GROUND
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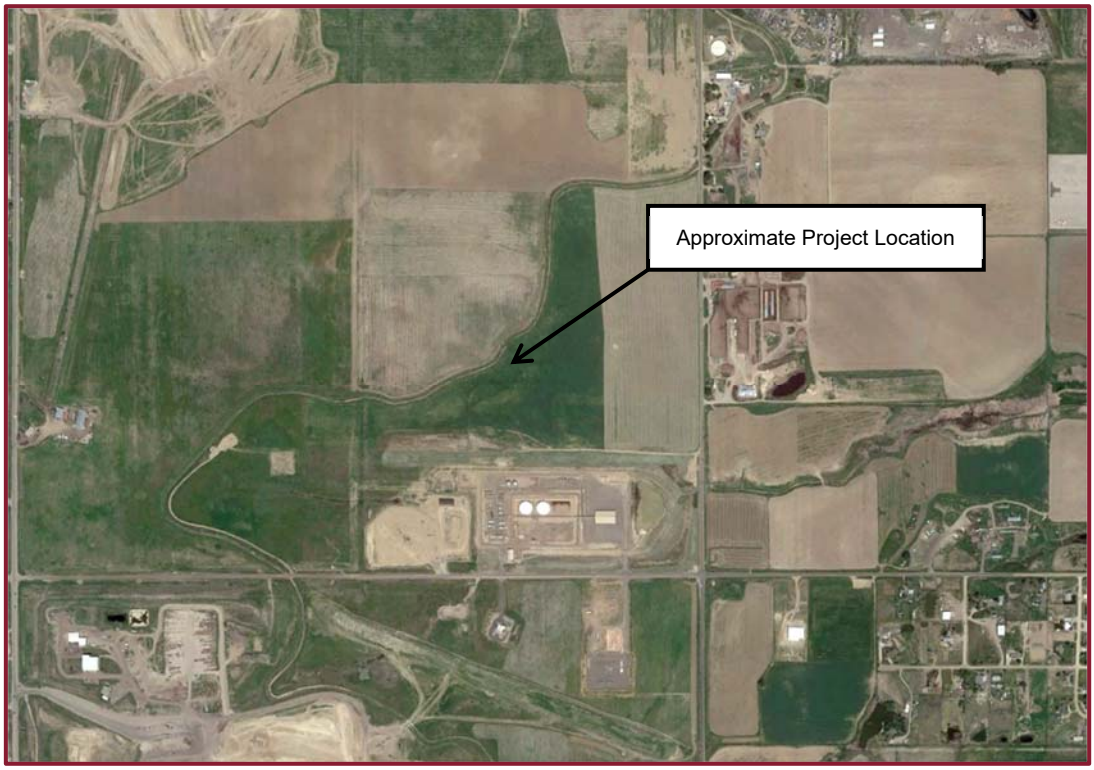
Geotechnical Data Report
Draco Well Pad – Depth to Groundwater
Erie, Colorado



Prepared For:

609 Consulting, LLC

1095 Saberton Avenue
Sheridan, Wyoming 82801

Attention: Mr. Jake Edmunds

Job Number: 23-3025 **June 30, 2023**

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PURPOSE AND SCOPE OF STUDY

This report summarizes the geotechnical data collected by GROUND Engineering Consultants, Inc. (GROUND) to provide groundwater elevation information for the proposed well pad associated with Draco Pad in Erie, Colorado. Our study was conducted in general accordance with GROUND's Proposal Number 2305-1099 dated May 30, 2023.

A limited field exploration program was conducted to obtain information on the subsurface conditions, particularly the depth to groundwater at the site. Material samples obtained during the subsurface exploration were tested in the laboratory to provide data on the classification and engineering characteristics of the on-site soils. The results of the field exploration and laboratory testing are presented herein.

This report has been prepared to summarize the data obtained and the subsurface conditions encountered. This report should be understood and utilized in its entirety; specific sections of the text, drawings, graphs, tables, and other information contained within this report are intended to be understood in the context of the entire report. This includes the *Closure* section of the report which outlines important limitations on the information contained herein.

This report was prepared for design purposes of 609 Consulting, LLC, based on our understanding of the project at the time of preparation of this report. The data, conclusions, opinions, and geotechnical parameters provided herein should not be construed to be sufficient for other purposes, including the use by contractors, or any other parties for any reason not specifically related to the design of the project. Furthermore, the information provided in this report was based on the exploration and testing methods described below. Deviations between what was reported herein and the actual surface and/or subsurface conditions may exist, and in some cases those deviations may be significant.

SITE CONDITIONS

At our time of subsurface exploration, the project site generally consisted of agricultural land planted with wheat and an east-west trending, unimproved access road. The well pad site was bordered by a reach of the Community Ditch to the northwest, by additional agricultural land to the north, east, and west, and by oil and gas infrastructure to the south. Additional agricultural land, oil and gas development, and land fill sites further surrounded the site.

The site was relatively moderately sloping, showing approximately 30 feet of relief across the site. The site descended toward the southeast and generally matched the slopes of the greater project area.

Review of historical aerial imagery indicated that the project site has undergone several iterations of development since 1993, the earliest available aerial imagery. Between 1993 and 1994, an access road and associated well pad was installed on the southeast corner of the site. Between 2004 and 2005, another access road and associated well pad was constructed at the northeast corner of the site. Between 2014 and 2015, a production facility was constructed to the south, as was an access road and what appears to be a spoils stockpile. Select images are available on the next page. Additionally, review of topographic maps published by USGS[1] indicated the site grades had not changed significantly since the 1950s, the earliest available 7.5-minute quadrangle maps.

[1] Garrity, C. (2022) *topoView*. USGS. Available at: https://ngmdb.usgs.gov/topoview/ (Accessed: April 12, 2023).

SUBSURFACE EXPLORATION

Subsurface exploration for the project was conducted on June 8, 2023. One test hole was drilled with a conventional truck mounted drill rig advancing 6-inch diameter hollow stem continuous flight auger to evaluate the subsurface conditions and retrieve samples for laboratory testing. The test hole was drilled at a location surveyed by others and then converted to a MOH (Monitoring and Observation Hole). A GROUND professional directed the subsurface exploration, logged the test hole in the field, and prepared the samples for transport to our laboratory.

Samples of the subsurface materials were retrieved with a 2-inch diameter California liner sampler and a 1⅜-inch inner diameter standard penetration sampler. The samplers were driven into the substrata with blows from a 140-pound hammer falling 30 inches, in general accordance with the Standard Penetration Test described by ASTM Method D1586. Penetration resistance values, when properly evaluated, indicate the relative density or consistency of soils. Depths at which the samples were obtained and associated penetration resistance values are shown on the test hole logs.

The approximate location of the test hole is shown in Figure 1. A detailed log of the test hole is shown in Figure 2. A legend and notes are provided on Figure 3. A diagram of the MOH is shown in Figure 4.

LABORATORY TESTING

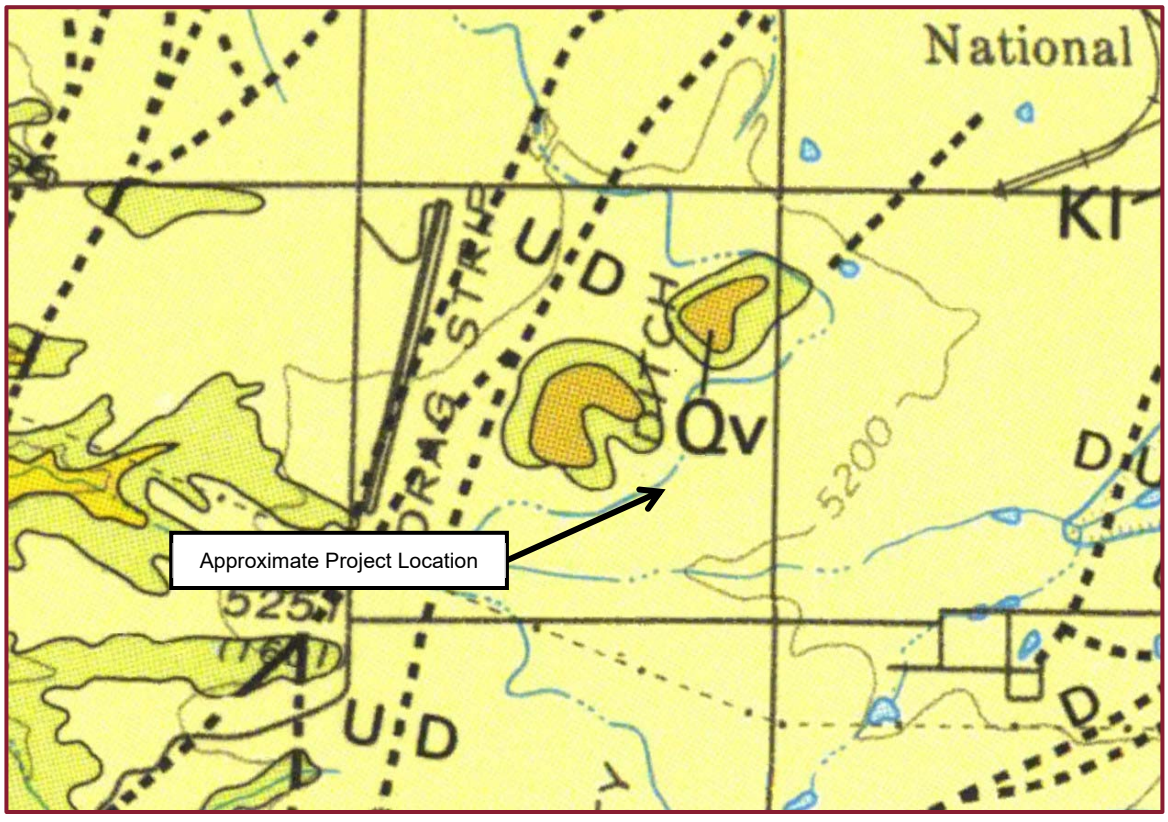
Samples retrieved from our test holes were examined and visually classified in the laboratory by the project engineer. Laboratory testing of soil samples included standard property tests, such as natural moisture contents, dry unit weights, grain size analyses,

and Atterberg limits. Laboratory tests were performed in general accordance with applicable ASTM protocols. Results of the laboratory testing program are summarized in Table 1.

SUBSURFACE CONDITIONS

Geologic Setting Published geologic maps, e.g., Colton (1978)[2] depict the site as underlain by Upper Holocene Eolium (**Qe**). These surficial materials are underlain by Upper Cretaceous Laramie Formation (**Kl**).

The eolian (wind-blown) deposits in the greater project area commonly consists of silts, clays, and fine sands. These deposits are known to be subject to hydro-consolidation "collapse" upon wetting.



[2] Colton, R.B. (1978) *Geologic Map of the Boulder-Fort Collins-Greeley area, Front Range Urban Corridor, Colorado.* Series I-855-G. U.S. Geological Survey. 1:100,000.

The Laramie Formation consists of interbedded sandstones, claystones, siltstones, and coal. The claystone and siltstone of the Laramie Formation can have relatively moderate to high swell potentials, and this formation can contain well cemented beds that can very hard and difficult to excavate. Additionally, the coal present in the Laramie Formation has been mined locally.

Local Conditions The test hole penetrated about 18 inches of tilled soil[3] before penetrating clays, silts, and sands that were recognized to a depths of about 18 feet below existing grade. Beneath the surficial soils, weathered claystone was encountered to a depth of about 21 feet below existing grade. Underlying the weathered claystones, claystone bedrock was encountered and extended to the depths explored.

We interpret the silts, sands, and clays to be eolium, and the weathered claystones and claystone bedrock to be Laramie Formation. Beds within the Laramie Formation can be relatively resistant and difficult to excavate; while not encountered during our subsurface exploration, resistant beds may be met locally.

Fill materials, other than the tilled soils, were not recognized in the test hole but may be present on the site. (See the *Site Conditions* section of this report.) These fill soils may contain coarse gravels and cobbles, as well as similarly sized pieces of construction debris even though these items were not recognized in the test holes. Delineation of the complete lateral and vertical extents of the fills at the site and their compositions was beyond our present scope of services. If more detailed information regarding fill extents and compositions at the site are of significance, they should be evaluated using test pits.

Similarly, coarse gravel and larger clasts are not well represented in small diameter liner samples collected from the test holes. Therefore, such materials may be present even where not called out in the material descriptions herein.

Tilled Soil consisted of mechanically disturbed silts, clays, and fine sands with trace medium to coarse sands and gravels. It was moist, moderately plastic, medium, and brown in color.

[3] "Tilled soil" as used herein is defined geotechnically and is used to describe soils that have been mechanically disturbed by agricultural practices.

Silts and Clays consisted of silts and clays with lesser fractions of fine to coarse sands. They were moist, stiff, moderately to highly plastic, and brown in color. Caliche was noted commonly.

Weathered Claystone consisted of weathered claystones. It was moist, highly plastic, weathered, and gray to dark gray in color. Iron-staining and lignite were noted locally.

Claystone Bedrock consisted of claystone bedrock. It was moist, non-plastic, hard, and gray in color. Iron-staining was noted commonly and lignite was noted locally.

Groundwater was encountered in the test hole at the time of drilling at a depth of approximately 18 feet below existing grade. After installing the monitoring and observation hole, groundwater was measured at a depth of approximately 11 feet below existing grade. Additional depth to groundwater measurements were made on June 14, 22, and 28, 2023 and a table summarizing the depth to groundwater measurements is tabulated below.

Depth to Groundwater Measurements

Date	***Depth to Groundwater (Feet below Existing Grade)***
June 8, 2023 – Time of Drilling	18.0 feet
June 8, 2023 – After MOH Installation	11.0 feet
June 14, 2023	11.3 feet
June 22, 2023	11.4 feet
June 28, 2023	11.5 feet

Groundwater levels can be expected to fluctuate, however, in response to annual and longer-term cycles of precipitation, irrigation (including canal and/ditch stages), surface drainage, land use, and the development of transient, perched water conditions.

The groundwater observations performed during our exploration must be interpreted carefully as they are short-term and do not constitute a groundwater study. Additional depth to groundwater measurements could be made in the installed monitoring and observation hole. GROUND can be contacted to make these observations upon request.

LIMITATIONS

This letter has been prepared for 609 Consulting, LLC. to present the geotechnical data herein. It should not be assumed to contain sufficient information for other parties or other purposes.

The geotechnical data in this report relied upon testing at a limited number of exploration points as discussed herein. It is not possible to guarantee the values obtained are representative of other locations on the site.

GROUND makes no warranties, either expressed or implied, as to the professional data, opinions or conclusions contained herein. This document is intended only for the specific purpose and client for which it was prepared. Reuse of, or improper reliance on this document without written authorization and adaption by GROUND Engineering Consultants, Inc., shall be without liability to GROUND Engineering Consultants, Inc.

We trust that this provides the information that you needed at this time. If you have any questions, please contact this office.

Sincerely,

GROUND Engineering Consultants, Inc.

Ben Fellbaum, P.G., E.I. Reviewed by Brian H. Reck, P.G., C.E.G., P.E.

GOOGLE EARTH AERIAL IMAGE (6/10/2022)

1
Indicates test hole numbers and approximate locations.

NOT TO SCALE

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FIGURE: 1

LOCATION OF TEST HOLES

TEST HOLE MOH1

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CLIENT: 609 Consulting LLC

PROJECT NAME: Draco Well Pad - Depth to Groundwater

JOB NO: 23-3025

PROJECT LOCATION: Erie, CO

Elevation (ft)	Depth (ft)	Material Descriptions and Drilling Notes	Sample Type	Blow Count
100	0	**TILLED SOIL:** Approximately 1.5 feet of tilled soil.		
		SILTS and CLAYS: consisted of silts and clays with lesser fractions of fine to coarse sands. They were moist, stiff moderately to highly plastic, and brown in color. Caliche was noted commonly.		
				5/12
95	5			
				15/12
90	10			
		Groundwater encountered at 11 feet approximately 2 hours after drilling.		
85	15			
		WEATHERED CLAYSTONE: consisted of weathered claystones. It was moist, highly plastic, weathered, and gray to dark gray in color. Iron-staining and lignite were noted locally.		4-8-12
80	20			
		Groundwater encountered at 18 feet at time of drilling.		
		CLAYSTONE BEDROCK: consisted of claystone bedrock. It was moist, non-plastic, hard, and gray in color. Iron-staining was noted commonly and lignite was noted locally.		
75	25			
				37/12
70	30			
				50/12

Bottom of borehole at Approx. 34 feet.

Natural Moisture Content (%)	Natural Dry Density (pcf)	Percent Passing No. 200 Sieve	Atterberg Limits: Liquid Limit	Atterberg Limits: Plasticity Index	Swell/Consolidation (%) at Surcharge Pressure (psf)	Unconfined Compressive Strength (ksf)	USCS Equivalent Classification

Figure 2

LEGEND AND NOTES

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CLIENT: 609 Consulting LLC **PROJECT NAME:** Draco Well Pad - Depth to Groundwater

JOB NO: 23-3025 **PROJECT LOCATION:** Erie, CO

MATERIAL SYMBOLS


TILLED SOIL


SILT and CLAY


WEATHERED CLAYSTONE


CLAYSTONE BEDROCK

NOTE: See Detailed Logs for Material descriptions.

SAMPLER SYMBOLS


Modified California Liner Sampler
23 / 12 Drive sample blow count indicates 23 blows of a 140 pound hammer falling 30 inches were required to drive the sampler 12 inches.


Standard Penetration Test Sampler
20-25-30 Drive sample blow count, indicates 20, 25, and 30 blows of a 140 pound hammer falling 30 inches were required to drive the sampler 18 inches in three 6 inch increments.

NOTES

1. Test holes were drilled on 6/8/2023 with 6" hollow stem auger.

2. Locations of the test holes were determined approximately by pacing from features shown on the site plan provided.

3. Elevations of the test holes were not measured and the logs of the test holes are drawn to depth. Nominal elevation of "100 feet" indicates existing ground level at the test hole at the time of drilling.

4. The test hole locations and elevations should be considered accurate only to the degree implied by the method used.

5. The lines between materials shown on the test hole logs represent the approximate boundaries between material types and the transitions may be gradual.

6. Groundwater level readings shown on the logs were made at the time and under the conditions indicated. Fluctuations in the water level may occur with time.

7. The material descriptions on these logs are for general classification purposes only. See full text of this report for descriptions of the site materials & related information.

8. All test holes were immediately backfilled upon completion of drilling, unless otherwise specified in this report.

ABBREVIATIONS

▽ Water Level at Time of Drilling, or as Shown

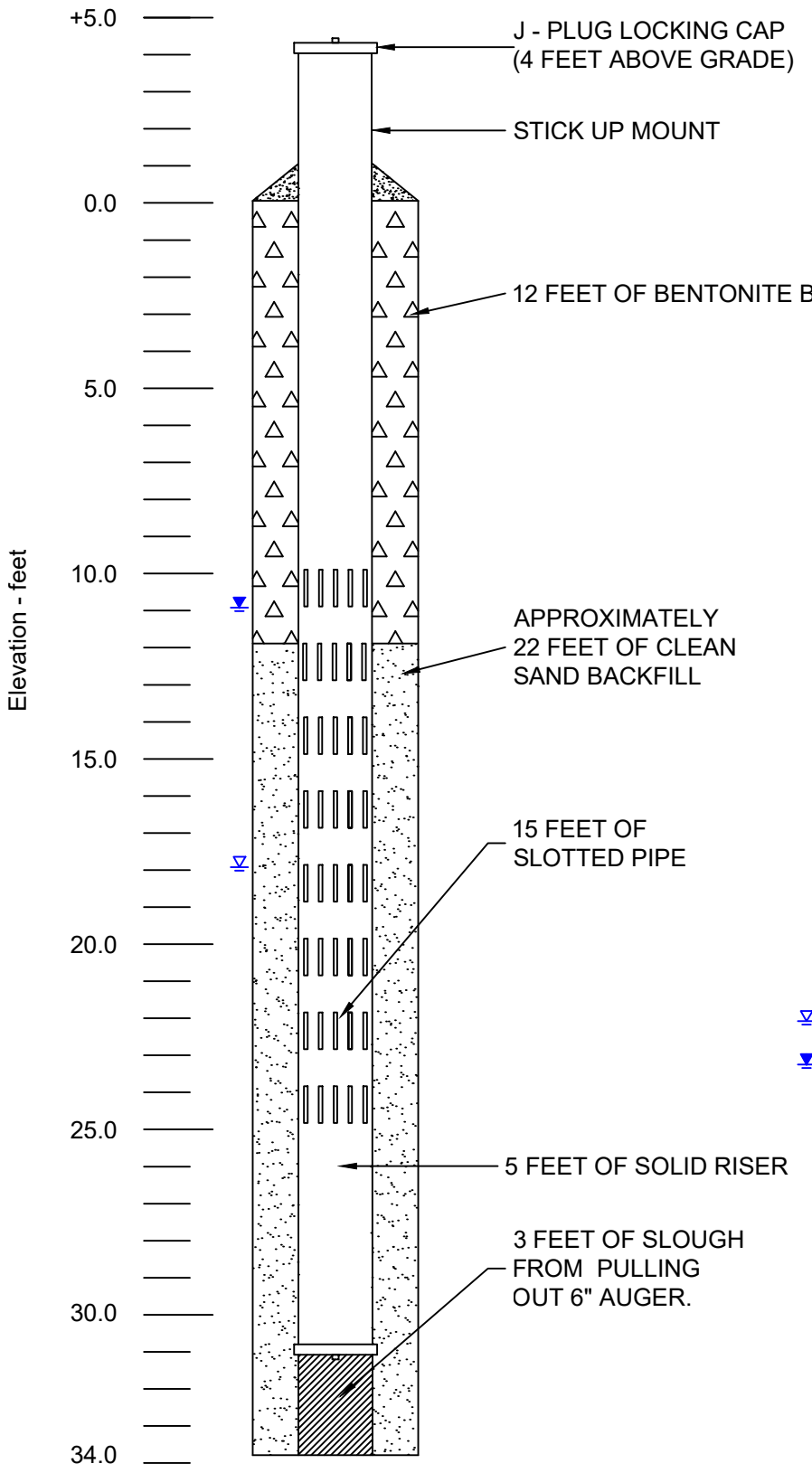
▼ Water Level at End of Drilling, or as Shown

▼ Water Level After 24 Hours, or as Shown

NV	No Value
NP	Non-Plastic

Figure 3

MOH-1



WATER READINGS

INSTALLATION DATE:	6/8/2023
DATE OF READING	**DEPTH**
6/8/2023	18'
6/8/2023 At the end of drilling.	11'
6/14/23	11'
6/22/23	11'
6/28/23	11'

NOTES:

1. Bore hole is approximately $4\frac{1}{4}$ inches in diameter.
2. PVC is schedule 40 and 2 inches in diameter slots for slotted PVC are 0.010" wide.
3. Test hole elevations provided by CLIENT

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FIGURE: 4

MONITORING AND OBSERVATION HOLE ASSEMBLY

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Draco Well Pad - Depth to Groundwater

TABLE 1: SUMMARY OF LABORATORY TEST RESULTS

Sample Location		Natural Moisture Content	Natural Dry Density	Gradation			Atterberg Limits		USCS Equivalent Classification	AASHTO Equivalent Classification (Group Index)	Sample Description
Test Hole No.	Depth *(feet)*	*(%)*	*(pcf)*	Gravel *(%)*	Sand *(%)*	Fines *(%)*	Liquid Limit	Plasticity Index			
1	3	19.2	98.7	0	16	83.9	31	13	(CL)s	A-6 (10)	FILL: CLAY with Sand
1	28	14.1	115.7	0	1	98.7	50	28	CH	A-7-6 (31)	CLAYSTONE Bedrock

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