MARCH 2024

MIAMI TOWNSHIP LORVEN DRIVE PHASE 2A PUBLIC ROADWAY IMPROVEMENTS

ADDENDUM #2

ISSUED MARCH 15, 2024

MIAMI TOWNSHIP, OHIO

Revised Bid Opening Date: Thursday, March 21, 2024 at 2:00 p.m.

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MIAMI TOWNSHIP LORVEN DRIVE PHASE 2A
PUBLIC ROADWAY IMPROVEMENTS
March 2024

ADDENDUM #2

ANSWERS TO REQUESTS FOR INFORMATION

The purpose of this Addendum is to provide clarification regarding the estimates and specifications for this project to ensure that all bidders utilize identical information in preparing and submitting their bids for this project.

This Addendum modifies the Bid Proposal Packet Miami Township Lorven Drive Phase 2A Public Roadway Improvements previously provided in the following ways:

1. **Bid estimate has been revised.**
2. **Rock Channel Protection is not required.**
3. **Underdrains are shown on the typical section on sheet 2.**
4. **All underground work must conform to Clermont County Water Resources Guidelines and Specifications.**
5. **Geotechnical report is attached to this addendum.**
6. **Sanitary Sewer is to be video recorded. Cost to be included in sanitary sewer pipe pay item.**
7. **Backfill for underground utilities is to be 8" bed of crushed limestone, 6" side fill, and 1' above pipe. No CDF is required.**
8. **Do not fill out any forms marked "sample".**
9. **See #2**
10. **Yes, subgrade must be proof rolled under Township inspection and repaired as proof rolling indicates prior to paving. Cost to be part of excavation.**
11. **Typical section calls for 1 lift of 6" 304 aggregate base, 1 lift of 5" 302 base asphalt, followed by 2 separate lifts of asphalt, 1 intermediate and 1 top course.**
12. **C-900 pipe was approved for the installation (water line).**
13. **No material is to be exported from site.**
14. **3000 CY cut and 650 CY fill with 2350 CY stockpile left on site.**
15. **Existing spoils in the way of this project to be relocated by Dalo Construction.**

NOTE: BIDDERS MUST ALSO SIGN AND RETURN WITH THEIR BIDS THE FORM ACKNOWLEDGING RECEIPT OF ADDENDUM NO. 2.

ACKNOWLEDGMENT OF RECEIPT OF ADDENDUM NO. 2

The undersigned hereby acknowledges that he/she has received Addendum #2 clarifying, revising and adding to/or subtracting from the Bid Proposal Packet for the Miami Township Lorven Drive Phase 2A Public Roadway Improvement, specifically, an extension to the bid opening date. The undersigned attests that he/she has read the terms and conditions described in Addendum #2, understands those terms and conditions, and has incorporated those conditions into his/her bid proposal. Failure to comply with the terms and conditions of Addendum #2 may result in the rejection of the bid in its entirety.

Signature: ______________________________

Company: ______________________________

Title: ______________________________

Date: ______________________________

LORVEN DRIVE PHASE 2A PUBLIC ROADWAY IMPROVEMENTS
MIAMI TOWNSHIP, CLERMONT COUNTY, OHIO
"REVISED" ENGINEER'S ESTIMATE- $734,373.00

ITEM NO.	DESCRIPTION	UNIT OF MEASURE	APPROX. QTY.	UNIT PRICE	TOTAL
					March 15, 2024
201	CLEARING AND GRUBBING, AS PER PLAN	LUMP	1		
203	EXCAVATION, INCLUDING EMBANKMENT CONSTRUCTION, AS PER PLAN	LUMP	1		
204	SOILS TESTING (ALLOWANCE)	LUMP	1		
207	SILT FENCE	LF	650		
207	INLET PROTECTION	1	1		
207	SEED, MJULCH, FERTILIZER	SY	4272		
302	ASPHALT PAVING- BASE COURSES	SY	1886		
304	CONSTRUCTION ENTRANCE	1	1		
304	6' AGGREGATE BASE COURSE FOR ROADWAY	CY	314		
304	CRUSHED LIMESTONE FOR STORM/SANITARY PIPE BEDDING AND BACKFILL	C.Y.	400		
407	TACK COAT	GALS	189		
448	ASPHALT COURSES-TOP TWO COURSES	SY	1886		
605	UNDERDRAINS	LF	1886		
608	5' CONCRETE WALK	SF	2069		
609	ROLLED CURB AND GUTTER	LF	950		
611	8" SANITARY SEWER, SDR-26	LF	485		
611	STANDARD SANITARY MANHOLE	EACH	2		
611	CONNECT TO EXISTING SANITARY SEWER	EACH	1		
611	12" STORM SEWER	LF	321		
611	15" STORM SEWER	LF	210		
611	CB 3	EACH	1		
611	12" PLUG	EACH	1		
611	STORM MANHOLE	EACH	2		
638	8" WATER MAIN	LF	649		
638	FH ASSEMBLY	EACH	1		
638	8" WATER VALVE	EACH	3		
638	REMOVE PLUG AND CONNECT TO EXISTING 8" WATER MAIN	EACH	1		
644	4" YELLOW CENTER LINE (DOUBLE, SOLID)	LF	190		
730	STOP SIGNS WITH POST	EACH	1		
730	STREET NAME BLADES WITH POST	EACH	1		
730	DO NOT ENTER SIGNS WITH POST	EACH	1		
730	NO RIGHT TURN SIGN WITH POST	EACH	1		
SPL	CONTINGENCY	LS	1	$35,000.00	$35,000.00
					$35,000.00
	TOTAL BID				
	NAME OF BIDDER				
	SIGNATURE				

GEOTECHNICAL EXPLORATION
PROPOSED SR-28 MIXED-USE DEVELOPMENT
MILFORD, OHIO

Prepared for:

LORVEN MILFORD, LLC
DAYTON, OHIO

Prepared by:

GEOTECHNOLOGY, INC.
ERLANGER, KENTUCKY

Date:

MARCH 25, 2019

Geotechnology Project No.:

J034114.01

SAFETY
QUALITY
INTEGRITY
PARTNERSHIP
OPPORTUNITY
RESPONSIVENESS

St. Louis, MO | Erlanger, KY | Memphis, TN | Overland Park, KS | Cincinnati, OH | Fairview Heights, IL
Lexington, KY | Dayton, OH | Oxford, MS | Jonesboro, AR

GEOTECHNOLOGY INC
FROM THE GROUND UP

March 25, 2019

Mr. Harry Rao
Lorven Milford, LLC
7106 Corporate Way
Dayton, Ohio 45459

Re: Geotechnical Exploration
Proposed SR-28 Mixed-Use Development
Milford, Ohio
Geotechnology Project No. J034114.01

Dear Mr. Rao:

Presented in this report are the results of our geotechnical exploration completed for the Proposed SR-28 Mixed-Use Development in Milford, Ohio. Our services were performed in general accordance with our Proposal P034114.01, which was dated March 5, 2019, and signed for authorization on March 5, 2019.

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,
GEOTECHNOLOGY, INC.

STATE OF OHIO
DANIEL A. FURGASON
E-52286
REGISTERED
PROFESSIONAL ENGINEER

Akshat Saxena, EI
Project Engineer

Daniel A. Furgason, PE
Geotechnical Manager

AKS/DAF:aks/tmk

Copies submitted: Lorven Milford, LLC (email)

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GEOTECHNICAL EXPLORATION
PROPOSED SR-28 MIXED-USE DEVELOPMENT
MILFORD, OHIO
March 25, 2019 | Geotechnology Project No. J034114.01

1.0 INTRODUCTION

Geotechnology, Inc. (Geotechnology) prepared this geotechnical exploration report for Lorven Milford, LLC (Lorven) for the Proposed SR-28 Mixed-Use Development in Milford, Ohio. Our services were performed in general accordance with our Proposal P034114.01, which was dated March 5, 2019, and signed for authorization on March 5, 2019.

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, as defined in our proposal. Our scope of services included a site reconnaissance, geotechnical borings, laboratory testing, engineering analyses, and preparation of this report.

2.0 PROJECT INFORMATION

The following project information was derived from:

- The Preliminary Site Plan prepared by DLZ dated December 17, 2018;
- Alta Survey and Plat of Survey prepared by Berding Surveying dated February 15, 2019; and,
- Correspondence with Mr. David F. Betz, NAI Bergman

The project involves mixed-used development of a 21-acre site located off the south side of State Route (SR) 28 and east of Woodspoint Lane in Milford, Ohio. Initially, a single-story ALDI building and a single-story shopping center/retail building measuring approximately 21,725 square-feet (SF) and 11,900 sf in plan, respectively, have been proposed; accompanying parking lots have also been planned for both the buildings.

In the future, two 13,360 SF apartment buildings and a 32,800 SF nursing home have also been proposed in the southern portion of the parcel and south of the shopping center. The nursing home will be south of the apartment buildings, south of an existing creek.

A site grading plan was unavailable at the time of this report. Foundation loads were also not available, however it is assumed that column and wall loads will be less than 75 kips and 6 kips per linear foot (klf), respectively.

3.0 SITE CONDITIONS

The site location and topography area are shown on the Boring Plan included in Appendix B. The site generally has a rolling topography with streams located on the west side of the site and across the site from between the multi-family section and the nursing home. Previous slides and signs of slope instability were observed along the stream/drainage area between the multi-family and nursing home sections of the site. The overall site is generally wooded with a few open areas, generally in the vicinity of existing residences.

Based on the existing topography on the site, as shown on the preliminary site plan prepared by DLZ, the existing grade at the location of the Aldi's building varies from about El. 834 to El. 856. The existing grade at the single-story shopping center building ranges from El. 854 to El. 862. Grade changes at the multifamily apartment buildings vary by 20 feet at the south building and 12 feet at the west building and the grade varies from El. 846 to El. 866 across the nursing home building footprint. The higher elevations occur on ridgetops that enter the site from the east and the lower areas are between the ridgetops and along the west side of the property. Based on the grade changes across the building footprints, 10 to 15 feet of cut and fill may be required across the buildings and pavement areas.

4.0 SUBSURFACE EXPLORATION

The subsurface exploration consisted of twenty-one borings (numbered 1 through 21). The boring locations were selected and staked by Geotechnology. The locations of the borings are shown on our Boring Plan, which is included in Appendix B. Elevations shown on the boring logs were estimated from the site topography provided on the DLZ Preliminary Site Plan. The elevations shown could vary by a few feet. The boring locations should be surveyed to provide accurate elevations to the top of bedrock and elevations for weak soils and suitable bearing material at the borings.

The borings were drilled between March 13 and March 20, 2019, with a track-mounted drill rig advancing hollow-stem augers, as indicated on the boring logs presented in Appendix C. Sampling of the overburden soils and bedrock was accomplished ahead of the augers at the depths indicated on the boring logs, with 2-inch-outside-diameter (O.D.) split-spoons in general accordance with the procedures outlined by ASTM D1586. Standard Penetration Tests (SPTs) were performed with the split-spoon sampler to obtain the standard penetration resistance or N-value[1] of the sampled material.

[1] The standard penetration resistance, or N-value, is defined as the number of blows required to drive the split-spoon sampler 12 inches with a 140-pound hammer falling 30 inches. Since the split spoon 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. Additionally, "refusal" of the split-spoon sampler occurs when the sampler is driven less than 6 inches with 50 blows of the hammer.

Observations for groundwater were made in the borings during drilling, at the completion of drilling, and before backfilling the boring holes.

As each boring was advanced, the Drilling Foreman kept a field log of the subsurface profile noting the soil types and stratifications, groundwater, SPT results, and other pertinent data.

Representative portions of the split-spoon samples were placed in glass jars with lids to preserve the in-situ moisture contents of the samples. The glass jars were marked and labeled in the field for identification when returned to our 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.

The boring logs, which are included in Appendix C, were prepared by the Project Geotechnical Engineer on the basis of the field logs and the visual classification of the soil samples in the laboratory. Soil Classification Sheets are also included in Appendix C, which describe the terms and symbols used on the boring logs. The dashed lines on the boring logs indicate an approximate change in strata as estimated between samples, whereas a solid line indicates that the change in strata occurred within a sample where a more precise measurement could be made. Furthermore, the transition between strata can be abrupt or gradual.

6.0 SUBSURFACE CONDITIONS

6.1 Stratification

Generally, the soils below the topsoil included a shallow medium stiff lean clay at some locations (typically to 2.5 feet or less) and otherwise stiff to hard lean clay to the depth of the borings or to bedrock, where encountered. Weak sediment soils were present at to a depth of 9.5 feet in one boring performed in a swale at the edge of the Aldi building and existing fill was present in a boring in a swale west of the shopping center building. More specific descriptions of the subsurface strata are provided below, and the boring logs containing detailed material descriptions are located in Appendix C.

6.1.1 Topsoil

Topsoil was encountered at the ground surface in ten of the borings with depths ranging from 2 to 9 inches. Topsoil was removed during the clearing process at a few of the borings.

6.1.2 Fill

Existing fill was encountered at Boring 8 to a depth of 7.0 feet. Fill was not encountered at the other boring locations.

6.1.3 Sediment

Weak low density medium stiff lean clay sediment containing roots was present in Boring 6 to a depth of 9.5 feet.

6.1.4 Native Soils

The native soils generally consisted of lean clay. The shallow lean clay was alluvial or loess in origin and was generally medium stiff to stiff. The deeper natural soils were predominantly of glacial origin (classified as glacial till), and consisted of stiff to hard lean clay with significant percentages of silt, sand, and gravel. Residual soil, which is typically encountered just above the parent bedrock, was present at depths of 2.0 to 5.0 feet at Borings 3, 4 and 5 and at a depth of 10 feet at Boring 6 and consisted of layered clay and limestone. High plasticity (fat) clay was encountered at Boring 6 at a depth of 10.0 feet and Boring 10 at a depth of 14.5 feet.

6.1.5 Bedrock

The bedrock at the site is According to United States Geological Survey (USGS) Geologic Mapping is shale and limestone bedrock of the Ordovician age. Interbedded shale and limestone was encountered in Borings 2 through 6, and Boring 10 at depths of 7.5 to 17.0 feet.

6.2 Groundwater Conditions

As mentioned in Section 4.0, groundwater observations were made in the borings during drilling, at the completion of drilling, and before backfilling the boring holes. Groundwater was not encountered at the majority of the borings. Water seepage was noted in Borings 6, 7, 16 at a depth of 17.5 feet in each boring. At completion of drilling, measurable water was only encountered in Boring 6 at a depth of 3.8 feet.

Based on the groundwater observations and our local experience, groundwater seepage is anticipated, along the fill/native soil interface, along the overburden soil/bedrock interface, along limestone layers within the bedrock, and in the saturated zones of fill or native soils that are within the perched groundwater zones, or that are below the groundwater table. Locally concentrated flow may occur due to saturated layers of fill or native soils or along fractures in the bedrock. Additionally, groundwater levels and seepage amounts are expected to vary with time, location, season of the year, and amounts of precipitation.

7.0 CONCLUSIONS AND RECOMMENDATIONS

Based on our reconnaissance of the site, the borings, the visual examination of the recovered samples, the laboratory test results, our understanding of the proposed project, our engineering analyses, and our experience as Consulting Soil and Foundation Engineers in the Greater Cincinnati Area, we have reached the following conclusions and make the following recommendations of this report.

7.1 Subsurface Conditions

As discussed in Section 3.0, the project site is rolling with swales and ridges and grade changes as much as 20 to 22 feet across the various buildings. The ground surface or pavement in the project area is underlain by generally stiff to hard cohesive soils with low density weak soils present to shallow depths in a few areas and low density weak soils present deeper in swale areas. Refer to Section 6.1 and the boring logs in Appendix C for additional information on the subsurface strata. Significant groundwater was not encountered and is not anticipated to be a problem unless excavations are deep or excavations are performed in the low swale areas.

7.2 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 regulations.

7.3 Site Preparation and Earthwork

As stated in Section 2.0, earthwork for this project may involve cuts and fills of 10 to 15 feet. Grading information was not available at the time of preparation of this report. Once grading information is available, Geotechnology should be given the opportunity to review the grading plan and modify our recommendations, as needed. Depending on the final grading and the depth of the fill placement, it may be necessary to place settlement monuments in deep fill areas to determine when substantial settlement of new fill and underlying soil is complete and construction of the structure(s) may proceed.

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.

Any existing structures and pavements within the grading and proposed structure limits should be demolished, and the foundations removed. Concrete, asphalt, rubble, and debris associated with those structures and pavements should be disposed of off site. Pavements outside of the footprints of the proposed structures may temporarily be left in place prior to removal and/or replacement to provide a stable base for construction equipment.

Following clearing the site of the existing vegetation and topsoil, we recommend that undocumented fill, swale area sediments and surficial low-density very soft to medium stiff soils that exist within the building, pavement, and proposed fill areas be undercut to expose stiff to very stiff native clayey soils.

After the above operations and making the required excavations in the cut areas, the exposed subgrade should be thoroughly proofrolled using a heavily loaded piece of equipment under the review of the Project Geotechnical Engineer, or a representative thereof. Soft or yielding soils observed during the proofrolling should be undercut to stiff non-yielding cohesive soils; the depth of undercut below proposed subgrade may be limited to 4 feet in pavement areas.

Where undercuts are performed, the excavations should be backfilled with new compacted fill satisfying the material and compaction requirements presented in this section. The undercut soils 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 their replacement with new compacted and tested fill on a "per cubic yard of in-place compacted fill" basis. Experience indicates that the overburden soils can be excavated with conventional earthwork construction equipment (i.e., dozers, hoes, loaders, scrapers, etc.).

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 shale and limestone bedrock may be incorporated into the fill provided that the shale is pulverized to a soil-like consistency and moisture-conditioned, and provided that the limestone is broken up and dispersed so as not to cause nesting or retard compaction. The maximum dimension of the broken-up limestone floaters in the fills should be limited to 18 inches with a maximum thickness of 6 inches; thicker layers or larger pieces of limestone, if not capable of being broken up, should be wasted off site. Additionally, limestone floaters should be restricted from the fill from subgrade elevation to 2 feet below bearing elevations within the footprints of the proposed structures and 10-foot buffer areas around these structures. In pavement areas, we recommend that the limestone floaters be restricted from the fill within 1 foot of subgrade elevations.

The fill should be placed in shallow level lifts (or layers), 6 to 8 inches in loose thickness. Each lift should be moisture-conditioned to 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 drier soils; and/or thoroughly mixing wetter and drier soils into a uniform mixture. Additionally, if shale is used in the fill, water will likely need to be mixed in with the shale to moisture-condition the shale.

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

Area	Minimum Percent Compaction[a,b]	Acceptable Moisture Content Range[c]
Structural [d]	98% of SPMDD	-2% to +3% of OMC
Non-structural	95% of SPMDD	±3% of OMC
Floor slab subgrade	98% of SPMDD	0% to +3% of OMC
Pavement subgrade ≤ 12 inches below subgrade	100% of SPMDD	0% to +2% of OMC

[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 2 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 all subsequent benches 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 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. Instability was noted on the sides of the slopes north of the nursing home building area. Benching of the slope should remove any slide mass if a drive is to be located in a section where the slope has moved.

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 range 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 around the proposed structures to promote the rapid drainage of surface water away from these 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 extract moisture from plastic and low-plastic soils alike, causing them to 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 heave.

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.

7.4 Seismic Site Classification

Based on the subsurface conditions encountered, for preliminary design, a Site Class D should be assumed. Once final grades are determined at a specific building, the site class can be re-evaluated.

7.5 Foundation Design and Construction

We recommend that the proposed Aldi building and shopping center be supported on shallow foundations, i.e., continuous wall footings and isolated column pads, bearing in stiff to very stiff native soils or new compacted and tested fill (placed after removal of existing fill, low density sediment and low density surficial soils). The footings may be proportioned for a maximum net allowable bearing pressure of 3,000 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. An allowable bearing pressure of 3,000 pounds per square foot can be used for the multi-family and nursing home buildings as well, provided the column and wall loads are as stated in section 2.0 of this report.

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. Additionally, the foundation bearing elevations should not be located higher than a relationship of 2H:1V above proposed adjacent foundations or the inverts of nearby existing or proposed utilities that parallel or nearly parallel the foundations, without a site-specific evaluation of the conditions by the Project Geotechnical Engineer.

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 either bearing soils or bedrock 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.

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

Excavation difficulty in utility trenches will vary with location, depth of utility, and depth of cuts made to development grades on the ridgetops and slopes.

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 or shale, 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 2.

Table 2. Relative density compaction requirements for granular fill and backfill.

Area	Minimum Relative Density[a,b]
Structural ≤ 20 feet below proposed grades[c]	80%
Structural > 20 feet below proposed grades[c]	85%
Non-structural	75%
Floor slab and pavement subbase	80%

[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 page 7 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.

7.7 Floor Slab

We anticipate that the floor slabs for the buildings will be designed as slab-on-grade concrete. The concrete floor slab thicknesses should be designed based on the native or compacted and tested, stiff soils at this site providing a modulus of subgrade reaction (k) of 100 pounds per cubic inch (pci).

We recommend that the floor slab be underlain by a minimum 4-inch-thick subbase layer of dense-graded aggregate (DGA) or No. 57 coarse aggregate 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. For fork lift loading or heavy loads on the floor slab, we recommend a dense-graded aggregate (DGA) be used. The subbase should be compacted per the requirements presented in Table 1. Immediately 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.

Additionally, we recommend that a vapor retarder/barrier be provided between the floor slab and the subbase where moisture-sensitive floor coverings will be applied to the floors, where moisture-sensitive products/packaging will be stored in direct contact with the floors, and where the humidity of the enclosed space is a concern.

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. A cost-benefit analysis may need to be performed to evaluate the need for lime- or cement-treatment.

It is recommended 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 Design and Construction

Pavements for this project should be designed in accordance with expected axle loads, frequency of loading, and the properties of the subgrade. The subgrade properties should be evaluated by field California Bearing Ratio (CBR) or plate load tests after final grading is completed, or by the correlation of field density tests to laboratory CBR tests. For preliminary design purposes, a CBR equal to 3.0 may be used.

Proposed pavement subgrades should be proofrolled with a heavily loaded piece of equipment under the review of the Project Geotechnical Engineer, or representative thereof. Soft or yielding soils observed during the proofroll should be undercut to stiff, non-yielding soils; however, the depth of undercut below subgrade may be limited to 3 feet in light-duty traffic areas and 4 feet in heavy-duty traffic areas. The undercut should be backfilled with new compacted fill satisfying the material and compaction requirements presented in Section 7.3. We recommend that the Contract Documents include an item for undercutting unsuitable soils and replacing them with new compacted and tested fill on a "per cubic yard of compacted replacement fill" basis.

If soft or yielding soils are encountered at the maximum undercut depths specified above (i.e., 3 feet for light-duty traffic and 4 feet for heavy-duty traffic) and the compaction requirements of the undercut backfill cannot be achieved at the bottom of the undercut, the subgrade may be stabilized at those depths using a biaxial or triaxial geogrid (e.g., Tensar BX-1200 or TriAx TX160 or equivalent) and an 8-inch lift of compacted crushed stone. The remainder of the undercut should be backfilled with dense-graded aggregate or clayey soils satisfying the material and compaction requirements presented in Section 7.3. If clayey soils are used, a separation geotextile should be provided at the interface between the crushed stone and the clayey soils.

In lieu of undercutting soft or yielding soils to the maximum undercut depths specified above (i.e., 3 feet for light-duty traffic and 4 feet for heavy-duty traffic), the subgrade may be stabilized using a biaxial or triaxial geogrid (e.g., Tensar BX-1200 or TriAx TX160 or equivalent) and at least 12 inches of compacted crushed stone. We recommend that the thickness of undercut and compacted crushed stone be field-evaluated based on the conditions encountered during construction and using a test section.

Prior to the placement of pavement or aggregate base, where provided, we recommend that the top 12 inches of clayey subgrade be scarified and recompacted per the requirements presented in Table 1.

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 is capable of freezing, 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.

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 pavements, 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.

Regarding the pavements adjacent to loading docks, we recommend that the pavement be designed as a concrete slab to support the heavy prolonged loads of loaded and parked tractor-trailers.

If dumpsters are utilized at the project site, we recommend that the dumpster be supported on reinforced 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: Geotechnology'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 intent of the design recommendations is best understood by Geotechnology, we recommend that Geotechnology 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 Geotechnology 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 Geotechnology 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, the client 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, the client 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.

Geotechnology 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, or 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 Geotechnology'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, Geotechnology must be allowed to review them to assess their impact on the findings, conclusions, and/or design recommendations given in this report. Geotechnology 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. Geotechnology should be retained to perform construction observation and continue its geotechnical engineering service using observational methods. Geotechnology cannot assume liability for the adequacy of its recommendations when they are used in the field without Geotechnology 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 A for your review. The publication discusses some other limitations, as well as ways to manage risk associated with subsurface conditions.

APPENDIX A – 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.

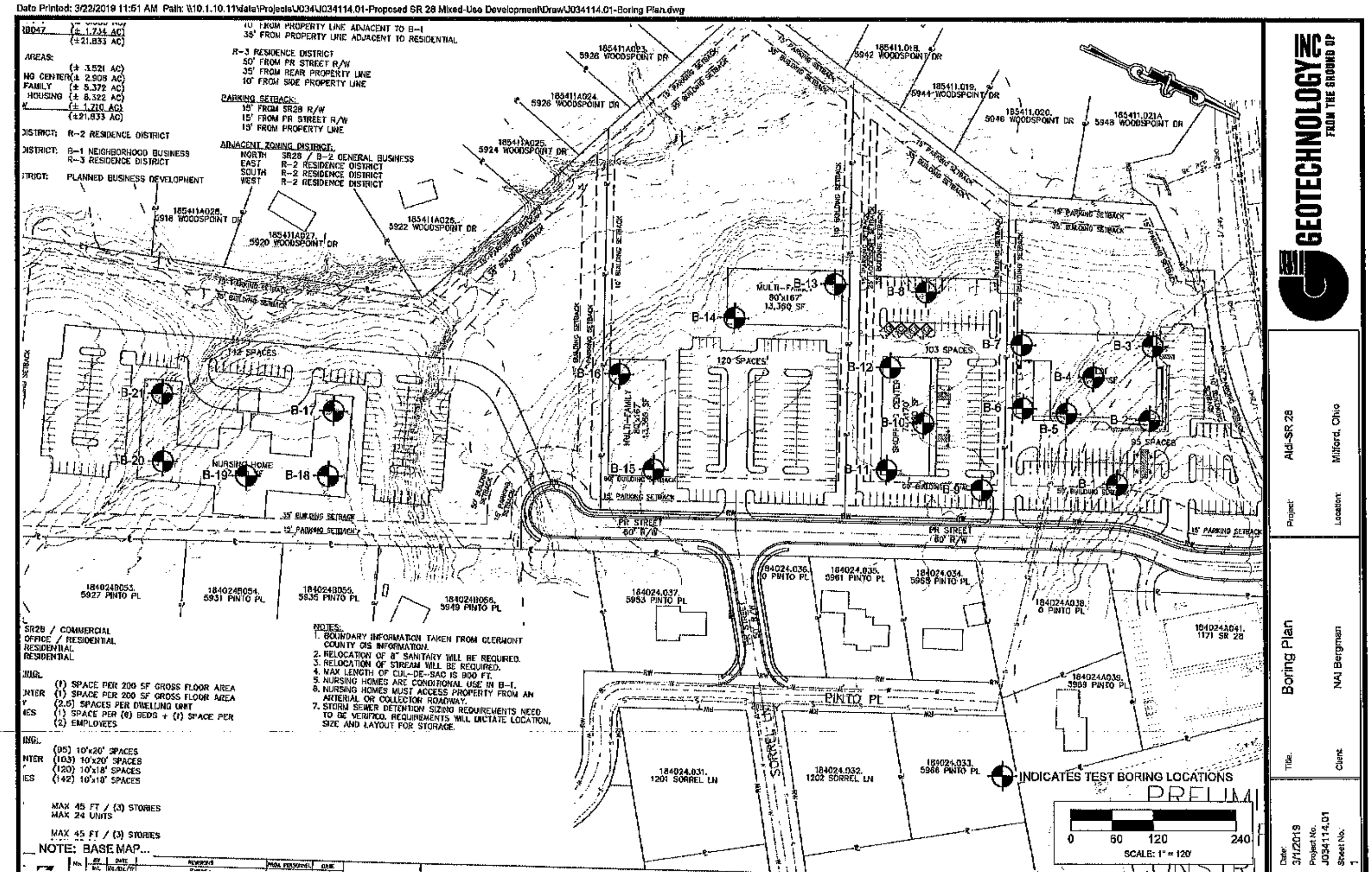
GBC GEOTECHNICAL BUSINESS COUNCIL
of the Geoprofessional Business Association

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

APPENDIX B – PLAN

Boring Plan, Sheet No. 1

Date Printed: 3/22/2019 11:51 AM Path: \\10.1.10.11\data\Projects\J034\J034114.01-Proposed SR 28 Mixed-Use Development\Draw\J034114.01-Boring Plan.dwg



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APPENDIX C – BORING INFORMATION

Boring Logs

Soil Classification Sheet

GEOTECHNOLOGY INC
FROM THE GROUND UP

LOG OF TEST BORING

CLIENT: Lorven Milford LLC
BORING #: 1
PROJECT: Proposed SR 28 Mixed-Use Development
Miami Township, Ohio
PROJECT #: J034114.01
PAGE #: 1 of 1
LOCATION OF BORING: As shown on Boring Plan, Sheet No. 1

ELEV.	COLOR, MOISTURE, DENSITY, PLASTICITY, SIZE, PROPORTIONS DESCRIPTION	Strata Depth (feet)	Depth Scale (feet)	Sample Condition	Sample Number	Sample Type	SPT* Blows/6" / Rock Core RQD (%)	Recovery (in.)	Recovery (%)
850.0	Ground Surface	0.0	0						
849.4	TOPSOIL (8 inches)	0.6		I	1	DS	3-3-3	18	100
	Brown moist stiff to very stiff LEAN CLAY with silt seams.			I	2	DS	4-4-4	18	100
			5	I	3	DS	6-6-5	18	100
841.0		9.0		I	4	DS	4-4-5	18	100
	Bottom of test boring at 9.0 feet.		10						
			15						
			20						
			25						
			30						

Datum: NAVD 88
Hammer Weight: 140 lb.
Hole Diameter: 7.5 in.
Drill Rig: CME-55 TD-5
Surface Elevation: 850.0 ft.
Hammer Drop: 30 in.
Rock Core Diameter: --
Foreman: N. Hudson
Date Started: 3/20/2019
Pipe Size: 2 in. O.D.
Boring Method: HSA-3.25
Engineer: Akshat Saxena
Date Completed: 3/20/2019

BORING METHOD
HSA = Hollow Stem Augers
CFA = Continuous Flight Augers
DC = Driving Casing
MD = Mud Drilling

SAMPLE TYPE
PC = Pavement Core
CA = Continuous Flight Auger
DS = Driven Split Spoon
PT = Pressed Shelby Tube
RC = Rock Core

SAMPLE CONDITIONS
D = Disintegrated
I = Intact
U = Undisturbed
L = Lost

GROUNDWATER DEPTH
First Noted: None
At Completion: Dry
After: --
Backfilled: --

* SPT = Standard Penetration Test - Driving 2" O.D. Sampler 18" with 140-Pound Hammer Falling 30"; Count Made at 6" Intervals

GEOTECHNOLOGY INC
FROM THE GROUND UP

LOG OF TEST BORING

CLIENT: Lorven Milford LLC
BORING #: 2
PROJECT: Proposed SR 28 Mixed-Use Development
Miami Township, Ohio
PROJECT #: J034114.01
PAGE #: 1 of 1
LOCATION OF BORING: As shown on Boring Plan, Sheet No. 1

ELEV.	COLOR, MOISTURE, DENSITY, PLASTICITY, SIZE, PROPORTIONS DESCRIPTION	Strata Depth (feet)	Depth Scale (feet)	Sample Condition	Sample Number	Sample Type	SPT* Blows/6" / Rock Core RQD (%)	Recovery (in.)	Recovery (%)
845.0	Ground Surface	0.0	0						
844.3	TOPSOIL (9 inches)	0.7							
	Brown medium stiff LEAN CLAY, trace sand, trace oxide stains.			I	1	DS	1-2-3	18	100
843.0		2.0							
	Brown and gray moist stiff to very stiff LEAN CLAY, trace sand, trace roots, trace oxide stains.			I	2	DS	3-3-3	14	78
			5	I	3	DS	2-4-5	18	100
				I	4	DS	4-4-5	18	100
			10	I	5	DS	7-9-14	18	100
833.0		12.0							
	Interbedded olive brown moist extremely weak weathered SHALE and gray medium strong to very strong LIMESTONE (bedrock).			I	6	DS	50/3"	3	100
830.5		14.5							
829.3	Interbedded gray moist very weak SHALE and gray medium strong to very strong LIMESTONE (bedrock).	15.7	15	I	7	DS	42-50/3"	9	100
	Bottom of test boring at 15.7 feet.								
			20						
			25						
			30						

Datum: NAVD 88
Hammer Weight: 140 lb.
Hole Diameter: 7.5 in.
Drill Rig: CME-55 TD-5
Surface Elevation: 845.0 ft.
Hammer Drop: 30 in.
Rock Core Diameter: --
Foreman: N. Hudson/J.Gilbert
Date Started: 3/19/2019
Pipe Size: 2 in. O.D.
Boring Method: HSA-3.25
Engineer: Akshat Saxena
Date Completed: 3/19/2019

BORING METHOD
HSA = Hollow Stem Augers
CFA = Continuous Flight Augers
DC = Driving Casing
MD = Mud Drilling

SAMPLE TYPE
PC = Pavement Core
CA = Continuous Flight Auger
DS = Driven Split Spoon
PT = Pressed Shelby Tube
RC = Rock Core

SAMPLE CONDITIONS
D= Disintegrated
I = Intact
U= Undisturbed
L = Lost

GROUNDWATER DEPTH
First Noted: None
At Completion: Dry
After: --
Backfilled: --

* SPT = Standard Penetration Test - Driving 2" O.D. Sampler 18" with 140-Pound Hammer Falling 30"; Count Made at 6" Intervals

GEOTECHNOLOGY INC
FROM THE GROUND UP

LOG OF TEST BORING

CLIENT: Lorven Milford LLC
BORING #: 3
PROJECT: Proposed SR 28 Mixed-Use Development
Miami Township, Ohio
PROJECT #: J034114.01
PAGE #: 1 of 1
LOCATION OF BORING: As shown on Boring Plan, Sheet No. 1

ELEV.	COLOR, MOISTURE, DENSITY, PLASTICITY, SIZE, PROPORTIONS DESCRIPTION	Strata Depth (feet)	Depth Scale (feet)	Sample Condition	Sample Number	Sample Type	SPT* Blows/6" / Rock Core RQD (%)	Recovery (in.)	Recovery (%)
836.0	Ground Surface	0.0	0						
835.3	TOPSOIL (9 inches)	0.7							
	Brown and gray moist stiff LEAN CLAY with silt seams.			I	1	DS	1-2-3	18	100
833.5		2.5							
	Gray moist stiff LEAN CLAY with silt seams.			I	2	DS	3-3-6	18	100
831.0		5.0	5						
	Brown moist very stiff to hard layered CLAY with limestone (residual).			I	3	DS	7-10-10	18	100
828.5		7.5							
	Interbedded brown weathered SHALE and gray strong LIMESTONE (bedrock).			I	4	DS	9-16-40	18	100
826.0		10.0	10						
825.7	Interbedded gray SHALE and gray strong LIMESTONE (bedrock).	10.3		I	5	DS	50/4"	4	100
	Bottom of test boring at 10.3 feet.								
			15						
			20						
			25						
			30						

Datum: NAVD 88
Hammer Weight: 140 lb.
Hole Diameter: 7.5 in.
Drill Rig: CME-55 TD-5
Surface Elevation: 836.0 ft.
Hammer Drop: 30 in.
Rock Core Diameter: --
Foreman: N. Hudson
Date Started: 3/20/2019
Pipe Size: 2 in. O.D.
Boring Method: HSA-3.25
Engineer: Akshat Saxena
Date Completed: 3/20/2019

BORING METHOD
HSA = Hollow Stem Augers
CFA = Continuous Flight Augers
DC = Driving Casing
MD = Mud Drilling

SAMPLE TYPE
PC = Pavement Core
CA = Continuous Flight Auger
DS = Driven Split Spoon
PT = Pressed Shelby Tube
RC = Rock Core

SAMPLE CONDITIONS
D = Disintegrated
I = Intact
U = Undisturbed
L = Lost

GROUNDWATER DEPTH
First Noted: None
At Completion: Dry
After: --
Backfilled: --

* SPT = Standard Penetration Test - Driving 2" O.D. Sampler 18" with 140-Pound Hammer Falling 30"; Count Made at 6" Intervals

GEOTECHNOLOGY INC
FROM THE GROUND UP

LOG OF TEST BORING

CLIENT: Lorven Milford LLC
BORING #: 4

PROJECT: Proposed SR 28 Mixed-Use Development
Miami Township, Ohio
PROJECT #: J034114.01

PAGE #: 1 of 1

LOCATION OF BORING: As shown on Boring Plan, Sheet No. 1

ELEV.	COLOR, MOISTURE, DENSITY, PLASTICITY, SIZE, PROPORTIONS DESCRIPTION	Strata Depth (feet)	Depth Scale (feet)	Sample Condition	Sample Number	Sample Type	SPT* Blows/6" / Rock Core RQD (%)	Recovery (in.)	Recovery (%)
839.0	Ground Surface	0.0	0						
838.7	TOPSOIL (4 inches)	0.3							
	Brown moist stiff to very stiff LEAN CLAY, trace oxide concretion, trace sand, trace roots, trace gravel.			I	1	DS	2-3-2	18	100
835.0		4.0		I	2	DS	2-2-4	18	100
	Olive brown moist very stiff LEAN CLAY, trace oxide concretion, with bedding planes, little limestone fragments (residual).		5	I	3	DS	3-5-6	18	100
				I	4	DS	6-9-11	18	100
829.5		9.5							
	Interbedded moist extremely weak SHALE and gray medium strong to very strong LIMESTONE (bedrock).		10	I	5	DS	30-50/3"	9	100
				I	6	DS	50/0"	2	
			15						
822.4		16.6							
	Bottom of test boring at 16.6 feet.		20						
			25						
			30						

Datum: NAVD 88
Hammer Weight: 140 lb.
Hole Diameter: 7.5 in.
Drill Rig: CME-55 TD-5

Surface Elevation: 839.0 ft.
Hammer Drop: 30 in.
Rock Core Diameter: --
Foreman: N. Hudson/J.Gilbert

Date Started: 3/19/2019
Pipe Size: 2 in. O.D.
Boring Method: HSA-3.25
Engineer: Akshat Saxena

Date Completed: 3/19/2019

BORING METHOD
HSA = Hollow Stem Augers
CFA = Continuous Flight Augers
DC = Driving Casing
MD = Mud Drilling

SAMPLE TYPE
PC = Pavement Core
CA = Continuous Flight Auger
DS = Driven Split Spoon
PT = Pressed Shelby Tube
RC = Rock Core

SAMPLE CONDITIONS
D = Disintegrated
I = Intact
U = Undisturbed
L = Lost

GROUNDWATER DEPTH
First Noted: None
At Completion: Dry
After: --
Backfilled: --

* SPT = Standard Penetration Test - Driving 2" O.D. Sampler 18" with 140-Pound Hammer Falling 30"; Count Made at 6" Intervals

GEOTECHNOLOGY INC
FROM THE GROUND UP

LOG OF TEST BORING

CLIENT: Lorven Milford LLC
BORING #: 5
PROJECT: Proposed SR 28 Mixed-Use Development
Miami Township, Ohio
PROJECT #: J034114.01
PAGE #: 1 of 1
LOCATION OF BORING: As shown on Boring Plan, Sheet No. 1

ELEV.	COLOR, MOISTURE, DENSITY, PLASTICITY, SIZE, PROPORTIONS DESCRIPTION	Strata Depth (feet)	Depth Scale (feet)	Sample Condition	Sample Number	Sample Type	SPT* Blows/6" / Rock Core RQD (%)	Recovery (in.)	Recovery (%)
844.0	Ground Surface	0.0	0						
843.7	TOPSOIL (2 inches)	0.3							
	Brown moist medium stiff LEAN CLAY, trace oxide concretions, trace roots.			I	1	DS	2-2-3	18	100
842.0		2.0							
	Brown and gray moist very stiff LEAN CLAY, trace oxide concretion, trace roots, little bedding planes.			I	2	DS	2-2-3	13	72
			5	I	3	DS	4-6-6	17	94
				I	4	DS	3-4-6	18	100
834.5		9.5							
	Interbedded brown moist extremely weak highly weathered SHALE and gray medium strong to very strong LIMESTONE (bedrock).		10						
833.0		11.0		I	5	DS	40-26-50/4"	16	100
	Interbedded gray moist very weak SHALE and gray medium strong to very strong LIMESTONE (bedrock).								
831.4		12.6		I	6	DS	50/2"	2	100
	Bottom of test boring at 12.6 feet.								
			15						
			20						
			25						
			30						

Datum: NAVD 88
Surface Elevation: 844.0 ft.
Date Started: 3/19/2019
Date Completed: 3/19/2019
Hammer Weight: 140 lb.
Hammer Drop: 30 in.
Pipe Size: 2 in. O.D.
Hole Diameter: 7.5 in.
Rock Core Diameter: --
Boring Method: HSA-3.25
Drill Rig: CME-55 TD-5
Foreman: N. Hudson/J.Gilbert
Engineer: Akshat Saxena

BORING METHOD
HSA = Hollow Stem Augers
CFA = Continuous Flight Augers
DC = Driving Casing
MD = Mud Drilling

SAMPLE TYPE
PC = Pavement Core
CA = Continuous Flight Auger
DS = Driven Split Spoon
PT = Pressed Shelby Tube
RC = Rock Core

SAMPLE CONDITIONS
D= Disintegrated
I = Intact
U= Undisturbed
L = Lost

GROUNDWATER DEPTH
First Noted: None
At Completion: Dry
After: --
Backfilled: --

* SPT = Standard Penetration Test - Driving 2" O.D. Sampler 18" with 140-Pound Hammer Falling 30"; Count Made at 6" Intervals

GEOTECHNOLOGY INC
FROM THE GROUND UP

LOG OF TEST BORING

CLIENT: Lorven Milford LLC
BORING #: 6
PROJECT: Proposed SR 28 Mixed-Use Development
Miami Township, Ohio
PROJECT #: J034114.01

LOCATION OF BORING: As shown on Boring Plan, Sheet No. 1

ELEV.	COLOR, MOISTURE, DENSITY, PLASTICITY, SIZE, PROPORTIONS DESCRIPTION	Strata Depth (feet)	Depth Scale (feet)	Sample Condition	Sample Number	Sample Type	SPT* Blows/6" / Rock Core RQD (%)	Recovery (in.)	Recovery (%)
851.0	Ground Surface	0.0	0						
850.8	TOPSOIL (3 inches)	0.2							
	Brown moist medium stiff LEAN CLAY, little sand and gravel, trace roots, trace cinders (sediment).			I	1	DS	2-3-3	18	100
				I	2	DS	2-2-2	18	100
			5	I	3	DS	2-2-4	18	100
				I	4	DS	2-2-2	4	22
841.5		9.5							
841.0	Brown moist stiff LEAN CLAY, trace sand.	10.0	10						
	Brown and gray moist very stiff FAT CLAY, trace sand, trace oxide concretions, trace roots, trace bedding planes with shale fragments (residual).			I	5	DS	4-4-6	18	100
				I	6	DS	4-6-8	18	100
			15	I	7	DS	8-14-17	18	100
834.0		17.0							
	Interbedded olive brown moist extremely weak unweathered SHALE and gray medium strong to very strong LIMESTONE (bedrock).			I	8	DS	16-14-20	12	67
			20	I	9	DS	25-15-50/4"	16	100
829.7		21.3							
	Bottom of test boring at 21.3 feet.		25						
			30						

Datum: NAVD 88
Hammer Weight: 140 lb.
Hole Diameter: 7.5 in.
Drill Rig: CME-55 TD-5
Surface Elevation: 851.0 ft.
Hammer Drop: 30 in.
Rock Core Diameter: --
Foreman: N. Hudson/J.Gilbert
Date Started: 3/19/2019
Pipe Size: 2 in. O.D.
Boring Method: HSA-3.25
Engineer: Akshat Saxena
Date Completed: 3/19/2019

BORING METHOD
HSA = Hollow Stem Augers
CFA = Continuous Flight Augers
DC = Driving Casing
MD = Mud Drilling

SAMPLE TYPE
PC = Pavement Core
CA = Continuous Flight Auger
DS = Driven Split Spoon
PT = Pressed Shelby Tube
RC = Rock Core

SAMPLE CONDITIONS
D = Disintegrated
I = Intact
U = Undisturbed
L = Lost

GROUNDWATER DEPTH
First Noted 17.5 ft.
At Completion 3.8 ft.
After --
Backfilled --

* SPT = Standard Penetration Test - Driving 2" O.D. Sampler 18" with 140-Pound Hammer Falling 30"; Count Made at 6" Intervals

GEOTECHNOLOGY INC
FROM THE GROUND UP

LOG OF TEST BORING

CLIENT: Lorven Milford LLC
BORING #: 7
PROJECT: Proposed SR 28 Mixed-Use Development
Miami Township, Ohio
PROJECT #: J034114.01
PAGE #: 1 of 1
LOCATION OF BORING: As shown on Boring Plan, Sheet No. 1

ELEV.	COLOR, MOISTURE, DENSITY, PLASTICITY, SIZE, PROPORTIONS DESCRIPTION	Strata Depth (feet)	Depth Scale (feet)	Sample Condition	Sample Number	Sample Type	SPT* Blows/6" / Rock Core RQD (%)	Recovery (in.)	Recovery (%)
856.0	Ground Surface	0.0	0						
855.6	TOPSOIL (5 inches)	0.4		I	1	DS	3-3-2	18	100
	Brown moist stiff LEAN CLAY, trace sand, trace oxide stains.			I	2	DS	3-2-3	8	44
852.0		4.0							
	Brown moist very stiff LEAN CLAY, with sand and gravel, some limestone fragments (glacial).		5	I	3	DS	5-7-9	16	89
				I	4	DS	5-8-9	18	100
			10	I	5	DS	5-7-8	18	100
				I	6	DS	3-3-7	3	17
			15	I	7	DS	3-7-10	18	100
839.0		17.0							
	Brownish-gray moist very stiff LEAN CLAY, with sand and gravel.			I	8	DS	5-10-12	18	100
836.5		19.5							
	Gray moist very stiff FAT CLAY, with sand.		20	I	9	DS	5-6-9	18	100
834.5		21.5							
	Bottom of test boring at 21.5 feet.		25						
			30						

Datum: NAVD 88
Hammer Weight: 140 lb.
Hole Diameter: 7.5 in.
Drill Rig: CME-55 TD-5
Surface Elevation: 856.0 ft.
Hammer Drop: 30 in.
Rock Core Diameter: --
Foreman: N. Hudson/J.Gilbert
Date Started: 3/19/2019
Pipe Size: 2 in. O.D.
Boring Method: HSA-3.25
Engineer: Akshat Saxena
Date Completed: 3/19/2019

BORING METHOD
HSA = Hollow Stem Augers
CFA = Continuous Flight Augers
DC = Driving Casing
MD = Mud Drilling

SAMPLE TYPE
PC = Pavement Core
CA = Continuous Flight Auger
DS = Driven Split Spoon
PT = Pressed Shelby Tube
RC = Rock Core

SAMPLE CONDITIONS
D = Disintegrated
I = Intact
U = Undisturbed
L = Lost

GROUNDWATER DEPTH
First Noted 17.5 ft.
At Completion Dry
After --
Backfilled --

* SPT = Standard Penetration Test - Driving 2" O.D. Sampler 18" with 140-Pound Hammer Falling 30"; Count Made at 6" Intervals

GEOTECHNOLOGY INC
FROM THE GROUND UP

LOG OF TEST BORING

CLIENT: Lorven Milford LLC
BORING #: 8
PROJECT: Proposed SR 28 Mixed-Use Development
Miami Township, Ohio
PROJECT #: J034114.01
PAGE #: 1 of 1
LOCATION OF BORING: As shown on Boring Plan, Sheet No. 1

ELEV.	COLOR, MOISTURE, DENSITY, PLASTICITY, SIZE, PROPORTIONS DESCRIPTION	Strata Depth (feet)	Depth Scale (feet)	Sample Condition	Sample Number	Sample Type	SPT* Blows/6" / Rock Core RQD (%)	Recovery (in.)	Recovery (%)
848.0	Ground Surface	0.0	0						
	Mixed dark brown moist soft to medium stiff FILL, lean clay, little sand and gravel, trace roots, trace rock fragments, little limestone.			I	1	DS	2-3-4	12	67
846.0		2.0							
	Mixed brown and gray moist stiff to very stiff FILL, lean clay, some sand, trace gravel, trace roots.			I	2	DS	2-4-6	18	100
			5	I	3	DS	9-13-14	18	100
841.0		7.0							
	Gray moist stiff to very stiff LEAN CLAY, trace sand.			I	4	DS	7-9-11		
839.5		8.5							
	Bottom of test boring at 8.5 feet.		10						
			15						
			20						
			25						
			30						

Datum: NAVD 88
Hammer Weight: 140 lb.
Hole Diameter: 7.5 in.
Drill Rig: CME-55 TD-5
Surface Elevation: 848.0 ft.
Hammer Drop: 30 in.
Rock Core Diameter: --
Foreman: N. Hudson/J.Gilbert
Date Started: 3/13/2019
Pipe Size: 2 in. O.D.
Boring Method: HSA-3.25
Engineer: Akshat Saxena
Date Completed: 3/13/2019

BORING METHOD
HSA= Hollow Stem Augers
CFA= Continuous Flight Augers
DC = Driving Casing
MD = Mud Drilling

SAMPLE TYPE
PC = Pavement Core
CA = Continuous Flight Auger
DS = Driven Split Spoon
PT = Pressed Shelby Tube
RC = Rock Core

SAMPLE CONDITIONS
D= Disintegrated
I = Intact
U= Undisturbed
L = Lost

GROUNDWATER DEPTH
First Noted None
At Completion Dry
After --
Backfilled --

* SPT = Standard Penetration Test - Driving 2" O.D. Sampler 18" with 140-Pound Hammer Falling 30"; Count Made at 6" Intervals

GEOTECHNOLOGY INC
FROM THE GROUND UP

LOG OF TEST BORING

CLIENT: Lorven Milford LLC
PROJECT: Proposed SR 28 Mixed-Use Development
Miami Township, Ohio
LOCATION OF BORING: As shown on Boring Plan, Sheet No. 1

BORING #: 9
PROJECT #: J034114.01
PAGE #: 1 of 1

ELEV.	COLOR, MOISTURE, DENSITY, PLASTICITY, SIZE, PROPORTIONS DESCRIPTION	Strata Depth (feet)	Depth Scale (feet)	Sample Condition	Sample Number	Sample Type	SPT* Blows/6" / Rock Core RQD (%)	Recovery (in.)	Recovery (%)
860.0	Ground Surface	0.0	0						
859.4	TOPSOIL (8 inches)	0.6							
	Brown moist medium stiff LEAN CLAY, some silt, some sand, little gravel.			I	1	DS	2-2-3	18	100
857.5		2.5							
	Brown moist stiff to very stiff LEAN CLAY, some silt, some sand (glacial).			I	2	DS	2-3-11	16	89
	Rock fragments at 5.0 feet.		5						
853.5		6.5		I	3	DS	5-9-7	18	100
	Bottom of test boring at 6.5 feet.								
			10						
			15						
			20						
			25						
			30						

Datum: NAVD 88
Surface Elevation: 860.0 ft.
Date Started: 3/20/2019
Date Completed: 3/20/2019
Hammer Weight: 140 lb.
Hammer Drop: 30 in.
Pipe Size: 2 in. O.D.
Hole Diameter: 7.5 in.
Rock Core Diameter: --
Boring Method: HSA-3.25
Drill Rig: CME-55 TD-5
Foreman: N. Hudson
Engineer: Akshat Saxena

BORING METHOD
HSA = Hollow Stem Augers
CFA = Continuous Flight Augers
DC = Driving Casing
MD = Mud Drilling

SAMPLE TYPE
PC = Pavement Core
CA = Continuous Flight Auger
DS = Driven Split Spoon
PT = Pressed Shelby Tube
RC = Rock Core

SAMPLE CONDITIONS
D = Disintegrated
I = Intact
U = Undisturbed
L = Lost

GROUNDWATER DEPTH
First Noted: None
At Completion: Dry
After: --
Backfilled: --

* SPT = Standard Penetration Test - Driving 2" O.D. Sampler 18" with 140-Pound Hammer Falling 30"; Count Made at 6" Intervals

GEOTECHNOLOGY INC
FROM THE GROUND UP

LOG OF TEST BORING

CLIENT: Lorven Milford LLC — BORING #: 10
PROJECT: Proposed SR 28 Mixed-Use Development — PROJECT #: J034114.01
Miami Township, Ohio — PAGE #: 1 of 1
LOCATION OF BORING: As shown on Boring Plan, Sheet No. 1

ELEV.	COLOR, MOISTURE, DENSITY, PLASTICITY, SIZE, PROPORTIONS DESCRIPTION	Strata Depth (feet)	Depth Scale (feet)	Sample Condition	Sample Number	Sample Type	SPT* Blows/6" / Rock Core RQD (%)	Recovery (in.)	Recovery (%)
858.0	Ground Surface	0.0	0						
	Dark brown moist medium stiff LEAN CLAY, some gravel, trace roots with topsoil.			I	1	DS	2-2-2	18	100
856.0		2.0							
	Brown and gray moist very stiff LEAN CLAY with sand and gravel (glacial).			I	2	DS	7-9-13	15	83
			5	I	3	DS	7-10-15	18	100
				I	4	DS	16-20-17	18	100
			10	I	5	DS	11-12-16	18	100
846.0		12.0							
	Gray moist very stiff LEAN CLAY, with sand and gravel.			I	6	DS	4-10-14	18	100
843.5		14.5							
	Brownish-gray moist very stiff FAT CLAY, little sand and gravel.		15	I	7	DS	5-8-10	18	100
841.0		17.0							
	Interbedded brown moist extremely weak highly weathered SHALE and gray medium strong to very strong LIMESTONE (bedrock).			I	8	DS	6-8-13	18	100
			20	I	9	DS	11-39-25	18	100
836.5		21.5							
	Bottom of test boring at 21.5 feet.		25						
			30						

Datum: NAVD 88 — Hammer Weight: 140 lb. — Hole Diameter: 7.5 in. — Drill Rig: CME-55 TD-5
Surface Elevation: 858.0 ft. — Hammer Drop: 30 in. — Rock Core Diameter: -- — Foreman: N. Hudson/J.Gilbert
Date Started: 3/19/2019 — Pipe Size: 2 in. O.D. — Boring Method: HSA-3.25 — Engineer: Akshat Saxena
Date Completed: 3/19/2019

BORING METHOD
HSA = Hollow Stem Augers
CFA = Continuous Flight Augers
DC = Driving Casing
MD = Mud Drilling

SAMPLE TYPE
PC = Pavement Core
CA = Continuous Flight Auger
DS = Driven Split Spoon
PT = Pressed Shelby Tube
RC = Rock Core

SAMPLE CONDITIONS
D = Disintegrated
I = Intact
U = Undisturbed
L = Lost

GROUNDWATER DEPTH
First Noted: None
At Completion: Dry
After: --
Backfilled: --

* SPT = Standard Penetration Test - Driving 2" O.D. Sampler 18" with 140-Pound Hammer Falling 30"; Count Made at 6" Intervals

GEOTECHNOLOGY INC
FROM THE GROUND UP

LOG OF TEST BORING

CLIENT: Lorven Milford LLC — BORING #: 11
PROJECT: Proposed SR 28 Mixed-Use Development — PROJECT #: J034114.01
Miami Township, Ohio — PAGE #: 1 of 1
LOCATION OF BORING: As shown on Boring Plan, Sheet No. 1

ELEV.	COLOR, MOISTURE, DENSITY, PLASTICITY, SIZE, PROPORTIONS DESCRIPTION	Strata Depth (feet)	Depth Scale (feet)	Sample Condition	Sample Number	Sample Type	SPT* Blows/6" / Rock Core RQD (%)	Recovery (in.)	Recovery (%)
862.0	Ground Surface	0.0	0						
	Brown and gray stiff to very stiff LEAN CLAY, trace sand, trace oxide concretions, trace roots, little gravel, trace limestone fragments.			I	1	DS	2-3-6	18	100
				I	2	DS	4-4-4	15	83
857.5		4.5							
	Brown and gray moist very stiff LEAN CLAY, with sand and gravel (glacial).		5	I	3	DS	5-6-12	15	83
				I	4	DS	7-10-14	18	100
			10	I	5	DS	12-15-19	18	100
				I	6	DS	11-15-15	15	83
			15	I	7	DS	9-17-21	15	83
				I	8	DS	9-12-16	18	100
			20	I	9	DS	5-7-8	18	100
840.5		21.5							
	Bottom of test boring at 21.5 feet.		25						
			30						

Datum: NAVD 88	Hammer Weight: 140 lb.	Hole Diameter: 7.5 in.	Drill Rig: CME-55 TD-5
Surface Elevation: 862.0 ft.	Hammer Drop: 30 in.	Rock Core Diameter: --	Foreman: N. Hudson
Date Started: 3/19/2019	Pipe Size: 2 in. O.D.	Boring Method: HSA-3.25	Engineer: Akshat Saxena
Date Completed: 3/19/2019			

BORING METHOD
HSA = Hollow Stem Augers
CFA = Continuous Flight Augers
DC = Driving Casing
MD = Mud Drilling

SAMPLE TYPE
PC = Pavement Core
CA = Continuous Flight Auger
DS = Driven Split Spoon
PT = Pressed Shelby Tube
RC = Rock Core

SAMPLE CONDITIONS
D = Disintegrated
I = Intact
U = Undisturbed
L = Lost

GROUNDWATER DEPTH
First Noted: None
At Completion: Dry
After: --
Backfilled: --

* SPT = Standard Penetration Test - Driving 2" O.D. Sampler 18" with 140-Pound Hammer Falling 30"; Count Made at 6" Intervals

GEOTECHNOLOGY INC
FROM THE GROUND UP

LOG OF TEST BORING

CLIENT: Lorven Milford LLC
BORING #: 12
PROJECT: Proposed SR 28 Mixed-Use Development
Miami Township, Ohio
PROJECT #: J034114.01

LOCATION OF BORING: As shown on Boring Plan, Sheet No. 1

ELEV.	COLOR, MOISTURE, DENSITY, PLASTICITY, SIZE, PROPORTIONS DESCRIPTION	Strata Depth (feet)	Depth Scale (feet)	Sample Condition	Sample Number	Sample Type	SPT* Blows/6" / Rock Core RQD (%)	Recovery (In.)	Recovery (%)
860.0	Ground Surface	0.0	0						
859.2	TOPSOIL (9 inches)	0.8							
	Brown moist medium stiff LEAN CLAY with few roots.			I	1	DS	1-2-2	18	100
857.5		2.5							
	Brown moist stiff to very stiff LEAN CLAY, silt seams, some sand, little to some gravel.			I	2	DS	4-6-7	18	100
			5	I	3	DS	5-9-9	18	100
	Rock fragments and gravel at 7.5 feet becomes very stiff to hard.			I	4	DS	6-10-11	18	100
			10	I	5	DS	6-9-10	18	100
				I	6	DS	4-6-7	18	100
			15	I	7	DS	5-7-6	18	100
				I	8	DS	6-10-13	18	100
840.0		20.0	20						
	Gray moist very stiff CLAY with sand, gravel and rock fragments.			I	9	DS	5-11-9	10	56
838.5		21.5							
	Bottom of test boring at 21.5 feet.		25						
			30						

Datum: NAVD 88	Hammer Weight: 140 lb.	Hole Diameter: 7.5 in.	Drill Rig: CME-55 TD-5
Surface Elevation: 860.0 ft.	Hammer Drop: 30 in.	Rock Core Diameter: --	Foreman: N. Hudson
Date Started: 3/20/2019	Pipe Size: 2 in. O.D.	Boring Method: HSA-3.25	Engineer: Akshat Saxena
Date Completed: 3/20/2019			

BORING METHOD
HSA = Hollow Stem Augers
CFA = Continuous Flight Augers
DC = Driving Casing
MD = Mud Drilling

SAMPLE TYPE
PC = Pavement Core
CA = Continuous Flight Auger
DS = Driven Split Spoon
PT = Pressed Shelby Tube
RC = Rock Core

SAMPLE CONDITIONS
D = Disintegrated
I = Intact
U = Undisturbed
L = Lost

GROUNDWATER DEPTH
First Noted: None
At Completion: Dry
After: --
Backfilled: --

* SPT = Standard Penetration Test - Driving 2" O.D. Sampler 18" with 140-Pound Hammer Falling 30"; Count Made at 6" Intervals

GEOTECHNOLOGY INC
FROM THE GROUND UP

LOG OF TEST BORING

CLIENT: Lorven Milford LLC
BORING #: 13
PROJECT: Proposed SR 28 Mixed-Use Development
Miami Township, Ohio
PROJECT #: J034114.01
PAGE #: 1 of 1
LOCATION OF BORING: As shown on Boring Plan, Sheet No. 1

ELEV.	COLOR, MOISTURE, DENSITY, PLASTICITY, SIZE, PROPORTIONS DESCRIPTION	Strata Depth (feet)	Depth Scale (feet)	Sample Condition	Sample Number	Sample Type	SPT* Blows/6" / Rock Core RQD (%)	Recovery (in.)	Recovery (%)
854.0	Ground Surface	0.0	0						
853.7	TOPSOIL (4 inches)	0.3							
	Brown moist stiff LEAN CLAY with roots.			I	1	DS	1-2-2	18	100
				L	2	DS	3-4-5	0	0
849.0		5.0	5						
	Brown moist to damp very stiff to hard LEAN CLAY with sand gravel and rock fragments (glacial).			I	3	DS	9-14-13	18	100
				I	4	DS	9-10-12	18	100
			10	I	5	DS	5-7-8	18	100
				I	6	DS	7-10-14	18	100
839.0		15.0	15						
	Gray moist very stiff LEAN CLAY with sand, gravel and rock fragments (glacial).			I	7	DS	5-7-9	18	100
				I	8	DS	6-8-9	11	61
			20	I	9	DS	6-8-11	18	100
832.5		21.5							
	Bottom of test boring at 21.5 feet.								
			25						
			30						

Datum: NAVD 88
Hammer Weight: 140 lb.
Hole Diameter: 7.5 in.
Drill Rig: CME-55 TD-5
Surface Elevation: 854.0 ft.
Hammer Drop: 30 in.
Rock Core Diameter: --
Foreman: N. Hudson
Date Started: 3/20/2019
Pipe Size: 2 in. O.D.
Boring Method: HSA-3.25
Engineer: Akshat Saxena
Date Completed: 3/20/2019

BORING METHOD
HSA = Hollow Stem Augers
CFA = Continuous Flight Augers
DC = Driving Casing
MD = Mud Drilling

SAMPLE TYPE
PC = Pavement Core
CA = Continuous Flight Auger
DS = Driven Split Spoon
PT = Pressed Shelby Tube
RC = Rock Core

SAMPLE CONDITIONS
D = Disintegrated
I = Intact
U = Undisturbed
L = Lost

GROUNDWATER DEPTH
First Noted: None
At Completion: Dry
After: --
Backfilled: --

* SPT = Standard Penetration Test - Driving 2" O.D. Sampler 18" with 140-Pound Hammer Falling 30"; Count Made at 6" Intervals

GEOTECHNOLOGY INC
FROM THE GROUND UP

LOG OF TEST BORING

CLIENT: Lorven Milford LLC
BORING #: 14
PROJECT: Proposed SR 28 Mixed-Use Development
Miami Township, Ohio
PROJECT #: J034114.01
PAGE #: 1 of 1
LOCATION OF BORING: As shown on Boring Plan, Sheet No. 1

ELEV.	COLOR, MOISTURE, DENSITY, PLASTICITY, SIZE, PROPORTIONS DESCRIPTION	Strata Depth (feet)	Depth Scale (feet)	Sample Condition	Sample Number	Sample Type	SPT* Blows/6" / Rock Core RQD (%)	Recovery (in.)	Recovery (%)
852.0	Ground Surface	0.0	0						
	Brown moist stiff LEAN CLAY with roots and silt SEAMS.			I	1	DS	1-2-2	10	56
849.5		2.5							
	Brown damp hard LEAN CLAY, some sand, some gravel (glacial).			I	2	DS	8-10-12	18	100
			5	I	3	DS	15-18-13	18	100
				I	4	DS	13-15-16	18	100
			10	I	5	DS	12-16-19	18	100
839.5		12.5							
	Gray damp to moist very stiff to hard clayey SILT with gravel, rock fragments and silt seams.			I	6	DS	22-11-10	18	100
			15	I	7	DS	23-19-23	10	56
				I	8	DS	6-8-11	18	100
			20	I	9	DS	12-12-14	18	100
830.5		21.5							
	Bottom of test boring at 21.5 feet.		25						
			30						

Datum: NAVD 88
Hammer Weight: 140 lb.
Hole Diameter: 7.5 in.
Drill Rig: CME-55 TD-5
Surface Elevation: 852.0 ft.
Hammer Drop: 30 in.
Rock Core Diameter: --
Foreman: N. Hudson
Date Started: 3/20/2019
Pipe Size: 2 in. O.D.
Boring Method: HSA-3.25
Engineer: Akshat Saxena
Date Completed: 3/20/2019

BORING METHOD
HSA = Hollow Stem Augers
CFA = Continuous Flight Augers
DC = Driving Casing
MD = Mud Drilling

SAMPLE TYPE
PC = Pavement Core
CA = Continuous Flight Auger
DS = Driven Split Spoon
PT = Pressed Shelby Tube
RC = Rock Core

SAMPLE CONDITIONS
D = Disintegrated
I = Intact
U = Undisturbed
L = Lost

GROUNDWATER DEPTH
First Noted: None
At Completion: Dry
After: --
Backfilled: --

* SPT = Standard Penetration Test - Driving 2" O.D. Sampler 18" with 140-Pound Hammer Falling 30"; Count Made at 6" Intervals

LOG OF TEST BORING

CLIENT: Lorven Milford LLC
PROJECT: Proposed SR 28 Mixed-Use Development
Miami Township, Ohio
LOCATION OF BORING: As shown on Boring Plan, Sheet No. 1

BORING #: 15
PROJECT #: J034114.01
PAGE #: 1 of 1

ELEV.	COLOR, MOISTURE, DENSITY, PLASTICITY, SIZE, PROPORTIONS DESCRIPTION	Strata Depth (feet)	Depth Scale (feet)	Sample Condition	Sample Number	Sample Type	SPT* Blows/6" / Rock Core RQD (%)	Recovery (in.)	Recovery (%)
862.0	Ground Surface	0.0	0						
	Brown moist stiff to very stiff LEAN CLAY, some sand, little gravel.			I	1	DS	3-4-6	18	100
				I	2	DS	4-5-5	12	67
857.5		4.5	5						
	Brown, some gray moist very stiff LEAN CLAY, with sand and gravel, some limestone fragments (glacial).			I	3	DS	10-13-16	15	83
				I	4	DS	10-14-14	18	100
			10	I	5	DS	10-16-18	18	100
				I	6	DS	9-13-17	18	100
			15	I	7	DS	7-17-18	18	100
845.0		17.0							
	Gray moist very stiff LEAN CLAY with sand and gravel.			I	8	DS	9-12-15	18	100
			20	I	9	DS	8-11-13	18	100
840.5		21.5							
	Bottom of test boring at 21.5 feet.		25						
			30						

Datum: NAVD 88
Surface Elevation: 862.0 ft.
Date Started: 3/19/2019
Date Completed: 3/19/2019
Hammer Weight: 140 lb.
Hammer Drop: 30 in.
Pipe Size: 2 in. O.D.
Hole Diameter: 7.5 in.
Rock Core Diameter: --
Boring Method: HSA-3.25
Drill Rig: CME-55 TD-5
Foreman: N. Hudson
Engineer: Akshat Saxena

BORING METHOD
HSA = Hollow Stem Augers
CFA = Continuous Flight Augers
DC = Driving Casing
MD = Mud Drilling

SAMPLE TYPE
PC = Pavement Core
CA = Continuous Flight Auger
DS = Driven Split Spoon
PT = Pressed Shelby Tube
RC = Rock Core

SAMPLE CONDITIONS
D = Disintegrated
I = Intact
U = Undisturbed
L = Lost

GROUNDWATER DEPTH
First Noted: None
At Completion: Dry
After: --
Backfilled: --

* SPT = Standard Penetration Test - Driving 2" O.D. Sampler 18" with 140-Pound Hammer Falling 30"; Count Made at 6" Intervals

GEOTECHNOLOGY INC
FROM THE GROUND UP

LOG OF TEST BORING

CLIENT: Lorven Milford LLC
BORING #: 16
PROJECT: Proposed SR 28 Mixed-Use Development
Miami Township, Ohio
PROJECT #: J034114.01
PAGE #: 1 of 1
LOCATION OF BORING: As shown on Boring Plan, Sheet No. 1

ELEV.	COLOR, MOISTURE, DENSITY, PLASTICITY, SIZE, PROPORTIONS DESCRIPTION	Strata Depth (feet)	Depth Scale (feet)	Sample Condition	Sample Number	Sample Type	SPT* Blows/6" / Rock Core RQD (%)	Recovery (in.)	Recovery (%)
848.0	Ground Surface	0.0	0						
	Brown moist stiff to very stiff LEAN CLAY, trace sand, trace till, limestone fragments.			I	1	DS	3-4-6	15	83
				I	2	DS	6-11-13	12	67
			5	I	3	DS	8-10-14	18	100
841.0		7.0							
	Brown and gray moist stiff to very stiff CLAY and sand, limestone fragments (glacial).			I	4	DS	14-16-18	18	100
			10	I	5	DS	9-14-18	18	100
836.0		12.0							
	Gray and brown moist stiff to very stiff CLAY, sand and gravel, trace sand, trace till, limestone fragments.			I	6	DS	7-11-9	12	67
			15	I	7	DS	5-6-18	18	100
				I	8	DS	22-28-26	15	83
			20	I	9	DS	9-15-19	18	100
826.5		21.5							
	Bottom of test boring at 21.5 feet.		25						
			30						

Datum: NAVD 88
Hammer Weight: 140 lb.
Hole Diameter: 7.5 in.
Drill Rig: CME-55 TD-5
Surface Elevation: 848.0 ft.
Hammer Drop: 30 in.
Rock Core Diameter: --
Foreman: N. Hudson
Date Started: 3/18/2019
Pipe Size: 2 in. O.D.
Boring Method: HSA-3.25
Engineer: Akshat Saxena
Date Completed: 3/18/2019

BORING METHOD
HSA = Hollow Stem Augers
CFA = Continuous Flight Augers
DC = Driving Casing
MD = Mud Drilling

SAMPLE TYPE
PC = Pavement Core
CA = Continuous Flight Auger
DS = Driven Split Spoon
PT = Pressed Shelby Tube
RC = Rock Core

SAMPLE CONDITIONS
D = Disintegrated
I = Intact
U = Undisturbed
L = Lost

GROUNDWATER DEPTH
First Noted 17.5 ft.
At Completion Dry
After --
Backfilled --

* SPT = Standard Penetration Test - Driving 2" O.D. Sampler 18" with 140-Pound Hammer Falling 30"; Count Made at 6" Intervals

GEOTECHNOLOGY INC
FROM THE GROUND UP

LOG OF TEST BORING

CLIENT: Lorven Milford LLC
BORING #: 17
PROJECT: Proposed SR 28 Mixed-Use Development
Miami Township, Ohio
PROJECT #: J034114.01
PAGE #: 1 of 1
LOCATION OF BORING: As shown on Boring Plan, Sheet No. 1

ELEV.	COLOR, MOISTURE, DENSITY, PLASTICITY, SIZE, PROPORTIONS DESCRIPTION	Strata Depth (feet)	Depth Scale (feet)	Sample Condition	Sample Number	Sample Type	SPT* Blows/6" Rock Core RQD (%)	Recovery (in.)	Recovery (%)
862.0	Ground Surface	0.0	0						
	Brown moist stiff LEAN CLAY, trace sand, trace roots.			I	1	DS	4-5-4	15	83
860.0		2.0							
	Brown moist very stiff LEAN CLAY, with sand and gravel (glacial).			I	2	DS	4-5-8	15	83
			5	I	3	DS	13-16-13	18	100
				I	4	DS	8-15-15	18	100
852.5		9.5							
	Brown and gray moist very stiff LEAN CLAY, with sand and gravel.		10	I	5	DS	12-14-42	15	83
850.5		11.5							
	Gray moist very stiff LEAN CLAY, with sand and gravel.			I	6	DS	9-14-17	18	100
			15	I	7	DS	7-9-10	18	100
				I	8	DS	7-8-10	18	100
			20	I	9	DS	5-8-11	12	67
840.5		21.5							
	Bottom of test boring at 21.5 feet.		25						
			30						

Datum: NAVD 88
Surface Elevation: 862.0 ft.
Date Started: 3/18/2019
Date Completed: 3/18/2019
Hammer Weight: 140 lb.
Hammer Drop: 30 in.
Pipe Size: 2 in. O.D.
Hole Diameter: 7.5 in.
Rock Core Diameter: --
Boring Method: HSA-3.25
Drill Rig: CME-55 TD-5
Foreman: N. Hudson
Engineer: Akshat Saxena

BORING METHOD
HSA = Hollow Stem Augers
CFA = Continuous Flight Augers
DC = Driving Casing
MD = Mud Drilling

SAMPLE TYPE
PC = Pavement Core
CA = Continuous Flight Auger
DS = Driven Split Spoon
PT = Pressed Shelby Tube
RC = Rock Core

SAMPLE CONDITIONS
D = Disintegrated
I = Intact
U = Undisturbed
L = Lost

GROUNDWATER DEPTH
First Noted: None
At Completion: Dry
After: –
Backfilled: –

* SPT = Standard Penetration Test - Driving 2" O.D. Sampler 18" with 140-Pound Hammer Falling 30"; Count Made at 6" Intervals

GEOTECHNOLOGY INC
FROM THE GROUND UP

LOG OF TEST BORING

CLIENT: Lorven Milford LLC | BORING #: 18
PROJECT: Proposed SR 28 Mixed-Use Development | PROJECT #: J034114.01
Miami Township, Ohio | PAGE #: 1 of 1
LOCATION OF BORING: As shown on Boring Plan, Sheet No. 1

ELEV.	COLOR, MOISTURE, DENSITY, PLASTICITY, SIZE, PROPORTIONS DESCRIPTION	Strata Depth (feet)	Sample Condition	Sample Number	Sample Type	SPT* Blows/6" / Rock Core RQD (%)	Recovery (in.)	Recovery (%)
865.0	Ground Surface	0.0						
	Brown moist stiff LEAN CLAY, trace sand, trace roots.		I	1	DS	2-3-4	18	100
863.0		2.0						
	Brown, little gray moist stiff to very stiff LEAN CLAY, little sand, trace oxide concretions.		I	2	DS	2-4-5	12	67
860.5		4.5						
	Brown, little gray moist very stiff to stiff LEAN CLAY, little to some sand and gravel, some limestone fragments, trace oxide concretion (glacial).		I	3	DS	8-9-9	18	100
			I	4	DS	10-13-18	18	100
			I	5	DS	15-15-16	18	100
			I	6	DS	6-18-13	18	100
			I	7	DS	7-13-13	18	100
848.0		17.0						
	Gray moist very stiff LEAN CLAY with sand and gravel.		I	8	DS	7-8-10	18	100
			I	9	DS	5-8-10	18	100
843.5		21.5						
	Bottom of test boring at 21.5 feet.							

Depth Scale (feet): 0, 5, 10, 15, 20, 25, 30

Datum: NAVD 88 | Hammer Weight: 140 lb. | Hole Diameter: 7.5 in. | Drill Rig: CME-55 TD-5
Surface Elevation: 865.0 ft. | Hammer Drop: 30 in. | Rock Core Diameter: -- | Foreman: N. Hudson
Date Started: 3/18/2019 | Pipe Size: 2 in. O.D. | Boring Method: HSA-3.25 | Engineer: Akshat Saxena
Date Completed: 3/18/2019

BORING METHOD
HSA = Hollow Stem Augers
CFA = Continuous Flight Augers
DC = Driving Casing
MD = Mud Drilling

SAMPLE TYPE
PC = Pavement Core
CA = Continuous Flight Auger
DS = Driven Split Spoon
PT = Pressed Shelby Tube
RC = Rock Core

SAMPLE CONDITIONS
D = Disintegrated
I = Intact
U = Undisturbed
L = Lost

GROUNDWATER DEPTH
First Noted: None
At Completion: Dry
After: --
Backfilled: --

* SPT = Standard Penetration Test - Driving 2" O.D. Sampler 18" with 140-Pound Hammer Falling 30"; Count Made at 6" Intervals

GEOTECHNOLOGY INC
FROM THE GROUND UP

LOG OF TEST BORING

CLIENT: Lorven Milford LLC
BORING #: 19
PROJECT: Proposed SR 28 Mixed-Use Development
Miami Township, Ohio
PROJECT #: J034114.01
PAGE #: 1 of 1
LOCATION OF BORING: As shown on Boring Plan, Sheet No. 1

ELEV.	COLOR, MOISTURE, DENSITY, PLASTICITY, SIZE, PROPORTIONS DESCRIPTION	Strata Depth (feet)	Depth Scale (feet)	Sample Condition	Sample Number	Sample Type	SPT* Blows/6" / Rock Core RQD (%)	Recovery (in.)	Recovery (%)
865.0	Ground Surface	0.0	0						
863.0	Brown moist medium stiff LEAN CLAY, trace sand and gravel, trace roots.	2.0		I	1	DS	3-4-4	18	100
858.0	Brown moist stiff to very stiff LEAN CLAY, trace sand, trace oxide concretions, some limestone fragments.	7.0	5	I	2	DS	3-3-3	15	83
				I	3	DS	4-5-7	18	100
853.0	Brown and gray moist very stiff LEAN CLAY, with limestone fragments, some sand (glacial).	12.0	10	I	4	DS	8-14-15	12	67
				I	5	DS	9-20-16	18	100
845.5	Brown and gray moist very stiff LEAN CLAY, with sand and gravel, with limestone fragments.	19.5	15	I	6	DS	10-43-22	18	100
				I	7	DS	13-16-24	18	100
				I	8	DS	10-17-31	6	33
843.5	Brownish-gray moist very stiff LEAN C.AY, with sand and gravel, little limestone fragments.	21.5	20	I	9	DS	13-17-18		
	Bottom of test boring at 21.5 feet.		25						
			30						

Datum: NAVD 88
Hammer Weight: 140 lb.
Hole Diameter: 7.5 in.
Drill Rig: CME-55 TD-5
Surface Elevation: 865.0 ft.
Hammer Drop: 30 in.
Rock Core Diameter: --
Foreman: N. Hudson
Date Started: 3/18/2019
Pipe Size: 2 in. O.D.
Boring Method: HSA-3.25
Engineer: Akshat Saxena
Date Completed: 3/18/2019

BORING METHOD
HSA = Hollow Stem Augers
CFA = Continuous Flight Augers
DC = Driving Casing
MD = Mud Drilling

SAMPLE TYPE
PC = Pavement Core
CA = Continuous Flight Auger
DS = Driven Split Spoon
PT = Pressed Shelby Tube
RC = Rock Core

SAMPLE CONDITIONS
D = Disintegrated
I = Intact
U = Undisturbed
L = Lost

GROUNDWATER DEPTH
First Noted: None
At Completion: Dry
After: --
Backfilled: --

* SPT = Standard Penetration Test - Driving 2" O.D. Sampler 18" with 140-Pound Hammer Falling 30"; Count Made at 6" Intervals

GEOTECHNOLOGY INC
FROM THE GROUND UP

LOG OF TEST BORING

CLIENT: Lorven Milford LLC
BORING #: 20
PROJECT: Proposed SR 28 Mixed-Use Development
Miami Township, Ohio
PROJECT #: J034114.01
PAGE #: 1 of 1
LOCATION OF BORING: As shown on Boring Plan, Sheet No. 1

ELEV.	COLOR, MOISTURE, DENSITY, PLASTICITY, SIZE, PROPORTIONS DESCRIPTION	Strata Depth (feet)	Depth Scale (feet)	Sample Condition	Sample Number	Sample Type	SPT* Blows/6" / Rock Core RQD (%)	Recovery (in.)	Recovery (%)
854.0	Ground Surface	0.0	0						
	Brown and dark brown moist medium stiff LEAN CLAY, trace roots, little sand.			I	1	DS	3-4-6	18	100
				I	2	DS	8-13-14	18	100
849.0		5.0	5						
	Brown, little gray moist very stiff to stiff LEAN CLAY, with sand and gravel (glacial).			I	3	DS	11-14-14	18	100
				I	4	DS	21-18-30	6	33
			10	I	5	DS	13-18-16	6	33
842.0		12.0							
	Gray, trace brown moist LEAN CLAY, with sand and gravel.			I	6	DS	9-12-16	18	100
			15	I	7	DS	12-15-20	18	100
				I	8	DS	5-8-10		
			20	I	9	DS	8-10-13	15	83
832.5		21.5							
	Bottom of test boring at 21.5 feet.		25						
			30						

Datum: NAVD 88
Hammer Weight: 140 lb.
Hole Diameter: 7.5 in.
Drill Rig: CME-55 TD-5
Surface Elevation: 854.0 ft.
Hammer Drop: 30 in.
Rock Core Diameter: --
Foreman: N. Hudson
Date Started: 3/13/2019
Pipe Size: 2 in. O.D.
Boring Method: HSA-3.25
Engineer: Akshat Saxena
Date Completed: 3/13/2019

BORING METHOD
HSA = Hollow Stem Augers
CFA = Continuous Flight Augers
DC = Driving Casing
MD = Mud Drilling

SAMPLE TYPE
PC = Pavement Core
CA = Continuous Flight Auger
DS = Driven Split Spoon
PT = Pressed Shelby Tube
RC = Rock Core

SAMPLE CONDITIONS
D = Disintegrated
I = Intact
U = Undisturbed
L = Lost

GROUNDWATER DEPTH
First Noted: None
At Completion: Dry
After: --
Backfilled: --

* SPT = Standard Penetration Test - Driving 2" O.D. Sampler 18" with 140-Pound Hammer Falling 30"; Count Made at 6" Intervals

GEOTECHNOLOGY INC
FROM THE GROUND UP

LOG OF TEST BORING

CLIENT: Lorven Milford LLC
PROJECT: Proposed SR 28 Mixed-Use Development
Miami Township, Ohio
LOCATION OF BORING: As shown on Boring Plan, Sheet No. 1

BORING #: 21
PROJECT #: J034114.01
PAGE #: 1 of 1

ELEV.	COLOR, MOISTURE, DENSITY, PLASTICITY, SIZE, PROPORTIONS DESCRIPTION	Strata Depth (feet)	Depth Scale (feet)	Sample Condition	Sample Number	Sample Type	SPT* Blows/6" / Rock Core RQD (%)	Recovery (in.)	Recovery (%)
854.0	Ground Surface	0.0	0						
	Brown moist medium stiff LEAN CLAY, little sand, trace organics, trace topsoil.			I	1	DS	2-2-3	15	83
852.0		2.0							
	Brown and gray moist stiff to very stiff LEAN CLAY, with sand and gravel (glacial).			I	2	DS	4-7-9	18	100
			5	I	3	DS	8-10-10	18	100
				I	4	DS	8-11-13	18	100
844.5		9.5							
	Gray, trace brown moist very stiff LEAN CLAY, with sand and gravel, trace limestone fragments.		10	I	5	DS	7-12-16	18	100
				I	6	DS	5-6-10	18	100
			15	I	7	DS	6-8-12	18	100
				I	8	DS	5-15-9	15	83
			20	I	9	DS	6-9-11	18	100
832.5		21.5							
	Bottom of test boring at 21.5 feet.		25						
			30						

Datum: NAVD 88
Surface Elevation: 854.0 ft.
Date Started: 3/13/2019
Date Completed: 3/13/2019
Hammer Weight: 140 lb.
Hammer Drop: 30 in.
Pipe Size: 2 in. O.D.
Hole Diameter: 7.5 in.
Rock Core Diameter: --
Boring Method: HSA-3.25
Drill Rig: CME-55 TD-5
Foreman: N. Hudson
Engineer: Akshat Saxena

BORING METHOD
HSA = Hollow Stem Augers
CFA = Continuous Flight Augers
DC = Driving Casing
MD = Mud Drilling

SAMPLE TYPE
PC = Pavement Core
CA = Continuous Flight Auger
DS = Driven Split Spoon
PT = Pressed Shelby Tube
RC = Rock Core

SAMPLE CONDITIONS
D = Disintegrated
I = Intact
U = Undisturbed
L = Lost

GROUNDWATER DEPTH
First Noted: None
At Completion: Dry
After: --
Backfilled: --

* SPT = Standard Penetration Test - Driving 2" O.D. Sampler 18" with 140-Pound Hammer Falling 30"; Count Made at 6" Intervals

GEOTECHNOLOGY INC
FROM THE GROUND UP

SOIL CLASSIFICATION SHEET

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

Density

Very Loose	- 5 blows/ft. or less
Loose	- 6 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.