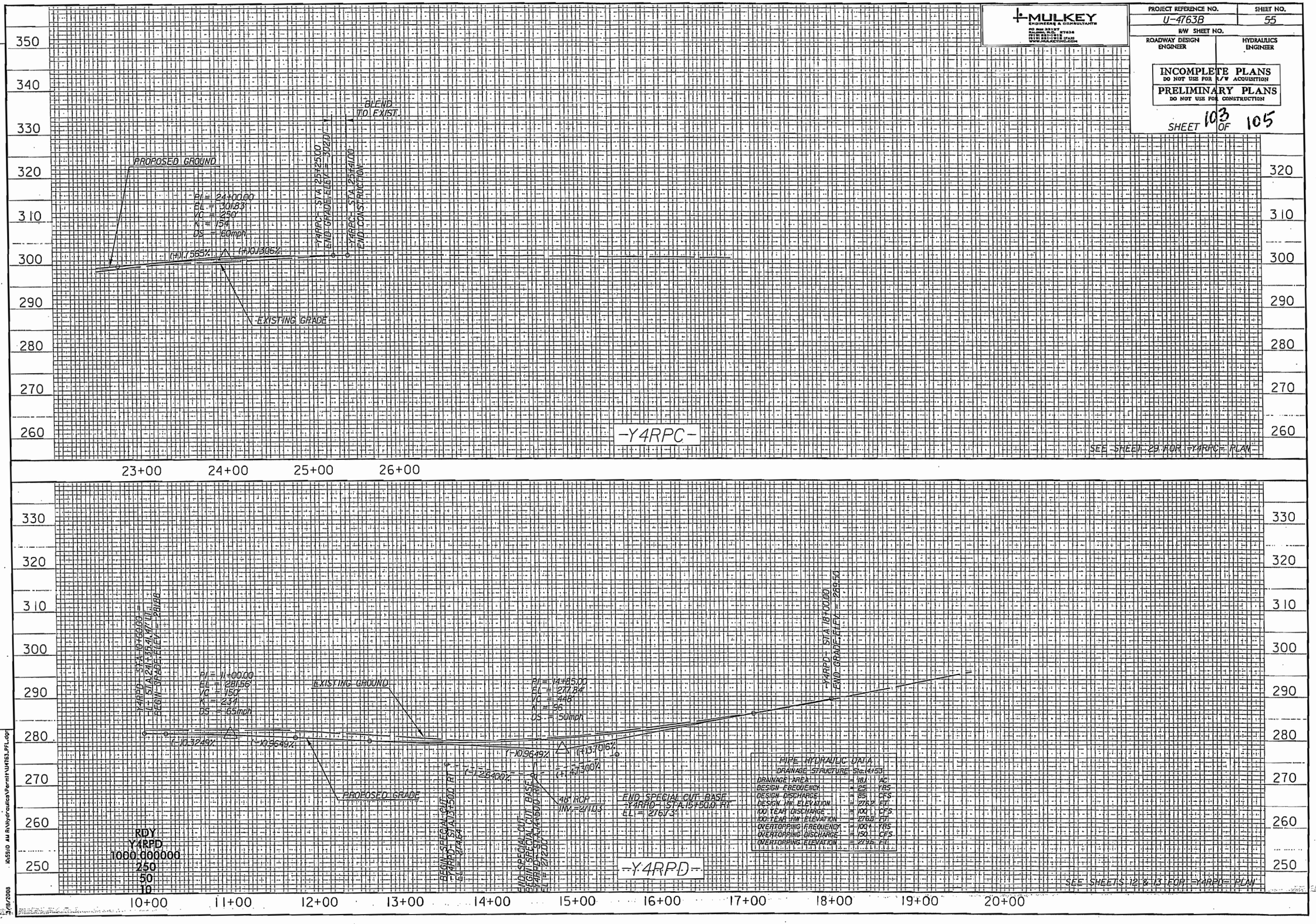
3/18/2008



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ENGINEERS & CONSULTANTS
PROJECT REFERENCE NO.
U-4763B
SHEET NO.
55
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION
SHEET 103 OF 105
REVISIONS
PROPOSED GROUND
PI = 24+00.00
EL = 301.83'
VC = 250'
K = 154
DS = 60mph
(+)1.7565%
(+)0.1306%
EXISTING GRADE
BLEND TO EXIST.
-Y4RPC- STA 25+25.00
END GRADE ELEV = 302.01
-Y4RPC- STA 25+41.00
END CONSTRUCTION
-Y4RPC-
SEE SHEET 29 FOR -Y4RPC- PLAN
23+00
24+00
25+00
26+00
-Y4RPD- STA 10+00.00 =
-L- STA 241+35.41, 47' LT.
BEGIN GRADE ELEV = 281.88
PI = 11+00.00
EL = 281.56'
VC = 150'
K = 234
DS = 65mph
(-)0.3249%
(-)0.9649%
EXISTING GROUND
PROPOSED GRADE
BEGIN SPECIAL CUT
-Y4RPD- STA 13+50.0 RT
EL = 274.64
END SPECIAL CUT
BEGIN SPECIAL CUT BASE
-Y4RPD- STA 14+50.0 RT
EL = 272.00
PI = 14+85.00
EL = 277.84'
VC = 448'
K = 96
DS = 50mph
(-)0.9649%
(+)3.7016%
(-)2.6400%
(+)4.7300%
48" RCP
INV = 2/1.03
END SPECIAL CUT BASE
-Y4RPD- STA 15+50.0 RT
EL = 276.73'
-Y4RPD- STA 18+00.00
END GRADE ELEV = 289.50
PIPE HYDRAULIC DATA
DRAINAGE STRUCTURE Sta. 14+53
DRAINAGE AREA = 18.1 AC
DESIGN FREQUENCY = 25 YRS
DESIGN DISCHARGE = 85 CFS
DESIGN HW ELEVATION = 276.2 FT
100 YEAR DISCHARGE = 100 CFS
100 YEAR HW ELEVATION = 276.8 FT
OVERTOPPING FREQUENCY = 100+ YRS
OVERTOPPING DISCHARGE = 150 CFS
OVERTOPPING ELEVATION = 279.6 FT
-Y4RPD-
SEE SHEETS 12 & 13 FOR -Y4RPD- PLAN
RDY
Y4RPD
1000.000000
250
50
10
10+00
11+00
12+00
13+00
14+00
15+00
16+00
17+00
18+00
19+00
20+00

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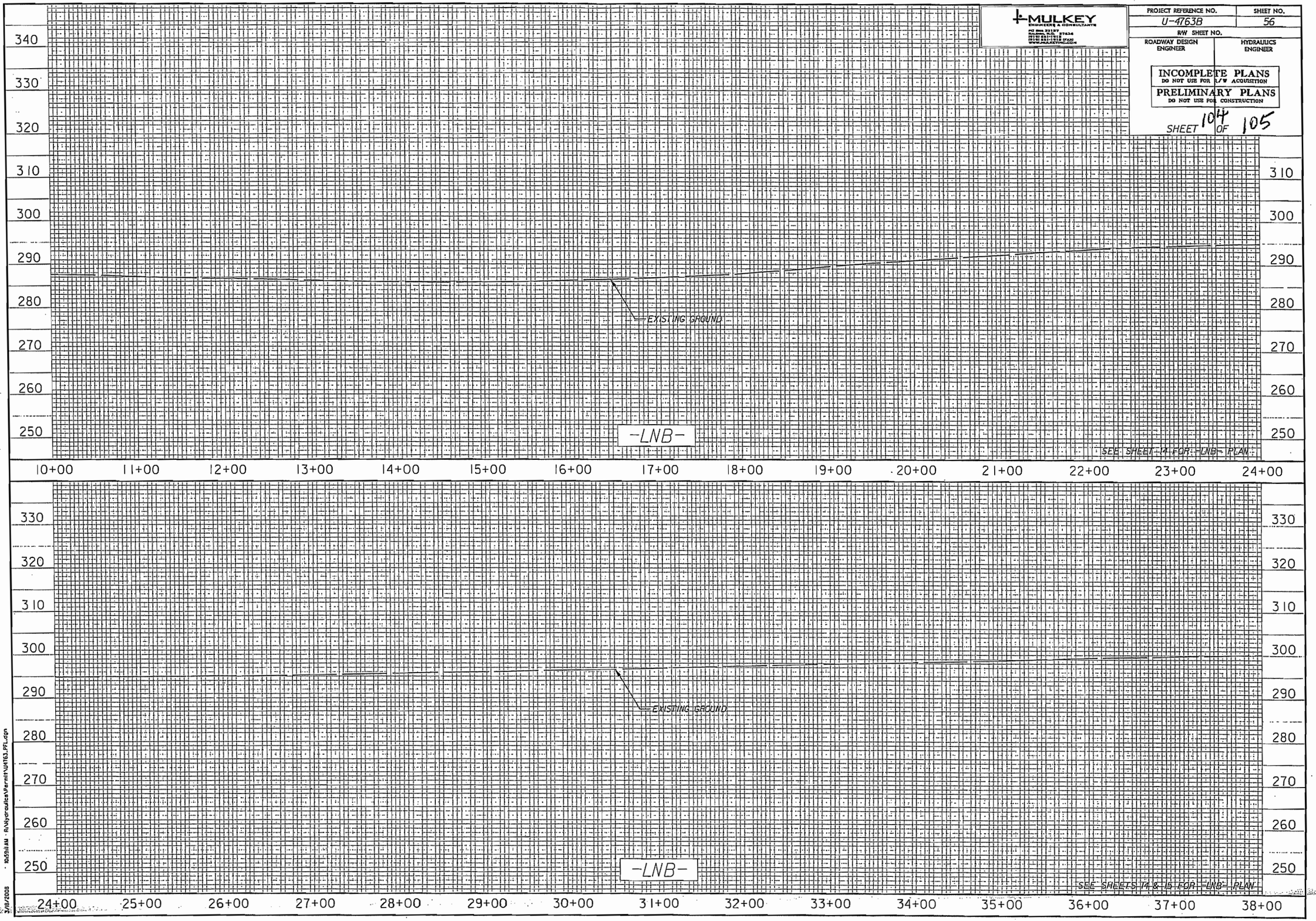
PROJECT REFERENCE NO.	SHEET NO.
U-4763B	56
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

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

SHEET 104 OF 105



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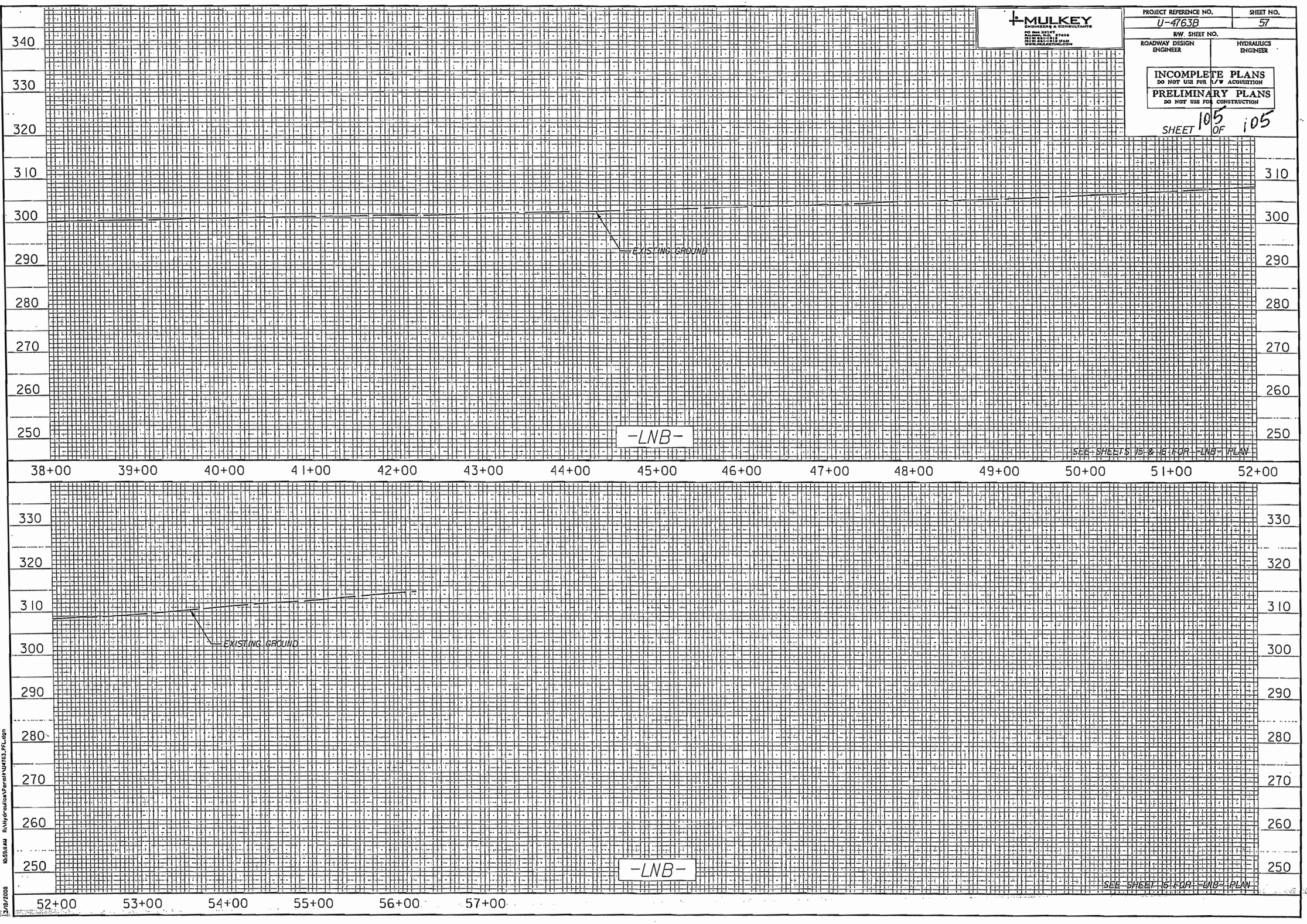
MULKEY
ENGINEERS & CONSULTANTS
PO Box 33127
Raleigh, NC 27636
(919) 851-1312
(919) 851-1918 (FAX)
www.mulkeyinc.com

PROJECT REFERENCE NO.	SHEET NO.
U-4763B	57
R/W. SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

SHEET 105 OF 105



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2/18/2008