ECS Midwest, LLC

Geotechnical Engineering Report

Proposed New Childcare Facility in Hudson

802 W Streetsboro St
Hudson, Summit County, Ohio

ECS Project No. 67:4334

January 28, 2026

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Ms. Kim Tatsch
Crosslands Development Company LLC
9635 Maroon Circle, Suite 125
Englewood, Colorado 80112

ECS Project No. 67:4334

Reference: Geotechnical Engineering Report
Proposed New Childcare Facility in Hudson
802 W Streetsboro St
Hudson, Summit County, Ohio

Dear Ms. Tatsch:

ECS Midwest, LLC has completed the subsurface exploration, laboratory testing, and Geotechnical Engineering analyses for the above-referenced project. Our services were performed in general accordance with our agreed to scope of work. This report presents our understanding of the geotechnical aspects of the project along with the results of the field exploration and laboratory testing conducted, and our design and construction recommendations.

It has been our pleasure to be of service to **Crosslands Companies** during the design phase of this project. We would appreciate the opportunity to remain involved during the continuation of the design phase, and we would like to provide our services during construction phase operations as well to verify subsurface conditions assumed for this report. Should you have any questions concerning the information contained in this report, or if we can be of further assistance to you, please contact us.

Respectfully submitted,

ECS Midwest, LLC

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APPENDICES

EXECUTIVE SUMMARY

This Executive Summary is solely provided to give a brief overview of the project findings. This Summary is abbreviated, and information gleaned from this text should not be utilized in lieu of reading the entire geotechnical report:

- The project involves the construction of a single-story, slab-on-grade building with an approximate plan area of 10,000 square feet. In addition, a play area of approximately 5,120 square feet is planned immediately west of the proposed building.
- Based on the soil borings, the subsurface conditions generally consist of thick deposits of undocumented fill and deleterious (weak, highly compressible) organic clay soils that extended to the depths ranging from roughly 6 to 23.5 feet below the existing grades. These unfavorable soil conditions that are present below the project site are not suitable to support the foundations of the proposed building without implementing one of the two ground improvement methods discussed in this report.
- The proposed building structure can be supported by shallow foundation using one of the following options:
    - ❖ **Option 1**: Undercut the fill soils from the foundation footprint to a depth of about 3½ feet below the foundation bearing elevation and replace with compacted granular engineered fill soils. Shallow foundations can be proportioned for a maximum allowable bearing pressure of **1,500 pounds per square foot (psf)**.
    - ❖ **Option 2**: In lieu of removal and replacement, utilize ground improvement system such as rigid inclusions to support the superstructure and the slab-on-grade. It is anticipated that foundations supported by the underlying ground improvement system may be designed for a maximum allowable bearing pressure between **1,500 to 2,500 psf**.
- Floor Slab: The building floor slab thickness may be determined based on a modulus of subgrade reaction of 100 pounds per cubic inch (pci) provided that a minimum of 12 inches of clean, compacted Engineered Fill is placed under the floor slab granular drainage layer. The design and construction of the slabs-on-grade for the building should follow the recommendations provided in the report sections titled **Subgrade Preparation** and **Earthwork Operations**.
- Due to the presence of thick, weak organic (compressible) soil and undocumented fill, the default **Seismic Site Classification is "D"** for this project site.
- For pavement design purposes, we recommend that a **CBR value of 3** for flexible pavements or a modulus of subgrade reaction, **k of 100 pounds per cubic inch (pci)** for rigid pavements be used as the anticipated subgrade reaction value provided the pavement is supported on a minimum of 12 inches of newly placed and compacted granular engineered fill.

1.0 INTRODUCTION

The purpose of this report is to provide the results of our subsurface exploration and laboratory testing, site characterization, engineering analyses, and geotechnical recommendations for the design of foundations, floor slabs, and pavements for the proposed development. Also included are geotechnical subgrade preparation, fill placement, and general dewatering recommendations. The recommendations developed for this report are based on project information supplied by Crosslands Companies.

Our services were provided in accordance with ECS Proposal No. 67: 5432-GP, dated May 22, 2025. This scope of services was authorized by the signing of ECS's proposal by Mr. Jeff Durbon, Manager of Crosslands Companies on October 10, 2025, and includes ECS's Terms and Conditions of Service.

This report contains the procedures and results of our subsurface exploration and laboratory testing programs, review of existing site conditions, engineering analyses, and recommendations for the design and construction of the project.

The report includes the following items:

- A brief review and description of our field and laboratory test procedures and the results of testing conducted.
- A review of surface topographical features and site conditions.
- A review of area and site geologic conditions.
- A review of subsurface soil/rock stratigraphy with pertinent physical properties.
- Records of the field exploration (test boring logs) prepared in accordance with the standard practice for Geotechnical Engineering.
- Recommendations for site preparation and construction of compacted fills, including an evaluation of on-site soils for use as compacted fill and identification of potentially unsuitable soils and/or soils exhibiting excessive moisture at the time of sampling.
- Recommended foundation type and recommended ground improvement system.
- Recommended Seismic Site Class.
- An evaluation of the on-site soil characteristics encountered in the soil borings and suitability of the on-site materials for reuse as Engineered Fill to support pavements and slabs, including compaction requirements and suitable material guidelines.
- General recommendations for pavement design including a recommended design CBR value and minimum design the pavement sections based on anticipated traffic data
- Evaluation and recommendations relative to groundwater control including recommendations for pavement underdrains.
- Recommendations for design and construction of drainage structures and stormwater management facilities.

2.0 PROJECT INFORMATION

The following information explains our understanding of the planned development including the proposed buildings and related infrastructure. This understanding is based on our review of the following documents and communications:

- *Architectural site plan (Sheet Number A-0) prepared by Boduch Design Group (BDG) dated March 6, 2025.*

2.1 PROJECT LOCATION AND SITE HISTORY

The project site is located at 802 W Streetsboro St in Hudson, Summit County, Ohio. Specifically, the site area for the proposed development is located at Southwest Corner of West Streetsboro Street and Terex Road, in the city of Hudson, Summit County, Ohio. Please see the Figure below and the Site Location Diagram included in Appendix A for more details.

Site Location Map

The site area is currently open and covered with a few trees. However, the area designated for the proposed development was previously developed with residential buildings and associated features, which have been demolished. Based on the provided topographic plans, the overall site slopes downwards from southwest towards north with an elevation difference of about 17 feet (1024 feet MSL to 1007 feet MSL). However, the elevation within the proposed building slopes in the same direction with an elevation difference of about 4 feet (1013’ MSL to 1009’ MSL)

2.2 PROPOSED CONSTRUCTION

The following information outlines our understanding of the planned Childcare Facility including proposed building and related infrastructure:

PROJECT CHARACTERISTICS		
Subject	**Design Information/Assumptions**	**Source**
Buildings	Construction of a single-story, slab-on-grade building measuring approximately 10,000 square feet in plan area. In addition, a play area of approximately 5,120 square feet is planned immediately west of the proposed building.	R
Max Column Loads	75 kips	R
Max Wall Loads	2.5 kips per linear foot (klf)	R
Max Floor Loads	100 psf live load	B
Exiting Topographic	The overall site slopes downwards from southwest towards north with an elevation difference of about 17 feet (1024 feet MSL to 1007 feet MSL). However, the elevation within the proposed building slopes in the same direction with an elevation difference of about 4 feet (1013 feet MSL to 1009 feet MSL)	R
Anticipated Finish Floor Elevation	1011 ± feet MSL	R
Grading Operations	Building Area: Maximum cut/fill about 2 feet Pavement Area: Maximum cut/fill less than 2 feet Detention Pond Area: Max Cut 4 feet and Max Fill 3 feet	B
Settlement Tolerance	Estimated to be a maximum of 1 inch total & ¾ inch of differential settlement	B
Pavement Area	Parking area with 45 parking spaces, and a trash enclosure and one access driveway from Terex Road	R
Retention Pond	A retention pond about 6,400 square feet in plan area and about 4 feet deep plans at north of the proposed building area.	R

R: Reported by client and/or Design Team

B: Based on ECS assumption in absence of information from Client and/or Design Team

Please note that a grading plan was not available at the time of this proposal. ECS should be provided with a grading plan prior to initiating our services to review our proposed depth of borings regarding actual cut/fill depths and make changes to our proposed scope and fee as necessary.

If our understanding of the proposed project is inaccurate or the design changes, please contact ECS immediately so we can review (and revise, if necessary) the recommendations provided herein.

3.0 FIELD EXPLORATION AND LABORATORY TESTING

3.1 FIELD EXPLORATION

Our field services included drilling twelve (12) soil borings to terminal depths of approximately 10 to 25 feet below existing grades. Geotechnical exploration procedures employed by ECS are explained in Appendix B including the insert titled Subsurface Exploration Procedure. The test boring locations were selected by ECS and were established in the field by ECS personnel using Global Positioning System (GPS). The approximate locations of the soil borings are shown on the Boring Location Diagram in Appendix A.

3.2 SUBSURFACE CHARACTERIZATION

The subsurface conditions encountered were generally consistent with published geological mapping. The Table (in the following Section) provides a generalized characterization of the soil strata encountered in the soil borings. For more detailed information, please refer to the boring logs and subsurface profiles in Appendix B.

General Subsurface Stratigraphy

Approx. bottom Depth Range (ft)	Stratum No.	Material Description	Calibrated Penetrometer Resistance (tsf)	SPT (1) N-values (bpf)	Natural Moisture Content (%)
0 to 1	--	**Surface Materials** Topsoil (B-05, B-06, B-07, B-09)	--	--	--
6 to 23.5	I	**Undocumented Fill/Possible Fill:** LEAN CLAY, FAT CLAY *with varying degrees of organics, wood and roots* *(Borings B-01, B-02, B-03, B-04, B-08, B-09, B-10, B-11 and B-12)*	N/A	0 to 14	18.6 to 89.7
13.5 to 20	II	**Granular Natural Soils:** SILTY SAND WITH GRAVEL (SM) Loose to Medium Dense (Borings B-04 and B-05)	N/A	5 to 19	13 to 29.1
10 to 25	III	**Cohesive Natural Soils:** Firm to Very Stiff LEAN CLAY (CL) LEAN CLAY WITH SAND (CL) with varying degrees of gravel and rock fragments Loose to Medium Dense SANDY SILT (ML) (B-01, B-02, B-03, B-05, B-06, B-07, B-08, B-09, B-10, B-11, B-12)	2 to 4	4 to 25	8.8 to 33.8

Notes:

(1) Standard Penetration Testing.

A graphical presentation of the subsurface conditions is shown on the Subsurface Soil Profile Diagrams included in Appendix B.

3.3 GROUNDWATER OBSERVATIONS

Measured free ground water levels are reported on the boring logs in Appendix B. Groundwater depths measured at the time of drilling ranged from about 4.2 to 11.5 feet below the ground surface, thereby corresponding to EL. 999 feet to EL. 1008.8 feet MSL. Free ground water was only encountered in Borings B-1, B-04, B-05, B-06, B-11 and B-12 at the time of drilling activities. Variations in groundwater elevation can occur as a result of changes in precipitation, evaporation, surface water runoff, construction activities, and other factors. The groundwater level may take days or weeks to stabilize in the boreholes. Seasonal shallower perched water conditions may also develop or exist in fill and underground utility trenches.

The following Table illustrates the groundwater information encountered at the specified test boring locations during the field drilling operations:

FREE GROUNDWATER DEPTHS/ ELEVATIONS DURING DRILLING ACTIVITIES

Boring No.	Ground Water Encountered				Boring No.	Ground Water Encountered			
	During Drilling		After Drilling			During Drilling		After Drilling	
	Depths	Elevation Feet MSL	Depths	Elevation Feet MSL		Depth Feet	Elevation Feet MSL	Depth Feet	Elevation Feet MSL
B-01	8	1,002.0	NA	NA	**B-07**	NA	NA	NA	NA
B-02	NA	NA	NA	NA	**B-08**	NA	NA	NA	NA
B-03	NA	NA	NA	NA	**B-09**	NA	NA	NA	NA
B-04	11.5	1000.5	NA	NA	**B-10**	NA	NA	NA	NA
B-05	4.2	1002.8	NA	NA	**B-11**	6	1007	7.5	1005.5
B-06	4.2	1008.8	NA	NA	**B-12**	8	999.0	7	1000.0

Note: Ground water was not observed at the remaining test boring location at time of drilling operation

3.4 LABORATORY TESTING

The laboratory testing consisted of selected tests performed on samples obtained during our field exploration operations. Classification and index property tests were performed on representative soil samples, including Atterberg limit testing per ASTM D4318 and grain size analysis per ASTM D1140 and D422.

Each sample was visually classified on the basis of texture and plasticity in accordance with ASTM D2488 Standard Practice for Description and Identification of Soils (Visual-Manual Procedures) and including USCS classification symbols. After classification, the samples were grouped in the major zones noted on the boring logs in Appendix B. The group symbols for each soil type are indicated in parentheses along with the soil descriptions. The stratification lines between strata on the logs are approximate; in situ, the transitions may be gradual.

4.0 DESIGN RECOMMENDATIONS

4.1 GEOTECHNICAL DISCUSSION

As noted in Section **3.2 Subsurface Characterization** of this report, our field exploration encountered uncontrolled and/or undocumented fill material across the project site that extended to approximately 10 to 23 ½ feet below existing grades. Laboratory testing of representative samples of uncontrolled and/or undocumented fill material soil determined moisture contents between 18.6 to 89.7 percent.

ECS does not recommend supporting the proposed building with conventional shallow foundations that bear on the undocumented fill material without the implementation of ground improvements. Based on subsurface conditions, the proposed building must be supported by conventional shallow foundations following the implementation of ground improvement techniques (i.e., Removal and replacement or rigid inclusions). Aggregate piers or vibratory stone columns are not recommended due to the possible high ground water table, as well as the high compressibility of the existing undocumented fill materials/organic soils.

The proposed building structure can be supported by shallow foundation using one of the following options:

- **Option 1**: Undercut the fill soils from the foundation footprint to a depth of about 3 to 4 feet below the foundation bearing elevation and replace with compacted granular engineered fill soils. Shallow foundations can be proportioned for a maximum allowable bearing pressure of **1,500 pounds per square foot (psf)**.

- **Option 2**: In lieu of removal and replacement, utilize ground improvement system such as rigid inclusions to support the superstructure and the slab-on-grade. It is anticipated that foundations supported by the underlying ground improvement system may be designed for a maximum allowable bearing pressure between **1,500 to 2,500 psf** .

4.2 FOUNDATION DESIGN

4.2.1 Option I - Shallow Foundation recommendation

Provided subgrades and Engineered Fill are prepared as recommended in this report, the proposed building structure can be supported by shallow foundations including column footings and continuous wall footings. We recommend the foundation design use the parameters in the following Table. The Structural Engineer should design the footings and determine the actual footing size and steel reinforcing requirements.

The excavations may be made within the footprint of the proposed new footings as neatly as possible, and that the excavated soil be replaced with either compacted engineered fill up to design bottom of footing level (see **Engineered Fill Below Foundations** section of this report). The shallow foundations should be designed using the following parameters:

FOUNDATION DESIGN RECOMMENDATIONS		
Design Parameter	**Column Footing**	**Wall Footing**
Net Allowable Bearing Pressure [(1)]	1,500 psf	1,500 psf
Acceptable Bearing Elevation	1004 feet MSL (Engineered Fill)	
Competent Soils Designated Suitable for the	N ≥ 6 bpf or Q_p ≥ 1.0 tsf	

FOUNDATION DESIGN RECOMMENDATIONS		
Design Parameter	**Column Footing**	**Wall Footing**
Allowable Bearing Pressure		
Minimum Width	24 inches	16 inches
Minimum Footing Embedment Depth (Below slab or finished grade) (2)	24 inches	18 inches
Minimum Exterior Frost Depth (Below final exterior grade)	42 inches	42 inches
Estimated Total Settlement (3)	Less than 1 inch	Less than 1 inch
Estimated Differential Settlement (4)	Less than ¾ inch between columns	Less than ¾ inch

Notes:

(1) Net allowable bearing pressure is the applied pressure in excess of the surrounding overburden soils above the base of the foundation.
(2) For bearing considerations, frost penetration requirements.
(3) Based on assumed structural loads. If Final loads are different, ECS must be contacted to update foundation recommendations and settlement calculations.
(4) Based on assumed structural loads and variability in borings. Differential settlement can be re-evaluated once the foundation plans are more complete

We recommend the excavation/backfill of foundations be observed and tested full-time by ECS to check that the soil bearing pressure is consistent with the boring log information obtained during the geotechnical exploration. The foundation bearing grade should be observed and tested, and any undercut for foundations backfilled as recommended in the **Foundation and Slab Observations** section of this report.

4.2.2 Option 2 - Shallow Foundations Supported by Rigid Inclusions

The design and installation of rigid inclusion ground improvement elements are typically performed by a design/build specialty geotechnical Contractor because of the *proprietary* nature of the various installation methods used to construct the rigid inclusions. The various methods result in different diameters, depths, and stiffness moduli for the elements. The rigid inclusions are constructed by drilling a nominal 18-inch or 24-inch diameter hole through the subsurface materials to the design depth and subsequently grouting the borehole as the drilling augers are removed from the hole. The degree of improvement (I.e., the resulting bearing pressure and estimated settlement) is a function of the replacement ratio (i.e., the diameter and spacing of the rigid inclusions) and the stiffness characteristics of the undocumented fill/ existing soil matrix.

Rigid Inclusions should be designed for Net allowable bearing pressures on the order of 1,500 to 2,500 psf. The depth of the Rigid Inclusion elements should be determined by specialty contractor. It should be anticipated that shallow ground water may be encountered on the site and that a down-hole hammer will be required to penetrate rock fragments that will inhibit construction of the rigid inclusion elements. Specialty Contractors with experience in the design and installation of ground improvement should be consulted. *ECS can provide contact information relative to qualified contractors for these specialty construction services.*

Foundation Design for Rigid Inclusions: We recommend that these foundation systems be designed by a specialty Contractor. We also recommend that the foundation systems design and support calculations be made available to the ECS for review. ECS can provide the Project Team with contact information of specialty Contractors if requested. ECS can also design a rigid inclusion system and work with specialty

Contractors, upon your request. Specific to the ground improvement design and construction, ECS recommends the following:

- Settlement calculations should be performed by the Designer to confirm that the maximum tolerable total and differential settlements are met. Unless confirmed otherwise by the Structural Engineer, we recommend settlement criteria of 1 inch and ¾ inch in total and differentially for the planned foundations.
- Specifications for the proposed ground improvement system should be prepared by the Designer. We recommend that these specifications be reviewed by the ECS Geotechnical Engineer.
- The Contractor who will install the ground improvement system should demonstrate his qualifications by showing a minimum of 5 years of experience in ground improvement using that system. The Contractor should also provide a site superintendent and/or site engineer with a minimum of 5 years' experience in ground improvement construction projects that may be considered like this particular project. The Contractor should provide at least three references of projects of similar scope and magnitude.
- After the ground improvement system has been installed, ECS recommends that the reinforced ground be adequately protected by providing proper drainage to eliminate ponding of water around the proposed construction and maintaining new excavations a sufficient distance so that the ground improvement system is not disturbed.
- We recommend that the foundations of the proposed building be founded at least 42 inches below the proposed grades for frost protection.

Ground Improvement System Installation Observations: The installation should be conducted under the observation of the ECS Geotechnical Engineer or his representative to verify proper installation procedures and document changes in the explored soil conditions.

4.3 SEISMIC DESIGN CONSIDERATIONS

Seismic Site Classification: The Ohio Building Code (OBC) 2017 requires site classification for seismic design based on the upper 100 feet of a soil profile. At least two methods are utilized in classifying sites, namely the shear wave velocity (v_s) method and the Standard Penetration Resistance (N-value) method. The second method (Standard Penetration Resistance) was used in classifying this site.

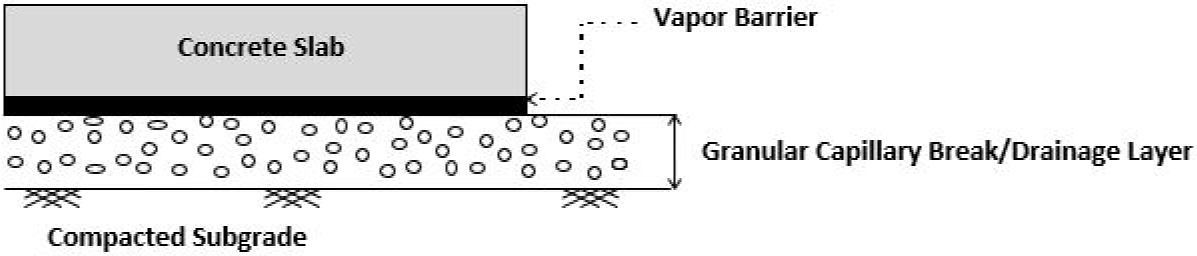
Seismic Site Classification per the OBC

Site Class	Soil Profile Name	Shear Wave Velocity, Vs, (ft./s)	N value (bpf)	S_u value (psf)
A	Hard Rock	Vs > 5,000 fps	N/A	N/A
B	Rock	2,500 < Vs ≤ 5,000 fps	N/A	N/A
C	Very dense soil and soft rock	1,200 < Vs ≤ 2,500 fps	>50	≥ 2,000
D	**Stiff Soil Profile**	**600 ≤ Vs ≤ 1,200 fps**	**15 to 60**	**1,000 to 2,000**
E	Soft Soil Profile	Vs < 600 fps	<15	≤ 1,000

The maximum explored depth in the present subsurface exploration was approximately 25 feet below existing grades. Therefore, ECS recommends **Seismic Site Classification is "D"** as shown in the preceding Table.

4.4 FLOOR SLABS

The finished floor elevation of the building was not provided to ECS at the time that this report was developed. Therefore, we have estimated the floor slab to be at about **El. 1011 feet** MSL, for this report submittal. If undercutting option is selected, all slabs-on-grade which will be located within the interior of the structures that are underlain by thick undocumented fill that is laden with high organic and/or compressible soil must be removed at least 12 inches below building floor slab subgrade elevation and replaced with compacted granular engineered fill**.** The following graphic depicts our soil-supported slab recommendations based on the anticipated subgrade soils and floor loading:



Notes:

1. **Concrete Slab:** Minimum 5 inches thick
2. **Drainage Layer:** Minimum 6 inches thick
3. **Drainage Layer Material:** ODOT Item 304 LIMESTONE
4. **Compacted Subgrade:** Compacted to at least 98 percent of the maximum dry density per ASTM D698.

If Rigid Inclusion option is selected, all slabs-on-grade which will be located within the interior of the structures that are underlain by thick undocumented fill that is laden with high organic and/or compressible soil must be supported via **rigid inclusions** as described earlier in this report. The failure to support these slabs situated over deleterious materials with rigid inclusions will result in **adverse settlement and appurtenant structural distress**

A thicker slab may be needed depending on the actual floor loads. The Structural Engineer should determine the actual slab thickness and other requirements such as steel reinforcement. Provide adequate construction joints, contraction joints and isolation joints in the slab to reduce the impacts of cracking and shrinkage. Refer to the ACI 302.1R04 *Guide for Concrete Floor and Slab Construction* for additional information regarding concrete slab joint design. Reinforce the slab with welded wire fabric or include an appropriate fiber mesh admixture to help control shrinkage cracking.

Positive drainage around the perimeter of the proposed structures should be used to reduce the potential for water accumulation under the floor slab and foundation elements. Slope exterior grades adjacent to the building such that runoff is directed away from the building walls. Direct building downspouts away from the building walls/foundations. Direct slab and pavement surface runoff to appropriate stormwater infrastructure.

Subgrade Modulus: Provided that the Subgrade is prepared, and any Engineered Fill and the Granular Drainage Layer are constructed in accordance with our recommendations, the slab may be designed assuming a modulus of subgrade reaction, **k of 100 psi/in** (pounds per square inch per inch) provided the final subgrade prepared after rigid inclusions system. These estimated values are based on the recommended minimum drainage base thickness and a 1 foot by 1 foot plate load test.

Vapor Barrier: Before the placement of concrete, a vapor barrier may be placed on top of the granular drainage layer to provide additional protection against moisture penetration through the floor slab. When a vapor barrier is used, special attention should be given to surface curing of the slab to reduce the potential for uneven drying, curling and/or cracking of the slab. Depending on proposed flooring material types, the Structural Engineer and/or the architect may choose to eliminate the vapor barrier.

Slab Isolation: Soil-supported slabs should be isolated from the foundations and foundation-supported elements of the structure so that differential movement between the foundations and slab will not induce excessive shear and bending stresses in the floor slab. Where the structural configuration prevents the use of a free-floating slab, such as in a drop-down footing/monolithic slab configuration, the slab should be designed with suitable reinforcement and load transfer devices to preclude overstressing of the slab.

Frost Susceptible Areas: Exterior patios and sidewalks, and portions of the floor slab, such as doorways, and entrance/exit vestibules may be susceptible to frost heave movement during freezing weather. Additional insulation, installation of subgrade drainage, and/or replacement to the frost depth with non-frost-susceptible backfill should be considered for these areas. Pavement and ground surface grades are recommended to be sloped away from the building and flatwork, to reduce water infiltration and potential frost heave problems.

4.5 PAVEMENT DESIGN CONSIDERATIONS

California Bearing Ratio (CBR) testing was not performed as part of this study. Based on the results of our laboratory testing, we recommend that a **CBR value of 3** for flexible pavements or a modulus of subgrade reaction, **k of 100 pounds per cubic inch (pci)** for rigid pavements be used as preliminary anticipated subgrade reaction values. The pavement design recommendations assume the subgrade consists of suitable materials evaluated by ECS, and the subgrade is prepared as recommended in the **Subgrade Preparation** and **Earthwork Operations** sections of this report.

The site plan we reviewed did not indicate where different pavement types might be proposed. Nor was traffic information provided to ECS at the time of this report. Typically, standard-duty pavement is used for automobile parking areas whereas heavy-duty pavement is used for internal drives. We anticipate that there will be concrete aprons at all entrance and exit points. We estimate that over 20 years, the standard-duty pavement will be subjected to 20,000 ESALs and the heavy-duty pavement will be subjected to 100,000 ESALs.

The proposed pavement sections in this report are preliminary in nature to act as guidelines that may or may not comply with local jurisdictional minimums. The Civil Engineer should design the pavement sections based on their determined traffic information.

MINIMUM PAVEMENT SECTION RECOMMENDATIONS				
Pavement Material	**Compacted Material Thicknesses (Inches)**			
	Flexible Pavement		**Rigid Pavement**	
	(Standard-Duty)	**(Heavy-Duty)**	**(Standard-Duty)**	**(Heavy-Duty)**
Portland Cement Concrete (f'_c = 4,000 psi)	--	--	5	6
Asphalt Concrete Surface Course (ODOT Item 441, Type 1)	1½	1½	--	--
Asphalt Concrete Intermediate Course (ODOT Item 441, Type 1 or 2)	2	2½	--	--
ODOT Item 304 Aggregate Base	6	8	4	6
Total Pavement Section Thickness	9½	12	9	12

The pavement sections in the Table above do not provide an allowance for construction traffic. If pavements will be constructed early during site development to accommodate construction traffic, consideration should be given to the construction of designated haul roads, where thickened pavement sections can be provided to accommodate the construction traffic, as well as the future in-service traffic. ECS can provide additional design assistance with pavement sections for haul roads if requested.

We recommend the crushed granular base course be compacted to at least 98 percent of the maximum dry density obtained in accordance with ASTM D698, Standard Proctor Method. The hot mix asphalt should be compacted to a minimum of 93 percent of the maximum theoretical density value.

Rigid Concrete Pavements: Concrete pavement at **least 8 inches thick** is recommended in frequent traffic areas such as where trucks frequently turn, delivery areas, trash enclosure pads, and points of ingress or egress due to the high wheel and impact loads that these areas receive. The concrete pavement section should consist of air-entrained Portland cement concrete having a minimum 28-day compressive strength of 4,000 psi. The rigid pavement section should be provided with construction joints at appropriate intervals per PCA requirements. The construction joints should be reinforced with dowels to transfer loads across the joints.

Pavement Drainage: An important consideration with the design and construction of pavements is surface and subsurface drainage. Where standing water develops, either on the pavement surface or within the base course layer, softening of the subgrade and other problems related to the deterioration of the pavement can be expected. Based on our estimated groundwater level, we consider surface water infiltration would be the main source of water to be considered for pavement design on this project.

Shape or crown the final pavement surface to properly direct surface water to suitable on or off-site storm water drainage infrastructure. Properly slope the clay pavement subgrade to avoid dips or pockets where water may become trapped. Dips in the silty clay subgrade could result in a "bathtub" effect, which may trap water and potentially soften the subgrade. The subgrade in areas requiring undercut and backfill with granular soils are recommended to be graded to drain toward a drain tile. The drain tile should be sloped a minimum of ½ to 1 percent to discharge to nearby storm sewers, drainage ditches or other appropriate drainage facilities. Install edge drains where site grades slope toward the pavement edge to reduce the potential for water to enter the base course layer. Slope edge drains to the nearest appropriate drainage facility. Water that accumulates and ponds on the subgrade surface can lead to deterioration of the subgrade soils, reduction of the base course support characteristics and pavement heave. Good drainage should help reduce the possibility of the subgrade materials being wet over a long period of time.

To reduce the potential for shallow perched water to develop in areas of the site, install “stub” or “finger” drains around catch basins and in other low-lying areas of the parking lot to reduce the accumulation of water above and within the subgrade soils and aggregate base. As an alternative to the use of stub or finger drains, perforate existing manholes and storm sewer inlets with 1-inch diameter holes at 2-foot centers and wrap the manhole/inlet with a non-woven geotextile to reduce migration of material into the manhole/inlet. The holes could be placed at 90-degree intervals around the perimeter of the manhole, and the excavation around the manhole backfilled with free draining granular materials.

Pavement Maintenance Considerations: A sound maintenance program should be implemented to help maintain and enhance the performance of pavements and help attain design service life. A preventative maintenance program should be started early in the pavement life to be effective. The research-supported industry standard indicates that preventative maintenance should typically begin within 2 to 5 years of the placement of pavement. Failure to perform preventative maintenance will reduce the service life of the pavement and increase the costs for corrective maintenance and full pavement rehabilitation. Seal joints and cracks with elastomeric caulk in a timely manner to help reduce water infiltration through the pavement section into the base course layer, which may result in softening of the subgrade and deterioration of the pavement. Observe pavements for distresses, such as cracks, depressions, and poor drainage, at least twice a year, typically once in the Spring and once in the Fall.

5.0 SITE CONSTRUCTION RECOMMENDATIONS

5.1 SUBGRADE PREPARATION

5.1.1 Existing Utilities

Locate all existing utilities. Relocate any utilities planned to be maintained outside the proposed building area, if possible. For utilities not reused, cap-off and removed, or properly abandon in-place in accordance with local codes and ordinances. Backfill excavations for utilities to be removed in the influence zone of new construction with Engineered Fill. Grading operations must be done carefully so that existing utilities are not damaged or disturbed. Check utility invert elevations, depths, and sizes relative to the planned foundation elevations to determine what specific concerns are present.

5.1.2 Stripping and Initial Site Preparation.

The subgrade preparation should consist of stripping all vegetation, rootmat, topsoil, concrete, gravel, sods, and any other soft or unsuitable materials from the 10-foot expanded building and 5-foot expanded pavement limits and to 5 feet beyond the toe of Engineered Fills. ECS should be called on to verify that topsoil and unsuitable surficial materials have been completely removed prior to the placement of Engineered Fill or construction of structures. Based on the subsurface exploration, topsoil depths ranging from approximately 0 to 10 inches were encountered across the site. Accordingly, an average topsoil stripping depth of approximately 6 inches should be anticipated for the proposed project site. We recommend using this average stripping depth for earthwork quantity calculations and construction cost estimating.

Proper removal of existing underground utilities, and existing concrete pavements, left over concrete retaining walls etc. within the planned footprint of the proposed construction will be critical to the successful and long-term performance of the components of the new structures. It is important that both existing at-grade and below-ground structures are removed from within the planned building footprint and the planned subgrade elevations are re-established with properly compacted fill (i.e., Engineered Fill). Construction debris generated from demolition is not considered suitable for use in on-site fills, unless the oversized materials, which are not deleterious, can be sorted and broken down sufficiently to meet the requirements of Engineered Fill (refer to the **Engineered Fill** section of this report) and approved by the Owner and Geotechnical Engineer. It is recommended that demolition debris be hauled to an appropriate landfill, properly recycled, or stockpiled in an approved area of the site. ECS recommends that a designated representative of the Geotechnical Engineer be retained to observe and document the demolition activities. The geotechnical representative can verify that the intent of the demolition recommendations contained herein are implemented, as well as identify and act upon unknown or unforeseen underground structures/utilities that are uncovered during the demolition.

5.1.3 Proofrolling

Prior to fill placement or other construction on subgrades, the subgrades should be evaluated by an ECS field technician. The exposed subgrade should be thoroughly proofrolled with construction equipment having a minimum axle load of 10 tons (e.g. fully loaded tandem-axle dump truck). Proofrolling should be traversed in two perpendicular directions with overlapping passes of the vehicle under the observation of an ECS technician. This procedure is intended to assist in identifying any localized yielding materials.

Where proofrolling identifies areas that are unstable or “pumping” subgrade those areas should be repaired prior to the placement of any subsequent Engineered Fill or other construction materials. Methods of stabilization include undercutting, moisture conditioning, or chemical stabilization. The situation should be discussed with ECS to determine the appropriate procedure. Test pits may be excavated to explore the shallow subsurface materials to help in determining the cause of the observed unstable materials, and to assist in the evaluation of appropriate remedial actions to stabilize the subgrade.

Seasonal reduction of the near surface soil strength can occur during wet times of the year (such as during the spring and fall months) or immediately following extended periods of rain. This may result in additional unstable or pumping subgrade areas. High moisture content clay materials may be encountered near the ground surface at some localized areas may not pass a proofroll and may need to be undercut or repaired. Some undercutting or repair of unstable subgrade soils should be anticipated during slab and pavement subgrade preparation. The actual quantity of the subgrade undercut, or stabilization should be determined at the time of construction.

The method to be chosen to repair unstable subgrades to establish a suitable support condition may be influenced by several factors such as weather and schedule, as well as the area, depth, and nature of the unstable subgrade soils. Depending on these and other factors, subgrade repair methods may include:

Scarification and Compaction: Soils can be scarified, moisture conditioned (i.e., dried or wetted) to within a narrow range of the material’s optimum moisture content and compacted. Scarification and compaction are generally most applicable where very shallow unstable conditions are encountered and at times when the soil can be properly dried or wetted to within a narrow range of the material’s optimum moisture content.

Undercut and Replacement: We recommend soft or yielding soils be evaluated in approximately 6 to 12-inch intervals to help limit the required volume of undercuts. If soft or yielding soils are identified, the Contractor should remove only 6 to 12 inches of material at a time in the subject area and then proofroll/evaluate the undercut subgrade to determine if additional undercut is needed. This may take more time but could potentially reduce the removal of more soil than necessary. Use of a geogrid could also be considered to reduce undercut depths. A geogrid, if used, should be placed after underground work, such as utility construction, is complete. Do not operate equipment on the geogrid until after 1 foot of Engineered Fill is placed above it. Depending on the conditions at the time of repair, use of an aggregate Engineered Fill, such as crushed stone, crushed concrete, or gravel, may be needed.

Chemical Modification: Alternatively, if these soils cannot be stabilized by conventional methods, chemical modification of the subgrade soils, such as with lime kiln dust, cement, cement kiln dust, or other materials, may be utilized to reduce the moisture content and/or provide additional stabilization. An experienced pre-qualified Contractor that has successfully chemically modified similar-sized projects with similar soil conditions is recommended to be used. The soil modification procedure, such as determination of the type and quantity of additive, and mixing and curing procedures, should be evaluated before implementation. This evaluation may include testing the soil for pH, resistivity, sulphates, and chloride to check if an adverse chemical reaction could occur. The Contractor should be required to minimize dusting or implement dust control measures. For preliminary estimating purposes, the approximate incorporation rate (based on dry weight of soil) is 6 to 7 percent for hydrated lime or lime by-products, and 5 to 7 percent for Portland cement. Typically, the percentage needed is less for hydrated lime than other lime byproducts because the available calcium oxide content of lime by-products tends to be lower. Alteration of the pavement section to include additional drainage such as an open-graded drainage aggregate layer may be needed if a chemically stabilized subgrade is used.

5.1.4 Site Temporary Dewatering

Based on the noted groundwater as shown in boring logs, we believe construction dewatering at this site will be mainly to remove accumulated rainwater and potentially seasonal perched water conditions. We anticipate that the removal of accumulated water from the anticipated relatively shallow excavation depths can be achieved utilizing drainage trenches, and a sump and pump system.

5.2 EARTHWORK OPERATIONS

5.2.1 Engineered Fill

Prior to placement of Engineered Fill, representative bulk samples (about 50 pounds) of on-site and/or off-site borrow should be submitted to ECS for laboratory testing, which will typically include Atterberg limits, natural moisture content, grain-size distribution, and moisture-density relationships (i.e., Proctors) for compaction. Import materials should be tested prior to being hauled to the site to determine if they meet project specifications. Alternatively, Proctor data from other accredited laboratories can be submitted if the test results are within the last 90 days.

Satisfactory Engineered Fill Materials: Materials satisfactory for use as Engineered Fill should consist of inorganic soils with the following engineering properties and compaction requirements.

Engineered Fill Index Properties		Engineered Fill Compaction Requirements	
Subject	**Property**	**Subject**	**Requirement**
Building and Pavement Areas	LL < 40, PI < 20	Compaction Standard	Standard Proctor, ASTM D698
Maximum Particle Size	4 inches	Required Compaction	98 % of Maximum Dry Density
Fines Content (% passing #200 sieve)	Maximum 13 %	Moisture Content	-3 to +3 % points of the soil's optimum value
Maximum Organic Content	5 % by dry weight	Loose Thickness	8 inches prior to compaction

Unsatisfactory Materials: Unsatisfactory Engineered Fill materials, which do not satisfy the requirements for suitable materials, include topsoil and organic materials (PT, OH, OL), silt (ML), sandy silt (ML), elastic Silt (MH), and sandy silty clay (CL/ML). ECS does not recommend the use of high plasticity soils such as FAT CLAY (CH) for use as Engineered Fill without chemical stabilization using a material such as lime kiln dust (LKD). Topsoil is not recommended to be used as Engineered Fill but may be suitable for use within future landscape areas. A landscape architect should approve any materials proposed for use in future landscape areas.

Pea gravel is not recommended to be used as Engineered Fill. Pea gravel has round/smooth characteristics, no fines and does not interlock when compacted, which makes it more susceptible to future movement and instability resulting in excessive and variable settlement.

On-Site Borrow Suitability: The on-site soil, **except for topsoil and miscellaneous fill soils** may be feasible to use as Engineered Fill but should be further evaluated and approved by ECS prior to its use. On-site soil used as Engineered Fill must not contain an adverse amount of organic matter, and must be free of frozen matter, deleterious materials, over-sized material (maximum 3-inch particle diameter), or chemicals that may result in the material being classified as "contaminated." Some conditions at the time of construction, such as wet or freezing weather, may preclude the use of on-site soil, and it may be necessary to use an imported less moisture sensitive or less frost susceptible granular material. The soils must be compacted within a narrow range of the material's optimum moisture content. The soil should not be compacted too dry as it may lose its apparent stability if it later becomes wet. The suitability of Engineered Fill materials should be checked by ECS prior to placement.

Fill Placement: Fill materials should not be placed on frozen soils, on frost-heaved soils, and/or on excessively wet soils. Borrow fill materials should not contain frozen materials at the time of placement, and all frozen or frost-heaved soils should be removed prior to placement of Engineered Fill or other fill soils and aggregates. Excessively wet soils or aggregates should be scarified, aerated, and moisture conditioned.

Compaction: Engineered Fill within the expanded building, pavement, and embankment limits should be placed in maximum 8-inch loose lifts, moisture conditioned as necessary to within -3 and +3 % of the soil's optimum moisture content and be compacted with suitable equipment to a dry density of at least 98% of the Standard Proctor maximum dry density (ASTM D698). Beyond these areas, compaction of at least 95% should be achieved. ECS should be called on to document that proper fill compaction has been achieved.

Fill Compaction Control: The expanded limits of the proposed construction areas should be well defined, including the limits of the fill zones for buildings, pavements, and slopes, etc., at the time of fill placement. Grade controls should be maintained throughout the filling operations. All filling operations should be observed on a full-time basis by a qualified representative of the construction testing laboratory to determine that the minimum compaction requirements are being achieved. Field density testing of fills will be performed at the frequencies shown in the following Table, but not less than 1 test per lift.

Frequency of Compaction Tests in Fill Areas

Location	Frequency of Tests
Expanded Building Limits	1 test per 2,500 sq. ft. per lift
Pavement Areas	1 test per 10,000 sq. ft. per lift
Utility Trenches	1 test per 200 linear ft. per lift
Outparcels/SWM Facilities	1 test per 5,000 sq. ft. per lift
All Other Non-Critical Areas	1 test per 10,000 sq. ft. per lift

Compaction Equipment: Compaction equipment suitable for the soil type being compacted should be used to compact the subgrades and fill materials. Sheepsfoot compaction equipment should be suitable for the fine-grained soils (Clays and Silts). A vibratory steel drum roller should be used for compaction of coarse-grained soils (Sands) as well as for sealing compacted surfaces.

Fill Placement Considerations: Fill materials should not be placed on frozen soils, on frost-heaved soils, and/or on excessively wet soils. Borrow fill materials should not contain frozen materials at the time of placement, and all frozen or frost-heaved soils should be removed prior to placement of Engineered Fill or other fill soils and aggregates. Excessively wet soils or aggregates should be scarified, aerated, and moisture conditioned.

At the end of each workday, all fill areas should be graded to facilitate drainage of any precipitation and the surface should be sealed by use of a smooth-drum roller to limit infiltration of surface water. During placement and compaction of new fill at the beginning of each workday, the Contractor may need to scarify existing subgrades to a depth on the order of 4 inches so that a weak plane will not be formed between the new fill and the existing subgrade soils.

Drying and compaction of wet soils is typically difficult during the cold, winter months. Accordingly, earthwork should be performed during the warmer, drier times of the year, if practical. Proper drainage should be maintained during the earthwork phases of construction to prevent ponding of water which tends to degrade subgrade soils. Alternatively, if these soils cannot be stabilized by conventional methods as previously discussed, additional modifications to the subgrade soils such as lime or cement stabilization may be utilized to adjust the moisture content. If lime kiln dust (LKD) or Portland cement are utilized to control moisture contents and/or for stabilization, Calciment® or regular Type 1 Portland cement can be used. The construction testing laboratory should evaluate proposed lime or cement soil modification procedures, such as quantity of additive and mixing and curing procedures before implementation. Admixture concentrations on the order of 5 to 7 percent by dry unit weight are typical for this type of soil. Also, sufficient water must be available in the soil to hydrate the admixture to achieve its optimal strength The Contractor should be required to minimize dusting or implement dust control measures, as required.

Where fill materials will be placed to widen existing embankment fills, or placed up against sloping ground, the soil subgrade should be scarified, and the new fill benched or keyed into the existing material (see ODOT Construction and Material Specifications Section 203.05). Fill material should be placed in horizontal lifts. In confined areas such as utility trenches, portable compaction equipment and thin lifts of 3 inches to 4 inches may be required to achieve specified degrees of compaction.

We recommend that the grading Contractor have equipment on site during earthwork for both drying and wetting fill soils. We do not anticipate significant problems in controlling moisture within the fill during dry weather, but moisture control may be difficult during winter months or extended periods of rain. The control of moisture content of higher plasticity soils is difficult when these soils become wet. Further, such soils are easily degraded by construction traffic when the moisture content is elevated.

5.3 FOUNDATION AND SLAB OBSERVATIONS

Slab Subgrade Verification: A representative of ECS should be called on to observe exposed subgrades within the expanded building limits prior to Engineered Fill placement to assure that adequate subgrade preparation has been achieved. Proofrolling using a drum roller or loaded dump truck should be performed in their presence at that time. Once subgrades have been prepared to the satisfaction of ECS, subgrades should be properly compacted and new Engineered Fill can be placed. Engineered Fill should be moisture conditioned to within a narrow range of optimum moisture content then be compacted to the required density. If there will be a significant time lag between the site grading work and final grading of concrete slab areas prior to the placement of the subbase stone and concrete/bituminous, a representative of ECS should be called on to verify the condition of the prepared subgrade. Prior to final slab construction, the subgrade may require scarification, moisture conditioning, and re-compaction to restore stable conditions.

5.4 UTILITY INSTALLATION

Utility Subgrades: The soils encountered in our exploration are expected to be generally suitable for support of utility pipes. The pipe subgrades should be observed and probed for stability by ECS. Any loose or unsuitable materials encountered should be removed and replaced with suitable compacted Engineered Fill, or pipe stone bedding material.

Utility Backfilling: The granular bedding material (often AASHTO No. 57 stone) should be at least 4 inches thick, but not less than that specified by the Civil Engineer’s project drawings and specifications. We recommend that the bedding materials be placed up to the springline of the pipe. Fill placed for support of the utilities, as well as backfill over the utilities, should satisfy the requirements for Engineered Fill and Fill Placement.

Utility Excavation Dewatering: Perched water may be encountered by utility excavations. It is expected that removal of perched water which seeps into excavations could be accomplished by pumping from sumps in the trench bottom and are backfilled with open graded bedding material.

5.5 GENERAL CONSTRUCTION CONSIDERATIONS

Construction Observation and Testing: We recommend that all earthwork, foundation, and slab construction be observed and tested by ECS. If we are not consulted during this critical aspect of the subgrade and earthwork operations and foundation construction, ECS cannot be responsible for long term performance of the ground-supported construction. The importance of the observations cannot be over-emphasized due to the presence of undocumented fill, buried organic soils, and high moisture content and low strength soils at the site.

Subgrade Protection: Measures should also be taken to limit site disturbance, especially from rubber-tired heavy construction equipment, and to control and remove surface water from development areas. It would be advisable to designate a haul road and construction staging area to limit the areas of disturbance and to prevent construction traffic from excessively degrading sensitive subgrade soils and existing pavement areas. Haul roads and construction staging areas could be covered with excess depths of aggregate to protect those subgrades. The aggregate can later be removed and used in pavement areas.
Surface Drainage: Surface drainage conditions should be properly maintained. Surface water should be directed away from the construction area, and the work area should be sloped away from the construction area at a gradient of 1 percent or greater to reduce the potential of ponding water and the subsequent saturation of the surface soils. At the end of each workday, the subgrade soils should be sealed by rolling the surface with a smooth drum roller to minimize infiltration of surface water.

Excavation Safety: All excavations and slopes should be made and maintained in accordance with OSHA excavation safety standards. The Contractor is solely responsible for designing and constructing stable, temporary excavations and slopes and should shore, slope, or bench the sides of the excavations and slopes as required to maintain stability of both the excavation sides and bottom. The Contractor's person responsible, as defined in 29 CFR Part 1926, should evaluate the soil exposed in the excavations as part of the Contractor's safety procedures.

Contractors should be familiar with applicable OSHA codes to ensure that adequate protection of the excavations and trench walls is provided. We recommend that construction excavation less than 20 feet should be sloped 1½H:1V or flatter. In no case should slope height, slope inclination, or excavation depth, including utility trench excavation depth, exceed those specified in local, state, and federal safety regulations. ECS provides this information solely as a service to our client. ECS is not assuming responsibility for construction site safety or the Contractor's activities; such responsibility is not being implied and should not be inferred.

Erosion Control: The surface soils may be erodible. Therefore, the Contractor should provide and maintain good site drainage during earthwork operations to maintain the integrity of the surface soils. All erosion and sedimentation controls should be in accordance with sound engineering practices and local requirements.

Existing Fill Considerations: Existing fill was encountered at some of the test boring locations. Unsuitable materials may be buried beneath the site surface not identified by the borings. Questionable material encountered is recommended to be evaluated by ECS to determine if removal and replacement with Engineered Fill is necessary. Alteration to the recommendations of this report may be needed, if conditions different than those noted on the test boring logs are revealed.

Bidding/Estimating Considerations: Contractors bidding or undertaking any work at the site should examine the results of the subsurface exploration, satisfy themselves as to the adequacy of the information for bidding and construction, make their own interpretation of the data, and consider the effect it may have on their cost proposal, construction techniques, schedule, and equipment capabilities. Furthermore, Contractors should complete any additional fieldwork and investigation they deem necessary to properly prepare a cost proposal for the site work. Soil borings do not provide the same wide-scale view of the subsurface conditions that is obtained during site grading, excavation, or other aspects of earthwork construction. Additional scope may be required to obtain more detailed subsurface information needed for earthwork bid preparation, which could include test pits to better understand the lateral and vertical extents of the subsurface materials of concern such as existing undocumented fill. Even with this additional information, budget contingencies should be carried out in construction to help cover potential variations in subsurface conditions.

6.0 CLOSING

ECS has prepared this report to guide the geotechnical-related design and construction aspects of the project. We performed these services in accordance with the standard of care expected of professionals in the industry performing similar services on projects of like size and complexity at this time in the region. No other representation expressed or implied, and no warranty or guarantee is included or intended in this report.

The description of the proposed project is based on information provided to ECS by **Crosslands Companies**. If any of this information is inaccurate or changes, either because of our interpretation of the documents provided or site or design changes that may occur later, ECS should be contacted so we can review our recommendations and provide additional or alternate recommendations that reflect the proposed construction.

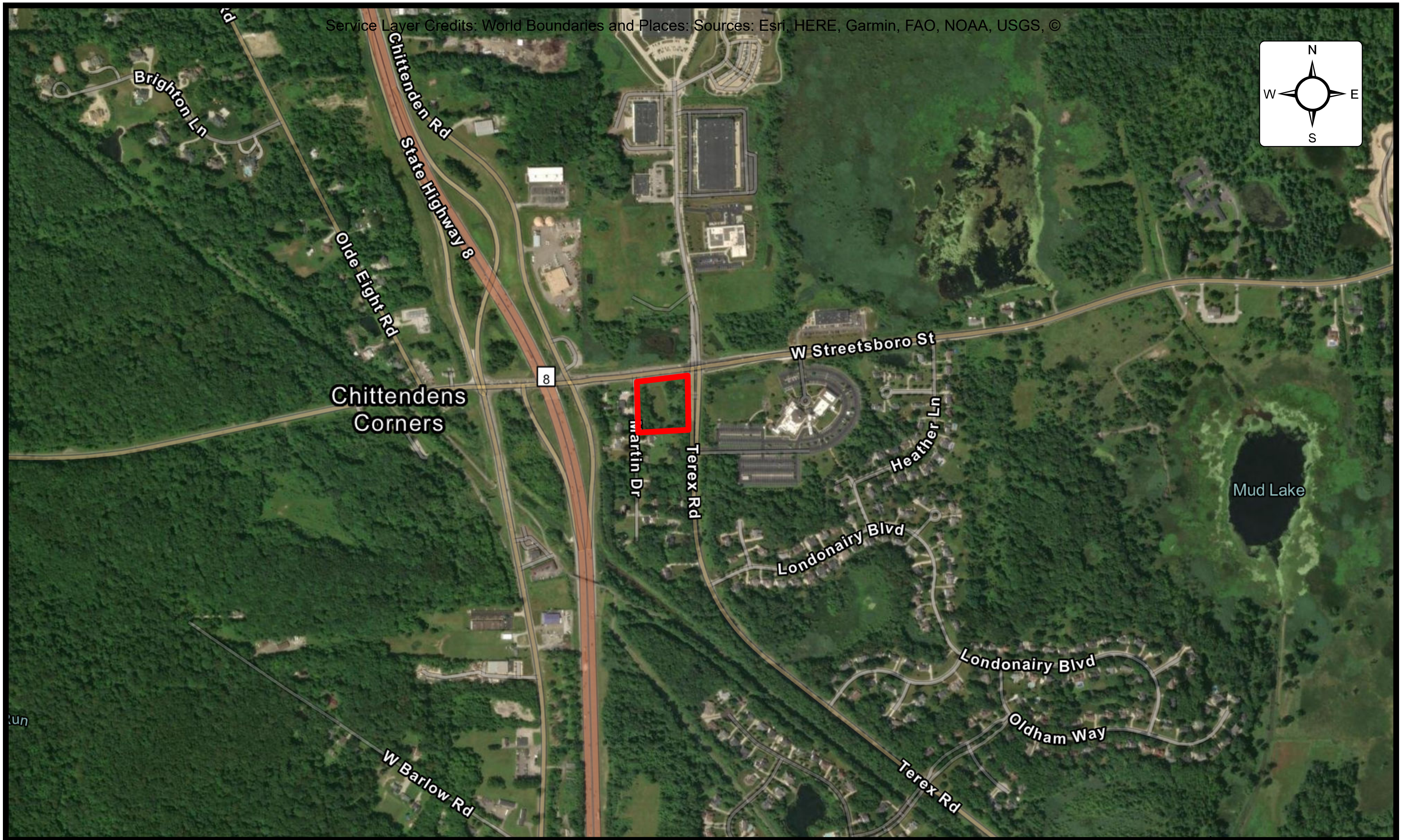
We recommend that ECS review the project plans and specifications so we can confirm that those plans/specifications are in accordance with the recommendations of this geotechnical report.

Field observations, and quality assurance testing during earthwork and foundation installation are an extension of, and integral to, the geotechnical design. We recommend that ECS be retained to apply our expertise throughout the geotechnical phases of construction, and to provide consultation and recommendation should issues arise.

ECS is not responsible for the conclusions, opinions, or recommendations of others based on the data in this report.

Appendix A - Drawings and Reports

Site Location Diagram
Boring Location Diagram(s)
Subsurface Cross-Section(s)


Service Layer Credits: World Boundaries and Places: Sources: Esri, HERE, Garmin, FAO, NOAA, USGS, ©

SITE LOCATION DIAGRAM

New Childcare Facility in Hudson

802 W Streetsboro St, Hudson, Ohio
Crosslands Companies

ENGINEER
AV4

SCALE
1" = 1000mi

PROJECT NO.
67:4334

SHEET

DATE
1/14/2026

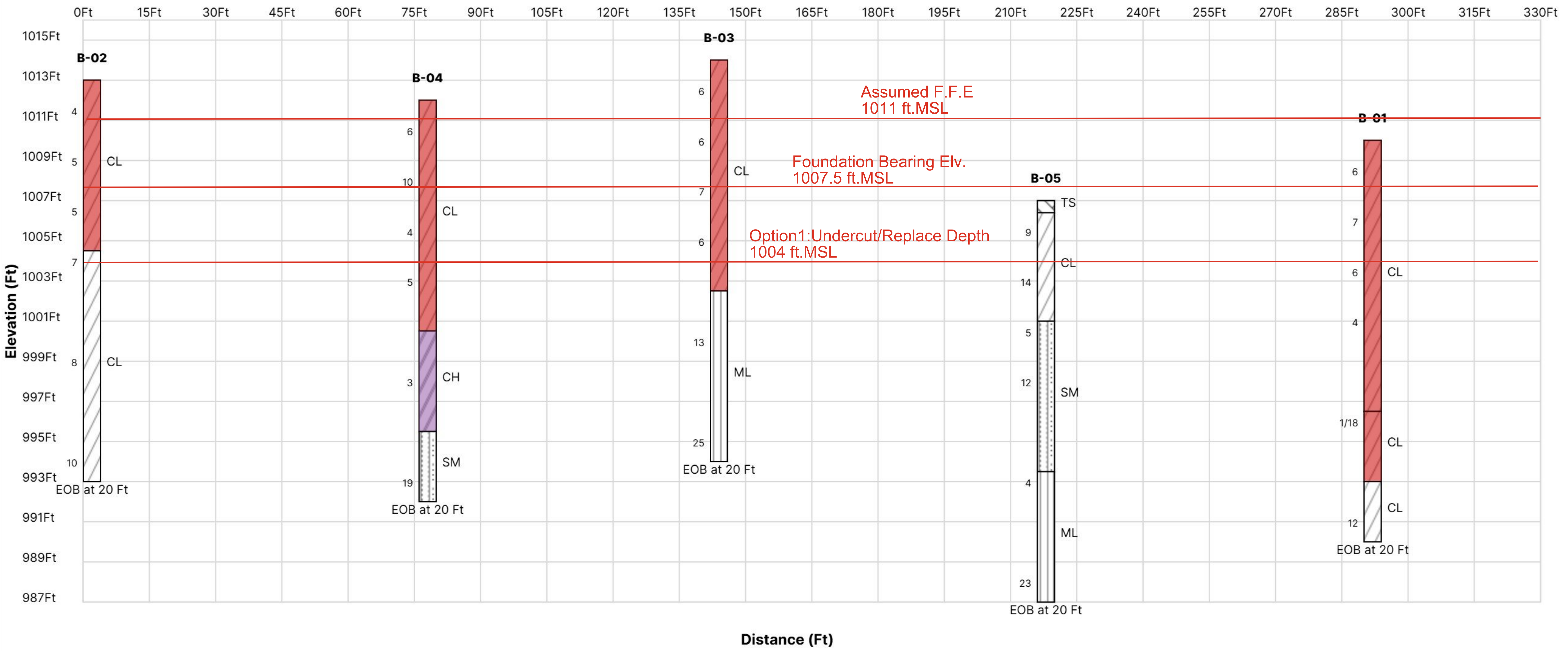
BORING LOCATION DIAGRAM

New Childcare Facility in Hudson

802 W Streetsboro St, Hudson, Ohio

ENGINEER	AV4
SCALE	1" = 60'
PROJECT NO.	67:5432
SHEET	
DATE	5/22/2025

Generalized Subsurface Cross Section Untitled Fence Diagram



CLIENT:	Crosslands Companies	PROJECT:	New Childcare Facility in Hudson
DRAWN DATE:	Jan 14, 2026	PROJECT NO.:	67:4334
CHECKED DATE:	Jan 14, 2026	SCALE:	AS SHOWN

Notes:
1-EOB: END OF BORING AR: AUGER REFUSALSR: SAMPLER REFUSAL
2-SEE INDIVIDUAL BORING LOG AND GEOTECHNICAL INFORMATION.
3-STANDARD PENETRATION TEST RESISTANCE (LEFT OF BORING) IN BLOWS PER FOOT (ASTM D1586).
4- TOPOGRAPHIC INFORMATION IS BASED ON PUBLICLY AVAILABLE DATA (GOOGLE OR CESIUM).THE TOPOGRAPHIC LINE SHOWN BETWEEN BORINGS IS FOR VISUAL REFERENCE ONLY.PLEASE REFER TO THE REFERENCE NOTES FOR BORING LOGS FOR SYMBOLOGY MEANING AND ADDITIONAL

Plastic Limit Water Content Liquid Limit X———●———△	▽ WL (First Encountered)	🟥	Fill
[FINES CONTENT %]	▼ WL (Completion)	🟪	Possible Fill
▶ BOTTOM OF CASING	▼ WL (Estimated Seasonal High Water)	🟥	Probable Fill
⟩100⟩ LOSS OF CIRCULATION	▽ WL (Stabilized)	🟩	WR/Rock
○ CALIBRATED PENETROMETER			

Appendix B – Field Operations

Reference Notes
Exploration Procedures
Boring Logs

REFERENCE NOTES FOR BORING LOGS

MATERIAL[1,2]

■		**ASPHALT**
⁘		**CONCRETE**
⁘		**GRAVEL**
▨		**TOPSOIL**
□		**VOID**
▤		**BRICK**
○		**AGGREGATE BASE COURSE**
▨	**GW**	**WELL-GRADED GRAVEL** **gravel-sand mixtures, little or no fines**
▨	**GP**	**POORLY-GRADED GRAVEL** **gravel-sand mixtures, little or no fines**
▨	**GM**	**SILTY GRAVEL** **gravel-sand-silt mixtures**
▨	**GC**	**CLAYEY GRAVEL** **gravel-sand-clay mixtures**
▨	**SW**	**WELL-GRADED SAND** **gravelly sand, little or no fines**
▨	**SP**	**POORLY-GRADED SAND** **gravelly sand, little or no fines**
▨	**SM**	**SILTY SAND** **sand-silt mixtures**
▨	**SC**	**CLAYEY SAND** **sand-clay mixtures**
▥	**ML**	**SILT** **non-plastic to medium plasticity**
▥	**MH**	**ELASTIC SILT** **high plasticity**
▨	**CL**	**LEAN CLAY** **low to medium plasticity**
▨	**CH**	**FAT CLAY** **high plasticity**
▨	**OL**	**ORGANIC SILT or CLAY** **non-plastic to low plasticity**
▨	**OH**	**ORGANIC SILT or CLAY** **high plasticity**
▨	**PT**	**PEAT** **highly organic soils**

DRILLING SAMPLING SYMBOLS & ABBREVIATIONS

SS	Split Spoon Sampler	PM	Pressuremeter Test
ST	Shelby Tube Sampler	RD	Rock Bit Drilling
WS	Wash Sample	RC	Rock Core, NX, BX, AX
BS	Bulk Sample of Cuttings	REC	Rock Sample Recovery %
PA	Power Auger (no sample)	RQD	Rock Quality Designation %
HSA	Hollow Stem Auger		

PARTICLE SIZE IDENTIFICATION

DESIGNATION		PARTICLE SIZES
Boulders		12 inches (300 mm) or larger
Cobbles		3 inches to 12 inches (75 mm to 300 mm)
Gravel:	Coarse	¾ inch to 3 inches (19 mm to 75 mm)
	Fine	4.75 mm to 19 mm (No. 4 sieve to ¾ inch)
Sand:	Coarse	2.00 mm to 4.75 mm (No. 10 to No. 4 sieve)
	Medium	0.425 mm to 2.00 mm (No. 40 to No. 10 sieve)
	Fine	0.074 mm to 0.425 mm (No. 200 to No. 40 sieve)
Silt & Clay ("Fines")		<0.074 mm (smaller than a No. 200 sieve)

COHESIVE SILTS & CLAYS

UNCONFINED COMPRESSIVE STRENGTH, QP[4]	SPT[5] (BPF)	CONSISTENCY[7] (COHESIVE)
<0.25	<2	Very Soft
0.25 - <0.50	2 - 4	Soft
0.50 - <1.00	5 - 8	Firm
1.00 - <2.00	9 - 15	Stiff
2.00 - <4.00	16 - 30	Very Stiff
4.00 - 8.00	31 - 50	Hard
>8.00	>50	Very Hard

RELATIVE AMOUNT[7]	COARSE GRAINED (%)[8]	FINE GRAINED (%)[8]
Trace	≤5	≤5
With	10 - 20	10 - 25
Adjective *(ex: "Silty")*	25 - 45	30 - 45

GRAVELS, SANDS & NON-COHESIVE SILTS

SPT[5]	DENSITY
<5	Very Loose
5 - 10	Loose
11 - 30	Medium Dense
31 - 50	Dense
>50	Very Dense

WATER LEVELS[6]

▽	WL (First Encountered)
▼	WL (Completion)
▼	WL (Seasonal High Water)
▽	WL (Stabilized)

FILL AND ROCK

🟥	🟪	⬜	🟩
FILL	**POSSIBLE FILL**	**PROBABLE FILL**	**ROCK**

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[1] Classifications and symbols per ASTM D 2488-17 (Visual-Manual Procedure) unless noted otherwise.

[2] To be consistent with general practice, "POORLY GRADED" has been removed from GP, GP-GM, GP-GC, SP, SP-SM, SP-SC soil types on the boring logs.

[3] Non-ASTM designations are included in soil descriptions and symbols along with ASTM symbol [Ex: (SM-FILL)].

[4] Typically estimated via pocket penetrometer or Torvane shear test and expressed in tons per square foot (tsf).

[5] Standard Penetration Test (SPT) refers to the number of hammer blows (blow count) of a 140 lb. hammer falling 30 inches on a 2 inch OD split spoon sampler required to drive the sampler 12 inches (ASTM D 1586). "N-value" is another term for "blow count" and is expressed in blows per foot (bpf). SPT correlations per 7.4.2 Method B and need to be corrected if using an auto hammer.

[6] The water levels are those levels actually measured in the borehole at the times indicated by the symbol. The measurements are relatively reliable when augering, without adding fluids, in granular soils. In clay and cohesive silts, the determination of water levels may require several days for the water level to stabilize. In such cases, additional methods of measurement are generally employed.

[7] Minor deviation from ASTM D 2488-17 Note 14.

[8] Percentages are estimated to the nearest 5% per ASTM D 2488-17.

SUBSURFACE EXPLORATION PROCEDURE:
STANDARD PENETRATION TESTING (SPT)
ASTM D 1586
Split-Barrel Sampling

Standard Penetration Testing, or **SPT**, is the most frequently used subsurface exploration test performed worldwide. This test provides samples for identification purposes, as well as a measure of penetration resistance, or N-value. The N-Value, or blow counts, when corrected and correlated, can approximate engineering properties of soils used for geotechnical design and engineering purposes.

SPT Procedure:

- Involves driving a hollow tube (split-spoon) into the ground by dropping a 140-lb hammer a height of 30-inches at desired depth
- Recording the number of hammer blows required to drive split-spoon a distance of 18-24 inches (in 3 or 4 Increments of 6 inches each)

- Auger is advanced* and an additional SPT is performed
- One SPT typically performed for every two to five feet. An approximate 1.5 inch diameter soil sample is recovered.

**Drilling Methods May Vary—* The predominant drilling methods used for SPT are open hole fluid rotary drilling and hollow-stem auger drilling.

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
Crosslands Companies	**67:4334**	**B-01**	**1 OF 1**

PROJECT NAME: **New Childcare Facility in Hudson**

DRILLER/CONTRACTOR: **Ohio TestBor, Inc.**

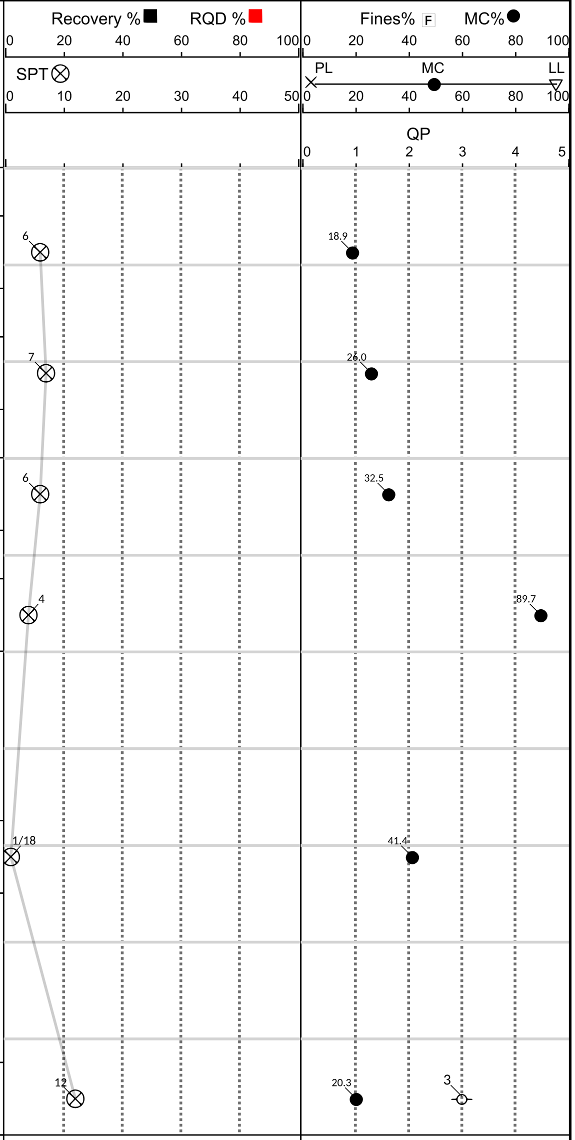
SITE LOCATION: **802 W Streetsboro St, Hudson, Ohio, 44236**

LOSS OF CIRCULATION

BOTTOM OF CASING

LATITUDE:	LONGITUDE:	STRUCTURE:	SURFACE ELEVATION:
41.23206127	**-81.48762293**		**1010**

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DISTANCE (IN)	SAMPLE RECOVERY (IN)	DESCRIPTION OF MATERIAL	STRATIGRAPHY	WATER LEVELS	ELEVATION (FT)	BLOWS/6" (TCP/RS/MC/SPT-N VALUE)*
	S-1	SS	18	15	FILL - (CL) LEAN CLAY - trace gravel, brown/black, contains slight rock fragments and organics, moist, soft to firm.				2-3-3 (6)
	S-2	SS	18	18					2-3-4 (7)
5.0								1005	
	S-3	SS	18	18					2-3-3 (6)
								×	
							▽		
	S-4	SS	18	18					1-2-2 (4)
10.0								1000	
	S-5	SS	18	18	FILL - (CL) LEAN CLAY - gray, contains organics, very soft.				0/12"-1 (1/18)
15.0								995	
					(CL) LEAN CLAY - trace gravel and sand, gray, contains slight rock fragments, moist, stiff.				
	S-6	SS	18	18					3-4-8 (12)
					END OF BORING at 20.0 FT			990	



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

▽ **WL (First Encountered):**	**8 FT**	**BORING STARTED:**	**12/17/2025**	**CAVE IN DEPTH:**	**7.5FT**
▼ **WL (Completion):**	**NA**	**BORING COMPLETED:**	**12/17/2025**	**HAMMER TYPE:**	**Automatic**
▼ **WL (Seasonal High Water):**		**EQUIPMENT:**	**LOGGED BY:**	**DRILLING METHOD:**	
▽ **WL (Stabilized):**		**ATV**	**ZNO1**	**Hollow Stem Auger (0'-20')**	

GEOTECHNICAL BOREHOLE LOG

CLIENT:
Crosslands Companies

PROJECT NO.:
67:4334

BORING NO.:
B-02

SHEET:
1 OF 1

PROJECT NAME:
New Childcare Facility in Hudson

DRILLER/CONTRACTOR:
Ohio TestBor, Inc.

SITE LOCATION:
802 W Streetsboro St, Hudson, Ohio, 44236

LOSS OF CIRCULATION

BOTTOM OF CASING

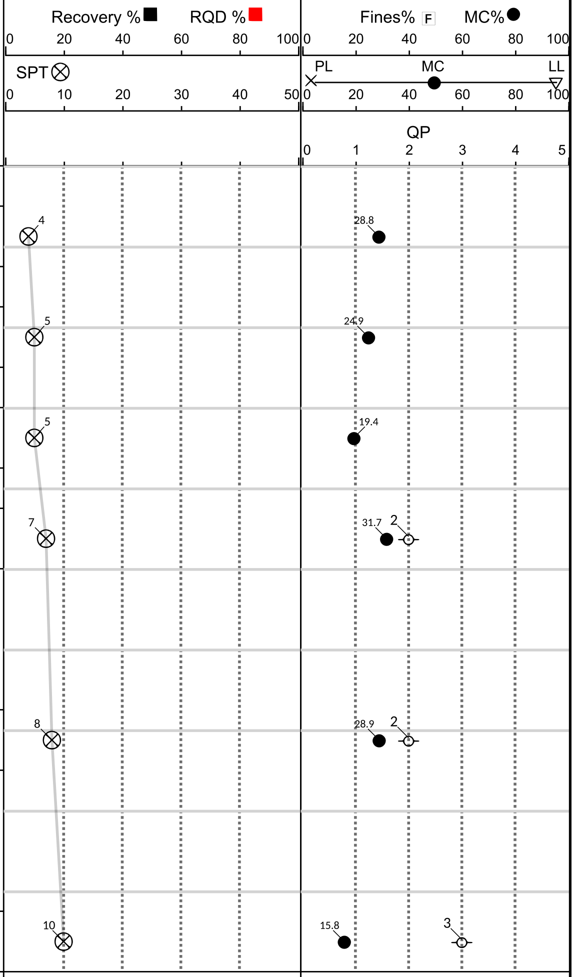
LATITUDE:
41.23175049

LONGITUDE:
-81.48763465

STRUCTURE:

SURFACE ELEVATION:
1013

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DISTANCE (IN)	SAMPLE RECOVERY (IN)	DESCRIPTION OF MATERIAL	STRATIGRAPHY	WATER LEVELS	ELEVATION (FT)	BLOWS/6" (TCP/RS/MC/SPT-N VALUE)*
					FILL - (CL) LEAN CLAY - brown, contains slight roots, wood and organics, moist, firm.	▨			
	S-1	SS	18	12					2-2-2 (4)
								1010	
	S-2	SS	18	15					2-2-3 (5)
5.0									
	S-3	SS	18	16					2-2-3 (5)
								1005	
	S-4	SS	18	18	(CL) LEAN CLAY WITH SAND - trace gravel and silt, brown, moist, firm to stiff.	▨			3-3-4 (7)
10.0								1000	
	S-5	SS	18	18					2-3-5 (8)
15.0								995	
	S-6	SS	18	8					5-6-4 (10)
					END OF BORING at 20.0 FT				



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

▽ **WL (First Encountered):**	NA	**BORING STARTED:**	12/16/2025	**CAVE IN DEPTH:**	Not Observed
▼ **WL (Completion):**	NA	**BORING COMPLETED:**	12/16/2025	**HAMMER TYPE:**	Automatic
▼ **WL (Seasonal High Water):**		**EQUIPMENT:**	**LOGGED BY:**	**DRILLING METHOD:**	
▽ **WL (Stabilized):**		ATV	ZNO1	Hollow Stem Auger (0'-20')	

GEOTECHNICAL BOREHOLE LOG

CLIENT: **Crosslands Companies**	PROJECT NO.: **67:4334**	BORING NO.: **B-03**	SHEET: **1 OF 1**
PROJECT NAME: **New Childcare Facility in Hudson**	DRILLER/CONTRACTOR: **Ohio TestBor, Inc.**		

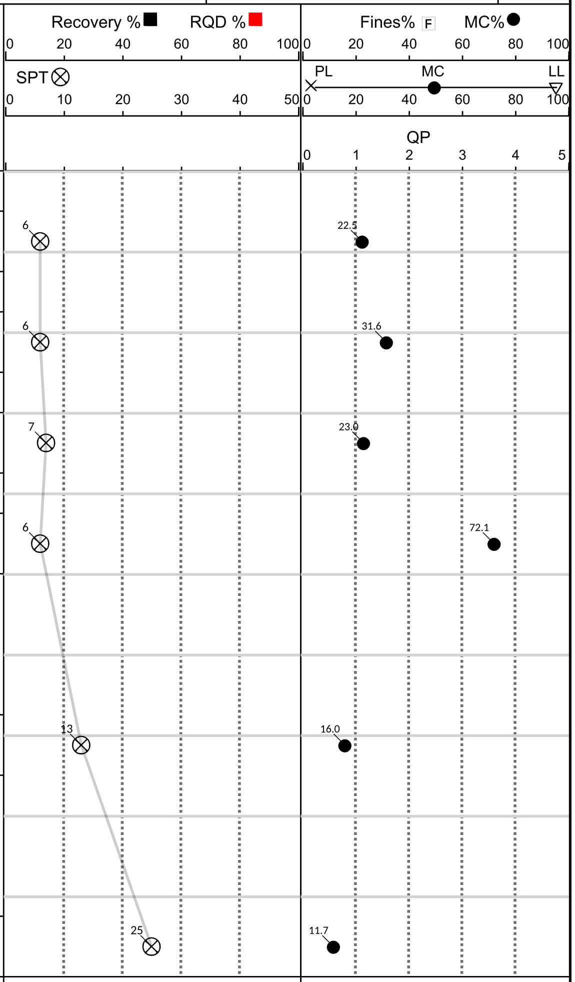
SITE LOCATION:
802 W Streetsboro St, Hudson, Ohio, 44236

LOSS OF CIRCULATION

BOTTOM OF CASING

LATITUDE: **41.23189995**	LONGITUDE: **-81.48749097**	STRUCTURE:	SURFACE ELEVATION: **1014**

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DISTANCE (IN)	SAMPLE RECOVERY (IN)	DESCRIPTION OF MATERIAL	STRATIGRAPHY	WATER LEVELS	ELEVATION (FT)	BLOWS/6" (TCP/RS/MC/SPT-N VALUE)*
	S-1	SS	18	14	FILL - (CL) LEAN CLAY - brown/black, contains wood and organics, moist, firm.	▨			2-3-3 (6)
5.0	S-2	SS	18	11		▨		1010	1-2-4 (6)
	S-3	SS	18	14		▨			3-3-4 (7)
10.0	S-4	SS	18	15		▨		1005	2-3-3 (6)
15.0	S-5	SS	18	10	(ML) SANDY SILT WITH GRAVEL - gray, contains rock fragments, moist, medium dense.	▥		1000	5-6-7 (13)
	S-6	SS	18	15		▥		995	6-13-12 (25)
					END OF BORING at 20.0 FT				



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

▽ **WL (First Encountered):**	NA	**BORING STARTED:**	12/16/2025	**CAVE IN DEPTH:**	Not Observed
▼ **WL (Completion):**	NA	**BORING COMPLETED:**	12/16/2025	**HAMMER TYPE:**	Automatic
WL (Seasonal High Water):		**EQUIPMENT:**	**LOGGED BY:**	**DRILLING METHOD:**	
WL (Stabilized):		ATV	ZNO1	Hollow Stem Auger (0'-20')	

GEOTECHNICAL BOREHOLE LOG

CLIENT: **Crosslands Companies**	PROJECT NO.: **67:4334**	BORING NO.: **B-04**	SHEET: **1 OF 1**
PROJECT NAME: **New Childcare Facility in Hudson**	DRILLER/CONTRACTOR: **Ohio TestBor, Inc.**		

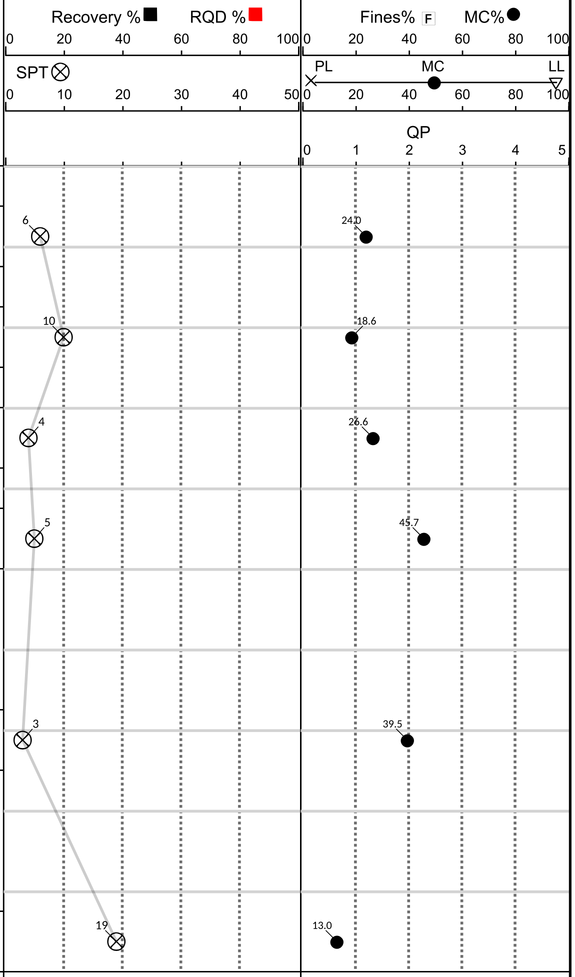
SITE LOCATION:
802 W Streetsboro St, Hudson, Ohio, 44236

LOSS OF CIRCULATION

BOTTOM OF CASING

LATITUDE: **41.23175126**	LONGITUDE: **-81.48735361**	STRUCTURE:	SURFACE ELEVATION: **1012**

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DISTANCE (IN)	SAMPLE RECOVERY (IN)	DESCRIPTION OF MATERIAL	STRATIGRAPHY	WATER LEVELS	ELEVATION (FT)	BLOWS/6" (TCP/RS/MC/SPT-N VALUE)*
					FILL - (CL) LEAN CLAY - brown/gray, contains slight wood and organics, moist, firm to stiff.				
	S-1	SS	18	12				1010	3-3-3 (6)
5.0	S-2	SS	18	15					4-4-6 (10)
	S-3	SS	18	10				1005	2-2-2 (4)
10.0	S-4	SS	18	18					2-2-3 (5)
					POSSIBLE FILL - (CH) FAT CLAY - gray, very soft.		▽	1000	
15.0	S-5	SS	18	18					1-1-2 (3)
					(SM) SILTY SAND WITH GRAVEL - gray, moist, medium dense.			995	
	S-6	SS	18	14					7-8-11 (19)
					END OF BORING at 20.0 FT				



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

▽ **WL (First Encountered):**	**11.5 FT**	**BORING STARTED:**	**12/16/2025**	**CAVE IN DEPTH:**	**12FT**
▼ **WL (Completion):**	**NA**	**BORING COMPLETED:**	**12/16/2025**	**HAMMER TYPE:**	**Automatic**
▼ **WL (Seasonal High Water):**		**EQUIPMENT:**	**LOGGED BY:**	**DRILLING METHOD:**	
▽ **WL (Stabilized):**		**ATV**	**ZNO1**	**Hollow Stem Auger (0'-20')**	

GEOTECHNICAL BOREHOLE LOG

CLIENT:
Crosslands Companies

PROJECT NO.:
67:4334

BORING NO.:
B-05

SHEET:
1 OF 1

PROJECT NAME:
New Childcare Facility in Hudson

DRILLER/CONTRACTOR:
Ohio TestBor, Inc.

SITE LOCATION:
802 W Streetsboro St, Hudson, Ohio, 44236

LOSS OF CIRCULATION

BOTTOM OF CASING

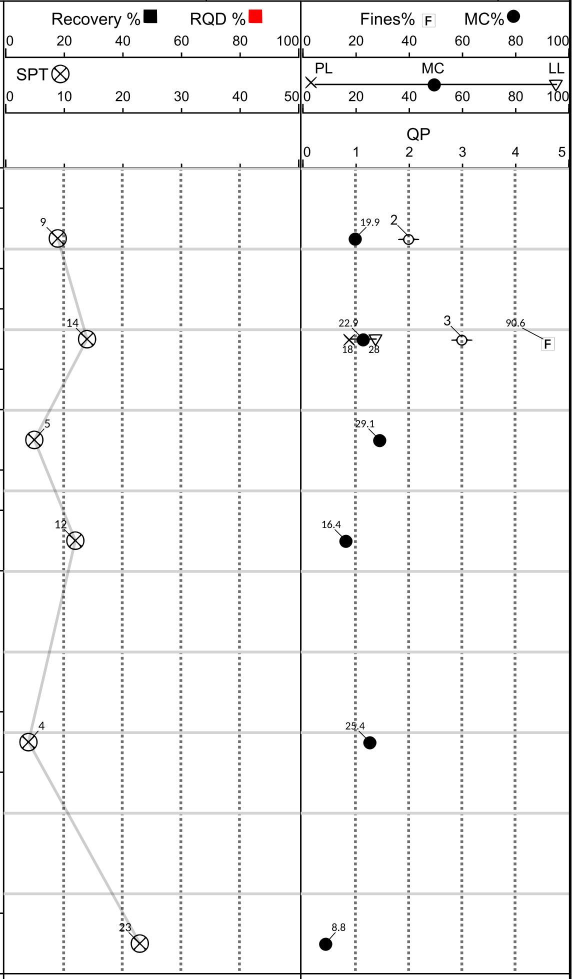
LATITUDE:
41.23206246

LONGITUDE:
-81.48735085

STRUCTURE:

SURFACE ELEVATION:
1007

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DISTANCE (IN)	SAMPLE RECOVERY (IN)	DESCRIPTION OF MATERIAL	STRATIGRAPHY	WATER LEVELS	ELEVATION (FT)	BLOWS/6" (TCP/RS/MC/SPT-N VALUE)*
					~~Topsoil [Thickness=7"].~~				
	S-1	SS	18	18	(CL) LEAN CLAY - trace gravel and sand, brown/gray, contains rock fragments, moist, stiff.			1005	2-3-6 (9)
5.0	S-2	SS	18	18			⊽		3-6-8 (14)
	S-3	SS	18	14	(SM) SILTY SAND WITH GRAVEL - brown, moist, loose to medium dense.			× 1000	1-2-3 (5)
10.0	S-4	SS	18	12					2-5-7 (12)
								995	
15.0	S-5	SS	18	4	(ML) SANDY SILT - trace gravel, gray, contains slight rock fragments, moist, loose to medium dense.				1-1-3 (4)
								990	
	S-6	SS	18	16					7-8-15 (23)
					END OF BORING at 20.0 FT				



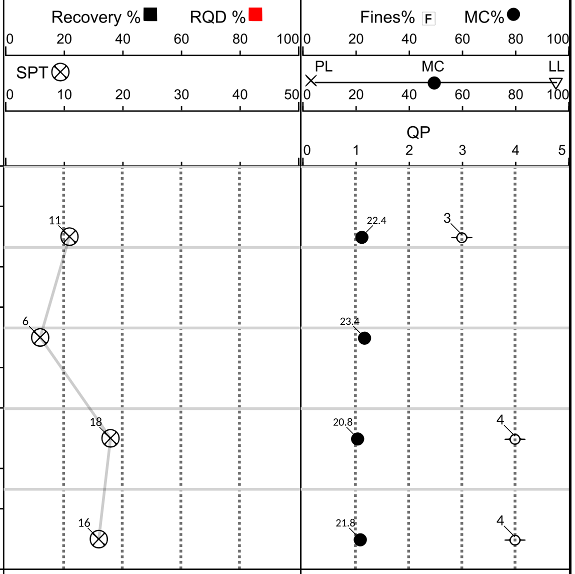
THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

⊽ **WL (First Encountered):**	4.2 FT	**BORING STARTED:**	12/17/2025	**CAVE IN DEPTH:**	6.5FT
▼ **WL (Completion):**	NA	**BORING COMPLETED:**	12/17/2025	**HAMMER TYPE:**	Automatic
▼ **WL (Seasonal High Water):**		**EQUIPMENT:**	**LOGGED BY:**	**DRILLING METHOD:**	
⊽ **WL (Stabilized):**		ATV	ZNO1	Hollow Stem Auger (0'-20')	

GEOTECHNICAL BOREHOLE LOG

CLIENT: **Crosslands Companies**	PROJECT NO.: **67:4334**	BORING NO.: **B-06**	SHEET: **1 OF 1**
PROJECT NAME: **New Childcare Facility in Hudson**	DRILLER/CONTRACTOR: **Ohio TestBor, Inc.**		
SITE LOCATION: **802 W Streetsboro St, Hudson, Ohio, 44236**		LOSS OF CIRCULATION	
LATITUDE: **41.23169376**	LONGITUDE: **-81.48682665**	STRUCTURE:	SURFACE ELEVATION: **1013**
		BOTTOM OF CASING	

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DISTANCE (IN)	SAMPLE RECOVERY (IN)	DESCRIPTION OF MATERIAL	STRATIGRAPHY	WATER LEVELS	ELEVATION (FT)	BLOWS/6" (TCP/RS/MC/SPT-N VALUE)*
					Topsoil [Thickness=10"].				
	S-1	SS	18	14	(CL) LEAN CLAY WITH SAND - trace gravel and silt, brown, moist, firm to stiff.				5-5-6 (11)
								1010	
	S-2	SS	18	15	(ML) SANDY SILT - trace gravel, brown, contains slight rock fragments, moist, medium dense.		▽		3-3-3 (6)
5.0									
	S-3	SS	18	18	(CL) LEAN CLAY - trace gravel and sand, brown, contains slight rock fragments, moist, very stiff.				7-8-10 (18)
								1005	
	S-4	SS	18	18					5-6-10 (16)
					END OF BORING at 10.0 FT				



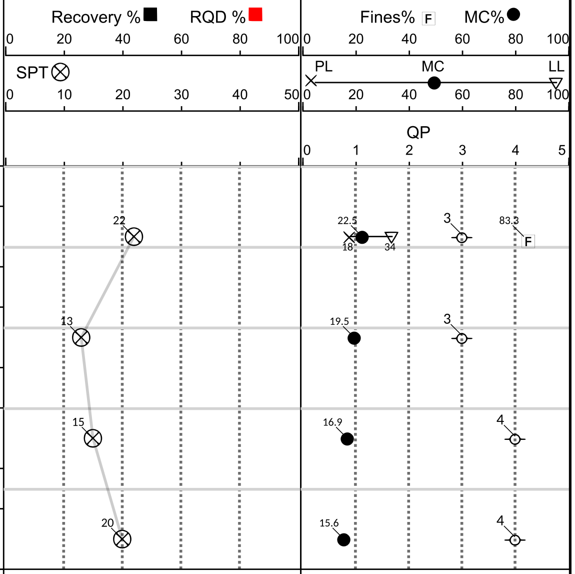
THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

▽ **WL (First Encountered):**	**4.2 FT**	**BORING STARTED:**	**12/17/2025**	**CAVE IN DEPTH:**	**Not Observed**
▼ **WL (Completion):**	**NA**	**BORING COMPLETED:**	**12/17/2025**	**HAMMER TYPE:**	**Automatic**
▼ **WL (Seasonal High Water):**		**EQUIPMENT:**	**LOGGED BY:**	**DRILLING METHOD:**	
▽ **WL (Stabilized):**		**ATV**	**ZNO1**	**Hollow Stem Auger (0'-10')**	

GEOTECHNICAL BOREHOLE LOG

CLIENT: **Crosslands Companies**	PROJECT NO.: **67:4334**	BORING NO.: **B-07**	SHEET: **1 OF 1**
PROJECT NAME: **New Childcare Facility in Hudson**	DRILLER/CONTRACTOR: **Ohio TestBor, Inc.**		
SITE LOCATION: **802 W Streetsboro St, Hudson, Ohio, 44236**			LOSS OF CIRCULATION
LATITUDE: **41.2319481**	LONGITUDE: **-81.48720358**	STRUCTURE:	SURFACE ELEVATION: **1008**
			BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DISTANCE (IN)	SAMPLE RECOVERY (IN)	DESCRIPTION OF MATERIAL	STRATIGRAPHY	WATER LEVELS	ELEVATION (FT)	BLOWS/6" (TCP/RS/MC/SPT-N VALUE)*
					Topsoil [Thickness=8"].				
	S-1	SS	18	9	(CL) LEAN CLAY WITH SAND - trace gravel, brown/gray, contains slight rock fragments, moist, stiff to very stiff.				2-14-8 (22)
								1005	
	S-2	SS	18	18					5-6-7 (13)
5.0									
	S-3	SS	18	18					4-6-9 (15)
								1000	
	S-4	SS	18	14					23-9-11 (20)
					END OF BORING at 10.0 FT				



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

▽ **WL (First Encountered):**	**NA**	**BORING STARTED:**	**12/16/2025**	**CAVE IN DEPTH:**	**Not Observed**
▼ **WL (Completion):**	**NA**	**BORING COMPLETED:**	**12/16/2025**	**HAMMER TYPE:**	**Automatic**
▼ **WL (Seasonal High Water):**		**EQUIPMENT:**	**LOGGED BY:**	**DRILLING METHOD:**	
▽ **WL (Stabilized):**		**ATV**	**ZNO1**	**Hollow Stem Auger (0'-10')**	

GEOTECHNICAL BOREHOLE LOG

CLIENT:
Crosslands Companies

PROJECT NO.:
67:4334

BORING NO.:
B-08

SHEET:
1 OF 1

PROJECT NAME:
New Childcare Facility in Hudson

DRILLER/CONTRACTOR:
Ohio TestBor, Inc.

SITE LOCATION:
802 W Streetsboro St, Hudson, Ohio, 44236

LOSS OF CIRCULATION

BOTTOM OF CASING

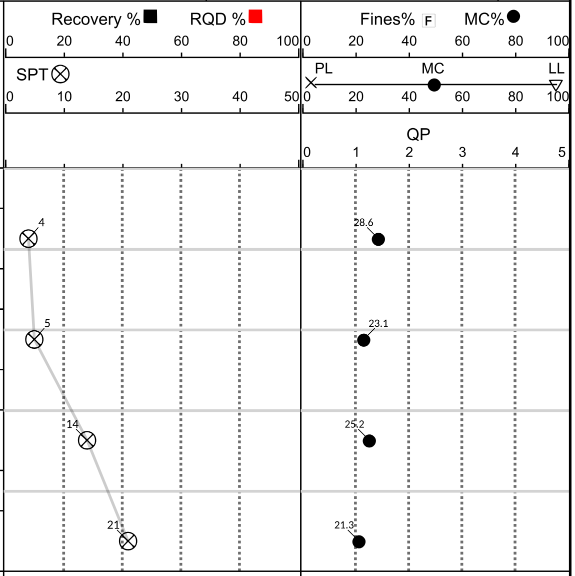
LATITUDE:
41.23202825

LONGITUDE:
-81.48700229

STRUCTURE:

SURFACE ELEVATION:
1011

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DISTANCE (IN)	SAMPLE RECOVERY (IN)	DESCRIPTION OF MATERIAL	STRATIGRAPHY	WATER LEVELS	ELEVATION (FT)	BLOWS/6" (TCP/RS/MC/SPT-N VALUE)*
					FILL - (CL) LEAN CLAY WITH SAND - brown/black, contains roots, wood and organics, moist, soft to firm.	▨		1010	
	S-1	SS	18	18		▨			2-2-2 (4)
	S-2	SS	18	8		▨			1-2-3 (5)
5.0						▨			
	S-3	SS	18	1	(ML) SANDY SILT - trace gravel, brown, moist, medium dense.	▥		1005	4-5-9 (14)
	S-4	SS	18	18		▥			8-9-12 (21)
					END OF BORING at 10.0 FT				



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

WL (First Encountered): NA

WL (Completion): NA

WL (Seasonal High Water):

WL (Stabilized):

BORING STARTED: 12/16/2025

BORING COMPLETED: 12/16/2025

EQUIPMENT: ATV

LOGGED BY: ZNO1

CAVE IN DEPTH: Not Observed

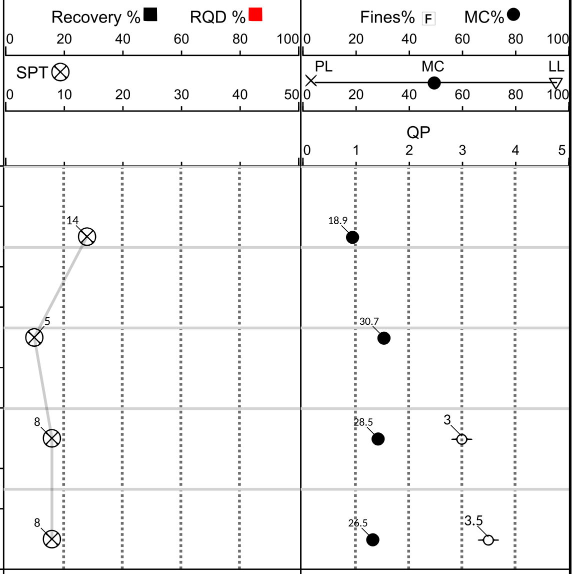
HAMMER TYPE: Automatic

DRILLING METHOD: Hollow Stem Auger (0'-10')

GEOTECHNICAL BOREHOLE LOG

CLIENT: **Crosslands Companies**	PROJECT NO.: **67:4334**	BORING NO.: **B-09**	SHEET: **1 OF 1**
PROJECT NAME: **New Childcare Facility in Hudson**	DRILLER/CONTRACTOR: **Ohio TestBor, Inc.**		
SITE LOCATION: **802 W Streetsboro St, Hudson, Ohio, 44236**		LOSS OF CIRCULATION	
LATITUDE: **41.23164643**	LONGITUDE: **-81.48708566**	STRUCTURE:	SURFACE ELEVATION: **1012**
		BOTTOM OF CASING	

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DISTANCE (IN)	SAMPLE RECOVERY (IN)	DESCRIPTION OF MATERIAL	STRATIGRAPHY	WATER LEVELS	ELEVATION (FT)	BLOWS/6" (TCP/RS/MC/SPT-N VALUE)*
					Topsoil [Thickness=8"].				
	S-1	SS	18	14	FILL - (CL) LEAN CLAY - trace gravel and sand, brown/gray, contains slight rock fragments, moist, firm to stiff, contains organics.			1010	7-7-7 (14)
5.0	S-2	SS	18	10					2-2-3 (5)
	S-3	SS	18	18	(CL) LEAN CLAY - trace gravel and sand, brown/gray, moist, firm.			1005	2-3-5 (8)
	S-4	SS	18	18					2-3-5 (8)
					END OF BORING at 10.0 FT				



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

WL (First Encountered): NA	**BORING STARTED:** 12/17/2025		**CAVE IN DEPTH:** Not Observed
WL (Completion): MA	**BORING COMPLETED:** 12/17/2025		**HAMMER TYPE:** Automatic
WL (Seasonal High Water):	**EQUIPMENT:**	**LOGGED BY:**	**DRILLING METHOD:**
WL (Stabilized):	ATV	ZNO1	Hollow Stem Auger (0'-10')

GEOTECHNICAL BOREHOLE LOG

CLIENT:
Crosslands Companies

PROJECT NO.:
67:4334

BORING NO.:
B-10

SHEET:
1 OF 1

PROJECT NAME:
New Childcare Facility in Hudson

DRILLER/CONTRACTOR:
Ohio TestBor, Inc.

SITE LOCATION:
802 W Streetsboro St, Hudson, Ohio, 44236

LOSS OF CIRCULATION

LATITUDE:
41.23163521

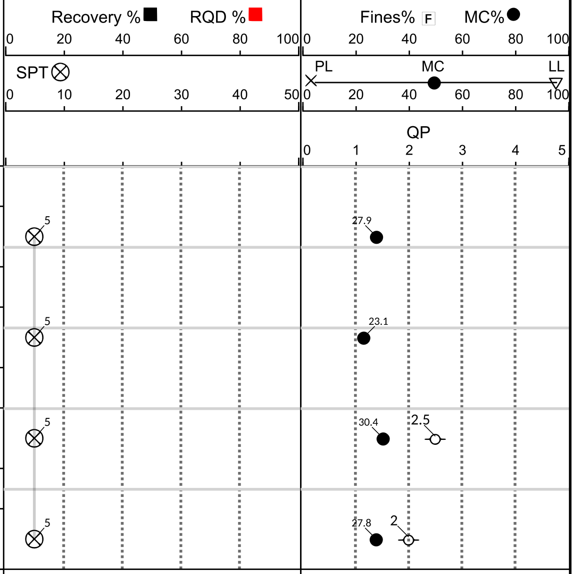
LONGITUDE:
-81.48750755

STRUCTURE:

SURFACE ELEVATION:
1012

BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DISTANCE (IN)	SAMPLE RECOVERY (IN)	DESCRIPTION OF MATERIAL	STRATIGRAPHY	WATER LEVELS	ELEVATION (FT)	BLOWS/6" (TCP/RS/MC/SPT-N VALUE)*
					FILL - (CL) LEAN CLAY - brown, contains slight wood and organics, moist, firm.				
	S-1	SS	18	15				1010	2-2-3 (5)
	S-2	SS	18	10					3-3-2 (5)
5.0									
	S-3	SS	18	16	(CL) LEAN CLAY - trace gravel, sand and silt, brown/gray to gray, contains slight rock fragments, moist, firm, @ 8.5 ft. Gray.			1005	2-2-3 (5)
	S-4	SS	18	18					2-2-3 (5)
					END OF BORING at 10.0 FT				



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

WL (First Encountered): NA

WL (Completion): NA

WL (Seasonal High Water):

WL (Stabilized):

BORING STARTED: 12/16/2025

BORING COMPLETED: 12/16/2025

EQUIPMENT:
ATV

LOGGED BY:
ZNO1

CAVE IN DEPTH: Not Observed

HAMMER TYPE: Automatic

DRILLING METHOD:
Hollow Stem Auger (0'-10')

GEOTECHNICAL BOREHOLE LOG

CLIENT:
Crosslands Companies

PROJECT NO.:
67:4334

BORING NO.:
B-11

SHEET:
1 OF 1

PROJECT NAME:
New Childcare Facility in Hudson

DRILLER/CONTRACTOR:
Ohio TestBor, Inc.

SITE LOCATION:
802 W Streetsboro St, Hudson, Ohio, 44236

LOSS OF CIRCULATION

LATITUDE:
41.23191347

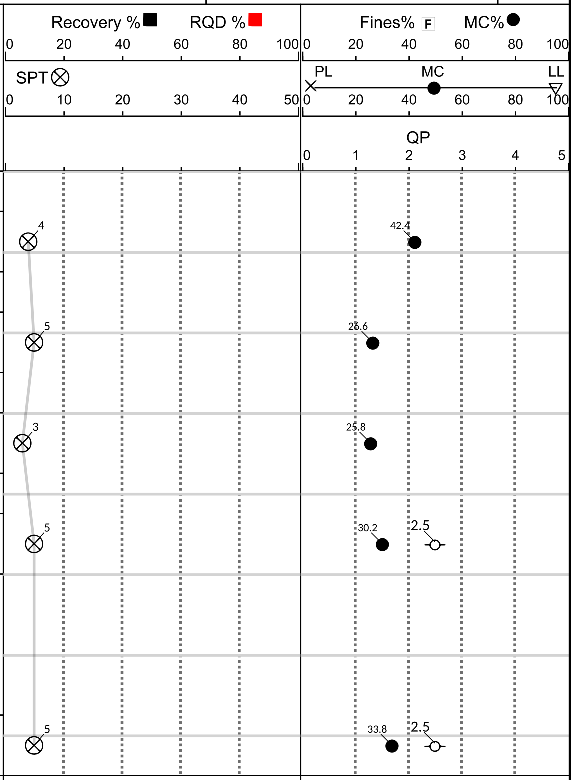
LONGITUDE:
-81.4877631

STRUCTURE:

SURFACE ELEVATION:
1013

BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DISTANCE (IN)	SAMPLE RECOVERY (IN)	DESCRIPTION OF MATERIAL	STRATIGRAPHY	WATER LEVELS	ELEVATION (FT)	BLOWS/6" (TCP/RS/MC/SPT-N VALUE)*
					FILL - (CL) LEAN CLAY - brown/black, contains wood and organics, moist, soft to firm.				
	S-1	SS	18	14					2-2-2 (4)
								1010	
	S-2	SS	18	15					2-2-3 (5)
5.0									
	S-3	SS	18	0			∇		1-2-1 (3)
							▼	1005	
	S-4	SS	18	16	(CL) LEAN CLAY WITH SAND - trace gravel, brown/gray, moist, firm.				2-2-3 (5)
10.0								1000	
	S-5	SS	18	18					2-2-3 (5)
					END OF BORING at 15.0 FT				



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

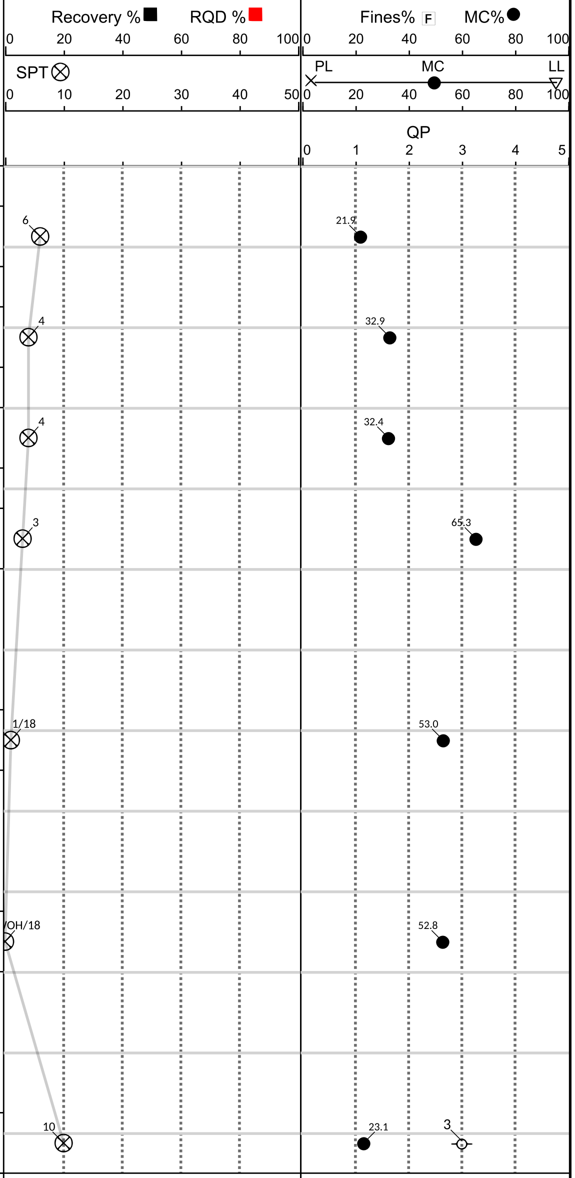
∇ **WL (First Encountered):**	**6 FT**	**BORING STARTED:**	**12/16/2025**	**CAVE IN DEPTH:**	**Not Observed**
▼ **WL (Completion):**	**7.5 FT**	**BORING COMPLETED:**	**12/16/2025**	**HAMMER TYPE:**	**Automatic**
▼ **WL (Seasonal High Water):**		**EQUIPMENT:**	**LOGGED BY:**	**DRILLING METHOD:**	
∇ **WL (Stabilized):**		**ATV**	**ZNO1**		

GEOTECHNICAL BOREHOLE LOG

CLIENT: **Crosslands Companies**	PROJECT NO.: **67:4334**	BORING NO.: **B-12**	SHEET: **1 OF 1**
PROJECT NAME: **New Childcare Facility in Hudson**	DRILLER/CONTRACTOR: **Ohio TestBor, Inc.**		
SITE LOCATION: **802 W Streetsboro St, Hudson, Ohio, 44236**		LOSS OF CIRCULATION	
LATITUDE: **41.23218337**	LONGITUDE: **-81.48766655**	STRUCTURE:	SURFACE ELEVATION: **1007**
		BOTTOM OF CASING	

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DISTANCE (IN)	SAMPLE RECOVERY (IN)	DESCRIPTION OF MATERIAL	STRATIGRAPHY	WATER LEVELS	ELEVATION (FT)	BLOWS/6" (TCP/RS/MC/SPT-N VALUE)*
	S-1	SS	18	10	FILL - (CL) LEAN CLAY - brown, contains organics, moist, firm.			1005	2-3-3 (6)
5.0	S-2	SS	18	18	FILL - (CL) LEAN CLAY - brown, contains significant organics, moist, very soft to soft, @ 8 ft. Wet.				2-2-2 (4)
	S-3	SS	18	16			▼ ▽	1000	1-2-2 (4)
10.0	S-4	SS	18	18					1-1-2 (3)
								995	
15.0	S-5	SS	18	18					0/12"-1 (1/18)
								990	
20.0	S-6	SS	18	18					0/18" (WOH/18)
								985	
	S-7	SS	18	18	(CL) LEAN CLAY - trace gravel, sand and silt, gray, contains slight rock fragments, moist, stiff.				2-4-6 (10)

END OF BORING at 25.0 FT



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

▽ **WL (First Encountered):**	**8 FT**	**BORING STARTED:**	**12/17/2025**		**CAVE IN DEPTH:**	**Not Observed**
▼ **WL (Completion):**	**7 FT**	**BORING COMPLETED:**	**12/17/2025**		**HAMMER TYPE:**	**Automatic**
WL (Seasonal High Water):		**EQUIPMENT:**		**LOGGED BY:**	**DRILLING METHOD:**	
WL (Stabilized):		**ATV**		**ZNO1**	**Hollow Stem Auger (0'-25')**	

GEOTECHNICAL BOREHOLE LOG

Appendix C – Laboratory Testing

Laboratory Testing Summary
Grain Size Analysis/Analyses
Plasticity Chart(s)

Laboratory Testing Summary

Sample Location	Sample Number	Depth (ft)	^MC (%)	Soil Type	Atterberg Limits			**Percent Passing No. 200 Sieve	Moisture - Density		CBR (%)		#Organic Content (%)
					LL	PL	PI		<Maximum Density (pcf)	<Optimum Moisture (%)	0.1 in.	0.2 in.	
B-01	S-1	1.0-2.5	18.9										
B-01	S-2	3.5-5.0	26.0										
B-01	S-3	6.0-7.5	32.5										
B-01	S-4	8.5-10.0	89.7										
B-01	S-5	13.5-15.0	41.4										
B-01	S-6	18.5-20.0	20.3										
B-02	S-1	1.0-2.5	28.8										
B-02	S-2	3.5-5.0	24.9										
B-02	S-3	6.0-7.5	19.4										
B-02	S-4	8.5-10.0	31.7										

Notes: See test reports for test method, ^ASTM D2216-19, *ASTM D2488, **ASTM D1140-17, #ASTM D2974-20e1 < See test report for D4718 corrected values

Definitions: MC: Moisture Content, Soil Type: USCS (Unified Soil Classification System), LL: Liquid Limit, PL: Plastic Limit, PI: Plasticity Index, CBR: California Bearing Ratio, OC: Organic Content

Project: New Childcare Facility in Hudson
Client: Crosslands Companies

Project No.: 67:4334
Date Reported: 12/30/2025

Office / Lab	Address	Office Number / Fax
ECS Midwest LLC - Cleveland	1125 Valley Belt Road Brooklyn Heights, OH 44131	(216)741-7007 (216)741-7011

Tested by	Checked by	Approved by	Date Received
JonKocaja	JonKocaja	JonKocaja	

Laboratory Testing Summary

Sample Location	Sample Number	Depth (ft)	^MC (%)	Soil Type	Atterberg Limits			**Percent Passing No. 200 Sieve	Moisture - Density		CBR (%)		#Organic Content (%)
					LL	PL	PI		<Maximum Density (pcf)	<Optimum Moisture (%)	0.1 in.	0.2 in.	
B-02	S-5	13.5-15.0	28.9										
B-02	S-6	18.5-20.0	15.8										
B-03	S-1	1.0-2.5	22.5										
B-03	S-2	3.5-5.0	31.6										
B-03	S-3	6.0-7.5	23.0										
B-03	S-4	8.5-10.0	72.1										
B-03	S-5	13.5-15.0	16.0										
B-03	S-6	18.5-20.0	11.7										
B-04	S-1	1.0-2.5	24.0										
B-04	S-2	3.5-5.0	18.6										

Notes: See test reports for test method, ^ASTM D2216-19, *ASTM D2488, **ASTM D1140-17, #ASTM D2974-20e1 < See test report for D4718 corrected values

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Tested by	Checked by	Approved by	Date Received
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Laboratory Testing Summary

Sample Location	Sample Number	Depth (ft)	^MC (%)	Soil Type	Atterberg Limits			**Percent Passing No. 200 Sieve	Moisture - Density		CBR (%)		#Organic Content (%)
					LL	PL	PI		<Maximum Density (pcf)	<Optimum Moisture (%)	0.1 in.	0.2 in.	
B-04	S-3	6.0-7.5	26.6										
B-04	S-4	8.5-10.0	45.7										
B-04	S-5	13.5-15.0	39.5										
B-04	S-6	18.5-20.0	13.0										
B-05	S-1	1.0-2.5	19.9										
B-05	S-2	3.5-5.0	22.9	CL	28	18	10	90.6					
B-05	S-3	6.0-7.5	29.1										
B-05	S-4	8.5-10.0	16.4										
B-05	S-5	13.5-15.0	25.4										
B-05	S-6	18.5-20.0	8.8										

Notes: See test reports for test method, ^ASTM D2216-19, *ASTM D2488, **ASTM D1140-17, #ASTM D2974-20e1 < See test report for D4718 corrected values

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Tested by	Checked by	Approved by	Date Received
JonKocaja	JonKocaja	JonKocaja	

Laboratory Testing Summary

Sample Location	Sample Number	Depth (ft)	^MC (%)	Soil Type	Atterberg Limits			**Percent Passing No. 200 Sieve	Moisture - Density		CBR (%)		#Organic Content (%)
					LL	PL	PI		<Maximum Density (pcf)	<Optimum Moisture (%)	0.1 in.	0.2 in.	
B-06	S-1	1.0-2.5	22.4										
B-06	S-2	3.5-5.0	23.4										
B-06	S-3	6.0-7.5	20.8										
B-06	S-4	8.5-10.0	21.8										
B-07	S-1	1.0-2.5	22.5	CL	34	18	16	83.3					
B-07	S-2	3.5-5.0	19.5										
B-07	S-3	6.0-7.5	16.9										
B-07	S-4	8.5-10.0	15.6										
B-08	S-1	1.0-2.5	28.6										
B-08	S-2	3.5-5.0	23.1										

Notes: See test reports for test method, ^ASTM D2216-19, *ASTM D2488, **ASTM D1140-17, #ASTM D2974-20e1 < See test report for D4718 corrected values

Definitions: MC: Moisture Content, Soil Type: USCS (Unified Soil Classification System), LL: Liquid Limit, PL: Plastic Limit, PI: Plasticity Index, CBR: California Bearing Ratio, OC: Organic Content

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Tested by	Checked by	Approved by	Date Received
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Laboratory Testing Summary

Sample Location	Sample Number	Depth (ft)	^MC (%)	Soil Type	Atterberg Limits			**Percent Passing No. 200 Sieve	Moisture - Density		CBR (%)		#Organic Content (%)
					LL	PL	PI		<Maximum Density (pcf)	<Optimum Moisture (%)	0.1 in.	0.2 in.	
B-08	S-3	6.0-7.5	25.2										
B-08	S-4	8.5-10.0	21.3										
B-09	S-1	1.0-2.5	18.9										
B-09	S-2	3.5-5.0	30.7										
B-09	S-3	6.0-7.5	28.5										
B-09	S-4	8.5-10.0	26.5										
B-10	S-1	1.0-2.5	27.9										
B-10	S-2	3.5-5.0	23.1										
B-10	S-3	6.0-7.5	30.4										
B-10	S-4	8.5-10.0	27.8										

Notes: See test reports for test method, ^ASTM D2216-19, *ASTM D2488, **ASTM D1140-17, #ASTM D2974-20e1 < See test report for D4718 corrected values

Definitions: MC: Moisture Content, Soil Type: USCS (Unified Soil Classification System), LL: Liquid Limit, PL: Plastic Limit, PI: Plasticity Index, CBR: California Bearing Ratio, OC: Organic Content

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JonKocaja	JonKocaja	JonKocaja	

Laboratory Testing Summary

Sample Location	Sample Number	Depth (ft)	^MC (%)	Soil Type	Atterberg Limits			**Percent Passing No. 200 Sieve	Moisture - Density		CBR (%)		#Organic Content (%)
					LL	PL	PI		<Maximum Density (pcf)	<Optimum Moisture (%)	0.1 in.	0.2 in.	
B-11	S-1	1.0-2.5	42.4										
B-11	S-2	3.5-5.0	26.6										
B-11	S-3	6.0-7.5	25.8										
B-11	S-4	8.5-10.0	30.2										
B-11	S-5	13.5-15.0	33.8										
B-12	S-1	1.0-2.5	21.9										
B-12	S-2	3.5-5.0	32.9										
B-12	S-3	6.0-7.5	32.4										
B-12	S-4	8.5-10.0	65.3										
B-12	S-5	13.5-15.0	53.0										

Notes: See test reports for test method, ^ASTM D2216-19, *ASTM D2488, **ASTM D1140-17, #ASTM D2974-20e1 < See test report for D4718 corrected values

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Laboratory Testing Summary

Sample Location	Sample Number	Depth (ft)	^MC (%)	Soil Type	Atterberg Limits			**Percent Passing No. 200 Sieve	Moisture - Density		CBR (%)		#Organic Content (%)
					LL	PL	PI		<Maximum Density (pcf)	<Optimum Moisture (%)	0.1 in.	0.2 in.	
B-12	S-6	18.5-20.0	52.8										
B-12	S-7	23.5-25.0	23.1										

Notes: See test reports for test method, ^ASTM D2216-19, *ASTM D2488, **ASTM D1140-17, #ASTM D2974-20e1 < See test report for D4718 corrected values

Definitions: MC: Moisture Content, Soil Type: USCS (Unified Soil Classification System), LL: Liquid Limit, PL: Plastic Limit, PI: Plasticity Index, CBR: California Bearing Ratio, OC: Organic Content

Project: New Childcare Facility in Hudson
Client: Crosslands Companies

Project No.: 67:4334
Date Reported: 12/30/2025

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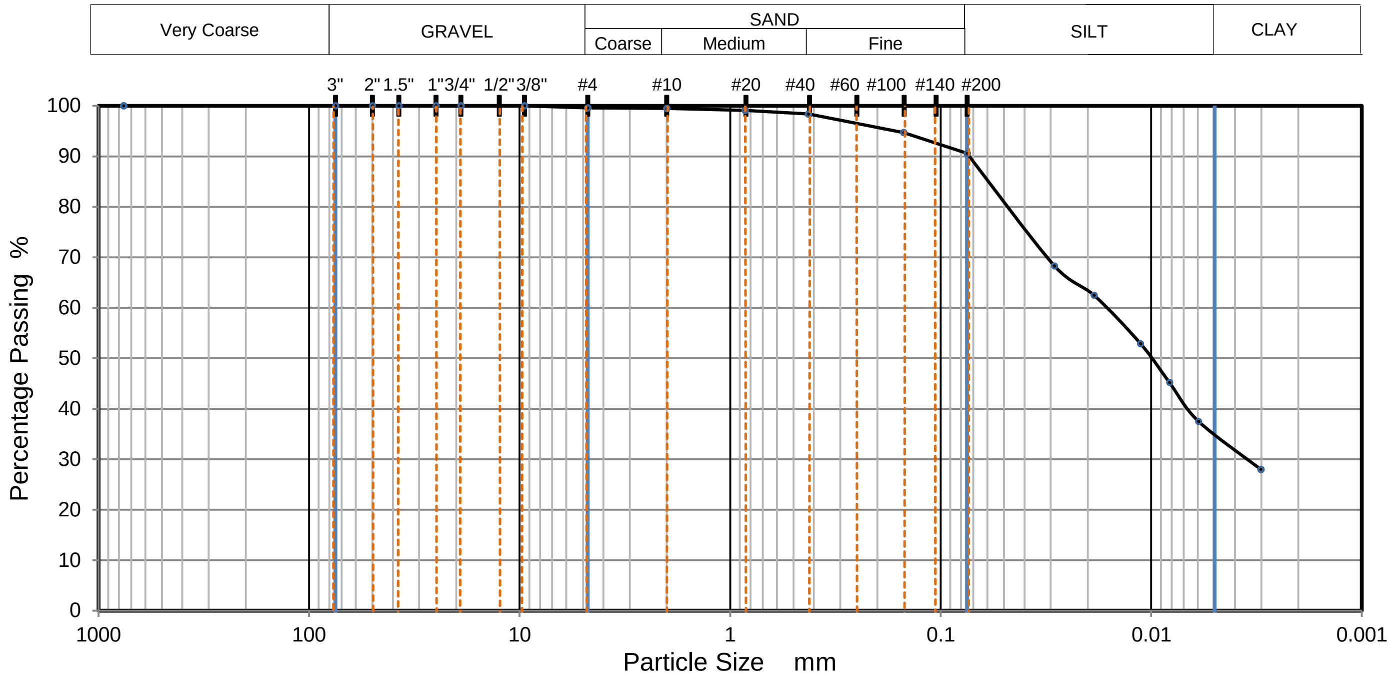
Tested by	Checked by	Approved by	Date Received
JonKocaja	JonKocaja	JonKocaja	

PARTICLE SIZE DISTRIBUTION



TEST RESULTS (ASTM D422-63(2007))

Sieving		Hydrometer Sedimentation	
Particle Size	% Passing	Particle Size mm	% Passing
3"	100.0	0.0288	68.3
2"	100.0	0.0187	62.5
1 1/2"	100.0	0.0112	52.9
1"	100.0	0.0082	45.2
3/4"	100.0	0.0060	37.5
3/8"	100.0	0.0030	28.0
#4	99.6		
#10	99.5		
#20	99.1		
#40	98.4		
#100	94.7	Specific Gravity (Historical) 2.70	
#200	90.6		

Dry Mass of sample, g	193.6

Sample Proportions	% dry mass
Very coarse, >3" sieve	0.0
Gravel, 3" to # 4 sieve	0.4
Coarse Sand, #4 to #10 sieve	0.1
Medium Sand, #10 to #40	1.1
Fine Sand, #40 to #200	7.8
Silt, 75µm to 5 µm	55.6
Clay < 5µm	35.0

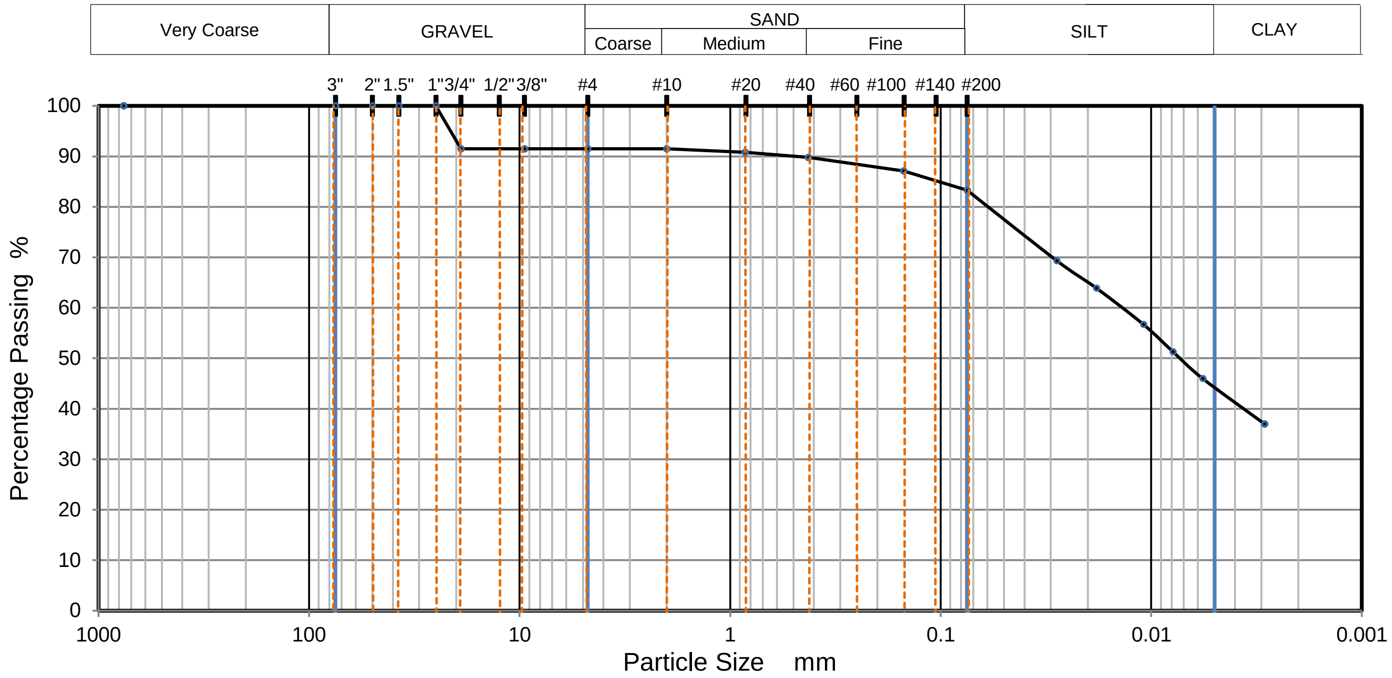
USCS	CL	Liquid Limit	28	D90	0.073	D50	0.010	D10	
AASHTO	A-4	Plastic Limit	18	D85	0.059	D30	0.003	Cu	
USCS Group Name	Lean clay	Plasticity Index	10	D60	0.016	D15		Cc	

Project:	New Childcare Facility in Hudson	Project No.:	67:4334
Client:	Crosslands Companies	Depth (ft):	3.5 - 5.0
Sample Description:		Sample No.:	S-2
Sample Source:	B-05	Date Reported:	12/30/2025

Office / Lab	Address	Office Number / Fax
ECS Midwest LLC - Cleveland	1125 Valley Belt Road Brooklyn Heights, OH 44131	(216)741-7007 (216)741-7011

Tested by	Checked by	Approved by	Date Received	Remarks
JonKocaja	JonKocaja	JonKocaja		

PARTICLE SIZE DISTRIBUTION



TEST RESULTS (ASTM D422-63(2007))

Sieving		Hydrometer Sedimentation	
Particle Size	% Passing	Particle Size mm	% Passing
3"	100.0	0.0280	69.3
2"	100.0	0.0182	63.9
1 1/2"	100.0	0.0109	56.7
1"	100.0	0.0079	51.3
3/4"	91.5	0.0057	46.0
3/8"	91.5	0.0029	37.0
#4	91.5		
#10	91.5		
#20	90.8		
#40	89.8		
#100	87.1	Specific Gravity (Historical) 2.70	
#200	83.3		

Dry Mass of sample, g	166.7

Sample Proportions	% dry mass
Very coarse, >3" sieve	0.0
Gravel, 3" to # 4 sieve	8.5
Coarse Sand, #4 to #10 sieve	0.0
Medium Sand, #10 to #40	1.7
Fine Sand, #40 to #200	6.5
Silt, 75µm to 5 µm	39.0
Clay < 5µm	44.3

USCS	CL	Liquid Limit	34	D90	0.488	D50	0.007	D10	
AASHTO	A-6	Plastic Limit	18	D85	0.102	D30		Cu	
USCS Group Name	Lean clay with gravel	Plasticity Index	16	D60	0.014	D15		Cc	

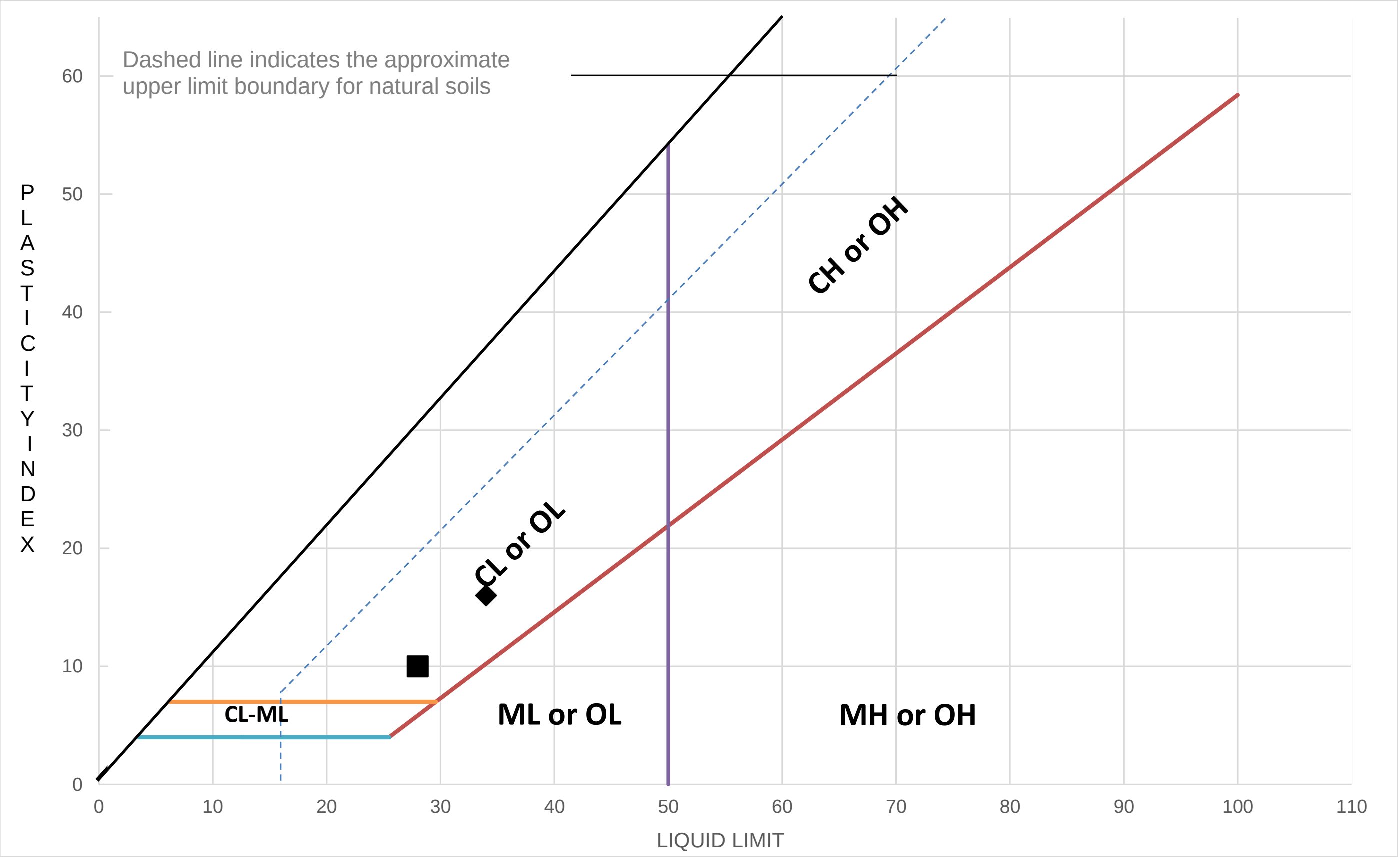
Project: New Childcare Facility in Hudson
Client: Crosslands Companies
Sample Description:
Sample Source: B-07

Project No.: 67:4334
Depth (ft): 1.0 - 2.5
Sample No.: S-1
Date Reported: 12/30/2025

Office / Lab	Address	Office Number / Fax
ECS Midwest LLC - Cleveland	1125 Valley Belt Road Brooklyn Heights, OH 44131	(216)741-7007 (216)741-7011

Tested by	Checked by	Approved by	Date Received	Remarks
JonKocaja	JonKocaja	JonKocaja		

LIQUID AND PLASTIC LIMITS TEST REPORT



TEST RESULTS (ASTM D4318-10 (MULTIPOINT TEST))

	Sample Location	Sample Number	Sample Depth (ft)	LL	PL	PI	%<#40	%<#200	AASHTO	USCS	Material Description
■	B-05	S-2	3.50-5.00	28	18	10	98.4	90.6	A-4	CL	
◆	B-07	S-1	1.00-2.50	34	18	16	89.8	83.3	A-6	CL	

Project: New Childcare Facility in Hudson
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Project No.: 67:4334
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