

**Emily.N Marsh - SR 101 Cumberland Co Soils Request**

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**From:** Len Oliver  
**To:** Johnston, Jim.A; Marsh, Emily.N  
**Date:** 8/17/2010 4:35 PM  
**Subject:** SR 101 Cumberland Co Soils Request  
**CC:** Bateman, Vanessa; Perkins, Mike

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Emily and Jim,

We received the soils request letter and plans for the SR 101 project Phases 1 and 2. As you mentioned, a request to conduct the soils investigation was originally made in 2002 and we subsequently provided a report submitted to Jim Johnston on September 19, 2002. Due to the limited grading of the proposed project (widening and cut and fill slopes less than 10') no soil sheets were developed but a note regarding the type material to be expected was provided in the report which was recommended to be placed on the plans notes sheets. Slope ratio recommendations were provided also.

It appears this new request has an additional 3000 feet of roadway length involved as compared to the original request. Due to this additional length and the time since the original report, we will have a geologist revisit the site with the new plans and cross-sections to determine if the recommendations in the original report are still valid. We will provide a Report Addendum and any soils sheets that may be developed if deemed necessary.

M. Leonard Oliver, P.E.  
Tennessee Department of Transportation  
Geotechnical Engineering Section  
6601 Centennial Blvd.  
Nashville, Tn 37243

Phone (615) 350-4130  
[Len.Oliver@tn.gov](mailto:Len.Oliver@tn.gov)



STATE OF TENNESSEE  
TENNESSEE DEPARTMENT OF TRANSPORTATION  
GEOTECHNICAL ENGINEERING SECTION  
6601 CENTENNIAL BOULEVARD  
NASHVILLE, TENNESSEE 37243-0360

January 11, 2011

Robert Rodgers,  
Region 2 Design  
4005 Cromwell Road  
Chattanooga, TN 37422

RE: Project No. 18038-1230-04  
State Route 101 (Peavine Road)  
From Lakeview Drive to East of Westchester Drive/Catoosa Blvd.in  
Fairfield Glade  
PIN No. 100268.02  
Cumberland County

Dear Mr. Rodgers:

Enclosed is the Geotechnical Report on the above project. An electronic copy of the drawing is also being forwarded to you via e-mail.

If additional information is needed, please advise.

Sincerely,

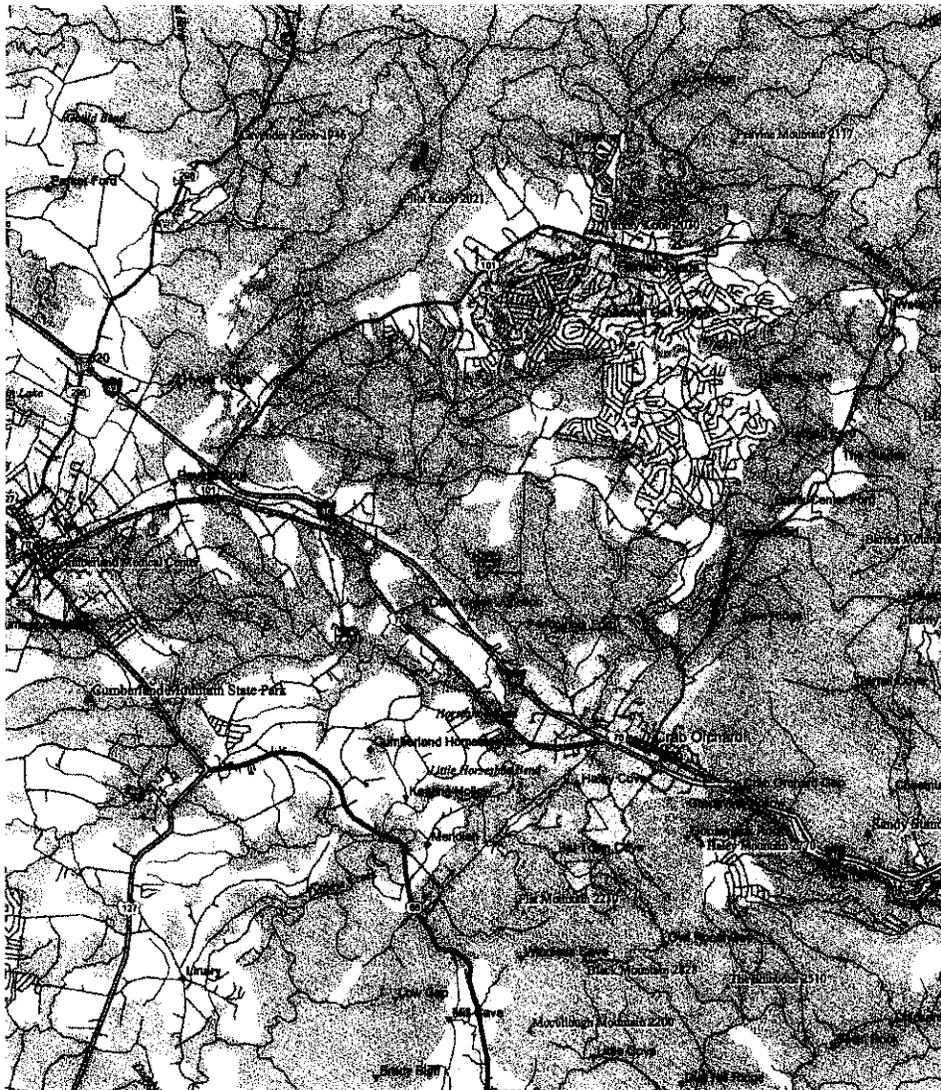
A handwritten signature in black ink, appearing to read "M. Leonard Oliver".

M. Leonard Oliver, P.E.  
Civil Engineering Manager 2

MLO:CJW  
Enclosure

cc: Gary King

GEOTECHNICAL REPORT  
STATE ROUTE 101 (PEAVINE ROAD)  
FROM LAKEVIEW DRIVE  
TO EAST OF WESTCHESTER DRIVE/CATOOSA BLVD  
IN FAIRFIELD GLADE  
STATE PROJECT NO. 18038-1230-04  
PIN NO. 100268.02  
CUMBERLAND COUNTY



**GEOTECHNICAL REPORT  
ADDENDUM**

State Route 101 Widening From Fire Tower Road to  
Stonehinge Drive/Eagle Lane in Fairfield Glade

Project No. 18038-1230-04

Pin No. 100268.00

**New Project Name**

SR-101 (Peavine Road)

Phase 1 – From Fire Tower Road to Lakeview Drive

Phase – 2 From Lakeview Drive to East of Westchester Drive/Catoosa Blvd  
In Fairfield Glade

**Project No.** 18038-1230-04

**Pin No.** 100268.01 and 100268.02

Cumberland County

Executive Summary

This report is an addendum to the previous geotechnical recommendations for the widening of State Route 101. The original project began at Fire Tower Road (at or near Station 66+54) and ended at the intersection of Stonehinge Drive/Eagle Lane and SR-101, at or near Station 323+78. The revised project begins at the original location and ends approximately 3,132- feet east of the original terminus of the project at a point east of the intersection of Westchester Drive/Catoosa Boulevard and SR- 101(Station 355+10). The revised project has also been split into two phases of construction with Phase 2 gaining the additional length at the eastern end of the project. This report addresses the additional alignment.

The project will consist of widening of the existing two lane road to four traffic lanes, a center turn lane, and 10-foot wide paved shoulders with curbs and gutters. Construction will consist of shallow cuts, fills and at grade improvements along with several fills in excess of 10-feet in thickness along the existing alignment. The site is

1825501

designed for 3H: 1V or flatter for right of way planning. A CBR value of 6, based on the county average, should be utilized for pavement subgrade design.

## Introduction

This report is an addendum to the previous geotechnical recommendations for the widening of State Route 101 in Cumberland County north of Crossville from Fire Tower Road (at or near Station 66+54) to the intersection of Stonehinge Drive/Eagle Lane and SR-101, at or near Station 323+78. The revised project begins at the original location and ends approximately 3,132- feet east of the original terminus of the project at a point east of the intersection of Westchester Drive/Catoosa Boulevard and SR-101 (Station 355+10). The revised project has also been split into two phases of construction with Phase 2 gaining the additional length at the eastern end of the project. The report provides a summary of geotechnical recommendations for the additional section of alignment added since the original report was issued.

## Geology and Soils and Site Conditions

The project area is located within the Cumberland Plateau physiographic region, which is characterized as generally flat with gently rolling uplands. Available geologic mapping (USGS Geologic Map of the Hillsdale Quadrangle, 1972) indicates the site is underlain by the Rockcastle Sandstone at the beginning of the project and transecting units of the Duskin Creek Shale, including the Lower Shale and Crossville Sandstone members of the formation, of Pennsylvanian age. The Rockcastle Sandstone typically consists of light grey, fine grained, quartzose, massive, non-conglomeratic sandstone, with cross bedding. The Lower Shale member is dark grey silty shale 40 to 50 feet thick. The Crossville Sandstone consists of light grey, fine grained, quartzose, massive, non-conglomeratic sandstone, with cross bedding. It is locally evenly thin and flaggy

bedded and quarried as a building stone. Residual soil formed by the in-place weathering of the parent sandstone is generally yellow-orange-brown sandy clayey silt. The geologic mapping does not indicate any karst terrain features present in the vicinity of the proposed structure, nor is the formation prone to karstic activity. In addition, no pyritic or acid producing soils or rock were encountered in the project area.

### Surface and Subsurface Exploration

Surface exploration of the proposed project area revealed numerous low sandstone bedrock outcrops along the proposed alignment.

The subsurface investigation was conducted by literature review and visual observation of the few shallow cuts along the existing alignment. Visual inspection of the soils in ditch lines and cuts were generally a yellow-orange-brown sandy clayey silt residual soil that appeared to be formed by the in-place weathering of the parent sandstone.

The above subsurface description is of a generalized nature to highlight the major subsurface stratification features and material characteristics. Variations may occur and should be expected between boring locations.

### Recommendations and Discussion

Slopes should be constructed with a ratio of 3H: 1V or flatter if possible. Lift thickness in embankments shall be no thicker than 10 inches (See Special Notes and Specifications: *Formation of Embankments* for detail on fill slope construction) and the existing slopes will require continuous pre-benching for each lift of fill material that will

be emplaced against an existing slope. Redressing of slopes should still be expected following construction, utilizing the latest erosion control measures required by Roadway Design. No special considerations for pyritic shale or potentially acid producing rock should be needed for this site.

#### Station 221+00 to 250+50

The interval consists of at grade improvements, broad thin fills up to seven feet in thickness, and shallow ditch line cuts of up to approximately 3 feet. A long, thin, full width cut of up to seven feet deep is required from Station 250+50 to Station 252+50.

It is recommended that the fill material in this interval be compacted thoroughly on a maximum slope ratio of 3H: 1V or flatter with adequate drainage being provided. Refer to cross-section Representative of Station 221+00 to Station 250+50.

#### Station 250+50 to Station 256+00

The interval consists of at grade improvements, broad shallow cuts of up to approximately seven feet deep left of centerline, and broad thin fills up to seven feet in thickness to the right of centerline. A long, thin, full width cut of up to seven feet deep is required from Station 250+50 to Station 252+50.

It is recommended that the fill material in this interval be compacted thoroughly on a maximum slope ratio of 3H: 1V or flatter with adequate drainage being provided. Refer to cross-section Representative of Station 250+50 to Station 256+00.

Station 256+00 to Station 272+50

The interval consists of very broad fills up to thirteen feet in thickness to the right of centerline with some shallow ditch line cuts of up to approximately 3 feet deep to the left of centerline.

It is recommended that the fill material in this interval be compacted thoroughly on a maximum slope ratio of 3H: 1V or flatter with adequate drainage being provided. Refer to cross-section Representative of Station 256+00 to Station 272+50.

Station 272+50 to Station 284+00

The interval consists of thin fills up to six feet in thickness to the left of centerline. The interval to the right of centerline begins with thin fills up to four feet thick from Station 272+50 to Station 274+50 then transitions to shallow cuts of up to six feet deep to Station 283+50.

It is recommended that the fill material in this interval be compacted thoroughly on a maximum slope ratio of 3H: 1V or flatter with adequate drainage being provided. Refer to cross-section Representative of Station 272+50 to Station 284+00.

Station 284+00 to 285+50

The interval consists of thin fills up to six feet in thickness to the left and right of centerline. It is recommended that the fill material in this interval be compacted thoroughly on a maximum slope ratio of 3H: 1V or flatter with adequate drainage being provided. Refer to cross-section Representative of Station 284+00 to 285+50.

#### Station 285+50 to 291+00

The interval begins with at grade improvements left and right of centerline and transitions to thin cuts of less than four feet in thickness near Station 286+50. At Station 289+50 the cuts transition to thin fills of four feet in thickness to the left and right of centerline along with at grade improvements to Station 291+00. It is recommended that the fill material in this interval be compacted thoroughly on a maximum slope ratio of 3H: 1V or flatter with adequate drainage being provided. Refer to cross-section Representative of Station 285+50 to 291+00.

#### Station 291+00 to 297+00

The interval consists of broad fills to the left and right of centerline of not more than fifteen feet in thickness. It is recommended that the fill material in this interval be compacted thoroughly on a maximum slope ratio of 3H: 1V or flatter with adequate drainage being provided. Refer to cross-section Representative of Station 291+00 to 297+00.

#### Station 297+00 to Station 347+00

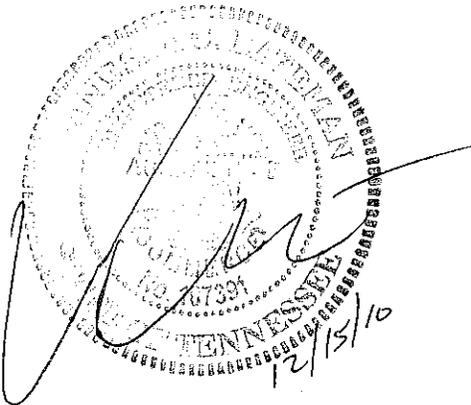
The interval consists of at grade improvements, shallow cuts of less than approximately three feet deep left and right of centerline, along with areas of thin fills up to three feet in thickness left and right of centerline.

It is recommended that the fill material in this interval be compacted thoroughly on a maximum slope ratio of 3H: 1V or flatter with adequate drainage being provided. Refer to cross-section Representative of Station 297+00 to Station 347+00.

Station 347+00 to Station 355+10

The beginning of the interval consists of at grade improvements, shallow ditch line cuts of up to five feet deep left of centerline, and thin fills up to three feet in thickness to the right of centerline to near Station 348+50 . At Station 348+50 the grading transitions from cut and fill to broad thin fills up to eight feet thick to the end of the proposed project. It is recommended that the fill material in this interval be compacted thoroughly on a maximum slope ratio of 3H: 1V or flatter with adequate drainage being provided. Refer to cross-section Representative of Station 347+00 to Station 355+10.

If there are questions concerning this report, please contact the Geotechnical Engineering Section. CBR values for pavement subgrade design were determined to be 6 based on the county average.



  
Samuel Porter Williams, P.G.  
Geologist 3

  
Vanessa Bateman, P.E., P.G.  
Civil Engineering Manager 1

VB:SW:CW  
December 15, 2010

GEOTECHNICAL REPORT  
State Route 101 Widening  
From Fire Tower Road to East of Stonehinge Drive/Eagle Lane in Fairfield Glade  
Cumberland County  
Project No. 18038-1230-04

This is a report on the geotechnical study of the proposed widening of State Route 101 between existing four-lane and one-half mile east of Eagle Lane in Fairfield Glade. The existing alignment is curvy laid down on undulating ground. The widening includes some straightening and leveling. The latter mostly includes filling the lows, whereas cuts are minimal. Barring any change in grade the material will be mostly borrow. No soil sheets were developed for this project due to the minimal grading required. The following paragraph should be put on the note sheet of the plans.

Soils on the plateau are commonly sandy silts (A-2-4, A-4, etc.), which are the weathering products of sandstone and shale. Cuts on the job rarely exceed 5 feet, whereas fill depths may be up to 10 feet deep. Some cuts may include weathered sandstone characterized by thin beds loosely held together and easily rippable. Hence, treat all cuts as soil slopes.

No geologic hazards were noted within limits of the job.

Recommendations

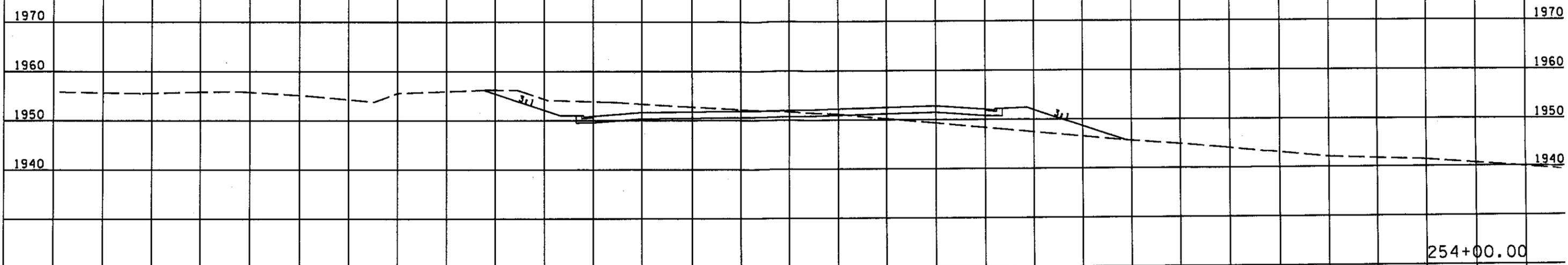
SLOPES.—Maintain cut slopes not steeper than 3:1 and all soil fill slopes 3:1 or flatter.

PAVEMENT.—Owing to the lack of material on the job, only one sample was taken as a representative of that material and tested for compaction and CBR properties. This was supplemented by 7 other CBRs of similar soil classification and taken from the same

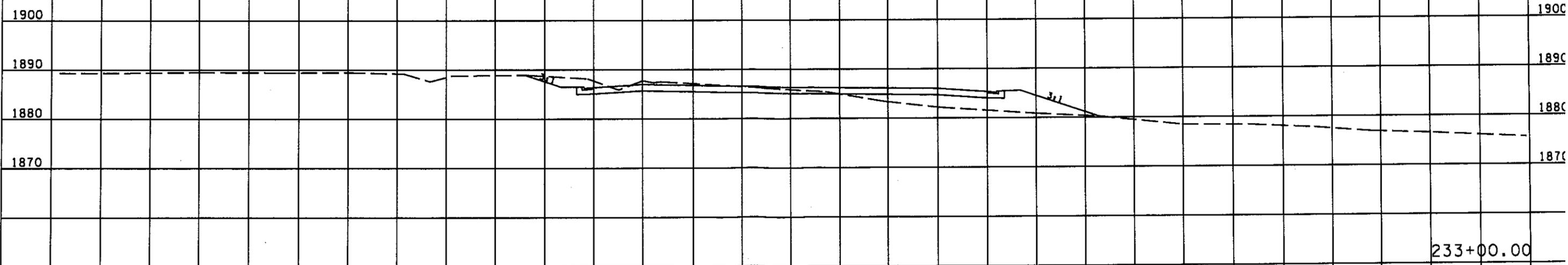
FILE NO.

TYPE	YEAR	PROJECT NO.	NO.

REPRESENTATIVE OF STATION 250+50 TO STATION 256+00



REPRESENTATIVE OF STATION 221+00 TO STATION 250+50



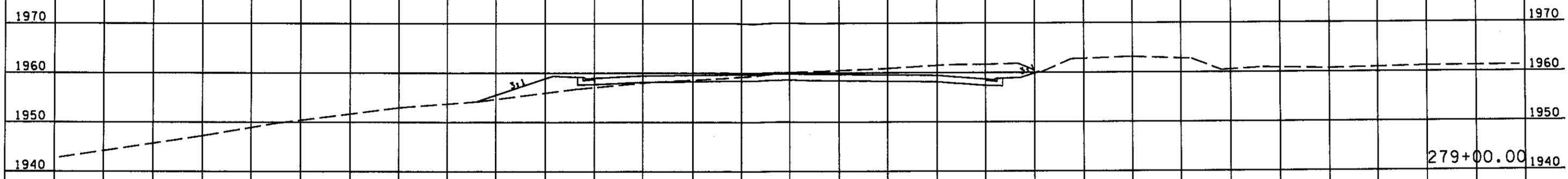
STATE OF TENNESSEE  
DEPARTMENT OF TRANSPORTATION  
TYPICAL SECTION  
STATE ROUTE 10  
CUMBERLAND COUNTY

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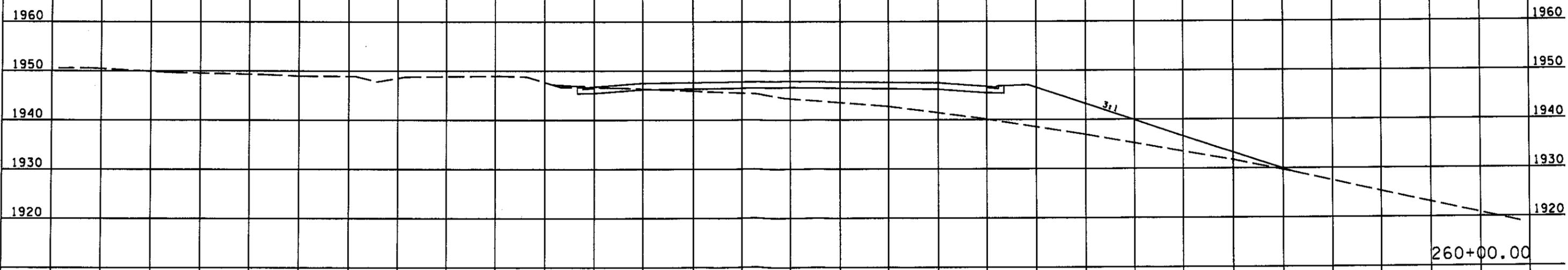
FILE NO.

TYPE	YEAR	PROJECT NO.	SHEET NO.

REPRESENTATIVE OF STATION 272+50 TO STATION 284+00



REPRESENTATIVE OF STATION 256+00 TO STATION 272+50



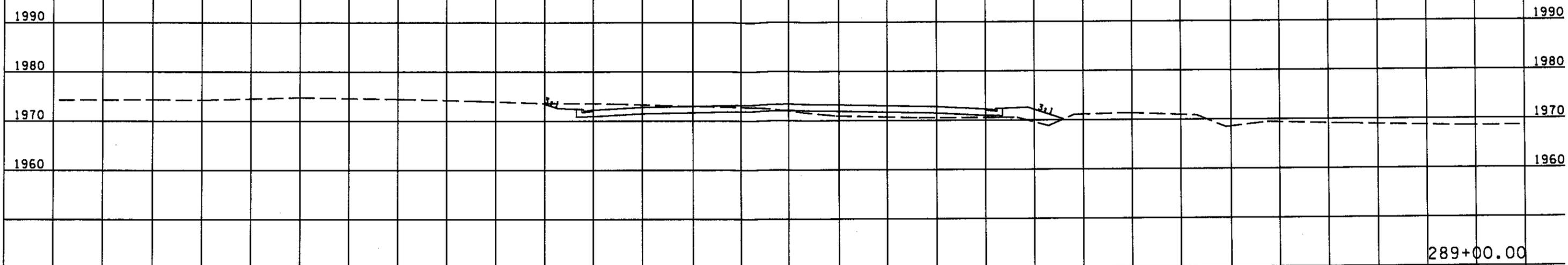
STATE OF TENNESSEE  
DEPARTMENT OF TRANSPORTATION  
TYPICAL SECTION  
STATE ROUTE 10  
CUMBERLAND COUNTY

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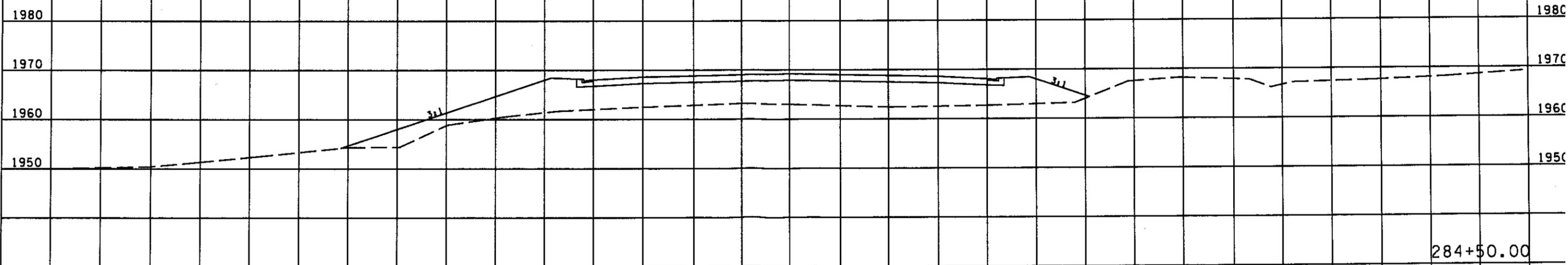
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TYPE	YEAR	PROJECT NO.	NO.

REPRESENTATIVE OF STATION 285+50 TO STATION 291+00



REPRESENTATIVE OF STATION 284+00 TO STATION 285+50

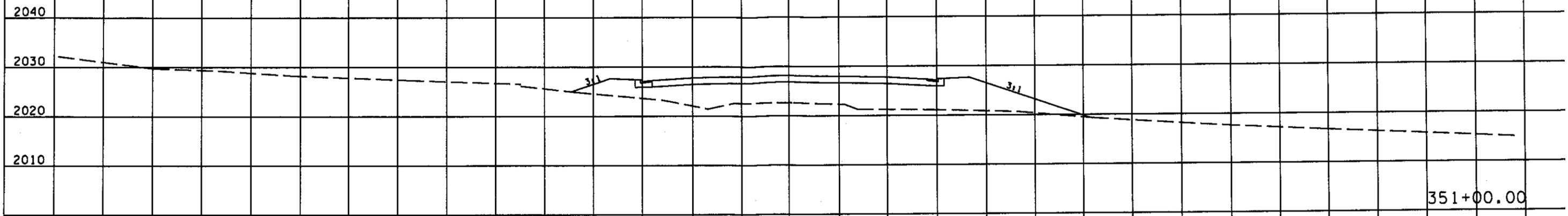


STATE OF TENNESSEE  
DEPARTMENT OF TRANSPORTATION  
TYPICAL SECTION  
STATE ROUTE 10  
CUMBERLAND COUNTY

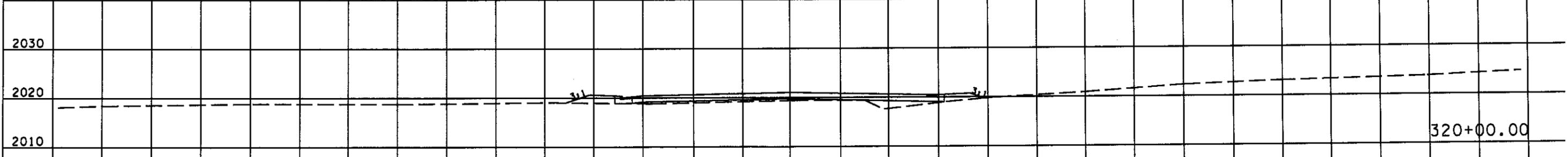
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TYPE	YEAR	PROJECT NO.	NO.

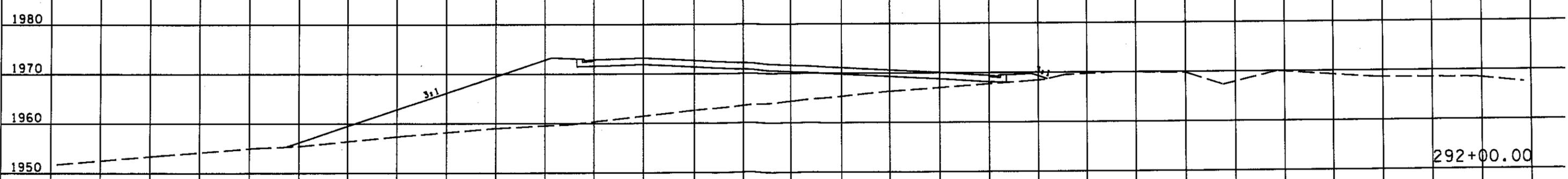
REPRESENTATIVE OF STATION 347+00 TO STATION 355+10



REPRESENTATIVE OF STATION 297+00 TO STATION 347+00



REPRESENTATIVE OF STATION 291+00 TO STATION 297+00



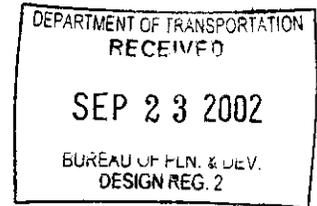
STATE OF TENNESSEE  
DEPARTMENT OF TRANSPORTATION  
TYPICAL SECTION  
STATE ROUTE 10  
CUMBERLAND COUNT

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120



STATE OF TENNESSEE  
TENNESSEE DEPARTMENT OF TRANSPORTATION  
6601 CENTENNIAL BOULEVARD  
NASHVILLE, TENNESSEE 37243-0360

September 19, 2002



Mr. Jim Johnston  
Civil Engineering Manager 1  
Design Division  
4005 Cromwell Road  
Chattanooga, TN 37422

RE: Project No. 18038-1230-04  
State Route 101 from Fire Tower Rd. to E. of Stonehenge Dr./Eagle Ln.  
Cumberland County

Dear Mr. Johnston:

Enclosed is the Geotechnical Report on the above project.

If additional information is needed, please advise.

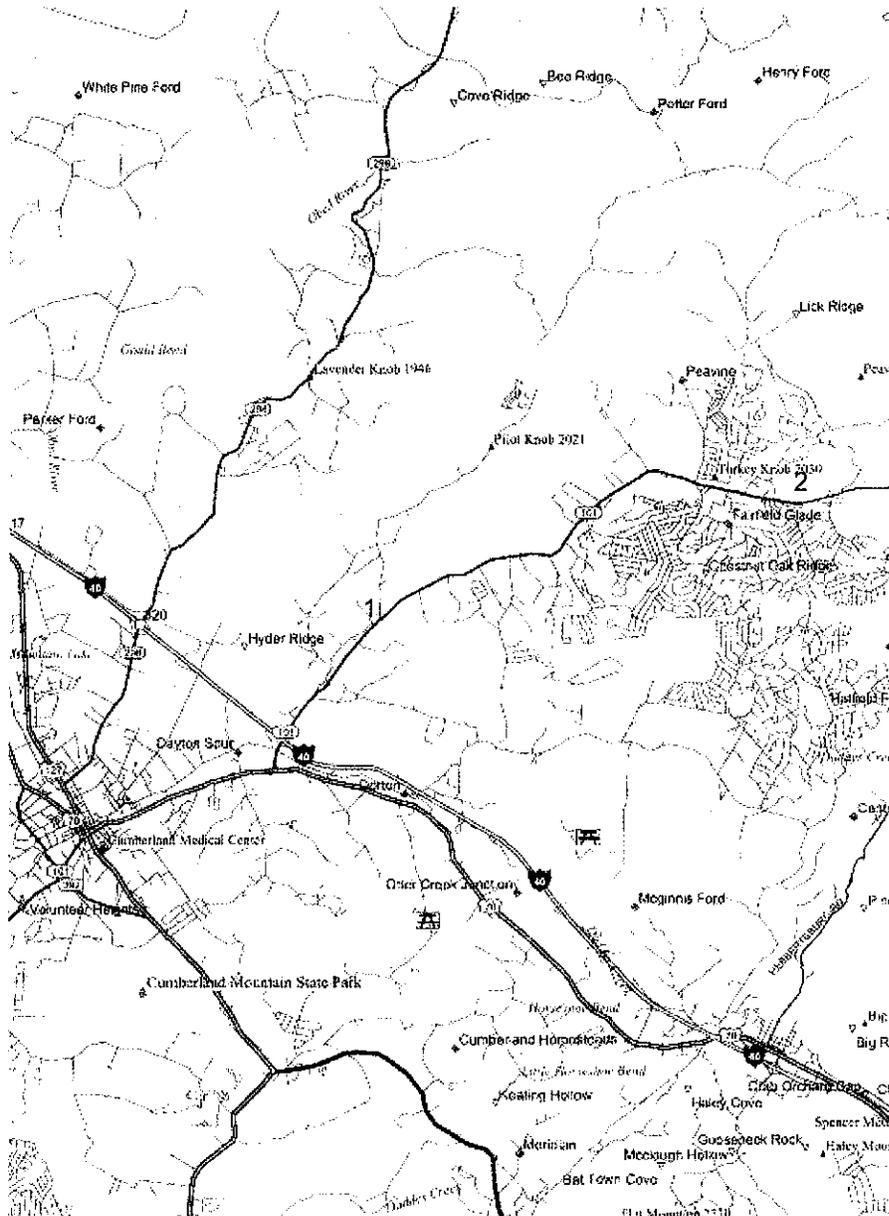
Sincerely,

A handwritten signature in black ink, appearing to read "M. Leonard Oliver".

M. Leonard Oliver, P.E.  
Civil Engineering Manager 2

MLO:LGW  
Enclosure

GEOTECHNICAL REPORT  
STATE ROUTE 101  
FROM FIRE TOWER ROAD  
TO 0.58 MILE EAST OF STONEHENGE DRIVE  
EAGLE LANE IN FAIRFIELD GLADE  
STATE PROJECT NO. 18038-1230-04  
CUMBERLAND COUNTY



1. BEGIN OF PROJECT STATION 69+53.73  
2. END OF PROJECT STATION 354+75

FILE NO. 1825501

GEOTECHNICAL REPORT  
State Route 101 Widening  
From Fire Tower Road to East of Stonehinge Drive/Eagle Lane in Fairfield Glade  
Cumberland County  
Project No. 18038-1230-04

This is a report on the geotechnical study of the proposed widening of State Route 101 between existing four-lane and one-half mile east of Eagle Lane in Fairfield Glade. The existing alignment is curvy laid down on undulating ground. The widening includes some straightening and leveling. The latter mostly includes filling the lows, whereas cuts are minimal. Barring any change in grade the material will be mostly borrow. No soil sheets were developed for this project due to the minimal grading required. The following paragraph should be put on the note sheet of the plans.

Soils on the plateau are commonly sandy silts (A-2-4, A-4, etc.), which are the weathering products of sandstone and shale. Cuts on the job rarely exceed 5 feet, whereas fill depths may be up to 10 feet deep. Some cuts may include weathered sandstone characterized by thin beds loosely held together and easily rippable. Hence, treat all cuts as soil slopes.

No geologic hazards were noted within limits of the job.

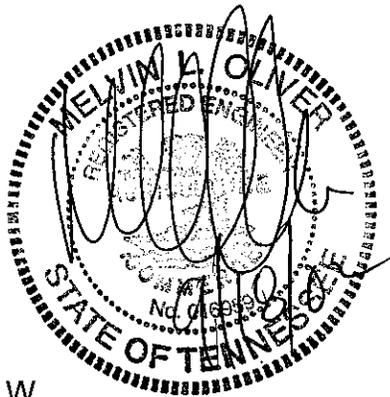
Recommendations

SLOPES.—Maintain cut slopes not steeper than 3:1 and all soil fill slopes 3:1 or flatter.

PAVEMENT.—Owing to the lack of material on the job, only one sample was taken as a representative of that material and tested for compaction and CBR properties. This was supplemented by 7 other CBRs of similar soil classification and taken from the same

environment. The CBR values ranged from 1.5 to 21.5, which was skewed to some value less than 10. (See the Subgrade Evaluation Report.) For preliminary design use a value of 5, and sample as necessary from the borrow material to determine actual CBR value.

If there are questions concerning this report, please contact the Geotechnical Engineering Section.



*Sam H*  
Sam Hilderbrand  
Geologist 3

*M. Leonard Oliver*  
M. Leonard Oliver, P.E.  
Civil Engineering Manager 2

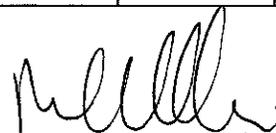
LO:SH:LW  
09/17/02

TENNESSEE DEPARTMENT OF TRANSPORTATION  
 DIVISION OF MATERIALS AND TESTS  
 GEOTECHNICAL ENGINEERING SECTION  
 NASHVILLE, TENNESSEE

SOIL AND SUBGRADE CONDITION AND EVALUATION REPORT

PROJECT NO. 18038-1230-04 COUNTY: Cumberland REGION: II  
 LOCATION: State Route 101 from Firetower Rd. to East of Stonehenge Dr./Eagle Ln. in Fairfield Glade

Station or Sample No.	Percentage Passing No. 200	Predominant Soil Type	Group Index	CBR	T-99: (Proctor)	
					Density (lb/ft <sup>3</sup> )	Optimum Moisture (%)
* 1	46	A-4	0	9.6	106.5	14.0
2	78	A-4	8	7.5	111.5	14.0
3	12	A-2-4	0	21.5	113.0	14.0
4	84	A-4	0	2.0	101.5	15.5
5	49	A-4	0	12.5	120.5	12.0
6	57	A-4	1	6.5	117.5	13.0
7	69	A-4	4	2.0	119.0	11.0
8	79	A-4	6	1.5	114.0	13.0



M. Leonard Oliver, Civil Engineering Manager 1  
 Geotechnical Engineering Section

LO:SH:LW  
 09/17/02

\* Station 354+50; remainder from other jobs

File No. 1825501

environment. The CBR values ranged from 1.5 to 21.5, which was skewed to some value less than 10. (See the Subgrade Evaluation Report.) For preliminary design use a value of 5, and sample as necessary from the borrow material to determine actual CBR value.

If there are questions concerning this report, please contact the Geotechnical Engineering Section.

Sam Hilderbrand  
Geologist 3

M. Leonard Oliver, P.E.  
Civil Engineering Manager 2

LO:SH:LW  
09/17/02

**TENNESSEE DEPARTMENT OF TRANSPORTATION**  
**DIVISION OF MATERIALS AND TESTS**  
**GEOTECHNICAL OPERATIONS**

Form DT-0212  
 Re: SG-107

**C.B.R. REPORT ON SAMPLE OF EMBANKMENT MATERIALS**

Project Reference No. \_\_\_\_\_ County Cumberland Region 2  
 Project No. 1803B-1230-04  
 Location S.R. 101 Soils Engineer Oliver  
 Report No. \_\_\_\_\_ Date Sampled 8-13-02  
 Serial No. 025605 Date Reported 9-5-02

**GRADATION—TOTAL PER CENT PASSING**

Sample No.	1				
Station	354+50				
Depth, Ft.	1				
Location, Ref.	30' L				
1"	99				
3/4"	99				
3/8"	97				
4M	94				
10M	88				
40M	74				
100M	50				
200M	46				
Silt and Clay	46				
Clay	19				

**SOIL CONSTANTS**

Lower Liquid Limit	25				
Lower Plastic Limit	18				
Plasticity Index	7				
Cal. P. I.	5				
Type	A-4				
Group	0				

**DENSITY CORRECTED FOR + 4 MATERIALS**

Proctor Density	106.6				
Optimum Moisture	14.0				
Moisture Range	9.0-21.0				

**C.B.R. DATA**

Density	109.2				
% Water	13.6				
% Water after 96 hrs. soaking	14.7				
C.B.R. Values: 0.1	9.6				
0.2	6.7				

Combarland  
CPR

