SOILS ENGINEERING REPORT
ACCESS ROAD FOR SANTA ROSA WELL #4
COAST UNION HIGH SCHOOL
2950 SANTA ROSA CREEK ROAD
CAMBRIA AREA
SAN LUIS OBISPO COUNTY, CALIFORNIA

PROJECT GS00496-1

Prepared for

Cambria Community Services District
Attn: James Green
PO Box 65
Cambria, CA

Prepared by

GEOSOLUTIONS, INC.
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July 22, 2025

SOILS ENGINEERING REPORT

DATE
July 22, 2025

PROJECT NUMBER
GS00496-1

CLIENT
Cambria Community Services District
Attn: James Green
PO Box 65
Cambria, CA 93428

PROJECT
Access Road for Santa Rosa Well #4
Coast Union High School
2950 Santa Rosa Creek Road
Cambria area
San Luis Obispo County, CA

Dear Cambria Community Services District:

This Soils Engineering Report has been prepared for the proposed access road for Santa Rosa Well #4 to be located at Coast Union High School, 2950 Santa Rosa Creek Road, in the Cambria area of San Luis Obispo County, California. Geotechnically, the site is suitable for the proposed improvements provided the recommendations in this report for site preparation, earthwork, pavement design, and surface drainage are incorporated into the design.

Logs of exploratory borings, results of laboratory testing, engineering analysis, and our geologic and geotechnical findings pertaining to the project are provided within.

Thank you for the opportunity to have been of service in preparing this report. If you have any questions, please contact the undersigned at (805) 543-8639.

Sincerely,
GeoSolutions, Inc.

Brian Jagger, PE
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1.0 INTRODUCTION

This report presents the results of the geotechnical exploration for the proposed access road for Santa Rosa Well #4 to be located at Coast Union High School, 2950 Santa Rosa Creek Road, in the Cambria area of San Luis Obispo County, California. See Figure 1: Site Location Map (USGS, 2022) for the general location of the project and surrounding topography.

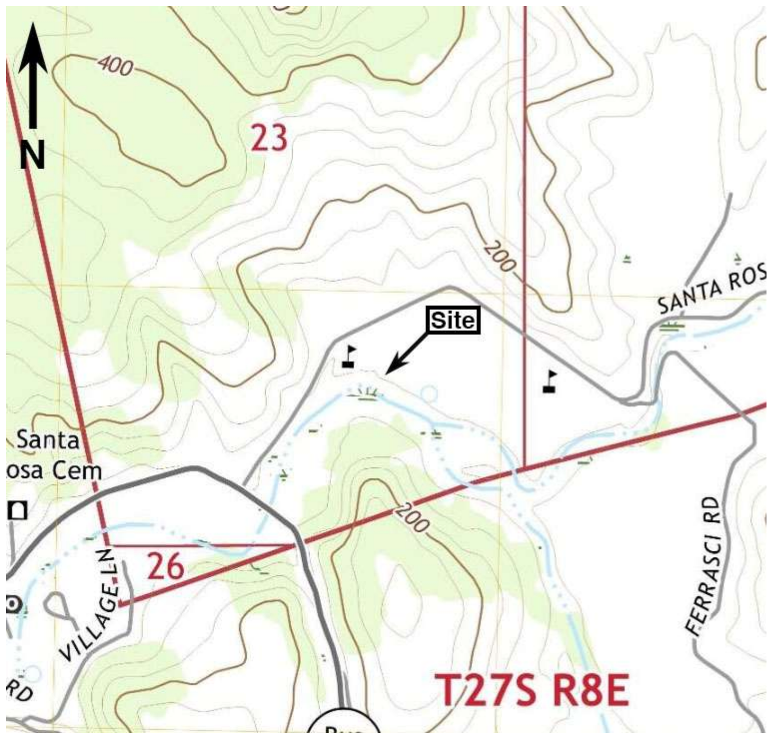

Figure 1: Site Location Map

1.1 Site Description

The proposed access road is to be located in the western portion of the Coast Union High School property. The alignment of the proposed access road will hereafter be referred to as the "Site."

The Site is situated in a grassy area at an average elevation of approximately 85 feet above sea level, just north of Santa Rosa Creek. The area has slight gradients sloping downwards towards a swale which is located near the midpoint of the proposed alignment. Surface drainage flows towards the swale and Santa Rosa Creek.

1.2 Project Description

The proposed project consists of constructing a road and associated fencing to access Santa Rosa Well #4 from Santa Rosa Creek Road, along the easement indicated on Figure 2: Site Plan. It is our understanding that the road will be required to support a 40-ton vehicle which is used to deliver supplies to Santa Rosa Well #4 in all-weather conditions and that the access road surface is to be comprised of aggregate base.

2.0 WORK PERFORMED

2.1 Purpose and Scope

The purpose of this study was to explore and evaluate the surface and sub-surface soil conditions at the Site and to develop geotechnical information and design criteria. The scope of this study includes the following items:

1. A literature review of available geotechnical data pertinent to the project site including geologic maps and available on-line aerial photographs.
2. A field exploration consisting of site reconnaissance and subsurface exploration including exploratory borings in order to formulate a description of the sub-surface conditions at the Site.
3. Laboratory testing performed on representative soil samples that were collected during our field exploration.
4. Engineering analysis of the data gathered during our literature review, field study, and laboratory testing.
5. Development of recommendations for site preparation and grading as well as geotechnical design criteria for pavement sections, underground utilities, and drainage facilities.

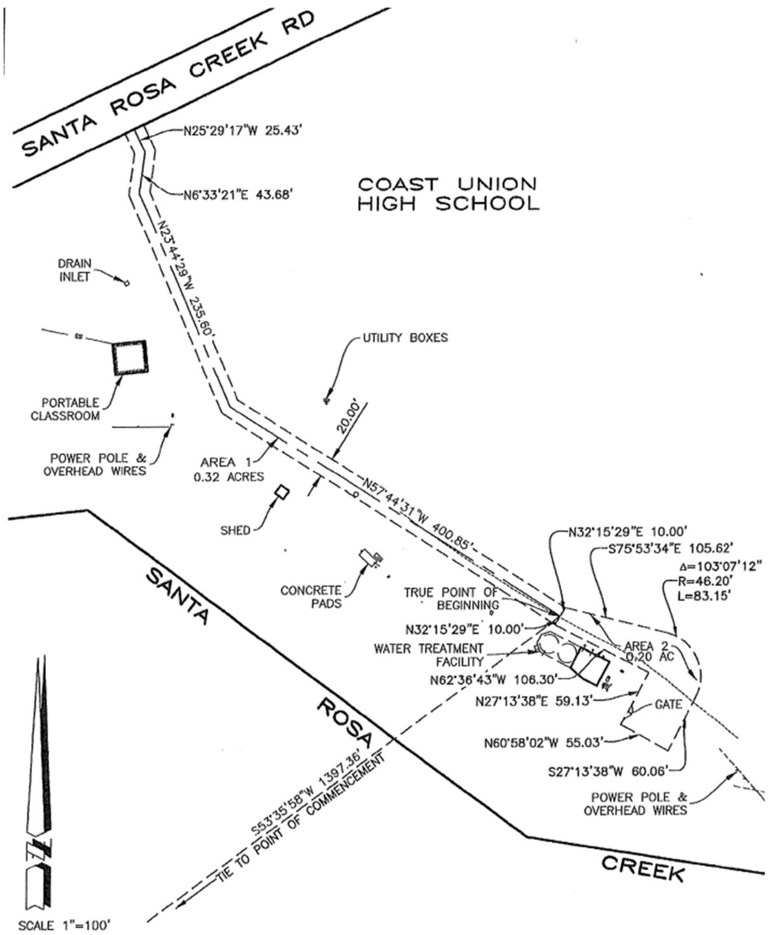

Figure 2: Site Plan

2.2 Field Exploration

The field exploration for the project consisted of advancing four exploratory borings. See Figure 3: Field Exploration for the approximate boring locations.

GeoSolutions, Inc. performed the exploratory borings on May 23, 2025, using a Mobile B-24 drill rig equipped with a 6-inch diameter, solid-stem auger. The exploratory borings were advanced to depths of approximately 10 feet below ground surface (bgs). Sampling methods included the Standard Penetration Test utilizing a standard split-spoon sampler (SPT) as well as collection of bulk samples from auger cuttings. The Mobile B-24 drill rig was equipped with a safety hammer with an efficiency ratio of approximately 60 percent which was used to obtain test blow counts in the form of SPT N-values.

During the boring operations the soils encountered were continuously examined, visually classified, and sampled for general laboratory testing. Additional information regarding the field exploration and logs of the borings are provided in **Appendix A.**

2.3 Laboratory Testing

Laboratory tests were performed on representative soil samples that were obtained from the Site during the field exploration. Results and explanations of the tests are provided in **Appendix B**. The testing performed for the project included the following:

- Soil Classification (ASTM D2487, ASTM D2488)
- Particle Size Analysis (ASTM D422)
- Liquid Limit, Plastic Limit, and Plasticity Index (ASTM 4318)
- Expansion Index (ASTM D4829)
- Laboratory Maximum Density (ASTM D1557)
- R-Value (ASTM D2844)

Figure 3: Field Exploration

3.0 FINDINGS

3.1 Geologic Setting

Regional site geology was obtained through review of available geologic maps provided by the USGS National Geologic Map Database (USGS, 2025). Figure 4: Regional Geologic Map provides the surficial geologic units in the project vicinity, as mapped by Dibblee (2007). The surficial geologic units mapped at the Site consist of Quaternary Surficial Deposits described as “alluvial gravel, sand and clay” (Qa).

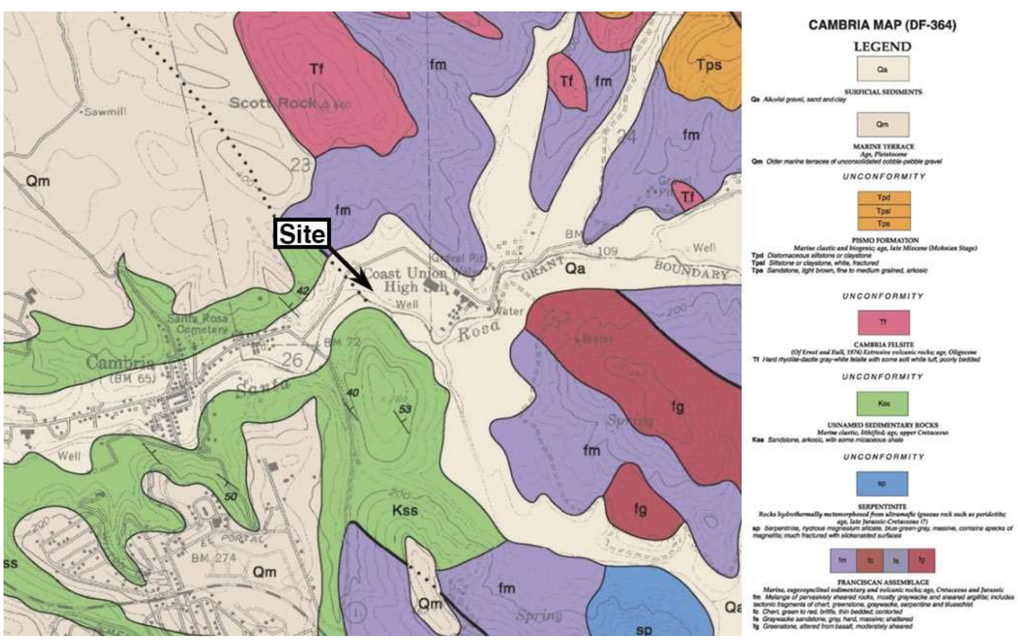

Figure 4: Regional Geologic Map

3.2 Subsurface Conditions

Data gathered during the field exploration indicates that the soils underlying the Site are comprised of alluvial materials to the maximum depth of the exploratory borings. A summary of the conditions encountered is provided below.

The surficial material encountered in all of the exploratory borings consisted of very dark gray sandy fat CLAY (CH), encountered in stiff to very stiff and slightly moist to saturated conditions from the ground surface to depths of approximately 4.0 to 4.5 feet bgs.

Underlying the surficial material, the material encountered in borings B-1, B-2 and B-4 generally consisted of very dark gray sandy lean CLAY (CL), encountered in stiff to very stiff and very moist to saturated conditions to the termination of the borings at depths of approximately 10 feet bgs.

The sub-surface material encountered in boring B-3 consisted of a thin layer (approximately 18 inches) of dark yellowish brown silty sand (SM), encountered in a slightly moist and medium dense condition. This material was underlain by very dark sandy fat CLAY (CH) encountered in a slightly moist and stiff condition to the termination of the boring at a depth of approximately 10 feet bgs.

Refer to **Appendix A** for logs of the borings performed at the Site and Figure 3: Field Exploration for the approximate exploration locations.

3.3 Groundwater

Groundwater was not encountered in any of the exploratory borings. Review of data available from Geotracker (State Water Resources Control Board, 2025) indicates that groundwater levels can be very near the ground surface at the Hampton Hotel (T0607900034) LUST cleanup site which is located approximately 0.35 miles southwest of the Site. It should be anticipated that groundwater levels may change seasonally and with irrigation practices.

3.4 Engineering Properties

Relevant engineering properties determined from laboratory testing on representative samples obtained during the field exploration are provided in Table 1: Engineering Properties. Refer to **Appendix B** for additional information on the testing performed and laboratory test results.

Table 1: Engineering Properties

Sample ID	Sample Description	USCS Specification	Fines Content (%)	Plasticity Index	Maximum Dry Density, γ_d (pcf)	Optimum Moisture (%)	R-Value
A (B-1 @ 0-4’)	Very Dark Gray Sandy Fat CLAY	CH	56.9	40	111.3	16.0	11
B (B-1 @ 5-9’)	Very Dark Gray Sandy Lean CLAY	CL	63.3	26	-	-	-

4.0 SEISMIC DESIGN CONSIDERATIONS

4.1 Seismic Design Parameters

Estimating the design ground motions at the Site depends on many factors including the distance from the Site to known active faults; the expected magnitude and rate of recurrence of seismic events produced on such faults; the source-to-site ground motion attenuation characteristics; and the Site soil profile characteristics. According to section 1613 of the 2022 CBC (CBSC, 2022), all structures and portions of structures should be designed to resist the effects of seismic loadings caused by earthquake ground motions in accordance with the ASCE 7: Minimum Design Loads for Buildings and Other Structures, hereafter referred to as ASCE 7-16 (ASCE, 2016). The Site soil profile classification (Site Class) can be determined by the average soil properties in the upper 100 feet of the Site profile and the criteria provided in Table 20.3-1 of ASCE 7-16.

Spectral response accelerations and peak ground accelerations, provided in this report were obtained using the computer-based Seismic Design Maps tool available from the Structural Engineers Association of California (SEAOC, 2019). This program utilizes the methods developed in ASCE 7-16 in conjunction with user-inputted Site location to calculate seismic design parameters and response spectra (both for period and displacement) for soil profile Site Classes A through E.

Site coordinates of 35.5687 degrees north latitude and -121.0719 degrees east longitude were used in the web-based probabilistic seismic hazard analysis (SEAOC, 2019). Based on the results from the in-situ tests performed during the field exploration, the Site was defined as **Site Class D**, “Stiff Soil” profile per ASCE 7-16, Chapter 20. Relevant seismic design parameters obtained from the program are summarized in Table 4: Seismic Design Parameters.

Table 2: Seismic Design Parameters

Site Class	D – Stiff Soil
Structure Risk Category	I
Short-Period Design Spectral Response Acceleration, S_{DS}	0.814 g
1-Second Period Design Spectral Response Acceleration, S_{D1}	*
Site Specific MCE Peak Ground Acceleration, PGA_M	0.593 g

** In accordance with ASCE 7-16, SUPPLEMENT 3, Section 11.4.8.1: A ground motion hazard analysis is not required for structures on Site Class D sites with S_1 greater than or equal to 0.2, where the value of the parameter S_{M1} determined by Eq. (11.4-2) is increased by 50% for all applications of S_{M1} in this Standard. The resulting value of the parameter S_{D1} determined by Eq. (11.4-4) shall be used for all applications of S_{D1} in this Standard.*

4.2 Liquefaction Potential

Liquefaction occurs when saturated cohesionless soils lose shear strength due to earthquake shaking. Ground motion from an earthquake may induce cyclic reversals of shear stresses of large amplitude. Lateral and vertical movement of the soil mass combined with the loss of bearing strength can result from this phenomenon. Liquefaction potential of soil deposits during earthquake activity depends on soil type, void ratio, groundwater conditions, the duration of shaking, and confining pressures on the potentially liquefiable soil unit. Fine, poorly graded loose sand, shallow groundwater, high intensity earthquakes, and long duration of ground shaking are the principal factors leading to liquefaction.

Due to the high fines content of the near-surface soils and results of analyses performed for nearby projects which included deep sub-surface exploration, it is our opinion that the potential for surface manifestation of liquefaction of soils at the Site is low. Assuming that the recommendations of the Soils Engineering Report are implemented, the potential for seismically induced settlement at the Site is considered to be low.

5.0 GENERAL SOIL-FOUNDATION DISCUSSION

It is anticipated that the scope of the project will be limited to construction of the access road and associated improvements. The recommendations provided in the following sections of this report are intended to provide a section which will support a 40-ton supply vehicle in all-weather conditions.

6.0 CONCLUSIONS AND RECOMMENDATIONS

The Site is suitable for the proposed development provided the recommendations presented in this report are incorporated into the project plans and specifications. The primary geotechnical concerns at the Site are:

1. The presence of highly expansive, low strength native soils.

2. The presence of grass and organic materials in the upper 6 to 12 inches of the soil profile.

3. The presence of irrigation lines and existing utilities within the alignment of the proposed access road.

4. Stormwater which flows along the swale located near the midpoint of the proposed access road alignment.

6.1 Subgrade Preparation

1. The access road should be excavated to approximate subgrade elevation or to stiff native material; whichever is deeper. The exposed surface should be scarified an additional depth of 6 inches, moisture conditioned to approximately 3 percent over optimum moisture content, and compacted to a minimum relative compaction of 95 percent (ASTM D1557-12 test method).

2. The top 12 inches of subgrade soil under all structural sections should be compacted to a minimum relative compaction of 95 percent (ASTM D1557-12 test method) at approximately 3 percent over optimum moisture content.

3. Subgrade soils should not be allowed to dry out or have excessive construction traffic between moisture conditioning and compaction, and placement of the pavement structural section.

6.2 Pavement Section Design

1. As specified in Section 6.1, the top 12 inches of subgrade soil under pavement sections should be compacted to a minimum relative compaction of 95 percent based on the ASTM D1557-12 test method at approximately 3 percent over optimum moisture content.

2. The structural section overlying the prepared subgrade material should consist of a minimum of 12 inches of Class II Aggregate Base placed at a minimum relative compaction of 95 percent based on the ASTM D1557-12 test method. Class II Aggregate Base used for the structural section should conform to Section 26 of the State of California Department of Transportation Standard Specifications (State of California, 2024).

3. Due to the potential for degradation of the aggregate base section caused by cyclical expansion and contraction of the native soils due to changes in moisture content, we strongly recommend that a Type 2 laterally-reinforcing geotextile grid, such as Tensar

BX1200, Syntec SBX12, ADS BX124GG, Mirafi BXG120 or equivalent, be installed between the prepared subgrade and the Class II Aggregate Base section.

4. The alignment of the proposed access road crosses a swale which collects surface drainage from the surrounding fields. It is our understanding that this swale can experience significant flowrates during storm events. To prevent the structural section of the proposed access road from being compromised by erosion during storm events, we recommend that a low-water crossing be installed at this location. The design team should design an appropriate low-water crossing based on the grading plan, surrounding topography and anticipated flowrates.

7.0 ADDITIONAL GEOTECHNICAL SERVICES

The recommendations contained in this report are based on a limited number of borings and on the continuity of the sub-surface conditions encountered. GeoSolutions, Inc. assumes that it will be retained to provide additional services during future phases of the proposed project. These services would be provided by GeoSolutions, Inc. as required by the County of San Luis Obispo, the 2022 CBC, and/or industry standard practices. These services would be in addition to those included in this report and would include, but are not limited to, the following services:

1. Consultation during plan development.

2. Plan review of grading and foundation documents prior to construction and a report certifying that the reviewed plans are in conformance with our geotechnical recommendations.

3. Construction inspections and testing, as required, during all grading and excavating operations beginning with the stripping of vegetation at the Site, at which time a site meeting or pre-job meeting would be appropriate.

4. Special inspection services during construction of reinforced concrete, structural masonry, high strength bolting, epoxy embedment of threaded rods and reinforcing steel, and welding of structural steel.

5. Preparation of construction reports certifying that earthwork has been performed in conformance with our geotechnical recommendations.

6. Preparation of special inspection reports as required during construction.

7. In addition to the construction inspections listed above, section 1705.6 of the 2022 CBC (CBSC, 2022) requires the following inspections by the Soils Engineer for controlled fill thicknesses greater than 12 inches as shown in Table 3: Required Special Inspections and Tests of Soils:

Table 3: Required Special Inspections and Tests of Soils

Verification and Inspection Task	Continuous During Task Listed	Periodically During Task Listed
1. Verify materials below footings are adequate to achieve the design bearing capacity.	-	X
2. Verify excavations are extended to proper depth and have reached proper material.	-	X
3. Perform classification and testing of controlled fill materials.	-	X
4. Verify use of proper materials, densities and lift thicknesses during placement and compaction of controlled fill.	X	-
5. Prior to placement of controlled fill, observe sub-grade and verify that site has been prepared properly.	-	X

8.0 LIMITATIONS AND UNIFORMITY OF CONDITIONS

1. The recommendations of this report are based upon the assumption that the soil conditions do not deviate from those disclosed during our study. Should any variations or undesirable conditions be encountered during the development of the Site, GeoSolutions, Inc. should be notified immediately and GeoSolutions, Inc. will provide supplemental recommendations as dictated by the field conditions.

2. This report is issued with the understanding that it is the responsibility of the owner or his/her representative to ensure that the information and recommendations contained herein are brought to the attention of the architect and engineer for the project, and incorporated into the project plans and specifications. The owner or his/her representative is responsible to ensure that the necessary steps are taken to see that the contractor and subcontractors carry out such recommendations in the field.

3. As of the present date, the findings of this report are valid for the property studied. With the passage of time, changes in the conditions of a property can occur whether they are due to natural processes or to the works of man on this or adjacent properties. Therefore, this report should not be relied upon after a period of 3 years without our review nor should it be used or is it applicable for any properties other than those studied. However many events such as floods, earthquakes, grading of the adjacent properties and building and municipal code changes could render sections of this report invalid in less than 3 years.

REFERENCES

REFERENCES

American Society of Civil Engineers (ASCE). *Minimum Design Loads and Associated Criteria for Buildings and Other Structures (7-16).* 2017.

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Unites States Geologic Survey (USGS). *MapView – Geologic Maps of the Nation*. Internet Application. USGS, accessed July 21, 2025. <http://ngmdb.usgs.gov/maps/MapView/>.

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APPENDIX A

Field Exploration

Soil Classification Chart

Boring Logs

FIELD EXPLORATION

The field exploration was conducted on May 23, 2025, using a Mobile B-24 drill rig. The surface and sub-surface conditions were studied by advancing four exploratory borings at the approximate locations indicated in Figure 3: Field Exploration. The exploration was conducted in accordance with presently accepted geotechnical engineering procedures consistent with the scope of the services authorized to GeoSolutions, Inc. The drilling operations were performed under the direction of the project engineer.

The Mobile B-24 drill rig used a six-inch diameter solid-stem continuous flight auger to advance the two exploratory borings to maximum depths of 20 feet below ground surface. A representative of GeoSolutions, Inc. maintained a log of the soil conditions and obtained soil samples suitable for laboratory testing. The soils were classified in accordance with the Unified Soil Classification System. See the Soil Classification Chart in this appendix.

Standard Penetration Tests with a two-inch outside diameter standard split tube sampler (SPT) without liners (ASTM D1586-99) were performed to obtain field indication of the in-situ density of the soil and to allow visual observation of at least a portion of the soil column. Soil samples obtained with the split spoon sampler are retained for further observation and testing. The split spoon samples are driven by a 140-pound hammer free falling 30 inches. The sampler is initially seated six inches to penetrate any loose cuttings and is then driven an additional 12 inches with the results recorded in the boring logs as N-values, which area the number of blows per foot required to advance the sample the final 12 inches.

Disturbed bulk samples are obtained from cuttings developed during boring operations. The bulk samples are selected for classification and testing purposes and may represent a mixture of soils within the noted depths. Recovered samples are placed in transport containers and returned to the laboratory for further classification and testing.

Logs of the borings showing the approximate depths and descriptions of the encountered soils, applicable geologic structures, recorded N-values, and the results of laboratory tests are presented in this appendix. The logs represent the interpretation of field logs and field tests as well as the interpolation of soil conditions between samples. The results of laboratory observations and tests are also included in the boring logs. The stratification lines recorded in the boring logs represent the approximate boundaries between the surface soil types. However, the actual transition between soil types may be gradual or varied.

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS		LABORATORY CLASSIFICATION CRITERIA		GROUP SYMBOLS	PRIMARY DIVISIONS
COARSE GRAINED SOILS More than 50% retained on No. 200 sieve	GRAVELS More than 50% of coarse fraction retainined on No. 4 (4.75mm) sieve	Clean gravels (less than 5% fines*)	C_u greater than 4 and C_z between 1 and 3	GW	Well-graded gravels and gravel-sand mixtures, little or no fines
			Not meeting both criteria for GW	GP	Poorly graded gravels and gravel-sand mixtures, little or no fines
		Gravel with fines (more than 12% fines*)	Atterberg limits plot below "A" line or plasticity index less than 4	GM	Silty gravels, gravel-sand-silt mixtures
			Atterberg limits plot below "A" line and plasticity index greater than 7	GC	Clayey gravels, gravel-sand-clay mixtures
	SANDS More than 50% of coarse fraction passes No. 4 (4.75mm) sieve	Clean sand (less than 5% fines*)	C_u greater than 6 and C_z between 1 and 3	SW	Well graded sands, gravely sands, little or no fines
			Not meeting both criteria for SW	SP	Poorly graded sands and gravelly and sands, little or no fines
		Sand with fines (more than 12% fines*)	Atterberg limits plot below "A" line or plasticity index less than 4	SM	Silty sands, sand-silt mixtures
			Atterberg limits plot above "A" line and plasticity index greater than 7	SC	Clayey sands, sand-clay mixtures
FINE GRAINED SOILS 50% or more passes No. 200 sieve	SILTS AND CLAYS (liquid limit less than 50)	Inorganic soil	PI < 4 or plots below "A"-line	ML	Inorganic silts, very fine sands, rock flour, silty or clayey fine sands
		Inorganic soil	PI > 7 and plots on or above "A" line**	CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
		Organic Soil	LL (oven dried)/LL (not dried) < 0.75	OL	Organic silts and organic silty clays of low plasticity
	SILTS AND CLAYS (liquid limit 50 or more)	Inorganic soil	Plots below "A" line	MH	Inorganic silts, micaceous or diatomaceous fine sands or silts, elastic silts
		Inorganic soil	Plots on or above "A" line	CH	Inorganic clays of high plasticity, fat clays
		Organic Soil	LL (oven dried)/LL (not dried) < 0.75	OH	Organic silts and organic clays of high plasticity
Peat	Highly Organic	Primarily organic matter, dark in color, and organic odor		PT	Peat, muck and other highly organic soils

*Fines are those soil particles that pass the No. 200 sieve. For gravels and sands with between 5 and 12% fines, use of dual symbols is required (I.e. GW-GM, GW-GC, GP-GM, or GP-GC).

**If the plasticity index is between 4 and 7 and it plots above the "A" line, then dual symbols (I.e. CL-ML) are required.
the "A" line, then dual symbols (I.e. CL-ML) are required.

CONSISTENCY

CLAYS AND PLASTIC SILTS	STRENGTH TON/SQ. FT ++	BLOWS/ FOOT +
VERY SOFT	0 - 1/4	0 - 2
SOFT	1/4 - 1/2	2 - 4
FIRM	1/2 - 1	4 - 8
STIFF	1 - 2	8 - 16
VERY STIFF	2 - 4	16 - 32
HARD	Over 4	Over 32

RELATIVE DENSITY

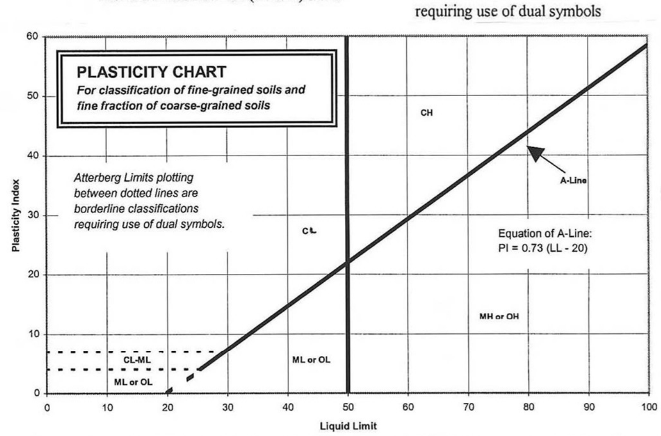
SANDS, GRAVELS AND NON-PLASTIC SILTS	BLOWS/ FOOT +
VERY LOOSE	0 - 4
LOOSE	4 - 10
MEDIUM DENSE	10 - 30
DENSE	30 - 50
VERY DENSE	Over 50

\+ Number of blows of a 140-pound hammer falling 30-inches to drive a 2-inch O.D. (1-3/8-inch I.D.) split spoon (ASTM D1586).

++ Unconfined compressive strength in tons/sq.ft. as determined by laboratory testing or approximated by the standard penetration test (ASTM D1586), pocket penetrometer, torvane, or visual observation.

CLASSIFICATIONS BASED ON PERCENTAGE OF FINES

Less than 5%, Pass No. 200 (75mm)sieve)	GW, GP, SW, SP
More than 12% Pass N. 200 (75 mm) sieve	GM, GC, SM, SC
5%-12% Pass No. 200 (75 mm) sieve	Borderline Classification requiring use of dual symbols



Drilling Notes:

1. Sampling and blow counts
   a. California Modified – number of blows per foot of a 140 pound hammer falling 30 inches
   b. Standard Penetration Test – number of blows per 12 inches of a 140 pound hammer falling 30 inches

Types of Samples:
X – Sample
SPT - Standard Penetration
CA - California Modified
N - Nuclear Gauge
PO – Pocket Penetrometer (tons/sq.ft.)

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BORING LOG

BORING NO. B-1

JOB NO. GS00496-1

PROJECT INFORMATION		DRILLING INFORMATION	
PROJECT:	**Cambria CSD SR4 Well**	DRILL RIG:	**Mobile B-24**
DRILLING LOCATION:	**See Figure 3, Field Exploration**	HOLE DIAMETER:	**6 inches**
DATE DRILLED:	**May 23, 2025**	SAMPLING METHOD:	**SPT, Bulk**
LOGGED BY:	**BJ**	APPROX. ELEVATION:	**Not Recorded**

Depth of Groundwater: **Not Encountered** Boring Terminated: **10 feet**

DEPTH	LITHOLOGY	USCS	SOIL DESCRIPTION	SAMPLE ID	SAMPLERS TYPE	N (BLOWS / FT)	(N1) 60	MOISTURE CONTENT (%)	FINES CONTENT (%)	PLASTICITY INDEX (PI)	EXPANSION INDEX (EI)	OPTIMUM WATER CONTENT (%)	MAXIMUM DRY DENSITY (pcf)	COHESION, C (psf)	FRICTION ANGLE, (degrees)
0			Gravel/Base												
1		CH	Sandy Fat CLAY: very dark gray, saturated, mottled with dark yellowish brown, stiff, (pvc in SPT sample)	A	Bulk				56.9	40	109	16.0	111.3		
2				SPT	SPT	8	11								
4		CL	Sandy Lean CLAY: very dark gray, saturated, stiff	SPT	SPT	9	12								
6				B	Bulk				63.3	26					
9			very stiff	SPT	SPT	17	23								
10															

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BORING LOG

BORING NO. **B-2**
JOB NO. **GS00496-1**

PROJECT INFORMATION		DRILLING INFORMATION	
PROJECT:	**Cambria CSD SR4 Well**	DRILL RIG:	**Mobile B-24**
DRILLING LOCATION:	**See Figure 3, Field Exploration**	HOLE DIAMETER:	**6 inches**
DATE DRILLED:	**May 23, 2025**	SAMPLING METHOD:	**SPT**
LOGGED BY:	**BJ**	APPROX. ELEVATION:	**Not Recorded**

Depth of Groundwater: **Not Encountered** Boring Terminated: **10 feet**

DEPTH	LITHOLOGY	USCS	SOIL DESCRIPTION	SAMPLE ID	SAMPLERS TYPE	N (BLOWS / FT)	(N1) 60	MOISTURE CONTENT (%)	FINES CONTENT (%)	PLASTICITY INDEX (PI)	EXPANSION INDEX (EI)	OPTIMUM WATER CONTENT (%)	MAXIMUM DRY DENSITY (pcf)	COHESION, C (psf)	FRICTION ANGLE, (degrees)
0			Grass												
1		CH	Sandy Fat CLAY: very dark gray, slightly moist												
2			stiff	SPT		12	16								
3															
4		CL	Sandy Lean CLAY: very dark gray mottled with dark yellowish brown, very moist, stiff	SPT		11	15								
5															
6															
7															
8															
9			mottled light gray to dark yellowish brown, shell fragments, very moist	SPT		13	17								
10															
11															
12															
13															
14															
15															
16															
17															
18															
19															
20															

220 High Street, San Luis Obispo, CA 93401
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201 S. Milpas St, Ste 103, Santa Barbara, CA 93103
Phone: 805-966-2200

BORING LOG

BORING NO. **B-3**
JOB NO. **GS00496-1**

PROJECT INFORMATION		DRILLING INFORMATION	
PROJECT:	**Cambria CSD SR4 Well**	DRILL RIG:	**Mobile B-24**
DRILLING LOCATION:	**See Figure 3, Field Exploration**	HOLE DIAMETER:	**6 inches**
DATE DRILLED:	**May 23, 2025**	SAMPLING METHOD:	**SPT**
LOGGED BY:	**BJ**	APPROX. ELEVATION:	**Not Recorded**

Depth of Groundwater: **Not Encountered** Boring Terminated: **10 feet**

DEPTH	LITHOLOGY	USCS	SOIL DESCRIPTION	SAMPLE ID	SAMPLERS TYPE	N (BLOWS / FT)	(N1) 60	MOISTURE CONTENT (%)	FINES CONTENT (%)	PLASTICITY INDEX (PI)	EXPANSION INDEX (EI)	OPTIMUM WATER CONTENT (%)	MAXIMUM DRY DENSITY (pcf)	COHESION, C (psf)	FRICTION ANGLE, (degrees)
0			Grass												
1		CH	Sandy Fat CLAY: very dark gray, slightly moist												
2			dark brown, slightly moist, stiff	SPT		11	15								
3															
4		SM	Silty SAND: dark yellowish brown, slightly moist, medium dense	SPT		11	15								
5															
6		CH	Sandy Fat CLAY: very dark gray, slightly moist												
7															
8															
9			very stiff	SPT		12	16								
10															
11															
12															
13															
14															
15															
16															
17															
18															
19															
20															

GEO SOLUTIONS
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Phone: 805-966-2200

BORING LOG

BORING NO. B-4
JOB NO. GS00496-1

PROJECT INFORMATION		DRILLING INFORMATION	
PROJECT:	**Cambria CSD SR4 Well**	DRILL RIG:	**Mobile B-24**
DRILLING LOCATION:	**See Figure 3, Field Exploration**	HOLE DIAMETER:	**6 inches**
DATE DRILLED:	**May 23, 2025**	SAMPLING METHOD:	**SPT**
LOGGED BY:	**BJ**	APPROX. ELEVATION:	**Not Recorded**

Depth of Groundwater: **Not Encountered** Boring Terminated: **10 feet**

DEPTH	LITHOLOGY	USCS	SOIL DESCRIPTION	SAMPLE ID	SAMPLERS TYPE	N (BLOWS / FT)	(N1) 60	MOISTURE CONTENT (%)	FINES CONTENT (%)	PLASTICITY INDEX (PI)	EXPANSION INDEX (EI)	OPTIMUM WATER CONTENT (%)	MAXIMUM DRY DENSITY (pcf)	COHESION, C (psf)	FRICTION ANGLE, (degrees)
0			Grass												
1		CH	Sandy Fat CLAY: very dark gray, very moist												
2			very stiff	SPT		17	23								
4				SPT		15	20								
5		CL	Sandy Lean CLAY: very dark gray, very moist												
9			mottled light gray to dark yellowish brown, very stiff	SPT		7	9								
10															

Depth scale: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20

APPENDIX B

Laboratory Testing

Soil Test Reports

LABORATORY TESTING

This appendix includes a discussion of the test procedures and the laboratory test results performed as part of this exploration. The purpose of the laboratory testing is to assess the engineering properties of the soil materials at the Site. The laboratory tests are performed using the currently accepted test methods, when applicable, of the American Society for Testing and Materials (ASTM).

Undisturbed and disturbed bulk samples used in the laboratory tests are obtained from various locations during the course of the field exploration, as discussed in **Appendix A** of this report. Each sample is identified by sample letter and depth. The Unified Soils Classification System is used to classify soils according to their engineering properties. The various laboratory tests performed are described below:

Expansion Index of Soils (ASTM D4829) is conducted in accordance with the ASTM test method and the California Building Code Standard, and are performed on representative bulk and undisturbed soil samples. The purpose of this test is to evaluate expansion potential of the site soils due to fluctuations in moisture content. The sample specimens are placed in a consolidometer, surcharged under a 144-psf vertical confining pressure, and then inundated with water. The amount of expansion is recorded over a 24-hour period with a dial indicator. The expansion index is calculated by determining the difference between final and initial height of the specimen divided by the initial height.

Laboratory Compaction Characteristics of Soil Using Modified Effort (ASTM D1557-12-12) is performed to determine the relationship between the moisture content and density of soils and soil-aggregate mixtures when compacted in a standard size mold with a 10-lbf hammer from a height of 18 inches. The test is performed on a representative bulk sample of bearing soil near the estimated footing depth. The procedure is repeated on the same soil sample at various moisture contents sufficient to establish a relationship between the maximum dry unit weight and the optimum water content for the soil. The data, when plotted, represents a curvilinear relationship known as the moisture density relations curve. The values of optimum water content and modified maximum dry unit weight can be determined from the plotted curve.

Liquid Limit, Plastic Limit, and Plasticity Index of Soils (ASTM D4318) are the water contents at certain limiting or critical stages in cohesive soil behavior. The liquid limit (LL or W_L) is the lower limit of viscous flow, the plastic limit (PL or W_P) is the lower limit of the plastic stage of clay and plastic index (PI or I_P) is a range of water content where the soil is plastic. The Atterberg Limits are performed on samples that have been screened to remove any material retained on a No. 40 sieve. The liquid limit is determined by performing trials in which a portion of the sample is spread in a brass cup, divided in two by a grooving tool, and then allowed to flow together from the shocks caused by repeatedly dropping the cup in a standard mechanical device. To determine the Plastic Limit a small portion of plastic soil is alternately pressed together and rolled into a 1/8-inch diameter thread. This process is continued until the water content of the sample is reduced to a point at which the thread crumbles and can no longer be pressed together and re-rolled. The water content of the soil at this point is reported as the plastic limit. The plasticity index is calculated as the difference between the liquid limit and the plastic limit.

Particle Size Analysis of Soils (ASTM D422) is used to determine the particle-size distribution of fine and coarse aggregates. In the test method the sample is separated through a series of sieves of progressively smaller openings for determination of particle size distribution. The total percentage passing each sieve is reported and used to determine the distribution of fine and coarse aggregates in the sample.

R-Value (ASTM D2844) determination was provided by Pavement Engineering, Inc.

GeoSolutions, Inc.	LABORATORY SUMMARY REPORT SHEET	(805) 543 - 8539

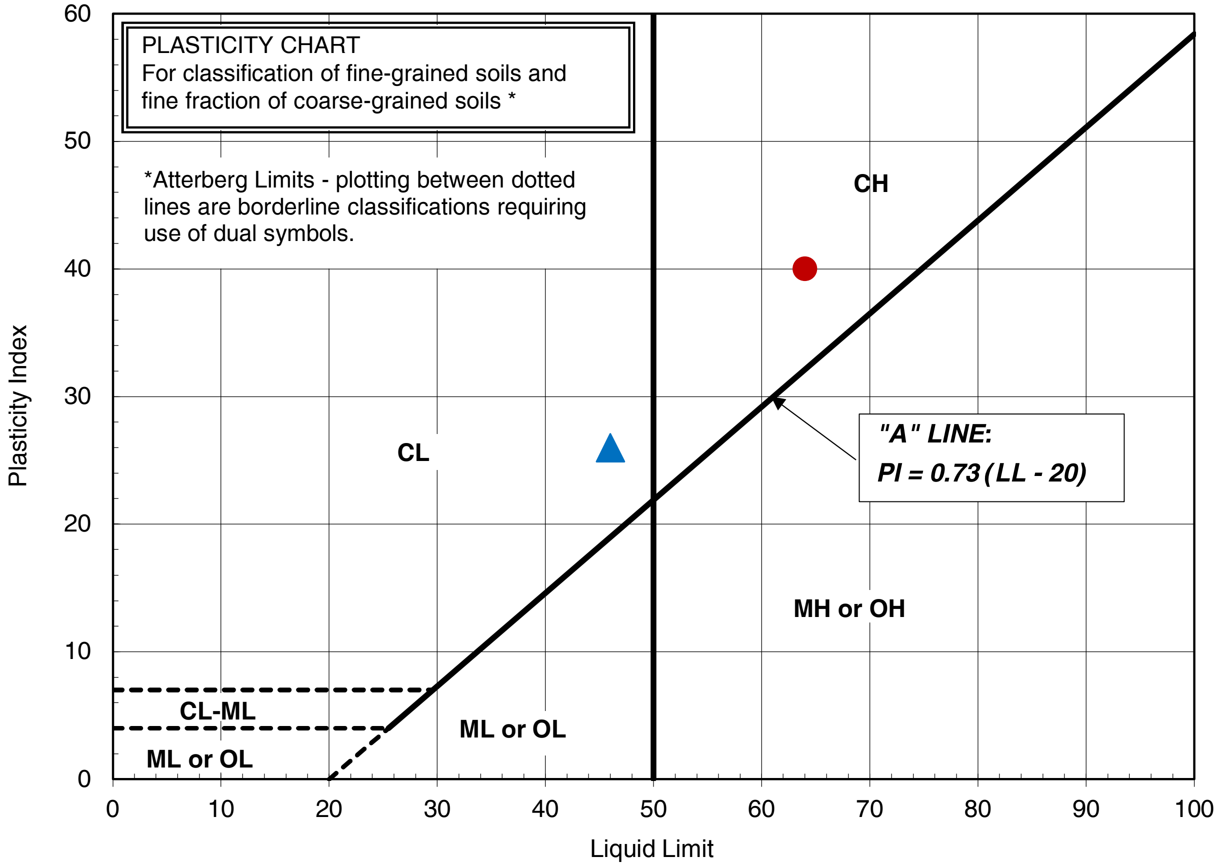
Project: Cambria CSD SR4 Well   Lab #: 979
Client: Cambria CSD   Date: 6/18/25
Job #: GS00496-1   Checked By: AE

Sample ID			Material Description	USCS Specifications	Dry Density (pcf)	Moisture Content (%)	% Fines	Atterberg Limits		Compaction Curve		Direct Shear (Peak)		Direct Shear (Ultimate)		Expansion Index	R-Value
Boring Hole	Depth (ft)	Sample						LL	PI	γ_{d_max} (pcf)	ω_{c_opt} (%)	C (psf)	ø (deg)	C (psf)	ø (deg)		
B-1	0-4'	A	Very Dark Gray Sandy Fat CLAY	CH			56.9	64	40	111.3	16.0					109	11
B-1	5-9'	B	Very Dark Gray Sandy Lean CLAY	CL			63.3	46	26								

GeoSolutions, Inc.	PLASTICITY INDEX TEST SUMMARY REPORT (ASTM D4318)	(805) 543-8539

Project: Cambria CSD SR4 Well
Client: Cambria CSD
Project #: GS00496-1

Date: 6/18/25
Checked by: AE



LEGEND symbol	location	depth	CLASSIFICATION	Liquid Limit (LL)	Plastic Limit (PL)	Plasticity Index (PI)
● (red circle)	B-1	0-4'	Very Dark Gray Sandy Fat CLAY	64	24	40
▲ (blue triangle)	B-1	5-9'	Very Dark Gray Sandy Lean CLAY	46	20	26

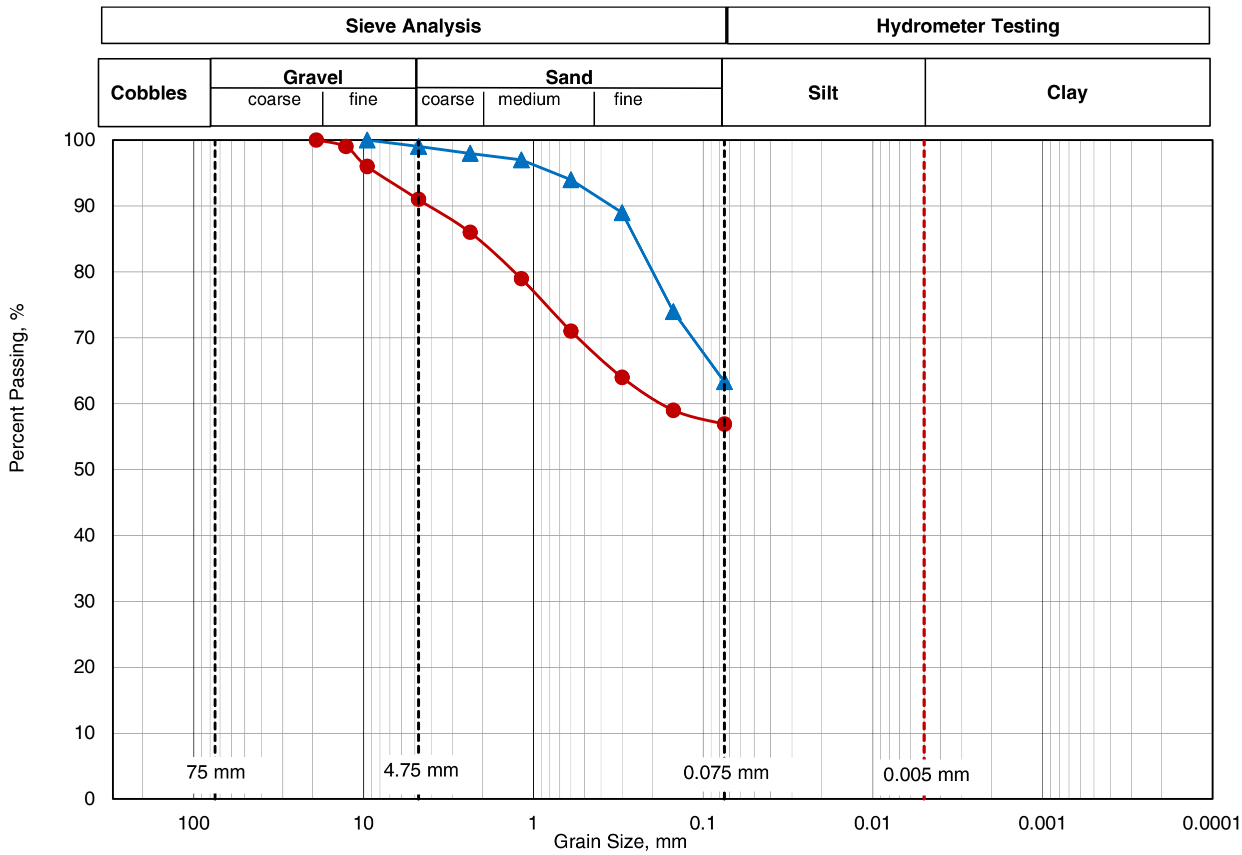
Remarks:

Testing was performed in accordance with ASTM D4318

NP - material tested is nonplastic (liquid or plastic limit tests could not be performed)

Report By: Aaron Eichman

Project:	Cambria CSD SR4 Well		
Client:	Cambria CSD	Date:	6/18/2025
Project #:	GS00496-1	Checked By:	AE



LEGEND			SAMPLE DESCRIPTION	PLASTICITY (FINER FRACTION)			
symbol	location	depth		Liquid Limit (LL)	Plastic Limit (PL)	Plasticity Index (PI)	Expansion Index (EI)
●	B-1	0-4'	Very Dark Gray Sandy Fat CLAY	64	24	40	109
▲	B-1	5-9'	Very Dark Gray Sandy Lean CLAY	46	20	26	-

LEGEND			PARTICLE SIZE ANALYSIS SUMMARY										
symbol	location	depth	D_{100}	D_{60}	D_{30}	D_{10}	C_u	C_c	% Gravel	% Sand	% Passing No. 200	% Silt	% Clay
●	B-1	0-4'	19.0	0.180	NA	NA	NA	NA	9.0	34.1	56.9	NA	NA
▲	B-1	5-9'	9.5	0.071	NA	NA	NA	NA	1.0	35.7	63.3	NA	NA

Remarks: Testing was performed in accordance with ASTM D422 and D4318 (where applicable)

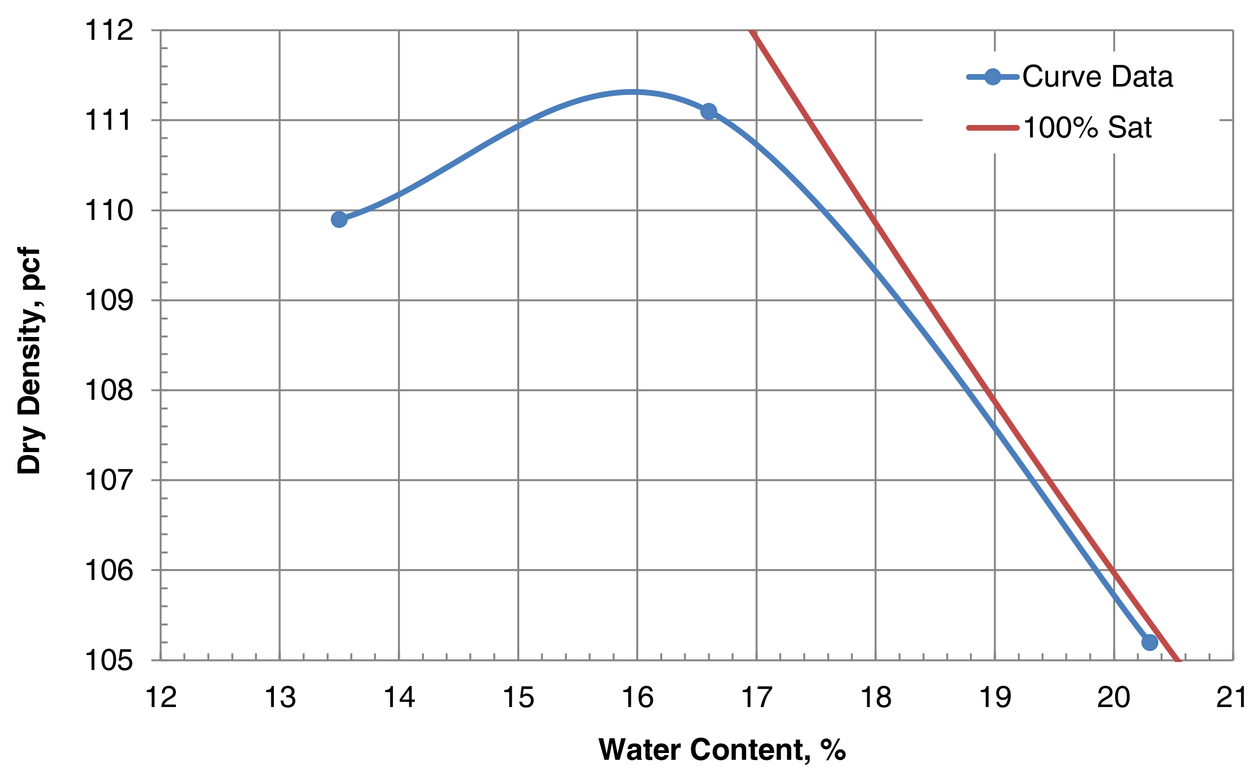
NP - non-plastic
NA - not available (could not be calculated from data)

D_{100} - grain size diameter corresponding to 100% passing (mm)
D_{60} - grain size diameter corresponding to 60% passing (mm)
D_{30} - grain size diameter corresponding to 30% passing (mm)
D_{10} - grain size diameter corresponding to 30% passing (mm)

C_c - coefficient of curvature: $C_c = (D_{30})^2 / (D_{60}*D_{10})$
Cu - coefficient of uniformity: $C_u = D_{60} / D_{10}$

GeoSolutions, Inc.	LAB COMPACTION REPORT ASTM D1557	(805) 543-8539

Project:	Cambria CSD SR4 Well			Date Tested:	June 13, 2025
Client:	Cambria CSD			Project #:	GS00496-1
Sample:	A	Depth:	0.0 to 4.0 Feet	Lab #:	979
Source:	B-1			Sample Date:	May 23, 2025
Material:	Very Dark Gray Sandy Fat CLAY			Sampled By:	DB



ASTM Test Designation: [ ] D 698 [x] D 1557
Method (sieve size): [ ] A (#4) [x] B (3/8") [ ] C (3/4")
% Passing, Pf: ________ *% Retained, Pc:* ________ [x] Estimated [ ] Measured
Type of Rammer: [x] Mechanical [ ] Manual
Preparation Method [x] Moist [ ] Dry
100% Saturation Curve-Estimated Gs: **2.57**

Laboratory Test Results

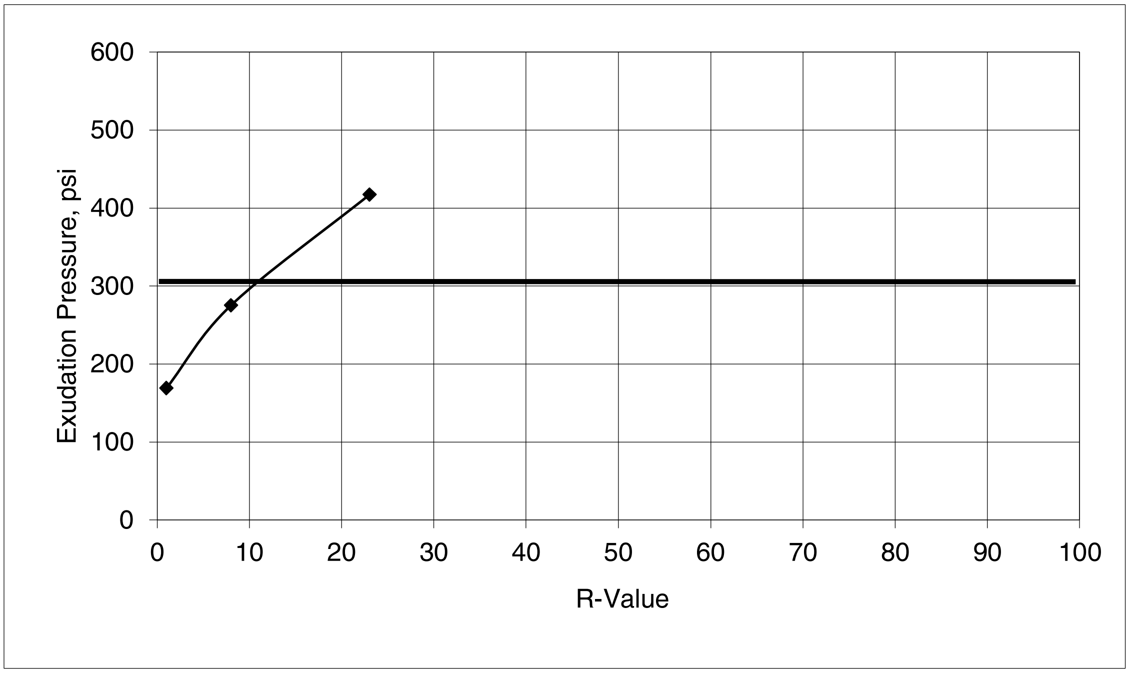
Trial #	1	2	3	4
Water Content,%	13.5	16.6	20.3	
Dry Density, pcf	109.9	111.1	105.2	

MAXIMUM DRY DENSITY, pcf:	111.3	OPTIMUM MOISTURE, %:	16.0

Report By: Aaron Eichman

GeoSolutions, Inc.	R-VALUE TEST REPORT ASTM D2844	(805) 543-8539

Project:	Cambria CSD SR4 Well			Date Tested:	June 30, 2025
Client:	Cambria CSD			Project #:	GS00496-1
Sample #:	A	Depth:	0.0 to 4.0 Feet	Lab #:	979
Location:	B-1			Sample Date:	May 23, 2025
Material:	Very Dark Gray Sandy Fat CLAY			Sampled By:	DB



Specimen No.	**A**	**B**	**C**
Exudation Pressure, psi	169	275	417
Expansion Pressure, psf	9	43	87
R-Value	1	8	23
Moisture Content at test, %	19.3	18.7	17.6
Dry Density at Test, pcf	108.5	109.7	110.6

R-Value @ 300 psi Exudation Pressure:	**11**

*R-Values are tested by an outside laboratory, Pavement Engineering.

Report By: Aaron Eichman

APPENDIX C

Seismic Hazard Analysis

Design Map Summary (SEAOC, 2019)

SEISMIC HAZARD ANALYSIS

According to section 1613 of the 2022 CBC (CBSC, 2022), all structures and portions of structures should be designed to resist the effects of seismic loadings caused by earthquake ground motions in accordance with the *ASCE 7: Minimum Design Loads for Buildings and Other Structures*, hereafter referred to as ASCE7-16 (ASCE, 2016). Estimating the design ground motions at the Site depends on many factors including the distance from the Site to known active faults; the expected magnitude and rate of recurrence of seismic events produced on such faults; the source-to-site ground motion attenuation characteristics; and the Site soil profile characteristics. As per section 1613.2.2 of the 2022 CBC, the Site soil profile classification is determined by the average soil properties in the upper 100 feet of the Site profile and can be determined based on the criteria provided in Table 20.3-1 of ASCE7-16.

ASCE7-16 provides recommendations for estimating site-specific ground motion parameters for seismic design considering a Risk-targeted Maximum Considered Earthquake (MCE_R) in order to determine *design spectral response accelerations* and a Maximum Considered Earthquake Geometric Mean (MCE_G) in order to determine probabilistic geometric mean *peak ground accelerations*.

Spectral accelerations from the MCE_R are based on a 5% damped acceleration response spectrum and a 1% probability of exceedance in 50 years. *Maximum* short period (S_s) and 1-second period (S_1) spectral accelerations are interpolated from the MCE_R-based ground motion parameter maps for bedrock, provided in ASCE7-16. These spectral accelerations are then multiplied by site-specific coefficients (F_a, F_v), based on the Site soil profile classification and the maximum spectral accelerations determined for bedrock, to yield the *maximum* short period (S_{MS}) and 1-second period (S_{M1}) spectral response accelerations at the Site. According to section 11 of ASCE7-16 and section 1613 of the 2022 CBC, buildings and structures should be specifically proportioned to resist *design* earthquake ground motions. Section 1613.2.4 of the 2022 CBC indicates the site-specific *design* spectral response accelerations for short (S_{DS}) and 1-second (S_{D1}) periods can be taken as two-thirds of *maximum* ($S_{DS} = 2/3*S_{MS}$ and $S_{D1} = 2/3*S_{M1}$).

Per ASCE7-16, Section 21.5, the probabilistic maximum mean peak ground acceleration (PGA) corresponding to the MCE_G can be computed assuming a 2% probability of exceedance in 50 years (2475-year return period) and is initially determined from mapped ground accelerations for bedrock conditions. The site-specific peak ground acceleration (PGA_M) is then determined by multiplying the PGA by the site-specific coefficient F_h (where F_h is a function of Site Class and PGA).

Spectral response accelerations and peak ground accelerations, provided in this report were obtained using the computer-based Seismic Design Maps tool available from the Structural Engineers Association of California (SEAOC, 2019). This program utilizes the methods developed in ASCE 7-16 in conjunction with user-inputted Site location to calculate seismic design parameters and response spectra (both for period and displacement) for soil profile Site Classes A through E.

Announcement
ASCE 7-22 is now available.

CCSD SR4 Well Access Road

Latitude, Longitude: 35.5687, -121.0719

Date	7/21/2025, 3:51:21 PM
Design Code Reference Document	ASCE7-16
Risk Category	I
Site Class	D

Type	Value	Description
S_S	1.195	MCE_R ground motion. (for 0.2 second period)
S_1	0.43	MCE_R ground motion. (for 1.0s period)
S_{MS}	1.221	Site-modified spectral acceleration value
S_{M1}	null -See Section 11.4.8	Site-modified spectral acceleration value
S_{DS}	0.814	Numeric seismic design value at 0.2 second SA
S_{D1}	null -See Section 11.4.8	Numeric seismic design value at 1.0 second SA

Type	Value	Description
SDC	null -See Section 11.4.8	Seismic design category
F_a	1.022	Site amplification factor at 0.2 second
F_v	null -See Section 11.4.8	Site amplification factor at 1.0 second
PGA	0.539	MCE_G peak ground acceleration
F_{PGA}	1.1	Site amplification factor at PGA
PGA_M	0.593	Site modified peak ground acceleration
T_L	8	Long-period transition period in seconds
SsRT	1.195	Probabilistic risk-targeted ground motion. (0.2 second)
SsUH	1.339	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration
SsD	1.972	Factored deterministic acceleration value. (0.2 second)
S1RT	0.43	Probabilistic risk-targeted ground motion. (1.0 second)
S1UH	0.474	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration.
S1D	0.746	Factored deterministic acceleration value. (1.0 second)
PGAd	0.825	Factored deterministic acceleration value. (Peak Ground Acceleration)
PGA_{UH}	0.539	Uniform-hazard (2% probability of exceedance in 50 years) Peak Ground Acceleration
C_{RS}	0.892	Mapped value of the risk coefficient at short periods
C_{R1}	0.908	Mapped value of the risk coefficient at a period of 1 s
C_V	1.339	Vertical coefficient

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APPENDIX D

Preliminary Grading Specifications

PRELIMINARY GRADING SPECIFICATIONS

A. General

1. These preliminary specifications have been prepared for the subject site; GeoSolutions, Inc. should be consulted prior to the commencement of site work associated with site development to ensure compliance with these specifications.

2. GeoSolutions, Inc. should be notified at least 72 hours prior to site clearing or grading operations on the property in order to observe the stripping of surface materials and to coordinate the work with the grading contractor in the field.

3. These grading specifications may be modified and/or superseded by recommendations contained in the text of this report and/or subsequent reports.

4. If disputes arise out of the interpretation of these grading specifications, the Soils Engineer shall provide the governing interpretation.

B. Obligation of Parties

1. The Soils Engineer should provide observation and testing services and should make evaluations to advise the client on geotechnical matters. The Soils Engineer should report the findings and recommendations to the client or the authorized representative.

2. The client should be chiefly responsible for all aspects of the project. The client or authorized representative has the responsibility of reviewing the findings and recommendations of the Soils Engineer. During grading the client or the authorized representative should remain on-site or should remain reasonably accessible to all concerned parties in order to make decisions necessary to maintain the flow of the project.

3. The contractor is responsible for the safety of the project and satisfactory completion of all grading and other operations on construction projects, including, but not limited to, earthwork in accordance with project plans, specifications, and controlling agency requirements.

C. Site Preparation

1. The client, prior to any site preparation or grading, should arrange and attend a meeting which includes the grading contractor, the design Structural Engineer, the Soils Engineer, representatives of the local building department, as well as any other concerned parties. All parties should be given at least 72 hours' notice.

2. All surface and sub-surface deleterious materials should be removed from the proposed building and pavement areas and disposed of off-site or as approved by the Soils Engineer. This includes, but is not limited to, any debris, organic materials, construction spoils, buried utility line, septic systems, building materials, and any other surface and subsurface structures within the proposed building areas. Trees designated for removal on the construction plans should be removed and their primary root systems grubbed under the observations of a representative of GeoSolutions, Inc. Voids left from site clearing should be cleaned and backfilled as recommended for structural fill.

3. Once the Site has been cleared, the exposed ground surface should be stripped to remove surface vegetation and organic soil. A representative of GeoSolutions, Inc. should determine the required

depth of stripping at the time of work being completed. Strippings may either be disposed of off-site or stockpiled for future use in landscape areas, if approved by the landscape architect.

D. Site Protection

1. Protection of the Site during the period of grading and construction should be the responsibility of the contractor.

2. The contractor should be responsible for the stability of all temporary excavations.

3. During periods of rainfall, plastic sheeting should be kept reasonably accessible to prevent unprotected slopes from becoming saturated. Where necessary during periods of rainfall, the contractor should install check-dams, de-silting basins, sand bags, or other devices or methods necessary to control erosion and provide safe conditions.

E. Excavations

1. Materials that are unsuitable should be excavated under the observation and recommendations of the Soils Engineer. Unsuitable materials include, but may not be limited to: 1) dry, loose, soft, wet, organic, or compressible natural soils; 2) fractured, weathered, or soft bedrock; 3) non-engineered fill; 4) other deleterious materials; and 5) materials identified by the Soils Engineer or Engineering Geologist.

2. Unless otherwise recommended by the Soils Engineer and approved by the local building official, permanent cut slopes should not be steeper than 2:1 (horizontal to vertical). Final slope configurations should conform to section 1804 of the 2022 California Building Code unless specifically modified by the Soil Engineer/Engineering Geologist.

3. The Soil Engineer/Engineer Geologist should review cut slopes during excavations. The contractor should notify the Soils Engineer/Engineer Geologist prior to beginning slope excavations.

F. Structural Fill

1. Structural fill should not contain rocks larger than 4 inches in greatest dimension, and should have no more than 15 percent larger than 3 inches in greatest dimension.

2. Imported fill should be free of organic and other deleterious material and should have very low expansion potential, with a plasticity index of 12 or less. Before delivery to the Site, a sample of the proposed import should be tested in our laboratory to determine its suitability for use as structural fill.

G. Compacted Fill

1. Structural fill using approved import or native should be placed in horizontal layers, each approximately 8 inches in thickness before compaction. On-site inorganic soil or approved imported

fill should be conditioned with water to produce a soil water content near optimum moisture and compacted to a minimum relative compaction of 90 percent based on ASTM D1557-12-12.

2. Fill slopes should not be constructed at gradients greater than 2-to-1 (horizontal to vertical). The contractor should notify the Soils Engineer/Engineer Geologist prior to beginning slope excavations.

3. If fill areas are constructed on slopes greater than 10-to-1 (horizontal to vertical), we recommend that benches be cut every 4 feet as fill is placed. Each bench shall be a minimum of 10 feet wide with a minimum of 2 percent gradient into the slope.

4. If fill areas are constructed on slopes greater than 5-to-1, we recommend that the toe of all areas to receive fill be keyed a minimum of 24 inches into underlying dense material. Key depths are to be observed and approved by a representative of GeoSolutions, Inc. Sub-drains shall be placed in the keyway and benches as required.

H. Drainage

1. During grading, a representative of GeoSolutions, Inc. should evaluate the need for a sub-drain or back-drain system. Areas of observed seepage should be provided with sub-surface drains to release the hydrostatic pressures. Sub-surface drainage facilities may include gravel blankets, rock filled trenches or Multi-Flow systems or equal. The drain system should discharge in a non-erosive manner into an approved drainage area.

2. All final grades should be provided with a positive drainage gradient away from foundations. Final grades should provide for rapid removal of surface water runoff. Ponding of water should not be allowed on building pads or adjacent to foundations. Final grading should be the responsibility of the contractor, general Civil Engineer, or architect.

3. Concentrated surface water runoff within or immediately adjacent to the Site should be conveyed in pipes or in lined channels to discharge areas that are relatively level or that are adequately protected against erosion.

4. Water from roof downspouts should be conveyed in solid pipes that discharge in controlled drainage localities. Surface drainage gradients should be planned to prevent ponding and promote drainage of surface water away from building foundations, edges of pavements and sidewalks. For soil areas we recommend that a minimum of 2 percent gradient be maintained.

5. Attention should be paid by the contractor to erosion protection of soil surfaces adjacent to the edges of roads, curbs and sidewalks, and in other areas where hard edges of structures may cause concentrated flow of surface water runoff. Erosion resistant matting such as Miramat, or other similar products, may be considered for lining drainage channels.

6. Sub-drains should be placed in established drainage courses and potential seepage areas. The location of sub-drains should be determined after a review of the grading plan. The sub-drain outlets should extend into suitable facilities or connect to the proposed storm drain system or existing

drainage control facilities. The outlet pipe should consist of a non-perforated pipe the same diameter as the perforated pipe.

I. Maintenance

1. Maintenance of slopes is important to their long-term performance. Precautions that can be taken include planting with appropriate drought-resistant vegetation as recommended by a landscape architect, and not over-irrigating, a primary source of surficial failures.

2. Property owners should be made aware that over-watering of slopes is detrimental to long term stability of slopes.

J. Underground Facilities Construction

1. The attention of contractors, particularly the underground contractors, should be drawn to the State of California Construction Safety Orders for “Excavations, Trenches, Earthwork.” Trenches or excavations greater than 5 feet in depth should be shored or sloped back in accordance with OSHA Regulations prior to entry.

2. Bedding is defined as material placed in a trench up to 1 foot above a utility pipe and backfill is all material placed in the trench above the bedding. Unless concrete bedding is required around utility pipes, free-draining sand should be used as bedding. Sand to be used as bedding should be tested in our laboratory to verify its suitability and to measure its compaction characteristics. Sand bedding should be compacted by mechanical means to achieve at least 90 percent relative compaction based on ASTM D1557-12-12.

3. On-site inorganic soils, or approved import, may be used as utility trench backfill. Proper compaction of trench backfill will be necessary under and adjacent to structural fill, building foundations, concrete slabs, and vehicle pavements. In these areas, backfill should be conditioned with water (or allowed to dry), to produce a soil water content near the optimum value and placed in horizontal layers, each not exceeding 8 inches in thickness before compaction. Each layer should be compacted to at least 90 percent relative compaction based on ASTM D1557-12-12. The top lift of trench backfill under vehicle pavements should be compacted to the requirements given in report under Preparation of Paved Areas for vehicle pavement sub-grades. Trench walls must be kept moist prior to and during backfill placement.

K. Completion of Work

1. After the completion of work, a report should be prepared by the Soils Engineer retained to provide such services. The report should including locations and elevations of field density tests, summaries of field and laboratory tests, other substantiating data, and comments on any changes made during grading and their effect on the recommendations made in the approved Soils Engineering Report.

2. Soils Engineers shall submit a statement that, to the best of their knowledge, the work within their area of responsibilities is in accordance with the approved soils engineering report and applicable provisions within Chapter 18 of the 2022 CBC.