STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	B-5808	1	26

REFERENCE: B-5808

PROJECT: 45762

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

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY *Cabbarrus*

SITE DESCRIPTION *Bridge No. 57 on US 29/601 NBL over Irish Buffalo Creek*

CONTENTS

CAUTION NOTICE

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DATE *January 2020*

NORTH CAROLINA LICENSED SEAL 2029 GEOLOGIST KEVIN BENNETT MILLER

DocuSigned by:

01/18/2022

SIGNATURE DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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PROJECT REFERENCE NO.	SHEET NO.
B–5808	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 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 206, 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

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 #40 #200	50 MX 30 MX 15 MX		51 MN 10 MX	35 MX	35 MX	35 MX	35 MX	36 MN	36 MN	36 MN	36 MN	GRANULAR SOILS	SILT-CLAY SOILS	MUCK, PEAT
MATERIAL PASSING #40 LL PI	– 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 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/FT²)
GENERALLY GRANULAR MATERIAL (NON-COHESIVE)	VERY LOOSE	< 4	
	LOOSE	4 TO 10	
	MEDIUM DENSE	10 TO 30	
	DENSE	30 TO 50	N/A
	VERY DENSE	> 50	
GENERALLY SILT-CLAY MATERIAL (COHESIVE)	VERY SOFT	< 2	< 0.25
	SOFT	2 TO 4	0.25 TO 0.5
	MEDIUM STIFF	4 TO 8	0.5 TO 1.0
	STIFF	8 TO 15	1 TO 2
	VERY STIFF	15 TO 30	2 TO 4
	HARD	> 30	> 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
	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 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
NON PLASTIC	0-5	VERY LOW
SLIGHTLY PLASTIC	6-15	SLIGHT
MODERATELY PLASTIC	16-25	MEDIUM
HIGHLY PLASTIC	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.
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

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 WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.

COMPRESSIBILITY

SLIGHTLY COMPRESSIBLE	LL < 31
MODERATELY COMPRESSIBLE	LL = 31 - 50
HIGHLY COMPRESSIBLE	LL > 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
- SPT, DPT, DMT, VST, PMT — TEST BORING
- AUGER BORING
- CORE BORING
- MW — MONITORING WELL
- PIEZOMETER INSTALLATION
- SLOPE INDICATOR INSTALLATION
- CONE PENETROMETER TEST
- SOUNDING ROD
- TEST BORING WITH CORE
- SPT N-VALUE

RECOMMENDATION SYMBOLS

- UNDERCUT
- SHALLOW UNDERCUT
- UNCLASSIFIED EXCAVATION - UNSUITABLE WASTE
- UNCLASSIFIED EXCAVATION - ACCEPTABLE DEGRADABLE ROCK
- UNCLASSIFIED EXCAVATION - ACCEPTABLE, BUT NOT TO BE USED IN THE TOP 3 FEET OF EMBANKMENT OR BACKFILL

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
γ - UNIT WEIGHT
γ_d - DRY UNIT WEIGHT

SAMPLE ABBREVIATIONS

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

EQUIPMENT USED ON SUBJECT PROJECT

DRILL UNITS:
- [ ] CME-45C
- [ ] CME-55
- [ ] CME-550
- [ ] VANE SHEAR TEST
- [ ] PORTABLE HOIST
- [X] CME-550X
- [ ] _____

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 _____ [ ] -H _____
- [X] -N X

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

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. 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, WOULD YIELD SPT N VALUES > 100 BPF*
VERY SEVERE (V SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE THAT ONLY MINOR VESTIGES OF ORIGINAL ROCK FABRIC REMAIN. *IF TESTED, WOULD YIELD 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 FOOT
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 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, 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 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: -L- STA. 19+78.83, 71.56' LT
N: 609,812.6440, E: 1,519,260.6710
ELEVATION: N/A FEET

NOTES:

FIAD= FILLED IMMEDIATELY AFTER DRILLING

DATE: 8-15-14

PROJECT REFERENCE NO.	SHEET NO.
B–5808	2A

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

SUPPLEMENTAL LEGEND, GEOLOGICAL STRENGTH INDEX (GSI) TABLES FROM AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS

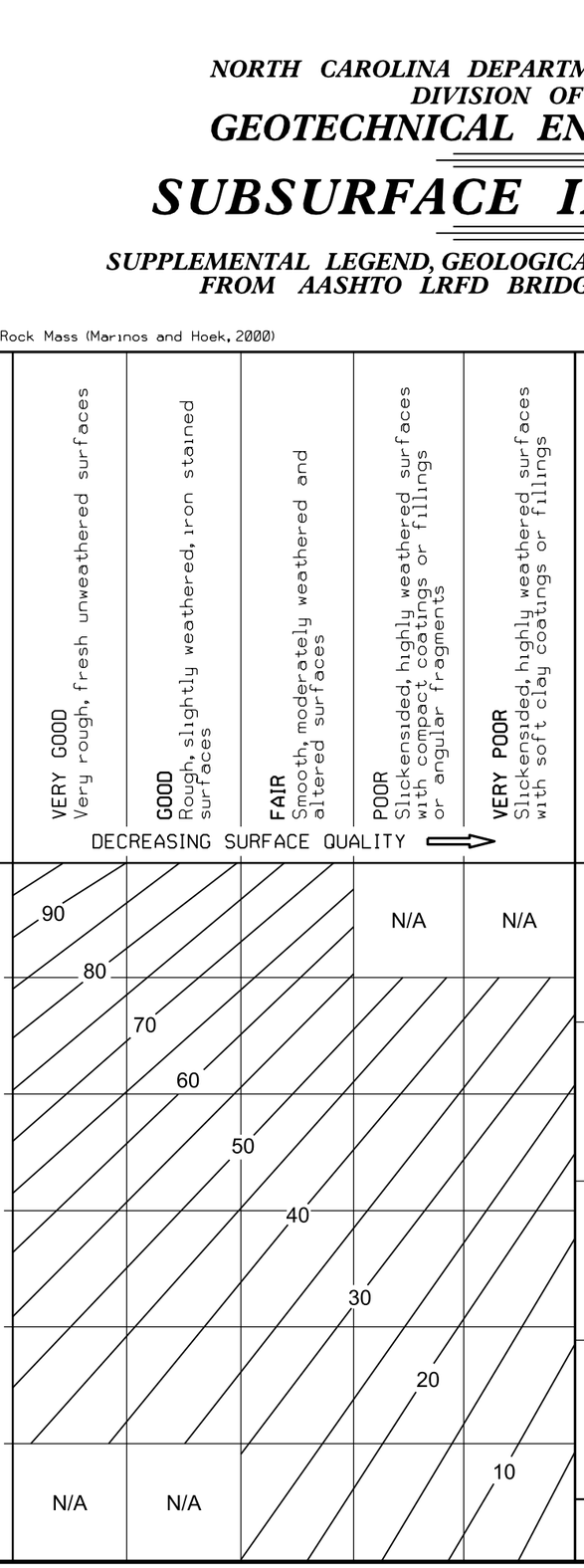
AASHTO LRFD Figure 10.4.6.4-1 — Determination of GSI for Jointed Rock Mass (Marinos and Hoek, 2000)

GEOLOGICAL STRENGTH INDEX (GSI) FOR JOINTED ROCKS (Hoek and Marinos, 2000)

From the lithology, structure and surface conditions of the discontinuities, estimate the average value of GSI. Do not try to be too precise. Quoting a range from 33 to 37 is more realistic than stating that GSI = 35. Note that the table does not apply to structurally controlled failures. Where weak planar structural planes are present in an unfavorable orientation with respect to the excavation face, these will dominate the rock mass behaviour. The shear strength of surfaces in rocks that are prone to deterioration as a result of changes in moisture content will be reduced if water is present. When working with rocks in the fair to very poor categories, a shift to the right may be made for wet conditions. Water pressure is dealt with by effective stress analysis.

STRUCTURE

- INTACT OR MASSIVE - intact rock specimens or massive in situ rock with few widely spaced discontinuities
- BLOCKY - well interlocked undisturbed rock mass consisting of cubical blocks formed by three intersecting discontinuity sets
- VERY BLOCKY - interlocked, partially disturbed mass with multi-faceted angular blocks formed by 4 or more joint sets
- BLOCKY/DISTURBED/SEAMY - folded with angular blocks formed by many intersecting discontinuity sets. Persistence of bedding planes or schistosity
- DISINTEGRATED - poorly interlocked, heavily broken rock mass with mixture of angular and rounded rock pieces
- LAMINATED/SHEARED - Lack of blockiness due to close spacing of weak schistosity or shear planes

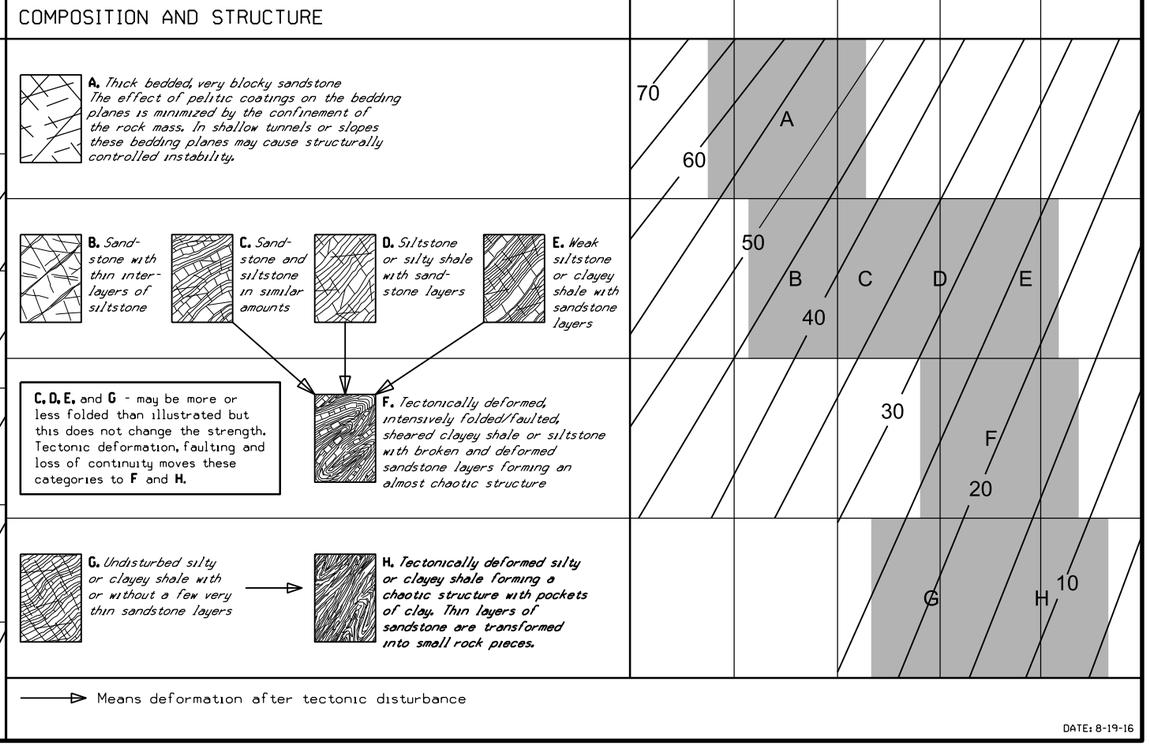


AASHTO LRFD Figure 10.4.6.4-2 — Determination of GSI for Tectonically Deformed Heterogeneous Rock Masses (Marinos and Hoek, 2000)

GSI FOR HETEROGENEOUS ROCK MASSES SUCH AS FLYSCH (Marinos. P and Hoek E., 2000)

From a description of the lithology, structure and surface conditions (particularly of the bedding planes), choose a box in the chart. Locate the position in the box that corresponds to the condition of the discontinuities and estimate the average value of GSI from the contours. Do not attempt to be too precise. Quoting a range from 33 to 37 is more realistic than giving GSI = 35. Note that the Hoek-Brown criterion does not apply to structurally controlled failures. Where unfavourably oriented continuous weak planar discontinuities are present, these will dominate the behaviour of the rock mass. The strength of some rock masses is reduced by the presence of groundwater and this can be allowed for by a slight shift to the right in the columns for fair, poor and very poor conditions. Water pressure does not change the value of GSI and it is dealt with by using effective stress analysis.

COMPOSITION AND STRUCTURE



DATE: 8-19-16

PROJECT REFERENCE NO.	SHEET NO.
B-5808	3

SITE PLAN

0 50 100

FEET

SKEW = 45°

NAD 83 NC GRID NA 2011

EB1–A(2)

EB2–A(2)

–DET–

EB1–A

B1–A

Bridge No. 57

B1–C

B2–A

EB2–A

EB1–C

B2–C

EB2–C

EB1–B

B1–B

B2–B

–L–

–L–

BM #2

BL-5 CONC ISL

US 29/US 601 Concord Parkway

SR 1594 Poplar Tent Rd.

ISMBUS

MTL CANOPY

RIP RAP

IRISH BUFFALO CREEK

CONC BRIDGE DECK

MCGILL Ave.

36" WD WALL

24" CORRUGABLE CONC WALL

6 IN. STL

42" CMP

12" CMP

12" PVC

12" PVC DIRECTION ONLY

20" PVC

72" CHL 3SBW

18" RCP

24" TCP

18" C&G

CONC

PA ASPH

MTL

GR

EOI

DI

OTCB

RPCONC

LP

MTR

PROJECT REFERENCE NO.	SHEET NO.
B-5808	4

PROFILE BORINGS PROJECTED ALONG -L-

0 10 20
FEET
VE = 1:1

EB1-C
19+80
8.0' LT

B1-C
20+35
8.0' LT

B2-C
20+76
23.0' RT

EB2-C
21+36
23.0' RT

BEGIN BRIDGE
-L- STA 19+69.35

END BRIDGE
-L- STA 21+59.35

Ground Surface

Roadway Embankment:
Soft to Medium Stiff, Moist, Brown-Orange, Sandy Silty CLAY

Roadway Embankment:
Medium Stiff, Moist, Brown-Orange, Sandy Silty CLAY

Alluvial:
Very Loose to Loose, Moist, Brown-Gray and Brown-Orange, Clayey Silty SAND

Alluvial:
Soft to Medium Stiff, Moist, Gray, Silty Sandy CLAY

SAND and Gray (META-QUARTZ DIORITE)

Residual: Very Loose to Very Dense, Moist, Brown-Gray-Orange, Clayey Silty

Weathered Rock: Pink-Orange-White

Crystalline Rock: Gray-Black and Pink (META-QUARTZ DIORITE)

06/19

BT
FIAD

REC=96%
RQD=83%
GSI=92-95

REC=69%
RQD=28%
GSI=30-45 (20.7'-30.2')
GSI=94 (30.3'-32.6')

REC=100%
RQD=10%
GSI=35-40

REC=100%
RQD=84%
GSI=95

620
610
600
590
580
570
560
550
540

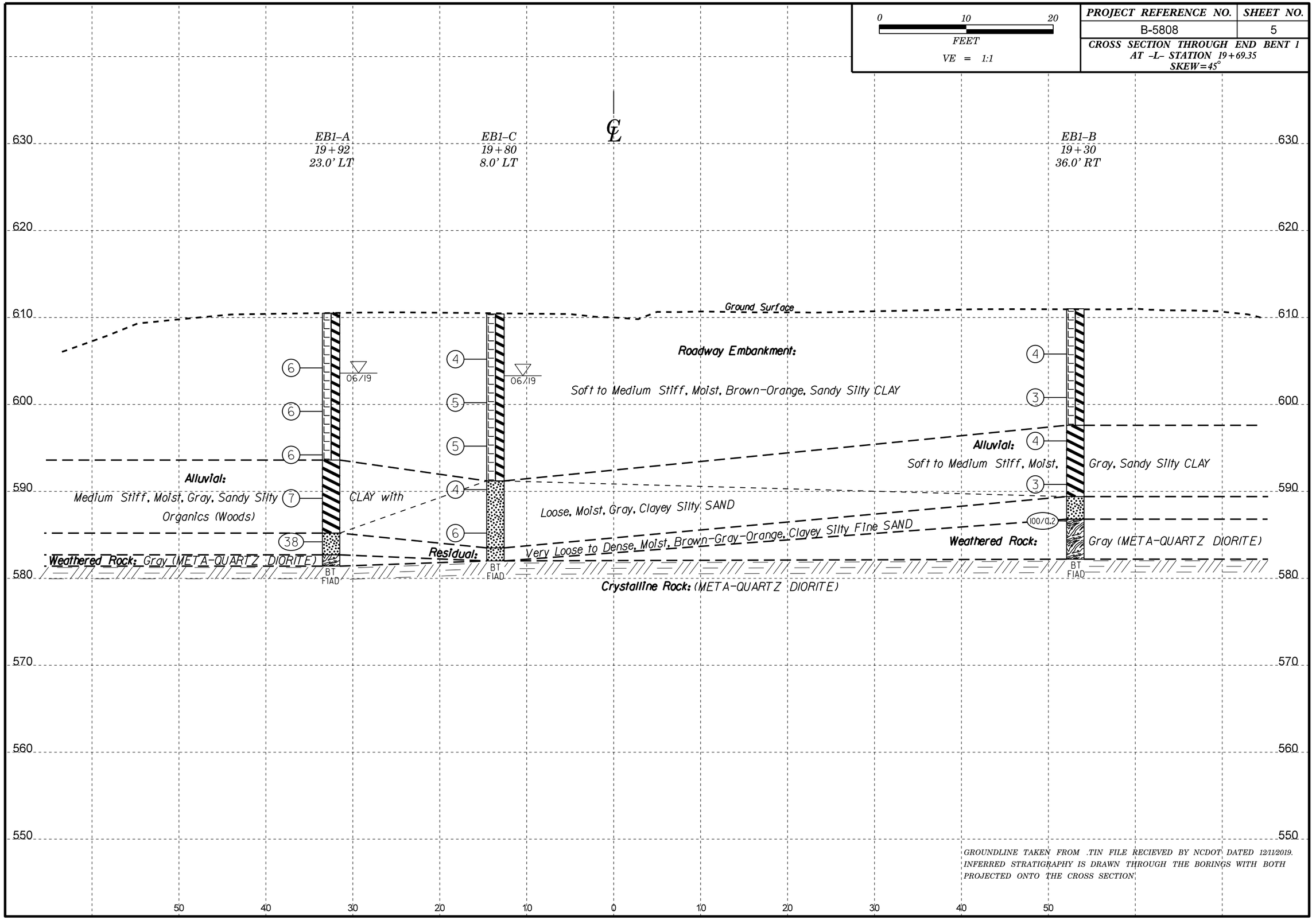
20+00
21+00
22+00

GROUNDLINE TAKEN FROM .TIN FILE RECIEVED BY NCDOT DATED 12/11/2019.
INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE CROSS SECTION

PROJECT REFERENCE NO.	SHEET NO.
B-5808	5

CROSS SECTION THROUGH END BENT 1
AT –L– STATION 19+69.35
SKEW=45°

0 10 20
FEET
VE = 1:1

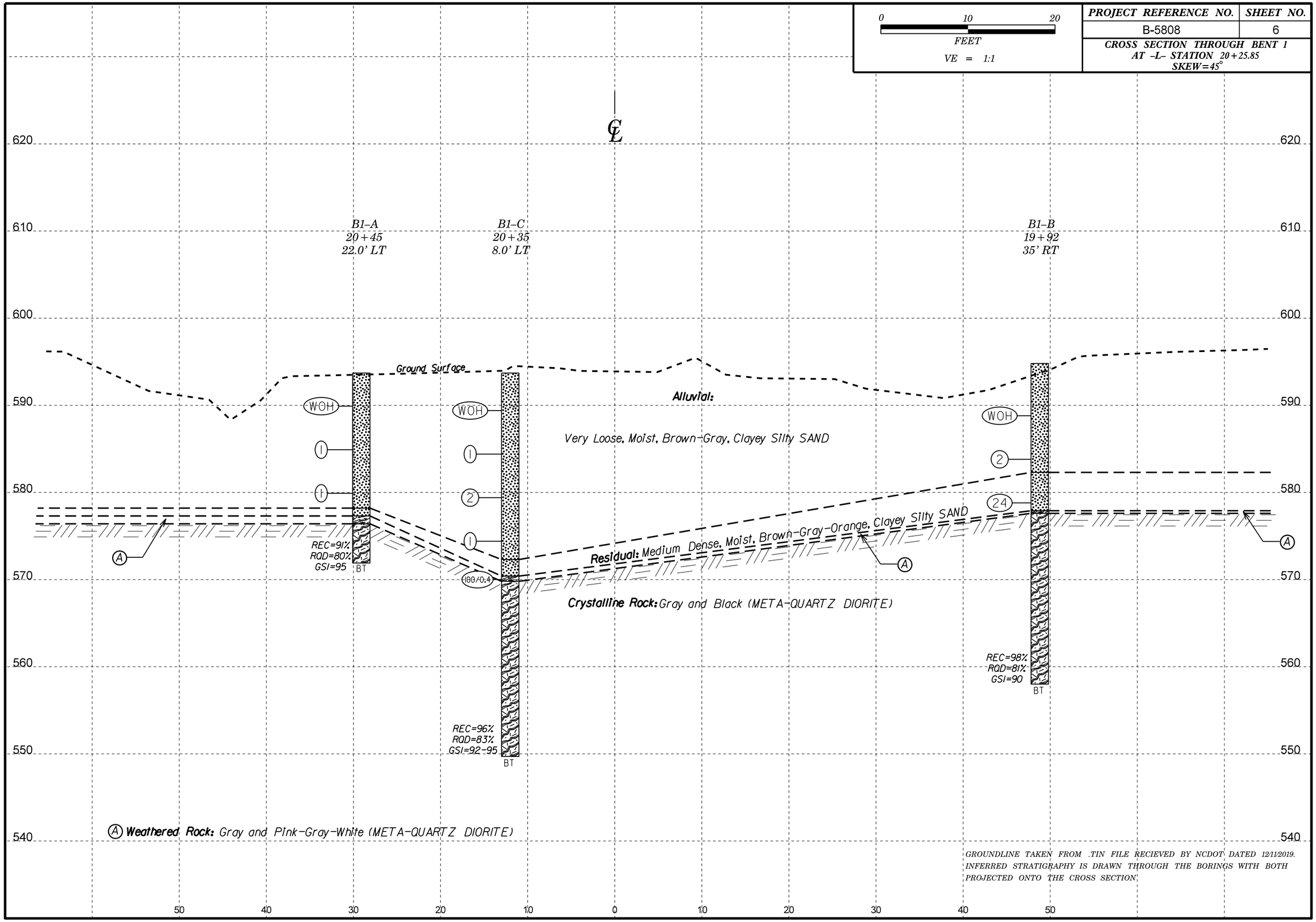


GROUNDLINE TAKEN FROM .TIN FILE RECIEVED BY NCDOT DATED 12/11/2019.
INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE CROSS SECTION.

PROJECT REFERENCE NO.	SHEET NO.
B-5808	6

CROSS SECTION THROUGH BENT 1
AT -L- STATION 20+25.85
SKEW=45°

0 10 20
FEET
VE = 1:1



GROUNDLINE TAKEN FROM .TIN FILE RECIEVED BY NCDOT DATED 12/11/2019.
INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE CROSS SECTION.

PROJECT REFERENCE NO.	SHEET NO.
B-5808	7

CROSS SECTION THROUGH BENT 2
AT -L- STATION 21+02.85
SKEW=45°

0 10 20
FEET
VE = 1:1

℄

B2-A
21+22
21.0' LT

B2-C
20+76
23.0' RT

B2-B
20+66
36.0' RT

Ground Surface

Alluvial:
Very Loose to Loose, Moist, Brown-Orange, Clayey Silty SAND

Residual:
Dense to Very Dense, Moist, Brown-Gray, Clayey Silty SAND with Rock Fragments

Crystalline Rock: Gray-Black (META-QUARTZ DIORITE)

Ⓐ **Weathered Rock:** Gray (META-QUARTZ DIORITE)

B2-A: 3, 2, (100/0.4), A
B2-C: WOH, 2, 5, 63, A, 55
B2-B: WOH, 2, 6, 31, 63

REC=92%
RQD=83%
GSI=95
BT

REC=69%
RQD=28%
GSI=30-45 (20.7'-30.2')
GSI=94 (30.3'-32.6')
REC=100%
RQD=10%
GSI=35-40
REC=100%
RQD=84%
GSI=95
BT

REC=96%
RQD=87%
GSI=90-94
BT

610 600 590 580 570 560 550 540 530

50 40 30 20 10 0 10 20 30 40 50

GROUNDLINE TAKEN FROM .TIN FILE RECIEVED BY NCDOT DATED 12/11/2019.
INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE CROSS SECTION.

PROJECT REFERENCE NO.	SHEET NO.
B-5808	8

CROSS SECTION THROUGH END BENT 2
AT -L- STATION 21+59.35
SKEW=45°

0 10 20
FEET
VE = 1:1

EB2-A
21+82
23' LT

EB2-C
21+36
23' RT

Ground Surface

Roadway Embankment:
Soft to Medium Stiff, Moist, Brown-Orange, Sandy Silty CLAY

Alluvial:
Soft tO Medium Stiff, Moist, Gray, Silty Sandy CLAY

Residual: Very Dense, Moist, Brown-Gray-Orange, Clayey Silty Fine SAND

Weathered Rock: Gray (META-QUARTZ DIORITE)

Crystalline Rock: (META-QUARTZ DIORITE)

	4	4	3	2	60/0.1
	5	3	2	6	100/0.6

BT
BT
FIAD

630 620 610 600 590 580 570 560 550

50 40 30 20 10 0 10 20 30 40 50

GROUNDLINE TAKEN FROM .TIN FILE RECIEVED BY NCDOT DATED 12/1/2019.
INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE CROSS SECTION

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 45762.1.1	**TIP** B-5808	**COUNTY** CABARRUS	**GEOLOGIST** Stickney, J. K.	
SITE DESCRIPTION Bridge No. 57 on US 29/601 Over Irish Buffalo Creek				**GROUND WTR (ft)**
BORING NO. EB1-A	**STATION** 19+92	**OFFSET** 23 ft LT	**ALIGNMENT** -L-	**0 HR.** 6.9
COLLAR ELEV. 610.5 ft	**TOTAL DEPTH** 29.1 ft	**NORTHING** 609,838	**EASTING** 1,519,304	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE HFC0072 CME-550X 92% 08/15/2018		**DRILL METHOD** NW Casing w/ Advancer	**HAMMER TYPE** Automatic	
DRILLER Smith, C. L.	**START DATE** 06/03/19	**COMP. DATE** 06/03/19	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE 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)
615											
610										610.5	0.0
										GROUND SURFACE	
										ROADWAY EMBANKMENT Brown-Orange Sandy Silty CLAY	
605	605.2	5.3	1	3	3	6		M			
600	600.2	10.3	1	2	4	6		M			
595	595.2	15.3	4	3	3	6		M		593.6	16.9
590	590.2	20.3	1	4	3	7		M		**ALLUVIAL** Gray, Sandy Silty CLAY with Organics (Wood)	
585	585.2	25.3	13	17	21	38		M		585.2	25.3
										RESIDUAL Brown-Gray-Orange, Clayey Silty Fine SAND	
										582.7	27.8
										WEATHERED ROCK Gray (META-QUARTZ DIORITE)	
										581.4	29.1
										Boring Terminated with Casing Advancer Refusal at Elevation 581.4 ft on CRYSTALLINE ROCK (META-QUARTZ DIORITE)	

Note:
FIAD=Filled Immediately After Drilling

WBS 45762.1.1	**TIP** B-5808	**COUNTY** CABARRUS	**GEOLOGIST** Stickney, J. K.	
SITE DESCRIPTION Bridge No. 57 on US 29/601 Over Irish Buffalo Creek				**GROUND WTR (ft)**
BORING NO. EB1-C	**STATION** 19+80	**OFFSET** 8 ft LT	**ALIGNMENT** -L-	**0 HR.** 7.1
COLLAR ELEV. 610.4 ft	**TOTAL DEPTH** 28.4 ft	**NORTHING** 609,830	**EASTING** 1,519,322	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE HFC0072 CME-550X 92% 08/15/2018		**DRILL METHOD** NW Casing w/ Advancer	**HAMMER TYPE** Automatic	
DRILLER Smith, C. L.	**START DATE** 06/17/19	**COMP. DATE** 06/17/19	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE 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
615										
610										610.4 **GROUND SURFACE** 0.0
										ROADWAY EMBANKMENT Brown-Orange, Sandy Silty CLAY
605	606.2	4.2	1	1	3	4		M		
600	601.2	9.2	2	2	3	5		M		
595	596.2	14.2	2	3	2	5		M		
590	591.2	19.2	1	2	2	4		M		591.2 19.2 **ALLUVIAL** Gray, Clayey Silty SAND
585	586.2	24.2	2	3	3	6		M		583.5 26.9 **RESIDUAL** 582.0 28.4 Brown-Gray-Orange, Clayey Silty Fine SAND
										Boring Terminated with Casing Advancer Refusal at Elevation 582.0 ft on CRYSTALLINE ROCK (META-QUARTZ DIORITE)

Note:
FIAD=Filled Immediately After Drilling

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 45762.1.1	**TIP** B-5808	**COUNTY** CABARRUS	**GEOLOGIST** Stickney, J. K.	
SITE DESCRIPTION Bridge No. 57 on US 29/601 Over Irish Buffalo Creek				**GROUND WTR (ft)**
BORING NO. EB1-B	**STATION** 19+30	**OFFSET** 36 ft RT	**ALIGNMENT** -L-	**0 HR.** NM
COLLAR ELEV. 611.0 ft	**TOTAL DEPTH** 28.8 ft	**NORTHING** 609,793	**EASTING** 1,519,377	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE HFC0072 CME-550X 92% 08/15/2018		**DRILL METHOD** NW Casing w/ Advancer	**HAMMER TYPE** Automatic	
DRILLER Smith, C. L.	**START DATE** 06/05/19	**COMP. DATE** 06/05/19	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE 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)
615										
610	611.0	0.0								GROUND SURFACE
										ROADWAY EMBANKMENT Brown-Orange, Sandy Silty CLAY
605	606.8	4.2	1	2	2	4		M		
600	601.8	9.2	1	1	2	3		M		
	597.6	13.4								**ALLUVIAL** Gray-Brown, Sandy Silty CLAY
595	596.8	14.2	3	2	2	4		M		
590	591.8	19.2	1	1	2	3		M		
	589.4	21.6								**RESIDUAL** Brown-Gray-Orange, Clayey Silty Fine SAND
	586.8	24.2	100/0.2			100/0.2				**WEATHERED ROCK** Gray (META-QUARTZ DIORITE)
585	582.2	28.8								Boring Terminated with Casing Advancer Refusal at Elevation 582.2 ft on CRYSTALLINE ROCK (META-QUARTZ DIORITE)

Notes:
1. NM=Not Measured
2. FIAD=Filled Immediately After Drilling

NCDOT BORE DOUBLE B5808_GEO_BH_BRDG0057.GPJ NC_DOT.GDT 1/17/20

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 45762.1.1	**TIP** B-5808	**COUNTY** CABARRUS	**GEOLOGIST** Stickney, J. K.	
SITE DESCRIPTION Bridge No. 57 on US 29/601 Over Irish Buffalo Creek				**GROUND WTR (ft)**
BORING NO. B1-A	**STATION** 20+45	**OFFSET** 22 ft LT	**ALIGNMENT** -L-	**0 HR.** NM
COLLAR ELEV. 593.7 ft	**TOTAL DEPTH** 21.8 ft	**NORTHING** 609,889	**EASTING** 1,519,292	**24 HR.** NM
DRILL RIG/HAMMER EFF./DATE HFO0072 CME-550X 92% 08/15/2018		**DRILL METHOD** NW Casing w/ Advancer	**HAMMER TYPE** Automatic	
DRILLER Smith, C. L.	**START DATE** 06/03/19	**COMP. DATE** 06/03/19	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE 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)
595										593.7 GROUND SURFACE	0.0
	590.9	2.8	WOH	WOH	WOH	0		M		**ALLUVIAL** Brown-Gray, Clayey Silty SAND	
590	585.9	7.8	1	0	1	1		M			
585	580.9	12.8	1	1	0	1		M			
580										578.2	15.5
										577.3 **RESIDUAL**	16.4
575										576.4 Brown-Gray-Orange, Clayey Silty Fine SAND	17.3
										WEATHERED ROCK Gray (META-QUARTZ DIORITE)	
										571.9 **CRYSTALLINE ROCK** Gray (META-QUARTZ DIORITE)	21.8
										Boring Terminated at Elevation 571.9 ft in CRYSTALLINE ROCK (META-QUARTZ DIORITE)	

Notes:
1.NM=Not Measured
2. Boring Abandoned due to Core Equipment Failure

GEOTECHNICAL BORING REPORT
CORE LOG

WBS 45762.1.1	**TIP** B-5808	**COUNTY** CABARRUS	**GEOLOGIST** Stickney, J. K.	
SITE DESCRIPTION Bridge No. 57 on US 29/601 Over Irish Buffalo Creek				**GROUND WTR (ft)**
BORING NO. B1-A	**STATION** 20+45	**OFFSET** 22 ft LT	**ALIGNMENT** -L-	**0 HR.** NM
COLLAR ELEV. 593.7 ft	**TOTAL DEPTH** 21.8 ft	**NORTHING** 609,889	**EASTING** 1,519,292	**24 HR.** NM
DRILL RIG/HAMMER EFF./DATE HFO0072 CME-550X 92% 08/15/2018		**DRILL METHOD** NW Casing w/ Advancer	**HAMMER TYPE** Automatic	
DRILLER Smith, C. L.	**START DATE** 06/03/19	**COMP. DATE** 06/03/19	**SURFACE WATER DEPTH** N/A	
CORE SIZE NX	**TOTAL RUN** 4.5 ft			

ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	STRATA RQD (ft) %	LOG	DESCRIPTION AND REMARKS ELEV. (ft)	DEPTH (ft)
576.4											Begin Coring @ 17.3 ft	
575	576.4	17.3	1.8		(1.4) 78%	(1.2) 67%		(4.1) 91%	(3.6) 80%		576.4 **CRYSTALLINE ROCK**	17.3
	574.6	19.1									Gray, Very Slightly Weathered to fresh, Very Hard META-QUARTZ DIORITE with Close to Wide Fracture Spacing; GSI=95	
			2.7		(2.7) 100%	(2.4) 89%						
	571.9	21.8									571.9	21.8
											Boring Terminated at Elevation 571.9 ft in CRYSTALLINE ROCK (META-QUARTZ DIORITE)	

Notes:
1.NM=Not Measured
2. Boring Abandoned due to Core Equipment Failure

CORE PHOTOGRAPHS: Bridge No. 57 on US 29/601 over Irish Buffalo Creek, B1-A 20+45, 22.0’ LT

Begin
17.3 feet

End
21.8 feet

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 45762.1.1	**TIP** B-5808	**COUNTY** CABARRUS	**GEOLOGIST** Stickney, J. K.	
SITE DESCRIPTION Bridge No. 57 on US 29/601 Over Irish Buffalo Creek				**GROUND WTR (ft)**
BORING NO. B1-C	**STATION** 20+35	**OFFSET** 8 ft LT	**ALIGNMENT** -L-	**0 HR.** Caved
COLLAR ELEV. 593.7 ft	**TOTAL DEPTH** 44.0 ft	**NORTHING** 609,883	**EASTING** 1,519,308	**24 HR.** NM
DRILL RIG/HAMMER EFF./DATE HFO0072 CME-550X 92% 08/15/2018		**DRILL METHOD** NW Casing w/ Advancer	**HAMMER TYPE** Automatic	
DRILLER Smith, C. L.	**START DATE** 06/19/19	**COMP. DATE** 06/19/19	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE 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)
595											
										593.7 GROUND SURFACE	0.0
										ALLUVIAL Brown-Gray, Clayey Silty SAND	
590	590.4	3.3	WOH	WOH	WOH	0		M			
585	585.4	8.3	1	0	1	1		M			
580	580.4	13.3	1	1	1	2		M			
575	575.4	18.3	1	1	0	1		M			
										572.3	21.4
570	570.4	23.3	100/0.4			100/0.4				570.4 **RESIDUAL** Brown-Gray-Orange, Clayey Silty SAND	23.3
										569.8 **WEATHERED ROCK** Pink-Orange-White (META-QUARTZ DIORITE)	23.9
565										**CRYSTALLINE ROCK** Gray-Black (META-QUARTZ DIORITE)	
560											
555											
550										549.7	44.0
										Boring Terminated at Elevation 549.7 ft in CRYSTALLINE ROCK (META-QUARTZ DIORITE)	
										Note: NM=Not Measured	

NCDOT BORE DOUBLE B5808_GEO_BH_BRDG0057.GPJ NC_DOT.GDT 1/22/20

GEOTECHNICAL BORING REPORT
CORE LOG

WBS 45762.1.1	**TIP** B-5808	**COUNTY** CABARRUS	**GEOLOGIST** Stickney, J. K.	
SITE DESCRIPTION Bridge No. 57 on US 29/601 Over Irish Buffalo Creek				**GROUND WTR (ft)**
BORING NO. B1-C	**STATION** 20+35	**OFFSET** 8 ft LT	**ALIGNMENT** -L-	**0 HR.** Caved
COLLAR ELEV. 593.7 ft	**TOTAL DEPTH** 44.0 ft	**NORTHING** 609,883	**EASTING** 1,519,308	**24 HR.** NM
DRILL RIG/HAMMER EFF./DATE HFO0072 CME-550X 92% 08/15/2018		**DRILL METHOD** NW Casing w/ Advancer	**HAMMER TYPE** Automatic	
DRILLER Smith, C. L.	**START DATE** 06/19/19	**COMP. DATE** 06/19/19	**SURFACE WATER DEPTH** N/A	
CORE SIZE NX	**TOTAL RUN** 20.1 ft			

ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	STRATA RQD (ft) %	LOG	DESCRIPTION AND REMARKS ELEV. (ft)	DEPTH (ft)
569.8											Begin Coring @ 23.9 ft	
	569.8	23.9	5.1	1:03/1.1 1:07/1.0 1:11/1.0 1:04/1.0 1:08/1.0	(4.5) 88%	(3.6) 71%		(19.3) 96%	(16.7) 83%		569.8 **CRYSTALLINE ROCK** Gray-Black, Slightly Weathered to Fresh, Very Hard META-QUARTZ DIORITE with Close to Wide Fracture Spacing; GSI=92-95	23.9
565	564.7	29.0	5.0	1:06/1.0 1:10/1.0 1:00/1.0 1:04/1.0 1:02/1.0	(5.0) 100%	(5.0) 100%						
560	559.7	34.0	5.0	1:10/1.0 1:05/1.0 1:09/1.0 1:11/1.0 1:13/1.0	(5.0) 100%	(4.8) 96%						
555	554.7	39.0	5.0	1:15/1.0 1:06/1.0 1:10/1.0 1:04/1.0 1:06/1.0	(4.8) 96%	(3.3) 66%						
550	549.7	44.0									549.7	44.0
											Boring Terminated at Elevation 549.7 ft in CRYSTALLINE ROCK (META-QUARTZ DIORITE)	
											Note: NM=Not Measured	

NCDOT CORE DOUBLE B5808_GEO_BH_BRDG0057.GPJ NC_DOT.GDT 1/22/20

CORE PHOTOGRAPHS: Bridge No. 57 on US 29/601 over Irish Buffalo Creek, B1-C 20+35, 8.0' LT

Begin
23.9 feet

0.0 0.2 0.4 0.6 0.8 1.0 1.2 1.4 1.6 1.8 2.0

SCALE IN FEET

End
44.0 feet

. 0.0 0.2 0.4 0.6 0.8 1.0 1.2 1.4 1.6 1.8 2.0

SCALE IN FEET

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 45762.1.1	**TIP** B-5808	**COUNTY** CABARRUS	**GEOLOGIST** Stickney, J. K.	
SITE DESCRIPTION Bridge No. 57 on US 29/601 Over Irish Buffalo Creek				**GROUND WTR (ft)**
BORING NO. B1-B	**STATION** 19+92	**OFFSET** 35 ft RT	**ALIGNMENT** -L-	**0 HR.** Cave 4.0'
COLLAR ELEV. 594.8 ft	**TOTAL DEPTH** 36.8 ft	**NORTHING** 609,853	**EASTING** 1,519,360	**24 HR.** NM
DRILL RIG/HAMMER EFF./DATE HFO0072 CME-550X 92% 08/15/2018		**DRILL METHOD** NW Casing w/ Advancer	**HAMMER TYPE** Automatic	
DRILLER Smith, C. L.	**START DATE** 06/05/19	**COMP. DATE** 06/05/19	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE 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)
595										594.8	0.0
										GROUND SURFACE	
										ALLUVIAL	
										Brown to Gray, Clayey Silty SAND	
590	589.8	5.0	WOH	WOH	WOH	0		M			
585	584.8	10.0	1	1	1	2		M			
										582.3	12.5
										RESIDUAL	
										Brown-Gray-Orange, Clayey Silty Fine SAND	
580	579.8	15.0	25	15	9	24		M			
										577.9	16.9
										577.6	17.2
										WEATHERED ROCK	
										Gray (META-QUARTZ DIORITE)	
575										**CRYSTALLINE ROCK**	
										Gray and Black (META-QUARTZ DIORITE)	
570											
565							RS-2				
560										558.0	36.8
										Boring Terminated at Elevation 558.0 ft in CRYSTALLINE ROCK (META-QUARTZ DIORITE)	
										Note: NM=Not Measured	

NCDOT BORE DOUBLE B5808_GEO_BH_BRDG0057.GPJ NC_DOT.GDT 1/22/20

GEOTECHNICAL BORING REPORT
CORE LOG

WBS 45762.1.1	**TIP** B-5808	**COUNTY** CABARRUS	**GEOLOGIST** Stickney, J. K.	
SITE DESCRIPTION Bridge No. 57 on US 29/601 Over Irish Buffalo Creek				**GROUND WTR (ft)**
BORING NO. B1-B	**STATION** 19+92	**OFFSET** 35 ft RT	**ALIGNMENT** -L-	**0 HR.** Cave 4.0'
COLLAR ELEV. 594.8 ft	**TOTAL DEPTH** 36.8 ft	**NORTHING** 609,853	**EASTING** 1,519,360	**24 HR.** NM
DRILL RIG/HAMMER EFF./DATE HFO0072 CME-550X 92% 08/15/2018		**DRILL METHOD** NW Casing w/ Advancer	**HAMMER TYPE** Automatic	
DRILLER Smith, C. L.	**START DATE** 06/05/19	**COMP. DATE** 06/05/19	**SURFACE WATER DEPTH** N/A	
CORE SIZE NX	**TOTAL RUN** 19.6 ft			

ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	STRATA RQD (ft) %	LOG	DESCRIPTION AND REMARKS ELEV. (ft)	DEPTH (ft)
577.6											Begin Coring @ 17.2 ft	
	577.6	17.2	2.6	1:28/1.0	(2.6) 100%	(2.5) 96%		(19.2) 98%	(15.9) 81%		577.6	17.2
575	575.0	19.8									**CRYSTALLINE ROCK**	
											Gray and Black, Very Slightly Weathered to Fresh, Very Hard META-QUARTZ DIORITE with Close to Wide Fracture Spacing; RS-2: 27.7-28.2; GSI=90	
			5.0	1:40/1.0 1:35/1.0 1:32/1.0 1:47/1.0 1:45/1.0	(4.9) 98%	(3.2) 64%						
570	570.0	24.8										
			5.0	1:44/1.0 1:48/1.0 1:39/1.0 1:52/1.0 1:46/1.0	(4.7) 94%	(4.0) 80%	RS-2					
565	565.0	29.8										
			5.0	1:50/1.0 1:53/1.0 1:44/1.0 1:51/1.0 1:42/1.0	(5.0) 100%	(4.2) 84%						
560	560.0	34.8										
	558.0	36.8	2.0	1:50/1.0 1:37/1.0	(2.0) 100%	(2.0) 100%					558.0	36.8
											Boring Terminated at Elevation 558.0 ft in CRYSTALLINE ROCK (META-QUARTZ DIORITE)	
											Note: NM=Not Measured	

NCDOT CORE DOUBLE B5808_GEO_BH_BRDG0057.GPJ NC_DOT.GDT 1/22/20

CORE PHOTOGRAPHS: Bridge No. 57 on US 29/601 over Irish Buffalo Creek, B1-B 19+92, 35.0’ RT

Begin
17.2 feet

0.0 0.2 0.4 0.6 0.8 1.0 1.2 1.4 1.6 1.8 2.0

SCALE IN FEET

End
36.8 feet

. 0.0 0.2 0.4 0.6 0.8 1.0 1.2 1.4 1.6 1.8 2.0

SCALE IN FEET

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 45762.1.1	**TIP** B-5808	**COUNTY** CABARRUS	**GEOLOGIST** Stickney, J. K.	
SITE DESCRIPTION Bridge No. 57 on US 29/601 Over Irish Buffalo Creek				**GROUND WTR (ft)**
BORING NO. B2-A	**STATION** 21+22	**OFFSET** 21 ft LT	**ALIGNMENT** -L-	**0 HR.** Cave 3.0'
COLLAR ELEV. 594.1 ft	**TOTAL DEPTH** 35.3 ft	**NORTHING** 609,964	**EASTING** 1,519,273	**24 HR.** NM
DRILL RIG/HAMMER EFF./DATE HFO0072 CME-550X 92% 08/15/2018		**DRILL METHOD** NW Casing w/ Advancer	**HAMMER TYPE** Automatic	
DRILLER Smith, C. L.	**START DATE** 06/04/19	**COMP. DATE** 06/04/19	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE 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)
595											
										594.1	0.0
										GROUND SURFACE	
										ALLUVIAL	
590	590.4	3.7	2	2	1	3		M		Brown-Orange, Clayey Silty SAND	
										583.5	10.6
585	585.4	8.7	WOH	WOH	2	2		M		**RESIDUAL**	
										Brown-Gray-Orange, Clayey Silty Fine SAND	
580	580.4	13.7	100/0.4			100/0.4				580.4	13.7
										579.2	14.9
										WEATHERED ROCK	
575										Gray (META-QUARTZ DIORITE)	
										CRYSTALLINE ROCK	
570										Gray-Black (META-QUARTZ DIORITE)	
565											
560										558.8	35.3
										Boring Terminated at Elevation 558.8 ft in CRYSTALLINE ROCK (META-QUARTZ DIORITE)	

Note:
NM=Not Measured

GEOTECHNICAL BORING REPORT
CORE LOG

WBS 45762.1.1	**TIP** B-5808	**COUNTY** CABARRUS	**GEOLOGIST** Stickney, J. K.	
SITE DESCRIPTION Bridge No. 57 on US 29/601 Over Irish Buffalo Creek				**GROUND WTR (ft)**
BORING NO. B2-A	**STATION** 21+22	**OFFSET** 21 ft LT	**ALIGNMENT** -L-	**0 HR.** Cave 3.0'
COLLAR ELEV. 594.1 ft	**TOTAL DEPTH** 35.3 ft	**NORTHING** 609,964	**EASTING** 1,519,273	**24 HR.** NM
DRILL RIG/HAMMER EFF./DATE HFO0072 CME-550X 92% 08/15/2018		**DRILL METHOD** NW Casing w/ Advancer	**HAMMER TYPE** Automatic	
DRILLER Smith, C. L.	**START DATE** 06/04/19	**COMP. DATE** 06/04/19	**SURFACE WATER DEPTH** N/A	
CORE SIZE NX	**TOTAL RUN** 20.4 ft			

ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	STRATA RQD (ft) %	LOG	DESCRIPTION AND REMARKS ELEV. (ft)	DEPTH (ft)
579.2												
	579.2	14.9	5.4		(4.0) 74%	(3.5) 65%		(18.8) 92%	(16.9) 83%		Begin Coring @ 14.9 ft	
575				1:47/1.0 1:44/1.0 1:38/1.0							579.2 **CRYSTALLINE ROCK** Gray-Black, Fresh to Very Slightly Weathered, Very Hard META-QUARTZ DIORITE with Close to Wide Fracture Spacing (Felsic Zone from 32.0'-33.3'); GSI=95	14.9
	573.8	20.3	5.0	1:35/1.0 1:40/1.0 1:30/1.0 1:39/1.0 1:41/1.0	(5.0) 100%	(4.4) 88%						
570	568.8	25.3	5.0	1:28/1.0 1:38/1.0 1:36/1.0 1:42/1.0 1:40/1.0	(4.8) 96%	(4.8) 96%						
565	563.8	30.3	5.0	1:36/1.0 1:40/1.0 1:44/1.0 1:39/1.0 1:37/1.0	(5.0) 100%	(4.2) 84%						
560	558.8	35.3									558.8	35.3
											Boring Terminated at Elevation 558.8 ft in CRYSTALLINE ROCK (META-QUARTZ DIORITE)	

Note:
NM=Not Measured

CORE PHOTOGRAPHS: Bridge No. 57 on US 29/601 over Irish Buffalo Creek, B2-A 21+22, 21.0' LT

Begin
14.9 feet

0.0 0.2 0.4 0.6 0.8 1.0 1.2 1.4 1.6 1.8 2.0

SCALE IN FEET

End
35.3 feet

0.0 0.2 0.4 0.6 0.8 1.0 1.2 1.4 1.6 1.8 2.0

SCALE IN FEET

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 45762.1.1	**TIP** B-5808	**COUNTY** CABARRUS	**GEOLOGIST** Stickney, J. K.	
SITE DESCRIPTION Bridge No. 57 on US 29/601 Over Irish Buffalo Creek				**GROUND WTR (ft)**
BORING NO. B2-C	**STATION** 20+76	**OFFSET** 23 ft RT	**ALIGNMENT** -L-	**0 HR.** NM
COLLAR ELEV. 591.6 ft	**TOTAL DEPTH** 42.6 ft	**NORTHING** 609,931	**EASTING** 1,519,327	**24 HR.** NM
DRILL RIG/HAMMER EFF./DATE HFO0072 CME-550X 92% 08/15/2018		**DRILL METHOD** NW Casing w/ Advancer	**HAMMER TYPE** Automatic	
DRILLER Smith, C. L.	**START DATE** 06/17/19	**COMP. DATE** 06/17/19	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE 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)
595										591.6 GROUND SURFACE	0.0
590	589.7	1.9	WOH	WOH	WOH	0		M		**ALLUVIAL** Brown-Orange, Clayey Silty SAND	
585	584.7	6.9	WOH	WOH	2	2		M			
580	579.7	11.9	1	2	3	5		M			
575	574.7	16.9	16	23	40	63		M		576.8	14.8
										RESIDUAL Brown-Gray, Clayey Silty SAND	
										571.6	20.0
570										570.9 **WEATHERED ROCK** (META-QUARTZ DIORITE)	20.7
										CRYSTALLINE ROCK Gray-Black (META-QUARTZ DIORITE)	
565											
560										559.0	32.6
										Pink (META-QUARTZ DIORITE)	
555										554.0	37.6
										Gray-Black (META-QUARTZ DIORITE)	
550										549.0	42.6
										Boring Terminated at Elevation 549.0 ft in CRYSTALLINE ROCK (META-QUARTZ DIORITE)	

Note:
NM=Not Measured

NCDOT BORE DOUBLE B5808_GEO_BH_BRDG0057.GPJ NC_DOT.GDT 1/22/20

GEOTECHNICAL BORING REPORT
CORE LOG

WBS 45762.1.1	**TIP** B-5808	**COUNTY** CABARRUS	**GEOLOGIST** Stickney, J. K.	
SITE DESCRIPTION Bridge No. 57 on US 29/601 Over Irish Buffalo Creek				**GROUND WTR (ft)**
BORING NO. B2-C	**STATION** 20+76	**OFFSET** 23 ft RT	**ALIGNMENT** -L-	**0 HR.** NM
COLLAR ELEV. 591.6 ft	**TOTAL DEPTH** 42.6 ft	**NORTHING** 609,931	**EASTING** 1,519,327	**24 HR.** NM
DRILL RIG/HAMMER EFF./DATE HFO0072 CME-550X 92% 08/15/2018		**DRILL METHOD** NW Casing w/ Advancer	**HAMMER TYPE** Automatic	
DRILLER Smith, C. L.	**START DATE** 06/17/19	**COMP. DATE** 06/17/19	**SURFACE WATER DEPTH** N/A	
CORE SIZE NX	**TOTAL RUN** 21.9 ft			

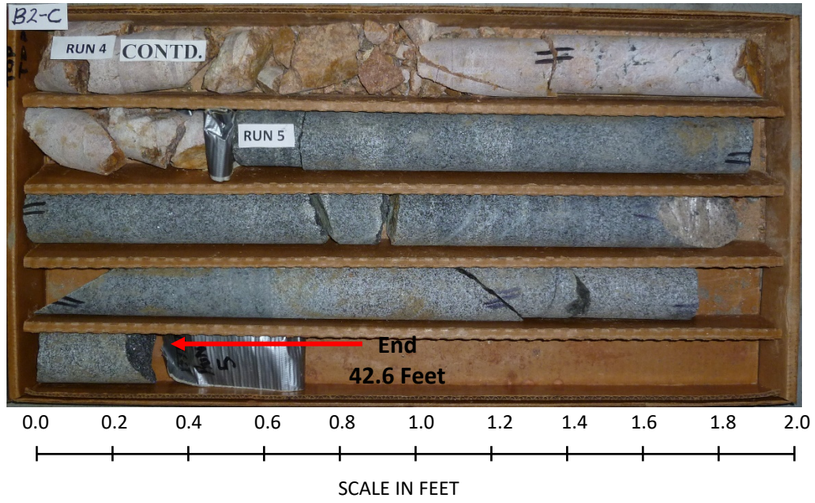
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	STRATA RQD (ft) %	LOG	DESCRIPTION AND REMARKS ELEV. (ft)	DEPTH (ft)
570.9											Begin Coring @ 20.7 ft	
570	570.9	20.7	1.9		(1.4) 74%	(1.0) 53%		(8.2) 69%	(3.3) 28%		570.9 **CRYSTALLINE ROCK** Gray-Black, Fresh to Very Severely Weathered, Very Hard to Soft META-QUARTZ DIORITE with Very Close to Moderately Close Fracture Spacing GSI=30-45 from 20.7'-30.2'; GS=94 at 30.3'-32.6'	20.7
	569.0	22.6	5.0	1:11/1.0 1:15/1.0 1:03/1.0 1:10/1.0 1:19/1.0	(1.8) 36%	(0.0) 0%						
565	564.0	27.6	5.0	1:22/1.0 1:15/1.0 1:24/1.0 1:30/1.0 1:33/1.0	(5.0) 100%	(2.3) 46%						
560	559.0	32.6	5.0	1:37/1.0 1:41/1.0 1:44/1.0 1:35/1.0 1:47/1.0	(3.5) 70%	(0.5) 10%		(5.0) 100%	(0.5) 10%		559.0 Pink, Moderately Weathered to Slightly Weathered, Medium to Moderately Hard GRANITE with Very Close to Close Fracture Spacing GSI=35-40	32.6
555	554.0	37.6	5.0	1:31/1.0 1:40/1.0 1:38/1.0 1:29/1.0 1:35/1.0	(5.0) 100%	(4.2) 84%		(5.0) 100%	(4.2) 84%		554.0 Gray-Black, Fresh, Very Hard META-QUARTZ DIORITE with Close to Wide Fracture Spacing GSI= 95	37.6
550	549.0	42.6									549.0 Boring Terminated at Elevation 549.0 ft in CRYSTALLINE ROCK (META-QUARTZ DIORITE)	42.6

Note:
NM=Not Measured

NCDOT CORE DOUBLE B5808_GEO_BH_BRDG0057.GPJ NC_DOT.GDT 1/22/20

CORE PHOTOGRAPHS: Bridge No. 57 on US 29/601 over Irish Buffalo Creek, B2-C 20+76, 23.0' RT

Begin 20.7 feet



GEOTECHNICAL BORING REPORT
BORE LOG

WBS 45762.1.1	**TIP** B-5808	**COUNTY** CABARRUS	**GEOLOGIST** Stickney, J. K.	
SITE DESCRIPTION Bridge No. 57 on US 29/601 Over Irish Buffalo Creek				**GROUND WTR (ft)**
BORING NO. B2-B	**STATION** 20+66	**OFFSET** 36 ft RT	**ALIGNMENT** -L-	**0 HR.** NM
COLLAR ELEV. 591.0 ft	**TOTAL DEPTH** 49.5 ft	**NORTHING** 609,924	**EASTING** 1,519,342	**24 HR.** NM
DRILL RIG/HAMMER EFF./DATE HFO0072 CME-550X 92% 08/15/2018		**DRILL METHOD** NW Casing w/ Advancer	**HAMMER TYPE** Automatic	
DRILLER Smith, C. L.	**START DATE** 06/06/19	**COMP. DATE** 06/06/19	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE 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)
595										
590	589.7	1.3	WOH	WOH	WOH	0		M		591.0 / 0.0 GROUND SURFACE **ALLUVIAL** Brown-Orange Clayey Silty SAND
585	584.7	6.3	WOH	1	1	2		M		
580	579.7	11.3	1	2	4	6		M		
575	574.7	16.3	20	18	13	31		M		576.2 / 14.8 **RESIDUAL** Brown-Gray-Orange, Clayey Silty Fine SAND with Rock Fragments
570	569.7	21.3	16	31	32	63		M		
565	564.7	26.3	28	28	27	55		M		561.5 / 29.5 **CRYSTALLINE ROCK** (META-QUARTZ DIORITE)
560										
555										
550							RS-1			
545										541.5 / 49.5 Boring Terminated at Elevation 541.5 ft in CRYSTALLINE ROCK (META-QUARTZ DIORITE) Note: NM=Not Measured

NCDOT BORE DOUBLE B5808_GEO_BH_BRDG0057.GPJ NC_DOT.GDT 1/22/20

GEOTECHNICAL BORING REPORT
CORE LOG

WBS 45762.1.1	**TIP** B-5808	**COUNTY** CABARRUS	**GEOLOGIST** Stickney, J. K.	
SITE DESCRIPTION Bridge No. 57 on US 29/601 Over Irish Buffalo Creek				**GROUND WTR (ft)**
BORING NO. B2-B	**STATION** 20+66	**OFFSET** 36 ft RT	**ALIGNMENT** -L-	**0 HR.** NM
COLLAR ELEV. 591.0 ft	**TOTAL DEPTH** 49.5 ft	**NORTHING** 609,924	**EASTING** 1,519,342	**24 HR.** NM
DRILL RIG/HAMMER EFF./DATE HFO0072 CME-550X 92% 08/15/2018		**DRILL METHOD** NW Casing w/ Advancer	**HAMMER TYPE** Automatic	
DRILLER Smith, C. L.	**START DATE** 06/06/19	**COMP. DATE** 06/06/19	**SURFACE WATER DEPTH** N/A	
CORE SIZE NX	**TOTAL RUN** 20.0 ft			

ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	STRATA RQD (ft) %	LOG	DESCRIPTION AND REMARKS ELEV. (ft) / DEPTH (ft)
561.5											Begin Coring @ 29.5 ft
560	561.5	29.5	2.5	3:08/1.0	(2.1) 84%	(2.0) 80%		(19.2) 96%	(17.3) 87%		561.5 / 29.5 **CRYSTALLINE ROCK** Gray-Black, Very Slightly Weathered to Fresh, Very Hard META-QUARTZ DIORITE with Close to Wide Fracture Spacing; RS-1: 40.1'-40.4'; GSI=90-94
555	559.0	32.0	5.0	5:33/1.0 5:40/1.0 5:44/1.0 5:38/1.0 5:49/1.0	(4.8) 96%	(4.5) 90%					
550	554.0	37.0	5.0	6:10/1.0 6:14/1.0 5:45/1.0 6:20/1.0 6:24/1.0	(4.9) 98%	(4.2) 84%	RS-1				
545	549.0	42.0	5.0	6:30/1.0 6:41/1.0 6:43/1.0 6:40/1.0 6:45/1.0	(5.0) 100%	(4.2) 84%					
	544.0	47.0	2.5	6:34/1.0 6:40/1.0	(2.4) 96%	(2.4) 96%					
	541.5	49.5									541.5 / 49.5 Boring Terminated at Elevation 541.5 ft in CRYSTALLINE ROCK (META-QUARTZ DIORITE) Note: NM=Not Measured

NCDOT CORE DOUBLE B5808_GEO_BH_BRDG0057.GPJ NC_DOT.GDT 1/22/20

CORE PHOTOGRAPHS: Bridge No. 57 on US 29/601 over Irish Buffalo Creek, B2-B 20+66, 36.0' RT

Begin 29.5 feet

0.0 0.2 0.4 0.6 0.8 1.0 1.2 1.4 1.6 1.8 2.0

SCALE IN FEET

End 49.5 feet

0.0 0.2 0.4 0.6 0.8 1.0 1.2 1.4 1.6 1.8 2.0

SCALE IN FEET

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 45762.1.1	**TIP** B-5808	**COUNTY** CABARRUS	**GEOLOGIST** Stickney, J. K.	
SITE DESCRIPTION Bridge No. 57 on US 29/601 Over Irish Buffalo Creek				**GROUND WTR (ft)**
BORING NO. EB2-A	**STATION** 21+82	**OFFSET** 23 ft LT	**ALIGNMENT** -L-	**0 HR.** NM
COLLAR ELEV. 609.2 ft	**TOTAL DEPTH** 24.7 ft	**NORTHING** 610,021	**EASTING** 1,519,256	**24 HR.** NM
DRILL RIG/HAMMER EFF./DATE HFC0072 CME-550X 92% 08/15/2018		**DRILL METHOD** NW Casing w/ Advancer	**HAMMER TYPE** Automatic	
DRILLER Smith, C. L.	**START DATE** 06/04/19	**COMP. DATE** 06/04/19	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE 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)
610										609.2 GROUND SURFACE 0.0
										ROADWAY EMBANKMENT
										Brown-Orange, Sandy Silty CLAY
605	604.8	4.4	4	2	2	4		M		
600	599.8	9.4	WOH	WOH	4	4		M		
595	594.8	14.4	1	1	2	3		M		594.8 14.4
										ALLUVIAL
										Gray, Sandy Silty CLAY
590	589.8	19.4	1	1	1	2		M		587.3 21.9
										RESIDUAL
585	584.8	24.4	60/0.1			60/0.1				584.9 Brown-Gray-Orange, Clayey Silty Fine SAND 24.3
										584.5 **WEATHERED ROCK** 24.7
										Gray (META-QUARTZ DIORITE)
										Boring Terminated with Casing Advancer Refusal at Elevation 584.5 ft on CRYSTALLINE ROCK (META-QUARTZ DIORITE)
										Note: NM=Not Measured

WBS 45762.1.1	**TIP** B-5808	**COUNTY** CABARRUS	**GEOLOGIST** Stickney, J. K.	
SITE DESCRIPTION Bridge No. 57 on US 29/601 Over Irish Buffalo Creek				**GROUND WTR (ft)**
BORING NO. EB2-C	**STATION** 21+36	**OFFSET** 23 ft RT	**ALIGNMENT** -L-	**0 HR.** NM
COLLAR ELEV. 609.3 ft	**TOTAL DEPTH** 28.5 ft	**NORTHING** 609,989	**EASTING** 1,519,312	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE HFC0072 CME-550X 92% 08/15/2018		**DRILL METHOD** NW Casing w/ Advancer	**HAMMER TYPE** Automatic	
DRILLER Smith, C. L.	**START DATE** 06/17/19	**COMP. DATE** 06/17/19	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE 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
610										609.3 GROUND SURFACE 0.0
										ROADWAY EMBANKMENT
										Brown-Orange, Sandy Silty CLAY
605	604.9	4.4	2	3	2	5		M		
600	599.9	9.4	1	1	2	3		M		599.9 9.4
										ALLUVIAL
										Gray, Silty Sandy CLAY
595	594.9	14.4	2	1	1	2		M		
590	589.9	19.4	1	2	4	6		M		587.1 22.2
										RESIDUAL
585	584.9	24.4	72	28/0.1		100/0.6				584.9 Brown-Gray-Orange, Clayey Silty Fine SAND 24.4
										WEATHERED ROCK
										Gray (META-QUARTZ DIORITE)
										580.8 28.5
										Boring Terminated with Casing Advancer Refusal at Elevation 580.8 ft on CRYSTALLINE ROCK (META-QUARTZ DIORITE)
										Notes: 1. NM=Not Measured 2. FIAD=Filled Immediately After Drilling

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 45762.1.1	**TIP** B-5808	**COUNTY** CABARRUS	**GEOLOGIST** Stickney, J. K.	
SITE DESCRIPTION Bridge No. 57 on US 29/601 Over Irish Buffalo Creek				**GROUND WTR (ft)**
BORING NO. EB1-A (2)	**STATION** 20+40	**OFFSET** 30 ft LT	**ALIGNMENT** -DET-	**0 HR.** Dry
COLLAR ELEV. 598.4 ft	**TOTAL DEPTH** 21.4 ft	**NORTHING** 609,854	**EASTING** 1,519,208	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE HFO0072 CME-550X 92% 08/15/2018		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER Smith, C. L.	**START DATE** 06/20/19	**COMP. DATE** 06/20/19	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE 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)
600										598.4 — GROUND SURFACE — 0.0
										ROADWAY EMBANKMENT Tan-Orange, Sandy Silty CLAY
595	594.5	3.9	2	3	4	7		M		595.4 — 3.0 **ALLUVIAL** Gray, Silty Clayey SAND
590	589.5	8.9	1	1	1	2		M		586.4 — 12.0
585	584.5	13.9	1	3	5	8		M		**RESIDUAL** Brown-Gray-Orange, Clayey Silty Fine SAND
580	579.5	18.9	10	14	12	26		M		577.0 — 21.4 Boring Terminated by Auger Refusal at Elevation 577.0 ft on CRYSTALLINE ROCK (META-QUARTZ DIORITE) Note: FIAD=Filled Immediately After Drilling

WBS 45762.1.1	**TIP** B-5808	**COUNTY** CABARRUS	**GEOLOGIST** Stickney, J. K.	
SITE DESCRIPTION Bridge No. 57 on US 29/601 Over Irish Buffalo Creek				**GROUND WTR (ft)**
BORING NO. EB2-A (2)	**STATION** 22+61	**OFFSET** 15 ft LT	**ALIGNMENT** -DET-	**0 HR.** Dry
COLLAR ELEV. 600.6 ft	**TOTAL DEPTH** 11.8 ft	**NORTHING** 610,072	**EASTING** 1,519,166	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE HFO0072 CME-550X 92% 08/15/2018		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER Smith, C. L.	**START DATE** 06/20/19	**COMP. DATE** 06/20/19	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE 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
605										
600	596.8	3.8	4	7	6	13		M		600.6 — GROUND SURFACE — 0.0 **ALLUVIAL** Gray, Silty Clayey SAND 596.8 — 3.8
595	591.8	8.8	2	4	7	11		M		**RESIDUAL** Brown-Gray-Orange, Clayey Silty Fine SAND 589.8 — 10.8
590										588.8 — **WEATHERED ROCK** (META-QUARTZ DIORITE) — 11.8 Boring Terminated by Auger Refusal at Elevation 588.8 ft on CRYSTALLINE ROCK (META-QUARTZ DIORITE) Note: FIAD=Filled Immediately After Drilling

LABORATORY SUMMARY SHEET FOR ROCK CORE SAMPLES

PROJECT NO.: 45761.1.1
TIP: B-5808
COUNTY: CABARRUS
Bridge No. 57 on US 29/601 over Irish Buffalo Creek

Sample #	Boring #	Depth (ft)	Rock Type	Geologic Map Unit	Run RQD (%)	Length (in)	Diameter (in)	Unit Weight (PCF)	Unconfined Compressive Strength (PSI)	Remarks
RS-1	B2-B	40.1-40.4	Meta-Quartz Diorite	PzZq	87	0.3	1.86	164.0	13,560	Bridge No.57
RS-2	B1-B	27.7-28.2	Meta-Quartz Diorite	PzZq	81	0.5	1.86	166.7	16,640	Bridge No. 57

Bridge No. 57 on US 29/601 over Irish Buffalo Creek

SITE PHOTOGRAPHS

Photograph No. 1: Looking at End Bent 1 toward End Bent 2

Photograph No. 2: Looking at End Bent 1 toward End Bent 2