CTL Engineering, Inc.
2860 Fisher Road, P.O. Box 44548, Columbus, Ohio 43204-3538
Phone: 614/276-8123 • Fax: 614/276-6377
Email: ctl@ctleng.com

AN EMPLOYEE OWNED COMPANY

Consulting Engineers • Testing • Inspection Services • Analytical Laboratories

Established 1927

April 2, 2026

Pike County Engineer's Office
502 Pike Street
Waverly, Ohio 45690

Attention: Mr. John C. Slone, P.E., P.S.
Pike County Engineer

Reference: Structure Foundation Exploration Report- Final Report
PIK-TR428-0.04 Beatty Road Bridge
PID No. 117984, Structure File No. 6633455
Pike County, Ohio
CTL Project No. 23050051COL

Dear Mr. Slone:

CTL Engineering, Inc. (CTL) has completed the geotechnical exploration report for the above referenced project. We are providing an electronic version (PDF file) of the Final Report via email.

Thank you for the opportunity to be of service to you on this project. If you have any questions, please contact me at our office.

Respectfully Submitted,

CTL Engineering, Inc.

Sastry Malladi, P. E.
Project Engineer

STRUCTURE FOUNDATION EXPLORATION - FINAL REPORT

PIK-TR428-0.04 BEATTY ROAD BRIDGE
PID NO. 117984
STRUCTURE FILE NO. 6633455
PIKE COUNTY, OHIO
CTL PROJECT NO. 23050051COL

PREPARED FOR:

PIKE COUNTY ENGINEER'S OFFICE
502 PIKE STREET
WAVERLY, OHIO 45690

PREPARED BY:

CTL ENGINEERING, INC.
2860 FISHER ROAD
COLUMBUS, OHIO 43204

April 2, 2026

TABLE OF CONTENTS

PAGE

I. EXECUTIVE SUMMARY 1
II. INTRODUCTION 1
III. GEOLOGY AND OBSERVATIONS OF THE PROJECT 2
IV. EXPLORATION 2
IV. FINDINGS 3
V. ANALYSES AND RECOMMENDATIONS 4
A. Bridge - Scour Data 4
B. Bridge – Foundation Support 5
C. Lateral Earth Parameters 7
D. Subgrade Considerations – Bridge Approach 7
VI. CHANGED CONDITIONS 7
VII. TESTING AND OBSERVATION 8
VIII. CLOSING 8

APPENDIX A GEOTECHNICAL PROFILE

APPENDIX B TEST BORING RECORDS

APPENDIX C LABORATORY TEST RESULTS

APPENDIX D ROCK CORE PHOTOS

APPENDIX E DRILLED SHAFT DESIGN CALCULATIONS

APPENDIX F LPILE PARAMETERS

APPENDIX G SUBGRADE ANALYSIS

APPENDIX H CTL RESPONSE TO COMMENTS

I. EXECUTIVE SUMMARY

The overall project, identified as PIK-TR428-0.04, consists of replacing an existing 70-foot, two-span steel pony truss bridge (SFN 6633455) that carries Township Road 428 (Beatty Road) over the Left Fork Crooked Creek in Pee Pee Township, Pike County, Ohio.

Three (3) structure test borings (Type E1) and two (2) roadway borings (Type A) were performed for this project. Below the surficial materials, the test boring encountered both fine-grained, cohesive soils and coarse-grained, granular soils before reaching the termination depth or encountering bedrock. The fine-grained soils were described as very stiff to hard silty clay (A-6b) and clay (A-7-6). The coarse-grained, granular soils were described as medium dense to very dense gravel and/or stone fragments with sand (A-1-b), gravel and/or stone fragments with sand and silt (A-2-4), and sandy silt (A-4a).

Below the native soil material, three (3) of the five (5) test borings encountered weathered bedrock. This depth corresponds to elevations ranging from 684.0 to 681.3 feet. The bedrock was described as brown and gray, highly to slightly weathered shale. Also, each of these three (3) test borings encountered a thin layer of limestone within the upper bedrock stratum.

Groundwater was encountered in one (1) of the five (5) test borings (B-003-0-23) during drilling at a depth of 1.0 foot below ground surface which corresponds to an elevation of 683.0 feet.

At the time this report was prepared, the plans for the proposed structure had not been finalized. In addition, the proposed bottom of footing elevation and scour elevation were not provided.

Based on the soil and rock conditions encountered in the test borings, the proposed bridge can be supported on drilled shafts socketed into the underlying bedrock. Additional details are provided in the Analyses and Recommendations section.

II. INTRODUCTION

The overall project, identified as PIK-TR428-0.04, consists of replacing an existing 70-foot, two-span steel truss bridge (SFN 6633455) that carries Township Road 428 (Beatty Road) over the Left Fork Crooked Creek in Pee Pee Township, Pike County, Ohio.

At the time that this report was prepared, the plans for the proposed structure had not been finalized. Therefore, the Geotechnical Profile sheets included in this report do not show the proposed structure in plan or profile view.

This is a Final Structure Foundation Exploration Report.

III. GEOLOGY AND OBSERVATIONS OF THE PROJECT

The project site is located within the Shawnee-Mississippian plateau physiographic region of Ohio. The underlying bedrock consists of the sedimentary bedrock formation identified as the Devonian-age and/or Mississippian-age Sunbury shale, Berea sandstone, and Bedford shale undivided.

According to the USDA Soil Survey Map, the primary surficial soil type at the site consisted of Clifty silt loam, occasionally flooded (Cf). These soils are well drained and exhibit high hydraulic conductivity (2.0 to 6.0 in/hr.). According to the USDA Soil Survey Map, the underlying soils pose moderate risk to corrosion of steel and concrete.

According to the ODNR website, no mapped deep mines are located within the project area. According to ODNR's karst interactive map website, there are no mapped karst features within the project area.

A field reconnaissance was conducted by CTL personnel on June 27, 2023. Township Road 428 is a single-lane, two-way roadway that runs generally west to east direction within the project limits. Left fork crooked creek flows beneath Township Road 428, a large erosion hole was noted between the forward abutment and the approach slab of the existing bridge. The surrounding topography is moderately sloping, while the ground immediately adjacent to the stream drops steeply along the creek banks. The surrounding land usage consists of rural residential and wooded.

IV. EXPLORATION

Three (3) structure test borings (Type E1) designated as B-002-0-23 through B-004-0-23 and two (2) roadway test borings designated a B-001-0-23 and B-005-0-23 were performed for this project. The location, depth and surface elevations of the borings are summarized in Table 1. The boring locations are included in the Geotechnical Profile sheets included in Appendix A, and on the boring logs included in Appendix B. The survey information at the test boring locations was provided by Resource International.

Table 1: Boring Locations, Depths and Elevations

Boring No.	Boring Type	Station	Offset	Boring Elevation (ft)	Depth (ft)
B-001-0-23	Type A	10+97.61	1.53' Lt	697.83	7.0
B-002-0-23	Type E1	11+80.38	9.42' Lt	696.30	30.0
B-003-0-23	Type E1	12+10.15	13.66' Rt	683.95	19.0
B-004-0-23	Type E1	12+79.32	4.45' Lt	696.34	30.0
B-005-0-23	Type A	13+33.71	1.40' Lt	693.52	7.0

The test borings were drilled on July 6, 2023 and July 7, 2023 utilizing 3-1/4-inch I.D. hollow-stem augers (HAS), powered by a track-mounted rotary drill rig. Split-barrel

(spoon) disturbed soil samples and Standard Penetration Tests (SPTs) were performed at 1.5- and 2.5-foot intervals. The automatic hammer was calibrated on May 3, 2023 had an energy ratio of 76.8 percent. Rock core sampling was performed using a wire-line system equipped with a NQ core barrel and a diamond bit.

The recovered split spoon samples obtained during the drilling operations were preserved in glass jars, visually classified in the field, and laboratory, and tested for moisture content. Representative samples were subjected to additional laboratory testing including Atterberg Limits, grain size distribution, sulfate testing and hand penetrometer.

The recovered rock from the coring operations was visually described, and the Rock Quality Designation (RQD) and core recovery values were determined. Representative samples of the recovered rock were subjected to compressive strength and slake durability testing.

Historic geotechnical records were searched on the ODOT TIMS website. No historic structure boring data was available for the existing structure.

IV. FINDINGS

The four (4) test borings, designated as B-001-0-23, B-002-0-23, B-004-0-23 and B-005-0-23 were drilled within the existing roadway pavement. These borings encountered 5 inches of asphalt at the ground surface.

Boring B-003-0-23 was performed though the creek channel. This boring encountered augerable shale bedrock at the ground surface.

Below the surficial materials, the test boring encountered both fine-grained, cohesive soils and coarse-grained, granular soils before reaching the termination depth or encountering bedrock. The fine-grained soils were described as very stiff to hard silty clay (A-6b) and clay (A-7-6). The coarse-grained, granular soils were described as medium dense to very dense gravel and/or stone fragments with sand (A-1-b), gravel and/or stone fragments with sand and silt (A-2-4), and sandy silt (A-4a). These soils exhibited standard penetration (SPT) N_{60} values ranging from 19 blows per foot (bpf) to 50 blows for 2 inches of penetration, with natural moisture content values ranging from 5 to 20 percent.

Beneath the soil overburden or from creek bed level, borings B-002-0-23 through B-004-0-23 encountered weathered bedrock at elevations ranging from 684.0 to 681.3 feet. The augerable bedrock layer at the creek bed level exhibited SPT N_{60} values ranging from 65 bpf to 50 blows for 4 inches of penetration.

Rock coring was performed in the borings from top of bedrock or below the augerable rock layers. The recovered rock was described as brown and gray, highly to slightly weathered shale. Also, each of these three test borings encountered a thin layer of limestone within the upper bedrock stratum. The rock cores exhibited rock quality

designation (RQD) values ranging from 9 to 75 percent, with core recovery values ranging from 72 to 100 percent.

Unconfined Compressive Strength (UCS) and slake durability testing was performed on selected bedrock core samples representative of the bedrock units. Results of the testing are provided in Appendix C, are summarized in Table 2.

Table 2. Rock Test Results

Boring ID	Sample Elevation (Feet)	Sample Depth (Feet)	Unit Weight (pcf)	Q_u (psi)	SDI (%)	Lithology
B-002-0-23	680.9 – 680.6	15.4 – 15.7	140.2	270	-	Shale
	677.0 – 676.6	19.3 – 19.7	146.5	320	-	Shale
B-003-0-23	680.0 – 675.0	4.0 – 9.0	-	-	38.6	Shale
	676.1 – 675.7	7.9 – 8.3	140.9	70	-	Shale
	669.4 – 669.0	14.6 – 15.0	160.6	2,840	-	Shale
B-004-0-23	681.1 – 680.7	15.0 – 15.4	150.2	2,220	-	Shale
	680.1 – 679.7	16.0 – 16.4	166.6	8,070	-	Limestone

Q_u= Unconfined Compressive Strength Test, ASTM D7012
SDI= Slake Durability Index Test, ASTM D4644

Groundwater was encountered in boring B-003-0-23 during drilling at a depth of 1.0 foot below ground surface which corresponds to an elevation of 683.0 feet.

V. ANALYSES AND RECOMMENDATIONS

A. Bridge - Scour Data

For the scour analysis, the mean particle grain size (D_{50}) and erosion category (EC) of the creek bed soil samples, as well as the erodibility index and critical shear stress of the bedrock, were determined in accordance with ODOT Geotechnical Design Manual (GDM) Section 1302. The scour-related data for the soil samples and bedrock for the proposed structures are presented in Table 3 and Table 4, respectively.

Table 3. Soil Scour Data

Boring	Sample No.	Elevation MSL (feet)	D_{50} (mm)	Erosion Category (EC)
B-002-0-23 Rear Abutment	SS-1	695.3 - 693.8	0.9896	2.195
	SS-3	690.3 - 688.8	0.8615	2.122
	SS-5	686.3 - 684.8	0.0124	4.156
B-004-0-23 Forward Abutment	SS-1	695.3 - 693.8	0.7106	2.022
	SS-2	692.8 - 691.3	0.5812	1.917
	SS-3	690.3 - 688.8	0.4430	1.776

Table 4. Bedrock Scour Data

Boring	Sample No.	Elevation MSL (feet)	K Index	Critical Shear Stress (Pa)	Erosion Category (EC)
B-002-0-23 Rear Abutment	NQ-1	681.3 - 676.3	31.30	1416	3.761
	NQ-2	676.3 - 671.3	58.10	1929	3.761
	NQ-3	671.3 - 666.3	54.92	1876	3.761
B-003-0-23 Pier	SS-1/SS-2	684.0 - 680.0	0.01	30	3.761
	NQ-1	681.3 - 676.3	31.30	1416	3.761
	NQ-2	676.3 - 671.3	58.10	1929	3.761
	NQ-3	671.3 - 666.3	54.92	1876	3.761
B-004-0-23 Forward Abutment	NQ-1	681.3 - 676.3	170.11	3301	3.761
	NQ-2	676.3 - 671.3	61.24	1981	3.761
	NQ-3	671.3 - 666.3	190.53	3494	3.761

B. Bridge – Foundation Support

At the time that this report was prepared, plans for the proposed structure had not been provided to us. For the purpose of this report, it is assumed that the proposed structure will be similar to the existing structure.

Drilled Shaft Foundations

Based upon the soil and rock information obtained from the borings, it is CTL's opinion that the proposed bridge can be supported onto drilled shaft foundations socketed into the underlying bedrock. For the purpose of this report, nominal pile tip resistance for different rock layers are provided in this report. The drilled shaft foundations may be proportioned using a nominal unit tip resistance value not exceeding those provided in Table 5. The socket length should be determined by the structural engineer.

Table 5. Nominal Unit Tip Resistance for Drilled Shafts

Location/ Boring No.	Top of Rock Elevation	Rock Layer Elevation	Nominal Unit Tip Resistance, q_p (ksf)
Rear Abutment/ B-002-0-23	681.3	681.3 - 677.0	97.2
		677.0 - 666.3	115.2
Pier/ B-003-0-23	684.0	680.0 – 669.4	25.2
		669.4 – 665.0	1022.4
Forward Abutment/ B-004-0-24	681.3	681.3 – 679.9	799.2
		679.9 – 666.3	270.0

According to AASHTO Table 10.5.5.2.4-1, a resistance factor of 0.5 should be used for Unit Tip Resistance for the Strength Limit State.

Per ODOT BDM 305.4.1.1, the shaft sockets should extend a minimum of 10 feet below the controlling scour elevation into the bedrock.

The socket tip should extend at least 1.5 times the socket diameter into the bedrock per ODOT BDM 305.4.2 (AASHTO LRFD 10.8.3.5.4c).

Per ODOT GDM 1306.4.2, the drilled shafts should be designed for tip resistance or side resistance, but not both. If both tip and side resistance are used, then each value should be modified according to deflection and mobilization of resistance in accordance with ODOT GDM 1306.3.2. If needed, the side resistance in bedrock for additional capacity can be provided for drilled shafts socketed into bedrock once the final structure type and bottom of foundation elevation are selected for the proposed structure.

Drilled shaft design calculations analysis are provided in Appendix E.

<u>Driven piles or Piles Set in Pre-bored Holes.</u>

Depending on the bottom of pile cap elevations and the anticipated scour depths at the substructure locations, the proposed structure may also be supported on piles driven to refusal on bedrock or on steel piles installed in prebored holes extending to bedrock.

Once the structure type, pile cap elevations, and anticipated scour depths are established, the design team can evaluate the suitability of these alternatives, taking into account the minimum pile penetration requirements outlined in ODOT BDM Sections 305.3.2.1 and 305.3.5.7.

It should be noted that these BDM sections limit the use of driven piles where bedrock is shallow, particularly when scour is a design consideration.

C. Lateral Earth Parameters

Please refer to Appendix F for the Lpile parameters for soil and rock which can be utilized while performing lateral pile analysis. It is understood that the Lpile analyses for this project will be performed by others.

D. Subgrade Considerations – Bridge Approach

A subgrade analysis was performed utilizing the subsurface information from the B-001-0-23 and B-005-0-23 and ODOT Geotechnical Design Manual (GDM) Section 600. A copy of the Subgrade Analysis spreadsheet is provided in Appendix G. A proposed pavement thickness of 1.0 feet was assumed for estimating cut/fill in the Subgrade Analysis spreadsheet.

Based on the requirements outlined in the GDM Section 600, no subgrade issues are expected within the underlying soils, therefore, provided the underlying soils are stable during the proofrolling operations, no subgrade stabilization is needed within the bridge approach areas.

The natural moisture content values of the near surface soil samples ranged from 5 to 12 percent, averaging 8 percent. The estimated optimum moisture content (OMC) value was 10 percent. On average, the natural moisture content values were 2 percent lower than the optimum moisture content values.

Group Index values were calculated for the samples tested within the proposed subgrade. Group Index values ranged from 0 to 16, averaging 2. This average Group Index value corresponds to an estimated California Bearing Ratio (CBR) value of 10.0 percent. The pavements for this project may be designed using a CBR value of 10.0.

VI. CHANGED CONDITIONS

The evaluations, conclusions, and recommendations in this report are based on our interpretation of the field and laboratory data obtained during the exploration, our understanding of the project and our experience with similar sites and subsurface conditions using generally accepted geotechnical engineering practices. Although individual test borings are representative of the subsurface conditions at the boring locations on the dates drilled, they are not necessarily representative of the subsurface conditions between boring locations or subsurface conditions during other seasons of the year.

In the event that changes in the project are proposed, additional information becomes available, or if it is apparent that subsurface conditions are different from those provided in this report, CTL should be notified so that our recommendations can be modified, if required.

VII. TESTING AND OBSERVATION

During the design process, it is recommended that CTL work with the project designers to confirm that the geotechnical recommendations are properly incorporated into the final plans and specifications, and to assist with establishing criteria for the construction observation and testing.

CTL is not responsible for independent conclusions, opinions and recommendations made by others based on the data and recommendations provided in this report. It is recommended that CTL be retained to provide construction quality control services on this project. If CTL is not retained for these services, CTL shall assume no responsibility for compliance with the design concepts or recommendations provided.

VIII. CLOSING

This report has been prepared for the exclusive use by the client for use only on this project. Our services have been performed in accordance with generally accepted Geotechnical Engineering principles and practices. No warranty is either expressed or implied.

CTL Engineering's assignment does not include, nor does this geotechnical report address the environmental aspects of this particular site.

Specific design and construction recommendations have been provided in this report. Therefore, the report should be used in its entirety.

Respectfully Submitted,

CTL ENGINEERING, INC.

CTL ENGINEERING, INC.

Shahedur Rahman
Project Engineer

Sastry Malladi, P.E.
Project Engineer

APPENDIX A

GEOTECHNICAL PROFILE

PROJECT DESCRIPTION

THE OVERALL PROJECT, IDENTIFIED AS PIK- TR428- 0.04, CONSISTS OF REPLACING AN EXISTING 70- FOOT, TWO- SPAN STEEL PONY TRUSS BRIDGE (SFN 6633455) THAT CARRIES TOWNSHIP ROAD 428 (BEATTY ROAD) OVER THE LEFT FORK CROOKED CREEK IN PEE PEE TOWNSHIP, PIKE COUNTY, OHIO.

HISTORIC RECORDS

HISTORIC GEOTECHNICAL RECORDS WERE SEARCHED FOR ON THE ODOT TIMS WEBSITE. NO HISTORIC RECORDS WERE FOUND FOR THIS PROJECT.

GEOLOGY

THE PROJECT SITE IS LOCATED WITHIN THE SHAWNEE- MISSISSIPPIAN PLATEAU PHYSIOGRAPHIC REGION THAT IS DESCRIBED AS CHANNERY COLLUVIUM AND SILT LOAM UNDERLAIN BY DEVONIAN-AGE AND MISSISSIPPIAN-AGE SHALES, SILTSTONES AND LOCALLY THICK SANDSTONES. THE PROJECT SITE IS COVERED BY HOLOCENE- AGE ALLUVIUM AND CENOZOIC-AGE COLLUVIUM. THE UNDERLYING BEDROCK CONSISTS OF THE SEDIMENTARY BEDROCK FORMATION IDENTIFIED AS THE DEVONIAN- AGE AND/OR MISSISSIPPIAN- AGE SUNBURY SHALE, BEREA SANDSTONE, AND BEDFORD SHALE UNDIVIDED.

ACCORDING TO THE ODNR WEBSITE, NO MAPPED DEEP MINES ARE LOCATED WITHIN THE PROJECT AREA. ACCORDING TO ODNR'S KARST INTERACTIVE MAP WEBSITE, THERE ARE NO MAPPED KARST FEATURES WITHIN THE PROJECT AREA.

RECONNAISSANCE

A FIELD RECONNAISSANCE WAS CONDUCTED BY CTL PERSONNEL ON JUNE 27, 2023. TOWNSHIP ROAD 428 IS A SINGLE-LANE, TWO-WAY ROADWAY THAT RUNS GENERALLY WEST TO EAST DIRECTION WITHIN THE PROJECT LIMITS. LEFT FORK CROOKED CREEK FLOWS ROUGHLY NORTH TO SOUTH DIRECTION BENEATH TOWNSHIP ROAD 428. AT THE TIME OF THE RECONNAISSANCE, BOTH THE ROAD AND THE BRIDGE WERE CLOSED TO TRAFFIC BECAUSE A LARGE EROSION VOID HAD FORMED BETWEEN THE FORWARD ABUTMENT AND THE APPROACH SLAB OF THE EXISTING BRIDGE. THE SURROUNDING TOPOGRAPHY IS MODERATELY SLOPING, WHILE THE GROUND IMMEDIATELY ADJACENT TO THE STREAM DROPS STEEPLY ALONG THE CREEK BANKS. THE SURROUNDING LAND USAGE CONSISTS OF RURAL RESIDENTIAL AND WOODED.

SUBSURFACE EXPLORATION

FIVE (5) TEST BORINGS, IDENTIFIED AS B-001-0-23 THROUGH B-005-0-23, WERE COMPLETED FOR THIS SUBSURFACE EXPLORATION. FOUR (4) OF THE TEST BORINGS (B-001-0-23, B-002-0-23, B-004-0-23, AND B-005-0-23) WERE DRILLED WITHIN THE EXISTING ROADWAY PAVEMENT; THE REMAINING TEST BORING B-003-0-23 WAS DRILLED WITHIN THE CREEK CHANNEL. THE TEST BORINGS WERE DRILLED TO DEPTHS RANGING FROM 7.0 FEET TO 30.0 FEET BELOW THE EXISTING GROUND SURFACE.

THE TEST BORINGS WERE DRILLED ON JULY 6, 2023 AND JULY 7, 2023 UTILIZING 3-1/4 INCH I.D. HOLLOW-STEM AUGERS POWERED BY A TRACK-MOUNTED ROTARY DRILL RIG. SPLIT-BARREL (SPOON) DISTURBED SOIL SAMPLES AND STANDARD PENETRATION TEST WERE PERFORMED IN ACCORDANCE WITH AASHTO T206 AT 1.5- AND 2.5- FOOT INTERVALS. THE AUTOMATIC HAMMER WAS CALIBRATED ON MAY 3, 2023 HAD AN ENERGY RATIO OF 76.8 PERCENT. ROCK CORE SAMPLING WAS PERFORMED USING A WIRE-LINE SYSTEM EQUIPPED WITH A NQ CORE BARREL AND A DIAMOND BIT.

EXPLORATION FINDINGS

THE FOUR (4) TEST BORINGS DRILLED WITHIN THE EXISTING ROADWAY PAVEMENT ENCOUNTERED FIVE (5) INCHES OF ASPHALT AT THE GROUND SURFACE. THE TEST BORING DRILLED WITHIN THE CREEK CHANNEL ENCOUNTERED AUGERABLE SHALE BEDROCK AT THE GROUND SURFACE.

BELOW THE SURFICIAL MATERIALS, THE TEST BORING ENCOUNTERED BOTH FINE-GRAINED, COHESIVE SOILS AND COARSE- GRAINED, GRANULAR SOILS BEFORE REACHING THE TERMINATION DEPTH OR ENCOUNTERING BEDROCK. THE FINE- GRAINED SOILS WERE DESCRIBED AS VERY STIFF TO HARD SILTY CLAY (A- 6b) AND CLAY (A- 7- 6). THE COARSE-GRAINED, GRANULAR SOILS WERE DESCRIBED AS MEDIUM DENSE TO VERY DENSE GRAVEL AND/OR STONE FRAGMENTS WITH SAND (A-1-b), GRAVEL AND/OR STONE FRAGMENTS WITH SAND AND SILT (A-2-4), AND SANDY SILT (A-4a).

BELOW THE NATIVE SOIL MATERIAL, THREE (3) OF THE FIVE (5) TEST BORINGS ENCOUNTERED WEATHERED BEDROCK. THE BEDROCK WAS DESCRIBED AS BROWN AND GRAY, HIGHLY TO SLIGHTLY WEATHERED SHALE. ALSO, EACH OF THESE THREE (3) TEST BORINGS ENCOUNTERED A THIN LAYER OF LIMESTONE WITHIN THE UPPER BEDROCK STRATUM.

GROUNDWATER WAS ENCOUNTERED IN ONE (1) OF THE FIVE (5) TEST BORINGS (B-003-0-23) DURING DRILLING AT A DEPTH OF 1.0 FOOT BELOW GROUND SURFACE.

SPECIFICATIONS

THIS GEOTECHNICAL EXPLORATION WAS PERFORMED IN ACCORDANCE WITH THE STATE OF OHIO, DEPARTMENT OF TRANSPORTATION, OFFICE OF GEOTECHNICAL ENGINEERING,

LEGEND

	DESCRIPTION	ODOT CLASS	CLASSIFIED MECH./VISUAL	
	GRAVEL AND/OR STONE FRAGMENTS WITH SAND	A-1-b (0)	3	0
	GRAVEL AND/OR STONE FRAGMENTS W/SAND AND SILT	A-2-4 (0)	6	7
	SANDY SILT	A-4a (1)	1	0
	SILTY CLAY	A-6b	0	1
	CLAY	A-7-6 (17)	1	3
		TOTAL	11	11
	LIMESTONE	VISUAL		
	SHALE	VISUAL		
XXXXX	PAVEMENT OR BASE = X = APPROXIMATE THICKNESS	VISUAL		
	PROJECT BORING LOCATION - PLAN VIEW			
	DRIVE SAMPLE AND/OR ROCK CORE BORING PLOTTED TO VERTICAL SCALE ONLY. HORIZONTAL BAR INDICATES A CHANGE IN STRATIGRAPHY.			
WC	INDICATES WATER CONTENT IN PERCENT.			
N_{60}	INDICATES STANDARD PENETRATION RESISTANCE NORMALIZED TO 60% DRILL ROD ENERGY RATIO.			
X/D"	NUMBER OF BLOWS FOR STANDARD PENETRATION TEST (SPT): X/D" = NUMBER OF BLOWS (UNCORRECTED) FOR D" OF PENETRATION AT REFUSAL.			
X/Y/D"	NUMBER OF BLOWS FOR STANDARD PENETRATION TEST (SPT): X = NUMBER OF BLOWS FOR 6 INCHES (UNCORRECTED). Y/D" = NUMBER OF BLOWS (UNCORRECTED) FOR D" OF PENETRATION AT REFUSAL.			
X/Y/Z/D"	NUMBER OF BLOWS FOR STANDARD PENETRATION TEST (SPT): X = NUMBER OF BLOWS FOR 6 INCHES (UNCORRECTED). Y = NUMBER OF BLOWS FOR SECOND 6 INCHES (UNCORRECTED). Z/D" = NUMBER OF BLOWS (UNCORRECTED) FOR D" OF PENETRATION AT REFUSAL.			
⊖	INDICATES A NON-PLASTIC MATERIAL WITH A MOISTURE CONTENT GREATER THAN 25% OR GREATER THAN 19% WITH A WET APPEARANCE.			
⩢	INDICATES FREE WATER ELEVATION.			
SS	INDICATES A SPLIT SPOON SAMPLE.			
NP	INDICATES A NON-PLASTIC SAMPLE.			
TR	INDICATES TOP OF ROCK ELEVATION.			
NQ	"N" SERIES ROCK CORE BARREL OF "Q" WIRELINE BIT SIZE.			
Qu	INDICATES UNCONFINED COMPRESSION TEST, ASTM D7012.			
SDI	INDICATES SLAKE DURABILITY INDEX TEST, ASTM D4644.			

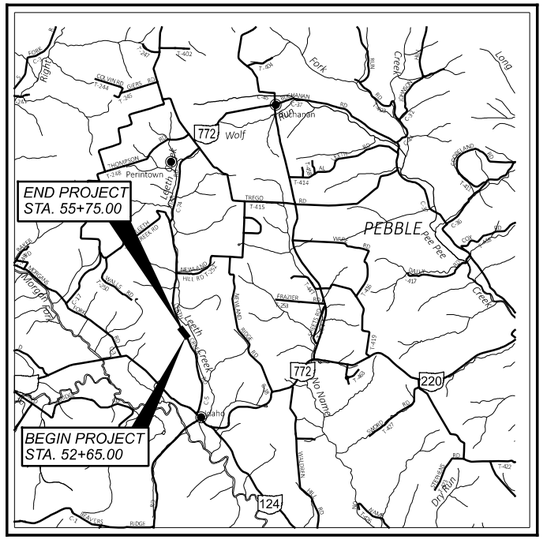
SPECIFICATIONS FOR GEOTECHNICAL EXPLORATIONS, DATED JULY 2023.

AVAILABLE INFORMATION

THE SOIL AND GROUNDWATER INFORMATION COLLECTED FOR THIS SUBSURFACE EXPLORATION THAT CAN BE CONVENIENTLY DISPLAYED ON THE GEOTECHNICAL PROFILE SHEETS HAS BEEN PRESENTED. GEOTECHNICAL REPORTS, IF PREPARED, ARE AVAILABLE FOR REVIEW ON THE OFFICE OF CONTRACT SALES WEBSITE.

BEDROCK TEST SUMMARY

BORING NO.	SAMPLE ELEVATION	SAMPLE DEPTH (FT)	UNIT WEIGHT (PCF)	Qu (PSI)	SDI (%)	LITHOLOGY
B-002-0-23	680.9 - 680.6	15.4 - 15.7	140.2	270	-	SHALE
	677.0 - 676.6	19.3 - 19.7	146.5	320	-	SHALE
B-003-0-23	680.0 - 675.0	4.0 - 9.0	-	-	38.6	SHALE
	676.1 - 675.7	7.9 - 8.3	140.9	70	-	SHALE
	669.4 -669.0	14.6 - 15.0	160.6	2,840	-	SHALE
B-004-0-23	681.1 - 680.7	15.0 -15.4	150.2	2,220	-	SHALE
	680.1 - 679.7	16.0 - 16.4	166.6	8,070	-	LIMESTONE



LOCATION MAP

SCALE IN MILES

0 1 2 3 4

PARTICLE SIZE DEFINITIONS

12"	3"	2.0 mm	0.42 mm	0.074 mm	0.005 mm
BOULDERS |	COBBLES |	GRAVEL |	COARSE SAND |	FINE SAND |	SILT | CLAY
		No. 10 SIEVE	No. 40 SIEVE	No. 200 SIEVE	

INDEX OF SHEETS

LOCATION FROM STA.	TO STA.	PLAN VIEW SHEET	PROFILE SHEET
COVER SHEET 1 & 2			
SUMMARY OF SOIL TEST DATA 3			
TR - 428 (BEATTY ROAD) 10+00.00	14+00.00	4	4
BORING LOGS & ROCK CORE PHOTOS 5 TO 10			

RECON. - CTL 06/27/2023
DRILLING - CTL 07/06/2023 & 07/07/2023
DRAWN - N.K.S 03/09/2026
REVIEWED - SM 03/09/2026

GEOTECHNICAL PROFILE - ROADWAY

DESIGN AGENCY

CTL ENGINEERING
2860 FISHER ROAD
COLUMBUS, OHIO 43204
PHONE: (614)276-8123
FAX: (614)276-6377

DESIGNER	N.K.S
REVIEWER	SM 03-09-26
PROJECT ID	117984
SUBSET	1
TOTAL	10
SHEET	P.
TOTAL	-

PIK-TR428-00.04

MODEL: Sheet PAPERSIZE: 17x11 (in.) DATE: 09-03-2026 TIME: 17:52:09 USER: hp
D:\Drop Box\CTL 2026\March\Dept 05\COL\Shahed\23050051COL_ODOT\Mod_09.03.26\117984IC001.dgn

SOIL SCOUR SAMPLE DATA				
BORING NO.	SAMPLE NO.	ELEVATION (ft.)	D_{50} (mm)	EROSION CATEGORY (EC)
B-002-0-23 (REAR ABUTMENT)	SS-1	695.3 - 693.8	0.9896	2.195
	SS-3	690.3 - 688.8	0.8615	2.122
	SS-5	686.3 - 684.8	0.0124	4.156
B-004-0-23 (FORWARD ABUTMENT)	SS-1	695.3 - 693.8	0.7106	2.022
	SS-2	692.8 - 691.3	0.5812	1.917
	SS-3	690.3 - 688.8	0.4430	1.776

BEDROCK SCOUR SAMPLE DATA					
BORING NO.	SAMPLE NO.	ELEVATION (ft.)	K INDEX	CRITICAL SHEAR STRESS (Pa)	EROSION CATEGORY (EC)
B-002-0-23 (REAR ABUTMENT)	NQ-1	681.3 - 676.3	31.30	1416	3.761
	NQ-2	676.3 - 671.3	58.10	1929	3.761
	NQ-3	671.3 - 666.3	54.92	1876	3.761
B-003-0-23 (PIER)	SS-1/SS-2	684.0 - 680.0	0.01	30	3.761
	NQ-1	681.3 - 676.3	31.30	1416	3.761
	NQ-2	676.3 - 671.3	58.10	1929	3.761
	NQ-3	671.3 - 666.3	54.92	1876	3.761
B-004-0-23 (FORWARD ABUTMENT)	NQ-1	681.3 - 676.3	170.11	3301	3.761
	NQ-2	676.3 - 671.3	61.24	1981	3.761
	NQ-3	671.3 - 666.3	190.53	3494	3.761

GEOTECHNICAL PROFILE - ROADWAY

PIK-TR428-00.04

MODEL: Sheet PAPERSIZE: 17x11 (in.) DATE: 09-03-2026 TIME: 17:53:52 USER: hp
D:\Drop Box\CTL 2026\March\Dept 05\COL\Shaheid\23050051COL_ODOTMod_09.03.26\117984C002.dgn

DESIGN AGENCY
GTL ENGINEERING
2860 FISHER ROAD
COLUMBUS, OHIO 43204
PHONE: (614)276-8123
FAX: (614)276-6377

DESIGNER N.K.S

REVIEWER SM 03-09-26

PROJECT ID 117984

SUBSET 2 | TOTAL 10

SHEET P. | TOTAL -

MODEL: Sheet PAPERSIZE: 11x17 (in.) DATE: 02-04-2026 TIME: 12:47:45 USER: hp
D:\Drop Box\CTL 2026\March\Dept 05\COL\Shahed\23050051COL_ODOT\Mod_02.04.26\117984ID001.dgn

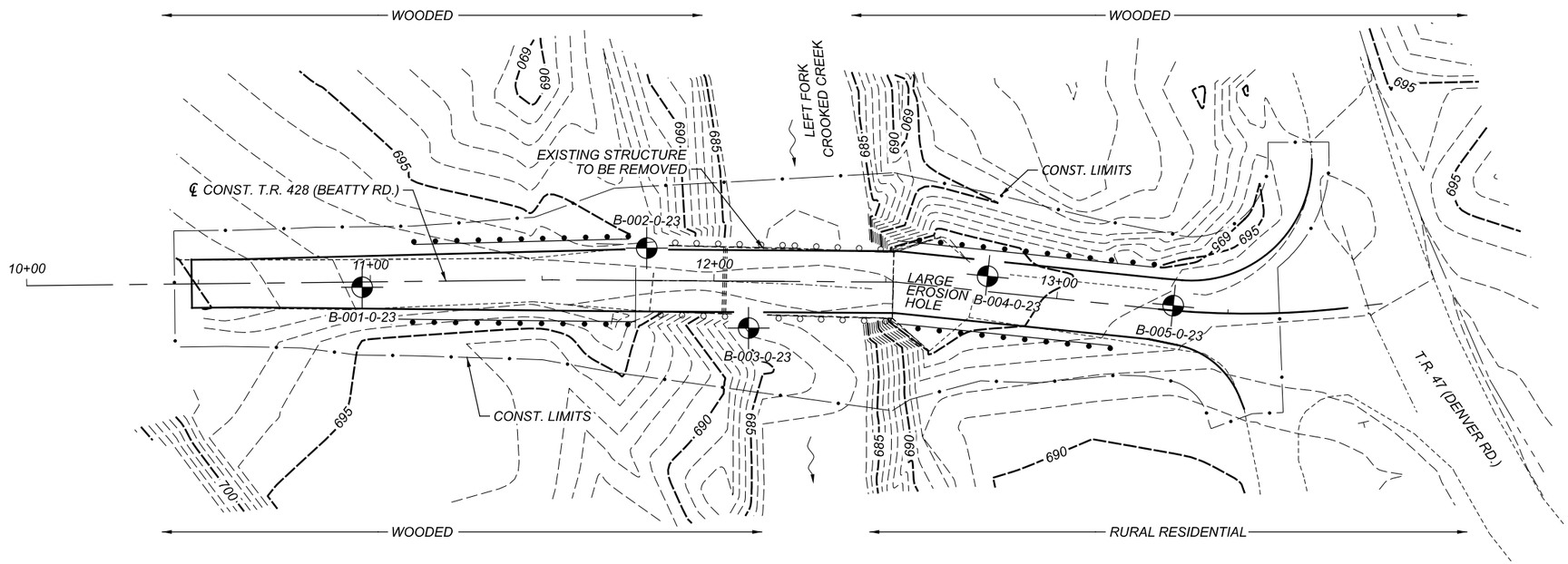
SUMMARY OF SOIL TEST DATA
PIK-TR428-00.04

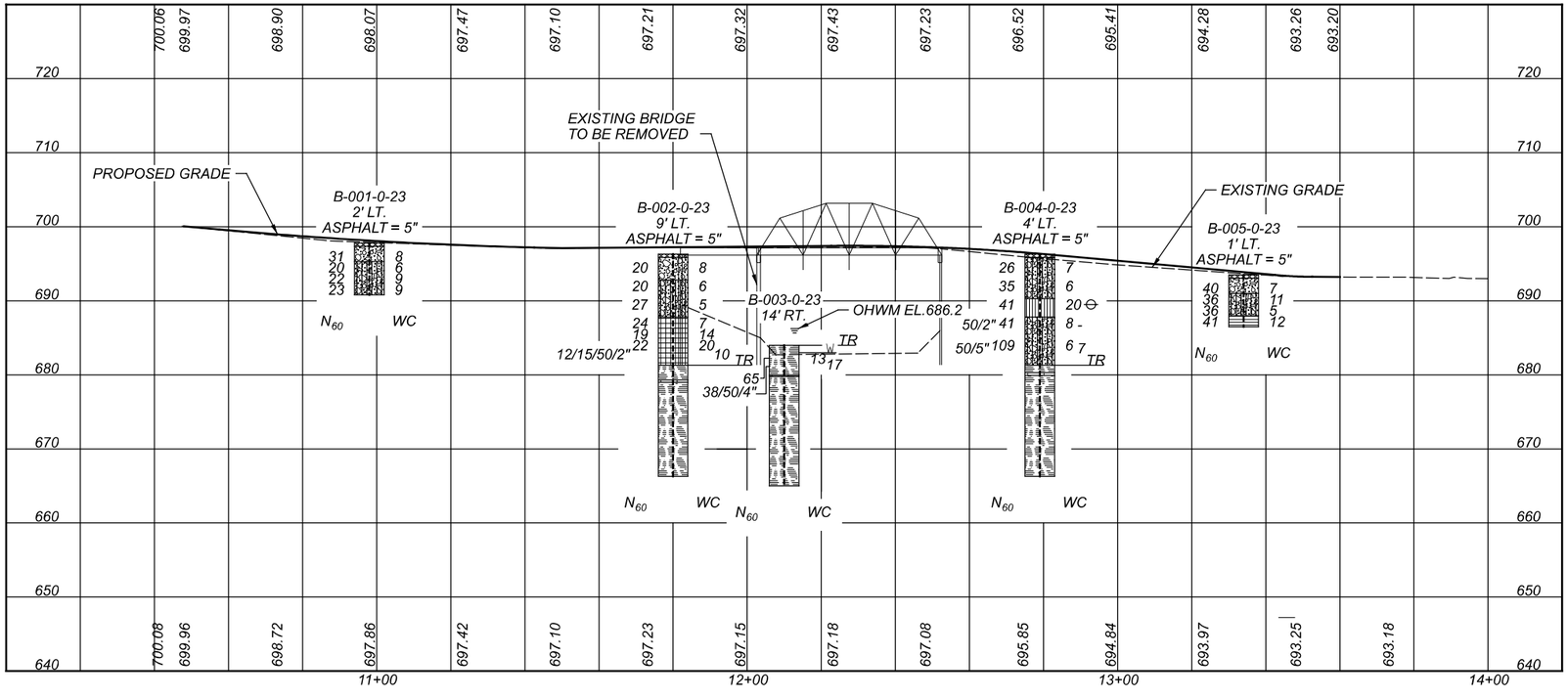
EXPLORATION NO., STATION & OFFSET	FROM TO	SAMPLE ID	N_{60}	% REC	HP tsf	% GR	% CS	% FS	% SILT	% CLAY	LL	PL	PI	% WC	ODOT CLASS (GI)	ppm SO_4
B-001-0-23	1.0 - 2.5	SS-1	31	100	-	38	27	13	13	9	NP	NP	NP	8	A-2-4 (0)	<100
STA. 10+98, 2' LT.	2.5 - 4.0	SS-2	20	28	-	39	23	10	19	9	NP	NP	NP	6	A-2-4 (0)	<100
LATITUDE = 39.174100	4.0 - 5.5	SS-3	22	100	-				SAME AS SS-2					9	A-2-4 (VISUAL)	-
LONGITUDE = -83.034950	5.5 - 7.0	SS-4	23	100	-				SAME AS SS-2					9	A-2-4 (VISUAL)	-
FOR STRUCTURE BORINGS B-002-0-23, B-003-0-23 AND B-004-0-23 REFER TO BORING LOGS ON PAGES 5,7 AND 9 RESPECTIVELY.																
B-005-0-23	1.0 - 2.5	SS-1	40	100	3.0	52	19	9	14	6	NP	NP	NP	7	A-1-b (0)	360
STA. 13+34, 1' LT.	2.5 - 4.0	SS-2	36	100	4.5	38	24	10	19	9	NP	NP	NP	11	A-2-4 (0)	-
LATITUDE = 39.173947	4.0 - 5.5	SS-3	36	100	-				SAME AS SS-2					5	A-2-4 (VISUAL)	-
LONGITUDE = -83.034142	5.5 - 7.0	SS-4	41	100	4.5				HARD, BROWN SILTY CLAY					12	A-6b (VISUAL)	-

DESIGN AGENCY
ENGINEERING
2080 EAST LINCOLN AVENUE
COLUMBUS, OHIO 43224
PHONE: (614)276-8123
FAX: (614)276-6377

DESIGNER N.K.S
REVIEWER SM 04-02-26
PROJECT ID 117984
SUBSET 3 TOTAL 10
SHEET P. - TOTAL -

GEOTECHNICAL PROFILE - ROADWAY
SUMMARY OF SOIL TEST DATA





PIK-TR428-00.04

MODEL: CLP_TR428 - Plan 1(Drawing1 PAPERSIZE: 17x11 (in.) DATE: 09-03-2026 TIME: 17:56:57 USER: hp
D:\Drop Box\CTL 2026\March\Dept 05\COL\Shared\2305005ICOL_ODOT\Mod_09.03.26\117984_SFN6633455_SP001.dgn

HORIZONTAL
SCALE IN FEET
0 10 20 40

GEOTECHNICAL PROFILE - BRIDGE
BRIDGE NO. PIK-TR428-00.04
OVER LEFT FORK CROOKED CREEK

DESIGN AGENCY
CTL ENGINEERING
2860 FISHER ROAD
COLUMBUS, OHIO 43204
PHONE:(614)276-8123
FAX:(614)276-6377

DESIGNER N.K.S
REVIEWER SM 03-09-26
PROJECT ID 117984
SUBSET 4 TOTAL 10
SHEET P. TOTAL -

PIK-TR428-00.04

MODEL: Sheet PAPERSIZE: 17x11 (in.) DATE: 02-04-2026 TIME: 12:50:49 USER: hp
D:\Drop Box\CTL 2026\March\Dept 05\COL\Shahed\23050051COL_ODOT\Mod_02.04.26\117984ZL001.dgn

PROJECT: PIK-TR428-0.04	DRILLING FIRM / OPERATOR: CTL / HARVEY	DRILL RIG: MOBILE B-57 TRACK	STATION / OFFSET: 11+80, 9' LT.	EXPLORATION ID B-002-0-23
TYPE: BRIDGE	SAMPLING FIRM / LOGGER: CTL / HARVEY	HAMMER: MOBILE AUTOMATIC	ALIGNMENT: TR 428	
PID: 117984 SFN: 6633455	DRILLING METHOD: 3.25" HSA / NQ	CALIBRATION DATE: 5-3-23	ELEVATION: 696.3 (MSL) EOB: 30.0 ft.	PAGE 1 OF 1
START: 7-6-23 END: 7-6-23	SAMPLING METHOD: SPT / NQ	ENERGY RATIO (%): 76.8	LAT / LONG: 39.174081, -83.034658	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	SO4 ppm	HOLE SEALED
ASPHALT (5")	696.3 / 695.9																		
MEDIUM DENSE, BROWN, **GRAVEL AND/OR STONE FRAGMENTS WITH SAND**, LITTLE SILT, TRACE CLAY, DAMP	692.8		7 7 9	20	100	SS-1	-	36	31	13	13	7	NP	NP	NP	8	A-1-b (0)	-	
MEDIUM DENSE, BROWN, **GRAVEL AND/OR STONE FRAGMENTS WITH SAND AND SILT**, TRACE CLAY, DAMP	687.8		7 8 8	20	100	SS-2	-	-	-	-	-	-	-	-	-	6	A-2-4 (0)	-	
			8 10 11	27	100	SS-3	-	37	24	13	18	8	NP	NP	NP	5	A-2-4 (0)	-	
HARD, BROWN, **CLAY**, "AND" SILT, LITTLE SAND, TRACE GRAVEL, DAMP			10 9 10	24	100	SS-4	4.25	-	-	-	-	-	-	-	-	7	A-7-6 (V)	-	
			7 7 8	19	100	SS-5	4.50	1	12	7	43	37	47	15	32	14	A-7-6 (17)	-	
@11.5'; VERY STIFF, BROWN AND GRAY, SOME STONE FRAGMENTS, MOIST			8 8 9	22	100	SS-6	4.00	-	-	-	-	-	-	-	-	20	A-7-6 (V)	-	
@13.0'; BROWN, DAMP	681.3	TR	12 15 50/2"	-	100	SS-7	3.25	-	-	-	-	-	-	-	-	10	A-7-6 (V)	-	
SHALE, GRAY, MODERATELY WEATHERED, VERY WEAK; RQD 50%, REC 100%. @15.4'-15.7'; UCS = 270 PSI	679.3		47		100	NQ-1											CORE		
LIMESTONE, GRAY, SLIGHTLY WEATHERED, STRONG; RQD 0%, REC 100%.	679.0																		
SHALE, GRAY, MODERATELY WEATHERED, VERY WEAK; RQD 66%, REC 100%. @19.3'-19.7'; UCS = 320 PSI			73		100	NQ-2											CORE		
			69		100	NQ-3											CORE		
	666.3	EOB																	

NOTES: CAVED AT (12.4')

ABANDONMENT METHODS, MATERIALS, QUANTITIES: BACKFILLED WITH BENTONITE GROUT

STANDARD ODOT LOG W/ SULFATES (11 X 17) - OH DOT.GDT - 2-4-26 12:38 - G:\2026\APRIL\02\23050051COL\23050051COL.GPJ

SHEET	SUBSET	PROJECT ID	REVIEWER	DESIGNER	DESIGN AGENCY
P. 1 TOTAL -	5 TOTAL 10	117984	SM 04-02-26	N.K.S	GTL ENGINEERING, INC. 6175 HUNTLEY ROAD COLUMBUS, OHIO 43229 PHONE (614) 476-6343 FAX (614) 476-6373

GEOTECHNICAL PROFILE - BRIDGE
BORING LOG B-002-0-23

B-002-0-23



Run #:	Depth		Recovery (in)		RQD (in)	
NQ-1	15.0’	20.0’	60/60	100%	28/60	47%
NQ-2	20.0’	25.0’	60/60	100%	43.5/60	73%
PIK-TR428-0.04 PID: 117984						

B-002-0-23



Run #:	Depth		Recovery (in)		RQD (in)	
NQ-3	25.0’	30.0’	60/60	100%	41.5/60	69%
PIK-TR428-0.04 PID: 117984						

CTL ENGINEERING, INC.
COLUMBUS, OHIO 43204
PHONE 614.276.8123
FAX 614.276.6377

GEOTECHNICAL PROFILE - BRIDGE
ROCK CORE PHOTO FOR B-002-0-23

PIK-TR428-00.04

MODEL: Sheet PAPERSIZE: 17x11 (in.) DATE: 02-04-2026 TIME: 12:57:08 USER: hp
D:\Drop Box\CTL 2026\March\Dept 05\COL\Shahed\23050051COL_ODOT\Mod_02.04.26\117984ZL003.dgn

PROJECT: PIK-TR428-0.04	DRILLING FIRM / OPERATOR: CTL / HARVEY	DRILL RIG: MOBILE B-57 TRACK	STATION / OFFSET: 12+10, 14' RT.	EXPLORATION ID B-003-0-23
TYPE: BRIDGE	SAMPLING FIRM / LOGGER: CTL / HARVEY	HAMMER: MOBILE AUTOMATIC	ALIGNMENT: TR 428	
PID: 117984 SFN: 6633455	DRILLING METHOD: 3.25" HSA / NQ	CALIBRATION DATE: 5-3-23	ELEVATION: 684.0 (MSL) EOB: 19.0 ft.	PAGE 1 OF 1
START: 7-7-23 END: 7-7-23	SAMPLING METHOD: SPT / NQ	ENERGY RATIO (%): 76.8	LAT / LONG: 39.174000, -83.034575	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	SO4 ppm	HOLE SEALED
SHALE, BROWN AND GRAY, HIGHLY WEATHERED.	684.0	TR W 683.0	12 21 30	65	100	SS-1	1.50	-	-	-	-	-	-	-	-	13	Rock (V)	-	
			38 50/4"	-	100	SS-2	2.00	-	-	-	-	-	-	-	-	17	Rock (V)	-	
	680.0																		
LIMESTONE, BROWN, SLIGHTLY WEATHERED, STRONG; RQD 0%, REC 100%.	679.8																		
SHALE, GRAY, MODERATELY WEATHERED, VERY WEAK; RQD 60%, REC 90%. @4.0'-9.0'; SDI = 38.6% @7.9'-8.3'; UCS = 70 PSI			75		100	NQ-1											CORE		
			38		100	NQ-2											CORE		
@14.6'-15.0'; UCS = 2,840 PSI, SLIGHTLY WEATHERED, SLIGHTLY STRONG			64		72	NQ-3											CORE		
	665.0	EOB																	

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: BACKFILLED WITH BENTONITE GROUT

STANDARD ODOT LOG W/ SULFATES (11 X 17) - OH DOT.GDT - 2-4-26 12:38 - G:\2026\APRIL\02\23050051COL\23050051COL.GPJ

SHEET	SUBSET	PROJECT ID	REVIEWER	DESIGNER	DESIGN AGENCY
P. -	7 TOTAL 10	117984	SM 04-02-26	N.K.S	GTL ENGINEERING, LLC COLUMBUS, OHIO 43204 PHONE:(614)276-8123 FAX:(614)276-8377

GEOTECHNICAL PROFILE - BRIDGE
BORING LOG B-003-0-23

MODEL: Sheet PAPERSIZE: 17x11 (in.) DATE: 09-03-2026 TIME: 18:02:58 USER: hp
D:\Drop Box\CTL 2026\March\Dept 05\COL\Shahed\23050051COL_ODOT\Mod_09.03.26\117984ZL004.dgn

B-003-0-23



Run #:	Depth		Recovery (in)		RQD (in)	
NQ-1	4.0’	9.0’	60/60	100%	45/60	75%
NQ-2	9.0’	14.0’	60/60	100%	23/60	38%
PIK-TR428-0.04 PID: 117984						

B-003-0-23



Run #:	Depth		Recovery (in)		RQD (in)	
NQ-3	14.0’	19.0’	43/60	72%	38.4/60	64%
PIK-TR428-0.04 PID: 117984						

GEOTECHNICAL PROFILE - BRIDGE
ROCK CORE PHOTO FOR B-003-0-23

PIK-TR428-00.04

MODEL: Sheet PAPERSIZE: 17x11 (in.) DATE: 02-04-2026 TIME: 12:59:28 USER: hp
D:\Drop Box\CTL 2026\March\Dept 05\COL\Shaded\23050051COL_ODOT\Mod_02.04.26\117984ZL005.dgn

PROJECT: PIK-TR428-0.04	DRILLING FIRM / OPERATOR: CTL / HARVEY	DRILL RIG: MOBILE B-57 TRACK	STATION / OFFSET: 12+79, 4' LT.	EXPLORATION ID B-004-0-23
TYPE: BRIDGE	SAMPLING FIRM / LOGGER: CTL / HARVEY	HAMMER: MOBILE AUTOMATIC	ALIGNMENT: TR 428	
PID: 117984 SFN: 6633455	DRILLING METHOD: 3.25" HSA / NQ	CALIBRATION DATE: 5-3-23	ELEVATION: 696.3 (MSL) EOB: 30.0 ft.	PAGE 1 OF 1
START: 7-6-23 END: 7-6-23	SAMPLING METHOD: SPT / NQ	ENERGY RATIO (%): 76.8	LAT / LONG: 39.174003, -83.034322	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	SO4 ppm	HOLE SEALED
ASPHALT (5")	696.3 / 695.9																		
MEDIUM DENSE, BROWN, **GRAVEL AND/OR STONE FRAGMENTS WITH SAND AND SILT**, TRACE CLAY, DAMP		1–2	9 11 9	26	100	SS-1	-	31	29	15	18	7	NP	NP	NP	7	A-2-4 (0)	-	
@3.5'; DENSE		4–5	10 14 13	35	100	SS-2	-	26	30	15	19	10	NP	NP	NP	6	A-2-4 (0)	-	
	690.3																		
DENSE, BROWN, **SANDY SILT**, LITTLE GRAVEL, TRACE CLAY, MOIST		6–7	12 14 18	41	100	SS-3	-	17	34	13	26	10	NP	NP	NP	20	A-4a (1)	-	
	687.8																		
DENSE, BROWN, **GRAVEL AND/OR STONE FRAGMENTS WITH SAND AND SILT**, TRACE CLAY, CONTAINS STONE FRAGMENTS, DAMP		9–10	14 15 17	41	100	SS-4	-	-	-	-	-	-	-	-	-	8	A-2-4 (V)	-	
@10.0'; VERY DENSE			50/2"	-	100	SS-5	-	-	-	-	-	-	-	-	-	-	A-2-4 (V)	-	
		12–13	34 41 44	109	100	SS-6	-	-	-	-	-	-	-	-	-	6	A-2-4 (V)	-	
	681.3		50/5"	-	100	SS-7	4.50	-	-	-	-	-	-	-	-	7	A-2-4 (V)	-	
		TR 15																	
SHALE, BROWN AND GRAY, MODERATELY WEATHERED, SLIGHTLY STRONG; RQD 52%, REC 100%.	680.3																		
@15.0'-15.4'; UCS = 2,220 PSI	679.9																		
LIMESTONE, GRAY, SLIGHTLY WEATHERED, STRONG; RQD 88%, REC 100%.		15–20	25		100	NQ-1											CORE		
@16.0'-16.4'; UCS = 8,070 PSI																			
SHALE, GRAY, HIGHLY WEATHERED, WEAK; RQD 16%, REC 100%.		20–25	9		100	NQ-2											CORE		
		25–30	28		100	NQ-3											CORE		
	666.3	EOB 30																	

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: BACKFILLED WITH BENTONITE GROUT

STANDARD ODOT LOG W/ SULFATES (11 X 17) - OH DOT.GDT - 2-4-26 12:38 - G:\2026\APRIL\02\23050051COL\23050051COL.GPJ

SHEET	SUBSET	PROJECT ID	REVIEWER	DESIGNER	DESIGN AGENCY
P. -	9 TOTAL 10	117984	SM 04-02-26	N.K.S	GTL ENGINEERING, LLC COLUMBUS, OHIO 43204 PHONE (614) 276-8123 FAX (614) 276-8377

GEOTECHNICAL PROFILE - BRIDGE
BORING LOG B-004-0-23

B-004-0-23



Run #:	Depth		Recovery (in)		RQD (in)	
NQ-1	15.0'	20.0'	60/60	100%	15/60	25%
NQ-2	20.0'	25.0'	60/60	100%	5.5/60	9%
PIK-TR428-0.04 PID: 117984						

B-004-0-23



Run #:	Depth		Recovery (in)		RQD (in)	
NQ-3	25.0'	30.0'	60/60	100%	16.5/60	28%
PIK-TR428-0.04 PID: 117984						

CTL ENGINEERING, INC.
COLUMBUS, OHIO 43204
PHONE (614) 276-8123
FAX (614) 276-6377

GEOTECHNICAL PROFILE - BRIDGE
ROCK CORE PHOT FOR B-004-0-23

APPENDIX B

TEST BORING RECORDS

APPENDIX A.1 - ODOT Quick Reference for Visual Description of Soils

1) STRENGTH OF SOIL:

Non-Cohesive (granular) Soils - Compactness	
Description	**Blows Per Ft.**
Very Loose	≤ 4
Loose	5 – 10
Medium Dense	11 – 30
Dense	31 – 50
Very Dense	> 50

2) COLOR :

If a color is a uniform color throughout, the term is single, modified by an adjective such as light or dark. If the predominate color is shaded by a secondary color, the secondary color precedes the primary color. If two major and distinct colors are swirled throughout the soil, the colors are modified by the term "mottled"

3) PRIMARY COMPONENT

Use **DESCRIPTION** from ODOT Soil Classification Chart on Back

Cohesive (fine grained) Soils - Consistency

Description	Qu (TSF)	Blows Per Ft.	Hand Manipulation
Very Soft	<0.25	<2	Easily penetrates 2" by fist
Soft	0.25-0.5	2 - 4	Easily penetrates 2" by thumb
Medium Stiff	0.5-1.0	5 - 8	Penetrates by thumb with moderate effort
Stiff	1.0-2.0	9 - 15	Readily indents by thumb, but not penetrate
Very Stiff	2.0-4.0	16 - 30	Readily indents by thumbnail
Hard	>4.0	>30	Indent with difficulty by thumbnail

4) COMPONENT MODIFIERS:

Description	Percentage By Weight
Trace	0% - 10%
Little	>10% - 20%
Some	>20% - 35%
"And"	>35%

5) Soil Organic Content

Description	% by Weight
Slightly Organic	2% - 4%
Moderately Organic	4% - 10%
Highly Organic	> 10%

6) Relative Visual Moisture

Description	Criteria	
	Cohesive Soil	**Non-cohesive Soils**
Dry	Powdery; Cannot be rolled; Water content well below the plastic limit	No moisture present
Damp	Leaves very little moisture when pressed between fingers; Crumbles at or before rolled to $^1/_8$"; Water content below plastic limit	Internal moisture, but no to little surface moisture
Moist	Leaves small amounts of moisture when pressed between fingers; Rolled to $^1/_8$" or smaller before crumbling; Water content above plastic limit to -3% of the liquid limit	Free water on surface, moist (shiny) appearance
Wet	Very mushy; Rolled multiple times to $^1/_8$" or smaller before crumbles; Near or above the liquid limit	Voids filled with free water, can be poured from split spoon.

CLASSIFICATION OF SOILS

Ohio Department of Transportation

(The classification of a soil is found by proceeding from top to bottom of the chart.
The first classification that the test data fits is the correct classification.)

SYMBOL	DESCRIPTION	Classifcation AASHTO	Classifcation OHIO	LL_0/LL x 100*	% Pass #40	% Pass #200	Liquid Limit (LL)	Plastic Index (PI)	Group Index Max.	REMARKS
	Gravel and/or Stone Fragments	A-1-a			30 Max.	15 Max.		6 Max.	0	Min. of 50% combined gravel, cobble and boulder sizes
	Gravel and/or Stone Fragments with Sand	A-1-b			50 Max.	25 Max.		6 Max.	0	
F S	Fine Sand	A-3			51 Min.	10 Max.	NON-PLASTIC		0	
	Coarse and Fine Sand	--	A-3a			35 Max.		6 Max.	0	Min. of 50% combined coarse and fine sand sizes
	Gravel and/or Stone Fragments with Sand and Silt	A-2-4				35 Max.	40 Max.	10 Max.	0	
		A-2-5					41 Min.			
	Gravel and/or Stone Fragments with Sand, Silt and Clay	A-2-6				35 Max.	40 Max.	11 Min.	4	
		A-2-7					41 Min.			
	Sandy Silt	A-4	A-4a	76 Min.		36 Min.	40 Max.	10 Max.	8	Less than 50% silt sizes
	Silt	A-4	A-4b	76 Min.		50 Min.	40 Max.	10 Max.	8	50% or more silt sizes
	Elastic Silt and Clay	A-5		76 Min.		36 Min.	41 Min.	10 Max.	12	
	Silt and Clay	A-6	A-6a	76 Min.		36 Min.	40 Max.	11 - 15	10	
	Silty Clay	A-6	A-6b	76 Min.		36 Min.	40 Max.	16 Min.	16	
	Elastic Clay	A-7-5		76 Min.		36 Min.	41 Min.	$\leq$ LL-30	20	
	Clay	A-7-6		76 Min.		36 Min.	41 Min.	>LL-30	20	
	Organic Silt	A-8	A-8a	75 Max.		36 Min.				W/o organics would classify as A-4a or A-4b
	Organic Clay	A-8	A-8b	75 Max.		36 Min.				W/o organics would classify as A-5, A-6a, A-6b, A-7-5 or A-7-6

MATERIAL CLASSIFIED BY VISUAL INSPECTION

Sod and Topsoil

Pavement or Base

Uncontrolled Fill (Describe)

Bouldery Zone

P Peat

* Only perform the oven-dried liquid limit test and this calculation if organic material is present in the sample.

APPENDIX A.2 – ODOT Quick Reference Guide for Rock Description

1: ROCK TYPE: Common rock types are: Claystone; Coal; Dolomite; Limestone; Sandstone; Siltstone; & Shale.

2: COLOR: To be determined when rock is wet. When using the GSA Color charts use only Name, not code.

3: WEATHERING

Description	Field Parameter
Unweathered	No evidence of any chemical or mechanical alternation of the rock mass. Mineral crystals have a bright appearance with no discoloration. Fractures show little or no staining on surfaces.
Slightly weathered	Slight discoloration of the rock surface with minor alterations along discontinuities. Less than 10% of the rock volume presents alteration.
Moderately weathered	Portions of the rock mass are discolored as evident by a dull appearance. Surfaces may have a pitted appearance with weathering "halos" evident. Isolated zones of varying rock strengths due to alteration may be present. 10 to 15% of the rock volume presents alterations.
Highly weathered	Entire rock mass appears discolored and dull. Some pockets of slightly too moderately weathered rock may be present and some areas of severely weathered materials may be present.
Severely weathered	Majority of the rock mass reduced to a soil-like state with relic rock structure discernable. Zones of more resistant rock may be present, but the material can generally be molded and crumbled by hand pressures.

4: TEXTURE

Component		Grain Diameter
Boulder		>12″
Cobble		3″-12″
Gravel		0.08″-3″
Sand	Coarse	0.02″-0.08″
	Medium	0.01″-0.02″
	Fine	0.005″-0.01″
	Very Fine	0.003″-0.005″

5: RELATIVE STRENGTH

Description	Field Parameter
Very Weak	Core can be carved with a knife and scratched by fingernail. Can be excavated readily with a point of a pick. Pieces 1 inch or more in thickness can be broken by finger pressure.
Weak	Core can be grooved or gouged readily by a knife or pick. Can be excavated in small fragments by moderate blows of a pick point. Small, thin pieces can be broken by finger pressure.
Slightly Strong	Core can be grooved or gouged 0.05 inch deep by firm pressure of a knife or pick point. Can be excavated in small chips to pieces about 1-inch maximum size by hard blows of the point of a geologist's pick.
Moderately Strong	Core can be scratched with a knife or pick. Grooves or gouges to ¼" deep can be excavated by hand blows of a geologist's pick. Requires moderate hammer blows to detach hand specimen.
Strong	Core can be scratched with a knife or pick only with difficulty. Requires hard hammer blows to detach hand specimen. Sharp and resistant edges are present on hand specimen.
Very Strong	Core cannot be scratched by a knife or sharp pick. Breaking of hand specimens requires hard repeated blows of the geologist hammer.
Extremely strong	Core cannot be scratched by a knife or sharp pick. Chipping of hand specimens requires hard repeated blows of the geologist hammer.

6: BEDDING

Description	Thickness
Very Thick	>36"
Thick	18" – 36"
Medium	10" – 18"
Thin	2" – 10"
Very Thin	0.4" – 2"
Laminated	0.1" – 0.4"
Thinly Laminated	<0.1"

7: DESCRIPTORS

Arenaceous – sandy	Argillaceous - clayey	Brecciated – contains angular to subangular gravel
Calcareous - contains calcium carbonate	Carbonaceous - contains carbon	Cherty- contains chert fragments
Conglomeritic - contains rounded to subrounded gravel	Crystalline – contains crystalline structure	Dolomitic- contains calcium/magnesium carbonate
Ferriferous – contains iron	Fissile – thin planner partings	Fossiliferous – contains fossils
Friable – easily broken down	Micaceous – contains mica	Pyritic – contains pyrite
Siliceous – contains silica	Stylolitic – contain stylotites (suture like structure)	Vuggy – contains openings

STANDARD ODOT LOG W/ SULFATES (8.5 X 11) - OH DOT.GDT - 4/1/26 10:44 - O:\PROJECT\2023\COL-05\23050051COL_PIK-TR428-0-04 BRIDGE REPLACEMENT_PIKE COUNTY ENGINEERS OFFICE

PROJECT: PIK-TR428-0.04	DRILLING FIRM / OPERATOR: CTL / HARVEY	DRILL RIG: MOBILE B-57 TRACK	STATION / OFFSET: 10+98, 2' LT.	EXPLORATION ID B-001-0-23
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: CTL / HARVEY	HAMMER: MOBILE AUTOMATIC	ALIGNMENT: TR 428	
PID: 117984 SFN: 6633455	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 5/3/23	ELEVATION: 697.8 (MSL) EOB: 7.0 ft.	PAGE 1 OF 1
START: 7/6/23 END: 7/6/23	SAMPLING METHOD: SPT	ENERGY RATIO (%): 76.8	LAT / LONG: 39.174100, -83.034950	

MATERIAL DESCRIPTION AND NOTES	ELEV. 697.8	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	SO4 ppm	BACK FILL
ASPHALT (5")	697.4																		
DENSE, BROWN, **GRAVEL AND/OR STONE FRAGMENTS WITH SAND**, LITTLE SILT, TRACE CLAY, DAMP	695.3	1	9 12 12	31	100	SS-1	-	38	27	13	13	9	NP	NP	NP	8	A-1-b (0)	<100	
MEDIUM DENSE, BROWN, **GRAVEL AND/OR STONE FRAGMENTS WITH SAND AND SILT**, TRACE CLAY, DAMP		2																	
		3	9 8 8	20	28	SS-2	-	39	23	10	19	9	NP	NP	NP	6	A-2-4 (0)	<100	
		4																	
		5	8 7 10	22	100	SS-3	-	-	-	-	-	-	-	-	-	9	A-2-4 (V)	-	
		6																	
	690.8	EOB 7	7 7 11	23	100	SS-4	-	-	-	-	-	-	-	-	-	9	A-2-4 (V)	-	

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: PLACED ASPHALT PATCH; BACKFILLED WITH SOIL CUTTINGS

PROJECT: PIK-TR428-0.04	DRILLING FIRM / OPERATOR: CTL / HARVEY	DRILL RIG: MOBILE B-57 TRACK	STATION / OFFSET: 11+80, 9' LT.	EXPLORATION ID B-002-0-23
TYPE: BRIDGE	SAMPLING FIRM / LOGGER: CTL / HARVEY	HAMMER: MOBILE AUTOMATIC	ALIGNMENT: TR 428	
PID: 117984 SFN: 6633455	DRILLING METHOD: 3.25" HSA / NQ	CALIBRATION DATE: 5/3/23	ELEVATION: 696.3 (MSL) EOB: 30.0 ft.	PAGE 1 OF 1
START: 7/6/23 END: 7/6/23	SAMPLING METHOD: SPT / NQ	ENERGY RATIO (%): 76.8	LAT / LONG: 39.174081, -83.034658	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	SO4 ppm	HOLE SEALED
ASPHALT (5")	696.3																		
MEDIUM DENSE, BROWN, **GRAVEL AND/OR STONE FRAGMENTS WITH SAND**, LITTLE SILT, TRACE CLAY, DAMP	695.9		7 7 9	20	100	SS-1	-	36	31	13	13	7	NP	NP	NP	8	A-1-b (0)	-	
	692.8																		
MEDIUM DENSE, BROWN, **GRAVEL AND/OR STONE FRAGMENTS WITH SAND AND SILT**, TRACE CLAY, DAMP			7 8 8	20	100	SS-2	-	-	-	-	-	-	-	-	-	6	A-2-4 (0)	-	
			8 10 11	27	100	SS-3	-	37	24	13	18	8	NP	NP	NP	5	A-2-4 (0)	-	
	687.8																		
HARD, BROWN, **CLAY**, "AND" SILT, LITTLE SAND, TRACE GRAVEL, DAMP			10 9 10	24	100	SS-4	4.25	-	-	-	-	-	-	-	-	7	A-7-6 (V)	-	
			7 7 8	19	100	SS-5	4.50	1	12	7	43	37	47	15	32	14	A-7-6 (17)	-	
@11.5'; VERY STIFF, BROWN AND GRAY, SOME STONE FRAGMENTS, MOIST			8 8 9	22	100	SS-6	4.00	-	-	-	-	-	-	-	-	20	A-7-6 (V)	-	
@13.0'; BROWN, DAMP			12 15 50/2"	-	100	SS-7	3.25	-	-	-	-	-	-	-	-	10	A-7-6 (V)	-	
	681.3	TR																	
SHALE, GRAY, MODERATELY WEATHERED, VERY WEAK; RQD 50%, REC 100%. @15.4'-15.7'; UCS = 270 PSI	679.3																		
LIMESTONE, GRAY, SLIGHTLY WEATHERED, STRONG; RQD 0%, REC 100%.	679.0		47		100	NQ-1											CORE		
SHALE, GRAY, MODERATELY WEATHERED, VERY WEAK; RQD 66%, REC 100%. @19.3'-19.7'; UCS = 320 PSI			73		100	NQ-2											CORE		
			69		100	NQ-3											CORE		
	666.3	EOB																	

NOTES: CAVED AT (12.4')

ABANDONMENT METHODS, MATERIALS, QUANTITIES: BACKFILLED WITH BENTONITE GROUT

STANDARD ODOT LOG W/ SULFATES (8.5 X 11) - OH DOT.GDT - 4/1/26 10:45 - O:\PROJECT\2023\COL-05\23050051COL_PIK-TR428-0-04 BRIDGE REPLACEMENT_PIKE COUNTY ENGINEERS OFFICE

STANDARD ODOT LOG W/ SULFATES (8.5 X 11) - OH DOT.GDT - 4/1/26 10:45 - O:\PROJECT\2023\COL-05\23050051COL_PIK-TR428-0-04 BRIDGE REPLACEMENT_PIKE COUNTY ENGINEERS OFFICE\

PROJECT: PIK-TR428-0.04	DRILLING FIRM / OPERATOR: CTL / HARVEY	DRILL RIG: MOBILE B-57 TRACK	STATION / OFFSET: 12+10, 14' RT.	EXPLORATION ID B-003-0-23
TYPE: BRIDGE	SAMPLING FIRM / LOGGER: CTL / HARVEY	HAMMER: MOBILE AUTOMATIC	ALIGNMENT: TR 428	
PID: 117984 SFN: 6633455	DRILLING METHOD: 3.25" HSA / NQ	CALIBRATION DATE: 5/3/23	ELEVATION: 684.0 (MSL) EOB: 19.0 ft.	PAGE 1 OF 1
START: 7/7/23 END: 7/7/23	SAMPLING METHOD: SPT / NQ	ENERGY RATIO (%): 76.8	LAT / LONG: 39.174000, -83.034575	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	SO4 ppm	HOLE SEALED
SHALE, BROWN AND GRAY, HIGHLY WEATHERED.	684.0	TR W 683.0	12 21 30	65	100	SS-1	1.50	-	-	-	-	-	-	-	-	13	Rock (V)	-	
			38 50/4"	-	100	SS-2	2.00	-	-	-	-	-	-	-	-	17	Rock (V)	-	
	680.0																		
LIMESTONE, BROWN, SLIGHTLY WEATHERED, STRONG; RQD 0%, REC 100%.	679.8																		
SHALE, GRAY, MODERATELY WEATHERED, VERY WEAK; RQD 60%, REC 90%. @4.0'-9.0'; SDI = 38.6% @7.9'-8.3'; UCS = 70 PSI			75		100	NQ-1											CORE		
			38		100	NQ-2											CORE		
@14.6'-15.0'; UCS = 2,840 PSI, SLIGHTLY WEATHERED, SLIGHTLY STRONG			64		72	NQ-3											CORE		
	665.0	EOB																	

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: BACKFILLED WITH BENTONITE GROUT

STANDARD ODOT LOG W/ SULFATES (8.5 X 11) - OH DOT.GDT - 4/1/26 10:45 - O:\PROJECT\2023\COL-05\23050051COL_PIK-TR428-0-04 BRIDGE REPLACEMENT_PIKE COUNTY ENGINEERS OFFICE

PROJECT: PIK-TR428-0.04	DRILLING FIRM / OPERATOR: CTL / HARVEY	DRILL RIG: MOBILE B-57 TRACK	STATION / OFFSET: 12+79, 4' LT.	EXPLORATION ID B-004-0-23
TYPE: BRIDGE	SAMPLING FIRM / LOGGER: CTL / HARVEY	HAMMER: MOBILE AUTOMATIC	ALIGNMENT: TR 428	
PID: 117984 SFN: 6633455	DRILLING METHOD: 3.25" HSA / NQ	CALIBRATION DATE: 5/3/23	ELEVATION: 696.3 (MSL) EOB: 30.0 ft.	PAGE 1 OF 1
START: 7/6/23 END: 7/6/23	SAMPLING METHOD: SPT / NQ	ENERGY RATIO (%): 76.8	LAT / LONG: 39.174003, -83.034322	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	SO4 ppm	HOLE SEALED
ASPHALT (5")	696.3																		
MEDIUM DENSE, BROWN, **GRAVEL AND/OR STONE FRAGMENTS WITH SAND AND SILT**, TRACE CLAY, DAMP	695.9		9 11 9	26	100	SS-1	-	31	29	15	18	7	NP	NP	NP	7	A-2-4 (0)	-	
@3.5'; DENSE			10 14 13	35	100	SS-2	-	26	30	15	19	10	NP	NP	NP	6	A-2-4 (0)	-	
DENSE, BROWN, **SANDY SILT**, LITTLE GRAVEL, TRACE CLAY, MOIST	690.3		12 14 18	41	100	SS-3	-	17	34	13	26	10	NP	NP	NP	20	A-4a (1)	-	
DENSE, BROWN, **GRAVEL AND/OR STONE FRAGMENTS WITH SAND AND SILT**, TRACE CLAY, CONTAINS STONE FRAGMENTS, DAMP	687.8		14 15 17	41	100	SS-4	-	-	-	-	-	-	-	-	-	8	A-2-4 (V)	-	
@10.0'; VERY DENSE			50/2"	-	100	SS-5	-	-	-	-	-	-	-	-	-	-	A-2-4 (V)	-	
			34 41 44	109	100	SS-6	-	-	-	-	-	-	-	-	-	6	A-2-4 (V)	-	
	681.3	TR	50/5"	-	100	SS-7	4.50	-	-	-	-	-	-	-	-	7	A-2-4 (V)	-	
SHALE, BROWN AND GRAY, MODERATELY WEATHERED, SLIGHTLY STRONG; RQD 52%, REC 100%.	680.3																		
@15.0'-15.4'; UCS = 2,220 PSI	679.9		25		100	NQ-1											CORE		
LIMESTONE, GRAY, SLIGHTLY WEATHERED, STRONG; RQD 88%, REC 100%.																			
@16.0'-16.4'; UCS = 8,070 PSI																			
SHALE, GRAY, HIGHLY WEATHERED, WEAK; RQD 16%, REC 100%.			9		100	NQ-2											CORE		
			28		100	NQ-3											CORE		
	666.3	EOB																	

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: BACKFILLED WITH BENTONITE GROUT

STANDARD ODOT LOG W/ SULFATES (8.5 X 11) - OH DOT.GDT - 4/1/26 10:45 - O:\PROJECT\2023\COL-05\23050051COL_PIK-TR428-0-04 BRIDGE REPLACEMENT_PIKE COUNTY ENGINEERS OFFICE

PROJECT: PIK-TR428-0.04	DRILLING FIRM / OPERATOR: CTL / HARVEY	DRILL RIG: MOBILE B-57 TRACK	STATION / OFFSET: 13+34, 1' LT.
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: CTL / HARVEY	HAMMER: MOBILE AUTOMATIC	ALIGNMENT: TR 428
PID: 117984 SFN: 6633455	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 5/3/23	ELEVATION: 693.5 (MSL) EOB: 7.0 ft.
START: 7/6/23 END: 7/6/23	SAMPLING METHOD: SPT	ENERGY RATIO (%): 76.8	LAT / LONG: 39.173947, -83.034142

EXPLORATION ID B-005-0-23

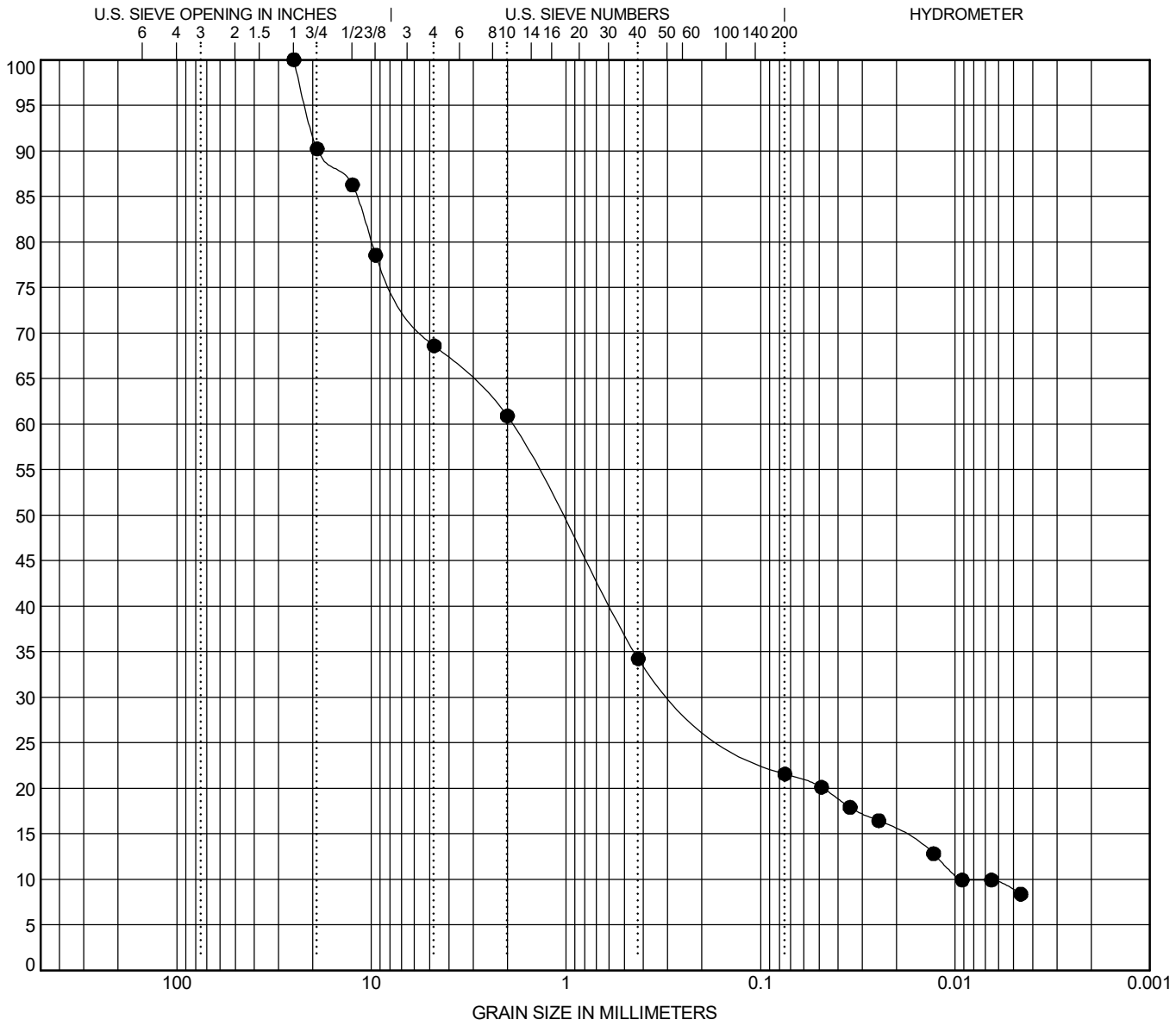
MATERIAL DESCRIPTION AND NOTES	ELEV. 693.5	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	SO4 ppm	BACK FILL
ASPHALT (5")	693.1																		
DENSE, BROWN, **GRAVEL AND/OR STONE FRAGMENTS WITH SAND**, LITTLE SILT, TRACE CLAY, DAMP	691.0	1	12 14 17	40	100	SS-1	3.00	52	19	9	14	6	NP	NP	NP	7	A-1-b (0)	360	
DENSE, BROWN, **GRAVEL AND/OR STONE FRAGMENTS WITH SAND AND SILT**, TRACE CLAY, DAMP	688.0	2	9 14 14	36	100	SS-2	4.50	38	24	10	19	9	NP	NP	NP	11	A-2-4 (0)	-	
		3	16 13 15	36	100	SS-3	-	-	-	-	-	-	-	-	-	5	A-2-4 (V)	-	
HARD, BROWN, **SILTY CLAY**, SOME SAND, SOME GRAVEL, DAMP	686.5	4	13 13 19	41	100	SS-4	4.50	-	-	-	-	-	-	-	-	12	A-6b (V)	-	
		EOB 7																	

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: PLACED ASPHALT PATCH; BACKFILLED WITH SOIL CUTTINGS

APPENDIX C

LABORATORY TEST RESULTS



COBBLES	GRAVEL		SAND		SILT OR CLAY
	coarse	fine	coarse	fine	

Specimen Identification	Depth	Classification	MC	LL	PL	PI	Cc	Cu
B-001-0-23	**1.0**	**A-1-b(0)**	**8**	**NP**	**NP**	**NP**	**3.22**	**204.36**

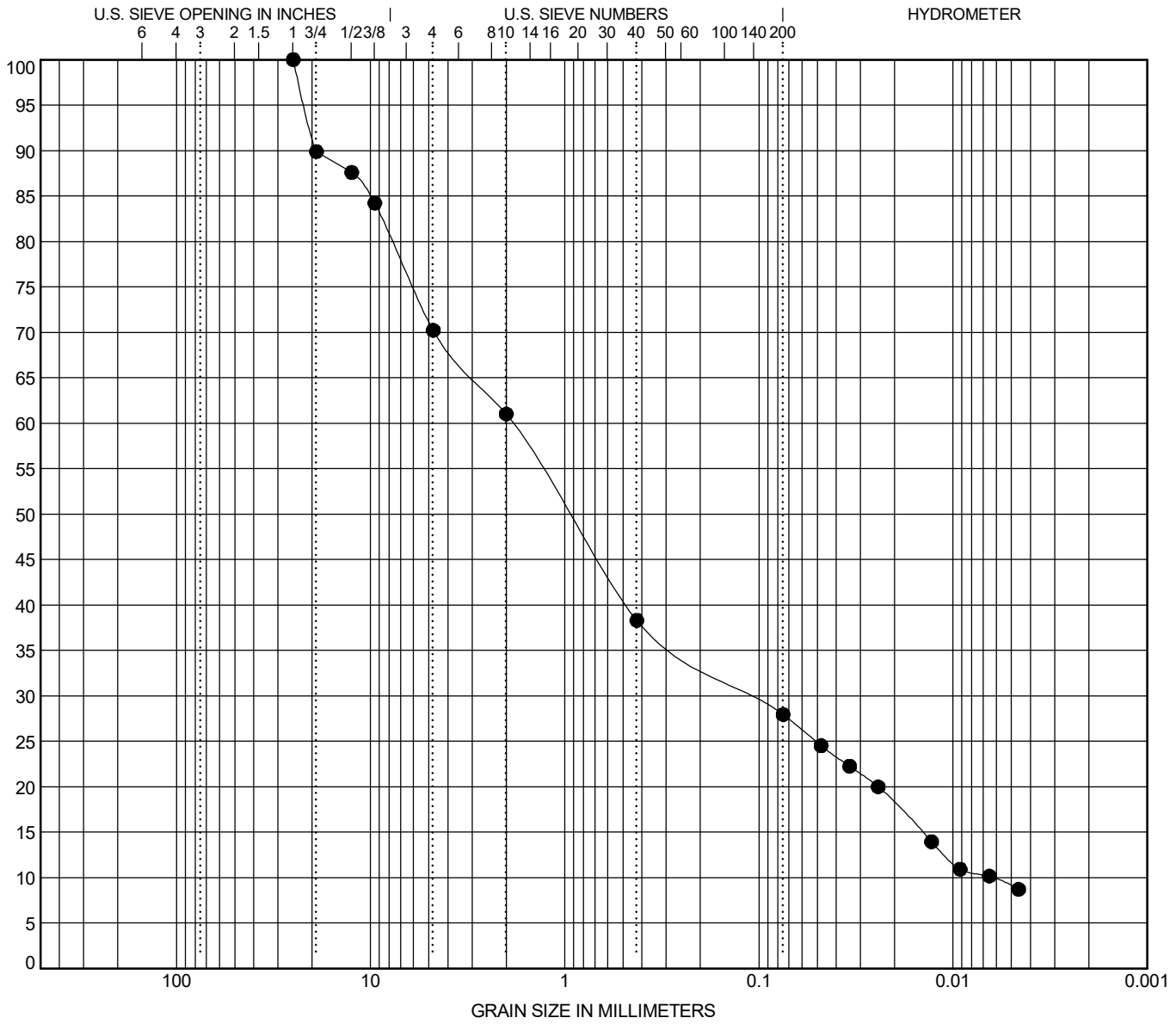
Specimen Identification	Depth	D100	D60	D50	D30	D10	%Gravel	%Coarse Sand	%Fine Sand	%Silt	%Clay
B-001-0-23	**1.0**	**25**	**1.901**	**1.063**	**0.239**	**0.009**	**38**	**27**	**13**	**13**	**9**

CTL Engineering, Inc.
2860 Fisher Road
Columbus, Ohio 43204
Telephone: 614-276-8123
Fax: 614-276-6377

GRAIN SIZE DISTRIBUTION

Project: PIK-TR428-0.04
Location:PIK COUNTY
CTL Project Number:

CTL GRADATION - 2014 ODOT.GDT - 1/6/25 14:43 - O:\PROJECT\2023\COL-05\23050051COL_PIK-TR428-0-04 BRIDGE REPLACEMENT_PIKE COUNTY ENGINEERS OFFICE\REPORTS\LAB REPORTS\23050051COL.GPJ



COBBLES	GRAVEL		SAND		SILT OR CLAY
	coarse	fine	coarse	fine	

Specimen Identification	Depth	Classification	MC	LL	PL	PI	Cc	Cu
B-001-0-23	**2.5**	**A-2-4(0)**	**6**	**NP**	**NP**	**NP**	**0.96**	**297.98**

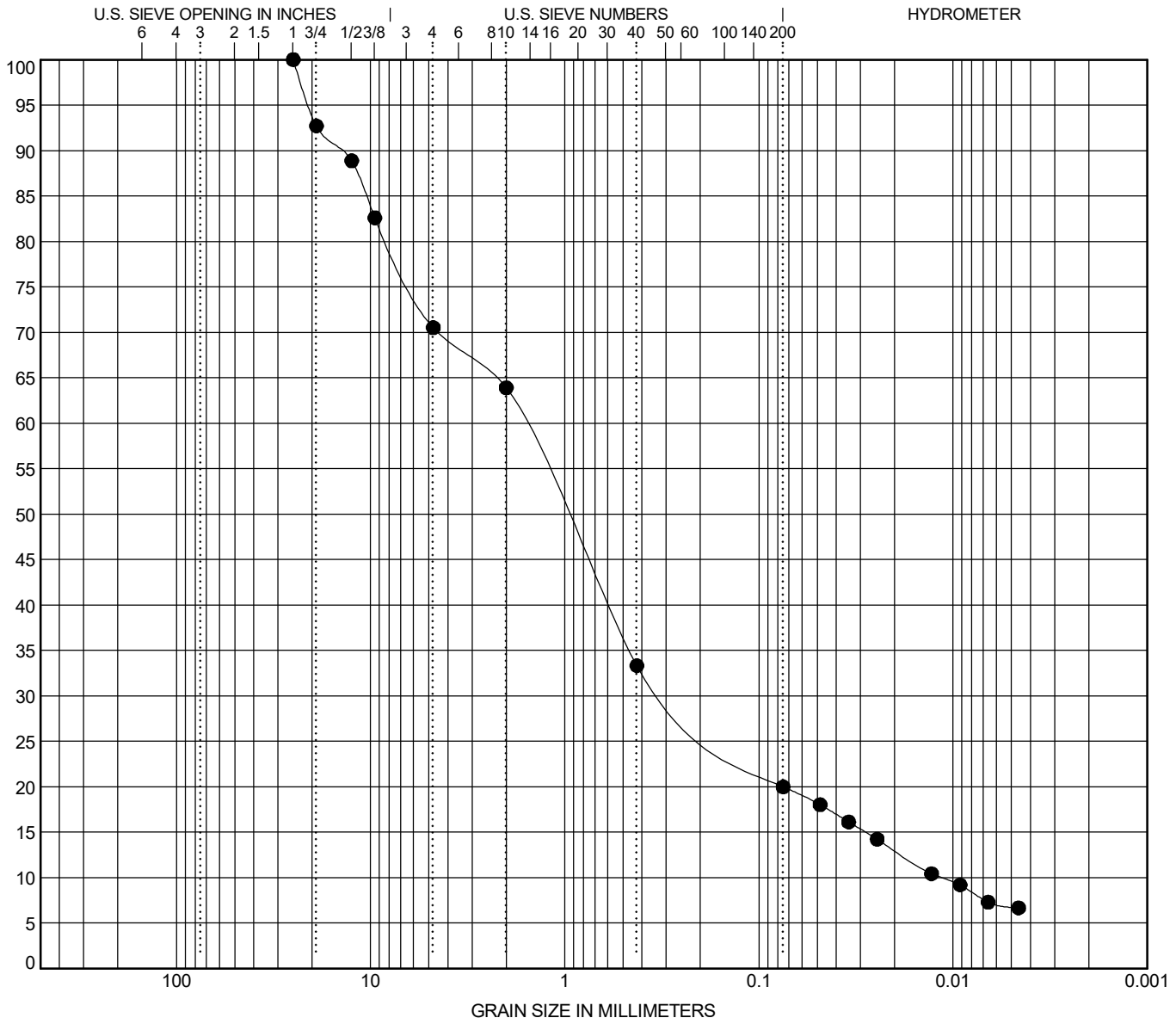
Specimen Identification	Depth	D100	D60	D50	D30	D10	%Gravel	%Coarse Sand	%Fine Sand	%Silt	%Clay
B-001-0-23	**2.5**	**25**	**1.867**	**0.944**	**0.106**	**0.006**	**39**	**23**	**10**	**19**	**9**

CTL Engineering, Inc.
2860 Fisher Road
Columbus, Ohio 43204
Telephone: 614-276-8123
Fax: 614-276-6377

GRAIN SIZE DISTRIBUTION

Project: PIK-TR428-0.04
Location:PIK COUNTY
CTL Project Number:

CTL GRADATION - 2014 ODOT.GDT - 1/6/25 14:43 - O:\PROJECT\2023\COL-05\23050051COL_PIK-TR428-0-04 BRIDGE REPLACEMENT_PIKE COUNTY ENGINEERS OFFICE\REPORTS\LAB REPORTS\23050051COL.GPJ



COBBLES	GRAVEL		SAND		SILT OR CLAY
	coarse	fine	coarse	fine	

Specimen Identification	Depth	Classification	MC	LL	PL	PI	Cc	Cu
B-002-0-23	**1.0**	**A-1-b(0)**	**8**	**NP**	**NP**	**NP**	**4.04**	**142.53**

Specimen Identification	Depth	D100	D60	D50	D30	D10	%Gravel	%Coarse Sand	%Fine Sand	%Silt	%Clay
B-002-0-23	**1.0**	**25**	**1.642**	**0.99**	**0.276**	**0.012**	**36**	**31**	**13**	**13**	**7**

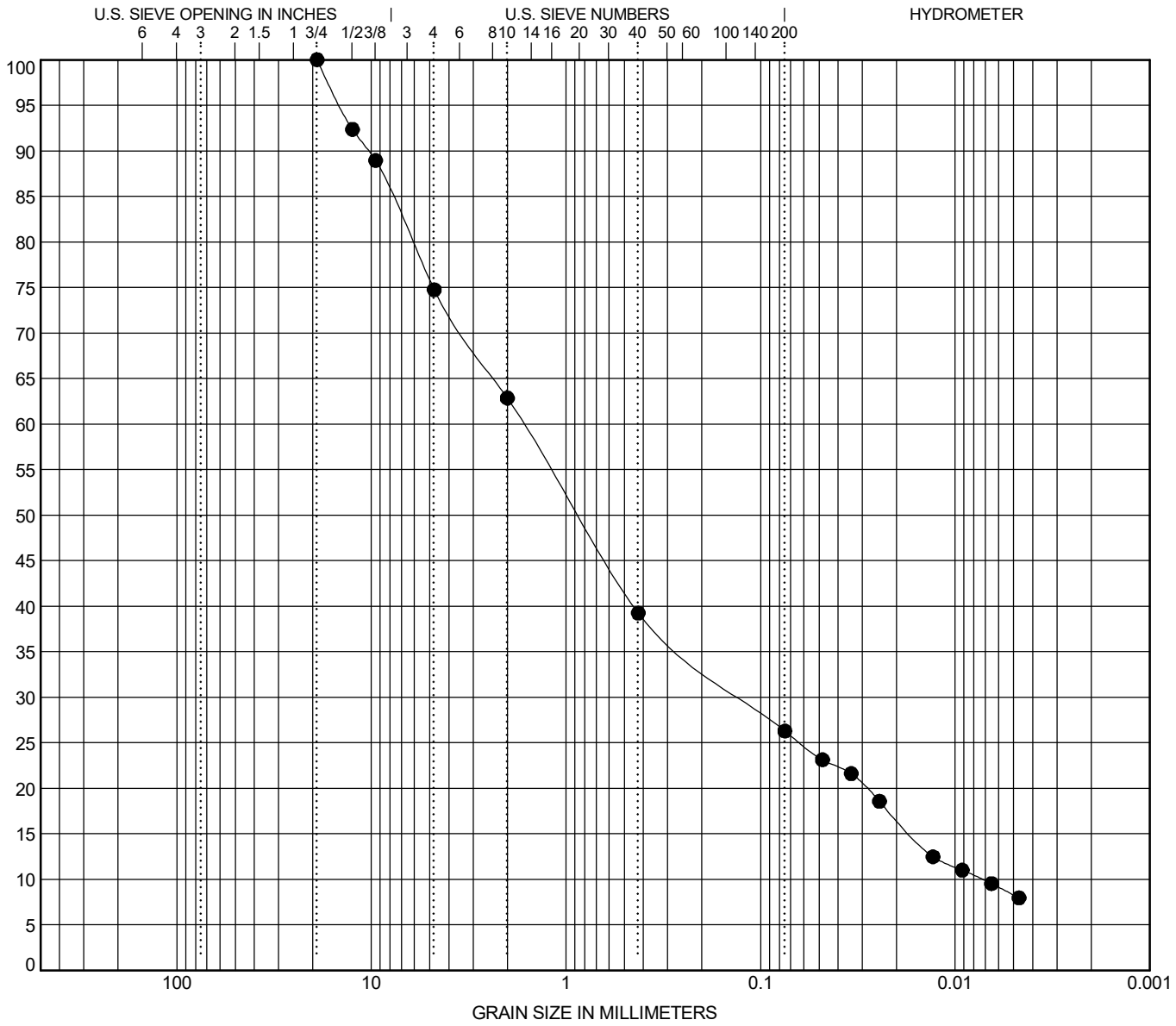
CTL ENGINEERING

CTL Engineering, Inc.
2860 Fisher Road
Columbus, Ohio 43204
Telephone: 614-276-8123
Fax: 614-276-6377

GRAIN SIZE DISTRIBUTION

Project: PIK-TR428-0.04
Location:PIK COUNTY
CTL Project Number:

CTL GRADATION - 2014 ODOT.GDT - 1/6/25 14:43 - O:\PROJECT\2023\COL-05\23050051COL_PIK-TR428-0-04 BRIDGE REPLACEMENT_PIKE COUNTY ENGINEERS OFFICE\REPORTS\LAB REPORTS\23050051COL.GPJ



COBBLES	GRAVEL		SAND		SILT OR CLAY
	coarse	fine	coarse	fine	

Specimen Identification	Depth	Classification	MC	LL	PL	PI	Cc	Cu
B-002-0-23	**6.0**	**A-2-4(0)**	**5**	**NP**	**NP**	**NP**	**1.26**	**227.77**

Specimen Identification	Depth	D100	D60	D50	D30	D10	%Gravel	%Coarse Sand	%Fine Sand	%Silt	%Clay
B-002-0-23	**6.0**	**19**	**1.66**	**0.861**	**0.124**	**0.007**	**37**	**24**	**13**	**18**	**8**

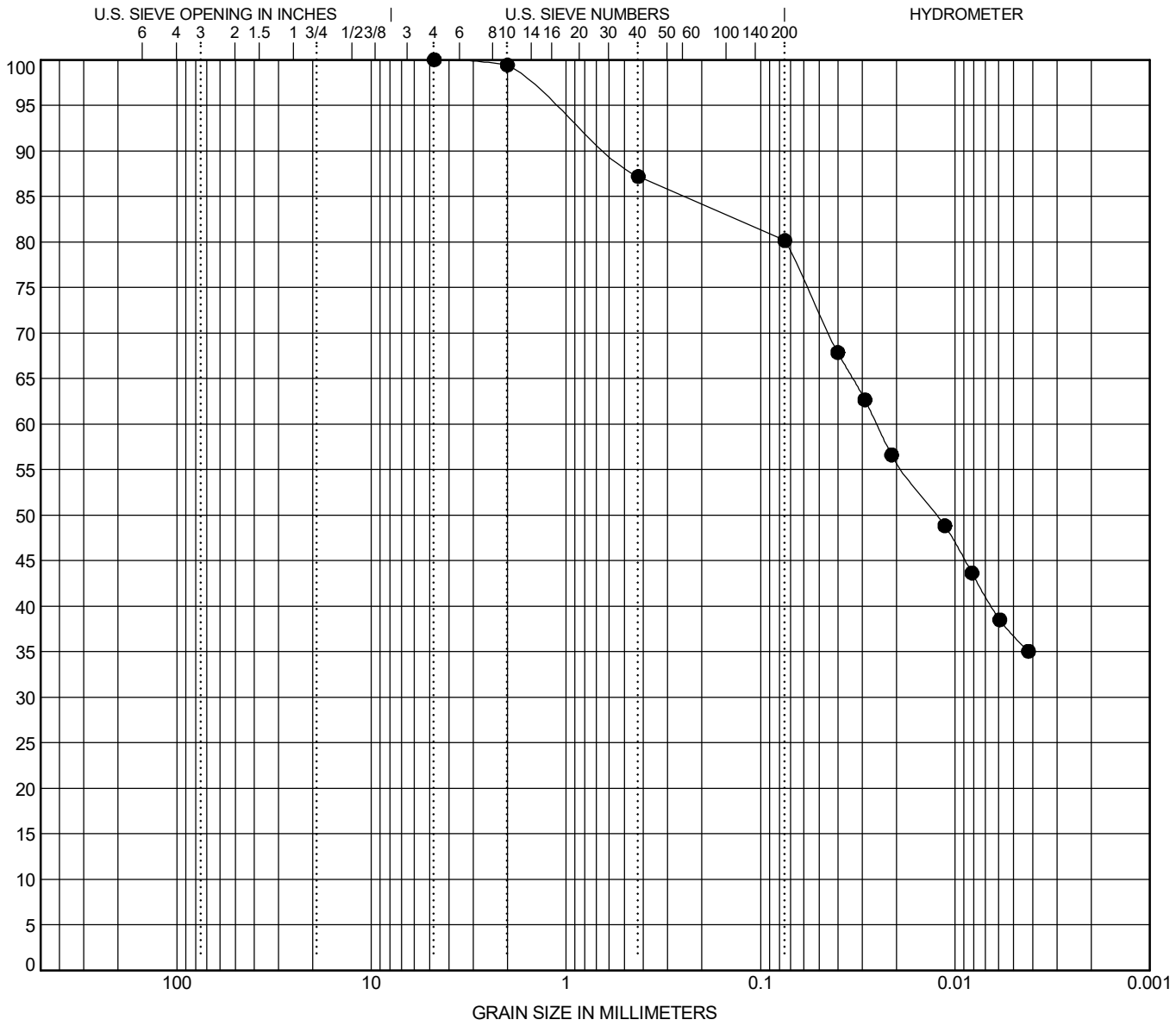
CTL ENGINEERING

CTL Engineering, Inc.
2860 Fisher Road
Columbus, Ohio 43204
Telephone: 614-276-8123
Fax: 614-276-6377

GRAIN SIZE DISTRIBUTION

Project: PIK-TR428-0.04
Location:PIK COUNTY
CTL Project Number:

CTL GRADATION - 2014 ODOT.GDT - 1/6/25 14:43 - O:\PROJECT\2023\COL-05\23050051COL_PIK-TR428-0-04 BRIDGE REPLACEMENT_PIKE COUNTY ENGINEERS OFFICE\REPORTS\LAB REPORTS\23050051COL.GPJ



COBBLES	GRAVEL		SAND		SILT OR CLAY
	coarse	fine	coarse	fine	

Specimen Identification	Depth	Classification	MC	LL	PL	PI	Cc	Cu
B-002-0-23	**10.0**	**A-7-6(17)**	**14**	**47**	**15**	**32**		

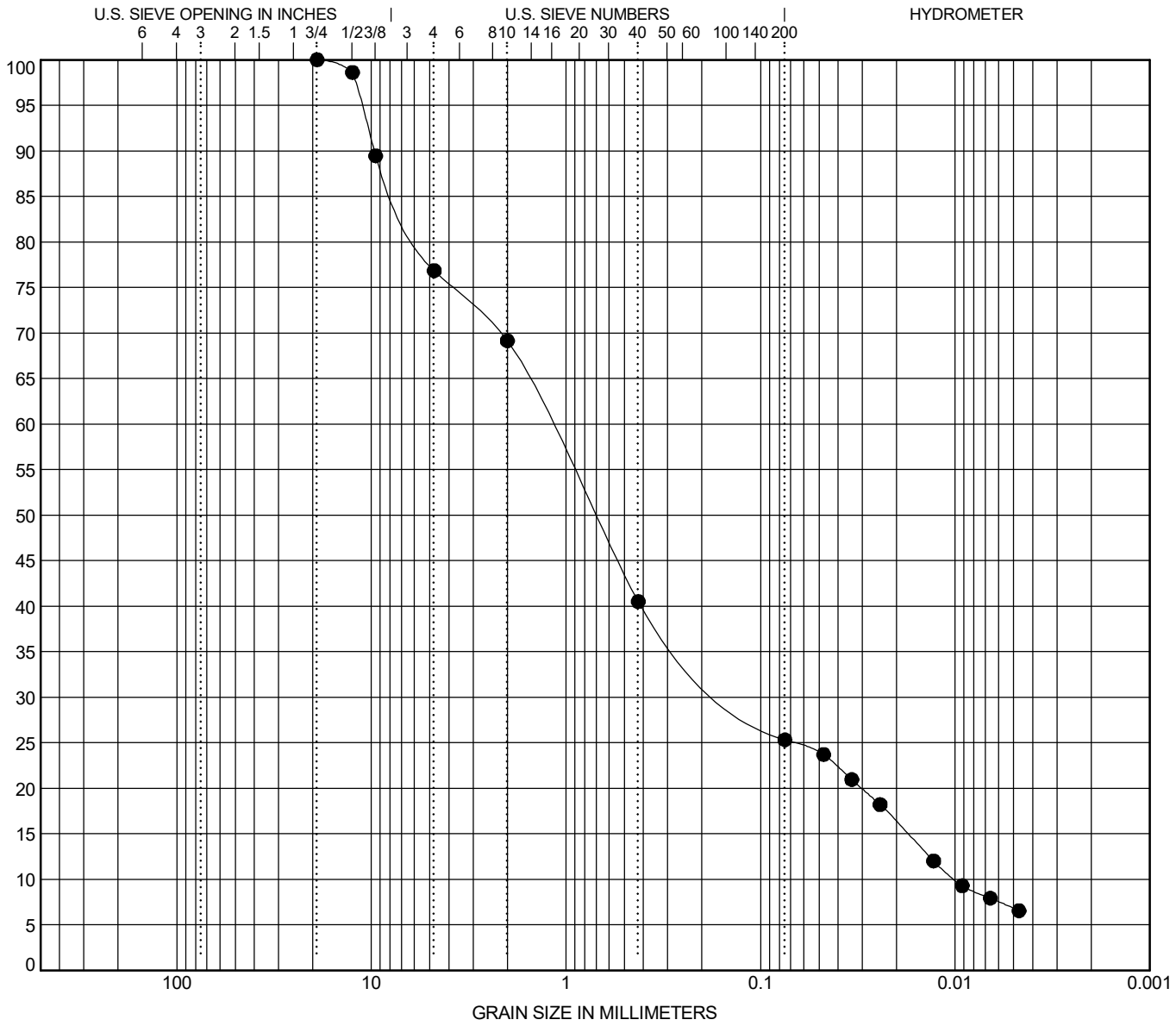
Specimen Identification	Depth	D100	D60	D50	D30	D10	%Gravel	%Coarse Sand	%Fine Sand	%Silt	%Clay
B-002-0-23	**10.0**	**4.75**	**0.025**	**0.012**			**1**	**12**	**7**	**43**	**37**

CTL Engineering, Inc.
2860 Fisher Road
Columbus, Ohio 43204
Telephone: 614-276-8123
Fax: 614-276-6377

GRAIN SIZE DISTRIBUTION

Project: PIK-TR428-0.04
Location:PIK COUNTY
CTL Project Number:

CTL GRADATION - 2014 ODOT.GDT - 1/6/25 14:43 - O:\PROJECT\2023\COL-05\23050051COL_PIK-TR428-0-04 BRIDGE REPLACEMENT_PIKE COUNTY ENGINEERS OFFICE\REPORTS\LAB REPORTS\23050051COL.GPJ



COBBLES	GRAVEL		SAND		SILT OR CLAY
	coarse	fine	coarse	fine	

Specimen Identification	Depth	Classification	MC	LL	PL	PI	Cc	Cu
B-004-0-23	**1.0**	**A-1-b(0)**	**7**	**NP**	**NP**	**NP**	**1.34**	**121.39**

Specimen Identification	Depth	D100	D60	D50	D30	D10	%Gravel	%Coarse Sand	%Fine Sand	%Silt	%Clay
B-004-0-23	**1.0**	**19**	**1.22**	**0.711**	**0.128**	**0.01**	**31**	**29**	**15**	**18**	**7**

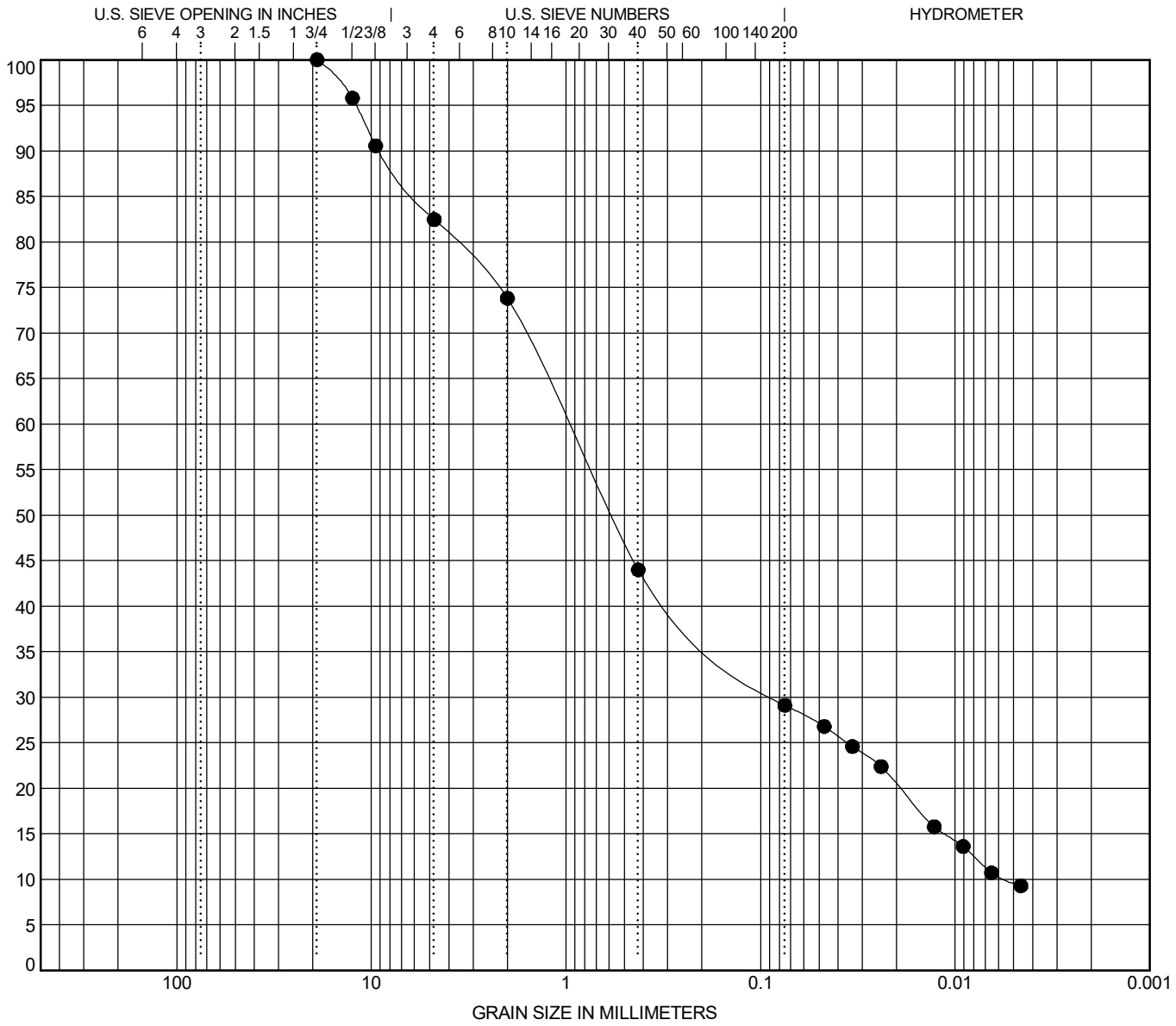
CTL ENGINEERING

CTL Engineering, Inc.
2860 Fisher Road
Columbus, Ohio 43204
Telephone: 614-276-8123
Fax: 614-276-6377

GRAIN SIZE DISTRIBUTION

Project: PIK-TR428-0.04
Location:PIK COUNTY
CTL Project Number:

CTL GRADATION - 2014 ODOT.GDT - 1/6/25 14:43 - O:\PROJECT\2023\COL-05\23050051COL_PIK-TR428-0-04 BRIDGE REPLACEMENT_PIKE COUNTY ENGINEERS OFFICE\REPORTS\LAB REPORTS\23050051COL.GPJ



COBBLES	GRAVEL		SAND		SILT OR CLAY
	coarse	fine	coarse	fine	

Specimen Identification	Depth	Classification	MC	LL	PL	PI	Cc	Cu
B-004-0-23	**3.5**	**A-2-4(0)**	**6**	**NP**	**NP**	**NP**	**1.30**	**178.09**

Specimen Identification	Depth	D100	D60	D50	D30	D10	%Gravel	%Coarse Sand	%Fine Sand	%Silt	%Clay
B-004-0-23	**3.5**	**19**	**0.977**	**0.581**	**0.083**	**0.005**	**26**	**30**	**15**	**19**	**10**

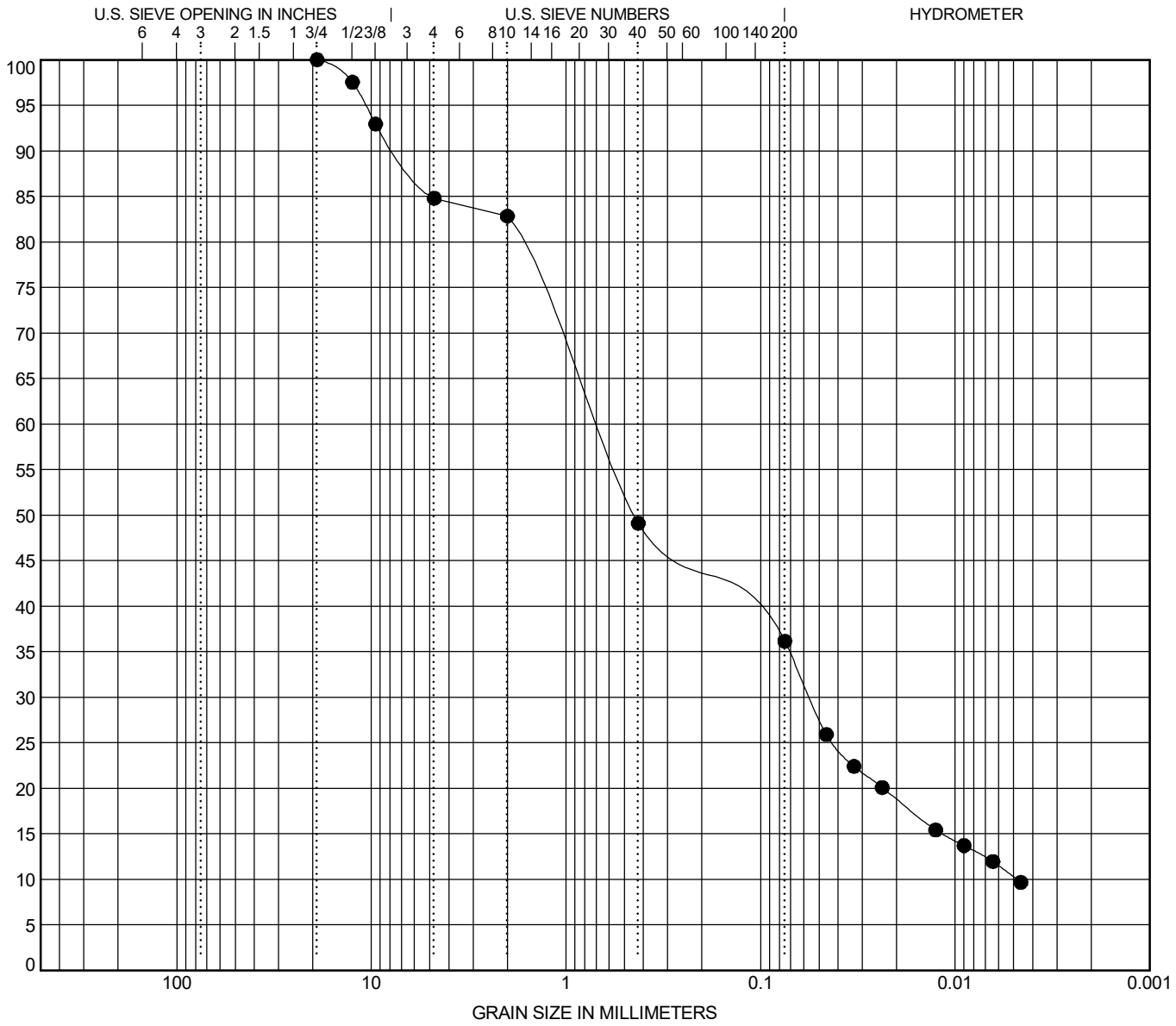
CTL ENGINEERING

CTL Engineering, Inc.
2860 Fisher Road
Columbus, Ohio 43204
Telephone: 614-276-8123
Fax: 614-276-6377

GRAIN SIZE DISTRIBUTION

Project: PIK-TR428-0.04
Location:PIK COUNTY
CTL Project Number:

CTL GRADATION - 2014 ODOT.GDT - 1/6/25 14:43 - O:\PROJECT\2023\COL-05\23050051COL_PIK-TR428-0-04 BRIDGE REPLACEMENT_PIKE COUNTY ENGINEERS OFFICE\REPORTS\LAB REPORTS\23050051COL.GPJ



COBBLES	GRAVEL		SAND		SILT OR CLAY
	coarse	fine	coarse	fine	

Specimen Identification	Depth	Classification	MC	LL	PL	PI	Cc	Cu
B-004-0-23	**6.0**	**A-4a(0)**	**20**	**NP**	**NP**	**NP**	**0.92**	**144.91**

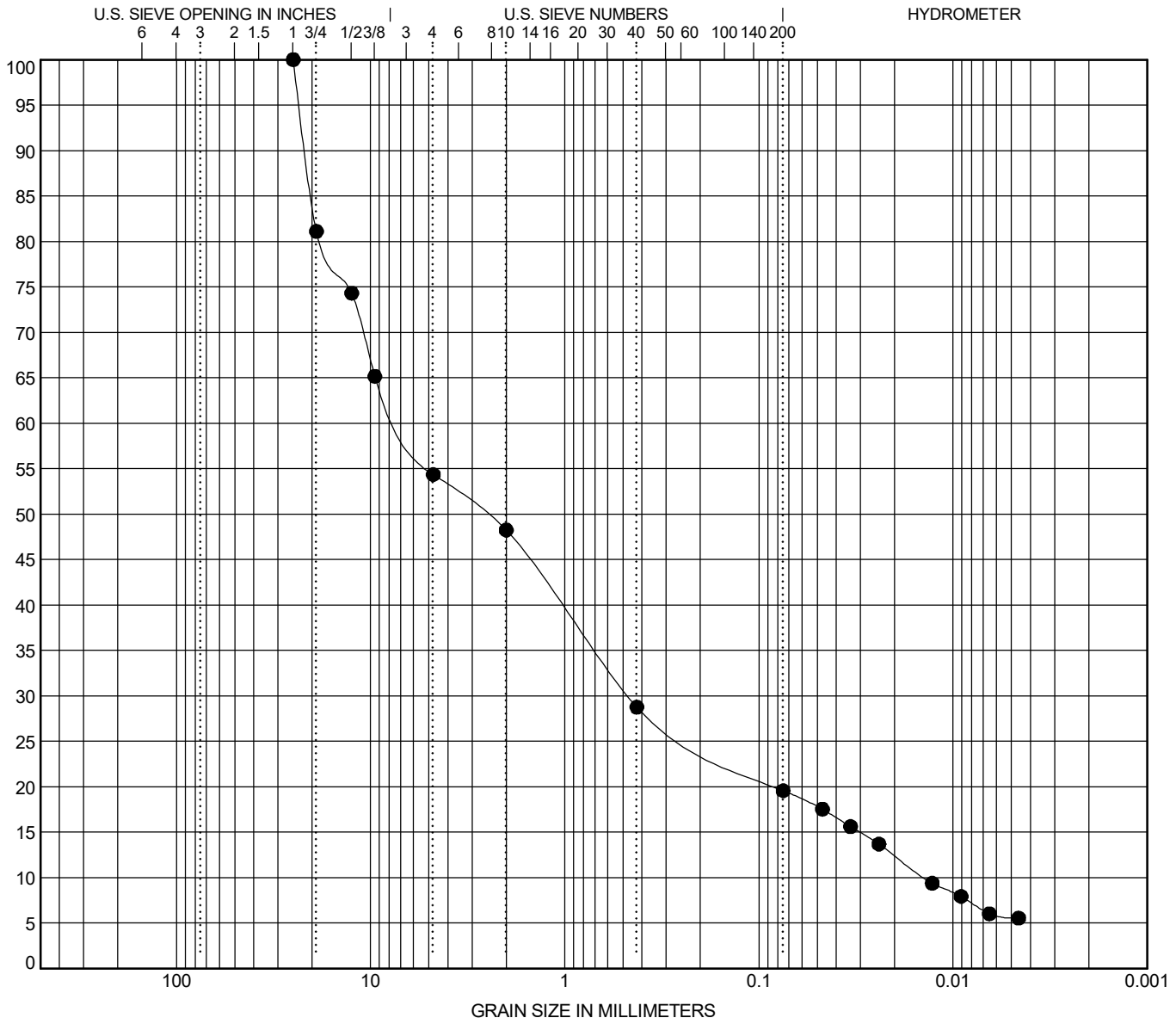
Specimen Identification	Depth	D100	D60	D50	D30	D10	%Gravel	%Coarse Sand	%Fine Sand	%Silt	%Clay
B-004-0-23	**6.0**	**19**	**0.701**	**0.443**	**0.056**	**0.005**	**17**	**34**	**13**	**26**	**10**

CTL Engineering, Inc.
2860 Fisher Road
Columbus, Ohio 43204
Telephone: 614-276-8123
Fax: 614-276-6377

GRAIN SIZE DISTRIBUTION

Project: PIK-TR428-0.04
Location:PIK COUNTY
CTL Project Number:

CTL GRADATION - 2014 ODOT.GDT - 1/6/25 14:43 - O:\PROJECT\2023\COL-05\23050051COL_PIK-TR428-0-04 BRIDGE REPLACEMENT_PIKE COUNTY ENGINEERS OFFICE\REPORTS\LAB REPORTS\23050051COL.GPJ



COBBLES	GRAVEL		SAND		SILT OR CLAY
	coarse	fine	coarse	fine	

Specimen Identification	Depth	Classification	MC	LL	PL	PI	Cc	Cu
B-005-0-23	**1.0**	**A-1-b(0)**	**7**	**NP**	**NP**	**NP**	**2.30**	**485.78**

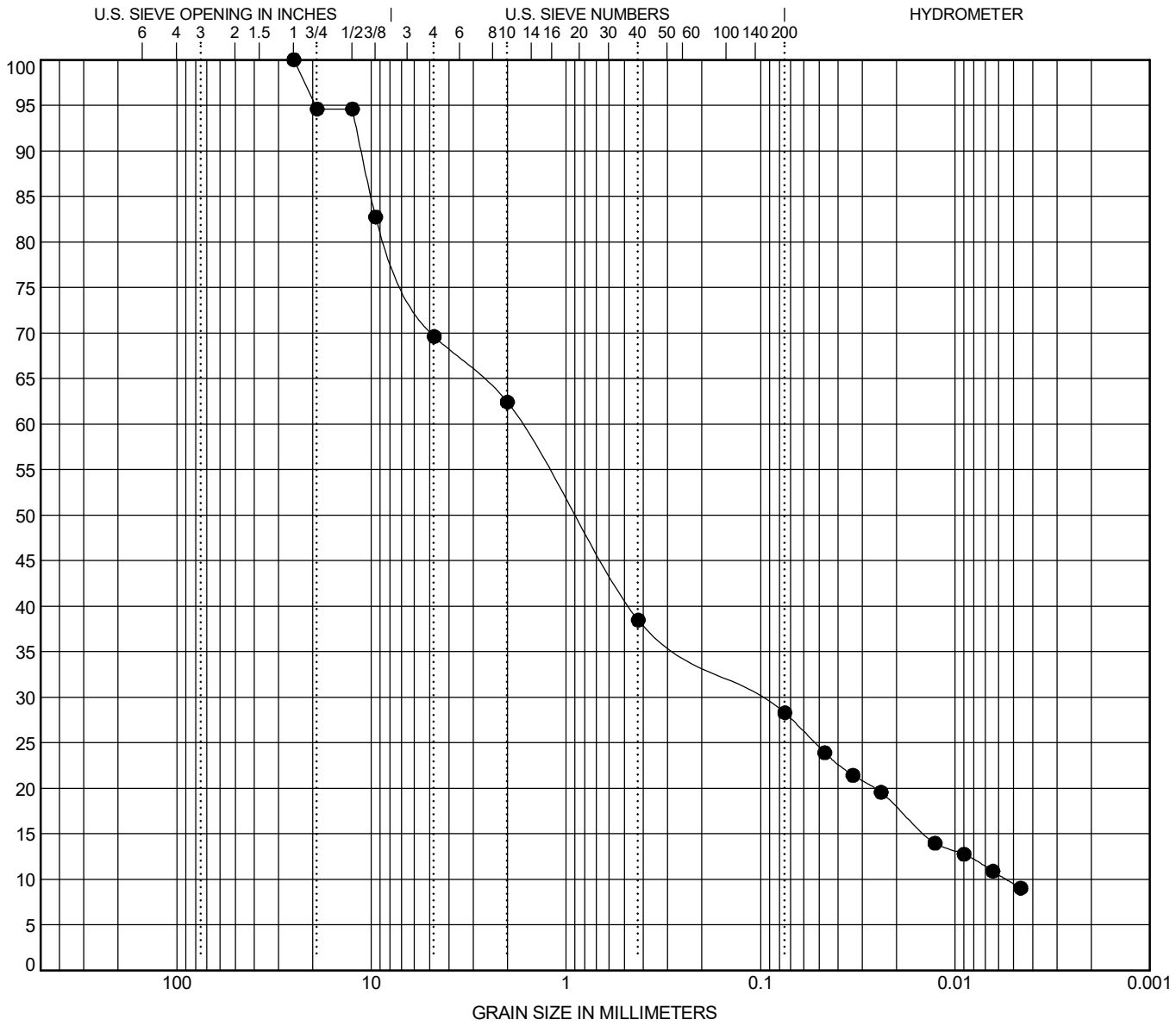
Specimen Identification	Depth	D100	D60	D50	D30	D10	%Gravel	%Coarse Sand	%Fine Sand	%Silt	%Clay
B-005-0-23	**1.0**	**25**	**6.829**	**2.568**	**0.47**	**0.014**	**52**	**19**	**9**	**14**	**6**

CTL Engineering, Inc.
2860 Fisher Road
Columbus, Ohio 43204
Telephone: 614-276-8123
Fax: 614-276-6377

GRAIN SIZE DISTRIBUTION

Project: PIK-TR428-0.04
Location:PIK COUNTY
CTL Project Number:

CTL GRADATION - 2014 ODOT.GDT - 1/6/25 14:43 - O:\PROJECT\2023\COL-05\23050051COL_PIK-TR428-0-04 BRIDGE REPLACEMENT_PIKE COUNTY ENGINEERS OFFICE\REPORTS\LAB REPORTS\23050051COL.GPJ



COBBLES	GRAVEL		SAND		SILT OR CLAY
	coarse	fine	coarse	fine	

Specimen Identification	Depth	Classification	MC	LL	PL	PI	Cc	Cu
B-005-0-23	**2.5**	**A-2-4(0)**	**11**	**NP**	**NP**	**NP**	**1.08**	**312.66**

Specimen Identification	Depth	D100	D60	D50	D30	D10	%Gravel	%Coarse Sand	%Fine Sand	%Silt	%Clay
B-005-0-23	**2.5**	**25**	**1.713**	**0.897**	**0.101**	**0.005**	**38**	**24**	**10**	**19**	**9**

CTL Engineering, Inc.
2860 Fisher Road
Columbus, Ohio 43204
Telephone: 614-276-8123
Fax: 614-276-6377

GRAIN SIZE DISTRIBUTION

Project: PIK-TR428-0.04
Location:PIK COUNTY
CTL Project Number:

CTL GRADATION - 2014 ODOT.GDT - 1/6/25 14:43 - O:\PROJECT\2023\COL-05\23050051COL_PIK-TR428-0-04 BRIDGE REPLACEMENT_PIKE COUNTY ENGINEERS OFFICE\REPORTS\LAB REPORTS\23050051COL.GPJ

OHIO DEPARTMENT OF TRANSPORTATION

DETERMINING SULFATE CONTENT IN SOILS
SUPPLEMENT 1122

Project C-R-S: PIK-TR428-0.04

PID No: 117984

Report Date: 4/25/2025

Consultant: CTL Engineering, Inc.

Technician: RV

Sample or Boring ID	Station	Offset	Latitude & Longitude or State Plane Coordinates		Elevation	Soaking Time (hr)	Replicate Sample Readings						Sulfate Content (ppm)
							1		2		3		
							Dilution	Reading	Dilution	Reading	Dilution	Reading	
B-001-0-23, SS-1	10+98	2' Lt	N 428073.91	E 1816845.66	697.8	21	20	< 5	20	< 5	20	< 5	< 100
B-001-0-23, SS-2	10+98	2' Lt	N 428073.91	E 1816845.66	697.8	21	20	< 5	20	< 5	20	< 5	< 100
B-005-0-23, SS-1	13+34	1' Lt	N 428017.82	E 1817074.95	693.5	21	20	18	20	18	20	18	360

PROJECT NO:	23050051COL
DATE:	1/14/2025

UNIAXIAL COMPRESSIVE STRENGTH OF INTACT ROCK CORE - ASTM D 7012

Method C

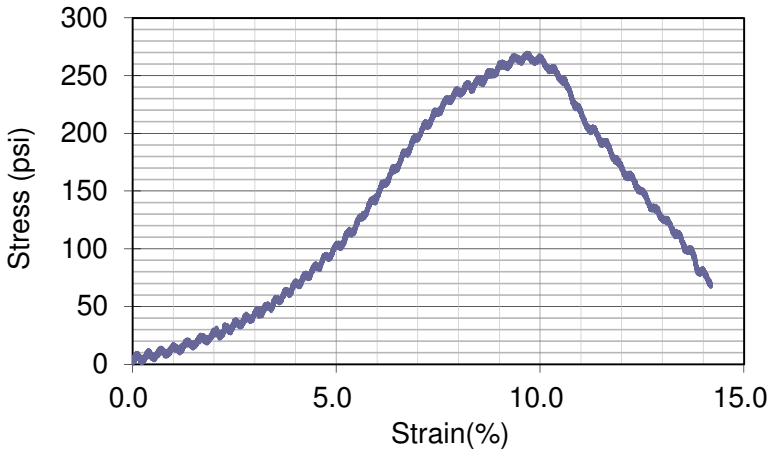
BORING NUMBER	B-002-0-23	TOP DEPTH(FT)	15.4	BOTTOM DEPTH(FT)	15.7
SAMPLE NUMBER	NQ-1	DISTRICT	9	PID NO.	117984
COUNTY	PIK	ROUTE	TR 428	SECTION	0.04

FORMATION	Devonian age Sunbury Shale, Berea Sandstone, and Bedford Shale Undivided
DESCRIPTION	Shale, Gray, Moderately Weathered, Very Weak
MOISTURE CONDITION	As Received

MEASUREMENT	LENGTH(INCHES)	DIAMETER(INCHES)
1	4.219	2.025
2	4.311	2.023
3	4.255	2.014
AVERAGE	4.262	2.021

LENGTH/DIAMETER	2.1
CORRECTION FACTOR	1
AREA(IN^2)	3.2
MASS (GRAMS)	502.9
UNIT WEIGHT(LBS/FT^3)	140.2

RATE OF LOADING (in/min)
0.10
COMPRESSIVE STRENGTH (PSI)
270
Equip. ID - 68897
NON-CONFORMANCES - None
TIME OF TEST (MINUTES)
5.55
LOADING DIRECTION
PERP. TO BEDDING
TECHNICIAN - MW
TEMPERATURE - Room





BEFORE TESTING



AFTER TESTING

Physical Appearance after Test - Sample sheared through middle portion - No signs of cracking, spalling or shearing at the platen-specimen interface

PROJECT NO:	23050051COL
DATE:	1/14/2025

UNIAXIAL COMPRESSIVE STRENGTH OF INTACT ROCK CORE - ASTM D 7012

Method C

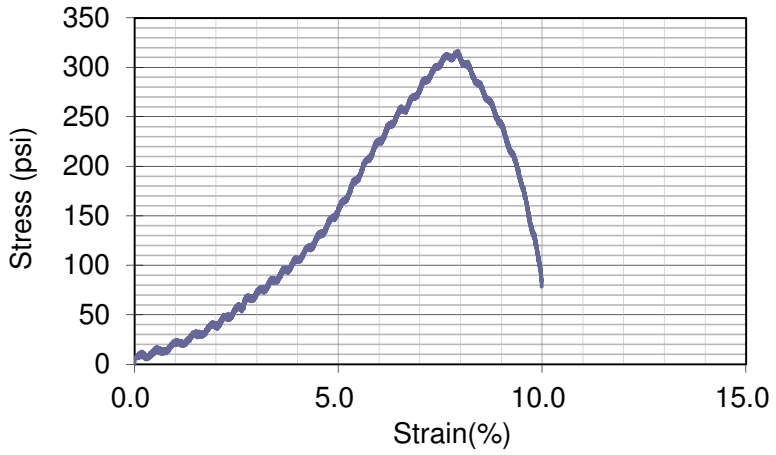
BORING NUMBER	B-002-0-23	TOP DEPTH(FT)	19.3	BOTTOM DEPTH(FT)	19.7
SAMPLE NUMBER	NQ-1	DISTRICT	9	PID NO.	117984
COUNTY	PIK	ROUTE	TR 428	SECTION	0.04

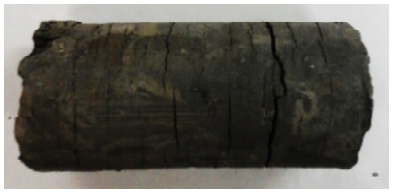
FORMATION	Devonian age Sunbury Shale, Berea Sandstone, and Bedford Shale Undivided
DESCRIPTION	Shale, Gray, Moderately Weathered, Very Weak
MOISTURE CONDITION	As Received

MEASUREMENT	LENGTH(INCHES)	DIAMETER(INCHES)
1	4.043	2.038
2	4.052	2.040
3	4.057	2.048
AVERAGE	4.051	2.042

LENGTH/DIAMETER	2.0
CORRECTION FACTOR	1
AREA(IN^2)	3.3
MASS (GRAMS)	510.3
UNIT WEIGHT(LBS/FT^3)	146.5

RATE OF LOADING (in/min)
0.10
COMPRESSIVE STRENGTH (PSI)
320
Equip. ID - 68897
NON-CONFORMANCES - None
TIME OF TEST (MINUTES)
3.96
LOADING DIRECTION
PERP. TO BEDDING
TECHNICIAN - MW
TEMPERATURE - Room





BEFORE TESTING



AFTER TESTING

Physical Appearance after Test - Sample sheared through middle portion - No signs of cracking, spalling or shearing at the platen-specimen interface

PROJECT NO:	23050051COL
DATE:	1/6/2025

UNIAXIAL COMPRESSIVE STRENGTH OF INTACT ROCK CORE - ASTM D 7012

Method C

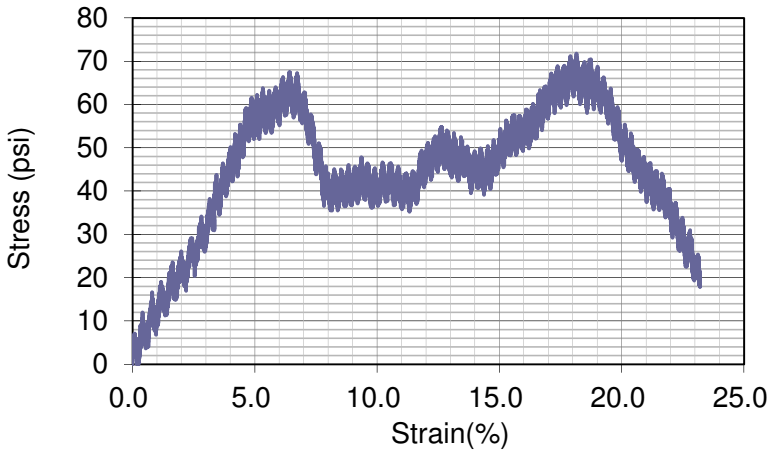
BORING NUMBER	B-003-0-23	TOP DEPTH(FT)	7.9	BOTTOM DEPTH(FT)	8.3
SAMPLE NUMBER	NQ-1	DISTRICT	9	PID NO.	117984
COUNTY	PIK	ROUTE	TR 428	SECTION	0.04

FORMATION	Devonian age Sunbury Shale, Berea Sandstone, and Bedford Shale Undivided
DESCRIPTION	Shale, Gray, Moderatly Weathered, Very Weak
MOISTURE CONDITION	As Received

MEASUREMENT	LENGTH(INCHES)	DIAMETER(INCHES)
1	4.269	2.029
2	4.211	2.039
3	4.204	2.033
AVERAGE	4.228	2.034

LENGTH/DIAMETER	2.1
CORRECTION FACTOR	1
AREA(IN^2)	3.2
MASS (GRAMS)	507.8
UNIT WEIGHT(LBS/FT^3)	140.9

RATE OF LOADING (in/min)
0.11
COMPRESSIVE STRENGTH (PSI)
70
Equip. ID - 68897
NON-CONFORMANCES - None
TIME OF TEST (MINUTES)
8.81
LOADING DIRECTION
PERP. TO BEDDING
TECHNICIAN - MW
TEMPERATURE - Room





BEFORE TESTING



AFTER TESTING

Physical Appearance after Test - Sample sheared through middle portion - No signs of cracking, spalling or shearing at the platen-specimen interface

PROJECT NO:	23050051COL
DATE:	1/6/2025

UNIAXIAL COMPRESSIVE STRENGTH OF INTACT ROCK CORE - ASTM D 7012

Method C

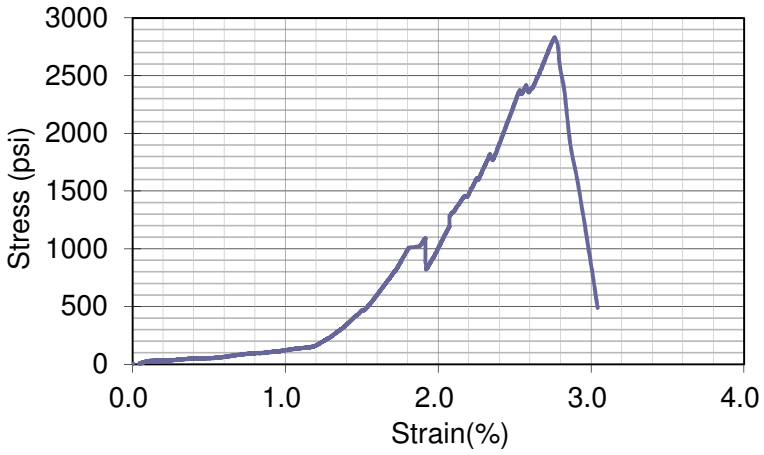
BORING NUMBER	B-003-0-23	TOP DEPTH(FT)	14.6	BOTTOM DEPTH(FT)	15.0
SAMPLE NUMBER	NQ-3	DISTRICT	9	PID NO.	117984
COUNTY	PIK	ROUTE	TR 428	SECTION	0.04

FORMATION	Devonian age Sunbury Shale, Berea Sandstone, and Bedford Shale Undivided
DESCRIPTION	Shale, Gray, Slightly Weathered, Slightly Strong
MOISTURE CONDITION	As Received

MEASUREMENT	LENGTH(INCHES)	DIAMETER(INCHES)
1	4.043	1.967
2	4.106	1.969
3	4.040	1.970
AVERAGE	4.063	1.969

LENGTH/DIAMETER	2.1
CORRECTION FACTOR	1
AREA(IN^2)	3.0
MASS (GRAMS)	521.5
UNIT WEIGHT(LBS/FT^3)	160.6

RATE OF LOADING (in/min)
0.10
COMPRESSIVE STRENGTH (PSI)
2,840
Equip. ID - 68897
NON-CONFORMANCES - None
TIME OF TEST (MINUTES)
1.11
LOADING DIRECTION
PERP. TO BEDDING
TECHNICIAN - MW
TEMPERATURE - Room





BEFORE TESTING



AFTER TESTING

Physical Appearance after Test - Sample sheared through middle portion - No signs of cracking, spalling or shearing at the platen-specimen interface

PROJECT NO:	23050051COL
DATE:	1/14/2025

UNIAXIAL COMPRESSIVE STRENGTH OF INTACT ROCK CORE - ASTM D 7012

Method C

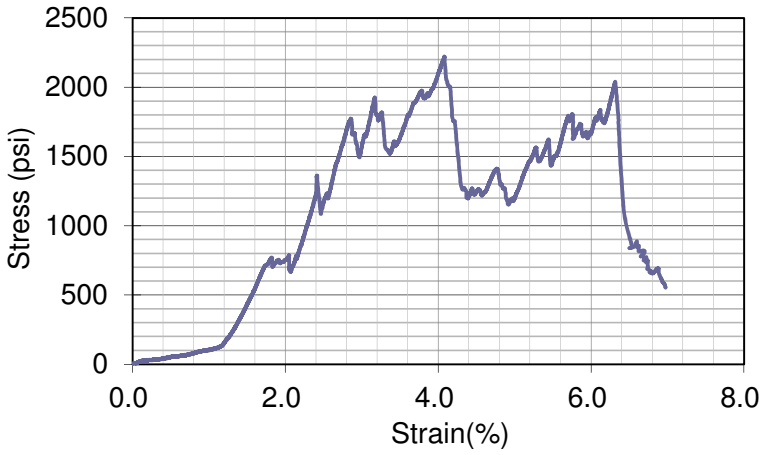
BORING NUMBER	B-004-0-23	TOP DEPTH(FT)	15.0	BOTTOM DEPTH(FT)	15.4
SAMPLE NUMBER	NQ-1	DISTRICT	9	PID NO.	117984
COUNTY	PIK	ROUTE	TR 428	SECTION	0.04

FORMATION	Devonian age Sunbury Shale, Berea Sandstone, and Bedford Shale Undivided
DESCRIPTION	Shale, Gray, Moderately Weathered, Slightly Strong
MOISTURE CONDITION	As Received

MEASUREMENT	LENGTH(INCHES)	DIAMETER(INCHES)
1	3.747	1.983
2	3.742	1.984
3	3.722	1.984
AVERAGE	3.737	1.984

LENGTH/DIAMETER	1.9
CORRECTION FACTOR	1
AREA(IN^2)	3.1
MASS (GRAMS)	455.4
UNIT WEIGHT(LBS/FT^3)	150.2

RATE OF LOADING (in/min)
0.13
COMPRESSIVE STRENGTH (PSI)
2,220
Equip. ID - 68897
NON-CONFORMANCES - None
TIME OF TEST (MINUTES)
2.01
LOADING DIRECTION
PERP. TO BEDDING
TECHNICIAN - MW
TEMPERATURE - Room





BEFORE TESTING



AFTER TESTING

Physical Appearance after Test - Sample sheared through middle portion - No signs of cracking, spalling or shearing at the platen-specimen interface

PROJECT NO:	23050051COL
DATE:	1/6/2025

UNIAXIAL COMPRESSIVE STRENGTH OF INTACT ROCK CORE - ASTM D 7012

Method C

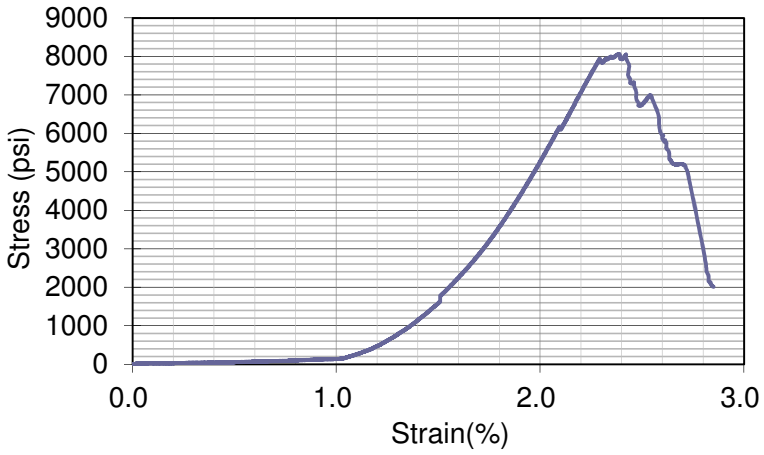
BORING NUMBER	B-004-0-23	TOP DEPTH(FT)	16.0	BOTTOM DEPTH(FT)	16.4
SAMPLE NUMBER	NQ-1	DISTRICT	9	PID NO.	117984
COUNTY	PIK	ROUTE	TR 428	SECTION	0.04

FORMATION	Devonian age Sunbury Shale, Berea Sandstone, and Bedford Shale Undivided
DESCRIPTION	Limestone, Gray, Slightly Weathered, Strong
MOISTURE CONDITION	As Received

MEASUREMENT	LENGTH(INCHES)	DIAMETER(INCHES)
1	4.062	1.981
2	4.052	1.985
3	4.053	1.979
AVERAGE	4.056	1.982

LENGTH/DIAMETER	2.0
CORRECTION FACTOR	1
AREA(IN^2)	3.1
MASS (GRAMS)	547.0
UNIT WEIGHT(LBS/FT^3)	166.6

RATE OF LOADING (in/min)
0.07
COMPRESSIVE STRENGTH (PSI)
8,070
Equip. ID - 68897
NON-CONFORMANCES - None
TIME OF TEST (MINUTES)
1.78
LOADING DIRECTION
PERP. TO BEDDING
TECHNICIAN - MW
TEMPERATURE - Room





BEFORE TESTING



AFTER TESTING

Physical Appearance after Test - Sample sheared through middle portion - No signs of cracking, spalling or shearing at the platen-specimen interface

Slake Durability of Shales and Similar Weak Rocks ASTM D 4644	CTL ENGINEERING, INC. 2860 Fisher Road Columbus, Ohio 43204
Sample ID: B-003-0-23 NQ-1 Depth: 4'-9' Sample Description: Shale, Gray Slake Durability Index (%): 38.6 (second cycle) Moisture Content (%): 5.8 Temperature Range (°C): 21.4-22.4 Temperature Average (°C): 21.9	Client: Pike County Engineers Office Project: PIK-TR428-0.04 Bridge Replacement Project No. 23050051COL Lab Code. NA Date Tested: 8/11/2023 Reviewed by: SM



Pre-Test Sample



Post Test Sample

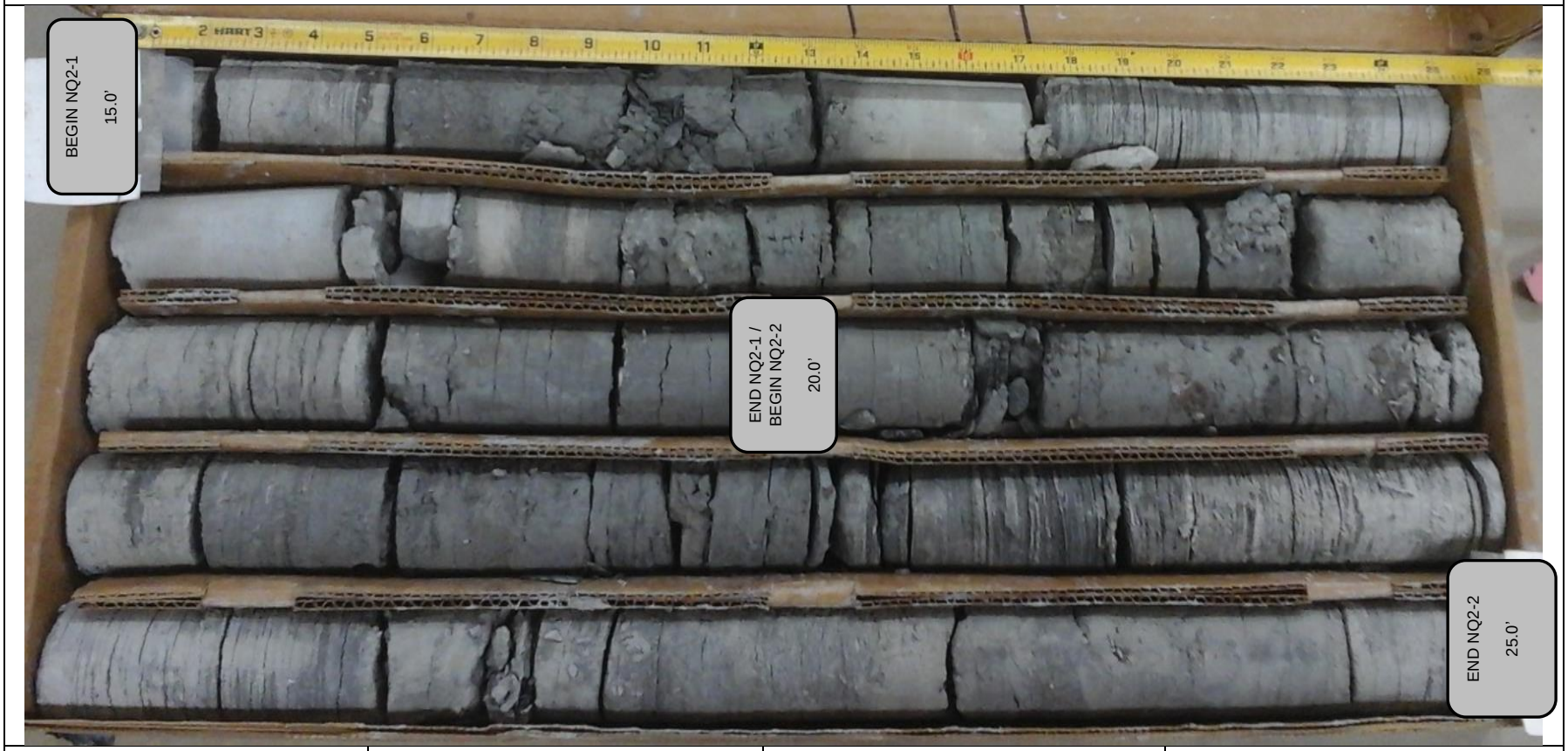
Remarks:

Post Test Sample Description : Type III—Retained specimen is exclusively small fragments.

APPENDIX D

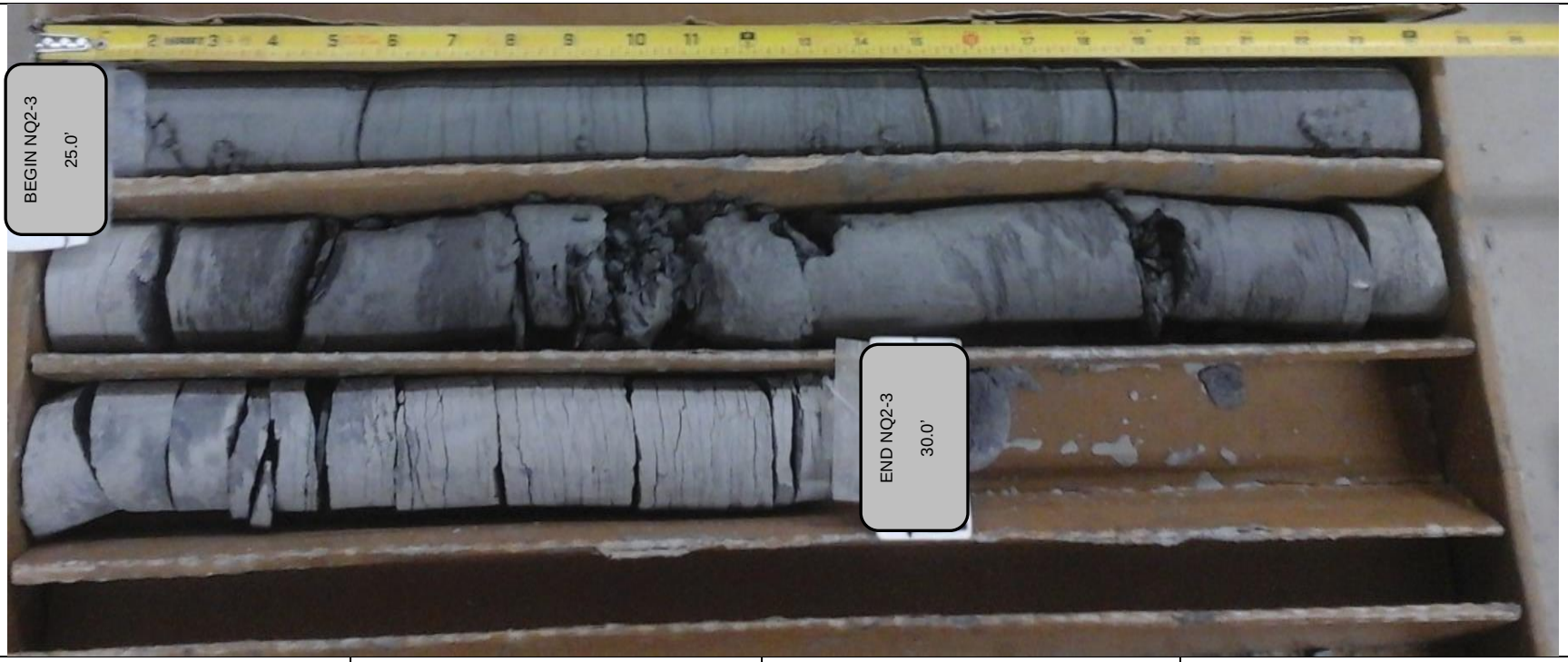
ROCK CORE PHOTOS

B-002-0-23



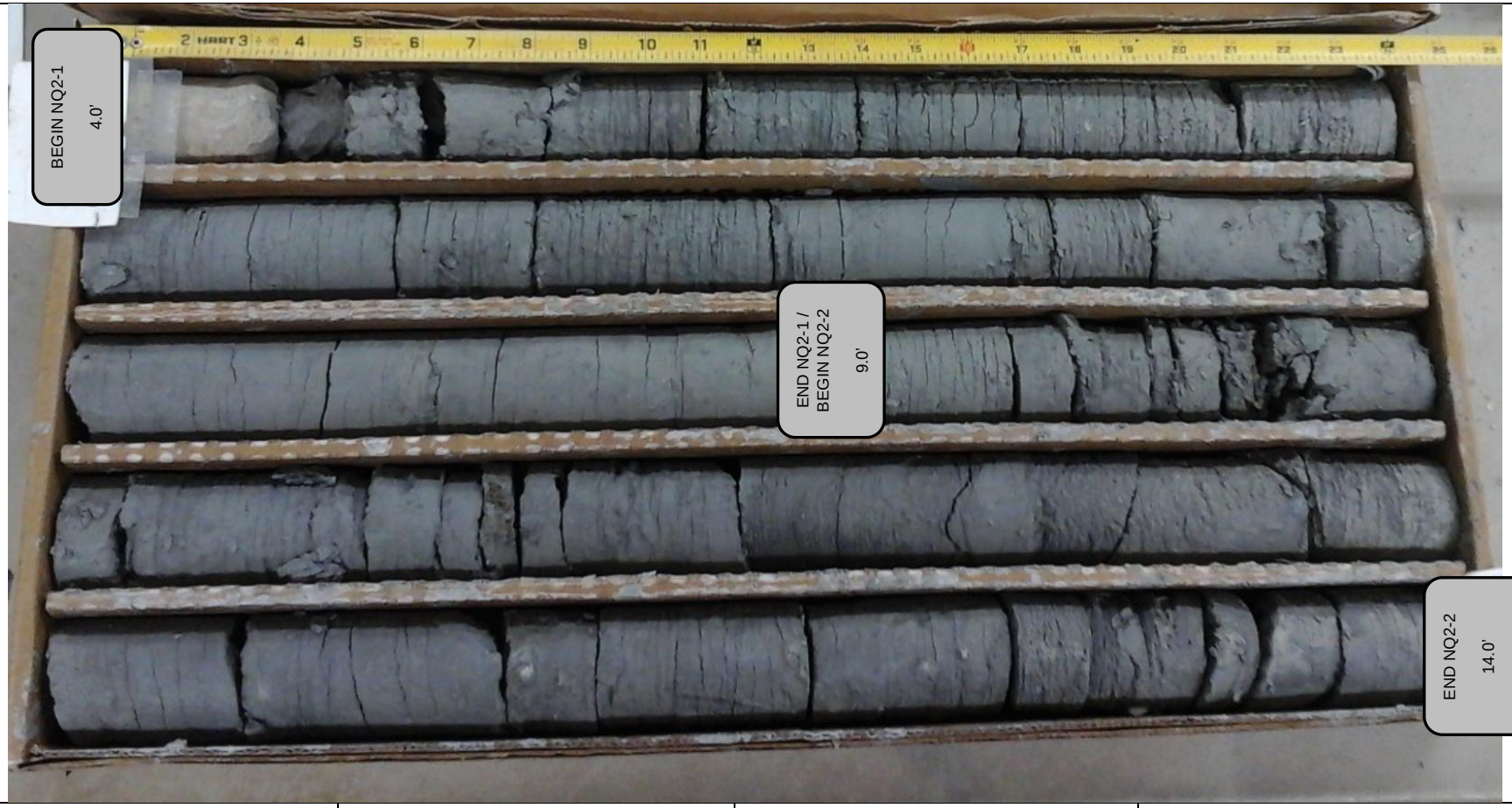
Run #:	Depth		Recovery (in)		RQD (in)	
NQ2-1	15.0’	20.0’	60/60	100%	28/60	47%
NQ2-2	20.0’	25.0’	60/60	100%	43.5/60	73%
PIK-TR428-0.04 PID: 117984						

B-002-0-23



Run #:	Depth		Recovery (in)		RQD (in)	
NQ2-3	25.0'	30.0'	60/60	100%	41.5/60	69%
PIK-TR428-0.04 PID: 117984						

B-003-0-23



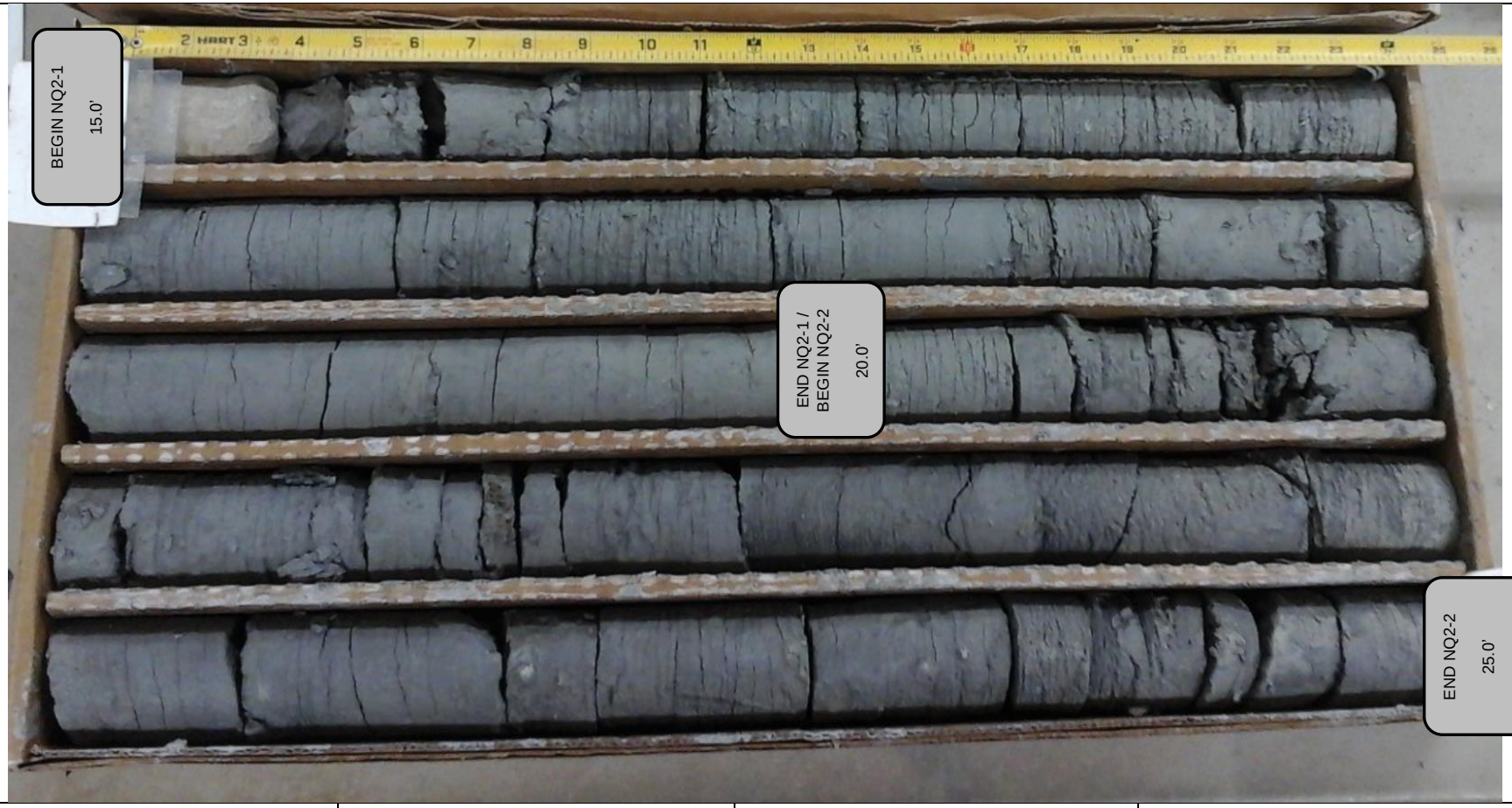
Run #:	Depth		Recovery (in)		RQD (in)	
NQ2-1	4.0’	9.0’	60/60	100%	45/60	75%
NQ2-2	9.0’	14.0’	60/60	100%	23/60	38%
PIK-TR428-0.04 PID: 117984						

B-003-0-23



Run #:	Depth		Recovery (in)		RQD (in)	
NQ2-3	14.0’	19.0’	43/60	72%	38.4/60	64%
PIK-TR428-0.04 PID: 117984						

B-004-0-23



Run #:	Depth		Recovery (in)		RQD (in)	
NQ2-1	15.0’	20.0’	60/60	100%	15/60	25%
NQ2-2	20.0’	25.0’	60/60	100%	5.5/60	9%
PIK-TR428-0.04 PID: 117984						

B-004-0-23



Run #:	Depth		Recovery (in)		RQD (in)	
NQ2-3	25.0’	30.0’	60/60	100%	16.5/60	28%
PIK-TR428-0.04 PID: 117984						

APPENDIX E

DRILLED SHAFT CALCULATIONS

Drilled Shaft - Tip Resistance

PIK-TR428-0.04
Rear Abutment

Boring No	B-002-0-23		
Top of Rock Elevation	681.3	feet	(From Boring)

LRFD Tip Resistance

Rock Layer Elevation	Unconfined Compressive Strength, $q_{u\,(1)}$ (psi)	Unconfined Compressive Strength, q_u (ksf)	Nominal Unit Tip Resistance, q_p (2) (ksf)	Resistance Factor, Tip Resistance (3)	Factored Unit Tip Resistance, q_p (ksf)
681.3'-677.0'	270	38.9	97.2	0.50	48.6
677.0'-666.3'	320	46.1	115.2	0.50	57.6

Reference Key

(1)	Compressive Strength of Shale (psi)=	270	(Compressive strength test result NQ-1, 15.4'-15.7')
	Compressive Strength of Shale (psi)=	320	(Compressive strength test result NQ-1, 19.3'-19.7')
(2)	AASHTO 10.8.3.5.4c-1		
(3)	AASHTO Table 10.5.5.2.4-1		

Drilled Shaft - Tip Resistance

PIK-TR428-0.04
Pier

Boring No	B-003-0-23		
Top of Rock Elevation	684.0	feet	(From Boring)

LRFD Tip Resistance

Rock Layer Elevation	Unconfined Compressive Strength, q_u (1) (psi)	Unconfined Compressive Strength, q_u (ksf)	Nominal Unit Tip Resistance, q_p (2) (ksf)	Resistance Factor, Tip Resistance (3)	Factored Unit Tip Resistance, q_p (ksf)
680.0'-669.4'	70	10.1	25.2	0.50	12.6
669.4'-665.0'	2840	409.0	1022.4	0.50	511.2

Reference Key

(1)	Compressive Strength of Shale (psi)=	70	(Compressive strength test result NQ-1, 7.9'-8.3')
	Compressive Strength of Shale (psi)=	2840	(Compressive strength test result NQ-3, 14.6'-15.0')
(2)	AASHTO 10.8.3.5.4c-1		
(3)	AASHTO Table 10.5.5.2.4-1		

Drilled Shaft - Tip Resistance

PIK-TR428-0.04
Forward Abutment

Boring No B-004-0-23
Top of Rock Elevation 681.3 feet (From Boring)

LRFD Tip Resistance

Rock Layer Elevation	Unconfined Compressive Strength, $q_{u\,(1)}$ (psi)	Unconfined Compressive Strength, q_u (ksf)	Nominal Unit Tip Resistance, q_p (2) (ksf)	Resistance Factor, Tip Resistance (3)	Factored Unit Tip Resistance, q_p (ksf)
681.3'-679.9'	2220	319.7	799.2	0.50	399.6
679.9'-666.3'	750	108.0	270.0	0.50	135.0

Reference Key

(1)	Compressive Strength of shale (psi)=	2220	(Compressive strength test result NQ-1, 15.0'-15.4')
	Compressive Strength of Shale (psi)=	750	(Compressive strength of weak rock as per ODOT GDM Table 400-6)
(2)	AASHTO 10.8.3.5.4c-1		
(3)	AASHTO Table 10.5.5.2.4-1		

APPENDIX F

LPILE PARAMETERS

L-PILE Parameters

Project: PIK-TR428-0.05 Beatty Road Bridge Replacement
Structure: Rear Abutment

Boring No	B-002-0-23
Bottom of Foundation Elevation	NA

From Bottom of Footing Elevation to 687.8 feet

Use Soil Type-	Sand (Reese)		
Effective Unit Weight =	125	pcf	GDM Table 400-4
Friction Angle=	32	Degrees	LRFD Table 10.4.6.2.4-1
k =	90	pci	From L-pile Table 3.6

From 687.8 to 681.3 feet

Use Soil Type-	Stiff Clay w/o Free Water (Reese)		
Effective Unit Weight =	62.6	pcf	GDM Table 400-4
Undrained Cohesion =	2700	psf	GDM 404.1
Strain Factor ε_{50} =	0.005		From L-pile Table 3.4
k =	1000	pci	From L-pile Table 3.3

From 681.3 to 666.3 feet

Use Rock Type-	Weak Rock (Reese)		
Effective Unit Weight =	81	pcf	Laboratory Test of B-002-0-23, NQ-1
Strain Factor K_{rm} =	0.00005		From L-pile
Compressive Strength q_u =	295	psi	Laboratory Test of B-002-0-23, NQ-1
Initial Rock Modulus =	26,313	psi	GDM Table 400-6, Weak Rock
RQD =	63%		B-002-0-23, Average RQD

L-PILE Parameters

Project: PIK-TR428-0.05 Beatty Road Bridge Replacement
Structure: Pier

Boring No	B-003-0-23
Bottom of Foundation Elevation	NA

From Bottom of Footing Elevation to 680.0 feet

Use Rock Type-	Weak Rock (Reese)		
Effective Unit Weight =	87.6	pcf	GDM Table 400-5, Weathered Shale
Strain Factor K_{rm} =	0.0005		From L-pile
Compressive Strength q_u =	55	psi	ODOT GDM Section 404.3
Initial Rock Modulus =	4930	psi	GDM Table 400-6, Very Weak Rock
RQD =	0%		Assumed

From 680.0 to 670.0 feet

Use Rock Type-	Weak Rock (Reese)		
Effective Unit Weight =	78.5	pcf	Laboratory Test of B-003-0-23, NQ-1
Strain Factor K_{rm} =	0.00005		From L-pile
Compressive Strength q_u =	70	psi	Laboratory Test of B-003-0-23, NQ-1
Initial Rock Modulus =	6,300	psi	GDM Table 400-6, Very Weak Rock
RQD =	56%		B-003-0-23, Average RQD

From 670.0 to 665.0 feet

Use Rock Type-	Weak Rock (Reese)		
Effective Unit Weight =	98.2	pcf	Laboratory Test of B-003-0-23, NQ-3
Strain Factor K_{rm} =	0.00005		From L-pile
Compressive Strength q_u =	2,840	psi	Laboratory Test of B-003-0-23, NQ-3
Initial Rock Modulus =	252,444	psi	GDM Table 400-6, Slightly Strong Rock
RQD =	64%		B-003-0-23, Average RQD

L-PILE Soil Parameters

Project: PIK-TR428-0.05 Beatty Road Bridge Replacement
Structure: Forward Abutment

Boring No	B-004-0-23
Bottom of Foundation Elevation	NA

From Bottom of Footing Elevation to 686.2 feet

Use Soil Type-	Sand (Reese)		
Effective Unit Weight =	128	pcf	GDM Table 400-4
Friction Angle=	34	Degrees	LRFD Table 10.4.6.2.4-1
k =	225	pci	From L-pile Table 3.6

From 686.2 to 681.3 feet

Use Soil Type-	Sand (Reese)		
Effective Unit Weight =	67.6	pcf	GDM Table 400-4
Friction Angle=	35	Degrees	LRFD Table 10.4.6.2.4-1
k =	125	pci	From L-pile Table 3.6

From 681.3 to 679.9 feet

Use Rock Type-	Weak Rock (Reese)		
Effective Unit Weight =	87.8	pcf	Laboratory Test of B-004-0-23, NQ-1
Strain Factor K_{rm} =	0.00005		From L-pile
Compressive Strength q_u =	2,220	psi	Laboratory Test of B-004-0-23, NQ-1
Initial Rock Modulus =	197,600	psi	GDM Table 400-6, Slightly Strong Rock
RQD =	52%		B-004-0-23, Average RQD

From 679.9 to 666.3 feet

Use Rock Type-	Weak Rock (Reese)		
Effective Unit Weight =	87.6	pcf	GDM Table 400-6, Weak Rock
Strain Factor K_{rm} =	0.00005		From L-pile
Compressive Strength q_u =	750	psi	GDM Table 400-6, Weak Rock
Initial Rock Modulus =	68,000	psi	GDM Table 400-6, Weak Rock
RQD =	20%		B-004-0-23, Average RQD

APPENDIX G

SUBGRADE ANALYSIS

OHIO DEPARTMENT OF TRANSPORTATION

OFFICE OF GEOTECHNICAL ENGINEERING

PLAN SUBGRADES
Geotechnical Design Manual Section 600

Instructions: Enter data in the shaded cells only.
(Enter state route number, project description,county, consultant's name, prepared by name, and date prepared. This information will be transferred to all other sheets. The date prepared must be entered in the appropriate cell on this sheet to remove these instructions prior to printing.)

PIK-TR428-0.04
PID 117984

<PROJECT DESCRIPTION - roadway length, number of bridges/culverts, type and length of other structures, type and length of geohazard>

CTL ENGINEERING, INC.

Prepared By: SR
Date prepared: Thursday, April 24, 2025

Shahedur Rahman
2860 Fisher Road
Columbus
OH 43204
614-276-8123
srahman@ctleng.com

NO. OF BORINGS: 2

#	Boring ID	Alignment	Station	Offset	Dir	Drill Rig	ER	Boring EL.	Proposed Subgrade EL	Cut Fill
1	B-001-0-23	TR 428	10+98	2	Lt	Mobile B-57 Track	77	697.8	696.8	1.0 C
2	B-005-0-23	TR 428	13+34	1	Lt	Mobile B-57 Track	77	693.5	692.5	1.0 C

OHIO DEPARTMENT OF TRANSPORTATION

Subgrade Analysis

V. 14.7 11/6/2024

#	Boring	Sample	Sample Depth		Subgrade Depth		Standard Penetration		HP (tsf)	Physical Characteristics						Moisture		Ohio DOT		Sulfate Content (ppm)	Problem		Excavate and Replace (Item 204)		Recommendation (Enter depth in inches)
			From	To	From	To	N_{60}	N_{60L}		LL	PL	PI	% Silt	% Clay	P200	M_C	M_{OPT}	Class	GI		Unsuitable	Unstable	Unsuitable	Unstable	
1	B	SS-1	1.0	2.5	0.0	1.5	31			NP	NP	NP	13	9	22	8	6	A-1-b	0	99					
	001-0	SS-2	2.5	4.0	1.5	3.0	20			NP	NP	NP	19	9	28	6	10	A-2-4	0	99					
	23	SS-3	4.0	5.5	3.0	4.5	22									9	10	A-2-4	0						
		SS-4	5.5	7.0	4.5	6.0	23	30								9	10	A-2-4	0						
2	B	SS-1	1.0	2.5	0.0	1.5	40		3	NP	NP	NP	14	6	20	7	6	A-1-b	0	360					
	005-0	SS-2	2.5	4.0	1.5	3.0	36		4.5	NP	NP	NP	19	9	28	11	10	A-2-4	0						
	23	SS-3	4.0	5.5	3.0	4.5	36									5	10	A-2-4	0						
		SS-4	5.5	7.0	4.5	6.0	41	30	4.5							12	16	A-6b	16						

OHIO DEPARTMENT OF TRANSPORTATION

Subgrade Analysis

V. 14.7 11/6/2024

PID: PID 117984

County-Route-Section: PIK-TR428-0.04

No. of Borings: 2

Geotechnical Consultant: CTL ENGINEERING, INC.

Prepared By: SR

Date prepared: 4/24/2025

Chemical Stabilization Options		
320	Rubblize & Roll	Option
206	Cement Stabilization	Option
	Lime Stabilization	No
206	Depth	NA

Excavate and Replace Stabilization Options	
Global Geotextile Average(N60L):	0"
Average(HP):	0"
Global Geogrid Average(N60L):	0"
Average(HP):	0"

Design CBR	10

% Samples within 3 feet of subgrade			
$N_{60} \leq 5$	0%	HP ≤ 0.5	0%
$N_{60} < 12$	0%	0.5 < HP ≤ 1	0%
$12 \leq N_{60} < 15$	0%	1 < HP ≤ 2	0%
$N_{60} \geq 20$	75%	HP > 2	25%
M+	0%		
Rock	0%		
Unsuitable Soil	0%		

Excavate and Replace at Surface	
Average	0"
Maximum	0"
Minimum	0"

% Proposed Subgrade Surface	
Unstable & Unsuitable	0%
Unstable	0%
Unsuitable (Soil & Rock)	0%

	N_{60}	N_{60L}	HP	LL	PL	PI	Silt	Clay	P 200	M_C	M_{OPT}	GI
Average	31	30	4.00	0	0	0	16	8	25	8	10	2
Maximum	41	30	4.50	0	0	0	19	9	28	12	16	16
Minimum	20	30	3.00	0	0	0	13	6	20	5	6	0

Classification Counts by Sample

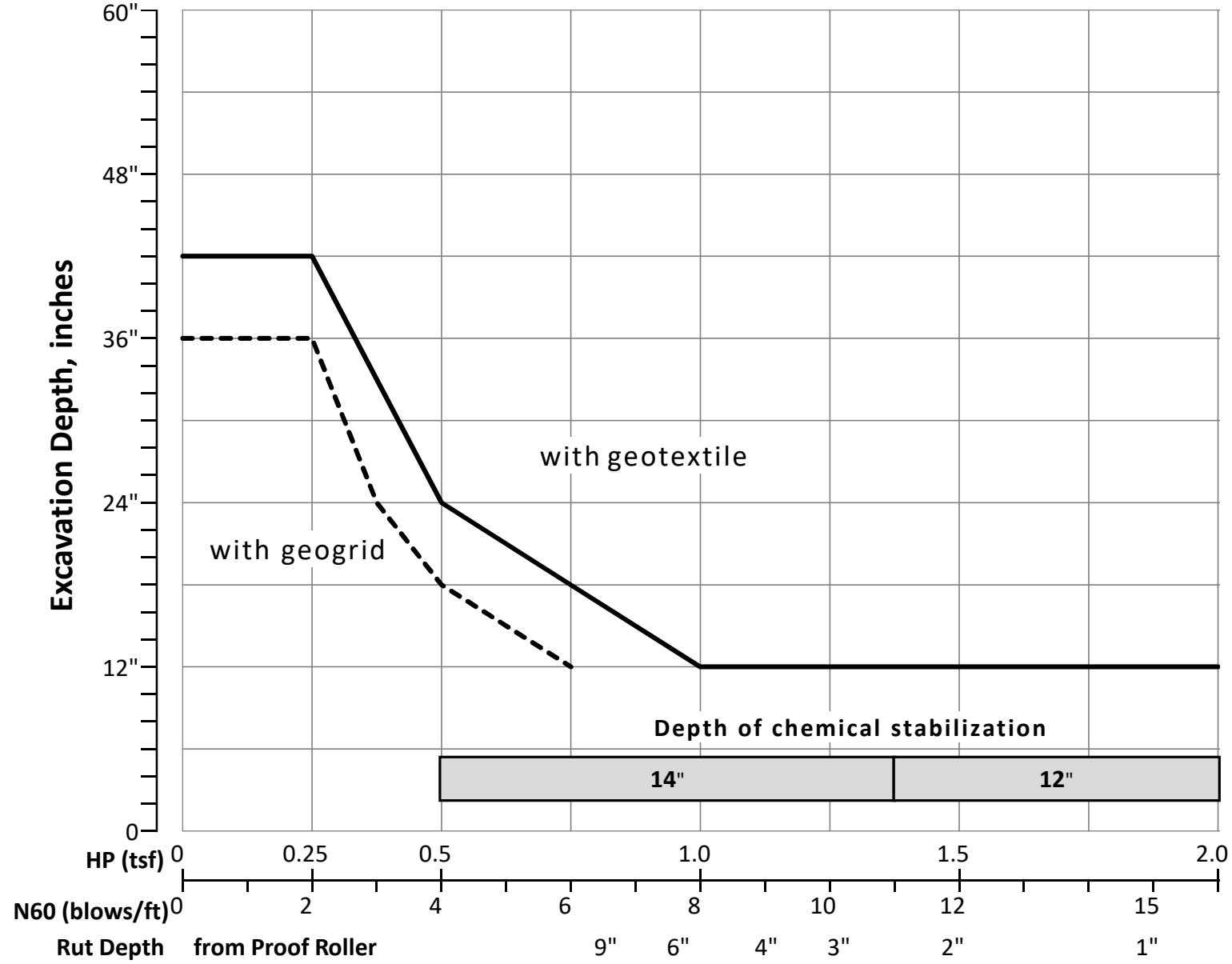
ODOT Class	UCF	Rock	A-1-a	A-1-b	A-2-4	A-2-5	A-2-6	A-2-7	A-3	A-3a	A-4a	A-4b	A-5	A-6a	A-6b	A-7-5	A-7-6	A-8a	A-8b	Totals
Count	0	0	0	2	5	0	0	0	0	0	0	0	0	0	1	0	0	0	0	8
Percent	0%	0%	0%	25%	63%	0%	0%	0%	0%	0%	0%	0%	0%	0%	13%	0%	0%	0%	0%	100%
% Rock|Granular|Cohesive	0%	0%	88%									13%								100%
Surface Class Count	0	0	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
Surface Class Percent	0%	0%	0%	50%	50%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%

OHIO DEPARTMENT OF TRANSPORTATION

Subgrade Analysis

V. 14.7 11/6/2024

Fig. 600-1 – Subgrade Stabilization



OVERRIDE TABLE

Calculated Average	New Values	Check to Override
4.00	0.50	☐ HP
30.00	6.00	☐ N60L

Average HP

Average N_{60L}

APPENDIX H

CTL RESPONSE TO COMMENTS

CTL Engineering, Inc.
2860 Fisher Road, P.O. Box 44548, Columbus, Ohio 43204-3538
Phone: 614/276-8123 Fax: 614/276-6377
Email: ctl@ctleng.com

April 2, 2026

Pike County Engineer's Office
502 Pike Street
Waverly, Ohio 45690

Attention: Mr. John C. Slone, P.E., P.S.
Pike County Engineer

Reference: Response to ODOT Comments - Structure Foundation Exploration Report
PIK-TR428-0.04 Beatty Road Bridge
PID No. 117984, Structure File No. 6633455
Pike County, Ohio
CTL Project No. 23050051COL

Dear Mr. Slone:

This letter provides our responses to the comments on the Geotechnical Report from ODOT for Stage 2 Compliance Submission. The comments were sent to CTL via email from Resource International personnel on March 5, 2026.

Geotechnical Report:

a. The geotechnical report should note whether historical plans or borings were available and the quality of the data. Based on a review of TIMS, none in the vicinity of the existing bridge were available.

CTL response: This information has already been included in the draft report under Section IV – Exploration.

b. Scour data presented on Table 3 (pp. 7 and 8) provides a D50, equivalent for a cohesive fine grained soil of 82.818. The current guidance from FHWA is that cohesion cannot be relied upon and for purposes of scour calculations a D50 of 0.20 mm shall be used for fine grained soils. While this is likely overly conservative, this should be considered for preliminary scour calculations.

CTL Response: The scour sample data for soil and bedrock has been revised in the final report in accordance with ODOT GDM Section 1302.

c. Per Table 4 (pp. 8) of the Report, the nominal tip resistance for the rear abutment (B-002-0-23) is calculated at 48.6 and 57.6 ksf, respectively. It is possible this will not be sufficient tip resistance for the proposed structural load (not made available yet). The District suggests once design has been finalized including rock socket length that an

additional Qu test may need to be taken at a deeper test depth to confirm Qu value that will be used in design.

CTL Response: The values presented in Table 4 were incorrectly labeled as nominal tip resistances in the draft report. These values actually represent factored unit tip resistances. The detailed calculations in Appendix E document the full calculation methodology and correctly distinguish between nominal and factored tip resistances.

The final report has been revised so that Table 5 now presents the nominal unit tip resistances, consistent with the values and procedures in Appendix E, while the factored resistances remain documented in Appendix E.

d. Based on boring log for B-004-0-23 (pp. 29), the shale rock starting at an elevation of about 679.9 has an RQD of 16% and is described as highly weathered and weak. The nominal tip resistance calculated on pp. 60 and summarized on Table 4 (pp. 8) was based on a Qu of 2220 psi of the upper layer of shale with an RQD of 52% and described as moderately weathered and slightly strong. We suggest confirming or providing a test for the nominal tip resistance for this weaker layer of bedrock.

CTL Response: We acknowledge the concern regarding the weaker shale layer encountered at approximately Elev. 679.9 at B-004-0-23. However, no suitable retained rock core samples are available from the current exploration program to perform additional laboratory testing. Therefore, for this weaker bedrock, we have used ODOT GDM Table 400-6 to estimate the rock strength based on the logged material description.

The nominal tip resistance for B-004-0-23 has been recalculated using this estimated strength and the tip resistance values for this location have been updated accordingly in the final report.

We appreciate the opportunity to be of service to you on this project. If you have any questions or need further information, please do not hesitate to contact us.

Respectfully submitted,

CTL Engineering, Inc.

Shahedur Rahman
Project Engineer

Sastry Malladi, P.E.
Project Engineer