



Geotechnical Exploration Report

**City of Lyons Land Annexation
Longmont, Colorado**

May 19, 2022
Terracon Project No. 22215049

Prepared for:

TEBO Properties
Boulder, Colorado

Prepared by:

Terracon Consultants, Inc.
Longmont, Colorado

May 19, 2022

TEBO Properties
3111 28th Street
Boulder, Colorado 80301



Attn: Mr. George Chelwick
P: (303) 447-8326
E: gchelwick@teboproperties.com

Re: Geotechnical Exploration Report
City of Lyons Land Annexation
4545 Ute Highway
Longmont, Colorado
Terracon Project No. 22215049

Dear Mr. Chelwick:

Terracon Consultants, Inc. (Terracon) has performed geotechnical exploration services for the project referenced above. This study was performed in general accordance with Terracon Proposal No. P22215049 (Revised) dated January 10, 2022. This report presents the findings of the subsurface exploration for the proposed project.

We appreciate the opportunity to be of service to you on this project. Materials testing and construction observation services are provided by Terracon as well. We would be pleased to discuss these services with you. If you have any questions concerning this report, or if we may be of further service, please contact us.

Sincerely,
Terracon Consultants, Inc.

Alec N. Strassburg
Alec N. Strassburg, P.E. (KS, OK)
Project Engineer



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Environmental



Facilities



Geotechnical



Materials

REPORT TOPICS

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Note: This report was originally delivered in a web-based format. **Orange Bold** text in the report indicates a referenced section heading. The PDF version also includes hyperlinks which direct the reader to that section and clicking on the **GeoReport** logo will bring you back to this page. For more interactive features, please view your project online at client.terracon.com.

ATTACHMENTS

EXPLORATION AND TESTING PROCEDURES
SITE LOCATION AND EXPLORATION PLANS
EXPLORATION RESULTS
SUPPORTING INFORMATION

Note: Refer to each individual Attachment for a listing of contents.

REPORT SUMMARY

Topic ¹	Overview Statement ²
Project Overview	A geotechnical exploration was performed for the proposed City of Lyons Land Annexation project located at 4545 Ute Highway in Longmont, Colorado. Six (6) borings were performed to depths of approximately 20 to 30½ feet below existing site grades.
Subsurface Conditions	Subsurface conditions encountered in our exploratory borings generally consisted of about 4½ to 6 feet of sandy lean clay soil over about 20½ to 27½ feet of sand with varying amounts of silt, gravel, and cobbles. Sandstone bedrock was encountered below the overburden soils in most of the borings at depths of approximately 25 to 29 feet below existing site grades. Boring logs are presented in the Exploration Results section of this report.
Groundwater Conditions	Groundwater was encountered in all the test borings at depths of about 5½ to 9 feet below existing site grades at the time of drilling. Groundwater levels can fluctuate in response to site development and to varying seasonal and weather conditions, irrigation on or adjacent to the site and fluctuations in nearby water features.
General Comments	This section contains important information about the limitations of this geotechnical exploration report.
	<ol style="list-style-type: none">1. If the reader is reviewing this report as a pdf, the topics (bold orange font) above can be used to access the appropriate section of the report by simply clicking on the topic itself.2. This summary is for convenience only. It should be used in conjunction with the entire report for design making and design purposes. It should be recognized that specific details were not included or fully developed in this section, and the report must be read in its entirety for a comprehensive understanding of the items contained herein.

Geotechnical Exploration Report

City of Lyons Land Annexation

4545 Ute Highway

Longmont, Colorado

Terracon Project No. 22215049

May 19, 2022

INTRODUCTION

This report presents the results of our subsurface exploration services performed for the City of Lyons land annexation planned at 4545 Ute Highway in Longmont, Colorado. The purpose of these services is to provide information relative to:

- Subsurface soil and rock conditions
- Groundwater conditions

The geotechnical engineering scope of services for this project included the advancement of six test borings to depths ranging from approximately 20 to 30½ feet below existing site grades. A seventh boring was requested. However, due to obstructions at the site, the seventh boring could not be performed at the time of the field exploration.

Maps showing the site and boring locations are shown in the **Site Location and Exploration Plans** section of this report. The results of the laboratory testing performed on soil and bedrock samples obtained from the site during the field exploration are included on the boring logs and as separate graphs in the **Exploration Results** section of this report.

SITE CONDITIONS

The following description of site conditions is derived from our site visit in association with the field exploration.

Item	Description
Parcel Information	The project site is located at 4545 Ute Highway in Longmont, Colorado. The property is approximately 1.25 acres in size. An approximate Latitude/Longitude for the site is 40.21259° N / 105.24843° W (See Site Location).
Existing Improvements	The site is currently developed. At least 5 existing buildings with some ancillary structures occupy the project site. Some of the buildings are occupied by small businesses. Some of the buildings are unoccupied.
Surrounding Developments	Other business/commercial properties and municipal buildings for the City of Lyons and City of Longmont are located around the property. The Palmerton Ditch and Rough and Ready Ditch are located along the property boundaries.

Item	Description
Current Ground Cover	Mainly asphalt pavement and gravel; some parts are earthen or covered by grasses.
Existing Topography (from USGS topographic maps)	The grades at the site are relatively level. Overall grades in the area slope down from west to east.

PROJECT DESCRIPTION

Our final understanding of the project conditions is as follows:

Item	Description
Information Provided	The following project information described below is based on the following: <ul style="list-style-type: none">■ Communication with the client
Project Description	We understand the project site will be annexed to the City of Lyons. The City of Lyons requires a subsurface exploration be performed at the site to complete the annexation process.
Proposed Construction	No new construction is anticipated based on this exploration.

If project information or assumptions vary from what is described above or if location of construction changes, we should be contacted as soon as possible to confirm and/or modify our recommendations accordingly.

GEOTECHNICAL CHARACTERIZATION

Subsurface Profile

We have developed a general characterization of the subsurface conditions based upon our review of the subsurface exploration, laboratory data, geologic setting and our understanding of the project. This characterization, termed GeoModel, forms the basis of our geotechnical calculations and evaluation of site preparation and foundation options. Conditions encountered at each exploration point are indicated on the individual logs. The individual logs and the GeoModel can be found in the **Exploration Results** section this report.

Model Layer	Layer Name	General Description	Approximate Depth to Bottom of Stratum
1	Existing Ground Cover	About 2 to 3½ inches of asphalt pavement or about 4 inches of gravel.	About 2 to 4 inches below existing site grades.

Model Layer	Layer Name	General Description	Approximate Depth to Bottom of Stratum
2	Clay Soil	Very soft to stiff sandy lean clay soils; brown, reddish brown, orange brown, dark brown.	About 4½ to 6 feet below existing site grades.
3	Sand	Loose to very dense sand soils with varying amounts of silt, gravel and cobbles; brown, orange brown, tan, reddish brown, gray, gray brown.	About 25 to 29 feet below existing site grades.
4	Bedrock	Hard to very hard sandstone bedrock with varying amounts of silt and clay; gray to dark gray; slightly to moderately weathered.	Extended to the boring termination depths of about 29 to 30½ feet below existing site grades.

As noted in **General Comments**, this characterization is based upon widely spaced exploration points across the site and variations are likely.

Groundwater Conditions

The boreholes were observed while drilling and shortly after completion for the presence and level of groundwater. The water levels observed in the boreholes are noted on the attached boring logs, and are summarized below:

Boring Number	Depth/Elevation ¹ to Groundwater While Drilling, ft.	Depth/Elevation ¹ to Groundwater Shortly After Completion of Drilling, ft.
B-1	8 / ±5,259	8 / ±5,259
B-2	7½ / ±5,260½	7½ / ±5,260½
B-3	8 / ±5,259	7½ / ±5,259½
B-4	7½ / ±5,258½	7 / ±5,259
B-5	8½ / ±5,256½	7½ / ±5,257½
B-6	9 / ±5,255	5½ / ±5,258½

1. A surface elevation at each boring location was obtained by Terracon by interpolation from a publicly available USGS topographic map.

These observations represent short-term groundwater conditions at the time of and shortly after completion of the field exploration and may not be indicative of other times or at other locations. Groundwater level fluctuations occur due to seasonal variations in the water levels present in nearby water features, amount of rainfall, runoff and other factors not evident at the time the borings were performed. Therefore, groundwater levels during construction or at other times in the life of the structures may be higher or lower than the levels indicated on the boring logs. The possibility of groundwater level fluctuations should be considered when developing the design

and construction plans for the project.

Laboratory Testing

Representative soil samples were selected for swell-consolidation testing and exhibited about less than 0.1 percent compression to 0.1 percent swell when wetted. The on-site clay soils are considered to have low expansive potential or to be non-expansive. Samples of site soils selected for plasticity testing exhibited low to moderate plasticity with liquid limits ranging from non-plastic to 30 and plasticity indices ranging from non-plastic to 14. Laboratory test results are presented in the **Exploration Results** section of this report.

WATER-SOLUBLE SULFATES

At the time this report was prepared, the laboratory testing for water-soluble sulfates had not been completed. We will submit a supplemental section with the testing results and recommendations once the testing has been completed.

GENERAL COMMENTS

Our analysis and opinions are based upon our understanding of the project, the geotechnical conditions in the area, and the data obtained from our site exploration. Natural variations will occur between exploration point locations or due to the modifying effects of construction or weather. The nature and extent of such variations may not become evident until during or after construction. Terracon should be retained as the Geotechnical Engineer, where noted in this report, to provide observation and testing services during pertinent construction phases. If variations appear, we can provide further evaluation and supplemental recommendations. If variations are noted in the absence of our observation and testing services on-site, we should be immediately notified so that we can provide evaluation and supplemental recommendations.

Our Scope of Services does not include either specifically or by implication any environmental or biological (e.g., mold, fungi, bacteria) assessment of the site or identification or prevention of pollutants, hazardous materials or conditions. If the owner is concerned about the potential for such contamination or pollution, other studies should be undertaken.

Our services and any correspondence or collaboration through this system are intended for the sole benefit and exclusive use of our client for specific application to the project discussed and are accomplished in accordance with generally accepted geotechnical engineering practices with no third-party beneficiaries intended. Any third-party access to services or correspondence is solely for information purposes to support the services provided by Terracon to our client. Reliance upon the services and any work product is limited to our client, and is not intended for

third parties. Any use or reliance of the provided information by third parties is done solely at their own risk. No warranties, either express or implied, are intended or made.

Site characteristics as provided are for design purposes and not to estimate excavation cost. Any use of our report in that regard is done at the sole risk of the excavating cost estimator as there may be variations on the site that are not apparent in the data that could significantly impact excavation cost. Any parties charged with estimating excavation costs should seek their own site characterization for specific purposes to obtain the specific level of detail necessary for costing. Site safety, and cost estimating including, excavation support, and dewatering requirements/design are the responsibility of others. If changes in the nature, design, or location of the project are planned, our conclusions and recommendations shall not be considered valid unless we review the changes and either verify or modify our conclusions in writing.

ATTACHMENTS

Contents:

EXPLORATION AND TESTING PROCEDURES

SITE LOCATION AND EXPLORATION PLANS

EXPLORATION RESULTS

SUPPORTING INFORMATION

Note: Refer to each individual Attachment for a listing of contents.

EXPLORATION AND TESTING PROCEDURES

Field Exploration

The field exploration program consisted of the following:

Number of Borings ¹	Boring Depth (feet)	Location
6 (B-1 through B-6)	20 to 30.4	At select locations across the project site

¹ 1. A seventh boring was requested by the client. However, due to some obstructions at the site, the seventh boring could not be performed at the time of the field exploration.

Boring Layout and Elevations: Terracon personnel provided the boring layout. Coordinates of the boring locations were obtained with a handheld GPS unit (estimated horizontal accuracy of about ± 20 feet). A surface elevation at each boring location was obtained by Terracon by interpolation from a publicly available USGS topographic map.

Subsurface Exploration Procedures: We advanced the soil borings with a truck-mounted drill rig using continuous-flight, hollow-stem augers. Soil sampling was performed using standard split-barrel and modified California barrel sampling procedures. For the standard split-barrel sampling procedure, a standard 2-inch outer diameter split-barrel sampling spoon is driven into the ground by a 140-pound automatic hammer falling a distance of 30 inches. The number of blows required to advance the sampling spoon the last 12 inches of a normal 18-inch penetration is recorded as the Standard Penetration Test (SPT) resistance value. The SPT resistance values, also referred to as N-values, are indicated on the boring logs at the test depths. For the modified California barrel sampling procedure, a 2½-inch outer diameter split-barrel sampling spoon is used for sampling. Modified California barrel sampling procedures are similar to standard split-barrel sampling procedures; however, blow counts are typically recorded for 6-inch intervals for a total of 12 inches of penetration. The samples were placed in appropriate containers, taken to our soil laboratory for testing, and classified by a geotechnical engineer.

In addition, we observed and recorded groundwater levels during drilling operations and shortly after completion of drilling. For safety purposes, the borings were backfilled with auger cuttings and bentonite chips and capped with asphalt after completion or drilling.

Our exploration team prepared field boring logs as part of standard drilling operations including sampling depths, penetration distances, and other relevant sampling information. Field logs included visual classifications of materials encountered during drilling, and our interpretation of subsurface conditions between samples. Final boring logs, prepared from field logs, represent

the geotechnical engineer's interpretation of the subsurface conditions at the boring locations based on field data, observation of samples, and laboratory test results.

Laboratory Testing

The project engineer reviewed field data and assigned various laboratory tests to better understand the engineering properties of various soil and bedrock strata. Laboratory testing was conducted in general accordance with applicable or other locally recognized standards. Procedural standards noted in this report are for reference to methodology in general. In some cases, variations to methods are applied as a result of local practice or professional judgement. Testing was performed under the direction of a geotechnical engineer and included the following:

- Visual classification
- Moisture content
- Dry density
- Atterberg limits
- Grain-size analysis
- One-dimensional swell
- Water-soluble sulfates (to be provided upon completion)

Our laboratory testing program included examination of soil samples by an engineer. Based on the material's texture and plasticity, we described and classified soil samples in accordance with the Unified Soil Classification System (USCS). Bedrock samples obtained had rock classification conducted using locally accepted practices for engineering purposes.

SITE LOCATION AND EXPLORATION PLANS

Contents:

- Site Location Plan
- Exploration Plan

Note: All attachments are one page unless noted above.

SITE LOCATION

City of Lyons Land Annexation ■ Longmont, Colorado
May 19, 2022 ■ Terracon Project No. 22215049

The logo for Terracon GeoReport. It features the word "Terracon" in a bold, dark red, sans-serif font, with a thin orange swoosh underneath. Below it, the word "GeoReport" is written in a blue, italicized, sans-serif font, with a registered trademark symbol (®) at the end.



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

MAP PROVIDED BY MICROSOFT BING MAPS

EXPLORATION PLAN

City of Lyons Land Annexation ■ Longmont, Colorado
May 19, 2022 ■ Terracon Project No. 22215049

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GeoReport



EXPLORATION RESULTS

Contents:

GeoModel

Boring Logs (B-1 through B-6)

Atterberg Limits

Grain Size Distribution (2 pages)

Consolidation/Swell (3 pages)

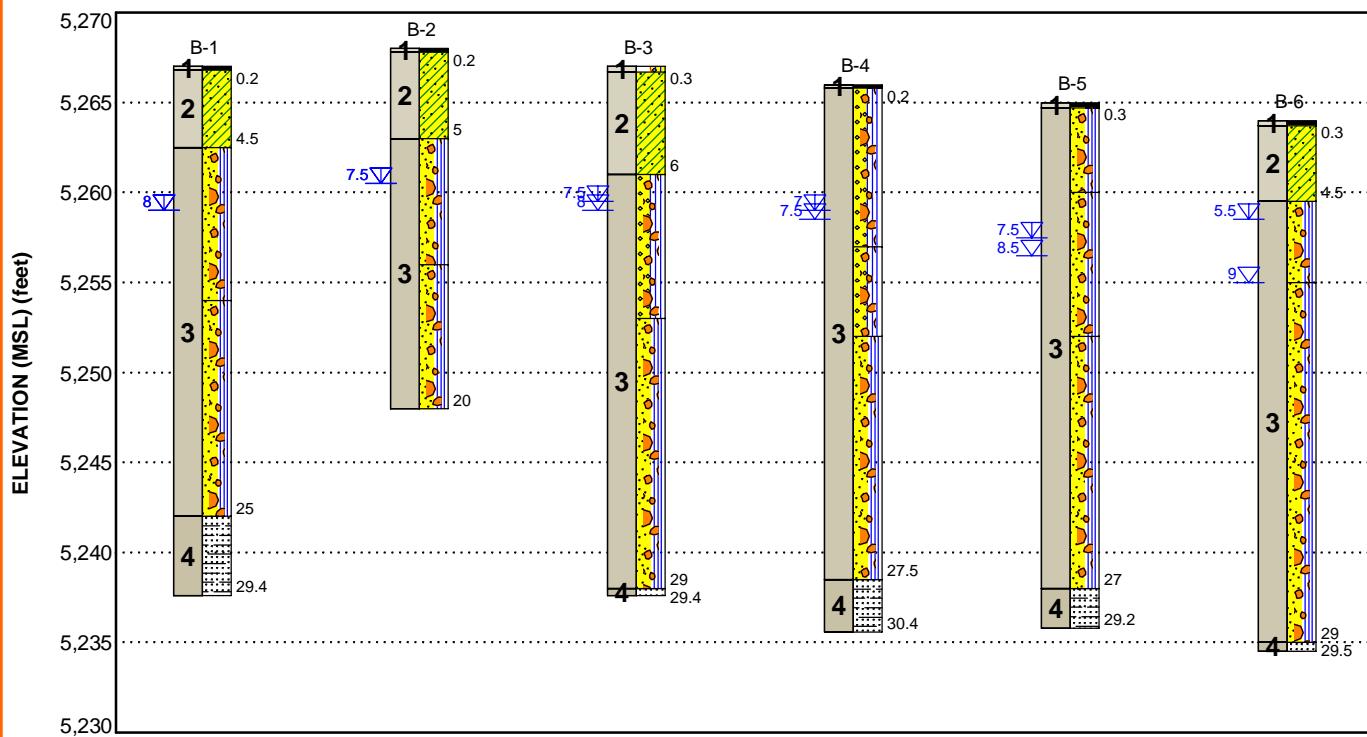
Water-Soluble Sulfates (To Be Provided Upon Completion)

Note: All attachments are one page unless noted above.

GEOMODEL

City of Lyons Land Annexation ■ Longmont, Colorado
Terracon Project No. 22215049

Terracon
GeoReport



This is not a cross section. This is intended to display the Geotechnical Model only. See individual logs for more detailed conditions.

Model Layer	Layer Name	General Description
1	Existing Ground Cover	About 2 to 3-1/2 inches of asphalt pavement or about 4 inches of gravel.
2	Clay Soil	Very soft to stiff sandy lean clay soils; brown, reddish brown, orange brown, dark brown.
3	Sand Soil	Loose to very dense sand soils with varying amounts of silt, gravel and cobbles; brown, orange brown, tan, reddish brown, gray, gray brown.
4	Bedrock	Hard to very hard sandstone bedrock with varying amounts of silt and clay; gray to dark gray; slightly to moderately weathered.

LEGEND

■ Asphalt	■ Sandstone
■ Sandy Lean Clay	■ Well-graded Gravel with silt and sand
■ Poorly-graded Sand with Silt and Gravel	■ Well-graded Sand with Silt and Gravel

▀ First Water Observation
▀ Second Water Observation

Groundwater levels are temporal. The levels shown are representative of the date and time of our exploration. Significant changes are possible over time. Water levels shown are as measured during and/or after drilling. In some cases, boring advancement methods mask the presence/absence of groundwater. See individual logs for details.

NOTES:

Layering shown on this figure has been developed by the geotechnical engineer for purposes of modeling the subsurface conditions as required for the subsequent geotechnical engineering for this project. Numbers adjacent to soil column indicate depth below ground surface.

BORING LOG NO. B-1

Page 1 of 1

PROJECT: City of Lyons Land Annexation			CLIENT: TEBO Properties Boulder, Colorado										
SITE: 4545 Ute Highway Longmont, Colorado													
MODEL LAYER	GRAPHIC LOG	LOCATION See Exploration Plan	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	SWELL-CONSOLIDATION LOAD (%/psf)	UNCONFINED COMPRESSIVE STRENGTH (psf)	WATER CONTENT (%)	ATTERBERG LIMITS DRY UNIT WEIGHT (pcf)	PERCENT FINES LL-PL-PI
1		Latitude: 40.2126° Longitude: -105.2488° Approximate Surface Elev.: 5267 (Ft.) +/-											
2		0.2 <u>ASPHALT</u> , about 2-1/2 inches thick <u>SANDY LEAN CLAY (CL)</u> , brown to reddish brown, medium stiff	4.5	5262.5 +/-	5		2-4 6/12"	<-0.1/500			18.9	101	30-19-11 54
3		<u>POORLY GRADED SAND</u> , with silt, gravel and cobbles, fine to coarse grained sand, brown to orange brown, dense	13.0	5254 +/-	10		3-14-18 N=32				9.7		
3		<u>POORLY GRADED SAND</u> , with silt, gravel and trace cobbles, fine to coarse grained sand, gray, loose to medium dense	25.0	5242 +/-	15		6-10-26 N=36				12.0		
4		dense to very dense below about 23 feet <u>SANDSTONE</u> , gray with trace reddish brown, very hard, slightly to moderately weathered	29.4	5237.5 +/-	20		8-5-4 N=9				22.8		
		Boring Terminated at 29.4 Feet			25		14-11-16 N=27				18.6		
							18-42-50 N=92				10.1		
							50/5"				13.2	105	
Stratification lines are approximate. In-situ, the transition may be gradual.													
Hammer Type: Automatic													
Advancement Method: 4-1/4 inch inside diameter, continuous-flight, hollow-stem augers			See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (if any).				Notes:						
Abandonment Method: Boring backfilled with auger cuttings upon completion.			See Supporting Information for explanation of symbols and abbreviations.										
			Elevations were interpolated from a publicly available topographic map.										
WATER LEVEL OBSERVATIONS													
 8 feet while drilling													
 8 feet at completion of drilling													

BORING LOG NO. B-2

Page 1 of 1

PROJECT: City of Lyons Land Annexation		CLIENT: TEBO Properties Boulder, Colorado	
SITE: 4545 Ute Highway Longmont, Colorado			
MODEL LAYER	GRAPHIC LOG	LOCATION See Exploration Plan	
		Latitude: 40.2125° Longitude: -105.2486°	
		Approximate Surface Elev.: 5268 (Ft.) +/-	
DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS
1	0.2 <u>ASPHALT</u> , about 2-1/2 inches thick	5268+/-	
2	<u>SANDY LEAN CLAY</u> , brown to reddish brown and orange brown, medium stiff to stiff	5.0	
3	<u>POORLY GRADED SAND</u> , with silt, gravel and cobbles, fine to coarse grained sand, brown to reddish brown, medium dense	12.0	
		5263+/-	
		5256+/-	
		20.0	
	Boring Terminated at 20 Feet	5248+/-	
Stratification lines are approximate. In-situ, the transition may be gradual.		Hammer Type: Automatic	
Advancement Method: 4-1/4 inch inside diameter, continuous-flight, hollow-stem augers	See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (if any).	Notes:	
Abandonment Method: Boring backfilled with auger cuttings upon completion. Surface capped with asphalt.	See Supporting Information for explanation of symbols and abbreviations. Elevations were interpolated from a publicly available topographic map.		
WATER LEVEL OBSERVATIONS		Boring Started: 04-28-2022	Boring Completed: 04-28-2022
 7.5 feet while drilling		Drill Rig: CME 75 Truck	Driller: Drilling Engineers, Inc.
 7.5 feet at completion of drilling		Project No.: 22215049	

BORING LOG NO. B-3

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PROJECT: City of Lyons Land Annexation		CLIENT: TEBO Properties Boulder, Colorado	
SITE: 4545 Ute Highway Longmont, Colorado			
MODEL LAYER	GRAPHIC LOG	DEPTH (Ft.)	ELEVATION (Ft.)
	LOCATION See Exploration Plan Latitude: 40.2127° Longitude: -105.2485° Approximate Surface Elev.: 5267 (Ft.) +/-		
1	0.3 GRAVEL , about 4 inches thick SANDY LEAN CLAY (CL) , brown to reddish brown, medium stiff very soft at about 4 feet	5266.5 +/-	5261 +/-
2	WELL GRADED SAND (SW-SM) , with silt, gravel, and cobbles, fine to coarse grained sand, brown, very dense	5	5261 +/-
3	POORLY GRADED SAND , with silt, gravel, and cobbles, fine to coarse grained sand, gray to gray brown, very dense	10	5253 +/-
4	29.0 SANDSTONE , gray, very hard, slightly weathered Boring Terminated at 29.4 Feet	25	5238 +/-
Stratification lines are approximate. In-situ, the transition may be gradual.		Hammer Type: Automatic	
Advancement Method: 4-1/4 inch inside diameter, continuous-flight, hollow-stem augers	See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (if any). See Supporting Information for explanation of symbols and abbreviations. Elevations were interpolated from a publicly available topographic map	Notes:	
WATER LEVEL OBSERVATIONS		Boring Started: 04-28-2022	Boring Completed: 04-28-2022
 8 feet while drilling		Drill Rig: CME 75 Truck	Driller: Drilling Engineers, Inc.
 7.5 feet at completion of drilling		Project No.: 22215049	

BORING LOG NO. B-4

Page 1 of 1

PROJECT: City of Lyons Land Annexation		CLIENT: TEBO Properties Boulder, Colorado	
SITE: 4545 Ute Highway Longmont, Colorado			
MODEL LAYER	GRAPHIC LOG	DEPTH (Ft.)	ELEVATION (Ft.)
	LOCATION See Exploration Plan Latitude: 40.2125° Longitude: -105.2484° Approximate Surface Elev.: 5266 (Ft.) +/-		
1	0.2 ASPHALT , about 2 inches thick WELL GRADED SAND (SW-SM) , with silt and gravel, fine to coarse grained sand, brown to reddish brown, dense with cobbles below about 5 feet	5	5266 +/-
2	9.0 WELL GRADED SAND , with silt, gravel and cobbles, fine to coarse grained sand, brown, very dense	10	5257 +/-
3	14.0 POORLY GRADED SAND , with silt, gravel and cobbles, fine to coarse grained sand, gray, very dense	15	5252 +/-
4	27.5 SANDSTONE , with silt, gray, hard to very hard, slightly to moderately weathered	20	5238.5 +/-
	30.4 Boring Terminated at 30.4 Feet	25	5235.5 +/-
Stratification lines are approximate. In-situ, the transition may be gradual.		Hammer Type: Automatic	
Advancement Method: 4-1/4 inch inside diameter, continuous-flight, hollow-stem augers		See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (if any).	
Abandonment Method: Boring backfilled with auger cuttings upon completion. Surface capped with asphalt.		See Supporting Information for explanation of symbols and abbreviations. Elevations were interpolated from a publicly available topographic map.	
WATER LEVEL OBSERVATIONS		Notes:	
 7.5 feet while drilling		Boring Started: 04-28-2022	
 7 feet at completion of drilling		Boring Completed: 04-28-2022	
		Drill Rig: CME 75 Truck	
		Driller: Drilling Engineers, Inc.	
		Project No.: 22215049	

BORING LOG NO. B-5

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PROJECT: City of Lyons Land Annexation		CLIENT: TEBO Properties Boulder, Colorado	
SITE: 4545 Ute Highway Longmont, Colorado			
MODEL LAYER	GRAPHIC LOG	LOCATION See Exploration Plan	
		Latitude: 40.2125° Longitude: -105.2481°	
		Approximate Surface Elev.: 5265 (Ft.) +/-	
DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS
1	0.3 ASPHALT , about 3-1/2 inches thick	5264.5 +/-	
	POORLY GRADED SAND , with silt and gravel, trace cobbles, fine to coarse grained sand, reddish brown, medium dense		
	5.0 very dense at about 4 feet	5260 +/-	
	POORLY GRADED SAND , with silt, gravel and cobbles, fine to coarse grained sand, brown, medium dense	5	
		10	8-12 20/12"
3	13.0	15	23-50/5"
	POORLY GRADED SAND , with silt, gravel and cobbles, fine to coarse grained sand, gray, dense to very dense - sample at 14 feet skipped during drilling due to caving conditions	20	11-31 42/12"
		25	50/5"
4	27.0 SANDSTONE , with silt, gray to dark gray, very hard, slightly weathered	25.38 +/-	50/5"
	29.2 Boring Terminated at 29.2 Feet	25.36 +/-	50/2"
Stratification lines are approximate. In-situ, the transition may be gradual.		Hammer Type: Automatic	
Advancement Method: 0 to 19.5': 4 inch outside diameter, continuous-flight, solid-stem augers Below 19.5': 4-1/4 inch inside diameter, continuous-flight, hollow-stem augers	See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (if any). See Supporting Information for explanation of symbols and abbreviations.	Notes:	
Abandonment Method: Boring backfilled with auger cuttings upon completion. Surface capped with asphalt.	Elevations were interpolated from a publicly available topographic map		
WATER LEVEL OBSERVATIONS		Boring Started: 04-28-2022	Boring Completed: 04-28-2022
 8.5 feet while drilling		Drill Rig: CME 75 Truck	Driller: Drilling Engineers, Inc.
 7.5 feet at completion of drilling		Project No.: 22215049	

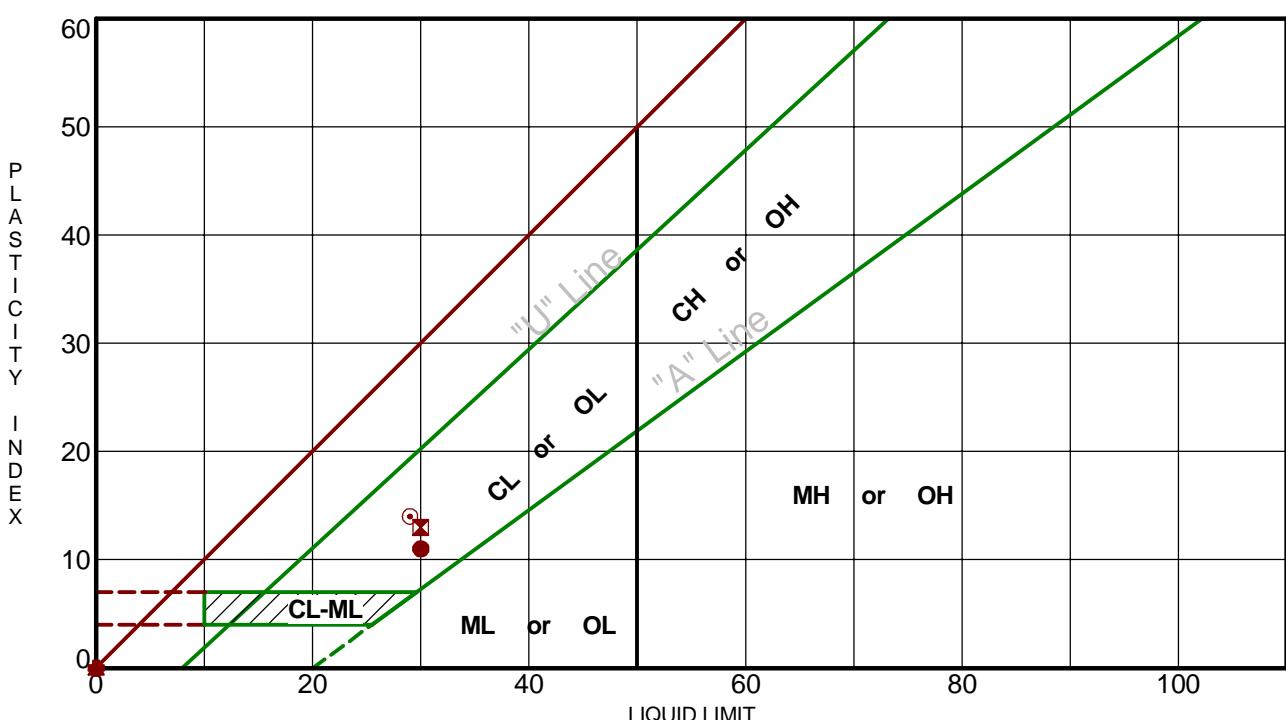
BORING LOG NO. B-6

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PROJECT: City of Lyons Land Annexation			CLIENT: TEBO Properties Boulder, Colorado							
SITE: 4545 Ute Highway Longmont, Colorado										
MODEL LAYER	GRAPHIC LOG	LOCATION See Exploration Plan	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	SWELL-CONSOLIDATION LOAD (%/psf)	UNCONFINED COMPRESSIVE STRENGTH (psf)
1		Latitude: 40.2124° Longitude: -105.2478° Approximate Surface Elev.: 5264 (Ft.) +/-								
2		0.3 <u>ASPHALT</u> , about 3 inches thick <u>SANDY LEAN CLAY (CL)</u> , brown to dark brown, with reddish brown, medium stiff	4.5	5263.5+/-	5		3-4 7/12"	<-0.1/500		19.6
3		<u>POORLY GRADED SAND</u> , with silt, gravel and cobbles, fine to coarse grained sand, reddish brown to tan, dense to very dense	9.0	5259.5+/-	10		2-16-50/2"			13.5
4		<u>POORLY GRADED SAND (SP-SM)</u> , with silt, gravel and cobbles, fine to coarse grained sand, gray, very dense	29.0	5255+/-	15		27-32-30 N=62			7.3
					20		27-38-39 N=77			8.3
					25		31-37 68/12"			13.3
							37-50/5"			9.4
							50/6"			8.4
										133
<p><i>Boring Terminated at 29.5 Feet</i></p> <p>Stratification lines are approximate. In-situ, the transition may be gradual.</p> <p>Hammer Type: Automatic</p>										
Advancement Method: 4 1/4 inch inside diameter, continuous-flight, hollow-stem augers			See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (if any).				Notes:			
Abandonment Method: Boring backfilled with auger cuttings upon completion. Surface capped with asphalt.			See Supporting Information for explanation of symbols and abbreviations.							
			Elevations were interpolated from a publicly available topographic map.							
WATER LEVEL OBSERVATIONS										
 9 feet while drilling							Boring Started: 04-29-2022			
 5.5 feet at completion of drilling							Boring Completed: 04-29-2022			
							Drill Rig: CME 75 Truck			
							Driller: Drilling Engineers, Inc.			
							Project No.: 22215049			

ATTERBERG LIMITS RESULTS

ASTM D4318



LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. ATTERBERG LIMITS 22215049 CITY OF LYONS LAN.GPJ TERRACON_DATETEMPLATE.GDT 5/17/22

PROJECT: City of Lyons Land Annexation

SITE: 4545 Ute Highway
Longmont, Colorado

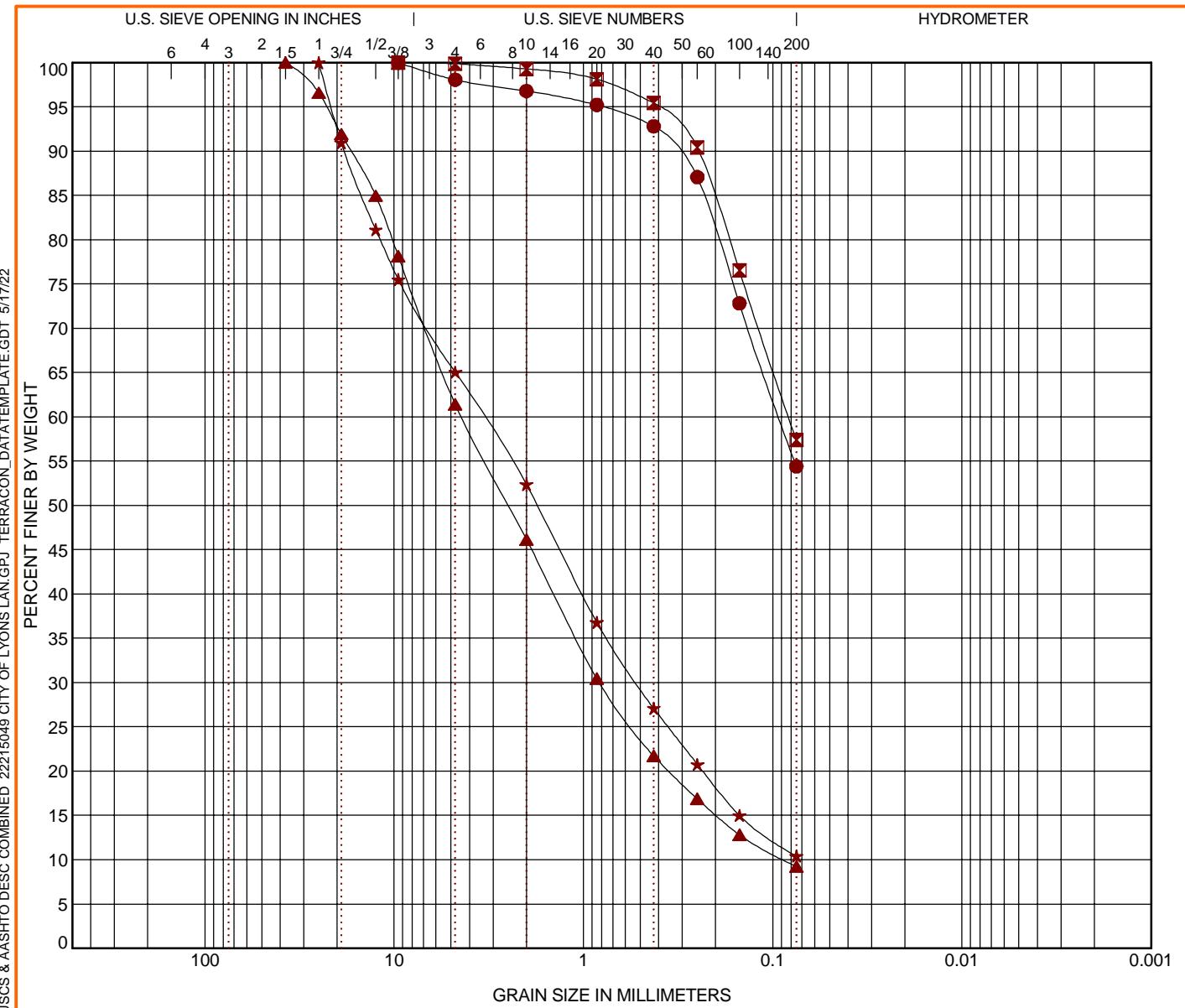
Terracon
1831 Lefthand Cir Ste C
Longmont, CO

PROJECT NUMBER: 22215049

CLIENT: TEBO Properties
Boulder, Colorado

GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136

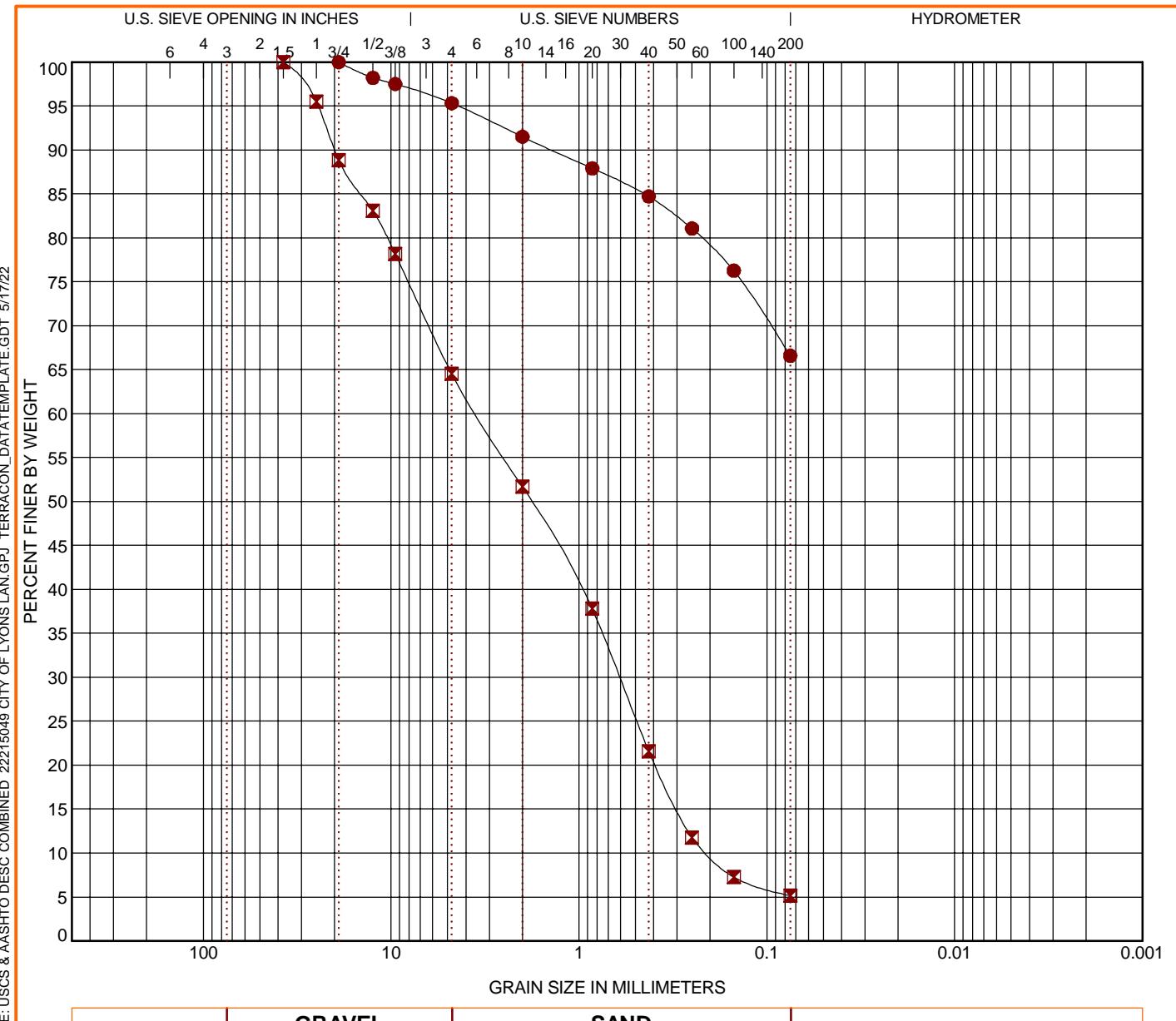


COBBLES	GRAVEL			SAND			SILT OR CLAY		
	coarse	fine	coarse	medium	fine				
● B-1 2 - 3	SANDY LEAN CLAY (CL)			A-6 (3)	18.9	30	19	11	
■ B-3 2 - 3	SANDY LEAN CLAY (CL)			A-6 (5)	18.0	30	17	13	
▲ B-3 9 - 10.5	WELL-GRADED SAND with SILT and GRAVEL (SW-SM)			A-1-a (0)	9.2	NP	NP	NP	1.76 50.36
★ B-4 4 - 5	WELL-GRADED SAND with SILT and GRAVEL (SW-SM)			A-1-b (0)	6.8	NP	NP	NP	1.15 47.74
Boring ID	Depth	D ₁₀₀	D ₆₀	D ₃₀	D ₁₀	%Gravel	%Sand	%Silt	%Fines %Clay
● B-1	2 - 3	9.5	0.093			1.9	43.7		54.4
■ B-3	2 - 3	9.5	0.082			0.1	42.5		57.4
▲ B-3	9 - 10.5	37.5	4.382	0.82	0.087	38.6	52.2		9.2
★ B-4	4 - 5	25	3.364	0.523		34.9	54.6		10.4

PROJECT: City of Lyons Land Annexation	Terracon 1831 Lefthand Cir Ste C Longmont, CO	PROJECT NUMBER: 22215049
SITE: 4545 Ute Highway Longmont, Colorado		CLIENT: TEBO Properties Boulder, Colorado

GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136



Boring ID	Depth	USCS Classification			AASHTO Classification		WC (%)	LL	PL	PI	Cc	Cu
● B-6	2 - 3	SANDY LEAN CLAY (CL)			A-6 (7)		19.6	29	15	14		
■ B-6	19 - 20	POORLY GRADED SAND with SILT and GRAVEL (SP-SM)			A-1-b (0)		13.3	NP	NP	NP	0.52	17.13
Boring ID	Depth	D ₁₀₀	D ₆₀	D ₃₀	D ₁₀	%Gravel	%Sand	%Silt	%Fines	%Clay		
● B-6	2 - 3	19				4.7	28.7				66.6	
■ B-6	19 - 20	37.5	3.5	0.609	0.204	35.5	59.4				5.2	

PROJECT: City of Lyons Land Annexation

Terracon
1831 Lefthand Cir Ste C
Longmont, CO

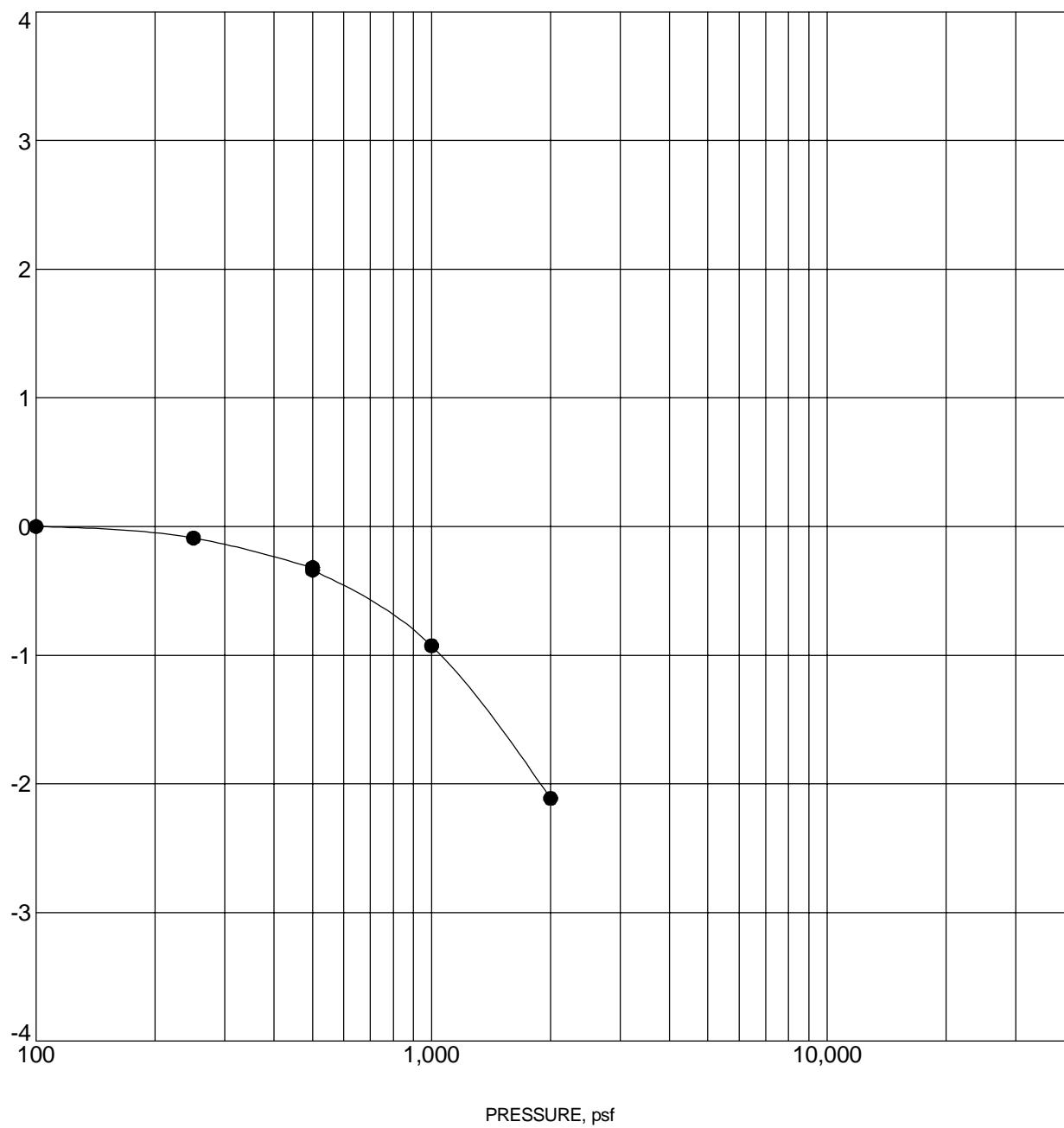
PROJECT NUMBER: 22215049

SITE: 4545 Ute Highway
Longmont, Colorado

CLIENT: TEBO Properties
Boulder, Colorado

SWELL CONSOLIDATION TEST

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. TC_CONSOL_STRAIN-USCS-NO ASTM 22215049 CITY OF LYONS LAN GPJ TERRACON DATA TEMPLATE.GDT 5/18/22



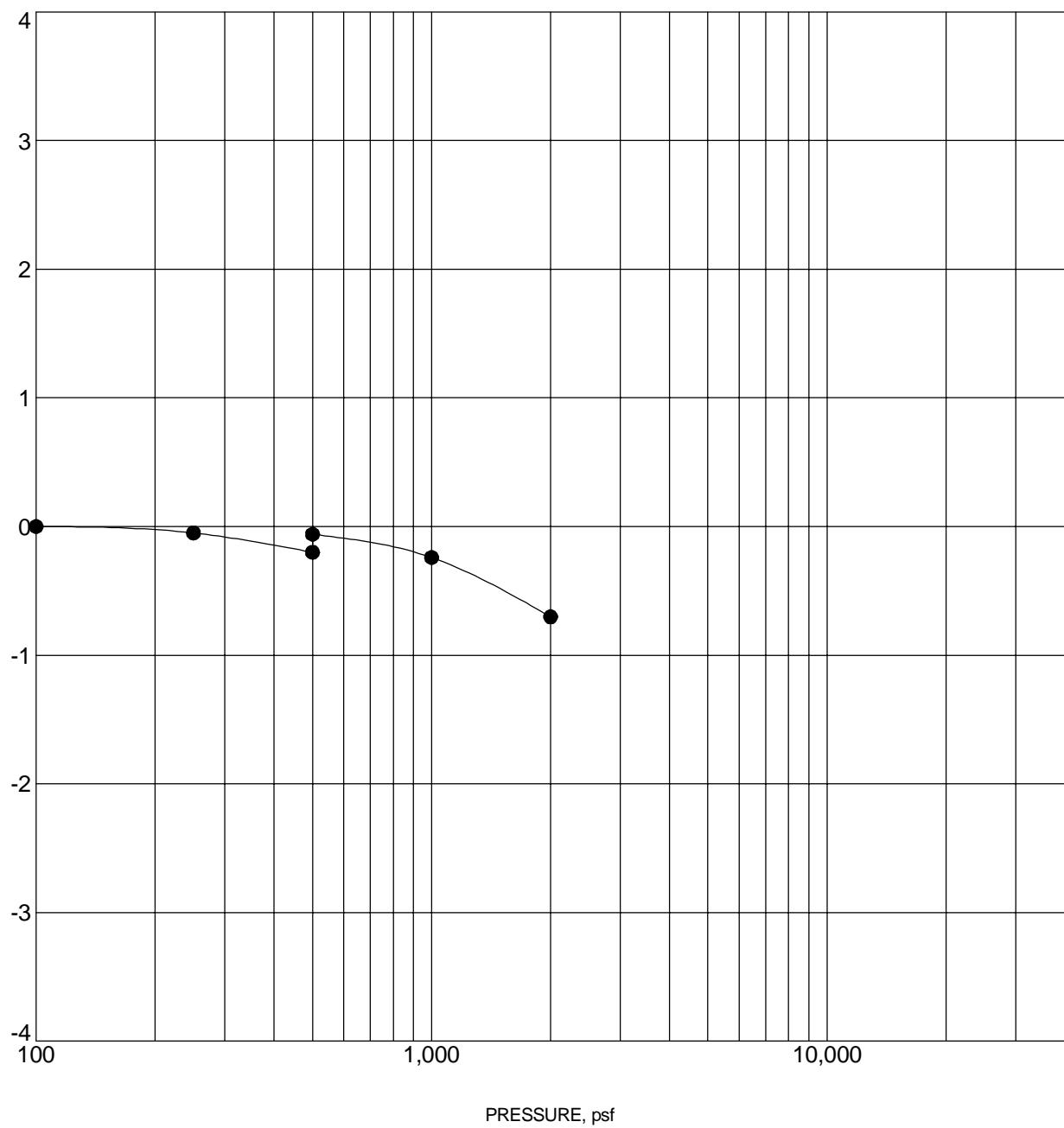
Specimen Identification		Classification		γ_d , pcf	WC, %
●	B-1	2 - 3 ft	SANDY LEAN CLAY(CL)	101	18.9

NOTES: Sample exhibited less than 0.1 percent compression upon wetting under an applied pressure of 500 psf.

PROJECT: City of Lyons Land Annexation	Terracon 1831 Lefthand Cir Ste C Longmont, CO	PROJECT NUMBER: 22215049
SITE: 4545 Ute Highway Longmont, Colorado		CLIENT: TEBO Properties Boulder, Colorado

SWELL CONSOLIDATION TEST

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. TC_CONSOL_STRAIN-USCS-NO ASTM 22215049 CITY OF LYONS LAN GPJ TERRACON DATA TEMPLATE.GDT 5/18/22

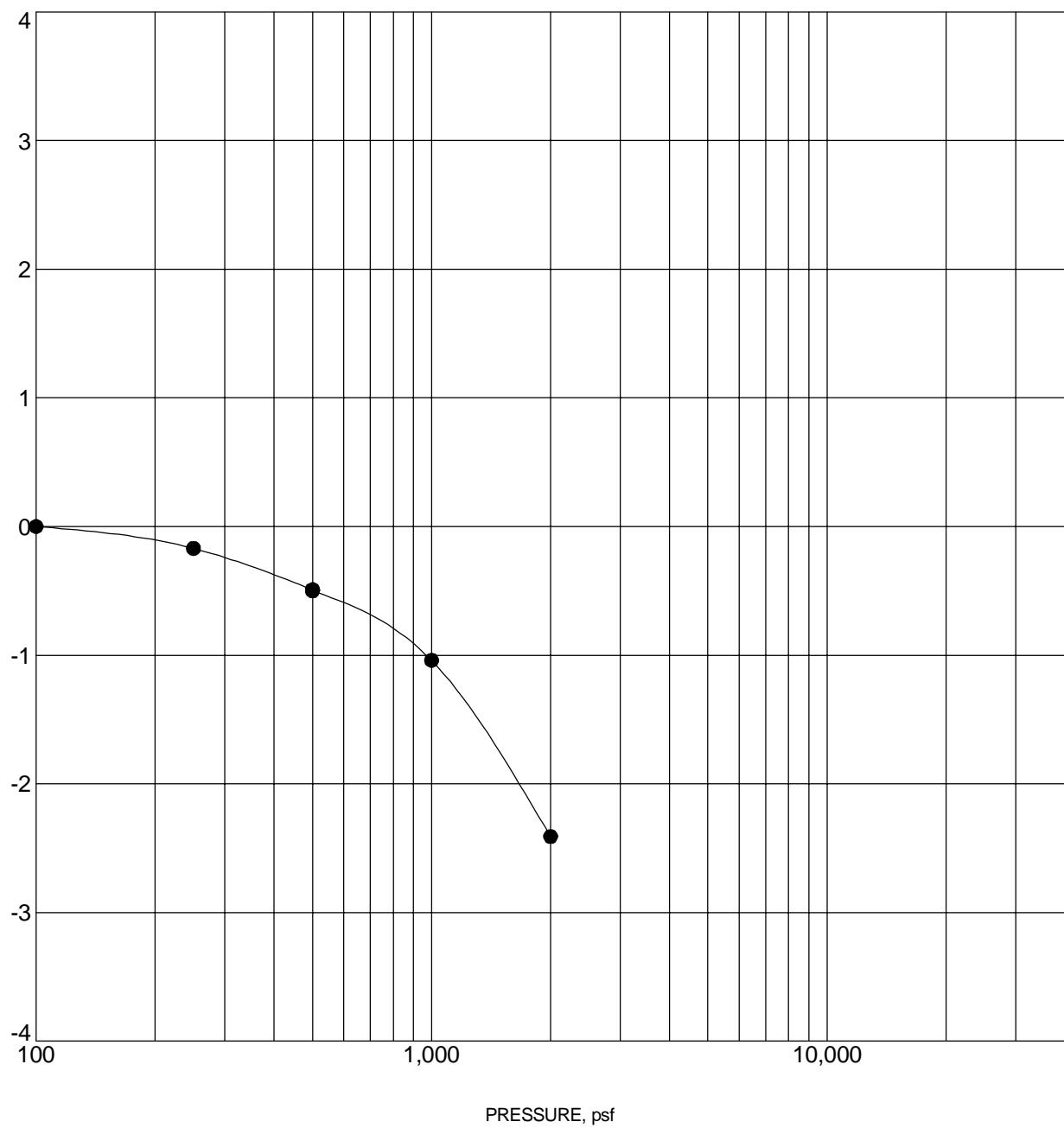


NOTES: Sample exhibited 0.1 percent swell upon wetting under an applied pressure of 500 psf.

PROJECT: City of Lyons Land Annexation	Terracon 1831 Lefthand Cir Ste C Longmont, CO	PROJECT NUMBER: 22215049
SITE: 4545 Ute Highway Longmont, Colorado		CLIENT: TEBO Properties Boulder, Colorado

SWELL CONSOLIDATION TEST

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. TC_CONSOL_STRAIN-USCS-NO ASTM 22215049 CITY OF LYONS LAN GPJ TERRACON DATA TEMPLATE GDT 5/18/22



Specimen Identification		Classification		γ_d , pcf	WC, %
●	B-6	2 - 3 ft	SANDY LEAN CLAY(CL)	109	19.6

NOTES: Sample exhibited less than 0.1 percent compression upon wetting under an applied pressure of 500 psf.

PROJECT: City of Lyons Land Annexation	Terracon 1831 Lefthand Cir Ste C Longmont, CO	PROJECT NUMBER: 22215049
SITE: 4545 Ute Highway Longmont, Colorado		CLIENT: TEBO Properties Boulder, Colorado

SUPPORTING INFORMATION

Contents:

General Notes

Unified Soil Classification System (USCS)

Note: All attachments are one page unless noted above.

GENERAL NOTES

DESCRIPTION OF SYMBOLS AND ABBREVIATIONS

City of Lyons Land Annexation ■ Longmont, Colorado

Terracon Project No. 22215049

SAMPLING		WATER LEVEL		FIELD TESTS			
	Auger Cuttings		Modified California Ring Sampler		Water Initially Encountered	N	Standard Penetration Test Resistance (Blows/Ft.)
	Standard Penetration Test		Water Level After a Specified Period of Time	(HP)	Hand Penetrometer		
			Water Level After a Specified Period of Time	(T)	Torvane		
			Cave In Encountered	(DCP)	Dynamic Cone Penetrometer		
		Water levels indicated on the soil boring logs are the levels measured in the borehole at the times indicated. Groundwater level variations will occur over time. In low permeability soils, accurate determination of groundwater levels is not possible with short term water level observations.		UC	Unconfined Compressive Strength		
				(PID)	Photo-Ionization Detector		
				(OVA)	Organic Vapor Analyzer		

DESCRIPTIVE SOIL CLASSIFICATION

Soil classification as noted on the soil boring logs is based Unified Soil Classification System. Where sufficient laboratory data exist to classify the soils consistent with ASTM D2487 "Classification of Soils for Engineering Purposes" this procedure is used. ASTM D2488 "Description and Identification of Soils (Visual-Manual Procedure)" is also used to classify the soils, particularly where insufficient laboratory data exist to classify the soils in accordance with ASTM D2487. In addition to USCS classification, coarse grained soils are classified on the basis of their in-place relative density, and fine-grained soils are classified on the basis of their consistency. See "Strength Terms" table below for details. The ASTM standards noted above are for reference to methodology in general. In some cases, variations to methods are applied as a result of local practice or professional judgment.

LOCATION AND ELEVATION NOTES

Exploration point locations as shown on the Exploration Plan and as noted on the soil boring logs in the form of Latitude and Longitude are approximate. See [Exploration and Testing Procedures](#) in the report for the methods used to locate the exploration points for this project. Surface elevation data annotated with +/- indicates that no actual topographical survey was conducted to confirm the surface elevation. Instead, the surface elevation was approximately determined from topographic maps of the area.

STRENGTH TERMS

RELATIVE DENSITY OF COARSE-GRAINED SOILS (More than 50% retained on No. 200 sieve.) Density determined by Standard Penetration Resistance			CONSISTENCY OF FINE-GRAINED SOILS (50% or more passing the No. 200 sieve.) Consistency determined by laboratory shear strength testing, field visual-manual procedures or standard penetration resistance				BEDROCK		
Descriptive Term (Density)	Standard Penetration or N-Value Blows/Ft.	Ring Sampler Blows/Ft.	Descriptive Term (Consistency)	Unconfined Compressive Strength Qu, (psf)	Standard Penetration or N-Value Blows/Ft.	Ring Sampler Blows/Ft.	Ring Sampler Blows/Ft.	Standard Penetration or N-Value Blows/Ft.	Descriptive Term (Consistency)
Very Loose	0 - 3	0 - 5	Very Soft	less than 500	0 - 1	< 3	< 24	< 20	Soft
Loose	4 - 9	6 - 14	Soft	500 to 1,000	2 - 4	3 - 5	24 - 35	20 - 29	Firm
Medium Dense	10 - 29	15 - 46	Medium Stiff	1,000 to 2,000	4 - 8	6 - 10	36 - 60	30 - 49	Medium Hard
Dense	30 - 50	47 - 79	Stiff	2,000 to 4,000	8 - 15	11 - 18	61 - 96	50 - 79	Hard
Very Dense	> 50	≥ 80	Very Stiff	4,000 to 8,000	15 - 30	19 - 36	> 96	> 79	Very Hard
			Hard	> 8,000	> 30	> 36			

RELEVANCE OF SOIL BORING LOG

The soil boring logs contained within this document are intended for application to the project as described in this document. Use of these soil boring logs for any other purpose may not be appropriate.

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 $[Cc < 1 \text{ or } Cc > 3.0]$ ^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 $[Cc < 1 \text{ or } Cc > 3.0]$ ^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"	CL	Lean clay ^{K, L, M}
			PI $<$ 4 or plots below "A" line ^J	ML	Silt ^{K, L, M}
	Silts and Clays: Liquid limit 50 or more	Organic:	Liquid limit - oven dried	< 0.75	Organic clay ^{K, L, M, N}
			Liquid limit - not dried		Organic silt ^{K, L, M, O}
	Inorganic:	PI plots on or above "A" line		CH	Fat clay ^{K, L, M}
		PI plots below "A" line		MH	Elastic Silt ^{K, L, M}
		Liquid limit - oven dried	< 0.75	OH	Organic clay ^{K, L, M, P}
		Liquid limit - not dried			Organic silt ^{K, L, M, O}
Highly organic soils:	Primarily organic matter, dark in color, and organic odor			PT	Peat

A Based on the material passing the 3-inch (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.

$$E \quad Cu = \frac{(D_{30})^2}{D_{10} \times D_{60}}$$

F If soil contains $\geq 15\%$ 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 $\geq 15\%$ 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 $\geq 30\%$ plus No. 200 predominantly sand, add "sandy" to group name.

M If soil contains $\geq 30\%$ 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.

