



March 14, 2024

MEMORANDUM TO: John L. Pilipchuk, LG, PE
State Geotechnical Engineer
NCDOT

FROM: ESP Associates, Inc.

STATE PROJECT: 42370.1.1 (U-5108)
F.A. PROJECT: STBGDA-1001(078)
COUNTY: Mecklenburg
DESCRIPTION: Northcross Drive Extension from end of Northcross Drive to
Westmoreland Drive

SUBJECT: Sound Barrier Wall Foundation Recommendations

The Geotechnical Engineering Unit (GEU) has received the following proposed sound barrier wall location, completed a subsurface investigation for the referenced project and recommends the following standard sound barrier wall foundation table as shown:

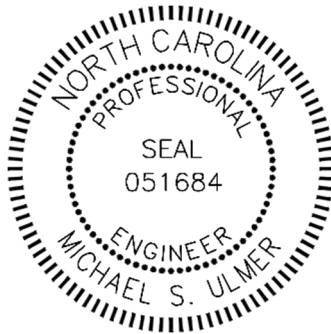
Sound Barrier Wall No.	Begin Station & Offset	End Station & Offset	Estimated Maximum Wall Height	Standard Sound Barrier Wall Foundation Table No.
No. 1	36+00.00 -L- 29.00' LT 10+00.00 -NB3-	43+50.00 -L- 23.50' LT 17+20.00 -NB3-	11 ft.	2

The standard sound barrier wall foundations table is based on 36" dia. holes and a maximum wall height of 25 ft. For 30" dia. holes, add an additional 1 ft to pile excavation depth (D) in standard foundation tables.

Please contact Shiping Yang, Ph.D., P.E. at (704) 455-8902 or Shane Clark, P.E. at (828) 298-3228 if there are any questions concerning this memorandum.

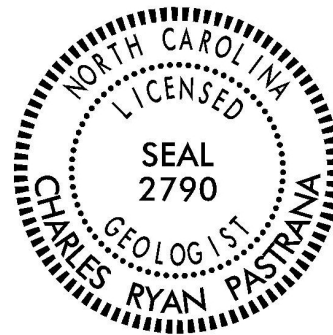
Thank you for the opportunity to be of service on this project.

Prepared by,



Michael S. Ulmer, PE
Senior Geotechnical Engineer

Prepared by,



3/14/2024

Ryan C. Pastrana, PG
Project Geologist

MSU/CRP

Attachments: U-5108_GEO_WALL_InventoryReport

REFERENCE: U-5108

PROJECT: 42370

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

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	U-5108	1	6

CONTENTS

SHEET NO.	DESCRIPTION
1	TITLE SHEET
2	LEGEND (SOIL & ROCK)
3	SITE PLAN
4-5	PROFILE
6	SOIL TEST RESULTS

STRUCTURE
SUBSURFACE INVESTIGATION

COUNTY MECKLENBURG
PROJECT DESCRIPTION NORTHCROSS DRIVE EXTENSION
FROM EXISTING END OF NORTHCROSS DRIVE
TO WESTMORELAND DRIVE
SITE DESCRIPTION NOISE WALL NO.1
-NB3- STA. 10+00 TO 17+20 /
-L- STA. 36+00 TO 43+50

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) 707-6850. THE SUBSURFACE PLANS AND REPORTS, FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA ARE NOT 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 THE 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.

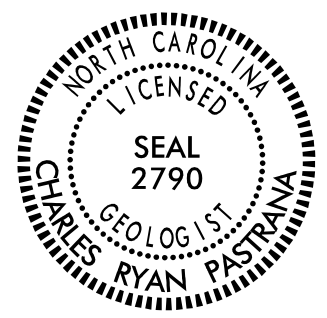
NOTES:
1. THE INFORMATION CONTAINED HEREIN IS NOT IMPLIED OR GUARANTEED BY THE N. C. DEPARTMENT OF TRANSPORTATION AS ACCURATE NOR IS IT CONSIDERED PART OF THE PLANS, SPECIFICATIONS OR CONTRACT FOR THE PROJECT.
2. BY HAVING REQUESTED THIS INFORMATION, THE CONTRACTOR SPECIFICALLY WAIVES ANY CLAIMS FOR INCREASED COMPENSATION OR EXTENSION OF TIME BASED ON DIFFERENCES BETWEEN THE CONDITIONS INDICATED HEREIN AND THE ACTUAL CONDITIONS AT THE PROJECT SITE.


PERSONNEL

- P.M. WEAVER
- C.R. PASTRANA
- D.M. NANCE
- HPC

INVESTIGATED BY ESP Associates, Inc.
DRAWN BY C.R. PASTRANA
CHECKED BY C.R. PASTRANA
SUBMITTED BY ESP Associates, Inc.
DATE March 2024

 **ESP ASSOCIATES, INC.**
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 3/14/2024
SIGNATURE DATE

DOCUMENT NOT CONSIDERED FINAL
UNLESS ALL SIGNATURES COMPLETED

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

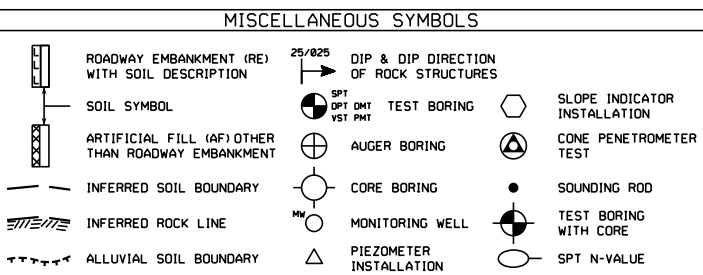
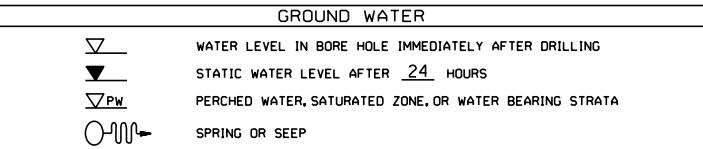
SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION
SOIL IS CONSIDERED 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 THE STANDARD PENETRATION TEST (AASHTO T 208, ASTM D1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY INCLUDE THE FOLLOWING: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. FOR EXAMPLE, VERY STIFF, GRAY, SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6

SOIL LEGEND AND AASHTO CLASSIFICATION table with columns for General Class, Group Class, Symbol, % Passing, Material Passing, Group Index, Usual Types, Gen. Rating, and Consistency or Denseness.

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

ANGULARITY OF GRAINS
MINERALOGICAL COMPOSITION
COMPRESSIBILITY
PERCENTAGE OF MATERIAL
GROUND WATER



ROCK DESCRIPTION
HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT REFUSAL IF TESTED, AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL...

WEATHERING
FRESH
VERY SLIGHT (IV SLI)
SLIGHT (SLI)
MODERATE (MOD)
MODERATELY SEVERE (MOD. SEV.)
SEVERE (SEV)
VERY SEVERE (IV SEV)
COMPLETE

ROCK HARDNESS
VERY HARD
HARD
MODERATELY HARD
MEDIUM HARD
SOFT
VERY SOFT

TEXTURE OR GRAIN SIZE table with columns for U.S. Std. Sieve Size, Boulder, Cobble, Gravel, Coarse Sand, Fine Sand, Silt, and Clay.

RECOMMENDATION SYMBOLS
UNCLASSIFIED EXCAVATION - UNSUITABLE WASTE
UNCLASSIFIED EXCAVATION - ACCEPTABLE DEGRADABLE ROCK

ABBREVIATIONS
AR - AUGER REFUSAL
BT - BORING TERMINATED
CL - CLAY
CPT - CLAY 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

SOIL MOISTURE - CORRELATION OF TERMS table with columns for Soil Moisture Scale, Field Moisture Description, and Guide for Field Moisture Description.

EQUIPMENT USED ON SUBJECT PROJECT table with columns for Drill Units, Advancing Tools, Hammer Type, Core Size, Hand Tools, and Equipment.

FRACTURE SPACING and BEDDING tables with columns for Term, Spacing, and Thickness.

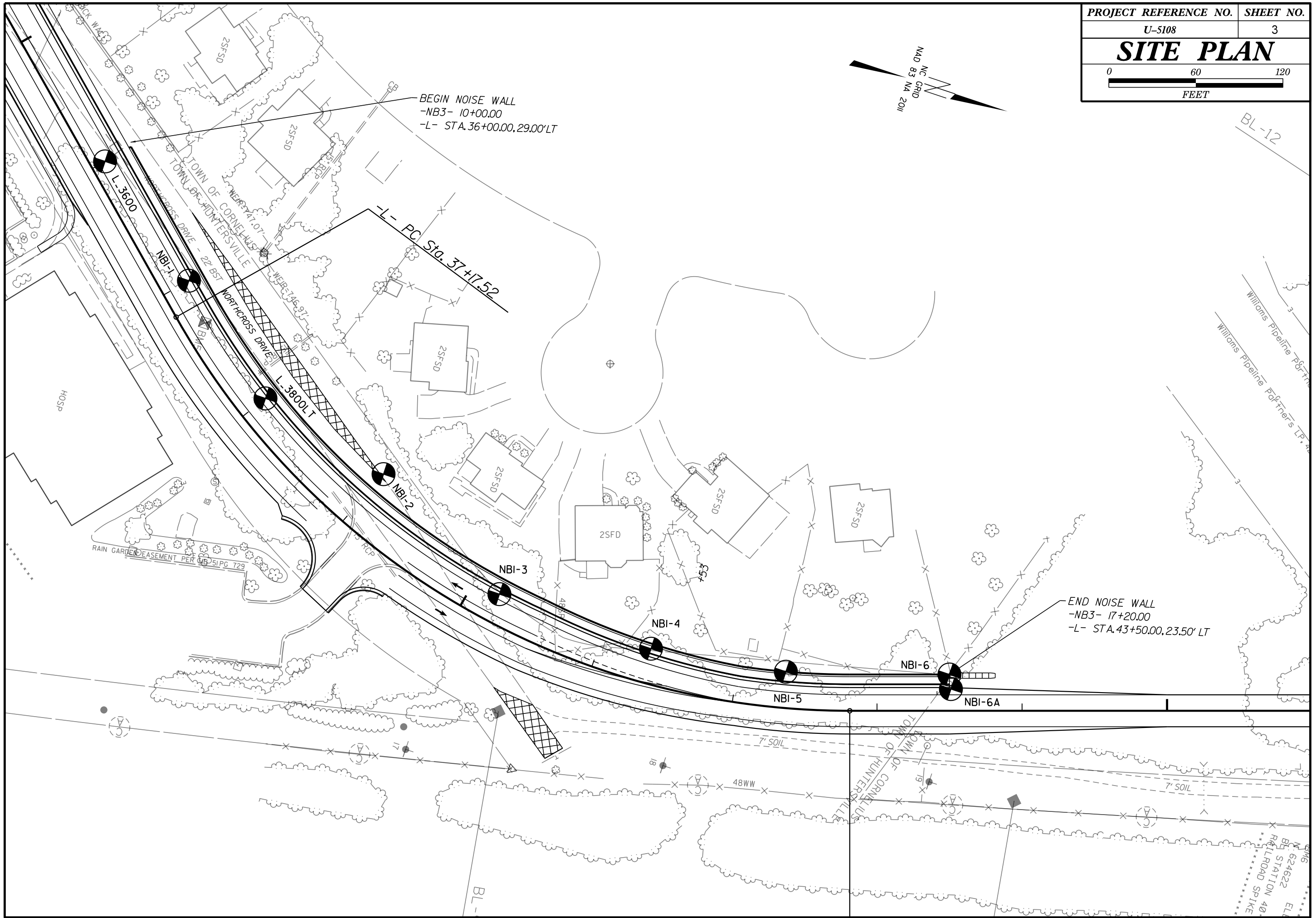
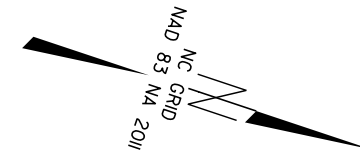
PLASTICITY and COLOR tables with columns for Plasticity Index, Dry Strength, and Color descriptions.

INDURATION table with columns for Term, Induration, and Induration description.

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, SUCH 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 DISLOGGED 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 (ROD) - 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 (SROD) - 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.

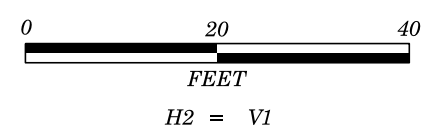
BENCH MARK: FILE 'u5108_is_tin.tin' WAS USED TO DETERMINE GROUND ELEVATION AT BORINGS. ELEVATION: FEET

NOTES:
F.I.A.D. = FILLED IMMEDIATELY AFTER DRILLING



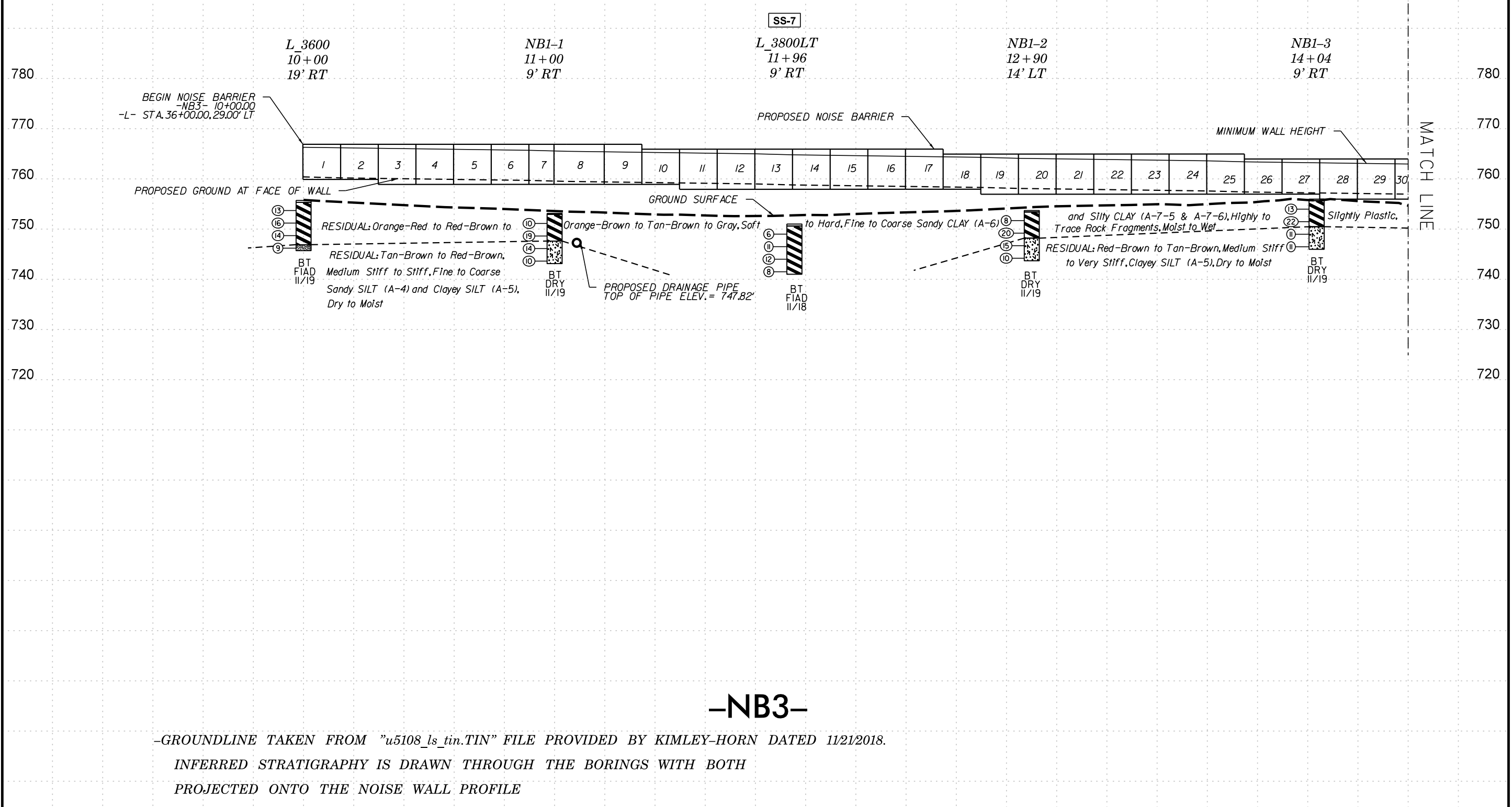
BL-12

BL-11
 RAILROAD SPIKE
 STATION 40+
 624622
 ELEVATION



PROJECT REFERENCE NO.	SHEET NO.
U-5108	4
PROFILE ALONG NOISE WALL NO.1	

PANEL NO.	1-9	10-17	18-25	26-36	37-48
TOP ELEVATION	767'	766'	765'	764'	765'
LENGTH	135'	120'	120'	165'	180'

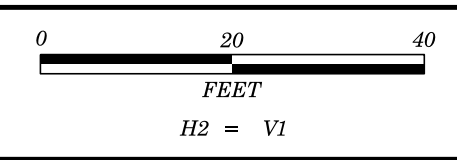


-NB3-

-GROUNDLINE TAKEN FROM "u5108_ls_tm.TIN" FILE PROVIDED BY KIMLEY-HORN DATED 11/21/2018.

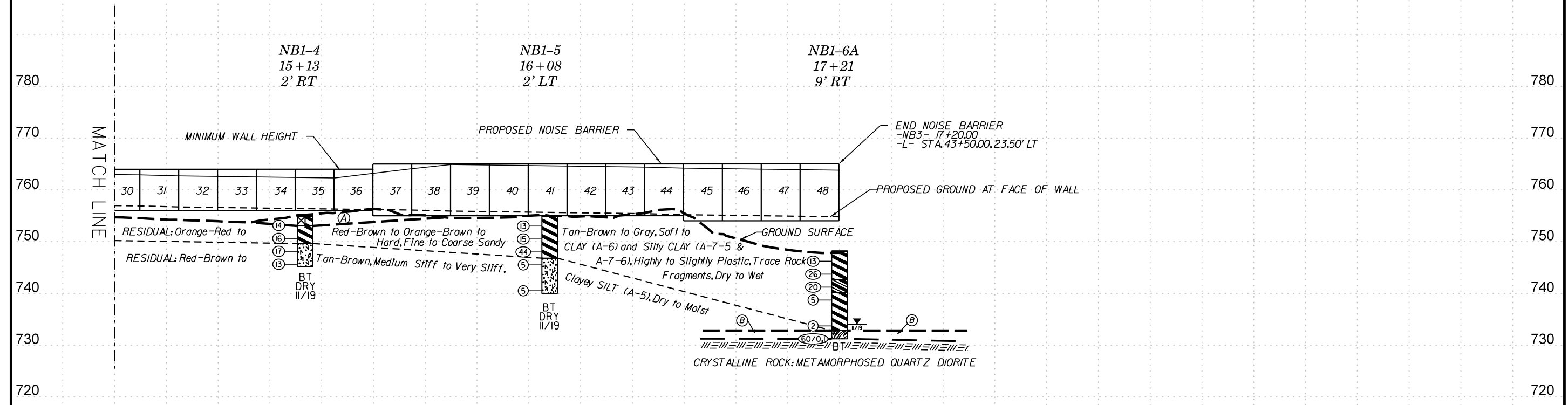
INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH
PROJECTED ONTO THE NOISE WALL PROFILE

10+00 11+00 12+00 13+00 14+00 14+40



PROJECT REFERENCE NO.	SHEET NO.
U-5108	5
PROFILE ALONG NOISE WALL NO. 1	

PANEL NO.	1-9	10-17	18-25	26-36	37-48
TOP ELEVATION	767'	766'	765'	764'	765'
LENGTH	135'	120'	120'	165'	180'



- (A) ARTIFICIAL FILL: Red-Brown to Tan, Hard, Silty CLAY (A-7-5), Trace Gravel
Note: Blow Count Influenced by Gravel
- (B) WEATHERED ROCK: METAMORPHOSED QUARTZ DIORITE

-NB3-

-GROUNDLINE TAKEN FROM "u5108_ls_tin.TIN" FILE PROVIDED BY KIMLEY HORN DATED 4/20/2018.
 INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH
 PROJECTED ONTO THE NOISE WALL PROFILE

SOILS LABORATORY TESTS RESULTS

WBS NO.: 42370.1.1

TIP NO.: U-5108

COUNTY: Mecklenburg

SITE DESCRIPTION: Northcross Drive Extension From End of Northcross Drive to Westmoreland Drive - Noise Wall

BORING NO.	SAMPLE NO.	BORING LOCATION	DEPTH INTERVAL (FT)	AASHTO CLASS	N	L.L	P.I.	% BY WEIGHT				% PASSING SIEVES			% MOISTURE	% ORGANIC
								CSE. SAND	F. SAND	SILT	CLAY	10	40	200		
L_3800LT	SS-7	-L- STA. 38+00, 20' LT	1.0-2.5	A-7-5 (22)	6	68	38	33	7	9	51	100	73	61	25.8	-

Signed: 

NCDOT Certification No. 129-04-0411