

# **TRAVELERS STATION**

## **Percolation / Septic Tests**

**Land Set Engineering, Inc.**

**February 2020**



February 11, 2020

File No.: 2055-01

Mr. Liam Saleh  
12 Maher Road  
Watsonville, California 95076

SUBJECT: RESULTS OF PERCOLATION TESTING  
**Traveler's Station (APN 012-030-023)**  
Searle Road  
San Juan Bautista Area of Monterey County, California

Dear Mr. Saleh:

In accordance with your authorization, Landset Engineers, Inc. has completed the drilling and testing of one exploratory boring and three percolation test borings to determine the soil percolation rates for a proposed business on the above referenced parcel located in the San Juan Bautista area of San Benito County, California. This report presents the results of our field investigation and conclusions. In general, it is our opinion that the site soil conditions are not suitable at the locations tested without supplemental treatment for a septic effluent disposal field in accordance San Benito County Department of Environmental Health standards.

**PURPOSE AND SCOPE OF SERVICES**

This report has been prepared to explore the subsurface soil and groundwater conditions at the site, and to determine the percolation rates relative to site suitability for a septic effluent disposal system.

The percolation test procedures were accomplished in general conformance with the standards of the San Benito County. Evaluation for the actual design of septic effluent disposal field was beyond the scope of work for this study. Our scope of services included:

1. Exploration and classification of the subsurface earth materials by means of drilling one deep exploratory boring to a depth of 21.5' and field testing three percolation test borings at depths ranging from approximately 5.0 to 10.0 feet below the ground surface.
2. Analysis of the information collected based on the results of the field exploration & testing.
3. Preparation of this report summarizing our findings and conclusions.

**SITE DESCRIPTION AND PROPOSED DEVELOPMENT**

The site (APN 012-030-023) is located at Searle Road and Chittenden Road in the San Juan Bautista area of San Benito County, California (Figure 1). The overall property consists of an irregular shaped vacant parcel of about 3.5-acres in area. The parcel is generally flat and is bound by Chittenden Road to the north, Searle Road to the south west, and the 101 freeway onramp to the east (Figure 2). Proposed site development will consist of the construction of a business with associated infrastructure, surface drainage and landscaping improvements.

**FIELD EXPLORATION**

One deep 21.5' exploratory boring and three percolation test borings were drilled on the subject parcel on January 27, 2020. The borings were drilled with a truck mounted drill rig utilizing a 4-inch or 6-inch outside diameter auger. The borings were logged in the field by an engineering technician working under the supervision of a Professional Engineer.

The earth materials encountered in the borings were visually classified in the field and a continuous log was recorded. Visual classifications were made in general accordance with the Unified Soil Classification System and ASTM D2487. The logs of the exploratory boring and percolation test borings (Figures A4, A5, A6 & A7) can be found in Appendix A. Appendix A also contains a Key to the Unified Soil Classification System, Key to Log of Borings and Soil Terminology (Figures A1 through A3).

Soil samples were obtained by drilling to the desired depth and then driving a 2-inch OD Standard Penetration Test sampler. The sampler was driven into the ground using force generated by a 140-pound hammer dropping freely through a distance of 30-inches. The number of blows required to drive the last 12-inches of an 18-inch sampler were recorded as penetration resistance (blows/foot) on the exploratory boring log (Figure A4). The penetration resistance values were used to describe the consistency/density of the subsurface materials.

**SUBSURFACE CONDITIONS**

The soil materials encountered typically consist of medium dense, moist, clayey SAND and sandy CLAY to the maximum depth explored of 21.5 feet below the ground surface.

**GROUNDWATER**

Groundwater was not encountered in any of the borings drilled on site as part of this study. Local groundwater levels can fluctuate over time depending on but not limited to factors such as seasonal rainfall, site elevation, groundwater withdrawal, and agricultural irrigation & construction activities at neighboring sites. The influence of these time dependent factors could not be assessed at the time of our investigation.

**PERCOLATION TESTING**

The percolation test borings were drilled on January 27, 2020 with a truck mounted drill rig utilizing a 6-inch outside diameter auger. Upon completion of drilling operations the test borings were fitted with a 4-inch diameter slotted PVC pipe. About 2-inches of ¼" diameter angular gravel was placed at the bottom of the test hole prior to installing the slotted pipe. After placement of the pipe in the test holes, the annular space between the pipe and the boring sidewall was backfilled with gravel.

The percolation test holes were pre-saturated on January 27, 2020 by means of filling the test borings through the slotted pipe with clean water up to approximately 6" above the bottom of the hole and maintained at that elevation for a period of at least 4 hours. After pre-saturation, the test holes were allowed to sit for a period of approximately 24 hours prior to percolation testing.

Percolation testing was performed on-site on January 28, 2020. Upon completion of test hole pre-saturation, the water level was adjusted to an approximate depth of 6 inches above the bottom of the test hole. Percolation testing was performed in general accordance with the Falling Head Test Method and San Benito County test procedures.

**SUMMARIZED CONCLUSIONS**

The following conclusions for site suitability and percolation are drawn from the data acquired. In our opinion, the site soil conditions at the locations tested are not suitable for a septic effluent disposal field without supplemental treatment. Please refer to the table below for a summary of the final percolation test results and four-hour average test readings.

**Summary of Percolation Test Results**

Test Hole	Test Depth (ft)	Final Percolation Rate (min/in)
P-1	5.3	>120.0
P-2	7.2	>120.0
P-3	9.7	>120.0
<i>Average</i>		<i>&gt;120.0</i>

Based on the soil conditions encountered and the results of the percolation testing performed, we recommend that the project septic designer utilize a soil application rate of 0.1 gpd/ft<sup>2</sup> for design. The exploratory boring log, individual percolation test boring logs and percolation test data is presented in the following Appendix A.

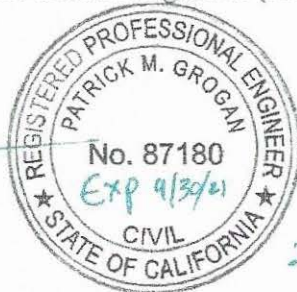
Based on the visual observations and the percolation testing performed by this firm, it is our opinion that the site soils yield percolation rates satisfactory for development of per the requirements set forth by San Benito County for alternative disposal fields. The percolation test data should be presented to the project designer and the appropriate regulatory agency that shall locate, size and determine the necessity for any supplemental treatment for the proposed leach fields.

It has been a pleasure to be of service to you on this project. If you have any questions regarding the attached report, please contact the undersigned at (831) 443-6970

Respectfully submitted,  
**LandSet Engineers, Inc.**

Patrick Grogan  
 RCE 87180

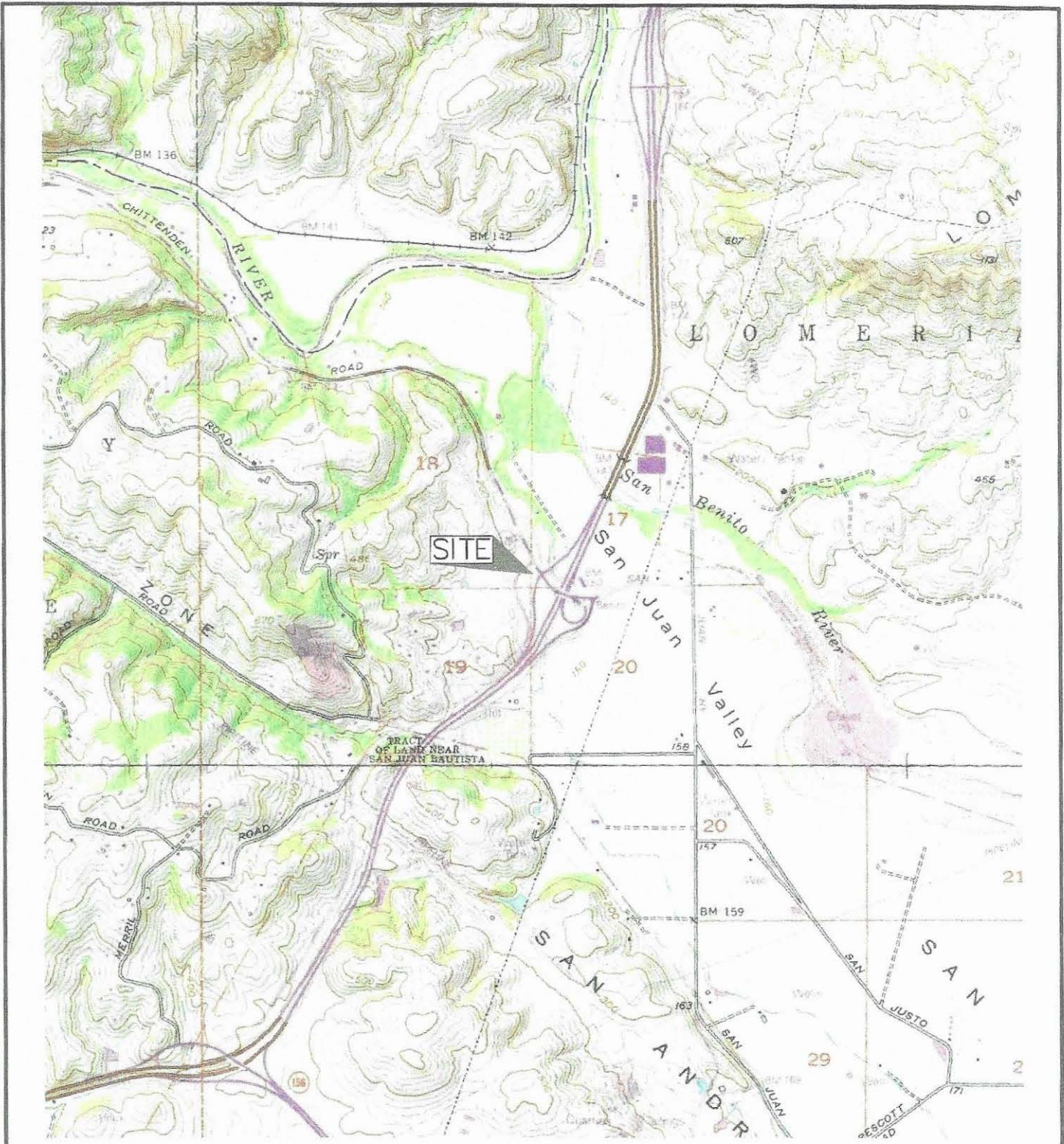
Distribution: Addressee (e-mail: helium\_559@hotmail.com, matt@kelley-engineering.com)



*2/11/20*

**FIGURES**

Figure 1, Vicinity Map  
Figure 2, Boring Location Map

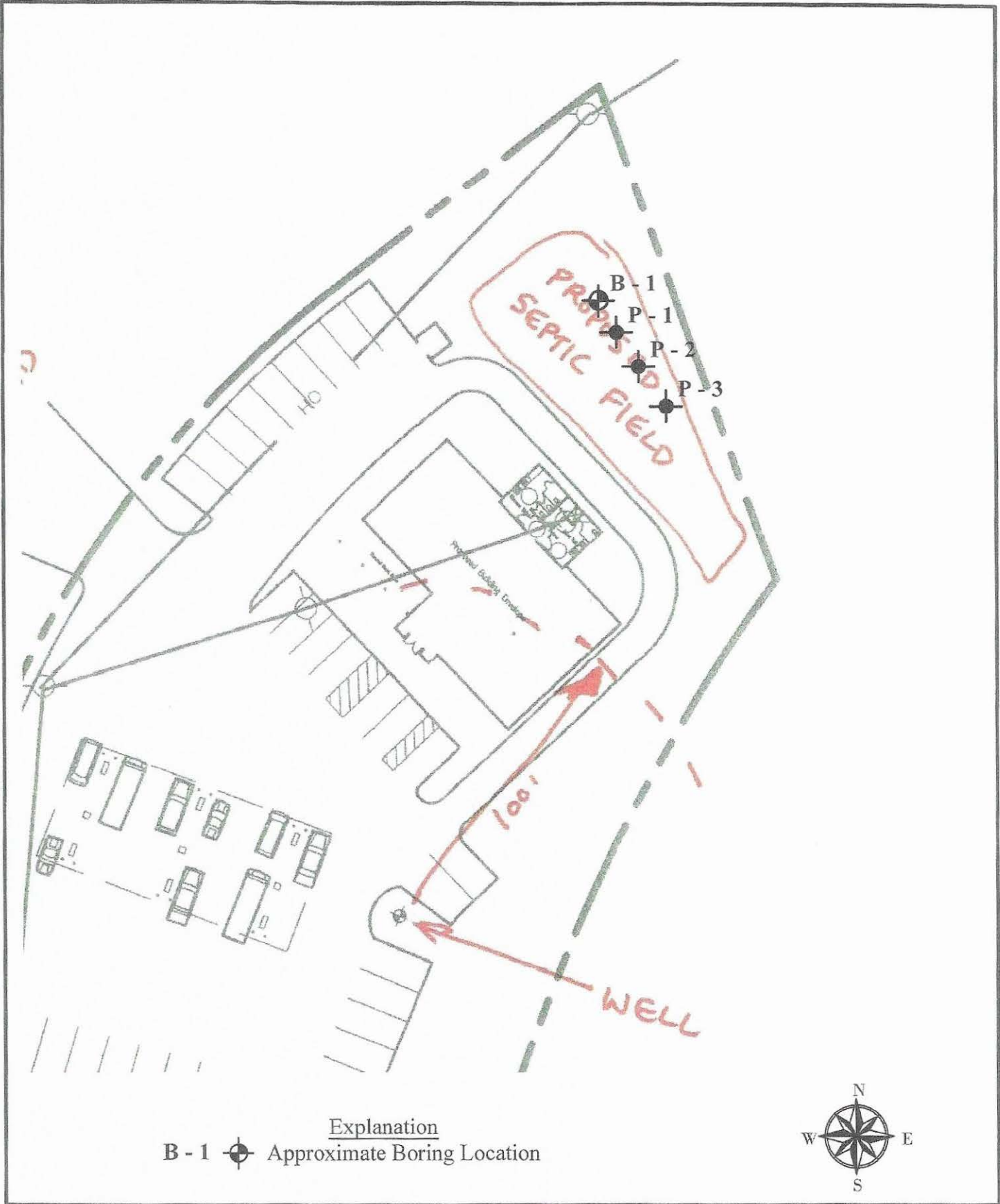


BASE MAP: San Juan Bautista, California  
 U.S.G.S. 7.5' Topographic  
 Quadrangle Map  
 Scale: 1" = 2000'



**Vicinity Map**  
 Traveler's Station (APN 012-030-023)  
 Searle Road  
 San Juan Bautista, CA

FIGURE  
 I  
 PROJECT  
 2055-01



Explanation  
 B - 1 ⊕ Approximate Boring Location





**APPENDIX A**

Unified Soil Classification System

Key to Log of Borings

Soil Terminology

Exploratory Boring Logs B-1

Percolation Test Boring Logs P-1 through P-3 and Percolation Test Results

# UNITED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS			GRAPHIC SYMBOL	LETTER SYMBOL	TYPICAL DESCRIPTIONS		
<b>COARSE GRAINED SOILS</b>  More than 50% of material is larger than No. 200 sieve size.	<b>GRAVEL AND GRAVELLY SOILS</b>  More than 50% of coarse fraction retained on No. 4 sieve.	CLEAN GRAVELS		GW	Well-graded gravels, gravel-sand mixtures, little or no fines.		
		<b>GRAVELS WITH FINES</b>	(Little or no fines)		GP	Poorly-graded gravels, gravel-sand mixtures, little or no fines.	
			(Appreciable amount of fines)		GM	Silty gravel, gravel-sand-silt mixtures.	
			(Appreciable amount of fines)		GC	Clayey gravels, gravel-sand-clay mixture.	
	<b>SAND AND SANDY SOILS</b>  More than 50% of coarse fraction passing No. 4 sieve.	CLEAN SAND		SW	Well-graded sands, gravelly sands, little or no fines.		
		(Little or no fines)		SP	Poorly-graded sands, gravelly sands, little or no fines.		
		<b>CLEAN GRAVELS</b>  (Appreciable amount of fines)	(Little or no fines)		SM	Silty sands, sand-silt mixtures.	
			(Appreciable amount of fines)		SC	Clayey sands, sand-clay mixtures.	
			<b>LIQUID LIMIT LESS THAN 50</b>	(Little or no fines)		ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands, or clay silts with slight plasticity.
				(Appreciable amount of fines)		CL	Inorganic clay of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.
<b>LIQUID LIMIT GREATER THAN 50</b>	(Little or no fines)		OL	Organic silts and organic silty clay of low plasticity.			
	(Appreciable amount of fines)		MH	Inorganic silty, micaceous or diatomaceous fine sand or silty soils.			
	(Appreciable amount of fines)		CH	Inorganic clays of high plasticity, fat clays.			
	(Appreciable amount of fines)		OH	Organic clays of medium to high plasticity, organic silts.			
HIGHLY ORGANIC SOILS				PT	Peat, humus, swamp soils with high organic contents.		
VARIOUS SOILS AND MAN MADE MATERIALS					Fill materials.		
MAN MADE MATERIALS					Asphalt and concrete.		



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FIGURE  
A-1

# KEY TO LOG OF BORINGS

Depth (ft)	Sample	Graphic Log	Blows per Foot	Pocket Pen (tsf)	Description	U.C.S.C. Soil Group	Dry Density (pcf)	Moisture (% dry weight)
0								
1					Shelby Sampler Thin walled, 3" diameter, 3 ft long, hydraulically advanced			
2								
3					Modified California Sampler 3" diameter split-barrel sampler with brass liners driven by a 140 lb hammer with a drop of 30"			
4								
5					Standard Penetration Test (SPT) Sampler 2" diameter split-barrel sampler driven by a 140 lb hammer with a drop of 30"			
6								
7					Bulk Sample Loose soil removed for testing			
8								
9								
10					California Sampler 2.5" diameter split-barrel sampler with brass liners driven by a 140 lb hammer with a drop of 30" Shaded area denotes sample taken			
11								
12					Hand Sampler 2.5" diameter driven by hand	Groundwater encountered during drilling		
13						Groundwater encountered after drilling		
14					Continuous Core Sampler 94 mm Christianson Sampler	Seepage		
15								
16			75		Approximate blows per foot			
17								
18					Solid Line denotes soil or lithologic change			
19					-----			
20					Dashed Line denotes gradational or approximate soil or lithologic change			
21								
22					Heavy Line denotes termination of boring			
23								
24					N/R = No sample recovered D.S. = Disturbed Sample			
25								
26								
27								
28								
29								



# SOIL TERMINOLOGY

## SOIL TYPES (Ref. 1)

Boulders:	Particles of rock that will not pass a 12 inch screen.
Cobbles:	Particles of rock that will pass a 12 inch screen but not a 3 inch sieve.
Gravel:	Particles of rock that will pass a 3 inch sieve, but not a No. 4 sieve.
Sand:	Particles that will pass a No. 4 sieve but not a No. 200 sieve.
Silt:	Soil that will pass a No. 200 sieve, that is non-plastic or very slightly plastic, and that exhibits little or no strength when dry.
Clay:	Soil that will pass a No. 200 sieve, that can be made to exhibit plasticity (putty-like properties) within a range of water contents, and that exhibits considerable strength when dry.

## MOISTURE AND DENSITY

Moisture Condition:	An observational term; dry, slightly moist, moist, very moist, saturated.
Moisture Content:	The weight of water in a sample divided by the weight of dry soil in the soil sample, expressed as a percentage.
Dry Density:	The pounds of dry soil in a cubic foot of soil.

## DESCRIPTIONS OF CONSISTENCY (Ref. 3)

Liquid Limit:	The water content at which a No. 40 soil is on the boundary between exhibiting liquid and plastic characteristics. The consistency feels like soft butter.
Plastic Limit:	The water content at which a No. 40 soil is on the boundary between exhibiting plastic and semi-solid characteristics. The consistency feels like stiff putty.
Plasticity Index:	The difference between the liquid limit and the plastic limit, i.e. the range in water contents over which the soil is in a plastic state.

## MEASURES OF CONSISTENCY OF COHESIVE SOILS (CLAYS) (Recs. 2 & 3)

Very soft	N=0-1*	C=0-250 psf	Squeezes between fingers
Soft	N=2-4	C=250-500 psf	Easily molded by finger pressure
Medium Stiff	N=5-8	C=500-1000 psf	Molded by strong finger pressure
Stiff	N=9-15	C=1000-2000 psf	Dented by strong finger pressure
Very Stiff	N=16-30	C=2000-4000 psf	Dented slightly by finger pressure
Hard	N>30	C>4000 psf	Dented slightly by pencil point

\*N = Blows per foot in the Standard Penetration Test. In cohesive soils, with the 3" diameter sampler, 140 pound weight, divide the blow count by 1.2 to get N (Ref. 4).

## MEASURES OF RELATIVE DENSITY OF GRANULAR SOILS (GRAVELS, SANDS AND SILTS) (Refs. 2 & 3)

Very Loose	N=0-4**	RD=0-30	Easily push a 1/2" reinforcing rod by hand
Loose	N=5-10	RD=30-50	Push a 1/2" reinforcing rod by hand
Medium Dense	N=11-30	RD=50-70	Easily drive a 1/2" reinforcing rod
Dense	N=31-50	RD=70-90	Drive a 1/2" reinforcing rod
Very Dense	N>50	RD=90-100	Drive a 1/2" reinforcing rod a few inches

\*\*N= Blows per foot in the Standard Penetration Test. In granular soils, with the 3" diameter sampler, 140 pound weight, divide the blow count by 2 to get N (Ref. 4). RD = Relative Density

- Ref. 1: ASTM Designation: D 2487-93, Standard Classification of Soils for Engineering Purposes (Unified Soils Classification System).
- Ref. 2: Terzaghi, Karl, and Peck, Ralph B., Soil Mechanics in Engineering Practice, John Wiley & Sons, New York, 2nd Ed., 1967, pp. 30, 341, 347.
- Ref. 3: Sowers, George F., Introductory Soil Mechanics and Foundations: Geotechnical Engineering. Macmillan Publishing Company, New York, 4th Ed., 1979. pp. 80, 81 and 312.
- Ref. 4: Lowe, John III, and Zaccheo, Phillip F., Subsurface Explorations and Sampling Chapter 1 in "Foundation Engineering Handbook," Hsai.Yang Fang, Editor, Van Nostrand Reinhold Company, New York, 2nd Ed., 1991. p. 39.



# EXPLORATORY BORING LOG

No. B-1

PROJECT: Traveler's Station

DATE DRILLED: 01-27-20

PROJECT: 2055-01

DRILLER: California Geotech

DRILLING METHOD: B-24

LOGGED BY: TL

BORING DIAMETER: 4" SS

BORING DEPTH: 21.5'

GROUNDWATER DEPTH: N/A

Depth (ft)	Sample	Graphic Log	Blows per Foot	Pocket Pen (tsf)	Description	U.C.S.C. Soil Group	Dry Density (pcf)	Moisture (% dry weight)
0								
1					Dark brown clayey SAND, very moist, med dense			
2								
3					Color change to brown	SC		
4								
5					With orange mottling			
6	1-1		21		Brown sandy CLAY, stiff, moist to very moist, 30-40% very fine sand fraction With orange mottling	CL		
7								
8								
9								
10								
11	1-2		14		Brown clayey SAND, medium dense, moist, very fine to fine sand, 25-35% fines			
12								
13								
14						SC		
15					Same			
16	1-3		15					
17								
18								
19								
20								
21	1-4		23		Brown sandy SILT, medium dense, slightly moist, 35-40% very fine sand	ML		
22					TD @ 21.5'			
23					NO GROUNDWATER ENCOUNTERED			
24								
25								
26								



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FIGURE  
A4

# EXPLORATORY BORING LOG

No. P1

PROJECT: Traveler's Station

DATE DRILLED: 03-27-20

PROJECT: 2055-01

DRILLER: California Geotech

DRILLING METHOD: B-24

LOGGED BY: TL

BORING DIAMETER: 6"

BORING DEPTH: 5.3'

GROUNDWATER DEPTH: N/A

Depth (ft)	Sample	Graphic Log	Blows per Foot	Pocket Pen (tsf)	Description	U.C.S.C. Soil Group	Dry Density (pcf)	Moisture (% dry weight)
0								
1					Brown clayey SAND, loose to medium dense, moist to very moist, very fine grained sand, 30-35% fines	SC		
2								
3								
4					Brown sandy CLAY, medium dense, moist, very fine sand fraction	CL		
5								
6					TD @ 5.3'			
7					NO GROUNDWATER ENCOUNTERED			
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								
23								
24								
25								
26								



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FIGURE  
A5

# EXPLORATORY BORING LOG

No. P2

PROJECT: A6

DATE DRILLED: 01-27-20

PROJECT: 2055-01

DRILLER: California Geotech

DRILLING METHOD: B-24

LOGGED BY: TL

BORING DIAMETER: 6"

BORING DEPTH: 7.2'

GROUNDWATER DEPTH: N/A

Depth (ft)	Sample	Graphic Log	Blows per Foot	Pocket Pen (tst)	Description	U.C.S.C. Soil Group	Dry Density (pcf)	Moisture (% dry weight)
0								
1					Brown clayey SAND, loose to medium dense, moist to very moist, very fine grained sand, 35-40% fines	SC		
2					Same, medium dense			
3								
4								
5								
6								
7								
8					TD @ 7.2'			
9					NO GROUNDWATER ENCOUNTERED			
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								
23								
24								
25								
26								



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FIGURE  
A6

# EXPLORATORY BORING LOG

No. P3

PROJECT: Traveler's Station

DATE DRILLED: 01-27-20

PROJECT: 2055-01

DRILLER: California Geotech

DRILLING METHOD: B-24

LOGGED BY: TL

BORING DIAMETER: 6"

BORING DEPTH: 9.7'

GROUNDWATER DEPTH: N/A

Depth (ft)	Sample	Graphic Log	Blows per Foot	Pocket Pen (tsf)	Description	U.C.S.C. Soil Group	Dry Density (pcf)	Moisture (% dry weight)
0								
1					Brown clayey SAND, loose to medium dense, moist to very moist, very fine grained sand, 35-40% fines	SC		
2					Same, medium dense, moist			
3								
4								
5								
6								
7								
8								
9								
10								
11					TD @ 9.7'			
12					NO GROUNDWATER ENCOUNTERED			
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								
23								
24								
25								
26								



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FIGURE  
A7







