



March 6, 2023

Jason Lawing, PE  
Kimley-Horn  
200 South Tryon Street  
Suite 200  
Charlotte, NC 28202

Reference: **GEOTECHNICAL SUBSURFACE EXPLORATION AND FOUNDATION DESIGN RECOMMENDATIONS REPORT-REVISED**  
**Proposed Culverts for SR 2415 (Bailey Road) From Poole Place Drive to US 21 (Statesville Road) – Construct Roadway on New Location**  
Mecklenburg County, North Carolina  
State Project No. 48173.1.1  
State TIP No. U-6105  
ESP Project No. GV20.300

Dear Mr. Lawing:

ESP Associates, Inc. has completed the subsurface investigation for the above referenced project and submits the following report with subsurface data and geotechnical recommendations. Attached to this report is the NCDOT “Structure Subsurface Investigation” graphics report for the project culverts. The “Geotechnical Report-Roadway Inventory” and the “Geotechnical Report-Roadway Design and Construction Recommendations” have been submitted to Kimley-Horn separate from this report.

## **GEOTECHNICAL SUBSURFACE EXPLORATION**

### **Project Description**

This proposed project is located in Cornelius, North Carolina. The project begins at -L- Station 10+00.00, which is at the east side of US 21 (Statesville Road), and continues to -L- Station 34+66.65, which is approximately 644 feet east of the intersection of -L-, -Y2- (Existing Bailey Road), and -Y3- (Poole Place Drive). The total length of the project is approximately 0.469 mile. As part of the project on new location, the construction of two culverts is planned as follows:

- The construction of a concrete reinforced double-barrel box culvert with each barrel measuring 14 feet wide and 7 feet high for the Unnamed Tributary to Caldwell Station Creek that will be approximately 130 feet in length and will cross -L- at approximately Station 22+02.
- The construction of an approximately 80-foot-long, 10 feet by 10 feet reinforced concrete pedestrian box culvert crossing -L- at approximately Station 21+05 for the Caldwell Station Creek Greenway (-G1-) to cross under -L-.

### **Geology**

The project corridor is located in the Kings Mountain Belt of the Piedmont physiographic province. “The Kings Mountain Belt includes metasedimentary sequences with interlayered quartzite, metaconglomerate, marble, and schists derived from both sedimentary and volcanic protoliths” (The

*Geology of the Carolinas*, Horton and Zullo, 1991). Rocks of the Kings Mountain Belt are intensely deformed, and it is dominated by steeply dipping units striking northeast to north-northeast. The age of the rocks are Paleozoic to late Proterozoic, and the deformation on the leading edge of the Carolina terrane as it collided with North America may be recorded in the deformation of the rocks in the Kings Mountain Belt. Coring of the bedrock was outside the scope of this project, but according to the Geologic Map of North Carolina, 1985, the rock underlying the project corridor consists of metamorphosed quartz diorite.

## **Soil Properties**

### **Tributary to Caldwell Station Creek Culvert**

Alluvial soils were encountered beginning at the existing ground surface in the soil test borings drilled in the vicinity of the proposed creek culvert. The alluvium extends to depths below the existing ground surface ranging from approximately 7 feet to approximately 18 feet which correspond to elevations ranging from approximately 711 feet to approximately 700 feet (MSL). The alluvium consists of soft, silty clay (A-7-5) and very loose to loose silty sand (A-2-4) and clayey sand (A-2-6). The moisture levels of the alluvial soils encountered were wet to saturated.

The residual soils were encountered underlying the alluvium in the vicinity of the proposed creek culvert. The residual soils consist of loose to very dense silty sand (A-2-4). The moisture levels of the residual soils encountered were moist to saturated.

### **Pedestrian Culvert for Caldwell Station Creek Greenway**

Residual soils were encountered beginning at the existing ground surface in the vicinity of the proposed pedestrian culvert. The residual soils consist of soft to very stiff, silty clay (A-7-6) overlying loose to medium dense silty sand (A-2-4). The moisture levels of the residual soils encountered were moist to wet.

## **Rock Properties**

### **Tributary to Caldwell Station Creek Culvert**

Weathered rock was encountered underlying the residual soils in vicinity of the proposed creek culvert at depths below the existing ground surface ranging from approximately 29 feet to approximately 33 feet which correspond to elevations ranging from approximately 689 feet to approximately 685 feet (MSL). The weathered rock classifies as a Metamorphosed Quartz Diorite.

Crystalline rock was encountered underlying the weathered rock in the vicinity of the proposed creek culvert at depths below the existing ground surface ranging from approximately 33 feet to approximately 38 feet which correspond with elevations ranging from approximately 685 feet to approximately 680 feet (MSL). The crystalline rock classifies as a Metamorphosed Quartz Diorite.

### **Pedestrian Culvert for Caldwell Station Creek Greenway**

Weathered rock was encountered underlying the residual soils in 2 of the 3 borings drilling in the vicinity of the proposed pedestrian culvert. The weathered rock was encountered at depths below the existing ground surface ranging from approximately 19 feet to approximately 26 feet which correspond to elevations ranging from approximately 704 feet to approximately 700 feet (MSL). The weathered rock classifies as a Metamorphosed Quartz Diorite.

Crystalline rock was encountered underlying the weathered rock in 2 of the borings drilled in the vicinity of the proposed pedestrian culvert. The crystalline rock was encountered at depths below the existing ground surface ranging from approximately 20 feet to approximately 26 feet which correspond with elevations ranging from approximately 703 feet to approximately 700 feet (MSL). The crystalline rock classifies as a Metamorphosed Quartz Diorite.

### **Ground Water Properties**

#### **Tributary to Caldwell Station Creek Culvert**

Ground water data was collected in January 2022. Twenty-four-hour ground water depths in the vicinity of the proposed creek culvert ranged from approximately 1 foot to approximately 2 feet which correspond with elevations ranging from approximately 717 feet to approximately 716 feet (MSL).

#### **Pedestrian Culvert for Caldwell Station Creek Greenway**

Ground water data was collected in January 2022. Twenty-four-hour ground water depths in the vicinity of the proposed pedestrian culvert were approximately 8 feet which correspond with elevations ranging from approximately 718 feet to approximately 714 feet (MSL).

### **GEOTECHNICAL RECOMMENDATIONS**

#### **Slope and Embankment Stability and Settlement**

##### **Slope Designs**

We generally recommend that all embankment slopes be constructed at a ratio of 2:1 (H:V) or flatter. Please verify that Roadside Environmental Unit addresses proper erosion control measures for the embankment slopes.

##### **Rock Embankments (Creek Culvert)**

Soft and/or wet to saturated alluvial material is present at the base of proposed embankment, within the flood plain area.

Standing water was not observed during the field investigation beyond the limits of the existing creek. If standing water is present in these areas at the time that construction will take place, then Rock Embankments in Water may be required to stabilize the embankment basal areas in order to provide a base for the placement of the new embankment fill.

#### **Borrow Specifications**

##### **Borrow Criteria**

Common borrow for embankment construction to subgrade shall meet Piedmont and Western Area specifications outlined in the NCDOT Standard Specifications, Article 1018-2(A).

##### **Shrinkage Factor**

A shrinkage factor of 15 percent is recommended for calculation of earthwork on this project.

### **Tributary to Caldwell Station Creek Culvert Foundations**

#### Culvert Base Foundations Excavation

Based on the borings from our geotechnical subsurface exploration, we assume that the base of the culvert and associated wing walls will be founded on the existing near-surface soils stabilized with geotextile fabric and NCDOT No. 57 stone. The soil types that may be encountered in the excavation are soft, silty clay (A-7-5) and very loose to loose silty sand (A-2-4) and clayey sand (A-2-6). It should be expected that the existing near-surface soils will be saturated. We expect that the excavated slopes will have seeping water and that groundwater will be encountered above the bottom of excavations.

As required by OSHA, temporary spoil from the excavation must be placed at least 2 feet away from the surface edge of the excavation. This distance is measured from the edge of the spoil, not from its crown. ESP recommends that temporary spoil should be placed so that it channels rainwater and other runoff away from the excavation and also it does not fall into the excavation.

The culvert base foundations should be excavated approximately 2 feet below the planned bottom of culvert.

Surface water control is important during and after the excavation. ESP recommends that the Contractor take necessary steps to enhance surface flow and promote rapid clearing of rainfall and runoff water following rain events. In such event, plastic sheets may be placed for slope protection.

ESP expects that the water table will be encountered above the base of excavation. We recommend that the Contractor plan the suitable dewatering operations to ensure that the base of excavation remain dry throughout the construction operations.

ESP recommends that the Excavation Plan includes the plan and section view details to show the limits of the excavation. Provide the plan notes in accordance with the NCDOT 2018 Standard Specifications for Roads and Structures, Section 410: Foundation Excavation.

#### Culvert Base Foundations Construction

ESP recommends that following the excavation of the culvert and associated wing walls foundations, the basal area of the culvert be raised to the proposed base elevation using NCDOT No. 57 stone placed over geotextile stabilization fabric and in turn covered with Class A and Class B Riprap.

The following geotechnical notes should be placed on the structural plans for the proposed culvert extension:

**BACKFILL WITH SELECT MATERIAL, CLASS VI MEETING THE REQUIREMENTS OF SECTION 1016 OF THE STANDARD SPECIFICATIONS.**

**CARRY IN FOOTINGS FOR THE REINFORCED BOX CULVERT AT STATION 22+02 -L- AT LEAST 12" INTO NCDOT NO 57 STONE WITH A MINIMUM THICKNESS AS SHOWN ON THE PLANS.**

## **Pedestrian Culvert for Caldwell Station Creek Greenway Culvert Foundations**

### **Culvert Base Foundations Excavation**

Based on the borings from our geotechnical subsurface exploration, we assume that the base of the culvert will be founded on the existing near-surface soils. The soil types that may be encountered in the excavation are soft to very stiff, silty clay (A-7-6) overlying loose to medium dense silty sand (A-2-4). Plasticity indexes within the tested A-7-6 material were 34 and 37. It should be expected that the existing near-surface soils will be moist near the existing ground surface becoming wet approaching the ground water table which is at approximately 4 to 8 feet below the proposed grade.

As required by OSHA, temporary spoil from the excavation must be placed at least 2 feet away from the surface edge of the excavation. This distance is measured from the edge of the spoil, not from its crown. ESP recommends that temporary spoil should be placed so that it channels rainwater and other runoff away from the excavation and also it does not fall into the excavation.

The culvert foundations should bear in the existing residual soils. If soft and/or saturated soils and/or otherwise unsatisfactory materials are encountered at the base of excavation, notify the Geotechnical Engineer for changes in dimensions or elevations of the foundation as necessary to secure a satisfactory foundation.

Surface water control is important during and after the excavation. ESP recommends that the Contractor take necessary steps to enhance surface flow and promote rapid clearing of rainfall and runoff water following rain events. In such event, plastic sheets may be placed for slope protection.

ESP does not expect that the water table will be encountered above the base of excavation. However, we do recommend that the Contractor plan suitable dewatering operations to ensure that the base of excavation remain dry throughout the construction operations should construction take place at a time when the water table is higher than that encountered during our subsurface exploration.

ESP recommends that the Excavation Plan includes the plan and section view details to show the limits of the excavation. Provide the plan notes in accordance with the NCDOT 2018 Standard Specifications for Roads and Structures, Section 410: Foundation Excavation.

### **Culvert Base Foundations Construction**

ESP recommends that following the excavation of the culvert foundations, if needed, the basal area of the culvert be raised to the proposed base elevation using NCDOT No. 57 stone.

The following geotechnical notes should be placed on the structural plans for the proposed culvert extension:

**BACKFILL WITH SELECT MATERIAL, CLASS VI MEETING THE REQUIREMENTS OF SECTION 1016 OF THE STANDARD SPECIFICATIONS.**

**CARRY IN FOOTINGS FOR THE REINFORCED BOX CULVERT AT STATION 21+05 -L- AT LEAST 12" INTO SUITABLE RESIDUAL SOIL WITH A MINIMUM THICKNESS AS SHOWN ON THE PLANS.**

Prepared by,



Matthew M. Lattin, PE  
Senior Geotechnical Engineer

Prepared by,



Paul M. Weaver, LG  
Senior Geologist

Pablo Barrera Gonzalez, EI  
Geotechnical Engineer

MML/PMW/PBG

Attachment: Structure Subsurface Investigation (Inventory Report)

PROJECT: 48173

REFERENCE: U-6105

**CONTENTS**

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

**STRUCTURE**  
**SUBSURFACE INVESTIGATION**

COUNTY MECKLENBURG

PROJECT DESCRIPTION SR 2415 (BAILEY ROAD) FROM  
POOLE PLACE DRIVE TO US 21 (STATESVILLE  
ROAD) - CONSTRUCT ROADWAY ON NEW LOCATION

SITE DESCRIPTION CULVERT OVER UNNAMED  
TRIBUTARY TO CALDWELL STATION CREEK AT  
-L- STATION 22+02  
PEDESTRIAN TUNNEL 10'X10' RCBC AT  
-L- STATION 21+05.48

STATE	STATE PROJECT REFERENCE NO.	sheet no.	total sheets
N.C.	U-6105	1	

**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-PLACED) 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 PERFORM INDEPENDENT SUBSURFACE INVESTIGATIONS AND MAKE INTERPRETATIONS AS NECESSARY TO CONFIRM CONDITIONS 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

P. BARRERA

M.M. LATTIN

M.S. ULMER

CG2 Exploration, LLC

INVESTIGATED BY ESP Associates, Inc.

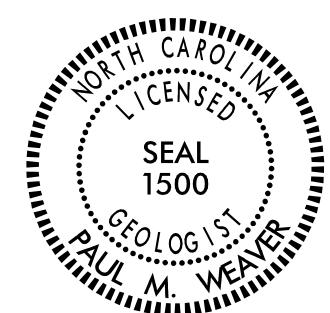
DRAWN BY C.R. PASTRANA

CHECKED BY P.M. WEAVER

SUBMITTED BY ESP Associates, Inc.

DATE March 2023

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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												GRADATION												ROCK DESCRIPTION												TERMS AND DEFINITIONS											
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												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.												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:												ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER.											
SOIL LEGEND AND AASHTO CLASSIFICATION												ANGULARITY OF GRAINS												AQUIFER - A WATER BEARING FORMATION OR STRATA.												ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND.											
GENERAL CLASS.												MINERALOGICAL COMPOSITION												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.											
GROUP CLASS.												COMPRESSIONS												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.											
SYMBOL												PERCENTAGE OF MATERIAL												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.											
% PASSING												WEATHERING												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.											
*10												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.											
*40												FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.												FORMATION (FM) - A MAPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD.												JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.											
*200												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.											
GENERAL PASSING %												PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA												PERCHED (PER.) - 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.											
LL												SILTY OR CLAYEY												ROCK HARDNESS												SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK.											
PI												SILTY SOILS												SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMBLED 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.											
USUAL TYPES OF MAJOR MATERIALS												TESTING SYMBOLS												STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS IN OR BPF OF A 14 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS.												STRATA CORE RECOVERY (REC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIV											

<b>PROJECT REFERENCE NO.</b>		<b>SHEET NO.</b>
U-6105		3
<b>SITE PLAN</b>		
0	40	80
 <b>FEET</b>		

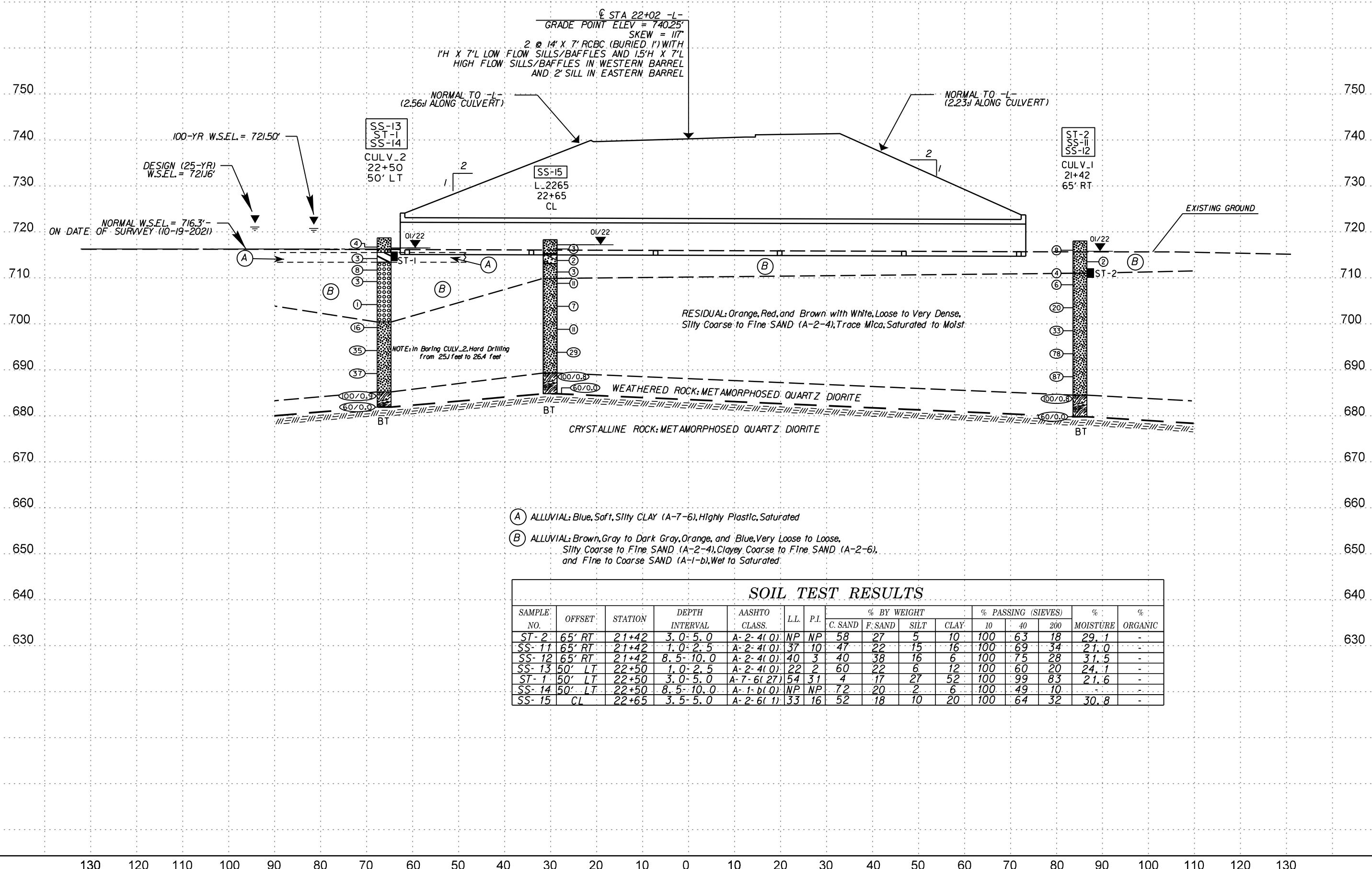
## **SITE PLAN**

A horizontal scale bar with markings at 0, 40, and 80 feet. The segment from 0 to 40 is shaded black.

- PROFILE TAKEN FROM "U-6105\_CSR Sta. 22+02 -L-.dgn" FILE PROVIDED BY KIMLEY-HORN ON 02/14/22

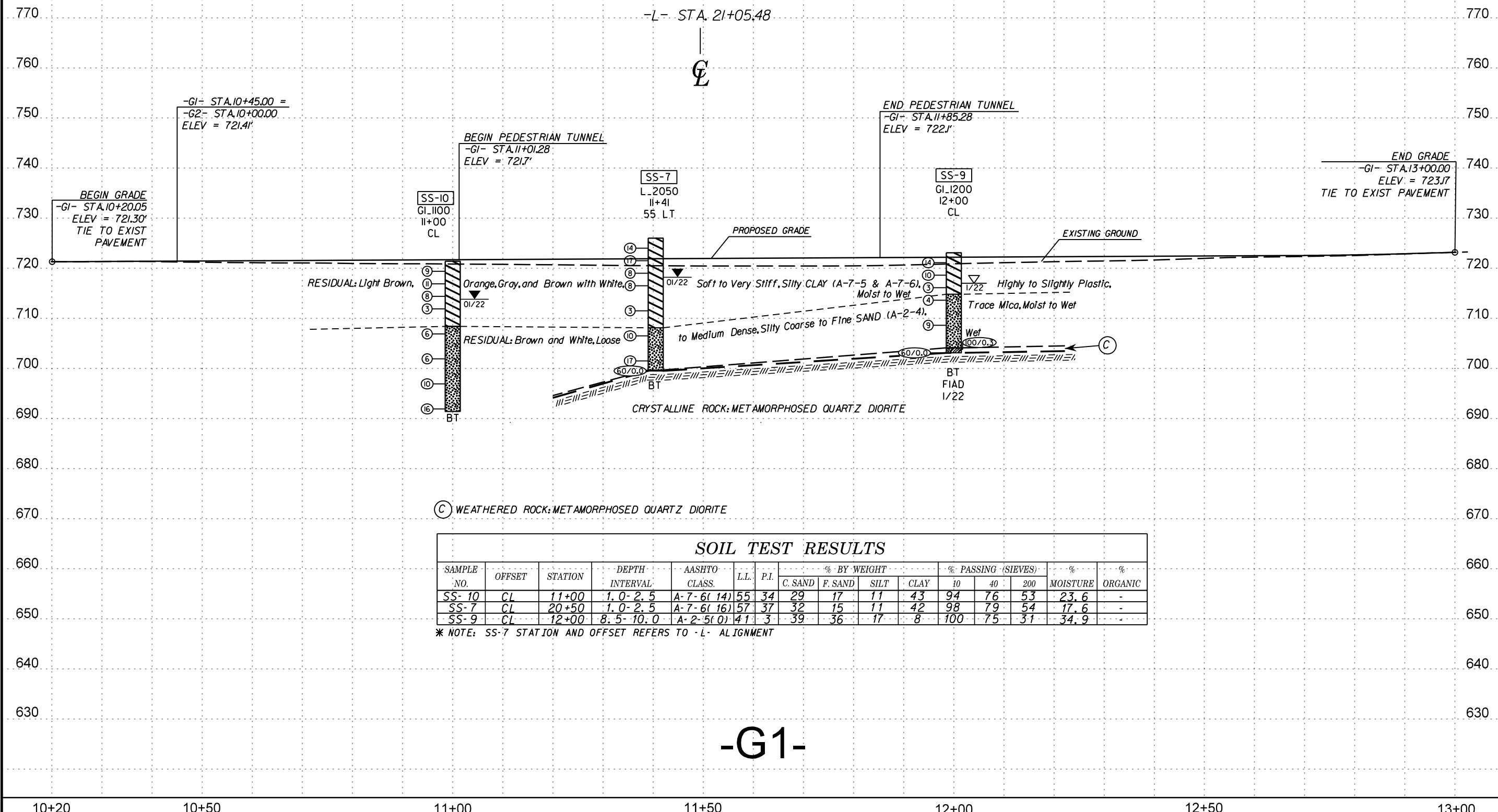
PROJECT REFERENCE NO.	SHEET NO.
U-6105	4

**CULVERT OVER UNNAMED TRIBUTARY  
TO CALDWELL STATION CREEK**  
-L- STA 22+02 SKEW = 117°



- PROFILE TAKEN FROM "U-6105\_rdy\_wpfl.dgn" FILE PROVIDED BY KIMLEY-HORN ON 02/14/22

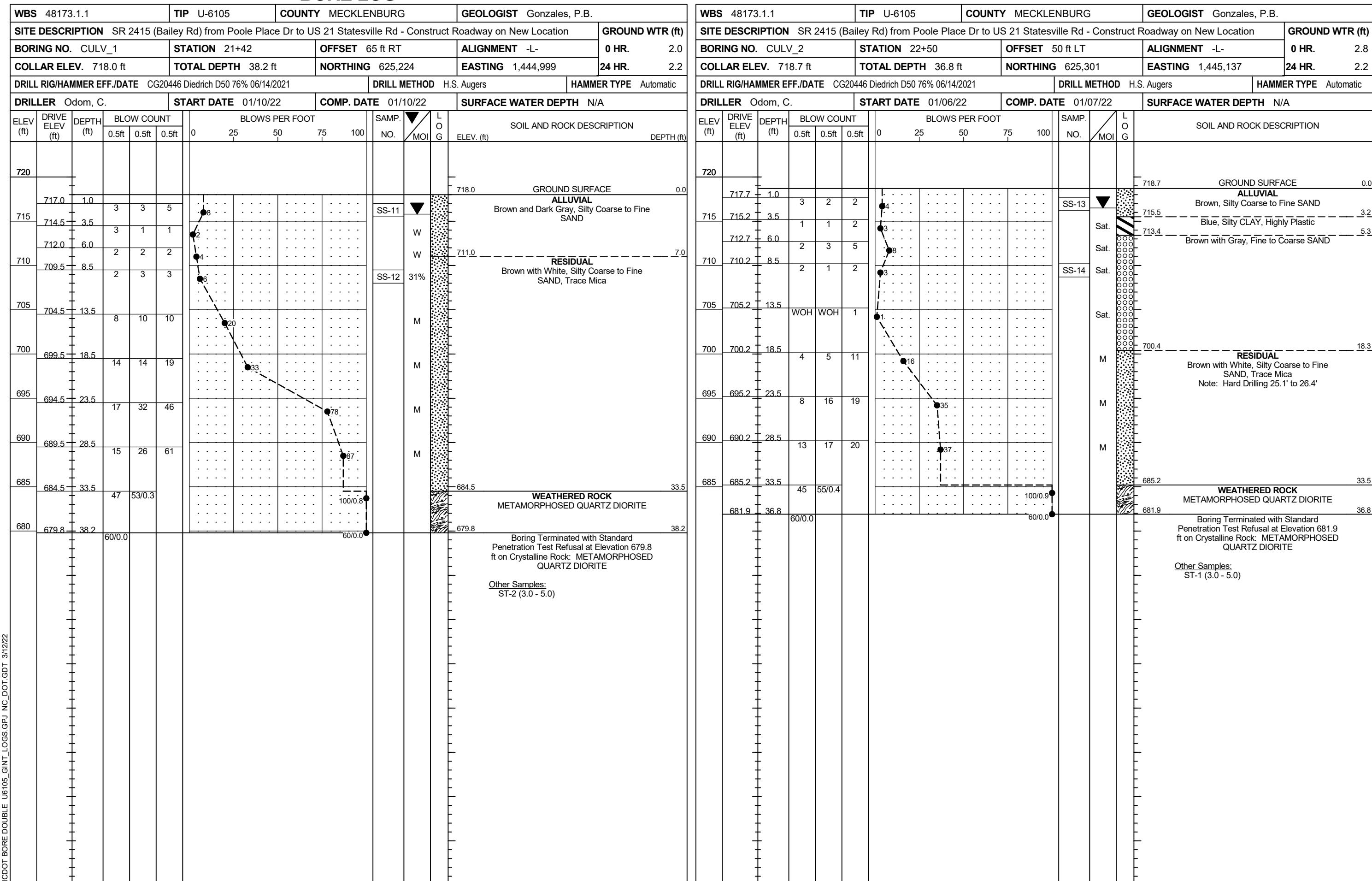
PROJECT REFERENCE NO.	SHEET NO.
U-6105	5
<i>PEDESTRIAN TUNNEL 10'X10' RCBC</i> <i>-L- STA. 21 + 05.48</i> <i>SKEW <math>\pm 10^\circ</math></i>	



# **GEOTECHNICAL BORING REPORT**

## **BORE LOG**

**GEOTECHNICAL BORING REPORT**  
**BORE LOG**



# **GEOTECHNICAL BORING REPORT**

## **BORE LOG**

SHEET 8

## SOILS LABORATORY TESTS RESULTS

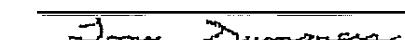
WBS NO.: 48173.1.1

TIP NO.: U-6105

COUNTY: Mecklenburg

SITE DESCRIPTION: SR 2415 (Bailey Road) From Poole Place Drive to US 21 (Statesville Road) - Construct Roadway on New Location

BORING	SAMPLE	BORING	DEPTH	AASHTO	N	L.L	P.I.	% BY WEIGHT				% PASSING SIEVES			% MOISTURE	% ORGANIC
								CSE.	SAND	F. SAND	SILT	CLAY	10	40	200	
L_2050	SS-7	-L- STA. 20+50, CL	1.0-2.5	A-7-6 (16)	14	57	37	32	15	11	42	98	79	54	17.6	-
G1_1200	SS-9	-G1- STA. 12+00, CL	8.5-10.0	A-2-5 (0)	4	41	3	39	36	17	8	100	75	31	34.9	-
G1_1100	SS-10	-G1- STA. 11+00, CL	1.0-2.5	A-7-6 (14)	9	55	34	29	17	11	43	94	76	53	23.6	-
CULV-1	ST-2	-L- STA. 21+42, 65' RT	3.0-5.0	A-2-4 (0)	2	NP	NP	58	27	5	10	100	63	18	29.1	-
CULV-1	SS-11	-L- STA. 21+42, 65' RT	1.0-2.5	A-2-4 (0)	8	37	10	47	22	15	16	100	69	34	21.0	-
CULV-1	SS-12	-L- STA. 21+42, 65' RT	8.5-10.0	A-2-4 (0)	6	40	3	40	38	16	6	100	75	28	31.5	-
CULV-2	SS-13	-L- STA. 22+50, 50' LT	1.0-2.5	A-2-4 (0)	4	22	2	60	22	6	12	100	60	20	24.1	-
CULV-2	ST-1	-L- STA. 22+50, 50' LT	3.0-5.0	A-7-6 (27)	3	54	31	4	17	27	52	100	99	83	21.6	-
CULV-2	SS-14	-L- STA. 22+50, 50' LT	8.5-10.0	A-1-b (0)	3	NP	NP	72	20	2	6	100	49	10	-	-
L_2265	SS-15	-L- STA. 22+65, CL	3.5-5.0	A-2-6 (1)	2	33	16	52	18	10	20	100	64	32	30.8	-

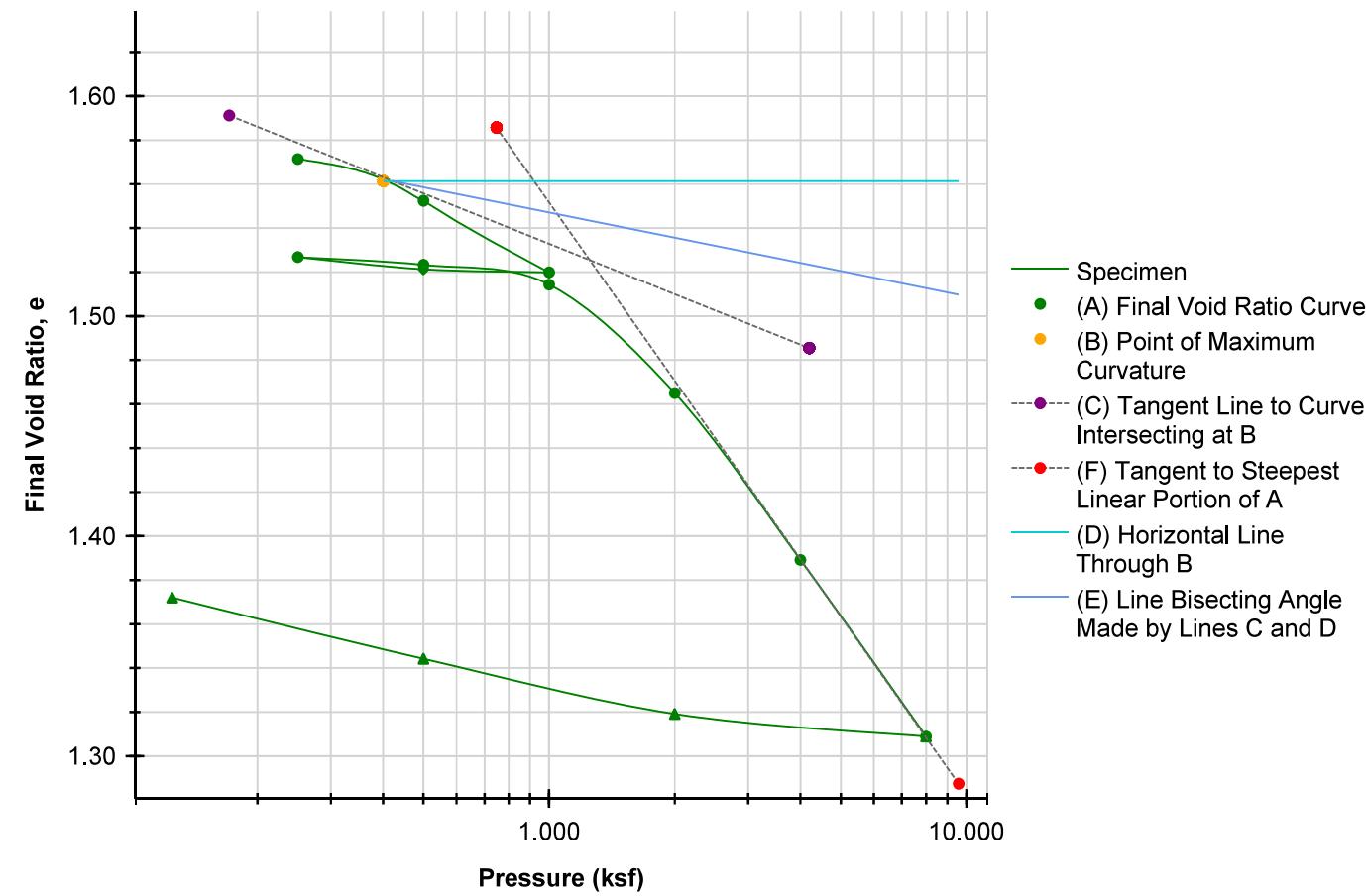


Certification No. 121-01-1108



## Final Voids [Log]

AASHTO T-216



Moisture (%)	BEFORE	AFTER	Liquid Limits	0	Test Date 2/4/2022				
Dry Density (pcf)	26.4	33.5	Plastic Limits	0					
Saturation (%)	89.1	82.9							
Void Ratio	79.2	86.9							
Sample Description		Dark Gray Silty Sand A-2-4 (0)							
Project Number	GV20.300	Depth (ft)	3-5	Remarks					
Sample Number	ST-2	Boring Number CULV-1		Shelby Tube					
Project	U-6105								
Client									
Location	CULV-1 ST-2 (3-5 ft)								

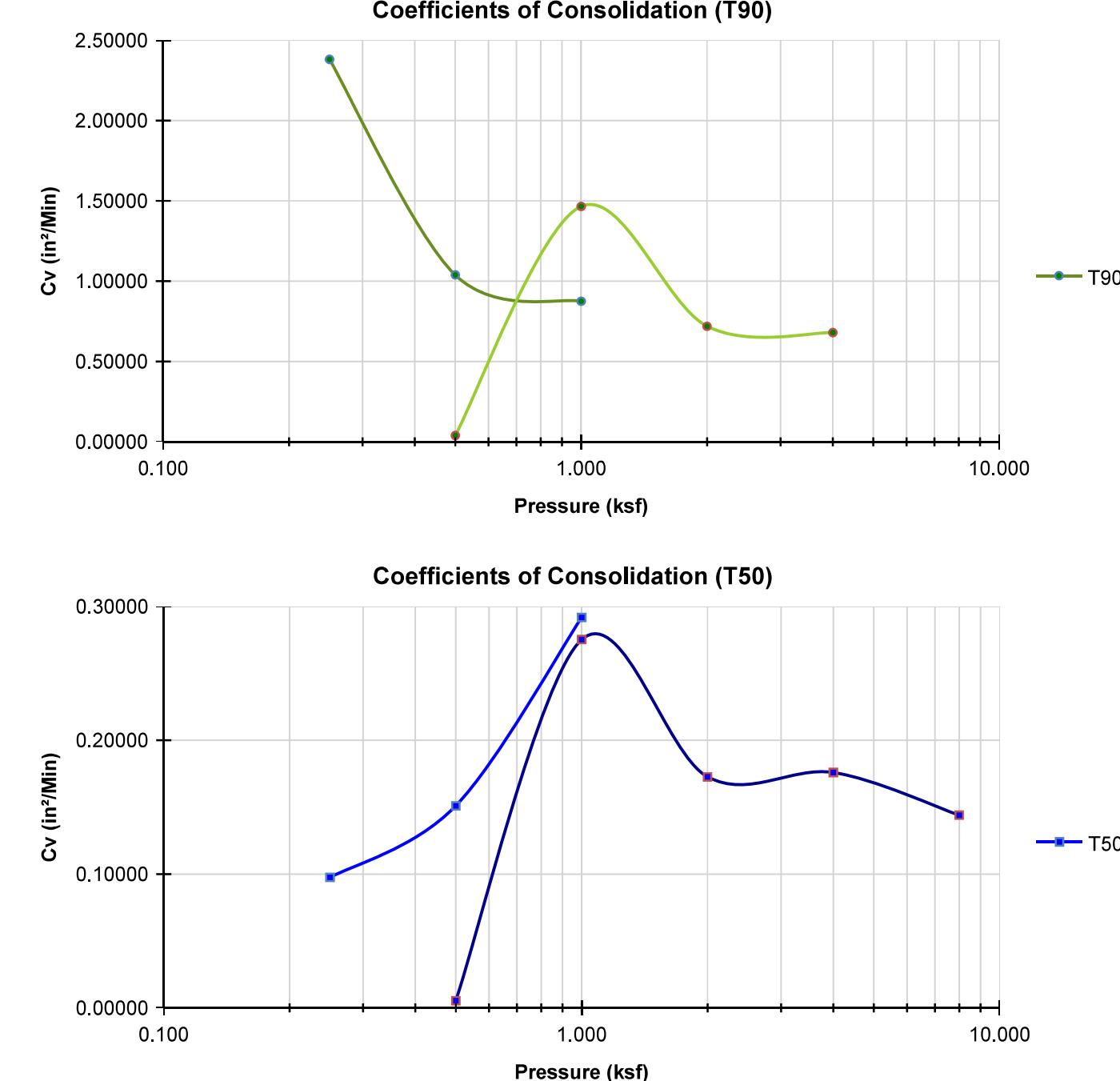
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## Coefficients of Consolidation

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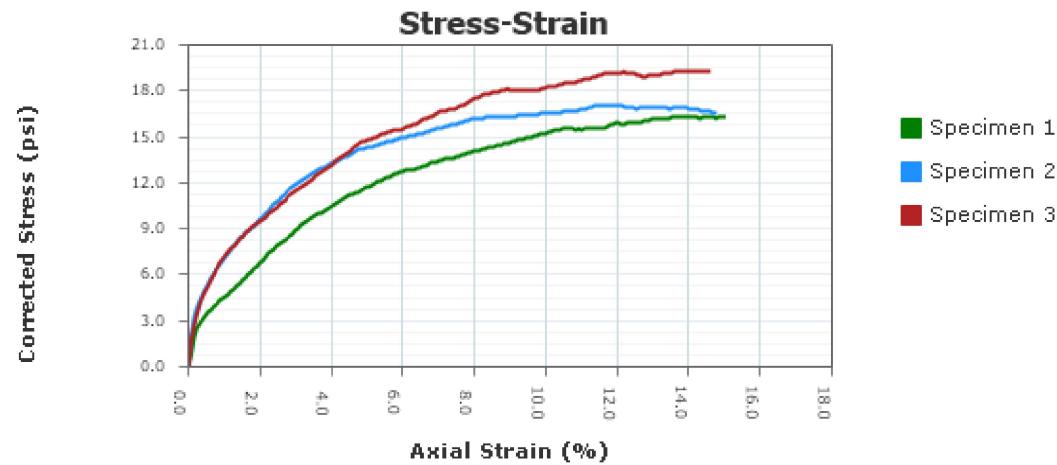
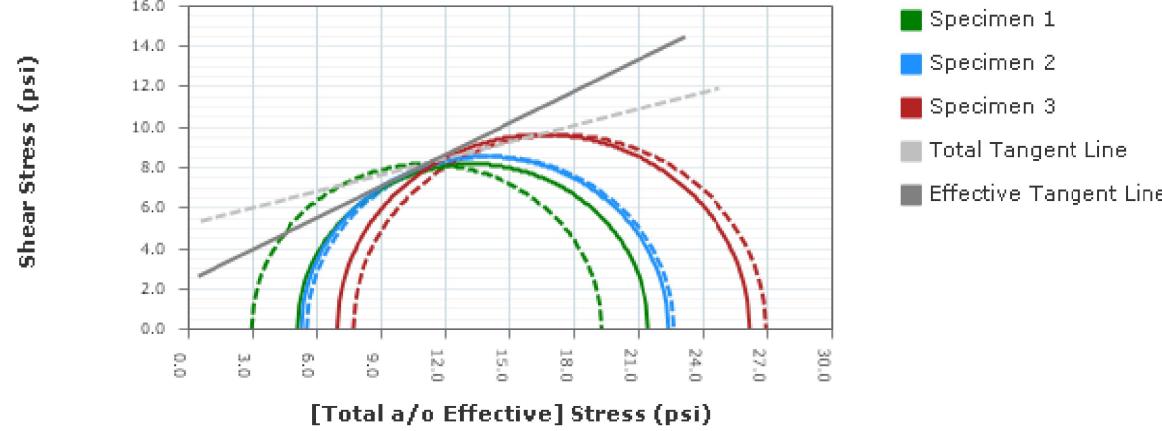
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803-802-2440

## Consolidated Undrained Test

AASHTO T-297

Calculation Method: Deviator Stress

### Mohr Circles

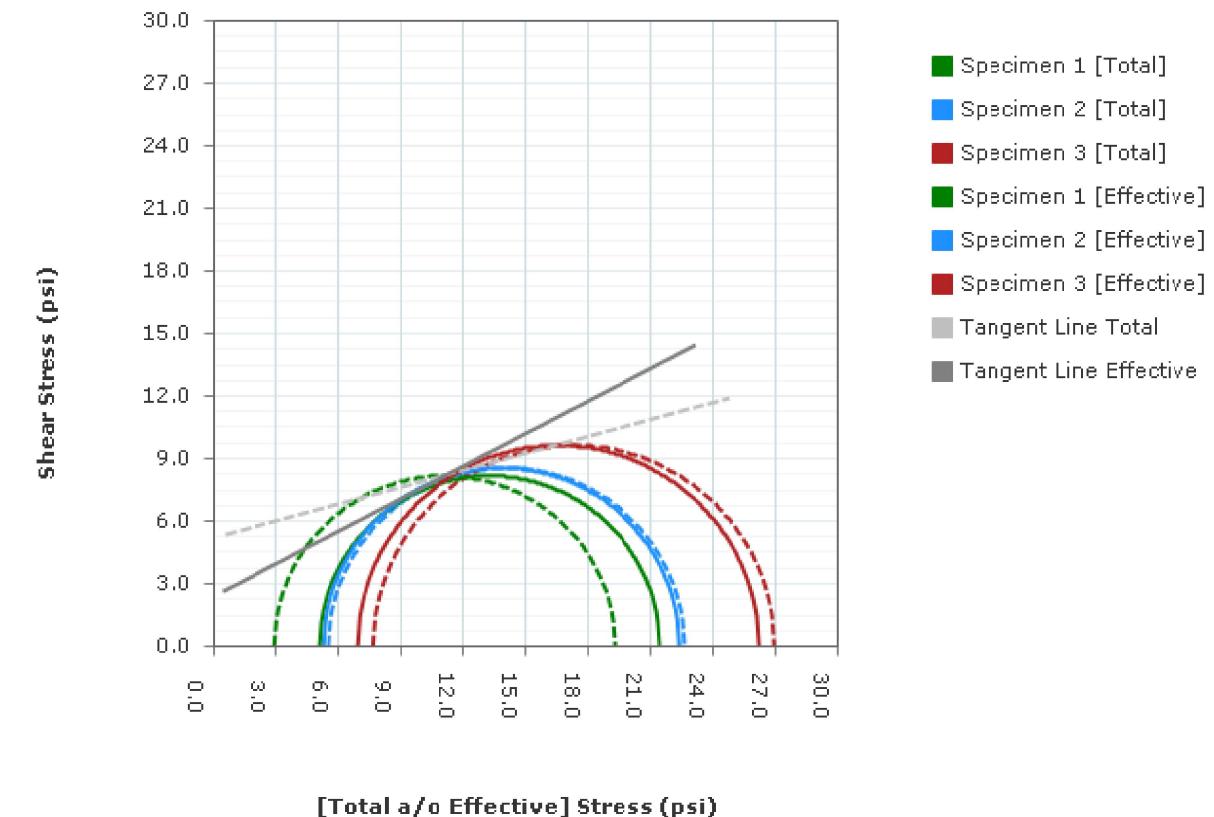


After Shear	Specimen Number							
	1	2	3	4	5	6	7	8
$\sigma'_1$ at Failure (psi)	21.4	22.4	26.2					
$\sigma'_3$ at Failure (psi)	5.1	5.3	6.9					
Project:	U-6105							
Project Number:	GV20.300							
Sampling Date:	1/14/2022							
Sample Number:	ST-3							
Sample Depth:	6-8 ft							
Location:	L-1050 ST-3 (6-8 ft)							
Remarks:	Shelby Tube							



## Graph - Mohr Circle

AASHTO T-297



Tangent Line Results		TOTAL	EFFECTIVE
Strength Intercept (psi)	5.2	5.2	2.4
Friction Angle (°)	15.188	15.188	27.577
Calculation Method: Deviator Stress			