SUBSURFACE EXPLORATION REPORT

PROPOSED APARTMENT COMPLEX
LEE'S SUMMIT, MISSOURI

Project No. 1185020
May 10, 2018

Prepared for:

CASE & ASSOCIATES PROPERTIES, INC.
Tulsa, Oklahoma

Prepared by:

BELONGIA CONSULTANTS INC.
Broken Arrow, Oklahoma
and
E & E ENGINEERING & ASSOCIATES, LLC

BELONGIA CONSULTANTS, INC.

2145 W. Concord Circle
Broken Arrow, OK 74012
dlbelongia@peoplepc.com
(918) 251-5500

May 10, 2018

Case & Associates Properties, Inc.
4200 E. Skelly Drive, Suite 800
Tulsa, Oklahoma 74135

Attention: Mr. Justin W Dixon

Re: Subsurface Exploration
Proposed Apartments
Lee's Summit, Missouri
Project No.1185020

Dear Mr. Dixon:

Because of the variation in subsurface conditions and the presence of low strength, high plasticity clay soils at the site, we recommend the structures be supported on post-tensioned slab foundations. Based on site grades, some cutting and filling will likely be required to develop grades. Thus, post-tensioned slab foundations could potentially bear in new engineered fill, natural lean to fat and fat clay. Very low strength clay soils were encountered at the site to depths ranging from 2 to 2.5 feet. These materials are not suitable for supporting foundations and new fill and will need to be overexcavated and replaced with engineered compacted fill. Alternately, the low strength clay soils could be stabilized full depth with a sufficient amount of cement kiln dust to facilitate compaction. Shallow foundations and on-grade slabs would be subject to some differential movement due to consolidation and shrinking/swelling of the bearing materials. Because of the variation in subgrade soils, subgrade improvement procedures will be required beneath pavements to improve pavement support. Specific recommendations regarding the design and construction of foundations and the support of floor slabs and pavements, as related to the subsurface conditions encountered in the borings, are provided below.

If you have any questions regarding the contents of this report or if we can be of further service, please do not hesitate to contact us.

Sincerely,
BELONGIA CONSULTANTS INC

David L. Belongia, P.E.
Project Manager

E & E ENGINEERING & ASSOCIATES, LLC

Turgay M. Ertugrul, P.E
Missouri No. E-26701

STATE OF MISSOURI TURGAY MEHMET ERTUGRUL NUMBER E-26701 REGISTERED PROFESSIONAL ENGINEER

Copies To: Addressee (1)
Architects Collective (1)

TABLE OF CONTENTS

Page

Letter of Transmittal i

INTRODUCTION 1

SUBSURFACE EXPLORATION PROCEDURES 1

LABORATORY TESTING PROGRAM 2

SITE AND SUBSURFACE CONDITIONS 3

GROUNDWATER CONDITIONS 9

ANALYSIS AND RECOMMENDATIONS 4

- Geotechnical Considerations 4
- General Site Preparation and Grading 4
- Post-Tensioned Slab Foundations 6
- Pavements 7
- Construction Considerations 9

GENERAL COMMENTS 10

APPENDIX A

- Boring Location Diagram
- Boring Logs

APPENDIX B

- General Notes
- Unified Soil Classification System

SUBSURFACE EXPLORATION

PROPOSED APARTMENT COMPLEX
LEE'S SUMMIT, MISSOURI

Project No. 1185020
May 10, 2018

INTRODUCTION

This report presents the results of the subsurface exploration performed for the proposed apartment complex to be constructed north of Highway 50 in Lee's Summit, Missouri. Thirty eight soil borings extending to depths ranging from about 6.5 to 15 feet were drilled as part of our exploration. The results of the borings and a diagram showing the approximate locations of the borings are attached.

The project involves constructing twelve, four story apartment buildings, thirteen, two story, garage/apartment buildings, a clubhouse and a pool. In addition, paved parking and drive areas will be constructed around the buildings.

Foundation loads are unknown; however, we anticipate maximum isolated column and continuous wall loads will be less than 80 kips and 3 kips per lineal foot, respectively. Floor loads are expected to be light. Final grades are unknown, however, we anticipate only minor cutting and filling will be required to develop final grades.

The purpose of this report is to describe the subsurface conditions encountered in the borings; analyze the data obtained and provide recommendations regarding the design and construction of foundations and the support of floor slabs and pavements, relative to the subsurface conditions encountered in the borings.

SUBSURFACE EXPLORATION PROCEDURES

A total of thirty eight exploratory borings were drilled for the project. The borings were located in the field based on GPS coordinates programed into a hand held device. The boring locations should be considered accurate only to the degree implied by the methods used to locate them.

The borings were drilled with a rubber tired, all-terrain drill rig using continuous hollow stem to advance the borings. Representative soil samples were obtained using the split-barrel sampling procedure in general accordance with the appropriate ASTM standard.

Disturbed samples were obtained in the split-barrel sampling procedure by driving a 2-inch O.D. split-barrel sampling spoon into the ground using a 140-pound, automatic hammer falling 30 inches. The number of blows required to advance the sampler were recorded in the field and are shown on the boring logs as the standard penetration resistance (N) value. The number of blows required to advance the sampling spoon the final 12 inches or less of a standard 18-inch sampling interval indicate the in-place relative density of granular soils and, to a lesser degree of accuracy, the consistency of cohesive soils and the hardness of weathered bedrock.

A greater mechanical efficiency is achieved with the automatic hammer, compared to the conventional safety hammer operated with a cathead and rope. The effect of this increased efficiency has been considered in interpreting the standard resistance values.

Soil samples obtained in the field were sealed and returned to the laboratory for further examination, testing, and classification.

During the drilling operation, field logs were prepared by the drill crew. These logs report drilling and sampling methods, sampling intervals, soil and groundwater conditions, and the driller's visual evaluation of the conditions encountered between samples. The final boring logs, included in this report, have been prepared based on the driller's field logs and have been modified, where appropriate, based on the results of the laboratory observation and testing.

LABORATORY TESTING PROGRAM

Moisture content and, where applicable, calibrated hand penetrometer tests were performed on the split-barrel samples. Additionally, Atterberg limits, washed sieve analysis and hydrometer tests were performed on selected samples. The calibrated hand penetrometer test provides an approximation of the unconfined compressive strength of a cohesive soil. The Atterberg limits indicate the plasticity of a cohesive soil and are used to approximate the soil's potential for volume change with variation in moisture content. The washed sieve analysis and hydrometer tests were used to aid in classification and determine per cent clay. The laboratory test results are shown on the boring logs or attached data sheets.

The soil samples were examined in the laboratory by an experienced geotechnical engineer and classified based on the soil's texture and plasticity in accordance with the attached General Notes and Unified Soil Classification System. The estimated Unified System group symbols are shown on the boring logs. A brief description of the Unified System is attached to this report. Bedrock materials were classified in accordance with the attached General Notes and described using commonly accepted geotechnical terminology. Petrographic analysis may reveal other rock types.

SITE AND SUBSURFACE CONDITIONS

The proposed apartment complex is to be located north of Highway 50 in Lee's Summit, Missouri. At the time the borings were drilled, the site was a grass covered vacant field with a few trees. A small pond is located on the property. Based on the topographic map provided, the ground surface slopes downward from southwest to northeast with about 20 feet of relief across the site.

The subsurface conditions encountered in borings are shown on the attached boring logs and are briefly described below. The stratification lines shown on the logs represent the approximate boundary between soil and rock types; in-situ, the transition between materials may be gradual and indistinct.

About 6 to 8 inches of surface vegetation and topsoil was encountered at the boring locations. The topsoil was underlain by dark brown, soft to very soft, lean to fat clay and fat clay, which extended to depths ranging from about 2 to 2.5 feet. Typically, the low strength clay was underlain by brown, medium stiff to stiff, lean to fat and fat clay with varying amounts of silt, sand and gravel. The clay overburden soil was generally underlain by limestone, sandstone and shale bedrock. The bedrock materials were encountered at depths ranging from 8.5 to 14 feet below the existing ground surface. At several locations, auger refusal was encountered in the limestone sandstone at depths ranging from 9 to 13 feet below the existing ground surface.

GROUNDWATER CONDITIONS

Groundwater level observations made while drilling and immediately after completion of the borings are shown in the lower left corner of the boring logs. Water was encountered at some of the boring locations at depths ranging from about 8 to 10 feet below the existing ground surface.

The groundwater level observations made during our exploration provide an indication of the groundwater conditions at the time the borings were drilled. Longer monitoring in piezometers or cased holes would be required to evaluate long-term groundwater conditions. Fluctuations in perched and long-term groundwater levels should be expected throughout the years depending upon variations in the amount of rainfall, runoff, evaporation, and other hydrological conditions not apparent at the time the borings were drilled.

ANALYSIS AND RECOMMENDATIONS

Geotechnical Considerations

Because of the variation in subsurface conditions and the presence of low strength, high plasticity clay soils at the site, we recommend the structures be supported on post-tensioned slab foundations. Based on site grades, some cutting and filling will likely be required to develop grades. Thus, post-tensioned slab foundations could potentially bear in new engineered fill, natural lean to fat and fat clay.

Very low strength clay soils were encountered at the site to depths ranging from 2 to 2.5 feet. These materials are not suitable for supporting foundations and new fill and will need to be overexcavated and replaced with engineered compacted fill. Alternately, the low strength clay soils could be stabilized full depth with a sufficient amount of cement kiln dust to facilitate compaction. Close observation and testing should be performed to verify that foundations are supported on suitable materials. Shallow foundations and on-grade slabs would be subject to some differential movement due to consolidation and shrinking/swelling of the bearing materials.

Because of the variation in subgrade soils, subgrade improvement procedures will be required beneath pavements to improve pavement support.

Specific recommendations regarding the design and construction of foundations and the support of floor slabs and pavements, as related to the subsurface conditions encountered in the borings, are provided below.

General Site Preparation and Grading

The recommendations presented below apply to general site preparation and grading for the structures, pavement areas, and any other areas where structural fills will be constructed.

Additional recommendations specific to foundations, floor slabs and pavements are discussed in their respective report sections.

Areas to be graded should be stripped of all surface vegetation and topsoil. Prior to placing any fill, the subgrade exposed after completing any required cuts should be proofrolled with a fully-loaded dump truck, scraper, or other rubber-tired construction equipment weighing at least 25 tons to evaluate the presence of any unstable soils. Also, during the proofrolling, close observation and testing should be performed to evaluate the presence of any low strength soils that are unsuitable for supporting new fill and foundations. Any low strength and/or unstable soils should be overexcavated full-depth and replaced with approved, engineered fill if they cannot be stabilized in place. As discussed above, overexcavation depths of about 2 to 2.5 feet will be required to encounter suitable bearing materials.

A small pond is located on the property. Care should be taken to remove all loose and soft sediments from the bottom of the pond.

After proofrolling and performing any required overexcavations, the exposed subgrade should be scarified to a depth of at least 9 inches, moisture conditioned to a level ranging from 0 to 4 percentage points above the material's optimum moisture content, and compacted to at least 95 percent of the material's maximum laboratory dry density determined in accordance with the standard Proctor procedure, ASTM D-698.

Off-site fill should consist of approved, low plasticity material having a plasticity index of 8 to 18 or less and containing at least 20 percent fines (material passing the No. 200 sieve, based on dry weight). All materials proposed for use as fill should be tested and approved before their use to verify their suitability. Fill materials should also be free of organic matter and debris, and contain a maximum rock size of about 3 inches.

Fill should be placed in loose lifts not exceeding 9 inches in thickness, at a moisture content equal to or slightly above the material's optimum moisture content, and compacted to at least 95 percent of the material's maximum laboratory dry density, determined in accordance with ASTM D-698. Engineered fill placed beneath foundations should extend laterally beyond all sides of the foundation at least 8 inches for each 12-inch thickness of fill placed below the bearing level.

The recommended moisture content should be maintained in the scarified and compacted zone and fills, until fills are completed and foundations, floor slabs, and pavements are constructed.

During fill construction, quality control observation and testing should be performed by a geotechnical engineer or qualified person to verify that the fills are properly constructed.

Care should be taken in design and construction to develop and maintain rapid, positive drainage away from buildings and pavement areas. In addition to sloping the ground surface away from these areas, establishing proper drainage in landscape areas adjacent to the buildings and pavements and discharging roof drainage away from the buildings and pavements would reduce the potential for moisture fluctuations in the floor slab and pavement subgrade soils. Planters located within 10 feet of the structure should be self contained or include drainage systems to prevent water from accessing on grade slab subgrade soils.

Post-Tensioned Slab Foundations

Low to very low strength clay soils were encountered at the site to depths ranging from 2 to 2.5 feet. These materials are not suitable for supporting foundations and new fill and will need to be overexcavated and replaced. As discussed previously, the low strength clay soils could be reused if they were mixed with a sufficient amount of cement kiln dust to facilitate compaction. Close observation and testing should be performed to verify that suitable bearing materials have been encountered.

Assuming some cutting and filling will be required to develop final grades and based on the subsurface conditions encountered in the borings, a post-tensioned slab foundation could bear on new engineered fill, natural lean to fat clay and fat clay. A post tensioned slab foundation bearing on a combination of tested and approved materials as described above can be designed using a maximum net allowable total load soil bearing pressure of 2,000 pounds per square foot (psf). The net allowable bearing pressure refers to the pressure at the foundation bearing level in excess of the minimum surrounding overburden pressure. We recommend a Site Class C be used per IBC Code.

Perimeter footings or turned-down edges should extend at least 36 inches below the final adjacent ground surface to provide frost protection.

A post-tensioned slab foundation would be subject to movements due to consolidation of underlying fill and natural soil, and shrinking and swelling of the high plasticity clays. The amount of potential shrinking and swelling will generally depend on the plasticity, thickness, and in-situ moisture and density of the fill materials and natural soils. Differential movements could occur where the foundations are underlain by materials of variable composition and thickness and variable moisture changes occur within the subgrade soils.

Assuming a post-tensioned slab foundation is constructed as recommended in this report, we estimate differential movements should be less than 1 inch. This movement assumes that the on-site soils or recommended off-site fill materials are used to construct the building pads. If it is desired to reduce potential movement, a layer of low plasticity select fill could be constructed beneath the foundation.

The following parameters may be used for design in conjunction with the Post-Tensioning Institute (PTI) design method.

Principal Clay Mineral=Montmorillonite
Thornwaite Moisture Index=+10
Percent Clay=40 percent
Depth to Constant Suction=4 feet
Constant Soil Suction=3.5Pf
Velocity of Moisture Flow=0.7 inch/month
Em Center=4 feet
Em Edge=4 feet

Pavements

Based on the results of the borings and assuming some cuts and fills, the pavement subgrade could consist of new engineered fill, low strength lean to fat clay and fat clay. The clay soils are subject to volume change with variation in moisture content.

Based on the subgrade conditions, we recommend that after completing the proofrolling and any necessary overexcavations, the subgrade soils be treated with a chemical admixture or undercut and replaced with select fill to improve long-term pavement performance.

Because of the high plasticity of the subgrade materials, we recommend the subgrade soil be modified with hydrated or quick lime. Based on previous experience, we estimate minimum

application rates of 5 to 7 per cent hydrated or quick lime, based on the materials compacted dry unit weight, should be adequate to lower the materials plasticity index and improve pavement support. Based on a stabilization depth of 8 inches, the average application rate would be on the order of 40 pounds per square yard. If wet weather conditions occur during construction, deeper stabilization of the near surface clay soils may be required. Lime mixing and compaction should be performed in accordance with MoDOT specifications.

As an alternative to modifying the on-site soils, the subgrade soils could be undercut sufficiently to construct a minimum 10-thick layer of select fill beneath the pavement section. The thickness of select fill does not include the thickness of the aggregate base course in the recommended pavement sections. Also, depending on weather conditions at the time of construction, a greater thickness of select fill may be required. Select fill should consist of an approved, low plasticity material having a plasticity index of 18 or less and containing at least 15 percent fines (material passing the No. 200 sieve, based on dry weight). Select fill materials should be tested to verify that they are suitable and approved prior to their use.

Recommended alternative minimum pavement sections are presented below. The sections are based on a 15-year design life and an untreated subgrade CBR value of 3. Also, these sections assume the light-duty pavements will only be traveled by automobiles, and the heavy-duty pavements will be traveled by no more than 5 trucks per day having a gross weight of 50,000 pounds or equivalent trafficking. If heavier or more frequent truck traffic is expected, the heavy-duty pavement sections should be reviewed and modified, if necessary. Some periodic maintenance should be expected to realize the 15-year life. Other pavement sections could be considered.

	HEAVY-DUTY	**LIGHT-DUTY**
PAVEMENT SECTION I		
(Asphaltic Concrete Over	2.0" Surface Course [1,3]	2.0" Surface Course [1,3]
Treated or Select	4.5" Base [2,3]	3.0" Base [2,3]
Fill Subgrade	8.0" Treated Subgrade	8.0" Treated Subgrade
	or	or
	10.0" Select Fill	10.0" Select Fill

PAVEMENT SECTION II		
(Asphaltic Concrete Over Aggregate Base Over Treated or Select Fill Subgrade)	1.5" Surface Course 1,3 3.5" Base 2,3 4.0" Type 5 Aggregate Base* 8.0" Treated Subgrade* or 10.0" Select Fill	1.5" Surface Course 1,3 2.0" Base 2,3 4.0" Type 5 Aggregate Base* 8.0" Treated Subgrade* or 10.0" Select Fill
PAVEMENT SECTION III		
(3,500 psi Air Entrained Portland Cement Concrete Over Treated or Select Fill Subgrade)	6.0" Concrete 8.0" Treated Subgrade* or 10.0" Select Fill	5.0" Concrete 8.0" Treated Subgrade* or 10.0" Select Fill

1. Asphaltic concrete surface course mixtures should be in accordance with Section 401 of the Missouri Standard Specifications for Highway Construction Surface Course Mix BP-1
2. Asphaltic concrete base mixtures should be in accordance with Section 401 of the Missouri Standard Specifications for Highway Construction Base Mixture
3. http//www.modot.orgbusiness/standards and specs/Sec0401.pdf

*Missouri Department of Transportation Standard Specifications

Because of the heavy concentrated wheel loads and frequent stopping and turning motions of trash collection and delivery trucks, we recommend that the pavements at the trash dumpster area consist of a minimum of 7 inches of reinforced concrete underlain by a treated or select fill subgrade.

Construction Considerations

Low strength clay soils were encountered to depths of about 2 to 2.5 feet at the boring locations. These soils will need to be overexcavated in building areas and, depending on weather conditions at the time of construction, may need to be overexcavated in pavement areas. Close observation and testing should be performed during construction to verify that unsuitable materials have been removed and replaced with approved materials.

Limestone bedrock was encountered at depths as shallow as 8.5 feet. Bedrock materials that can be penetrated with the drill rig flight augers can sometimes be excavated with large, heavy duty, track mounted excavation equipment. Excavations below the depth of auger refusal may require other rock removal techniques. Of course, variations in the depth and hardness of the rock could occur throughout the site.

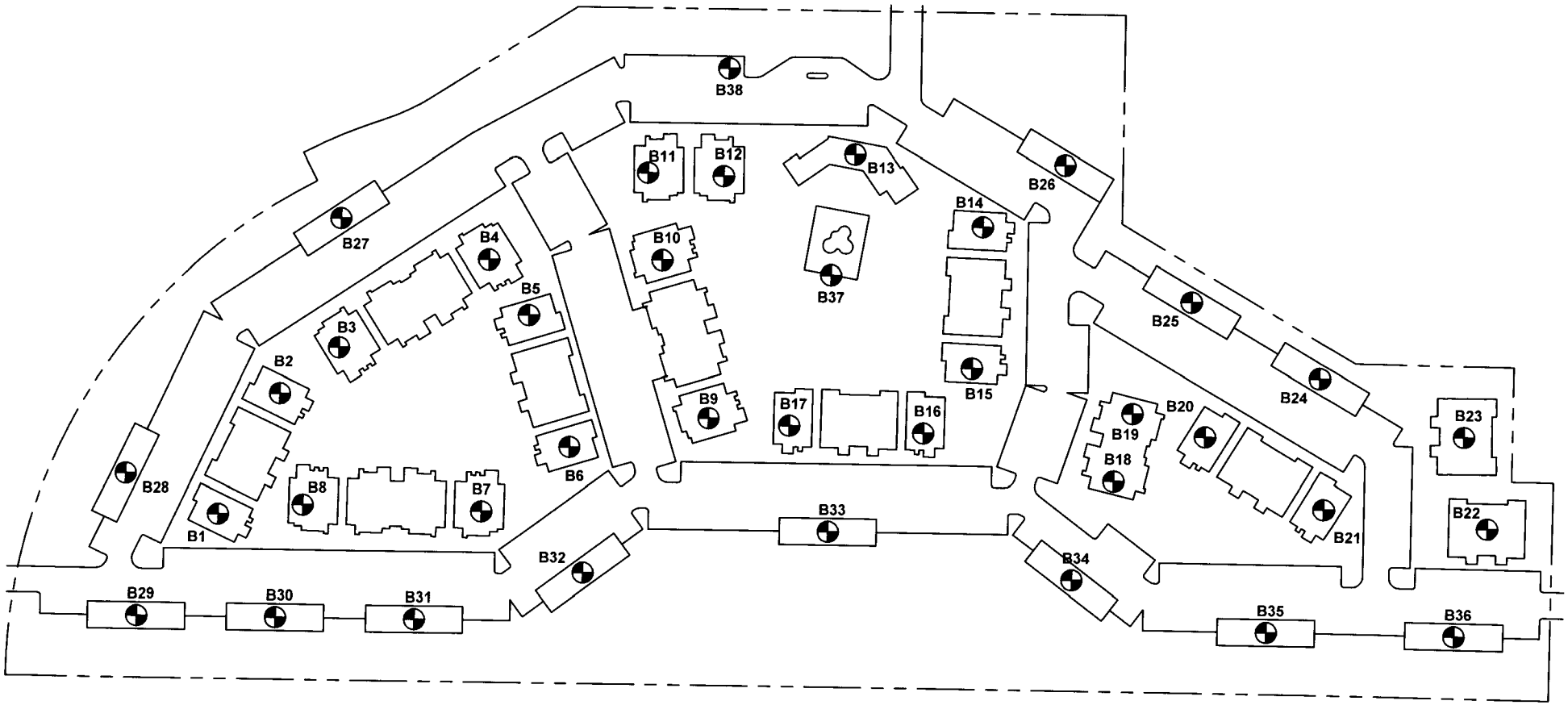
GENERAL COMMENTS

Belongia Consultants, Inc. and E & E Engineering and Associates, LLC should be retained to review the final design plans and specifications so that comments can be made regarding interpretation and implementation of our geotechnical recommendations in the design and specifications.

The analysis and recommendations presented in this report are based upon the data obtained from the borings performed at the indicated locations and from any other information discussed in this report. This report does not reflect any variations which may occur between borings or across the site. The nature and extent of such variations may not become evident until construction. If variations appear, it will be necessary to reevaluate the recommendations of this report.

The scope of services for this project does not include either specifically or by implication any environmental assessment of the site or identification of contaminated or hazardous materials or conditions. If the owner is concerned about the potential for such contamination, other studies should be undertaken.

This report has been prepared for the exclusive use of our client for specific application to the project discussed, and has been prepared in accordance with generally accepted geotechnical engineering practices. No warranties, either express or implied are intended or made. In the event that changes in the nature, design, or location of the project as outlined in this report are planned, the conclusions and recommendations contained in this report shall not be considered valid unless Belongia Consultants Inc. and E & E Engineering and Associates, LLC reviews the changes, and either verifies or modifies the conclusions of this report in writing.



LEGEND

SOIL BORING LOCATION

N

DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

SOIL BORING LOCATION DIAGRAM

PROPOSED APARTMENTS
LEE'S SUMMIT, MISSOURI

Project Mngr: DLB	Belongia Consultants Inc. 2145 W. Concord Circle Broken Arrow, OK 74012	Project No. 01185020
Designed By: DLB		Scale: Not to Scale
Checked By: DLB		Date: MAY 2018
Approved By: DLB		Drawn By: DLB
File Name: 01185020		Figure No: 1

LOG OF BORING NO. B-1

OWNER

ARCHITECT
Architects Collective

SITE
Highway 50
Lee's Summit, Missouri

PROJECT
Proposed Apartment Complex

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY, in.	SAMPLES SPT - N BLOWS / ft.	TESTS WATER CONTENT, %	TESTS DRY UNIT WT pcf	TESTS UNCONFINED STRENGTH, psf	
	8" Topsoil				HS						
	FAT CLAY dark brown, very soft		CH	1	SS	11	4	32.0			S-1 LL=52 PL=26 PI=26
	2										
	FAT CLAY, TRACE SAND brown, reddish-brown and gray		CH	2	SS	17	9	25.7		*2000	S-2 LL=53 PL=22 PI=31
			CH	3	SS	16	10	26.9			
		5	CH	4	SS	16	9	25.4			
					HS						
	8										
	FAT CLAY WITH SAND brown, reddish-brown and gray		CH	5	SS	10	6/6" 50/1"	30.1			
	9.5										
	10 WEATHERED LIMESTONE gray	10			HS						
	Auger Refusal@10'										

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft		
WL	▽ 8' WD	▼
WL	▼	▼
WL		

Belongia Consultants, Inc.

BORING STARTED	4-15-18		
BORING COMPLETED	4-15-18		
RIG	ATV	FOREMAN	DJ
APPROVED	DLB	JOB #	1185020

BOREHOLE 1185020.GPJ BELONGIA 5/9/18

LOG OF BORING NO. B-2

OWNER

ARCHITECT
Architects Collective

SITE
Highway 50
Lee's Summit, Missouri

PROJECT
Proposed Apartment Complex

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY, in.	SAMPLES SPT - N BLOWS / ft.	TESTS WATER CONTENT, %	TESTS DRY UNIT WT pcf	TESTS UNCONFINED STRENGTH, psf
	8" Topsoil				HS					
	FAT CLAY dark brown, very soft		CH	1	SS	4	2	37.1		
	2									
	FAT CLAY, TRACE GRAVEL brown, reddish-brown and gray		CH	2	SS	10	6	27.8		*1500
			CH	3	SS	16	7	30.7		*2000
		5	CH	4	SS	16	9	29.6		
					HS					
	8.5									
	9 WEATHERED LIMESTONE gray			5	SS	1	50/2"	11.4		
	Auger Refusal@9'				HS					

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft		
WL	▽ None WD	▼
WL	▽	▼
WL		

Belongia Consultants, Inc.

BORING STARTED			4-15-18
BORING COMPLETED			4-15-18
RIG	ATV	FOREMAN	DJ
APPROVED	DLB	JOB #	1185020

BOREHOLE 1185020.GPJ BELONGIA 5/8/18

LOG OF BORING NO. B-3

OWNER

ARCHITECT
Architects Collective

SITE
Highway 50
Lee's Summit, Missouri

PROJECT
Proposed Apartment Complex

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY, in.	SAMPLES SPT - N BLOWS / ft.	TESTS WATER CONTENT, %	TESTS DRY UNIT WT pcf	TESTS UNCONFINED STRENGTH, psf
					HS					
	8" Topsoil FAT CLAY dark brown, very soft		CH	1	SS	4	2	27.0		
		2								
	FAT CLAY, TRACE GRAVEL brown, reddish-brown and gray		CH	2	SS	17	9	26.7		*2000
			CH	3	SS	16	12	24.2		*3000
		5	CH	4	SS	16	11	26.7		
					HS					
		8								
	LEAN TO FAT CLAY, TRACE SILT AND SAND brown and reddish-brown		CL CH	5	SS	14	9	33.5		
		10			HS					
		12								
	Auger Refusal@12'									

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft		
WL	▽ 3' WD	▼
WL	▼	▼
WL		

Belongia Consultants, Inc.

BORING STARTED	4-15-18		
BORING COMPLETED	4-15-18		
RIG	ATV	FOREMAN	DJ
APPROVED	DLB	JOB #	1185020

BOREHOLE 1185020.GPJ BELONGIA 5/9/18

LOG OF BORING NO. B-4

OWNER

ARCHITECT
Architects Collective

SITE
Highway 50
Lee's Summit, Missouri

PROJECT
Proposed Apartment Complex

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY, in.	SAMPLES SPT - N BLOWS / ft.	TESTS WATER CONTENT, %	TESTS DRY UNIT WT pcf	TESTS UNCONFINED STRENGTH, psf
	8" Topsoil				HS					
	FAT CLAY dark brown, very soft		CH	1	SS	6	3	30.2		
	2.5									
	FAT CLAY, TRACE SAND brown and reddish brown		CH	2	SS	14	7	29.3		*2000
	4.5									
	LEAN TO FAT CLAY, TRACE SILT AND SAND brown, reddish-brown and gray		CH	3	SS	16	7	23.1		
		5	CL CH	4	SS	16	10	22.9		
					HS					
	9									
	HIGHLY WEATHERED SILTY SANDSTONE, TRACE CLAY reddish-brown and gray			5	SS	6	16/6" 50/6"	18.1		
		10			HS					
	11									
	Auger Refusal@11'									

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft		
WL	▽ None WD	▼
WL	▼	▼
WL		

Belongia Consultants, Inc.

BORING STARTED	4-15-18		
BORING COMPLETED	4-15-18		
RIG	ATV	FOREMAN	DJ
APPROVED	DLB	JOB #	1185020

BOREHOLE 1185020.GPJ BELONGIA 5/8/18

LOG OF BORING NO. B-5

OWNER

ARCHITECT
Architects Collective

SITE
Highway 50
Lee's Summit, Missouri

PROJECT
Proposed Apartment Complex

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY, in.	SAMPLES SPT - N BLOWS / ft.	TESTS WATER CONTENT, %	TESTS DRY UNIT WT pcf	TESTS UNCONFINED STRENGTH, psf	
					HS						
	6" Topsoil LEAN TO FAT CLAY WITH SILT dark brown, very soft		CL CH	1	SS	8	2	30.3			
	2										
	FAT CLAY brown, reddish-brown and gray		CH	2	SS	16	8	30.0		*2000	S-2 LL=60 PL=24 PI=36
			CH	3	SS	18	8	26.2		*2000	
		5	CH	4	SS	16	7	24.2			
					HS						
	8.5 SILT, TRACE CLAY olive brown and gray		ML	5	SS	16	42	18.6			
		10			HS						
	12 Auger Refusal@12'										

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft		
WL	▽ None WD	▼
WL	▽	▼
WL		

Belongia Consultants, Inc.

BORING STARTED	4-15-18		
BORING COMPLETED	4-15-18		
RIG	ATV	FOREMAN	DJ
APPROVED	DLB	JOB #	1185020

BOREHOLE 1185020.GPJ BELONGIA 5/8/18

LOG OF BORING NO. B-6

OWNER

ARCHITECT
Architects Collective

SITE
Highway 50
Lee's Summit, Missouri

PROJECT
Proposed Apartment Complex

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY, in.	SAMPLES SPT - N BLOWS / ft.	TESTS WATER CONTENT, %	TESTS DRY UNIT WT pcf	TESTS UNCONFINED STRENGTH, psf
	8" Topsoil				HS					
	FAT CLAY dark brown, very soft		CH	1	SS	6	5	29.9		
2										
	FAT CLAY, TRACE GRAVEL reddish-brown and brown, stiff		CH	2	SS	14	5	26.7		*1500
			CH	3	SS	15	6	30.7		
		5	CH	4	SS	16	7	31.6		
					HS					
8.5										
	LEAN TO FAT CLAY brown, reddish-brown and gray		CL CH	5	SS	14	17	22.6		*4000
		10			HS					
12										
	Auger Refusal@12'									

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft		
WL	▽ None WD	▼
WL	▽	▼
WL		

Belongia Consultants, Inc.

BORING STARTED	4-15-18		
BORING COMPLETED	4-15-18		
RIG	ATV	FOREMAN	DJ
APPROVED	DLB	JOB #	1185020

BOREHOLE 1185020.GPJ BELONGIA 5/8/18

LOG OF BORING NO. B-7

OWNER

ARCHITECT
Architects Collective

SITE
Highway 50
Lee's Summit, Missouri

PROJECT
Proposed Apartment Complex

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY, in.	SAMPLES SPT - N BLOWS / ft.	TESTS WATER CONTENT, %	TESTS DRY UNIT WT pcf	TESTS UNCONFINED STRENGTH, psf	
	8" Topsoil				HS						
	FAT CLAY dark brown, very soft		CH	1	SS	10	4	28.9			S-1 LL=59 PL=26 PI=33
	2										
	FAT CLAY, TRACE GRAVEL brown, dark brown and reddish-brown		CH	2	SS	4	8				
			CH	3	SS	16	11	23.8		*2500	
		5	CH	4	SS	16	11	24.9			
					HS						
	8.5										
	HIGHLY WEATHERED SILTY SANDSTONE, TRACE CLAY reddish-brown and gray			5	SS	5	50/6"	18.4			
					HS						
	10.5	10									
	Auger Refusal@12'										

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft		
WL	▽ None WD	▼
WL	▼	▼
WL		

Belongia Consultants, Inc.

BORING STARTED	4-15-18		
BORING COMPLETED	4-15-18		
RIG	ATV	FOREMAN	DJ
APPROVED	DLB	JOB #	1185020

BOREHOLE 1185020.GPJ BELONGIA 5/9/18

LOG OF BORING NO. B-8

OWNER

ARCHITECT
Architects Collective

SITE
Highway 50
Lee's Summit, Missouri

PROJECT
Proposed Apartment Complex

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY, in.	SAMPLES SPT - N BLOWS / ft.	TESTS WATER CONTENT, %	TESTS DRY UNIT WT pcf	TESTS UNCONFINED STRENGTH, psf
					HS					
	8" Topsoil FAT CLAY dark brown, soft		CH	1	SS	9	2	29.5		
2										
	FAT CLAY, TRACE GRAVEL brown and reddish-brown		CH	2	SS	16	7	29.0		*2000
			CH	3	SS	3	7			*2000
		5	CH	4	SS	16	8	30.9		
					HS					
8										
	LEAN TO FAT CLAY, TRACE GRAVEL olive gray			5	SS	6	27/6" 50/2"	20.6		
9					HS					
	WEATHERED LIMESTONE gray	10								
10.5										
	Auger Refusal@10.5'									

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft			
WL	▽ None WD	▼	
WL	▽	▼	
WL			

Belongia Consultants, Inc.

BORING STARTED	4-15-18		
BORING COMPLETED	4-15-18		
RIG	ATV	FOREMAN	DJ
APPROVED	DLB	JOB #	1185020

BOREHOLE 1185020.GPJ BELONGIA 5/8/18

LOG OF BORING NO. B-9

OWNER

ARCHITECT
Architects Collective

SITE
Highway 50
Lee's Summit, Missouri

PROJECT
Proposed Apartment Complex

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY, in.	SAMPLES SPT - N BLOWS / ft.	TESTS WATER CONTENT, %	TESTS DRY UNIT WT pcf	TESTS UNCONFINED STRENGTH, psf	
	8" Topsoil				HS						
	FAT CLAY dark brown, soft		CH	1	SS	8	2	28.2		*500	
2											
	FAT CLAY, TRACE GRAVEL brown, reddish-brown and gray		CH	2	SS	15	9	28.5		*2000	S-2 LL=57 PL=23 PI=34
			CH	3	SS	9	8	27.9		*2000	
		5	CH	4	SS	16	8	22.8			
					HS						
8											
	LEAN CLAY, TRACE SAND brown and reddish-brown		CL	5	SS	17	8	32.6			
		10			HS						
13											
	SHALEY LEAN CLAY olive gray		CL	6	SS	16	28	21.1			
15		15									

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft		
WL	▽ 10' WD	▼
WL	▽	▼
WL		

Belongia Consultants, Inc.

BORING STARTED	4-15-18		
BORING COMPLETED	4-15-18		
RIG	ATV	FOREMAN	DJ
APPROVED	DLB	JOB #	1185020

BOREHOLE 1185020.GPJ BELONGIA 5/9/18

LOG OF BORING NO. B-10

OWNER

ARCHITECT
Architects Collective

SITE
Highway 50
Lee's Summit, Missouri

PROJECT
Proposed Apartment Complex

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY, in.	SAMPLES SPT - N BLOWS / ft.	TESTS WATER CONTENT, %	TESTS DRY UNIT WT pcf	TESTS UNCONFINED STRENGTH, psf	
	8" Topsoil				HS						
	FAT CLAY dark brown, very soft		CH	1	SS	6	2	32.9			
2											
	FAT CLAY, TRACE GRAVEL brown, reddish-brown and gray		CH	2	SS	16	10	30.2		*2000	
			CH	3	SS	15	10	26.9		*2000	S-3 LL=41 PL=17 PI=24
5		5									
	LEAN CLAY, TRACE SAND brown, reddish-brown and gray		CL	4	SS	14	11	21.2			
					HS						
8											
	FAT CLAY brown, reddish-brown and gray		CH	5	SS	17	9	29.9			
		10			HS						
13											
	HIGHLY WEATHERED SANDSTONE, TRACE CLAY brown			6	SS	4	50/6"	15.2			
14											

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft		
WL	▽ None WD	▼
WL	▽	▼
WL		

Belongia Consultants, Inc.

BORING STARTED	4-15-18		
BORING COMPLETED	4-15-18		
RIG	ATV	FOREMAN	DJ
APPROVED	DLB	JOB #	1185020

BOREHOLE 1185020.GPJ BELONGIA 5/8/18

LOG OF BORING NO. B-11

OWNER

ARCHITECT
Architects Collective

SITE
Highway 50
Lee's Summit, Missouri

PROJECT
Proposed Apartment Complex

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY, in.	SAMPLES SPT - N BLOWS / ft.	TESTS WATER CONTENT, %	TESTS DRY UNIT WT pcf	TESTS UNCONFINED STRENGTH, psf	
	8" Topsoil				HS						
	FAT CLAY dark brown, very soft		CH	1	SS	5	2	31.2			
2											
	FAT CLAY brown, reddish brown and gray		CH	2	SS	14	7	27.7		*2000	S-2 LL=63 PL=25 PI=38
			CH	3	SS	17	12	26.6		*2000	
		5	CH	4	SS	17	8	25.8			
					HS						
8											
	LEAN CLAY, TRACE SAND brown		CL	5	SS	10	9	23.7			
		10			HS						
13											
	HIGHLY WEATHERED SILTY SANDSTONE light brown			6	SS	5	50/6"	16.1			
14											

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft		
WL	▽ None WD	▼
WL	▽	▼
WL		

Belongia Consultants, Inc.

BORING STARTED	4-15-18		
BORING COMPLETED	4-15-18		
RIG	ATV	FOREMAN	DJ
APPROVED	DLB	JOB #	1185020

BOREHOLE 1185020.GPJ BELONGIA 5/8/18

LOG OF BORING NO. B-12

OWNER

ARCHITECT
Architects Collective

SITE
Highway 50
Lee's Summit, Missouri

PROJECT
Proposed Apartment Complex

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY, in.	SAMPLES SPT - N BLOWS / ft.	TESTS WATER CONTENT, %	TESTS DRY UNIT WT pcf	TESTS UNCONFINED STRENGTH, psf
	8" Topsoil				HS					
	FAT CLAY dark brown, very soft		CH	1	SS	6	2	29.8		
			CH	2	SS	14	8	28.9		*2000
			CH	3	SS	18	9	29.3		*2000
		5	CH	4	SS	16	10	23.6		
					HS					
			CH	5	SS	16	11	24.3		
		10			HS					
	2.5 FAT CLAY, TRACE SILT brown, reddish brown and gray									
	14 14.8 HIGHLY WEATHERED SILTY SANDSTONE light brown			6	SS	12	25/6" 50/3"	17.2		

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft		
WL	▽ None WD	▼
WL	▽	▼
WL		

Belongia Consultants, Inc.

BORING STARTED	4-15-18		
BORING COMPLETED	4-15-18		
RIG	ATV	FOREMAN	DJ
APPROVED	DLB	JOB #	1185020

BOREHOLE 1185020.GPJ BELONGIA 5/8/18

LOG OF BORING NO. B-13

OWNER

ARCHITECT
Architects Collective

SITE
Highway 50
Lee's Summit, Missouri

PROJECT
Proposed Apartment Complex

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY, in.	SAMPLES SPT - N BLOWS / ft.	TESTS WATER CONTENT, %	TESTS DRY UNIT WT pcf	TESTS UNCONFINED STRENGTH, psf
					HS					
	8" Topsoil		CH	1	SS	5	2	31.5		
	FAT CLAY dark brown, very soft	2								
	FAT CLAY, TRACE SAND brown, reddish brown and gray		CH	2	SS	14	10	27.9		*2000
			CH	3	SS	16	9	24.7		*2000
		5	CH	4	SS	16	9	22.2		
					HS					
			CH	5	SS	12	11	30.6		
		10			HS					
		13								
	HIGHLY WEATHERED SILTY SANDSTONE light brown	13.7		6	SS	1	50/2"	14.2		

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft		
WL	▽ None WD	▼
WL	▽	▼
WL		

Belongia Consultants, Inc.

BORING STARTED	4-15-18		
BORING COMPLETED	4-15-18		
RIG	ATV	FOREMAN	DJ
APPROVED	DLB	JOB #	1185020

BOREHOLE 1185020.GPJ BELONGIA 5/8/18

LOG OF BORING NO. B-14

OWNER

ARCHITECT
Architects Collective

SITE
Highway 50
Lee's Summit, Missouri

PROJECT
Proposed Apartment Complex

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY, in.	SAMPLES SPT - N BLOWS / ft.	TESTS WATER CONTENT, %	TESTS DRY UNIT WT pcf	TESTS UNCONFINED STRENGTH, psf
	8" Topsoil				HS					
	LEAN TO FAT CLAY dark brown, soft		CL CH	1	SS	5	4	29.9		
	2.5									
	FAT CLAY brown, reddish-brown and gray		CH	2	SS	12	6	28.6		*2000
			CH	3	SS	16	8	24.0		*2000
	5	5								
	LEAN TO FAT CLAY, TRACE SILT brown, reddish-brown and gray		CL CH	4	SS	18	11	22.6		
					HS					
			CL CH	5	SS	16	10	27.5		
		10			HS					
	14									
	14.5 HIGHLY WEATHERED SILTY SHALE olive brown			6	SS	8	8/6" 50/6"	25.4		

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft		
WL	▽ None WD	▼
WL	▼	▼
WL		

Belongia Consultants, Inc.

BORING STARTED	4-15-18		
BORING COMPLETED	4-15-18		
RIG	ATV	FOREMAN	DJ
APPROVED	DLB	JOB #	1185020

BOREHOLE 1185020.GPJ BELONGIA 5/8/18

LOG OF BORING NO. B-15

OWNER

ARCHITECT
Architects Collective

SITE
Highway 50
Lee's Summit, Missouri

PROJECT
Proposed Apartment Complex

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY, in.	SAMPLES SPT - N BLOWS / ft.	TESTS WATER CONTENT, %	TESTS DRY UNIT WT pcf	TESTS UNCONFINED STRENGTH, psf	
	8" Topsoil				HS						
	LEAN TO FAT CLAY dark gray, soft		CL CH	1	SS	15	5	27.1			
2											
	LEAN TO FAT CLAY, TRACE SILT brown, reddish-brown and gray		CL CH	2	SS	16	9	26.2		*2000	S-2 LL=45 PL=20 PI=25
			CL CH	3	SS	16	10	22.3			
5		5									
	LEAN CLAY, TRACE SILT brown and reddish-brown		CL	4	SS	12	11	22.1			
					HS						
8.5											
	HIGHLY WEATHERED SILTY SHALE olive brown			~~5~~	~~SS~~ HS	~~1~~	~~50/2"~~	~~16.1~~			
10											
	Auger Refusal@10'	10									

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft		
WL	▽ None WD	▼
WL	▽	▼
WL		

Belongia Consultants, Inc.

BORING STARTED	4-15-18		
BORING COMPLETED	4-15-18		
RIG	ATV	FOREMAN	DJ
APPROVED	DLB	JOB #	1185020

BOREHOLE 1185020.GPJ BELONGIA 5/8/18

LOG OF BORING NO. B-16

OWNER

ARCHITECT
Architects Collective

SITE
Highway 50
Lee's Summit, Missouri

PROJECT
Proposed Apartment Complex

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY, in.	SAMPLES SPT - N BLOWS / ft.	TESTS WATER CONTENT, %	TESTS DRY UNIT WT pcf	TESTS UNCONFINED STRENGTH, psf
	8" Topsoil				HS					
	FAT CLAY dark brown, very soft		CH	1	SS	7	2	29.3		
			CH	2	SS	14	7	24.2		*2000
			CH	3	SS	16	9	24.9		*2000
		5	CH	4	SS	16	6	31.3		
					HS					
				5	SS	16	28	22.2		
		10			HS					
	2.5 FAT CLAY brown and dark brown									
	8 LEAN TO FAT CLAY, TRACE SILT brown, reddish-brown and gray									
	11 11.5 WEATHERED SANDSTONE brown Auger Refusal@11.5'									

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft		
WL	▽ None WD	▼
WL	▼	▼
WL		

Belongia Consultants, Inc.

BORING STARTED	4-15-18		
BORING COMPLETED	4-15-18		
RIG	ATV	FOREMAN	DJ
APPROVED	DLB	JOB #	1185020

BOREHOLE 1185020.GPJ BELONGIA 5/8/18

LOG OF BORING NO. B-17

OWNER

ARCHITECT
Architects Collective

SITE
Highway 50
Lee's Summit, Missouri

PROJECT
Proposed Apartment Complex

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY, in.	SAMPLES SPT - N BLOWS / ft.	TESTS WATER CONTENT, %	TESTS DRY UNIT WT pcf	TESTS UNCONFINED STRENGTH, psf
	8" Topsoil				HS					
	FAT CLAY dark brown, very soft		CH	1	SS	6	2	31.5		
	2									
	FAT CLAY brown and reddish-brown		CH	2	SS	12	9	27.3		*2000
			CH	3	SS	16	9	23.6		*2000
		5	CH	4	SS	17	8	23.3		
					HS					
			CH	5	SS	16	12	31.9		
		10			HS					
	13									
	HIGHLY WEATHERED SHALE 13.8 olive brown and gray			6	SS	3	50/4"	16.6		

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft		
WL	▽ None WD	▼
WL	▽	▼
WL		

Belongia Consultants, Inc.

BORING STARTED	4-15-18		
BORING COMPLETED	4-15-18		
RIG	ATV	FOREMAN	DJ
APPROVED	DLB	JOB #	1185020

BOREHOLE 1185020.GPJ BELONGIA 5/8/18

LOG OF BORING NO. B-18

OWNER

ARCHITECT
Architects Collective

SITE
Highway 50
Lee's Summit, Missouri

PROJECT
Proposed Apartment Complex

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY, in.	SAMPLES SPT - N BLOWS / ft.	TESTS WATER CONTENT, %	TESTS DRY UNIT WT pcf	TESTS UNCONFINED STRENGTH, psf	
	6" Topsoil				HS						
	FAT CLAY dark brown, soft		CH	1	SS	9	5	31.9			S-1 LL=45 PL=19 PI=26
2	FAT CLAY brown and reddish-brown		CH	2	SS	18	10	26.3		*2500	
4	LEAN TO FAT CLAY brown, reddish-brown and gray		CH	3	SS	16	10	24.0			
		5	CL CH	4	SS	17	9	22.6			
					HS						
8	FAT CLAY WITH SILT reddish-brown and gray		CH	5	SS	16	19	22.4			
		10			HS						
12.5											
13	LIMESTONE gray Auger Refusal@13'										

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft		
WL	▽ None WD	▼
WL	▽	▼
WL		

Belongia Consultants, Inc.

BORING STARTED	4-15-18		
BORING COMPLETED	4-15-18		
RIG	ATV	FOREMAN	DJ
APPROVED	DLB	JOB #	1185020

BOREHOLE 1185020.GPJ BELONGIA 5/8/18

LOG OF BORING NO. B-19

OWNER

ARCHITECT
Architects Collective

SITE
Highway 50
Lee's Summit, Missouri

PROJECT
Proposed Apartment Complex

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY, in.	SAMPLES SPT - N BLOWS / ft.	TESTS WATER CONTENT, %	TESTS DRY UNIT WT pcf	TESTS UNCONFINED STRENGTH, psf
	6" Topsoil				HS					
	FAT CLAY dark brown, soft		CH	1	SS	4	4	31.6		
2										
	FAT CLAY brown, dark brown and reddish-brown		CH	2	SS	14	7	29.3		*2000
			CH	3	SS	16	6	25.5		
		5	CH	4	SS	17	6	26.2		*2000
					HS					
			CH	5	SS	16	14	22.7		
		10			HS					
13										
	Auger Refusal@13'									

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft		
WL	▽ None WD	▼
WL	▽	▼
WL		

Belongia Consultants, Inc.

BORING STARTED	4-15-18		
BORING COMPLETED	4-15-18		
RIG	ATV	FOREMAN	DJ
APPROVED	DLB	JOB #	1185020

BOREHOLE 1185020.GPJ BELONGIA 5/8/18

LOG OF BORING NO. B-20

OWNER

ARCHITECT
Architects Collective

SITE
Highway 50
Lee's Summit, Missouri

PROJECT
Proposed Apartment Complex

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY, in.	SAMPLES SPT - N BLOWS / ft.	TESTS WATER CONTENT, %	TESTS DRY UNIT WT pcf	TESTS UNCONFINED STRENGTH, psf	
					HS						
	8" Topsoil FAT CLAY dark brown, soft		CH	1	SS	4	2	30.6			
	2 FAT CLAY, TRACE SAND brown, reddish-brown and gray		CH	2	SS	16	8	28.2		*2000	S-2 LL=65 PL=26 PI=39
			CH	3	SS	15	8	28.8		*2000	
		5	CH	4	SS	16	11	30.5			
					HS						
	9 LIMESTONE			5	SS	10	7/6" 50/6"	21.0			
	10 gray				HS						
	Auger Refusal@10'	10									

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft		
WL	▽ None WD	▼
WL	▽	▼
WL		

Belongia Consultants, Inc.

BORING STARTED	4-15-18		
BORING COMPLETED	4-15-18		
RIG	ATV	FOREMAN	DJ
APPROVED	DLB	JOB #	1185020

BOREHOLE 1185020.GPJ BELONGIA 5/9/18

LOG OF BORING NO. B-21

OWNER

ARCHITECT
Architects Collective

SITE
Highway 50
Lee's Summit, Missouri

PROJECT
Proposed Apartment Complex

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY, in.	SAMPLES SPT - N BLOWS / ft.	TESTS WATER CONTENT, %	TESTS DRY UNIT WT pcf	TESTS UNCONFINED STRENGTH, psf	
					HS						
	8" Topsoil FAT CLAY dark brown, very soft		CH	1	SS	7	3	29.6			
	2										
	FAT CLAY, TRACE GRAVEL brown, reddish-brown and gray		CH	2	SS	15	9	27.3		*2000	S-2 LL=46 PL=21 PI=25
			CH	3	SS	16	8	29.6		*2000	
		5	CH	4	SS	18	7	26.5			
					HS						
				5	SS	15	5/6" 50/3"	28.9			
	9.5 LIMESTONE gray	10			HS						
	11 Auger Refusal@11'										

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft		
WL	▽ None WD	▼
WL	▽	▼
WL		

Belongia Consultants, Inc.

BORING STARTED	4-15-18		
BORING COMPLETED	4-15-18		
RIG	ATV	FOREMAN	DJ
APPROVED	DLB	JOB #	1185020

BOREHOLE 1185020.GPJ BELONGIA 5/9/18

LOG OF BORING NO. B-22

OWNER

ARCHITECT
Architects Collective

SITE
Highway 50
Lee's Summit, Missouri

PROJECT
Proposed Apartment Complex

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY, in.	SAMPLES SPT - N BLOWS / ft.	TESTS WATER CONTENT, %	TESTS DRY UNIT WT pcf	TESTS UNCONFINED STRENGTH, psf
					HS					
	6" Topsoil FAT CLAY dark brown, soft		CH	1	SS	12	4	31.0		
	2									
	FAT CLAY, TRACE SILT brown, reddish-brown and gray		CH	2	SS	16	9	28.2		*2000
			CH	3	SS	18	8	28.5		*2000
		5	CH	4	SS	17	8	26.7		
					HS					
				5	SS	12	5/6" 50/4"	28.8		
	9.5									
	LIMESTONE gray	10			HS					
	11									
	Auger Refusal@11'									

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft		
WL	▽ None WD	▼
WL	▽	▼
WL		

Belongia Consultants, Inc.

BORING STARTED	4-15-18		
BORING COMPLETED	4-15-18		
RIG	ATV	FOREMAN	DJ
APPROVED	DLB	JOB #	1185020

BOREHOLE 1185020.GPJ BELONGIA 5/9/18

LOG OF BORING NO. B-23

OWNER

ARCHITECT
Architects Collective

SITE
Highway 50
Lee's Summit, Missouri

PROJECT
Proposed Apartment Complex

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY, in.	SAMPLES SPT - N BLOWS / ft.	TESTS WATER CONTENT, %	TESTS DRY UNIT WT pcf	TESTS UNCONFINED STRENGTH, psf	
	6" Topsoil				HS						
	FAT CLAY dark brown, soft		CH	1	SS	6	5	30.7			
	2										
	FAT CLAY brown, reddish-brown and gray		CH	2	SS	14	11	27.8		*2500	S-2 LL=61 PL=25 PI=36
			CH	3	SS	18	9	30.2		*2500	
		5	CH	4	SS	16	10	25.1			
					HS						
	8										
	FAT CLAY WITH SILT, TRACE GRAVEL brown and reddish-brown		CH	5	SS	15	12	27.3			
		10			HS						
	13										
	13.5 LIMESTONE gray Auger Refusal@13.5'										

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft		
WL	▽ None WD	▼
WL	▽	▼
WL		

Belongia Consultants, Inc.

BORING STARTED	4-15-18		
BORING COMPLETED	4-15-18		
RIG	ATV	FOREMAN	DJ
APPROVED	DLB	JOB #	1185020

BOREHOLE 1185020.GPJ BELONGIA 5/9/18

LOG OF BORING NO. B-24

OWNER

ARCHITECT
Architects Collective

SITE
Highway 50
Lee's Summit, Missouri

PROJECT
Proposed Apartment Complex

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY, in.	SAMPLES SPT - N BLOWS / ft.	TESTS WATER CONTENT, %	TESTS DRY UNIT WT pcf	TESTS UNCONFINED STRENGTH, psf
	6" Topsoil				HS					
	FAT CLAY dark brown, soft		CH	1	SS	5	4	31.2		
	2		CH	2	SS	14	10	30.0		*2500
	FAT CLAY brown, reddish-brown and gray		CH	3	SS	14	7	31.6		
		5	CH	4	SS	17	8	29.6		
					HS					
	8									
	FAT CLAY WITH SILT SEAMS reddish-brown and gray		CH	5	SS	17	12	28.5		
	10	10								

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft		
WL	▽ None WD	▼
WL	▽	▼
WL		

Belongia Consultants, Inc.

BORING STARTED	4-15-18		
BORING COMPLETED	4-15-18		
RIG	ATV	FOREMAN	DJ
APPROVED	DLB	JOB #	1185020

BOREHOLE 1185020.GPJ BELONGIA 5/9/18

LOG OF BORING NO. B-25

OWNER

ARCHITECT
Architects Collective

SITE
Highway 50
Lee's Summit, Missouri

PROJECT
Proposed Apartment Complex

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY, in.	SAMPLES SPT - N BLOWS / ft.	TESTS WATER CONTENT, %	TESTS DRY UNIT WT pcf	TESTS UNCONFINED STRENGTH, psf
	6" Topsoil				HS					
	FAT CLAY dark brown, soft		CH	1	SS	5	4	31.3		
2										
	FAT CLAY brown, reddish-brown and gray		CH	2	SS	14	8	30.6		*2000
			CH	3	SS	14	8	28.1		*2000
		5	CH	4	SS	16	7	24.7		
					HS					
8										
	FAT CLAY WITH SILT SEAMS brown, reddish-brown and gray		CH	5	SS	16	11	28.4		
10		10								

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft		
WL	▽ None WD	▼
WL	▽	▼
WL		

Belongia Consultants, Inc.

BORING STARTED			4-15-18
BORING COMPLETED			4-15-18
RIG	ATV	FOREMAN	DJ
APPROVED	DLB	JOB #	1185020

BOREHOLE 1185020.GPJ BELONGIA 5/9/18

LOG OF BORING NO. B-26

OWNER

ARCHITECT
Architects Collective

SITE
Highway 50
Lee's Summit, Missouri

PROJECT
Proposed Apartment Complex

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY, in.	SAMPLES SPT - N BLOWS / ft.	TESTS WATER CONTENT, %	TESTS DRY UNIT WT pcf	TESTS UNCONFINED STRENGTH, psf
					HS					
	8" Topsoil FAT CLAY dark brown, very soft		CH	1	SS	5	2	30.3		
		2	CH	2	SS	14	7	30.7		*2000
	FAT CLAY, TRACE SAND brown, reddish-brown and gray		CH	3	SS	16	8	28.6		*2000
		5	CH	4	SS	16	7	24.2		
					HS					
			CH	5	SS	17	8	30.5		
		10								

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft		
WL	▽ None WD	▼
WL	▽	▼
WL		

Belongia Consultants, Inc.

BORING STARTED	4-15-18		
BORING COMPLETED	4-15-18		
RIG	ATV	FOREMAN	DJ
APPROVED	DLB	JOB #	1185020

BOREHOLE 1185020.GPJ BELONGIA 5/9/18

LOG OF BORING NO. B-27

OWNER

ARCHITECT
Architects Collective

SITE
Highway 50
Lee's Summit, Missouri

PROJECT
Proposed Apartment Complex

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY, in.	SAMPLES SPT - N BLOWS / ft.	TESTS WATER CONTENT, %	TESTS DRY UNIT WT pcf	TESTS UNCONFINED STRENGTH, psf
					HS					
	8" Topsoil FAT CLAY dark brown, soft		CH	1	SS	6	4	28.9		
	2									
	FAT CLAY WIITH SILT brown, reddish-brown and gray		CH	2	SS	16	11	29.9		*2000
			CH	3	SS	14	9	22.8		*2000
		5	CH	4	SS	16	11	22.7		
					HS					
			CH	5	SS	17	16	23.1		
	10	10								

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft		
WL	▽ None WD	▼
WL	▽	▼
WL		

Belongia Consultants, Inc.

BORING STARTED	4-15-18		
BORING COMPLETED	4-15-18		
RIG	ATV	FOREMAN	DJ
APPROVED	DLB	JOB #	1185020

BOREHOLE 1185020.GPJ BELONGIA 5/9/18

LOG OF BORING NO. B-28

OWNER

ARCHITECT
Architects Collective

SITE
Highway 50
Lee's Summit, Missouri

PROJECT
Proposed Apartment Complex

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY, in.	SAMPLES SPT - N BLOWS / ft.	TESTS WATER CONTENT, %	TESTS DRY UNIT WT pcf	TESTS UNCONFINED STRENGTH, psf
					HS					
	8" Topsoil LEAN TO FAT CLAY dark brown, very soft		CL CH	1	SS	12	1	31.9		
	2.5 FAT CLAY brown, dark brown and reddish-brown		CH	2	SS	15	10	29.0		*2000
			CH	3	SS	16	8	26.1		*2000
	5 LEAN TO FAT CLAY WIITH SILT brown, reddish-brown and dark brown	5	CL CH	4	SS	18	9	22.9		
					HS					
	10		CL CH	5	SS	18	10	29.3		
		10								

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft		
WL	▽ None WD	▼
WL	▼	▼
WL		

Belongia Consultants, Inc.

BORING STARTED	4-15-18		
BORING COMPLETED	4-15-18		
RIG	ATV	FOREMAN	DJ
APPROVED	DLB	JOB #	1185020

BOREHOLE 1185020.GPJ BELONGIA 5/9/18

LOG OF BORING NO. B-29

OWNER

ARCHITECT
Architects Collective

SITE
Highway 50
Lee's Summit, Missouri

PROJECT
Proposed Apartment Complex

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY, in.	SAMPLES SPT - N BLOWS / ft.	TESTS WATER CONTENT, %	TESTS DRY UNIT WT pcf	TESTS UNCONFINED STRENGTH, psf
	8" Topsoil				HS					
	FAT CLAY dark brown, very soft		CH	1	SS	6	3	29.0		
	2									
	FAT CLAY, TRACE GRAVEL brown, reddish-brown and gray		CH	2	SS	16	10	22.7		*2000
			CH	3	SS	14	11	23.7		*2000
		5	CH	4	SS	17	11	25.8		
					HS					
	8									
	LIMESTONE gray			5	SS	2	50/3"			
	8.8									

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft		
WL	▽ None WD	▼
WL	▽	▼
WL		

Belongia Consultants, Inc.

BORING STARTED	4-15-18		
BORING COMPLETED	4-15-18		
RIG	ATV	FOREMAN	DJ
APPROVED	DLB	JOB #	1185020

BOREHOLE 1185020.GPJ BELONGIA 5/9/18

LOG OF BORING NO. B-30

OWNER

ARCHITECT
Architects Collective

SITE
Highway 50
Lee's Summit, Missouri

PROJECT
Proposed Apartment Complex

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY, in.	SAMPLES SPT - N BLOWS / ft.	TESTS WATER CONTENT, %	TESTS DRY UNIT WT pcf	TESTS UNCONFINED STRENGTH, psf
	8" Topsoil				HS					
	FAT CLAY dark brown, very soft		CH	1	SS	6	4	31.5		
	2									
	FAT CLAY brown, reddish-brown and gray		CH	2	SS	12	9	26.3		*2000
			CH	3	SS	14	9	29.8		*2000
		5	CH	4	SS	15	12	31.2		
					HS					
	8									
	8.6 LIMESTONE brown			5	SS	1	50/1"			

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft		
WL	▽ None WD	▼
WL	▽	▼
WL		

Belongia Consultants, Inc.

BORING STARTED	4-15-18		
BORING COMPLETED	4-15-18		
RIG	ATV	FOREMAN	DJ
APPROVED	DLB	JOB #	1185020

BOREHOLE 1185020.GPJ BELONGIA 5/9/18

LOG OF BORING NO. B-31

OWNER

ARCHITECT
Architects Collective

SITE
Highway 50
Lee's Summit, Missouri

PROJECT
Proposed Apartment Complex

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY, in.	SAMPLES SPT - N BLOWS / ft.	TESTS WATER CONTENT, %	TESTS DRY UNIT WT pcf	TESTS UNCONFINED STRENGTH, psf
	6" Topsoil				HS					
	FAT CLAY dark brown, soft		CH	1	SS	10	5	34.0		
	2									
	FAT CLAY, TRACE GRAVEL brown and dark brown		CH	2	SS	16	6	30.2		*1500
			CH	3	SS	14	8	27.5		*2000
		5	CH	4	SS	16	9	30.3		
					HS					
	7.5									
	LEAN CLAY, TRACE GRAVEL olive gray			5	SS	5	12/6" 50/1"	18.9		
	9.1									
	LIMESTONE brown									

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft		
WL	▽ None WD	▼
WL	▽	▼
WL		

Belongia Consultants, Inc.

BORING STARTED	4-15-18		
BORING COMPLETED	4-15-18		
RIG	ATV	FOREMAN	DJ
APPROVED	DLB	JOB #	1185020

BOREHOLE 1185020.GPJ BELONGIA 5/9/18

LOG OF BORING NO. B-32

OWNER

ARCHITECT
Architects Collective

SITE
Highway 50
Lee's Summit, Missouri

PROJECT
Proposed Apartment Complex

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY, in.	SAMPLES SPT - N BLOWS / ft.	TESTS WATER CONTENT, %	TESTS DRY UNIT WT pcf	TESTS UNCONFINED STRENGTH, psf
	8" Topsoil				HS					
	FAT CLAY dark brown, very soft		CH	1	SS	10	2	32.3		
			CH	2	SS	14	7	28.1		*2000
			CH	3	SS	16	4	28.2		
		5	CH	4	SS	16	8	25.0		
					HS					
	2.5 FAT CLAY, TRACE GRAVEL brown, reddish-brown and gray									
	8 Auger Refusal@8'									

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft		
WL	▽ None WD	▼
WL	▽	▼
WL		

Belongia Consultants, Inc.

BORING STARTED			4-15-18
BORING COMPLETED			4-15-18
RIG	ATV	FOREMAN	DJ
APPROVED	DLB	JOB #	1185020

BOREHOLE 1185020.GPJ BELONGIA 5/9/18

LOG OF BORING NO. B-33

OWNER

ARCHITECT
Architects Collective

SITE
Highway 50
Lee's Summit, Missouri

PROJECT
Proposed Apartment Complex

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY, in.	SAMPLES SPT - N BLOWS / ft.	TESTS WATER CONTENT, %	TESTS DRY UNIT WT pcf	TESTS UNCONFINED STRENGTH, psf
					HS					
	6" Topsoil LEAN TO FAT CLAY dark brown		CL CH	1	SS	8	6	29.3		
2			CH	2	SS	15	10	23.8		*2000
	FAT CLAY, TRACE GRAVEL brown, reddish-brown and gray		CH	3	SS	16	10	28.8		*2000
		5	CH	4	SS	14	8	25.8		
					HS					
			CH	5	SS	16	9	24.1		
10		10								

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft		
WL	▽ None WD	▼
WL	▼	▼
WL		

Belongia Consultants, Inc.

BORING STARTED	4-15-18		
BORING COMPLETED	4-15-18		
RIG	ATV	FOREMAN	DJ
APPROVED	DLB	JOB #	1185020

BOREHOLE 1185020.GPJ BELONGIA 5/9/18

LOG OF BORING NO. B-34

OWNER

ARCHITECT
Architects Collective

SITE
Highway 50
Lee's Summit, Missouri

PROJECT
Proposed Apartment Complex

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY, in.	SAMPLES SPT - N BLOWS / ft.	TESTS WATER CONTENT, %	TESTS DRY UNIT WT pcf	TESTS UNCONFINED STRENGTH, psf
					HS					
	8" Topsoil LEAN TO FAT CLAY dark brown, very soft		CH	1	SS	6	3	29.8		
	2		CH	2	SS	18	9	24.9		*2000
	FAT CLAY, TRACE GRAVEL brown, reddish-brown and gray		CH	3	SS	16	10	25.3		*2000
		5	CH	4	SS	16	6	32.3		
					HS					
			CH	5	SS	17	11	30.7		
	10	10								

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft		
WL	▽ None WD	▼
WL	▽	▼
WL		

Belongia Consultants, Inc.

BORING STARTED	4-15-18		
BORING COMPLETED	4-15-18		
RIG	ATV	FOREMAN	DJ
APPROVED	DLB	JOB #	1185020

BOREHOLE 1185020.GPJ BELONGIA 5/9/18

LOG OF BORING NO. B-35

OWNER

ARCHITECT
Architects Collective

SITE
Highway 50
Lee's Summit, Missouri

PROJECT
Proposed Apartment Complex

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY, in.	SAMPLES SPT - N BLOWS / ft.	TESTS WATER CONTENT, %	TESTS DRY UNIT WT pcf	TESTS UNCONFINED STRENGTH, psf
	6" Topsoil				HS					
	FAT CLAY dark brown, soft		CH	1	SS	7	4	29.0		
	2									
	FAT CLAY brown, reddish-brown and gray		CH	2	SS	14	9	27.9		*2000
			CH	3	SS	16	8	29.0		*2000
		5	CH	4	SS	16	10	23.8		
					HS					
			CH	5	SS	17	10	33.5		
	10	10								

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft		
WL	▽ None WD	▼
WL	▽	▼
WL		

Belongia Consultants, Inc.

BORING STARTED	4-15-18		
BORING COMPLETED	4-15-18		
RIG	ATV	FOREMAN	DJ
APPROVED	DLB	JOB #	1185020

BOREHOLE 1185020.GPJ BELONGIA 5/9/18

LOG OF BORING NO. B-36

OWNER

ARCHITECT
Architects Collective

SITE
Highway 50
Lee's Summit, Missouri

PROJECT
Proposed Apartment Complex

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY, in.	SAMPLES SPT - N BLOWS / ft.	TESTS WATER CONTENT, %	TESTS DRY UNIT WT pcf	TESTS UNCONFINED STRENGTH, psf
	6" Topsoil				HS					
	FAT CLAY dark brown, soft		CH	1	SS	6	3	31.3		
2										
	FAT CLAY, TRACE SILT brown, reddish-brown and gray		CH	2	SS	14	11	27.7		*2000
			CH	3	SS	16	8	31.0		*2000
		5	CH	4	SS	18	6	29.0		
					HS			27.9		
			CH	5	SS	18	12			
10		10								

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft		
WL	▽ None WD	▼
WL	▽	▼
WL		

Belongia Consultants, Inc.

BORING STARTED	4-15-18		
BORING COMPLETED	4-15-18		
RIG	ATV	FOREMAN	DJ
APPROVED	DLB	JOB #	1185020

BOREHOLE 1185020.GPJ BELONGIA 5/9/18

LOG OF BORING NO. B-37

OWNER

ARCHITECT
Architects Collective

SITE
Highway 50
Lee's Summit, Missouri

PROJECT
Proposed Apartment Complex

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY, in.	SAMPLES SPT - N BLOWS / ft.	TESTS WATER CONTENT, %	TESTS DRY UNIT WT pcf	TESTS UNCONFINED STRENGTH, psf
	8" Topsoil				HS					
	LEAN TO FAT CLAY dark brown, very soft		CH	1	SS	6	4	29.5		
2										
	FAT CLAY, TRACE SILT brown, reddish-brown and gray		CH	2	SS	14	10	26.1		*2000
			CH	3	SS	14	8	23.3		*2000
		5	CH	4	SS	15	8	23.7		
					HS					
8										
	8.6 LIMESTONE gray			5	SS	1	50/1			

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft		
WL	▽ None WD	▼
WL	▽	▼
WL		

Belongia Consultants, Inc.

BORING STARTED	4-15-18		
BORING COMPLETED	4-15-18		
RIG	ATV	FOREMAN	DJ
APPROVED	DLB	JOB #	1185020

BOREHOLE 1185020.GPJ BELONGIA 5/9/18

LOG OF BORING NO. B-38

OWNER

ARCHITECT
Architects Collective

SITE
Highway 50
Lee's Summit, Missouri

PROJECT
Proposed Apartment Complex

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY, in.	SAMPLES SPT - N BLOWS / ft.	TESTS WATER CONTENT, %	TESTS DRY UNIT WT pcf	TESTS UNCONFINED STRENGTH, psf
	8" Topsoil				HS					
	FAT CLAY dark brown, very soft		CH	1	SS	3	2	29.1		
	2									
	FAT CLAY brown, reddish brown and gray		CH	2	SS	14	9	28.5		
			CH	3	SS	15	10	28.9		
		5	CH	4	SS	15	10	27.9		
	6.5									

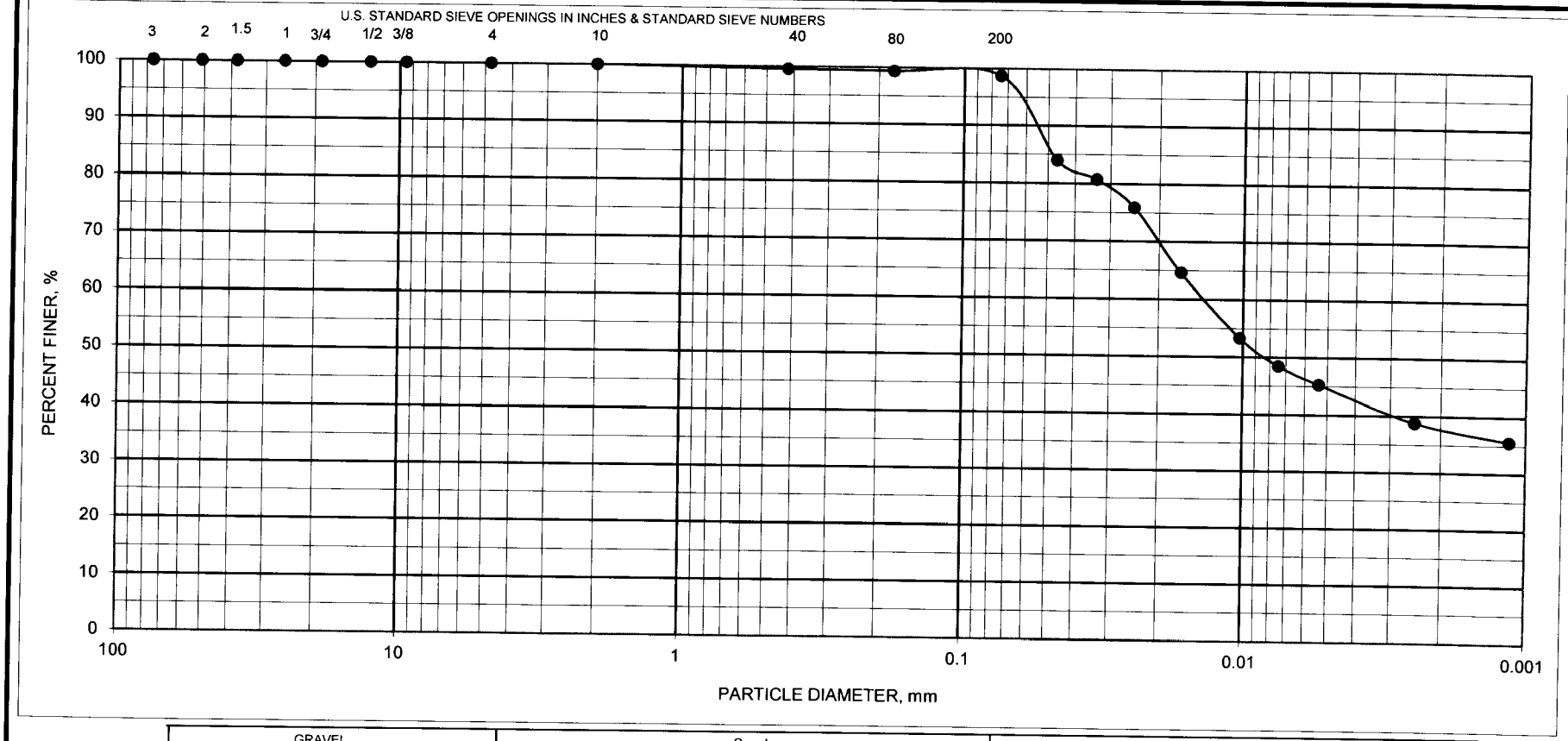
The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft		
WL	▽ None WD	▼
WL	▽	▼
WL		

Belongia Consultants, Inc.

BORING STARTED	4-15-18		
BORING COMPLETED	4-15-18		
RIG	ATV	FOREMAN	DJ
APPROVED	DLB	JOB #	1185020

BOREHOLE 1185020.GPJ BELONGIA 5/9/18



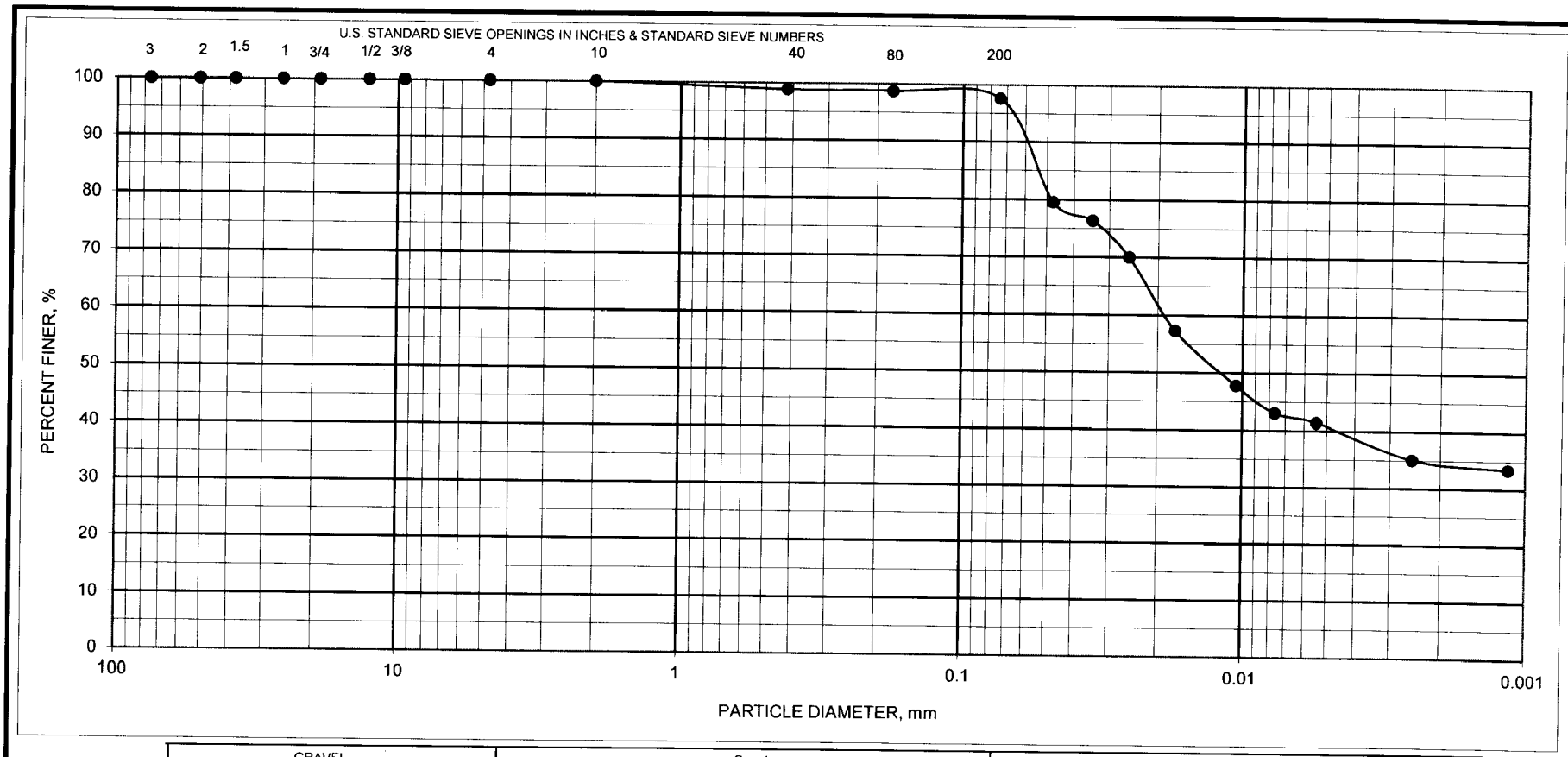
GRAVEL		Sand			Silt or Clay
Coarse	Fine	Coarse	Medium	Fine	

GRAIN SIZE DISTRIBUTION CURVE

BORING NO.	SAMPLE NO.	DEPTH, feet	DESCRIPTION	UNIFIED SYMBOL	NAT. WC, %	ATTERBERG LIMITS LL	PL	PI
13	2	2-3.5'	Brown, Red Brown&Gray Fat Clay Trace Sand					

PROJECT Proposed Apartments

Lee's Summit, MO JOB NO. 01185020 DATE 5/7/2018



GRAVEL		Sand			Silt or Clay
Coarse	Fine	Coarse	Medium	Fine	

GRAIN SIZE DISTRIBUTION CURVE

BORING NO.	SAMPLE NO.	DEPTH, feet	DESCRIPTION	UNIFIED SYMBOL	NAT. WC, %	ATTERBERG LIMITS LL	PL	PI
3	2	2-3.5'	Brown & Red Brown Fat Clay					

PROJECT Proposed Apartments

Lee's Summit, MO JOB NO. 01185020 DATE 5/7/2018

GENERAL NOTES

DRILLING & SAMPLING SYMBOLS:

SS:	Split Spoon - 1-3/8" I.D., 2" O.D., unless otherwise noted	HS:	Hollow Stem Auger
ST:	Thin-Walled Tube - 2" O.D., unless otherwise noted	PA:	Power Auger
RS:	Ring Sampler - 2.42" I.D., 3" O.D., unless otherwise noted	HA:	Hand Auger
DB:	Diamond Bit Coring - 4", N, B	RB:	Rock Bit
BS:	Bulk Sample or Auger Sample	WB:	Wash Boring or Mud Rotary

The number of blows required to advance a standard 2-inch O.D. split-spoon sampler (SS) the last 12 inches of the total 18-inch penetration with a 140-pound hammer falling 30 inches is considered the "Standard Penetration" or "N-value".

WATER LEVEL MEASUREMENT SYMBOLS:

WL:	Water Level	WS:	While Sampling
WCI:	Wet Cave in	WD:	While Drilling
DCI:	Dry Cave in	BCR:	Before Casing Removal
AB:	After Boring	ACR:	After Casing Removal

Water levels indicated on the boring logs are the levels measured in the borings at the times indicated. Groundwater levels at other times and other locations across the site could vary. In pervious soils, the indicated levels may reflect the location of groundwater. In low permeability soils, the accurate determination of groundwater levels may not be possible with only short-term observations.

DESCRIPTIVE SOIL CLASSIFICATION: Soil classification is based on the Unified Classification System. Coarse Grained Soils have more than 50% of their dry weight retained on a #200 sieve; their principal descriptors are: boulders, cobbles, gravel or sand. Fine Grained Soils have less than 50% of their dry weight retained on a #200 sieve; they are principally described as clays if they are plastic, and silts if they are slightly plastic or non-plastic. Major constituents may be added as modifiers and minor constituents may be added according to the relative proportions based on grain size. In addition to gradation, coarse-grained soils are defined on the basis of their in-place relative density and fine-grained soils on the basis of their consistency.

CONSISTENCY OF FINE-GRAINED SOILS

Unconfined Compressive Strength, Qu, psf	Standard Penetration or N-value (SS) Blows/Ft.	Consistency
< 500	<2	Very Soft
500 – 1,000	2-3	Soft
1,001 – 2,000	4-6	Medium Stiff
2,001 – 4,000	7-12	Stiff
4,001 – 8,000	13-26	Very Stiff
8,000+	26+	Hard

RELATIVE DENSITY OF COARSE-GRAINED SOILS

Standard Penetration or N-value (SS) Blows/Ft.	Relative Density
0 – 3	Very Loose
4 – 9	Loose
10 – 29	Medium Dense
30 – 49	Dense
50+	Very Dense

RELATIVE PROPORTIONS OF SAND AND GRAVEL

Descriptive Term(s) of other constituents	Percent of Dry Weight
Trace	< 15
With	15 – 29
Modifier	> 30

GRAIN SIZE TERMINOLOGY

Major Component of Sample	Particle Size
Boulders	Over 12 in. (300mm)
Cobbles	12 in. to 3 in. (300mm to 75 mm)
Gravel	3 in. to #4 sieve (75mm to 4.75 mm)
Sand	#4 to #200 sieve (4.75mm to 0.075mm)
Silt or Clay	Passing #200 Sieve (0.075mm)

RELATIVE PROPORTIONS OF FINES

Descriptive Term(s) of other constituents	Percent of Dry Weight
Trace	< 5
With	5 – 12
Modifiers	> 12

PLASTICITY DESCRIPTION

Term	Plasticity Index
Non-plastic	0
Low	1-10
Medium	11-30
High	30+

GENERAL NOTES

Sedimentary Rock Classification

DESCRIPTIVE ROCK CLASSIFICATION:

Sedimentary rocks are composed of cemented clay, silt and sand sized particles. The most common minerals are clay, quartz and calcite. Rock composed primarily of calcite is called limestone; rock of sand size grains is called sandstone, and rock of clay and silt size grains is called mudstone or claystone, siltstone, or shale. Modifiers such as shaly, sandy, dolomitic, calcareous, carbonaceous, etc. are used to describe various constituents. Examples: sandy shale; calcareous sandstone.

LIMESTONE	Light to dark colored, crystalline to fine-grained texture, composed of $CaCo_3$, reacts readily with HCl.
DOLOMITE	Light to dark colored, crystalline to fine-grained texture, composed of $CaMg(CO_3)_2$, harder than limestone, reacts with HCl when powdered.
CHERT	Light to dark colored, very fine-grained texture, composed of micro-crystalline quartz (SiO_2), brittle, breaks into angular fragments, will scratch glass.
SHALE	Very fine-grained texture, composed of consolidated silt or clay, bedded in thin layers. The unlaminated equivalent is frequently referred to as siltstone, claystone or mudstone.
SANDSTONE	Usually light colored, coarse to fine texture, composed of cemented sand size grains of quartz, feldspar, etc. Cement usually is silica but may be such minerals as calcite, iron-oxide, or some other carbonate.
CONGLOMERATE	Rounded rock fragments of variable mineralogy varying in size from near sand to boulder size but usually pebble to cobble size (½ inch to 6 inches). Cemented together with various cementing agents. Breccia is similar but composed of angular, fractured rock particles cemented together.

PHYSICAL PROPERTIES:

DEGREE OF WEATHERING

Slight	Slight decomposition of parent material on joints. May be color change.
Moderate	Some decomposition and color change throughout.
High	Rock highly decomposed, may be extremely broken.

HARDNESS AND DEGREE OF CEMENTATION

Limestone and Dolomite:

Hard	Difficult to scratch with knife.
Moderately Hard	Can be scratched easily with knife, cannot be scratched with fingernail.
Soft	Can be scratched with fingernail.

Shale, Siltstone and Claystone

Hard	Can be scratched easily with knife, cannot be scratched with fingernail.
Moderately Hard	Can be scratched with fingernail.
Soft	Can be easily dented but not molded with fingers.

Sandstone and Conglomerate

Well Cemented	Capable of scratching a knife blade.
Cemented	Can be scratched with knife.
Poorly Cemented	Can be broken apart easily with fingers.

BEDDING AND JOINT CHARACTERISTICS

Bed Thickness	Joint Spacing	Dimensions
Very Thick	Very Wide	> 10′
Thick	Wide	3′ - 10′
Medium	Moderately Close	1′ - 3′
Thin	Close	2″ - 1′
Very Thin	Very Close	.4″ - 2″
Laminated	—	.1″ - .4″

Bedding Plane	A plane dividing sedimentary rocks of the same or different lithology.
Joint	Fracture in rock, generally more or less vertical or transverse to bedding, along which no appreciable movement has occurred.
Seam	Generally applies to bedding plane with an unspecified degree of weathering.

SOLUTION AND VOID CONDITIONS

Solid	Contains no voids.
Vuggy (Pitted)	Rock having small solution pits or cavities up to ½ inch diameter, frequently with a mineral lining.
Porous	Containing numerous voids, pores, or other openings, which may or may not interconnect.
Cavernous	Containing cavities or caverns, sometimes quite large.

UNIFIED SOIL CLASSIFICATION SYSTEM

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests[A]					Soil Classification	
					Group Symbol	Group Name[B]
Coarse Grained Soils More than 50% retained on No. 200 sieve	Gravels More than 50% of coarse fraction retained on No. 4 sieve	Clean Gravels Less than 5% fines[C]	$Cu \geq 4$ 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[C]	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 fraction passes No. 4 sieve	Clean Sands Less than 5% fines[D]	$Cu \geq 6$ 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[D]	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[J]		CL	Lean clay[K,L,M]
			PI < 4 or plots below "A" line[J]		ML	Silt[K,L,M]
		organic	Liquid limit - oven dried / 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 lots below "A" line		MH	Elastic Silt[K,L,M]
		organic	Liquid limit - oven dried / Liquid limit - not dried	< 0.75	OH	Organic clay[K,L,M,P] / Organic silt[K,L,M,Q]
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% fines 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] $Cu = D_{60}/D_{10}$ $\quad Cc = \dfrac{(D_{30})^2}{D_{10} \times D_{60}}$

[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.

[J] If Atterberg limits plot in shaded 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 soil 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.