Geotechnical Exploration
Grailville Preserve and Park
Miami Township, Clermont County, Ohio

Prepared for:

Burgess & Niple, Inc
Cincinnati, Ohio

Prepared by:

UES
Cincinnati, Ohio

Date:

January 9, 2026

UES Project No.:

A25133.00105.000

SAFETY
TEAMWORK
RESPONSIVENESS
INTEGRITY
VALUE
EXCELLENCE

January 9, 2026

Mr. David Griffith, PE. Assoc. DBIA
Burgess & Niple, Inc
525 Vine Street Suite 1300
Cincinnati, Ohio 45202

Re: Geotechnical Exploration
Grailville Preserve and Park
Miami Township, Clermont County, Ohio
Project No. A25133.00105.000

Dear Mr. Griffith:

Presented in this report are the results of our geotechnical exploration completed for the proposed Grailville Preserve and Park project to be located on south side of O'Bannonville Road in Clermont County, Ohio. Our services were performed in general accordance with our Proposal A25133.00105.000 dated November 12, 2025, and authorized with signed agreement on November 19, 2025.

We appreciate the opportunity to provide the geotechnical services for this project. If you have any questions regarding this report, or if we may be of any additional service to you, please do not hesitate to contact us.

Respectfully submitted,
UES

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1.0 INTRODUCTION

UES prepared this geotechnical exploration report for Burgess & Niple, Inc (client) for the proposed Grailville Preserve and Park project to be located on the south side of O'Bannonville Road in Miami Township, Clermont County, Ohio.

The purposes of the geotechnical exploration were to evaluate the general subsurface profile at the site and the engineering properties of the soils; and to develop recommendations for the geotechnical aspects of the design and construction of the project. Our scope of services included site reconnaissance, geotechnical borings, laboratory testing, engineering analyses, and preparation of this report.

2.0 PROJECT INFORMATION

The project information was derived from our site visit during field exploration, correspondence with client and a review of following document:

- 30% Design Plans provided by Mr. Griffith (Burgess & Niple, Inc.) received via email on November 11, 2025; and

The project will include construction of a slab-on-grade restroom structure (approximately 60 feet by 50 feet) and a parking lot (approximately 108 feet by 60 feet) along with associated site improvements that include driveways, utility installations, and designated play areas.

The restroom structure will be situated on the south side of the site. The proposed parking lot is located on northwest side of the proposed restroom structure. Finished floor elevation (FFE) of the proposed restroom is near El. 706.75 feet. A comparison between existing site grades and proposed FFE of restroom suggests earthwork requiring fill depths ranging from 1 to 6 feet. The proposed parking lot will be primarily in cut with cut depths ranging up to 4 feet.

The site gently slopes upward from El. 687 feet (on northeast) to El. 716 feet (on southwest). Existing grades across the site gradually grades upwards with elevations ranging from El. 687 feet on north to El. 716 feet on south.

The proposed project site is bordered to the north by O'Bannonville Road, to the west and south by gravel road, and to the east by vacant lot and sparse trees The site is currently open with sparse trees on the northwest corner. Few residential structures are present to the east side of the proposed project site.

3.0 SITE GEOLOGY

According to Ohio Department of Natural Resources (ODNR) Geology Interactive Map, Illinoian glacial outwash soils are present as overburden soils on the project site. The underlying bedrock in the project area belongs to Ordovician Age Point Pleasant Formation which consists of interbedded shale and limestone. Shale comprises approximately 40% of the formation and limestone comprises the balance. Bedrock was encountered at shallow depths of 7.5 feet in the drilled test boring across the site.

4.0 SUBSURFACE EXPLORATION

The subsurface exploration consisted of four (4) borings (numbered B-1 through B-4). UES selected boring locations in consultation with the client. The boring locations were staked and surveyed by client. The locations of the borings are shown on our Exploration Plan, which is included in Appendix A.

The borings were drilled with our Mobile B57 drill rig (Drill rig Energy Transfer Ratio = 87%.) advancing hollow-stem augers, as indicated on the boring logs presented in Appendix B. Sampling of the overburden soil was accomplished ahead of the augers at the depths indicated on the boring logs, with a 2-inch-outside-diameter split-barrel. Standard Penetration Tests (SPTs) were performed with the split-barrel sampler to obtain the standard penetration resistance or N-value[1] of the sampled material. We also pushed a Shelby Tube at Boring B-3 (Depth Interval: 5 to 7 feet) to obtain relatively undisturbed soil specimen.

Observation for short-term groundwater level was made in the borings during drilling and before backfilling the boreholes.

Representative portions of the split-barrel samples were placed in glass jars with lids to preserve their in-situ moisture contents. The Shelby tube was capped and taped at both ends to maintain the in-situ moisture content and density and was transported and stored in an upright position. All glass jars and Shelby tube were marked and labeled in the field for proper identification upon return to the laboratory.

5.0 LABORATORY REVIEW AND TESTING

Upon completion of the fieldwork, the samples recovered from the borings were transported to our Soil Mechanics Laboratory, where they were visually reviewed and classified by the Project Geotechnical Engineer.

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[1] The standard penetration resistance, or N-value, is defined as the number of blows required to drive the split-barrel sampler 12 inches with a 140-pound hammer falling 30 inches. Since the split-barrel sampler is driven 18 inches or until refusal, the blows for the first 6 inches are for seating the sampler, and the number of blows for the final 12 inches is the N-value, which is reported as blows per foot (or bpf). Additionally, “refusal” of the split-barrel sampler occurs when the sampler is driven less than 6 inches with 50 blows of the hammer.

Laboratory testing was performed on selected soil samples to estimate engineering and index properties. Laboratory testing of the selected soil samples included various combinations of the following tests: moisture content, Atterberg limits, and unconfined compression test.

The boring logs, laboratory test results and Soil Classification Sheets are included in Appendix B.

6.0 SUBSURFACE CONDITIONS

The proposed project area is a vacant lot with sparse trees across the site. The test borings encountered 6-inch-thick topsoil as surficial layer. Beneath topsoil, the test borings encountered native glacial soils and bedrock. More specific descriptions of the subsurface strata are provided below, and the boring logs containing detailed material descriptions are located in Appendix B.

6.1.1 Soft to Medium Stiff Soils

The test borings encountered soft to medium stiff cohesive soils in the upper 2.5 feet. The in-situ N-values of these soils ranged between 4 to 8 blows per foot (bpf) and hand-penetrometer reading was approximately 0.5 tsf.

The uppermost layer of these soils is plow layer which consisted of soils that are disturbed by the action of plowing, tillage, and presence of grass roots.

The upper 2.5 feet of medium stiff soils should be considered marginally competent as they will fail most likely during proof-rolling and should be undercut during earthwork and foundation excavations.

6.1.2 Stiff to Hard Glacial Soils

Beneath medium stiff soils, the test borings encountered native glacial soils with consistency ranging from stiff to hard. Test Boring B-1 was terminated in native glacial soils at 11.5 feet

Atterberg limit test run on these soils yielded moderate to high plasticity with liquid limit ranging from 44 to 54%, and plasticity index ranging from 22 to 27%. An unconfined compression test run on a fat clay sample (LL=54 and PI= 27), yielded a dry unit weight of 112 pcf and an unconfined compressive strength of 9,260 psf.

Glacial soils (or glacial till) are soils that have been deposited, transported, or reworked in place by the advancement or retreat of a glacier across the area. The glacial soils in the test borings were primarily cohesive.

6.1.3 Bedrock

Beneath native glacial soils, the test borings encountered bedrock that was able to be augered. Borings B-2, B-3 and B-4 and was terminated within the bedrock stratum. Boring B-1 did not encounter bedrock within the exploration depth of 11.5 feet.

The bedrock is comprised primarily of brown and gray highly weathered to weathered shale with thin limestone layers. Bedrock was encountered in Boring B-2 at 11 feet depth (El. 693.2 feet), in Boring B-3 at 8 feet (El. 691.6 feet), and in Boring B-4 at 10 feet depth (El. 682.3 feet). Rock coring was not performed.

6.2 Groundwater Conditions

Groundwater observations were made in the borings during drilling and before backfilling the boreholes. Groundwater was not encountered in any of the borings during the short duration boreholes remained open. However, this does not necessarily mean borings were terminated above static groundwater level. Long-term, systematic measurements of water levels are needed to develop static groundwater level.

Based on our local experience, groundwater seepage is anticipated along soil/bedrock interface. It is also common to encounter perched groundwater or saturated seams of granular layers within glacial till. Additionally, groundwater levels, seepage amounts, and flow rates are expected to vary with time, location, season of the year, and amounts of precipitation.

7.0 CONCLUSIONS AND RECOMMENDATIONS

Based on our engineering reconnaissance of the site, subsurface conditions within the borings, the visual examination of the recovered samples, the laboratory test results, our understanding of the proposed project, engineering analyses of the soil conditions, and our experience as Geotechnical Engineers in the Ohio, the following conclusions and recommendations are presented.

7.1 Excavation Support

Excavation support should be the responsibility of the Contractor. Excavation support should be designed and implemented such that excavations are adequately ventilated and braced, shored, and/or sloped in order to protect and ensure the safety of workers within and near the excavations and to protect adjacent ground, slopes, structures, and infrastructure. Federal, state, and local safety regulations should be satisfied. The analyses, discussions, conclusions, and recommendations throughout this report are not to be interpreted as pre-engineering compliance with any safety regulation.

7.2 Site Preparation and Earthwork

UES anticipates proposed site grading will involve cuts of up to 4 feet and fill up to 6 feet. Recommendations in the sections below should be followed as part of the site development

7.2.1 Site Preparation

The initial preparation of the site for grading should include the removal of vegetation, heavy root systems, and topsoil from the proposed cut, fill, pavement, and structure areas. The topsoil may be stockpiled for future use on the completed cut and fill slopes or in landscaped areas, if permitted by specification, whereas the vegetation, including the heavy root systems, should be disposed of off-site in accordance with applicable regulations.

7.2.2 Undercutting and Subgrade Preparation

After clearing and stripping topsoil, the exposed subgrade should be thoroughly proof rolled using a heavily loaded piece of equipment or a loaded tandem-axle dump truck weighing at least 40,000 pounds under the review of the Project Geotechnical Engineer, or a representative thereof. Soft or yielding soils observed during the proof rolling should be undercut to stiff, non-yielding, cohesive soils or medium dense to dense, well-graded, cohesionless soils.

Based on the in-situ N-values of the soils in upper 2.5 feet of test borings, the soft to medium stiff soils encountered in upper 2.5 feet of test borings will most likely fail during the proof-rolling program. These soils should be undercut to stiff native soils, and the excavations should be backfilled with new compacted fill satisfying the material and compaction requirements presented in Section 7.2.3.

The undercut soil may be reused provided that they conform to the recommendations contained in this report regarding acceptable fill materials. We recommend that the Contract Documents include a bid item for the recommended undercutting, as deemed necessary, and the replacement with new compacted and tested fill on a “per cubic yard of in-place compacted fill” basis.

If soft or yielding soils are encountered below what the borings indicate, the subgrade may be able to be stabilized using either geogrid or chemical modification. The Project Geotechnical Engineer supervising proof-rolling shall determine appropriate stabilization technique based on actual conditions encountered during construction.

7.2.3 Fill Materials, Placement, and Compaction

Fill materials should consist of approved on-site, non-organic, clayey soils, or approved borrow material that are relatively free of topsoil, vegetation, trash, construction or demolition debris, frozen materials, particles over 6 inches in maximum dimension, or other deleterious materials.

The fill should be placed in shallow level lifts (or layers), 8 to 10 inches in loose thickness. Each lift should be moisture-conditioned within the acceptable moisture content range provided in Table 1, and compacted with a sheepsfoot roller or self-propelled compactor to at least the minimum percent compaction indicated in the same table. Moisture-conditioning may include: aeration and drying of wetter soils; wetting of drier soils; and/or thoroughly mixing wetter and drier soils into a uniform mixture.

Table 1. Percent compaction and moisture-conditioning recommendations for fill and backfill.

Area	Minimum Percent Compaction[a,b]	Acceptable Moisture Content Range[c]
Structural	98% of SPMDD	-2% to +3% of OMC
Floor slab subgrade	98% of SPMDD	-2% to +3% of OMC
Pavement subgrade: ≤ 8 inches below subgrade	98% of SPMDD	±2% of OMC

Notes:

[a] SPMDD = standard Proctor maximum dry density determined from ASTM D698.

[b] For granular soils that do not exhibit a well-defined moisture-density relationship, refer to Table 3 for minimum relative density requirements.

[c] OMC = optimum moisture content determined from ASTM D698.

[d] Structural fill and backfill for foundations are defined as fill and backfill located within the zones of influence of structures. The zone of influence of a structure is defined as the area below the footprint of the structure and 2H:1V outward and downward projections from the bearing elevation of the structure.

Where fill is placed on sloping terrain that is steeper than 6H:1V, the fill should be placed on continuous horizontal benches up the sloping terrain with the initial bench having a minimum width of 15 feet and each subsequent bench being at least 5 feet wide. The initial 15-foot-wide bench should be located at the toe of the proposed fill, unless noted otherwise. The benching operations should remove surficial medium stiff or softer soils and expose stiff native soils or undisturbed, intact bedrock on the surfaces of the benches. The benches should not be made until the fill is ready to be placed. If groundwater seepage is noted on the benches, the Project Geotechnical Engineer should be contacted for underdrainage recommendations before the soils are replaced and compacted.

If groundwater seepage is noted in areas not scheduled for bench, blanket, or trench drains, the Project Geotechnical Engineer should be contacted for underdrainage recommendations before the area is filled.

7.2.4 Earthwork Design and Construction Considerations

We recommend that the permanent cut and fill slopes for this project be designed not steeper than 3H:1V. Gentler slopes should be used whenever possible for ease of maintenance. Additionally, we recommend that the fill slopes be slightly overbuilt and then trimmed back to the design slope to achieve a well-compacted surface. Silt and/or sand soils should also be excluded from the surficial 5 feet of the fill slopes, as these materials are more susceptible to erosion.

Topsoil should be track-compacted on the proposed cut and fill slopes. We recommend that a maximum of 6 inches of topsoil be placed on the slopes. It should be noted that bedrock exposures at proposed grades may not consistently hold the topsoil layer, and small pop-outs may occur, especially at points of seepage.

Groundwater is not expected to have a significant adverse effect on the proposed earthwork construction; however, the Contractor must be prepared to remove seepage that accumulates in excavations, on fill surfaces, or at subgrade levels.

Maintaining the moisture content of bearing and subgrade soils within the acceptable ranges provided in Table 1 is very important during and after construction for the proposed structures. The clayey bearing and subgrade soils should not be allowed to become excessively wet or dried during or after construction, and measures should be taken to prevent water from ponding on these soils and to prevent these soils from desiccating during dry weather.

Positive drainage should be established to promote the rapid drainage of surface water away from the proposed structures and to prevent the ponding of water adjacent to these structures. Finish grading in grass and landscaped areas should be sloped down and away from the structures at 10 percent for at least 10 feet, and then at a gradient of at least 2 percent beyond the initial 10 feet from the structures. Proposed pavements should drain away from the structures at a minimum of 2 percent. The final grades should direct the surface water to storm water collection systems.

Deep-rooted vegetation should not be planted within 1.5 times their projected mature foliage radius from foundations, as the roots of such vegetation can seasonally extract moisture from plastic and low-plastic soils alike, causing them to seasonally shrink, which can potentially create foundation settlement issues. Additionally, smaller bushes or flowerbeds adjacent to proposed structures should not be watered by ponding water in the beds where the bushes or flowers may be growing, which could lead to swelling of the foundation soils and subsequent heave.

Due to the moisture-sensitivity of placing clay soils as fill, we recommend that the earthwork operations be carried out during the drier season of the year and that a sufficient gradient be maintained at the ground surface to prevent ponding of surface water. In our experience, the weather conditions are historically more favorable for earthwork during the months of May through October in the Greater Cincinnati Area. Regardless of the time of year, asphalt, concrete, or fill should not be placed over frozen or saturated soils, and frozen or saturated soils should not be used as compacted fill or backfill.

Best management practices (BMPs) should be implemented to reduce the effects of erosion and the siltation of adjacent properties. Upon completion of earthwork, disturbed areas should be stabilized. It is also recommended that riprap and/or suitable armoring be used at the outlets of storm sewers and headwalls to reduce flow velocities and protect against erosion.

7.3 Seismic Site Classification

Based on the borings and our interpretation of the 2021 Edition of the Ohio Building Code (2021 OBC), it is our opinion that Site Class C is applicable for this project site.

7.4 Foundation Design and Construction

7.4.1 Shallow Foundations

We recommend that the proposed rest room structure be supported on shallow foundations (i.e., continuous wall footings and isolated column pads) bearing in at-least stiff native soils or new compacted/tested engineered fill placed atop native stiff soils.

The soft to medium stiff native soils are not suitable for direct support of foundations. All foundations shall penetrate soft-to medium stiff soils to bear atop stiff native soils or engineered fill.

The footings may be proportioned for a maximum net allowable bearing pressure of 2,000 pounds per square foot (psf), full dead and full live load. We recommend that the minimum lateral dimensions for continuous wall footings and isolated column footings be at least 18 and 24 inches, respectively.

Exterior footings and footings in unheated interior areas should bear at least 30 inches below the lowest adjacent exterior/unheated grade for protection from frost penetration.

Where shallow foundations will be subjected to lateral loads, resistance to overturning and sliding may be evaluated using the parameters provided in Table 2. Furthermore, lateral resistance to sliding may be provided by a combination of friction and passive resistance; however, passive resistance should be ignored above the frost penetration depth of 30 inches. It also should be noted that the passive resistance parameters assume a level ground surface. If the ground is sloping down and away from the foundation in the area of passive resistance, we should be contacted to provide site-specific parameters. The frictional force should be based on dead normal loads only, and a factor of safety of 1.5 should be applied to the sliding resistance.

Table 2. Design parameters for laterally loaded shallow foundations.

Soil unit weight, γ (pcf)	125
Internal angle of friction, ϕ (°)	26
Cohesion, c (psf)	0
Ultimate coefficient of static friction, μ_{ult}	0.35 for concrete cast on stiff in-situ clayey soils
	0.40 for formed precast concrete on compacted granular leveling base
Ultimate passive resistance, σ_p[a, b]	320 psf (drained condition) 222 psf (undrained condition)

Note:

[a] Parameter based on level ground surface. Passive resistance may be considered where concrete is cast against free-standing vertical faces of the indicated soil type; however, passive resistance should be ignored in the upper 30 inches below proposed grade due to seasonal variations in moisture and frost penetration. If the ground is sloping down and away from the foundation in the area of passive resistance, we should be contacted to provide site-specific recommendations.

7.4.2 General Shallow Foundation Construction Recommendations

We recommend that foundation excavations be cut to neat lines and grades so that concrete may be placed directly against the banks of the excavations without forming. Loose, soft, wet, frozen, or otherwise disturbed materials should be removed from the bearing surfaces of the foundations prior to the placement of reinforcing steel and concrete. If a crusted or saturated surface develops at the bearing surface for a foundation, we recommend that it be skimmed to expose a fresh surface before reinforcing steel and concrete are placed. Foundation concrete should be placed the same day as the excavation is made to prevent saturation or desiccation of the bearing surfaces.

Concrete mud mats may be placed over the bearing surfaces to protect the bearing materials from desiccation or softening via saturation. If concrete mud mats are utilized, the concrete should have a minimum compressive strength of 1,500 psi and a minimum thickness of 3 inches. The excavated bearing surface should be lowered at least the thickness of the mud mat, and the top of the mud mat should be at or below the design bearing elevation of the foundation. Prior to the placement of the concrete mud mat, the bearing surfaces should be cleaned of loose, soft, wet, frozen, or otherwise disturbed material.

Water should not be allowed to pond on top of bearing soils within footing excavations, or on or around completed footings, in order to reduce potential softening or swelling of the bearing materials.

We recommend that foundation steps have a maximum height of 2 feet and a corresponding minimum length of 4 feet. Reinforcing steel and concrete should remain continuous through the foundation steps.

7.4.3 Foundations – Observation Platform

7.5 Foundation-Observation Platform

UES understands that a 90 feet long boardwalk will be required on the northern side of the site along the trail to cross over the detention pond and bioretention basin.

Based on our conversation with client on Jan 9, 2026, the boardwalk will be supported on 8" diameter timber piles. The pile installation method has not been decided yet but the approach would be non-displacement method (either drilled shaft or auger-cast pile) based on proximity to bedrock. Borings B-3 is the closest borings to the proposed boardwalk and encountered bedrock at 8 feet below existing ground.

Geotechnical Axial resistance for the piles may be provided by a combination of end resistance and side resistance. However, the timber pile capacity will likely govern the allowable capacity of the piles rather than the allowable end bearing and side resistance. We recommend that the minimum center-to-center spacing of the piles be 3 times their diameter, unless group effects are accounted for in their axial design. Where piles will be supporting lateral loads, the piles should be designed using a p-y approach.

Where the spacing of laterally loaded piles will be close enough that their areas of resistance overlap, we recommend that an appropriate p-multiplier be applied in the analyses to account for the overlap and reduction in lateral resistance. For piles spaced closer than 3.75 times the pile diameter or width and where the direction of pile spacing will be perpendicular to the load direction, we recommend that the p-multiplier (p_m) be defined by the empirical relationship presented in Reese et al. (2006):

$$p_m = 0.64(S/D)^{0.34} \leq 1.0$$

where S is the pile spacing and D is the pile diameter or width. For piles where the direction of pile spacing will be parallel to the load direction, the p-multipliers should be per Table 10.7.2.4-1 from the *AASHTO LRFD Bridge Design Specifications* (AASHTO 2020).

The idealized subsurface profile table below provides the p-y parameters for L-Pile Analyses and recommended values for allowable end and side resistance for the different subsurface layers.

IDEALIZED SUBSURFACE PROFILE
FOR AXIAL/LATERAL LOAD ANALYSES
FOR OBSERVATION PLATFORM (BASED ON BORING B-3)

El. (feet)	Depth (ft.)		
699.00	0.0	Existing Ground Surface	
696.00	3.0	Ignore upper 3.0 feet to account for frost depth and soft to medium stiff soils	
691.00		Stiff cohesive soils (stiff clay model):	
		Lateral Parameters for LPILE	
		γ = 125 pcf	γ' = 67.6 pcf
		c = 1,500 psf	ε_{50} = 0.007
		Axial Parameters	
	8.0	$q_{s,all}$ = 360 psf **	$q_{p,all}$ = 4,500 psf
		Highly Weathered Augurable Shale Bedrock (stiff clay model):	
		Lateral Parameters	
		γ = 140 pcf	
		c = 4,500 psf	ε_{50} = 0.002
	Below 8 feet	Axial Parameters	
		$q_{s,all}$ = 800 psf **	$q_{p,all}$ = 8,000 psf (12-inch min. bedrock)

Note:
**Shafts need to penetrate at least 2.5 X Shaft Diameter into the stratum to consider the contribution from side resistance.

Symbol Definition:
- γ = Unit weight
- γ' = Effective unit weight
- c = Cohesion
- ϕ = Friction angle
- ε_{50} = Strain at 50% of unconfined compressive strength
- k = Initial horizontal modulus of subgrade reaction
- $q_{s,all}$ = Allowable side resistance
- $q_{p,all}$ = Allowable end/tip resistance
- FOS = Factor of Safety = 2.75 for side and 3.0 for end/tip resistance

We recommend that foundation excavations be reviewed by the Project Geotechnical Engineer, or a representative thereof, prior to placing concrete in order to confirm that the bearing materials and surfaces are consistent with the design recommendations of this report.

7.6 Utility Construction

We anticipate that select granular backfill will be used as pipe bedding and pipe zone backfill for the utilities. We recommend that the granular backfill be limited to the pipe bedding and minimum required pipe/utility cover. The remainder of the utility trenches should be backfilled with flowable fill or compacted clayey soils up to design subgrade elevation to reduce the potential for water collecting in these trenches and being absorbed by the surrounding clays, causing heave of foundations, slabs, pavement, etc.

Granular bedding and backfill that exhibits a well-defined moisture-density relationship should be compacted and moisture-conditioned per the requirements presented in Table 1; otherwise, the granular material should be compacted to at least the minimum relative densities indicated in Table 3.

Table 3. Relative density compaction recommendations for granular fill and backfill.

Area	Minimum Relative Density [a,b]
Structural [c]	80%
Non-structural	75%
Floor slab and Pavement subbase	80%

Notes:
[a] Relative density evaluated on the basis of the maximum and minimum index densities determined from ASTM D4253 and D4254, respectively.
[b] For granular soils that exhibit a well-defined moisture-density relationship, refer to Table 1 on for minimum percent compaction and moisture-conditioning requirements.
[c] Structural fill and backfill for foundations are defined as fill and backfill located within the zones of influence of structures. The zone of influence of a structure is defined as the area below the footprint of the structure and 2H:1V outward and downward projections from the bearing elevation of the structure.

Utility trench backfill should be placed in 6- to 8-inch-thick lifts with each lift compacted to at least the specified degree of compaction. Under no circumstances should the backfill be flushed in an attempt to obtain compaction.

If flowable fill is used, it should have a design strength of at least 30 psi for stability and not greater than 100 psi for future excavatability.

Prior to placing the bedding and utilities within the utility trench, soft, saturated, and compressible material should be removed from the bottom of the trench, exposing moist stiff soils or undisturbed bedrock.

7.7 Floor Slab

The floor slab subgrade shall be prepared in general accordance with the requirements of Section 7.2.2 and Section 7.2.3. The floor slab subgrade shall be constructed on either stiff native soils or engineered fill atop stiff native soils.

The concrete slab thicknesses for the building slab should be designed based on the approved subgrade providing a modulus of subgrade reaction (k) of 100 pounds per cubic inch (pci) for point loads[2].

We recommend that the building floor slab be underlain by a minimum 4 to 6-inch-thick subbase layer of dense-graded aggregate (DGA) to serve as a capillary break and reduce the potential for groundwater rising beneath and into the floor slab from the clayey subgrade via capillary action. The DGA subbase should be compacted per the requirements presented in Table 1. Immediately

[2] For large area loads, the modulus of subgrade reaction would be lower, and settlement analyses would need to be completed to develop a specific modulus value for such loads.

prior to placement of the granular base, we recommend that the top 8 inches of clayey floor slab subgrade be compacted and moisture-conditioned per the requirements presented in Table 1.

Care should be taken during slab-on-grade construction to not allow the subgrade to become desiccated or saturated. Additionally, consideration should be given to the timing of construction relative to the time of year and weather. If the slab construction is performed during relatively cold and wet weather, the use of lime-or cement-treatment of the subgrade may be beneficial to maintain progress during construction; otherwise, the subgrade is likely to be weakened by softening from saturation by rain and/or snow, leading to delays in reworking the subgrade to prepare it back to its pre-softened condition.

We recommend that control joints be provided within the concrete slab-on-grade floors. These joints should be sealed to reduce surface water infiltration until the building is enclosed. The floor slab should be structurally separated from walls, columns, footings, and penetrations to allow independent movement of the floor. Alternatively, floor slabs that are not structurally independent should be designed to allow for differential movements that normally occur between the floor slabs, columns, and foundation walls.

7.8 Pavement Subgrade

Pavements for this project should be designed in accordance with expected axle loads, frequency of loading, and the properties of the subgrade. A California Bearing Ratio (CBR) value of 3 should be assumed in the pavement design for subgrade prepared per the recommendations in this report.

Prior to the placement of pavement or aggregate base, where provided, we recommend that the top 8 inches of clayey subgrade be scarified and recompacted per the requirements presented in Table 1.

We recommend incorporation of aggregate base in pavement design because it improves drainage separating pavement layers from subgrade.

If the proposed pavement section includes an aggregate base, we recommend that caution be exercised so that the proposed aggregate base does not become saturated during or after construction. Water trapped in the aggregate base can freeze, causing it to expand within the voids it occupies. Consequently, ice lenses may form and potentially heave the pavement. Furthermore, the thawing process can soften underlying cohesive subgrades, which reduces the pavement support provided by the subgrade, giving rise to “pumping” of the pavements under loads. Preferably, the aggregate base should be a free-draining material with provisions for draining the base through a system of underdrains. Regardless, we recommend that transverse underdrains at subgrade elevations be installed at the transitions from existing pavement to new pavement.

Surface drainage should be directed away from the edges of proposed or existing pavements so that water does not pond next to pavements or flow onto pavements from unpaved areas. Such ponding or flow can cause deterioration of pavement subgrades and premature failure of pavements. If drainage ditches are used to intercept surface water before it reaches the pavement, the ditches should have an invert at least 6 inches below the pavement subgrade and have a sufficient longitudinal gradient to rapidly drain the ditches and prevent ponding of water. In those areas where exterior grades do not fully slope away from the edges of the proposed pavement, we recommend that edge drains be installed along the perimeter of the pavement.

If dumpsters are utilized at the project site, we recommend that the dumpster be supported on concrete slabs and that the slabs be sized to accommodate the loading wheels of the dumpster truck. The access lane to the dumpster should also be designed for the heavier wheel loads associated with dumpster trucks.

8.0 RECOMMENDED ADDITIONAL SERVICES

The conclusions and recommendations given in this report are based on: UES's understanding of the proposed design and construction, as outlined in this report; site observations; interpretation of the exploration data; and our experience. Since the design recommendations is best understood by UES, we recommend that UES be included in the final design and construction process and be retained to review the project plans and specifications to confirm that the recommendations given in this report have been correctly implemented. We recommend that UES be retained to participate in prebid and preconstruction conferences to reduce the risk of misinterpretation of the conclusions and recommendations in this report relative to the proposed construction of the subject project.

Since actual subsurface conditions between boring locations may vary from those encountered in the borings, our design recommendations are subject to adjustment in the field based on the subsurface conditions encountered during construction. Therefore, we recommend that UES be retained to provide construction observation services as a continuation of the design process to confirm the recommendations in this report and to revise them accordingly to accommodate differing subsurface conditions. Construction observation is intended to enhance compliance with project plans and specifications. It is not insurance, nor does it constitute a warranty or guarantee of any type. Regardless of construction observation, contractors, suppliers, and others are solely responsible for the quality of their work and for adhering to plans and specifications.

9.0 LIMITATIONS

This report has been prepared on behalf of, and for the exclusive use of, Burgess & Niple, Inc for specific application to the named project as described herein. If this report is provided to other parties, it should be provided in its entirety with all supplementary information. In addition, Burgess & Niple, Inc should make it clear that the information is provided for factual data only, and not as a warranty of subsurface conditions presented in this report.

UES has attempted to conduct the services reported herein in a manner consistent with that level of care and skill ordinarily exercised by members of the profession currently practicing in the same locality and under similar conditions. The recommendations and conclusions contained in this report are professional opinions. The report is not a bidding document and should not be used for that purpose.

Our scope for this phase of the project did not include any environmental assessment or investigation for the presence or absence of wetlands or hazardous or toxic materials in the soil, surface water, groundwater, air, on or below or around this site. Any statements in this report or on the boring logs regarding odors noted or unusual or suspicious items or conditions observed are strictly for the information of our client. Our scope did not include an assessment of the effects of flooding and erosion of creeks or rivers adjacent to or on the project site.

The analyses, conclusions, and recommendations contained in this report are based on the data obtained from the subsurface exploration. The field exploration methods used indicate subsurface conditions only at the specific locations where samples were obtained, only at the time they were obtained, and only to the depths penetrated. Consequently, subsurface conditions may vary gradually, abruptly, and/or nonlinearly between sample locations and/or intervals.

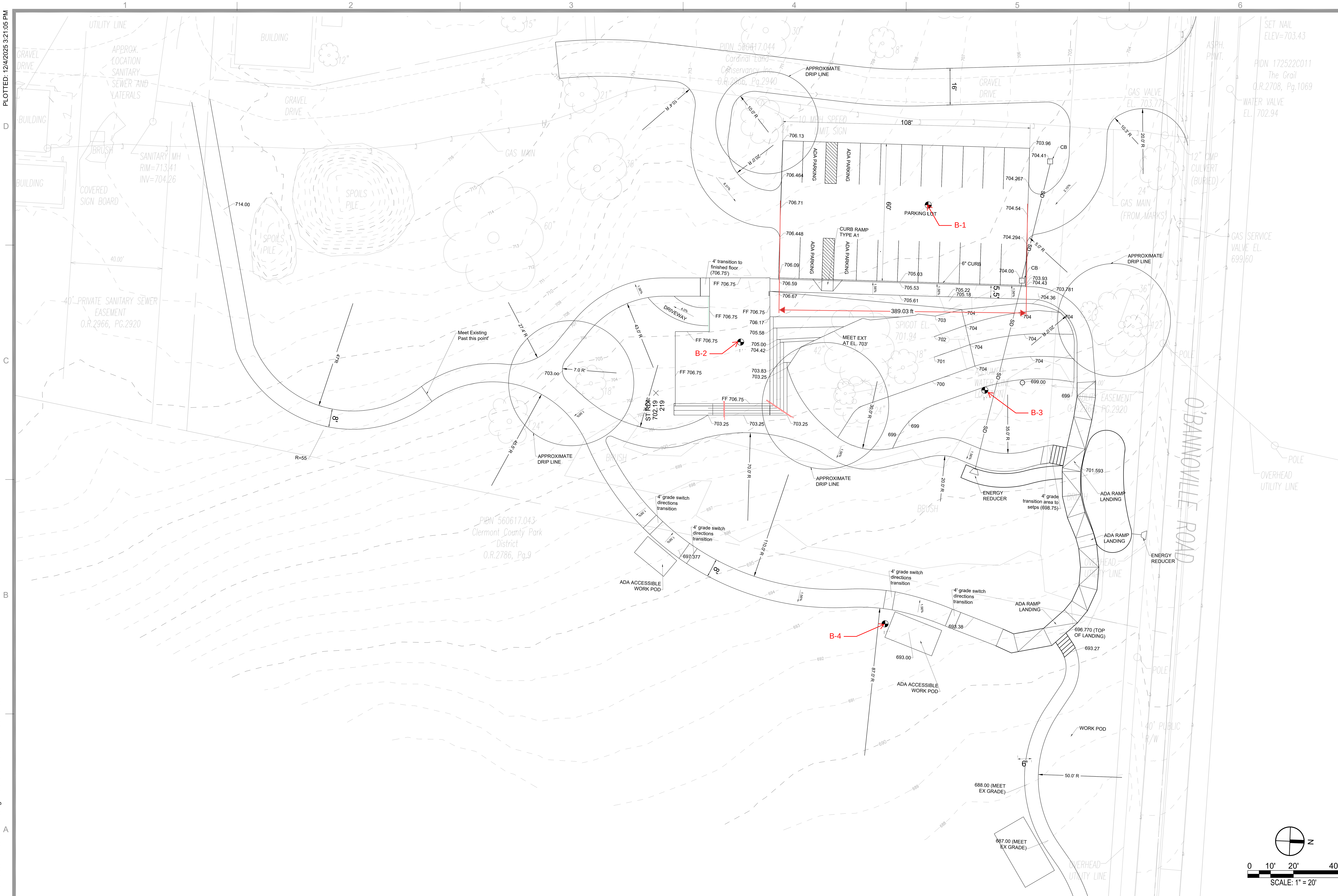
The conclusions or recommendations presented in this report should not be used without UES's review and assessment if the nature, design, or location of the facilities is changed, if there is a substantial lapse in time between the submittal of this report and the start of work at the site, or if there is a substantial interruption or delay during work at the site. If changes are contemplated or delays occur, UES must be allowed to review them to assess their impact on the findings, conclusions, and/or design recommendations given in this report. UES will not be responsible for any claims, damages, or liability associated with any other party's interpretations of the subsurface data or with reuse of the subsurface data or engineering analyses in this report.

The recommendations included in this report have been based in part on assumptions about variations in site stratigraphy that may be evaluated further during earthwork and foundation construction. UES should be retained to perform construction observation and continue its geotechnical engineering service using observational methods. UES cannot assume liability for the adequacy of its recommendations when they are used in the field without UES being retained to observe construction.

A copy of "Important Information about This Geotechnical-Engineering Report" that is published by the Geotechnical Business Council (GBC) of the Geoprofessional Business Association (GBA) is included in Appendix C for your review. The publication discusses some other limitations, as well as ways to manage risk associated with subsurface conditions.

APPENDIX

APPENDIX A – PLAN



SITE PLAN

00 / C-201

SCALE: 1/4" = 1'-0"

PLOTTED: 12/4/2025 3:21:05 PM

P:\PR63329\06 CAD\Sheets\C-201 SITE PLAN.dwg 12/4/2025 2:16:31 PM Ellie Vonderhaar

BURGESS & NIPLE
525 VINE STREET
SUITE 1300
CINCINNATI, OHIO 45202

Clermont County Parks District
Grailville Preserve & Park Design- Phase 1
Miami Township
Clermont County, Ohio

NO.	REVISIONS DESCRIPTION	DATE

JOB NO:	PR63329
DATE:	11/11/2025
DESIGNED BY:	EV
DRAWN BY:	EV
CHECKED BY:	DG
APPROVED BY:	DG
SCALE:	1"=20'

SITE PLAN

SHEET IDENTIFICATION
C-201

SHEET: XX OF XX

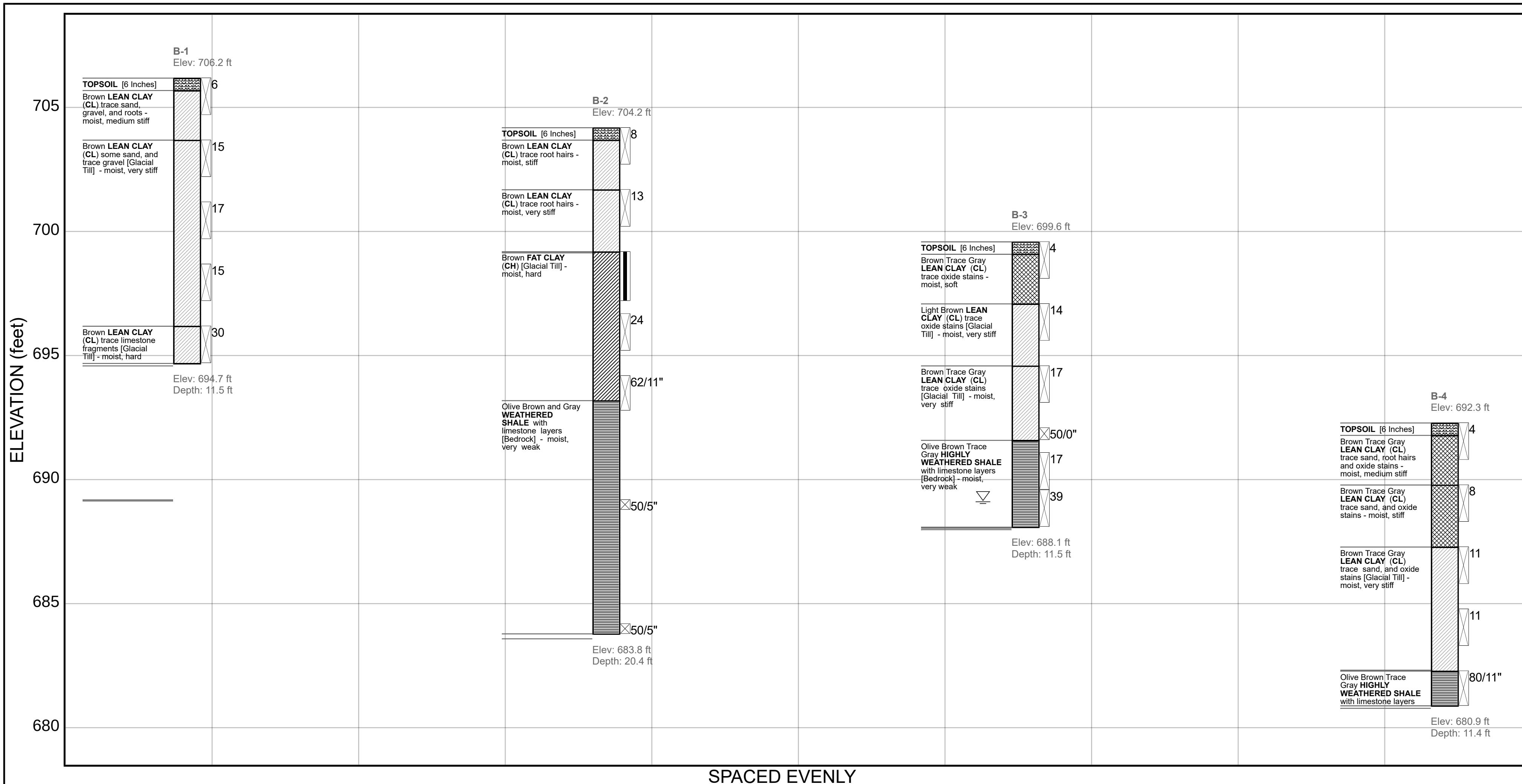
APPENDIX B – BORING INFORMATION

Cross-section Report

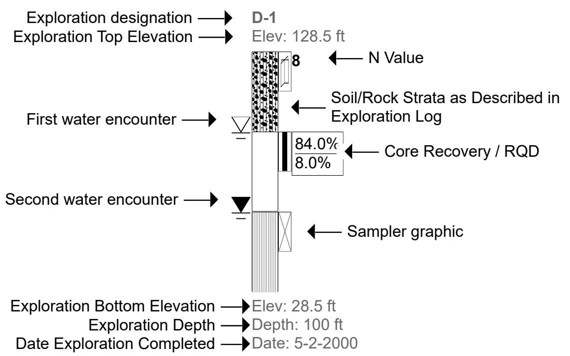
Boring Logs

Soil Classification Sheet

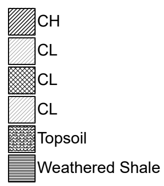
Unconfined Compression Test Result



EXPLORATION LOG LEGEND



LEGEND KEY



Grailville Park and Preserve
Miami Township, Clermont County, OH

A25133.00105.000

CROSS SECTIONS REPORT

UES

SOIL BORING B-1

SHEET 1 OF 1

Project: Grailville Park and Preserve
Project Location: Miami Township, Clermont County, OH
Location Accuracy: Provided by Burgess & Niple, Inc.
Coordinates: Latitude: 39.265325 Longitude: -84.242401
Surface Elevation: 706.2'

Project Number: A25133.00105.000
Client Name: Burgess & Niple, Inc.
Logged By: Sunil Badam
Checked By: Suraj Khadka

Elevation (ft)	Visual Classification and Remarks	Depth (ft)	Sample Number	Sample Graphic	Blow Counts	N-Value (bpf)	N60	Recovery Length (in)	Pocket Pen (tsf)	Moisture Content (%)
706.2	**TOPSOIL** [6 Inches]	0.5	1	SPT	2-3-3	6	9	18	0.5	23.6
705	Brown **LEAN CLAY** (**CL**) trace sand, gravel, and roots - moist, medium stiff	2.5								
	Brown **LEAN CLAY** (**CL**) some sand, and trace gravel [Glacial Till] - moist, very stiff		2	SPT	3-7-8	15	22	18	2.0	17.4
700		5	3	SPT	4-7-10	17	25	18	4.0	20.8
		10	4	SPT	4-6-9	15	22	18	4.0	31.4
695	Brown **LEAN CLAY** (**CL**) trace limestone fragments [Glacial Till] - moist, hard	11.5	5	SPT	14-8-22	30	44	18		18.8
	End of boring at 11.5' Boring backfilled with auger cuttings									
690		15								
685		20								

Remarks:
-

Date Completed: 11/24/2025
Drilling Firm: UES
Rig Type: Mobile B57
Driller: Chris Lake
Drilling Method: 3-1/4" Hollow Stem Auger
Hammer Efficiency: 87%
Hammer Type: Auto

SAMPLE TYPES

SPT - Standard Penetration Test

WATER LEVEL OBSERVATIONS

At Time of Drilling (ATD) None

Depth To Cave In: N/A

SOIL BORING B-2

Project: Grailville Park and Preserve
Project Location: Miami Township, Clermont County, OH
Location Accuracy: Provided by Burgess & Niple, Inc.
Coordinates: Latitude: 39.265103 Longitude: -84.242184
Surface Elevation: 704.2'

Project Number: A25133.00105.000
Client Name: Burgess & Niple, Inc.
Logged By: Driller
Checked By: Suraj Khadka

Elevation (ft)	Visual Classification and Remarks	Depth (ft)	Sample Number	Sample Graphic	Blow Counts	N-Value (bpf) (uncorrected)	N60	Pocket Pen (tsf)	Moisture Content (%)	Atterberg Limits (LL-PL-PI)	% Fines
704.2	**TOPSOIL** [6 Inches]	0.5	1	SPT	1-3-5	8	12	1.0	25.3		
	Brown **LEAN CLAY** (**CL**) trace root hairs - moist, stiff	2.5									
700	Brown **LEAN CLAY** (**CL**) trace root hairs - moist, very stiff	5	2	SPT	5-7-6	13	19	2.0	15.2		
	Brown **FAT CLAY** (**CH**) [Glacial Till] - moist, hard *[Dry Unit Weight = 111.8pcf, Unconfined Compressive Strength = 9,260psf on ST-3]*	11	3	ST				4.0	21.8	54-27-27	71.4
695			4	SPT	4-5-19	24	35	4.5	19.4		
			5	SPT	14-12-50/5"	62	90		16.8		
690	Olive Brown and Gray **WEATHERED SHALE** with limestone layers [Bedrock] - moist, very weak	20.4	6	SPT	50/5"	50	73				
685			7	SPT	50/5"	50	73				
680	End of boring at 20.4' Boring backfilled with auger cuttings										

Remarks:
-

Date Completed: 11/26/2025
Drilling Firm: UES
Rig Type: Mobile B57
Driller: Chris Lake
Drilling Method: 3-1/4" Hollow Stem Auger
Hammer Efficiency: 87%
Hammer Type: Auto

SAMPLE TYPES

SPT - Standard Penetration Test
ST - Shelby Tube

WATER LEVEL OBSERVATIONS

At Time of Drilling (ATD) None

Depth To Cave In: N/A

SOIL BORING B-3

SHEET 1 OF 1

Project: Grailville Park and Preserve
Project Location: Miami Township, Clermont County, OH
Location Accuracy: Provided by Burgess & Niple, Inc.
Coordinates: Latitude: 39.265397 Longitude: -84.242117
Surface Elevation: 699.6'

Project Number: A25133.00105.000
Client Name: Burgess & Niple, Inc.
Logged By: Driller
Checked By: Suraj Khadka

Elevation (ft)	Visual Classification and Remarks	Depth (ft)	Sample Number	Blow Counts	N-Value (bpf)	N60	Recovery Length (in)	Pocket Pen (tsf)	Moisture Content (%)
699.6	**TOPSOIL** [6 Inches]	0.5	1	WOH-1-3	4	6	18	0.5	27.9
	Brown Trace Gray **LEAN CLAY** (**CL**) trace oxide stains - moist, soft	2.5							
	Light Brown **LEAN CLAY** (**CL**) trace oxide stains [Glacial Till] - moist, very stiff	5	2	4-6-8	14	20	18	4.0	20.9
	Brown Trace Gray **LEAN CLAY** (**CL**) trace oxide stains [Glacial Till] - moist, very stiff	8	3	5-7-10	17	25	18	4.0	20.3
			4	6-50/0"	50	73	6		18.5
	Olive Brown Trace Gray **HIGHLY WEATHERED SHALE** with limestone layers [Bedrock] - moist, very weak	11.5	5	33-9-8	17	25	14		9.3
			6	4-19-20	39	57	12		20.7

Elevation scale: 695, 690, 685, 680, 675. Depth scale: 5, 10, 15, 20. Water level symbol at 10.5 ft.

End of boring at 11.5'
Boring backfilled with auger cuttings

Remarks:
-

Date Completed:	11/26/2025
Drilling Firm:	UES
Rig Type:	Mobile B57
Driller:	Chris Lake
Drilling Method:	3-1/4" Hollow Stem Auger
Hammer Efficiency:	87%
Hammer Type:	Auto

SAMPLE TYPES

SPT - Standard Penetration Test

WATER LEVEL OBSERVATIONS

At Time of Drilling (ATD) 10.5'

Depth To Cave In: N/A

SOIL BORING B-4

SHEET 1 OF 1

Project: Grailville Park and Preserve
Project Location: Miami Township, Clermont County, OH
Location Accuracy: Provided by Burgess & Niple, Inc.
Coordinates: Latitude: 39.265283 Longitude: -84.241753
Surface Elevation: 692.3'

Project Number: A25133.00105.000
Client Name: Burgess & Niple, Inc.
Logged By: Driller
Checked By: Suraj Khadka

Elevation (ft)	Visual Classification and Remarks	Depth (ft)	Sample Number	Blow Counts	N-Value (bpf)	N60	Recovery Length (in)	Pocket Pen (tsf)	Moisture Content (%)	Atterberg Limits (LL-PL-PI)
692.3	**TOPSOIL** [6 Inches]	0.5	1	WOH-2-2	4	6	18	0.5	31.6	
	Brown Trace Gray **LEAN CLAY** (**CL**) trace sand, root hairs and oxide stains - moist, medium stiff	2.5								
	Brown Trace Gray **LEAN CLAY** (**CL**) trace sand, and oxide stains - moist, stiff	5	2	2-3-5	8	12	18	1.5	22.7	44-22-22
	Brown Trace Gray **LEAN CLAY** (**CL**) trace sand, and oxide stains [Glacial Till] - moist, very stiff	10	3	3-5-6	11	16	16	2.0	25.3	
			4	4-4-7	11	16	17	3.0	22.3	
	Olive Brown Trace Gray **HIGHLY WEATHERED SHALE** with limestone layers [Bedrock] - moist, very weak	11.4	5	17-30-50/5"	80	116	14			

End of boring at 11.4'
Boring backfilled with auger cuttings

Elevation scale: 690, 685, 680, 675, 670. Depth scale: 5, 10, 15, 20.

Remarks:
-

Date Completed:	11/26/2025
Drilling Firm:	UES
Rig Type:	Mobile B57
Driller:	Chris Lake
Drilling Method:	3-1/4" Hollow Stem Auger
Hammer Efficiency:	87%
Hammer Type:	Auto

SAMPLE TYPES

☒ SPT - Standard Penetration Test

WATER LEVEL OBSERVATIONS

At Time of Drilling (ATD) None

Depth To Cave In: N/A

SOIL CLASSIFICATION SHEET

NON COHESIVE SOILS
(Silt, Sand, Gravel and Combinations)

Density

Very Loose	- 4 blows/ft. or less
Loose	- 5 to 10 blows/ft.
Medium Dense	- 11 to 30 blows/ft.
Dense	- 31 to 50 blows/ft.
Very Dense	- 51 blows/ft. or more

Relative Properties

Descriptive Term	Percent
Trace	1 – 10
Little	11 – 20
Some	21 – 35
And	36 – 50

Particle Size Identification

Boulders	- 8 inch diameter or more	
Cobbles	- 3 to 8 inch diameter	
Gravel	- Coarse	- 3/4 to 3 inches
	- Fine	- 3/16 to 3/4 inches
Sand	- Coarse	- 2mm to 5mm (dia. of pencil lead)
	- Medium	- 0.45mm to 2mm (dia. of broom straw)
	- Fine	- 0.075mm to 0.45mm (dia. of human hair)
Silt		- 0.005mm to 0.075mm (Cannot see particles)

COHESIVE SOILS
(Clay, Silt and Combinations)

Consistency	Field Identification	Unconfined Compressive Strength (tons/sq. ft.)
Very Soft	Easily penetrated several inches by fist	Less than 0.25
Soft	Easily penetrated several inches by thumb	0.25 – 0.5
Medium Stiff	Can be penetrated several inches by thumb with moderate effort	0.5 – 1.0
Stiff	Readily indented by thumb but penetrated only with great effort	1.0 – 2.0
Very Stiff	Readily indented by thumbnail	2.0 – 4.0
Hard	Indented with difficulty by thumbnail	Over 4.0

Classification on logs are made by visual inspection.

Standard Penetration Test – Driving a 2.0” O.D., 1 3/8” I.D., sampler a distance of 1.0 foot into undisturbed soil with a 140 pound hammer free falling a distance of 30 inches. It is customary to drive the spoon 6 inches to seat into undisturbed soil, then perform the test. The number of hammer blows for seating the spoon and making the tests are recorded for each 6 inches of penetration on the drill log (Example – 6/8/9). The standard penetration test results can be obtained by adding the last two figures (i.e. 8+9=17 blows/ft.). Refusal is defined as greater than 50 blows for 6 inches or less penetration.

Strata Changes – In the column “Soil Descriptions” on the drill log, the horizontal lines represent strata changes. A solid line (————) represents an actually observed change; a dashed line (— — — —) represents an estimated change.

Groundwater observations were made at the times indicated. Porosity of soil strata, weather conditions, site topography, etc., may cause changes in the water levels indicated on the logs.

UNCONFINED COMPRESSIVE STRENGTH OF COHESIVE SOILS
ASTM D2166

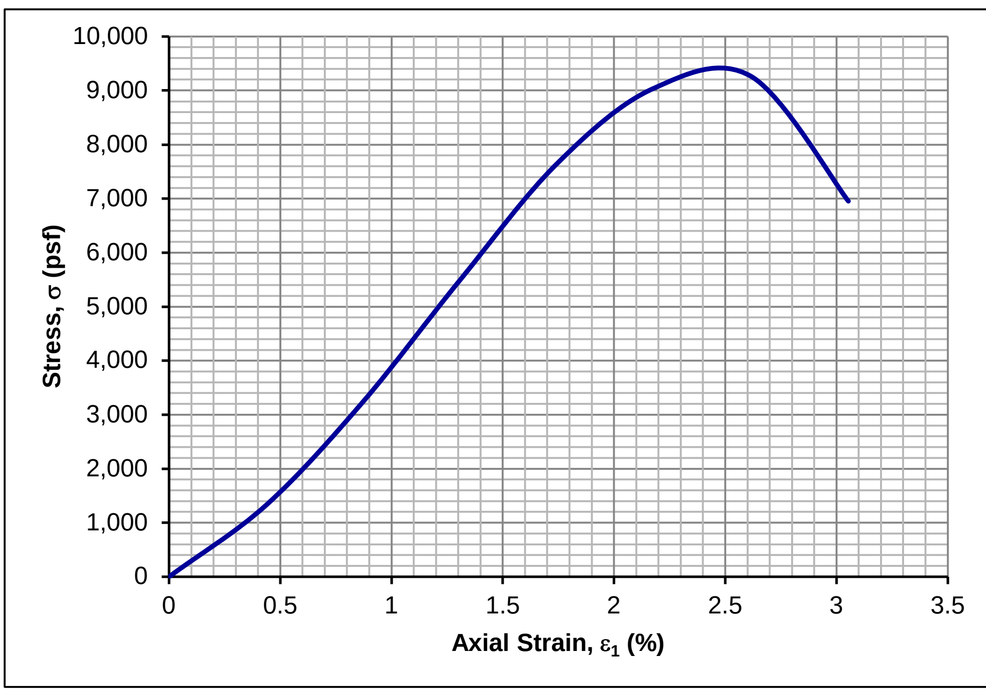
CLIENT : Burgess & Niple, Inc. DATE: 12/3/2025
PROJECT NO.: A25133.00105.000
PROJECT: Grailville Park and Preserve
LOCATION: Batavia, OH

BORING NO.: B-2 SAMPLE NO.: ST-3 DEPTH (ft.): 5.0-7.0
SAMPLE OBTAINED BY: Shelby Tube CONDITION: Undisturbed
SAMPLE DESCRIPTION:

LIQUID LIMIT (%): 54 PLASTIC LIMIT (%): 27 PLASTICITY INDEX (%): 27 USCS: CH
GRAVEL (%): SAND (%): SILT (%): CLAY (%):
SPECIFIC GRAVITY OF SOLIDS: 2.75 (Assumed) LOAD CELL NO.: 1059

SAMPLE DATA	
DIAMETER (in.):	2.84
HEIGHT (in.):	5.74
HEIGHT TO DIAMETER RATIO:	2.02
WET UNIT WEIGHT (pcf):	131.4
DRY UNIT WEIGHT (pcf):	111.8
VOID RATIO:	0.53
MOISTURE CONTENT (%)*:	17.5
DEGREE OF SATURATION (%):	90

FAILURE DATA	
AVERAGE RATE OF AXIAL STRAIN TO FAILURE (%/min.):	**0.7**
AXIAL STRAIN AT FAILURE (%):	**2.6**
TIME TO FAILURE (min.):	**1.9**
UNCONFINED COMPRESSIVE STRENGTH, q_u (psf):	**9,260**
UNDRAINED SHEAR STRENGTH, s_u (psf):	**4,630**
SENSITIVITY, S_t:	**-**



FAILURE SHAPES

FRONT VIEW

SIDE VIEW

REMARKS :

*Moisture content determined after shear from entire sample.

APPENDIX C – IMPORTANT INFORMATION ABOUT THIS GEOTECHNICAL-ENGINEERING REPORT

Important Information about This
Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

Geotechnical Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical-engineering study conducted for a civil engineer may not fulfill the needs of a constructor — a construction contractor — or even another civil engineer. Because each geotechnical- engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client. No one except you should rely on this geotechnical-engineering report without first conferring with the geotechnical engineer who prepared it. *And no one — not even you* — should apply this report for any purpose or project except the one originally contemplated.

Read the Full Report

Serious problems have occurred because those relying on a geotechnical-engineering report did not read it all. Do not rely on an executive summary. Do not read selected elements only.

Geotechnical Engineers Base Each Report on a Unique Set of Project-Specific Factors

Geotechnical engineers consider many unique, project-specific factors when establishing the scope of a study. Typical factors include: the client's goals, objectives, and risk-management preferences; the general nature of the structure involved, its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless the geotechnical engineer who conducted the study specifically indicates otherwise, do not rely on a geotechnical-engineering report that was:

- not prepared for you;
- not prepared for your project;
- not prepared for the specific site explored; or
- completed before important project changes were made.

Typical changes that can erode the reliability of an existing geotechnical-engineering report include those that affect:

- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light-industrial plant to a refrigerated warehouse;
- the elevation, configuration, location, orientation, or weight of the proposed structure;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes—even minor ones—and request an assessment of their impact. *Geotechnical engineers cannot accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.*

Subsurface Conditions Can Change

A geotechnical-engineering report is based on conditions that existed at the time the geotechnical engineer performed the study. *Do not rely on a geotechnical-engineering report whose adequacy may have been affected by*: the passage of time; man-made events, such as construction on or adjacent to the site; or natural events, such as floods, droughts, earthquakes, or groundwater fluctuations. *Contact the geotechnical engineer before applying this report to determine if it is still reliable.* A minor amount of additional testing or analysis could prevent major problems.

Most Geotechnical Findings Are Professional Opinions

Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field and laboratory data and then apply their professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ — sometimes significantly — from those indicated in your report. Retaining the geotechnical engineer who developed your report to provide geotechnical-construction observation is the most effective method of managing the risks associated with unanticipated conditions.

A Report's Recommendations Are Not Final

Do not overrely on the confirmation-dependent recommendations included in your report. *Confirmation-dependent recommendations are not final,* because geotechnical engineers develop them principally from judgment and opinion. Geotechnical engineers can finalize their recommendations *only* by observing actual subsurface conditions revealed during construction. *The geotechnical engineer who developed your report cannot assume responsibility or liability for the report's confirmation-dependent recommendations if that engineer does not perform the geotechnical-construction observation required to confirm the recommendations' applicability.*

A Geotechnical-Engineering Report Is Subject to Misinterpretation

Other design-team members' misinterpretation of geotechnical-engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer confer with appropriate members of the design team after submitting the report. Also retain your geotechnical engineer to review pertinent elements of the design team's plans and specifications. Constructors can also misinterpret a geotechnical-engineering report. Confront that risk by having your geotechnical engineer participate in prebid and preconstruction conferences, and by providing geotechnical construction observation.

Do Not Redraw the Engineer's Logs

Geotechnical engineers prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical-engineering report should *never* be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, *but recognize that separating logs from the report can elevate risk.*

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can make constructors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give constructors the complete geotechnical-engineering report, *but* preface it with a clearly written letter of transmittal. In that letter, advise constructors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with the geotechnical engineer who prepared the report (a modest fee may be required) and/or to conduct additional study to obtain the specific types of information they need or prefer. A prebid conference can also be valuable. *Be sure constructors have sufficient time* to perform additional study. Only then might you be in a position to give constructors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

Read Responsibility Provisions Closely

Some clients, design professionals, and constructors fail to recognize that geotechnical engineering is far less exact than other engineering disciplines. This lack of understanding has created unrealistic expectations that have led to disappointments, claims, and disputes. To help reduce the risk of such outcomes, geotechnical engineers commonly include a variety of explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Environmental Concerns Are Not Covered

The equipment, techniques, and personnel used to perform an *environmental* study differ significantly from those used to perform a *geotechnical* study. For that reason, a geotechnical-engineering report does not usually relate any environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated environmental problems have led to numerous project failures.* If you have not yet obtained your own environmental information, ask your geotechnical consultant for risk-management guidance. *Do not rely on an environmental report prepared for someone else.*

Obtain Professional Assistance To Deal with Mold

Diverse strategies can be applied during building design, construction, operation, and maintenance to prevent significant amounts of mold from growing on indoor surfaces. To be effective, all such strategies should be devised for the *express purpose* of mold prevention, integrated into a comprehensive plan, and executed with diligent oversight by a professional mold-prevention consultant. Because just a small amount of water or moisture can lead to the development of severe mold infestations, many mold- prevention strategies focus on keeping building surfaces dry. While groundwater, water infiltration, and similar issues may have been addressed as part of the geotechnical- engineering study whose findings are conveyed in this report, the geotechnical engineer in charge of this project is not a mold prevention consultant; *none of the services performed in connection with the geotechnical engineer's study were designed or conducted for the purpose of mold prevention. Proper implementation of the recommendations conveyed in this report will not of itself be sufficient to prevent mold from growing in or on the structure involved.*

Rely, on Your GBC-Member Geotechnical Engineer for Additional Assistance

Membership in the Geotechnical Business Council of the Geoprofessional Business Association exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project. Confer with you GBC-Member geotechnical engineer for more information.

GBC GEOTECHNICAL BUSINESS COUNCIL *of the Geoprofessional Business Association*

8811 Colesville Road/Suite G106, Silver Spring, MD 20910
Telephone: 301/565-2733 Facsimile: 301/589-2017
e-mail: info@geoprofessional.org www.geoprofessional.org