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October 7, 2024
November 27, 2024 (1st Revision)
December 18, 2024 (2nd Revision)

HNTB Ohio, Inc.
88 E. Broad St.
Ste. 1600
Columbus, OH 43215

Attention: Mr. Naiel Hussein, PE
Transportation Group Director – Ohio

Reference: Proposed US 33 Main Line – West Section - Final Report
ATH/MEG-033-18.70
PID No. 119141, Agreement No. 39087
Alexander and Lodi Townships, Athens County, Ohio
CTL Project No. 23050059COL

Dear Mr. Hussein:

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

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

Respectfully Submitted,

CTL Engineering, Inc.

Sastry M.V.S

Sastry Malladi, P. E.
Project Engineer

ROADWAY EXPLORATION- FINAL REPORT

PROPOSED US 33 MAIN LINE – WEST SECTION- FINAL REPORT
ATH/MEG-033-18.70
PID No. 119141
AGREEMENT NO. 39087
ALEXANDER AND LODI TOWNSHIPS, ATHENS COUNTY, OHIO
CTL PROJECT NO. 23050059COL

PREPARED FOR:

HNTB OHIO, INC.
88 E. BROAD STREET. STE. 1600
COLUMBUS, OH 43215

PREPARED BY:

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

December 18, 2024

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I. EXECUTIVE SUMMARY

The overall ATH/MEG-033-18.70/00.00 project will convert 9.9 miles of roadway located in Athens and Meigs Counties from the existing two-lane highway configuration to a four lane, divided highway. The work will take place from just south of Athens extending down to Darwin. The overall project is divided into two sub projects, PID 119141 and PID 119142.

This report addresses the PID 119141 project which involves the construction of a 4.48-mile conversion from SLM 18.78 (just east of Oxley Road bridge over US 33) to SLM 23.23 (just west of Pratts Fork Long bridge). The report addresses global stability, rock cut slopes and settlement considerations for PID 119141. It is understood that the pavement design for the portion of US 33 within the project limits was performed by ODOT based on the subgrade recommendations determined by the District. Therefore, no additional subgrade recommendations for the proposed roadways are included by CTL in this report.

Roadway design memos were previously submitted for this project. This Final report includes our recommendations, and address comments received by the District on the previously submitted roadway design memos.

Two (2) new overhead structures (SFN 500315 and SFN 500317) with associated ramps are also planned within the project limits. A Final Structure Foundation exploration report was submitted separately.

A total of eleven (11) roadway/embankment test borings were performed for this project. From the surface or beneath the surface cover, these test borings encountered both fine-grained soils and coarse-grained soils or bedrock extending down to the boring termination depths. The fine-grained soils were described as A-4a, A-4b, A-6a, A-6b, A-7-5 or A-7-6 soils. The coarse-grained soils were described as A-1-a, A-2-6, A-4a or A-4b. Below the soil overburden, bedrock was encountered in three (3) test borings. The bedrock was described as sandstone or claystone.

Groundwater was encountered during or at completion of drilling in three (3) test borings (B-003-0-23, B-005-0-23 and B-006-0-23) at depths ranging from 6.0 to 67.0 feet. These depths correspond to elevations ranging from 889.2 to 809.7. No groundwater was encountered in the remaining borings, at any time during the field exploration.

Please refer to the Analyses and Recommendations section of this report for global stability, rock cut slope, catchment width, and settlement considerations for this project.

II. INTRODUCTION

The overall ATH/MEG-033-18.70/00.00 project will convert 9.9 miles of roadway located in Athens and Meigs Counties from the existing two-lane highway configuration to a four lane, divided highway. The work will take place from just south of Athens

extending down to Darwin. The overall project is divided into two sub projects, PID 119141 and PID 119142.

This report addresses the PID 119141 project which involves the construction of a 4.48-mile conversion from SLM 18.78 (just east of Oxley Road bridge over US 33) to SLM 23.23 (just west of Pratts Fork Long bridge. The project begins at Station 990+24.19, and ends at Station 1227+00.

This is a Final Roadway Exploration Report.

III. GEOLOGY AND OBSERVATIONS OF THE PROJECT

The project site is located within the Marietta Plateau physiographic region. Soils in this area are described as Pleistocene (Teays) age Minford clay, red and brown silty clay loam colluvium underlain by Pennsylvanian age sedimentary bedrocks. The bedrock mainly consists of sandstone, siltstone, shale, claystone of the Conemaugh and Monongahela formations.

According to the Web Soil Survey (*United States Department of Agriculture, Natural Resources Conservation Service*), major surficial soils mapped at the subject site are described as Dekalb-Westmoreland complex (DtE or DtF), 25 to 70 percent slopes, Guernsey-Upshur complex (GuC or GuD), 8 to 25 percent slopes, Westmoreland-Guernsey silt loams (WhE), 25 to 40 percent slopes, Westmoreland-Upshur complex (WmD, WmE or WmF), 15 to 40 percent slopes, or Woodsfield silt loam (WtC), 8 to 15 percent slopes.

According to the mapping of historic and active mines (ODNR Mines of Ohio), there are no documented mines in the immediate vicinity of the project. However, surface mining activities were performed on the hillsides south and west of US Route 33, outside the project limits.

According to the mapping of karst features (Known and Probable Karst in Ohio, *ODNR Geological Survey Map EG-1, 1999; Revised 2002, 2006*), there are no mapped karst features in the general vicinity of the project area. Additionally, karst features were not observed at the ground surface during our field exploration.

Several site visits were completed by CTL personnel between October 30, 2023, and August 2, 2024. The US 33 roadway is a two lane, bi directional road that runs generally west to east within the project limits. The topography along the roadway alignment consists of rolling hills with upward and downward slopes immediately adjacent to the roadway. The construction of the proposed US 33 is planned on the south side of the existing US 33. The original roadway plans included the conceptual layout of a future four lane highway. The right of way is wide enough to accommodate the future four lane road and interchanges.

Surface erosion, shallow sloughing and saturated areas were noted within the existing embankments. Special benching will be necessary to "tie" the embankments together. Several existing underdrain outlets were noted within the project corridor. No significant rock falls were noted within the hills present along the south side of US 33. The talus from the rock fall was discoidal or spherical in shape with fallen rock size ranging from less than 0.5 foot to 4.3 feet. The talus was mainly noted on the hillside slopes or within the existing catchment area.

There are several existing culverts running beneath US 33 that were designed for future conditions. It is understood that a majority of these culverts will remain in place without any additional improvements required.

The surrounding land usage within the project limits consists of grasslands and wooded areas.

Historic geotechnical records were obtained from the original geotechnical soil profile sheets prepared for ATH-033-30.981 completed in 1998. The historic boring data was utilized while performing the design analysis. Per the direction of the District, no re-work was done to include the historic boring information on the current Soil Profile sheets. The original geotechnical soil profile sheets can be referred to for historic boring information.

IV. EXPLORATION

A total of eleven (11) roadway/embankment test borings, identified as B-001-0-23 through B-006-0-23, B-006-1-23, B-046-0-23, and B-061-0-23 through B-063-0-23 were drilled for this project. The location, depth and elevations of the borings are summarized in Table 1 below. The boring locations are included in the Geotechnical Profile - Roadway sheets included in Appendix A, and on the boring logs included in Appendix B.

Table 1. Boring Locations, Depths, Elevations, and Coordinates

Boring No.	Station	Offset	Boring Elevation (ft)	Depth (ft)
B-001-0-23	1004+95.76	511.61' Rt.	799.53	15.0
B-002-0-23	1047+95.06	141.88' Rt.	897.76	15.0
B-003-0-23	1056+76.49	43.00' Rt.	910.17	30.0
B-004-0-23	1067+54.87	138.11' Rt.	896.84	15.5*
B-005-0-23	1110+52.43	124.71' Rt.	885.95	15.0
B-006-0-23	1138+36.84	2.31' Lt.	876.72	80.0
B-006-1-23	1138+15.01	270.50' Rt.	805.61	30.0
B-046-0-23	1030+72.94	447.69' Rt.	904.46	15.0
B-061-0-23	1010+34.23	208.14' Lt.	905.489	6.5*
B-062-0-23	1017+26.04	648.81' Lt.	925.068	8.5*
B-063-0-23	1025+39.15	769.34' Rt.	953.637	14.1*

*Boring terminated upon encountering auger refusal.

The borings were performed between December 6, 2023, and June 21, 2024. The borings were performed with track mounted drills rigs 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. The energy transfer ratio associated with the automatic SPT hammers ranged from 76.8 to 77.0 percent. The automatic hammers were calibrated between May 2023 and March 2024.

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

The survey information at the test boring locations was provided by the survey team member Buckley Group.

IV. FINDINGS

No topsoil was encountered in boring B-062-0-24. The remaining borings exhibited 3 to 8 inches of topsoil at the surface.

From the surface or beneath the surface cover, these test borings encountered both fine-grained soils and coarse-grained soils or bedrock extending down to the boring termination depths. The fine-grained soils were described as A-4a, A-4b, A-6a, A-6b, A-7-5 or A-7-6 soils. The coarse-grained soils were described as A-1-a, A-2-6, A-4a or A-4b. These soils exhibited standard penetration N_{60} values ranging from 5 blows per foot (bpf) to 50 blows for 2 inches of penetration, with natural moisture content values ranging from 3 to 33 percent.

Beneath the soil overburden, bedrock was encountered in borings B-061-0-23 through B-063-0-23, at depths ranging from 0.0 feet (from the surface), to 8.5 feet below the existing grade. The bedrock was described as sandstone or claystone. The top of bedrock was encountered in these borings at elevations ranging from 902.0 to 945.1. The bedrock was augered and sampled using soil sampling techniques. The augerable bedrock was described as shale or limestone. The augerable bedrock exhibited N_{60} values ranging from 50 bpf to 50 blows with no penetration.

Groundwater was encountered during or at completion of drilling in three (3) test borings (B-003-0-23, B-005-0-23 and B-006-0-23) at depths ranging from 6.0 to 67.0 feet. These depths correspond to elevations ranging from 889.2 to 809.7. No groundwater was encountered in the remaining borings, at any time during the field exploration.

V. ANALYSES AND RECOMMENDATIONS

Results from the global stability, rock cut slope, catchment and settlement considerations for the project are presented below.

In addition to the information obtained from roadway/embankment test borings performed by CTL, the conditions encountered in the historic test borings designated as 34+133, 34+425, 35+970, B-58, 38+680, B-62, B-63, 37+780, 38+420, B-73, B-76, and B-79 were also utilized in the design analyses.

A. Global Stability Analyses

Global stability analyses were performed in the following areas where new fills are planned or where proposed side hill embankment slope rates are steeper than the slope rates of the existing slopes.

Table 2: Areas of Global Stability Analyses

Location	Station	Boring No's	Comments
US 33	1005+50	B-001-0-23, B-002-0-23	2.5H:1V fill slope evaluation*
	1048+00	B-002-0-23, 34+133	Slope steepened from 4:1 to 3:1
	1057+50	B-003-0-23, 34+425	
	1067+00	B-004-0-23	
	1110+50	B-005-0-23, 35+970	
	1138+00	B-006-0-23, B-006-1-23	
Ramp 21A	49+00	B-061-0-23	2.5H:1V fill slope evaluation
Ramp 21 D	206+50	B-046-0-23	3H:1V fill slope evaluation

* The slope stability analyses for this station were modeled using a 2.5H:1V fill slope. However, the most recent version of the cross sections show a 3H:1V fill slope at this station. Since the slope stability analyses yielded acceptable results for a 2.5H:1V fill slope, the flatter 3H:1V fill slope will also exhibit acceptable factor of safety values.

The soil parameters used in the analysis were based on the subsurface conditions encountered in the current and historic test borings, laboratory test results, and ODOT's Geotechnical Design Manual (GDM). The cross sections developed by HNTB were used to determine the geometry for the analyses.

In addition, the embankment inspection summary report prepared by HDR along the proposed EB lanes was also reviewed while performing the global stability analyses. HDR's inspection included identifying areas of concern such as erosion, slippage, and saturation along the proposed EB embankment areas.

A summary of the areas of concern identified at the sections considered for global stability analyses is presented in Table 3.

Table 3: Areas of Concern

Location	Station	Summary of areas of concerns identified during visual inspection by HDR	Comments
US 33	1005+50	Landslide, several saturated areas, erosion and depression	slope experiencing shallow surficial failures, several saturated areas along existing slope face
	1048+00	Landslide, saturated areas, and depression	Surface erosion and saturated areas from underdrain outlet
	1057+50	Saturated areas	Saturated areas from underdrain outlet
	1067+00	Landslide, slope toe erosion, saturated areas	Surface erosion and saturated areas near toe of slope or along drainage ditch line
	1110+50	Saturated, slope toe erosion, depression	Surface erosion and saturated areas from underdrain outlet or near toe of slope
	1138+00	Saturated, slope toe erosion	Several saturated areas along existing slope face
Ramp 21 D	206+50	Slope toe erosion, several saturated areas	Several saturated and surficial erosion areas along existing slope face

Per HDR's report, areas of concern, especially saturated areas/zones were also identified in other embankment sections where global stability was not performed. CTL reviewed the mainline cross sections. It is CTL's opinion that no additional analyses are needed along the mainline.

The stability analyses were performed using the *Slide* computer program. The Morgenstern-Price method was used in the analyses. To incorporate the saturated surface conditions as identified in the visual inspection performed by HDR, a piezometric surface was introduced in the global stability analysis. The piezometric surface, labelled "1" is shown on the stability models.

Results of the global stability analyses are submitted in graphical form in Appendix D, and the results are summarized in Table 4.

Table 4: Global Stability Analyses Results

Location/Station	Case	Calculated Factor of Safety	Minimum Required Factor of Safety	Capacity to Demand Ratio
US 33/ 1005+50*	Effective Stress	1.6	1.3	0.8
	Total Stress	1.3		1.0
US 33/ 1048+00	Effective Stress	1.9		0.7
	Total Stress	1.6		0.8
US 33/ 1057+50	Effective Stress	1.4		0.9
	Total Stress	1.8		0.7
US 33/ 1067+00	Effective Stress	2.2		0.6
	Total Stress	4.5		0.3
US 33/ 1110+50	Effective Stress	1.3		1.0
	Total Stress	1.6		0.8
US 33/ 1138+00	Effective Stress	1.4		0.9
	Total Stress	1.8		0.7
CR 21/ 109+00	Effective Stress	1.4		0.9
	Total Stress	4.1		0.3
Ramp 21 A/ 49+00	Effective Stress	1.7		0.8
	Total Stress	2.4		0.5
Ramp 21 D/ 206+50	Effective Stress	1.9		0.7
	Total Stress	1.9		0.7

* The slope stability analyses for this station were modeled using a 2.5H:1V fill slope. However, the most recent version of the cross sections show a 3H:1V fill slope at this station. Since the slope stability analyses yielded acceptable results for a 2.5H:1V fill slope, the flatter 3H:1V fill slope will also exhibit acceptable factor of safety values.

According to GDM section 502, a factor of safety of 1.3 or greater is considered acceptable for slopes that do not support structures.

As mentioned above, several areas of concern were noted on the existing embankment slopes. CTL reviewed the areas of concern and developed a spreadsheet which shows the limits of special benching and/or standard benching along the western section of the project. Please refer to the *Benching and Cut Slope Summary* sheet attached to this report in Appendix G for additional details.

The special benching should be designed per ODOT GDM Section 800, Figures 800-1 or 800-2. Due to the presence of several saturated areas on the existing embankment slopes, it is our opinion that the special benching should also include slope drains as shown in Figure 800-6 of the ODOT GDM. Example benching details for these areas are provided in Appendix E.

In addition to the suggested benching in Appendix E, temporary fill should be placed in areas where sliver fills are less than 8 feet in width (per ODOT GDM Figure 800-2), to facilitate compaction of the new fill along the slope.

Per the District's direction, the maximum bench height for special benching should be 15 feet.

For reference, sketches showing the recommended special benching and slope drains at Stations 1002+00, 1005+50, 1030+50, 1057+50, 1138+00, 44+50 (Ramp 21A), 116+00 (Ramp 21 C), 211+00 (Ramp 21 D), and 109+00 (C.R. 21) are attached to this report. These sketches can be used as a guideline while developing the special benching geometry for all other embankment slopes planned within the project limits.

B. Rock Cut Slope & Catchment Design

The proposed US 33 mainline and a few ramp areas will include cuts into the existing hillsides. Bedrock is primarily expected on the hillsides.

Rock cut slope analyses were performed in the following areas of the project. Information from the historic borings performed in these areas were utilized for the rock cut slope analysis.

Table 5: Areas of Rock Cut Slope Analyses

Location	Station	Historic Boring No.	Recommended Cut Slope Rates [1] [2] (H:V)
US 33	1128+00	B-58	3:1 (Soils) 2:1 (Incompetent Rock)
	1148+00	B-62	
	1189+00	38+420	3:1 (Soils) 2:1 (Incompetent Rock) 1:1 (Competent Rock)
	1199+00	38+680 & B-73	3:1 (Soils) 2:1 (Incompetent Rock)
	1213+00	B-76	3:1 (Soils) 2:1 (Incompetent Rock) 2:1 (Competent Rock)
	1222+00	B-79	
Ramp 16E	37+63.16	B-63 & B-62	3:1 (Soils) 2:1 (Incompetent Rock)
Ramp 16F	52+50		
Ramp 16G	169+34.43	37+780	3:1 (Soils) 2:1 (Incompetent Rock) 2:1 (Competent Rock)
Ramp 16H	29+50		

(1) Based on the prior discussions with District personnel, if the recommended 3H:1V cut slope falls outside the eco boundary, then 2H:1V slopes can be utilized for the overburden soil layer.
(2) If the competent bedrock unit thickness is not significant, then to avoid a 10-foot-wide geotechnical bench at the bottom and top of the unit, flatter 2H:1V slope rates are recommended.

Any rock cuts that are not addressed in the above table should be laid back at slope rates shown on the historic cross section sheets. The station limits of these rock cuts (i.e. slope rates based on provided rock cut designs or historical cross section sheets) are shown in the Benching and Cut Slope Summary exhibit appended to this report.

Parameters used in the rock cut slope design along with recommended slope rates are also provided in Appendix F of this report.

Overburden Bench

The thickness of soil overburden in the historic test borings considered for the rock cut design analysis ranged from 3.6 and 23.6 feet. For estimating purposes, it is recommended that the top 15 feet of the cut slopes are considered as soil, and are laid back at a flatter slope rate of 3H:1V slope rate, as recommended by the District.

Based on comments received from the District, if it is determined that a cut slope including an overburden bench will extend beyond the ecological boundary limits, the overburden soils may be laid back at a slope rate of 2H:1V, or the overburden benches may be eliminated. Otherwise, if the inclusion of an overburden bench will not extend the cut slopes beyond the ecological boundary limits, it is recommended to include a 10-foot wide overburden bench at the soil-bedrock interface.

Geotechnical (Lithologic) Bench

A geotechnical or lithologic bench is a bench placed at the top of a less durable (Incompetent) design unit, such as shale or claystone, which underlies a more durable (Competent) design unit, such as sandstone or limestone. The purpose of a geotechnical bench is to provide protection against undercutting of the more durable design unit as the less durable design unit weathers and erodes.

In addition, per District's direction, a geotechnical bench is also recommended at the top of a competent design unit which underlies an incompetent design unit.

The 10-foot wide geotechnical bench is recommended between the incompetent and competent units. Please refer to the appended Rock Cut Slope Analysis which identifies the recommended locations of the geotechnical benches.

Per ODOT GDM section 1005.2, geotechnical benches must be field adjusted during construction to align with elevation changes in the bedding contact.

Construction Bench

Based on comments from the District, construction benches are only required when pre-splitting is performed.

Catchment Areas

Catchment areas are sections of flat or negatively sloped ground used to dissipate rockfall energy and to collect rocks and other debris that have detached from the slope. The catchment areas are required at the toe of the proposed rock cut slopes. ODOT GDM Section 1000 provides guidance on the design of the catchment for rock cut slopes. ODOT GDM Figures 1000-1 and 1000-2, provide the geometry for the design of the proposed catchment width for a given fore slope, rock cut slope angle and height of rock cut slope.

Catchment designs were performed at critical locations for this project. The analyses included the following details:

- A 10-foot-wide flat maintenance bench and angled foreslope will be for the catchment area (Similar to ODOT GDM Figure 1000-2)
- A foreslope of 8H:1V (from cross section sheets), and rock cut slope angles as recommended in Section B above

The catchment widths were verified using the Colorado Rockfall Simulation Program (CRSP), version 4.0. ODOT GDM requires a minimum rockfall catchment of 95 percent at the outside edge of pavement. Table 6 summarizes the input data and the results of the rockfall catchment analysis using CRSP. The CRSP input and output data files along with the figures showing the catchment geometry are contained in Appendix H.

CTL personnel performed site visits to determine the size and shape of the talus from the existing rock slopes. During the site visit, it was noted that the talus was discoidal or spherical in shape with fallen rock size ranging from less than 0.5 foot to 4.3 feet. The talus was mainly noted near the toe of the slopes or within the existing catchment area. The talus sizes were utilized while designing the catchment width.

Table 6. Rockfall Catchment Options and Results

Station	Maximum Rock Size		Cut Slope Height (feet)	Catchment Width (Feet)	Rockfall Catchment %
	Diameter (Feet)	Thickness (feet)			
1148+00	2.2	1.4	39±	25	96
1189+00	4.3	3.4	27±	20	95
1199+00	1.0	0.8	43±	15	100
Ramp 16F 52+50	2.2	1.5	30±	20	100
Ramp 16G 169+34.43	0.8	0.7	33±	15	100

The results meet the requirements of the 95 percent rockfall catchment requirement for the given assumptions. Based on the test results, CTL recommends utilizing a catchment width of 25.0 feet at the base of the rock cuts planned between Sta. 1144+50 and Sta. 1150+50. For the remaining areas within the project, a 20-foot wide catchment width can be utilized at the base of the planned rock cuts.

C. Settlement Analyses

Settlement analyses were performed in the areas of the eastern section where the proposed maximum fill heights are in the range of 20 to 73 feet, as summarized in Table 7.

Table 7: Areas of Settlement Analyses

Location	Station	Boring No's	Proposed Maximum Fill Height (feet)
US 33	1048+00	B-002-0-23	20.0±
US 33	1057+50	B-003-0-23	19.0±
Ramp 21 A	48+00	B-061-0-23	73.0±
Ramp 21 D	206+50	B-046-0-23	59.0 ±

Results of the settlement analyses are summarized in Table 8. Settlement calculations are included in Appendix I.

Table 8: Settlement Analyses

Location	Station	Estimated Settlement (inches)
US 33	1048+00	3.6
US 33	1057+50	5.4
Ramp 21 A	49+00	2.7
Ramp 21 D	206+50	4.0

According to GDM Section 504, where a structure, utility, or other roadway infrastructure or adjacent property is not influenced by settlement of the embankment, a predicted total settlement of 3 inches or less is considered reasonable and should not require any corrective action.

For US 33 and Ramp 21D locations indicated in Table 8 above, it is estimated that that more than 50 percent of the total settlement will occur within 1 week of the completion of fill placement. No settlement monitoring is anticipated.

VI. CHANGED CONDITIONS

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

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

VII. TESTING AND OBSERVATION

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

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

VIII. CLOSING

The report was prepared by CTL Engineering, Inc. (Consultant) solely for the use of Client in accordance with an executed contract. The Client's use of or reliance on this report is limited by the terms and conditions of the contract and by the qualifications and limitations stated in the report. It is also acknowledged that the Client's use of and reliance of this report is limited for reasons which include: actual site conditions that may change with time; hidden conditions, not discoverable within the scope of the assessment,

may exist at the site; and the scope of the investigation may have been limited by time, budget and other constraints imposed by the Client.

Neither the report, nor its contents, conclusions or recommendations, are intended for the use of any party other than the Client. Consultant and the Client assume no liability for any reliance placed on this report by such party. The rights of the Client under contract may not be assigned to any person or entity, without the consent of the Consultant which consent shall not be unreasonably withheld. This geotechnical report does not address the environmental conditions of the site. The Consultant is not responsible for consequences or conditions arising from facts that were concealed, withheld, or not fully disclosed at the time the assessment was conducted.

To the fullest extent permitted by law, the Consultant and Client agree to indemnify and hold each other, and their officers and employees harmless from and against claims, damages, losses and expenses arising out of unknown or concealed conditions. Furthermore, neither the Consultant nor its employees shall be liable to the Owner in an amount in excess of the available professional liability insurance coverage of the Consultant. In addition, Client and Consultant agree neither shall be liable for any special, indirect or consequential damages of any kind or nature.

The Consultant's services have been provided consistent with its professional standard of care. No other warranties are made, either expressed or implied.

Respectfully Submitted,

CTL ENGINEERING, INC.

Sastry Malladi, P.E
Project Engineer

Joe Grani, P.E.
Project Engineer

APPENDIX A

GEOTECHNICAL PROFILE - ROADWAY

LEGEND

	DESCRIPTION	ODOT CLASS	CLASSIFIED MECH./VISUAL	
	GRAVEL AND/OR STONE FRAGMENTS	A-1-a	0	3
	GRAVEL AND/OR STONE FRAGMENTS W/SAND, SILT & CLAY	A-2-6	0	1
	COARSE AND FINE SAND	A-3a	2	0
	SANDY SILT	A-4a	10	3
	SILT	A-4b	2	2
	SILT AND CLAY	A-6a	19	26
	SILTY CLAY	A-6b	9	12
	ELASTIC CLAY	A-7-5	2	1
	CLAY	A-7-6	13	10
		TOTAL	57	58
	CLAYSTONE	VISUAL		
	SANDSTONE	VISUAL		
	SHALE	VISUAL		
	PAVEMENT OR BASE = X = APPROXIMATE THICKNESS	VISUAL		
	SOD AND TOPSOIL = X = APPROXIMATE THICKNESS	VISUAL		

EXPLORATION LOCATION - PLAN VIEW

DRIVE SAMPLE AND/OR ROCK CORE BORING PLOTTED TO VERTICAL SCALE ONLY. HORIZONTAL BAR INDICATES A CHANGE IN STRATIGRAPHY.

WC — INDICATES WATER CONTENT IN PERCENT.

N_{60} — INDICATES STANDARD PENETRATION RESISTANCE NORMALIZED TO 60% DRILL ROD ENERGY RATIO.

X/D" — NUMBER OF BLOWS FOR STANDARD PENETRATION TEST (SPT):
X/D" = NUMBER OF BLOWS (UNCORRECTED) FOR D" OF PENETRATION AT REFUSAL.

X/Y/D" — NUMBER OF BLOWS FOR STANDARD PENETRATION TEST (SPT):
X = NUMBER OF BLOWS FOR 6 INCHES (UNCORRECTED).
Y/D" = NUMBER OF BLOWS (UNCORRECTED) FOR D" OF PENETRATION AT REFUSAL.

X/Y/Z/D" — NUMBER OF BLOWS FOR STANDARD PENETRATION TEST (SPT):
X = NUMBER OF BLOWS FOR FIRST INCHES (UNCORRECTED).
Y= NUMBER OF BLOWS FOR SECOND 6 INCHES (UNCORRECTED).
Z/D" = NUMBER OF BLOWS (UNCORRECTED) FOR D" OF PENETRATION AT REFUSAL.

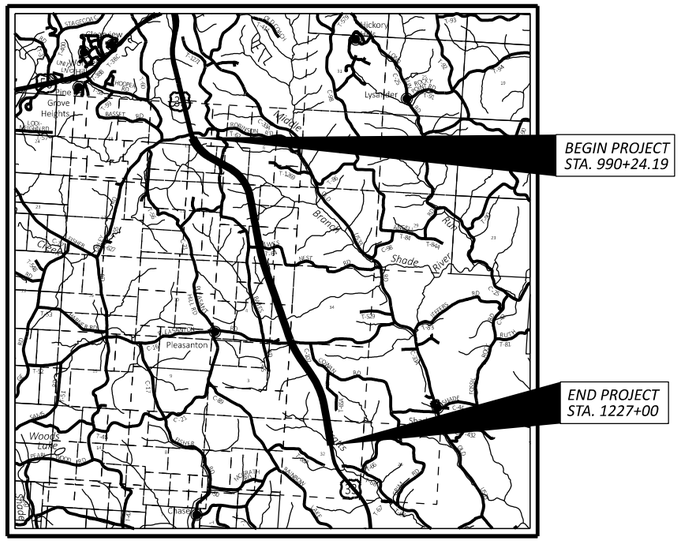
NP — INDICATES A NON-PLASTIC SAMPLE.

NQ — "N" SERIES ROCK CORE BARREL OF "Q" IRELINE BIT SIZE.

Qu — INDICATES UNCONFINED COMPRESSION TEST, ASTM D7012.

SS — INDICATES A SPLIT SPOON SAMPLE.

TR — INDICATES TOP OF ROCK ELEVATION



LOCATION MAP

SCALE IN MILES

0 1 2 3 4

PARTICLE SIZE DEFINITIONS

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

RECON. - CTL 10/30/2023, 12/29/2023

DRILLING - CTL 12/6/2023 - 6/21/24

DRAWN - NKS 11/06/2024

REVIEWED - SM, JG 11/06/2024

BEDROCK TEST SUMMARY

BORING ID	SAMPLE ELEVATION (FEET)	SAMPLE DEPTH (FEET)	QU (PSI)	LITHOLOGY
B-042-0-23	938.8-938.3	31.5-32.0	80	CLAYSTONE
B-044-0-23	944.8-944.3	24.5-25.0	130	CLAYSTONE
B-045-0-23	963.6-963.1	10.0-10.5	2,210	SANDSTONE
B-047-0-23	873.4-872.9	24.2-24.7	100	CLAYSTONE
	872.4-871.9	25.2-25.7	110	CLAYSTONE
B-048-0-23	869.9-869.2	29.1-29.8	110	CLAYSTONE
	864.6-864.0	34.4-35.0	5,630	SANDSTONE
B-049-0-23	863.7-863.2	32.9-33.4	5,590	SHALE
	858.3-857.8	38.3-38.8	4,490	SHALE

GEOTECHNICAL PROFILE - ROADWAY

DESIGN AGENCY
GTL ENGINEERING INC
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FAX:(614)276-6377

DESIGNER N.K.S

REVIEWER SM 11-06-24

PROJECT ID 119141

SUBSET 1 TOTAL 82

SHEET • TOTAL

'ATH-US 33-18.70

MODEL: Sheet PAPERSIZE: 17x11 (in.) DATE: 06-11-2024 TIME: 17:01:01 USER: ACAD
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PROJECT DESCRIPTION

THE OVERALL PROJECT, IDENTIFIED AS ATH-033-18.70 (PID NUMBER 119141), CONSISTS OF THE CONSTRUCTION AND CONVERSION OF A 4.48 MILE SECTION OF ROADWAY (U.S. ROUTE 33) FROM A SUPER TWO- LANE HIGHWAY TO A FOUR- LANE FREEWAY AS WELL AS THE CONSTRUCTION OF 2 BRIDGE STRUCTURES (PLEASANT HILL ROAD AND PLEASANTON ROAD) ALONG WITH GRADE SEPARATED INTERCHANGES AND RAMPS. THE PROJECT IS LOCATED IN BOTH ALEXANDER TOWNSHIP AND LODI TOWNSHIP, ATHENS COUNTY, OHIO. THE PROJECT BEGINS AT STATION 990+24.19 AND ENDS AT STATION 1227+00.

HISTORIC RECORDS

HISTORIC GEOTECHNICAL RECORDS WERE OBTAINED FROM THE ORIGINAL GEOTECHNICAL SOIL PROFILE SHEETS PREPARED FOR ATH-033-30.981 COMPLETED IN 1998. THE HISTORIC BORING DATA WAS UTILIZED WHILE PERFORMING THE DESIGN ANALYSIS. THE ORIGINAL GEOTECHNICAL SOIL PROFILE SHEETS CAN BE REFERRED TO FOR HISTORIC BORING INFORMATION.

GEOLOGY

THE ENTIRE PROJECT SITE IS LOCATED WITHIN THE MARIETTA PLATEAU PHYSIOGRAPHIC REGION SOILS IN THIS AREA ARE IS DESCRIBED AS PLEISTOCENE (TEAYS)- AGE MINFORD CLAY, RED AND BROWN SILTY-CLAY LOAM COLLUVIUM UNDERLAIN BY PENNSYLVANIAN-AGE UPPER CONEMAUGH GROUP THROUGH PERMIAN- AGE DUNKARD GROUP CYCLIC SEQUENCES OF RED AND GRAY SHALES, AND SILTSTONES, SANDSTONES, LIMESTONES, AND COAL. THE PROJECT SITE IS COVERED BY CENOZOIC- AGE COLLUVIUM UNDERLAIN BY PENNSYLVANIAN- AGE SEDIMENTARY BEDROCK. THE BEDROCK CONSISTS OF TWO FORMATIONS IDENTIFIED AS THE CONEMAUGH GROUP AND THE MONONGAHELA GROUP.

ACCORDING TO THE MAPPING OF KARST FEATURES (KNOWN AND PROBABLE KARST IN OHIO, ODNR GEOLOGICAL SURVEY MAP EG-1, 1999; REVISED 2002, 2006), THERE ARE NO MAPPED KARST FEATURES IN THE GENERAL VICINITY OF THE PROJECT AREA. ADDITIONALLY, KARST FEATURES WERE NOT OBSERVED AT THE GROUND SURFACE DURING OUR FIELD EXPLORATION. ACCORDING TO THE MAPPING OF HISTORIC AND ACTIVE MINES (ODNR MINES OF OHIO), THERE ARE NO DOCUMENTED MINES IN THE IMMEDIATE VICINITY OF THE PROJECT. HOWEVER, MINING ACTIVITIES WERE PERFORMED ON THE HILL SIDES SOUTH AND WEST OF US ROUTE 33, OUTSIDE THE PROJECT LIMITS.

RECONNAISSANCE

SEVERAL SITE VISITS WERE COMPLETED BY CTL PERSONNEL BETWEEN OCTOBER 30, 2023, AND AUGUST 2, 2024. THE US 33 ROADWAY IS A TWO LANE, BI DIRECTIONAL ROAD THAT RUNS GENERALLY WEST TO EAST WITHIN THE PROJECT LIMITS. THE TOPOGRAPHY ALONG THE ROADWAY ALIGNMENT CONSISTS OF ROLLING HILLS WITH UPWARD AND DOWNWARD SLOPES IMMEDIATELY ADJACENT TO THE ROADWAY. THE CONSTRUCTION OF THE PROPOSED US 33 IS PLANNED ON THE SOUTH SIDE OF THE EXISTING US 33. THE ORIGINAL ROADWAY PLANS INCLUDED THE CONCEPTUAL LAYOUT OF A FUTURE FOUR LANE HIGHWAY. THE RIGHT OF WAY IS WIDE ENOUGH TO ACCOMMODATE THE FUTURE FOUR LANE ROAD AND INTERCHANGES.

SURFACE EROSION, SHALLOW SLOUGHING AND SATURATED AREAS WERE NOTED WITHIN THE EXISTING EMBANKMENTS. SPECIAL BENCHING WILL BE NECESSARY TO "TIE" THE EMBANKMENTS TOGETHER. SEVERAL EXISTING UNDERDRAIN OUTLETS WERE NOTED WITHIN THE PROJECT CORRIDOR. NO SIGNIFICANT ROCK FALLS WERE NOTED WITHIN THE HILLS PRESENT ALONG THE SOUTH SIDE OF US33. THE DEBRIS FROM THE ROCK FALL WAS DISCOIDAL OR SPHERICAL IN SHAPE WITH FALLEN ROCK SIZE RANGING FROM LESS THAN 0.5 FOOT TO 4.3 FEET. THE ROCK DEBRIS WAS MAINLY NOTED ON THE HILLSIDE SLOPES OR WITHIN THE EXISTING CATCHMENT AREA.

THERE ARE SEVERAL EXISTING CULVERTS RUNNING BENEATH US 33 THAT WERE DESIGNED FOR FUTURE CONDITIONS. IT IS UNDERSTOOD THAT MANY OF THESE CULVERTS WILL REMAIN IN PLACE WITHOUT ANY ADDITIONAL IMPROVEMENTS REQUIRED.

THE SURROUNDING LAND USAGE WITHIN THE PROJECT LIMITS CONSISTS OF GRASSLANDS AND WOODED AREAS.

SUBSURFACE EXPLORATION

SEVENTEEN (17) TEST BORINGS WERE COMPLETED FOR THIS SUBSURFACE EXPLORATION. OF THE SEVENTEEN (17) TEST BORINGS, ELEVEN (11) TEST BORINGS WERE ROADWAY BORINGS, THREE (3) TEST BORINGS WERE PLEASANT HILL ROAD BRIDGE BORINGS, AND THREE (3) TEST BORINGS WERE PLEASANTON ROAD BRIDGE BORINGS. ALL OF THE TEST BORINGS WERE DRILLED OFF OF THE EXISTING U.S. 33 ROADWAY PAVEMENT.

THE TEST BORINGS WERE DRILLED BETWEEN DECEMBER 6, 2023 AND JUNE 21, 2024, UTILIZING 3¼- INCH I.D. HOLLOW STEM AUGERS POWERED BY TWO SEPARATE TRACK-MOUNTED ROTARY DRILL RIGS. SPLIT- BARREL (SPOON) DISTURBED SOIL SAMPLES AND STANDARD PENETRATION TESTS WERE PERFORMED IN ACCORDANCE WITH AASHTOT206 AT 1.5-FOOT, 2.5-FOOT, AND 5-FOOT INTERVALS. THE AUTOMATIC HAMMERS WERE CALIBRATED ON MAY 3, 2023 AND MARCH 27, 2024, AND HAD AN ENERGY RATIOS OF 76.8 PERCENT AND 77.0 PERCENT, RESPECTIVELY. ROCK CORE SAMPLING WAS PERFORMED USING A WIRE-LINE SYSTEM EQUIPPED WITH A NQ-2 DOUBLE TUBE CORE BARREL AND A DIAMOND BIT.

EXPLORATION FINDINGS

ALL TEST BORINGS FOR ROADWAY EXCEPT B-062-0-23 EXHIBITED 3 TO 8 INCHES OF TOPSOIL AT THE SURFACE. FROM THE SURFACE OR BENEATH THE SURFACE COVER, THESE TEST BORINGS ENCOUNTERED BOTH FINE- GRAINED SOILS AND COARSE- GRAINED SOILS OR BEDROCK EXTENDING DOWN TO THE BORING TERMINATION DEPTHS. THE FINE- GRAINED SOILS WERE DESCRIBED AS A-4a, A-4b, A-6a, A-6b, A-7- 5 OR A-7- 6 SOILS. THE COARSE-GRAINED SOILS WERE DESCRIBED AS A-1- a, A- 2- 6, A-4a OR A- 4b. BENEATH THE SOIL OVERBURDEN, BEDROCK WAS ENCOUNTERED IN BORINGS B-061-0-23 THROUGH B-063-0-23, AT DEPTHS RANGING FROM 0.0 (FROM THE SURFACE) FEET TO 8.5 FEET BELOW THE EXISTING GRADE. THE BEDROCK WAS DESCRIBED AS SANDSTONE OR CLAYSTONE. THE TOP OF BEDROCK WAS ENCOUNTERED IN THE TEST BORINGS A+ ELEVATIONS RANGING FROM 902.0 TO 945.1. THE BEDROCK WAS AUGERED AND SAMPLED USING SOIL SAMPLING TECHNIQUES.

ALL THE TEST BORINGS FOR PLEASANT HILL ROAD BRIDGE ENCOUNTERED 4 TO 6 INCHES OF TOPSOIL AT THE SURFACE. BENEATH THE SURFACE COVER, THESE TEST BORINGS ENCOUNTERED BOTH FINE-GRAINED SOILS AND COARSE- GRAINED SOILS TO THE TOP OF BEDROCK. THE FINE-GRAINED SOILS WERE DESCRIBED AS A-6a, A-6b, OR A-7-6 SOILS. THE COARSE-GRAINED SOILS WERE DESCRIBED AS A-1- a. BENEATH THE SOIL OVERBURDEN, BEDROCK WAS ENCOUNTERED IN THE BORINGS AT DEPTHS RANGING FROM 3.5 FEET TO 21.0 FEET BELOW THE EXISTING GRADE. THE BEDROCK WAS DESCRIBED AS SANDSTONE, SHALE OR CLAYSTONE. THE TOP OF BEDROCK WAS ENCOUNTERED IN THE TEST BORINGS A+ ELEVATIONS FROM 949.3 TO 970.1.

ALL THE TEST BORINGS FOR PLEASANTON ROAD BRIDGE ENCOUNTERED 3 TO 6 INCHES OF TOPSOIL AT THE SURFACE. BORING B-047-0-23 ENCOUNTERED 6 INCHES OF GRAVEL BELOW TOPSOIL. BENEATH THE SURFACE COVER, THESE TEST BORINGS ENCOUNTERED BOTH FINE-GRAINED SOILS AND COARSE- GRAINED SOILS TO THE TOP OF BEDROCK. THE FINE-GRAINED SOILS WERE DESCRIBED AS A- 4a, A- 6a, A- 6b, OR A- 7- 6 SOILS. THE COARSE-GRAINED SOILS WERE DESCRIBED AS A- 3a OR A- 4a. BENEATH THE SOIL OVERBURDEN, BEDROCK WAS ENCOUNTERED IN THE BORINGS AT DEPTHS RANGING FROM 13.5 FEET TO 21.0 FEET BELOW THE EXISTING GRADE. THE BEDROCK WAS DESCRIBED AS SANDSTONE, SHALE OR CLAYSTONE. THE TOP OF BEDROCK WAS ENCOUNTERED IN THE TEST BORINGS A+ ELEVATIONS FROM 884.1 TO 875.6.

GROUNDWATER WAS ENCOUNTERED IN THREE (3) OF THE ELEVEN (11) ROADWAY BORINGS (B-003-0-23, B-005-0-23, B-006-0-23) DURING DRILLING OR AT THE COMPLETION OF DRILLING AT DEPTHS RANGING FROM 6.0 FEET TO 67.0 FEET BELOW GROUND SURFACE. NO GROUNDWATER WAS ENCOUNTERED IN THE REMAINING BORINGS, AT ANY TIME DURING THE FIELD EXPLORATION.

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 19, 2024.

AVAILABLE INFORMATION

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

INDEX OF SHEETS

DCP EXPLORATION

EXPLORATION ID	NORTHING	EASTING	ELEVATION	STATION	OFFSET
D-001-0-23	299862.1	166481.1	1082.1	1022+10.74	9.4 RT
D-002-0-23	298566.3	168027.4	1058.9	1042+56.41	-12.6 LT
D-003-0-23	297488.1	168412.6	1037.7	1054+03.92	-10.9 LT
D-004-0-23	296515.2	168587.5	1034.5	1063+92.39	-9.8 LT
D-005-0-23	295550.4	168767.5	1044.2	1073+73.88	-15.2 LT
D-006-0-23	293619.2	169133.2	1058.1	1093+40.40	-12 LT
D-007-0-23	292677.3	169400.1	1047.0	1103+20.57	-8.6 LT
D-008-0-23	291743.0	169717.0	1026.7	1113+07.15	-3.8 LT
D-009-0-23	290037.4	170314.4	991.9	1131+14.38	-11.8 LT
D-010-0-23	289262.0	170579.4	990.5	1139+33.84	-9.2 LT
D-011-0-23	287257.7	171299.4	1012.1	1160+64.40	2.3 RT
D-012-0-23	285317.0	172521.2	995.2	1183+61.29	-11.6 LT
D-013-0-23	283703.3	173322.6	976.6	1201+67.13	-10.3 LT
D-014-0-23	283062.6	173486.1	970.8	1208+27.39	-11.8 LT
D-015-0-23	282078.1	173650.5	960.6	1218+25.24	-11.3 LT

GEOTECHNICAL PROFILE - ROADWAY

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FAX:(614)276-6377

DESIGNER N.K.S

REVIEWER SM 11-22-24

PROJECT ID 119141

SUBSET 2 | TOTAL 82

SHEET . | TOTAL

ATH-US 33-18.70

MODEL: Sheet PAPERSIZE: 17x11 (in.) DATE: 22-11-2024 TIME: 10:08:45 USER: hp
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SUMMARY OF SOIL TEST DATA
US 33

EXPLORATION NO., STATION & OFFSET	FROM TO	SAMPLE ID	N_{60}	% REC	HP tsf	% GR	% CS	% FS	% SILT	% CLAY	LL	PL	PI	% WC	ODOT CLASS (GI)	ppm SO_4
B-001-0-23	01.00-02.50	SS-1	5	100	2.5	4	4	14	44	34	50	27	23	22	A-7-6 (15)	-
STA. 1004+96, 512' RT.	02.00-04.00*	ST-1	-	100	-	1	4	18	41	36	34	21	13	24	A-6a (9)	-
LATITUDE = 39.274126	03.50-05.00	SS-2	6	100	1.5	4	5	11	47	33	38	22	16	24	A-6b (10)	-
LONGITUDE = -82.097705	06.00-07.50	SS-3	26	100	4.25	HARD, RED, SILTY CLAY								14	A-6b (VISUAL)	-
* OFFSET BOREHOLE	08.50-10.00	SS-4	38	100	4.5	SAME AS SS-3								13	A-6b (VISUAL)	-
	11.00-12.50	SS-5	35	100	4.5	SAME AS SS-3								14	A-6b (VISUAL)	-
	13.50-14.80	SS-6	12/18/50/3"	100	4.0	SAME AS SS-3								10	A-6b (VISUAL)	-
B-002-0-23	01.00-02.50	SS-1	8	83	2.0	3	2	3	51	41	37	24	13	24	A-6a (9)	-
STA. 1047+95, 142' RT.	02.00-04.00*	ST-1	-	100	-	1	3	9	48	39	37	21	16	19	A-6b (10)	-
LATITUDE = 39.267480	03.50-05.00	SS-2	15	100	1.75	SAME AS ST-1								22	A-6b (VISUAL)	-
LONGITUDE = -82.085613	06.00-07.50	SS-3	14	100	3.5	0	2	4	51	43	39	24	15	16	A-6a (10)	-
* OFFSET BOREHOLE	08.50-10.00	SS-4	24	89	3.75	SAME AS SS-3								20	A-6a (VISUAL)	-
	11.00-12.50	SS-5	33	100	3.5	SAME AS SS-3								13	A-6a (VISUAL)	-
	13.50-15.00	SS-6	64	100	3.0	SAME AS SS-3								10	A-6a (VISUAL)	
B-003-0-23	01.00-02.50	SS-1	12	100	3.75	2	4	3	57	34	39	22	17	13	A-6b (11)	-
STA. 1056+76, 43' RT.	02.00-04.00*	ST-1	-	100	-	1	5	5	49	40	42	23	19	25	A-7-6 (12)	-
LATITUDE = 39.265242	03.50-05.00	SS-2	17	100	2.25	SAME AS SS-3								20	A-7-6 (VISUAL)	-
LONGITUDE = -82.084579	06.00-07.50	SS-3	18	100	3.5	1	1	3	52	43	46	26	20	22	A-7-6 (13)	-
* OFFSET BOREHOLE	08.50-10.00	SS-4	18	100	3.5	SAME AS SS-3								12	A-7-6 (VISUAL)	-
	11.00-12.50	SS-5	17	100	4.5	13	3	2	42	40	33	19	14	11	A-6a (10)	-
	13.50-15.00	SS-6	17	100	3.5	VERY STIFF, BROWN, SILT AND CLAY								10	A-6a (VISUAL)	-
	16.00-17.50	SS-7	18	100	2.5	SAME AS SS-6								14	A-6a (VISUAL)	-
	18.50-20.00	SS-8	22	100	3.5	SAME AS SS-6								12	A-6a (VISUAL)	-
	21.00-22.50	SS-9	23	100	3.75	1	1	48	33	17	NP	NP	NP	10	A-4a (3)	-
	23.5 - 25.0	SS-10	20	100	3.5	SAME AS SS-9								18	A-4a (VISUAL)	-
	26.00-27.50	SS-11	18	100	2.0	0	1	35	46	18	NP	NP	NP	14	A-4a (6)	-
	28.50-30.00	SS-12	22	100	3.25	SAME AS SS-11								16	A-4a (VISUAL)	-
B-004-0-23	01.00-02.50	SS-1	19	100	4.5	6	4	5	38	47	38	22	16	13	A-6b (10)	-
STA. 1067+55, 138' RT.	03.50-05.00	SS-2	18	100	2.75	VERY STIFF, BROWN, SILTY CLAY								19	A-6b (VISUAL)	-
LATITUDE = 39.262282	06.00-07.50	SS-3	19	100	3.25	1	7	13	40	39	40	22	18	14	A-6b (11)	-
LONGITUDE = -82.084233	08.50-10.00	SS-4	23	100	3.75	SAME AS SS-3								20	A-6b (VISUAL)	-
	11.00-12.50	SS-5	42	100	2.75	VERY STIFF, RED, SILT AND CLAY								28	A-6a (VISUAL)	-
	13.50-14.70	SS-6	15/16/50/2"	100	4.5	HARD, RED, SILT AND CLAY								17	A-6a (VISUAL)	-
B-005-0-23	01.00-02.50	SS-1	20	100	3.25	0	4	6	54	36	43	24	19	21	A-7-6 (12)	-
STA. 1110+52, 125' RT.	03.50-05.00	SS-2	23	100	2.5	SAME AS SS-1								26	A-7-6 (VISUAL)	-
LATITUDE = 39.250778	06.00-07.50	SS-3	20	100	3.5	2	7	31	31	29	33	19	14	15	A-6a (7)	-
LONGITUDE = -82.080683	08.50-10.00	SS-4	22	100	2.0	SAME AS SS-3								15	A-6a (VISUAL)	-
	11.00-12.50	SS-5	23	100	2.25	0	2	29	40	29	33	20	13	20	A-6a (8)	-
	13.50-15.00	SS-6	28	100	2.5	SAME AS SS-5								14	A-6a (VISUAL)	-
B-006-0-23	01.00-02.50	SS-1	32	100	4.5	1	7	21	42	29	34	19	15	13	A-6a (9)	-
STA. 1138+37, 2' LT.	03.50-05.00	SS-2	31	100	4.5	SAME AS SS-1								16	A-6a (VISUAL)	-
LATITUDE = 39.243666	06.00-07.50	SS-3	26	100	4.5	SAME AS SS-1								11	A-6a (VISUAL)	-
LONGITUDE = -82.077053	08.50-10.00	SS-4	23	100	2.75	0	3	3	57	37	31	20	11	15	A-6a (8)	-
	11.00-12.50	SS-5	23	100	3.25	SAME AS SS-4								16	A-6a (VISUAL)	-
	13.50-15.00	SS-6	22	100	3.75	SAME AS SS-4								23	A-6a (VISUAL)	-
	16.00-17.50	SS-7	23	100	4.5	HARD, RED, SILT AND CLAY								14	A-6a (VISUAL)	-
	18.50-20.00	SS-8	23	100	4.5	0	5	8	54	33	35	21	14	11	A-6a (10)	-
	23.50-25.00	SS-9	19	100	4.5	SAME AS SS-8								16	A-6a (VISUAL)	-
	28.50-30.00	SS-10	27	100	4.5	HARD, BROWN, SILT AND CLAY								17	A-6a (VISUAL)	-
	33.50-35.00	SS-11	54	100	3.0	VERY DENSE, GRAY, GRAVEL AND/OR STONE FRAGMENTS WITH SAND, SILT, AND CLAY								6	A-2-6 (VISUAL)	-

DESIGN AGENCY

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DESIGNER N.K.S
REVIEWER SM 11-06-24
PROJECT ID 119141
SUBSET 3 TOTAL 82
SHEET * TOTAL -

GEOTECHNICAL PROFILE - ROADWAY
SUMMARY OF SOIL TEST DATA

SUMMARY OF SOIL TEST DATA
US 33

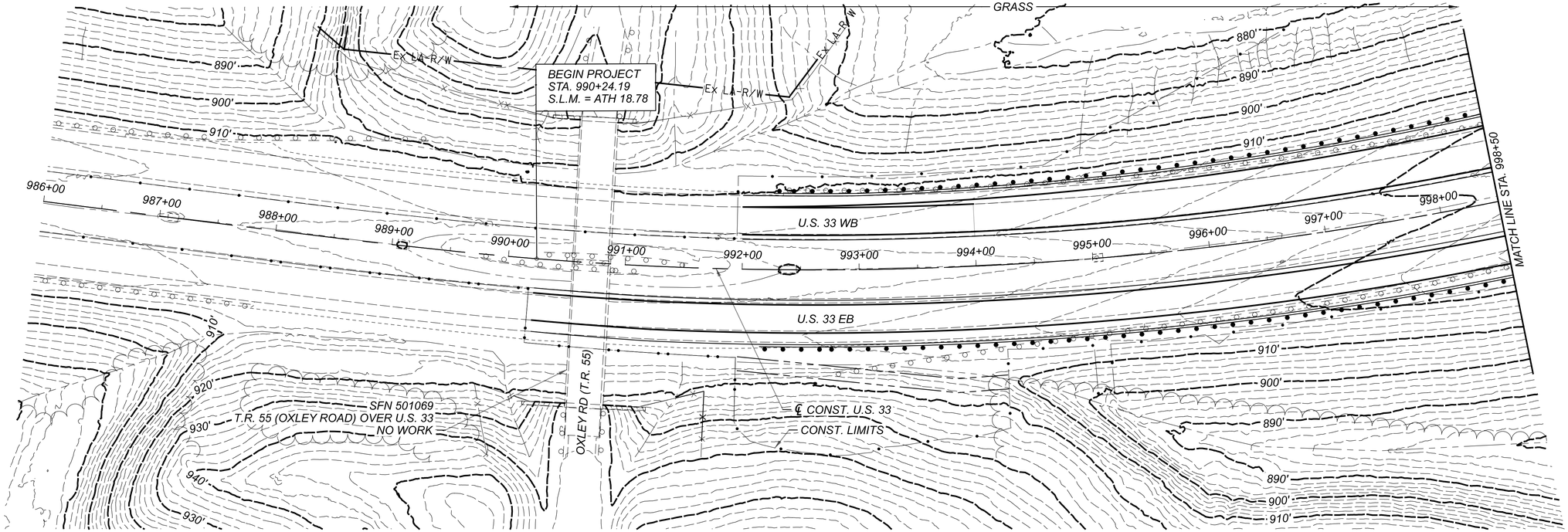
EXPLORATION NO., STATION & OFFSET	FROM TO	SAMPLE ID	N_{60}	% REC	HP tsf	% GR	% CS	% FS	% SILT	% CLAY	LL	PL	PI	% WC	ODOT CLASS (GI)	ppm SO_4
B-006-0-23 (CONTD.)	38.50-40.00	SS-12	68	100	-	0	17	17	56	10	NP	NP	NP	3	A-4b (6)	-
	4350-45.00	SS-13	63	100	3.5	SAME AS SS-12								7	A-4b (VISUAL)	-
	48.50-50.00	SS-14	41	100	4.25	HARD, RED AND GRAY, CLAY								12	A-7-6 (VISUAL)	-
	53.50-55.00	SS-15	38	100	4.25	SAME AS SS-15								15	A-7-6 (VISUAL)	-
	58.50-60.00	SS-16	33	100	2.5	11	6	6	53	24	30	20	10	14	A-4b (8)	-
	63.50-65.00	SS-17	61	100	4.0	SAME AS SS-16								13	A-4b (VISUAL)	-
	68.50-70.00	SS-18	68	100	4.5	VERY DENSE, GRAY, GRAVEL AND/OR STONE FRAGMENTS								10	A-1-a (VISUAL)	-
	73.50-75.00	SS-19	63	100	4.0	SAME AS SS-19								5	A-1-a (VISUAL)	-
	78.50-80.00	SS-20	76	100	4.5	4	4	15	44	33	31	19	12	12	A-6a (9)	-
B-006-1-23	01.00-02.50	SS-1	19	100	3.75	3	2	5	43	47	33	23	10	15	A-4a (8)	-
STA. 1138+15, 271' RT.	03.50-05.00	SS-2	17	100	3.75	SAME AS SS-1								9	A-4a (VISUAL)	-
LATITUDE = 39.243478	06.00-07.50	SS-3	23	100	4.5	HARD, BROWN, SILT AND CLAY								10	A-6a (VISUAL)	-
LONGITUDE = -82.077988	08.50-10.00	SS-4	28	100	4.5	6	8	5	55	26	36	22	14	12	A-6a (10)	-
	11.00-12.50	SS-5	23	100	4.5	SAME AS SS-4								11	A-6a (VISUAL)	-
	13.50-15.00	SS-6	23	100	3.5	VERY STIFF, BROWN, SILT AND CLAY								19	A-6a (VISUAL)	-
	16.00-17.50	SS-7	26	100	2.75	0	13	5	44	38	37	23	14	18	A-6a (10)	-
	18.50-20.00	SS-8	27	100	3.0	SAME AS SS-7								11	A-6a (VISUAL)	-
	23.50-25.00	SS-9	28	100	2.5	SAME AS SS-7								16	A-6a (VISUAL)	-
	28.50-30.00	SS-10	29	100	2.5	SAME AS SS-7								16	A-6a (VISUAL)	-

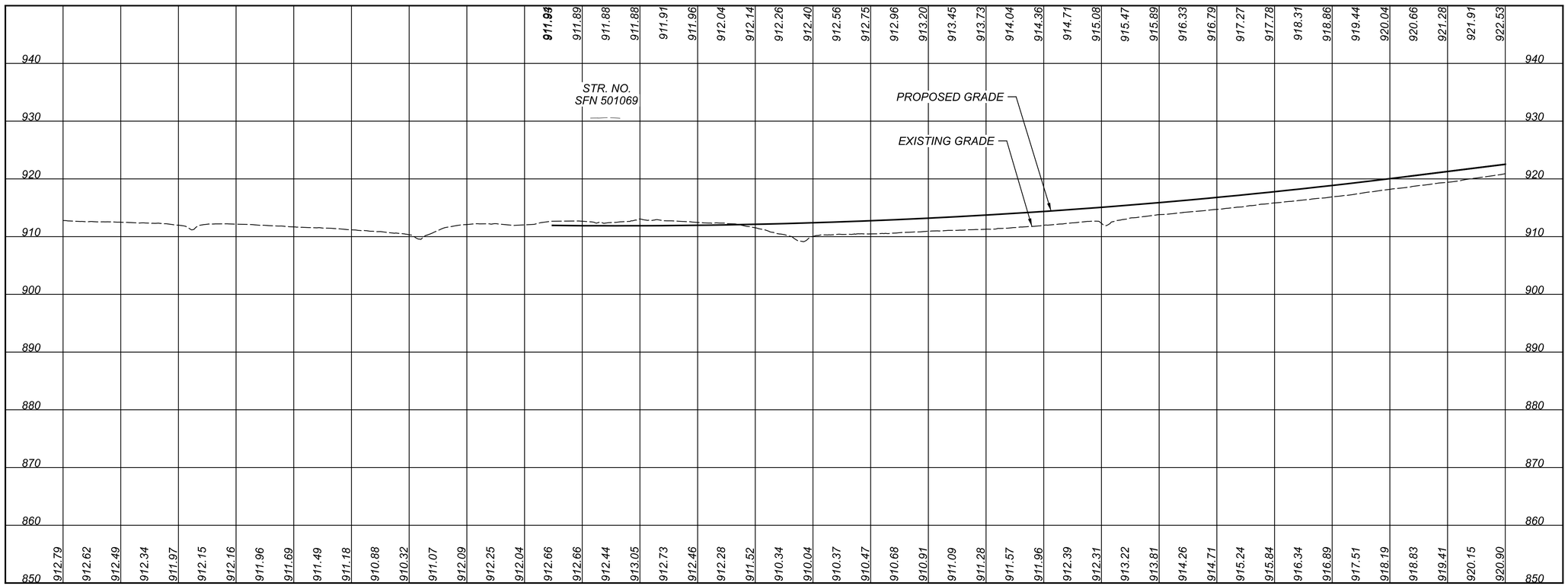
SUMMARY OF SOIL TEST DATA
RAMP 21A

EXPLORATION NO., STATION & OFFSET	FROM TO	SAMPLE ID	N_{60}	% REC	HP tsf	% GR	% CS	% FS	% SILT	% CLAY	LL	PL	PI	% WC	ODOT CLASS (GI)	ppm SO_4
B-061-0-23	01.00-02.50	SS-1	15	100	3.75	4	7	3	48	38	42	22	20	15	A-7-6 (12)	-
STA. 45+88, 23' LT.	03.50-04.20	SS-2	46/50/2"	100	-	SANDSTONE, BROWN, SEVERELY WEATHERED								7	ROCK (VISUAL)	-
LATITUDE = 39.274625 LONGITUDE = -82.094545	06.00-06.30	SS-3	50/4"	100	-	SAME AS SS-2								7	ROCK (VISUAL)	-
B-062-0-23	01.00-02.50	SS-1	50	100	4.0	CLAYSTONE, RED, SEVERELY WEATHERED								8	ROCK (VISUAL)	-
STA. 54+9, 34' RT.	03.50-05.00	SS-2	85	100	4.0	SAME AS SS-1								8	ROCK (VISUAL)	-
LATITUDE = 39.274749	06.00-07.50	SS-3	58	100	4.5	SAME AS SS-1								12	ROCK (VISUAL)	-
LONGITUDE = -82.091747	07.50-07.50	SS-4	50/0"	0	-	SAME AS SS-1								-	ROCK (VISUAL)	-

SUMMARY OF SOIL TEST DATA
RAMP 21D

EXPLORATION NO., STATION & OFFSET	FROM TO	SAMPLE ID	N_{60}	% REC	HP tsf	% GR	% CS	% FS	% SILT	% CLAY	LL	PL	PI	% WC	ODOT CLASS (GI)	ppm SO_4
B-063-0-23	01.00-02.50	SS-1	8	100	-	0	2	49	29	20	NP	NP	NP	14	A-4a (3)	-
STA. 201+16, 64' RT.	02.50-03.50	ST-2	-	83	-	0	4	68	17	11	NP	NP	NP	-	A-3a (0)	-
LATITUDE = 39.270262	03.50-05.00	SS-3	17	100	4.25	1	0	1	26	72	59	30	29	26	A-7-5 (19)	-
LONGITUDE = -82.091678	06.00-07.50	SS-4	26	100	4.25	SAME AS SS-3								18	A-7-5 (VISUAL)	-
	08.50-10.00	SS-5	112	100	3.0	CLAYSTONE, RED, SEVERELY WEATHERED								12	ROCK (VISUAL)	-
	11.00-11.30	SS-6	50/3"	100	3.0	SAME AS SS-5								7	ROCK (VISUAL)	-
	13.50-13.80	SS-7	50/4"	100	-	SAME AS SS-5								7	ROCK (VISUAL)	-
B-046-0-23	01.00-02.50	SS-1	10	100	2.25	0	2	14	46	38	42	25	17	24	A-7-6 (11)	-
STA. 206+58, 16' RT.	02.00-04.00	ST-1	-	100	-	0	1	3	28	68	69	33	36	33	A-7-5 (20)	-
LATITUDE = 39.270346	03.50-05.00	SS-2	15	100	2.5	VERY STIFF, RED, CLAY								21	A-7-6 (VISUAL)	-
LONGITUDE = -82.089688 * OFFSET BOREHOLE	06.00-07.50	SS-3	15	100	2.0	SAME AS SS-2								26	A-7-6 (VISUAL)	-
	08.50-10.00	SS-4	46	100	3.0	0	11	8	51	30	39	23	16	13	A-6b (10)	-
	11.00-12.50	SS-5	87	100	3.0	SAME AS SS-4								12	A-6b (VISUAL)	-
	13.50-14.20	SS-6	43/50/4"	80	-	SAME AS SS-4								5	A-6b (VISUAL)	-





ATH-US 33-18.70

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HORIZONTAL SCALE IN FEET
0 25 50 100

GEOTECHNICAL PROFILE - ROADWAY
STA. 986+00.00 TO STA. 998+50.00 (US 33)

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

DESIGNER	N.K.S
REVIEWER	SM 11-06-24
PROJECT ID	119141
SUBSET	5
TOTAL	82
SHEET	P.
TOTAL	-

MODEL: CLP_U033 - Plan 2 PAPERSIZE: 34x22 (in.) DATE: 15-11-2024 TIME: 10:51:21 USER: hp
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SEE SHEET 7 OF 82 FOR B-001-0-23 PROFILE VIEW

DESIGN AGENCY
CTL ENGINEERING, INC
COLUMBUS, OHIO 43204
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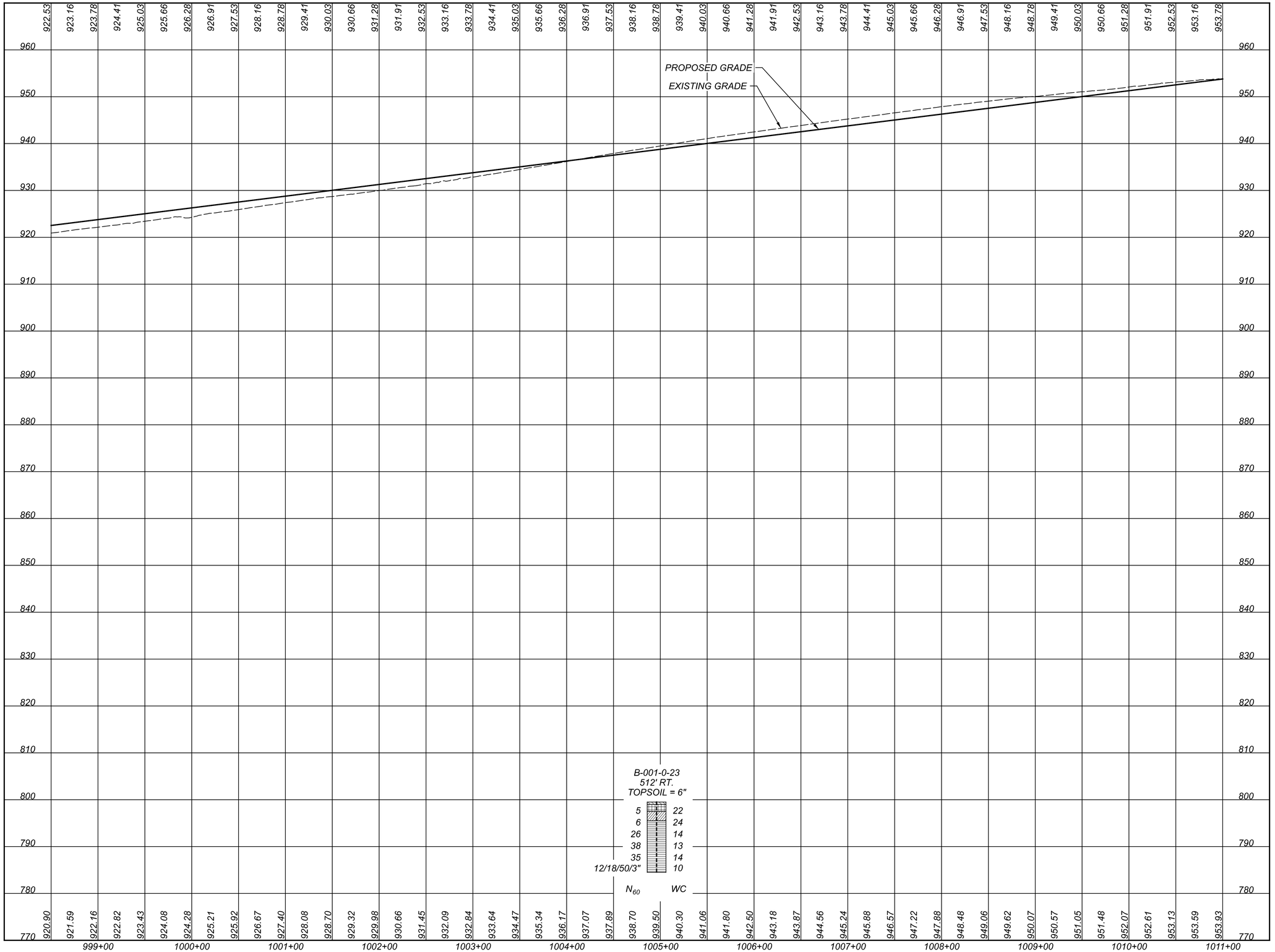
FAX (614) 276-6373

DESIGNER N.K.S
REVIEWER SM 11-06-24
PROJECT ID 119141
SUBSET 6 TOTAL 82
SHEET P. - TOTAL -

GEOTECHNICAL PROFILE - ROADWAY
STA. 998+50.00 TO STA. 1011+00.00 (US 33)

HORIZONTAL SCALE IN FEET
0 50
25 100



HORIZONTAL SCALE IN FEET
0 50 100
25

GEOTECHNICAL PROFILE - ROADWAY
STA. 998+50.00 TO STA. 1011+00.00 (US 33)

ATH-US 33-18.70

MODEL: CLP_U033_Final - Profile 2 PAPERSIZE: 34x22 (in.) DATE: 06-11-2024 TIME: 10:52:40 USER: hp
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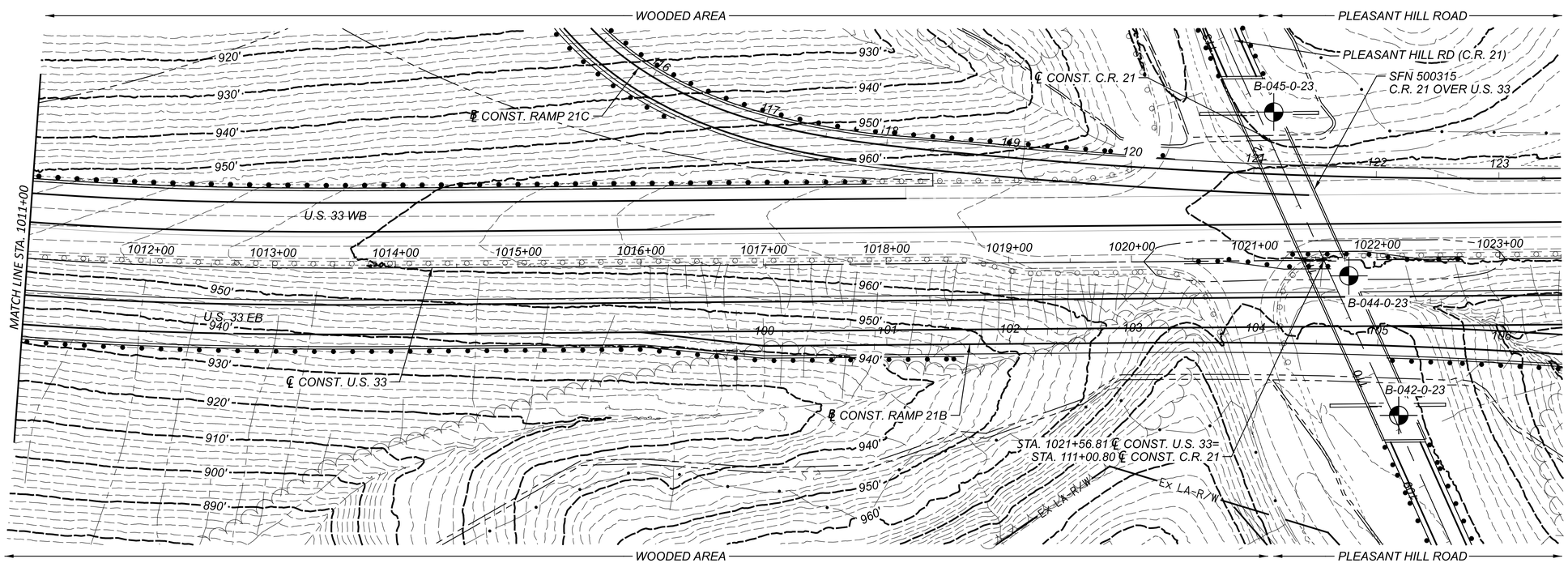
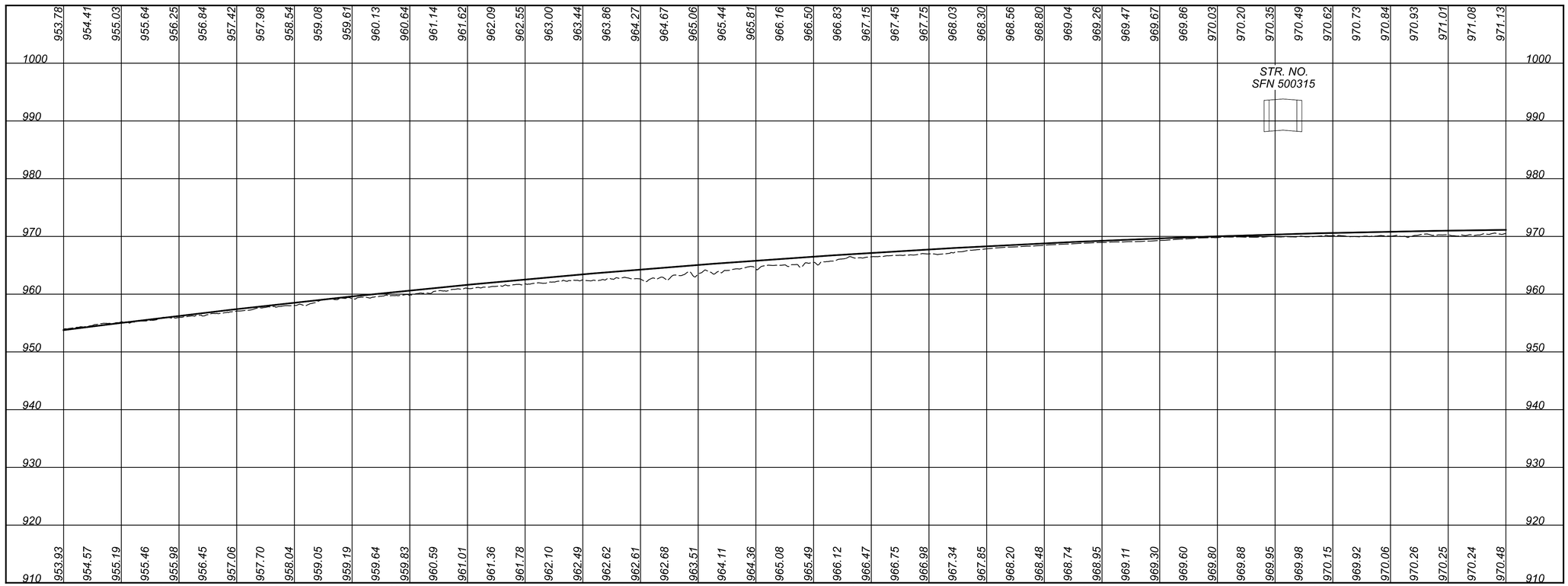
DESIGN AGENCY
CTL ENGINEERING
2860 FISHER ROAD
COLUMBUS, OHIO 43204
PHONE:(614)276-8123
FAX:(614)276-8377

DESIGNER N.K.S
REVIEWER SM 11-06-24
PROJECT ID 119141
SUBSET 7 TOTAL 82
SHEET P. TOTAL -



SEE SHEET 17 OF 82 FOR B-042-0-23 & B-044-0-23 PROFILE VIEW
SEE SHEET 18 OF 82 FOR B-045-0-23 PROFILE VIEW



HORIZONTAL SCALE IN FEET
0 25 50 100

GEOTECHNICAL PROFILE - ROADWAY
STA. 1011+00.00 TO STA. 1023+50.00 (US 33)

PATH-US 33-18.70

MODEL: CLP_U033 - Plan 3 PAPERSIZE: 34x22 (in.) DATE: 06-11-2024 TIME: 11:02:07 USER: hp
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DESIGN AGENCY
GTL ENGINEERING INC
2860 FISHER ROAD
COLUMBUS, OHIO 43204
PHONE:(614)276-8123
FAX:(614)276-6377

DESIGNER	
N.K.S	
REVIEWER	
SM	11-06-24
PROJECT ID	
119141	
SUBSET	TOTAL
8	82
SHEET	TOTAL
P.	-

ATH-US 33-18.70

MODEL: CLP_U033 - Plan 5 PAPERSIZE: 34x22 (in.) DATE: 06-11-2024 TIME: 11:04:08 USER: hp
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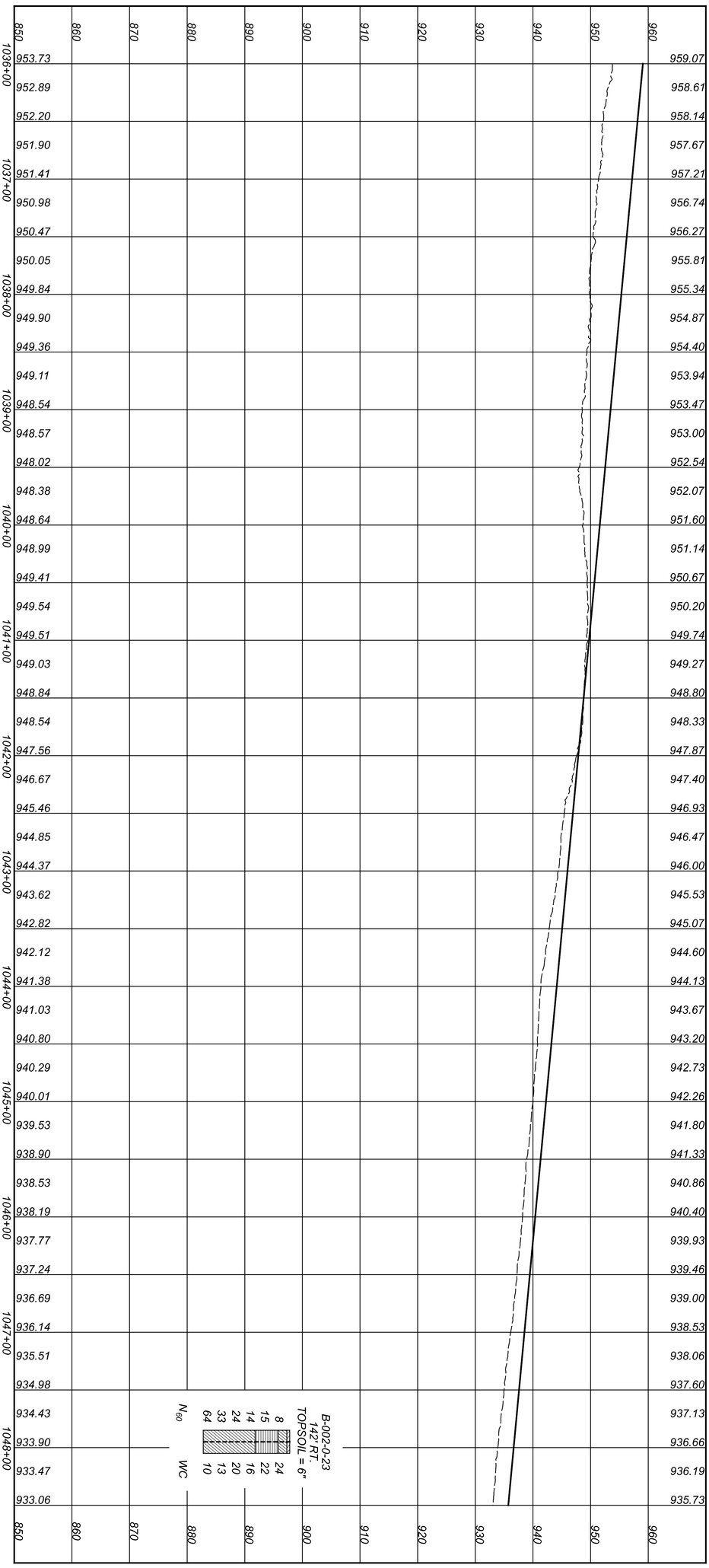
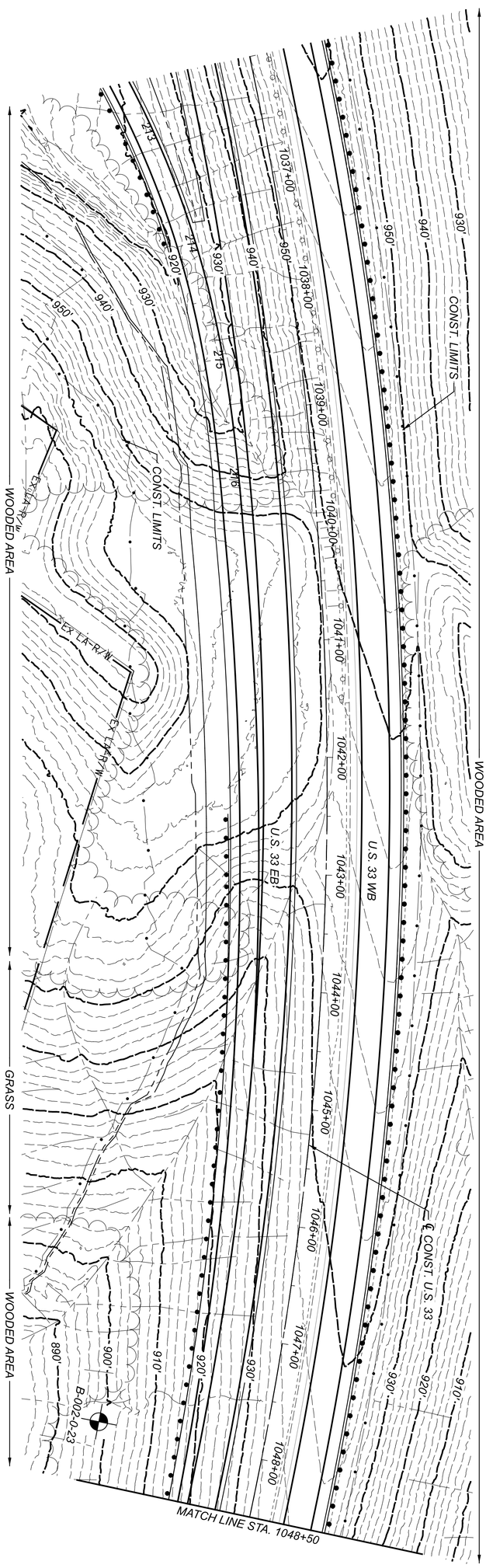


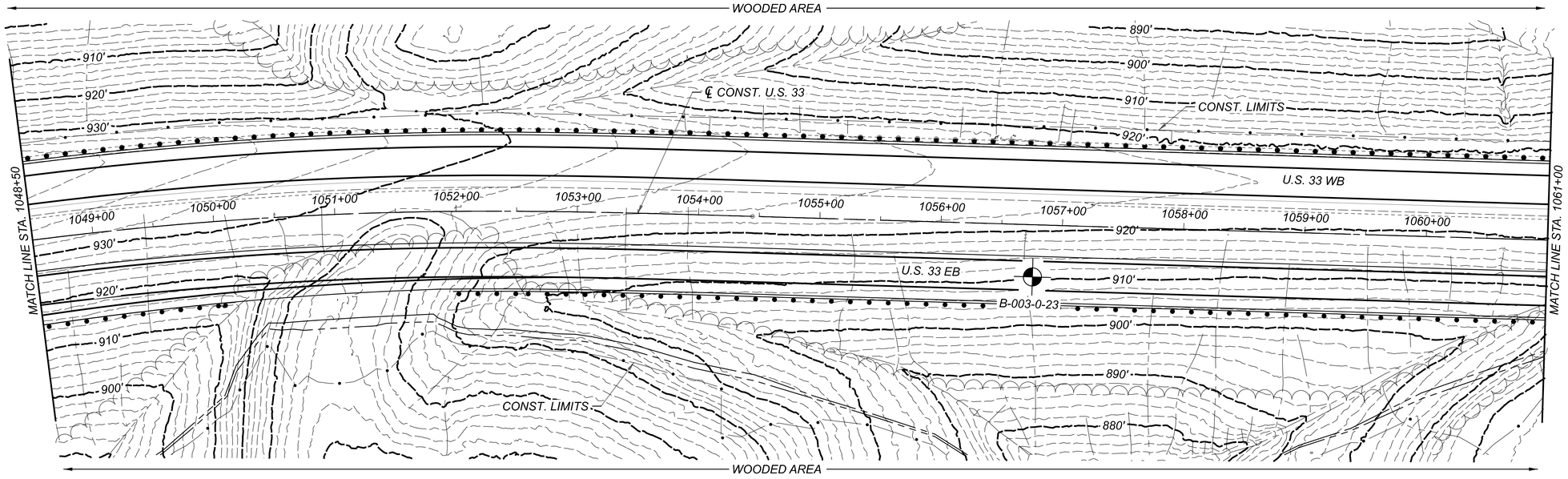


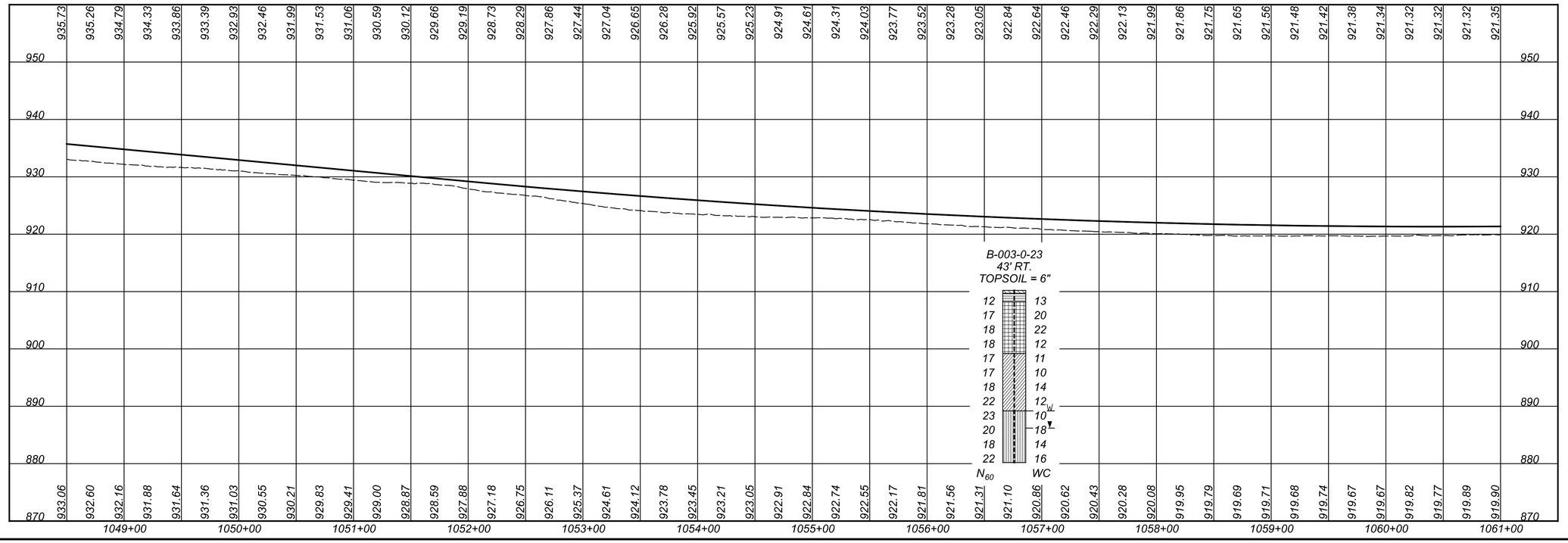
GEOTECHNICAL PROFILE - ROADWAY
STA. 1036+00.00 TO STA. 1048+50.00 (US 33)

HORIZONTAL SCALE IN FEET
0 50
25 100

DESIGNER N.K.S
REVIEWER SM 11-06-24
PROJECT ID 119141
SUBSET 9 TOTAL 82
SHEET P. - TOTAL -

DESIGN AGENCY
ENGINEERING, P.C.
COLUMBUS, OHIO 43204
PHONE (614) 276-8123
FAX (614) 276-6977





HORIZONTAL SCALE IN FEET
0 25 50 100

GEOTECHNICAL PROFILE - ROADWAY
STA. 1048+50.00 TO STA. 1061+00.00 (US 33)

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

DESIGNER: N.K.S
REVIEWER: SM 11-06-24
PROJECT ID: 119141
SUBSET: 10 TOTAL: 82
SHEET: P. TOTAL: -

ATH-US 33-18.70

MODEL: CLP_U033 - Plan 6 PAPERSIZE: 34x22 (in.) DATE: 06-11-2024 TIME: 11:06:21 USER: hp
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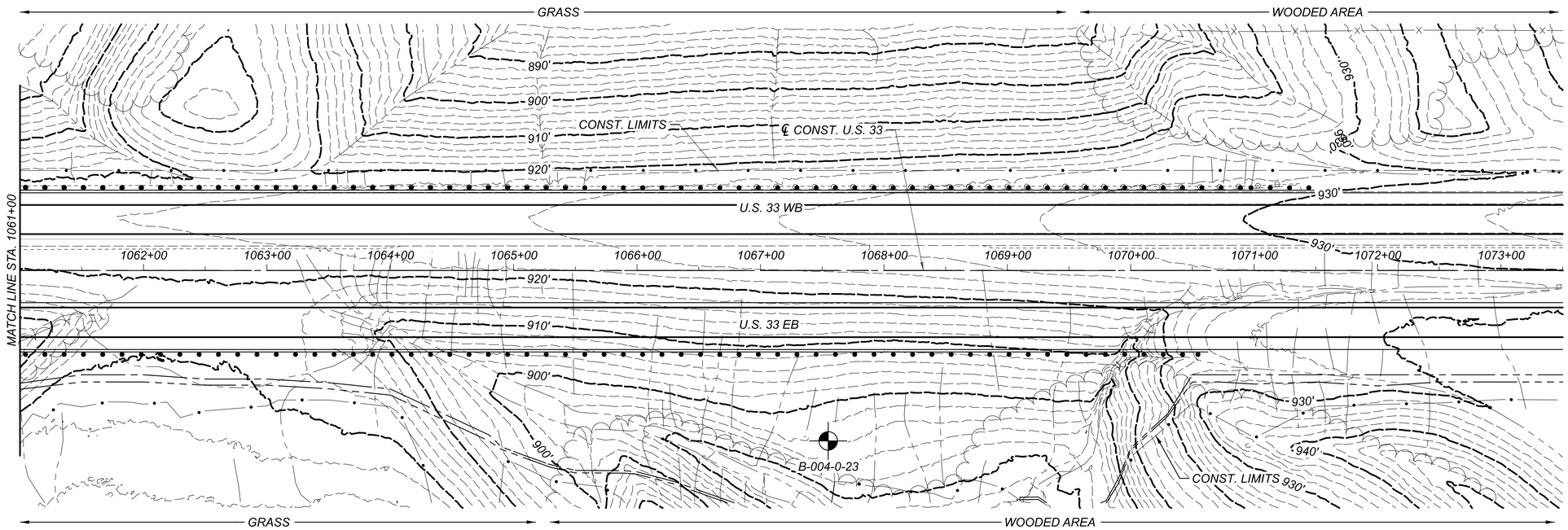

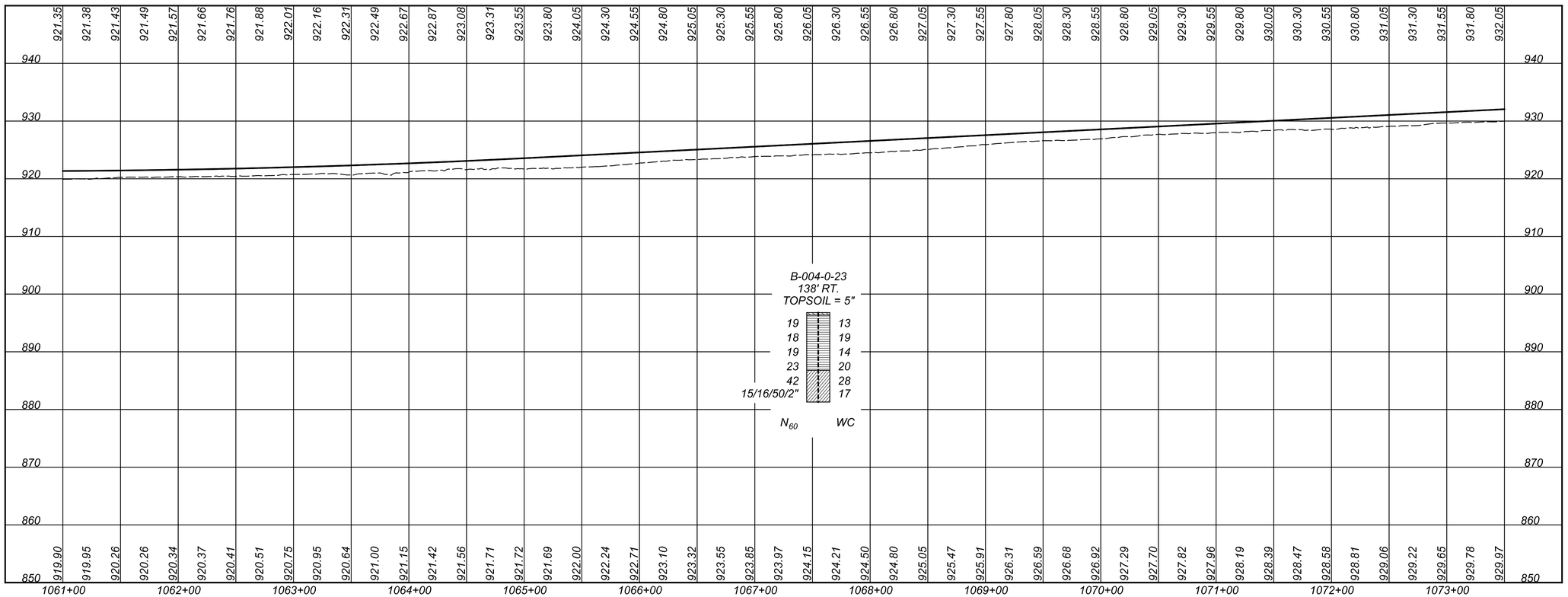

GEOTECHNICAL PROFILE - ROADWAY
STA. 1061+00.00 TO STA. 1073+50.00 (US 33)

HORIZONTAL SCALE IN FEET
0 25 50 100

'ATH-US 33-18.70

MODEL: CLP_U033 - Plan 7 PAPERSIZE: 34x22 (in.) DATE: 06-11-2024 TIME: 11:08:18 USER: hp
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DESIGN AGENCY
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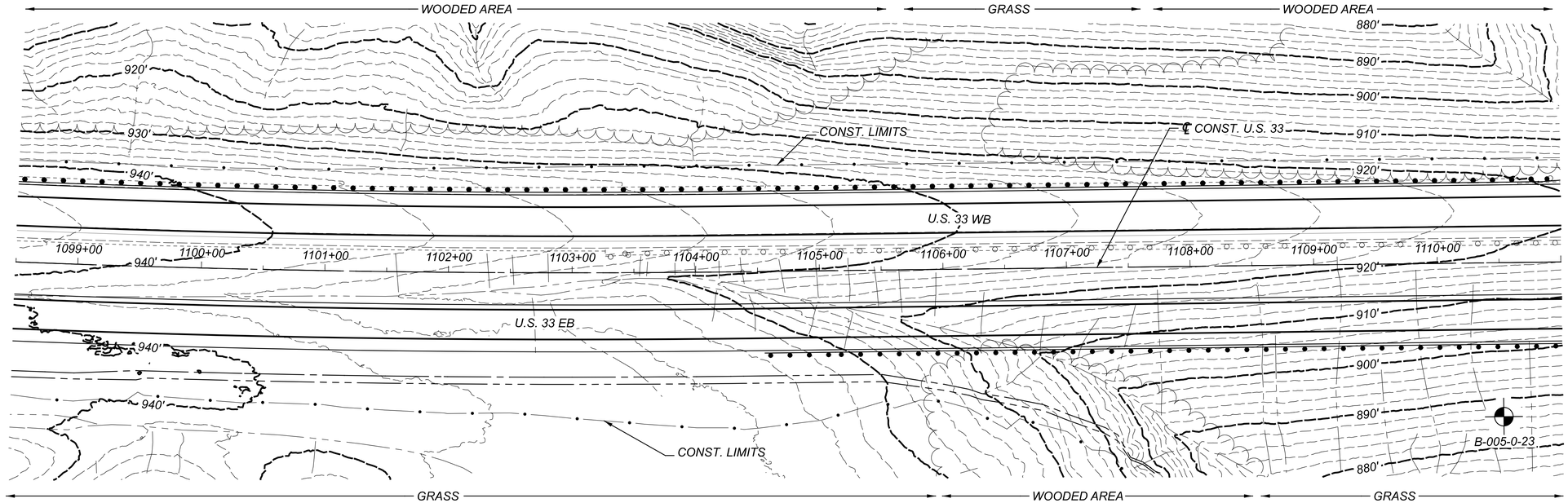
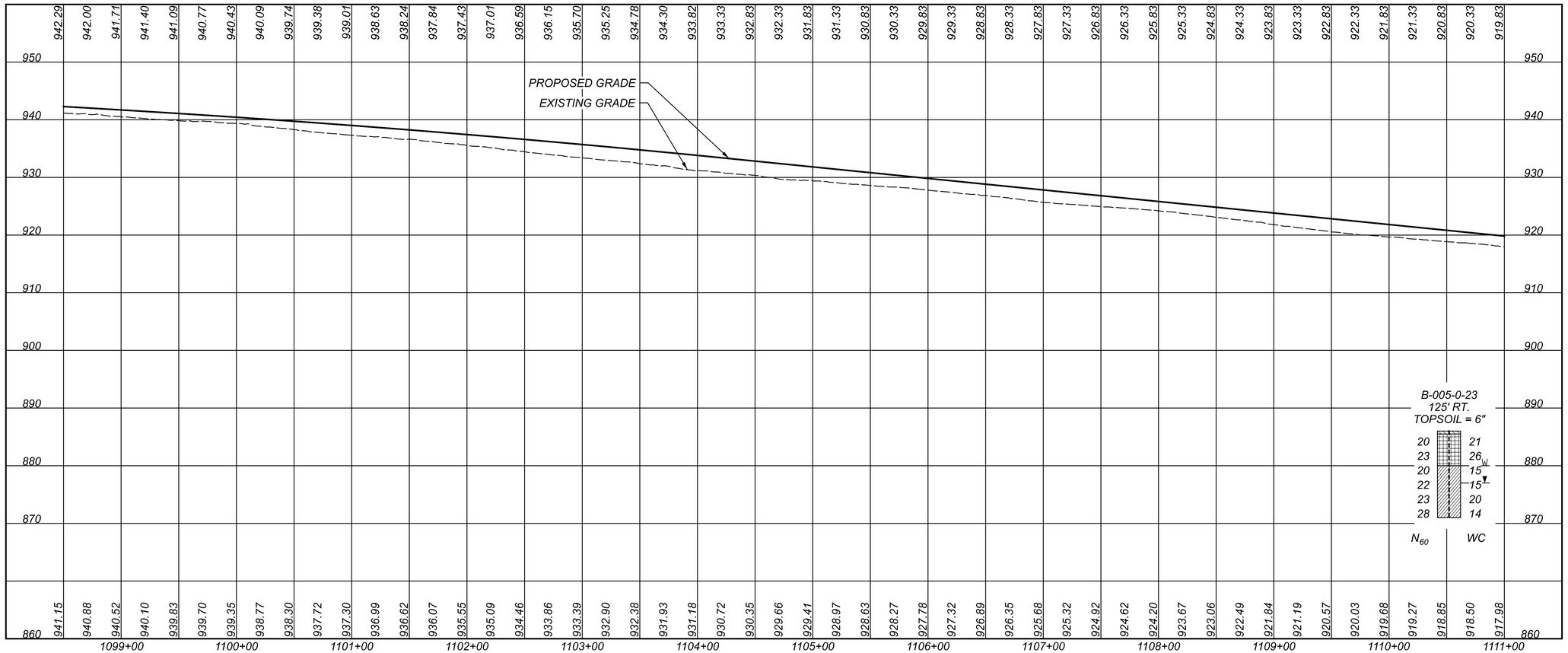
PHONE:(614)276-8123
FAX:(614)276-6377

DESIGNER	
N.K.S	
REVIEWER	
SM	11-06-24
PROJECT ID	
119141	
SUBSET	TOTAL
11	82
SHEET	TOTAL
P.	-





HORIZONTAL SCALE IN FEET
0 25 50 100

GEOTECHNICAL PROFILE - ROADWAY
STA. 1098+50.00 TO STA. 1111+00.00 (US 33)

DESIGN AGENCY

CTL ENGINEERING
2860 FISHER ROAD
COLUMBUS, OHIO 43204
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DESIGNER	N.K.S
REVIEWER	SM 11-06-24
PROJECT ID	119141
SUBSET	TOTAL 12 82
SHEET	TOTAL P. -

ATH-US 33-18.70

MODEL: CLP_U033 - Plan 10 PAPERSIZE: 34x22 (in.) DATE: 06-11-2024 TIME: 11:10:45 USER: hp
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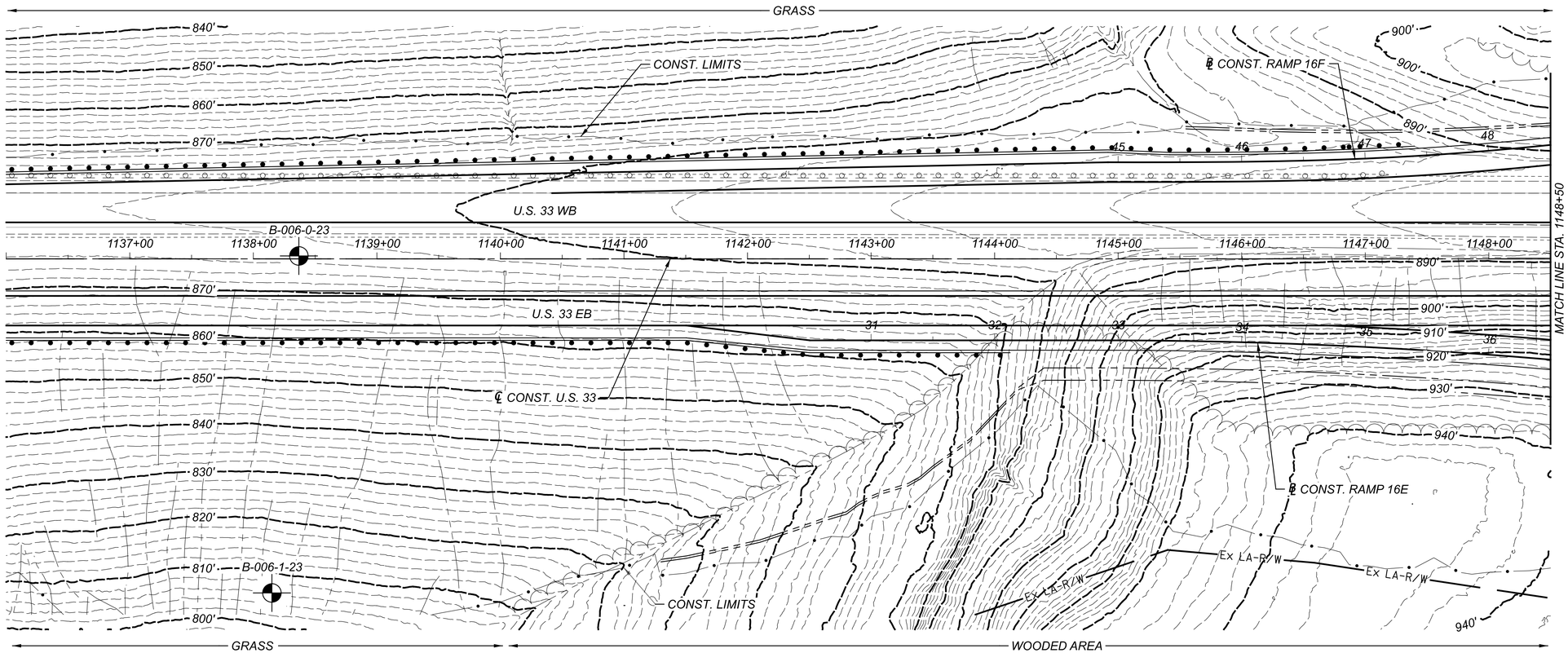

NOTE:
SEE SHEET 14 OF 82 FOR B-006-0-23 PROFILE VIEW.
SEE SHEET 15 OF 82 FOR B-006-1-23 PROFILE VIEW.

HORIZONTAL SCALE IN FEET
0 25 50 100

GEOTECHNICAL PROFILE - ROADWAY
STA. 1136+00.00 TO STA. 1148+50.00 (US 33)

DESIGN AGENCY
GTL ENGINEERING
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COLUMBUS, OHIO 43204
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FAX:(614)276-6377

DESIGNER	N.K.S
REVIEWER	SM 11-06-24
PROJECT ID	119141
SUBSET / TOTAL	13 / 82
SHEET / TOTAL	P. / -

PATH-US 33-18.70

MODEL: CLP_U033 - Plan 13 PAPERSIZE: 34x22 (in.) DATE: 06-11-2024 TIME: 11:13:08 USER: hp
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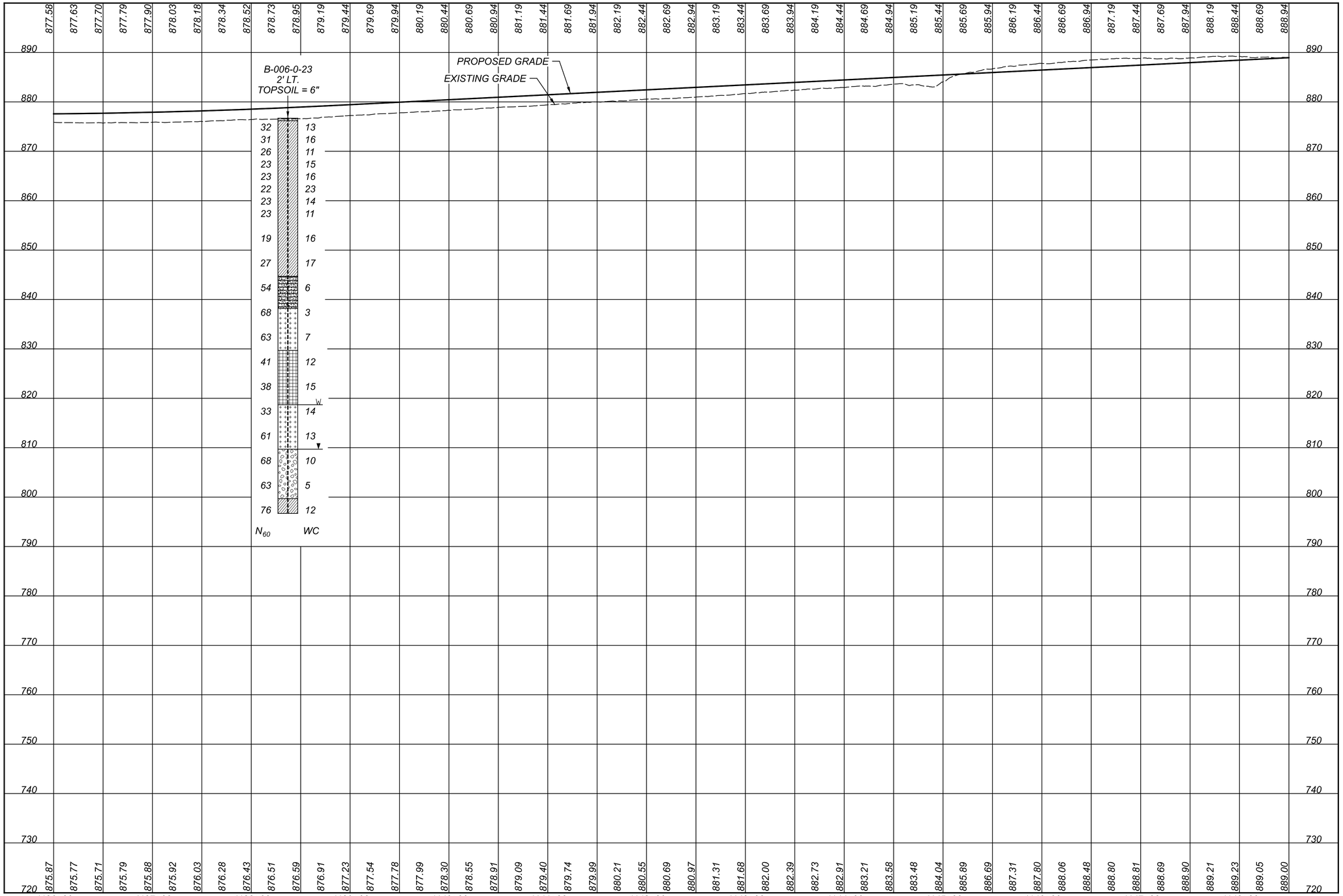

HORIZONTAL SCALE IN FEET
0 25 50 100

GEOTECHNICAL PROFILE - ROADWAY
STA. 1136+00.00 TO STA. 1148+50.00 (US 33)

ATH-US 33-18.70

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

DESIGNER	N.K.S
REVIEWER	SM 11-06-24
PROJECT ID	119141
SUBSET / TOTAL	14 / 82
SHEET / TOTAL	P. / -

MODEL: CLP_U033_Final - Profile 13 PAPERSIZE: 34x22 (in.) DATE: 06-11-2024 TIME: 10:54:33 USER: hp
D:\Drop Box\GTL 2024\November\Dept 05\COL\Sastry\23050059COL_WEST SECTION\MOD_05.11.24\11914fGF002.dgn

STA. 1138+00.00
PGL 878.52
XGL 876.43

ECO BDRY

B-006-0-23
2' LT.
TOPSOIL = 6"

N_{60}	WC
32	13
31	16
26	11
23	15
23	16
22	23
23	14
23	11
19	16
27	17
54	6
68	3
63	7
41	12
38	15
33	14
61	13
68	10
63	5
76	12

W

B-006-1-23
271' RT.
TOPSOIL = 8"

N_{60}	WC
19	15
17	9
23	10
28	12
23	11
23	19
26	18
27	11
28	16
29	16

910 900 890 880 870 860 850 840 830 820 810 800 790 780 770 760 750

220 200 180 160 140 120 100 80 60 40 20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300 320 340

HORIZONTAL
SCALE IN FEET
0 10 20 40

GEOTECHNICAL PROFILE - ROADWAY
CROSS SECTION STA. 1138+00.00

'ATH-US 33-18.70

MODEL: CLP_U033 - 1138+00.00 PAPERSIZE: 34x22 (in.) DATE: 06-11-2024 TIME: 11:33:31 USER: hp
D:\Drop Box\CTL 2024\November\Dept 05\COL\Sastry\23050059COL_WEST SECTION\MOD_05.11.24\119141XS001.dgn

DESIGN AGENCY

CTL ENGINEERING

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

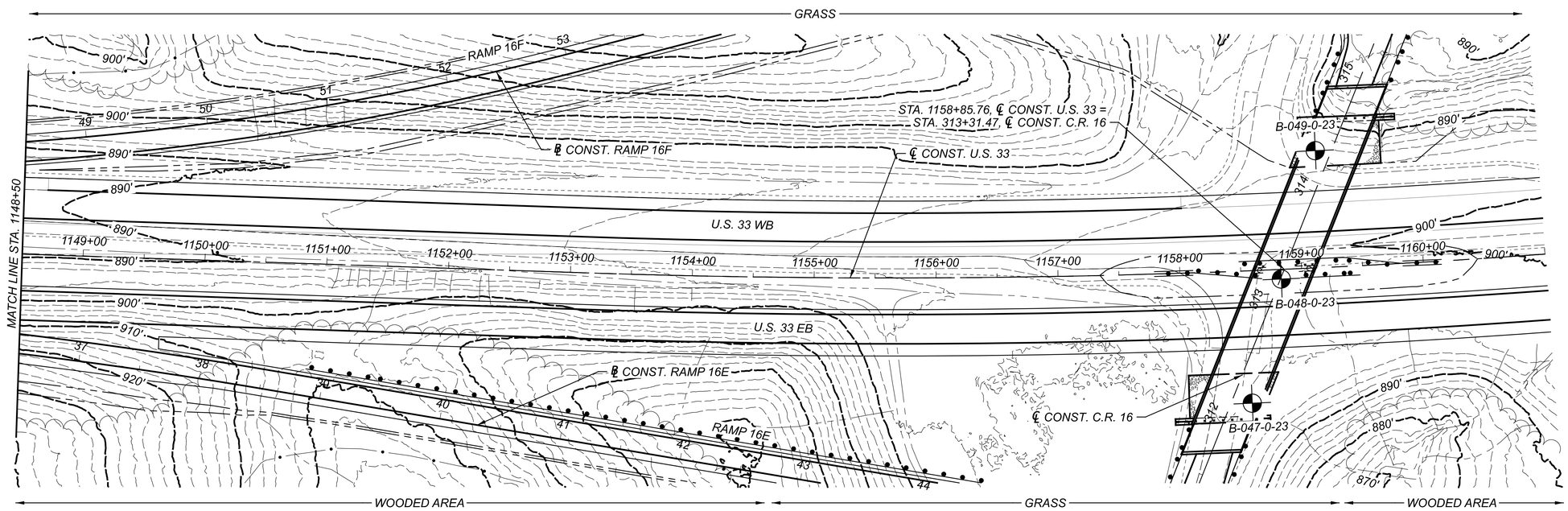
DESIGNER
N.K.S

REVIEWER
SM 11-06-24

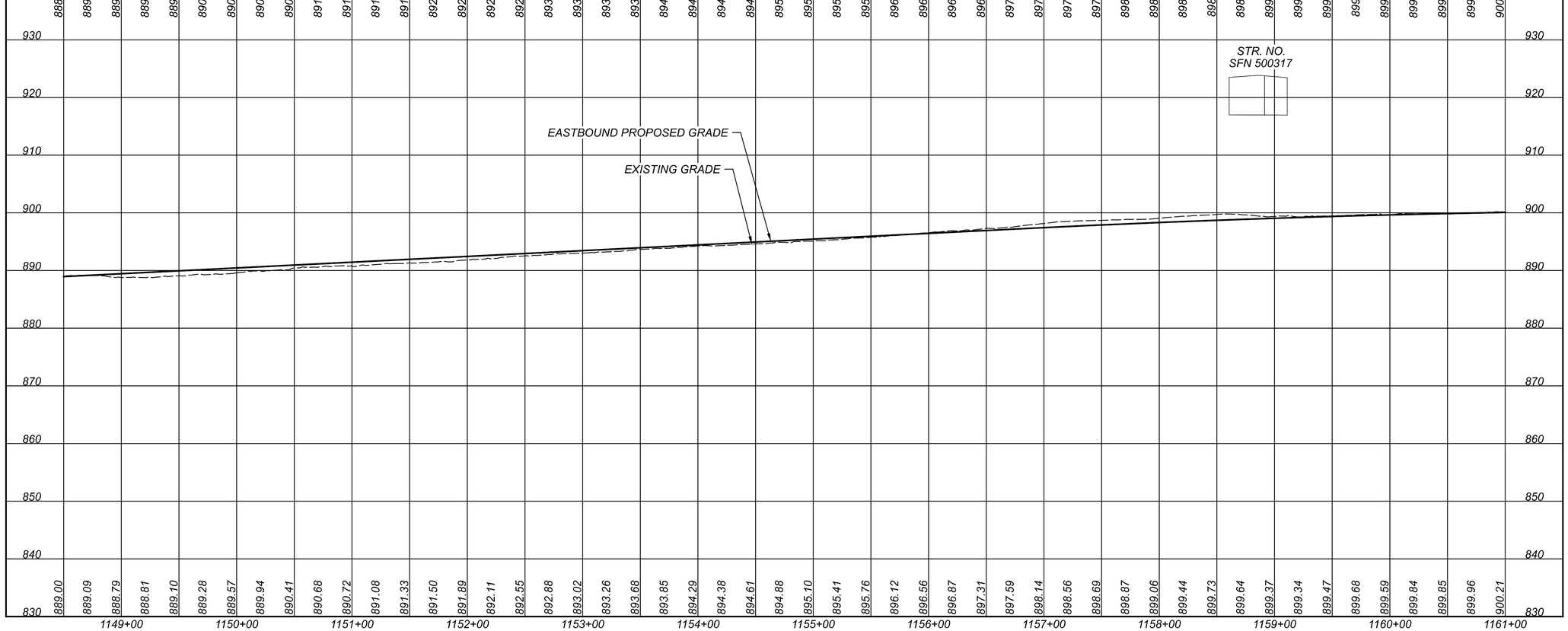
PROJECT ID
119141

SUBSET 15 | TOTAL 82

SHEET P. | TOTAL -



SEE SHEET 23 OF 82 FOR B-047-0-23, B-048-0-23, B-049-0-23 PROFILE VIEW



HORIZONTAL SCALE IN FEET
0 25 50 100

GEOTECHNICAL PROFILE - ROADWAY
STA. 1148+50.00 TO STA. 1161+00.00 (US 33)

DESIGN AGENCY
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COLUMBUS, OHIO 43204
PHONE:(614)276-8123
FAX:(614)276-6377

DESIGNER N.K.S
REVIEWER SM 11-06-24
PROJECT ID 119141
SUBSET 16 TOTAL 82
SHEET P. TOTAL -

PATH-US 33-18.70

MODEL: CLP_U033 - Plan 14 PAPERSIZE: 34x22 (in.) DATE: 06-11-2024 TIME: 11:18:38 USER: hp
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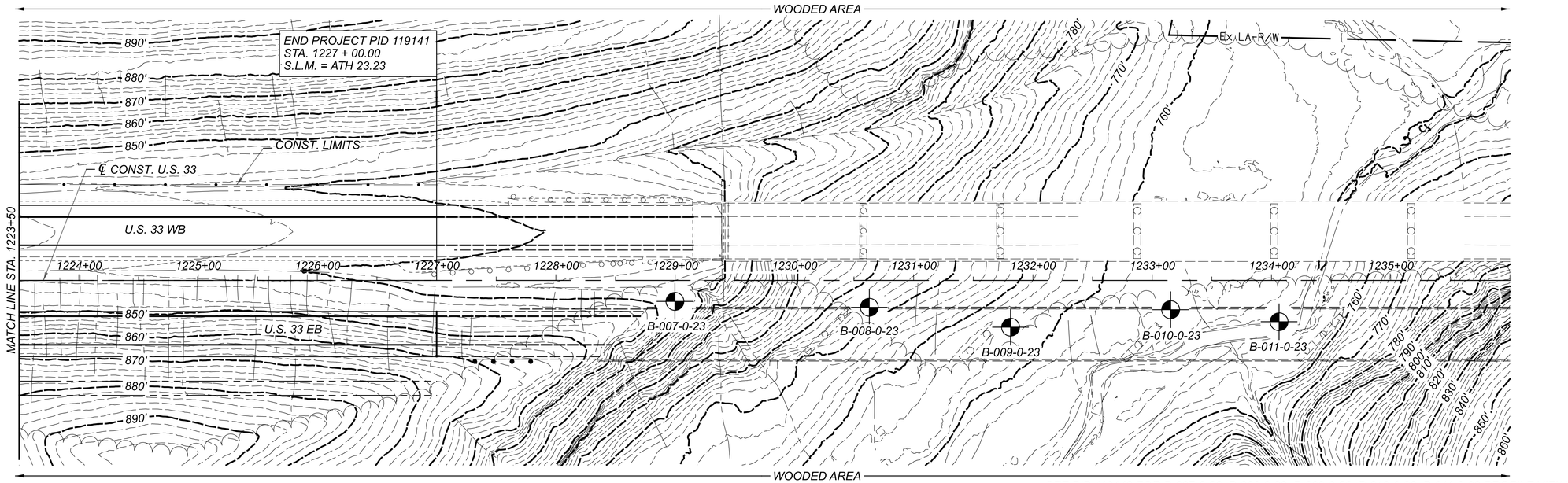
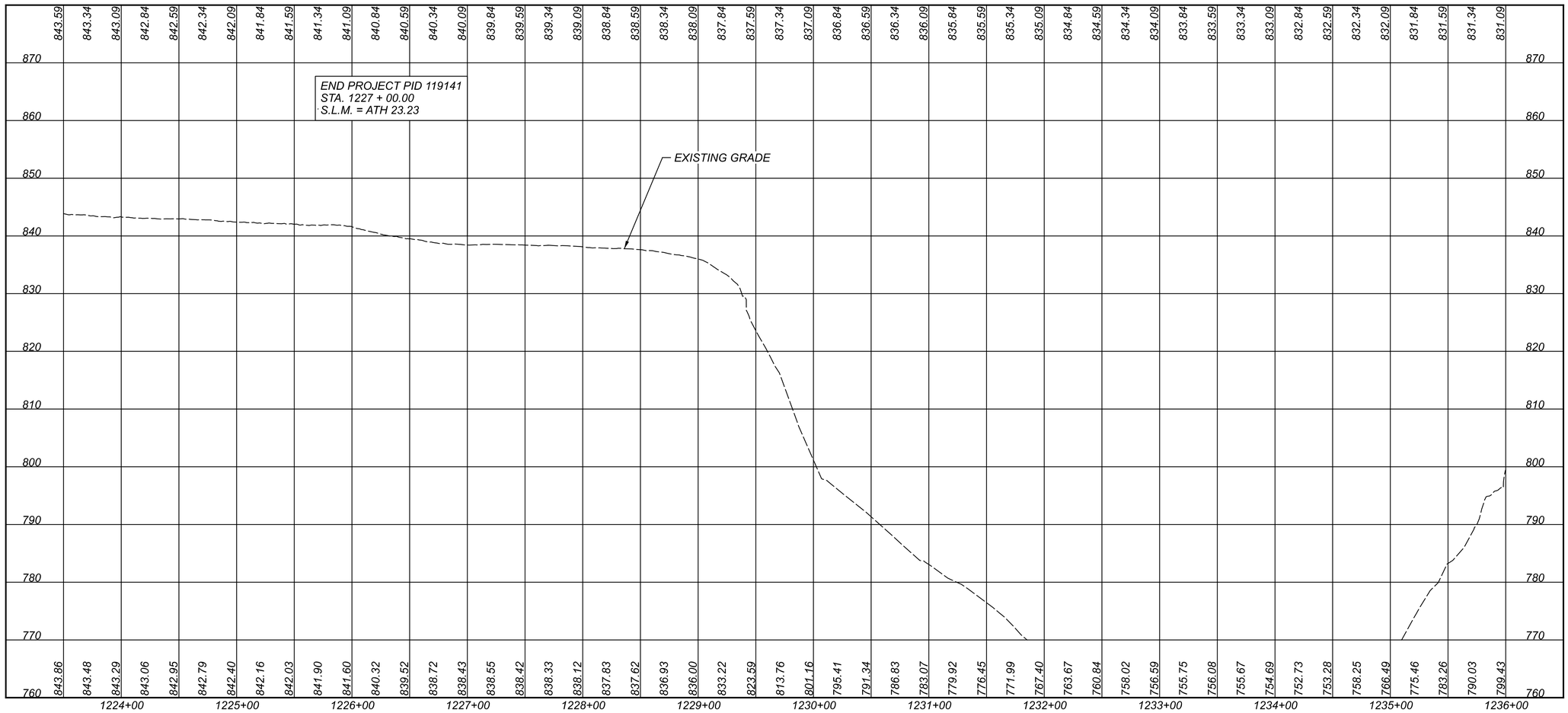


SEE PID 119142 FOR B-007-0-23, B-008-0-23, B-009-0-23, B-010-0-23, B-011-0-23 PROFILE VIEW



HORIZONTAL SCALE IN FEET
0 25 50 100

GEOTECHNICAL PROFILE - ROADWAY
STA. 1223+50.00 TO STA. 1227+00.00 (US 33)

ATH-US 33-18.70

MODEL: CLP_U033 - Plan 20 PAPERSIZE: 34x22 (in.) DATE: 06-11-2024 TIME: 11:20:47 USER: hp
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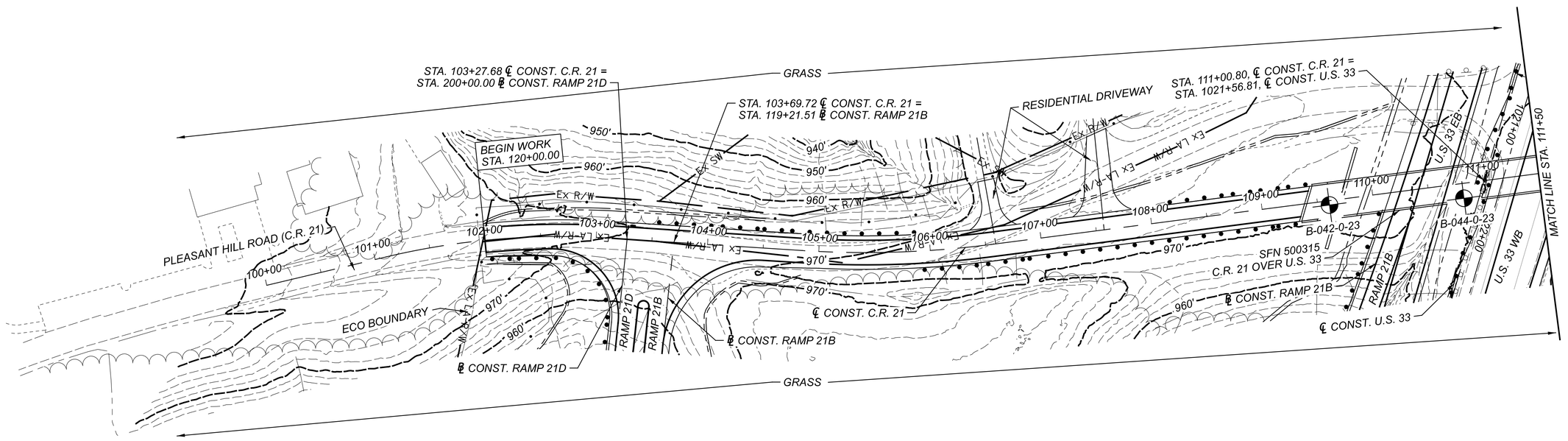
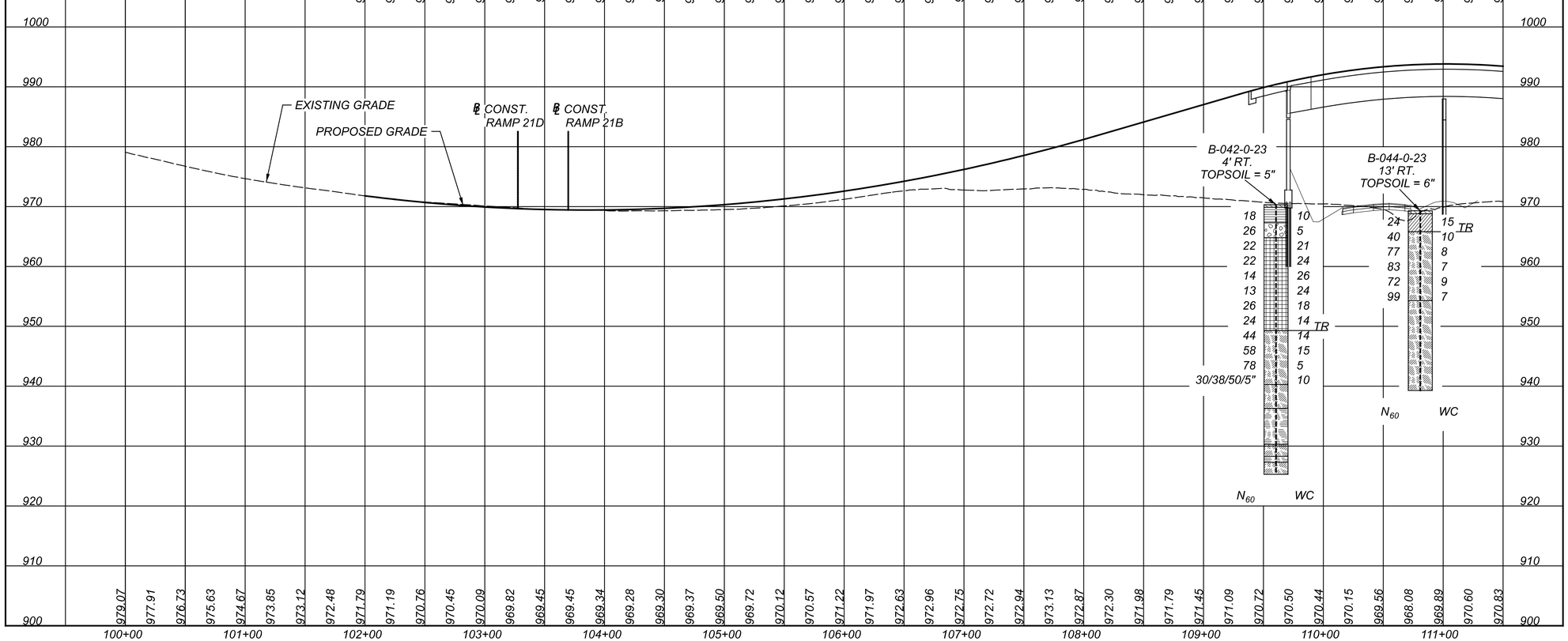
DESIGN AGENCY
GTL ENGINEERING
2960 FISHER ROAD
COLUMBUS, OHIO 43204
PHONE:(614)276-8123
FAX:(614)276-8377

DESIGNER	N.K.S
REVIEWER	SM 11-06-24
PROJECT ID	119141
SUBSET	17
TOTAL	82
SHEET	P.
TOTAL	-





HORIZONTAL SCALE IN FEET
0 25 50 100

GEOTECHNICAL PROFILE - ROADWAY
STA. 100+00.00 TO STA. 111+50.00 C.R. 21 (PLEASANT HILL ROAD)

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

DESIGNER	N.K.S
REVIEWER	SM 11-06-24
PROJECT ID	119141
SUBSET / TOTAL	18 / 82
SHEET / TOTAL	P. / -

ATH-33-18.70

MODEL: CLP_C021 - Plan 2 PAPERSIZE: 34x22 (in.) DATE: 06-11-2024 TIME: 11:22:40 USER: hp
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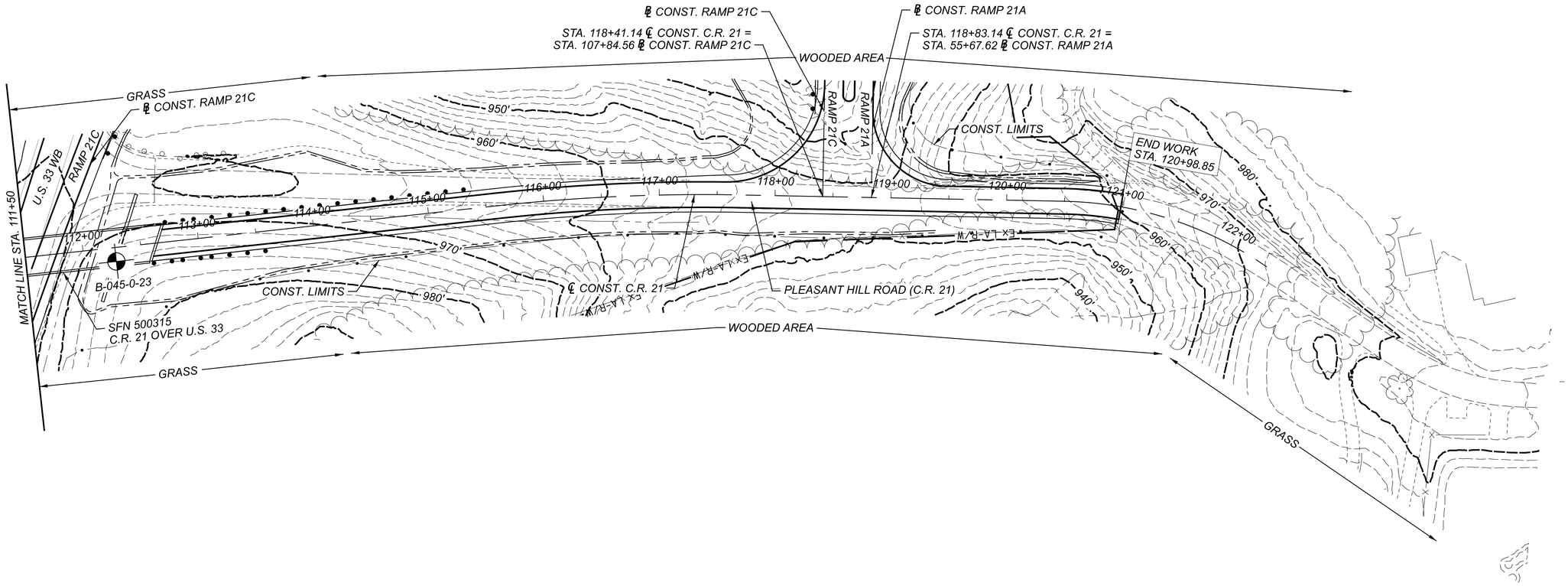

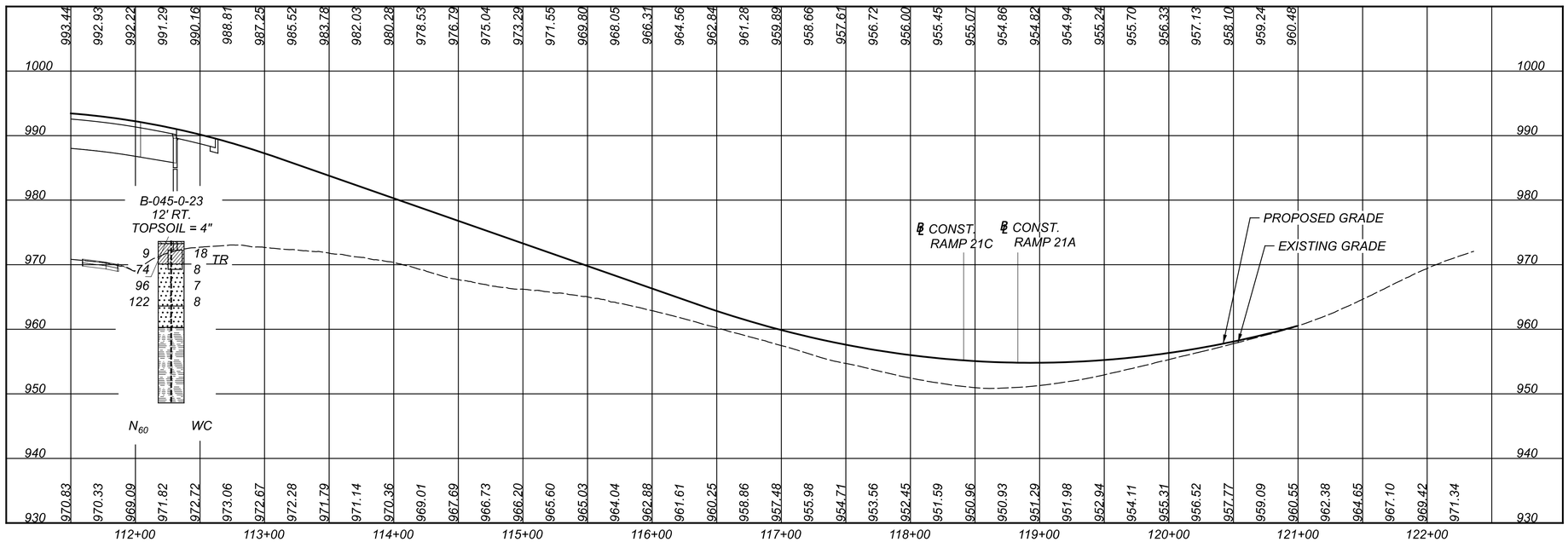

HORIZONTAL SCALE IN FEET
0 25 50 100

GEOTECHNICAL PROFILE - ROADWAY
STA. 111+50.00 TO STA. 120+98.85 C.R. 21 (PLEASANT HILL ROAD)

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

DESIGNER	N.K.S
REVIEWER	SM 11-06-24
PROJECT ID	119141
SUBSET	19
TOTAL	82
SHEET	P.
TOTAL	-

ATH-US 33-18.70

MODEL: CLP_C021 - Plan 5 PAPERSIZE: 34x22 (in.) DATE: 06-11-2024 TIME: 11:24:29 USER: hp
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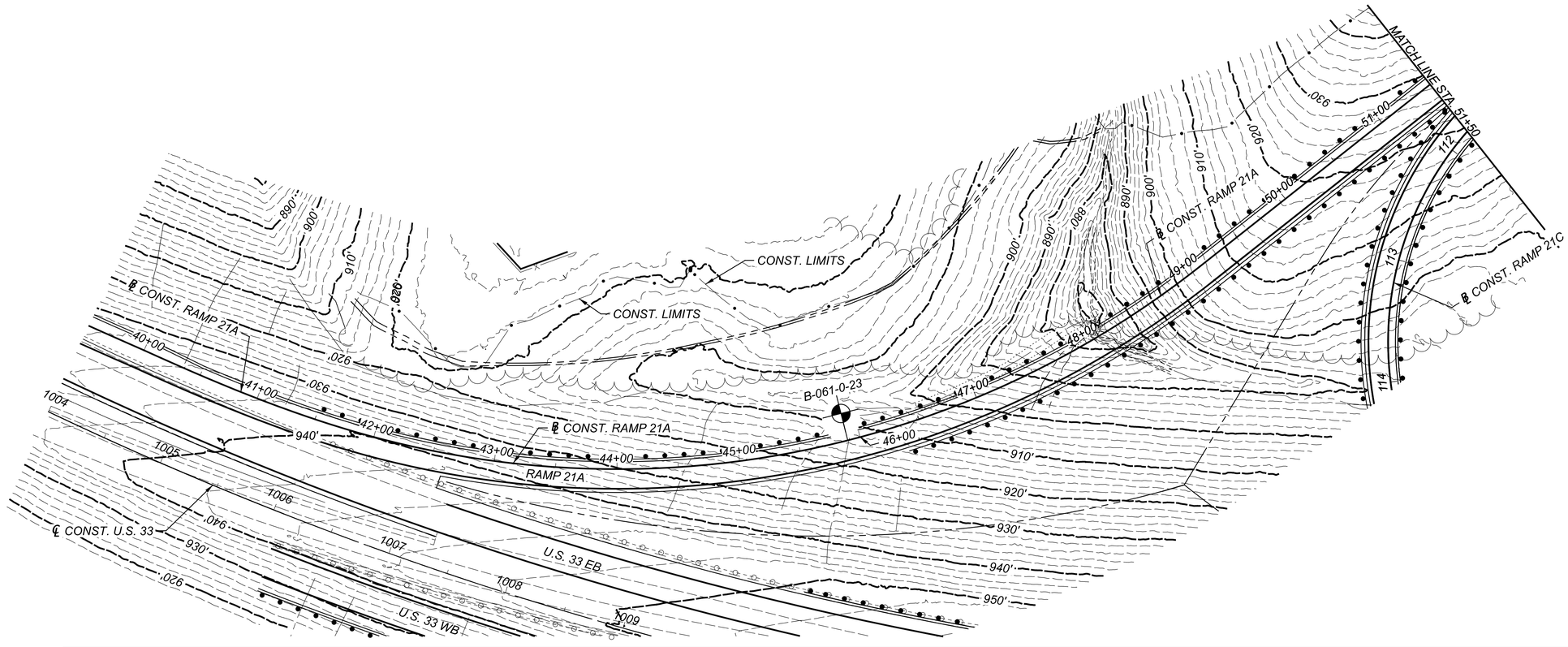

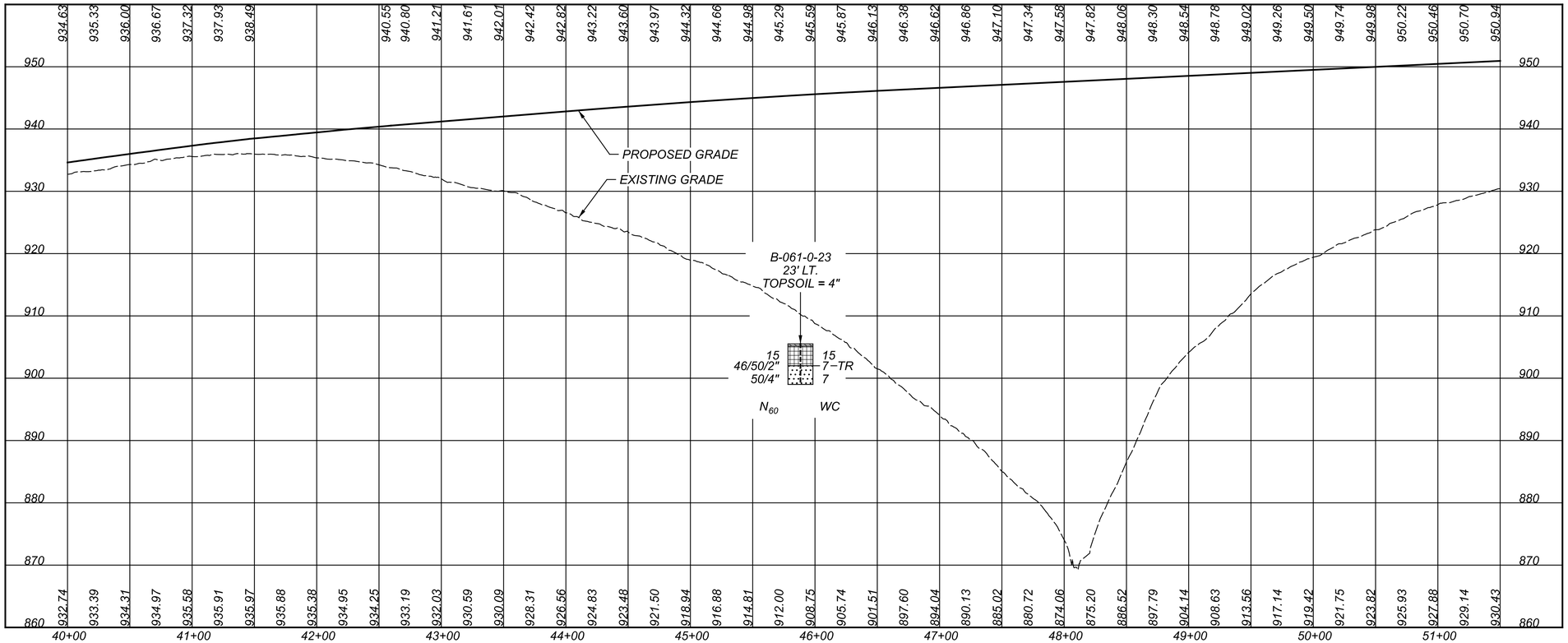

HORIZONTAL SCALE IN FEET
0 25 50 100

GEOTECHNICAL PROFILE - ROADWAY
STA. 40+00.00 TO STA. 51+50.00 RAMP 21A

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

DESIGNER	N.K.S
REVIEWER	SM 11-06-24
PROJECT ID	119141
SUBSET	20
TOTAL	82
SHEET	P.
TOTAL	-

PATH-US 33-18.70

MODEL: CLP_C021A - Plan 2 PAPERSIZE: 34x22 (in.) DATE: 06-11-2024 TIME: 11:26:23 USER: hp
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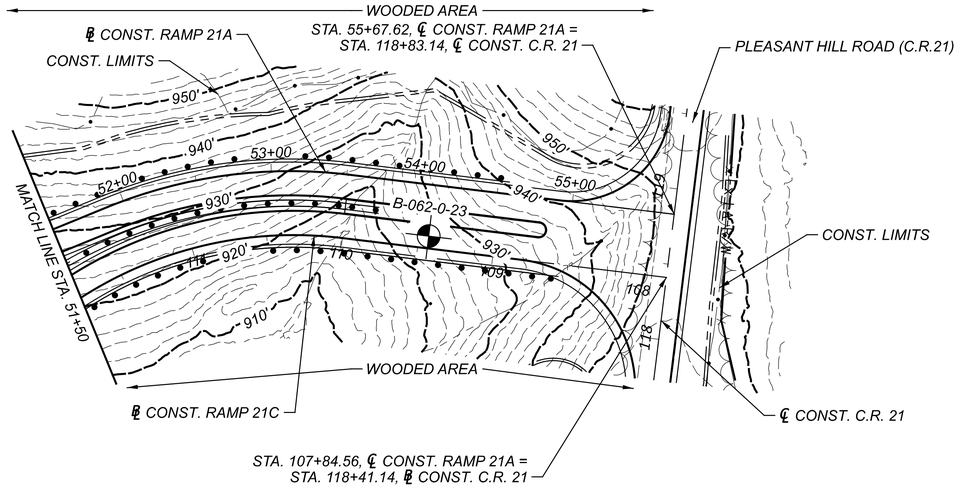

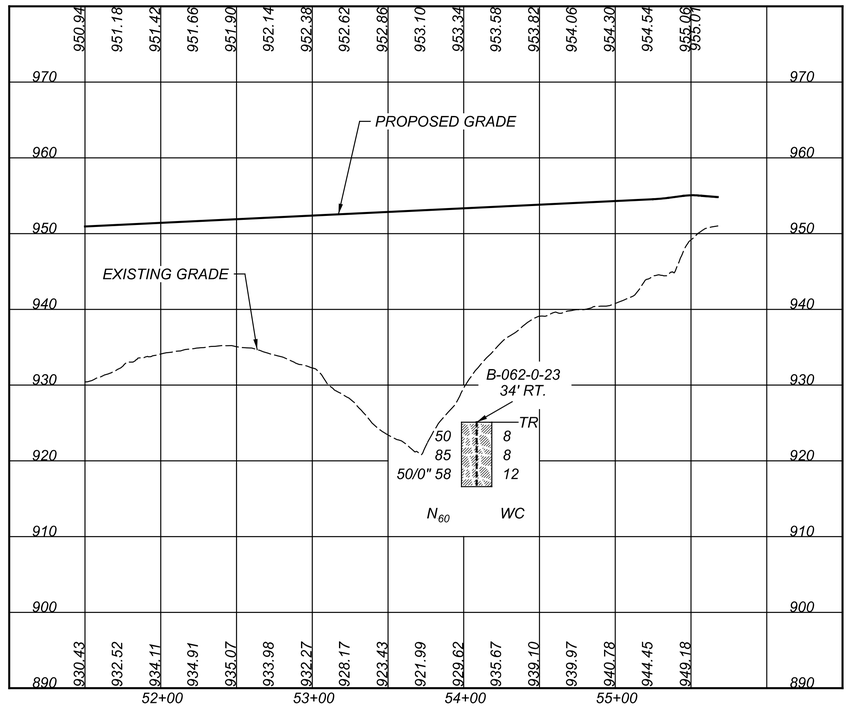

HORIZONTAL SCALE IN FEET
0 25 50 100

GEOTECHNICAL PROFILE - ROADWAY
STA. 51+50.00 TO STA. 55+67.62 RAMP 21A

PATH-US 33-18.70

MODEL: CLP_C021A - Plan 4 PAPERSIZE: 34x22 (in.) DATE: 06-11-2024 TIME: 11:27:59 USER: hp
D:\Drop Box\CTL 2024\November\Dept 05\COL\Sastry\2305059COL_WEST SECTION\MOD_05.11.24\119141GP102.dgn

DESIGN AGENCY

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

DESIGNER	N.K.S
REVIEWER	SM 11-06-24
PROJECT ID	119141
SUBSET / TOTAL	21 / 82
SHEET / TOTAL	P. / -

'ATH-US 33-18.70

MODEL: CLP_C021D - Plan 1 PAPERSIZE: 34x22 (in.) DATE: 06-11-2024 TIME: 11:29:58 USER: hp
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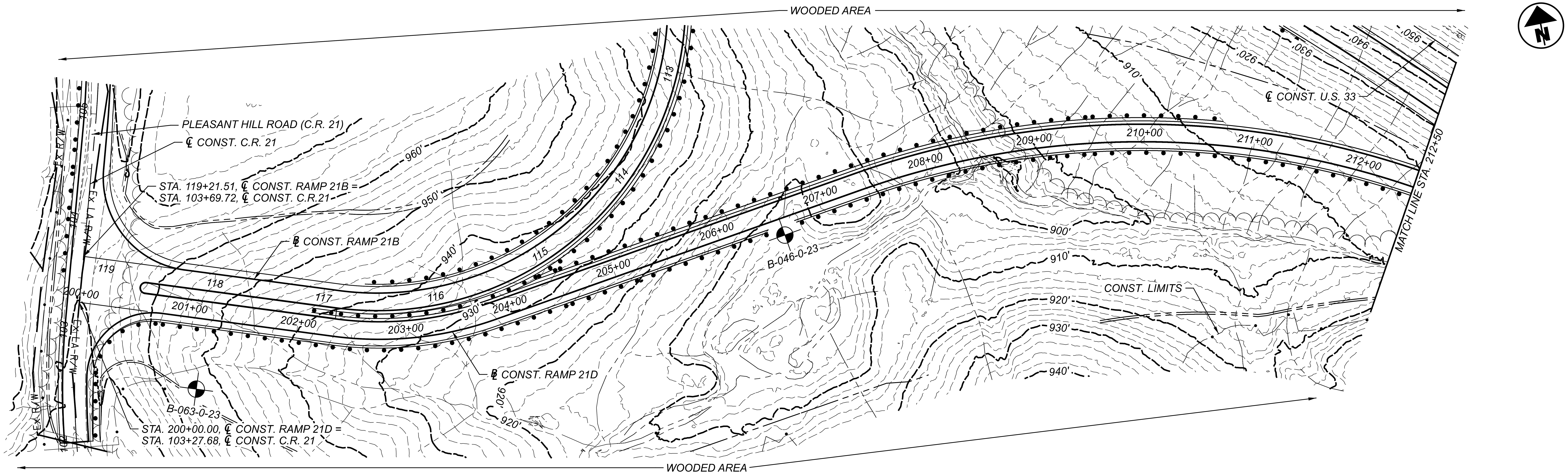
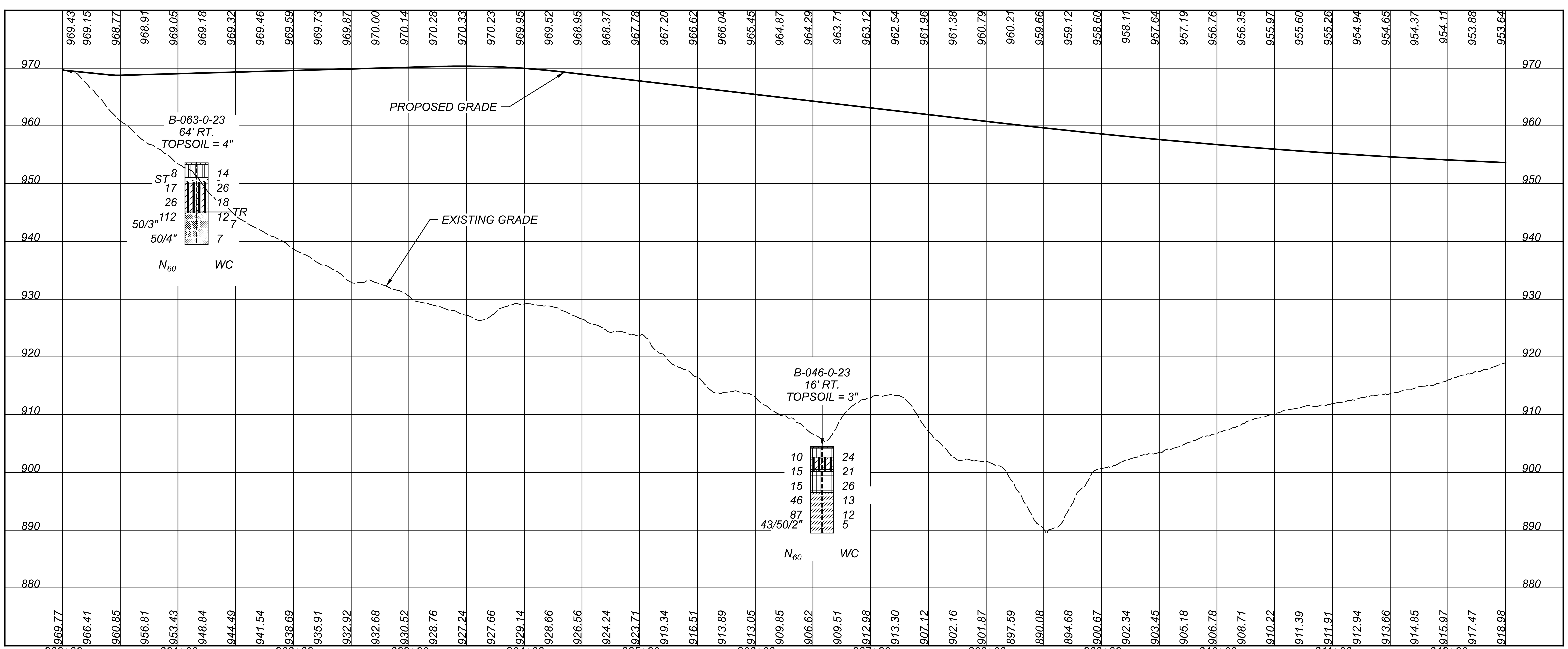




HORIZONTAL SCALE IN FEET
0 25 50 100

GEOTECHNICAL PROFILE - ROADWAY
STA. 200+00.00 TO STA. 212+50.00 - RAMP 21D

DESIGN AGENCY

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

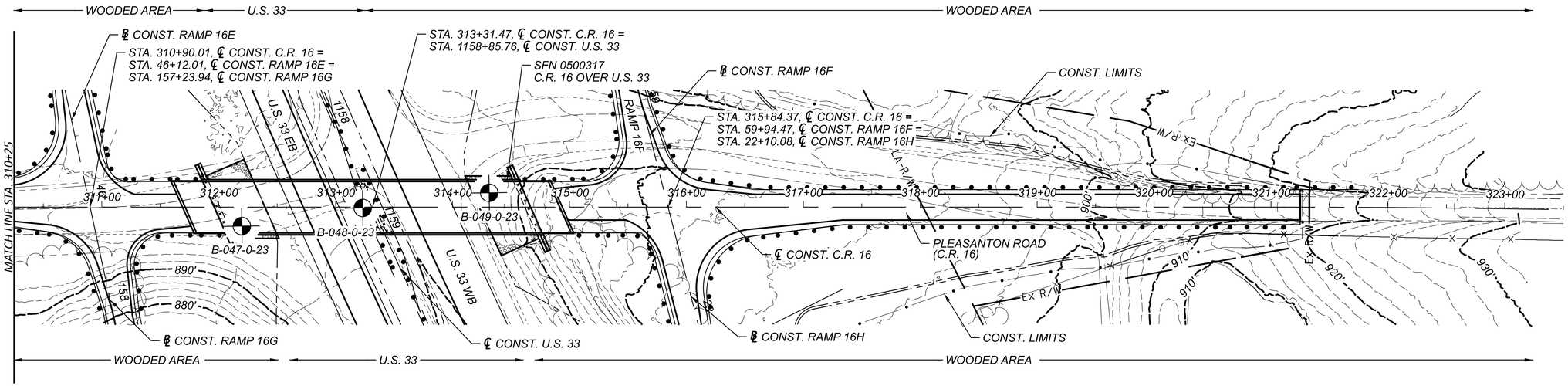
DESIGNER
N.K.S

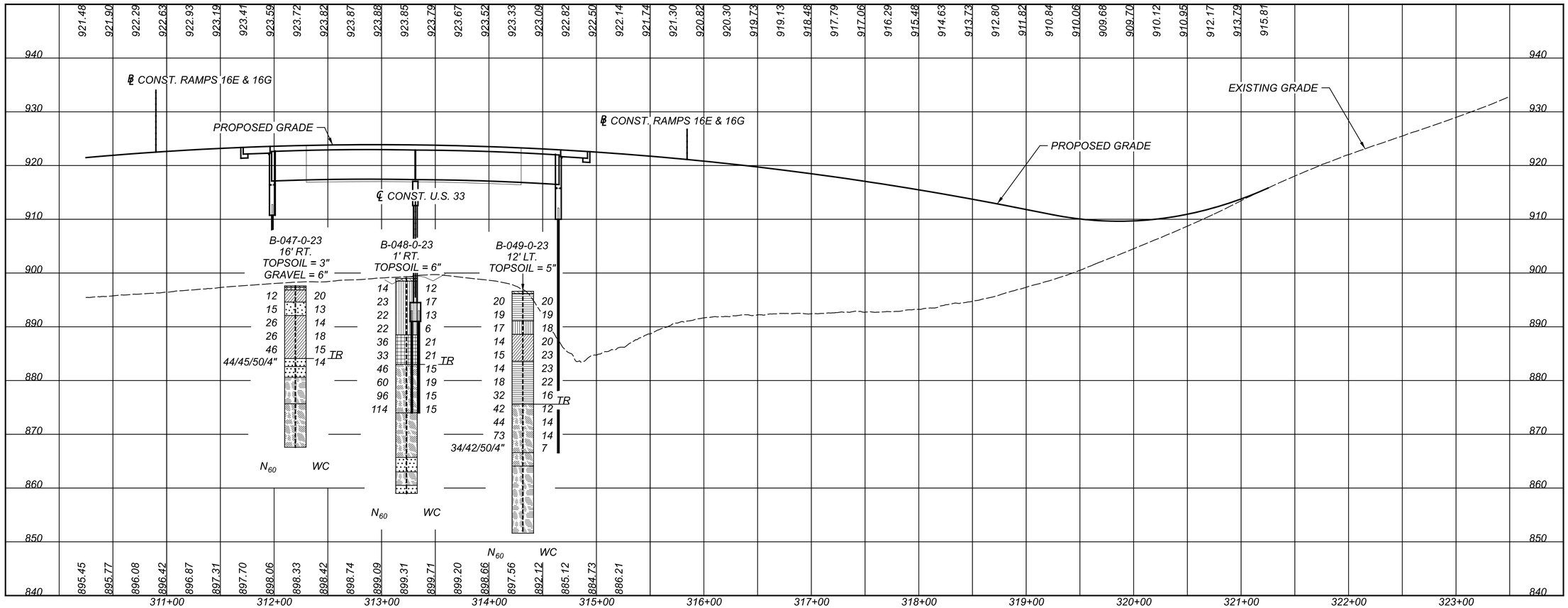
REVIEWER
SM 11-06-24

PROJECT ID
119141

SUBSET 22 TOTAL 82

SHEET P. TOTAL -





HORIZONTAL SCALE IN FEET
0 25 50 100

GEOTECHNICAL PROFILE - ROADWAY
STA. 310+25.00 TO STA. 323+50.00 C.R. 16 (PLEASANTON ROAD)

PATH-US 33-18.70

MODEL: CLP_C016 - Plan 5 PAPERSIZE: 34x22 (in.) DATE: 06-11-2024 TIME: 11:31:48 USER: hp
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DESIGN AGENCY

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

DESIGNER	N.K.S
REVIEWER	SM 11-06-24
PROJECT ID	119141
SUBSET / TOTAL	23 / 82
SHEET / TOTAL	P. / -

MODEL: Sheet PAPERSIZE: 11x17 (in.) DATE: 06-11-2024 TIME: 21:14:39 USER: ACAD
D:\Dept 05\COL\23050059COL\West Section\Mod_30.10.24\Working\119141ZL001.dgn

STANDARD ODOT SOIL BORING LOG (8.5 X 11) - OH DOT GDT - 9/11/24 15:01 - O:\PROJECT\2023\COL\05\23050059COL_ATH MEG-033-18-70 00-00_HNTB OHIO INC\REPORTS\LAB REPORTS\MAST

PROJECT: ATH-US 33-18.70 | DRILLING FIRM / OPERATOR: CTL / H. BROWN | DRILL RIG: MOBILE B-57 TRACK | STATION / OFFSET: 1022+17, 127' RT. | EXPLORATION ID B-042-0-23
TYPE: BRIDGE | SAMPLING FIRM / LOGGER: CTL / H. BROWN | HAMMER: MOBILE AUTOMATIC | ALIGNMENT: US 33
PID: 119141 SFN: 0500315 | DRILLING METHOD: 3.25" HSA / NQ2 | CALIBRATION DATE: 5/3/23 | ELEVATION: 970.3 (MSL) EOB: 45.0 ft. | PAGE 1 OF 2
START: 1/4/24 END: 1/4/24 | SAMPLING METHOD: SPT / NQ2 | ENERGY RATIO (%): 76.8 | LAT / LONG: 39.272233, -82.091568

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	HOLE SEALED
TOPSOIL (5")	969.9																	
VERY STIFF, BROWN, **SILTY CLAY**, "AND" SAND, TRACE GRAVEL, (FILL), DAMP	967.3		6 7 7	18	100	SS-1	3.25	1	31	7	39	22	36	20	16	10	A-6b (8)	
MEDIUM DENSE, BROWN, **GRAVEL AND/OR STONE FRAGMENTS**, CONTAINS ROCK FRAGMENTS, (FILL), DAMP	964.8		8 10 10	26	100	SS-2	-	-	-	-	-	-	-	-	-	5	A-1-a (V)	
VERY STIFF, RED AND GRAY, **CLAY**, "AND" SILT, LITTLE SAND, TRACE GRAVEL, DAMP			8 8 9	22	100	SS-3	3.00	7	7	5	37	44	48	23	25	21	A-7-6 (16)	
@8.5'; MOIST			9 8 9	22	100	SS-4	3.75	-	-	-	-	-	-	-	-	24	A-7-6 (V)	
@11.0'; BROWN, TRACE SAND, NO GRAVEL			6 6 5	14	100	SS-5	2.75	0	3	6	45	46	41	23	18	26	A-7-6 (11)	
			6 5 5	13	100	SS-6	3.25	-	-	-	-	-	-	-	-	24	A-7-6 (V)	
@16.0'; BROWN AND GRAY, SOME SILT, LITTLE SAND, DAMP			8 10 10	26	100	SS-7	4.00	0	15	5	30	50	52	26	26	18	A-7-6 (17)	
@18.5'; HARD, BROWN, "AND" SILT			9 9 10	24	100	SS-8	4.25	0	18	2	52	28	45	23	22	14	A-7-6 (14)	
	949.3	TR																
CLAYSTONE, BROWN, SEVERELY WEATHERED.			15 15 19	44	100	SS-9	4.50	-	-	-	-	-	-	-	-	14	Rock (V)	
			19 20 25	58	100	SS-10	2.50	-	-	-	-	-	-	-	-	15	Rock (V)	
			25 27 34	78	100	SS-11	4.50	-	-	-	-	-	-	-	-	5	Rock (V)	
	940.3		30 38 50/5"	-	88	SS-12	-	-	-	-	-	-	-	-	-	10	Rock (V)	

STANDARD ODOT SOIL BORING LOG (8.5 X 11) - OH DOT GDT - 9/11/24 15:01 - O:\PROJECT\2023\COL\05\23050059COL_ATH MEG-033-18-70 00-00_HNTB OHIO INC\REPORTS\LAB REPORTS\MAST

PID: 119141 | SFN: | PROJECT: ATH-US 33-18.70 | STATION / OFFSET: 1022+17, 127' RT. | START: 1/4/24 | END: 1/4/24 | PG 2 OF 2 | B-042-0-23

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	HOLE SEALED
CLAYSTONE, RED, MODERATELY WEATHERED, VERY WEAK; RQD 56%, REC 100%.																		
@31.5'-32.0'; UCS = 80 PSI	936.3		48		100	NQ2-1											CORE	
SHALE, GRAY, SLIGHTLY WEATHERED, SLIGHTLY STRONG; RQD 15%, REC 100%.																		
@37.5'; BROWN.	930.3		14		100	NQ2-2											CORE	
CLAYSTONE, RED, SEVERELY WEATHERED, WEAK; RQD 0%, REC 100%.	928.3																	
SHALE, GRAY, SLIGHTLY WEATHERED, SLIGHTLY STRONG; RQD 100%, REC 100%.	927.3		30		100	NQ2-3											CORE	
CLAYSTONE, RED TO GRAY, MODERATELY WEATHERED, WEAK; RQD 25%, REC 100%.	925.3	EOB																

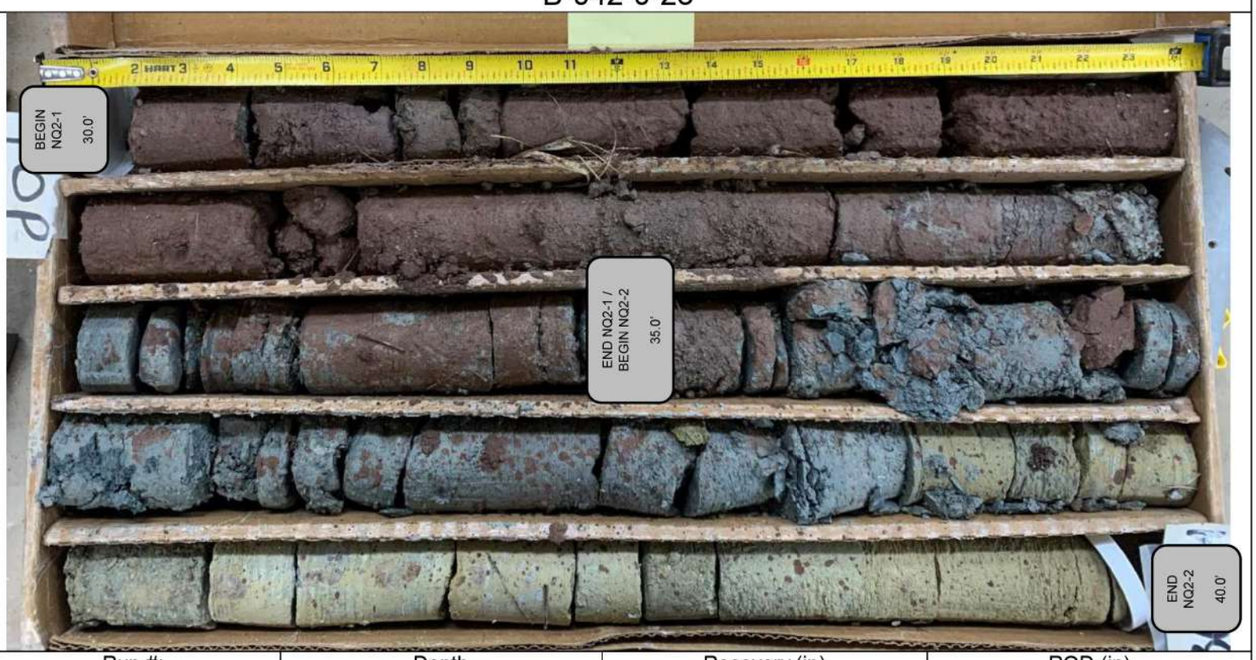
NOTES: CAVED AT 30'

ABANDONMENT METHODS, MATERIALS, QUANTITIES: TREMIED BENTONITE GROUT

SHEET	SUBSET	PROJECT ID	REVIEWER	DESIGNER	DESIGN AGENCY
- TOTAL -	24 TOTAL 82	119141	SM 11-06-24	N.K.S.	CTL ENGINEERING, INC. 2860 FISHER ROAD COLUMBUS, OHIO 43204 PHONE (614) 276-8123 FAX (614) 276-6377

GEOTECHNICAL PROFILE - ROADWAY
BORING LOG FOR B-042-0-23

B-042-0-23



Run #:	Depth		Recovery (in)		RQD (in)	
NQ2-1	30.0'	35.0'	60/60	100%	29/60	48%
NQ2-2	35.0'	40.0'	60/60	100%	8.5/60	14%

ATH/MEG-US33-18.70/00.00 STRUCTURE FOUNDATION EXPLORATION

B-042-0-23

Run #:	Depth		Recovery (in)		RQD (in)	
NQ2-3	40.0'	45.0'	60/60	100%	18/60	30%

ATH/MEG-US33-18.70/00.00 STRUCTURE FOUNDATION EXPLORATION

SHEET - | TOTAL -
SUBSET 25 | TOTAL 82
PROJECT ID 119141
SM 11-06-24 REVIEWER
N.K.S DESIGNER
DESIGN AGENCY

GEOTECHNICAL PROFILE - ROADWAY
ROCK CORE PHOTOS FOR B-042-0-23

MODEL: Sheet PAPERSIZE: 11x17 (in.) DATE: 06-11-2024 TIME: 21:16:50 USER: ACAD
D:\Dept 05\COL\23050059COL\West Section\Mod_30.10.24\Working\119141ZL003.dgn

PROJECT: ATH-US 33-18.70 | TYPE: BRIDGE | PID: 119141 | SFN: 0500315 | START: 1/4/24 | END: 1/4/24
DRILLING FIRM / OPERATOR: CTL / H. BROWN | SAMPLING FIRM / LOGGER: CTL / H. BROWN | DRILLING METHOD: 3.25" HSA | SAMPLING METHOD:
DRILL RIG: MOBILE B-57 TRACK | HAMMER: MOBILE AUTOMATIC | CALIBRATION DATE: 5/3/23 | ENERGY RATIO (%): 76.8
STATION / OFFSET: 1022+17, 127' RT. | ALIGNMENT: US 33 | ELEVATION: 970.3 (MSL) | EOB: 14.0 ft. | LAT / LONG: 39.272233, -82.091568
EXPLORATION ID: B-042-0A-23 | PAGE 1 OF 1

MATERIAL DESCRIPTION AND NOTES	ELEV. 970.3	DEPTHS	SPT/RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GR	CS	FS	SI	CL	LL	PL	PI	WC	ODOT CLASS (GI)	HOLE SEALED
Auger down to 7.0'	963.3	0–7																
RED, **CLAY**, SOME SILT, TRACE SAND, TRACE GRAVEL, MOIST	961.3	7–9			67	ST-1	-	1	2	3	34	60	60	26	34	32	A-7-6 (20)	
	958.3	9–12																
BROWN, **SILT AND CLAY**, TRACE SAND, TRACE GRAVEL, MOIST	956.3	12–14 EOB			83	ST-2	-	2	0	6	55	37	37	23	14	23	A-6a (10)	

NOTES: NONE
ABANDONMENT METHODS, MATERIALS, QUANTITIES: TREMIED BENTONITE GROUT

PROJECT: ATH-US 33-18.70 | TYPE: BRIDGE | PID: 119141 | SFN: 0500315 | START: 1/5/24 | END: 1/5/24
DRILLING FIRM / OPERATOR: CTL / H. BROWN | SAMPLING FIRM / LOGGER: CTL / H. BROWN | DRILLING METHOD: 3.25" HSA / NQ2 | SAMPLING METHOD: SPT / NQ2
DRILL RIG: MOBILE B-57 TRACK | HAMMER: MOBILE AUTOMATIC | CALIBRATION DATE: 5/3/23 | ENERGY RATIO (%): 76.8
STATION / OFFSET: 1021+77, 13' RT. | ALIGNMENT: US 33 | ELEVATION: 969.3 (MSL) | EOB: 30.0 ft. | LAT / LONG: 39.272560, -82.091494
EXPLORATION ID: B-044-0-23 | PAGE 1 OF 1

MATERIAL DESCRIPTION AND NOTES	ELEV. 969.3	DEPTHS	SPT/RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GR	CS	FS	SI	CL	LL	PL	PI	WC	ODOT CLASS (GI)	HOLE SEALED
TOPSOIL (6")	968.8																	
HARD, BROWN, **SILT AND CLAY**, LITTLE SAND, TRACE GRAVEL, DAMP	965.8	1–2.5	9 9 10	24	100	SS-1	4.25	1	7	4	60	28	40	27	13	15	A-6a (9)	
CLAYSTONE, BROWN, SEVERELY WEATHERED.		TR; 3.5–5	12 14 17	40	100	SS-2	4.50	-	-	-	-	-	-	-	-	10	Rock (V)	
		6–7.5	22 27 33	77	100	SS-3	-	-	-	-	-	-	-	-	-	8	Rock (V)	
		8.5–10	20 27 38	83	100	SS-4	-	-	-	-	-	-	-	-	-	7	Rock (V)	
		11–12.5	22 26 30	72	100	SS-5	-	-	-	-	-	-	-	-	-	9	Rock (V)	
	954.3	13.5–15	35 36 41	99	100	SS-6	-	-	-	-	-	-	-	-	-	7	Rock (V)	
CLAYSTONE, GRAY, SEVERELY TO MODERATELY WEATHERED, VERY WEAK; RQD 37%, REC 100%.		15–20	48		100	NQ2-1											CORE	
@20.0'; MODERATELY WEATHERED.		20–25	37		100	NQ2-2											CORE	
@24.5'-25.0'; UCS = 130 PSI @25.0'; GRAY AND RED.	939.3	25–30 EOB	27		100	NQ2-3											CORE	

NOTES: CAVED AT 11'
ABANDONMENT METHODS, MATERIALS, QUANTITIES: TREMIED BENTONITE GROUT

GEOTECHNICAL PROFILE - ROADWAY
BORING LOG FOR B-042-0A-23 & B-044-0-23

DESIGN AGENCY: CTL ENGINEERING INC. 2860 FISHER ROAD COLUMBUS, OHIO 43204 PHONE:(614)276-8123 FAX:(614)276-6377
DESIGNER: N.K.S
REVIEWER: SM 11-06-24
PROJECT ID: 119141
SUBSET 26 TOTAL 82
SHEET * TOTAL -

B-044-0-23

Run #:	Depth		Recovery (in)		RQD (in)	
NQ2-1	15.0'	20.0'	60/60	100%	29/60	48%
NQ2-2	20.0'	25.0'	60/60	100%	22/60	37%

ATH/MEG-US33-18.70/00.00 STRUCTURE FOUNDATION EXPLORATION

STANDARD ODOT SOIL BORING LOG (8.5 X 11) - OH DOT GDT - 9/11/24 15:01 - O:\PROJECT\2023\COL-05\23050059COL_ATH MEG-033-18-70 00-00_HNTB OHIO INC\REPORTS\LAB REPORTS\MAST

PROJECT: ATH-US 33-18.70 | DRILLING FIRM / OPERATOR: CTL / H. BROWN | DRILL RIG: MOBILE B-57 TRACK | STATION / OFFSET: 1021+17, 121' LT. | EXPLORATION ID B-045-0-23
TYPE: BRIDGE | SAMPLING FIRM / LOGGER: CTL / H. BROWN | HAMMER: MOBILE AUTOMATIC | ALIGNMENT: US 33 | PAGE 1 OF 1
PID: 119141 SFN: 0500315 | DRILLING METHOD: 3.25" HSA / NQ2 | CALIBRATION DATE: 5/3/23 | ELEVATION: 973.6 (MSL) EOB: 25.0 ft.
START: 1/3/24 END: 1/3/24 | SAMPLING METHOD: SPT / NQ2 | ENERGY RATIO (%): 76.8 | LAT / LONG: 39.272961, -82.091449

MATERIAL DESCRIPTION AND NOTES	ELEV. 973.6	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	HOLE SEALED
TOPSOIL (4")	973.3																	
VERY STIFF, BROWN, **SILT AND CLAY**, SOME SAND, LITTLE GRAVEL, DAMP	970.1		4 4 3	9	100	SS-1	2.50	13	11	18	39	19	38	24	14	18	A-6a (6)	
SANDSTONE, BROWN, HIGHLY WEATHERED.		TR	20 26 32	74	100	SS-2	-	-	-	-	-	-	-	-	-	8	Rock (V)	
			30 37 38	96	100	SS-3	-	-	-	-	-	-	-	-	-	7	Rock (V)	
@10.0'; AUGER REFUSAL ENCOUNTERED	963.6		40 46 49	122	100	SS-4	-	-	-	-	-	-	-	-	-	8	Rock (V)	
SANDSTONE, BROWN, SLIGHTLY TO MODERATELY WEATHERED, SLIGHTLY STRONG; RQD 68%, REC 100%. @10.0'-10.5'; UCS = 2,210 PSI	960.3		45		100	NQ2-1											CORE	
SHALE, GRAY, MODERATELY WEATHERED, WEAK; RQD 35%, REC 100%.			38		100	NQ2-2											CORE	
@20.0'; SLIGHTLY WEATHERED, SLIGHTLY STRONG.	948.6	EOB	43		100	NQ2-3											CORE	

NOTES: CAVED AT 17'
ABANDONMENT METHODS, MATERIALS, QUANTITIES: TREMIED BENTONITE GROUT

SHEET	TOTAL	SUBSET	TOTAL	PROJECT ID	REVIEWER	DESIGNER	DESIGN AGENCY
-	-	27	82	119141	SM 11-06-24	N.K.S	CTL ENGINEERING INC

GEOTECHNICAL PROFILE - ROADWAY
ROCK CORE PHOTO FOR B-044-0-23 & BORING LOG FOR B-045-0-23

B-045-0-23

Run #:	Depth		Recovery (in)		RQD (in)	
NQ2-1	10.0'	15.0'	60/60	100%	27/60	45%
NQ2-2	15.0'	20.0'	60/60	100%	23/60	38%

ATH/MEG-US33-18.70/00.00 STRUCTURE FOUNDATION EXPLORATION

B-045-0-23

Run #:	Depth		Recovery (in)		RQD (in)	
NQ2-3	20.0'	25.0'	60/60	100%	26/60	43%

ATH/MEG-US33-18.70/00.00 STRUCTURE FOUNDATION EXPLORATION

GEOTECHNICAL PROFILE - ROADWAY
ROCK CORE PHOTO FOR B-045-0-23

'ATH-US 33-18.70

MODEL: Sheet PAPERSIZE: 11x17 (in.) DATE: 06-11-2024 TIME: 21:19:52 USER: ACAD
D:\Dept 05\COL\23050059COL\West Section\Mod_30.10.24\Working\119141ZL006.dgn

STANDARD ODOT SOIL BORING LOG (8.5 X 11) - OH DOT.GDT - 9/11/24 15:01 - O:\PROJECT\2023\COL-05\23050059COL_ATH MEG-033-18-70 00-00_HNTB OHIO INC\REPORTS\LAB REPORTS\MAS

PROJECT: ATH-US 33-18.70	DRILLING FIRM / OPERATOR: CTL / H. BROWN	DRILL RIG: MOBILE B-57 TRACK	STATION / OFFSET: 1158+55, 109' RT.
TYPE: BRIDGE	SAMPLING FIRM / LOGGER: CTL / H. BROWN	HAMMER: MOBILE AUTOMATIC	ALIGNMENT: US 33
PID: 119141 SFN: 0500317	DRILLING METHOD: 3.25" HSA / NQ2	CALIBRATION DATE: 5/3/23	ELEVATION: 897.6 (MSL) EOB: 30.0 ft.
START: 1/10/24 END: 1/10/24	SAMPLING METHOD: SPT / NQ2	ENERGY RATIO (%): 76.8	LAT / LONG: 39.238327, -82.075024

EXPLORATION ID B-047-0-23 — PAGE 1 OF 1

MATERIAL DESCRIPTION AND NOTES	ELEV. 897.6	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GR	CS	FS	SI	CL	LL	PL	PI	WC	ODOT CLASS (GI)	HOLE SEALED
TOPSOIL (3")	897.4																	
GRAVEL (6")	896.9																	
VERY STIFF, BROWN, **SILT AND CLAY**, SOME SAND, TRACE GRAVEL, (FILL), DAMP	894.6	1–3	5 5 4	12	100	SS-1	3.25	6	6	16	40	32	35	21	14	20	A-6a (9)	
MEDIUM DENSE, BROWN, **COARSE AND FINE SAND**, LITTLE SILT, LITTLE CLAY, (FILL), DAMP	892.1	3–5	5 6 6	15	100	SS-2	3.00	0	2	65	20	13	NP	NP	NP	13	A-3a (0)	
VERY STIFF, BROWN, **SILT AND CLAY**, TRACE SAND, DAMP		6–7	8 10 10	26	100	SS-3	3.00	0	3	7	69	21	34	21	13	14	A-6a (9)	
		9–10	9 9 11	26	83	SS-4	3.25	-	-	-	-	-	-	-	-	18	A-6a (V)	
@11.0'; CONTAINS ROCK FRAGMENTS	884.1	11–13	15 16 20	46	100	SS-5	4.00	-	-	-	-	-	-	-	-	15	A-6a (V)	
SANDSTONE, BROWN, SEVERELY WEATHERED.	882.6	13.6 TR; 14	44 45 50/4"	-	19	SS-6	3.50	-	-	-	-	-	-	-	-	14	Rock (V)	
SANDSTONE, BROWN, SLIGHTLY WEATHERED, SLIGHTLY STRONG; RQD 38%, REC 100%.	880.6	15–17																
SHALE, BROWN, MODERATELY WEATHERED, VERY WEAK; RQD 33%, REC 100%.	875.7	15–20	23		100	NQ2-1											CORE	
CLAYSTONE, RED, HIGHLY WEATHERED, VERY WEAK; RQD 70%, REC 100%.		20–25	58		100	NQ2-2											CORE	
@24.2'-24.7'; UCS = 100 PSI																		
@25.2'-25.7'; UCS = 110 PSI	867.6	25–30 EOB	80		100	NQ2-3											CORE	

NOTES: CAVED AT 10'

ABANDONMENT METHODS, MATERIALS, QUANTITIES: TREMIED BENTONITE GROUT

CTL ENGINEERING INC.

B-047-0-23

Run #:	Depth		Recovery (in)		RQD (in)	
NQ2-1	15.0'	20.0'	60/60	100%	13.5/60	23%
NQ2-2	125.0'	30.0'	60/60	100%	35/60	58%

ATH/MEG-US33-18.70/00.00 STRUCTURE FOUNDATION EXPLORATION

GEOTECHNICAL PROFILE - ROADWAY
BORING LOG & ROCK CORE PHOTO FOR B-047-0-23

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

DESIGNER: N.K.S

REVIEWER: SM 11-06-24

PROJECT ID: 119141

SUBSET 29 TOTAL 82

SHEET • TOTAL -

B-047-0-23

Run #:	Depth		Recovery (in)		RQD (in)	
NQ2-3	25.0'	30.0'	60/60	100%	48/60	80%

ATH/MEG-US33-18.70/00.00 STRUCTURE FOUNDATION EXPLORATION

STANDARD ODOT SOIL BORING LOG (8.5 X 11) - OH DOT GDT - 9/11/24 15:01 - O:\PROJECT\2023\COL-05\23050059COL_ATH MEG-033-18-70 00-00_HNTB OHIO INC\REPORTS\LAB REPORTS\MAST

PROJECT: ATH-US 33-18.70	DRILLING FIRM / OPERATOR: CTL / H. BROWN	DRILL RIG: MOBILE B-57 TRACK	STATION / OFFSET: 1158+55, 109' RT.	EXPLORATION ID B-047-0A-23
TYPE: BRIDGE	SAMPLING FIRM / LOGGER: CTL / H. BROWN	HAMMER: MOBILE AUTOMATIC	ALIGNMENT: US 33	
PID: 119141 SFN: 0500317	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 5/3/23	ELEVATION: 897.6 (MSL) EOB: 9.0 ft.	PAGE 1 OF 1
START: 1/10/24 END: 1/10/24	SAMPLING METHOD: SPT	ENERGY RATIO (%): 76.8	LAT / LONG: 39.238327, -82.075024	

MATERIAL DESCRIPTION AND NOTES	ELEV. 897.6	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	HOLE SEALED
Auger down to 1.0'		1 2 3			100	ST-1	-	3	3	25	45	24	29	18	11	21	A-6a (7)	
	892.6	4 5																
BROWN, **SILT AND CLAY**, SOME SAND, TRACE GRAVEL, MOIST	890.6	6 7																
BROWN, **CLAY**, "AND" SILT, TRACE SAND, MOIST	888.6	8 EOB 9			100	ST-2	-	0	1	9	46	44	42	21	21	24	A-7-6 (13)	

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: TREMIED BENTONITE GROUT

SHEET	SUBSET	PROJECT ID	REVIEWER	DESIGNER	DESIGN AGENCY
- TOTAL	30 TOTAL 82	119141	SM 11-06-24	N.K.S	CTL ENGINEERING INC

GEOTECHNICAL PROFILE - ROADWAY
ROCK CORE PHOTO FOR B-047-0-23 CONTINUED & BORING LOG FOR B-047-0A-23

MODEL: Sheet PAPERSIZE: 11x17 (in.) DATE: 06-11-2024 TIME: 21:21:25 USER: ACAD
D:\Dept 05\COL\23050059COL\West Section\Mod_30.10.24\Working\119141ZL008.dgn

STANDARD ODOT SOIL BORING LOG (8.5 X 11) - OH DOT GDT - 9/11/24 15:01 - O:\PROJECT\2023\COL-05\23050059COL_ATH MEG-033-18-70 00-00_HNTB OHIO INC\REPORTS\LAB REPORTS\MAS1

PROJECT: ATH-US 33-18.70 | DRILLING FIRM / OPERATOR: CTL / H. BROWN | DRILL RIG: MOBILE B-57 TRACK | STATION / OFFSET: 1158+83, 8' RT. | EXPLORATION ID B-048-0-23
TYPE: BRIDGE | SAMPLING FIRM / LOGGER: CTL / H. BROWN | HAMMER: MOBILE AUTOMATIC | ALIGNMENT: US 33
PID: 119141 SFN: 0500317 | DRILLING METHOD: 3.25" HSA / NQ2 | CALIBRATION DATE: 5/3/23 | ELEVATION: 899.0 (MSL) EOB: 40.0 ft. | PAGE 1 OF 2
START: 1/10/24 END: 1/10/24 | SAMPLING METHOD: SPT / NQ2 | ENERGY RATIO (%): 76.8 | LAT / LONG: 39.238366, -82.074658

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	HOLE SEALED
TOPSOIL (6")	899.0																	
MEDIUM DENSE, BROWN, **SANDY SILT**, LITTLE CLAY, TRACE GRAVEL, DAMP	898.5		5 6 5	14	100	SS-1	1.75	4	4	56	23	13	NP	NP	NP	12	A-4a (0)	
			8 8 10	23	100	SS-2	3.00	-	-	-	-	-	-	-	-	17		
@6.0'; NO GRAVEL			8 8 9	22	100	SS-3	3.50	0	3	61	21	15	NP	NP	NP	13	A-4a (0)	
			9 9 8	22	100	SS-4	4.00	0	2	54	25	19	NP	NP	NP	6	A-4a (2)	
	888.5																	
VERY STIFF, RED AND BROWN, **CLAY**, "AND" SILT, LITTLE SAND, DAMP			12 12 16	36	100	SS-5	4.00	0	1	10	39	50	47	22	25	21	A-7-6 (15)	
@13.5'; HARD			14 14 12	33	100	SS-6	4.25	-	-	-	-	-	-	-	-	21	A-7-6 (V)	
	883.0	TR																
CLAYSTONE, RED, HIGHLY WEATHERED, VERY WEAK.			15 16 20	46	100	SS-7	-	0	4	1	67	28	41	26	15	15	Rock (V)	
			20 22 25	60	100	SS-8	4.00	-	-	-	-	-	-	-	-	19	Rock (V)	
			30 35 40	96	100	SS-9	4.00	-	-	-	-	-	-	-	-	15	Rock (V)	
	874.0		40 44 45	114	100	SS-10	4.00	-	-	-	-	-	-	-	-	15	Rock (V)	
CLAYSTONE, RED, SLIGHTLY TO MODERATELY WEATHERED, VERY WEAK; RQD 44%, REC 100%.																		
			42		100	NQ2-1											CORE	
@29.1'-29.8'; UCS = 110 PSI																		

STANDARD ODOT SOIL BORING LOG (8.5 X 11) - OH DOT GDT - 9/11/24 15:01 - O:\PROJECT\2023\COL-05\23050059COL_ATH MEG-033-18-70 00-00_HNTB OHIO INC\REPORTS\LAB REPORTS\MAS1

PID: 119141 | SFN: | PROJECT: ATH-US 33-18.70 | STATION / OFFSET: 1158+83, 8' RT. | START: 1/10/24 | END: 1/10/24 | PG 2 OF 2 | B-048-0-23

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	HOLE SEALED
CLAYSTONE, RED, SLIGHTLY TO MODERATELY WEATHERED, VERY WEAK; RQD 44%, REC 100%. *(continued)*	869.0																	
			65		100	NQ2-2											CORE	
	865.7																	
SANDSTONE, GRAY, SLIGHTLY TO MODERATELY WEATHERED, MODERATELY STRONG; RQD 100%, REC 100%. @34.4'-35.0'; UCS = 5,630 PSI	863.0																	
SHALE, GRAY, SLIGHTLY WEATHERED, SLIGHTLY STRONG; RQD 50%, REC 100%.	860.5		68		100	NQ2-3											CORE	
SANDSTONE, GRAY, SLIGHTLY WEATHERED, MODERATELY STRONG; RQD 78%, REC 100%.	859.0	EOB																

NOTES: CAVED AT 25'

ABANDONMENT METHODS, MATERIALS, QUANTITIES: TREMIED BENTONITE GROUT

SHEET	SUBSET	PROJECT ID	REVIEWER	DESIGNER	DESIGN AGENCY
- TOTAL	31 TOTAL 82	119141	SM 11-06-24	N.K.S.	CTL ENGINEERING, INC. 2860 FISHER ROAD COLUMBUS, OHIO 43204 PHONE 614.276.8123 FAX 614.276.6377

GEOTECHNICAL PROFILE - ROADWAY
BORING LOG FOR B-048-0-23

B-048-0-23

Run #:	Depth		Recovery (in)		RQD (in)	
NQ2-1	25.0'	30.0'	60/60	100%	25/60	42%
NQ2-2	30.0'	35.0'	60/60	100%	39/60	65%

ATH/MEG-US33-18.70/00.00 STRUCTURE FOUNDATION EXPLORATION

B-048-0-23

Run #:	Depth		Recovery (in)		RQD (in)	
NQ2-3	35.0'	40.0'	60/60	100%	41/60	68%

ATH/MEG-US33-18.70/00.00 STRUCTURE FOUNDATION EXPLORATION

GEOTECHNICAL PROFILE - ROADWAY
ROCK CORE PHOTO FOR B-048-0-23

DESIGN AGENCY
CTL ENGINEERING INC.
2860 FISHER ROAD
COLUMBUS, OHIO 43204
PHONE:(614)276-8123
FAX:(614)276-6377
DESIGNER
N.K.S
REVIEWER
SM 11-06-24

PROJECT ID
119141

ATH-US 33-18.70

MODEL: Sheet PAPERSIZE: 11x17 (in.) DATE: 06-11-2024 TIME: 21:26:55 USER: ACAD
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STANDARD ODOT SOIL BORING LOG (8.5 X 11) - OH DOT.GDT - 9/11/24 15:01 - O:\PROJECT\2023\COL-05\23050059COL_ATH MEG-033-18-70 00-00_HNTB OHIO INC\REPORTS\LAB REPORTS\MAS1

PROJECT: ATH-US 33-18.70	DRILLING FIRM / OPERATOR: CTL / H. BROWN	DRILL RIG: MOBILE B-57 TRACK	STATION / OFFSET: 1159+16, 96' LT.	EXPLORATION ID B-049-0-23	
TYPE: BRIDGE	SAMPLING FIRM / LOGGER: CTL / H. BROWN	HAMMER: MOBILE AUTOMATIC	ALIGNMENT: US 33		
PID: 119141 SFN: 0500317	DRILLING METHOD: 3.25" HSA / NQ2	CALIBRATION DATE: 5/3/23	ELEVATION: 896.6 (MSL) EOB: 45.0 ft.	PAGE 1 OF 2	
START: 1/10/24 END: 1/10/24	SAMPLING METHOD: SPT / NQ2	ENERGY RATIO (%): 76.8	LAT / LONG: 39.238397, -82.074276		

MATERIAL DESCRIPTION AND NOTES	ELEV. 896.6	DEPTHS
TOPSOIL (5")	896.2	
STIFF, BROWN, **SILTY CLAY**, SOME SAND, TRACE GRAVEL, CONTAINS ORGANICS, (FILL), DAMP @3.5'; VERY STIFF, DAMP	891.1	
MEDIUM DENSE, BROWN AND GRAY, **SANDY SILT**, LITTLE CLAY, TRACE GRAVEL, (FILL), DAMP	888.6	
VERY STIFF, BROWN AND GRAY, **SILT AND CLAY**, TRACE SAND, TRACE GRAVEL, DAMP @11.0'; MOIST	883.6	
VERY STIFF, BROWN, **SILTY CLAY**, LITTLE SAND, MOIST @18.5'; HARD, BROWN AND RED, DAMP	875.6	TR (21)
CLAYSTONE, BROWN AND GRAY, SEVERELY WEATHERED.	866.6	

DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GR	CS	FS	SI	CL	LL	PL	PI	WC	ODOT CLASS (GI)	HOLE SEALED
1–2	7 7 9	20	100	SS-1	1.50	-	-	-	-	-	-	-	-	20	A-6b (V)	
3.5–5	8 8 7	19	100	SS-2	3.50	2	9	23	33	33	36	20	16	19	A-6b (9)	
6–7.5	7 7 6	17	100	SS-3	4.00	1	1	62	21	15	NP	NP	NP	18	A-4a (0)	
8.5–10	5 5 6	14	100	SS-4	3.25	-	-	-	-	-	-	-	-	20	A-6a (V)	
11–12.5	5 5 7	15	100	SS-5	2.50	1	1	7	56	35	35	20	15	23	A-6a (10)	
13.5–15	6 6 5	14	100	SS-6	2.50	0	1	10	47	42	39	21	18	23	A-6b (11)	
16–17.5	7 6 8	18	100	SS-7	2.75	-	-	-	-	-	-	-	-	22	A-6b (V)	
18.5–20	12 12 13	32	100	SS-8	4.50	-	-	-	-	-	-	-	-	16	A-6b (V)	
21–22.5	13 15 18	42	100	SS-9	4.50	-	-	-	-	-	-	-	-	12	Rock (V)	
23.5–25	14 15 19	44	100	SS-10	4.50	-	-	-	-	-	-	-	-	14	Rock (V)	
26–27.5	22 26 31	73	100	SS-11	4.00	-	-	-	-	-	-	-	-	14	Rock (V)	
28.5–29.3	34 42 50/4"	-	100	SS-12	4.00	-	-	-	-	-	-	-	-	7	Rock (V)	

STANDARD ODOT SOIL BORING LOG (8.5 X 11) - OH DOT.GDT - 9/11/24 15:01 - O:\PROJECT\2023\COL-05\23050059COL_ATH MEG-033-18-70 00-00_HNTB OHIO INC\REPORTS\LAB REPORTS\MAS1

PID: 119141	SFN:	PROJECT: ATH-US 33-18.70	STATION / OFFSET: 1159+16, 96' LT.	START: 1/10/24	END: 1/10/24	PG 2 OF 2	B-049-0-23

MATERIAL DESCRIPTION AND NOTES	ELEV. 866.6	DEPTHS
CLAYSTONE, RED AND GRAY, MODERATELY TO SEVERELY WEATHERED, VERY WEAK; RQD 40%, REC 100%.	864.1	
SHALE, GRAY, SLIGHTLY TO MODERATELY WEATHERED, MODERATELY STRONG; RQD 57%, REC 100%. @32.9'-33.4'; UCS = 5,590 PSI @38.3'-38.8'; UCS = 4,490 PSI	851.6	EOB (45)

DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GR	CS	FS	SI	CL	LL	PL	PI	WC	ODOT CLASS (GI)	HOLE SEALED
30–35	35		100	NQ2-1											CORE	
35–40	53		100	NQ2-2											CORE	
40–45	73		100	NQ2-3											CORE	

NOTES: CAVED AT 28'

ABANDONMENT METHODS, MATERIALS, QUANTITIES: TREMIED BENTONITE GROUT

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

DESIGNER: N.K.S

REVIEWER: SM 11-06-24

PROJECT ID: 119141

SUBSET 33 TOTAL 82

SHEET • TOTAL -

GEOTECHNICAL PROFILE - ROADWAY
BORING LOG FOR B-049-0-23

ATH-US 33-18.70

MODEL: Sheet PAPERSIZE: 11x17 (in.) DATE: 06-11-2024 TIME: 21:28:00 USER: ACAD
D:\Dept 05\COL\23050059COL\West Section\Mod_30.10.24\Working\119141ZL011.dgn

B-049-0-23

Run #:	Depth		Recovery (in)		RQD (in)	
NQ2-1	30.0'	35.0'	60/60	100%	21/60	35%
NQ2-2	35.0'	40.0'	60/60	100%	32/60	53%

ATH/MEG-US33-18.70/00.00 STRUCTURE FOUNDATION EXPLORATION

B-049-0-23

Run #:	Depth		Recovery (in)		RQD (in)	
NQ2-3	40.0'	45.0'	60/60	100%	44/60	73%

ATH/MEG-US33-18.70/00.00 STRUCTURE FOUNDATION EXPLORATION

GEOTECHNICAL PROFILE - ROADWAY
ROCK CORE PHOTO FOR B-049-0-23

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

DESIGNER: N.K.S
REVIEWER: SM 11-06-24
PROJECT ID: 119141
SUBSET 34 TOTAL 82
SHEET • TOTAL -

STANDARD ODOT SOIL BORING LOG (8.5 X 11) - OH DOT.GDT - 9/11/24 15:01 - O:\PROJECT\2023\COL-05\23050059COL_ATH MEG-033-18.70 00-00_HNTB OHIO INC\REPORTS\LAB REPORTS\MAS

PROJECT: ATH-US 33-18.70 | TYPE: BRIDGE | PID: 119141 | SFN: 0500317 | START: 1/10/24 | END: 1/10/24

DRILLING FIRM / OPERATOR: CTL / H. BROWN | SAMPLING FIRM / LOGGER: CTL / H. BROWN | DRILLING METHOD: 3.25" HSA | SAMPLING METHOD: SPT

DRILL RIG: MOBILE B-57 TRACK | HAMMER: MOBILE AUTOMATIC | CALIBRATION DATE: 5/3/23 | ENERGY RATIO (%): 76.8

STATION / OFFSET: 1159+16, 96' LT. | ALIGNMENT: US 33 | ELEVATION: 676.8 (MSL) | EOB: 17.0 ft. | LAT / LONG: 39.238397, -82.074276

EXPLORATION ID: B-049-0A-23 | PAGE 1 OF 1

MATERIAL DESCRIPTION AND NOTES	ELEV. 676.8	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GR	CS	FS	SI	CL	LL	PL	PI	WC	ODOT CLASS (GI)	HOLE SEALED
Auger down to 1.0'	675.8	0–1																
BROWN, **SANDY SILT**, LITTLE CLAY, MOIST	673.8	1–3			100	ST-1	-	1	1	31	49	18	NP	NP	NP	16	A-4a (6)	
	671.8	3–5																
BROWN AND GRAY, **SANDY SILT**, LITTLE CLAY, MOIST	669.8	5–7			42	ST-2	-	0	1	45	37	17	NP	NP	NP	24	A-4a (4)	
	661.8	7–15																
BROWN, **SILT AND CLAY**, "AND" SAND, TRACE GRAVEL, MOIST	659.8	15–17 (EOB)			8	ST-3	-	1	2	43	21	33	32	19	13	22	A-6a (5)	

GRADATION (%): GR, CS, FS, SI, CL. ATTERBERG: LL, PL, PI.

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: TREMIED BENTONITE GROUT

GEOTECHNICAL PROFILE - ROADWAY
BORING LOG FOR B-049-0A-23

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

DESIGNER: N.K.S
REVIEWER: SM 11-06-24
PROJECT ID: 119141
SUBSET: 35 TOTAL: 82
SHEET: • TOTAL: -

DCP TEST DATA

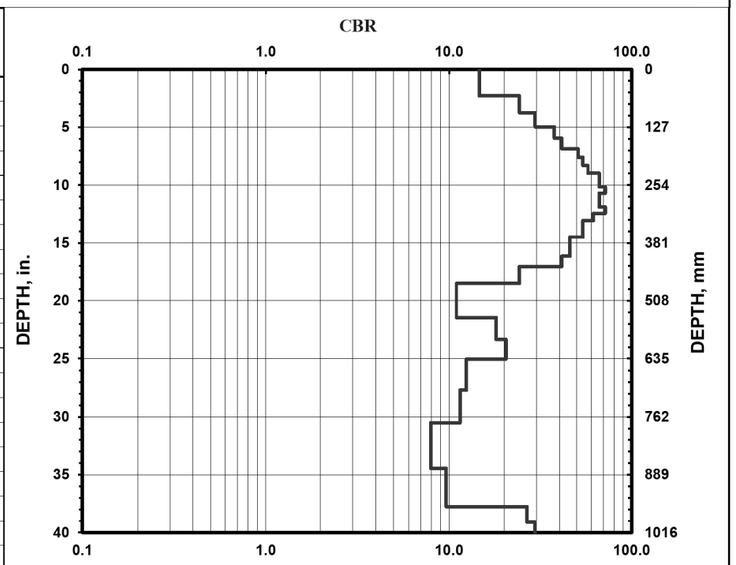
Project:	ATH/MEG-33-18.70/0.00	**PID:**	119141
Exploration ID:	D-001-0-23	**Date:**	6/12/2023
Elevation:	969.9	**Surface Materials:**	1" Topsoil
Lat / Long:	39.272523, -82.091384	**Test Starting Depth (ft):**	0.0

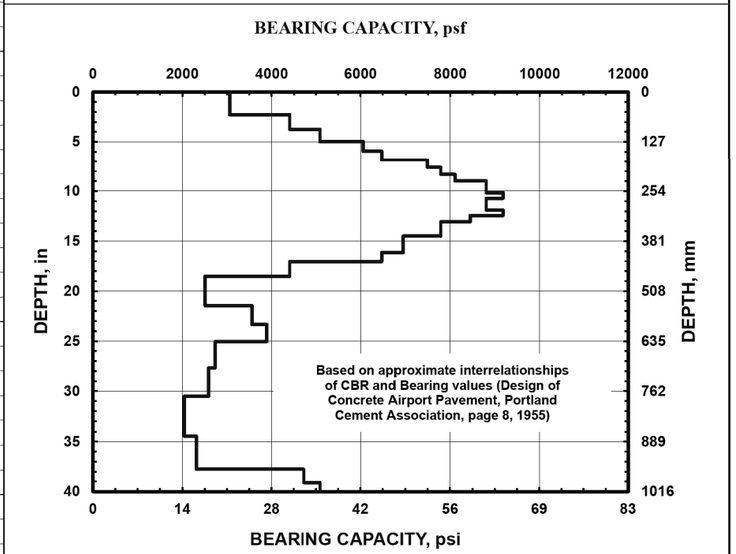
Hammer: ○ 10.1 lbs. ◉ 17.6 lbs. ○ Both hammers used

Office of Geotechnical Engineering
Geology, Exploration, and Laboratory Section
http://www.dot.state.oh.us/Divisions/Engineering/Geotechnical

Soil Type: ○ CH ○ CL ◉ All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	1
4	58	1
4	95	1
4	126	1
4	151	1
4	174	1
4	193	1
4	211	1
4	228	1
4	243	1
4	258	1
4	272	1
4	287	1
4	302	1
4	316	1
4	332	1
4	350	1
4	368	1
4	389	1
4	410	1
4	433	1
4	470	1
4	545	1
4	593	1
4	636	1
4	703	1
4	775	1
4	875	1
4	959	1
4	993	1
4	1024	1
4	1056	1
4	1082	1
4	1117	1





NOTES: Latitude/Longitude from Juniper Geode GNS3 receiver utilizing the ODOT VRS network. Elevation from USGS 3DEP map service.

HAND AUGER EXPLORATION LOG

PROJECT: ATH-33-18.70
TYPE: ROADWAY
PID: 119141 SFN:
START: 6/13/23 END: 6/13/23
LOGGER: ODOT / KERINS
EQUIPMENT:
STATION / OFFSET:
ALIGNMENT: CL US 33
ELEVATION: 969.9 (ft)
LAT / LONG: 39.272523, -82.091384
EXPLORATION ID D-001-0-23
PAGE 1 OF 1

ELEV. FT msl	DEPTH FT	HP (tsf)	MATERIAL DESCRIPTION AND NOTES	SAMPLE ID	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)
969.8			TOPSOIL (1")											
	1	-	GRAY, **GRAVEL WITH SAND, SILT, AND CLAY**, DAMP	AS-1	11	40	20	12	17	34	22	12	7	A-2-6 (0)
	2	-	@1.5'; BROWN	AS-2	16	35	17	13	18	34	23	11	10	A-2-6 (0)
966.9	3													

NOTES: LAT/LONG FROM OGE HANDHELD GPS UNIT. ELEV FROM USGS 3DEP MAP SERVICE. HOLE DRY UPON COMPLETION.
ABANDONMENT METHODS, MATERIALS, QUANTITIES: NOT RECORDED

STANDARD ODOT HAND AUGER LOG (8.5 X 11) - OH DOT.GDT - 7/19/23 14:00 - X:\GINT\PROJECTS\601072.GPJ

GEOTECHNICAL PROFILE - ROADWAY
DCP SOUNDING LOG FOR D-001-0-23

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

DESIGNER N.K.S
REVIEWER SM 11-06-24
PROJECT ID 119141
SUBSET 36 TOTAL 82
SHEET * TOTAL -

ATH-US 33-18.70

MODEL: Sheet PAPERSIZE: 17x11 (in.) DATE: 06-11-2024 TIME: 17:13:33 USER: ACAD
D:\Dept 05\COL\23050059COL\West Section\Mod_30.10.24\Working\119141D003.dgn

DCP TEST DATA

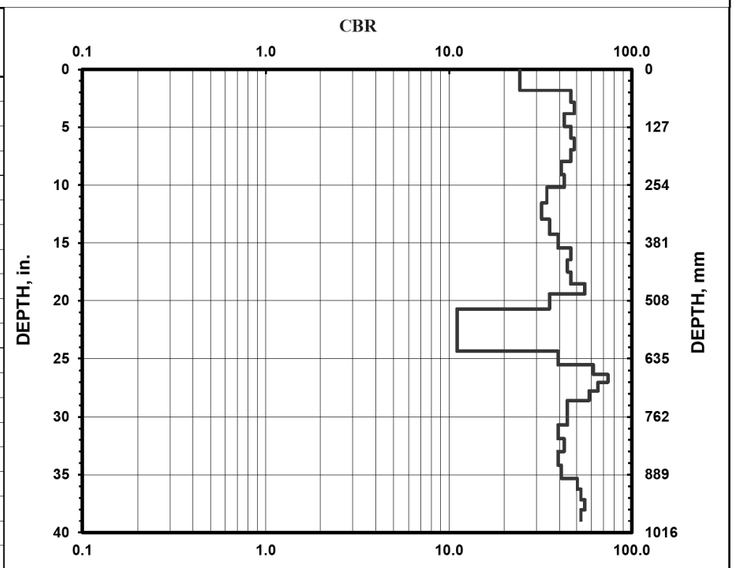
Project:	ATH/MEG-33-18.70/0.00	**PID:**	119141
Exploration ID:	D-002-0-23	**Date:**	6/12/2023
Elevation:	946.7	**Surface Materials:**	1" Topsoil
Lat / Long:	39.268965, -82.085923	**Test Starting Depth (ft):**	0.0

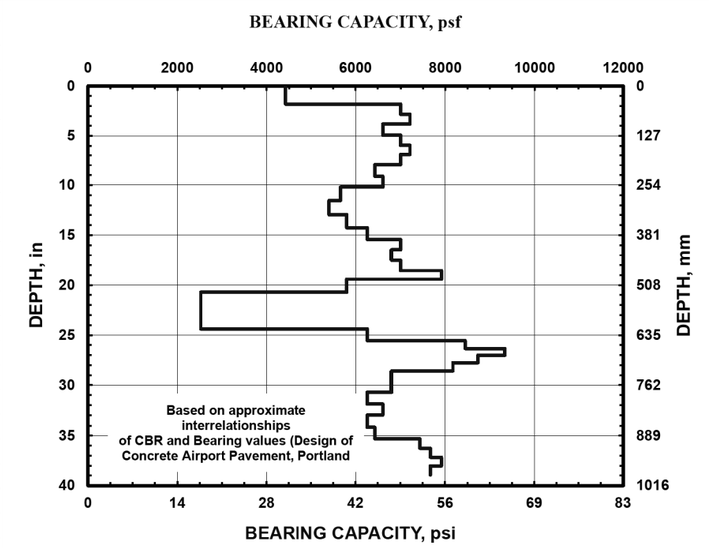
Hammer
- ○ 10.1 lbs.
- ◉ 17.6 lbs.
- ○ Both hammers used

Office of Geotechnical Engineering
Geology, Exploration, and Laboratory Section
http://www.dot.state.oh.us/Divisions/Engineering/Geotechnical

Soil Type
- ○ CH
- ○ CL
- ◉ All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	1
5	46	1
5	72	1
5	97	1
5	125	1
5	151	1
5	176	1
5	202	1
5	231	1
5	259	1
5	293	1
5	329	1
5	362	1
5	392	1
5	418	1
5	445	1
5	471	1
5	493	1
5	526	1
5	619	1
5	649	1
5	669	1
5	686	1
5	705	1
5	726	1
5	753	1
5	780	1
5	810	1
5	838	1
5	868	1
5	897	1
5	921	1
5	944	1
5	966	1
5	989	1





NOTES: Latitude/Longitude from Juniper Geode GNS3 receiver utilizing the ODOT VRS network. Elevation from USGS 3DEP map service.

GEOTECHNICAL PROFILE - ROADWAY
DCP SOUNDING LOG FOR D-002-0-23

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

DESIGNER N.K.S
REVIEWER SM 11-06-24
PROJECT ID 119141
SUBSET 37 TOTAL 82
SHEET A TOTAL -

ATH-US 33-18.70

MODEL: Sheet PAPERSIZE: 17x11 (in.) DATE: 06-11-2024 TIME: 17:15:14 USER: ACAD
D:\Dept 05\COL\23050059COL\West Section\Mod_30.10.24\Working\119141ID004.dgn

DCP TEST DATA

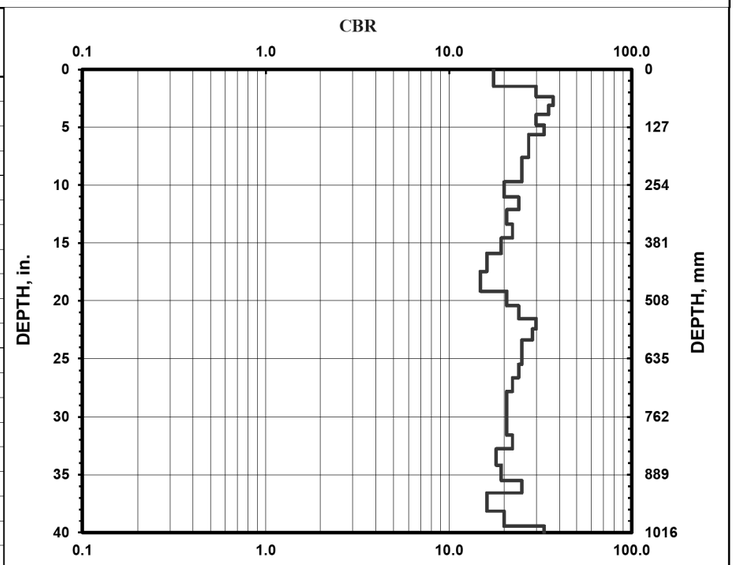
Project:	ATH/MEG-33-18.70/0.00	**PID:**	119141
Exploration ID:	D-003-0-23	**Date:**	6/12/2023
Elevation:	925.5	**Surface Materials:**	1" Topsoil
Lat / Long:	39.266005, -82.084563	**Test Starting Depth (ft):**	0.0

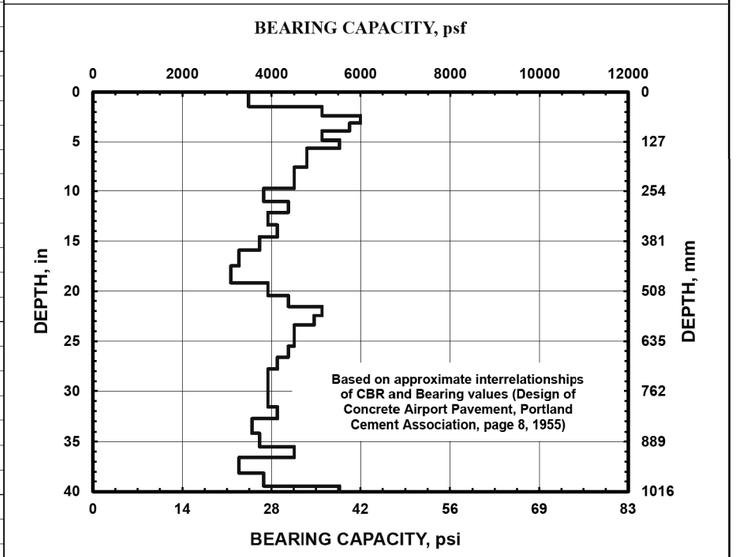
Hammer
- ○ 10.1 lbs.
- ◉ 17.6 lbs.
- ○ Both hammers used

Office of Geotechnical Engineering
Geology, Exploration, and Laboratory Section
http://www.dot.state.oh.us/Divisions/Engineering/Geotechnical

Soil Type
- ○ CH
- ○ CL
- ◉ All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	1
3	37	1
3	60	1
3	79	1
3	99	1
3	122	1
3	143	1
3	168	1
3	193	1
3	220	1
3	247	1
3	280	1
3	308	1
3	340	1
3	370	1
3	404	1
3	444	1
3	487	1
3	519	1
3	547	1
3	570	1
3	594	1
3	621	1
3	648	1
3	676	1
3	706	1
3	738	1
3	770	1
3	802	1
3	832	1
3	868	1
3	902	1
3	929	1
3	969	1
3	1002	1
3	1023	1
3	1049	1
3	1063	1





NOTES: Latitude/Longitude from Juniper Geode GNS3 receiver utilizing the ODOT VRS network. Elevation from USGS 3DEP map service.

HAND AUGER EXPLORATION LOG

PROJECT: ATH-33-18.70
TYPE: ROADWAY
PID: 119141 SFN:
START: 6/12/23 END: 6/12/23
LOGGER: ODOT / KERINS
EQUIPMENT:
STATION / OFFSET:
ALIGNMENT: CL US 33
ELEVATION: 925.5 (ft)
LAT / LONG: 39.266005, -82.084563
EXPLORATION ID D-003-0-23
PAGE 1 OF 1

ELEV. FT msl	DEPTH FT	HP (tsf)	MATERIAL DESCRIPTION AND NOTES	SAMPLE ID	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)
925.4			TOPSOIL (1")											
	1	-	BROWN, **SILTY CLAY**, LITTLE SAND, TRACE GRAVEL AND STONE FRAGMENTS, DAMP	AS-1	6	5	13	28	48	38	20	18	11	A-6b (11)
	2	-	@1.2'; REDDISH BROWN, TRACE SAND, NO GRAVEL AND STONE FRAGMENTS	AS-2	0	2	7	31	60	40	23	17	17	A-6b (11)
922.5	3													

NOTES: LAT/LONG FROM OGE HANDHELD GPS UNIT. ELEV FROM USGS 3DEP MAP SERVICE. HOLE DRY UPON COMPLETION.
ABANDONMENT METHODS, MATERIALS, QUANTITIES: NOT RECORDED

STANDARD ODOT HAND AUGER LOG (8.5 X 11) - OH DOT.GDT - 7/19/23 14:00 - X:\GINT\PROJECTS\601072.GPJ

GEOTECHNICAL PROFILE - ROADWAY
DCP SOUNDING LOG FOR D-003-0-23

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

DESIGNER N.K.S
REVIEWER SM 11-06-24
PROJECT ID 119141
SUBSET 38 TOTAL 82
SHEET * TOTAL -

ATH-US 33-18.70

MODEL: Sheet PAPERSIZE: 17x11 (in.) DATE: 06-11-2024 TIME: 17:16:16 USER: ACAD
D:\Dept 05\COL\2305009COL\West Section\Mod_30.10.24\Working\119141D005.dgn

DCP TEST DATA

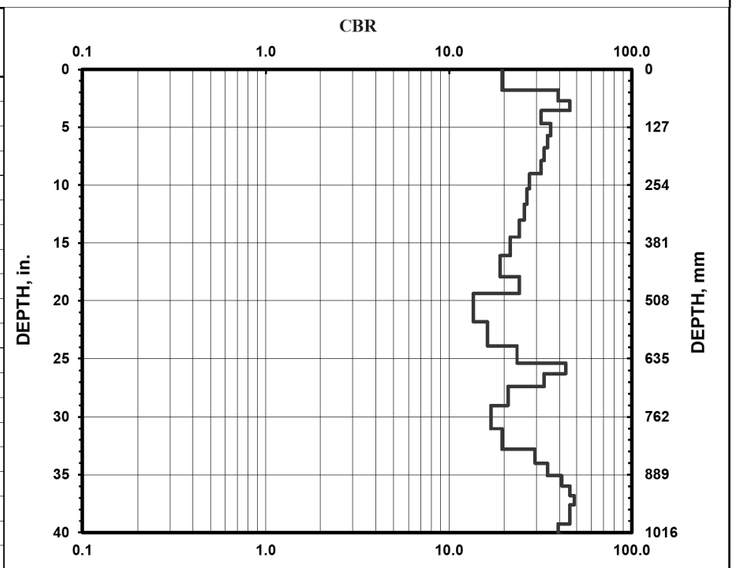
Project:	ATH/MEG-33-18.70/0.00	**PID:**	119141
Exploration ID:	D-004-0-23	**Date:**	6/12/2023
Elevation:	922.3	**Surface Materials:**	1" Topsoil
Lat / Long:	39.263334, -82.083946	**Test Starting Depth (ft):**	0.0

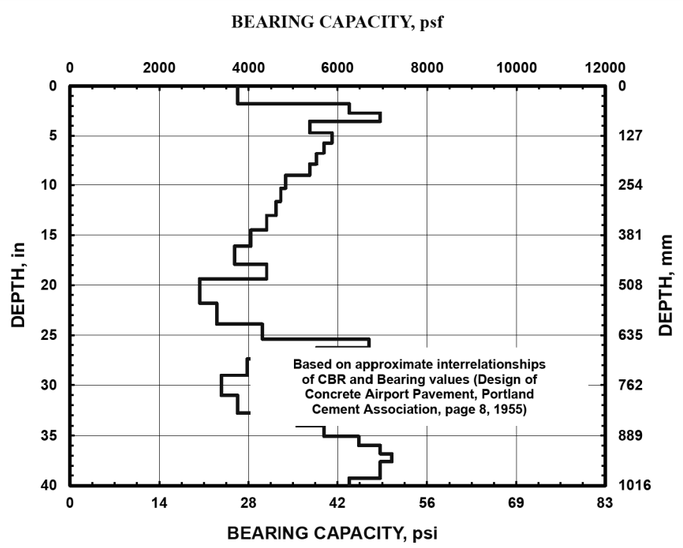
Hammer
- ○ 10.1 lbs.
- ◉ 17.6 lbs.
- ○ Both hammers used

Office of Geotechnical Engineering
Geology, Exploration, and Laboratory Section
http://www.dot.state.oh.us/Divisions/Engineering/Geotechnical

Soil Type
- ○ CH
- ○ CL
- ◉ All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	1
4	45	1
4	69	1
4	90	1
4	119	1
4	145	1
4	172	1
4	200	1
4	229	1
4	262	1
4	296	1
4	331	1
4	368	1
4	409	1
4	455	1
4	492	1
4	554	1
4	607	1
4	645	1
4	667	1
4	695	1
4	737	1
4	788	1
4	833	1
4	864	1
4	891	1
4	914	1
4	935	1
4	955	1
4	976	1
4	997	1
4	1021	1
4	1044	1
4	1072	1
4	1104	1





NOTES: Latitude/Longitude from Juniper Geode GNS3 receiver utilizing the ODOT VRS network. Elevation from USGS 3DEP map service.

GEOTECHNICAL PROFILE - ROADWAY
DCP SOUNDING LOG FOR D-004-0-23

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

DESIGNER N.K.S
REVIEWER SM 11-06-24
PROJECT ID 119141
SUBSET 39 TOTAL 82
SHEET A TOTAL -

ATH-US 33-18.70

MODEL: Sheet PAPERSIZE: 17x11 (in.) DATE: 06-11-2024 TIME: 17:17:18 USER: ACAD
D:\Dept 05\COL\23050059COL\West Section\Mod_30.10.24\Working\119141ID006.dgn

DCP TEST DATA

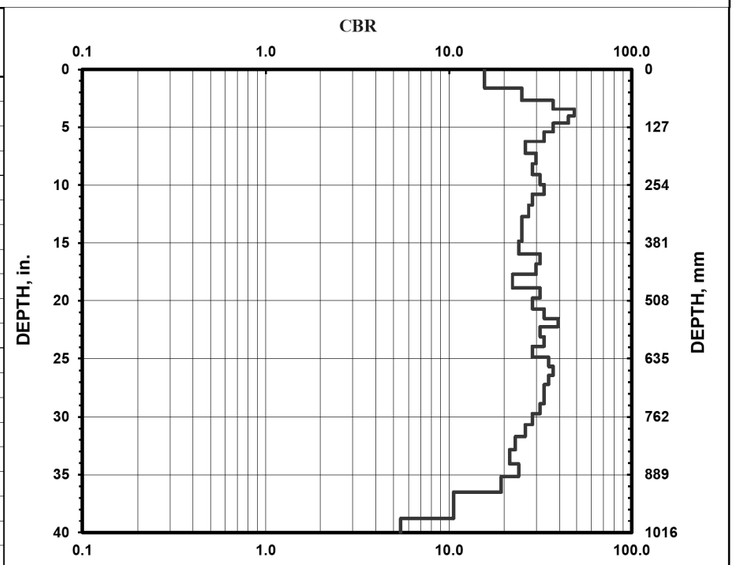
Project:	ATH/MEG-33-18.70/0.00	**PID:**	119141
Exploration ID:	D-005-0-23	**Date:**	6/12/2023
Elevation:	932.0	**Surface Materials:**	1" Topsoil
Lat / Long:	39.260685, -82.083311	**Test Starting Depth (ft):**	0.0

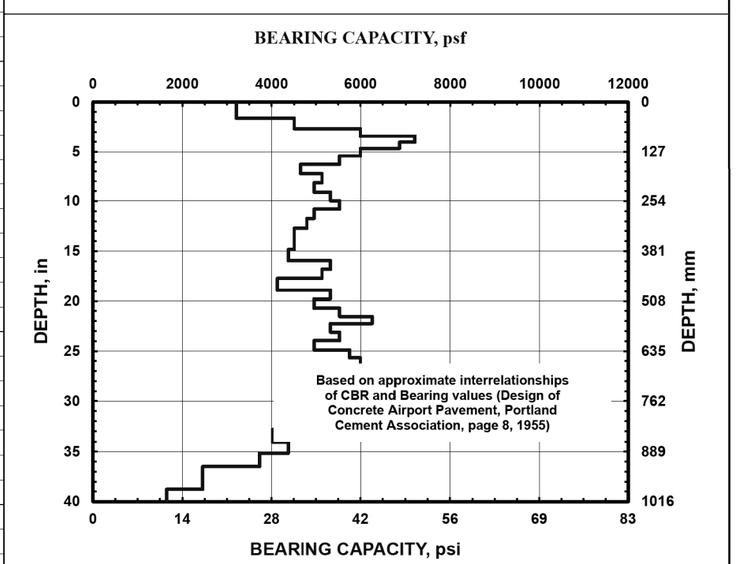
Hammer
- ○ 10.1 lbs.
- ◉ 17.6 lbs.
- ○ Both hammers used

Office of Geotechnical Engineering
Geology, Exploration, and Laboratory Section
http://www.dot.state.oh.us/Divisions/Engineering/Geotechnical

Soil Type
- ○ CH
- ○ CL
- ◉ All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	1
3	41	1
3	68	1
3	87	1
3	102	1
3	118	1
3	137	1
3	158	1
3	184	1
3	207	1
3	231	1
3	253	1
3	274	1
3	298	1
3	323	1
3	350	1
3	377	1
3	405	1
3	427	1
3	450	1
3	480	1
3	502	1
3	526	1
3	547	1
3	565	1
3	587	1
3	608	1
3	632	1
3	652	1
3	671	1
3	691	1
3	712	1
3	733	1
3	755	1
3	779	1
3	805	1
3	834	1
3	865	1
3	893	1
3	927	1
3	985	1
3	1090	1





NOTES: Latitude/Longitude from Juniper Geode GNS3 receiver utilizing the ODOT VRS network. Elevation from USGS 3DEP map service.

HAND AUGER EXPLORATION LOG

PROJECT: ATH-33-18.70
TYPE: ROADWAY
PID: 119141 SFN:
START: 6/12/23 END: 6/12/23
LOGGER: ODOT / KERINS
EQUIPMENT:
STATION / OFFSET:
ALIGNMENT: CL US 33
ELEVATION: 932.0 (ft)
LAT / LONG: 39.260685, -82.083311
EXPLORATION ID D-005-0-23
PAGE 1 OF 1

ELEV. FT msl	DEPTH FT	HP (tsf)	MATERIAL DESCRIPTION AND NOTES	SAMPLE ID	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)
931.9			TOPSOIL (1")											
	1	-	BROWN, **SILT AND CLAY**, SOME GRAVEL, LITTLE SAND, DAMP	AS-1	21	4	9	29	37	36	24	12	9	A-6a (7)
930.0	2		GRAY, **SANDY SILT**, SOME CLAY, SOME GRAVEL, DAMP											
		-		AS-2	20	8	11	31	30	31	21	10	8	A-4a (5)
929.0	3													

NOTES: LAT/LONG FROM OGE HANDHELD GPS UNIT. ELEV FROM USGS 3DEP MAP SERVICE. HOLE DRY UPON COMPLETION.
ABANDONMENT METHODS, MATERIALS, QUANTITIES: NOT RECORDED

STANDARD ODOT HAND AUGER LOG (8.5 X 11) - OH DOT.GDT - 7/19/23 14:00 - X:\GINT\PROJECTS\601072.GPJ

GEOTECHNICAL PROFILE - ROADWAY
DCP SOUNDING LOG FOR D-005-0-23

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

DESIGNER N.K.S
REVIEWER SM 11-06-24
PROJECT ID 119141
SUBSET 40 TOTAL 82
SHEET * TOTAL -

ATH-US 33-18.70

MODEL: Sheet PAPERSIZE: 17x11 (in.) DATE: 06-11-2024 TIME: 21:31:18 USER: ACAD
D:\Dept 05\COL\23050059COL\West Section\Mod_30.10.24\Working\119141D007.dgn

DCP TEST DATA

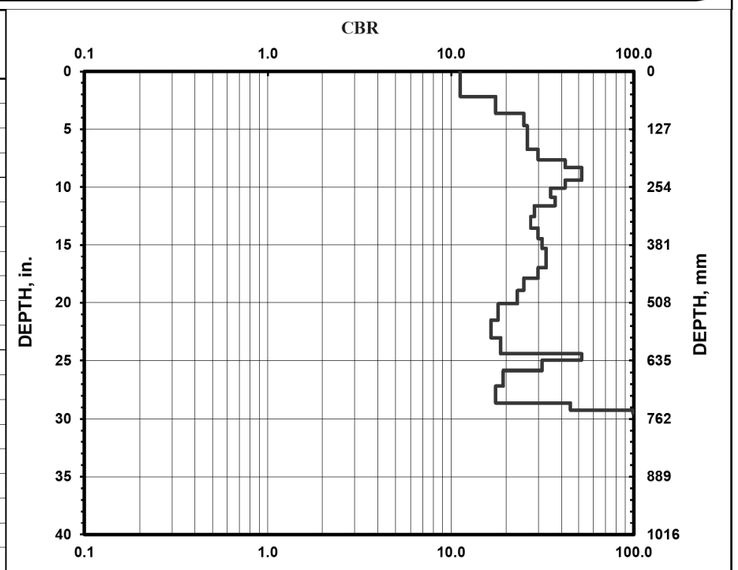
Project:	ATH/MEG-33-18.70/0.00	**PID:**	119141
Exploration ID:	D-006-0-23	**Date:**	6/12/2023
Elevation:	945.9	**Surface Materials:**	1" Topsoil
Lat / Long:	39.255383, -82.082021	**Test Starting Depth (ft):**	0.0

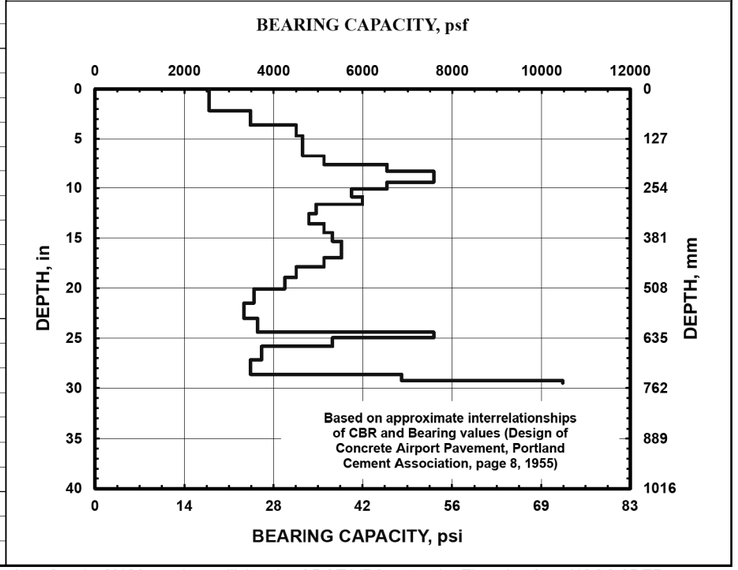
Hammer
- ○ 10.1 lbs.
- ◉ 17.6 lbs.
- ○ Both hammers used

Office of Geotechnical Engineering
Geology, Exploration, and Laboratory Section
http://www.dot.state.oh.us/Divisions/Engineering/Geotechnical

Soil Type
- ○ CH
- ○ CL
- ◉ All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	1
3	55	1
3	92	1
3	119	1
3	145	1
3	171	1
3	194	1
3	211	1
3	225	1
3	239	1
3	256	1
3	276	1
3	295	1
3	319	1
3	344	1
3	367	1
3	389	1
3	410	1
3	431	1
3	454	1
3	481	1
3	510	1
3	546	1
3	585	1
3	620	1
3	634	1
3	656	1
3	690	1
3	727	1
3	743	1
3	749	1





NOTES: Latitude/Longitude from Juniper Geode GNS3 receiver utilizing the ODOT VRS network. Elevation from USGS 3DEP map service. Sounding terminated at refusal.

GEOTECHNICAL PROFILE - ROADWAY
DCP SOUNDING LOG FOR D-006-0-23

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

DESIGNER N.K.S
REVIEWER SM 11-06-24
PROJECT ID 119141
SUBSET 41 TOTAL 82
SHEET A TOTAL -

ATH-US 33-18.70

MODEL: Sheet PAPERSIZE: 17x11 (in.) DATE: 06-11-2024 TIME: 17:21:11 USER: ACAD
D:\Dept 05\COL\2305005 9COL\West Section\Mod_30.10.24\Working\119141ID008.dgn

DCP TEST DATA

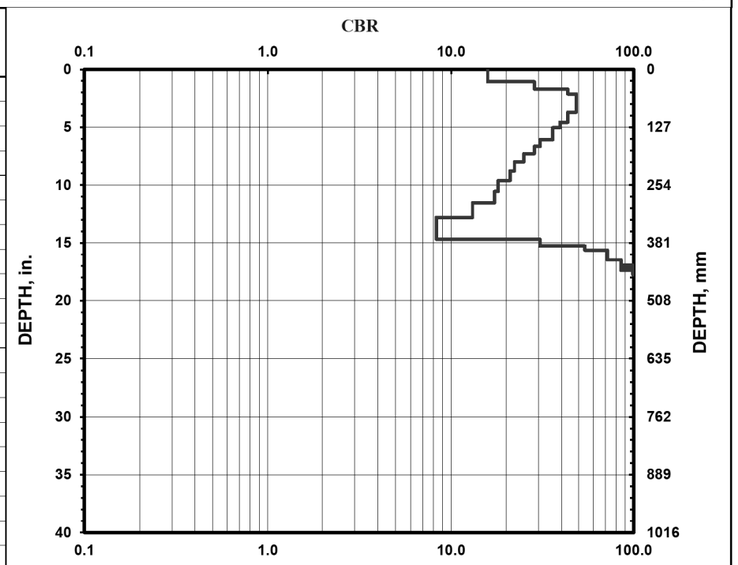
Project:	ATH/MEG-33-18.70/0.00	**PID:**	119141
Exploration ID:	D-007-0-23	**Date:**	6/12/2023
Elevation:	934.8	**Surface Materials:**	1" Topsoil
Lat / Long:	39.252797, -82.081079	**Test Starting Depth (ft):**	0.0

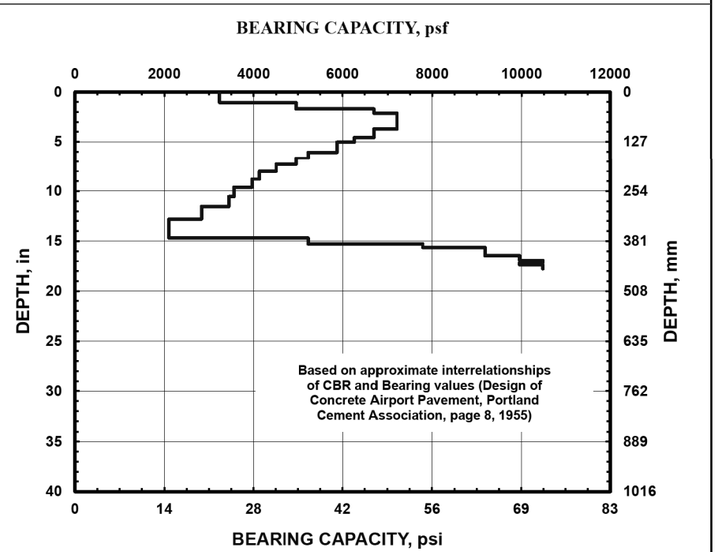
Hammer
- ○ 10.1 lbs.
- ◉ 17.6 lbs.
- ○ Both hammers used

Office of Geotechnical Engineering
Geology, Exploration, and Laboratory Section
http://www.dot.state.oh.us/Divisions/Engineering/Geotechnical

Soil Type
- ○ CH
- ○ CL
- ◉ All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	1
2	27	1
2	43	1
2	54	1
2	64	1
2	74	1
2	84	1
2	94	1
2	105	1
2	116	1
2	128	1
2	141	1
2	154	1
2	169	1
2	185	1
2	203	1
2	223	1
2	244	1
2	268	1
2	293	1
2	325	1
2	373	1
2	388	1
2	397	1
2	404	1
2	411	1
2	418	1
2	424	1
2	430	1
2	435	1
2	441	1
2	446	1
2	451	1





NOTES: Latitude/Longitude from Juniper Geode GNS3 receiver utilizing the ODOT VRS network. Elevation from USGS 3DEP map service. Sounding terminated at refusal.

HAND AUGER EXPLORATION LOG

PROJECT: ATH-33-18.70
TYPE: ROADWAY
PID: 119141 SFN:
START: 6/12/23 END: 6/12/23
LOGGER: ODOT / KERINS
EQUIPMENT:
STATION / OFFSET:
ALIGNMENT: CL US 33
ELEVATION: 934.8 (ft)
LAT / LONG: 39.252797, -82.081079
EXPLORATION ID D-007-0-23
PAGE 1 OF 1

ELEV. FT msl	DEPTH FT	HP (tsf)	MATERIAL DESCRIPTION AND NOTES	SAMPLE ID	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)
934.7			TOPSOIL (1")											
		-	BROWN, **SILT AND CLAY**, SOME SAND, LITTLE GRAVEL, DAMP	AS-1	12	5	24	23	36	30	18	12	11	A-6a (6)
933.3	1													

NOTES: LAT/LONG FROM OGE HANDHELD GPS UNIT. ELEV FROM USGS 3DEP MAP SERVICE. HOLE DRY UPON COMPLETION.
ABANDONMENT METHODS, MATERIALS, QUANTITIES: NOT RECORDED

STANDARD ODOT HAND AUGER LOG (8.5 X 11) - OH DOT.GDT - 7/19/23 14:00 - X:\GINT\PROJECTS\601072.GPJ

GEOTECHNICAL PROFILE - ROADWAY
DCP SOUNDING LOG FOR D-007-0-23

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

DESIGNER N.K.S
REVIEWER SM 11-06-24
PROJECT ID 119141
SUBSET 42 TOTAL 82
SHEET * TOTAL -

ATH-US 33-18.70

MODEL: Sheet PAPERSIZE: 17x11 (in.) DATE: 06-11-2024 TIME: 17:22:27 USER: ACAD
D:\Dept 05\COL\23050059COL\West Section\Mod_30.10.24\Working\119141D0009.dgn

DCP TEST DATA

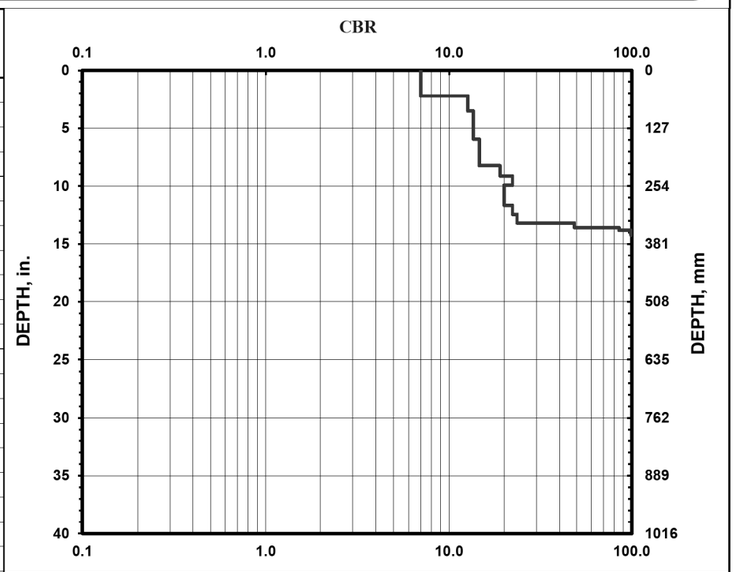
Project:	ATH/MEG-33-18.70/0.00	**PID:**	119141
Exploration ID:	D-008-0-23	**Date:**	6/12/2023
Elevation:	914.5	**Surface Materials:**	1" Topsoil
Lat / Long:	39.250232, -82.079961	**Test Starting Depth (ft):**	0.0

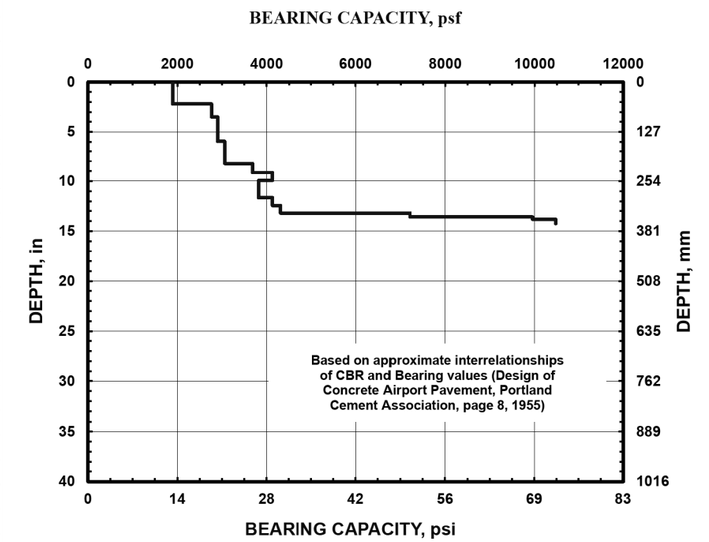
Hammer
- ○ 10.1 lbs.
- ◉ 17.6 lbs.
- ○ Both hammers used

Office of Geotechnical Engineering
Geology, Exploration, and Laboratory Section
http://www.dot.state.oh.us/Divisions/Engineering/Geotechnical

Soil Type
- ○ CH
- ○ CL
- ◉ All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	1
2	56	1
2	89	1
2	120	1
2	151	1
2	180	1
2	209	1
2	232	1
2	252	1
2	274	1
2	296	1
2	316	1
2	335	1
2	345	1
2	351	1
2	354	1
2	357	1
2	360	1
2	362	1





NOTES: Latitude/Longitude from Juniper Geode GNS3 receiver utilizing the ODOT VRS network. Elevation from USGS 3DEP map service. Sounding terminated at refusal.

GEOTECHNICAL PROFILE - ROADWAY
DCP SOUNDING LOG FOR D-008-0-23

DESIGN AGENCY
GTL ENGINEERING
2960 FISHER ROAD
COLUMBUS, OHIO 43204
PHONE:(614)276-8123
FAX:(614)276-8377

DESIGNER: N.K.S
REVIEWER: SM 11-06-24
PROJECT ID: 119141
SUBSET: 43 TOTAL: 82
SHEET: A TOTAL: -

ATH-US 33-18.70

MODEL: Sheet PAPERSIZE: 17x11 (in.) DATE: 06-11-2024 TIME: 17:26:22 USER: ACAD
D:\Dept 05\COL\2305005\9COL\West Section\Mod_30.10.24\Working\11914ID010.dgn

DCP TEST DATA

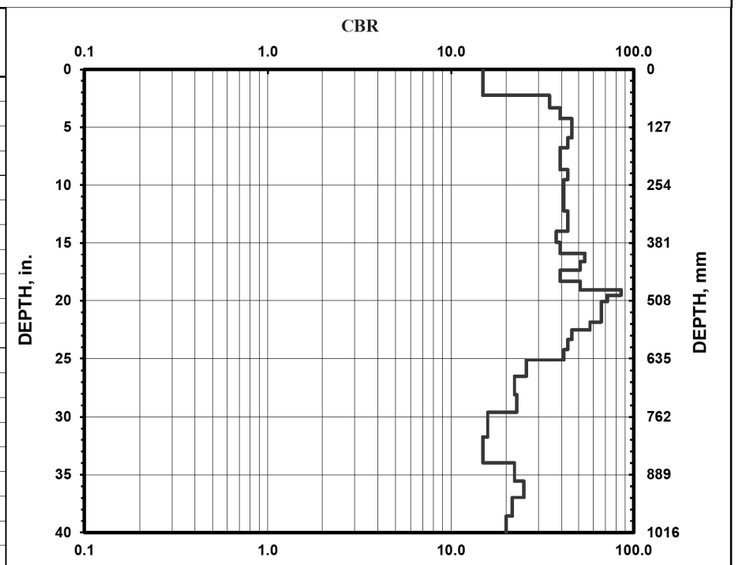
Project:	ATH/MEG-33-18.70/0.00	**PID:**	119141
Exploration ID:	D-009-0-23	**Date:**	6/12/2023
Elevation:	879.7	**Surface Materials:**	1" Topsoil
Lat / Long:	39.245549, -82.077853	**Test Starting Depth (ft):**	0.0

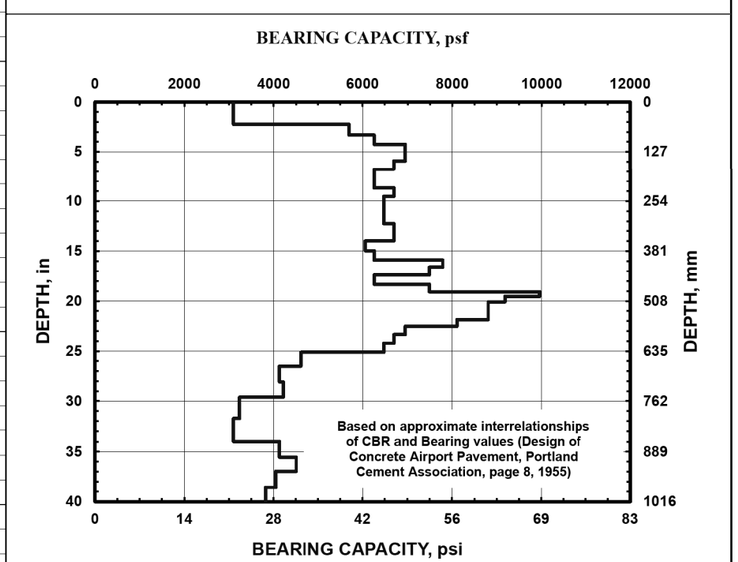
Hammer
- ○ 10.1 lbs.
- ◉ 17.6 lbs.
- ○ Both hammers used

Office of Geotechnical Engineering
Geology, Exploration, and Laboratory Section
http://www.dot.state.oh.us/Divisions/Engineering/Geotechnical

Soil Type
- ○ CH
- ○ CL
- ◉ All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	1
4	57	1
4	84	1
4	108	1
4	129	1
4	150	1
4	172	1
4	196	1
4	220	1
4	242	1
4	265	1
4	288	1
4	311	1
4	333	1
4	355	1
4	380	1
4	404	1
4	422	1
4	441	1
4	465	1
4	484	1
4	496	1
4	510	1
4	525	1
4	540	1
4	555	1
4	572	1
4	593	1
4	615	1
4	638	1
4	673	1
4	713	1
4	752	1
4	806	1
4	863	1
4	903	1
4	939	1
4	980	1
4	1024	1





NOTES: Latitude/Longitude from Juniper Geode GNS3 receiver utilizing the ODOT VRS network. Elevation from USGS 3DEP map service.

HAND AUGER EXPLORATION LOG

PROJECT: ATH-33-18.70
TYPE: ROADWAY
PID: 119141 SFN:
START: 6/12/23 END: 6/12/23
LOGGER: ODOT / KERINS
EQUIPMENT:
STATION / OFFSET:
ALIGNMENT: CL US 33
ELEVATION: 879.7 (ft)
LAT / LONG: 39.245549, -82.077853
EXPLORATION ID D-009-0-23
PAGE 1 OF 1

ELEV. FT msl	DEPTH FT	HP (tsf)	MATERIAL DESCRIPTION AND NOTES	SAMPLE ID	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)
879.6			TOPSOIL (1")											
	1	-	BROWN, **SILT AND CLAY**, SOME SAND, LITTLE GRAVEL, DAMP	AS-1	15	5	16	28	36	32	19	13	9	A-6a (7)
877.4	2													

NOTES: LAT/LONG FROM OGE HANDHELD GPS UNIT. ELEV FROM USGS 3DEP MAP SERVICE. HOLE DRY UPON COMPLETION.
ABANDONMENT METHODS, MATERIALS, QUANTITIES: NOT RECORDED

STANDARD ODOT HAND AUGER LOG (8.5 X 11) - OH DOT.GDT - 7/19/23 14:00 - X:\GINT\PROJECTS\601072.GPJ

GEOTECHNICAL PROFILE - ROADWAY
DCP SOUNDING LOG FOR D-009-0-23

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

DESIGNER N.K.S
REVIEWER SM 11-06-24
PROJECT ID 119141
SUBSET 44 TOTAL 82
SHEET * TOTAL -

ATH-US 33-18.70

MODEL: Sheet PAPERSIZE: 17x11 (in.) DATE: 06-11-2024 TIME: 17:27:25 USER: ACAD
D:\Dept 05\COL\23050059COL\West Section\Mod_30.10.24\Working\11914ID011.dgn

DCP TEST DATA

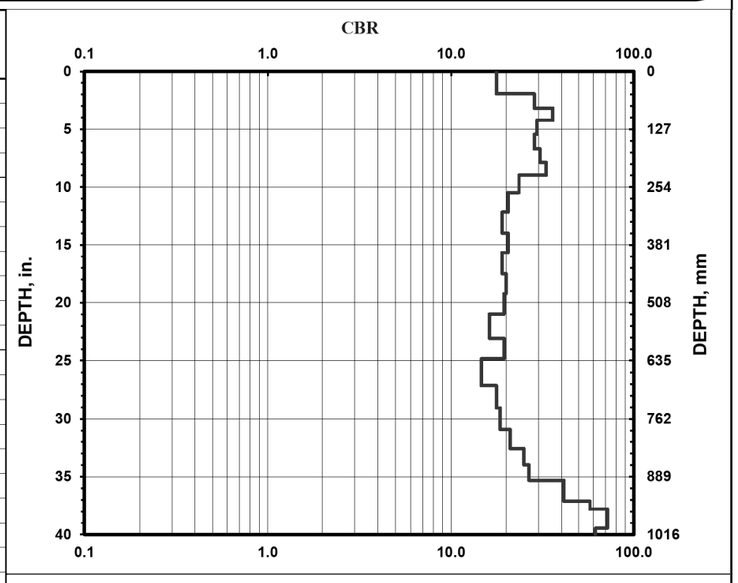
Project:	ATH/MEG-33-18.70/0.00	**PID:**	119141
Exploration ID:	D-010-0-23	**Date:**	6/12/2023
Elevation:	878.3	**Surface Materials:**	1" Topsoil
Lat / Long:	39.24342, -82.076918	**Test Starting Depth (ft):**	0.0

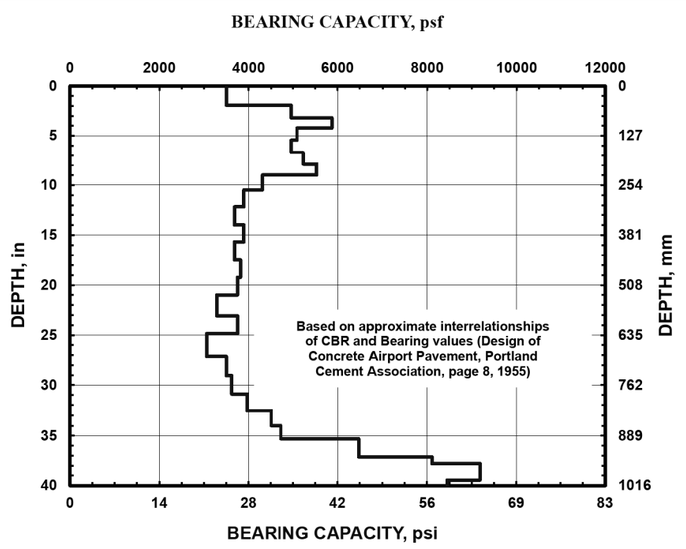
Hammer
- ○ 10.1 lbs.
- ◉ 17.6 lbs.
- ○ Both hammers used

Office of Geotechnical Engineering
Geology, Exploration, and Laboratory Section
http://www.dot.state.oh.us/Divisions/Engineering/Geotechnical

Soil Type
- ○ CH
- ○ CL
- ◉ All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	1
4	49	1
4	81	1
4	107	1
4	138	1
4	170	1
4	200	1
4	228	1
4	266	1
4	309	1
4	355	1
4	398	1
4	444	1
4	488	1
4	533	1
4	586	1
4	631	1
4	689	1
4	738	1
4	785	1
4	827	1
4	863	1
4	897	1
4	920	1
4	943	1
4	960	1
4	974	1
4	988	1
4	1002	1
4	1018	1
4	1034	1
4	1050	1
4	1067	1
4	1086	1





NOTES: Latitude/Longitude from Juniper Geode GNS3 receiver utilizing the ODOT VRS network. Elevation from USGS 3DEP map service.

GEOTECHNICAL PROFILE - ROADWAY
DCP SOUNDING LOG FOR D-010-0-23

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

DESIGNER N.K.S
REVIEWER SM 11-06-24
PROJECT ID 119141
SUBSET 45 TOTAL 82
SHEET A TOTAL -

ATH-US 33-18.70

MODEL: Sheet PAPERSIZE: 17x11 (in.) DATE: 06-11-2024 TIME: 17:28:27 USER: ACAD
D:\Dept 05\COL\23050059COL\West Section\Mod_30.10.24\Working\119141ID012.dgn

DCP TEST DATA

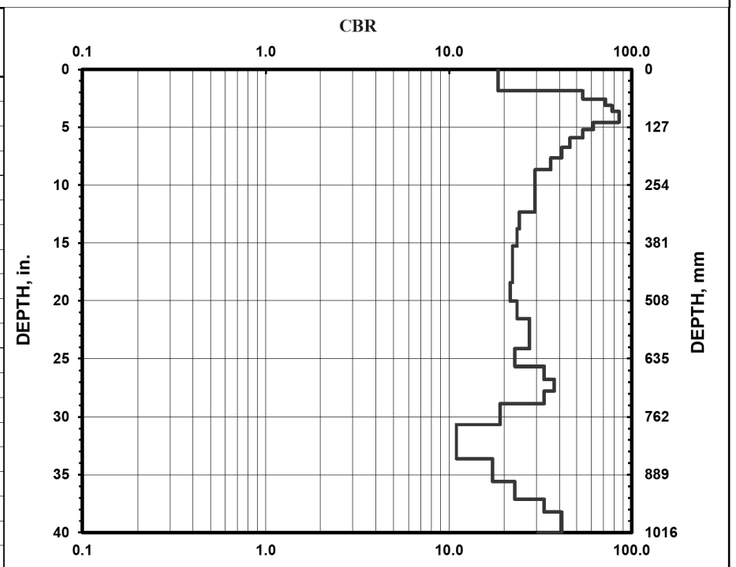
Project:	ATH/MEG-33-18.70/0.00	**PID:**	119141
Exploration ID:	D-011-0-23	**Date:**	6/12/2023
Elevation:	899.9	**Surface Materials:**	2" Topsoil
Lat / Long:	39.237917, -82.074378	**Test Starting Depth (ft):**	0.0

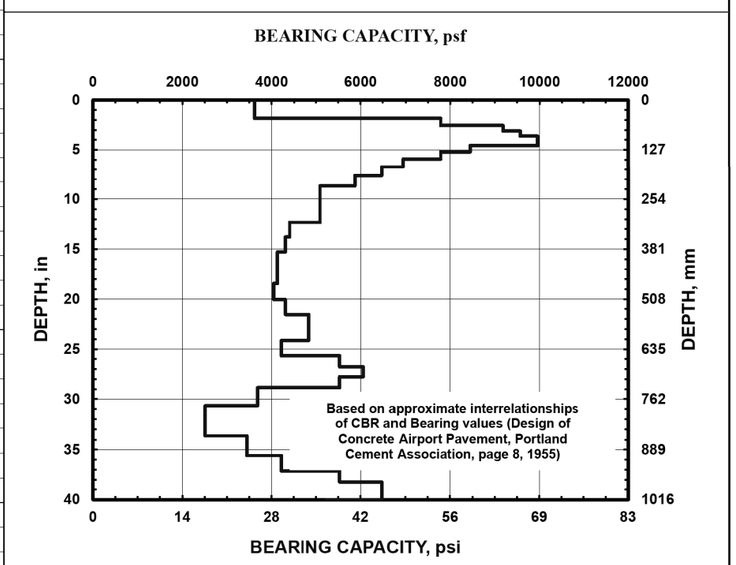
Hammer
- ○ 10.1 lbs.
- ◉ 17.6 lbs.
- ○ Both hammers used

Office of Geotechnical Engineering
Geology, Exploration, and Laboratory Section
http://www.dot.state.oh.us/Divisions/Engineering/Geotechnical

Soil Type
- ○ CH
- ○ CL
- ◉ All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	1
4	47	1
4	65	1
4	79	1
4	92	1
4	104	1
4	116	1
4	132	1
4	150	1
4	171	1
4	194	1
4	220	1
4	251	1
4	282	1
4	313	1
4	350	1
4	388	1
4	428	1
4	468	1
4	509	1
4	547	1
4	580	1
4	613	1
4	652	1
4	680	1
4	705	1
4	733	1
4	779	1
4	854	1
4	904	1
4	943	1
4	971	1
4	994	1
4	1017	1
4	1047	1
4	1076	1





NOTES: Latitude/Longitude from Juniper Geode GNS3 receiver utilizing the ODOT VRS network. Elevation from USGS 3DEP map service.

HAND AUGER EXPLORATION LOG

PROJECT: ATH-33-18.70
TYPE: ROADWAY
PID: 119141 SFN:
START: 6/12/23 END: 6/12/23
LOGGER: ODOT / KERINS
EQUIPMENT:
STATION / OFFSET:
ALIGNMENT: CL US 33
ELEVATION: 899.9 (ft)
LAT / LONG: 39.237917, -82.074378
EXPLORATION ID D-011-0-23
PAGE 1 OF 1

ELEV. FT msl	DEPTH FT	HP (tsf)	MATERIAL DESCRIPTION AND NOTES	SAMPLE ID	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)
899.7			TOPSOIL (2")											
	1		BROWN, **SANDY SILT**, SOME CLAY, SOME GRAVEL, DAMP											
		-		AS-1	21	15	17	21	26	29	19	10	8	A-4a (2)
	2													
896.9	3													

NOTES: LAT/LONG FROM OGE HANDHELD GPS UNIT. ELEV FROM USGS 3DEP MAP SERVICE. HOLE DRY UPON COMPLETION.
ABANDONMENT METHODS, MATERIALS, QUANTITIES: NOT RECORDED

STANDARD ODOT HAND AUGER LOG (8.5 X 11) - OH DOT.GDT - 7/19/23 14:00 - X:\GINT\PROJECTS\601072.GPJ

GEOTECHNICAL PROFILE - ROADWAY
DCP SOUNDING LOG FOR D-011-0-23

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

DESIGNER N.K.S
REVIEWER SM 11-06-24
PROJECT ID 119141
SUBSET 46 TOTAL 82
SHEET * TOTAL -

ATH-US 33-18.70

MODEL: Sheet PAPERSIZE: 17x11 (in.) DATE: 06-11-2024 TIME: 17:29:40 USER: ACAD
D:\Dept 05\COL\23050059COL\West Section\Mod_30.10.24\Working\11914ID013.dgn

DCP TEST DATA

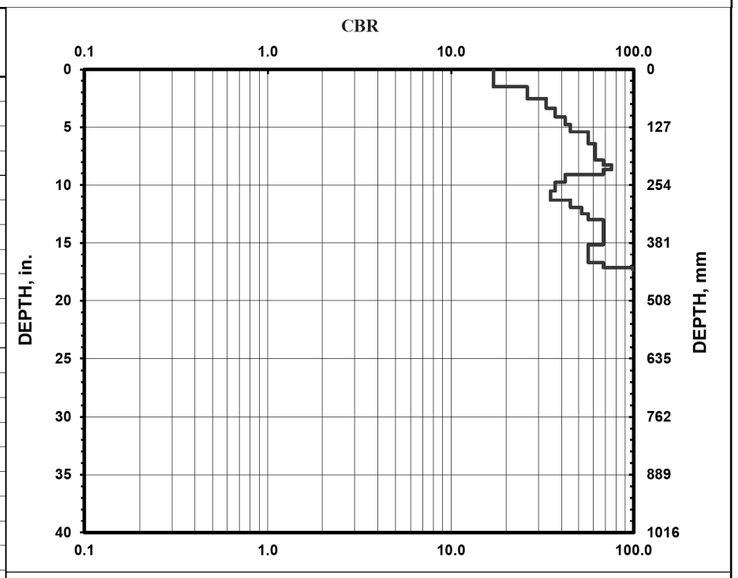
Project:	ATH/MEG-33-18.70/0.00	**PID:**	119141
Exploration ID:	D-012-0-23	**Date:**	6/12/2023
Elevation:	883.0	**Surface Materials:**	1" Topsoil
Lat / Long:	39.232588, -82.070067	**Test Starting Depth (ft):**	0.0

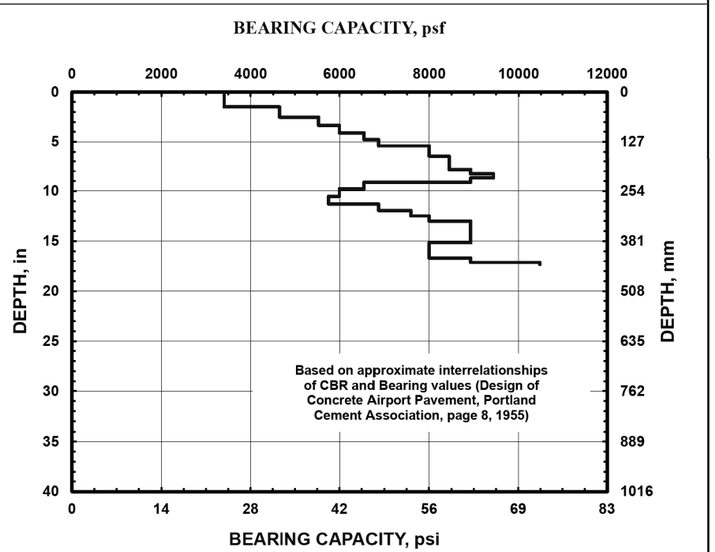
Hammer
- ○ 10.1 lbs.
- ◉ 17.6 lbs.
- ○ Both hammers used

Office of Geotechnical Engineering
Geology, Exploration, and Laboratory Section
http://www.dot.state.oh.us/Divisions/Engineering/Geotechnical

Soil Type
- ○ CH
- ○ CL
- ◉ All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	1
3	38	1
3	64	1
3	85	1
3	104	1
3	121	1
3	137	1
3	150	1
3	163	1
3	175	1
3	187	1
3	199	1
3	210	1
3	220	1
3	231	1
3	248	1
3	267	1
3	287	1
3	303	1
3	317	1
3	330	1
3	341	1
3	352	1
3	363	1
3	374	1
3	385	1
3	398	1
3	411	1
3	424	1
3	435	1
3	440	1





NOTES: Latitude/Longitude from Juniper Geode GNS3 receiver utilizing the ODOT VRS network. Elevation from USGS 3DEP map service. Sounding terminated at refusal.

HAND AUGER EXPLORATION LOG

PROJECT: ATH-33-18.70
TYPE: ROADWAY
PID: 119141 SFN:
START: 6/12/23 END: 6/12/23
LOGGER: ODOT / KERINS
EQUIPMENT:
STATION / OFFSET:
ALIGNMENT: CL US 33
ELEVATION: 883.0 (ft)
LAT / LONG: 39.232588, -82.070067
EXPLORATION ID D-012-0-23
PAGE 1 OF 1

ELEV. FT msl	DEPTH FT	HP (tsf)	MATERIAL DESCRIPTION AND NOTES	SAMPLE ID	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)
882.9			TOPSOIL (1")											
	1	-	BROWN, **GRAVEL WITH SAND, SILT, AND CLAY**, DRY	AS-1	80	2	3	7	8	34	22	12	3	A-2-6 (0)
881.4														
	2	-	GRAY AND BROWN, **SANDY SILT**, SOME CLAY, LITTLE GRAVEL, DAMP	AS-2	14	7	19	35	25	26	19	7	9	A-4a (5)
880.4														

NOTES: LAT/LONG FROM OGE HANDHELD GPS UNIT. ELEV FROM USGS 3DEP MAP SERVICE. HOLE DRY UPON COMPLETION.
ABANDONMENT METHODS, MATERIALS, QUANTITIES: NOT RECORDED

STANDARD ODOT HAND AUGER LOG (8.5 X 11) - OH DOT.GDT - 7/19/23 14:00 - X:\GINT\PROJECTS\601072.GPJ

GEOTECHNICAL PROFILE - ROADWAY
DCP SOUNDING LOG FOR D-012-0-23

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

DESIGNER N.K.S
REVIEWER SM 11-06-24
PROJECT ID 119141
SUBSET 47 TOTAL 82
SHEET * TOTAL -

ATH-US 33-18.70

MODEL: Sheet PAPERSIZE: 17x11 (in.) DATE: 06-11-2024 TIME: 17:30:55 USER: ACAD
D:\Dept 05\COL\2305005 9COL\West Section\Mod_30.10.24\Working\119141D014.dgn

DCP TEST DATA

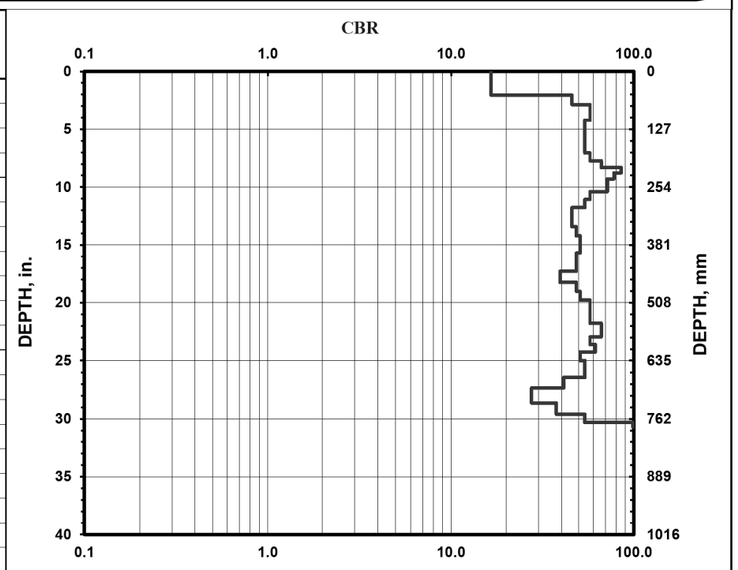
Project:	ATH/MEG-33-18.70/0.00	**PID:**	119141
Exploration ID:	D-013-0-23	**Date:**	6/12/2023
Elevation:	864.4	**Surface Materials:**	1" Topsoil
Lat / Long:	39.228157, -82.06724	**Test Starting Depth (ft):**	0.0

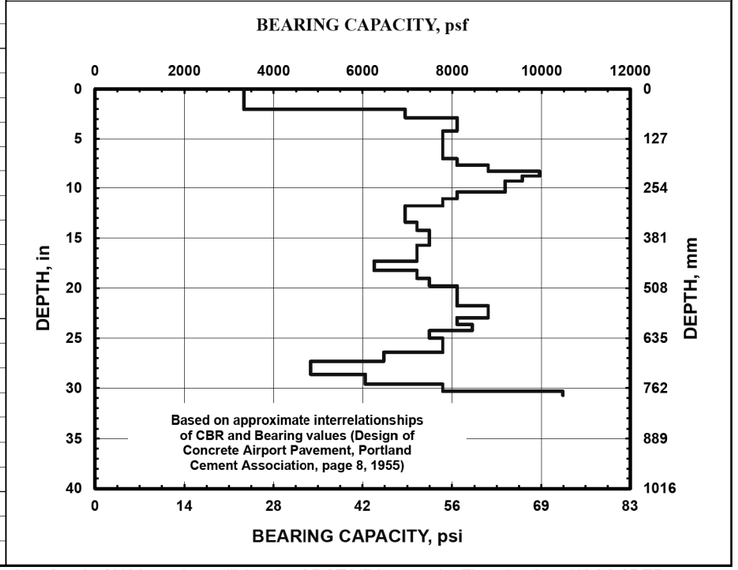
Hammer
- ○ 10.1 lbs.
- ◉ 17.6 lbs.
- ○ Both hammers used

Office of Geotechnical Engineering
Geology, Exploration, and Laboratory Section
http://www.dot.state.oh.us/Divisions/Engineering/Geotechnical

Soil Type
- ○ CH
- ○ CL
- ◉ All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	1
4	52	1
4	73	1
4	90	1
4	107	1
4	125	1
4	143	1
4	161	1
4	179	1
4	196	1
4	211	1
4	223	1
4	236	1
4	250	1
4	264	1
4	281	1
4	299	1
4	320	1
4	341	1
4	361	1
4	380	1
4	399	1
4	419	1
4	439	1
4	463	1
4	483	1
4	502	1
4	519	1
4	536	1
4	553	1
4	568	1
4	583	1
4	600	1
4	616	1
4	635	1
4	653	1
4	671	1
4	694	1
4	727	1
4	752	1
4	770	1
4	780	1
4	788	1





NOTES: Latitude/Longitude from Juniper Geode GNS3 receiver utilizing the ODOT VRS network. Elevation from USGS 3DEP map service. Sounding terminated at refusal.

GEOTECHNICAL PROFILE - ROADWAY
DCP SOUNDING LOG FOR D-013-0-23

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

DESIGNER N.K.S
REVIEWER SM 11-06-24
PROJECT ID 119141
SUBSET 48 TOTAL 82
SHEET A TOTAL -

ATH-US 33-18.70

MODEL: Sheet PAPERSIZE: 17x11 (in.) DATE: 06-11-2024 TIME: 17:32:07 USER: ACAD
D:\Dept 05\COL\23050059COL\West Section\Mod_30.10.24\Working\119141ID015.dgn

DCP TEST DATA

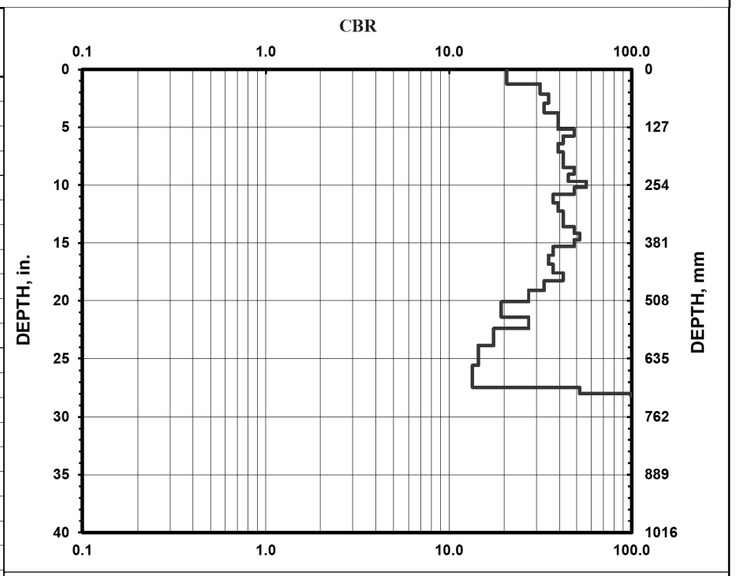
Project:	ATH/MEG-33-18.70/0.00	**PID:**	119141
Exploration ID:	D-014-0-23	**Date:**	6/12/2023
Elevation:	858.6	**Surface Materials:**	1" Topsoil
Lat / Long:	39.226398, -82.066664	**Test Starting Depth (ft):**	0.0

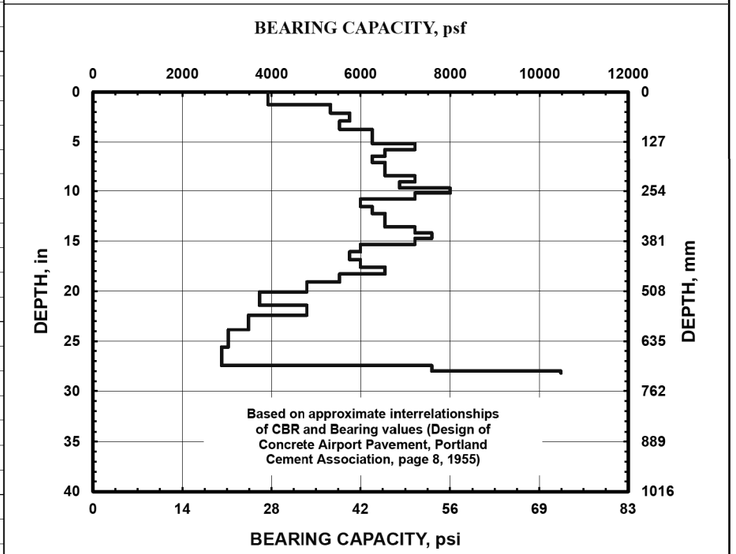
Hammer
- ○ 10.1 lbs.
- ◉ 17.6 lbs.
- ○ Both hammers used

Office of Geotechnical Engineering
Geology, Exploration, and Laboratory Section
http://www.dot.state.oh.us/Divisions/Engineering/Geotechnical

Soil Type
- ○ CH
- ○ CL
- ◉ All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	1
3	32	1
3	54	1
3	74	1
3	95	1
3	113	1
3	131	1
3	146	1
3	163	1
3	181	1
3	198	1
3	215	1
3	230	1
3	246	1
3	259	1
3	274	1
3	293	1
3	311	1
3	328	1
3	345	1
3	360	1
3	374	1
3	389	1
3	408	1
3	428	1
3	447	1
3	464	1
3	485	1
3	510	1
3	544	1
3	569	1
3	606	1
3	650	1
3	697	1
3	711	1
3	716	1





NOTES: Latitude/Longitude from Juniper Geode GNS3 receiver utilizing the ODOT VRS network. Elevation from USGS 3DEP map service. Sounding terminated at refusal.

HAND AUGER EXPLORATION LOG

PROJECT: ATH-33-18.70
TYPE: ROADWAY
PID: 119141 SFN:
START: 6/12/23 END: 6/12/23
LOGGER: ODOT / KERINS
EQUIPMENT:
STATION / OFFSET:
ALIGNMENT: CL US 33
ELEVATION: 858.6 (ft)
LAT / LONG: 39.226398, -82.066664
EXPLORATION ID D-014-0-23
PAGE 1 OF 1

ELEV. FT msl	DEPTH FT	HP (tsf)	MATERIAL DESCRIPTION AND NOTES	SAMPLE ID	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)
858.5			TOPSOIL (1")											
	1	-	BROWN, **SILT AND CLAY**, SOME SAND, LITTLE GRAVEL, DAMP	AS-1	13	6	16	32	33	32	21	11	9	A-6a (6)
856.4	2													

NOTES: LAT/LONG FROM OGE HANDHELD GPS UNIT. ELEV FROM USGS 3DEP MAP SERVICE. HOLE DRY UPON COMPLETION.
ABANDONMENT METHODS, MATERIALS, QUANTITIES: NOT RECORDED

STANDARD ODOT HAND AUGER LOG (8.5 X 11) - OH DOT.GDT - 7/19/23 14:00 - X:\GINT\PROJECTS\601072.GPJ

GEOTECHNICAL PROFILE - ROADWAY
DCP SOUNDING LOG FOR D-014-0-23

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

DESIGNER N.K.S
REVIEWER SM 11-06-24
PROJECT ID 119141
SUBSET 49 TOTAL 82
SHEET * TOTAL -

ATH-US 33-18.70

MODEL: Sheet PAPERSIZE: 17x11 (in.) DATE: 06-11-2024 TIME: 17:33:45 USER: ACAD
D:\Dept 05\COL\2305059COL\West Section\Mod_30.10.24\Working\119141D0016.dgn

DCP TEST DATA

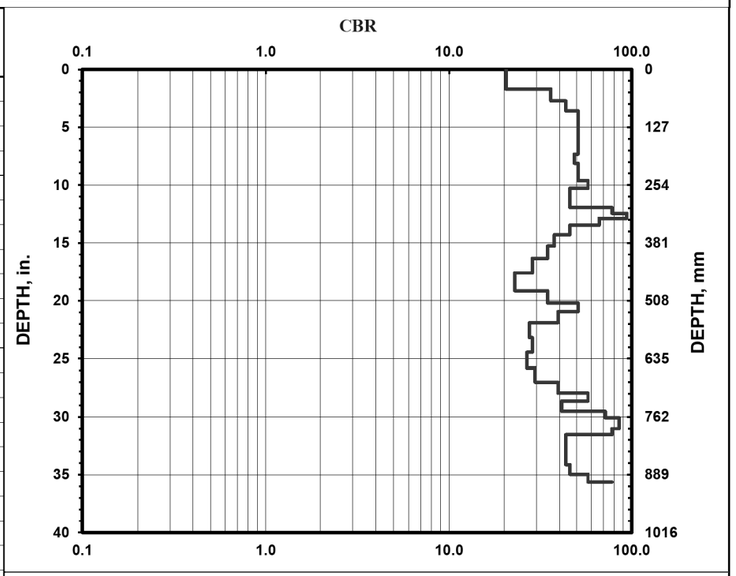
Project:	ATH/MEG-33-18.70/0.00	**PID:**	119141
Exploration ID:	D-015-0-23	**Date:**	6/12/2023
Elevation:	848.4	**Surface Materials:**	1" Topsoil
Lat / Long:	39.223695, -82.066085	**Test Starting Depth (ft):**	0.0

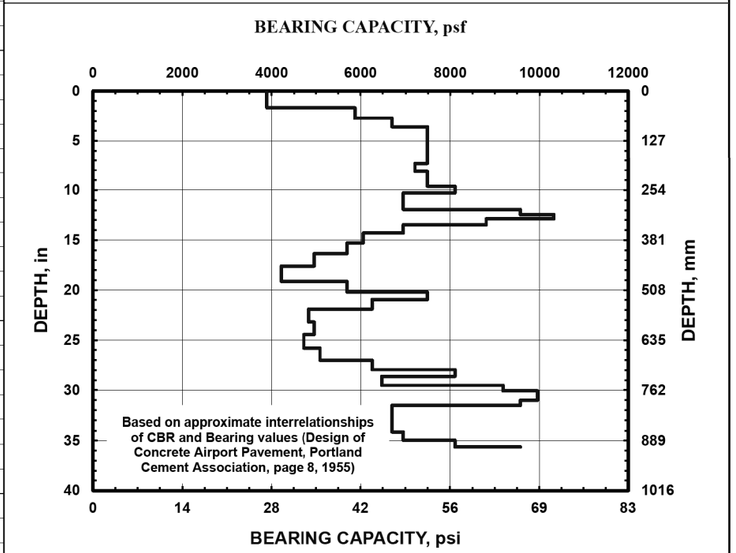
Hammer
- ○ 10.1 lbs.
- ◉ 17.6 lbs.
- ○ Both hammers used

Office of Geotechnical Engineering
Geology, Exploration, and Laboratory Section
http://www.dot.state.oh.us/Divisions/Engineering/Geotechnical

Soil Type
- ○ CH
- ○ CL
- ◉ All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	1
4	43	1
4	69	1
4	91	1
4	110	1
4	129	1
4	148	1
4	167	1
4	186	1
4	206	1
4	225	1
4	244	1
4	261	1
4	282	1
4	303	1
4	316	1
4	327	1
4	342	1
4	363	1
4	388	1
4	415	1
4	447	1
4	486	1
4	513	1
4	532	1
4	556	1
4	589	1
4	621	1
4	655	1
4	686	1
4	710	1
4	727	1
4	750	1
4	764	1
4	776	1
4	788	1
4	801	1
4	823	1
4	845	1
4	867	1
4	888	1
4	905	1
4	918	1





NOTES: Latitude/Longitude from Juniper Geode GNS3 receiver utilizing the ODOT VRS network. Elevation from USGS 3DEP map service. Sounding terminated at refusal.

HAND AUGER EXPLORATION LOG

PROJECT: ATH-33-18.70
TYPE: ROADWAY
PID: 119141 SFN:
START: 6/12/23 END: 6/12/23
LOGGER: ODOT / KERINS
EQUIPMENT:
STATION / OFFSET:
ALIGNMENT: CL US 33
ELEVATION: 848.4 (ft)
LAT / LONG: 39.223695, -82.066085
EXPLORATION ID D-015-0-23
PAGE 1 OF 1

ELEV. FT msl	DEPTH FT	HP (tsf)	MATERIAL DESCRIPTION AND NOTES	SAMPLE ID	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)
848.3			TOPSOIL (1")											
	1	-	BROWN, **SANDY SILT**, SOME CLAY, SOME GRAVEL, DAMP	AS-1	23	7	16	28	26	28	19	9	7	A-4a (4)
846.4	2													

NOTES: LAT/LONG FROM OGE HANDHELD GPS UNIT. ELEV FROM USGS 3DEP MAP SERVICE. HOLE DRY UPON COMPLETION.
ABANDONMENT METHODS, MATERIALS, QUANTITIES: NOT RECORDED

STANDARD ODOT HAND AUGER LOG (8.5 X 11) - OH DOT.GDT - 7/19/23 14:00 - X:\GINT\PROJECTS\601072.GPJ

GEOTECHNICAL PROFILE - ROADWAY
DCP SOUNDING LOG FOR D-015-0-23

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

DESIGNER N.K.S
REVIEWER SM 11-06-24
PROJECT ID 119141
SUBSET 50 TOTAL 82
SHEET * TOTAL -

ATH-US 33-18.70

MODEL: Sheet PAPERSIZE: 17x11 (in.) DATE: 06-11-2024 TIME: 17:34:58 USER: ACAD
D:\Dept 05\COL\2305059COL\West Section\Mod_30_10_24\Working\119141D017.dgn

One Dimensional Consolidation and Swell Properties of Soil - ASTM D 2435

CTL ENGINEERING, INC.

2860 Fisher Road

Columbus, OH 43204

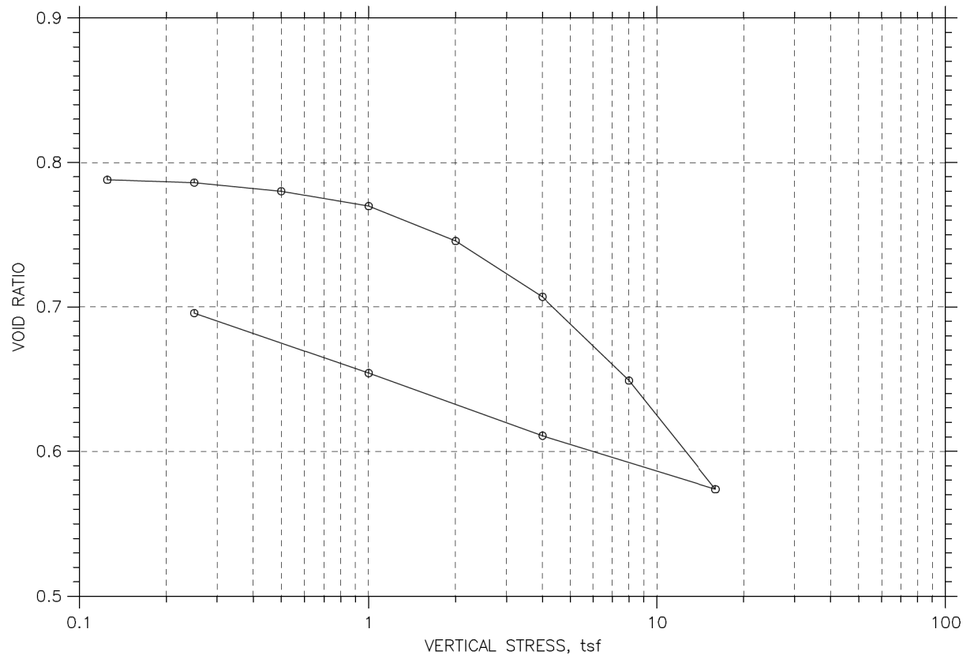
Project No.:	23050059COL		
Project:	ATH/MEG-033-18.70/00.00	Sample Type:	Undisturbed Specimen
Client:	HNTB Ohio, Inc	Test Date:	4/12/2024
Boring No.:	B-042-0-23	Checked By:	SM
Sample No.:	ST-1_7'-9'	Tested By:	MW
Soil Description:	Brown, Clay (A-7-6)	LL:	60
Specific Gravity:	2.622	PL:	26
Initial Dry Unit Weight	91.8 pcf	Initial Moisture	31.9%

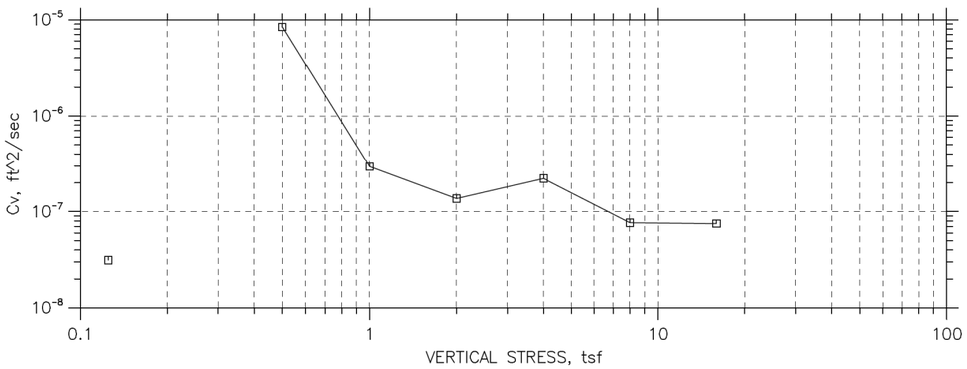
Step No.	Applied Stress (tsf)	Final Displacement (in)	Void Ratio	Strain at End (%)	Sqrt T_{90} (min)	Cv (ft^2/sec)
1	0.125	-0.005047	0.788			
2	0.25	-0.003947	0.786			
3	0.5	-0.0006147	0.78			
4	1	0.005176	0.77	0.52	97.3	2.51E-07
5	2	0.01873	0.746	1.87	153.3	1.56E-07
6	4	0.04044	0.707	4.05	97	2.38E-07
7	8	0.07301	0.649	7.31	269.3	8.09E-08
8	16	0.1153	0.574	11.54	276.7	7.26E-08
9	4	0.09443	0.611	9.45		
10	1	0.0701	0.654	7.02		
11	0.25	0.04678	0.696	4.68		

CONSOLIDATION PARAMETERS	
Preconsolidation Pressure (tsf): 3.00	Initial Void Ratio: 0.79
Compression Index (C_c): 0.25	Compression Ratio : 0.14
Recompression Index (C_r): 0.061	Recompression Ratio: 0.034

CONSOLIDATION TEST DATA

SUMMARY REPORT





Project: ATH/MEG-033-18.70/00.00	Location: ATH/MEG County, OH	Project No.: 23050059COL
Boring No.: B-042-0-24	Tested By: MW	Checked By: SM
Sample No.: ST-1	Test Date: 04/12/24	Depth: 7'-9'
Test No.: 1	Sample Type: Shelby Tube	Elevation:
Description: Brown, Clay (A-7-6)		
Remarks:		

Thu, 09-MAY-2024 12:50:41

GEOTECHNICAL PROFILE - ROADWAY
CONSOLIDATION RESULTS

DESIGN AGENCY

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

DESIGNER N.K.S

REVIEWER SM 11-06-24

PROJECT ID 119141

SUBSET 51 | TOTAL 82

SHEET A | TOTAL -

ATH-US 33-18.70

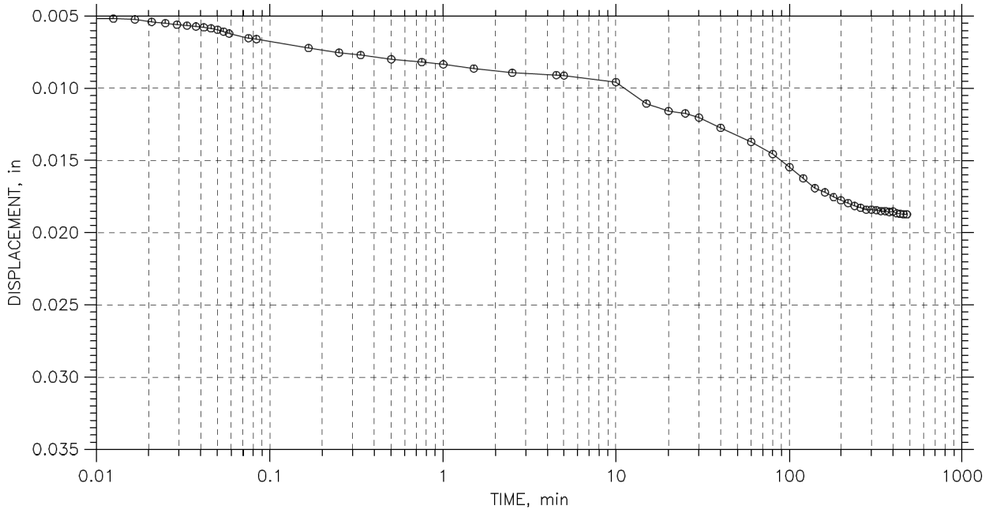
MODEL: Sheet PAPERSIZE: 17x11 (in.) DATE: 06-11-2024 TIME: 17:36:21 USER: ACAD
D:\Dept 05\COL\23050059COL\West Section\Mod_30.10.24\Working\119141ZD001.dgn

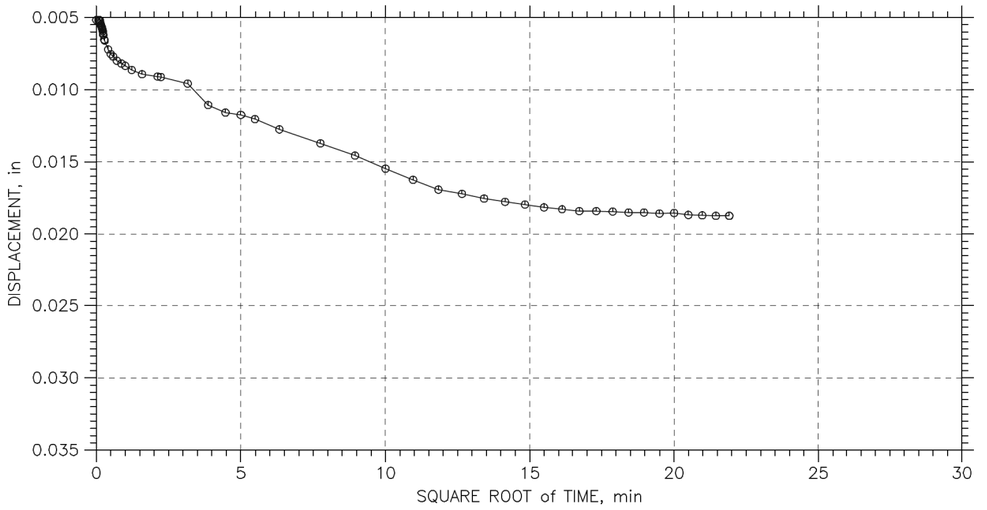
CONSOLIDATION TEST DATA

TIME CURVES

Step: 5 of 11

Stress: 2. tsf





Project: ATH/MEG-033-18.70/00.00	Location: ATH/MEG County, OH	Project No.: 23050059COL
Boring No.: B-042-0-24	Tested By: MW	Checked By: SM
Sample No.: ST-1	Test Date: 04/12/24	Depth: 7'-9'
Test No.: 1	Sample Type: Shelby Tube	Elevation:
Description: Brown, Clay (A-7-6)		
Remarks:		

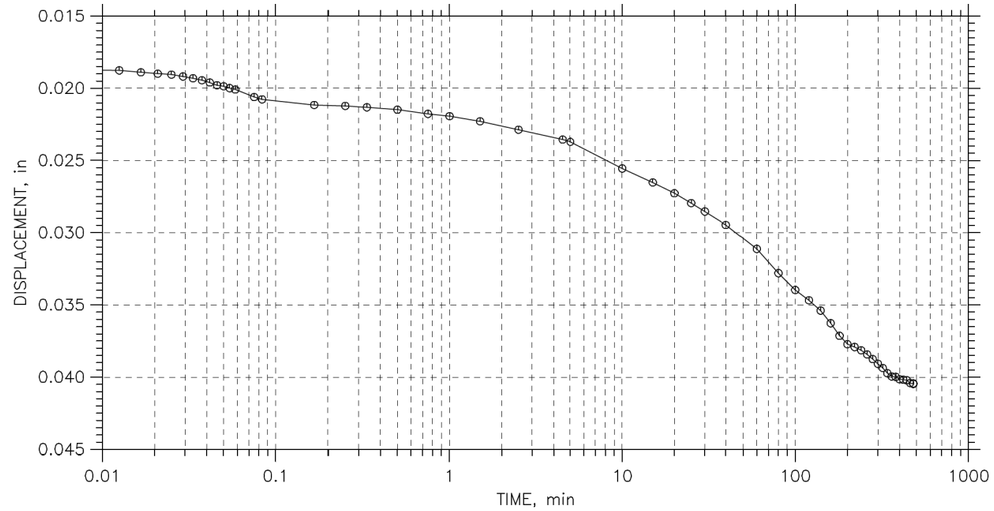
Thu, 09-MAY-2024 12:50:41

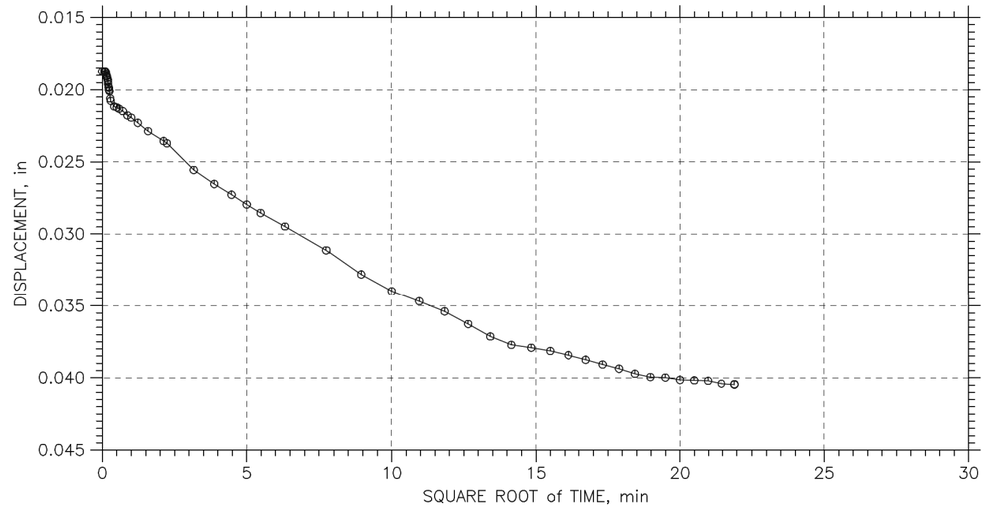
CONSOLIDATION TEST DATA

TIME CURVES

Step: 6 of 11

Stress: 4. tsf





Project: ATH/MEG-033-18.70/00.00	Location: ATH/MEG County, OH	Project No.: 23050059COL
Boring No.: B-042-0-24	Tested By: MW	Checked By: SM
Sample No.: ST-1	Test Date: 04/12/24	Depth: 7'-9'
Test No.: 1	Sample Type: Shelby Tube	Elevation:
Description: Brown, Clay (A-7-6)		
Remarks:		

Thu, 09-MAY-2024 12:50:41

GEOTECHNICAL PROFILE - ROADWAY
CONSOLIDATION RESULTS

DESIGN AGENCY
GTL ENGINEERING INC
2860 FISHER ROAD
COLUMBUS, OHIO 43204
PHONE:(614)276-6123
FAX:(614)276-6377

DESIGNER N.K.S

REVIEWER SM 11-06-24

PROJECT ID 119141

SUBSET 52 | TOTAL 82

SHEET - | TOTAL -

ATH-US 33-18.70

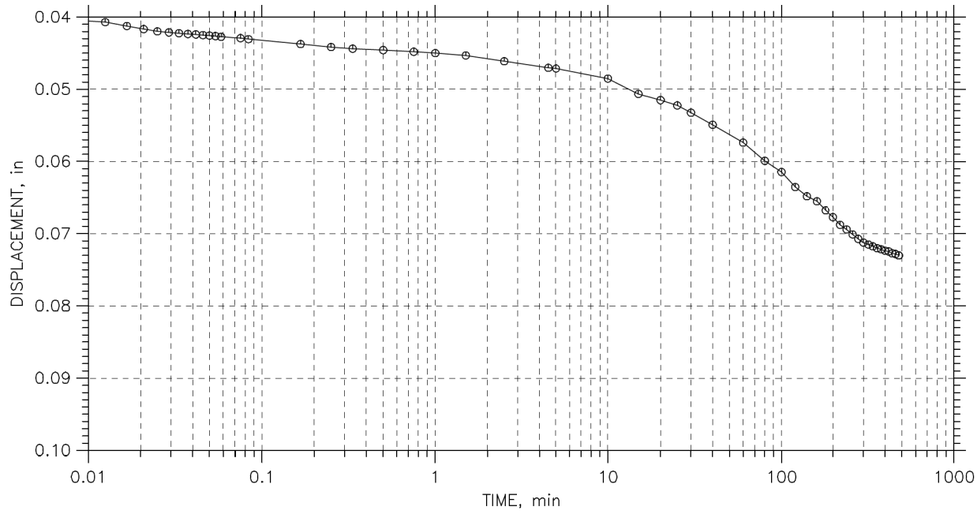
MODEL: Sheet PAPERSIZE: 17x11 (in.) DATE: 06-11-2024 TIME: 20:35:20 USER: ACAD
D:\Dept 05\COL\23050059COL\West Section\Mod_30.10.24\Working\119141D002.dgn

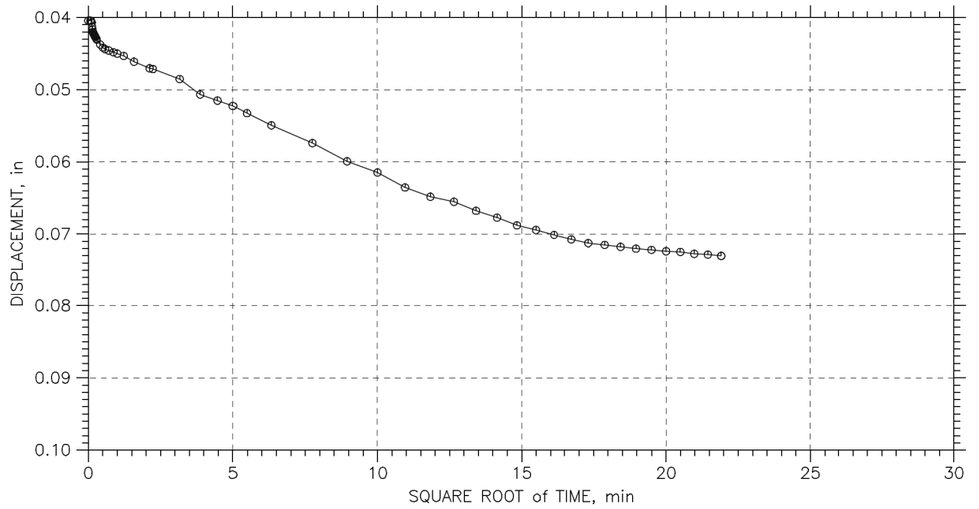
CONSOLIDATION TEST DATA

TIME CURVES

Step: 7 of 11

Stress: 8. tsf





Project: ATH/MEG-033-18.70/00.00	Location: ATH/MEG County, OH	Project No.: 23050059COL
Boring No.: B-042-0-24	Tested By: MW	Checked By: SM
Sample No.: ST-1	Test Date: 04/12/24	Depth: 7'-9'
Test No.: 1	Sample Type: Shelby Tube	Elevation:
Description: Brown, Clay (A-7-6)		
Remarks:		

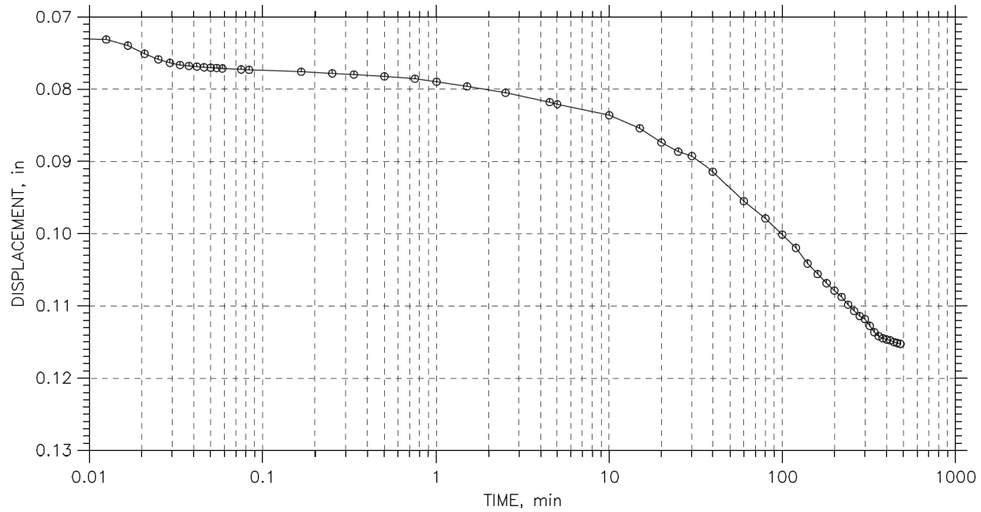
Thu, 09-MAY-2024 12:50:41

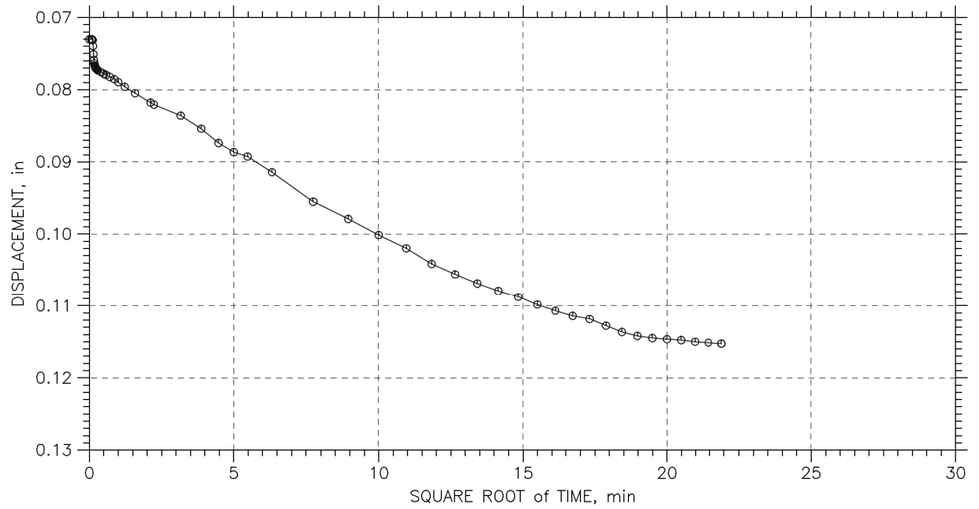
CONSOLIDATION TEST DATA

TIME CURVES

Step: 8 of 11

Stress: 16. tsf





Project: ATH/MEG-033-18.70/00.00	Location: ATH/MEG County, OH	Project No.: 23050059COL
Boring No.: B-042-0-24	Tested By: MW	Checked By: SM
Sample No.: ST-1	Test Date: 04/12/24	Depth: 7'-9'
Test No.: 1	Sample Type: Shelby Tube	Elevation:
Description: Brown, Clay (A-7-6)		
Remarks:		

Thu, 09-MAY-2024 12:50:41

GEOTECHNICAL PROFILE - ROADWAY
CONSOLIDATION RESULTS

DESIGN AGENCY
GTL ENGINEERING
2960 FISHER ROAD
COLUMBUS, OHIO 43204
PHONE:(614)276-8123
FAX:(614)276-6377

DESIGNER N.K.S

REVIEWER SM 11-06-24

PROJECT ID 119141

SUBSET 53 TOTAL 82

SHEET A TOTAL -

ATH-US 33-18.70

MODEL: Sheet PAPERSIZE: 17x11 (in.) DATE: 06-11-2024 TIME: 20:36:44 USER: ACAD
D:\Dept 05\COL\23050059COL\West Section\Mod_30.10.24\Working\119141ZD003.dgn

One Dimensional Consolidation and Swell Properties of Soil - ASTM D 2435

CTL ENGINEERING, INC.

2860 Fisher Road

Columbus, OH 43204

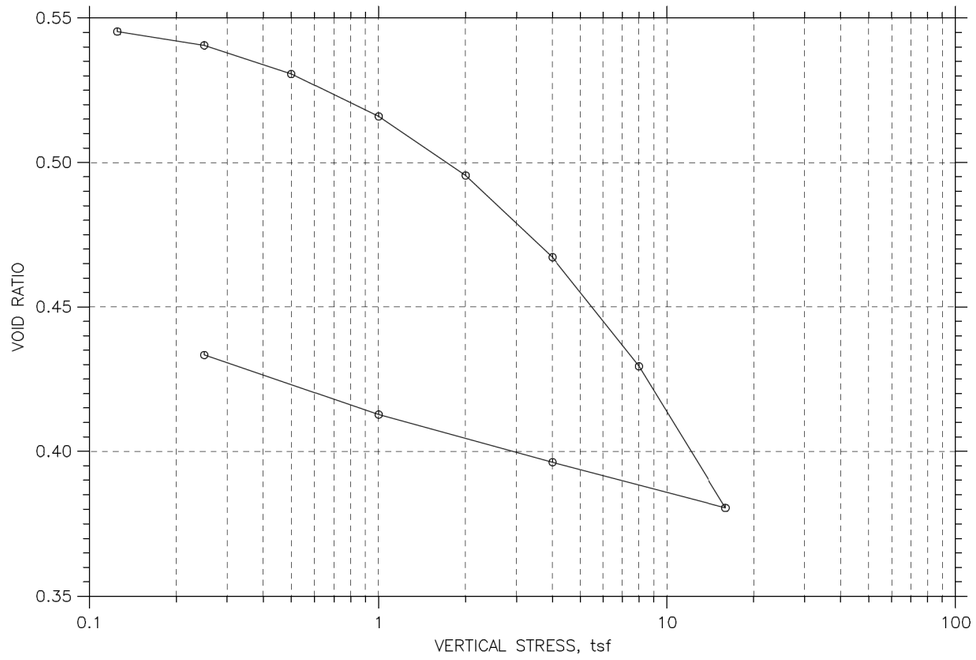
Project No.:	23050059COL		
Project:	ATH/MEG-033-18.70/00.00	Sample Type:	Undisturbed Specimen
Client:	HNTB Ohio, Inc	Test Date:	4/18/2024
Boring No.:	B-042-0-23	Checked By:	SM
Sample No.:	ST-1_12'-14'	Tested By:	MW
Soil Description:	Gray, Silt and Clay (A-6a)	LL:	37
Specific Gravity:	2.590	PL:	23
Initial Dry Unit Weight	103.6 pcf	Initial Moisture	22.6%

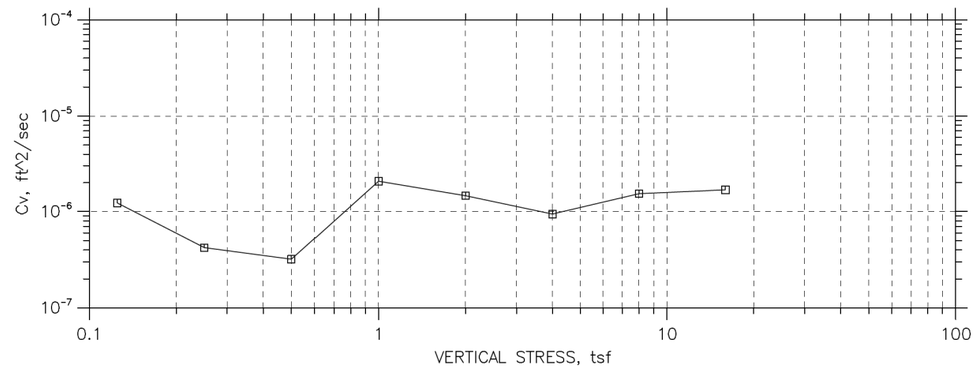
Step No.	Applied Stress (tsf)	Final Displacement (in)	Void Ratio	Strain at End (%)	Sqrt T_{90} (min)	Cv (ft^2/sec)
1	0.125	0.003429	0.545	0.34	16.8	
2	0.25	0.006502	0.541	0.65	59.6	
3	0.5	0.01291	0.531	1.29	36.3	
4	1	0.02235	0.516	2.24	19.7	1.20E-06
5	2	0.03555	0.495	3.56	19.8	1.17E-06
6	4	0.0538	0.467	5.38	28	8.01E-07
7	8	0.07816	0.429	7.82	13.8	1.55E-06
8	16	0.1098	0.38	10.98	12.4	1.63E-06
9	4	0.09957	0.396	9.96	0.5	
10	1	0.08893	0.413	8.89	26.2	
11	0.25	0.07563	0.433	7.56	96.8	

CONSOLIDATION PARAMETERS	
Preconsolidation Pressure (tsf): 2.70	Initial Void Ratio: 0.55
Compression Index (C_c): 0.16	Compression Ratio : 0.11
Recompression Index (C_r): 0.027	Recompression Ratio: 0.017

CONSOLIDATION TEST DATA

SUMMARY REPORT





Project: ATH/MEG-033-18.	Location:	Project No.: 23050059COL
Boring No.: B-042-0-24	Tested By: MW	Checked By: SM
Sample No.: ST-2	Test Date: 04/18/24	Depth: 12'-14'
Test No.: 1	Sample Type: Shelby Tube	Elevation:
Description: Gray Silt and Clay (A-6a)		
Remarks:		

Thu, 09-MAY-2024 12:58:56

GEOTECHNICAL PROFILE - ROADWAY
CONSOLIDATION RESULTS

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

DESIGNER N.K.S

REVIEWER SM 11-06-24

PROJECT ID 119141

SUBSET 54 | TOTAL 82

SHEET A | TOTAL -

ATH-US 33-18.70

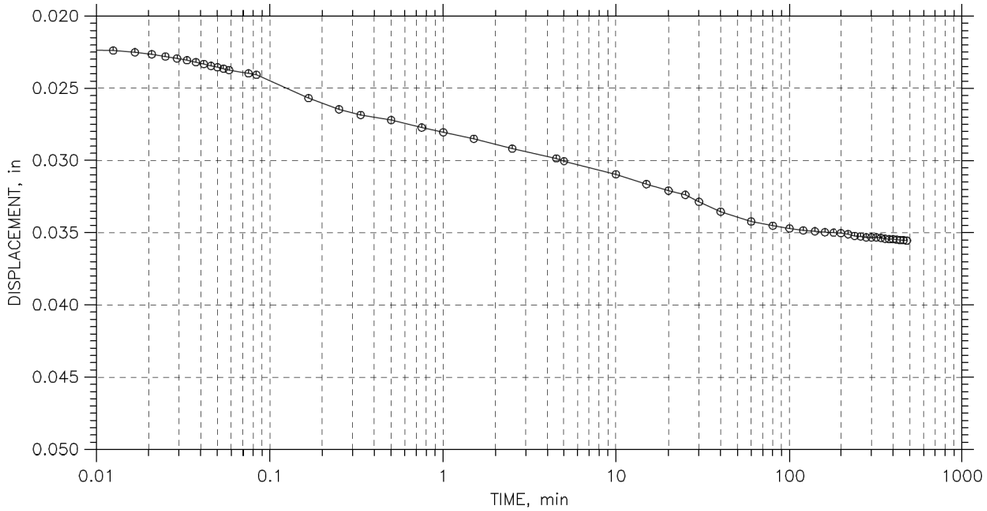
MODEL: Sheet PAPERSIZE: 17x11 (in.) DATE: 06-11-2024 TIME: 20:37:27 USER: ACAD
D:\Dept 05\COL\23050059COL\West Section\Mod_30.10.24\Working\119141ZD004.dgn

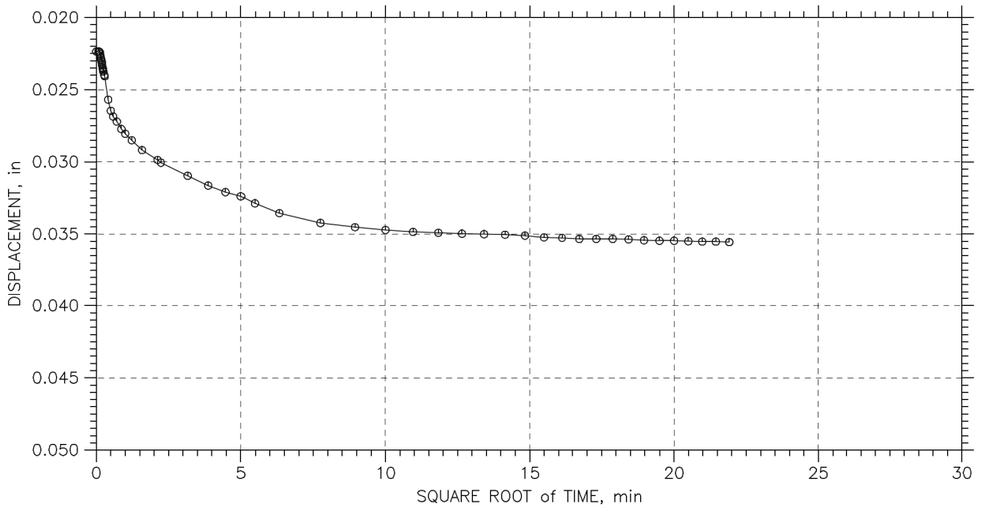
CONSOLIDATION TEST DATA

TIME CURVES

Step: 5 of 11

Stress: 2. tsf





Project: ATH/MEG-033-18.	Location:	Project No.: 23050059COL
Boring No.: B-042-0-24	Tested By: MW	Checked By: SM
Sample No.: ST-2	Test Date: 04/18/24	Depth: 12'-14'
Test No.: 1	Sample Type: Shelby Tube	Elevation:
Description: Gray Silt and Clay (A-6a)		
Remarks:		

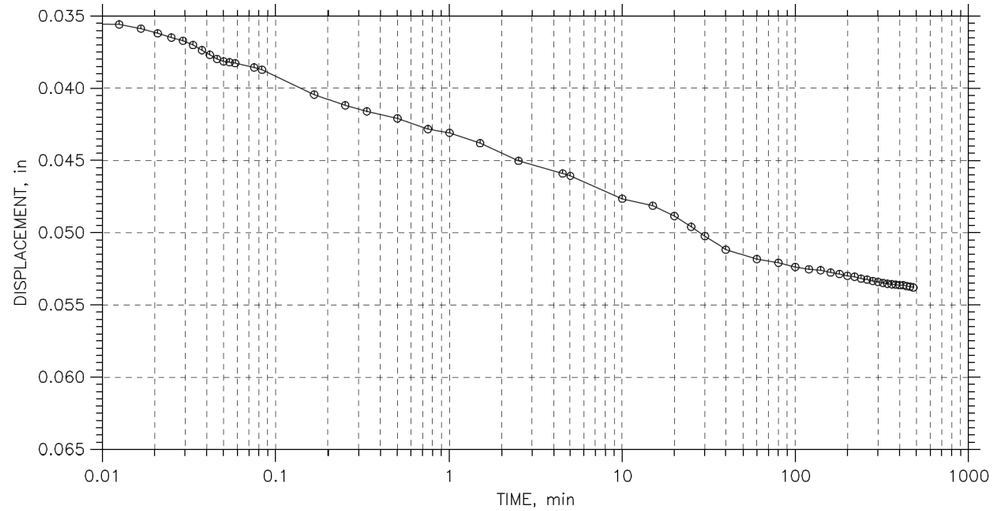
Thu, 09-MAY-2024 12:58:57

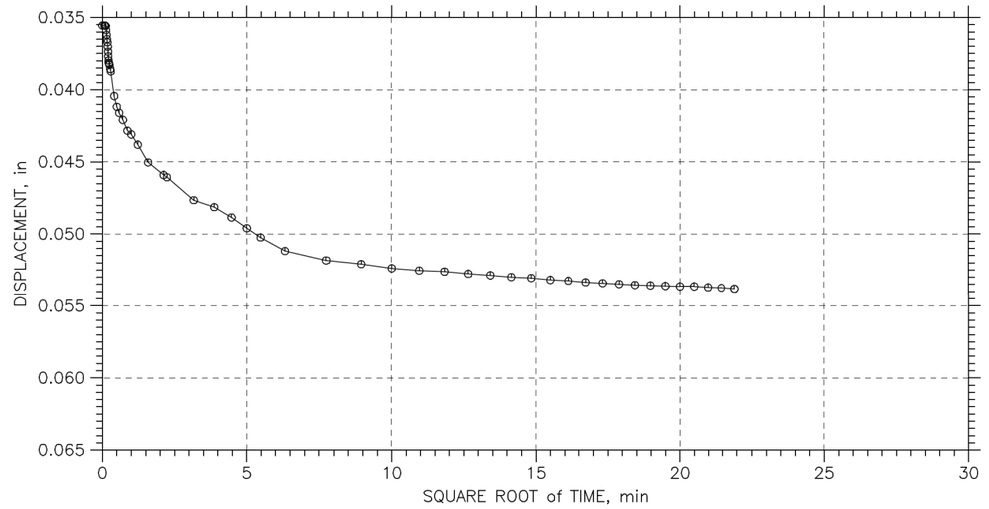
CONSOLIDATION TEST DATA

TIME CURVES

Step: 6 of 11

Stress: 4. tsf





Project: ATH/MEG-033-18.	Location:	Project No.: 23050059COL
Boring No.: B-042-0-24	Tested By: MW	Checked By: SM
Sample No.: ST-2	Test Date: 04/18/24	Depth: 12'-14'
Test No.: 1	Sample Type: Shelby Tube	Elevation:
Description: Gray Silt and Clay (A-6a)		
Remarks:		

Thu, 09-MAY-2024 12:58:57

GEOTECHNICAL PROFILE - ROADWAY
CONSOLIDATION RESULTS

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

DESIGNER N.K.S

REVIEWER SM 11-06-24

PROJECT ID 119141

SUBSET 55 TOTAL 82

SHEET A TOTAL -

ATH-US 33-18.70

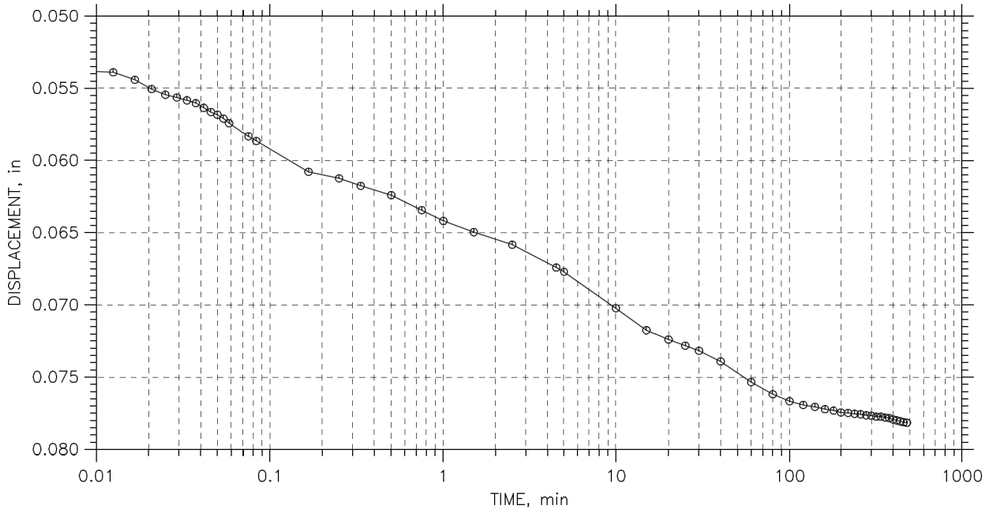
MODEL: Sheet PAPERSIZE: 17x11 (in.) DATE: 06-11-2024 TIME: 20:38:16 USER: ACAD
D:\Dept 05\COL\23050059COL\West Section\Mod_30.10.24\Working\119141ZD005.dgn

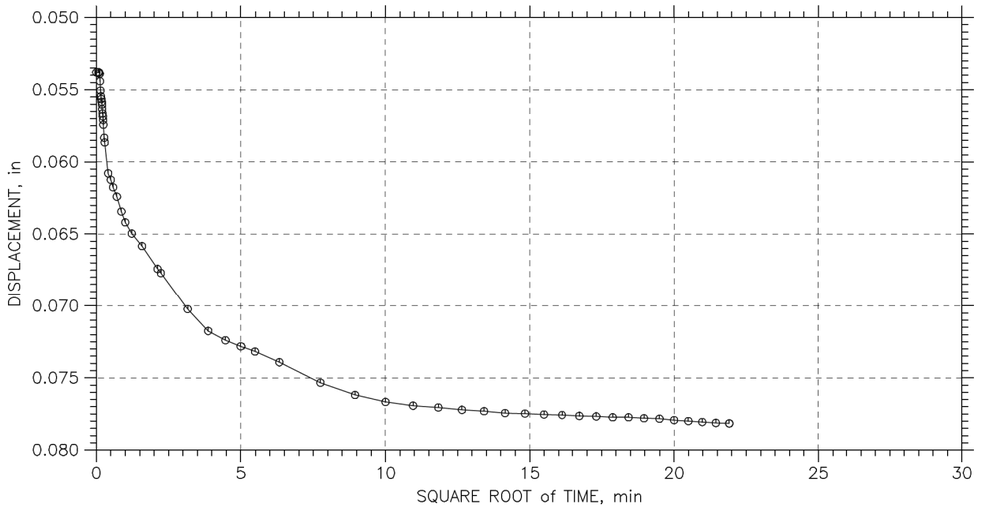
CONSOLIDATION TEST DATA

TIME CURVES

Step: 7 of 11

Stress: 8. tsf





Project: ATH/MEG-033-18.	Location:	Project No.: 23050059COL
Boring No.: B-042-0-24	Tested By: MW	Checked By: SM
Sample No.: ST-2	Test Date: 04/18/24	Depth: 12'-14'
Test No.: 1	Sample Type: Shelby Tube	Elevation:
Description: Gray Silt and Clay (A-6a)		
Remarks:		

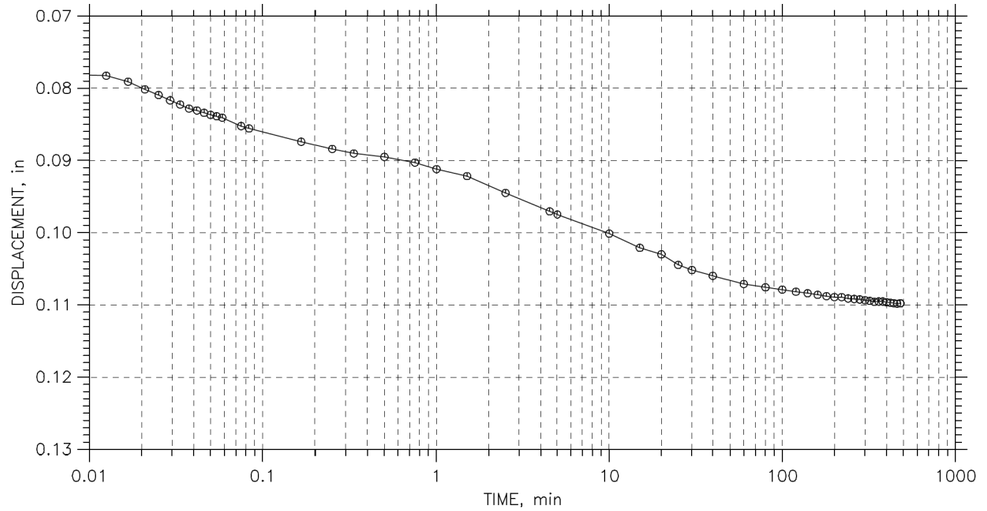
Thu, 09-MAY-2024 12:58:57

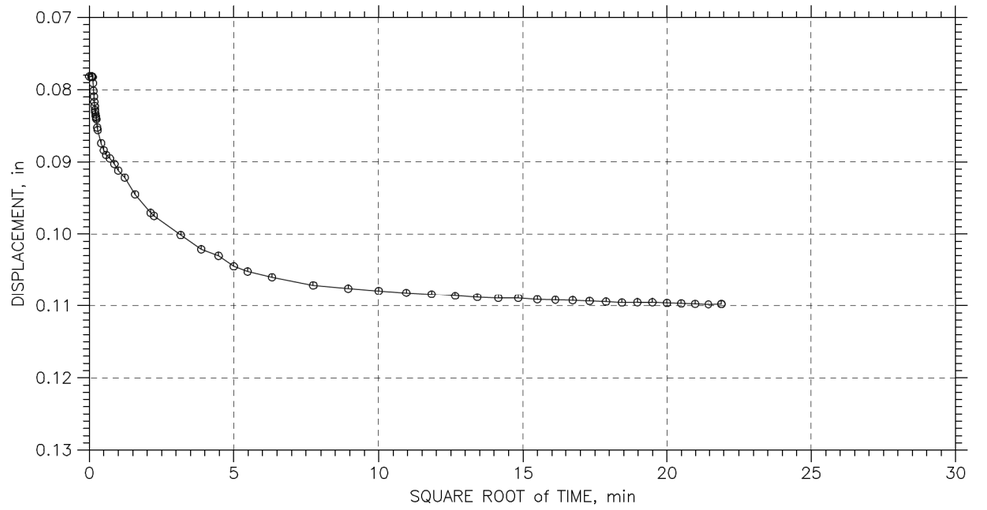
CONSOLIDATION TEST DATA

TIME CURVES

Step: 8 of 11

Stress: 16. tsf





Project: ATH/MEG-033-18.	Location:	Project No.: 23050059COL
Boring No.: B-042-0-24	Tested By: MW	Checked By: SM
Sample No.: ST-2	Test Date: 04/18/24	Depth: 12'-14'
Test No.: 1	Sample Type: Shelby Tube	Elevation:
Description: Gray Silt and Clay (A-6a)		
Remarks:		

Thu, 09-MAY-2024 12:58:57

GEOTECHNICAL PROFILE - ROADWAY
CONSOLIDATION RESULTS

DESIGN AGENCY
GTL ENGINEERING INC
2860 FISHER ROAD
COLUMBUS, OHIO 43204
PHONE:(614)276-6123
FAX:(614)276-6377

DESIGNER N.K.S

REVIEWER SM 11-06-24

PROJECT ID 119141

SUBSET 56 | TOTAL 82

SHEET A | TOTAL -

ATH-US 33-18.70

MODEL: Sheet PAPERSIZE: 17x11 (in.) DATE: 06-11-2024 TIME: 20:39:02 USER: ACAD
D:\Dept 05\COL\23050059COL\West Section\Mod_30.10.24\Working\119141ZD006.dgn

One Dimensional Consolidation and Swell Properties of Soil - ASTM D 2435

CTL ENGINEERING, INC.

2860 Fisher Road

Columbus, OH 43204

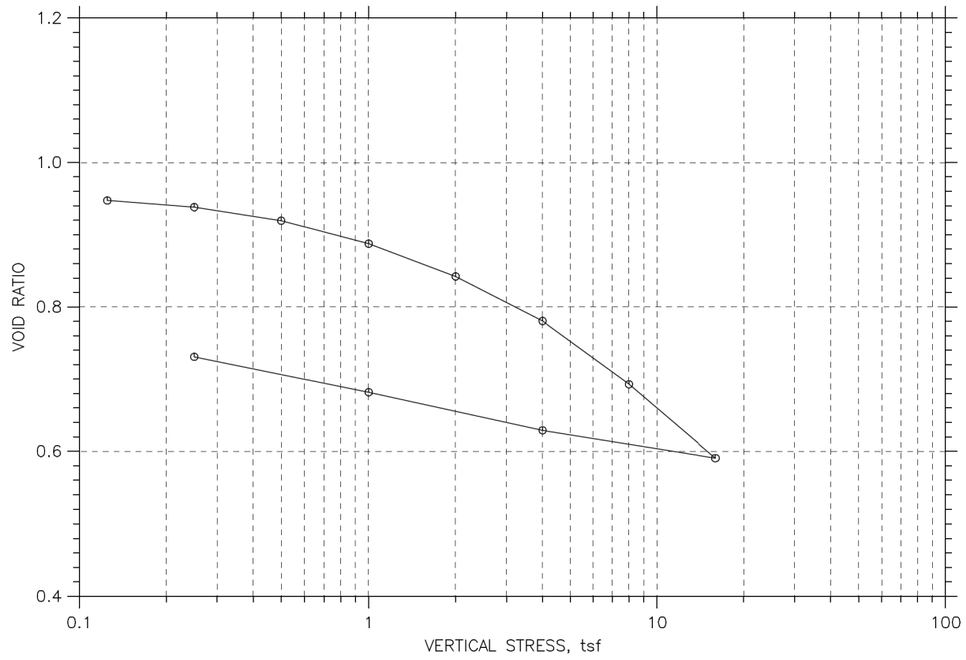
Project No.:	23050059COL		
Project:	ATH/MEG-033-18.70/00.00	Sample Type:	Undisturbed Specimen
Client:	HNTB Ohio, Inc	Test Date:	2/9/2024
Boring No.:	B-046-0-23	Checked By:	SM
Sample No.:	ST_2'-4'	Tested By:	MW
Soil Description:	Brown, Elastic Clay (A-7-5)	LL:	69
Specific Gravity:	2.642	PL:	33
Initial Dry Unit Weight	84.2 pcf	Initial Moisture	36.9%

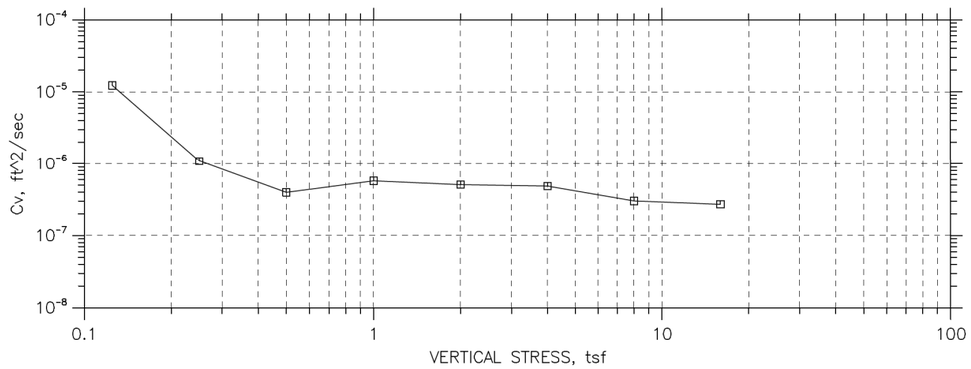
Step No.	Applied Stress (tsf)	Final Displacement (in)	Void Ratio	Strain at End (%)	Sqrt T_{90} (min)	Cv (ft^2/sec)
1	0.125	0.007441	0.947	0.74	0.7	
2	0.25	0.01213	0.938	1.21	27.8	8.66E-07
3	0.5	0.02174	0.919	2.17	56.6	4.19E-07
4	1	0.03791	0.888	3.79	34.6	6.67E-07
5	2	0.06108	0.842	6.11	36.2	6.13E-07
6	4	0.09246	0.781	9.25	35.6	5.87E-07
7	8	0.1371	0.693	13.71	58.1	3.31E-07
8	16	0.1893	0.591	18.93	59.8	2.88E-07
9	4	0.1696	0.629	16.96	9.8	
10	1	0.1428	0.682	14.28	69.7	
11	0.25	0.1178	0.731	11.78	357.1	

CONSOLIDATION PARAMETERS	
Preconsolidation Pressure (tsf): 2.10	Initial Void Ratio: 0.95
Compression Index (C_c): 0.34	Compression Ratio : 0.17
Recompression Index (C_r): 0.063	Recompression Ratio: 0.032

CONSOLIDATION TEST DATA

SUMMARY REPORT





Project: ATH/MEG-033-18.70/00.00	Location: Meigs County, Ohio	Project No.: 23050059COL
Boring No.: B-46-0-23	Tested By: MW	Checked By: SM
Sample No.: ST-1	Test Date: 02/09/24	Depth: 2'-4'
Test No.: 1	Sample Type: Shelby Tube	Elevation:
Description: Brown Elastic Clay (A-7-5)		
Remarks:		

Thu, 22-FEB-2024 15:47:10

GEOTECHNICAL PROFILE - ROADWAY
CONSOLIDATION RESULTS

DESIGN AGENCY

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

DESIGNER N.K.S

REVIEWER SM 11-06-24

PROJECT ID 119141

SUBSET 57 | TOTAL 82

SHEET A | TOTAL -

ATH-US 33-18.70

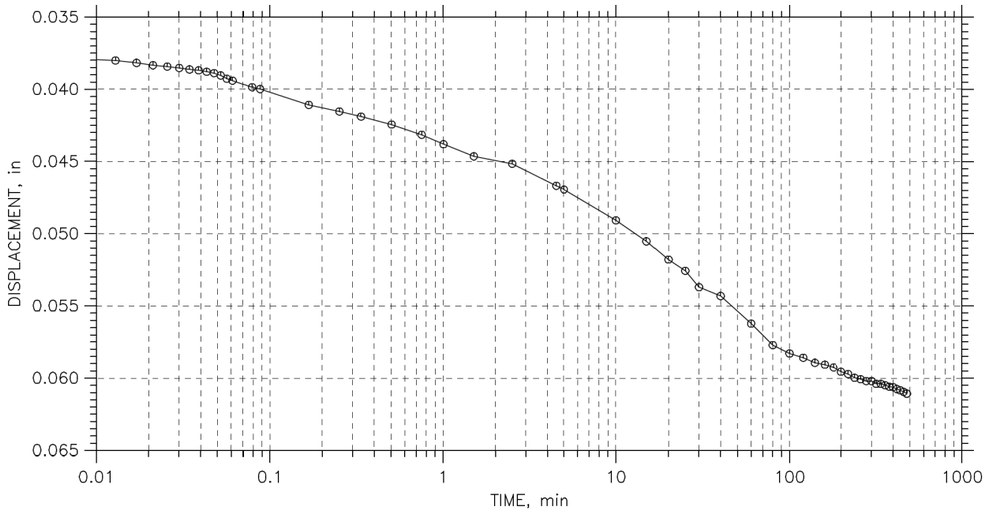
MODEL: Sheet PAPERSIZE: 17x11 (in.) DATE: 06-11-2024 TIME: 20:40:01 USER: ACAD
D:\Dept 05\COL\23050059COL\West Section\Mod_30.10.24\Working\119141ZD007.dgn

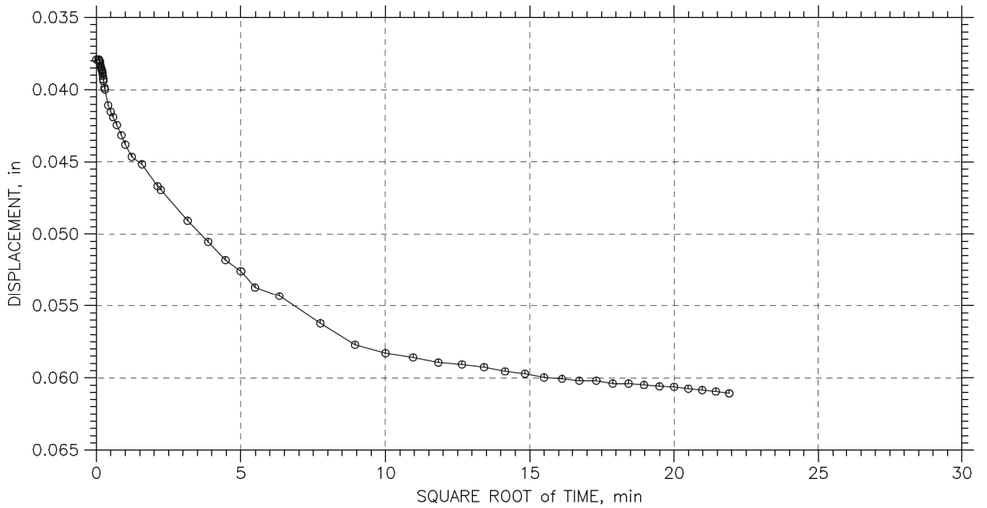
CONSOLIDATION TEST DATA

TIME CURVES

Step: 5 of 11

Stress: 2. tsf





Project: ATH/MEG-033-18.70/00.00	Location: Meigs County, Ohio	Project No.: 23050059COL
Boring No.: B-46-0-23	Tested By: MW	Checked By: SM
Sample No.: ST-1	Test Date: 02/09/24	Depth: 2'-4'
Test No.: 1	Sample Type: Shelby Tube	Elevation:
Description: Brown Elastic Clay (A-7-5)		
Remarks:		

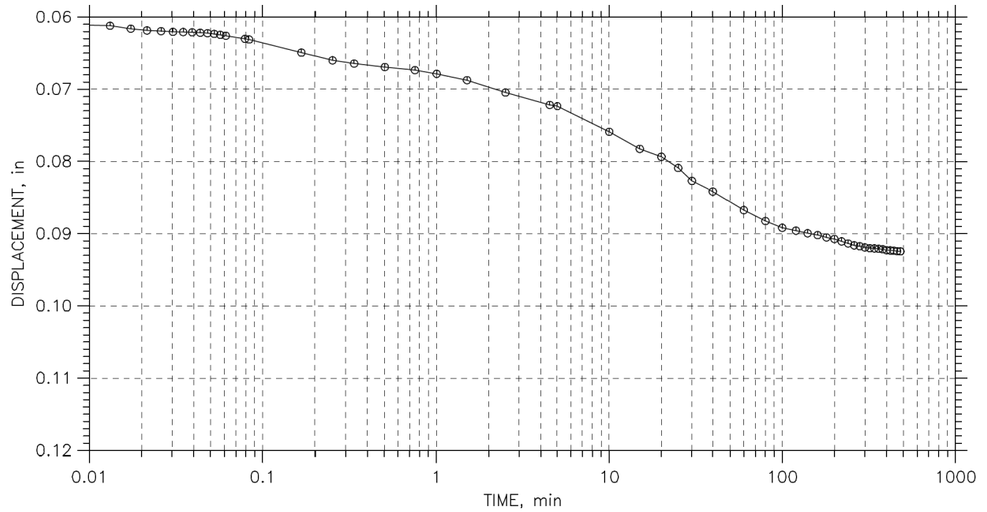
Thu, 22-FEB-2024 15:47:10

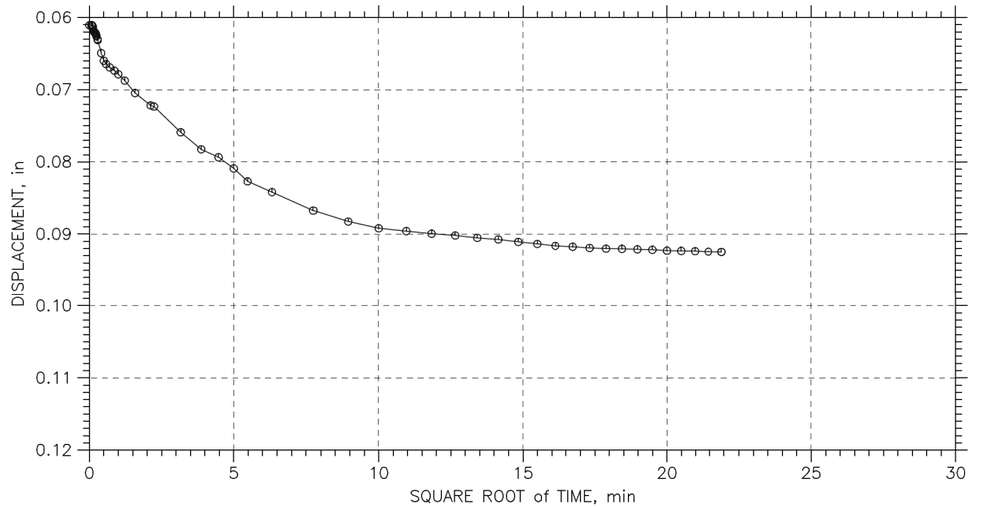
CONSOLIDATION TEST DATA

TIME CURVES

Step: 6 of 11

Stress: 4. tsf





Project: ATH/MEG-033-18.70/00.00	Location: Meigs County, Ohio	Project No.: 23050059COL
Boring No.: B-46-0-23	Tested By: MW	Checked By: SM
Sample No.: ST-1	Test Date: 02/09/24	Depth: 2'-4'
Test No.: 1	Sample Type: Shelby Tube	Elevation:
Description: Brown Elastic Clay (A-7-5)		
Remarks:		

Thu, 22-FEB-2024 15:47:10

GEOTECHNICAL PROFILE - ROADWAY
CONSOLIDATION RESULTS

DESIGN AGENCY
GTL ENGINEERING
2960 FISHER ROAD
COLUMBUS, OHIO 43204
PHONE:(614)276-8123
FAX:(614)276-8377

DESIGNER N.K.S

REVIEWER SM 11-06-24

PROJECT ID 119141

SUBSET 58 TOTAL 82

SHEET * TOTAL -

ATH-US 33-18.70

MODEL: Sheet PAPERSIZE: 17x11 (in.) DATE: 06-11-2024 TIME: 20:41:18 USER: ACAD
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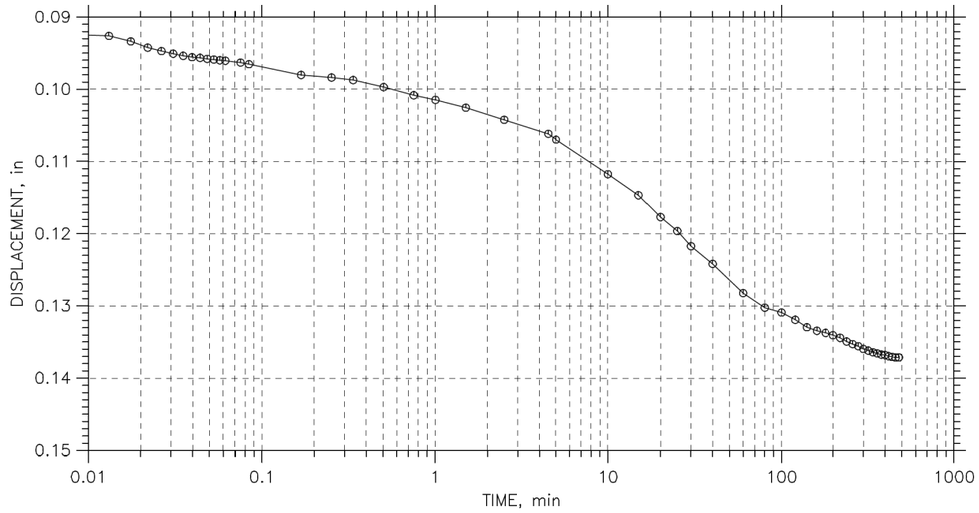
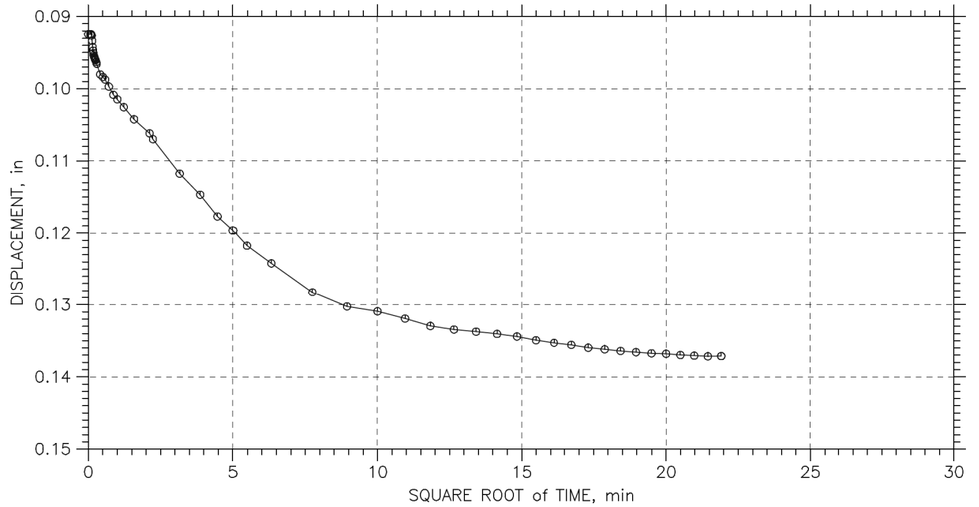
CONSOLIDATION TEST DATA

TIME CURVES

Step: 7 of 11

Stress: 8. tsf





Project: ATH/MEG-033-18.70/00.00	Location: Meigs County, Ohio	Project No.: 23050059COL
Boring No.: B-46-0-23	Tested By: MW	Checked By: SM
Sample No.: ST-1	Test Date: 02/09/24	Depth: 2'-4'
Test No.: 1	Sample Type: Shelby Tube	Elevation:
Description: Brown Elastic Clay (A-7-5)		
Remarks:		

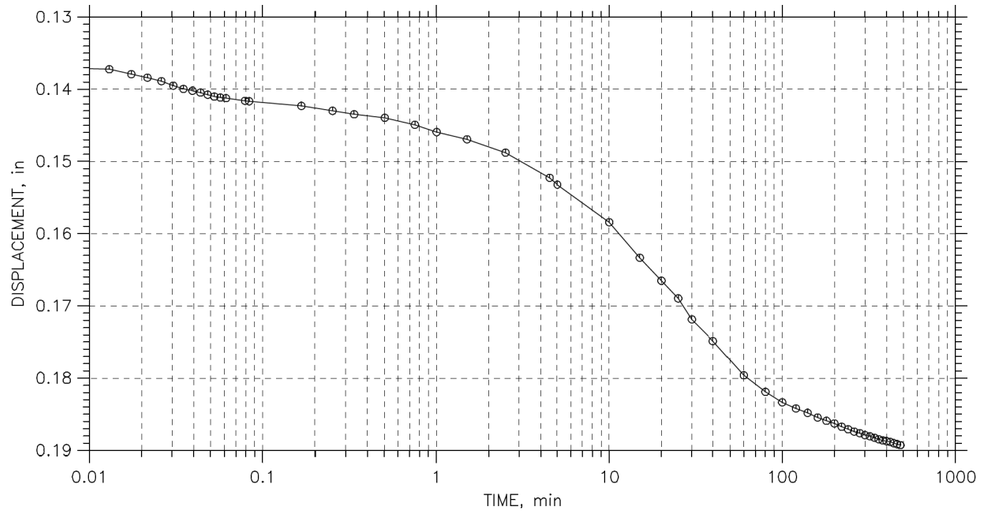
Thu, 22-FEB-2024 15:47:10

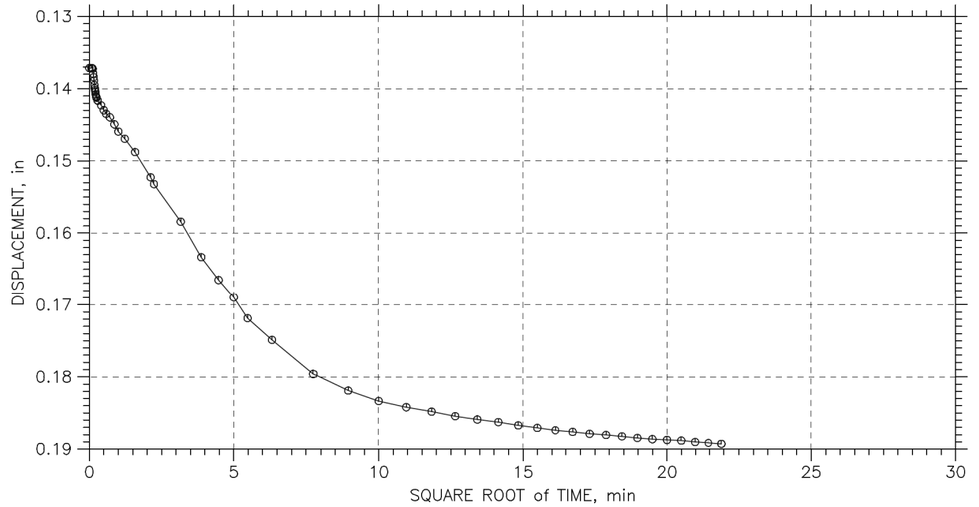
CONSOLIDATION TEST DATA

TIME CURVES

Step: 8 of 11

Stress: 16. tsf





Project: ATH/MEG-033-18.70/00.00	Location: Meigs County, Ohio	Project No.: 23050059COL
Boring No.: B-46-0-23	Tested By: MW	Checked By: SM
Sample No.: ST-1	Test Date: 02/09/24	Depth: 2'-4'
Test No.: 1	Sample Type: Shelby Tube	Elevation:
Description: Brown Elastic Clay (A-7-5)		
Remarks:		

Thu, 22-FEB-2024 15:47:10

GEOTECHNICAL PROFILE - ROADWAY
CONSOLIDATION RESULTS

DESIGN AGENCY
GTL ENGINEERING
2960 FISHER ROAD
COLUMBUS, OHIO 43204
PHONE:(614)276-8123
FAX:(614)276-8377

DESIGNER N.K.S

REVIEWER SM 11-06-24

PROJECT ID 119141

SUBSET 59 TOTAL 82

SHEET * TOTAL -

ATH-US 33-18.70

MODEL: Sheet PAPERSIZE: 17x11 (in.) DATE: 06-11-2024 TIME: 20:41:51 USER: ACAD
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One Dimensional Consolidation and Swell Properties of Soil - ASTM D 2435

CTL ENGINEERING, INC.

2860 Fisher Road

Columbus, OH 43204

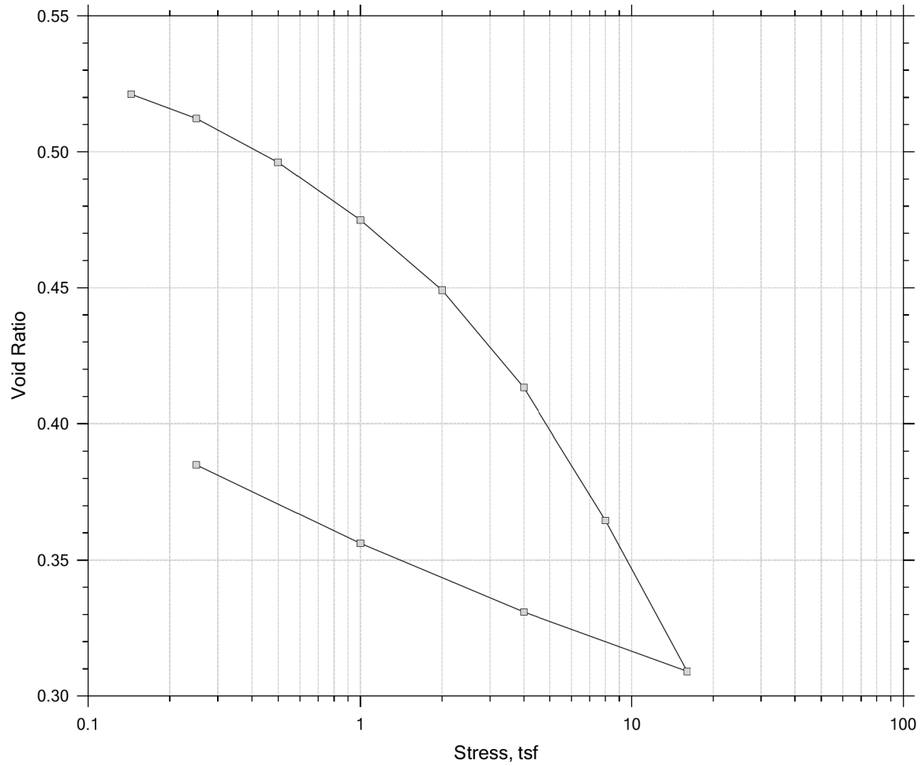
Project No.:	23050059COL		
Project:	ATH/MEG-033-18.70/00.00	Sample Type:	Undisturbed Specimen
Client:	HNTB Ohio, Inc	Test Date:	5/3/2024
Boring No.:	B-047-0-23	Checked By:	SM
Sample No.:	ST_1'-3'	Tested By:	MW
Soil Description:	Brown, Silt and Clay (A-6a)	LL:	29
Specific Gravity:	2.716	PL:	18
Initial Dry Unit Weight	104.6 pcf	Initial Moisture	20.6%

Step No.	Applied Stress (tsf)	Final Displacement (in)	Void Ratio	Strain at End (%)	Sqrt T_{90} (min)	Cv (ft^2/sec)
1	0.144	0.06157	0.521	6.13	19.716	
2	0.25	0.06713	0.512	6.68	49.624	4.38E-07
3	0.5	0.07715	0.496	7.68	32.506	6.57E-07
4	1	0.0903	0.475	8.98	20.082	1.04E-06
5	2	0.1063	0.449	10.6	14.58	1.38E-06
6	4	0.1285	0.413	12.8	28.463	6.79E-07
7	8	0.1587	0.365	15.8	40.478	4.50E-07
8	16	0.1931	0.309	19.2	49.124	3.43E-07
9	4	0.1796	0.331	17.9	21.432	
10	1	0.1639	0.356	16.3	57.412	
11	0.25	0.1461	0.385	14.5	152.109	

CONSOLIDATION PARAMETERS	
Preconsolidation Pressure (tsf): 1.50	Initial Void Ratio: 0.52
Compression Index (C_c): 0.19	Compression Ratio : 0.12
Recompression Index (C_r): 0.037	Recompression Ratio: 0.024

One-Dimensional Consolidation by ASTM D2435 - Method B

Summary Report



Project Name: ATH/MEG-033-18.70/00.00	Location: Athens and Meigs Counties, Ohio	Project Number: 23050059COL	
Boring Number: B-047-A-23	Tester: SAH/DS	Checker:	
Sample Number: ST-1	Test Date: 5/03/24	Depth: 1'-3'	
Test Number:	Preparation:	Elevation:	
Description:			
Remarks:			
Displacement at End of Increment			

2024-05-16 11:55:51 V 3.0.19.158 1 2024-05-03 11:46:32 V 3.0.19.158

GEOTECHNICAL PROFILE - ROADWAY
CONSOLIDATION RESULTS

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

DESIGNER N.K.S

REVIEWER SM 11-06-24

PROJECT ID 119141

SUBSET 60 TOTAL 82

SHEET A TOTAL -

ATH-US 33-18.70

MODEL: Sheet PAPERSIZE: 17x11 (in.) DATE: 06-11-2024 TIME: 20:42:39 USER: ACAD
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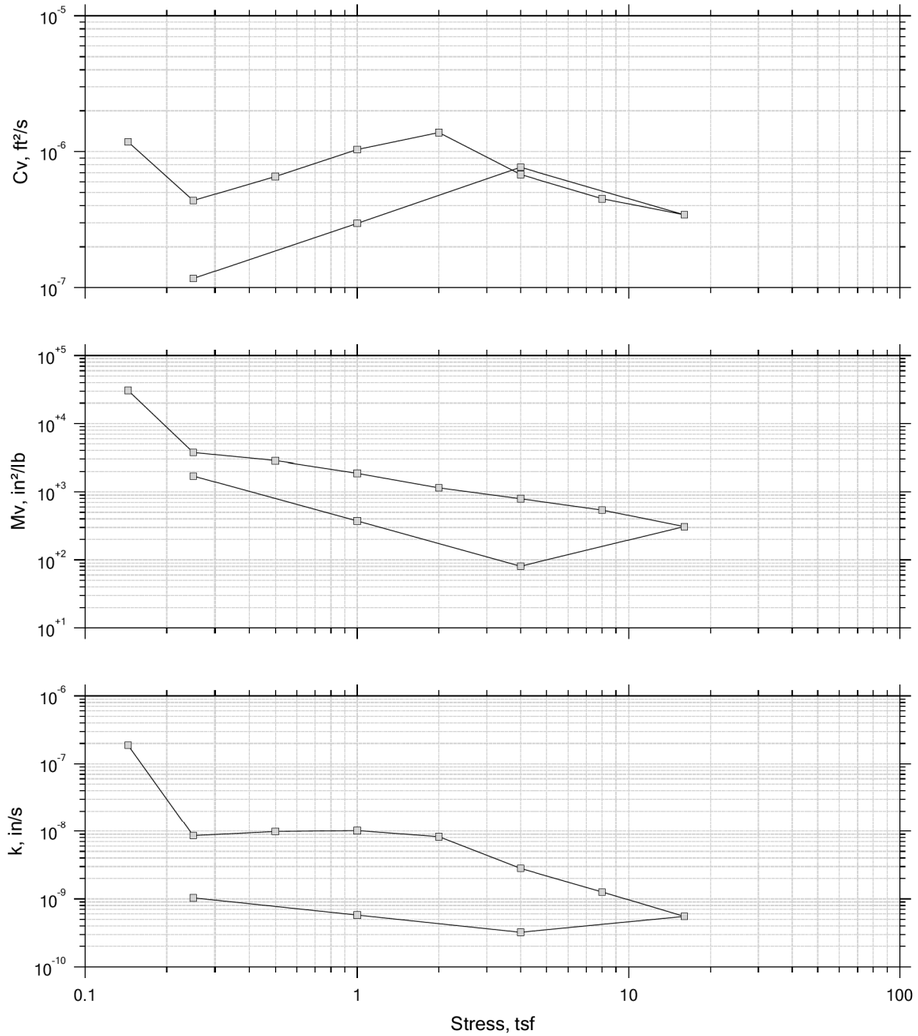
One-Dimensional Consolidation by ASTM D2435 - Method B

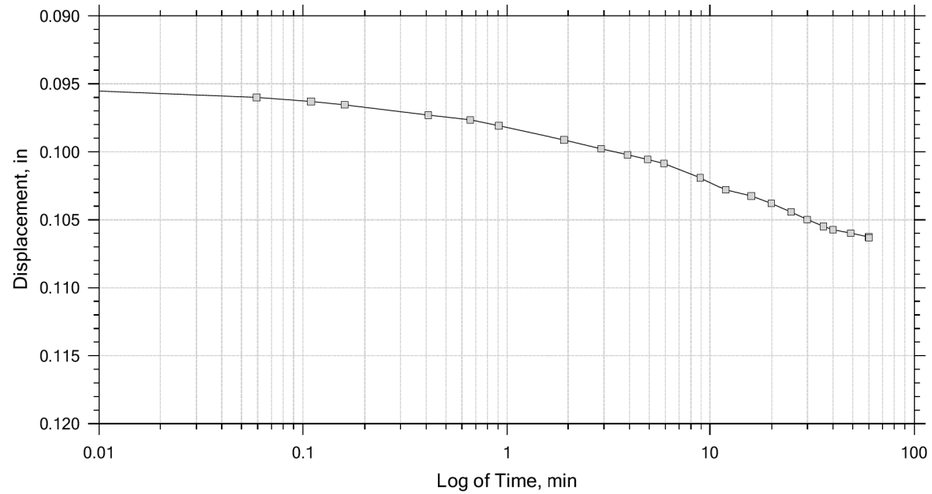
Sqrt of Time Coefficients

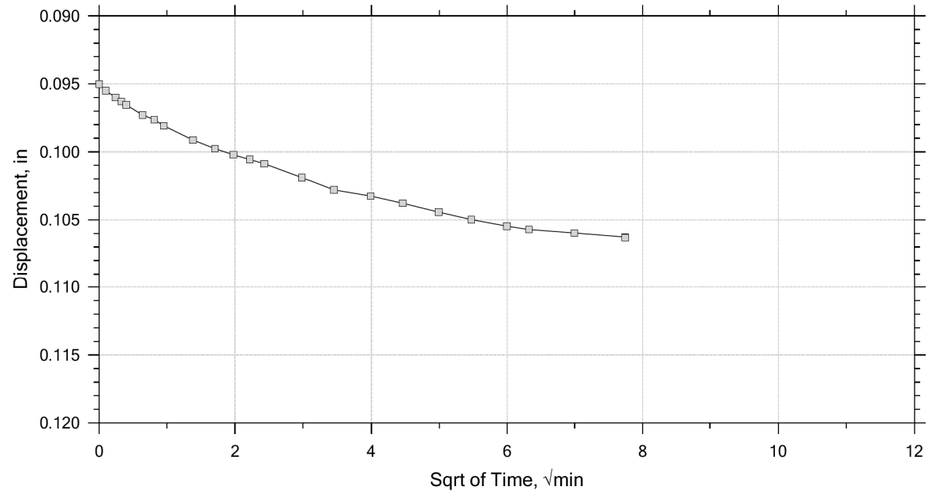


CTL ENGINEERING INC	Project Name: ATH/MEG-033-18.70/00.00	Location: Athens and Meigs Counties, Ohio	Project Number: 23050059COL
	Boring Number: B-047-A-23	Tester: SAH/DS	Checker:
	Sample Number: ST-1	Test Date: 5/03/24	Depth: 1'-3'
	Test Number:	Preparation:	Elevation:
	Description:		
	Remarks:		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 5 of 11
Constant Load Step
Stress: 2 tsf





CTL ENGINEERING INC	Project Name: ATH/MEG-033-18.70/00.00	Location: Athens and Meigs Counties, Ohio	Project Number: 23050059COL
	Boring Number: B-047-A-23	Tester: SAH/DS	Checker:
	Sample Number: ST-1	Test Date: 5/03/24	Depth: 1'-3'
	Test Number:	Preparation:	Elevation:
	Description:		
	Remarks:		

GEOTECHNICAL PROFILE - ROADWAY
CONSOLIDATION RESULTS

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

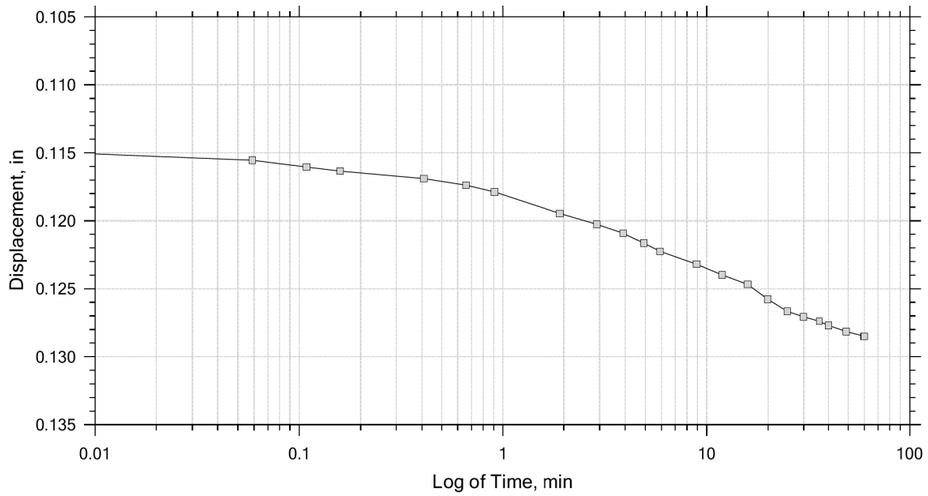
DESIGNER N.K.S
REVIEWER SM 11-06-24
PROJECT ID 119141
SUBSET 61 TOTAL 82
SHEET ▲ TOTAL -

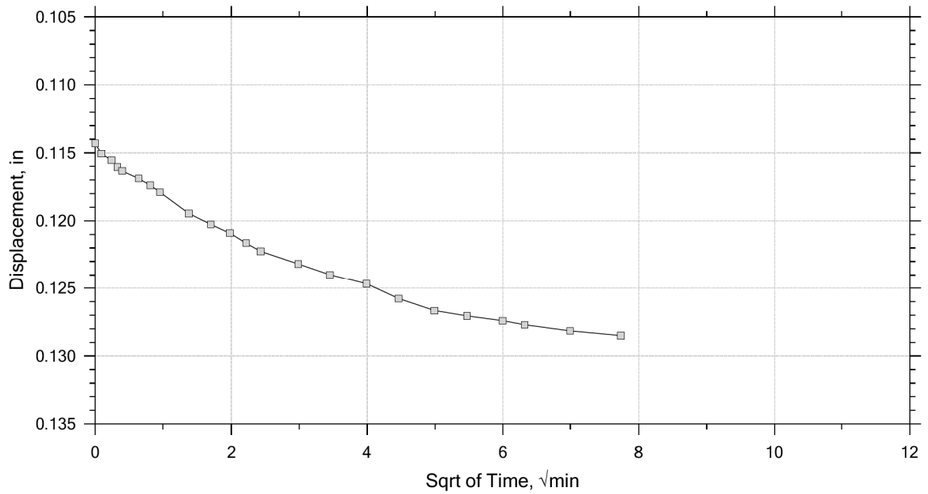
ATH-US 33-18.70

MODEL: Sheet PAPERSIZE: 17x11 (in.) DATE: 06-11-2024 TIME: 20:43:28 USER: ACAD
D:\Dept 05\COL\23050059COL\West Section\Mod_30.10.24\Working\119141ZD01.dgn

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 6 of 11
Constant Load Step
Stress: 4 tsf

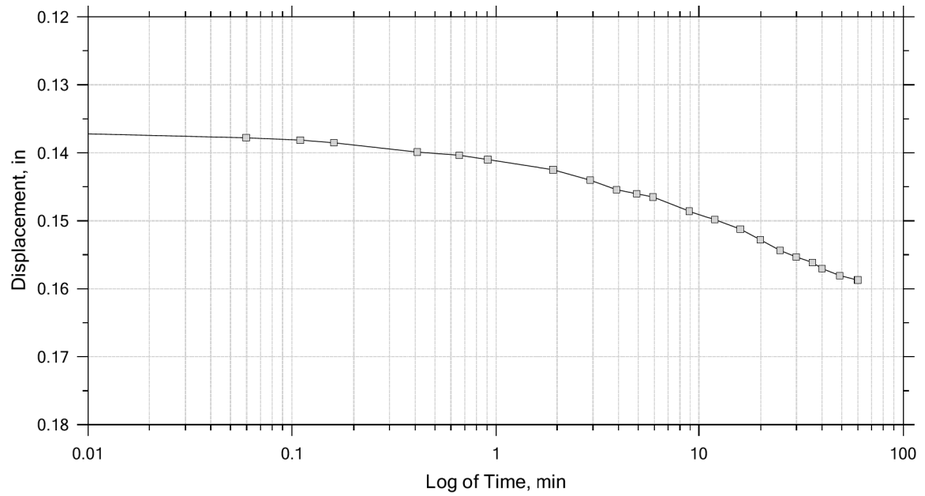


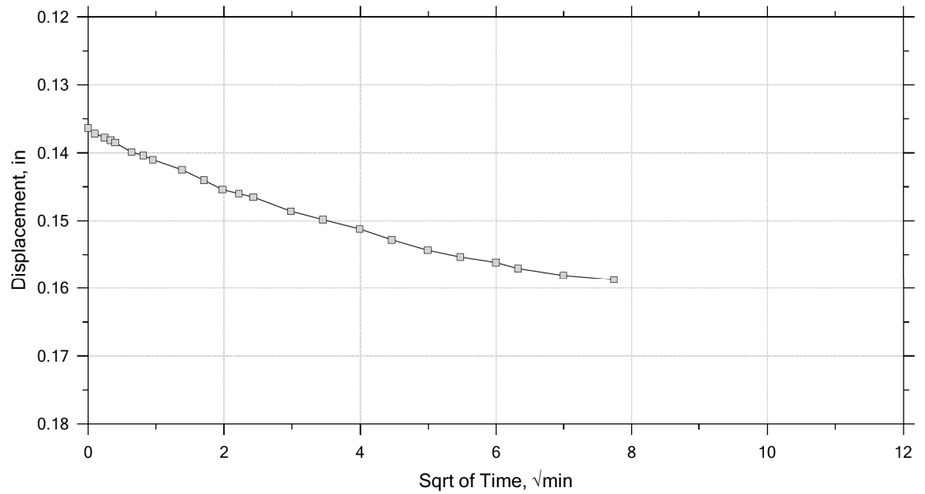


Project Name: ATH/MEG-033-18.70/00.00	Location: Athens and Meigs Counties, Ohio	Project Number: 23050059COL
Boring Number: B-047-A-23	Tester: SAH/DS	Checker:
Sample Number: ST-1	Test Date: 5/03/24	Depth: 1'-3'
Test Number:	Preparation:	Elevation:
Description:		
Remarks:		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 7 of 11
Constant Load Step
Stress: 8 tsf





Project Name: ATH/MEG-033-18.70/00.00	Location: Athens and Meigs Counties, Ohio	Project Number: 23050059COL
Boring Number: B-047-A-23	Tester: SAH/DS	Checker:
Sample Number: ST-1	Test Date: 5/03/24	Depth: 1'-3'
Test Number:	Preparation:	Elevation:
Description:		
Remarks:		

GEOTECHNICAL PROFILE - ROADWAY
CONSOLIDATION RESULTS

DESIGN AGENCY
GTL ENGINEERING INC
2960 FISHER ROAD
COLUMBUS, OHIO 43204
PHONE:(614)276-8123
FAX:(614)276-6377

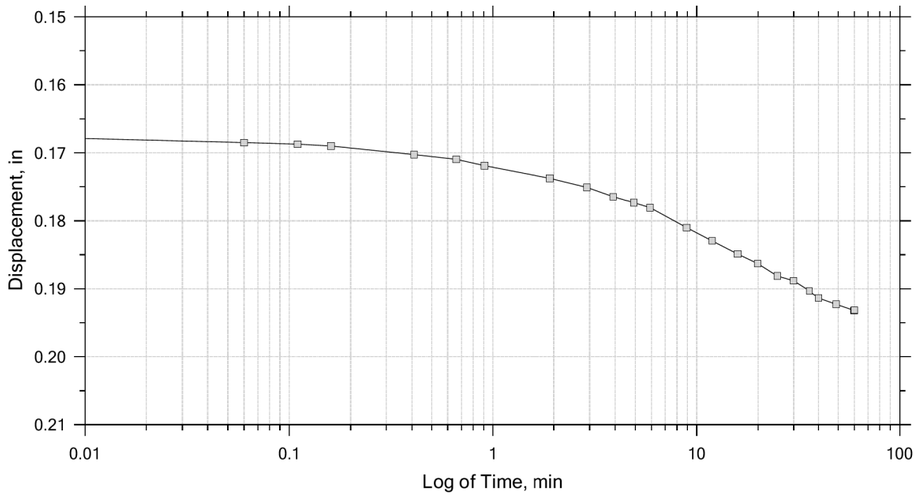
DESIGNER N.K.S
REVIEWER SM 11-06-24
PROJECT ID 119141
SUBSET 62 TOTAL 82
SHEET A TOTAL -

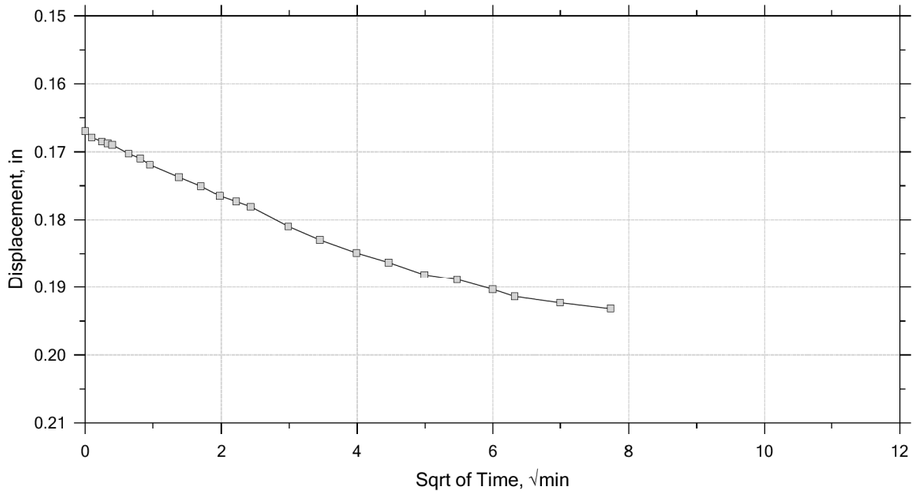
ATH-US 33-18.70

MODEL: Sheet PAPERSIZE: 17x11 (in.) DATE: 06-11-2024 TIME: 20:45:41 USER: ACAD
D:\Dept 05\COL\23050059COL\West Section\Mod_30.10.24\Working\119141ZD012.dgn

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 8 of 11
Constant Load Step
Stress: 16 tsf





GTL ENGINEERING INC.	Project Name: ATH/MEG-033-18.70/00.00	Location: Athens and Meigs Counties, Ohio	Project Number: 23050059COL
	Boring Number: B-047-A-23	Tester: SAH/DS	Checker:
	Sample Number: ST-1	Test Date: 5/03/24	Depth: 1'-3'
	Test Number:	Preparation:	Elevation:
	Description:		
	Remarks:		

2024-05-16 11:55:52 V 3.0.19.158 11 2024-05-03 11:46:32 V 3.0.19.158

One Dimensional Consolidation and Swell Properties of Soil - ASTM D 2435

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

Project No.:	23050059COL		
Project:	ATH/MEG-033-18.70/00.00	Sample Type:	Undisturbed Specimen
Client:	HNTB Ohio, Inc	Test Date:	5/7/2024
Boring No.:	B-047-0-23	Checked By:	SM
Sample No.:	ST_7'-9'	Tested By:	MW
Soil Description:	Brown, Clay (A-7-6)	LL:	42
Specific Gravity:	2.701	PL:	21
Initial Dry Unit Weight	99.6 pcf	Initial Moisture	23.5%

Step No.	Applied Stress (tsf)	Final Displacement (in)	Void Ratio	Strain at End (%)	Sqrt T_{90} (min)	Cv (ft^2/sec)
1	0.149	0.01255	0.673	1.23	5.712	
2	0.25	0.01558	0.668	1.52	9.749	2.57E-06
3	0.5	0.02089	0.659	2.04	18.63	1.33E-06
4	1	0.0323	0.64	3.15	16.36	1.49E-06
5	2	0.04803	0.614	4.69	37.55	6.33E-07
6	4	0.0642	0.588	6.27	10.164	2.26E-06
7	8	0.08563	0.552	8.36	47.959	4.61E-07
8	16	0.1229	0.491	12	49.404	4.21E-07
9	4	0.1104	0.511	10.8	15.899	
10	1	0.09491	0.537	9.26	54.988	
11	0.25	0.07849	0.564	7.66	154.38	

CONSOLIDATION PARAMETERS	
Preconsolidation Pressure (tsf): 3.00	Initial Void Ratio: 0.67
Compression Index (C_c): 0.20	Compression Ratio : 0.12
Recompression Index (C_r): 0.033	Recompression Ratio: 0.020

GTL ENGINEERING INC.

GEOTECHNICAL PROFILE - ROADWAY
CONSOLIDATION RESULTS

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

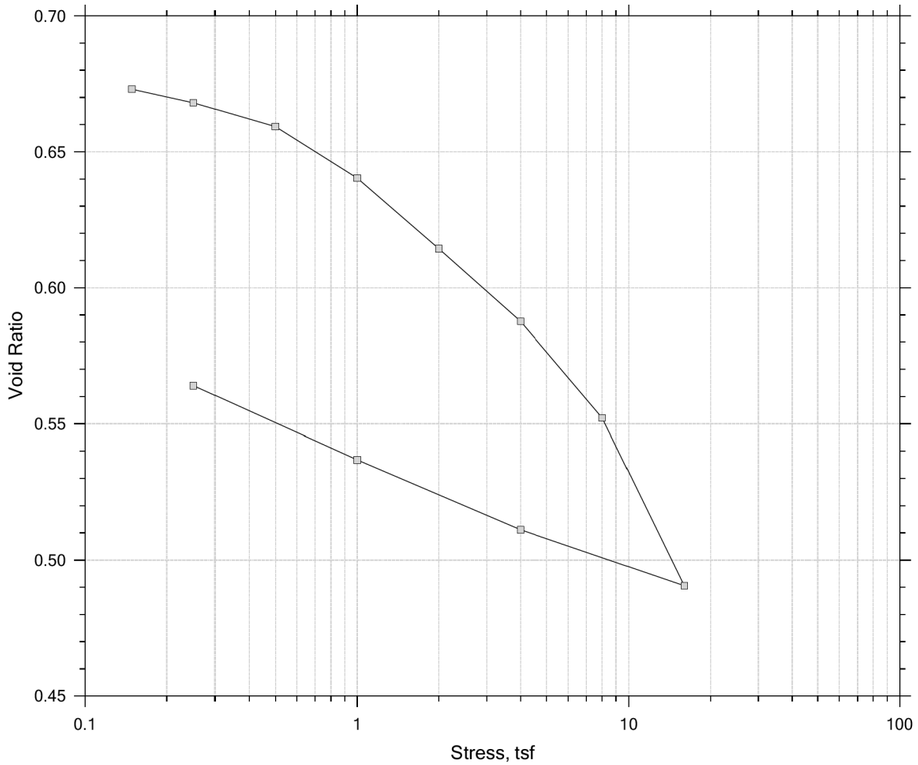
DESIGNER N.K.S
REVIEWER SM 11-06-24
PROJECT ID 119141
SUBSET 63 TOTAL 82
SHEET A TOTAL -

ATH-US 33-18.70

MODEL: Sheet PAPERSIZE: 17x11 (in.) DATE: 06-11-2024 TIME: 20:48:56 USER: ACAD
D:\Dept 05\COL\23050059COL\West Section\Mod_30.10.24\Working\119141ZD013.dgn

One-Dimensional Consolidation by ASTM D2435 - Method B

Summary Report

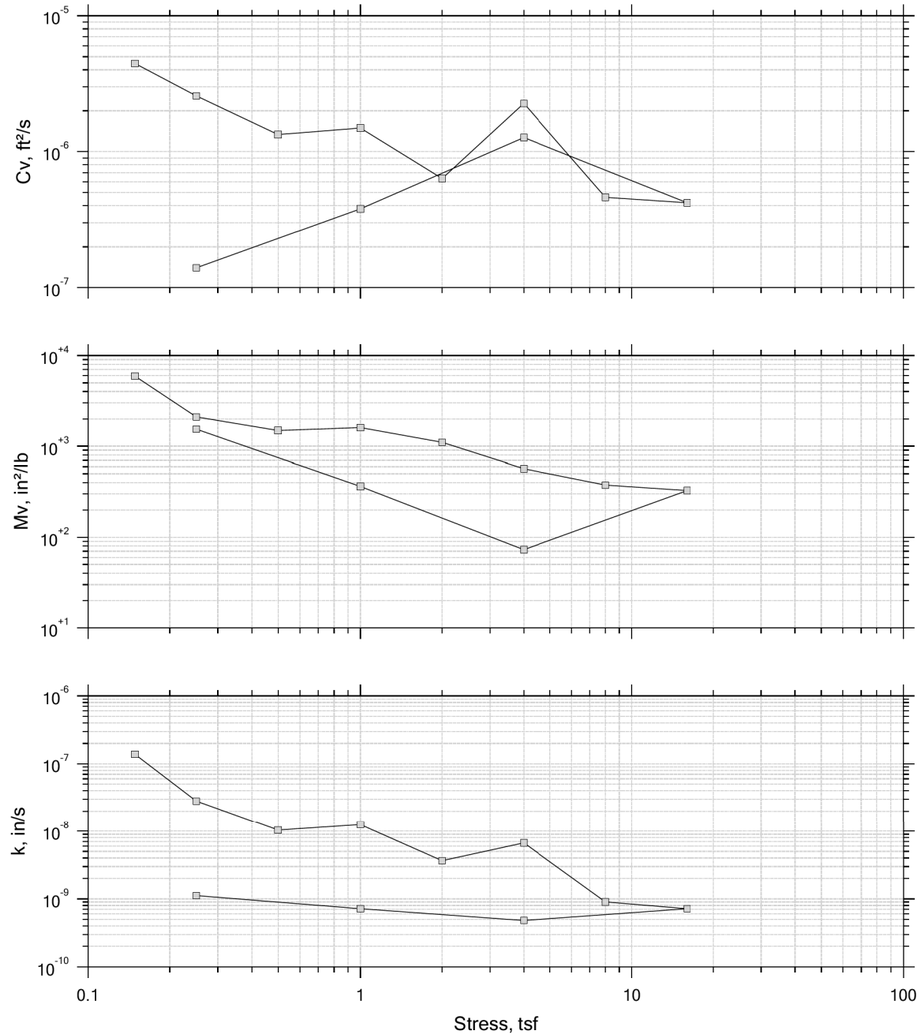


	Project Name: ATH/MEG-033-18.70/00.00	Location: Athens and Meigs Counties, Ohio	Project Number: 23050059COL
	Boring Number: B-047-A-23	Tester: JO	Checker:
	Sample Number: ST-2	Test Date: 5/7/24	Depth: 7'-9'
	Test Number:	Preparation:	Elevation:
	Description:		
	Remarks:		
	Displacement at End of Increment		

2024-05-16 12:01:53 V 3.0.19.158 1 2024-05-07 10:52:08 V 3.0.19.158

One-Dimensional Consolidation by ASTM D2435 - Method B

Sqrt of Time Coefficients



	Project Name: ATH/MEG-033-18.70/00.00	Location: Athens and Meigs Counties, Ohio	Project Number: 23050059COL
	Boring Number: B-047-A-23	Tester: JO	Checker:
	Sample Number: ST-2	Test Date: 5/7/24	Depth: 7'-9'
	Test Number:	Preparation:	Elevation:
	Description:		
	Remarks:		

2024-05-16 12:01:53 V 3.0.19.158 3 2024-05-07 10:52:08 V 3.0.19.158

GEOTECHNICAL PROFILE - ROADWAY
CONSOLIDATION RESULTS

DESIGN AGENCY
CTL ENGINEERING INC
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FAX(614)276-6377

DESIGNER N.K.S
REVIEWER SM 11-06-24
PROJECT ID 119141
SUBSET 64 TOTAL 82
SHEET - TOTAL -

ATH-US 33-18.70

MODEL: Sheet PAPERSIZE: 17x11 (in.) DATE: 06-11-2024 TIME: 20:51:43 USER: ACAD
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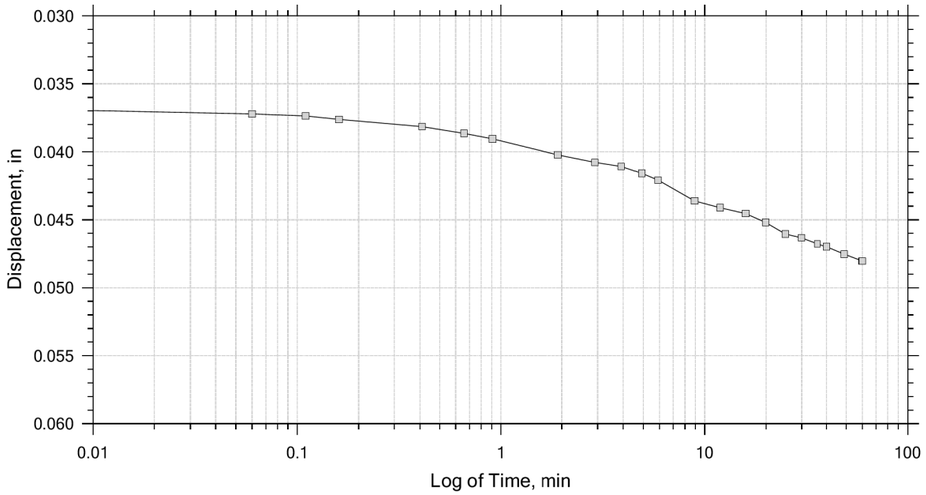
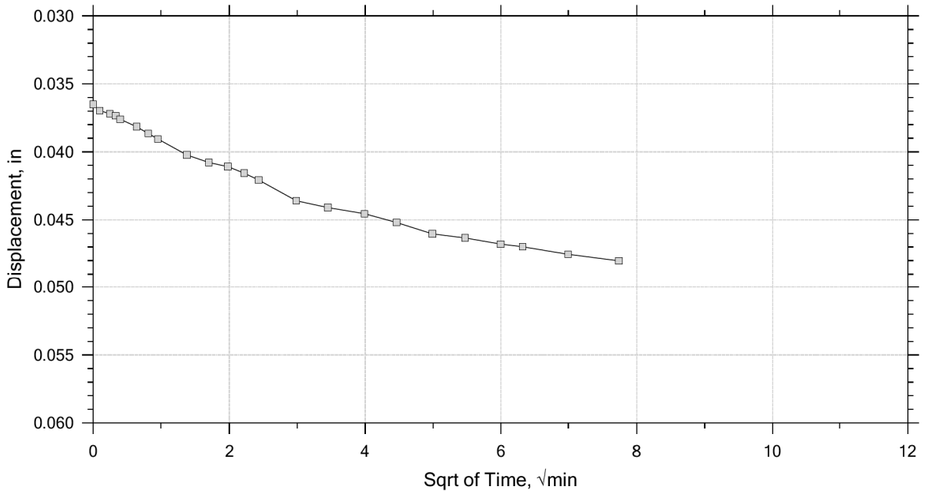
One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 5 of 11
Constant Load Step
Stress: 2 tsf

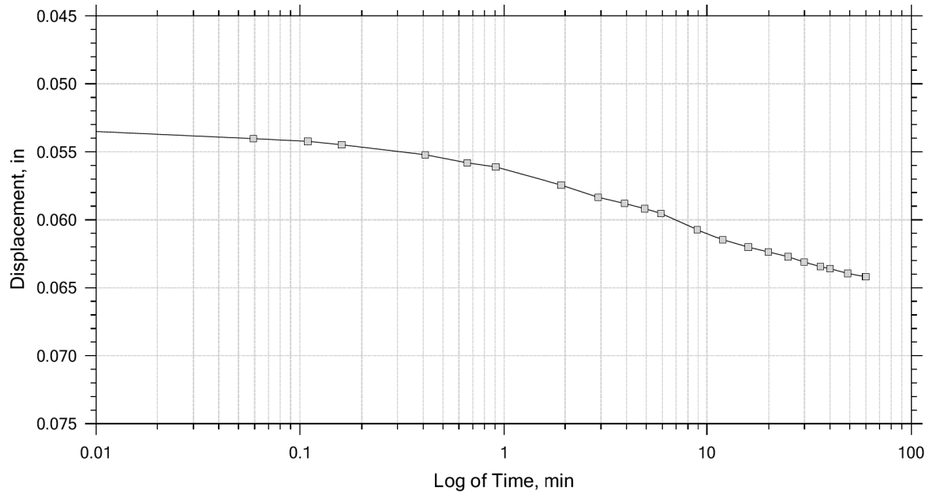


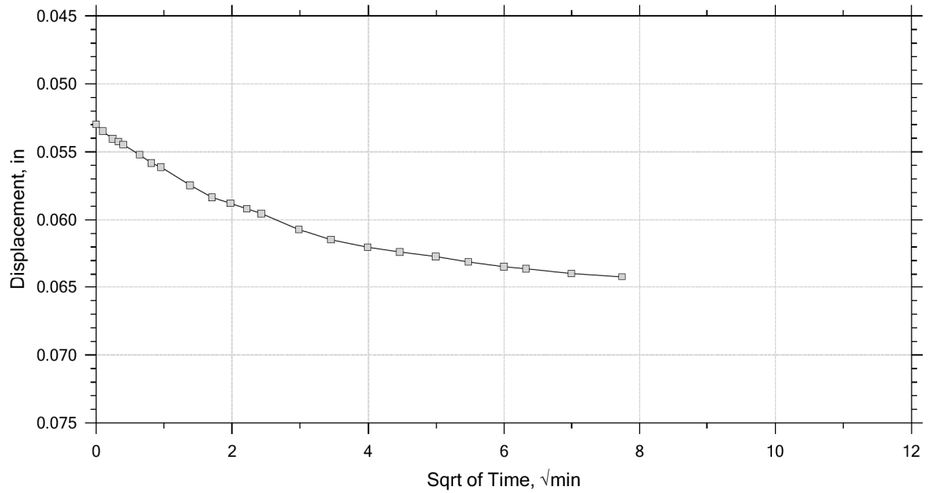


Project Name: ATH/MEG-033-18.70/00.00	Location: Athens and Meigs Counties, Ohio	Project Number: 23050059COL
Boring Number: B-047-A-23	Tester: JO	Checker:
Sample Number: ST-2	Test Date: 5/7/24	Depth: 7'-9'
Test Number:	Preparation:	Elevation:
Description:		
Remarks:		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 6 of 11
Constant Load Step
Stress: 4 tsf





Project Name: ATH/MEG-033-18.70/00.00	Location: Athens and Meigs Counties, Ohio	Project Number: 23050059COL
Boring Number: B-047-A-23	Tester: JO	Checker:
Sample Number: ST-2	Test Date: 5/7/24	Depth: 7'-9'
Test Number:	Preparation:	Elevation:
Description:		
Remarks:		

GEOTECHNICAL PROFILE - ROADWAY
CONSOLIDATION RESULTS

DESIGN AGENCY
GTL ENGINEERING INC
2960 FISHER ROAD
COLUMBUS, OHIO 43204
PHONE:(614)276-8123
FAX:(614)276-6377

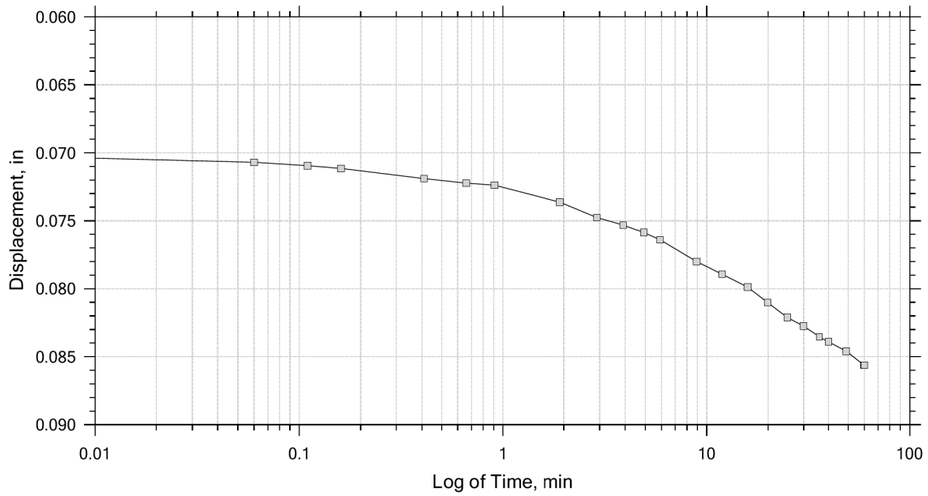
DESIGNER N.K.S
REVIEWER SM 11-06-24
PROJECT ID 119141
SUBSET 65 TOTAL 82
SHEET A TOTAL -

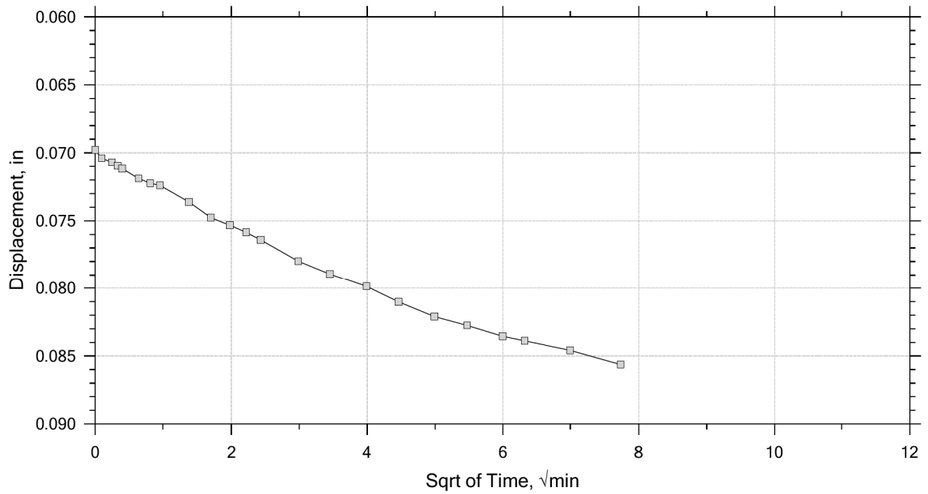
ATH-US 33-18.70

MODEL: Sheet PAPERSIZE: 17x11 (in.) DATE: 06-11-2024 TIME: 20:50:41 USER: ACAD
D:\Dept 05\COL\23050059COL\West Section\Mod_30.10.24\Working\119141ZD015.dgn

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 7 of 11
Constant Load Step
Stress: 8 tsf



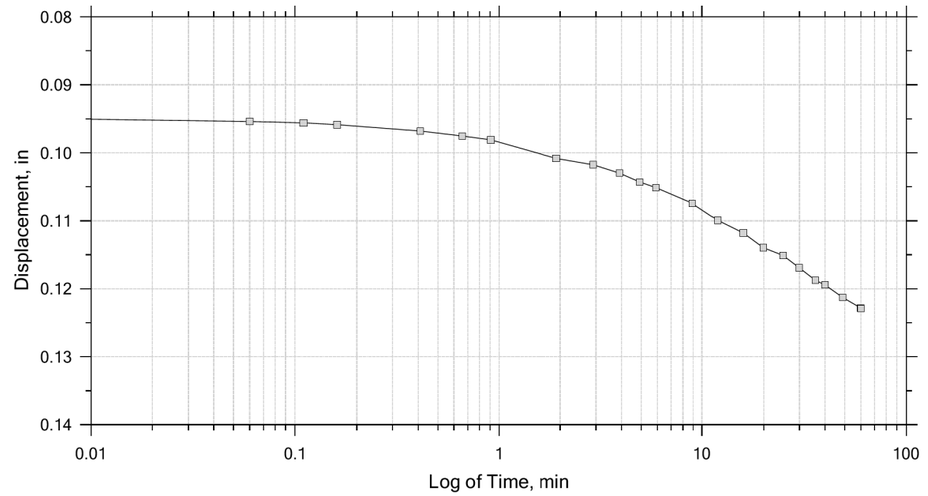


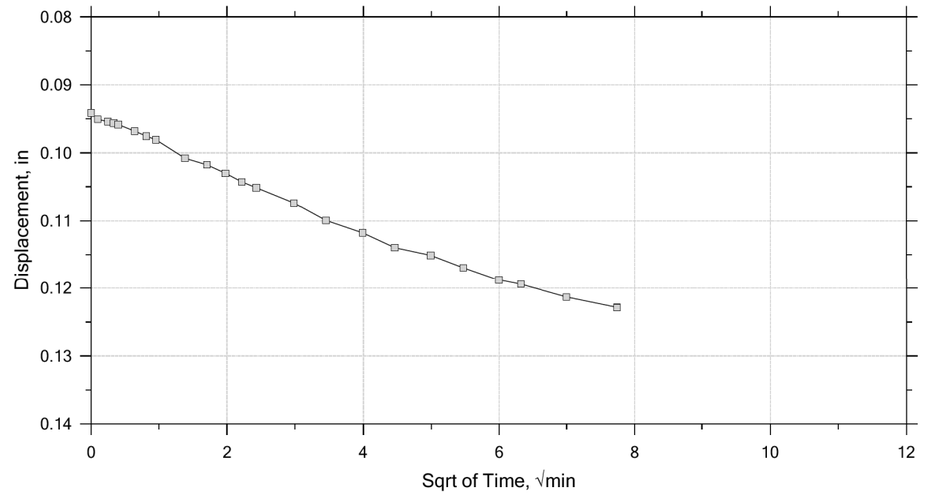
Project Name: ATH/MEG-033-18.70/00.00	Location: Athens and Meigs Counties, Ohio	Project Number: 23050059COL
Boring Number: B-047-A-23	Tester: JO	Checker:
Sample Number: ST-2	Test Date: 5/7/24	Depth: 7'-9'
Test Number:	Preparation:	Elevation:
Description:		
Remarks:		

2024-05-16 12:01:53 V 3.0.19.158 10 2024-05-07 10:52:08 V 3.0.19.158

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 8 of 11
Constant Load Step
Stress: 16 tsf





Project Name: ATH/MEG-033-18.70/00.00	Location: Athens and Meigs Counties, Ohio	Project Number: 23050059COL
Boring Number: B-047-A-23	Tester: JO	Checker:
Sample Number: ST-2	Test Date: 5/7/24	Depth: 7'-9'
Test Number:	Preparation:	Elevation:
Description:		
Remarks:		

2024-05-16 12:01:53 V 3.0.19.158 11 2024-05-07 10:52:08 V 3.0.19.158

GEOTECHNICAL PROFILE - ROADWAY
CONSOLIDATION RESULTS

DESIGN AGENCY
GTL ENGINEERING INC
2960 FISHER ROAD
COLUMBUS, OHIO 43204
PHONE:(614)276-8123
FAX:(614)276-6377

DESIGNER N.K.S
REVIEWER SM 11-06-24
PROJECT ID 119141
SUBSET 66 TOTAL 82
SHEET A TOTAL -

ATH-US 33-18.70

MODEL: Sheet PAPERSIZE: 17x11 (in.) DATE: 06-11-2024 TIME: 20:52:22 USER: ACAD
D:\Dept 05\COL\23050059COL\West Section\Mod_30.10.24\Working\119141ZD016.dgn

One Dimensional Consolidation and Swell Properties of Soil - ASTM D 2435

CTL ENGINEERING, INC.

2860 Fisher Road

Columbus, OH 43204

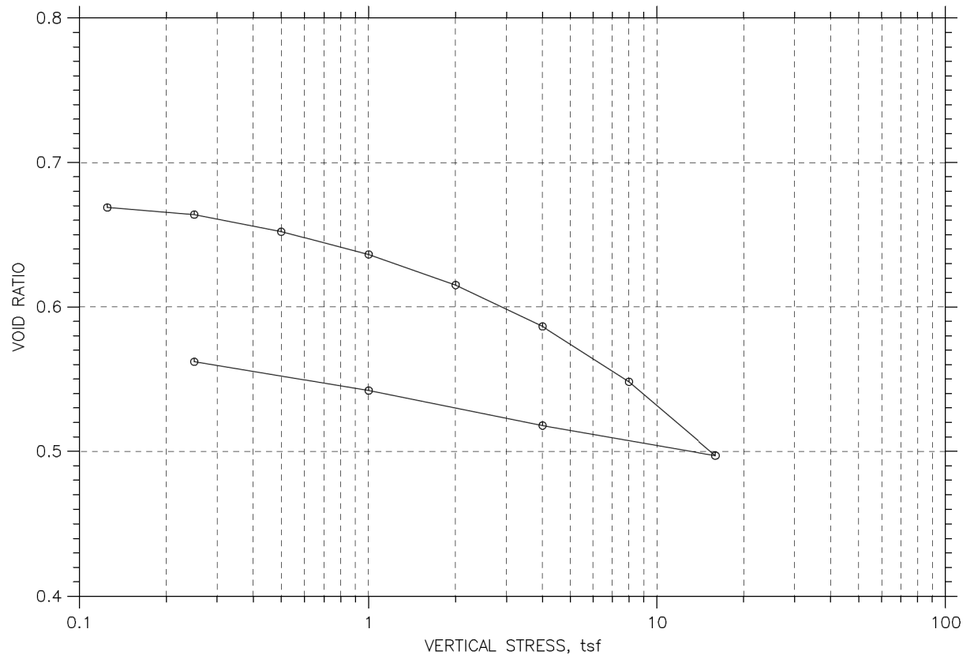
Project No.:	23050059COL		
Project:	ATH/MEG-033-18.70/00.00	Sample Type:	Undisturbed Specimen
Client:	HNTB Ohio, Inc	Test Date:	5/14/2024
Boring No.:	B-049-0-23	Checked By:	SM
Sample No.:	ST_5'-7'	Tested By:	MW
Soil Description:	Brown, Silt and Clay	LL:	
Specific Gravity:	2.617	PL:	
Initial Dry Unit Weight	100.4 pcf	Initial Moisture	23.5%

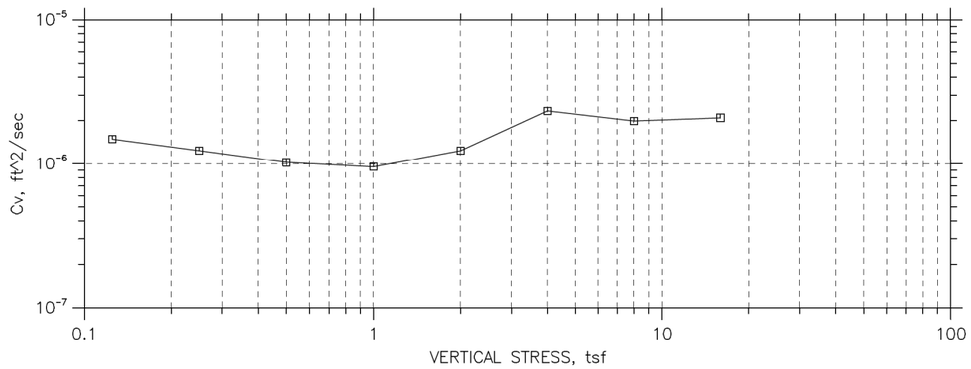
Step No.	Applied Stress (tsf)	Final Displacement (in)	Void Ratio	Strain at End (%)	Sqrt T_{90} (min)	Cv (ft^2/sec)
1	0.125	0.003526	0.669	0.35	14.8	1.65E-06
2	0.25	0.00647	0.664	0.65	19.5	1.24E-06
3	0.5	0.01352	0.652	1.35	14.1	1.70E-06
4	1	0.02294	0.636	2.3	23.6	1.00E-06
5	2	0.03555	0.615	3.56	19.9	1.16E-06
6	4	0.05263	0.586	5.27	9.7	2.31E-06
7	8	0.0755	0.548	7.56	8.7	2.46E-06
8	16	0.106	0.497	10.61	10	2.02E-06
9	4	0.09356	0.518	9.36	54.9	
10	1	0.07913	0.542	7.92	18	
11	0.25	0.06722	0.562	6.73	75.2	

CONSOLIDATION PARAMETERS	
Preconsolidation Pressure (tsf): 2.50	Initial Void Ratio: 0.67
Compression Index (C_c): 0.17	Compression Ratio : 0.10
Recompression Index (C_r): 0.035	Recompression Ratio: 0.021

CONSOLIDATION TEST DATA

SUMMARY REPORT





Project: ATH/MEG-033-18.70/00.00	Location:	Project No.: 23050059COL
Boring No.: B-049-0-24	Tested By: MW	Checked By: SM
Sample No.: ST-2	Test Date: 05/14/24	Depth: 5'-7'
Test No.: 1	Sample Type: Shelby Tube	Elevation:
Description: Brown, Sandy silt (A-4a)		
Remarks:		

Mon, 20-MAY-2024 11:15:35

GEOTECHNICAL PROFILE - ROADWAY
CONSOLIDATION RESULTS

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

DESIGNER N.K.S

REVIEWER SM 11-06-24

PROJECT ID 119141

SUBSET 67 | TOTAL 82

SHEET A | TOTAL -

ATH-US 33-18.70

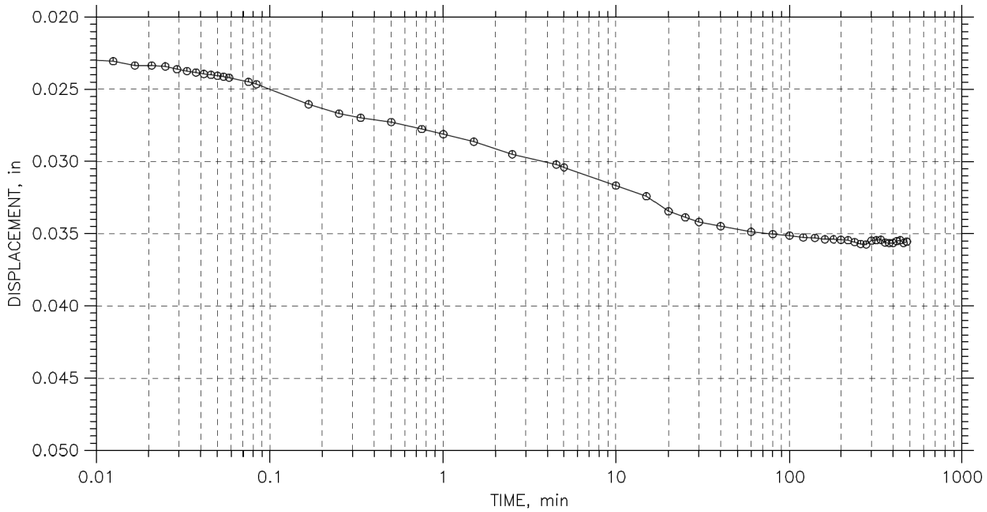
MODEL: Sheet PAPERSIZE: 17x11 (in.) DATE: 06-11-2024 TIME: 20:55:01 USER: ACAD
D:\Dept 05\COL\23050059COL\West Section\Mod_30.10.24\Working\119141ZD017.dgn

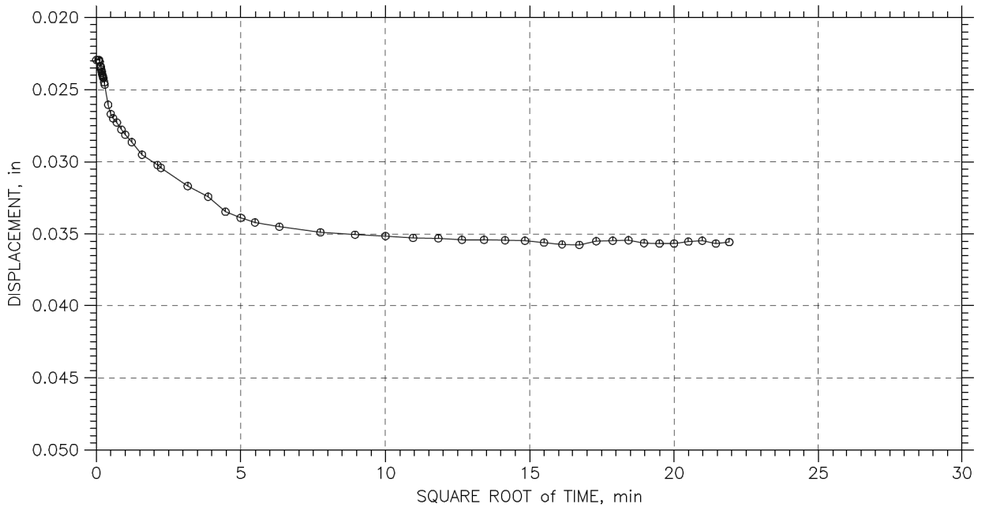
CONSOLIDATION TEST DATA

TIME CURVES

Step: 5 of 11

Stress: 2. tsf





Project: ATH/MEG-033-18.70/00.00	Location:	Project No.: 23050059COL
Boring No.: B-049-0-24	Tested By: MW	Checked By: SM
Sample No.: ST-2	Test Date: 05/14/24	Depth: 5'-7'
Test No.: 1	Sample Type: Shelby Tube	Elevation:
Description: Brown, Sandy silt (A-4a)		
Remarks:		

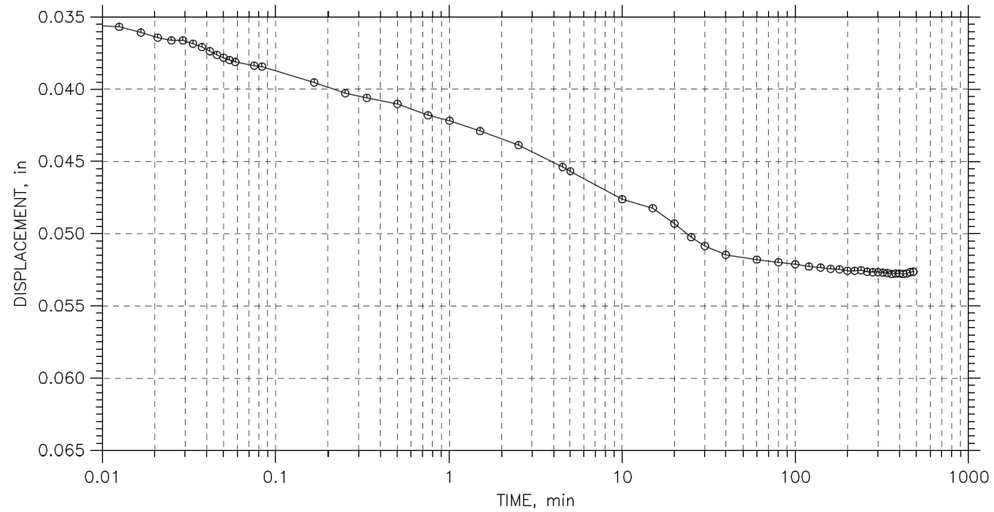
Mon, 20-MAY-2024 11:15:35

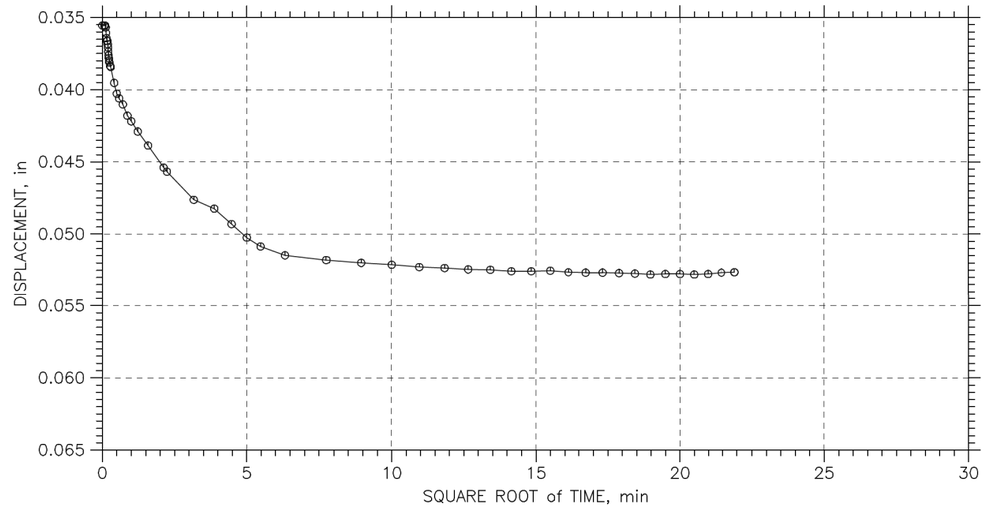
CONSOLIDATION TEST DATA

TIME CURVES

Step: 6 of 11

Stress: 4. tsf





Project: ATH/MEG-033-18.70/00.00	Location:	Project No.: 23050059COL
Boring No.: B-049-0-24	Tested By: MW	Checked By: SM
Sample No.: ST-2	Test Date: 05/14/24	Depth: 5'-7'
Test No.: 1	Sample Type: Shelby Tube	Elevation:
Description: Brown, Sandy silt (A-4a)		
Remarks:		

Mon, 20-MAY-2024 11:15:35

GEOTECHNICAL PROFILE - ROADWAY
CONSOLIDATION RESULTS

DESIGN AGENCY
GTL ENGINEERING
2960 FISHER ROAD
COLUMBUS, OHIO 43204
PHONE:(614)276-8123
FAX:(614)276-6377

DESIGNER N.K.S

REVIEWER SM 11-06-24

PROJECT ID 119141

SUBSET 68 | TOTAL 82

SHEET A | TOTAL -

ATH-US 33-18.70

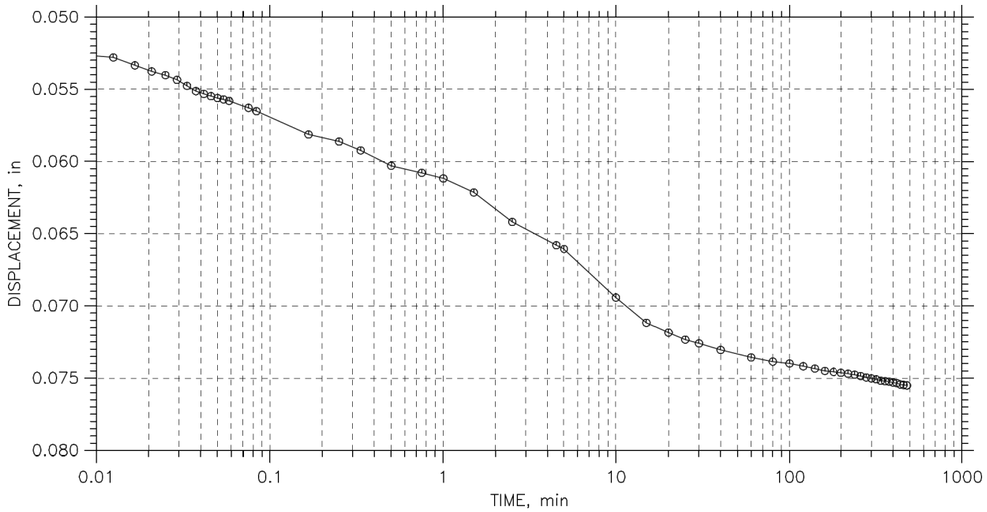
MODEL: Sheet PAPERSIZE: 17x11 (in.) DATE: 06-11-2024 TIME: 20:55:45 USER: ACAD
D:\Dept 05\COL\23050059COL\West Section\Mod_30.10.24\Working\119141ZD018.dgn

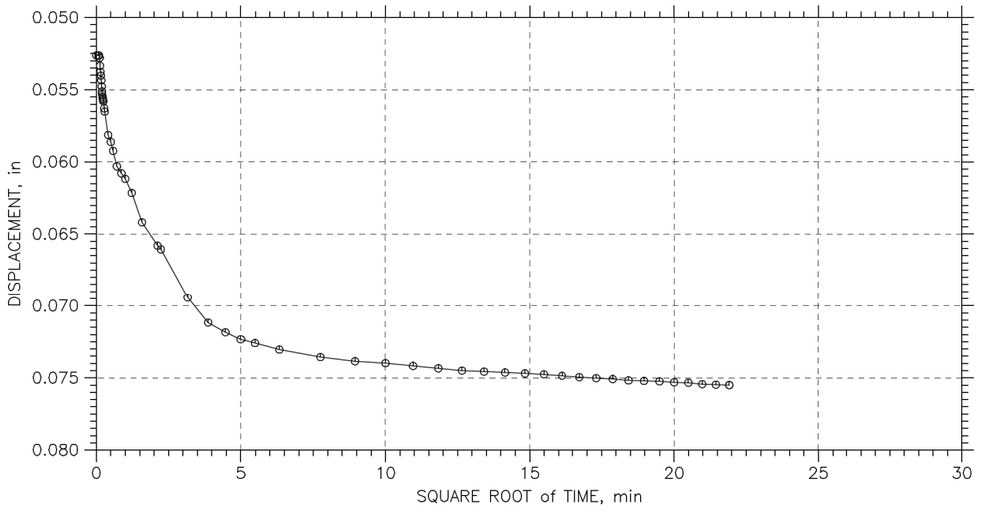
CONSOLIDATION TEST DATA

TIME CURVES

Step: 7 of 11

Stress: 8. tsf





Project: ATH/MEG-033-18.70/00.00	Location:	Project No.: 23050059COL
Boring No.: B-049-0-24	Tested By: MW	Checked By: SM
Sample No.: ST-2	Test Date: 05/14/24	Depth: 5'-7'
Test No.: 1	Sample Type: Shelby Tube	Elevation:
Description: Brown, Sandy silt (A-4a)		
Remarks:		

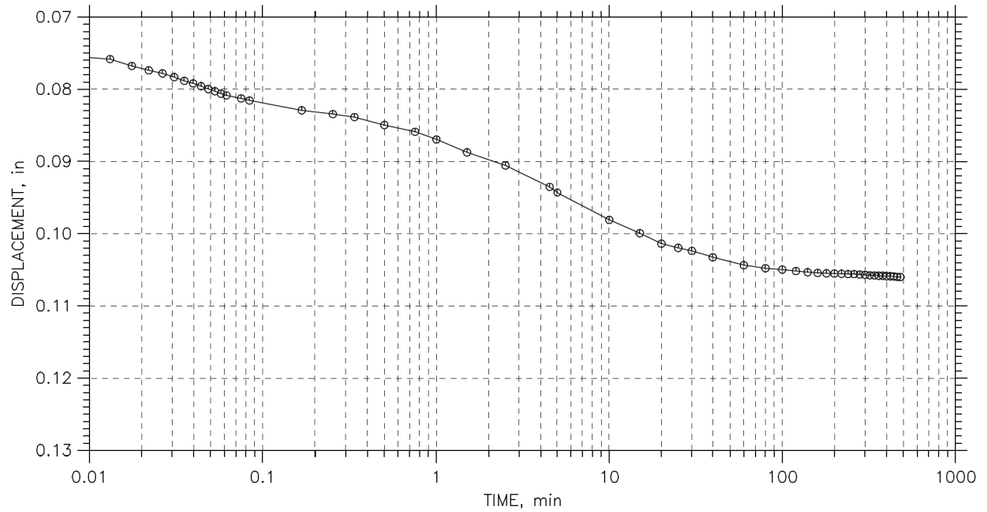
Mon, 20-MAY-2024 11:15:35

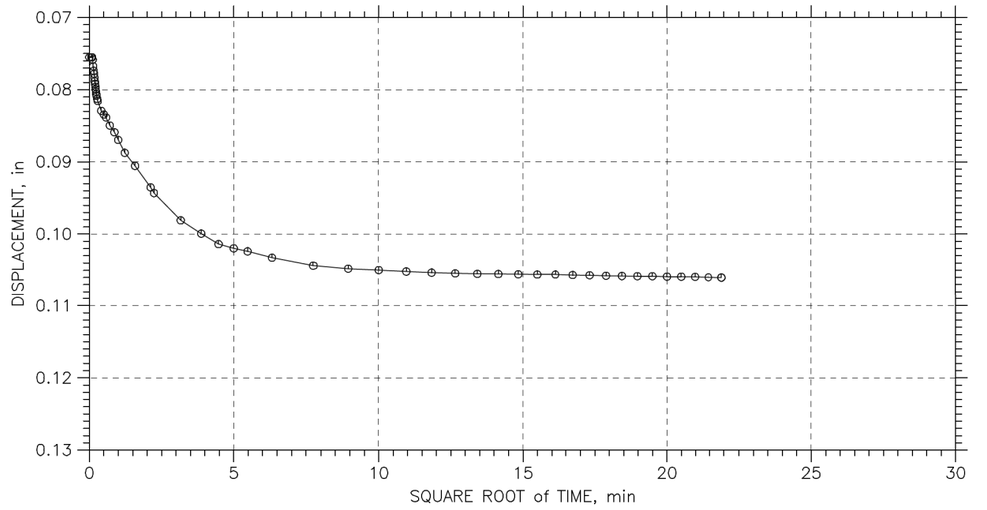
CONSOLIDATION TEST DATA

TIME CURVES

Step: 8 of 11

Stress: 16. tsf





Project: ATH/MEG-033-18.70/00.00	Location:	Project No.: 23050059COL
Boring No.: B-049-0-24	Tested By: MW	Checked By: SM
Sample No.: ST-2	Test Date: 05/14/24	Depth: 5'-7'
Test No.: 1	Sample Type: Shelby Tube	Elevation:
Description: Brown, Sandy silt (A-4a)		
Remarks:		

Mon, 20-MAY-2024 11:15:35

GEOTECHNICAL PROFILE - ROADWAY
CONSOLIDATION RESULTS

DESIGN AGENCY
GTL ENGINEERING
2860 FISHER ROAD
COLUMBUS, OHIO 43204
PHONE:(614)276-6123
FAX:(614)276-6377

DESIGNER N.K.S

REVIEWER SM 11-06-24

PROJECT ID 119141

SUBSET 69 | TOTAL 82

SHEET A | TOTAL -

ATH-US 33-18.70

MODEL: Sheet PAPERSIZE: 17x11 (in.) DATE: 06-11-2024 TIME: 20:56:31 USER: ACAD
D:\Dept 05\COL\23050059COL\West Section\Mod_30.10.24\Working\119141D019.dgn

CONSOLIDATED UNDRAINED TRIAXIAL TEST ON COHESIVE SOILS
AASHTO T 297 & ASTM D4767

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

Client: HNTB Ohio, Inc
PID NO. 119141
Project: ATH/MEG-033-18.70/00.00
Location: Meigs County, Ohio

Project No. 23050059COL
County, Rt. & Sec.: ATH/MEG, US 33, 18.70/00.00
Sample ID: B-001-0-23, ST-1, 2'-4'

Lab Code No. NA
Reviewed by: SM

Sample Type	Undisturbed		
Date Set-up:	1/12/2024	1/12/2024	1/12/2024
Date Sheared:	1/16/2024	1/16/2024	1/16/2024
Avg. Sample Height (in.):	5.7543	5.7520	5.7503
Avg. Sample Diameter (in.):	2.8750	2.8750	2.8750
Height-to-diameter ratio:	2.00	2.00	2.00
Wet Density (pcf):	122.0	125.3	130.4
Dry Density (pcf):	94.0	103.2	107.4
Void Ratio:	0.792	0.633	0.569
Specific Gravity (assumed):	2.7	2.7	2.7
Moisture Content (%):	29.7	21.4	21.4
Cross Sectional Area (ft^2):	0.045	0.045	0.045
Volume (ft^3):	0.02	0.02	0.02
Confining Pressure (psf):	1440	2880	4320
Rate of Axial Strain (%/min):	0.2085	0.2086	0.2087
Compressive Strength (psf):	1513	2746	4085
Minor Principal Stress at Failure (psf):	1440	2880	4320
Major Principal Stress at Failure (psf):	2953	5626	8405
Failure Criterian (%):	Point of Maximum Obliquity		
β:	0.96	0.97	0.96
Specimen Saturation:	Wet Method		

Grading (ASTM D422)

% Agg:	1
% Sand.:	22
% Silt:	41
% Clay:	36

Atterberg Limits (ASTM D 4318)

L.L.:	34
P.L.:	21
P.I.:	13

Visual Classification: Brown, Silt and Clay (A-6a)

POST SHEAR
1440 psf

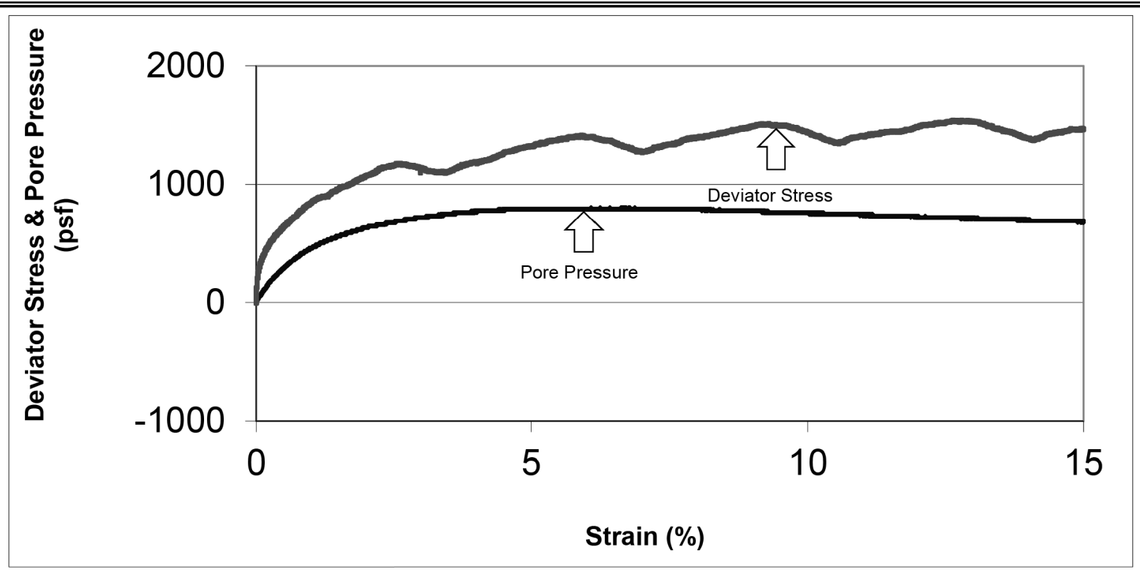
POST SHEAR
2880 psf

POST SHEAR
4320 psf

Deviator Stress & Pore Pressure vs. Strain

CLIENT: HNTB Ohio, Inc
PROJECT: ATH/MEG-033-18.70/00.00
LOCATION: Meigs County, Ohio
PROJECT #: 23050059COL

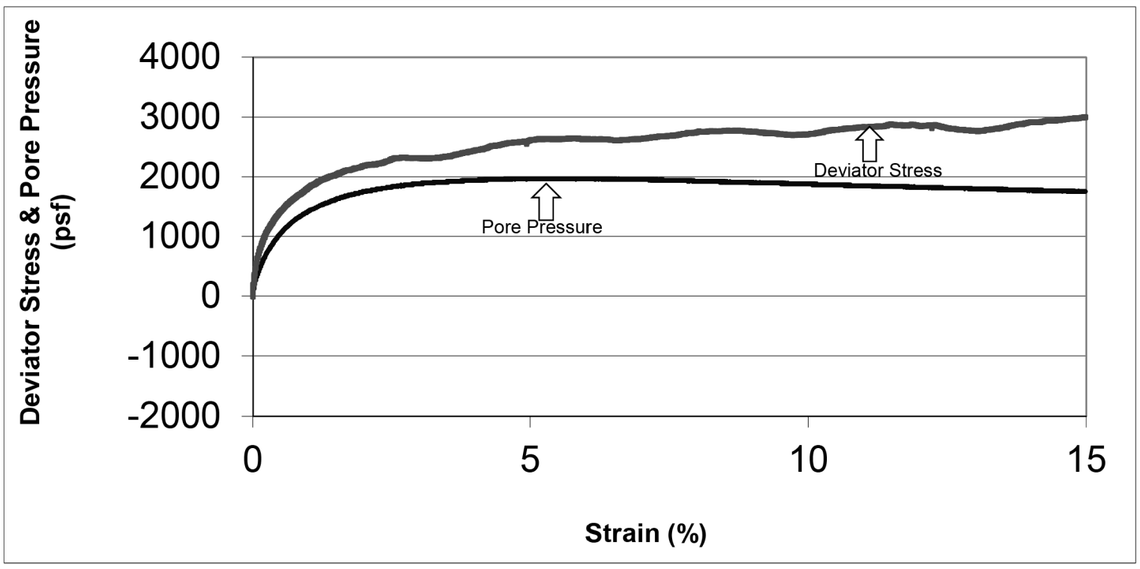
Sample ID: B-001-0-23, ST-1, 2'-4'
Confining Pressure (psf): 1440



GEOTECHNICAL PROFILE - ROADWAY
TRIAXIAL RESULTS

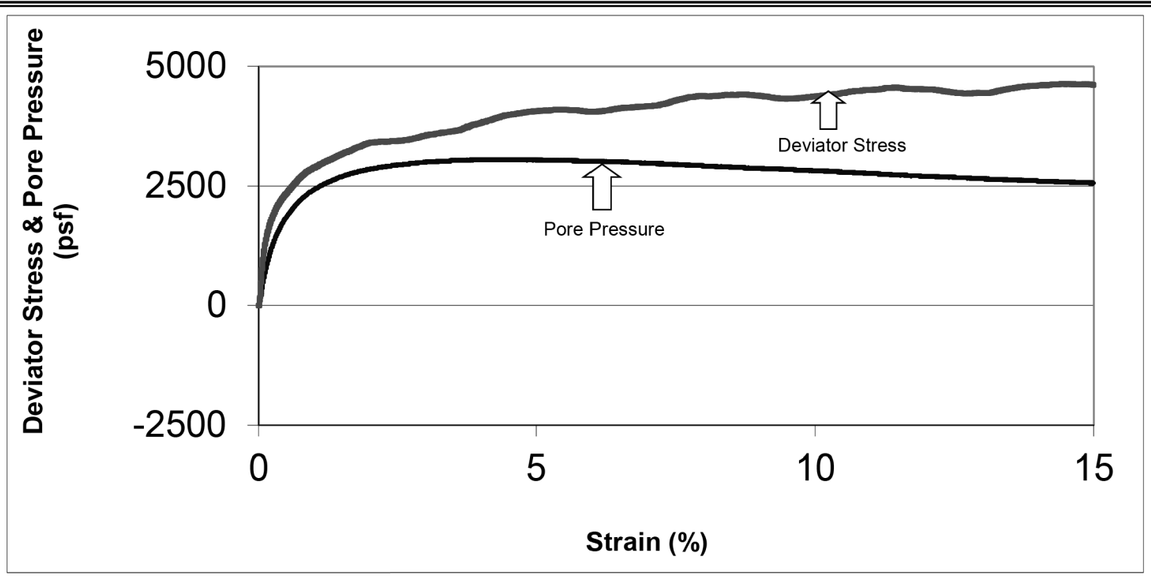
Deviator Stress & Pore Pressure vs. Strain

CLIENT:	HNTB Ohio, Inc	Sample ID:	B-001-0-23, ST-1, 2'-4'
PROJECT:	ATH/MEG-033-18.70/00.00	Confining Pressure (psf):	2880
LOCATION:	Meigs County, Ohio		
PROJECT #:	23050059COL		



Deviator Stress & Pore Pressure vs. Strain

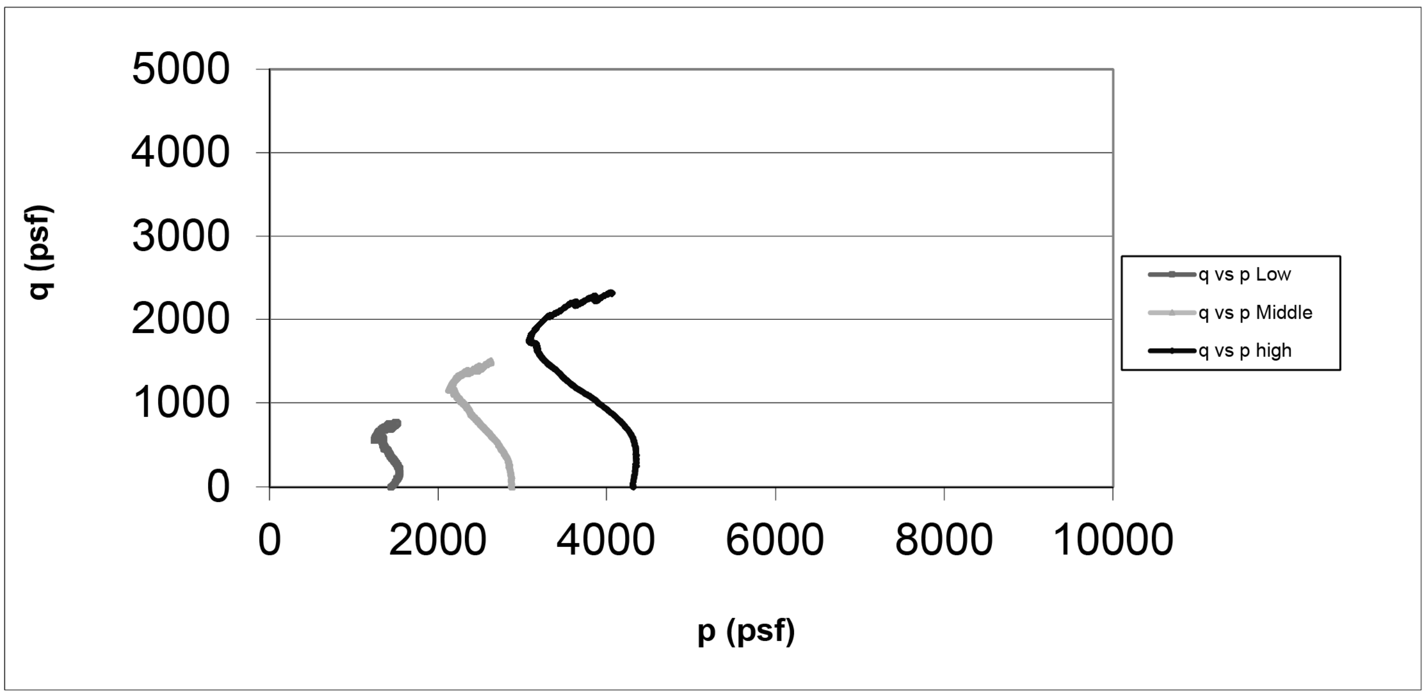
CLIENT:	HNTB Ohio, Inc	Sample ID:	B-001-0-23, ST-1, 2'-4'
PROJECT:	ATH/MEG-033-18.70/00.00	Confining Pressure (psf):	4320
LOCATION:	Meigs County, Ohio		
PROJECT #:	23050059COL		



GEOTECHNICAL PROFILE - ROADWAY
TRIAXIAL RESULTS

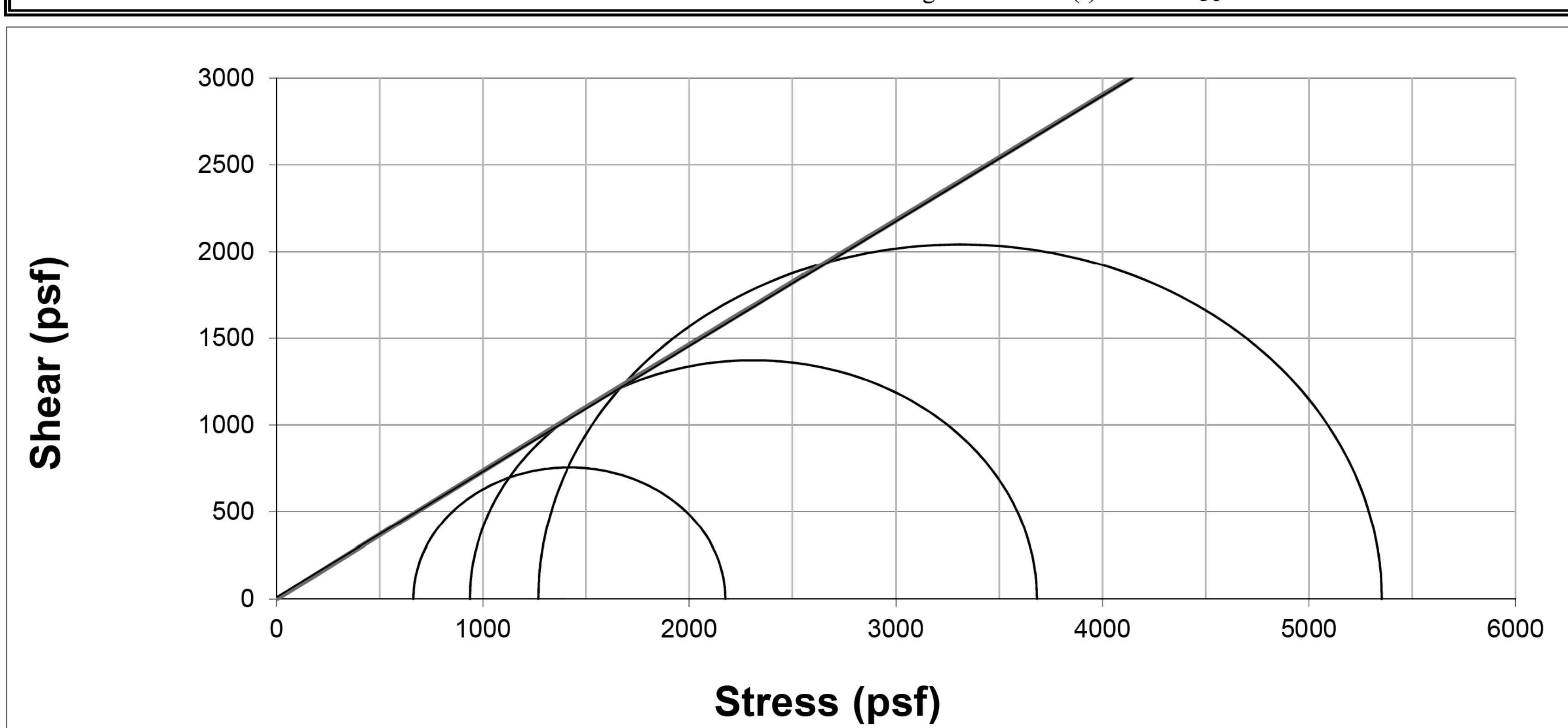
q vs. p

CLIENT:	HNTB Ohio, Inc	Sample ID:	B-001-0-23, ST-1, 2'-4'		
PROJECT:	ATH/MEG-033-18.70/00.00				
LOCATION:	Meigs County, Ohio	Confining Pressure (psf):	Low	Middle	High
PROJECT #:	23050059COL		1440	2880	4320



Mohr Circle Effective Stress

CLIENT:	HNTB Ohio, Inc	Sample ID:	B-001-0-23, ST-1, 2'-4'		
PROJECT:	ATH/MEG-033-18.70/00.00				
LOCATION:	Meigs County, Ohio	Confining Pressure (psf):	1440	2880	4320
PROJECT #:	23050059COL	Cohesion(psf):	0		
		Angle of Friction(°):	35		



DESIGN AGENCY
CTL ENGINEERING INC
2860 FISHER ROAD
COLUMBUS, OHIO 43204
PHONE:(614)276-8123
FAX:(614)276-6377
DESIGNER N.K.S
REVIEWER SM 11-06-24

PROJECT ID 119141

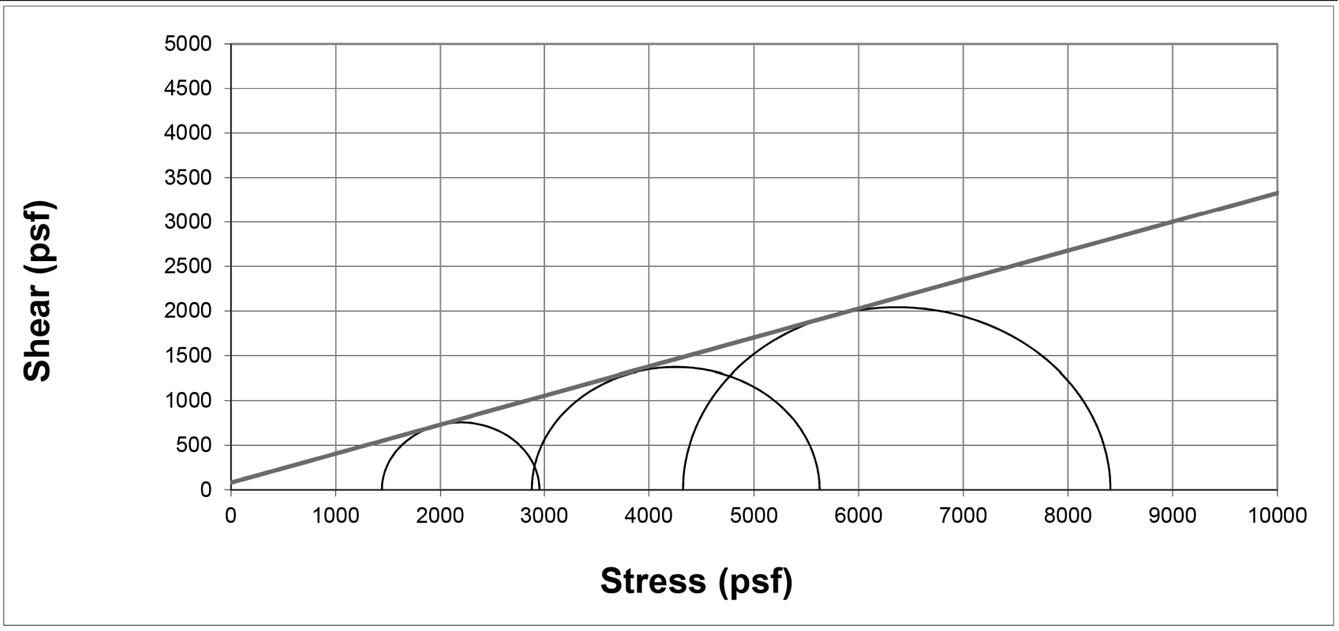
SUBSET 72 TOTAL 82

SHEET . TOTAL -

GEOTECHNICAL PROFILE - ROADWAY
TRIAXIAL RESULTS

Mohr Circle Total Stress

CLIENT:	HNTB Ohio, Inc	Sample ID: B-001-0-23, ST-1, 2'-4'			
PROJECT:	ATH/MEG-033-18.70/00.00				
LOCATION:	Meigs County, Ohio	Confining Pressure (psf):	1440	2880	4320
PROJECT #:	23050059COL	Cohesion(psf):	80		
		Angle of Friction(°):	18		



CONSOLIDATED UNDRAINED TRIAXIAL TEST ON COHESIVE SOILS
AASHTO T 297 & ASTM D4767

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

Client: HNTB Ohio, Inc
PID NO. 119141
Project: ATH/MEG-033-18.70/00.00
Location: Meigs County, Ohio

Project No. 23050059COL
County, Rt. & Sec.: ATH/MEG, US 33, 18.70/00.00
Sample ID: B-002A-0-23, ST-1, 2'-4'

Lab Code No. NA
Reviewed by: SM

Sample Type	Undisturbed		
Date Set-up:	1/9/2024	1/9/2024	1/9/2024
Date Sheared:	1/12/2024	1/12/2024	1/12/2024
Avg. Sample Height (in.):	5.7700	5.7750	5.7777
Avg. Sample Diameter (in.):	2.8750	2.8750	2.8750
Height-to-diameter ratio:	2.01	2.01	2.01
Wet Density (pcf):	130.1	132.6	132.5
Dry Density (pcf):	108.4	111.8	111.7
Void Ratio:	0.554	0.507	0.508
Specific Gravity (assumed):	2.7	2.7	2.7
Moisture Content (%):	20.0	18.6	18.6
Cross Sectional Area (ft^2):	0.045	0.045	0.045
Volume (ft^3):	0.02	0.02	0.02
Confining Pressure (psf):	1440	2880	4320
Rate of Axial Strain (%/min):	0.2080	0.2078	0.2077
Compressive Strength (psf):	2241	3656	5584
Minor Principal Stress at Failure (psf):	1440	2880	4320
Major Principal Stress at Failure (psf):	3681	6536	9904
Failure Criterian (%):	Point of Maximum Obliquity		
β:	0.97	0.95	0.96
Specimen Saturation:	Wet Method		

POST SHEAR
1440 psf

POST SHEAR
2880 psf

POST SHEAR
4320 psf

Grading (ASTM D422)

% Agg:	1
% Sand.:	12
% Silt:	48
% Clay:	39

Atterberg Limits (ASTM D 4318)

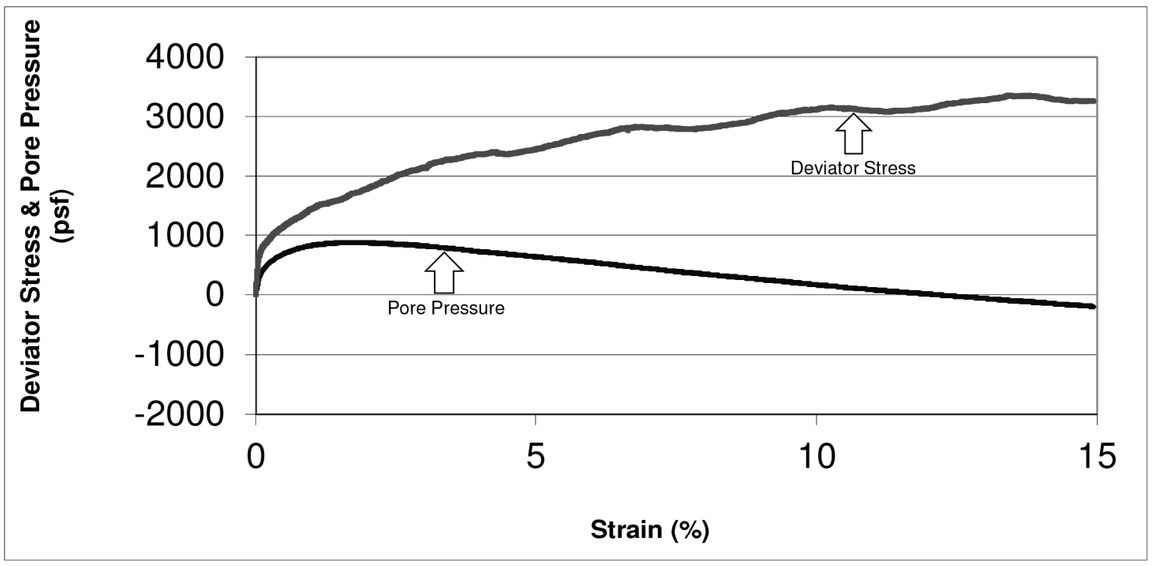
L.L.:	37
P.L.:	21
P.I.:	16

Visual Classification: Brown, Silty Clay (A-6b)

GEOTECHNICAL PROFILE - ROADWAY
TRIAXIAL RESULTS

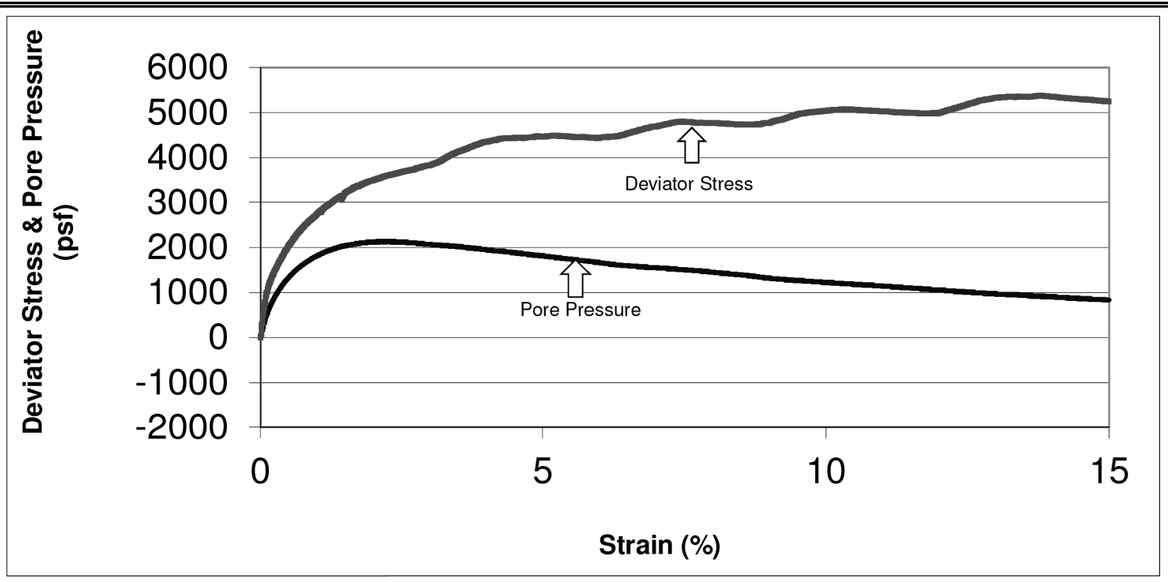
Deviator Stress & Pore Pressure vs. Strain

CLIENT:	HNTB Ohio, Inc	Sample ID:	B-002A-0-23, ST-1, 2'-4'
PROJECT:	ATH/MEG-033-18.70/00.00	Confining Pressure (psf):	1440
LOCATION:	Meigs County, Ohio		
PROJECT #:	23050059COL		



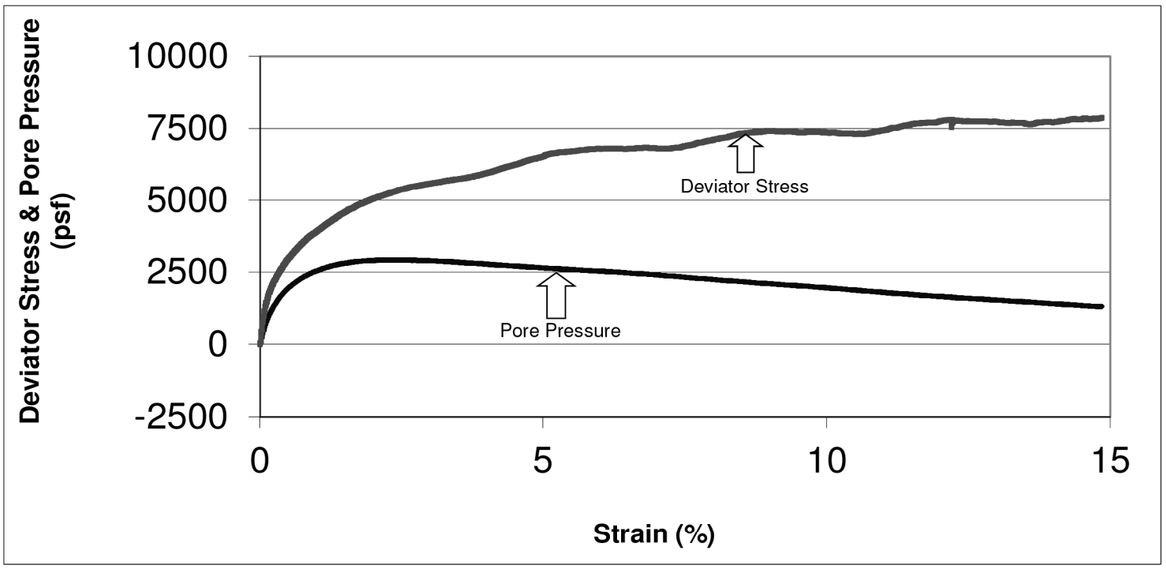
Deviator Stress & Pore Pressure vs. Strain

CLIENT:	HNTB Ohio, Inc	Sample ID:	B-002A-0-23, ST-1, 2'-4'
PROJECT:	ATH/MEG-033-18.70/00.00	Confining Pressure (psf):	2880
LOCATION:	Meigs County, Ohio		
PROJECT #:	23050059COL		



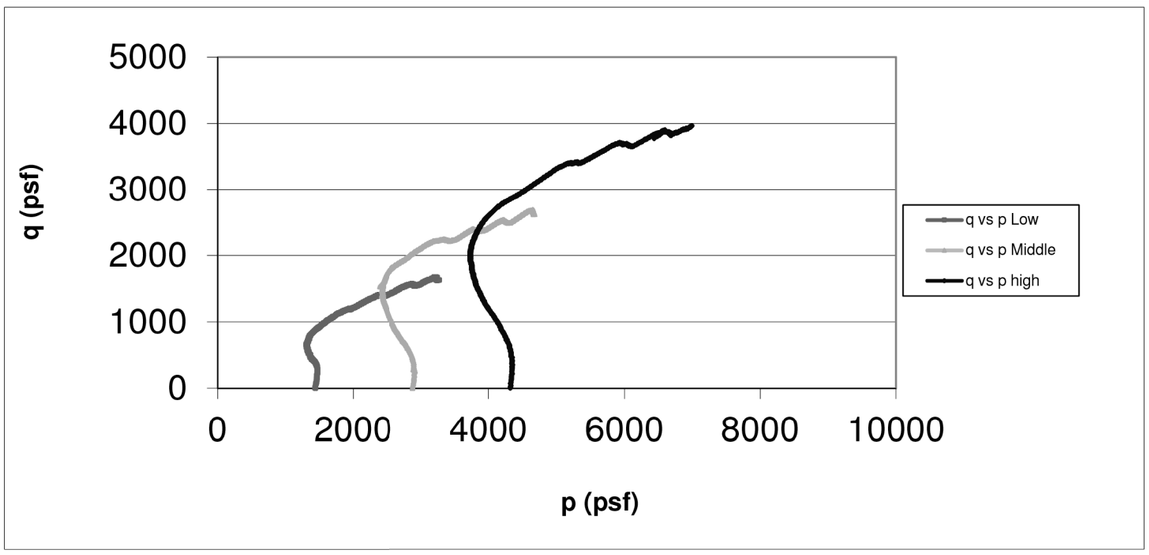
Deviator Stress & Pore Pressure vs. Strain

CLIENT:	HNTB Ohio, Inc	Sample ID:	B-002A-0-23, ST-1, 2'-4'
PROJECT:	ATH/MEG-033-18.70/00.00	Confining Pressure (psf):	4320
LOCATION:	Meigs County, Ohio		
PROJECT #:	23050059COL		



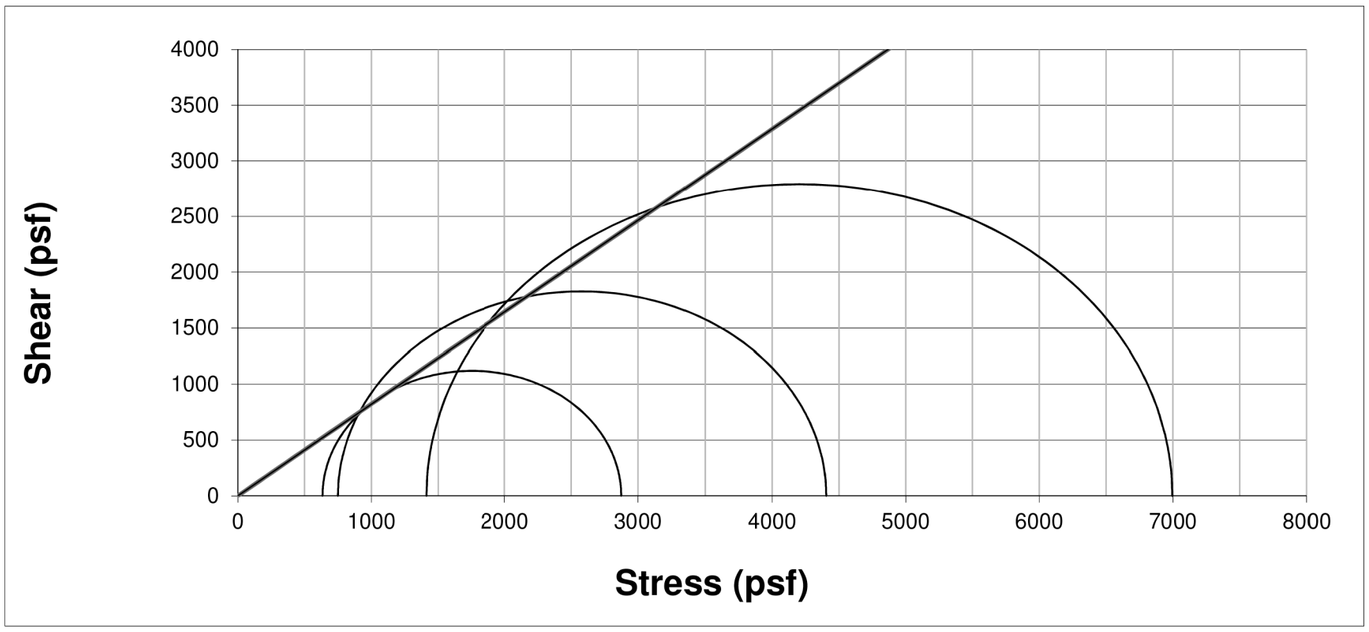
q vs. p

CLIENT:	HNTB Ohio, Inc	Sample ID:	B-002A-0-23, ST-1, 2'-4'		
PROJECT:	ATH/MEG-033-18.70/00.00				
LOCATION:	Meigs County, Ohio	Confining Pressure (psf):	Low	Middle	High
PROJECT #:	23050059COL		1440	2880	4320



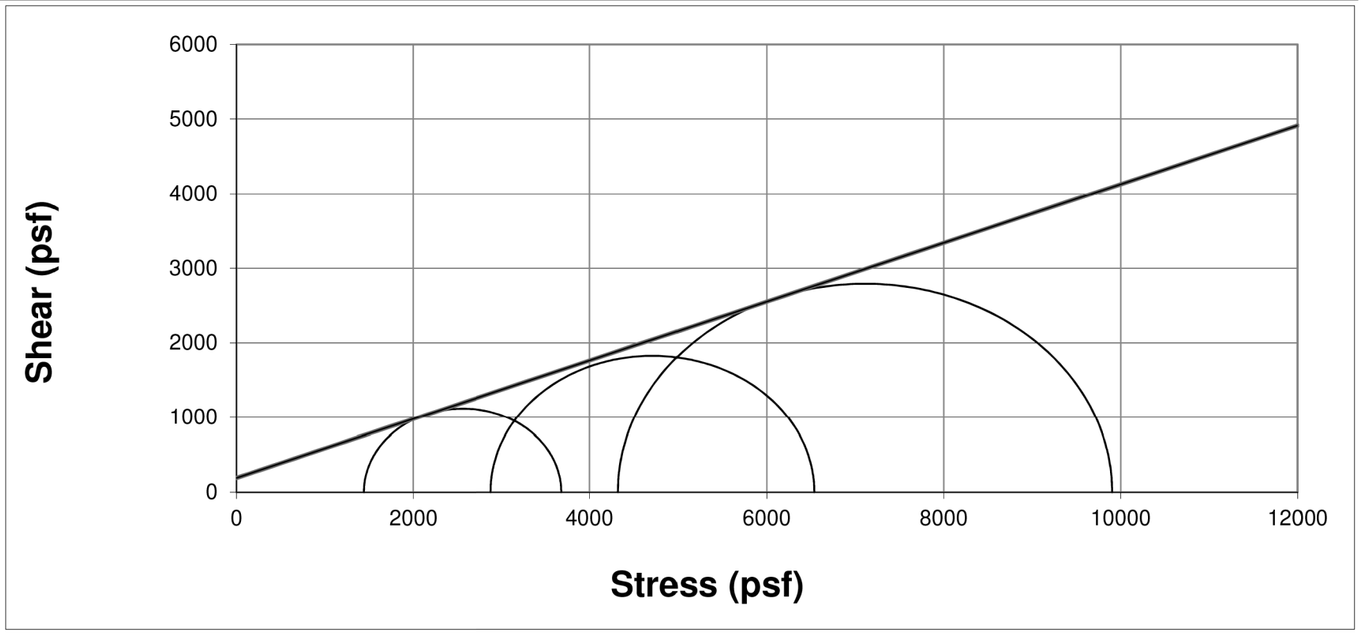
Mohr Circle Effective Stress

CLIENT:	HNTB Ohio, Inc	Sample ID: B-002A-0-23, ST-1, 2'-4'			
PROJECT:	ATH/MEG-033-18.70/00.00				
LOCATION:	Meigs County, Ohio	Confining Pressure (psf):	1440	2880	4320
PROJECT #:	23050059COL	Cohesion(psf):	0		
		Angle of Friction(°):	39		



Mohr Circle Total Stress

CLIENT:	HNTB Ohio, Inc	Sample ID: B-002A-0-23, ST-1, 2'-4'			
PROJECT:	ATH/MEG-033-18.70/00.00				
LOCATION:	Meigs County, Ohio	Confining Pressure (psf):	1440	2880	4320
PROJECT #:	23050059COL	Cohesion(psf):	190		
		Angle of Friction(°):	21.5		



CONSOLIDATED UNDRAINED TRIAXIAL TEST ON COHESIVE SOILS
AASHTO T 297 & ASTM D4767

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

Client: HNTB Ohio, Inc
PID NO. NA
Project: ATH/MEG-033-18.70/00.00
Location: Meigs County, Ohio

Project No. 23050059COL
County, Rt. & Sec.: NA
Station & Offset: NA
Sample ID: B-003A-0-23, ST, 2'-4'
Lab Code No. NA
Reviewed by: SM

Sample Type	ST-1	
Date Set-up:	1/2/2024	1/2/2024
Date Sheared:	1/6/2024	1/6/2024
Avg. Sample Height (in.):	5.7733	5.7800
Avg. Sample Diameter (in.):	2.8750	2.8750
Height-to-diameter ratio:	2.01	2.01
Wet Density (pcf):	125.5	134.1
Dry Density (pcf):	96.7	112.4
Void Ratio:	0.742	0.499
Specific Gravity (assumed):	2.7	2.7
Moisture Content (%):	29.8	19.3
Cross Sectional Area (ft^2):	0.045	0.045
Volume (ft^3):	0.02	0.02
Confining Pressure (psf):	1440	4320
Rate of Axial Strain (%/min):	0.2079	0.2076
Compressive Strength (psf):	1914	5150
Minor Principal Stress at Failure (psf):	1440	4320
Major Principal Stress at Failure (psf):	3354	9470
Failure Criterian (%):	Point of maximum obliquity	
β:	0.98	0.97
Specimen Saturation:	Wet Method	

POST SHEAR
1440 psf

POST SHEAR
4320 psf

Grading (ASTM D422)

% Agg:	1
% Sand.:	10
% Silt:	49
% Clay:	40

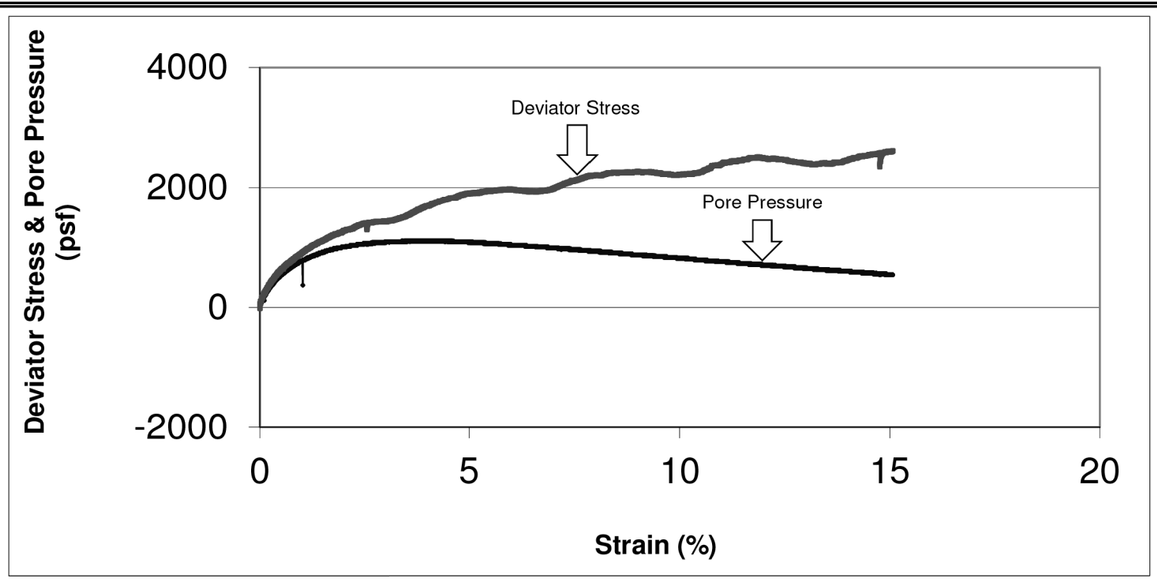
Atterberg Limits (ASTM D 4318)

L.L.:	42
P.L.:	23
P.I.:	19

Visual Description: Gray, Clay (A-7-6)

Deviator Stress & Pore Pressure vs. Strain

CLIENT:	HNTB Ohio, Inc	Sample ID:	B-003A-0-23, ST, 2'-4'
PROJECT:	ATH/MEG-033-18.70/00.00	Confining Pressure (psf):	1440
LOCATION:	Meigs County, Ohio		
PROJECT #:	23050059COL		



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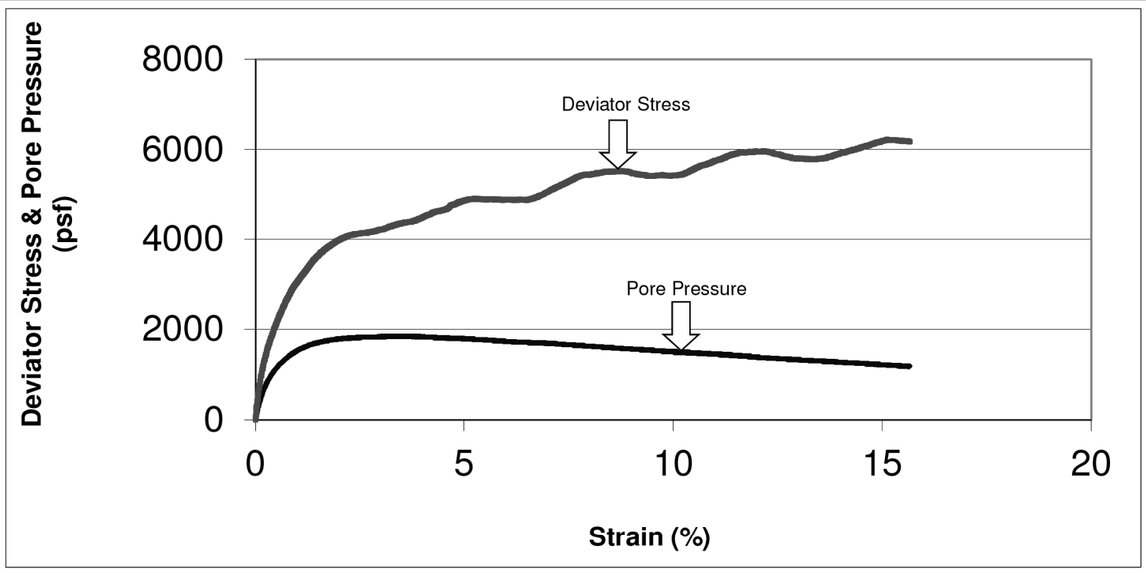
GEOTECHNICAL PROFILE - ROADWAY
TRIAXIAL RESULTS

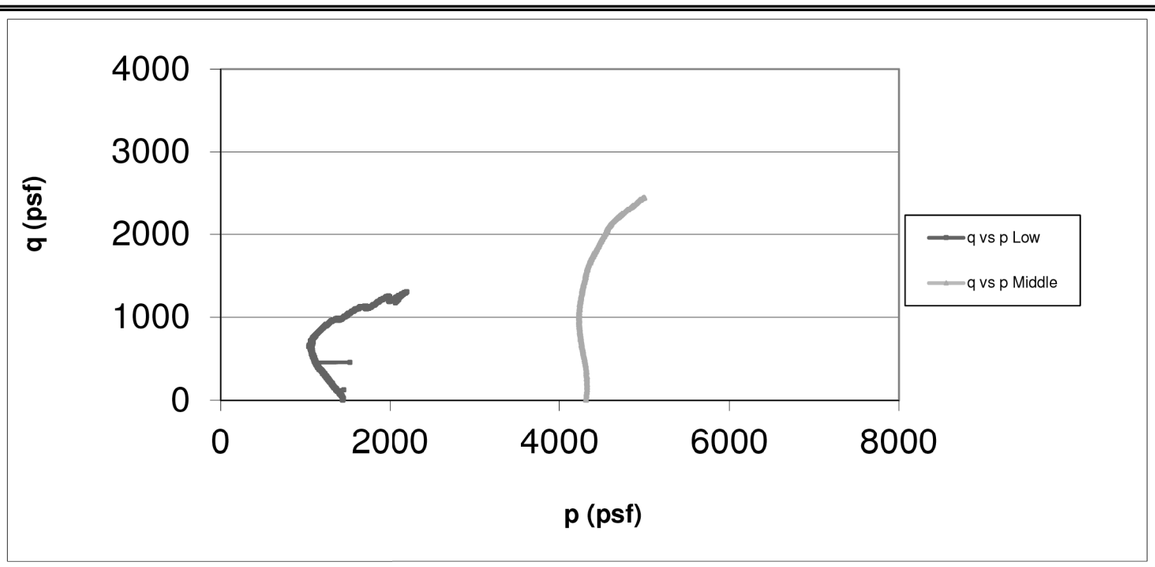
Deviator Stress & Pore Pressure vs. Strain

CLIENT:	HNTB Ohio, Inc	Sample ID:	B-003A-0-23, ST, 2'-4'
PROJECT:	ATH/MEG-033-18.70/00.00	Confining Pressure (psf):	4320
LOCATION:	Meigs County, Ohio		
PROJECT #:	23050059COL		



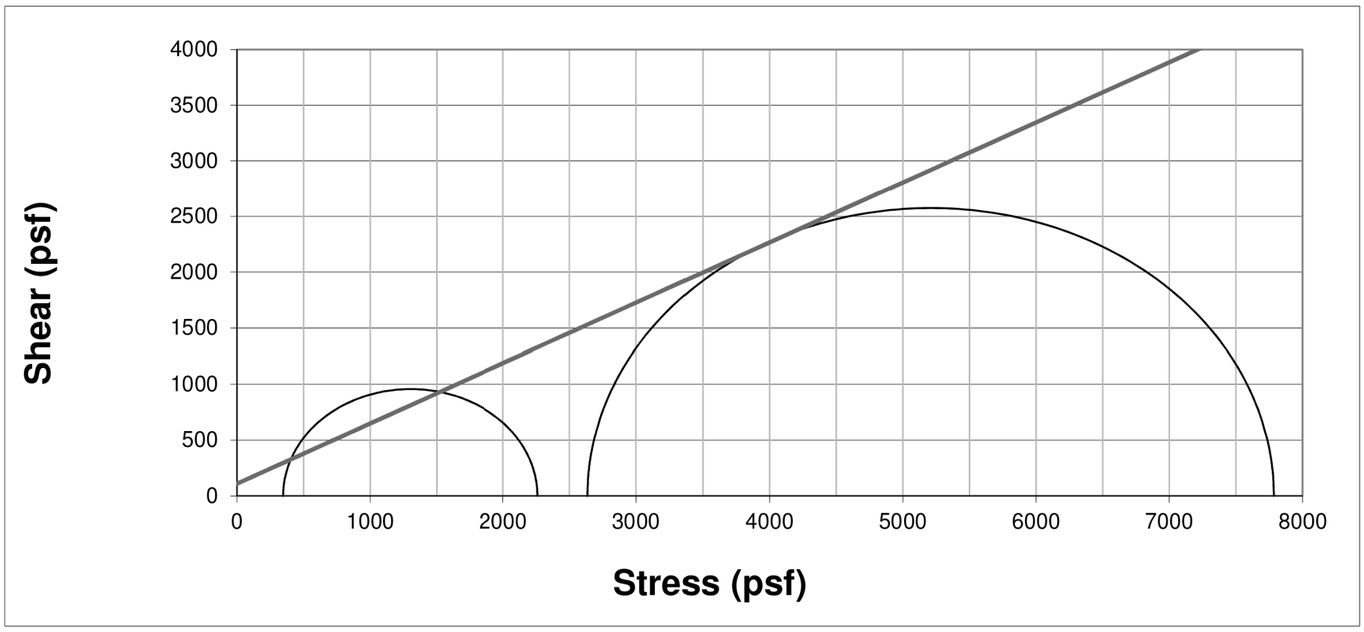
q vs. p

CLIENT:	HNTB Ohio, Inc	Sample ID:	B-003A-0-23, ST, 2'-4'		
PROJECT:	ATH/MEG-033-18.70/00.00	Confining Pressure (psf):	Low	Middle	High
LOCATION:	Meigs County, Ohio		1440	4320	#REF!
PROJECT #:	23050059COL				



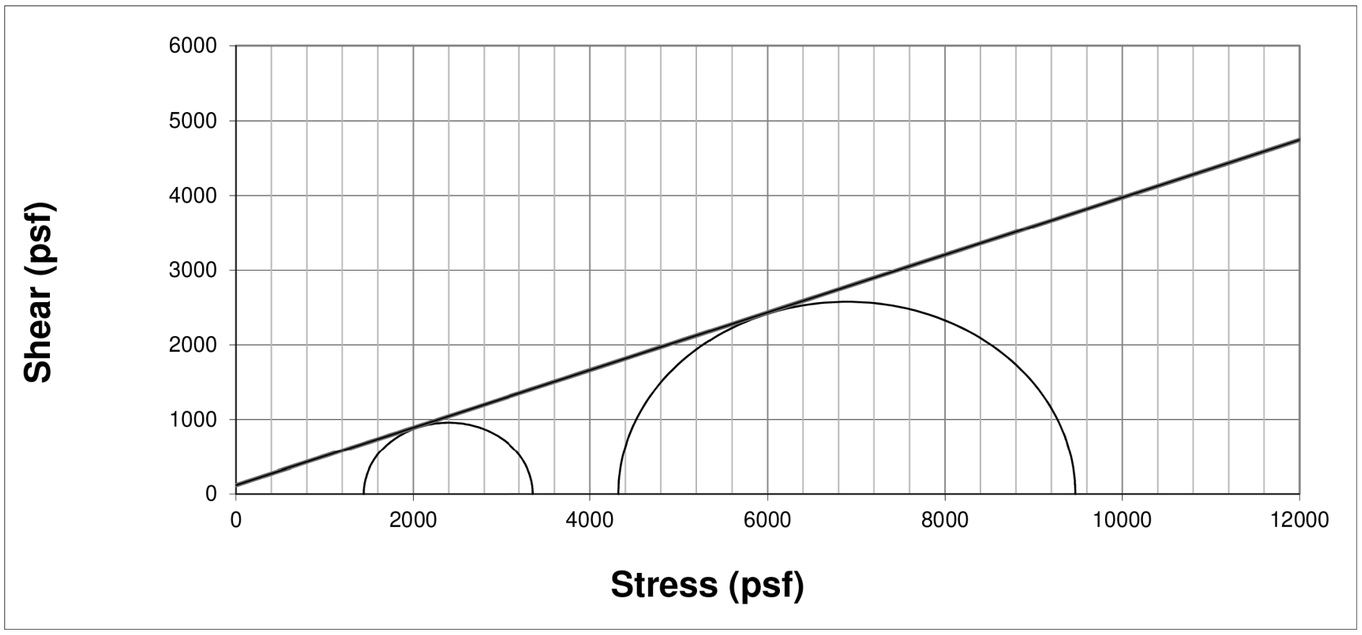
Mohr Circle Effective Stress

CLIENT:	HNTB Ohio, Inc	Sample ID:	B-003A-0-23, ST, 2'-4'	
PROJECT:	ATH/MEG-033-18.70/00.00	Confining Pressure (psf):	1440	4320
LOCATION:	Meigs County, Ohio	Cohesion(psf):	110	
PROJECT #:	23050059COL	Angle of Friction(°):	28	



Mohr Circle Total Stress

CLIENT:	HNTB Ohio, Inc	Sample ID:	B-003A-0-23, ST, 2'-4'	
PROJECT:	ATH/MEG-033-18.70/00.00	Confining Pressure (psf):	1440	4320
LOCATION:	Meigs County, Ohio	Cohesion(psf):	120	
PROJECT #:	23050059COL	Angle of Friction(°):	21	



GEOTECHNICAL PROFILE - ROADWAY
TRIAXIAL RESULTS

CONSOLIDATED UNDRAINED TRIAXIAL TEST ON COHESIVE SOILS
AASHTO T 297 & ASTM D4767

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

Client: HNTB Ohio, Inc
PID NO. NA
Project: ATH/MEG-033-18.70/00.00
Location: Meigs County, Ohio

Project No. 23050059COL
County, Rt. & Sec.: NA
Station & Offset: NA
Sample ID: B-046-0-23, ST, 2'-4'
Lab Code No. NA
Reviewed by: SM

Sample Type	ST-1	
Date Set-up:	2/9/2024	2/9/2024
Date Sheared:	2/13/2024	2/13/2024
Avg. Sample Height (in.):	5.8430	5.8237
Avg. Sample Diameter (in.):	2.8750	2.8750
Height-to-diameter ratio:	2.03	2.03
Wet Density (pcf):	118.9	122.3
Dry Density (pcf):	92.6	89.3
Void Ratio:	0.819	0.887
Specific Gravity (assumed):	2.7	2.7
Moisture Content (%):	28.4	36.9
Cross Sectional Area (ft^2):	0.045	0.045
Volume (ft^3):	0.02	0.02
Confining Pressure (psf):	1440	5760
Rate of Axial Strain (%/min):	0.2054	0.2061
Compressive Strength (psf):	2070	3456
Minor Principal Stress at Failure (psf):	1440	5760
Major Principal Stress at Failure (psf):	3510	9216
Failure Criterian (%):	Point of maximum obliquity	
β:	0.96	0.99
Specimen Saturation:	Wet Method	

POST SHEAR
1440 psf

POST SHEAR
5760 psf

Grading (ASTM D422)

% Agg:	0
% Sand.:	4
% Silt:	28
% Clay:	68

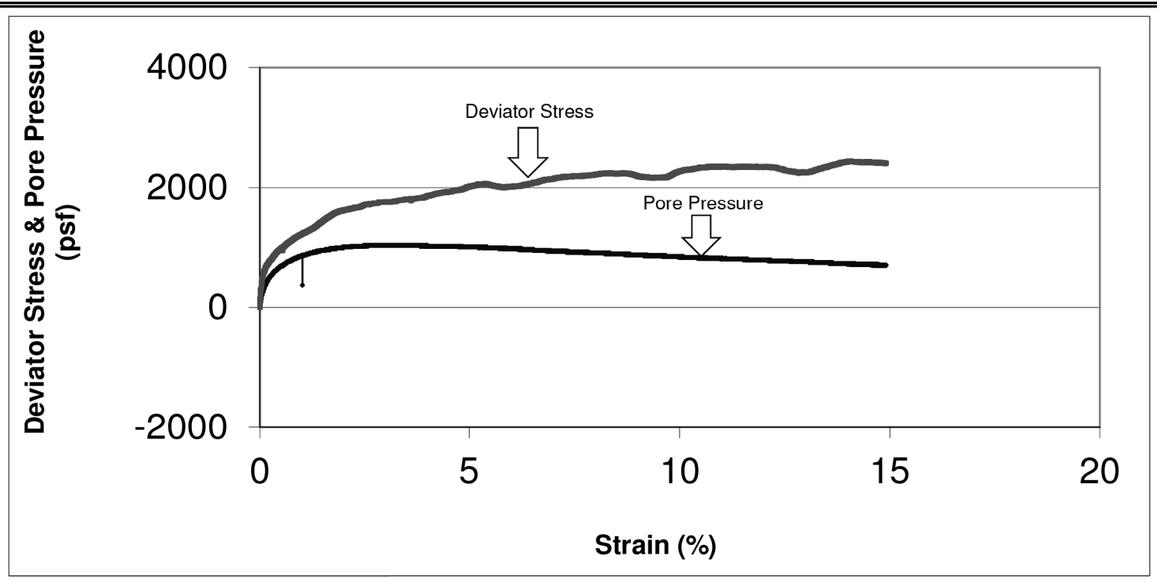
Atterberg Limits (ASTM D 4318)

L.L.:	69
P.L.:	33
P.I.:	36

Visual Description: Brown, Elastic Clay (A-7-5)

Deviator Stress & Pore Pressure vs. Strain

CLIENT:	HNTB Ohio, Inc	Sample ID:	B-046-0-23, ST, 2'-4'
PROJECT:	ATH/MEG-033-18.70/00.00	Confining Pressure (psf):	1440
LOCATION:	Meigs County, Ohio		
PROJECT #:	23050059COL		



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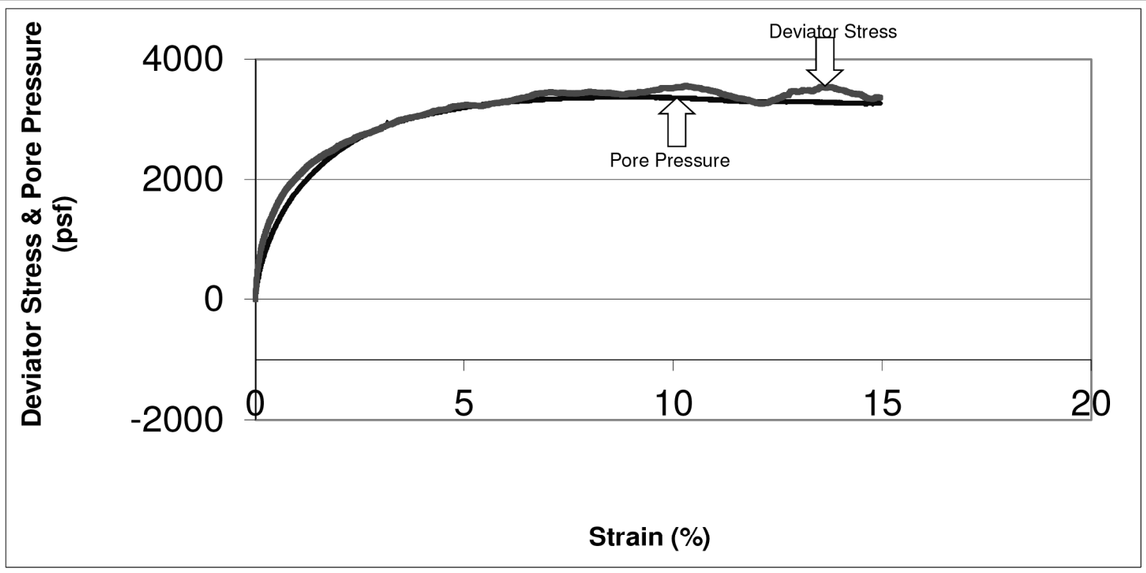
FAX (614) 276-6377

GEOTECHNICAL PROFILE - ROADWAY
TRIAXIAL RESULTS

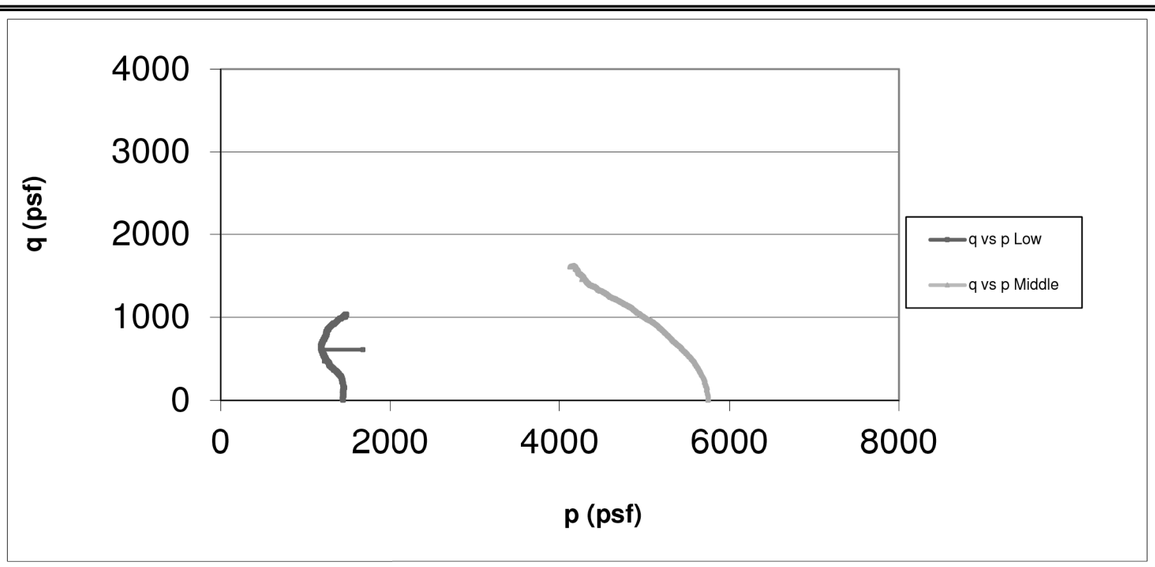
Deviator Stress & Pore Pressure vs. Strain

CLIENT:	HNTB Ohio, Inc	Sample ID:	B-046-0-23, ST, 2'-4'
PROJECT:	ATH/MEG-033-18.70/00.00	Confining Pressure (psf):	5760
LOCATION:	Meigs County, Ohio		
PROJECT #:	23050059COL		



q vs. p

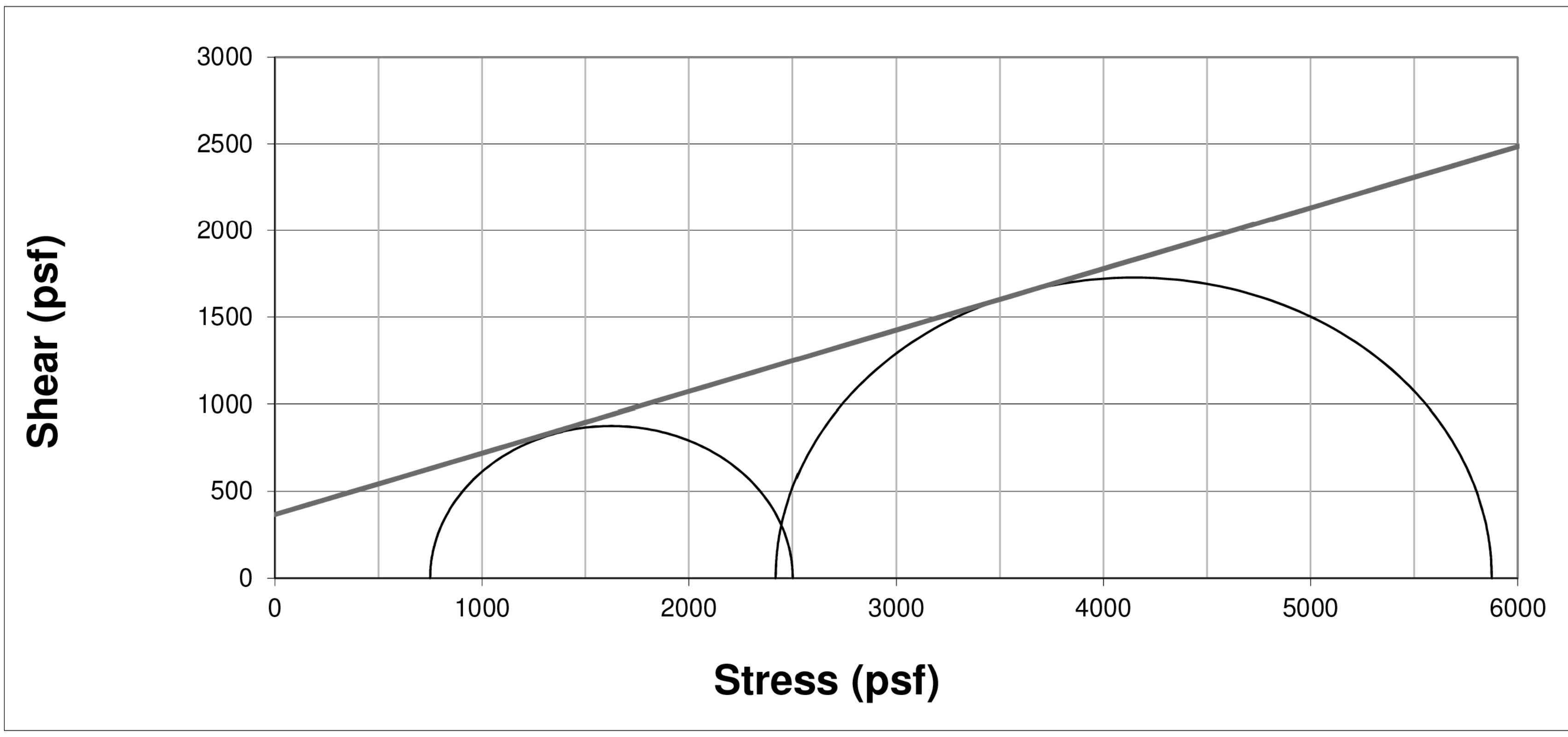
CLIENT:	HNTB Ohio, Inc	Sample ID:	B-046-0-23, ST, 2'-4'	
PROJECT:	ATH/MEG-033-18.70/00.00	Confining Pressure (psf):	Low	Middle
LOCATION:	Meigs County, Ohio		1440	5760
PROJECT #:	23050059COL			



GEOTECHNICAL PROFILE - ROADWAY
TRIAXIAL RESULTS

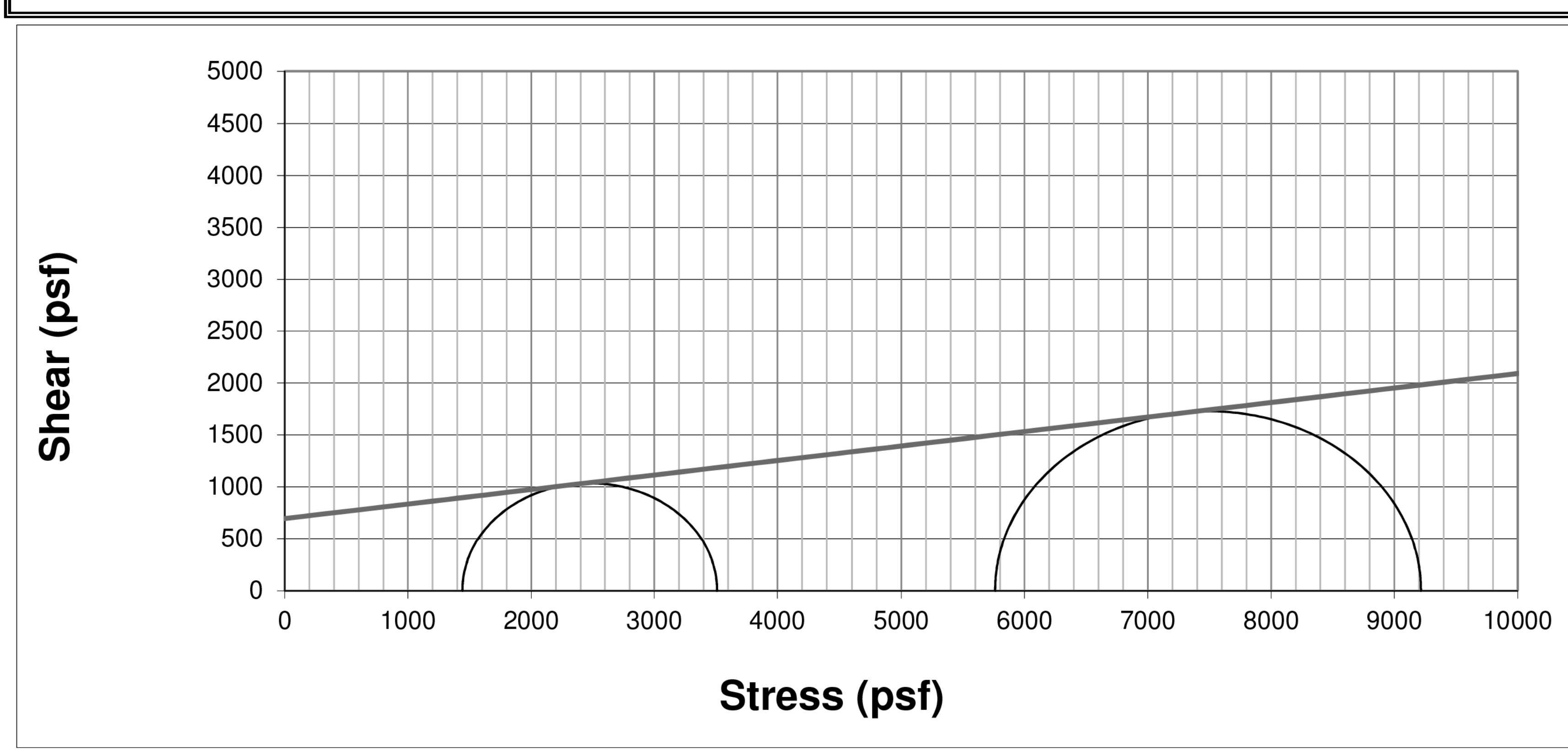
Mohr Circle Effective Stress

CLIENT:	HNTB Ohio, Inc	Sample ID:	B-046-0-23, ST, 2'-4'	
PROJECT:	ATH/MEG-033-18.70/00.00	Confining Pressure (psf):	1440	5760
LOCATION:	Meigs County, Ohio	Cohesion(psf):	360	
PROJECT #:	23050059COL	Angle of Friction(°):	19	



Mohr Circle Total Stress

CLIENT:	HNTB Ohio, Inc	Sample ID:	B-046-0-23, ST, 2'-4'	
PROJECT:	ATH/MEG-033-18.70/00.00	Confining Pressure (psf):	1440	5760
LOCATION:	Meigs County, Ohio	Cohesion(psf):	690	
PROJECT #:	23050059COL	Angle of Friction(°):	8	



GEOTECHNICAL PROFILE - ROADWAY
TRIAXIAL RESULTS

APPENDIX B

TEST BORING RECORDS

PROJECT: ATH-US 33-18.70
TYPE: ROADWAY
PID: 119141 SFN:
START: 12/6/23 END: 12/6/23

DRILLING FIRM / OPERATOR: CTL / H. BROWN
SAMPLING FIRM / LOGGER: CTL / H. BROWN
DRILLING METHOD: 3.25" HSA
SAMPLING METHOD: SPT

DRILL RIG: MOBILE B-57 TRACK
HAMMER: MOBILE AUTOMATIC
CALIBRATION DATE: 5/3/23
ENERGY RATIO (%): 76.8

STATION / OFFSET: 1004+96, 512' RT.
ALIGNMENT: US 33
ELEVATION: 799.5 (MSL) EOB: 15.0 ft.
LAT / LONG: 39.274126, -82.097705

EXPLORATION ID B-001-0-23

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	HOLE SEALED
TOPSOIL (6")	799.0																	
VERY STIFF, BROWN, **CLAY**, "AND" SILT, LITTLE SAND, TRACE GRAVEL, DAMP	797.5	1	2 2 2	5	100	SS-1	2.50	4	4	14	44	34	50	27	23	22	A-7-6 (15)	
BROWN, **SILT AND CLAY**, SOME SAND, TRACE GRAVEL, DAMP	795.5	2																
STIFF, BROWN, **SILTY CLAY**, LITTLE SAND, TRACE GRAVEL, MOIST		3	2 3 2	6	100	SS-2	1.50	4	5	11	47	33	38	22	16	24	A-6b (10)	
@6.0'; HARD, RED, DAMP		4																
		5	7 9 11	26	100	SS-3	4.25	-	-	-	-	-	-	-	-	14	A-6b (V)	
		6																
		7																
		8	12 15 15	38	100	SS-4	4.50	-	-	-	-	-	-	-	-	13	A-6b (V)	
		9																
		10																
		11	12 12 15	35	100	SS-5	4.50	-	-	-	-	-	-	-	-	14	A-6b (V)	
		12																
@13.5'; VERY STIFF		13																
	784.5	14	12 18 50/3"	-	100	SS-6	4.00	-	-	-	-	-	-	-	-	10	A-6b (V)	
	EOB	15																

NOTES: CAVED AT 7.3'

ABANDONMENT METHODS, MATERIALS, QUANTITIES: TREMIED BENTONITE GROUT

PROJECT: ATH-US 33-18.70	DRILLING FIRM / OPERATOR: CTL / H. BROWN	DRILL RIG: MOBILE B-57 TRACK	STATION / OFFSET: 1004+96, 512' RT.
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: CTL / H. BROWN	HAMMER: MOBILE AUTOMATIC	ALIGNMENT: US 33
PID: 119141 SFN:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 5/3/23	ELEVATION: 799.5 (MSL) EOB: 4.0 ft.
START: 12/6/23 END: 12/6/23	SAMPLING METHOD: SPT	ENERGY RATIO (%): 76.8	LAT / LONG: 39.274126, -82.097705

EXPLORATION ID B-001-0A-23

PAGE 1 OF 1

MATERIAL DESCRIPTION AND NOTES	ELEV. 799.5	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	HOLE SEALED
	797.5	1																
BROWN, **SILT AND CLAY**, SOME SAND, TRACE GRAVEL, MOIST	795.5	2 3 EOB 4			100	ST-1	-	1	4	18	41	36	34	21	13	24	A-6a (9)	

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: AUGER CUTTINGS MIXED WITH BENTONITE CHIPS

PROJECT: ATH-US 33-18.70	DRILLING FIRM / OPERATOR: CTL / H. BROWN	DRILL RIG: MOBILE B-57 TRACK	STATION / OFFSET: 1047+95, 142' RT.	EXPLORATION ID B-002-0-23
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: CTL / H. BROWN	HAMMER: MOBILE AUTOMATIC	ALIGNMENT: US 33	
PID: 119141 SFN:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 5/3/23	ELEVATION: 897.8 (MSL) EOB: 15.0 ft.	PAGE 1 OF 1
START: 12/11/23 END: 12/11/23	SAMPLING METHOD: SPT	ENERGY RATIO (%): 76.8	LAT / LONG: 39.267480, -82.085613	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	HOLE SEALED
TOPSOIL (6")	897.3																	
STIFF, RED, **SILT AND CLAY**, TRACE SAND, TRACE GRAVEL, (FILL), DAMP	895.8		2 3 3	8	83	SS-1	2.00	3	2	3	51	41	37	24	13	24	A-6a (9)	
STIFF, RED, **SILTY CLAY**, LITTLE SAND, TRACE GRAVEL, (FILL), DAMP	891.8		4 6 6	15	100	SS-2	1.75	-	-	-	-	-	-	-	-	22	A-6b (V)	
VERY STIFF, RED, **SILT AND CLAY**, TRACE SAND, (FILL), DAMP			5 4 7	14	100	SS-3	3.50	0	2	4	51	43	39	24	15	16	A-6a (10)	
			6 8 11	24	89	SS-4	3.75	-	-	-	-	-	-	-	-	20	A-6a (V)	
@11.0'; TRACE GRAVEL			11 9 17	33	100	SS-5	3.50	-	-	-	-	-	-	-	-	13	A-6a (V)	
	882.8	EOB	12 17 33	64	100	SS-6	3.00	-	-	-	-	-	-	-	-	10	A-6a (V)	

NOTES: CAVED AT 12.4'

ABANDONMENT METHODS, MATERIALS, QUANTITIES: AUGER CUTTINGS MIXED WITH BENTONITE CHIPS

PROJECT: ATH-US 33-18.70	DRILLING FIRM / OPERATOR: CTL / H. BROWN	DRILL RIG: MOBILE B-57 TRACK	STATION / OFFSET: 1047+95, 142' RT.
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: CTL / H. BROWN	HAMMER: MOBILE AUTOMATIC	ALIGNMENT: US 33
PID: 119141 SFN:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 5/3/23	ELEVATION: 897.8 (MSL) EOB: 4.0 ft.
START: 12/11/23 END: 12/11/23	SAMPLING METHOD: SPT	ENERGY RATIO (%): 76.8	LAT / LONG: 39.267480, -82.085613

EXPLORATION ID: B-002-0A-23

MATERIAL DESCRIPTION AND NOTES	ELEV. 897.8	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	HOLE SEALED
	895.8	1																
BROWN, **SILTY CLAY**, LITTLE SAND, TRACE GRAVEL, MOIST	893.8	2 3 EOB 4			100	ST-1	-	1	3	9	48	39	37	21	16	19	A-6b (10)	

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: AUGER CUTTINGS MIXED WITH BENTONITE CHIPS

STANDARD ODOT SOIL BORING LOG (8.5 X 11) - OH DOT.GDT - 10/4/24 09:27 - O:\PROJECT\2023\COL-05\23050059COL_ATH MEG-033-18-70 00-00_HNTB OHIO INC\REPORTS\LAB REPORTS\M

PROJECT: ATH-US 33-18.70	DRILLING FIRM / OPERATOR: CTL / H. BROWN	DRILL RIG: MOBILE B-57 TRACK	STATION / OFFSET: 1056+76, 43' RT.	EXPLORATION ID B-003-0-23
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: CTL / H. BROWN	HAMMER: MOBILE AUTOMATIC	ALIGNMENT: US 33	
PID: 119141 SFN:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 5/3/23	ELEVATION: 910.2 (MSL) EOB: 30.0 ft.	PAGE 1 OF 1
START: 12/12/23 END: 12/12/23	SAMPLING METHOD: SPT	ENERGY RATIO (%): 76.8	LAT / LONG: 39.265242, -82.084579	

MATERIAL DESCRIPTION AND NOTES	ELEV. 910.2	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	HOLE SEALED
TOPSOIL (6")	909.7																	
VERY STIFF, BROWN AND GRAY, **SILTY CLAY**, TRACE SAND, TRACE GRAVEL, (FILL), DAMP	908.2		4 4 5	12	100	SS-1	3.75	2	4	3	57	34	39	22	17	13	A-6b (11)	
VERY STIFF, BROWN, **CLAY**, "AND" SILT, TRACE SAND, TRACE GRAVEL, (FILL), DAMP			4 6 7	17	100	SS-2	2.25	-	-	-	-	-	-	-	-	20	A-7-6 (V)	
			6 6 8	18	100	SS-3	3.50	1	1	3	52	43	46	26	20	22	A-7-6 (13)	
@8.5'; CONTAINS ROCK FRAGMENTS			8 7 7	18	100	SS-4	3.50	-	-	-	-	-	-	-	-	12	A-7-6 (V)	
	899.2																	
HARD, BROWN, **SILT AND CLAY**, LITTLE GRAVEL, TRACE SAND, (FILL), DAMP			6 7 6	17	100	SS-5	4.50	13	3	2	42	40	33	19	14	11	A-6a (10)	
@13.5'; VERY STIFF			7 7 6	17	100	SS-6	3.50	-	-	-	-	-	-	-	-	10	A-6a (V)	
			8 7 7	18	100	SS-7	2.50	-	-	-	-	-	-	-	-	14	A-6a (V)	
			8 8 9	22	100	SS-8	3.50	-	-	-	-	-	-	-	-	12	A-6a (V)	
	889.2	W 889.2																
MEDIUM DENSE, BROWN AND GRAY, **SANDY SILT**, LITTLE CLAY, TRACE GRAVEL, (FILL), WET			9 9 9	23	100	SS-9	-	1	1	48	33	17	NP	NP	NP	10	A-4a (3)	
			7 9 7	20	100	SS-10	-	-	-	-	-	-	-	-	-	18	A-4a (V)	
@26.0'; NO GRAVEL			6 6 8	18	100	SS-11	-	0	1	35	46	18	NP	NP	NP	14	A-4a (6)	
			7 7 10	22	100	SS-12	-	-	-	-	-	-	-	-	-	16	A-4a (V)	
	880.2	EOB																

NOTES: CAVED AT 28'

ABANDONMENT METHODS, MATERIALS, QUANTITIES: TREMIED BENTONITE GROUT

PROJECT: ATH-US 33-18.70	DRILLING FIRM / OPERATOR: CTL / H. BROWN	DRILL RIG: MOBILE B-57 TRACK	STATION / OFFSET: 1056+76, 43' RT.	EXPLORATION ID B-003-0A-23
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: CTL / H. BROWN	HAMMER: MOBILE AUTOMATIC	ALIGNMENT: US 33	
PID: 119141 SFN:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 5/3/23	ELEVATION: 910.2 (MSL) EOB: 4.0 ft.	PAGE 1 OF 1
START: 12/12/23 END: 12/12/23	SAMPLING METHOD: SPT	ENERGY RATIO (%): 76.8	LAT / LONG: 39.265242, -82.084579	

MATERIAL DESCRIPTION AND NOTES	ELEV. 910.2	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	HOLE SEALED
Augered down to 2'	908.2	1																
VERY STIFF, BROWN, **CLAY**, "AND" SILT, TRACE SAND, TRACE GRAVEL, MOIST	906.2	2 3 EOB 4			100		-	1	5	5	49	40	42	23	19	25	A-7-6 (12)	

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: TREMIED BENTONITE GROUT

PROJECT: ATH-US 33-18.70	DRILLING FIRM / OPERATOR: CTL / H. BROWN	DRILL RIG: MOBILE B-57 TRACK	STATION / OFFSET: 1067+55, 138' RT.	EXPLORATION ID B-004-0-23
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: CTL / H. BROWN	HAMMER: MOBILE AUTOMATIC	ALIGNMENT: US 33	
PID: 119141 SFN:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 5/3/23	ELEVATION: 896.8 (MSL) EOB: 15.5 ft.	PAGE 1 OF 1
START: 12/12/23 END: 12/12/23	SAMPLING METHOD: SPT	ENERGY RATIO (%): 76.8	LAT / LONG: 39.262282, -82.084233	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	HOLE SEALED
TOPSOIL (5")	896.8																	
	896.4																	
HARD, BROWN AND RED, **CLAY**, "AND" SILT, TRACE SAND, TRACE GRAVEL, CONTAINS ROCK FRAGMENTS, (FILL), DAMP		1	7 7 8	19	100	SS-1	4.50	6	4	5	38	47	38	22	16	13	A-6b (10)	
		2																
		3																
@3.5'; VERY STIFF, BROWN		4	7 7 7	18	100	SS-2	2.75	-	-	-	-	-	-	-	-	19	A-6b (V)	
		5																
		6																
@6.0'; LITTLE SAND		7	8 8 7	19	100	SS-3	3.25	1	7	13	40	39	40	22	18	14	A-6b (11)	
		8																
		9	8 9 9	23	100	SS-4	3.75	-	-	-	-	-	-	-	-	20	A-6b (V)	
	886.8	10																
VERY STIFF, RED, **SILT AND CLAY**, LITTLE SAND, TRACE GRAVEL, MOIST		11																
		12	12 15 18	42	100	SS-5	2.75	-	-	-	-	-	-	-	-	28	A-6a (V)	
		13																
@13.5'; HARD, DAMP		14	15 16 50/2"	-	100	SS-6	4.50	-	-	-	-	-	-	-	-	17	A-6a (V)	
	881.3	15																
		EOB																
@15.5'; ENCOUNTERED AUGER REFUSAL																		

NOTES: CAVED AT 12'

ABANDONMENT METHODS, MATERIALS, QUANTITIES: AUGER CUTTINGS MIXED WITH BENTONITE CHIPS

PROJECT: ATH-US 33-18.70	DRILLING FIRM / OPERATOR: CTL / H. BROWN	DRILL RIG: MOBILE B-57 TRACK	STATION / OFFSET: 1110+52, 125' RT.	EXPLORATION ID B-005-0-23
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: CTL / H. BROWN	HAMMER: MOBILE AUTOMATIC	ALIGNMENT: US 33	
PID: 119141 SFN:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 5/3/23	ELEVATION: 886.0 (MSL) EOB: 15.0 ft.	PAGE 1 OF 1
START: 12/12/23 END: 12/12/23	SAMPLING METHOD: SPT	ENERGY RATIO (%): 76.8	LAT / LONG: 39.250778, -82.080683	

MATERIAL DESCRIPTION AND NOTES	ELEV. 886.0	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	HOLE SEALED
TOPSOIL (6")	885.5																	
VERY STIFF, BROWN, **CLAY**, "AND" SILT, TRACE SAND, CONTAINS ROCK FRAGMENTS, (FILL), DAMP		1	7 8 8	20	100	SS-1	3.25	0	4	6	54	36	43	24	19	21	A-7-6 (12)	
@3.5'; MOIST		4	9 9 9	23	100	SS-2	2.50	-	-	-	-	-	-	-	-	26	A-7-6 (V)	
	880.0	W 880.0 6																
VERY STIFF, BROWN, **SILT AND CLAY**, "AND" SAND, TRACE GRAVEL, (FILL), DAMP		7	8 8 8	20	100	SS-3	3.50	2	7	31	31	29	33	19	14	15	A-6a (7)	
		9	7 8 9	22	100	SS-4	2.00	-	-	-	-	-	-	-	-	15	A-6a (V)	
@11.0'; SOME SAND, NO GRAVEL		12	8 9 9	23	100	SS-5	2.25	0	2	29	40	29	33	20	13	20	A-6a (8)	
	871.0	EOB 15	10 10 12	28	100	SS-6	2.50	-	-	-	-	-	-	-	-	14	A-6a (V)	

NOTES: CAVED AT 12'

ABANDONMENT METHODS, MATERIALS, QUANTITIES: TREMIED BENTONITE GROUT

PROJECT: ATH-US 33-18.70	DRILLING FIRM / OPERATOR: CTL / H. BROWN	DRILL RIG: MOBILE B-57 TRACK	STATION / OFFSET: 1138+37, 2' LT.	EXPLORATION ID B-006-0-23
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: CTL / H. BROWN	HAMMER: MOBILE AUTOMATIC	ALIGNMENT: US 33	
PID: 119141 SFN:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 5/3/23	ELEVATION: 876.7 (MSL) EOB: 80.0 ft.	PAGE 1 OF 3
START: 12/12/23 END: 12/12/23	SAMPLING METHOD: SPT	ENERGY RATIO (%): 76.8	LAT / LONG: 39.243666, -82.077053	

MATERIAL DESCRIPTION AND NOTES	ELEV. 876.7	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	HOLE SEALED
TOPSOIL (6")	876.2																	
HARD, RED, **SILT AND CLAY**, SOME SAND, TRACE GRAVEL, (FILL), DAMP		1	12 12 13	32	100	SS-1	4.50	1	7	21	42	29	34	19	15	13	A-6a (9)	
		2																
		3																
		4	16 11 13	31	100	SS-2	4.50	-	-	-	-	-	-	-	-	16	A-6a (V)	
		5																
@6.0'; RED AND GRAY, CONTAINS ROCK FRAGMENTS		6																
		7	9 9 11	26	100	SS-3	4.50	-	-	-	-	-	-	-	-	11	A-6a (V)	
		8																
@8.5'; VERY STIFF, TRACE SAND, NO GRAVEL		9	8 10 8	23	100	SS-4	2.75	0	3	3	57	37	31	20	11	15	A-6a (8)	
		10																
		11	8 9 9	23	100	SS-5	3.25	-	-	-	-	-	-	-	-	16	A-6a (V)	
		12																
@13.5'; MOIST		13																
		14	8 8 9	22	100	SS-6	3.75	-	-	-	-	-	-	-	-	23	A-6a (V)	
		15																
@16.0'; HARD, RED, DAMP		16																
		17	8 8 10	23	100	SS-7	4.50	-	-	-	-	-	-	-	-	14	A-6a (V)	
		18																
@18.5'; LITTLE SAND		19	9 8 10	23	100	SS-8	4.50	0	5	8	54	33	35	21	14	11	A-6a (10)	
		20																
		21																
		22																
		23																
		24	7 7 8	19	100	SS-9	4.50	-	-	-	-	-	-	-	-	16	A-6a (V)	
		25																
		26																
		27																
		28																
@28.5'; BROWN		29	8 9 12	27	100	SS-10	4.50	-	-	-	-	-	-	-	-	17	A-6a (V)	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	HOLE SEALED
HARD, RED, **SILT AND CLAY**, SOME SAND, TRACE GRAVEL, (FILL), DAMP *(continued)*	846.7																	
	844.7																	
VERY DENSE, GRAY, **GRAVEL AND/OR STONE FRAGMENTS WITH SAND, SILT, AND CLAY**, (FILL), DAMP			17 20 22	54	100	SS-11	-	-	-	-	-	-	-	-	-	6	A-2-6 (V)	
	838.2																	
VERY DENSE, GRAY, **SILT**, SOME SAND, TRACE CLAY, CONTAINS ROCK FRAGMENTS, (FILL), DAMP			20 25 28	68	100	SS-12	-	0	17	17	56	10	NP	NP	NP	3	A-4b (6)	
			17 22 27	63	100	SS-13	-	-	-	-	-	-	-	-	-	7	A-4b (V)	
	829.7																	
HARD, RED AND GRAY, **CLAY**, CONTAINS ROCK FRAGMENTS, (FILL), DAMP			12 14 18	41	100	SS-14	4.25	-	-	-	-	-	-	-	-	12	A-7-6 (V)	
			10 12 18	38	100	SS-15	4.25	-	-	-	-	-	-	-	-	15	A-7-6 (V)	
	818.7	W 818.7																
VERY STIFF, GRAY, **SILT**, SOME CLAY, LITTLE SAND, LITTLE GRAVEL, (FILL), DAMP			12 10 16	33	100	SS-16	2.50	11	6	6	53	24	30	20	10	14	A-4b (8)	

PID: 119141	SFN:	PROJECT: ATH-US 33-18.70	STATION / OFFSET: 1138+37, 2' LT.	START: 12/12/23	END: 12/12/23	PG 3 OF 3	B-006-0-23

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	HOLE SEALED
VERY STIFF, GRAY, **SILT**, SOME CLAY, LITTLE SAND, LITTLE GRAVEL, (FILL), DAMP *(continued)*	814.6	63																
@63.5'; CONTAINS ROCK FRAGMENTS		64	19 23 25	61	100	SS-17	4.00	-	-	-	-	-	-	-	-	13	A-4b (V)	
	809.7	65																
VERY DENSE, GRAY, **GRAVEL AND/OR STONE FRAGMENTS**, SOME SILT, (FILL), WET		66																
		67																
		68																
		69	20 24 29	68	100	SS-18	-	-	-	-	-	-	-	-	-	10	A-1-a (V)	
		70																
		71																
		72																
		73																
		74	20 23 26	63	100	SS-19	-	-	-	-	-	-	-	-	-	5	A-1-a (V)	
	799.7	75																
HARD, RED AND GRAY, **SILT AND CLAY**, LITTLE SAND, TRACE GRAVEL, (FILL), DAMP		76																
		77																
		78																
		79	23 27 32	76	100	SS-20	4.50	4	4	15	44	33	31	19	12	12	A-6a (9)	
	796.7	EOB 80																

NOTES: CAVED AT 52'

ABANDONMENT METHODS, MATERIALS, QUANTITIES: TREMIED BENTONITE GROUT

STANDARD ODOT SOIL BORING LOG (8.5 X 11) - OH DOT.GDT - 10/4/24 09:27 - O:\PROJECT\2023\COL-05\23050059COL_ATH MEG-033-18-70 00-00_HNTB OHIO INC\REPORTS\LAB REPORTS\M

PROJECT: ATH-US 33-18.70	DRILLING FIRM / OPERATOR: CTL / H. BROWN	DRILL RIG: MOBILE B-57 TRACK	STATION / OFFSET: 1138+15, 271' RT.	EXPLORATION ID B-006-1-23
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: CTL / H. BROWN	HAMMER: MOBILE AUTOMATIC	ALIGNMENT: US 33	
PID: 119141 SFN:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 5/3/23	ELEVATION: 805.6 (MSL) EOB: 30.0 ft.	PAGE 1 OF 1
START: 12/12/23 END: 12/12/23	SAMPLING METHOD: SPT	ENERGY RATIO (%): 76.8	LAT / LONG: 39.243478, -82.077988	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	HOLE SEALED
TOPSOIL (8")	804.9																	
VERY STIFF, BROWN AND GRAY, **SANDY SILT**, "AND" CLAY, TRACE GRAVEL, (FILL), DAMP		1	7 7 8	19	100	SS-1	3.75	3	2	5	43	47	33	23	10	15	A-4a (8)	
		2																
		3																
		4	7 7 6	17	100	SS-2	3.75	-	-	-	-	-	-	-	-	9	A-4a (V)	
		5																
	799.6	6																
HARD, BROWN, **SILT AND CLAY**, LITTLE SAND, TRACE GRAVEL, (FILL), DAMP		7	8 9 9	23	100	SS-3	4.50	-	-	-	-	-	-	-	-	10	A-6a (V)	
		8																
		9	9 10 12	28	100	SS-4	4.50	6	8	5	55	26	36	22	14	12	A-6a (10)	
		10																
@11.0'; SOME STONE FRAGMENTS		11	8 8 10	23	100	SS-5	4.50	-	-	-	-	-	-	-	-	11	A-6a (V)	
		12																
@13.5'; VERY STIFF		13	5 9 9	23	100	SS-6	3.50	-	-	-	-	-	-	-	-	19	A-6a (V)	
		14																
@16.0'; NO GRAVEL		15	9 9 11	26	100	SS-7	2.75	0	13	5	44	38	37	23	14	18	A-6a (10)	
		16																
	785.6	17	10 9 12	27	100	SS-8	3.00	-	-	-	-	-	-	-	-	11	A-6a (V)	
VERY STIFF, BROWN, **SILT AND CLAY**, LITTLE SAND, TRACE GRAVEL, DAMP		18																
		19																
		20																
		21																
		22																
		23																
		24	10 10 12	28	100	SS-9	2.50	-	-	-	-	-	-	-	-	16	A-6a (V)	
		25																
		26																
		27																
		28																
	775.6	29	12 11 12	29	100	SS-10	2.50	-	-	-	-	-	-	-	-	16	A-6a (V)	
		EOB																

NOTES: CAVED AT 25'

ABANDONMENT METHODS, MATERIALS, QUANTITIES: AUGER CUTTINGS MIXED WITH BENTONITE CHIPS

STANDARD ODOT SOIL BORING LOG (8.5 X 11) - OH DOT.GDT - 10/4/24 09:27 - O:\PROJECT\2023\COL-05\23050059COL_ATH MEG-033-18-70 00-00_HNTB OHIO INC\REPORTS\LAB REPORTS\M

PROJECT: ATH-US 33-18.70	DRILLING FIRM / OPERATOR: CTL / H. BROWN	DRILL RIG: MOBILE B-57 TRACK	STATION / OFFSET: 1030+73, 448' RT.	EXPLORATION ID B-046-0-23
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: CTL / H. BROWN	HAMMER: MOBILE AUTOMATIC	ALIGNMENT: US 33	
PID: 119141 SFN:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 5/3/23	ELEVATION: 904.5 (MSL) EOB: 15.0 ft.	PAGE 1 OF 1
START: 12/11/23 END: 12/11/23	SAMPLING METHOD: SPT	ENERGY RATIO (%): 76.8	LAT / LONG: 39.270346, -82.089688	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	HOLE SEALED
TOPSOIL (3")	904.2																	
VERY STIFF, RED, **CLAY**, "AND" SILT, LITTLE SAND, DAMP	902.5	1	3 3 5	10	100	SS-1	2.25	0	2	14	46	38	42	25	17	24	A-7-6 (11)	
BROWN, **ELASTIC CLAY**, SOME SILT, TRACE SAND, DAMP	900.5	2 3 4																
VERY STIFF, RED, **CLAY**, "AND" SILT, LITTLE SAND, DAMP	896.5	4 5 6	5 6 6	15	100	SS-2	2.50	-	-	-	-	-	-	-	-	21	A-7-6 (V)	
		6 7 8	3 4 8	15	100	SS-3	2.00	-	-	-	-	-	-	-	-	26	A-7-6 (V)	
VERY STIFF, BROWN, **SILTY CLAY**, LITTLE SAND, DAMP		8 9 10	5 7 29	46	100	SS-4	3.00	0	11	8	51	30	39	23	16	13	A-6b (10)	
		11 12 13	18 29 39	87	100	SS-5	3.00	-	-	-	-	-	-	-	-	12	A-6b (V)	
@13.5'; HARD, POSSIBLE DECOMPOSED BEDROCK	889.5	14	43 50/4"	-	80	SS-6	-	-	-	-	-	-	-	-	-	5	A-6b (V)	
		EOB 15																

NOTES: CAVED AT 6.2'

ABANDONMENT METHODS, MATERIALS, QUANTITIES: AUGER CUTTINGS MIXED WITH BENTONITE CHIPS

PROJECT: ATH-US 33-18.70	DRILLING FIRM / OPERATOR: CTL / H. BROWN	DRILL RIG: MOBILE B-57 TRACK	STATION / OFFSET: 1030+73, 448' RT.
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: CTL / H. BROWN	HAMMER: MOBILE AUTOMATIC	ALIGNMENT: US 33
PID: 119141 SFN:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 5/3/23	ELEVATION: 904.5 (MSL) EOB: 4.0 ft.
START: 12/11/23 END: 12/11/23	SAMPLING METHOD: SPT	ENERGY RATIO (%): 76.8	LAT / LONG: 39.270346, -82.089688

EXPLORATION ID B-046-0A-23

PAGE 1 OF 1

MATERIAL DESCRIPTION AND NOTES	ELEV. 904.5	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	HOLE SEALED
	902.5	1																
BROWN, **ELASTIC CLAY**, SOME SILT, TRACE SAND, DAMP	900.5	2 3 EOB 4			100	ST-1	-	0	1	3	28	68	69	33	36	33	A-7-5 (20)	

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: AUGER CUTTINGS MIXED WITH BENTONITE CHIPS

PROJECT: ATH-US 33-18.70	DRILLING FIRM / OPERATOR: CTL / A. WILDER	DRILL RIG: CME 45 TRACK	STATION / OFFSET: 1010+34, 208' LT.	EXPLORATION ID B-061-0-23
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: CTL / A. WILDER	HAMMER: CME AUTOMATIC	ALIGNMENT: US 33	
PID: 119141 SFN:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 3/27/24	ELEVATION: 905.5 (MSL) EOB: 6.5 ft.	PAGE 1 OF 1
START: 6/21/24 END: 6/21/24	SAMPLING METHOD: SPT	ENERGY RATIO (%): 77	LAT / LONG: 39.274625, -82.094545	

MATERIAL DESCRIPTION AND NOTES	ELEV. 905.5	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	HOLE SEALED
TOPSOIL (4")	905.2																	
VERY STIFF, BROWN, **CLAY**, "AND" SILT, TRACE SAND, TRACE GRAVEL, DAMP		1	4 4 8	15	100	SS-1	3.75	4	7	3	48	38	42	22	20	15	A-7-6 (12)	
	902.0	2																
		TR 3																
SANDSTONE, BROWN, SEVERELY WEATHERED.		4	46 50/2"	-	100	SS-2	-	-	-	-	-	-	-	-	-	7	Rock (V)	
	899.0	5																
		EOB 6	50/4"	-	100	SS-3	-	-	-	-	-	-	-	-	-	7	Rock (V)	

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: AUGER CUTTINGS MIXED WITH BENTONITE CHIPS

PROJECT: ATH-US 33-18.70	DRILLING FIRM / OPERATOR: CTL / A. WILDER	DRILL RIG: CME 45 TRACK	STATION / OFFSET: 1017+26, 649' LT.	EXPLORATION ID B-062-0-23
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: CTL / A. WILDER	HAMMER: CME AUTOMATIC	ALIGNMENT: US 33	
PID: 119141 SFN:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 3/27/24	ELEVATION: 925.1 (MSL) EOB: 8.5 ft.	PAGE 1 OF 1
START: 6/21/24 END: 6/21/24	SAMPLING METHOD: SPT	ENERGY RATIO (%): 77	LAT / LONG: 39.274749, -82.091747	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	HOLE SEALED
CLAYSTONE, RED, SEVERELY WEATHERED.	925.1	TR																
		1	14															
		2	14 25	50	100	SS-1	4.00	-	-	-	-	-	-	-	-	8	Rock (V)	
		3																
		4	27															
		5	31 35	85	100	SS-2	4.00	-	-	-	-	-	-	-	-	8	Rock (V)	
		6																
		7	16 18 27	58	100	SS-3	4.50	-	-	-	-	-	-	-	-	12	Rock (V)	
	916.6	8	50/0"	-		SS-4	-	-	-	-	-	-	-	-	-	-	Rock (V)	
		EOB																

AUGER REFUSAL ENCOUNTERED @8.5'

NOTES: CAVED AT 3.1'

ABANDONMENT METHODS, MATERIALS, QUANTITIES: AUGER CUTTINGS MIXED WITH BENTONITE CHIPS

PROJECT: ATH-US 33-18.70	DRILLING FIRM / OPERATOR: CTL / A. WILDER	DRILL RIG: CME 45 TRACK	STATION / OFFSET: 1025+39, 769' RT.	EXPLORATION ID B-063-0-23
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: CTL / A. WILDER	HAMMER: CME AUTOMATIC	ALIGNMENT: US 33	
PID: 119141 SFN:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 3/27/24	ELEVATION: 953.6 (MSL) EOB: 14.1 ft.	PAGE 1 OF 1
START: 6/21/24 END: 6/21/24	SAMPLING METHOD: SPT	ENERGY RATIO (%): 77	LAT / LONG: 39.270262, -82.091678	

MATERIAL DESCRIPTION AND NOTES	ELEV. 953.6	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	HOLE SEALED
TOPSOIL (4")	953.3																	
LOOSE, BROWN, **SANDY SILT**, LITTLE CLAY, DAMP	951.1	1	3 2 4	8	100	SS-1	-	0	2	49	29	20	NP	NP	NP	14	A-4a (3)	
LOOSE, BROWN, **COARSE AND FINE SAND**, LITTLE SILT, LITTLE CLAY, DAMP	950.1	2			83	ST-2	-	0	4	68	17	11	NP	NP	NP	16	A-3a (0)	
HARD, GRAY AND BROWN, **ELASTIC CLAY**, SOME SILT, TRACE SAND, TRACE GRAVEL, DAMP		3	6 6 7	17	100	SS-3	4.25	1	0	1	26	72	59	30	29	26	A-7-5 (19)	
		4																
		5	4 8 12	26	100	SS-4	4.25	-	-	-	-	-	-	-	-	18	A-7-5 (V)	
	945.1	6																
		TR 7																
CLAYSTONE, RED, SEVERELY WEATHERED.		8	33 37 50	112	100	SS-5	3.00	-	-	-	-	-	-	-	-	12	Rock (V)	
		9																
		10	50/3"	-	100	SS-6	3.00	-	-	-	-	-	-	-	-	7	Rock (V)	
		11																
	939.5	12																
		EOB 13	50/4"	-	100	SS-7	-	-	-	-	-	-	-	-	-	7	Rock (V)	
		14																

AUGER REFUSAL ENCOUNTERED @14.1'

NOTES: CAVED AT 4.8'

ABANDONMENT METHODS, MATERIALS, QUANTITIES: AUGER CUTTINGS MIXED WITH BENTONITE CHIPS

APPENDIX C

LABORATORY TEST RESULTS

CONSOLIDATED UNDRAINED TRIAXIAL TEST ON COHESIVE SOILS

AASHTO T 297 & ASTM D4767

CTL ENGINEERING, INC.

2860 Fisher Road Columbus, Ohio 43204

Client: HNTB Ohio, Inc
PID NO. 119141
Project: ATH/MEG-033-18.70/00.00
Location: Meigs County, Ohio

Project No. 23050059COL
County, Rt. & Sec.: ATH/MEG, US 33, 18.70/00.00
Sample ID: B-001-0-23, ST-1, 2'-4'

Lab Code No. NA
Reviewed by: SM

Sample Type	Undisturbed		
Date Set-up:	1/12/2024	1/12/2024	1/12/2024
Date Sheared:	1/16/2024	1/16/2024	1/16/2024
Avg. Sample Height (in.):	5.7543	5.7520	5.7503
Avg. Sample Diameter (in.):	2.8750	2.8750	2.8750
Height-to-diameter ratio:	2.00	2.00	2.00
Wet Density (pcf):	122.0	125.3	130.4
Dry Density (pcf):	94.0	103.2	107.4
Void Ratio:	0.792	0.633	0.569
Specific Gravity (assumed):	2.7	2.7	2.7
Moisture Content (%):	29.7	21.4	21.4
Cross Sectional Area (ft^2):	0.045	0.045	0.045
Volume (ft^3):	0.02	0.02	0.02
Confining Pressure (psf):	1440	2880	4320
Rate of Axial Strain (%/min):	0.2085	0.2086	0.2087
Compressive Strength (psf):	1513	2746	4085
Minor Principal Stress at Failure (psf):	1440	2880	4320
Major Principal Stress at Failure (psf):	2953	5626	8405
Failure Criterian (%):	Point of Maximum Obliquity		
β:	0.96	0.97	0.96
Specimen Saturation:	Wet Method		

POST SHEAR
1440 psf

POST SHEAR
2880 psf

POST SHEAR
4320 psf

Grading (ASTM D422)

% Agg:	1
% Sand.:	22
% Silt:	41
% Clay:	36

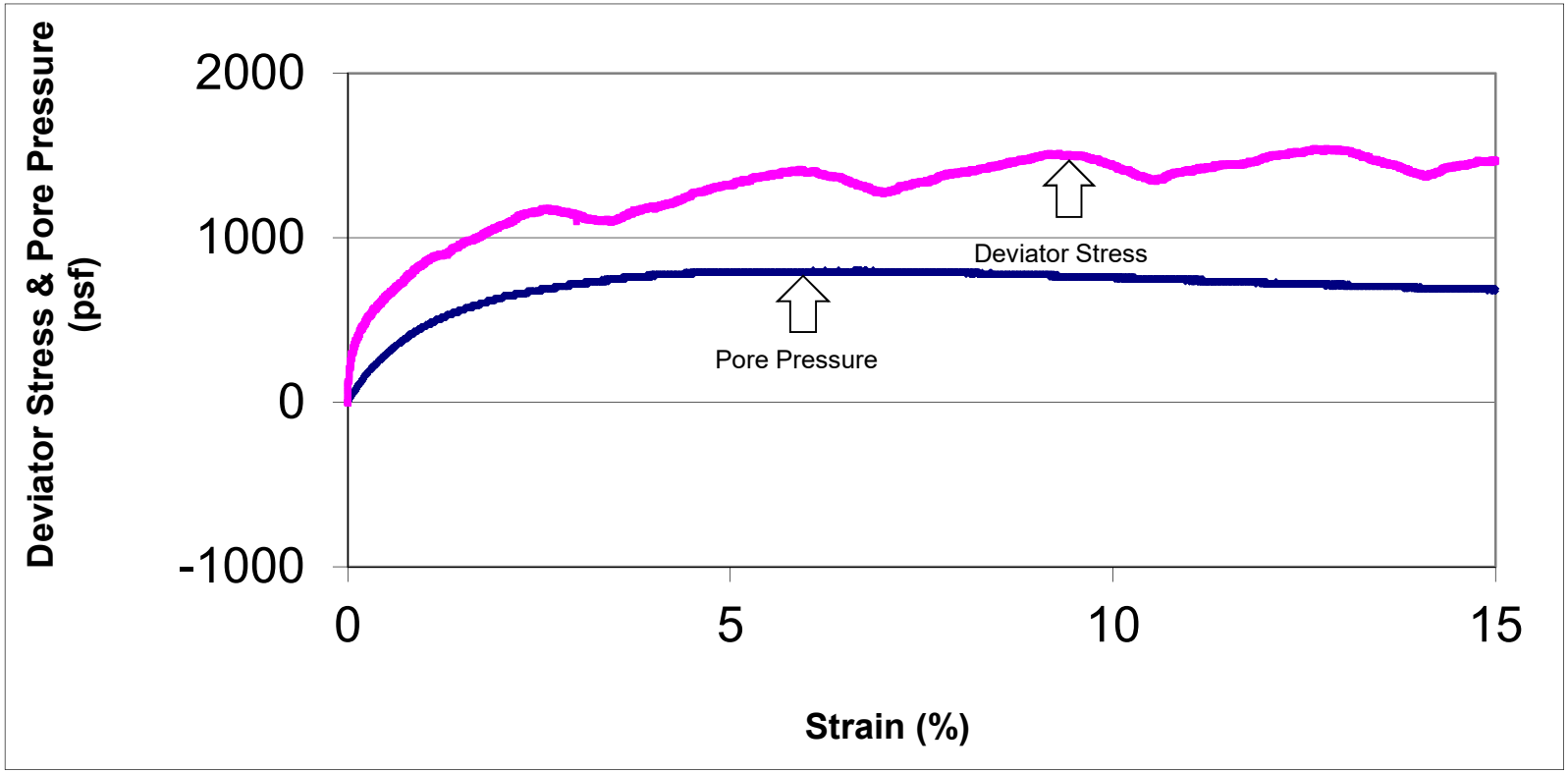
Atterberg Limits (ASTM D 4318)

L.L.:	34
P.L.:	21
P.I.:	13

Visual Classification: Brown, Silt and Clay (A-6a)

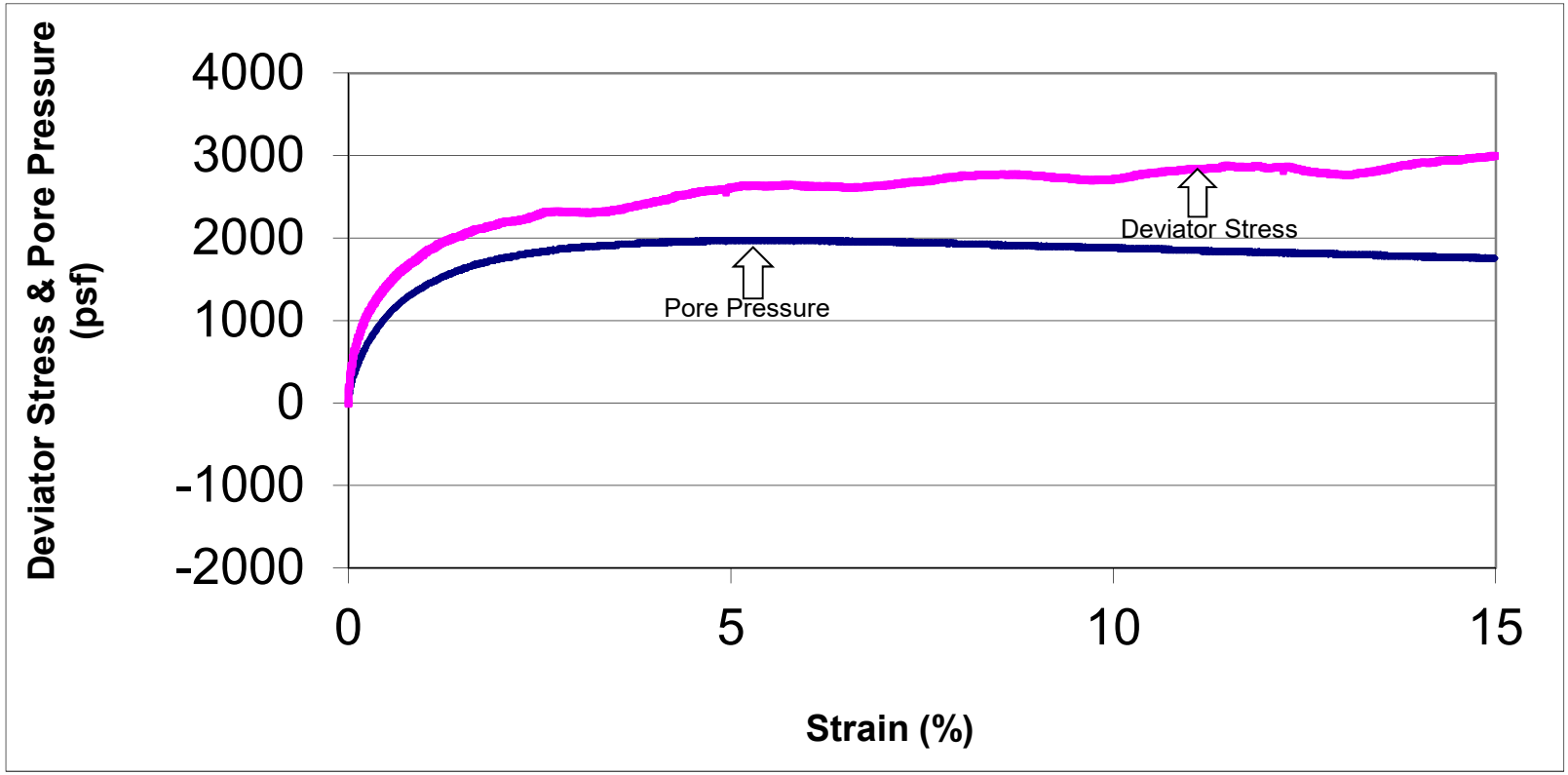
Deviator Stress & Pore Pressure vs. Strain

CLIENT:	HNTB Ohio, Inc	Sample ID:	B-001-0-23, ST-1, 2'-4'
PROJECT:	ATH/MEG-033-18.70/00.00	Confining Pressure (psf):	1440
LOCATION:	Meigs County, Ohio		
PROJECT #:	23050059COL		



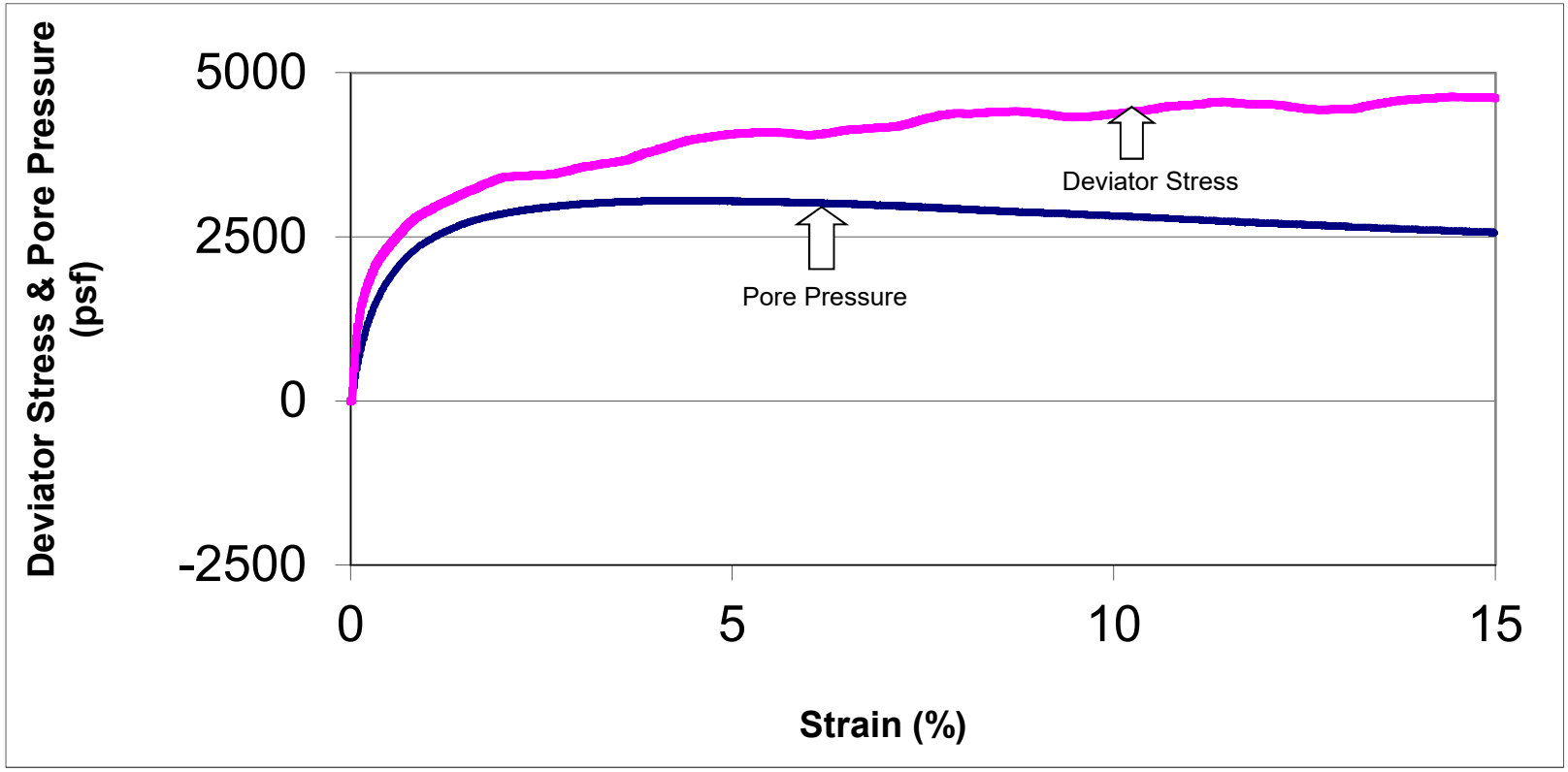
Deviator Stress & Pore Pressure vs. Strain

CLIENT:	HNTB Ohio, Inc	Sample ID:	B-001-0-23, ST-1, 2'-4'
PROJECT:	ATH/MEG-033-18.70/00.00	Confining Pressure (psf):	2880
LOCATION:	Meigs County, Ohio		
PROJECT #:	23050059COL		



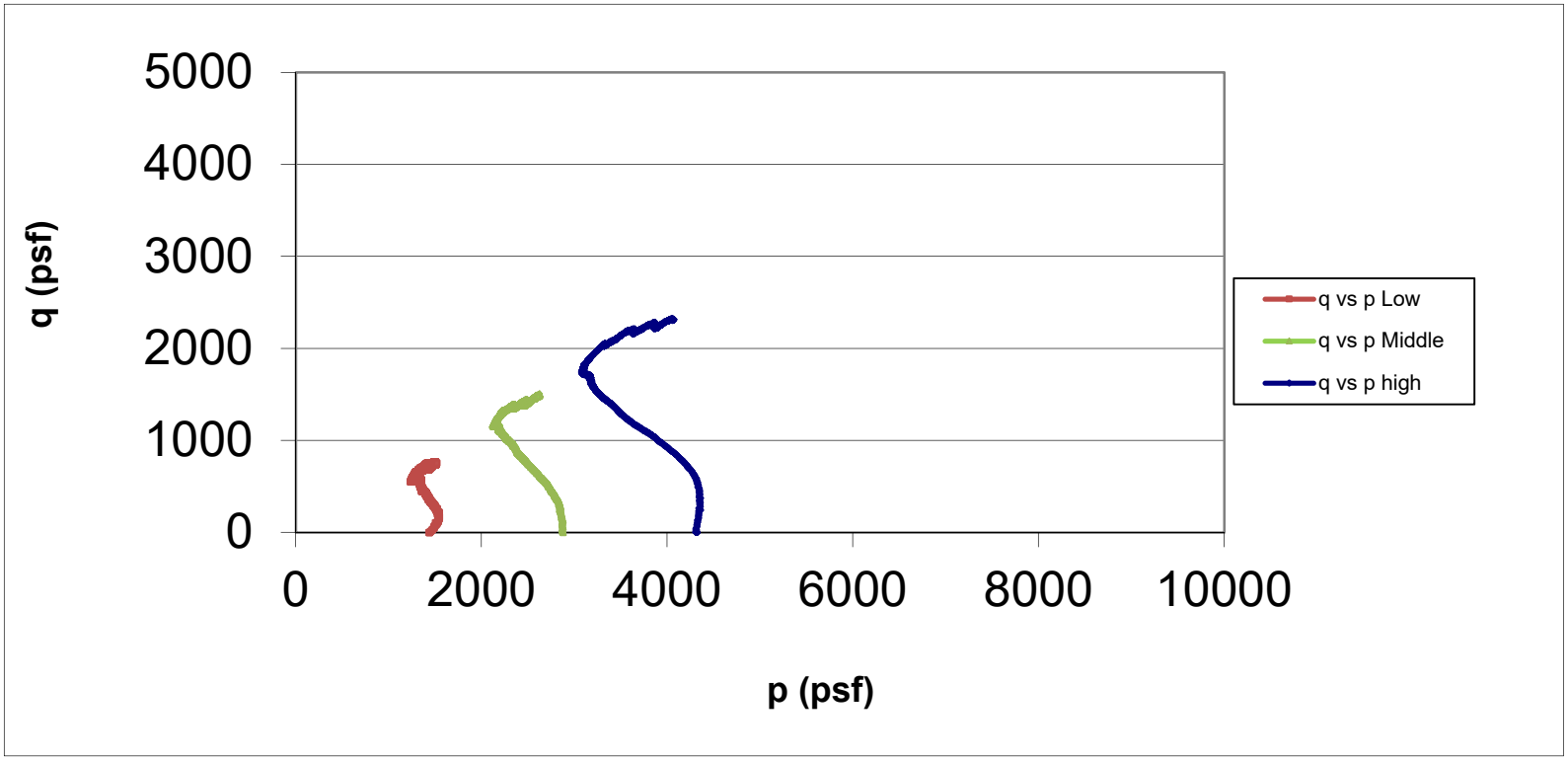
Deviator Stress & Pore Pressure vs. Strain

CLIENT:	HNTB Ohio, Inc	Sample ID:	B-001-0-23, ST-1, 2'-4'
PROJECT:	ATH/MEG-033-18.70/00.00	Confining Pressure (psf):	4320
LOCATION:	Meigs County, Ohio		
PROJECT #:	23050059COL		



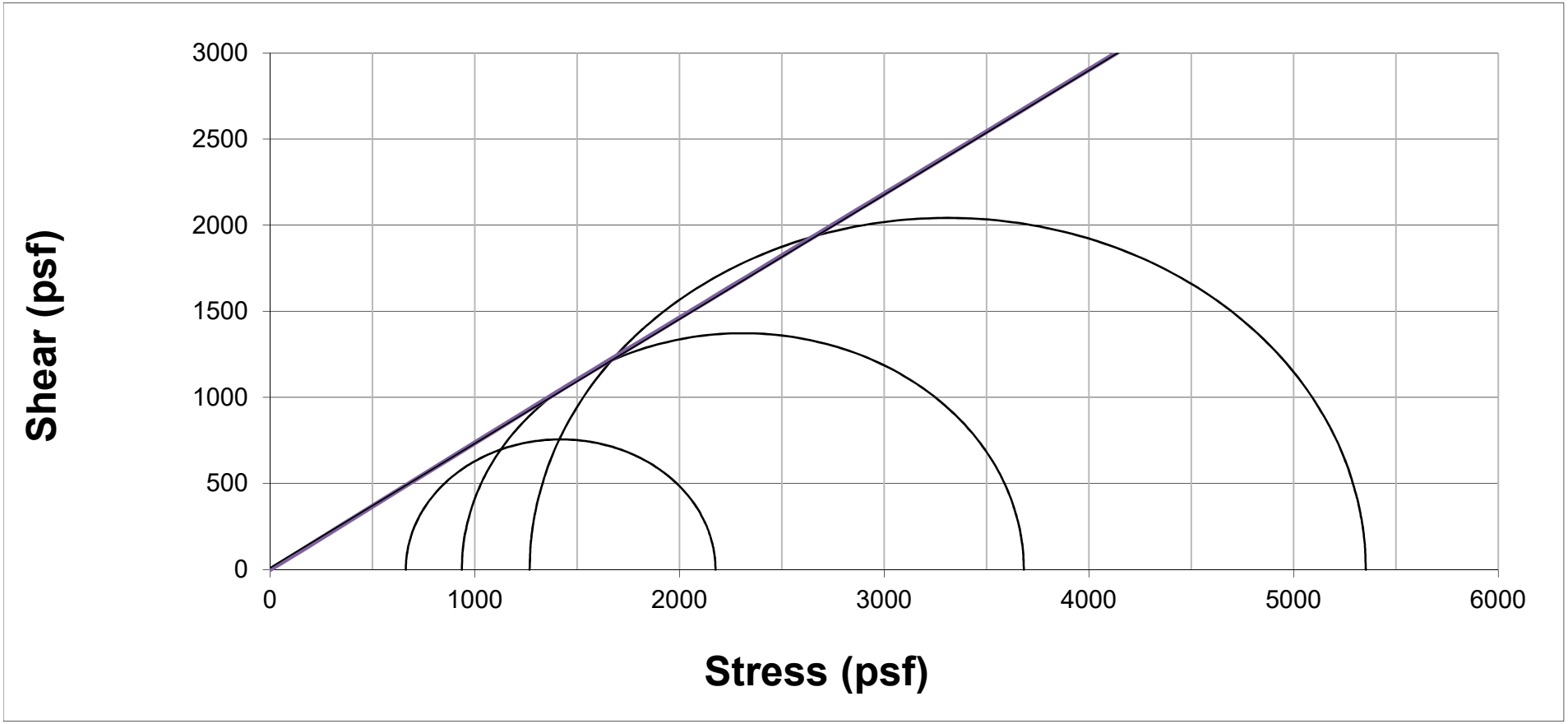
q vs. p

CLIENT:	HNTB Ohio, Inc	Sample ID:	B-001-0-23, ST-1, 2'-4'		
PROJECT:	ATH/MEG-033-18.70/00.00				
LOCATION:	Meigs County, Ohio	Confining Pressure (psf):	Low	Middle	High
PROJECT #:	23050059COL		1440	2880	4320



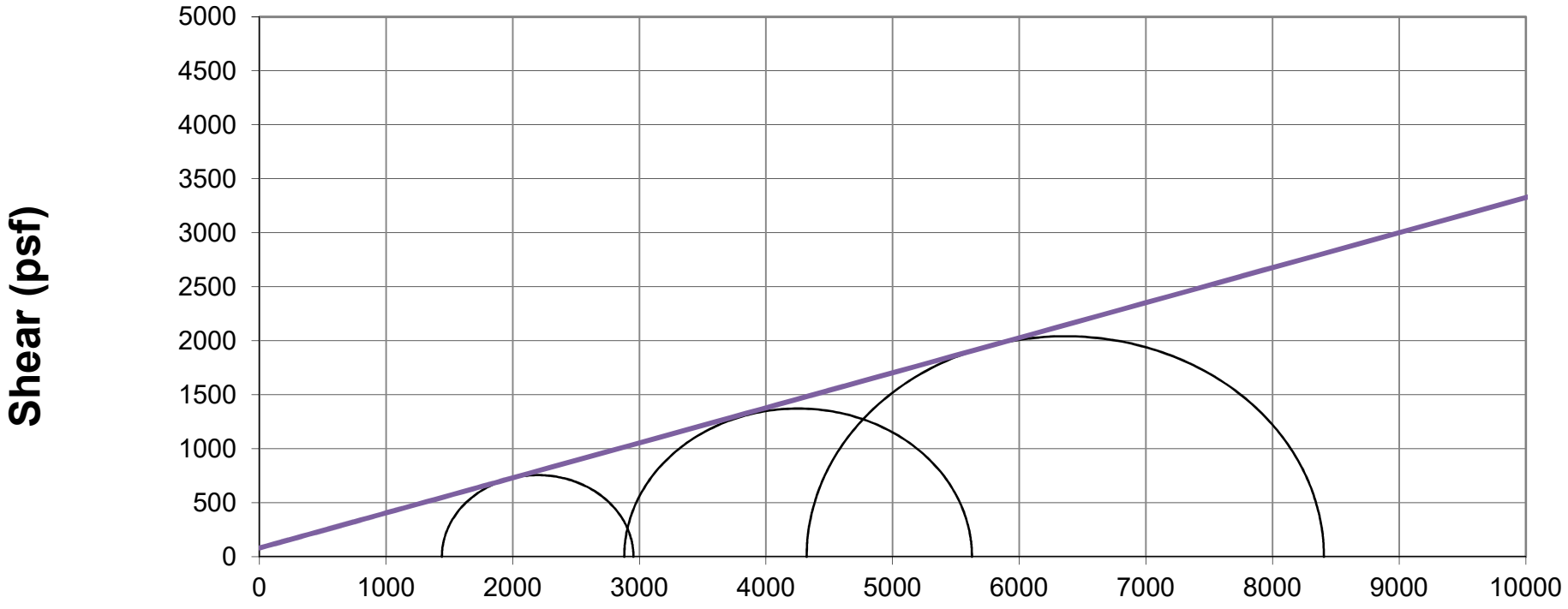
Mohr Circle Effective Stress

CLIENT:	HNTB Ohio, Inc	Sample ID:	B-001-0-23, ST-1, 2'-4'		
PROJECT:	ATH/MEG-033-18.70/00.00				
LOCATION:	Meigs County, Ohio	Confining Pressure (psf):	1440	2880	4320
PROJECT #:	23050059COL	Cohesion(psf):	0		
		Angle of Friction(°):	35		



Mohr Circle Total Stress

CLIENT:	HNTB Ohio, Inc	Sample ID:	B-001-0-23, ST-1, 2'-4'		
PROJECT:	ATH/MEG-033-18.70/00.00				
LOCATION:	Meigs County, Ohio	Confining Pressure (psf):	1440	2880	4320
PROJECT #:	23050059COL	Cohesion(psf):	80		
		Angle of Friction(°):	18		



CONSOLIDATED UNDRAINED TRIAXIAL TEST ON COHESIVE SOILS

AASHTO T 297 & ASTM D4767

CTL ENGINEERING, INC.

2860 Fisher Road Columbus, Ohio 43204

Client: HNTB Ohio, Inc
PID NO. 119141
Project: ATH/MEG-033-18.70/00.00
Location: Meigs County, Ohio

Project No. 23050059COL
County, Rt. & Sec.: ATH/MEG, US 33, 18.70/00.00
Sample ID: B-002A-0-23, ST-1, 2'-4'

Lab Code No. NA
Reviewed by: SM

Sample Type	Undisturbed		
Date Set-up:	1/9/2024	1/9/2024	1/9/2024
Date Sheared:	1/12/2024	1/12/2024	1/12/2024
Avg. Sample Height (in.):	5.7700	5.7750	5.7777
Avg. Sample Diameter (in.):	2.8750	2.8750	2.8750
Height-to-diameter ratio:	2.01	2.01	2.01
Wet Density (pcf):	130.1	132.6	132.5
Dry Density (pcf):	108.4	111.8	111.7
Void Ratio:	0.554	0.507	0.508
Specific Gravity (assumed):	2.7	2.7	2.7
Moisture Content (%):	20.0	18.6	18.6
Cross Sectional Area (ft^2):	0.045	0.045	0.045
Volume (ft^3):	0.02	0.02	0.02
Confining Pressure (psf):	1440	2880	4320
Rate of Axial Strain (%/min):	0.2080	0.2078	0.2077
Compressive Strength (psf):	2241	3656	5584
Minor Principal Stress at Failure (psf):	1440	2880	4320
Major Principal Stress at Failure (psf):	3681	6536	9904
Failure Criterian (%):	Point of Maximum Obliquity		
β:	0.97	0.95	0.96
Specimen Saturation:	Wet Method		

POST SHEAR
1440 psf

POST SHEAR
2880 psf

POST SHEAR
4320 psf

Grading (ASTM D422)

% Agg:	1
% Sand.:	12
% Silt:	48
% Clay:	39

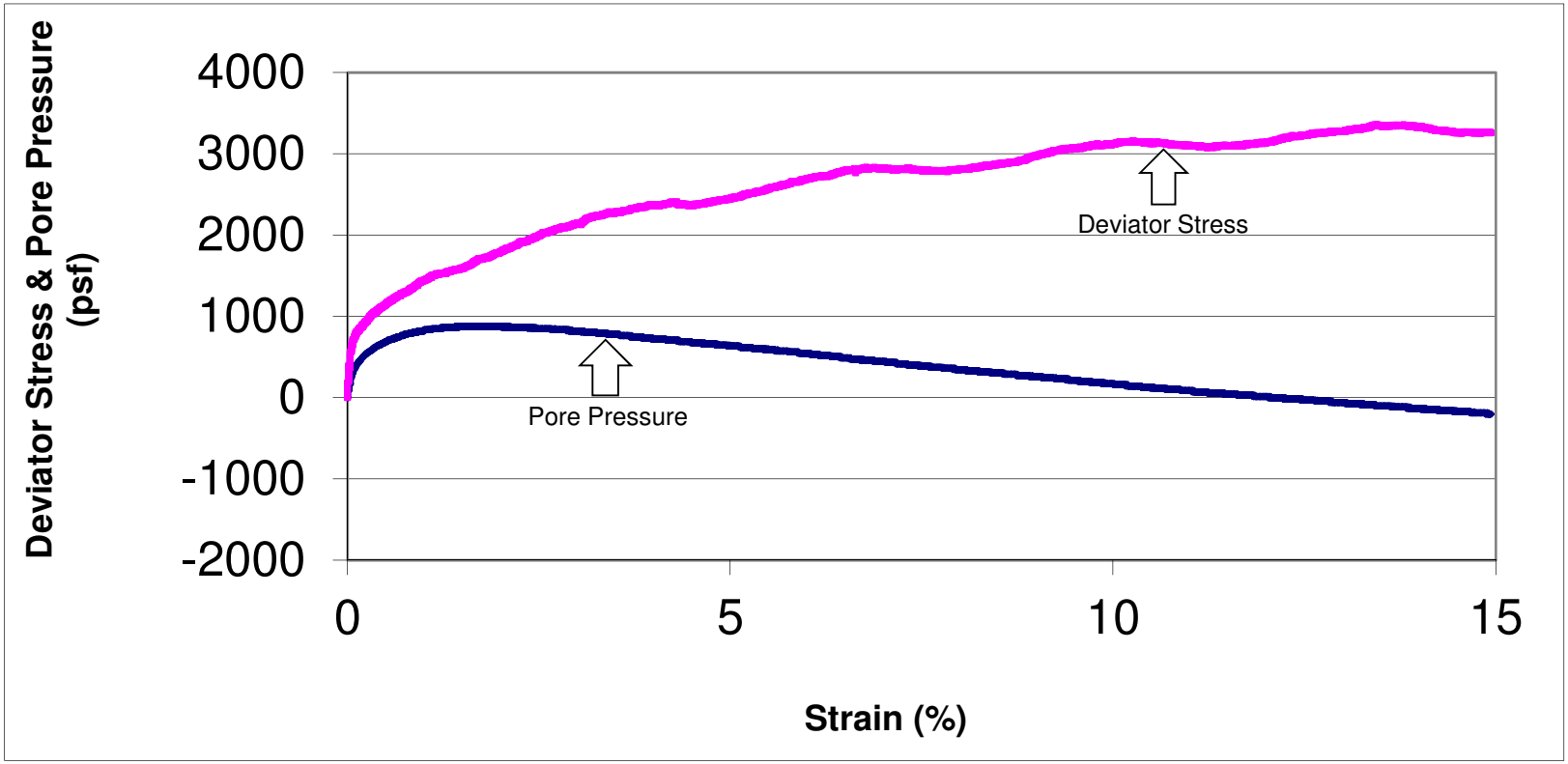
Atterberg Limits (ASTM D 4318)

L.L.:	37
P.L.:	21
P.I.:	16

Visual Classification: Brown, Silty Clay (A-6b)

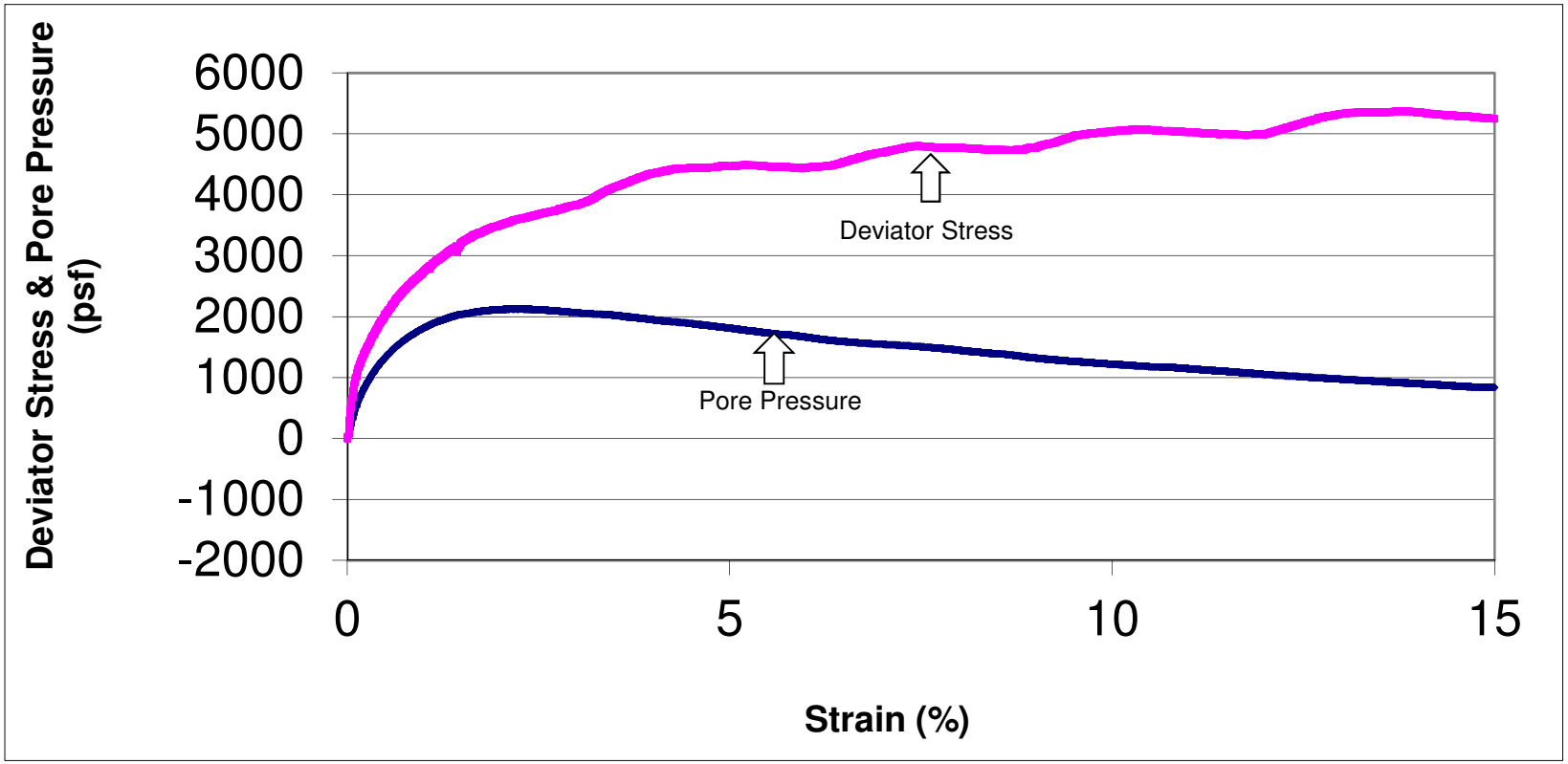
Deviator Stress & Pore Pressure vs. Strain

CLIENT:	HNTB Ohio, Inc	Sample ID:	B-002A-0-23, ST-1, 2'-4'
PROJECT:	ATH/MEG-033-18.70/00.00	Confining Pressure (psf):	1440
LOCATION:	Meigs County, Ohio		
PROJECT #:	23050059COL		



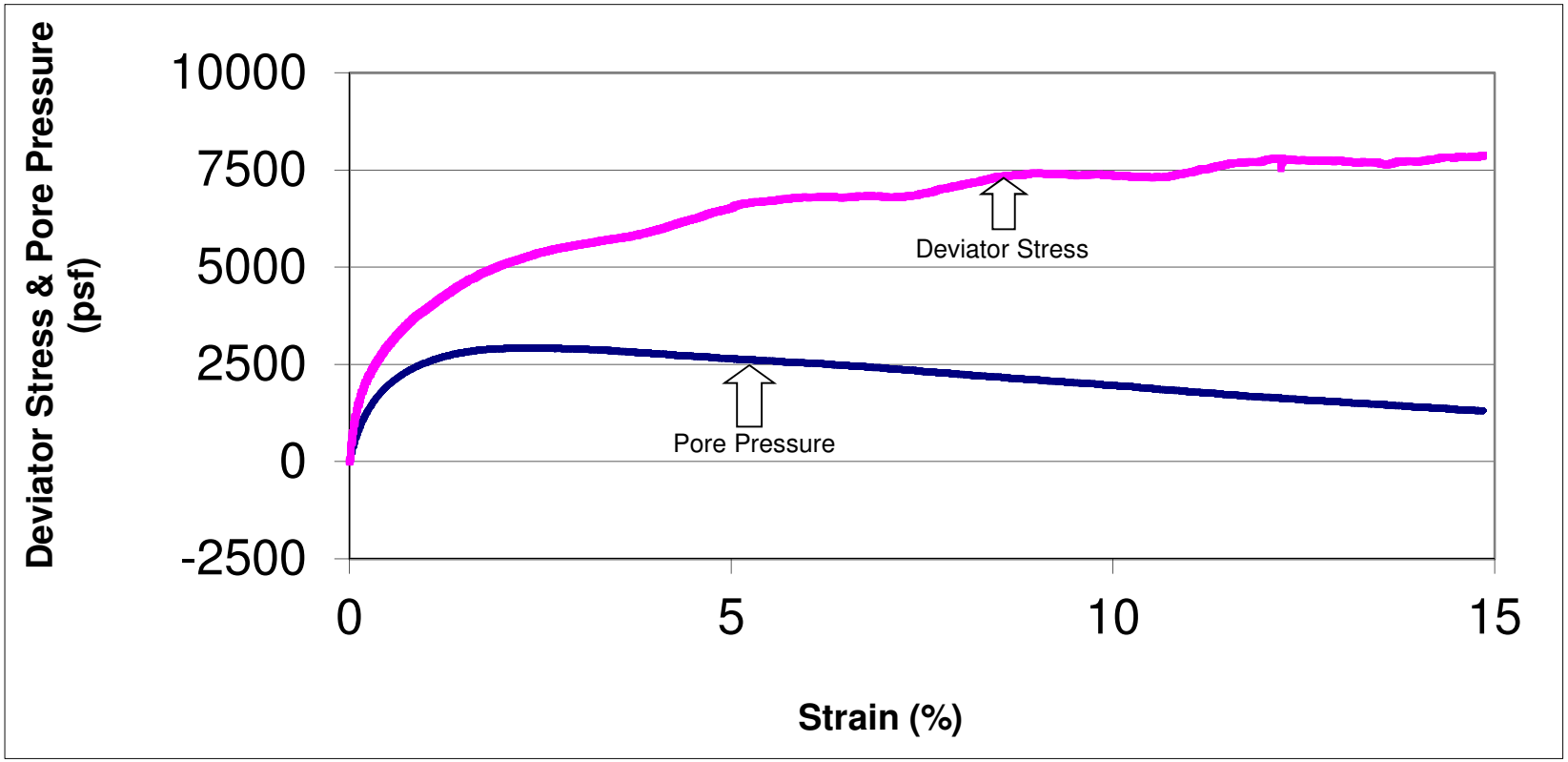
Deviator Stress & Pore Pressure vs. Strain

CLIENT:	HNTB Ohio, Inc	Sample ID:	B-002A-0-23, ST-1, 2'-4'
PROJECT:	ATH/MEG-033-18.70/00.00	Confining Pressure (psf):	2880
LOCATION:	Meigs County, Ohio		
PROJECT #:	23050059COL		



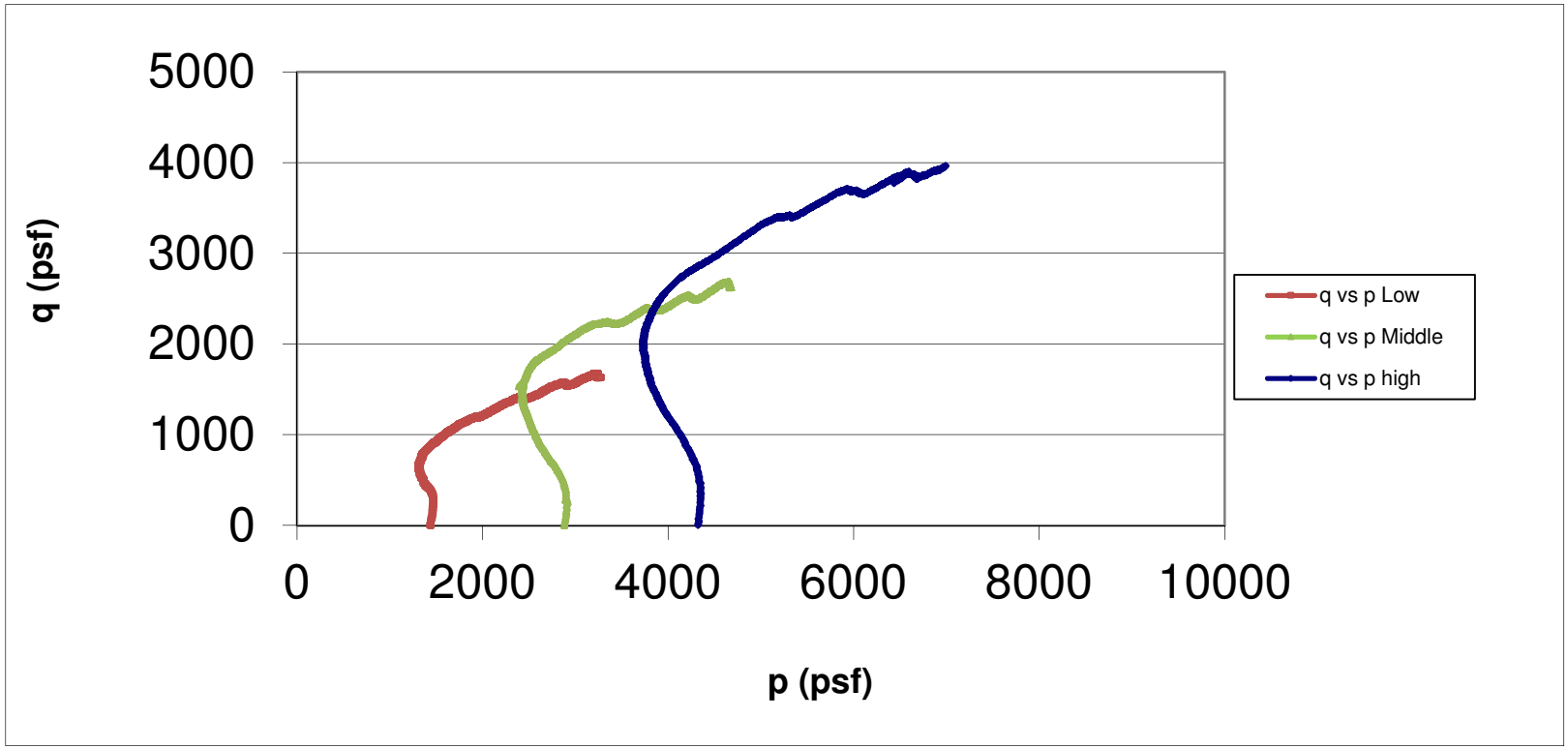
Deviator Stress & Pore Pressure vs. Strain

CLIENT:	HNTB Ohio, Inc	Sample ID:	B-002A-0-23, ST-1, 2'-4'
PROJECT:	ATH/MEG-033-18.70/00.00	Confining Pressure (psf):	4320
LOCATION:	Meigs County, Ohio		
PROJECT #:	23050059COL		



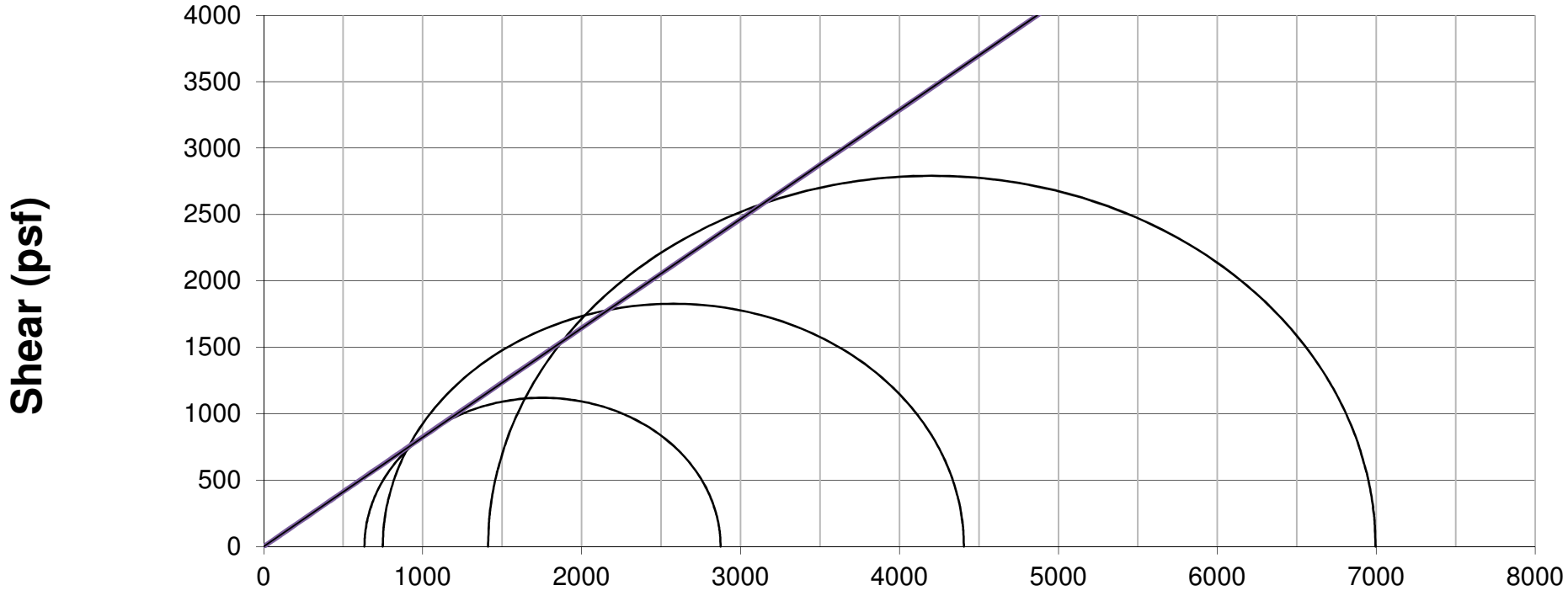
q vs. p

CLIENT:	HNTB Ohio, Inc	Sample ID:	B-002A-0-23, ST-1, 2'-4'		
PROJECT:	ATH/MEG-033-18.70/00.00				
LOCATION:	Meigs County, Ohio	Confining Pressure (psf):	Low	Middle	High
PROJECT #:	23050059COL		1440	2880	4320



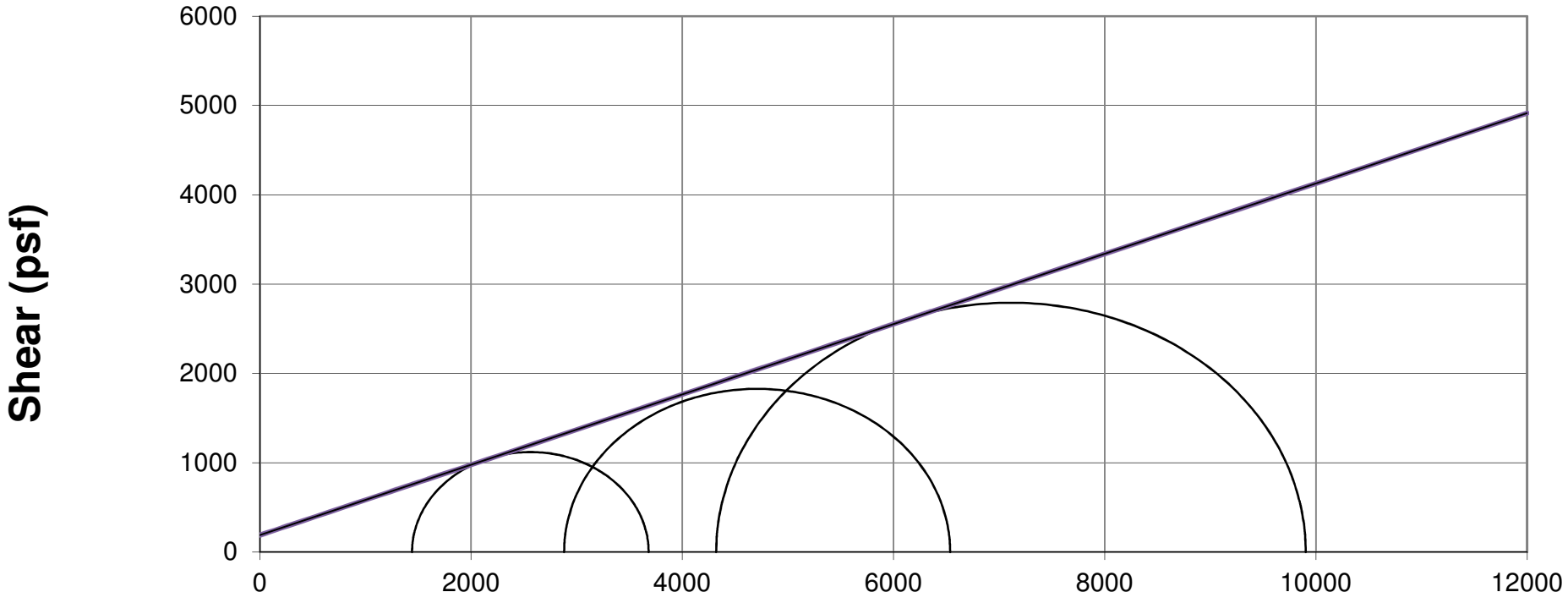
Mohr Circle Effective Stress

CLIENT:	HNTB Ohio, Inc	Sample ID:	B-002A-0-23, ST-1, 2'-4'		
PROJECT:	ATH/MEG-033-18.70/00.00				
LOCATION:	Meigs County, Ohio	Confining Pressure (psf):	1440	2880	4320
PROJECT #:	23050059COL	Cohesion(psf):	0		
		Angle of Friction(°):	39		



Mohr Circle Total Stress

CLIENT:	HNTB Ohio, Inc	Sample ID:	B-002A-0-23, ST-1, 2'-4'		
PROJECT:	ATH/MEG-033-18.70/00.00				
LOCATION:	Meigs County, Ohio	Confining Pressure (psf):	1440	2880	4320
PROJECT #:	23050059COL	Cohesion(psf):	190		
		Angle of Friction(°):	21.5		



CONSOLIDATED UNDRAINED TRIAXIAL TEST ON COHESIVE SOILS

AASHTO T 297 & ASTM D4767

CTL ENGINEERING, INC.

2860 Fisher Road Columbus, Ohio 43204

Client: HNTB Ohio, Inc
PID NO. NA
Project: ATH/MEG-033-18.70/00.00
Location: Meigs County, Ohio

Project No. 23050059COL
County, Rt. & Sec.: NA
Station & Offset: NA
Sample ID: B-003A-0-23, ST, 2'-4'
Lab Code No. NA
Reviewed by: SM

Sample Type	ST-1	
Date Set-up:	1/2/2024	1/2/2024
Date Sheared:	1/6/2024	1/6/2024
Avg. Sample Height (in.):	5.7733	5.7800
Avg. Sample Diameter (in.):	2.8750	2.8750
Height-to-diameter ratio:	2.01	2.01
Wet Density (pcf):	125.5	134.1
Dry Density (pcf):	96.7	112.4
Void Ratio:	0.742	0.499
Specific Gravity (assumed):	2.7	2.7
Moisture Content (%):	29.8	19.3
Cross Sectional Area (ft^2):	0.045	0.045
Volume (ft^3):	0.02	0.02
Confining Pressure (psf):	1440	4320
Rate of Axial Strain (%/min):	0.2079	0.2076
Compressive Strength (psf):	1914	5150
Minor Principal Stress at Failure (psf):	1440	4320
Major Principal Stress at Failure (psf):	3354	9470
Failure Criterian (%):	Point of maximum obliquity	
β:	0.98	0.97
Specimen Saturation:	Wet Method	

POST SHEAR
1440 psf

POST SHEAR
4320 psf

Grading (ASTM D422)

% Agg:	1
% Sand.:	10
% Silt:	49
% Clay:	40

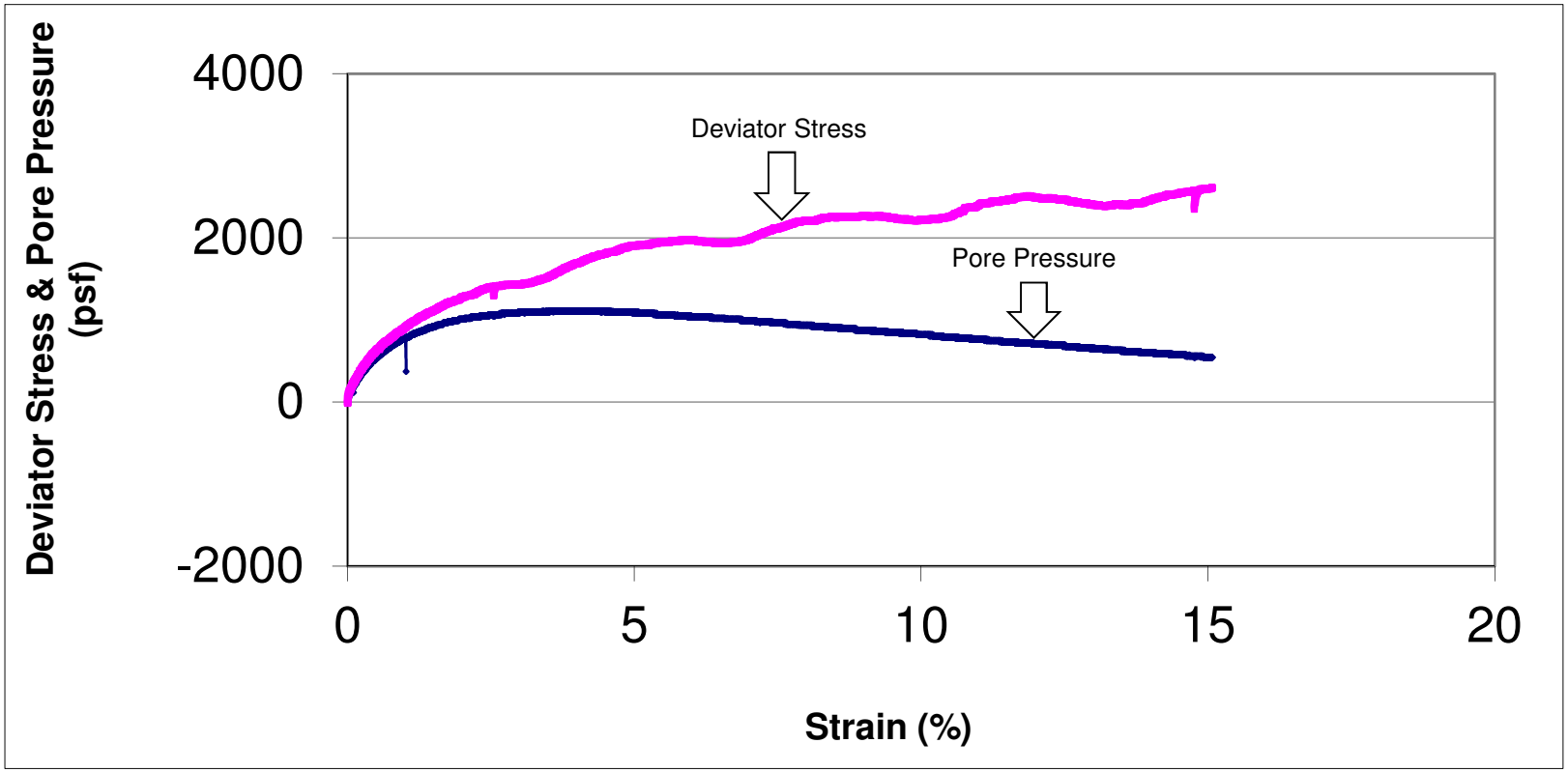
Atterberg Limits (ASTM D 4318)

L.L.:	42
P.L.:	23
P.I.:	19

Visual Description: Gray, Clay (A-7-6)

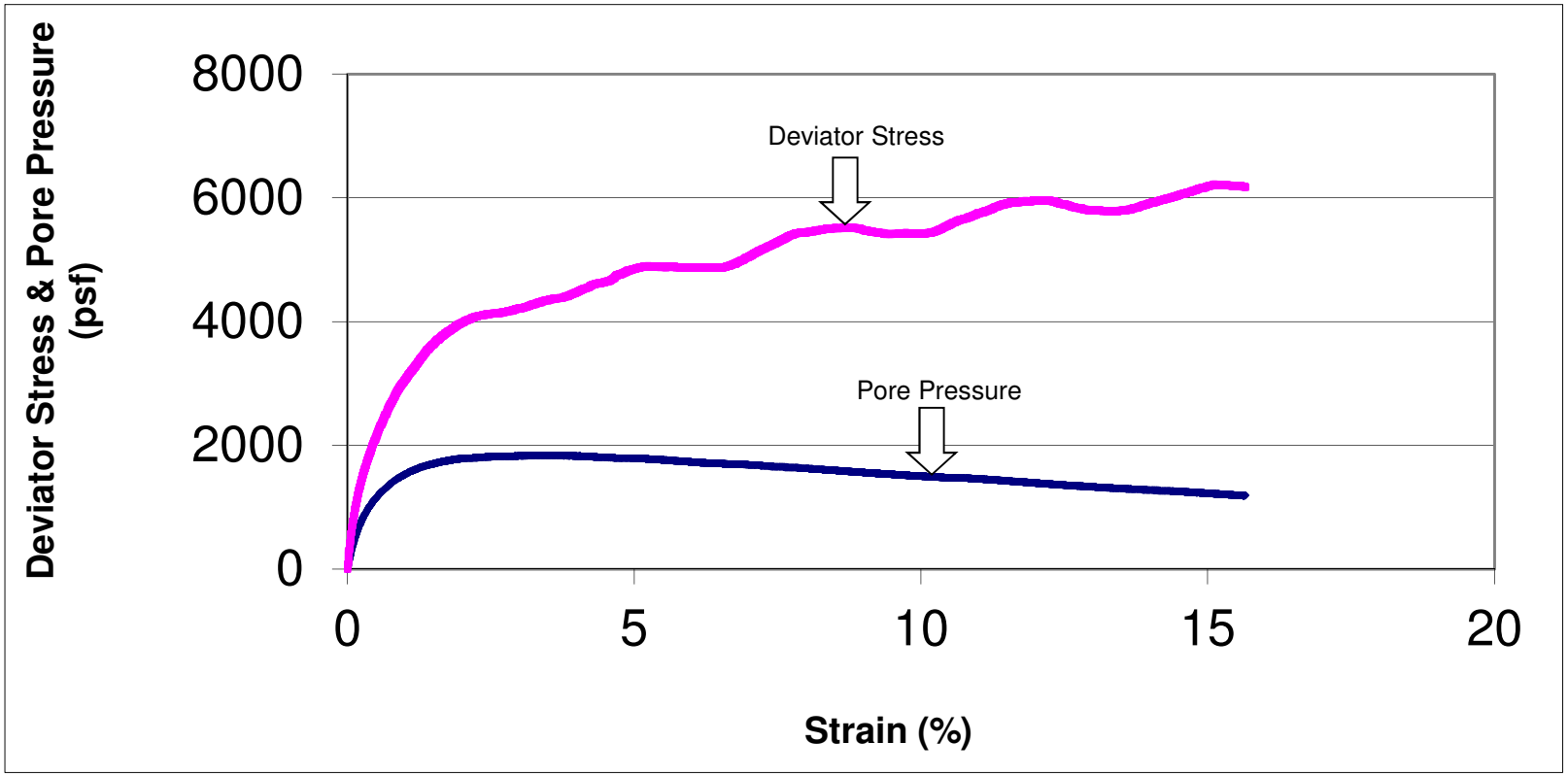
Deviator Stress & Pore Pressure vs. Strain

CLIENT:	HNTB Ohio, Inc	Sample ID:	B-003A-0-23, ST, 2'-4'
PROJECT:	ATH/MEG-033-18.70/00.00	Confining Pressure (psf):	1440
LOCATION:	Meigs County, Ohio		
PROJECT #:	23050059COL		



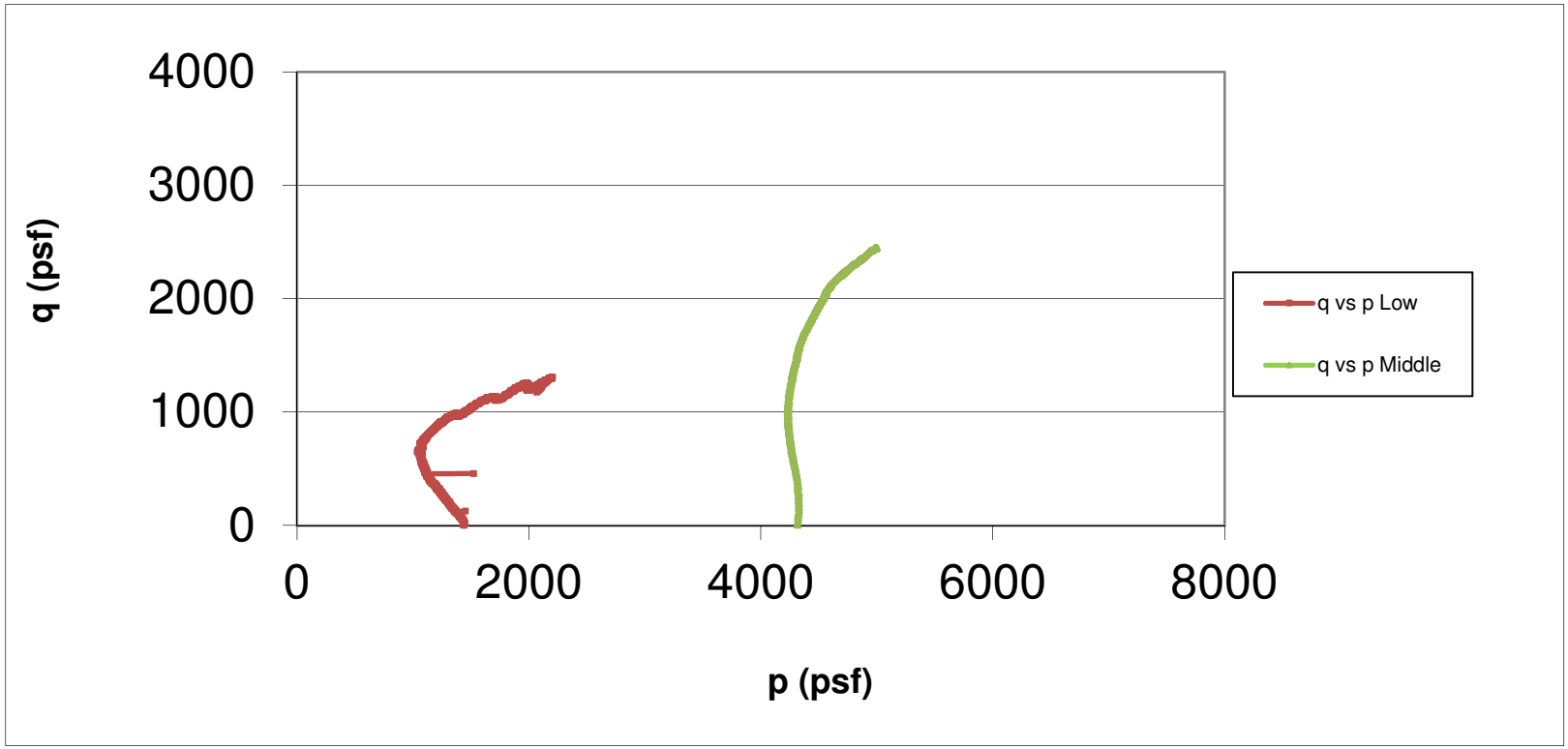
Deviator Stress & Pore Pressure vs. Strain

CLIENT:	HNTB Ohio, Inc	Sample ID:	B-003A-0-23, ST, 2'-4'
PROJECT:	ATH/MEG-033-18.70/00.00	Confining Pressure (psf):	4320
LOCATION:	Meigs County, Ohio		
PROJECT #:	23050059COL		



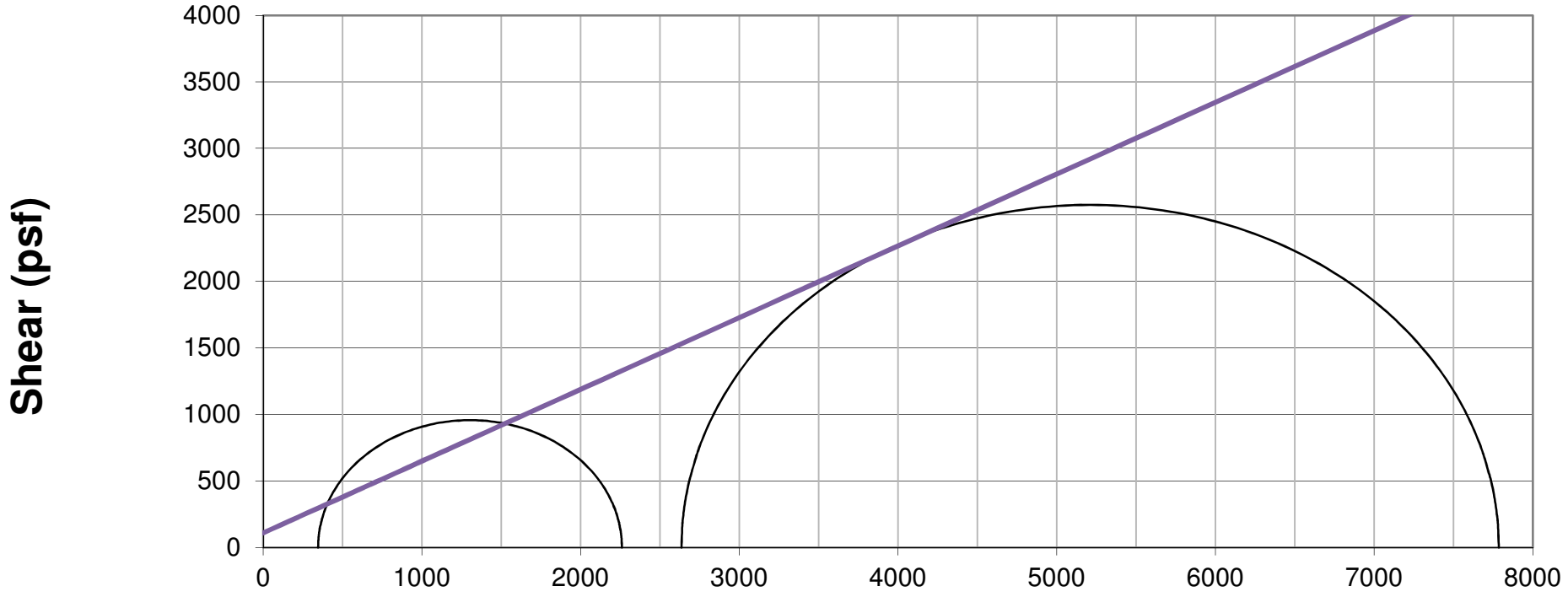
q vs. p

CLIENT:	HNTB Ohio, Inc	Sample ID:	B-003A-0-23, ST, 2'-4'		
PROJECT:	ATH/MEG-033-18.70/00.00	Confining Pressure (psf):	Low	Middle	High
LOCATION:	Meigs County, Ohio		1440	4320	#REF!
PROJECT #:	23050059COL				



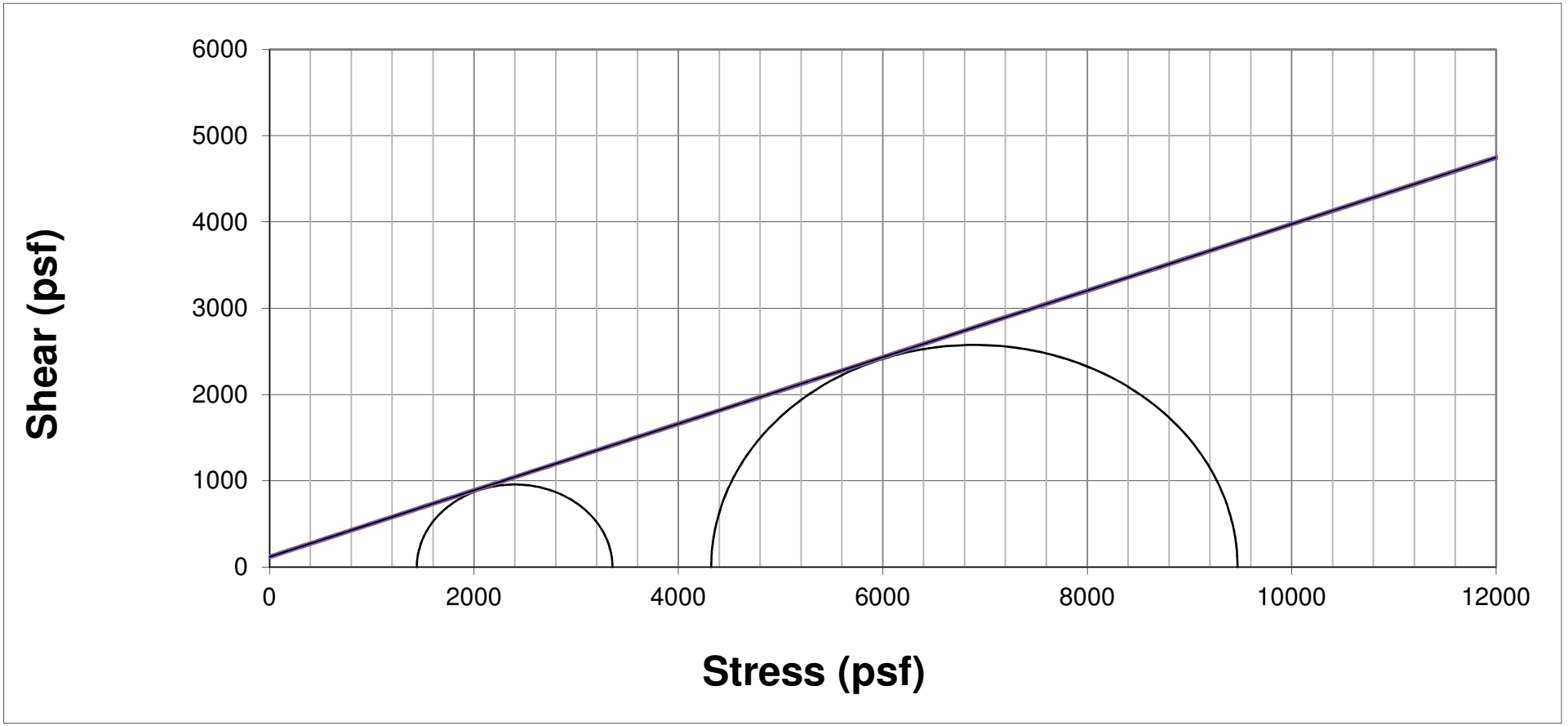
Mohr Circle Effective Stress

CLIENT:	HNTB Ohio, Inc	Sample ID:	B-003A-0-23, ST, 2'-4'	
PROJECT:	ATH/MEG-033-18.70/00.00	Confining Pressure (psf):	1440	4320
LOCATION:	Meigs County, Ohio	Cohesion(psf):	110	
PROJECT #:	23050059COL	Angle of Friction(°):	28	



Mohr Circle Total Stress

CLIENT:	HNTB Ohio, Inc	Sample ID:	B-003A-0-23, ST, 2'-4'	
PROJECT:	ATH/MEG-033-18.70/00.00	Confining Pressure (psf):	1440	4320
LOCATION:	Meigs County, Ohio	Cohesion(psf):	120	
PROJECT #:	23050059COL	Angle of Friction(°):	21	



CONSOLIDATED UNDRAINED TRIAXIAL TEST ON COHESIVE SOILS

AASHTO T 297 & ASTM D4767

CTL ENGINEERING, INC.

2860 Fisher Road Columbus, Ohio 43204

Client: HNTB Ohio, Inc
PID NO. NA
Project: ATH/MEG-033-18.70/00.00
Location: Meigs County, Ohio

Project No. 23050059COL
County, Rt. & Sec.: NA
Station & Offset: NA
Sample ID: B-046-0-23, ST, 2'-4'
Lab Code No. NA
Reviewed by: SM

Sample Type	ST-1	
Date Set-up:	2/9/2024	2/9/2024
Date Sheared:	2/13/2024	2/13/2024
Avg. Sample Height (in.):	5.8430	5.8237
Avg. Sample Diameter (in.):	2.8750	2.8750
Height-to-diameter ratio:	2.03	2.03
Wet Density (pcf):	118.9	122.3
Dry Density (pcf):	92.6	89.3
Void Ratio:	0.819	0.887
Specific Gravity (assumed):	2.7	2.7
Moisture Content (%):	28.4	36.9
Cross Sectional Area (ft^2):	0.045	0.045
Volume (ft^3):	0.02	0.02
Confining Pressure (psf):	1440	5760
Rate of Axial Strain (%/min):	0.2054	0.2061
Compressive Strength (psf):	2070	3456
Minor Principal Stress at Failure (psf):	1440	5760
Major Principal Stress at Failure (psf):	3510	9216
Failure Criterian (%):	Point of maximum obliquity	
β:	0.96	0.99
Specimen Saturation:	Wet Method	

POST SHEAR
1440 psf

POST SHEAR
5760 psf

Grading (ASTM D422)

% Agg:	0
% Sand.:	4
% Silt:	28
% Clay:	68

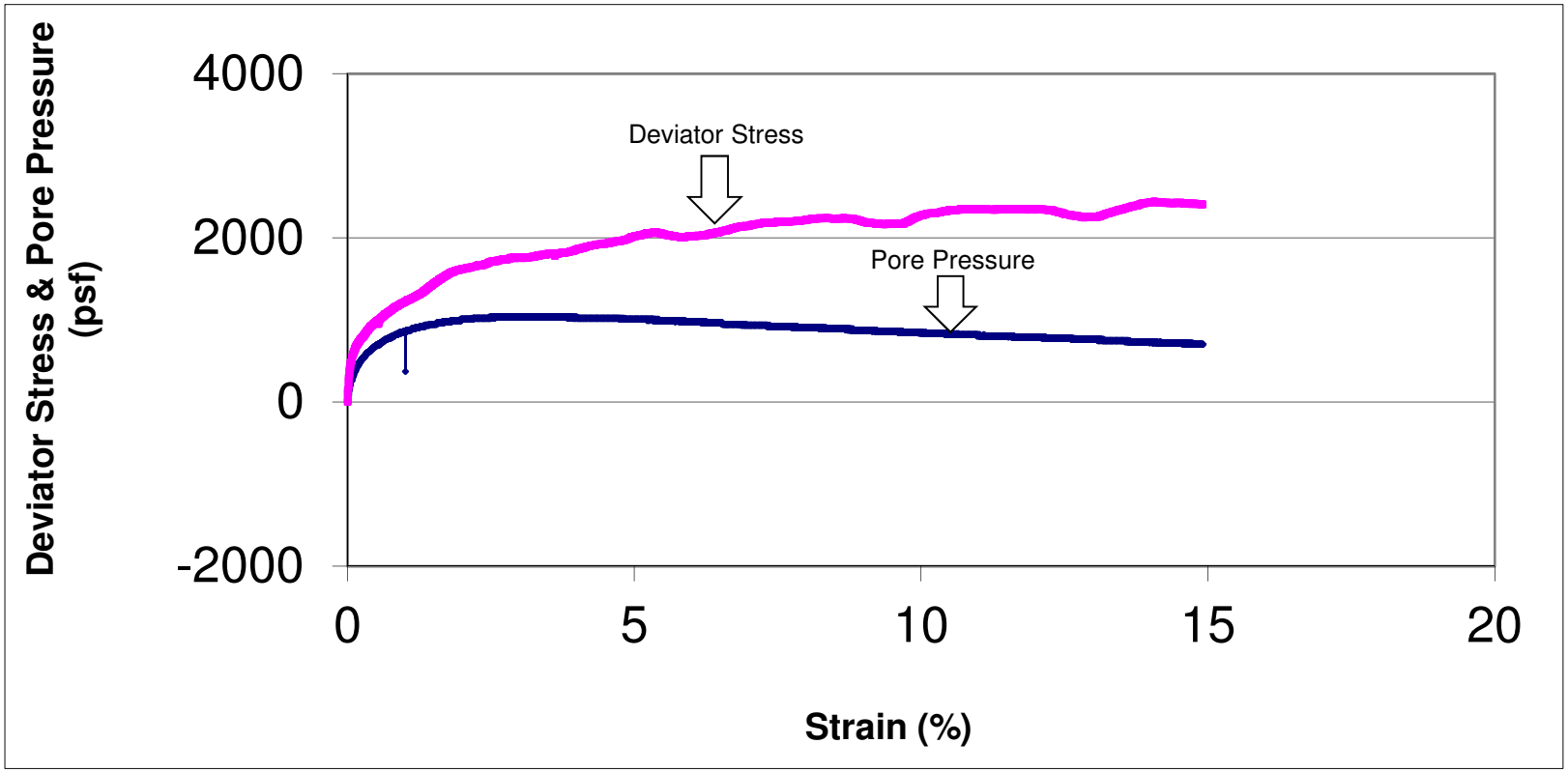
Atterberg Limits (ASTM D 4318)

L.L.:	69
P.L.:	33
P.I.:	36

Visual Description: Brown, Elastic Clay (A-7-5)

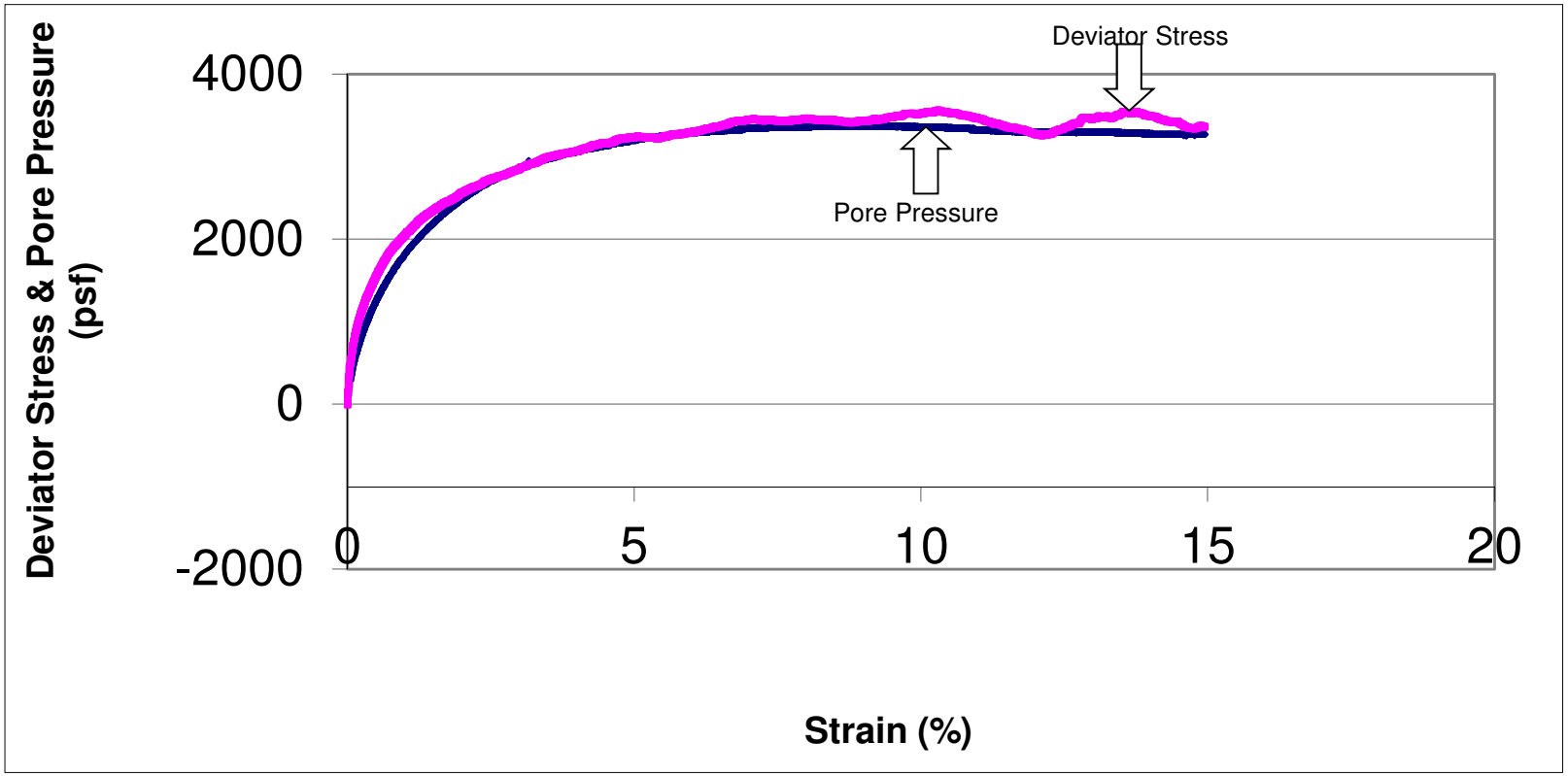
Deviator Stress & Pore Pressure vs. Strain

CLIENT:	HNTB Ohio, Inc	Sample ID:	B-046-0-23, ST, 2'-4'
PROJECT:	ATH/MEG-033-18.70/00.00	Confining Pressure (psf):	1440
LOCATION:	Meigs County, Ohio		
PROJECT #:	23050059COL		



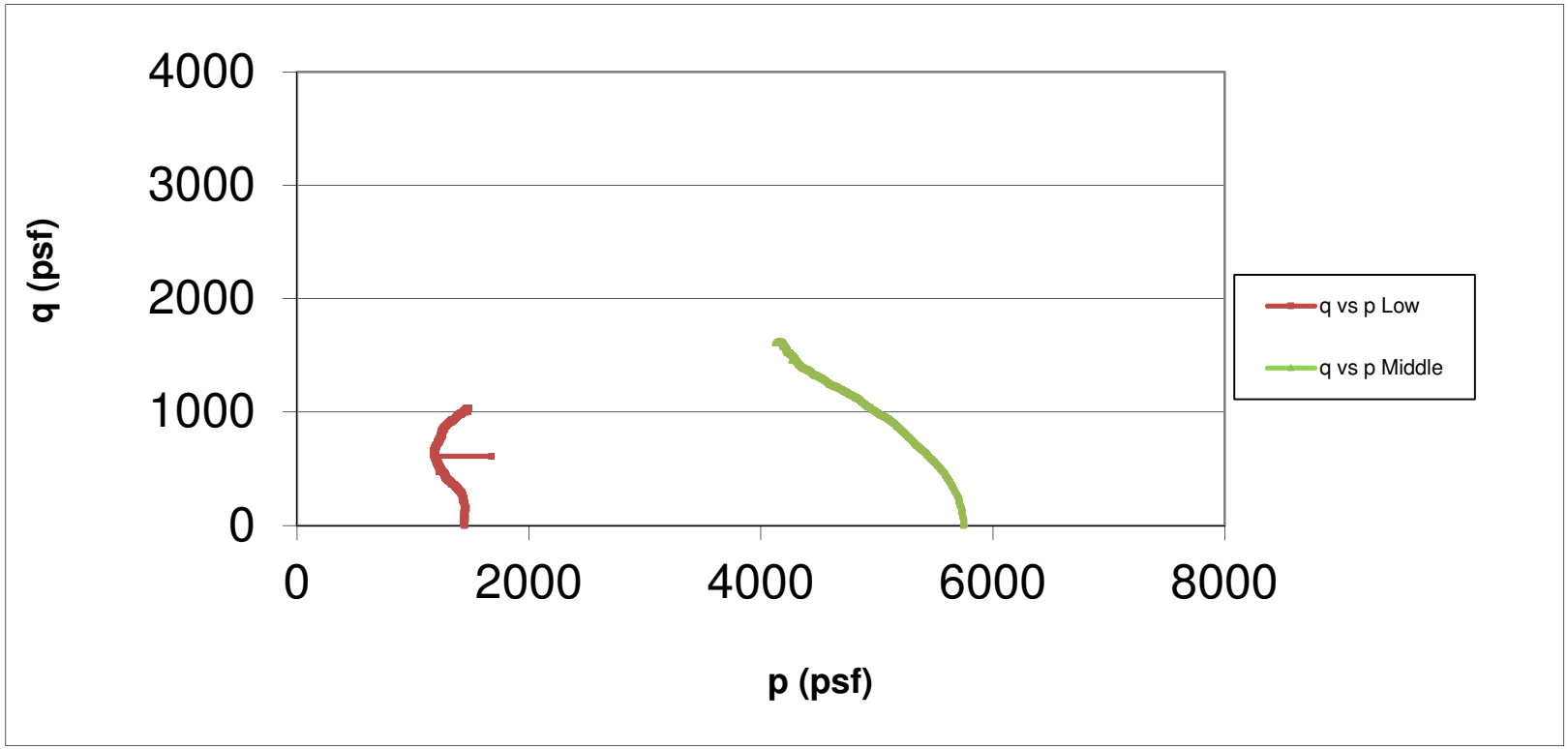
Deviator Stress & Pore Pressure vs. Strain

CLIENT:	HNTB Ohio, Inc	Sample ID:	B-046-0-23, ST, 2'-4'
PROJECT:	ATH/MEG-033-18.70/00.00	Confining Pressure (psf):	5760
LOCATION:	Meigs County, Ohio		
PROJECT #:	23050059COL		



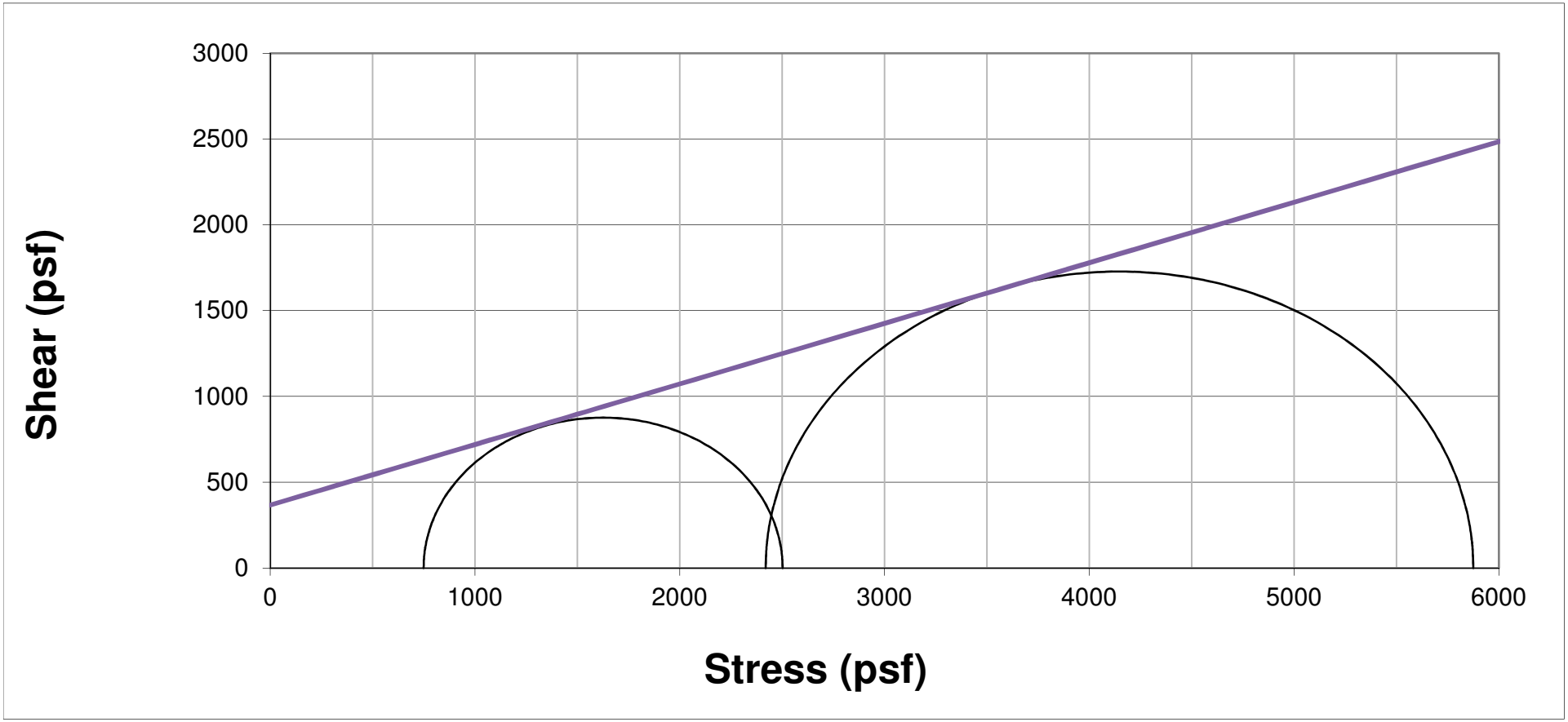
q vs. p

CLIENT:	HNTB Ohio, Inc	Sample ID:	B-046-0-23, ST, 2'-4'	
PROJECT:	ATH/MEG-033-18.70/00.00	Confining Pressure (psf):	Low	Middle
LOCATION:	Meigs County, Ohio		1440	5760
PROJECT #:	23050059COL			



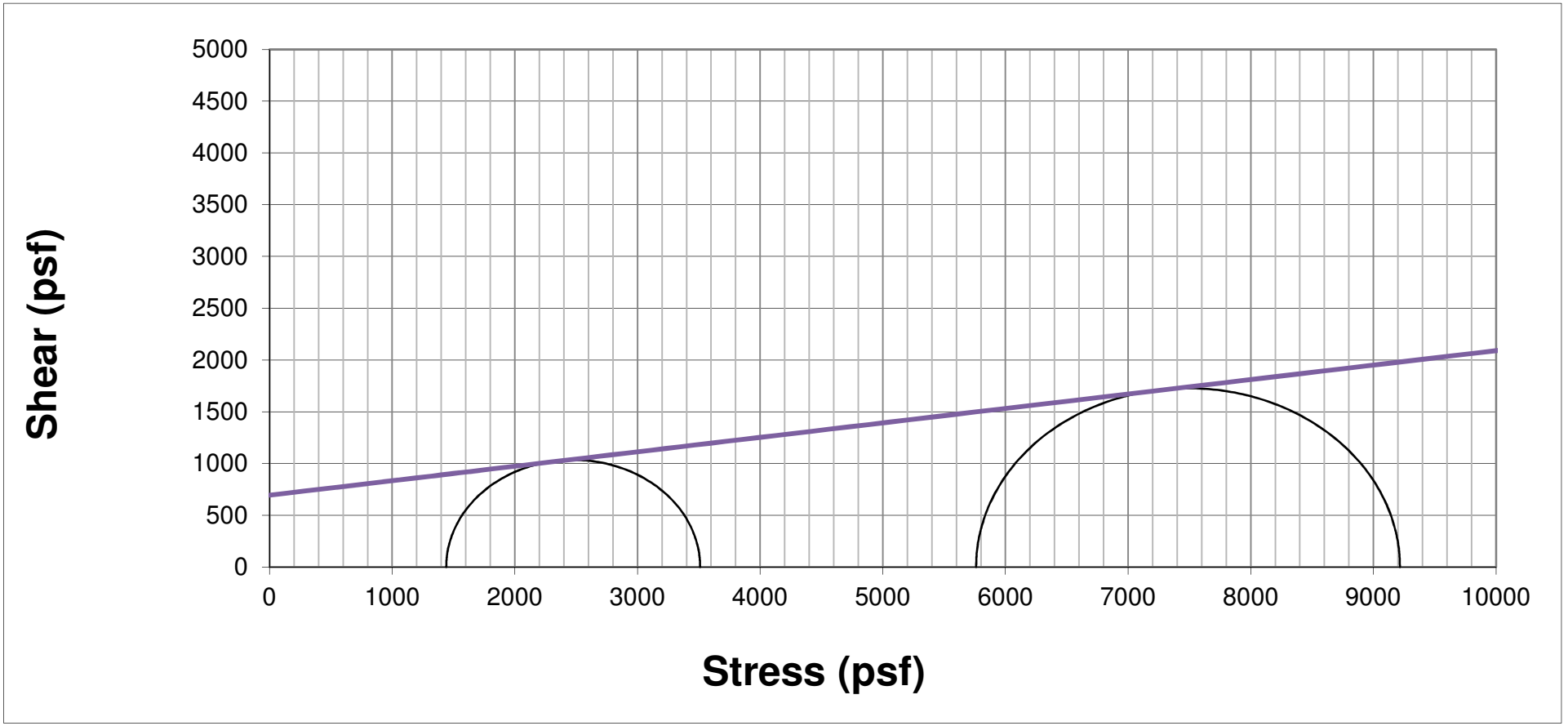
Mohr Circle Effective Stress

CLIENT:	HNTB Ohio, Inc	Sample ID:	B-046-0-23, ST, 2'-4'	
PROJECT:	ATH/MEG-033-18.70/00.00	Confining Pressure (psf):	1440	5760
LOCATION:	Meigs County, Ohio	Cohesion(psf):	360	
PROJECT #:	23050059COL	Angle of Friction(°):	19	



Mohr Circle Total Stress

CLIENT:	HNTB Ohio, Inc	Sample ID:	B-046-0-23, ST, 2'-4'	
PROJECT:	ATH/MEG-033-18.70/00.00	Confining Pressure (psf):	1440	5760
LOCATION:	Meigs County, Ohio	Cohesion(psf):	690	
PROJECT #:	23050059COL	Angle of Friction(°):	8	

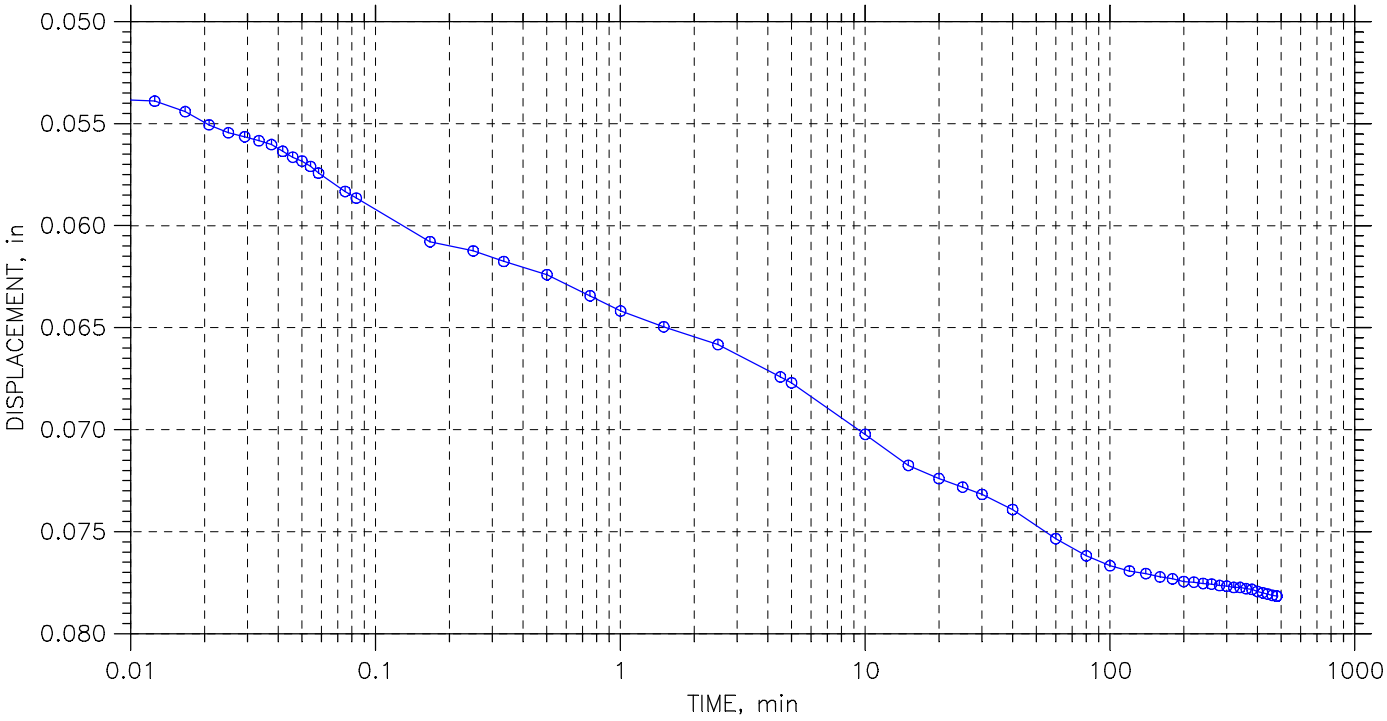


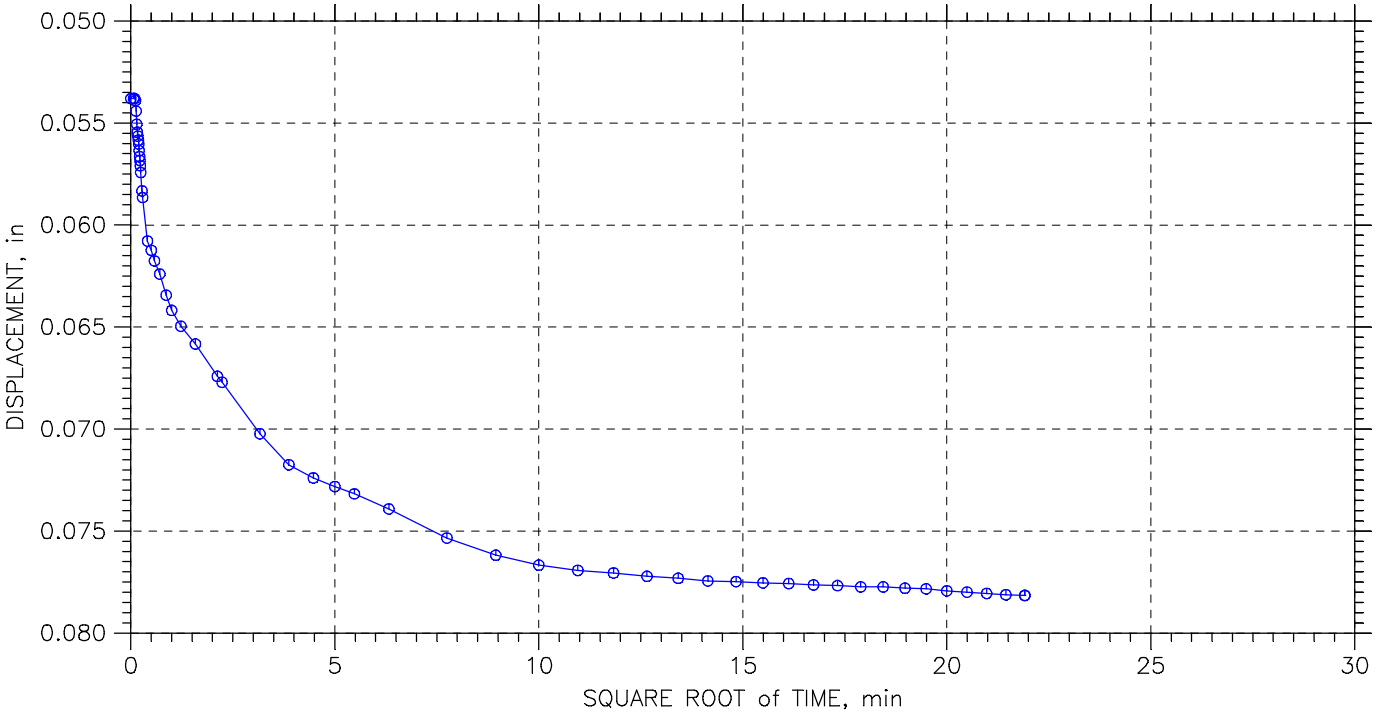
CONSOLIDATION TEST DATA

TIME CURVES

Step: 7 of 11

Stress: 8. tsf





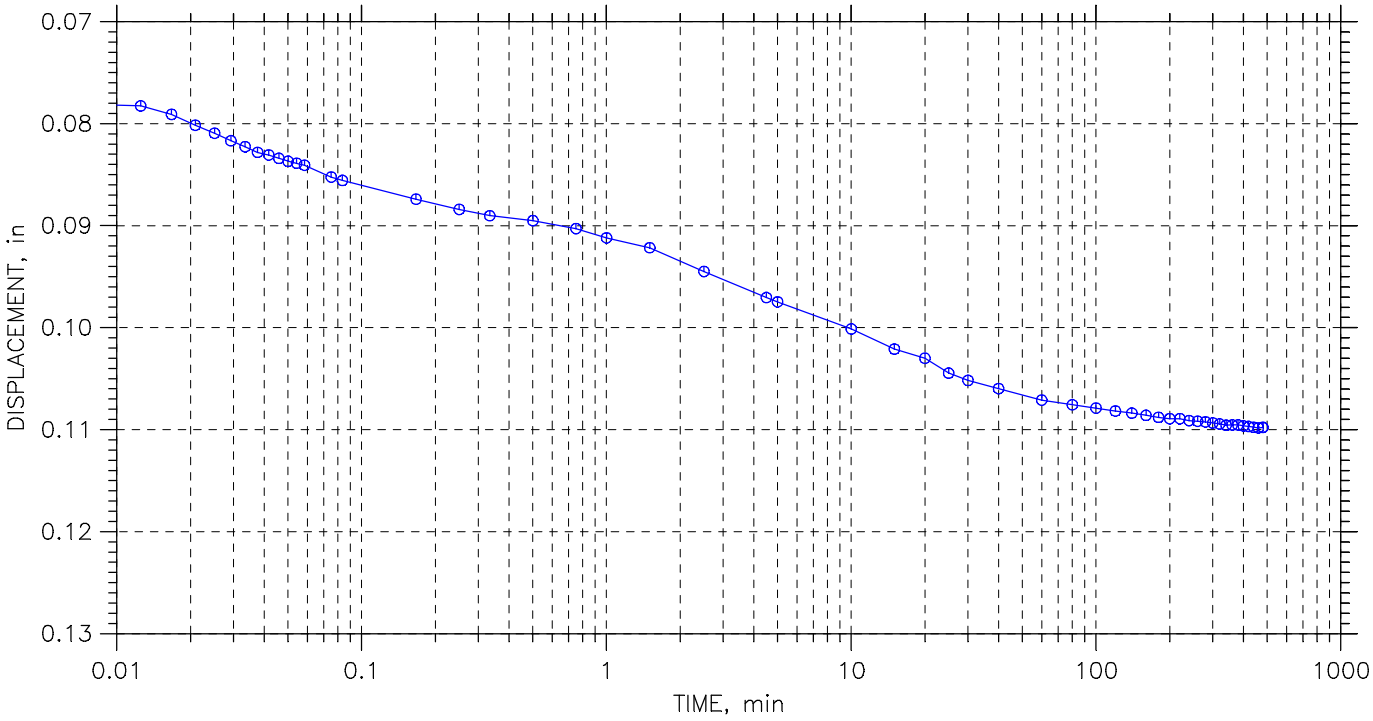
Project: ATH/MEG-033-18.	Location:	Project No.: 23050059COL
Boring No.: B-042-0-24	Tested By: MW	Checked By: SM
Sample No.: ST-2	Test Date: 04/18/24	Depth: 12'-14'
Test No.: 1	Sample Type: Shelby Tube	Elevation:
Description: Gray Silt and Clay (A-6a)		
Remarks:		

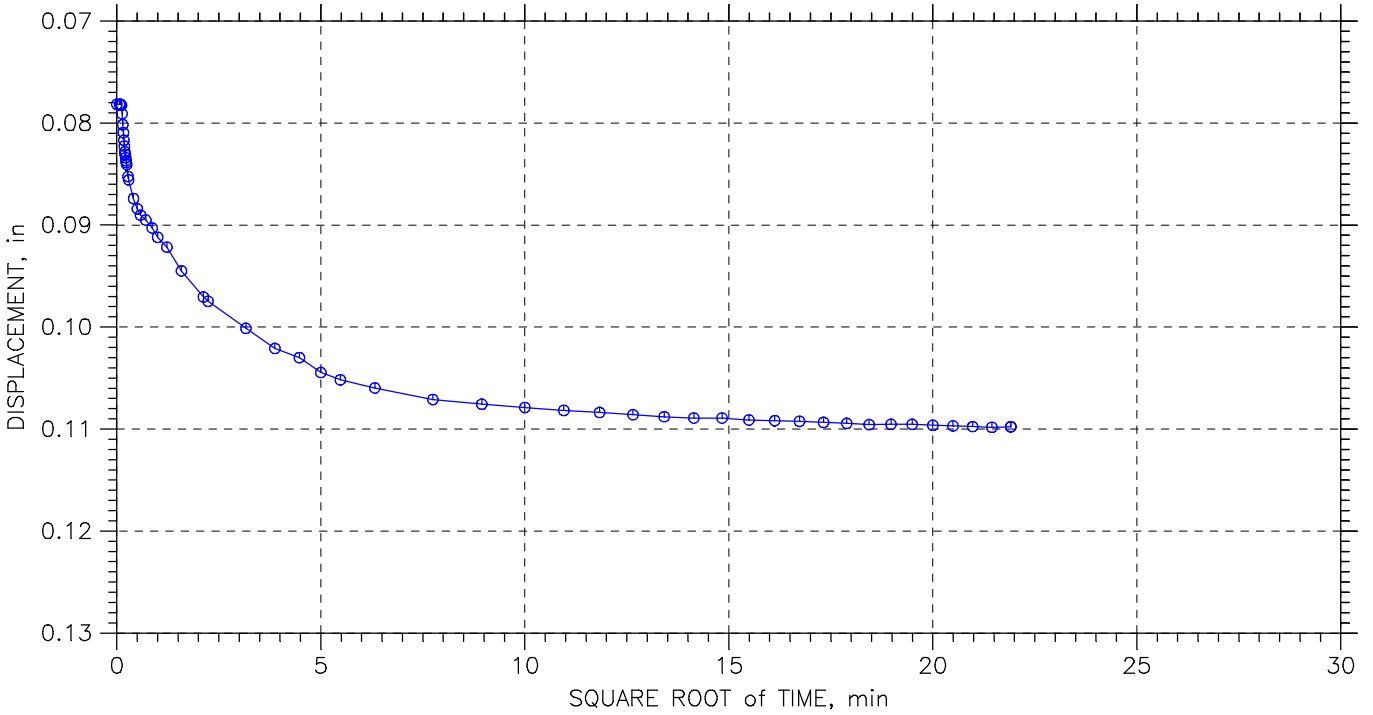
CONSOLIDATION TEST DATA

TIME CURVES

Step: 8 of 11

Stress: 16. tsf





Project: ATH/MEG-033-18.	Location:	Project No.: 23050059COL
Boring No.: B-042-0-24	Tested By: MW	Checked By: SM
Sample No.: ST-2	Test Date: 04/18/24	Depth: 12'-14'
Test No.: 1	Sample Type: Shelby Tube	Elevation:
Description: Gray Silt and Clay (A-6a)		
Remarks:		

One Dimensional Consolidation and Swell Properties of Soil - ASTM D 2435

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

Project No.:	23050059COL		
Project:	ATH/MEG-033-18.70/00.00	Sample Type:	Undisturbed Specimen
Client:	HNTB Ohio, Inc	Test Date:	2/9/2024
Boring No.:	B-046-0-23	Checked By:	SM
Sample No.:	ST_2'-4'	Tested By:	MW
Soil Description:	Brown, Elastic Clay (A-7-5)	LL:	69
Specific Gravity:	2.642	PL:	33
Initial Dry Unit Weight	84.2 pcf	Initial Moisture	36.9%

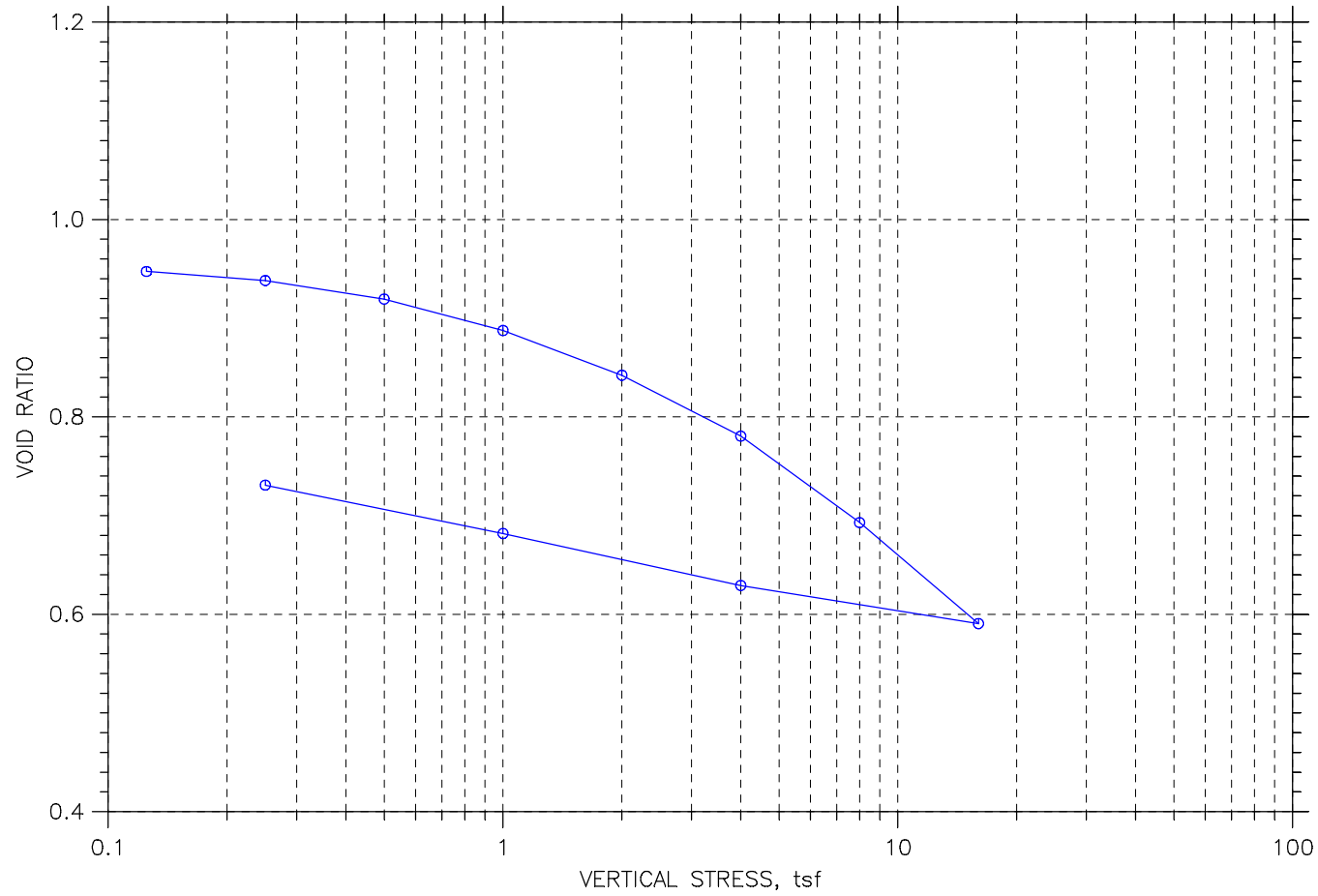
Step No.	Applied Stress (tsf)	Final Displacement (in)	Void Ratio	Strain at End (%)	Sqrt T_{90} (min)	Cv (ft^2/sec)
1	0.125	0.007441	0.947	0.74	0.7	
2	0.25	0.01213	0.938	1.21	27.8	8.66E-07
3	0.5	0.02174	0.919	2.17	56.6	4.19E-07
4	1	0.03791	0.888	3.79	34.6	6.67E-07
5	2	0.06108	0.842	6.11	36.2	6.13E-07
6	4	0.09246	0.781	9.25	35.6	5.87E-07
7	8	0.1371	0.693	13.71	58.1	3.31E-07
8	16	0.1893	0.591	18.93	59.8	2.88E-07
9	4	0.1696	0.629	16.96	9.8	
10	1	0.1428	0.682	14.28	69.7	
11	0.25	0.1178	0.731	11.78	357.1	

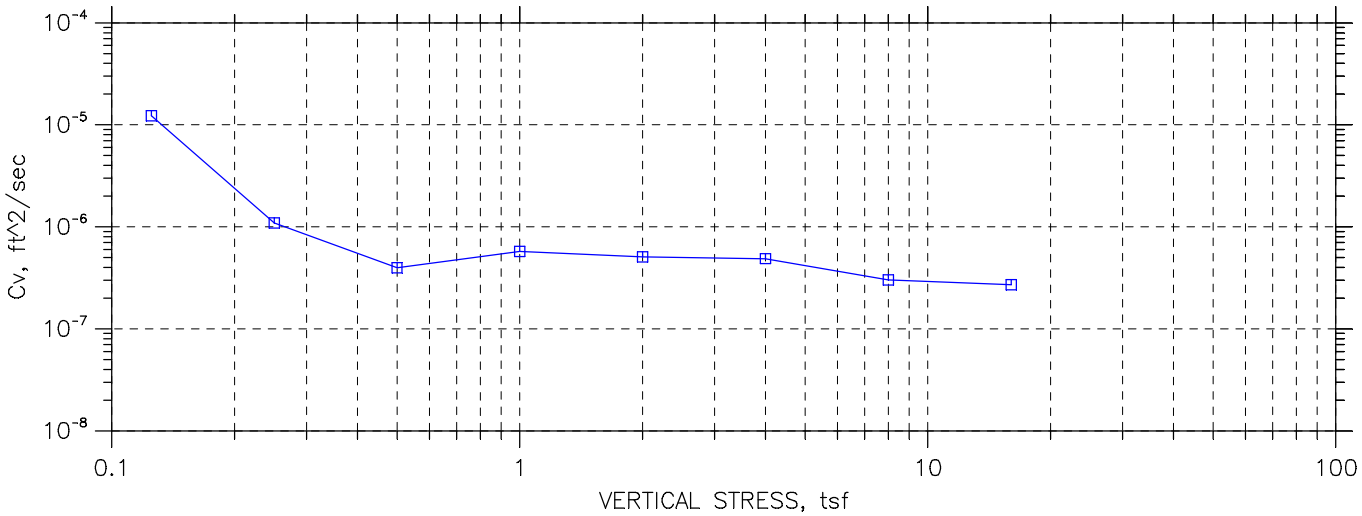
CONSOLIDATION PARAMETERS

Preconsolidation Pressure (tsf): 2.10	Initial Void Ratio: 0.95
Compression Index (C_c): 0.34	Compression Ratio : 0.17
Recompression Index (C_r): 0.063	Recompression Ratio: 0.032

CONSOLIDATION TEST DATA

SUMMARY REPORT





Project: ATH/MEG-033-18.70/00.00	Location: Meigs County, Ohio	Project No.: 23050059COL
Boring No.: B-46-0-23	Tested By: MW	Checked By: SM
Sample No.: ST-1	Test Date: 02/09/24	Depth: 2'-4'
Test No.: 1	Sample Type: Shelby Tube	Elevation:
Description: Brown Elastic Clay (A-7-5)		
Remarks:		

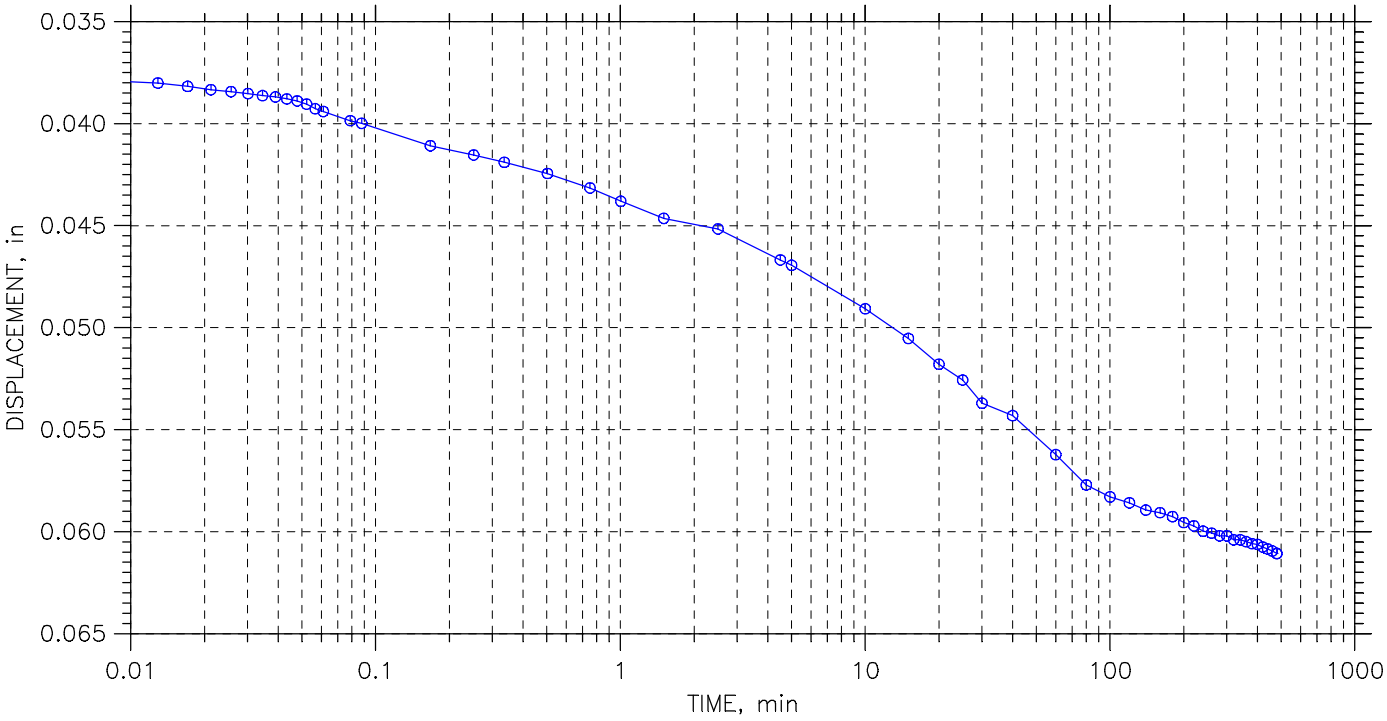
Thu, 22-FEB-2024 15:47:10

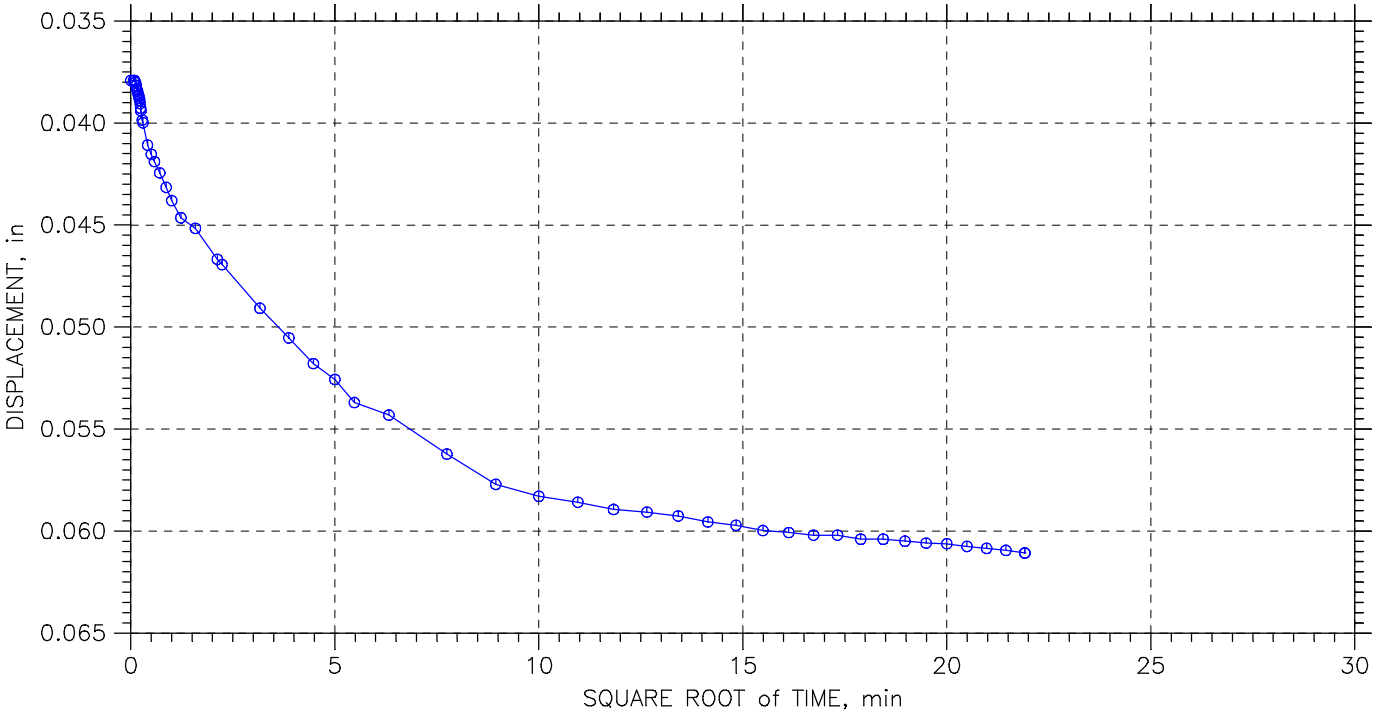
CONSOLIDATION TEST DATA

TIME CURVES

Step: 5 of 11

Stress: 2. tsf





Project: ATH/MEG-033-18.70/00.00	Location: Meigs County, Ohio	Project No.: 23050059COL
Boring No.: B-46-0-23	Tested By: MW	Checked By: SM
Sample No.: ST-1	Test Date: 02/09/24	Depth: 2'-4'
Test No.: 1	Sample Type: Shelby Tube	Elevation:
Description: Brown Elastic Clay (A-7-5)		
Remarks:		

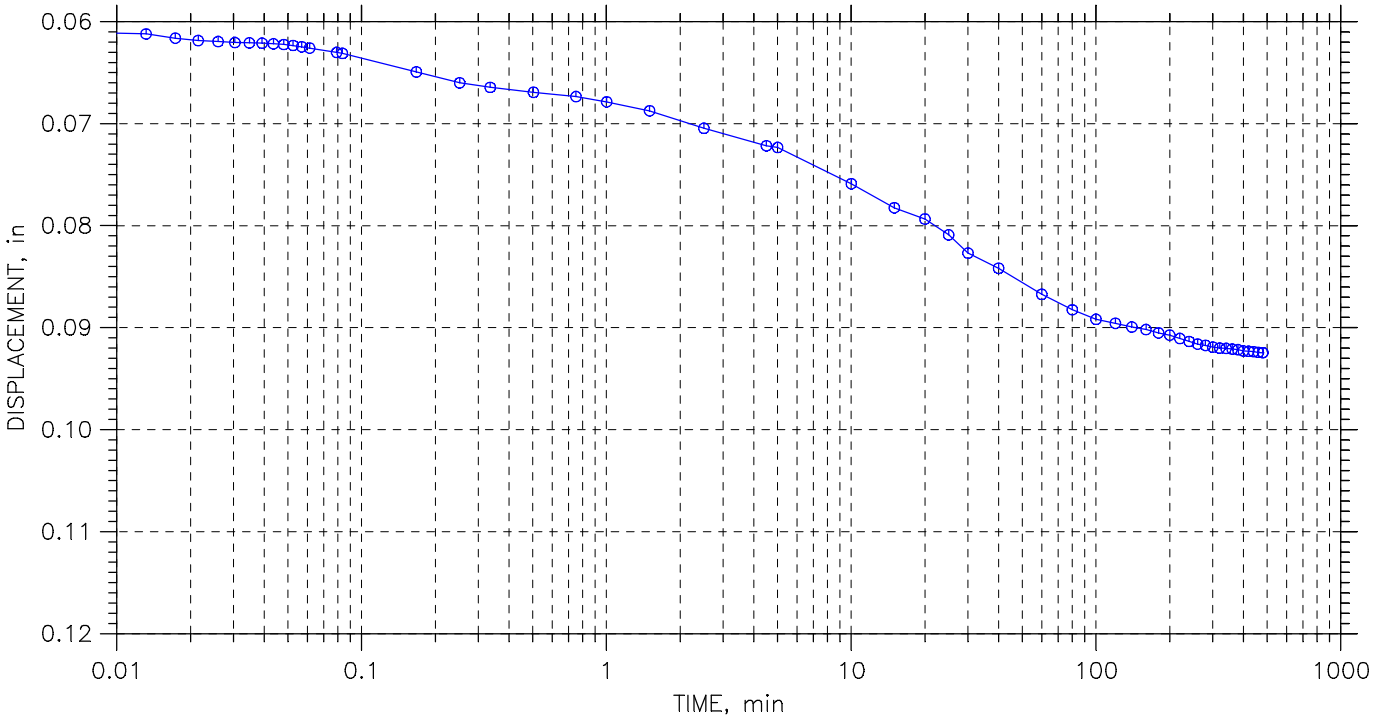
Thu, 22-FEB-2024 15:47:10

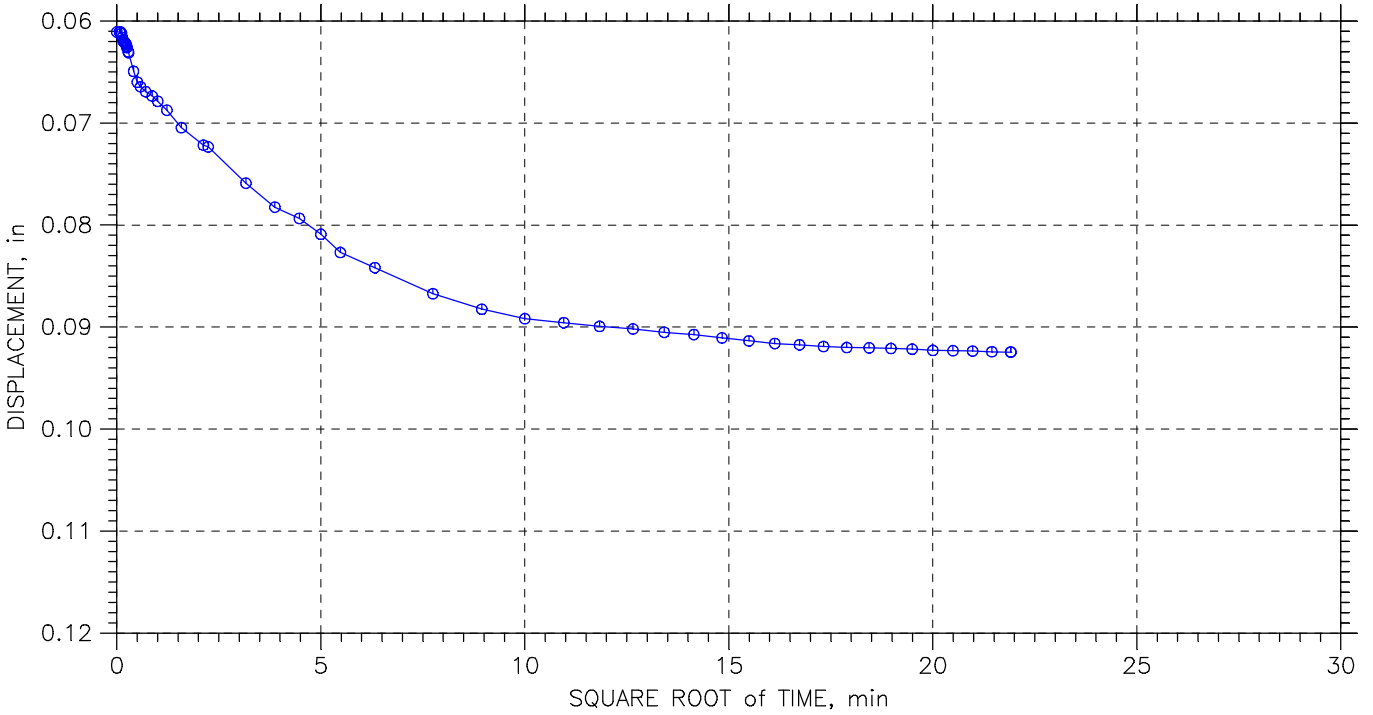
CONSOLIDATION TEST DATA

TIME CURVES

Step: 6 of 11

Stress: 4. tsf





Project: ATH/MEG-033-18.70/00.00	Location: Meigs County, Ohio	Project No.: 23050059COL
Boring No.: B-46-0-23	Tested By: MW	Checked By: SM
Sample No.: ST-1	Test Date: 02/09/24	Depth: 2'-4'
Test No.: 1	Sample Type: Shelby Tube	Elevation:
Description: Brown Elastic Clay (A-7-5)		
Remarks:		

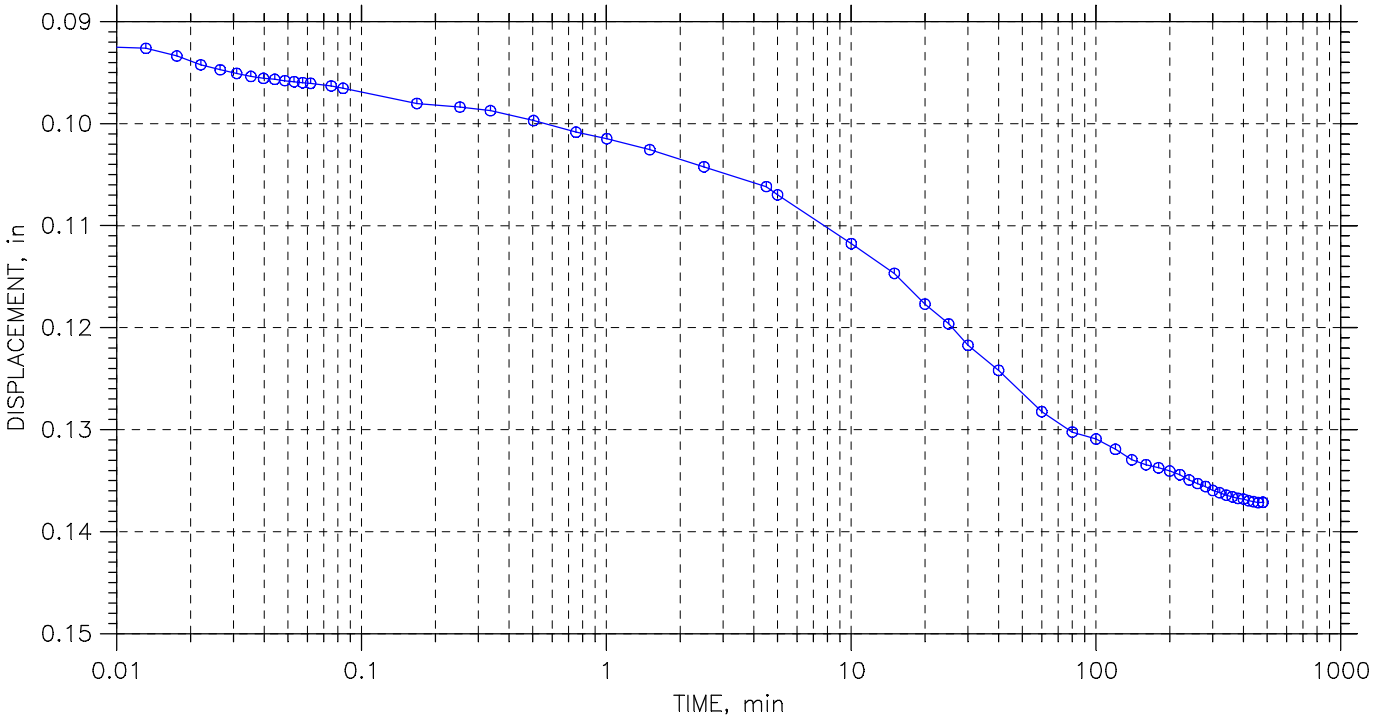
Thu, 22-FEB-2024 15:47:10

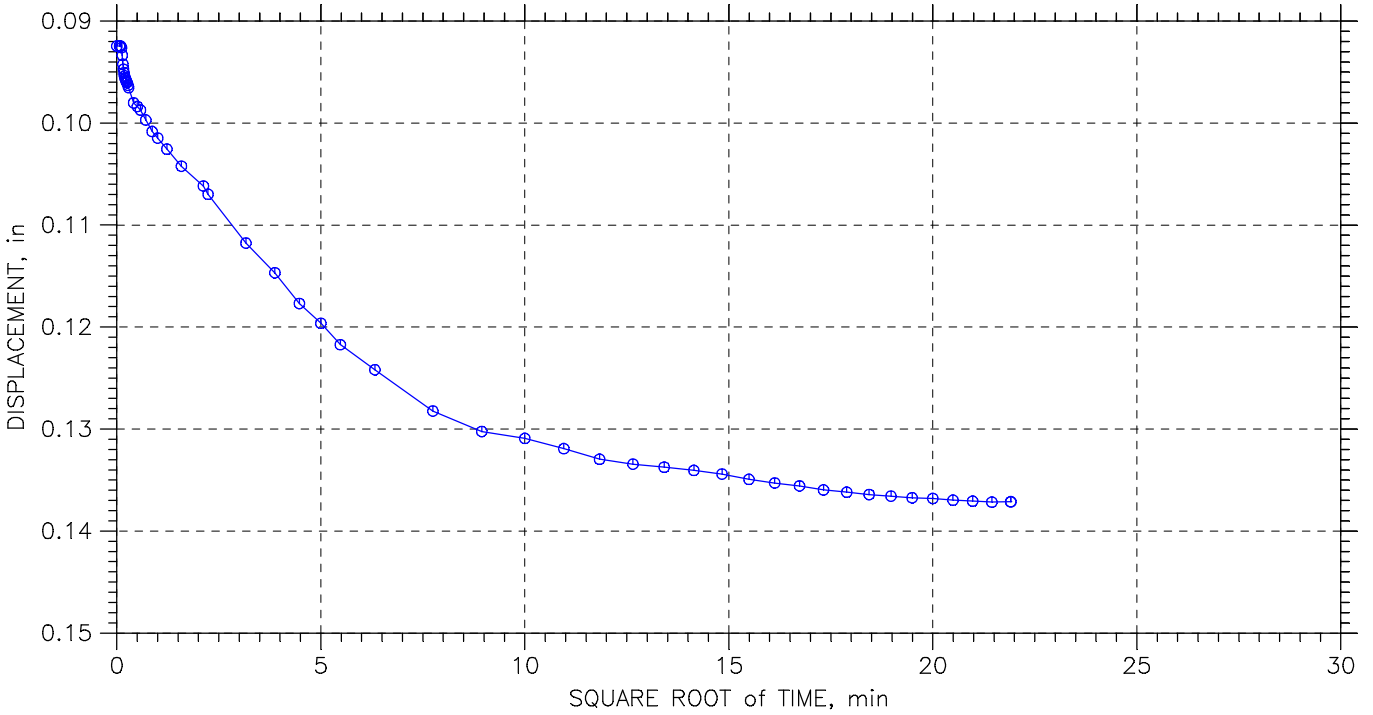
CONSOLIDATION TEST DATA

TIME CURVES

Step: 7 of 11

Stress: 8. tsf





Project: ATH/MEG-033-18.70/00.00	Location: Meigs County, Ohio	Project No.: 23050059COL
Boring No.: B-46-0-23	Tested By: MW	Checked By: SM
Sample No.: ST-1	Test Date: 02/09/24	Depth: 2'-4'
Test No.: 1	Sample Type: Shelby Tube	Elevation:
Description: Brown Elastic Clay (A-7-5)		
Remarks:		

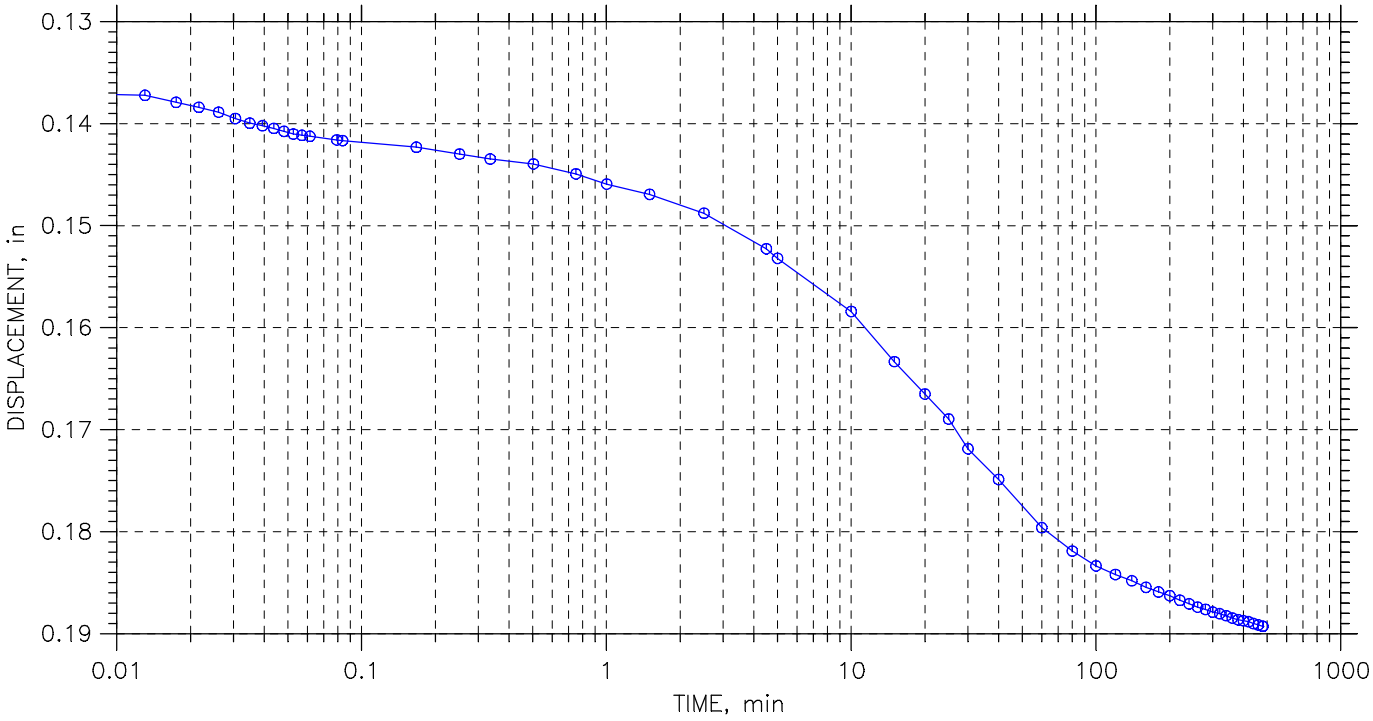
Thu, 22-FEB-2024 15:47:10

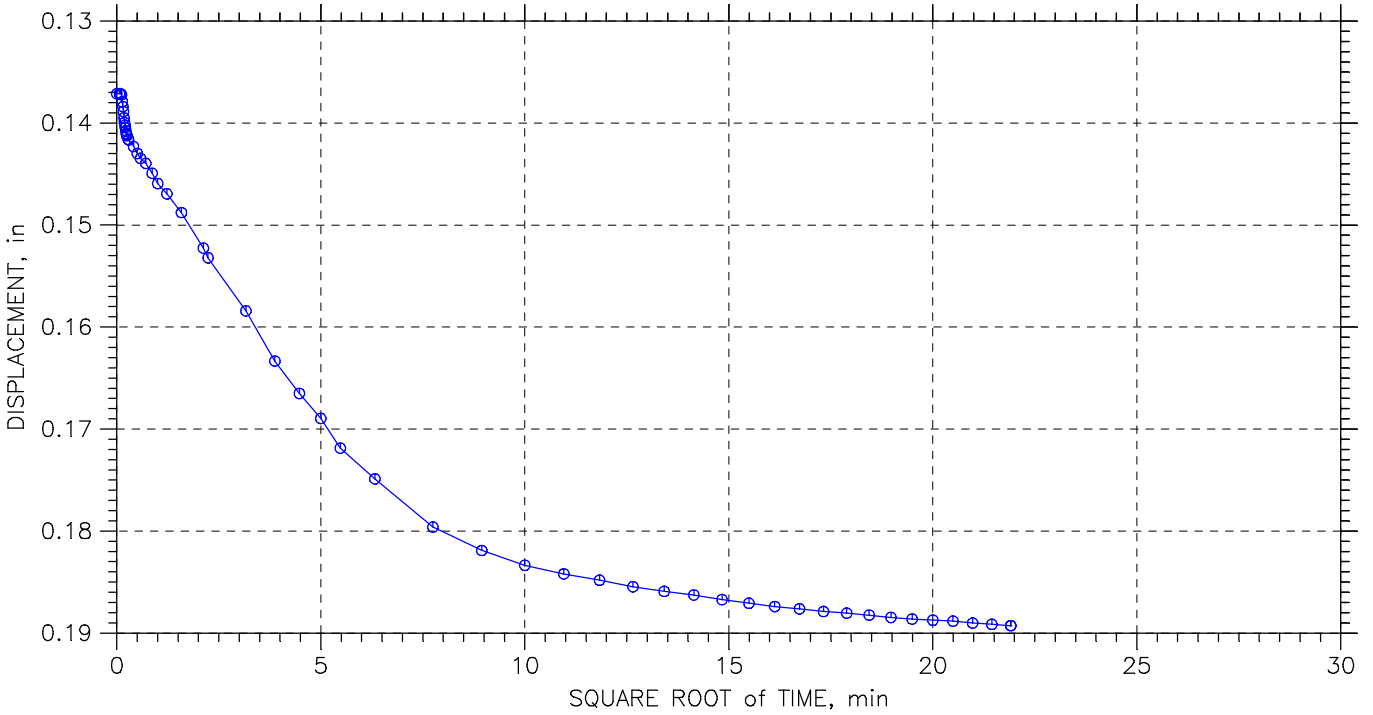
CONSOLIDATION TEST DATA

TIME CURVES

Step: 8 of 11

Stress: 16. tsf





Project: ATH/MEG-033-18.70/00.00	Location: Meigs County, Ohio	Project No.: 23050059COL
Boring No.: B-46-0-23	Tested By: MW	Checked By: SM
Sample No.: ST-1	Test Date: 02/09/24	Depth: 2'-4'
Test No.: 1	Sample Type: Shelby Tube	Elevation:
Description: Brown Elastic Clay (A-7-5)		
Remarks:		

Thu, 22-FEB-2024 15:47:10

APPENDIX D

GLOBAL STABILITY ANALYSES

Soil Parameters

Project: ATH-MEG-033-18.70/0.00
Station: 1005+50
Boring No.: B-001-0-23, B-002-0-23
Date: 8/14/24

							Total Stress		Effective Stress		
Layer No.	Top Elev	Bottom Elev	Thickness (feet)	Type	Total Weight (pcf)	N_{60} value (bpf)	Cohesion (psf)	Friction Angle (degrees)	Cohesion (psf)	Friction Angle (degrees)	Reference
1	940	889.8	50.2	A-6a/A-6b Ex. Fill	131.7	8 15 14					
			Avg	A-6a/A-6b	131.7	12	190	21.5	0*	39	4
2	889.8	799.5	90.3	A-6a Ex. Fill	128	24 33					
			Avg	A-6a	128	29	3625	0	290	24	1,2,3
3	799.5	793.5	6	A-7-6/A-6a	125.9	5 6					
			Avg	A-7-6/A-6a	125.9	6	80	18	0	35	5
4	793.5	784.5	9.0	A-6b	128	26 38 35					
			Avg	A-6b	128	33	4125	0	310	26	1,2,3

Note: Soil parameters for layers 1 and 2 taken from boring B-002-0-23 and soil parameters for layer 3 taken from Boring B-001-0-23

* A cohesion of 50 psf was used in slope stability model for drained condition to prevent surficial slip failure

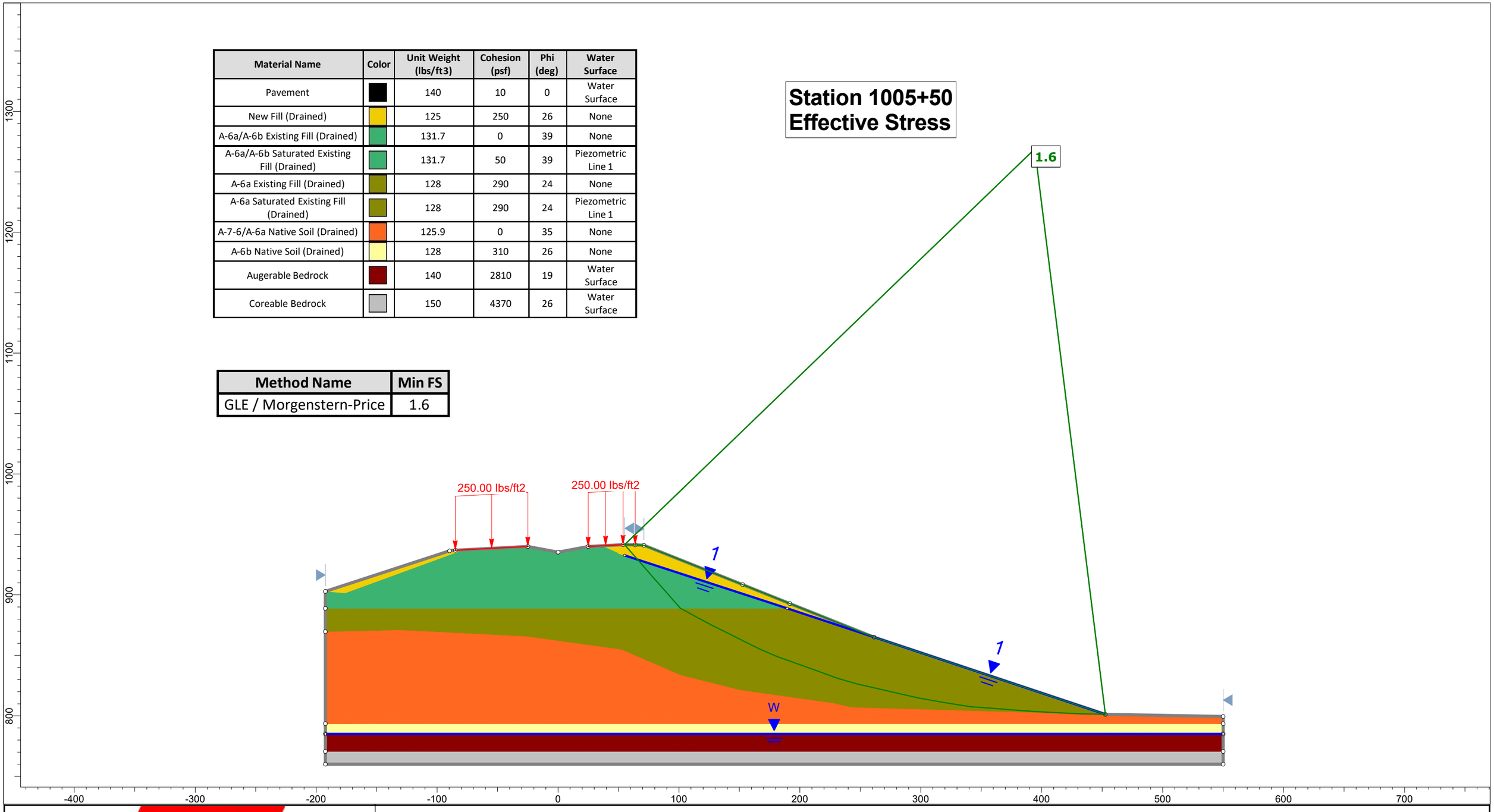
Reference Key

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
4 Laboratory consolidated undrained triaxial test results of B-002-A-23_ST-1_2'-4'
5 Laboratory consolidated undrained triaxial test results of B-001-A-23_ST-1_2'-4'

Material Name	Color	Unit Weight (lbs/ft3)	Cohesion (psf)	Phi (deg)	Water Surface
Pavement		140	10	0	Water Surface
New Fill (Drained)		125	250	26	None
A-6a/A-6b Existing Fill (Drained)		131.7	0	39	None
A-6a/A-6b Saturated Existing Fill (Drained)		131.7	50	39	Piezometric Line 1
A-6a Existing Fill (Drained)		128	290	24	None
A-6a Saturated Existing Fill (Drained)		128	290	24	Piezometric Line 1
A-7-6/A-6a Native Soil (Drained)		125.9	0	35	None
A-6b Native Soil (Drained)		128	310	26	None
Augerable Bedrock		140	2810	19	Water Surface
Coreable Bedrock		150	4370	26	Water Surface

Method Name	Min FS
GLE / Morgenstern-Price	1.6

Station 1005+50
Effective Stress

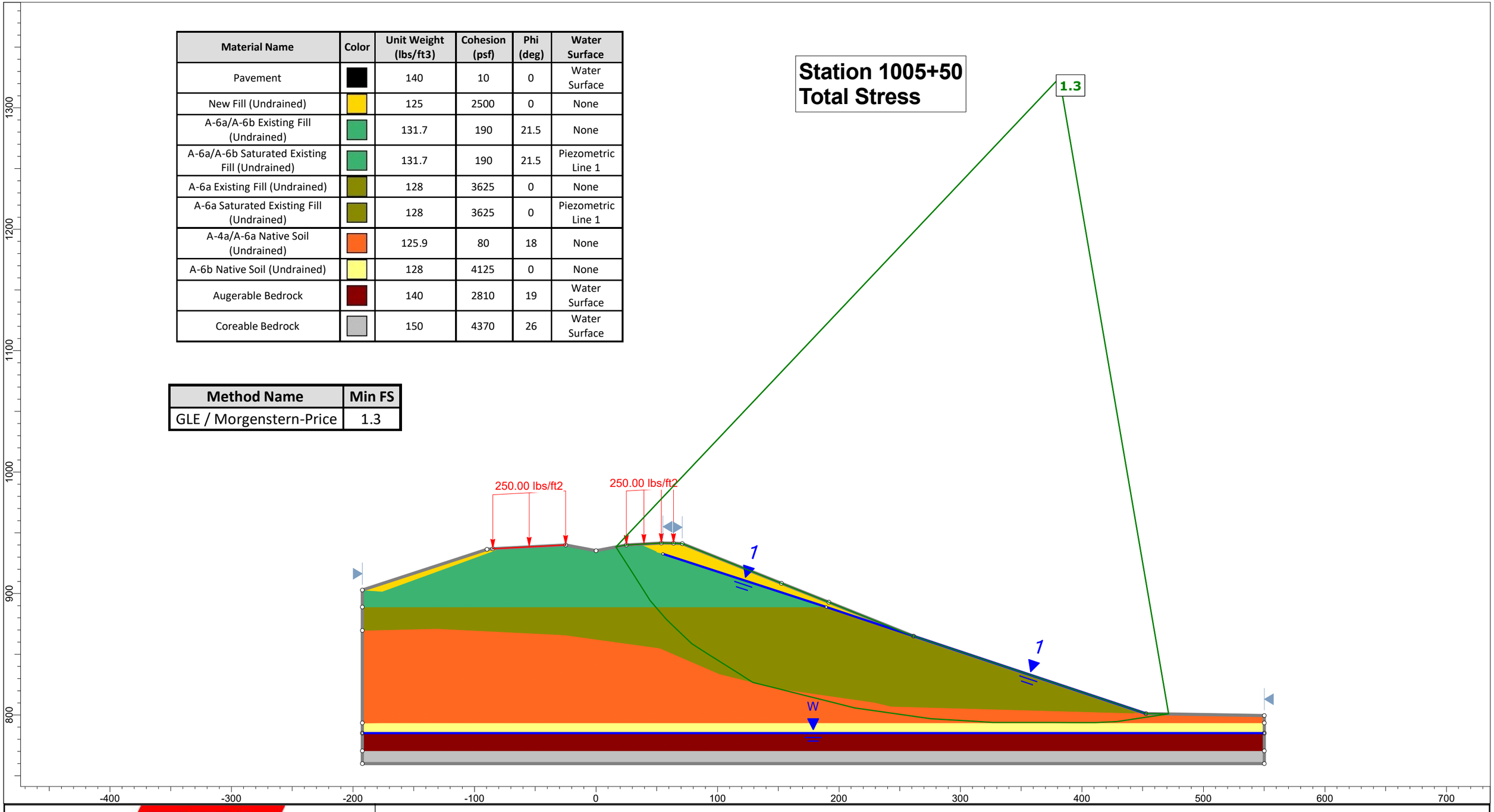


ATH/MEG-US33-18.70/00.00

Location	U.S 33	*Analysis*	Slope Stability
Drawn By	CTL Engineering, Inc.	*Company*	CTL Engineering Inc.
Date	5/21/2024 1:06:19 PM	*Client*	HNTB Ohio, Inc.

Material Name	Color	Unit Weight (lbs/ft3)	Cohesion (psf)	Phi (deg)	Water Surface
Pavement		140	10	0	Water Surface
New Fill (Undrained)		125	2500	0	None
A-6a/A-6b Existing Fill (Undrained)		131.7	190	21.5	None
A-6a/A-6b Saturated Existing Fill (Undrained)		131.7	190	21.5	Piezometric Line 1
A-6a Existing Fill (Undrained)		128	3625	0	None
A-6a Saturated Existing Fill (Undrained)		128	3625	0	Piezometric Line 1
A-4a/A-6a Native Soil (Undrained)		125.9	80	18	None
A-6b Native Soil (Undrained)		128	4125	0	None
Augerable Bedrock		140	2810	19	Water Surface
Coreable Bedrock		150	4370	26	Water Surface

Method Name	Min FS
GLE / Morgenstern-Price	1.3



CTL ENGINEERING INC

ATH/MEG-US33-18.70/00.00

Location	U.S 33	*Analysis*	Slope Stability
Drawn By	CTL Engineering, Inc.	*Company*	CTL Engineering Inc.
Date	5/22/2024 1:28:34 PM	*Client*	HNTB Ohio, Inc.

Soil Parameters

Project: ATH-MEG-033-18.70/0.00
Station: 1048+00
Boring No.: B-002-0-23, 34+133
Date: 8/14/24

							Total Stress		Effective Stress		
Layer No.	Top Elev	Bottom Elev	Thickness (feet)	Type	Total Weight (pcf)	N_{60} value (bpf)	Cohesion (psf)	Friction Angle (degrees)	Cohesion (psf)	Friction Angle (degrees)	Reference
1	897.8	889.8	8	A-6a/A-6b Ex. Fill	131.7	8 15 14					
			Avg	A-6a/A-6b	131.7	12	190	21.5	0	39	4
2	889.8	884.8	5.0	A-6a Ex. Fill	128	24 33					
			Avg	A-6a	128	29	3625	0	290	24	1,2,3
3	884.8	877.3	7.5	A-4a/A-6a	120	3 18					
			Avg	A-4a/A-6a	120	11	1375	0	130	23	1,2,3

Note: Soil parameters for layer 1 and 2 taken from boring B-002-0-23, and soil parameters for layer 3 taken from historic boring 34+133

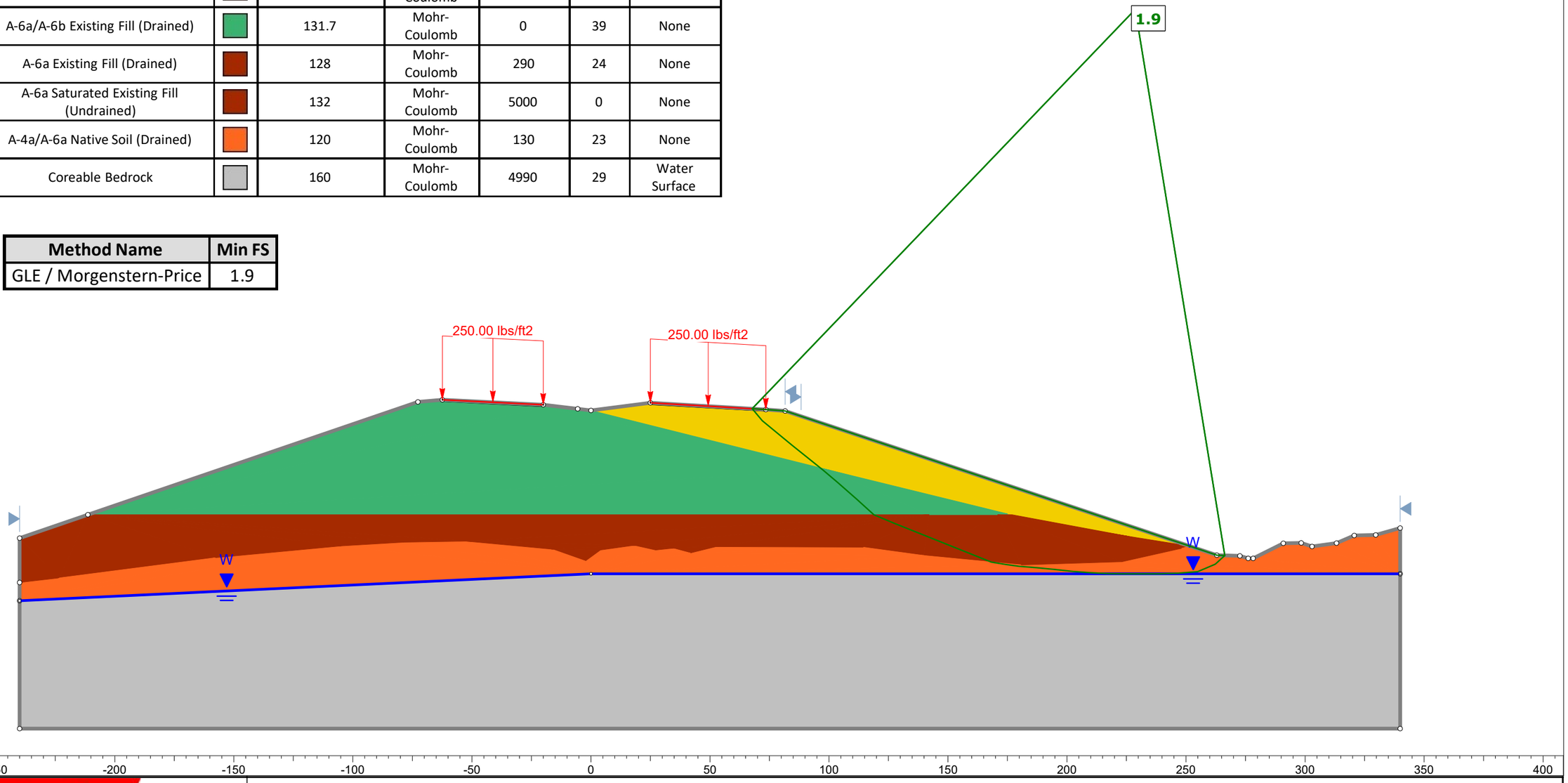
Reference Key

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
4 Laboratory consolidated undrained triaxial test results of B-002-A-23_ST-1_2'-4'

Material Name	Color	Unit Weight (lbs/ ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface
Pavement		140	Mohr-Coulomb	10	0	None
New Fill (Drained)		125	Mohr-Coulomb	250	26	None
A-6a/A-6b Existing Fill (Drained)		131.7	Mohr-Coulomb	0	39	None
A-6a Existing Fill (Drained)		128	Mohr-Coulomb	290	24	None
A-6a Saturated Existing Fill (Undrained)		132	Mohr-Coulomb	5000	0	None
A-4a/A-6a Native Soil (Drained)		120	Mohr-Coulomb	130	23	None
Coreable Bedrock		160	Mohr-Coulomb	4990	29	Water Surface

Method Name	Min FS
GLE / Morgenstern-Price	1.9

Station 1048+00 Effective Stress

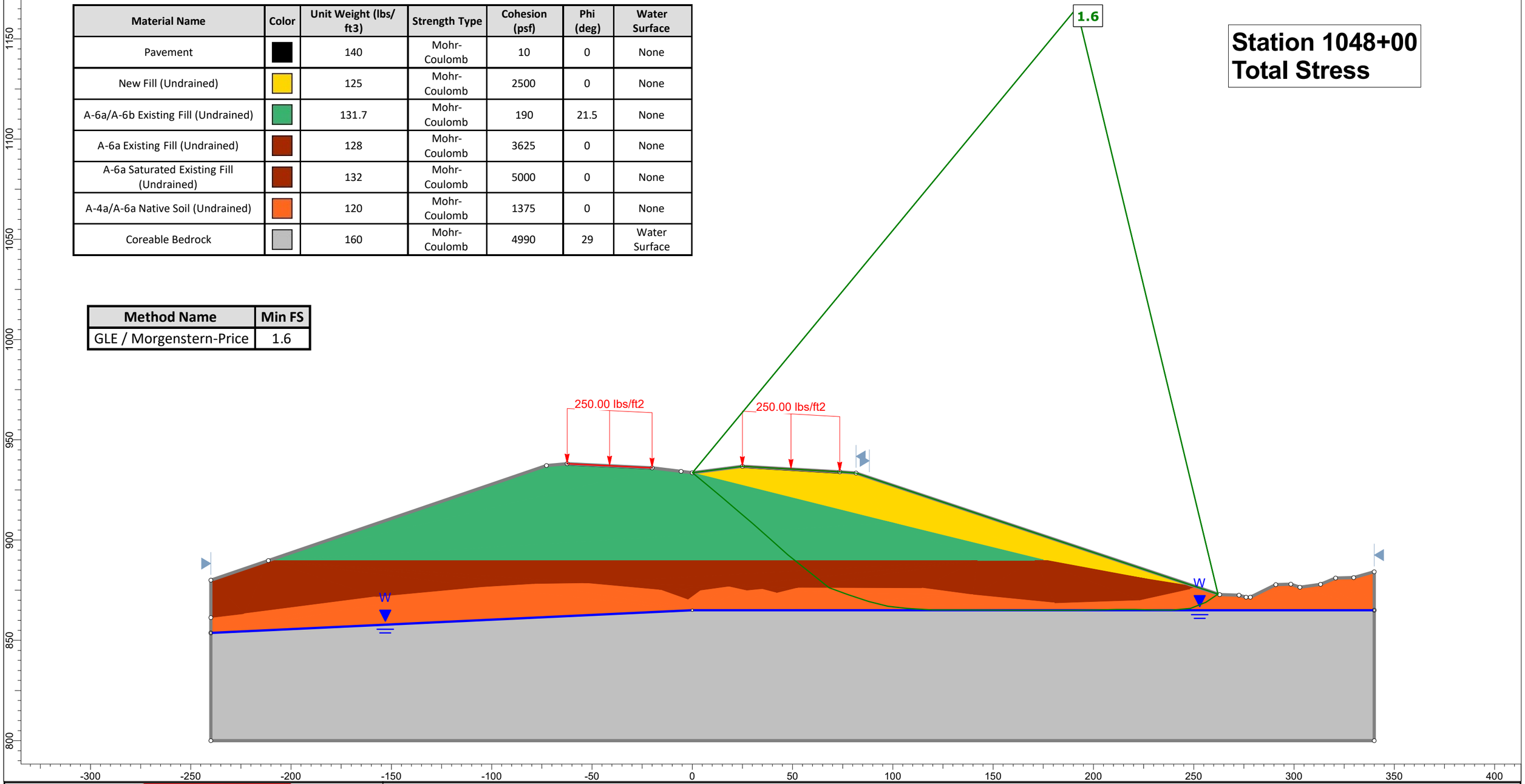


ATH/MEG-US33-18.70/00.00

Location	U.S 33	*Analysis*	Slope Stability
Drawn By	CTL Engineering, Inc.	*Company*	CTL Engineering Inc.
Date	5/20/2024 2:11:35 PM	*Client*	HNTB Ohio, Inc.

Material Name	Color	Unit Weight (lbs/ ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface
Pavement		140	Mohr-Coulomb	10	0	None
New Fill (Undrained)		125	Mohr-Coulomb	2500	0	None
A-6a/A-6b Existing Fill (Undrained)		131.7	Mohr-Coulomb	190	21.5	None
A-6a Existing Fill (Undrained)		128	Mohr-Coulomb	3625	0	None
A-6a Saturated Existing Fill (Undrained)		132	Mohr-Coulomb	5000	0	None
A-4a/A-6a Native Soil (Undrained)		120	Mohr-Coulomb	1375	0	None
Coreable Bedrock		160	Mohr-Coulomb	4990	29	Water Surface

Method Name	Min FS
GLE / Morgenstern-Price	1.6



ATH/MEG-US33-18.70/00.00

Location	U.S 33	*Analysis*	Slope Stability
Drawn By	CTL Engineering, Inc.	*Company*	CTL Engineering Inc.
Date	5/20/2024 2:14:06 PM	*Client*	HNTB Ohio, Inc.

Soil Parameters

Project: ATH-MEG-033-18.70/0.00
Station: 1057+50
Boring No.: B-003-0-23, 34+425
Date: 8/14/24

							Total Stress		Effective Stress		
Layer No.	Top Elev	Bottom Elev	Thickness (feet)	Type	Total Weight (pcf)	N_{60} value (bpf)	Cohesion (psf)	Friction Angle (degrees)	Cohesion (psf)	Friction Angle (degrees)	Reference
1	910.2	900.2	10	A-6b/A-7-6	129.8	12 17 18 18					
			Avg	A-6b/A-7-6	129.8	16	120	21	110	28	5
2	900.2	889.2	11.0	A-6a	122	17 17 18 22					
			Avg	A-6a	122	19	2375	0	220	24	1,2,3
3	889.2	859.0	30.2	A-4a	125	23 20 18 22					
			Avg	A-4a	125	21	0	32.5	0	32.5	4
4	859	849.1	9.9	A-6a/A-7-6	122	11 19					
			Avg	A-6a/A-7-6	122	15	1875	0	180	24	1,2,3

Note: Soil parameters for layer 1 through 3 taken from boring B-003-0-23, and soil parameters for layer 4 taken from historic boring 34+425

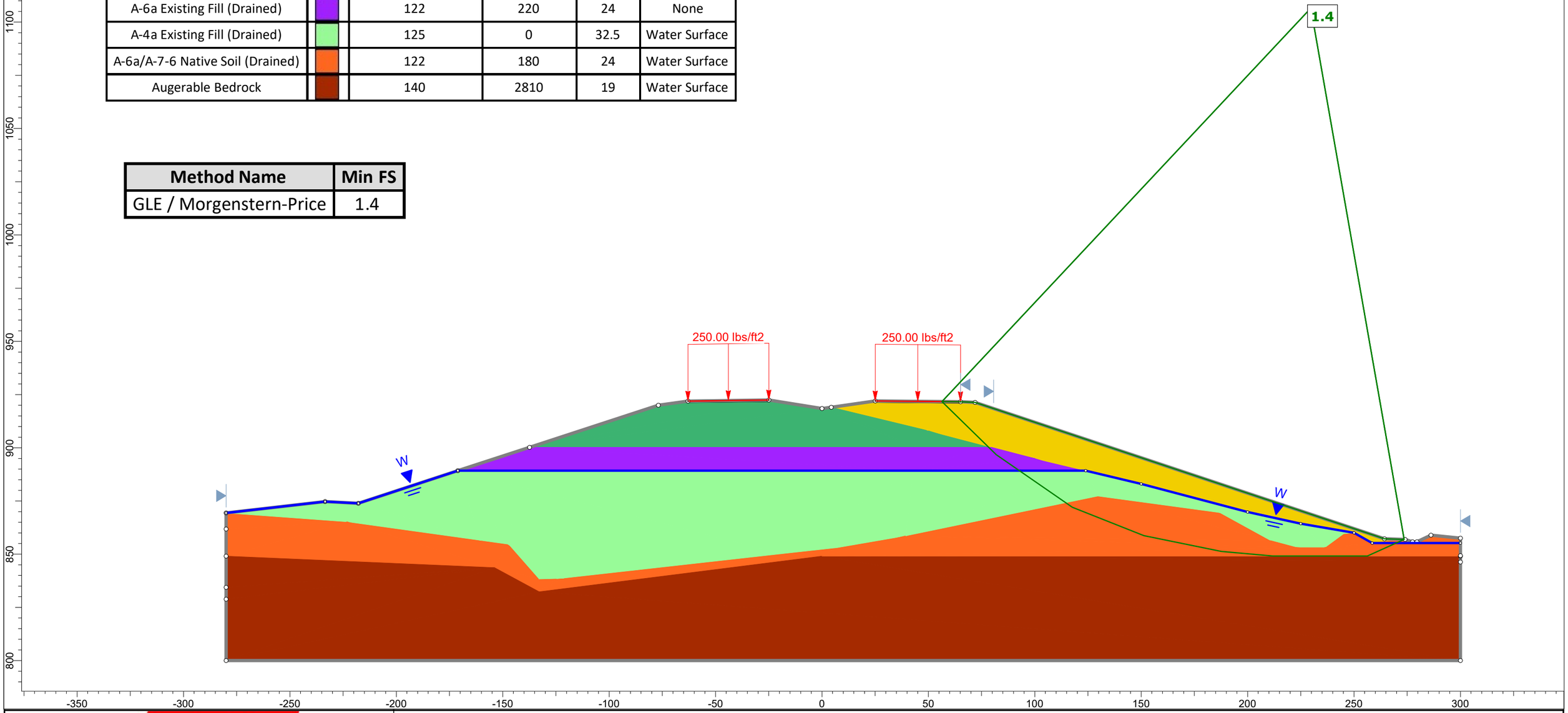
Reference Key

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
4 Non plastic soils - Friction angle estimated from AASHTO Table 10.4.6.2.4-1
5 Laboratory consolidated undrained triaxial test results of B-003-A-23_ST-1_2'-4'

Material Name	Color	Unit Weight (lbs/ft3)	Cohesion (psf)	Phi (deg)	Water Surface
Pavement		140	10	0	None
New Fill (Drained)		125	250	26	None
A-6b/A-7-6 Existing Fill (Drained)		129.8	110	28	None
A-6a Existing Fill (Drained)		122	220	24	None
A-4a Existing Fill (Drained)		125	0	32.5	Water Surface
A-6a/A-7-6 Native Soil (Drained)		122	180	24	Water Surface
Augerable Bedrock		140	2810	19	Water Surface

Method Name	Min FS
GLE / Morgenstern-Price	1.4

Station 1057+50
Effective Stress



ENGINEERING INC.

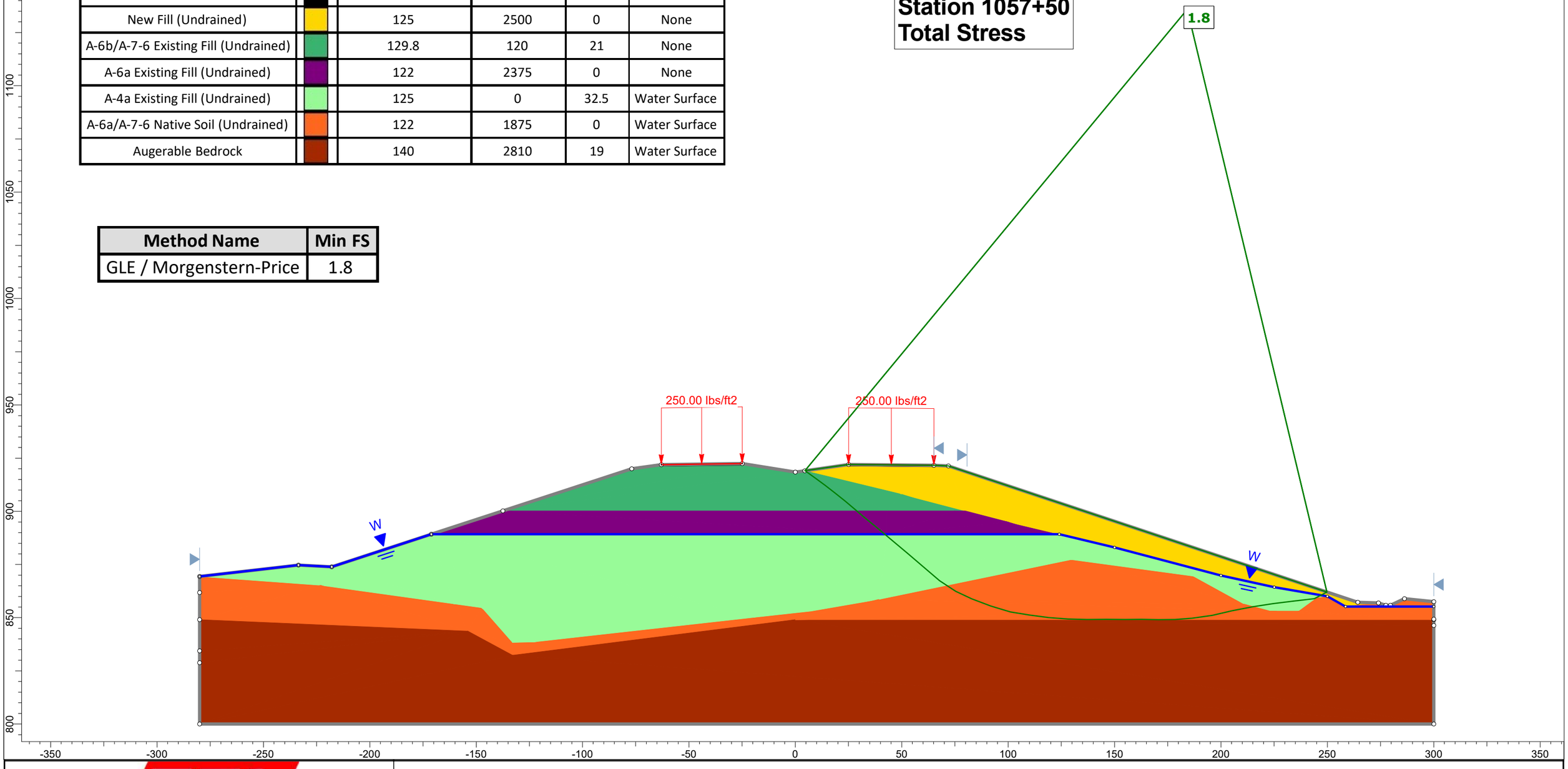
ATH/MEG-US33-18.70/00.00

Location	U.S 33	*Analysis*	Slope Stability
Drawn By	CTL Engineering, Inc.	*Company*	CTL Engineering Inc.
Date	5/20/2024 4:26:31 PM	*Client*	HNTB Ohio, Inc.

Material Name	Color	Unit Weight (lbs/ft3)	Cohesion (psf)	Phi (deg)	Water Surface
Pavement		140	10	0	None
New Fill (Undrained)		125	2500	0	None
A-6b/A-7-6 Existing Fill (Undrained)		129.8	120	21	None
A-6a Existing Fill (Undrained)		122	2375	0	None
A-4a Existing Fill (Undrained)		125	0	32.5	Water Surface
A-6a/A-7-6 Native Soil (Undrained)		122	1875	0	Water Surface
Augerable Bedrock		140	2810	19	Water Surface

Method Name	Min FS
GLE / Morgenstern-Price	1.8

Station 1057+50
Total Stress



CTL ENGINEERING INC

ATH/MEG-US33-18.70/00.00

Location	U.S 33	*Analysis*	Slope Stability
Drawn By	CTL Engineering, Inc.	*Company*	CTL Engineering Inc.
Date	5/20/2024 4:22:23 PM	*Client*	HNTB Ohio, Inc.

Soil Parameters

Project: ATH-MEG-033-18.70/0.00
Station: 1067+00
Boring No.: B-004-0-23
Date: 8/14/24

							Total Stress		Effective Stress		
Layer No.	Top Elev	Bottom Elev	Thickness (feet)	Type	Total Weight (pcf)	N_{60} value (bpf)	Cohesion (psf)	Friction Angle (degrees)	Cohesion (psf)	Friction Angle (degrees)	Reference
1	896.8	886.8	10	A-6b	125	19 18 19 23					
			Avg	A-6b	125	20	2500	0	220	25	1,2,3
2	886.8	881.8	5.0	A-6a	122	42					
			Avg	A-6a	122	42	5250	0	370	27	1,2,3

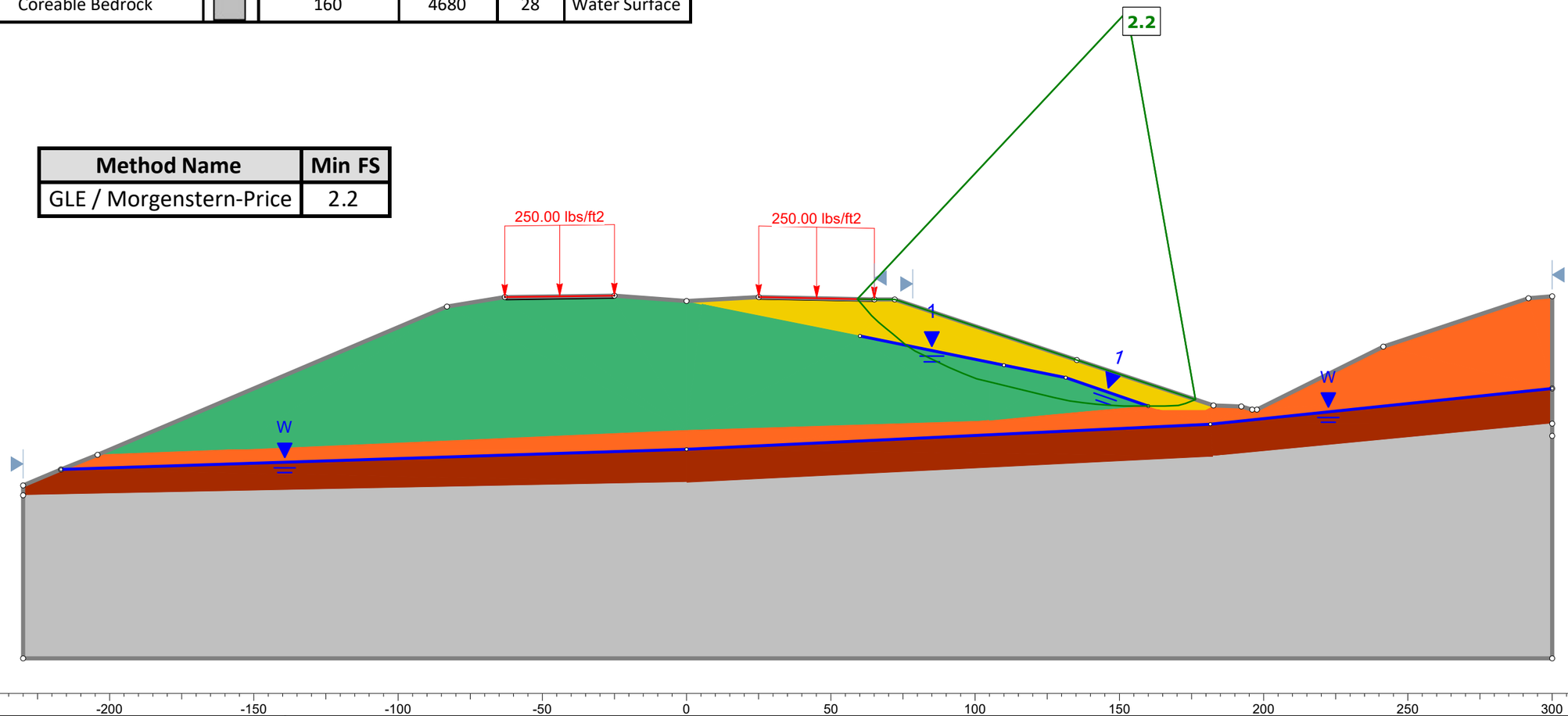
Reference Key

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

Material Name	Color	Unit Weight (lbs/ft3)	Cohesion (psf)	Phi (deg)	Water Surface
Pavement		140	10	0	Water Surface
New Fill (Drained)		125	250	26	Water Surface
A-6b Existing Fill (Drained)		125	220	25	Water Surface
A-6b Saturated Existing Fill (Drained)		125	220	25	Piezometric Line 1
A-6a Native Soil (Drained)		122	370	27	Water Surface
Augerable Bedrock		140	2810	19	Water Surface
Coreable Bedrock		160	4680	28	Water Surface

Station 1067+00 Effective Stress

Method Name	Min FS
GLE / Morgenstern-Price	2.2



ENGINEERING INC.

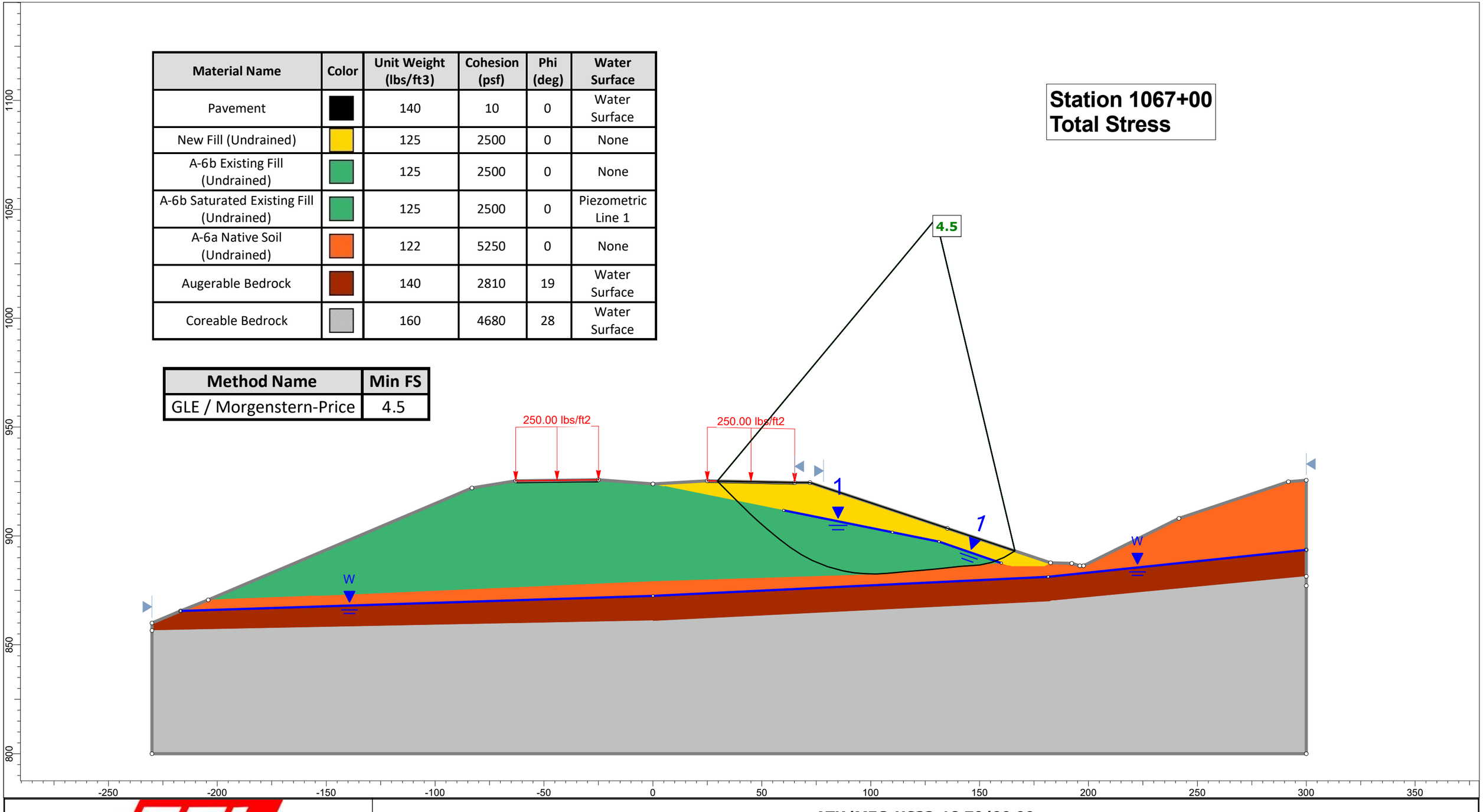
ATH/MEG-US33-18.70/00.00

Location	U.S 33	*Analysis*	Slope Stability
Drawn By	CTL Engineering, Inc.	*Company*	CTL Engineering Inc.
Date	5/22/2024 1:44:52 PM	*Client*	HNTB Ohio, Inc.

Material Name	Color	Unit Weight (lbs/ft3)	Cohesion (psf)	Phi (deg)	Water Surface
Pavement		140	10	0	Water Surface
New Fill (Undrained)		125	2500	0	None
A-6b Existing Fill (Undrained)		125	2500	0	None
A-6b Saturated Existing Fill (Undrained)		125	2500	0	Piezometric Line 1
A-6a Native Soil (Undrained)		122	5250	0	None
Augerable Bedrock		140	2810	19	Water Surface
Coreable Bedrock		160	4680	28	Water Surface

Method Name	Min FS
GLE / Morgenstern-Price	4.5

Station 1067+00
Total Stress



ATH/MEG-US33-18.70/00.00

Location	U.S 33	*Analysis*	Slope Stability
Drawn By	CTL Engineering, Inc.	*Company*	CTL Engineering Inc.
Date	5/22/2024 1:42:40 PM	*Client*	HNTB Ohio, Inc.

Soil Parameters

Project: ATH-MEG-033-18.70/0.00
Station: 1110+50
Boring No.: B-005-0-23, 35+970
Date: 8/14/24

							Total Stress		Effective Stress		
Layer No.	Top Elev	Bottom Elev	Thickness (feet)	Type	Total Weight (pcf)	N_{60} value (bpf)	Cohesion (psf)	Friction Angle (degrees)	Cohesion (psf)	Friction Angle (degrees)	Reference
1	886	880	6	A-7-6	125	20 23					
			Avg	A-7-6	125	22	2750	0	240	24	1,2,3
2	880	860.6	19.4	A-6a	125	20 22 23 28					
			Avg	A-6a	125	23	2875	0	250	25	1,2,3
3	860.6	845	15.6	A-4a/A-7-6	118	8 10					
			Avg	A-4a/A-7-6	118	9	1125	0	110	22	1,2,3

Note: Soil parameters for layer 1 and 2 taken from boring B-005-0-23, and soil parameters for layer 3 taken from historic boring 35+970

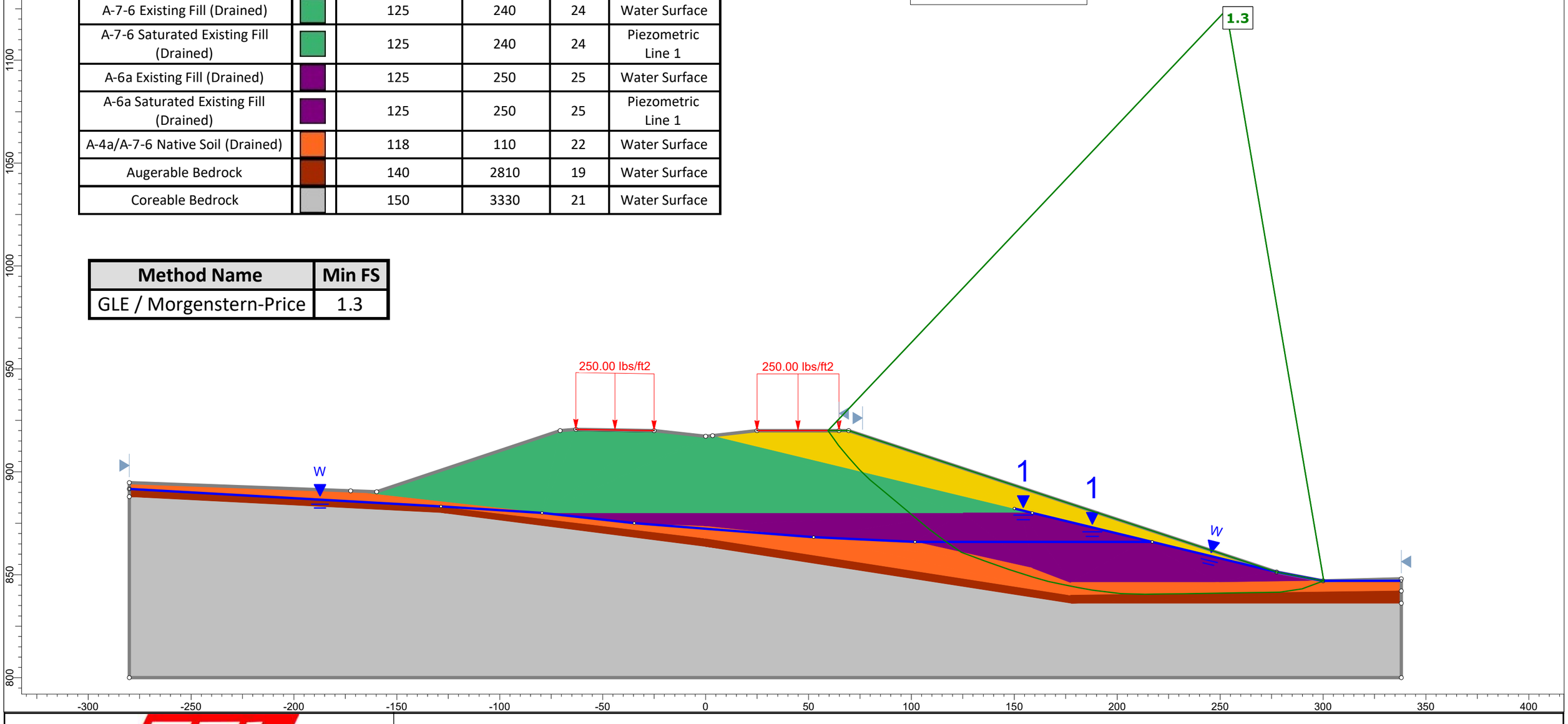
Reference Key

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

Material Name	Color	Unit Weight (lbs/ ft3)	Cohesion (psf)	Phi (deg)	Water Surface
Pavement		140	10	0	Water Surface
New Fill (Drained)		125	250	26	Water Surface
A-7-6 Existing Fill (Drained)		125	240	24	Water Surface
A-7-6 Saturated Existing Fill (Drained)		125	240	24	Piezometric Line 1
A-6a Existing Fill (Drained)		125	250	25	Water Surface
A-6a Saturated Existing Fill (Drained)		125	250	25	Piezometric Line 1
A-4a/A-7-6 Native Soil (Drained)		118	110	22	Water Surface
Augerable Bedrock		140	2810	19	Water Surface
Coreable Bedrock		150	3330	21	Water Surface

Method Name	Min FS
GLE / Morgenstern-Price	1.3

Station 1110+50 Effective Stress

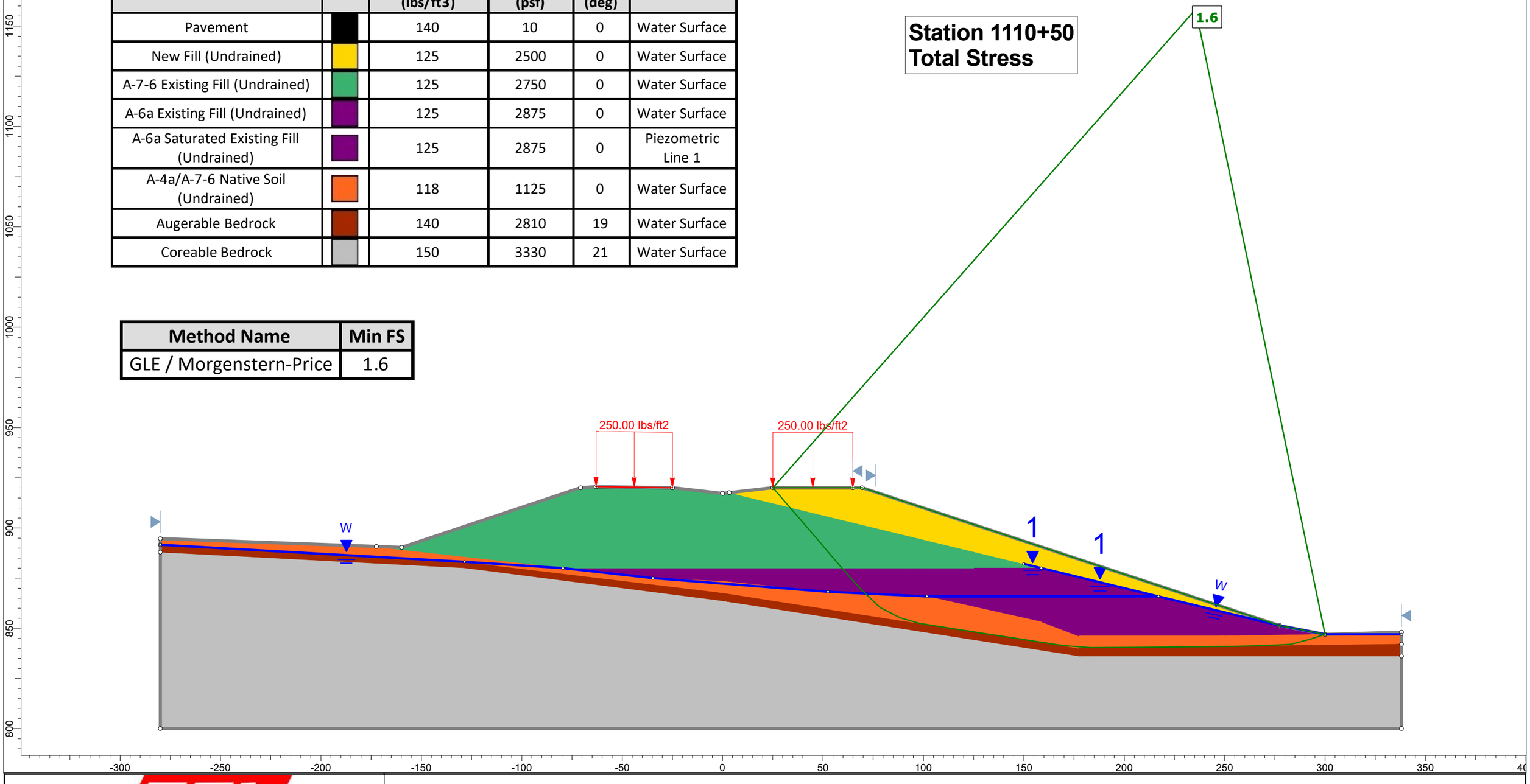


ATH/MEG-US33-18.70/00.00

Location	U.S 33	*Analysis*	Slope Stability
Drawn By	CTL Engineering, Inc.	*Company*	CTL Engineering Inc.
Date	5/22/2024 1:47:47 PM	*Client*	HNTB Ohio, Inc.

Material Name	Color	Unit Weight (lbs/ft3)	Cohesion (psf)	Phi (deg)	Water Surface
Pavement		140	10	0	Water Surface
New Fill (Undrained)		125	2500	0	Water Surface
A-7-6 Existing Fill (Undrained)		125	2750	0	Water Surface
A-6a Existing Fill (Undrained)		125	2875	0	Water Surface
A-6a Saturated Existing Fill (Undrained)		125	2875	0	Piezometric Line 1
A-4a/A-7-6 Native Soil (Undrained)		118	1125	0	Water Surface
Augerable Bedrock		140	2810	19	Water Surface
Coreable Bedrock		150	3330	21	Water Surface

Method Name	Min FS
GLE / Morgenstern-Price	1.6



ENGINEERING INC.

ATH/MEG-US33-18.70/00.00

Location	U.S 33	*Analysis*	Slope Stability
Drawn By	CTL Engineering, Inc.	*Company*	CTL Engineering Inc.
Date	5/22/2024 1:50:09 PM	*Client*	HNTB Ohio, Inc.

Soil Parameters

Project: ATH-MEG-033-18.70/0.00
Boring No.: B-006-0-23, B-006-1-23
Station: 1138+00
Date: 8/14/24

							Total Stress		Effective Stress		
Layer No.	Top Elev	Bottom Elev	Thickness (feet)	Type	Total Weight (pcf)	N_{60} value (bpf)	Cohesion (psf)	Friction Angle (degrees)	Cohesion (psf)	Friction Angle (degrees)	Reference
1	876.7	844.7	32.0	A-6a	125	26 23 23 22 23 23 19 27					
			Avg	A-6a	125	23	2875	0	250	24	1,2,3
2	844.7	838.2	6.5	A-2-6	132	54					
			Avg	A-2-6	132	54	0	40	0	40	4
3	838.2	829.7	8.5	A-4b	140	68 63					
			Avg	A-4b	140	66	0	38	0	38	4
4	829.7	818.7	11.0	A-7-6	132	41 38					
			Avg	A-7-6	132	40	5000	0	350	26	1,2,3
5	818.7	809.7	9.0	A-4b	135	33 61					
			Avg	A-4b	135	47	5875	0	400	27	1,2,3
6	809.7	799.7	10.0	A-1-a	140	68 63					
			Avg	A-1-a	140	66	0	40	0	40	4
7	799.7	785.6	14.1	A-6a Fill	125	23 28 23 23 26 27					
			Avg	A-6a	125	25	1750	0	170	25	1,2,3
8	785.6	775.6	10.0	A-6a Native	128	28 29					
			Avg	A-6a	128	29	2000	0	200	26	1,2,3

Note: Soil parameters for layer 1 through 6 taken from boring B-006-0-23, and soil parameters for layers 7 and 8 taken from boring B-006-1-23

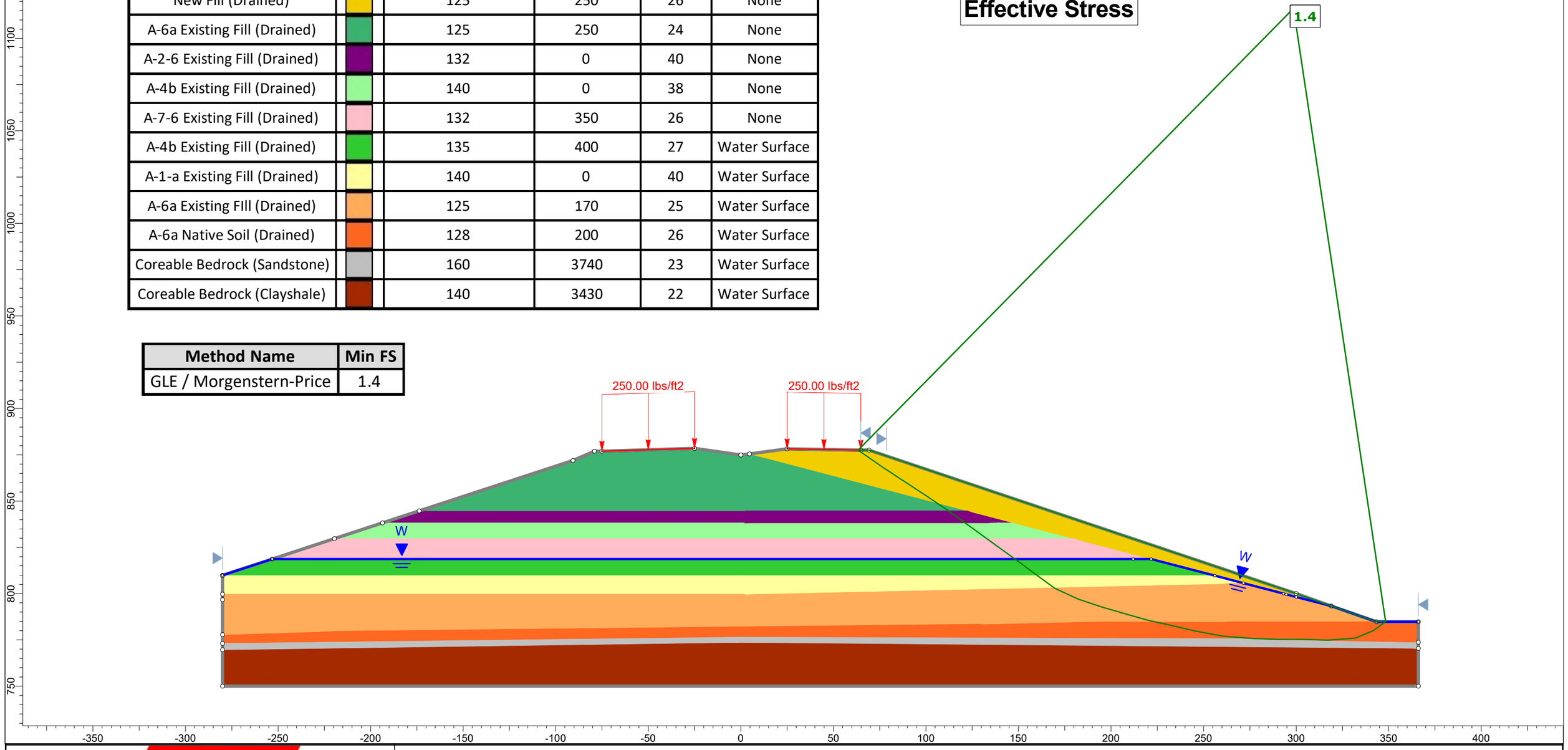
Reference Key

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
4 Non plastic soils - Friction angle estimated from AASHTO Table 10.4.6.2.4-1

Material Name	Color	Unit Weight (lbs/ft3)	Cohesion (psf)	Phi (deg)	Water Surface
Pavement		140	10	0	None
New Fill (Drained)		125	250	26	None
A-6a Existing Fill (Drained)		125	250	24	None
A-2-6 Existing Fill (Drained)		132	0	40	None
A-4b Existing Fill (Drained)		140	0	38	None
A-7-6 Existing Fill (Drained)		132	350	26	None
A-4b Existing Fill (Drained)		135	400	27	Water Surface
A-1-a Existing Fill (Drained)		140	0	40	Water Surface
A-6a Existing FIll (Drained)		125	170	25	Water Surface
A-6a Native Soil (Drained)		128	200	26	Water Surface
Coreable Bedrock (Sandstone)		160	3740	23	Water Surface
Coreable Bedrock (Clayshale)		140	3430	22	Water Surface

Method Name	Min FS
GLE / Morgenstern-Price	1.4

Station 1138+00
Effective Stress



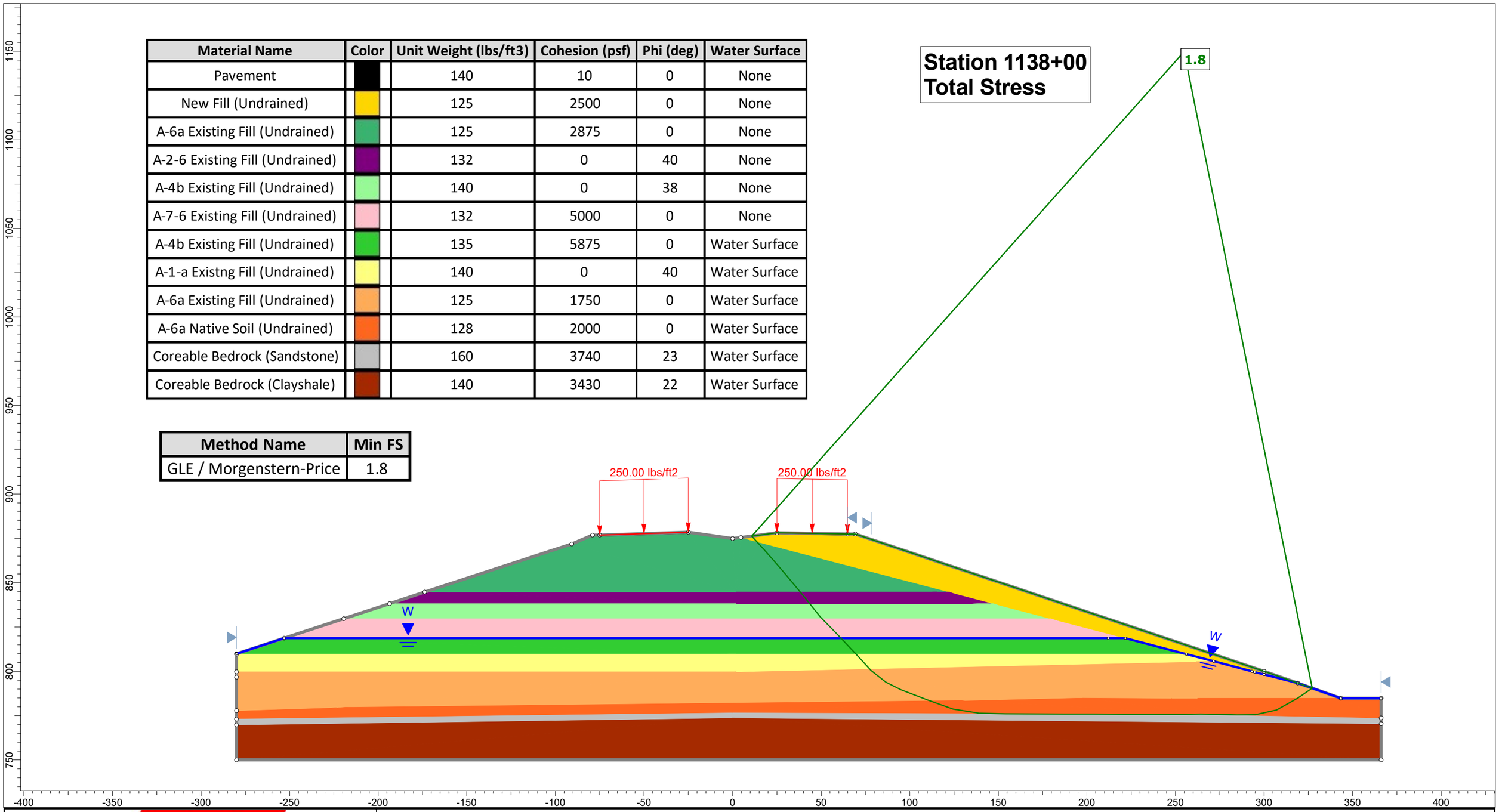
CTL ENGINEERING INC

ATH/MEG-US33-18.70/00.00

Location	U.S 33	*Analysis*	Slope Stability
Drawn By	CTL Engineering, Inc.	*Company*	CTL Engineering Inc.
Date	5/22/2024 1:32:35 PM	*Client*	HNTB Ohio, Inc.

Material Name	Color	Unit Weight (lbs/ft3)	Cohesion (psf)	Phi (deg)	Water Surface
Pavement		140	10	0	None
New Fill (Undrained)		125	2500	0	None
A-6a Existing Fill (Undrained)		125	2875	0	None
A-2-6 Existing Fill (Undrained)		132	0	40	None
A-4b Existing Fill (Undrained)		140	0	38	None
A-7-6 Existing Fill (Undrained)		132	5000	0	None
A-4b Existing Fill (Undrained)		135	5875	0	Water Surface
A-1-a Existng Fill (Undrained)		140	0	40	Water Surface
A-6a Existing Fill (Undrained)		125	1750	0	Water Surface
A-6a Native Soil (Undrained)		128	2000	0	Water Surface
Coreable Bedrock (Sandstone)		160	3740	23	Water Surface
Coreable Bedrock (Clayshale)		140	3430	22	Water Surface

Method Name	Min FS
GLE / Morgenstern-Price	1.8



ENGINEERING INC

ATH/MEG-US33-18.70/00.00

Location	U.S 33	*Analysis*	Slope Stability
Drawn By	CTL Engineering, Inc.	*Company*	CTL Engineering Inc.
Date	5/22/2024 1:35:27 PM	*Client*	HNTB Ohio, Inc.

Soil Parameters

Project: ATH-MEG-033-18.70/0.00
Location: CR 21
Station: 109+00
Boring No.: B-042-0-23
Date: 11/18/24

							Total Stress		Effective Stress		
Layer No.	Top Elev	Bottom Elev	Thickness (feet)	Type	Total Weight (pcf)	N_{60} value (bpf)	Cohesion (psf)	Friction Angle (degrees)	Cohesion (psf)	Friction Angle (degrees)	Reference
1	970.3	964.8	5.5	A-6b Existing Fill	125	18 26					
			Avg	A-6b	125	22	2750	0	240	25	1,2,3
2	964.8	949.3	15.5	A-7-6	125	22 22 14 13 26 24					
			Avg	A-7-6	125	20	2500	0	220	25	1,2,3

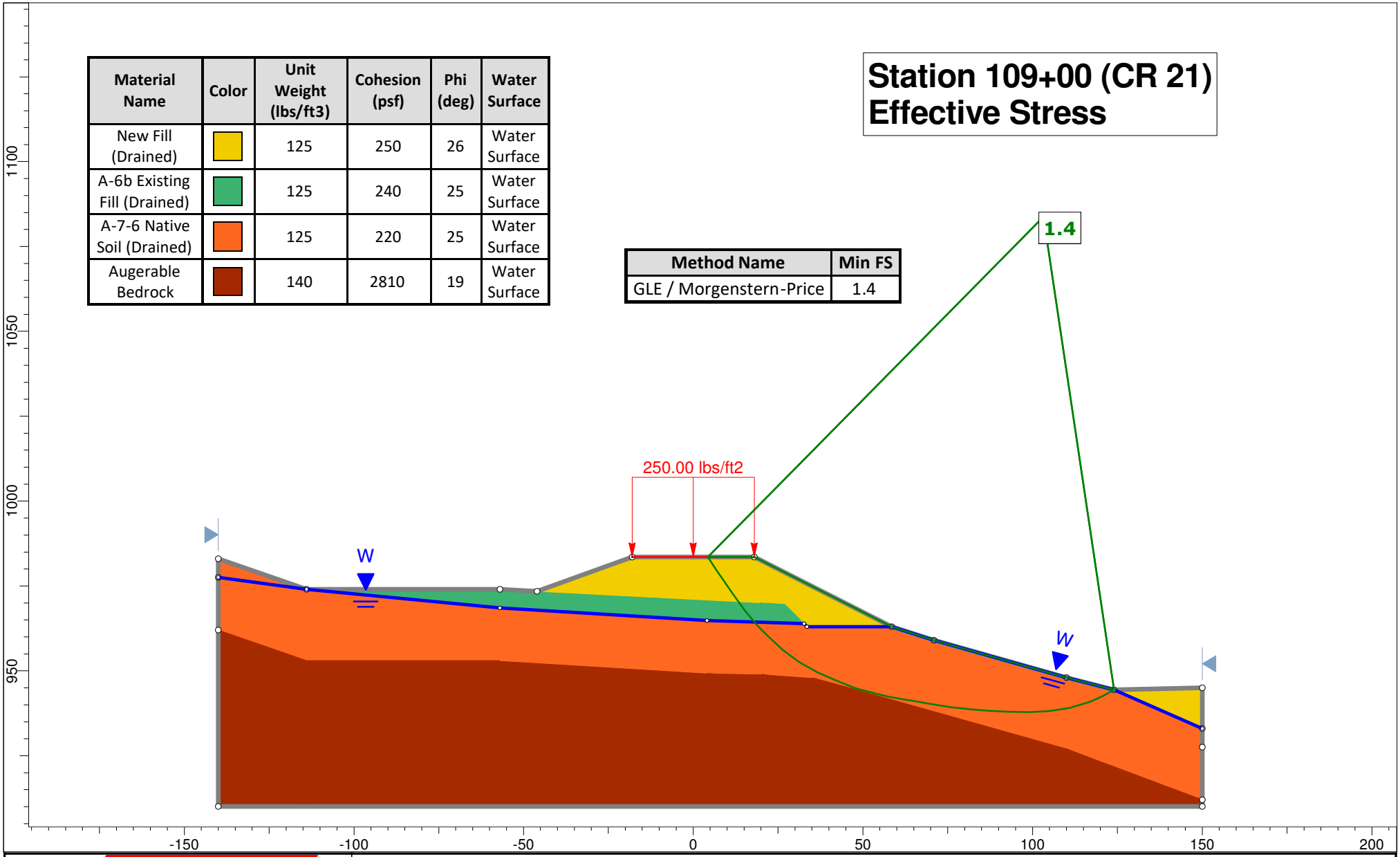
Reference Key

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

Station 109+00 (CR 21)
Effective Stress

Material Name	Color	Unit Weight (lbs/ft3)	Cohesion (psf)	Phi (deg)	Water Surface
New Fill (Drained)		125	250	26	Water Surface
A-6b Existing Fill (Drained)		125	240	25	Water Surface
A-7-6 Native Soil (Drained)		125	220	25	Water Surface
Augerable Bedrock		140	2810	19	Water Surface

Method Name	Min FS
GLE / Morgenstern-Price	1.4



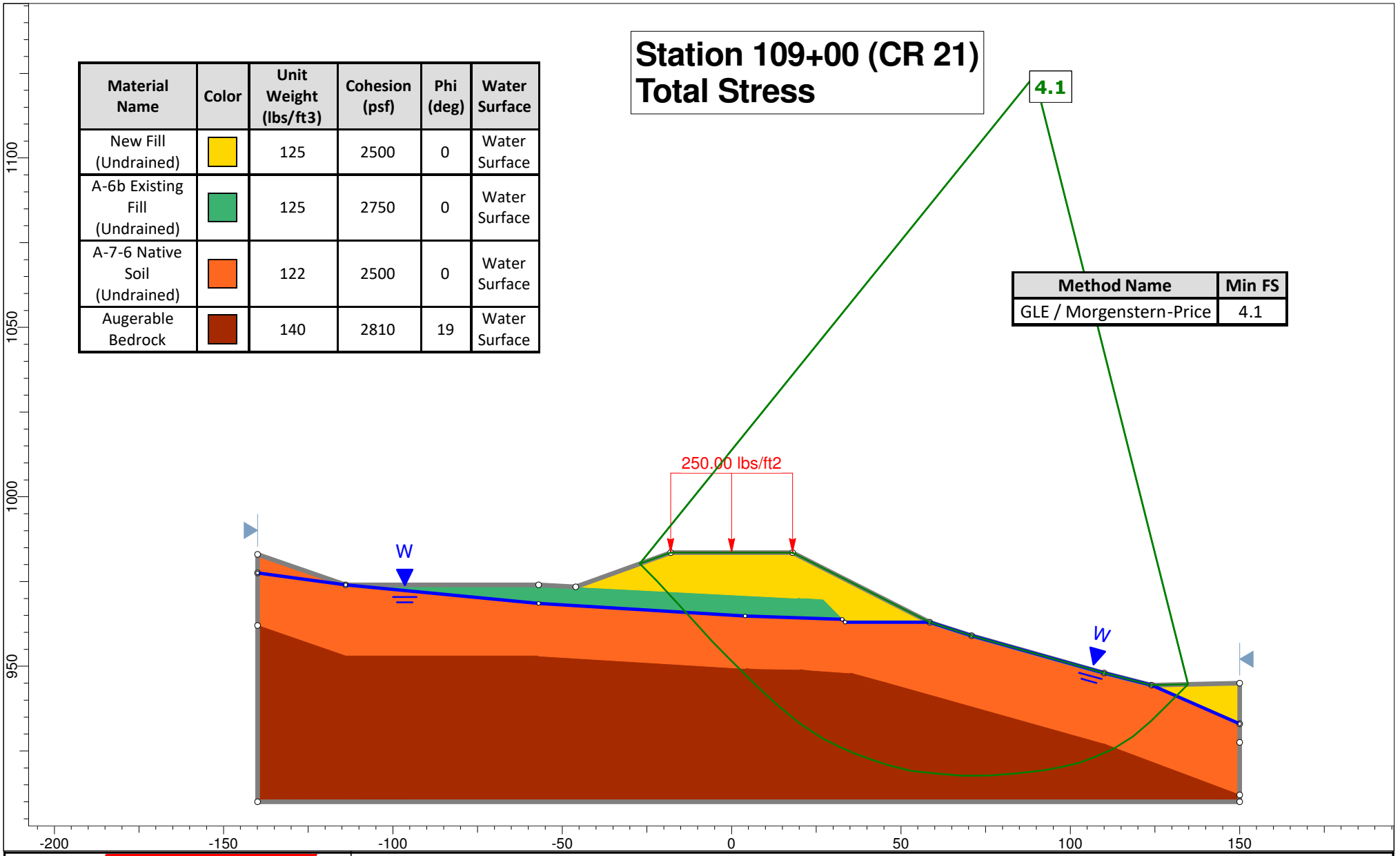
Project	ATH/MEG-US33-70.00/00.00		
Group	Group 1	Scenario	Master Scenario
Drawn By	CTL Engineering, Inc.	Company	CTL Engineering, Inc.
Date	3/17/24	File Name	109+00.slmd

SLIDEINTERPRET 10.0

Station 109+00 (CR 21)
Total Stress

Material Name	Color	Unit Weight (lbs/ft3)	Cohesion (psf)	Phi (deg)	Water Surface
New Fill (Undrained)		125	2500	0	Water Surface
A-6b Existing Fill (Undrained)		125	2750	0	Water Surface
A-7-6 Native Soil (Undrained)		122	2500	0	Water Surface
Augerable Bedrock		140	2810	19	Water Surface

Method Name	Min FS
GLE / Morgenstern-Price	4.1



Project	ATH/MEG-US33-70.00/00.00		
Group	Group 1	Scenario	Master Scenario
Drawn By	CTL Engineering, Inc.	Company	CTL Engineering, Inc.
Date	3/17/24	File Name	109+00.slmd

CTL ENGINEERING INC

SLIDEINTERPRET 10.0

Soil Parameters

Project: ATH-MEG-033-18.70/0.00
Location: Ramp 21A
Station: 49+00
Boring No.: B-061-0-23
Date: 8/14/24

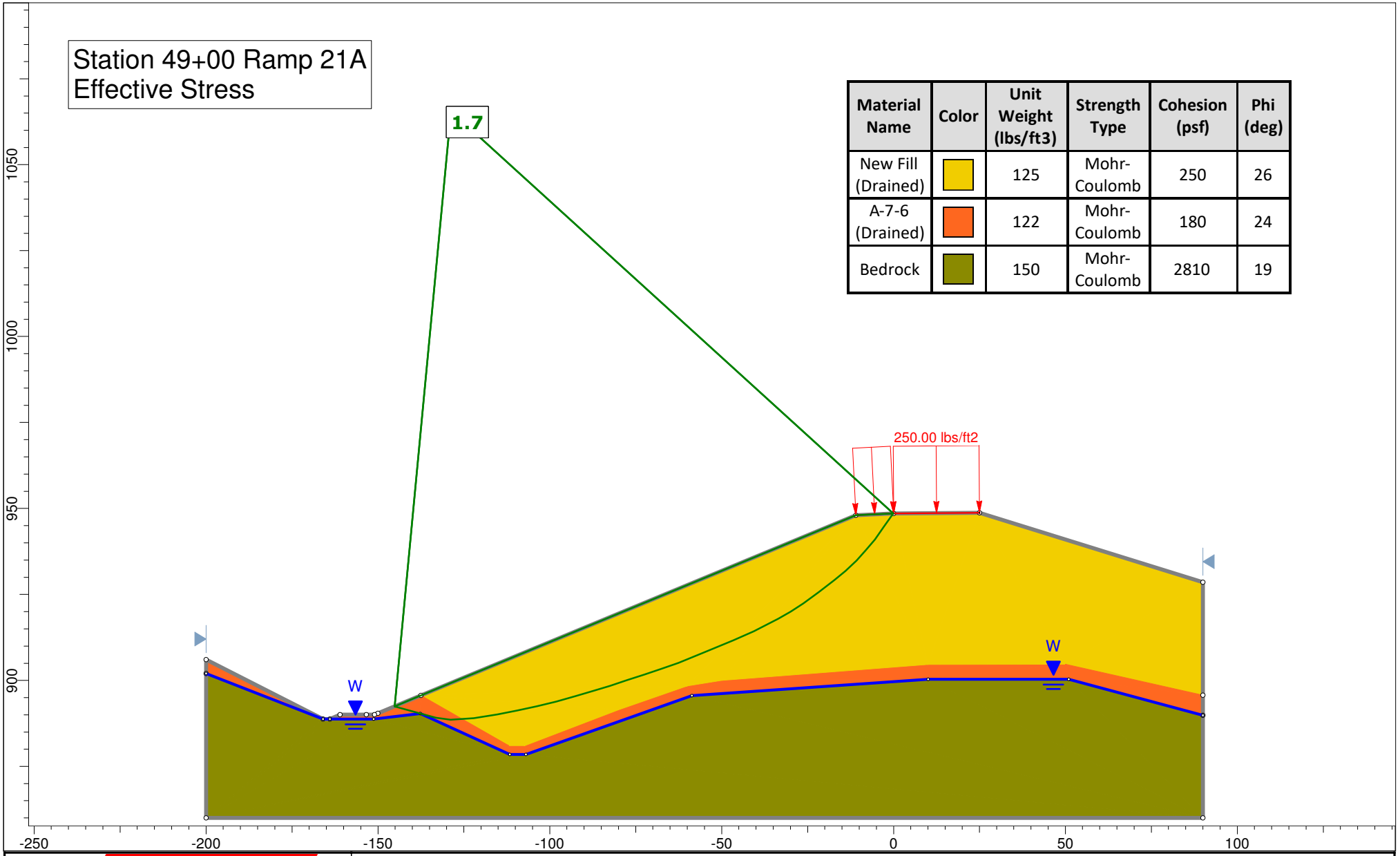
							Total Stress		Effective Stress		
Layer No.	Top Elev	Bottom Elev	Thickness (feet)	Type	Total Weight (pcf)	N_{60} value (bpf)	Cohesion (psf)	Friction Angle (degrees)	Cohesion (psf)	Friction Angle (degrees)	Reference
1	905.5	902	3.5	A-7-6	122	15					
			Avg	A-7-6	122	15	1875	0	180	24	1,2,3

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

Station 49+00 Ramp 21A
Effective Stress

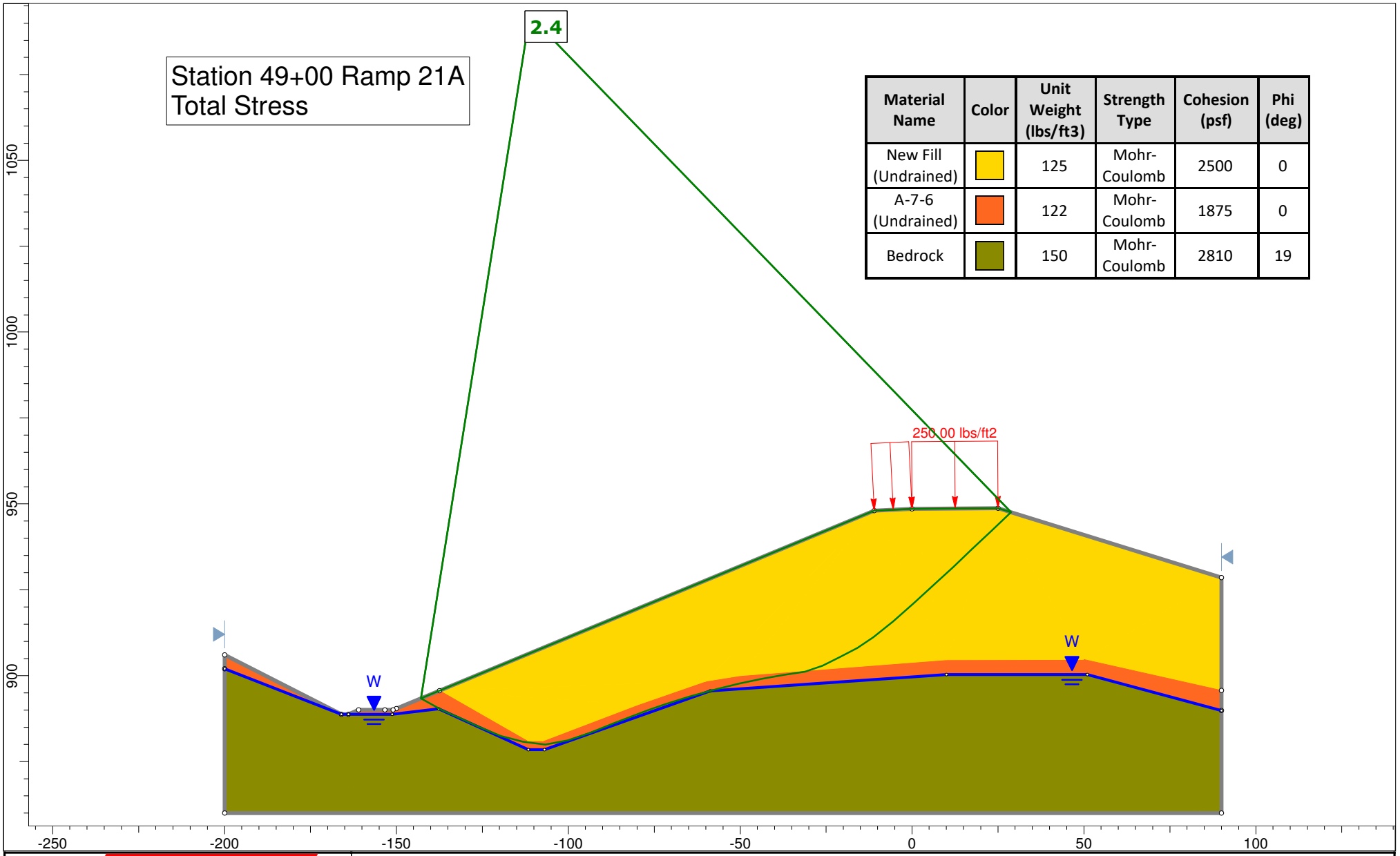
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
New Fill (Drained)		125	Mohr-Coulomb	250	26
A-7-6 (Drained)		122	Mohr-Coulomb	180	24
Bedrock		150	Mohr-Coulomb	2810	19



ENGINEERING INC.

Project	Station 49+00 Ramp 21A		
Group	Group 1	Scenario	Master Scenario
Drawn By	SR	Company	CTL Engineering, Inc.
Date	7/22/2024, 1:26:12 PM	File Name	Slope Stability Sta. 49+00 Ramp 21A.slmd

Station 49+00 Ramp 21A
Total Stress



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
New Fill (Undrained)		125	Mohr-Coulomb	2500	0
A-7-6 (Undrained)		122	Mohr-Coulomb	1875	0
Bedrock		150	Mohr-Coulomb	2810	19

CTL ENGINEERING INC

Project	Station 49+00 Ramp 21A		
Group	Group 1	Scenario	Master Scenario
Drawn By	SR	Company	CTL Engineering, Inc.
Date	7/22/2024, 1:26:12 PM	File Name	Slope Stability Sta. 49+00 Ramp 21A.slmd

SLIDEINTERPRET 10.0

Soil Parameters

Project: ATH-MEG-033-18.70/0.00
Location Ramp 21 D
Station 206+50
Boring No.: B-046-0-23
Date: 11/18/24

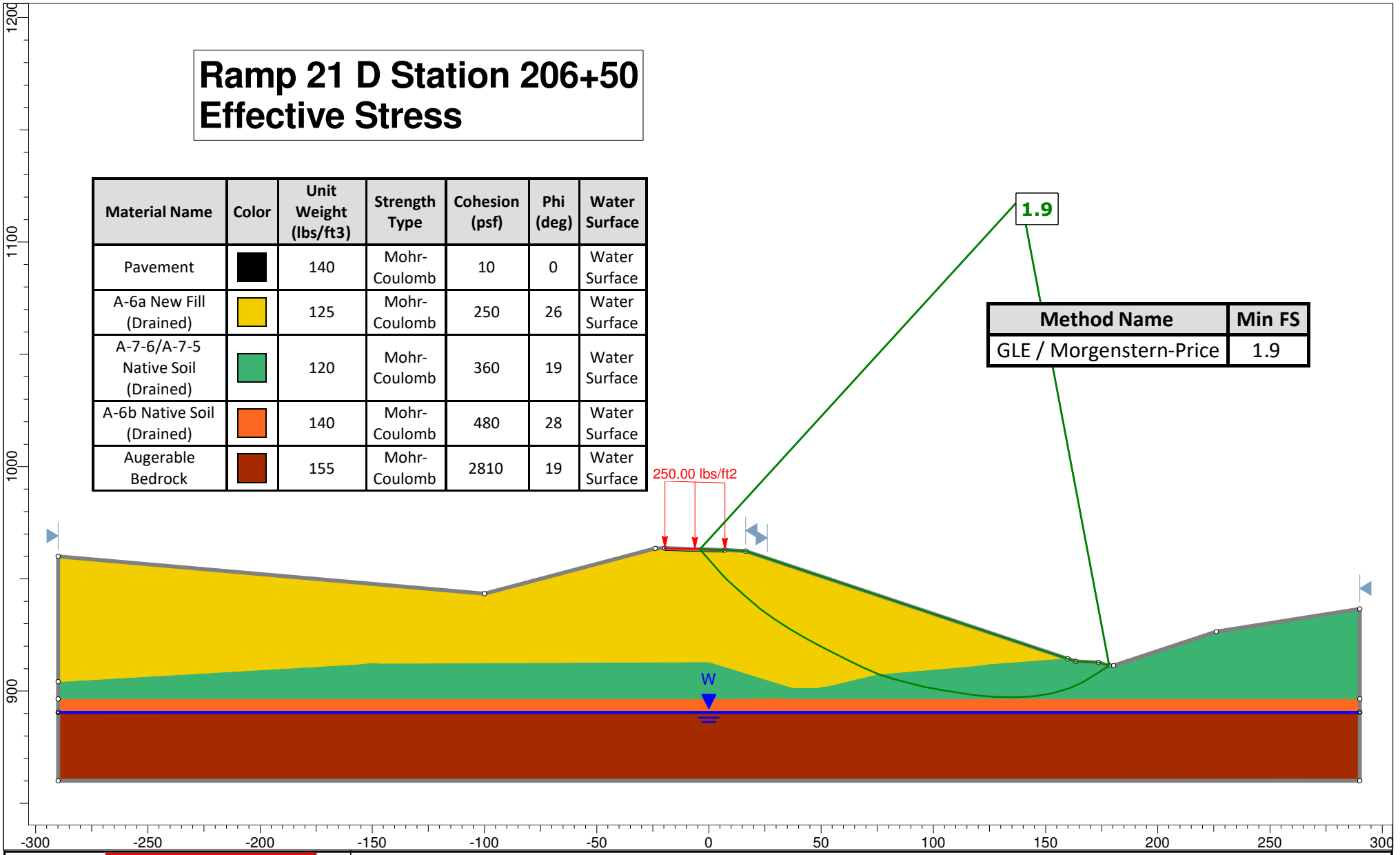
								Total Stress		Effective Stress		
Layer No.	Top Elev	Bottom Elev	Thickness (feet)	Type	Total Weight (pcf)	N_{60} value (bpf)	f1	Cohesion (psf)	Friction Angle (degrees)	Cohesion (psf)	Friction Angle (degrees)	Reference
1	904.5	902.5	2.0	A-7-6	120	10						
			Avg	A-7-6	120	10		1250	0	120	22	1,2,3
2	902.5	900.5	2.0	A-7-5	120							
			Avg	A-7-5	120			690	8	360	19	4
3	900.5	896.5	4.0	A-7-6	122	15 15						
			Avg	A-7-6	122	15		1875	0	180	24	1,2,3
4	896.5	889.5	7.0	A-6b	140	46 87						
			Avg	A-6b	140	67	5.4	7700	0	480	28	1,2,3

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
4 Laboratory consolidated undrained triaxial test results of B-046-A-23_ST-1_2'-4'

Ramp 21 D Station 206+50
Effective Stress

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface
Pavement		140	Mohr-Coulomb	10	0	Water Surface
A-6a New Fill (Drained)		125	Mohr-Coulomb	250	26	Water Surface
A-7-6/A-7-5 Native Soil (Drained)		120	Mohr-Coulomb	360	19	Water Surface
A-6b Native Soil (Drained)		140	Mohr-Coulomb	480	28	Water Surface
Augerable Bedrock		155	Mohr-Coulomb	2810	19	Water Surface



Method Name	Min FS
GLE / Morgenstern-Price	1.9

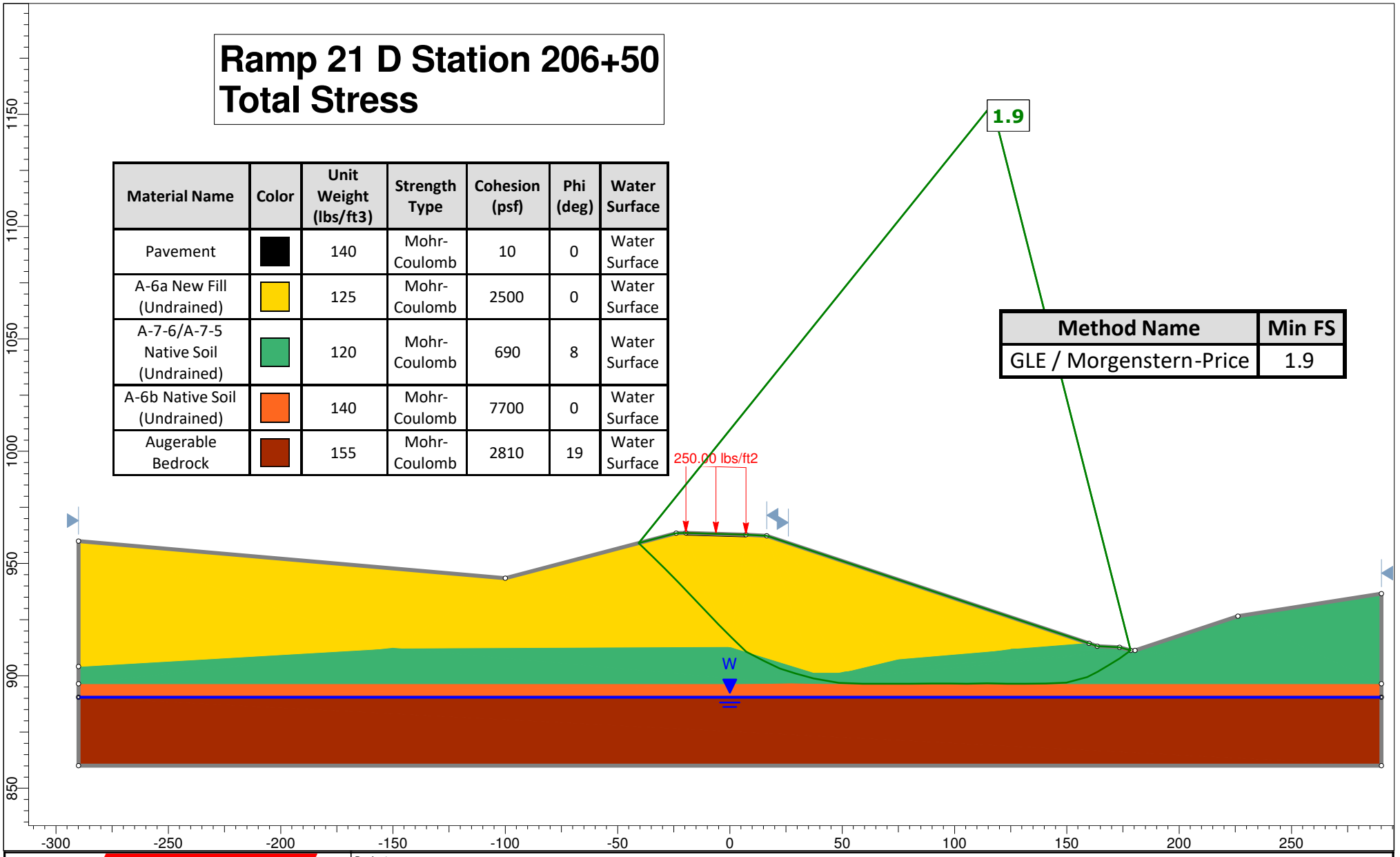
CTL ENGINEERING INC

Project	ATH/MEG-US33-70.00/00.00		
Group	Group 1	Scenario	Master Scenario
Drawn By	CTL Engineering, Inc.	Company	CTL Engineering, Inc.
Date	3/17/24	File Name	24.11.18 Ramp 21 D 206+50.slmd

SLIDEINTERPRET 10.0

Ramp 21 D Station 206+50
Total Stress

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface
Pavement		140	Mohr-Coulomb	10	0	Water Surface
A-6a New Fill (Undrained)		125	Mohr-Coulomb	2500	0	Water Surface
A-7-6/A-7-5 Native Soil (Undrained)		120	Mohr-Coulomb	690	8	Water Surface
A-6b Native Soil (Undrained)		140	Mohr-Coulomb	7700	0	Water Surface
Augerable Bedrock		155	Mohr-Coulomb	2810	19	Water Surface



Method Name	Min FS
GLE / Morgenstern-Price	1.9

Project	ATH/MEG-US33-70.00/00.00		
Group	Group 1	Scenario	Master Scenario
Drawn By	CTL Engineering, Inc.	Company	CTL Engineering, Inc.
Date	3/17/24	File Name	24.11.18 Ramp 21 D 206+50.slmd

CTL ENGINEERING INC

SLIDEINTERPRET 10.0

APPENDIX E

SPECIAL BENCHING SKETCHES

Recommended Benching Detail
Station 1002+00

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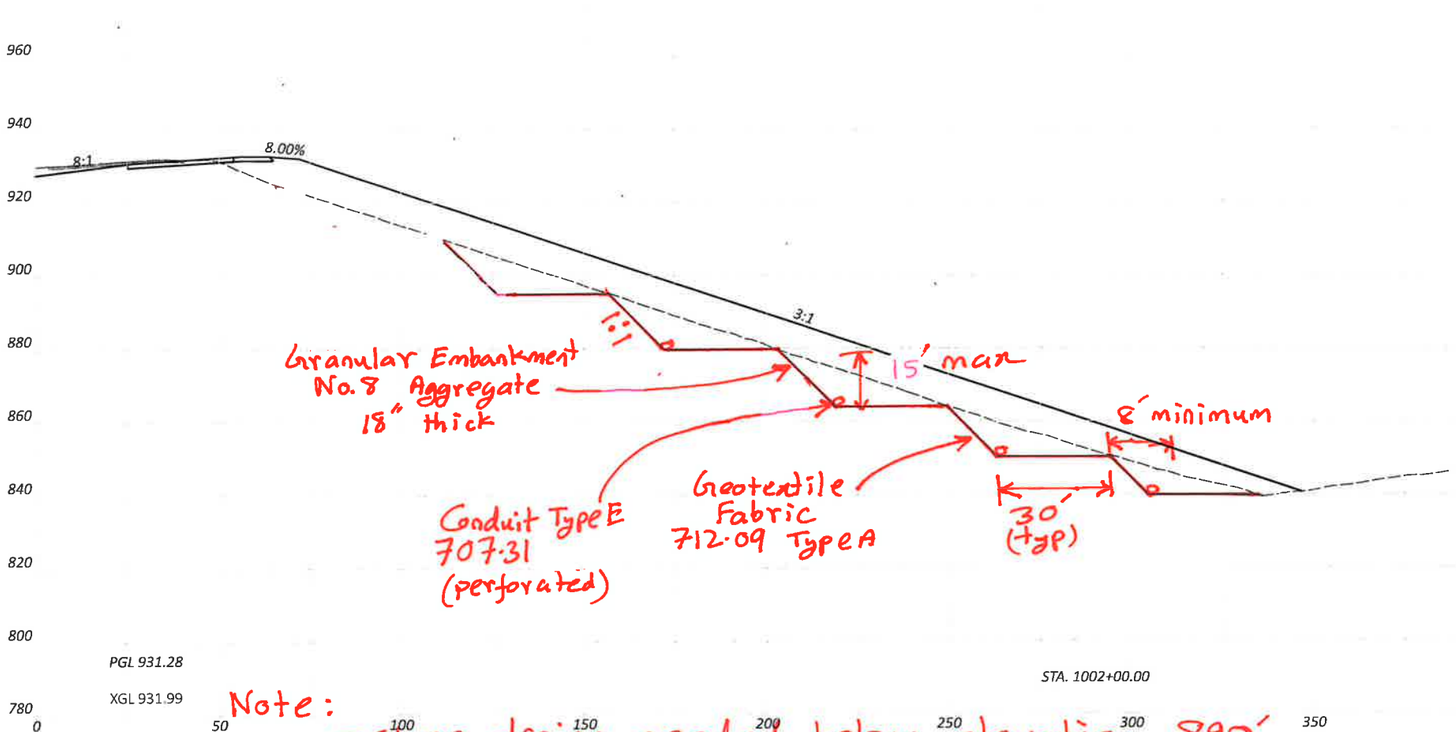

Note:
- slope drains needed below elevation 890'
- Use spring drains above elevation 890'

CROSS SECTIONS
U.S. 33

DESIGN AGENCY

DESIGNER XXX
REVIEWER XXX MM-DD-YY
PROJECT ID 0

Sheet Totals		
Seeding	Cut	Fill

SHEET P.0 TOTAL 0

CTY-RTE-SECTION

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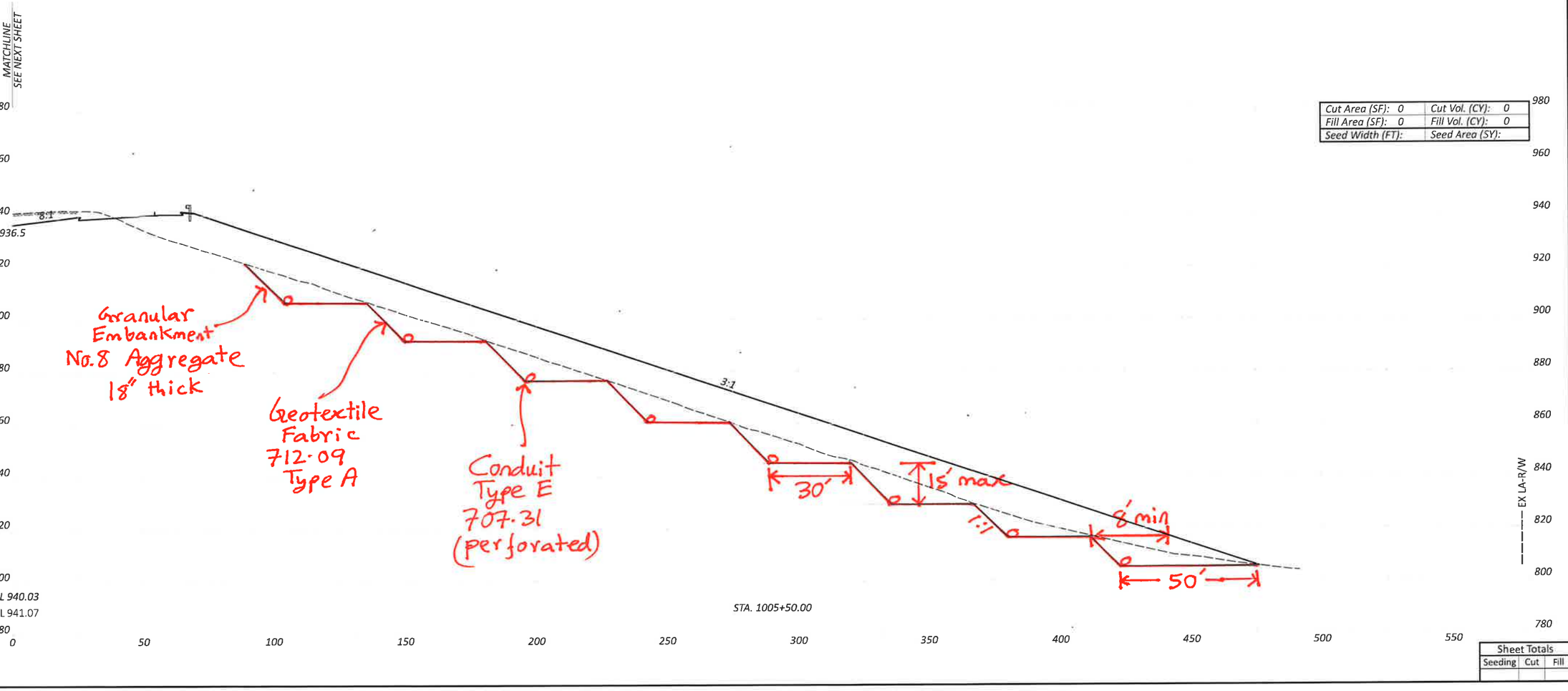
Recommended Benching Detail
Station 1005+50



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STA. 1005+50.00

Sheet Totals		
Seeding	Cut	Fill

DESIGN AGENCY: HNTB
DESIGNER: SGM
REVIEWER: KKP 05/14/24
PROJECT ID: 119141
SHEET: 177
TOTAL: 731

ATH-33-18.70

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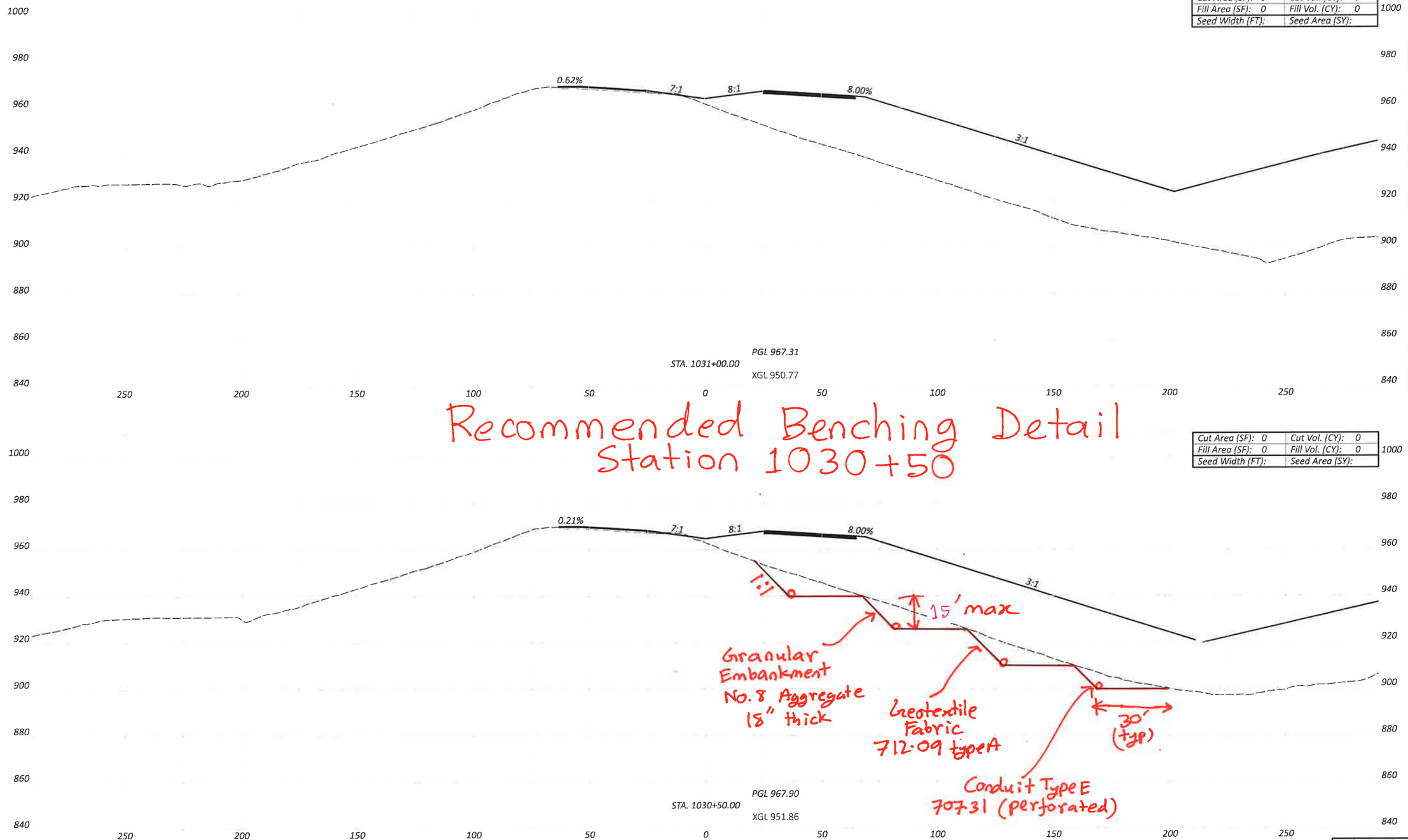

Recommended Benching Detail
Station 1030+50

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Fill Area (SF): 0	Fill Vol. (CY): 0
Seed Width (FT):	Seed Area (SY):

CROSS SECTIONS
U.S. 33

DESIGN AGENCY

DESIGNER
XXX

REVIEWER
XXX MM-DD-YY

PROJECT ID
0

SHEET P.0 | TOTAL 0

Sheet Totals		
Seeding	Cut	Fill

CTY-RTE-SECTION

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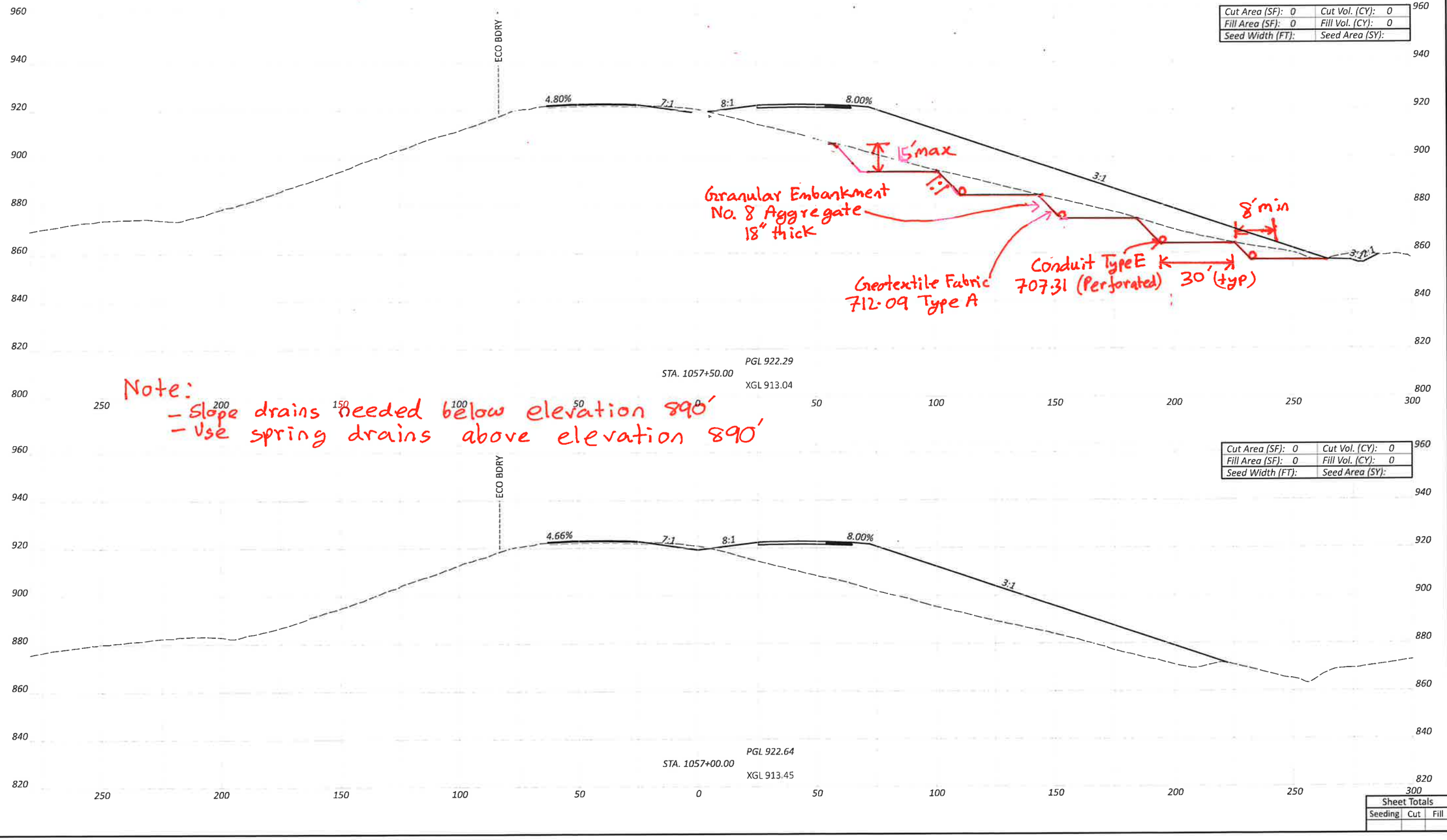
Recommended Benching Detail
Station 1057+50



Note:
- Slope drains needed below elevation 890'
- Use spring drains above elevation 890'

CROSS SECTIONS
MAINLINE

CTY-RTE-SECTION

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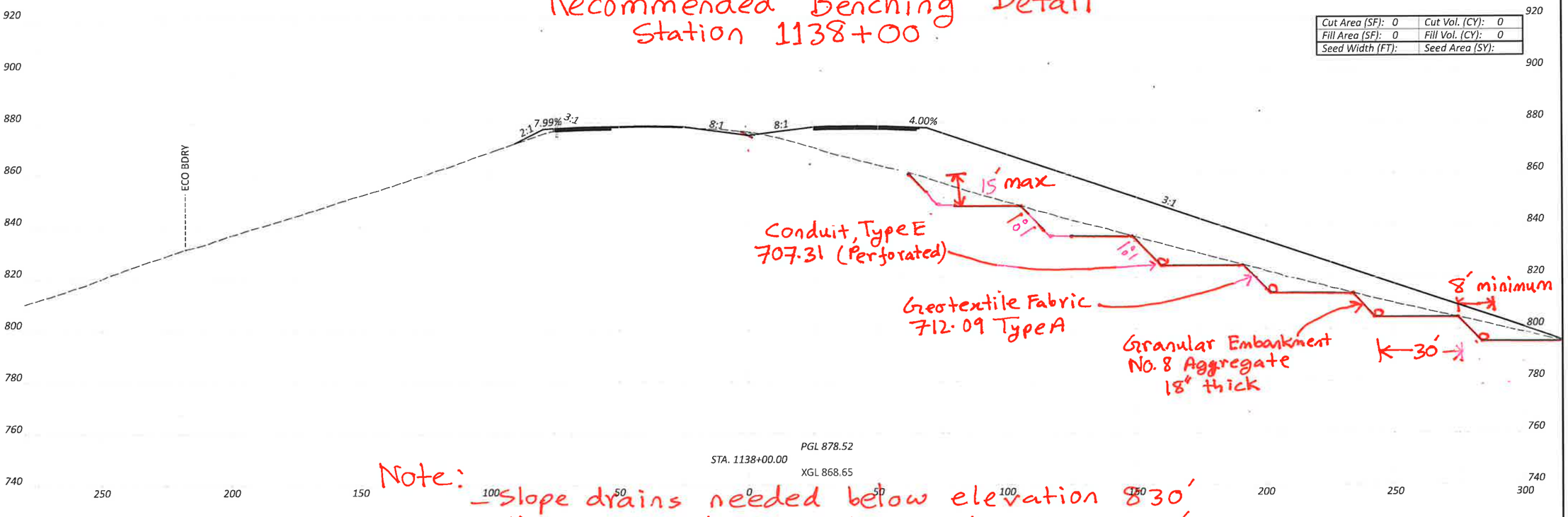
DESIGN AGENCY

DESIGNER: XXX
REVIEWER: XXX MM-DD-YY
PROJECT ID: 0

Sheet Totals		
Seeding	Cut	Fill

SHEET: P.0
TOTAL: 0

Recommended Benching Detail
Station 1138+00



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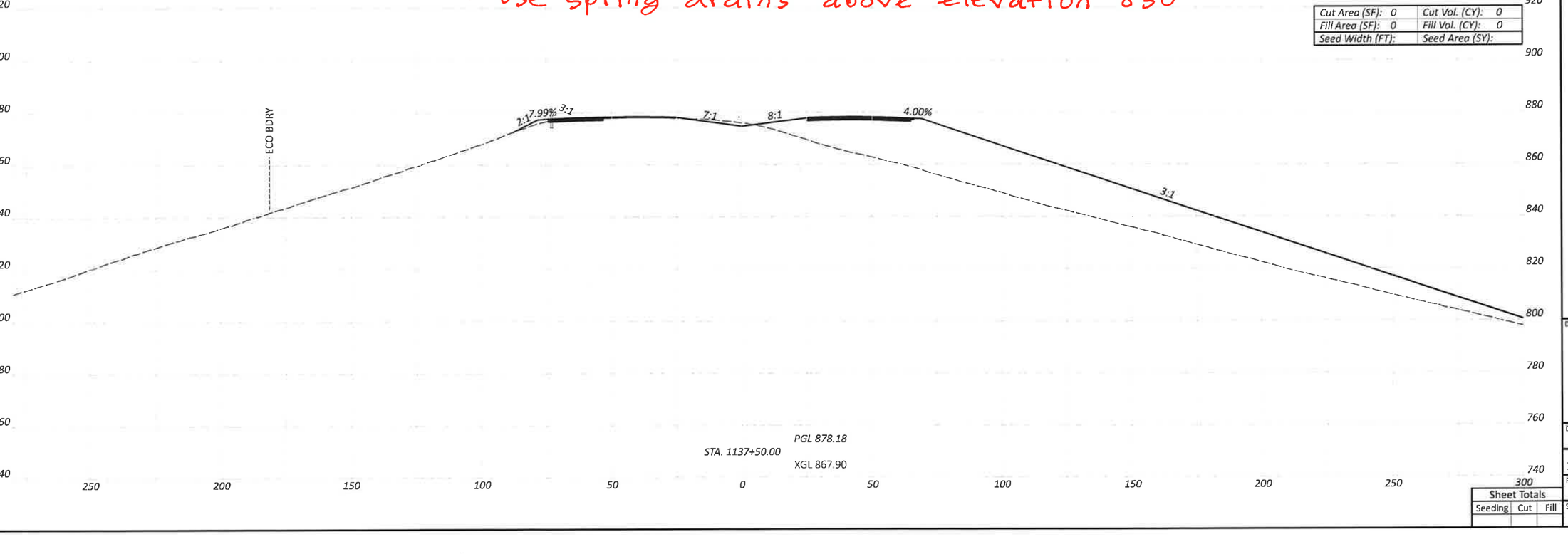
Note:
- Slope drains needed below elevation 830'
- Use spring drains above elevation 830'



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Sheet Totals		
Seeding	Cut	Fill

CROSS SECTIONS
U.S. 33

DESIGN AGENCY

DESIGNER XXX

REVIEWER XXX MM-DD-YY

PROJECT ID 0

SHEET P.0 TOTAL 0

CTY-RTE-SECTION

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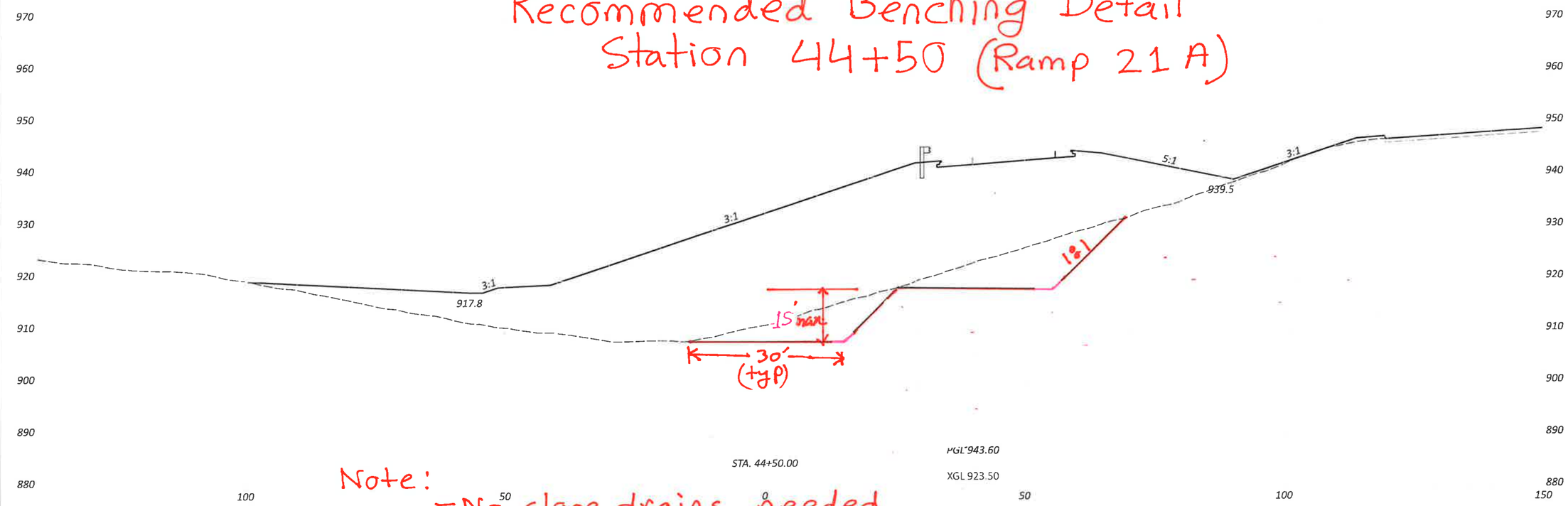
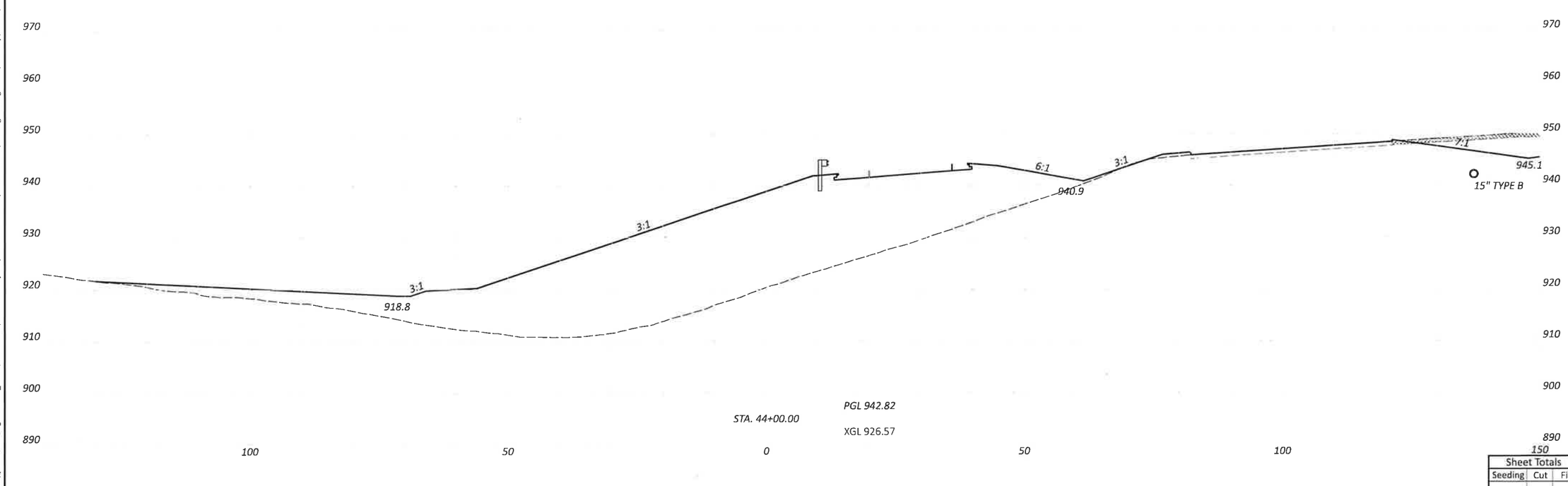
Recommended Benching Detail
Station 44+50 (Ramp 21 A)



Note:
- No slope drains needed
- Use spring drains – as directed by the engineer



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STA. 44+00.00 TO STA. 44+50.00

ATH-33-18.70

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Sheet Totals		
Seeding	Cut	Fill

DESIGN AGENCY
HNTB

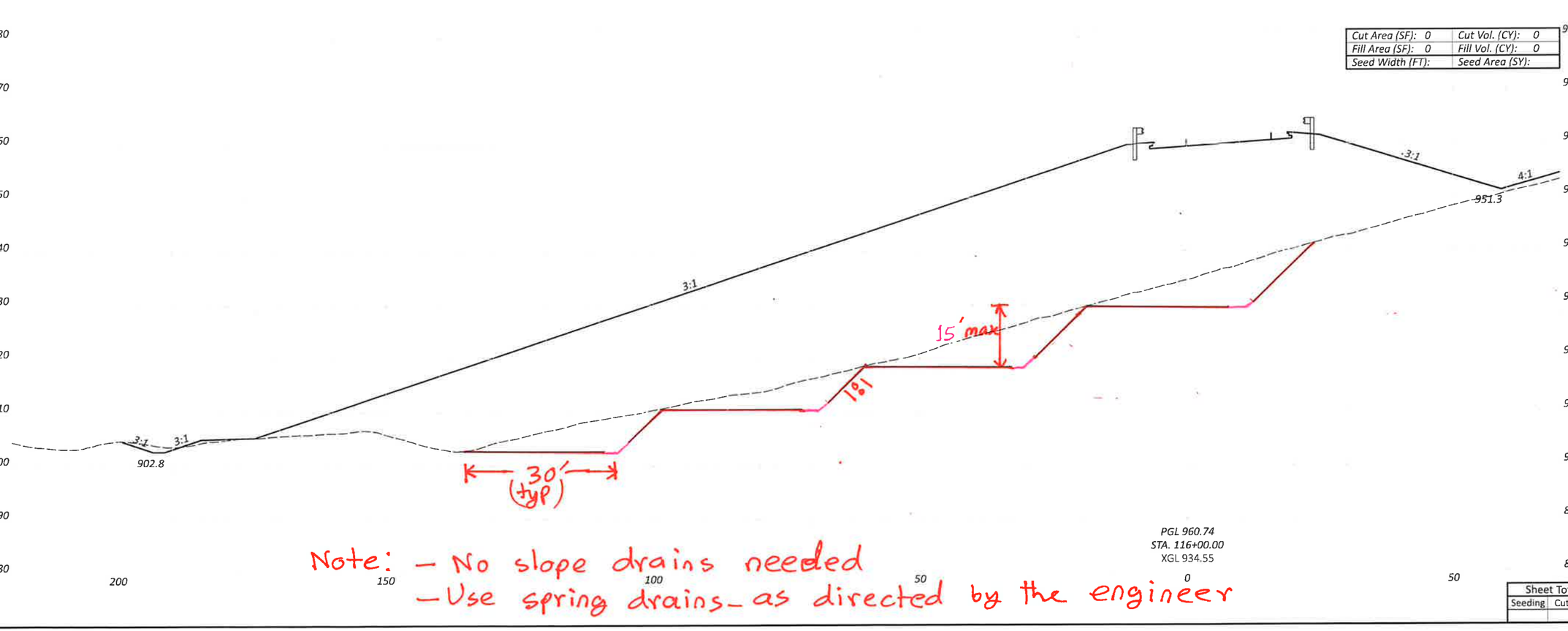
DESIGNER
SGM

REVIEWER
KKP 05/14/24

PROJECT ID
119141

SHEET 453 | TOTAL 731

Recommended Benching Detail
Station 116+00 (Ramp 21C)



Note: – No slope drains needed
– Use spring drains as directed by the engineer

CROSS SECTIONS - RAMP 21C
STA. 116+00.00

ATH-33-18.70

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Sheet Totals		
Seeding	Cut	Fill

DESIGN AGENCY
HNTB

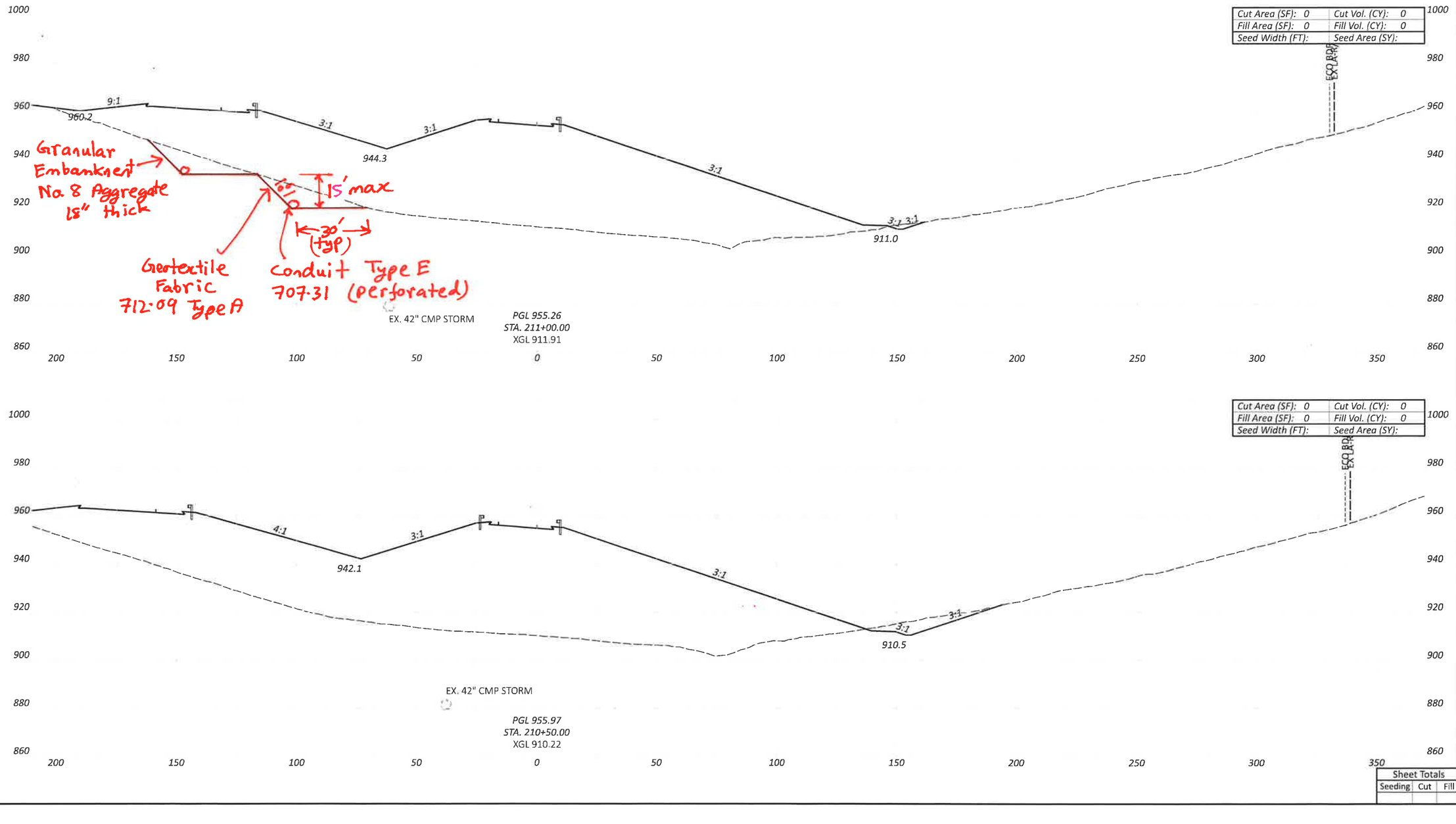
DESIGNER
SGM

REVIEWER
KKP 05/14/24

PROJECT ID
119141

SHEET 498 TOTAL 731

Recommended Benching Detail
Station 211+00



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ATH-33-18.70

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DESIGN AGENCY
HNTB

DESIGNER	SGM
REVIEWER	KKP 05/14/24
PROJECT ID	119141
SHEET	513
TOTAL	731

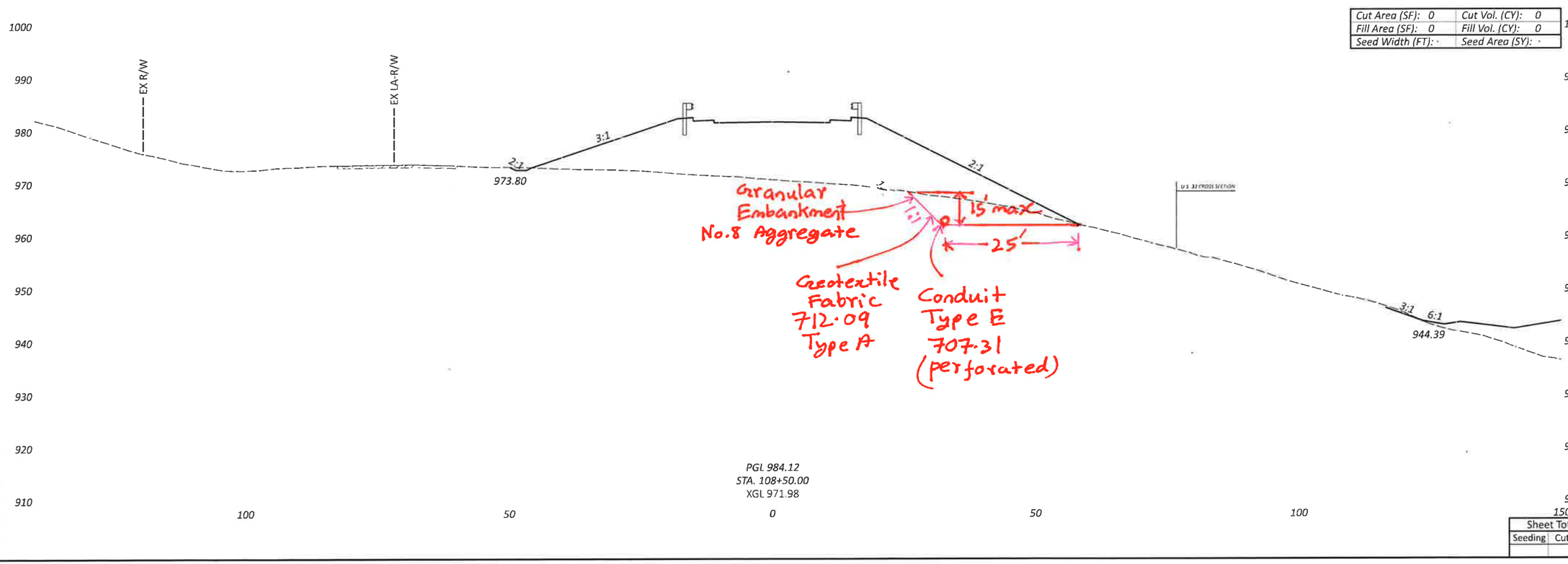
Sheet Totals

Seeding	Cut	Fill

Recommended Benching Detail
Station 109+00
(C.R. 21)

CROSS SECTIONS - C.R. 21
STA. 108+50.00

Cut Area (SF): 0	Cut Vol. (CY): 0
Fill Area (SF): 0	Fill Vol. (CY): 0
Seed Width (FT): -	Seed Area (SY): -



Sheet Totals		
Seeding	Cut	Fill

DESIGN AGENCY
HNTB

DESIGNER SGM
REVIEWER KKP 05/14/24
PROJECT ID 119141
SHEET P.444 TOTAL P. 883

ATH-33-18.78

MODEL: CLP_C021 - 108+50.00 [Sheet] PAPERSIZE: 34x22 (in.) DATE: 10/9/2024 TIME: 4:27:28 PM USER: sturner
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APPENDIX F

ROCK CUT SLOPE DESIGN

Rock Cut Slope Design
Sta. 1128+00

Boring No= B-58
Boring Surface Elevation = 284.1 meters
Boring Surface Elevation = 932.1 feet
Rock Cut Limits= 1116+00 to 1132+00
Lowest Catchment Ditch
Elevation = 877.9 feet (Sta. 1131+50)

Top Depth (meters)	Bottom Depth (meters)	Top Depth (feet)	Bottom Depth (feet)	Top Elevation (meters)	Bottom Elevation (meters)	Top Elevation (feet)	Bottom Elevation (feet)	Material Type	Strength (Historic Hardness Descriptor Prior to 2007)*	Strength (Geologic Strength Descriptor)*	RQD (%)	Unit Weight (pcf)	Unconfined Compressive Strength (psi)	Id_2 SDI (%)	Thickness (feet)	Competent or Incompetent	Cut Slope Rate (H:V)	Comments
0.0	1.8	0.0	5.9	284.1	282.3	932.1	926.2	Soil	--	--	--	--	--	--	5.9	NA	3:1	Overburden bench not required if it will cause the cut slope to extend beyond the eco. boundary. Otherwise a 10 foot min. overburden bench required
1.8	9.1	5.9	29.9	282.3	275.0	926.2	902.2	Sandstone/Indurated Clay/Weathered Mudstone	Augerable	Augerable	--	--	--	--	24.0	Incompetent	2:1	
9.1	12.2	29.9	40.0	275.0	271.9	902.2	892.1	Mudstone	Soft	Weak	0	--	--	--	10.2	Incompetent	2:1	
12.2	14.3	40.0	46.9	271.9	269.8	892.1	885.2	Samdstone	Medium to Moderately Hard	Slightly Strong to Moderately Strong	40	--	4278.6	--	6.9	Incompetent	2:1	
14.3	18.0	46.9	59.1	269.8	266.1	885.2	873.0	Mudstone/Siltstone/Shale	Very Soft to Medium	Very Weak to Slightly Strong	17 - 40	--	--	--	7.3	Incompetent	2:1	

*Strength descriptor determined by UCS test result when laboratory data available, otherwise taken from visual descriptor on historic boring log

Rock Cut Slope Design
Sta. 1148+00

Boring No. = B-62
Boring Surface Elevation = 288.8 meters
Boring Surface Elevation = 947.5 feet
Rock Cut Limits= 1144+50 to 1150+50
Lowest Catchment Ditch Elevation = 882.9 feet (Sta. 1144+50)

Top Depth (meters)	Bottom Depth (meters)	Top Depth (feet)	Bottom Depth (feet)	Top Elevation (meters)	Bottom Elevation (meters)	Top Elevation (feet)	Bottom Elevation (feet)	Material Type	Strength (Historic Hardness Descriptor Prior to 2007)*	Strength (Geologic Strength Descriptor)*	RQD (%)	Unit Weight (pcf)	Unconfined Compressive Strength (psi)	Id_2 SDI (%)	Thickness (feet)	Competent or Incompetent	Cut Slope Rate (H:V)	Comments
0.0	5.1	0.0	16.7	288.8	283.7	947.5	930.8	Soil	--	--	--	--	--	--	16.7	NA	3:1	Overburden bench not required if it will cause the cut slope to extend beyond the eco. boundary. Otherwise a 10 foot min. overburden bench required
5.1	6.1	16.7	20.0	283.7	282.7	930.8	927.5	Weathered Shale	Augerable	Augerable	--	--	--	--	3.3	Incompetent	2:1	
6.1	15.2	20.0	49.9	282.7	273.6	927.5	897.6	Shale/Clayshale/Siltstone/ Mudstone	Soft to Medium	Very Weak to Slightly Strong	0 to 21	--	5642.0	--	29.9	Incompetent	2:1	Place bench at 908, at the base of the siltstone to break up concentrated flow.
15.2	17.9	49.9	58.7	273.6	270.9	897.6	888.8	Siltstone with Interbedded Shale	Medium	Slightly Strong	27	--	--	--	8.9	Incompetent	2:1	
17.9	20.3	58.7	66.6	270.9	268.5	888.8	880.9	Mudstone	Soft	Weak	0	--	--	--	5.9	Incompetent	2:1	

*Strength descriptor determined by UCS test result when laboratory data available, otherwise taken from visual descriptor on historic boring log

Rock Cut Slope Design
Sta. 1189+00

Boring No. = 38+420
Boring Surface Elevation = 288.1 meters
Boring Surface Elevation = 945.2 feet
Rock Cut Limits= 1184+50 to 1193+00
Lowest Catchment Ditch Elevation = 870.1 feet (Sta. 1193+50)

Top Depth (meters)	Bottom Depth (meters)	Top Depth (feet)	Bottom Depth (feet)	Top Elevation (meters)	Bottom Elevation (meters)	Top Elevation (feet)	Bottom Elevation (feet)	Material Type	Strength (Historic Hardness Descriptor Prior to 2007)*	Strength (Geologic Strength Descriptor)*	RQD (%)	Unit Weight (pcf)	Unconfined Compressive Strength (psi)	Id_2 SDI (%)	Thickness (Feet)	Competent or Incompetent	Cut Slope Rate (H:V)	Comments
0.0	7.2	0.0	23.6	288.1	280.9	945.2	921.6	Soil	--	--	--	--	--	--	23.6	NA	3:1	Overburden bench not required if it will cause the cut slope to extend beyond the eco. boundary. Otherwise a 10 foot min. overburden bench required
7.2	13.3	23.6	43.6	280.9	274.8	921.6	901.6	Weathered Shale (Assumed)	Augerable	Augerable	--	--	--	--	20.0	Incompetent	2:1	
13.3	15.7	43.6	51.5	274.8	272.4	901.6	893.7	Shale	Soft	Weak	68	--	--	62.7	7.9	Incompetent	2:1	
15.7	17.3	51.5	56.8	272.4	270.8	893.7	888.5	Sandstone	Medium	Slightly Strong	88	--	10515.3	--	5.2	Competent	1:1	1:1 slope requested by District to maintain uniform slope. Geotechnical bench required at top (10 ft min. width)
17.3	18.9	56.8	62.0	270.8	269.2	888.5	883.2	Sandstone	Medium to Moderately Hard	Slightly Strong to Moderately Strong	35-88	--	3321.1	--	5.2	Competent	1:1	
18.9	20.1	62.0	65.9	269.2	268.0	883.2	879.3	Shale	Very Soft to Soft	Very Weak to Weak	35	--	--	58.5	3.9	Incompetent	2:1	Geotechnical bench required at top (10 ft min. width)
20.1	21.8	65.9	71.5	268.0	266.3	879.3	873.7	Shale	Very Soft to Soft	Very Weak to Weak	30-70	--	--	1.7	5.6	Incompetent	2:1	
21.8	22.8	71.5	74.8	266.3	265.3	873.7	870.4	Shale/Limestone	Moderately Hard	Slightly Strong*	70	--	2079.4	92.6	3.6	Incompetent	2:1	

*Strength descriptor determined by UCS test result when laboratory data available, otherwise taken from visual descriptor on historic boring log

Rock Cut Slope Design
Sta. 1199+00

Boring No. = 38+680 & B-73
Boring Surface Elevation = 282.8 meters (B-73)
Boring Surface Elevation = 927.8 feet
Rock Cut Limits= 1197+00 to 1201+50
Lowest Catchment Ditch Elevation = 862.1 feet (Sta. 1201+50)

Top Depth (meters)**	Bottom Depth (meters)**	Top Depth (feet)	Bottom Depth (feet)	Top Elevation (meters)	Bottom Elevation (meters)	Top Elevation (feet)	Bottom Elevation (feet)	Material Type	Strength (Historic Hardness Descriptor Prior to 2007)*	Strength (Geologic Strength Descriptor)*	RQD (%)	Unit Weight (pcf)	Unconfined Compressive Strength (psi)	Id_2 SDI (%)	Thickness (feet)	Competent or Incompetent	Cut Slope Rate (H:V)	Comments
0.0	6.1	0.0	20.0	282.8	276.7	927.8	907.8	Soil	--	--	--	--	--	--	20.0	NA	3:1	Overburden bench not required if it will cause the cut slope to extend beyond the eco. boundary. Otherwise a 10 foot min. overburden bench required
6.1	7.6	20.0	24.9	276.7	275.2	907.8	902.9	Indurated Clay/Weathered mudstone	Augerable	Augerable	--	--	--	--	4.9	Incompetent	2:1	
7.6	10.7	24.9	35.1	275.2	272.1	902.9	892.7	Mudstone	Soft	Weak	68	--	--	--	10.2	Incompetent	2:1	
10.7	14.4	35.1	47.2	272.1	268.4	892.7	880.6	Sandstone/Siltstone/shale (interbedded)	Moderately Hard/Soft to Medium	Moderately Strong/Weak to Slightly Strong	76***	--	--	--	12.1	Incompetent	2:1	Install geotechnical bench at the bottom of this layer.
14.4	15.9	47.2	52.2	268.4	266.9	880.6	875.7	Shale/Mudstone	Soft	Weak	0	--	--	--	4.9	Incompetent	2:1	
15.9	18.7	52.2	61.4	266.9	264.1	875.7	866.5	Sandstone	Medium to Moderately Hard	Slightly Strong to Moderately Strong	54 to 55	--	--	--	13.6	Incompetent	2:1	

*Strength descriptor determined by UCS test result when laboratory data available, otherwise taken from visual descriptor on historic boring log

**Information from historic boring B-73 was used for the first four layers, and information from historic boring 38+680 was used for the bottom 2 layers. No boring data from the bottom of boring 38+680 to the bottom of cut. Assume similar conditions to the bottom of cut.
***Average RQD of the layers encountered within the elevations from boring 38+680 and B-73

Rock Cut Slope Design
1213+00

Boring No. = B-76
Boring Surface Elevation = 287.4 meters
Boring Surface Elevation = 942.9 feet
Rock Cut Limits= 1208+50 to 1217+50
Lowest Catchment Ditch Elevation = 847.5 feet (Sta. 1217+00)

Top Depth (meters)	Bottom Depth (meters)**	Top Depth (feet)	Bottom Depth (feet)	Top Elevation (meters)	Bottom Elevation (meters)	Top Elevation (feet)	Bottom Elevation (feet)	Material Type	Strength (Historic Hardness Descriptor Prior to 2007)*	Strength (Geologic Strength Descriptor)*	RQD (%)	Unit Weight (pcf)	Unconfined Compressive Strength (psi)	Id_2 SDI (%)	Thickness (feet)	Competent or Incompetent	Cut Slope Rate (H:V)	Comments
0.0	4.1	0.0	13.5	287.4	283.3	942.9	929.5	Soil	--	--	--	--	--	--	13.5	NA	3:1	Overburden bench not required if it will cause the cut slope to extend beyond the eco. boundary. Otherwise a 10 foot min. overburden bench required
4.1	11.8	13.5	38.7	283.3	275.6	929.5	904.2	Indurated Clay/Weathered Mudstone	Augerable	Augerable	--	--	--	--	25.3	Incompetent	2:1	
11.8	16.5	38.7	54.1	275.6	270.9	904.2	888.8	Mudstone	Very Soft to Soft	Very Weak to Weak	0-31	--	--	--	15.4	Incompetent	2:1	
16.5	18.3	54.1	60.0	270.9	269.1	888.8	882.9	Siltstone with Interbedded Shale	Very Soft to Moderately Hard	Very Weak to Moderately Strong	40	--	6193.1	--	5.9	Incompetent	2:1	
18.3	18.9	60.0	62.0	269.1	268.5	882.9	880.9	Sandstone	Moderately Hard	Moderately Strong	40	--	--	--	2.0	Competent	2:1	
18.9	20.7	62.0	67.9	268.5	266.7	880.9	875.0	Siltstone	Moderately Hard	Moderately Strong	30-40	--	--	--	5.9	Incompetent	2:1	Install geotechnical bench at the bottom of this layer.
20.7	28.2	67.9	92.5	266.7	259.2	875.0	850.4	Siltstone/Mudstone	Very Soft to Moderately Hard	Very Weak to Moderately Strong	16-53	--	--	..	27.5	Incompetent	2:1	

*Strength descriptor determined by UCS test result when laboratory data available, otherwise taken from visual descriptor on historic boring log

** No boring data from the bottom of boring B-76 to the bottom of cut. Assume similar conditions to the bottom of cut.

Rock Cut Slope Design
1222+00

Boring No. = B-79
Boring Surface Elevation = 275.3 meters
Boring Surface Elevation = 903.3 feet
Rock Cut Limits= 1220+50 to 1228+00
Lowest Catchment Ditch Elevation = 837.5 feet (Sta. 1227+00)

Top Depth (meters)	Bottom Depth (meters)	Top Depth (feet)	Bottom Depth (feet)	Top Elevation (meters)	Bottom Elevation (meters)	Top Elevation (feet)	Bottom Elevation (feet)	Material Type	Strength (Historic Hardness Descriptor Prior to 2007)*	Strength (Geologic Strength Descriptor)*	RQD (%)	Unit Weight (pcf)	Unconfined Compressive Strength (psi)	Id_2 SDI (%)	Thickness (feet)	Competent or Incompetent	Cut Slope Rate (H:V)	Comments
0.0	1.2	0.0	3.9	275.3	274.1	903.3	899.3	Soil	--	--	--	--	--	--	3.9	NA	3:1	Overburden bench not required if it will cause the cut slope to extend beyond the eco. boundary. Otherwise a 10 foot min. overburden bench required
1.2	3.0	3.9	9.8	274.1	272.3	899.3	893.4	Indurated Clay/Weathered Shale	Augerable	Augerable	--	--	--	--	5.9	Incompetent	2:1	
3.0	13.7	9.8	44.9	272.3	261.6	893.4	858.3	Shale/Mudstone	Very Soft to Medium	Very Weak to Slightly Strong	0 to 24	--	--	--	35.1	Incompetent	2:1	
13.7	15.8	44.9	51.8	261.6	259.5	858.3	851.4	Sandstone	Moderately Hard	Strong	50	--	9515.9	--	6.9	Competent	2:1	Geotechnical bench at bottom of layer
15.8	16.8	51.8	55.1	259.5	258.5	851.4	848.1	Mudstone/Siltstone	Medium	Slightly Strong	50	--	--	--	3.3	Incompetent	2:1	
16.8	18.0	55.1	59.1	258.5	257.3	848.1	844.2	Samdstone	Moderately Hard	Maderately Strong	47	--	--	--	3.9	Competent	2:1	
18.0	19.8	59.1	65.0	257.3	255.5	844.2	838.3	Mudstone	Very Soft to Soft	Very Weak to Weak	0	--	--	--	5.9	Incompetent	2:1	
19.8	20.4	65.0	66.9	255.5	265.2	838.3	836.3	Sandstone	Moderately Hard	Moderately Strong	40	--	--	--	0.8	Competent	2:1	

*Strength descriptor determined by UCS test result when laboratory data available, otherwise taken from visual descriptor on historic boring log

Rock Cut Slope Design
Sta. 37+63.16 Ramp 16E

Boring No. = B-63 & B-62 (lowest layer only)
Boring Surface Elevation = 286.0 meters (B-63)
Boring Surface Elevation = 938.3 feet
Rock Cut Limits= 37+63.16 to 43+00 Ramp 16E
Lowest Catchment Ditch Elevation = 883.8 feet (Sta.37+63.16)

Top Depth (meters)	Bottom Depth (meters)	Top Depth (feet)	Bottom Depth (feet)	Top Elevation (meters)	Bottom Elevation (meters)	Top Elevation (feet)	Bottom Elevation (feet)	Material Type	Strength (Historic Hardness Descriptor Prior to 2007)*	Strength (Geologic Strength Descriptor)*	RQD (%)	Unit Weight (pcf)	Unconfined Compressive Strength (psi)	Id_2 SDI (%)	Thickness (feet)	Competent or Incompetent	Cut Slope Rate (H:V)	Comments
0.0	4.6	0.0	15.1	286.0	281.4	938.3	923.2	Soil	--	--	--	--	--	--	15.1	NA	3:1	Overburden bench not required if it will cause the cut slope to extend beyond the eco. boundary. Otherwise a 10 foot min. overburden bench required
4.6	5.8	15.1	19.0	281.4	280.2	923.2	919.3	Indurated Clay/Weathered Mudstone	Augerable	Augerable	--	--	--	--	3.9	Incompetent	2:1	
5.8	8.5	19.0	27.9	280.2	277.5	919.3	910.4	Mudstone/shale	Soft	Slightly Stong*	10 to 40	--	2690.5	--	8.9	Incompetent	2:1	
8.5	9.1	27.9	29.9	277.5	276.9	910.4	908.5	Siltstone	Medium	Slightly Strong	40	--	--	--	2.0	Incompetent	2:1	Install bench at bottom of layer
9.1	11.3	29.9	37.1	276.9	274.7	908.5	901.2	Shale/Siltstone	Medium	Slightly Strong	30	--	--	--	7.2	Incompetent	2:1	
11.3	12.2	37.1	40.0	274.7	273.8	901.2	898.3	Sandstone	Medium to Moderately Hard	Slightly Strong to Moderately Stromg	26	--	--	--	3.0	Incompetent	2:1	
12.2	15.2	40.0	49.9	273.8	270.8	898.3	888.4	Shale/Mudstone	Very Soft to Medium	Very Weak to Slightly Strong	0-25	--	--	--	9.8	Incompetent	2:1	
15.2	17.5	49.9	57.4	270.8	268.5	888.4	880.9	Mudstone	Soft	Weak	0	--	--	--	4.7	Incompetent	2:1	

*Strength descriptor determined by UCS test result when laboratory data available, otherwise taken from visual descriptor on historic boring log

Rock Cut Slope Design
Sta. 52+50 Ramp 16F

Boring No. = B-63 & B-62 (lowest layer only)
Boring Surface Elevation = 286.0 meters (B-63)
Boring Surface Elevation = 938.3 feet
Rock Cut Limits= 48+48.97 to 56+00 Ramp 16F
Lowest Catchment Ditch Elevation = 886.1 feet (Sta. 48+48.97)

Top Depth (meters)	Bottom Depth (meters)	Top Depth (feet)	Bottom Depth (feet)	Top Elevation (meters)	Bottom Elevation (meters)	Top Elevation (feet)	Bottom Elevation (feet)	Material Type	Strength (Historic Hardness Descriptor Prior to 2007)*	Strength (Geologic Strength Descriptor)*	RQD (%)	Unit Weight (pcf)	Unconfined Compressive Strength (psi)	Id_2 SDI (%)	Thickness (feet)	Competent or Incompetent	Cut Slope Rate (H:V)	Comments
0.0	4.6	0.0	15.1	286.0	281.4	938.3	923.2	Soil	--	--	--	--	--	--	15.1	NA	3:1	Overburden bench not required if it will cause the cut slope to extend beyond the eco. boundary. Otherwise a 10 foot min. overburden bench required
4.6	5.8	15.1	19.0	281.4	280.2	923.2	919.3	Indurated Clay/Weathered Mudstone	Augerable	Augerable	--	--	--	--	3.9	Incompetent	2:1	
5.8	8.5	19.0	27.9	280.2	277.5	919.3	910.4	Mudstone/shale	Soft	Slightly Stong*	10 to 40	--	2690.5	--	8.9	Incompetent	2:1	
8.5	9.1	27.9	29.9	277.5	276.9	910.4	908.5	Siltstone	Medium	Slightly Strong	40	--	--	--	2.0	Incompetent	2:1	Install bench at bottom of layer
9.1	11.3	29.9	37.1	276.9	274.7	908.5	901.2	Shale/Siltstone	Medium	Slightly Strong	30	--	--	--	7.2	Incompetent	2:1	
11.3	12.2	37.1	40.0	274.7	273.8	901.2	898.3	Sandstone	Medium to Moderately Hard	Slightly Strong to Moderately Stromg	26	--	--	--	3.0	Incompetent	2:1	
12.2	15.2	40.0	49.9	273.8	270.8	898.3	888.4	Shale/Mudstone	Very Soft to Medium	Very Weak to Slightly Strong	0-25	--	--	--	9.8	Incompetent	2:1	
15.2	17.5	49.9	57.4	270.8	268.5	888.4	880.9	Mudstone	Soft	Weak	0	--	--	--	2.3	Incompetent	2:1	

*Strength descriptor determined by UCS test result when laboratory data available, otherwise taken from visual descriptor on historic boring log

Rock Cut Slope Design
Sta. 169+34.43 Ramp 16G

Boring No. = 37+780
Boring Surface Elevation = 292.5 meters
Boring Surface Elevation = 959.6 feet
Rock Cut Limits= 162+50 to 169+34.43 Ramp 16G
Lowest Catchment Ditch Elevation = 894.9 feet From Sta. 169+34.43 Ramp 16G Cross Section Sheet

Top Depth (meters)	Bottom Depth (meters)	Top Depth (feet)	Bottom Depth (feet)	Top Elevation (meters)	Bottom Elevation (meters)	Top Elevation (feet)	Bottom Elevation (feet)	Material Type	Strength (Historic Hardness Descriptor Prior to 2007)*	Strength (Geologic Strength Descriptor)*	RQD (%)	Unit Weight (pcf)	Unconfined Compressive Strength (psi)	Id_2 SDI (%)	Thickness (feet)	Competent or Incompetent	Cut Slope Rate (H:V)	Comments
0.0	4.3	0.0	14.1	292.5	288.2	959.6	945.5	Soil	--	--	--	--	--	--	14.1	NA	3:1	Overburden bench not required if it will cause the cut slope to extend beyond the eco. boundary. Otherwise a 10 foot min. overburden bench required
4.3	6.4	14.1	21.0	288.2	286.1	945.5	938.6	Shale	Augerable	Augerable	--	--	--	--	6.9	Incompetent	2:1	
6.4	14.2	21.0	46.6	286.1	278.3	938.6	913.1	Claystone	Very Soft to Soft	Very Weak to Weak	0-76	--	136.5 to 1,759.4	32.7 to 78.2	25.6	Incompetent	2:1	
14.2	15.5	46.6	50.9	278.3	277.0	913.1	908.8	Sandstone/Shale	Soft to Moderately Hard	Weak to Moderately Strong	72	--	2900.0	6.2	4.3	Incompetent	2:1	Install bench at bottom of layer
15.5	17.4	50.9	57.1	277.0	275.1	908.8	902.6	Shale	Medium	Slightly Strong	70	--	--	--	6.2	Incompetent	2:1	
17.4	21.0	57.1	68.9	275.1	271.5	902.6	890.7	Sandstone	Moderately Hard	Moderately Strong	83-95	--	6852.8	80.1	7.7	Competent	2:1	

*Strength descriptor determined by UCS test result when laboratory data available, otherwise taken from visual descriptor on historic boring log

Rock Cut Slope Design
Sta. 29+50 Ramp 16H

Boring No. = 37+780
Boring Surface Elevation = 292.5 meters
Boring Surface Elevation = 959.6 feet
Rock Cut Limits= 26+50 to 34+28.77 Ramp 16H
Lowest Catchment Ditch
Elevation = 885.5 feet (Sta. 34+28.77)

Top Depth (meters)	Bottom Depth (meters)	Top Depth (feet)	Bottom Depth (feet)	Top Elevation (meters)	Bottom Elevation (meters)	Top Elevation (feet)	Bottom Elevation (feet)	Material Type	Strength (Historic Hardness Descriptor Prior to 2007)*	Strength (Geologic Strength Descriptor)*	RQD (%)	Unit Weight (pcf)	Unconfined Compressive Strength (psi)	Id_2 SDI (%)	Thickness (feet)	Competent or Incompetent	Cut Slope Rate (H:V)	Comments
0.0	4.3	0.0	14.1	292.5	288.2	959.6	945.5	Soil	--	--	--	--	--	--	14.1	NA	3:1	Overburden bench not required if it will cause the cut slope to extend beyond the eco. boundary. Otherwise a 10 foot min. overburden bench required
4.3	6.4	14.1	21.0	288.2	286.1	945.5	938.6	Shale	Augerable	Augerable	--	--	--	--	6.9	Incompetent	2:1	
6.4	14.2	21.0	46.6	286.1	278.3	938.6	913.1	Claystone	Very Soft to Soft	Very Weak to Weak	0-76	--	136.5 to 1,759.4	32.7 to 78.2	25.6	Incompetent	2:1	
14.2	15.5	46.6	50.9	278.3	277.0	913.1	908.8	Sandstone/Shale	Soft to Moderately Hard	Weak to Moderately Strong	72	--	2900.0	6.2	4.3	Incompetent	2:1	Install bench at bottom of layer
15.5	17.4	50.9	57.1	277.0	275.1	908.8	902.6	Shale	Medium	Slightly Strong	70	--	--	--	6.2	Incompetent	2:1	
17.4	21.0	57.1	68.9	275.1	271.5	902.6	890.7	Sandstone	Moderately Hard	Moderately Strong	83-95	--	6852.8	80.1	11.8	Competent	2:1	
21.0	24.7	68.9	81.0	271.5	267.8	890.7	878.6	Shale	Very Soft to Soft	Very Weak to Weak	64	--	162.0 - 1,224.6	--	5.3	Incompetent	2:1	

*Strength descriptor determined by UCS test result when laboratory data available, otherwise taken from visual descriptor on historic boring log

APPENDIX G

BENCHING AND CUT SLOPE SUMMARY

Begin Station	End Station	Majority Cut/Fill	Benching/ Rock Cut Criteion
0989+00	0989+50	--	None
0989+50	0991+50	--	None
0991+50	0994+00	Cut	Use cut slopes from Historic Cross Section
0994+00	0995+50	--	None
0996+00	1003+50	Fill	Use 1002+00 Benching Detail
1004+00	1005+50	Fill	Use 2.5H:1V slope or flatter, Use 1005+50 Benching Detail
1006+00	1018+00	Fill	Use 1002+00 Benching Detail
1018+50	1030+00	FIll	Use Standard Benching
1028+50	1035+00	Fill	Use Benching Detail per District Stage 3 comments
1035+50	1039+50	Fill	Use Standard Benching
1040+00	1043+00	Cut	Use 3H:1V cut slopes or flatter if possible
1043+50	1045+00	Fill	Use Standard Benching, Install Spring Drains as Needed
1045+50	1050+00	Fill	Use 1030+50 Benching Detail
1050+50	1051+50	Cut/Fill	Minor Cut/Fill, Use 3H:1V cut slopes or flatter, standard benching
1052+00	1054+00	Fill	Use Standard Benching
1054+50	1059+50	Fill	Use 1057+50 Benching Detail
1060+00	1061+00	Fill	Use Standard Benching
1061+50	1063+50	Cut/Fill	Minor Cut/Fill, Use 3H:1V cut slopes or flatter, standard benching
1064+00	1065+50	Fill	Use Standard Benching
1066+00	1069+50	Fill	Use 1057+50 Benching Detail
1070+00	1070+00	Fill	Use Standard Benching
1070+50	1105+50	Cut/Fill	Minor Cut/Fill, Use 3H:1V cut slopes or flatter, standard benching
1106+00	1108+00	Fill	Use Standard Benching
1108+50	1111+00	Fill	Use 1057+50 Benching Detail
1111+50	1112+00	Fill	Use 1138+00 Benching Detail
1112+50	1116+00	Cut/Fill	Minor Cut/Fill, Use 3H:1V cut slopes or flatter, standard benching
1116+50	1131+50	Cut	Use 1128+00 Rock Cut Slope Design
1132+00	1134+00	Fill	Use Standard Benching
1134+50	1143+00	Fill	Use 1138+00 Benching Detail
1143+50	1144+50	Fill	Standard Benching
1145+00	1149+50	Cut	Use 1148+00 Rock Cut Slope Design
1150+00	1169+00	Cut/fill	Refer to ramp cross sections
1169+50	1176+00	Cut	Use Ramp 16G 169+34.43 Rock Cut Slope Design
1176+50	1181+50	Cut	Use 3H:1V cut slopes or flatter
1182+00	1184+00	Cut/Fill	Minor Cut/Fill, Use 3H:1V cut slopes or flatter, standard benching
1184+50	1185+00	Cut	Use 3H:1V cut slopes or flatter
1185+50	1193+50	Cut	Use 1189+00 Rock Cut Slope Design
1194+00	1195+50	Cut/Fill	Minor Cut/Fill, Use 3H:1V cut slopes or flatter, standard benching
1196+00	1201+50	Cut	Use 1199+00 Rock Cut Slope Design
1202+00	1203+00	Cut/Fill	Minor Cut/Fill, Use 3H:1V cut slopes or flatter, standard benching
1203+50	1206+00	Cut	Use 3H:1V cut slopes or flatter
1206+50	1208+50	Fill	Use Standard Benching
1208+50	1209+50	Cut/Fill	Minor Cut/Fill, Use 3H:1V cut slopes or flatter, standard benching
1210+00	1215+50	Cut	Use 1213+00 Rock Cut Slope Design
1216+00	1217+50	Cut	Use 3H:1V cut slopes or flatter
1218+00	1219+50	Cut/Fill	Minor Cut/Fill, Use 3H:1V cut slopes or flatter, standard benching
1220+00	1227+00	Cut	Use 1222+00 Rock Cut Slope Design

Areas of Minor Cut and Fill

Majority Cut Limits

Majority Fill Limits

CR/Ramp	Begin Station	End Station	Majority Cut/Fill	Benching/ Rock Cut Criterion
21	101+50	108+00	Cut/Fill	Use 3:1 cut slopes or flatter or 3:1 fill slopes or flatter
	108+50	109+70.56	Fill	Use 109+00 Benching Detail
	109+70.56	112+32.74	None	Pleasant Hill Road Bridge
	112+32.74	120+98.80	Cut/Fill	Use 3H:1V cut slopes or flatter, use standard benching
16	300+00	311+96.24	Cut/fill	Use 3H:1V cut slopes or flatter, use standard benching
	311+96.24	314+66.70	None	Pleasanton Road Bridge
	314+66.70	321+24.99	Cut/fill	Use 3H:1V cut slopes or flatter if possible, use standard benching
21A	42+59.10	45+00	Fill	Use 44+50 Benching Detail
	45+50	55+00	Fill	Use Standard Benching
21B	108+11.37	116+86.93	Cut/Fill	Use 3H:1V cut slopes or flatter, use standard benching
21C	110+00.53	115+00	Fill	Use Standard Benching
	115+50	118+39.68	Fill	Use 116+00 Benching Detail
21D	200+50.00	210+50	Cut/Fill	Use 3H:1V cut slopes or flatter, use standard benching
	211+00	213+84.30	Fill	Use US 33 1030+50 Benching Detail
16E	37+63.16	38+00	Cut	Use 37+63.16 Rock Cut Design
	38+00	43+50	Cut	Use 3H:1V Cut slopes or flatter
	44+00	45+50	Cut/fill	Use 3H:1V cut slopes or flatter, use standard benching
16F	48+48.97	56+00	Cut	Use 52+50 Rock Cut Design
	56+50	59+00	Cut/fill	Use 2H:1V cut slopes or flatter, use standard benching
16G	158+00	161+50	Cut/fill	Use 3H:1V cut slopes or flatter, use standard benching
	162+00	169+34.07	Cut	Use 169+34.43 Rock Cut Design
16H	23+00	27+00	Cut/fill	Use 3H:1V cut slopes or flatter, use standard benching
	27+50	34+28.77	Cut	Use 29+50 Rock Cut Design

Majority Cut Limits
Majority Fill Limits
Cut/Fill
Bridge

APPENDIX H

CATCHMENT DESIGN

CTL Engineering, Inc.

AN EMPLOYEE OWNED COMPANY Established 1927

Consulting Engineers • Testing • Inspection Services • Analytical Laboratories

PROJECT NO: 230500590 02 SHEET 1 OF 1

~~PHASE~~ PID: 119141 TASK

PROJECT NAME ATH/MEG2-033-18.75

BY DATE

CHECKED BY DATE

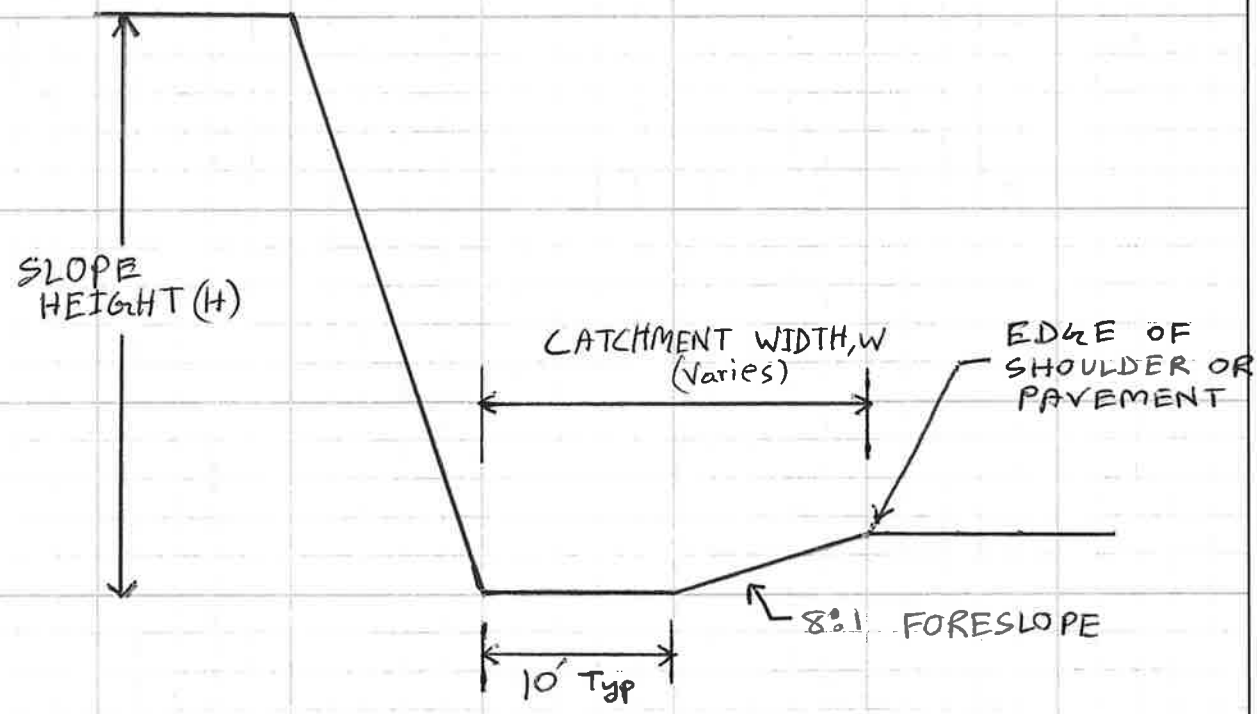

Figure: Typical Ditch Configuration for a Catchment Area with Flat Catchment Area and Angled Foreslope

NOT TO SCALE

CRSP Input File -O:\PROJECT\2023\COL-05\23050059COL_ATH MEG-033-18-70 00-00_HNTB Ohio Inc\Design\Roadway Design Calculations\West Section\Rock Cut Design\Rock Fall Simulation\Sta. 1148+00.dat

Input File Specifications

Units of Measure: U.S.
Total Number of Cells: 5
Analysis Point 1 X-Coordinate: 113.4
Analysis Point 2 X-Coordinate: 0
Analysis Point 3 X-Coordinate: 0
Initial Y-Top Starting Zone Coordinate: 925
Initial Y-Base Starting Zone Coordinate: 925

Remarks:

Cell Data

Cell No.	S.R.	Tang. C.	Norm. C.	Begin X	Begin Y	End X	End Y
1	.5	.8	.2	0	925	34	908
2	.5	.8	.2	34	908	44	908
3	.5	.8	.2	44	908	88.4	885.8
4	.5	.8	.2	88.4	885.8	98.4	885.8
5	.5	.8	.2	98.4	885.8	113.4	887.675

CRSP Simulation Specifications: Used with O:\PROJECT\2023\COL-05\23050059COL_ATH MEG-033-18-70 00-00_HNTB Ohio Inc\Design\Roadway Design Calculations\West Section\Rock Cut Design\Rock Fall Simulation\Sta. 1148+00.dat

Total Number of Rocks Simulated: 100
Starting Velocity in X-Direction: 1 ft/sec
Starting Velocity in Y-Direction: -1 ft/sec
Starting Cell Number: 1
Ending Cell Number: 5
Rock Density: 165 lb/ft^3
Rock Shape: Discoidal
Diameter: 2.2 ft
Thickness: 1.4 ft

CRSP Analysis Point 1 Data - O:\PROJECT\2023\COL-05\23050059COL_ATH MEG-033-18-70 00-00_HNTB Ohio Inc\Design\Roadway Design Calculations\West Section\Rock Cut Design\Rock Fall Simulation\Sta. 1148+00.dat

Analysis Point 1: X = 113.4, Y = 888

Total Rocks Passing Analysis Point: 4

Cumulative Probability	Velocity (ft/sec)	Energy (ft-lb)	Bounce Ht. (ft)
50%	6.69	1137	0.06
75%	6.69	1137	0.74
90%	6.69	1137	1.34
95%	6.69	1137	1.71
98%	6.69	1137	2.12

Velocity (ft/sec)	Bounce Height (ft)	Kinetic Energy (ft-lb)
Maximum: 10.48	Maximum: .18	Maximum: 2249
Average: 6.69	Average: .09	Average: 1137
Minimum: 2.51	G. Mean: .06	Std. Dev.: 0
Std. Dev.: 0 Std. Dev.: 1		

Remarks:

CRSP Data Collected at End of Each Cell - O:\PROJECT\2023\COL-05\23050059COL_ATH MEG-033-18-70 00-00_HNTB Ohio Inc\Design\Roadway Design Calculations\West Section\Rock Cut Design\Rock Fall Simulation\Sta. 1148+00.dat

Velocity Units: ft/sec Bounce Height Units: ft

Cell #	Max. Vel.	Avg. Vel.	S.D. Vel.	Max. Bounce Ht.	Avg. Bounce Ht.
1	21	17	1.58	1	0

2	13	9	2.37	1	0
3	26	21	2.41	2	0
4	20	12	3.03	1	0
5	10	7	0	0	0

CRSP Rocks Stopped Data - O:\PROJECT\2023\COL-05\23050059COL_ATH MEG-033-18-70 00-00_HNTB Ohio Inc\Design\Roadway Design Calculations\West Section\Rock Cut Design\Rock Fall Simulation\Sta. 1148+00.dat

X Interval	Rocks Stopped
0 To 10 ft	22
10 To 20 ft	0
20 To 30 ft	0
30 To 40 ft	0
40 To 50 ft	9
50 To 60 ft	0
60 To 70 ft	0
70 To 80 ft	0
80 To 90 ft	0
90 To 100 ft	3
100 To 110 ft	53
110 To 113.4 ft	9

CRSP Input File -O:\PROJECT\2023\COL-05\23050059COL_ATH MEG-033-18-70 00-00_HNTB Ohio Inc\Design\Roadway Design Calculations\West Section\Rock Cut Design\Rock Fall Simulation\old\Sta. 1189+00.dat

Input File Specifications

Units of Measure: U.S.
Total Number of Cells: 7
Analysis Point 1 X-Coordinate: 84.8
Analysis Point 2 X-Coordinate: 0
Analysis Point 3 X-Coordinate: 0
Initial Y-Top Starting Zone Coordinate: 902
Initial Y-Base Starting Zone Coordinate: 902

Remarks:

Cell Data

Cell No.	S.R.	Tang. C.	Norm. C.	Begin X	Begin Y	End X	End Y
1	.5	.8	.2	0	902	18	893
2	.5	.8	.2	18	893	28	893
3	.5	.8	.2	28	893	38	883
4	.5	.8	.2	38	883	48	883
5	.5	.8	.2	48	883	64.8	874.6
6	.5	.8	.2	64.8	874.6	74.8	874.6
7	.5	.8	.2	74.8	874.6	84.8	875.85

CRSP Simulation Specifications: Used with O:\PROJECT\2023\COL-05\23050059COL_ATH MEG-033-18-70 00-00_HNTB Ohio Inc\Design\Roadway Design Calculations\West Section\Rock Cut Design\Rock Fall Simulation\old\Sta. 1189+00.dat

Total Number of Rocks Simulated: 100
Starting Velocity in X-Direction: 1 ft/sec
Starting Velocity in Y-Direction: -1 ft/sec
Starting Cell Number: 1
Ending Cell Number: 7
Rock Density: 165 lb/ft^3
Rock Shape: Discoidal
Diameter: 4.3 ft

Thickness: 3.4 ft

CRSP Analysis Point 1 Data - O:\PROJECT\2023\COL-05\23050059COL_ATH MEG-033-18-70 00-00_HNTB Ohio Inc\Design\Roadway Design Calculations\West Section\Rock Cut Design\Rock Fall Simulation\old\Sta. 1189+00.dat

Analysis Point 1: X = 84.8, Y = 876

Total Rocks Passing Analysis Point: 5

Cumulative Probability	Velocity (ft/sec)	Energy (ft-lb)	Bounce Ht. (ft)
50%	5.59	6091	0.01
75%	6.02	6959	2.44
90%	6.4	7740	4.63
95%	6.63	8209	5.95
98%	6.89	8735	7.42

Velocity (ft/sec)	Bounce Height (ft)	Kinetic Energy (ft-lb)
Maximum: 6.14	Maximum: .03	Maximum: 7373
Average: 5.59	Average: .01	Average: 6091
Minimum: 4.58	G. Mean: .01	Std. Dev.: 1285
Std. Dev.: .63	Std. Dev.: 3.6	

Remarks:

CRSP Data Collected at End of Each Cell - O:\PROJECT\2023\COL-05\23050059COL_ATH MEG-033-18-70 00-00_HNTB Ohio Inc\Design\Roadway Design Calculations\West Section\Rock Cut Design\Rock Fall Simulation\old\Sta. 1189+00.dat

Velocity Units: ft/sec Bounce Height Units: ft

Cell #	Max. Vel.	Avg. Vel.	S.D. Vel.	Max. Bounce Ht.	Avg. Bounce Ht.

1	15	13	1.78	0	0
2	9	7	1.31	0	0
3	22	20	.97	0	0
4	14	10	2.04	0	0
5	19	17	1.59	0	0
6	14	11	2.03	0	0
7	6	6	.63	0	0

CRSP Rocks Stopped Data - O:\PROJECT\2023\COL-05\23050059COL_ATH MEG-033-18-70 00-00_HNTB Ohio Inc\Design\Roadway Design Calculations\West Section\Rock Cut Design\Rock Fall Simulation\old\Sta. 1189+00.dat

X Interval	Rocks Stopped
0 To 10 ft	71
10 To 20 ft	7
20 To 30 ft	5
30 To 40 ft	0
40 To 50 ft	0
50 To 60 ft	1
60 To 70 ft	0
70 To 80 ft	3
80 To 84.8 ft	8

CRSP Input File -O:\PROJECT\2023\COL-05\23050059COL_ATH MEG-033-18-70 00-00_HNTB Ohio Inc\Design\Roadway Design Calculations\West Section\Rock Cut Design\Rock Fall Simulation\Sta. 1199+00.dat

Input File Specifications

Units of Measure: U.S.
Total Number of Cells: 5
Analysis Point 1 X-Coordinate: 111.4
Analysis Point 2 X-Coordinate: 0
Analysis Point 3 X-Coordinate: 0
Initial Y-Top Starting Zone Coordinate: 907.8
Initial Y-Base Starting Zone Coordinate: 907.8

Remarks:

Cell Data

Cell No.	S.R.	Tang. C.	Norm. C.	Begin X	Begin Y	End X	End Y
1	.5	.8	.2	0	907.8	54.4	880.6
2	.5	.8	.2	54.4	880.6	64.4	880.6
3	.5	.8	.2	64.4	880.6	96.4	864.6
4	.5	.8	.2	96.4	864.6	106.4	864.6
5	.5	.8	.2	106.4	864.6	111.4	865.225

CRSP Simulation Specifications: Used with O:\PROJECT\2023\COL-05\23050059COL_ATH MEG-033-18-70 00-00_HNTB Ohio Inc\Design\Roadway Design Calculations\West Section\Rock Cut Design\Rock Fall Simulation\Sta. 1199+00.dat

Total Number of Rocks Simulated: 100
Starting Velocity in X-Direction: 1 ft/sec
Starting Velocity in Y-Direction: -1 ft/sec
Starting Cell Number: 1
Ending Cell Number: 5
Rock Density: 165 lb/ft^3
Rock Shape: Discoidal
Diameter: 1 ft
Thickness: 0.8 ft

CRSP Analysis Point 1 Data - O:\PROJECT\2023\COL-05\23050059COL_ATH MEG-033-18-70 00-00_HNTB Ohio Inc\Design\Roadway Design Calculations\West Section\Rock Cut Design\Rock Fall Simulation\Sta. 1199+00.dat

Analysis Point 1: X = 111.4, Y = 865

NO ROCKS PAST ANALSYSIS POINT 1

CRSP Data Collected at End of Each Cell - O:\PROJECT\2023\COL-05\23050059COL_ATH MEG-033-18-70 00-00_HNTB Ohio Inc\Design\Roadway Design Calculations\West Section\Rock Cut Design\Rock Fall Simulation\Sta. 1199+00.dat

Velocity Units: ft/sec Bounce Height Units: ft

Cell #	Max. Vel.	Avg. Vel.	S.D. Vel.	Max. Bounce Ht.	Avg. Bounce Ht.
1	No rocks	past end of cell			
2	No rocks	past end of cell			
3	No rocks	past end of cell			
4	No rocks	past end of cell			
5	No rocks	past end of cell			

CRSP Rocks Stopped Data - O:\PROJECT\2023\COL-05\23050059COL_ATH MEG-033-18-70 00-00_HNTB Ohio Inc\Design\Roadway Design Calculations\West Section\Rock Cut Design\Rock Fall Simulation\Sta. 1199+00.dat

X Interval	Rocks Stopped
0 To 10 ft	96
10 To 20 ft	3
20 To 30 ft	1
30 To 40 ft	0
40 To 50 ft	0

50 To 60 ft	0
60 To 70 ft	0
70 To 80 ft	0
80 To 90 ft	0
90 To 100 ft	0
100 To 110 ft	0
110 To 111.4 ft	0

CRSP Input File -O:\PROJECT\2023\COL-05\23050059COL_ATH MEG-033-18-70 00-00_HNTB Ohio Inc\Design\Roadway Design Calculations\West Section\Rock Cut Design\Rock Fall Simulation\Ramp 16F Sta. 52+50.dat

Input File Specifications

Units of Measure: U.S.
Total Number of Cells: 5
Analysis Point 1 X-Coordinate: 90.8
Analysis Point 2 X-Coordinate: 0
Analysis Point 3 X-Coordinate: 0
Initial Y-Top Starting Zone Coordinate: 923
Initial Y-Base Starting Zone Coordinate: 923

Remarks:

Cell Data

Cell No.	S.R.	Tang. C.	Norm. C.	Begin X	Begin Y	End X	End Y
1	.5	.8	.2	0	923	29	908.5
2	.5	.8	.2	29	908.5	39	908.5
3	.5	.8	.2	39	908.5	70.8	892.6
4	.5	.8	.2	70.8	892.6	80.8	892.6
5	.5	.8	.2	80.8	892.6	90.8	893.85

CRSP Simulation Specifications: Used with O:\PROJECT\2023\COL-05\23050059COL_ATH MEG-033-18-70 00-00_HNTB Ohio Inc\Design\Roadway Design Calculations\West Section\Rock Cut Design\Rock Fall Simulation\Ramp 16F Sta. 52+50.dat

Total Number of Rocks Simulated: 100
Starting Velocity in X-Direction: 1 ft/sec
Starting Velocity in Y-Direction: -1 ft/sec
Starting Cell Number: 1
Ending Cell Number: 5
Rock Density: 165 lb/ft^3
Rock Shape: Discoidal
Diameter: 2.2 ft
Thickness: 1.5 ft

CRSP Analysis Point 1 Data - O:\PROJECT\2023\COL-05\23050059COL_ATH MEG-033-18-70 00-00_HNTB Ohio Inc\Design\Roadway Design Calculations\West Section\Rock Cut Design\Rock Fall Simulation\Ramp 16F Sta. 52+50.dat

Analysis Point 1: X = 90.8, Y = 894

NO ROCKS PAST ANALSYSIS POINT 1

CRSP Data Collected at End of Each Cell - O:\PROJECT\2023\COL-05\23050059COL_ATH MEG-033-18-70 00-00_HNTB Ohio Inc\Design\Roadway Design Calculations\West Section\Rock Cut Design\Rock Fall Simulation\Ramp 16F Sta. 52+50.dat

Velocity Units: ft/sec Bounce Height Units: ft

Cell #	Max. Vel.	Avg. Vel.	S.D. Vel.	Max. Bounce Ht.	Avg. Bounce Ht.
1	19	16	1.32	1	0
2	12	7	1.98	0	0
3	23	18	1.96	1	0
4	14	9	2.53	1	0
5	No rocks	past end of cell			

CRSP Rocks Stopped Data - O:\PROJECT\2023\COL-05\23050059COL_ATH MEG-033-18-70 00-00_HNTB Ohio Inc\Design\Roadway Design Calculations\West Section\Rock Cut Design\Rock Fall Simulation\Ramp 16F Sta. 52+50.dat

X Interval	Rocks Stopped
0 To 10 ft	21
10 To 20 ft	0
20 To 30 ft	0
30 To 40 ft	4
40 To 50 ft	0

50 To	60 ft	0
60 To	70 ft	0
70 To	80 ft	4
80 To	90 ft	69
90 To	90.8 ft	2

CRSP Input File -O:\PROJECT\2023\COL-05\23050059COL_ATH MEG-033-18-70 00-00_HNTB Ohio Inc\Design\Roadway Design Calculations\West Section\Rock Cut Design\Rock Fall Simulation\Ramp 16G Sta. 169+34.43.dat

Input File Specifications

Units of Measure: U.S.
Total Number of Cells: 5
Analysis Point 1 X-Coordinate: 91.2
Analysis Point 2 X-Coordinate: 0
Analysis Point 3 X-Coordinate: 0
Initial Y-Top Starting Zone Coordinate: 928
Initial Y-Base Starting Zone Coordinate: 928

Remarks:

Cell Data

Cell No.	S.R.	Tang. C.	Norm. C.	Begin X	Begin Y	End X	End Y
1	.5	.8	.2	0	928	36	910
2	.5	.8	.2	36	910	46	910
3	.5	.8	.2	46	910	76.2	894.9
4	.5	.8	.2	76.2	894.9	86.2	894.9
5	.5	.8	.2	86.2	894.9	91.2	895.525

CRSP Simulation Specifications: Used with O:\PROJECT\2023\COL-05\23050059COL_ATH MEG-033-18-70 00-00_HNTB Ohio Inc\Design\Roadway Design Calculations\West Section\Rock Cut Design\Rock Fall Simulation\Ramp 16G Sta. 169+34.43.dat

Total Number of Rocks Simulated: 100
Starting Velocity in X-Direction: 1 ft/sec
Starting Velocity in Y-Direction: -1 ft/sec
Starting Cell Number: 1
Ending Cell Number: 5
Rock Density: 165 lb/ft^3
Rock Shape: Discoidal
Diameter: 0.8 ft
Thickness: 0.7 ft

CRSP Analysis Point 1 Data - O:\PROJECT\2023\COL-05\23050059COL_ATH MEG-033-18-70 00-00_HNTB Ohio Inc\Design\Roadway Design Calculations\West Section\Rock Cut Design\Rock Fall Simulation\Ramp 16G Sta. 169+34.43.dat

Analysis Point 1: X = 91.2, Y = 896

NO ROCKS PAST ANALSYSIS POINT 1

CRSP Data Collected at End of Each Cell - O:\PROJECT\2023\COL-05\23050059COL_ATH MEG-033-18-70 00-00_HNTB Ohio Inc\Design\Roadway Design Calculations\West Section\Rock Cut Design\Rock Fall Simulation\Ramp 16G Sta. 169+34.43.dat

Velocity Units: ft/sec Bounce Height Units: ft

Cell #	Max. Vel.	Avg. Vel.	S.D. Vel.	Max. Bounce Ht.	Avg. Bounce Ht.
1	No rocks	past end of cell			
2	No rocks	past end of cell			
3	No rocks	past end of cell			
4	No rocks	past end of cell			
5	No rocks	past end of cell			

CRSP Rocks Stopped Data - O:\PROJECT\2023\COL-05\23050059COL_ATH MEG-033-18-70 00-00_HNTB Ohio Inc\Design\Roadway Design Calculations\West Section\Rock Cut Design\Rock Fall Simulation\Ramp 16G Sta. 169+34.43.dat

X Interval	Rocks Stopped
0 To 10 ft	100
10 To 20 ft	0
20 To 30 ft	0
30 To 40 ft	0
40 To 50 ft	0

50 To 60 ft	0
60 To 70 ft	0
70 To 80 ft	0
80 To 90 ft	0
90 To 91.2 ft	0

APPENDIX I

SETTLEMENT ANALYSES

Soil Parameters

Project: ATH-MEG-033-18.70/0.00
Boring No.: B-002-0-23
Station 1048+00
Date: 5/22/24

Layer No.	Top Elev	Bottom Elev	Thickness (feet)	Type	Total Weight (pcf)	N_{60} value (bpf)	Moisture Content (%)	Liquid Limit (LL)	Plastic Limit (PL)	Gs	e_0	C_c	C_r	C_v (cm^2/sec)	Su (psf)	Pre-Consolidation Stress σ'p (psf)	Reference
1	913.2	891.8	21.4	A-6a/A-6b	132	8	24	37	24	2.70							
						15	22	37	21								
			Avg	A-6a/A-6b	132	12	23	37	23	2.70	0.62	0.196	0.039	0.0200	1500	9166	1,2,3
2	891.8	886.8	5.0	A-6a	122	14	16	39	24	2.70							
						24	20										
			Avg	A-6a	122	19	18	39	24	2.70	0.49	0.203	0.041	0.0200	2375	14350	1,2,3

Soil layers encountered below elevation 886.8 are considered incompressible

Reference Key

1 Skempton (1957), FHWA-IF-03-017- GEC-N0.7, TABLE 3.7 used for computing σ'p if no consolidation data is available
2 Kulhawy and Mayne (1990) per GEC 5 (2016), Figure 6-36 used for computing C_c and C_r if no consolidation data is available
3 FHWA GEC 5 (2016) Figure 6-37, Reloading (lower bound) curve used for C_v computation of Cohesive soil if no consolidation data is available

Settlement Calculations

Location **ATH-MEG-033-18.70/0.00**
Boring No. **B-002-0-23**

	Elevation			
Top of Embankment	933.4			
		Emb. Fill Unit Wt. =	125	pcf
Existing Grade	913.2			
		N_{60} Avg =	12	bpf
	Layer A	Unit Wt. =	132	pcf
	906.2			
		N_{60} Avg =	12	bpf
	Layer B	Unit Wt. =	132	pcf
	899.2			
		N_{60} Avg =	12	bpf
	Layer C	Unit Wt. =	132	pcf
	891.8			
		N_{60} Avg =	19	bpf
	Layer D	Unit Wt. =	122	pcf
	886.8			

Emb. Fill Ht.	20.2	ft
Unit Wt. =	125	pcf
q =	2525	psf

Layer	Thickness (H_c) (ft)	Unit Weight(pcf)	z (ft)	$б'_o$ (psf)	I*	N_{60} Avg	$б'_p$ (psf)	$б'_f$ (psf)	Consolidation	Settlement (in) **
A	7	132	3.5	461	1.00	12	9,166	2,986	OC	1.6
B	7	132	10.5	1383	1.00	12	9,166	3,908	OC	0.9
C	7.4	132	17.7	2331	1.00	12	9,166	4,856	OC	0.7
D	5	122	23.9	3123	0.98	19	14,350	5,598	OC	0.4
									Total	3.6

*The influence value (I) for embankment loading was computed based on “Influence Values for Vertical Stresses in Semi- Infinite Loading” charts (After Osterberg 1957).

**The settlement value of Cohesive soils is computed based on LRFD Equation 10.6.2.4.3-1

Time Rate of Settlement Determination

Project: **ATH-MEG-033-18.70/0.00**
Boring No.: **B-002-0-23**
Date: **5/22/24**

Top Elev	Bottom Elev	1 or 2 sides Drained	Total Settlement (in)	H (feet)	Cv (cm2/sec)	Cv (ft2/day)	t (days)	Tv	U (%)	Settlement Remaining (in)	
913.2	906.2	1	1.6	7	0.0200	1.86	7	0.265714	0.58	0.7	
906.2	899.2	1	0.9	7	0.0200	1.86	7	0.265714	0.58	0.4	
899.2	891.8	1	0.7	7.4	0.0200	1.86	7	0.237765	0.55	0.3	
891.8	886.8	1	0.4	5	0.0200	1.86	7	0.5208	0.78	0.1	
	Net=		3.6	in					Total	1.5	in

Top Elev	Bottom Elev	1 or 2 sides Drained	Total Settlement (in)	H (feet)	Cv (cm2/sec)	Cv (ft2/day)	t (days)	Tv	U (%)	Settlement Remaining (in)	
913.2	906.2	1	1.6	7	0.0200	1.86	21	0.797143	0.89	0.2	
906.2	899.2	1	0.9	7	0.0200	1.86	21	0.797143	0.89	0.1	
899.2	891.8	1	0.7	7.4	0.0200	1.86	21	0.713294	0.86	0.1	
891.8	886.8	1	0.4	5	0.0200	1.86	21	1.5624	0.98	0.0	
	Net=		3.6	in					Total	0.4	in

Soil Parameters

Project: ATH-MEG-033-18.70/0.00
Boring No.: B-003-0-23, 34+425
Station 1057+50
Date: 8/14/24

Layer No.	Top Elev	Bottom Elev	Thickness (feet)	Type	Total Weight (pcf)	N_{60} value (bpf)	Moisture Content (%)	Liquid Limit (LL)	Plastic Limit (PL)	Gs	Bearing Capacity Index (BCI)	Sand Fraction (BCI)	e_0	C_c	C_r	C_v (cm^2/sec)	Su (psf)	Pre-Consolidation Stress Ó'p (psf)	Reference
1	902	899.2	2.8	A-7-6	132	18	12	46	26	2.70		0.3							
			Avg	A-7-6	132	18	12	46	26	2.70	44.8	0.3	0.32	0.270	0.054	0.0200	2250	12228	1,2,3
2	899.2	889.2	10.0	A-6a	122	17	11	33	19	2.70		0.4							
						17	10												
						18	14												
						22	12												
			Avg	A-6a	122	19	12	33	19	2.70		0.4	0.32	0.189	0.038	0.0200	2375	14679	1,2,3
3	889.2	865.2	24.0	A-4a	125	23	20			2.65		0.3							
						20	13												
						18													
						22	10												
			Avg	A-4a	125	21	14	NP	NP	2.65	50.6	0.3	0.37			0.0281	0	0	4
4	865.2	849.2	16.0	A-6a/A-7-6	122	11	15	38	25	2.70		0.4							
						19	15	42	24										
			Avg	A-6a/A-7-6	122	15	15	40	25	2.70		0.4	0.41	0.209	0.042	0.0200	1875	11204	1,2,3

*Note: Layers 1, 2 and 3 taken from boring B-003-0-23, Layer 4 taken from historic boring 34+425
Bedrock layers encountered below elevation 849.2 are considered incompressible

Reference Key

1 Skempton (1957), FHWA-IF-03-017- GEC-N0.7, TABLE 3.7 used for computing Ó'p if no consolidation data is available
2 Kulhawy and Mayne (1990) per GEC 5 (2016), Figure 6-36 used for computing C_c and C_r if no consolidation data is available
3 FHWA GEC 5 (2016) Figure 6-37, Reloading (lower bound) curve used for C_v computation of Cohesive soil if no consolidation data is available
4 FHWA GEC 5 (2016) Figure 6-37, Virgin Compression used for C_v computation of granular soils if no consolidation data is available

Settlement Calculations

Location **ATH-MEG-033-18.70/0.00**
Boring No. **B-003-0-23, 34+425**

Emb. Fill Ht. 19.3
Unit Wt. = 125
q = 2412.5 psf

	Elevation		
Top of Embankment	921.3		
		Emb. Fill Unit Wt. =	125 pcf
Existing Grade	902		
		N_{60} Avg =	18 bpf
Layer A		Unit Wt. =	132 pcf
	899.2		
		N_{60} Avg =	19 bpf
Layer B		Unit Wt. =	122 pcf
	889.2		
		N_{60} Avg =	21 bpf
Layer C		Unit Wt. =	125 pcf
	881.2		
		N_{60} Avg =	21 bpf
Layer D		Unit Wt. =	125 pcf
	873.2		
		N_{60} Avg =	21 bpf
Layer E		Unit Wt. =	125 pcf
	865.2		
		N_{60} Avg =	15 bpf
Layer F		Unit Wt. =	122 pcf
	857.2		
		N_{60} Avg =	15 bpf
Layer G		Unit Wt. =	122 pcf
	849.2		
	Bedrock		

Layer	Thickness (H_c) (ft)	Unit Weight(pcf)	z (ft)	σ'_o (psf)	I*	N_{60} Avg	Coarse Fraction	Fine Fraction	BCI	σ'_p (psf)	σ'_f (psf)	Consolidation	Settlement (in) **
A	2.8	132	1.4	184	1.00	18				12,228	2,597	OC	1.6
B	10	122	7.8	979	1.00	19				14,679	3,391	OC	1.9
C	8	125	16.8	2089	1.00	21	0.6	0.4	70.56	-	4,501	NC	0.5
D	8	125	24.8	3089	1.00	21	0.6	0.4	70.56	-	5,501	NC	0.3
E	8	125	32.8	4089	1.00	21	0.6	0.4	70.56	-	6,501	NC	0.3
F	8	122	40.8	5077	1.00	15				11,204	7,489	OC	0.5
G	8	122	48.8	6053	1.00	15				11,204	8,465	OC	0.4
												Total	5.4

*The influence value (I) for embankment loading was computed based on "Influence Values for Vertical Stresses in Semi- Infinite Loading" charts (After Osterberg 1957).

**The settlement value of granular soils (layers C ,D & E) is computed based on the Hough Method and LRFD Equation 10.6.2.4.2b-2.

**The settlement value of Cohesive soils (layers A, B, F & G) is computed based on LRFD Equation 10.6.2.4.3-1

Time Rate of Settlement Determination

Project: **ATH-MEG-033-18.70/0.00**
Boring No.: **B-003-0-23, 34+425**
Date: **8/14/24**

Top Elev	Bottom Elev	1 or 2 sides Drained	Total Settlement (in)	H (feet)	Cv (cm2/sec)	Cv (ft2/day)	t (days)	Tv	U (%)	Settlement Remaining (in)	
902	899.2	1	1.6	2.8	0.0200	1.86	7	1.660714	0.99	0.0	
899.2	889.2	1	1.9	10	0.0200	1.86	7	0.1302	0.41	1.1	
889.2	881.2	2	0.5	4	0.0281	2.6133	7	1.143319	0.95	0.0	
881.2	873.2	2	0.3	4	0.0281	2.6133	7	1.143319	0.95	0.0	
873.2	865.2	2	0.3	4	0.0281	2.6133	7	1.143319	0.95	0.0	
865.2	857.2	1	0.5	8	0.0200	1.86	7	0.203438	0.51	0.2	
857.2	849.2	1	0.4	8	0.0200	1.86	7	0.203438	0.51	0.2	
	Net=		5.4	in					Total	1.6	in

Top Elev	Bottom Elev	1 or 2 sides Drained	Total Settlement (in)	H (feet)	Cv (cm2/sec)	Cv (ft2/day)	t (days)	Tv	U (%)	Settlement Remaining (in)	
902	899.2	1	1.6	2.8	0.0200	1.86	30	7.117347	1.00	0.0	
899.2	889.2	1	1.9	10	0.0200	1.86	30	0.558	0.80	0.4	
889.2	881.2	2	0.5	4	0.0281	2.6133	30	4.899938	1.00	0.0	
881.2	873.2	2	0.3	4	0.0281	2.6133	30	4.899938	1.00	0.0	
873.2	865.2	2	0.3	4	0.0281	2.6133	30	4.899938	1.00	0.0	
865.2	857.2	1	0.5	8	0.0200	1.86	30	0.871875	0.91	0.0	
857.2	849.2	1	0.4	8	0.0200	1.86	30	0.871875	0.91	0.0	
	Net=		4.2	in					Total	0.5	in

Soil Parameters

Project: ATH-MEG-033-18.70/0.00
Boring No.: B-061-0-23
Station 49+00
Date: 8/12/24

Layer No.	Top Elev	Bottom Elev	Thickness (feet)	Type	Total Weight (pcf)	N_{60} value (bpf)	Moisture Content (%)	Liquid Limit (LL)	Plastic Limit (PL)	Gs	e_0	C_c	C_r	C_v (cm^2/sec)	Su (psf)	Pre-Consolidation Stress Ó'p (psf)	Reference
1	905.5	902.0	3.5	A-7-6	122	15	15	42	22	2.7							
			Avg	A-7-6	122	15	15	42	22	2.7	0.41	0.270	0.054	0.0200	1875	10190	1,2,3

Reference Key

1 Skempton (1957), FHWA-IF-03-017- GEC-N0.7, TABLE 3.7 used for computing Ó'p if no consolidation data is available

2 Kulhawy and Mayne (1990) per GEC 5 (2016), Figure 6-36 used for computing C_c and C_r if no consolidation data is available

3 FHWA GEC 5 (2016) Figure 6-37, Reloading (lower bound) curve used for C_v computation of Cohesive soil if no consolidation data is available

Settlement Calculations

Location **ATH-MEG-033-18.70/0.00**
Boring No. **B-061-0-23**

	Elevation			
Top of Embankment	947.58			
			Emb. Fill Unit Wt. =	125 pcf
Existing Grade	874.08		Height =	73.5 ft
			N_{60} Avg =	15 bpf
		Layer A	Unit Wt. =	122 pcf
	870.58			

Embankment Geometry

B_1 = 17 ft
B_2 = 125 ft

Emb. Fill Ht. 73.5 ft
Unit Wt. = 125 pcf
q = 9187.5 psf

Layer	Thickness (H_c) (ft)	Unit Weight(pcf)	z (ft)	$б'_o$ (psf)	B_1 / z	B_2 / z	I*	N_{60} Avg	б'p (psf)	$б'_f$ (psf)	Consolidation	Settlement (in) **
A	3.5	122	1.75	213.5	9.7	71.4	1.00	15	10,190.2	9,401.0	OC	2.65
											Total	2.65

*The influence value (I) for embankment loading was computed based on “Influence Values for Vertical Stresses in Semi- Infinite Loading” charts (After Osterberg 1957).

**The settlement value of Cohesive soils is computed based on LRFD Equation 10.6.2.4.3-1

Time Rate of Settlement Determination

Project: **ATH-MEG-033-18.70/0.00**
Boring No.: **B-061-0-23**
Date: **8/12/24**

Top Elev	Bottom Elev	1 or 2 sides Drained	Total Settlement (in)	H (feet)	Cv (cm2/sec)	Cv (ft2/day)	t (days)	Tv	U (%)	Settlement Remaining (in)	
905.5	902	1	2.65	3.5	0.0200	1.86	7	1.062857	0.94	0.16	
	Net=		2.65	in					Total	0.16	in

Top Elev	Bottom Elev	1 or 2 sides Drained	Total Settlement (in)	H (feet)	Cv (cm2/sec)	Cv (ft2/day)	t (days)	Tv	U (%)	Settlement Remaining (in)	
905.5	902	1	2.65	3.5	0.0200	1.86	30	4.555102	1.00	0.00	
	Net=		2.65	in					Total	0.00	in

Soil Parameters

Project: ATH-MEG-033-18.70/0.00
Boring No.: B-046-0-23
Station 206+50
Date: 5/22/24

Layer No.	Top Elev	Bottom Elev	Thickness (feet)	Type	Total Weight (pcf)	N_{60} value (bpf)	Moisture Content (%)	Liquid Limit (LL)	Plastic Limit (PL)	Gs	e_0	C_c	C_r	C_v (cm^2/sec)	Su (psf)	Pre-Consolidation Stress Ơ'p (psf)	Reference
1	904.5	902.5	2.0	A-7-6	120	10	24	42	25	2.7							
			Avg	A-7-6	120	10	24	42	25	2.7	0.65	0.230	0.046	0.0200	1250	7230	1,2,3
2	902.5	900.5	2.0	A-7-5	115			69	33	2.6	0.95	0.34	0.063			4200	
			Avg	A-7-5	115			69	33	2.6	0.95	0.34	0.063	0.0005		4200.0	4
3	900.5	896.5	4.0	A-7-6	122	15 15	21 26	42	25	2.7							
			Avg	A-7-6	122	15	24	42	25	2.7	0.65	0.230	0.046	0.0200	1875	10844	1,2,3

Soil layers encountered below elevation 896.5 are considered incompressible

Reference Key

1 Skempton (1957), FHWA-IF-03-017- GEC-N0.7, TABLE 3.7 used for computing Ơ'p if no consolidation data is available

2 Kulhawy and Mayne (1990) per GEC 5 (2016), Figure 6-36 used for computing C_c and C_r if no consolidation data is available

3 FHWA GEC 5 (2016) Figure 6-37, Reloading (lower bound) curve used for C_v computation of Cohesive soil if no consolidation data is available

4 Laboratory consolidation test results for boring B-046-0-23, ST-1_2'-4'

Settlement Calculations

Location **ATH-MEG-033-18.70/0.00**
Boring No. **B-046-0-23**

Embankment Geometry

B_1 = 20 ft
B_2 = 118 ft

Emb. Fill Ht. 59 ft
Unit Wt. = 125 pcf
q = 7375 psf

	Elevation			
Top of Embankment	963.5			
		Emb. Fill Unit Wt. =	125	pcf
Existing Grade	904.5	Height =	59	ft
		N_{60} Avg =	10	bpf
		Layer A Unit Wt. =	120	pcf
	902.5			
		Layer B Unit Wt. =	115	pcf
	900.5			
		N_{60} Avg =	15	bpf
		Layer C Unit Wt. =	122	pcf
	896.5			

Layer	Thickness (H_c) (ft)	Unit Weight(pcf)	z (ft)	σ'_o (psf)	B_1 / z	B_2 / z	I*	N_{60} Avg	σ'_p (psf)	σ'_f (psf)	Consolidation	Settlement (in) **
A	2	120	1	120	20.0	118.0	1.00	10	7,229.6	7,495.0	OC	1.22
B	2	115	3	355.4	6.7	39.3	1.00		4,200.0	7,730.4	OC	1.40
C	4	122	6	714.8	3.3	19.7	1.00	15	10,844.4	8,089.8	OC	1.41
											Total	4.03

*The influence value (I) for embankment loading was computed based on “Influence Values for Vertical Stresses in Semi- Infinite Loading” charts (After Osterberg 1957).

**The settlement value of Cohesive soils is computed based on LRFD Equation 10.6.2.4.3-1

Time Rate of Settlement Determination

Project: **ATH-MEG-033-18.70/0.00**
Boring No.: **B-046-0-23**
Date: **5/22/24**

Top Elev	Bottom Elev	1 or 2 sides Drained	Total Settlement (in)	H (feet)	Cv (cm2/sec)	Cv (ft2/day)	t (days)	Tv	U (%)	Settlement Remaining (in)	
904.5	902.5	1	1.22	2	0.0200	1.86	7	3.255	1.00	0.00	
902.5	900.5	1	1.40	2	0.0005	0.050868	7	0.089019	0.35	0.91	
900.5	896.5	1	1.41	4	0.0200	1.86	7	0.81375	0.89	0.15	
	Net=		4.03	in					Total	1.06	in

Top Elev	Bottom Elev	1 or 2 sides Drained	Total Settlement (in)	H (feet)	Cv (cm2/sec)	Cv (ft2/day)	t (days)	Tv	U (%)	Settlement Remaining (in)	
904.5	902.5	1	1.22	2	0.0200	1.86	30	13.95	1.00	0.00	
902.5	900.5	1	1.40	2	0.0005	0.050868	30	0.381511	0.68	0.44	
900.5	896.5	1	1.41	4	0.0200	1.86	30	3.4875	1.00	0.00	
	Net=		4.03	in					Total	0.44	in

APPENDIX J

RESPONSE TO COMMENTS

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

Comments Received from ODOT District 10 on Geotechnical Profile- Roadway Sheets

Comment 1: *Remove "According to Stage 2 Plans" from the Project Description section of the title sheet (Sheet 2/65)*

CTL Response 1: CTL has removed the words.

Comment 2: *Remove "Per the direction of the District, no re-work was done to include the historic boring information on the current soil profile sheets." from the Historic Records section of the title sheet (Sheet 2/65)*

CTL Response 2: CTL has removed the sentence.

Comment 3: *Add DCP Data and Location Table (Sheet 2/65)*

CTL Response 3: CTL has added the table

Comment 4: *Add additional topo lines to the SW portion (Sheet 6/65)*

CTL Response 4: Additional topo lines were added.