

REFERENCE: BR-0152

PROJECT: 67152

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

STRUCTURE  
SUBSURFACE INVESTIGATION

COUNTY DAVIE  
PROJECT DESCRIPTION REPLACEMENT OF BRIDGE  
NO. 76 ON SR 1436 (PINEBROOK SCHOOL ROAD)  
OVER I-40  
SITE DESCRIPTION STA. 19+69.97 -L-

CONTENTS

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3	SITE PLAN
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STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	BR-0152	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 1919 T07-6850. THE SUBSURFACE PLANS AND REPORTS, FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA ARE NOT PART OF THE CONTRACT.

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- 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.
  - 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

M. FOSTER  
TRIGON EXPLORATION

INVESTIGATED BY KLEINFELDER, INC  
DRAWN BY M. FOSTER  
CHECKED BY J. FREGOSI  
SUBMITTED BY KLEINFELDER, INC  
DATE MAY 2024

Prepared in the Office of:



DocuSigned by:  
Joshua D. Fregosi 05/01/2024  
SIGNATURE DATE

DOCUMENT NOT CONSIDERED FINAL  
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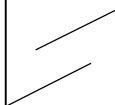
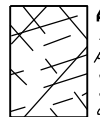
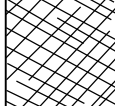
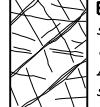



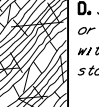

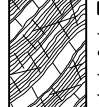


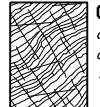

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION  
DIVISION OF HIGHWAYS  
GEOTECHNICAL ENGINEERING UNIT

**SUBSURFACE INVESTIGATION**

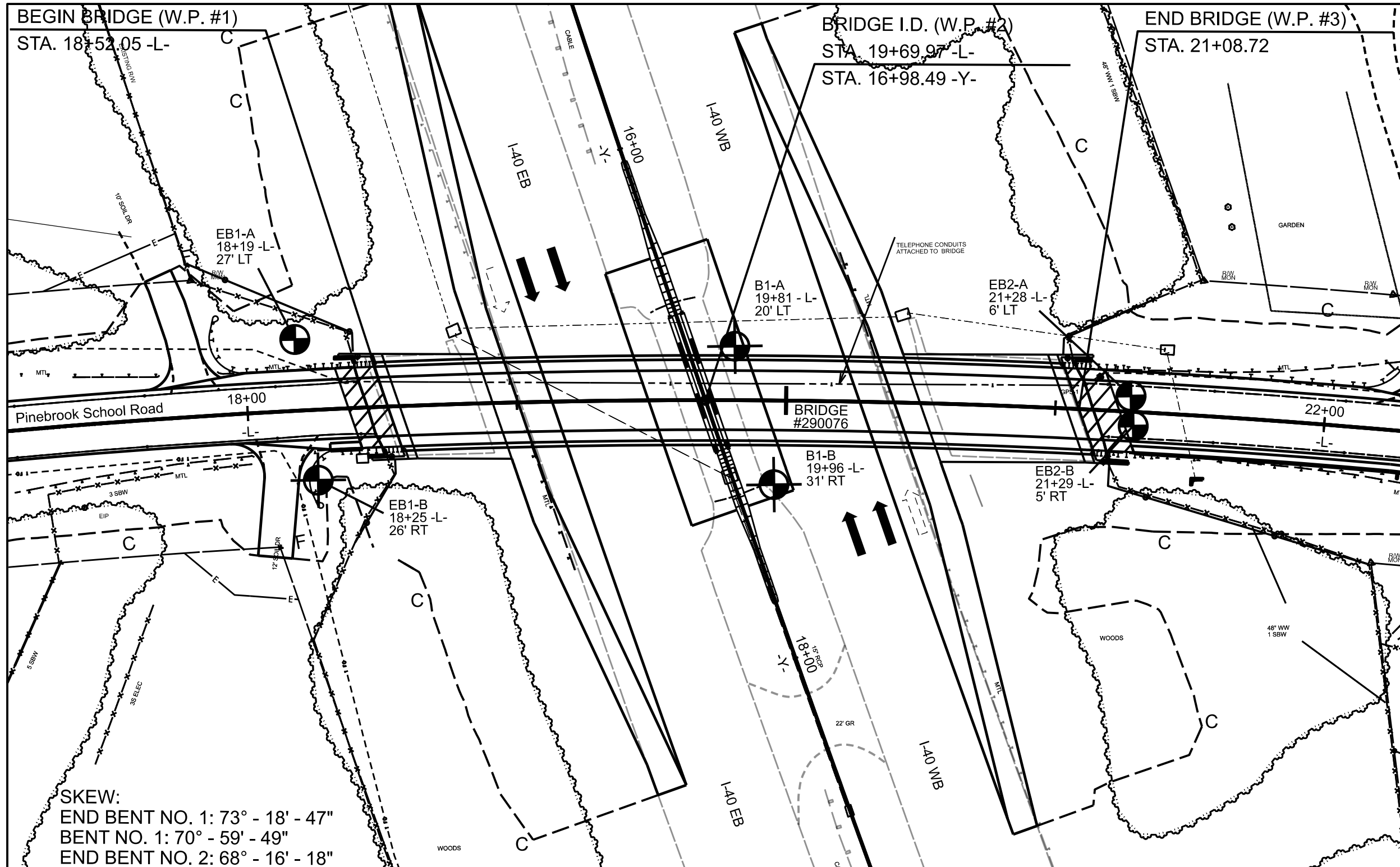
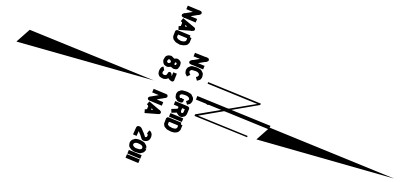
SUPPLEMENTAL LEGEND, GEOLOGICAL STRENGTH INDEX (GSI) TABLES  
FROM AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS

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

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

GEOLOGICAL STRENGTH INDEX (GSI) FOR JOINTED ROCKS (Hoek and Marinos, 2000)		SURFACE CONDITIONS					GSI FOR HETEROGENEOUS ROCK MASSES SUCH AS FLYSCH (Marinos, P and Hoek E., 2000)		SURFACE CONDITIONS OF DISCONTINUITIES (Predominantly bedding planes)					
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.		VERY GOOD	GOOD	FAIR	POOR	VERY POOR	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.		VERY GOOD	GOOD	FAIR	POOR	VERY POOR	
STRUCTURE		DECREASING SURFACE QUALITY →					COMPOSITION AND STRUCTURE							
	INTACT OR MASSIVE - intact rock specimens or massive in situ rock with few widely spaced discontinuities	90			N/A	N/A		A. Thick bedded, very blocky sandstone. The effect of pelitic coatings on the bedding planes is minimized by the confinement of the rock mass. In shallow tunnels or slopes these bedding planes may cause structurally controlled instability.	70					
	BLOCKY - well interlocked undisturbed rock mass consisting of cubical blocks formed by three intersecting discontinuity sets	80						B. Sandstone with thin inter-layers of siltstone	60					
	VERY BLOCKY - interlocked, partially disturbed mass with multi-faceted angular blocks formed by 4 or more joint sets		70					C. Sandstone and siltstone in similar amounts	50					
	BLOCKY/DISTURBED/SEAMY - folded with angular blocks formed by many intersecting discontinuity sets. Persistence of bedding planes or schistosity		60					D. Siltstone or silty shale with sandstone layers	40					
	DISINTEGRATED - poorly interlocked, heavily broken rock mass with mixture of angular and rounded rock pieces		50					E. Weak siltstone or clayey shale with sandstone layers	30					
	LAMINATED/SHEARED - Lack of blockiness due to close spacing of weak schistosity or shear planes		40					F. Tectonically deformed, intensively folded/faulted, sheared clayey shale or siltstone with broken and deformed sandstone layers forming an almost chaotic structure	20					
			30					G. Undisturbed silty or clayey shale with or without a few very thin sandstone layers	10					
			20					H. Tectonically deformed silty or clayey shale forming a chaotic structure with pockets of clay. Thin layers of sandstone are transformed into small rock pieces.						
			10											
		N/A	N/A											

→ Means deformation after tectonic disturbance



# GEOTECHNICAL BORING REPORT

## BORE LOG

<b>WBS</b> 67152.1.1		<b>TIP</b> BR-0152		<b>COUNTY</b> DAVIE		<b>GEOLOGIST</b> M. Foster										
<b>SITE DESCRIPTION</b> Replacement of Bridge No. 67 on SR 1436 (Pinebrook School Road) over I-40: STA. 19+69.97 -L-							<b>GROUND WTR (ft)</b>									
<b>BORING NO.</b> EB1-A		<b>STATION</b> 18+19		<b>OFFSET</b> 27 ft LT		<b>ALIGNMENT</b> -L-	0 HR. N/A									
<b>COLLAR ELEV.</b> 728.5 ft		<b>TOTAL DEPTH</b> 23.2 ft		<b>NORTHING</b> 810,583		<b>EASTING</b> 1,551,865	24 HR. 17.5									
<b>DRILL RIG/HAMMER EFF./DATE</b> TRI0055 CME-55 83% 05/09/2022				<b>DRILL METHOD</b> Mud Rotary		<b>HAMMER TYPE</b> Automatic										
<b>DRILLER</b> R. Toothman		<b>START DATE</b> 03/04/24		<b>COMP. DATE</b> 03/04/24		<b>SURFACE WATER DEPTH</b> N/A										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION			
			0.5ft	0.5ft	0.5ft	0	25	50	75	100			ELEV. (ft)	DEPTH (ft)		
730																
	728.5	0.0	2	6	11									728.5	0.0	GROUND SURFACE
														727.3	1.2	<b>RESIDUAL</b> Stiff, Olive Brown, Fine to Coarse Sandy SILT (A-4), Saprolitic
725	725.1	3.4	9	12	16											Stiff, Highly Plastic, Brown, Silty CLAY (A-7), Saprolitic
														721.8	6.7	Very Dense, Olive Yellow, Silty Coarse to Fine SAND (A-2-4), Saprolitic
720	720.1	8.4	31	37	42											
	715.7	12.8	100/0.4											717.0	11.5	<b>WEATHERED ROCK</b> Gray, METADIORITE
715																
	710.7	17.8	100/0.5													
710																
	705.7	22.8	100/0.4											705.3	23.2	Boring Terminated at Elevation 705.3 ft in WEATHERED ROCK: METADIORITE
																NOTE: Topsoil (0.1 Foot)

NCDOT BORE DOUBLE BR0152\_GEO\_BRD0076\_GINT.GPJ NC\_DOT.GDT 4/7/24

# GEOTECHNICAL BORING REPORT

## BORE LOG

# GEOTECHNICAL BORING REPORT

## CORE LOG

WBS 67152.1.1		TIP BR-0152		COUNTY DAVIE		GEOLOGIST M. Foster										
SITE DESCRIPTION Replacement of Bridge No. 67 on SR 1436 (Pinebrook School Road) over I-40: STA. 19+69.97 -L-							GROUND WTR (ft)									
BORING NO. EB1-B		STATION 18+25		OFFSET 26 ft RT		ALIGNMENT -L-										
COLLAR ELEV. 728.8 ft		TOTAL DEPTH 21.1 ft		NORTHING 810,611		EASTING 1,551,910										
DRILL RIG/HAMMER EFF./DATE TRI0055 CME-55 83% 05/09/2022				DRILL METHOD Mud Rotary and Core		HAMMER TYPE Automatic										
DRILLER R. Toothman		START DATE 03/04/24		COMP. DATE 03/05/24		SURFACE WATER DEPTH N/A										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION			
			0.5ft	0.5ft	0.5ft	0	25	50	75	100			ELEV. (ft)	DEPTH (ft)		
730																
	728.8	0.0	2	5	7									728.8	0.0	GROUND SURFACE
	725.5	3.3												726.4	2.4	<b>RESIDUAL</b> Stiff, Olive Brown, Fine to Coarse Sandy CLAY (A-6), Saprolitic
	725.5	3.3	3	2	3											Medium Stiff to Hard, Highly Plastic, Yellowish Brown, Silty CLAY (A-7-6), Saprolitic
	720.5	8.3												719.5	9.3	<b>WEATHERED ROCK</b>
	718.2	10.6	16	50	50/0.3									718.2	10.6	Light Brownish Gray, METADIORITE
																<b>CRYSTALLINE ROCK</b> Gray and Pale Red, METADIORITE
														712.7	16.1	Light Brownish Gray, METADIORITE
														709.2	19.6	<b>WEATHERED ROCK</b>
														707.7	21.1	Light Brownish Gray, METADIORITE
																Boring Terminated at Elevation 707.7 ft in WEATHERED ROCK: METADIORITE
																NOTE: Topsoil (0.1 Foot)

WBS 67152.1.1		TIP BR-0152		COUNTY DAVIE		GEOLOGIST M. Foster									
SITE DESCRIPTION Replacement of Bridge No. 67 on SR 1436 (Pinebrook School Road) over I-40: STA. 19+69.97 -L-							GROUND WTR (ft)								
BORING NO. EB1-B		STATION 18+25		OFFSET 26 ft RT		ALIGNMENT -L-									
COLLAR ELEV. 728.8 ft		TOTAL DEPTH 21.1 ft		NORTHING 810,611		EASTING 1,551,910									
DRILL RIG/HAMMER EFF./DATE TRI0055 CME-55 83% 05/09/2022				DRILL METHOD Mud Rotary and Core		HAMMER TYPE Automatic									
DRILLER R. Toothman		START DATE 03/04/24		COMP. DATE 03/05/24		SURFACE WATER DEPTH N/A									
CORE SIZE NQ				TOTAL RUN 10.5 ft											
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN		SAMP. NO.	STRATA		LOG	DESCRIPTION AND REMARKS				
					REC. (ft) %	RQD (ft) %		REC. (ft) %	RQD (ft) %		ELEV. (ft)	DEPTH (ft)			
718.2	718.2	0.0	0.5	0:54/0.5	(0.5)	(0.0)		(4.7)	(1.8)			718.2	0.0	Begin Coring @ 10.6 ft	
	717.7	11.1	5.0	1:11 9:27 6:03 1:25 1:15	100%	0%		85%	33%			718.2	10.6	<b>CRYSTALLINE ROCK</b> Slight to Moderate Weathering, Hard to Moderately Hard, Gray and Pale Red, METADIORITE with Close to Very Close Fracture Spacing (GSI: 45 - 55)	
	712.7	16.1	5.0	1:02 1:30 1:45 1:55 1:59	(4.2)	(1.8)		(3.3)	(0.0)			712.7	16.1	Moderate to Moderately Severe Weathering, Medium Hard, Light Brownish Gray, METADIORITE with Close to Very Close Spacing (GSI: 30 - 40)	
	707.7	21.1			(4.1)	(0.0)		(0.8)	(0.0)			709.2	19.6	<b>WEATHERED ROCK</b>	
								53%	0%			707.7	21.1	Severe Weathering, Soft to Very Soft, Light Brownish Gray, METADIORITE with Very Close Spacing	
															Boring Terminated at Elevation 707.7 ft in WEATHERED ROCK: METADIORITE
															NOTE: Topsoil (0.1 Foot)

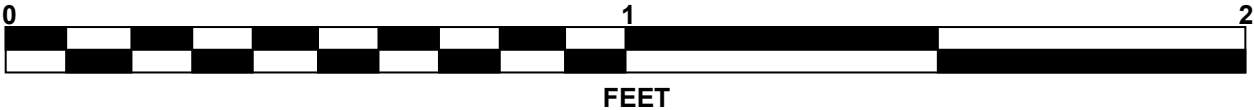
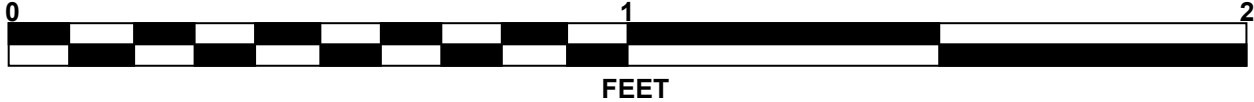
# ROCK CORE PHOTOGRAPHS

BR-0152 (67152.1.1)

Replacement of Bridge No. 76 on SR 1436 (Pinebrook School Road) over I-40

**EB1-B**

BOX 1: 10.6 - 21.1 FEET



# GEOTECHNICAL BORING REPORT

## BORE LOG

# GEOTECHNICAL BORING REPORT

## CORE LOG

WBS 67152.1.1		TIP BR-0152		COUNTY DAVIE		GEOLOGIST M. Foster										
SITE DESCRIPTION Replacement of Bridge No. 67 on SR 1436 (Pinebrook School Road) over I-40: STA. 19+69.97 -L-							GROUND WTR (ft)									
BORING NO. B1-A		STATION 19+81		OFFSET 20 ft LT		ALIGNMENT -L-										
COLLAR ELEV. 711.7 ft		TOTAL DEPTH 35.5 ft		NORTHING 810,735		EASTING 1,551,805										
DRILL RIG/HAMMER EFF./DATE TRI0055 CME-55 83% 05/09/2022				DRILL METHOD Mud Rotary and Core		HAMMER TYPE Automatic										
DRILLER R. Toothman		START DATE 03/13/24		COMP. DATE 03/14/24		SURFACE WATER DEPTH N/A										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION			
			0.5ft	0.5ft	0.5ft	0	25	50	75	100			ELEV. (ft)	DEPTH (ft)		
715																
710	710.3	1.4	13	7	9							M	711.7	GROUND SURFACE	0.0	
	707.7	4.0	100/0.4										709.8	ROADWAY EMBANKMENT Asphalt (0.0 - 1.1 Feet)	1.9	
	703.8	7.9	100/0.2										708.2	ABC Stone (1.1 - 1.9 Feet) Very Stiff, Silty CLAY (A-7)	3.5	
705														WEATHERED ROCK Gray, METADIORITE		
700	701.1	10.6	60/0.0										701.1	CRYSTALLINE ROCK Gray and Greenish Black, METADIORITE	10.6	
695																
690													690.7	Gray and Greenish Gray, METADIORITE	21.0	
685												RS-1	686.2	Gray, METADIORITE	25.5	
680													683.3	Gray and Greenish Gray, METADIORITE	28.4	
													676.2	Boring Terminated at Elevation 676.2 ft in CRYSTALLINE ROCK: METADIORITE	35.5	

WBS 67152.1.1		TIP BR-0152		COUNTY DAVIE		GEOLOGIST M. Foster					
SITE DESCRIPTION Replacement of Bridge No. 67 on SR 1436 (Pinebrook School Road) over I-40: STA. 19+69.97 -L-							GROUND WTR (ft)				
BORING NO. B1-A		STATION 19+81		OFFSET 20 ft LT		ALIGNMENT -L-					
COLLAR ELEV. 711.7 ft		TOTAL DEPTH 35.5 ft		NORTHING 810,735		EASTING 1,551,805					
DRILL RIG/HAMMER EFF./DATE TRI0055 CME-55 83% 05/09/2022				DRILL METHOD Mud Rotary and Core		HAMMER TYPE Automatic					
DRILLER R. Toothman		START DATE 03/13/24		COMP. DATE 03/14/24		SURFACE WATER DEPTH N/A					
CORE SIZE NQ		TOTAL RUN 24.9 ft		L O G		DESCRIPTION AND REMARKS					
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	REC. (ft) %	RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	RQD (ft) %	ELEV. (ft)	DEPTH (ft)
701.1											
700	701.1	10.6	4.9	1:55/0.9	(3.3) 67%	(0.0) 0%		(8.8) 85%	(1.0) 10%	701.1	10.6
695	696.2	15.5	5.0	1:34 1:25 1:17 2:05	(5.0) 100%	(1.0) 20%					
690	691.2	20.5	5.0	1:42 1:43 1:50 1:40 1:35	96%	70%		(4.3) 96%	(3.5) 78%	690.7	21.0
685	686.2	25.5	5.0	1:30 2:08 2:02 1:45 2:13	(4.5) 90%	(2.2) 44%	RS-1	(2.9) 100%	(0.6) 21%	686.2	25.5
680	681.2	30.5	5.0	1:40 2:05 1:57 2:19	(4.7) 94%	(3.4) 68%		(6.3) 89%	(5.0) 70%	683.3	28.4
	676.2	35.5		1:52 1:41 1:52						676.2	35.5
Boring Terminated at Elevation 676.2 ft in CRYSTALLINE ROCK: METADIORITE											

NCDOT BORE DOUBLE BR0152\_GEO\_BRD0076\_GINT.GPJ NC\_DOT.GDT 4/7/24

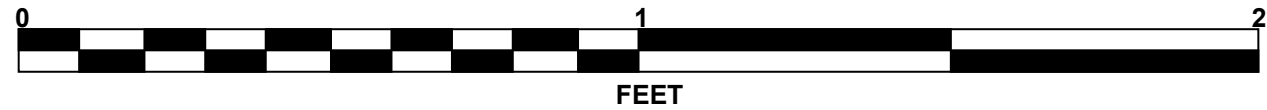


# ROCK CORE PHOTOGRAPHS

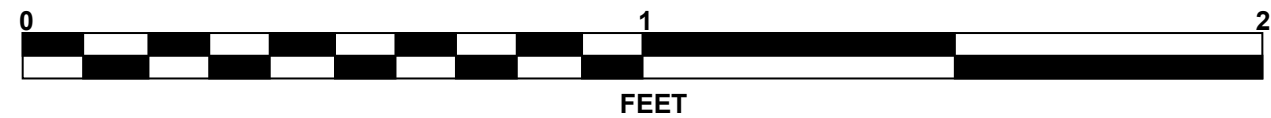
BR-0152 (67152.1.1)

Replacement of Bridge No. 76 on SR 1436 (Pinebrook School Road) over I-40

**B1-A**  
BOXES 1 & 2: 10.6 - 30.5 FEET



**B1-A**  
BOX 3: 30.5 - 35.5 FEET



## GEOTECHNICAL BORING REPORT BORE LOG

## GEOTECHNICAL BORING REPORT CORE LOG

WBS 67152.1.1		TIP BR-0152		COUNTY DAVIE		GEOLOGIST M. Foster										
SITE DESCRIPTION Replacement of Bridge No. 67 on SR 1436 (Pinebrook School Road) over I-40: STA. 19+69.97 -L-							GROUND WTR (ft)									
BORING NO. B1-B		STATION 19+96		OFFSET 31 ft RT		ALIGNMENT -L-										
COLLAR ELEV. 711.8 ft		TOTAL DEPTH 35.6 ft		NORTHING 810,768		EASTING 1,551,847										
DRILL RIG/HAMMER EFF./DATE TRI0055 CME-55 83% 05/09/2022				DRILL METHOD Mud Rotary and Core		HAMMER TYPE Automatic										
DRILLER R. Toothman		START DATE 03/12/24		COMP. DATE 03/13/24		SURFACE WATER DEPTH N/A										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION			
			0.5ft	0.5ft	0.5ft	0	25	50	75	100			ELEV. (ft)	DEPTH (ft)		
715																
710	710.4	1.4	13	5	7							M		711.8	0.0	GROUND SURFACE
														710.0	1.8	ROADWAY EMBANKMENT Asphalt (0.0 - 1.0 Foot) ABC Stone (1.0-1.8 Feet)
	707.8	4.0	100/0.4											708.3	3.5	Stiff, Olive Brown and Gray, Silty CLAY (A-7)
														702.8	9.0	WEATHERED ROCK Olive Gray and Gray, METADIORITE
705	704.1	7.7	100/0.4													CRYSTALLINE ROCK Gray, METADIORITE
	702.8	9.0	60/0.0													
700																
695																
690												RS-2		691.2	20.6	Greenish Black and Greenish Gray, METAGABBRO (METADIORITE Encountered Throughout)
685																
680														677.7	34.1	Gray, METADIORITE
														676.2	35.6	Boring Terminated at Elevation 676.2 ft in CRYSTALLINE ROCK: METADIORITE

WBS 67152.1.1		TIP BR-0152		COUNTY DAVIE		GEOLOGIST M. Foster						
SITE DESCRIPTION Replacement of Bridge No. 67 on SR 1436 (Pinebrook School Road) over I-40: STA. 19+69.97 -L-							GROUND WTR (ft)					
BORING NO. B1-B		STATION 19+96		OFFSET 31 ft RT		ALIGNMENT -L-						
COLLAR ELEV. 711.8 ft		TOTAL DEPTH 35.6 ft		NORTHING 810,768		EASTING 1,551,847						
DRILL RIG/HAMMER EFF./DATE TRI0055 CME-55 83% 05/09/2022				DRILL METHOD Mud Rotary and Core		HAMMER TYPE Automatic						
DRILLER R. Toothman		START DATE 03/12/24		COMP. DATE 03/13/24		SURFACE WATER DEPTH N/A						
CORE SIZE NQ		TOTAL RUN 26.6 ft										
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN		SAMP. NO.	STRATA		LOG	DESCRIPTION AND REMARKS	
					REC. (ft) %	RQD (ft) %		REC. (ft) %	RQD (ft) %		ELEV. (ft)	DEPTH (ft)
702.8	702.8	9.0	1.6		(1.1)	(1.1)		(10.5)	(8.3)			Begin Coring @ 9.0 ft <b>CRYSTALLINE ROCK</b>
700	701.2	10.6	5.0	2:07/0.6 2:00 2:06 1:57 2:39 2:21 2:13	69%	69%		91%	72%			Slight to Moderate Weathering, Hard to Moderately Hard, Gray, METADIORITE with Moderately Close to Close Fracture Spacing (GSI: 55 - 65)
695	696.2	15.6	5.0	2:19 2:59 2:25 2:38 2:56	96%	72%						
690	691.2	20.6	5.0	2:09 2:33 2:07 2:16 2:22	(5.0)	(2.1)	RS-2	(13.1)	(4.8)			Slight to Moderate Weathering, Moderately Hard to Medium Hard, Greenish Black and Greenish Gray, METAGABBRO with Moderately Close to Close Fracture Spacing (GSI: 45 - 55)
685	686.2	25.6	5.0	2:20 2:43 2:53 2:37 2:29	(4.7)	(1.6)						(METADIORITE Encountered Throughout)
680	681.2	30.6	5.0	2:11 2:14 2:16 2:06 2:17	(4.9)	(2.0)						
	676.2	35.6			100%	60%		(1.5)	(0.9)			Very Slight to Slight Weathering, Hard to Moderately Hard, Gray, METADIORITE with Close Fracture Spacing Boring Terminated at Elevation 676.2 ft in CRYSTALLINE ROCK: METADIORITE

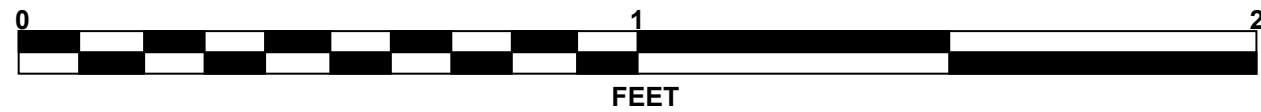
NCDOT BORE DOUBLE BR0152\_GEO\_BRD0076\_GINT.GPJ\_NC\_DOT.GDT 4/7/24

# ROCK CORE PHOTOGRAPHS

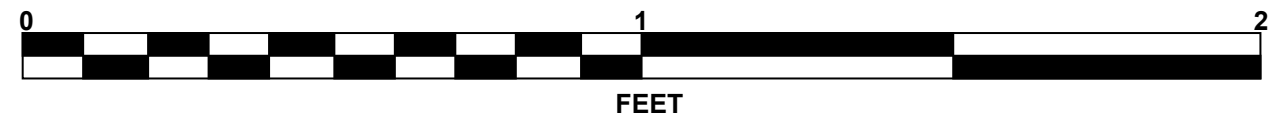
BR-0152 (67152.1.1)

Replacement of Bridge No. 76 on SR 1436 (Pinebrook School Road) over I-40

**B1-B**  
BOXES 1 & 2: 10.6 - 30.5 FEET



**B1-B**  
BOX 3: 30.5 - 35.5 FEET



# GEOTECHNICAL BORING REPORT

## BORE LOG

WBS 67152.1.1		TIP BR-0152		COUNTY DAVIE		GEOLOGIST M. Foster								
SITE DESCRIPTION Replacement of Bridge No. 67 on SR 1436 (Pinebrook School Road) over I-40: STA. 19+69.97 -L-							GROUND WTR (ft)							
BORING NO. EB2-A		STATION 21+28		OFFSET 6 ft LT		ALIGNMENT -L-								
COLLAR ELEV. 739.9 ft		TOTAL DEPTH 33.3 ft		NORTHING 810,878		EASTING 1,551,766								
DRILL RIG/HAMMER EFF./DATE TRI0055 CME-55 83% 05/09/2022				DRILL METHOD Mud Rotary		HAMMER TYPE Automatic								
DRILLER R. Toothman		START DATE 03/08/24		COMP. DATE 03/08/24		SURFACE WATER DEPTH N/A								
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)
			0.5ft	0.5ft	0.5ft	0	25	50	75	100				
740	738.9	1.0	5	8	7							M	GROUND SURFACE 0.0	0.0
	736.2	3.7	8	13	13							M	ROADWAY EMBANKMENT Asphalt (0.0 - 0.5 Foot) ABC Stone (0.5 - 1.1 Feet)	1.1
735	731.9	8.0	21	33	31							M	RESIDUAL Stiff to Very Stiff, Highly Plastic, Olive Brown, Yellowish Brown, and Olive Yellow, Silty CLAY (A-7), Saprolitic	6.6
730	726.9	13.0	100/0.5								SS-2	10%	Very Dense, Non Plastic, Light Brownish Gray, Silty Coarse to Fine SAND (A-2-4), Saprolitic	12.0
725	721.9	18.0	80	20/0.1								M	WEATHERED ROCK Light Brownish Gray, METADIORITE	20.8
720	716.9	23.0	28	22	12							M	RESIDUAL Dense, Light Brownish Gray and Gray, Silty Coarse to Fine SAND (A-2-4), Saprolitic	26.3
715	711.9	28.0	74	26/0.1								M	WEATHERED ROCK Light Brownish Gray and Gray, METADIORITE	33.3
710	706.9	33.0	100/0.3										Boring Terminated at Elevation 706.6 ft in WEATHERED ROCK: METADIORITE	

WBS 67152.1.1		TIP BR-0152		COUNTY DAVIE		GEOLOGIST M. Foster								
SITE DESCRIPTION Replacement of Bridge No. 67 on SR 1436 (Pinebrook School Road) over I-40: STA. 19+69.97 -L-							GROUND WTR (ft)							
BORING NO. EB2-B		STATION 21+29		OFFSET 5 ft RT		ALIGNMENT -L-								
COLLAR ELEV. 739.3 ft		TOTAL DEPTH 33.5 ft		NORTHING 810,803		EASTING 1,551,776								
DRILL RIG/HAMMER EFF./DATE TRI0055 CME-55 83% 05/09/2022				DRILL METHOD Mud Rotary		HAMMER TYPE Automatic								
DRILLER R. Toothman		START DATE 03/11/24		COMP. DATE 03/11/24		SURFACE WATER DEPTH N/A								
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)
			0.5ft	0.5ft	0.5ft	0	25	50	75	100				
740	738.3	1.0	4	7	7							M	GROUND SURFACE 0.0	0.0
	735.6	3.7	5	9	10							M	ROADWAY EMBANKMENT Asphalt (0.0 - 0.6 Foot) ABC Stone (0.6 - 1.1 Feet)	1.1
735	731.3	8.0	10	14	15							M	RESIDUAL Stiff to Very Stiff, Highly Plastic, Olive Brown and Yellowish Brown, Silty CLAY (A-7), Trace Mica, Saprolitic	7.0
730	726.3	13.0	17	23	28						SS-3	15%	Medium Dense to Very Dense, Non Plastic, Light Brownish Gray and Gray, Silty Coarse to Fine SAND (A-2-4), Saprolitic	21.4
725	721.3	18.0	17	17	19							M	WEATHERED ROCK Gray, Light Brownish Gray, and Olive Gray, METADIORITE	21.4
720	716.3	23.0	69	31/0.1								M	WEATHERED ROCK Gray, Light Brownish Gray, and Olive Gray, METADIORITE	33.5
715	711.3	28.0	100/0.2										Boring Terminated at Elevation 705.8 ft in WEATHERED ROCK: METADIORITE	
710	706.3	33.0	100/0.5										Boring Terminated at Elevation 705.8 ft in WEATHERED ROCK: METADIORITE	

NCDOT BORE DOUBLE BR0152\_GEO\_BRD0076\_GINT.GPJ\_NC\_DOT.GDT 4/7/24

## LABORATORY SUMMARY SHEET FOR SOIL SAMPLES

WBS NO. (TIP NO.): 67152.1.1 (BR-0152)

PROJECT ID: 44248

COUNTY: DAVIE

DESCRIPTION: REPLACEMENT OF BRIDGE NO. 76 ON SR 1436 (PINEBROOK SCHOOL ROAD) OVER I-40

SITE DESCRIPTION: STA. 19+69.97 -L-

Sample No.	Boring Number	Alignment	Station	Offset	Sample Depth (ft)	Natural Moisture Content (%)	AASHTO Class. (Group Index)		N-Value (blows/ft)	Atterberg Limits			Gradation Results							
										L.L.	P.L.	P.I.	Retained #4 Sieve (%)	Pass #10 Sieve (%)	Pass #40 Sieve (%)	Pass #200 Sieve (%)	Coarse Sand (%)	Fine Sand (%)	Silt (%)	Clay (%)
SS-1	EB1-B	-L-	18+25	26' RT	3.3 - 4.8	42.8	A-7-6	(20)	5	53	25	28	0.6	99.0	89.0	71.8	14.0	18.0	31.2	36.8
SS-2	EB2-A	-L-	21+28	6' LT	8.0 - 9.5	10.1	A-2-4	(0)	64	NP	NP	NP	0.0	99.3	80.6	27.0	36.2	42.0	13.8	8.0
SS-3	EB2-B	-L-	21+29	5' RT	13.0 - 14.5	14.9	A-2-4	(0)	51	NP	NP	NP	0.0	100.0	80.0	28.4	35.7	41.2	15.1	8.0

**Michelle Stadel, P.E.**



NCDOT Certification No.: 111-02-1203

## LABORATORY SUMMARY SHEET FOR ROCK SAMPLES

WBS NO. (TIP NO.): 67152.1.1 (BR-0152)

PROJECT ID: 44248

COUNTY: DAVIE

DESCRIPTION: REPLACEMENT OF BRIDGE NO. 76 ON SR 1436 (PINEBROOK SCHOOL ROAD) OVER I-40

SITE DESCRIPTION: STA. 19+69.97 -L-

Sample No.	Boring Number	Alignment	Station	Offset	Sample Depth (ft)	Core Run Interval (ft)	Core Run Recovery (%)	Core Run RQD (%)	Core Run GSI	Rock Type	Geologic Map Unit	Sample Height (in)	Sample Diameter (in)	Unit Weight (pcf)	Unconfined Compressive Strength (psi)
RS-1	B1-A	-L-	19+81	20' LT	26.1 - 26.6	25.5 - 30.5	90	44	35 - 45	METADIORITE	PzZm	4.30	1.98	181.4	17,823
RS-2	B1-B	-L-	19+96	31' RT	19.4 - 20.1	15.6 - 20.6	96	72	55 - 65	METADIORITE	PzZm	3.99	1.98	176.3	4,769

Lab testing performed by *Froehling & Robertson, Inc.*

ASTM D7012 - Method D (Modified)

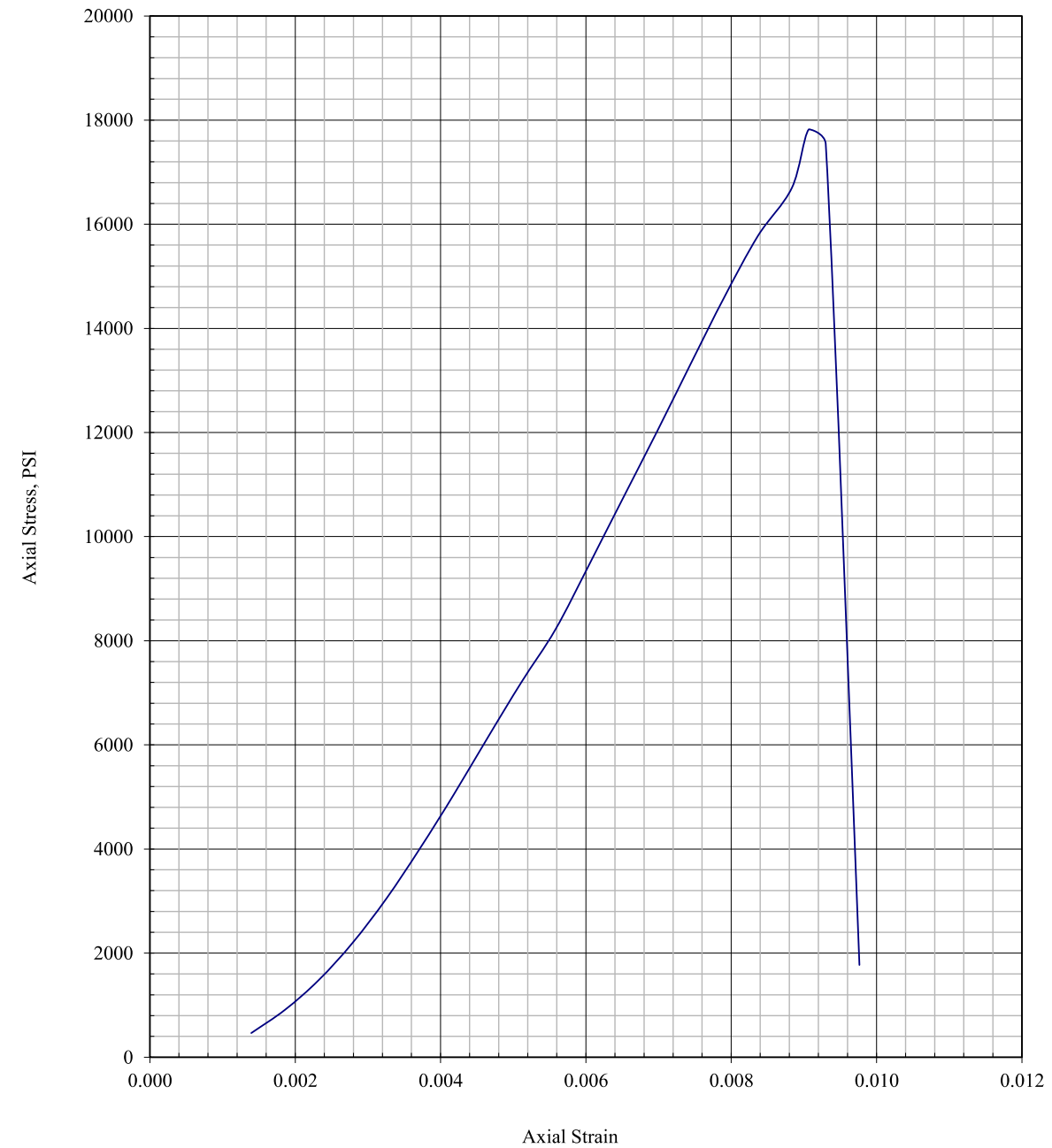
Elastic Moduli of Intact Rock Core Specimens in Uniaxial Compression

Client:	Kleinfelder	Project:	BR-0152 Bridge Investigation
Submitted By:	Dan Kubinski		(24003782.002A)
Boring No.:	B1-A	F&R Project No.:	66B-0136
Sample ID:	RS-1	Testing Date:	3/29/2024
Depth, ft.:	26.1' - 26.6'	Report Date:	4/2/2024

Reading No.	Dial Guage Reading (in.)	Axial Load (lbs)*	Total Axial Deformation (in.)	Axial Strain	Corrected Area <sup>1</sup> (in <sup>2</sup> )	Axial Stress (psi)	Axial Stress (Kpa)
1	0.006	1433	0.006	0.0014	3.08	465.311	3208.206
2	0.008	2809	0.008	0.0019	3.08	911.827	6286.831
3	0.010	4569	0.010	0.0023	3.08	1483.305	10227.033
4	0.012	6771	0.012	0.0028	3.08	2198.018	15154.804
5	0.014	9390	0.014	0.0033	3.08	3048.176	21016.445
6	0.016	12372	0.016	0.0037	3.08	4016.213	27690.823
7	0.018	15568	0.018	0.0042	3.08	5053.929	34845.625
8	0.020	18923	0.020	0.0047	3.08	6143.048	42354.844
9	0.022	22211	0.022	0.0051	3.08	7210.216	49712.706
10	0.024	25302	0.024	0.0056	3.08	8213.734	56631.724
11	0.026	29148	0.026	0.0060	3.08	9462.017	65238.335
12	0.028	33085	0.028	0.0065	3.08	10739.952	74049.390
13	0.030	36990	0.030	0.0070	3.08	12007.579	82789.379
14	0.032	41011	0.032	0.0074	3.08	13312.966	91789.707
15	0.034	44985	0.034	0.0079	3.08	14603.027	100684.364
16	0.036	48614	0.036	0.0084	3.08	15780.792	108804.772
17	0.038	51450	0.038	0.0088	3.08	16701.460	115152.561
18	0.039	54906	0.039	0.0091	3.08	17823.188	122886.605
19	0.040	54037	0.040	0.0093	3.08	17540.900	120940.293
20	0.042	5460	0.042	0.0098	3.08	1772.373	12220.089

<u>Time to Failure</u>	
Time (secs)	200
<u>Specimen Conditions</u>	
Diameter (in.)	1.98
Height (in.)	4.30
Area (in <sup>2</sup> )	3.08
Unit Wt. (pcf)	181.4
<u>Shear Testing Conditions</u>	
Loading Rate (%/min):	0.012 in/min.

Tested by: Joshua Davis



Maximum Load = 17823 psi

\* Method D (Modified) provides stress-strain curve *only*

ASTM D7012 - Method D (Modified)

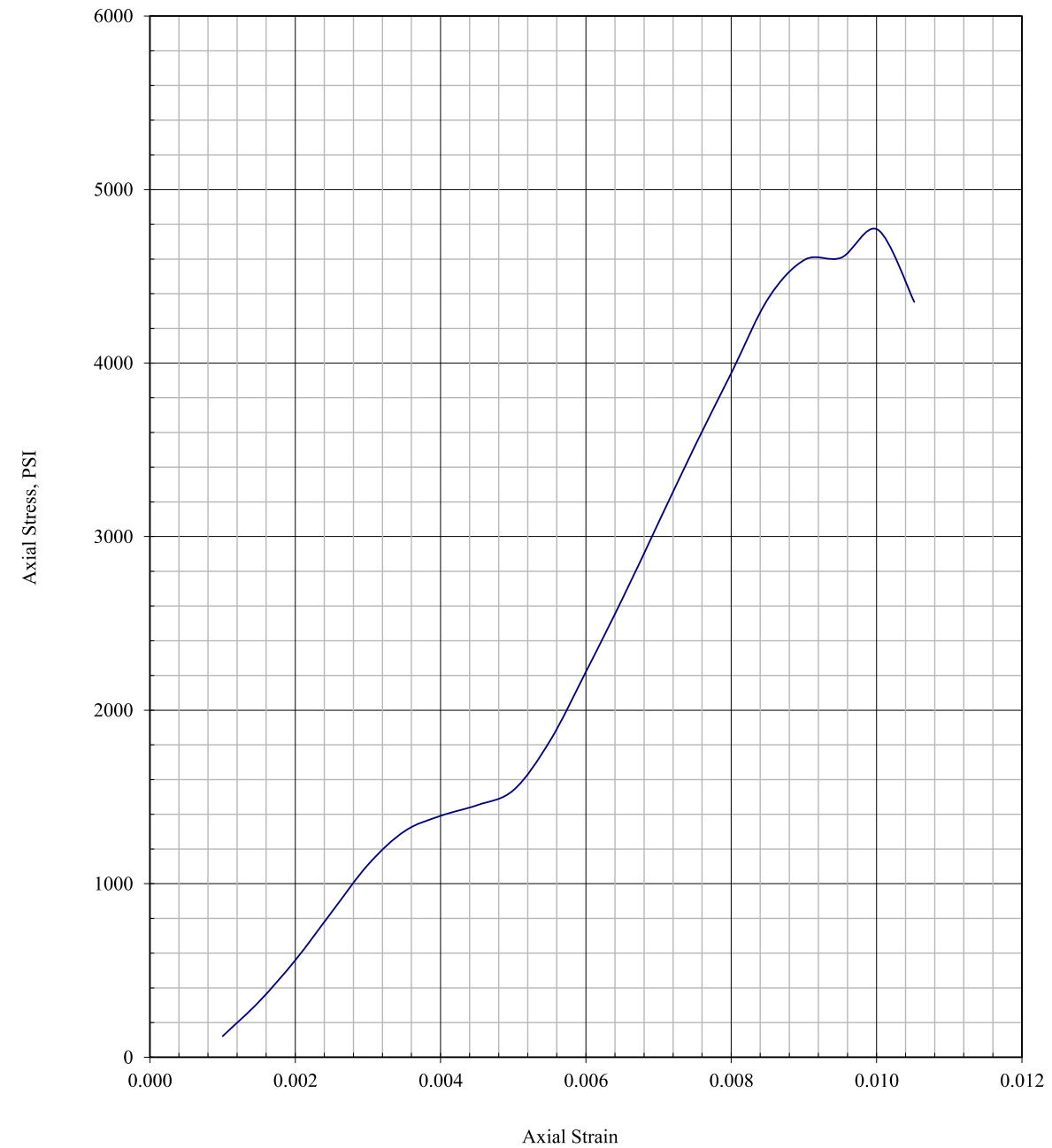
Elastic Moduli of Intact Rock Core Specimens in Uniaxial Compression

Client: Kleinfelder Project: BR-0152 Bridge Investigation  
 Submitted By: Dan Kubinski (24003782.002A)  
 Boring No.: B1-B F&R Project No.: 66B-0136  
 Sample ID: RS-2 Testing Date: 3/29/2024  
 Depth, ft.: 19.4' - 20.1' Report Date: 4/2/2024

Reading No.	Dial Guage Reading (in.)	Axial Load (lbs)*	Total Axial Deformation (in.)	Axial Strain	Corrected Area <sup>1</sup> (in <sup>2</sup> )	Axial Stress (psi)	Axial Stress (Kpa)
1	0.004	375	0.004	0.0010	3.08	121.814	839.878
2	0.006	987	0.006	0.0015	3.08	320.396	2209.050
3	0.008	1726	0.008	0.0020	3.08	560.416	3863.933
4	0.010	2580	0.010	0.0025	3.08	837.434	5773.909
5	0.012	3424	0.012	0.0030	3.08	1111.619	7664.344
6	0.014	4015	0.014	0.0035	3.08	1303.370	8986.426
7	0.016	4287	0.016	0.0040	3.08	1391.713	9595.530
8	0.018	4476	0.018	0.0045	3.08	1453.094	10018.734
9	0.020	4747	0.020	0.0050	3.08	1540.920	10624.276
10	0.022	5625	0.022	0.0055	3.08	1826.098	12590.505
11	0.024	6867	0.024	0.0060	3.08	2229.219	15369.931
12	0.026	8160	0.026	0.0065	3.08	2649.002	18264.235
13	0.028	9525	0.028	0.0070	3.08	3092.139	21319.555
14	0.030	10883	0.030	0.0075	3.08	3532.761	24357.541
15	0.032	12182	0.032	0.0080	3.08	3954.526	27265.510
16	0.034	13483	0.034	0.0085	3.08	4376.673	30176.111
17	0.036	14159	0.036	0.0090	3.08	4596.259	31690.103
18	0.038	14195	0.038	0.0095	3.08	4607.882	31770.243
19	0.040	14691	0.040	0.0100	3.08	4768.841	32880.013
20	0.042	13410	0.042	0.0105	3.08	4352.994	30012.849

Time to Failure	
Time (secs)	235
Specimen Conditions	
Diameter (in.)	1.98
Height (in.)	3.99
Area (in <sup>2</sup> )	3.08
Unit Wt. (pcf)	176.3
Shear Testing Conditions	
Loading Rate (%/min):	0.012 in/min.

Tested by: Joshua Davis



Maximum Load = 4769 psi

\* Method D (Modified) provides stress-strain curve *only*



**SITE PHOTOGRAPH**

**BR-0152 (67152.1.1)**

**Replacement of Bridge No. 76 on SR 1436 (Pinebrook School Road) over I-40**



**Looking East on I-40 (-Y-) towards Bridge No. 76 on Pinebrook School Road (-L-)**