

May 15, 2025

Korda
1650 Watermark Dr.
Columbus, Ohio USA 43215

Attention: Ms. Carol A. Boehm, PE
Senior Associate / Bridge Engineer

Reference: Structure Foundation Exploration- Final Report
ADA-247-(14.51) (15.56) Bridge Replacement
PID No. 93800
Oliver and Wayne Townships, Adams County, Ohio
CTL Project No. 23050024COL

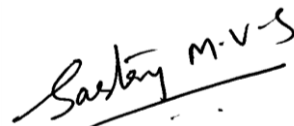
Dear Ms. Boehm:

CTL Engineering, Inc. has completed the Structure Foundation Exploration (SFE) report for the above referenced project. A Final Report is being submitted to the design team.

Thank you for the opportunity to work with you on this project. If you have any questions or need further information, please feel free to contact our office.

Respectfully Submitted

CTL ENGINEERING, INC.



Sastry Malladi, P.E.
Project Engineer

STRUCTURE FOUNDATION EXPLORATION FINAL REPORT

**ADA-247-(14.51) (15.56) BRIDGE REPLACEMENT
PID NO. 93800
OLIVER AND WAYNE TOWNSHIPS
ADAMS COUNTY, OHIO
CTL PROJECT NO. 23050024COL**

PREPARED FOR:

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May 15, 2025



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I. EXECUTIVE SUMMARY

The project designated as ADA-247-(14.51) (15.56) involves improvement of 0.17 miles of State Route 247 by replacement of two bridges in Adams County, Ohio. The two bridges are S.R. 247 over Cherry Fork (ADA-247-14.545) and S.R. 247 over Grace Run (ADA-247-15.597). The existing bridges are 3-span continuous steel beam bridges and were built in 1962. It is understood that the replacement bridges will be single span composite prestressed concrete wide flange I-beams with reinforced concrete deck and semi-integral abutments on drilled shaft foundations.

A total of ten (10) test borings, identified as B-001-0-23 through B-010-0-23, were performed for this project. Borings B-001-0-23 through B-005-0-23 were performed near the proposed ADA-247-14.545 structure, and B-006-0-23 through B-010-0-23 were performed near bridge ADA-247-15.597. The borings include one landslide boring (Type C5), three structure borings (Type E1), and one pavement boring (Type A) for each structure. The borings were performed between October 3 and October 17, 2023. The borings were extended to depths ranging from of 7.0 to 30.0 feet below grade.

The borings generally exhibited layers of gravel and/or stone fragments with sand, silt and clay (A-2-7), silt and clay (A-6a), silty clay (A-6b), or clay (A-7-6) extending down to the drilled depths or top of rock. Beneath the soil overburden, the borings B-001-0-23 through B-004-0-23 near the bridge ADA-247-14.545 encountered top of bedrock at depths ranging from 1.0 to 14.5 feet below ground corresponding to elevations ranging from 772.6 to 782.7 feet. The borings B-006-0-23 through B-009-0-23 near the bridge ADA-247-15.597 encountered top of bedrock at depths ranging from 3.0 to 14.0 feet below ground corresponding to elevations ranging from 765.5 to 775.4 feet. Rock coring was performed below augerable rock layer. The rock was described as shale or interbedded shale and limestone.

Historic auger boring information indicate the presence of cohesive soils overlying shallow bedrock near both structure locations. Auger refusal on bedrock was encountered near bridge ADA-247-14.545 and ADA-247-15.597 at depths 786.4 and 772.1 feet respectively. The bedrock was described as limestone.

Free water was noted in borings B-002-0-23, B-003-0-23 and B-007-0-23 at elevation 774.8, 773.9 and 769.5 feet, respectively.

Based upon the soil and rock information obtained from the current and historic boring data, it is CTL's opinion that the proposed bridges can be supported onto drilled shafts socketed into the underlying bedrock. Please refer to the Analyses and Recommendations section for additional information.

II. INTRODUCTION

The project designated as ADA-247-(14.51) (15.56) involves improvement of 0.17 miles of State Route 247 by replacement of two bridges in Adams County, Ohio. The two bridges are S.R. 247 over Cherry Fork (ADA-247-14.545) and S.R. 247 over Grace Run (ADA-247-15.597). The existing bridges are 3-span continuous steel beam bridges and were built in 1962. It is understood that the proposed replacement bridges will be single span composite prestressed concrete wide flange I-beams with reinforced concrete deck and semi-integral abutments on drilled shaft foundations. The work also includes minimal roadway approach reconstruction.

This is a Final Structure Foundation Exploration Report.

III. GEOLOGY AND OBSERVATIONS OF THE PROJECT

According to the Ohio Department of Natural Resources (ODNR), Physiographic Regions of Ohio map, the project areas are located within the Dissected Illionian Till Plain region, which is in Till Plains section of Ohio. This region is characterized by hilly former till plain in which glacial deposits have been eroded from valley sides. The geology of this region includes Illionian-age till, slopes of bedrock and till-derived colluvium.

According to the Bedrock Geologic Map of Ohio (2006), the underlying bedrock within the project areas are mapped as Ordovician age Preacherville Member of the Drakes Formation, Waynesville and Arnheim Formation. The underlying bedrocks are shale, limestone, and dolomite, interbedded.

According to the ODNR website, no mapped deep mines are located within the project areas. According to ODNR's karst interactive map website, there are no mapped karst features within the project areas. However, there are several karst – field verified and suspect features mapped within 0.5-mile radius of the proposed bridge sites.

According to the web-based mapping from United States Department of Agriculture, Natural Resources Conservation Service, the near-surface soils within the project areas primarily consist Nolin silt loam, 0 to 3 percent slopes, occasionally flooded (No). According to the *Soil Survey of Adams County, Ohio*, these soils are considered low risk for concrete and steel corrosion, and exhibit moderately high to high permeability.

A most recent site visit was performed by an engineer from CTL on March 23, 2023. The existing bridges are 3-span continuous steel beam structures. Both structures have major deterioration present on the edges of the decks, especially at the guardrail anchors. The abutments and beam seats are severely spalled, and the backwalls exhibit significant staining and cracking. A minor slope stability issue was observed near the left side of

rear abutment of ADA-247-15.597 bridge over Grace Run. The existing ditch has become stream-like and migrated toward and scoured away a portion of the embankment.

The surrounding land use of the project areas was noted as being wooded and agricultural.

IV. EXPLORATION

A total of ten (10) test borings, identified as B-001-0-23 through B-010-0-23, were performed for this project. Borings B-001-0-23 through B-005-0-23 were performed near bridge ADA-247-14.545, and B-006-0-23 through B-010-0-23 were performed near bridge ADA-247-15.597. The borings include one landslide boring (Type C5), three structure borings (Type E1), and one pavement boring (Type A) for each structure. The borings were performed between October 3 and October 17, 2023. The borings were extended to depths ranging from of 7.0 to 30.0 feet below grade.

The borings were performed with a track mounted drill rig utilizing 3.25-inch inside diameter (I.D) hollow stem augers (HSA). Standard Penetration Tests (SPTs) were conducted using a 140-pound automatic hammer, falling 30 inches, to drive 2-inch outside diameter (O.D) split barrel samplers. Rock coring was performed where rock was encountered in the borings using an NQ-size core barrel. The hammer system used was calibrated on May 3, 2023. The energy transfer ratio associated with the automatic SPT hammer was 76.8 percent.

Soil samples obtained were preserved in glass jars, visually classified in the field and laboratory, and tested for natural moisture content. Representative soil samples were subjected to laboratory testing including grain size distribution and Atterberg limits.

Rock from the coring operation was visually classified. The Rock Quality Designation (RQD) and percent core loss values were determined. Representative samples of the recovered rock were subjected to compressive strength, point load and slake durability testing.

Ground surface elevations, Northings, Eastings, Station, and Offset information of the test boring locations were provided by personnel from Korda.

Historic auger boring records were obtained from ODOT's Transportation Information Mapping System (TIMS) for ADA-247-14.25, performed in 1960 along the centerline of the S.R. 247. The historic auger borings were performed near the forward abutment of existing bridge over Cherry Fork and near the rear abutment of existing bridge over Grace Run and designated as H-001-0-60 and H-002-0-60, respectively. All historic auger boring elevations were corrected to datum shift from National Geodetic Vertical Datum of 1929 (NGVD 29) to North American Vertical Datum of 1988 (NAVD 88).

V. FINDINGS

Boring B-001-0-23, B-005-0-23, B-006-0-23 exhibited 9 inches of asphalt overlying 5 to 11 inches of aggregate base at the surface. Boring B-010-0-23 encountered 2 inches of asphalt overlying 15 inches of concrete. Below the surface cover or from the surface, the borings generally exhibited layers of gravel and/or stone fragments with sand, silt and clay (A-2-7), silt and clay (A-6a), silty clay (A-6b), or clay (A-7-6) extending down to the drilled depths or top of rock. The soils exhibited the SPT N_{60} values ranging from 0 blows per foot (bpf) (weight of hammer), to 50 blows for 1 inch of penetration, with natural moisture content values ranging from 6 to 32 percent. The near surface soils encountered to depths ranging from 5.5 to 10 feet in borings B-001-0-23 & B-005-0-23; and the near surface soils encountered to depths ranging from 7.0 to 10.0 feet in borings B-006-0-23 & B-010-0-23 were further identified as fill materials.

Beneath the soil overburden, borings B-001-0-23 through B-004-0-23, drilled near bridge ADA-247-14.545, encountered top of bedrock at depths ranging from 1.0 to 14.5 feet below grade, and elevations ranging from 772.6 to 782.7 feet. Borings B-006-0-23 through B-009-0-23, drilled near bridge ADA-247-15.597, encountered top of bedrock at depths ranging from 3.0 to 14.0 feet below grade, and elevations ranging from 765.5 to 775.4 feet. Rock coring was performed below the augerable rock layer. The rock was described as shale or interbedded shale and limestone. The rock cores exhibited rock quality designation (RQD) values ranging from 0 to 63 percent, with core recovery values ranging from 40 to 100 percent.

Unconfined Compressive Strength (UCS), point load and Slake Durability Index (SDI) testing were performed on selected bedrock core samples representative of the bedrock units. Table 1 shows the results of these tests.

Table 1. Rock Test Results

Boring ID	Sample Elevation (Feet)	Sample Depth (Feet)	Sc (PSI)	Qu (PSI)	SDI (%)	Lithology
B-001-0-23	768.9-768.4	23.2-23.7		10,570		Limestone
B-002-0-23	765.8-765.2	13.0-13.6		580		Shale
	759.2-758.8	19.6-20.0		2,370		Limestone
B-003-0-23	772.6-767.6	1.0-6.0			57.2	Shale
	770.6-770.2	3.0-3.4		140		Shale
	764.9-764.5	8.7-9.1		210		Shale
B-004-0-23	782.7-777.7	4.5-9.5			87.2	Shale
	777.2-776.7	10.0-10.5		120		Shale
	768.7-768.2	18.5-19.0		2,880		Limestone
B-006-0-23	771.9-771.4	15.4-15.9		3,420		Limestone
B-007-0-23	759.6-759.2	19.9-20.3		220		Shale
	756.7-756.3	22.8-23.2		3,110		Limestone
	750.5-750.0	29.0-29.5		2,470		Shale
B-008-0-23	765.7-760.7	4.0-9.0	1,432		43.8	Shale
	760.7-755.7	9.0-14.0	3,596			Limestone
B-009-0-23	771.9-766.9	7.5-12.5			64.0	Shale
	763.4-763.0	16.0-16.4		1,170		Shale
	760.0-759.6	19.4-19.8		1,340		Shale

Sc= Point load strength value, ASTM D5731

Qu= Unconfined compressive strength test, ASTM D7012

SDI= Slake durability test, ASTM D4644

Free water was noted in borings B-002-0-23, B-003-0-23 and B-007-0-23 at elevation 774.8, 773.9 and 769.5 feet, respectively.

Historic auger borings indicated that predominantly cohesive soils are present before encountering the auger refusal on the underlying bedrock. According to the historic records, the top of rock elevations in H-001-0-60 and H-002-0-60 are 786.4 and 772.1 feet, respectively.

VI. ANALYSES AND RECOMMENDATIONS

Based on the soil and rock data obtained from the field and laboratory testing, the following recommendations are provided for the proposed structures.

A. Subgrade Considerations

A subgrade analysis was performed for the approach roads of the proposed bridges ADA-247-14.545 and ADA-247-15.597. The subgrade analysis was performed utilizing the subsurface information from the borings near the proposed structures and ODOT Geotechnical Design Manual (GDM) Section 600. A copy of the Subgrade Analysis spreadsheet is provided in Appendix E. A proposed pavement thickness of 1.5 feet was assumed for estimating cut/fill in the Subgrade Analysis spreadsheet.

Based on the requirements outlined in the GDM Section 600, it is estimated that subgrade stabilization will be required within the project limits. The subgrade stabilization may consist of excavate and replace per Item 204. The estimated depth of subgrade stabilization is summarized in Table 2.

The approximate depth of excavate and replace is measured from the top of the proposed pavement subgrade level. It should be noted that the location and depth of subgrade stabilization provided below is only an estimate. The actual depths and horizontal limits of excavate and replace will be determined by the Project Engineer in the field based upon proofrolling.

Table 2. Excavate and Replace Depths

Structure	Limits	Average Depth of Excavate and Replace (inches)
ADA-247-14.545	Begin Project to End Approach Slab (Sta. 767+98.24)	12
ADA-247-15.597	Begin Project to End Approach Slab (Sta. 823+53.86)	21
	Begin Approach Slab (Sta. 824+44.75) to End Project	12

Unsuitable soils that exhibited a high liquid limit value (LL>65) were encountered at the proposed subgrade level in boring B-005-0-23 drilled near the forward abutment of bridge ADA-247-14.545. According to the ODOT GDM Section 610, these soils should be completely removed or excavated to 36 inches below subgrade level, whichever is less. The excavation should be replaced with



Item 204 material if the entire depth of the material is removed; otherwise replace with granular material.

For estimating purposes, it can be assumed that these unsuitable soils will need to be removed from locations and depths summarized below.

Table 3. Estimated Unsuitable Soil Replacement

Structure	Approximate Limits	Approximate Depth Excavate and Replace (inches)
ADA-247-14.545	Approach Slab (Sta. 769+18.43) to End Project	30

As an alternative to undercutting the unsuitable soils indicated in Table 3, or the excavate and replace in Table 2, chemical stabilization using lime would be an option for this project. Per Subgrade Analysis spreadsheet, the recommended depth for chemical stabilization is 14 inches. However, per ODOT GDM Section 610, appropriate laboratory testing should be performed to confirm if the soils with high liquid limit (LL>65) are suitable for chemical stabilization.

However, based on the short project length, chemical stabilization may not be a feasible option for this project.

The natural moisture content values of the near surface soil samples ranged from 6 to 30 percent, averaging 23 percent. The estimated optimum moisture content (OMC) value was 19 percent. On average, the natural moisture content values were 4 percent higher than the estimated optimum moisture content values.

Group Index values were calculated for the samples tested in the upper 2.5 feet of the proposed subgrade. Group Index values ranged from 3 to 20, averaging 15. This average Group Index value corresponds to an estimated California Bearing Ratio (CBR) value of 4.0 percent. The approach pavements for this project may be designed using a CBR value of 4.0.

B. Embankment Stability

Sidehill fills are planned on both sides of the bridge approach areas. According to the cross-section sheets provided, sidehill fills will be placed on the face of the existing slopes.

At Sta. 767+68.24 of the ADA-14.545 structure, the slope height of the sidehill fills are slightly taller than 10 feet. The slope heights of the sidehill fills in other areas of the project are less than 10 feet.



Therefore, global stability analyses were performed near the rear approach area of ADA-247-14.545 structure at Sta. 767+68.24 (critical section).

The stability of the slopes was evaluated using the SLIDE program. The SLIDE program is based on two-dimensional limit equilibrium methods in which the calculation of the factor of safety against instability of a slope is performed by the method of slices. The method used was the Morgenstern-Price method for surfaces of a non-circular shape. The soil parameters used in the analysis are based on the subsurface conditions encountered in the borings, laboratory test results, and ODOT’s Office of Geotechnical Engineering (OGE) criteria for embankment construction.

Stability analyses were performed for both long term and short term or undrained conditions. The long-term condition is designated as Effective Stress (ES) and the short term or undrained condition is designated as Total Stress (TS) in the slope stability models. Results of the stability analysis are submitted in graphical form in Appendix F, and the results are summarized in Table 4.

Table 4: Global Stability Analysis Results

Structure/ Station	Case	Calculated Factor of Safety	Minimum Required Factor of Safety	Capacity to Demand Ratio
ADA-247-14.545/ 767+68.24	ES (left side)	1.7	1.3	0.8
	TS (left side)	5.0		0.3
	ES (right side)	1.6		0.8
	TS (right side)	4.2		0.3

Results of the stability analysis for each case considered yielded acceptable factor of safety values. Therefore, the proposed sidehill fills are considered safe against global stability.

According to ODOT GDM section 800, when sidehill fills are planned on the face of an existing slope which is steeper than 4 horizontal to 1 vertical (H:V), then special benching (as detailed in the ODOT Construction Inspection Manual of Procedures, Section 203.05, “Benching”) is recommended to assure the embankment is “knitted” together. Therefore, special benching is recommended within the project areas where the existing slopes are steeper than 4H:1V. The special benching should follow Figures 800-1 through 800-4 of the ODOT GDM.

As mentioned previously, a minor slope stability issue was observed near the left side of the embankment behind the rear abutment of ADA-247-15.597 bridge over Grace Run. The existing ditch has become stream-like and migrated toward



and scoured away a portion of the embankment. Therefore, in addition to the special benching, CTL recommends placing rock channel protection (RCP) near the proposed ditch planned on the left side of rear abutment approach area of ADA-247-15.597 structure.

C. Bridge - Scour Data

For the purpose of scour analysis, the mean particle grain size (D_{50}), critical shear stress (τ_c) and erosion category (EC) of the creek bed materials were determined according to ODOT Geotechnical Design Manual (GDM) Section 1302. The scour data for the proposed structures are shown in Table 5 and Table 6.

Table 5. Scour Data (ADA-247-14.545)

Boring No.	Sample ID	Elevation (feet)	D_{50} (mm)	τ_c (psf)	$D_{50, equiv}$ (mm)	Erosion Category (EC)
B-002-0-23 (Rear Abutment)	SS-1	778.8-777.3	0.0139	0.3456	16.549	3.413
	SS-4	774.3-772.8	N/A	0.8467	40.532	3.761
	NQ-1	772.8-767.8	N/A	42.361	2028	3.761
	NQ-2	767.8-762.8	N/A	51.338	2458	3.761
B-004-0-23 (Forward Abutment)	NQ-1	782.7-777.7	N/A	1.0355	49.571	3.761
	NQ-2	777.7-772.7	N/A	15.818	757	3.761

Table 6. Scour Data (ADA-247-15.597)

Boring No.	Sample ID	Elevation (feet)	D_{50} (mm)	τ_c (psf)	$D_{50, equiv}$ (mm)	Erosion Category (EC)
B-007-0-23 (Rear Abutment)	SS-4	775.0 to 773.5	0.0078	0.2656	12.716	3.550
	SS-8	765.5-764.5	N/A	0.4500	21.542	3.761
	NQ-1	764.5-762.5	N/A	1.7435	83.459	3.761
	NQ-2	762.5-757.5	N/A	34.869	1669	3.761
B-009-0-23 (Forward Abutment)	SS-1	779.4 to 777.9	0.0092	0.3599	17.230	3.775
	SS-2	777.9 to 776.4	0.0190	0.2988	14.308	3.775
	SS-4 & 5	775.4-771.9	N/A	0.5843	27.970	3.761
	NQ-1	771.9-766.9	N/A	28.638	1371	3.761
	NQ-2	766.9-761.9	N/A	57.276	2742	3.761

D. Bridge - Foundation Support

Based upon the soil and rock information obtained from the current and historic boring data, it is CTL’s opinion that the proposed bridges can be supported onto drilled shaft foundations socketed into the underlying bedrock. Based on the laboratory test results performed on the recovered rock samples along with requirements outlined in the BDM section 305.2.1.2.b, the underlying rock is considered as non-scour resistant. Per ODOT BDM Section 305.4.1.1, if the underlying rock is non-scour resistant then the drilled shafts should penetrate a minimum of 10-ft below the controlling scour elevation in the bedrock. Controlling scour elevation for design flood and check flood conditions for both structure locations were provided to CTL by Korda.

The drilled shaft foundations may be proportioned using a nominal unit tip resistance value not exceeding those provided in Table 7 and Table 8 for both structures.

Table 7: Nominal Unit Tip Resistance (ADA-247-14.545)

Location	Bottom of Pier Cap Elevation	Boring No.	Top of Bedrock Elevation (Feet)	Scour Elevation (feet)	Rock Socket Length (feet)	Nominal Unit Tip Resistance, q_p (ksf)
Rear Abutment	777.93	B-002-0-23	774.3	772.8	11.5	369.9
Forward Abutment	781.74	B-004-0-23	782.7	777.7	14.0	291.6

Table 8: Nominal Unit Tip Resistance (ADA-247-15.597)

Location	Bottom of Pier Cap Elevation	Boring No.	Top of Bedrock Elevation (Feet)	Scour Elevation (feet)	Rock Socket Length (feet)	Nominal Unit Tip Resistance, q_p (ksf)
Rear Abutment	771.37	B-007-0-23	765.5	764.4	11.1	339.3
Forward Abutment	772.39	B-009-0-23	775.4	771.9	10.5	641.7

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.

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).



Additionally, capacity can be achieved along the shafts using side resistance. Unfactored unit side resistance values are provided in Table 9 and Table 10. Side resistance within soil overburden and upper portion of the rock socket should be neglected as outlined in ODOT BDM section 305.4.2.

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.

Table 9: Unfactored Unit Side Resistance (ADA-247-14.545)

Location	Bottom of Pier Cap Elevation	Scour Elevation (feet)	Boring No.	Elevation (feet)	Nominal Unit Side Resistance, q_s (ksf)
Rear Abutment	777.93	772.8	B-002-0-23	772.8 to 762.8	17.7
Forward Abutment	781.74	777.7	B-004-0-23	777.7 to 767.7	15.7

Table 10: Unfactored Unit Side Resistance (ADA-247-15.597)

Location	Bottom of Pier Cap Elevation	Scour Elevation (feet)	Boring No.	Elevation (feet)	Nominal Unit Side Resistance, q_s (ksf)
Rear Abutment	771.37	764.4	B-007-0-23	764.4 to 754.4	17.0
Forward Abutment	772.39	771.9	B-009-0-23	771.9 to 761.9	22.5

The resistance factors in Table 11 should be used for Shaft Side Resistance. The resistance factors were obtained from AASHTO Table 10.5.5.2.4-1.

Table 11. Resistance Factors for Shaft Side Resistance

Material Type	Resistance Factors	
	Compressive	Uplift
Rock	0.55	0.40

The drilled shaft tip and side resistance calculations are provided in Appendix G.

Due to potential for long term scour, the drilled shafts for the proposed abutments will likely have to stand cantilevered over some distance. It is understood that Korda has analyzed the drilled shafts for deflections due to lateral loading considering the expected long-term scour depths. They have notified us that the deflections were within the acceptable limits when the drilled shafts are extended

to the rock socket lengths indicated in Tables 7 and 8 above.

E. Lateral Parameters

Please refer to Appendix H for the Lpile parameters which can be utilized while performing lateral pile analysis.

F. General Construction and Earthwork

1. Site preparation and earthwork should be performed in accordance with the ODOT Construction and Material Specifications and applicable Geotechnical Bulletins.
2. The embankment side slopes should be protected from erosion to limit sloughing and slope failure.
3. Temporary excavations in excess of 4 feet in depth should be sloped or shored according to OSHA requirements.

VII. 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 Engineering should be notified so that our recommendations can be modified, if required.

VIII. TESTING AND OBSERVATION

During the design process, it is recommended that CTL Engineering 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 Engineering 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 Engineering is not retained for these services, CTL shall assume no responsibility for compliance with the design concepts or recommendations provided.

IX. CLOSING

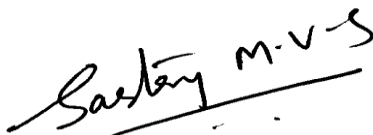
This report has been prepared for the exclusive use by the client for use only on this project. Our services have been performed in accordance with generally accepted Geotechnical Engineering principles and practices. No warranty is either expressed or implied.

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.



Sastry Malladi, P.E.
Project Engineer



Shahedur Rahman
Geotechnical Engineer



Joe Grani, P.E.
Project Engineer

APPENDIX A
GEO TECHNICAL PROFILE BRIDGE



PROJECT DESCRIPTION

THE PROJECT DESIGNATED AS ADA-247-(14.51)(15.56) INVOLVES IMPROVEMENT OF 0.17 MILES OF STATE ROUTE 247 BY REPLACEMENT OF TWO BRIDGES IN ADAMS COUNTY, OHIO. THE TWO BRIDGES ARE S.R. 247 OVER CHERRY FORK (ADA-247-14.545) AND S.R. 247 OVER GRACE RUN (ADA-247-15.597).

HISTORIC RECORDS

HISTORIC AUGER BORING RECORDS WERE OBTAINED FROM ODOT'S TRANSPORTATION INFORMATION MAPPING SYSTEM (TIMS) FOR ADA-247-14.25, PERFORMED IN 1960 ALONG THE CENTERLINE OF THE S.R. 247. THE HISTORIC AUGER BORINGS WERE PERFORMED NEAR THE FORWARD ABUTMENT OF EXISTING BRIDGE OVER CHERRY FORK AND NEAR THE REAR ABUTMENT OF EXISTING BRIDGE OVER GRACE RUN AND DESIGNATED AS H-001-0-60 AND H-002-0-60, RESPECTIVELY. RESULTS OF THE EXPLORATIONS INDICATED THAT PREDOMINANTLY COHESIVE SOILS ARE PRESENT BEFORE SHALLOW REFUSAL TO LIMESTONE BEDROCK. ACCORDING TO THE HISTORIC RECORDS, THE TOP OF ROCK ELEVATIONS IN H-001-0-60 AND H-002-0-60 ARE 786.4 AND 772.1 FEET, RESPECTIVELY. ALL HISTORIC AUGER BORING ELEVATIONS WERE CORRECTED TO DATUM SHIFT FROM NATIONAL GEODETIC VERTICAL DATUM OF 1929 (NGVD 29) TO NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88).

GEOLOGY

ACCORDING TO THE OHIO DEPARTMENT OF NATURAL RESOURCES (ODNR), PHYSIOGRAPHIC REGIONS OF OHIO MAP, THE PROJECT AREAS ARE LOCATED WITHIN THE DISSECTED ILLIONIAN TILL PLAIN REGION, WHICH IS IN TILL PLAINS SECTION OF OHIO. THIS REGION IS CHARACTERIZED BY HILLY FORMER TILL PLAIN IN WHICH GLACIAL DEPOSITS HAVE BEEN ERODED FROM VALLEY SIDES. THE GEOLOGY OF THIS REGION INCLUDES ILLIONIAN-AGE TILL, SLOPES OF BEDROCK AND TILL-DERIVED COLLUVIUM.

ACCORDING TO THE BEDROCK GEOLOGIC MAP OF OHIO (2006), THE UNDERLYING BEDROCK WITHIN THE PROJECT AREAS ARE MAPPED AS ORDOVICIAN AGE PREACHERVILLE MEMBER OF THE DRAKES FORMATION, WAYNESVILLE AND ARNHIM FORMATION. THE UNDERLYING BEDROCKS ARE SHALE, LIMESTONE, AND DOLOMITE, INTERBEDDED.

RECONNAISSANCE

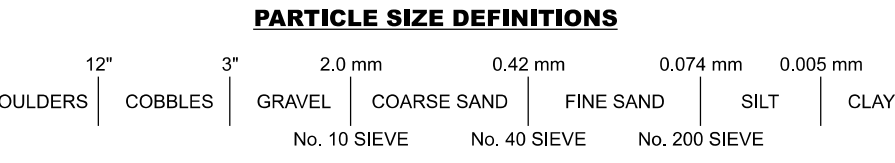
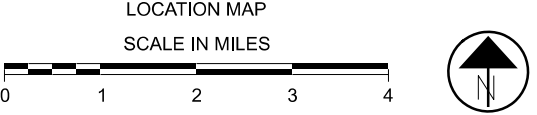
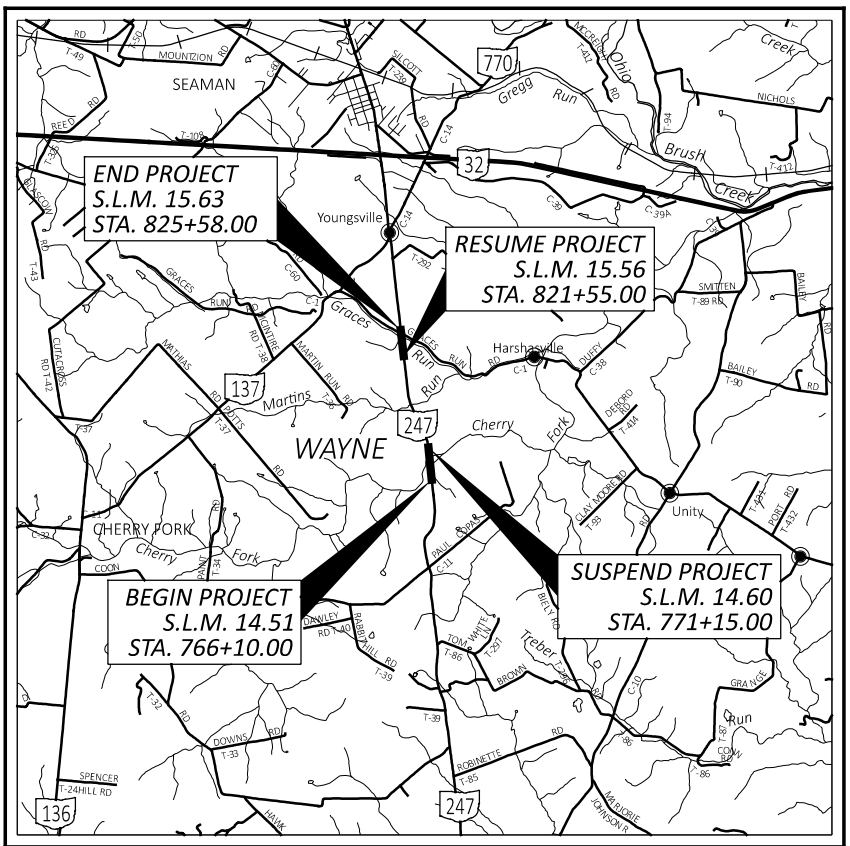
A MOST RECENT SITE VISIT WAS PERFORMED BY AN ENGINEER FROM CTL ON MARCH 23, 2023. THE EXISTING BRIDGES ARE 3-SPAN CONTINUOUS STEEL BEAM STRUCTURES. BOTH STRUCTURES HAVE MAJOR DETERIORATION PRESENT ON THE EDGES OF THE DECKS, ESPECIALLY AT THE GUARDRAIL ANCHORS. THE ABUTMENTS AND BEAM SEATS ARE SEVERELY SPALLED, AND THE BACKWALLS EXHIBIT SIGNIFICANT STAINING AND CRACKING. A MINOR SLOPE STABILITY ISSUE WAS OBSERVED NEAR THE LEFT SIDE OF REAR ABUTMENT OF ADA-247-15.597 BRIDGE OVER GRACE RUN. THE EXISTING DITCH HAS BECOME STREAM-LIKE AND MIGRATED TOWARD AND SCOURED AWAY A PORTION OF THE EMBANKMENT. THE SURROUNDING LAND USE OF THE PROJECT AREAS WAS NOTED AS BEING WOODED AND AGRICULTURAL.

SUBSURFACE EXPLORATION

A TOTAL OF TEN (10) TEST BORINGS, IDENTIFIED AS B-001-0-23 THROUGH B-010-0-23, WERE PERFORMED FOR THIS PROJECT. BORINGS B-001-0-23 THROUGH B-005-0-23 WERE PERFORMED NEAR BRIDGE ADA-247-14.545, AND B-006-0-23 THROUGH B-010-0-23 WERE PERFORMED NEAR BRIDGE ADA-247-15.597. THE BORINGS INCLUDE ONE LANDSLIDE BORING (TYPE C5), BY THREE STRUCTURE BORINGS (TYPE E1), AND ONE PAVEMENT BORING (TYPE A) FOR EACH STRUCTURE. THE BORINGS WERE PERFORMED BETWEEN OCTOBER 3 AND OCTOBER 17, 2023. THE BORINGS WERE EXTENDED TO DEPTHS RANGING FROM 7.0 TO 30.0 FEET BELOW GRADE.

THE BORINGS WERE PERFORMED WITH A TRACK MOUNTED DRILL RIG UTILIZING 3.25-INCH INSIDE DIAMETER (I.D) HOLLOW STEM AUGERS (HSA). STANDARD PENETRATION TESTS (SPTS) WERE CONDUCTED USING A 140-POUND AUTOMATIC HAMMER, FALLING 30 INCHES, TO DRIVE 2-INCH OUTSIDE DIAMETER (O.D) SPLIT BARREL SAMPLERS. ROCK CORING WAS PERFORMED WHERE ROCK WAS ENCOUNTERED IN THE BORINGS USING AN NQ-SIZE CORE BARREL. THE HAMMER SYSTEM USED WAS CALIBRATED ON MAY 3, 2023. THE ENERGY TRANSFER RATIO ASSOCIATED WITH THE AUTOMATIC SPT HAMMER WAS 76.8 PERCENT.

LEGEND		ODOT CLASS	CLASSIFIED MECH./VISUAL	
DESCRIPTION				
	GRAVEL AND/OR STONE FRAGMENTS W/SAND, SILT AND CLAY	A-2-7	0	3
	SILT AND CLAY	A-6a	2	2
	SILTY CLAY	A-6b	2	6
	CLAY	A-7-6	12	14
	TOTAL		16	25
	CONCRETE	VISUAL		
	INTERBEDDED SHALE AND LIMESTONE	VISUAL		
	SHALE	VISUAL		
	PAVEMENT OR BASE =X= APPROXIMATE THICKNESS			
	PROJECT BORING LOCATION - PLAN VIEW			
	DRIVE SAMPLE AND/OR ROCK CORE BORING PLOTTED TO VERTICAL SCALE ONLY. HORIZONTAL BAR INDICATES A CHANGE IN STRATIGRAPHY.			
	AUGER 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.			
W	INDICATES FREE WATER ELEVATION.			
	HISTORICAL BORING LOCATION - PLAN VIEW - ADA-247-14.25			
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 ¹ /Y ² /Z/D"	NUMBER OF BLOWS FOR STANDARD PENETRATION TEST (SPT): X = NUMBER OF BLOWS FOR FIRST 6 INCHES (UNCORRECTED). Y = NUMBER OF BLOWS FOR SECOND 6 INCHES (UNCORRECTED). Z/D" = NUMBER OF BLOWS (UNCORRECTED) FOR D" OF PENETRATION AT REFUSAL.			
NQ	"N" SERIES ROCK CORE BARREL OF "Q" WIRELINE BIT SIZE.			
Qu	INDICATES UNCONFINED COMPRESSION TEST, ASTM D7012.			
TR	INDICATES TOP OF ROCK ELEVATION.			
SS	INDICATES A SPLIT SPOON SAMPLE, STANDARD PENETRATION TEST.			
Sc	INDICATES POINT LOAD STRENGTH VALUE, ASTM D5731.			
SDI	INDICATES SLAKE DURABILITY TEST ASTM D4644.			
HISTORIC BORING DESCRIPTION		ODOT CLASS	CLASSIFIED MECH./VISUAL	
	SILT	A-4b	1	0
	CLAY	A-7-6	4	0
	TOTAL		5	0



RECON. - SM 03/23/2023
DRILLING - CTL ENGINEERING, INC. 10/03/2023 - 10/17/2023
DRAWN - N.K.S 06/21/2024
REVIEWED - SM 05/14/2025

GEOTECHNICAL PROFILE - BRIDGE

ADA-247-14.51/15.56

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DESIGN AGENCY	
DESIGNER	N.K.S
REVIEWER	SM 05-05-25
PROJECT ID	93800
SUBSET	TOTAL
1	21
SHEET	TOTAL
P.67	107

EXPLORATION FINDINGS

BORING B-001-0-23, B-005-0-23, B-006-0-23 EXHIBITED 9 INCHES OF ASPHALT OVERLYING 5 TO 11 INCHES OF AGGREGATE BASE AT THE SURFACE. BORING B-010-0-23 ENCOUNTERED 2 INCHES OF ASPHALT OVERLYING 15 INCHES OF CONCRETE. BELOW THE SURFACE COVER OR FROM THE SURFACE, THE BORINGS GENERALLY EXHIBITED LAYERS OF GRAVEL AND/OR STONE FRAGMENTS WITH SAND, SILT AND CLAY (A-2-7), SILT AND CLAY (A-6a), SILTY CLAY (A-6b), OR CLAY (A-7-6) EXTENDING DOWN TO THE DRILLED DEPTHS OR TOP OF ROCK. THE NEAR SURFACE SOILS ENCOUNTERED TO DEPTHS RANGING FROM 5.5 TO 10 FEET IN BORINGS B-001-0-23 & B-005-0-23; AND THE NEAR SURFACE SOILS ENCOUNTERED TO DEPTHS RANGING FROM 7.0 TO 10.0 FEET IN BORINGS B-006-0-23 & B-010-0-23 WERE FURTHER IDENTIFIED AS FILL MATERIALS.

BENEATH THE SOIL OVERBURDEN, BORINGS B-001-0-23 THROUGH B-004-0-23, DRILLED NEAR BRIDGE ADA-247-14.545, ENCOUNTERED TOP OF BEDROCK AT DEPTHS RANGING FROM 1.0 TO 14.5 FEET BELOW GRADE, AND ELEVATIONS RANGING FROM 772.6 TO 782.7 FEET. BORINGS B-006-0-23 THROUGH B-009-0-23, DRILLED NEAR THE PROPOSED BRIDGE ADA-247-15.597, ENCOUNTERED TOP OF BEDROCK AT DEPTHS RANGING FROM 3.0 TO 14.0 FEET BELOW GRADE, AND ELEVATIONS RANGING FROM 765.5 TO 775.4 FEET. ROCK CORING WAS PERFORMED BELOW THE AUGERABLE ROCK LAYER. THE ROCK WAS DESCRIBED AS SHALE OR INTERBEDDED SHALE AND LIMESTONE.

FREE WATER WAS NOTED IN BORINGS B-002-0-23, B-003-0-23 AND B-007-0-23 AT ELEVATION 774.8, 773.9 AND 769.5 FEET, RESPECTIVELY.

HISTORIC AUGER BORINGS INDICATED THAT PREDOMINANTLY COHESIVE SOILS ARE PRESENT BEFORE ENCOUNTERING THE AUGER REFUSAL ON THE UNDERLYING BEDROCK. ACCORDING TO THE HISTORIC RECORDS, THE TOP OF ROCK ELEVATIONS IN H-001-0-60 AND H-002-0-60 ARE 786.4 AND 772.1 FEET, RESPECTIVELY. THE BEDROCK WAS DESCRIBED AS LIMESTONE.

SPECIFICATIONS

THIS GEOTECHNICAL EXPLORATION WAS PERFORMED IN ACCORDANCE WITH THE STATE OF OHIO, DEPARTMENT OF TRANSPORTATION, OFFICE OF GEOTECHNICAL ENGINEERING, SPECIFICATIONS FOR GEOTECHNICAL EXPLORATIONS, DATED JANUARY 2024.

AVAILABLE INFORMATION

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

SCOUR SAMPLES (ADA-247-14.545)						
BORING NO.	SAMPLE ID	ELEVATION (FEET)	D ₅₀ (mm)	T _c (PSF)	D ₅₀ equi. (mm)	EROSION CATEGORY (EC)
B-002-0-23 (REAR ABUTMENT)	SS-1	778.8 - 777.3	0.0139	0.3456	16.549	3.413
	SS-4	774.3 - 772.8	N/A	0.8467	40.532	3.761
	NQ-1	772.8 - 767.8	N/A	42.361	2028	3.761
	NQ-2	767.8 - 762.8	N/A	51.338	2458	3.761
B-004-0-23 (FORWARD ABUTMENT)	NQ-1	782.7 - 777.7	N/A	1.0355	49.571	3.761
	NQ-2	777.7 - 772.7	N/A	15.818	757	3.761

SCOUR SAMPLES (ADA-247-15.597)						
BORING NO.	SAMPLE ID	ELEVATION (FEET)	D ₅₀ (mm)	T _c (PSF)	D ₅₀ equi. (mm)	EROSION CATEGORY (EC)
B-007-0-23 (REAR ABUTMENT)	SS-4	775.0 - 773.5	0.0078	0.2656	12.716	3.550
	SS-8	765.5 - 764.5	N/A	0.4500	21.542	3.761
	NQ-1	764.5 - 762.5	N/A	1.7435	83.459	3.761
	NQ-2	762.5 - 757.5	N/A	34.869	1669	3.761
B-009-0-23 (FORWARD ABUTMENT)	SS-1	779.4 - 777.9	0.0092	0.3599	17.230	3.775
	SS-2	777.9 - 776.4	0.0190	0.2988	14.308	3.775
	SS-4 & 5	775.4 - 771.9	N/A	0.5843	27.970	3.761
	NQ-1	771.9 - 766.9	N/A	28.638	1371	3.761
	NQ-2	766.9 - 761.9	N/A	57.276	2742	3.761

BEDROCK TEST SUMMARY						
BORING ID	SAMPLE ELEVATION (FEET)	SAMPLE DEPTH (FEET)	Sc (PSI)	Qu (PSF)	SDI (%)	LITHOLOGY
B-001-0-23	768.9 - 768.4	23.2 - 23.7		10,570		LIMESTONE
B-002-0-23	765.8 - 765.2	13.0 - 13.6		580		SHALE
	759.2 - 758.8	19.6 - 20.0		2,370		LIMESTONE
B-003-0-23	772.6 - 767.6	1.0 - 6.0			57.2	SHALE
	770.6 - 770.2	3.0 - 3.4		140		SHALE
	764.9 - 764.5	8.7 - 9.1		210		SHALE
B-004-0-23	782.7 - 777.7	4.5 - 9.5			87.2	SHALE
	777.2 - 776.7	10.0 - 10.5		120		SHALE
	768.7 - 768.2	18.5 - 19.0		2,880		LIMESTONE
B-006-0-23	771.9 - 771.4	15.4 - 15.9		3,420		LIMESTONE
B-007-0-23	759.6 - 759.2	19.9 - 20.3		220		SHALE
	756.7 - 756.3	22.8 - 23.2		3,110		LIMESTONE
	750.5 - 750.0	29.0 - 29.5		2,470		SHALE
B-008-0-23	765.7 - 760.7	4.0 - 9.0	1,432		43.8	SHALE
	760.7 - 755.7	9.0 - 14.0	3,596			LIMESTONE
B-009-0-23	771.9 - 766.9	7.5 - 12.5			64.0	SHALE
	763.4 - 763.0	16.0 - 16.4		1,170		SHALE
	760.0 - 759.6	19.4 - 19.8		1,340		SHALE

ADA-247-14.51/15.56

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GEOTECHNICAL PROFILE - BRIDGE

DESIGN AGENCY



DESIGNER

N.K.S

REVIEWER

SM 05-05-25

PROJECT ID

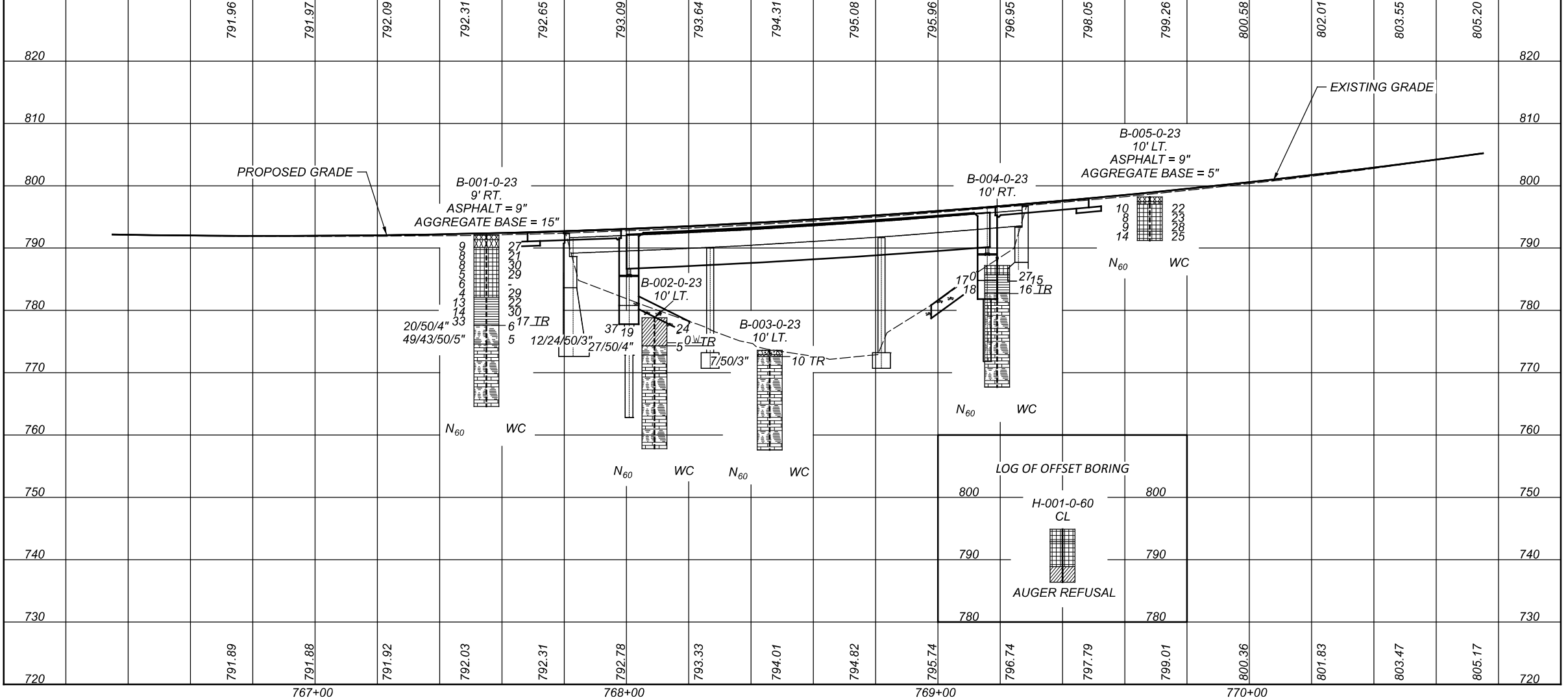
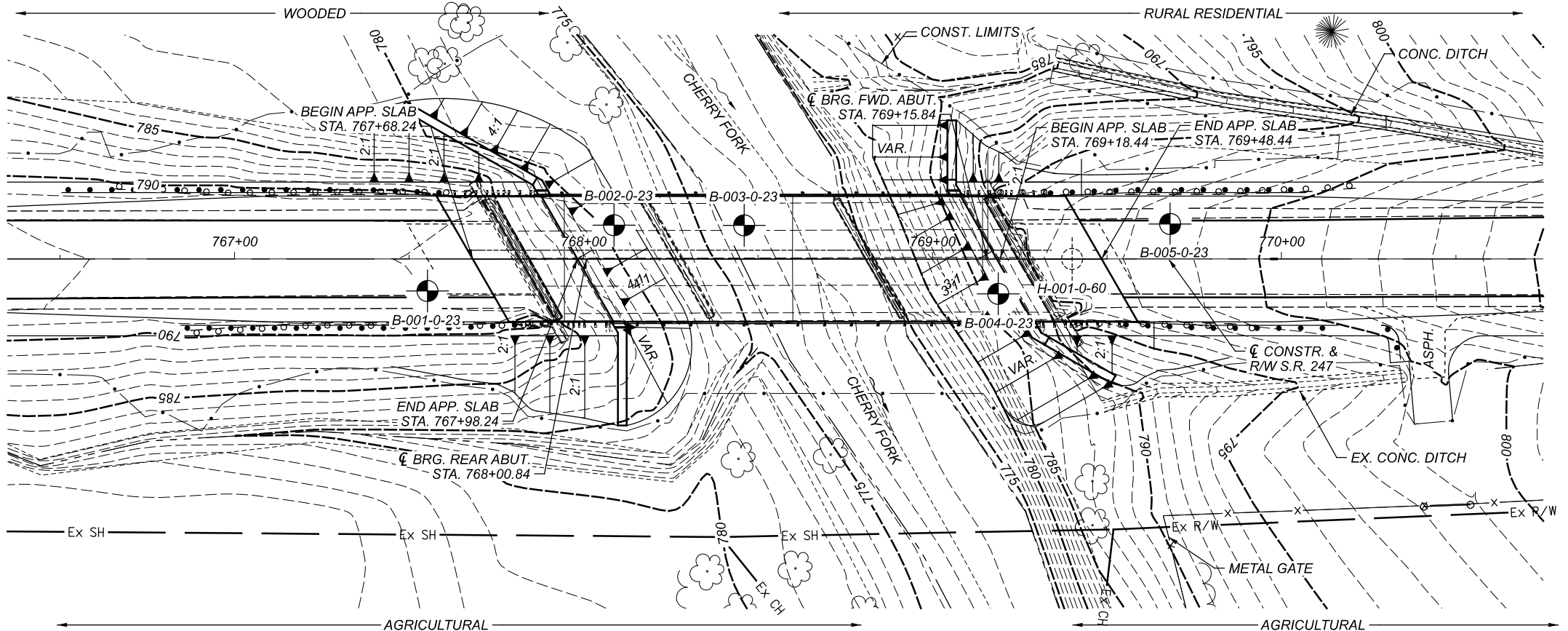
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SUBSET TOTAL

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SHEET TOTAL

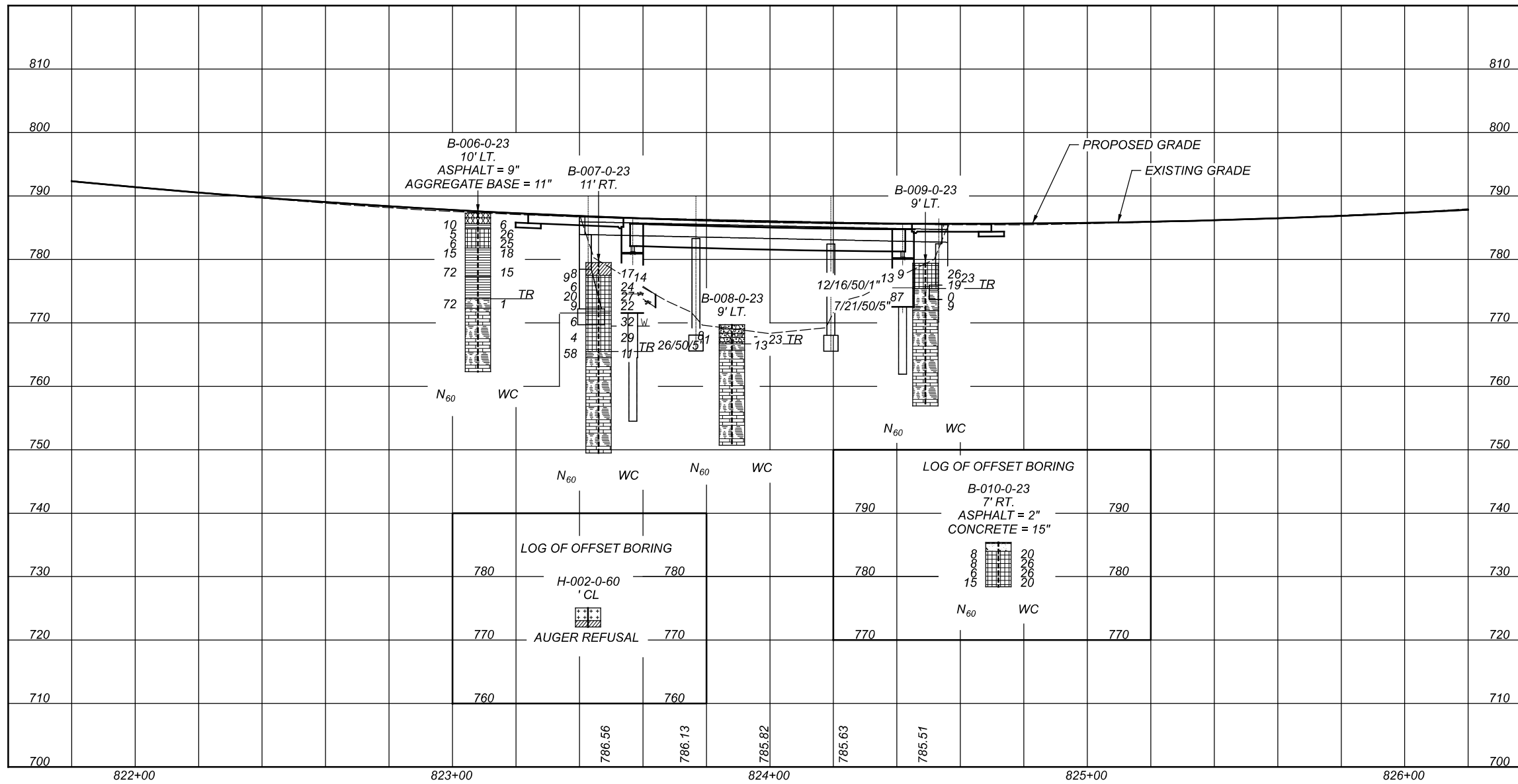
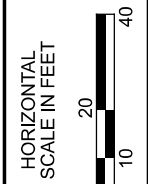
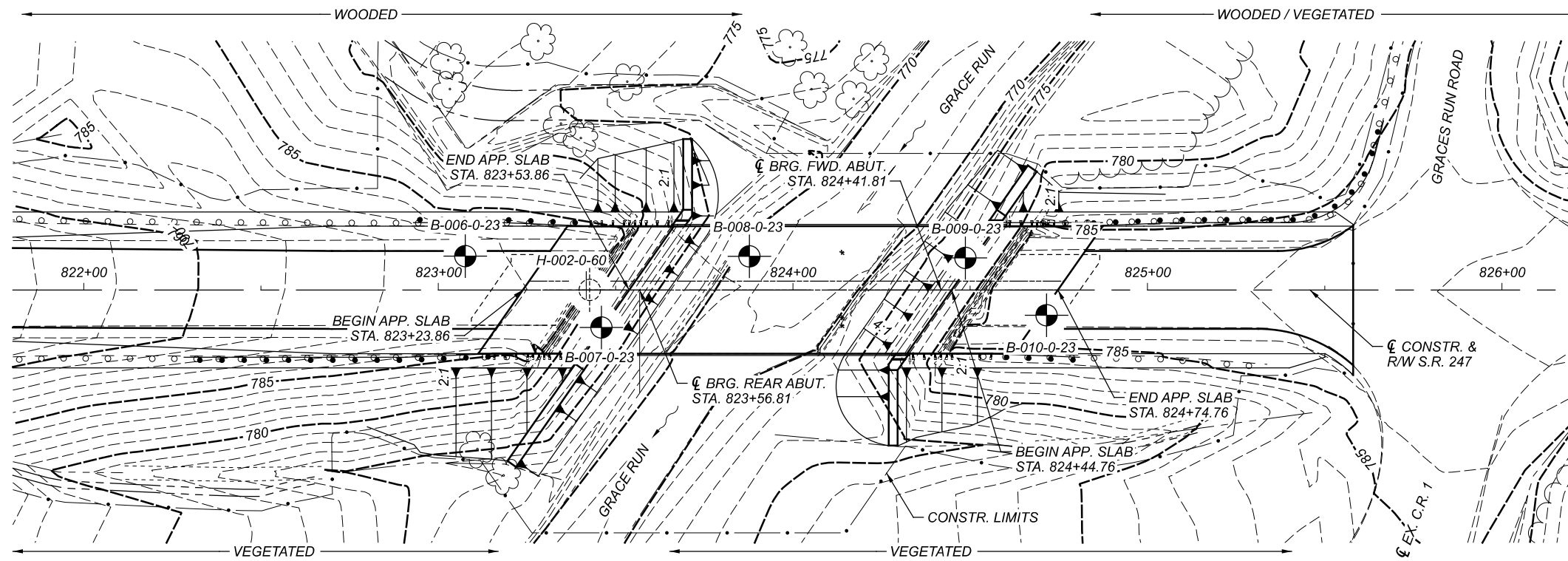
P.68 107



GEOTECHNICAL PROFILE - BRIDGE
 BRIDGE NO. - ADA-00247-14.545
 S.R. 247 OVER CHERRY FORK

DESIGN AGENCY
GTL
 ENGINEERING
 2860 FISHER ROAD
 COLUMBUS, OHIO 43204
 PHONE: (614)276-8123
 FAX: (614)276-8377

DESIGNER	N.K.S
REVIEWER	SM
PROJECT ID	93800
SUBSET	TOTAL
3	21
SHEET	TOTAL
P.89	107



GEOTECHNICAL PROFILE - BRIDGE
 BRIDGE NO. - ADA-00247-15.597
 S.R. 247 OVER GRACE RUN

DESIGN AGENCY
CTL
 ENGINEERING
 2880 FISHER ROAD
 COLUMBUS, OHIO 43204
 PHONE: (614)276-8123
 FAX: (614)276-8377

DESIGNER	N.K.S
REVIEWER	SM
PROJECT ID	93800
SUBSET	TOTAL
4	21
SHEET	TOTAL
P.90	107

B-002-0-23



Run #:	Depth	Recovery	RQD
NQ-3	16.0' - 21.0'	60/60 - 100%	18/60 - 30%

ADA-247-14.51/15.56, PID 93800



DESIGN AGENCY



2860 FISHER ROAD
 COLUMBUS, OHIO 43204
 PHONE: (614)276-8123
 FAX: (614)276-8377

DESIGNER

N.K.S

REVIEWER

SM 05-05-25

PROJECT ID

93800

SUBSET TOTAL

7 21

SHEET TOTAL

P.93 107

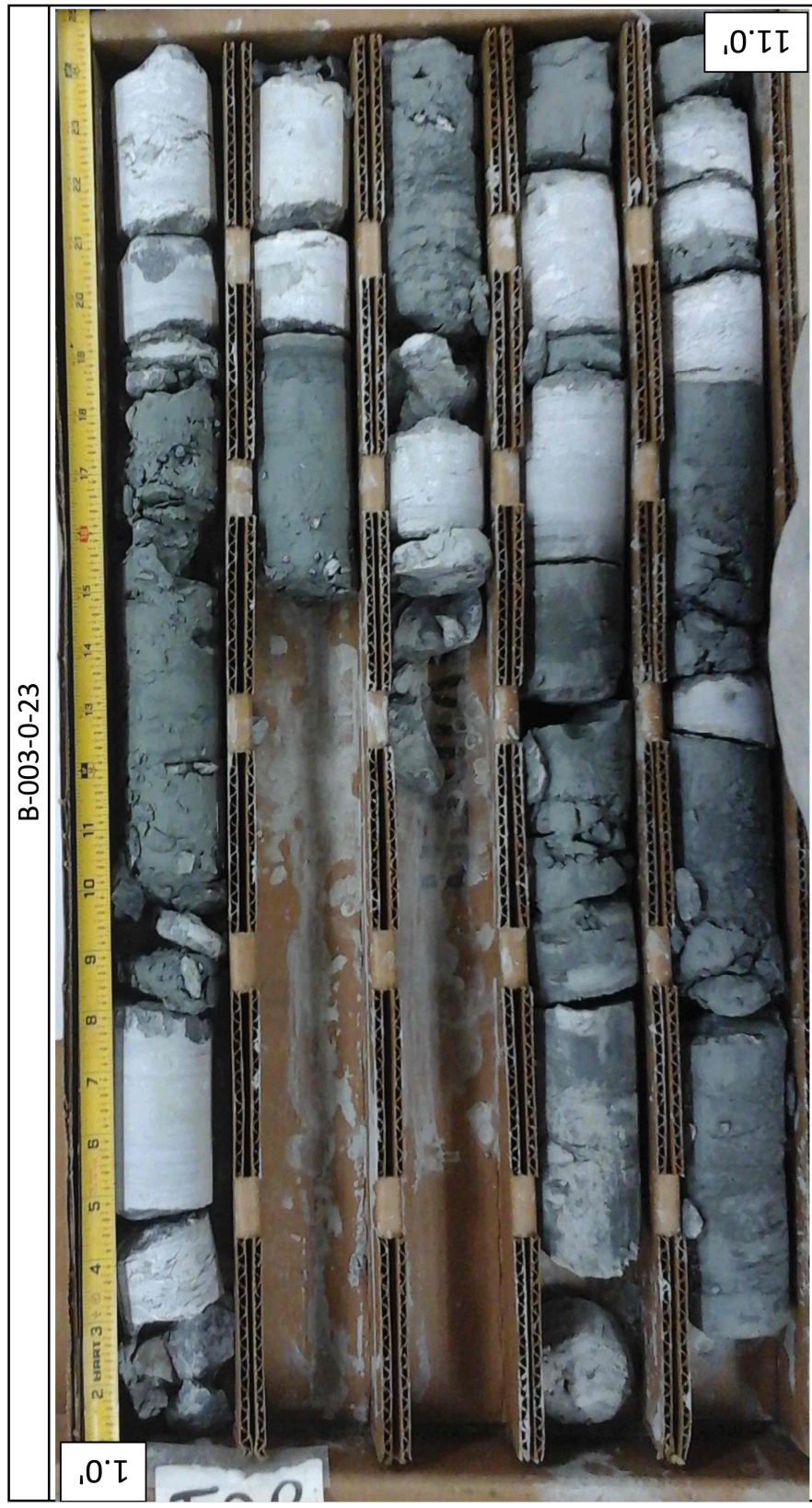
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PROJECT: ADA-247-14.51/15.56	DRILLING FIRM / OPERATOR: CTL / J.S	STATION / OFFSET: 768+46, 10' LT.	EXPLORATION ID: B-003-0-23
TYPE: BRIDGE	SAMPLING FIRM / LOGGER: CTL / J.S	ALIGNMENT: SR 247	
PID: 93800 SFN: 0103934	DRILLING METHOD: 3.25" HSA / NQ	ELEVATION: 773.6 (MSL) EOB: 16.0 ft.	PAGE 1 OF 1
START: 10-17-23 END: 10-17-23	SAMPLING METHOD: SPT / NQ	COORD: 327976.1200 N, 1666640.1750 E	
MATERIAL DESCRIPTION AND NOTES			
VERY DENSE, BROWN, GRAVEL AND/OR STONE FRAGMENTS WITH SAND, SILT, AND CLAY, MOIST INTERBEDDED SHALE (75%) AND LIMESTONE (25%), RQD 25%, REC. 80%; SHALE, GRAY, HIGHLY WEATHERED, VERY WEAK; LIMESTONE, GRAY, MODERATELY WEATHERED, MODERATELY STRONG. @3.0'-3.4': COMPRESSIVE STRENGTH (SHALE)= 140 PSI @1.0'-6.0': SLAKE DURABILITY INDEX (SHALE) = 57.2 PERCENT @8.7'-9.1': COMPRESSIVE STRENGTH (SHALE)= 210 PSI			
DRILL RIG: MOBILE B-57 TRACK HAMMER: MOBILE AUTOMATIC CALIBRATION DATE: 5-3-23 ENERGY RATIO (%): 76.8		GRADATION (%) GR CS FS SI CL LL PL PI WC - - - - - - - - 10 A-2-7 (V)	
SPT / RQD 50/3" 17 40 18		REC SAMPLE ID (tsf) SS-1 NQ-1 NQ-2 NQ-3	
DEPTHS 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16		ODOT CLASS (GI) - CORE CORE CORE	
ELEV. 773.6 772.6 757.6		HOLE SEALED - - -	



NOTES: BRIDGE DECK ELEVATION= 793.56 FEET. STREAM WATER SURFACE ELEVATION= 773.86 FEET
 ABANDONMENT METHODS, MATERIALS, QUANTITIES: BACKFILLED WITH GROUT



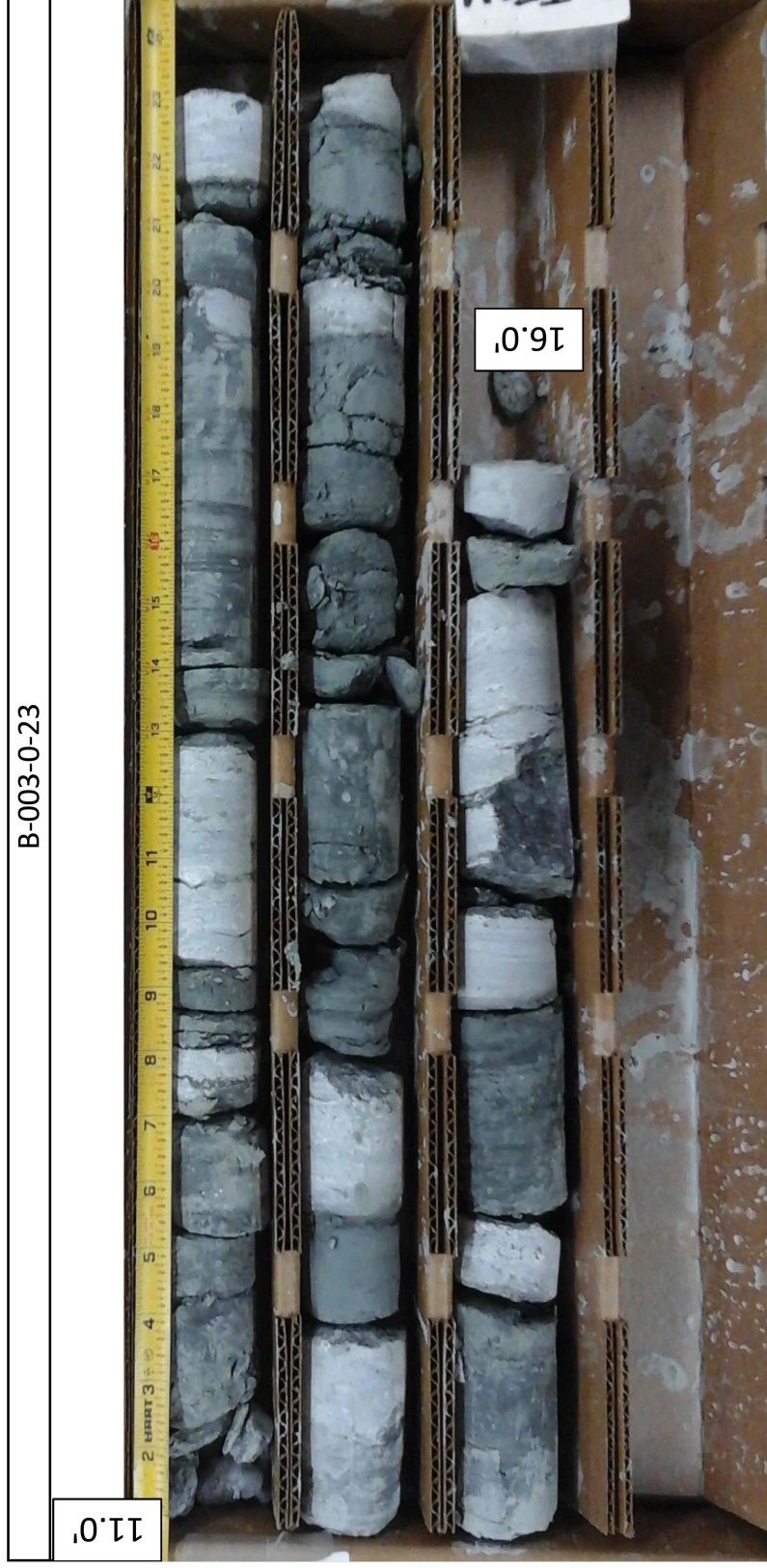
Run #:	Depth	Recovery	RQD
NQ-1	1.0'	32/60	10/60
NQ-2	6.0'	52/60	24/60
		53%	17%
		87%	40%

ADA-247-14.51/15.56, PID 93800



DESIGN AGENCY	
2860 FISHER ROAD COLUMBUS, OHIO 43204 PHONE: (614)276-8123 FAX: (614)276-8377	
DESIGNER	N.K.S
REVIEWER	SM 05-05-25
PROJECT ID	93800
SUBSET	TOTAL
8	21
SHEET	TOTAL
P.94	107

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



B-003-0-23

Run #:	Depth	Recovery	RQD
NQ-3	11.0'	60/60	11/60
	16.0'	100%	18%

ADA-247-14.51/15.56, PID 93800



DESIGN AGENCY



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

DESIGNER

N.K.S

REVIEWER

SM 05-05-25

PROJECT ID

93800

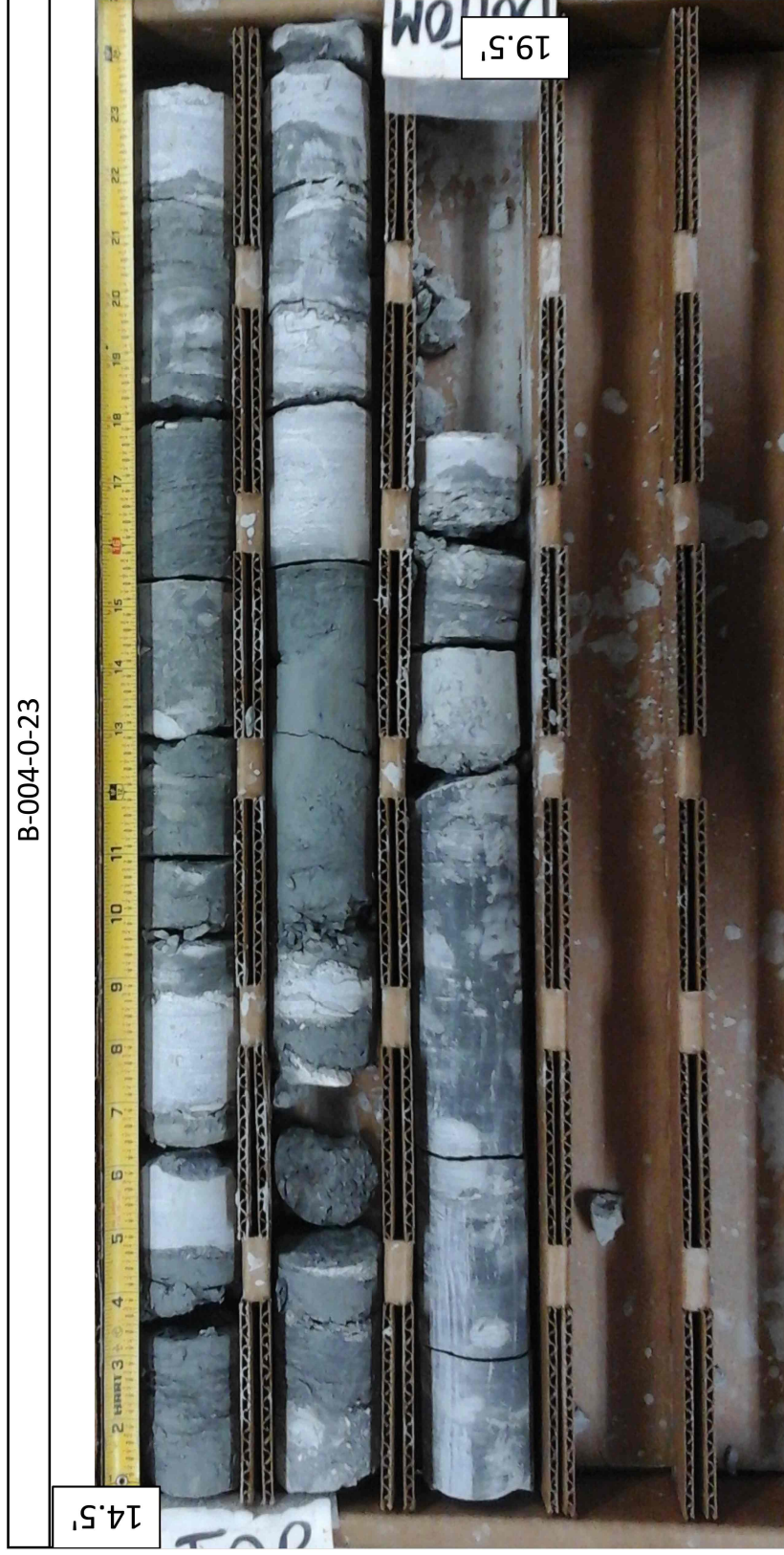
SUBSET TOTAL

9 21

SHEET TOTAL

P.95 107

B-004-0-23



Run #:	Depth	Recovery	RQD
NQ-3	14.5'	60/60	29/60
	19.5'	100%	48%

ADA-247-14.51/15.56, PID 93800



DESIGN AGENCY



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

DESIGNER

N.K.S

REVIEWER

SM 05-05-25

PROJECT ID

93800

SUBSET TOTAL

11	21
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SHEET TOTAL

P.97	107
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ADA-247-14.51/15.56

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PROJECT: ADA-247-14.51/15.56	DRILLING FIRM / OPERATOR: CTL / J.S	STATION / OFFSET: 769+68, 10' LT.	EXPLORATION ID: B-005-0-23
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: CTL / J.S	ALIGNMENT: SR 247	
PID: 93800 SFN:	DRILLING METHOD: 3.25" HSA	ELEVATION: 798.6 (MSL) EOB: 7.0 ft.	PAGE: 1 OF 1
START: 10-18-23 END: 10-18-23	SAMPLING METHOD: SPT	COORD: 328097.5100 N, 1666627.1540 E	

MATERIAL DESCRIPTION AND NOTES	ELEV.	SPT / RQD	REC SAMPLE ID (%)	HP (tsf)	GRADATION (%)			ATTENBERG			WC	SO4 ppm	HOLE SEALED	
					GR	CS	FS	SI	CL	LL				PL
ASPHALT (9")	798.6	-												
AGGREGATE BASE (5")	797.9	5												
VERY STIFF, BROWN, CLAY, SOME SILT, TRACE SAND, TRACE GRAVEL, (FILL), DAMP @2.5'; NO GRAVEL	797.4	3	10	3.50	8	2	5	32	53	65	24	41	22	A-7-6 (20)
@4.0'; HARD		2	8	67	1	0	1	37	61	66	29	37	23	A-7-6 (20)
		3												
		4												
		2	9	100	4.25	-	-	-	-	-	-	-	28	A-7-6 (V)
HARD, BROWN, CLAY, SOME SILT, TRACE SAND, TRACE GRAVEL, DAMP	793.1	3	14	100	4.50	-	-	-	-	-	-	-	25	A-7-6 (V)
	791.6	4												
		5												
		6												
		7												

STANDARD ODOT LOG W/ SULFATES (8.5 X 11) - OH DOT.GDT - 21-6-24 11:59 - G:\2024\JUNNE21\2305024COL\2305024COL.GPJ

NOTES: NONE
 ABANDONMENT METHODS, MATERIALS, QUANTITIES: PLACED ASPHALT PATCH; BACKFILLED WITH GROUT

DESIGN AGENCY	
2860 FISHER ROAD COLUMBUS, OHIO 43204 PHONE: (614)276-8123 FAX: (614)276-6377	
DESIGNER	N.K.S
REVIEWER	SM 05-05-25
PROJECT ID	93800
SUBSET	TOTAL
12	21
SHEET	TOTAL
P.98	107

**GEOTECHNICAL PROFILE - BRIDGE
 BORING LOG FOR B-005-0-23**

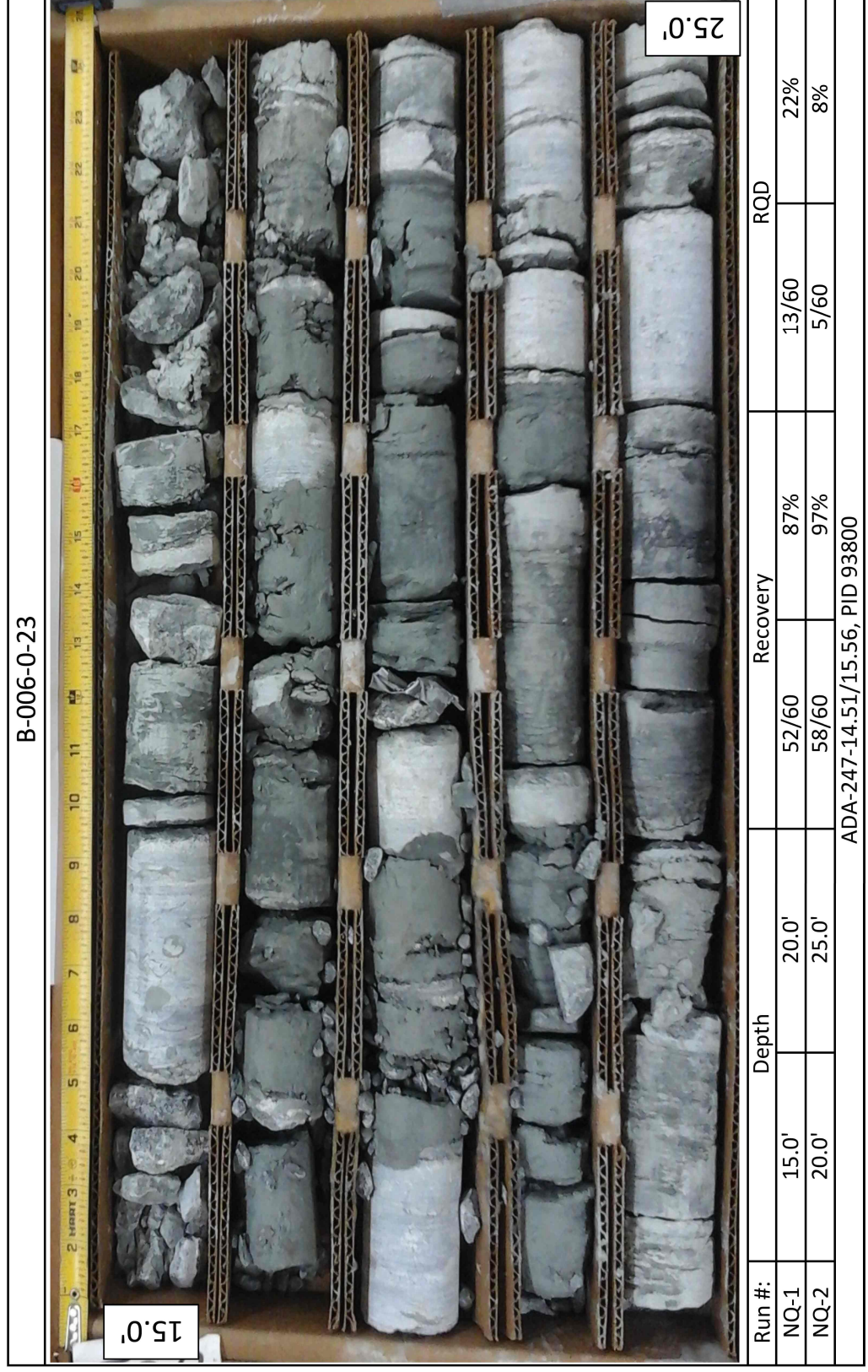
ADA-247-14.51/15.56

MODEL: Sheet PAPER: 17x11 (in.) DATE: 05-05-2025 TIME: 16:18:14 USER: hp
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PROJECT: ADA-247-14.51/15.56	DRILLING FIRM / OPERATOR: CTL / J/S	STATION / OFFSET: 823+08, 10' LT.	EXPLORATION ID: B-006-0-23
TYPE: LANDSLIDE	SAMPLING FIRM / LOGGER: CTL / J/S	ALIGNMENT: SR 247	
PID: 93800 SFN:	DRILLING METHOD: 3.25" HSA / NQ	ELEVATION: 787.3 (MSL) EOB: 25.0 ft.	PAGE 1 OF 1
START: 10-9-23 END: 10-9-23	SAMPLING METHOD: SPT / NQ	COORD: 333239.6300 N, 1665419.2620 E	
MATERIAL DESCRIPTION AND NOTES			
ASPHALT (9")	ELEV: 787.3		
AGGREGATE BASE (11")	786.5		
VERY STIFF BROWN, SILTY CLAY, SOME SAND, SOME GRAVEL, (FILL), DAMP	785.6		
VERY STIFF BROWN CLAY, "AND" SILT, TRACE SAND, TRACE GRAVEL, (FILL), MOIST	784.8		
VERY STIFF, GRAY, SILTY CLAY, LITTLE SAND, LITTLE GRAVEL, (FILL), DAMP	781.8		
@8.5'; HARD, CONTAINS ROCK FRAGMENTS	777.3		
HARD, GRAY, SILTY CLAY, DAMP			
SHALE, GRAY, SEVERLY WEATHERED.	773.8		
INTERBEDDED SHALE (75%) AND LIMESTONE (25%) ROD 15%, REC. 92%;	772.3		
SHALE, GRAY, HIGHLY WEATHERED, VERY WEAK;			
LIMESTONE, GRAY, MODERATELY WEATHERED, SLIGHTLY STRONG @15.4'-15.9'; COMPRESSIVE STRENGTH (LIMESTONE)= 3.420 PSI			

DEPTH (ft)	SPT / RQD	REC SAMPLE ID (%)	HP (tsf)	GR	CS	FS	SI	CL	LL	PL	PI	WC	ODOT CLASS (GI)	SO4 ppm	HOLE SEALED
1	8	67	3.25	29	21	9	13	28	34	18	16	6	A-6b (3)	-	
2	5	10	3.25	29	21	9	13	28	34	18	16	6	A-6b (3)	-	
3	2	5	67	2.25	1	2	48	48	47	23	24	26	A-7-6 (15)	-	
4	2	2	67	2.25	1	2	48	48	47	23	24	26	A-7-6 (15)	-	
5	2	6	44	3.75	-	-	-	-	-	-	-	25	A-7-6 (V)	-	
6	4	15	33	3.75	18	10	3	21	48	39	21	18	A-6b (10)	-	
7	4	8													
8															
9	12	72	33	SS-5	-	-	-	-	-	-	-	15	A-6b (V)	-	
10	38	72	56	SS-6	-	-	-	-	-	-	-	1	Rock (V)	-	
11	18														
12	47	32	72	56	SS-6	-	-	-	-	-	-	1	Rock (V)	-	
13	24														
14	22	87	NQ-1										CORE		
15	8	97	NQ-2										CORE		
16															
17															
18															
19															
20															
21															
22															
23															
24															
25															

NOTES: CAVED AT 13'. BRIDGE DECK ELEVATION= 786.47 FEET
 ABANDONMENT METHODS, MATERIALS, QUANTITIES: PLACED ASPHALT PATCH; BACKFILLED WITH GROUT



Run #:	Depth	Recovery	RQD
NQ-1	15.0'	52/60	13/60
NQ-2	20.0'	58/60	5/60
		87%	22%
		97%	8%

ADA-247-14.51/15.56, PID 93800



B-007-0-23

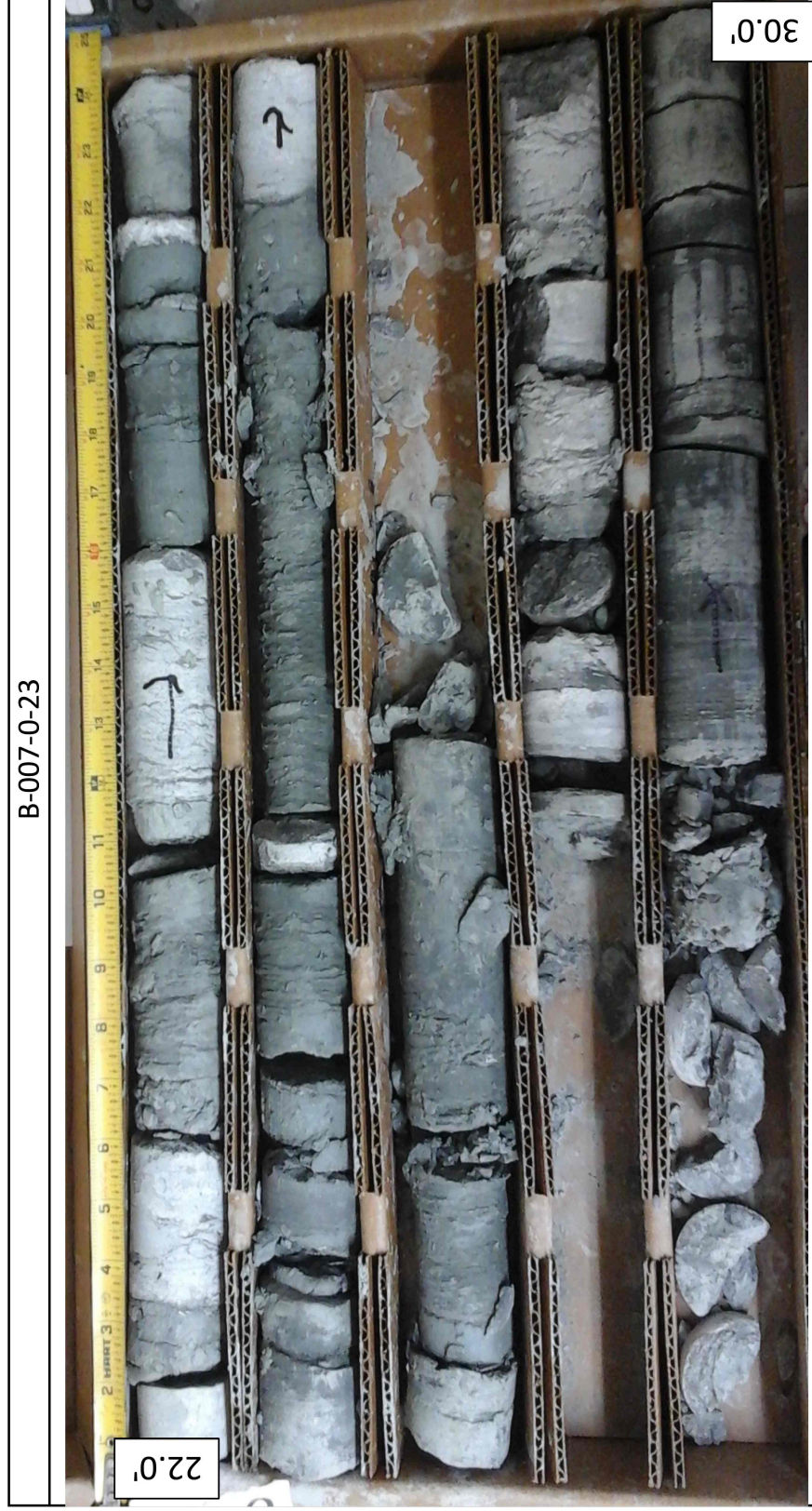


Run #:	Depth	Recovery	RQD
NQ-1	15.0'	15/24	63%
NQ-2	17.0'	60/60	100%
			36/60
			0/24
			36/60
			0%
			60%

ADA-247-14.51/15.56, PID 93800



B-007-0-23



Run #:	Depth	Recovery	RQD
NQ-3	22.0'	60/60	100%
NQ-4	27.0'	30/36	83%
			9/36
			31.5/60
			53%
			25%

ADA-247-14.51/15.56, PID 93800



DESIGN AGENCY



2860 FISHER ROAD
 COLUMBUS, OHIO 43204
 PHONE: (614)276-8123
 FAX: (614)276-8377

DESIGNER

N.K.S

REVIEWER

SM 05-05-25

PROJECT ID

93800

SUBSET TOTAL

15 21

SHEET TOTAL

P.101 107

GEOTECHNICAL PROFILE - BRIDGE
 ROCK CORE PHOTO FOR B-007-0-23

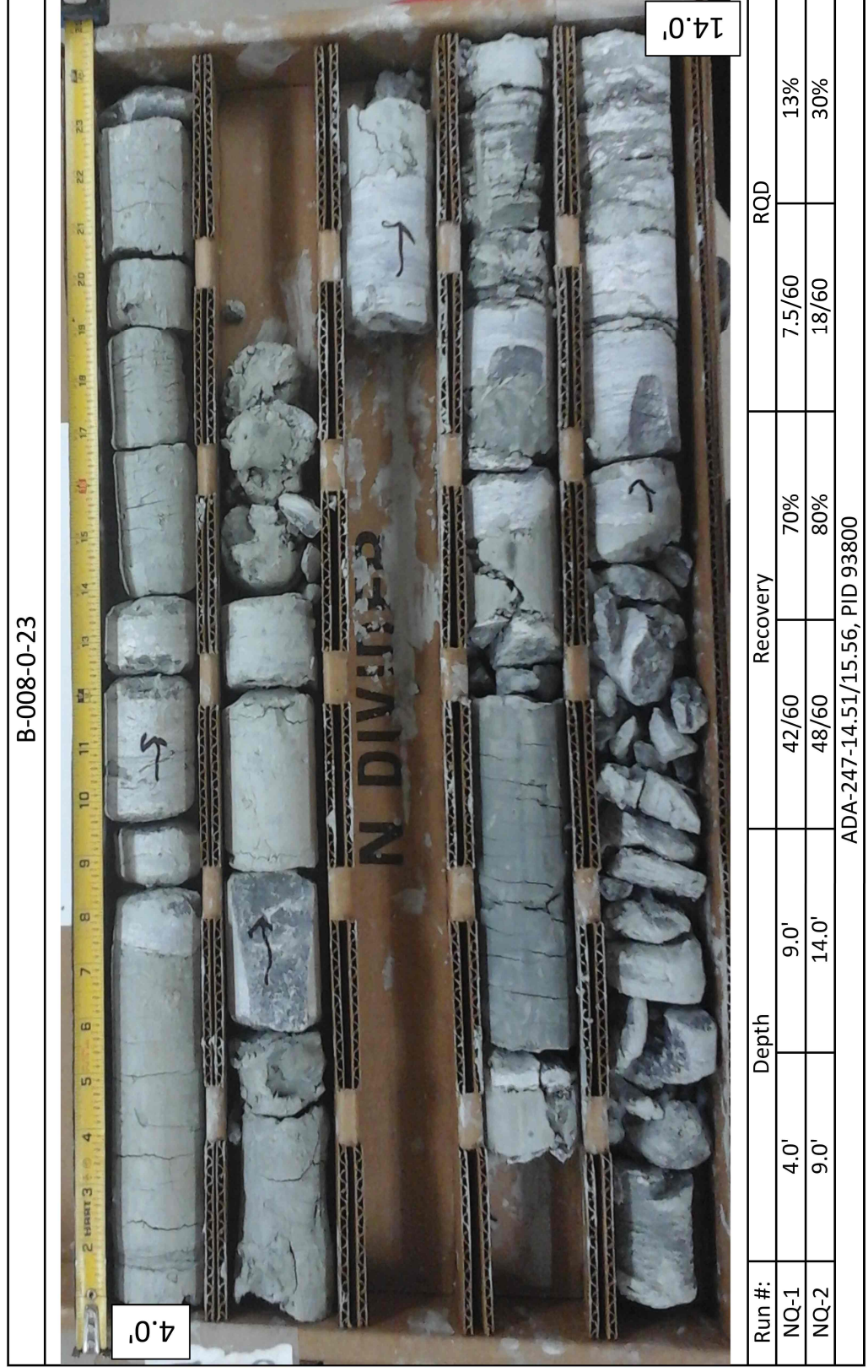
ADA-247-14.51/15.56

MODEL: Sheet PAPER: 17x11 (in.) DATE: 05-05-2025 TIME: 16:25:28 USER: hp
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PROJECT: ADA-247-14.51/15.56	DRILLING FIRM / OPERATOR: CTL / J/S	STATION / OFFSET: 823+88, 9' LT.	EXPLORATION ID
TYPE: BRIDGE	SAMPLING FIRM / LOGGER: CTL / J/S	ALIGNMENT: SR.247	B-008-0-23
PID: 93800 SFN: 0103993	DRILLING METHOD: 3.25" HSA / NQ	ELEVATION: 769.7 (MSL) EOB: 19.0 ft.	PAGE
START: 10-3-23 END: 10-3-23	SAMPLING METHOD: SPT / NQ	COORD: 333319.2500 N, 1665410.1640 E	1 OF 1
MATERIAL DESCRIPTION AND NOTES			
VERY LOOSE, BROWN, GRAVEL AND/OR STONE FRAGMENTS WITH SAND, SILT, AND CLAY, WET			
SHALE, GRAY, SEVERLY WEATHERED.			
INTERBEDDED SHALE (75%) AND LIMESTONE (25%), RQD 23%, REC. 75%, SHALE, GRAY, HIGHLY WEATHERED, VERY WEAK TO WEAK; LIMESTONE, GRAY, HIGHLY WEATHERED, MODERATELY STRONG.			
@4.0'-9.0': SLAKE DURABILITY INDEX (SHALE) = 43.8 PERCENT			
@4.0'-9.0': COMPRESSIVE STRENGTH (POINT LOAD) = 1,432 PSI			
@9.0'-14.0': COMPRESSIVE STRENGTH (POINT LOAD) = 3,596 PSI			

DEPTH (ft)	ELEV.	SPT / RQD	REC SAMPLE ID (%)	HP (tsf)	GRADATION (%)	ATTERBERG	WC	ODOT CLASS (GI)	SO4 ppm	HOLE SEALED
1	769.7	3	8	0	SS-1	-	-	-	-	-
2	766.7	4	1	17	SS-2	-	-	23	A-2-7 (V)	-
3	765.7	26	-	100	SS-3	3.00	-	13	Rock (V)	-
4										
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
16										
17										
18										
19	750.7									

NOTES: BRIDGE DECK ELEVATION= 785.74 FEET
 ABANDONMENT METHODS, MATERIALS, QUANTITIES: BACKFILLED WITH GROUT

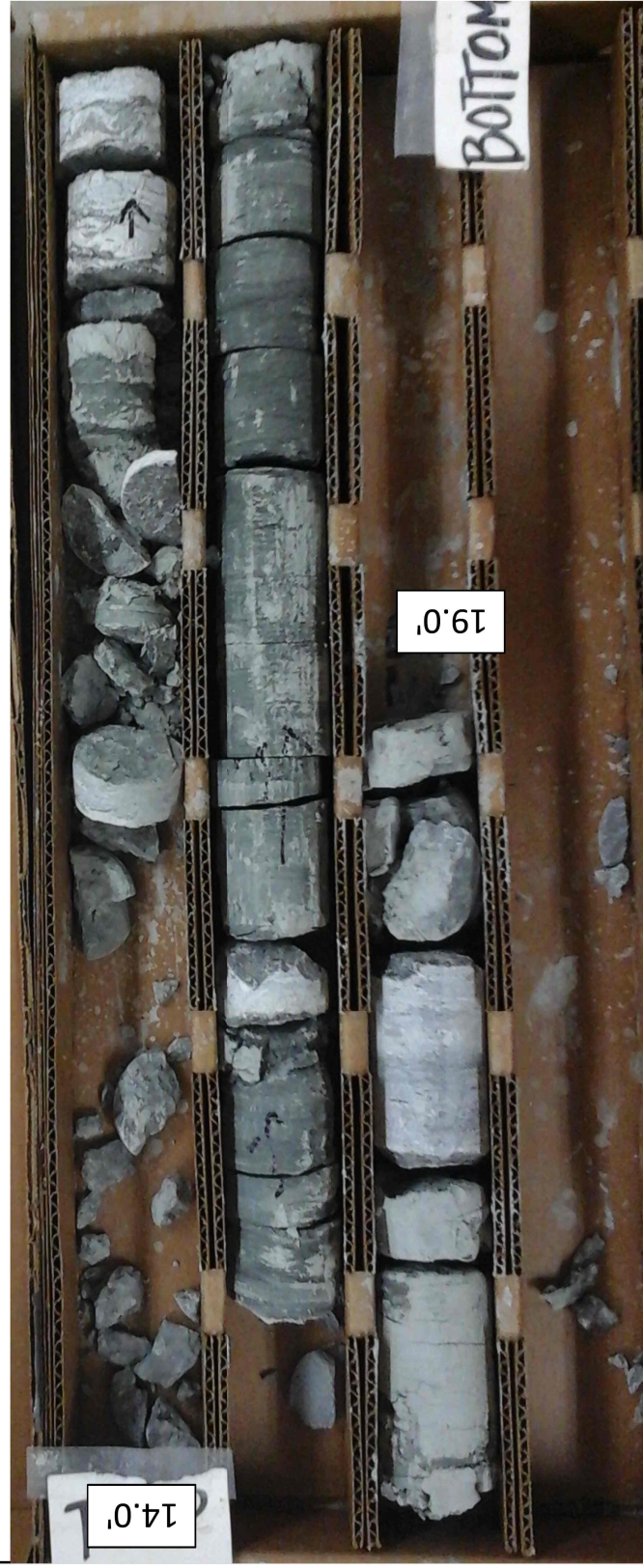


Run #:	Depth	Recovery	RQD
NQ-1	4.0'	42/60	70%
NQ-2	9.0'	48/60	80%
		7.5/60	13%
		18/60	30%

ADA-247-14.51/15.56, PID 93800



B-008-0-23



Run #:	Depth	Recovery	RQD
NQ-3	14.0'	45/60	16/60
	19.0'	75%	27%

ADA-247-14.51/15.56, PID 93800



DESIGN AGENCY



2860 FISHER ROAD
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 FAX: (614)276-8377

DESIGNER

N.K.S

REVIEWER

SM 05-05-25

PROJECT ID

93800

SUBSET TOTAL

17 21

SHEET TOTAL

P.103 107

ADA-247-14.51/15.56

MODEL: Sheet PAPER: 17x11 (in.) DATE: 05-05-2025 TIME: 16:28:45 USER: hp
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PROJECT: ADA-247-14.51/15.56	DRILLING FIRM / OPERATOR: CTL / J.S	STATION / OFFSET: 824+49, 9' LT.	EXPLORATION ID: B-009-0-23
TYPE: BRIDGE	SAMPLING FIRM / LOGGER: CTL / J.S	ALIGNMENT: SR 247	
PID: 93800 SFN: 0103993	DRILLING METHOD: 3.25" HSA / NQ	ELEVATION: 779.4 (MSL) EOB: 22.5 ft.	PAGE 1 OF 1
START: 10-11-23 END: 10-11-23	SAMPLING METHOD: SPT / NQ	COORD: 333379.7900 N, 1665403.5880 E	
MATERIAL DESCRIPTION AND NOTES			
VERY STIFF, BROWN, CLAY, SOME SILT, SOME SAND, TRACE GRAVEL, DAMP @1.5'; LITTLE SILT	ELEV: 779.4	GRADATION (%): FS 17, CS 33, CL 47, PL 26, PI 21	ATTERBERG: LL 47, PL 26, PI 21
SHALE, GRAY, WEATHERED.	ELEV: 775.4	GRADATION (%): FS 19, CS 44, CL 42, PL 26, PI 21	ATTERBERG: LL 47, PL 26, PI 21
INTERBEDDED SHALE (75%) AND LIMESTONE (25%), RQD 30%, REC. 97%. SHALE GRAY, HIGHLY WEATHERED, VERY WEAK TO WEAK; LIMESTONE GRAY, HIGHLY WEATHERED, WEAK TO SLIGHTLY STRONG. @7.5'-12.5': SLAKE DURABILITY INDEX (SHALE) = 64 PERCENT	ELEV: 771.9	GRADATION (%): FS 19, CS 44, CL 42, PL 26, PI 21	ATTERBERG: LL 47, PL 26, PI 21
@16.0'-16.4': COMPRESSIVE STRENGTH (SHALE) = 1,170 PSI		GRADATION (%): FS 19, CS 44, CL 42, PL 26, PI 21	ATTERBERG: LL 47, PL 26, PI 21
@19.4'-19.8': COMPRESSIVE STRENGTH (SHALE) = 1,340 PSI		GRADATION (%): FS 19, CS 44, CL 42, PL 26, PI 21	ATTERBERG: LL 47, PL 26, PI 21

STANDARD ODOT LOG W/ SULFATES (8.5 X 11) - OH DOT GDT - 21-6-24 11-59 - G:2024\JUNNE12\13050024COL\23050024COL.GPJ

NOTES: CAVED AT 4.9'. BRIDGE DECK ELEVATION= 792.40 FEET
 ABANDONMENT METHODS, MATERIALS, QUANTITIES: BACKFILLED WITH GROUT

B-009-0-23



Run #:	Depth	Recovery	RQD
NQ-1	7.5'	57/60	4/60
NQ-2	12.5'	58/60	17/60
		95%	7%
		97%	28%

ADA-247-14.51/15.56, PID 93800



DESIGN AGENCY
GTL ENGINEERING
 2860 FISHER ROAD
 COLUMBUS, OHIO 43204
 PHONE: (614)276-8123
 FAX: (614)276-8377

DESIGNER: N.K.S
 REVIEWER: SM 05-05-25
 PROJECT ID: 93800
 SUBSET: 18 TOTAL: 21
 SHEET: P.104 TOTAL: 107

GEOTECHNICAL PROFILE - BRIDGE
BORING LOG AND ROCK CORE PHOTO FOR B-009-0-23

B-009-0-23



Run #:	Depth	Recovery	RQD
NQ-3	17.5'	60/60	33/60
	22.5'	100%	55%

ADA-247-14.51/15.56, PID 93800



DESIGN AGENCY



2860 FISHER ROAD
 COLUMBUS, OHIO 43204
 PHONE: (614)276-8123
 FAX: (614)276-8377

DESIGNER

N.K.S

REVIEWER

SM 05-05-25

PROJECT ID

93800

SUBSET TOTAL

19 21

SHEET TOTAL

P.105 107

State of Ohio
 Department of Highways
 Testing Laboratory

LOG OF BORING

Date Started: 8-4-60 Sampler Type: WILLIAMS AUGER Water Elev. Immediate: _____ After: _____ Hours: _____
 Date Completed: 8-4-60 Casing Length: _____ Dia: _____
 Boring No. A-1 Station & Offset: 777+59, CL (FORWARD ABUTMENT) Surface Elev. 795.5
 Project Identification: ADAMS
ADA-247-14.25
ADA-247-1471
OVER CHERRY FORK

Elev.	Depth	Description	Lab. Nos.	Physical Characteristics						SHTL Class.				
				% Agg.	% C.S.	% FS	% Silt	% Clay	LL		PI	WC		
795.5	0													
793.5	2	Reddish Brown Clay	12869558	0	0	2	34	64	63	37	13			
789.5	4	Gray Clay	12969559	0	1	1	51	47	46	25	15			
787.0	8	Reddish Brown Sandy Clay	13069560	0	27	18	21	34	39	12	20			
	10	Refusal												
	12													
	14													
	16													
	18													
	20													
	22													
	24													
	26													
	28													
	30													
	32													
	34													
	36													

Particle Sizes: Agg. = > 200mm, Coarse Sand = 2.00 - 0.42mm, Fine Sand = 0.42 - 0.074mm, Silt = 0.074 - 0.005mm, Clay = < 0.005mm

State of Ohio
 Department of Highways
 Testing Laboratory

LOG OF BORING

Date Started: 8-4-60 Sampler Type: WILLIAMS AUGER Water Elev. Immediate: _____ After: _____ Hours: _____
 Date Completed: 8-4-60 Casing Length: _____ Dia: _____
 Boring No. L-1 Station & Offset: 831+50, CL Surface Elev. 772.7
 Project Identification: ADAMS
ADA-247-14.25
ADA-247-1578
OVER GRACE'S RUN

Elev.	Depth	Description	Lab. Nos.	Physical Characteristics						SHTL Class.				
				% Agg.	% C.S.	% FS	% Silt	% Clay	LL		PI	WC		
775.7	0													
773.7	2	Brown Silt w/Trace of Plant Tissue	3769606	0	6	7	50	37	36	5	31			
772.7	4	Gray Sandy Clay w/Trace of Plant Tissue	3869607	0	14	8	40	38	36	14	36			
	6	Refusal (Limestone)												
	8													
	10													
	12													
	14													
	16													
	18													
	20													
	22													
	24													
	26													
	28													
	30													
	32													
	34													
	36													

Particle Sizes: Agg. = > 200mm, Coarse Sand = 2.00 - 0.42mm, Fine Sand = 0.42 - 0.074mm, Silt = 0.074 - 0.005mm, Clay = < 0.005mm

DESIGN AGENCY



2860 FISHER ROAD
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 PHONE: (614) 276-8123
 FAX: (614) 276-8377

DESIGNER	N.K.S
REVIEWER	SM 05-05-25
PROJECT ID	93800
SUBSET	TOTAL
21	21
SHEET	TOTAL
P.107	107

APPENDIX B
TEST BORING RECORDS



STANDARD ODOT SOIL BORING LOG (8.5 X 11) - OH DOT.GDT - 6/20/24 16:38 - O:\PROJECT\2023\COL-05\23050024\COL_ADA-247-14.67 15-72 BRIDGE REPLACEMENTS_KORDA NEMETH ENGINEERING

PROJECT: <u>ADA-247-14.51/15.56</u>	DRILLING FIRM / OPERATOR: <u>CTL / J.S</u>	DRILL RIG: <u>MOBILE B-57 TRACK</u>	STATION / OFFSET: <u>767+55, 9' RT.</u>	EXPLORATION ID <u>B-001-0-23</u>
TYPE: <u>LANDSLIDE</u>	SAMPLING FIRM / LOGGER: <u>CTL / J.S</u>	HAMMER: <u>MOBILE AUTOMATIC</u>	ALIGNMENT: <u>SR 247</u>	
PID: <u>93800</u> SFN: _____	DRILLING METHOD: <u>3.25" HSA / NQ</u>	CALIBRATION DATE: <u>5/3/23</u>	ELEVATION: <u>792.1 (MSL)</u> EOB: <u>27.5 ft.</u>	PAGE 1 OF 1
START: <u>10/16/23</u> END: <u>10/16/23</u>	SAMPLING METHOD: <u>SPT / NQ</u>	ENERGY RATIO (%): <u>76.8</u>	COORD: <u>327887.8300 N, 1666668.2780 E</u>	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTH	SPT/ RQD	N ₆₀	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%)					ATTERBERG				ODOT CLASS (GI)	HOLE SEALED			
								GR	CS	FS	SI	CL	LL	PL	PI	WC					
ASPHALT (9")	791.4																				
AGGREGATE BASE (15")	790.1	1	13																		
VERY STIFF, BROWN, CLAY , SOME SILT, LITTLE SAND, TRACE GRAVEL, (FILL), MOIST @2.5'; LITTLE SILT, DAMP @4.0'; MOIST @7.0'; MEDIUM STIFF @8.5'; VERY STIFF, SOME SILT, TRACE SAND, NO GRAVEL	782.1	2	5	9	67	SS-1	3.25	6	8	6	31	49	48	22	26	27	A-7-6 (16)				
		3	3	8	67	SS-2	2.25	7	7	7	30	49	59	24	35	21	A-7-6 (20)				
		4	2	1	8	22	SS-3	2.25	-	-	-	-	-	-	-	-	30	A-7-6 (V)			
		5	2	1	5	33	SS-4	2.50	-	-	-	-	-	-	-	-	29	A-7-6 (V)			
		6	2	1	5	33	SS-4	2.50	-	-	-	-	-	-	-	-	29	A-7-6 (V)			
		7	2	2	3	6	0	SS-5	-	-	-	-	-	-	-	-	-	A-7-6 (V)			
		8	2	2	3	6	0	SS-5	-	-	-	-	-	-	-	-	-	A-7-6 (V)			
		9	2	1	4	67	SS-6	2.50	0	3	5	32	60	64	28	36	29	A-7-6 (20)			
		10	2	1	2	13	100	SS-7	4.50	-	-	-	-	-	-	-	22	A-6b (V)			
		11	5	1	9	13	100	SS-7	4.50	-	-	-	-	-	-	-	22	A-6b (V)			
HARD, BROWN, SILTY CLAY , DAMP @11.5'; VERY STIFF, DAMP @13.0'; HARD	777.6	12	6	14	22	SS-8	3.00	-	-	-	-	-	-	-	-	30	A-6b (V)				
		13	5	6	5	14	22	SS-8	3.00	-	-	-	-	-	-	-	30	A-6b (V)			
		14	5	6	20	33	67	SS-9	-	-	-	-	-	-	-	-	17	A-6b (V)			
SHALE , GRAY, SEVERLY WEATHERED.	774.6	15	20	50/4"	-	40	SS-10	-	-	-	-	-	-	-	-	6	Rock (V)				
		16	49	43	50/5"	-	82	SS-11	-	-	-	-	-	-	-	-	5	Rock (V)			
INTERBEDDED SHALE (75%) AND LIMESTONE (25%) , RQD 55%, REC. 93%; SHALE , GRAY, HIGHLY WEATHERED, VERY WEAK; LIMESTONE , GRAY, MODERATELY WEATHERED, STRONG. @23.2'-23.7'; COMPRESSIVE STRENGTH (LIMESTONE)= 10,570 PSI	764.6	17																			
		18																			
		19																			
		20	47			85	NQ-1												CORE		
		21																			
		22																			
		23																			
		24																			
		25	63			100	NQ-2													CORE	
		26																			
27																					

NOTES: CAVED AT 15.5'

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

STANDARD ODOT SOIL BORING LOG (8.5 X 11) - OH DOT.GDT - 6/20/24 16:38 - O:\PROJECT\2023\COL-05\2306002\COL_ADA-247-14.67-15-72 BRIDGE REPLACEMENTS_KORDA NEMETH ENGINEERING

PROJECT: ADA-247-14.51/15.56	DRILLING FIRM / OPERATOR: CTL / J.S	DRILL RIG: MOBILE B-57 TRACK	STATION / OFFSET: 768+09, 10' LT.	EXPLORATION ID B-002-0-23
TYPE: BRIDGE	SAMPLING FIRM / LOGGER: CTL / J.S	HAMMER: MOBILE AUTOMATIC	ALIGNMENT: SR 247	PAGE 1 OF 1
PID: 93800 SFN: 0103934	DRILLING METHOD: 3.25" HSA / NQ	CALIBRATION DATE: 5/3/23	ELEVATION: 778.8 (MSL) EOB: 21.0 ft.	
START: 10/12/23 END: 10/12/23	SAMPLING METHOD: SPT / NQ	ENERGY RATIO (%): 76.8	COORD: 327939.0300 N, 1666644.0140 E	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N ₆₀	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%)					ATTERBERG			WC	ODOT CLASS (GI)	HOLE SEALED				
								GR	CS	FS	SI	CL	LL	PL	PI							
VERY STIFF, BROWN, SILT AND CLAY, TRACE SAND, TRACE GRAVEL, DAMP @3.0'; HARD, CONTAINS ROCK FRAGMENTS	778.8		9	19	37	100	SS-1	4.00	11	1	7	50	31	40	25	15	24	A-6a (10)				
			9	7	19	0	SS-2	-	-	-	-	-	-	-	-	-	-	A-6a (V)				
		774.3	W 774.8	12	24	-	7	SS-3	-	-	-	-	-	-	-	-	-	0	A-6a (V)			
SHALE, GRAY, SEVERLY WEATHERED.	772.8	TR	27	50/4"	-	80	SS-4	4.50	-	-	-	-	-	-	-	-	-	5	Rock (V)			
INTERBEDDED SHALE (75%) AND LIMESTONE (25%), RQD 36%, REC. 97%; SHALE, GRAY, HIGHLY WEATHERED, VERY WEAK TO WEAK; LIMESTONE, GRAY, HIGHLY WEATHERED, SLIGHTLY STRONG. @13.0'-13.6'; COMPRESSIVE STRENGTH (SHALE)= 580 PSI @19.6'-20.0'; COMPRESSIVE STRENGTH (LIMESTONE)= 2,370 PSI																						
				32		95	NQ-1													CORE		
				47		95	NQ-2														CORE	
				30		100	NQ-3														CORE	
		757.8	EOB																			

NOTES: CAVED AT 4.5'; BRIDGE DECK ELEVATION= 792.81 FEET
 ABANDONMENT METHODS, MATERIALS, QUANTITIES: BACKFILLED WITH GROUT

STANDARD ODOT SOIL BORING LOG (8.5 X 11) - OH DOT.GDT - 6/20/24 16:38 - O:\PROJECT\2023\COL-05\23060024\COL_ADA-247-14.67 15-72 BRIDGE REPLACEMENTS_KORDA NEMETH ENGINEERING

PROJECT: <u>ADA-247-14.51/15.56</u>	DRILLING FIRM / OPERATOR: <u>CTL / J.S</u>	DRILL RIG: <u>MOBILE B-57 TRACK</u>	STATION / OFFSET: <u>768+46, 10' LT.</u>	EXPLORATION ID <u>B-003-0-23</u>
TYPE: <u>BRIDGE</u>	SAMPLING FIRM / LOGGER: <u>CTL / J.S</u>	HAMMER: <u>MOBILE AUTOMATIC</u>	ALIGNMENT: <u>SR 247</u>	PAGE 1 OF 1
PID: <u>93800</u> SFN: <u>0103934</u>	DRILLING METHOD: <u>3.25" HSA / NQ</u>	CALIBRATION DATE: <u>5/3/23</u>	ELEVATION: <u>773.6 (MSL)</u> EOB: <u>16.0 ft.</u>	
START: <u>10/17/23</u> END: <u>10/17/23</u>	SAMPLING METHOD: <u>SPT / NQ</u>	ENERGY RATIO (%): <u>76.8</u>	COORD: <u>327976.1200 N, 1666640.1750 E</u>	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N ₆₀	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%)					ATTERBERG				ODOT CLASS (GI)	HOLE SEALED	
								GR	CS	FS	SI	CL	LL	PL	PI	WC			
VERY DENSE, BROWN, GRAVEL AND/OR STONE FRAGMENTS WITH SAND, SILT, AND CLAY, MOIST	773.6																		
INTERBEDDED SHALE (75%) AND LIMESTONE (25%), RQD 25%, REC. 80%; SHALE, GRAY, HIGHLY WEATHERED, VERY WEAK; LIMESTONE, GRAY, MODERATELY WEATHERED, MODERATELY STRONG. @3.0'-3.4': COMPRESSIVE STRENGTH (SHALE)= 140 PSI @1.0'-6.0'; SLAKE DURABILITY INDEX (SHALE) = 57.2 PERCENT	772.6	TR	50/3"	-	33	SS-1	-	-	-	-	-	-	-	-	-	-	10	A-2-7 (V)	
		1																	
		2																	
		3																	
		4	17		53	NQ-1													CORE
		5																	
		6																	
		7																	
		8																	
		9	40		87	NQ-2													CORE
		10																	
		11																	
		12																	
		13	18		100	NQ-3													CORE
		14																	
		15																	
	757.6	EOB																	

NOTES: BRIDGE DECK ELEVATION= 793.56 FEET, STREAM WATER SURFACE ELEVATION= 773.86 FEET
 ABANDONMENT METHODS, MATERIALS, QUANTITIES: BACKFILLED WITH GROUT

STANDARD ODOT SOIL BORING LOG (8.5 X 11) - OH DOT.GDT - 6/20/24 16:38 - O:\PROJECT\2023\COL-05\2306002\COL ADA-247-14.67 15-72 BRIDGE REPLACEMENTS_KORDA NEMETH ENGINEERING

PROJECT: ADA-247-14.51/15.56	DRILLING FIRM / OPERATOR: CTL / J.S	DRILL RIG: MOBILE B-57 TRACK	STATION / OFFSET: 769+19, 10' RT.	EXPLORATION ID B-004-0-23
TYPE: BRIDGE	SAMPLING FIRM / LOGGER: CTL / J.S	HAMMER: MOBILE AUTOMATIC	ALIGNMENT: SR 247	
PID: 93800 SFN: 0103934	DRILLING METHOD: 3.25" HSA / NQ	CALIBRATION DATE: 5/3/23	ELEVATION: 787.2 (MSL) EOB: 19.5 ft.	PAGE 1 OF 1
START: 10/17/23 END: 10/17/23	SAMPLING METHOD: SPT / NQ	ENERGY RATIO (%): 76.8	COORD: 328050.5700 N, 1666652.1500 E	

MATERIAL DESCRIPTION AND NOTES	ELEV.	787.2	DEPTHS	SPT/ RQD	N ₆₀	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%)					ATTERBERG			WC	ODOT CLASS (GI)	HOLE SEALED				
									GR	CS	FS	SI	CL	LL	PL	PI							
VERY SOFT, BROWN, CLAY, SOME GRAVEL, DAMP	785.7		1	0	0	11	SS-1	-	-	-	-	-	-	-	-	-	-	27	A-7-6 (V)				
HARD, GRAY, SILTY CLAY, DRY	782.7	TR	2	3	6	17	78	SS-2	4.50	-	-	-	-	-	-	-	-	15	A-6b (V)				
			3	5	7	18	33	SS-3	4.50	-	-	-	-	-	-	-	-	16	A-6b (V)				
			4	7	7																		
INTERBEDDED SHALE (75%) AND LIMESTONE (25%), RQD 28%, REC. 63%; SHALE, GRAY, HIGHLY WEATHERED, VERY WEAK; LIMESTONE, GRAY, HIGHLY WEATHERED, SLIGHTLY TO MODERATELY STRONG. @4.5'-9.5' ; SLAKE DURABILITY INDEX (SHALE) = 87.2 PERCENT @10.0'-10.5'; COMPRESSIVE STRENGTH (SHALE)= 120 PSI @18.0'; SHALE, MODERATELY WEATHERED. @18.5'-19.0'; COMPRESSIVE STRENGTH (LIMESTONE)= 2,880 PSI	782.7	TR	5																				
			6																				
			7	0		40		NQ-1														CORE	
			8																				
			9																				
			10																				
			11																				
			12	35		50		NQ-2															CORE
			13																				
			14																				
15																							
16																							
17	48		100		NQ-3															CORE			
18																							
19																							
	767.7		EOB																				

NOTES: BRIDGE DECK ELEVATION= 796.40 FEET
 ABANDONMENT METHODS, MATERIALS, QUANTITIES: BACKFILLED WITH GROUT

STANDARD ODOT SOIL BORING LOG (8.5 X 11) - OH DOT.GDT - 6/20/24 16:38 - O:\PROJECT\2023\COL-05123060024\COL ADA-247-14.67 15-72 BRIDGE REPLACEMENTS_KORDA NEMETH ENGINEERING

PROJECT: <u>ADA-247-14.51/15.56</u>	DRILLING FIRM / OPERATOR: <u>CTL / J.S</u>	DRILL RIG: <u>MOBILE B-57 TRACK</u>	STATION / OFFSET: <u>769+68, 10' LT.</u>	EXPLORATION ID <u>B-005-0-23</u>
TYPE: <u>ROADWAY</u>	SAMPLING FIRM / LOGGER: <u>CTL / J.S</u>	HAMMER: <u>MOBILE AUTOMATIC</u>	ALIGNMENT: <u>SR 247</u>	PAGE 1 OF 1
PID: <u>93800</u> SFN: _____	DRILLING METHOD: <u>3.25" HSA</u>	CALIBRATION DATE: <u>5/3/23</u>	ELEVATION: <u>798.6 (MSL)</u> EOB: <u>7.0 ft.</u>	
START: <u>10/18/23</u> END: <u>10/18/23</u>	SAMPLING METHOD: <u>SPT</u>	ENERGY RATIO (%): <u>76.8</u>	COORD: <u>328097.5100 N, 1666627.1540 E</u>	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N ₆₀	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%)					ATTERBERG				ODOT CLASS (GI)	HOLE SEALED	
								GR	CS	FS	SI	CL	LL	PL	PI	WC			
ASPHALT (9")	798.6																		
AGGREGATE BASE (5")	797.9																		
VERY STIFF, BROWN, CLAY , SOME SILT, TRACE SAND, TRACE GRAVEL, (FILL), DAMP @2.5'; NO GRAVEL	797.4	1	5																
		2	3	10	89	SS-1	3.50	8	2	5	32	53	65	24	41	22	A-7-6 (20)		
		3	2																
		4	3	8	67	SS-2	3.00	1	0	1	37	61	66	29	37	23	A-7-6 (20)		
@4.0'; HARD		5	2																
		6	3	9	100	SS-3	4.25	-	-	-	-	-	-	-	-	28	A-7-6 (V)		
HARD, BROWN, CLAY , SOME SILT, TRACE SAND, TRACE GRAVEL, DAMP	793.1	7	4																
	791.6	EOB	5	14	100	SS-4	4.50	-	-	-	-	-	-	-	-	25	A-7-6 (V)		

NOTES: NONE

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

STANDARD ODOT SOIL BORING LOG (8.5 X 11) - OH DOT.GDT - 6/20/24 16:38 - O:\PROJECT\2023\COL-05\23060024\COL ADA-247-14.67 15-72 BRIDGE REPLACEMENTS_KORDA NEMETH ENGINEERING

PROJECT: ADA-247-14.51/15.56	DRILLING FIRM / OPERATOR: CTL / J.S	DRILL RIG: MOBILE B-57 TRACK	STATION / OFFSET: 823+08, 10' LT.	EXPLORATION ID B-006-0-23
TYPE: LANDSLIDE	SAMPLING FIRM / LOGGER: CTL / J.S	HAMMER: MOBILE AUTOMATIC	ALIGNMENT: SR 247	
PID: 93800 SFN:	DRILLING METHOD: 3.25" HSA / NQ	CALIBRATION DATE: 5/3/23	ELEVATION: 787.3 (MSL) EOB: 25.0 ft.	PAGE 1 OF 1
START: 10/9/23 END: 10/9/23	SAMPLING METHOD: SPT / NQ	ENERGY RATIO (%): 76.8	COORD: 333239.6300 N, 1665419.2620 E	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTH	SPT/ RQD	N ₆₀	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%)					ATTERBERG				ODOT CLASS (GI)	HOLE SEALED
								GR	CS	FS	SI	CL	LL	PL	PI	WC		
ASPHALT (9")	787.3																	
AGGREGATE BASE (11")	786.5	1	8															
VERY STIFF, BROWN, SILTY CLAY, SOME SAND, SOME GRAVEL, (FILL), DAMP	785.6	2	5	10	67	SS-1	3.25	29	21	9	13	28	34	18	16	6	A-6b (3)	
VERY STIFF, BROWN, CLAY, "AND" SILT, TRACE SAND, TRACE GRAVEL, (FILL), MOIST	784.8	3	2	5	67	SS-2	2.25	1	1	2	48	48	47	23	24	26	A-7-6 (15)	
		4	3															
		5	2	6	44	SS-3	3.75	-	-	-	-	-	-	-	-	25	A-7-6 (V)	
VERY STIFF, GRAY, SILTY CLAY, LITTLE SAND, LITTLE GRAVEL, (FILL), DAMP	781.8	6	4	15	33	SS-4	3.75	18	10	3	21	48	39	21	18	18	A-6b (10)	
		7	4	8														
		8																
@8.5'; HARD, CONTAINS ROCK FRAGMENTS	777.3	9	12	38	18	72	33	SS-5	-	-	-	-	-	-	-	15	A-6b (V)	
HARD, GRAY, SILTY CLAY, DAMP		10																
		11																
		12																
	773.8	13																
SHALE, GRAY, SEVERLY WEATHERED.		14	47	32	24	72	56	SS-6	-	-	-	-	-	-	-	1	Rock (V)	
	772.3	15																
INTERBEDDED SHALE (75%) AND LIMESTONE (25%), RQD 15%, REC. 92%;		16																
SHALE, GRAY, HIGHLY WEATHERED, VERY WEAK;		17																
LIMESTONE, GRAY, MODERATELY WEATHERED, SLIGHTLY STRONG.		18	22			87		NQ-1										CORE
@15.4'-15.9'; COMPRESSIVE STRENGTH (LIMESTONE)= 3,420 PSI		19																
		20																
		21																
		22																
		23	8			97		NQ-2										CORE
		24																
	762.3	25																
		EOB																

NOTES: CAVED AT 13'; BRIDGE DECK ELEVATION= 786.47 FEET
 ABANDONMENT METHODS, MATERIALS, QUANTITIES: PLACED ASPHALT PATCH; BACKFILLED WITH GROUT

STANDARD ODOT SOIL BORING LOG (8.5 X 11) - OH DOT.GDT - 6/20/24 16:38 - O:\PROJECT\2023\COL-05\2306002\COL_ADA-247-14.67-15-72 BRIDGE REPLACEMENTS_KORDA NEMETH ENGINEERING

PROJECT: <u>ADA-247-14.51/15.56</u>	DRILLING FIRM / OPERATOR: <u>CTL / J.S</u>	DRILL RIG: <u>MOBILE B-57 TRACK</u>	STATION / OFFSET: <u>823+46, 11' RT.</u>	EXPLORATION ID <u>B-007-0-23</u>
TYPE: <u>BRIDGE</u>	SAMPLING FIRM / LOGGER: <u>CTL / J.S</u>	HAMMER: <u>MOBILE AUTOMATIC</u>	ALIGNMENT: <u>SR 247</u>	
PID: <u>93800</u> SFN: <u>0103993</u>	DRILLING METHOD: <u>3.25" HSA / NQ</u>	CALIBRATION DATE: <u>5/3/23</u>	ELEVATION: <u>779.5 (MSL)</u> EOB: <u>30.0 ft.</u>	PAGE 1 OF 2
START: <u>10/10/23</u> END: <u>10/10/23</u>	SAMPLING METHOD: <u>SPT / NQ</u>	ENERGY RATIO (%): <u>76.8</u>	COORD: <u>333280.0800 N, 1665434.8540 E</u>	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N ₆₀	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%)					ATTERBERG			WC	ODOT CLASS (GI)	HOLE SEALED
								GR	CS	FS	SI	CL	LL	PL	PI			
VERY STIFF, BROWN AND GRAY, SILT AND CLAY, LITTLE SAND, TRACE GRAVEL, DAMP	779.5		3															
		1	3	8	56	SS-1	3.75	9	11	7	30	43	32	19	13	17	A-6a (9)	
VERY STIFF, BROWN, CLAY, "AND" SILT, LITTLE SAND, TRACE GRAVEL, DAMP	777.5	2	3	9	22	SS-2	2.50	-	-	-	-	-	-	-	-	14	A-7-6 (V)	
@4.5'; MOIST		3	4	3														
@6.0'; DAMP		4	2	6	33	SS-3	3.00	-	-	-	-	-	-	-	-	24	A-7-6 (V)	
		5	6	10	20	78	SS-4	3.00	7	4	11	44	34	43	26	17	27	A-7-6 (11)
@8.5'; STIFF, SOME SILT, TRACE SAND, NO GRAVEL, MOIST		6	2	3	9	33	SS-5	2.75	-	-	-	-	-	-	-	22	A-7-6 (V)	
		7	3	4														
		8																
		9	2	3	6	11	SS-6	2.00	-	-	-	-	-	-	-	32	A-7-6 (V)	
		10	3	2														
		11	0	1	4	44	SS-7	2.00	0	2	2	34	62	53	25	28	29	A-7-6 (18)
		12	1	2														
SHALE, GRAY, SEVERLY WEATHERED.	765.5	13	0	20	58	100	SS-8	-	-	-	-	-	-	-	-	11	Rock (V)	
		14	20	25														
INTERBEDDED SHALE (75%) AND LIMESTONE (25%), RQD 36%, REC. 88%; SHALE, GRAY, HIGHLY WEATHERED, VERY WEAK; LIMESTONE, GRAY, HIGHLY WEATHERED, SLIGHTLY STRONG.	764.5	15	0		63	NQ-1											CORE	
@19.9'-20.3'; COMPRESSIVE STRENGTH (SHALE)= 220 PSI		16																
		17																
@22.8'-23.2'; COMPRESSIVE STRENGTH (LIMESTONE)= 3,110 PSI		18	60		100	NQ-2											CORE	
		19																
		20																
		21																
		22																
		23																
		24	53		100	NQ-3											CORE	
		25																
		26																
		27																
		28	25		83	NQ-4											CORE	
SHALE, MODERATELY WEATHERED, SLIGHTLY STRONG.	749.5	29																

EOB

STANDARD ODOT SOIL BORING LOG (8.5 X 11) - OH DOT.GDT - 6/20/24 16:38 - O:\PROJECT\2023\COL-05\23050024COL_ADA-247-14.67 15-72 BRIDGE REPLACEMENTS_KORDA NEMETH ENGINEERING

PID: 93800	SFN:	PROJECT: ADA-247-14.51/15.56	STATION / OFFSET: 823+46, 11' RT.	START: 10/10/23	END: 10/10/23	PG 2 OF 2	B-007-0-23
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MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N ₆₀	REC SAMPLE (%) ID	HP (tsf)	GRADATION (%)					ATTERBERG				ODOT CLASS (GI)	HOLE SEALED
							GR	CS	FS	SI	CL	LL	PL	PI	WC		

@29.0'-29.5'; COMPRESSIVE STRENGTH (SHALE)= 2,470 PSI /

NOTES: BRIDGE DECK ELEVATION= 785.74 FEET
 ABANDONMENT METHODS, MATERIALS, QUANTITIES: BACKFILLED WITH GROUT

STANDARD ODOT SOIL BORING LOG (8.5 X 11) - OH DOT.GDT - 6/20/24 16:38 - O:\PROJECT\2023\COL-05\23060024\COL ADA-247-14.67 15-72 BRIDGE REPLACEMENTS_KORDA NEMETH ENGINE

PROJECT: ADA-247-14.51/15.56	DRILLING FIRM / OPERATOR: CTL / J.S	DRILL RIG: MOBILE B-57 TRACK	STATION / OFFSET: 823+88, 9' LT.	EXPLORATION ID B-008-0-23
TYPE: BRIDGE	SAMPLING FIRM / LOGGER: CTL / J.S	HAMMER: MOBILE AUTOMATIC	ALIGNMENT: SR 247	
PID: 93800 SFN: 0103993	DRILLING METHOD: 3.25" HSA / NQ	CALIBRATION DATE: 5/3/23	ELEVATION: 769.7 (MSL) EOB: 19.0 ft.	PAGE 1 OF 1
START: 10/3/23 END: 10/3/23	SAMPLING METHOD: SPT / NQ	ENERGY RATIO (%): 76.8	COORD: 333319.2500 N, 1665410.1640 E	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTH	SPT/ RQD	N ₆₀	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%)					ATTERBERG				ODOT CLASS (GI)	HOLE SEALED
								GR	CS	FS	SI	CL	LL	PL	PI	WC		
VERY LOOSE, BROWN, GRAVEL AND/OR STONE FRAGMENTS WITH SAND, SILT, AND CLAY, WET	769.7		3															
			4	8	0	SS-1	-	-	-	-	-	-	-	-	-	-	-	A-2-7 (V)
SHALE, GRAY, SEVERLY WEATHERED.	766.7	TR	0															
			0	1	17	SS-2	-	-	-	-	-	-	-	-	-	-	23	A-2-7 (V)
INTERBEDDED SHALE (75%) AND LIMESTONE (25%), RQD 23%, REC. 75%; SHALE, GRAY, HIGHLY WEATHERED, VERY WEAK TO WEAK; LIMESTONE, GRAY, HIGHLY WEATHERED, MODERATELY STRONG. @4.0'-9.0'; SLAKE DURABILITY INDEX (SHALE) = 43.8 PERCENT @4.0'-9.0'; COMPRESSIVE STRENGTH (POINT LOAD)= 1,432 PSI	765.7		26		100	SS-3	3.00	-	-	-	-	-	-	-	-	-	13	Rock (V)
			50/5"															
			13		70	NQ-1												CORE
			30		80	NQ-2												CORE
			27		75	NQ-3												CORE
	750.7	EOB																

NOTES: BRIDGE DECK ELEVATION= 785.74 FEET
 ABANDONMENT METHODS, MATERIALS, QUANTITIES: BACKFILLED WITH GROUT

STANDARD ODOT SOIL BORING LOG (8.5 X 11) - OH DOT.GDT - 6/20/24 16:38 - O:\PROJECT\2023\COL-05123050024\COL ADA-247-14.67 15-72 BRIDGE REPLACEMENTS_KORDA NEMETH ENGINEERING

PROJECT: ADA-247-14.51/15.56	DRILLING FIRM / OPERATOR: CTL / J.S	DRILL RIG: MOBILE B-57 TRACK	STATION / OFFSET: 824+49, 9' LT.	EXPLORATION ID B-009-0-23
TYPE: BRIDGE	SAMPLING FIRM / LOGGER: CTL / J.S	HAMMER: MOBILE AUTOMATIC	ALIGNMENT: SR 247	
PID: 93800 SFN: 0103993	DRILLING METHOD: 3.25" HSA / NQ	CALIBRATION DATE: 5/3/23	ELEVATION: 779.4 (MSL) EOB: 22.5 ft.	PAGE 1 OF 1
START: 10/11/23 END: 10/11/23	SAMPLING METHOD: SPT / NQ	ENERGY RATIO (%): 76.8	COORD: 333379.7900 N, 1665403.5880 E	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTH	SPT/ RQD	N ₆₀	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%)					ATTERBERG				ODOT CLASS (GI)	HOLE SEALED		
								GR	CS	FS	SI	CL	LL	PL	PI	WC				
VERY STIFF, BROWN, CLAY , SOME SILT, SOME SAND, TRACE GRAVEL, DAMP @1.5'; LITTLE SILT	779.4	TR	4	4	9	56	SS-1	3.25	2	6	17	33	42	47	26	21	26	A-7-6 (14)		
			3	4	13	78	SS-2	4.00	10	13	19	21	37	44	23	21	23	A-7-6 (9)		
			6	12	-	77	SS-3	3.75	-	-	-	-	-	-	-	-	-	19	A-7-6 (V)	
SHALE, GRAY, WEATHERED.	775.4	TR	16	19	87	89	SS-4	-	-	-	-	-	-	-	-	-	0	Rock (V)		
			17	44	24															
INTERBEDDED SHALE (75%) AND LIMESTONE (25%), RQD 30%, REC. 97%; SHALE, GRAY, HIGHLY WEATHERED, VERY WEAK TO WEAK; LIMESTONE, GRAY, HIGHLY WEATHERED, WEAK TO SLIGHTLY STRONG. @7.5'-12.5' ; SLAKE DURABILITY INDEX (SHALE) = 64 PERCENT	771.9	TR	7	21	-	94	SS-5	-	-	-	-	-	-	-	-	-	9	Rock (V)		
			50/5"																	
			10	7	95	NQ-1													CORE	
@16.0'-16.4'; COMPRESSIVE STRENGTH (SHALE)= 1,170 PSI	771.9	TR	13																	
			14	28	97	NQ-2													CORE	
@19.4'-19.8'; COMPRESSIVE STRENGTH (SHALE)= 1,340 PSI	771.9	TR	18																	
			19	55	100	NQ-3													CORE	
	756.9	EOB	22																	

NOTES: CAVED AT 4.9'; BRIDGE DECK ELEVATION= 792.40 FEET
 ABANDONMENT METHODS, MATERIALS, QUANTITIES: BACKFILLED WITH GROUT

STANDARD ODOT SOIL BORING LOG (8.5 X 11) - OH DOT.GDT - 6/20/24 16:38 - O:\PROJECT\2023\COL-05123050024\COL ADA-247-14.67 15-72 BRIDGE REPLACEMENTS_KORDA NEMETH ENGINEERING

PROJECT: <u>ADA-247-14.51/15.56</u>	DRILLING FIRM / OPERATOR: <u>CTL / J.S</u>	DRILL RIG: <u>MOBILE B-57 TRACK</u>	STATION / OFFSET: <u>824+72, 7' RT.</u>	EXPLORATION ID <u>B-010-0-23</u>
TYPE: <u>ROADWAY</u>	SAMPLING FIRM / LOGGER: <u>CTL / J.S</u>	HAMMER: <u>MOBILE AUTOMATIC</u>	ALIGNMENT: <u>SR 247</u>	PAGE 1 OF 1
PID: <u>93800</u> SFN: _____	DRILLING METHOD: <u>3.25" HSA</u>	CALIBRATION DATE: <u>5/3/23</u>	ELEVATION: <u>785.4 (MSL)</u> EOB: <u>7.0 ft.</u>	
START: <u>10/3/23</u> END: <u>10/3/23</u>	SAMPLING METHOD: <u>SPT</u>	ENERGY RATIO (%): <u>76.8</u>	COORD: <u>333404.3800 N, 1665417.0260 E</u>	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N ₆₀	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%)					ATTERBERG				ODOT CLASS (GI)	HOLE SEALED
								GR	CS	FS	SI	CL	LL	PL	PI	WC		
ASPHALT (2")	785.2																	
CONCRETE (15")	784.0																	
VERY STIFF, BROWN, CLAY , SOME SILT, TRACE SAND, (FILL), DAMP @2.5'; HARD, MOIST		1	3	8	67	SS-1	3.25	0	2	1	32	65	41	23	18	20	A-7-6 (11)	
@4.0'; VERY STIFF		2	3	8	67	SS-2	4.50	1	1	2	41	55	52	22	30	26	A-7-6 (18)	
@5.5'; HARD, DAMP		3	3	6	100	SS-3	2.75	-	-	-	-	-	-	-	-	26	A-7-6 (V)	
		4	2	6	100	SS-3	2.75	-	-	-	-	-	-	-	-	26	A-7-6 (V)	
		5	3	15	100	SS-4	4.25	-	-	-	-	-	-	-	-	20	A-7-6 (V)	
	778.4	6	6															
		7	6															
		EOB	6															

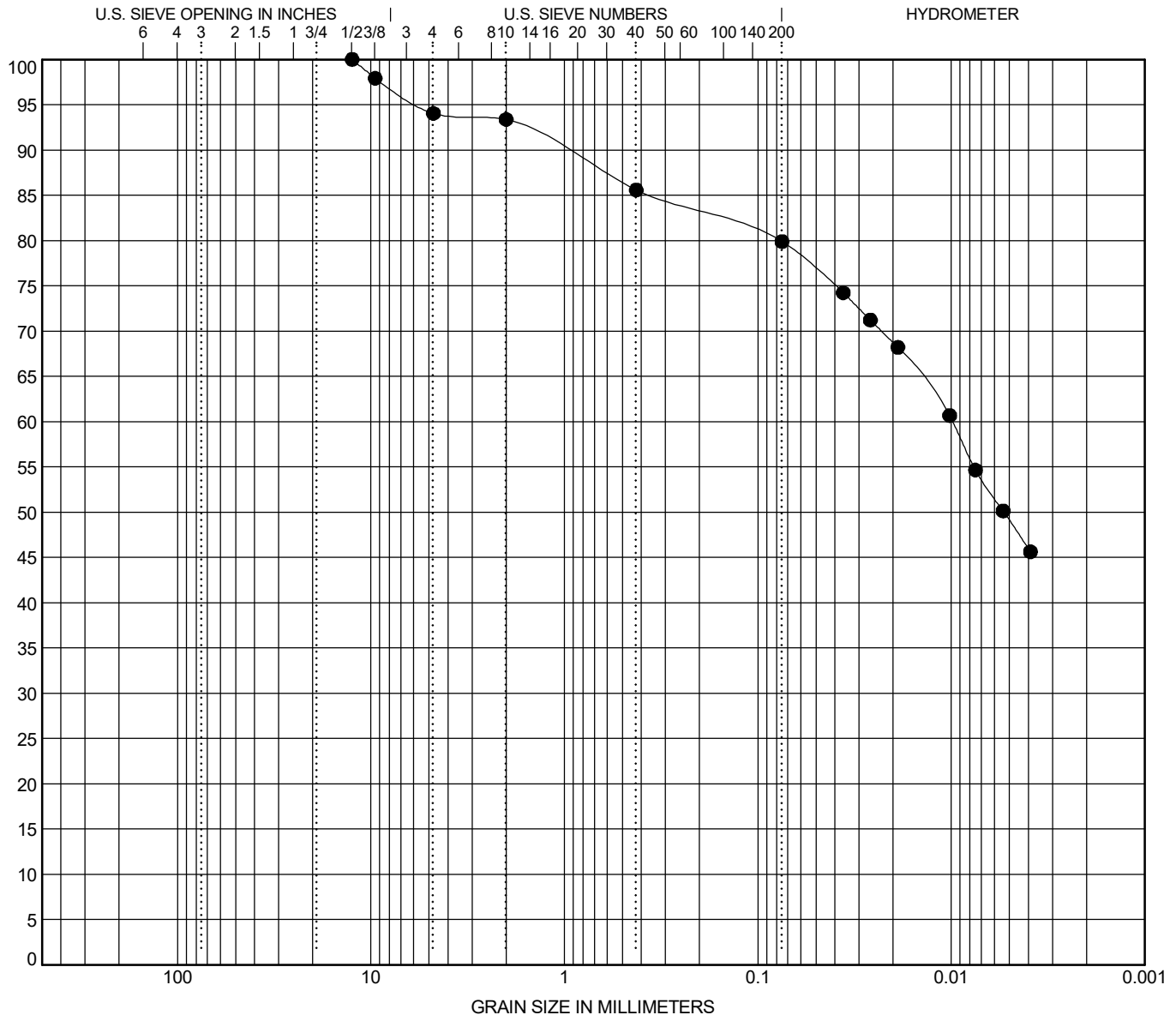
NOTES: NONE

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

APPENDIX C
LABORATORY TEST RESULTS



CTL GRADATION - 2014 ODOT.GDT - 6/19/24 13:06 - O:\PROJECT\2023\COL-05\230500024COL_ADA-247-14-67 15-72 BRIDGE REPLACEMENTS_KORDA NEMETH ENGINEERING_INC\REPORTS\LAB REPORTS\230500024COL.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	1.0	A-7-6(16)	27	48	22	26		

Specimen Identification	Depth	D100	D60	D50	D30	D10	%Gravel	%Coarse Sand	%Fine Sand	%Silt	%Clay
B-001-0-23	1.0	12.5	0.01	0.005			6	8	6	31	49

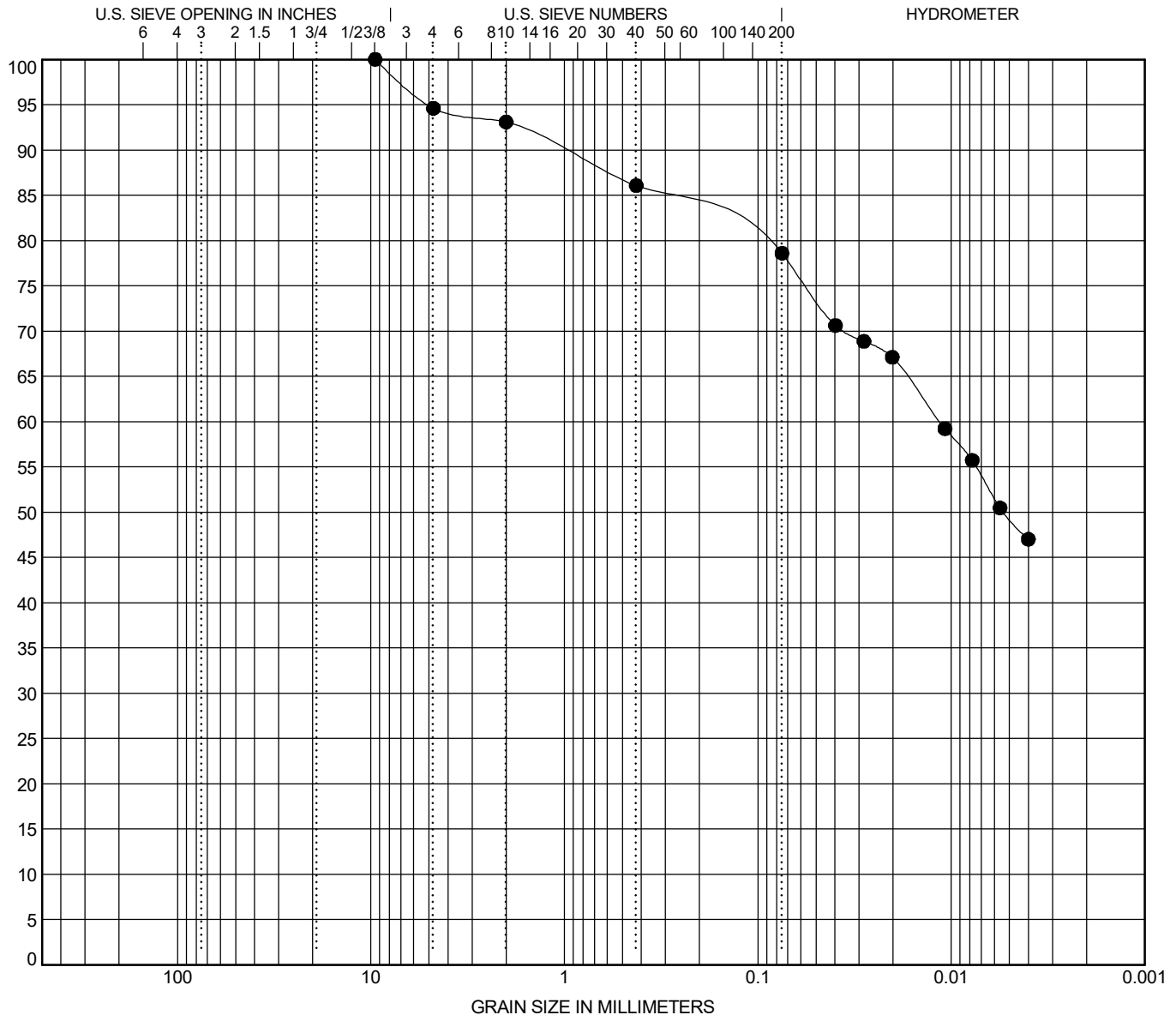


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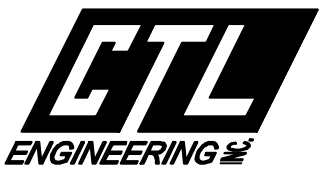
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COBBLES	GRAVEL		SAND		SILT OR CLAY
	coarse	fine	coarse	fine	

Specimen Identification	Depth	Classification	MC	LL	PL	PI	Cc	Cu
B-001-0-23	2.5	A-7-6(20)	21	59	24	35		

Specimen Identification	Depth	D100	D60	D50	D30	D10	%Gravel	%Coarse Sand	%Fine Sand	%Silt	%Clay
B-001-0-23	2.5	9.5	0.011	0.005			7	7	7	30	49

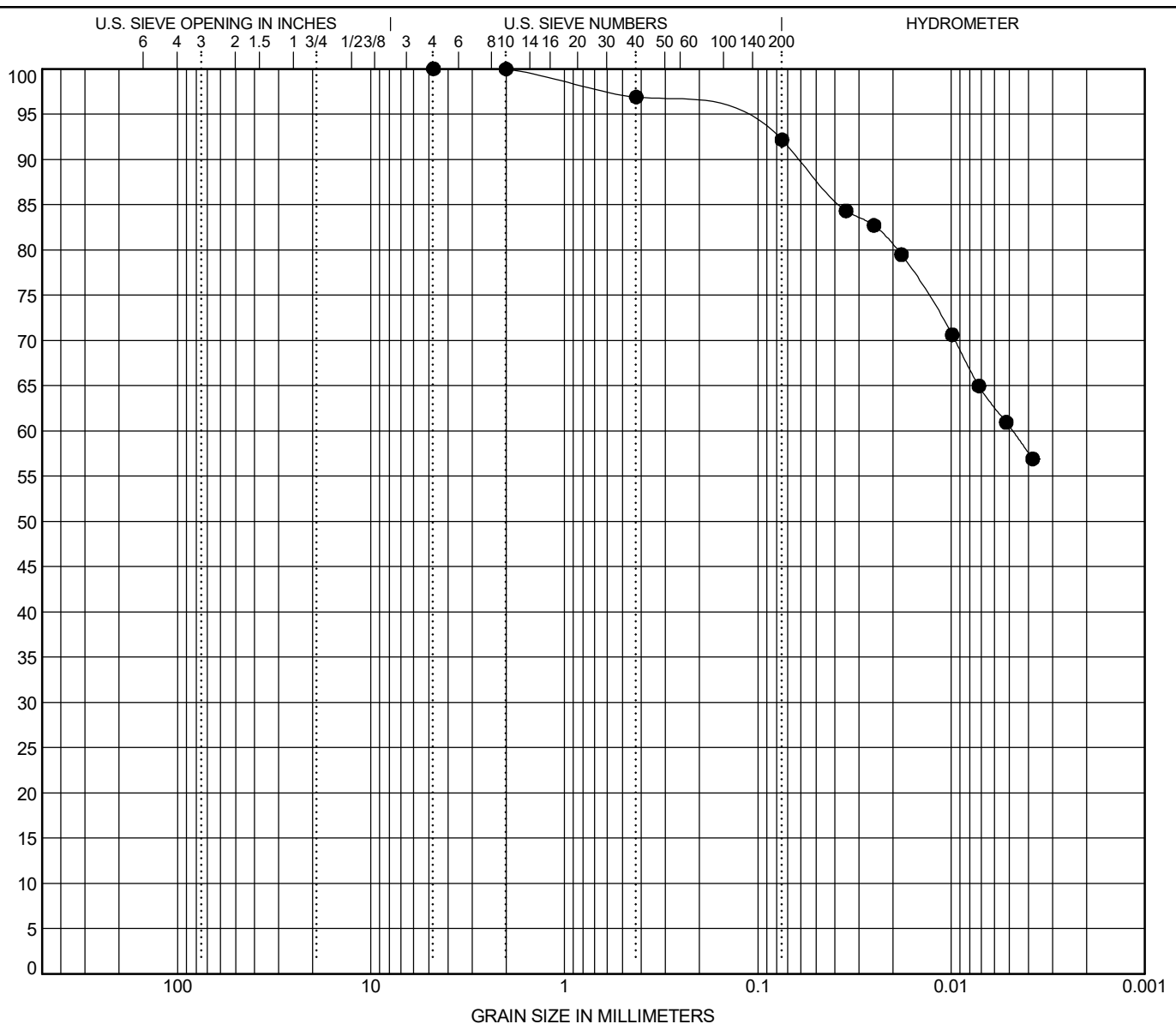


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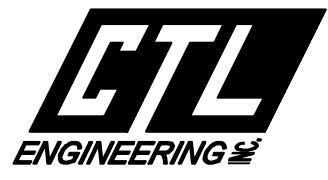
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COBBLES	GRAVEL		SAND		SILT OR CLAY
	coarse	fine	coarse	fine	

Specimen Identification	Depth	Classification	MC	LL	PL	PI	Cc	Cu
B-001-0-23	8.5	A-7-6(20)	29	64	28	36		

Specimen Identification	Depth	D100	D60	D50	D30	D10	%Gravel	%Coarse Sand	%Fine Sand	%Silt	%Clay
B-001-0-23	8.5	4.75	0.005				0	3	5	32	60

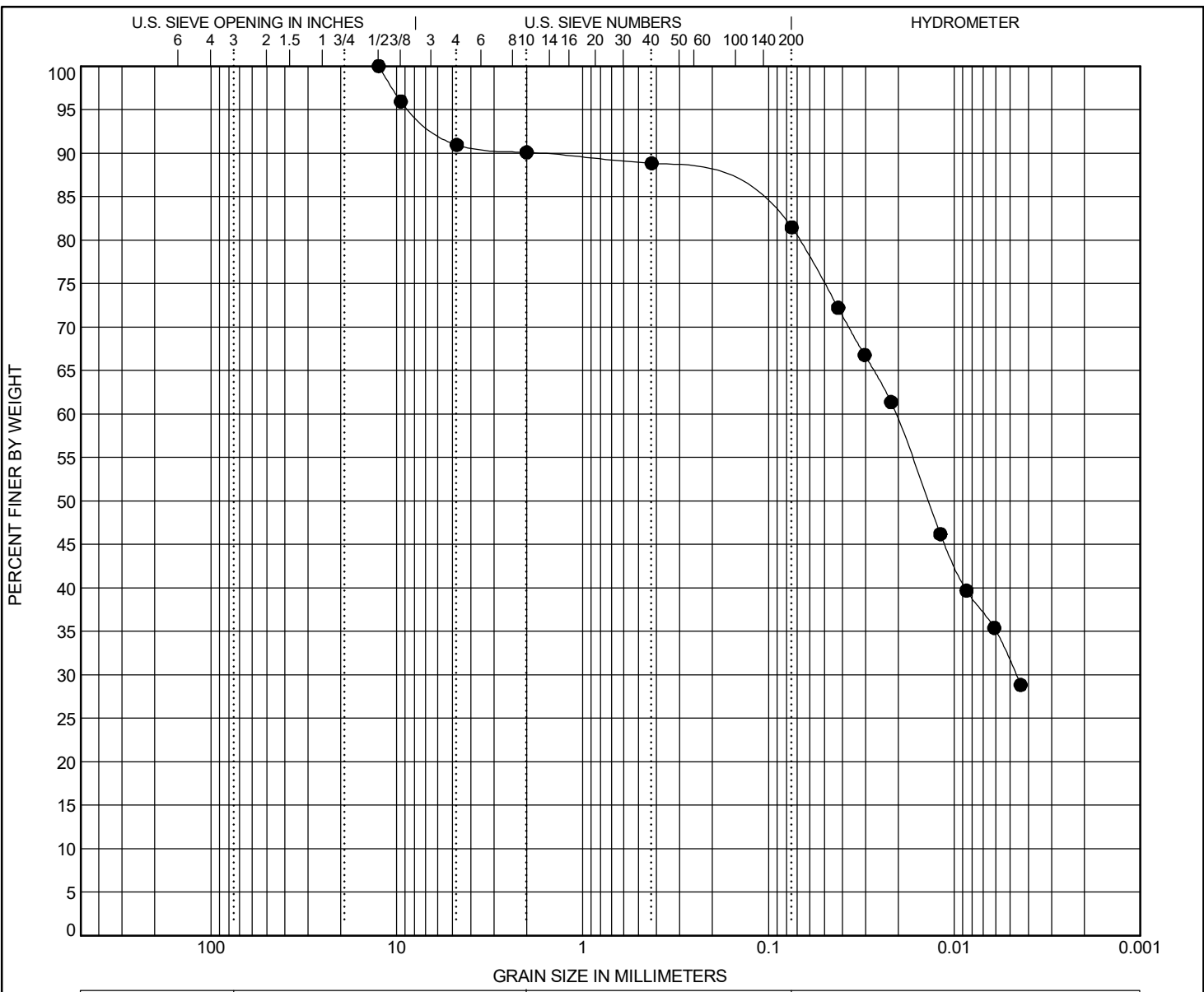


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COBBLES	GRAVEL		SAND		SILT OR CLAY
	coarse	fine	coarse	fine	

Specimen Identification	Depth	Classification	MC	LL	PL	PI	Cc	Cu
B-002-0-23	0.0	A-6a(10)	24	40	25	15		

Specimen Identification	Depth	D100	D60	D50	D30	D10	%Gravel	%Coarse Sand	%Fine Sand	%Silt	%Clay
B-002-0-23	0.0	12.5	0.021	0.014	0.005		11	1	7	50	31

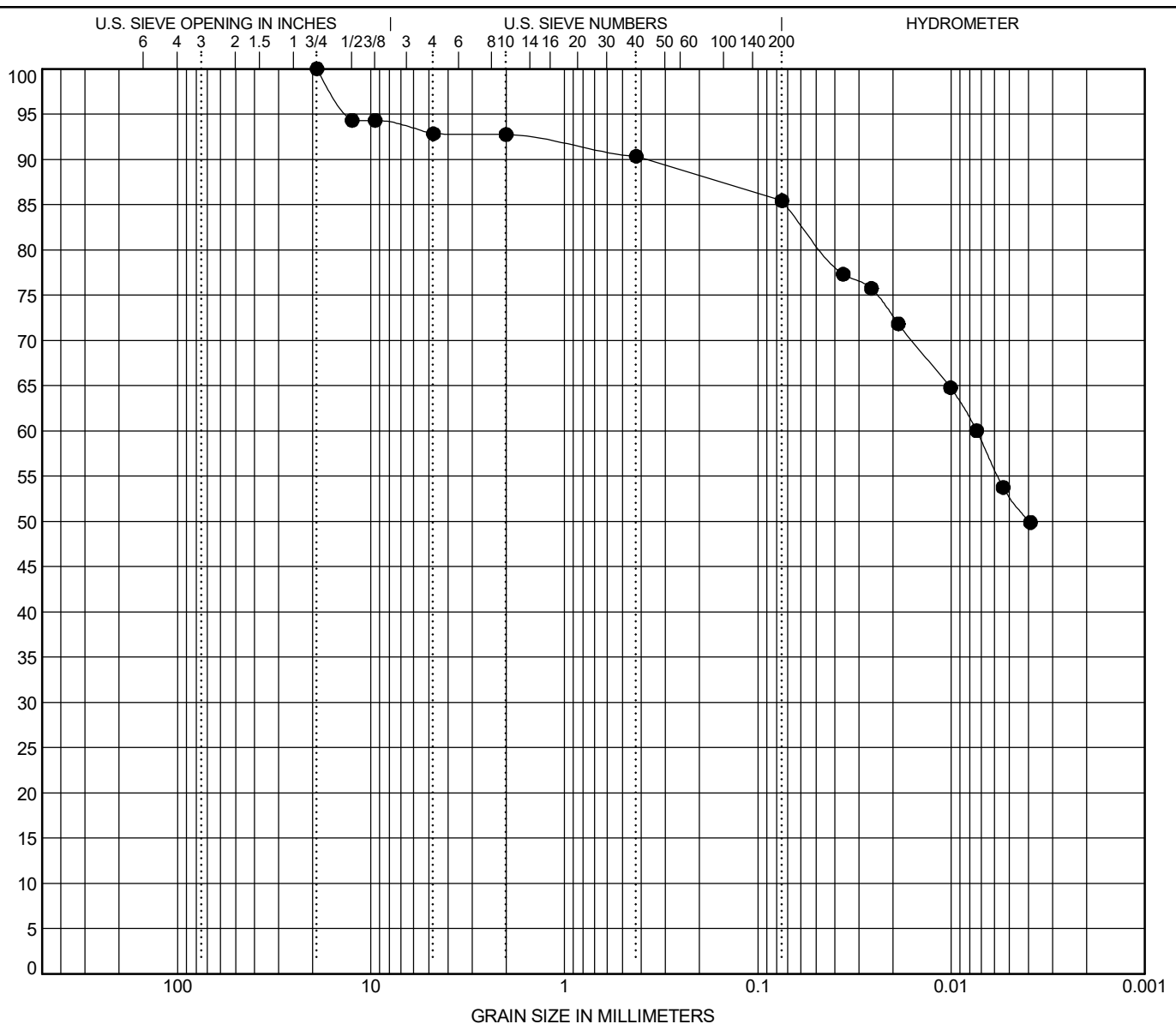


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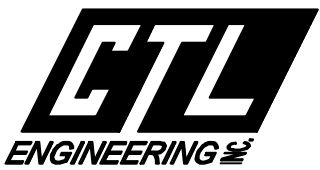
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COBBLES	GRAVEL		SAND		SILT OR CLAY
	coarse	fine	coarse	fine	

Specimen Identification	Depth	Classification	MC	LL	PL	PI	Cc	Cu
B-005-0-23	1.0	A-7-6(20)	22	65	24	41		

Specimen Identification	Depth	D100	D60	D50	D30	D10	%Gravel	%Coarse Sand	%Fine Sand	%Silt	%Clay
B-005-0-23	1.0	19	0.007	0.004			8	2	5	32	53

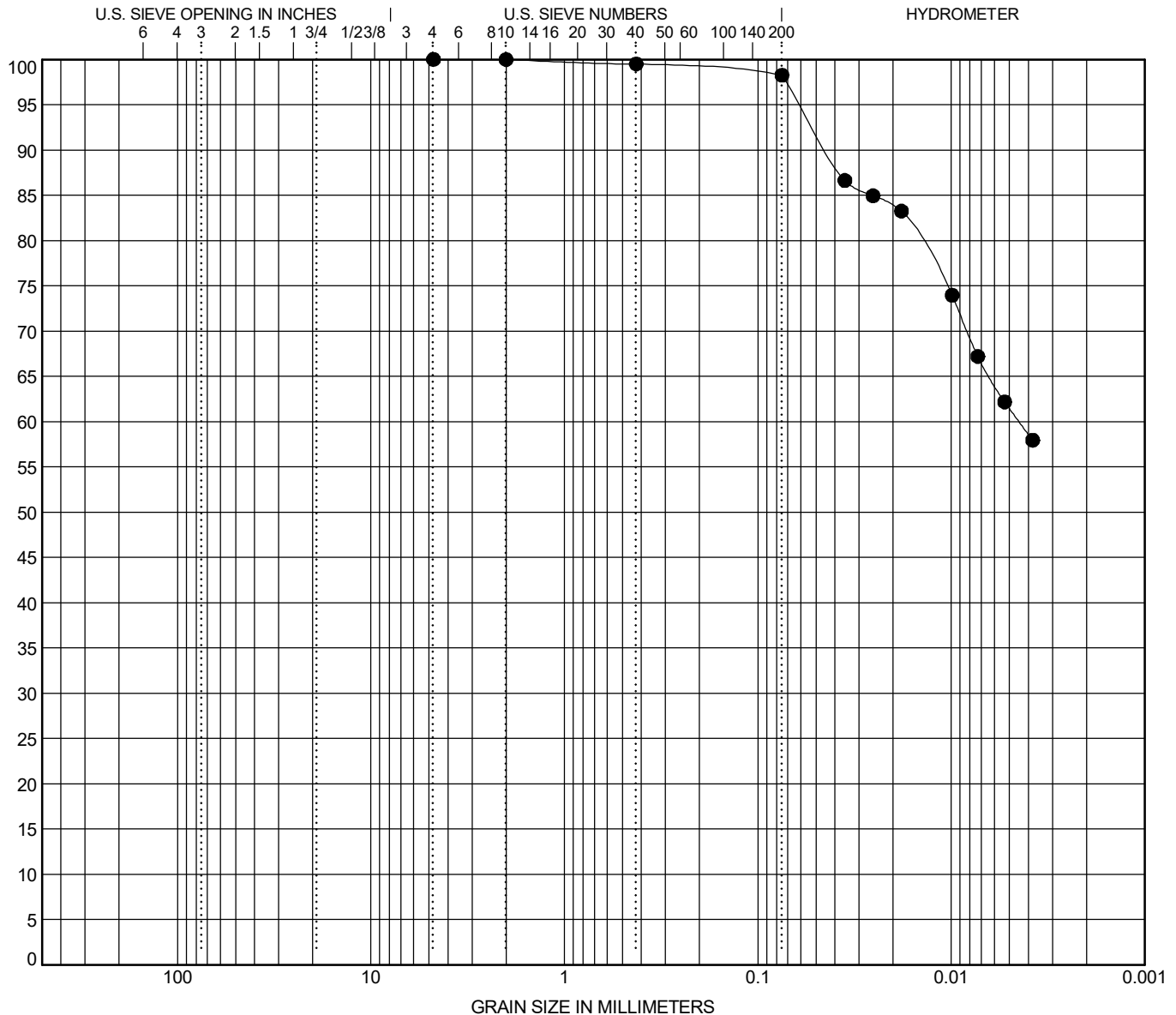


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COBBLES	GRAVEL		SAND		SILT OR CLAY
	coarse	fine	coarse	fine	

Specimen Identification	Depth	Classification					MC	LL	PL	PI	Cc	Cu
B-005-0-23	2.5	A-7-6(20)					23	66	29	37		

Specimen Identification	Depth	D100	D60	D50	D30	D10	%Gravel	%Coarse Sand	%Fine Sand	%Silt	%Clay
B-005-0-23	2.5	4.75	0.004				1	0	1	37	61

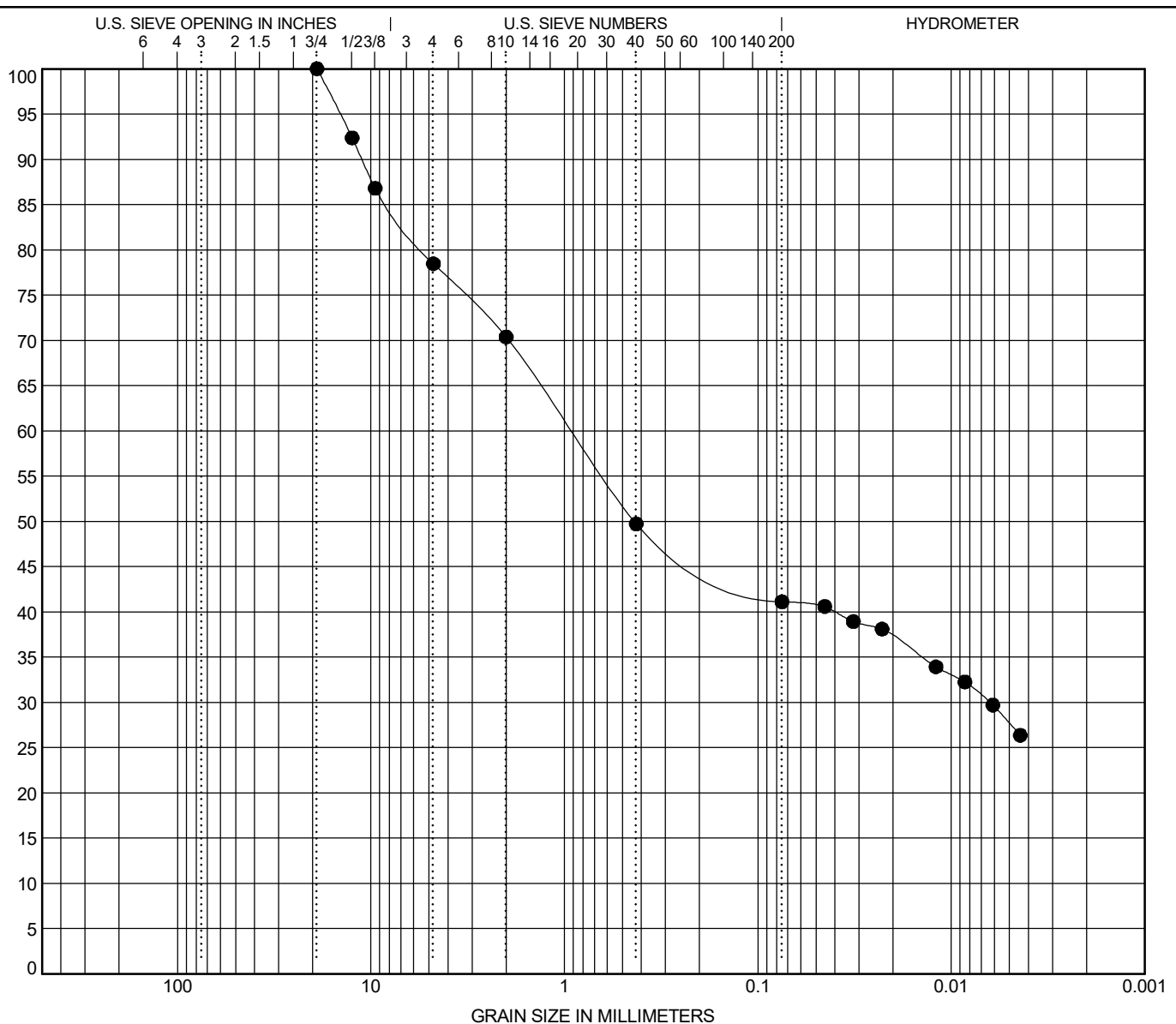


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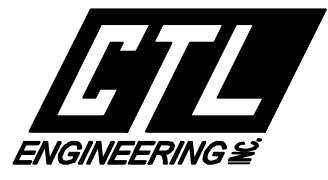
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COBBLES	GRAVEL		SAND		SILT OR CLAY
	coarse	fine	coarse	fine	

Specimen Identification	Depth	Classification	MC	LL	PL	PI	Cc	Cu
B-006-0-23	1.0	A-6b(3)	6	34	18	16		

Specimen Identification	Depth	D100	D60	D50	D30	D10	%Gravel	%Coarse Sand	%Fine Sand	%Silt	%Clay
B-006-0-23	1.0	19	0.919	0.434	0.006		29	21	9	13	28

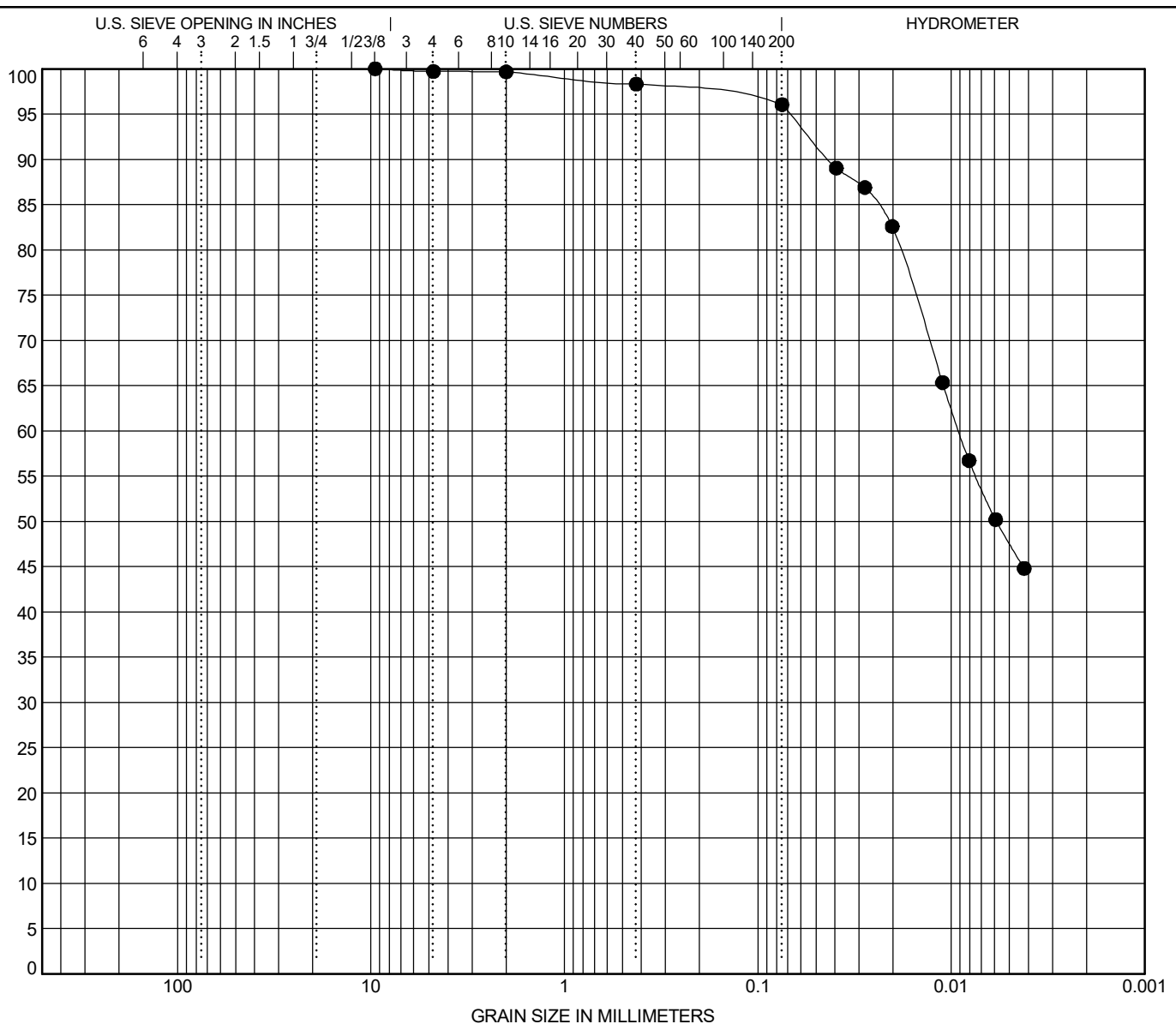


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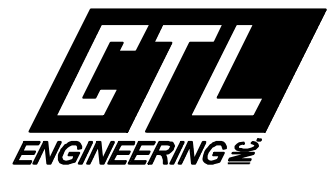
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COBBLES	GRAVEL		SAND		SILT OR CLAY
	coarse	fine	coarse	fine	

Specimen Identification	Depth	Classification	MC	LL	PL	PI	Cc	Cu
B-006-0-23	2.5	A-7-6(15)	26	47	23	24		

Specimen Identification	Depth	D100	D60	D50	D30	D10	%Gravel	%Coarse Sand	%Fine Sand	%Silt	%Clay
B-006-0-23	2.5	9.5	0.009	0.006			1	1	2	48	48

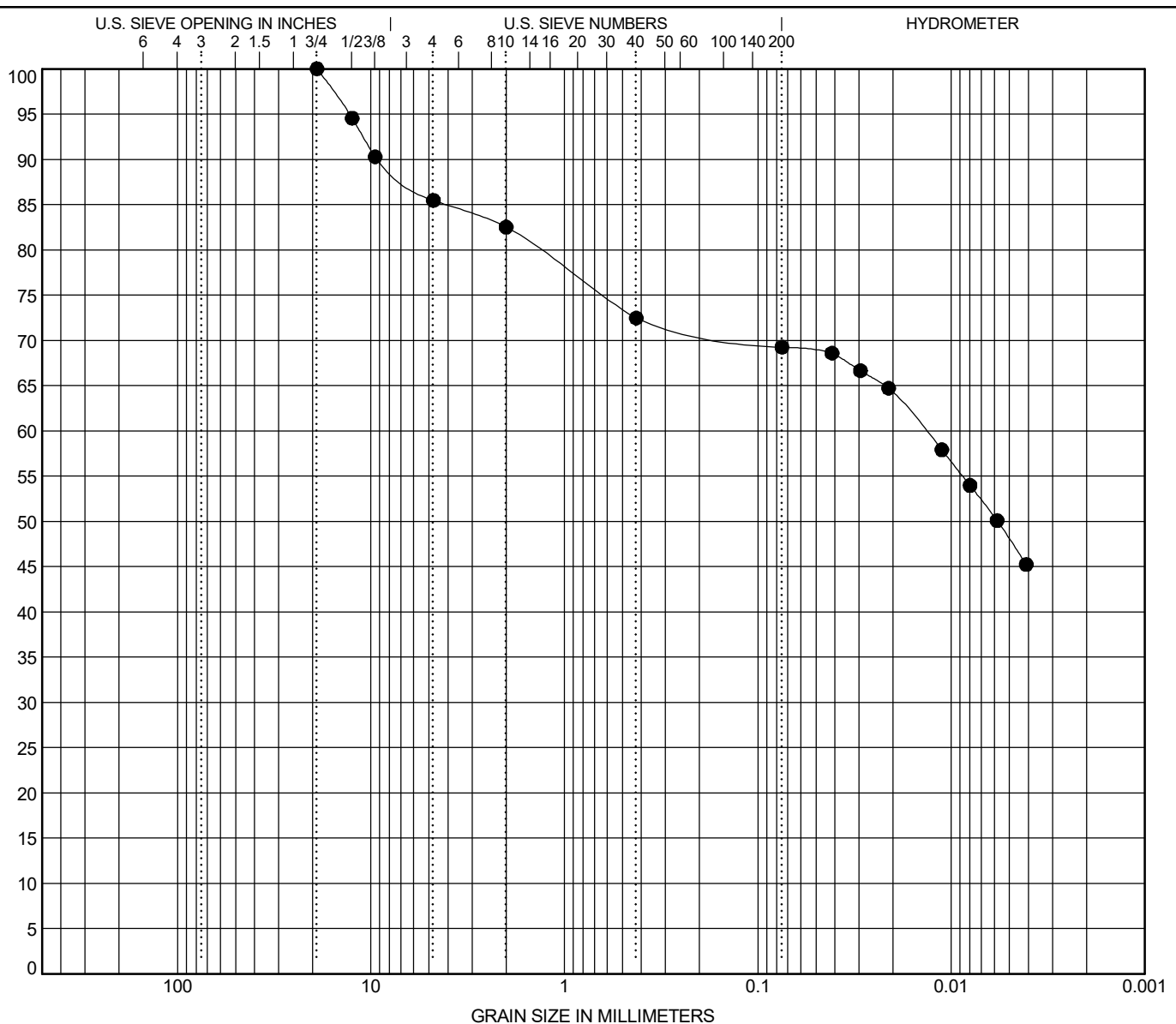


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COBBLES	GRAVEL		SAND		SILT OR CLAY
	coarse	fine	coarse	fine	

Specimen Identification	Depth	Classification					MC	LL	PL	PI	Cc	Cu
B-006-0-23	5.5	A-6b(10)					18	39	21	18		

Specimen Identification	Depth	D100	D60	D50	D30	D10	%Gravel	%Coarse Sand	%Fine Sand	%Silt	%Clay
B-006-0-23	5.5	19	0.014	0.006			18	10	3	21	48

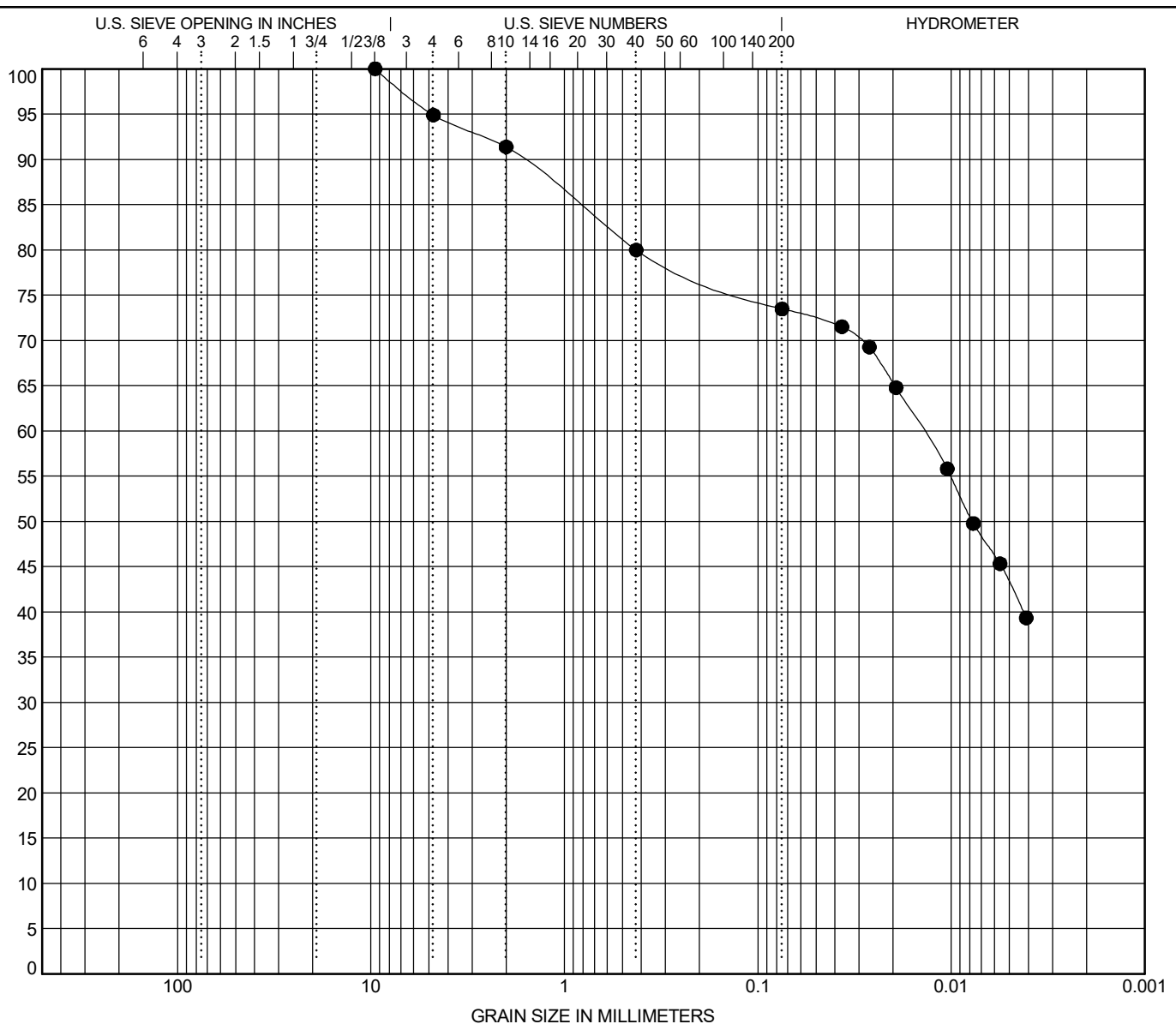


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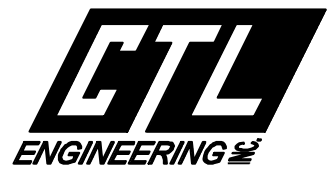
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COBBLES	GRAVEL		SAND		SILT OR CLAY
	coarse	fine	coarse	fine	

Specimen Identification	Depth	Classification	MC	LL	PL	PI	Cc	Cu
B-007-0-23	0.0	A-6a(9)	17	32	19	13		

Specimen Identification	Depth	D100	D60	D50	D30	D10	%Gravel	%Coarse Sand	%Fine Sand	%Silt	%Clay
B-007-0-23	0.0	9.5	0.014	0.008			9	11	7	30	43

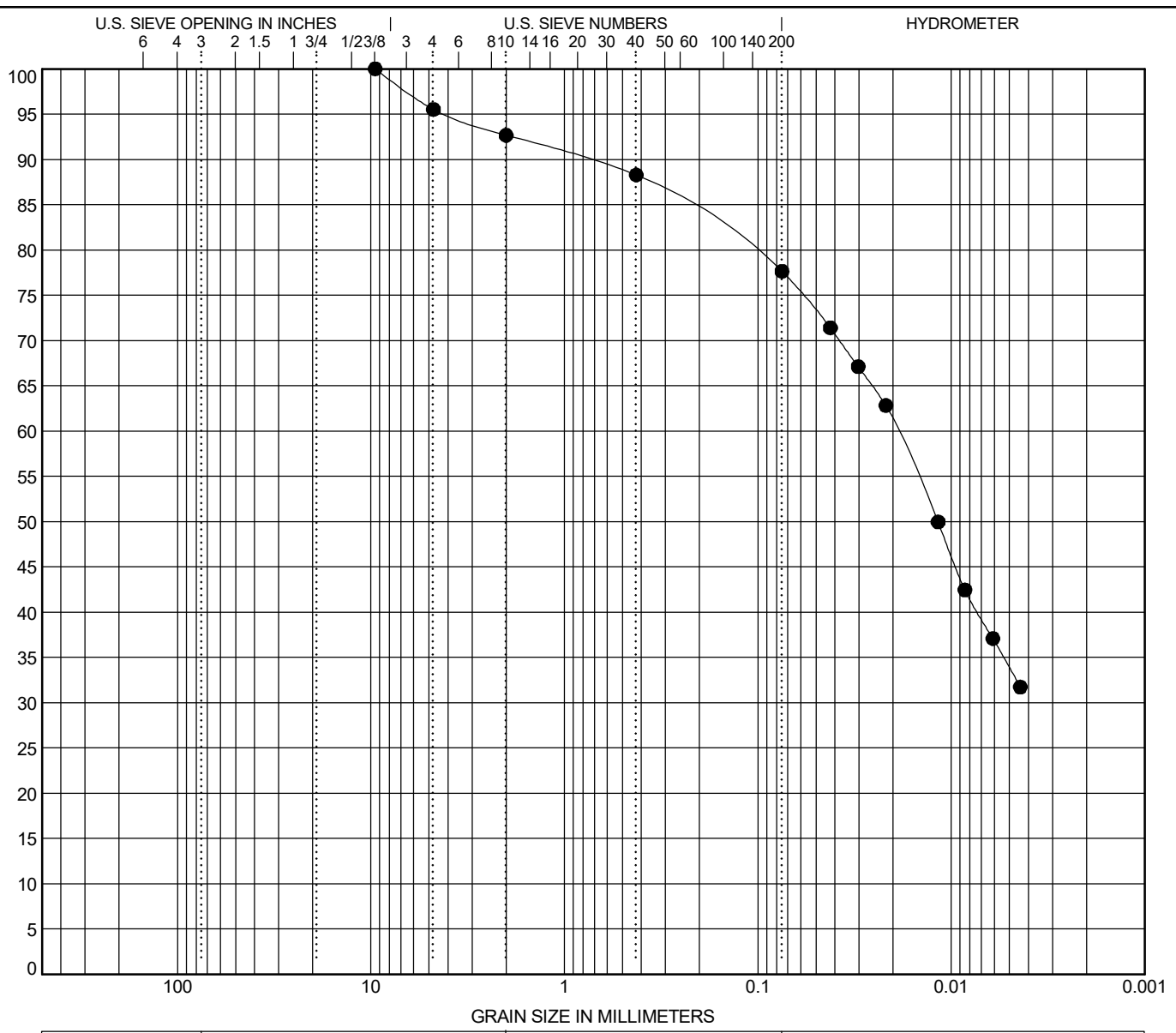


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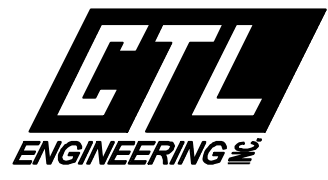
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COBBLES	GRAVEL		SAND		SILT OR CLAY
	coarse	fine	coarse	fine	

Specimen Identification	Depth	Classification	MC	LL	PL	PI	Cc	Cu
B-007-0-23	4.5	A-7-6(11)	27	43	26	17		

Specimen Identification	Depth	D100	D60	D50	D30	D10	%Gravel	%Coarse Sand	%Fine Sand	%Silt	%Clay
B-007-0-23	4.5	9.5	0.019	0.012			7	4	11	44	34

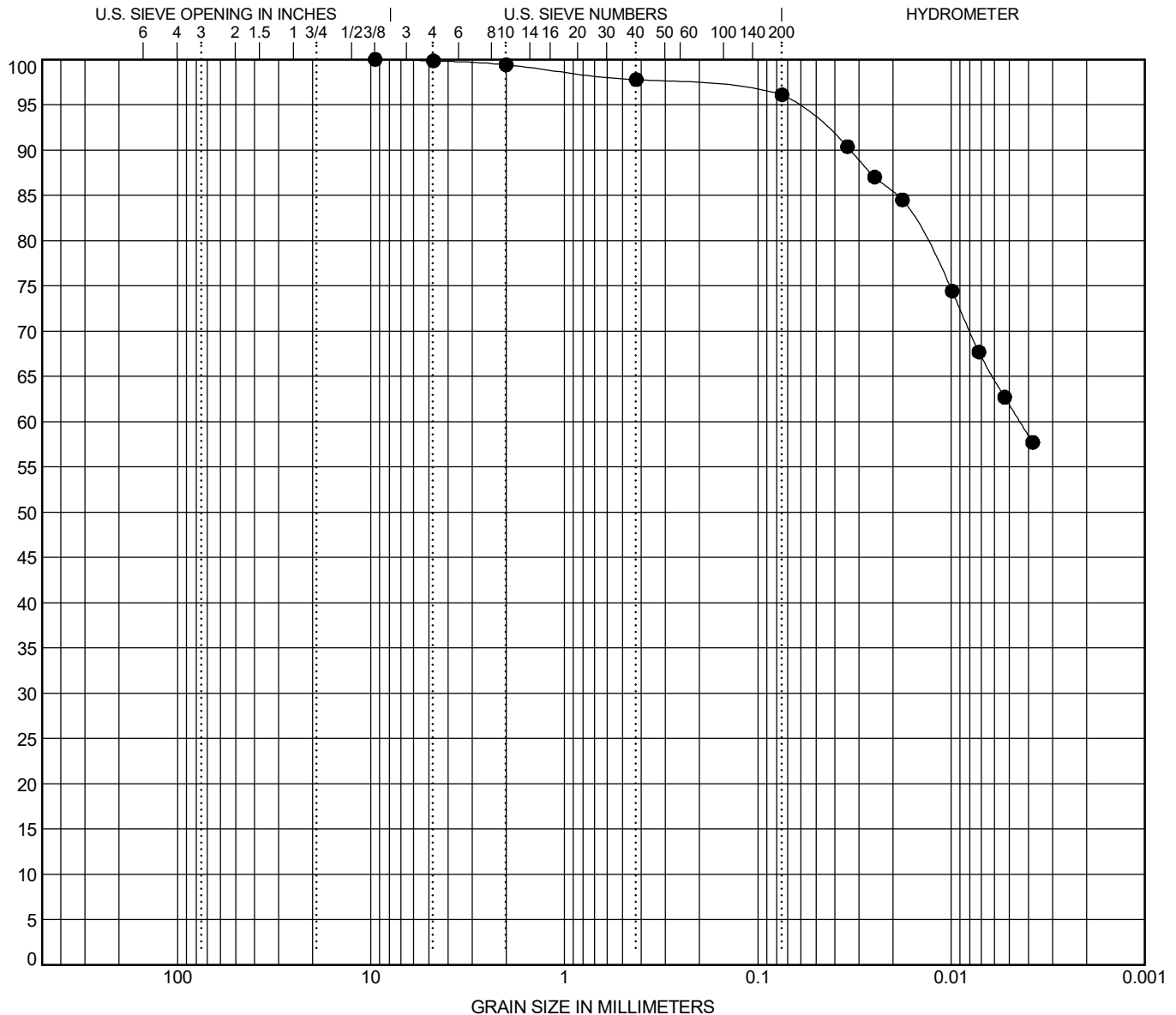


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COBBLES	GRAVEL		SAND		SILT OR CLAY
	coarse	fine	coarse	fine	

Specimen Identification	Depth	Classification					MC	LL	PL	PI	Cc	Cu
B-007-0-23	11.0	A-7-6(18)					29	53	25	28		

Specimen Identification	Depth	D100	D60	D50	D30	D10	%Gravel	%Coarse Sand	%Fine Sand	%Silt	%Clay
B-007-0-23	11.0	9.5	0.004				0	2	2	34	62

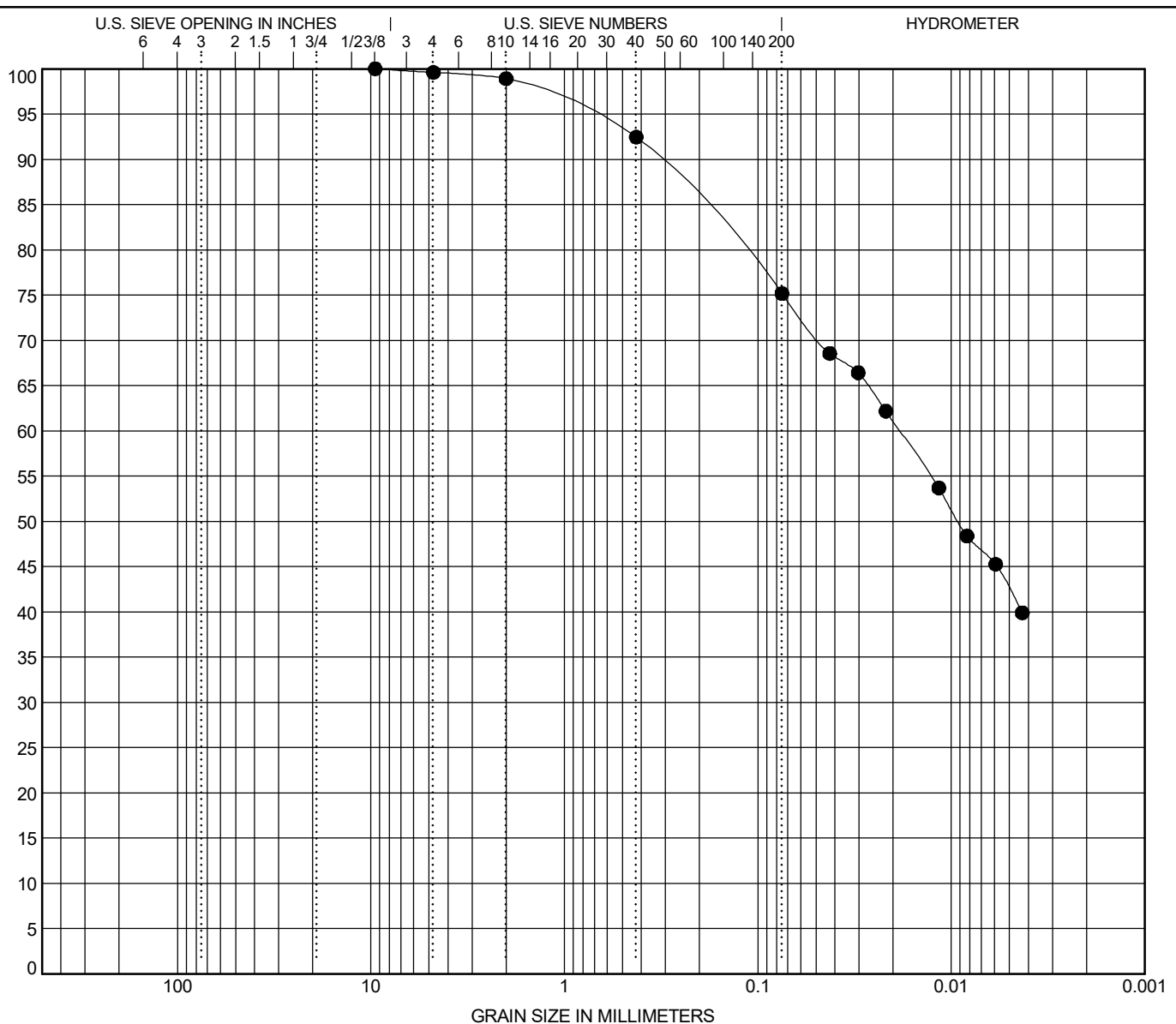


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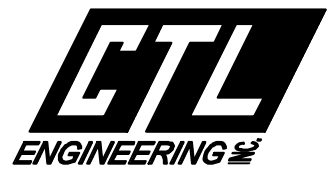
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COBBLES	GRAVEL		SAND		SILT OR CLAY
	coarse	fine	coarse	fine	

Specimen Identification	Depth	Classification	MC	LL	PL	PI	Cc	Cu
B-009-0-23	0.0	A-7-6(14)	26	47	26	21		

Specimen Identification	Depth	D100	D60	D50	D30	D10	%Gravel	%Coarse Sand	%Fine Sand	%Silt	%Clay
B-009-0-23	0.0	9.5	0.019	0.009			2	6	17	33	42

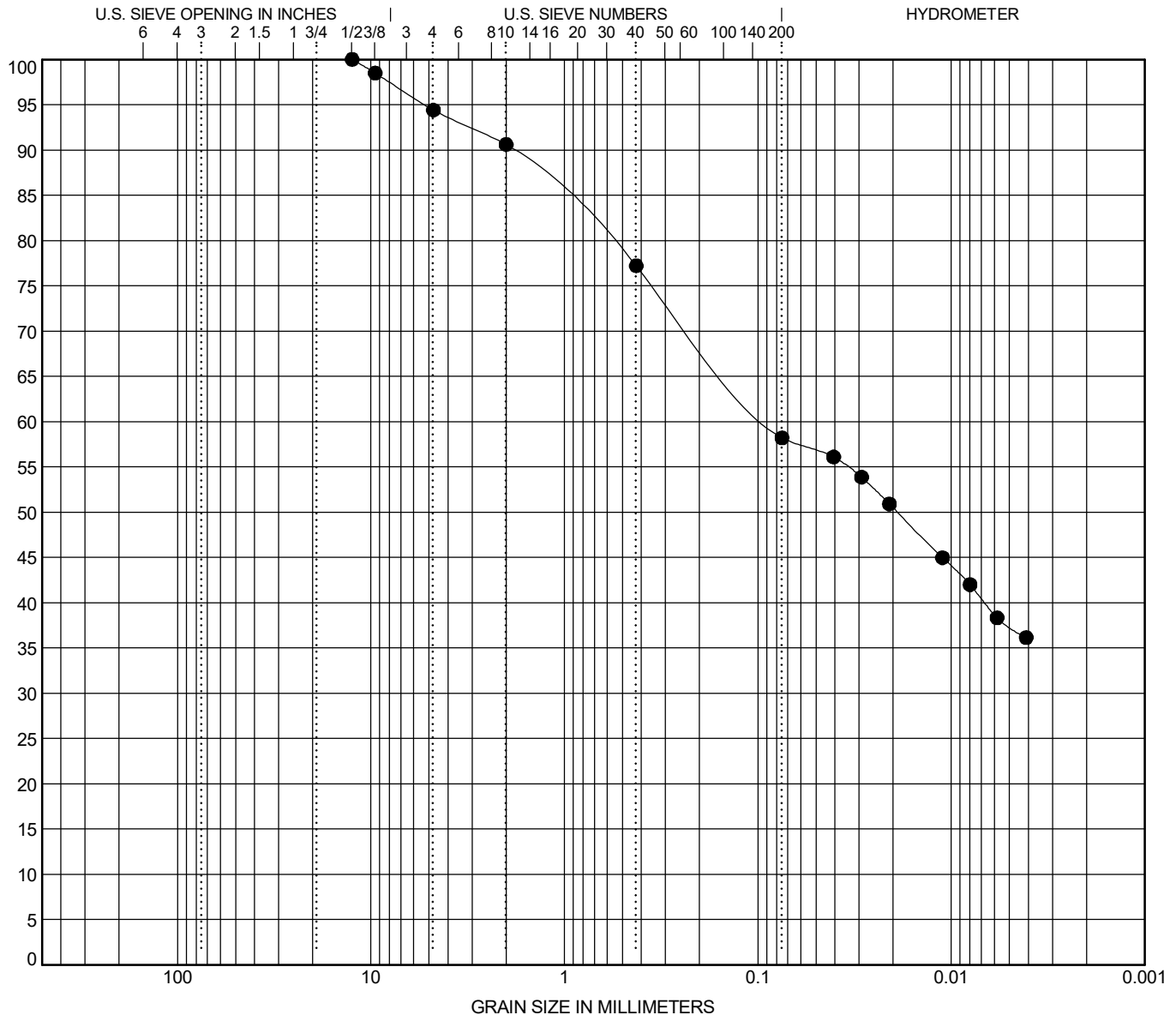


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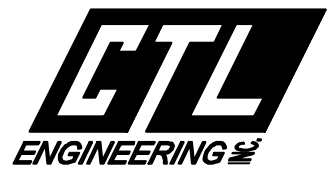
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COBBLES	GRAVEL		SAND		SILT OR CLAY
	coarse	fine	coarse	fine	

Specimen Identification	Depth	Classification	MC	LL	PL	PI	Cc	Cu
B-009-0-23	1.5	A-7-6(9)	23	44	23	21		

Specimen Identification	Depth	D100	D60	D50	D30	D10	%Gravel	%Coarse Sand	%Fine Sand	%Silt	%Clay
B-009-0-23	1.5	12.5	0.088	0.019			10	13	19	21	37

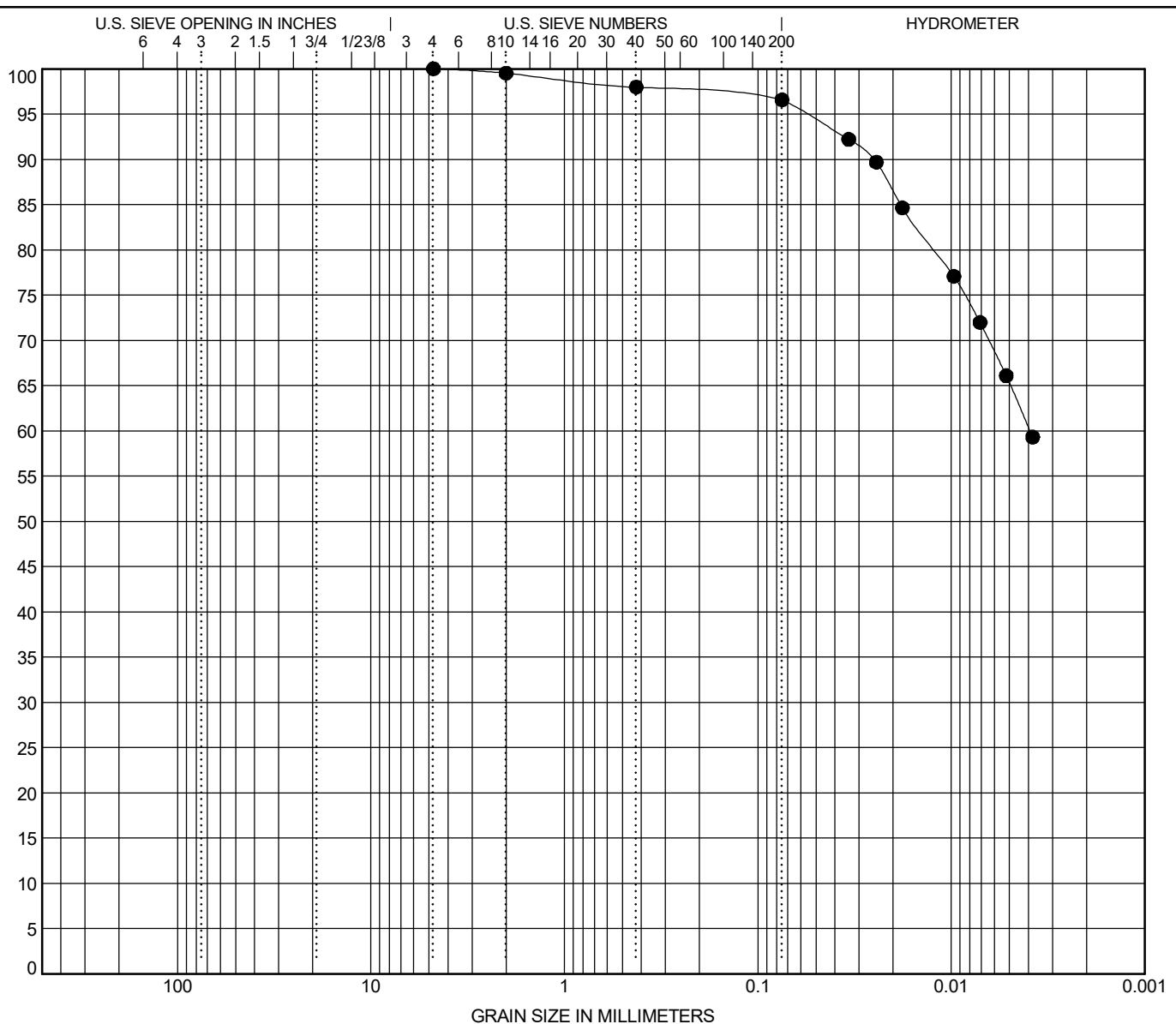


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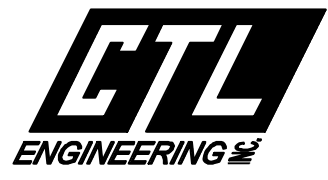
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COBBLES	GRAVEL		SAND		SILT OR CLAY
	coarse	fine	coarse	fine	

Specimen Identification	Depth	Classification	MC	LL	PL	PI	Cc	Cu
B-010-0-23	1.0	A-7-6(11)	20	41	23	18		

Specimen Identification	Depth	D100	D60	D50	D30	D10	%Gravel	%Coarse Sand	%Fine Sand	%Silt	%Clay
B-010-0-23	1.0	4.75	0.004				0	2	1	32	65

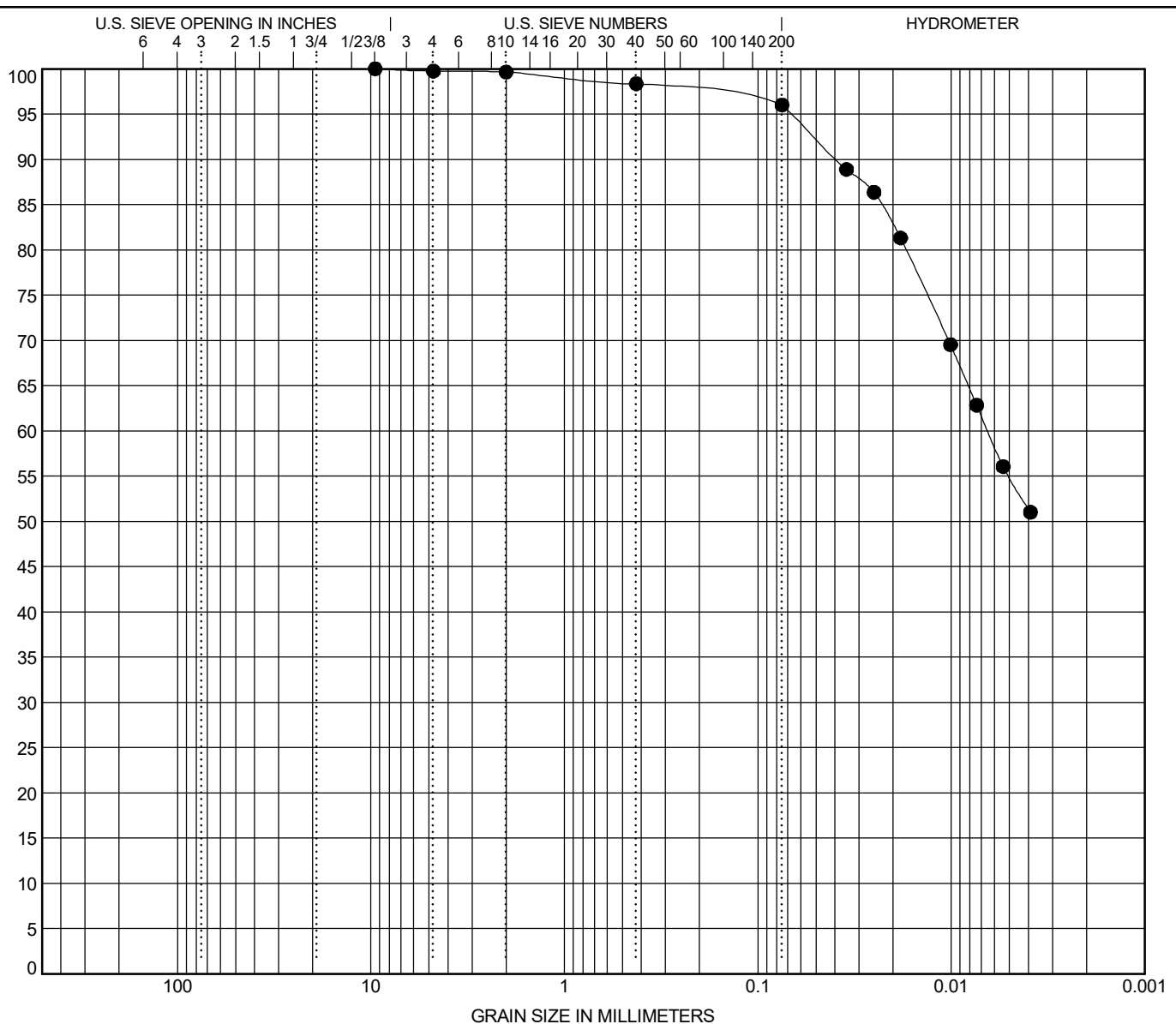


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GRAIN SIZE DISTRIBUTION

Project: ADA-247-14.51/15.56
Location: ADA COUNTY
CTL Project Number:

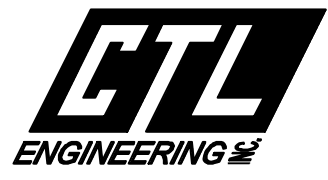
CTL GRADATION - 2014 ODOT.GDT - 6/19/24 13:06 - O:\PROJECT\2023\COL-05\230500024COL_ADA-247-14-67 15-72 BRIDGE REPLACEMENTS_KORDA NEMETH ENGINEERING_INC\REPORTS\LAB REPORTS\230500024COL.GPJ



COBBLES	GRAVEL		SAND		SILT OR CLAY
	coarse	fine	coarse	fine	

Specimen Identification	Depth	Classification	MC	LL	PL	PI	Cc	Cu
B-010-0-23	2.5	A-7-6(18)	26	52	22	30		

Specimen Identification	Depth	D100	D60	D50	D30	D10	%Gravel	%Coarse Sand	%Fine Sand	%Silt	%Clay
B-010-0-23	2.5	9.5	0.006				1	1	2	41	55



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

GRAIN SIZE DISTRIBUTION

Project: ADA-247-14.51/15.56
 Location: ADA COUNTY
 CTL Project Number:

PROJECT NO:	23050024COL
DATE:	10/19/2023

**UNIAXIAL COMPRESSIVE STRENGTH OF
INTACT ROCK CORE - ASTM D 7012**



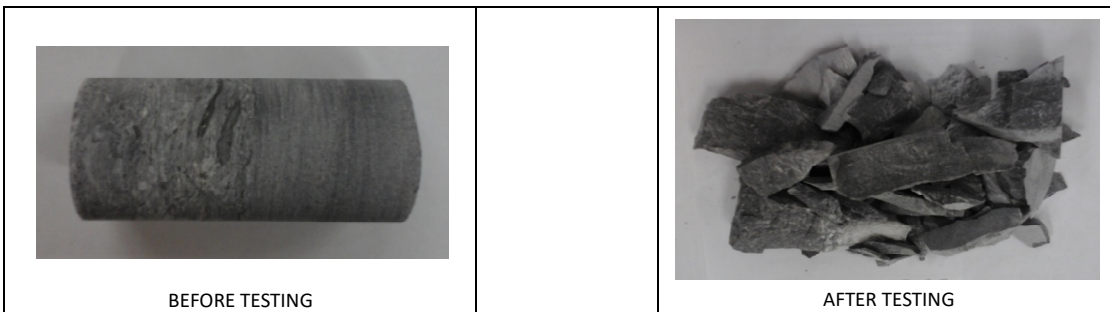
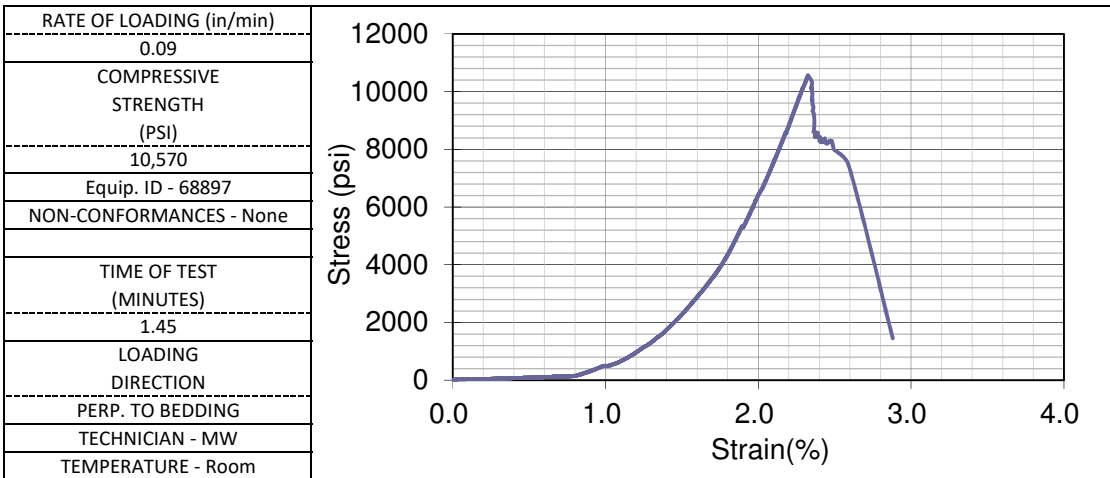
Method C

BORING NUMBER	B-001-0-23	TOP DEPTH(FT)	23.2	BOTTOM DEPTH(FT)	23.7
SAMPLE NUMBER	NQ-2	DISTRICT	9	PID NO.	93800
COUNTY	ADA	ROUTE	247	SECTION	14.545

FORMATION	Ordovician Age, Preacherville Member of the Drakes Formation, Waynesville and Arnheim Formation, Undivided
DESCRIPTION	Limestone, Gray, Moderately Weathered, Strong
MOISTURE CONDITION	As Received

MEASUREMENT	LENGTH(INCHES)	DIAMETER(INCHES)
1	3.967	1.973
2	3.966	1.974
3	3.964	1.977
AVERAGE	3.966	1.975

LENGTH/DIAMETER	2.0
CORRECTION FACTOR	1
AREA(IN ²)	3.1
MASS (GRAMS)	538.3
UNIT WEIGHT(LBS/FT ³)	168.9



PROJECT NO:	23050024COL
DATE:	10/19/2023

**UNIAXIAL COMPRESSIVE STRENGTH OF
INTACT ROCK CORE - ASTM D 7012**



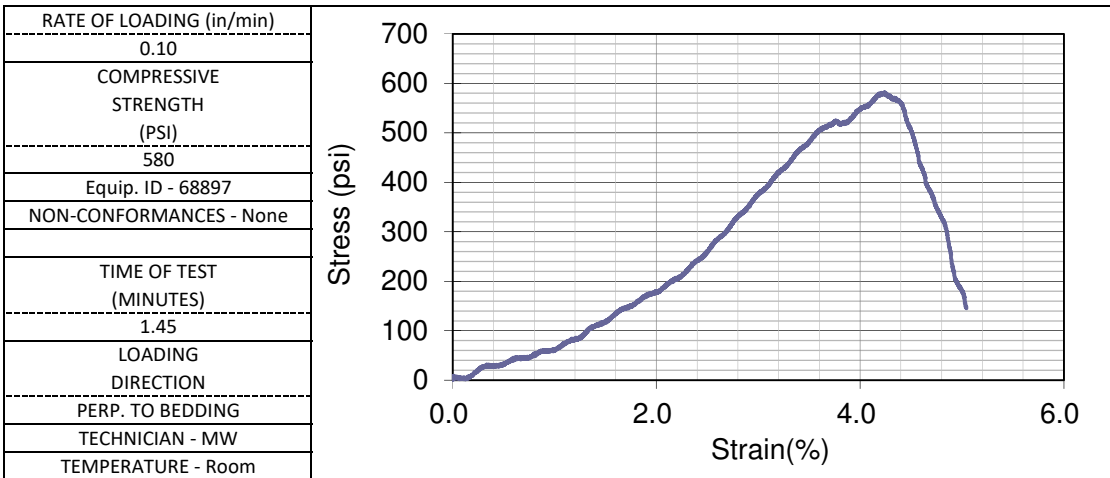
Method C

BORING NUMBER	B-002-0-23	TOP DEPTH(FT)	13.0	BOTTOM DEPTH(FT)	13.6
SAMPLE NUMBER	NQ-2	DISTRICT	9	PID NO.	93800
COUNTY	ADA	ROUTE	247	SECTION	14.545

FORMATION	Ordovician Age, Preacherville Member of the Drakes Formation, Waynesville and Arnheim Formation, Undivided
DESCRIPTION	Shale, Gray, Highly Weathered, Very Weak
MOISTURE CONDITION	As Received

MEASUREMENT	LENGTH(INCHES)	DIAMETER(INCHES)
1	4.016	1.982
2	4.017	1.967
3	4.008	1.945
AVERAGE	4.014	1.965

LENGTH/DIAMETER	2.0
CORRECTION FACTOR	1
AREA(IN ²)	3.0
MASS (GRAMS)	494.3
UNIT WEIGHT(LBS/FT ³)	154.8



PROJECT NO:	23050024COL
DATE:	10/19/2023

**UNIAXIAL COMPRESSIVE STRENGTH OF
INTACT ROCK CORE - ASTM D 7012**



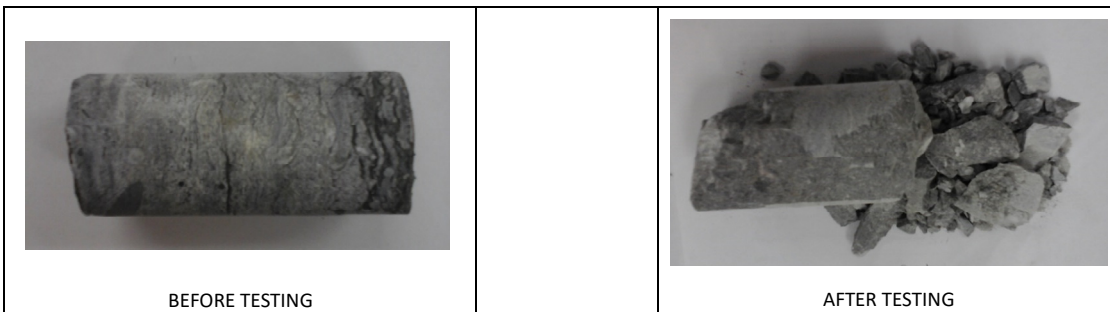
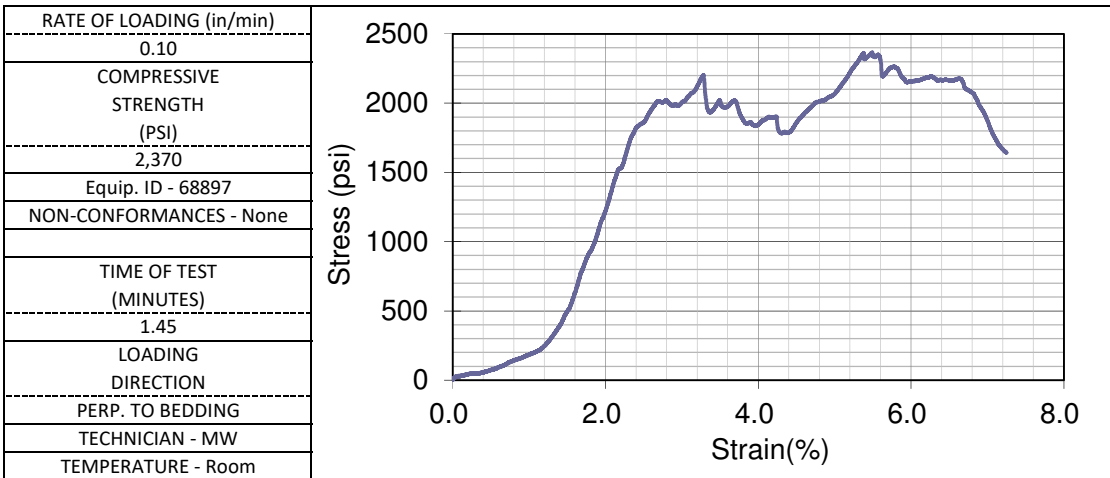
Method C

BORING NUMBER	B-002-0-23	TOP DEPTH(FT)	19.6	BOTTOM DEPTH(FT)	20.0
SAMPLE NUMBER	NQ-3	DISTRICT	9	PID NO.	93800
COUNTY	ADA	ROUTE	247	SECTION	14.545

FORMATION	Ordovician Age, Preacherville Member of the Drakes Formation, Waynesville and Arnheim Formation, Undivided
DESCRIPTION	Limestone, Gray, Highly Weathered, Slightly Strong
MOISTURE CONDITION	As Received

MEASUREMENT	LENGTH(INCHES)	DIAMETER(INCHES)
1	4.011	1.963
2	4.027	1.975
3	4.009	1.967
AVERAGE	4.016	1.968

LENGTH/DIAMETER	2.0
CORRECTION FACTOR	1
AREA(IN ²)	3.0
MASS (GRAMS)	532.0
UNIT WEIGHT(LBS/FT ³)	165.9



PROJECT NO:	23050024COL
DATE:	10/23/2023

**UNIAXIAL COMPRESSIVE STRENGTH OF
INTACT ROCK CORE - ASTM D 7012**



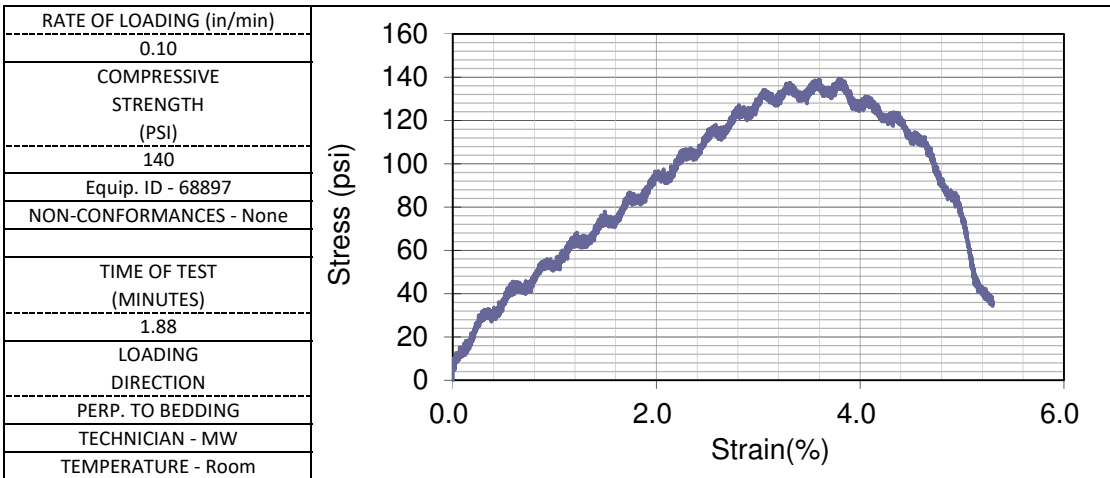
Method C

BORING NUMBER	B-003-0-23	TOP DEPTH(FT)	3.0	BOTTOM DEPTH(FT)	3.4
SAMPLE NUMBER	NQ-1	DISTRICT	9	PID NO.	93800
COUNTY	ADA	ROUTE	247	SECTION	14.545

FORMATION	Ordovician Age, Preacherville Member of the Drakes Formation, Waynesville and Arnheim Formation, Undivided
DESCRIPTION	Shale, Gray, Highly Weathered, Very Weak
MOISTURE CONDITION	As Received

MEASUREMENT	LENGTH(INCHES)	DIAMETER(INCHES)
1	4.047	1.932
2	4.052	1.929
3	4.048	1.940
AVERAGE	4.049	1.934

LENGTH/DIAMETER	2.1
CORRECTION FACTOR	1
AREA(IN ²)	2.9
MASS (GRAMS)	442.9
UNIT WEIGHT(LBS/FT ³)	141.9



PROJECT NO:	23050024COL
DATE:	10/23/2023

**UNIAXIAL COMPRESSIVE STRENGTH OF
INTACT ROCK CORE - ASTM D 7012**



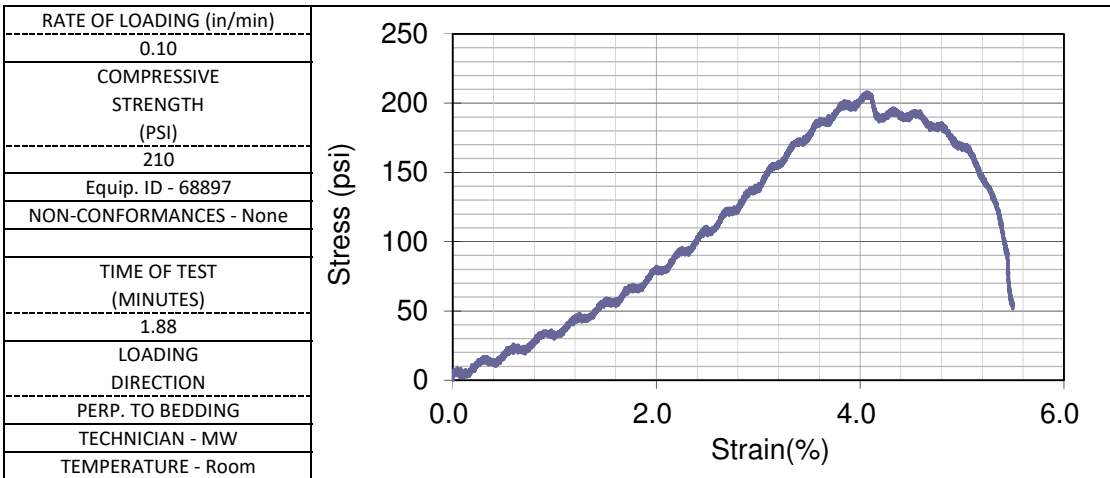
Method C

BORING NUMBER	B-003-0-23	TOP DEPTH(FT)	8.7	BOTTOM DEPTH(FT)	9.1
SAMPLE NUMBER	NQ-2	DISTRICT	9	PID NO.	93800
COUNTY	ADA	ROUTE	247	SECTION	14.545

FORMATION	Ordovician Age, Preacherville Member of the Drakes Formation, Waynesville and Arnheim Formation, Undivided
DESCRIPTION	Shale, Gray, Highly Weathered, Very Weak
MOISTURE CONDITION	As Received

MEASUREMENT	LENGTH(INCHES)	DIAMETER(INCHES)
1	4.019	1.945
2	4.026	1.965
3	4.022	1.951
AVERAGE	4.022	1.954

LENGTH/DIAMETER	2.1
CORRECTION FACTOR	1
AREA(IN ²)	3.0
MASS (GRAMS)	475.9
UNIT WEIGHT(LBS/FT ³)	150.4



PROJECT NO:	23050024COL
DATE:	10/23/2023

**UNIAXIAL COMPRESSIVE STRENGTH OF
INTACT ROCK CORE - ASTM D 7012**



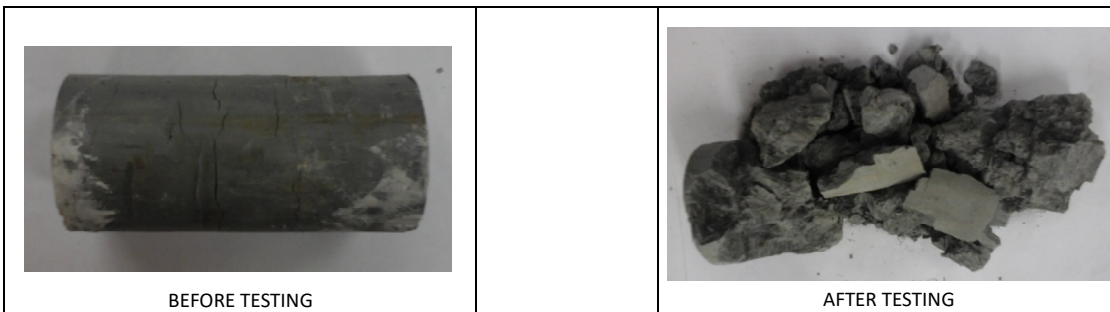
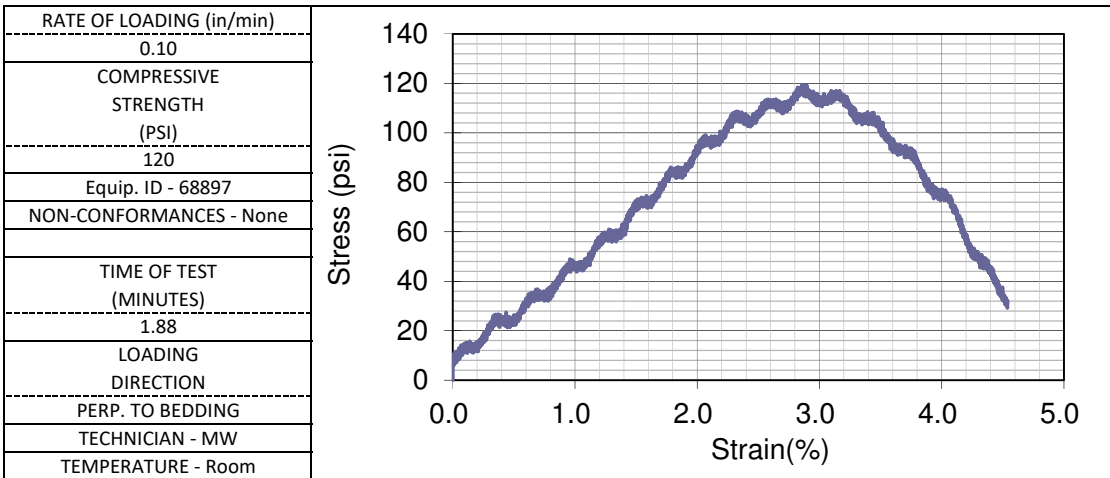
Method C

BORING NUMBER	B-004-0-23	TOP DEPTH(FT)	10.0	BOTTOM DEPTH(FT)	10.5
SAMPLE NUMBER	NQ-2	DISTRICT	9	PID NO.	93800
COUNTY	ADA	ROUTE	247	SECTION	14.545

FORMATION	Ordovician Age, Preacherville Member of the Drakes Formation, Waynesville and Arnheim Formation, Undivided
DESCRIPTION	Shale, Gray, Highly Weathered, Very Weak
MOISTURE CONDITION	As Received

MEASUREMENT	LENGTH(INCHES)	DIAMETER(INCHES)
1	4.023	2.045
2	4.021	2.039
3	4.029	2.035
AVERAGE	4.024	2.040

LENGTH/DIAMETER	2.0
CORRECTION FACTOR	1
AREA(IN ²)	3.3
MASS (GRAMS)	510.0
UNIT WEIGHT(LBS/FT ³)	147.7



PROJECT NO:	23050024COL
DATE:	10/23/2023

**UNIAXIAL COMPRESSIVE STRENGTH OF
INTACT ROCK CORE - ASTM D 7012**



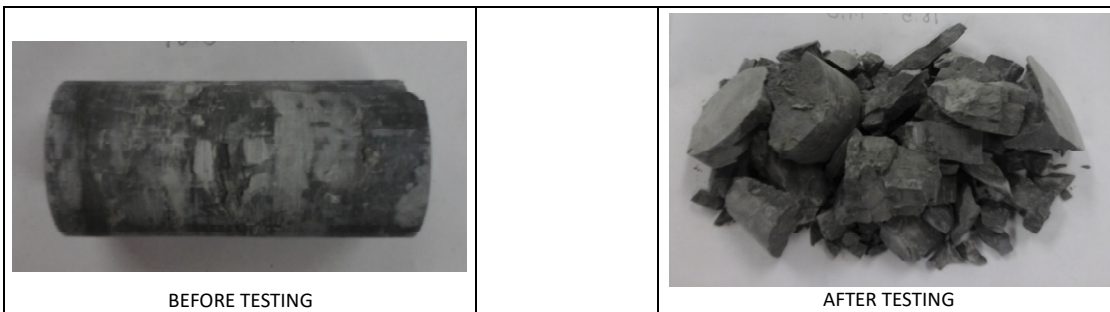
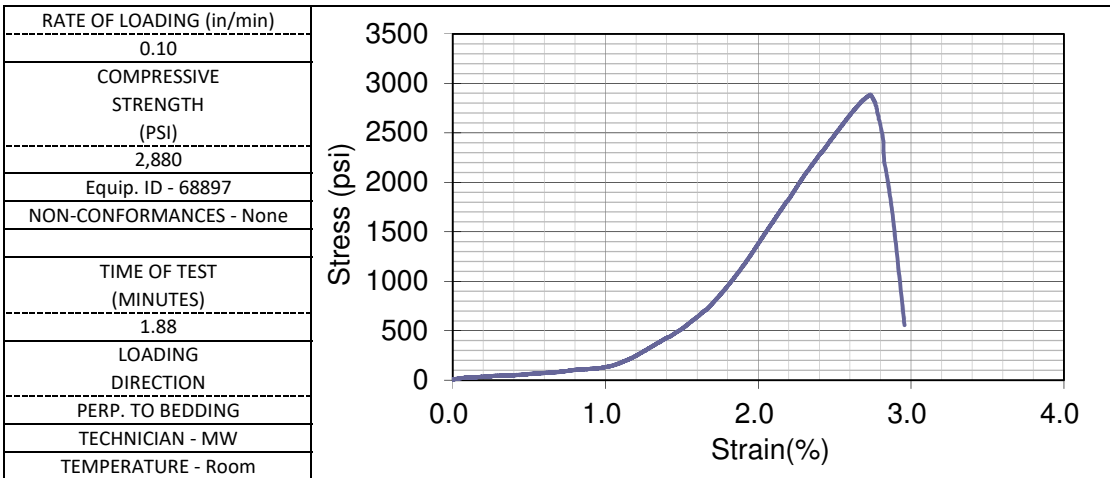
Method C

BORING NUMBER	B-004-0-23	TOP DEPTH(FT)	18.5	BOTTOM DEPTH(FT)	19.0
SAMPLE NUMBER	NQ-3	DISTRICT	9	PID NO.	93800
COUNTY	ADA	ROUTE	247	SECTION	14.545

FORMATION	Ordovician Age, Preacherville Member of the Drakes Formation, Waynesville and Arnheim Formation, Undivided
DESCRIPTION	Limestone, Gray, Moderately Weathered, Slightly Strong
MOISTURE CONDITION	As Received

MEASUREMENT	LENGTH(INCHES)	DIAMETER(INCHES)
1	4.019	1.976
2	4.016	1.976
3	4.018	1.979
AVERAGE	4.018	1.977

LENGTH/DIAMETER	2.0
CORRECTION FACTOR	1
AREA(IN ²)	3.1
MASS (GRAMS)	519.5
UNIT WEIGHT(LBS/FT ³)	160.5



PROJECT NO:	23050024COL
DATE:	10/19/2023

**UNIAXIAL COMPRESSIVE STRENGTH OF
INTACT ROCK CORE - ASTM D 7012**



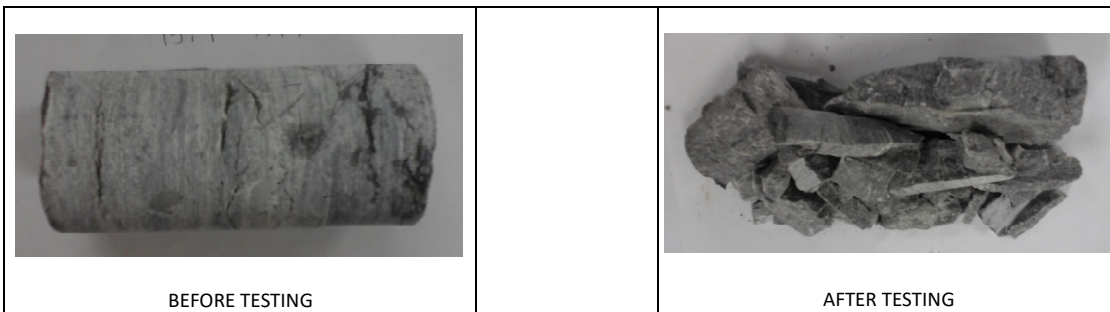
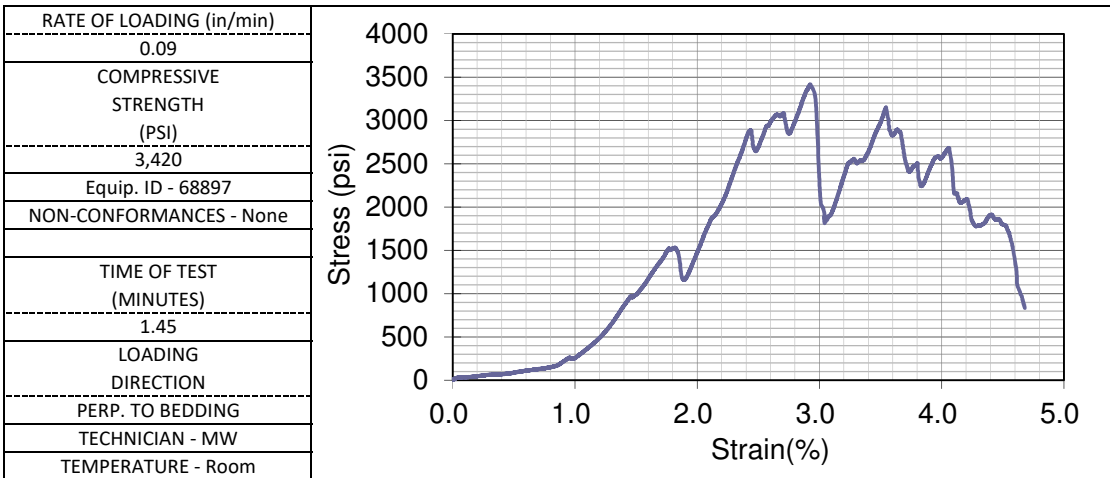
Method C

BORING NUMBER	B-006-0-23	TOP DEPTH(FT)	15.4	BOTTOM DEPTH(FT)	15.9
SAMPLE NUMBER	NQ-1	DISTRICT	9	PID NO.	93800
COUNTY	ADA	ROUTE	247	SECTION	15.597

FORMATION	Ordovician Age, Preacherville Member of the Drakes Formation, Waynesville and Arnheim Formation, Undivided
DESCRIPTION	Limestone, Gray, Moderately Weathered, Slightly Strong
MOISTURE CONDITION	As Received

MEASUREMENT	LENGTH(INCHES)	DIAMETER(INCHES)
1	4.011	1.967
2	4.021	1.964
3	4.018	1.962
AVERAGE	4.017	1.964

LENGTH/DIAMETER	2.0
CORRECTION FACTOR	1
AREA(IN ²)	3.0
MASS (GRAMS)	531.8
UNIT WEIGHT(LBS/FT ³)	166.4



PROJECT NO:	23050024COL
DATE:	10/19/2023

**UNIAXIAL COMPRESSIVE STRENGTH OF
INTACT ROCK CORE - ASTM D 7012**



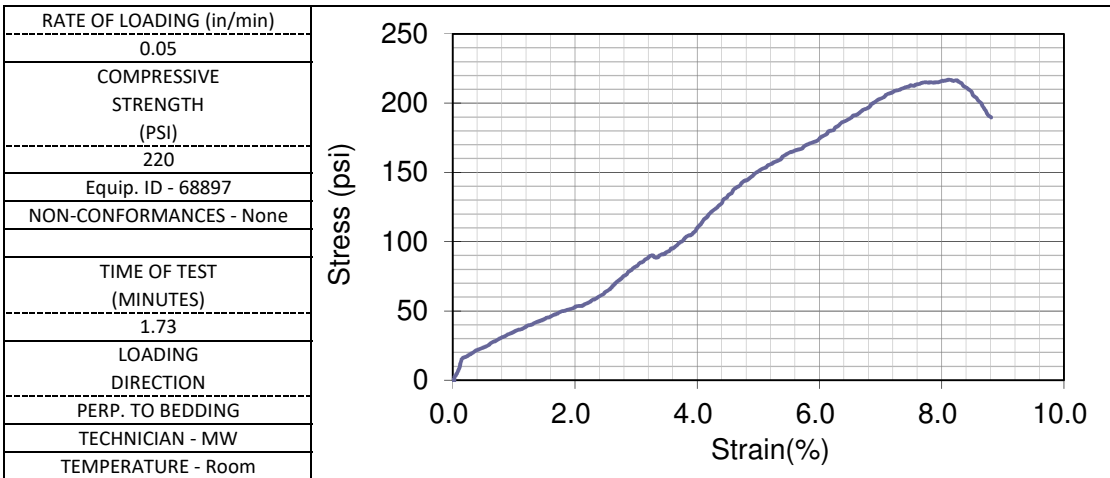
Method C

BORING NUMBER	B-007-0-23	TOP DEPTH(FT)	19.9	BOTTOM DEPTH(FT)	20.3
SAMPLE NUMBER	NQ-2	DISTRICT	9	PID NO.	93800
COUNTY	ADA	ROUTE	247	SECTION	15.597

FORMATION	Ordovician Age, Preacherville Member of the Drakes Formation, Waynesville and Arnheim Formation, Undivided
DESCRIPTION	Shale, Gray, Highly Weathered, Very Weak
MOISTURE CONDITION	As Received

MEASUREMENT	LENGTH(INCHES)	DIAMETER(INCHES)
1	3.740	1.669
2	3.709	1.677
3	3.719	1.673
AVERAGE	3.723	1.673

LENGTH/DIAMETER	2.2
CORRECTION FACTOR	1
AREA(IN ²)	2.2
MASS (GRAMS)	298.7
UNIT WEIGHT(LBS/FT ³)	139



PROJECT NO:	23050024COL
DATE:	10/19/2023

**UNIAXIAL COMPRESSIVE STRENGTH OF
INTACT ROCK CORE - ASTM D 7012**



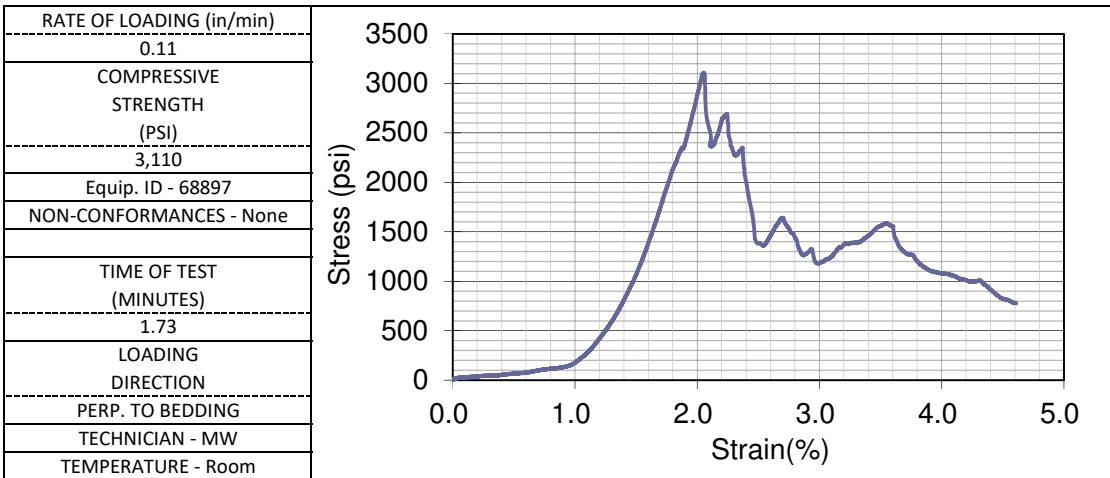
Method C

BORING NUMBER	B-007-0-23	TOP DEPTH(FT)	22.8	BOTTOM DEPTH(FT)	23.2
SAMPLE NUMBER	NQ-3	DISTRICT	9	PID NO.	93800
COUNTY	ADA	ROUTE	247	SECTION	15.597

FORMATION	Ordovician Age, Preacherville Member of the Drakes Formation, Waynesville and Arnheim Formation, Undivided
DESCRIPTION	Limestone, Gray, Highly Weathered, Slightly Strong
MOISTURE CONDITION	As Received

MEASUREMENT	LENGTH(INCHES)	DIAMETER(INCHES)
1	4.076	1.963
2	4.072	1.966
3	4.068	1.969
AVERAGE	4.072	1.966

LENGTH/DIAMETER	2.1
CORRECTION FACTOR	1
AREA(IN ²)	3.0
MASS (GRAMS)	543.9
UNIT WEIGHT(LBS/FT ³)	167.6



PROJECT NO:	23050024COL
DATE:	10/18/2023

**UNIAXIAL COMPRESSIVE STRENGTH OF
INTACT ROCK CORE - ASTM D 7012**



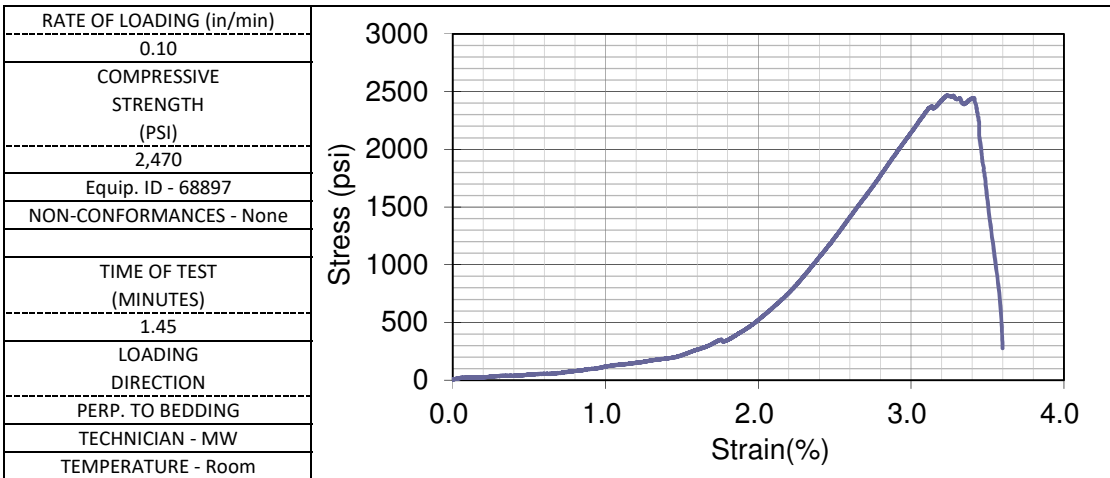
Method C

BORING NUMBER	B-007-0-23	TOP DEPTH(FT)	29.0	BOTTOM DEPTH(FT)	29.5
SAMPLE NUMBER	NQ-4	DISTRICT	9	PID NO.	93800
COUNTY	ADA	ROUTE	247	SECTION	15.597

FORMATION	Ordovician Age, Preacherville Member of the Drakes Formation, Waynesville and Arnheim Formation, Undivided
DESCRIPTION	Shale, Gray, Highly Weathered, Slightly Strong
MOISTURE CONDITION	As Received

MEASUREMENT	LENGTH(INCHES)	DIAMETER(INCHES)
1	4.044	1.976
2	4.045	1.974
3	4.047	1.979
AVERAGE	4.045	1.976

LENGTH/DIAMETER	2.0
CORRECTION FACTOR	1
AREA(IN ²)	3.1
MASS (GRAMS)	503.3
UNIT WEIGHT(LBS/FT ³)	154.5



PROJECT NO:	23050024COL
DATE:	10/19/2023

**UNIAXIAL COMPRESSIVE STRENGTH OF
INTACT ROCK CORE - ASTM D 7012**



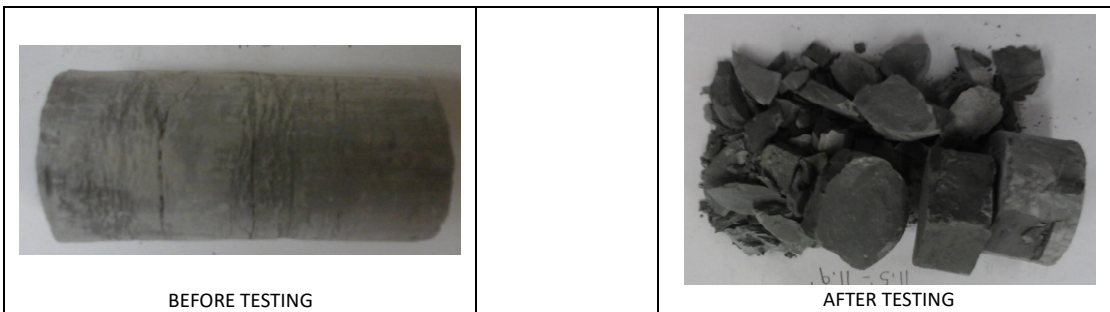
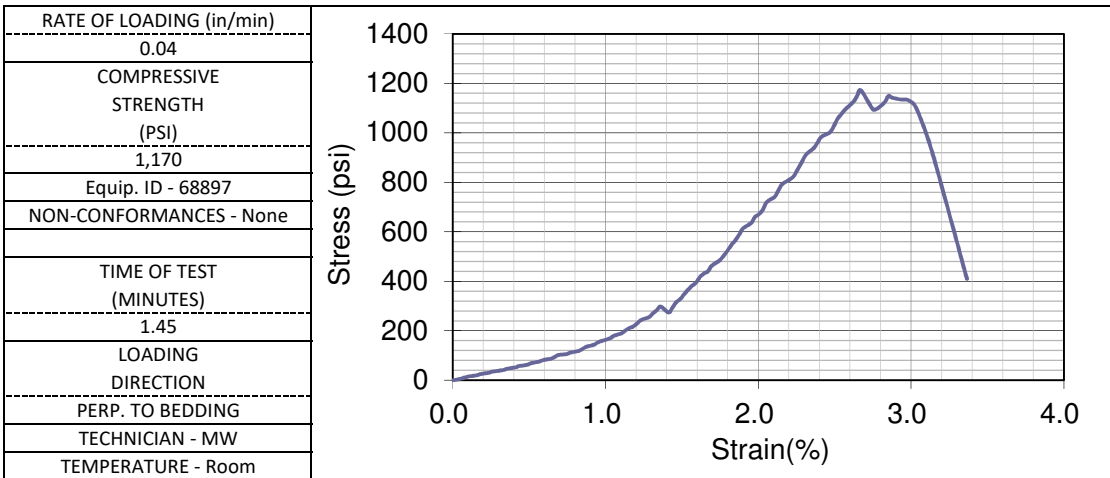
Method C

BORING NUMBER	B-009-0-23	TOP DEPTH(FT)	16.0	BOTTOM DEPTH(FT)	16.4
SAMPLE NUMBER	NQ-2	DISTRICT	9	PID NO.	93800
COUNTY	ADA	ROUTE	247	SECTION	15.597

FORMATION	Ordovician Age, Preacherville Member of the Drakes Formation, Waynesville and Arnheim Formation, Undivided
DESCRIPTION	Shale, Gray, Moderately Weathered, Weak
MOISTURE CONDITION	As Received

MEASUREMENT	LENGTH(INCHES)	DIAMETER(INCHES)
1	3.876	1.949
2	3.904	1.952
3	3.897	1.956
AVERAGE	3.892	1.952

LENGTH/DIAMETER	2.0
CORRECTION FACTOR	1
AREA(IN ²)	3.0
MASS (GRAMS)	460.1
UNIT WEIGHT(LBS/FT ³)	150.4



PROJECT NO:	23050024COL
DATE:	10/19/2023

**UNIAXIAL COMPRESSIVE STRENGTH OF
INTACT ROCK CORE - ASTM D 7012**



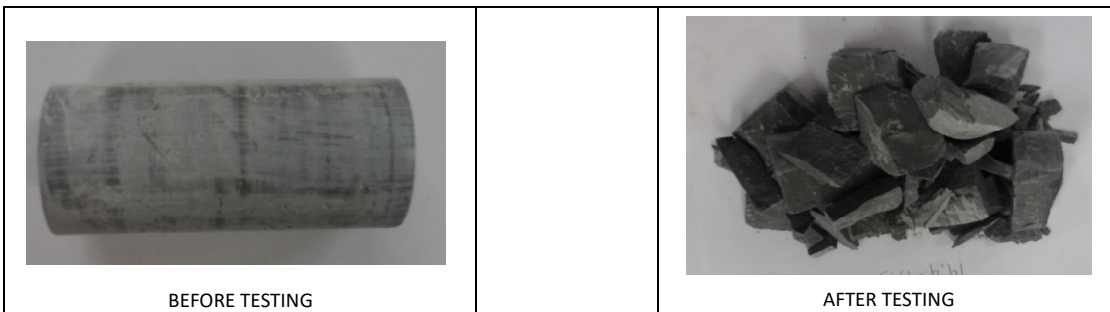
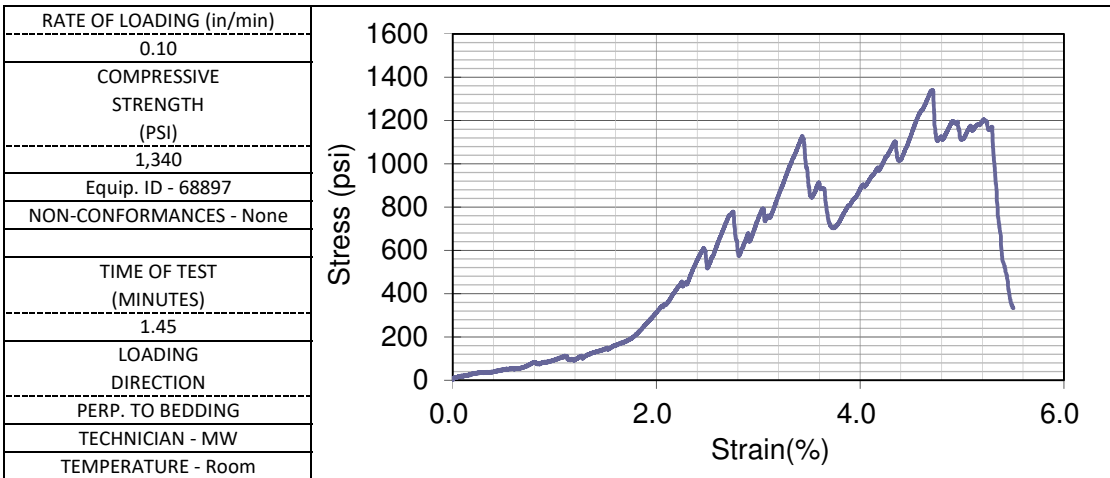
Method C

BORING NUMBER	B-009-0-23	TOP DEPTH(FT)	19.4	BOTTOM DEPTH(FT)	19.8
SAMPLE NUMBER	NQ-3	DISTRICT	9	PID NO.	93800
COUNTY	ADA	ROUTE	247	SECTION	15.597

FORMATION	Ordovician Age, Preacherville Member of the Drakes Formation, Waynesville and Arnheim Formation, Undivided
DESCRIPTION	Shale, Gray, Moderately Weathered, Weak
MOISTURE CONDITION	As Received

MEASUREMENT	LENGTH(INCHES)	DIAMETER(INCHES)
1	4.020	1.950
2	4.016	1.949
3	4.018	1.951
AVERAGE	4.018	1.950

LENGTH/DIAMETER	2.1
CORRECTION FACTOR	1
AREA(IN ²)	3.0
MASS (GRAMS)	493.9
UNIT WEIGHT(LBS/FT ³)	156.8



Point Load Strength Index of Rock ASTM D 5731	CTL ENGINEERING, INC. 2860 Fisher Road Columbus, Ohio 43204
Sample ID: B-8, Run# 1 , 4'-9' Sample Description: Interbedded Shale and Limestone Avg Uncorrected Point Load Strength Index (psi): 120.81 Avg Corrected Point Load Strength Index (psi): 119.4 Estimated Uniaxial Compressive Strength S_c (psi): 1432 Point Load Strength Anisotropy Index: $I_{a(50)}$ (psi) : 86.7	Client: Korda Nemeth Engineering, Inc. Project: ADA-247-14.67/15.72 Bridge Replacements Location: Adams County, OH Project No. 23050024COL Lab Code No. Date Tested: 11/17/23 Reviewed by: SM

Specimen Number	Test Type	Width (W), (in)	Diameter D (in)	Effective Diameter (in)	Load lbs)	Is(psi)	F	Is(50) (psi)
1	Axial	1.989	1.710	2.081	1988	458.977	1.0057	461.595
2	Axial	2.019	1.742	2.116	75	16.751	1.0150	17.001
3	Axial	1.955	1.576	1.980	32	8.159	0.9785	7.983
4	Axial	1.936	1.299	1.790	91	28.415	0.9251	26.286
5	Axial	1.973	1.488	1.933	123	32.911	0.9655	31.775
6	Diametrical	---	1.933	1.933	38	10.170	0.9654	9.818
7	Diametrical	---	1.972	1.972	815	209.506	0.9763	204.530
8	Diametrical	---	1.666	1.666	2160	777.911	0.8894	691.846
9	Diametrical	---	2.030	2.030	42	10.195	0.9919	10.112
10	Diametrical	---	1.953	1.953	761	199.585	0.9708	193.767



Point Load Strength Index of Rock ASTM D 5731	CTL ENGINEERING, INC. 2860 Fisher Road Columbus, Ohio 43204
Sample ID: B-8, Run# 2 , 9'-14' Sample Description: Interbedded Shale and Limestone Avg Uncorrected Point Load Strength Index (psi): 307.66 Avg Corrected Point Load Strength Index (psi): 299.7 Estimated Uniaxial Compressive Strength S_c (psi): 3596 Point Load Strength Anisotropy Index: $I_{a(50)}$ (psi) : 52.3	Client: Korda Nemeth Engineering, Inc. Project: ADA-247-14.67/15.72 Bridge Replacements Location: Adams County, OH Project No. 23050024COL Lab Code No. Date Tested: 11/17/23 Reviewed by: SM

Specimen Number	Test Type	Width (W), (in)	Diameter D (in)	Effective Diameter (in)	Load lbs)	Is(psi)	F	Is(50) (psi)
1	Axial	2.027	1.603	2.034	46	11.119	0.9930	11.042
2	Axial	1.869	1.869	2.109	1591	357.719	1.0131	362.401
3	Axial	2.029	1.606	2.037	44	10.606	0.9938	10.540
4	Axial	1.980	1.560	1.983	1719	437.115	0.9792	428.019
5	Axial	1.979	1.322	1.825	1506	452.179	0.9352	422.861
6	Diametrical	---	1.970	1.970	1954	503.662	0.9755	491.332
7	Diametrical	---	1.950	1.950	2159	567.784	0.9701	550.815
8	Diametrical	---	1.973	1.973	801	205.768	0.9764	200.919
9	Diametrical	---	1.964	1.964	1858	481.848	0.9739	469.259
10	Diametrical	---	2.012	2.012	48	11.861	0.9870	11.707



**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, 1.0'-6.0'

Sample Description: Gray, Shale

Slake Durability Index (%): 57.2
(second cycle)
Moisture Content (%): 4.8
Temperature Range (°C): 21.1-21.6
Temperature Average (°C): 21.4

Client: Korda Nemeth Engineering
Project: ADA-247-14.51/15.56
Location: Adams County, Ohio
Project No. 23050024COL
Lab Code: NA
Date Tested: 10/23/2023
Reviewed by: SM



Pre-Test Sample



Post Test Sample

Remarks:

Post Test Sample Description : Type I—Retained specimen remain virtually unchanged.

<p align="center">Slake Durability of Shales and Similar Weak Rocks ASTM D 4644</p>	<p align="center">CTL ENGINEERING, INC. 2860 Fisher Road Columbus, Ohio 43204</p>
<p align="center">Sample ID: B-004-0-23, NQ 1, 4.5'-9.5'</p> <p>Sample Description: Gray, Shale</p> <p>Slake Durability Index (%): 87.2 (second cycle)</p> <p>Moisture Content (%): 1.1</p> <p>Temperature Range (°C): 20.7-21.1</p> <p>Temperature Average (°C): 20.9</p>	<p>Client: Korda Nemeth Engineering Project: ADA-247-14.51/15.56 Location: Adams County, Ohio Project No. 23050024COL Lab Code: NA Date Tested: 10/23/2023 Reviewed by: SM</p>



Pre-Test Sample



Post Test Sample

Remarks:

Post Test Sample Description : Type I—Retained specimen remain virtually unchanged.



**Slake Durability of Shales and Similar Weak Rocks
ASTM D 4644**

CTL ENGINEERING, INC.
2860 Fisher Road Columbus, Ohio 43204

Sample ID: B-008-0-23, NQ-1, 4'-9'

Sample Description: Gray, Shale

Slake Durability Index (%): 43.8
(second cycle)
Moisture Content (%): 3.6
Temperature Range (°C): 20.6-21
Temperature Average (°C): 20.8

Client: Korda Nemeth Engineering
Project: ADA-247-14.51/15.56
Location: Adams County, Ohio
Project No. 23050024COL
Lab Code: NA
Date Tested: 10/23/2023
Reviewed by: SM



Pre-Test Sample



Post Test Sample

Remarks:

Post Test Sample Description : Type I—Retained specimen remain virtually unchanged.

**Slake Durability of Shales and Similar Weak Rocks
ASTM D 4644**

CTL ENGINEERING, INC.
2860 Fisher Road Columbus, Ohio 43204

Sample ID: B-009-0-23, NQ-1, 7.5'-12.5'

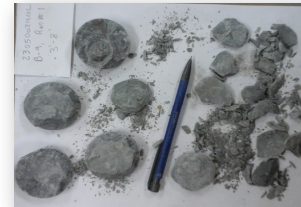
Sample Description: Gray, Shale

Slake Durability Index (%): 64.0
(second cycle)
Moisture Content (%): 3.0
Temperature Range (°C): 21-21.5
Temperature Average (°C): 21.3

Client: Korda Nemeth Engineering
Project: ADA-247-14.51/15.56
Location: Adams County, Ohio
Project No. 23050024COL
Lab Code: NA
Date Tested: 10/23/2023
Reviewed by: SM



Pre-Test Sample



Post Test Sample

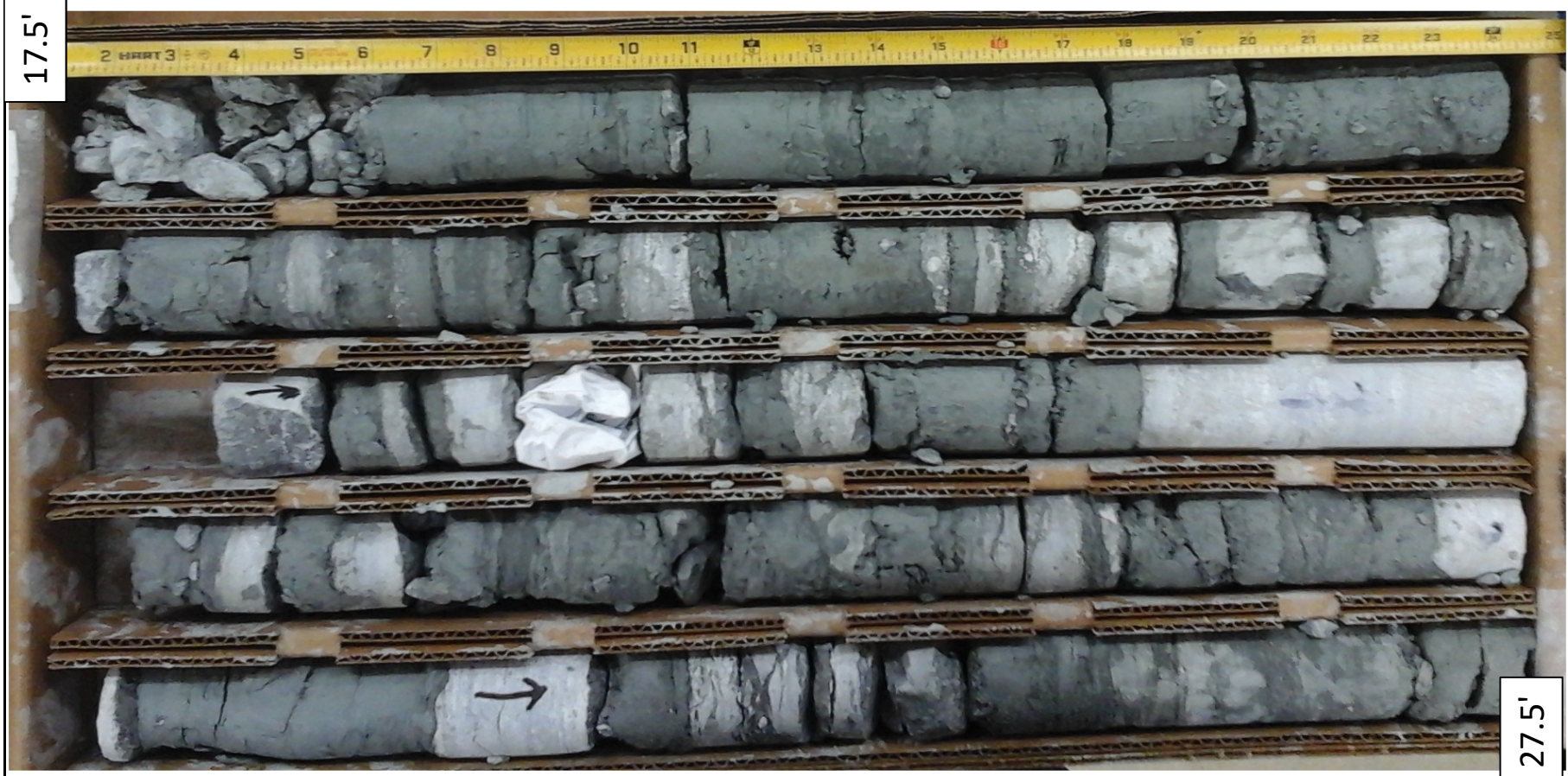
Remarks:

Post Test Sample Description : Type I—Retained specimen remain virtually unchanged.

APPENDIX D
ROCK CORE PHOTOS



B-001-0-23



Run #:	Depth		Recovery		RQD	
NQ-1	17.5'	22.5'	51/60	85%	28/60	47%
NQ-2	22.5'	27.5'	60/60	100%	38/60	63%

ADA-247-14.51/15.56, PID 93800



B-002-0-23



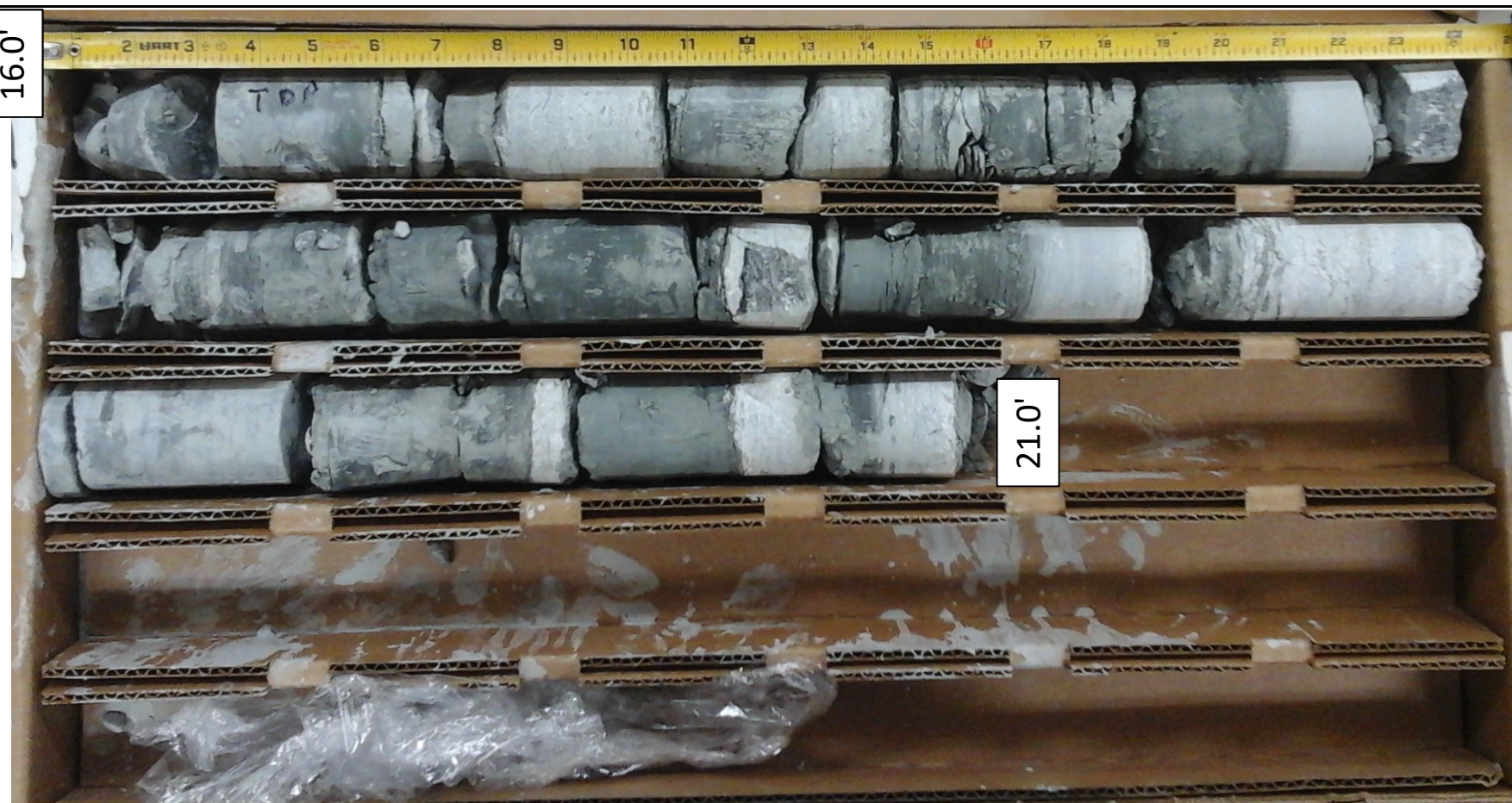
Run #:	Depth		Recovery		RQD	
NQ-1	6.0'	11.0'	57/60	95%	19/60	32%
NQ-2	11.0'	16.0'	57/60	95%	28/60	47%

ADA-247-14.51/15.56, PID 93800



B-002-0-23

16.0'



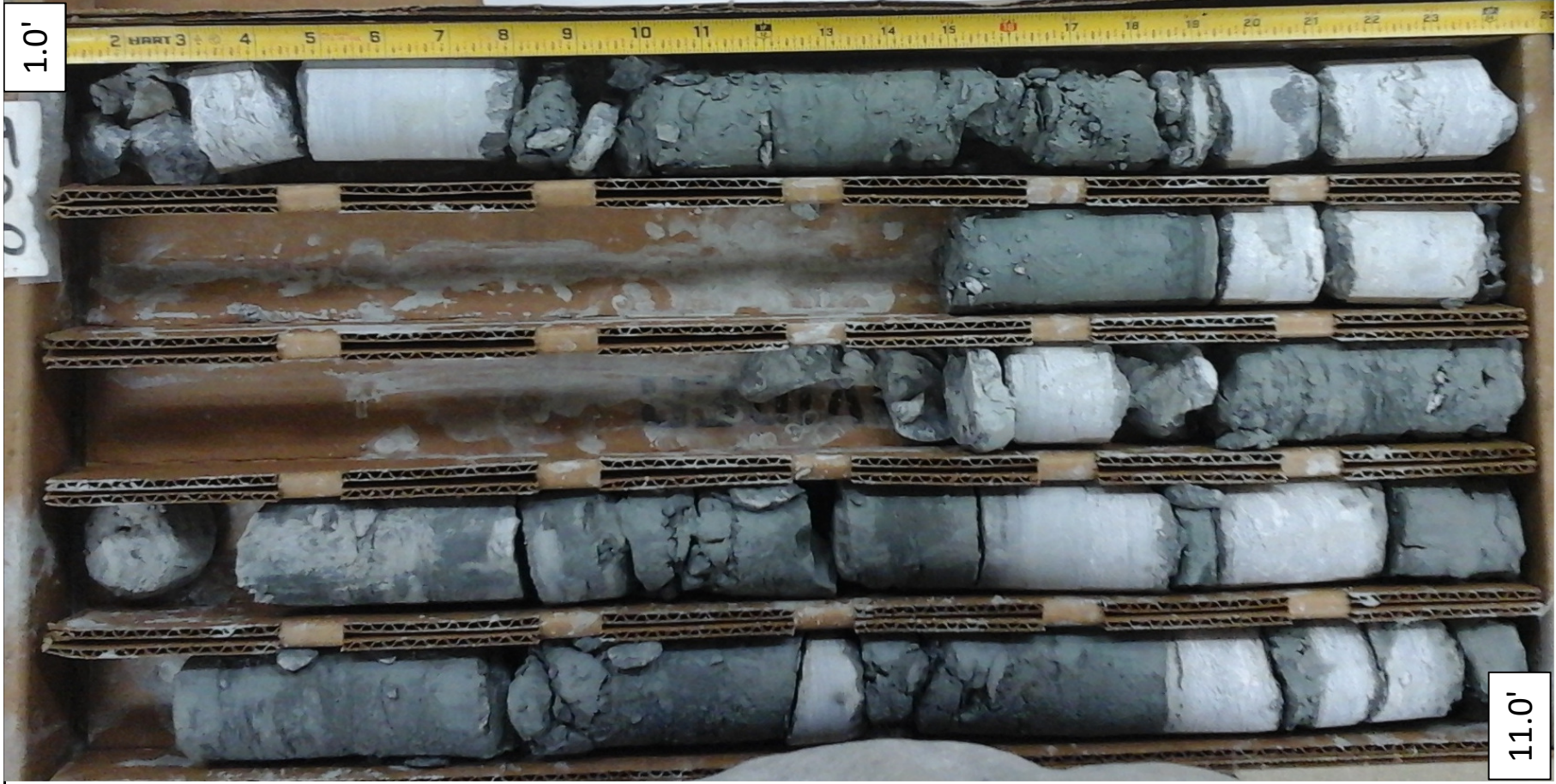
21.0'

Run #:	Depth		Recovery		RQD	
NQ-3	16.0'	21.0'	60/60	100%	18/60	30%

ADA-247-14.51/15.56, PID 93800



B-003-0-23



Run #:	Depth		Recovery		RQD	
NQ-1	1.0'	6.0'	32/60	53%	10/60	17%
NQ-2	6.0'	11.0'	52/60	87%	24/60	40%

ADA-247-14.51/15.56, PID 93800



B-003-0-23



Run #:	Depth		Recovery		RQD	
NQ-3	11.0'	16.0'	60/60	100%	11/60	18%

ADA-247-14.51/15.56, PID 93800



B-004-0-23



Run #:	Depth		Recovery		RQD	
NQ-1	4.5'	9.5'	24/60	40%	0/60	0%
NQ-2	9.5'	14.5'	30/60	50%	21/60	35%

ADA-247-14.51/15.56, PID 93800



B-004-0-23



Run #:	Depth		Recovery		RQD	
NQ-3	14.5'	19.5'	60/60	100%	29/60	48%

ADA-247-14.51/15.56, PID 93800



B-006-0-23



Run #:	Depth		Recovery		RQD	
NQ-1	15.0'	20.0'	52/60	87%	13/60	22%
NQ-2	20.0'	25.0'	58/60	97%	5/60	8%

ADA-247-14.51/15.56, PID 93800



B-007-0-23



Run #:	Depth		Recovery		RQD	
NQ-1	15.0'	17.0'	15/24	63%	0/24	0%
NQ-2	17.0'	22.0'	60/60	100%	36/60	60%

ADA-247-14.51/15.56, PID 93800



B-007-0-23



Run #:	Depth		Recovery		RQD	
NQ-3	22.0'	27.0'	60/60	100%	31.5/60	53%
NQ-4	27.0'	30.0'	30/36	83%	9/36	25%

ADA-247-14.51/15.56, PID 93800



B-008-0-23

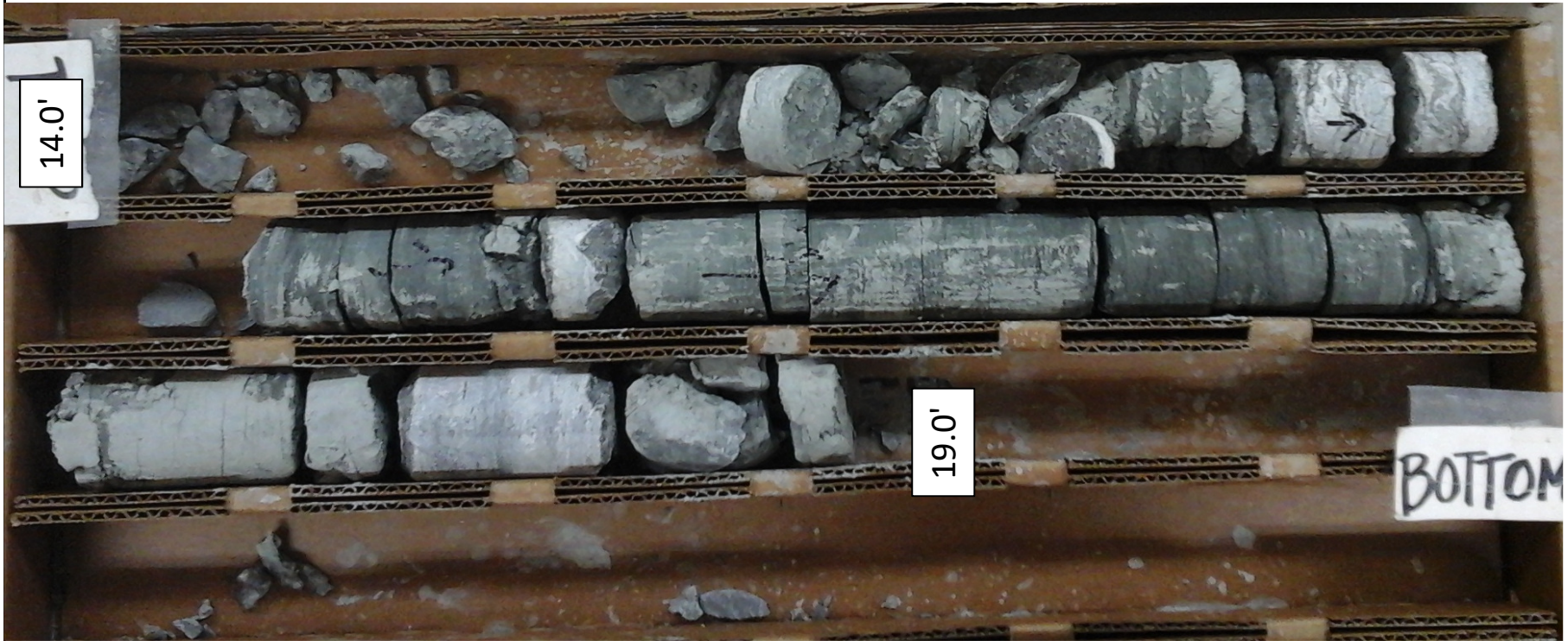


Run #:	Depth		Recovery		RQD	
NQ-1	4.0'	9.0'	42/60	70%	7.5/60	13%
NQ-2	9.0'	14.0'	48/60	80%	18/60	30%

ADA-247-14.51/15.56, PID 93800



B-008-0-23



Run #:	Depth		Recovery		RQD	
NQ-3	14.0'	19.0'	45/60	75%	16/60	27%

ADA-247-14.51/15.56, PID 93800



B-009-0-23



Run #:	Depth		Recovery		RQD	
NQ-1	7.5'	12.5'	57/60	95%	4/60	7%
NQ-2	12.5'	17.5'	58/60	97%	17/60	28%

ADA-247-14.51/15.56, PID 93800



B-009-0-23



Run #:	Depth		Recovery		RQD	
NQ-3	17.5'	22.5'	60/60	100%	33/60	55%

ADA-247-14.51/15.56, PID 93800



APPENDIX E
SUBGRADE ANALYSIS SPREADSHEET



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.)

**ADA-247-(14.51)(15.56)
93800**

Approach roads for structures ADA-247-14.545 and ADA-247-15.597

CTL ENGINEERING, INC.

Prepared By: Shahedur Rahman
Date prepared: Wednesday, June 19, 2024

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

NO. OF BORINGS: **4**

#	Boring ID	Alignment	Station	Offset	Dir	Drill Rig	ER	Boring EL.	Proposed Subgrade EL	Cut Fill
1	B-001-0-23	SR 247	767+55	9	Rt	Mobile B-57 Track	77	792.1	790.6	1.5 C
2	B-005-0-23	SR 247	769+68	10	Lt	Mobile B-57 Track	77	798.6	797.1	1.5 C
3	B-006-0-23	SR 247	823+08	10	Lt	Mobile B-57 Track	77	787.3	785.8	1.5 C
4	B-010-0-23	SR 247	824+72	7	Rt	Mobile B-57 Track	77	785.4	783.9	1.5 C

#	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 001-0 23	SS-1	1.0	2.5	-0.5	1.0	9	9	3.25	48	22	26	31	49	80	27	19	A-7-6	16			N ₆₀ & Mc	12"		
		SS-2	2.5	4.0	1.0	2.5	8		2.25	59	24	35	30	49	79	21	21	A-7-6	20			N ₆₀	12"		
		SS-3	4.0	5.5	2.5	4.0	8		2.25							30	18	A-7-6	16						
		SS-4	5.5	7.0	4.0	5.5	5		2.5							29	18	A-7-6	16						
2	B 005-0 23	SS-1	1.0	2.5	-0.5	1.0	10	10	3.5	65	24	41	32	53	85	22	21	A-7-6	20			N ₆₀	12"		
		SS-2	2.5	4.0	1.0	2.5	8		3	66	29	37	37	61	98	23	26	A-7-6	20	High LL	N ₆₀	30"	12"		
		SS-3	4.0	5.5	2.5	4.0	9		4.25							28	18	A-7-6	16						
		SS-4	5.5	7.0	4.0	5.5	14		4.5							25	18	A-7-6	16						
3	B 006-0 23	SS-1	1.0	2.5	-0.5	1.0	10	10	3.25	34	18	16	13	28	41	6	16	A-6b	3			N ₆₀	12"		
		SS-2	2.5	4.0	1.0	2.5	5		2.25	47	23	24	48	48	96	26	20	A-7-6	15			N ₆₀ & Mc	21"		
		SS-3	4.0	5.5	2.5	4.0	6		3.75							25	16	A-6b	16						
		SS-4	5.5	7.0	4.0	5.5	15		3.75	39	21	18	21	48	69	18	16	A-6b	10						
4	B 010-0 23	SS-1	1.0	2.5	-0.5	1.0	8	8	3.25	41	23	18	32	65	97	20	20	A-7-6	11			N ₆₀	12"		
		SS-2	2.5	4.0	1.0	2.5	8		4.5	52	22	30	41	55	96	26	19	A-7-6	18			N ₆₀ & Mc	12"		
		SS-3	4.0	5.5	2.5	4.0	6		2.75							26	18	A-7-6	16						
		SS-4	5.5	7.0	4.0	5.5	15		4.25							20	18	A-7-6	16						

PID: 93800

County-Route-Section: ADA-247-(14.51)(15.56)

No. of Borings: 4

Geotechnical Consultant: CTL ENGINEERING, INC.

Prepared By: Shahedur Rahman

Date prepared: 6/19/2024

Chemical Stabilization Options		
320	Rubblize & Roll	No
206	Cement Stabilization	No
	Lime Stabilization	Option
206	Depth	14"

Excavate and Replace Stabilization Options	
Global Geotextile Average(N60L): Average(HP):	12" 0"
Global Geogrid Average(N60L): Average(HP):	0" 0"

Design CBR	4
-------------------	----------

% Samples within 3 feet of subgrade			
N ₆₀ ≤ 5	6%	HP ≤ 0.5	0%
N ₆₀ < 12	75%	0.5 < HP ≤ 1	0%
12 ≤ N ₆₀ < 15	0%	1 < HP ≤ 2	0%
N ₆₀ ≥ 20	0%	HP > 2	75%
M+	19%		
Rock	0%		
Unsuitable Soil	0%		

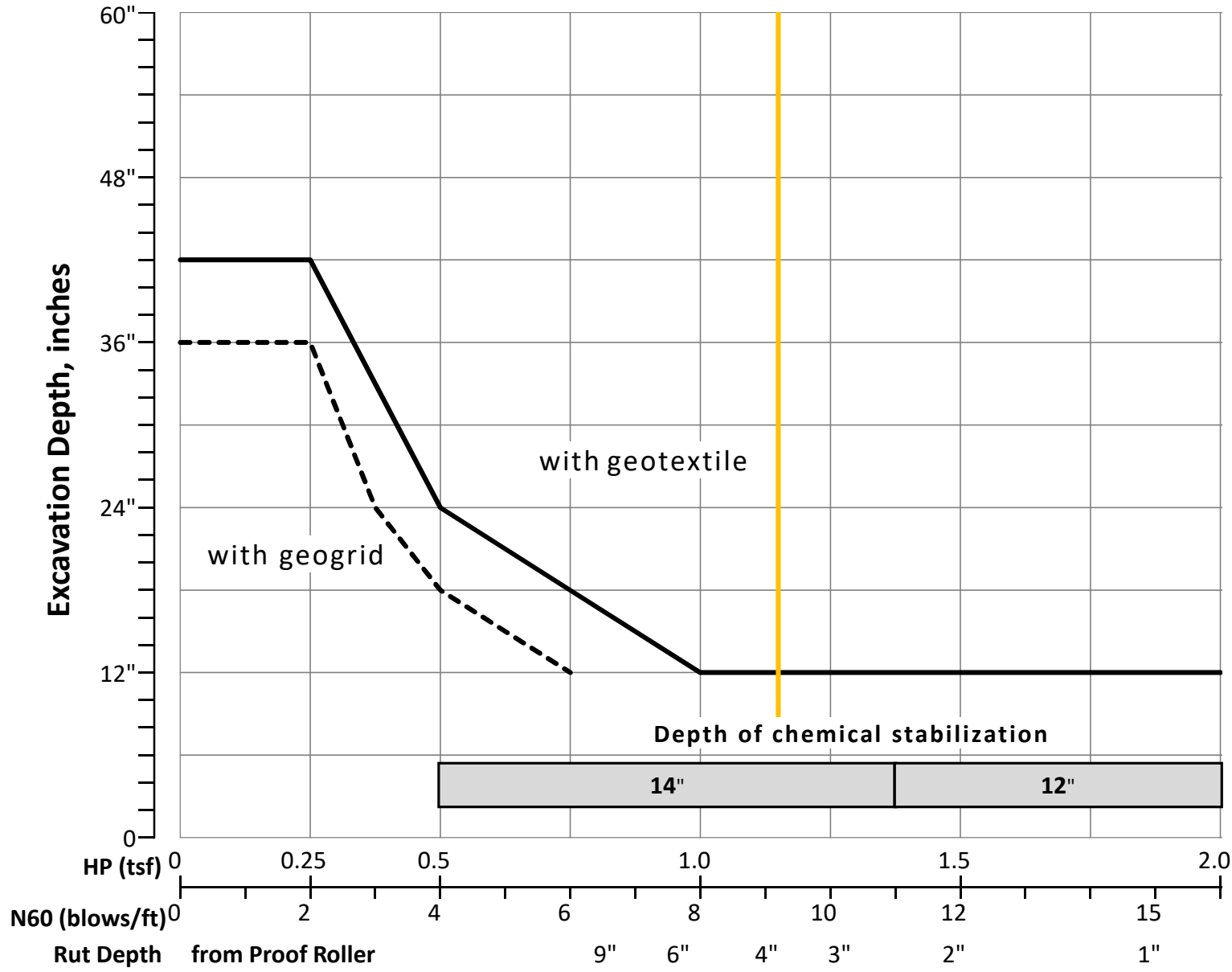
Excavate and Replace at Surface	
Average	0"
Maximum	0"
Minimum	0"

% Proposed Subgrade Surface	
Unstable & Unsuitable	75%
Unstable	67%
Unsuitable (Soil & Rock)	8%

	N ₆₀	N _{60L}	HP	LL	PL	PI	Silt	Clay	P 200	M _C	M _{OPT}	GI
Average	9	9	3.33	50	23	27	32	51	82	23	19	15
Maximum	15	10	4.50	66	29	41	48	65	98	30	26	20
Minimum	5	8	2.25	34	18	16	13	28	41	6	16	3

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	0	0	0	0	0	0	0	0	0	0	0	3	0	13	0	0	16
Percent	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	19%	0%	81%	0%	0%	100%
% Rock Granular Cohesive	0%	0%	0%										100%							100%
Surface Class Count	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	10	0	0	12
Surface Class Percent	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	17%	0%	83%	0%	0%	100%

Fig. 600-1 – Subgrade Stabilization



OVERRIDE TABLE

Calculated Average	New Values	Check to Override
3.33	0.50	<input type="checkbox"/> HP
9.25	6.00	<input type="checkbox"/> N60L

Average HP —
 Average N_{60L} —

The subgrade analysis workbook consists of five worksheets. Each worksheet functions independently. In all of the worksheets the fields are color coded as follows:

- Every yellow highlighted field indicates a field to be entered by the user.
- Every salmon field is to indicate a problem/issue.
- Every gray or green field is a heading/informational field.

IMPORTANT: The sequence of filling out the data needs to be followed as outlined below:

1. Cover Sheet: this worksheet is designed for the purpose of entering the project information. Enter all the following fields:

County-Route-Section	This includes the county, route, section number assigned to the project.
PID	the Project Identification Number
Project Description	See Cover Sheet for list of example details
Geotechnical Consultant	The Geotechnical Consultant performing the analysis.
Prepared By	The preparer of the subgrade analysis
Date prepared	The date the analysis is performed.
Contact Information	Name, address, telephone #, and email address
No. of Borings	Enter the total number of borings within the alignment that is being analyzed.

2. Boring Logs Entry Worksheet: this worksheet has a programming code that will run in the background every time the sheet is activated and will make the sheet unresponsive for less than a minute. The code is designed to read the total number of borings from the cover sheet and generate the needed number of fields.

- a. All yellow highlighted fields are user's entry.
- b. ODOT has developed a text table export from gINT (*GB 1 Borings Log Entry Tab*) that will allow for copy and paste of all highlighted fields with the exception of proposed subgrade elevation. The designer must provide a proposed subgrade elevation in order for the spreadsheet to function properly.
- c. The Cut/Fill field is a calculated field that, based on the difference between the boring elevation and the proposed subgrade elevation, will highlight the cell either gray and adds the letter "C" to the end in a cut situation or highlights the cell in light purple and adds the letter "F" to the end in a fill situation.
- d. Every duplicate boring ID will be highlighted in salmon background and red text.
- e. **IMPORTANT:** After entering all the borings' information, the user must click "Add Subgrade Analysis Entry Fields" button. This will generate all the required fields in the "Subgrade Analysis" Worksheet.

3. Subgrade Analysis Worksheet:

- a. The boring number and boring ID is read from the "Boring Logs Entry Worksheet" excluding every boring that has six feet or more of fill.
- b. All yellow highlighted fields are to be entered by the user and salmon highlighted fields indicates a problem or issue.
- c. Every sample that has a Sulfate Content greater than or equal to 3000 will be highlighted in light salmon background. Every sample that has a Sulfate Content greater than or equal to 8000 will be highlighted in darker salmon background. **Refer to Section 605 of the Geotechnical Design Manual for the latest guidance regarding high sulfate soils.**

d. Unsuitable/Unstable:

- i. Unsuitable samples that are within 3 feet of the top of subgrade will be highlighted with salmon background and the class will be showing in this field.
- ii. Unstable Samples that are within 3 feet of top of subgrade will be highlighted with salmon background and text to indicate the problem as follows:

Criterion	Stabilization Need Check	Text displayed in the field
A-1-a, A-1-b, A-3, or A-3a Soil Class	No Stabilization is needed	
$HP \geq 1.875$	No Stabilization is needed	
$N_{60} \geq 15$	No Stabilization is needed	
$1.875 \geq HP \geq 1.5$ and $M_c \geq \text{Opt. } M_c + 3$	Unstable Subgrade	HP & Mc
$15 \geq N_{60} \geq 12$ and $M_c \geq \text{Opt. } M_c + 3$	Unstable Subgrade	N_{60} & Mc
$HP \leq 1.5$	Unstable Subgrade	HP
$N_{60} \leq 12$	Unstable Subgrade	N_{60}

- iii. The field is formulated to check for HP first and check for N_{60} second.

f. Excavate and Replace (Item 204) is going to be calculated based on the subgrade depth for each sample indicating an unsuitable or unstable problem.

g. Recommendation:

- i. Geotextile Option is calculated and rounded to a multiple of 3 inches based on the subgrade depth for every sample indicating an unsuitable or unstable problem.
- ii. GEOGRID Option is only offered in case of unstable subgrade problem and if the geotextile option indicates the need to excavate greater than 12 inches.

PLEASE NOTE: The Problem, Excavate & Replace, and Recommendation Fields are the responsibility of the Designer. These fields are being enhanced to attempt to capture the ODOT philosophy regarding the subgrade stabilization chart, but are considered still under development. If there are discrepancies between the spreadsheet output and the stabilization chart - the chart governs in conjunction with engineering judgement. Please contact Steve Taliaferro at stephen.taliaferro@dot.ohio.gov if you have any questions.

PLEASE NOTE: It is the Designer's responsibility to identify the most representative data when samples have been separated into multiple specimen (say 1.5 to 2.3 feet and 2.3 to 3.0 feet). The spreadsheet is not capable at this time of addressing this issue within a direct data export from gINT.

4. Results Summary:

All fields in this sheet are password protected and are either calculated or read from the other worksheets.

The spreadsheet calculates the % unstable and % unsuitable soils based on the number of samples encountered within 3.0 feet of the bottom of subgrade (say if 10 samples are taken within 3.0 feet of the bottom of subgrade and two encounter unstable soils and three encounter unsuitable soils, then the spreadsheet will return unstable = 20% and unsuitable = 30% for a combined total of 50%).

5. Graph Worksheet:

This worksheet is designed to read the average N_{60L} and the average HP from the Cover Sheet and plot a blue line for Average HP and orange line for Average N_{60L} on GDM Figure 600-1 – Subgrade Stabilization. The Override Table can be used to enter HP and/or N_{60L} values that are different than the calculated averages. The Override values will change the global undercut recommendation in the Results Summary.

APPENDIX F
SLOPE STABILITY ANALYSES



Soil Parameters

Project: ADA-247-(14.51)(15.56)
 Structure: ADA-247-14.545
 Station: 767+68.24
 Boring No.: B-001-0-23
 Date: 6/27/24

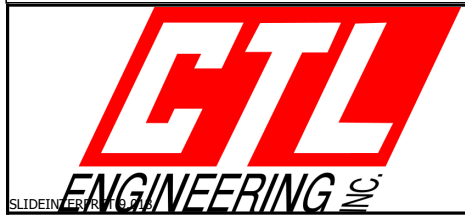
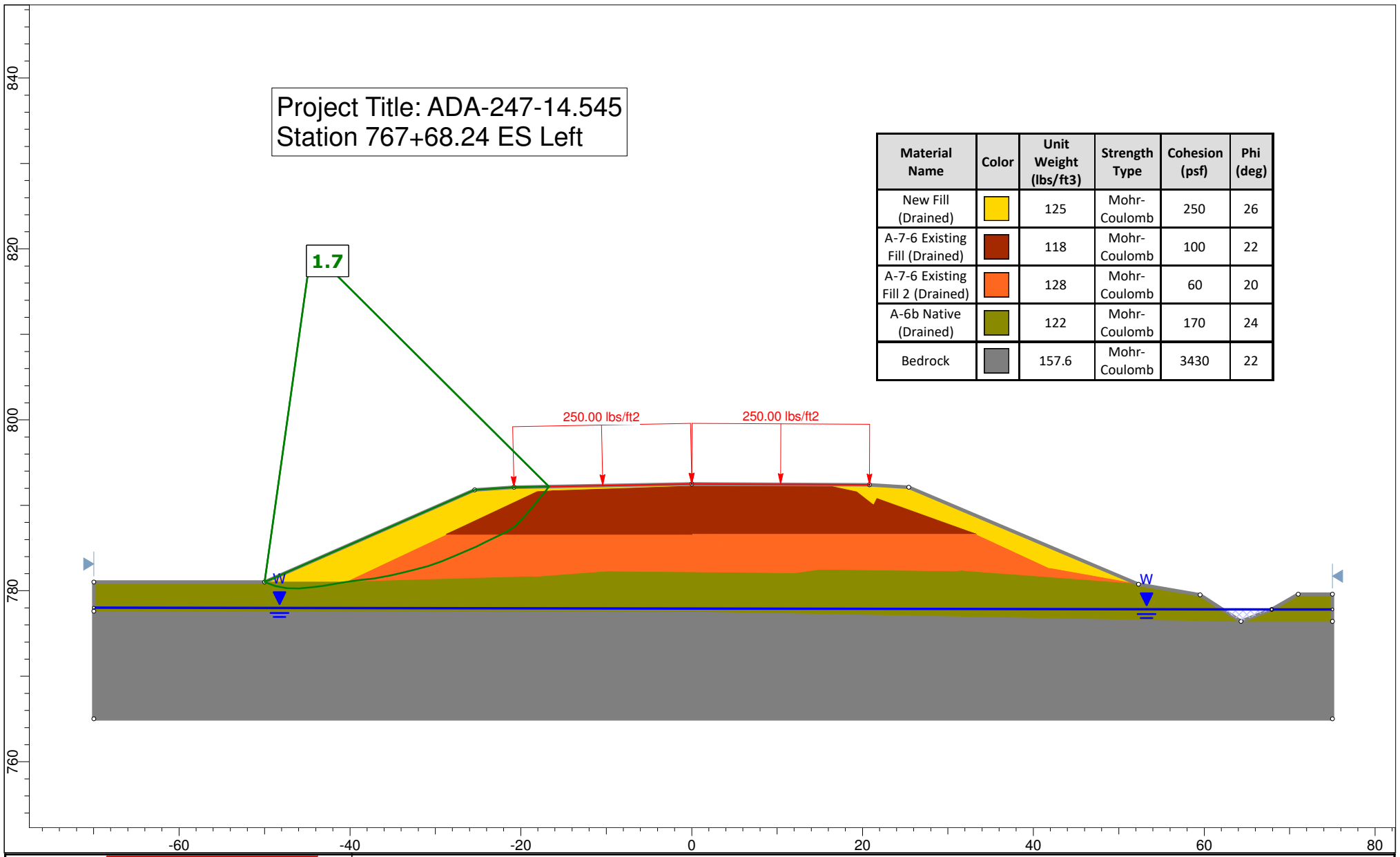
Layer No.	Top Elev	Bottom Elev	Thickness (feet)	Type	Total Weight (pcf)	N ₆₀ value (bpf)	Moisture Content (%)	Liquid Limit (LL)	Plastic Limit (PL)	Total Stress		Effective Stress		Reference
										Cohesion (psf)	Friction Angle (degrees)	Cohesion (psf)	Friction Angle (degrees)	
1	792.1	786.6	5.5	A-7-6	118	9	27	48	22	1000	0	100	22	1,2,3
						8	21	59	24					
			Avg	A-7-6	118	8	26	54	23					
2	786.6	782.1	4.5	A-7-6	122	5	29			625	0	60	20	1,2,3
						6								
			Avg	A-7-6	122	5	29	64	28					
3	782.1	777.6	4.5	A-6b	122	13	22			1750	0	170	24	1,2,3
						14	30							
			Avg	A-6b	122	14	26							

Reference Key

- 1 Total stress and effective stress cohesion estimated according to ODOT GDM Section 404.1
- 2 Total stress friction angle of cohesive soils estimated to be 0
- 3 Effective stress friction angle for cohesive soils estimated using GB7 Table 2

Project Title: ADA-247-14.545
 Station 767+68.24 ES Left

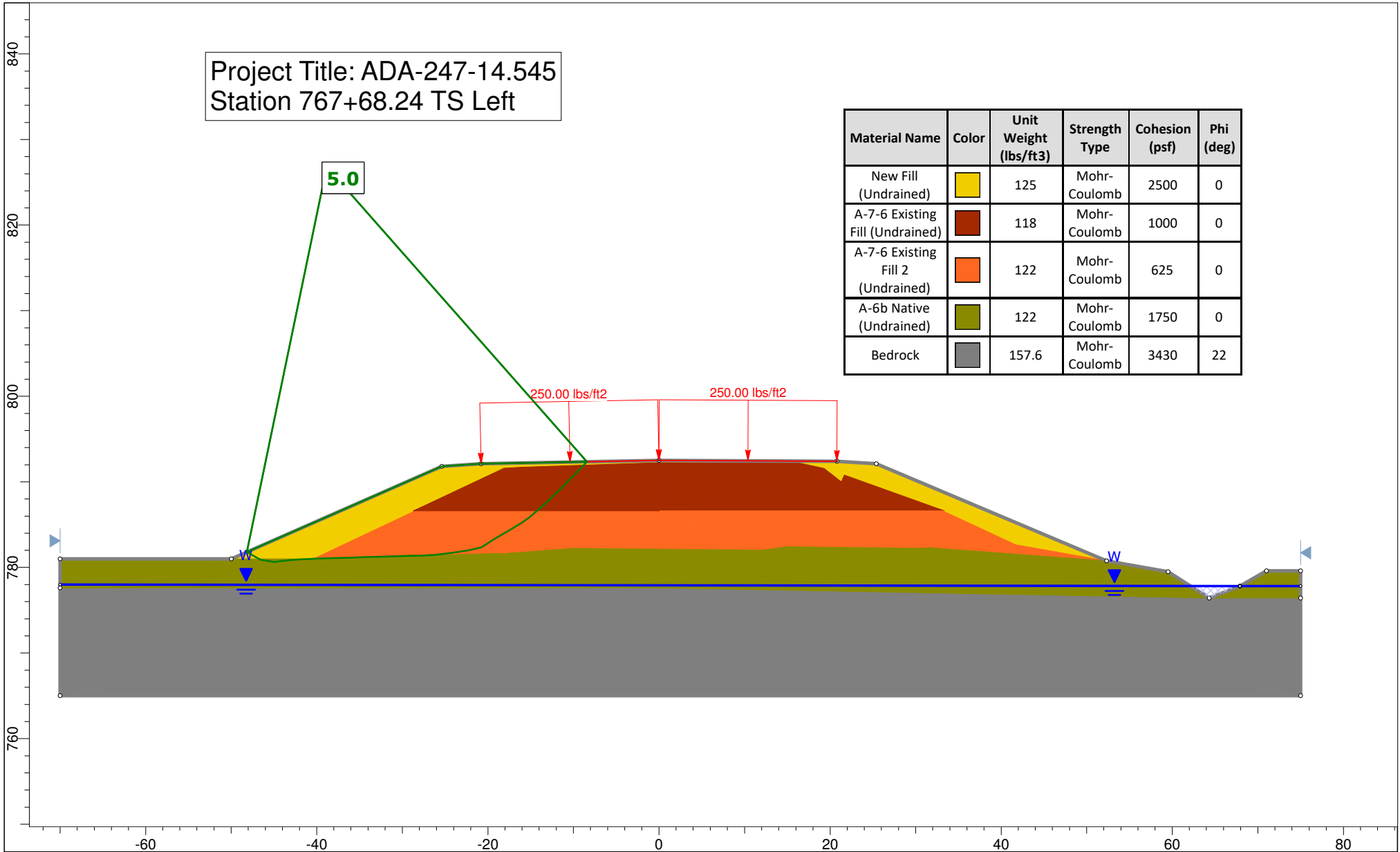
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
New Fill (Drained)	Yellow	125	Mohr-Coulomb	250	26
A-7-6 Existing Fill (Drained)	Brown	118	Mohr-Coulomb	100	22
A-7-6 Existing Fill 2 (Drained)	Orange	128	Mohr-Coulomb	60	20
A-6b Native (Drained)	Green	122	Mohr-Coulomb	170	24
Bedrock	Grey	157.6	Mohr-Coulomb	3430	22




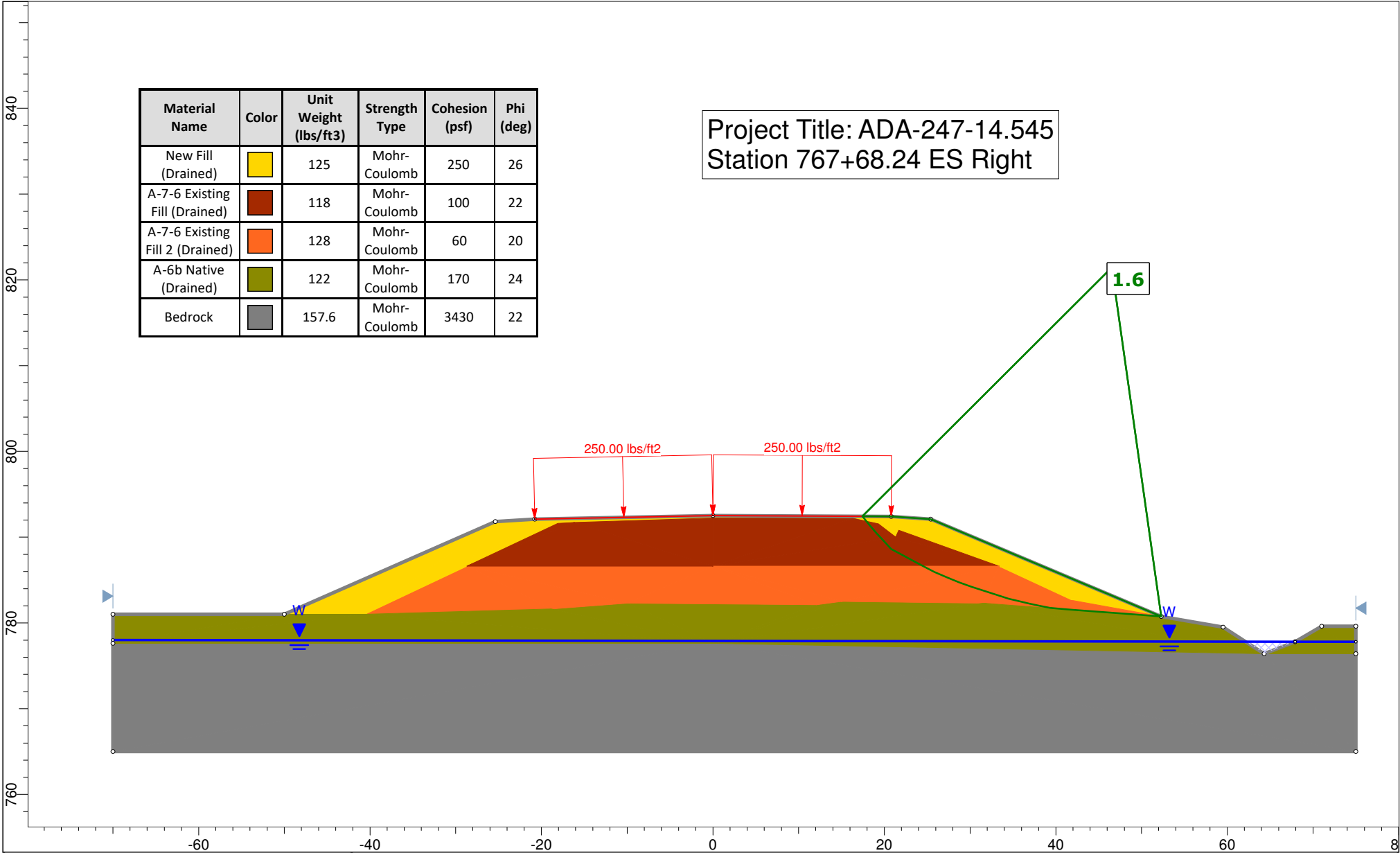
Project	ADA-247-14.545		
Group	Group 1	Scenario	Master Scenario
Drawn By	SR	Company	CTL Engineering
Date	6/21/2024, 11:57:19 AM	File Name	Station 767+68.24.slmd

Project Title: ADA-247-14.545
 Station 767+68.24 TS Left

Material Name	Color	Unit Weight (lbs/ft ³)	Strength Type	Cohesion (psf)	Phi (deg)
New Fill (Undrained)	Yellow	125	Mohr-Coulomb	2500	0
A-7-6 Existing Fill (Undrained)	Brown	118	Mohr-Coulomb	1000	0
A-7-6 Existing Fill 2 (Undrained)	Orange	122	Mohr-Coulomb	625	0
A-6b Native (Undrained)	Green	122	Mohr-Coulomb	1750	0
Bedrock	Grey	157.6	Mohr-Coulomb	3430	22

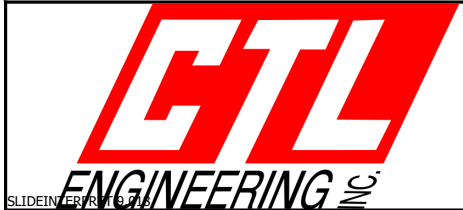


	Project		ADA-247-14.545	
	Group	Group 1	Scenario	Master Scenario
	Drawn By	SR	Company	CTL Engineering
	Date	6/21/2024, 11:57:19 AM	File Name	Station 767+68.24.slmd



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
New Fill (Drained)	Yellow	125	Mohr-Coulomb	250	26
A-7-6 Existing Fill (Drained)	Dark Red	118	Mohr-Coulomb	100	22
A-7-6 Existing Fill 2 (Drained)	Orange	128	Mohr-Coulomb	60	20
A-6b Native (Drained)	Olive Green	122	Mohr-Coulomb	170	24
Bedrock	Grey	157.6	Mohr-Coulomb	3430	22

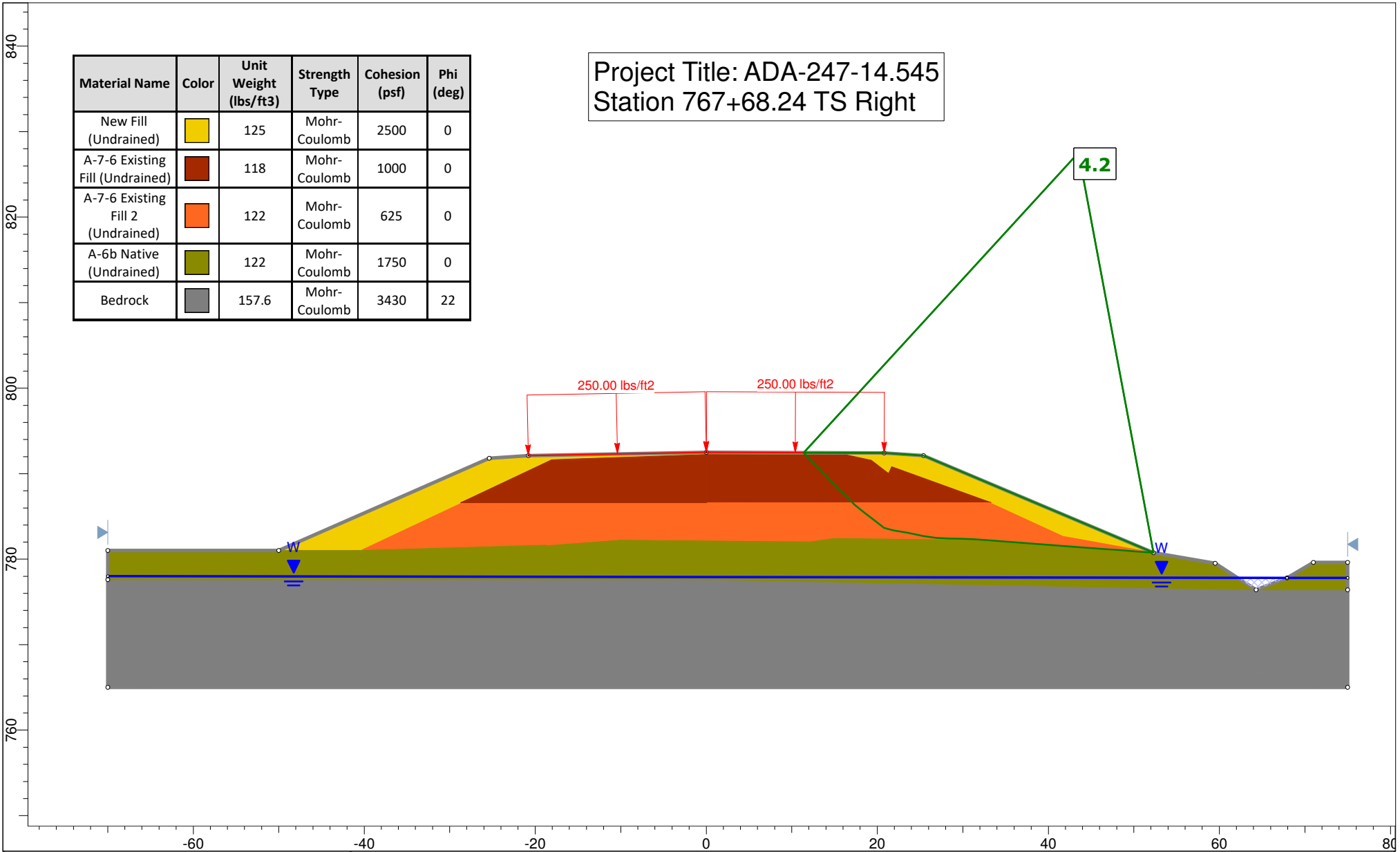
Project Title: ADA-247-14.545
 Station 767+68.24 ES Right

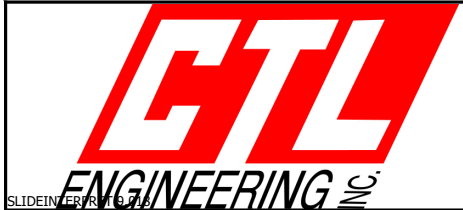


Project		ADA-247-14.545	
Group	Group 1	Scenario	Master Scenario
Drawn By	SR	Company	CTL Engineering
Date	6/21/2024, 11:57:19 AM	File Name	Station 767+68.24.slmd

Project Title: ADA-247-14.545
 Station 767+68.24 TS Right

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
New Fill (Undrained)	Yellow	125	Mohr-Coulomb	2500	0
A-7-6 Existing Fill (Undrained)	Brown	118	Mohr-Coulomb	1000	0
A-7-6 Existing Fill 2 (Undrained)	Orange	122	Mohr-Coulomb	625	0
A-6b Native (Undrained)	Green	122	Mohr-Coulomb	1750	0
Bedrock	Grey	157.6	Mohr-Coulomb	3430	22



	Project		ADA-247-14.545	
	Group		Group 1	Scenario
	Drawn By		SR	Company
	Date		6/21/2024, 11:57:19 AM	File Name
				Station 767+68.24.slmd

APPENDIX G
DRILLED SHAFT DESIGN CALCULATIONS



Drilled Shaft - Tip Resistance

ADA-00247-14.545
SR 247 over Cherry Fork
Rear Abutment

Boring No	B-002-0-23		
Bottom of Foundation Elevation	777.93	feet	(From Bridge Site plan)
Top of Rock Elevation	774.3	feet	(From Boring)
Scour Elevation	772.8	feet	(For design flood and check flood condition provided by Bridge Engineer)
Rock Socket Length	11.5	feet	Assumed 10-foot shaft embedment into coreable bedrock below the scour elevation

LRFD Tip Resistance

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)
1027.5	148.0	369.9	0.50	185.0

Reference Key

- (1) Composite strength of interbedded shale (75%) and limestone (25%) per BDM 2020, Section 305.4.2
- (2) AASHTO 10.8.3.5.4c-1
- (3) AASHTO Table 10.5.5.2.4-1

Composite strength q_u = 1027.5 psi
 (Composite strength of interbedded shale (75%) and limestone (25%) per BDM 2020, Section 305.4.2)
 Compressive Strength of shale (psi)= 580 (Compressive strength test result B-002-0-23, NQ-2)
 Compressive Strength of limestone (psi)= 2370 (Compressive strength test result B-002-0-23, NQ-3)

Drilled Shaft - Side Resistance in Rock

ADA-00247-14.545

SR 247 over Cherry Fork

Rear Abutment

Boring No	B-002-0-23		
Bottom of Foundation Elevation	777.93	feet	(From Bridge Site plan)
Top of Rock Elevation	774.3	feet	(From Boring)
Scour Elevation	772.8	feet	(For design flood and check flood condition provided by Bridge Engineer)
Rock Socket Length	11.5	feet	Assumed 10-foot shaft embedment into coreable bedrock below the scour elevation

LRFD Side Resistance

Top Elev.	Bottom Elev.	Layer Thickness (feet)	Material	q _u (ksf)	P _a (ksf)	C	f' _c (ksf)	q _s (ksf)	q _{s,max} (ksf)	Check	Compressive		Uplift	
											Resistance Factor	Factored Side Resistance (ksf)	Resistance Factor	Factored Side Resistance (ksf)
772.8	762.8	10	Rock	148.0	2.12	1.00	576	17.7	34.9	OK	0.55	9.7	0.4	7.1

* Shaft resistance provided by soil or non-scour resistance rock in the scour zone is neglected as per ODOT BDM section 305.4.1.1

Notes

P_a(ksf)= Atmospheric Pressure

C = regression Coefficient

(C=1 for corable rock per AASHTO TABLE 10.8.3.5.4b-1)

f'_c(ksi)= Concrete Compressive Strength

(4.0 ksi as per ODOT BDM Section C304.2.1)

$$q_s = C P_a (q_u / P_a)^{0.5}$$

(AASHTO Equation 10.8.3.5.4b-1)

$$q_{s,max} = P_a (f'_c / P_a)^{0.5}$$

Resistance Factor= 0.55 Compressive
0.40 Uplift

(AASHTO TABLE 10.5.5.2.4-1)
(AASHTO TABLE 10.5.5.2.4-1)

Composite strength q_u = 1027.5 psi
148.0 ksf

(Composite strength of interbedded shale (75%) and limestone (25%) per BDM 2020, Section 305.4.2)

Compressive Strength of shale (psi)= 580 (Compressive strength test result B-002-0-23, NQ-2)

Compressive Strength of limestone (psi)= 2370 (Compressive strength test result B-002-0-23, NQ-3)

Drilled Shaft - Tip Resistance

ADA-00247-14.545
SR 247 over Cherry Fork
Forward Abutment

Boring No	B-004-0-23		
Bottom of Foundation Elevation	781.74	feet	(From Bridge Site plan)
Top of Rock Elevation	782.7	feet	(From Boring)
Scour Elevation	777.7	feet	(For design flood and check flood condition provided by Bridge Engineer)
Rock Socket Length	14.0	feet	Assumed 10-foot shaft embedment into coreable bedrock below the scour elevation

LRFD Tip Resistance

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)
810.0	116.6	291.6	0.50	145.8

* Shaft Tip elevation is at the bottom of boring B-004-0-23.

However, nearby boring B-003-0-23 was extended down to elevation 757.6, and exhibited similar conditions.

Reference Key

- (1) Composite strength of interbedded shale (75%) and limestone (25%) per BDM 2020, Section 305.4.2
- (2) AASHTO 10.8.3.5.4c-1
- (3) AASHTO Table 10.5.5.2.4-1

Composite strength $q_u = 810.0$ psi

(Composite strength of interbedded shale (75%) and limestone (25%) per BDM 2020, Section 305.4.2)

Compressive Strength of shale (psi)= 120 (Compressive strength test result B-004-0-23, NQ-2)

Compressive Strength of limestone (psi)= 2880 (Compressive strength test result B-004-0-23, NQ-3)

Drilled Shaft - Side Resistance in Rock

ADA-00247-14.545

SR 247 over Cherry Fork

Forward Abutment

Boring No	B-004-0-23		
Bottom of Foundation Elevation	781.74	feet	(From Bridge Site plan)
Top of Rock Elevation	782.7	feet	(From Boring)
Scour Elevation	777.7	feet	(For design flood and check flood condition provided by Bridge Engineer)
Rock Socket Length	14.0	feet	Assumed 10-foot shaft embedment into coreable bedrock below the scour elevation

LRFD Side Resistance

Top Elev.	Bottom Elev.	Layer Thickness (feet)	Material	q _u (ksf)	P _a (ksf)	C	f' _c (ksf)	q _s (ksf)	q _s max (ksf)	Check	Compressive		Uplift	
											Resistance Factor	Factored Side Resistance (ksf)	Resistance Factor	Factored Side Resistance (ksf)
777.7	767.7	10	Rock	116.6	2.12	1.00	576	15.7	34.9	OK	0.55	8.6	0.4	6.3

* Shaft resistance provided by soil or non-scour resistance rock in the scour zone is neglected as per ODOT BDM section 305.4.1.1

Notes

P_a(ksf)= Atmospheric Pressure

C = regression Coefficient

(C=1 for corable rock per AASHTO TABLE 10.8.3.5.4b-1)

f'_c(ksi)= Concrete Compressive Strength

(4.0 ksi as per BDM 2020, Section C304.2.1)

$$q_s = C P_a (q_u / P_a)^{0.5}$$

(AASHTO Equation 10.8.3.5.4b-1)

$$q_{s\max} = P_a (f'_c / P_a)^{0.5}$$

Resistance Factor= 0.55 Compressive

(AASHTO TABLE 10.5.5.2.4-1)

0.40 Uplift

(AASHTO TABLE 10.5.5.2.4-1)

Composite strength q_u = 810.0 psi

(Composite strength of interbedded shale (75%) and limestone (25%) per BDM 2020, Section 305.4.2)

116.6 ksf

Compressive Strength of shale (psi)= 120 (Compressive strength test result B-004-0-23, NQ-2)

Compressive Strength of limestone (psi)= 2880 (Compressive strength test result B-004-0-23, NQ-3)

Drilled Shaft - Tip Resistance

ADA-00247-15.597
SR 247 over Grace Run
Rear Abutment

Boring No	B-007-0-23		
Bottom of Foundation Elevation	771.37	feet	(From Bridge Site plan)
Top of Rock Elevation	765.5	feet	(From Boring)
Scour Elevation	764.4	feet	(For check flood condition provided by Bridge Engineer)
Rock Socket Length	11.1	feet	Assumed 10-foot shaft embedment into coreable bedrock below the scour elevation

LRFD Tip Resistance

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)
942.5	135.7	339.3	0.50	169.7

Reference Key

- (1) Composite strength of interbedded shale (75%) and limestone (25%) per BDM 2020, Section 305.4.2
- (2) AASHTO 10.8.3.5.4c-1
- (3) AASHTO Table 10.5.5.2.4-1

Composite strength q_u = 942.5 psi

(Composite strength of interbedded shale (75%) and limestone (25%) per BDM 2020, Section 305.4.2)

Compressive Strength of shale (psi)= 220 (Compressive strength test result B-007-0-23, NQ-2)

Compressive Strength of limestone (psi)= 3110 (Compressive strength test result B-007-0-23, NQ-3)

Drilled Shaft - Side Resistance in Rock

ADA-00247-15.597
SR 247 over Grace Run
Rear Abutment

Boring No	B-007-0-23		
Bottom of Foundation Elevation	771.37	feet	(From Bridge Site plan)
Top of Rock Elevation	765.5	feet	(From Boring)
Scour Elevation	764.4	feet	(For check flood condition provided by Bridge Engineer)
Rock Socket Length	11.1	feet	Assumed 10-foot shaft embedment into coreable bedrock below the scour elevation

LRFD Side Resistance

Top Elev.	Bottom Elev.	Layer Thickness (feet)	Material	q _u (ksf)	P _a (ksf)	C	f' _c (ksf)	q _s (ksf)	q _{s,max} (ksf)	Check	Compressive		Uplift	
											Resistance Factor	Factored Side Resistance (ksf)	Resistance Factor	Factored Side Resistance (ksf)
764.4	754.4	10	Rock	135.7	2.12	1.00	576	17.0	34.9	OK	0.55	9.3	0.4	6.8

* Shaft resistance provided by soil or non-scour resistance rock in the scour zone is neglected as per ODOT BDM section 305.4.1.1

Notes

P_a(ksf)= Atmospheric Pressure

C = regression Coefficient

(C=1 for corable rock per AASHTO TABLE 10.8.3.5.4b-1)

f'_c(ksi)= Concrete Compressive Strength

(4.0 ksi as per ODOT BDM Section C304.2.1)

$$q_s = C P_a (q_u / P_a)^{0.5}$$

(AASHTO Equation 10.8.3.5.4b-1)

$$q_{s,max} = P_a (f'_c / P_a)^{0.5}$$

Resistance Factor= 0.55 Compressive

(AASHTO TABLE 10.5.5.2.4-1)

0.40 Uplift

(AASHTO TABLE 10.5.5.2.4-1)

Composite strength q_u = 942.5 psi

(Composite strength of interbedded shale (75%) and limestone (25%) per BDM 2020, Section 305.4.2)

135.7 ksf

Compressive Strength of shale (psi)= 220 (Compressive strength test result B-007-0-23, NQ-2)

Compressive Strength of limestone (psi)= 3110 (Compressive strength test result B-007-0-23, NQ-3)

Drilled Shaft - Tip Resistance

ADA-00247-15.597
SR 247 over Grace Run
Forward Abutment

Boring No	B-009-0-23		
Bottom of Foundation Elevation	772.39	feet	(From Bridge Site plan)
Top of Rock Elevation	775.4	feet	(From Boring)
Scour Elevation	771.9	feet	(For check flood condition provided by Bridge Engineer)
Rock Socket Length	10.5	feet	Assumed 10-foot shaft embedment into coreable bedrock below the scour elevation

LRFD Tip Resistance

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)
1782.5	256.7	641.7	0.50	320.9

Reference Key

- (1) Composite strength of interbedded shale (75%) and limestone (25%) per BDM 2020, Section 305.4.2
- (2) AASHTO 10.8.3.5.4c-1
- (3) AASHTO Table 10.5.5.2.4-1

Composite strength q_u = 1782.5 psi
 (Composite strength of interbedded shale (75%) and limestone (25%) per BDM 2020, Section 305.4.2)
 Compressive Strength of shale (psi)= 1340 (Compressive strength test result B-009-0-23, NQ-3)
 Compressive Strength of limestone (psi)= 3110 (Compressive strength test result B-007-0-23, NQ-3)

Drilled Shaft - Side Resistance in Rock

ADA-00247-15.597
SR 247 over Grace Run
Forward Abutment

Boring No	B-009-0-23		
Bottom of Foundation Elevation	772.39	feet	(From Bridge Site plan)
Top of Rock Elevation	775.4	feet	(From Boring)
Scour Elevation	771.9	feet	(For design flood and check flood condition provided by Bridge Engineer)
Rock Socket Length	10.5	feet	Assumed 10-foot shaft embedment into coreable bedrock below the scour elevation

LRFD Side Resistance

Top Elev.	Bottom Elev.	Layer Thickness (feet)	Material	q _u (ksf)	P _a (ksf)	C	f' _c (ksf)	q _s (ksf)	q _{s,max} (ksf)	Check	Compressive		Uplift	
											Resistance Factor	Factored Side Resistance (ksf)	Resistance Factor	Factored Side Resistance (ksf)
771.9	761.9	10	Rock	238.3	2.12	1.00	576	22.5	34.9	OK	0.55	12.4	0.4	9.0

* Shaft resistance provided by soil or non-scour resistance rock in the scour zone is neglected as per ODOT BDM section 305.4.1.1

Notes

P_a(ksf)= Atmospheric Pressure

C = regression Coefficient

(C=1 for corable rock per AASHTO TABLE 10.8.3.5.4b-1)

f'_c(ksi)= Concrete Compressive Strength

(4.0 ksi as per BDM 2020, Section C304.2.1)

$$q_s = C P_a (q_u / P_a)^{0.5}$$

(AASHTO Equation 10.8.3.5.4b-1)

$$q_{s,max} = P_a (f'_c / P_a)^{0.5}$$

Resistance Factor= 0.55 Compressive

(AASHTO TABLE 10.5.5.2.4-1)

0.40 Uplift

(AASHTO TABLE 10.5.5.2.4-1)

Composite strength q_u = 1655.0 psi

(Composite strength of interbedded shale (75%) and limestone (25%) per BDM 2020, Section 305.4.2)

238.3 ksf

Compressive Strength of shale (psi)= 1170 (Compressive strength test result B-009-0-23, NQ-2)

Compressive Strength of limestone (psi)= 3110 (Compressive strength test result B-007-0-23, NQ-3)

APPENDIX H
LPILE PARAMETERS



L-PILE Soil and Rock Parameters

ADA-00247-14.545

SR 247 over Cherry Fork

Rear Abutment

Boring No	B-002-0-23		
Bottom of Foundation Elevation	777.93	feet	(From Bridge Site plan)
Top of Augerable Rock Elevation	774.3	feet	(From Boring)
Top of Coreable Rock Elevation	772.8	feet	(From Boring)
Scour Elevation	772.8	feet	(For design flood and check flood condition provided by Bridge Engineer)
Rock Socket Length	11.5	feet	Assumed 10-foot shaft embedment into coreable bedrock below the scour elevation

Below Scour Elevation of 772.8

Use Rock Type-	Weak Rock (Reese)		
Composite unit weight of Interbedded shale (75%) and limestone (25%)=	157.6	pcf	Unit weight of shale (pcf)= 154.8 Unit weight of limestone (pcf)= 165.9 (Laboratory test results of NQ-2 and NQ-3)
Effective unit weight =	95.2	pcf	
Composite strength of Interbedded shale (75%) and limestone (25%) (q_u) =	147.96	psi	(BDM 2020, Section 305.4.2) Compressive Strength of shale (psi)= 580 Compressive Strength of limestone (psi)= 2370 (Laboratory test results of NQ-2 and NQ-3)
Initial Rock Modulus =	100000	psi	(Per ODOT GDM Table 400-6, Weak to Slightly Strong Rock)
RQD =	36%		(Average value for B-002-0-23)
Use K_{rm} =	0.0005		(From L-pile)

L-PILE Soil and Rock Parameters

ADA-00247-14.545

SR 247 over Cherry Fork

Forward Abutment

Boring No	B-004-0-23		
Bottom of Foundation Elevation	781.74	feet	(From Bridge Site plan)
Top of Coreable Rock Elevation	782.7	feet	(From Boring)
Scour Elevation	777.7	feet	(For design flood and check flood condition provided by Bridge Engineer)
Rock Socket Length	14.0	feet	Assumed 10-foot shaft embedment into coreable bedrock below the scour elevation

From Below Scour Elevation of 777.7

Use Rock Type-	Weak Rock (Reese)		
Composite unit weight of Interbedded shale (75%) and limestone (25%)=	150.9	pcf	Unit weight of shale (pcf)= 147.7 Unit weight of limestone (pcf)= 160.5 (Laboratory test results of NQ-2 and NQ-3)
Effective unit weight = Composite strength of Interbedded shale (75%) and limestone (25%) (q_u) =	88.5	pcf	
	810	psi	(BDM 2020, Section 305.4.2) Compressive Strength of shale (psi)= 120 Compressive Strength of limestone (psi)= 2880 (Per ODOT GDM Table 400-6, Weak to Slightly Strong Rock)
Initial Rock Modulus =	100000	psi	(Average values for B-004-0-23)
RQD =	41%		(From L-pile)
Use K_{rm} =	0.0005		

L-PILE Soil and Rock Parameters

**ADA-00247-15.597
SR 247 over Grace Run
Rear Abutment**

Boring No	B-007-0-23		
Bottom of Foundation Elevation	771.37	feet	(From Bridge Site plan)
Top of Augerable Rock Elevation	765.5	feet	(From Boring)
Top of Coreable Rock Elevation	764.5	feet	(From Boring)
Scour Elevation	764.4	feet	(For check flood condition provided by Bridge Engineer)
Rock Socket Length	11.1	feet	Assumed 10-foot shaft embedment into coreable bedrock below the scour elevation

From Below Scour Elevation of 764.4

Use Rock Type-	Weak Rock (Reese)		
Composite unit weight of Interbedded shale (75%) and limestone (25%)=	146.2	pcf	Unit weight of shale (pcf)= 139.0 Unit weight of limestone (pcf)= 167.6 (Laboratory test results of NQ-2 and NQ-3)
Effective unit weight = Composite strength of Interbedded shale (75%) and limestone (25%) (q_u) =	83.8	pcf	
	942.5	psi	(BDM 2020, Section 305.4.2) Compressive Strength of shale (psi)= 220 Compressive Strength of limestone (psi)= 3110 (Laboratory test results of NQ-2 and NQ-3)
Initial Rock Modulus =	100000	psi	(Per ODOT GDM Table 400-6, Weak to Slightly Strong Rock)
RQD =	34%		(Average values for B-007-0-23)
Use K_{rm} =	0.0005		(From L-pile)

L-PILE Soil and Rock Parameters

ADA-00247-15.597
SR 247 over Grace Run
Forward Abutment

Boring No	B-009-0-23		
Bottom of Foundation Elevation	772.39	feet	(From Bridge Site plan)
Top of Augerable Rock Elevation	775.4	feet	(From Boring)
Top of Coreable Rock Elevation	771.9	feet	(From Boring)
Scour Elevation	771.9	feet	(For design flood and check flood condition provided by Bridge Engineer)
Rock Socket Length	10.5	feet	Assumed 10-foot shaft embedment into coreable bedrock below the scour elevation

From Below Scour Elevation of 771.9 to 761.9

Use Rock Type-	Weak Rock (Reese)				
Composite unit weight of Interbedded shale (75%) and limestone (25%)=	154.7	pcf	Unit weight of shale (pcf)=	150.4	*
			Unit weight of limestone (pcf)=	167.6	*
			*(Laboratory test results of B-009-0-23, NQ-2 and B-007-0-23, NQ-3)		
Effective unit weight = Composite strength of Interbedded shale (75%) and limestone (25%) (q_u) =	92.3	pcf			
	1655	psi	(BDM 2020, Section 305.4.2)		
			Compressive Strength of shale (psi)=	1170	*
			Compressive Strength of limestone (psi)=	3110	*
Initial Rock Modulus =	100000	psi	(Per ODOT GDM Table 400-6, Weak to Slightly Strong Rock)		
RQD =	17%		(Average values B-009-0-23, NQ-1 & NQ-2)		
Use K_{rm} =	0.0005		(From L-pile)		

Below 761.9

Use Rock Type-	Weak Rock (Reese)				
Composite unit weight of Interbedded shale (75%) and limestone (25%)=	159.5	pcf	Unit weight of shale (pcf)=	156.8	**
			Unit weight of limestone (pcf)=	167.6	**
			**(Laboratory test results of B-009-0-23, NQ-3 and B-007-0-23, NQ-3)		
Effective unit weight = Composite strength of Interbedded shale (75%) and limestone (25%) (q_u) =	97.1	pcf			
	1782.5	psi	(BDM 2020, Section 305.4.2)		
			Compressive Strength of shale (psi)=	1340	**
			Compressive Strength of limestone (psi)=	3110	**
Initial Rock Modulus =	100000	psi	(Per ODOT GDM Table 400-6, Weak to Slightly Strong Rock)		
RQD =	55%		(B-009-0-23, NQ-3)		
Use K_{rm} =	0.0005		(From L-pile)		

APPENDIX I
GEOTECHNICAL CERTIFICATION LETTER



May 15, 2025

Korda
1650 Watermark Dr.
Columbus, Ohio USA 43215

Attention: Ms. Carol A. Boehm, PE
Senior Associate / Bridge Engineer

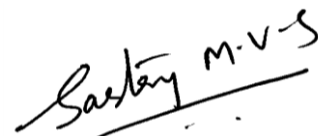
Reference: Certification Letter- Stage 2 Plans
ADA-247-(14.51) (15.56) Bridge Replacement
PID No. 93800
Oliver and Wayne Townships, Adams County, Ohio
CTL Project No. 23050024COL

Dear Ms. Boehm:

As the Geotechnical Engineer of Record for the subject project, I certify that I have reviewed the Stage 2 plans for the subject project.

Respectfully Submitted

CTL ENGINEERING, INC.



Sastry Malladi, P.E.
Project Engineer