| STATE | STATE PROJECT REFERENCE NO. | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|
| N.C. | R-2100B | 1 | 17 |

# STATE OF NORTH CAROLINA
## DEPARTMENT OF TRANSPORTATION
## DIVISION OF HIGHWAYS
## GEOTECHNICAL ENGINEERING UNIT

# STRUCTURE SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. 34369.1.1 F.A. PROJ. STP-16 (1)

COUNTY ASHE

PROJECT DESCRIPTION NC 16 IMPROVEMENTS BETWEEN SR 1631 AND SR 1628

SITE DESCRIPTION BRIDGE NO. 9 ON NC 16 OVER BEAR CREEK

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INVESTIGATED BY J. C. KUHNE
CHECKED BY W. D. FRYE
SUBMITTED BY W. D. FRYE
DATE

NORTH CAROLINA LICENSED SEAL 1878 GEOLOGIST JODY KUHNE

7/24/07

PROJECT: 34369.1.1

ID: R-2100B

DRAWN BY: JC KUHNE

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# NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
## DIVISION OF HIGHWAYS
## GEOTECHNICAL ENGINEERING UNIT

# SUBSURFACE INVESTIGATION

## SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

### SOIL DESCRIPTION

SOIL IS CONSIDERED TO BE THE UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER, AND YIELD LESS THAN 100 BLOWS PER FOOT ACCORDING TO STANDARD PENETRATION TEST (AASHTO T206, ASTM D-1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY SHALL INCLUDE: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. EXAMPLE:

*VERY STIFF, GRAY, SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6*

### SOIL LEGEND AND AASHTO CLASSIFICATION

| GENERAL CLASS. | GRANULAR MATERIALS (≤ 35% PASSING #200) | | | | | | | SILT-CLAY MATERIALS (> 35% PASSING #200) | | | | ORGANIC MATERIALS | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GROUP CLASS. | A-1 | | A-3 | A-2 | | | | A-4 | A-5 | A-6 | A-7 | A-1, A-2 A-3 | A-4, A-5 A-6, A-7 | |
| | A-1-a | A-1-b | | A-2-4 | A-2-5 | A-2-6 | A-2-7 | | | | A-7-5 A-7-6 | | | |
| SYMBOL | | | | | | | | | | | | | | |
| % PASSING #10 | 50 MX | | | | | | | | | | | GRANULAR SOILS | SILT-CLAY SOILS | MUCK, PEAT |
| #40 | 30 MX | 50 MX | 51 MN | | | | | | | | | | | |
| #200 | 15 MX | 25 MX | 10 MX | 35 MX | 35 MX | 35 MX | 35 MX | 36 MN | 36 MN | 36 MN | 36 MN | | | |
| LIQUID LIMIT | 6 MX | | NP | 40 MX | 41 MN | 40 MX | 41 MN | 40 MX | 41 MN | 40 MX | 41 MN | SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER | | HIGHLY ORGANIC SOILS |
| PLASTIC INDEX | | | | 10 MX | 10 MX | 11 MN | 11 MN | 10 MX | 10 MX | 11 MN | 11 MN | | | |
| GROUP INDEX | 0 | | 0 | 0 | | 4 MX | | 8 MX | 12 MX | 16 MX | No MX | | | |
| USUAL TYPES OF MAJOR MATERIALS | STONE FRAGS. GRAVEL, AND SAND | | FINE SAND | SILTY OR CLAYEY GRAVEL AND SAND | | | | SILTY SOILS | | CLAYEY SOILS | | | | |
| GEN. RATING AS A SUBGRADE | EXCELLENT TO GOOD | | | | | | | FAIR TO POOR | | | | FAIR TO POOR | POOR | UNSUITABLE |

PI OF A-7-5 SUBGROUP IS ≤ LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30

### CONSISTENCY OR DENSENESS

| PRIMARY SOIL TYPE | COMPACTNESS OR CONSISTENCY | RANGE OF STANDARD PENETRATION RESISTENCE (N-VALUE) | RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT$^2$) |
|---|---|---|---|
| GENERALLY GRANULAR MATERIAL (NON-COHESIVE) | VERY LOOSE<br>LOOSE<br>MEDIUM DENSE<br>DENSE<br>VERY DENSE | <4<br>4 TO 10<br>10 TO 30<br>30 TO 50<br>>50 | N/A |
| GENERALLY SILT-CLAY MATERIAL (COHESIVE) | VERY SOFT<br>SOFT<br>MEDIUM STIFF<br>STIFF<br>VERY STIFF<br>HARD | <2<br>2 TO 4<br>4 TO 8<br>8 TO 15<br>15 TO 30<br>>30 | <0.25<br>0.25 TO 0.50<br>0.5 TO 1.0<br>1 TO 2<br>2 TO 4<br>>4 |

### TEXTURE OR GRAIN SIZE

| U.S. STD. SIEVE SIZE | 4 | 10 | 40 | 60 | 200 | 270 |
|---|---|---|---|---|---|---|
| OPENING (MM) | 4.76 | 2.00 | 0.42 | 0.25 | 0.075 | 0.053 |

| BOULDER (BLDR.) | COBBLE (COB.) | GRAVEL (GR.) | COARSE SAND (CSE. SD.) | FINE SAND (F SD.) | SILT (SL.) | CLAY (CL.) |
|---|---|---|---|---|---|---|

GRAIN SIZE MM: 305 | 75 | 2.0 | 0.25 | 0.05 | 0.005
GRAIN SIZE IN.: 12 | 3

### SOIL MOISTURE - CORRELATION OF TERMS

| SOIL MOISTURE SCALE (ATTERBERG LIMITS) | FIELD MOISTURE DESCRIPTION | GUIDE FOR FIELD MOISTURE DESCRIPTION |
|---|---|---|
| | - SATURATED - (SAT.) | USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE |
| LL — LIQUID LIMIT<br>PLASTIC RANGE (PI)<br>PL — PLASTIC LIMIT | - WET - (W) | SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE |
| OM — OPTIMUM MOISTURE<br>SL — SHRINKAGE LIMIT | - MOIST - (M) | SOLID; AT OR NEAR OPTIMUM MOISTURE |
| | - DRY - (D) | REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE |

### PLASTICITY

| | PLASTICITY INDEX (PI) | DRY STRENGTH |
|---|---|---|
| NONPLASTIC | 0-5 | VERY LOW |
| LOW PLASTICITY | 6-15 | SLIGHT |
| MED. PLASTICITY | 16-25 | MEDIUM |
| HIGH PLASTICITY | 26 OR MORE | HIGH |

### COLOR

DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY). MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.

### GRADATION

WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE.
UNIFORM - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. (ALSO POORLY GRADED)
GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLES OF TWO OR MORE SIZES.

### ANGULARITY OF GRAINS

THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.

### MINERALOGICAL COMPOSITION

MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE.

### COMPRESSIBILITY

| | |
|---|---|
| SLIGHTLY COMPRESSIBLE | LIQUID LIMIT LESS THAN 31 |
| MODERATELY COMPRESSIBLE | LIQUID LIMIT EQUAL TO 31-50 |
| HIGHLY COMPRESSIBLE | LIQUID LIMIT GREATER THAN 50 |

### PERCENTAGE OF MATERIAL

| ORGANIC MATERIAL | GRANULAR SOILS | SILT - CLAY SOILS | OTHER MATERIAL | |
|---|---|---|---|---|
| TRACE OF ORGANIC MATTER | 2 - 3% | 3 - 5% | TRACE | 1 - 10% |
| LITTLE ORGANIC MATTER | 3 - 5% | 5 - 12% | LITTLE | 10 - 20% |
| MODERATELY ORGANIC | 5 - 10% | 12 - 20% | SOME | 20 - 35% |
| HIGHLY ORGANIC | >10% | >20% | HIGHLY | 35% AND ABOVE |

### GROUND WATER

- WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING
- STATIC WATER LEVEL AFTER 24 HOURS
- PW PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA
- SPRING OR SEEP

### MISCELLANEOUS SYMBOLS

- ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION
- SOIL SYMBOL
- ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT
- INFERRED SOIL BOUNDARY
- INFERRED ROCK LINE
- ALLUVIAL SOIL BOUNDARY
- 25/025 DIP & DIP DIRECTION OF ROCK STRUCTURES
- SOUNDING ROD
- SPT CPT DPT DMT VST PMT TEST BORING
- AUGER BORING
- CORE BORING
- MW MONITORING WELL
- PIEZOMETER INSTALLATION
- SLOPE INDICATOR INSTALLATION
- SPT N-VALUE
- REF SPT REFUSAL

SAMPLE DESIGNATIONS
S - BULK SAMPLE
SS - SPLIT SPOON SAMPLE
ST - SHELBY TUBE SAMPLE
RS - ROCK SAMPLE
RT - RECOMPACTED TRIAXIAL SAMPLE
CBR - CALIFORNIA BEARING RATIO SAMPLE
O.G. - ORIGINAL GROUND SURFACE

### ABBREVIATIONS

AR - AUGER REFUSAL
BT - BORING TERMINATED
CL. - CLAY
CPT - CONE PENETRATION TEST
CSE. - COARSE
DMT - DILATOMETER TEST
DPT - DYNAMIC PENETRATION TEST
e - VOID RATIO
F - FINE
FOSS. - FOSSILIFEROUS
FRAC. - FRACTURED, FRACTURES
FRAGS. - FRAGMENTS
HI. - HIGHLY
MED. - MEDIUM
MIC. - MICACEOUS
MOD. - MODERATELY
NP - NON PLASTIC
ORG. - ORGANIC
PMT - PRESSUREMETER TEST
SAP. - SAPROLITIC
SD. - SAND, SANDY
SL. - SILT, SILTY
SLI. - SLIGHTLY
TCR - TRICONE REFUSAL
w - MOISTURE CONTENT
V - VERY
VST - VANE SHEAR TEST
WEA. - WEATHERED
$\gamma$ - UNIT WEIGHT
$\gamma_d$ - DRY UNIT WEIGHT
FIAD - FILLED IN AFTER DRILLING
O.G. - ORIGINAL GROUND SURFACE

### EQUIPMENT USED ON SUBJECT PROJECT

DRILL UNITS:
- [ ] MOBILE B-___
- [ ] BK-51
- [ ] CME-45C
- [X] CME-550
- [ ] PORTABLE HOIST
- [ ] _____
- [ ] _____

ADVANCING TOOLS:
- [ ] CLAY BITS
- [ ] 6" CONTINUOUS FLIGHT AUGER
- [ ] 8" HOLLOW AUGERS
- [ ] HARD FACED FINGER BITS
- [ ] TUNG.-CARBIDE INSERTS
- [X] CASING [X] W/ ADVANCER
- [ ] TRICONE _____" STEEL TEETH
- [ ] TRICONE _____" TUNG.-CARB.
- [ ] CORE BIT
- [ ] _____

HAMMER TYPE:
- [X] AUTOMATIC
- [ ] MANUAL

CORE SIZE:
- [ ] -B_____
- [ ] -N_____
- [ ] -H_____

HAND TOOLS:
- [ ] POST HOLE DIGGER
- [ ] HAND AUGER
- [ ] SOUNDING ROD
- [ ] VANE SHEAR TEST
- [ ] _____

### ROCK DESCRIPTION

HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT IF TESTED, WOULD YIELD SPT REFUSAL. AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS. IN NON-COASTAL PLAIN MATERIAL, THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK.
ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:

| | |
|---|---|
| WEATHERED ROCK (WR) | NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100 BLOWS PER FOOT IF TESTED. |
| CRYSTALLINE ROCK (CR) | FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC. |
| NON-CRYSTALLINE ROCK (NCR) | FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN SEDIMENTARY ROCK THAT WOULD YEILD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC. |
| COASTAL PLAIN SEDIMENTARY ROCK (CP) | COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC. |

### WEATHERING

| | |
|---|---|
| FRESH | ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER HAMMER IF CRYSTALLINE. |
| VERY SLIGHT (V SLI.) | ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN, CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF OF A CRYSTALLINE NATURE. |
| SLIGHT (SLI.) | ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS. |
| MODERATE (MOD.) | SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED WITH FRESH ROCK. |
| MODERATELY SEVERE (MOD. SEV.) | ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES "CLUNK" SOUND WHEN STRUCK. *IF TESTED, WOULD YIELD SPT REFUSAL* |
| SEVERE (SEV.) | ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. *IF TESTED, YIELDS SPT N VALUES > 100 BPF* |
| VERY SEVERE (V SEV.) | ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT THE MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE SUCH THAT ONLY MINOR VESTIGES OF THE ORIGINAL ROCK FABRIC REMAIN. *IF TESTED, YIELDS SPT N VALUES < 100 BPF* |
| COMPLETE | ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE. |

### ROCK HARDNESS

| | |
|---|---|
| VERY HARD | CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK. |
| HARD | CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN. |
| MODERATELY HARD | CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS. |
| MEDIUM HARD | CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PEICES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK. |
| SOFT | CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE. |
| VERY SOFT | CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNAIL. |

### FRACTURE SPACING

| TERM | SPACING |
|---|---|
| VERY WIDE | MORE THAN 10 FEET |
| WIDE | 3 TO 10 FEET |
| MODERATELY CLOSE | 1 TO 3 FEET |
| CLOSE | 0.16 TO 1 FEET |
| VERY CLOSE | LESS THAN 0.16 FEET |

### BEDDING

| TERM | THICKNESS |
|---|---|
| VERY THICKLY BEDDED | > 4 FEET |
| THICKLY BEDDED | 1.5 - 4 FEET |
| THINLY BEDDED | 0.16 - 1.5 FEET |
| VERY THINLY BEDDED | 0.03 - 0.16 FEET |
| THICKLY LAMINATED | 0.008 - 0.03 FEET |
| THINLY LAMINATED | < 0.008 FEET |

### INDURATION

FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF THE MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.

| | |
|---|---|
| FRIABLE | RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE. |
| MODERATELY INDURATED | GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER. |
| INDURATED | GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER. |
| EXTREMELY INDURATED | SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS. |

### TERMS AND DEFINITIONS

ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER.

AQUIFER - A WATER BEARING FORMATION OR STRATA.

ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND.

ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS. OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, AS SHALE, SLATE, ETC.

ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE.

CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.

COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE.

CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.

DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK.

DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL.

DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.

FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.

FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.

FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM PARENT MATERIAL.

FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.

FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD.

JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.

LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT.

LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.

MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.

PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM.

RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.

ROCK QUALITY DESIGNATION (RQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.

SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK.

SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS.

SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE.

STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N OR BPF) OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS.

STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.

STRATA ROCK QUALITY DESIGNATION (SRQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.

TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.

BENCH MARK: BM #6 ON -BL- STA. 129+35.2

ELEVATION: 2672.9 FT.

NOTES:

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
Michael F. Easley, GOVERNOR
P.O. BOX 25201, RALEIGH, N.C. 27611-5201
Lyndo Tippett, SECRETARY

12 July, 2007

STATE PROJECT: 34369.1.1, R-2100B

COUNTY: Ashe

DESCRIPTION: NC 16 from SE of SR 1158 to SE of NC 88
SITE: Bridge No. 9 on NC 16 over Bear Creek

SUBJECT: Geotechnical Report – Foundation Investigation

**Introduction**

This is a 80 feet long single span replacement of the existing culvert structure. According to the Hydraulics Report the skew is $90^0$. The investigation borings were advanced using a CME 550 ATV rig using NW casing and advancer. Standard Penetration Tests (SPT) were performed at intervals of 5.0 feet using an automatic drop hammer. Soil samples were submitted for testing of quality.

The existing culvert crosses Bear Creek at the intersection of the creek and the floodplain of the New River. A detour bridge in the form of a crown span culvert will be constructed 75' east of the existing. No borings were taken for the temporary structure.

**Foundation Materials**

End Bent One

Subsurface materials across the bent range from roadway fill over in-situ weathered rock and rock on the right into roadway fill over alluvial sediments of the New River floodplain on the left. The break between fill and alluvium in boring EB1-A is difficult to ascertain due to the similarity of the soil qualities and strength. 2.9' of weathered rock overlies high quality crystalline rock at 11.0' depth. Cored rock was recovered with RQD's above 98% to a termination depth of 30.2'. EB1-B had 2.1' of fill over 1.5' of weathered rock. Cored rock was drilled to a depth of 22.8' with recoveries of 100% and RQD's of 100%.

End Bent Two

EB2 shows alluvial thickness greater than EB1 since the bent rests in a widened part of the New River floodplain. Roadway fill is consistent across the bent at 7.5 – 8' which overlies 5.5' of alluvium in EB2-A and 9.1' of alluvium in EB2-B. EB1-A has a thin veneer of weathered rock over moderately weathered rock to 18', then 100% recovery and RQD values to termination depth at 33.1'. EB2-B has alluvium directly on fresh rock with quality values of 92% in the first 2' of coring and RQD's of 100% to termination depth at 35.9'.

Alluvium tested as AASHTO a-1 but runs a range of quality from silty sands to dense gravels.

**Groundwater**

Water levels are fairly consistent in EB1-A, EB1-B and EB2-A at 11 – 13'. These depths probably relate more to the New River base flow and floodplain than for Bear Creek. The water level of 2.0' in EB2-B is related to the proximity of the ditchline and recent rain at the time of drilling..

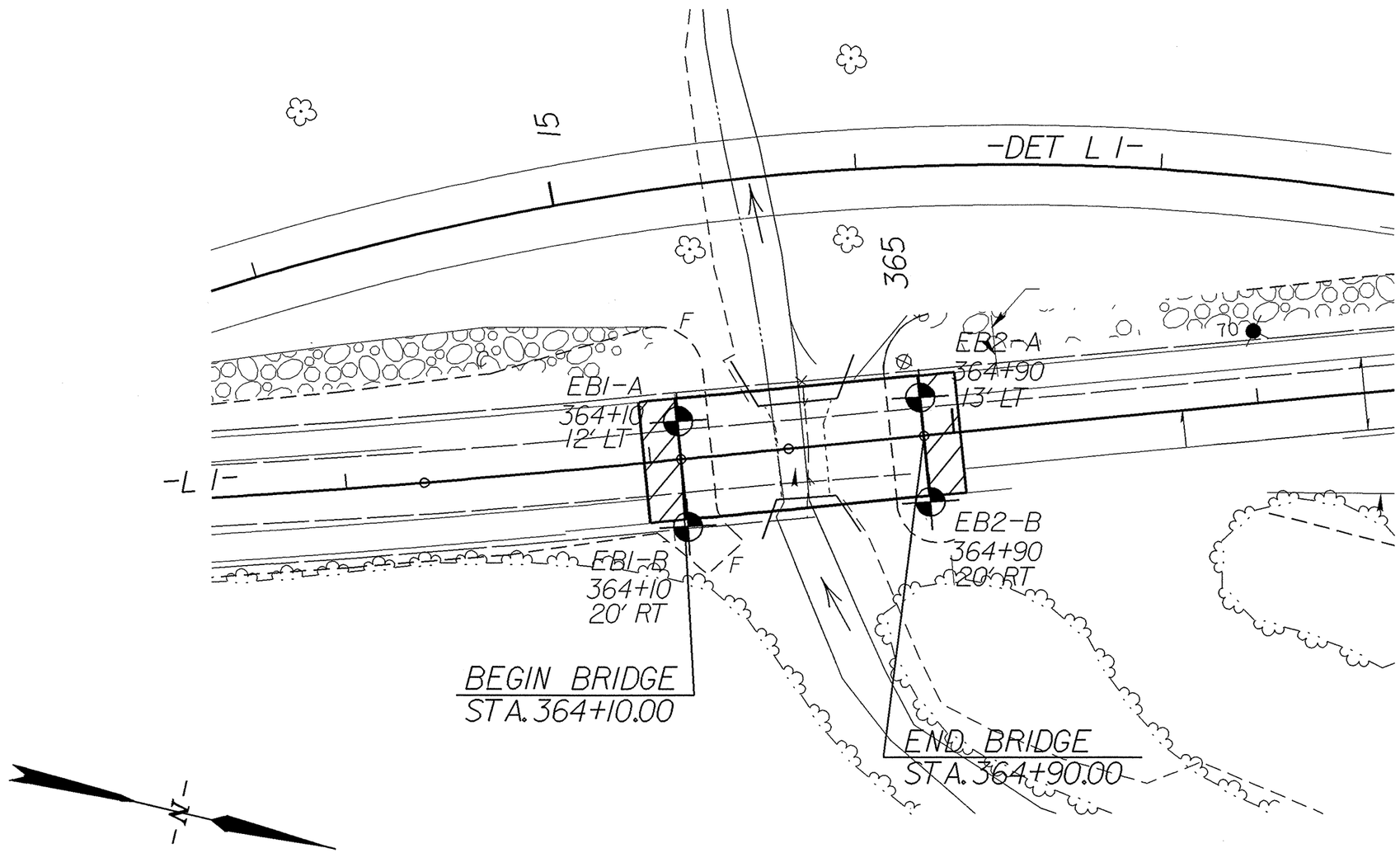
Respectfully submitted,

Jody C. Kuhne

| PROJECT REFERENCE NO. | | SHEET |
|---|---|---|
| R2100B | 34369.1.1 | 4 OF 7 |

0 50 100

FEET
40 SCALE
SKEW = 90°




**GEOTECHNICAL ENGINEERING UNIT**

☐ EASTERN REGIONAL OFFICE
☒ WESTERN REGIONAL OFFICE
☐ CONTRACT OFFICE

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

REVISIONS

| NO. | BY | DATE | NO. | BY | DATE |
|---|---|---|---|---|---|
| 1 | | | 3 | | |
| 2 | | | 4 | | |

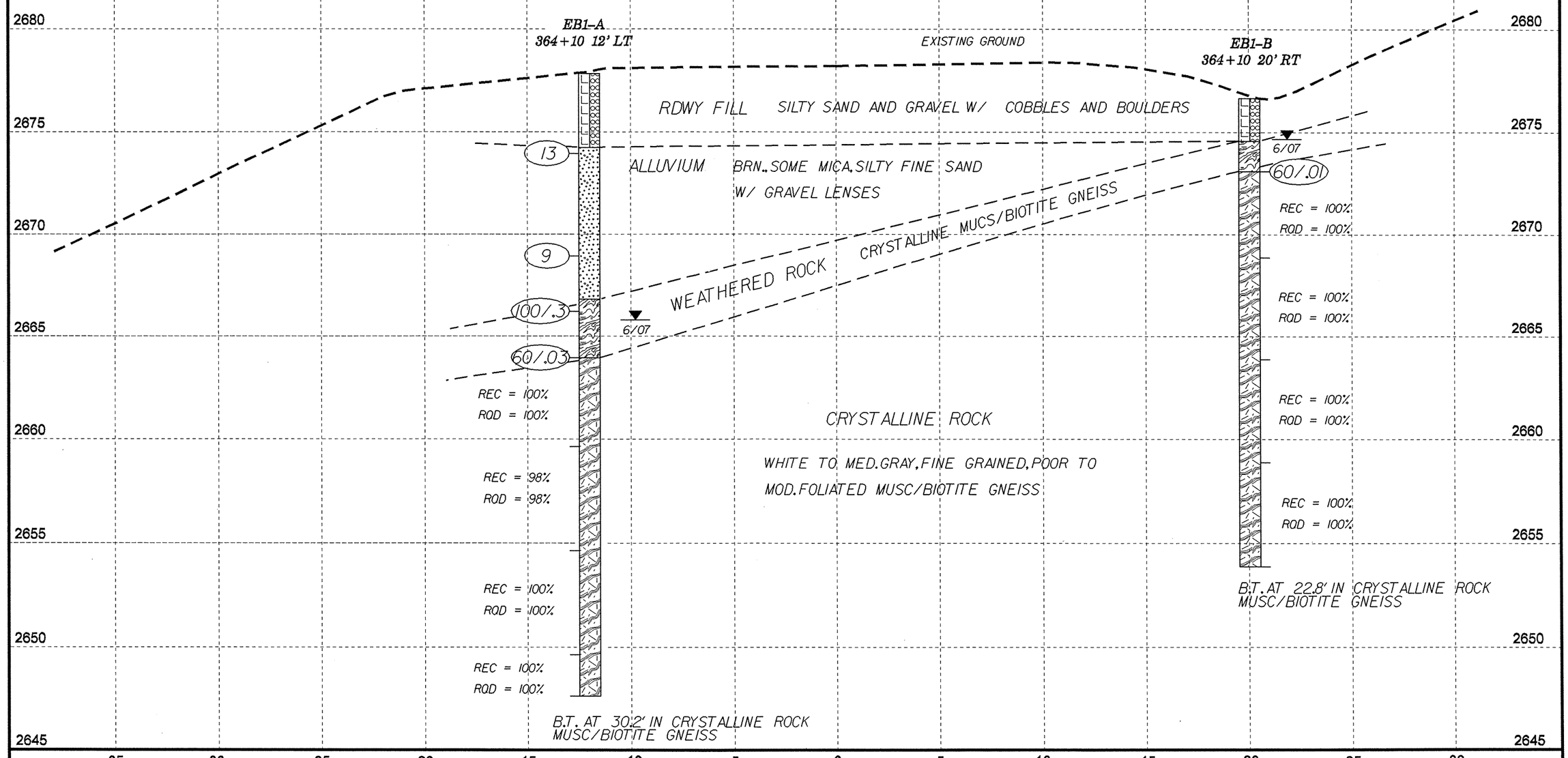
| PROJECT REFERENCE NO. | SHEET |
|---|---|
| R-2100B | 5 OF 17 |

0 5 10
FEET
VE = 1

# R-2100B, 34369.1.1
# BRIDGE NO. 9 ON NC 16
# OVER BEAR CREEK

SKEW = 90°
50 SCALE

## SECTION THROUGH EB-1

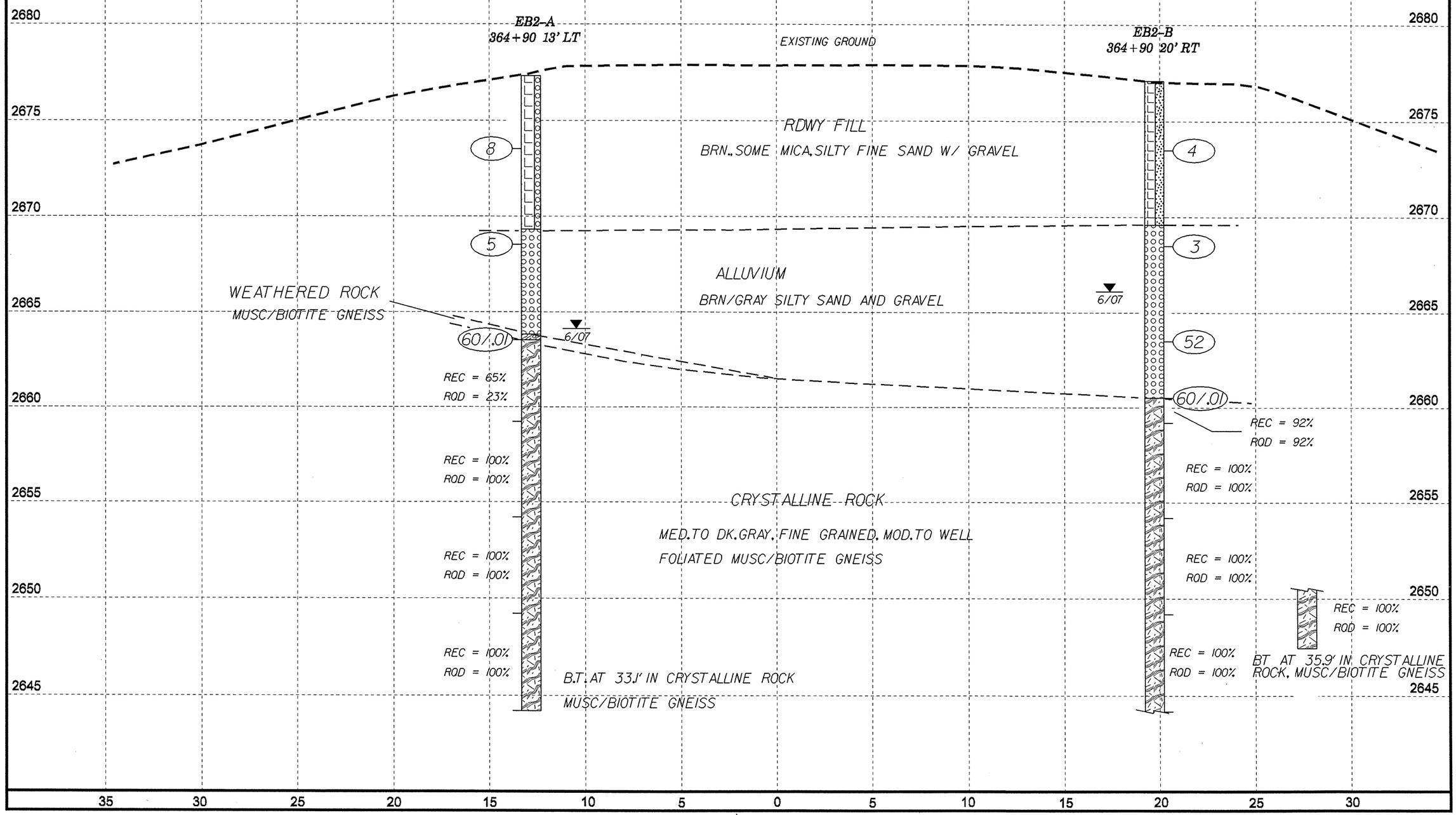


| PROJECT REFERENCE NO. | SHEET |
|---|---|
| R-2100B | 6 OF 17 |

# R-2100B, 34369.1.1
# BRIDGE NO. 9 ON NC 16
# OVER BEAR CREEK

## SECTION THROUGH EB-2

SKEW = 90°
50 SCALE



# NCDOT GEOTECHNICAL ENGINEERING UNIT
# BORELOG REPORT

SHEET

| | | | |
|---|---|---|---|
| PROJECT NO. 34369.1.1 | ID. R2100B | COUNTY ASHE | GEOLOGIST Daniel, T. B. |
| SITE DESCRIPTION BR #9 ON NC 15 OVER BEAR CREEK | | | GROUND WTR (ft) |
| BORING NO. EB1A | STATION 364+10 | OFFSET 12ft LT | ALIGNMENT -L1- | 0 HR. N/A |
| COLLAR ELEV. 2,677.8 ft | TOTAL DEPTH 30.2 ft | NORTHING 969,686 | EASTING 1,292,275 | 24 HR. 12.0 |
| DRILL MACHINE CME-550 | DRILL METHOD NW Casing w/ SPT Core | | HAMMER TYPE Automatic |
| START DATE 06/12/07 | COMP. DATE 06/12/07 | SURFACE WATER DEPTH N/A | DEPTH TO ROCK 13.9 ft |

| ELEV (ft) | DEPTH (ft) | BLOW COUNT 0.5ft | 0.5ft | 0.5ft | BLOWS PER FOOT 0 25 50 75 100 | SAMP. NO. | MOI | LOG | SOIL AND ROCK DESCRIPTION ELEV. (ft) | DEPTH (ft) |
|---|---|---|---|---|---|---|---|---|---|---|
| 2680 | | | | | | | | | 2,677.8 GROUND SURFACE | 0.0 |
| 2,673.9 | 3.9 | | | | | | | | **ROADWAY EMBANKMENT** SAND AND GRAVEL W/ COBBLES 2,674.2 | 3.6 |
| | | 23 | 3 | 10 | 13 | | M | | **ALLUVIAL** BRN., SOME MICA, SILTY FINE SAND W/ GRAVEL LENSES | |
| 2,668.9 | 8.9 | | | | | | | | | |
| 2,666.2 | 11.6 | 3 | 4 | 5 | 9 | SS-3 | W | | 2,666.8 | 11.0 |
| | | 100/0.3 | | | 100/0.3 | | | | **WEATHERED ROCK** NO SAMPLE: WEATHERED CRYSTALLINE ROCK, BIOTITE GNEISS | |
| 2,663.9 | 13.9 | 60/.03 | | | 60/.03 | | | | 2,663.9 **CRYSTALLINE ROCK** WHITE/LT. GRAY, FINE GRAINED, POORLY FOLIATED MUSC./BIOTITE GNEISS | 13.9 |
| | | | | | | | | | 2,647.6 | 30.2 |
| | | | | | | | | | Boring Terminated at Elevation 2,647.6 ft IN CRYSTALLINE ROCK | |

NCDOT BORE SINGLE R2100B_GEO_BH.GPJ NC_DOT.GDT 07/24/07

SHEET 7 of 17

DATE 10-Jul-07

# CORE BORING REPORT

PROJECT: 34369.1.1 I. D. NO: R-2100B BORING NO: EB1-A GEOLOGIST: TB DANIEL

DESCRIPTION: BRIDGE #9 ON NC 16 OVER BEAR CREEK

COUNTY: ASHE COLLAR ELEVATION: 2677.8 FT. TOTAL DEPTH: 30.2 FT.

| ELEV. (FEET) | DEPTH (FEET) | DRILL RATE MIN./FT. | RUN (FEET) | REC. FEET % | RQD. FEET % | SAMP. # | FIELD CLASSIFICATION AND REMARKS |
|---|---|---|---|---|---|---|---|
| 2663.9 | 13.9 | | | | | | |
| | | 9 | 4.3 | 4.3 | 4.3 | | WHITE/LT. GRAY, MED. TO FINE GRAINED, POORLY FOLIATED MUSC/BIOTITE GNEISS |
| | | TOTAL | | 100 | 100 | | |
| 2659.6 | 18.2 | RUN | | | | | |
| 2659.6 | 18.2 | | | | | | |
| | | 10 | 5.0 | 4.9 | 4.9 | | SAME AS ABOVE |
| | | TOTAL | | 98 | 98 | | |
| 2654.6 | 23.2 | RUN | | | | | |
| 2654.6 | 23.2 | | | | | | |
| | | 11 | 5.0 | 5.0 | 5.0 | | SAME AS ABOVE |
| | | TOTAL | | 100 | 100 | | |
| 2649.6 | 28.2 | RUN | | | | | |
| 2649.6 | 28.2 | | | | | | |
| | | 3 | 2.0 | 2.0 | 2.0 | | SAME AS ABOVE |
| | | TOTAL | | 100 | 100 | | |
| 2647.6 | 30.2 | RUN | | | | | |

CORING TERMINATED AT ELEVATION FT.

DRILLER: C COFFEY CORE SIZE: NXWL EQUIPMENT: CME-550

# NCDOT GEOTECHNICAL ENGINEERING UNIT
# BORELOG REPORT

SHEET

| | | | |
|---|---|---|---|
| PROJECT NO. 34369.1.1 | ID. R2100B | COUNTY ASHE | GEOLOGIST Daniel, T. B. |
| SITE DESCRIPTION BR #9 ON NC 15 OVER BEAR CREEK | | | GROUND WTR (ft) |
| BORING NO. EB1B | STATION 364+10 | OFFSET 20ft RT | ALIGNMENT -L1- | 0 HR. N/A |
| COLLAR ELEV. 2,676.7 ft | TOTAL DEPTH 22.8 ft | NORTHING 969,704 | EASTING 1,292,305 | 24 HR. 2.0 |
| DRILL MACHINE CME-550 | DRILL METHOD NW Casing w/ SPT Core | | HAMMER TYPE Automatic |
| START DATE 06/11/07 | COMP. DATE 06/11/07 | SURFACE WATER DEPTH N/A | DEPTH TO ROCK 3.6 ft |

| ELEV (ft) | DEPTH (ft) | BLOW COUNT 0.5ft | 0.5ft | 0.5ft | BLOWS PER FOOT 0 25 50 75 100 | SAMP. NO. | MOI | LOG | SOIL AND ROCK DESCRIPTION ELEV. (ft) | DEPTH (ft) |
|---|---|---|---|---|---|---|---|---|---|---|
| 2680 | | | | | | | | | 2,676.7 GROUND SURFACE | 0.0 |
| | | | | | | | | | **ROADWAY EMBANKMENT** NO SAMPLE, SILTY SAND W/ BOULDERS AND GRAVEL 2,674.6 | 2.1 |
| 2,673.1 | 3.6 | 60/.01 | | | 60/.01 | | | | 2,673.1 **WEATHERED ROCK** NO SAMPLE, HARD DRILLING THROUGH INTERVAL | 3.6 |
| | | | | | | | | | **CRYSTALLINE ROCK** LT. TO MED. GRAY, FINE GRAINED, POOR TO MOD. FOLIATED BIOTITE/MUSC. GNEISS | |
| | | | | | | | | | 2,653.9 | 22.8 |
| | | | | | | | | | Boring Terminated at Elevation 2,653.9 ft IN CRYSTALLINE ROCK | |

NCDOT BORE SINGLE R2100B_GEO_BH.GPJ NC_DOT.GDT 07/24/07

SHEET 8 of 17

DATE 10-Jul-07

# CORE BORING REPORT

PROJECT: 34369.1.1 I. D. NO: R-2100B BORING NO: EB1-B GEOLOGIST: TB DANIEL

DESCRIPTION: BRIDGE #9 ON NC 16 OVER BEAR CREEK

COUNTY: ASHE COLLAR ELEVATION: 2676.7 FT. TOTAL DEPTH: 22.8 FT.

| ELEV. (FEET) | DEPTH (FEET) | DRILL RATE MIN./FT. | RUN (FEET) | REC. FEET % | RQD. FEET % | SAMP. # | FIELD CLASSIFICATION AND REMARKS |
|---|---|---|---|---|---|---|---|
| 2673.1 | 3.6 | | | | | | |
| | | 8 | 4.2 | 4.2 | 4.2 | | LT. GRAY, FINE GRAINED, POORLY FOLIATED MUSC/BIOTITE GNEISS |
| | | TOTAL | | 100 | 100 | | |
| 2668.9 | 7.8 | RUN | | | | | |
| 2668.9 | 7.8 | | | | | | |
| | | 10 | 5.0 | 5.0 | 5.0 | | MED. GRAY, FINE TO MED. GRAINED, MOD. TO POORLY FOLIATED MUSC/BIOTITE GNEISS |
| | | TOTAL | | 100 | 100 | | |
| 2663.9 | 12.8 | RUN | | | | | |
| 2663.9 | 12.8 | | | | | | |
| | | 9 | 5.0 | 5.0 | 5.0 | | MED. GRAY, FINE TO MED. GRAINED, MOD. TO POORLY FOLIATED MUSC/BIOTITE GNEISS |
| | | TOTAL | | 100 | 100 | | |
| 2658.9 | 17.8 | RUN | | | | | |
| 2658.9 | 17.8 | | | | | | |
| | | 9 | 5.0 | 5.0 | 5.0 | | MED. GRAY, MED. GRAINED MOD. FOLIATED MUSC/BIOTITE GNEISS |
| | | TOTAL | | 100 | 100 | | |
| 2653.9 | 22.8 | RUN | | | | | |

CORING TERMINATED AT ELEVATION FT.

DRILLER: C COFFEY CORE SIZE: NXWL EQUIPMENT: CME-550

# NCDOT GEOTECHNICAL ENGINEERING UNIT
# BORELOG REPORT

SHEET

| | | | |
|---|---|---|---|
| PROJECT NO. 34369.1.1 | ID. R2100B | COUNTY ASHE | GEOLOGIST Daniel, T. B. |
| SITE DESCRIPTION BR #9 ON NC 15 OVER BEAR CREEK | | | GROUND WTR (ft) |
| BORING NO. EB2A | STATION 364+90 | OFFSET 13ft LT | ALIGNMENT -L1- | 0 HR. N/A |
| COLLAR ELEV. 2,677.4 ft | TOTAL DEPTH 33.1 ft | NORTHING 969,755 | EASTING 1,292,234 | 24 HR. 13.2 |
| DRILL MACHINE CME-550 | DRILL METHOD NW Casing w/ SPT Core | | HAMMER TYPE Automatic |
| START DATE 06/12/07 | COMP. DATE 06/12/07 | SURFACE WATER DEPTH N/A | DEPTH TO ROCK 13.8 ft |

| ELEV (ft) | DEPTH (ft) | BLOW COUNT 0.5ft | 0.5ft | 0.5ft | BLOWS PER FOOT 0 25 50 75 100 | SAMP. NO. | MOI | LOG | SOIL AND ROCK DESCRIPTION ELEV. (ft) | DEPTH (ft) |
|---|---|---|---|---|---|---|---|---|---|---|
| 2680 | | | | | | | | | | |
| | | | | | | | | | 2,677.4 GROUND SURFACE | 0.0 |
| 2,673.6 | 3.8 | | | | | | | | ROADWAY EMBANKMENT<br>BRN SILTY FINE SAND AND GRAVEL | |
| | | 2 | 6 | 2 | 8 | | W | | | |
| 2,668.6 | 8.8 | | | | | | | | 2,669.4 | 8.0 |
| | | 0 | 2 | 3 | 5 | | W | | ALLUVIAL<br>SAMPLE LOST, GRAVEL NOTED IN DRILLING | |
| 2,663.6 | 13.8 | | | | | | | | 2,663.9 | 13.5 |
| | | 60/.01 | | | 60/.01 | | | | 2,663.6 WEATHERED ROCK<br>NO SAMPLE, SLOW DRILL PENETRATION TO REFUSAL | 13.8 |
| | | | | | | | | | CRYSTALLINE ROCK<br>MED. TO DK. GRAY, FINE GRAINED, MOD. TO WELL FOLIATED MUSC./BIOTITE GNEISS | |
| | | | | | | | | | 2,644.3 | 33.1 |
| | | | | | | | | | Boring Terminated at Elevation 2,644.3 ft IN CRYSTALLINE ROCK | |

NCDOT BORE SINGLE R2100B_GEO_BH.GPJ NC_DOT.GDT 07/24/07

SHEET 9 of 17

DATE 10-Jul-07

# CORE BORING REPORT

PROJECT: 34369.1.1 I. D. NO: R-2100B BORING NO: EB2-A GEOLOGIST: TB DANIEL

DESCRIPTION: BRIDGE #9 ON NC 16 OVER BEAR CREEK

COUNTY: ASHE COLLAR ELEVATION: 2677.4 FT. TOTAL DEPTH: 22.8 FT.

| ELEV. (FEET) | DEPTH (FEET) | DRILL RATE MIN./FT. | RUN (FEET) | REC. FEET % | RQD. FEET % | SAMP. # | FIELD CLASSIFICATION AND REMARKS |
|---|---|---|---|---|---|---|---|
| 2663.6 | 13.8 | | 4.3 | 2.8<br>65 | 1.0<br>23 | | LT. TO MED GRAY, POOR TO MOD. FOLIATED, MOD. WEATHERED MUSC/BIOTITE GNEISS |
| 2659.3 | 18.1 | | | | | | |
| 2659.3 | 18.1 | 10 | 5.0 | 5.0<br>100 | 5.0<br>100 | | MED. GRAY, FINE TO MED. GRAINED, MOD. TO POORLY FOLIATED MUSC/BIOTITE GNEISS |
| | | TOTAL | | | | | |
| 2654.3 | 23.1 | RUN | | | | | |
| 2654.3 | 23.1 | 11 | 5.0 | 5.0<br>100 | 5.0<br>100 | | MED. GRAY, FINE TO MED. GRAINED, MOD. TO POORLY FOLIATED MUSC/BIOTITE GNEISS |
| | | TOTAL | | | | | |
| 2649.3 | 28.1 | RUN | | | | | |
| 2649.3 | 28.1 | | 5.0 | 5.0<br>100 | 5.0<br>100 | | MED. TO DK. GRAY, MOD. TO WELL FOLIATED MUSC/BIOTITE GNEISS |
| 2644.3 | 33.1 | | | | | | |

CORING TERMINATED AT ELEVATION FT.

DRILLER: C COFFEY CORE SIZE: NXWL EQUIPMENT: CME-550

# NCDOT GEOTECHNICAL ENGINEERING UNIT
# BORELOG REPORT

SHEET

| | | | |
|---|---|---|---|
| PROJECT NO. 34369.1.1 | ID. R2100B | COUNTY ASHE | GEOLOGIST Daniel, T. B. |
| SITE DESCRIPTION BR #9 ON NC 15 OVER BEAR CREEK | | | GROUND WTR (ft) |
| BORING NO. EB2B | STATION 364+90 | OFFSET 20ft RT | ALIGNMENT -L1- | 0 HR. N/A |
| COLLAR ELEV. 2,677.0 ft | TOTAL DEPTH 35.9 ft | NORTHING 969,772 | EASTING 1,292,264 | 24 HR. 11.0 |
| DRILL MACHINE CME-550 | DRILL METHOD NW Casing w/ SPT Core | | HAMMER TYPE Automatic |
| START DATE 06/07/07 | COMP. DATE 06/07/07 | SURFACE WATER DEPTH N/A | DEPTH TO ROCK 16.6 ft |

| ELEV (ft) | DEPTH (ft) | BLOW COUNT 0.5ft | 0.5ft | 0.5ft | BLOWS PER FOOT 0 25 50 75 100 | SAMP. NO. | MOI | LOG | SOIL AND ROCK DESCRIPTION ELEV. (ft) | DEPTH (ft) |
|---|---|---|---|---|---|---|---|---|---|---|
| 2680 | | | | | | | | | | |
| | | | | | | | | | 2,677.0 GROUND SURFACE | 0.0 |
| 2,673.4 | 3.6 | | | | | | | | **ROADWAY EMBANKMENT** BRN, SOME MIC., SILTY FINE SAND | |
| | | 6 | 3 | 1 | 4 | SS-1 | M | | | |
| 2,668.4 | 8.6 | | | | | | | | 2,669.5 | 7.5 |
| | | 1 | 1 | 2 | 3 | | M | | **ALLUVIAL** BRN/GRAY SILTY SAND AND GRAVEL | |
| 2,663.4 | 13.6 | | | | | | | | | |
| | | 68 | 27 | 25 | 52 100/.01 | SS-2 | W | | 2,660.4 | 16.6 |
| | | | | | | | | | **CRYSTALLINE ROCK** MED. TO DK. GRAY, MOD. TO WELL FOLIATED, FINE GRAINED BIOTITE/MUSC. GNEISS | |
| | | | | | | | | | 2,641.1 | 35.9 |
| | | | | | | | | | Boring Terminated at Elevation 2,641.1 ft IN CRYSTALLINE ROCK | |

NCDOT BORE SINGLE R2100B_GEO_BH.GPJ NC_DOT.GDT 07/24/07

SHEET 10 of 17

DATE 10-Jul-07

# CORE BORING REPORT

PROJECT: 34369.1.1 I. D. NO: R-2100B BORING NO: EB2-B GEOLOGIST: TB DANIEL

DESCRIPTION: BRIDGE #9 ON NC 16 OVER BEAR CREEK

COUNTY: ASHE COLLAR ELEVATION: 2677.0 FT. TOTAL DEPTH: 22.8 FT.

| ELEV. (FEET) | DEPTH (FEET) | DRILL RATE MIN./FT. | RUN (FEET) | REC. FEET % | RQD. FEET % | SAMP. # | FIELD CLASSIFICATION AND REMARKS |
|---|---|---|---|---|---|---|---|
| 2660.4 | 16.6 | | 1.3 | 1.2 92 | 1.2 92 | | MED. TO DK. GRAY, FINE TO MED. GRAINED, MOD. FOLIATED MUSC/BIOTITE GNEISS |
| 2659.1 | 17.9 | | | | | | |
| 2659.1 | 17.9 | 10 | 5.0 | 5.0 100 | 5.0 100 | | SAME AS ABOVE |
| 2654.1 | 22.9 | TOTAL RUN | | | | | |
| 2654.1 | 22.9 | 11 | 5.0 | 5.0 100 | 5.0 100 | | MED. GRAY, FINE TO MED. GRAINED, MOD. TO POORLY FOLIATED MUSC/BIOTITE GNEISS |
| 2649.1 | 27.9 | TOTAL RUN | | | | | |
| 2649.1 | 27.9 | 8 | 5.0 | 5.0 100 | 5.0 100 | | MED. TO DK. GRAY, MOD. TO WELL FOLIATED MUSC/BIOTITE GNEISS |
| 2644.1 | 32.9 | TOTAL RUN | | | | | |
| 2644.1 | 32.9 | 4 | 3.0 | 3.0 100 | 3.0 100 | | MED. TO DK. GRAY, MOD. TO WELL FOLIATED MUSC/BIOTITE GNEISS |
| 2641.1 | 35.9 | TOTAL RUN | | | | | |

CORING TERMINATED AT ELEVATION FT.

DRILLER: C COFFEY CORE SIZE: NXWL EQUIPMENT: CME-550

JCS

# NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
## DIVISION OF HIGHWAYS-MATERIALS AND TESTS UNIT
## SOILS TEST REPORT-SOILS LABORATORY

| | |
|---|---|
| T.I.P. ID #: | -- |

| | |
|---|---|
| REPORT ON SAMPLES OF: | Soils for Quality |

| | | | | | |
|---|---|---|---|---|---|
| PROJECT: | R-2100B | COUNTY: | N/A | Owner: | |
| DATE SAMPLED: | 6.7.07 | DATE RECEIVED: | 6.19.07 | DATE REPORTED: | 6.25.07 |
| SAMPLED FROM: | Split Spoon | SAMPLED BY: | J. C. Kuhne | | |
| SUBMITTED BY: | W. D. Frye | 2002 | STANDARD SPECIFICATION | | |
| LABORATORY: | Asheville | | | | |

### TEST RESULTS

| Project Sample No. | SS-1 | SS-2 | SS-3 | | | | | |
|---|---|---|---|---|---|---|---|---|
| Lab Sample No. A | 155447 | 155448 | 155449 | | | | | |
| HiCAMS Sample # | -- | -- | -- | | | | | |
| Retained #4 Sieve % | 5.0 | 30.0 | 34.0 | | | | | |
| Passing #10 Sieve % | 89 | 35 | 57 | | | | | |
| Passing #40 Sieve % | 82 | 30 | 51 | | | | | |
| Passing #200 Sieve % | 32 | 12 | 21 | | | | | |

### MINUS #10 FRACTION

| Soil Mortar - 100% | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Coarse Sand -Ret. #60 | 20 | 31 | 19 | | | | | |
| Fine Sand - Ret. #270 | 52 | 46 | 54 | | | | | |
| Silt 0.05-0.005 mm % | 16 | 19 | 19 | | | | | |
| Clay < 0.005 mm % | 12 | 4 | 8 | | | | | |
| Passing # 40 Sieve % | -- | -- | -- | | | | | |
| Passing # 200 Sieve % | -- | -- | -- | | | | | |

| Liquid Limit | 21 | 24 | 26 | | | | | |
|---|---|---|---|---|---|---|---|---|
| Plastic Index | NP | NP | NP | | | | | |
| AASHTO Classification | A-2-4 (0) | A-1-a (0) | A-2-4 (0) | | | | | |
| Quantity | | | | | | | | |
| Texture | | | | | | | | |
| Station | N/A | N/A | N/A | | | | | |
| Hole No. | | | | | | | | |
| Depth (ft) From: | 3.6 | 13.6 | 8.9 | | | | | |
| To: | 5.1 | 15.1 | 10.4 | | | | | |
| | | | | | | | | |

**Remarks:**

A-155447 - 155449

**CC:**

| | |
|---|---|
| J. C. Kuhne | |
| File | |
| | |
| | |

| | |
|---|---|
| SOILS ENGINEER: | |

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL ENGINEERING UNIT

# FIELD SCOUR REPORT

WBS: 34369.1.1 TIP: R-2100B COUNTY: ASHE

DESCRIPTION(1): ____

## EXISTING BRIDGE

Information from: Field Inspection XX Microfilm ____ (reel ____ pos: ____ )
Other (explain) ____

Bridge No.: 9 Length: 24' Total Bents: 2 Bents in Channel: 0 Bents in Floodplain: 2
Foundation Type: ____

**EVIDENCE OF SCOUR(2)**

Abutments or End Bent Slopes: NONE NOTED

Interior Bents: ____

Channel Bed: ____

Channel Bank: MINOR CUTTING AND SLOUGHING OF BANKS, OUTLET SIDE

**EXISTING SCOUR PROTECTION**

Type(3): WINGWALLS, EACH BENT

Extent(4): 10', EACH BENT

Effectiveness(5): EFFECTIVE

Obstructions(6): NONE

**INSTRUCTIONS**

1 Describe the specific site's location, including route number and body of water crossed.
2 Note scour evidence at existing end bents or abutments (e.g. undermining, sloughing, degradations).
3 Note existing scour protection (e.g. rip rap).
4 Describe extent of existing scour protection.
5 Describe whether or not the scour protection appears to be working.
6 Note obstructions such as dams, fallen trees, debris at bents, etc.
7 Describe the channel bed material based on observation and/or samples. Include any lab results with report.
8 Describe the channel bank material based on observation and/or samples. Include any lab results with report.
9 Describe the material covering the banks (e.g. grass, trees, rip rap, none).
10 Determine the approximate floodplain width from field observation or a topographic map.
11 Describe the material covering the floodplain (e.g. grass, trees, crops).
12 Use professional judgement to specify if the stream is degrading, aggrading, or static.
13 Describe potential and direction of the stream to migrate laterally during the bridge's life (approx. 100 years).
14 Give the design scour elevation (DSE) expected over the life of the bridge (approx. 100 years). This elevation can be given as a range across the site, or for each bent. Discuss the relationship between the Hydraulics Unit theoritical scour and the DSE. If the DSE is dependent on scour counter measures, explain (e.g. rip rap armoring on slopes). The DSE is based on the erodability of materials, giving consideration to the influence of joints, foliation, bedding characteristics, % core recovery, % RQD, differential weathering, shear strength, observations at existing structures, other tests deemed appropriate, and overall geologic conditions at the site.



## DESIGN INFORMATION

Channel Bed Material(7): SILTY SAND W/ GRAVEL AND COBBLES

Channel Bank Material(8): SILTY SAND W/ GRAVEL AND COBBLES

Channel Bank Cover(9): SHRUBS AND GRASS

Floodplain Width(10): 20'

Floodplain Cover(11): GRASS, SHRUBS, TREES

Stream is(12): Aggrading ____ Degrading ____ Static XX

Channel Migration Tendency(13): NONE IN PARTICULAR

Observations and Other Comments: OUTLET FLOODPLAIN DOMINATED BY RIVER

**DESIGN SCOUR ELEVATIONS(14)** Feet NA Meters ____

| BENTS B1 | BENTS B2 | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| NA | NA | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

Comparison of DSE to Hydraulics Unit theoretical scour:
NO LOCAL, LONG TERM OR CONTRACTION SCOUR NOTED

**SOIL ANALYSIS RESULTS FROM CHANNEL BED AND BANK MATERIAL**

| Bed or Bank | | | | | | | |
|---|---|---|---|---|---|---|---|
| Sample No. | | | | | | | |
| Retained #4 | | | | | | | |
| Passed #10 | | | | | | | |
| Passed #40 | | | | | | | |
| Passed #200 | | | | | | | |
| Coarse Sand | | | | | | | |
| Fine Sand | | | | | | | |
| Silt | | | | | | | |
| Clay | | | | | | | |
| LL | | | | | | | |
| PI | | | | | | | |
| AASHTO | | | | | | | |
| Station | | | | | | | |
| Offset | | | | | | | |
| Depth | | | | | | | |

Template Revised 02/07/06

Reported by: [signature] Date: 7/12/07

R-2100B, 34369.1.1
BRIDGE #9 ON NC 16 OVER BEAR CREEK
BORING EB1-A

DEPTH: 13.9' – 23.8'

R-2100B, 34369.1.1
BRIDGE #9 ON NC 16 OVER BEAR CREEK
BORING EB1-A

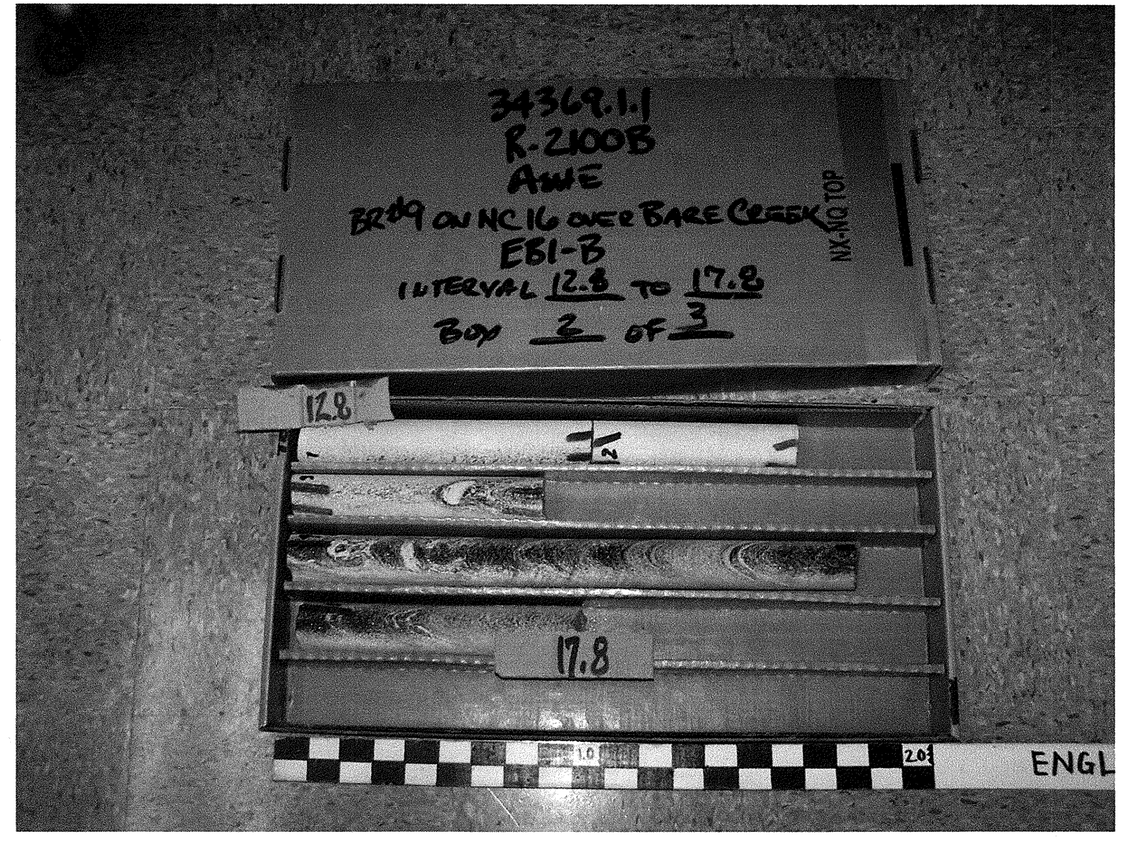
DEPTH: 23.8' – 30.2'

R-2100B, 34369.1.1
BRIDGE #9 ON NC 16 OVER BEAR CREEK
BORING EB1-B

DEPTH: 3.6' – 12.8'

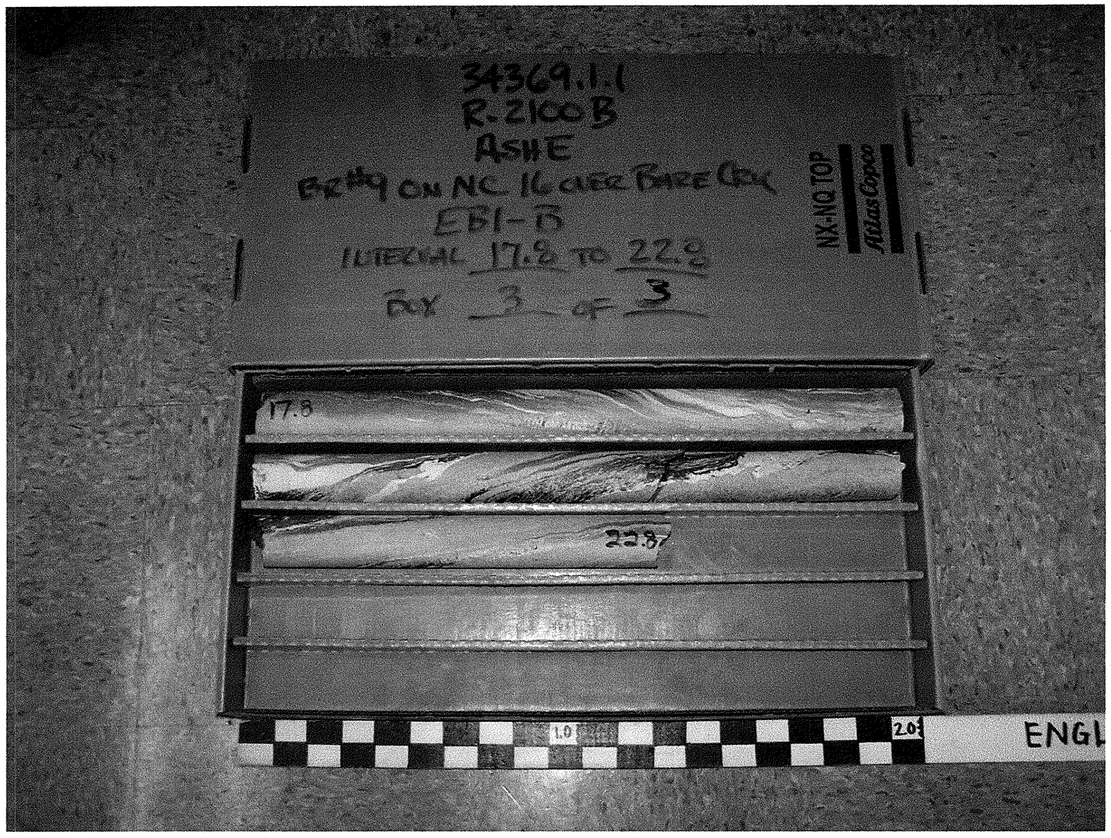
R-2100B, 34369.1.1
BRIDGE #9 ON NC 16 OVER BEAR CREEK
BORING EB1-B

DEPTH: 12.8' – 17.8'



R-2100B, 34369.1.1
BRIDGE #9 ON NC 16 OVER BEAR CREEK
BORING EB1-B

DEPTH: 17.8' – 22.8'

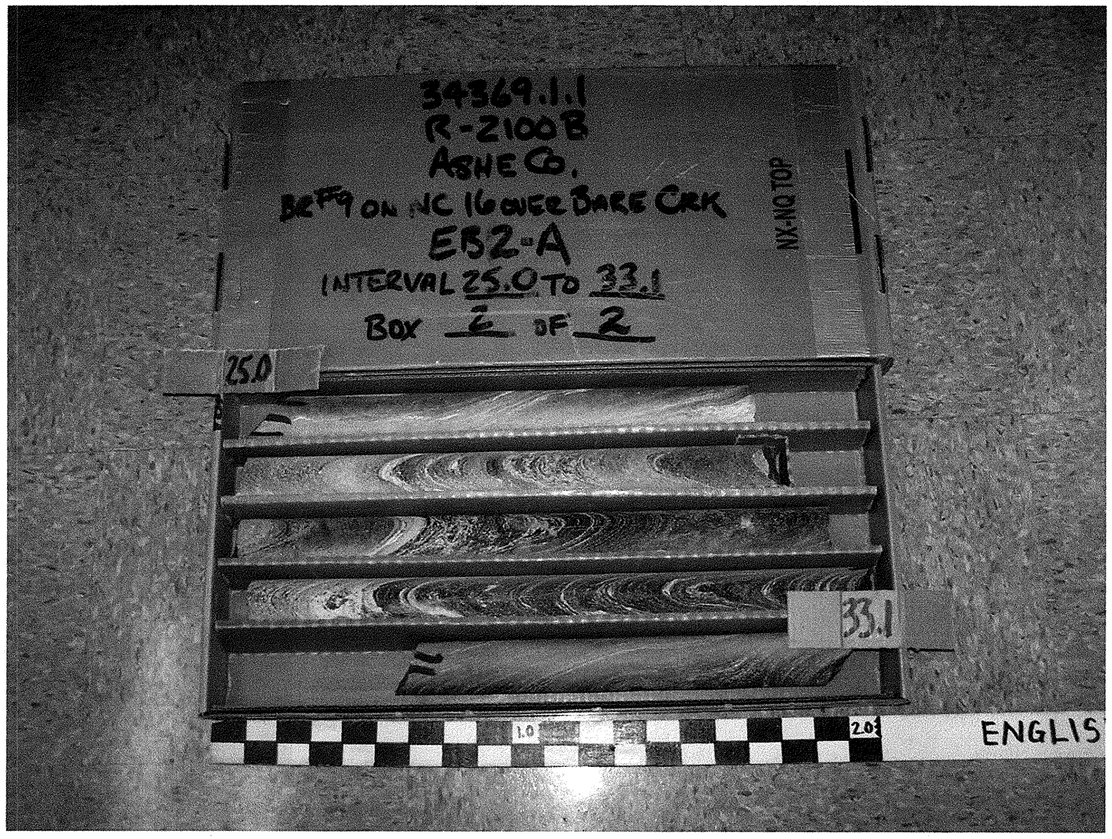



R-2100B, 34369.1.1
BRIDGE #9 ON NC 16 OVER BEAR CREEK
BORING EB2-A

DEPTH: 13.8' – 25.0'

R-2100B, 34369.1.1
BRIDGE #9 ON NC 16 OVER BEAR CREEK
BORING EB2-A

DEPTH: 25.0' – 33.1'




R-2100B, 34369.1.1
BRIDGE #9 ON NC 16 OVER BEAR CREEK
BORING EB2-B

DEPTH: 16.6' – 26.1'

R-2100B, 34369.1.1
BRIDGE #9 ON NC 16 OVER BEAR CREEK
BORING EB2-B

DEPTH: 26.1' – 35.9'

| STATE | STATE PROJECT REFERENCE NO. | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|
| N.C. | R2100B | 1 | 17 |

# STATE OF NORTH CAROLINA
## DEPARTMENT OF TRANSPORTATION
## DIVISION OF HIGHWAYS
## GEOTECHNICAL ENGINEERING UNIT

# STRUCTURE SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. R2100B F.A. PROJ. STP-16(1)

COUNTY ASHE

PROJECT DESCRIPTION NC 16 FROM SOUTHEAST OF SR 1158 TO SOUTHEAST OF NC 88

SITE DESCRIPTION RETAINING WALL FROM STA. 253+00 TO STA. 256+00 (LEFT) ON NC 16

## CONTENTS


| SHEET | DESCRIPTION |
|---|---|
| 1 | TITLE SHEET |
| 2 | LEGEND |
| 3 | SITE PLAN |
| 4 | PROFILE |
| 5 - 11 | CROSS SECTION(S) |
| 12 - 16 | BORE LOG & CORE REPORT(S) |
| 17 | SOIL TEST RESULTS |


## CAUTION NOTICE

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PERSONNEL

F & R ENGINEERING

INVESTIGATED BY L.L. ACKER

CHECKED BY W.D. FRYE

SUBMITTED BY W.D. FRYE

DATE 6/8/06

NORTH CAROLINA LICENSED SEAL 1007 GEOLOGIST LOUIS L. ACKER

6/08/06

DRAWN BY: J. T. WILLIAMS

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NOTE - BY HAVING REQUESTED THIS INFORMATION THE CONTRACTOR SPECIFICALLY WAIVES ANY CLAIMS FOR INCREASED COMPENSATION OR EXTENSION OF TIME BASED ON DIFFERENCES BETWEEN THE CONDITIONS INDICATED HEREIN AND THE ACTUAL CONDITIONS AT THE PROJECT SITE.

PROJECT: 34369.1.1

ID: R2100B

| PROJECT REFERENCE NO. | SHEET NO. |
|---|---|
| R2100B | 2 |

# NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
## DIVISION OF HIGHWAYS
## GEOTECHNICAL ENGINEERING UNIT

# SUBSURFACE INVESTIGATION

### SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

## SOIL DESCRIPTION

SOIL IS CONSIDERED TO BE THE UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER, AND YIELD LESS THAN 100 BLOWS PER FOOT ACCORDING TO STANDARD PENETRATION TEST (AASHTO T206, ASTM D-1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY SHALL INCLUDE: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. EXAMPLE:

*VERY STIFF, GRAY, SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6*

## SOIL LEGEND AND AASHTO CLASSIFICATION

| GENERAL CLASS. | GRANULAR MATERIALS (≤ 35% PASSING #200) | | | | | | | SILT-CLAY MATERIALS (> 35% PASSING #200) | | | | ORGANIC MATERIALS | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GROUP CLASS. | A-1 | | A-3 | A-2 | | | | A-4 | A-5 | A-6 | A-7 | A-1, A-2 A-3 | A-4, A-5 A-6, A-7 | |
| | A-1-a | A-1-b | | A-2-4 | A-2-5 | A-2-6 | A-2-7 | | | | A-7-5 A-7-6 | | | |
| SYMBOL | | | | | | | | | | | | | | |
| % PASSING # 10 | 50 MX | | | | | | | | | | | GRANULAR SOILS | SILT-CLAY SOILS | MUCK, PEAT |
| # 40 | 30 MX | 50 MX | 51 MN | | | | | | | | | | | |
| # 200 | 15 MX | 25 MX | 10 MX | 35 MX | 35 MX | 35 MX | 35 MX | 36 MN | 36 MN | 36 MN | 36 MN | | | |
| LIQUID LIMIT | 6 MX | | NP | 40 MX | 41 MN | 40 MX | 41 MN | 40 MX | 41 MN | 40 MX | 41 MN | SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER | | HIGHLY ORGANIC SOILS |
| PLASTIC INDEX | | | | 10 MX | 10 MX | 11 MN | 11 MN | 10 MX | 10 MX | 11 MN | 11 MN | | | |
| GROUP INDEX | 0 | | 0 | 0 | | 4 MX | | 8 MX | 12 MX | 16 MX | No MX | | | |
| USUAL TYPES OF MAJOR MATERIALS | STONE FRAGS. GRAVEL, AND SAND | | FINE SAND | SILTY OR CLAYEY GRAVEL AND SAND | | | | SILTY SOILS | | CLAYEY SOILS | | | | |
| GEN. RATING AS A SUBGRADE | EXCELLENT TO GOOD | | | | | | | FAIR TO POOR | | | | FAIR TO POOR | POOR | UNSUITABLE |

PI OF A-7-5 SUBGROUP IS ≤ LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30

## CONSISTENCY OR DENSENESS

| PRIMARY SOIL TYPE | COMPACTNESS OR CONSISTENCY | RANGE OF STANDARD PENETRATION RESISTENCE (N-VALUE) | RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT$^2$) |
|---|---|---|---|
| GENERALLY GRANULAR MATERIAL (NON-COHESIVE) | VERY LOOSE<br>LOOSE<br>MEDIUM DENSE<br>DENSE<br>VERY DENSE | <4<br>4 TO 10<br>10 TO 30<br>30 TO 50<br>>50 | N/A |
| GENERALLY SILT-CLAY MATERIAL (COHESIVE) | VERY SOFT<br>SOFT<br>MEDIUM STIFF<br>STIFF<br>VERY STIFF<br>HARD | <2<br>2 TO 4<br>4 TO 8<br>8 TO 15<br>15 TO 30<br>>30 | <0.25<br>0.25 TO 0.50<br>0.5 TO 1.0<br>1 TO 2<br>2 TO 4<br>>4 |

## TEXTURE OR GRAIN SIZE

| U.S. STD. SIEVE SIZE | 4 | 10 | 40 | 60 | 200 | 270 |
|---|---|---|---|---|---|---|
| OPENING (MM) | 4.76 | 2.00 | 0.42 | 0.25 | 0.075 | 0.053 |

| BOULDER (BLDR.) | COBBLE (COB.) | GRAVEL (GR.) | COARSE SAND (CSE. SD.) | FINE SAND (F SD.) | SILT (SL.) | CLAY (CL.) |
|---|---|---|---|---|---|---|

GRAIN SIZE MM: 305 | 75 | 2.0 | 0.25 | 0.05 | 0.005
GRAIN SIZE IN.: 12 | 3

## SOIL MOISTURE - CORRELATION OF TERMS

| SOIL MOISTURE SCALE (ATTERBERG LIMITS) | FIELD MOISTURE DESCRIPTION | GUIDE FOR FIELD MOISTURE DESCRIPTION |
|---|---|---|
| | - SATURATED - (SAT.) | USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE |
| LL — LIQUID LIMIT<br>PLASTIC RANGE (PI)<br>PL — PLASTIC LIMIT | - WET - (W) | SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE |
| OM — OPTIMUM MOISTURE<br>SL — SHRINKAGE LIMIT | - MOIST - (M) | SOLID; AT OR NEAR OPTIMUM MOISTURE |
| | - DRY - (D) | REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE |

## PLASTICITY

| | PLASTICITY INDEX (PI) | DRY STRENGTH |
|---|---|---|
| NONPLASTIC | 0-5 | VERY LOW |
| LOW PLASTICITY | 6-15 | SLIGHT |
| MED. PLASTICITY | 16-25 | MEDIUM |
| HIGH PLASTICITY | 26 OR MORE | HIGH |

## COLOR

DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY). MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.

## GRADATION

WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE.
UNIFORM - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. (ALSO POORLY GRADED)
GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLES OF TWO OR MORE SIZES.

## ANGULARITY OF GRAINS

THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.

## MINERALOGICAL COMPOSITION

MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE.

## COMPRESSIBILITY

| | |
|---|---|
| SLIGHTLY COMPRESSIBLE | LIQUID LIMIT LESS THAN 31 |
| MODERATELY COMPRESSIBLE | LIQUID LIMIT EQUAL TO 31-50 |
| HIGHLY COMPRESSIBLE | LIQUID LIMIT GREATER THAN 50 |

## PERCENTAGE OF MATERIAL

| ORGANIC MATERIAL | GRANULAR SOILS | SILT - CLAY SOILS |
|---|---|---|
| TRACE OF ORGANIC MATTER | 2 - 3% | 3 - 5% |
| LITTLE ORGANIC MATTER | 3 - 5% | 5 - 12% |
| MODERATELY ORGANIC | 5 - 10% | 12 - 20% |
| HIGHLY ORGANIC | >10% | >20% |

| OTHER MATERIAL | |
|---|---|
| TRACE | 1 - 10% |
| LITTLE | 10 - 20% |
| SOME | 20 - 35% |
| HIGHLY | 35% AND ABOVE |

## GROUND WATER

- WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING
- STATIC WATER LEVEL AFTER 24 HOURS
- PW PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA
- SPRING OR SEEP

## MISCELLANEOUS SYMBOLS

- ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION
- SOIL SYMBOL
- ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT
- INFERRED SOIL BOUNDARY
- INFERRED ROCK LINE
- ALLUVIAL SOIL BOUNDARY
- 25/025 DIP & DIP DIRECTION OF ROCK STRUCTURES
- SOUNDING ROD
- SPT CPT DPT DMT VST PMT TEST BORING
- AUGER BORING
- CORE BORING
- MW MONITORING WELL
- PIEZOMETER INSTALLATION
- SLOPE INDICATOR INSTALLATION
- SPT N-VALUE
- REF SPT REFUSAL

SAMPLE DESIGNATIONS
S - BULK SAMPLE
SS - SPLIT SPOON SAMPLE
ST - SHELBY TUBE SAMPLE
RS - ROCK SAMPLE
RT - RECOMPACTED TRIAXIAL SAMPLE
CBR - CALIFORNIA BEARING RATIO SAMPLE

## ABBREVIATIONS

AR - AUGER REFUSAL
BT - BORING TERMINATED
CL. - CLAY
CPT - CONE PENETRATION TEST
CSE. - COARSE
DMT - DILATOMETER TEST
DPT - DYNAMIC PENETRATION TEST
e - VOID RATIO
F - FINE
FOSS. - FOSSILIFEROUS
FRAC. - FRACTURED, FRACTURES
FRAGS. - FRAGMENTS
HI. - HIGHLY
MED. - MEDIUM
MICA. - MICACEOUS
MOD. - MODERATELY
NP - NON PLASTIC
ORG. - ORGANIC
PMT - PRESSUREMETER TEST
SAP. - SAPROLITIC
SD. - SAND, SANDY
SL. - SILT, SILTY
SLI. - SLIGHTLY
TCR - TRICONE REFUSAL
w - MOISTURE CONTENT
V - VERY
VST - VANE SHEAR TEST
WEA. - WEATHERED
$\gamma$ - UNIT WEIGHT
$\gamma_d$ - DRY UNIT WEIGHT

## EQUIPMENT USED ON SUBJECT PROJECT

DRILL UNITS:
- [ ] MOBILE B-___
- [ ] BK-51
- [ ] CME-45C
- [X] CME-550
- [ ] PORTABLE HOIST
- [ ] _____
- [ ] _____

ADVANCING TOOLS:
- [ ] CLAY BITS
- [ ] 6" CONTINUOUS FLIGHT AUGER
- [X] 8" HOLLOW AUGERS
- [ ] HARD FACED FINGER BITS
- [ ] TUNG.-CARBIDE INSERTS
- [X] CASING [X] W/ ADVANCER
- [ ] TRICONE ____" STEEL TEETH
- [ ] TRICONE ____" TUNG.-CARB.
- [ ] CORE BIT
- [ ] _____

HAMMER TYPE:
- [X] AUTOMATIC
- [ ] MANUAL

CORE SIZE:
- [ ] -B_____
- [X] -N_____
- [ ] -H_____

HAND TOOLS:
- [ ] POST HOLE DIGGER
- [ ] HAND AUGER
- [ ] SOUNDING ROD
- [ ] VANE SHEAR TEST
- [ ] _____

## ROCK DESCRIPTION

HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT IF TESTED, WOULD YIELD SPT REFUSAL. AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS. IN NON-COASTAL PLAIN MATERIAL, THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK.
ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:

| | |
|---|---|
| WEATHERED ROCK (WR) | NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100 BLOWS PER FOOT IF TESTED. |
| CRYSTALLINE ROCK (CR) | FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC. |
| NON-CRYSTALLINE ROCK (NCR) | FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN SEDIMENTARY ROCK THAT WOULD YEILD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC. |
| COASTAL PLAIN SEDIMENTARY ROCK (CP) | COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC. |

## WEATHERING

| | |
|---|---|
| FRESH | ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER HAMMER IF CRYSTALLINE. |
| VERY SLIGHT (V SLI.) | ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN, CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF OF A CRYSTALLINE NATURE. |
| SLIGHT (SLI.) | ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS. |
| MODERATE (MOD.) | SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED WITH FRESH ROCK. |
| MODERATELY SEVERE (MOD. SEV.) | ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES "CLUNK" SOUND WHEN STRUCK. *IF TESTED, WOULD YIELD SPT REFUSAL* |
| SEVERE (SEV.) | ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. *IF TESTED, YIELDS SPT N VALUES > 100 BPF* |
| VERY SEVERE (V SEV.) | ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT THE MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE SUCH THAT ONLY MINOR VESTIGES OF THE ORIGINAL ROCK FABRIC REMAIN. *IF TESTED, YIELDS SPT N VALUES < 100 BPF* |
| COMPLETE | ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE. |

## ROCK HARDNESS

| | |
|---|---|
| VERY HARD | CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK. |
| HARD | CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN. |
| MODERATELY HARD | CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS. |
| MEDIUM HARD | CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PEICES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK. |
| SOFT | CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE. |
| VERY SOFT | CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNAIL. |

## FRACTURE SPACING

| TERM | SPACING |
|---|---|
| VERY WIDE | MORE THAN 10 FEET |
| WIDE | 3 TO 10 FEET |
| MODERATELY CLOSE | 1 TO 3 FEET |
| CLOSE | 0.16 TO 1 FEET |
| VERY CLOSE | LESS THAN 0.16 FEET |

## BEDDING

| TERM | THICKNESS |
|---|---|
| VERY THICKLY BEDDED | > 4 FEET |
| THICKLY BEDDED | 1.5 - 4 FEET |
| THINLY BEDDED | 0.16 - 1.5 FEET |
| VERY THINLY BEDDED | 0.03 - 0.16 FEET |
| THICKLY LAMINATED | 0.008 - 0.03 FEET |
| THINLY LAMINATED | < 0.008 FEET |

## INDURATION

FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF THE MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.

| | |
|---|---|
| FRIABLE | RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE. |
| MODERATELY INDURATED | GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER. |
| INDURATED | GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER. |
| EXTREMELY INDURATED | SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS. |

## TERMS AND DEFINITIONS

ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER.

AQUIFER - A WATER BEARING FORMATION OR STRATA.

ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND.

ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, AS SHALE, SLATE, ETC.

ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE.

CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.

COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE.

CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.

DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK.

DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL.

DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.

FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.

FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.

FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM PARENT MATERIAL.

FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.

FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD.

JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.

LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT.

LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.

MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.

PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM.

RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.

ROCK QUALITY DESIGNATION (RQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.

SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK.

SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS.

SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE.

STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N OR BPF) OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS.

STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.

STRATA ROCK QUALITY DESIGNATION (SRQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.

TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.

BENCH MARK: BM #1-BY- 5 +17.49, 13.96 RT

ELEVATION: 2826.77 FT.

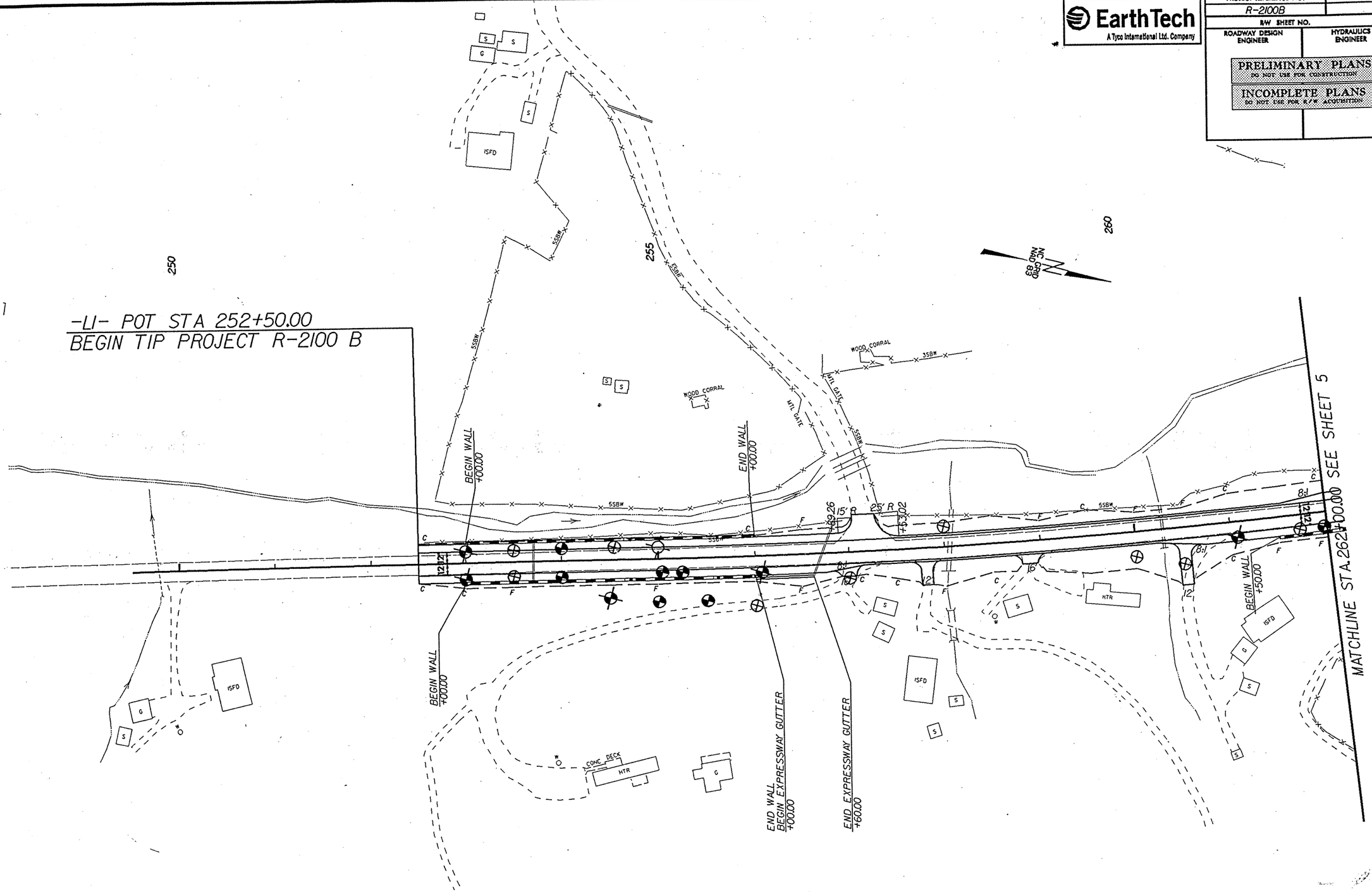
NOTES: FOR RETAINING WALL STA. 253+00 TO 256+00 LT

| PROJECT REFERENCE NO. | SHEET NO. |
|---|---|
| R-2100B | 3 |
| R/W SHEET NO. | |
| ROADWAY DESIGN ENGINEER | HYDRAULICS ENGINEER |

EarthTech
A Tyco International Ltd. Company

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

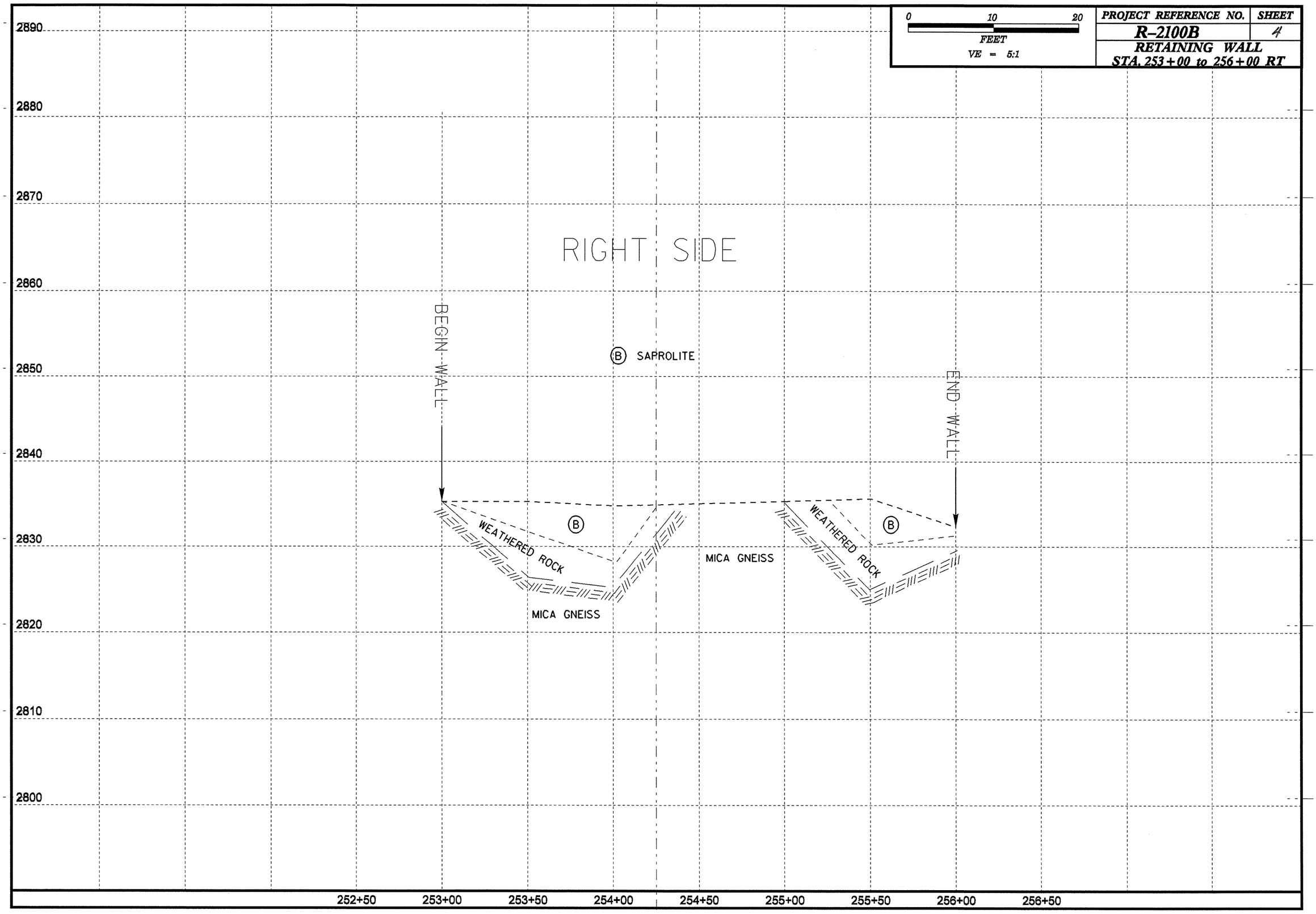


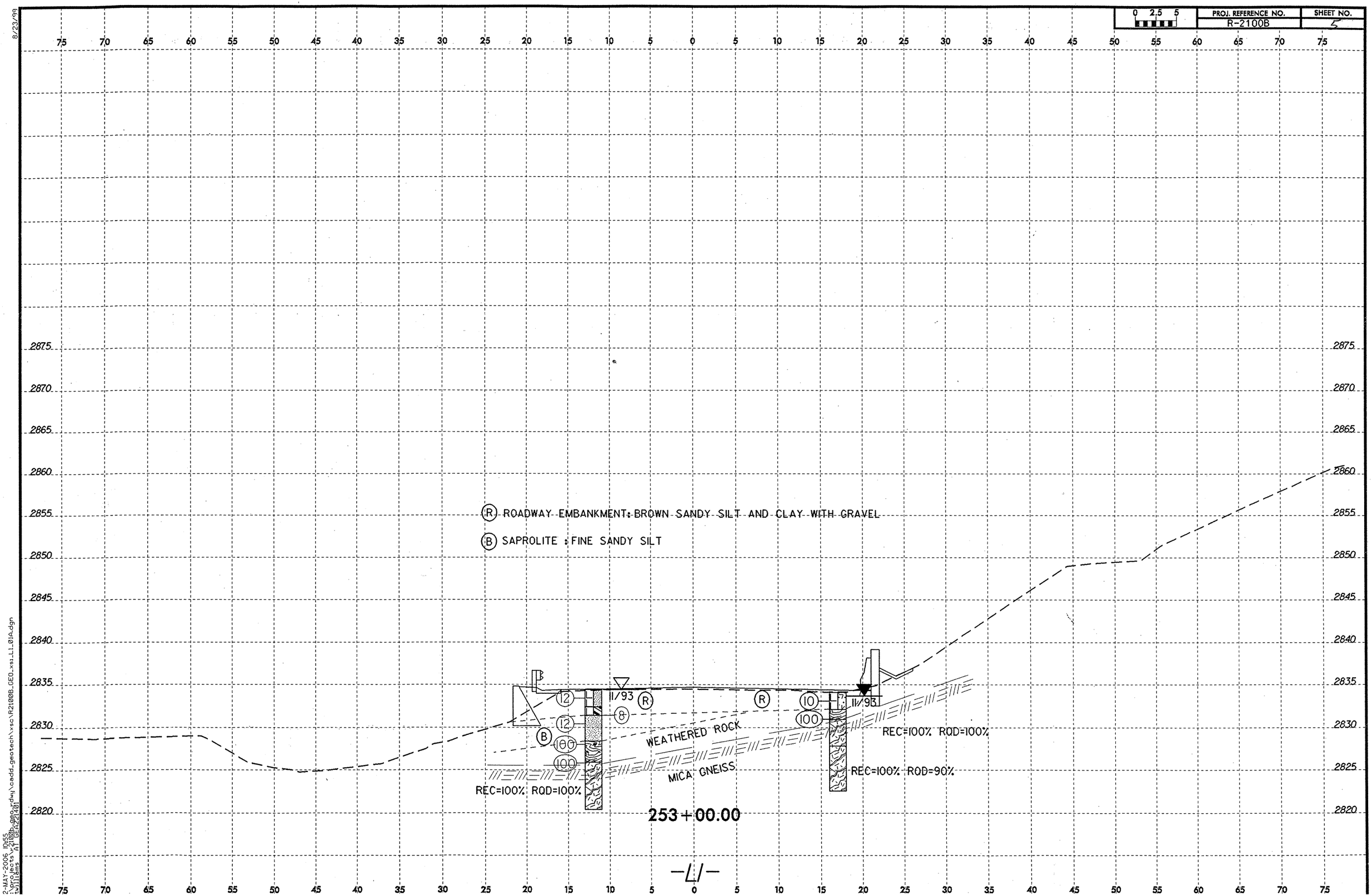

**DATUM DESCRIPTION :**

THE LOCALIZED COORDINATE SYSTEM DEVELOPED FOR THIS PROJECT IS BASED ON THE NAD83 STATE PLANE COORDINATES FOR THE NCGS MONUMENT "CALLOWAY" WITH NORTHING OF 930843.1890, EASTING OF 1293861.6330.
THE AVERAGE COMBINED FACTOR USED ON THIS PROJECT GROUND TO GRID IS 0.99993295. ALL LINEAR DISTANCES ARE LOCALIZED HORIZONTAL DISTANCES.
THE VERICAL DATUM IS BASED ON MONUMENT "CALLOWAY" (ELEV.3652.88') (NAVD29)

FOR -L1- PROFILE SEE SHEET 14

| PROJECT REFERENCE NO. | SHEET |
|---|---|
| R-2100B | 4 |
| RETAINING WALL STA. 253+00 to 256+00 RT | |



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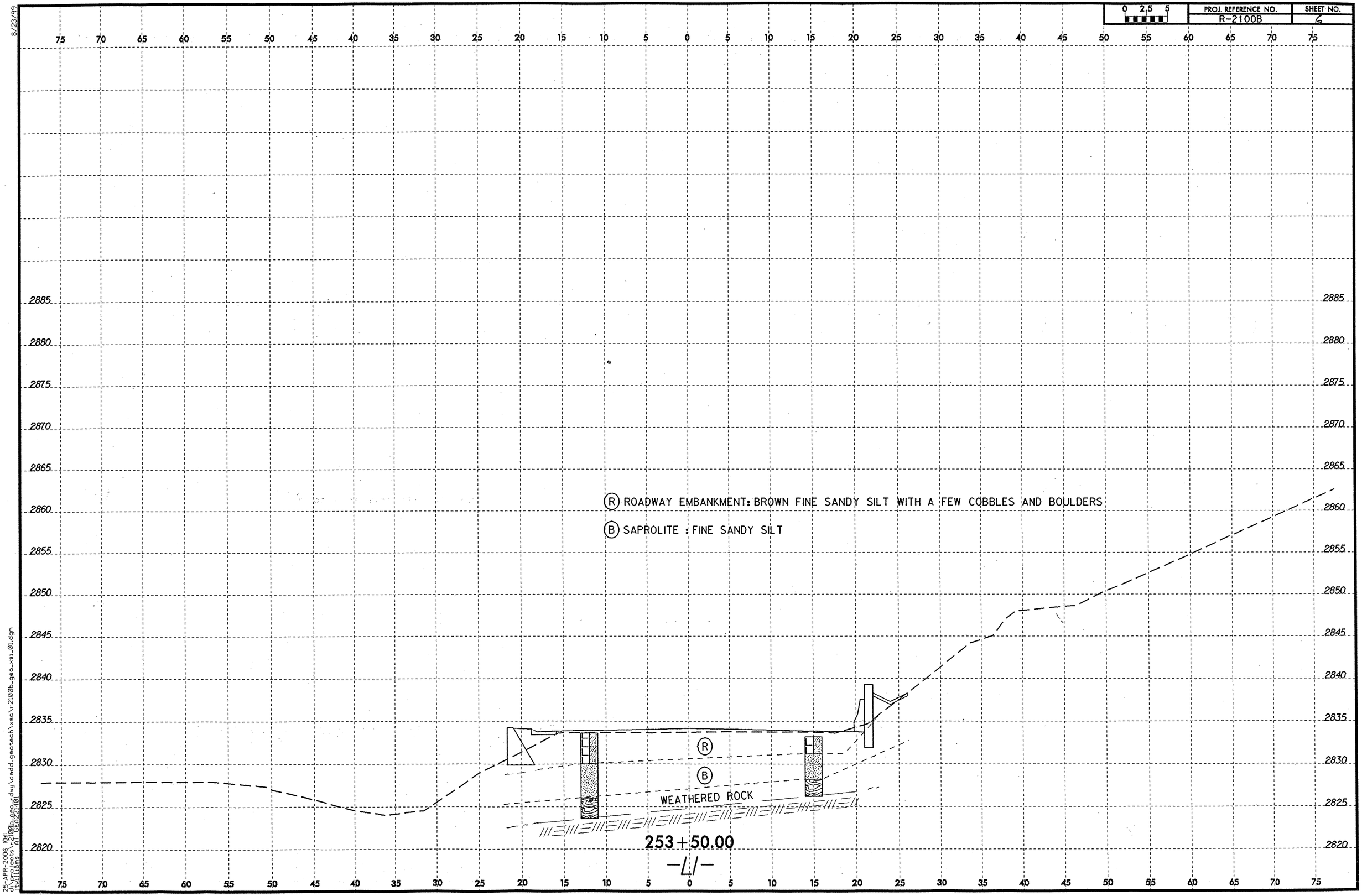


8/23/99

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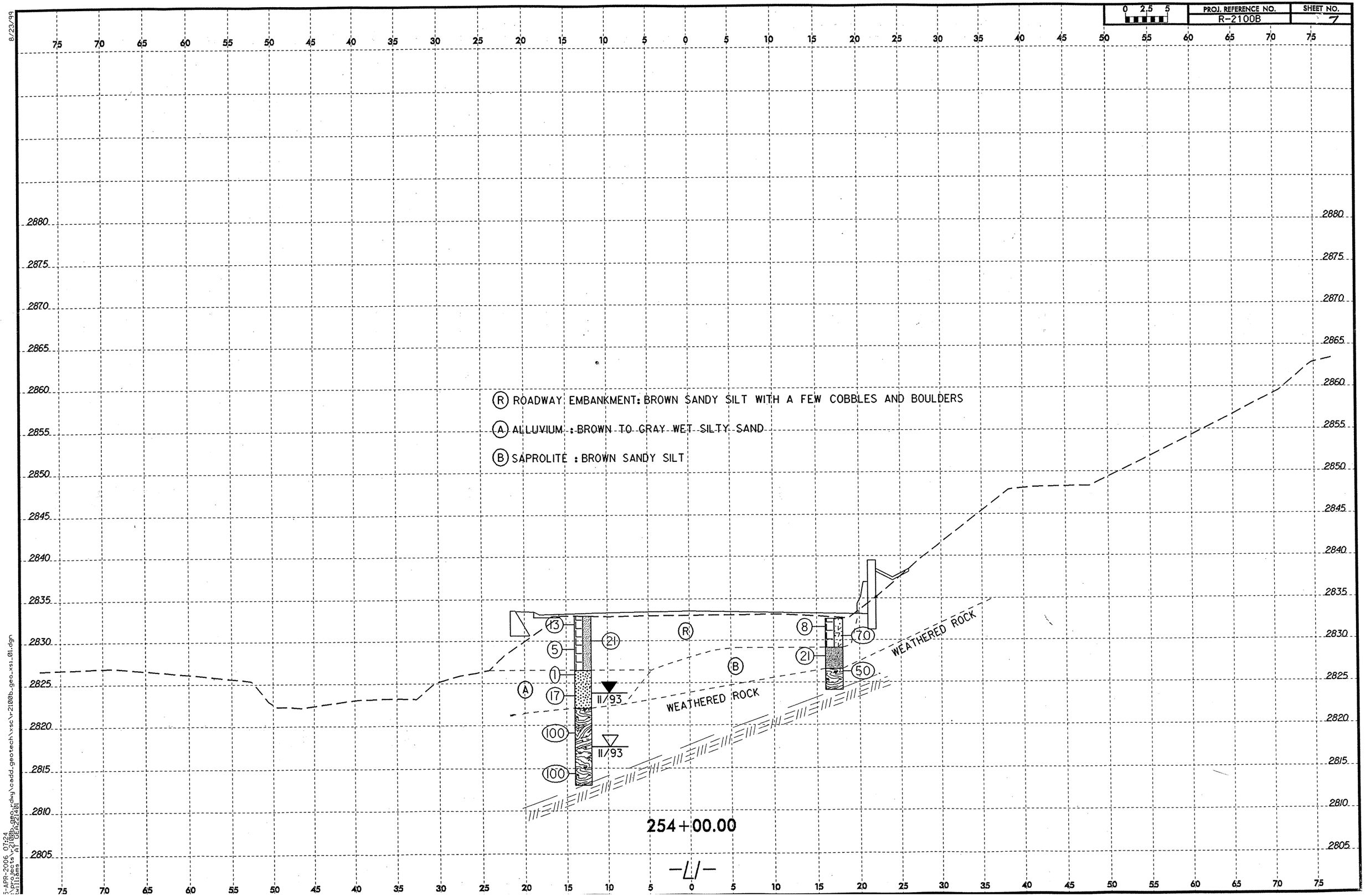
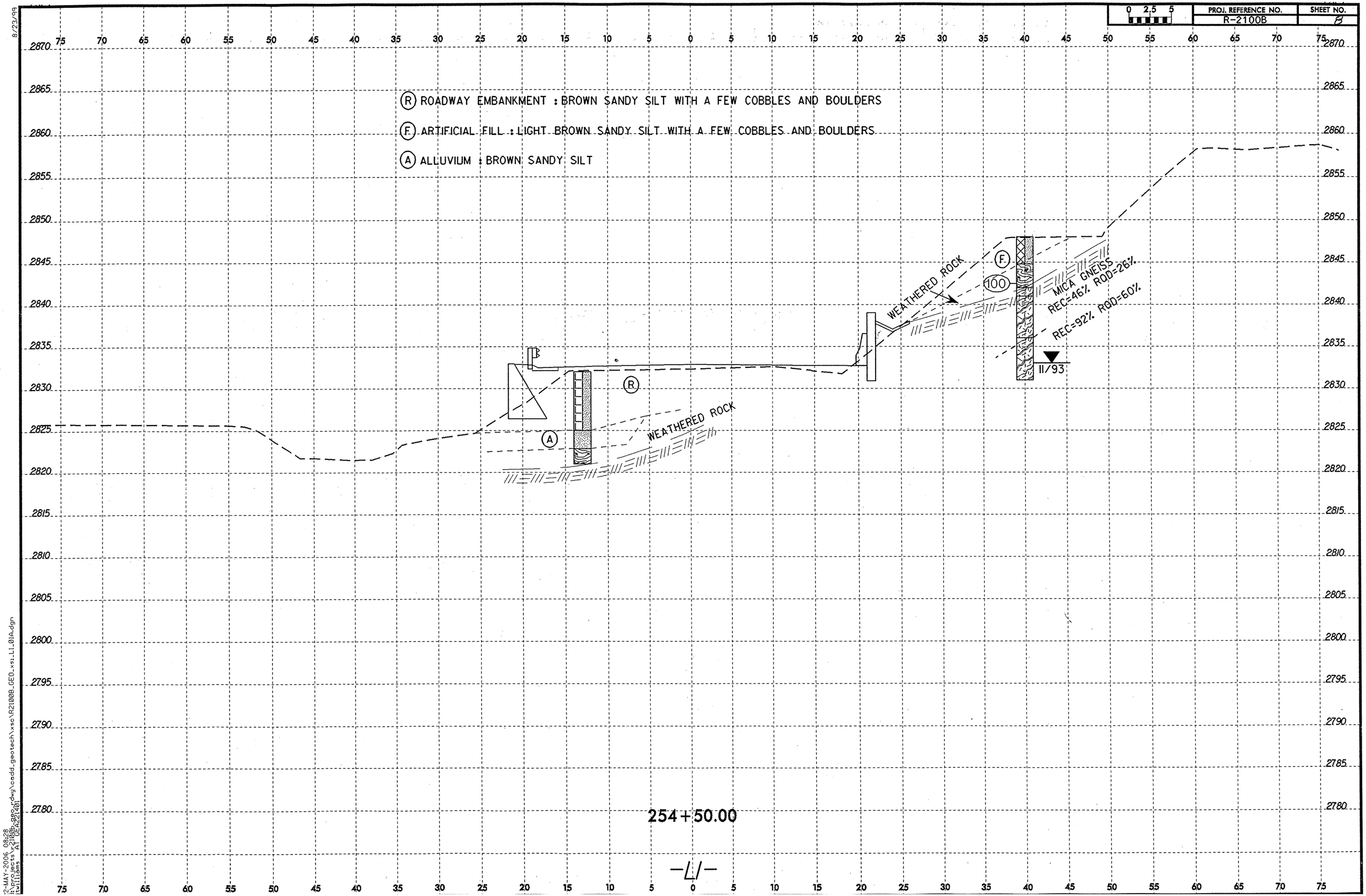
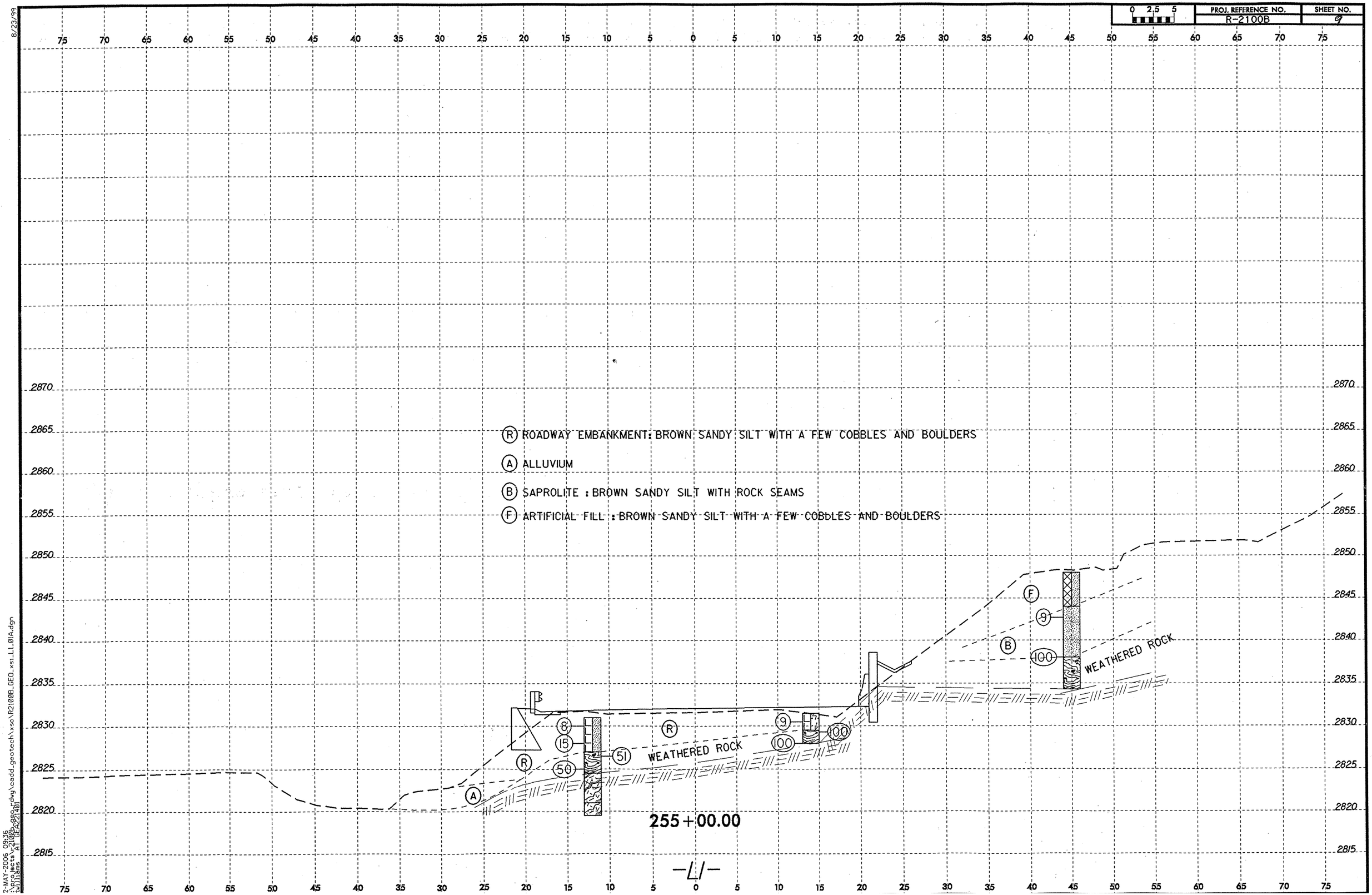


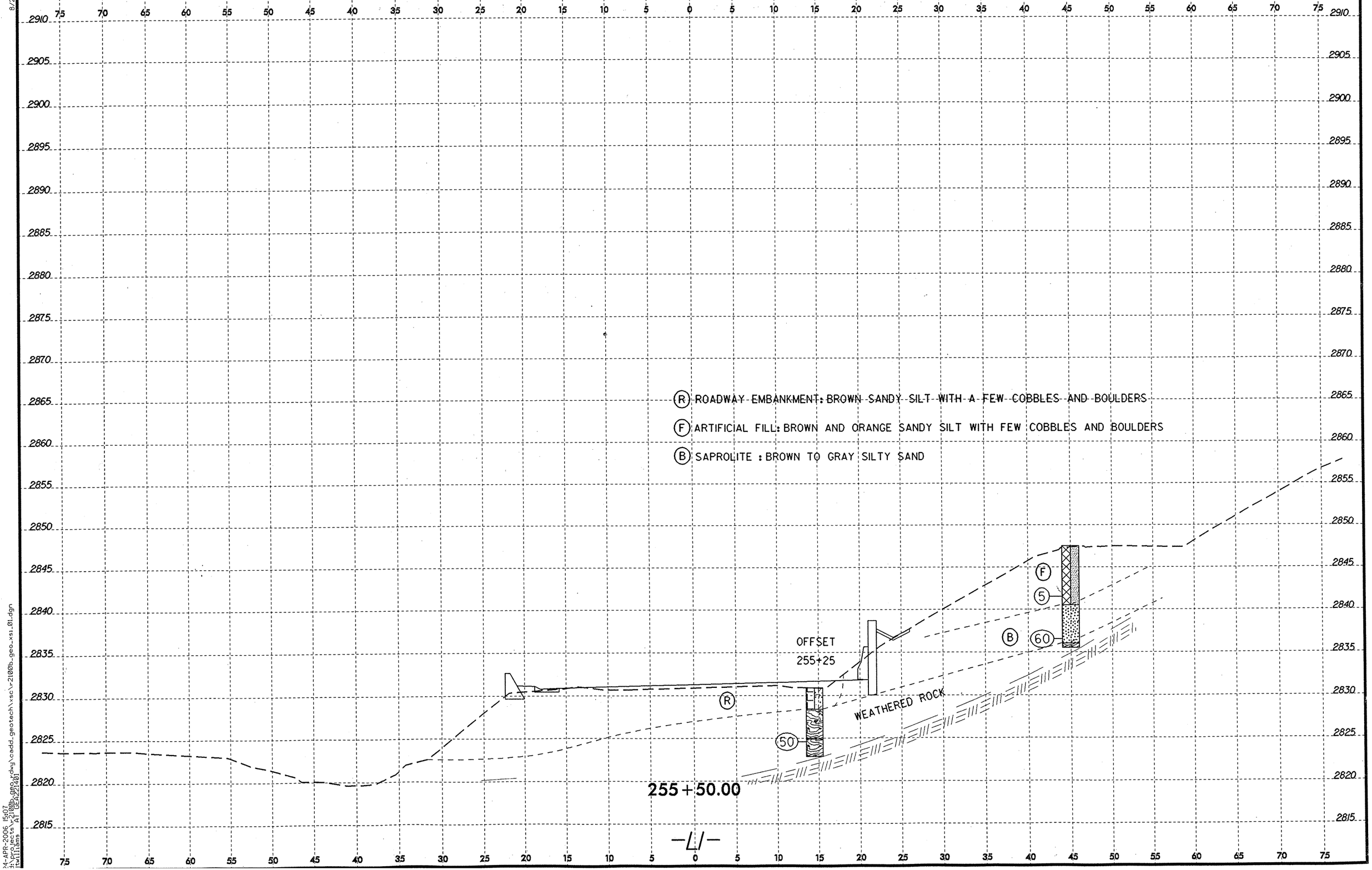
PROJ. REFERENCE NO.
R-2100B
SHEET NO.
7
0 2.5 5
8/23/99
R ROADWAY EMBANKMENT: BROWN SANDY SILT WITH A FEW COBBLES AND BOULDERS
A ALLUVIUM : BROWN TO GRAY WET SILTY SAND
B SAPROLITE : BROWN SANDY SILT
WEATHERED ROCK
WEATHERED ROCK
11/93
11/93
254+00.00
-L1-



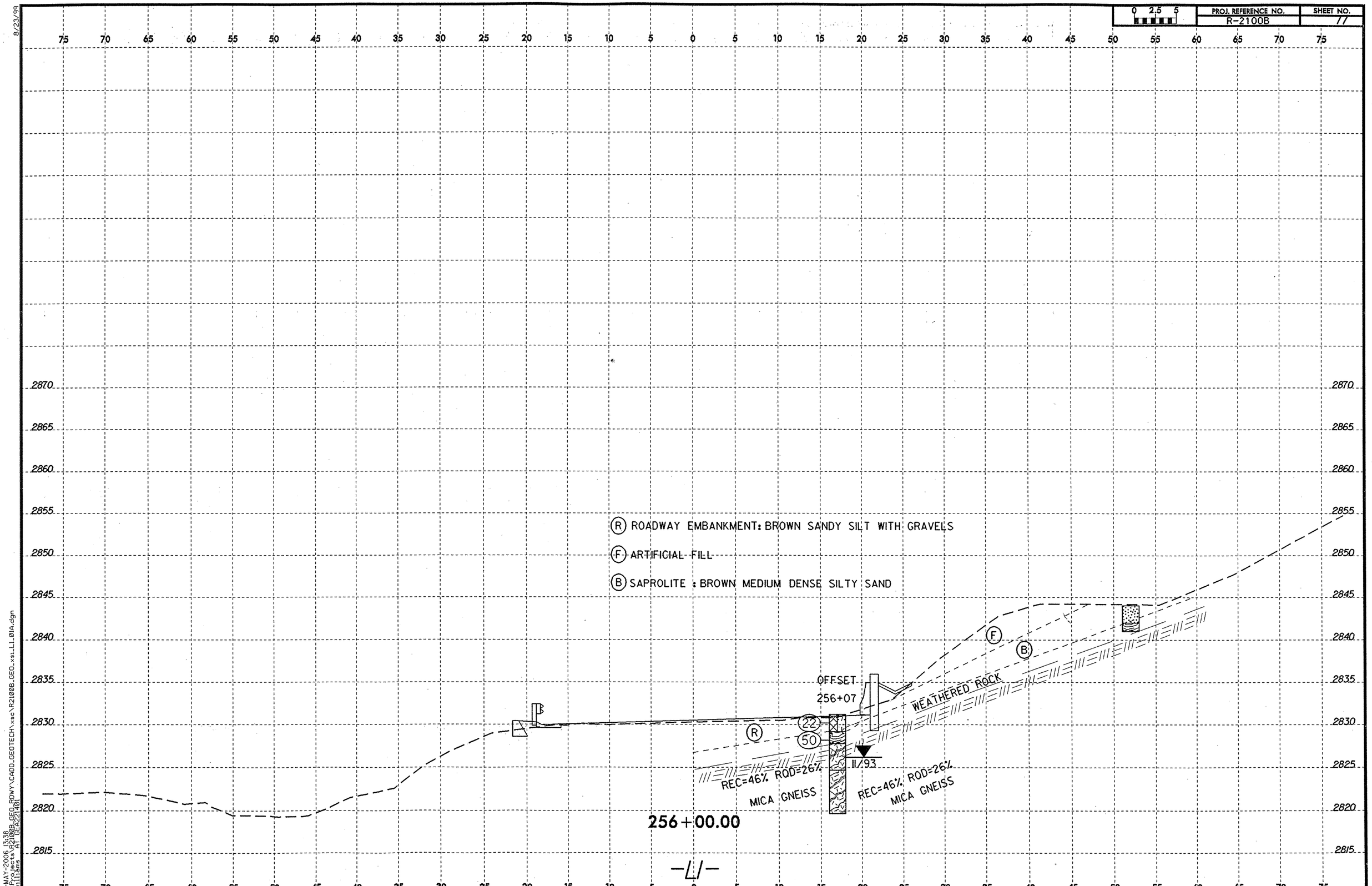
PROJ. REFERENCE NO.
R-2100B
SHEET NO.
8
0 2.5 5
(R) ROADWAY EMBANKMENT : BROWN SANDY SILT WITH A FEW COBBLES AND BOULDERS
(F) ARTIFICIAL FILL : LIGHT BROWN SANDY SILT WITH A FEW COBBLES AND BOULDERS
(A) ALLUVIUM : BROWN SANDY SILT
WEATHERED ROCK
WEATHERED ROCK
MICA GNEISS
REC=46% RQD=26%
REC=92% RQD=60%
100
11/93
254+50.00
-L1-



0 2.5 5
PROJ. REFERENCE NO.
R-2100B
SHEET NO.
9
8/23/99
2870
2865
2860
2855
2850
2845
2840
2835
2830
2825
2820
2815
R ROADWAY EMBANKMENT: BROWN SANDY SILT WITH A FEW COBBLES AND BOULDERS
A ALLUVIUM
B SAPROLITE : BROWN SANDY SILT WITH ROCK SEAMS
F ARTIFICIAL FILL : BROWN SANDY SILT WITH A FEW COBBLES AND BOULDERS
WEATHERED ROCK
WEATHERED ROCK
255+00.00
-L1-
2-MAY-2006 09:36



0 2.5 5
PROJ. REFERENCE NO.
R-2100B
SHEET NO.
10
8/23/99
R ROADWAY EMBANKMENT: BROWN SANDY SILT WITH A FEW COBBLES AND BOULDERS
F ARTIFICIAL FILL: BROWN AND ORANGE SANDY SILT WITH FEW COBBLES AND BOULDERS
B SAPROLITE : BROWN TO GRAY SILTY SAND
OFFSET
255+25
WEATHERED ROCK
255+50.00
-L1-



PROJ. REFERENCE NO.
R-2100B
SHEET NO.
77
0 2.5 5
R ROADWAY EMBANKMENT: BROWN SANDY SILT WITH GRAVELS
F ARTIFICIAL FILL
B SAPROLITE : BROWN MEDIUM DENSE SILTY SAND
OFFSET
256+07
WEATHERED ROCK
22
50
11/93
REC=46% RQD=26%
MICA GNEISS
REC=46% RQD=26%
MICA GNEISS
256+00.00
-L1-

# NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
## GEOTECHNICAL UNIT BORING LOG

| | | | |
|---|---|---|---|
| **PROJECT NO** 8.1710902 | **ID** R-2100 | **COUNTY** ASHE | **GEOLOGIST** S. FREDRICK |
| **SITE DESCRIPTION** RETAINING WALL FOR NC 16 FRM JEFFERSON TO WILKES CO (RW#4) | | | **GND WATER** |
| **BORING NO** 253+00 | **NORTHING** 0.00 | **EASTING** 0.00 | **0 HR** N/A |
| **ALIGNMENT** 253+00 | **BORING LOCATION** 253+00.000 | **OFFSET** 17.00ft RT | **24 HR** 0.50ft |
| **COLLAR ELEV** 2834.10ft | **TOTAL DEPTH** 11.50ft | **START DATE** 11/03/93 | **COMPLETION DATE** 11/03/93 |
| **DRILL MACHINE** CME-550 | **DRILL METHOD** H.S. AUGERS | | **HAMMER TYPE** AUTOMATIC |
| **SURFACE WATER DEPTH** | **DEPTH TO ROCK** N/A | | Log 253+00, Page 1 of 1 |

| ELEV | DEPTH | BLOW CT 6in | BLOW CT 6in | BLOW CT 6in | PEN (ft) | BLOWS PER FOOT 0 25 50 75 100 | SAMPLE NO | MOI | LOG | SOIL AND ROCK DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|
| 2834.10 | 0.00 | 1 | 3 | 7 | 1.0 | Ground Surface | | | | |
| 2830.00 | 3.00 | 0 | 0 | 50 | 0.1 | 10 50 | 1 1 | M | | ROADWAY FILL BROWN FINE SANDY CLAYEY SILT WITH ROCK FRAGMENTS AND ROOTS. (A-5) |
| | | | | | | | 2 | | | SOFT WEATHERED ROCK APPEARS AS BROWN AND GRAY FINE SANDY SILT WITH ROCK FRAGMENTS. |
| 2822.60 | | | | | | | 2 | D | | REC=100% RQD=100% BIOTITE GNEISS VERY SLIGHTLY WEATHERD VERY HARD GRAY AND WHITE HORIZONTAL FRACTURES |
| | | | | | | CORING TERMINATED AT ELEVATION 2822.6 FEET IN CRYSTALLINE ROCK | | | | REC=100% RQD=90% BIOTITE GNEISS:VERY SLIGHTLY WEATHERED VERY HARD GRAY AND WHITE HORIZONTAL FRACTURES |

# NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
## GEOTECHNICAL UNIT BORING LOG

| | | | |
|---|---|---|---|
| **PROJECT NO** 8.1710902 | **ID** R-2100 | **COUNTY** ASHE | **GEOLOGIST** S. FREDRICK |
| **SITE DESCRIPTION** RETAINING WALL FOR NC 16 FRM JEFFERSON TO WILKES CO (RW#4) | | | **GND WATER** |
| **BORING NO** 253+50 | **NORTHING** 0.00 | **EASTING** 0.00 | **0 HR** N/A |
| **ALIGNMENT** 253+50 | **BORING LOCATION** 253+50.000 | **OFFSET** 15.00ft RT | **24 HR** N/A |
| **COLLAR ELEV** 2833.20ft | **TOTAL DEPTH** 7.00ft | **START DATE** 11/09/93 | **COMPLETION DATE** 11/09/93 |
| **DRILL MACHINE** CME-550 | **DRILL METHOD** CORE BORING | | **HAMMER TYPE** AUTOMATIC |
| **SURFACE WATER DEPTH** | **DEPTH TO ROCK** N/A | | Log 253+50, Page 1 of 1 |

| ELEV | DEPTH | BLOW CT 6in | BLOW CT 6in | BLOW CT 6in | PEN (ft) | BLOWS PER FOOT 0 25 50 75 100 | SAMPLE NO | MOI | LOG | SOIL AND ROCK DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|
| 2833.20 | | | | | | Ground Surface | | | | |
| 2830.00 | | | | | | | | | | ROADWAY FILL BROWN FINE SANDY SILT (A-4) |
| 2826.20 | | | | | | | | | | RESIDUAL BROWN FINE SANY SILT WITH MICA (A-4) |
| | | | | | | AUGER REFUSAL AT ELEVATION 2826.2 FEET ON CRYSTALLINE ROCK | | | | SOFT WEATHERED ROCK APPEARS AS BROWN AND GRAY FINE SANYD SILT SILTY SAND |

# NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
## GEOTECHNICAL UNIT BORING LOG

| | | | |
|---|---|---|---|
| **PROJECT NO** 34369.1.1 | **ID** R-2100B | **COUNTY** ASHE | **GEOLOGIST** D. CHITTENDEN (F&H) |
| **SITE DESCRIPTION** NC 16 FROM SOUTHEAST OF SR 1158 TO SOUTHEAST OF NC 88 | | | **GND WATER** |
| **BORING NO** 25450R | **NORTHING** 0.00 | **EASTING** 0.00 | **0 HR** N/A |
| **ALIGNMENT** -L- | **BORING LOCATION** 254+50.000 | **OFFSET** 40.00ft RT | **24 HR** 15.00ft |
| **COLLAR ELEV** 2848.00ft | **TOTAL DEPTH** 17.00ft | **START DATE** 8/14/05 | **COMPLETION DATE** 08/14/05 |
| **DRILL MACHINE** CME-45 | **DRILL METHOD** SPT CORE BORING | | **HAMMER TYPE** AUTOMATIC |
| **SURFACE WATER DEPTH** | **DEPTH TO ROCK** 7.00ft | | **Log 25450R, Page 1 of 1** |

| ELEV | DEPTH | BLOW CT 6in | BLOW CT 6in | BLOW CT 6in | PEN (ft) | BLOWS PER FOOT 0 25 50 75 100 | SAMPLE NO | MOI | LOG | SOIL AND ROCK DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|
| 2848.00 | | | | | | Ground Surface | | | | |
| | 5.00 | 40 | 38 | 62 | 0.5 | 100 | CORE 1 | | | ARTIFICIAL FILL: LIGHT BROWN SANDY SILT WITH SCATTERED BOULDERS |
| | | | | | | | | | | WEATHERED ROCK |
| 2840.00 | | | | | | | | | | HARD ROCK |
| | | | | | | | CORE 2 | | | HARD ROCK: MODERATELY TO COMPLETELY WEATHERED GNEISS REC=46 RQD=26 |
| 2831.00 | | | | | | | | | | HARD ROCK: MODERATELY TO COMPLETELY WEATHETED GNEISS REC=92 RQD=60 |
| | | | | | | TERMINATED BORING IN HARD ROCK AT ELEVATION 2831.0 FEET. | | | | |



# NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
## GEOTECHNICAL UNIT BORING LOG

| | | | |
|---|---|---|---|
| **PROJECT NO** 34369.1.1 | **ID** R-2100B | **COUNTY** ASHE | **GEOLOGIST** D. CHITTENDEN (F&H) |
| **SITE DESCRIPTION** NC 16 FROM SOUTHEAST OF SR 1158 TO SOUTHEAST OF NC 88 | | | **GND WATER** |
| **BORING NO** 25550R | **NORTHING** 0.00 | **EASTING** 0.00 | **0 HR** N/A |
| **ALIGNMENT** -L- | **BORING LOCATION** 255+50.000 | **OFFSET** 45.00ft RT | **24 HR** N/A |
| **COLLAR ELEV** 2847.50ft | **TOTAL DEPTH** 12.00ft | **START DATE** 8/14/05 | **COMPLETION DATE** 08/14/05 |
| **DRILL MACHINE** CME-45 | **DRILL METHOD** SPT CORE BORING | | **HAMMER TYPE** AUTOMATIC |
| **SURFACE WATER DEPTH** | **DEPTH TO ROCK** 12.00ft | | **Log 25550R, Page 1 of 1** |

| ELEV | DEPTH | BLOW CT 6in | BLOW CT 6in | BLOW CT 6in | PEN (ft) | BLOWS PER FOOT 0 25 50 75 100 | SAMPLE NO | MOI | LOG | SOIL AND ROCK DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|
| 2847.50 | | | | | | Ground Surface | | | | |
| | 5.00 | 2 | 2 | 3 | 1.0 | 5 | SS-627 | | | ARTIFICIAL FILL: BROWN AND ORANGE SANDY SILT WITH ROCK FRAGMENTS |
| 2840.00 | | | | | | | | | | |
| | 10.00 | 4 | 30 | 30 | 1.0 | 60 | SS-628 | | | SAPROLITE: BROWN TO GRAY, SILTY SAND |
| 2835.50 | | | | | | | | | | WEATHERED ROCK |
| | | | | | | TERMINATED BORING ON HARD ROCK AT ELEVATION 2835.5 FEET. | | | | |

# NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
## GEOTECHNICAL UNIT BORING LOG

| | | | |
|---|---|---|---|
| PROJECT NO 8.1710902 | ID R-2100 | COUNTY ASHE | GEOLOGIST S. FREDRICK |
| SITE DESCRIPTION RETAINING WALL FOR NC 16 FRM JEFFERSON TO WILKES CO (RW#4) | | | GND WATER |
| BORING NO 254+00 | NORTHING 0.00 | EASTING 0.00 | 0 HR N/A |
| ALIGNMENT 254+00 | BORING LOCATION 254+00.000 | OFFSET 17.00ft RT | 24 HR N/A |
| COLLAR ELEV 2832.60ft | TOTAL DEPTH 8.50ft | START DATE 11/03/93 | COMPLETION DATE 11/03/93 |
| DRILL MACHINE CME-550 | DRILL METHOD H.S. AUGERS | | HAMMER TYPE AUTOMATIC |
| SURFACE WATER DEPTH N/A | DEPTH TO ROCK N/A | | Log 254+00, Page 1 of 1 |

| ELEV | DEPTH | BLOW CT 6in | BLOW CT 6in | BLOW CT 6in | PEN (ft) | BLOWS PER FOOT 0 25 50 75 100 | SAMPLE NO | MOI | LOG | SOIL AND ROCK DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|
| 2832.60 | 0.00 | 1 | 3 | 5 | 1.0 | Ground Surface | | | | |
| 2830.00 | 2.00 | 12 | 20 | 50 | 0.1 | 8, 21, 70, 50 | | | | ROADWAY FILL BROWN FINE SANDY SILT WITH MICA (A-5) |
| | 3.50 | 11 | 10 | 11 | 1.0 | | | | | |
| | 6.00 | 0 | 0 | 50 | 0.3 | | 1 | D | | SOFT WEATHERED ROCK APPEARS AS BROWN AND GRAY FINE SANY SILT WITH ROCK FRAGMENTS. |
| 2824.10 | | | | | | AUGER REFUSAL AT ELEVATION 2824.1 FEET ON CRYSTALLINE ROCK | | | | |

# NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
## GEOTECHNICAL UNIT BORING LOG

| | | | |
|---|---|---|---|
| PROJECT NO 8.1710902 | ID R-2100 | COUNTY ASHE | GEOLOGIST S. FREDRICK 14 |
| SITE DESCRIPTION RETAINING WALL FOR NC 16 FRM JEFFERSON TO WILKES CO (RW#4) | | | GND WATER |
| BORING NO 255+04 | NORTHING 0.00 | EASTING 0.00 | 0 HR N/A |
| ALIGNMENT 255+04 | BORING LOCATION 255+04.000 | OFFSET 14.00ft RT | 24 HR N/A |
| COLLAR ELEV 2831.50ft | TOTAL DEPTH 3.80ft | START DATE 11/03/93 | COMPLETION DATE 11/03/93 |
| DRILL MACHINE CME-550 | DRILL METHOD H.S. AUGERS | | HAMMER TYPE AUTOMATIC |
| SURFACE WATER DEPTH N/A | DEPTH TO ROCK N/A | | Log 255+04, Page 1 of 1 |

| ELEV | DEPTH | BLOW CT 6in | BLOW CT 6in | BLOW CT 6in | PEN (ft) | BLOWS PER FOOT 0 25 50 75 100 | SAMPLE NO | MOI | LOG | SOIL AND ROCK DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|
| 2831.50 | 0.00 | 1 | 4 | 5 | 1.0 | Ground Surface | | | | |
| 2830.00 | 2.00 | 5 | 50 | 0 | 0.2 | 9, 50 | | | | ROADWAY FILL BROWN FINE SANDY CLAYEY SILT WITH ROCK FRAGMENTS(A-5) |
| 2827.70 | 3.50 | 0 | 50 | 0 | 0.2 | | 1 | D | | SOFT WEATHERED ROCK/ HARD WEATHERED ROCK APPEARS AS GRAY FINE TO MEDIUM SANDY SILT WITH ROCK FRAGMENTS. |
| | | | | | | AUGER REFUSAL AT ELEVATION 2827.7 FEET ON CRYSTALLINE ROCK | | | | |

# NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
## GEOTECHNICAL UNIT BORING LOG

| | | | |
|---|---|---|---|
| PROJECT NO 8.1710902 | ID R-2100 | COUNTY ASHE | GEOLOGIST S. FREDERICK |
| SITE DESCRIPTION RETAINING WALL FOR NC16 FROM JEFFERSON TO WILKES CO (RW #4) | | | GND WATER |
| BORING NO 255+25 | NORTHING 0.00 | EASTING 0.00 | 0 HR N/A |
| ALIGNMENT 255+25 | BORING LOCATION 255+25.000 | OFFSET 14.50ft RT | 24 HR N/A |
| COLLAR ELEV 2831.00ft | TOTAL DEPTH 8.00ft | START DATE 11/03/93 | COMPLETION DATE 11/03/93 |
| DRILL MACHINE CME-550 | DRILL METHOD H.S. AUGERS | | HAMMER TYPE AUTOMATIC |
| SURFACE WATER DEPTH | DEPTH TO ROCK N/A | | Log 255+25, Page 1 of 1 |

| ELEV | DEPTH | BLOW CT 6in | BLOW CT 6in | BLOW CT 6in | PEN (ft) | BLOWS PER FOOT 0 25 50 75 100 | SAMPLE NO | MOI | LOG | SOIL AND ROCK DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|
| 2831.00 | | | | | | Ground Surface | | | | |
| | 6.00 | 5 | 50 | 0 | 0.3 | 50 | | D | | ROADWAY FILL BROWN FINE SANDY SILT (A-5). SOFT WEATHERED ROCK APPEARS AS GRAY AND BROWN FINE SANY SILT WITH ROCK FRAGMENTS |
| 2823.00 | | | | | | AUGER REFUSAL AT ELEVATION 2823.0 FEET ON CRYSTALLINE ROCK | | | | SOFT WEATHERED ROCK APPEARS AS BROWN AND GRAY FINE SANDY SILT WITH ROCK FRAGMENTS. |

# NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
## GEOTECHNICAL UNIT BORING LOG

| | | | |
|---|---|---|---|
| PROJECT NO 8.1710902 | ID R-2100 | COUNTY ASHE | GEOLOGIST S. FREDERICK |
| SITE DESCRIPTION RETAINING WALL FOR NC16 FROM JEFFERSON TO WILKES CO (RW #4) | | | GND WATER |
| BORING NO 256+07 | NORTHING 0.00 | EASTING 0.00 | 0 HR N/A |
| ALIGNMENT 256+07(-L-) | BORING LOCATION 256+07.000 | OFFSET 17.00ft RT | 24 HR 5.00ft |
| COLLAR ELEV 2891.20ft | TOTAL DEPTH 11.50ft | START DATE 11/04/93 | COMPLETION DATE 11/04/93 |
| DRILL MACHINE CME-550 | DRILL METHOD CORE BORING | | HAMMER TYPE AUTOMATIC |
| SURFACE WATER DEPTH N/A | DEPTH TO ROCK N/A | | Log 256+07, Page 1 of 1 |

| ELEV | DEPTH | BLOW CT 6in | BLOW CT 6in | BLOW CT 6in | PEN (ft) | BLOWS PER FOOT 0 25 50 75 100 | SAMPLE NO | MOI | LOG | SOIL AND ROCK DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|
| 2891.20 | 0.00 | 3 | 8 | 14 | 1.0 | Ground Surface | | | | |
| | 2.00 | 0 | 0 | 50 | 1.0 | 22 50 | 1 2 | D | | ROADWAY FILL BROWN FINE SANDY CLAYEY SILT WITH ROCK FRAGMENTS. WEATHERED ROCK APPEARS AS BROWN AND GRAY FINE SANDY SILT |
| 2879.70 | | | | | | CORING TERMINATED AT ELEVATION 2879.7 FEET ON CRYSTALLINE ROCK | | | | REC=100%RQD 89% BIOTITE GNEISS VERY SLIGHTLY WEATHERED VERY HARD GRAY AND WHITE HORIZONTAL FRACTURES. REC=1--% RQD=100% BIOTITE GNEISIS VERY SLIGHTLY WEATHERED VERY HARD GRAY AND WHITE HORIZONTAL FRACTURES. |

# NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
## GEOTECHNICAL UNIT BORING LOG

| | | | |
|---|---|---|---|
| **PROJECT NO** 34369.1.1 | **ID** R-2100B | **COUNTY** ASHE | **GEOLOGIST** R. SHRANK |
| **SITE DESCRIPTION** NC 16 FROM SOUTHEAST OF SR 1158 TO SOUTHEAST OF NC 88 | | | **GND WATER** |
| **BORING NO** 25500RT | **NORTHING** 0.00 | **EASTING** 0.00 | **0 HR** N/A |
| **ALIGNMENT** -L- | **BORING LOCATION** 255+00.000 | **OFFSET** 45.00ft RT | **24 HR** N/A |
| **COLLAR ELEV** 2848.00ft | **TOTAL DEPTH** 13.70ft | **START DATE** 8/24/93 | **COMPLETION DATE** 08/24/93 |
| **DRILL MACHINE** CME 550 | **DRILL METHOD** H.S. AUGERS | | **HAMMER TYPE** MANUAL |
| **SURFACE WATER DEPTH** | **DEPTH TO ROCK** 13.70ft | | **Log 25500RT, Page 1 of 1** |

| ELEV | DEPTH | BLOW CT 6in | BLOW CT 6in | BLOW CT 6in | PEN (ft) | BLOWS PER FOOT 0 25 50 75 100 | SAMPLE NO | MOI | LOG | SOIL AND ROCK DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|
| 2848.00 | | | | | | Ground Surface | | | | |
| | 4.30 | 3 | 4 | 5 | 1.0 | 9 | SS-44 | M | | BROWN SANDY SILT WITH WR SEAMS |
| 2840.00 | 9.30 | 5 | 16 | 84 | 0.7 | 100 | | | | WEATHERED ROCK |
| 2834.30 | | | | | | TERMINATED BORING ON HARD ROCK AT ELEVATION 2834.3 FEET. | | | | |



# NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
## GEOTECHNICAL UNIT BORING LOG

| | | | |
|---|---|---|---|
| **PROJECT NO** 34369.1.1 | **ID** R-2100B | **COUNTY** ASHE | **GEOLOGIST** R. SHRANK |
| **SITE DESCRIPTION** NC 16 FROM SOUTHEAST OF SR 1158 TO SOUTHEAST OF NC 88 | | | **GND WATER** |
| **BORING NO** 25600RT | **NORTHING** 0.00 | **EASTING** 0.00 | **0 HR** N/A |
| **ALIGNMENT** -L- | **BORING LOCATION** 256+00.000 | **OFFSET** 52.00ft RT | **24 HR** N/A |
| **COLLAR ELEV** 2844.00ft | **TOTAL DEPTH** 3.00ft | **START DATE** 8/24/93 | **COMPLETION DATE** 08/24/93 |
| **DRILL MACHINE** CME 550 | **DRILL METHOD** SOLID AUGERS | | **HAMMER TYPE** MANUAL |
| **SURFACE WATER DEPTH** | **DEPTH TO ROCK** 3.00ft | | **Log 25600RT, Page 1 of 1** |

| ELEV | DEPTH | BLOW CT 6in | BLOW CT 6in | BLOW CT 6in | PEN (ft) | BLOWS PER FOOT 0 25 50 75 100 | SAMPLE NO | MOI | LOG | SOIL AND ROCK DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|
| 2844.00 | | | | | | Ground Surface | | | | |
| 2841.00 | | | | | | | | M | | SAPROLITE: BROWN, MED. DENSE, SILTY SAND |
| | | | | | | TERMINATED BORING ON HARD ROCK AT ELEVATION 2841.0 FEET. | | | | WEATHERED ROCK |

JCS

# NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
## DIVISION OF HIGHWAYS-MATERIALS AND TESTS UNIT
## SOILS TEST REPORT-SOILS LABORATORY

| | |
|---|---|
| T.I.P. ID #: | R-2100 B |

| | |
|---|---|
| REPORT ON SAMPLES OF: | Soils for Classification |

| | | | | | |
|---|---|---|---|---|---|
| PROJECT: | 34369.1.1 | COUNTY: | Ashe | Owner: | -- |
| DATE SAMPLED: | 8.05 | DATE RECEIVED: | 9.23.05 | DATE REPORTED: | 10.5.05 |
| SAMPLED FROM: | Roadway | SAMPLED BY: | L. L. Acker | | |
| SUBMITTED BY: | W. D. Frye | | 2002 | STANDARD SPECIFICATION | |
| LABORATORY: | Asheville | | | | |

## TEST RESULTS

| Project Sample No. | SS-627 | SS-628 | SS-631 | SS-632 | | | | |
|---|---|---|---|---|---|---|---|---|
| Lab Sample No. A | 150496 | 150497 | 150498 | 150499 | | | | |
| HiCAMS Sample # | -- | -- | -- | -- | | | | |
| Retained #4 Sieve % | -- | -- | -- | -- | | | | |
| Passing #10 Sieve % | 84 | 75 | 89 | 93 | | | | |
| Passing #40 Sieve % | 76 | 61 | 81 | 87 | | | | |
| Passing #200 Sieve % | 44 | 22 | 37 | 40 | | | | |

## MINUS #10 FRACTION

| Soil Mortar - 100% | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Coarse Sand -Ret. #60 | 17 | 32 | 19 | 16 | | | | |
| Fine Sand - Ret. #270 | 39 | 47 | 49 | 56 | | | | |
| Silt 0.05-0.005 mm % | 24 | 17 | 24 | 24 | | | | |
| Clay < 0.005 mm % | 20 | 4 | 8 | 4 | | | | |
| Passing # 40 Sieve % | -- | -- | -- | -- | | | | |
| Passing # 200 Sieve % | -- | -- | -- | -- | | | | |

| Liquid Limit | 37 | 34 | 34 | 39 | | | | |
|---|---|---|---|---|---|---|---|---|
| Plastic Index | NP | NP | NP | NP | | | | |
| AASHTO Classification | A-4 (2) | A-2-4 (0) | A-4 (0) | A-4 (1) | | | | |
| Quantity | | | | | | | | |
| Texture | | | | | | | | |
| Station | 255+50 | 255+50 | 321+00 | 321+00 | | | | |
| Hole No. | | | | | | | | |
| Depth (ft) From: | 5.0 | 10.0 | 2.0 | 5.0 | | | | |
| To: | 6.5 | 11.5 | 3.5 | 6.5 | | | | |
| | | | | | | | | |

**Remarks:**

A-150496 - 150499

**CC:**

| | |
|---|---|
| L. L. Acker | |
| File | |
| | |
| | |

| | |
|---|---|
| SOILS ENGINEER: | |

| STATE | STATE PROJECT REFERENCE NO. | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|
| N.C. | R2100B | 1 | 11 |

# STATE OF NORTH CAROLINA
## DEPARTMENT OF TRANSPORTATION
## DIVISION OF HIGHWAYS
## GEOTECHNICAL ENGINEERING UNIT

# STRUCTURE SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. R2100B F.A. PROJ. STP-16(1)

COUNTY ASHE

PROJECT DESCRIPTION NC 16 FROM SOUTHEAST OF SR 1158 TO SOUTHEAST OF NC 88

SITE DESCRIPTION RETAINING WALL FROM STA. 267+50 TO STA. 269+00 (LEFT) ON NC 16

## CONTENTS


| SHEET | DESCRIPTION |
|---|---|
| 1 | TITLE SHEET |
| 2 | LEGEND |
| 3 | SITE PLAN |
| 4 | PROFILE(S) |
| 5 - 9 | CROSS SECTION(S) |
| 10 - 11 | BORE LOG & CORE REPORT(S) |
| 11 | SOIL TEST RESULTS |


## CAUTION NOTICE

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WERE MADE FOR THE PURPOSE OF STUDY, PLANNING, AND DESIGN, AND NOT FOR CONSTRUCTION OR PAY PURPOSES. THE VARIOUS FIELD BORING LOGS, ROCK CORES, AND SOIL TEST DATA AVAILABLE MAY BE REVIEWED OR INSPECTED IN RALEIGH BY CONTACTING THE N. C. DEPARTMENT OF TRANSPORTATION, GEOTECHNICAL ENGINEERING UNIT AT (919) 250-4088. NEITHER THE SUBSURFACE PLANS AND REPORTS, NOR THE FIELD BORING LOGS, ROCK CORES, OR SOIL TEST DATA ARE PART OF THE CONTRACT.

GENERAL SOIL AND ROCK STRATA DESCRIPTIONS AND INDICATED BOUNDARIES ARE BASED ON A GEOTECHNICAL INTERPRETATION OF ALL AVAILABLE SUBSURFACE DATA AND MAY NOT NECESSARILY REFLECT THE ACTUAL SUBSURFACE CONDITIONS BETWEEN BORINGS OR BETWEEN SAMPLED STRATA WITHIN THE BOREHOLE. THE LABORATORY SAMPLE DATA AND THE IN SITU (IN-PLACE) TEST DATA CAN BE RELIED ON ONLY TO THE DEGREE OF RELIABILITY INHERENT IN THE STANDARD TEST METHOD. THE OBSERVED WATER LEVELS OR SOIL MOISTURE CONDITIONS INDICATED IN THE SUBSURFACE INVESTIGATIONS ARE AS RECORDED AT THE TIME OF THE INVESTIGATION. THESE WATER LEVELS OR SOIL MOISTURE CONDITIONS MAY VARY CONSIDERABLY WITH TIME ACCORDING TO CLIMATIC CONDITIONS INCLUDING TEMPERATURES, PRECIPITATION, AND WIND, AS WELL AS OTHER NON-CLIMATIC FACTORS.

THE BIDDER OR CONTRACTOR IS CAUTIONED THAT DETAILS SHOWN ON THE SUBSURFACE PLANS ARE PRELIMINARY ONLY AND IN MANY CASES THE FINAL DESIGN DETAILS ARE DIFFERENT. FOR BIDDING AND CONSTRUCTION PURPOSES, REFER TO THE CONSTRUCTION PLANS AND DOCUMENTS FOR FINAL DESIGN INFORMATION ON THIS PROJECT. THE DEPARTMENT DOES NOT WARRANT OR GUARANTEE THE SUFFICIENCY OR ACCURACY OF THE INVESTIGATION MADE, NOR THE INTERPRETATIONS MADE, OR OPINION OF THE DEPARTMENT AS TO THE TYPE OF MATERIALS AND CONDITIONS TO BE ENCOUNTERED. THE BIDDER OR CONTRACTOR IS CAUTIONED TO MAKE SUCH INDEPENDENT SUBSURFACE INVESTIGATIONS AS HE DEEMS NECESSARY TO SATISFY HIMSELF AS TO CONDITIONS TO BE ENCOUNTERED ON THIS PROJECT. THE CONTRACTOR SHALL HAVE NO CLAIM FOR ADDITIONAL COMPENSATION OR FOR AN EXTENSION OF TIME FOR ANY REASON RESULTING FROM THE ACTUAL CONDITIONS ENCOUNTERED AT THE SITE DIFFERING FROM THOSE INDICATED IN THE SUBSURFACE INFORMATION.

PERSONNEL

F & R ENGINEERING

R.A SHRANK

INVESTIGATED BY L.L. ACKER

CHECKED BY W.D. FRYE

SUBMITTED BY W.D. FRYE

DATE 6/8/06

NORTH CAROLINA LICENSED SEAL 1909 GEOLOGIST LOUIS L. ACKER

06/08/06

PROJECT: 34369.1.1

ID: R2100B

DRAWN BY: J. T. WILLIAMS

NOTE - THE INFORMATION CONTAINED HEREIN IS NOT IMPLIED OR GUARANTEED BY THE N. C. DEPARTMENT OF TRANSPORTATION AS BEING ACCURATE NOR IT IS CONSIDERED TO BE PART OF THE PLANS, SPECIFICATIONS, OR CONTRACT FOR THE PROJECT.

NOTE - BY HAVING REQUESTED THIS INFORMATION THE CONTRACTOR SPECIFICALLY WAIVES ANY CLAIMS FOR INCREASED COMPENSATION OR EXTENSION OF TIME BASED ON DIFFERENCES BETWEEN THE CONDITIONS INDICATED HEREIN AND THE ACTUAL CONDITIONS AT THE PROJECT SITE.

| PROJECT REFERENCE NO. | SHEET NO. |
|---|---|
| R2100B | 2 |

# NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
## DIVISION OF HIGHWAYS
## GEOTECHNICAL ENGINEERING UNIT

# SUBSURFACE INVESTIGATION

### SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

## SOIL DESCRIPTION

SOIL IS CONSIDERED TO BE THE UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER, AND YIELD LESS THAN 100 BLOWS PER FOOT ACCORDING TO STANDARD PENETRATION TEST (AASHTO T206, ASTM D-1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY SHALL INCLUDE: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. EXAMPLE:

*VERY STIFF, GRAY, SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6*

## SOIL LEGEND AND AASHTO CLASSIFICATION

| GENERAL CLASS. | GRANULAR MATERIALS (≤ 35% PASSING #200) | | | | | | | SILT-CLAY MATERIALS (> 35% PASSING #200) | | | | ORGANIC MATERIALS | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GROUP CLASS. | A-1 | | A-3 | A-2 | | | | A-4 | A-5 | A-6 | A-7 | A-1, A-2 A-3 | A-4, A-5 A-6, A-7 | |
| | A-1-a | A-1-b | | A-2-4 | A-2-5 | A-2-6 | A-2-7 | | | | A-7-5 A-7-6 | | | |
| SYMBOL | | | | | | | | | | | | | | |
| % PASSING #10 | 50 MX | 50 MX | 51 MN | | | | | | | | | GRANULAR SOILS | SILT-CLAY SOILS | MUCK, PEAT |
| #40 | 30 MX | 25 MX | 10 MX | 35 MX | 35 MX | 35 MX | 35 MX | 36 MN | 36 MN | 36 MN | 36 MN | | | |
| #200 | 15 MX | | | | | | | | | | | | | |
| LIQUID LIMIT | 6 MX | | NP | 40 MX | 41 MN | 40 MX | 41 MN | 40 MX | 41 MN | 40 MX | 41 MN | SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER | | HIGHLY ORGANIC SOILS |
| PLASTIC INDEX | | | | 10 MX | 10 MX | 11 MN | 11 MN | 10 MX | 10 MX | 11 MN | 11 MN | | | |
| GROUP INDEX | 0 | | 0 | 0 | | 4 MX | | 8 MX | 12 MX | 16 MX | No MX | | | |
| USUAL TYPES OF MAJOR MATERIALS | STONE FRAGS. GRAVEL, AND SAND | | FINE SAND | SILTY OR CLAYEY GRAVEL AND SAND | | | | SILTY SOILS | | CLAYEY SOILS | | | | |
| GEN. RATING AS A SUBGRADE | EXCELLENT TO GOOD | | | | | | | FAIR TO POOR | | | | FAIR TO POOR | POOR | UNSUITABLE |

PI OF A-7-5 SUBGROUP IS ≤ LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30

## CONSISTENCY OR DENSENESS

| PRIMARY SOIL TYPE | COMPACTNESS OR CONSISTENCY | RANGE OF STANDARD PENETRATION RESISTENCE (N-VALUE) | RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT$^2$) |
|---|---|---|---|
| GENERALLY GRANULAR MATERIAL (NON-COHESIVE) | VERY LOOSE<br>LOOSE<br>MEDIUM DENSE<br>DENSE<br>VERY DENSE | <4<br>4 TO 10<br>10 TO 30<br>30 TO 50<br>>50 | N/A |
| GENERALLY SILT-CLAY MATERIAL (COHESIVE) | VERY SOFT<br>SOFT<br>MEDIUM STIFF<br>STIFF<br>VERY STIFF<br>HARD | <2<br>2 TO 4<br>4 TO 8<br>8 TO 15<br>15 TO 30<br>>30 | <0.25<br>0.25 TO 0.50<br>0.5 TO 1.0<br>1 TO 2<br>2 TO 4<br>>4 |

## TEXTURE OR GRAIN SIZE

| U.S. STD. SIEVE SIZE | 4 | 10 | 40 | 60 | 200 | 270 |
|---|---|---|---|---|---|---|
| OPENING (MM) | 4.76 | 2.00 | 0.42 | 0.25 | 0.075 | 0.053 |

| BOULDER (BLDR.) | COBBLE (COB.) | GRAVEL (GR.) | COARSE SAND (CSE. SD.) | FINE SAND (F SD.) | SILT (SL.) | CLAY (CL.) |
|---|---|---|---|---|---|---|

GRAIN SIZE MM: 305 | 75 | 2.0 | 0.25 | 0.05 | 0.005
GRAIN SIZE IN.: 12 | 3

## SOIL MOISTURE - CORRELATION OF TERMS

| SOIL MOISTURE SCALE (ATTERBERG LIMITS) | FIELD MOISTURE DESCRIPTION | GUIDE FOR FIELD MOISTURE DESCRIPTION |
|---|---|---|
| | - SATURATED - (SAT.) | USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE |
| LL — LIQUID LIMIT | | |
| PLASTIC RANGE (PI) | - WET - (W) | SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE |
| PL — PLASTIC LIMIT | | |
| OM — OPTIMUM MOISTURE | - MOIST - (M) | SOLID; AT OR NEAR OPTIMUM MOISTURE |
| SL — SHRINKAGE LIMIT | | |
| | - DRY - (D) | REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE |

## PLASTICITY

| | PLASTICITY INDEX (PI) | DRY STRENGTH |
|---|---|---|
| NONPLASTIC | 0-5 | VERY LOW |
| LOW PLASTICITY | 6-15 | SLIGHT |
| MED. PLASTICITY | 16-25 | MEDIUM |
| HIGH PLASTICITY | 26 OR MORE | HIGH |

## COLOR

DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY). MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.

## GRADATION

WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE.
UNIFORM - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. (ALSO POORLY GRADED)
GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLES OF TWO OR MORE SIZES.

## ANGULARITY OF GRAINS

THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.

## MINERALOGICAL COMPOSITION

MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE.

## COMPRESSIBILITY

| | |
|---|---|
| SLIGHTLY COMPRESSIBLE | LIQUID LIMIT LESS THAN 31 |
| MODERATELY COMPRESSIBLE | LIQUID LIMIT EQUAL TO 31-50 |
| HIGHLY COMPRESSIBLE | LIQUID LIMIT GREATER THAN 50 |

## PERCENTAGE OF MATERIAL

| ORGANIC MATERIAL | GRANULAR SOILS | SILT - CLAY SOILS |
|---|---|---|
| TRACE OF ORGANIC MATTER | 2 - 3% | 3 - 5% |
| LITTLE ORGANIC MATTER | 3 - 5% | 5 - 12% |
| MODERATELY ORGANIC | 5 - 10% | 12 - 20% |
| HIGHLY ORGANIC | >10% | >20% |

| OTHER MATERIAL | |
|---|---|
| TRACE | 1 - 10% |
| LITTLE | 10 - 20% |
| SOME | 20 - 35% |
| HIGHLY | 35% AND ABOVE |

## GROUND WATER

- WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING
- STATIC WATER LEVEL AFTER 24 HOURS
- PW PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA
- SPRING OR SEEP

## MISCELLANEOUS SYMBOLS

- ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION
- SOIL SYMBOL
- ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT
- INFERRED SOIL BOUNDARY
- INFERRED ROCK LINE
- ALLUVIAL SOIL BOUNDARY
- 25/025 DIP & DIP DIRECTION OF ROCK STRUCTURES
- SOUNDING ROD
- SPT CPT DPT DMT VST PMT TEST BORING
- AUGER BORING
- CORE BORING
- MW MONITORING WELL
- PIEZOMETER INSTALLATION
- SLOPE INDICATOR INSTALLATION
- SPT N-VALUE
- REF SPT REFUSAL

SAMPLE DESIGNATIONS
- S - BULK SAMPLE
- SS - SPLIT SPOON SAMPLE
- ST - SHELBY TUBE SAMPLE
- RS - ROCK SAMPLE
- RT - RECOMPACTED TRIAXIAL SAMPLE
- CBR - CALIFORNIA BEARING RATIO SAMPLE

## ABBREVIATIONS

AR - AUGER REFUSAL
BT - BORING TERMINATED
CL. - CLAY
CPT - CONE PENETRATION TEST
CSE. - COARSE
DMT - DILATOMETER TEST
DPT - DYNAMIC PENETRATION TEST
e - VOID RATIO
F - FINE
FOSS. - FOSSILIFEROUS
FRAC. - FRACTURED, FRACTURES
FRAGS. - FRAGMENTS
HI. - HIGHLY
MED. - MEDIUM
MICA. - MICACEOUS
MOD. - MODERATELY
NP - NON PLASTIC
ORG. - ORGANIC
PMT - PRESSUREMETER TEST
SAP. - SAPROLITIC
SD. - SAND, SANDY
SL. - SILT, SILTY
SLI. - SLIGHTLY
TCR - TRICONE REFUSAL
$w$ - MOISTURE CONTENT
V - VERY
VST - VANE SHEAR TEST
WEA. - WEATHERED
$\gamma$ - UNIT WEIGHT
$\gamma_d$ - DRY UNIT WEIGHT

## EQUIPMENT USED ON SUBJECT PROJECT

DRILL UNITS:
- [ ] MOBILE B-___
- [ ] BK-51
- [ ] CME-45C
- [X] CME-550
- [ ] PORTABLE HOIST
- [ ] _____
- [ ] _____

ADVANCING TOOLS:
- [ ] CLAY BITS
- [X] 6" CONTINUOUS FLIGHT AUGER
- [X] 8" HOLLOW AUGERS
- [ ] HARD FACED FINGER BITS
- [ ] TUNG.-CARBIDE INSERTS
- [X] CASING [X] W/ ADVANCER
- [ ] TRICONE ____" STEEL TEETH
- [ ] TRICONE ____" TUNG.-CARB.
- [ ] CORE BIT
- [ ] _____

HAMMER TYPE:
- [X] AUTOMATIC [X] MANUAL

CORE SIZE:
- [ ] -B_____
- [X] -N_____
- [ ] -H_____

HAND TOOLS:
- [ ] POST HOLE DIGGER
- [ ] HAND AUGER
- [ ] SOUNDING ROD
- [ ] VANE SHEAR TEST
- [ ] _____

## ROCK DESCRIPTION

HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT IF TESTED, WOULD YIELD SPT REFUSAL. AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLE EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS. IN NON-COASTAL PLAIN MATERIAL, THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK.
ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:

| | |
|---|---|
| WEATHERED ROCK (WR) | NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100 BLOWS PER FOOT IF TESTED. |
| CRYSTALLINE ROCK (CR) | FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC. |
| NON-CRYSTALLINE ROCK (NCR) | FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN SEDIMENTARY ROCK THAT WOULD YEILD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC. |
| COASTAL PLAIN SEDIMENTARY ROCK (CP) | COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC. |

## WEATHERING

| | |
|---|---|
| FRESH | ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER HAMMER IF CRYSTALLINE. |
| VERY SLIGHT (V SLI.) | ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN, CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF OF A CRYSTALLINE NATURE. |
| SLIGHT (SLI.) | ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS. |
| MODERATE (MOD.) | SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED WITH FRESH ROCK. |
| MODERATELY SEVERE (MOD. SEV.) | ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES "CLUNK" SOUND WHEN STRUCK. *IF TESTED, WOULD YIELD SPT REFUSAL* |
| SEVERE (SEV.) | ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. *IF TESTED, YIELDS SPT N VALUES > 100 BPF* |
| VERY SEVERE (V SEV.) | ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT THE MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE SUCH THAT ONLY MINOR VESTIGES OF THE ORIGINAL ROCK FABRIC REMAIN. *IF TESTED, YIELDS SPT N VALUES < 100 BPF* |
| COMPLETE | ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE. |

## ROCK HARDNESS

| | |
|---|---|
| VERY HARD | CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK. |
| HARD | CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN. |
| MODERATELY HARD | CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS. |
| MEDIUM HARD | CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PEICES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK. |
| SOFT | CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE. |
| VERY SOFT | CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNAIL. |

## FRACTURE SPACING

| TERM | SPACING |
|---|---|
| VERY WIDE | MORE THAN 10 FEET |
| WIDE | 3 TO 10 FEET |
| MODERATELY CLOSE | 1 TO 3 FEET |
| CLOSE | 0.16 TO 1 FEET |
| VERY CLOSE | LESS THAN 0.16 FEET |

## BEDDING

| TERM | THICKNESS |
|---|---|
| VERY THICKLY BEDDED | > 4 FEET |
| THICKLY BEDDED | 1.5 - 4 FEET |
| THINLY BEDDED | 0.16 - 1.5 FEET |
| VERY THINLY BEDDED | 0.03 - 0.16 FEET |
| THICKLY LAMINATED | 0.008 - 0.03 FEET |
| THINLY LAMINATED | < 0.008 FEET |

## INDURATION

FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF THE MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.

| | |
|---|---|
| FRIABLE | RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE. |
| MODERATELY INDURATED | GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER. |
| INDURATED | GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER. |
| EXTREMELY INDURATED | SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS. |

## TERMS AND DEFINITIONS

ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER.

AQUIFER - A WATER BEARING FORMATION OR STRATA.

ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND.

ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, AS SHALE, SLATE, ETC.

ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE.

CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.

COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE.

CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.

DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK.

DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL.

DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.

FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.

FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.

FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM PARENT MATERIAL.

FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.

FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD.

JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.

LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT.

LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.

MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.

PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM.

RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.

ROCK QUALITY DESIGNATION (RQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.

SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK.

SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS.

SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE.

STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N OR BPF) OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS.

STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.

STRATA ROCK QUALITY DESIGNATION (SRQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.

TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.

BENCH MARK: BM #1-BY-5 + 17.49, 13.96 RT

ELEVATION: 2826.77 FT.

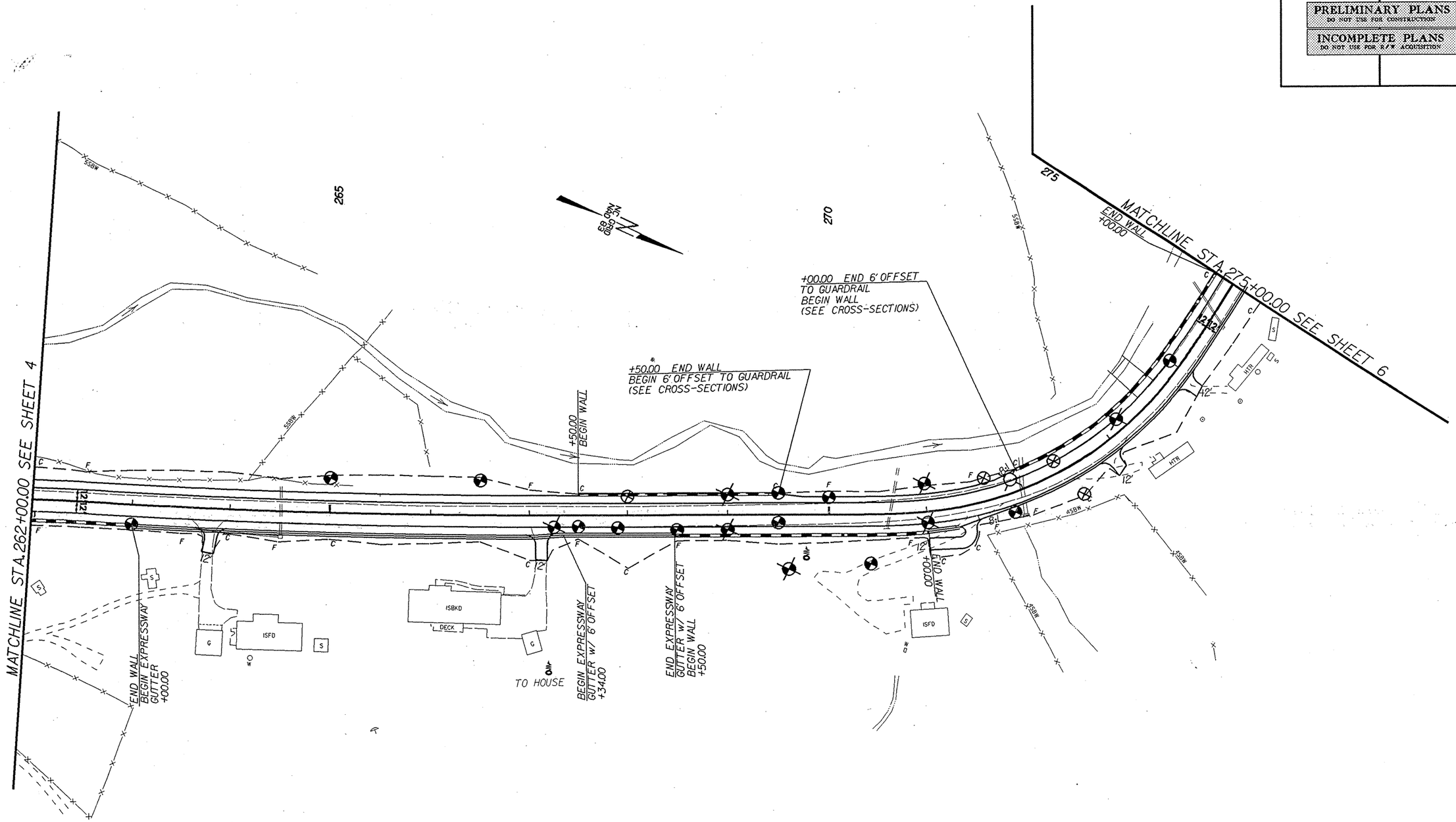
NOTES: FOR RETAINING WALL STA. 267+50 TO 269+00 LT.

| PROJECT REFERENCE NO. | SHEET NO. |
|---|---|
| R-2100B | 3 |
| R/W SHEET NO. | |
| ROADWAY DESIGN ENGINEER | HYDRAULICS ENGINEER |

Earth Tech
A Tyco International Ltd. Company

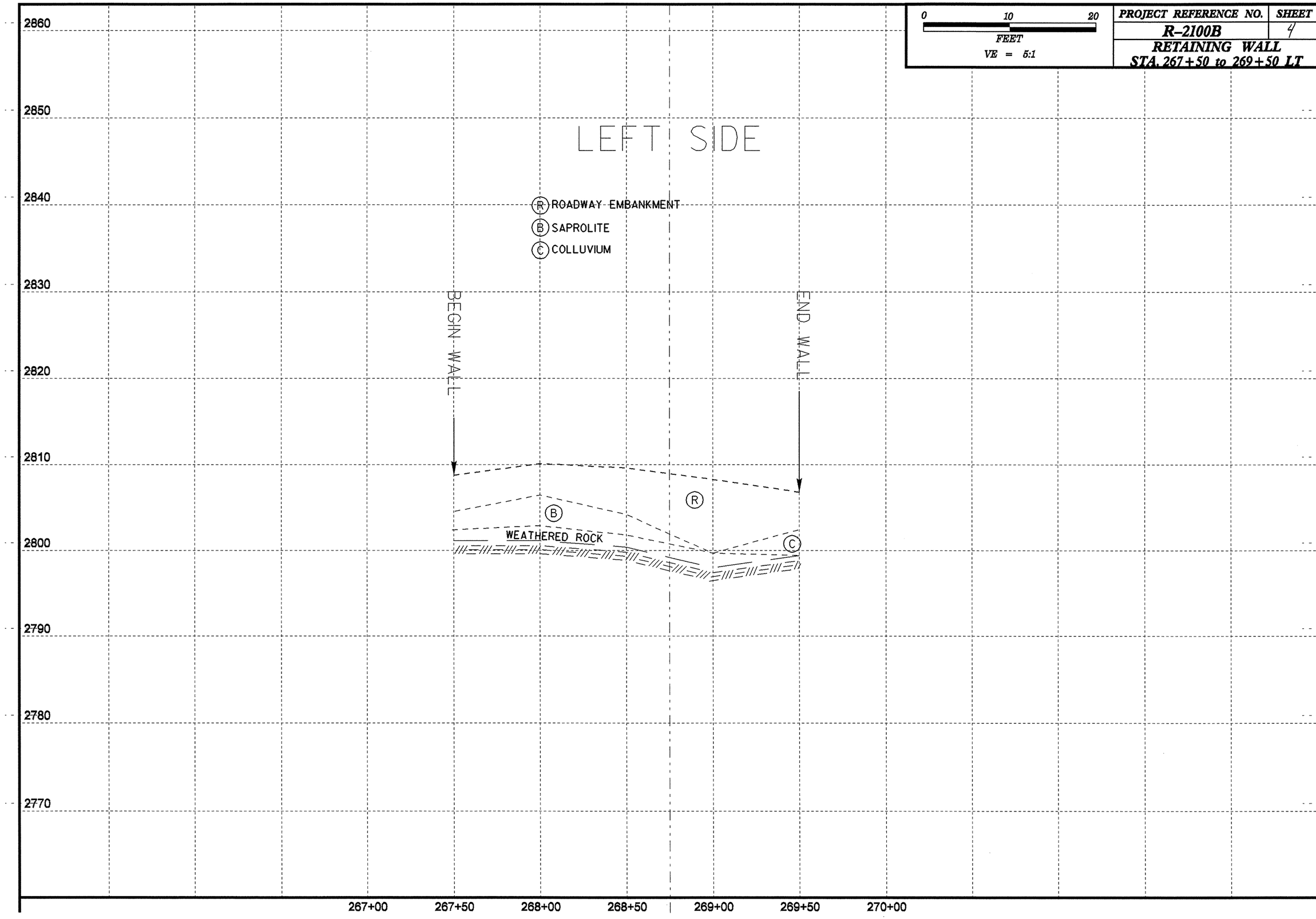
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

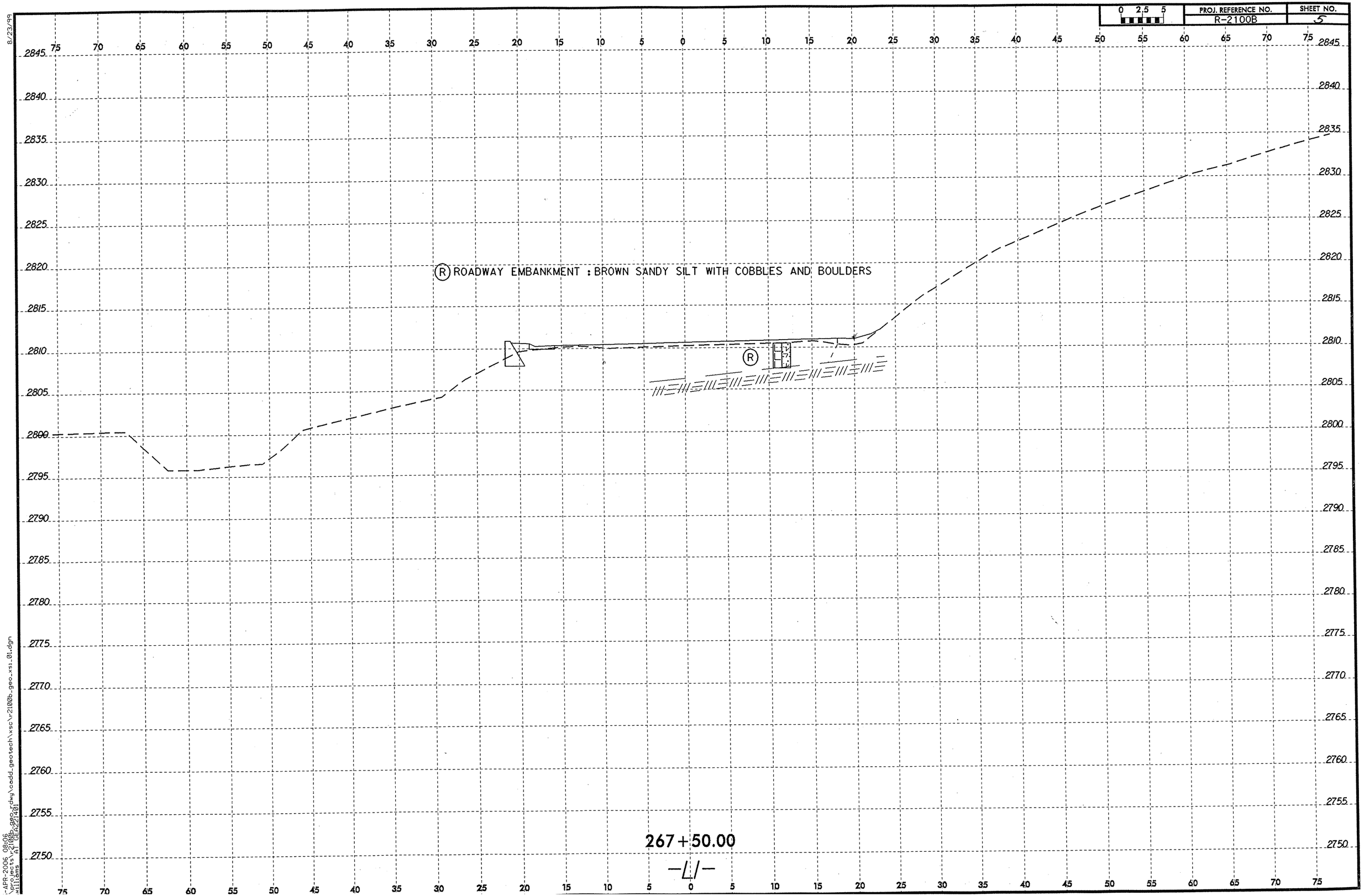
INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION




FOR -L- PROFILE SEE SHEET 14

| PROJECT REFERENCE NO. | SHEET |
|---|---|
| R-2100B | 4 |
| RETAINING WALL STA. 267+50 to 269+50 LT | |

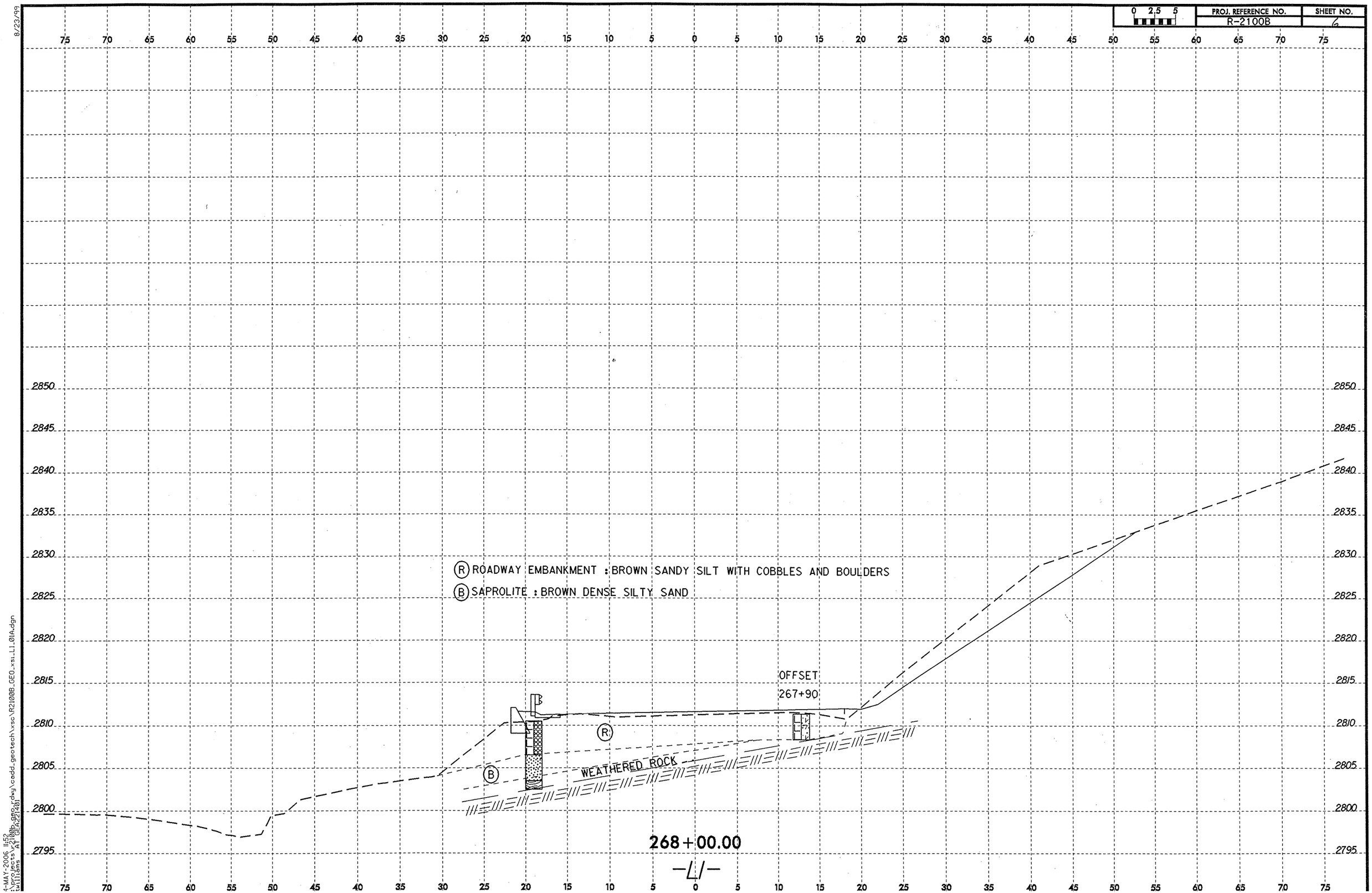




0 2.5 5
PROJ. REFERENCE NO.
R-2100B
SHEET NO.
5
8/23/99
R ROADWAY EMBANKMENT : BROWN SANDY SILT WITH COBBLES AND BOULDERS
R
267+50.00
-L/-

8/23/99

| 0 2.5 5 | PROJ. REFERENCE NO. | SHEET NO. |
|---|---|---|
| | R-2100B | 6 |

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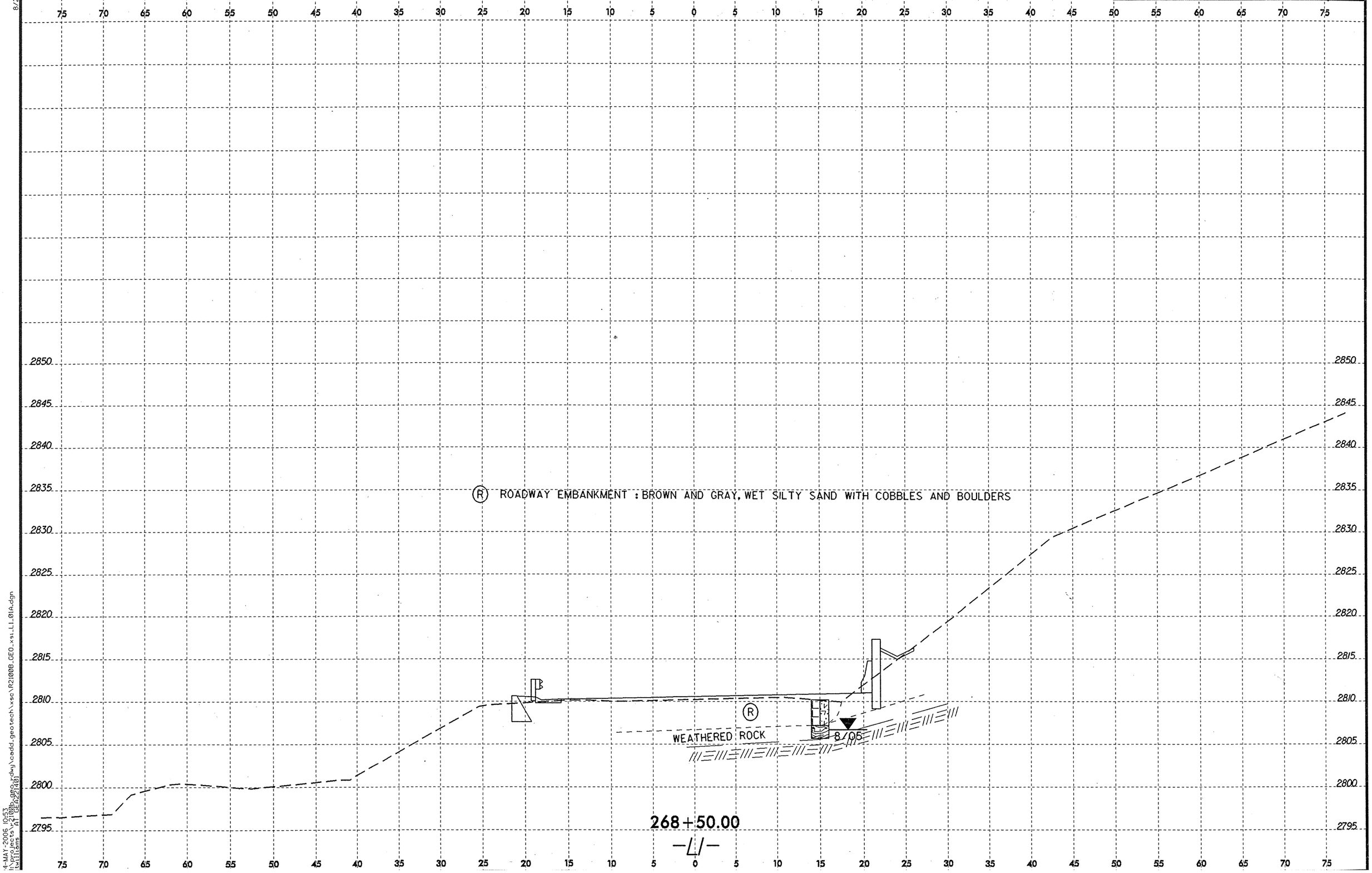
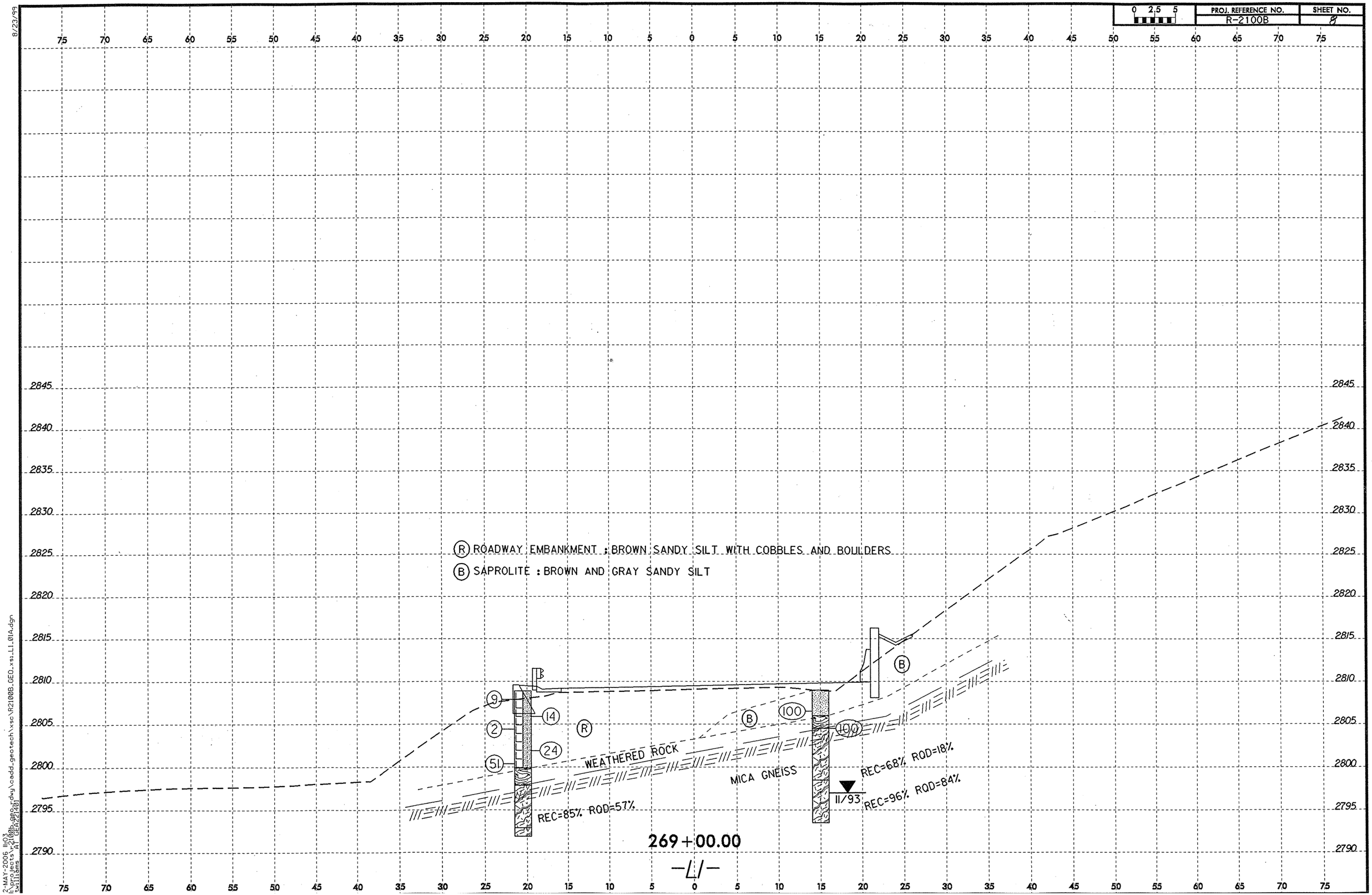


0 2.5 5
PROJ. REFERENCE NO.
R-2100B
SHEET NO.
7
8/23/99
75 70 65 60 55 50 45 40 35 30 25 20 15 10 5 0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75
2850
2845
2840
2835
2830
2825
2820
2815
2810
2805
2800
2795
R ROADWAY EMBANKMENT : BROWN AND GRAY, WET SILTY SAND WITH COBBLES AND BOULDERS
R
WEATHERED ROCK
8/05
268+50.00
-L1-



0 2.5 5
PROJ. REFERENCE NO.
R-2100B
SHEET NO.
8
8/23/99
2845
2840
2835
2830
2825
2820
2815
2810
2805
2800
2795
2790
(R) ROADWAY EMBANKMENT : BROWN SANDY SILT WITH COBBLES AND BOULDERS
(B) SAPROLITE : BROWN AND GRAY SANDY SILT
9
14
2
24
51
R
B
100
100
WEATHERED ROCK
MICA GNEISS
REC=85% RQD=57%
REC=68% RQD=18%
REC=96% RQD=84%
11/93
269+00.00
-L1-
2-MAY-2006 11:03
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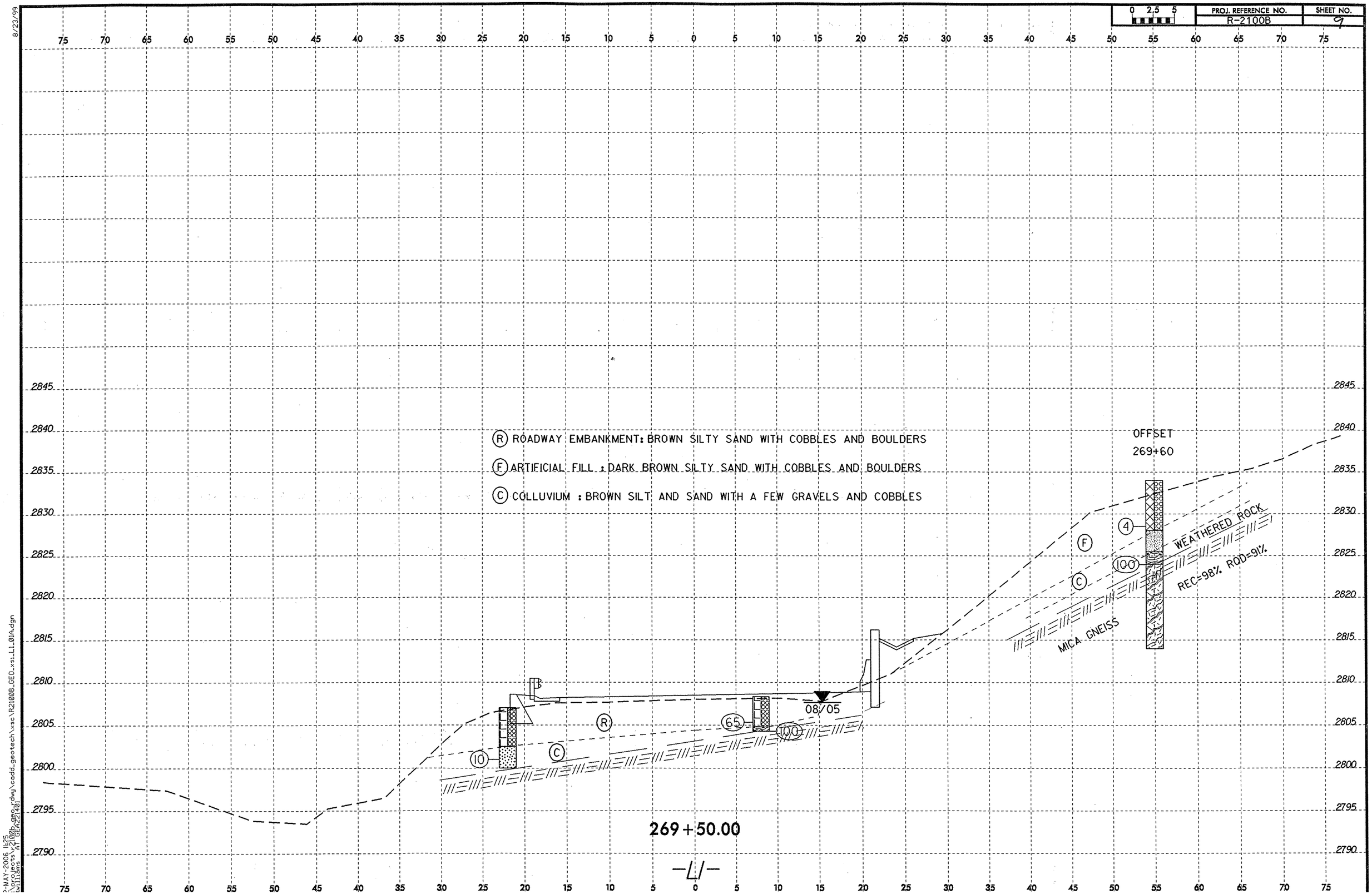


0 2.5 5
PROJ. REFERENCE NO.
R-2100B
SHEET NO.
9
8/23/99
(R) ROADWAY EMBANKMENT: BROWN SILTY SAND WITH COBBLES AND BOULDERS
(F) ARTIFICIAL FILL : DARK BROWN SILTY SAND WITH COBBLES AND BOULDERS
(C) COLLUVIUM : BROWN SILT AND SAND WITH A FEW GRAVELS AND COBBLES
OFFSET
269+60
WEATHERED ROCK
REC=98% RQD=91%
MICA GNEISS
08/05
269+50.00
-L1-
2845
2840
2835
2830
2825
2820
2815
2810
2805
2800
2795
2790

# NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
## GEOTECHNICAL UNIT BORING LOG

| | | | |
|---|---|---|---|
| **PROJECT NO** 34369.1.1 | **ID** R-2100B | **COUNTY** ASHE | **GEOLOGIST** R. SHRANK |
| **SITE DESCRIPTION** NC 16 FROM SOUTHEAST OF SR 1158 TO SOUTHEAST OF NC 88 | | | **GND WATER** |
| **BORING NO** 26800LT | **NORTHING** 0.00 | **EASTING** 0.00 | **0 HR** N/A |
| **ALIGNMENT** -L- | **BORING LOCATION** 268+00.000 | **OFFSET** 19.00ft LT | **24 HR** N/A |
| **COLLAR ELEV** 2810.50ft | **TOTAL DEPTH** 8.00ft | **START DATE** 8/25/93 | **COMPLETION DATE** 08/25/93 |
| **DRILL MACHINE** CME 550 | **DRILL METHOD** SOLID AUGERS | | **HAMMER TYPE** MANUAL |
| **SURFACE WATER DEPTH** | **DEPTH TO ROCK** 8.00ft | | **Log 26800LT, Page 1 of 1** |

| ELEV | DEPTH | BLOW CT 6in | BLOW CT 6in | BLOW CT 6in | PEN (ft) | BLOWS PER FOOT 0 25 50 75 100 | SAMPLE NO | MOI | LOG | SOIL AND ROCK DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|
| 2810.50 | | | | | | Ground Surface | | | | |
| | | | | | | | | M<br>M | | EMBANKMENT: BROWN SILTY SAND WITH COBBLES AND BOULDERS |
| 2802.50 | | | | | | | | | | SAPROLITE: BROWN, MED. DENSE SILTY SAND |
| | | | | | | TERMINATED BORING ON HARD ROCK AT ELEVATION 2802.5 FEET. | | | | WEATHERED ROCK |



# NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
## GEOTECHNICAL UNIT BORING LOG

| | | | |
|---|---|---|---|
| **PROJECT NO** 8.1710902 | **ID** R-2100 | **COUNTY** ASHE | **GEOLOGIST** K. GAY |
| **SITE DESCRIPTION** RETAINING WALL FOR NC16 FROM JEFFERSON TO WILKES CO (RW #7) | | | **GND WATER** |
| **BORING NO** 269+00LT | **NORTHING** 0.00 | **EASTING** 0.00 | **0 HR** N/A |
| **ALIGNMENT** 269+00LT | **BORING LOCATION** 269+00.000 | **OFFSET** 20.50ft LT | **24 HR** N/A |
| **COLLAR ELEV** 2808.90ft | **TOTAL DEPTH** 17.00ft | **START DATE** 11/17/93 | **COMPLETION DATE** 11/17/93 |
| **DRILL MACHINE** CME-550 | **DRILL METHOD** H.S. AUGERS | | **HAMMER TYPE** AUTOMATIC |
| **SURFACE WATER DEPTH** N/A | **DEPTH TO ROCK** N/A | | **Log 269+00LT, Page 1 of 1** |

| ELEV | DEPTH | BLOW CT 6in | BLOW CT 6in | BLOW CT 6in | PEN (ft) | BLOWS PER FOOT 0 25 50 75 100 | SAMPLE NO | MOI | LOG | SOIL AND ROCK DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|
| 2808.90 | 0.00 | 2 | 4 | 5 | 1.0 | Ground Surface | | | | |
| | 2.00 | 5 | 6 | 8 | 1.0 | 9 14 | | | | ROADWAY FILL BROWN AND TAN FINE SANDY SILT WITH MICA AND BOULDERS (A-4) |
| | 3.50 | 3 | 1 | 1 | 1.0 | 2 | | | | |
| | 6.00 | 3 | 6 | 18 | 1.0 | 24 | | | | |
| 2800.00 | 8.50 | 20 | 50 | 1 | 0.1 | 51 | | | | |
| | | | | | | | 1 | D<br>D | | SOFT WEATHERED ROCK-APPEARS AS BROWN FINE SANDY SILT |
| 2791.90 | | | | | | CORING TERMINATED AT ELEVATION 2791.0 IN CRYSTALLINE ROCK | | | | REC=85% RQD=57% AMPHIBOLITE SLIGHTLY WEATHERED HARD GREEN GRAY QUARTZ VEINS. |
| | | | | | | | | | | BIOTITE GNEISS: SLIGHTLY WEATHERED HARD GRAY FOLIATED |

# NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
## GEOTECHNICAL UNIT BORING LOG

| | | | |
|---|---|---|---|
| PROJECT NO 34369.1.1 | ID R-2100B | COUNTY ASHE | GEOLOGIST D. CHITTENDEN (F&H) |
| SITE DESCRIPTION NC 16 FROM SOUTHEAST OF SR 1158 TO SOUTHEAST OF NC 88 | | | GND WATER |
| BORING NO 26950L | NORTHING 0.00 | EASTING 0.00 | 0 HR N/A |
| ALIGNMENT -L- | BORING LOCATION 269+50.000 | OFFSET 22.00ft LT | 24 HR N/A |
| COLLAR ELEV 2807.00ft | TOTAL DEPTH 7.00ft | START DATE 8/13/05 | COMPLETION DATE 08/13/05 |
| DRILL MACHINE CME-45 | DRILL METHOD ROTARY W/O MUD | | HAMMER TYPE AUTOMATIC |
| SURFACE WATER DEPTH N/A | DEPTH TO ROCK 7.00ft | | Log 26950L, Page 1 of 1 |

| ELEV | DEPTH | BLOW CT 6in | BLOW CT 6in | BLOW CT 6in | PEN (ft) | BLOWS PER FOOT 0 25 50 75 100 | SAMPLE NO | MOI | LOG | SOIL AND ROCK DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|
| 2807.00 | | | | | | Ground Surface | | | | |
| | 5.00 | 2 | 6 | 4 | 1.0 | 10 | SS-623 | | | EMBANKMENT: BROWN SILTY SAND WITH COBBLES AND BOULDERS |
| 2800.00 | | | | | | | | | | COLLUVIUM: DARK BROWN SILTY SAND WITH FEW ROCK FRAGMENTS |
| | | | | | | TERMINATED BORING ON HARD ROCK AT ELEVATION 2800.0 FEET | | | | |

M&T 503E

JCS

# NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
## DIVISION OF HIGHWAYS-MATERIALS AND TESTS UNIT
## SOILS TEST REPORT-SOILS LABORATORY

| | |
|---|---|
| T.I.P. ID #: | R-2100 B |

| | |
|---|---|
| REPORT ON SAMPLES OF: | Soils for Classification |

| | | | | | |
|---|---|---|---|---|---|
| PROJECT: | 34369.1.1 | COUNTY: | Ashe | Owner: | -- |
| DATE SAMPLED: | 8.05 | DATE RECEIVED: | 9.23.05 | DATE REPORTED: | 10.5.05 |
| SAMPLED FROM: | Roadway | SAMPLED BY: | L. L. Acker | | |
| SUBMITTED BY: | W. D. Frye | 2002 | STANDARD SPECIFICATION | | |
| LABORATORY: | Asheville | | | | |

## TEST RESULTS

| Project Sample No. | SS-614 | SS-618 | SS-619 | SS-621 | SS-622 | SS-623 | SS-624 | SS-625 |
|---|---|---|---|---|---|---|---|---|
| Lab Sample No. A | 150488 | 150489 | 150490 | 150491 | 150492 | 150493 | 150494 | 150495 |
| HiCAMS Sample # | -- | -- | -- | -- | -- | -- | -- | -- |
| Retained #4 Sieve % | -- | -- | -- | -- | -- | -- | -- | -- |
| Passing #10 Sieve % | 91 | 78 | 55 | 30 | 65 | 61 | 55 | 82 |
| Passing #40 Sieve % | 78 | 72 | 48 | 23 | 55 | 55 | 41 | 76 |
| Passing #200 Sieve % | 21 | 40 | 21 | 10 | 20 | 22 | 14 | 28 |

## MINUS #10 FRACTION

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Soil Mortar - 100% | | | | | | | | |
| Coarse Sand -Ret. #60 | 30 | 17 | 23 | 33 | 27 | 22 | 40 | 18 |
| Fine Sand - Ret. #270 | 55 | 41 | 47 | 40 | 53 | 51 | 40 | 59 |
| Silt 0.05-0.005 mm % | 13 | 32 | 22 | 21 | 16 | 23 | 16 | 21 |
| Clay < 0.005 mm % | 2 | 10 | 8 | 6 | 4 | 4 | 4 | 2 |
| Passing # 40 Sieve % | -- | -- | -- | -- | -- | -- | -- | -- |
| Passing # 200 Sieve % | -- | -- | -- | -- | -- | -- | -- | -- |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Liquid Limit | 44 | 43 | 32 | 34 | 34 | 32 | 31 | 45 |
| Plastic Index | NP | NP | NP | NP | NP | NP | NP | NP |
| AASHTO Classification | A-2-5 (0) | A-5 (1) | A-1-b (0) | A-1-a (0) | A-2-4 (0) | A-2-4 (0) | A-1-b (0) | A-2-5 (0) |
| Quantity | | | | | | | | |
| Texture | | | | | | | | |
| Station | 284+00 | 294+50 | 280+30 | 280+00 | 280+00 | 269+50 | 266+50 | 266+50 |
| Hole No. | | | | | | | | |
| Depth (ft) From: | 9.5 | 5.0 | 5.0 | 5.0 | 10.0 | 5.0 | 4.5 | 9.5 |
| To: | 11.0 | 6.5 | 6.5 | 6.5 | 11.0 | 6.5 | 6.0 | 11.0 |
| | | | | | | | | |

**Remarks:**

A-150488 - 150495

**CC:**

| | |
|---|---|
| L. L. Acker | |
| File | |
| | |
| | |

| | |
|---|---|
| SOILS ENGINEER: | |

| STATE | STATE PROJECT REFERENCE NO. | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|
| N.C. | R2100B | 1 | 14 |

# STATE OF NORTH CAROLINA
## DEPARTMENT OF TRANSPORTATION
## DIVISION OF HIGHWAYS
## GEOTECHNICAL ENGINEERING UNIT

# STRUCTURE SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. R2100B F.A. PROJ. STP-16(1)

COUNTY ASHE

PROJECT DESCRIPTION NC 16 FROM SOUTHEAST OF SR 1158 TO SOUTHEAST OF NC 88

SITE DESCRIPTION RETAINING WALL FROM STA. 272+00 TO STA. 275+00 (LEFT) ON NC 16

## CONTENTS


| SHEET | DESCRIPTION |
|---|---|
| 1 | TITLE SHEET |
| 2 | LEGEND |
| 3 | SITE PLAN |
| 4 | PROFILE |
| 5 - 11 | CROSS SECTION(S) |
| 12 - 14 | BORE LOG & CORE REPORT(S) |


## CAUTION NOTICE

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WERE MADE FOR THE PURPOSE OF STUDY, PLANNING, AND DESIGN, AND NOT FOR CONSTRUCTION OR PAY PURPOSES. THE VARIOUS FIELD BORING LOGS, ROCK CORES, AND SOIL TEST DATA AVAILABLE MAY BE REVIEWED OR INSPECTED IN RALEIGH BY CONTACTING THE N. C. DEPARTMENT OF TRANSPORTATION, GEOTECHNICAL ENGINEERING UNIT AT (919) 250-4088. NEITHER THE SUBSURFACE PLANS AND REPORTS, NOR THE FIELD BORING LOGS, ROCK CORES, OR SOIL TEST DATA ARE PART OF THE CONTRACT.

GENERAL SOIL AND ROCK STRATA DESCRIPTIONS AND INDICATED BOUNDARIES ARE BASED ON A GEOTECHNICAL INTERPRETATION OF ALL AVAILABLE SUBSURFACE DATA AND MAY NOT NECESSARILY REFLECT THE ACTUAL SUBSURFACE CONDITIONS BETWEEN BORINGS OR BETWEEN SAMPLED STRATA WITHIN THE BOREHOLE. THE LABORATORY SAMPLE DATA AND THE IN SITU (IN-PLACE) TEST DATA CAN BE RELIED ON ONLY TO THE DEGREE OF RELIABILITY INHERENT IN THE STANDARD TEST METHOD. THE OBSERVED WATER LEVELS OR SOIL MOISTURE CONDITIONS INDICATED IN THE SUBSURFACE INVESTIGATIONS ARE AS RECORDED AT THE TIME OF THE INVESTIGATION. THESE WATER LEVELS OR SOIL MOISTURE CONDITIONS MAY VARY CONSIDERABLY WITH TIME ACCORDING TO CLIMATIC CONDITIONS INCLUDING TEMPERATURES, PRECIPITATION, AND WIND, AS WELL AS OTHER NON-CLIMATIC FACTORS.

THE BIDDER OR CONTRACTOR IS CAUTIONED THAT DETAILS SHOWN ON THE SUBSURFACE PLANS ARE PRELIMINARY ONLY AND IN MANY CASES THE FINAL DESIGN DETAILS ARE DIFFERENT. FOR BIDDING AND CONSTRUCTION PURPOSES, REFER TO THE CONSTRUCTION PLANS AND DOCUMENTS FOR FINAL DESIGN INFORMATION ON THIS PROJECT. THE DEPARTMENT DOES NOT WARRANT OR GUARANTEE THE SUFFICIENCY OR ACCURACY OF THE INVESTIGATION MADE, NOR THE INTERPRETATIONS MADE, OR OPINION OF THE DEPARTMENT AS TO THE TYPE OF MATERIALS AND CONDITIONS TO BE ENCOUNTERED. THE BIDDER OR CONTRACTOR IS CAUTIONED TO MAKE SUCH INDEPENDENT SUBSURFACE INVESTIGATIONS AS HE DEEMS NECESSARY TO SATISFY HIMSELF AS TO CONDITIONS TO BE ENCOUNTERED ON THIS PROJECT. THE CONTRACTOR SHALL HAVE NO CLAIM FOR ADDITIONAL COMPENSATION OR FOR AN EXTENSION OF TIME FOR ANY REASON RESULTING FROM THE ACTUAL CONDITIONS ENCOUNTERED AT THE SITE DIFFERING FROM THOSE INDICATED IN THE SUBSURFACE INFORMATION.

PERSONNEL

F & R ENGINEERING

INVESTIGATED BY L.L. ACKER

CHECKED BY W.D. FRYE

SUBMITTED BY W.D. FRYE

DATE 6/8/06

NORTH CAROLINA LICENSED SEAL 1002 GEOLOGIST LOUIS L. ACKER

06/08/06

DRAWN BY: J. T. WILLIAMS

NOTE - THE INFORMATION CONTAINED HEREIN IS NOT IMPLIED OR GUARANTEED BY THE N. C. DEPARTMENT OF TRANSPORTATION AS BEING ACCURATE NOR IT IS CONSIDERED TO BE PART OF THE PLANS, SPECIFICATIONS, OR CONTRACT FOR THE PROJECT.

NOTE - BY HAVING REQUESTED THIS INFORMATION THE CONTRACTOR SPECIFICALLY WAIVES ANY CLAIMS FOR INCREASED COMPENSATION OR EXTENSION OF TIME BASED ON DIFFERENCES BETWEEN THE CONDITIONS INDICATED HEREIN AND THE ACTUAL CONDITIONS AT THE PROJECT SITE.

PROJECT: 34369.1.1

ID: R2100B

| PROJECT REFERENCE NO. | SHEET NO. |
|---|---|
| R2100B | 2 |

# NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
## DIVISION OF HIGHWAYS
## GEOTECHNICAL ENGINEERING UNIT

# SUBSURFACE INVESTIGATION

### SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

## SOIL DESCRIPTION

SOIL IS CONSIDERED TO BE THE UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER, AND YIELD LESS THAN 100 BLOWS PER FOOT ACCORDING TO STANDARD PENETRATION TEST (AASHTO T206, ASTM D-1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY SHALL INCLUDE: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. EXAMPLE:

*VERY STIFF, GRAY, SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6*

## SOIL LEGEND AND AASHTO CLASSIFICATION

| GENERAL CLASS. | GRANULAR MATERIALS (≤ 35% PASSING #200) | | | | | | | SILT-CLAY MATERIALS (> 35% PASSING #200) | | | | ORGANIC MATERIALS | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GROUP CLASS. | A-1 | | A-3 | A-2 | | | | A-4 | A-5 | A-6 | A-7 | A-1, A-2 A-3 | A-4, A-5 A-6, A-7 | |
| | A-1-a | A-1-b | | A-2-4 | A-2-5 | A-2-6 | A-2-7 | | | | A-7-5 A-7-6 | | | |
| SYMBOL | | | | | | | | | | | | | | |
| % PASSING # 10 | 50 MX | | | | | | | | | | | GRANULAR SOILS | SILT-CLAY SOILS | MUCK, PEAT |
| # 40 | 30 MX | 50 MX | 51 MN | | | | | | | | | | | |
| # 200 | 15 MX | 25 MX | 10 MX | 35 MX | 35 MX | 35 MX | 35 MX | 36 MN | 36 MN | 36 MN | 36 MN | | | |
| LIQUID LIMIT | 6 MX | | NP | 40 MX | 41 MN | 40 MX | 41 MN | 40 MX | 41 MN | 40 MX | 41 MN | SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER | | HIGHLY ORGANIC SOILS |
| PLASTIC INDEX | | | | 10 MX | 10 MX | 11 MN | 11 MN | 10 MX | 10 MX | 11 MN | 11 MN | | | |
| GROUP INDEX | 0 | | 0 | 0 | | 4 MX | | 8 MX | 12 MX | 16 MX | No MX | | | |
| USUAL TYPES OF MAJOR MATERIALS | STONE FRAGS. GRAVEL, AND SAND | | FINE SAND | SILTY OR CLAYEY GRAVEL AND SAND | | | | SILTY SOILS | | CLAYEY SOILS | | | | |
| GEN. RATING AS A SUBGRADE | EXCELLENT TO GOOD | | | | | | | FAIR TO POOR | | | | FAIR TO POOR | POOR | UNSUITABLE |

PI OF A-7-5 SUBGROUP IS ≤ LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30

## CONSISTENCY OR DENSENESS

| PRIMARY SOIL TYPE | COMPACTNESS OR CONSISTENCY | RANGE OF STANDARD PENETRATION RESISTENCE (N-VALUE) | RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT$^2$) |
|---|---|---|---|
| GENERALLY GRANULAR MATERIAL (NON-COHESIVE) | VERY LOOSE<br>LOOSE<br>MEDIUM DENSE<br>DENSE<br>VERY DENSE | <4<br>4 TO 10<br>10 TO 30<br>30 TO 50<br>>50 | N/A |
| GENERALLY SILT-CLAY MATERIAL (COHESIVE) | VERY SOFT<br>SOFT<br>MEDIUM STIFF<br>STIFF<br>VERY STIFF<br>HARD | <2<br>2 TO 4<br>4 TO 8<br>8 TO 15<br>15 TO 30<br>>30 | <0.25<br>0.25 TO 0.50<br>0.5 TO 1.0<br>1 TO 2<br>2 TO 4<br>>4 |

## TEXTURE OR GRAIN SIZE

| U.S. STD. SIEVE SIZE | 4 | 10 | 40 | 60 | 200 | 270 |
|---|---|---|---|---|---|---|
| OPENING (MM) | 4.76 | 2.00 | 0.42 | 0.25 | 0.075 | 0.053 |

| BOULDER (BLDR.) | COBBLE (COB.) | GRAVEL (GR.) | COARSE SAND (CSE. SD.) | FINE SAND (F SD.) | SILT (SL.) | CLAY (CL.) |
|---|---|---|---|---|---|---|

GRAIN SIZE MM: 305 | 75 | 2.0 | 0.25 | 0.05 | 0.005
GRAIN SIZE IN.: 12 | 3

## SOIL MOISTURE - CORRELATION OF TERMS

| SOIL MOISTURE SCALE (ATTERBERG LIMITS) | FIELD MOISTURE DESCRIPTION | GUIDE FOR FIELD MOISTURE DESCRIPTION |
|---|---|---|
| | - SATURATED - (SAT.) | USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE |
| LL — LIQUID LIMIT | | |
| PLASTIC RANGE (PI) | - WET - (W) | SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE |
| PL — PLASTIC LIMIT | | |
| OM — OPTIMUM MOISTURE | - MOIST - (M) | SOLID; AT OR NEAR OPTIMUM MOISTURE |
| SL — SHRINKAGE LIMIT | | |
| | - DRY - (D) | REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE |

## PLASTICITY

| | PLASTICITY INDEX (PI) | DRY STRENGTH |
|---|---|---|
| NONPLASTIC | 0-5 | VERY LOW |
| LOW PLASTICITY | 6-15 | SLIGHT |
| MED. PLASTICITY | 16-25 | MEDIUM |
| HIGH PLASTICITY | 26 OR MORE | HIGH |

## COLOR

DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY). MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.

## GRADATION

WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE.
UNIFORM - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. (ALSO POORLY GRADED)
GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLES OF TWO OR MORE SIZES.

## ANGULARITY OF GRAINS

THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.

## MINERALOGICAL COMPOSITION

MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE.

## COMPRESSIBILITY

| | |
|---|---|
| SLIGHTLY COMPRESSIBLE | LIQUID LIMIT LESS THAN 31 |
| MODERATELY COMPRESSIBLE | LIQUID LIMIT EQUAL TO 31-50 |
| HIGHLY COMPRESSIBLE | LIQUID LIMIT GREATER THAN 50 |

## PERCENTAGE OF MATERIAL

| ORGANIC MATERIAL | GRANULAR SOILS | SILT - CLAY SOILS | OTHER MATERIAL | |
|---|---|---|---|---|
| TRACE OF ORGANIC MATTER | 2 - 3% | 3 - 5% | TRACE | 1 - 10% |
| LITTLE ORGANIC MATTER | 3 - 5% | 5 - 12% | LITTLE | 10 - 20% |
| MODERATELY ORGANIC | 5 - 10% | 12 - 20% | SOME | 20 - 35% |
| HIGHLY ORGANIC | >10% | >20% | HIGHLY | 35% AND ABOVE |

## GROUND WATER

- WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING
- STATIC WATER LEVEL AFTER 24 HOURS
- PW PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA
- SPRING OR SEEP

## MISCELLANEOUS SYMBOLS

- ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION
- SOIL SYMBOL
- ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT
- INFERRED SOIL BOUNDARY
- INFERRED ROCK LINE
- ALLUVIAL SOIL BOUNDARY
- 25/025 DIP & DIP DIRECTION OF ROCK STRUCTURES
- SOUNDING ROD
- SPT CPT DPT DMT VST PMT TEST BORING
- AUGER BORING
- CORE BORING
- MW MONITORING WELL
- PIEZOMETER INSTALLATION
- SLOPE INDICATOR INSTALLATION
- SPT N-VALUE
- REF SPT REFUSAL

SAMPLE DESIGNATIONS
- S - BULK SAMPLE
- SS - SPLIT SPOON SAMPLE
- ST - SHELBY TUBE SAMPLE
- RS - ROCK SAMPLE
- RT - RECOMPACTED TRIAXIAL SAMPLE
- CBR - CALIFORNIA BEARING RATIO SAMPLE

## ABBREVIATIONS

AR - AUGER REFUSAL
BT - BORING TERMINATED
CL. - CLAY
CPT - CONE PENETRATION TEST
CSE. - COARSE
DMT - DILATOMETER TEST
DPT - DYNAMIC PENETRATION TEST
e - VOID RATIO
F - FINE
FOSS. - FOSSILIFEROUS
FRAC. - FRACTURED, FRACTURES
FRAGS. - FRAGMENTS
HI. - HIGHLY
MED. - MEDIUM
MICA. - MICACEOUS
MOD. - MODERATELY
NP - NON PLASTIC
ORG. - ORGANIC
PMT - PRESSUREMETER TEST
SAP. - SAPROLITIC
SD. - SAND, SANDY
SL. - SILT, SILTY
SLI. - SLIGHTLY
TCR - TRICONE REFUSAL
w - MOISTURE CONTENT
V - VERY
VST - VANE SHEAR TEST
WEA. - WEATHERED
$\gamma$ - UNIT WEIGHT
$\gamma_d$ - DRY UNIT WEIGHT

## EQUIPMENT USED ON SUBJECT PROJECT

DRILL UNITS:
- [ ] MOBILE B-___
- [ ] BK-51
- [ ] CME-45C
- [X] CME-550
- [ ] PORTABLE HOIST
- [ ] _____
- [ ] _____

ADVANCING TOOLS:
- [ ] CLAY BITS
- [ ] 6" CONTINUOUS FLIGHT AUGER
- [X] 8" HOLLOW AUGERS
- [ ] HARD FACED FINGER BITS
- [ ] TUNG.-CARBIDE INSERTS
- [X] CASING [X] W/ ADVANCER
- [ ] TRICONE ____" STEEL TEETH
- [ ] TRICONE ____" TUNG.-CARB.
- [ ] CORE BIT
- [ ] _____

HAMMER TYPE:
- [X] AUTOMATIC [ ] MANUAL

CORE SIZE:
- [ ] -B_____
- [X] -N_____
- [ ] -H_____

HAND TOOLS:
- [ ] POST HOLE DIGGER
- [ ] HAND AUGER
- [ ] SOUNDING ROD
- [ ] VANE SHEAR TEST
- [ ] _____

## ROCK DESCRIPTION

HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT IF TESTED, WOULD YIELD SPT REFUSAL. AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS. IN NON-COASTAL PLAIN MATERIAL, THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK.
ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:

| | |
|---|---|
| WEATHERED ROCK (WR) | NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100 BLOWS PER FOOT IF TESTED. |
| CRYSTALLINE ROCK (CR) | FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC. |
| NON-CRYSTALLINE ROCK (NCR) | FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN SEDIMENTARY ROCK THAT WOULD YEILD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC. |
| COASTAL PLAIN SEDIMENTARY ROCK (CP) | COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC. |

## WEATHERING

| | |
|---|---|
| FRESH | ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER HAMMER IF CRYSTALLINE. |
| VERY SLIGHT (V SLI.) | ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN, CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF OF A CRYSTALLINE NATURE. |
| SLIGHT (SLI.) | ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS. |
| MODERATE (MOD.) | SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED WITH FRESH ROCK. |
| MODERATELY SEVERE (MOD. SEV.) | ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES "CLUNK" SOUND WHEN STRUCK. *IF TESTED, WOULD YIELD SPT REFUSAL* |
| SEVERE (SEV.) | ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. *IF TESTED, YIELDS SPT N VALUES > 100 BPF* |
| VERY SEVERE (V SEV.) | ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT THE MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE SUCH THAT ONLY MINOR VESTIGES OF THE ORIGINAL ROCK FABRIC REMAIN. *IF TESTED, YIELDS SPT N VALUES < 100 BPF* |
| COMPLETE | ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE. |

## ROCK HARDNESS

| | |
|---|---|
| VERY HARD | CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK. |
| HARD | CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN. |
| MODERATELY HARD | CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS. |
| MEDIUM HARD | CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PEICES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK. |
| SOFT | CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE. |
| VERY SOFT | CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNAIL. |

## FRACTURE SPACING

| TERM | SPACING |
|---|---|
| VERY WIDE | MORE THAN 10 FEET |
| WIDE | 3 TO 10 FEET |
| MODERATELY CLOSE | 1 TO 3 FEET |
| CLOSE | 0.16 TO 1 FEET |
| VERY CLOSE | LESS THAN 0.16 FEET |

## BEDDING

| TERM | THICKNESS |
|---|---|
| VERY THICKLY BEDDED | > 4 FEET |
| THICKLY BEDDED | 1.5 - 4 FEET |
| THINLY BEDDED | 0.16 - 1.5 FEET |
| VERY THINLY BEDDED | 0.03 - 0.16 FEET |
| THICKLY LAMINATED | 0.008 - 0.03 FEET |
| THINLY LAMINATED | < 0.008 FEET |

## INDURATION

FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF THE MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.

| | |
|---|---|
| FRIABLE | RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE. |
| MODERATELY INDURATED | GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER. |
| INDURATED | GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER. |
| EXTREMELY INDURATED | SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS. |

## TERMS AND DEFINITIONS

ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER.

AQUIFER - A WATER BEARING FORMATION OR STRATA.

ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND.

ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, AS SHALE, SLATE, ETC.

ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE.

CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.

COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE.

CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.

DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK.

DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL.

DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.

FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.

FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.

FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM PARENT MATERIAL.

FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.

FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD.

JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.

LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT.

LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.

MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.

PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM.

RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.

ROCK QUALITY DESIGNATION (RQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.

SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK.

SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS.

SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE.

STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N OR BPF) OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS.

STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.

STRATA ROCK QUALITY DESIGNATION (SRQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.

TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.

BENCH MARK: BM #2 - BL- 41+33.84, 14.31 LT

ELEVATION: 2793.67 FT.

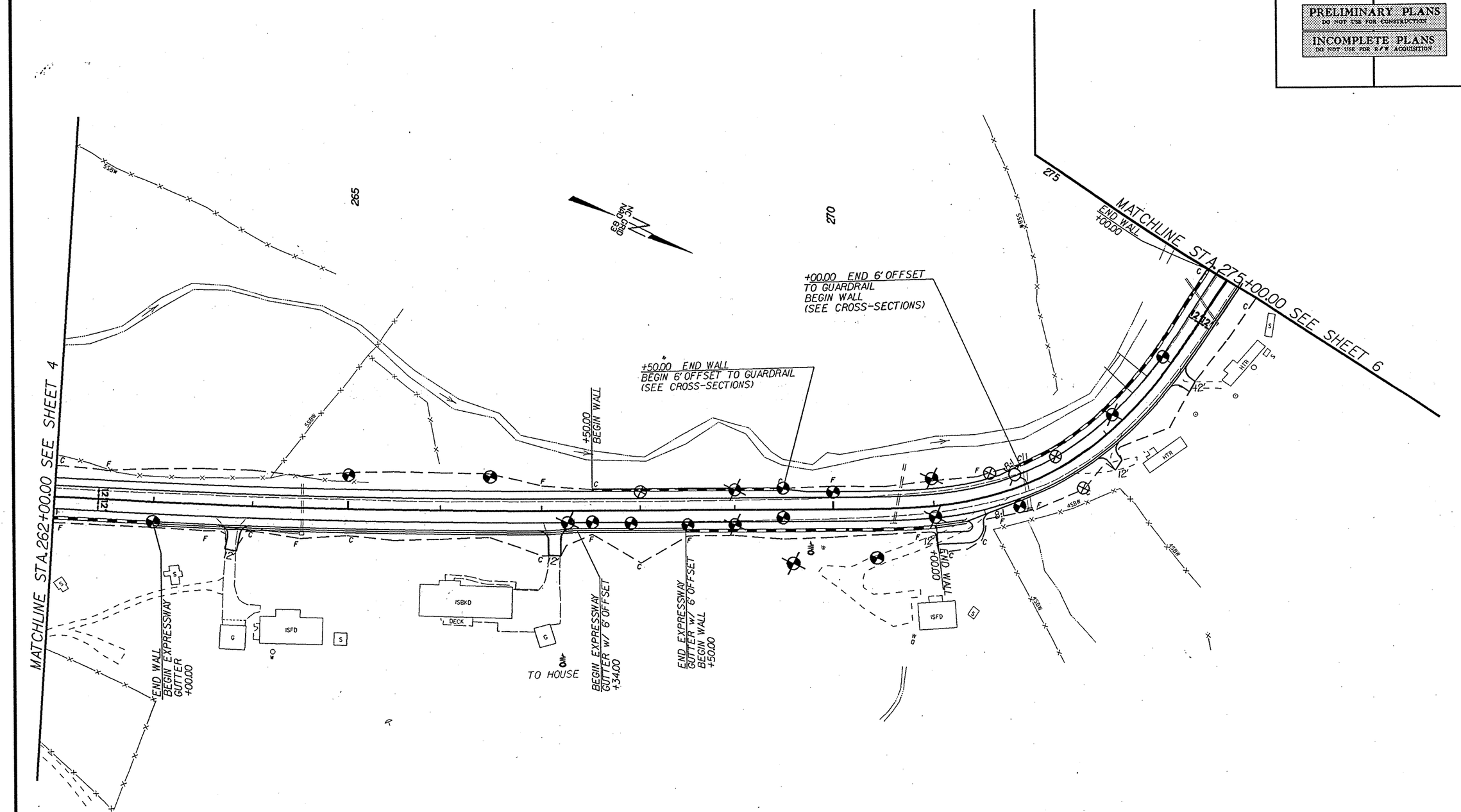
NOTES: FOR RETAINING WALL STA. 272+00 TO 275+00 LT

| PROJECT REFERENCE NO. | SHEET NO. |
|---|---|
| R-2100B | 3 |
| R/W SHEET NO. | |
| ROADWAY DESIGN ENGINEER | HYDRAULICS ENGINEER |

EarthTech
A Tyco International Ltd. Company

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION




FOR -L- PROFILE SEE SHEET 14

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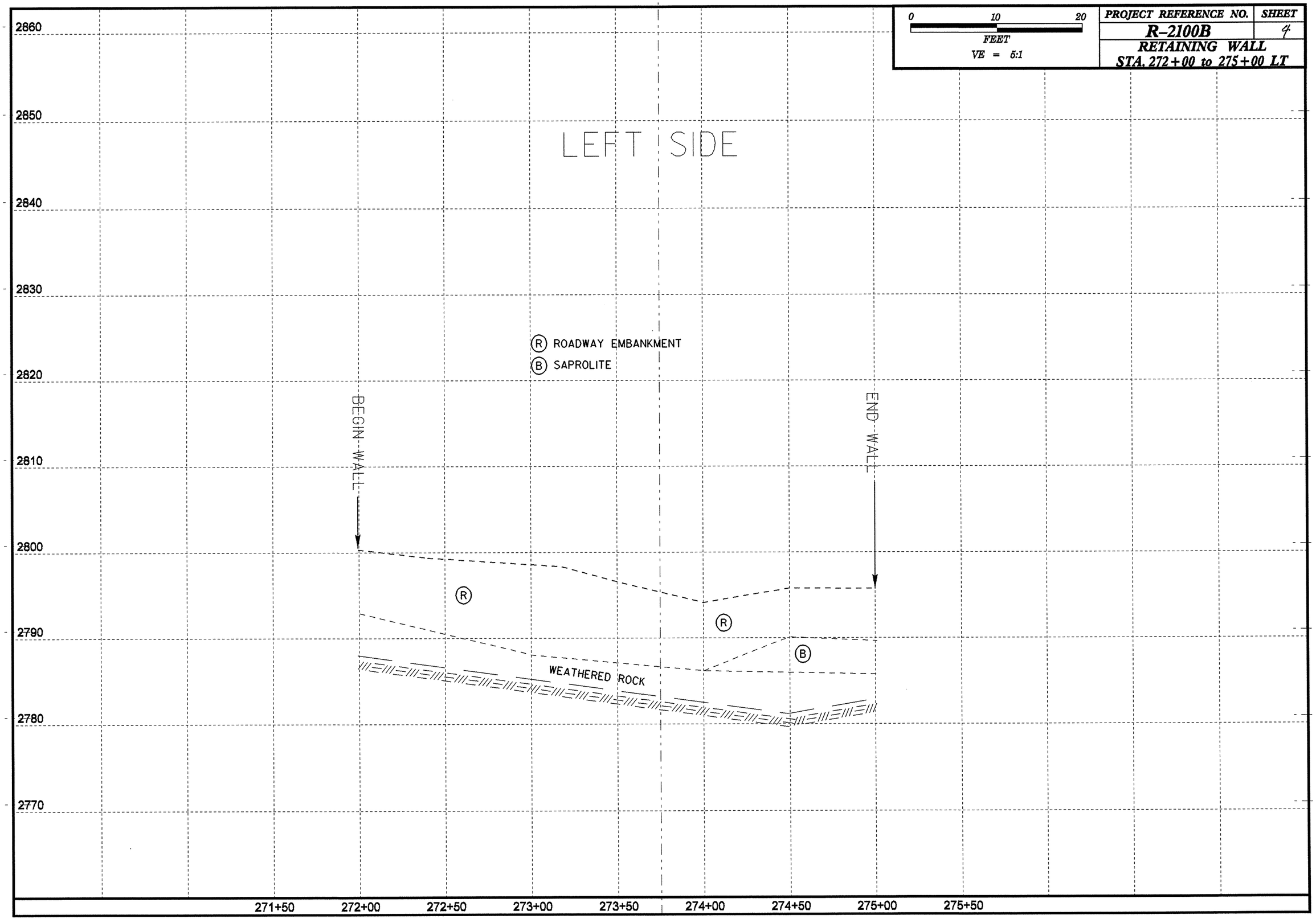
|---|---|
| R-2100B | 4 |
| RETAINING WALL STA. 272+00 to 275+00 LT | |



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| 0 2.5 5 | PROJ. REFERENCE NO. | SHEET NO. |
|---|---|---|
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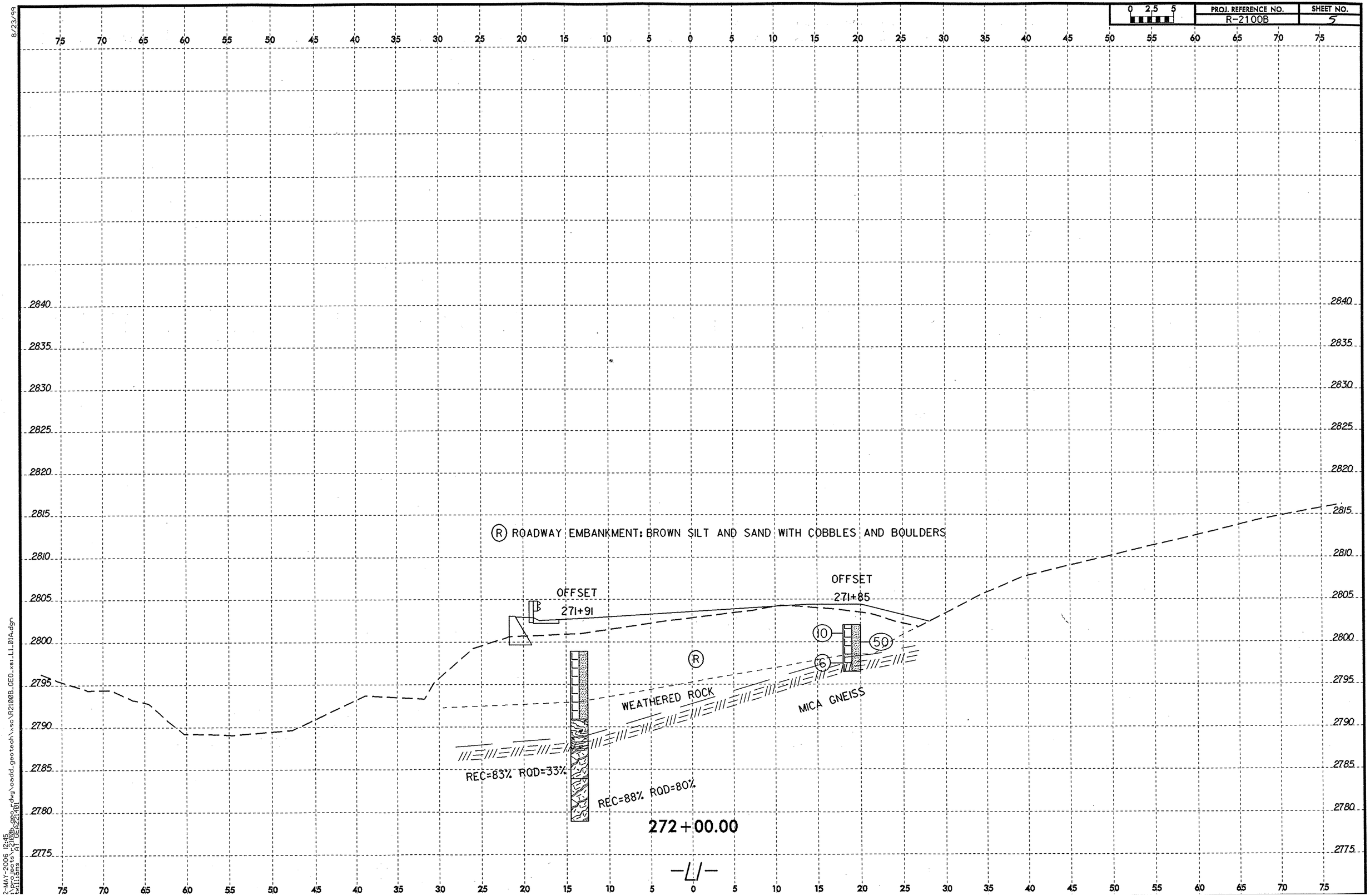


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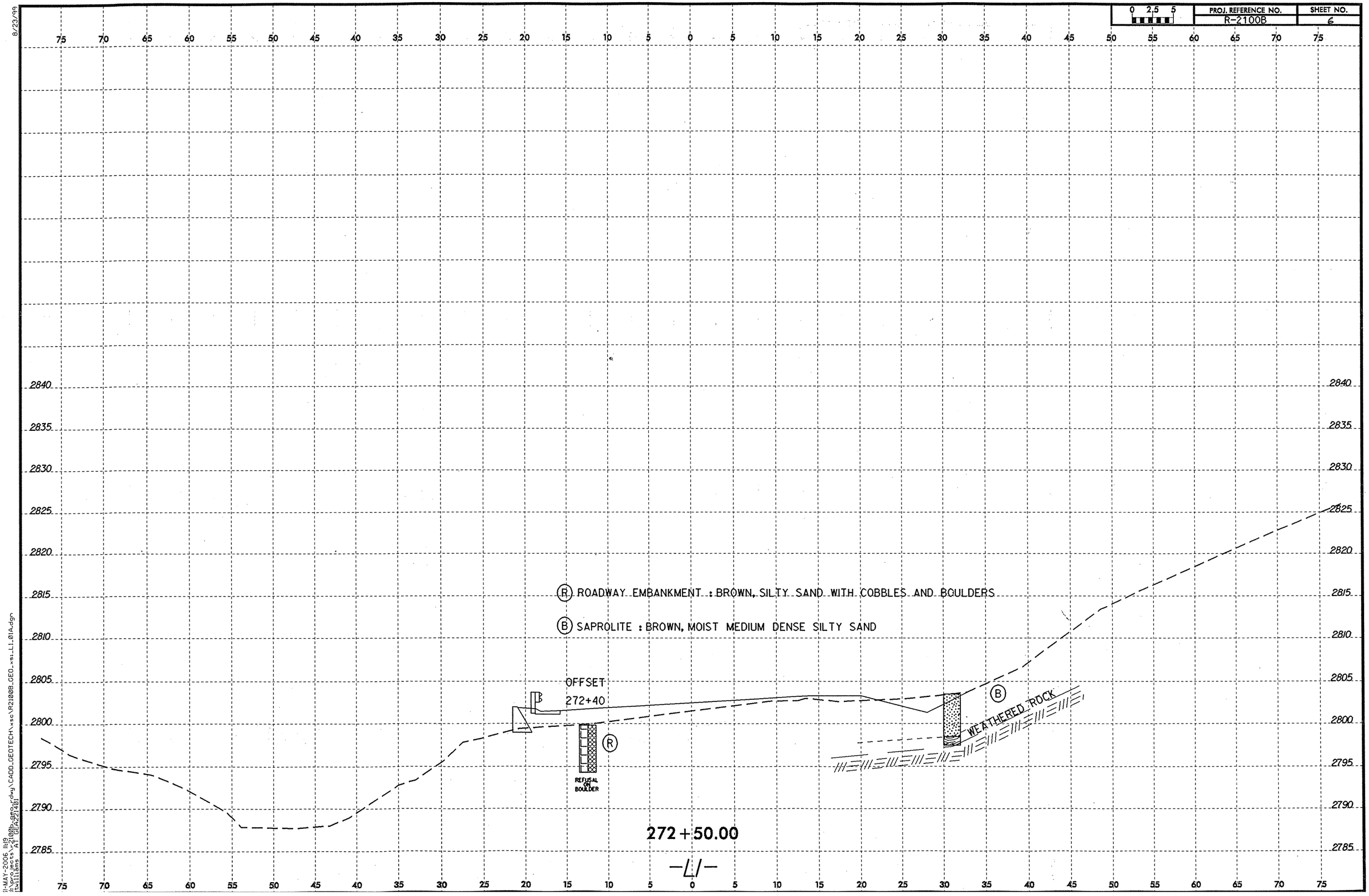

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PROJ. REFERENCE NO.
R-2100B
SHEET NO.
6
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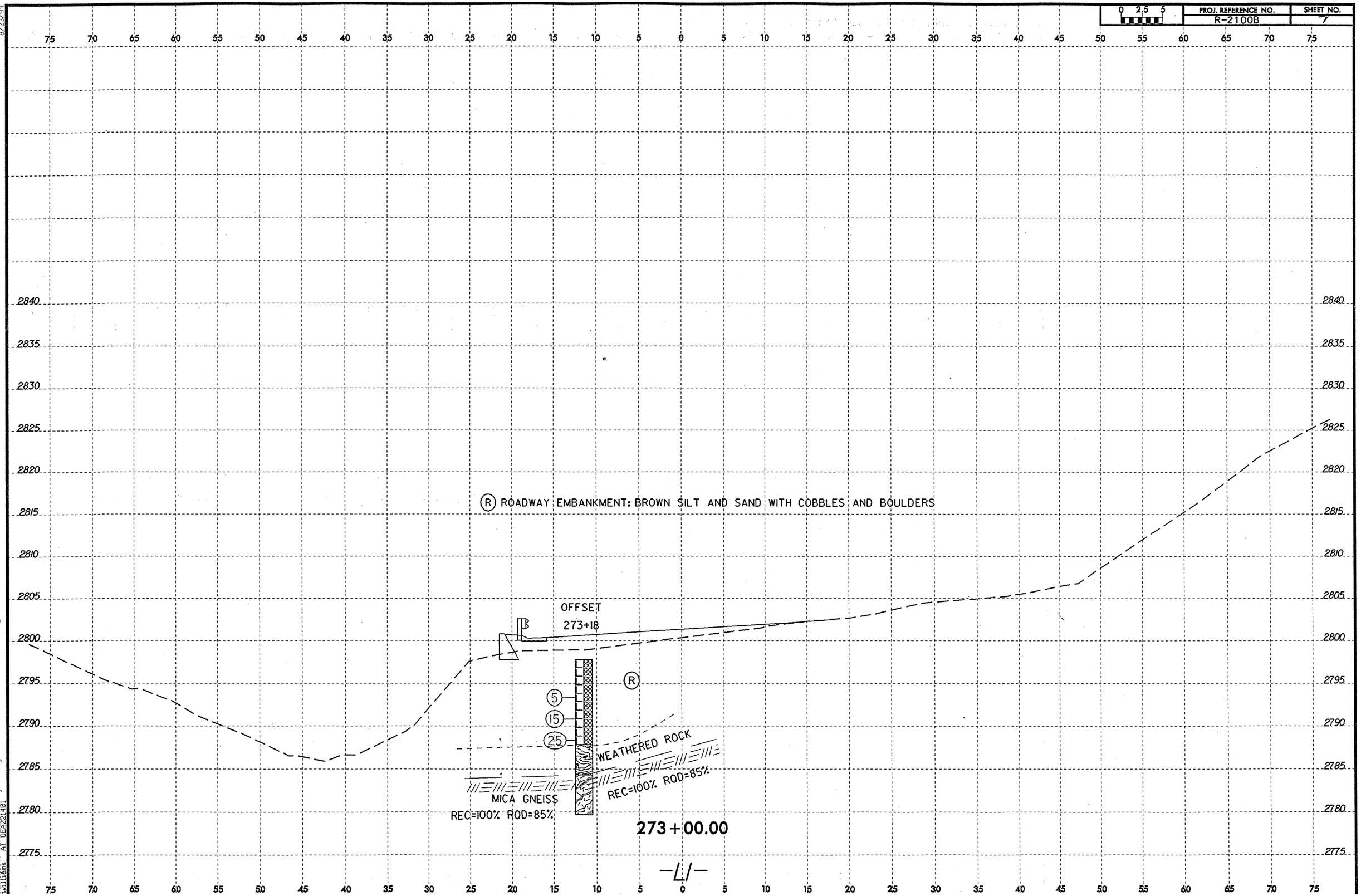
2840
2835
2830
2825
2820
2815
2810
2805
2800
2795
2790
2785
(R) ROADWAY EMBANKMENT : BROWN, SILTY SAND WITH COBBLES AND BOULDERS
(B) SAPROLITE : BROWN, MOIST MEDIUM DENSE SILTY SAND
OFFSET
272+40
(R)
REFUSAL ON BOULDER
(B)
WEATHERED ROCK
272+50.00
-L1-

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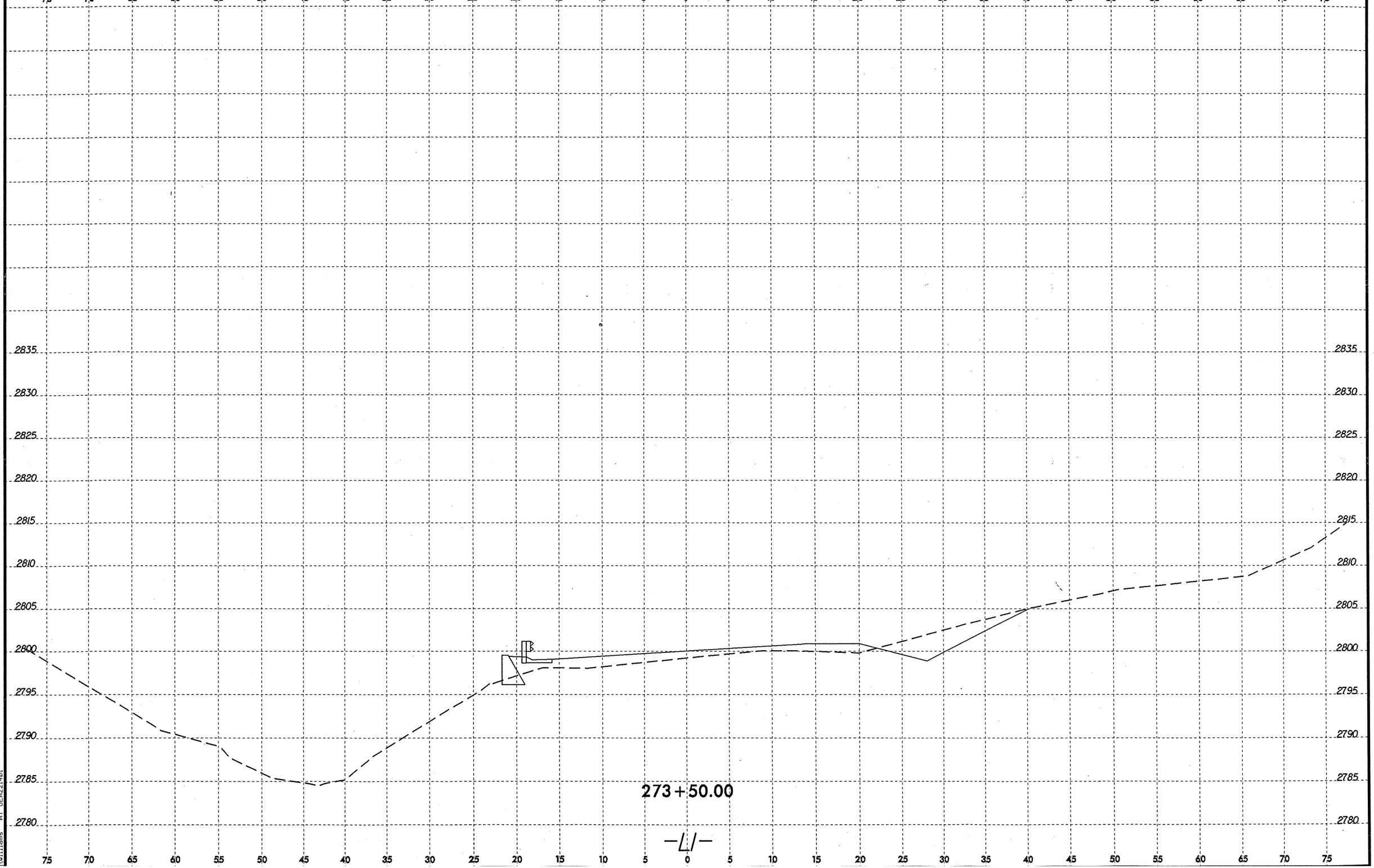


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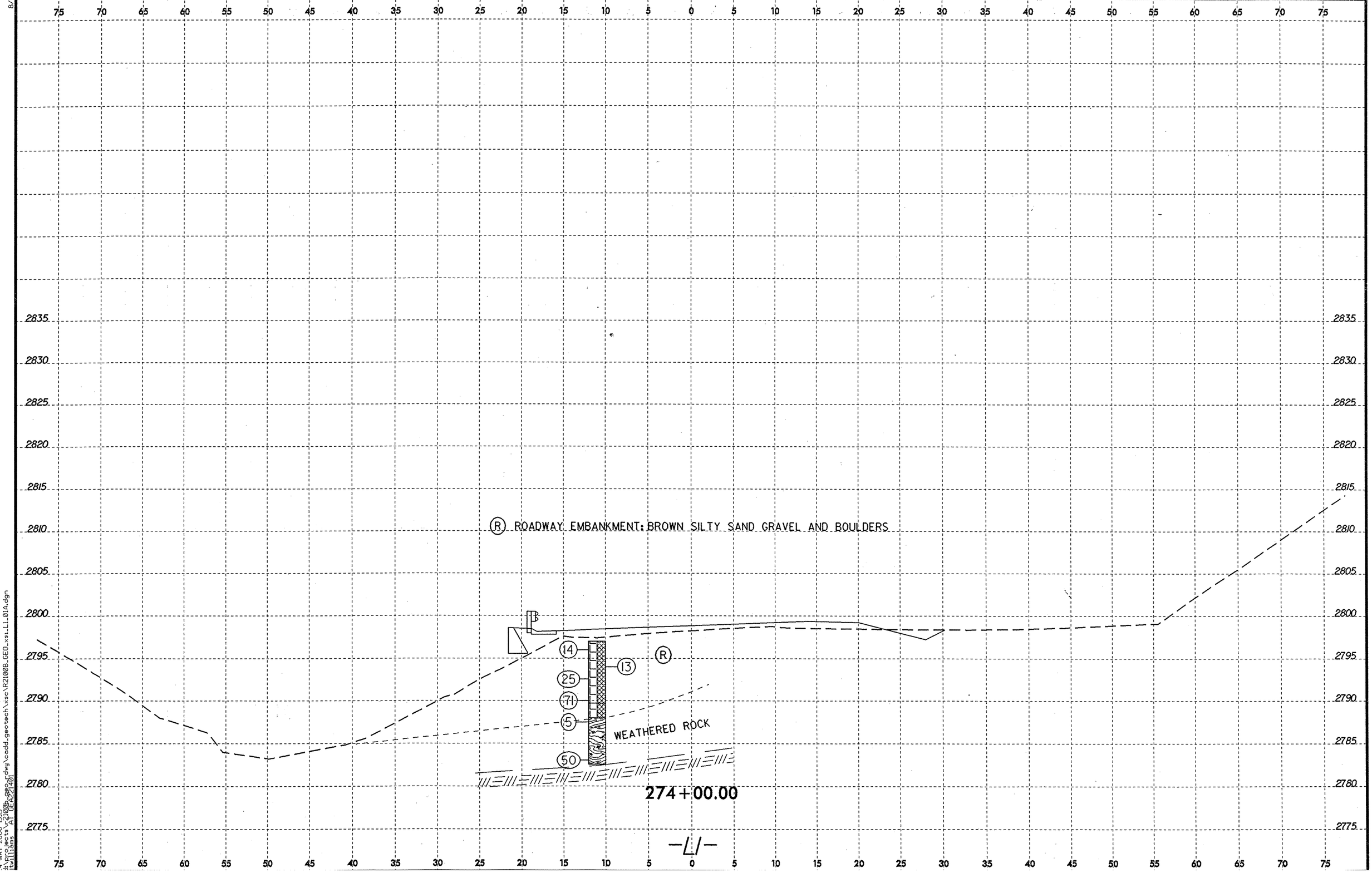


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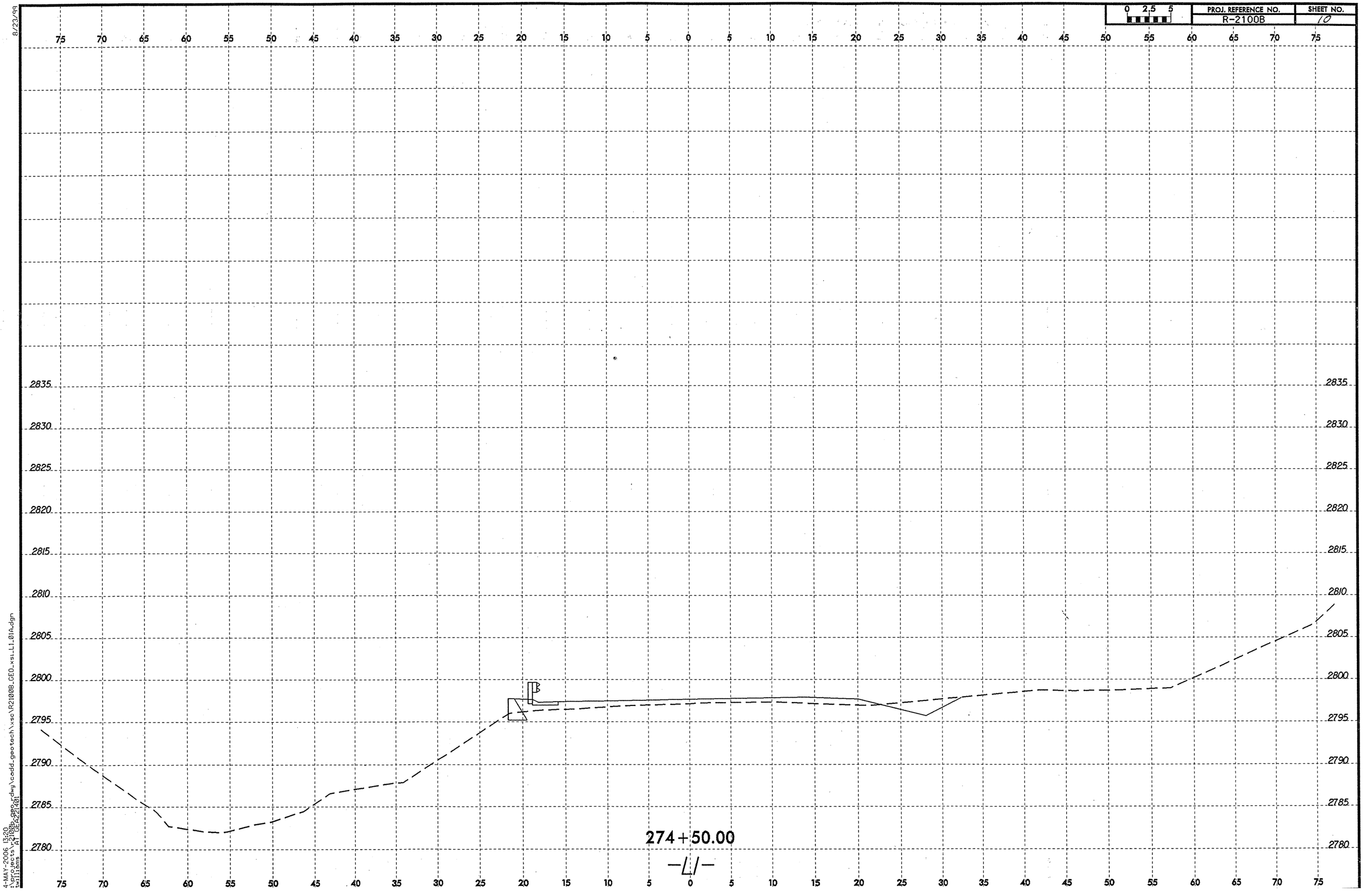
|---|---|---|
| | R-2100B | 10 |

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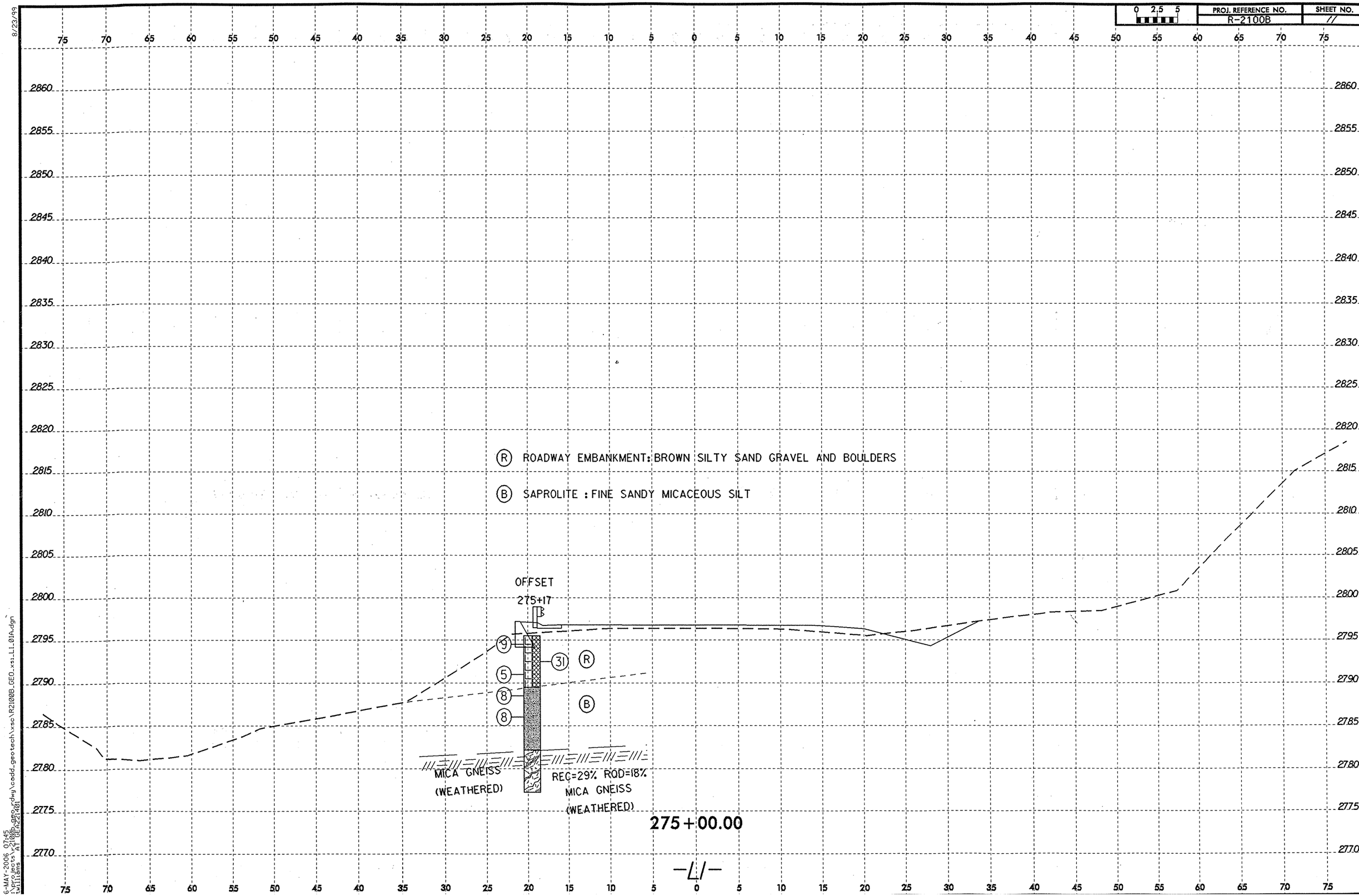
williams AT GEA221401

8/23/99

| 0 2.5 5 | PROJ. REFERENCE NO. | SHEET NO. |
|---|---|---|
| | R-2100B | 11 |

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twilliams AT GEA221401

# NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
## GEOTECHNICAL UNIT BORING LOG

| | | | |
|---|---|---|---|
| **PROJECT NO** 8.1710902 | **ID** R-2100 | **COUNTY** ASHE | **GEOLOGIST** K. GAY |
| **SITE DESCRIPTION** RETAINING WALL FOR NC16 FROM JEFFERSON TO WILKES CO (RW #7) | | | **GND WATER** |
| **BORING NO** 271+91LT | **NORTHING** 0.00 | **EASTING** 0.00 | **0 HR** N/A |
| **ALIGNMENT** 271+91LT | **BORING LOCATION** 271+91.000 | **OFFSET** 13.50ft LT | **24 HR** 11.50ft |
| **COLLAR ELEV** 2798.90ft | **TOTAL DEPTH** 20.00ft | **START DATE** 1/24/94 | **COMPLETION DATE** 01/24/94 |
| **DRILL MACHINE** CME-550 | **DRILL METHOD** H.S. AUGERS | | **HAMMER TYPE** AUTOMATIC |
| **SURFACE WATER DEPTH** N/A | **DEPTH TO ROCK** N/A | | **Log 271+91LT, Page 1 of 1** |

| ELEV | DEPTH | BLOW CT 6in | BLOW CT 6in | BLOW CT 6in | PEN (ft) | BLOWS PER FOOT 0 25 50 75 100 | SAMPLE NO | MOI | LOG | SOIL AND ROCK DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|
| 2798.90 | | | | | | Ground Surface | | | | |
| 2790.00 | | | | | | | | | | ROADWAY FILL BROWN SANDY MICACEOUS SILT (A-4) |
| | | | | | | | 1 | ▼ | | SOFT WEATHERED ROCK APPEARS AS BROWN AND TAN FINE SANDY SILT. |
| 2780.00 | | | | | | | 1 | | | REC=83% RQD=33% BIOTITE GNEISS: FRESH WITH MODERATELY SEVERE WEATHERED STREAKS HARD GRAY WITH QUARTZ VEINS. |
| 2778.90 | | | | | | CORING TEMINATED AT ELEVATION 2778.9 FEET IN GNEISS.(CRYSTALLINE ROCK) | | | | REC=88% RQD=80% BIOTITE GNEISS:FRESH HARD GRAY |

# NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
## GEOTECHNICAL UNIT BORING LOG

| | | | |
|---|---|---|---|
| **PROJECT NO** 8.1710902 | **ID** R-2100 | **COUNTY** ASHE | **GEOLOGIST** K. GAY |
| **SITE DESCRIPTION** RETAINING WALL FOR NC16 FROM JEFFERSON TO WILKES CO (RW #7) | | | **GND WATER** |
| **BORING NO** 272+40LT | **NORTHING** 0.00 | **EASTING** 0.00 | **0 HR** N/A |
| **ALIGNMENT** 272+40LT | **BORING LOCATION** 272+40.000 | **OFFSET** 12.50ft LT | **24 HR** N/A |
| **COLLAR ELEV** 2799.80ft | **TOTAL DEPTH** 5.50ft | **START DATE** 11/18/93 | **COMPLETION DATE** 11/18/93 |
| **DRILL MACHINE** CME-550 | **DRILL METHOD** SOLID AUGERS | | **HAMMER TYPE** AUTOMATIC |
| **SURFACE WATER DEPTH** N/A | **DEPTH TO ROCK** N/A | | **Log 272+40LT, Page 1 of 1** |

| ELEV | DEPTH | BLOW CT 6in | BLOW CT 6in | BLOW CT 6in | PEN (ft) | BLOWS PER FOOT 0 25 50 75 100 | SAMPLE NO | MOI | LOG | SOIL AND ROCK DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|
| 2799.80 | | | | | | Ground Surface | | | | |
| 2794.30 | | | | | | | | | | ROADWAY FILL BROWN AND TAN FINE SANDY MICACEOUS SILT WITH INTERMITTENT HARD SEAMS (A-4) |
| | | | | | | AUGER REFUSAL AT ELEVATION 2794.3 IN CRYSTALLINE ROCK | | | | |

# NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
## GEOTECHNICAL UNIT BORING LOG

| | | | |
|---|---|---|---|
| **PROJECT NO** 8.1710902 | **ID** R-2100 | **COUNTY** ASHE | **GEOLOGIST** K. GAY |
| **SITE DESCRIPTION** RETAINING WALL FOR NC16 FROM JEFFERSON TO WILKES CO (RW #7) | | | **GND WATER** |
| **BORING NO** 273+18LT | **NORTHING** 0.00 | **EASTING** 0.00 | **0 HR** N/A |
| **ALIGNMENT** 273+13LT | **BORING LOCATION** 273+18.000 | **OFFSET** 11.50ft LT | **24 HR** N/A |
| **COLLAR ELEV** 2797.80ft | **TOTAL DEPTH** 18.10ft | **START DATE** 11/18/93 | **COMPLETION DATE** 11/18/93 |
| **DRILL MACHINE** CME-550 | **DRILL METHOD** H.S. AUGERS/NO SPT | | **HAMMER TYPE** AUTOMATIC |
| **SURFACE WATER DEPTH** N/A | **DEPTH TO ROCK** N/A | | **Log 273+18LT, Page 1 of 1** |

| ELEV | DEPTH | BLOW CT 6in | BLOW CT 6in | BLOW CT 6in | PEN (ft) | BLOWS PER FOOT 0 25 50 75 100 | SAMPLE NO | MOI | LOG | SOIL AND ROCK DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|
| 2797.80 | | | | | | Ground Surface | | | | |
| | 3.50 | 2 | 3 | 2 | 1.0 | 5 | | | | ROADWAY FILL BROWN AND TAN FINE TO MEDIUM SANDY MICACEOUS SILT WITH BOULDERS |
| | 6.00 | 3 | 10 | 5 | 1.0 | 15 | | | | |
| 2790.00 | 8.50 | 5 | 17 | 8 | 1.0 | 25 | | | | |
| | | | | | | | 1 | D | | SOFT WEATHERED ROCK APPEARS AS BROWN AND TAN FINE SANDY SILT |
| 2779.90 | | | | | | | | | | CRYSTALLINE ROCK REC= 100% RQD=85% BIOTITE GNEISS SLIGHTLY WEATHERED HARD GRAY FOLIATED |
| | | | | | | CORING TERMINATED AT ELEVATION 2779.7 IN CRYSTALLINE ROCK | | | | |

# NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
## GEOTECHNICAL UNIT BORING LOG

| | | | |
|---|---|---|---|
| **PROJECT NO** 8.1710902 | **ID** R-2100 | **COUNTY** ASHE | **GEOLOGIST** K. GAY |
| **SITE DESCRIPTION** RETAINING WALL FOR NC16 FROM JEFFERSON TO WILKES CO (RW #7) | | | **GND WATER** |
| **BORING NO** 274+00LT | **NORTHING** 0.00 | **EASTING** 0.00 | **0 HR** N/A |
| **ALIGNMENT** 274+00 | **BORING LOCATION** 274+00.000 | **OFFSET** 11.00ft LT | **24 HR** N/A |
| **COLLAR ELEV** 2797.00ft | **TOTAL DEPTH** 14.50ft | **START DATE** 11/19/93 | **COMPLETION DATE** 11/19/93 |
| **DRILL MACHINE** CME-550 | **DRILL METHOD** H.S. AUGERS/NO SPT | | **HAMMER TYPE** AUTOMATIC |
| **SURFACE WATER DEPTH** | **DEPTH TO ROCK** N/A | | **Log 274+00LT, Page 1 of 1** |

| ELEV | DEPTH | BLOW CT 6in | BLOW CT 6in | BLOW CT 6in | PEN (ft) | BLOWS PER FOOT 0 25 50 75 100 | SAMPLE NO | MOI | LOG | SOIL AND ROCK DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|
| 2797.00 | 0.00 | 4 | 7 | 7 | 1.0 | Ground Surface | | | | |
| | 2.00 | 4 | 3 | 10 | 1.0 | 14 | | | | ROADWAY FILL TAN FINE SANDY MICACEOUS SILT WITH HARD SEAMS AND BOULDERS. (A-4) |
| | 3.50 | 42 | 18 | 7 | 1.0 | 25 | | D | | |
| | 6.00 | 26 | 42 | 29 | 1.0 | 71 | | | | |
| 2790.00 | 8.50 | 3 | 2 | 3 | 1.0 | 5 | | | | ROADWAY FILL BROWN FINE SANDY SILT WITH MICA (A-4) |
| 2782.50 | 13.50 | 29 | 50 | 0 | 0.5 | 50 | | | | SOFT WEATHERED ROCK APPEARS AS BROWN AND TAN FINE SANDY SILT. |
| | | | | | | BORING TERMINATED AT ELEVATION 2782.5 IN SOFT WEATHERED ROCK | | | | |

# NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
## GEOTECHNICAL UNIT BORING LOG

| | | | |
|---|---|---|---|
| **PROJECT NO** 8.1710902 | **ID** R-2100 | **COUNTY** ASHE | **GEOLOGIST** K. GAY |
| **SITE DESCRIPTION** RETAINING WALL FOR NC16 FROM JEFFERSON TO WILKES CO (RW #7) | | | **GND WATER** |
| **BORING NO** 275+17LT | **NORTHING** 0.00 | **EASTING** 0.00 | **0 HR** N/A |
| **ALIGNMENT** 275+17 | **BORING LOCATION** 275+17.000 | **OFFSET** 19.50ft LT | **24 HR** N/A |
| **COLLAR ELEV** 2795.50ft | **TOTAL DEPTH** 18.30ft | **START DATE** 11/19/93 | **COMPLETION DATE** 11/19/93 |
| **DRILL MACHINE** CME-550 | **DRILL METHOD** SPT CORE BORING | | **HAMMER TYPE** AUTOMATIC |
| **SURFACE WATER DEPTH** N/A | **DEPTH TO ROCK** N/A | | **Log 275+17LT, Page 1 of 1** |

| ELEV | DEPTH | BLOW CT 6in | BLOW CT 6in | BLOW CT 6in | PEN (ft) | BLOWS PER FOOT (0 25 50 75 100) | SAMPLE NO | MOI | LOG | SOIL AND ROCK DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|
| 2795.50 | 0.00 | 3 | 4 | 5 | 1.0 | Ground Surface | | | | |
| | 2.00 | 16 | 15 | 16 | 1.0 | 9 31 | | | | ROADWAY FILL TAN FINE SANDY MICACEOUS SILT WITH HARD SEAMS AND BOULDERS |
| | 3.50 | 1 | 2 | 3 | 1.0 | 5 | | | | |
| 2790.00 | 6.00 | 3 | 5 | 3 | 1.0 | 8 | | | | RESIDUAL LOOSE BROWN SANDY MICACEOUS SILT |
| | 8.50 | 2 | 3 | 5 | 1.0 | 8 | | | | |
| 2780.00 | | | | | | | 1 | D | | CRYSTALLINE ROCK REC=29% RQD =18% BIOTITE GNEISS: VERY SLIGHLY WEATHERED HARD GRAY FOLIATED |
| 2777.20 | | | | | | CORING TERMINATED AT ELEVATION 2777.2 IN CRYSTALLINE ROCK | | | | |

| STATE | STATE PROJECT REFERENCE NO. | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|
| N.C. | R2100B | 1 | 8 |

# STATE OF NORTH CAROLINA
## DEPARTMENT OF TRANSPORTATION
## DIVISION OF HIGHWAYS
## GEOTECHNICAL ENGINEERING UNIT

# STRUCTURE SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. R2100B F.A. PROJ. STP-16(1)

COUNTY ASHE

PROJECT DESCRIPTION NC 16 FROM SOUTHEAST OF SR 1158 TO SOUTHEAST OF NC 88

SITE DESCRIPTION RETAINING WALL FROM STA. 280+00 TO STA. 280+50 (LEFT) ON NC 16

## CONTENTS


| SHEET | DESCRIPTION |
|---|---|
| 1 | TITLE SHEET |
| 2 | LEGEND |
| 3 | SITE PLAN |
| 4 | PROFILE |
| 5 - 6 | CROSS SECTION(S) |
| 7 | BORE LOG & CORE REPORT(S) |
| 8 | SOIL TEST RESULTS |


## CAUTION NOTICE

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WERE MADE FOR THE PURPOSE OF STUDY, PLANNING, AND DESIGN, AND NOT FOR CONSTRUCTION OR PAY PURPOSES. THE VARIOUS FIELD BORING LOGS, ROCK CORES, AND SOIL TEST DATA AVAILABLE MAY BE REVIEWED OR INSPECTED IN RALEIGH BY CONTACTING THE N. C. DEPARTMENT OF TRANSPORTATION, GEOTECHNICAL ENGINEERING UNIT AT (919) 250-4088. NEITHER THE SUBSURFACE PLANS AND REPORTS, NOR THE FIELD BORING LOGS, ROCK CORES, OR SOIL TEST DATA ARE PART OF THE CONTRACT.

GENERAL SOIL AND ROCK STRATA DESCRIPTIONS AND INDICATED BOUNDARIES ARE BASED ON A GEOTECHNICAL INTERPRETATION OF ALL AVAILABLE SUBSURFACE DATA AND MAY NOT NECESSARILY REFLECT THE ACTUAL SUBSURFACE CONDITIONS BETWEEN BORINGS OR BETWEEN SAMPLED STRATA WITHIN THE BOREHOLE. THE LABORATORY SAMPLE DATA AND THE IN SITU (IN-PLACE) TEST DATA CAN BE RELIED ON ONLY TO THE DEGREE OF RELIABILITY INHERENT IN THE STANDARD TEST METHOD. THE OBSERVED WATER LEVELS OR SOIL MOISTURE CONDITIONS INDICATED IN THE SUBSURFACE INVESTIGATIONS ARE AS RECORDED AT THE TIME OF THE INVESTIGATION. THESE WATER LEVELS OR SOIL MOISTURE CONDITIONS MAY VARY CONSIDERABLY WITH TIME ACCORDING TO CLIMATIC CONDITIONS INCLUDING TEMPERATURES, PRECIPITATION, AND WIND, AS WELL AS OTHER NON-CLIMATIC FACTORS.

THE BIDDER OR CONTRACTOR IS CAUTIONED THAT DETAILS SHOWN ON THE SUBSURFACE PLANS ARE PRELIMINARY ONLY AND IN MANY CASES THE FINAL DESIGN DETAILS ARE DIFFERENT. FOR BIDDING AND CONSTRUCTION PURPOSES, REFER TO THE CONSTRUCTION PLANS AND DOCUMENTS FOR FINAL DESIGN INFORMATION ON THIS PROJECT. THE DEPARTMENT DOES NOT WARRANT OR GUARANTEE THE SUFFICIENCY OR ACCURACY OF THE INVESTIGATION MADE, NOR THE INTERPRETATIONS MADE. OR OPINION OF THE DEPARTMENT AS TO THE TYPE OF MATERIALS AND CONDITIONS TO BE ENCOUNTERED. THE BIDDER OR CONTRACTOR IS CAUTIONED TO MAKE SUCH INDEPENDENT SUBSURFACE INVESTIGATIONS AS HE DEEMS NECESSARY TO SATISFY HIMSELF AS TO CONDITIONS TO BE ENCOUNTERED ON THIS PROJECT. THE CONTRACTOR SHALL HAVE NO CLAIM FOR ADDITIONAL COMPENSATION OR FOR AN EXTENSION OF TIME FOR ANY REASON RESULTING FROM THE ACTUAL CONDITIONS ENCOUNTERED AT THE SITE DIFFERING FROM THOSE INDICATED IN THE SUBSURFACE INFORMATION.

PERSONNEL

F & H ENGINEERING

INVESTIGATED BY L.L. ACKER

CHECKED BY W.D. FRYE

SUBMITTED BY W.D. FRYE

DATE 5/31/06

NORTH CAROLINA LICENSED SEAL 1007 GEOLOGIST LOUIS L. ACKER

06/08/06

PROJECT: 34369.1.1

ID: R2100B

DRAWN BY: J. T. WILLIAMS

NOTE - THE INFORMATION CONTAINED HEREIN IS NOT IMPLIED OR GUARANTEED BY THE N. C. DEPARTMENT OF TRANSPORTATION AS BEING ACCURATE NOR IT IS CONSIDERED TO BE PART OF THE PLANS, SPECIFICATIONS, OR CONTRACT FOR THE PROJECT.

NOTE - BY HAVING REQUESTED THIS INFORMATION THE CONTRACTOR SPECIFICALLY WAIVES ANY CLAIMS FOR INCREASED COMPENSATION OR EXTENSION OF TIME BASED ON DIFFERENCES BETWEEN THE CONDITIONS INDICATED HEREIN AND THE ACTUAL CONDITIONS AT THE PROJECT SITE.

| PROJECT REFERENCE NO. | SHEET NO. |
|---|---|
| R2100B | 2 |

# NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
## DIVISION OF HIGHWAYS
## GEOTECHNICAL ENGINEERING UNIT

# SUBSURFACE INVESTIGATION

### SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

## SOIL DESCRIPTION

SOIL IS CONSIDERED TO BE THE UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER, AND YIELD LESS THAN 100 BLOWS PER FOOT ACCORDING TO STANDARD PENETRATION TEST (AASHTO T206, ASTM D-1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY SHALL INCLUDE: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. EXAMPLE:

*VERY STIFF, GRAY, SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6*

## SOIL LEGEND AND AASHTO CLASSIFICATION

| GENERAL CLASS. | GRANULAR MATERIALS (≤ 35% PASSING #200) | | | | | | | SILT-CLAY MATERIALS (> 35% PASSING #200) | | | | ORGANIC MATERIALS | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GROUP CLASS. | A-1 | | A-3 | A-2 | | | | A-4 | A-5 | A-6 | A-7 | A-1, A-2 A-3 | A-4, A-5 A-6, A-7 | |
| | A-1-a | A-1-b | | A-2-4 | A-2-5 | A-2-6 | A-2-7 | | | | A-7-5 A-7-6 | | | |
| SYMBOL | | | | | | | | | | | | | | |
| % PASSING # 10 | 50 MX | | | | | | | | | | | GRANULAR SOILS | SILT-CLAY SOILS | MUCK, PEAT |
| # 40 | 30 MX | 50 MX | 51 MN | | | | | | | | | | | |
| # 200 | 15 MX | 25 MX | 10 MX | 35 MX | 35 MX | 35 MX | 35 MX | 36 MN | 36 MN | 36 MN | 36 MN | | | |
| LIQUID LIMIT | 6 MX | | NP | 40 MX | 41 MN | 40 MX | 41 MN | 40 MX | 41 MN | 40 MX | 41 MN | SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER | | HIGHLY ORGANIC SOILS |
| PLASTIC INDEX | | | | 10 MX | 10 MX | 11 MN | 11 MN | 10 MX | 10 MX | 11 MN | 11 MN | | | |
| GROUP INDEX | 0 | | 0 | 0 | | 4 MX | | 8 MX | 12 MX | 16 MX | No MX | | | |
| USUAL TYPES OF MAJOR MATERIALS | STONE FRAGS. GRAVEL, AND SAND | | FINE SAND | SILTY OR CLAYEY GRAVEL AND SAND | | | | SILTY SOILS | | CLAYEY SOILS | | | | |
| GEN. RATING AS A SUBGRADE | EXCELLENT TO GOOD | | | | | | | FAIR TO POOR | | | | FAIR TO POOR | POOR | UNSUITABLE |

PI OF A-7-5 SUBGROUP IS ≤ LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30

## CONSISTENCY OR DENSENESS

| PRIMARY SOIL TYPE | COMPACTNESS OR CONSISTENCY | RANGE OF STANDARD PENETRATION RESISTENCE (N-VALUE) | RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT$^2$) |
|---|---|---|---|
| GENERALLY GRANULAR MATERIAL (NON-COHESIVE) | VERY LOOSE<br>LOOSE<br>MEDIUM DENSE<br>DENSE<br>VERY DENSE | <4<br>4 TO 10<br>10 TO 30<br>30 TO 50<br>>50 | N/A |
| GENERALLY SILT-CLAY MATERIAL (COHESIVE) | VERY SOFT<br>SOFT<br>MEDIUM STIFF<br>STIFF<br>VERY STIFF<br>HARD | <2<br>2 TO 4<br>4 TO 8<br>8 TO 15<br>15 TO 30<br>>30 | <0.25<br>0.25 TO 0.50<br>0.5 TO 1.0<br>1 TO 2<br>2 TO 4<br>>4 |

## TEXTURE OR GRAIN SIZE

| U.S. STD. SIEVE SIZE | 4 | 10 | 40 | 60 | 200 | 270 |
|---|---|---|---|---|---|---|
| OPENING (MM) | 4.76 | 2.00 | 0.42 | 0.25 | 0.075 | 0.053 |

| BOULDER (BLDR.) | COBBLE (COB.) | GRAVEL (GR.) | COARSE SAND (CSE. SD.) | FINE SAND (F SD.) | SILT (SL.) | CLAY (CL.) |
|---|---|---|---|---|---|---|

GRAIN SIZE MM: 305 | 75 | 2.0 | 0.25 | 0.05 | 0.005
GRAIN SIZE IN.: 12 | 3

## SOIL MOISTURE - CORRELATION OF TERMS

| SOIL MOISTURE SCALE (ATTERBERG LIMITS) | FIELD MOISTURE DESCRIPTION | GUIDE FOR FIELD MOISTURE DESCRIPTION |
|---|---|---|
| | - SATURATED - (SAT.) | USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE |
| LL — LIQUID LIMIT<br>PLASTIC RANGE (PI)<br>PL — PLASTIC LIMIT | - WET - (W) | SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE |
| OM — OPTIMUM MOISTURE<br>SL — SHRINKAGE LIMIT | - MOIST - (M) | SOLID; AT OR NEAR OPTIMUM MOISTURE |
| | - DRY - (D) | REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE |

## PLASTICITY

| | PLASTICITY INDEX (PI) | DRY STRENGTH |
|---|---|---|
| NONPLASTIC | 0-5 | VERY LOW |
| LOW PLASTICITY | 6-15 | SLIGHT |
| MED. PLASTICITY | 16-25 | MEDIUM |
| HIGH PLASTICITY | 26 OR MORE | HIGH |

## COLOR

DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY). MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.

## GRADATION

WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE.
UNIFORM - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. (ALSO POORLY GRADED)
GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLES OF TWO OR MORE SIZES.

## ANGULARITY OF GRAINS

THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.

## MINERALOGICAL COMPOSITION

MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE.

## COMPRESSIBILITY

| | |
|---|---|
| SLIGHTLY COMPRESSIBLE | LIQUID LIMIT LESS THAN 31 |
| MODERATELY COMPRESSIBLE | LIQUID LIMIT EQUAL TO 31-50 |
| HIGHLY COMPRESSIBLE | LIQUID LIMIT GREATER THAN 50 |

## PERCENTAGE OF MATERIAL

| ORGANIC MATERIAL | GRANULAR SOILS | SILT - CLAY SOILS | OTHER MATERIAL | |
|---|---|---|---|---|
| TRACE OF ORGANIC MATTER | 2 - 3% | 3 - 5% | TRACE | 1 - 10% |
| LITTLE ORGANIC MATTER | 3 - 5% | 5 - 12% | LITTLE | 10 - 20% |
| MODERATELY ORGANIC | 5 - 10% | 12 - 20% | SOME | 20 - 35% |
| HIGHLY ORGANIC | >10% | >20% | HIGHLY | 35% AND ABOVE |

## GROUND WATER

- WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING
- STATIC WATER LEVEL AFTER 24 HOURS
- PW PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA
- SPRING OR SEEP

## MISCELLANEOUS SYMBOLS

- ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION
- SOIL SYMBOL
- ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT
- INFERRED SOIL BOUNDARY
- INFERRED ROCK LINE
- ALLUVIAL SOIL BOUNDARY
- 25/025 DIP & DIP DIRECTION OF ROCK STRUCTURES
- SOUNDING ROD
- SPT CPT DPT DMT VST PMT TEST BORING
- AUGER BORING
- CORE BORING
- MW MONITORING WELL
- PIEZOMETER INSTALLATION
- SLOPE INDICATOR INSTALLATION
- SPT N-VALUE
- REF SPT REFUSAL

SAMPLE DESIGNATIONS
S - BULK SAMPLE
SS - SPLIT SPOON SAMPLE
ST - SHELBY TUBE SAMPLE
RS - ROCK SAMPLE
RT - RECOMPACTED TRIAXIAL SAMPLE
CBR - CALIFORNIA BEARING RATIO SAMPLE

## ABBREVIATIONS

AR - AUGER REFUSAL
BT - BORING TERMINATED
CL. - CLAY
CPT - CONE PENETRATION TEST
CSE. - COARSE
DMT - DILATOMETER TEST
DPT - DYNAMIC PENETRATION TEST
e - VOID RATIO
F - FINE
FOSS. - FOSSILIFEROUS
FRAC. - FRACTURED, FRACTURES
FRAGS. - FRAGMENTS
HI. - HIGHLY
MED. - MEDIUM
MICA. - MICACEOUS
MOD. - MODERATELY
NP - NON PLASTIC
ORG. - ORGANIC
PMT - PRESSUREMETER TEST
SAP. - SAPROLITIC
SD. - SAND, SANDY
SL. - SILT, SILTY
SLI. - SLIGHTLY
TCR - TRICONE REFUSAL
$w$ - MOISTURE CONTENT
V - VERY
VST - VANE SHEAR TEST
WEA. - WEATHERED
$\gamma$ - UNIT WEIGHT
$\gamma_d$ - DRY UNIT WEIGHT

## EQUIPMENT USED ON SUBJECT PROJECT

DRILL UNITS:
- [ ] MOBILE B-___
- [ ] BK-51
- [X] CME-45C
- [X] CME-550
- [ ] PORTABLE HOIST
- [ ] _____
- [ ] _____

ADVANCING TOOLS:
- [ ] CLAY BITS
- [ ] 6" CONTINUOUS FLIGHT AUGER
- [X] 8" HOLLOW AUGERS
- [ ] HARD FACED FINGER BITS
- [ ] TUNG.-CARBIDE INSERTS
- [X] CASING [X] W/ ADVANCER
- [ ] TRICONE ____" STEEL TEETH
- [ ] TRICONE ____" TUNG.-CARB.
- [ ] CORE BIT
- [ ] _____

HAMMER TYPE:
- [X] AUTOMATIC
- [ ] MANUAL

CORE SIZE:
- [ ] -B_____
- [X] -N_____
- [ ] -H_____

HAND TOOLS:
- [ ] POST HOLE DIGGER
- [ ] HAND AUGER
- [ ] SOUNDING ROD
- [ ] VANE SHEAR TEST
- [ ] _____

## ROCK DESCRIPTION

HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT IF TESTED, WOULD YIELD SPT REFUSAL. AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS. IN NON-COASTAL PLAIN MATERIAL, THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK.
ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:

| | |
|---|---|
| WEATHERED ROCK (WR) | NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100 BLOWS PER FOOT IF TESTED. |
| CRYSTALLINE ROCK (CR) | FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC. |
| NON-CRYSTALLINE ROCK (NCR) | FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN SEDIMENTARY ROCK THAT WOULD YEILD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC. |
| COASTAL PLAIN SEDIMENTARY ROCK (CP) | COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC. |

## WEATHERING

| | |
|---|---|
| FRESH | ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER HAMMER IF CRYSTALLINE. |
| VERY SLIGHT (V SLI.) | ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN, CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF OF A CRYSTALLINE NATURE. |
| SLIGHT (SLI.) | ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS. |
| MODERATE (MOD.) | SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED WITH FRESH ROCK. |
| MODERATELY SEVERE (MOD. SEV.) | ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES "CLUNK" SOUND WHEN STRUCK. *IF TESTED, WOULD YIELD SPT REFUSAL* |
| SEVERE (SEV.) | ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. *IF TESTED, YIELDS SPT N VALUES > 100 BPF* |
| VERY SEVERE (V SEV.) | ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT THE MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE SUCH THAT ONLY MINOR VESTIGES OF THE ORIGINAL ROCK FABRIC REMAIN. *IF TESTED, YIELDS SPT N VALUES < 100 BPF* |
| COMPLETE | ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE. |

## ROCK HARDNESS

| | |
|---|---|
| VERY HARD | CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK. |
| HARD | CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN. |
| MODERATELY HARD | CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS. |
| MEDIUM HARD | CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PEICES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK. |
| SOFT | CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE. |
| VERY SOFT | CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNAIL. |

## FRACTURE SPACING

| TERM | SPACING |
|---|---|
| VERY WIDE | MORE THAN 10 FEET |
| WIDE | 3 TO 10 FEET |
| MODERATELY CLOSE | 1 TO 3 FEET |
| CLOSE | 0.16 TO 1 FEET |
| VERY CLOSE | LESS THAN 0.16 FEET |

## BEDDING

| TERM | THICKNESS |
|---|---|
| VERY THICKLY BEDDED | > 4 FEET |
| THICKLY BEDDED | 1.5 - 4 FEET |
| THINLY BEDDED | 0.16 - 1.5 FEET |
| VERY THINLY BEDDED | 0.03 - 0.16 FEET |
| THICKLY LAMINATED | 0.008 - 0.03 FEET |
| THINLY LAMINATED | < 0.008 FEET |

## INDURATION

FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF THE MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.

| | |
|---|---|
| FRIABLE | RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE. |
| MODERATELY INDURATED | GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER. |
| INDURATED | GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER. |
| EXTREMELY INDURATED | SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS across GRAINS. |

## TERMS AND DEFINITIONS

ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER.

AQUIFER - A WATER BEARING FORMATION OR STRATA.

ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND.

ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, AS SHALE, SLATE, ETC.

ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE.

CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.

COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE.

CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.

DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK.

DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL.

DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.

FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.

FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.

FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM PARENT MATERIAL.

FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.

FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD.

JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.

LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT.

LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.

MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.

PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM.

RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.

ROCK QUALITY DESIGNATION (RQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.

SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK.

SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS.

SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE.

STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N OR BPF) OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS.

STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.

STRATA ROCK QUALITY DESIGNATION (SRQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.

TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.

BENCH MARK: BM #2 - BL- 41+33.84, 14.31 LT

ELEVATION: 2793.67 FT.

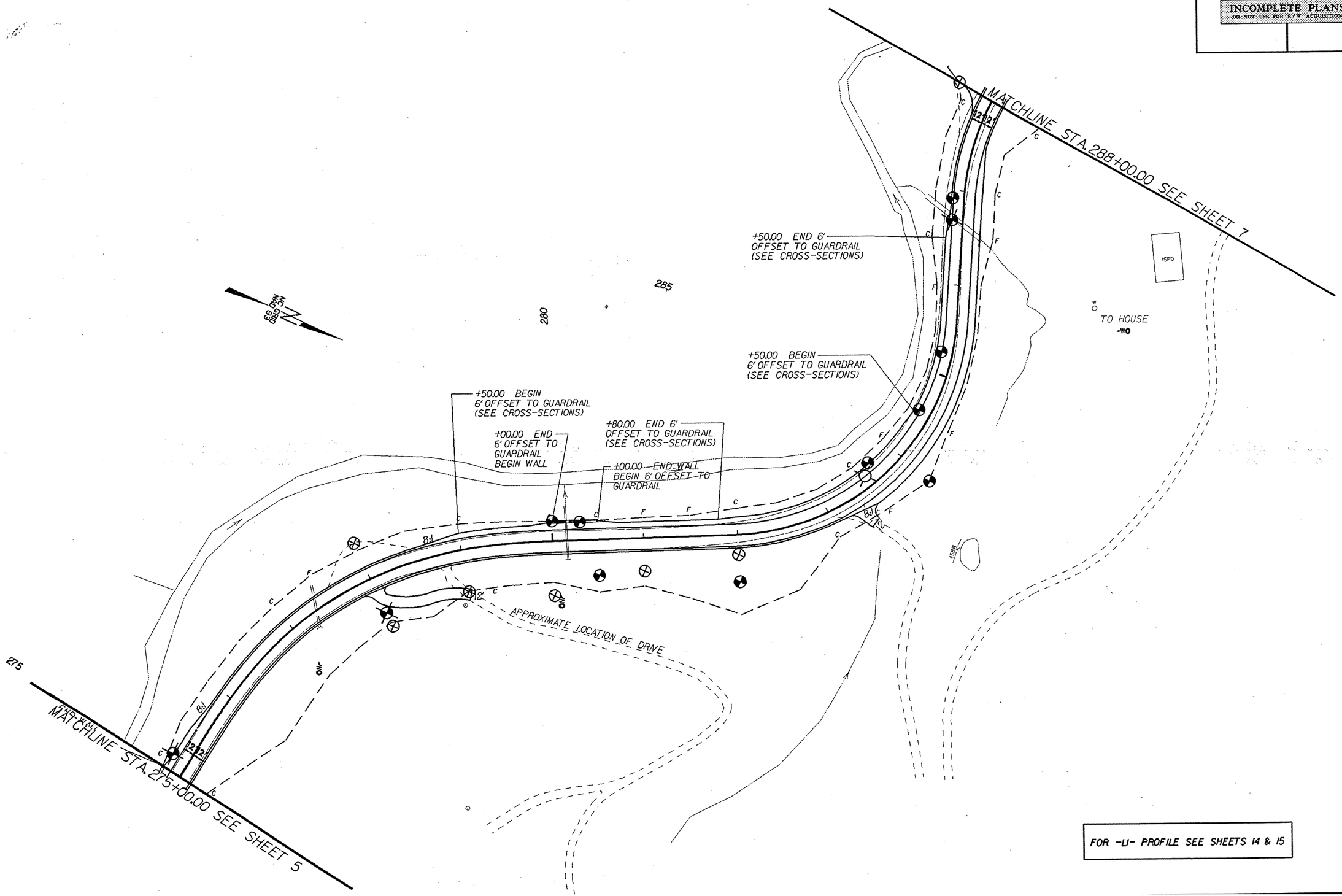
NOTES: FOR RETAINING WALL STA. 280+00 TO 280+50 LT

| PROJECT REFERENCE NO. | SHEET NO. |
|---|---|
| R-2100B | 3 |
| R/W SHEET NO. | |
| ROADWAY DESIGN ENGINEER | HYDRAULICS ENGINEER |

EarthTech
A Tyco International Ltd. Company

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION




FOR -L1- PROFILE SEE SHEETS 14 & 15

| PROJECT REFERENCE NO. | SHEET |
|---|---|
| R-2100B | 4 |
| RETAINING WALL STA. 280+00 to 280+50 LT | |

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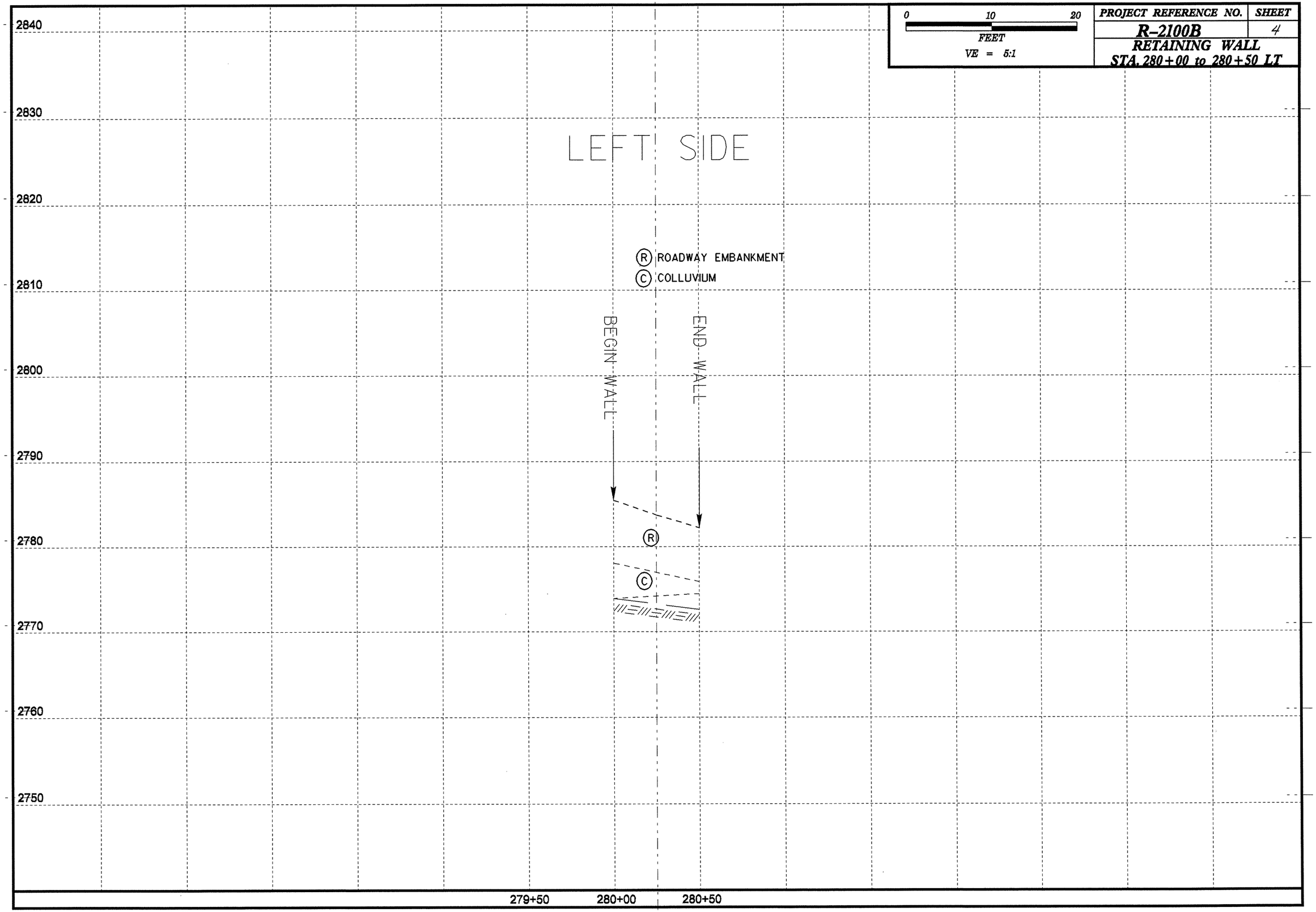

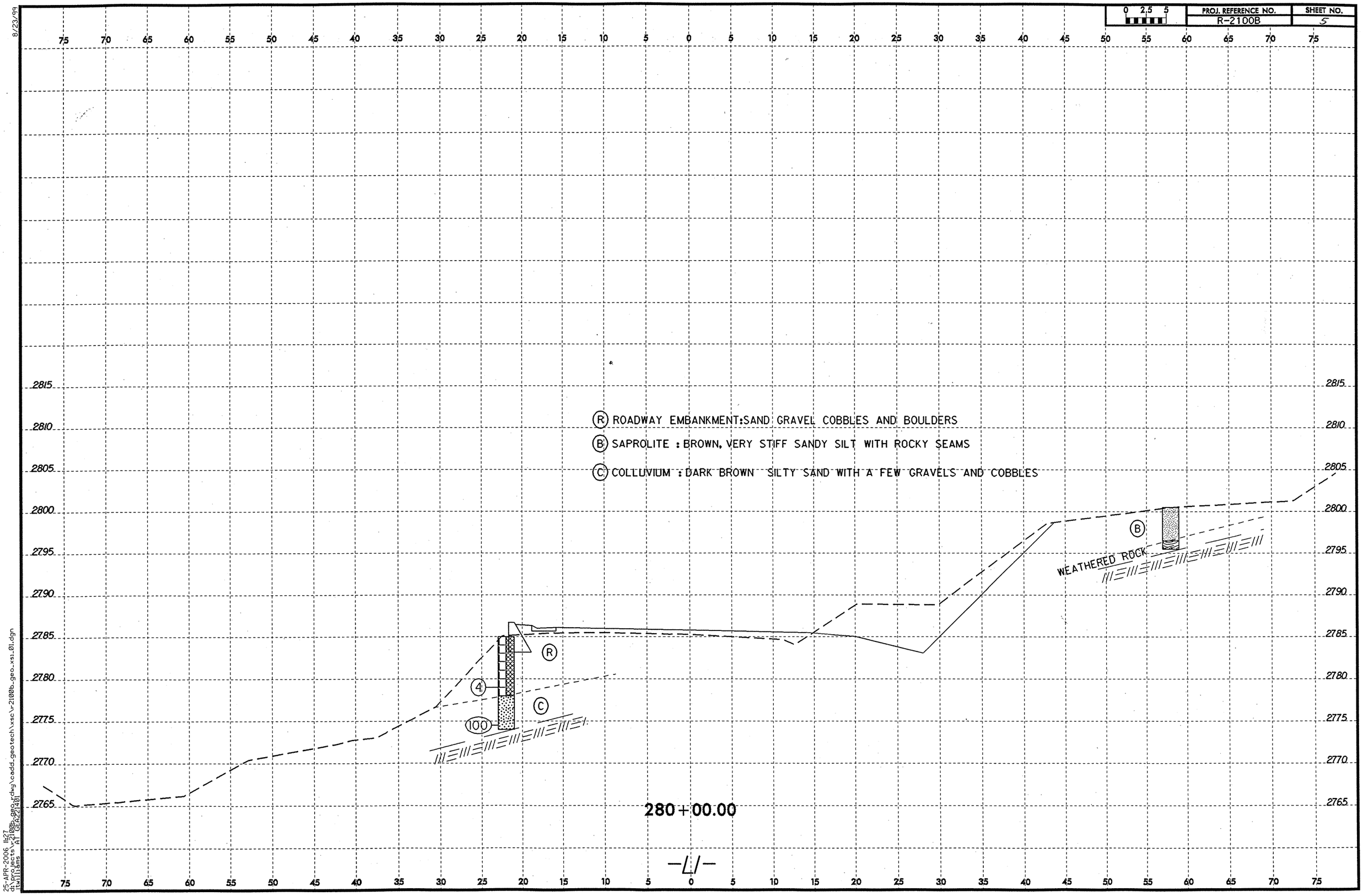

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R-2100B
SHEET NO.
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R ROADWAY EMBANKMENT:SAND GRAVEL COBBLES AND BOULDERS
B SAPROLITE : BROWN, VERY STIFF SANDY SILT WITH ROCKY SEAMS
C COLLUVIUM : DARK BROWN SILTY SAND WITH A FEW GRAVELS AND COBBLES
WEATHERED ROCK
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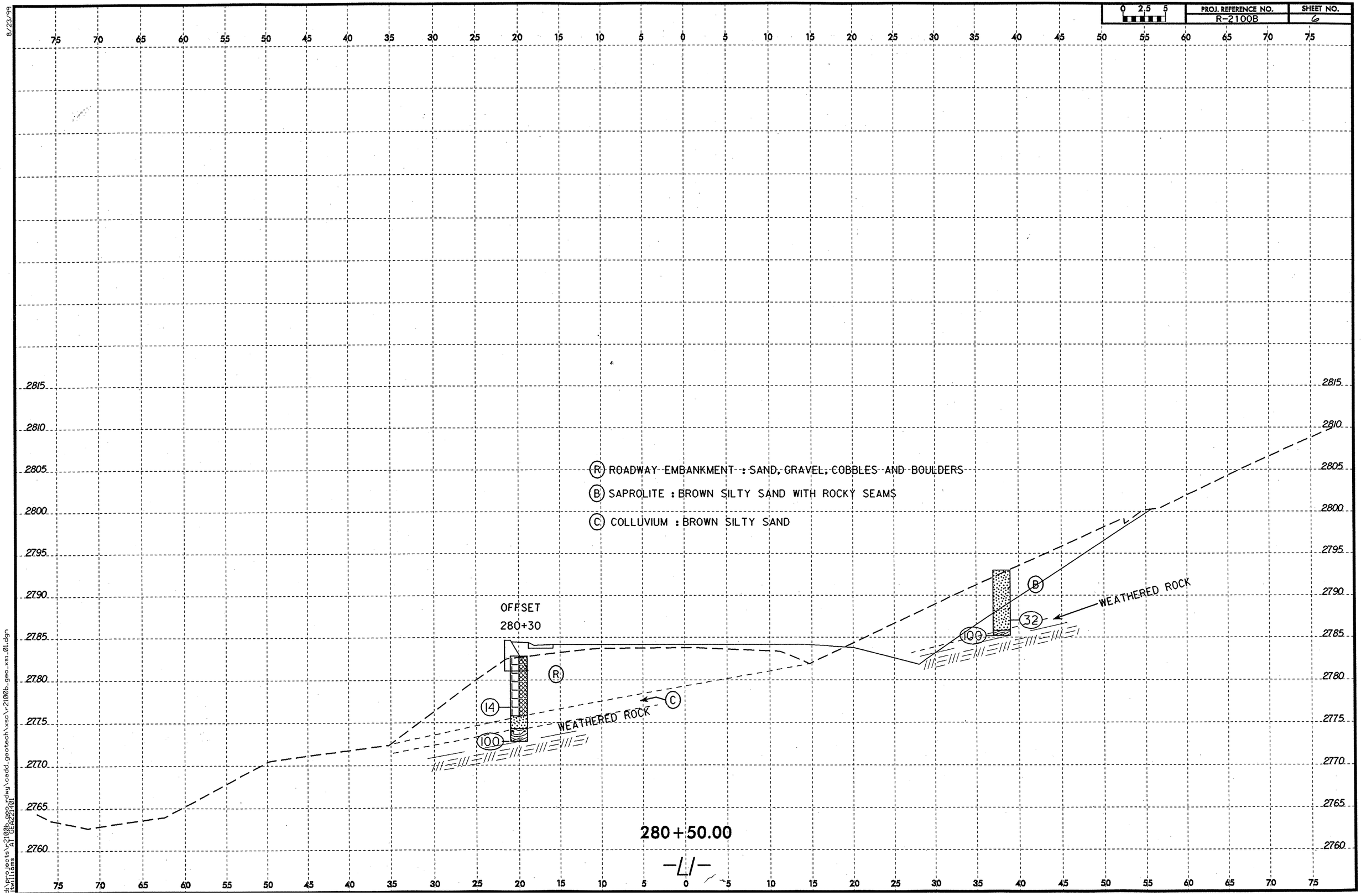
|---|---|---|
| | R-2100B | 6 |

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Williams at 08:22:01

# NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
## GEOTECHNICAL UNIT BORING LOG

| | | | |
|---|---|---|---|
| **PROJECT NO** 34369.1.1 | **ID** R-2100B | **COUNTY** ASHE | **GEOLOGIST** D. CHITTENDEN (F&H) |
| **SITE DESCRIPTION** NC 16 FROM SOUTHEAST OF SR 1158 TO SOUTHEAST OF NC 88 | | | **GND WATER** |
| **BORING NO** 28000L | **NORTHING** 0.00 | **EASTING** 0.00 | **0 HR** N/A |
| **ALIGNMENT** -L- | **BORING LOCATION** 280+00.000 | **OFFSET** 22.00ft LT | **24 HR** N/A |
| **COLLAR ELEV** 2785.00ft | **TOTAL DEPTH** 11.00ft | **START DATE** 8/13/05 | **COMPLETION DATE** 08/13/05 |
| **DRILL MACHINE** CME-45 | **DRILL METHOD** ROTARY W/O MUD | | **HAMMER TYPE** AUTOMATIC |
| **SURFACE WATER DEPTH** N/A | **DEPTH TO ROCK** 11.00ft | | **Log 28000L, Page 1 of 1** |

| ELEV | DEPTH | BLOW CT 6in | BLOW CT 6in | BLOW CT 6in | PEN (ft) | BLOWS PER FOOT 0 25 50 75 100 | SAMPLE NO | MOI | LOG | SOIL AND ROCK DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|
| 2785.00 | | | | | | Ground Surface | | | | |
| 2780.00 | 5.00 | 2 | 2 | 2 | 1.0 | 4 | SS-621 | | | EMBANKMENT: SAND, GRAVEL, COBBLES AND BOULDERS |
| 2774.00 | 10.00 | 10 | 15 | 85 | 0.5 | 100 | SS-622 | | | COLLUVIUM: DARK BROWN SILTY SAND WITH ROCK FRAGMENTS |
| | | | | | | TERMINATED BORING ON HARD ROCK AT ELEVATION 2774.0 FEET. | | | | |

# NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
## GEOTECHNICAL UNIT BORING LOG

| | | | |
|---|---|---|---|
| **PROJECT NO** 34369.1.1 | **ID** R-2100B | **COUNTY** ASHE | **GEOLOGIST** D. CHITTENDEN (F&H) 7 |
| **SITE DESCRIPTION** NC 16 FROM SOUTHEAST OF SR 1158 TO SOUTHEAST OF NC 88 | | | **GND WATER** |
| **BORING NO** 28030L | **NORTHING** 0.00 | **EASTING** 0.00 | **0 HR** N/A |
| **ALIGNMENT** -L- | **BORING LOCATION** 280+30.000 | **OFFSET** 20.00ft LT | **24 HR** N/A |
| **COLLAR ELEV** 2782.80ft | **TOTAL DEPTH** 10.00ft | **START DATE** 8/13/05 | **COMPLETION DATE** 08/13/05 |
| **DRILL MACHINE** CME-45 | **DRILL METHOD** ROTARY W/O MUD | | **HAMMER TYPE** AUTOMATIC |
| **SURFACE WATER DEPTH** N/A | **DEPTH TO ROCK** 10.00ft | | **Log 28030L, Page 1 of 1** |

| ELEV | DEPTH | BLOW CT 6in | BLOW CT 6in | BLOW CT 6in | PEN (ft) | BLOWS PER FOOT 0 25 50 75 100 | SAMPLE NO | MOI | LOG | SOIL AND ROCK DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|
| 2782.80 | | | | | | Ground Surface | | | | |
| 2780.00 | 5.00 | 1 | 4 | 10 | 1.0 | 14 | SS-619 | | | EMBANKMENT: SAND GRAVEL COBBLES AND BOULDERS |
| 2772.80 | 10.00 | 100 | | | 0.0 | 100 | | | | COLLUVIUM: BROWN SILTY SAND WEATHERED ROCK |
| | | | | | | TERMINATED BORING ON HARD ROCK AT ELEVATION 2772.8 FEET. | | | | |

M&T 50

JCS

# NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
## DIVISION OF HIGHWAYS-MATERIALS AND TESTS UNIT
## SOILS TEST REPORT-SOILS LABORATORY

| | |
|---|---|
| T.I.P. ID #: | R-2100 B |

| | |
|---|---|
| REPORT ON SAMPLES OF: | Soils for Classification |

| | | | | | |
|---|---|---|---|---|---|
| PROJECT: | 34369.1.1 | COUNTY: | Ashe | Owner: | -- |
| DATE SAMPLED: | 8.05 | DATE RECEIVED: | 9.23.05 | DATE REPORTED: | 10.5.05 |
| SAMPLED FROM: | Roadway | SAMPLED BY: | L. L. Acker | | |
| SUBMITTED BY: | W. D. Frye | 2002 | STANDARD SPECIFICATION | | |
| LABORATORY: | Asheville | | | | |

## TEST RESULTS

| Project Sample No. | SS-614 | SS-618 | SS-619 | SS-621 | SS-622 | SS-623 | SS-624 | SS-625 |
|---|---|---|---|---|---|---|---|---|
| Lab Sample No. A | 150488 | 150489 | 150490 | 150491 | 150492 | 150493 | 150494 | 150495 |
| HiCAMS Sample # | -- | -- | -- | -- | -- | -- | -- | -- |
| Retained #4 Sieve % | -- | -- | -- | -- | -- | -- | -- | -- |
| Passing #10 Sieve % | 91 | 78 | 55 | 30 | 65 | 61 | 55 | 82 |
| Passing #40 Sieve % | 78 | 72 | 48 | 23 | 55 | 55 | 41 | 76 |
| Passing #200 Sieve % | 21 | 40 | 21 | 10 | 20 | 22 | 14 | 28 |

## MINUS #10 FRACTION

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Soil Mortar - 100% | | | | | | | | |
| Coarse Sand -Ret. #60 | 30 | 17 | 23 | 33 | 27 | 22 | 40 | 18 |
| Fine Sand - Ret. #270 | 55 | 41 | 47 | 40 | 53 | 51 | 40 | 59 |
| Silt 0.05-0.005 mm % | 13 | 32 | 22 | 21 | 16 | 23 | 16 | 21 |
| Clay < 0.005 mm % | 2 | 10 | 8 | 6 | 4 | 4 | 4 | 2 |
| Passing # 40 Sieve % | -- | -- | -- | -- | -- | -- | -- | -- |
| Passing # 200 Sieve % | -- | -- | -- | -- | -- | -- | -- | -- |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Liquid Limit | 44 | 43 | 32 | 34 | 34 | 32 | 31 | 45 |
| Plastic Index | NP | NP | NP | NP | NP | NP | NP | NP |
| AASHTO Classification | A-2-5 (0) | A-5 (1) | A-1-b (0) | A-1-a (0) | A-2-4 (0) | A-2-4 (0) | A-1-b (0) | A-2-5 (0) |
| Quantity | | | | | | | | |
| Texture | | | | | | | | |
| Station | 284+00 | 294+50 | 280+30 | 280+00 | 280+00 | 269+50 | 266+50 | 266+50 |
| Hole No. | | | | | | | | |
| Depth (ft) From: | 9.5 | 5.0 | 5.0 | 5.0 | 10.0 | 5.0 | 4.5 | 9.5 |
| To: | 11.0 | 6.5 | 6.5 | 6.5 | 11.0 | 6.5 | 6.0 | 11.0 |
| | | | | | | | | |

**Remarks:**

A-150488 - 150495

**CC:**

| | |
|---|---|
| L. L. Acker | |
| File | |
| | |
| | |

| | |
|---|---|
| SOILS ENGINEER: | |

| STATE | STATE PROJECT REFERENCE NO. | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|
| N.C. | R2100B | 1 | 19 |

# STATE OF NORTH CAROLINA
## DEPARTMENT OF TRANSPORTATION
## DIVISION OF HIGHWAYS
## GEOTECHNICAL ENGINEERING UNIT

# STRUCTURE SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. R2100B F.A. PROJ. STP-16(1)

COUNTY ASHE

PROJECT DESCRIPTION NC 16 FROM SOUTHEAST OF SR 1158 TO SOUTHEAST OF NC 88

SITE DESCRIPTION RETAINING WALL FROM STA. 290+50 TO STA. 295+50 (LEFT) ON NC 16

## CONTENTS


| SHEET | DESCRIPTION |
|---|---|
| 1 | TITLE SHEET |
| 2 | LEGEND |
| 3 | SITE PLAN |
| 4 | PROFILE |
| 5 - 15 | CROSS SECTION(S) |
| 16 - 19 | BORE LOG & CORE REPORT(S) |


## CAUTION NOTICE

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WERE MADE FOR THE PURPOSE OF STUDY, PLANNING, AND DESIGN, AND NOT FOR CONSTRUCTION OR PAY PURPOSES. THE VARIOUS FIELD BORING LOGS, ROCK CORES, AND SOIL TEST DATA AVAILABLE MAY BE REVIEWED OR INSPECTED IN RALEIGH BY CONTACTING THE N. C. DEPARTMENT OF TRANSPORTATION, GEOTECHNICAL ENGINEERING UNIT AT (919) 250-4088. NEITHER THE SUBSURFACE PLANS AND REPORTS, NOR THE FIELD BORING LOGS, ROCK CORES, OR SOIL TEST DATA ARE PART OF THE CONTRACT.

GENERAL SOIL AND ROCK STRATA DESCRIPTIONS AND INDICATED BOUNDARIES ARE BASED ON A GEOTECHNICAL INTERPRETATION OF ALL AVAILABLE SUBSURFACE DATA AND MAY NOT NECESSARILY REFLECT THE ACTUAL SUBSURFACE CONDITIONS BETWEEN BORINGS OR BETWEEN SAMPLED STRATA WITHIN THE BOREHOLE. THE LABORATORY SAMPLE DATA AND THE IN SITU (IN-PLACE) TEST DATA CAN BE RELIED ON ONLY TO THE DEGREE OF RELIABILITY INHERENT IN THE STANDARD TEST METHOD. THE OBSERVED WATER LEVELS OR SOIL MOISTURE CONDITIONS INDICATED IN THE SUBSURFACE INVESTIGATIONS ARE AS RECORDED AT THE TIME OF THE INVESTIGATION. THESE WATER LEVELS OR SOIL MOISTURE CONDITIONS MAY VARY CONSIDERABLY WITH TIME ACCORDING TO CLIMATIC CONDITIONS INCLUDING TEMPERATURES, PRECIPITATION, AND WIND, AS WELL AS OTHER NON-CLIMATIC FACTORS.

THE BIDDER OR CONTRACTOR IS CAUTIONED THAT DETAILS SHOWN ON THE SUBSURFACE PLANS ARE PRELIMINARY ONLY AND IN MANY CASES THE FINAL DESIGN DETAILS ARE DIFFERENT. FOR BIDDING AND CONSTRUCTION PURPOSES, REFER TO THE CONSTRUCTION PLANS AND DOCUMENTS FOR FINAL DESIGN INFORMATION ON THIS PROJECT. THE DEPARTMENT DOES NOT WARRANT OR GUARANTEE THE SUFFICIENCY OR ACCURACY OF THE INVESTIGATION MADE, NOR THE INTERPRETATIONS MADE, OR OPINION OF THE DEPARTMENT AS TO THE TYPE OF MATERIALS AND CONDITIONS TO BE ENCOUNTERED. THE BIDDER OR CONTRACTOR IS CAUTIONED TO MAKE SUCH INDEPENDENT SUBSURFACE INVESTIGATIONS AS HE DEEMS NECESSARY TO SATISFY HIMSELF AS TO CONDITIONS TO BE ENCOUNTERED ON THIS PROJECT. THE CONTRACTOR SHALL HAVE NO CLAIM FOR ADDITIONAL COMPENSATION OR FOR AN EXTENSION OF TIME FOR ANY REASON RESULTING FROM THE ACTUAL CONDITIONS ENCOUNTERED AT THE SITE DIFFERING FROM THOSE INDICATED IN THE SUBSURFACE INFORMATION.

PERSONNEL

F & R ENGINEERING

F & H ENGINEERING

INVESTIGATED BY L.L. ACKER

CHECKED BY W.D. FRYE

SUBMITTED BY W.D. FRYE

DATE 6/8/06

NORTH CAROLINA LICENSED SEAL 1007 GEOLOGIST LOUIS L. ACKER

06/08/06

PROJECT: 34369.1.1

ID: R2100B

DRAWN BY: J. T. WILLIAMS

NOTE - THE INFORMATION CONTAINED HEREIN IS NOT IMPLIED OR GUARANTEED BY THE N. C. DEPARTMENT OF TRANSPORTATION AS BEING ACCURATE NOR IT IS CONSIDERED TO BE PART OF THE PLANS, SPECIFICATIONS, OR CONTRACT FOR THE PROJECT.

NOTE - BY HAVING REQUESTED THIS INFORMATION THE CONTRACTOR SPECIFICALLY WAIVES ANY CLAIMS FOR INCREASED COMPENSATION OR EXTENSION OF TIME BASED ON DIFFERENCES BETWEEN THE CONDITIONS INDICATED HEREIN AND THE ACTUAL CONDITIONS AT THE PROJECT SITE.

| PROJECT REFERENCE NO. | SHEET NO. |
|---|---|
| R2100B | 2 |

# NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
## DIVISION OF HIGHWAYS
## GEOTECHNICAL ENGINEERING UNIT

# SUBSURFACE INVESTIGATION

### SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

## SOIL DESCRIPTION

SOIL IS CONSIDERED TO BE THE UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER, AND YIELD LESS THAN 100 BLOWS PER FOOT ACCORDING TO STANDARD PENETRATION TEST (AASHTO T206, ASTM D-1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY SHALL INCLUDE: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. EXAMPLE:

*VERY STIFF, GRAY, SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6*

## SOIL LEGEND AND AASHTO CLASSIFICATION

| GENERAL CLASS. | GRANULAR MATERIALS (≤ 35% PASSING #200) | | | | | | | SILT-CLAY MATERIALS (> 35% PASSING #200) | | | | ORGANIC MATERIALS | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GROUP CLASS. | A-1 | | A-3 | A-2 | | | | A-4 | A-5 | A-6 | A-7 | A-1, A-2 A-3 | A-4, A-5 A-6, A-7 | |
| | A-1-a | A-1-b | | A-2-4 | A-2-5 | A-2-6 | A-2-7 | | | | A-7-5 A-7-6 | | | |
| SYMBOL | | | | | | | | | | | | | | |
| % PASSING # 10 | 50 MX | | | | | | | | | | | GRANULAR SOILS | SILT-CLAY SOILS | MUCK, PEAT |
| # 40 | 30 MX | 50 MX | 51 MN | | | | | | | | | | | |
| # 200 | 15 MX | 25 MX | 10 MX | 35 MX | 35 MX | 35 MX | 35 MX | 36 MN | 36 MN | 36 MN | 36 MN | | | |
| LIQUID LIMIT | 6 MX | | NP | 40 MX | 41 MN | 40 MX | 41 MN | 40 MX | 41 MN | 40 MX | 41 MN | SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER | | HIGHLY ORGANIC SOILS |
| PLASTIC INDEX | | | | 10 MX | 10 MX | 11 MN | 11 MN | 10 MX | 10 MX | 11 MN | 11 MN | | | |
| GROUP INDEX | 0 | | 0 | 0 | | 4 MX | | 8 MX | 12 MX | 16 MX | No MX | | | |
| USUAL TYPES OF MAJOR MATERIALS | STONE FRAGS. GRAVEL, AND SAND | | FINE SAND | SILTY OR CLAYEY GRAVEL AND SAND | | | | SILTY SOILS | | CLAYEY SOILS | | | | |
| GEN. RATING AS A SUBGRADE | EXCELLENT TO GOOD | | | | | | | FAIR TO POOR | | | | FAIR TO POOR | POOR | UNSUITABLE |

PI OF A-7-5 SUBGROUP IS ≤ LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30

## CONSISTENCY OR DENSENESS

| PRIMARY SOIL TYPE | COMPACTNESS OR CONSISTENCY | RANGE OF STANDARD PENETRATION RESISTENCE (N-VALUE) | RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT$^2$) |
|---|---|---|---|
| GENERALLY GRANULAR MATERIAL (NON-COHESIVE) | VERY LOOSE<br>LOOSE<br>MEDIUM DENSE<br>DENSE<br>VERY DENSE | <4<br>4 TO 10<br>10 TO 30<br>30 TO 50<br>>50 | N/A |
| GENERALLY SILT-CLAY MATERIAL (COHESIVE) | VERY SOFT<br>SOFT<br>MEDIUM STIFF<br>STIFF<br>VERY STIFF<br>HARD | <2<br>2 TO 4<br>4 TO 8<br>8 TO 15<br>15 TO 30<br>>30 | <0.25<br>0.25 TO 0.50<br>0.5 TO 1.0<br>1 TO 2<br>2 TO 4<br>>4 |

## TEXTURE OR GRAIN SIZE

| U.S. STD. SIEVE SIZE | 4 | 10 | 40 | 60 | 200 | 270 |
|---|---|---|---|---|---|---|
| OPENING (MM) | 4.76 | 2.00 | 0.42 | 0.25 | 0.075 | 0.053 |

| BOULDER (BLDR.) | COBBLE (COB.) | GRAVEL (GR.) | COARSE SAND (CSE. SD.) | FINE SAND (F SD.) | SILT (SL.) | CLAY (CL.) |
|---|---|---|---|---|---|---|

GRAIN SIZE MM: 305 | 75 | 2.0 | 0.25 | 0.05 | 0.005
GRAIN SIZE IN.: 12 | 3

## SOIL MOISTURE - CORRELATION OF TERMS

| SOIL MOISTURE SCALE (ATTERBERG LIMITS) | FIELD MOISTURE DESCRIPTION | GUIDE FOR FIELD MOISTURE DESCRIPTION |
|---|---|---|
| | - SATURATED - (SAT.) | USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE |
| LL - LIQUID LIMIT<br>PLASTIC RANGE (PI)<br>PL - PLASTIC LIMIT | - WET - (W) | SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE |
| OM - OPTIMUM MOISTURE<br>SL - SHRINKAGE LIMIT | - MOIST - (M) | SOLID; AT OR NEAR OPTIMUM MOISTURE |
| | - DRY - (D) | REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE |

## PLASTICITY

| | PLASTICITY INDEX (PI) | DRY STRENGTH |
|---|---|---|
| NONPLASTIC | 0-5 | VERY LOW |
| LOW PLASTICITY | 6-15 | SLIGHT |
| MED. PLASTICITY | 16-25 | MEDIUM |
| HIGH PLASTICITY | 26 OR MORE | HIGH |

## COLOR

DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY). MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.

## GRADATION

WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE.
UNIFORM - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. (ALSO POORLY GRADED)
GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLES OF TWO OR MORE SIZES.

## ANGULARITY OF GRAINS

THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.

## MINERALOGICAL COMPOSITION

MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE.

## COMPRESSIBILITY

| | |
|---|---|
| SLIGHTLY COMPRESSIBLE | LIQUID LIMIT LESS THAN 31 |
| MODERATELY COMPRESSIBLE | LIQUID LIMIT EQUAL TO 31-50 |
| HIGHLY COMPRESSIBLE | LIQUID LIMIT GREATER THAN 50 |

## PERCENTAGE OF MATERIAL

| ORGANIC MATERIAL | GRANULAR SOILS | SILT - CLAY SOILS | OTHER MATERIAL | |
|---|---|---|---|---|
| TRACE OF ORGANIC MATTER | 2 - 3% | 3 - 5% | TRACE | 1 - 10% |
| LITTLE ORGANIC MATTER | 3 - 5% | 5 - 12% | LITTLE | 10 - 20% |
| MODERATELY ORGANIC | 5 - 10% | 12 - 20% | SOME | 20 - 35% |
| HIGHLY ORGANIC | >10% | >20% | HIGHLY | 35% AND ABOVE |

## GROUND WATER

- WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING
- STATIC WATER LEVEL AFTER 24 HOURS
- PW PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA
- SPRING OR SEEP

## MISCELLANEOUS SYMBOLS

- ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION
- SOIL SYMBOL
- ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT
- INFERRED SOIL BOUNDARY
- INFERRED ROCK LINE
- ALLUVIAL SOIL BOUNDARY
- 25/025 DIP & DIP DIRECTION OF ROCK STRUCTURES
- SOUNDING ROD
- SPT CPT DPT DMT VST PMT TEST BORING
- AUGER BORING
- CORE BORING
- MW MONITORING WELL
- PIEZOMETER INSTALLATION
- SLOPE INDICATOR INSTALLATION
- SPT N-VALUE
- REF SPT REFUSAL

SAMPLE DESIGNATIONS
S - BULK SAMPLE
SS - SPLIT SPOON SAMPLE
ST - SHELBY TUBE SAMPLE
RS - ROCK SAMPLE
RT - RECOMPACTED TRIAXIAL SAMPLE
CBR - CALIFORNIA BEARING RATIO SAMPLE

## ABBREVIATIONS

AR - AUGER REFUSAL
BT - BORING TERMINATED
CL. - CLAY
CPT - CONE PENETRATION TEST
CSE. - COARSE
DMT - DILATOMETER TEST
DPT - DYNAMIC PENETRATION TEST
e - VOID RATIO
F - FINE
FOSS. - FOSSILIFEROUS
FRAC. - FRACTURED, FRACTURES
FRAGS. - FRAGMENTS
HI. - HIGHLY
MED. - MEDIUM
MICA. - MICACEOUS
MOD. - MODERATELY
NP - NON PLASTIC
ORG. - ORGANIC
PMT - PRESSUREMETER TEST
SAP. - SAPROLITIC
SD. - SAND, SANDY
SL. - SILT, SILTY
SLI. - SLIGHTLY
TCR - TRICONE REFUSAL
w - MOISTURE CONTENT
V - VERY
VST - VANE SHEAR TEST
WEA. - WEATHERED
$\gamma$ - UNIT WEIGHT
$\gamma_d$ - DRY UNIT WEIGHT

## EQUIPMENT USED ON SUBJECT PROJECT

DRILL UNITS:
- [ ] MOBILE B-___
- [ ] BK-51
- [X] CME-45C
- [X] CME-550
- [ ] PORTABLE HOIST
- [ ] _____
- [ ] _____

ADVANCING TOOLS:
- [ ] CLAY BITS
- [ ] 6" CONTINUOUS FLIGHT AUGER
- [X] 8" HOLLOW AUGERS
- [ ] HARD FACED FINGER BITS
- [ ] TUNG.-CARBIDE INSERTS
- [X] CASING [X] W/ ADVANCER
- [ ] TRICONE _____" STEEL TEETH
- [ ] TRICONE _____" TUNG.-CARB.
- [ ] CORE BIT
- [ ] _____

HAMMER TYPE:
- [X] AUTOMATIC
- [ ] MANUAL

CORE SIZE:
- [ ] -B_____
- [X] -N_____
- [ ] -H_____

HAND TOOLS:
- [ ] POST HOLE DIGGER
- [ ] HAND AUGER
- [ ] SOUNDING ROD
- [ ] VANE SHEAR TEST
- [ ] _____

## ROCK DESCRIPTION

HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT IF TESTED, WOULD YIELD SPT REFUSAL. AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS. IN NON-COASTAL PLAIN MATERIAL, THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK.
ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:

| | |
|---|---|
| WEATHERED ROCK (WR) | NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100 BLOWS PER FOOT IF TESTED. |
| CRYSTALLINE ROCK (CR) | FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC. |
| NON-CRYSTALLINE ROCK (NCR) | FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN SEDIMENTARY ROCK THAT WOULD YEILD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC. |
| COASTAL PLAIN SEDIMENTARY ROCK (CP) | COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC. |

## WEATHERING

| | |
|---|---|
| FRESH | ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER HAMMER IF CRYSTALLINE. |
| VERY SLIGHT (V SLI.) | ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN, CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF OF A CRYSTALLINE NATURE. |
| SLIGHT (SLI.) | ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS. |
| MODERATE (MOD.) | SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED WITH FRESH ROCK. |
| MODERATELY SEVERE (MOD. SEV.) | ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES "CLUNK" SOUND WHEN STRUCK. *IF TESTED, WOULD YIELD SPT REFUSAL* |
| SEVERE (SEV.) | ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. *IF TESTED, YIELDS SPT N VALUES > 100 BPF* |
| VERY SEVERE (V SEV.) | ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT THE MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE SUCH THAT ONLY MINOR VESTIGES OF THE ORIGINAL ROCK FABRIC REMAIN. *IF TESTED, YIELDS SPT N VALUES < 100 BPF* |
| COMPLETE | ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE. |

## ROCK HARDNESS

| | |
|---|---|
| VERY HARD | CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK. |
| HARD | CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN. |
| MODERATELY HARD | CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS. |
| MEDIUM HARD | CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PEICES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK. |
| SOFT | CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE. |
| VERY SOFT | CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNAIL. |

## FRACTURE SPACING

| TERM | SPACING |
|---|---|
| VERY WIDE | MORE THAN 10 FEET |
| WIDE | 3 TO 10 FEET |
| MODERATELY CLOSE | 1 TO 3 FEET |
| CLOSE | 0.16 TO 1 FEET |
| VERY CLOSE | LESS THAN 0.16 FEET |

## BEDDING

| TERM | THICKNESS |
|---|---|
| VERY THICKLY BEDDED | > 4 FEET |
| THICKLY BEDDED | 1.5 - 4 FEET |
| THINLY BEDDED | 0.16 - 1.5 FEET |
| VERY THINLY BEDDED | 0.03 - 0.16 FEET |
| THICKLY LAMINATED | 0.008 - 0.03 FEET |
| THINLY LAMINATED | < 0.008 FEET |

## INDURATION

FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF THE MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.

| | |
|---|---|
| FRIABLE | RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE. |
| MODERATELY INDURATED | GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER. |
| INDURATED | GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER. |
| EXTREMELY INDURATED | SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS across GRAINS. |

## TERMS AND DEFINITIONS

ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER.

AQUIFER - A WATER BEARING FORMATION OR STRATA.

ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND.

ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, AS SHALE, SLATE, ETC.

ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE.

CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.

COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE.

CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.

DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK.

DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL.

DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.

FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.

FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.

FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM PARENT MATERIAL.

FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.

FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD.

JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.

LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT.

LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.

MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.

PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM.

RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.

ROCK QUALITY DESIGNATION (RQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.

SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK.

SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS.

SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE.

STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N OR BPF) OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS.

STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.

STRATA ROCK QUALITY DESIGNATION (SRQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.

TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.

BENCH MARK: BM #3 - BL- 61+98.54, 75.30 LT

ELEVATION: 2688.62 FT.

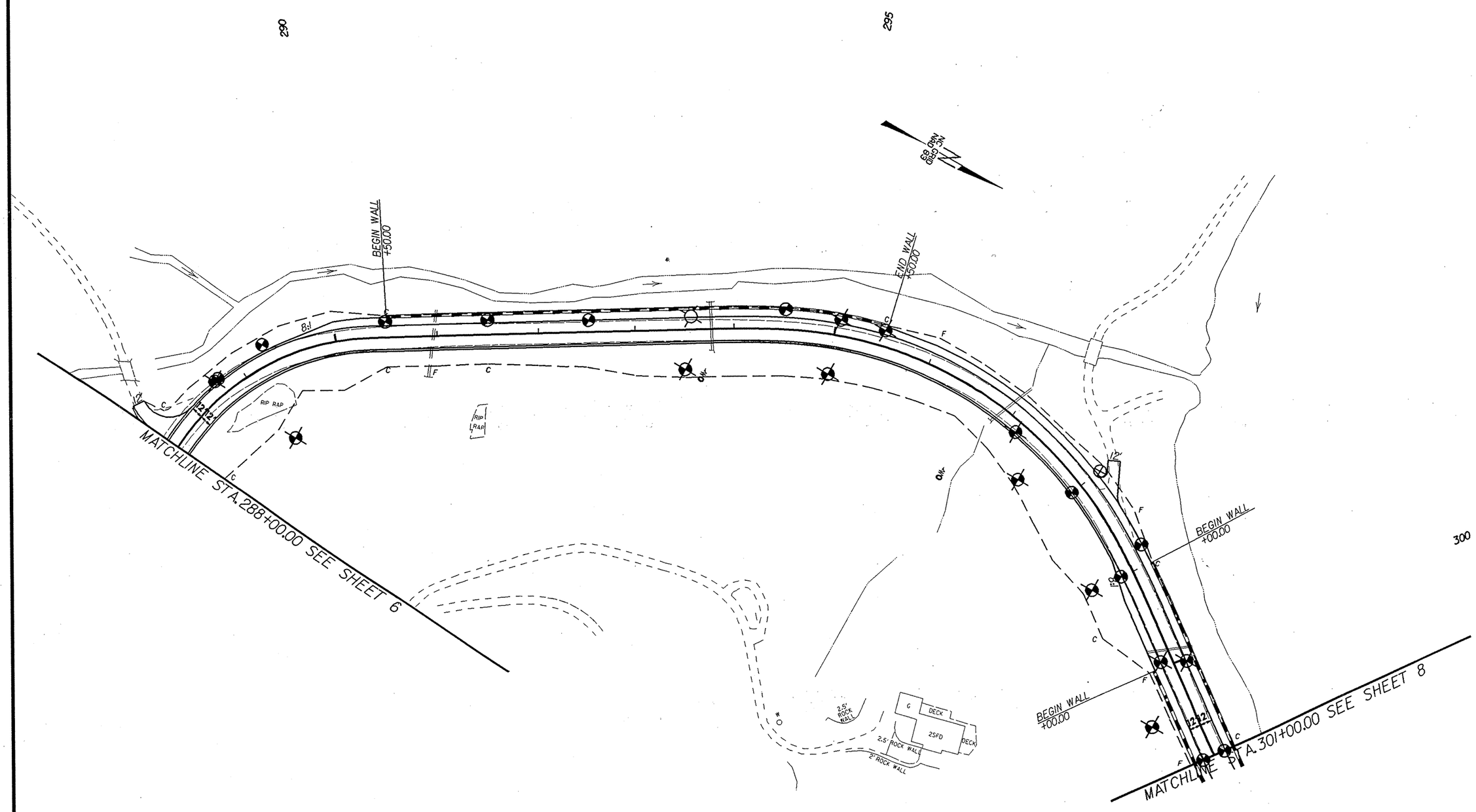
NOTES: FOR RETAINING WALL STA. 290+50 TO 295+50 LT

Earth Tech
A Tyco International Ltd. Company

| PROJECT REFERENCE NO. | SHEET NO. |
|---|---|
| R-2100B | 3 |
| R/W SHEET NO. | |
| ROADWAY DESIGN ENGINEER | HYDRAULICS ENGINEER |

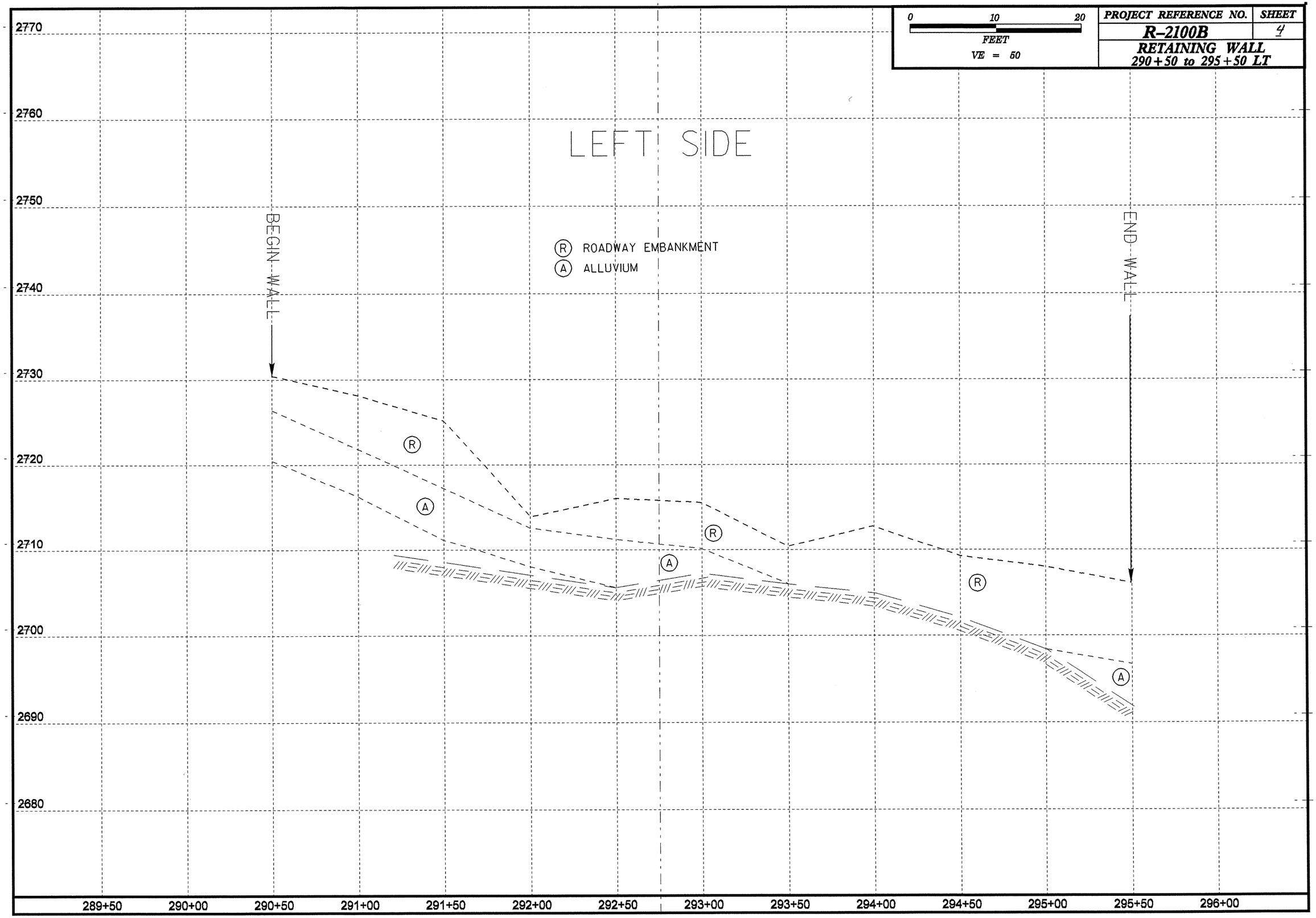
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

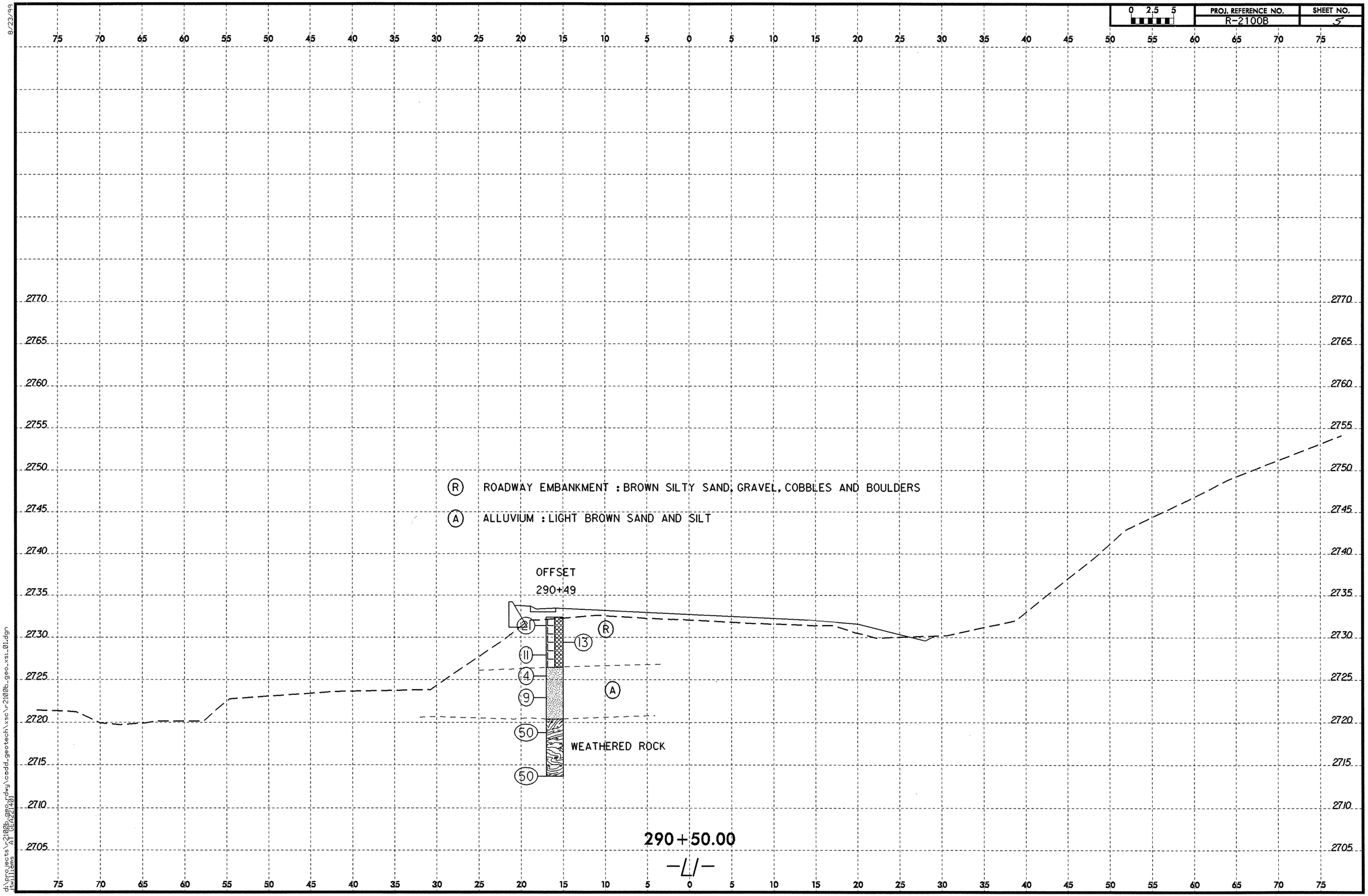
INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION




FOR -L1- PROFILE SEE SHEET 15

| PROJECT REFERENCE NO. | SHEET |
|---|---|
| R-2100B | 4 |
| RETAINING WALL 290+50 to 295+50 LT | |






8/23/99

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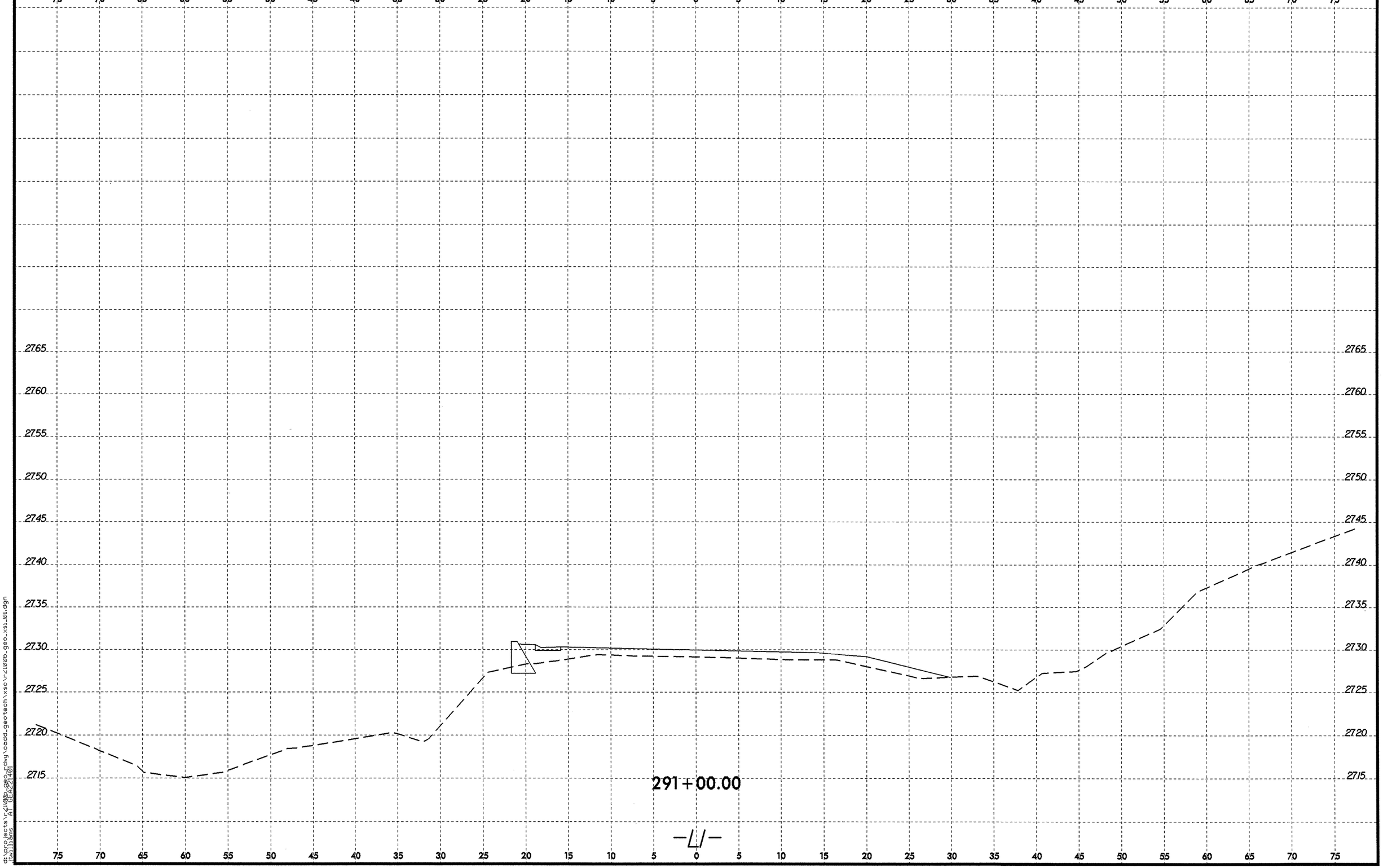


8/23/99

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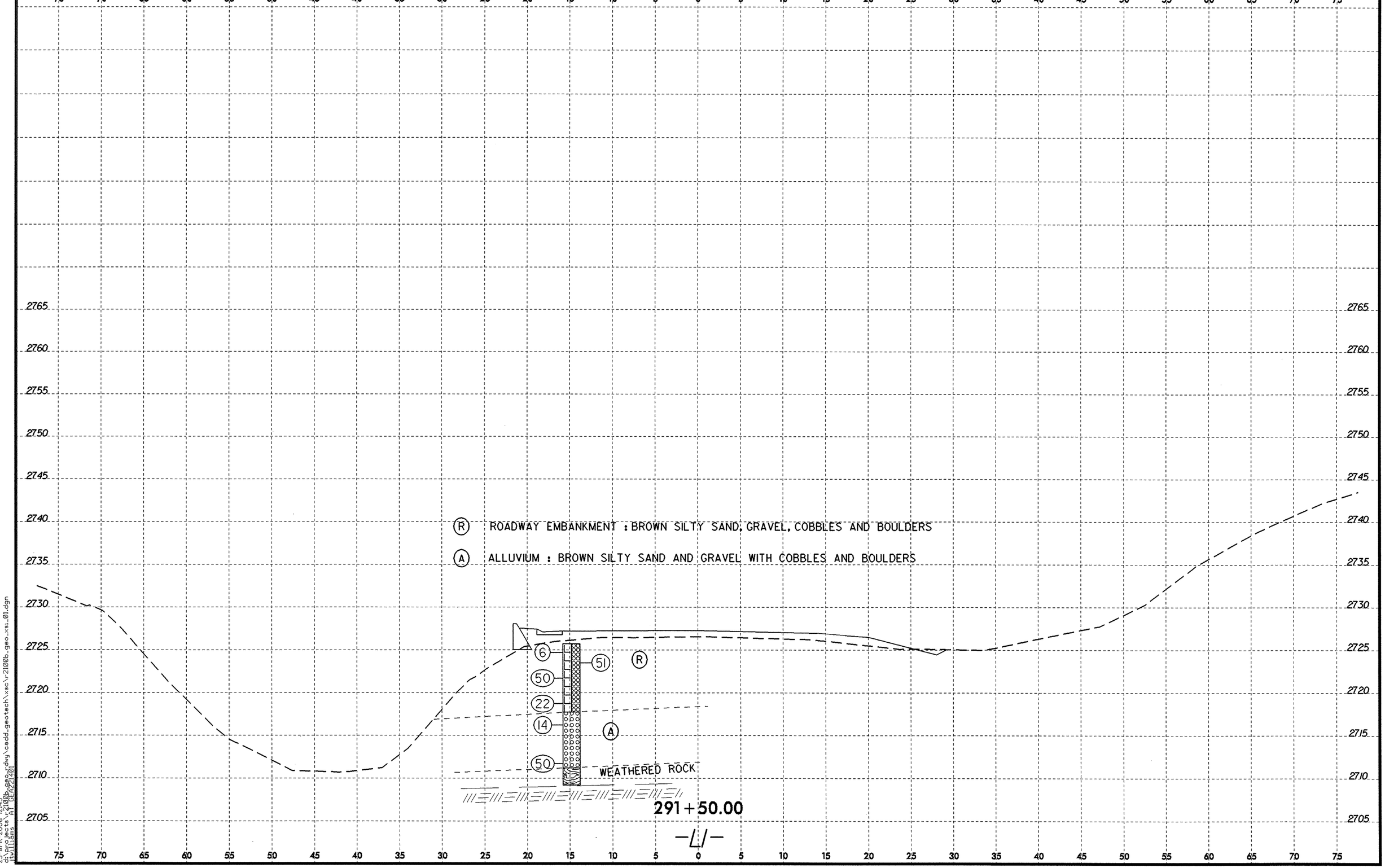


8/23/99

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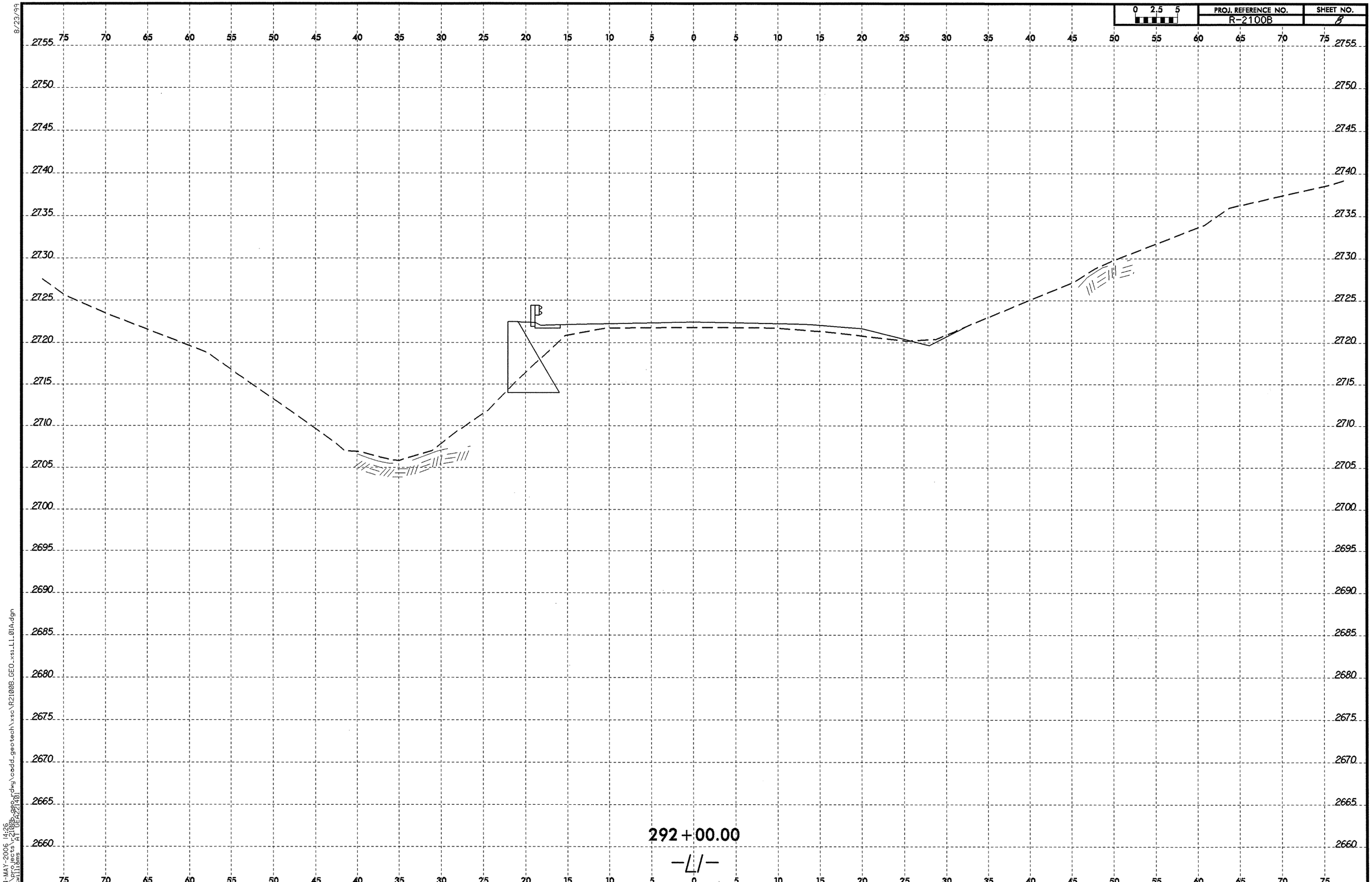
jtwilliams AT GEA221401

8/23/99

| 0 2.5 5 | PROJ. REFERENCE NO. | SHEET NO. |
|---|---|---|
| | R-2100B | 8 |

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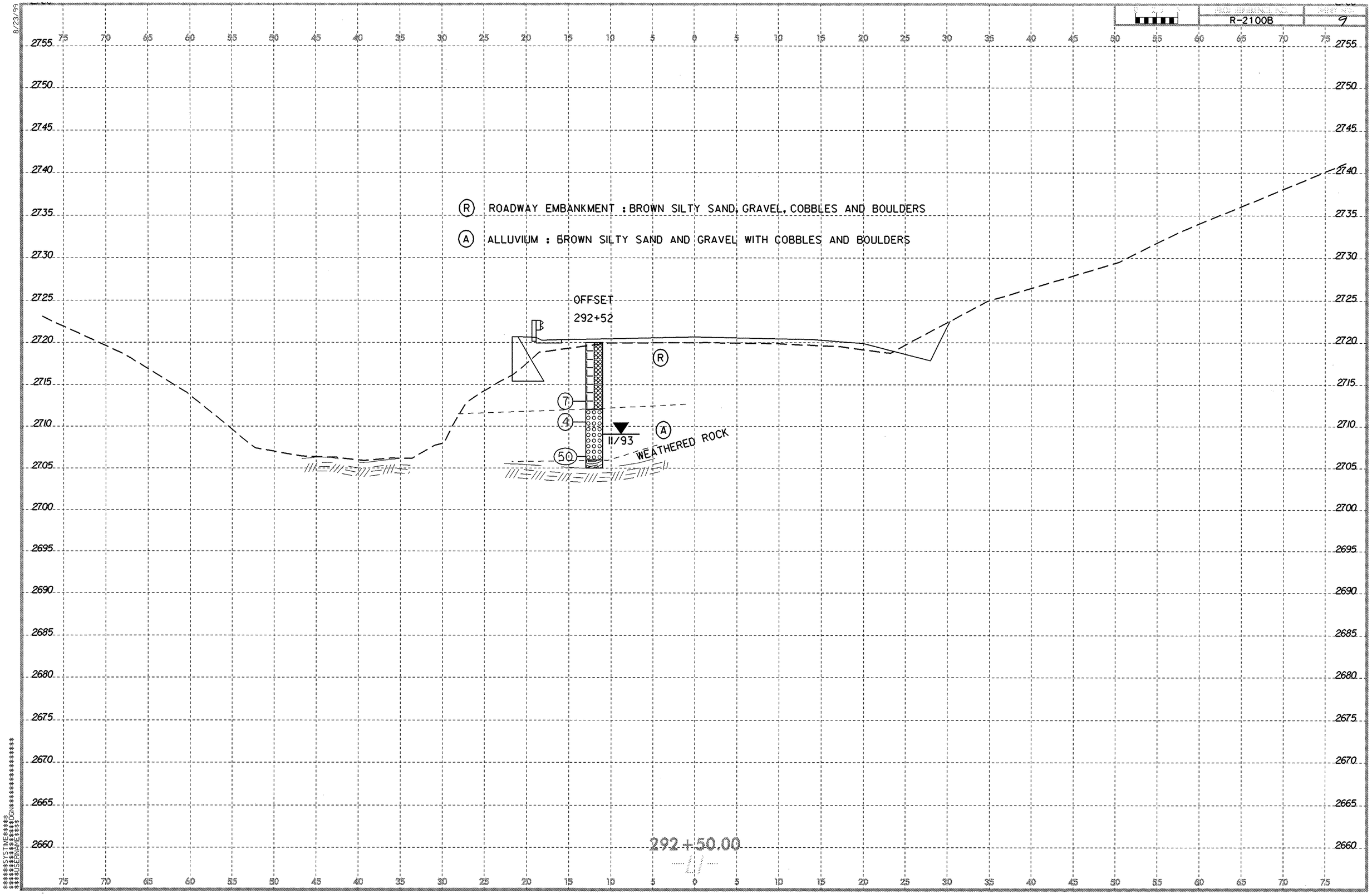
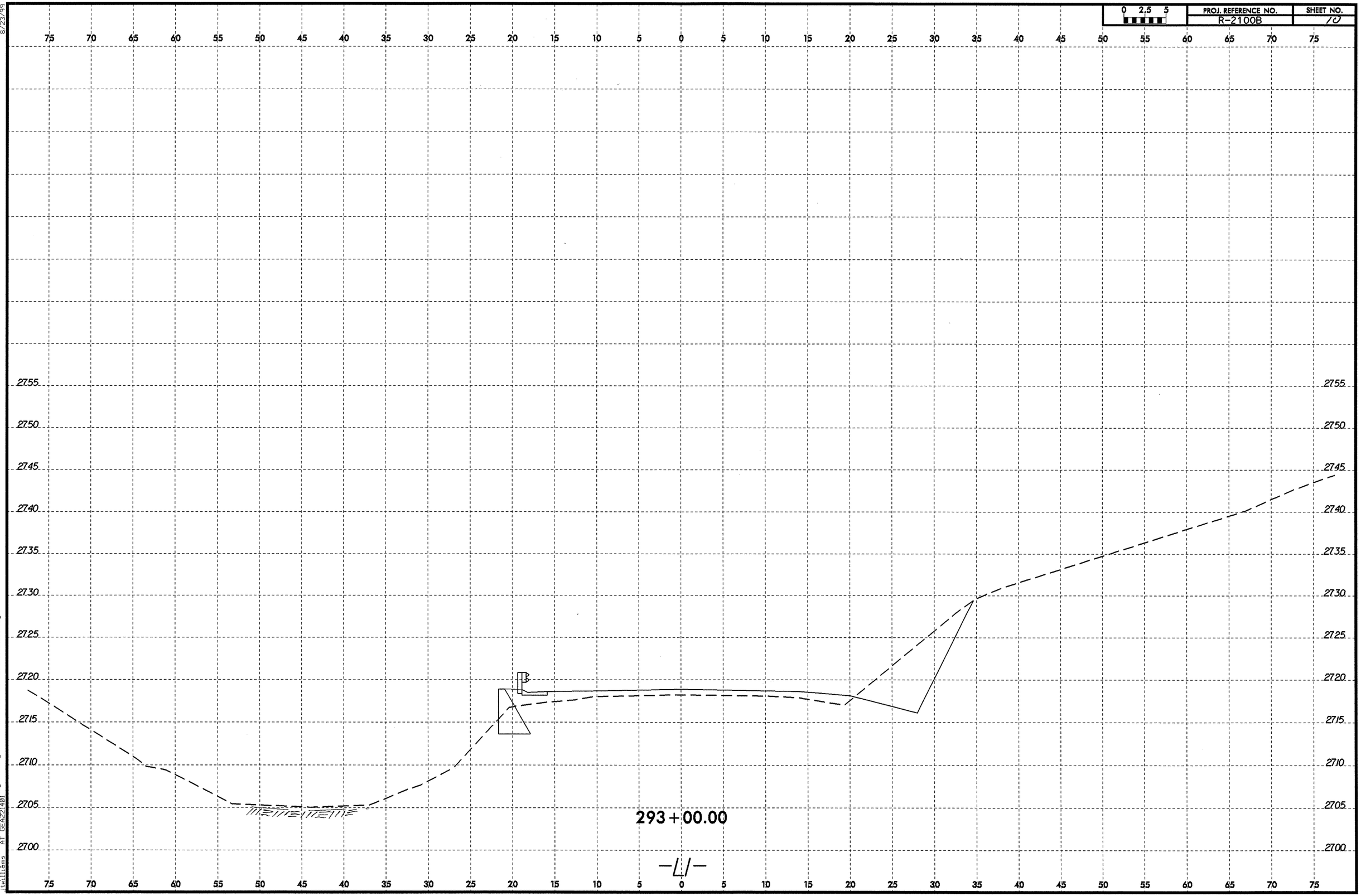
tbwilliams A1 GEA221401



R-2100B
9
8/23/99
R ROADWAY EMBANKMENT : BROWN SILTY SAND, GRAVEL, COBBLES AND BOULDERS
A ALLUVIUM : BROWN SILTY SAND AND GRAVEL WITH COBBLES AND BOULDERS
OFFSET
292+52
R
7
4
50
11/93
A
WEATHERED ROCK
292+50.00




8/23/99

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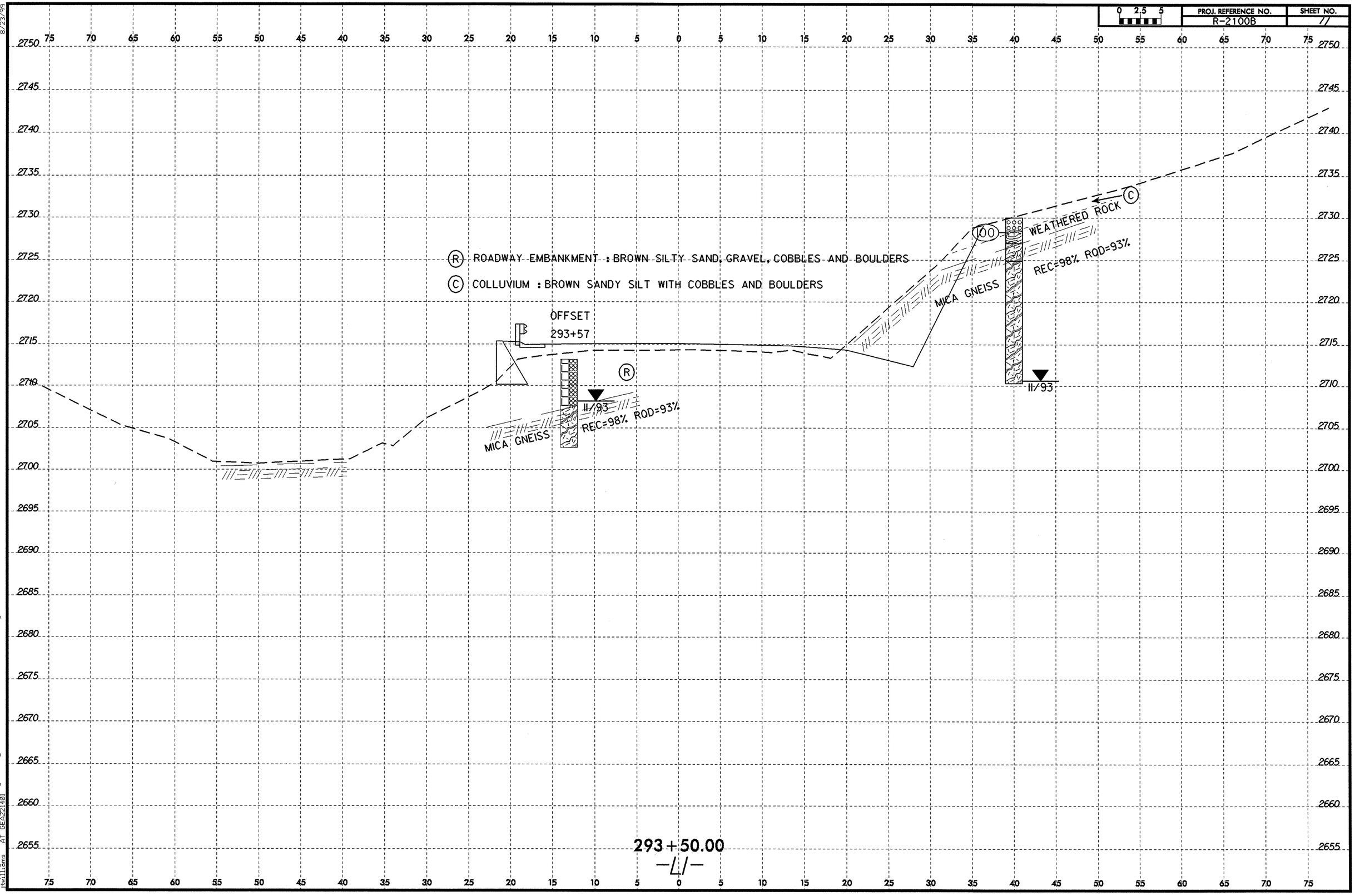


8/23/99

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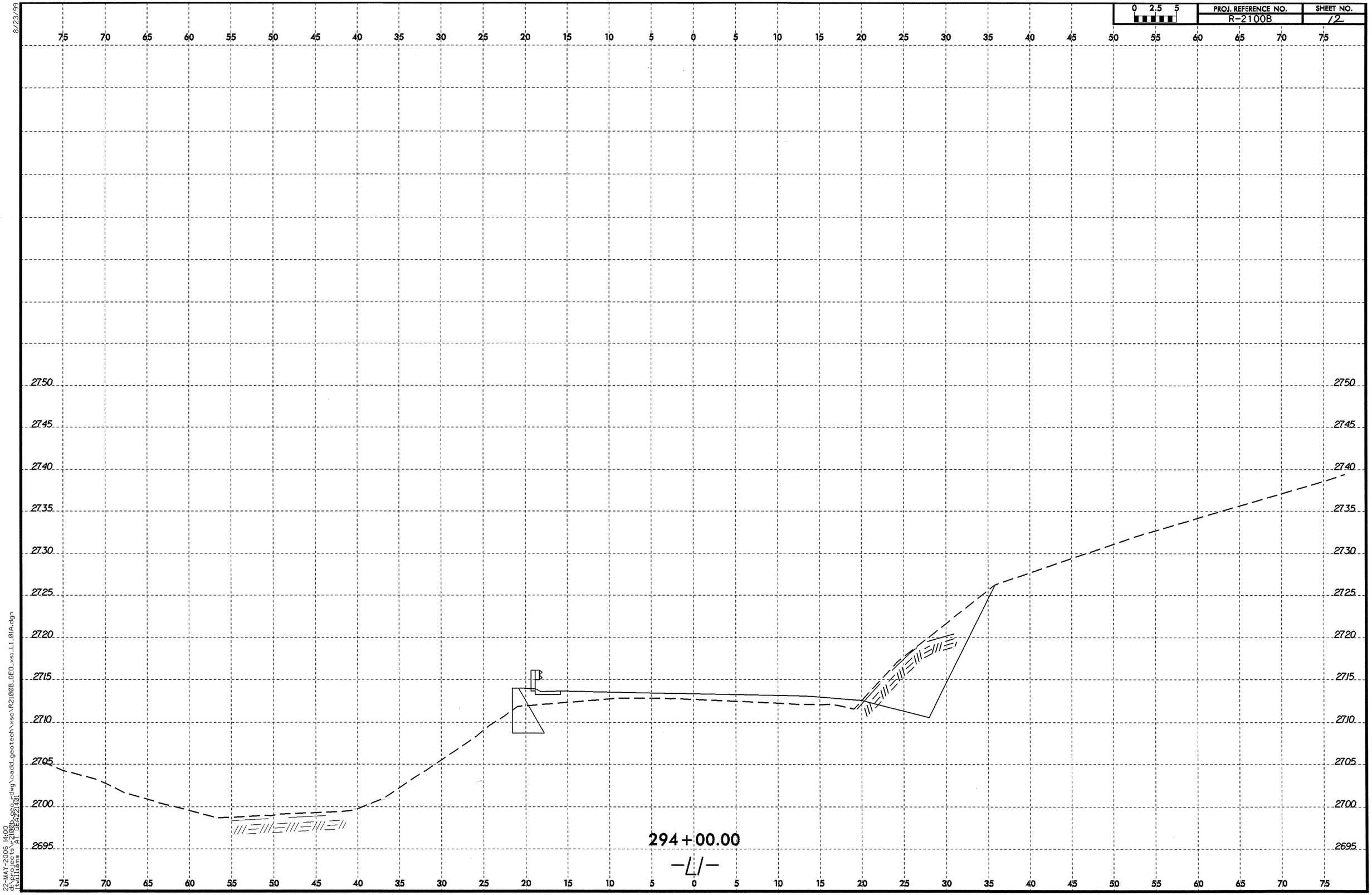
8/23/99

| 0 2.5 5 | PROJ. REFERENCE NO. | SHEET NO. |
|---|---|---|
| | R-2100B | 12 |

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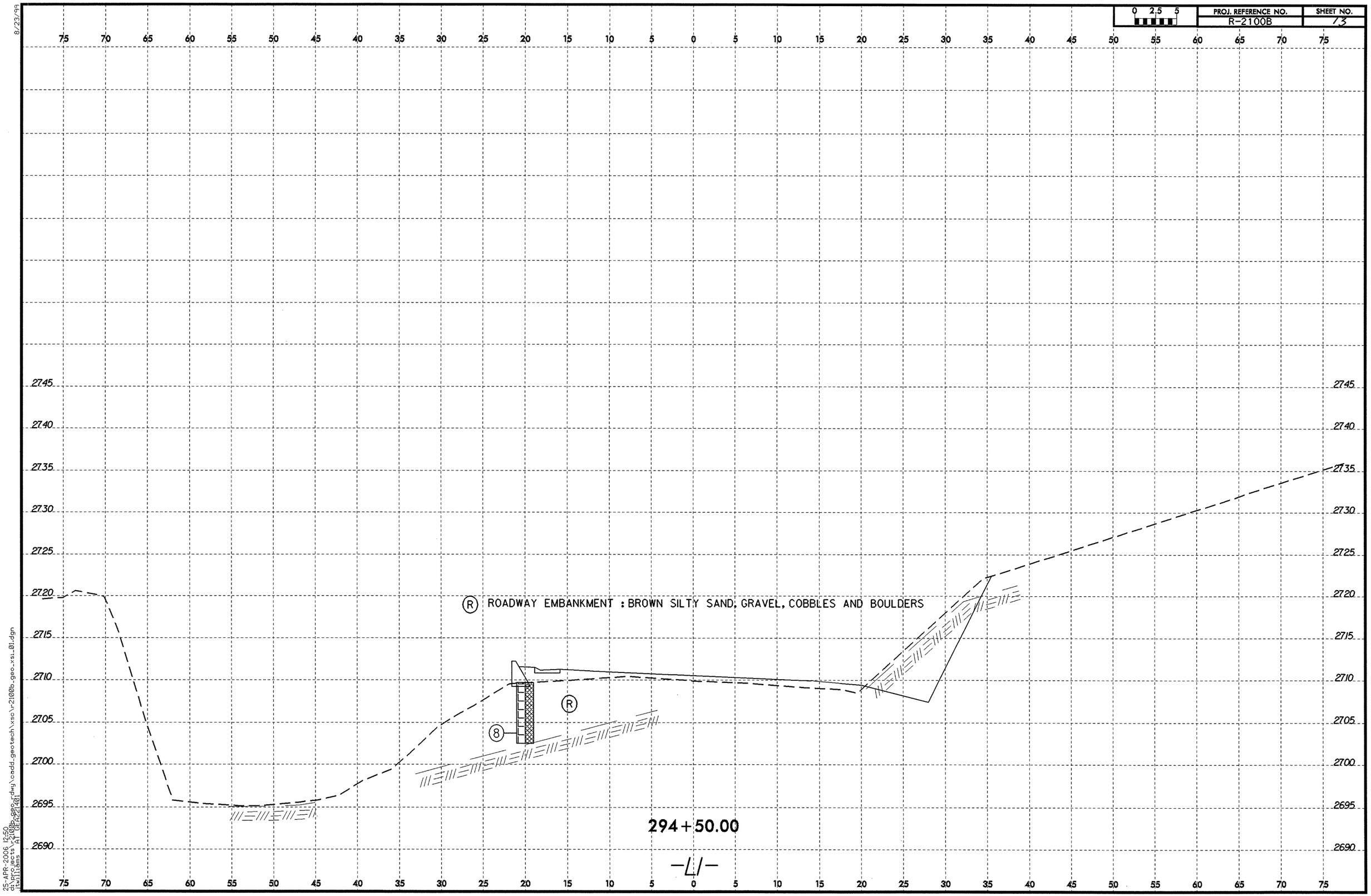


8/23/99

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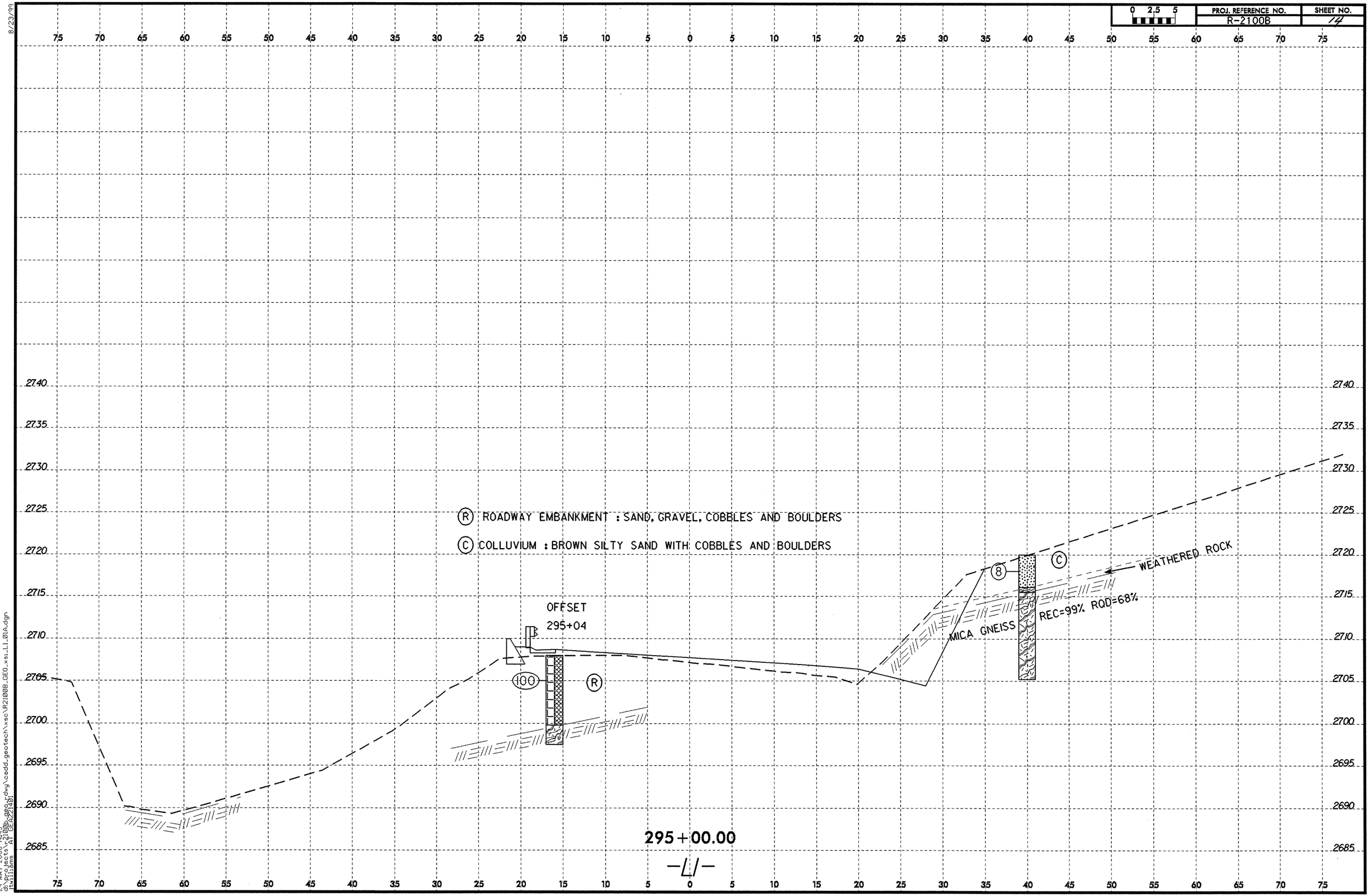


8/23/99

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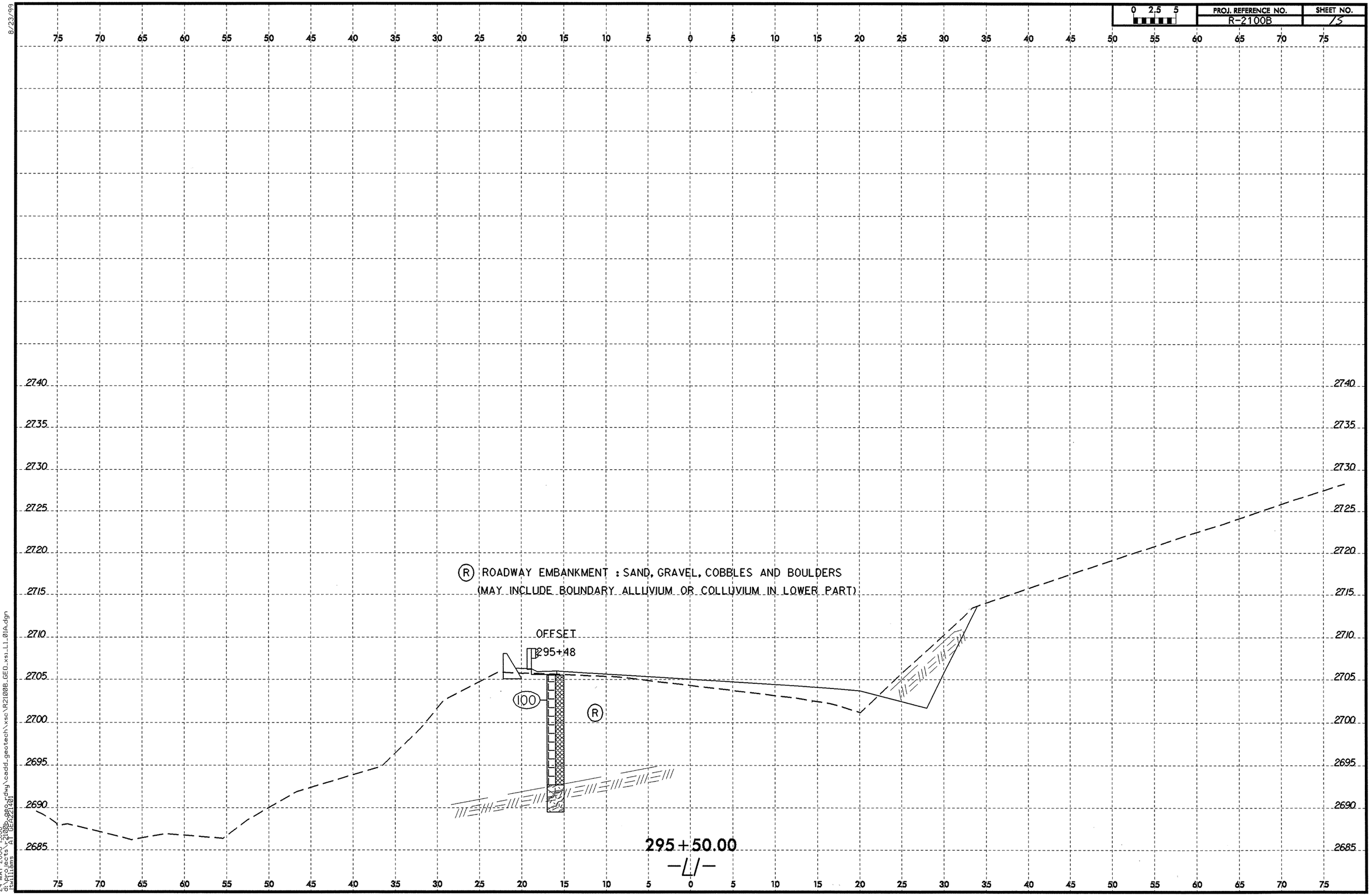
jtwilliams AT GEA221401



0 2.5 5
PROJ. REFERENCE NO.
R-2100B
SHEET NO.
15
8/23/99
75 70 65 60 55 50 45 40 35 30 25 20 15 10 5 0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75
2740
2735
2730
2725
2720
2715
2710
2705
2700
2695
2690
2685
R ROADWAY EMBANKMENT : SAND, GRAVEL, COBBLES AND BOULDERS
(MAY INCLUDE BOUNDARY ALLUVIUM OR COLLUVIUM IN LOWER PART)
OFFSET
295+48
100
R
295+50.00
-L1-
24-MAY-2006 15:08
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ftwilliams AT GEA221401

# NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
## GEOTECHNICAL UNIT BORING LOG

| | | | |
|---|---|---|---|
| **PROJECT NO** 8.1710902 | **ID** R-2100 | **COUNTY** ASHE | **GEOLOGIST** K. GAY |
| **SITE DESCRIPTION** RETAINING WALL FOR NC16 FROM JEFFERSON TO WILKES CO (RW #10) | | | **GND WATER** |
| **BORING NO** 290+49LT | **NORTHING** 0.00 | **EASTING** 0.00 | **0 HR** N/A |
| **ALIGNMENT** 288+49LT | **BORING LOCATION** 290+49.000 | **OFFSET** 16.00ft LT | **24 HR** N/A |
| **COLLAR ELEV** 2733.40ft | **TOTAL DEPTH** 18.70ft | **START DATE** 11/24/93 | **COMPLETION DATE** 11/24/93 |
| **DRILL MACHINE** CME-550 | **DRILL METHOD** H.S. AUGERS | | **HAMMER TYPE** AUTOMATIC |
| **SURFACE WATER DEPTH** | **DEPTH TO ROCK** N/A | | **Log 290+49LT, Page 1 of 1** |

| ELEV | DEPTH | BLOW CT 6in | BLOW CT 6in | BLOW CT 6in | PEN (ft) | BLOWS PER FOOT (0 25 50 75 100) | SAMPLE NO | MOI | LOG | SOIL AND ROCK DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|
| 2733.40 | 0.00 | 2 | 6 | 15 | 1.0 | Ground Surface | | | | |
| | 2.00 | 6 | 6 | 7 | 1.0 | 21, 13 | 7 | D | | ROADWAY FILL BROWN FILL BROWN SANDY MICACEOUS SILT WITH ROCK FRAGMENTS |
| 2730.00 | 3.50 | 4 | 7 | 4 | 1.0 | 11 | | | | |
| | 6.00 | 2 | 2 | 2 | 1.0 | 4 | | | | |
| | 8.50 | 3 | 4 | 5 | 1.0 | 9 | | D | | ALLUVIUM TAN BROWN FINE SANDY SILT (A-4) |
| 2720.00 | 13.50 | 0 | 0 | 50 | 0.1 | 50 | | | | SOFT WEATHERED ROCK APPEARS AS BROWN MICACEOUS SILT WITH ROCK FRAGMENTS |
| 2714.70 | 18.50 | 0 | 0 | 50 | 0.2 | 50 | | | | |

BORING TERMINATED AT ELEVATION 2714.7 FEET IN SOFT WEATHERED ROCK

# NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
## GEOTECHNICAL UNIT BORING LOG

| | | | |
|---|---|---|---|
| **PROJECT NO** 8.1710902 | **ID** R-2100 | **COUNTY** ASHE | **GEOLOGIST** K. GAY |
| **SITE DESCRIPTION** RETAINING WALL FOR NC16 FROM JEFFERSON TO WILKES CO (RW #10) | | | **GND WATER** |
| **BORING NO** 291+50LT | **NORTHING** 0.00 | **EASTING** 0.00 | **0 HR** N/A |
| **ALIGNMENT** 291+50LT | **BORING LOCATION** 291+50.000 | **OFFSET** 14.80ft LT | **24 HR** N/A |
| **COLLAR ELEV** 2725.70ft | **TOTAL DEPTH** 16.50ft | **START DATE** 11/24/93 | **COMPLETION DATE** 11/24/93 |
| **DRILL MACHINE** CME-550 | **DRILL METHOD** H.S. AUGERS | | **HAMMER TYPE** AUTOMATIC |
| **SURFACE WATER DEPTH** N/A | **DEPTH TO ROCK** N/A | | **Log 291+50LT, Page 1 of 1** |

| ELEV | DEPTH | BLOW CT 6in | BLOW CT 6in | BLOW CT 6in | PEN (ft) | BLOWS PER FOOT (0 25 50 75 100) | SAMPLE NO | MOI | LOG | SOIL AND ROCK DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|
| 2725.70 | 0.00 | 2 | 3 | 3 | 1.0 | Ground Surface | | | | |
| | 2.00 | 30 | 50 | 1 | 0.2 | 6, 50 | | | | ROADWAY FILL BROWN FINE SANDY SILT WITH MICA, ROOTS AND ROCK FRAGMENTS. |
| | 3.50 | 0 | 0 | 50 | 0.5 | 50 | | | | |
| 2720.00 | 6.00 | 6 | 14 | 8 | 1.0 | 22 | | | | |
| | 8.50 | 10 | 5 | 9 | 1.0 | 14 | | | | ALLUVIUM BROWN FINE SANDY MICACEOUS SILT WITH ROOTS AND ROCK FRAGMENTS |
| | 13.50 | 0 | 0 | 50 | 0.5 | 50 | 1 | D | | |
| 2710.00 / 2709.20 | | | | | | | | W | | SOFT WEATHERED ROCK APPEARS AS GRY SILTY SAND WITH ROCK FRAGMENTS |

AUGER REFUSAL AT ELEVATION 2709.2 FEET IN SOFT WEATHERED ROCK

# NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
## GEOTECHNICAL UNIT BORING LOG

| | | | |
|---|---|---|---|
| **PROJECT NO** 8.1710902 | **ID** R-2100 | **COUNTY** ASHE | **GEOLOGIST** K. GAY |
| **SITE DESCRIPTION** RETAINING WALL FOR NC16 FROM JEFFERSON TO WILKES CO (RW #10) | | | **GND WATER** |
| **BORING NO** 292+52LT | **NORTHING** 0.00 | **EASTING** 0.00 | **0 HR** N/A |
| **ALIGNMENT** 292+52LT | **BORING LOCATION** 292+52.000 | **OFFSET** 12.00ft LT | **24 HR** 1.70ft |
| **COLLAR ELEV** 2721.00ft | **TOTAL DEPTH** 15.00ft | **START DATE** 12/01/93 | **COMPLETION DATE** 12/01/93 |
| **DRILL MACHINE** CME-550 | **DRILL METHOD** H.S. AUGERS | | **HAMMER TYPE** AUTOMATIC |
| **SURFACE WATER DEPTH** N/A | **DEPTH TO ROCK** N/A | | **Log 292+52LT, Page 1 of 1** |

| ELEV | DEPTH | BLOW CT 6in | BLOW CT 6in | BLOW CT 6in | PEN (ft) | BLOWS PER FOOT 0 25 50 75 100 | SAMPLE NO | MOI | LOG | SOIL AND ROCK DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|
| 2721.00 | | | | | | Ground Surface | | | | |
| | 6.00 | 2 | 4 | 3 | 1.0 | 7 | | | | ROADWAY FILL BROWN FINE SANDY SILT WITH MICA AND ROCK FRAGMENTS(A-5) |
| | 8.50 | 2 | 2 | 2 | 1.0 | 4 | | | | |
| 2710.00 | | | | | | | | | | |
| | 13.50 | 23 | 50 | 0 | 0.1 | 50 | | W | | |
| 2706.00 | | | | | | AUGER REFUSAL AT ELEVATION 2706.0 FEET IN SOFT WEATHERED ROCK | | | | SOFT WEATHERED ROCK APPEARS AS BROWN SANDY MICACEOUS SILT. |

# NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
## GEOTECHNICAL UNIT BORING LOG

| | | | |
|---|---|---|---|
| **PROJECT NO** 8.1710902 | **ID** R-2100 | **COUNTY** ASHE | **GEOLOGIST** K. GAY |
| **SITE DESCRIPTION** RETAINING WALL FOR NC16 FROM JEFFERSON TO WILKES CO (RW #10) | | | **GND WATER** |
| **BORING NO** 293+57LT | **NORTHING** 0.00 | **EASTING** 0.00 | **0 HR** N/A |
| **ALIGNMENT** 292+57LT | **BORING LOCATION** 293+57.000 | **OFFSET** 13.00ft LT | **24 HR** 5.00ft |
| **COLLAR ELEV** 2715.10ft | **TOTAL DEPTH** 10.50ft | **START DATE** 12/01/93 | **COMPLETION DATE** 12/01/93 |
| **DRILL MACHINE** CME-550 | **DRILL METHOD** CORE BORING | | **HAMMER TYPE** AUTOMATIC |
| **SURFACE WATER DEPTH** N/A | **DEPTH TO ROCK** N/A | | **Log 293+57LT, Page 1 of 1** |

| ELEV | DEPTH | BLOW CT 6in | BLOW CT 6in | BLOW CT 6in | PEN (ft) | BLOWS PER FOOT 0 25 50 75 100 | SAMPLE NO | MOI | LOG | SOIL AND ROCK DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|
| 2715.10 | | | | | | Ground Surface | | | | |
| 2710.00 | | | | | | | 1 | | | ROADWAY FILL BROWN FINE SANDY SILT WITH MICA AND ROCK FRAGMENTS |
| 2704.60 | | | | | | | | | | CRYSTALLINE ROCK REC=98% RQD=93% BIOTITE GNDISS: FRESH HARD BLACK AND WHITE. |
| | | | | | | CORING TERMINATED AT ELEVATION 2704.6 FEET IN CRYSTALLINE ROCK | | | | |

# NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
## GEOTECHNICAL UNIT BORING LOG

| | | | |
|---|---|---|---|
| **PROJECT NO** 34369.1.1 | **ID** R-2100B | **COUNTY** ASHE | **GEOLOGIST** D. CHITTENDEN (F&H) |
| **SITE DESCRIPTION** NC 16 FROM SOUTHEAST OF SR 1158 TO SOUTHEAST OF NC 88 | | | **GND WATER** |
| **BORING NO** 29450L | **NORTHING** 0.00 | **EASTING** 0.00 | **0 HR** N/A |
| **ALIGNMENT** -L- | **BORING LOCATION** 294+50.000 | **OFFSET** 20.00ft LT | **24 HR** N/A |
| **COLLAR ELEV** 2709.70ft | **TOTAL DEPTH** 7.20ft | **START DATE** 8/13/05 | **COMPLETION DATE** 08/13/05 |
| **DRILL MACHINE** CME-45 | **DRILL METHOD** ROTARY W/O MUD | | **HAMMER TYPE** AUTOMATIC |
| **SURFACE WATER DEPTH** N/A | **DEPTH TO ROCK** N/A | | **Log 29450L, Page 1 of 1** |

| ELEV | DEPTH | BLOW CT 6in | BLOW CT 6in | BLOW CT 6in | PEN (ft) | BLOWS PER FOOT 0 25 50 75 100 | SAMPLE NO | ▼ / MOI | LOG | SOIL AND ROCK DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|
| 2709.70 | | | | | | Ground Surface | | | | |
| 2702.50 | 5.00 | 4 | 2 | 6 | 1.0 | 8 | SS-618 | | | EMBANKMENT: SAND, GRAVEL, COBBLES AND BOULDERS |
| | | | | | | TERMINATED BORING IN EMBANKMENT AT ELEVATION 2702.5 FEET. | | | | |

# NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
## GEOTECHNICAL UNIT BORING LOG

| | | | |
|---|---|---|---|
| **PROJECT NO** 34369.1.1 | **ID** R-2100B | **COUNTY** ASHE | **GEOLOGIST** D. CHITTENDEN (F&H) |
| **SITE DESCRIPTION** NC 16 FROM SOUTHEAST OF SR 1158 TO SOUTHEAST OF NC 88 | | | **GND WATER** |
| **BORING NO** 29504L | **NORTHING** 0.00 | **EASTING** 0.00 | **0 HR** N/A |
| **ALIGNMENT** -L- | **BORING LOCATION** 295+04.000 | **OFFSET** 16.00ft LT | **24 HR** N/A |
| **COLLAR ELEV** 2708.00ft | **TOTAL DEPTH** 10.50ft | **START DATE** 8/24/05 | **COMPLETION DATE** 08/24/05 |
| **DRILL MACHINE** CME-45 | **DRILL METHOD** SPT CORE BORING | | **HAMMER TYPE** AUTOMATIC |
| **SURFACE WATER DEPTH** N/A | **DEPTH TO ROCK** 8.20ft | | **Log 29504L, Page 1 of 1** |

| ELEV | DEPTH | BLOW CT 6in | BLOW CT 6in | BLOW CT 6in | PEN (ft) | BLOWS PER FOOT 0 25 50 75 100 | SAMPLE NO | ▼/MOI | LOG | SOIL AND ROCK DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|
| 2708.00 | | | | | | Ground Surface | | | | |
| | 3.00 | 100 | | | 0.0 | 100 | RUN 1<br>RUN 2 | | | EMBANKMENT: SAND, GRAVEL, COBBLES AND BOULDERS |
| 2700.00 | | | | | | | | | | |
| 2697.50 | | | | | | | | | | HARD ROCK |
| | | | | | | TERMINATED BORING IN HARD ROCK AT ELEVATION 2697.5 FEET. | | | | |

# NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
## GEOTECHNICAL UNIT BORING LOG

| | | | |
|---|---|---|---|
| **PROJECT NO** 34369.1.1 | **ID** R-2100B | **COUNTY** ASHE | **GEOLOGIST** D. CHITTENDEN (F&H) |
| **SITE DESCRIPTION** NC 16 FROM SOUTHEAST OF SR 1158 TO SOUTHEAST OF NC 88 | | | **GND WATER** |
| **BORING NO** 29548L | **NORTHING** 0.00 | **EASTING** 0.00 | **0 HR** N/A |
| **ALIGNMENT** -L- | **BORING LOCATION** 295+48.000 | **OFFSET** 16.00ft LT | **24 HR** N/A |
| **COLLAR ELEV** 2705.50ft | **TOTAL DEPTH** 16.00ft | **START DATE** 8/24/05 | **COMPLETION DATE** 08/24/05 |
| **DRILL MACHINE** CME-45 | **DRILL METHOD** SPT CORE BORING | | **HAMMER TYPE** AUTOMATIC |
| **SURFACE WATER DEPTH** N/A | **DEPTH TO ROCK** 12.80ft | | **Log 29548L, Page 1 of 1** |

| ELEV | DEPTH | BLOW CT 6in | BLOW CT 6in | BLOW CT 6in | PEN (ft) | BLOWS PER FOOT 0 25 50 75 100 | SAMPLE NO | ▼/MOI | LOG | SOIL AND ROCK DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|
| 2705.50 | | | | | | Ground Surface | | | | |
| | 2.90 | 100 | | | 0.0 | 100 | RUN 1<br>RUN 2<br>RUN 3 | | | EMBANKMENT: SAND, GRAVEL, COBBLES AND BOULDERS |
| 2700.00 | | | | | | | | | | |
| 2690.00<br>2689.50 | | | | | | | | | | HARD ROCK |
| | | | | | | TERMINATED BORING IN HARD ROCK AT ELEVATION 2689.5 FEET. | | | | |

| STATE | STATE PROJECT REFERENCE NO. | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|
| N.C. | R2100B | 1 | 15 |

# STATE OF NORTH CAROLINA
## DEPARTMENT OF TRANSPORTATION
## DIVISION OF HIGHWAYS
## GEOTECHNICAL ENGINEERING UNIT

# STRUCTURE SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. R2100B F.A. PROJ. STP-16(1)

COUNTY ASHE

PROJECT DESCRIPTION NC 16 FROM SOUTHEAST OF SR 1158 TO SOUTHEAST OF NC 88

SITE DESCRIPTION RETAINING WALL FROM STA. 299+00 TO STA. 302+50 (LEFT) ON NC 16

## CONTENTS


| SHEET | DESCRIPTION |
|---|---|
| 1 | TITLE SHEET |
| 2 | LEGEND |
| 3 - 4 | SITE PLAN |
| 5 | PROFILE |
| 6 - 13 | CROSS SECTION(S) |
| 14 - 15 | BORE LOG & CORE REPORT(S) |


## CAUTION NOTICE

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WERE MADE FOR THE PURPOSE OF STUDY, PLANNING, AND DESIGN, AND NOT FOR CONSTRUCTION OR PAY PURPOSES. THE VARIOUS FIELD BORING LOGS, ROCK CORES, AND SOIL TEST DATA AVAILABLE MAY BE REVIEWED OR INSPECTED IN RALEIGH BY CONTACTING THE N. C. DEPARTMENT OF TRANSPORTATION, GEOTECHNICAL ENGINEERING UNIT AT (919) 250-4088. NEITHER THE SUBSURFACE PLANS AND REPORTS, NOR THE FIELD BORING LOGS, ROCK CORES, OR SOIL TEST DATA ARE PART OF THE CONTRACT.

GENERAL SOIL AND ROCK STRATA DESCRIPTIONS AND INDICATED BOUNDARIES ARE BASED ON A GEOTECHNICAL INTERPRETATION OF ALL AVAILABLE SUBSURFACE DATA AND MAY NOT NECESSARILY REFLECT THE ACTUAL SUBSURFACE CONDITIONS BETWEEN BORINGS OR BETWEEN SAMPLED STRATA WITHIN THE BOREHOLE. THE LABORATORY SAMPLE DATA AND THE IN SITU (IN-PLACE) TEST DATA CAN BE RELIED ON ONLY TO THE DEGREE OF RELIABILITY INHERENT IN THE STANDARD TEST METHOD. THE OBSERVED WATER LEVELS OR SOIL MOISTURE CONDITIONS INDICATED IN THE SUBSURFACE INVESTIGATIONS ARE AS RECORDED AT THE TIME OF THE INVESTIGATION. THESE WATER LEVELS OR SOIL MOISTURE CONDITIONS MAY VARY CONSIDERABLY WITH TIME ACCORDING TO CLIMATIC CONDITIONS INCLUDING TEMPERATURES, PRECIPITATION, AND WIND, AS WELL AS OTHER NON-CLIMATIC FACTORS.

THE BIDDER OR CONTRACTOR IS CAUTIONED THAT DETAILS SHOWN ON THE SUBSURFACE PLANS ARE PRELIMINARY ONLY AND IN MANY CASES THE FINAL DESIGN DETAILS ARE DIFFERENT. FOR BIDDING AND CONSTRUCTION PURPOSES, REFER TO THE CONSTRUCTION PLANS AND DOCUMENTS FOR FINAL DESIGN INFORMATION ON THIS PROJECT. THE DEPARTMENT DOES NOT WARRANT OR GUARANTEE THE SUFFICIENCY OR ACCURACY OF THE INVESTIGATION MADE, NOR THE INTERPRETATIONS MADE, OR OPINION OF THE DEPARTMENT AS TO THE TYPE OF MATERIALS AND CONDITIONS TO BE ENCOUNTERED. THE BIDDER OR CONTRACTOR IS CAUTIONED TO MAKE SUCH INDEPENDENT SUBSURFACE INVESTIGATIONS AS HE DEEMS NECESSARY TO SATISFY HIMSELF AS TO CONDITIONS TO BE ENCOUNTERED ON THIS PROJECT. THE CONTRACTOR SHALL HAVE NO CLAIM FOR ADDITIONAL COMPENSATION OR FOR AN EXTENSION OF TIME FOR ANY REASON RESULTING FROM THE ACTUAL CONDITIONS ENCOUNTERED AT THE SITE DIFFERING FROM THOSE INDICATED IN THE SUBSURFACE INFORMATION.

PERSONNEL

F & R ENGINEERING

INVESTIGATED BY L.L. ACKER

CHECKED BY W.D. FRYE

SUBMITTED BY W.D. FRYE

DATE 6/8/06

NORTH CAROLINA LICENSED SEAL 1007 GEOLOGIST LOUIS L. ACKER

06/08/06

PROJECT: 34369.1.1

ID: R2100B

DRAWN BY: J. T. WILLIAMS

NOTE - THE INFORMATION CONTAINED HEREIN IS NOT IMPLIED OR GUARANTEED BY THE N. C. DEPARTMENT OF TRANSPORTATION AS BEING ACCURATE NOR IT IS CONSIDERED TO BE PART OF THE PLANS, SPECIFICATIONS, OR CONTRACT FOR THE PROJECT.

NOTE - BY HAVING REQUESTED THIS INFORMATION THE CONTRACTOR SPECIFICALLY WAIVES ANY CLAIMS FOR INCREASED COMPENSATION OR EXTENSION OF TIME BASED ON DIFFERENCES BETWEEN THE CONDITIONS INDICATED HEREIN AND THE ACTUAL CONDITIONS AT THE PROJECT SITE.

| PROJECT REFERENCE NO. | SHEET NO. |
|---|---|
| R2100B | 2 |

# NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
## DIVISION OF HIGHWAYS
## GEOTECHNICAL ENGINEERING UNIT

# SUBSURFACE INVESTIGATION

### SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

## SOIL DESCRIPTION

SOIL IS CONSIDERED TO BE THE UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER, AND YIELD LESS THAN 100 BLOWS PER FOOT ACCORDING TO STANDARD PENETRATION TEST (AASHTO T206, ASTM D-1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY SHALL INCLUDE: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. EXAMPLE:

*VERY STIFF, GRAY, SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6*

## SOIL LEGEND AND AASHTO CLASSIFICATION

| GENERAL CLASS. | GRANULAR MATERIALS (≤ 35% PASSING #200) | | | | | | | SILT-CLAY MATERIALS (> 35% PASSING #200) | | | | ORGANIC MATERIALS | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GROUP CLASS. | A-1 | | A-3 | A-2 | | | | A-4 | A-5 | A-6 | A-7 | A-1, A-2 A-3 | A-4, A-5 A-6, A-7 | |
| | A-1-a | A-1-b | | A-2-4 | A-2-5 | A-2-6 | A-2-7 | | | | A-7-5 A-7-6 | | | |
| SYMBOL | | | | | | | | | | | | | | |
| % PASSING # 10 | 50 MX | | | | | | | | | | | GRANULAR SOILS | SILT-CLAY SOILS | MUCK, PEAT |
| # 40 | 30 MX | 50 MX | 51 MN | | | | | | | | | | | |
| # 200 | 15 MX | 25 MX | 10 MX | 35 MX | 35 MX | 35 MX | 35 MX | 36 MN | 36 MN | 36 MN | 36 MN | | | |
| LIQUID LIMIT | 6 MX | | NP | 40 MX | 41 MN | 40 MX | 41 MN | 40 MX | 41 MN | 40 MX | 41 MN | SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER | | HIGHLY ORGANIC SOILS |
| PLASTIC INDEX | | | | 10 MX | 10 MX | 11 MN | 11 MN | 10 MX | 10 MX | 11 MN | 11 MN | | | |
| GROUP INDEX | 0 | | 0 | 0 | | 4 MX | | 8 MX | 12 MX | 16 MX | No MX | | | |
| USUAL TYPES OF MAJOR MATERIALS | STONE FRAGS. GRAVEL, AND SAND | | FINE SAND | SILTY OR CLAYEY GRAVEL AND SAND | | | | SILTY SOILS | | CLAYEY SOILS | | | | |
| GEN. RATING AS A SUBGRADE | EXCELLENT TO GOOD | | | | | | | FAIR TO POOR | | | | FAIR TO POOR | POOR | UNSUITABLE |

PI OF A-7-5 SUBGROUP IS ≤ LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30

## CONSISTENCY OR DENSENESS

| PRIMARY SOIL TYPE | COMPACTNESS OR CONSISTENCY | RANGE OF STANDARD PENETRATION RESISTENCE (N-VALUE) | RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT$^2$) |
|---|---|---|---|
| GENERALLY GRANULAR MATERIAL (NON-COHESIVE) | VERY LOOSE<br>LOOSE<br>MEDIUM DENSE<br>DENSE<br>VERY DENSE | <4<br>4 TO 10<br>10 TO 30<br>30 TO 50<br>>50 | N/A |
| GENERALLY SILT-CLAY MATERIAL (COHESIVE) | VERY SOFT<br>SOFT<br>MEDIUM STIFF<br>STIFF<br>VERY STIFF<br>HARD | <2<br>2 TO 4<br>4 TO 8<br>8 TO 15<br>15 TO 30<br>>30 | <0.25<br>0.25 TO 0.50<br>0.5 TO 1.0<br>1 TO 2<br>2 TO 4<br>>4 |

## TEXTURE OR GRAIN SIZE

| U.S. STD. SIEVE SIZE | 4 | 10 | 40 | 60 | 200 | 270 |
|---|---|---|---|---|---|---|
| OPENING (MM) | 4.76 | 2.00 | 0.42 | 0.25 | 0.075 | 0.053 |

| BOULDER (BLDR.) | COBBLE (COB.) | GRAVEL (GR.) | COARSE SAND (CSE. SD.) | FINE SAND (F SD.) | SILT (SL.) | CLAY (CL.) |
|---|---|---|---|---|---|---|

GRAIN SIZE MM: 305 | 75 | 2.0 | 0.25 | 0.05 | 0.005
GRAIN SIZE IN.: 12 | 3

## SOIL MOISTURE - CORRELATION OF TERMS

| SOIL MOISTURE SCALE (ATTERBERG LIMITS) | FIELD MOISTURE DESCRIPTION | GUIDE FOR FIELD MOISTURE DESCRIPTION |
|---|---|---|
| | - SATURATED - (SAT.) | USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE |
| LL — LIQUID LIMIT<br>PLASTIC RANGE (PI)<br>PL — PLASTIC LIMIT | - WET - (W) | SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE |
| OM — OPTIMUM MOISTURE<br>SL — SHRINKAGE LIMIT | - MOIST - (M) | SOLID; AT OR NEAR OPTIMUM MOISTURE |
| | - DRY - (D) | REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE |

## PLASTICITY

| | PLASTICITY INDEX (PI) | DRY STRENGTH |
|---|---|---|
| NONPLASTIC | 0-5 | VERY LOW |
| LOW PLASTICITY | 6-15 | SLIGHT |
| MED. PLASTICITY | 16-25 | MEDIUM |
| HIGH PLASTICITY | 26 OR MORE | HIGH |

## COLOR

DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY). MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.

## GRADATION

WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE.
UNIFORM - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. (ALSO POORLY GRADED)
GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLES OF TWO OR MORE SIZES.

## ANGULARITY OF GRAINS

THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.

## MINERALOGICAL COMPOSITION

MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE.

## COMPRESSIBILITY

| | |
|---|---|
| SLIGHTLY COMPRESSIBLE | LIQUID LIMIT LESS THAN 31 |
| MODERATELY COMPRESSIBLE | LIQUID LIMIT EQUAL TO 31-50 |
| HIGHLY COMPRESSIBLE | LIQUID LIMIT GREATER THAN 50 |

## PERCENTAGE OF MATERIAL

| ORGANIC MATERIAL | GRANULAR SOILS | SILT - CLAY SOILS |
|---|---|---|
| TRACE OF ORGANIC MATTER | 2 - 3% | 3 - 5% |
| LITTLE ORGANIC MATTER | 3 - 5% | 5 - 12% |
| MODERATELY ORGANIC | 5 - 10% | 12 - 20% |
| HIGHLY ORGANIC | >10% | >20% |

| OTHER MATERIAL | |
|---|---|
| TRACE | 1 - 10% |
| LITTLE | 10 - 20% |
| SOME | 20 - 35% |
| HIGHLY | 35% AND ABOVE |

## GROUND WATER

- WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING
- STATIC WATER LEVEL AFTER 24 HOURS
- PW PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA
- SPRING OR SEEP

## MISCELLANEOUS SYMBOLS

- ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION
- SOIL SYMBOL
- ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT
- INFERRED SOIL BOUNDARY
- INFERRED ROCK LINE
- ALLUVIAL SOIL BOUNDARY
- 25/025 DIP & DIP DIRECTION OF ROCK STRUCTURES
- SOUNDING ROD
- SPT CPT DPT DMT VST PMT TEST BORING
- AUGER BORING
- CORE BORING
- MW MONITORING WELL
- PIEZOMETER INSTALLATION
- SLOPE INDICATOR INSTALLATION
- SPT N-VALUE
- REF SPT REFUSAL

SAMPLE DESIGNATIONS
S - BULK SAMPLE
SS - SPLIT SPOON SAMPLE
ST - SHELBY TUBE SAMPLE
RS - ROCK SAMPLE
RT - RECOMPACTED TRIAXIAL SAMPLE
CBR - CALIFORNIA BEARING RATIO SAMPLE

## ABBREVIATIONS

AR - AUGER REFUSAL
BT - BORING TERMINATED
CL. - CLAY
CPT - CONE PENETRATION TEST
CSE. - COARSE
DMT - DILATOMETER TEST
DPT - DYNAMIC PENETRATION TEST
e - VOID RATIO
F - FINE
FOSS. - FOSSILIFEROUS
FRAC. - FRACTURED, FRACTURES
FRAGS. - FRAGMENTS
HI. - HIGHLY
MED. - MEDIUM
MICA. - MICACEOUS
MOD. - MODERATELY
NP - NON PLASTIC
ORG. - ORGANIC
PMT - PRESSUREMETER TEST
SAP. - SAPROLITIC
SD. - SAND, SANDY
SL. - SILT, SILTY
SLI. - SLIGHTLY
TCR - TRICONE REFUSAL
$w$ - MOISTURE CONTENT
V - VERY
VST - VANE SHEAR TEST
WEA. - WEATHERED
$\gamma$ - UNIT WEIGHT
$\gamma_d$ - DRY UNIT WEIGHT

## EQUIPMENT USED ON SUBJECT PROJECT

DRILL UNITS:
- [ ] MOBILE B-___
- [ ] BK-51
- [ ] CME-45C
- [X] CME-550
- [ ] PORTABLE HOIST
- [ ] _____
- [ ] _____

ADVANCING TOOLS:
- [ ] CLAY BITS
- [ ] 6" CONTINUOUS FLIGHT AUGER
- [X] 8" HOLLOW AUGERS
- [ ] HARD FACED FINGER BITS
- [ ] TUNG.-CARBIDE INSERTS
- [X] CASING [X] W/ ADVANCER
- [ ] TRICONE ____" STEEL TEETH
- [ ] TRICONE ____" TUNG.-CARB.
- [ ] CORE BIT
- [ ] _____

HAMMER TYPE:
- [X] AUTOMATIC
- [ ] MANUAL

CORE SIZE:
- [ ] -B_____
- [X] -N_____
- [ ] -H_____

HAND TOOLS:
- [ ] POST HOLE DIGGER
- [ ] HAND AUGER
- [ ] SOUNDING ROD
- [ ] VANE SHEAR TEST
- [ ] _____

## ROCK DESCRIPTION

HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT IF TESTED, WOULD YIELD SPT REFUSAL. AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS. IN NON-COASTAL PLAIN MATERIAL, THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK.
ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:

| | |
|---|---|
| WEATHERED ROCK (WR) | NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100 BLOWS PER FOOT IF TESTED. |
| CRYSTALLINE ROCK (CR) | FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC. |
| NON-CRYSTALLINE ROCK (NCR) | FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN SEDIMENTARY ROCK THAT WOULD YEILD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC. |
| COASTAL PLAIN SEDIMENTARY ROCK (CP) | COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC. |

## WEATHERING

| | |
|---|---|
| FRESH | ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER HAMMER IF CRYSTALLINE. |
| VERY SLIGHT (V SLI.) | ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN, CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF OF A CRYSTALLINE NATURE. |
| SLIGHT (SLI.) | ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS. |
| MODERATE (MOD.) | SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED WITH FRESH ROCK. |
| MODERATELY SEVERE (MOD. SEV.) | ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES "CLUNK" SOUND WHEN STRUCK. *IF TESTED, WOULD YIELD SPT REFUSAL* |
| SEVERE (SEV.) | ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. *IF TESTED, YIELDS SPT N VALUES > 100 BPF* |
| VERY SEVERE (V SEV.) | ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT THE MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE SUCH THAT ONLY MINOR VESTIGES OF THE ORIGINAL ROCK FABRIC REMAIN. *IF TESTED, YIELDS SPT N VALUES < 100 BPF* |
| COMPLETE | ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE. |

## ROCK HARDNESS

| | |
|---|---|
| VERY HARD | CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK. |
| HARD | CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN. |
| MODERATELY HARD | CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS. |
| MEDIUM HARD | CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PEICES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK. |
| SOFT | CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE. |
| VERY SOFT | CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNAIL. |

## FRACTURE SPACING

| TERM | SPACING |
|---|---|
| VERY WIDE | MORE THAN 10 FEET |
| WIDE | 3 TO 10 FEET |
| MODERATELY CLOSE | 1 TO 3 FEET |
| CLOSE | 0.16 TO 1 FEET |
| VERY CLOSE | LESS THAN 0.16 FEET |

## BEDDING

| TERM | THICKNESS |
|---|---|
| VERY THICKLY BEDDED | > 4 FEET |
| THICKLY BEDDED | 1.5 - 4 FEET |
| THINLY BEDDED | 0.16 - 1.5 FEET |
| VERY THINLY BEDDED | 0.03 - 0.16 FEET |
| THICKLY LAMINATED | 0.008 - 0.03 FEET |
| THINLY LAMINATED | < 0.008 FEET |

## INDURATION

FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF THE MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.

| | |
|---|---|
| FRIABLE | RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE. |
| MODERATELY INDURATED | GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER. |
| INDURATED | GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER. |
| EXTREMELY INDURATED | SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS. |

## TERMS AND DEFINITIONS

ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER.

AQUIFER - A WATER BEARING FORMATION OR STRATA.

ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND.

ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, AS SHALE, SLATE, ETC.

ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE.

CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.

COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE.

CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.

DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK.

DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL.

DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.

FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.

FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.

FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM PARENT MATERIAL.

FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.

FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD.

JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.

LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT.

LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.

MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.

PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM.

RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.

ROCK QUALITY DESIGNATION (RQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.

SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK.

SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS.

SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE.

STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N OR BPF) OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS.

STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.

STRATA ROCK QUALITY DESIGNATION (SRQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.

TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.

BENCH MARK: BM #3 - BL- 61+98.54, 75.30 LT

ELEVATION: 2688.62 FT.

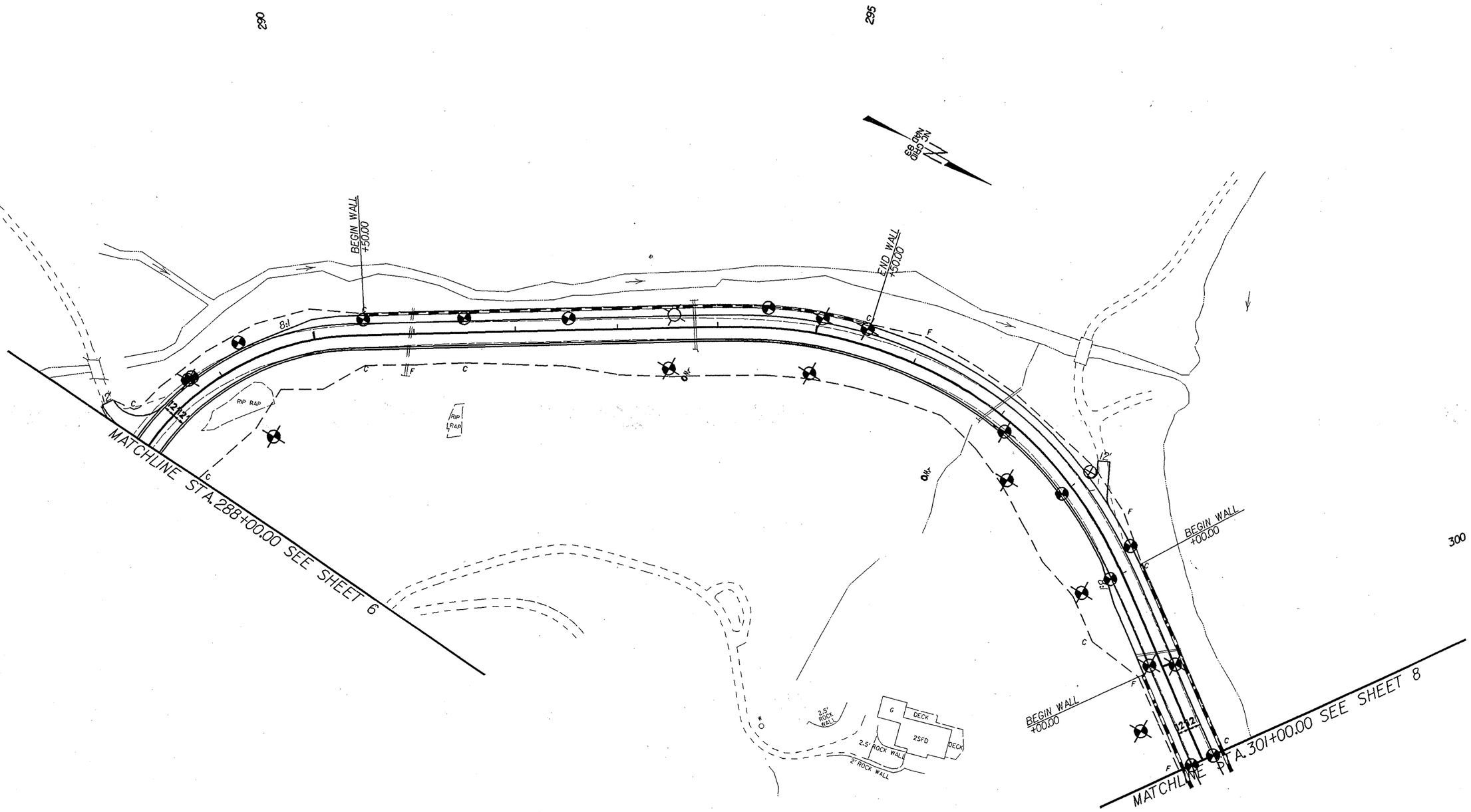
NOTES: FOR RETAINING WALL STA. 299+00 TO 302+50 LT

Earth Tech
A Tyco International Ltd. Company

| PROJECT REFERENCE NO. | SHEET NO. |
|---|---|
| R-2100B | 3 |
| R/W SHEET NO. | |
| ROADWAY DESIGN ENGINEER | HYDRAULICS ENGINEER |

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION



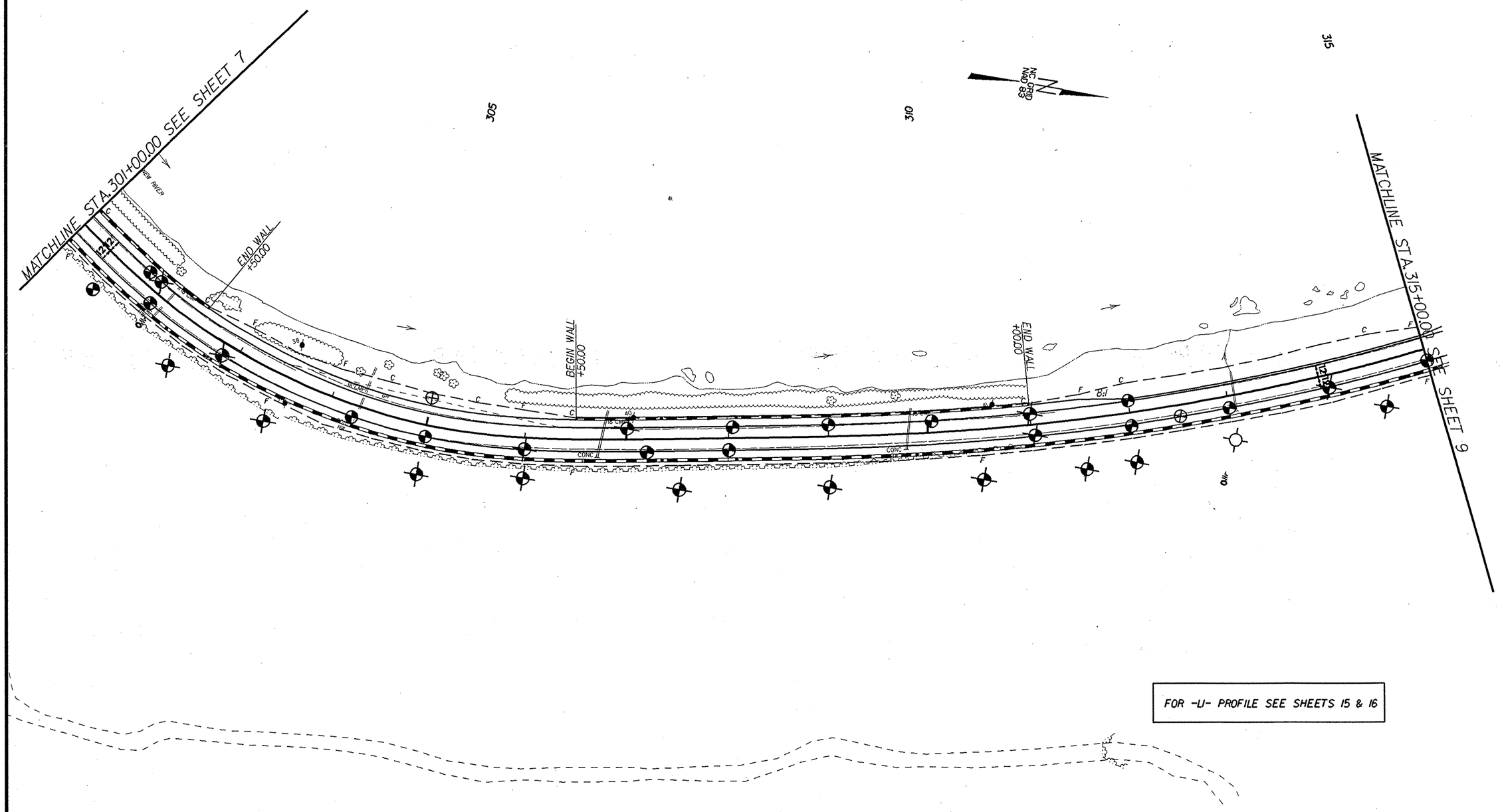

FOR -L1- PROFILE SEE SHEET 15

EarthTech
A Tyco International Ltd. Company

| PROJECT REFERENCE NO. | SHEET NO. |
|---|---|
| R-2100B | 4 |
| R/W SHEET NO. | |
| ROADWAY DESIGN ENGINEER | HYDRAULICS ENGINEER |

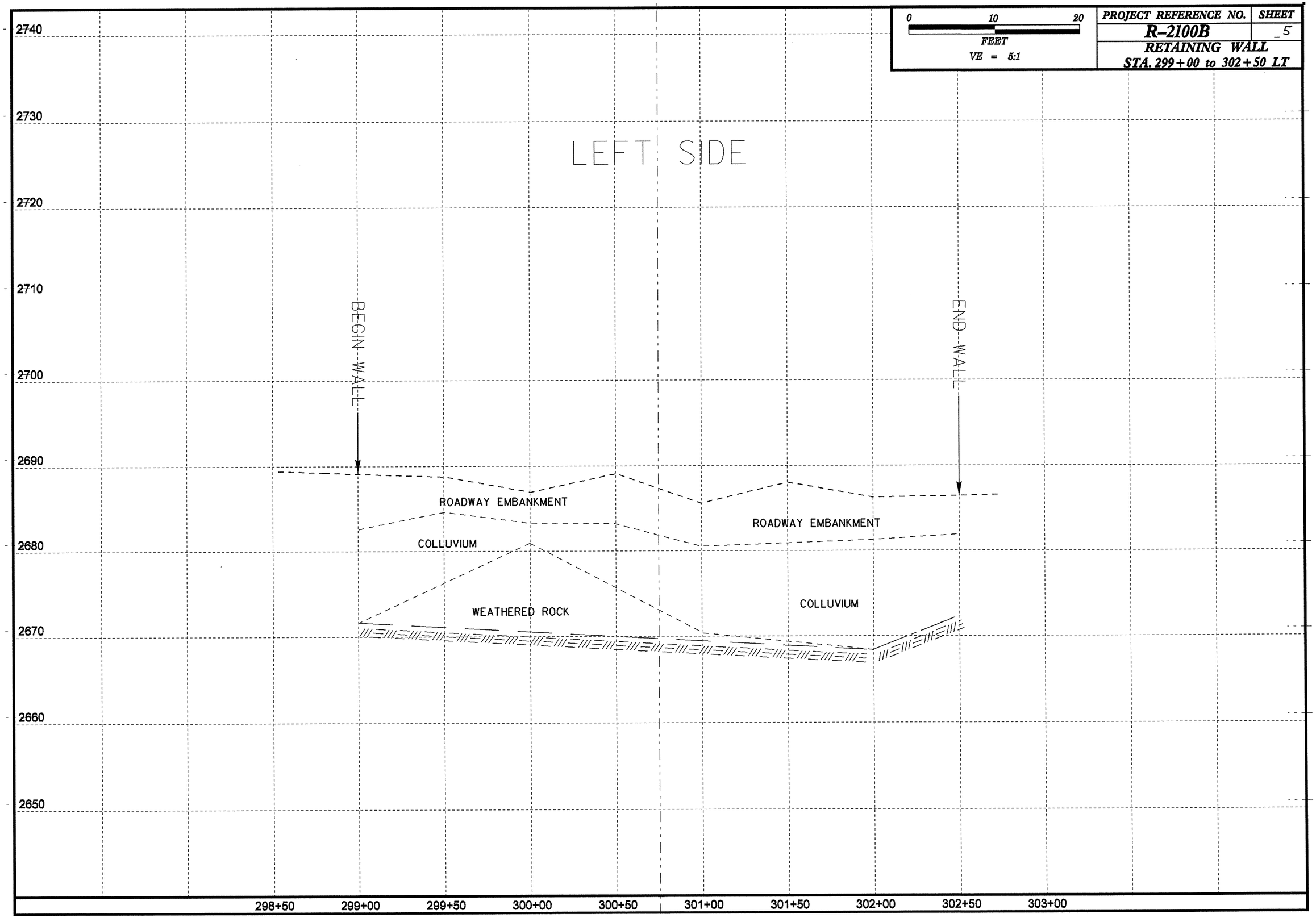
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

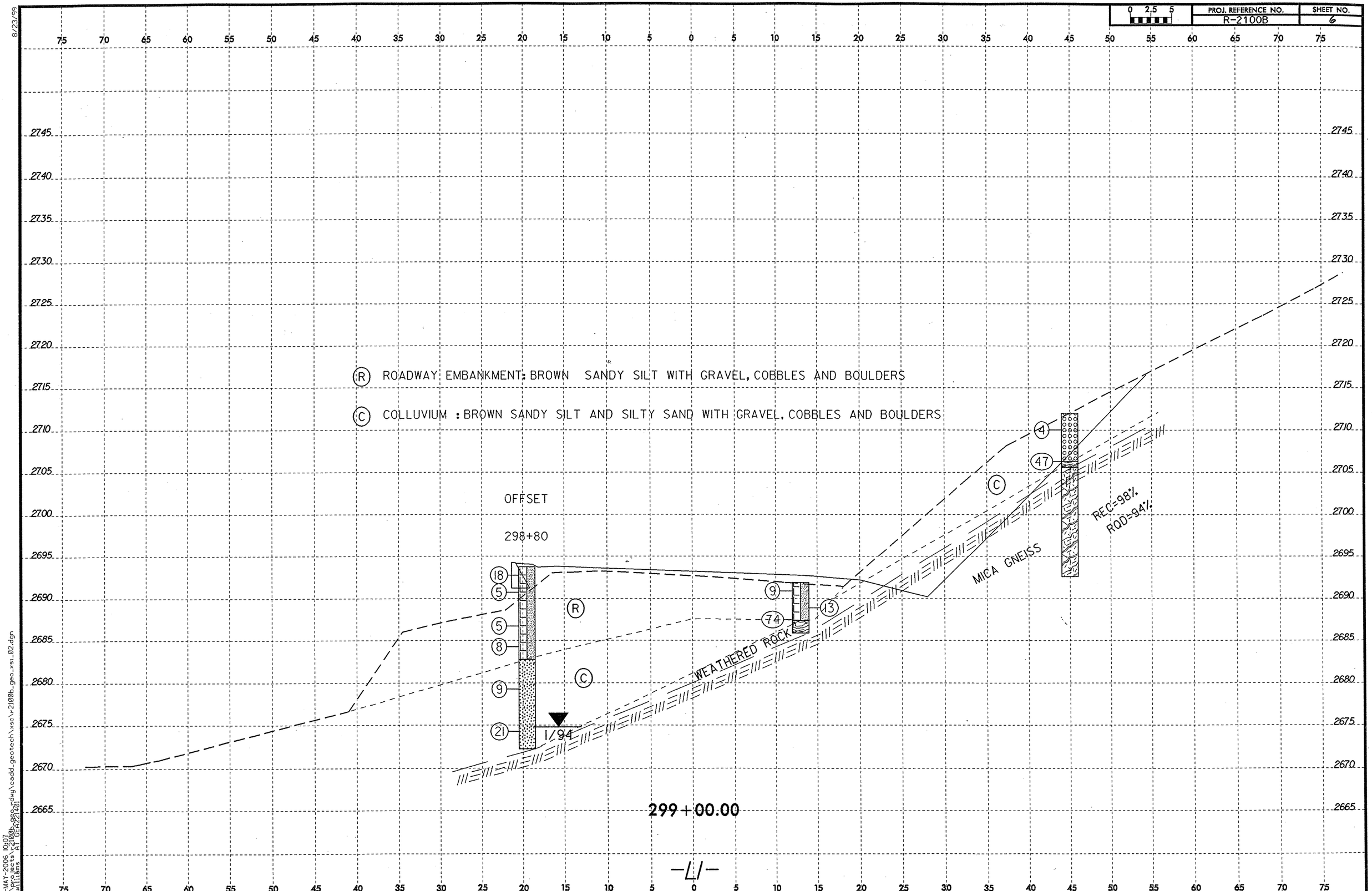
INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION




FOR -L1- PROFILE SEE SHEETS 15 & 16

| PROJECT REFERENCE NO. | SHEET |
|---|---|
| R-2100B | 5 |
| RETAINING WALL | |
| STA. 299+00 to 302+50 LT | |



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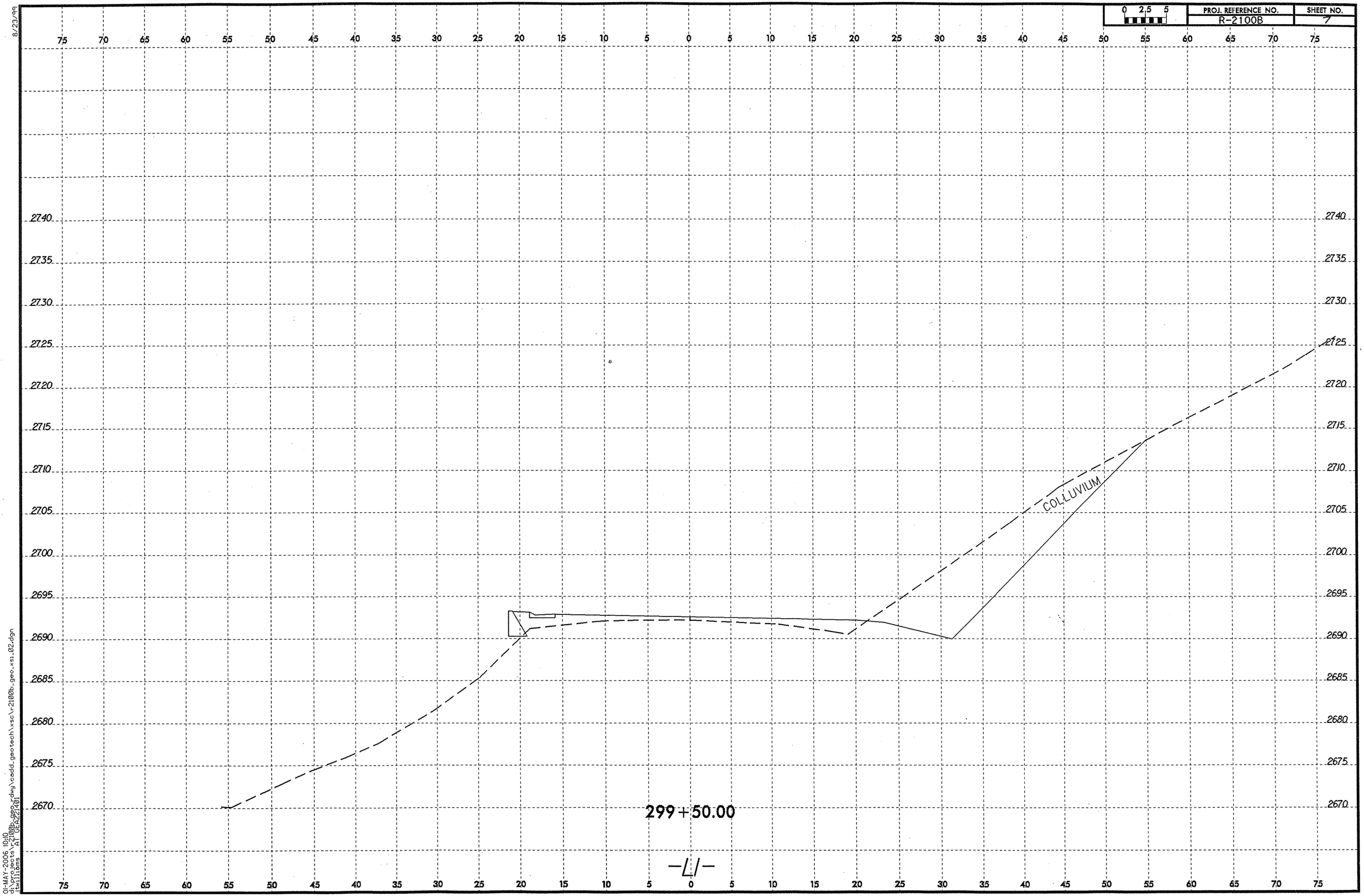


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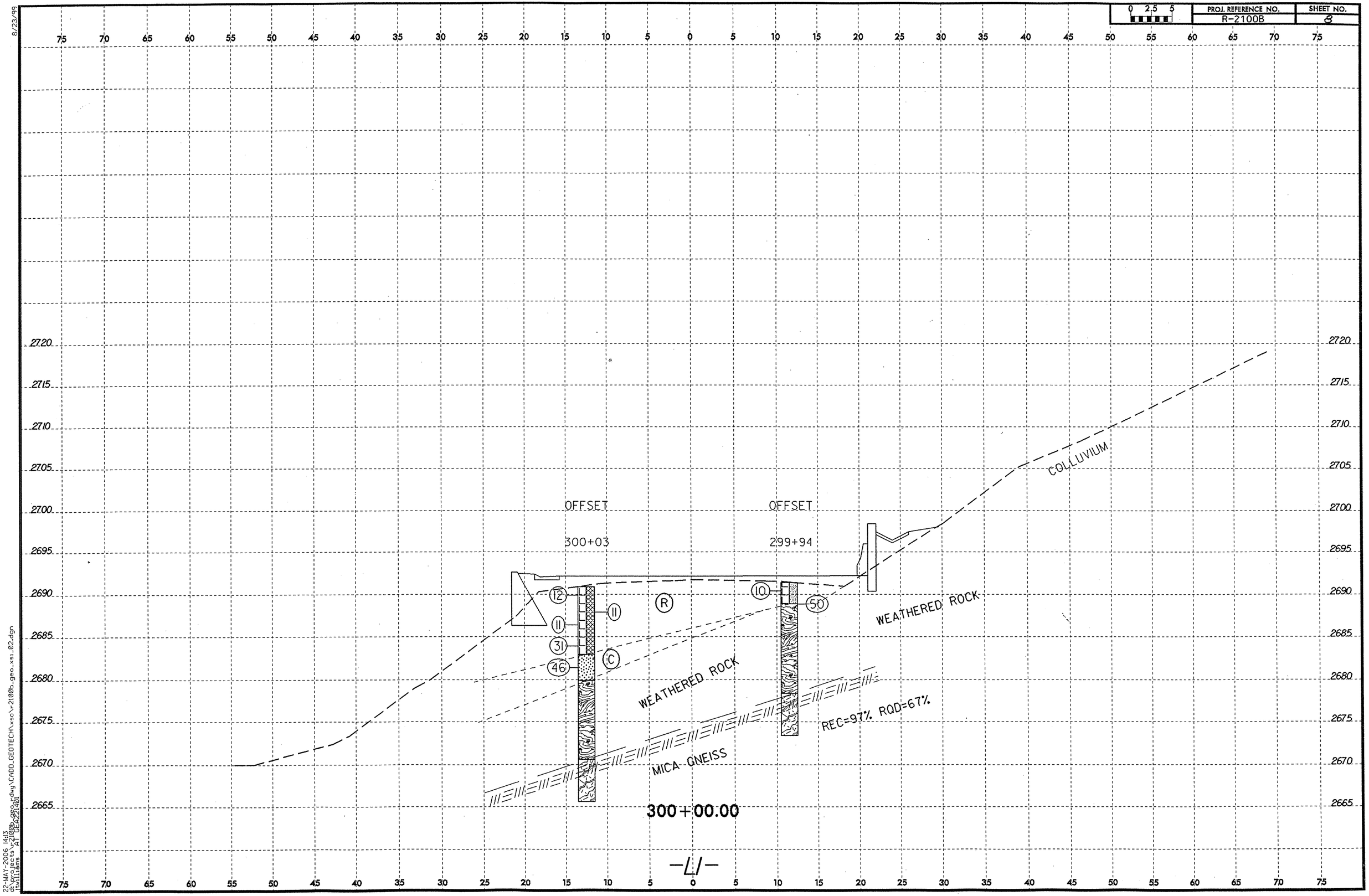
jtwilliams AT GEA221401

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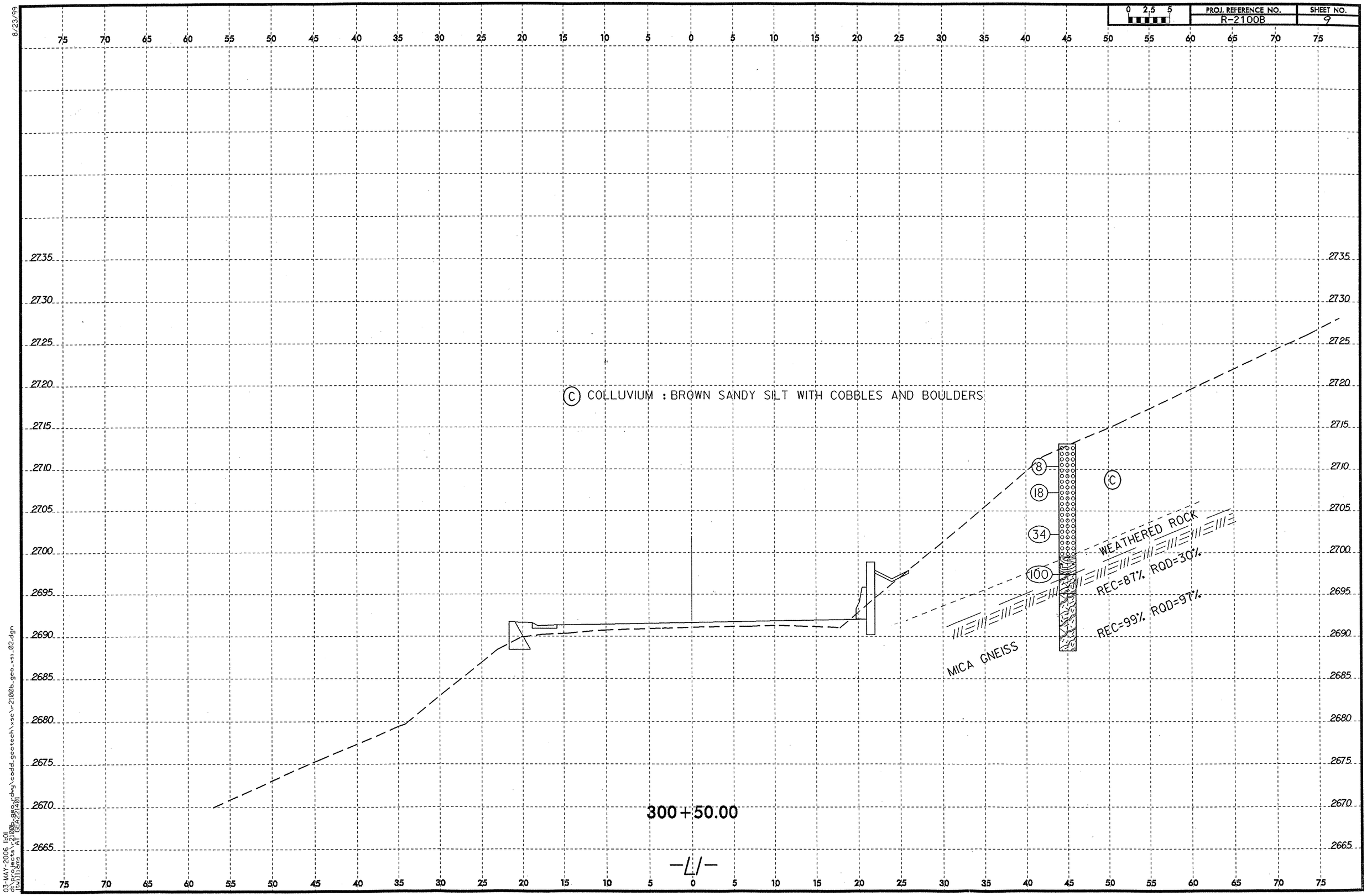

0 2.5 5
PROJ. REFERENCE NO.
R-2100B
SHEET NO.
9
8/23/99
75 70 65 60 55 50 45 40 35 30 25 20 15 10 5 0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75
2735
2730
2725
2720
2715
2710
2705
2700
2695
2690
2685
2680
2675
2670
2665
C COLLUVIUM : BROWN SANDY SILT WITH COBBLES AND BOULDERS
8
18
34
100
C
WEATHERED ROCK
REC=87% RQD=30%
REC=99% RQD=97%
MICA GNEISS
300+50.00
-L/-
03-MAY-2006 11:01
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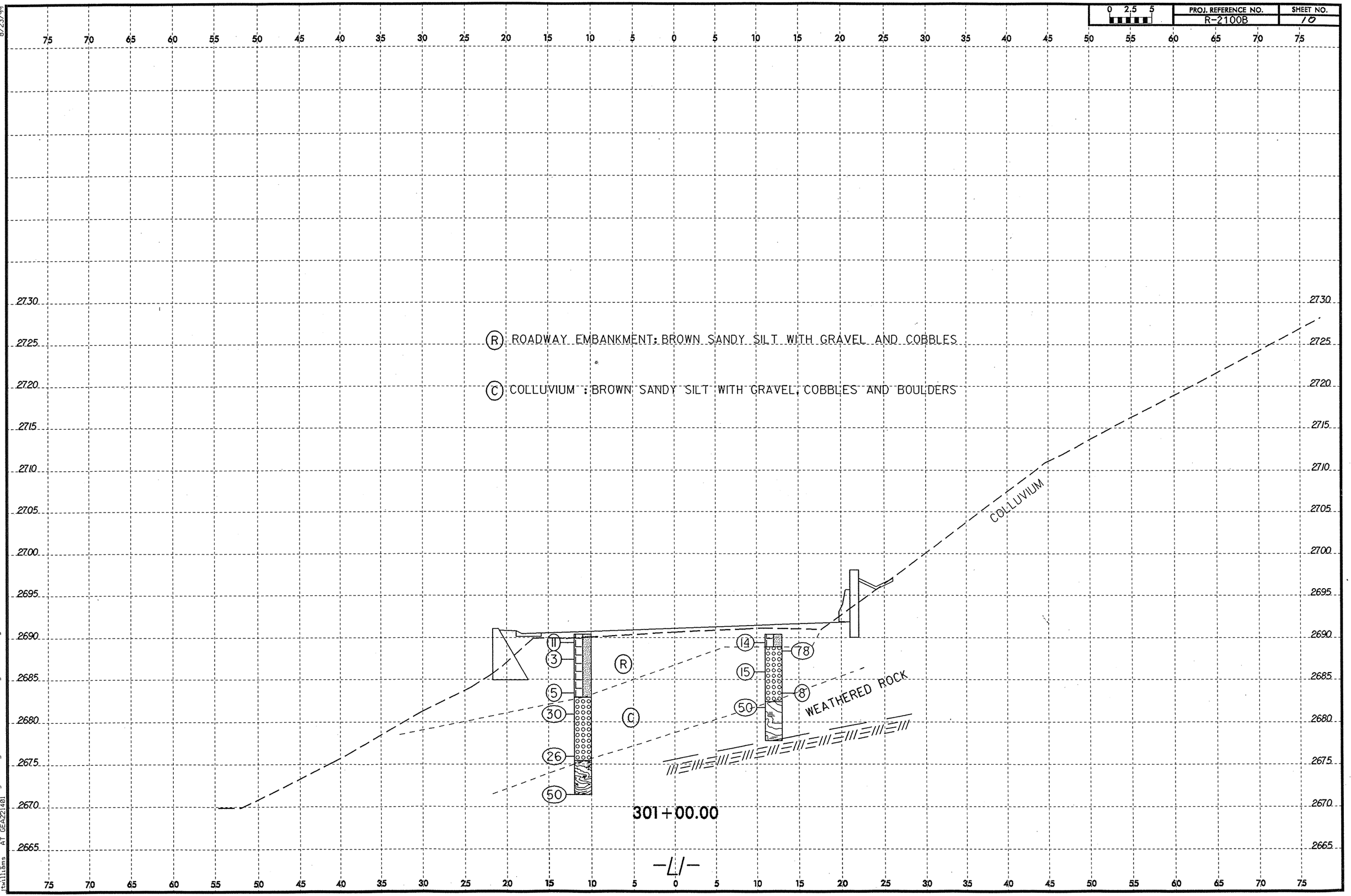
jtwilliams AT GEA221401

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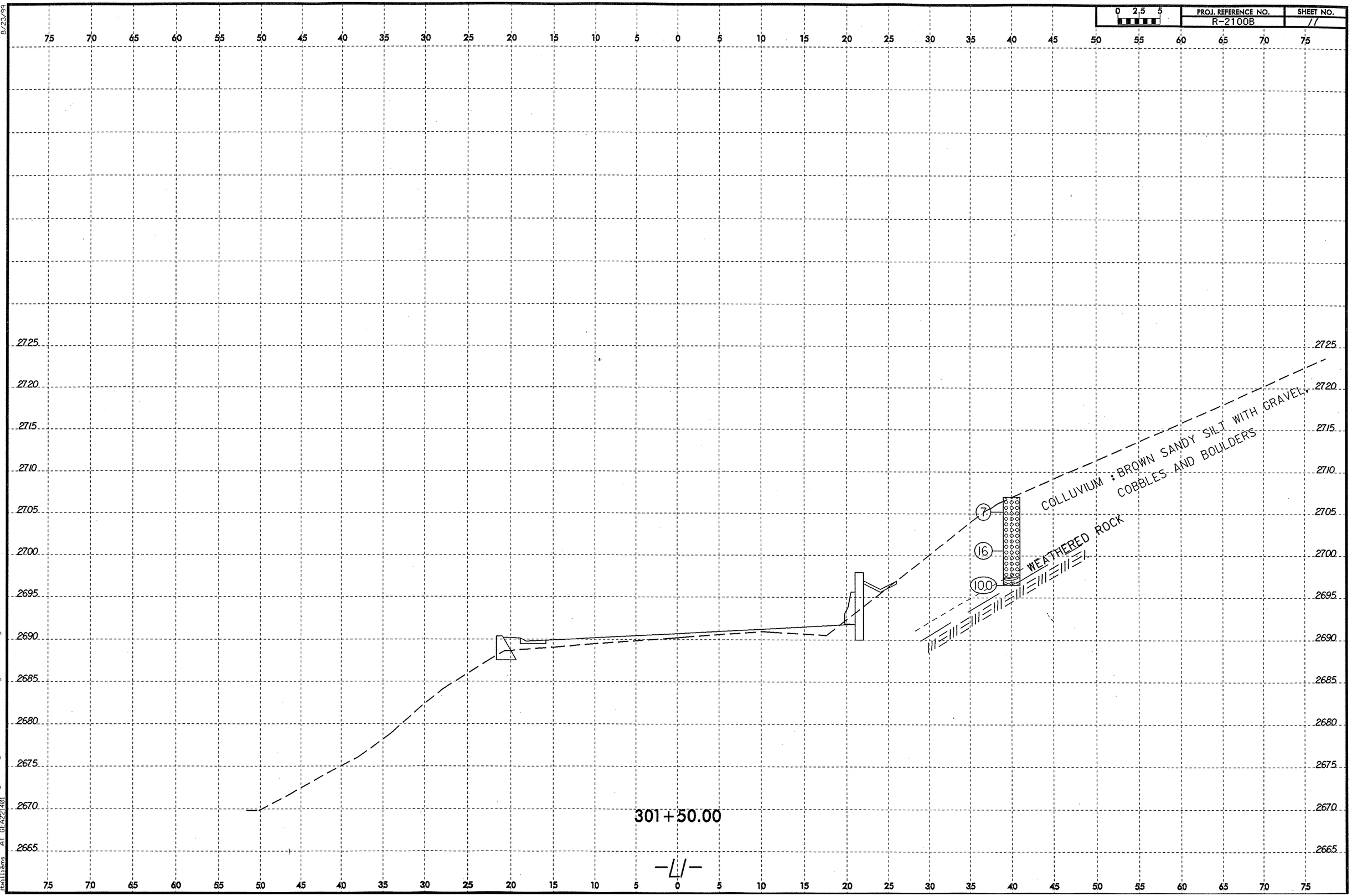


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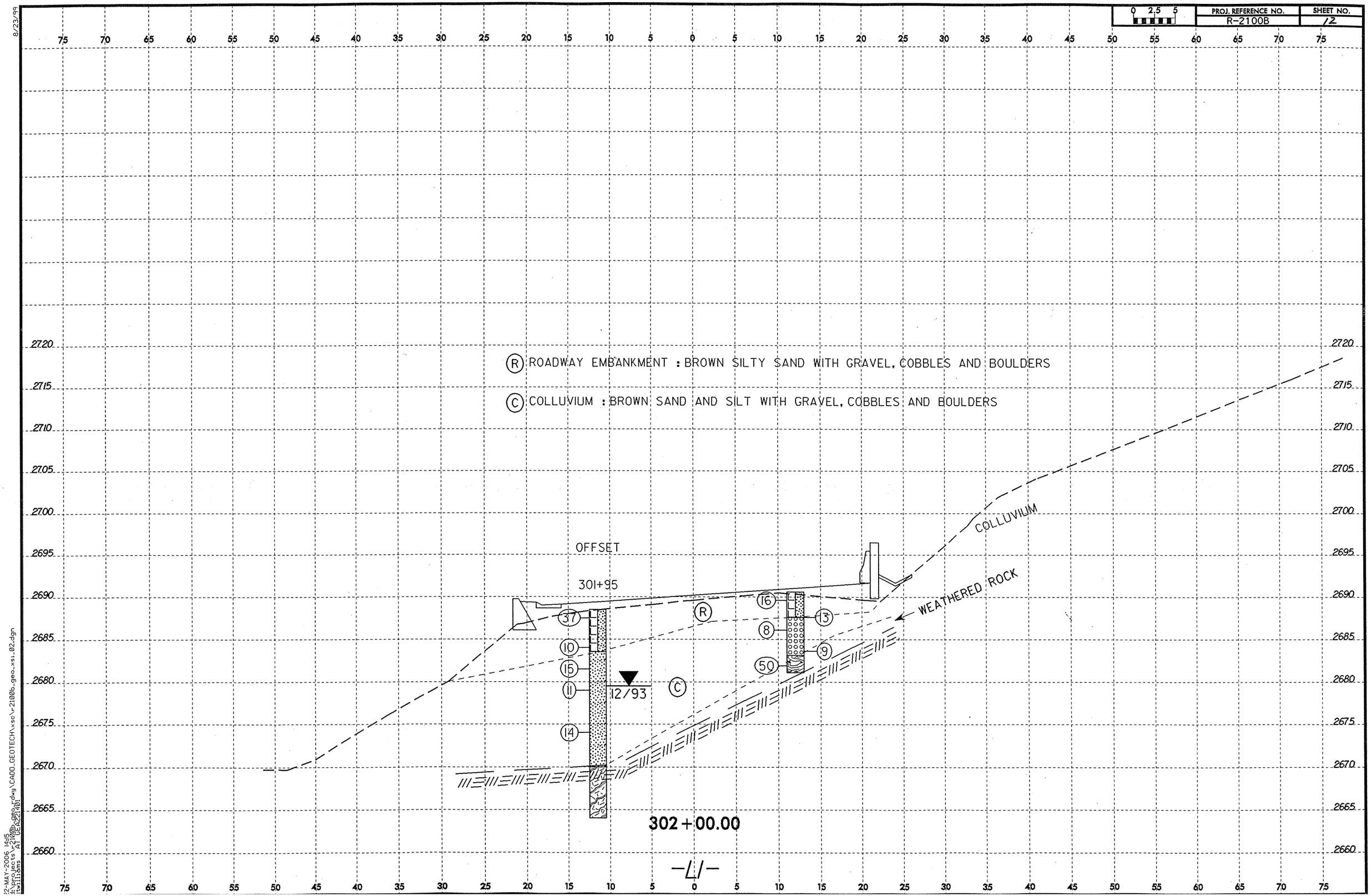
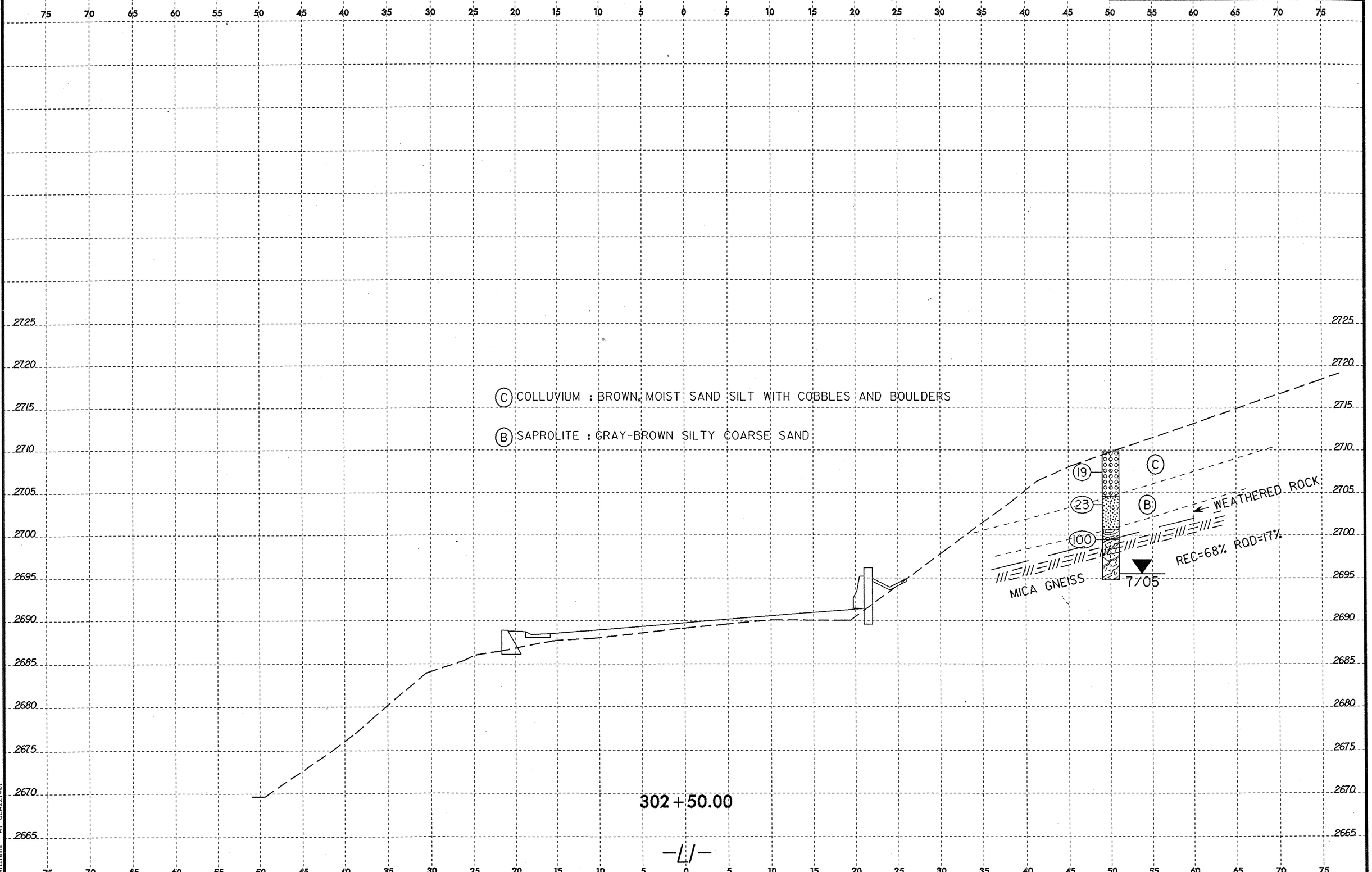
jtwilliams AT GEA221401



PROJ. REFERENCE NO.
R-2100B
SHEET NO.
12
0 2.5 5
8/23/99
R ROADWAY EMBANKMENT : BROWN SILTY SAND WITH GRAVEL, COBBLES AND BOULDERS
C COLLUVIUM : BROWN SAND AND SILT WITH GRAVEL, COBBLES AND BOULDERS
OFFSET
301+95
COLLUVIUM
WEATHERED ROCK
37
10
15
11
14
12/93
16
13
8
9
50
302+00.00
-L1-
2720
2715
2710
2705
2700
2695
2690
2685
2680
2675
2670
2665
2660



0 2.5 5
PROJ. REFERENCE NO.
R-2100B
SHEET NO.
13
8/23/99
(C) COLLUVIUM : BROWN, MOIST SAND SILT WITH COBBLES AND BOULDERS
(B) SAPROLITE : GRAY-BROWN SILTY COARSE SAND
19
23
100
C
B
WEATHERED ROCK
REC=68% RQD=17%
MICA GNEISS
7/05
302+50.00
-L1-
03-MAY-2006 12:15
d:\projects\r2100b_geo_rdwy\cadd_geotech\xsc\r2100b_geo_xsi_02.dgn
jtwilliams AT GEA221401

# NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
## GEOTECHNICAL UNIT BORING LOG

| | | | |
|---|---|---|---|
| **PROJECT NO** 8.1710902 | **ID** R-2100 | **COUNTY** ASHE | **GEOLOGIST** K. GAY |
| **SITE DESCRIPTION** RETAINING WALL FOR NC16 FROM JEFFERSON TO WILKES CO (RW #12) | | | **GND WATER** |
| **BORING NO** 298+80LT | **NORTHING** 0.00 | **EASTING** 0.00 | **0 HR** N/A |
| **ALIGNMENT** 298+80LT | **BORING LOCATION** 298+80.000 | **OFFSET** 19.50ft LT | **24 HR** 19.00ft |
| **COLLAR ELEV** 2693.50ft | **TOTAL DEPTH** 21.50ft | **START DATE** 12/02/93 | **COMPLETION DATE** 12/02/93 |
| **DRILL MACHINE** CME-45C | **DRILL METHOD** H.S. AUGERS | | **HAMMER TYPE** AUTOMATIC |
| **SURFACE WATER DEPTH** N/A | **DEPTH TO ROCK** N/A | | **Log 298+80LT, Page 1 of 1** |

| ELEV | DEPTH | BLOW CT 6in | 6in | 6in | PEN (ft) | BLOWS PER FOOT 0 25 50 75 100 | SAMPLE NO | MOI | LOG | SOIL AND ROCK DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|
| 2693.50 | 0.00 | 2 | 4 | 14 | 1.0 | Ground Surface | | | | |
| | 2.00 | 2 | 2 | 3 | 1.0 | 5 18 | | D | | ROADWAY FILL BROWN FINE SANDY SILT WITH ROOTS AND MICA (A-4) |
| 2690.00 | | | | | | | | | | |
| | 6.00 | 2 | 1 | 4 | 1.0 | 5 | | | | |
| | 8.50 | 2 | 4 | 4 | 1.0 | 8 | | | | |
| 2680.00 | 13.50 | 3 | 4 | 5 | 1.0 | 9 | | | | COLLUVIUM LIGHT BROWN SILTY FINE SAND WITH ROOTS (A-2-4) |
| | 18.50 | 36 | 14 | 7 | 1.0 | 21 | | ▼ | | |
| 2672.00 | | | | | | AUGER REFUSAL AT ELEVATION 2672.0 ON CRYSTALLINE ROCK | | | | |

# NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
## GEOTECHNICAL UNIT BORING LOG

| | | | |
|---|---|---|---|
| **PROJECT NO** 8.1710902 | **ID** R-2100 | **COUNTY** ASHE | **GEOLOGIST** K. GAY |
| **SITE DESCRIPTION** RETAINING WALL FOR NC16 FROM JEFFERSON TO WILKES CO (RW #12) | | | **GND WATER** |
| **BORING NO** 300+03LT | **NORTHING** 0.00 | **EASTING** 0.00 | **0 HR** N/A |
| **ALIGNMENT** 300+03LT | **BORING LOCATION** 300+03.000 | **OFFSET** 12.50ft LT | **24 HR** N/A |
| **COLLAR ELEV** 2693.60ft | **TOTAL DEPTH** 25.30ft | **START DATE** 12/08/93 | **COMPLETION DATE** 12/08/93 |
| **DRILL MACHINE** CME-550 | **DRILL METHOD** CORE BORING | | **HAMMER TYPE** AUTOMATIC |
| **SURFACE WATER DEPTH** | **DEPTH TO ROCK** N/A | | **Log 300+03LT, Page 1 of 1** |

| ELEV | DEPTH | BLOW CT 6in | 6in | 6in | PEN (ft) | BLOWS PER FOOT 0 25 50 75 100 | SAMPLE NO | MOI | LOG | SOIL AND ROCK DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|
| 2693.60 | 0.00 | 2 | 5 | 7 | 1.0 | Ground Surface | | | | |
| | 2.00 | 3 | 6 | 5 | 1.0 | 12 11 | | | | ROADWAY FILL BROWN FINE SANDY MICACEOUS SILT WITH ROCK FRAGMENTS. |
| 2690.00 | 3.50 | 6 | 4 | 7 | 1.0 | 11 | | | | |
| | 6.00 | 1 | 25 | 6 | 1.0 | 31 | | | | |
| | 8.50 | 6 | 19 | 27 | 1.0 | 46 | | | | COLLUVIUM BROWN SILTY SAND WITH PEEBLES AND MICA (A-2-4) |
| 2680.00 | | | | | | | 1 | | | SOFT WEATHERED ROCK APPEARS AS LIGHT BROWN SILTY SAND WITH MICA AND ROCK FRAGMENTS. |
| | | | | | | | 2 | | | WEATHERED ROCK REC=32.5% RQD=25% |
| | | | | | | | 3 | | | WEATHERED ROCK REC=12% RQD 0% |
| 2670.00 | | | | | | | | | | CRYSTALLINE ROCK REC=32.5% RQD=25% BIOTITE GNEISS: FRESH TO SLIGHTLY WEATHERED HARD GRAY WHITE ORANGE STAINS. |
| 2668.30 | | | | | | CORING TERMINATED AT ELEVATION 2668.3 IN GNEISS. | | D | | |

# NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
## GEOTECHNICAL UNIT BORING LOG

| | | | |
|---|---|---|---|
| PROJECT NO 8.1710902 | ID R-2100 | COUNTY ASHE | GEOLOGIST K. GAY |
| SITE DESCRIPTION RETAINING WALL FOR NC16 FROM JEFFERSON TO WILKES CO (RW #12) | | | GND WATER |
| BORING NO 301+00LT | NORTHING 0.00 | EASTING 0.00 | 0 HR N/A |
| ALIGNMENT 308+00LT | BORING LOCATION 301+00.000 | OFFSET 11.00ft LT | 24 HR N/A |
| COLLAR ELEV 2693.40ft | TOTAL DEPTH 19.00ft | START DATE 12/08/93 | COMPLETION DATE 12/08/93 |
| DRILL MACHINE CME-550 | DRILL METHOD H.S. AUGERS | | HAMMER TYPE AUTOMATIC |
| SURFACE WATER DEPTH | DEPTH TO ROCK N/A | | Log 301+00LT, Page 1 of 1 |

| ELEV | DEPTH | BLOW CT 6in | BLOW CT 6in | BLOW CT 6in | PEN (ft) | BLOWS PER FOOT 0 25 50 75 100 | SAMPLE NO | MOI | LOG | SOIL AND ROCK DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|
| 2693.40 | 0.00 | 12 | 6 | 5 | 1.0 | Ground Surface | | | | |
| 2690.00 | 2.00 | 4 | 2 | 1 | 1.0 | 3 11 | | D | | ROADWAY FILL BROWN FINE SANDY SILT WITH MICA AND ROCK FRAGMENTS. (A-4) |
| | 6.00 | 5 | 3 | 2 | 1.0 | 5 | | | | |
| | 8.50 | 16 | 12 | 18 | 1.0 | 30 | | W | | COLLUVIUM BROWN SILTY SAND WITH ROCK FRAGMENTS AND ROCK STRUCTURES |
| 2680.00 | 13.50 | 12 | 13 | 13 | 1.0 | 26 | | | | |
| 2674.40 | 18.50 | 0 | 0 | 50 | 0.5 | 50 | | M | | SOFT WEATHERED ROCK APPEARS AS TAN VERY FINE SANDY CLAYEY SILT |

BORING TERMINATED AT ELEVATION 2673.4 IN SOFT WEATHERED ROCK



# NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
## GEOTECHNICAL UNIT BORING LOG

| | | | |
|---|---|---|---|
| PROJECT NO 8.1710902 | ID R-2100 | COUNTY ASHE | GEOLOGIST K. GAY |
| SITE DESCRIPTION RETAINING WALL FOR NC16 FROM JEFFERSON TO WILKES CO (RW #12) | | | GND WATER |
| BORING NO 301+80LT | NORTHING 0.00 | EASTING 0.00 | 0 HR 14.00ft |
| ALIGNMENT 301+80LT | BORING LOCATION 301+80.000 | OFFSET 11.50ft LT | 24 HR 14.00ft |
| COLLAR ELEV 2691.40ft | TOTAL DEPTH 18.10ft | START DATE 12/08/93 | COMPLETION DATE 12/08/93 |
| DRILL MACHINE CME-550 | DRILL METHOD H.S. AUGERS | | HAMMER TYPE AUTOMATIC |
| SURFACE WATER DEPTH N/A | DEPTH TO ROCK N/A | | Log 301+80LT, Page 1 of 1 |

| ELEV | DEPTH | BLOW CT 6in | BLOW CT 6in | BLOW CT 6in | PEN (ft) | BLOWS PER FOOT 0 25 50 75 100 | SAMPLE NO | MOI | LOG | SOIL AND ROCK DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|
| 2691.40 | 0.00 | 3 | 5 | 6 | 1.0 | Ground Surface | | | | |
| 2690.00 | 2.00 | 2 | 1 | 3 | 1.0 | 4 11 | | D | | ROADWAY FILL BROWN SILTY SAND WITH MICA AND ROCK FRAGMENTS.(A-2-4) |
| | 3.50 | 1 | 2 | 3 | 1.0 | 5 | | | | |
| | 6.00 | 4 | 4 | 8 | 1.0 | 12 | | | | TAN/BROWN FINE SANDY SILT WITH MICA AND ROCK FRAGMENTS (A-4) |
| | 8.50 | 8 | 8 | 9 | 1.0 | 17 | | | | |
| 2680.00 | 13.50 | 7 | 12 | 7 | 1.0 | 19 | | ▼ | | |
| 2673.30 | | | | | | | | W | | |

AUGER REFUSAL AT ELEVATION 2673.3 AT CRYSTALLINE ROCK

| STATE | STATE PROJECT REFERENCE NO. | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|
| N.C. | R2100B | 1 | 17 |

# STATE OF NORTH CAROLINA
## DEPARTMENT OF TRANSPORTATION
## DIVISION OF HIGHWAYS
## GEOTECHNICAL ENGINEERING UNIT

# STRUCTURE SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. R2100B F.A. PROJ. STP-16(1)

COUNTY ASHE

PROJECT DESCRIPTION NC 16 FROM SOUTHEAST OF SR 1158 TO SOUTHEAST OF NC 88

SITE DESCRIPTION RETAINING WALL FROM STA. 306+50 TO STA. 311+00 (LEFT) ON NC 16

## CONTENTS


| SHEET | DESCRIPTION |
|---|---|
| 1 | TITLE SHEET |
| 2 | LEGEND |
| 3 | SITE PLAN |
| 4 | PROFILE |
| 5 - 14 | CROSS SECTION(S) |
| 15 - 17 | BORE LOG & CORE REPORT(S) |


## CAUTION NOTICE

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WERE MADE FOR THE PURPOSE OF STUDY, PLANNING, AND DESIGN, AND NOT FOR CONSTRUCTION OR PAY PURPOSES. THE VARIOUS FIELD BORING LOGS, ROCK CORES, AND SOIL TEST DATA AVAILABLE MAY BE REVIEWED OR INSPECTED IN RALEIGH BY CONTACTING THE N. C. DEPARTMENT OF TRANSPORTATION, GEOTECHNICAL ENGINEERING UNIT AT (919) 250-4088. NEITHER THE SUBSURFACE PLANS AND REPORTS, NOR THE FIELD BORING LOGS, ROCK CORES, OR SOIL TEST DATA ARE PART OF THE CONTRACT.

GENERAL SOIL AND ROCK STRATA DESCRIPTIONS AND INDICATED BOUNDARIES ARE BASED ON A GEOTECHNICAL INTERPRETATION OF ALL AVAILABLE SUBSURFACE DATA AND MAY NOT NECESSARILY REFLECT THE ACTUAL SUBSURFACE CONDITIONS BETWEEN BORINGS OR BETWEEN SAMPLED STRATA WITHIN THE BOREHOLE. THE LABORATORY SAMPLE DATA AND THE IN SITU (IN-PLACE) TEST DATA CAN BE RELIED ON ONLY TO THE DEGREE OF RELIABILITY INHERENT IN THE STANDARD TEST METHOD. THE OBSERVED WATER LEVELS OR SOIL MOISTURE CONDITIONS INDICATED IN THE SUBSURFACE INVESTIGATIONS ARE AS RECORDED AT THE TIME OF THE INVESTIGATION. THESE WATER LEVELS OR SOIL MOISTURE CONDITIONS MAY VARY CONSIDERABLY WITH TIME ACCORDING TO CLIMATIC CONDITIONS INCLUDING TEMPERATURES, PRECIPITATION, AND WIND, AS WELL AS OTHER NON-CLIMATIC FACTORS.

THE BIDDER OR CONTRACTOR IS CAUTIONED THAT DETAILS SHOWN ON THE SUBSURFACE PLANS ARE PRELIMINARY ONLY AND IN MANY CASES THE FINAL DESIGN DETAILS ARE DIFFERENT. FOR BIDDING AND CONSTRUCTION PURPOSES, REFER TO THE CONSTRUCTION PLANS AND DOCUMENTS FOR FINAL DESIGN INFORMATION ON THIS PROJECT. THE DEPARTMENT DOES NOT WARRANT OR GUARANTEE THE SUFFICIENCY OR ACCURACY OF THE INVESTIGATION MADE, NOR THE INTERPRETATIONS MADE, OR OPINION OF THE DEPARTMENT AS TO THE TYPE OF MATERIALS AND CONDITIONS TO BE ENCOUNTERED. THE BIDDER OR CONTRACTOR IS CAUTIONED TO MAKE SUCH INDEPENDENT SUBSURFACE INVESTIGATIONS AS HE DEEMS NECESSARY TO SATISFY HIMSELF AS TO CONDITIONS TO BE ENCOUNTERED ON THIS PROJECT. THE CONTRACTOR SHALL HAVE NO CLAIM FOR ADDITIONAL COMPENSATION OR FOR AN EXTENSION OF TIME FOR ANY REASON RESULTING FROM THE ACTUAL CONDITIONS ENCOUNTERED AT THE SITE DIFFERING FROM THOSE INDICATED IN THE SUBSURFACE INFORMATION.

PERSONNEL

F & R ENGINEERING

INVESTIGATED BY L.L. ACKER

CHECKED BY W.D. FRYE

SUBMITTED BY W.D. FRYE

DATE 6/8/06

NORTH CAROLINA LICENSED SEAL 1007 GEOLOGIST LOUIS L. ACKER

06/08/06

DRAWN BY: J. T. WILLIAMS

NOTE - THE INFORMATION CONTAINED HEREIN IS NOT IMPLIED OR GUARANTEED BY THE N. C. DEPARTMENT OF TRANSPORTATION AS BEING ACCURATE NOR IT IS CONSIDERED TO BE PART OF THE PLANS, SPECIFICATIONS, OR CONTRACT FOR THE PROJECT.

NOTE - BY HAVING REQUESTED THIS INFORMATION THE CONTRACTOR SPECIFICALLY WAIVES ANY CLAIMS FOR INCREASED COMPENSATION OR EXTENSION OF TIME BASED ON DIFFERENCES BETWEEN THE CONDITIONS INDICATED HEREIN AND THE ACTUAL CONDITIONS AT THE PROJECT SITE.

PROJECT: 34369.1.1

ID: R2100B

| PROJECT REFERENCE NO. | SHEET NO. |
|---|---|
| R2100B | 2 |

# NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
## DIVISION OF HIGHWAYS
## GEOTECHNICAL ENGINEERING UNIT

# SUBSURFACE INVESTIGATION

### SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

## SOIL DESCRIPTION

SOIL IS CONSIDERED TO BE THE UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER, AND YIELD LESS THAN 100 BLOWS PER FOOT ACCORDING TO STANDARD PENETRATION TEST (AASHTO T206, ASTM D-1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY SHALL INCLUDE: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. EXAMPLE:

*VERY STIFF, GRAY, SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6*

## SOIL LEGEND AND AASHTO CLASSIFICATION

| GENERAL CLASS. | GRANULAR MATERIALS (≤ 35% PASSING #200) | | | | | | | SILT-CLAY MATERIALS (> 35% PASSING #200) | | | | ORGANIC MATERIALS | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GROUP CLASS. | A-1 | | A-3 | A-2 | | | | A-4 | A-5 | A-6 | A-7 | A-1, A-2 A-3 | A-4, A-5 A-6, A-7 | |
| | A-1-a | A-1-b | | A-2-4 | A-2-5 | A-2-6 | A-2-7 | | | | A-7-5 A-7-6 | | | |
| SYMBOL | | | | | | | | | | | | | | |
| % PASSING # 10 | 50 MX | | | | | | | | | | | GRANULAR SOILS | SILT-CLAY SOILS | MUCK, PEAT |
| # 40 | 30 MX | 50 MX | 51 MN | | | | | | | | | | | |
| # 200 | 15 MX | 25 MX | 10 MX | 35 MX | 35 MX | 35 MX | 35 MX | 36 MN | 36 MN | 36 MN | 36 MN | | | |
| LIQUID LIMIT | 6 MX | | NP | 40 MX | 41 MN | 40 MX | 41 MN | 40 MX | 41 MN | 40 MX | 41 MN | SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER | | HIGHLY ORGANIC SOILS |
| PLASTIC INDEX | | | | 10 MX | 10 MX | 11 MN | 11 MN | 10 MX | 10 MX | 11 MN | 11 MN | | | |
| GROUP INDEX | 0 | | 0 | 0 | | 4 MX | | 8 MX | 12 MX | 16 MX | No MX | | | |
| USUAL TYPES OF MAJOR MATERIALS | STONE FRAGS. GRAVEL, AND SAND | | FINE SAND | SILTY OR CLAYEY GRAVEL AND SAND | | | | SILTY SOILS | | CLAYEY SOILS | | | | |
| GEN. RATING AS A SUBGRADE | EXCELLENT TO GOOD | | | | | | | FAIR TO POOR | | | | FAIR TO POOR | POOR | UNSUITABLE |

PI OF A-7-5 SUBGROUP IS ≤ LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30

## CONSISTENCY OR DENSENESS

| PRIMARY SOIL TYPE | COMPACTNESS OR CONSISTENCY | RANGE OF STANDARD PENETRATION RESISTENCE (N-VALUE) | RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT$^2$) |
|---|---|---|---|
| GENERALLY GRANULAR MATERIAL (NON-COHESIVE) | VERY LOOSE<br>LOOSE<br>MEDIUM DENSE<br>DENSE<br>VERY DENSE | <4<br>4 TO 10<br>10 TO 30<br>30 TO 50<br>>50 | N/A |
| GENERALLY SILT-CLAY MATERIAL (COHESIVE) | VERY SOFT<br>SOFT<br>MEDIUM STIFF<br>STIFF<br>VERY STIFF<br>HARD | <2<br>2 TO 4<br>4 TO 8<br>8 TO 15<br>15 TO 30<br>>30 | <0.25<br>0.25 TO 0.50<br>0.5 TO 1.0<br>1 TO 2<br>2 TO 4<br>>4 |

## TEXTURE OR GRAIN SIZE

| U.S. STD. SIEVE SIZE | 4 | 10 | 40 | 60 | 200 | 270 |
|---|---|---|---|---|---|---|
| OPENING (MM) | 4.76 | 2.00 | 0.42 | 0.25 | 0.075 | 0.053 |

| BOULDER (BLDR.) | COBBLE (COB.) | GRAVEL (GR.) | COARSE SAND (CSE. SD.) | FINE SAND (F SD.) | SILT (SL.) | CLAY (CL.) |
|---|---|---|---|---|---|---|

GRAIN SIZE MM: 305 | 75 | 2.0 | 0.25 | 0.05 | 0.005
GRAIN SIZE IN.: 12 | 3

## SOIL MOISTURE - CORRELATION OF TERMS

| SOIL MOISTURE SCALE (ATTERBERG LIMITS) | FIELD MOISTURE DESCRIPTION | GUIDE FOR FIELD MOISTURE DESCRIPTION |
|---|---|---|
| | - SATURATED - (SAT.) | USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE |
| LL - LIQUID LIMIT | | |
| PLASTIC RANGE (PI) | - WET - (W) | SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE |
| PL - PLASTIC LIMIT | | |
| OM - OPTIMUM MOISTURE | - MOIST - (M) | SOLID; AT OR NEAR OPTIMUM MOISTURE |
| SL - SHRINKAGE LIMIT | | |
| | - DRY - (D) | REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE |

## PLASTICITY

| | PLASTICITY INDEX (PI) | DRY STRENGTH |
|---|---|---|
| NONPLASTIC | 0-5 | VERY LOW |
| LOW PLASTICITY | 6-15 | SLIGHT |
| MED. PLASTICITY | 16-25 | MEDIUM |
| HIGH PLASTICITY | 26 OR MORE | HIGH |

## COLOR

DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY). MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.

## GRADATION

WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE.
UNIFORM - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. (ALSO POORLY GRADED)
GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLES OF TWO OR MORE SIZES.

## ANGULARITY OF GRAINS

THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.

## MINERALOGICAL COMPOSITION

MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE.

## COMPRESSIBILITY

| | |
|---|---|
| SLIGHTLY COMPRESSIBLE | LIQUID LIMIT LESS THAN 31 |
| MODERATELY COMPRESSIBLE | LIQUID LIMIT EQUAL TO 31-50 |
| HIGHLY COMPRESSIBLE | LIQUID LIMIT GREATER THAN 50 |

## PERCENTAGE OF MATERIAL

| ORGANIC MATERIAL | GRANULAR SOILS | SILT - CLAY SOILS |
|---|---|---|
| TRACE OF ORGANIC MATTER | 2 - 3% | 3 - 5% |
| LITTLE ORGANIC MATTER | 3 - 5% | 5 - 12% |
| MODERATELY ORGANIC | 5 - 10% | 12 - 20% |
| HIGHLY ORGANIC | >10% | >20% |

| OTHER MATERIAL | |
|---|---|
| TRACE | 1 - 10% |
| LITTLE | 10 - 20% |
| SOME | 20 - 35% |
| HIGHLY | 35% AND ABOVE |

## GROUND WATER

- WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING
- STATIC WATER LEVEL AFTER 24 HOURS
- PW PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA
- SPRING OR SEEP

## MISCELLANEOUS SYMBOLS

- ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION
- SOIL SYMBOL
- ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT
- INFERRED SOIL BOUNDARY
- INFERRED ROCK LINE
- ALLUVIAL SOIL BOUNDARY
- 25/025 DIP & DIP DIRECTION OF ROCK STRUCTURES
- SOUNDING ROD
- SPT CPT DPT DMT VST PMT TEST BORING
- AUGER BORING
- CORE BORING
- MW MONITORING WELL
- PIEZOMETER INSTALLATION
- SLOPE INDICATOR INSTALLATION
- SPT N-VALUE
- REF SPT REFUSAL

SAMPLE DESIGNATIONS
- S - BULK SAMPLE
- SS - SPLIT SPOON SAMPLE
- ST - SHELBY TUBE SAMPLE
- RS - ROCK SAMPLE
- RT - RECOMPACTED TRIAXIAL SAMPLE
- CBR - CALIFORNIA BEARING RATIO SAMPLE

## ABBREVIATIONS

AR - AUGER REFUSAL
BT - BORING TERMINATED
CL. - CLAY
CPT - CONE PENETRATION TEST
CSE. - COARSE
DMT - DILATOMETER TEST
DPT - DYNAMIC PENETRATION TEST
e - VOID RATIO
F - FINE
FOSS. - FOSSILIFEROUS
FRAC. - FRACTURED, FRACTURES
FRAGS. - FRAGMENTS
HI. - HIGHLY
MED. - MEDIUM
MICA. - MICACEOUS
MOD. - MODERATELY
NP - NON PLASTIC
ORG. - ORGANIC
PMT - PRESSUREMETER TEST
SAP. - SAPROLITIC
SD. - SAND, SANDY
SL. - SILT, SILTY
SLI. - SLIGHTLY
TCR - TRICONE REFUSAL
w - MOISTURE CONTENT
V - VERY
VST - VANE SHEAR TEST
WEA. - WEATHERED
$\gamma$ - UNIT WEIGHT
$\gamma_d$ - DRY UNIT WEIGHT

## EQUIPMENT USED ON SUBJECT PROJECT

DRILL UNITS:
- [ ] MOBILE B-___
- [ ] BK-51
- [ ] CME-45C
- [X] CME-550
- [ ] PORTABLE HOIST
- [ ] _____
- [ ] _____

ADVANCING TOOLS:
- [ ] CLAY BITS
- [ ] 6" CONTINUOUS FLIGHT AUGER
- [X] 8" HOLLOW AUGERS
- [ ] HARD FACED FINGER BITS
- [ ] TUNG.-CARBIDE INSERTS
- [X] CASING [X] W/ ADVANCER
- [ ] TRICONE ____" STEEL TEETH
- [ ] TRICONE ____" TUNG.-CARB.
- [X] CORE BIT
- [ ] _____

HAMMER TYPE:
- [X] AUTOMATIC
- [ ] MANUAL

CORE SIZE:
- [ ] -B_____
- [X] -N_____
- [ ] -H_____

HAND TOOLS:
- [ ] POST HOLE DIGGER
- [ ] HAND AUGER
- [ ] SOUNDING ROD
- [ ] VANE SHEAR TEST
- [ ] _____

## ROCK DESCRIPTION

HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT IF TESTED, WOULD YIELD SPT REFUSAL. AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS. IN NON-COASTAL PLAIN MATERIAL, THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK.
ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:

| | |
|---|---|
| WEATHERED ROCK (WR) | NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100 BLOWS PER FOOT IF TESTED. |
| CRYSTALLINE ROCK (CR) | FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC. |
| NON-CRYSTALLINE ROCK (NCR) | FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN SEDIMENTARY ROCK THAT WOULD YEILD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC. |
| COASTAL PLAIN SEDIMENTARY ROCK (CP) | COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC. |

## WEATHERING

| | |
|---|---|
| FRESH | ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER HAMMER IF CRYSTALLINE. |
| VERY SLIGHT (V SLI.) | ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN, CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF OF A CRYSTALLINE NATURE. |
| SLIGHT (SLI.) | ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS. |
| MODERATE (MOD.) | SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED WITH FRESH ROCK. |
| MODERATELY SEVERE (MOD. SEV.) | ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES "CLUNK" SOUND WHEN STRUCK. *IF TESTED, WOULD YIELD SPT REFUSAL* |
| SEVERE (SEV.) | ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. *IF TESTED, YIELDS SPT N VALUES > 100 BPF* |
| VERY SEVERE (V SEV.) | ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT THE MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE SUCH THAT ONLY MINOR VESTIGES OF THE ORIGINAL ROCK FABRIC REMAIN. *IF TESTED, YIELDS SPT N VALUES < 100 BPF* |
| COMPLETE | ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE. |

## ROCK HARDNESS

| | |
|---|---|
| VERY HARD | CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK. |
| HARD | CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN. |
| MODERATELY HARD | CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS. |
| MEDIUM HARD | CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PEICES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK. |
| SOFT | CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE. |
| VERY SOFT | CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNAIL. |

## FRACTURE SPACING

| TERM | SPACING |
|---|---|
| VERY WIDE | MORE THAN 10 FEET |
| WIDE | 3 TO 10 FEET |
| MODERATELY CLOSE | 1 TO 3 FEET |
| CLOSE | 0.16 TO 1 FEET |
| VERY CLOSE | LESS THAN 0.16 FEET |

## BEDDING

| TERM | THICKNESS |
|---|---|
| VERY THICKLY BEDDED | > 4 FEET |
| THICKLY BEDDED | 1.5 - 4 FEET |
| THINLY BEDDED | 0.16 - 1.5 FEET |
| VERY THINLY BEDDED | 0.03 - 0.16 FEET |
| THICKLY LAMINATED | 0.008 - 0.03 FEET |
| THINLY LAMINATED | < 0.008 FEET |

## INDURATION

FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF THE MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.

| | |
|---|---|
| FRIABLE | RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE. |
| MODERATELY INDURATED | GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER. |
| INDURATED | GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER. |
| EXTREMELY INDURATED | SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS. |

## TERMS AND DEFINITIONS

ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER.

AQUIFER - A WATER BEARING FORMATION OR STRATA.

ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND.

ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, AS SHALE, SLATE, ETC.

ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE.

CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.

COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE.

CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.

DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK.

DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL.

DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.

FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.

FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.

FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM PARENT MATERIAL.

FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.

FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD.

JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.

LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT.

LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.

MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.

PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM.

RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.

ROCK QUALITY DESIGNATION (RQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.

SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK.

SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS.

SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE.

STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N OR BPF) OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS.

STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.

STRATA ROCK QUALITY DESIGNATION (SRQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.

TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.

BENCH MARK: BM #3 - BL- 61+98.54, 75.30 LT

ELEVATION: 2688.62 FT.

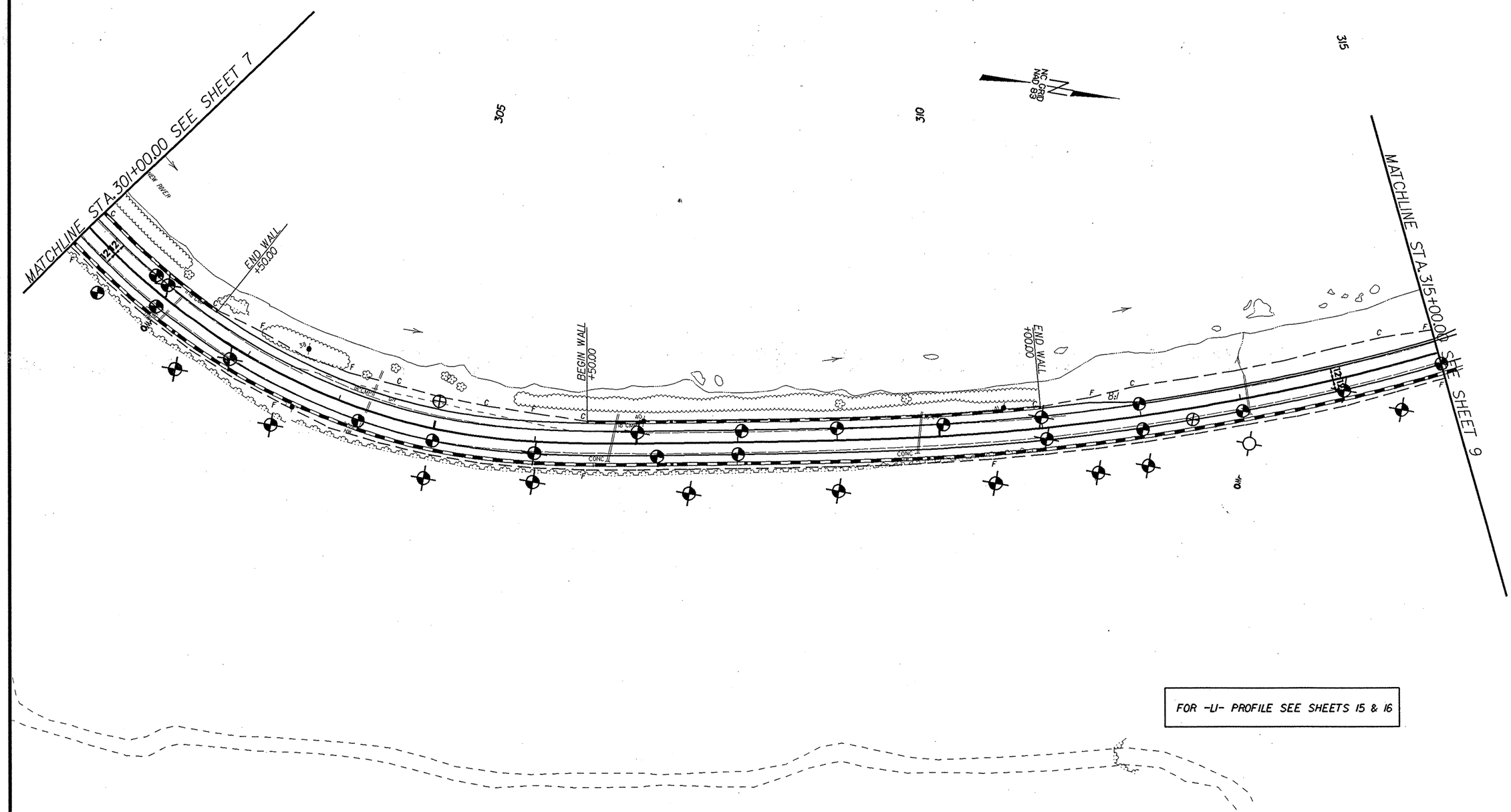
NOTES: FOR RETAINING WALL STA.306+50 TO 311+00 LT

EarthTech
A Tyco International Ltd. Company

| PROJECT REFERENCE NO. | SHEET NO. |
|---|---|
| R-2100B | 3 |
| R/W SHEET NO. | |
| ROADWAY DESIGN ENGINEER | HYDRAULICS ENGINEER |

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION



| PROJECT REFERENCE NO. | SHEET |
|---|---|
| R-2100B | 4 |
| RETAINING WALL STA.306+50 to 311+00 LT | |

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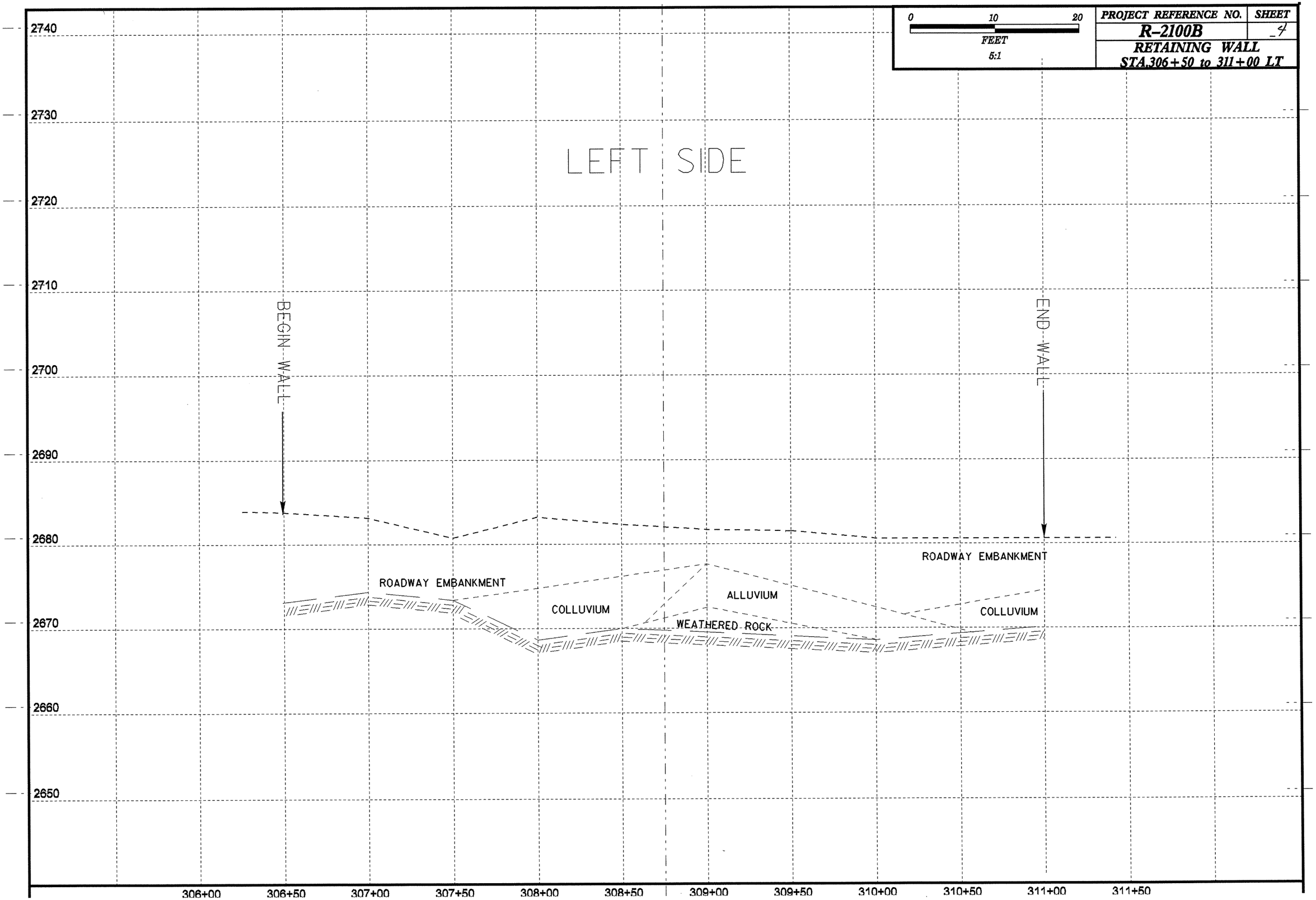

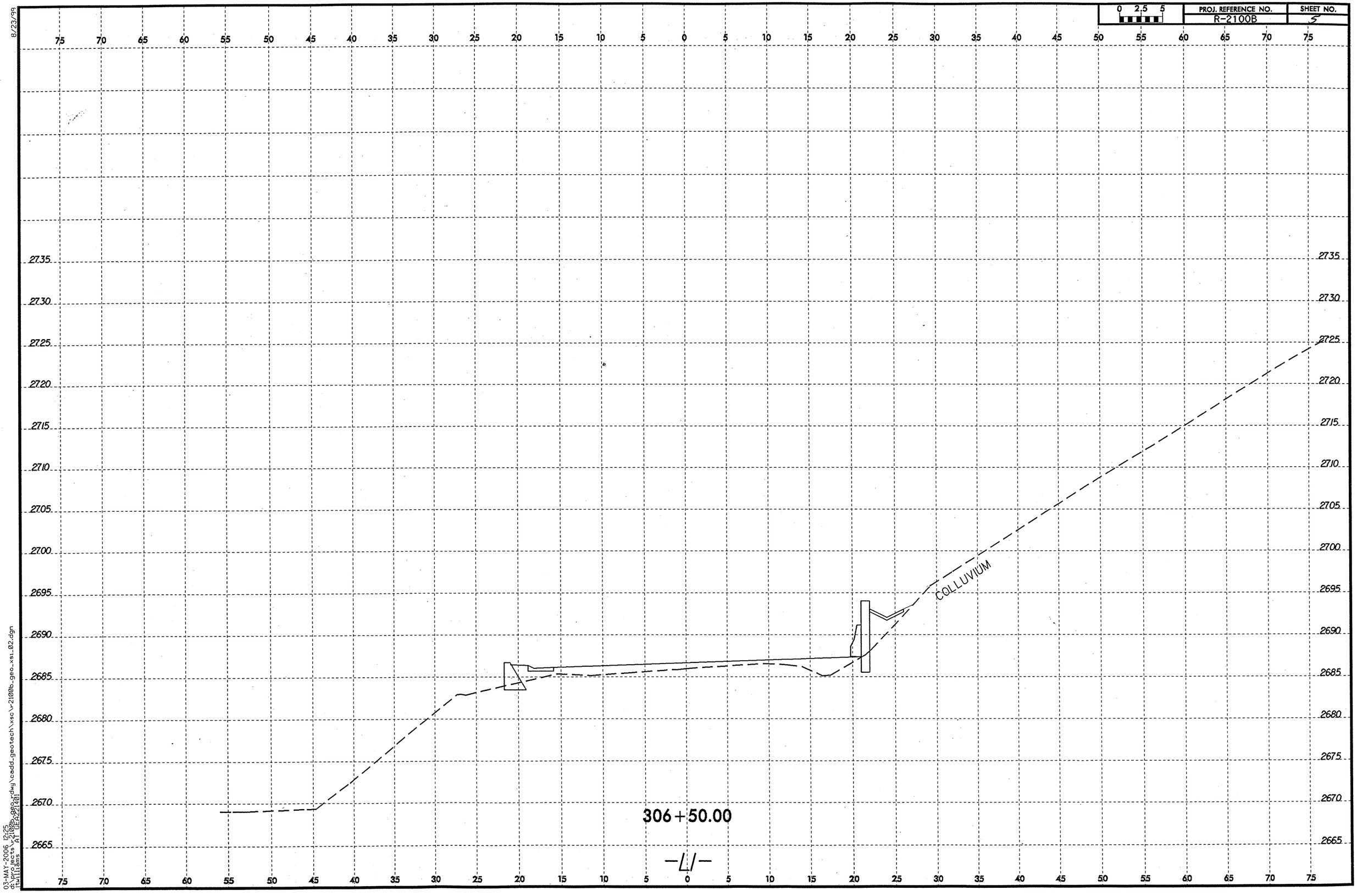


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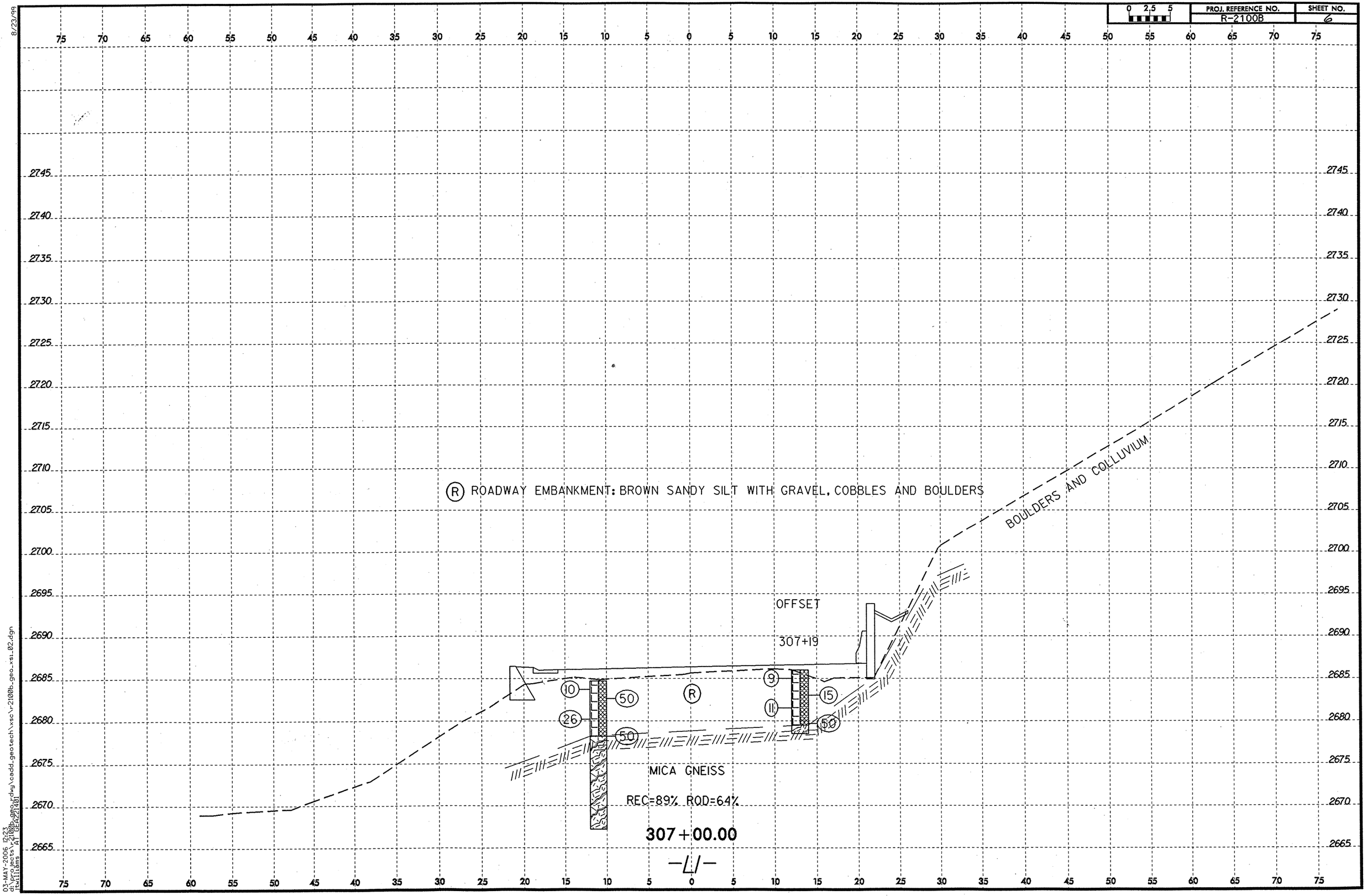


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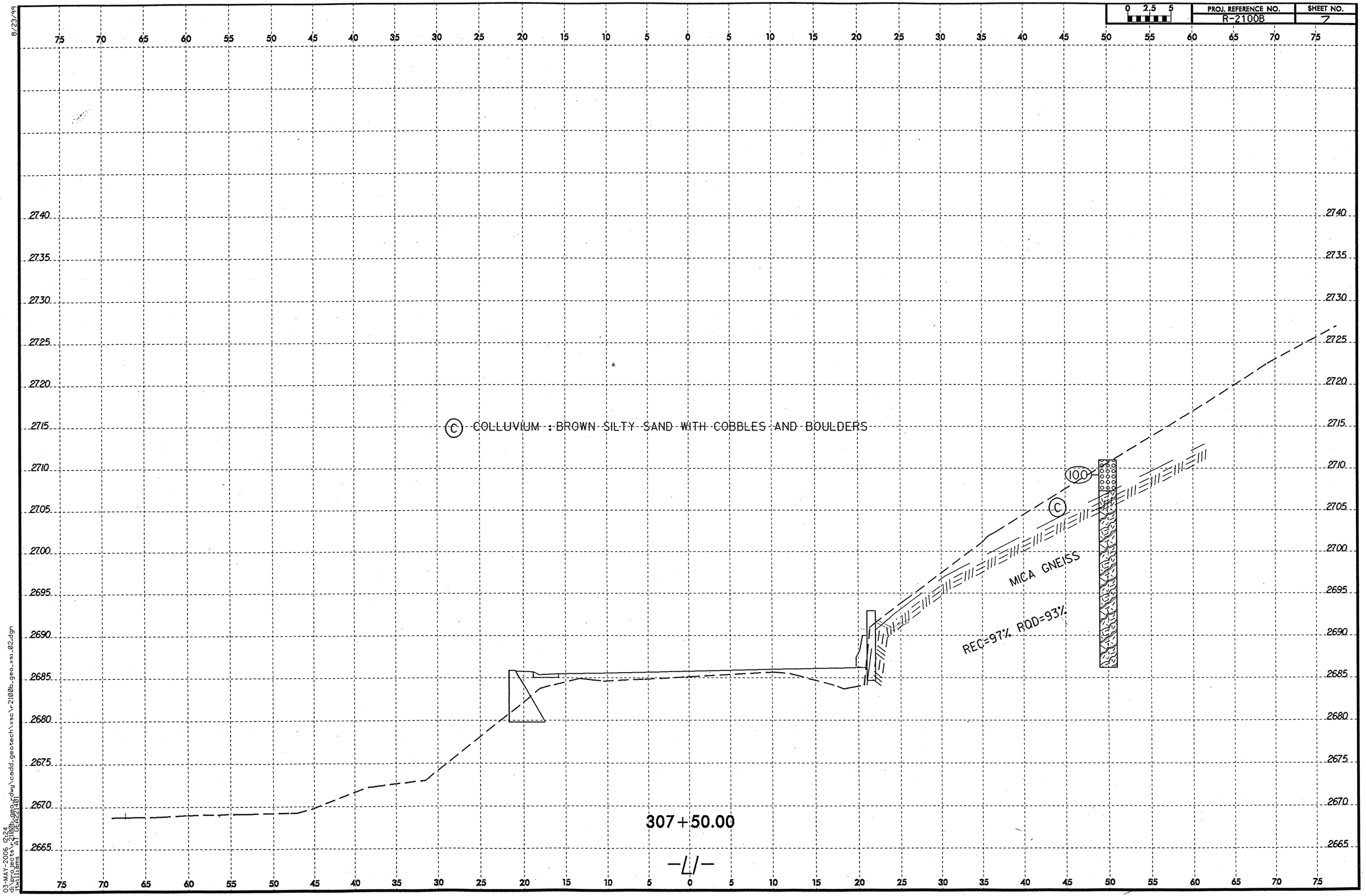

0 2.5 5
PROJ. REFERENCE NO.
R-2100B
SHEET NO.
7
8/23/99
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2740
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2710
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2700
2695
2690
2685
2680
2675
2670
2665
C COLLUVIUM : BROWN SILTY SAND WITH COBBLES AND BOULDERS
100
C
MICA GNEISS
REC=97% RQD=93%
307+50.00
-L1-
03-MAY-2006 12:24
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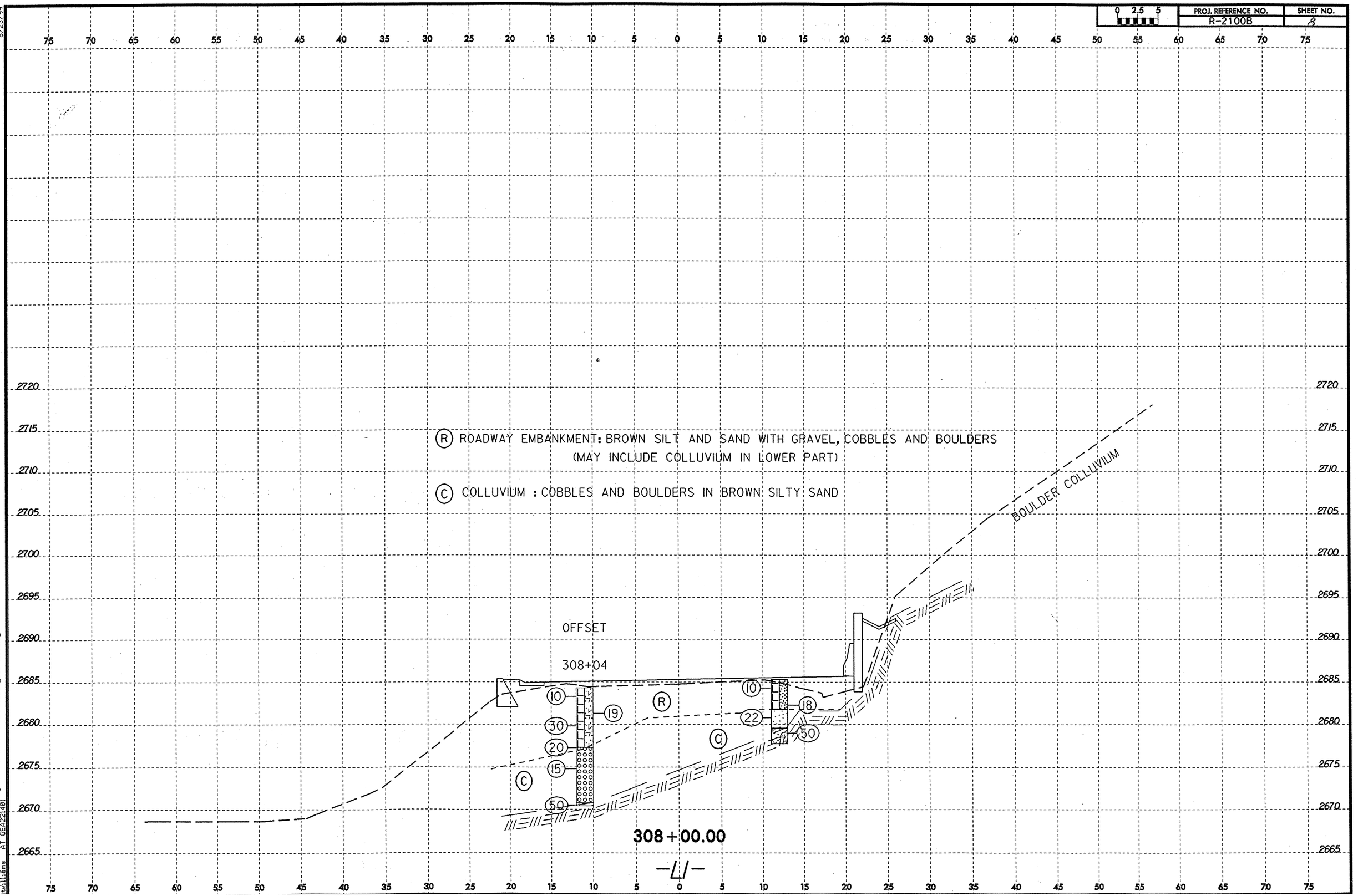
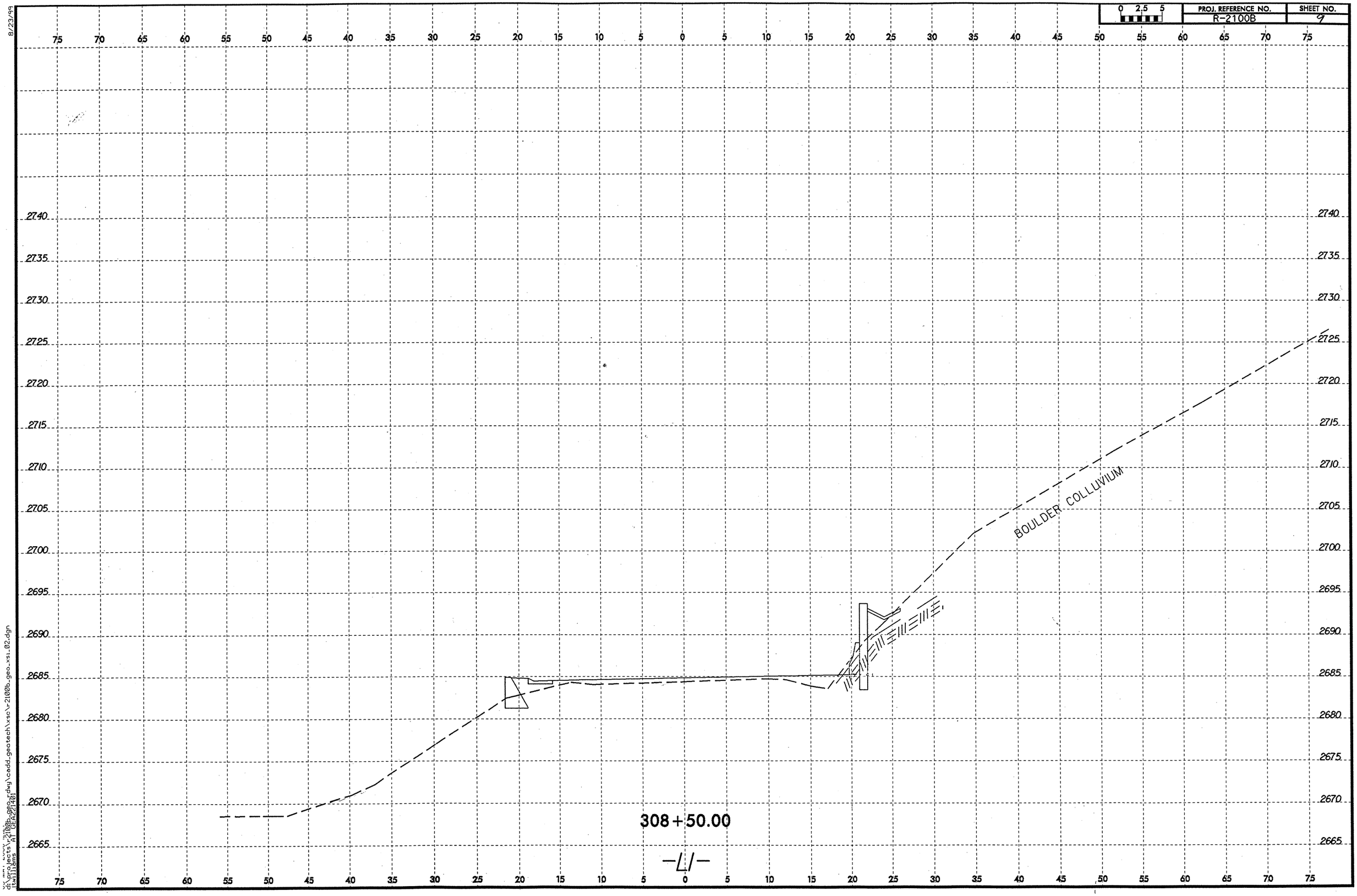
jtwilliams AT GEA221401



PROJ. REFERENCE NO.
R-2100B
SHEET NO.
8
0 2.5 5
(R) ROADWAY EMBANKMENT: BROWN SILT AND SAND WITH GRAVEL, COBBLES AND BOULDERS
(MAY INCLUDE COLLUVIUM IN LOWER PART)
(C) COLLUVIUM : COBBLES AND BOULDERS IN BROWN SILTY SAND
BOULDER COLLUVIUM
OFFSET
308+04
308+00.00
-L1-




8/23/99

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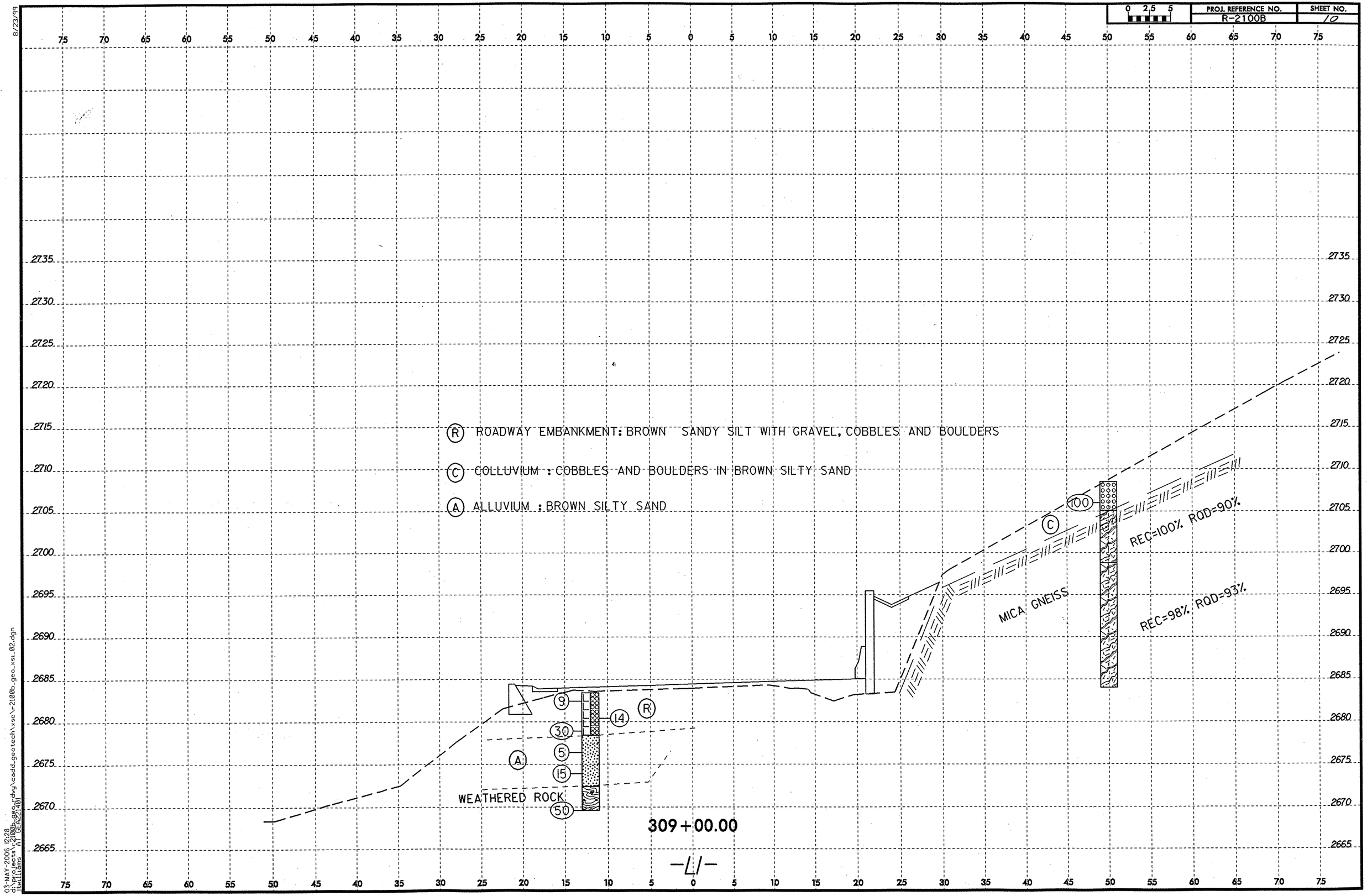


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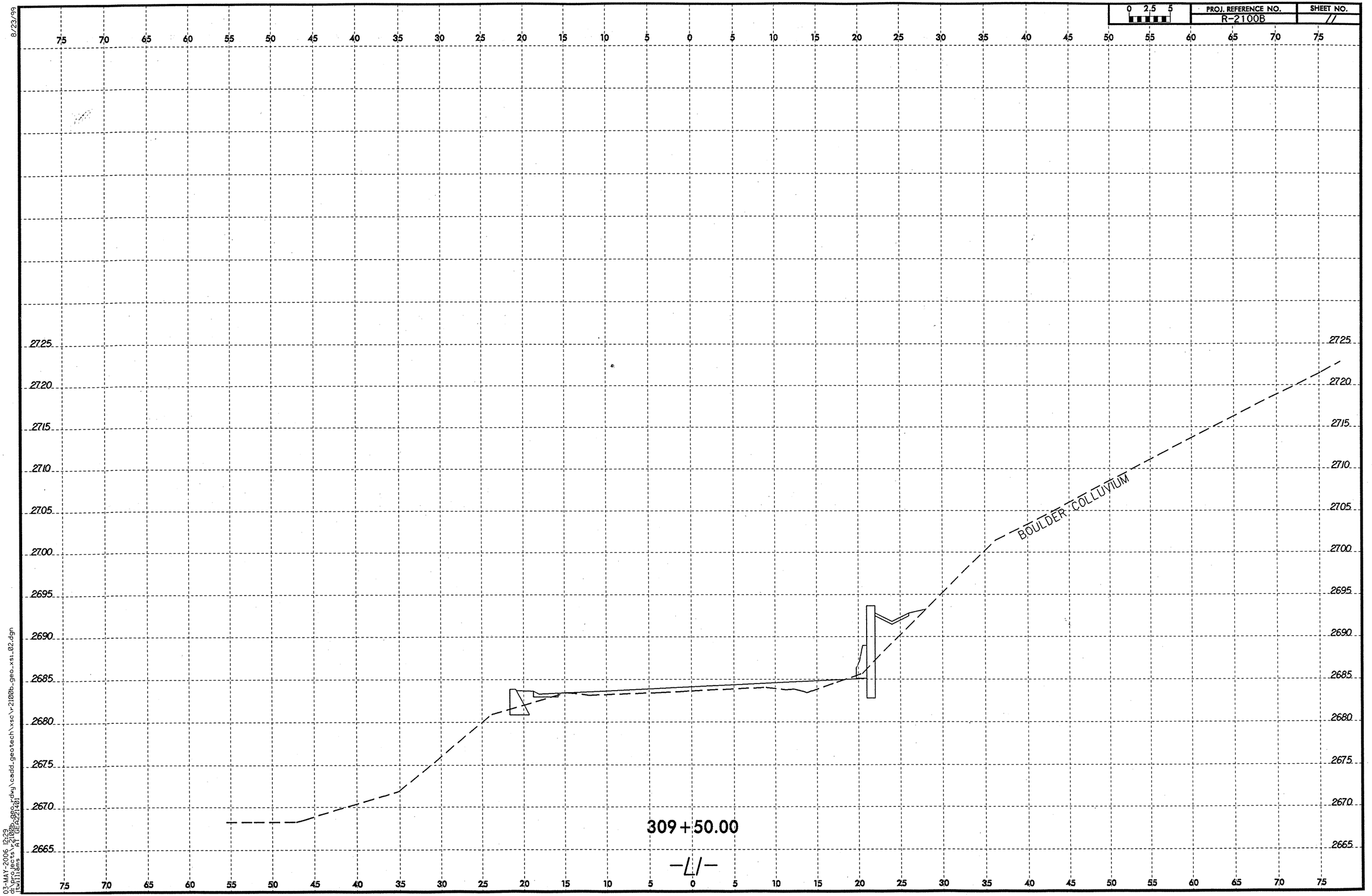


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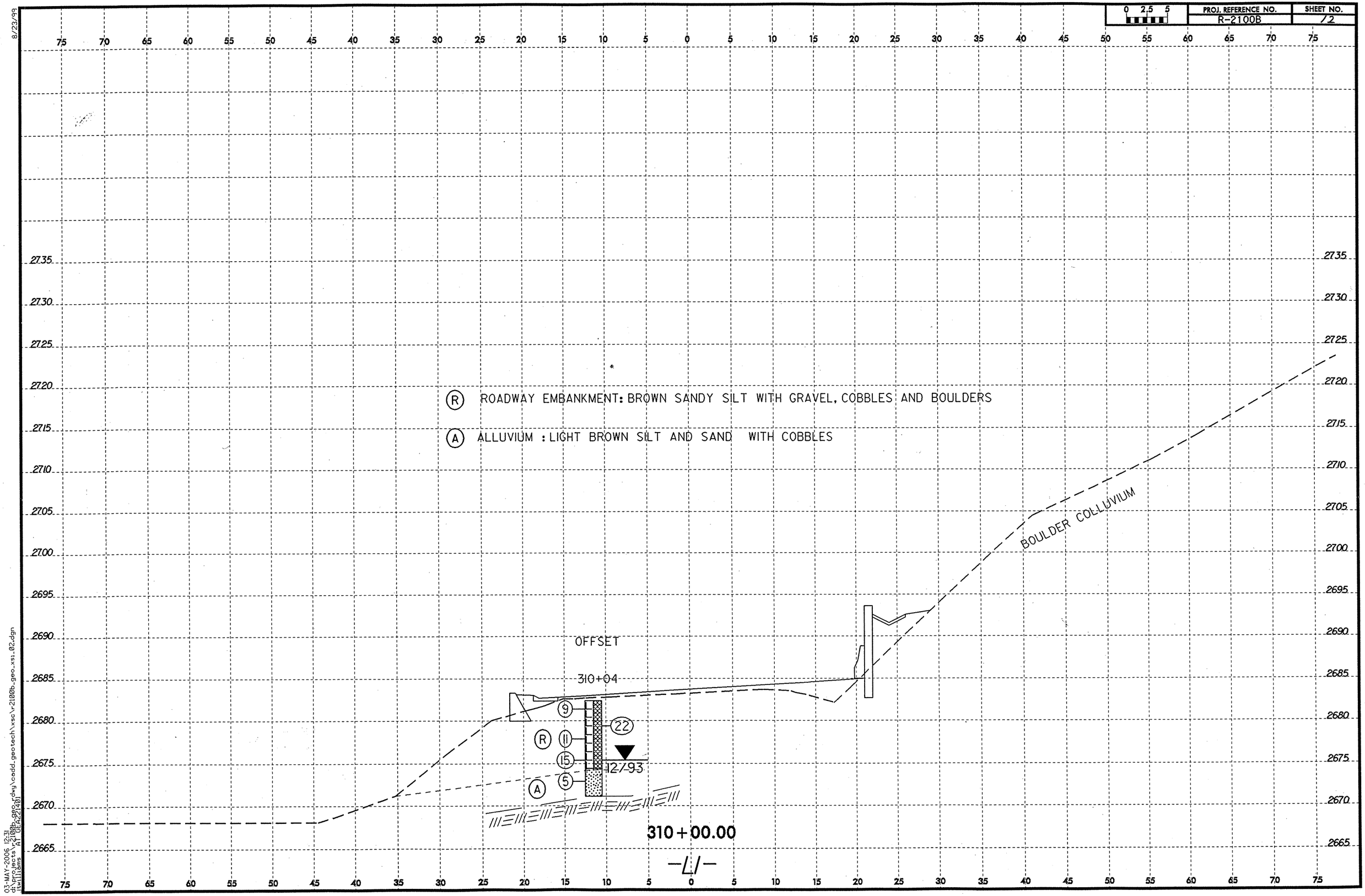
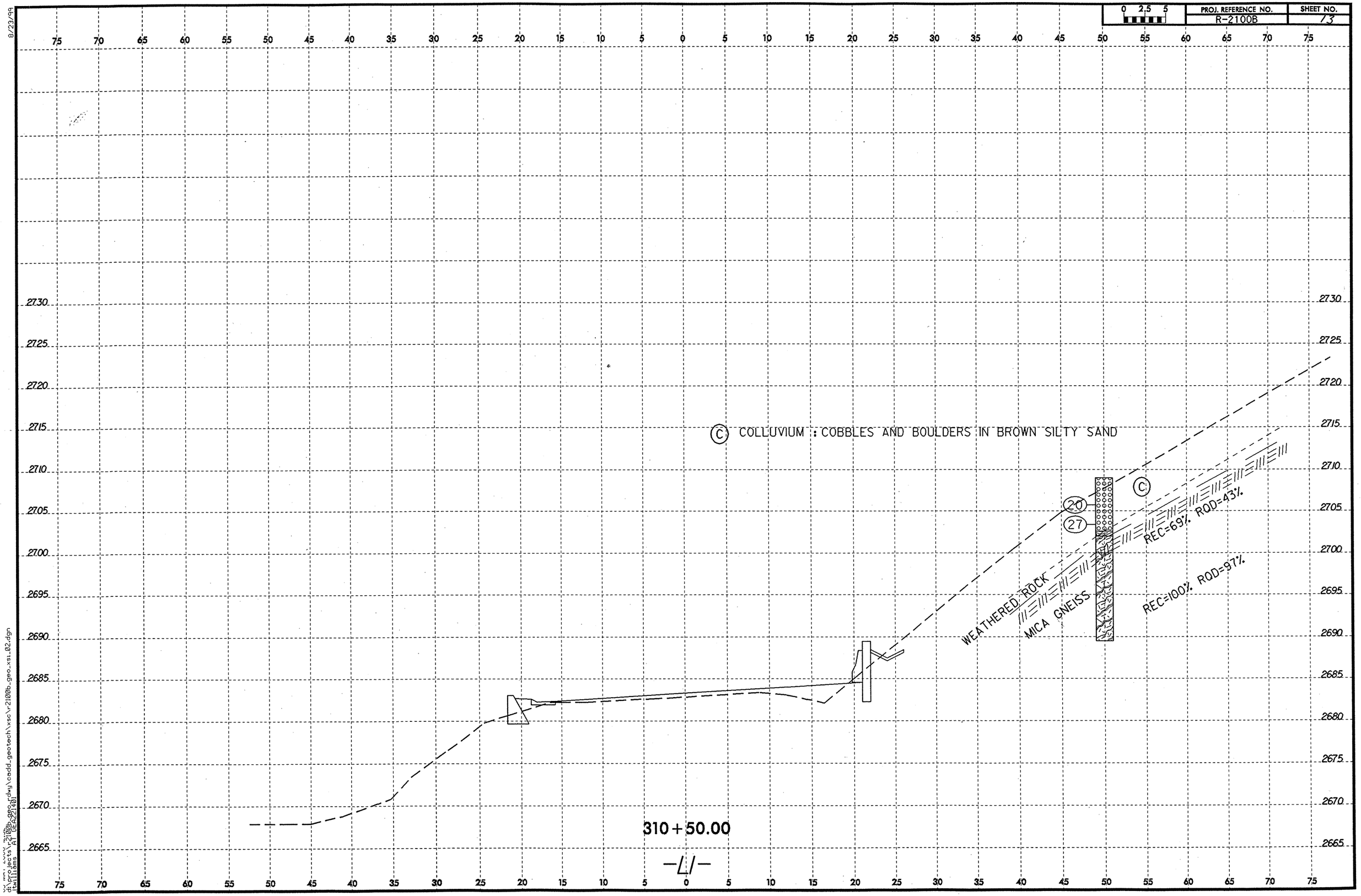
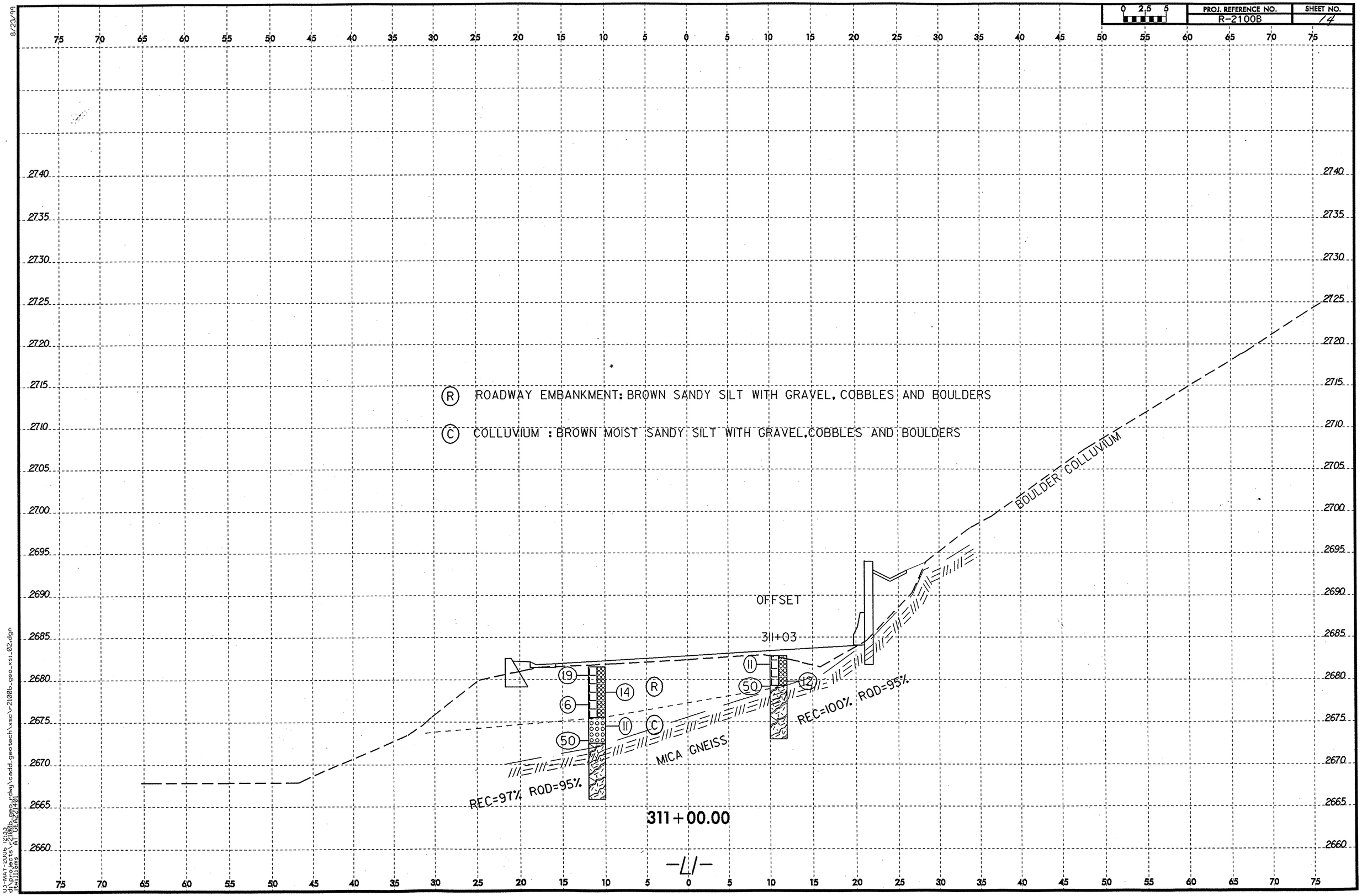


PROJ. REFERENCE NO.
R-2100B
SHEET NO.
12
0 2.5 5
8/23/99
R ROADWAY EMBANKMENT: BROWN SANDY SILT WITH GRAVEL, COBBLES AND BOULDERS
A ALLUVIUM : LIGHT BROWN SILT AND SAND WITH COBBLES
BOULDER COLLUVIUM
OFFSET
310+04
9
22
R
11
15
12/93
5
A
310+00.00
-L1-
03-MAY-2006 12:31
d:\projects\r2100b_geo_rdwy\cadd_geotech\xsc\r2100b_geo_xsi_02.dgn
jtwilliams AT GEA221401



0 2.5 5
PROJ. REFERENCE NO.
R-2100B
SHEET NO.
13
8/23/99
75 70 65 60 55 50 45 40 35 30 25 20 15 10 5 0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75
2730
2725
2720
2715
2710
2705
2700
2695
2690
2685
2680
2675
2670
2665
C COLLUVIUM : COBBLES AND BOULDERS IN BROWN SILTY SAND
C
20
27
REC=69% RQD=43%
REC=100% RQD=97%
WEATHERED ROCK
MICA GNEISS
310+50.00
-L1-



PROJ. REFERENCE NO.
R-2100B
SHEET NO.
14
0 2.5 5
8/23/99
(R) ROADWAY EMBANKMENT: BROWN SANDY SILT WITH GRAVEL, COBBLES AND BOULDERS
(C) COLLUVIUM : BROWN MOIST SANDY SILT WITH GRAVEL, COBBLES AND BOULDERS
BOULDER COLLUVIUM
OFFSET
311+03
MICA GNEISS
REC=97% RQD=95%
REC=100% RQD=95%
311+00.00
-L1-

# NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
## GEOTECHNICAL UNIT BORING LOG

| | | | |
|---|---|---|---|
| PROJECT NO 8.1710902 | ID R-2100 | COUNTY ASHE | GEOLOGIST K. GAY |
| SITE DESCRIPTION RETAINING WALL FOR NC16 FROM JEFFERSON TO WILKES CO (RW #13) | | | GND WATER |
| BORING NO 307+00LT | NORTHING 0.00 | EASTING 0.00 | 0 HR N/A |
| ALIGNMENT 307+00LT | BORING LOCATION 307+00.000 | OFFSET 11.00ft LT | 24 HR N/A |
| COLLAR ELEV 2684.70ft | TOTAL DEPTH 17.50ft | START DATE 12/09/93 | COMPLETION DATE 12/09/93 |
| DRILL MACHINE CME-550 | DRILL METHOD H.S. AUGERS | | HAMMER TYPE AUTOMATIC |
| SURFACE WATER DEPTH N/A | DEPTH TO ROCK N/A | | Log 307+00LT, Page 1 of 1 |

| ELEV | DEPTH | BLOW CT 6in | 6in | 6in | PEN (ft) | BLOWS PER FOOT 0 25 50 75 100 | SAMPLE NO | MOI | LOG | SOIL AND ROCK DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|
| 2684.70 | 0.00 | 4 | 5 | 5 | 1.0 | Ground Surface | | | | |
| | 2.00 | 6 | 50 | 0 | 0.1 | 10 50 | | | | ROADWAY FILL BROWN FINE SANDY MICACEOUS SILT WITH ROCKS AND BOULDERS(A-4) |
| 2680.00 | 3.50 | 9 | 12 | 14 | 1.0 | 26 | | | | |
| | 6.00 | 10 | 50 | 0 | 0.5 | 50 | | | | ROADWAY FILL APPEARS AS SMR BROWN SILTY SAND WITH MICA AND ROCK FRAGMENTS |
| | | | | | | | | | | ROADWAY FILL BROWN SANDY SICACEOUS SILT (A-4) |
| | | | | | | | 1 | | | |
| 2670.00 | | | | | | | | | | SOFT WEATHERED ROCK APPEARS AS TAN SILTY SAND |
| 2667.20 | | | | | | CORING TERMINATED AT ELEVATION 2667.2 FEET IN GNEISS | | | | CRYSTALLINE ROCK REC=89% RQD=64% BIOTITIE GNEISS FRESH TO VERY SLIGHTLY WEATHERED HARD GRAY/WHITE. |

# NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
## GEOTECHNICAL UNIT BORING LOG

| | | | |
|---|---|---|---|
| PROJECT NO 8.1710902 | ID R-2100 | COUNTY ASHE | GEOLOGIST K. GAY |
| SITE DESCRIPTION RETAINING WALL FOR NC16 FROM JEFFERSON TO WILKES CO (RW #13) | | | GND WATER |
| BORING NO 308+04LT | NORTHING 0.00 | EASTING 0.00 | 0 HR N/A |
| ALIGNMENT 308+04LT | BORING LOCATION 308+04.000 | OFFSET 11.00ft LT | 24 HR N/A |
| COLLAR ELEV 2684.30ft | TOTAL DEPTH 14.00ft | START DATE 12/14/93 | COMPLETION DATE 12/14/93 |
| DRILL MACHINE CME-45C | DRILL METHOD H.S. AUGERS | | HAMMER TYPE AUTOMATIC |
| SURFACE WATER DEPTH N/A | DEPTH TO ROCK N/A | | Log 308+04LT, Page 1 of 1 |

| ELEV | DEPTH | BLOW CT 6in | 6in | 6in | PEN (ft) | BLOWS PER FOOT 0 25 50 75 100 | SAMPLE NO | MOI | LOG | SOIL AND ROCK DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|
| 2684.30 | 0.00 | 2 | 4 | 6 | 1.0 | Ground Surface | | | | |
| | 2.00 | 5 | 8 | 11 | 1.0 | 10 19 | | | | ROADWAY FILL BROWN SANDY SILT WITH MICA ROCK FRAGMENTS AND ROOTS(A-5) |
| 2680.00 | 3.50 | 8 | 12 | 18 | 1.0 | 30 | | | | |
| | 6.00 | 6 | 12 | 8 | 1.0 | 20 | | | | |
| | 8.50 | 8 | 6 | 9 | 1.0 | 15 | | | | COLLUVIUM BROWN SILTY SAND WITH COBBLES AND BOULDERS |
| 2670.30 | 13.50 | 0 | 0 | 50 | 0.3 | 50 | | D | | |
| | | | | | | AUGER REFUSAL AT ELEVATION 2670.3 ON CRYSTALLINE ROCK | | | | SOFT WEATHERED ROCK APPEARS AS TAN SILTY VERY FINE SAND |

# NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
## GEOTECHNICAL UNIT BORING LOG

| | | | |
|---|---|---|---|
| **PROJECT NO** 8.1710902 | **ID** R-2100 | **COUNTY** ASHE | **GEOLOGIST** K. GAY |
| **SITE DESCRIPTION** RETAINING WALL FOR NC16 FROM JEFFERSON TO WILKES CO (RW #13) | | | **GND WATER** |
| **BORING NO** 309+00LT | **NORTHING** 0.00 | **EASTING** 0.00 | **0 HR** N/A |
| **ALIGNMENT** 309+00LT | **BORING LOCATION** 309+00.000 | **OFFSET** 12.00ft LT | **24 HR** N/A |
| **COLLAR ELEV** 2683.40ft | **TOTAL DEPTH** 13.80ft | **START DATE** 12/14/93 | **COMPLETION DATE** 12/14/93 |
| **DRILL MACHINE** CME-550 | **DRILL METHOD** H.S. AUGERS | | **HAMMER TYPE** AUTOMATIC |
| **SURFACE WATER DEPTH** | **DEPTH TO ROCK** N/A | | Log 309+00LT, Page 1 of 1 |

| ELEV | DEPTH | BLOW CT 6in | BLOW CT 6in | BLOW CT 6in | PEN (ft) | BLOWS PER FOOT 0 25 50 75 100 | SAMPLE NO | MOI | LOG | SOIL AND ROCK DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|
| 2683.40 | 0.00 | 2 | 4 | 5 | 1.0 | Ground Surface | | | | |
| | 2.00 | 6 | 7 | 7 | 1.0 | 9 14 | | | | ROADWAY FILL BROWN SANDY SILT WITH MICA ROCK FRAGMENTS ROOTS AND ASPHALT |
| 2680.00 | 3.50 | 10 | 16 | 14 | 1.0 | 30 | | | | |
| | 6.00 | 2 | 3 | 2 | 1.0 | 5 | | | | ALLUVIUM TAN VERY FINE SAND (A-2-4) |
| | 8.50 | 3 | 9 | 6 | 1.0 | 15 | | D | | |
| 2670.00 | 13.50 | 0 | 0 | 50 | 1.0 | 50 | | M D | | SOFT WEATHERED ROCK APPEARS AS BROWN SILTY SAND WITH ROCK STRUCTURES |
| 2669.60 | | | | | | BORING TERMINATED AT ELEVATION 2669.6 IN SOFT WEATHERED ROCK | | | | SOFT WEATHERED ROCK APPEARS AS BROWN SILTY SAND WITH ROCK STRUCTURES |

# NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
## GEOTECHNICAL UNIT BORING LOG

| | | | |
|---|---|---|---|
| **PROJECT NO** 8.1710902 | **ID** R-2100 | **COUNTY** ASHE | **GEOLOGIST** K. GAY |
| **SITE DESCRIPTION** RETAINING WALL FOR NC16 FROM JEFFERSON TO WILKES CO (RW #13) | | | **GND WATER** |
| **BORING NO** 310+04LT | **NORTHING** 0.00 | **EASTING** 0.00 | **0 HR** N/A |
| **ALIGNMENT** 310+04LT | **BORING LOCATION** 310+04.000 | **OFFSET** 11.50ft LT | **24 HR** 7.00ft |
| **COLLAR ELEV** 2682.40ft | **TOTAL DEPTH** 11.30ft | **START DATE** 12/14/93 | **COMPLETION DATE** 12/14/93 |
| **DRILL MACHINE** CME-550 | **DRILL METHOD** H.S. AUGERS | | **HAMMER TYPE** AUTOMATIC |
| **SURFACE WATER DEPTH** N/A | **DEPTH TO ROCK** N/A | | Log 310+04LT, Page 1 of 1 |

| ELEV | DEPTH | BLOW CT 6in | BLOW CT 6in | BLOW CT 6in | PEN (ft) | BLOWS PER FOOT 0 25 50 75 100 | SAMPLE NO | MOI | LOG | SOIL AND ROCK DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|
| 2682.40 | 0.00 | 3 | 4 | 5 | 1.0 | Ground Surface | | | | |
| 2680.00 | 2.00 | 10 | 10 | 12 | 1.0 | 9 22 | | | | ROADWAY FILL BROWN SANDY SILT WITH MICA AND ROCK FRAGMENTS (A-4) |
| | 3.50 | 8 | 6 | 5 | 1.0 | 11 | | | | |
| | 6.00 | 5 | 7 | 8 | 1.0 | 15 | | D | | |
| | 8.50 | 2 | 2 | 3 | 1.0 | 5 | | M | | |
| 2671.10 | | | | | | AUGER REFUSAL AT ELEVATION 2671.1 FEET ON CRYSTALLINE ROCK | | W | | ALLUVIUM TAN VERY FINE SANDY SILT WITH PEEBLES (A-4) |

# NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
## GEOTECHNICAL UNIT BORING LOG

| | | | |
|---|---|---|---|
| **PROJECT NO** 8.1710902 | **ID** R-2100 | **COUNTY** ASHE | **GEOLOGIST** K. GAY |
| **SITE DESCRIPTION** RETAINING WALL FOR NC16 FROM JEFFERSON TO WILKES CO (RW #13) | | | **GND WATER** |
| **BORING NO** 311+00LT | **NORTHING** 0.00 | **EASTING** 0.00 | **0 HR** N/A |
| **ALIGNMENT** 311+00LT | **BORING LOCATION** 311+00.000 | **OFFSET** 11.00ft LT | **24 HR** N/A |
| **COLLAR ELEV** 2681.50ft | **TOTAL DEPTH** 15.70ft | **START DATE** 12/09/93 | **COMPLETION DATE** 12/09/93 |
| **DRILL MACHINE** CME-550 | **DRILL METHOD** H.S. AUGERS | | **HAMMER TYPE** AUTOMATIC |
| **SURFACE WATER DEPTH** N/A | **DEPTH TO ROCK** N/A | | **Log 311+00LT, Page 1 of 1** |

| ELEV | DEPTH | BLOW CT 6in | BLOW CT 6in | BLOW CT 6in | PEN (ft) | BLOWS PER FOOT (0 25 50 75 100) | SAMPLE NO | ▼ / MOI | LOG | SOIL AND ROCK DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|
| 2681.50 | 0.00 | 3 | 4 | 15 | 1.0 | Ground Surface | | | | |
| 2680.00 | 2.00 | 6 | 7 | 7 | 1.0 | 19 | | D | | ROADWY FILL TAN BROWN FINE SANDY SILT WITH MICA AND ROCK FRAGMENTS. (A-4) |
| | 3.50 | 2 | 1 | 5 | 1.0 | 14 | | | | |
| | 6.00 | 5 | 6 | 5 | 1.0 | 11 | | | | COLLUVIUM TAN BROWN FINE SANDY CLAYEY SILT WITH MICA AND ROCK FRAGMENTS. |
| | 8.50 | 7 | 0 | 50 | 0.2 | 50 | | | | |
| 2670.00 | | | | | | | 1 | | | CRYSTALLINE ROCK REC=97% RQD=95% BIOTITE GNEISS FRESH HAD GRAY WHITE |
| 2665.80 | | | | | | CORING TERMINATED AT ELEVATION 2665.8 FEET IN GNEISS. | | | | |

| STATE | STATE PROJECT REFERENCE NO. | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|
| N.C. | R2100B | 1 | 24 |

# STATE OF NORTH CAROLINA
## DEPARTMENT OF TRANSPORTATION
## DIVISION OF HIGHWAYS
## GEOTECHNICAL ENGINEERING UNIT

# STRUCTURE SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. R2100B F.A. PROJ. STP-16(1)

COUNTY ASHE

PROJECT DESCRIPTION NC 16 FROM SOUTHEAST OF SR 1158 TO SOUTHEAST OF NC 88

SITE DESCRIPTION RETAINING WALL FROM STA. 339+50 TO STA. 345+50 (LEFT) ON NC 16

## CONTENTS


| SHEET | DESCRIPTION |
|---|---|
| 1 | TITLE SHEET |
| 2 | LEGEND |
| 3 - 4 | SITE PLAN |
| 5 | PROFILE |
| 6 - 17 | CROSS SECTION(S) |
| 18 - 22 | BORE LOG & CORE REPORT(S) |
| 23 - 24 | SOIL TEST RESULTS |


## CAUTION NOTICE

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WERE MADE FOR THE PURPOSE OF STUDY, PLANNING, AND DESIGN, AND NOT FOR CONSTRUCTION OR PAY PURPOSES. THE VARIOUS FIELD BORING LOGS, ROCK CORES, AND SOIL TEST DATA AVAILABLE MAY BE REVIEWED OR INSPECTED IN RALEIGH BY CONTACTING THE N.C. DEPARTMENT OF TRANSPORTATION, GEOTECHNICAL ENGINEERING UNIT AT (919) 250-4088. NEITHER THE SUBSURFACE PLANS AND REPORTS, NOR THE FIELD BORING LOGS, ROCK CORES, OR SOIL TEST DATA ARE PART OF THE CONTRACT.

GENERAL SOIL AND ROCK STRATA DESCRIPTIONS AND INDICATED BOUNDARIES ARE BASED ON A GEOTECHNICAL INTERPRETATION OF ALL AVAILABLE SUBSURFACE DATA AND MAY NOT NECESSARILY REFLECT THE ACTUAL SUBSURFACE CONDITIONS BETWEEN BORINGS OR BETWEEN SAMPLED STRATA WITHIN THE BOREHOLE. THE LABORATORY SAMPLE DATA AND THE IN SITU (IN-PLACE) TEST DATA CAN BE RELIED ON ONLY TO THE DEGREE OF RELIABILITY INHERENT IN THE STANDARD TEST METHOD.
THE OBSERVED WATER LEVELS OR SOIL MOISTURE CONDITIONS INDICATED IN THE SUBSURFACE INVESTIGATIONS ARE AS RECORDED AT THE TIME OF THE INVESTIGATION. THESE WATER LEVELS OR SOIL MOISTURE CONDITIONS MAY VARY CONSIDERABLY WITH TIME ACCORDING TO CLIMATIC CONDITIONS INCLUDING TEMPERATURES, PRECIPITATION, AND WIND, AS WELL AS OTHER NON-CLIMATIC FACTORS.

THE BIDDER OR CONTRACTOR IS CAUTIONED THAT DETAILS SHOWN ON THE SUBSURFACE PLANS ARE PRELIMINARY ONLY AND IN MANY CASES THE FINAL DESIGN DETAILS ARE DIFFERENT. FOR BIDDING AND CONSTRUCTION PURPOSES, REFER TO THE CONSTRUCTION PLANS AND DOCUMENTS FOR FINAL DESIGN INFORMATION ON THIS PROJECT. THE DEPARTMENT DOES NOT WARRANT OR GUARANTEE THE SUFFICIENCY OR ACCURACY OF THE INVESTIGATION MADE, NOR THE INTERPRETATIONS MADE, OR OPINION OF THE DEPARTMENT AS TO THE TYPE OF MATERIALS AND CONDITIONS TO BE ENCOUNTERED. THE BIDDER OR CONTRACTOR IS CAUTIONED TO MAKE SUCH INDEPENDENT SUBSURFACE INVESTIGATIONS AS HE DEEMS NECESSARY TO SATISFY HIMSELF AS TO CONDITIONS TO BE ENCOUNTERED ON THIS PROJECT. THE CONTRACTOR SHALL HAVE NO CLAIM FOR ADDITIONAL COMPENSATION OR FOR AN EXTENSION OF TIME FOR ANY REASON RESULTING FROM THE ACTUAL CONDITIONS ENCOUNTERED AT THE SITE DIFFERING FROM THOSE INDICATED IN THE SUBSURFACE INFORMATION.

PERSONNEL

F & R ENGINEERING

F & H ENGINEERING

INVESTIGATED BY L.L. ACKER

CHECKED BY W.D. FRYE

SUBMITTED BY W.D. FRYE

DATE 6/8/06

NORTH CAROLINA LICENSED SEAL 1007 GEOLOGIST LOUIS L. ACKER

06/08/06

DRAWN BY: J. T. WILLIAMS

NOTE - THE INFORMATION CONTAINED HEREIN IS NOT IMPLIED OR GUARANTEED BY THE N.C. DEPARTMENT OF TRANSPORTATION AS BEING ACCURATE NOR IT IS CONSIDERED TO BE PART OF THE PLANS, SPECIFICATIONS, OR CONTRACT FOR THE PROJECT.

NOTE - BY HAVING REQUESTED THIS INFORMATION THE CONTRACTOR SPECIFICALLY WAIVES ANY CLAIMS FOR INCREASED COMPENSATION OR EXTENSION OF TIME BASED ON DIFFERENCES BETWEEN THE CONDITIONS INDICATED HEREIN AND THE ACTUAL CONDITIONS AT THE PROJECT SITE.

PROJECT: 34369.1.1

ID: R2100B

| PROJECT REFERENCE NO. | SHEET NO. |
|---|---|
| R2100B | 2 |

# NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
## DIVISION OF HIGHWAYS
## GEOTECHNICAL ENGINEERING UNIT

# SUBSURFACE INVESTIGATION

### SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

## SOIL DESCRIPTION

SOIL IS CONSIDERED TO BE THE UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER, AND YIELD LESS THAN 100 BLOWS PER FOOT ACCORDING TO STANDARD PENETRATION TEST (AASHTO T206, ASTM D-1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY SHALL INCLUDE: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. EXAMPLE:

*VERY STIFF, GRAY, SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6*

## SOIL LEGEND AND AASHTO CLASSIFICATION

| GENERAL CLASS. | GRANULAR MATERIALS (≤ 35% PASSING #200) | | | | | | | SILT-CLAY MATERIALS (> 35% PASSING #200) | | | | ORGANIC MATERIALS | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GROUP CLASS. | A-1 | | A-3 | A-2 | | | | A-4 | A-5 | A-6 | A-7 | A-1, A-2 A-3 | A-4, A-5 A-6, A-7 | |
| | A-1-a | A-1-b | | A-2-4 | A-2-5 | A-2-6 | A-2-7 | | | | A-7-5 A-7-6 | | | |
| SYMBOL | | | | | | | | | | | | | | |
| % PASSING # 10 | 50 MX | | | | | | | | | | | GRANULAR SOILS | SILT-CLAY SOILS | MUCK, PEAT |
| # 40 | 30 MX | 50 MX | 51 MN | | | | | | | | | | | |
| # 200 | 15 MX | 25 MX | 10 MX | 35 MX | 35 MX | 35 MX | 35 MX | 36 MN | 36 MN | 36 MN | 36 MN | | | |
| LIQUID LIMIT / PLASTIC INDEX | 6 MX | | NP | 40 MX / 10 MX | 41 MN / 10 MX | 40 MX / 11 MN | 41 MN / 11 MN | 40 MX / 10 MX | 41 MN / 10 MX | 40 MX / 11 MN | 41 MN / 11 MN | SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER | | HIGHLY ORGANIC SOILS |
| GROUP INDEX | 0 | | 0 | 0 | | 4 MX | | 8 MX | 12 MX | 16 MX | No MX | | | |
| USUAL TYPES OF MAJOR MATERIALS | STONE FRAGS. GRAVEL, AND SAND | | FINE SAND | SILTY OR CLAYEY GRAVEL AND SAND | | | | SILTY SOILS | | CLAYEY SOILS | | | | |
| GEN. RATING AS A SUBGRADE | EXCELLENT TO GOOD | | | | | | | FAIR TO POOR | | | | FAIR TO POOR | POOR | UNSUITABLE |

PI OF A-7-5 SUBGROUP IS ≤ LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30

## CONSISTENCY OR DENSENESS

| PRIMARY SOIL TYPE | COMPACTNESS OR CONSISTENCY | RANGE OF STANDARD PENETRATION RESISTENCE (N-VALUE) | RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT$^2$) |
|---|---|---|---|
| GENERALLY GRANULAR MATERIAL (NON-COHESIVE) | VERY LOOSE<br>LOOSE<br>MEDIUM DENSE<br>DENSE<br>VERY DENSE | <4<br>4 TO 10<br>10 TO 30<br>30 TO 50<br>>50 | N/A |
| GENERALLY SILT-CLAY MATERIAL (COHESIVE) | VERY SOFT<br>SOFT<br>MEDIUM STIFF<br>STIFF<br>VERY STIFF<br>HARD | <2<br>2 TO 4<br>4 TO 8<br>8 TO 15<br>15 TO 30<br>>30 | <0.25<br>0.25 TO 0.50<br>0.5 TO 1.0<br>1 TO 2<br>2 TO 4<br>>4 |

## TEXTURE OR GRAIN SIZE

| U.S. STD. SIEVE SIZE | 4 | 10 | 40 | 60 | 200 | 270 |
|---|---|---|---|---|---|---|
| OPENING (MM) | 4.76 | 2.00 | 0.42 | 0.25 | 0.075 | 0.053 |

| BOULDER (BLDR.) | COBBLE (COB.) | GRAVEL (GR.) | COARSE SAND (CSE. SD.) | FINE SAND (F SD.) | SILT (SL.) | CLAY (CL.) |
|---|---|---|---|---|---|---|

GRAIN SIZE MM: 305 | 75 | 2.0 | 0.25 | 0.05 | 0.005
GRAIN SIZE IN.: 12 | 3

## SOIL MOISTURE - CORRELATION OF TERMS

| SOIL MOISTURE SCALE (ATTERBERG LIMITS) | FIELD MOISTURE DESCRIPTION | GUIDE FOR FIELD MOISTURE DESCRIPTION |
|---|---|---|
| | - SATURATED - (SAT.) | USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE |
| LL — LIQUID LIMIT<br>PLASTIC RANGE (PI)<br>PL — PLASTIC LIMIT | - WET - (W) | SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE |
| OM — OPTIMUM MOISTURE<br>SL — SHRINKAGE LIMIT | - MOIST - (M) | SOLID; AT OR NEAR OPTIMUM MOISTURE |
| | - DRY - (D) | REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE |

## PLASTICITY

| | PLASTICITY INDEX (PI) | DRY STRENGTH |
|---|---|---|
| NONPLASTIC | 0-5 | VERY LOW |
| LOW PLASTICITY | 6-15 | SLIGHT |
| MED. PLASTICITY | 16-25 | MEDIUM |
| HIGH PLASTICITY | 26 OR MORE | HIGH |

## COLOR

DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY). MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.

## GRADATION

WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE.
UNIFORM - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. (ALSO POORLY GRADED)
GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLES OF TWO OR MORE SIZES.

## ANGULARITY OF GRAINS

THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.

## MINERALOGICAL COMPOSITION

MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE.

## COMPRESSIBILITY

| | |
|---|---|
| SLIGHTLY COMPRESSIBLE | LIQUID LIMIT LESS THAN 31 |
| MODERATELY COMPRESSIBLE | LIQUID LIMIT EQUAL TO 31-50 |
| HIGHLY COMPRESSIBLE | LIQUID LIMIT GREATER THAN 50 |

## PERCENTAGE OF MATERIAL

| ORGANIC MATERIAL | GRANULAR SOILS | SILT - CLAY SOILS | OTHER MATERIAL | |
|---|---|---|---|---|
| TRACE OF ORGANIC MATTER | 2 - 3% | 3 - 5% | TRACE | 1 - 10% |
| LITTLE ORGANIC MATTER | 3 - 5% | 5 - 12% | LITTLE | 10 - 20% |
| MODERATELY ORGANIC | 5 - 10% | 12 - 20% | SOME | 20 - 35% |
| HIGHLY ORGANIC | >10% | >20% | HIGHLY | 35% AND ABOVE |

## GROUND WATER

- WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING
- STATIC WATER LEVEL AFTER 24 HOURS
- PW PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA
- SPRING OR SEEP

## MISCELLANEOUS SYMBOLS

- ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION
- SOIL SYMBOL
- ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT
- INFERRED SOIL BOUNDARY
- INFERRED ROCK LINE
- ALLUVIAL SOIL BOUNDARY
- 25/025 DIP & DIP DIRECTION OF ROCK STRUCTURES
- SOUNDING ROD
- SPT CPT DPT DMT VST PMT TEST BORING
- AUGER BORING
- CORE BORING
- MW MONITORING WELL
- PIEZOMETER INSTALLATION
- SLOPE INDICATOR INSTALLATION
- SPT N-VALUE
- REF SPT REFUSAL

SAMPLE DESIGNATIONS
- S - BULK SAMPLE
- SS - SPLIT SPOON SAMPLE
- ST - SHELBY TUBE SAMPLE
- RS - ROCK SAMPLE
- RT - RECOMPACTED TRIAXIAL SAMPLE
- CBR - CALIFORNIA BEARING RATIO SAMPLE

## ABBREVIATIONS

AR - AUGER REFUSAL
BT - BORING TERMINATED
CL. - CLAY
CPT - CONE PENETRATION TEST
CSE. - COARSE
DMT - DILATOMETER TEST
DPT - DYNAMIC PENETRATION TEST
e - VOID RATIO
F - FINE
FOSS. - FOSSILIFEROUS
FRAC. - FRACTURED, FRACTURES
FRAGS. - FRAGMENTS
HI. - HIGHLY
MED. - MEDIUM
MICA. - MICACEOUS
MOD. - MODERATELY
NP - NON PLASTIC
ORG. - ORGANIC
PMT - PRESSUREMETER TEST
SAP. - SAPROLITIC
SD. - SAND, SANDY
SL. - SILT, SILTY
SLI. - SLIGHTLY
TCR - TRICONE REFUSAL
w - MOISTURE CONTENT
V - VERY
VST - VANE SHEAR TEST
WEA. - WEATHERED
$\gamma$ - UNIT WEIGHT
$\gamma_d$ - DRY UNIT WEIGHT

## EQUIPMENT USED ON SUBJECT PROJECT

DRILL UNITS:
- [ ] MOBILE B-___
- [ ] BK-51
- [X] CME-45C
- [X] CME-550
- [ ] PORTABLE HOIST
- [ ] _____
- [ ] _____

ADVANCING TOOLS:
- [ ] CLAY BITS
- [ ] 6" CONTINUOUS FLIGHT AUGER
- [X] 8" HOLLOW AUGERS
- [ ] HARD FACED FINGER BITS
- [ ] TUNG.-CARBIDE INSERTS
- [X] CASING [X] W/ ADVANCER
- [ ] TRICONE ____" STEEL TEETH
- [ ] TRICONE ____" TUNG.-CARB.
- [X] CORE BIT
- [ ] _____

HAMMER TYPE:
- [X] AUTOMATIC
- [ ] MANUAL

CORE SIZE:
- [ ] -B_____
- [X] -N_____
- [ ] -H_____

HAND TOOLS:
- [ ] POST HOLE DIGGER
- [ ] HAND AUGER
- [ ] SOUNDING ROD
- [ ] VANE SHEAR TEST
- [ ] _____

## ROCK DESCRIPTION

HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT IF TESTED, WOULD YIELD SPT REFUSAL. AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS. IN NON-COASTAL PLAIN MATERIAL, THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK.
ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:

| | |
|---|---|
| WEATHERED ROCK (WR) | NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100 BLOWS PER FOOT IF TESTED. |
| CRYSTALLINE ROCK (CR) | FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC. |
| NON-CRYSTALLINE ROCK (NCR) | FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN SEDIMENTARY ROCK THAT WOULD YEILD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC. |
| COASTAL PLAIN SEDIMENTARY ROCK (CP) | COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC. |

## WEATHERING

| | |
|---|---|
| FRESH | ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER HAMMER IF CRYSTALLINE. |
| VERY SLIGHT (V SLI.) | ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN, CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF OF A CRYSTALLINE NATURE. |
| SLIGHT (SLI.) | ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS. |
| MODERATE (MOD.) | SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED WITH FRESH ROCK. |
| MODERATELY SEVERE (MOD. SEV.) | ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES "CLUNK" SOUND WHEN STRUCK. *IF TESTED, WOULD YIELD SPT REFUSAL* |
| SEVERE (SEV.) | ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. *IF TESTED, YIELDS SPT N VALUES > 100 BPF* |
| VERY SEVERE (V SEV.) | ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT THE MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE SUCH THAT ONLY MINOR VESTIGES OF THE ORIGINAL ROCK FABRIC REMAIN. *IF TESTED, YIELDS SPT N VALUES < 100 BPF* |
| COMPLETE | ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE. |

## ROCK HARDNESS

| | |
|---|---|
| VERY HARD | CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK. |
| HARD | CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN. |
| MODERATELY HARD | CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS. |
| MEDIUM HARD | CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PEICES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK. |
| SOFT | CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE. |
| VERY SOFT | CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNAIL. |

## FRACTURE SPACING

| TERM | SPACING |
|---|---|
| VERY WIDE | MORE THAN 10 FEET |
| WIDE | 3 TO 10 FEET |
| MODERATELY CLOSE | 1 TO 3 FEET |
| CLOSE | 0.16 TO 1 FEET |
| VERY CLOSE | LESS THAN 0.16 FEET |

## BEDDING

| TERM | THICKNESS |
|---|---|
| VERY THICKLY BEDDED | > 4 FEET |
| THICKLY BEDDED | 1.5 - 4 FEET |
| THINLY BEDDED | 0.16 - 1.5 FEET |
| VERY THINLY BEDDED | 0.03 - 0.16 FEET |
| THICKLY LAMINATED | 0.008 - 0.03 FEET |
| THINLY LAMINATED | < 0.008 FEET |

## INDURATION

FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF THE MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.

| | |
|---|---|
| FRIABLE | RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE. |
| MODERATELY INDURATED | GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER. |
| INDURATED | GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER. |
| EXTREMELY INDURATED | SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS. |

## TERMS AND DEFINITIONS

ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER.

AQUIFER - A WATER BEARING FORMATION OR STRATA.

ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND.

ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS. OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, AS SHALE, SLATE, ETC.

ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE.

CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.

COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE.

CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.

DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK.

DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL.

DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.

FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.

FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.

FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM PARENT MATERIAL.

FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.

FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD.

JOINT - FRACTURE IN ROCK ALONG WHICH ND APPRECIABLE MOVEMENT HAS OCCURRED.

LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT.

LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.

MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.

PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM.

RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.

ROCK QUALITY DESIGNATION (RQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.

SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK.

SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS.

SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE.

STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N OR BPF) OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS.

STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.

STRATA ROCK QUALITY DESIGNATION (SRQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.

TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.

BENCH MARK: BM #5 - BYI- 6 + 04.57, 31.30 LT

ELEVATION: 2697.24 FT.

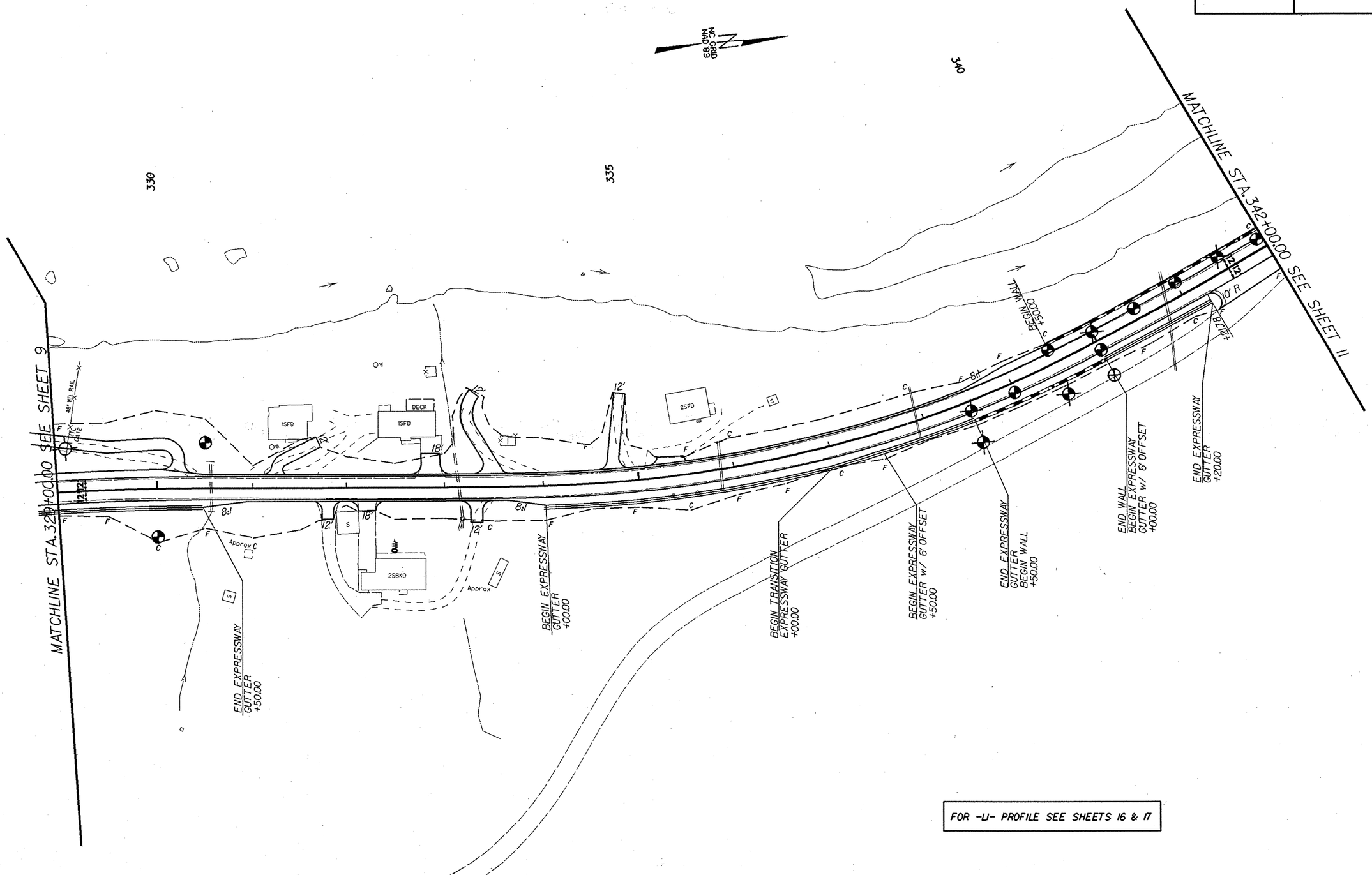
NOTES: FOR RETAINING WALL STA.339+50 TO 345+50 LT

| PROJECT REFERENCE NO. | SHEET NO. |
|---|---|
| R-2100B | 3 |
| R/W SHEET NO. | |
| ROADWAY DESIGN ENGINEER | HYDRAULICS ENGINEER |

EarthTech
A Tyco International Ltd. Company

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION



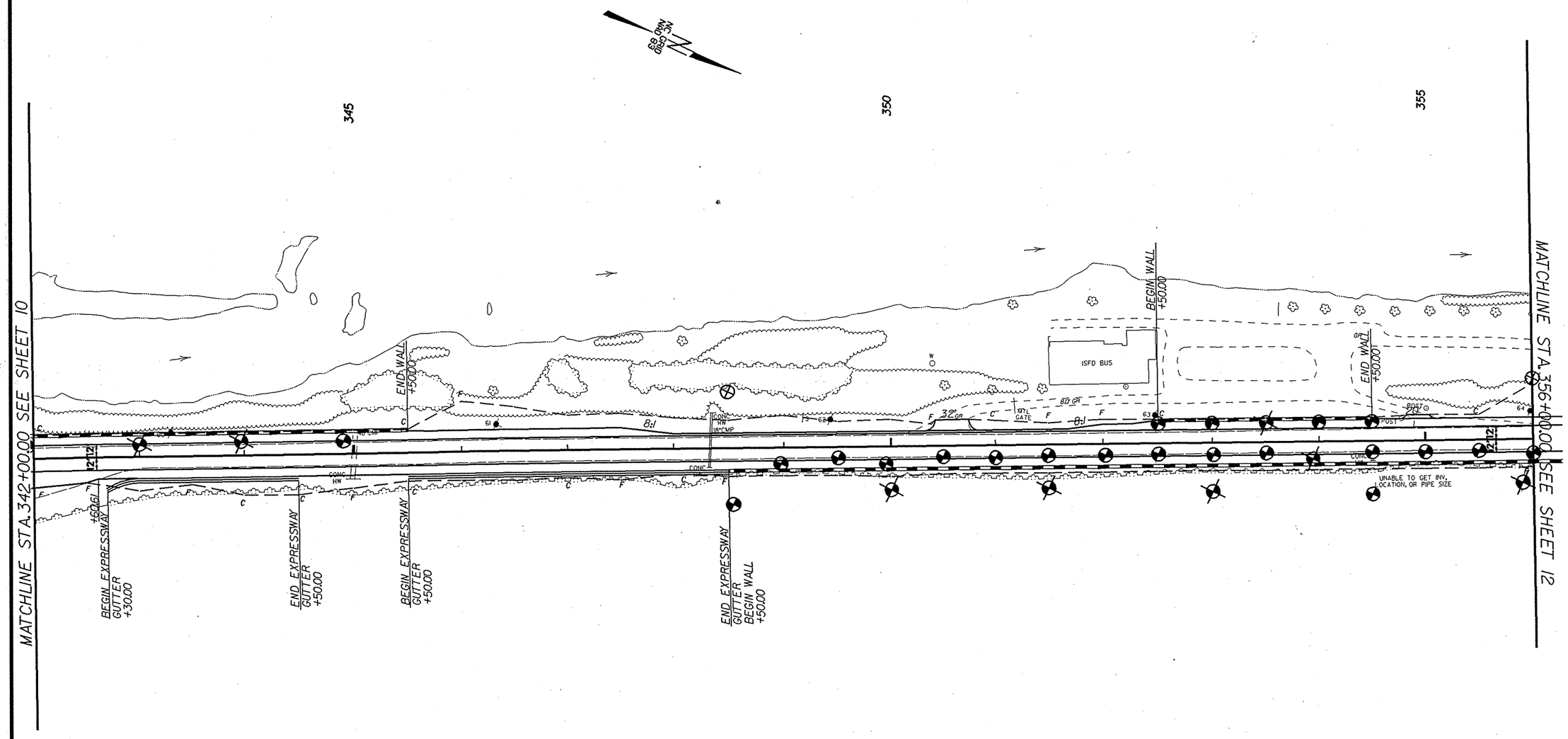

FOR -L- PROFILE SEE SHEETS 16 & 17

EarthTech
A Tyco International Ltd. Company

| PROJECT REFERENCE NO. | SHEET NO. |
|---|---|
| R-2100B | 4 |
| R/W SHEET NO. | |
| ROADWAY DESIGN ENGINEER | HYDRAULICS ENGINEER |

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION




FOR -L- PROFILE SEE SHEETS 17 & 18

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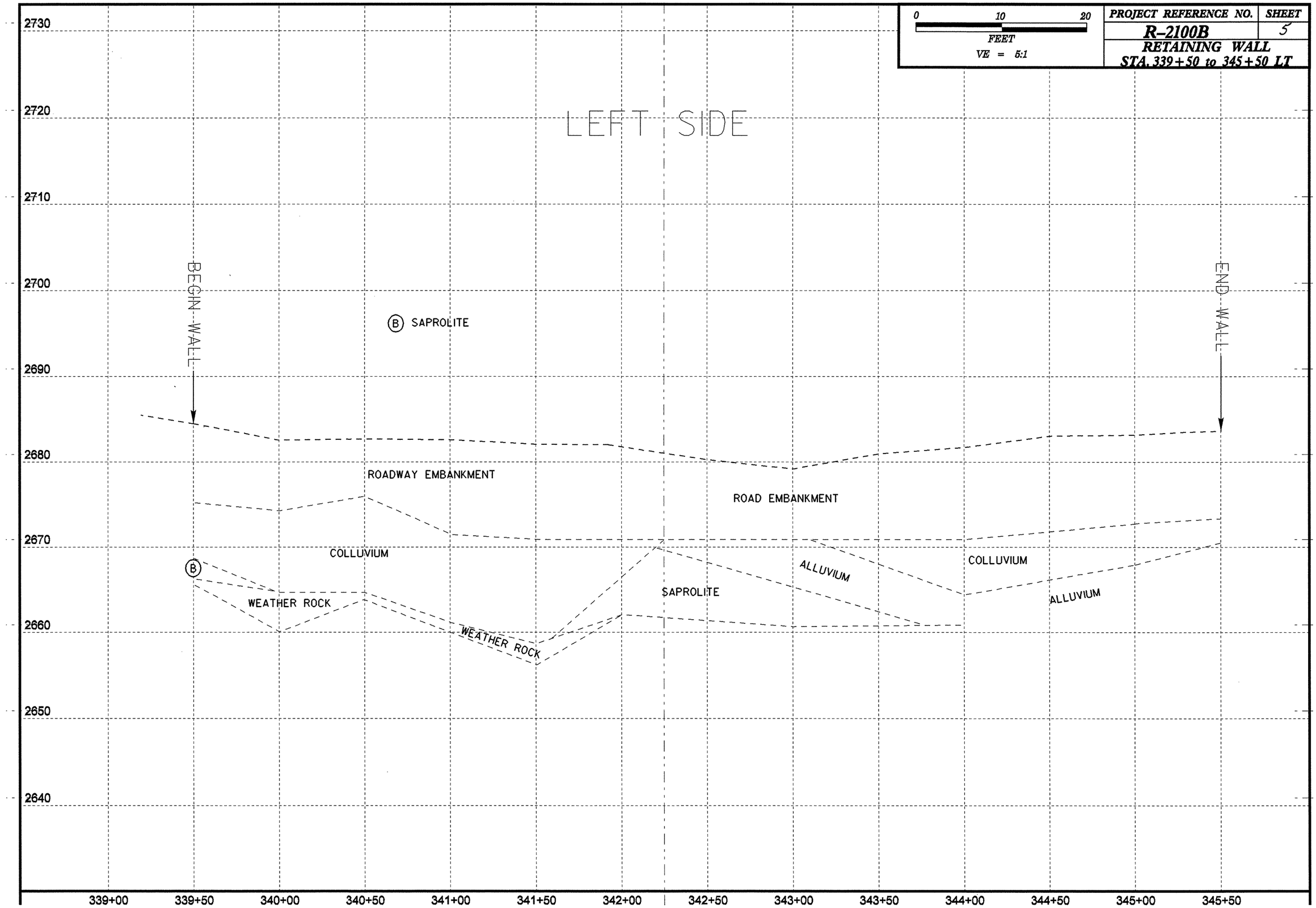
| RETAINING WALL STA. 339+50 to 345+50 LT | |



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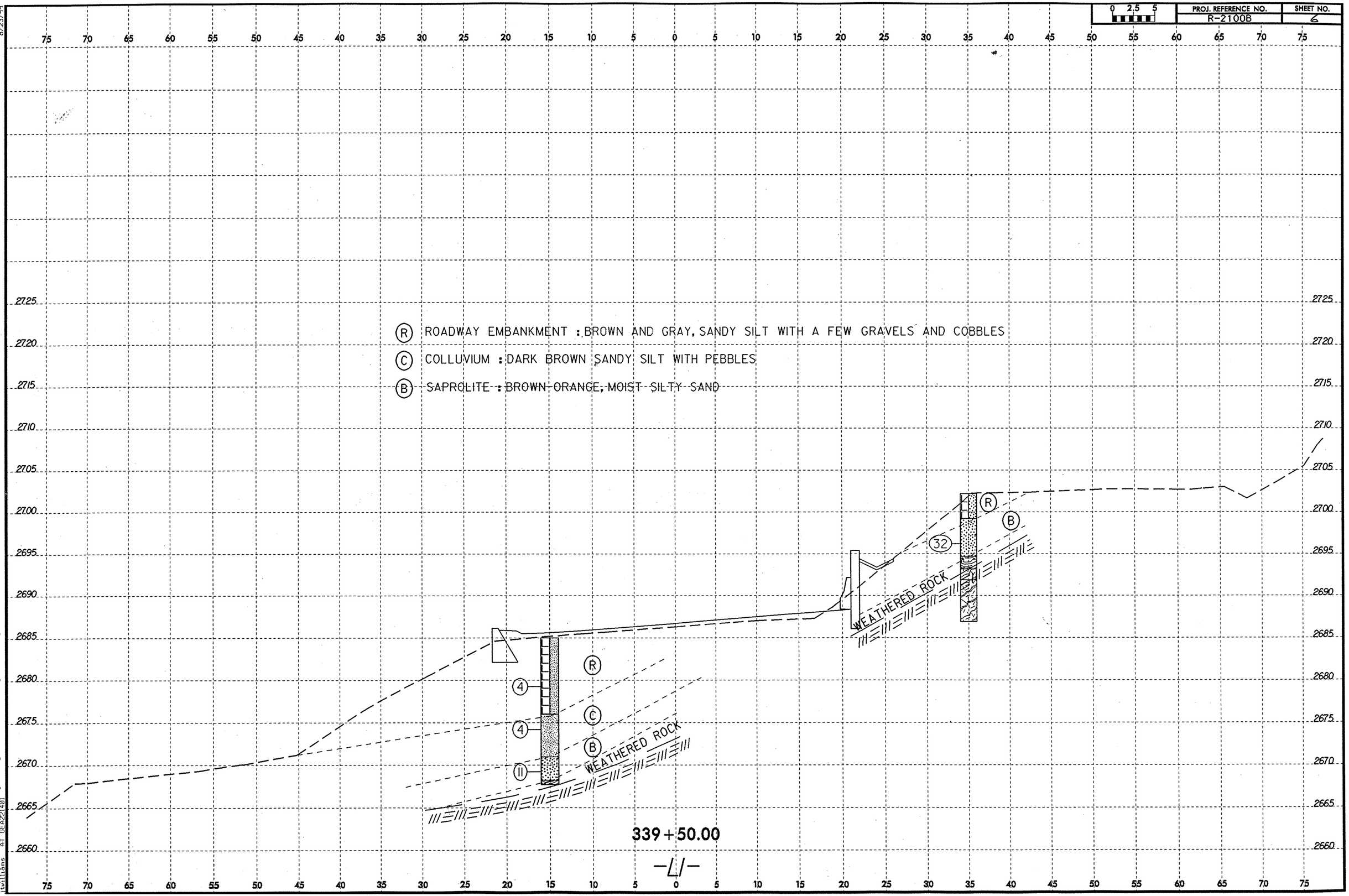


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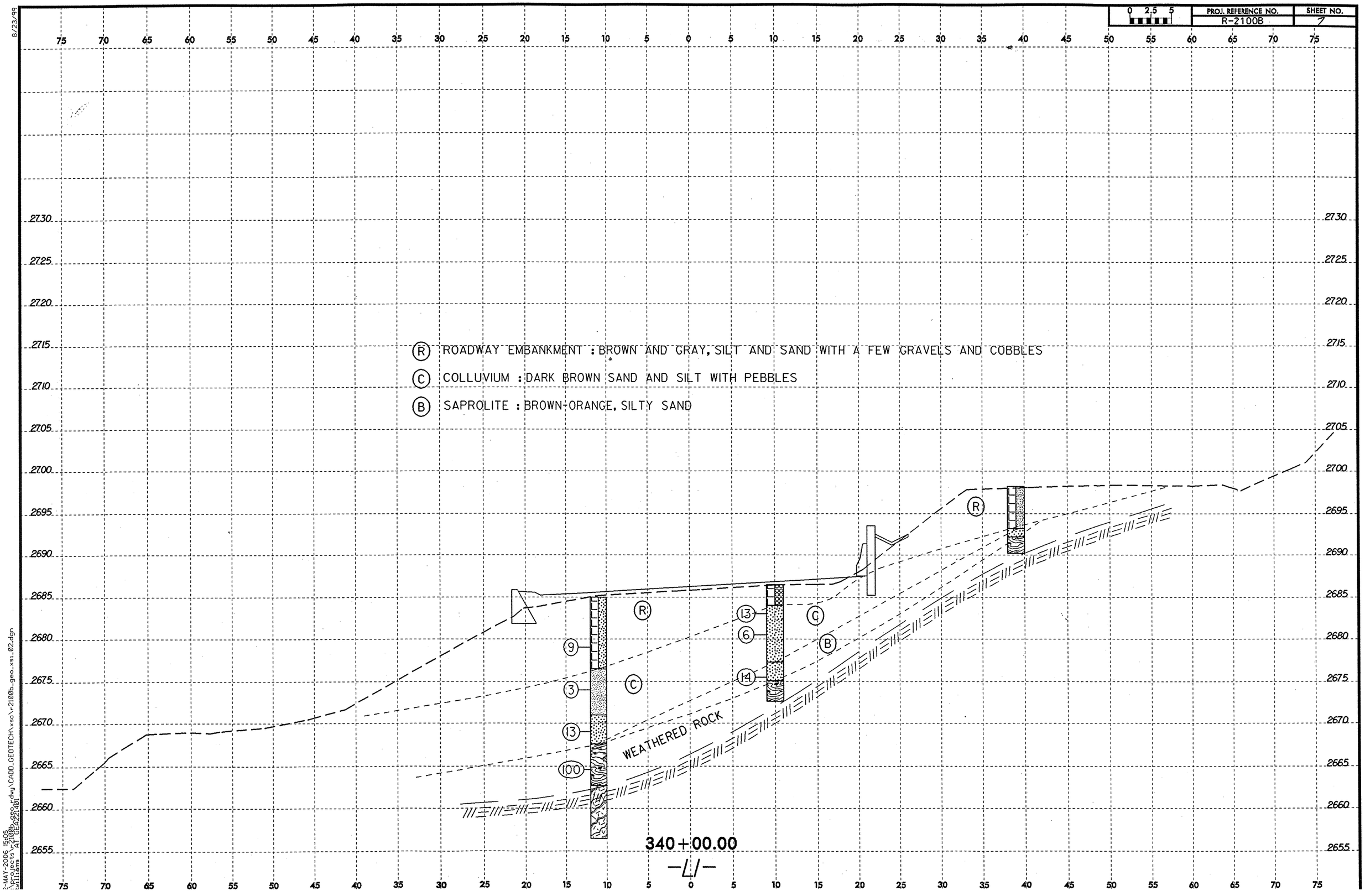

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C COLLUVIUM : DARK BROWN SAND AND SILT WITH PEBBLES
B SAPROLITE : BROWN-ORANGE, SILTY SAND
WEATHERED ROCK
340+00.00
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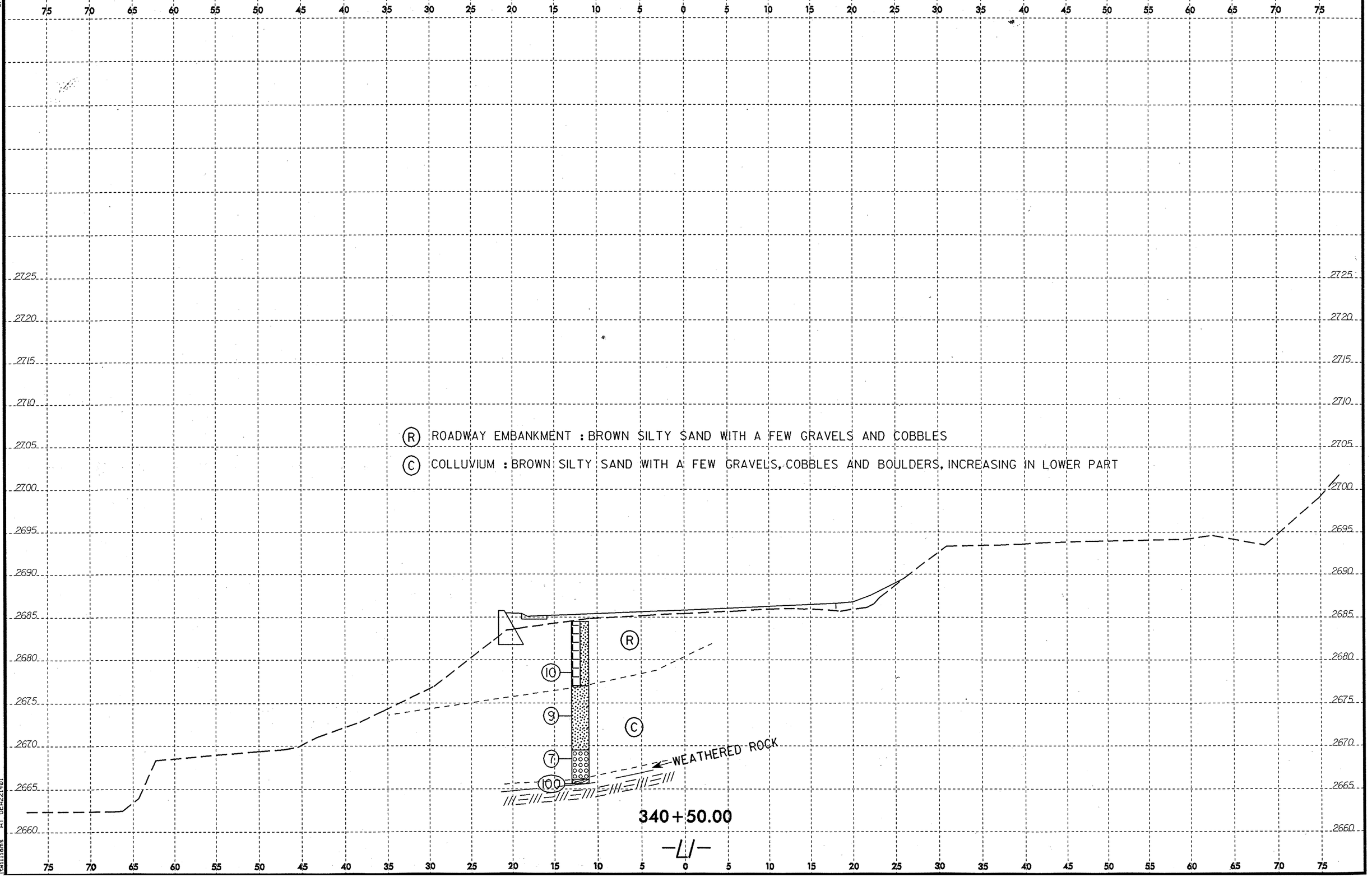


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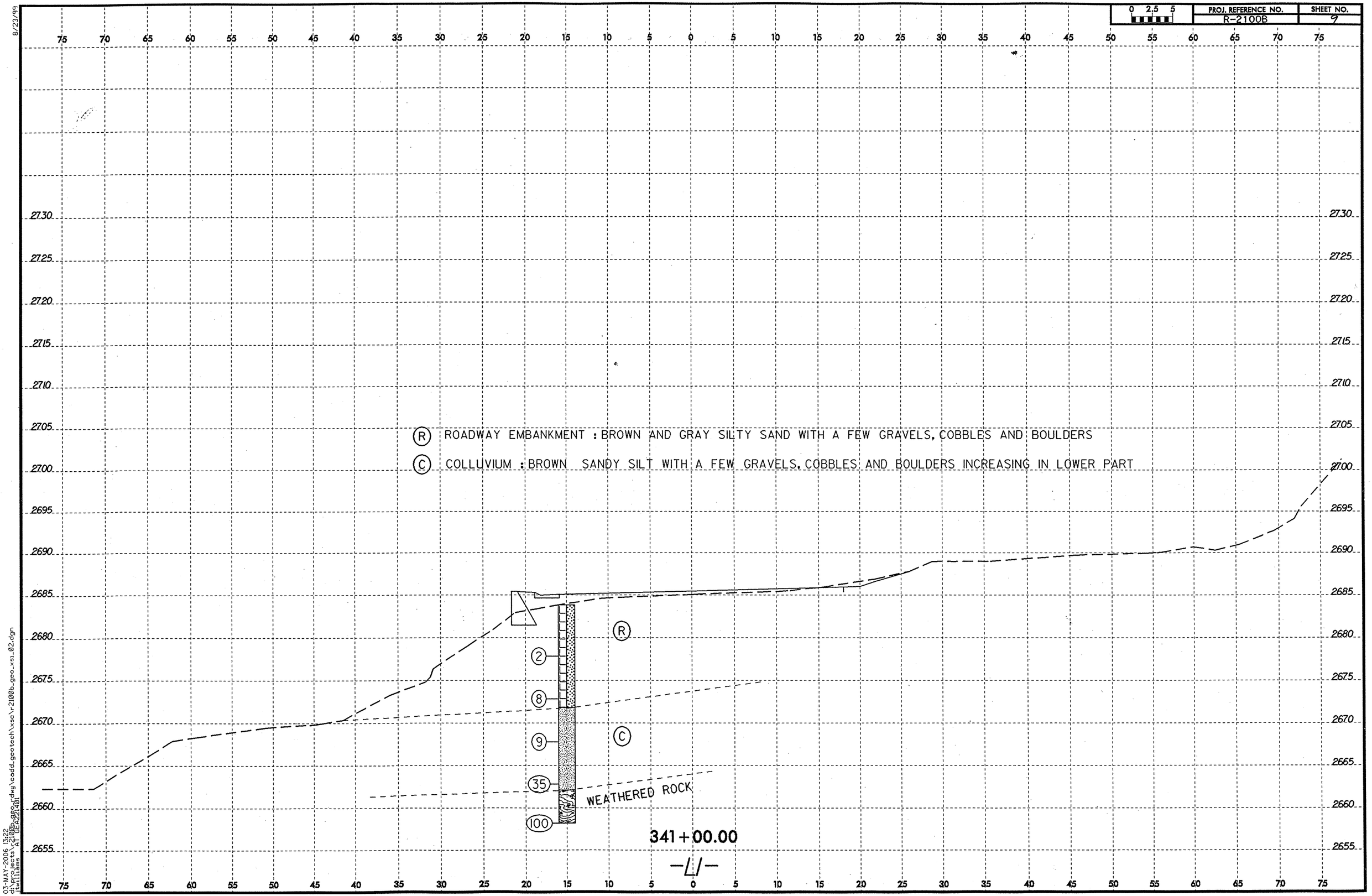

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R ROADWAY EMBANKMENT : BROWN AND GRAY SILTY SAND WITH A FEW GRAVELS, COBBLES AND BOULDERS
C COLLUVIUM : BROWN SANDY SILT WITH A FEW GRAVELS, COBBLES AND BOULDERS INCREASING IN LOWER PART
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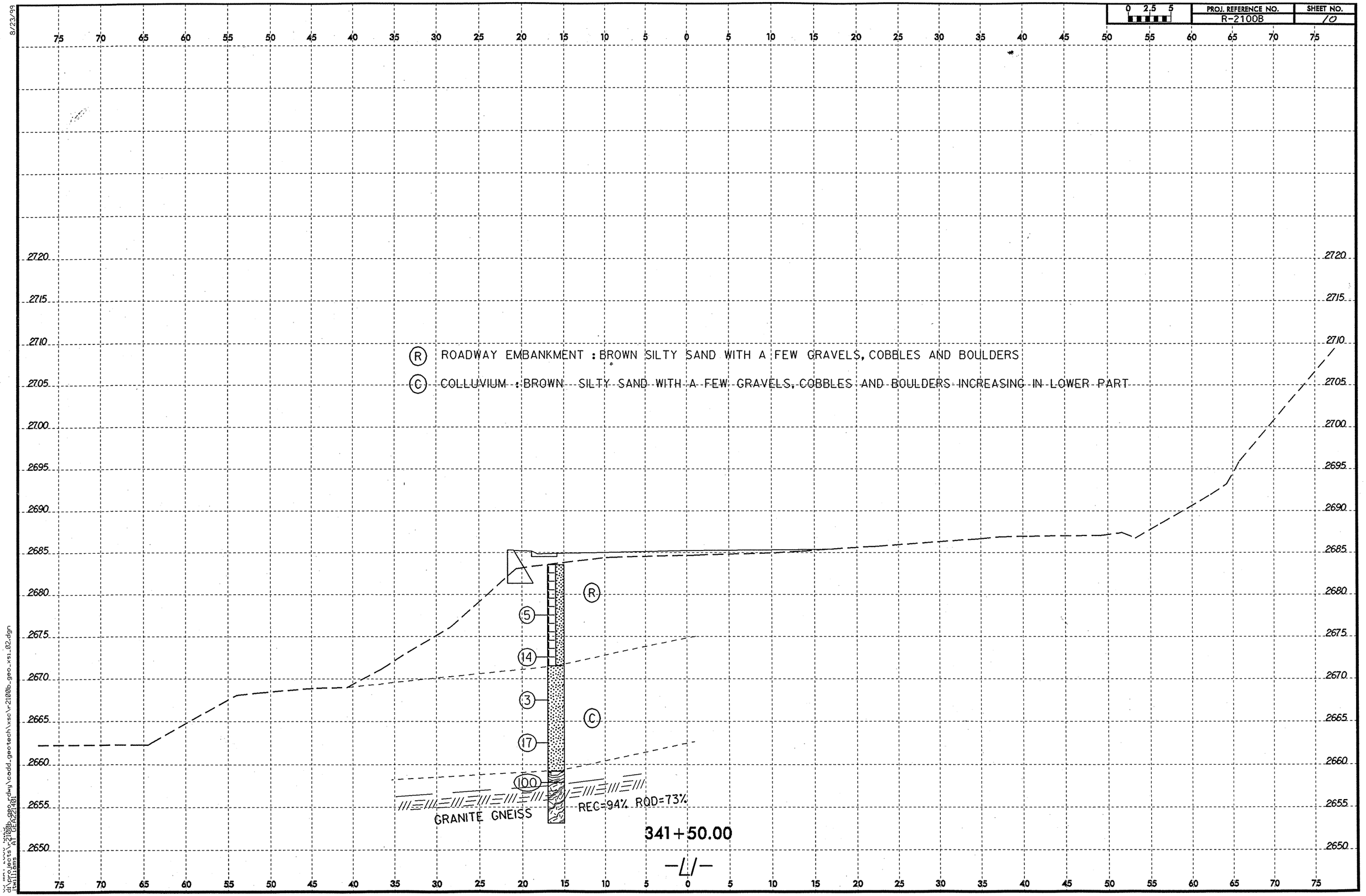

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C COLLUVIUM : BROWN SILTY SAND WITH A FEW GRAVELS, COBBLES AND BOULDERS INCREASING IN LOWER PART
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GRANITE GNEISS
REC=94% RQD=73%
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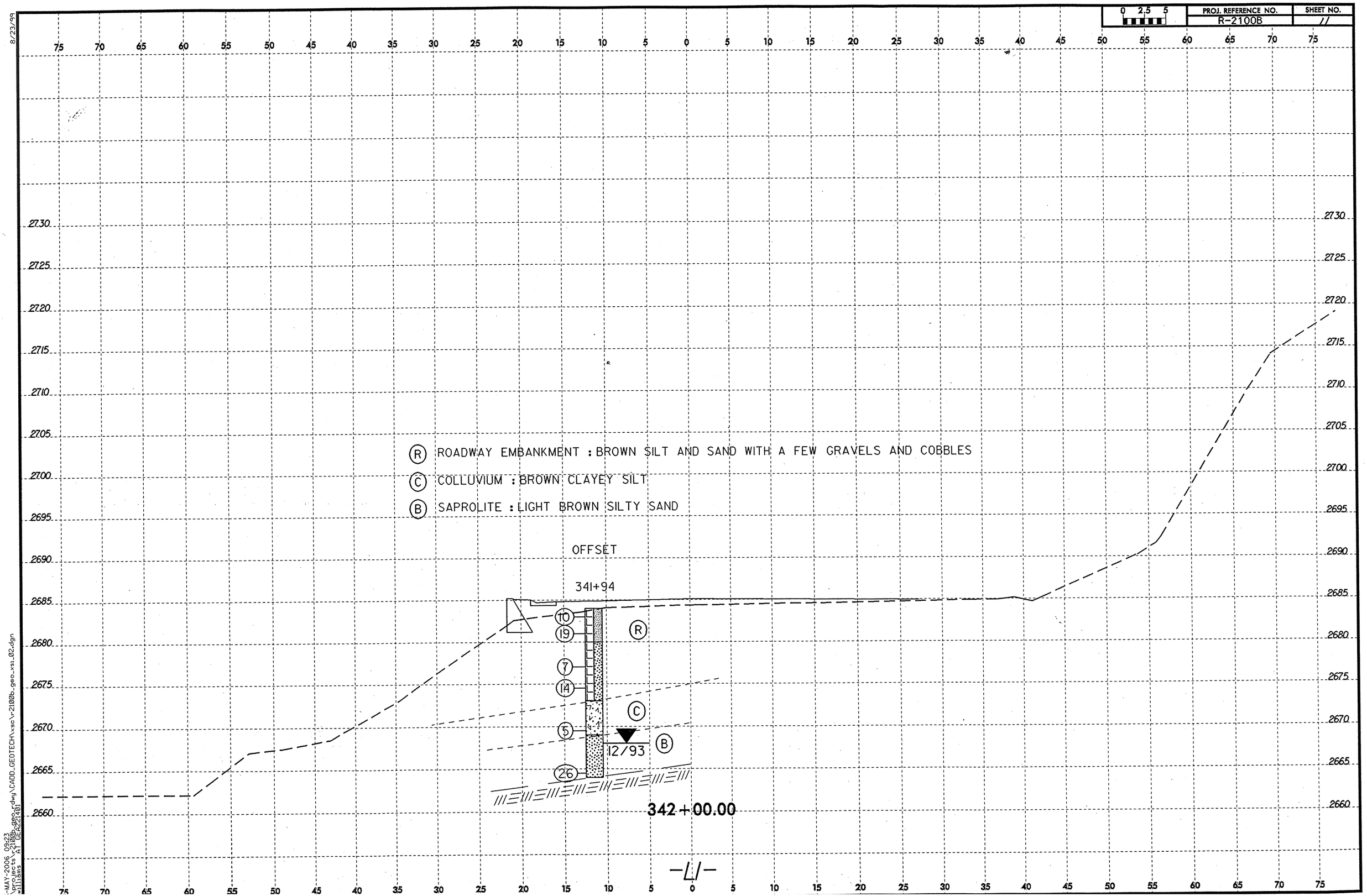


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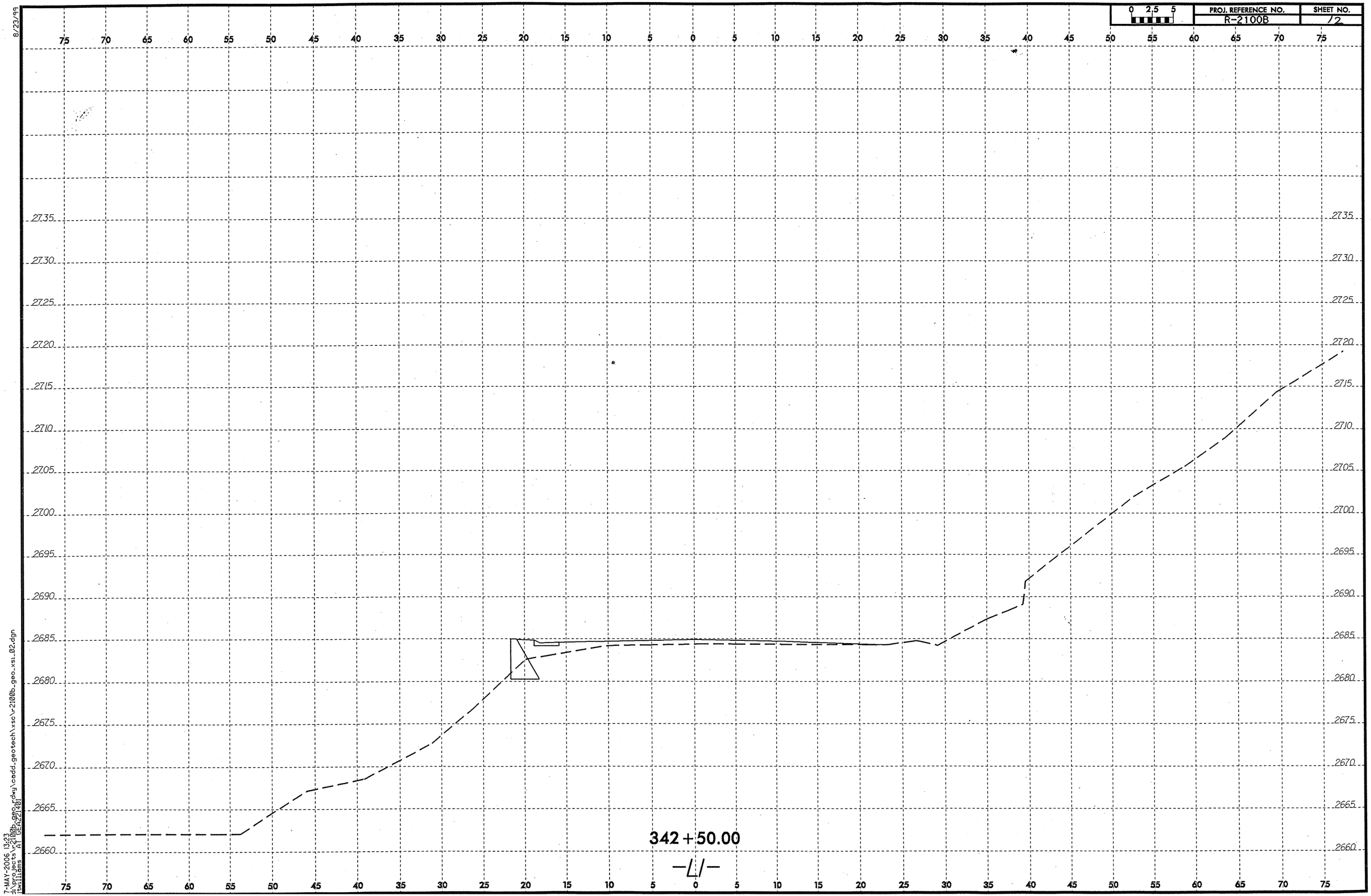

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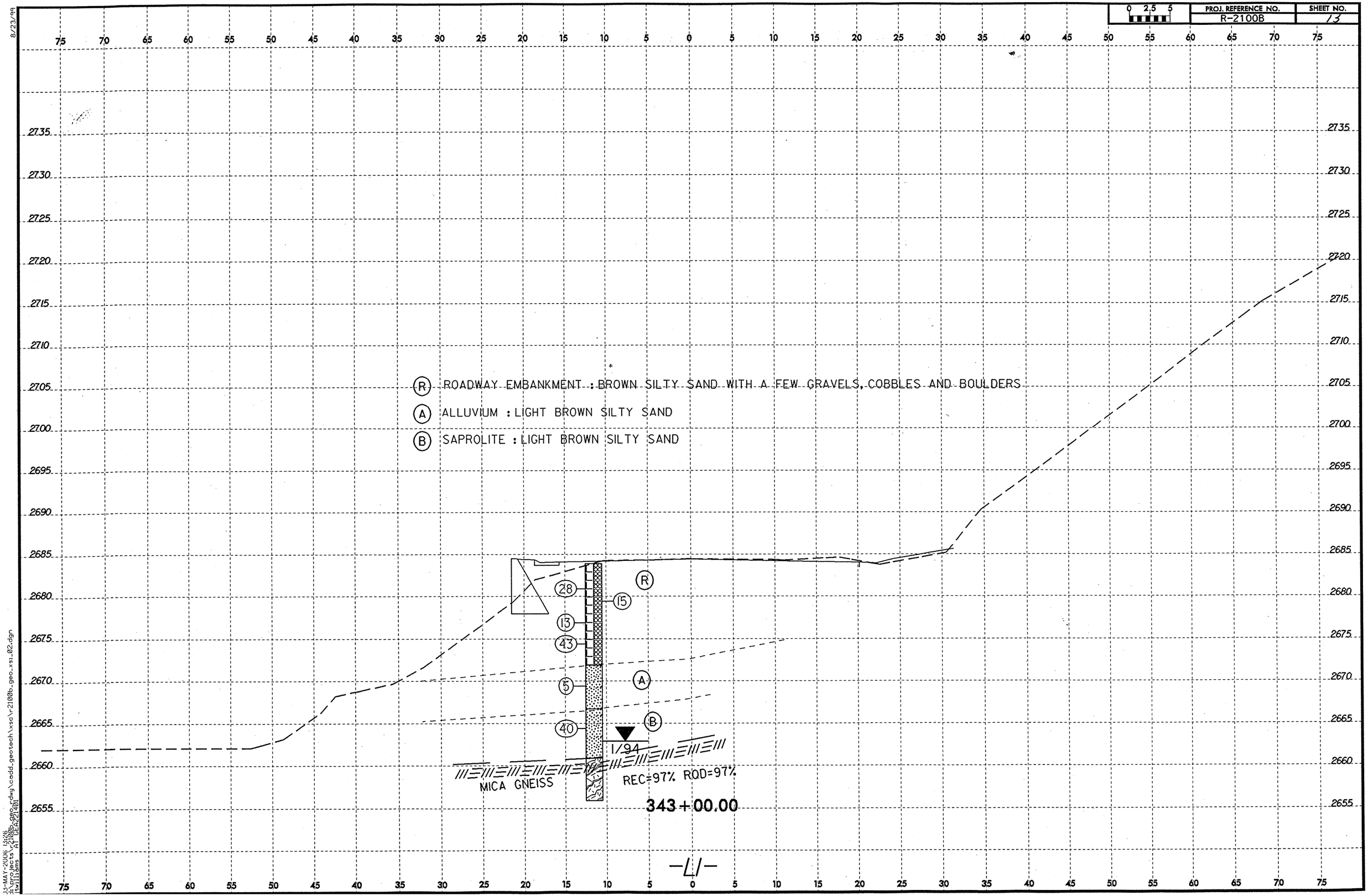


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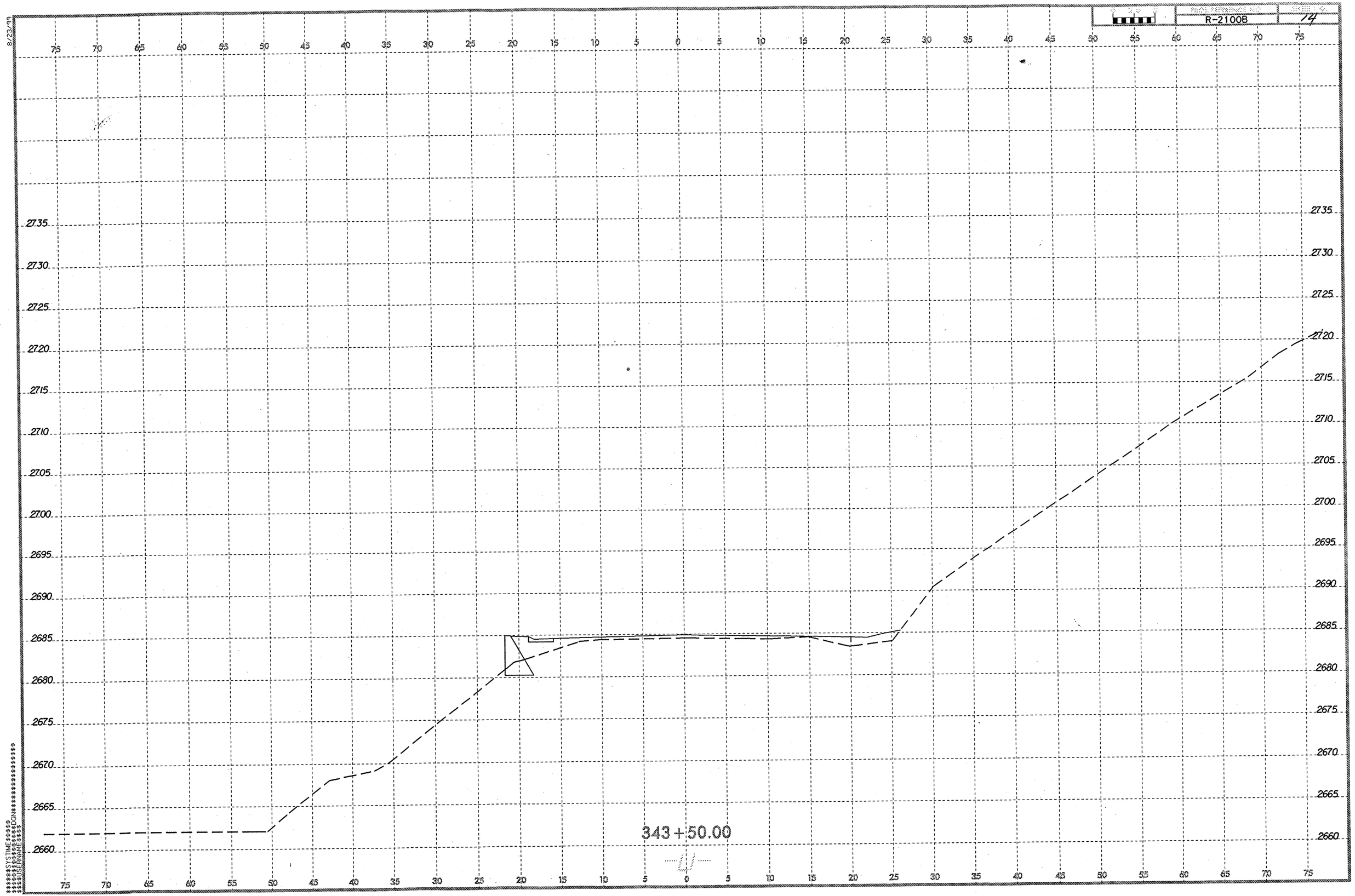
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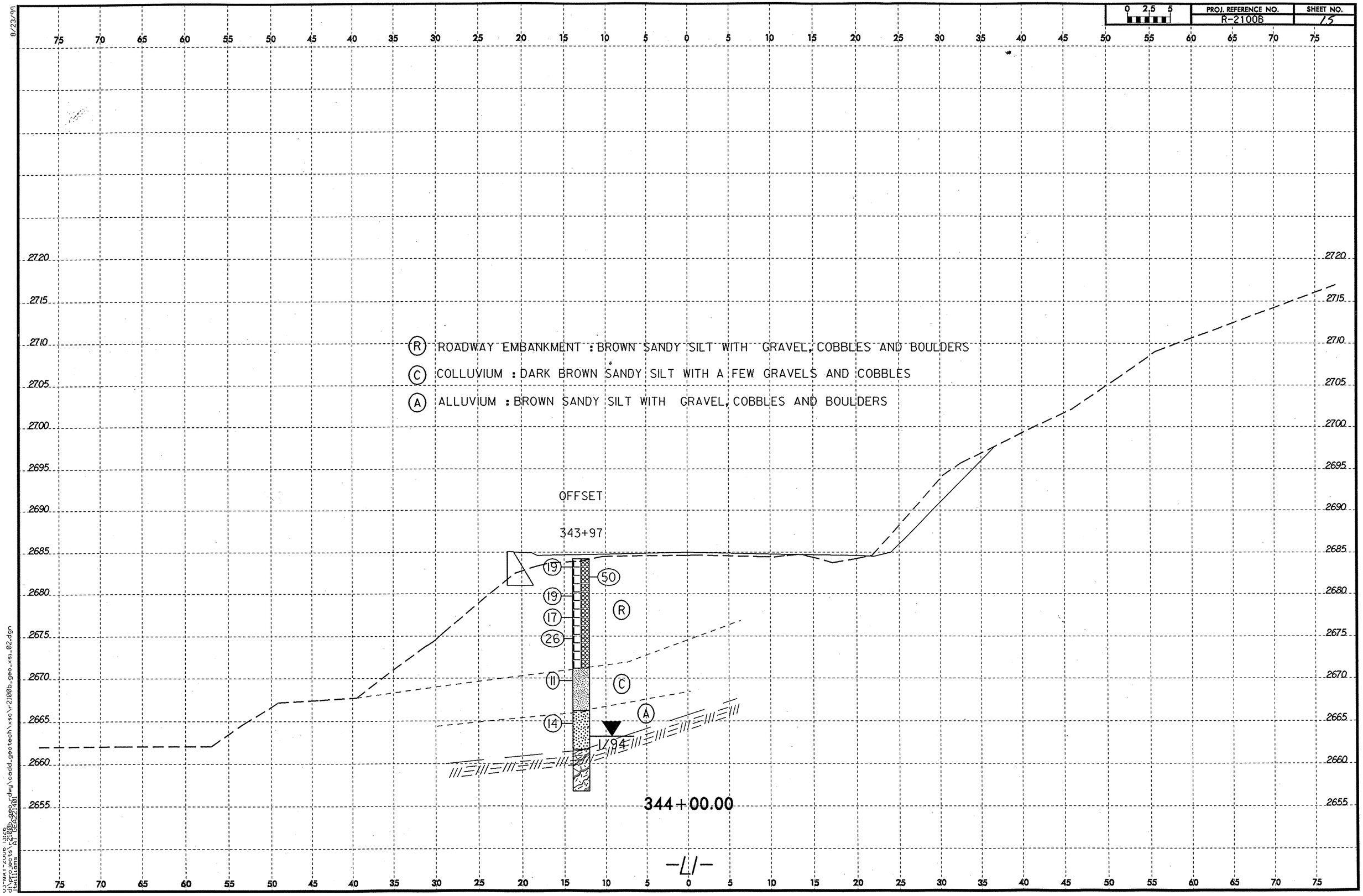

PROJ. REFERENCE NO.
R-2100B
SHEET NO.
15
0 2.5 5
R ROADWAY EMBANKMENT : BROWN SANDY SILT WITH GRAVEL, COBBLES AND BOULDERS
C COLLUVIUM : DARK BROWN SANDY SILT WITH A FEW GRAVELS AND COBBLES
A ALLUVIUM : BROWN SANDY SILT WITH GRAVEL, COBBLES AND BOULDERS
OFFSET
343+97
19
50
19
17
26
11
14
R
C
A
1/94
344+00.00
-L1-
2720
2715
2710
2705
2700
2695
2690
2685
2680
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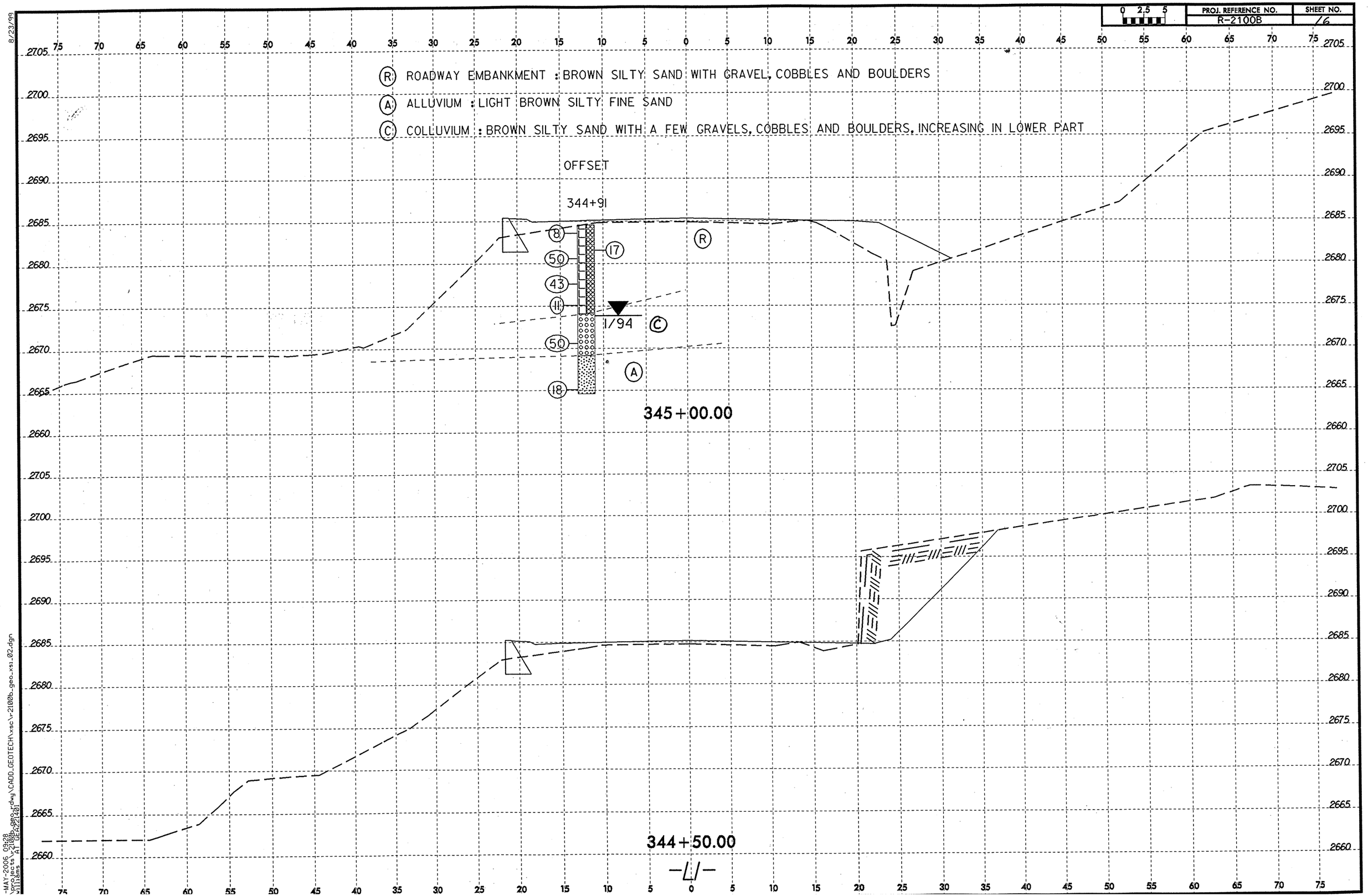
2670
2665
2660
2655
75 70 65 60 55 50 45 40 35 30 25 20 15 10 5 0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75

| PROJ. REFERENCE NO. | SHEET NO. |
|---|---|
| R-2100B | 16 |

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Williams AT GEA22140

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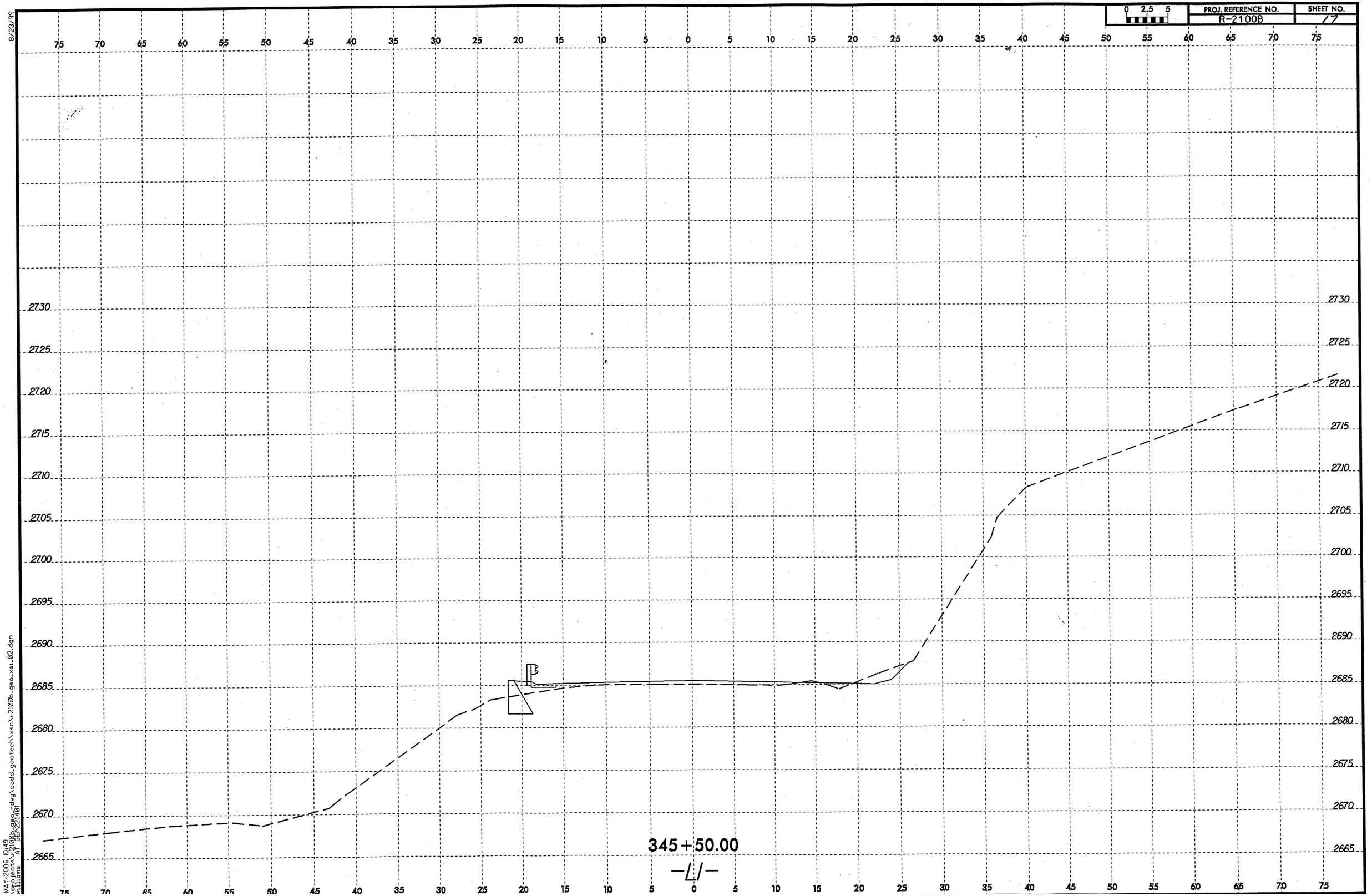
| 0 2.5 5 | PROJ. REFERENCE NO. | SHEET NO. |
|---|---|---|
| | R-2100B | 17 |

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Williams
A1 GEA221401

# NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
## GEOTECHNICAL UNIT BORING LOG

| | | | |
|---|---|---|---|
| **PROJECT NO** 34369.1.1 | **ID** R-2100B | **COUNTY** ASHE | **GEOLOGIST** D. CHITTENDEN (F&H) |
| **SITE DESCRIPTION** NC 16 FROM SOUTHEAST OF SR 1158 TO SOUTHEAST OF NC 88 | | | **GND WATER** |
| **BORING NO** 33950L | **NORTHING** 0.00 | **EASTING** 0.00 | **0 HR** N/A |
| **ALIGNMENT** -L- | **BORING LOCATION** 339+50.000 | **OFFSET** 15.00ft LT | **24 HR** N/A |
| **COLLAR ELEV** 2685.00ft | **TOTAL DEPTH** 17.30ft | **START DATE** 7/28/05 | **COMPLETION DATE** 07/28/05 |
| **DRILL MACHINE** CME-45 | **DRILL METHOD** ROTARY W/O MUD | | **HAMMER TYPE** AUTOMATIC |
| **SURFACE WATER DEPTH** N/A | **DEPTH TO ROCK** 17.30ft | | Log 33950L, Page 1 of 1 |

| ELEV | DEPTH | BLOW CT 6in | BLOW CT 6in | BLOW CT 6in | PEN (ft) | BLOWS PER FOOT 0 25 50 75 100 | SAMPLE NO | MOI | LOG | SOIL AND ROCK DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|
| 2685.00 | | | | | | Ground Surface | | | | |
| 2680.00 | 4.80 | 2 | 2 | 2 | 1.0 | 4 | SS-552 | | | EMBANKMENT: BROWN AND GRAY SANDY SILT WITH ROCK FRAGMENTS |
| | 9.80 | 4 | 2 | 2 | 1.0 | 4 | SS-553 | | | COLLUVIUM: BROWN SANDY SILT WITH ROCK FRAGMENTS |
| 2670.00 | 14.80 | 3 | 5 | 6 | 1.0 | 11 | SS-554 | | | SAPROLITE: BROWN ORANGE SILTY SAND |
| 2667.70 | | | | | | | | | | WEATHERED ROCK |
| | | | | | | TERMINATED BORING ON HARD ROCK AT ELEVATION 2667.7 FEET. | | | | |

# NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
## GEOTECHNICAL UNIT BORING LOG

| | | | |
|---|---|---|---|
| **PROJECT NO** 34369.1.1 | **ID** R-2100B | **COUNTY** ASHE | **GEOLOGIST** D. CHITTENDEN (F&H) |
| **SITE DESCRIPTION** NC 16 FROM SOUTHEAST OF SR 1158 TO SOUTHEAST OF NC 88 | | | **GND WATER** |
| **BORING NO** 34000L | **NORTHING** 0.00 | **EASTING** 0.00 | **0 HR** N/A |
| **ALIGNMENT** -L- | **BORING LOCATION** 340+00.000 | **OFFSET** 11.00ft LT | **24 HR** N/A |
| **COLLAR ELEV** 2685.00ft | **TOTAL DEPTH** 28.50ft | **START DATE** 7/28/05 | **COMPLETION DATE** 07/28/05 |
| **DRILL MACHINE** CME-45 | **DRILL METHOD** SPT CORE BORING | | **HAMMER TYPE** AUTOMATIC |
| **SURFACE WATER DEPTH** N/A | **DEPTH TO ROCK** 23.50ft | | Log 34000L, Page 1 of 1 |

| ELEV | DEPTH | BLOW CT 6in | BLOW CT 6in | BLOW CT 6in | PEN (ft) | BLOWS PER FOOT 0 25 50 75 100 | SAMPLE NO | MOI | LOG | SOIL AND ROCK DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|
| 2685.00 | | | | | | Ground Surface | | | | |
| 2680.00 | 5.00 | 3 | 4 | 5 | 1.0 | 9 | | | | EMBANKMENT: BROWN GRAY SILTY SAND WITH ROCK FRAGMENTS |
| | 10.00 | 2 | 1 | 2 | 1.0 | 3 | SS-549 | | | COLLUVIUM: BROWN SANDY SILT WITH ROCK FRAGMENTS |
| 2670.00 | 15.00 | 3 | 7 | 6 | 1.0 | 13 | SS-550 | | | COLLUVIUM: BROWN SILTY SAND WITH ROCK FRAGMENTS |
| | 20.00 | 100 | | | 0.4 | 100 | RUN 1 | | | WEATHERED ROCK |
| 2660.00 | | | | | | | | | | HARD ROCK: SLI. TO MOD. WEATHERED MICA GNEISS REC=96 RQD=50 |
| 2656.50 | | | | | | TERMINATED BORING IN HARD ROCK AT ELEVATION 2656.5 FEET. | | | | |

# NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
## GEOTECHNICAL UNIT BORING LOG

| | | | |
|---|---|---|---|
| **PROJECT NO** 34369.1.1 | **ID** R-2100B | **COUNTY** ASHE | **GEOLOGIST** D. CHITTENDEN (F&H) |
| **SITE DESCRIPTION** NC 16 FROM SOUTHEAST OF SR 1158 TO SOUTHEAST OF NC 88 | | | **GND WATER** |
| **BORING NO** 34050L | **NORTHING** 0.00 | **EASTING** 0.00 | **0 HR** N/A |
| **ALIGNMENT** -L- | **BORING LOCATION** 340+50.000 | **OFFSET** 12.00ft LT | **24 HR** N/A |
| **COLLAR ELEV** 2684.50ft | **TOTAL DEPTH** 18.90ft | **START DATE** 7/27/05 | **COMPLETION DATE** 07/27/05 |
| **DRILL MACHINE** CME-45 | **DRILL METHOD** ROTARY W/O MUD | | **HAMMER TYPE** AUTOMATIC |
| **SURFACE WATER DEPTH** N/A | **DEPTH TO ROCK** 18.90ft | | **Log 34050L, Page 1 of 1** |

| ELEV | DEPTH | BLOW CT 6in | BLOW CT 6in | BLOW CT 6in | PEN (ft) | BLOWS PER FOOT 0 25 50 75 100 | SAMPLE NO | MOI | LOG | SOIL AND ROCK DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|
| 2684.50 | | | | | | Ground Surface | | | | |
| 2680.00 | 5.00 | 4 | 5 | 5 | 1.0 | 10 | | | | EMBANKMENT: BROWN SILTY SAND WITH ROCK FRAGMENTS |
| | 10.00 | 8 | 5 | 4 | 1.0 | 9 | | | | COLLUVIUM: BROWN GRAY SILTY SAND WITH ROCK FRAGMENTS |
| 2670.00 | 15.00 | 1 | 2 | 5 | 1.0 | 7 | SS-542 | | | |
| 2665.60 | 18.90 | 100 | | | 0.0 | 100 | | | | COLLUVIUM: BROWN GRAY SILTY SAND AND ROCK FRAGMENTS |
| | | | | | | TERMINATED BORING ON HARD ROCK AT ELEVATION 2665.6 FEET. | | | | WEATHERED ROCK |

# NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
## GEOTECHNICAL UNIT BORING LOG

| | | | |
|---|---|---|---|
| **PROJECT NO** 34369.1.1 | **ID** R-2100B | **COUNTY** ASHE | **GEOLOGIST** D. CHITTENDEN (F&H) |
| **SITE DESCRIPTION** NC 16 FROM SOUTHEAST OF SR 1158 TO SOUTHEAST OF NC 88 | | | **GND WATER** |
| **BORING NO** 34100L | **NORTHING** 0.00 | **EASTING** 0.00 | **0 HR** N/A |
| **ALIGNMENT** -L- | **BORING LOCATION** 341+00.000 | **OFFSET** 15.00ft LT | **24 HR** N/A |
| **COLLAR ELEV** 2683.80ft | **TOTAL DEPTH** 25.60ft | **START DATE** 7/27/05 | **COMPLETION DATE** 07/27/05 |
| **DRILL MACHINE** CME-45 | **DRILL METHOD** ROTARY W/O MUD | | **HAMMER TYPE** AUTOMATIC |
| **SURFACE WATER DEPTH** | **DEPTH TO ROCK** N/A | | **Log 34100L, Page 1 of 1** |

| ELEV | DEPTH | BLOW CT 6in | BLOW CT 6in | BLOW CT 6in | PEN (ft) | BLOWS PER FOOT 0 25 50 75 100 | SAMPLE NO | MOI | LOG | SOIL AND ROCK DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|
| 2683.80 | | | | | | Ground Surface | | | | |
| 2680.00 | 5.00 | 2 | 1 | 1 | 1.0 | 2 | SS-537 | | | EMBANKMENT: BROWN AND GRAY SILTY SAND WITH ROCK FRAGMENTS |
| | 10.00 | 2 | 3 | 5 | 1.0 | 8 | | | | |
| 2670.00 | 15.00 | 2 | 3 | 6 | 1.0 | 9 | SS-539 | | | COLLUVIUM: BROWN SANDY SILT WITH ROCK FRAGMENTS AND A FEW BOULDERS |
| | 20.00 | 17 | 17 | 18 | 1.0 | 35 | SS-540 | | | |
| 2660.00 | | | | | | | | | | WEATHERED ROCK |
| 2658.20 | 25.00 | 64 | 36 | | 0.6 | 100 | | | | |
| | | | | | | TERMINATED BORING IN WEATHERED ROCK AT ELEVATION 2658.2 FEET. | | | | |

# NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
## GEOTECHNICAL UNIT BORING LOG

| | | | |
|---|---|---|---|
| PROJECT NO 34369.1.1 | ID R-2100B | COUNTY ASHE | GEOLOGIST D. CHITTENDEN (F&H) |
| SITE DESCRIPTION NC 16 FROM SOUTHEAST OF SR 1158 TO SOUTHEAST OF NC 88 | | | GND WATER |
| BORING NO 34150L | NORTHING 0.00 | EASTING 0.00 | 0 HR N/A |
| ALIGNMENT -L- | BORING LOCATION 341+50.000 | OFFSET 16.00ft LT | 24 HR N/A |
| COLLAR ELEV 2683.50ft | TOTAL DEPTH 30.40ft | START DATE 7/27/05 | COMPLETION DATE 07/27/05 |
| DRILL MACHINE CME-45 | DRILL METHOD SPT CORE BORING | | HAMMER TYPE AUTOMATIC |
| SURFACE WATER DEPTH N/A | DEPTH TO ROCK 26.60ft | | Log 34150L, Page 1 of 1 |

| ELEV | DEPTH | BLOW CT 6in | BLOW CT 6in | BLOW CT 6in | PEN (ft) | BLOWS PER FOOT 0 25 50 75 100 | SAMPLE NO | MOI | LOG | SOIL AND ROCK DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|
| 2683.50 | | | | | | Ground Surface | | | | |
| 2680.00 | 5.00 | 2 | 2 | 3 | 1.0 | 5 | SS-532 | | | EMBANKMENT: BROWN GRAY SILTY SAND WITH ROCK FRAGMENTS |
| | 10.00 | 4 | 5 | 9 | 1.0 | 14 | SS-533 | | | |
| 2670.00 | 15.00 | 0 | 1 | 2 | 1.0 | 3 | SS-534 | | | COLLUVIUM: BROWN SILTY SAND WITH ROCK FRAGMENTS AND A FEW BOULDERS |
| | 20.00 | 4 | 6 | 11 | 1.0 | 7 | SS-535 | | | |
| 2660.00 | 25.00 | 55 | 45 | | 0.6 | 100 | RUN 1 | | | WEATHERED ROCK<br>HARD ROCK: MOD. WEATHERED GRANITE GNEISS REC=94 RQD=73 |
| 2653.10 | | | | | | TERMINATED BORING IN HARD ROCK AT ELEVATION 2653.1 FEET. | | | | |

20

# NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
## GEOTECHNICAL UNIT BORING LOG

| | | | |
|---|---|---|---|
| PROJECT NO 8.1710902 | ID R-2100 | COUNTY ASHE | GEOLOGIST K. GAY |
| SITE DESCRIPTION RETAINING WALL FOR NC16 FROM JEFFERSON TO WILKES CO (RW #13) | | | GND WATER |
| BORING NO 341+94LT | NORTHING 0.00 | EASTING 0.00 | 0 HR N/A |
| ALIGNMENT 341+94LT | BORING LOCATION 341+94.000 | OFFSET 11.50ft LT | 24 HR 16.00ft |
| COLLAR ELEV 2684.00ft | TOTAL DEPTH 20.00ft | START DATE 12/16/93 | COMPLETION DATE 12/16/93 |
| DRILL MACHINE CME-550 | DRILL METHOD H.S. AUGERS | | HAMMER TYPE AUTOMATIC |
| SURFACE WATER DEPTH N/A | DEPTH TO ROCK N/A | | Log 341+94LT, Page 1 of 1 |

| ELEV | DEPTH | BLOW CT 6in | BLOW CT 6in | BLOW CT 6in | PEN (ft) | BLOWS PER FOOT 0 25 50 75 100 | SAMPLE NO | MOI | LOG | SOIL AND ROCK DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|
| 2684.00 | 0.00 | 2 | 4 | 6 | 1.0 | Ground Surface | | | | |
| 2680.00 | 2.00 | 6 | 8 | 11 | 1.0 | 10 19 | | D | | ROADWAY FILL BROWN FINE SANDY MICACEOUS SILT WITH BOULDERS. (A-4) |
| | 6.00 | 4 | 3 | 4 | 1.0 | 7 | | | | ROADWAY FILL BROWN SILTY VERY FINE SAND WITH MICA AND ROCK FRAGMENTS (A-2-4) |
| | 8.50 | 3 | 7 | 7 | 1.0 | 14 | | | | |
| 2670.00 | 13.50 | 3 | 2 | 3 | 1.0 | 5 | | ▼ | | COLLUVIUM BROWN CLAYEY SILT |
| 2664.00 | 18.50 | 7 | 9 | 17 | 1.0 | 26 | | | | LIGHTLY TAN SILTY VERY FINE SAND WITH MICA AND ROCK STUCTURE (A-2-4) |
| | | | | | | BORING TERMINATED AT ELEVATION 2664.0 FEET ON CRYSTALLINE ROCK | | | | |

# NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
## GEOTECHNICAL UNIT BORING LOG

| | | | |
|---|---|---|---|
| PROJECT NO 8.1710902 | ID R-2100 | COUNTY ASHE | GEOLOGIST K. GAY |
| SITE DESCRIPTION RETAINING WALL FOR NC16 FROM JEFFERSON TO WILKES CO (RW #15) | | | GND WATER |
| BORING NO 343+00LT | NORTHING 0.00 | EASTING 0.00 | 0 HR N/A |
| ALIGNMENT 343+00LT | BORING LOCATION 343+00.000 | OFFSET 11.50ft LT | 24 HR 21.00ft |
| COLLAR ELEV 2683.90ft | TOTAL DEPTH 28.00ft | START DATE 1/23/94 | COMPLETION DATE 01/23/94 |
| DRILL MACHINE CME-550 | DRILL METHOD H.S. AUGERS | | HAMMER TYPE AUTOMATIC |
| SURFACE WATER DEPTH | DEPTH TO ROCK N/A | | Log 343+00LT, Page 1 of 1 |

| ELEV | DEPTH | BLOW CT 6in | 6in | 6in | PEN (ft) | BLOWS PER FOOT 0 25 50 75 100 | SAMPLE NO | MOI | LOG | SOIL AND ROCK DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|
| 2683.90 | | | | | | Ground Surface | | | | |
| 2680.00 | 2.00 | 7 | 8 | 20 | 1.0 | 28 | | | | ROADWAY FILL BROWN SANDY SILT WITH MICA, SOFT WEATHERED ROCK FRAGMENTS AND BOULDERS. (A-4) |
| | 3.50 | 5 | 8 | 7 | 1.0 | 15 | | | | |
| | 6.00 | 9 | 6 | 7 | 1.0 | 13 | | D | | |
| | 8.50 | 7 | 22 | 21 | 1.0 | 43 | | | | |
| 2670.00 | 13.50 | 2 | 2 | 3 | 1.0 | 5 | | | | ALLUVIUM TAN SILTY VERY FINE SAND WITH MICA (A-2-4) |
| | 18.50 | 11 | 19 | 21 | 1.0 | 40 | | | | ALLUVIUM TAN SILTY VERY FINE SAND WITH MICA (A-2-4) |
| 2660.00 | | | | | | | RUN 1 | | | CRYSTALLINE ROCK REC=97% RQD=97% BIOTITE GNEISS SLIGHTLY WEATHERD HARD GRAY WITH ABUNDANT PARING ALONG FOLIATION. |
| 2655.90 | | | | | | CORING TERMINATED AT ELEVATION 2655.9 FEET IN GNEISS. | | | | |

# NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
## GEOTECHNICAL UNIT BORING LOG

| | | | |
|---|---|---|---|
| PROJECT NO 8.1710902 | ID R-2100 | COUNTY ASHE | GEOLOGIST K. GAY |
| SITE DESCRIPTION RETAINING WALL FOR NC16 FROM JEFFERSON TO WILKES CO (RW #15) | | | GND WATER |
| BORING NO 343+97LT | NORTHING 0.00 | EASTING 0.00 | 0 HR N/A |
| ALIGNMENT 343+97LT | BORING LOCATION 343+97.000 | OFFSET 13.00ft LT | 24 HR 21.00ft |
| COLLAR ELEV 2684.20ft | TOTAL DEPTH 27.50ft | START DATE 1/22/94 | COMPLETION DATE 01/22/94 |
| DRILL MACHINE CME-550 | DRILL METHOD H.S. AUGERS | | HAMMER TYPE AUTOMATIC |
| SURFACE WATER DEPTH N/A | DEPTH TO ROCK N/A | | Log 343+97LT, Page 1 of 1 |

| ELEV | DEPTH | BLOW CT 6in | 6in | 6in | PEN (ft) | BLOWS PER FOOT 0 25 50 75 100 | SAMPLE NO | MOI | LOG | SOIL AND ROCK DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|
| 2684.20 | 0.00 | 11 | 12 | 7 | 1.0 | Ground Surface | | | | |
| 2680.00 | 2.00 | 15 | 50 | 0 | 0.2 | 10 50 | | | | ROADWAY FILL BROWN SANDY SILT WITH MICA , ROOTS AND BOULDERS |
| | 3.50 | 20 | 10 | 9 | 1.0 | 19 | | | | |
| | 6.00 | 12 | 8 | 9 | 1.0 | 7 | | | | |
| | 8.50 | 8 | 12 | 14 | 1.0 | 26 | | | | |
| 2670.00 | 13.50 | 8 | 4 | 7 | 1.0 | 11 | | | | COLLUVIUM BROWN SANDY SILT WITH MICA AND ROOTS (A-4) |
| | 18.50 | 4 | 5 | 9 | 1.0 | 14 | | D | | ALLUVIUM TAN SILTY FINE SAND WITH MICA (A-2-4) |
| 2660.00 | | | | | | | RUN 1 | D | | CRYSTALLINE ROCK REC=97% RQD=97% BIOTITE GMEISS FRESH HARD GRAY WITH QUARTZ VEINS. |
| 2656.70 | | | | | | CORING TERMINATED AT ELEVATION 2656.7 FEET IN GNEISS. | | | | |

# NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
## GEOTECHNICAL UNIT BORING LOG

| | | | |
|---|---|---|---|
| **PROJECT NO** 8.1710902 | **ID** R-2100 | **COUNTY** ASHE | **GEOLOGIST** K. GAY |
| **SITE DESCRIPTION** RETAINING WALL FOR NC16 FROM JEFFERSON TO WILKES CO (RW #15) | | | **GND WATER** |
| **BORING NO** 344+91LT | **NORTHING** 0.00 | **EASTING** 0.00 | **0 HR** N/A |
| **ALIGNMENT** 344+91LT | **BORING LOCATION** 344+91.000 | **OFFSET** 12.00ft LT | **24 HR** 10.75ft |
| **COLLAR ELEV** 2684.60ft | **TOTAL DEPTH** 20.00ft | **START DATE** 12/16/93 | **COMPLETION DATE** 12/16/93 |
| **DRILL MACHINE** CME-550 | **DRILL METHOD** H.S. AUGERS | | **HAMMER TYPE** AUTOMATIC |
| **SURFACE WATER DEPTH** N/A | **DEPTH TO ROCK** N/A | | **Log 344+91LT, Page 1 of 1** |

| ELEV | DEPTH | BLOW CT 6in | BLOW CT 6in | BLOW CT 6in | PEN (ft) | BLOWS PER FOOT (0 25 50 75 100) | SAMPLE NO | MOI | LOG | SOIL AND ROCK DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|
| 2684.60 | 0.00 | 2 | 3 | 5 | 1.0 | Ground Surface | | | | |
| | 2.00 | 10 | 8 | 9 | 1.0 | 8 17 | | | | ROADWAY FILL BROWN SANDY MICACEOUS SILT WITH BOULDERS |
| 2680.00 | 3.50 | 0 | 50 | 0 | 0.5 | 50 | | D | | |
| | 6.00 | 10 | 20 | 23 | 1.0 | 43 | | | | |
| | 8.50 | 20 | 7 | 4 | 1.0 | 11 | | D | | |
| | | | | | | | | ▼ | | COLLUVIUM BROWN SANDY MICACEOUS SILT WITH GRAVEL COBBLES AND BOULDERS INCREASING IN LOWER PART |
| 2670.00 | 13.50 | 10 | 50 | 0 | 0.5 | 50 | | D | | |
| | 18.50 | 6 | 6 | 12 | 1.0 | 18 | | D | | ALLUVIUM TAN SILTY MICACEOUS VERY FINE SAND (A-2-4) |
| 2664.60 | | | | | | BORING TERMINATED AT ELEVATION 2664.6 IN SAND | | | | |

JCS

# NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
## DIVISION OF HIGHWAYS-MATERIALS AND TESTS UNIT
## SOILS TEST REPORT-SOILS LABORATORY

| | |
|---|---|
| T.I.P. ID #: | R-2100B |

| | |
|---|---|
| REPORT ON SAMPLES OF: | Soils for Classification |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| PROJECT: | 34369.1.1 | COUNTY: | Ashe | Owner: | -- | | |
| DATE SAMPLED: | 8.05 | DATE RECEIVED: | 8.19.05 | DATE REPORTED: | 8.29.05 | | |
| SAMPLED FROM: | Roadway | SAMPLED BY: | L. L. Acker | | | | |
| SUBMITTED BY: | W. D. Frye | 2002 | STANDARD SPECIFICATION | | | | |
| LABORATORY: | Asheville | | | | | | |

### TEST RESULTS

| Project Sample No. | SS-7 | SS-8 | SS-10 | SS-11 | SS-13 | SS-14 | SS-532 | SS-533 |
|---|---|---|---|---|---|---|---|---|
| Lab Sample No. A | 150061 | 150062 | 150063 | 150064 | 150065 | 150066 | 150067 | 150068 |
| HiCAMS Sample # | -- | -- | -- | -- | -- | -- | -- | -- |
| Retained #4 Sieve % | -- | -- | -- | -- | -- | -- | -- | -- |
| Passing #10 Sieve % | 59 | 49 | 77 | 58 | 56 | 34 | 72 | 70 |
| Passing #40 Sieve % | 50 | 40 | 69 | 47 | 38 | 28 | 59 | 62 |
| Passing #200 Sieve % | 24 | 15 | 39 | 18 | 21 | 15 | 19 | 27 |

### MINUS #10 FRACTION

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Soil Mortar - 100% | | | | | | | | |
| Coarse Sand -Ret. #60 | 26 | 31 | 20 | 26 | 32 | 27 | 27 | 24 |
| Fine Sand - Ret. #270 | 41 | 47 | 36 | 51 | 41 | 36 | 54 | 48 |
| Silt 0.05-0.005 mm % | 21 | 20 | 28 | 19 | 25 | 25 | 15 | 20 |
| Clay < 0.005 mm % | 12 | 2 | 16 | 4 | 2 | 12 | 4 | 8 |
| Passing # 40 Sieve % | -- | -- | -- | -- | -- | -- | -- | -- |
| Passing # 200 Sieve % | -- | -- | -- | -- | -- | -- | -- | -- |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Liquid Limit | 32 | 31 | 32 | 30 | 33 | 35 | 31 | 28 |
| Plastic Index | NP | NP | NP | NP | NP | NP | NP | NP |
| AASHTO Classification | A-1-b (0) | A-1-b (0) | A-4 (1) | A-2-4 (0) | A-1-b (0) | A-1-a (0) | A-2-4 (0) | A-2-4 (0) |
| Quantity | | | | | | | | |
| Texture | | | | | | | | |
| Station | 300+50 | 300+50 | 301+50 | 301+50 | 302+50 | 303+50 | 341+50 | 341+50 |
| Hole No. | | | | | | | | |
| Depth (ft) From: | 1.7 | 4.8 | 0.8 | 5.4 | 5.2 | 1.8 | 5.0 | 10.0 |
| To: | 3.2 | 6.3 | 2.3 | 6.9 | 6.7 | 3.3 | 6.5 | 11.5 |
| | | | | | | | | |

**Remarks:**

A-150061 - 150068

**CC:**

| | |
|---|---|
| L. L. Acker | |
| File | |
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|---|---|
| SOILS ENGINEER: | |





JCS

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS-MATERIALS AND TESTS UNIT
SOILS TEST REPORT-SOILS LABORATORY

| | |
|---|---|
| T.I.P. ID #: | R-2100B |

| | |
|---|---|
| REPORT ON SAMPLES OF: | Soils for Classification |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| PROJECT: | 34369.1.1 (cont.) | COUNTY: | Ashe | Owner: | -- | | |
| DATE SAMPLED: | 8.05 | DATE RECEIVED: | 8.19.05 | DATE REPORTED: | 8.29.05 | | |
| SAMPLED FROM: | Roadway | SAMPLED BY: | L. L. Acker | | | | |
| SUBMITTED BY: | W. D. Frye | 2002 | STANDARD SPECIFICATION | | | | |
| LABORATORY: | Asheville | | | | | | |

### TEST RESULTS

| Project Sample No. | SS-534 | SS-535 | SS-537 | SS-539 | SS-540 | SS-544 | SS-545 | SS-546 |
|---|---|---|---|---|---|---|---|---|
| Lab Sample No. A | 150069 | 150070 | 150071 | 150072 | 150073 | 150074 | 150075 | 150076 |
| HiCAMS Sample # | -- | -- | -- | -- | -- | -- | -- | -- |
| Retained #4 Sieve % | -- | -- | -- | -- | -- | -- | -- | -- |
| Passing #10 Sieve % | 93 | 96 | 81 | 94 | 80 | 85 | 94 | 91 |
| Passing #40 Sieve % | 88 | 88 | 73 | 90 | 72 | 76 | 88 | 87 |
| Passing #200 Sieve % | 54 | 30 | 27 | 41 | 36 | 37 | 44 | 33 |

### MINUS #10 FRACTION

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Soil Mortar - 100% | | | | | | | | |
| Coarse Sand -Ret. #60 | 12 | 20 | 24 | 12 | 21 | 23 | 17 | 10 |
| Fine Sand - Ret. #270 | 38 | 57 | 51 | 54 | 42 | 40 | 44 | 62 |
| Silt 0.05-0.005 mm % | 32 | 19 | 19 | 24 | 23 | 23 | 25 | 20 |
| Clay < 0.005 mm % | 18 | 4 | 6 | 10 | 14 | 14 | 14 | 8 |
| Passing # 40 Sieve % | -- | -- | -- | -- | -- | -- | -- | -- |
| Passing # 200 Sieve % | -- | -- | -- | -- | -- | -- | -- | -- |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Liquid Limit | 41 | 32 | 34 | 39 | 30 | 33 | 33 | 31 |
| Plastic Index | NP | NP | NP | NP | NP | NP | NP | NP |
| AASHTO Classification | A-5 (4) | A-2-4 (0) | A-2-4 (0) | A-4 (1) | A-4 (0) | A-4 (1) | A-4 (2) | A-2-4 (0) |
| Quantity | | | | | | | | |
| Texture | | | | | | | | |
| Station | 341+50 | 341+50 | 341+00 | 341+00 | 341+00 | 352+50 | 352+50 | 352+50 |
| Hole No. | | | | | | | | |
| Depth (ft) From: | 15.0 | 20.0 | 5.0 | 15.0 | 20.0 | 1.5 | 9.7 | 14.8 |
| To: | 16.5 | 21.5 | 6.5 | 16.5 | 21.5 | 3.0 | 10.3 | 16.3 |
| | | | | | | | | |

**Remarks:**

A-150069 - 150076

**CC:**

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|---|---|
| L. L. Acker | |
| File | |
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|---|---|
| SOILS ENGINEER: | |

JCS

# NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
## DIVISION OF HIGHWAYS-MATERIALS AND TESTS UNIT
## SOILS TEST REPORT-SOILS LABORATORY

| | |
|---|---|
| T.I.P. ID #: | R-2100B |

| | |
|---|---|
| REPORT ON SAMPLES OF: | Soils for Classification |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| PROJECT: | 34369.1.1 (cont.) | COUNTY: | Ashe | Owner: | -- | | |
| DATE SAMPLED: | 8.05 | DATE RECEIVED: | 8.19.05 | DATE REPORTED: | 8.29.05 | | |
| SAMPLED FROM: | Roadway | SAMPLED BY: | L. L. Acker | | | | |
| SUBMITTED BY: | W. D. Frye | 2002 | STANDARD SPECIFICATION | | | | |
| LABORATORY: | Asheville | | | | | | |

### TEST RESULTS

| Project Sample No. | SS-547 | SS-549 | SS-550 | SS-552 | SS-553 | SS-554 | SS-555 | SS-556 |
|---|---|---|---|---|---|---|---|---|
| Lab Sample No. A | 150077 | 150078 | 150079 | 150080 | 150081 | 150082 | 150083 | 150084 |
| HiCAMS Sample # | -- | -- | -- | -- | -- | -- | -- | -- |
| Retained #4 Sieve % | -- | -- | -- | -- | -- | -- | -- | -- |
| Passing #10 Sieve % | 85 | 88 | 67 | 79 | 94 | 90 | 41 | 39 |
| Passing #40 Sieve % | 74 | 82 | 59 | 71 | 88 | 81 | 32 | 28 |
| Passing #200 Sieve % | 21 | 45 | 25 | 37 | 49 | 28 | 13 | 8 |

### MINUS #10 FRACTION

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Soil Mortar - 100% | | | | | | | | |
| Coarse Sand -Ret. #60 | 28 | 18 | 17 | 21 | 17 | 25 | 34 | 42 |
| Fine Sand - Ret. #270 | 60 | 38 | 54 | 40 | 38 | 35 | 43 | 43 |
| Silt 0.05-0.005 mm % | 12 | 28 | 21 | 23 | 31 | 17 | 19 | 15 |
| Clay < 0.005 mm % | 0 | 16 | 8 | 16 | 14 | 6 | 4 | 0 |
| Passing # 40 Sieve % | -- | -- | -- | -- | -- | -- | -- | -- |
| Passing # 200 Sieve % | -- | -- | -- | -- | -- | -- | -- | -- |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Liquid Limit | 46 | 34 | 32 | 32 | 34 | 37 | 25 | 29 |
| Plastic Index | NP | 4 | NP | NP | NP | NP | NP | NP |
| AASHTO Classification | A-2-5 (0) | A-4 (2) | A-2-4 (0) | A-4 (1) | A-4 (3) | A-2-4 (0) | A-1-b (0) | A-1-b (0) |
| Quantity | | | | | | | | |
| Texture | | | | | | | | |
| Station | 352+50 | 340+00 | 340+00 | 339+50 | 339+50 | 339+50 | 338+50 | 338+50 |
| Hole No. | | | | | | | | |
| Depth (ft) From: | 19.8 | 10.0 | 15.0 | 4.8 | 9.8 | 14.8 | 1.0 | 2.9 |
| To: | 21.3 | 11.5 | 16.5 | 6.3 | 11.3 | 16.3 | 2.5 | 4.4 |
| | | | | | | | | |

**Remarks:**

A-150077 - 150084

**CC:**

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|---|---|
| L. L. Acker | |
| File | |
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| SOILS ENGINEER: | |





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# NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
## DIVISION OF HIGHWAYS-MATERIALS AND TESTS UNIT
## SOILS TEST REPORT-SOILS LABORATORY

| | |
|---|---|
| T.I.P. ID #: | R2100B |

| | |
|---|---|
| REPORT ON SAMPLES OF: | SOILS FOR CLASSIFICATION |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| PROJECT: | 34369.1.1 | COUNTY: | ASHE | Owner: | -- | | |
| DATE SAMPLED: | 07/05 | DATE RECEIVED: | 08/19/05 | DATE REPORTED: | 08/30/05 | | |
| SAMPLED FROM: | ROADWAY | SAMPLED BY: | L.L. ACKER | | | | |
| SUBMITTED BY: | W.D. FRYE | 2002 | STANDARD SPECIFICATION | | | | |
| LABORATORY: | ASHEVILLE | | | | | | |

### TEST RESULTS

| Project Sample No. | SS-526 | SS-527 | SS-528 | SS-542 | SS-560 | SS-561 | SS-562 | SS-563 |
|---|---|---|---|---|---|---|---|---|
| Lab Sample No. A | 150095 | 150096 | 150097 | 150098 | 150099 | 150100 | 150101 | 150102 |
| HiCAMS Sample # | -- | -- | -- | -- | -- | -- | -- | -- |
| Retained #4 Sieve % | -- | -- | -- | -- | -- | -- | -- | -- |
| Passing #10 Sieve % | 38 | 85 | 54 | 48 | 65 | 62 | 63 | 72 |
| Passing #40 Sieve % | 32 | 80 | 48 | 40 | 60 | 57 | 56 | 65 |
| Passing #200 Sieve % | 20 | 51 | 30 | 13 | 35 | 27 | 18 | 31 |

### MINUS #10 FRACTION

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Soil Mortar - 100% | | | | | | | | |
| Coarse Sand -Ret. #60 | 21 | 10 | 17 | 24 | 19 | 20 | 27 | 20 |
| Fine Sand - Ret. #270 | 38 | 47 | 40 | 56 | 34 | 44 | 53 | 47 |
| Silt 0.05-0.005 mm % | 33 | 35 | 29 | 16 | 31 | 24 | 18 | 19 |
| Clay < 0.005 mm % | 8 | 8 | 14 | 4 | 16 | 12 | 2 | 14 |
| Passing # 40 Sieve % | -- | -- | -- | -- | -- | -- | -- | -- |
| Passing # 200 Sieve % | -- | -- | -- | -- | -- | -- | -- | -- |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Liquid Limit | 25 | 39 | 43 | 29 | 35 | 33 | 32 | 40 |
| Plastic Index | NP | NP | NP | NP | 4 | NP | NP | NP |
| AASHTO Classification | A-1-b(0) | A-4(3) | A-1-b(0) | A-1-b(0) | A-2-4(0) | A-2-4(0) | A-2-4(0) | A-2-4(0) |
| Quantity | | | | | | | | |
| Texture | | | | | | | | |
| Station | 369+65 | 369+65 | 369+65 | 340+50 | 340+00 | 340+00 | 340+00 | 324+00 |
| Hole No. | | | | | | | | |
| Depth (ft) From: | 1.0 | 3.7 | 8.7 | 15.0 | 2.5 | 5.0 | 10.0 | 2.5 |
| To: | 2.5 | 5.2 | 10.2 | 16.5 | 4.0 | 6.5 | 11.5 | 4.0 |
| | | | | | | | | |

**Remarks:**

A150095-150102

**CC:**

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|---|---|
| L.L. ACKER | |
| FILE | |
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| SOILS ENGINEER: | |

| STATE | STATE PROJECT REFERENCE NO. | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|
| N.C. | R2100B | 1 | 14 |

# STATE OF NORTH CAROLINA
## DEPARTMENT OF TRANSPORTATION
## DIVISION OF HIGHWAYS
## GEOTECHNICAL ENGINEERING UNIT

# STRUCTURE SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. R2100B F.A. PROJ. STP-16(1)

COUNTY ASHE

PROJECT DESCRIPTION NC 16 FROM SOUTHEAST OF SR 1158 TO SOUTHEAST OF NC 88

SITE DESCRIPTION RETAINING WALL FROM STA. 352+50 TO STA. 354+50 (LEFT) ON NC 16

## CONTENTS


| SHEET | DESCRIPTION |
|---|---|
| 1 | TITLE SHEET |
| 2 | LEGEND |
| 3 | SITE PLAN |
| 4 | PROFILE |
| 5 - 9 | CROSS SECTION(S) |
| 10 - 12 | BORE LOG & CORE REPORT(S) |
| 13 - 14 | SOIL TEST RESULTS |


## CAUTION NOTICE

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WERE MADE FOR THE PURPOSE OF STUDY, PLANNING, AND DESIGN, AND NOT FOR CONSTRUCTION OR PAY PURPOSES. THE VARIOUS FIELD BORING LOGS, ROCK CORES, AND SOIL TEST DATA AVAILABLE MAY BE REVIEWED OR INSPECTED IN RALEIGH BY CONTACTING THE N. C. DEPARTMENT OF TRANSPORTATION, GEOTECHNICAL ENGINEERING UNIT AT (919) 250-4088. NEITHER THE SUBSURFACE PLANS AND REPORTS, NOR THE FIELD BORING LOGS, ROCK CORES, OR SOIL TEST DATA ARE PART OF THE CONTRACT.

GENERAL SOIL AND ROCK STRATA DESCRIPTIONS AND INDICATED BOUNDARIES ARE BASED ON A GEOTECHNICAL INTERPRETATION OF ALL AVAILABLE SUBSURFACE DATA AND MAY NOT NECESSARILY REFLECT THE ACTUAL SUBSURFACE CONDITIONS BETWEEN BORINGS OR BETWEEN SAMPLED STRATA WITHIN THE BOREHOLE. THE LABORATORY SAMPLE DATA AND THE IN SITU (IN-PLACE) TEST DATA CAN BE RELIED ON ONLY TO THE DEGREE OF RELIABILITY INHERENT IN THE STANDARD TEST METHOD. THE OBSERVED WATER LEVELS OR SOIL MOISTURE CONDITIONS INDICATED IN THE SUBSURFACE INVESTIGATIONS ARE AS RECORDED AT THE TIME OF THE INVESTIGATION. THESE WATER LEVELS OR SOIL MOISTURE CONDITIONS MAY VARY CONSIDERABLY WITH TIME ACCORDING TO CLIMATIC CONDITIONS INCLUDING TEMPERATURES, PRECIPITATION, AND WIND, AS WELL AS OTHER NON-CLIMATIC FACTORS.

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PERSONNEL

F & H ENGINEERING

INVESTIGATED BY L.L. ACKER

CHECKED BY W.D. FRYE

SUBMITTED BY W.D. FRYE

DATE 6/8/06

NORTH CAROLINA LICENSED SEAL 1007 GEOLOGIST LOUIS L. ACKER

06/08/06

DRAWN BY: J. T. WILLIAMS

NOTE - THE INFORMATION CONTAINED HEREIN IS NOT IMPLIED OR GUARANTEED BY THE N. C. DEPARTMENT OF TRANSPORTATION AS BEING ACCURATE NOR IT IS CONSIDERED TO BE PART OF THE PLANS, SPECIFICATIONS, OR CONTRACT FOR THE PROJECT.

NOTE - BY HAVING REQUESTED THIS INFORMATION THE CONTRACTOR SPECIFICALLY WAIVES ANY CLAIMS FOR INCREASED COMPENSATION OR EXTENSION OF TIME BASED ON DIFFERENCES BETWEEN THE CONDITIONS INDICATED HEREIN AND THE ACTUAL CONDITIONS AT THE PROJECT SITE.

PROJECT: 34369.1.1

ID: R2100B

| PROJECT REFERENCE NO. | SHEET NO. |
|---|---|
| R2100B | 2 |

# NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
## DIVISION OF HIGHWAYS
## GEOTECHNICAL ENGINEERING UNIT

# SUBSURFACE INVESTIGATION

### SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

## SOIL DESCRIPTION

SOIL IS CONSIDERED TO BE THE UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER, AND YIELD LESS THAN 100 BLOWS PER FOOT ACCORDING TO STANDARD PENETRATION TEST (AASHTO T206, ASTM D-1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY SHALL INCLUDE: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. EXAMPLE:

*VERY STIFF, GRAY, SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6*

## SOIL LEGEND AND AASHTO CLASSIFICATION

| GENERAL CLASS. | GRANULAR MATERIALS (≤ 35% PASSING #200) | | | | | | | SILT-CLAY MATERIALS (> 35% PASSING #200) | | | | ORGANIC MATERIALS | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GROUP CLASS. | A-1 | | A-3 | A-2 | | | | A-4 | A-5 | A-6 | A-7 | A-1, A-2 A-3 | A-4, A-5 A-6, A-7 | |
| | A-1-a | A-1-b | | A-2-4 | A-2-5 | A-2-6 | A-2-7 | | | | A-7-5 A-7-6 | | | |
| SYMBOL | | | | | | | | | | | | | | |
| % PASSING # 10 | 50 MX | | | | | | | | | | | GRANULAR SOILS | SILT-CLAY SOILS | MUCK, PEAT |
| # 40 | 30 MX | 50 MX | 51 MN | | | | | | | | | | | |
| # 200 | 15 MX | 25 MX | 10 MX | 35 MX | 35 MX | 35 MX | 35 MX | 36 MN | 36 MN | 36 MN | 36 MN | | | |
| LIQUID LIMIT | 6 MX | | NP | 40 MX | 41 MN | 40 MX | 41 MN | 40 MX | 41 MN | 40 MX | 41 MN | SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER | | HIGHLY ORGANIC SOILS |
| PLASTIC INDEX | | | | 10 MX | 10 MX | 11 MN | 11 MN | 10 MX | 10 MX | 11 MN | 11 MN | | | |
| GROUP INDEX | 0 | | 0 | 0 | | 4 MX | | 8 MX | 12 MX | 16 MX | No MX | | | |
| USUAL TYPES OF MAJOR MATERIALS | STONE FRAGS. GRAVEL, AND SAND | | FINE SAND | SILTY OR CLAYEY GRAVEL AND SAND | | | | SILTY SOILS | | CLAYEY SOILS | | | | |
| GEN. RATING AS A SUBGRADE | EXCELLENT TO GOOD | | | | | | | FAIR TO POOR | | | | FAIR TO POOR | POOR | UNSUITABLE |

PI OF A-7-5 SUBGROUP IS ≤ LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30

## CONSISTENCY OR DENSENESS

| PRIMARY SOIL TYPE | COMPACTNESS OR CONSISTENCY | RANGE OF STANDARD PENETRATION RESISTENCE (N-VALUE) | RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT$^2$) |
|---|---|---|---|
| GENERALLY GRANULAR MATERIAL (NON-COHESIVE) | VERY LOOSE<br>LOOSE<br>MEDIUM DENSE<br>DENSE<br>VERY DENSE | <4<br>4 TO 10<br>10 TO 30<br>30 TO 50<br>>50 | N/A |
| GENERALLY SILT-CLAY MATERIAL (COHESIVE) | VERY SOFT<br>SOFT<br>MEDIUM STIFF<br>STIFF<br>VERY STIFF<br>HARD | <2<br>2 TO 4<br>4 TO 8<br>8 TO 15<br>15 TO 30<br>>30 | <0.25<br>0.25 TO 0.50<br>0.5 TO 1.0<br>1 TO 2<br>2 TO 4<br>>4 |

## TEXTURE OR GRAIN SIZE

| U.S. STD. SIEVE SIZE | 4 | 10 | 40 | 60 | 200 | 270 |
|---|---|---|---|---|---|---|
| OPENING (MM) | 4.76 | 2.00 | 0.42 | 0.25 | 0.075 | 0.053 |

| BOULDER (BLDR.) | COBBLE (COB.) | GRAVEL (GR.) | COARSE SAND (CSE. SD.) | FINE SAND (F SD.) | SILT (SL.) | CLAY (CL.) |
|---|---|---|---|---|---|---|

GRAIN SIZE MM: 305 | 75 | 2.0 | 0.25 | 0.05 | 0.005
GRAIN SIZE IN.: 12 | 3

## SOIL MOISTURE - CORRELATION OF TERMS

| SOIL MOISTURE SCALE (ATTERBERG LIMITS) | FIELD MOISTURE DESCRIPTION | GUIDE FOR FIELD MOISTURE DESCRIPTION |
|---|---|---|
| | - SATURATED - (SAT.) | USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE |
| LL — LIQUID LIMIT<br>PLASTIC RANGE (PI)<br>PL — PLASTIC LIMIT | - WET - (W) | SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE |
| OM — OPTIMUM MOISTURE<br>SL — SHRINKAGE LIMIT | - MOIST - (M) | SOLID; AT OR NEAR OPTIMUM MOISTURE |
| | - DRY - (D) | REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE |

## PLASTICITY

| | PLASTICITY INDEX (PI) | DRY STRENGTH |
|---|---|---|
| NONPLASTIC | 0-5 | VERY LOW |
| LOW PLASTICITY | 6-15 | SLIGHT |
| MED. PLASTICITY | 16-25 | MEDIUM |
| HIGH PLASTICITY | 26 OR MORE | HIGH |

## COLOR

DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY). MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.

## GRADATION

WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE.
UNIFORM - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. (ALSO POORLY GRADED)
GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLES OF TWO OR MORE SIZES.

## ANGULARITY OF GRAINS

THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.

## MINERALOGICAL COMPOSITION

MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE.

## COMPRESSIBILITY

| | |
|---|---|
| SLIGHTLY COMPRESSIBLE | LIQUID LIMIT LESS THAN 31 |
| MODERATELY COMPRESSIBLE | LIQUID LIMIT EQUAL TO 31-50 |
| HIGHLY COMPRESSIBLE | LIQUID LIMIT GREATER THAN 50 |

## PERCENTAGE OF MATERIAL

| ORGANIC MATERIAL | GRANULAR SOILS | SILT - CLAY SOILS | OTHER MATERIAL | |
|---|---|---|---|---|
| TRACE OF ORGANIC MATTER | 2 - 3% | 3 - 5% | TRACE | 1 - 10% |
| LITTLE ORGANIC MATTER | 3 - 5% | 5 - 12% | LITTLE | 10 - 20% |
| MODERATELY ORGANIC | 5 - 10% | 12 - 20% | SOME | 20 - 35% |
| HIGHLY ORGANIC | >10% | >20% | HIGHLY | 35% AND ABOVE |

## GROUND WATER

- WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING
- STATIC WATER LEVEL AFTER 24 HOURS
- PW PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA
- SPRING OR SEEP

## MISCELLANEOUS SYMBOLS

- ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION
- SOIL SYMBOL
- ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT
- INFERRED SOIL BOUNDARY
- INFERRED ROCK LINE
- ALLUVIAL SOIL BOUNDARY
- 25/025 DIP & DIP DIRECTION OF ROCK STRUCTURES
- SOUNDING ROD
- SPT CPT DPT DMT VST PMT TEST BORING
- AUGER BORING
- CORE BORING
- MW MONITORING WELL
- PIEZOMETER INSTALLATION
- SLOPE INDICATOR INSTALLATION
- SPT N-VALUE
- REF SPT REFUSAL

SAMPLE DESIGNATIONS
S - BULK SAMPLE
SS - SPLIT SPOON SAMPLE
ST - SHELBY TUBE SAMPLE
RS - ROCK SAMPLE
RT - RECOMPACTED TRIAXIAL SAMPLE
CBR - CALIFORNIA BEARING RATIO SAMPLE

## ABBREVIATIONS

AR - AUGER REFUSAL
BT - BORING TERMINATED
CL. - CLAY
CPT - CONE PENETRATION TEST
CSE. - COARSE
DMT - DILATOMETER TEST
DPT - DYNAMIC PENETRATION TEST
e - VOID RATIO
F - FINE
FOSS. - FOSSILIFEROUS
FRAC. - FRACTURED, FRACTURES
FRAGS. - FRAGMENTS
HI. - HIGHLY
MED. - MEDIUM
MICA. - MICACEOUS
MOD. - MODERATELY
NP - NON PLASTIC
ORG. - ORGANIC
PMT - PRESSUREMETER TEST
SAP. - SAPROLITIC
SD. - SAND, SANDY
SL. - SILT, SILTY
SLI. - SLIGHTLY
TCR - TRICONE REFUSAL
w - MOISTURE CONTENT
V - VERY
VST - VANE SHEAR TEST
WEA. - WEATHERED
$\gamma$ - UNIT WEIGHT
$\gamma_d$ - DRY UNIT WEIGHT

## EQUIPMENT USED ON SUBJECT PROJECT

DRILL UNITS:
- [ ] MOBILE B-___
- [ ] BK-51
- [ ] CME-45C
- [X] CME-550
- [ ] PORTABLE HOIST
- [ ] _____
- [ ] _____

ADVANCING TOOLS:
- [ ] CLAY BITS
- [ ] 6" CONTINUOUS FLIGHT AUGER
- [X] 8" HOLLOW AUGERS
- [ ] HARD FACED FINGER BITS
- [ ] TUNG.-CARBIDE INSERTS
- [X] CASING [X] W/ ADVANCER
- [ ] TRICONE _____" STEEL TEETH
- [ ] TRICONE _____" TUNG.-CARB.
- [ ] CORE BIT
- [ ] _____

HAMMER TYPE:
- [X] AUTOMATIC
- [ ] MANUAL

CORE SIZE:
- [ ] -B_____
- [X] -N_____
- [ ] -H_____

HAND TOOLS:
- [ ] POST HOLE DIGGER
- [ ] HAND AUGER
- [ ] SOUNDING ROD
- [ ] VANE SHEAR TEST
- [ ] _____

## ROCK DESCRIPTION

HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT IF TESTED, WOULD YIELD SPT REFUSAL. AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS. IN NON-COASTAL PLAIN MATERIAL, THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK.
ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:

| | |
|---|---|
| WEATHERED ROCK (WR) | NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100 BLOWS PER FOOT IF TESTED. |
| CRYSTALLINE ROCK (CR) | FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC. |
| NON-CRYSTALLINE ROCK (NCR) | FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN SEDIMENTARY ROCK THAT WOULD YEILD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC. |
| COASTAL PLAIN SEDIMENTARY ROCK (CP) | COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC. |

## WEATHERING

| | |
|---|---|
| FRESH | ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER HAMMER IF CRYSTALLINE. |
| VERY SLIGHT (V SLI.) | ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN, CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF OF A CRYSTALLINE NATURE. |
| SLIGHT (SLI.) | ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS. |
| MODERATE (MOD.) | SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED WITH FRESH ROCK. |
| MODERATELY SEVERE (MOD. SEV.) | ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES "CLUNK" SOUND WHEN STRUCK. *IF TESTED, WOULD YIELD SPT REFUSAL* |
| SEVERE (SEV.) | ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. *IF TESTED, YIELDS SPT N VALUES > 100 BPF* |
| VERY SEVERE (V SEV.) | ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT THE MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE SUCH THAT ONLY MINOR VESTIGES OF THE ORIGINAL ROCK FABRIC REMAIN. *IF TESTED, YIELDS SPT N VALUES < 100 BPF* |
| COMPLETE | ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE. |

## ROCK HARDNESS

| | |
|---|---|
| VERY HARD | CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK. |
| HARD | CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN. |
| MODERATELY HARD | CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS. |
| MEDIUM HARD | CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PEICES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK. |
| SOFT | CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE. |
| VERY SOFT | CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNAIL. |

## FRACTURE SPACING

| TERM | SPACING |
|---|---|
| VERY WIDE | MORE THAN 10 FEET |
| WIDE | 3 TO 10 FEET |
| MODERATELY CLOSE | 1 TO 3 FEET |
| CLOSE | 0.16 TO 1 FEET |
| VERY CLOSE | LESS THAN 0.16 FEET |

## BEDDING

| TERM | THICKNESS |
|---|---|
| VERY THICKLY BEDDED | > 4 FEET |
| THICKLY BEDDED | 1.5 - 4 FEET |
| THINLY BEDDED | 0.16 - 1.5 FEET |
| VERY THINLY BEDDED | 0.03 - 0.16 FEET |
| THICKLY LAMINATED | 0.008 - 0.03 FEET |
| THINLY LAMINATED | < 0.008 FEET |

## INDURATION

FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF THE MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.

| | |
|---|---|
| FRIABLE | RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE. |
| MODERATELY INDURATED | GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER. |
| INDURATED | GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER. |
| EXTREMELY INDURATED | SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS. |

## TERMS AND DEFINITIONS

ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER.

AQUIFER - A WATER BEARING FORMATION OR STRATA.

ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND.

ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, AS SHALE, SLATE, ETC.

ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE.

CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.

COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE.

CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.

DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK.

DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL.

DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.

FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.

FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.

FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM PARENT MATERIAL.

FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.

FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD.

JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.

LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT.

LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.

MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.

PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM.

RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.

ROCK QUALITY DESIGNATION (RQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.

SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK.

SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS.

SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE.

STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N OR BPF) OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS.

STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.

STRATA ROCK QUALITY DESIGNATION (SRQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.

TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.

BENCH MARK: BM #5 - BYI- 6 + 04.57, 31.30 LT

ELEVATION: FT.

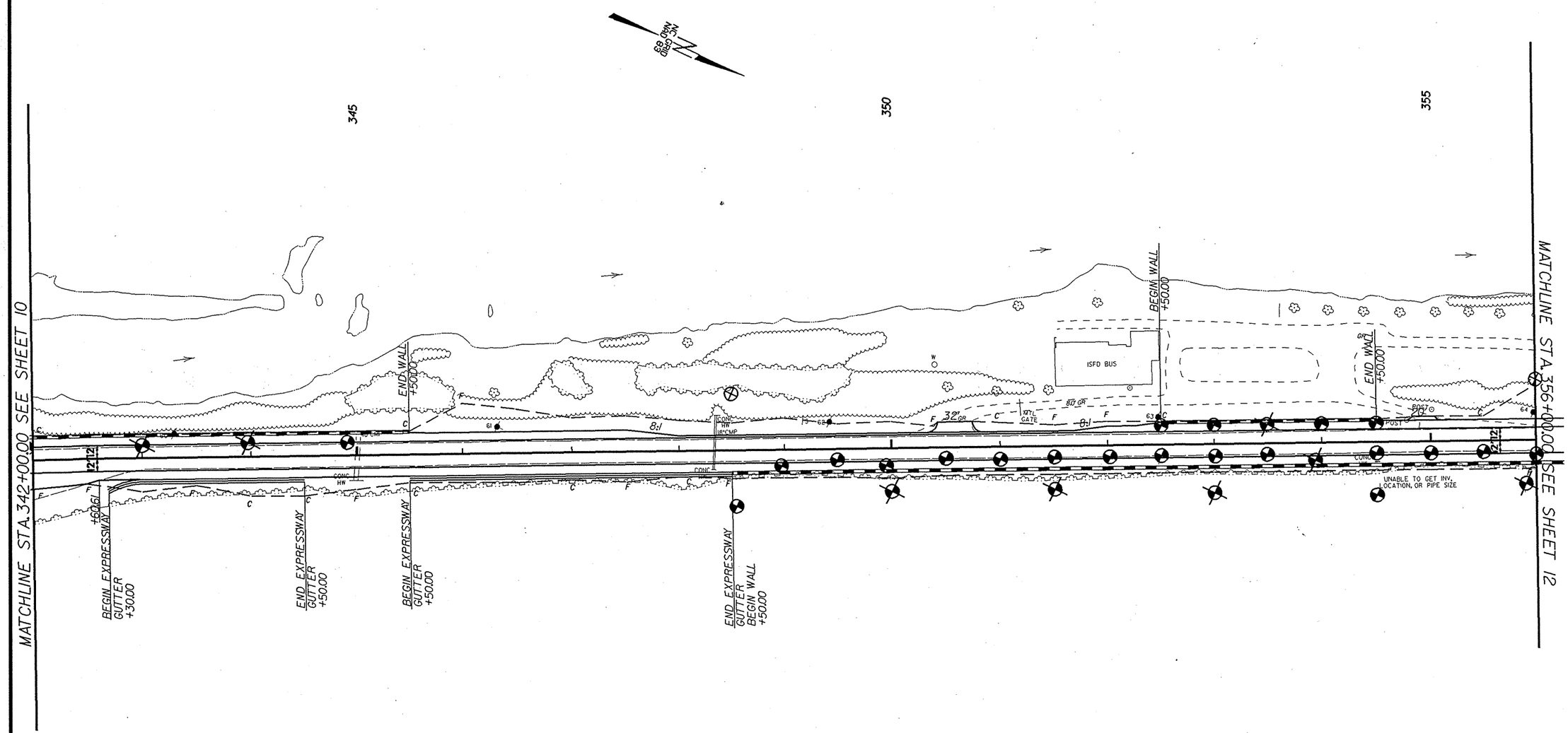
NOTES: FOR RETAINING WALL STA.352+50 TO 354+50 LT

EarthTech
A Tyco International Ltd. Company

| PROJECT REFERENCE NO. | SHEET NO. |
|---|---|
| R-2100B | 3 |
| R/W SHEET NO. | |
| ROADWAY DESIGN ENGINEER | HYDRAULICS ENGINEER |

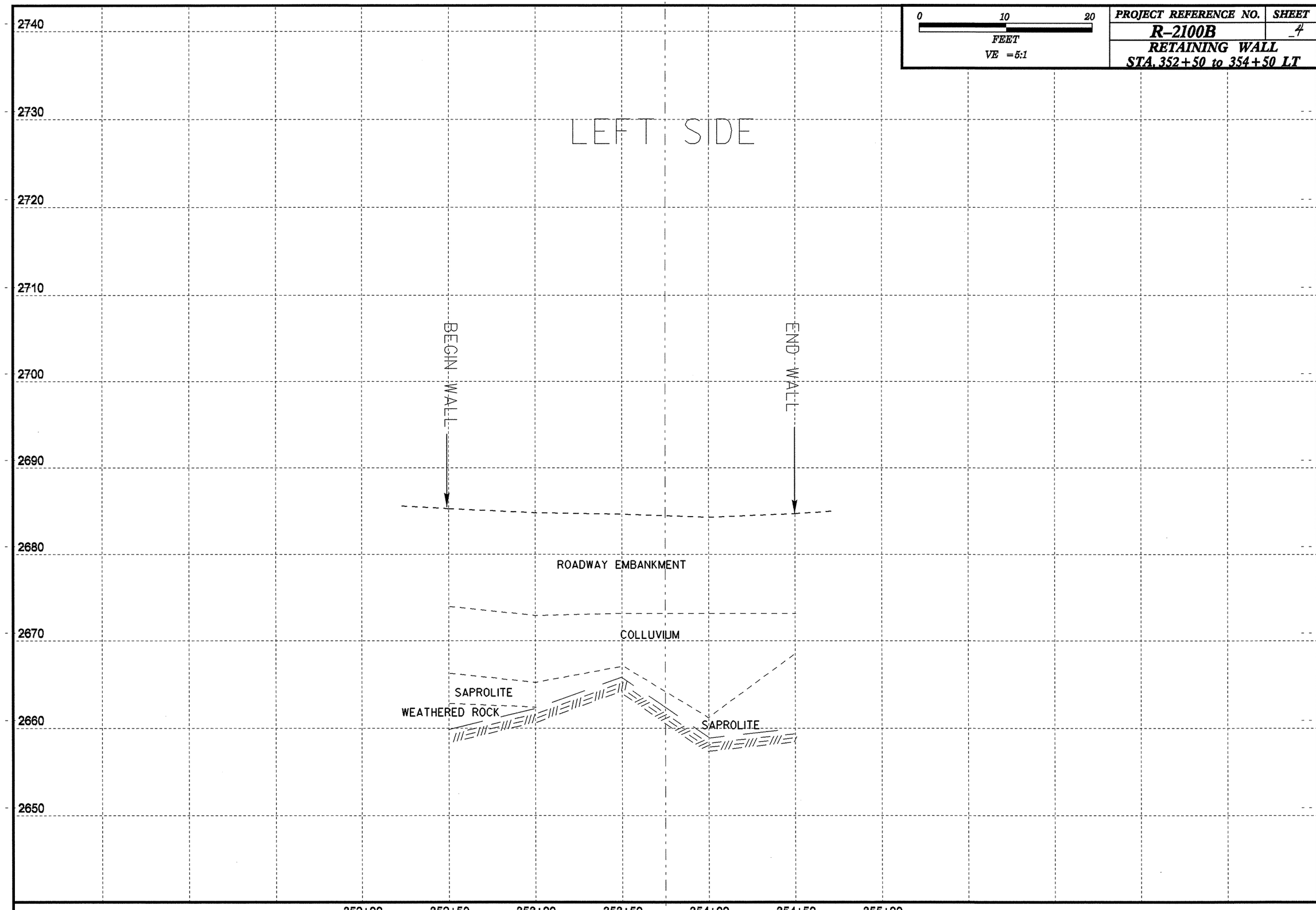
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION




FOR -L1- PROFILE SEE SHEETS 17 & 18

| PROJECT REFERENCE NO. | SHEET |
|---|---|
| R-2100B | 4 |
| RETAINING WALL STA. 352+50 to 354+50 LT | |



8/23/99

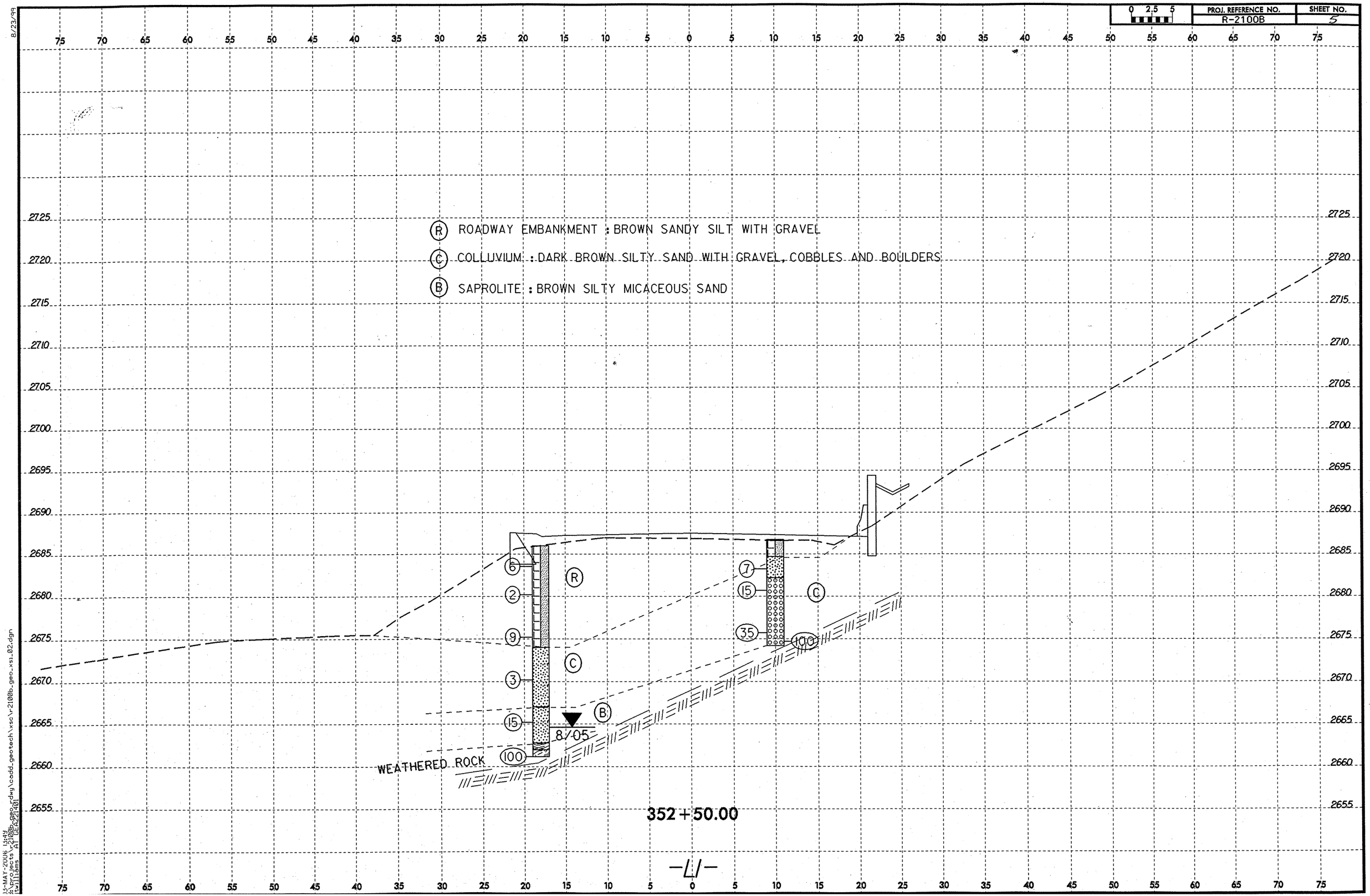
| PROJ. REFERENCE NO. | SHEET NO. |
|---|---|
| R-2100B | 5 |

0 2.5 5

(R) ROADWAY EMBANKMENT : BROWN SANDY SILT WITH GRAVEL

(C) COLLUVIUM : DARK BROWN SILTY SAND WITH GRAVEL, COBBLES AND BOULDERS

(B) SAPROLITE : BROWN SILTY MICACEOUS SAND

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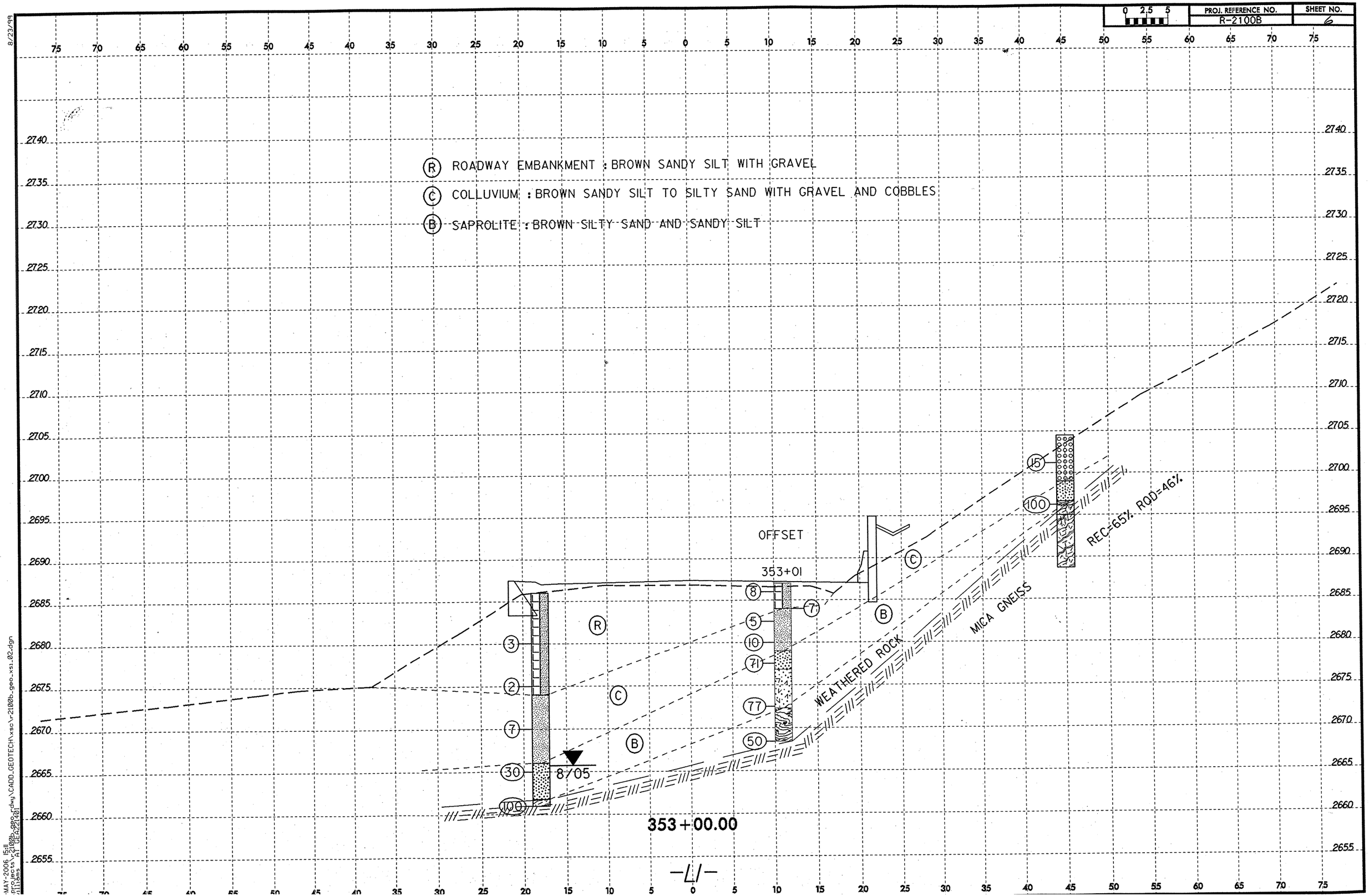
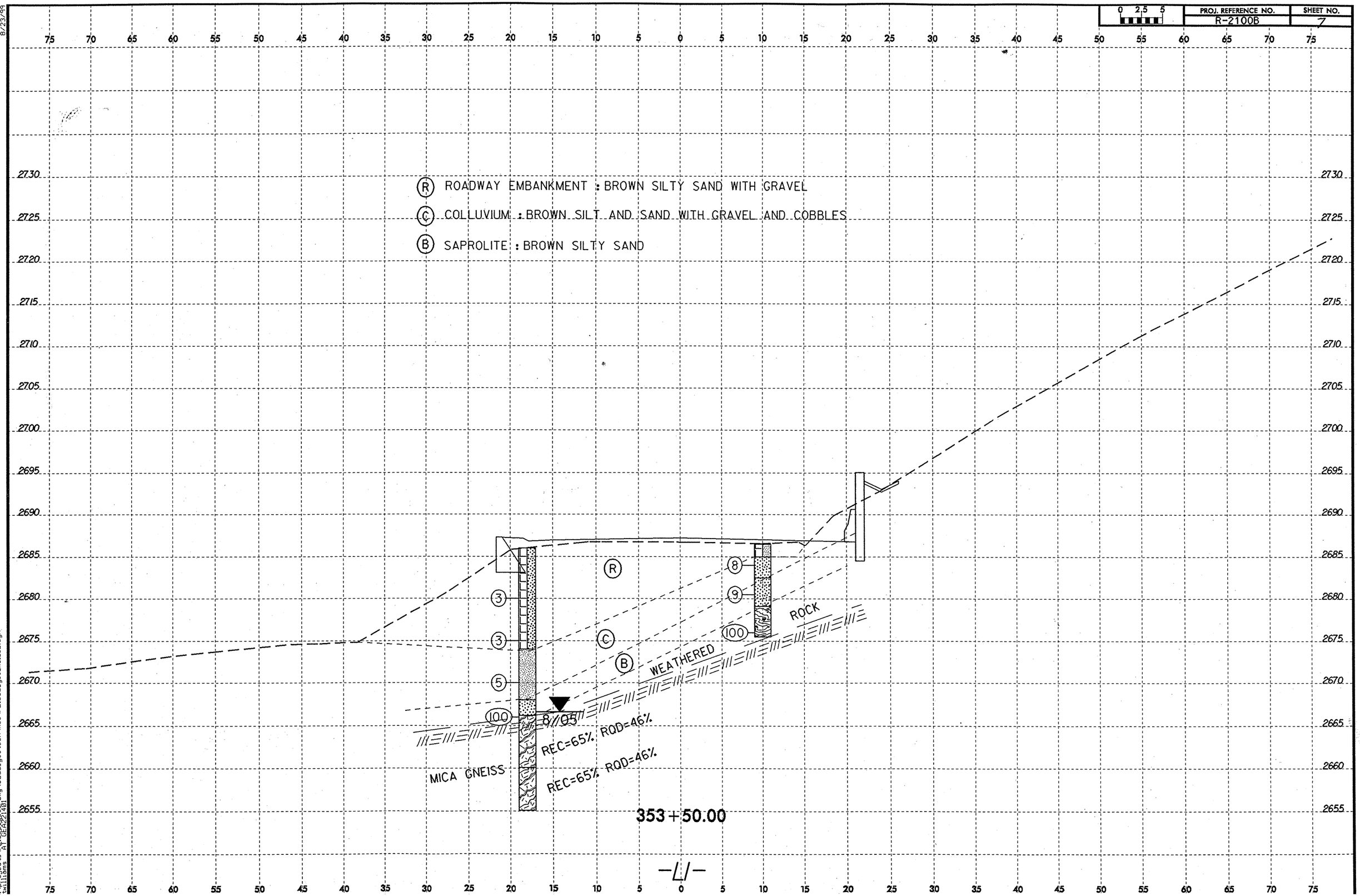


PROJ. REFERENCE NO.
R-2100B
SHEET NO.
6
0 2.5 5
R ROADWAY EMBANKMENT : BROWN SANDY SILT WITH GRAVEL
C COLLUVIUM : BROWN SANDY SILT TO SILTY SAND WITH GRAVEL AND COBBLES
B SAPROLITE : BROWN SILTY SAND AND SANDY SILT
OFFSET
353+01
8/05
WEATHERED ROCK
MICA GNEISS
REC=65% RQD=46%
353+00.00
-L/-

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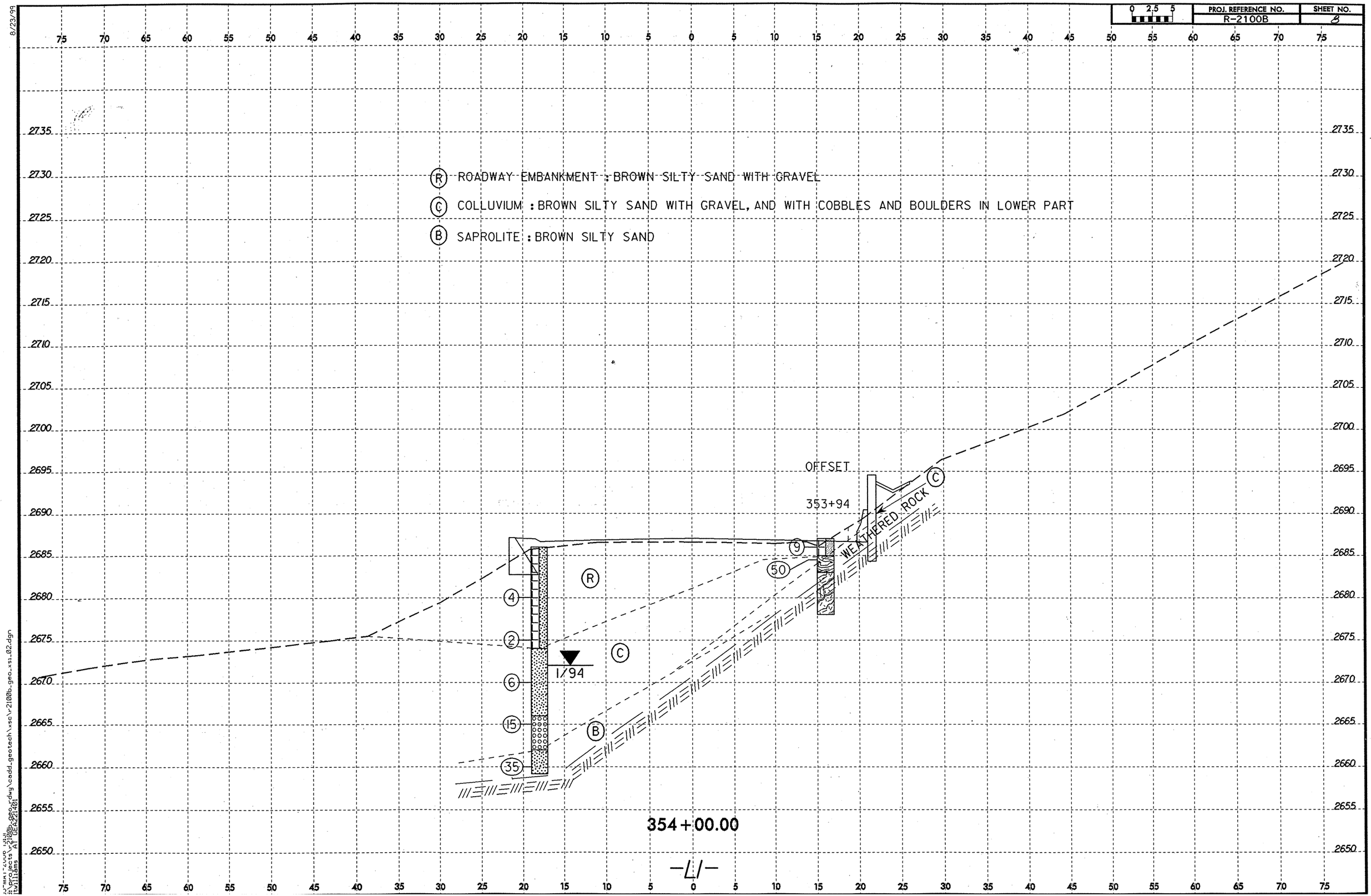
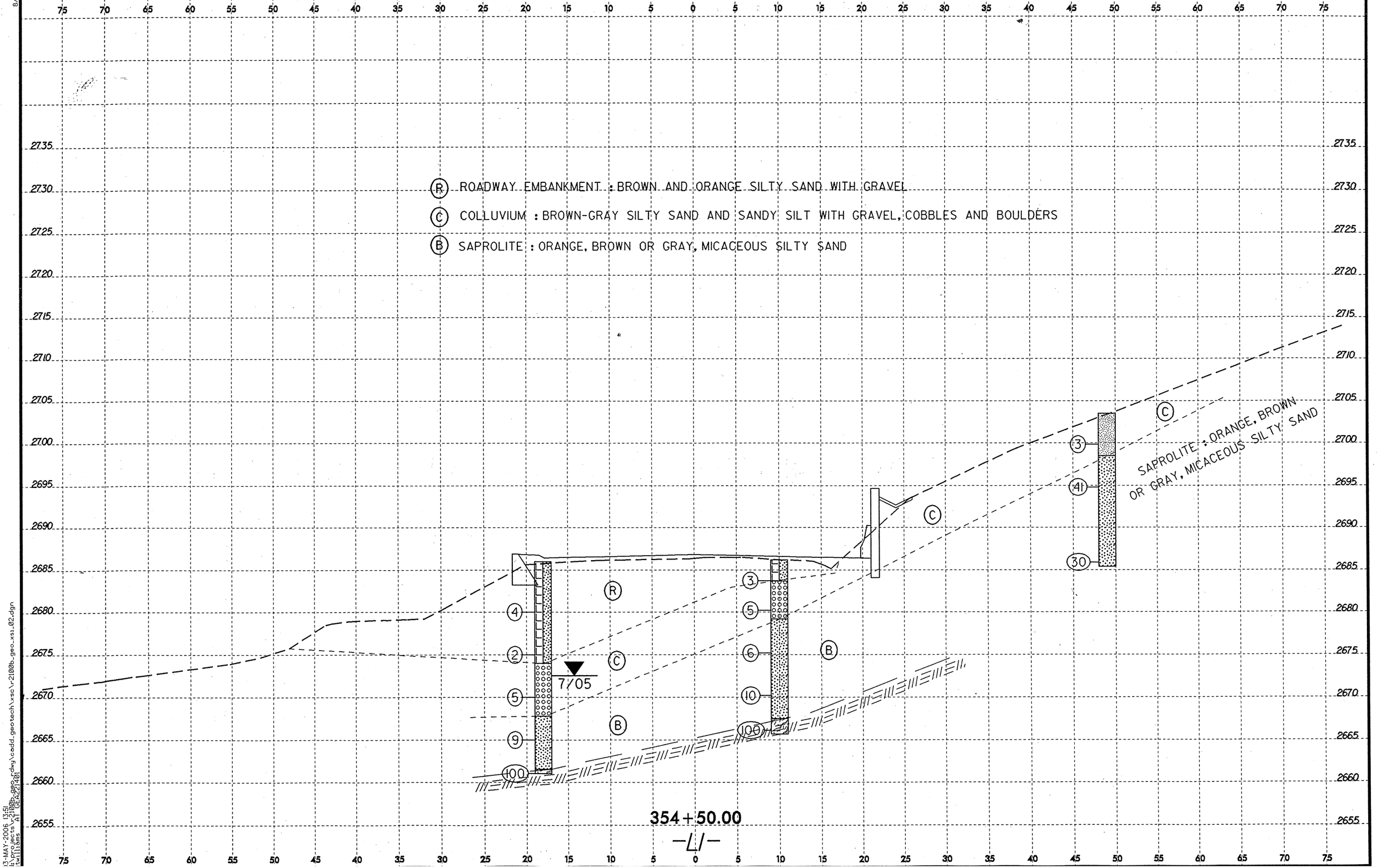


PROJ. REFERENCE NO.
R-2100B
SHEET NO.
8
0 2.5 5
R ROADWAY EMBANKMENT : BROWN SILTY SAND WITH GRAVEL
C COLLUVIUM : BROWN SILTY SAND WITH GRAVEL, AND WITH COBBLES AND BOULDERS IN LOWER PART
B SAPROLITE : BROWN SILTY SAND
OFFSET
353+94
WEATHERED ROCK
1/94
354+00.00
-L/-



PROJ. REFERENCE NO.
R-2100B
SHEET NO.
9
0 2.5 5
R ROADWAY EMBANKMENT : BROWN AND ORANGE SILTY SAND WITH GRAVEL
C COLLUVIUM : BROWN-GRAY SILTY SAND AND SANDY SILT WITH GRAVEL, COBBLES AND BOULDERS
B SAPROLITE : ORANGE, BROWN OR GRAY, MICACEOUS SILTY SAND
SAPROLITE : ORANGE, BROWN OR GRAY, MICACEOUS SILTY SAND
7/05
354+50.00
-L1-

# NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
## GEOTECHNICAL UNIT BORING LOG

| | | | |
|---|---|---|---|
| **PROJECT NO** 34369.1.1 | **ID** R-2100B | **COUNTY** ASHE | **GEOLOGIST** D. CHITTENDEN (F&H) |
| **SITE DESCRIPTION** NC 16 FROM SOUTHEAST OF SR 1158 TO SOUTHEAST OF NC 88 | | | **GND WATER** |
| **BORING NO** 35250L | **NORTHING** 0.00 | **EASTING** 0.00 | **0 HR** N/A |
| **ALIGNMENT** -L- | **BORING LOCATION** 352+50.000 | **OFFSET** 18.00ft LT | **24 HR** 21.40ft |
| **COLLAR ELEV** 2686.00ft | **TOTAL DEPTH** 24.80ft | **START DATE** 7/27/05 | **COMPLETION DATE** 07/27/05 |
| **DRILL MACHINE** CME-45 | **DRILL METHOD** ROTARY W/O MUD | | **HAMMER TYPE** AUTOMATIC |
| **SURFACE WATER DEPTH** N/A | **DEPTH TO ROCK** 24.80ft | | **Log 35250L, Page 1 of 1** |

| ELEV | DEPTH | BLOW CT 6in | BLOW CT 6in | BLOW CT 6in | PEN (ft) | BLOWS PER FOOT (0 25 50 75 100) | SAMPLE NO | MOI | LOG | SOIL AND ROCK DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|
| 2686.00 | | | | | | Ground Surface | | | | |
| | 1.50 | 2 | 3 | 3 | 1.0 | 6 | SS-544 | | | EMBANKMENT: BROWN AND ORANGE SANDY SILT WITH ROCK FRAGMENTS |
| 2680.00 | 4.80 | 1 | 1 | 1 | 1.0 | 2 | | | | |
| | 9.80 | 2 | 3 | 6 | 1.0 | 9 | SS-545 | | | |
| 2670.00 | 14.80 | 3 | 1 | 2 | 1.0 | 3 | SS-546 | | | COLLUVIUM: BROWN SILTY SAND WITH A FEW COBBLES AND BOULDERS |
| | 19.80 | 6 | 9 | 6 | 1.0 | 15 | SS-547 | ▼ | | SAPROLITE: BROWN SILTY, MICACEOUS SAND |
| 2661.20 | 24.80 | 100 | | | 0.0 | 100 | | | | WEATHERED ROCK |
| | | | | | | TERMINATED BORING ON HARD ROCK AT ELEVATION 2661.2 FEET. | | | | HARD ROCK |



# NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
## GEOTECHNICAL UNIT BORING LOG

| | | | |
|---|---|---|---|
| **PROJECT NO** 34369.1.1 | **ID** R-2100B | **COUNTY** ASHE | **GEOLOGIST** D. CHITTENDEN (F&H) |
| **SITE DESCRIPTION** NC 16 FROM SOUTHEAST OF SR 1158 TO SOUTHEAST OF NC 88 | | | **GND WATER** |
| **BORING NO** 35300L | **NORTHING** 0.00 | **EASTING** 0.00 | **0 HR** N/A |
| **ALIGNMENT** -L- | **BORING LOCATION** 353+00.000 | **OFFSET** 18.00ft LT | **24 HR** 20.30ft |
| **COLLAR ELEV** 2686.00ft | **TOTAL DEPTH** 25.00ft | **START DATE** 7/30/05 | **COMPLETION DATE** 07/30/05 |
| **DRILL MACHINE** CME-45 | **DRILL METHOD** ROTARY W/O MUD | | **HAMMER TYPE** AUTOMATIC |
| **SURFACE WATER DEPTH** N/A | **DEPTH TO ROCK** 24.20ft | | **Log 35300L, Page 1 of 1** |

| ELEV | DEPTH | BLOW CT 6in | BLOW CT 6in | BLOW CT 6in | PEN (ft) | BLOWS PER FOOT (0 25 50 75 100) | SAMPLE NO | MOI | LOG | SOIL AND ROCK DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|
| 2686.00 | | | | | | Ground Surface | | | | |
| 2680.00 | 5.00 | 2 | 1 | 2 | 1.0 | 3 | SS-568 | | | EMBANKMENT: BROWN AND ORANGE SANDY SILT WITH ROCK FRAGMENTS |
| | 10.00 | 0 | 1 | 1 | 1.0 | 2 | | | | |
| 2670.00 | 15.00 | 2 | 4 | 3 | 1.0 | 7 | SS-569 | | | COLLUVIUM: BROWN SANDY SILT WITH ROCK FRAGMENTS |
| | 20.00 | 14 | 17 | 13 | 1.0 | 30 | SS-570 | ▼ | | SAPROLITE: BROWN SILTY SAND |
| 2661.00 | 25.00 | 100 | | | 0.0 | 100 | | | | HARD ROCK |
| | | | | | | TERMINATED BORING IN HARD ROCK AT ELEVATION 2661.0 FEET. | | | | |

# NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
## GEOTECHNICAL UNIT BORING LOG

| | | | |
|---|---|---|---|
| **PROJECT NO** 34369.1.1 | **ID** R-2100B | **COUNTY** ASHE | **GEOLOGIST** D. CHITTENDEN (F&H) |
| **SITE DESCRIPTION** NC 16 FROM SOUTHEAST OF SR 1158 TO SOUTHEAST OF NC 88 | | | **GND WATER** |
| **BORING NO** 35350L | **NORTHING** 0.00 | **EASTING** 0.00 | **0 HR** N/A |
| **ALIGNMENT** -L- | **BORING LOCATION** 353+50.000 | **OFFSET** 18.00ft LT | **24 HR** 19.40ft |
| **COLLAR ELEV** 2686.00ft | **TOTAL DEPTH** 30.90ft | **START DATE** 7/30/05 | **COMPLETION DATE** 07/30/05 |
| **DRILL MACHINE** CME-45 | **DRILL METHOD** SPT CORE BORING | | **HAMMER TYPE** AUTOMATIC |
| **SURFACE WATER DEPTH** N/A | **DEPTH TO ROCK** 19.80ft | | **Log 35350L, Page 1 of 1** |

| ELEV | DEPTH | BLOW CT 6in | BLOW CT 6in | BLOW CT 6in | PEN (ft) | BLOWS PER FOOT (0 25 50 75 100) | SAMPLE NO | MOI | LOG | SOIL AND ROCK DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|
| 2686.00 | | | | | | Ground Surface | | | | |
| 2680.00 | 5.00 | 2 | 1 | 2 | 1.0 | 3 | SS-571 | | | EMBANKMENT: BROWN SILTY SAND WITH ROCK FRAGMENTS |
| | 10.00 | 0 | 1 | 2 | 1.0 | 3 | | | | |
| 2670.00 | 15.00 | 2 | 2 | 3 | 1.0 | 5 | SS-572 | | | COLLUVIUM: BROWN SANDY SILT WITH ROCK FRAGMENTS |
| | 20.00 | 100 | | | 0.0 | 100 | RUN 1 | ▼ | | SAPROLITE: BROWN SILTY SAND |
| 2660.00 | | | | | | | RUN 2 | | | HARD ROCK: MOD. TO SEV. WEATHERED MICA GNEISS REC=39 RQD=31 |
| 2655.10 | | | | | | | | | | HARD ROCK: SLI. WEATHERED MICA GNEISS REC=98 RQD=82 |
| | | | | | | TERMINATED BORING IN HARD ROCK AT ELEVATION 2655.1 FEET. | | | | |

# NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
## GEOTECHNICAL UNIT BORING LOG

| | | | |
|---|---|---|---|
| **PROJECT NO** 34369.1.1 | **ID** R-2100B | **COUNTY** ASHE | **GEOLOGIST** D. CHITTENDEN (F&H) |
| **SITE DESCRIPTION** NC 16 FROM SOUTHEAST OF SR 1158 TO SOUTHEAST OF NC 88 | | | **GND WATER** |
| **BORING NO** 35400L | **NORTHING** 0.00 | **EASTING** 0.00 | **0 HR** N/A |
| **ALIGNMENT** -L- | **BORING LOCATION** 354+00.000 | **OFFSET** 18.00ft LT | **24 HR** 14.00ft |
| **COLLAR ELEV** 2686.00ft | **TOTAL DEPTH** 26.80ft | **START DATE** 7/30/05 | **COMPLETION DATE** 07/30/05 |
| **DRILL MACHINE** CME-45 | **DRILL METHOD** ROTARY W/O MUD | | **HAMMER TYPE** AUTOMATIC |
| **SURFACE WATER DEPTH** N/A | **DEPTH TO ROCK** 26.80ft | | **Log 35400L, Page 1 of 1** |

| ELEV | DEPTH | BLOW CT 6in | BLOW CT 6in | BLOW CT 6in | PEN (ft) | BLOWS PER FOOT (0 25 50 75 100) | SAMPLE NO | MOI | LOG | SOIL AND ROCK DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|
| 2686.00 | | | | | | Ground Surface | | | | |
| 2680.00 | 5.00 | 2 | 2 | 2 | 1.0 | 4 | | | | EMBANKMENT: BROWN SILTY SAND WITH ROCK FRAGMENTS |
| | 10.00 | 0 | 0 | 2 | 1.0 | 2 | | | | |
| 2670.00 | 15.00 | 2 | 3 | 3 | 1.0 | 6 | SS-574 | ▼ | | COLLUVIUM: BROWN SILTY SAND WITH ROCK FRAGMENTS |
| | 20.00 | 6 | 9 | 6 | 1.0 | 15 | SS-575 | | | COLLUVIUM: BROWN SILTY SAND WITH COBBLES AND BOULDERS |
| 2660.00 | 25.00 | 2 | 14 | 21 | 1.0 | 35 | SS-576 | | | SAPROLITE: GRAY BROWN SILTY MICACEOUS SAND |
| 2659.20 | | | | | | TERMINATED BORING ON HARD ROCK AT ELEVATION 2659.2 FEET. | | | | |

# NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
## GEOTECHNICAL UNIT BORING LOG

| | | | |
|---|---|---|---|
| **PROJECT NO** 34369.1.1 | **ID** R-2100B | **COUNTY** ASHE | **GEOLOGIST** D. CHITTENDEN (F&H) |
| **SITE DESCRIPTION** NC 16 FROM SOUTHEAST OF SR 1158 TO SOUTHEAST OF NC 88 | | | **GND WATER** |
| **BORING NO** 35450L | **NORTHING** 0.00 | **EASTING** 0.00 | **0 HR** N/A |
| **ALIGNMENT** -L- | **BORING LOCATION** 354+50.000 | **OFFSET** 18.00ft LT | **24 HR** 13.50ft |
| **COLLAR ELEV** 2686.00ft | **TOTAL DEPTH** 25.00ft | **START DATE** 7/30/05 | **COMPLETION DATE** 07/30/05 |
| **DRILL MACHINE** CME-45 | **DRILL METHOD** ROTARY W/O MUD | | **HAMMER TYPE** AUTOMATIC |
| **SURFACE WATER DEPTH** N/A | **DEPTH TO ROCK** 24.50ft | | **Log 35450L, Page 1 of 1** |

| ELEV | DEPTH | BLOW CT 6in | BLOW CT 6in | BLOW CT 6in | PEN (ft) | BLOWS PER FOOT (0 25 50 75 100) | SAMPLE NO | MOI | LOG | SOIL AND ROCK DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|
| 2686.00 | | | | | | Ground Surface | | | | |
| 2680.00 | 5.00 | 1 | 2 | 2 | 1.0 | 4 | | | | EMBANKMENT: BROWN AND ORANGE SILTY SAND WITH ROCK FRAGMENTS |
| | 10.00 | 0 | 1 | 1 | 1.0 | 2 | | | | |
| 2670.00 | 15.00 | 2 | 2 | 3 | 1.0 | 5 | SS-578 | | | COLLUVIUM: BROWN GRAY SILTY SAND WITH GRAVEL, COBBLES AND BOULDERS |
| | 20.00 | 10 | 5 | 4 | 1.0 | 9 | SS-579 | | | SAPROLITE: BROWN SILTY MICACEOUS SAND |
| 2661.00 | 25.00 | 100 | | | 0.0 | 100 | | | | HARD ROCK |

TERMINATED BORING IN HARD ROCK AT ELEVATION 2661.0 FEET.

JCS

# NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
## DIVISION OF HIGHWAYS-MATERIALS AND TESTS UNIT
## SOILS TEST REPORT-SOILS LABORATORY

| | |
|---|---|
| T.I.P. ID #: | R-2100B |

| | |
|---|---|
| REPORT ON SAMPLES OF: | Soils for Classification |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| PROJECT: | 34369.1.1 (cont.) | COUNTY: | Ashe | Owner: | -- | | |
| DATE SAMPLED: | 8.05 | DATE RECEIVED: | 8.19.05 | DATE REPORTED: | 8.29.05 | | |
| SAMPLED FROM: | Roadway | SAMPLED BY: | L. L. Acker | | | | |
| SUBMITTED BY: | W. D. Frye | 2002 | STANDARD SPECIFICATION | | | | |
| LABORATORY: | Asheville | | | | | | |

### TEST RESULTS

| Project Sample No. | SS-534 | SS-535 | SS-537 | SS-539 | SS-540 | SS-544 | SS-545 | SS-546 |
|---|---|---|---|---|---|---|---|---|
| Lab Sample No. A | 150069 | 150070 | 150071 | 150072 | 150073 | 150074 | 150075 | 150076 |
| HiCAMS Sample # | -- | -- | -- | -- | -- | -- | -- | -- |
| Retained #4 Sieve % | -- | -- | -- | -- | -- | -- | -- | -- |
| Passing #10 Sieve % | 93 | 96 | 81 | 94 | 80 | 85 | 94 | 91 |
| Passing #40 Sieve % | 88 | 88 | 73 | 90 | 72 | 76 | 88 | 87 |
| Passing #200 Sieve % | 54 | 30 | 27 | 41 | 36 | 37 | 44 | 33 |

### MINUS #10 FRACTION

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Soil Mortar - 100% | | | | | | | | |
| Coarse Sand -Ret. #60 | 12 | 20 | 24 | 12 | 21 | 23 | 17 | 10 |
| Fine Sand - Ret. #270 | 38 | 57 | 51 | 54 | 42 | 40 | 44 | 62 |
| Silt 0.05-0.005 mm % | 32 | 19 | 19 | 24 | 23 | 23 | 25 | 20 |
| Clay < 0.005 mm % | 18 | 4 | 6 | 10 | 14 | 14 | 14 | 8 |
| Passing # 40 Sieve % | -- | -- | -- | -- | -- | -- | -- | -- |
| Passing # 200 Sieve % | -- | -- | -- | -- | -- | -- | -- | -- |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Liquid Limit | 41 | 32 | 34 | 39 | 30 | 33 | 33 | 31 |
| Plastic Index | NP | NP | NP | NP | NP | NP | NP | NP |
| AASHTO Classification | A-5 (4) | A-2-4 (0) | A-2-4 (0) | A-4 (1) | A-4 (0) | A-4 (1) | A-4 (2) | A-2-4 (0) |
| Quantity | | | | | | | | |
| Texture | | | | | | | | |
| Station | 341+50 | 341+50 | 341+00 | 341+00 | 341+00 | 352+50 | 352+50 | 352+50 |
| Hole No. | | | | | | | | |
| Depth (ft) From: | 15.0 | 20.0 | 5.0 | 15.0 | 20.0 | 1.5 | 9.7 | 14.8 |
| To: | 16.5 | 21.5 | 6.5 | 16.5 | 21.5 | 3.0 | 10.3 | 16.3 |
| | | | | | | | | |

**Remarks:**

A-150069 - 150076

**CC:**

| | |
|---|---|
| L. L. Acker | |
| File | |
| | |
| | |

| | |
|---|---|
| SOILS ENGINEER: | |





JCS

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS-MATERIALS AND TESTS UNIT
SOILS TEST REPORT-SOILS LABORATORY

| | |
|---|---|
| T.I.P. ID #: | R-2100B |

| | |
|---|---|
| REPORT ON SAMPLES OF: | Soils for Classification |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| PROJECT: | 34369.1.1 (cont.) | COUNTY: | Ashe | Owner: | -- | | |
| DATE SAMPLED: | 8.05 | DATE RECEIVED: | 8.19.05 | DATE REPORTED: | 8.29.05 | | |
| SAMPLED FROM: | Roadway | SAMPLED BY: | L. L. Acker | | | | |
| SUBMITTED BY: | W. D. Frye | 2002 | STANDARD SPECIFICATION | | | | |
| LABORATORY: | Asheville | | | | | | |

### TEST RESULTS

| Project Sample No. | SS-547 | SS-549 | SS-550 | SS-552 | SS-553 | SS-554 | SS-555 | SS-556 |
|---|---|---|---|---|---|---|---|---|
| Lab Sample No. A | 150077 | 150078 | 150079 | 150080 | 150081 | 150082 | 150083 | 150084 |
| HiCAMS Sample # | -- | -- | -- | -- | -- | -- | -- | -- |
| Retained #4 Sieve % | -- | -- | -- | -- | -- | -- | -- | -- |
| Passing #10 Sieve % | 85 | 88 | 67 | 79 | 94 | 90 | 41 | 39 |
| Passing #40 Sieve % | 74 | 82 | 59 | 71 | 88 | 81 | 32 | 28 |
| Passing #200 Sieve % | 21 | 45 | 25 | 37 | 49 | 28 | 13 | 8 |

### MINUS #10 FRACTION

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Soil Mortar - 100% | | | | | | | | |
| Coarse Sand -Ret. #60 | 28 | 18 | 17 | 21 | 17 | 25 | 34 | 42 |
| Fine Sand - Ret. #270 | 60 | 38 | 54 | 40 | 38 | 35 | 43 | 43 |
| Silt 0.05-0.005 mm % | 12 | 28 | 21 | 23 | 31 | 17 | 19 | 15 |
| Clay < 0.005 mm % | 0 | 16 | 8 | 16 | 14 | 6 | 4 | 0 |
| Passing # 40 Sieve % | -- | -- | -- | -- | -- | -- | -- | -- |
| Passing # 200 Sieve % | -- | -- | -- | -- | -- | -- | -- | -- |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Liquid Limit | 46 | 34 | 32 | 32 | 34 | 37 | 25 | 29 |
| Plastic Index | NP | 4 | NP | NP | NP | NP | NP | NP |
| AASHTO Classification | A-2-5 (0) | A-4 (2) | A-2-4 (0) | A-4 (1) | A-4 (3) | A-2-4 (0) | A-1-b (0) | A-1-b (0) |
| Quantity | | | | | | | | |
| Texture | | | | | | | | |
| Station | 352+50 | 340+00 | 340+00 | 339+50 | 339+50 | 339+50 | 338+50 | 338+50 |
| Hole No. | | | | | | | | |
| Depth (ft) From: | 19.8 | 10.0 | 15.0 | 4.8 | 9.8 | 14.8 | 1.0 | 2.9 |
| To: | 21.3 | 11.5 | 16.5 | 6.3 | 11.3 | 16.3 | 2.5 | 4.4 |
| | | | | | | | | |

**Remarks:**

A-150077 - 150084

**CC:**

| | |
|---|---|
| L. L. Acker | |
| File | |
| | |
| | |

| | |
|---|---|
| SOILS ENGINEER: | |

KHJ

# NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
## DIVISION OF HIGHWAYS-MATERIALS AND TESTS UNIT
## SOILS TEST REPORT-SOILS LABORATORY

| | |
|---|---|
| T.I.P. ID #: | R2100B |

| | |
|---|---|
| REPORT ON SAMPLES OF: | SOILS FOR CLASSIFICATION |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| PROJECT: | 34369.1.1 | COUNTY: | ASHE | Owner: | | | |
| DATE SAMPLED: | 07/05 | DATE RECEIVED: | 08/19/05 | DATE REPORTED: | 08/30/05 | | |
| SAMPLED FROM: | ROADWAY | SAMPLED BY: | L. L. ACKER | | | | |
| SUBMITTED BY: | W.D. FRYE | 2002 | STANDARD SPECIFICATION | | | | |
| LABORATORY: | ASHEVILLE | | | | | | |

### TEST RESULTS

| Project Sample No. | SS-564 | SS-565 | SS-566 | SS-567 | SS-568 | SS-569 | SS-570 | SS-571 |
|---|---|---|---|---|---|---|---|---|
| Lab Sample No. | 150103 | 150104 | 150105 | 150106 | 150107 | 150108 | 150109 | 150110 |
| HiCAMS Sample # | -- | -- | -- | -- | -- | -- | -- | -- |
| Retained #4 Sieve % | -- | -- | -- | -- | -- | -- | -- | -- |
| Passing #10 Sieve % | 87 | 82 | 84 | 91 | 86 | 80 | 64 | 82 |
| Passing #40 Sieve % | 75 | 69 | 77 | 83 | 79 | 76 | 58 | 75 |
| Passing #200 Sieve % | 29 | 24 | 36 | 26 | 40 | 37 | 20 | 34 |

### MINUS #10 FRACTION

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Soil Mortar - 100% | | | | | | | | |
| Coarse Sand -Ret. #60 | 25 | 21 | 20 | 21 | 20 | 15 | 22 | 12 |
| Fine Sand - Ret. #270 | 53 | 60 | 47 | 61 | 40 | 46 | 56 | 53 |
| Silt 0.05-0.005 mm % | 20 | 19 | 19 | 18 | 26 | 23 | 16 | 19 |
| Clay < 0.005 mm % | 2 | 0 | 14 | 0 | 14 | 16 | 6 | 16 |
| Passing # 40 Sieve % | -- | -- | -- | -- | -- | -- | -- | -- |
| Passing # 200 Sieve % | -- | -- | -- | -- | -- | -- | -- | -- |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Liquid Limit | 41 | 43 | 52 | 46 | 36 | 32 | 31 | 29 |
| Plastic Index | NP | NP | NP | NP | NP | NP | NP | 2 |
| AASHTO Classification | A-2-5(0) | A-2-5(0) | A-5(0) | A-2-5(0) | A-4(1) | A-4(0) | A-2-4(0) | A-2-4(0) |
| Quantity | | | | | | | | |
| Texture | | | | | | | | |
| Station | 324+00 | 324+00 | 324+50 | 324+50 | 353+00 | 353+00 | 353+00 | 353+50 |
| Hole No. | | | | | | | | |
| Depth (ft) From: | 5.0 | 10.0 | 5.0 | 10.0 | 5.0 | 15.0 | 20.0 | 5.0 |
| To: | 6.5 | 11.5 | 6.5 | 11.5 | 6.5 | 16.5 | 21.5 | 6.5 |

**Remarks:**

A150103-150110

**CC:**

| | |
|---|---|
| L. L. ACKER | |
| FILE | |

| | |
|---|---|
| SOILS ENGINEER: | |





KHJ

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS-MATERIALS AND TESTS UNIT
SOILS TEST REPORT-SOILS LABORATORY

| | |
|---|---|
| T.I.P. ID #: | R2100B |

| | |
|---|---|
| REPORT ON SAMPLES OF: | SOILS FOR CLASSIFICATION |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| PROJECT: | 34369.1.1 | COUNTY: | ASHE | Owner: | | | |
| DATE SAMPLED: | 07/05 | DATE RECEIVED: | 08/19/05 | DATE REPORTED: | 08/30/05 | | |
| SAMPLED FROM: | ROADWAY | SAMPLED BY: | L.L. ACKER | | | | |
| SUBMITTED BY: | W.D. FRYE | 2002 | STANDARD SPECIFICATION | | | | |
| LABORATORY: | ASHEVILLE | | | | | | |

### TEST RESULTS

| Project Sample No. | SS-572 | SS-574 | SS-575 | SS-576 | SS-578 | SS-579 | SS-580 | SS-581 |
|---|---|---|---|---|---|---|---|---|
| Lab Sample No. | 150111 | 150112 | 150113 | 150114 | 150115 | 150116 | 150117 | 150118 |
| HiCAMS Sample # | -- | -- | -- | -- | -- | -- | -- | -- |
| Retained #4 Sieve % | -- | -- | -- | -- | -- | -- | -- | -- |
| Passing #10 Sieve % | 100 | 80 | 54 | 85 | 53 | 89 | 76 | 80 |
| Passing #40 Sieve % | 98 | 74 | 49 | 78 | 44 | 83 | 68 | 76 |
| Passing #200 Sieve % | 46 | 30 | 18 | 23 | 16 | 27 | 25 | 47 |

### MINUS #10 FRACTION

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Soil Mortar - 100% | | | | | | | | |
| Coarse Sand -Ret. #60 | 2 | 22 | 22 | 20 | 34 | 18 | 23 | 13 |
| Fine Sand - Ret. #270 | 63 | 49 | 54 | 64 | 40 | 63 | 53 | 34 |
| Silt 0.05-0.005 mm % | 19 | 15 | 16 | 14 | 14 | 15 | 14 | 23 |
| Clay < 0.005 mm % | 16 | 14 | 8 | 2 | 12 | 4 | 10 | 30 |
| Passing # 40 Sieve % | -- | -- | -- | -- | -- | -- | -- | -- |
| Passing # 200 Sieve % | -- | -- | -- | -- | -- | -- | -- | -- |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Liquid Limit | 33 | 35 | 31 | 44 | 30 | 40 | 46 | 39 |
| Plastic Index | NP | NP | NP | NP | NP | NP | NP | 3 |
| AASHTO Classification | A-4(2) | A-2-4(0) | A-1-b(0) | A-2-5(0) | A-1-b(0) | A-2-4(0) | A-2-5(0) | A-4(2) |
| Quantity | | | | | | | | |
| Texture | | | | | | | | |
| Station | 353+50 | 354+00 | 354+00 | 354+00 | 354+50 | 354+50 | 330+50 | 326+50 |
| Hole No. | | | | | | | | |
| Depth (ft) From: | 15.0 | 15.0 | 20.0 | 25.0 | 15.0 | 20.0 | 2.5 | 2.6 |
| To: | 16.5 | 16.5 | 21.5 | 26.5 | 16.5 | 21.5 | 4.6 | 4.1 |

**Remarks:**

A150111-150118

**CC:**

| | |
|---|---|
| L.L. ACKER | |
| FILE | |

| | |
|---|---|
| SOILS ENGINEER: | |

| STATE | STATE PROJECT REFERENCE NO. | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|
| N.C. | R2100B | 1 | 6 |

# STATE OF NORTH CAROLINA
## DEPARTMENT OF TRANSPORTATION
## DIVISION OF HIGHWAYS
## GEOTECHNICAL ENGINEERING UNIT

# STRUCTURE SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. R2100B F.A. PROJ. STP-16(1)

COUNTY ASHE

PROJECT DESCRIPTION NC 16 FROM SOUTHEAST OF SR 1158 TO SOUTHEAST OF NC 88

SITE DESCRIPTION RETAINING WALL FROM STA. 325+70 TO STA. 326+20 (RIGHT) ON NC 16

## CONTENTS


| SHEET | DESCRIPTION |
|---|---|
| 1 | TITLE SHEET |
| 2 | LEGEND |
| 3 | SITE PLAN |
| 4 | PROFILE |
| 5 | CROSS SECTION(S) |
| 6 | BORE LOG & CORE REPORT(S) |
| 6 | SOIL TEST RESULTS |


## CAUTION NOTICE

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WERE MADE FOR THE PURPOSE OF STUDY, PLANNING, AND DESIGN, AND NOT FOR CONSTRUCTION OR PAY PURPOSES. THE VARIOUS FIELD BORING LOGS, ROCK CORES, AND SOIL TEST DATA AVAILABLE MAY BE REVIEWED OR INSPECTED IN RALEIGH BY CONTACTING THE N.C. DEPARTMENT OF TRANSPORTATION, GEOTECHNICAL ENGINEERING UNIT AT (919) 250-4088. NEITHER THE SUBSURFACE PLANS AND REPORTS, NOR THE FIELD BORING LOGS, ROCK CORES, OR SOIL TEST DATA ARE PART OF THE CONTRACT.

GENERAL SOIL AND ROCK STRATA DESCRIPTIONS AND INDICATED BOUNDARIES ARE BASED ON A GEOTECHNICAL INTERPRETATION OF ALL AVAILABLE SUBSURFACE DATA AND MAY NOT NECESSARILY REFLECT THE ACTUAL SUBSURFACE CONDITIONS BETWEEN BORINGS OR BETWEEN SAMPLED STRATA WITHIN THE BOREHOLE. THE LABORATORY SAMPLE DATA AND THE IN SITU (IN-PLACE) TEST DATA CAN BE RELIED ON ONLY TO THE DEGREE OF RELIABILITY INHERENT IN THE STANDARD TEST METHOD. THE OBSERVED WATER LEVELS OR SOIL MOISTURE CONDITIONS INDICATED IN THE SUBSURFACE INVESTIGATIONS ARE AS RECORDED AT THE TIME OF THE INVESTIGATION. THESE WATER LEVELS OR SOIL MOISTURE CONDITIONS MAY VARY CONSIDERABLY WITH TIME ACCORDING TO CLIMATIC CONDITIONS INCLUDING TEMPERATURES, PRECIPITATION, AND WIND, AS WELL AS OTHER NON-CLIMATIC FACTORS.

THE BIDDER OR CONTRACTOR IS CAUTIONED THAT DETAILS SHOWN ON THE SUBSURFACE PLANS ARE PRELIMINARY ONLY AND IN MANY CASES THE FINAL DESIGN DETAILS ARE DIFFERENT. FOR BIDDING AND CONSTRUCTION PURPOSES, REFER TO THE CONSTRUCTION PLANS AND DOCUMENTS FOR FINAL DESIGN INFORMATION ON THIS PROJECT. THE DEPARTMENT DOES NOT WARRANT OR GUARANTEE THE SUFFICIENCY OR ACCURACY OF THE INVESTIGATION MADE, NOR THE INTERPRETATIONS MADE, OR OPINION OF THE DEPARTMENT AS TO THE TYPE OF MATERIALS AND CONDITIONS TO BE ENCOUNTERED. THE BIDDER OR CONTRACTOR IS CAUTIONED TO MAKE SUCH INDEPENDENT SUBSURFACE INVESTIGATIONS AS HE DEEMS NECESSARY TO SATISFY HIMSELF AS TO CONDITIONS TO BE ENCOUNTERED ON THIS PROJECT. THE CONTRACTOR SHALL HAVE NO CLAIM FOR ADDITIONAL COMPENSATION OR FOR AN EXTENSION OF TIME FOR ANY REASON RESULTING FROM THE ACTUAL CONDITIONS ENCOUNTERED AT THE SITE DIFFERING FROM THOSE INDICATED IN THE SUBSURFACE INFORMATION.

PERSONNEL

F & H ENGINEERING

INVESTIGATED BY L.L. ACKER

CHECKED BY W.D. FRYE

SUBMITTED BY W.D. FRYE

DATE 6/8/06

NORTH CAROLINA LICENSED SEAL 1007 GEOLOGIST LOUIS L. ACKER

06/08/06

DRAWN BY: J. T. WILLIAMS

NOTE - THE INFORMATION CONTAINED HEREIN IS NOT IMPLIED OR GUARANTEED BY THE N. C. DEPARTMENT OF TRANSPORTATION AS BEING ACCURATE NOR IT IS CONSIDERED TO BE PART OF THE PLANS, SPECIFICATIONS, OR CONTRACT FOR THE PROJECT.

NOTE - BY HAVING REQUESTED THIS INFORMATION THE CONTRACTOR SPECIFICALLY WAIVES ANY CLAIMS FOR INCREASED COMPENSATION OR EXTENSION OF TIME BASED ON DIFFERENCES BETWEEN THE CONDITIONS INDICATED HEREIN AND THE ACTUAL CONDITIONS AT THE PROJECT SITE.

PROJECT: 34369.1.1

ID: R2100B

| PROJECT REFERENCE NO. | SHEET NO. |
|---|---|
| R2100B | 2 |

# NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
## DIVISION OF HIGHWAYS
## GEOTECHNICAL ENGINEERING UNIT

# SUBSURFACE INVESTIGATION

### SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

## SOIL DESCRIPTION

SOIL IS CONSIDERED TO BE THE UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER, AND YIELD LESS THAN 100 BLOWS PER FOOT ACCORDING TO STANDARD PENETRATION TEST (AASHTO T206, ASTM D-1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY SHALL INCLUDE: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. EXAMPLE:

*VERY STIFF, GRAY, SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6*

## SOIL LEGEND AND AASHTO CLASSIFICATION

| GENERAL CLASS. | GRANULAR MATERIALS (≤ 35% PASSING #200) | | | | | | | SILT-CLAY MATERIALS (> 35% PASSING #200) | | | | ORGANIC MATERIALS | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GROUP CLASS. | A-1 | | A-3 | A-2 | | | | A-4 | A-5 | A-6 | A-7 | A-1, A-2 A-3 | A-4, A-5 A-6, A-7 | |
| | A-1-a | A-1-b | | A-2-4 | A-2-5 | A-2-6 | A-2-7 | | | | A-7-5 A-7-6 | | | |
| SYMBOL | | | | | | | | | | | | | | |
| % PASSING # 10 | 50 MX | | | | | | | | | | | GRANULAR SOILS | SILT-CLAY SOILS | MUCK, PEAT |
| # 40 | 30 MX | 50 MX | 51 MN | | | | | | | | | | | |
| # 200 | 15 MX | 25 MX | 10 MX | 35 MX | 35 MX | 35 MX | 35 MX | 36 MN | 36 MN | 36 MN | 36 MN | | | |
| LIQUID LIMIT | 6 MX | | NP | 40 MX | 41 MN | 40 MX | 41 MN | 40 MX | 41 MN | 40 MX | 41 MN | SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER | | HIGHLY ORGANIC SOILS |
| PLASTIC INDEX | | | | 10 MX | 10 MX | 11 MN | 11 MN | 10 MX | 10 MX | 11 MN | 11 MN | | | |
| GROUP INDEX | 0 | | 0 | 0 | | 4 MX | | 8 MX | 12 MX | 16 MX | No MX | | | |
| USUAL TYPES OF MAJOR MATERIALS | STONE FRAGS. GRAVEL, AND SAND | | FINE SAND | SILTY OR CLAYEY GRAVEL AND SAND | | | | SILTY SOILS | | CLAYEY SOILS | | | | |
| GEN. RATING AS A SUBGRADE | EXCELLENT TO GOOD | | | | | | | FAIR TO POOR | | | | FAIR TO POOR | POOR | UNSUITABLE |

PI OF A-7-5 SUBGROUP IS ≤ LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30

## CONSISTENCY OR DENSENESS

| PRIMARY SOIL TYPE | COMPACTNESS OR CONSISTENCY | RANGE OF STANDARD PENETRATION RESISTENCE (N-VALUE) | RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT$^2$) |
|---|---|---|---|
| GENERALLY GRANULAR MATERIAL (NON-COHESIVE) | VERY LOOSE<br>LOOSE<br>MEDIUM DENSE<br>DENSE<br>VERY DENSE | <4<br>4 TO 10<br>10 TO 30<br>30 TO 50<br>>50 | N/A |
| GENERALLY SILT-CLAY MATERIAL (COHESIVE) | VERY SOFT<br>SOFT<br>MEDIUM STIFF<br>STIFF<br>VERY STIFF<br>HARD | <2<br>2 TO 4<br>4 TO 8<br>8 TO 15<br>15 TO 30<br>>30 | <0.25<br>0.25 TO 0.50<br>0.5 TO 1.0<br>1 TO 2<br>2 TO 4<br>>4 |

## TEXTURE OR GRAIN SIZE

| U.S. STD. SIEVE SIZE | 4 | 10 | 40 | 60 | 200 | 270 |
|---|---|---|---|---|---|---|
| OPENING (MM) | 4.76 | 2.00 | 0.42 | 0.25 | 0.075 | 0.053 |

| BOULDER (BLDR.) | COBBLE (COB.) | GRAVEL (GR.) | COARSE SAND (CSE. SD.) | FINE SAND (F SD.) | SILT (SL.) | CLAY (CL.) |
|---|---|---|---|---|---|---|

GRAIN SIZE MM: 305 | 75 | 2.0 | 0.25 | 0.05 | 0.005
GRAIN SIZE IN.: 12 | 3

## SOIL MOISTURE - CORRELATION OF TERMS

| SOIL MOISTURE SCALE (ATTERBERG LIMITS) | FIELD MOISTURE DESCRIPTION | GUIDE FOR FIELD MOISTURE DESCRIPTION |
|---|---|---|
| | - SATURATED - (SAT.) | USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE |
| LL — LIQUID LIMIT | | |
| PLASTIC RANGE (PI) | - WET - (W) | SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE |
| PL — PLASTIC LIMIT | | |
| OM — OPTIMUM MOISTURE | - MOIST - (M) | SOLID; AT OR NEAR OPTIMUM MOISTURE |
| SL — SHRINKAGE LIMIT | | |
| | - DRY - (D) | REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE |

## PLASTICITY

| | PLASTICITY INDEX (PI) | DRY STRENGTH |
|---|---|---|
| NONPLASTIC | 0-5 | VERY LOW |
| LOW PLASTICITY | 6-15 | SLIGHT |
| MED. PLASTICITY | 16-25 | MEDIUM |
| HIGH PLASTICITY | 26 OR MORE | HIGH |

## COLOR

DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY). MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.

## GRADATION

WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE.
UNIFORM - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. (ALSO POORLY GRADED)
GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLES OF TWO OR MORE SIZES.

## ANGULARITY OF GRAINS

THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.

## MINERALOGICAL COMPOSITION

MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE.

## COMPRESSIBILITY

| | |
|---|---|
| SLIGHTLY COMPRESSIBLE | LIQUID LIMIT LESS THAN 31 |
| MODERATELY COMPRESSIBLE | LIQUID LIMIT EQUAL TO 31-50 |
| HIGHLY COMPRESSIBLE | LIQUID LIMIT GREATER THAN 50 |

## PERCENTAGE OF MATERIAL

| ORGANIC MATERIAL | GRANULAR SOILS | SILT - CLAY SOILS |
|---|---|---|
| TRACE OF ORGANIC MATTER | 2 - 3% | 3 - 5% |
| LITTLE ORGANIC MATTER | 3 - 5% | 5 - 12% |
| MODERATELY ORGANIC | 5 - 10% | 12 - 20% |
| HIGHLY ORGANIC | >10% | >20% |

| OTHER MATERIAL | |
|---|---|
| TRACE | 1 - 10% |
| LITTLE | 10 - 20% |
| SOME | 20 - 35% |
| HIGHLY | 35% AND ABOVE |

## GROUND WATER

- WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING
- STATIC WATER LEVEL AFTER 24 HOURS
- PW PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA
- SPRING OR SEEP

## MISCELLANEOUS SYMBOLS

- ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION
- SOIL SYMBOL
- ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT
- INFERRED SOIL BOUNDARY
- INFERRED ROCK LINE
- ALLUVIAL SOIL BOUNDARY
- 25/025 DIP & DIP DIRECTION OF ROCK STRUCTURES
- SOUNDING ROD
- SPT CPT DPT DMT VST PMT TEST BORING
- AUGER BORING
- CORE BORING
- MW MONITORING WELL
- PIEZOMETER INSTALLATION
- SLOPE INDICATOR INSTALLATION
- SPT N-VALUE
- REF SPT REFUSAL

SAMPLE DESIGNATIONS
S - BULK SAMPLE
SS - SPLIT SPOON SAMPLE
ST - SHELBY TUBE SAMPLE
RS - ROCK SAMPLE
RT - RECOMPACTED TRIAXIAL SAMPLE
CBR - CALIFORNIA BEARING RATIO SAMPLE

## ABBREVIATIONS

AR - AUGER REFUSAL
BT - BORING TERMINATED
CL. - CLAY
CPT - CONE PENETRATION TEST
CSE. - COARSE
DMT - DILATOMETER TEST
DPT - DYNAMIC PENETRATION TEST
e - VOID RATIO
F - FINE
FOSS. - FOSSILIFEROUS
FRAC. - FRACTURED, FRACTURES
FRAGS. - FRAGMENTS
HI. - HIGHLY
MED. - MEDIUM
MICA. - MICACEOUS
MOD. - MODERATELY
NP - NON PLASTIC
ORG. - ORGANIC
PMT - PRESSUREMETER TEST
SAP. - SAPROLITIC
SD. - SAND, SANDY
SL. - SILT, SILTY
SLI. - SLIGHTLY
TCR - TRICONE REFUSAL
$w$ - MOISTURE CONTENT
V - VERY
VST - VANE SHEAR TEST
WEA. - WEATHERED
$\gamma$ - UNIT WEIGHT
$\gamma_d$ - DRY UNIT WEIGHT

## EQUIPMENT USED ON SUBJECT PROJECT

DRILL UNITS:
- [ ] MOBILE B-___
- [ ] BK-51
- [X] CME-45C
- [X] CME-550
- [ ] PORTABLE HOIST
- [ ] _____
- [ ] _____

ADVANCING TOOLS:
- [ ] CLAY BITS
- [ ] 6" CONTINUOUS FLIGHT AUGER
- [X] 8" HOLLOW AUGERS
- [ ] HARD FACED FINGER BITS
- [ ] TUNG.-CARBIDE INSERTS
- [X] CASING [X] W/ ADVANCER
- [ ] TRICONE ____" STEEL TEETH
- [ ] TRICONE ____" TUNG.-CARB.
- [ ] CORE BIT
- [ ] _____

HAMMER TYPE:
- [X] AUTOMATIC
- [ ] MANUAL

CORE SIZE:
- [ ] -B_____
- [X] -N_____
- [ ] -H_____

HAND TOOLS:
- [ ] POST HOLE DIGGER
- [ ] HAND AUGER
- [ ] SOUNDING ROD
- [ ] VANE SHEAR TEST
- [ ] _____

## ROCK DESCRIPTION

HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT IF TESTED, WOULD YIELD SPT REFUSAL. AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS. IN NON-COASTAL PLAIN MATERIAL, THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK.
ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:

| | |
|---|---|
| WEATHERED ROCK (WR) | NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100 BLOWS PER FOOT IF TESTED. |
| CRYSTALLINE ROCK (CR) | FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC. |
| NON-CRYSTALLINE ROCK (NCR) | FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN SEDIMENTARY ROCK THAT WOULD YEILD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC. |
| COASTAL PLAIN SEDIMENTARY ROCK (CP) | COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC. |

## WEATHERING

| | |
|---|---|
| FRESH | ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER HAMMER IF CRYSTALLINE. |
| VERY SLIGHT (V SLI.) | ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN, CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF OF A CRYSTALLINE NATURE. |
| SLIGHT (SLI.) | ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS. |
| MODERATE (MOD.) | SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED WITH FRESH ROCK. |
| MODERATELY SEVERE (MOD. SEV.) | ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES "CLUNK" SOUND WHEN STRUCK. *IF TESTED, WOULD YIELD SPT REFUSAL* |
| SEVERE (SEV.) | ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. *IF TESTED, YIELDS SPT N VALUES > 100 BPF* |
| VERY SEVERE (V SEV.) | ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT THE MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE SUCH THAT ONLY MINOR VESTIGES OF THE ORIGINAL ROCK FABRIC REMAIN. *IF TESTED, YIELDS SPT N VALUES < 100 BPF* |
| COMPLETE | ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE. |

## ROCK HARDNESS

| | |
|---|---|
| VERY HARD | CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK. |
| HARD | CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN. |
| MODERATELY HARD | CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS. |
| MEDIUM HARD | CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PEICES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK. |
| SOFT | CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE. |
| VERY SOFT | CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNAIL. |

## FRACTURE SPACING

| TERM | SPACING |
|---|---|
| VERY WIDE | MORE THAN 10 FEET |
| WIDE | 3 TO 10 FEET |
| MODERATELY CLOSE | 1 TO 3 FEET |
| CLOSE | 0.16 TO 1 FEET |
| VERY CLOSE | LESS THAN 0.16 FEET |

## BEDDING

| TERM | THICKNESS |
|---|---|
| VERY THICKLY BEDDED | > 4 FEET |
| THICKLY BEDDED | 1.5 - 4 FEET |
| THINLY BEDDED | 0.16 - 1.5 FEET |
| VERY THINLY BEDDED | 0.03 - 0.16 FEET |
| THICKLY LAMINATED | 0.008 - 0.03 FEET |
| THINLY LAMINATED | < 0.008 FEET |

## INDURATION

FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF THE MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.

| | |
|---|---|
| FRIABLE | RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE. |
| MODERATELY INDURATED | GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER. |
| INDURATED | GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER. |
| EXTREMELY INDURATED | SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS. |

## TERMS AND DEFINITIONS

ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER.

AQUIFER - A WATER BEARING FORMATION OR STRATA.

ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND.

ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, AS SHALE, SLATE, ETC.

ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE.

CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.

COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE.

CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.

DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK.

DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL.

DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.

FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.

FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.

FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM PARENT MATERIAL.

FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.

FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD.

JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.

LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT.

LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.

MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.

PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM.

RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.

ROCK QUALITY DESIGNATION (RQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.

SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK.

SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS.

SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE.

STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N OR BPF) OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS.

STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.

STRATA ROCK QUALITY DESIGNATION (SRQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.

TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.

BENCH MARK: BM #4 - BL- 82+15.33, 39.90 RT

ELEVATION: 2680.06 FT.

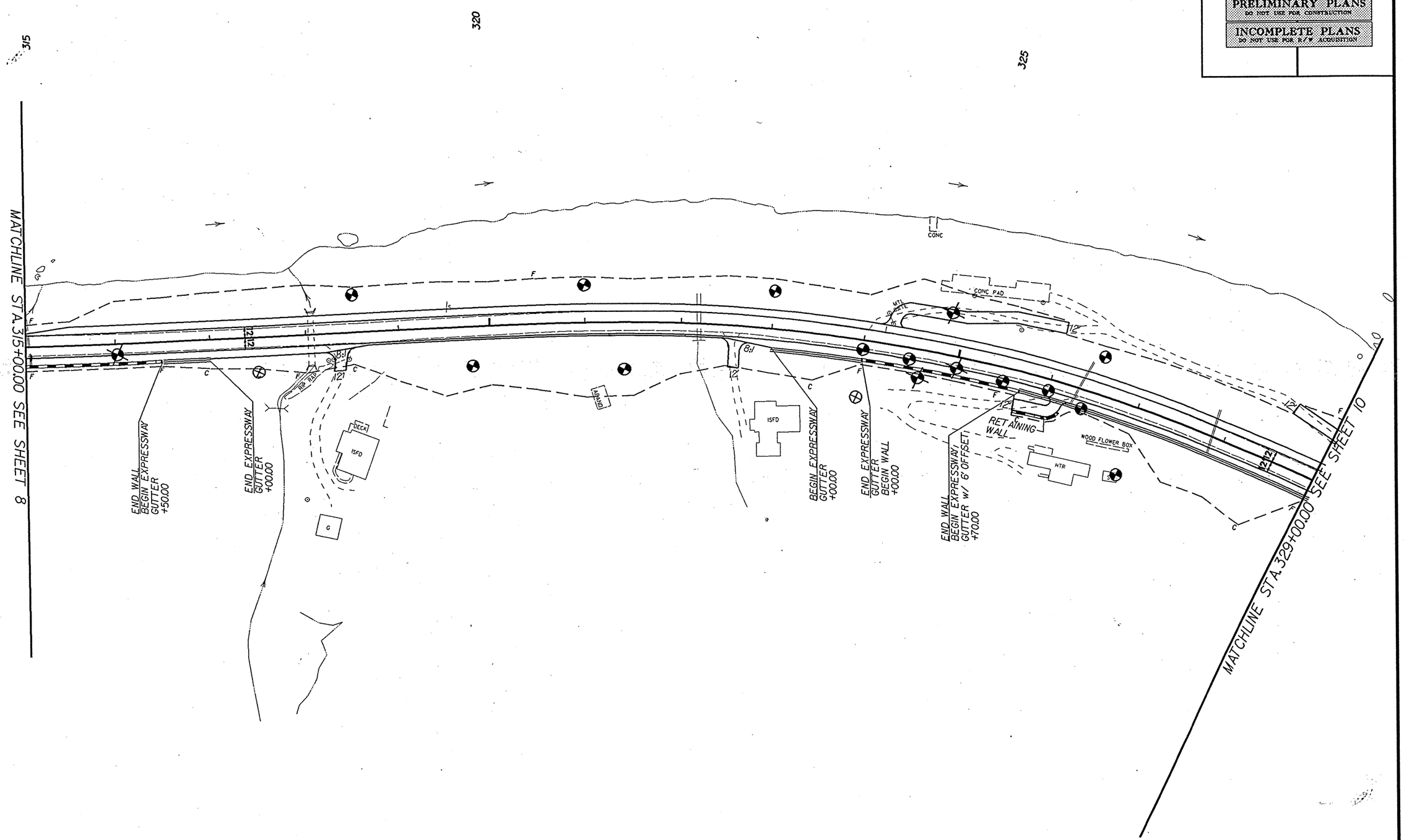
NOTES: FOR RETAINING WALL STA.325+70 TO 326+20 RT

| PROJECT REFERENCE NO. | SHEET NO. |
|---|---|
| R-2100B | 3 |
| R/W SHEET NO. | |
| ROADWAY DESIGN ENGINEER | HYDRAULICS ENGINEER |

EarthTech
A Tyco International Ltd. Company

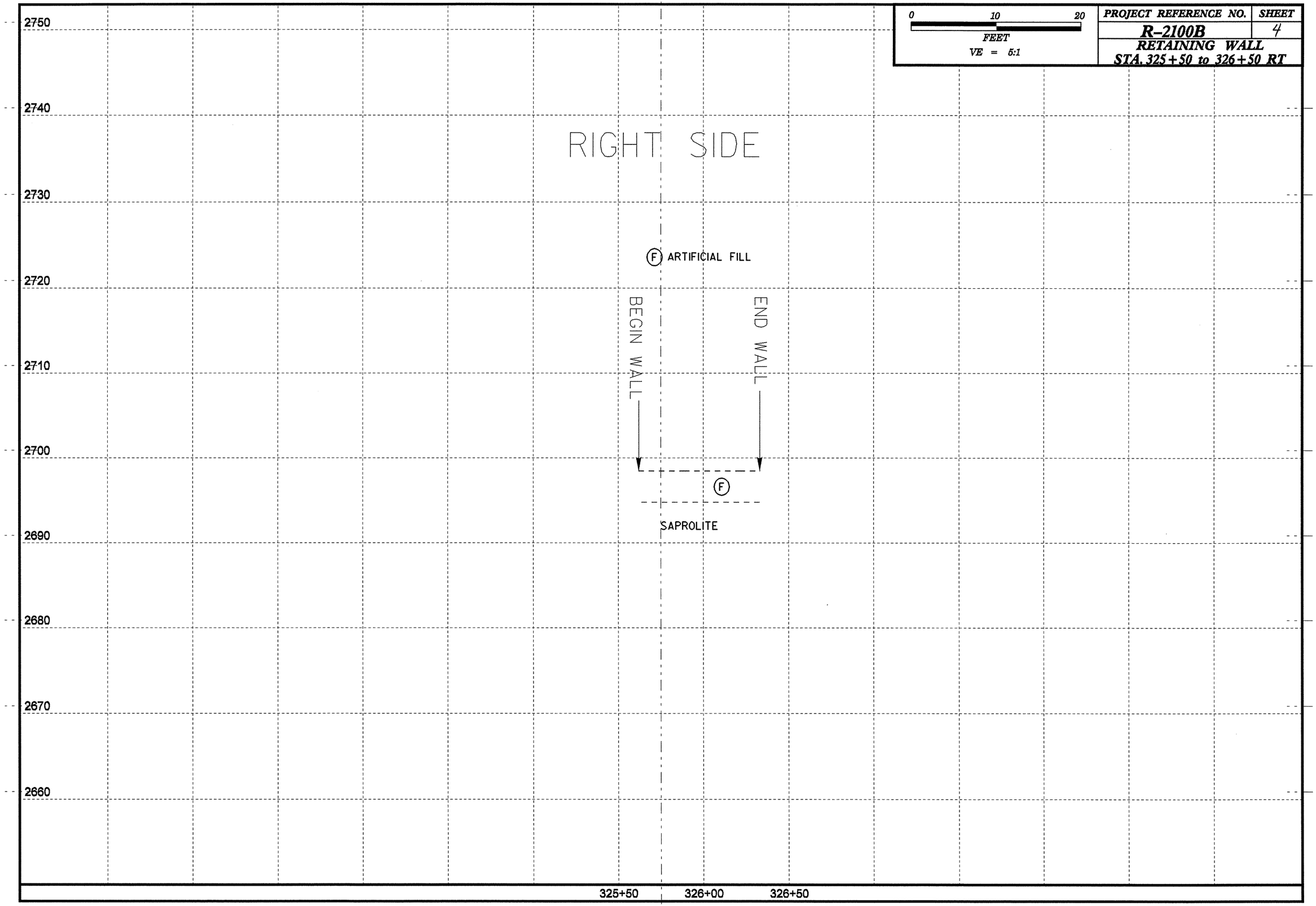
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

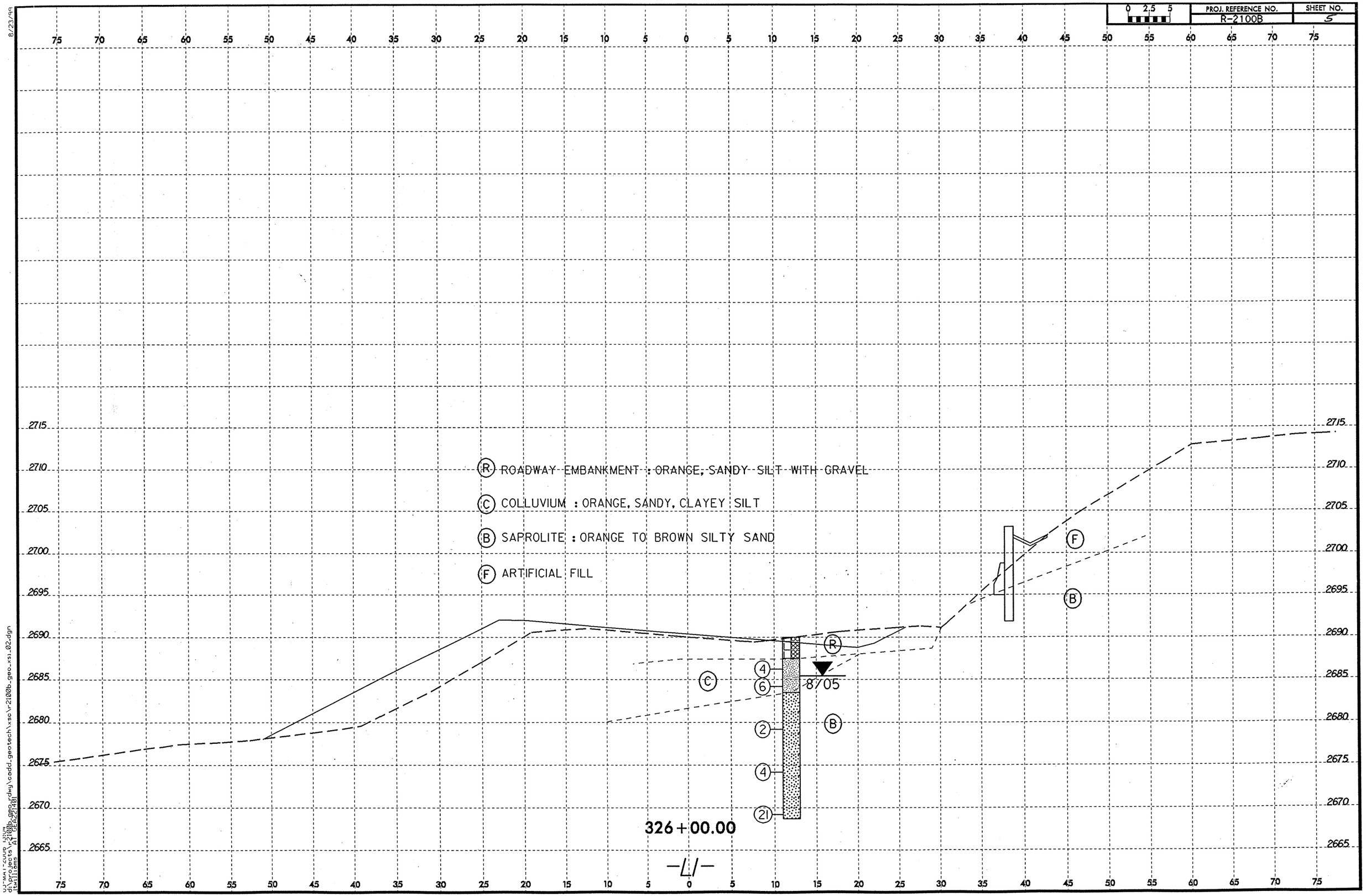
INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION




FOR -L1- PROFILE SEE SHEET 16

| PROJECT REFERENCE NO. | SHEET |
|---|---|
| R-2100B | 4 |
| RETAINING WALL STA. 325+50 to 326+50 RT | |





0 2.5 5
PROJ. REFERENCE NO.
R-2100B
SHEET NO.
5
8/23/99
R ROADWAY EMBANKMENT : ORANGE, SANDY SILT WITH GRAVEL
C COLLUVIUM : ORANGE, SANDY, CLAYEY SILT
B SAPROLITE : ORANGE TO BROWN SILTY SAND
F ARTIFICIAL FILL
8/05
326+00.00
-L/-

# NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
## GEOTECHNICAL UNIT BORING LOG

| | | | |
|---|---|---|---|
| PROJECT NO 34369.1.1 | ID R-2100B | COUNTY ASHE | GEOLOGIST J. CARVER (F&H) |
| SITE DESCRIPTION NC 16 FROM SOUTHEAST OF SR 1158 TO SOUTHEAST OF NC 88 | | | GND WATER |
| BORING NO 32600R | NORTHING 0.00 | EASTING 0.00 | 0 HR N/A |
| ALIGNMENT -L- | BORING LOCATION 326+00.000 | OFFSET 12.00ft RT | 24 HR 4.60ft |
| COLLAR ELEV 2690.00ft | TOTAL DEPTH 21.30ft | START DATE 8/01/05 | COMPLETION DATE 08/01/05 |
| DRILL MACHINE CME-45 | DRILL METHOD ROTARY W/O MUD | | HAMMER TYPE AUTOMATIC |
| SURFACE WATER DEPTH N/A | DEPTH TO ROCK N/A | | Log 32600R, Page 1 of 1 |

| ELEV | DEPTH | BLOW CT 6in | 6in | 6in | PEN (ft) | BLOWS PER FOOT 0 25 50 75 100 | SAMPLE NO | MOI | LOG | SOIL AND ROCK DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|
| 2690.00 | | | | | | Ground Surface | | | | |
| | 2.80 | 2 | 2 | 2 | 1.0 | 4 | | | | EMBANKMENT: ORANGE SANDY SILT WITH ROCK FRAGMENTS |
| | 4.80 | 1 | 3 | 3 | 1.0 | 6 | SS-582 | ▼ | | COLLUVIUM: ORANGE SANDY CLAY-SILT |
| 2680.00 | 9.80 | 0 | 1 | 1 | 1.0 | 2 | SS-583 | | | SAPROLITE: ORANGE TO BROWN SILTY SAND |
| | 14.80 | 1 | 2 | 2 | 1.0 | 4 | | | | |
| 2670.00 | 19.80 | 2 | 5 | 16 | 1.0 | 21 | SS-584 | | | |
| 2668.70 | | | | | | TERMINATED BORING IN SAPROLITE AT ELEVATION 2668.7 FEET. | | | | |

6

M&T 503E

JCS

# NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
## DIVISION OF HIGHWAYS-MATERIALS AND TESTS UNIT
## SOILS TEST REPORT-SOILS LABORATORY

| | |
|---|---|
| T.I.P. ID #: | R-2100 B |

| | |
|---|---|
| REPORT ON SAMPLES OF: | Soils for Classification |

| | | | | | |
|---|---|---|---|---|---|
| PROJECT: | 34369.1.1 | COUNTY: | Ashe | Owner: | -- |
| DATE SAMPLED: | 8.05 | DATE RECEIVED: | 9.23.05 | DATE REPORTED: | 10.5.05 |
| SAMPLED FROM: | Roadway | SAMPLED BY: | L. L. Acker | | |
| SUBMITTED BY: | W. D. Frye | 2002 | STANDARD SPECIFICATION | | |
| LABORATORY: | Asheville | | | | |

## TEST RESULTS

| Project Sample No. | SS-24 | SS-26 | SS-582 | SS-583 | SS-584 | SS-592 | SS-593 | SS-594 |
|---|---|---|---|---|---|---|---|---|
| Lab Sample No. A | 150464 | 150465 | 150466 | 150467 | 150468 | 150469 | 150470 | 150471 |
| HiCAMS Sample # | -- | -- | -- | -- | -- | -- | -- | -- |
| Retained #4 Sieve % | -- | -- | -- | -- | -- | -- | -- | -- |
| Passing #10 Sieve % | 72 | 73 | 84 | 95 | 91 | 89 | 74 | 87 |
| Passing #40 Sieve % | 60 | 60 | 78 | 80 | 78 | 82 | 62 | 75 |
| Passing #200 Sieve % | 22 | 21 | 49 | 31 | 25 | 49 | 24 | 23 |

## MINUS #10 FRACTION

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Soil Mortar - 100% | | | | | | | | |
| Coarse Sand -Ret. #60 | 30 | 31 | 16 | 31 | 29 | 17 | 29 | 30 |
| Fine Sand - Ret. #270 | 48 | 51 | 31 | 46 | 53 | 34 | 46 | 50 |
| Silt 0.05-0.005 mm % | 20 | 16 | 23 | 19 | 16 | 21 | 17 | 12 |
| Clay < 0.005 mm % | 2 | 2 | 30 | 4 | 2 | 28 | 8 | 8 |
| Passing # 40 Sieve % | -- | -- | -- | -- | -- | -- | -- | -- |
| Passing # 200 Sieve % | -- | -- | -- | -- | -- | -- | -- | -- |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Liquid Limit | 28 | 36 | 36 | 44 | 38 | 35 | 39 | 37 |
| Plastic Index | NP | NP | 5 | NP | NP | 5 | NP | NP |
| AASHTO Classification | A-2-4 (0) | A-2-4 (0) | A-4 (3) | A-2-5 (0) | A-2-4 (0) | A-4 (3) | A-2-4 (0) | A-2-4 (0) |
| Quantity | | | | | | | | |
| Texture | | | | | | | | |
| Station | 311+50 | 312+00 | 326+00 | 326+00 | 326+00 | 324+62 | 324+62 | 324+62 |
| Hole No. | | | | | | | | |
| Depth (ft) From: | 4.4 | 4.7 | 2.8 | 9.8 | 19.8 | 4.7 | 9.7 | 14.7 |
| To: | 5.9 | 6.2 | 4.3 | 11.3 | 21.3 | 6.2 | 11.2 | 16.2 |
| | | | | | | | | |

**Remarks:**

A-150464 - 150471

**CC:**

| | |
|---|---|
| L. L. Acker | |
| File | |
| | |
| | |

| | |
|---|---|
| SOILS ENGINEER: | |