Subgrade Exploration Report - Final
MER-127-3.71 Roundabout (PID 120177)
Mercer County, Ohio
S&ME Project No. 23170225A

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November 20, 2025

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Attention: Mr. Jay Hamilton, P.E.

Reference: **Subgrade Exploration Report - Final**
MER-127-3.71 Roundabout (PID 120177)
Mercer County, Ohio
S&ME Project No. 23170225A

Mr. Hamilton:

In accordance with our revised proposal dated January 29, 2025, which was authorized on February 25, 2025, by Mead & Hunt, Inc., Service Work Order No. 240717.02-001 and the Mead & Hunt, Inc. Master Services Agreement executed with S&ME, Inc. (S&ME) on November 15, 2022, S&ME has completed a Subgrade Exploration for the proposed roundabout to be constructed at the intersection of US 127 and SR 119 in southern Mercer County, Ohio. The approximate location of this project is illustrated on the Vicinity Map included as Plate 1 in Appendix A of this report.

In accordance with Section 701 of the January 2025 ODOT *Specifications for Geotechnical Explorations* (*SGE*), S&ME is herewith submitting a "final" version of this report, which is also to be provided to the ODOT District Geotechnical Engineer. This final report addresses the review comments provided by M&H on September 26, 2025. Additionally, ODOT Geotechnical Profile – Roadway sheets will be submitted under separate cover.

We appreciate the opportunity to be of service. Please do not hesitate to contact us if you have any questions concerning this report.

Respectfully,

S&ME, Inc.

Brian K. Sears, P.E.
Senior Engineer | Project Manager

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Principal Engineer | Senior Reviewer



Attachments: Appendices
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1.0 Executive Summary

A roundabout is proposed to improve safety at the existing intersection of US 127 and SR 119 in southern Mercer County, Ohio. Preliminary drawings from Mead & Hunt (M&H) indicate the roundabout will be shifted slightly southeast of the current intersection, with realignment/replacement of the approach embankments and pavement extending approximately 430 feet north, 565 feet west and south, and 635 feet east from the center of the proposed roundabout.

Five (5) subgrade borings and 3 Dynamic Cone Penetrometers (DCP) were performed during this exploration program. Four (4) of the borings were advanced through the existing approach embankments. The type and thickness of existing pavement encountered in these four (4) borings are summarized in Table 4-1 in Section 4.2 of this report. The fifth subgrade boring was located in the southeast quadrant of the existing intersection and encountered 6 inches of rootmat. The DCPs were performed in existing swales or at the toe of the existing roadway approach embankments where rig access was not practical. At the location of each DCP, a hand auger was used to obtain a sample of the uppermost soil beneath the rootmat, and a log of each of these augered explorations is included in Appendix A.

Beneath the existing pavement, Boring B-001-0-24 encountered 1.2 feet of existing fill consisting of hard brown SANDY SILT (A-4a), and Borings B-005-0-24 and B-008-0-24 encountered 2.7 and 0.8 feet, respectively, of possible fill consisting of medium stiff to stiff brown and dark brown SILT AND CLAY (A-6a) and SILTY CLAY (A-6b). In Boring B-005-0-24, the upper portion of the possible fill was slightly organic (Loss-on-Ignition = 2.8%).

Beneath the fill, all the borings and the hand-auger explorations at D-002 and D-004 encountered predominantly stiff to hard brown, brown mottled with gray, and gray CLAY (A-7-6) and SILTY CLAY (A-6b). The soil encountered at D-007-0-24 was medium-stiff. No groundwater was noted in any of these explorations.

Based on conditions encountered in the explorations and the preliminary information provided to date, a summary of the recommendations provided in this report is provided below.

- The ODOT Subgrade Analysis spreadsheet recommends a design California Bearing Ratio (CBR) of 4% based on the subgrade soils encountered during this exploration.
- The ODOT Subgrade Analysis spreadsheet indicates that potentially unstable subgrade materials requiring remediation were encountered in 3 of the 8 explorations (38%). Section 600 of the ODOT "*Geotechnical Design Manual*" (*GDM*) recommends that global subgrade remediation be considered when more than 30% of the subgrade soils may require remediation.
- Based on the predominant type of soils encountered at this site and the results of the subgrade analyses, 14 inches of chemical subgrade stabilization using lime as the additive should be considered for global remediation. See Section 5.2.3 for additional recommendations.
- If global lime stabilization is performed, all borrow soil placed as new fill within 2 feet of the proposed subgrade level of the new pavement shall consist of either A-6b or A-7-6 soil with a Plasticity Index (PI) of 16 or greater.
- Based upon observations made at the time of this investigation, significant groundwater problems are not anticipated in connection with the proposed roadway improvements.

2.0 Introduction

A roundabout is proposed to be constructed to improve safety at the existing intersection of US 127 and SR 119 in southern Mercer County, Ohio. Preliminary plan information provided by M&H indicates that the center of the new roundabout will be shifted into the southeast quadrant of the current intersection, and that realignment of the approach embankments and reconstruction of the pavement will extend roughly 430 to 635 feet from the center of the roundabout.

This exploration was performed in general accordance with the January 2025 updates to the ODOT *Specifications for Geotechnical Explorations* (*SGE*) and the ODOT *Geotechnical Design Manual* (*GDM*).

2.1 Geology

The project site is within a previously glaciated portion of the state identified as the Central Ohio Clayey Till Plain physiographic region, where the soil overburden consists of clayey, high-lime Wisconsinan-age glacial till with isolated areas intermorainal lake basins. The depth to Silurian-age limestone and dolomite bedrock near this site is greater than 100 feet. ODNR mapping indicates this site is not in a probable karst area, that no mapped abandoned underground mines are near the project site, and that the site is in an area of Ohio with low incidence and low susceptibility to landslides.

2.2 Site Reconnaissance

S&ME personnel visited this site on April 22, 2025, to observe the existing conditions at this project site with respect to traffic, utilities, and site access, and to also mark the planned exploration locations. The existing asphalt pavement surface on both roadways appeared to generally be in good condition, with some occasional transverse cracking that had been previously sealed. Micro-planing appeared to have been performed in the westbound lane of SR 119, just west of the intersection.

Numerous overhead wires generally paralleled both sides of all four approaches, and a few underground utility markers were also observed. Shallow, grassy ditches were also present along most of the approach embankments, interrupted by several driveways on the west leg of SR 119. The north, south, and east approach legs are bordered for the most part by crop land.

3.0 Exploration

3.1 Available Information

S&ME accessed the on-line ODOT Transportation Information Mapping System (TIMS) to determine if historic boring information was available for this area. No historic soil information and/or boring logs meeting current *SGE* requirements were located.

3.2 Field Exploration

On May 2, 2025, S&ME performed five (5) Type A subgrade borings and three (3) DCPs with hand-auger sampling for this project. The subgrade borings are designated as B-001-0-23, B-003-0-24, B-005-0-24, B-006-0-24, and B-008-0-24 (hereinafter referred to as B-001, B-003, B-005, B-006 and B-008). The DCPs/hand auger explorations are hereinafter referred to as D-002, D-004, and D-007. The locations (latitude/longitude) of these explorations were obtained by S&ME using a sub-meter GPS unit. These coordinates were forwarded to M&H, who provided S&ME

with the project stationing and offset and existing ground surface elevation at each exploration. The approximate locations of these explorations are shown on the Plan of Borings included as Plate 2 in Appendix A.

The subgrade borings were performed by an ATV-mounted drill rig using a 3¼-inch I.D. hollow-stem auger to advance the borings. Beginning at the existing ground surface or the approximate proposed subgrade level, six (6) feet of soil sampling was continuously attempted using a 2-inch O.D. split-barrel sampler driven by blows from a 140-pound hammer freely falling 30 inches (AASHTO T206 - Standard Penetration Test, SPT). Representative portions of the recovered soil samples were preserved in airtight jars. The drill rig used for this exploration was recalibrated in accordance with ASTM D4633 on May 12, 2025, shortly after completion of the field work for this project, with a measured drill rod energy of 74.9%. At the completion of drilling, these borings were backfilled with soil cuttings mixed with bentonite gravel. Where borings were advanced through existing pavement, the pavement was repaired with an approximately equivalent thickness of cold patch asphalt.

The three (3) DCP soundings were located in areas where new embankments are proposed or in existing swales where the drilling rig could not reasonably access. These explorations were performed using a Kessler K-100 series probe by raising a 17.6-pound weight and measuring the penetration of the DCP for each blow. The DCPs were advanced to termination depths of approximately 60 inches below the existing ground surface. Logs of these Kessler DCP probes are included on Plates 12 through 14 of Appendix A. Following the completion of each DCP, S&ME used a hand auger to obtain samples of the existing soil from 1 to 2 feet below the ground surface for laboratory classification testing. Logs of these hand sampled explorations are included as Plates 5, 7, and 10 in Appendix A.

In the field, experienced S&ME personnel performed the following: 1) examined all samples recovered from the explorations; 2) preserved representative portions of all samples in airtight jars; 3) prepared a log of each boring and DCP sounding; 4) made seepage and groundwater observations; 5) made hand-penetrometer measurements in soil specimens exhibiting cohesion; and, 6) provided liaison between the field work and the Project Manager so that the exploration program could be modified in the event unusual or unexpected subsurface conditions were encountered. All recovered samples were transported to S&ME's laboratory for further identification and testing.

3.3 Laboratory Testing Program

In the laboratory, all recovered soil samples were visually identified and tested for natural moisture content. Liquid/plastic limit determinations and grain-size analyses were performed on a minimum of two (2) selected samples from each subgrade boring and on the samples from the DCP locations. Sulfate testing was also performed on a soil sample recovered from within 3 feet of the approximate proposed subgrade level in each boring and on the samples retained at the DCPs. The results of all tests are reported numerically on the individual boring logs.

Based on the results of the laboratory testing program, soil descriptions contained on the field logs of the borings were modified, if necessary, and laboratory-corrected logs of the explorations are included as Plates 4 through 11 in Appendix A. Shown on these logs are: descriptions of the soil stratigraphy encountered; depths from which samples were preserved; sampling efforts (blow-counts) required to obtain the specimens in the borings; calculated N_{60} values; laboratory testing results; seepage and groundwater observations; and, values of hand-penetrometer measurements made in soil samples exhibiting cohesion. For your reference, hand-penetrometer values are roughly equivalent to the unconfined compressive strength of the cohesive fraction of the soil sample.

Soils have been classified in general accordance with Section 603 of the ODOT *SGE* and described in general accordance with Section 602. An explanation of the symbols and terms used on the boring logs, definitions of the special adjectives used to denote the minor soil components, and information pertaining to sampling and identification are presented on Plate 3 of Appendix A. Group Indices determined from the results of the laboratory testing program are also provided on the boring logs.

4.0 Findings

4.1 General Subsurface Conditions

A summary of the soil and groundwater conditions encountered in the borings is provided in the following sections. Please refer to the exploration logs (Plates 4 through 11 in Appendix A) for more detailed information at each location. Inferences should not be made to the subsurface conditions in the areas between or away from the borings without performance of additional borings or other field verifications.

4.2 Surficial Materials

Table 4-1 below summarizes the type and thickness of existing pavement materials encountered in the subgrade borings performed within existing pavement.

Table 4-1: Existing Pavement Material Thicknesses

Boring/Probe	Roadway	Asphalt (in.)	Concrete (in.)	Granular Base (in.)
B-001-0-24	SR 119	16	6	5
B-005-0-24	SR 119	16	-	6
B-006-0-24	US 127	17½	-	7½
B-008-0-24	US 127	16¾	-	7

Photographs of the cores of the existing pavement performed at Borings B-006 and B-008 are included on Plate 12 in Appendix A.

Boring B-003 and DCPs D-002, D-004, and D-007 were drilled along in the grass areas outside the existing pavement and encountered approximately 6 inches of rootmat.

4.3 Fill/Possible Fill

Boring B-001-0-24 encountered 1.2 feet of existing fill consisting of hard brown SANDY SILT (A-4a) beneath the existing pavement. Boring B-005 encountered possible fill consisting of 1.2 feet of medium stiff to stiff brown SILT AND CLAY (A-6a) which was slightly organic (Loss-on-Ignition = 2.8%) over 1.5 feet of medium stiff dark brown SILTY CLAY (A-6b). Beneath the existing pavement, Boring B-008 encountered 0.8 feet of possible fill described as stiff brown SILTY CLAY (A-6b).

4.4 Natural Soil

Beneath the above materials, the five (5) subgrade borings and the auger samples at DCPs D-002 and D-004 encountered predominantly stiff to hard brown, brown mottled with gray, and gray CLAY (A-7-6) and SILTY CLAY (A-6b) with Liquid Limit values ranging from 39% to 57%. The auger sample obtained at DCP D-007 was medium stiff brown mottled with gray CLAY (A-7-6) with a Liquid Limit of 60%.

4.5 Groundwater Observations

No seepage or groundwater was noted in any of the explorations.

4.6 Soil Sulfate Test Results

Sulfate content testing (ODOT Supplement 1122) was performed on soil samples recovered from just below the existing pavement in the subgrade borings and from within roughly 3 feet of the proposed subgrade level at Boring B-003 and the DCPs. The results of these tests indicated sulfate contents less than the test's detection limit of 40 ppm from all the explorations except D-002, which had a sulfate content of 93 ppm. The ODOT *GDM* identifies a threshold value of 5,000 ppm as the sulfate content concentration above which chemical stabilization should not be performed. The results of these tests are provided on each exploration log in Appendix A.

5.0 Analyses and Recommendations

5.1 Proposed Alignment and Profile

Preliminary plan and profile information from M&H indicates the center of the proposed roundabout will be positioned slightly southeast of the existing intersection, requiring realignment/replacement of the approach embankments and pavement approximately 430 feet north, 565 feet west and south, and 635 feet east from the center of the proposed roundabout. The proposed profiles of US 127 and SR 119 indicate that only minimal adjustments are planned where the horizontal alignment remains relatively unchanged, but that approximately 3 feet of new fill placement will be required in the southeast quadrant of the existing intersection where the majority of the new roundabout will be located.

5.2 Subgrade Analyses

5.2.1 ODOT Subgrade Analysis

Section 600 of the ODOT *GDM* provides a standard approach to performing explorations and assessing roadway subgrades. The associated spreadsheet (Ver. 14.6, updated 11/6/24) created by the ODOT Office of Geotechnical Engineering (OGE) is used to estimate roadway subgrade support parameters and identify areas requiring remediation. The spreadsheet (see Appendix B) summarizes the subgrade soil types encountered in the borings drilled for this project by ODOT/HRB classification, group indices, depth, blow-counts, Atterberg Limit, and sulfate content values. Using this data, this spreadsheet computes an average of the estimated values of the California Bearing Ratio (CBR) for the soils encountered at or below the anticipated subgrade level of the proposed roadway profile.

The ODOT Subgrade Analysis spreadsheet also identifies subgrade soils which are "unsuitable" either by classification (A-4b, A-2-5, A-5, A-7-5, A-8a, A-8b) or if the Liquid Limit value is greater than 65%. The spreadsheet also determines if a subgrade soil may be potentially "unstable" and possibly require subgrade

remediation by comparing the lab-measured moisture content to the estimated optimum moisture content of the subgrade soil, and/or by comparing the normalized blow-count (N_{60}) and the lowest N value (N_{60L}) from SPT sampling.

Based on these comparisons and correlations, the Subgrade Analysis spreadsheet provides alternative approaches to remediate and establish a stable soil subgrade using either "excavate and replace" (ODOT *Construction and Material Specifications* (*CMS*) Item 204) or chemical stabilization (*CMS* Item 206 and Supplement 1120). However, soils with a sulfate content above 5,000 ppm are generally prohibited from being chemically stabilized.

The subgrade remediation depths identified by the Subgrade Analysis spreadsheet presented in Appendix B are based on the conditions encountered in the borings during this subsurface investigation. However, because the required amount of remediation is dependent on the moisture content of the subgrade soil at the time of construction, Section 600 of the ODOT *GDM* states that the ultimate decision on required remediation depths and limits should be based on observations during either proofrolling or test-rolling operations.

5.2.2 Subgrade Support Parameters

The ODOT Subgrade Analysis spreadsheet (see Appendix B) computes an average of the estimated CBR values for the soils encountered at or below the anticipated subgrade level of the proposed roadway profile.

Based on the preliminary profile information provided by M&H for the proposed roadways, the following design CBR value has been computed by the ODOT Subgrade Analysis spreadsheet for use during new pavement design:

$$CBR = 4\%$$

Based on this CBR value and Section 203.1 of the current ODOT *Pavement Design Manual* (*PDM*), the following value of Resilient Modulus (M_R) correlates to this average CBR value.

$$M_R = 4{,}800 \text{ psi}$$

These subgrade support values may be used during new pavement thickness design for this project provided that the entire proposed pavement subgrade is prepared in strict accordance with Item 204 of the ODOT *CMS*, and that all borrow soil placed within 3 feet of the final subgrade elevation of the new pavement provides average subgrade support parameters which meet or exceed the above values. This subgrade evaluation also assumes that the subgrade for the new roadway and roundabout pavements is composed of the materials encountered in the borings. If, at the time of construction, it is determined that the subgrade consists of materials different than those encountered in the borings, the pavement design subgrade criteria should be reviewed and, if necessary, modified.

However, if a global chemical subgrade stabilization program is performed for this project, Section 203.4.1 of the ODOT *PDM* states when the entire subgrade is chemically stabilized, the resilient modulus of the subgrade soil may be increased by a factor of 1.36. This increase in the design Resilient Modulus value may enable ODOT to use a thinner pavement section to carry the same volume of traffic. Therefore, provided a **global** chemical subgrade stabilization program is implemented, the following value of Resilient Modulus ($M_{R\text{-}GCS}$) may be considered for use during replacement pavement design:

$$M_{R\text{-}GCS} = 6{,}525 \text{ psi}$$

Additional requirements, recommendations, and discussions related to a global chemical stabilization program for this project are presented in Section 5.2.3 of this report.

5.2.3 Subgrade Remediation Recommendations – Global Lime Stabilization

Three (3) of the eight (8) explorations (38%) performed for this project encountered soils at or just below the proposed subgrade level with characteristics defined by the Subgrade Analysis spreadsheet as being problematic (excessive soil moisture content, low N_{60} value or low hand penetrometer measurement) and require remediation by the procedures recommended in the subgrade analysis. The ODOT *GDM* recommends that a global subgrade remediation program be considered when more than 30% of the subgrade area requires remediation. As such, S&ME recommends that a global subgrade remediation program consisting of chemical stabilization using lime be performed.

The Subgrade Analysis spreadsheet indicates that a 14-inch-thick layer of lime stabilized subgrade soil should be provided for this project based on the soils encountered within 3 feet of the anticipated subgrade. Also, the lateral limits of the chemical stabilization should extend to at least 18 inches outside the outside edge of the proposed widened pavement or paved shoulder, including beneath any curbs and gutters.

Implementing a global lime subgrade stabilization program will also require that all soil placed as borrow within 2 feet of the proposed subgrade level must be tested in the laboratory to determine the Plasticity Index of the potential borrow is 16 or greater (e.g., A-7-6 or A-6b) and meets the criteria of ODOT CMS 703.16.A. We also recommend that lab testing of the borrow soils be performed prior to importing borrow to the site.

To utilize the improved Resilient Modulus value for a globally stabilized soil subgrade ($M_{R\text{-}GCS}$) discussed in Section 5.2.2 of this report, S&ME recommends that the mixture design for the lime-soil subgrade be performed in accordance with ODOT *CMS* Item 206, including Item 206.06, "Mixture Design for Chemically Stabilized Soils." Section 609 of the ODOT *GDM* presents additional pay items for the chemical stabilization which should be included in the project plans.

5.2.4 Additional Subgrade Remediation Considerations

The estimated subgrade remediation depth is based on conditions encountered in the borings during this subsurface exploration. However, because the required amount of remediation is dependent on the materials encountered and moisture content of the subgrade soil at the time of construction, the ultimate decision on required remediation depths and limits should be based on observations during either proof rolling or test rolling operations.

As underground utilities may be present near this intersection project, the depths of the known utilities should be taken into consideration prior to commencing subgrade remediation within the project alignment. Utilities near the proposed bottom of the subgrade stabilization depth should be removed/relocated prior to commencing subgrade remediation operations.

5.3 Earthen Embankment Construction

Although the preliminary profile information provided by M&H indicates the proposed roadway profile will be relatively unchanged with respect to the roadway profile, some fill placement will be required where horizontal

realignment of the approach embankments is planned. In the southeast quadrant of the existing intersection where the center of the new roundabout will be located, approximately 3 feet of new fill will be required.

5.3.1 Embankment Foundation Preparation

Before commencing earthwork operations, it is recommended that all existing pavement, granular base, grass, topsoil, vegetation, and other miscellaneous materials be completely removed from the entire footprint of the proposed roadway subgrade and embankment realignment/widening areas. Following the removal of these materials, it is recommended that the entire exposed subgrade and embankment foundation surface be examined by the Geotechnical Engineer of Record or their designated representative to identify any weak, wet, organic, or otherwise unsuitable soils that were not encountered during the subsurface exploration, especially in widened areas. Any such materials identified should be removed and replaced with suitable compacted fill (Item 203, or Item 204 when within 12 inches of the proposed subgrade).

Existing underground utility lines may be present beneath and adjacent to the existing roadway, and the type of material used and the relative compactness of backfill within any such utility trenches are unknown. S&ME recommends any planned utility relocation be performed prior to proofrolling. Some instability of utility trench backfill may occur during earthwork operations and/or proofrolling, and some recompaction of granular utility trench backfill may become necessary. Additionally, if water has accumulated within the utility backfill, the subgrade soil in the vicinity of any saturated utility trenches may have become sufficiently weak, soft, and/or wet that proofrolling may identify these additional areas as requiring overexcavation and replacement. In any case, care should be taken not to disturb any shallow utilities during proofrolling or overexcavation activities.

5.3.2 Unsuitable Soils

None of the borings performed during this exploration encountered soil within 3 feet of the proposed subgrade level which ODOT *GDM* Section 600 considers to be unsuitable either by classification (A-4b, A-2-5, A-5, A-7-5, A-8a, A-8b), or which has a Liquid Limit value exceeding 65%. However, because of the wide spacing of the explorations, it is possible that areas of unsuitable organic, elastic, or silt materials not encountered in any of the borings may be encountered during earthwork and proofrolling operations. If such materials are encountered, they should be either completely overexcavated and replaced, or removed to a depth of 3 feet below proposed subgrade.

5.3.3 "At-Grade"/"Cut" Soil Subgrade Areas

Once the desired soil subgrade elevation has been attained in "at-grade" and "cut" subgrade areas, it is recommended that construction traffic be restricted from traveling on the exposed subgrade soils prior to the completion of the chemical subgrade stabilization program. Cohesive subgrade soils subjected to repeated construction traffic and moisture fluctuations resulting from exposure to rainfall and/or surface water runoff may exhibit subgrade instability requiring additional remediation prior to the global subgrade stabilization program.

5.3.4 "Fill" Embankment Areas

Prior to commencing fill placement in embankment realignment or widening areas, S&ME recommends that consideration be given to performing Item 206.04 Test Rolling on all exposed embankment foundation areas beneath areas where new fill is required. Test rolling, performed in accordance with Item 204.06 of the ODOT *CMS* and Section 204 of the ODOT *Construction Administration Manual of Procedures*, would assist in identifying soft, wet, or weak zones, or areas of unsuitable, organic, or highly plastic soil that may be present in ditches,

swales, or wetland areas. If any such zones of soft, wet, or weak soils are present, the materials contained in these zones should be scarified, dried, and thoroughly recompacted in place in accordance with ODOT *CMS* Item 203.07. If unsuitable or organic soils are encountered, these materials should be completely removed and the overexcavation filled in a controlled manner with compacted, suitable embankment material (*CMS* Item 203.02) which meet the additional requirements previously discussed in Sections 5.2.2 and 5.2.3.

Soft, weak, wet, or unsuitable soils that are not removed from beneath a thin layer of fill may result in difficulties achieving the compaction percentages required for the new fill (ODOT *CMS* Items 203.07 or 204.03) such that final subgrade acceptance proofrolling may require overexcavation of the new fill where weak soils were "bridged" by a minimal thickness of new fill. Although ODOT *CMS* Item 203.05 permits the use of a "bridge lift" to aid in spanning soft or wet foundation areas, S&ME recommends that this practice not be permitted unless more than 3 feet of new embankment fill placement is required. Additionally, even if more than 3 feet of new fill is required in existing roadway ditches and the proposed widened areas, S&ME does not recommend that a bridge lift be permitted in these areas because of the potential for organic soil in these areas. Long term settlement within any organic soil left in the embankment areas may result in the development of a depression in the pavement surface.

5.3.5 Benching and Embankment Slopes

It is recommended that horizontal benches be cut into all existing sloping surfaces to permit placement and compaction of new fill in horizontal lifts. Where new fill is to be placed on an existing ground surface which is sloping more steeply than 8(H):1(V), S&ME recommends that benching of the existing ground be performed in accordance with ODOT *CMS* Item 203.05.

However, at locations where the existing ground surface is steeper than 4(H):1(V), S&ME recommends "Special Benching" procedures as outlined in Section 800, "Special Benching and Sidehill Embankment Fills" of the ODOT *GDM* and the 2017 ODOT *Construction Inspection Manual of Procedures* should be performed. Sketches illustrating several "typical" Special Benching configurations for sidehill fills on various slopes are included in Figures 800-1, 800-3, and 800-4 of the ODOT *GDM*.

During any required Special Benching procedures, S&ME also recommends the followings: 1) only one bench be exposed at any given time and that excavation of the next bench should not be permitted until embankment fill placement and compaction has been completed to the top of the backslope of the previous bench; and, 2) the length of any given bench that is exposed should not exceed the quantity of embankment fill which may be properly placed and compacted in one day. Additionally, S&ME recommends that the final, completed side slopes of embankments, either cut slopes or fill embankments, be constructed no steeper than 2(H):1(V).

As stated in Section 800 of the ODOT *GDM*, wherever "Special Benching" is used, Plan Note G109 from the ODOT L&D Manual, Vol. 3, should be included in the General Notes.

5.3.6 Borrow Requirements and Compaction Criteria

As previously discussed, all soil placed as borrow within 2 feet of the proposed pavement subgrade elevation must be tested in the laboratory to determine that the Plasticity Index of the borrow soil is no less than 16.

Additionally, all borrow materials placed as new fill or backfill within 3 feet of the proposed subgrade level should be tested in the laboratory to determine if the borrow materials are capable of exhibiting subgrade support characteristics that are no less than the CBR value used during the pavement design.

Soil used as borrow for embankment widening/realignment at depths greater than 3 feet below the proposed subgrade, or in areas more than 18 inches beyond the outside edges of the new pavement, should consist of inorganic soil free of all miscellaneous materials, cobbles, and boulders, which is placed in uniform, thin layers and then compacted in accordance with ODOT *CMS* Item 203. No borrow material should be placed in a frozen condition or upon a frozen surface, and any sloping surfaces on which new fill is to be placed should first be benched in accordance with either ODOT *CMS* Item 203.05 or Section 800 of the ODOT *GDM*, depending on the slope of the existing ground surface at each location.

Compaction requirements for the construction of earthen embankments are based on ODOT *CMS* Item 203.07.B which specifies a minimum percent compaction based on the dry unit weight of the type of soil fill being placed as borrow. S&ME recommends that once the source of borrow for this project is determined, sampling and testing of this borrow material be performed prior to construction to verify that the borrow soils are suitable for the planned construction.

5.3.7 Compaction/Moisture Conditioning Concerns

The cohesive soils encountered in the borings performed for this project, if exposed to inclement weather or rainfall, may rapidly absorb additional moisture, and weaken. It is imperative that these soil types not be exposed to rainfall while in a loosened state (such as during discing and drying for moisture conditioning during fill placement or prior to chemical subgrade stabilization). Should these materials become sufficiently saturated that additional moisture conditioning is impractical, the material should be wasted. Therefore, it is recommended that moisture conditioning only be performed when extended periods of suitable weather are anticipated, and that only the amount of borrow soil be exposed that may be moisture conditioned and properly compacted during suitable weather periods.

5.3.8 Additional Recommendations

S&ME recommends that construction traffic be minimized once the required subgrade level has been attained, both prior to and following, the global subgrade stabilization program. Construction traffic resulting from cyclical haul routes or limited access points may increase the quantity of soil identified by final proof rolling as requiring removal, even in chemically stabilized areas.

5.4 Groundwater Considerations for Roadway Subgrade

Based upon observations made at the time of this investigation, significant groundwater problems are not anticipated in connection with the proposed roundabout construction. The new roundabout subgrade should be graded to prevent surface runoff from pooling on the cohesive soils during construction as exposure of cohesive soils to moisture will result in a decrease in strength and an increase in compressibility. Soil softened by standing water or disturbed by construction activities should be removed before proceeding with construction.

In addition to proper subgrade preparation, we recommend that the pavement construction includes surface and subsurface drainage measures. Water which infiltrates the pavement and remains trapped within the pavement components during traffic loading is one of the leading causes of premature pavement failure. Effective design measures include the use of perforated underdrain pipes or finger drains below pavements and/or the use of perimeter swales, perimeter edge drains, curbs, or a combination of these features to collect surface water runoff from areas adjacent to the pavement. Cohesive subgrade soils should be crowned or sloped to promote drainage of infiltrating water towards subsurface drainage collection systems.

6.0 Considerations and Report Limitations

This report has been prepared in accordance with generally accepted geotechnical engineering practice for specific application to this project. The conclusions and recommendations contained in this report are based upon applicable standards of our practice in this geographic area at the time this report was prepared. No other representation or warranty, either expressed or implied, is made.

We relied on preliminary project information given to us to develop our conclusions and recommendations. If project information described in this report is not accurate, or if it changes during project development, we should be notified of the changes so that we can modify our recommendations based on this additional information, if necessary.

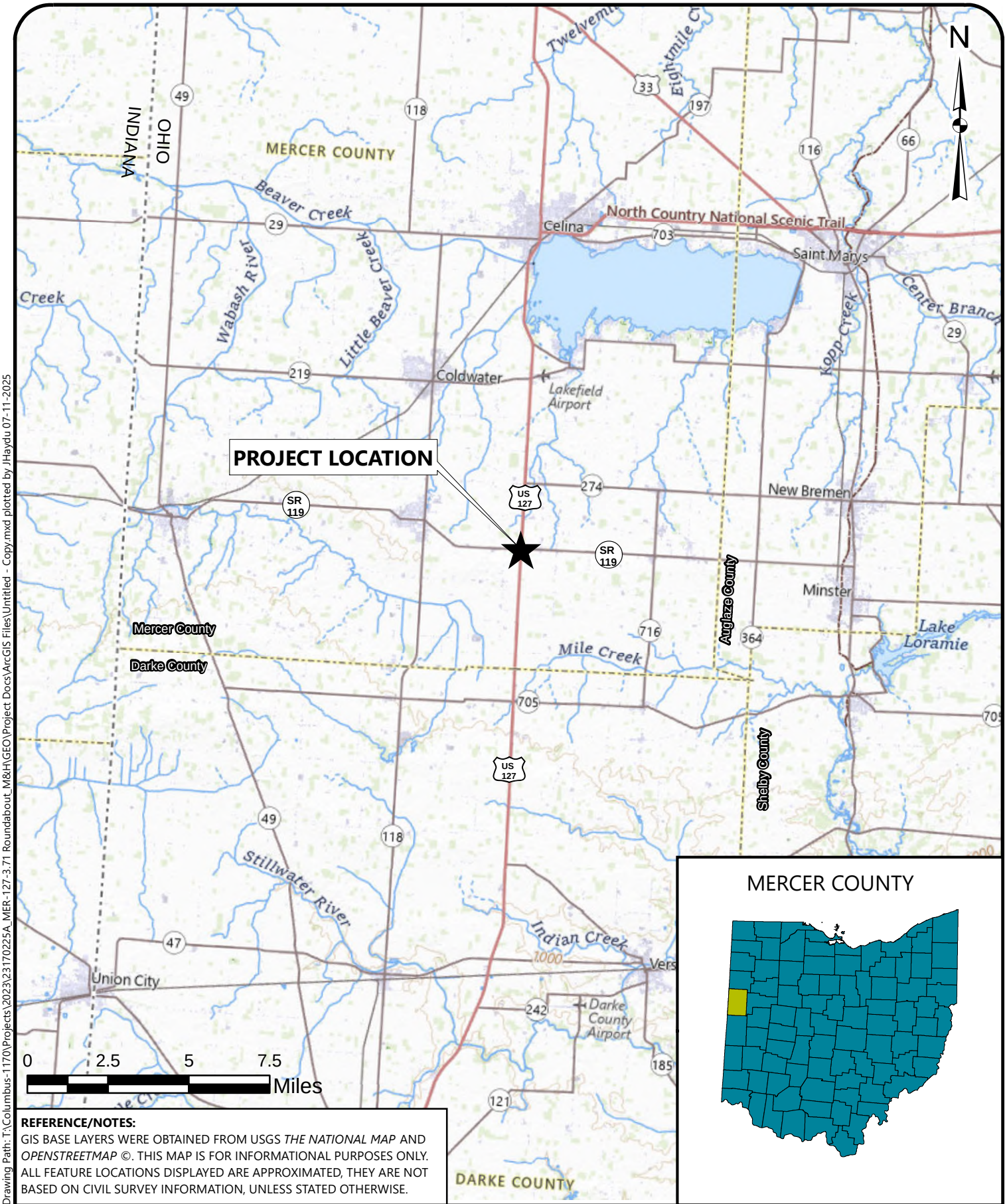
Our conclusions and recommendations are based on limited data from a field exploration program. Subsurface conditions can vary widely between explored areas. Some variations may not become evident until construction. If conditions are encountered which appear different than those described in our report, we should be notified. This report should not be construed to represent subsurface conditions for the entire site.

Unless specifically noted otherwise, our field exploration program did not include an assessment of regulatory compliance, environmental conditions or pollutants or presence of any biological materials (mold, fungi, bacteria). If there is a concern about these items, other studies should be performed. S&ME can provide a proposal and perform these services if requested.

S&ME should be retained to review the final plans and specifications to confirm that earthwork, foundation, and other recommendations are properly interpreted and implemented. The recommendations in this report are contingent on S&ME's review of final plans and specifications followed by our observation and monitoring of earthwork and foundation construction activities.

Appendices

Appendix A



REFERENCE/NOTES:
GIS BASE LAYERS WERE OBTAINED FROM USGS *THE NATIONAL MAP* AND *OPENSTREETMAP* ©. THIS MAP IS FOR INFORMATIONAL PURPOSES ONLY. ALL FEATURE LOCATIONS DISPLAYED ARE APPROXIMATED, THEY ARE NOT BASED ON CIVIL SURVEY INFORMATION, UNLESS STATED OTHERWISE.

Drawing Path: T:\Columbus-1170\Projects\2023\23170225A_MER-127-3.71 Roundabout_M&H\GEO\Project Docs\ArcGIS Files\Untitled - Copy.mxd plotted by JHaydu 07-11-2025

VICINITY MAP

MER-127-3.71 ROUNDABOUT
MERCER COUNTY, OHIO

SCALE:	1 in = 4 miles
DATE:	7-11-25
PROJECT NUMBER	23170225A
PLATE No.	1

Drawing Path: T:\Columbus-1170\Projects\2023\23170225A_MER-127-3.71 Roundabout_M&H\GEO\Project Docs\ArcGIS Files\POB.mxd plotted by MohdAnsari 07-07-2025



REFERENCE:
THIS MAP IS FOR INFORMATIONALPURPOSES ONLY. ALL FEATURE LOCATIONS DISPLAYED ARE APPROXIMATED, ANDARE NOT BASED ON CIVIL SURVEY INFORMATION UNLESS STATED OTHERWISE.

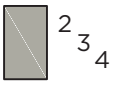
PLAN OF BORINGS AND DCP LOCATIONS

MER-127-3.71 ROUNDABOUT
MERCER COUNTY, OHIO

SCALE:	1 " = 250 '
DATE:	7-7-25
PROJECT NUMBER	23170225A
PLATE No.	2

ODOT SOIL LOG LEGEND

The STANDARD PENETRATION TEST (SPT) as defined by AASHTO T206 (or ASTM D1586) is a method to obtain a disturbed soil sample for examination and testing and to obtain relative density and consistency information. A standard 1.4-inch I.D./2-inch O.D. split-barrel sampler is driven three 6-inch increments (see graphic at right) with a 140 lb. hammer freely falling 30 inches. The hammer can either be of a trip, free-fall design, or actuated by a rope and cathead. The SPT N Value is determined by adding the number of blows from the 2nd and 3rd 6-inch increments.



SPT BLOWCOUNT CORRECTION FOR HAMMER EFFICIENCY (N_{60}) is determined by the following equation: $N_{60} = N * [$ Drill Rod Energy Ratio (%) / 60], and where the drill rod energy ratio is determined in accordance with ASTM D4633. If the drill rod energy ratio exceeds 90%, it is limited to 90% to determine the N_{60} value and is shown on the log as 90*.

SHELBY TUBE (ST) samples are obtained by hydraulically pushing a thin-walled tube (typically 3-inches in diameter) to obtain a relatively undisturbed sample for testing of fine-grained soils to determine engineering properties such as strength, compressibility, permeability, and density. Shelby tubes are sampled in general accordance with ASTM D1587 (AASHTO T207).



DESCRIPTIVE ORDER OF SOIL STRATA: Consistency/Density, color, ODOT soil classification description, minor soil constituents with percentage modifiers, organic content, miscellaneous constituents or descriptions, relative moisture condition.

ODOT SOIL CLASSIFICATION DESCRIPTION AND SYMBOL

- **GRAVEL** (A-1-a)
- **GRAVEL WITH SAND** (A-1-B)
- **FINE SAND** (A-3)
- **COARSE AND FINE SAND** (A-3a)
- **GRAVEL WITH SAND AND SILT** (A-2-4 OR A-2-5)
- **GRAVEL WITH SAND, SILT AND CLAY** (A-2-6 OR A-2-7)
- **SANDY SILT** (A-4a)
- **SILT** (A-4b)
- **ELASTIC SILT AND CLAY** (A-5)
- **SILT AND CLAY** (A-6a)
- **SILTY CLAY** (A-6b)
- **ELASTIC CLAY** (A-7-5)
- **CLAY** (A-7-6)
- **ORGANIC SILT** (A-8a)
- **ORGANIC CLAY** (A-8b)
- **PEAT**
- **UNCONTROLLED FILL**
- **BOULDERY ZONE**
- **SOD/ROOTMAT/ TOPSOIL**
- **PAVEMENT OR BASE**
- **CONCRETE**

SOIL LOG SYMBOLS

SS - Split-Spoon Sample

ST - Shelby Tube Sample

TR - Top of Rock

REC - Sample Recovery, %

HP - Hand Penetrometer Value, tsf

LOI - Loss on Ignition Test, %

Qu - Unconfined Compressive Strength

γd - Dry Unit Weight, pcf

γm - Moist Unit Weight, pcf

GR - Gravel Content, %

CS - Coarse Sand Content, %

FS - Fine Sand Content, %

SI - Silt Content, %

CL - Clay Content, %

LL - Liquid Limit

PL - Plastic Limit

PI - Plasticity Index

WC - Natural Water Content, %

NOTE: Particle size contents are expressed % by weight.

PARTICLE SIZE

Particle	Size	US Sieve Size
Boulder	>300 mm (12 in.)	12 in.
Cobble	75 - 300 mm (3 - 12 in.)	3 - 12 in.
Coarse gravel	19 - 75 mm (3/4 - 3 in.)	3/4 - 3 in.
Fine gravel	2 - 19 mm (0.08 - 3/4 in.)	#10 - 3/4 in.
Coarse sand	0.42 - 2.0 mm	#40 - #10
Fine sand	0.074 - 0.42 mm	#200 - #40
Silt	0.005 - 0.074 mm	NA
Clay	< 0.005 mm	NA

FINE-GRAINED SOIL
(Relative Consistency)

	N_{60}	HP
Very soft	< 2 bpf	< 0.25 tsf
Soft	2 - 4 bpf	> 0.25 - 0.5 tsf
Medium stiff	5 - 8 bpf	> 0.5 - 1.0 tsf
Stiff	9 - 15 bpf	> 1.0 - 2.0 tsf
Very stiff	16 - 30 bpf	> 2.0 - 4.0 tsf
Hard	> 30 bpf	> 4.0 tsf

COARSE-GRAINED SOIL
(Relative Density)

	N_{60}
Very loose	< 5 bpf
Loose	5 - 10 bpf
Medium dense	11 - 30 bpf
Dense	31 - 50 bpf
Very dense	> 50 bpf

MINOR CONSTITUENTS
(% By Weight)

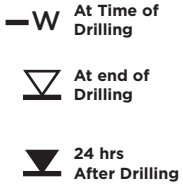
	Percentage
Trace	0% - 10%
Little	>10% - 20%
Some	>20% - 35%
"And"	≥ 35%

ORGANIC CONTENT OF SOIL
(Determined by ASTM D2974 or AASHTO T267)

Classification	Percentage
Slightly organic	2% - 4%
Moderately organic	>4% - 10%
Highly organic	> 10%

RELATIVE MOISTURE CONDITION

Dry	Cohesive - Powdery, WC well below PL Granular - No moisture present
Damp	Cohesive - Leaves very little moisture when pressed, WC < PL Granular - Internal moisture, little to no surface moisture
Moist	Cohesive - Leaves moisture when pressed, PL < WC < LL - 3 Granular - Free water on surface, shiny appearance
Wet	Cohesive - Mushy, WC near or above LL Granular - Voids filled with free water



Free water (seepage or groundwater) observation made anytime during the drilling process. Depending on time of reading and drilling methodologies, this value may be influenced by the drilling process.

Free water measurement soon after the drilling processes are complete, and the borehole is at final depth. Drilling fluids, if introduced during drilling, may influence this measurement.

Free water measurements made in a borehole hours to days after drilling is complete including the time elapsed (i.e., "24 hrs" as shown at left). Depending on subsurface conditions, elapsed time, drilling process, etc. this observation may reflect a stabilized level.

REFERENCES:

Ohio Department of Transportation (ODOT), Specifications for Geotechnical Explorations (SGE)

S&ME JOB: 23170225A

PROJECT: MER-127-3.71	DRILLING FIRM / OPERATOR: ADC / T. FROST	DRILL RIG: ADC CME 550X (ATV)	STATION / OFFSET: 678+10, 20' RT
TYPE: SUBGRADE	SAMPLING FIRM / LOGGER: S&ME / M. ANSARI	HAMMER: CME AUTOMATIC	ALIGNMENT: CL CONST SR 119
PID: 120177 BR ID: N/A	DRILLING METHOD: 3-1/4" HSA	CALIBRATION DATE: 5/12/25	ELEVATION: 960.1 (MSL) EOB: 8.0 ft.
START: 5/2/25 END: 5/2/25	SAMPLING METHOD: SPT	ENERGY RATIO (%): 74.9	LAT / LONG: 40.407038 N, 84.573530 W

EXPLORATION ID **B-001-0-24**

PAGE 1 OF 1

MATERIAL DESCRIPTION AND NOTES	ELEV. 960.1	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	SO4 ppm	BACK FILL
ASPHALT - 16 INCHES	958.8																		
CONCRETE - 6 INCHES	958.2																		
GRANULAR BASE - 5 INCHES	957.8					SS-1A	-	-	-	-	-	-	-	-	-	-	A-1-b (V)	-	
Fill: Hard brown **SANDY SILT**, some clay, little fine to coarse gravel, damp.	956.6	1	3 12 6	22	100	SS-1B	4.5+	16	16	17	27	24	26	16	10	12	A-4a (3)	40	
Hard brown mottled with gray **SILTY CLAY**, some fine to coarse sand, trace fine gravel, damp to moist.	955.1	2	3 4 4	10	100	SS-2	4.5+	5	7	16	24	48	39	19	20	22	A-6b (11)	-	
Stiff gray **SILTY CLAY**, some fine to coarse sand, trace fine gravel, damp.	953.6	3	1 2 2	5	100	SS-3	1.7-2.0	-	-	-	-	-	-	-	-	17	A-6b (V)	-	
Stiff to very stiff gray **CLAY**, some silt, trace to little fine to coarse sand, trace fine gravel, damp.	952.1	4	1 2 4	7	100	SS-4	1.0-2.2	-	-	-	-	-	-	-	-	23	A-7-6 (V)	-	
	EOB	5																	
		6																	
		7																	
		8																	

NOTES:
- No water encountered during drilling.

NOTES: SEE ABOVE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: ASPHALT PATCH; SOIL CUTTINGS MIXED WITH BENTONITE

S&ME ODOT SULFATE (8.5X11) - SGE 01/2019 - OH DOT.GDT - 7/11/25 08:52 - R:\SERVICE LINES\CS-2557\COLUMBUS\GINTW\PROJECTS\23170225A MER-127.GPJ

PLATE 4

S&ME JOB: 23170225A

PROJECT: MER-127-3.71
TYPE: SUBGRADE
PID: 120177 BR ID: N/A
START: 5/2/25 END: 5/2/25

DRILLING FIRM / OPERATOR: S&ME / M. ANSARI
SAMPLING FIRM / LOGGER: S&ME / M. ANSARI
DRILLING METHOD: BUCKET AUGER
SAMPLING METHOD: GRAB

DRILL RIG: HAND AUGER
HAMMER: HAND SAMPLING
CALIBRATION DATE: N/A
ENERGY RATIO (%): 0

STATION / OFFSET: 682+05, 41' LT
ALIGNMENT: CL CONST SR 119
ELEVATION: 956.2 (MSL) EOB: 2.0 ft.
LAT / LONG: 40.407282 N, 84.572139 W

EXPLORATION ID
D-002-0-24

PAGE 1 OF 1

MATERIAL DESCRIPTION AND NOTES	ELEV. 956.2	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	SO4 ppm	BACK FILL
ROOTMAT - 6 INCHES	955.7																		
Stiff brown mottled with gray **CLAY**, some silt, little fine to coarse sand, trace fine gravel, moist.	954.2	1			100	HA-1	1.3-1.8	2	4	10	27	57	45	21	24	25	A-7-6 (15)	93	
		EOB 2																	

NOTES:
- No seepage noted.

NOTES: SEE ABOVE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: SOIL CUTTINGS

S&ME ODOT SULFATE (8.5X11) - SGE 01/2019 - OH DOT.GDT - 7/11/25 08:52 - R:\SERVICE LINES\CS-2557\COLUMBUS\GINT\WPROJECTS\23170225A MER-127.GPJ

PLATE 5

S&ME JOB: 23170225A

PROJECT: MER-127-3.71	DRILLING FIRM / OPERATOR: ADC / T. FROST	DRILL RIG: ADC CME 550X (ATV)	STATION / OFFSET: 683+93, 12' RT
TYPE: SUBGRADE	SAMPLING FIRM / LOGGER: S&ME / M. ANSARI	HAMMER: CME AUTOMATIC	ALIGNMENT: CL CONST SR 119
PID: 120177 BR ID: N/A	DRILLING METHOD: 3-1/4" HSA	CALIBRATION DATE: 5/12/25	ELEVATION: 957.3 (MSL) EOB: 7.5 ft.
START: 5/2/25 END: 5/2/25	SAMPLING METHOD: SPT	ENERGY RATIO (%): 74.9	LAT / LONG: 40.407129 N, 84.571449 W

EXPLORATION ID **B-003-0-24**

PAGE 1 OF 1

MATERIAL DESCRIPTION AND NOTES	ELEV. 957.3	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GR	CS	FS	SI	CL	LL	PL	PI	WC	ODOT CLASS (GI)	SO4 ppm	BACK FILL
ROOTMAT - 6 INCHES	956.8							GRADATION (%)					ATTERBERG						
Stiff brown **CLAY**, some silt, trace fine to coarse sand, trace fine gravel, damp.	955.8	1	1 2 2	5	53	SS-1A	-	-	-	-	-	-	-	-	-	-	Visual (V)	-	
						SS-1B	1.0-1.2	1	1	6	33	59	50	24	26	29	A-7-6 (16)	40	
Very stiff to hard brown mottled with gray **SILTY CLAY**, little fine to coarse sand, trace fine gravel, damp.		2	4 6 7	16	100	SS-2	3.2-4.5	2	5	10	30	53	39	19	20	18	A-6b (12)	-	
		3	4 6 10	20	100	SS-3	4.5+	-	-	-	-	-	-	-	-	14	A-6b (V)	-	
		4	4 8 10	22	100	SS-4	4.5+	-	-	-	-	-	-	-	-	17	A-6b (V)	-	
		5	5 10 11	26	100	SS-5	4.5+	-	-	-	-	-	-	-	-	16	A-6b (V)	-	
	949.8	6 EOB																	
		7																	

NOTES:
- No water encountered during drilling.

NOTES: SEE ABOVE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: SOIL CUTTINGS

PLATE 6

S&ME ODOT SULFATE (8.5X11) - SGE 01/2019 - OH DOT.GDT - 7/11/25 08:52 - R:\SERVICE LINES\CS-2557\COLUMBUS\GINTW\PROJECTS\23170225A MER-127.GPJ

S&ME JOB: 23170225A

PROJECT: MER-127-3.71 | DRILLING FIRM / OPERATOR: S&ME / M. ANSARI | DRILL RIG: HAND AUGER | STATION / OFFSET: 686+53, 5' RT | EXPLORATION ID: D-004-0-24

TYPE: SUBGRADE | SAMPLING FIRM / LOGGER: S&ME / M. ANSARI | HAMMER: HAND SAMPLING | ALIGNMENT: CL CONST SR 119

PID: 120177 BR ID: N/A | DRILLING METHOD: BUCKET AUGER | CALIBRATION DATE: N/A | ELEVATION: 955.1 (MSL) EOB: 2.0 ft. | PAGE 1 OF 1

START: 5/2/25 END: 5/2/25 | SAMPLING METHOD: GRAB | ENERGY RATIO (%): 0 | LAT / LONG: 40.407324 N, 84.570549 W

MATERIAL DESCRIPTION AND NOTES	ELEV. 955.1	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	SO4 ppm	BACK FILL
ROOTMAT - 6 INCHES	954.6																		
Very stiff brown **CLAY**, some silt, little fine to coarse sand, trace fine gravel, moist.	953.1	1			100	HA-1	2.7-3.0	1	3	11	35	50	48	24	24	27	A-7-6 (15)	40	
		EOB 2																	

NOTES:
- No seepage noted.

NOTES: SEE ABOVE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: SOIL CUTTINGS

S&ME ODOT SULFATE (8.5X11) - SGE 01/2019 - OH DOT.GDT - 7/11/25 08:52 - R:\SERVICE LINES\CS-2557\COLUMBUS\GINT\WPROJECTS\23170225A MER-127.GPJ

PLATE 7

S&ME JOB: 23170225A

PROJECT: MER-127-3.71	DRILLING FIRM / OPERATOR: ADC / T. FROST	DRILL RIG: ADC CME 550X (ATV)	STATION / OFFSET: 689+90, 10' RT
TYPE: SUBGRADE	SAMPLING FIRM / LOGGER: S&ME / M. ANSARI	HAMMER: CME AUTOMATIC	ALIGNMENT: CL CONST SR 119
PID: 120177 BR ID: N/A	DRILLING METHOD: 3-1/4" HSA	CALIBRATION DATE: 5/12/25	ELEVATION: 958.4 (MSL) EOB: 7.5 ft.
START: 5/2/25 END: 5/2/25	SAMPLING METHOD: SPT	ENERGY RATIO (%): 74.9	LAT / LONG: 40.407442 N, 84.569361 W

EXPLORATION ID **B-005-0-24**

PAGE 1 OF 1

MATERIAL DESCRIPTION AND NOTES	ELEV. 958.4	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GR	CS	FS	SI	CL	LL	PL	PI	WC	ODOT CLASS (GI)	SO4 ppm	BACK FILL
ASPHALT - 16 INCHES	957.1																		
GRANULAR BASE - 6 INCHES	956.6					SS-1A	-	-	-	-	-	-	-	-	-	-	A-1-b (V)	-	
Possible Fill: Medium stiff to stiff brown **SILT AND CLAY**, some fine to coarse sand, trace fine gravel, slightly organic (LOI = 2.8%), damp.	955.4	1	2 3 3	7	67	SS-1B	0.7-1.2	6	13	14	34	33	31	17	14	17	A-6a (8)	40	
Possible Fill: Medium stiff dark brown **SILTY CLAY**, some fine to coarse sand, trace fine gravel, moist.	953.9	2	2 2 2	5	83	SS-2	0.5-0.7	4	11	12	34	39	36	18	18	21	A-6b (11)	-	
Stiff to very stiff gray mottled with brown **CLAY**, some silt, trace to little fine to coarse sand, trace fine gravel, moist.	950.9	3 4 5 6 7 EOB	1 3 3	7	100	SS-3	1.7-2.2	-	-	-	-	-	-	-	-	27	A-7-6 (V)	-	
			1 3 4	9	78	SS-4	1.0-1.2	-	-	-	-	-	-	-	-	27	A-7-6 (V)	-	

NOTES:
- No water encountered during drilling.

NOTES: SEE ABOVE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: ASPHALT PATCH; SOIL CUTTINGS MIXED WITH BENTONITE

S&ME ODOT SULFATE (8.5X11) - SGE 01/2019 - OH DOT.GDT - 7/11/25 08:52 - R:\SERVICE LINES\CS-2557\COLUMBUS\GINT\WP\PROJECTS\23170225A MER-127.GPJ

PLATE 8

S&ME JOB: 23170225A

PROJECT: MER-127-3.71	DRILLING FIRM / OPERATOR: ADC / T. FROST	DRILL RIG: ADC CME 550X (ATV)	STATION / OFFSET: 190+21, 9' RT
TYPE: SUBGRADE	SAMPLING FIRM / LOGGER: S&ME / M. ANSARI	HAMMER: CME AUTOMATIC	ALIGNMENT: CL CONST US 127
PID: 120177 BR ID: N/A	DRILLING METHOD: 3-1/4" HSA	CALIBRATION DATE: 5/12/25	ELEVATION: 968.1 (MSL) EOB: 7.4 ft.
START: 5/2/25 END: 5/2/25	SAMPLING METHOD: SPT	ENERGY RATIO (%): 74.9	LAT / LONG: 40.405666 N, 84.571638 W

EXPLORATION ID **B-006-0-24**

PAGE 1 OF 1

MATERIAL DESCRIPTION AND NOTES	ELEV. 968.1	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	SO4 ppm	BACK FILL
ASPHALT - 17-1/2 INCHES	966.6																		
GRANULAR BASE - 7-1/2 INCHES	966.0																		
Stiff to very stiff brown mottled with gray **CLAY**, some silt, trace fine to coarse sand, trace fine gravel, moist.		1	4 3 3	7	72	SS-1A	-	-	-	-	-	-	-	-	-	-	A-1-b (V)	-	
		2				SS-1B	2.0-2.2	-	-	-	-	-	-	-	-	26	A-7-6 (V)	40	
		3	3 2 2	5	100	SS-2	1.5-1.7	1	1	2	32	64	57	23	34	27	A-7-6 (19)	-	
		4	2 2 6	10	100	SS-3	3.2-3.7	1	1	2	35	61	51	23	28	25	A-7-6 (17)	-	
		5																	
		6	2 3 4	9	100	SS-4	2.2-2.7	-	-	-	-	-	-	-	-	25	A-7-6 (V)	-	
	960.7	7 EOB																	

NOTES:
- No water encountered during drilling.

NOTES: SEE ABOVE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: ASPHALT PATCH; SOIL CUTTINGS MIXED WITH BENTONITE

PLATE 9

S&ME ODOT SULFATE (8.5X11) - SGE 01/2019 - OH DOT.GDT - 7/11/25 08:52 - R:\SERVICE LINES\CS-2557\COLUMBUS\GINTW\PROJECTS\23170225A MER-127.GPJ

S&ME JOB: 23170225A

PROJECT: MER-127-3.71	DRILLING FIRM / OPERATOR: S&ME / M. ANSARI	DRILL RIG: HAND AUGER	STATION / OFFSET: 193+40, 2' RT
TYPE: SUBGRADE	SAMPLING FIRM / LOGGER: S&ME / M. ANSARI	HAMMER: HAND SAMPLING	ALIGNMENT: CL CONST US 127
PID: 120177 BR ID: N/A	DRILLING METHOD: BUCKET AUGER	CALIBRATION DATE: N/A	ELEVATION: 961.2 (MSL) EOB: 2.0 ft.
START: 5/2/25 END: 5/2/25	SAMPLING METHOD: GRAB	ENERGY RATIO (%): 0	LAT / LONG: 40.406539 N, 84.571570 W

EXPLORATION ID **D-007-0-24**

PAGE 1 OF 1

MATERIAL DESCRIPTION AND NOTES	ELEV. 961.2	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	SO4 ppm	BACK FILL
ROOTMAT - 6 INCHES	960.7																		
Medium stiff brown mottled with gray **CLAY**, some silt, trace fine to coarse sand, trace fine gravel, moist.	959.2	1			100	HA-1	0.5-0.8	1	1	2	21	75	60	26	34	33	A-7-6 (20)	40	
		EOB 2																	

NOTES:
- No seepage noted.

NOTES: SEE ABOVE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: SOIL CUTTINGS

S&ME ODOT SULFATE (8.5X11) - SGE 01/2019 - OH DOT.GDT - 7/11/25 08:52 - R:\SERVICE LINES\CS-2557\COLUMBUS\GINT\WPROJECTS\23170225A MER-127.GPJ

PLATE 10

S&ME JOB: 23170225A

PROJECT: MER-127-3.71	DRILLING FIRM / OPERATOR: ADC / T. FROST	DRILL RIG: ADC CME 550X (ATV)	STATION / OFFSET: 198+78, 8' RT
TYPE: SUBGRADE	SAMPLING FIRM / LOGGER: S&ME / M. ANSARI	HAMMER: CME AUTOMATIC	ALIGNMENT: CL CONST US 127
PID: 120177 BR ID: N/A	DRILLING METHOD: 3-1/4" HSA	CALIBRATION DATE: 5/12/25	ELEVATION: 956.1 (MSL) EOB: 7.3 ft.
START: 5/2/25 END: 5/2/25	SAMPLING METHOD: SPT	ENERGY RATIO (%): 74.9	LAT / LONG: 40.408005 N, 84.571626 W

EXPLORATION ID **B-008-0-24**

PAGE 1 OF 1

MATERIAL DESCRIPTION AND NOTES	ELEV. 956.1	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GR	CS	FS	SI	CL	LL	PL	PI	WC	ODOT CLASS (GI)	SO4 ppm	BACK FILL
ASPHALT - 16-3/4 INCHES	954.7																		
GRANULAR BASE - 7 INCHES	954.1																		
Possible Fill: Stiff brown **SILTY CLAY**, little fine to coarse sand, trace fine gravel, moist.	953.3	1	3 2 2	5	100	SS-1A	-	-	-	-	-	-	-	-	-	-	A-1-b (V)	-	
						SS-1B	1.5-2.0	5	7	10	30	48	40	18	22	22	A-6b (13)	40	
Stiff brown mottled with gray **CLAY**, some silt, little fine to coarse sand, trace fine gravel, moist.	950.1	2	2 2 2	5	67	SS-2	1.5-2.0	4	4	9	30	53	50	20	30	25	A-7-6 (18)	-	
		3	2 2 3	6	100	SS-3	2.2-2.5	-	-	-	-	-	-	-	-	23	A-7-6 (V)	-	
Stiff gray mottled with brown **SILTY CLAY**, little fine to coarse sand, trace fine gravel, moist.	948.8	4	3 5 6	14	100	SS-4	3.0-3.2	-	-	-	-	-	-	-	-	16	A-6b (V)	-	
		EOB 5																	
		6																	
		7																	

NOTES:
- No water encountered during drilling.

NOTES: SEE ABOVE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: ASPHALT PATCH; SOIL CUTTINGS MIXED WITH BENTONITE

S&ME ODOT SULFATE (8.5X11) - SGE 01/2019 - OH DOT.GDT - 7/11/25 08:52 - R:\SERVICE LINES\CS-2557\COLUMBUS\GINTW\PROJECTS\23170225A MER-127.GPJ

PLATE 11

DCP TEST DATA

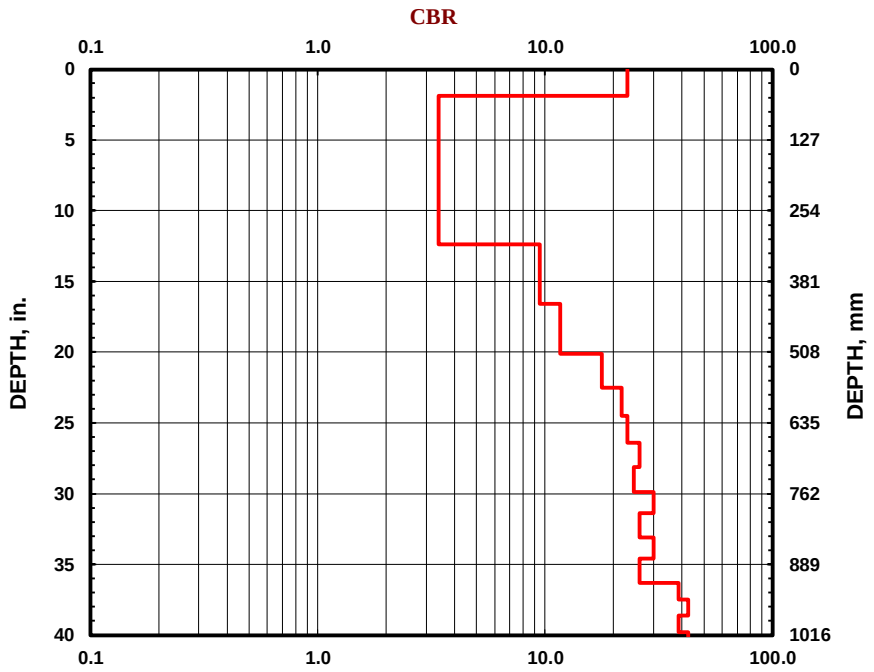
Project: *MER-127-3.71* **Date:** 2-May-25

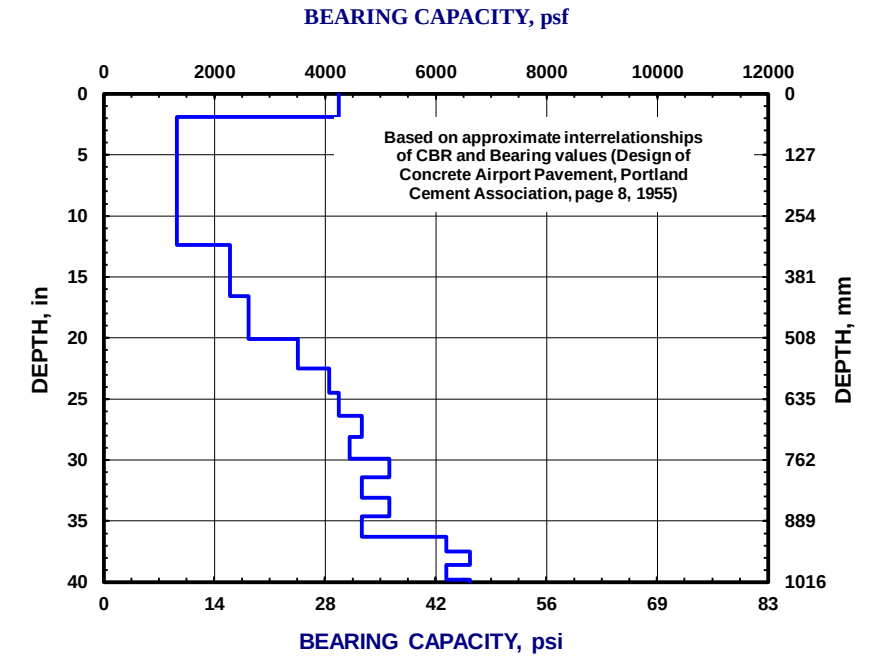
Location: D-002-0-24 **Soil Type(s):** A-6b/A-7-6

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

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

No. of Blows	Cumulative Penetration (mm)	Type of Hammer
0	0	1
5	48.26	1
5	314.96	1
5	421.64	1
5	510.54	1
5	571.5	1
5	622.3	1
5	670.56	1
5	713.74	1
5	759.46	1
5	797.56	1
5	840.74	1
5	878.84	1
5	922.02	1
5	952.5	1
5	980.44	1
5	1010.92	1
5	1038.86	1
5	1066.8	1
5	1092.2	1
5	1115.06	1
5	1137.92	1
5	1158.24	1
5	1178.56	1
5	1198.88	1
5	1221.74	1
5	1249.68	1
5	1272.54	1
5	1300.48	1
5	1328.42	1
5	1353.82	1
5	1379.22	1
5	1404.62	1
5	1427.48	1
5	1452.88	1
5	1475.74	1
5	1501.14	1
5	1524	1
5	1544.32	1





DCP TEST DATA

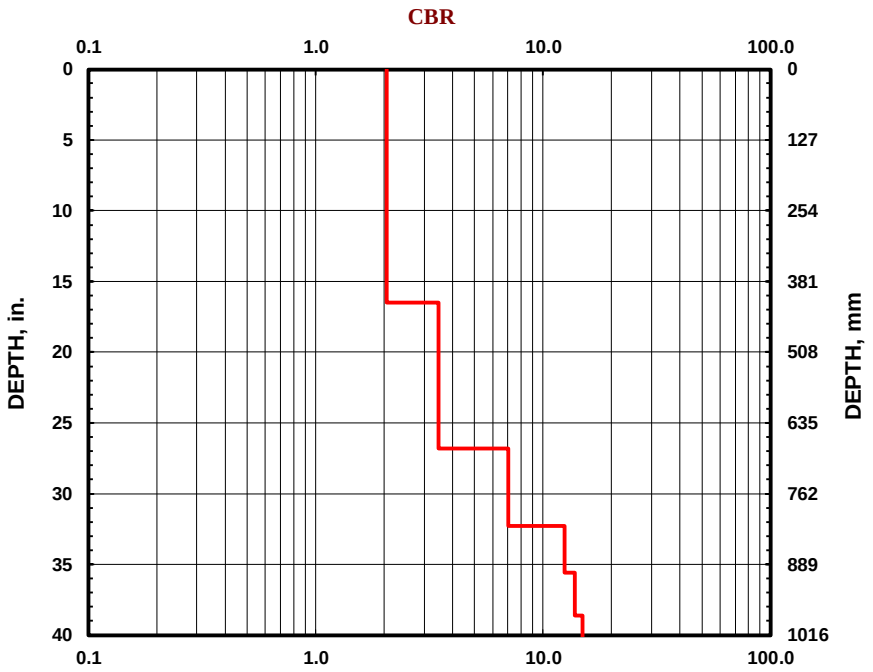
Project: *MER-127-3.71* **Date:** 2-May-25

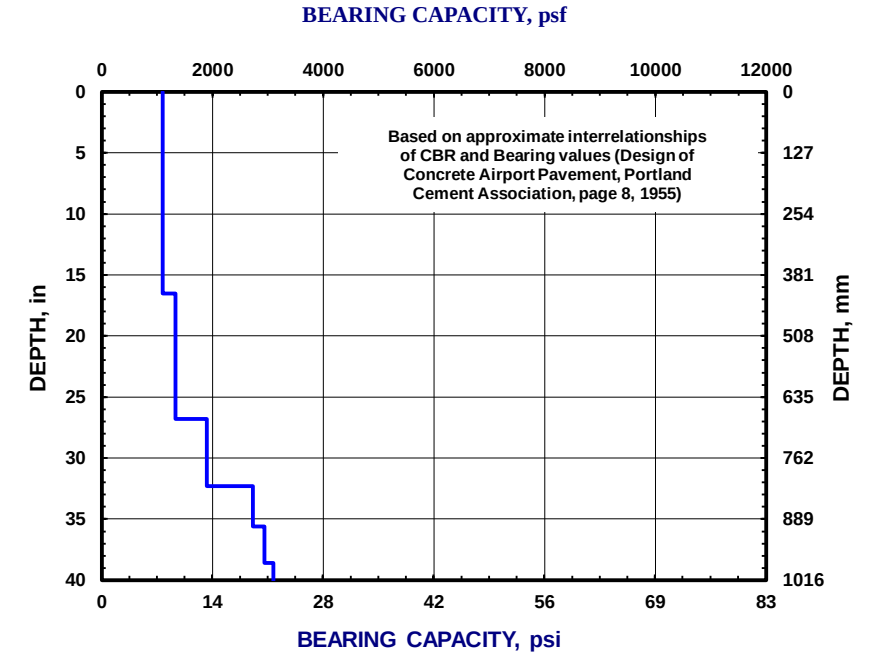
Location: D-004-0-24 **Soil Type(s):** A-6b/A-7-6

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

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

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	1
5	419.1	1
5	680.72	1
5	820.42	1
5	904.24	1
5	980.44	1
5	1051.56	1
5	1115.06	1
5	1178.56	1
5	1234.44	1
5	1282.7	1
5	1320.8	1
5	1356.36	1
5	1389.38	1
5	1419.86	1
5	1447.8	1
5	1475.74	1
5	1501.14	1
5	1524	1
5	1546.86	1





DCP TEST DATA

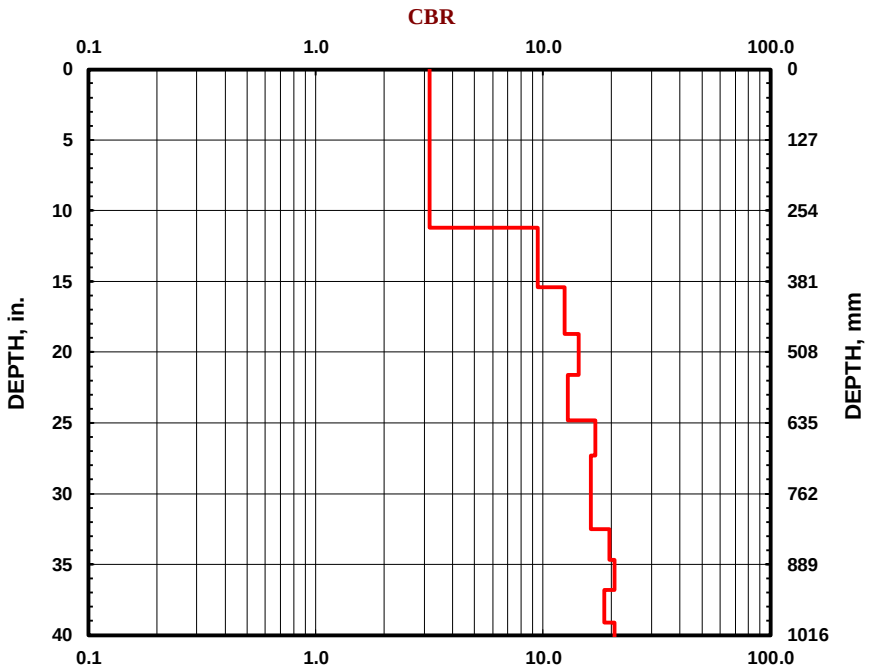
Project: *MER-127-3.71* **Date:** 2-May-25

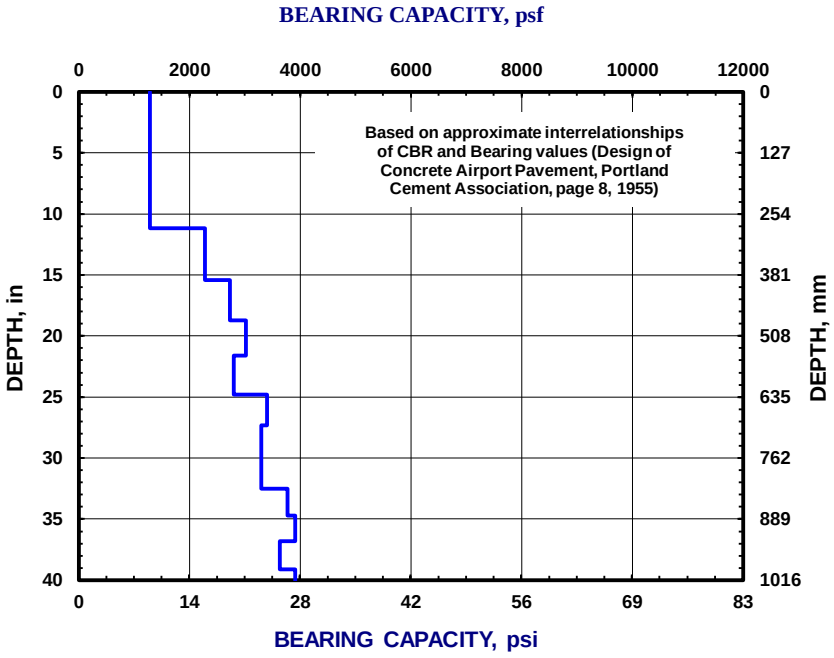
Location: D-007-0-24 **Soil Type(s):** A-7-6/A-6b

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

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

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	1
5	284.48	1
5	391.16	1
5	474.98	1
5	548.64	1
5	629.92	1
5	693.42	1
5	759.46	1
5	825.5	1
5	881.38	1
5	934.72	1
5	993.14	1
5	1046.48	1
5	1094.74	1
5	1153.16	1
5	1226.82	1
5	1280.16	1
5	1333.5	1
5	1394.46	1
5	1445.26	1
5	1513.84	1
5	1569.72	1
5	1612.9	1







Date: 6/27/2025

Photographer: BB

B-006	**Location**	STA 190+21, 9' Rt. of CL Constr. US 127
	Remarks	Asphalt = 17½ inches



Date: 6/27/2025

Photographer: BB

B-008	**Location**	STA 198+78, 8' Rt. of CL Constr. US 127
	Remarks	Asphalt = 16¾ inches

Important Information About Your
Geotechnical Engineering Report

Variations in subsurface conditions can be a principal cause of construction delays, cost overruns and claims. The following information is provided to assist you in understanding and managing the risk of these variations.

Geotechnical Findings Are Professional Opinions

Geotechnical engineers cannot specify material properties as other design engineers do. Geotechnical material properties have a far broader range on a given site than any manufactured construction material, and some geotechnical material properties may change over time because of exposure to air and water, or human activity.

Site exploration identifies subsurface conditions at the time of exploration and only at the points where subsurface tests are performed or samples obtained. Geotechnical engineers review field and laboratory data and then apply their judgment to render professional opinions about site subsurface conditions. Their recommendations rely upon these professional opinions. Variations in the vertical and lateral extent of subsurface materials may be encountered during construction that significantly impact construction schedules, methods and material volumes. While higher levels of subsurface exploration can mitigate the risk of encountering unanticipated subsurface conditions, no level of subsurface exploration can eliminate this risk.

Scope of Geotechnical Services

Professional geotechnical engineering judgment is required to develop a geotechnical exploration scope to obtain information necessary to support design and construction. A number of unique project factors are considered in developing the scope of geotechnical services, such as the exploration objective; the location, type, size and weight of the proposed structure; proposed site grades and improvements; the construction schedule and sequence; and the site geology.

Geotechnical engineers apply their experience with construction methods, subsurface conditions and exploration methods to develop the exploration scope. The scope of each exploration is unique based on available project and site information. Incomplete project information or constraints on the scope of exploration increases the risk of variations in subsurface conditions not being identified and addressed in the geotechnical report.

Services Are Performed for Specific Projects

Because the scope of each geotechnical exploration is unique, each geotechnical report is unique. Subsurface conditions are explored and recommendations are made for a specific project.

Subsurface information and recommendations may not be adequate for other uses. Changes in a proposed structure location, foundation loads, grades, schedule, etc. may require additional geotechnical exploration, analyses, and consultation. The geotechnical engineer should be consulted to determine if additional services are required in response to changes in proposed construction, location, loads, grades, schedule, etc.

Geo-Environmental Issues

The equipment, techniques, and personnel used to perform a geo-environmental study differ significantly from those used for a geotechnical exploration. Indications of environmental contamination may be encountered incidental to performance of a geotechnical exploration but go unrecognized. Determination of the presence, type or extent of environmental contamination is beyond the scope of a geotechnical exploration.

Geotechnical Recommendations Are Not Final

Recommendations are developed based on the geotechnical engineer's understanding of the proposed construction and professional opinion of site subsurface conditions. Observations and tests must be performed during construction to confirm subsurface conditions exposed by construction excavations are consistent with those assumed in development of recommendations. It is advisable to retain the geotechnical engineer that performed the exploration and developed the geotechnical recommendations to conduct tests and observations during construction. This may reduce the risk that variations in subsurface conditions will not be addressed as recommended in the geotechnical report.

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Appendix B

OHIO DEPARTMENT OF TRANSPORTATION

OFFICE OF GEOTECHNICAL ENGINEERING

PLAN SUBGRADES
Geotechnical Design Manual Section 600

MER-127-3.71 Roundabout
PID 120177

PROJECT DESCRIPTION - Subgrade Exploration (5 Type A borings/3 DCPs) for a proposed roundabout at the US127 / SR119 intersection in Mercer Co., OH.

S&ME, Inc.

Prepared By: Richard S. Weigand
Date prepared: Thursday, June 26, 2025

S&ME, Inc.
6190 Enterprise Court
Dublin, OH 43016

614-793-2226
rweigand@smeinc.com

NO. OF BORINGS: 8

OHIO DEPARTMENT OF TRANSPORTATION

Subgrade Analysis

V. 14.7 11/6/2024

#	Boring ID	Alignment	Station	Offset	Dir	Drill Rig	ER	Boring EL.	Proposed Subgrade EL.	Cut Fill
1	B-001-0-24	CL Constr. SR 119	678+10	20	R	ADC CME 550X	75	960.1	958.6	1.5 C
2	D-002-0-24	CL Constr. SR 119	682+05	41	L	DCP/Hand Auger	0	956.2	958.2	1.9 F
3	B-003-0-24	CL Constr. SR 119	683+93	12	R	ADC CME 550X	75	957.3	959.3	2.0 F
4	D-004-0-24	CL Constr. SR 119	686+53	5	R	DCP/Hand Auger	0	955.1	956.0	0.9 F
5	B-005-0-24	CL Constr. SR 119	689+90	10	R	ADC CME 550X	75	958.4	957.5	0.9 C
6	B-006-0-24	CL Constr. US 127	190+21	9	R	ADC CME 550X	75	968.1	967.5	0.6 C
7	D-007-0-24	CL Constr. US 127	193+40	2	R	DCP/Hand Auger	0	961.2	961.2	0.0 C
8	B-008-0-24	CL Constr. US 127	198+78	8	R	ADC CME 550X	75	956.1	955.0	1.1 C

OHIO DEPARTMENT OF TRANSPORTATION

Subgrade Analysis

V. 14.7 11/6/2024

#	Boring	Sample	Sample Depth		Subgrade Depth		Standard Penetration		HP (tsf)	Physical Characteristics						Moisture		Ohio DOT		Sulfate Content (ppm)	Problem		Excavate and Replace (Item 204)		Recommendation (Enter depth in inches)
			From	To	From	To	N_{60}	N_{60L}		LL	PL	PI	% Silt	% Clay	P200	M_C	M_{OPT}	Class	GI		Unsuitable	Unstable	Unsuitable	Unstable	
1	B 001-0 24	SS-1B	2.3	3.5	0.8	2.0	22		4.5	26	16	10	27	24	51	12	11	A-4a	3	40					Item 204.03
		SS-2	3.5	5.0	2.0	3.5	10		4.5	39	19	20	24	48	72	22	16	A-6b	11			N_{60} & Mc			
		SS-3	5.0	6.5	3.5	5.0	5		1.7							17	16	A-6b	16						
		SS-4	6.5	8.0	5.0	6.5	7	5	1							23	18	A-7-6	16						
2	D 002-0 24	HA-1	1.0	2.0	2.9	4.0			1.3	45	21	24	27	57	84	25	18	A-7-6	15	93					Strip TS, scarify/ moisture condition/ recompact per Item 203.07, then place new fill (w/ PI> 16)
3	B 003-0 24	SS-1B	0.5	1.5	2.5	3.5	5		1	50	24	26	33	59	92	29	21	A-7-6	16	40		HP & Mc			Strip TS, scarify/ moisture condition/ recompact per Item 203.07, then place new fill (w/ PI> 16)
		SS-2	1.5	3.0	3.5	5.0	16		3.2	39	19	20	30	53	83	18	16	A-6b	12						
		SS-3	3.0	4.5	5.0	6.5	20		4.5							14	16	A-6b	16						
		SS-4	4.5	6.0	6.5	8.0	22	5	4.5							17	16	A-6b							
4	D 004-0 24	HA-1	1.0	2.0	1.9	2.9			2.7	48	24	24	35	50	85	27	21	A-7-6	15	40		N_{60} & Mc			Strip TS, scarify/ moisture condition/ recompact per Item 203.07, then place new fill (w/ PI> 16)
5	B 005-0 24	SS-1B	1.8	2.5	0.9	1.6	7		0.7	31	17	14	34	33	67	17	14	A-6a	8	40		HP & Mc		20"	Excavate/Replace 20", or Cement Stabilize 14"
		SS-2	3.0	4.2	2.1	3.3	5		0.5	36	18	18	34	39	73	21	16	A-6b	11			HP & Mc			
		SS-3	4.5	6.0	3.6	5.1	7		1.7							27	18	A-7-6	16						
		SS-4	6.0	7.2	5.1	6.3	9	5	1							27	18	A-7-6							
6	B 006-0 24	SS-1B	2.1	2.6	1.5	2.0	7		2							26	18	A-7-6	16	40		N_{60} & Mc			Item 204.03
		SS-2	2.9	4.4	2.3	3.8	5		1.5	57	23	34	32	64	96	27	20	A-7-6	19						
		SS-3	4.4	5.9	3.8	5.3	10		3.2	51	23	28	35	61	96	25	20	A-7-6	17						
		SS-4	5.9	7.4	5.3	6.8	9	5	2.2							25	18	A-7-6							
7	D 007-0 24	HA-1	1.0	2.0	1.0	2.0			0.5	60	26	34	21	75	96	33	23	A-7-6	20	40		HP & Mc		24"	Excavate/Replace 24", or Lime Stabilize 14"
8	B 008-0 24	SS-1B	2.0	2.8	0.9	1.7	5		1.5	40	18	22	30	48	78	22	16	A-6b	13	40		HP & Mc		21"	Excavate/Replace 21", or Lime Stabilize 14"
		SS-2	2.8	4.3	1.7	3.2	5		1.5	50	20	30	30	53	83	25	18	A-7-6	18			HP & Mc			
		SS-3	4.3	5.8	3.2	4.7	6		2.2							23	18	A-7-6	16						
		SS-4	5.8	7.3	4.7	6.2	14	5	3							16									

PLATE 3

OHIO DEPARTMENT OF TRANSPORTATION

Subgrade Analysis

V. 14.7 11/6/2024

PID: PID 120177

County-Route-Section: MER-127-3.71 Roundabout
No. of Borings: 8

Geotechnical Consultant: S&ME, Inc.
Prepared By: Richard S. Weigand
Date prepared: 6/26/2025

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

Excavate and Replace Stabilization Options	
Global Geotextile Average(N60L):	21"
Average(HP):	0"
Global Geogrid Average(N60L):	15"
Average(HP):	0"

Design CBR	4

% Samples within 3 feet of subgrade			
$N_{60} \leq 5$	23%	HP ≤ 0.5	9%
$N_{60} < 12$	36%	0.5 < HP ≤ 1	9%
$12 \leq N_{60} < 15$	0%	1 < HP ≤ 2	23%
$N_{60} \geq 20$	5%	HP > 2	14%
M+	41%		
Rock	0%		
Unsuitable Soil	0%		

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

% Proposed Subgrade Surface	
Unstable & Unsuitable	64%
Unstable	64%
Unsuitable (Soil & Rock)	0%

	N_{60}	N_{60L}	HP	LL	PL	PI	Silt	Clay	P 200	M_C	M_{OPT}	GI
Average	10	5	2.19	44	21	23	30	51	81	23	18	14
Maximum	22	5	4.50	60	26	34	35	75	96	33	23	20
Minimum	5	5	0.50	26	16	10	21	24	51	12	11	3

Classification Counts by Sample

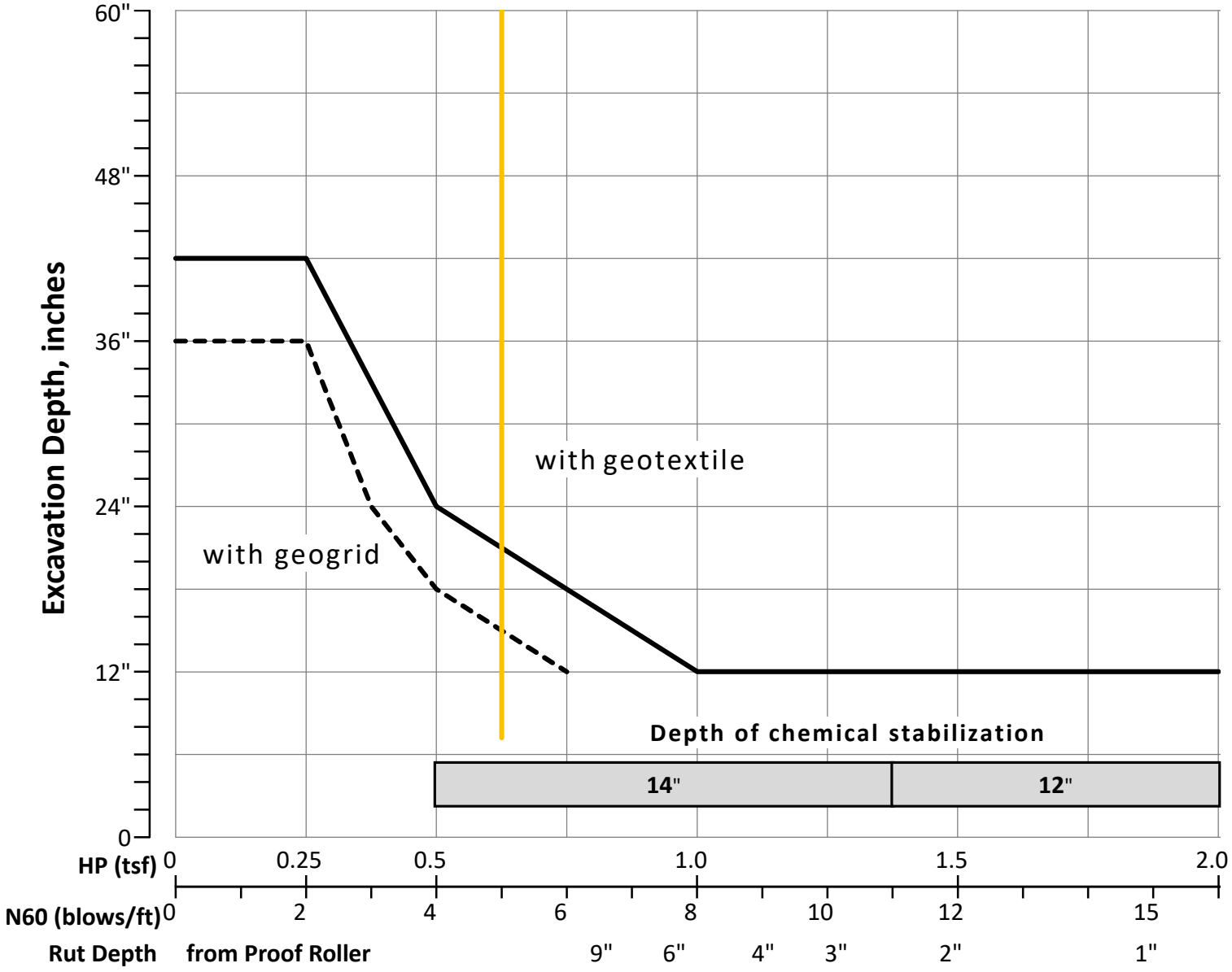
ODOT Class	UCF	Rock	A-1-a	A-1-b	A-2-4	A-2-5	A-2-6	A-2-7	A-3	A-3a	A-4a	A-4b	A-5	A-6a	A-6b	A-7-5	A-7-6	A-8a	A-8b	Totals
Count	0	0	0	0	0	0	0	0	0	0	1	0	0	1	7	0	13	0	0	22
Percent	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	5%	0%	0%	5%	32%	0%	59%	0%	0%	100%
% Rock|Granular|Cohesive	0%	0%	5%									95%								100%
Surface Class Count	0	0	0	0	0	0	0	0	0	0	1	0	0	1	3	0	6	0	0	11
Surface Class Percent	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	9%	0%	0%	9%	27%	0%	55%	0%	0%	100%

OHIO DEPARTMENT OF TRANSPORTATION

Subgrade Analysis

V. 14.7 11/6/2024

Fig. 600-1 – Subgrade Stabilization



OVERRIDE TABLE

Calculated Average	New Values	Check to Override
2.19		☐ HP
5.00		☐ N60L

Average HP

Average N_{60L}

PLATE 5