



# **REPORT OF TEST PIT EXPLORATION**

Cassville Road Property

Cartersville, Bartow County, Georgia

WSP Project No. 6162232474

Prepared for:

James R. Baker

Vice President, Investments

The Macallan Group

1642 Powers Ferry Road SE, Suite 250

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5/19/2023



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5/19/2023

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Marietta, Georgia 30067

Subject: **Report of Test Pit Exploration  
Cassville Road Property  
Cartersville, Bartow County, Georgia  
WSP Project No. 6162232474**

Dear Mr. Baker:

WSP USA Environment & Infrastructure Inc. (WSP) is pleased to submit this subsurface exploration and geotechnical engineering evaluation report for the above-referenced subject property located in Cartersville, Bartow County, Georgia. This exploration was conducted in general accordance with our proposal dated May 1, 2023. This report discusses our understanding of the project, describes our exploratory procedures, and results, and presents our conclusions and recommendations related to the project design and construction.

We appreciate the opportunity of working with you on this project and look forward to our continued association during the construction phase of the project. Please contact us if you have any questions about this report or if we may be of further service.

Sincerely,

**WSP USA Environment & Infrastructure Inc.**

Blake A. Morgan, P.G.  
Consultant Geologist

  
J. Todd Jackson, P.E. with permission  
Associate Geotechnical Engineer



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**5/19/2023**

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- GBA Information About Geotechnical Reports



## 1.0 Project Information

The Cassville Road property consists of a 33-acre tract of land located north of Highway 411, south of Hamilton Blvd NW, east of Rosen Street, and west of Cassville Road NW in Cartersville, Bartow County, Georgia. Site development plans have not yet been formed.

## 2.0 Field Exploration (Test Pits)

The objective of this exploration was to evaluate subsurface conditions across the site for recording possible groundwater, rock depth and to evaluate soils. The locations of test pits were provided to us by Contour Environmental, and the location plan is attached in the Appendix. An excavator with operator was subcontracted and provided by the Macallan Group and test pits were performed by excavating the soil using a mini excavator.

Fourteen test pits (designated TP-1 through TP-14) were extended to approximately 6 feet to observe the materials exposed and obtain bulk samples for laboratory testing. Test pit logs were recorded in addition to photographs. Groundwater was noted where encountered. The Test Pit Logs and Photographs are located in the Appendix.

The locations were spaced throughout the site based on the location plan provided. Figure 1, Test Pit Location Plan, in the Appendix presents the approximate locations of the test pits completed for this exploration. These locations were established in the field by WSP personnel using a hand-held Global Positioning System (GPS) and referencing existing site features.

Soil samples obtained from the borings were logged in the field by a geotechnical engineer. Soil descriptions were performed in general accordance with the Unified Soil Classification System (USCS) using visual/manual methods. Detailed descriptions of the materials encountered in the test pits, are presented on test pit logs in the Appendix. Associated pictures for the site and each test pit are also provided in the Appendix. These records represent our interpretation of the subsurface conditions based on an engineering examination of the samples. The designating interfaces between various strata represent approximate boundaries only, as transitions between materials may be gradual.

Bulk samples were collected in buckets and bags for lab testing to determine the suitability of soil for backfill.

## 3.0 Site and Subsurface Conditions

### 3.1 Area and Site Geology

The site is in the Valley and Ridge Physiographic Province. The rocks of this province in this area are generally ancient sedimentary materials 420 to 500 million years old, dating from Cambrian or Ordovician periods. Though these rocks were deposited as sediments long ago, they were consolidated into very hard rocks by

cementation and great pressure. The area consists of alternating folded beds of resistant and friable sedimentary rocks. The faulted and highly folded nature of these rocks is the result of collisions that formed the Appalachian Mountains along with the supercontinent of Pangaea.

In general, the rocks in the Valley and Ridge Province are interbedded and broken limestones, dolostones, sandstones and shales. USGS mapping of the area indicates that the site is underlain by the rocks of the Upper Unit of the Conasauga Group which is composed of limestone and shale. The sedimentary rocks have weathered in-place to form residual over-burden soils including clays, silts and sands, some of which contain chert fragments ranging from gravel to boulder sizes. Due to the interbedding, tilting, and weathering, relatively hard, sound rock layers may be underlain by soils or voids, creating complex subsurface conditions.

Hydrogeologic conditions in the Valley and Ridge Province are dependent on the type of bedrock, the degree of bedrock fracture and solutioning, and the relationship between these conditions and topography. In the site area, carbonate rocks (dolostone and limestone) are the best aquifers in terms of water quantity. These rocks commonly have a system of interconnected fractures enlarged by the dissolving action of groundwater, and therefore transmit groundwater effectively. This process leads to karst conditions, characterized by pinnacled rock, sinkholes, underground caves and springs. Cavities may be present at depth whenever carbonate rocks are present even if there are no obvious surface expressions.

Limestone is known to be present within Bartow County and sinkhole related problems have occurred in the past in the general vicinity (Cartersville area) of the site. Sinkholes can form spontaneously and are extremely difficult to predict. As a result of normal solutioning of limestone or dolostone bedrock, sinkholes can form either through a collapse of the rock itself as the crown of the void in solutioned rock approaches the ground surface, or through the erosion of soils from the overburden layer into slots and cavities in the bedrock. Many factors can influence sinkhole activity, including both on-site and off-site activities. In addition, excavation activities associated with construction can remove or weaken the "roof" over sinkholes. Further, changes in drainage patterns can induce development of sinkholes. It is not possible to accurately predict the probability of occurrence or potential magnitude of subsidence associated with sinkhole activity in a geologic setting such as this.

Voids within the soil mass are not unusual in areas underlain by soluble rocks such as limestone and dolostone. These voids are created by soil migration into solution openings in the underlying rock. Any construction on a site underlain by soluble rocks risks loss of support of foundations because of soil void collapse. Also, it is not unusual to find a softened soil zone several feet thick immediately overlying limestone or dolostone.

Review of a USGS topographic map of the site and immediate surrounding area did not indicate the presence of sinkholes at the site or in the immediate vicinity. Widely spaced borings and geophysical surveys comprise a small percent of a site area and cannot predict the degree of risk. In building on a site underlain by soluble rocks, the owner must assume the risk of potential future damage as a result of previously undetected solution related soil subsidence.

## **3.2 Site Stratigraphy**

The Test Pits encountered a thin surficial layer of grass/topsoil underlain by possible fill or disturbed cultivated soils to depths ranging from 2 to 3 feet below grade. The near surface soil is described as silty sands (SM) and clayey sands (SC). Beneath the fill, the borings encountered residual soils consisting of clay (CL) and Silt (ML).

Test pits 2, 11, and 11-A encountered groundwater during the field exploration at depths ranging from 2 feet to 4 feet below grade. Groundwater was actively flowing into the test pits during excavation.

No apparent rock was encountered in the test pits above the termination depths. Termination depths ranged from 4 to 7 feet.

## **4.0 Conclusions and Recommendations**

### **4.1 Basis for Recommendations**

The following conclusions and recommendations are based on our observations at the site, interpretation of the field and laboratory data, and our experience with similar subsurface conditions. Subsurface conditions in unexplored locations may vary from those encountered at the specific boring locations.

### **4.2 Lab Test Results**

Laboratory testing included standard Proctor compaction tests, moisture content, Grain Size Analysis, and Atterberg Limits. The results of the laboratory testing are in the Appendix. Some or the test results are also summarized on the Test Pit Log also located in the Appendix.

### **4.3 Groundwater**

Three of the test pits encountered the groundwater table during the field exploration at depths ranging from 2 to 4 feet below grade. The impact groundwater may have will be largely determined by proposed final site grades, which have not been developed at this time.

We note that groundwater levels are subject to seasonal, climatic, and other variations and may be different at other times than those stated in this report. The rainy season for the metro Atlanta area is primarily winter to early spring although monthly rainfall amounts in excess of 3 inches are common throughout the year. Our experience is that annual groundwater fluctuations of 3 to 5 feet are possible, with the higher levels typically occurring in winter and early spring.

### **4.4 On-Site Material as Structural Fill**

Excavations at the site will generate a variety of materials that will require planning to reuse in the available fill areas. Topsoil stripping should be limited to the upper most organic materials. Topsoil can be stockpiled and reused in landscape areas or to dress completed slopes.

The silty and clayey soils encountered in the test pits will be sensitive to disturbance from the construction activity and water seepage. If precipitation occurs prior to or during construction, the near surface soils could increase in moisture content and become more susceptible to disturbance. Construction activity should be monitored and should be curtailed if the construction activity is causing subgrade disturbance. Some of the highly silty soils encountered could require extra care due to their moisture sensitivity. Some silty soils can exhibit rutting under traffic loads even when conditions are ideal but this does not mean the soil is not appropriate for use as general structural fill, but such soils should be carefully evaluated where encountered.

Moisture contents in comparison to standard Proctor optimum moisture indicate soils are 2 to 3 percent above the optimum range. As such, some drying of the materials may be required depending on conditions at the time of construction. Such drying is more easily accomplished in hotter dryer months and may be impractical during wetter periods of the year.

It should be noted that the fat clays (CH) encountered on site in TP-6 should not be reused as structural fill material due to the high plasticity unless it is mixed with sandy soils to reduce the plasticity. Mixing of high-plasticity soils should be performed under the direction of the Geotechnical Engineer of Record. It may be feasible to use these soils in deeper fills or in non-structural areas, however, we recommend that a vertical separation of at least two feet be maintained between structure slabs or pavements and the high-plasticity soils. While not identified on-site elastic silts (MH) are common to the area and should also be mixed with other sandy soil types if used as structural fill.

Structural fill should generally be low to moderate plasticity soil (PI less than 30) and free of deleterious materials and large rock fragments. In general, the soils encountered by the borings satisfy these criteria, however the site does contain areas of plastic clays and possibly elastic silts. Soils excavated in frequently inundated areas of the site should be expected to be very wet due to the presence of shallow groundwater in the area and proximity to the creek. These wet soils will likely not be reusable as backfill nor capable of meeting typical without substantial drying. The contractor should be prepared to dry the excavated soils prior to reuse. We recommend that backfill placement be witnessed by a qualified soil technician and that density and moisture testing be performed to verify that specified compaction requirements are achieved.

## **5.0 Qualifications of Recommendations**

Our evaluation of subsurface and construction conditions has been based on our understanding of the site, the available project information, our assumptions, and the data obtained during our field exploration as described herein. The general subsurface conditions used were based on interpolation of the subsurface data at our borings. The design recommendations in this report have been developed on the basis of the previously described project characteristics and subsurface conditions. If project criteria or locations change, we must be permitted to determine if our recommendations are still applicable or if they must be modified. The findings of such a review will be presented in a supplemental report.

Subsurface conditions in unexplored locations may vary from those encountered at specific boring location. The nature and extent of variations may not become evident until the course of construction. If such

variations then appear evident, it will be necessary to re-evaluate the recommendations of this report after on-site observations of the conditions.

Regardless of the thoroughness of a subsurface exploration, there is the possibility that conditions will differ from those at the boring location, that conditions are not as anticipated by the designers, or that the construction process has altered the soil conditions. Therefore, experienced geotechnical engineers must observe earthwork and foundation construction to assess if the conditions anticipated in design actually exist.

Our professional services have been performed, our findings derived, and our recommendations prepared in accordance with generally accepted geotechnical engineering principles and practices. This warranty is in lieu of all other warranties either express or implied. This company is not responsible for the conclusions, opinions or recommendations of others based on these data.



## **Appendix**

**Figure 1 - Test Pit Location Plan**

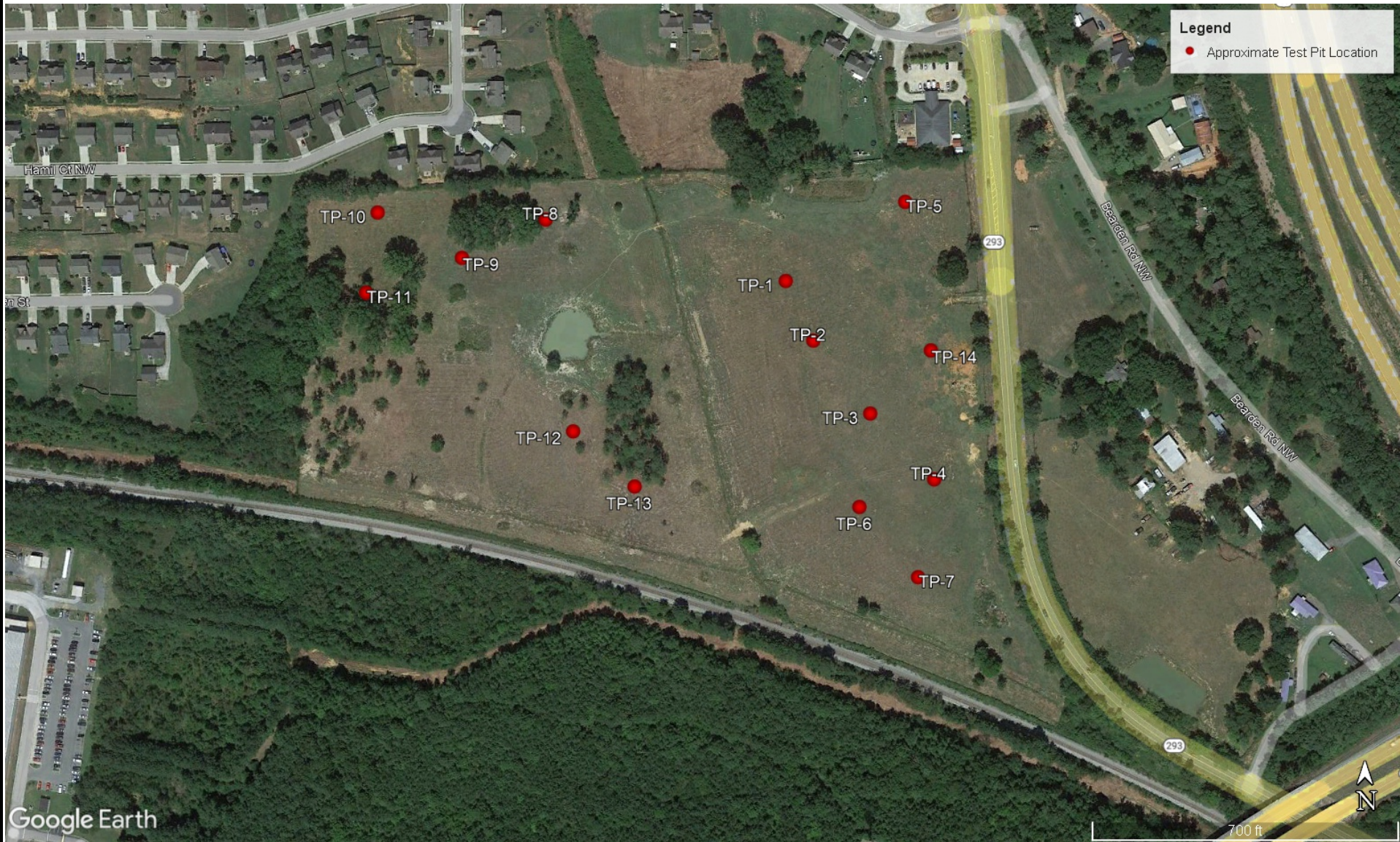
**Key to Symbols and Descriptions**

**Test Pit Logs**

**Lab Test Results**

**Test Pit Photo Logs**

**GBA Information About Geotechnical Reports**



**Cassville Road  
Cartersville, Georgia**

WSP  
2677 Buford Highway  
Atlanta, Georgia 30324  
(404) 873 4761



**TEST PIT LOCATION PLAN**

PROJECT NUMBER:  
6162 23 2474

DATE: May 2023  
Drawn By: BAM

FIGURE 1

MAJOR DIVISIONS			GROUP SYMBOLS	TYPICAL NAMES	Undisturbed Sample	Auger Cuttings						
<b>COARSE GRAINED SOILS</b> (More than 50% of material is LARGER than No. 200 sieve size)	<b>GRAVELS</b> (More than 50% of coarse fraction is LARGER than the No. 4 sieve size)	<b>CLEAN GRAVELS</b> (Little or no fines)	GW	Well graded gravels, gravel - sand mixtures, little or no fines.		Bulk Sample						
			GP	Poorly graded gravels or gravel - sand mixtures, little or no fines.				Crandall Sampler				
		<b>GRAVELS WITH FINES</b> (Appreciable amount of fines)	GM	Silty gravels, gravel - sand - silt mixtures.		Pressure Meter						
			GC	Clayey gravels, gravel - sand - clay mixtures.				No Recovery				
	<b>SANDS</b> (More than 50% of coarse fraction is SMALLER than the No. 4 Sieve Size)	<b>CLEAN SANDS</b> (Little or no fines)	SW	Well graded sands, gravelly sands, little or no fines.		Water Table at time of boring				Water Table after 24 hours		
			SP	Poorly graded sands or gravelly sands, little or no fines.			Correlation of Standard Penetration Resistance with Relative Density and Consistency					
		<b>SANDS WITH FINES</b> (Appreciable amount of fines)	SM	Silty sands, sand - silt mixtures	SAND & GRAVEL						SILT & CLAY	
			SC	Clayey sands, sand - clay mixtures.	No. of Blows	Relative Density					No. of Blows	Consistency
		<b>FINE GRAINED SOILS</b> (More than 50% of material is SMALLER than No. 200 sieve size)	<b>SILTS AND CLAYS</b> (Liquid limit LESS than 50)	ML	Inorganic silts and very fine sands, rock flour, silty of clayey fine sands or clayey silts and with slight plasticity.	0 - 4					Very Loose	0 - 2
				CL	Inorganic lays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.	5 - 10	Loose	3 - 4	Soft			
OL	Organic silts and organic silty clays of low plasticity.			11 - 30	Medium Dense	5 - 8	Firm					
				31 - 50	Dense	9 - 15	Stiff					
				Over 50	Very Dense	16 - 30	Very Stiff					
<b>SILTS AND CLAYS</b> (Liquid limit GREATER than 50)	MH		Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts.			31 - 50	Hard					
	CH		Inorganic clays of high plasticity, fat clays			Over 50	Very Hard					
	OH		Organic clays of medium to high plasticity, organic silts.	Correlation of Dynamic Cone Penetration Resistance with Relative Density and Consistency (Piedmont Residual Soils)								
								SAND & GRAVEL		SILT & CLAY		
				No. of Blows	Relative Density	No. of Blows	Consistency					
		0 - 4	Very Loose	0 - 2	Very Soft							
		5 - 15	Loose	3 - 4	Soft							
		16 - 30	Medium Dense	5 - 10	Firm							
<b>HIGHLY ORGANIC SOILS</b>			PT	Peat and other highly organic soils.		11 - 30	Stiff					
<b>FILL</b>				Fill								

**BOUNDARY CLASSIFICATIONS:** Soils possessing characteristics of two groups are designated by combinations of group symbols.

SILT OR CLAY	SAND			GRAVEL			Cobbles	Boulders
	Fine	Medium	Coarse	Fine	Coarse			
	No.200	No.40	No.10 No.4	3/4"	3"	12"		

U.S. STANDARD SIEVE SIZE

Reference: The Unified Soil Classification System, Corps of Engineers, U.S. Army Technical Memorandum No. 3-357, Vol. 1, March, 1953 (Revised April, 1960)

## KEY TO SYMBOLS AND DESCRIPTIONS



Cassville Road Property								
Test Pit	Depth (ft)	Soil Type	Groundwater (ft)	Rock	Lab Results			Comment
					Moisture Content/depth (ft)	Atterberg Limits (LL/PI)	Standard Proctore MDD/OM	
TP-1	0-2	Cultivated/Fill/Topsoil. Red and brown sandy lean clay (CL)			23.6/1	45/18		Test Pit terminated at approximately 6 feet
	2-6	Residuuum - Tan, brown, white silty clay	--	--			101.3/20.2	
TP-2	0-3	Cultivated/Fill/Topsoil. Red and brown SC			25/4			Test Pit terminated at approximately 6 feet
	3-6	Residuuum - Tan, brown, white silty clay	4	--				
TP-3	0-2	Cultivated/Fill/Topsoil. Red and brown sandy clay						Test Pit terminated at approximately 7 feet
	2-5	Residuuum - Red and brown sandy clay						
	5-7	White tan brown silty clay	--	--				
TP-4	0-3	Residuuum- Red and brown sandy clay			21/4			Test Pit terminated at approximately 6 feet
	3-6	Tan clayey sand	--	--				
TP-5	0-2	Cultivated/Fill/Topsoil. Red and brown sandy clay						Test Pit terminated at approximately 6 feet
	2-4	Red clayey silt						
	4-6	Tan and white sandy clay	--	--				
TP-6	0-3	Brown sandy clay						Test Pit terminated at approximately 6 feet
	3-6	White and tan clay (CH) with shale fragments	--	--	19.8/3	56/22	105.5/20.6	
TP-7	0-3	Brown sandt clay			23/4			Test Pit terminated at approximately 6 feet
	3-6	Tan and gray clayey silt	--	--				
TP-8	0-2	Gray, brown, tan sandy silt						Test Pit terminated at approximately 6 feet
	2-4	Red clayey silt			16.4/5			
	4-6	Tan and white clayey silt with shale fragments	--	--				
TP-9	0-3	Gray, brown, tan snandy silt			20.5/4			Test Pit terminated at approximately 6 feet
	3-6	Tan and white clayey silt with shale fragments	--	--				
TP-10	0-3	Red and brown sandy clay and clayey silt						Test Pit terminated at approximately 7 feet
	3-4	Tan, brown, white sandy clay						
	4-7	White ML with tan and brown silty clay	--	--				
TP-11	0-2	Red and brown sandy clay						Test Pit terminated at approximately 4 feet
	2-4	Gray clayey silt	2	--				
TP-11 (offset)	0-2	Red and brown sandy clay			21.3/3			Test Pit terminated at approximately 4 feet
	2-4	Gray clayey silt	2	--				
TP-12	0-2	Gray sandy silt and sandy clay						Test Pit terminated at approximately 6 feet
	2-6	Tan, white, brown silty clay	--	--				
TP-13	0-3	Gray clayey silt			17.2/4			Test Pit terminated at approximately 6 feet
	3-6	Tan and white clayey silt with shale fragments	--	--				
TP-14	0-6	Red and brown silty clay (CL)	--	--	23.5/2	44/19	104.5/20.5	Test Pit terminated at approximately 6 feet

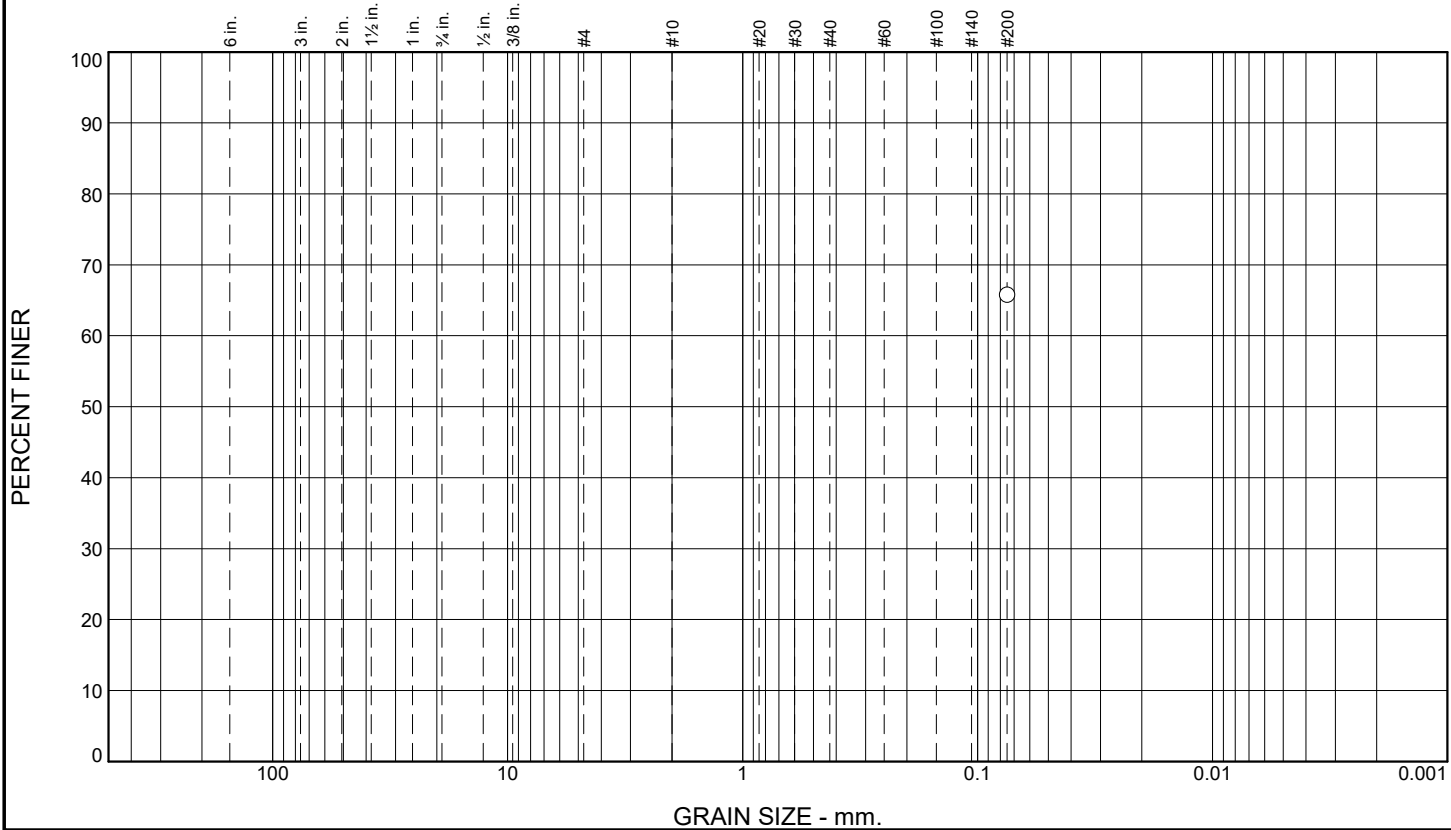






# Particle Size Distribution Report

ASTM D1140



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						65.8	

Test Results (ASTM D1140)				
Sieve Size or Diam. (mm.)	Finer (%)	Spec.* (%)	Out of Spec. (%)	Pct. of Fines
#200	65.8			

\* (no specification provided)

Material Description		
Gray and Tan Sandy Fat CLAY		
<b>Atterberg Limits</b>		
PL= 22	LL= 56	PI= 34
<b>Coefficients</b>		
D <sub>90</sub> =	D <sub>85</sub> =	D <sub>60</sub> =
D <sub>50</sub> =	D <sub>30</sub> =	D <sub>15</sub> =
D <sub>10</sub> =	C <sub>u</sub> =	C <sub>c</sub> =
<b>Classification</b>		
USCS= CH	AASHTO= N/A	
<b>Test Remarks</b>		
Lab # 23418		
As Received Moisture Content = 19.8 %		

Source of Sample: 6      Depth: 3-6 ft  
 Sample Number: 1

Sample Date: 05/11/2023



Client: Macallan Group  
 Project: Cassville Road Property

Project No: 6162232474

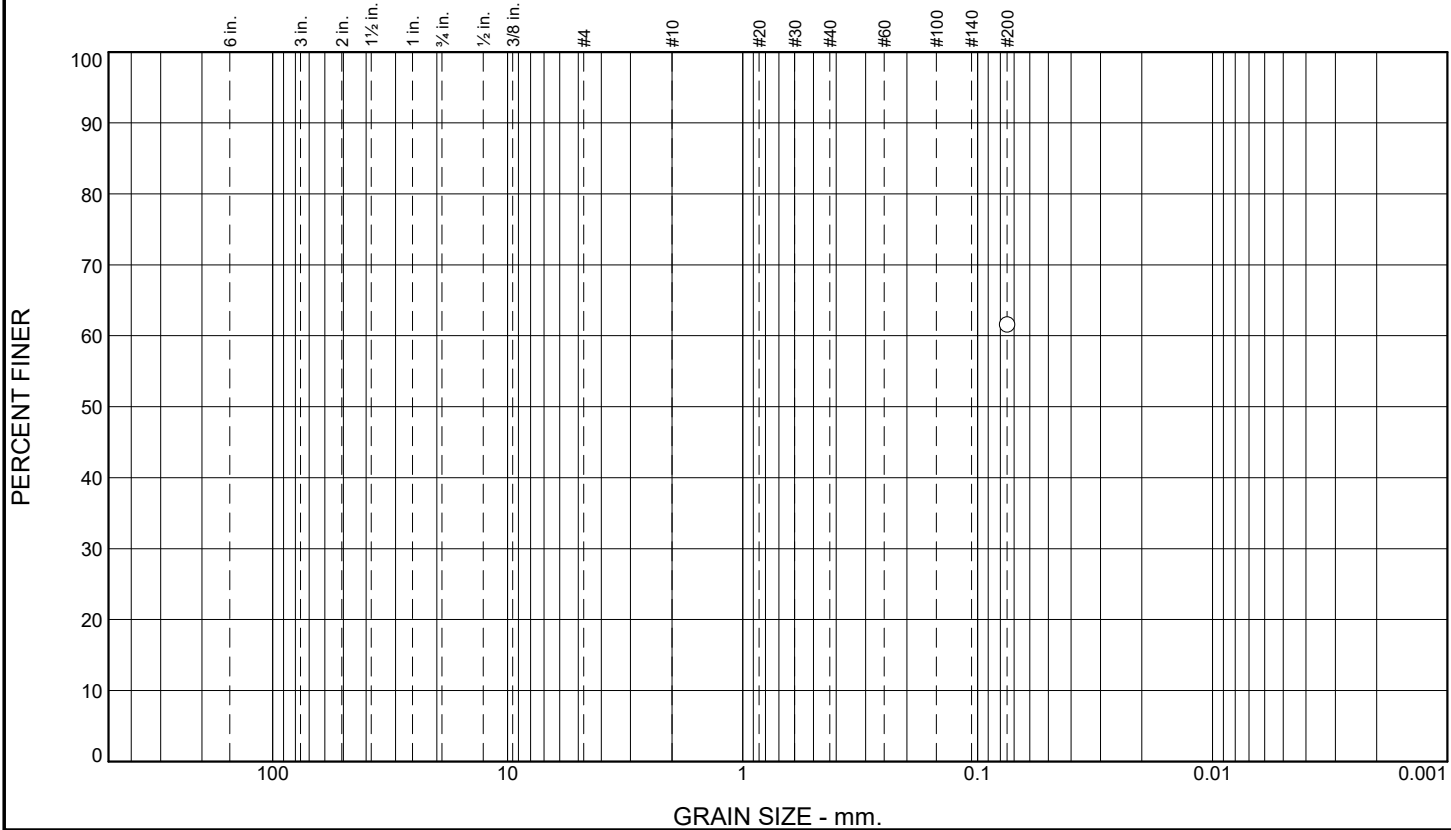
Figure

Tested By: DH

Checked By: TZ

# Particle Size Distribution Report

ASTM D1140



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						61.6	

Test Results (ASTM D1140)				
Sieve Size or Diam. (mm.)	Finer (%)	Spec.* (%)	Out of Spec. (%)	Pct. of Fines
#200	61.6			

\* (no specification provided)

**Material Description**

Reddish Brown Sandy Lean CLAY

**Atterberg Limits**

PL= 27      LL= 45      PI= 18

**Coefficients**

D<sub>90</sub>=      D<sub>85</sub>=      D<sub>60</sub>=  
 D<sub>50</sub>=      D<sub>30</sub>=      D<sub>15</sub>=  
 D<sub>10</sub>=      C<sub>u</sub>=      C<sub>c</sub>=

**Classification**

USCS= CL      AASHTO= N/A

**Test Remarks**

Lab # 23419  
 As Received Moisture Content = 23.6 %

Source of Sample: 1      Depth: 0-2 ft  
 Sample Number: 1

Sample Date: N/A



**Client:** Macallan Group  
**Project:** Cassville Road Property

**Project No:** 6162232474

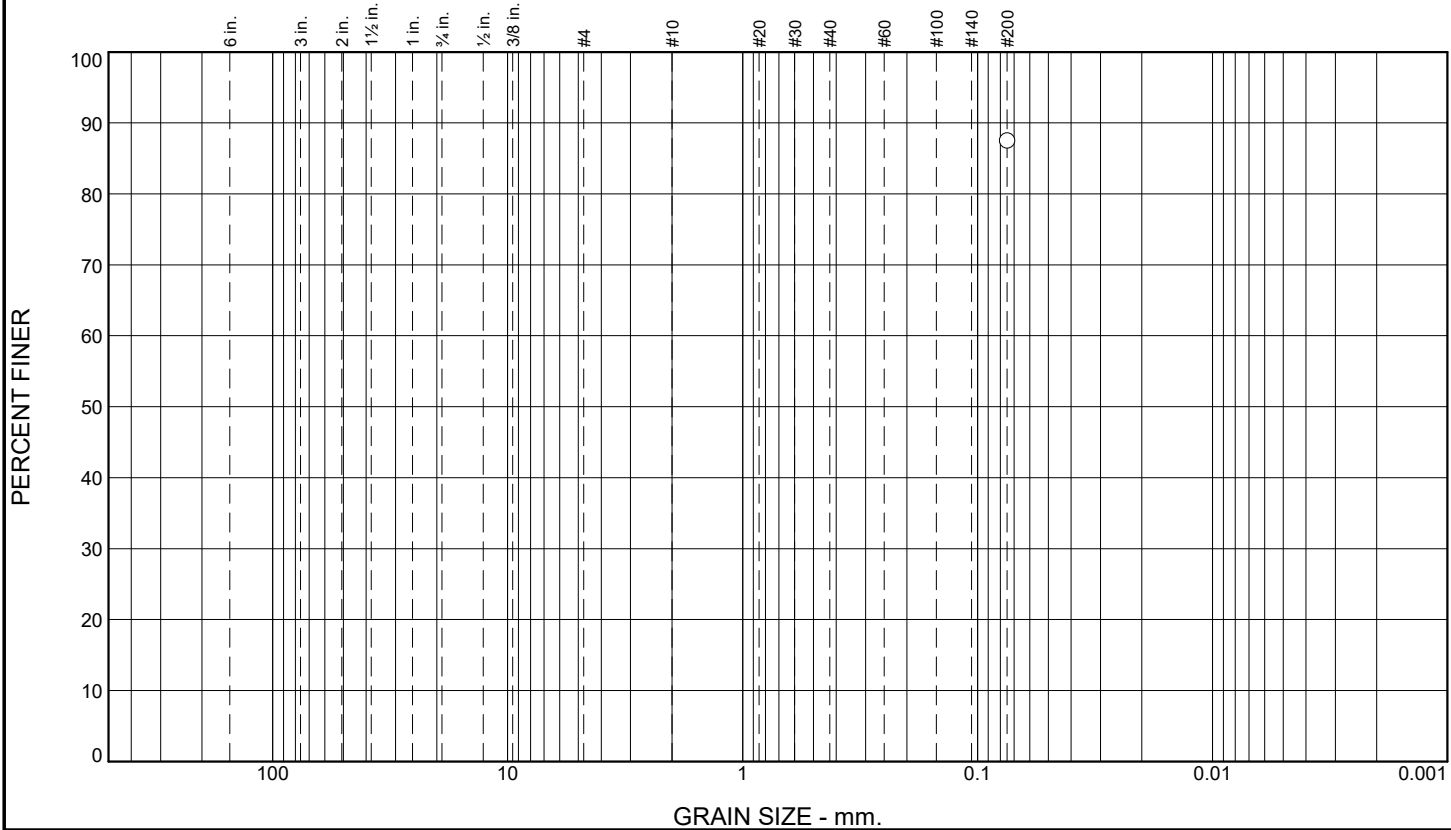
**Figure**

Tested By: DH

Checked By: TZ

# Particle Size Distribution Report

ASTM D1140



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						87.5	

Test Results (ASTM D1140)				
Sieve Size or Diam. (mm.)	Finer (%)	Spec.* (%)	Out of Spec. (%)	Pct. of Fines
#200	87.5			

\* (no specification provided)

Material Description		
Red Lean CLAY		
<b>Atterberg Limits</b>		
PL= 25	LL= 44	PI= 19
<b>Coefficients</b>		
D <sub>90</sub> =	D <sub>85</sub> =	D <sub>60</sub> =
D <sub>50</sub> =	D <sub>30</sub> =	D <sub>15</sub> =
D <sub>10</sub> =	C <sub>u</sub> =	C <sub>c</sub> =
<b>Classification</b>		
USCS= CL	AASHTO= N/A	
<b>Test Remarks</b>		
Lab # 23420		
As Received Moisture Content = 23.5 %		

Source of Sample: 14      Depth: 2-6 ft  
 Sample Number: 1

Sample Date: N/A



**Client:** Macallan Group  
**Project:** Cassville Road Property  
**Project No:** 6162232474

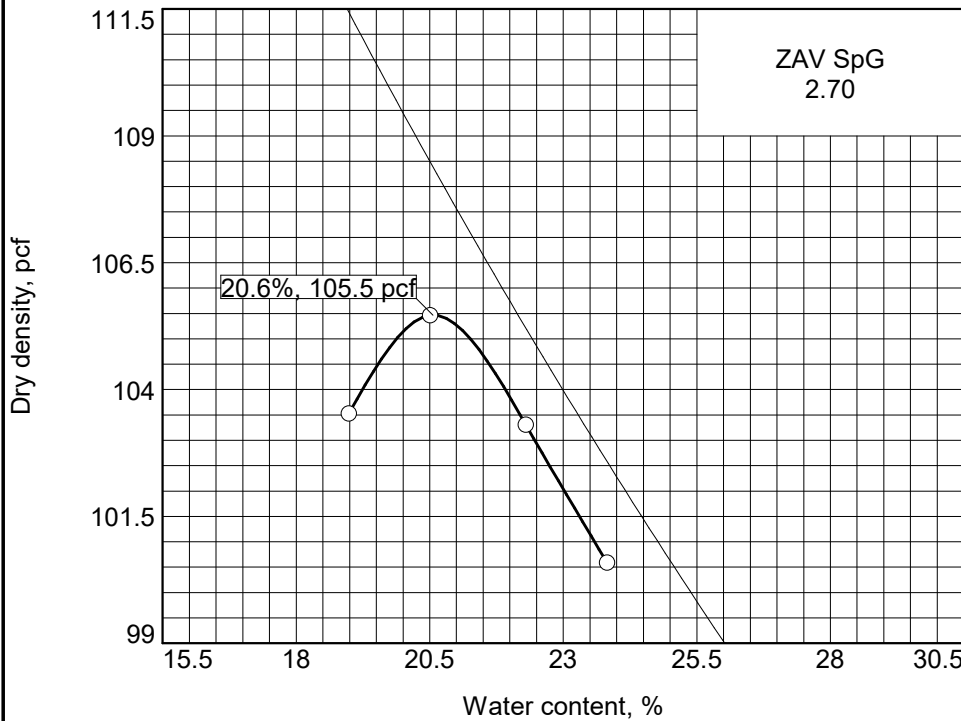
Figure

Tested By: DH      Checked By: TZ



# COMPACTION TEST REPORT

**Curve No.**



**Test Specification:**

ASTM D 698-12 Method A Standard

**Hammer Wt.:** 5.5 lb.

**Hammer Drop:** 12 in.

**Number of Layers:** three

**Blows per Layer:** 25

**Mold Size:** 0.03333 cu. ft.

**Test Performed on Material**

Passing #4 Sieve

**Soil Data**

**NM** 19.8      **Sp.G.** 2.7

**LL** 56      **PI** 34

**%>#4** N/A      **%<#200** 65.8

**USCS** CH      **AASHTO** N/A

**TESTING DATA**

	1	2	3	4	5	6
<b>WM + WS</b>	3977.0	3918.2	3965.7	3938.7		
<b>WM</b>	2063.1	2063.1	2063.1	2063.1		
<b>WW + T #1</b>	343.2	312.1	299.5	303.6		
<b>WD + T #1</b>	284.8	262.3	244.9	245.2		
<b>TARE #1</b>	0.0	0.0	0.0	0.0		
<b>WW + T #2</b>						
<b>WD + T #2</b>						
<b>TARE #2</b>						
<b>MOISTURE</b>	20.5	19.0	22.3	23.8		
<b>DRY DENSITY</b>	105.5	103.5	103.3	100.6		

**TEST RESULTS**

Maximum dry density = 105.5 pcf

Optimum moisture = 20.6 %

**Material Description**

Gray and Tan Sandy Fat CLAY

**Project No.** 6162232474    **Client:** Macallan Group

**Project:** Cassville Road Property

**Remarks:**

Lab # 23418

○ **Source of Sample:** 6      **Depth:** 3-6 ft      **Sample Number:** 1



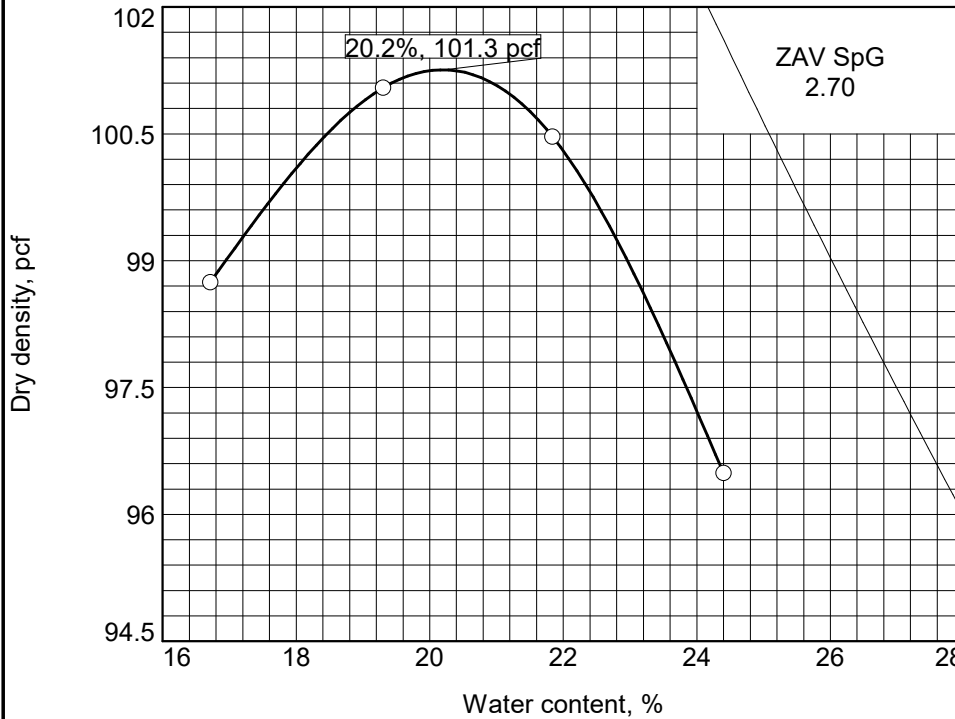
**Figure**

**Tested By:** DH

**Checked By:** TZ

# COMPACTION TEST REPORT

**Curve No.**



**Test Specification:**

ASTM D 698-12 Method A Standard

**Hammer Wt.:** 5.5 lb.

**Hammer Drop:** 12 in.

**Number of Layers:** three

**Blows per Layer:** 25

**Mold Size:** 0.03333 cu. ft.

**Test Performed on Material**

Passing #4 Sieve

**Soil Data**

**NM** 23.6      **Sp.G.** 2.7

**LL** 45      **PI** 18

**%>#4** N/A      **%<#200** 61.6

**USCS** CL      **AASHTO** N/A

**TESTING DATA**

	1	2	3	4	5	6
<b>WM + WS</b>	3806.1	3886.2	3914.3	3878.4		
<b>WM</b>	2063.7	2063.7	2063.7	2063.7		
<b>WW + T #1</b>	730.0	776.3	641.7	802.3		
<b>WD + T #1</b>	652.3	684.4	541.8	684.6		
<b>TARE #1</b>	187.4	208.3	84.3	202.2		
<b>WW + T #2</b>						
<b>WD + T #2</b>						
<b>TARE #2</b>						
<b>MOISTURE</b>	16.7	19.3	21.8	24.4		
<b>DRY DENSITY</b>	98.7	101.0	100.5	96.5		

**TEST RESULTS**

Maximum dry density = 101.3 pcf

Optimum moisture = 20.2 %

**Material Description**

Reddish Brown Sandy Lean CLAY

**Project No.** 6162232474    **Client:** Macallan Group

**Project:** Cassville Road Property

**Remarks:**

Lab # 23419

○ **Source of Sample:** 1      **Depth:** 0-2 ft      **Sample Number:** 1



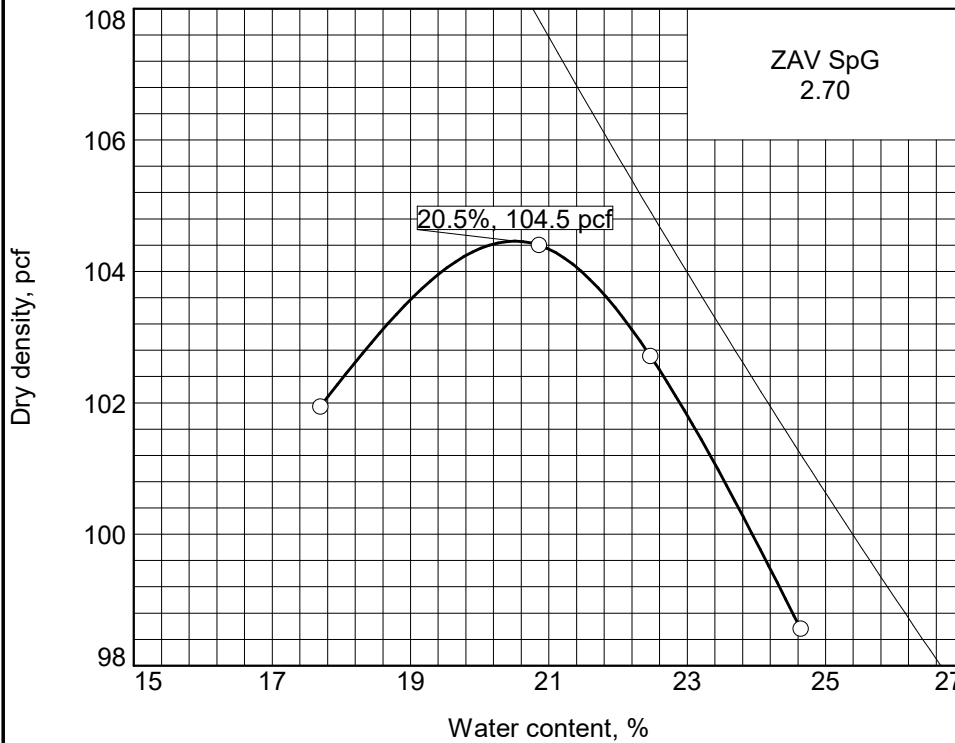
**Figure**

**Tested By:** DC

**Checked By:** TZ

# COMPACTION TEST REPORT

**Curve No.**



**Test Specification:**

ASTM D 698-91 Procedure A Standard

**Hammer Wt.:** 5.5 lb.

**Hammer Drop:** 12 in.

**Number of Layers:** three

**Blows per Layer:** 25

**Mold Size:** 0.03333 cu. ft.

**Test Performed on Material**

Passing #4 Sieve

**Soil Data**

**NM** 23.5      **Sp.G.** 2.7

**LL** 44      **PI** 19

**%>#4** 4.9      **%<#200** 87.5

**USCS** CL      **AASHTO** N/A

**TESTING DATA**

	1	2	3	4	5	6
<b>WM + WS</b>	3870.6	3963.8	3958.0	3913.7		
<b>WM</b>	2063.7	2063.7	2063.7	2063.7		
<b>WW + T #1</b>	790.6	730.1	709.1	1167.7		
<b>WD + T #1</b>	702.3	638.3	614.7	977.3		
<b>TARE #1</b>	203.3	198.1	194.5	204.5		
<b>WW + T #2</b>						
<b>WD + T #2</b>						
<b>TARE #2</b>						
<b>MOISTURE</b>	17.7	20.9	22.5	24.6		
<b>DRY DENSITY</b>	101.9	104.4	102.7	98.6		

**TEST RESULTS**

Maximum dry density = 104.5 pcf

Optimum moisture = 20.5 %

**Material Description**

Red Lean CLAY

**Project No.** 6162232474    **Client:** Macallan Group

**Project:**

**Remarks:**

Lab # 23420

○ **Source of Sample:** 14      **Depth:** 2-6 ft      **Sample Number:** 1

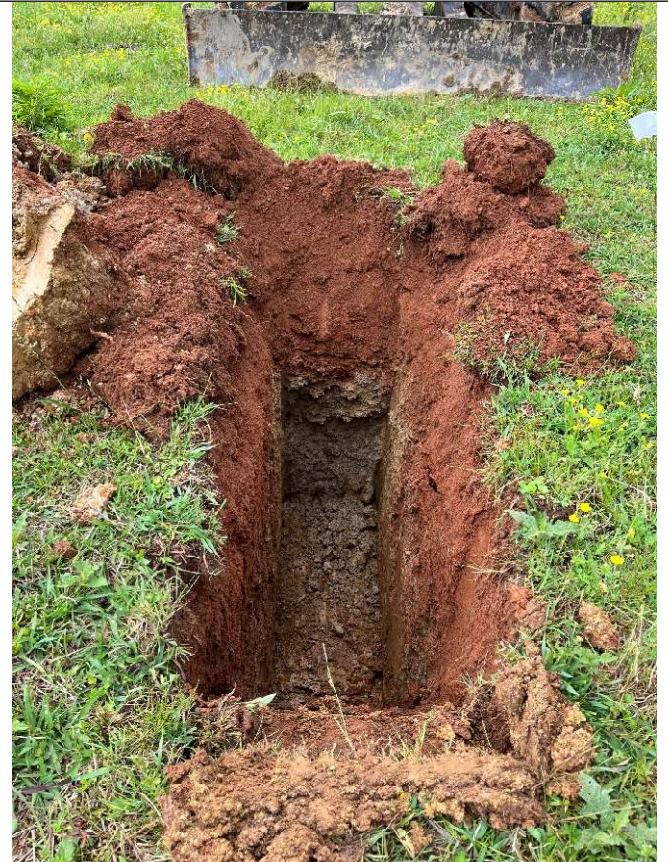
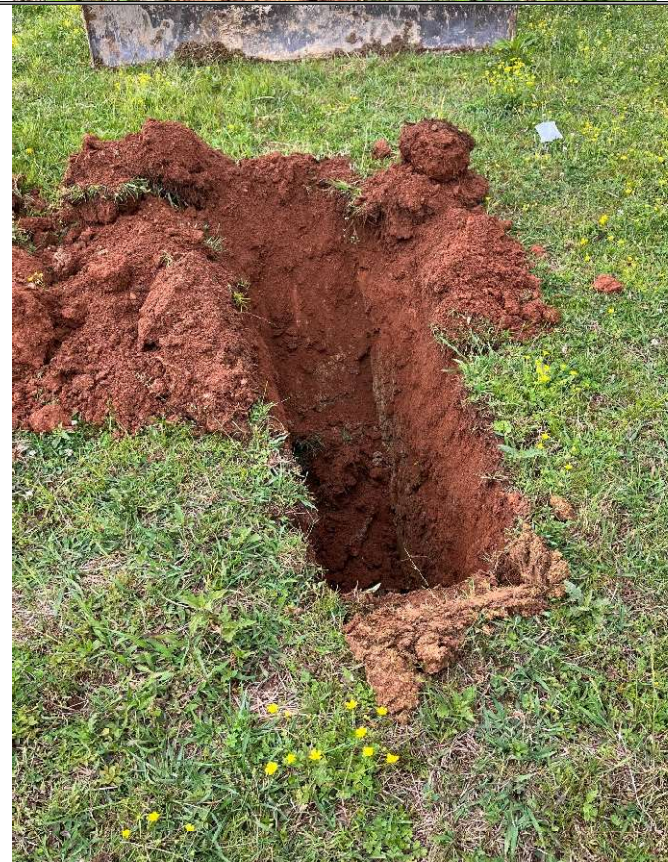


**Figure**

**Tested By:** DH

**Checked By:** TZ

By: E Rogers Date: 5/10/2023

	<p><b>Comment:</b></p> <p>Test Pit 1</p>
	<p><b>Comment:</b></p> <p>Test Pit 1</p>

By: E Rogers Date: 5/10/2023



**Comment:**

**Test Pit 2**



**Comment:**

**Test Pit 2**

By: E Rogers Date: 5/10/2023



**Comment:**

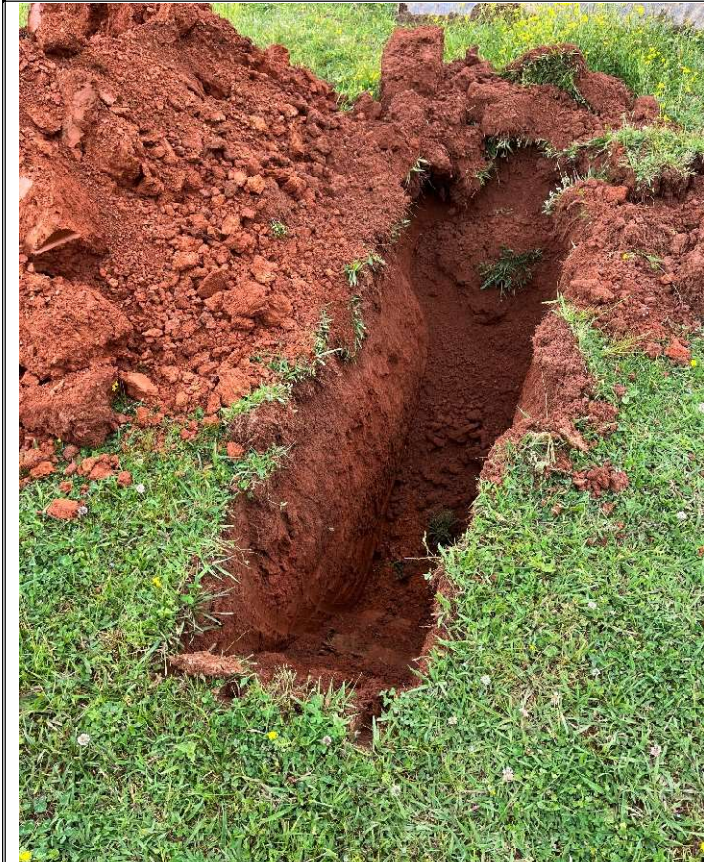
**Test Pit 3**



**Comment:**

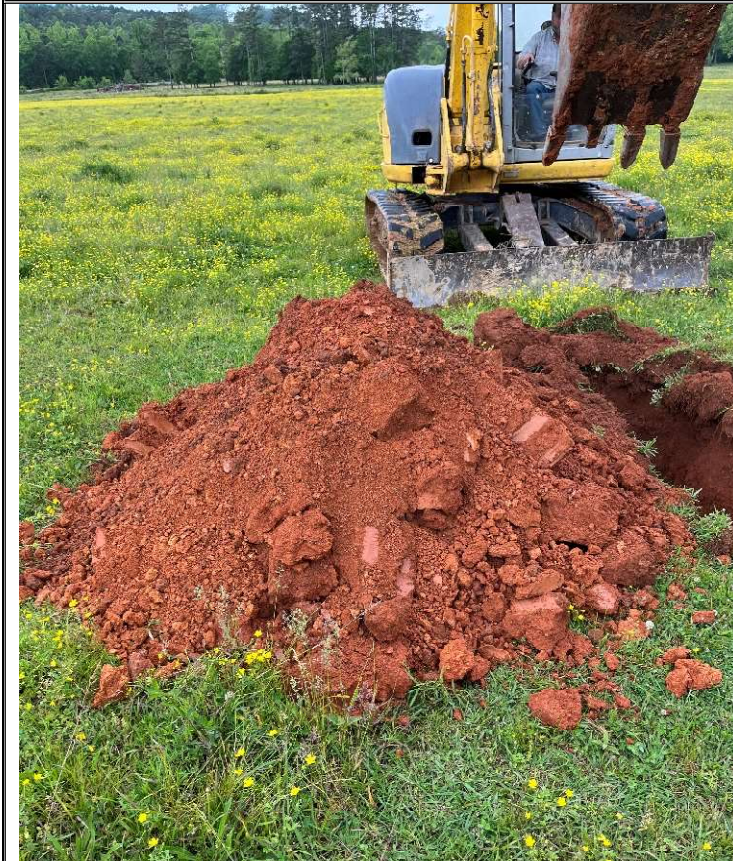
**Test Pit 4**

By: E Rogers Date: 5/10/2023



**Comment:**



**Test Pit 5**





**Comment:**

**Test Pit 5**

By: E Rogers Date: 5/10/2023

	<p><b>Comment:</b></p> <p>Test pit 6</p>
	<p><b>Comment:</b></p> <p>Test Pit 7</p>

By: E Rogers Date: 5/10/2023

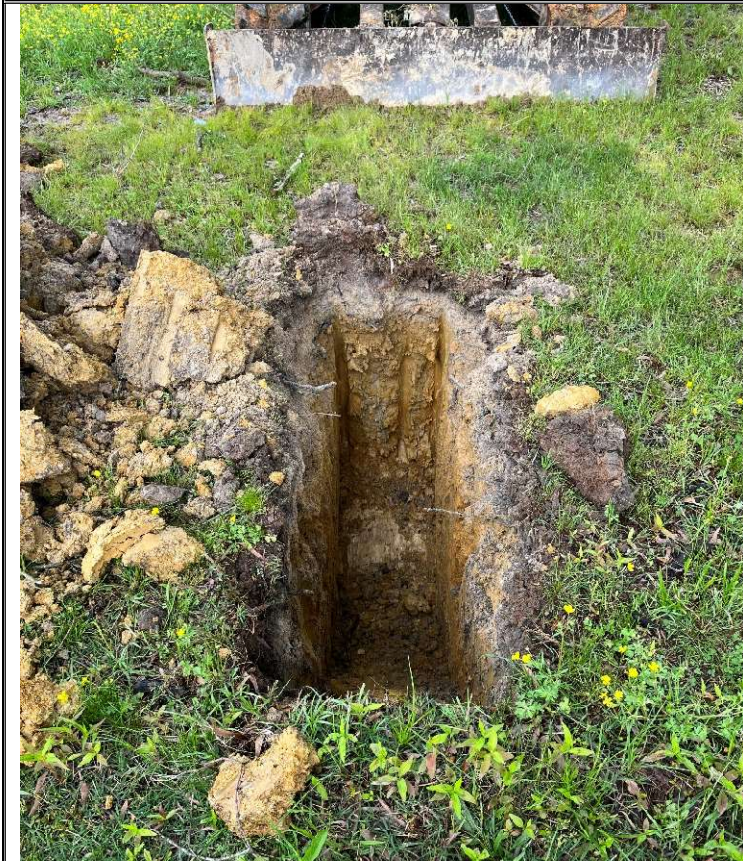
		<p><b>Comment:</b></p> <p>Test Pit 8</p>
		<p><b>Comment:</b></p> <p>Test Pit 8</p>

By: E Rogers Date: 5/10/2023



**Comment:**



**Test Pit 9**



**Comment:**

**Test Pit 9**

By: E Rogers Date: 5/10/2023

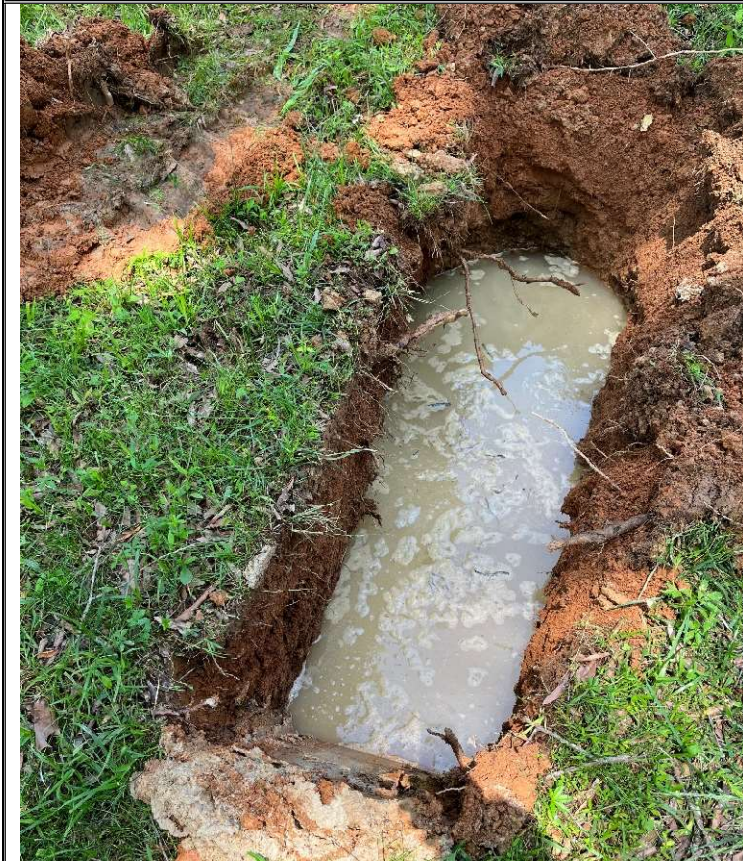
		<p><b>Comment:</b></p> <p><b>Test Pit 10</b></p>
		<p><b>Comment:</b></p> <p><b>Test Pit 10</b></p>

By: E Rogers Date: 5/10/2023



**Comment:**

**Test Pit 11**



**Comment:**

**Test Pit 11  
Stabilized Groundwater**

By: E Rogers Date: 5/10/2023



**Comment:**  
Test Pit 11 (offset)



**Comment:**  
Test Pit 11 (offset)

By: E Rogers Date: 5/10/2023



Comment:

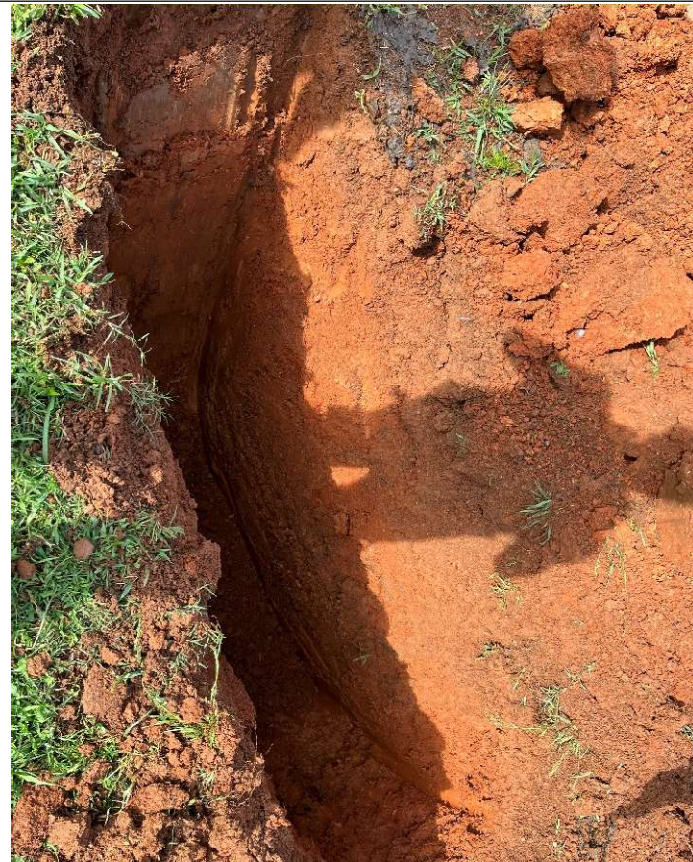
Test Pit 12



Comment:

Test Pit 13

By: E Rogers Date: 5/10/2023



**Comment:**

**Test Pit 14**



**Comment:**

**Standing Water**

By: E Rogers Date: 5/10/2023



**Comment:**  
**Standing Water**



**Comment:**  
**Standing Water**

By: E Rogers Date: 5/10/2023



**Comment:**  
**Standing Water**



**Comment:**  
**Standing Water**

# Important Information about This

# Geotechnical-Engineering Report

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

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

**The Geoprofessional Business Association (GBA) has prepared this advisory to help you – assumedly a client representative – interpret and apply this geotechnical-engineering report as effectively as possible. In that way, clients can benefit from a lowered exposure to the subsurface problems that, for decades, have been a principal cause of construction delays, cost overruns, claims, and disputes. If you have questions or want more information about any of the issues discussed below, contact your GBA-member geotechnical engineer. Active involvement in the Geoprofessional Business Association exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project.**

## Geotechnical-Engineering Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical-engineering study conducted for a given civil engineer will not likely meet the needs of a civil-works constructor or even a different civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client. *Those who rely on a geotechnical-engineering report prepared for a different client can be seriously misled.* No one except authorized client representatives should rely on this geotechnical-engineering report without first conferring with the geotechnical engineer who prepared it. *And no one – not even you – should apply this report for any purpose or project except the one originally contemplated.*

## Read this Report in Full

Costly problems have occurred because those relying on a geotechnical-engineering report did not read it *in its entirety*. Do not rely on an executive summary. Do not read selected elements only. *Read this report in full.*

## You Need to Inform Your Geotechnical Engineer about Change

Your geotechnical engineer considered unique, project-specific factors when designing the study behind this report and developing the confirmation-dependent recommendations the report conveys. A few typical factors include:

- the client's goals, objectives, budget, schedule, and risk-management preferences;
- the general nature of the structure involved, its size, configuration, and performance criteria;
- the structure's location and orientation on the site; and
- other planned or existing site improvements, such as retaining walls, access roads, parking lots, and underground utilities.

Typical changes that could erode the reliability of this report include those that affect:

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

As a general rule, *always* inform your geotechnical engineer of project changes – even minor ones – and request an assessment of their impact. *The geotechnical engineer who prepared this report cannot accept responsibility or liability for problems that arise because the geotechnical engineer was not informed about developments the engineer otherwise would have considered.*

## This Report May Not Be Reliable

*Do not rely on this report* if your geotechnical engineer prepared it:

- for a different client;
- for a different project;
- for a different site (that may or may not include all or a portion of the original site); or
- before important events occurred at the site or adjacent to it; e.g., man-made events like construction or environmental remediation, or natural events like floods, droughts, earthquakes, or groundwater fluctuations.

Note, too, that it could be unwise to rely on a geotechnical-engineering report whose reliability may have been affected by the passage of time, because of factors like changed subsurface conditions; new or modified codes, standards, or regulations; or new techniques or tools. *If your geotechnical engineer has not indicated an "apply-by" date on the report, ask what it should be, and, in general, if you are the least bit uncertain about the continued reliability of this report, contact your geotechnical engineer before applying it.* A minor amount of additional testing or analysis – if any is required at all – could prevent major problems.

## Most of the "Findings" Related in This Report Are Professional Opinions

Before construction begins, geotechnical engineers explore a site's subsurface through various sampling and testing procedures. *Geotechnical engineers can observe actual subsurface conditions only at those specific locations where sampling and testing were performed.* The data derived from that sampling and testing were reviewed by your geotechnical engineer, who then applied professional judgment to form opinions about subsurface conditions throughout the site. Actual sitewide-subsurface conditions may differ – maybe significantly – from those indicated in this report. Confront that risk by retaining your geotechnical engineer to serve on the design team from project start to project finish, so the individual can provide informed guidance quickly, whenever needed.

## This Report's Recommendations Are Confirmation-Dependent

The recommendations included in this report – including any options or alternatives – are confirmation-dependent. In other words, *they are not final*, because the geotechnical engineer who developed them relied heavily on judgment and opinion to do so. Your geotechnical engineer can finalize the recommendations *only after observing actual subsurface conditions* revealed during construction. If through observation your geotechnical engineer confirms that the conditions assumed to exist actually do exist, the recommendations can be relied upon, assuming no other changes have occurred. *The geotechnical engineer who prepared this report cannot assume responsibility or liability for confirmation-dependent recommendations if you fail to retain that engineer to perform construction observation.*

## This Report Could Be Misinterpreted

Other design professionals' misinterpretation of geotechnical-engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer serve as a full-time member of the design team, to:

- confer with other design-team members,
- help develop specifications,
- review pertinent elements of other design professionals' plans and specifications, and
- be on hand quickly whenever geotechnical-engineering guidance is needed.

You should also confront the risk of constructors misinterpreting this report. Do so by retaining your geotechnical engineer to participate in prebid and preconstruction conferences and to perform construction observation.

## Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can shift unanticipated-subsurface-conditions liability to constructors by limiting the information they provide for bid preparation. To help prevent the costly, contentious problems this practice has caused, include the complete geotechnical-engineering report, along with any attachments or appendices, with your contract documents, *but be certain to note conspicuously that you've included the material for informational purposes only*. To avoid misunderstanding, you may also want to note that "informational purposes" means constructors have no right to rely on the interpretations, opinions, conclusions, or recommendations in the report, but they may rely on the factual data relative to the specific times, locations, and depths/elevations referenced. Be certain that constructors know they may learn about specific project requirements, including options selected from the report, *only* from the design drawings and specifications. Remind constructors that they may

perform their own studies if they want to, and *be sure to allow enough time* to permit them to do so. Only then might you be in a position to give constructors the information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions. Conducting prebid and preconstruction conferences can also be valuable in this respect.

## Read Responsibility Provisions Closely

Some client representatives, design professionals, and constructors do not realize that geotechnical engineering is far less exact than other engineering disciplines. That lack of understanding has nurtured unrealistic expectations that have resulted in disappointments, delays, cost overruns, claims, and disputes. To confront that risk, geotechnical engineers commonly include explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely*. Ask questions. Your geotechnical engineer should respond fully and frankly.

## Geoenvironmental Concerns Are Not Covered

The personnel, equipment, and techniques used to perform an environmental study – e.g., a "phase-one" or "phase-two" environmental site assessment – differ significantly from those used to perform a geotechnical-engineering study. For that reason, a geotechnical-engineering report does not usually relate any environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated subsurface environmental problems have led to project failures*. If you have not yet obtained your own environmental information, ask your geotechnical consultant for risk-management guidance. As a general rule, *do not rely on an environmental report prepared for a different client, site, or project, or that is more than six months old*.

## Obtain Professional Assistance to Deal with Moisture Infiltration and Mold

While your geotechnical engineer may have addressed groundwater, water infiltration, or similar issues in this report, none of the engineer's services were designed, conducted, or intended to prevent uncontrolled migration of moisture – including water vapor – from the soil through building slabs and walls and into the building interior, where it can cause mold growth and material-performance deficiencies. Accordingly, *proper implementation of the geotechnical engineer's recommendations will not of itself be sufficient to prevent moisture infiltration*. Confront the risk of moisture infiltration by including building-envelope or mold specialists on the design team. *Geotechnical engineers are not building-envelope or mold specialists*.



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