SUBSURFACE EXPLORATION

AND

GEOTECHNICAL ENGINEERING REPORT

MARKET STREET CENTER

NWC OF HWY 291 AND HWY 150

LEE'S SUMMIT, MO

PREPARED FOR:

FDB HOLDINGS, LLC

105 N. STEWART CT.

SUITE 225 LIBERTY MO 64068

KCTE JOB # G20-22-022

DATE: 4/25/2022

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AND

GEOTECHNICAL ENGINEERING REPORT

MARKET STREET CENTER

NWC OF HWY 291 AND HWY 150

LEE'S SUMMIT, MO

KCTE NO. G20-22-020

Submitted to: FDB Holdings, LLC
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Suite 225 Liberty MO 64068

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Appendices

1.0 INTRODUCTION

Kansas City Testing & Engineering, LLC (KCTE) has completed the subsurface exploration for the Market Street Center. The project site is located at NWC of Hwy 291 and Hwy 150, Lee's Summit, MO. The exploration was performed at the request of Mr. John Davis, in accordance with the agreement dated 2/25/2022.

The purpose of this geotechnical exploration was to identify the soil strata, on-site soil physical properties, and provide geotechnical recommendations the future construction of two structures at lot .

1.1 SITE DESCRIPTION

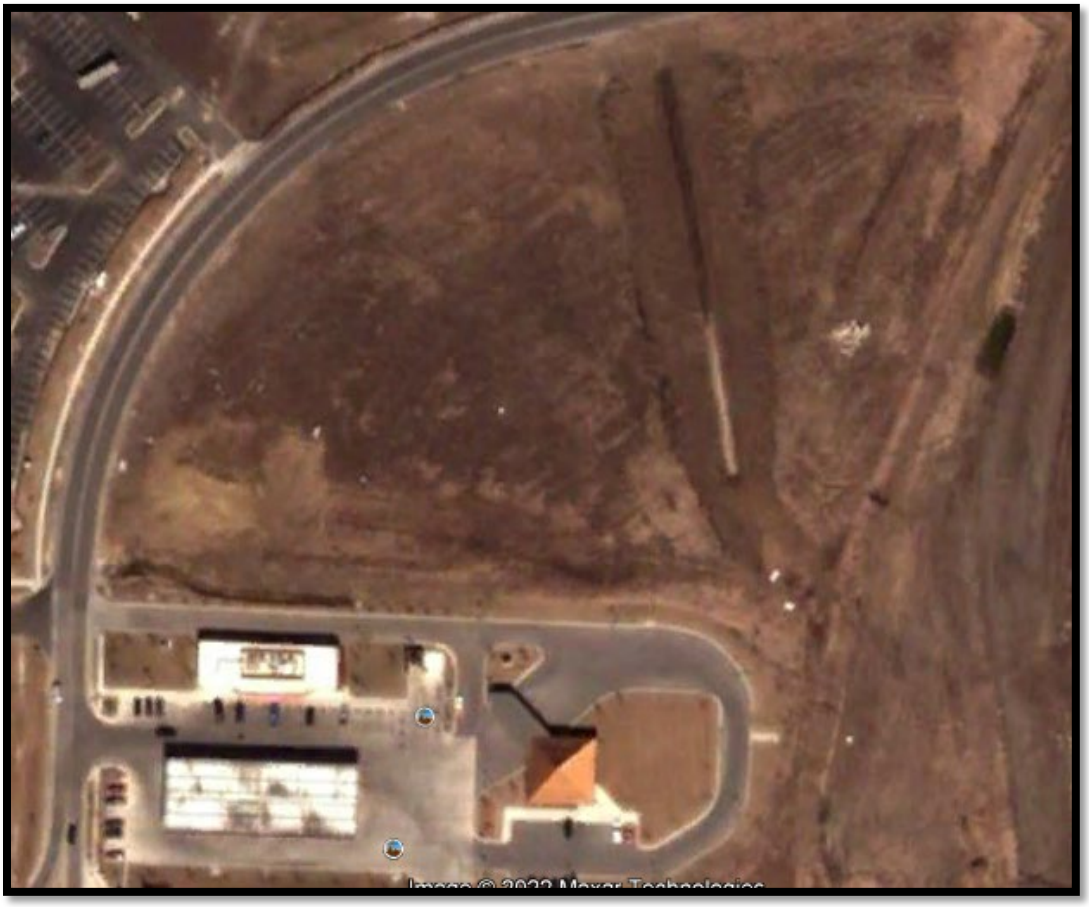
This report is limited to general geotechnical recommendations for site preparation, controlled fill, and pavement subgrade recommendations for Lot 2 (2.58 Acre) and Lot 1(1.85 Acre) and Tract 7 Detention Basin. In addition, foundation and slab-on-grade recommendations have been provided for two new structures on Lot 1, Tenant A and Tenant B, 4,200 sf and 3,000 sf respectively. These buildings are planned single-story office/retail structures located west of the 291-exit ramp along the northeast portion of the site. KCTE understands plans for future construction at lot 2 will be determined later. KCTE should be contacted for additional recommendations for any future proposed construction.

Site Plan

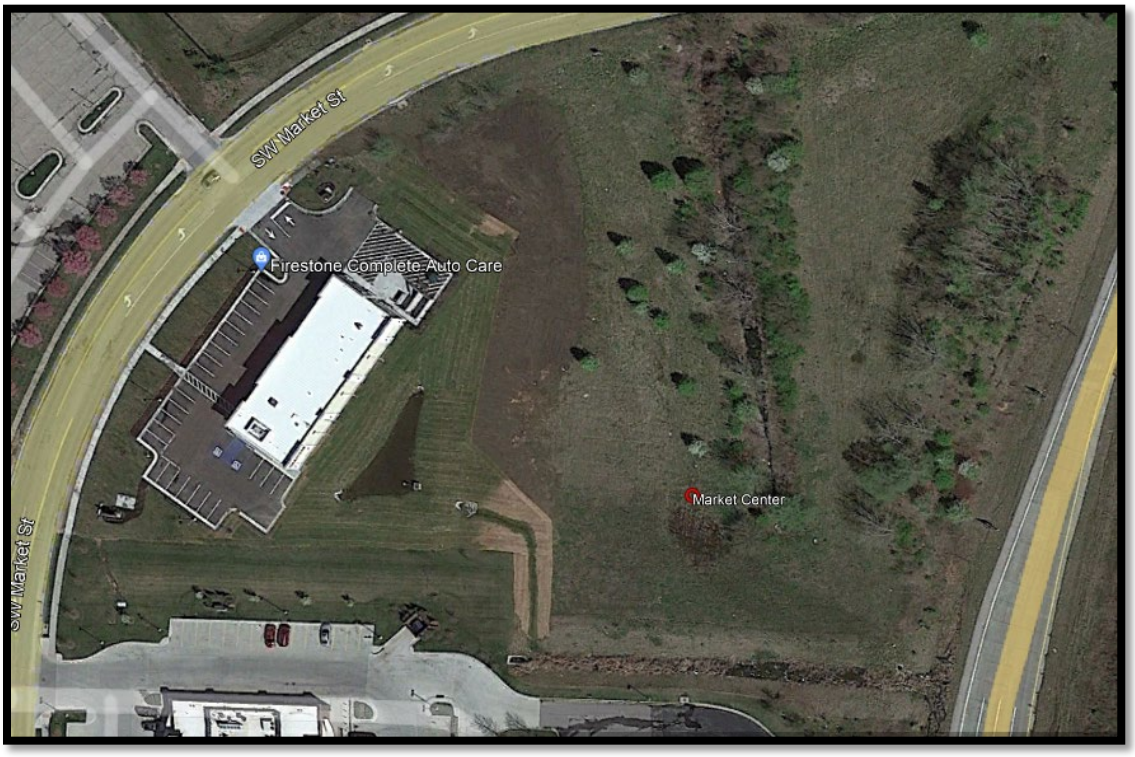
A brief historical review of the site from 1990 to present indicates excavations have been performed on the site. Other excavations and construction may have occurred as well.

The identified excavations include modification of natural drainage diverted to a trench that runs across the site from draining from north to south. These modifications could have been associated with the road construction of SW Market Street. In addition, new construction of adjacent structures, QuikTrip, Bank of the West to the south and Firestone to the west has also resulted in regrading and installation of a rock lined drainage channel running from west to east along the southern edge of the Lot 1 and Lot 2.

The property is depicted below and in the Appendix A Site Location Map. The boring locations are depicted in Appendix A Boring Location Map.



QuikTrip/Bank of the West-Google Earth Image Circa 4/02



Firestone Google Earth Image Circa 4/21

Item	Description
Site Layout	• The site drops 8ft from north to south. • A Drainage channel (8ft deep +/-) runs from north to south through the center of the site. • Previous creeks and a small pond (now buried near boring B-7) are present on the site. Exact locations of previous creeks could not be identified.
New Structures	Assumptions include: • Tenant A (4,200 sf) single story retail/office • Tenant B (3,00 sf) single story retail/office • Detention basin construction
Retaining Wall	Assumptions include: • Not determined
Anticipated Foundation & Floor Slab Loadings	Assumptions include: • Lightly loaded slabs and foundations
Provided Anticipated Finish Floor Elevations (FFE)	Assumptions include: • Tenant A FFE 1011 • Tenant B FFE 1009
Grading	Assumptions include: • Lot 1 Minor cuts with 0-4 ft of fill in parking and building pads. • Lot 2 Building pad not determined - minor fills with exception of filling the drainage channel which will require up to 8ft.of fill. • Detention Basin Construction on the order of 10ft. deep.

2.0 FIELD EXPLORATION PROGRAM

The site subsurface conditions were explored with thirteen (13) borings in proximity as shown on the boring plan. The boring locations were marked in the field by KCTE using non-precision geospatial references (cell phone), in conjunction with measurements from the curb or existing structures.

Borings were drilled and sampled to a depth range of 6 to 15 feet using a small ATV drill rig. Soil samples were obtained from the borings during the drilling process using standard thin-walled sampling techniques (ASTM 1587). Sample depths are indicated on the attached boring logs in Appendix B.

The drill crew prepared field logs of the materials encountered during drilling. The field logs represent the conditions observed at the time of the exploration. The field logs have been edited to incorporate the results of laboratory test data.

Field samples obtained from the borings were returned to our laboratory where they were visually classified and logged. The laboratory tests consisted of moisture and Atterberg limits testing, in substantial compliance with ASTM Procedures. The test results were utilized in the development of the geotechnical recommendations.

3.0 LABORATORY TESTING PROGRAM

Laboratory testing was performed on the soil samples to estimate pertinent engineering and index properties of the materials. Results of the laboratory tests are presented in Appendix B and on the boring logs. The laboratory testing program consisted of the following:

- Visual classification (ASTM D 2488, Standard Practice for Description and Identification of Soils (Visual-Manual Procedure))
- Moisture content tests (ASTM D 2216, *Standard Test Method for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass*)
- Atterberg limits tests (ASTM D 4318, *Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils*)
- Unconfined compression tests on soil (ASTM Designation D 2166, *Standard Test Method for Unconfined Compressive Strength of Cohesive Soil)*
- Hand held penetrometer

4.0 SUBSURFACE CONDITIONS

KCTE has explored the subsurface conditions of the project site at selected boring locations that represent potential future construction. The following sections describe the findings of our field exploration, laboratory testing and visual classification of the field samples.

This section presents a general summary of the materials encountered in the borings. Specific subsurface conditions encountered at the boring locations are presented on the respective boring logs in Appendix B. The stratification lines shown on the logs represent the approximate boundaries between material types; in many cases the transitions have been estimated.

4.1 SITE SPECIFIC STRATIGRAPHY

The soil on-site typically consisted of topsoil, stiff to hard fat clay overlying medium stiff to hard lean clays.

4.2 SOIL STRATA

Stratum	Depth	Description	Comment
Stratum 1	0-0.25 ft	TOPSOIL	Present in all Borings
Stratum 2	0.25-6 ft	Undocumented Clay Fill Medium Stiff to Very Stiff	Present in Borings B1,B2,B4, B7, B11,B12,B13
Stratum 3	0.25-10 ft	(CH) Fat Clay Stiff to Hard	Present in all Borings
Stratum 4	0-10 ft	(CL) Lean Clay Medium Stiff to Hard	Present in all Borings except B7

4.3 BEDROCK OBSERVATIONS

Bedrock was identified during the field exploratory program.

Boring Number	Material Depth	Refusal Depth N>50 or AR	Material Type
B3	11 ft	11.5 ft	Limestone
B4	12.5 ft	13 ft	Limestone
B9	12 ft	12 ft	Limestone

4.4 GROUNDWATER OBSERVATIONS

The driller observed the borings for evidence of groundwater at each location at the time of drilling. Groundwater was observed in boring B-7 at 8 feet after drilling and at 11.5 ft after drilling in boring B-9.

Our observations are based on the conditions encountered only at the actual boring locations after completion of drilling. Due to the low permeability of the clays soils encountered in the borings, a relatively long period of time may be required for a groundwater level to develop and stabilize in a borehole. Long term observations in piezometers or observation wells may be required to define groundwater levels in these materials or at this site. Also, it should be understood that the level of groundwater might fluctuate at other times of the year depending upon climatic and rainfall conditions. Groundwater levels may be different during construction or at other times during the life of the project.

5.0 RECOMMENDATIONS

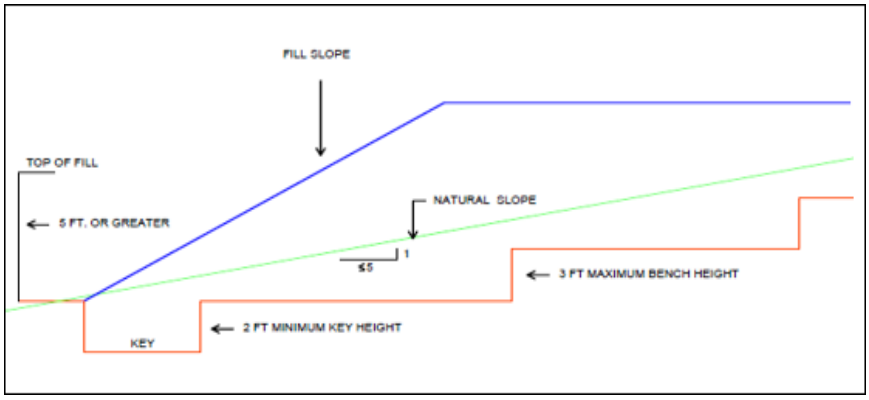
KCTE is providing recommendations in the following sections based on our laboratory/field testing during this exploration, observation in the field by the geotechnical engineer and experience with local materials.

5.1 SITE PREPARATIONS

The contractor should fully remove any topsoil, undocumented fill, or unsuitable soil materials in the building footprints and pavement locations prior to fill placement. For further recommendations on the removal of undocumented fill at the proposed building pad and pavement areas see Section 5.2. Additional clay may need to be removed to meet low volume change requirements

under slabs on grade. (Section 5.4).

All slopes steeper than a 5:1 (5H:1V) in new fill areas should be benched prior to placement of fill material. The benching of slopes allows interlocking of the fill and the natural soils and provides a platform for compaction of the fill. Benches should be cut as the fill progresses, and bench heights should not exceed a maximum of 3 feet. Fill slopes that require maintenance should not be constructed steeper than a 3:1.



Recommended Benching Procedures

After the existing soil subgrade is excavated to the proposed subgrade level, the exposed material should be observed by a representative of the geotechnical engineer. The subgrade should be proof-rolled with a loaded tandem-axle dump truck, typically with an axle load of a minimum of 9 tons.

Soft zones that are observed to rut or deflect excessively (typically greater than 1 inch) under the moving load during a proof-roll test should be undercut and replaced with properly compacted fill or stabilized in place. In place stabilization could be performed by moisture conditioning and recompaction. Alternately, soft soil could be removed and replaced with suitable on-site or off-site soil. The proof-rolling and undercutting activities should be observed by a representative of the geotechnical engineer and should be performed during a period of dry weather.

Subgrade soils should be dried, or moisture conditioned as necessary to achieve a moisture content in the range of -2 to +3% of the optimum moisture and compacted to at least 95% of the maximum dry density determined in accordance with the standard Proctor test (ASTM D698).

The upper fine-grained soils encountered at this site may be sensitive to disturbances caused by construction traffic and changes in moisture content. During wet weather periods, increases in the moisture content of the soil can cause significant reduction in the soil strength and support capabilities. In addition, soils that become wet may be slow to dry and thus significantly retard the progress of grading and compaction activities. It will, therefore, be advantageous to perform earthwork and subgrade preparation activities during dry weather.

Boring B-7 may have been near an old pond. At this location, the grading plan shows about 1 foot of new fill prior to placement of pavement. We do not think this will cause a problem with compressibility of the deeper material, but there is some risk of settlement in the future if this material is left in place, resulting in increased maintenance costs.

5.2 REMOVAL OF UNDOCUMENTED FILL

At the time of this exploration, and in the specific locations where drilling was executed, undocumented fill (i.e., there are no records provided by a registered engineer that the fill was

placed as engineered fill) was encountered in Borings B-1, B-2, B-4, B-7, B-11, B-12 and B-13 from a depth of 0 to 6.0 feet. In addition, other instances of undocumented fill may exist elsewhere on the site and could require further investigated during site preparation. Undocumented fill encountered during development, should be removed in accordance with this report. In areas planned for structures, undocumented fill should be removed and replaced with engineered fill or LVC as recommended in Section 5.3 and section 5.4. In pavement areas, undocumented fill should be completely removed. At the owner's option, undocumented fill may be removed to a minimum depth of 2 feet below the pavement subgrade elevation. This option carries some risk of increased future maintenance costs.

If the owner selects to allow some undocumented fill to remain in place, excavation of test pits into undocumented fill is recommended to further evaluate the composition and consistency of the material. If soft or unsuitable material is encountered during excavation of the test pits, it may be necessary that the undocumented fill be undercut to suitable material. If practical, the grade exposed in the undercut area should then be proofrolled to assess its stability. Soft or unstable areas should be undercut and replaced with engineered fill.

If required, the exposed grade should be moisture conditioned prior to placement of engineered fill. If undocumented fill is not removed and replaced with engineered fill, there is a significant risk that unsuitable materials may not be discovered during construction and may remain buried within the existing fill below the buildings, which could result in greater than anticipated differential settlement of the buildings. This risk cannot be eliminated without completely removing the fill.

5.3 CONTROLLED FILL

After subgrade preparation has been completed, fill placement may begin to establish construction grade. The first layer of fill material should be placed in a relatively uniform horizontal lift and be adequately keyed into the stripped and scarified subgrade soils. Fill materials should be free of organic or other deleterious material and have a maximum particle size less than 3 inches in any direction. A densely graded, crushed stone, equivalent to KDOT AB-3 aggregate or MoDOT Type 5 aggregate, is also acceptable as engineered fill material. All fill material should be unfrozen and be approved by the geotechnical engineer. Fill material should meet low plasticity requirements if used under slabs. (Section 5.4)

Of the soil types encountered in our borings, all Strata, except for Stratum 1 soils, are suitable for reuse as engineered fill, provided deleterious materials are removed prior to its use. Clay soils identified as completely weathered shale may present problems during compaction and should be evaluated prior to use as general fill.

Given the random nature of the fat, lean to fat clay soils, and depth of undocumented fill on this site. KCTE does not recommend using on-site materials for use as LVC. (Section 5.4)

If an off-site borrow source is used, the geotechnical engineer should be notified at least 72 hours before fill is imported to the site, to sample and test the material. No imported material should be delivered to the site without proper sampling and testing. The fill material should be unfrozen and be approved by the geotechnical engineer prior to placement.

The fill material should be placed in loose lifts having a maximum thickness of 8 inches and compacted to at least 95% of the maximum dry density in accordance with ASTM D 698 at moisture contents between -2% and +3% of the optimum moisture content.

Backfill material over unsuitable soils (i.e., soft, wet, frozen, thawing, or spongy surface) or during

unfavorable weather conditions should be prohibited. Where soil has been loosened or eroded by flooding or placement during rain, the damaged area should be removed and recompacted to the required density.

Placement of clay soils may be difficult during wet weather conditions. If the native soils and imported clay soils are too wet and cannot be dried to near-optimum moisture within the construction schedule, they can be stabilized with the addition of lime or fly ash to provide a stable subgrade material. As an alternate to stabilized subgrade, granular material may be placed at the site surface to provide a working platform. Stabilized soils may also be used for road embankment fill.

Backfilling of curbs and other structures whose foundation is unprotected from water should be accomplished as soon as the concrete has met the designs strength and forms are removed to eliminate possibility of a loosened subbase below the structure.

We recommend full-time observation and periodic testing of materials by the geotechnical engineer of record or their designated representative during the road grade construction placement of fill and backfill material.

5.4 SLABS-ON -GRADE

KCTE recommends the upper 24 inches of the subgrade below slabs-on-grade should consist of a low volume change (LVC) material with a liquid limit (LL) less than 45 and a plasticity index (PI) below 23. The material on-site does not meet this specification. To minimize the potential for future damage relating to movement of slabs, KCTE recommends options 2a, 2b, 2c. or 2d.

SLABS-ON-GRADE
1. DRAINAGE LAYER – 6" THICK ¾" CLEAN STONE
2. LVC LAYER – 18" THICK a. MODOT TYPE 5 OR KDOT AB-3 b. CEMENT STABILIZED SUBBASE c. DRAINAGE LAYER (3/4" CLEAN STONE) d. OFF-SITE SOIL MEETING REQUIREMENT OF LVC

1) Drainage Layer - KCTE recommends that a minimum 6-inch-thick mat of open-graded (clean) stone, with a maximum particle size of ¾-inch and less than 5 percent passing the No. 4 sieve (ASTM D448, No. 467, No. 57, No. 67, or similar material) be placed beneath the floor slab to enhance drainage. The granular layer will ease construction, provide a capillary break, and aid in drainage. The 6-inch-thick drainage aggregate below the slab should be considered as part of the 24 inches of LVC below the slabs.

2) LVC Layer - Any soils or crushed stone used for the LVC layer in building pads should be tested prior to placement of the drainage layer. Soil, if used should meet the requirements of(LVC) material with a liquid limit (LL) less than 45 and a plasticity index (PI) below 23. Crushed stone should be a well-graded stone similar in gradation to a KDOT AB-3 or MoDOT Type 5 aggregate. Compaction of low swell potential soil or crushed stone under the slab should be to a minimum of 95 percent of the material's maximum dry density as determined by ASTM D 698 at a moisture content between 0 and +4 percent of the optimum.

It is very important that the subgrade soils be maintained at or above standard Proctor optimum moisture content until concrete is placed. Any rutted subgrade should be repaired prior to placement of base rock to avoid a potential water trap and subsequent sub grade movement. To remove any potential water collected under the slab, KCTE recommends a temporary dewatering system (i.e., sump pump) be installed during the installation of the crushed stone base course. To reduce the effects of differential movement, slabs-on-grade should not be rigidly connected to columns, walls, or foundations unless it is designed to withstand the additional resultant forces. Floor slabs should not extend beneath exterior doors or over foundation grade beams, unless saw cut at the beam after construction. Expansion joints may be used to allow unrestrained vertical movement of the slabs. The floor slabs should be designed to have an adequate number of joints to reduce cracking resulting from differential movement and shrinkage. We suggest joints be provided on a minimum spacing of 15 feet on center.

5.5 FOUNDATION RECOMMENDATIONS

Based on the subsurface conditions encountered and following the recommended site preparation procedures outlined in the previous sections, the proposed structures may be supported on shallow foundations bearing in native soil or engineered fill material. It is considered essential that a representative of KCTE observe footing bottoms prior to placement of reinforcing steel. Recommendations for shallow foundation design and construction are provided in the following table.

5.5.1 ALLOWABLE BEARING PRESSURE – SPREAD FOOTINGS

Footings founded in the recommended materials may be proportioned for a maximum allowable bearing pressure of 2,000 pounds per square foot (psf) as long as the recommendations below are followed. The allowable bearing pressure is based on a factor of safety of approximately three (3) with respect to shear failure of the foundation bearing materials. Some soil remediation will be required to reach the above stated allowable bearing capacity in areas where soft soil is encountered during footing excavation.

Continuous wall footings should have a minimum width of 16 inches, and isolated spread footings should have a minimum width of 30 inches. Trench footings should have a minimum width of 12 inches to facilitate cleaning and evaluation of the bearing surface. All exterior footings and footings founded in unheated portions of the structures should be supported a minimum of 36 inches below final exterior grade to provide protection against frost penetration. All footings should be earth-formed, poured in neat excavations.

Description	Mat (Spread Footing)	Continuous Footing
Net allowable bearing pressure (Controlled fill or competent natural foundation soils)[1]	2,000 psf	
Minimum dimensions	30”	16”
Maximum footing width	10 ft.	
Recommended bearing depth[1]	Upon controlled fill or native clay, at least 1.5 ft. below existing grade.	
Minimum embedment below finished grade for frost protection and variation in soil moisture (footings on soil)[2]	3.0 ft.	

Minimum footing bearing depth below compacted fill surface	1 ft.
Allowable passive pressure[3]	600 psf
Coefficient of sliding friction[4]	0.33 (controlled fill or clay)

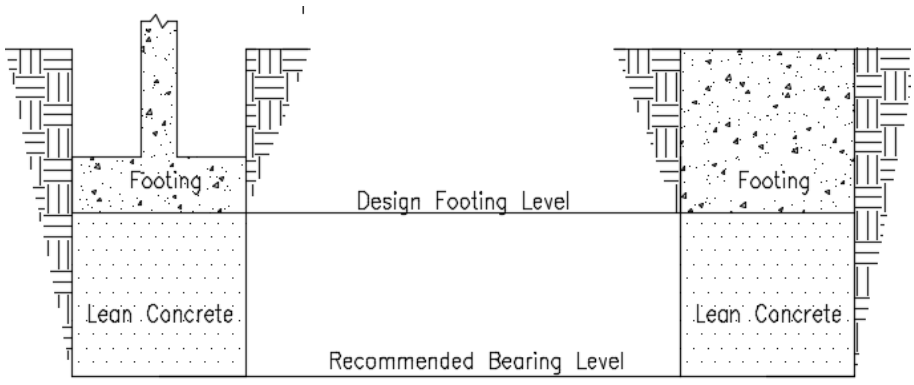
1. The recommended net allowable bearing pressure is the pressure in excess of the minimum surrounding overburden pressure at the footing base elevation. The recommended pressure considers all unsuitable and/or soft or loose soils, if encountered, are undercut and replaced with tested and approved new engineered fill. Footing excavations should be free of loose and disturbed material, debris, and water when concrete is placed.
2. For perimeter footings and footings beneath unheated areas.
3. Allowable passive pressure value considers a Factor of Safety of about 2. Passive pressure value applies to undisturbed native clay or properly compacted fill. If formed footings are constructed, the space between the formed side of a footing and excavation sidewall should be cleaned of all loose material, debris, and water and backfilled with tested approved fill compacted to at least 95% of the material's Standard Proctor dry density. Passive resistance should be neglected for the upper 2.5 ft. of the soil below the final adjacent grade due to strength loss from freeze/thaw and shrink/swell.
4. Coefficient of friction value is an ultimate value and does not contain a Factor of Safety.

5.5.2 ESTIMATED SETTLEMENTS

Long-term structural settlement for spread footings designed and constructed as outlined above should be minor, 1-inch or less for structures with the bearing elevation throughout the structure. If there are multiple bearing elevations for a given structure, additional evaluation is recommended to further evaluate potential settlements. Total settlement Differential settlements should occur gradually across the proposed structure and be on the order of 3/4-inch or less over 40 to 60 feet.

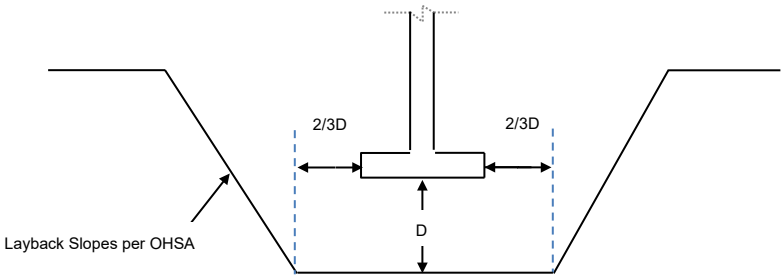
5.5.3 UNDERCUTTING AND LEAN CONCRETE BACKFILL - SPREAD FOOTINGS

If the design footing level is bearing in soft or unsuitable bearing material, KCTE recommends over-excavation to suitable material and backfilling with lean concrete to plan bottom of footing level as depicted below, or alternately using compacted backfill to design footing level.



Lean Concrete Backfill

At the contractors option the footing may also be over-excavated with replaced with compacted AB-3 (or similar) type backfill material. See Section 5.3 for compaction requirements. Over-excavation should extend outside of the footing as depicted below 2/3D, where D is the depth of the over-excavation.



5.6 SEISMIC DESIGN CONSIDERATIONS

The 2018 International Building Code requires a site class for the calculation of earthquake design forces. This class is a function of soil type (i.e., depth of soil and strata types). Based on the subsurface conditions of the site and the estimated shear strength properties of the materials in the upper 100 feet, Site Class “D” (i.e., Stiff Soil) is recommended for this project.

5.7 PAVEMENTS

The following are general recommendations for pavements. A pavement design was not performed. The recommendations are typical minimums based on our experience with projects and materials of this type.

5.7.1 SUBGRADE PREPARATION

Pavement subgrades should be prepared in accordance with the recommendations presented in the 5.1 Site Preparation, 5.2 Removal of undocumented fill and 5.3 Controlled Fill sections. Construction scheduling, involving paving and grading by separate contractors, typically results in a time lapse between the end of grading operations and the commencement of paving. Disturbance, desiccation, and/or wetting of the subgrade between grading and paving can result in deterioration of the previously completed subgrade. A non-uniform subgrade can result in poor pavement performance and local failures relatively soon after pavements are constructed.

We recommend that the pavement subgrades be proofrolled and the moisture content and density of the top 9 inches of subgrade be checked within two days prior to commencement of actual paving operations. If any significant event, such as precipitation, occurs after proofrolling, the subgrade should be reviewed by qualified personnel immediately prior to placing the pavement. The subgrade should be in its finished form at the time of the final review.

5.7.2 TYPICAL SECTIONS – ASPHALT CEMENT CONCRETE (ACC)

Asphaltic concrete pavements for parking and drive lane areas utilized primarily by automobile traffic should have a minimum thickness of 5.5 inches. Heavy duty asphalt for trucks and fire lanes should have a minimum thickness of 6.5 inches. Asphalt pavements for both pavement types may be supported by 6-inches of compacted crushed stone with fines (MoDOT Type 5 or similar) in conjunction with a geogrid such as Tensar Triax TX 5 or similar, or 6 inches of chemically treated soil. Chemical treatment recommendations are available on request.

Compaction of crushed stone under the pavement should be to 95 percent of the material's maximum dry density as determined by ASTM D 698 at a moisture content between -2 to +3 percent of the optimum. Pavement designers may use a CBR value of 3 for clay soils found at this site.

All asphaltic concrete pavements should be constructed with a minimum surface course thickness of 1.5 inches. The above sections represent minimum design thicknesses and, as such, periodic maintenance should be anticipated.

5.7.3 TYPICAL SECTIONS – PORTLAND CEMENT CONCRETE (PCC)

Portland cement concrete pavements for parking areas and drive lanes utilized primarily by automobile traffic should have a minimum thickness of 6.0 inches. We also recommend that a 6-inch-leveling and drainage course of clean ¾" crushed stone be placed below all concrete pavements. The pavement subgrade should be graded to provide positive drainage within the granular base section. Appropriate sub drainage or connection to a suitable gravity outfall should be provided to remove water from the granular base.

5.7.4 TYPICAL SECTIONS PORTLAND CEMENT CONCRETE (PCC) TRASH RECEPTACLES

Portland cement concrete (PCC) pavements are recommended for trash receptacle pads, drive approaches, and other areas where heavy wheel loads will be concentrated. We recommend that the concrete pavements in these areas have a minimum thickness of 8.0 inches. We also recommend that a 6-inch-leveling and drainage course of clean ¾" crushed stone be placed below all concrete pavements. The pavement subgrade should be graded to provide positive drainage within the granular base section. This should include a piped sloped subgrade to drain the subsurface water. Appropriate sub drainage or connection to a suitable gravity outfall should be provided to remove water from the granular base.

5.8 DRAINAGE AND MAINTENANCE

Pavements should be sloped to provide rapid drainage of surface water. Water that is allowed to accumulate on or adjacent to pavements could saturate the subgrade and contribute to premature pavement deterioration. KCTE recommends that drains are placed behind curbs. Drains should extend a minimum 6 inches in depth below the base of the curb and sloped to nearest inlet drains. Periodic maintenance of the pavement should be anticipated. This should include sealing of cracks and joints and maintenance of proper drainage to avoid ponding of water on or near the pavement areas.

5.9 EXCAVATION AND TRENCHES

All temporary slopes and excavations should conform to Occupational Safety and Health Administration (OSHA) Standards for the Construction Industry (29 CFR Part 1026, Subpart P).

Excavations in the native soils should be possible with conventional excavation equipment. The contractor should review the boring logs to determine the appropriate method(s) for excavation at this site. All excavations should be kept dry during subgrade preparation. Storm water runoff should be controlled and removed to prevent severe erosion of the subgrade and eliminate free standing water. Subgrade that has been rendered unsuitable from erosion or excessive wetting should be removed and replaced with controlled fill.

Trenches should be excavated so that pipes and culverts can be laid straight at uniform grade between the terminal elevations. Trench width should provide adequate working space and sidewall clearances. Trench subgrade should be removed and replaced with engineered fill if found to be wet, soft, loose, or frozen. The top 18 inches of trench backfill under roads should

consist of crushed limestone with fines. (MoDOT Type 5 or KDOT AB-3) Trench subgrade should be compacted to a minimum of 95% of the maximum dry density in accordance with ASTM D 698 at moisture contents between -2% to +3% of the optimum moisture content. A representative of the geotechnical engineer should be on-site full-time during trench backfill operations to test each lift of fill material.

Granular bedding materials for pipes, such as well-graded sand or gravel, may be used provided that the bottom of the trench is graded so that water flows away from structure. Open- graded granular bedding may be used provided that a separation geotextile is used at the subgrade interface. Bedding material should be graded to provide a continuous support beneath all points of the pipe and joints. Embedment material should be deposited and compacted uniformly and simultaneous on each side of the pipe to prevent lateral displacement. Compacted engineered fill material will be required for the full depth of the trench above the embedment material. No backfill should be placed or compacted in standing water.

6.0 GENERAL COMMENTS

This report is presented in broad terms to provide an assessment of the subsurface conditions and their potential effect on the adequate design and economical construction of the proposed development. Any changes in the design or location of the proposed streets or utilities should be assumed to invalidate the conclusions and recommendations given in this report until we have had the opportunity to review the changes and, if necessary, modify our conclusions and recommendations accordingly. It is recommended that the geotechnical engineer be afforded the opportunity of a general review of the final design plans and specifications prior to construction in order to determine if they are consistent with the conclusions and recommendations given in this report. For this project, these geotechnical document review services will be provided as part of the geotechnical report cost. Particular details of foundation design, construction specifications or quality control may develop, and we would be pleased to respond to any questions that you may have regarding these details.

The scope of our services did not include any environmental assessment or investigation for the presence of hazardous or toxic materials in the soil, surface water, groundwater, or air, on or below or around this site.

APPENDIX A

Site and Boring Location Maps

Figure 1 Project Location Map

Figure 2 Boring Locations Map

APPENDIX B

Boring Logs and Laboratory Data

Kansas City Testing and Engineering, LLC
1141 Southwest Blvd.
Kansas City, KS 66103
Tel: 913-321-8100
Fax: 913-321-8181

BORING NUMBER B-1

CLIENT FDB Holdings, LLC
PROJECT NAME Market Street Center
PROJECT NUMBER G20-22-022
PROJECT LOCATION NWC Hwy 150 and Hwy 291, Lee's Summit, MO
DATE STARTED 4/15/22 **COMPLETED** 4/15/22
GROUND ELEVATION _____ **HOLE SIZE** 4 inches
DRILLING CONTRACTOR KCTE
GROUND WATER LEVELS:
DRILLING METHOD 4 SS
AT TIME OF DRILLING ---
LOGGED BY CR **CHECKED BY** _____
AT END OF DRILLING ---
NOTES _____
AFTER DRILLING ---

Depth	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOWS (N COUNT)	RECOVERY % (RQD)	UNCONF COMPR. (psf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	Pocket Pen. (tsf)
0.0		**TOPSOIL**										
		FILL										
		FILL-Medium Stiff brown to dark brown clay trace organics	ST 1		58	1189	95	27.0				3.5
2.5		**LEAN CLAY**										
		Very stiff brown clay	ST 2		42	4659	99	24.2				3.75
5.0												
7.5												
		Stiff tan clay	ST 3		54	3195	91	33.1				2.5
10.0												
12.5												
		Very Stiff grey shaley clay	ST 4		63	4549	101	25.1				3
15.0												

Bottom of borehole at 15.0 feet.

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BORING NUMBER B-2

CLIENT FDB Holdings, LLC
PROJECT NAME Market Street Center
PROJECT NUMBER G20-22-022
PROJECT LOCATION NWC Hwy 150 and Hwy 291, Lee's Summit, MO
DATE STARTED 4/15/22 **COMPLETED** 4/15/22
GROUND ELEVATION _____ **HOLE SIZE** 4 inches
DRILLING CONTRACTOR KCTE
GROUND WATER LEVELS:
DRILLING METHOD 4 SS
AT TIME OF DRILLING ---
LOGGED BY CR **CHECKED BY** _____
AT END OF DRILLING ---
NOTES _____
AFTER DRILLING ---

Depth	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOWS (N COUNT)	RECOVERY % (RQD)	UNCONF COMPR. (psf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	Pocket Pen. (tsf)
0.0		**TOPSOIL**										
		FILL										
		FILL-brown clay to dark brown clay with trace organics	ST 1		31			30.3				3.1
2.5		**LEAN CLAY**										
		Very stiff brown mottled grey clay	ST 2		75	5471	103	22.4	40	22	18	2.75
5.0												
7.5		Stiff tan clay w/sand and limestone pcs.	ST 3		40	3368	94	28.4				2.4
10.0												
12.5		Tan grey shaley clay	ST 4		96	4800	101	26.0				2.75
15.0		Bottom of borehole at 15.0 feet.										

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BORING NUMBER B-3

CLIENT FDB Holdings, LLC
PROJECT NAME Market Street Center
PROJECT NUMBER G20-22-022
PROJECT LOCATION NWC Hwy 150 and Hwy 291, Lee's Summit, MO
DATE STARTED 4/15/22 **COMPLETED** 4/15/22
GROUND ELEVATION _____ **HOLE SIZE** 4 inches
DRILLING CONTRACTOR KCTE
GROUND WATER LEVELS:
DRILLING METHOD 4 SS
AT TIME OF DRILLING ---
LOGGED BY CR **CHECKED BY** _____
AT END OF DRILLING ---
NOTES _____
AFTER DRILLING ---

Depth	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOWS (N COUNT)	RECOVERY % (RQD)	UNCONF COMPR. (psf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	Pocket Pen. (tsf)
0.0		**TOPSOIL**										
		FAT CLAY, DARK BROWN TO GREY										
		Very stiff dark brown clay trace organics	ST 1		58	4177	93	28.6	56	26	30	2.75
2.5		**LEAN CLAY**										
		Stiff brown mottled grey clay	ST 2		40	3305	93	28.2				2
5.0												
7.5		Very Stiff Brown mottled grey shaley clay	ST 3		67	4156	97	28.8				2.5
10.0												
		BEDROCK AT 11 FT, AUGER REFUSAL AT 11.5 FT										

Refusal at 11.5 feet.
Bottom of borehole at 11.5 feet.

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BORING NUMBER B-4

CLIENT FDB Holdings, LLC
PROJECT NAME Market Street Center
PROJECT NUMBER G20-22-022
PROJECT LOCATION NWC Hwy 150 and Hwy 291, Lee's Summit, MO
DATE STARTED 4/15/22 **COMPLETED** 4/15/22
GROUND ELEVATION _____ **HOLE SIZE** 4 inches
DRILLING CONTRACTOR KCTE
GROUND WATER LEVELS:
DRILLING METHOD 4 SS
AT TIME OF DRILLING ---
LOGGED BY CR **CHECKED BY** _____
AT END OF DRILLING ---
NOTES _____
AFTER DRILLING ---

Depth	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOWS (N COUNT)	RECOVERY % (RQD)	UNCONF COMPR. (psf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	Pocket Pen. (tsf)
0.0		**TOPSOIL**										
		FILL CLAY, DARK BROWN TO GREY										
		Fill- brown to dark brown clay trace organics	ST 1		54	759	23	26.4				2.75
2.5		**LEAN CLAY**										
		Stiff brown mottled grey clay	ST 2		31	4487	95	27.1				3.5
5.0												
7.5		Grey Shaley Clay Medium Stiff	ST 3		100	1840	94	28.9				2
10.0												
12.5		**BEDROCK AT 12.5 FT, AUGER REFUSAL AT 13 FT**										

Refusal at 13.0 feet.
Bottom of borehole at 13.0 feet.

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BORING NUMBER B-5

CLIENT FDB Holdings, LLC
PROJECT NAME Market Street Center
PROJECT NUMBER G20-22-022
PROJECT LOCATION NWC Hwy 150 and Hwy 291, Lee's Summit, MO
DATE STARTED 4/19/22 **COMPLETED** 4/19/22
GROUND ELEVATION _____ **HOLE SIZE** 4 inches
DRILLING CONTRACTOR KCTE
GROUND WATER LEVELS:
DRILLING METHOD 4 SS
AT TIME OF DRILLING ---
LOGGED BY CR **CHECKED BY** _____
AT END OF DRILLING ---
NOTES _____
AFTER DRILLING ---

Depth	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOWS (N COUNT)	RECOVERY % (RQD)	UNCONF COMPR. (psf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	Pocket Pen. (tsf)
0.0		**TOPSOIL**										
		FAT CLAY, DARK BROWN TO GREY										
		Stiff dark brown clay trace organics										
2.5		**LEAN CLAY**										
		Stiff brown mottled grey clay	ST 1		35	4210	97	26.1				
5.0												
7.5												
		Stiff tan motteld grey clay	ST 2		46		97	27.4				3
10.0												

Bottom of borehole at 10.0 feet.

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BORING NUMBER B-6

CLIENT FDB Holdings, LLC
PROJECT NAME Market Street Center
PROJECT NUMBER G20-22-022
PROJECT LOCATION NWC Hwy 150 and Hwy 291, Lee's Summit, MO
DATE STARTED 4/19/22 **COMPLETED** 4/19/22
GROUND ELEVATION _____ **HOLE SIZE** 4 inches
DRILLING CONTRACTOR KCTE
GROUND WATER LEVELS:
DRILLING METHOD 4 SS
AT TIME OF DRILLING ---
LOGGED BY CR **CHECKED BY** _____
AT END OF DRILLING ---
NOTES _____
AFTER DRILLING ---

Depth	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOWS (N COUNT)	RECOVERY % (RQD)	UNCONF COMPR. (psf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	Pocket Pen. (tsf)
0.0		**TOPSOIL**										
		FAT CLAY, DARK BROWN										
2.5		Stiff dark brown clay	ST 1		29	3699	97	25.4				
5.0		**LEAN CLAY**										
7.5		Stiff Grey-brown Shaley Clay	ST 2		58		100	25.2				2.75
10.0		Bottom of borehole at 10.0 feet.										

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BORING NUMBER B-7

CLIENT FDB Holdings, LLC
PROJECT NAME Market Street Center
PROJECT NUMBER G20-22-022
PROJECT LOCATION NWC Hwy 150 and Hwy 291, Lee's Summit, MO
DATE STARTED 4/19/22 **COMPLETED** 4/19/22
GROUND ELEVATION _____ **HOLE SIZE** 4 inches
DRILLING CONTRACTOR KCTE
GROUND WATER LEVELS:
DRILLING METHOD 4 SS
AT TIME OF DRILLING ---
LOGGED BY CR **CHECKED BY** _____
AT END OF DRILLING ---
NOTES _____
AFTER DRILLING ---

Depth	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOWS (N COUNT)	RECOVERY % (RQD)	UNCONF COMPR. (psf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	Pocket Pen. (tsf)
0.0		**TOPSOIL**										
		FILL BROWN-TAN										
		Tan brown clay with trace gravel, medium stiff	ST 1		58	1803	97	27.0				1.5
2.5		**FAT CLAY, DARK BROWN TO BLACK**										
		Stiff dark brown clay with root hairs	ST 2		50	2788	90	27.1				1.75
7.5		Black clay on auger, water at 8ft, no recovery in tube sample	ST 3		0							
10.0												

Bottom of borehole at 10.0 feet.

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BORING NUMBER B-8

CLIENT FDB Holdings, LLC
PROJECT NAME Market Street Center
PROJECT NUMBER G20-22-022
PROJECT LOCATION NWC Hwy 150 and Hwy 291, Lee's Summit, MO
DATE STARTED 4/19/22 **COMPLETED** 4/19/22
GROUND ELEVATION _____ **HOLE SIZE** 4 inches
DRILLING CONTRACTOR KCTE
GROUND WATER LEVELS:
DRILLING METHOD 4 SS
AT TIME OF DRILLING ---
LOGGED BY CR **CHECKED BY** _____
AT END OF DRILLING ---
NOTES _____
AFTER DRILLING ---

Depth	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOWS (N COUNT)	RECOVERY % (RQD)	UNCONF COMPR. (psf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	Pocket Pen. (tsf)
0.0		**TOPSOIL**										
		FAT CLAY, DARK BROWN										
2.5		**LEAN CLAY**										
		Stiff grey mottled brown clay	ST 1		50	2090	94	29.6				
5.0												
7.5		Stiff grey mottled brown clay	ST 2		46			26.7				1.5
10.0												
12.5		Stiff grey mottled brown clay	ST 3		63	2832	90	31.6				2
15.0		Bottom of borehole at 15.0 feet.										

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BORING NUMBER B-9

CLIENT FDB Holdings, LLC
PROJECT NAME Market Street Center
PROJECT NUMBER G20-22-022
PROJECT LOCATION NWC Hwy 150 and Hwy 291, Lee's Summit, MO
DATE STARTED 4/19/22 **COMPLETED** 4/19/22
GROUND ELEVATION **HOLE SIZE** 4 inches
DRILLING CONTRACTOR KCTE
GROUND WATER LEVELS:
DRILLING METHOD 4 SS
AT TIME OF DRILLING 12.00 ft
LOGGED BY CR **CHECKED BY**
AT END OF DRILLING ---
NOTES
0.25hrs AFTER DRILLING 11.50 ft

Depth	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOWS (N COUNT)	RECOVERY % (RQD)	UNCONF COMPR. (psf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	Pocket Pen. (tsf)
0.0		**TOPSOIL**										
		FAT CLAY, DARK BROWN										
		Stiff dark brown clay trace organics										
2.5		**LEAN CLAY**										
		Stiff brown mottled grey clay	ST 1		38	4863	97	25.8				
5.0												
7.5		Stiff brown motteld grey clay, Fe nodules	ST 2		63	4065	92	31.2				
10.0												
		▽										

BEDROCK AT 12FT, Water at 12ft
Refusal at 12.0 feet.
Bottom of borehole at 12.0 feet.

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BORING NUMBER B-10

CLIENT FDB Holdings, LLC
PROJECT NAME Market Street Center
PROJECT NUMBER G20-22-022
PROJECT LOCATION NWC Hwy 150 and Hwy 291, Lee's Summit, MO
DATE STARTED 4/19/22 **COMPLETED** 4/19/22
GROUND ELEVATION _____ **HOLE SIZE** 4 inches
DRILLING CONTRACTOR KCTE
GROUND WATER LEVELS:
DRILLING METHOD 4 SS
AT TIME OF DRILLING ---
LOGGED BY CR **CHECKED BY** _____
AT END OF DRILLING ---
NOTES _____
AFTER DRILLING ---

Depth	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOWS (N COUNT)	RECOVERY % (RQD)	UNCONF COMPR. (psf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	Pocket Pen. (tsf)
0.0		**TOPSOIL**										
		FAT CLAY, DARK BROWN										
2.5		**LEAN CLAY**										
		Stiff brown mottled grey clay	ST 1		38	3952	90	29.0				2.75
5.0												
7.5												
		Very stiff brown motteld grey clay	ST 2		54	4983	19	28.0				2.75
10.0												

Bottom of borehole at 10.0 feet.

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BORING NUMBER B-11

CLIENT FDB Holdings, LLC
PROJECT NAME Market Street Center
PROJECT NUMBER G20-22-022
PROJECT LOCATION NWC Hwy 150 and Hwy 291, Lee's Summit, MO
DATE STARTED 4/19/22 **COMPLETED** 4/19/22
GROUND ELEVATION _____ **HOLE SIZE** 4 inches
DRILLING CONTRACTOR KCTE
GROUND WATER LEVELS:
DRILLING METHOD 4 SS
AT TIME OF DRILLING ---
LOGGED BY CR **CHECKED BY** _____
AT END OF DRILLING ---
NOTES _____
AFTER DRILLING ---

Depth	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOWS (N COUNT)	RECOVERY % (RQD)	UNCONF COMPR. (psf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	Pocket Pen. (tsf)
0.0		**TOPSOIL**										
		FILL										
		Fill-Stiff brown clay	ST 1		100	2895	101	23.8				2.75
2.5		**FAT CLAY, DARK BROWN**										
		Very stiff dark brown clay	ST 2		38	5228	101	22.4				
5.0												

Bottom of borehole at 6.0 feet.

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BORING NUMBER B-12

CLIENT FDB Holdings, LLC
PROJECT NAME Market Street Center
PROJECT NUMBER G20-22-022
PROJECT LOCATION NWC Hwy 150 and Hwy 291, Lee's Summit, MO
DATE STARTED 4/19/22 **COMPLETED** 4/19/22
GROUND ELEVATION **HOLE SIZE** 4 inches
DRILLING CONTRACTOR KCTE
GROUND WATER LEVELS:
DRILLING METHOD 4 SS
AT TIME OF DRILLING ---
LOGGED BY CR **CHECKED BY**
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

Depth	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOWS (N COUNT)	RECOVERY % (RQD)	UNCONF COMPR. (psf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	Pocket Pen. (tsf)
0.0		**TOPSOIL**										
		FILL										
		FILL, Stiff dark brown clay- damage sample no unconfined	ST 2		75			26.5				
2.5												
		FILL, Stiff dark brown clay - damage sample no unconfined	ST 1		50							2.75
5.0												

Bottom of borehole at 6.0 feet.

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BORING NUMBER B-13

CLIENT FDB Holdings, LLC
PROJECT NAME Market Street Center
PROJECT NUMBER G20-22-022
PROJECT LOCATION NWC Hwy 150 and Hwy 291, Lee's Summit, MO
DATE STARTED 4/15/22 **COMPLETED** 4/15/22
GROUND ELEVATION _____ **HOLE SIZE** 4 inches
DRILLING CONTRACTOR KCTE
GROUND WATER LEVELS:
DRILLING METHOD 4 SS
AT TIME OF DRILLING ---
LOGGED BY CR **CHECKED BY** _____
AT END OF DRILLING ---
NOTES _____
AFTER DRILLING ---

Depth	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOWS (N COUNT)	RECOVERY % (RQD)	UNCONF COMPR. (psf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	Pocket Pen. (tsf)
0.0		**TOPSOIL**										
		FILL										
		FILL, Stiff dark brown clay	ST 1		31	2705	100	23.6				2.75
2.5												
		FILL, Stiff dark brown clay	ST 2		42	3995	99	26.1				4
5.0												

Bottom of borehole at 6.0 feet.

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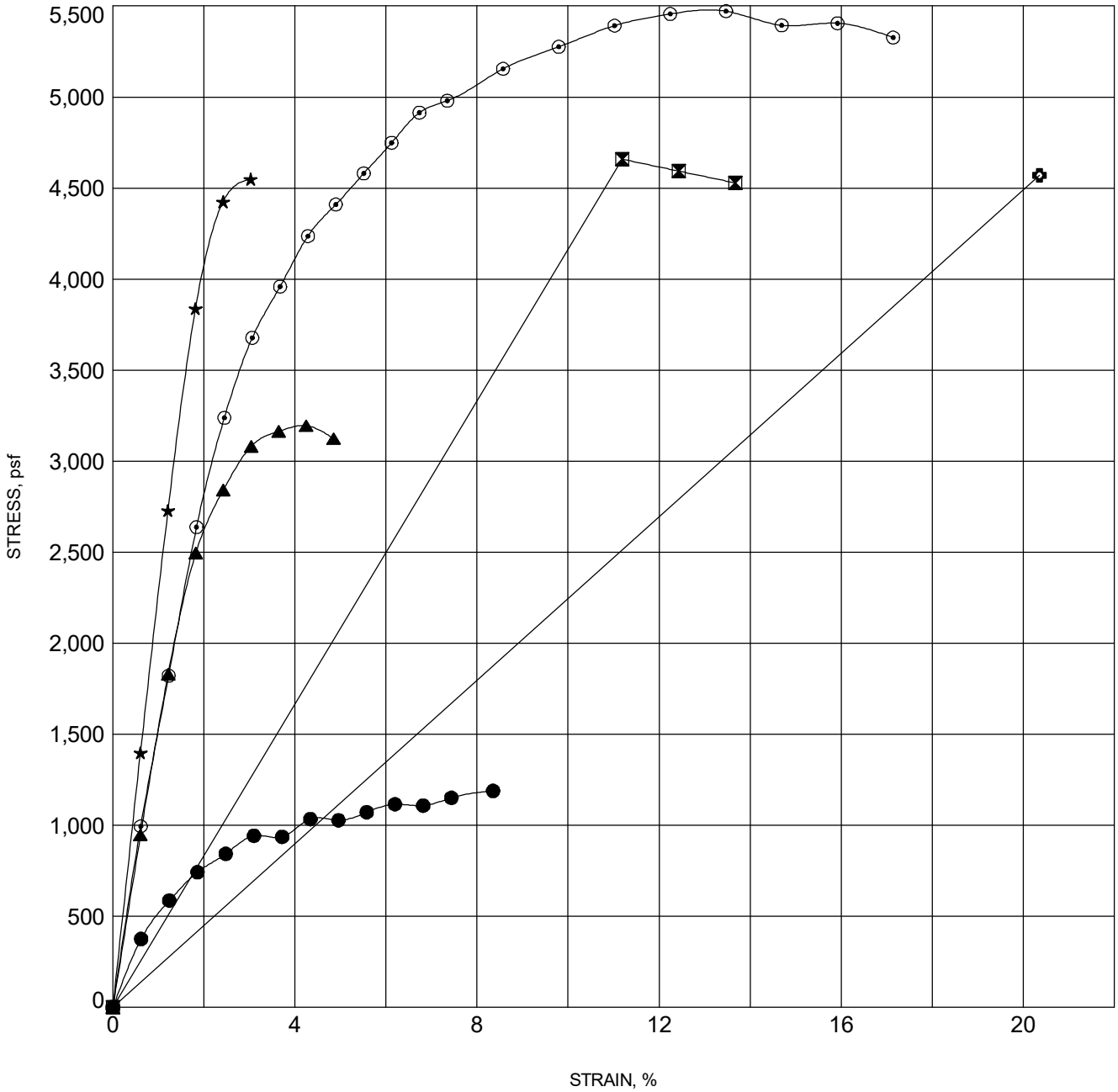
UNCONFINED COMPRESSION TEST

CLIENT FDB Holdings, LLC **PROJECT NAME** Market Street Center

PROJECT NUMBER G20-22-022 **PROJECT LOCATION** NWC Hwy 150 and Hwy 291, Lee's Summit, MO



BOREHOLE		DEPTH	Classification	γ_d	MC%
●	B-1	1.0		95	27
⧓	B-1	4.0		99	24
▲	B-1	8.0		91	33
★	B-1	13.0		101	25
⊙	B-2	4.0		103	22
✿	B-2	8.0		94	28

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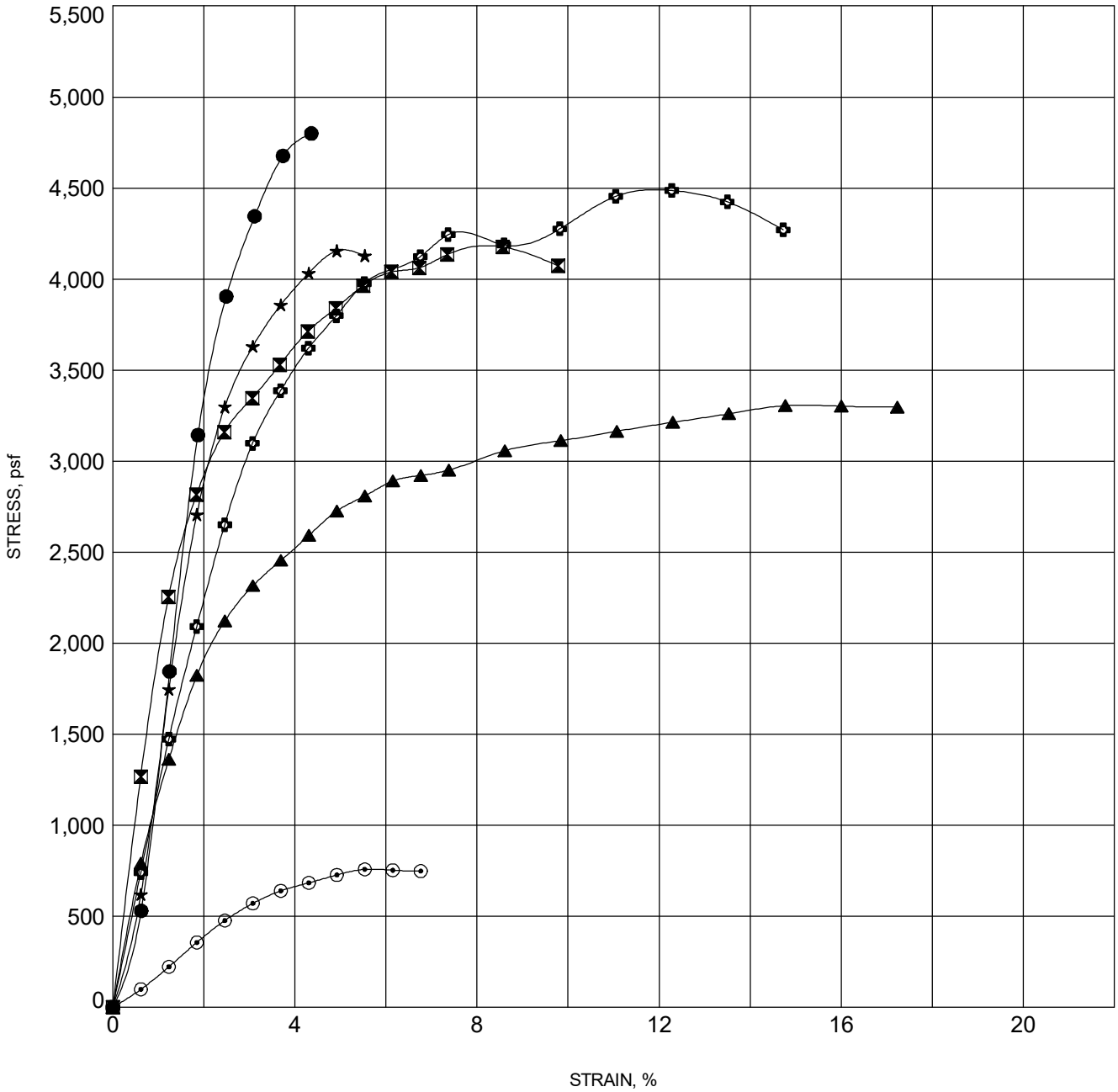
UNCONFINED COMPRESSION TEST

CLIENT FDB Holdings, LLC **PROJECT NAME** Market Street Center

PROJECT NUMBER G20-22-022 **PROJECT LOCATION** NWC Hwy 150 and Hwy 291, Lee's Summit, MO



BOREHOLE		DEPTH	Classification	γ_d	MC%
●	B-2	13.0		101	26
⊠	B-3	1.0		93	29
▲	B-3	4.0		93	28
★	B-3	8.0		97	29
⊙	B-4	1.0		23	26
✿	B-4	4.0		95	27

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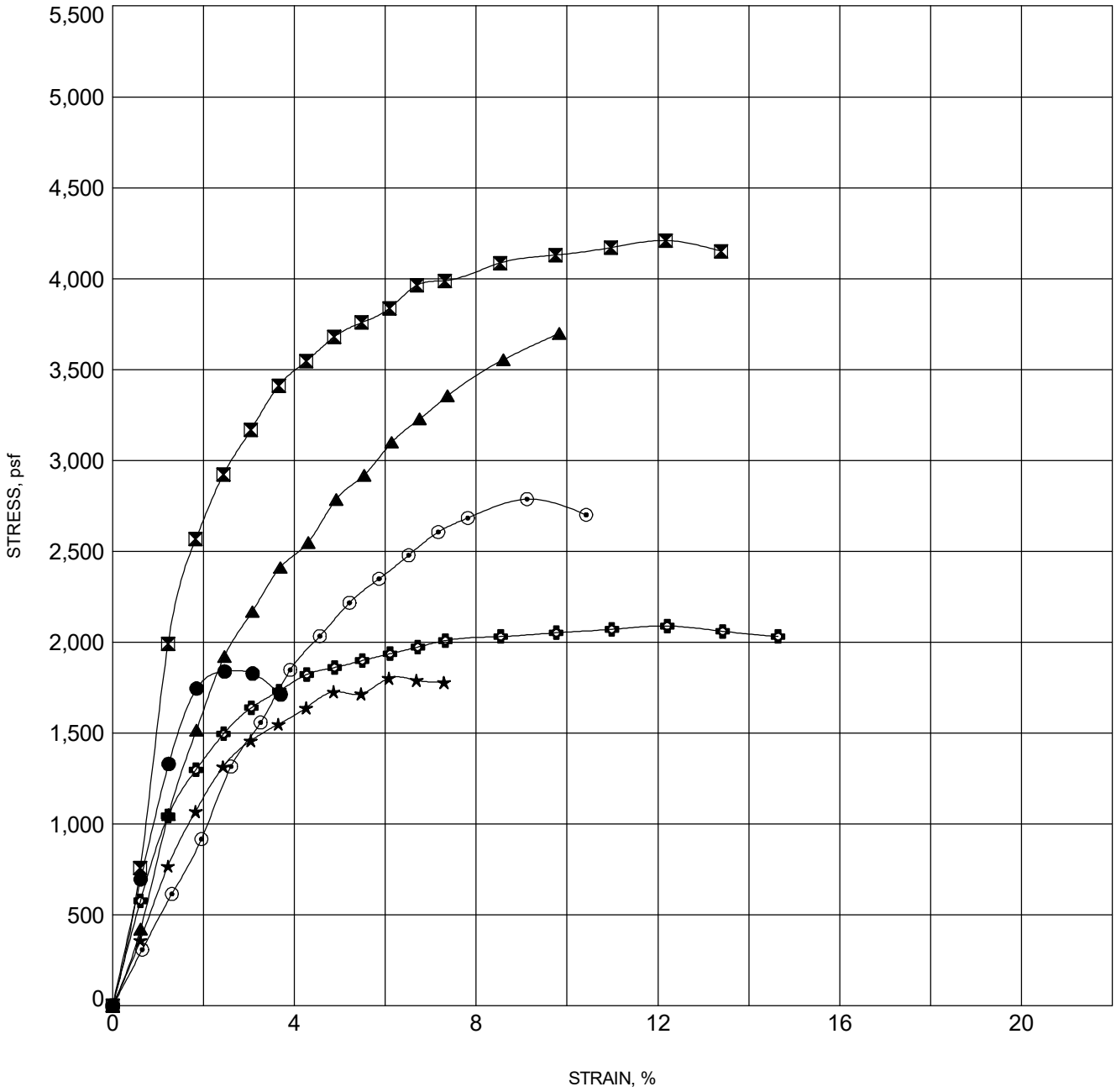
UNCONFINED COMPRESSION TEST

CLIENT FDB Holdings, LLC **PROJECT NAME** Market Street Center

PROJECT NUMBER G20-22-022 **PROJECT LOCATION** NWC Hwy 150 and Hwy 291, Lee's Summit, MO



	BOREHOLE	DEPTH	Classification	γ_d	MC%
●	B-4	8.0		94	29
⊠	B-5	4.0		97	26
▲	B-6	4.0		97	25
★	B-7	1.0		97	27
⊙	B-7	4.0		90	27
✿	B-8	4.0		94	30

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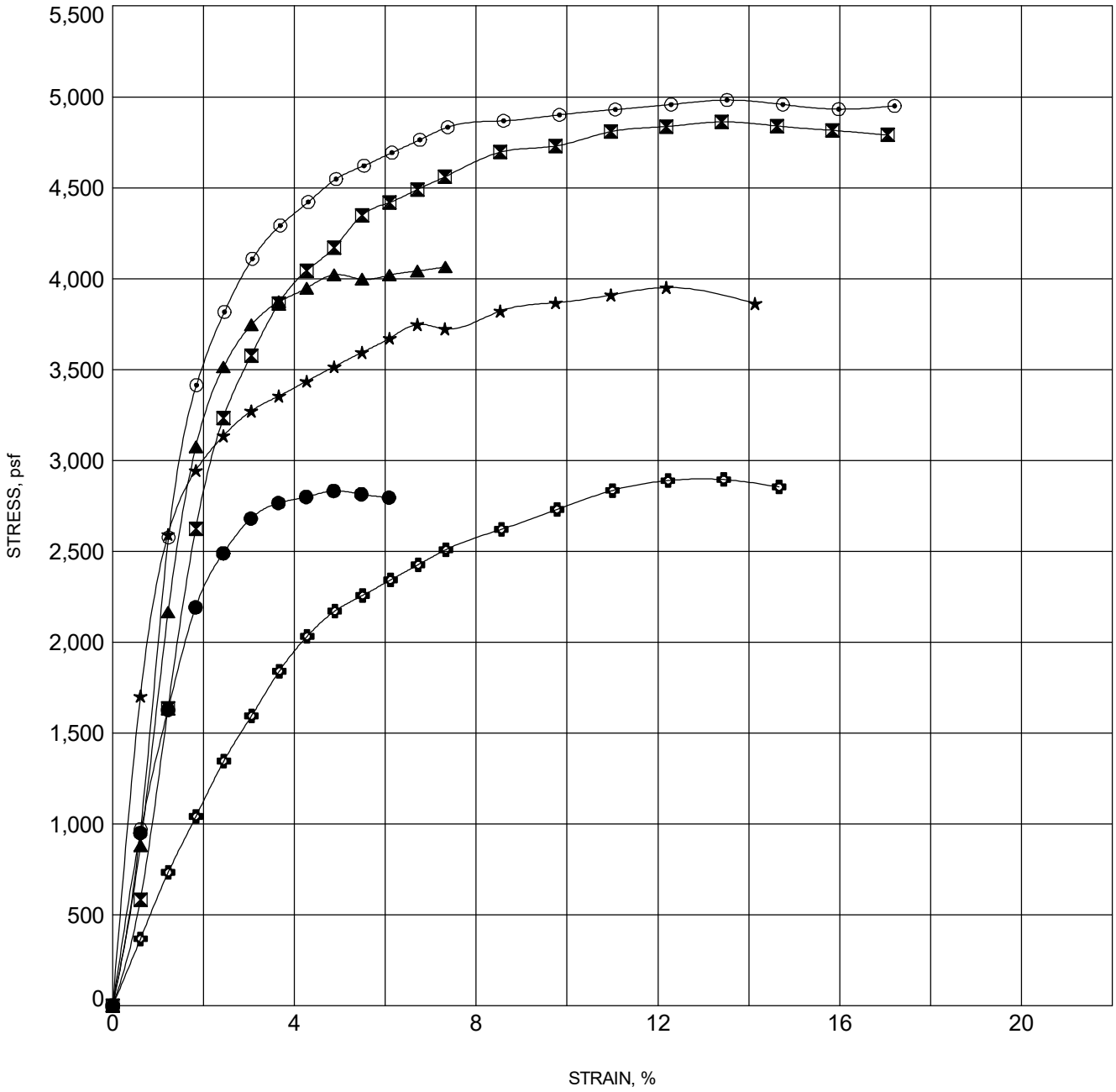
UNCONFINED COMPRESSION TEST

CLIENT FDB Holdings, LLC **PROJECT NAME** Market Street Center

PROJECT NUMBER G20-22-022 **PROJECT LOCATION** NWC Hwy 150 and Hwy 291, Lee's Summit, MO



	BOREHOLE	DEPTH	Classification	γ_d	MC%
●	B-8	13.0		90	32
⊠	B-9	4.0		97	26
▲	B-9	8.0		92	31
★	B-10	4.0		90	29
⊙	B-10	8.0		19	28
✿	B-11	1.0		101	24

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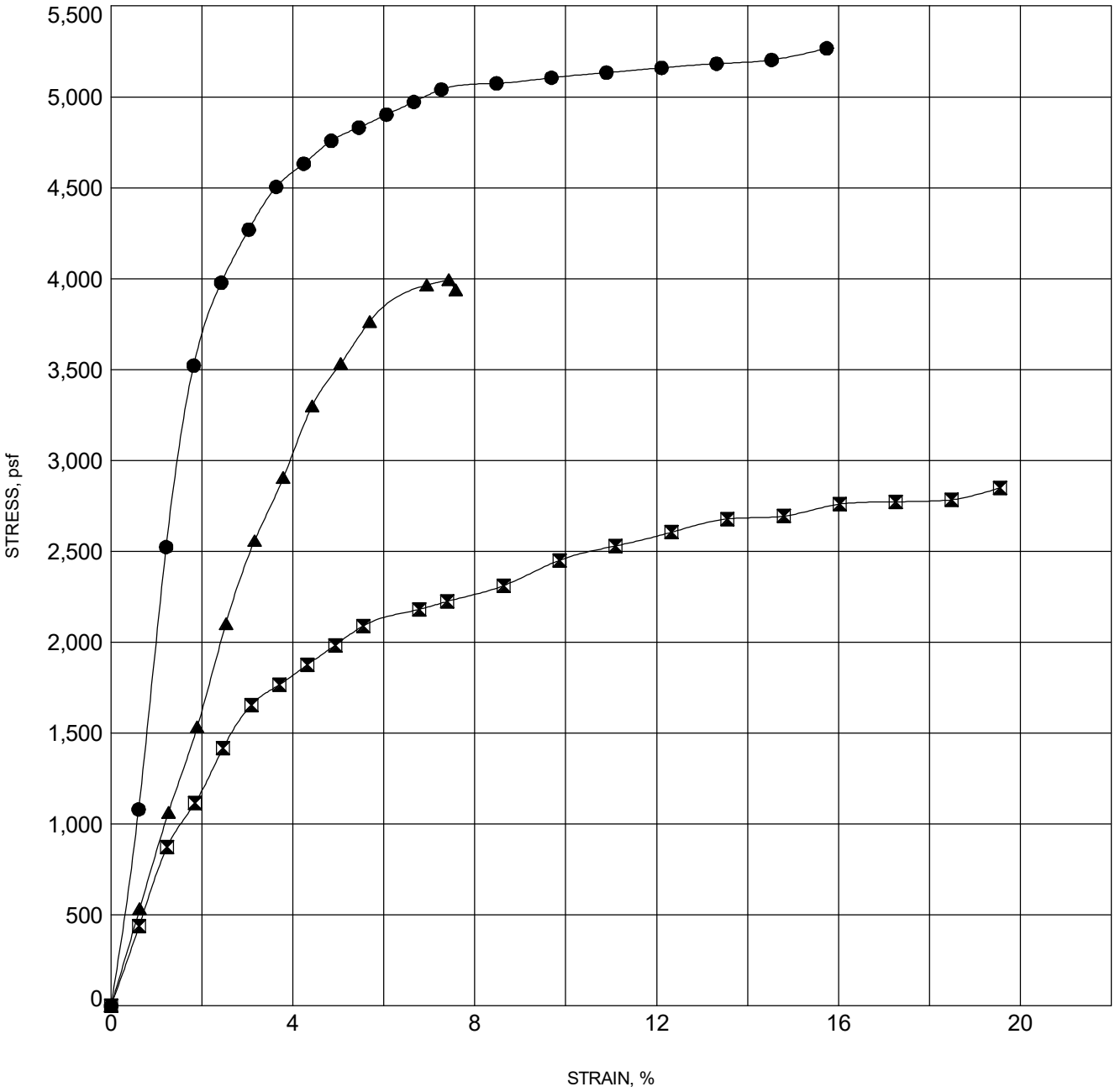
UNCONFINED COMPRESSION TEST

CLIENT FDB Holdings, LLC
PROJECT NAME Market Street Center
PROJECT NUMBER G20-22-022
PROJECT LOCATION NWC Hwy 150 and Hwy 291, Lee's Summit, MO



	BOREHOLE	DEPTH	Classification	γ_d	MC%
●	B-11	4.0		101	22
⊠	B-13	1.0		100	24
▲	B-13	4.0		99	26

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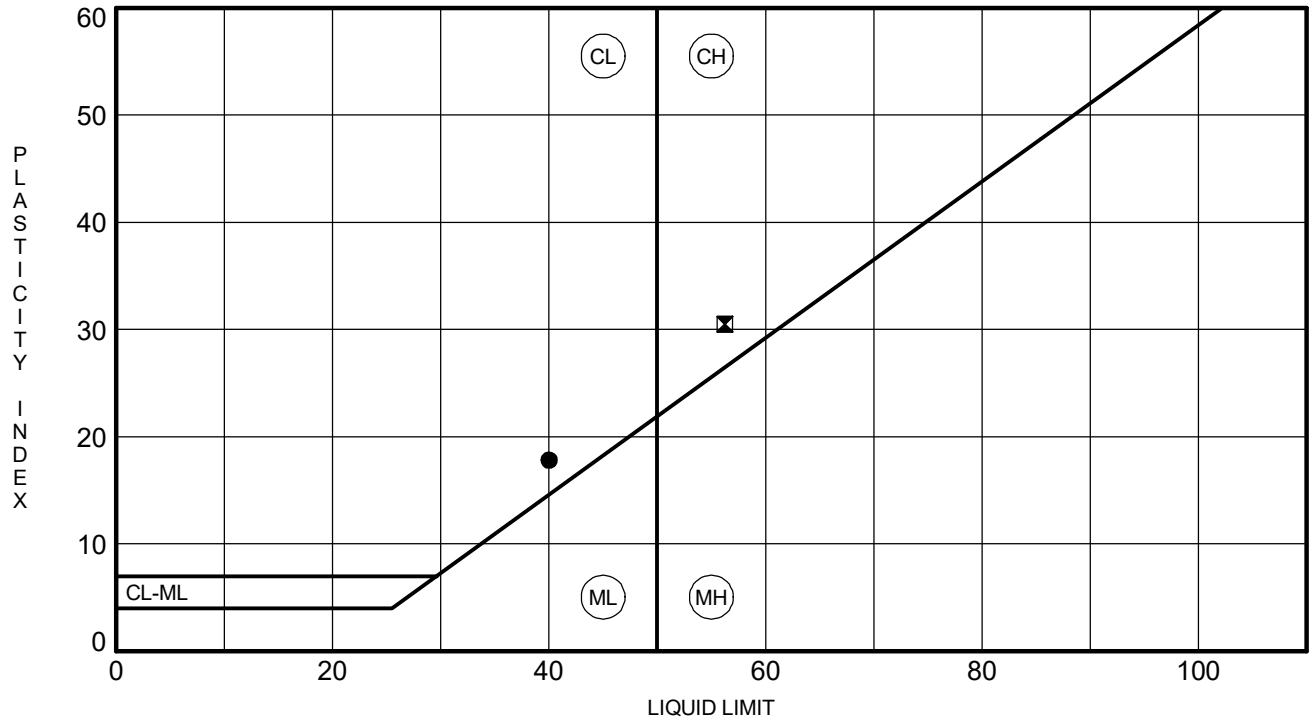
ATTERBERG LIMITS' RESULTS

CLIENT FDB Holdings, LLC **PROJECT NAME** Market Street Center

PROJECT NUMBER G20-22-022 **PROJECT LOCATION** NWC Hwy 150 and Hwy 291, Lee's Summit, MO



	BOREHOLE	DEPTH	LL	PL	PI	Fines	Classification
●	**B-2**	**4.0**	**40**	**22**	**18**		
⊠	**B-3**	**1.0**	**56**	**26**	**30**		

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APPENDIX C

General Comments and Soil Classifications

General Notes

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DRILLING NOTES

DRILLING AND SAMPLING SYMBOLS

AS	Auger Sample
CS	Continuous Sampler
HA	Hand Auger
HS	Hollow Stem Auger
PA	Power Auger
CF	Continuous Flight Auger
WB	Wash Bore
RB	Rock Bit
SS*	Split Spoon
ST	Shelby Tube

* The Standard Penetration Test (SPT) is conducted in conjunction with the split-spoon sampling procedure. The "N" value corresponds to the number of blows required to drive the the last 1 foot of an 18-inch-long, 2-inch O.D. split-spoon sampler with a 140-lb hammer falling a distance of 30 inches. The Standard Penetration Test is carried out according to ASTM D 1586.

WATER LEVEL MEASUREMENTS

ATD	At Time of Drilling
EOD	End of Drilling
AD	After Drilling

SOIL PROPERTIES & DESCRIPTIONS

TEXTURE

PARTICLE	*SIZE*
Clay	<0.002 mm
Silt	<#200 Sieve
Sand	#4 to #200 Sieve
Gravel	3 inch to #4 Sieve
Cobbles	12 inch to 3 inch
Boulders	> 12 inch

COMPOSITION

SAND & GRAVEL	
trace	< 15%
with	15% - 29%
some	> 30%
FINES (clay & silt)	
trace	< 5%
with	5% - 12%
some	> 12%

Soil descriptions are based on the Unified Soil Classification System (USCS) as outlined in ASTM D 2487 and D 2488. The USCS group symbol on the boring logs corresponds to the group names listed below. The descriptions include soil constituents, consistency or relative density, color and other appropriate descriptive terms. Geologic description of bedrock, when encountered, also is shown in the description column.

COHESIVE SOILS

CONSISTENCY	*UNCONFINED COMPRESSIVE STRENGTH* (psf)	(kPa)
Very Soft	< 500	< 24
Soft	500-1000	24-48
Medium Stiff	1001-2000	49-96
Stiff	2001-4000	97-192
Very Stiff	4001-8000	193-383
Hard	> 8001	> 384

PLASTICITY	Liquid Limit, %
Lean	< 45
Lean to Fat	45 - 49
Fat	> 50

COHESIONLESS SOILS

RELATIVE DENSITY	*N VALUE*
Very Loose	0 - 3
Loose	4 - 9
Medium Dense	10 - 29
Dense	30 - 49
Very Dense	> 49

BEDROCK PROPERTIES & DESCRIPTIONS

ROCK QUALITY DESIGNATION (RQD**)

QUALITY	*RQD, %*
Very Poor	0-25
Poor	25-50
Fair	50-75
Good	75-90
Excellent	90-100

**RQD is defined as the total length of sound core pieces, 4 inches (102 mm) or greater in length, expressed as a percentage of the total length cored. RQD provides an indication of the integrity of the rock mass and relative extent of seams and bedding planes.

DEGREE OF WEATHERING

Slightly Weathered	Slight decomposition of parent material.
Weathered	Well developed and decomposed.
Highly Weathered	Highly decomposed, may be extremely broken.

SOLUTION AND VOID CONDITIONS

Solid	Contains no voids.
Vuggy	Containing small cavities < 1/2 " (13mm)
Porous	Containing numerous voids, may be interconnected.
Cavernous	Containing cavities, sometime large.

When classification of bedrock materials has been estimated from disturbed samples, core samples and petrographic analysis may reveal other rock types.

HARDNESS & DEGREE OF CEMENTATION

LIMESTONE	
Hard	Difficult to scratch with knife.
Moderately Hard	Scratch with knife but not fingernail.
Soft	Can be scratched with fingernail.
SHALE	
Hard	Scratch with knife but not fingernail.
Moderately hard	Can be scratched with fingernail.
Soft	Can be molded easily with fingers.
SANDSTONE	
Well Cemented	Capable of scratching with a knife.
Cemented	Can be scratched with knife.
Poorly Cemented	Can be broken easily with fingers.

BEDDING CHARACTERISTICS

TERM	*THICKNESS, INCHES (MM)*
Very Thick Bedded	> 36 (915)
Thick Bedded	12-36 (305-915)
Medium Bedded	4-12 (102-305)
Thin Bedded	1-4 (25-102)
Very Thin Bedded	0.4-1 (10-25)
Laminated	0.1-0.4 (2.5-10)
Thinly Laminated	< 0.1 (<2.5)

Bedding Planes - Planes dividing layers, beds or strata of rocks.
Joint - Fracture in rock, usually vertical or transverse to bedding.
Seam - Applies to bedding plane with unspecified weathering.

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CLASSIFICATION OF SOILS FOR ENGINEERING PURPOSES

ASTM Designation: D 2487 – 11

(Based on Unified Soil Classification System)

MAJOR DIVISIONS				GROUP SYMBOL	GROUP NAME
Coarse-Grained Soils More than 50% retained on No. 200 sieve	Gravels More than 50% coarse fraction retained on No. 4 sieve	Clean Gravels Less than 5% fines	$Cu \geq 4$ and $1 \leq Cc \leq 3^E$	GW	Well graded gravel [F]
			$Cu < 4$ and/or $1 > Cc > 3^E$	GP	Poorly graded gravel [F]
		Gravels with Fines More than 12% fines	Fines classify as ML or MH	GM	Silty gravel [F G H]
			Fines classify as CL or CH	GC	Clayey gravel [F G H]
	Sands 50% or more of coarse faction passes No. 4 sieve	Clean Sands Less than 5% fines	$Cu \geq 6$ and $1 \leq Cc \leq 3^E$	SW	Well-graded sand [I]
			$Cu < 6$ and/or $1 > Cc > 3^E$	SP	Poorly graded sand [I]
		Sands with Fines More than 12% fines	Fines classify as ML or MH	SM	Silty Sand [G H I]
			Fines classify as CL or CH	SC	Clayey sand [G H I]
Fine-Grained Soils 50% or more passes the No. 200 sieve	Silts and Clays Liquid limit less than 50	Inorganic	PI > 7 and plots on or above "A" line	CL	Lean clay [K L M]
			PI < 4 or plots below "A" line	ML	Silt [K L M]
		Organic	$\frac{\text{Liquid limit – oven dried}}{\text{Liquid limit – not dried}} < 0.75$	OL	Organic clay [K L M N] Organic silt [K L M O]
	Silts and Clays Liquid limit 50 or more	Inorganic	PI plots on or above "A" line	CH	Fat clay [K L M]
			PI plots below "A" line	MH	Elastic silt [K L M]
		Organic	$\frac{\text{Liquid limit – oven dried}}{\text{Liquid limit – not dried}} < 0.75$	OH	Organic clay [K L M O] Organic silt [K L M O]
Highly organic soils	Primarily organic matter, dark in color, and organic odor			PT	Peat

[A] Based on the material passing the 3-in. (75-mm) sieve.

[B] If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.

[C] Gravels with 5 to 12% require dual symbols:
GW-GM well-graded gravel with silt
GW-GC well-graded gravel with clay
GP-GM poorly graded gravel with silt
GP-GC poorly graded gravel with clay

[D] Sands with 5 to 12% fines require dual symbols:
SW-SM well-graded sand with silt
SW-SC well-graded sand with clay
SP-SM poorly graded sand with silt
SP-SC poorly graded sand with clay

[E] $Cu = D_{60}/D_{10}$ $Cc=(D_{30})^2 / (D_{10} \times D_{90})$

[F] If soil contains ≥15% sand, add "with sand" to group name.

[G] If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.

[H] If fines are organic, add "with organic fines" to group name.

[I] If soil contains ≥15% gravel, add "with gravel" to group name.
If soil contains ≥ 15% gravel, add "with gravel" to group name.

[J] If Atterberg limits plot in hatched area, soil is a CL-ML, silty clay.

[K] If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel", whichever is predominant.

[L] If solid contains ≥ 30% plus No. 200, predominantly sand, add "sandy" to group name.

[M] If soil contains ≥ 30% plus No. 200, predominantly gravel, add "gravelly" to group name.

[N] PI ≥ 4 and plots on or above "A" line.

[O] PI < 4 or plots below "A: line.

[P] PI plots on or above "A: line.

[Q] PI plots below "A: line.