Project No. M024.G
May 5, 2025

Mr. Michael Brewer
Development Associate
City Ventures
1185 Old Mason Street
San Francisco CA 94123

Subject: Proposed Residential Development
20455 5th Street East
Sonoma, California
PRELIMINARY GEOTECHNICAL FEASIBILITY ASSESSMENT

Dear Mr. Brewer,

At your request, Quantum Geotechnical Inc. (QGI) completed the field investigation program of our geotechnical investigation on April 15, 2025, and is presenting herein our preliminary geotechnical feasibility assessment for the subject project. Please note that we have not performed any laboratory testing on the soil samples and the laboratory testing is on hold pending your notice. The purpose of this assessment is to identify any geotechnical concerns as part of your due diligence process.

PROJECT DESCRIPTION

We understand the site would be developed for a multi-family townhome project, but the project is still in the conceptual design phase. It is our understanding the project would consist of three-story buildings, and associated utility and street improvements. The buildings are being planned to be supported by a post-tensioned slab foundation system. The grading details are being developed and are currently unknown, however, considering the current site grades grading is expected to consist of minor to moderate cuts and fills.

SITE DESCRIPTION

The project site is in southeast Sonoma in unincorporated Sonoma County adjacent to the City of Sonoma incorporated area to the west and northwest. It is bordered by Napa Road to the south,

Jones Street to the west, and East 5th Street to the east. On the north side the project site is bordered by a low density rural residential parcel, while there is higher density residential housing to the west. The project site has an existing single-story house built in 1950 and there is a paved driveway to the house extending from East 5th Street westward onto the property. The house is surrounded by trees, but the remainder and majority of the site is a grassy pasture accessible from a gravel driveway and gate located at the southwest corner of the property on Napa Road. The other site structures include a concrete block storage shed and an abandoned chicken coop near the southwest corner. There are two wells on the property, in the center near the northwest corner of the house and next to the driveway off Napa Road, near the storage shed.

An aerial photo from 1953 shows the house used to be surrounded by vineyards and the trees have grown up since, but grades have not changed significantly. There is a drainage ditch on the east and southeast sides of the property. The eastern ditch is steepest with an estimated 4-to-5-foot drop with 2V:1H slopes (vertical to horizontal) and the western portion approximately 2 to 3 feet deep with 1V:2H slopes. These ditches had some ponded water when visited in April of 2025, but reportedly dry up in the summer. Except for the ditches 90 percent of the site has gentle slopes of less than 5 percent. The ground elevations range from an estimated +64 feet near the northeast corner to about +53 feet at the bottom of the swale near the southwest corner.

SITE GEOLOGY

Published geologic maps show the site underlain by Pleistocene-age alluvial fan deposits (Qpaf) consisting of sand, gravel, silt and clay that are deeply dissected (Wagner and others, 2004; Wagner and Gutierrez, 2017). The previous geologic evaluation (SFBEC, 2018) did not include soil sampling but noted weak and dried out soils, particularly in the broad swale crossing the site, as well as numerous animal burrows. The USDA maps the surface layer as the Huichica Loam, which consists of moderately well-drained fine loam. Nearby well logs indicate stiff to very stiff clays and dense gravelly clays with lenses of sand continue to depths of 200 to 300 feet, overlying volcanic and sedimentary bedrock.

Groundwater depths are expected to vary seasonally. In general, Sonoma County has shallow perched water in the rainy season that is often shallower than 10 feet below the existing grade, particularly near low lying drainage swales or creek We reviewed a geotechnical investigation report for the neighboring property at 404 Napa Road by PJC Associates (2003). They drilled 10 boreholes to depths of 7.5 to 15.5 feet and they reported groundwater in only two of the borings at depths of 11.5 feet and also 3.5 feet. The reported soil conditions were described as alluvium, including hard silt and stiff clay interbedded with dense to very dense sandy, clayey gravel and clayey sand.

CURRENT INVESTIGATION SUBSURFACE CONDITIONS

A total of five (5) borings were advanced within the site. Boring B-1 was drilled in the southeast portion of the property, near the main residence. Borings B-2 and B-3 were drilled in the western portion of the property. Boring B-4 was drilled near the northeast corner and Boring B-5 was drilled in the middle.

The subsurface conditions encountered in the borings were variable. In general, there was more sand and gravel with shallow groundwater encountered in the lower lying broad swale area that crosses the property from just west of the northwest corner (near Boring B-4) to the head of the ditch that crosses underneath Napa Road (south of Boring B-5).

In contrast, in Boring B-1 there was very stiff sandy clay with gravel and very stiff to hard clayey silt and silty clay continuing to a depth of 13.5 feet. Underlying this layer was stiff sandy clay with gravel becoming wet about 16 feet, and stiff clay that continued to the bottom depth of 25.5 feet. Following drilling groundwater rose to 12 feet below the ground surface (bgs). In Boring B-2 there was medium dense clayey sand with gravel overlying very stiff to hard sandy clay with gravel at depths of 4 to 13.5 feet. In Boring B-3 there was very stiff to hard sandy and clayey silt overlying very stiff sandy clay continuing to the bottom depth of 17.5 feet.

In Boring B-4 the soils were sandier with medium dense silty and clayey sand encountered in the upper 11 feet, becoming dense and continuing to the bottom depth of 13.5 feet bgs. Groundwater was very shallow at just 2 feet bgs after drilling. In Boring B-5 which was drilled in the middle of the property there was stiff sandy clay with gravel in the upper 5.5 feet,

overlying wet clayey gravel and sand. The groundwater was also very shallow, rising to 2 feet bgs following drilling.

It appears the broad swale feature has an influence on the depth to groundwater. Near the swale feature (borings B-4 and B-5) the groundwater was encountered at 2 feet, while elsewhere, the groundwater was encountered at 16 feet. It is noted that during our investigation, the swale had some water in it and may be influencing these high groundwater conditions.

PRELIMINARY GEOTECHNICAL EVALUATION

Based on our site reconnaissance and borings, the site is considered suitable for the proposed development. The site is not located within any Alquist Priolo Earthquake Fault Special Studies Zone, and the potential for surface rupture due to faulting is therefore nil. A post-tensioned slab foundation is the most appropriate foundation system for the proposed structures, given the presence of moderately expansive soil.

The primary geotechnical features on the site include the following. Please note that these findings are preliminary in nature as we have not performed laboratory testing on the soil samples.

(1) The broad swale traversing through the property appears to influence localized shallow groundwater with groundwater less than 5 feet deep, and may likely be the result of the rainy winter season and presence of near surface granular soil. Water flow in the granular soil is perched on the underlying clay stratum. There is not enough data to establish if the high groundwater table in this localized area is deeper during the summer months. If you proceed with this project we recommend that additional subsurface investigation be performed during the summer months to evaluate this influence. Underground construction during the during the winter and spring seasons, may lead to caving and unstable trenches without dewatering. Shoring or slope backs should be used on all trenching deeper than 5 feet in accordance with OSHA regardless of the season.

(2) The site is subject to very strong ground shaking and there is expected to be some limited settlements with potential liquefaction mainly in the area with medium dense sands and gravels in the lower lying broad swale area in the middle of the property. In its current condition the near surface granular soil in this area will be subject to liquefaction induced settlements during a design earthquake event and high groundwater during the winter months. We recommend that the granular layer be excavated and recompacted as engineered fill to mitigate this condition.

(3) The near surface soil encountered in Borings B-1 and B-3 appears to be moderately expansive clay. This material is prone to heave and shrink movements with changes in

moisture content and must be carefully considered in the design and construction of foundations, drainage, hardscape and pavements. The potential expansion can be verified through lab testing.

(4) The extent of fill appears to be limited but we did not explore the area of the existing ditch near the southeast corner where the ground has been disturbed. We recommend that this area be further investigated with a backhoe during grading to better view the material and better assess if it is native soil, or non-engineered fill. If it is deemed to be non-engineered fill, it must be removed and replaced as engineered fill. The existing fill can be reused as engineered fill.

(5) Other than mitigating the potential localized areas of non-engineered fill, standard grading practices for the site, and standard utility trenching operations are anticipated. However we recommend grading and utility construction take place during the dry season to potentially avoid high groundwater conditions and potential dewatering.

CLOSURE

Should there be any questions or should you require any additional information, please contact our office at your convenience.

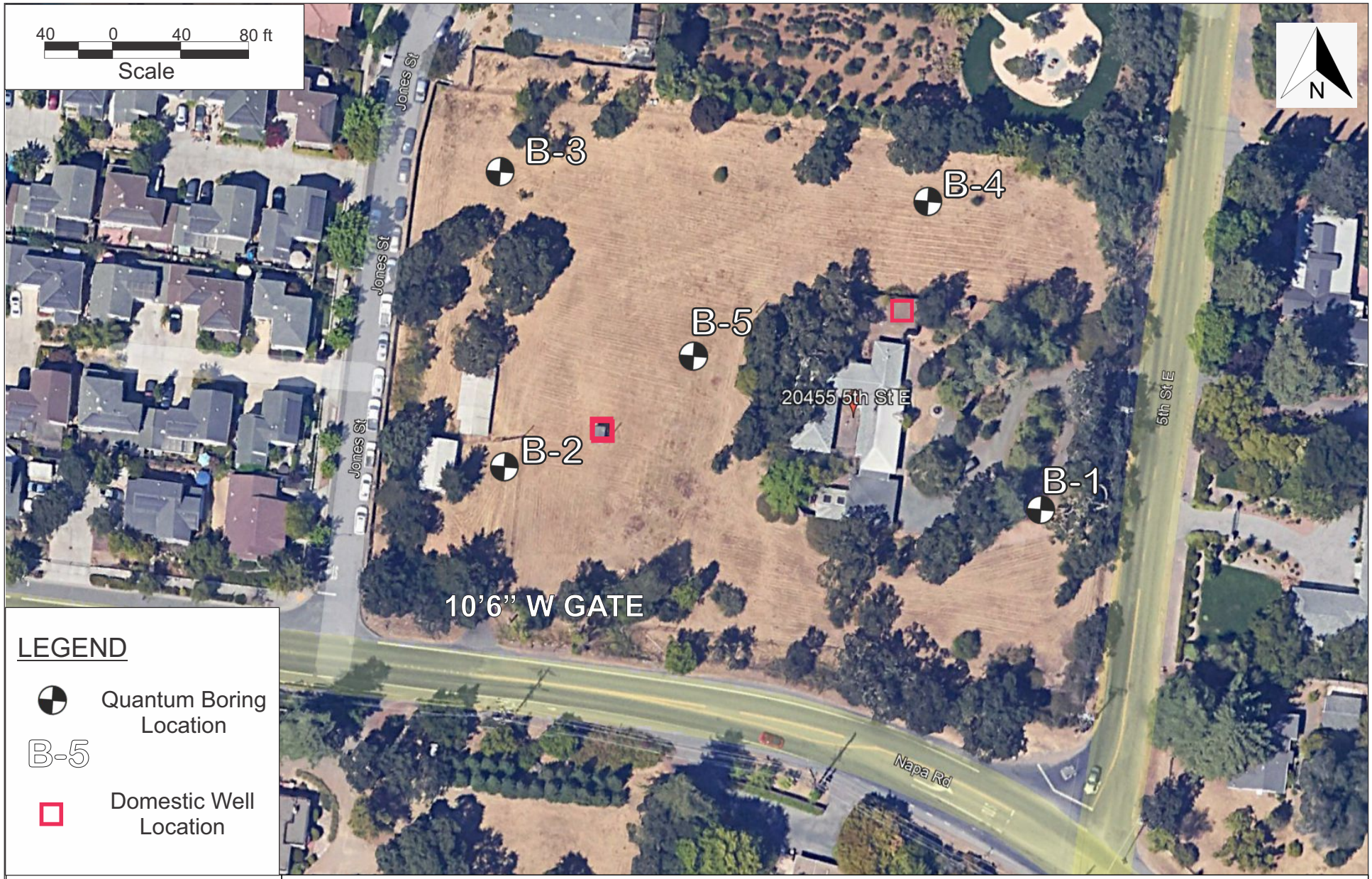
Sincerely,
Quantum Geotechnical, Inc.

Simon Makdessi, P.E., G.E.
President

Joe Farrow, P.G.
Senior Geologist

Copies: 1 via email

Attachments: Site Plan
Boring Logs



SITE PLAN

QUANTUM GEOTECHNICAL INC.

Geotechnical Investigation
Sonoma C
Sonoma, California

Project No.	Drawn By	Figure No.
M024.G	JF	1

Project: **Sonoma** Project Location: **20455 East 5th Street, Sonoma** Project Number: **M024.G**	Log of Boring B-1 **Sheet 1 of 1**	**Quantum Geotechnical Inc.** 1110 Burnett Avenue., Ste. B Concord, CA, 94520

Date(s) Drilled	**04/15/25**	Logged By	**JF**	Checked By	
Drilling Method	**Solid Flight Augers**	Drill Bit Size/Type	**4" O.D.**	Total Depth of Borehole	**25.5 feet bgs**
Drill Rig Type	**Bobcat**	Drilling Contractor	**Stapleton Engineering**	Approximate Surface Elevation	
Groundwater Level and Date Measured	**12' after drilling, initial about 16'**	Sampling Method(s)	**Modified California, SPT**	Hammer Data	**Automatic Trip**
Borehole Backfill	**Grout**	Location	**See Site Plan**		

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	Material Type	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, pcf	Percent Fines	LL, %	PI, %	UC, ksf
	0				Grass SOD		3-inches thick						
					CL		Sandy CLAY with Gravel (CL) - light brown moist, very stiff, fine to coarse sand, subrounded gravel in clay matrix						
			1	37									
					ML		Clayey SILT (ML) - pinkish brown, dry, hard						
	5		2	38 50\3"									
					CL		Silty CLAY (CL) - brown, moist, very stiff, low plasticity, grades into a fat clay with increasing depth						
			3	27									
	10												
					CH		Silty CLAY (CL) - brown with black stains, moist, stiff, moderate plasticity, few sand after drilling ▽						
			4	29									
					CH		Sandy CLAY with Gravel (CH) - light brown, moist, stiff, fine to coarse sand, little fine subrounded to angular gravel to 3/4-inch size						
	15						- becomes wet, stiff, few intermittent gravel layers ▼						
			5	12									
	20												
					CH		CLAY (CH) - patchy gray and brown, wet, very stiff, trace gravel						
	25		6	33									
							Bottom of Borehole (BOB) at 25.5 feet below the ground surface (bgs). Following drilling groundwater level 12 feet bgs. Tremy backfilled with neat cement grout per Sonoma County.						
	30												

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Project: **Sonoma** Project Location: **20455 East 5th Street, Sonoma** Project Number: **M024.G**	Log of Boring B-2 **Sheet 1 of 1**	**Quantum Geotechnical Inc.** 1110 Burnett Avenue., Ste. B Concord, CA, 94520

Date(s) Drilled	**04/15/25**	Logged By	**JF**	Checked By	
Drilling Method	**Solid Flight Augers**	Drill Bit Size/Type	**4" O.D.**	Total Depth of Borehole	**13.5 feet bgs**
Drill Rig Type	**Bobcat**	Drilling Contractor	**Stapleton Engineering**	Approximate Surface Elevation	
Groundwater Level and Date Measured	**Dry**	Sampling Method(s)	**Modified California, SPT**	Hammer Data	**Automatic Trip**
Borehole Backfill	**Grout**	Location	**See Site Plan**		

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	Material Type	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, pcf	Percent Fines	LL, %	PI, %	UC, ksf
	0				Grass SOD		3-inches thick						
					SC		Clayey SAND with Gravel (SC) - dark brown moist, fine to coarse sand, medium dense, little fine to coarse sand, subrounded gravel to 3/4-inch size						
			1	17									
					CL		Sandy CLAY with Gravel (CL) - brown with red and yellow stains, moist, very stiff, little fine to coarse sand, subrounded gravel to 1-inch size						
	5		2	18									
			3	50			- becomes hard						
	10												
			4	30									
							Bottom of Borehole (BOB) at 13.5 feet below the ground surface (bgs). Following drilling stayed dry. Backfilled with cuttings and grout per Sonoma County.						
	15												
	20												
	25												
	30												

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Project: **Sonoma** Project Location: **20455 East 5th Street, Sonoma** Project Number: **M024.G**	Log of Boring B-3 **Sheet 1 of 1**	**Quantum Geotechnical Inc.** 1110 Burnett Avenue., Ste. B Concord, CA, 94520

Date(s) Drilled	**04/15/25**	Logged By	**JF**	Checked By	
Drilling Method	**Solid Flight Augers**	Drill Bit Size/Type	**4" O.D.**	Total Depth of Borehole	**17.5 feet bgs**
Drill Rig Type	**Bobcat**	Drilling Contractor	**Stapleton Engineering**	Approximate Surface Elevation	
Groundwater Level and Date Measured	**16' after drilling, estimated same initial**	Sampling Method(s)	**Modified California, SPT**	Hammer Data	**Automatic Trip**
Borehole Backfill	**Grout**	Location	**See Site Plan**		

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	Material Type	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, pcf	Percent Fines	LL, %	PI, %	UC, ksf
	0				Grass SOD		3-inches thick						
					ML		Clayey SILT (ML) - grayish-brown, moist, very stiff, trace gravel						
			1	37			- becomes hard						
					ML		Sandy, Clayey SILT (ML) - gray-brown with red stains, damp, hard, few subrounded gravel to 1/2-inch size						
	5		2	38 50\3"			- slow drilling, possible cobble, softer below 6 feet						
					CL		Sandy CLAY with Gravel (CL) - brown with red and yellow stains, moist, very stiff, fine to coarse sand, little fine subrounded gravel to 3/4-inch size						
			3	27									
	10												
			4	29									
	15				CL		Silty, Sandy CLAY (CL) - brown, wet, very stiff, trace gravel after drilling ∇						
			5	12									
							Bottom of Borehole (BOB) at 17.5 feet below the ground surface (bgs). Following drilling groundwater level 16 feet bgs. Tremy backfilled with neat cement grout per Sonoma County.						
	20												
	25												
	30												

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Project: **Sonoma** Project Location: **20455 East 5th Street, Sonoma** Project Number: **M024.G**	Log of Boring B-4 **Sheet 1 of 1**	**Quantum Geotechnical Inc.** 1110 Burnett Avenue., Ste. B Concord, CA, 94520

Date(s) Drilled	**04/15/25**	Logged By	**JF**	Checked By	
Drilling Method	**Solid Flight Augers**	Drill Bit Size/Type	**4" O.D.**	Total Depth of Borehole	**13.5 feet bgs**
Drill Rig Type	**Bobcat**	Drilling Contractor	**Stapleton Engineering**	Approximate Surface Elevation	
Groundwater Level and Date Measured	**2' after drilling, initially about 3'**	Sampling Method(s)	**Modified California, SPT**	Hammer Data	**Automatic Trip**
Borehole Backfill	**Grout**	Location	**See Site Plan**		

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	Material Type	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, pcf	Percent Fines	LL, %	PI, %	UC, ksf
	0				Grass SOD		3-inches thick						
					SC		Silty, Clayey SAND with Gravel (SC) - patchy dark grayish-brown and yellow-brown, moist, fine to coarse sand, medium dense, little fine to coarse sand, subrounded gravel to 3/4-inch size						
			1	32			- becomes wet, loose, gravel and cobbles to estimated 3-inch szie						
	5												
			2	21			- yellow stains, gravel and cobbles to estimated 4-inch size						
					SC		Clayey SAND with Gravel (SC) - olive-brown, wet, medium dense, fine to medium sand, little clay, rounded gravel to estimated 2-inch size						
	10		3	32			- becomes dense						
			4	42									
							Bottom of Borehole (BOB) at 13.5 feet below the ground surface (bgs). Following drilling caved in to depth of 5 feet. Groundwater depth 2 feet bgs after drilling. Backfilled with cuttings and grout per Sonoma County.						
	15												
	20												
	25												
	30												

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Project: **Sonoma** Project Location: **20455 East 5th Street, Sonoma** Project Number: **M024.G**	Log of Boring B-5 **Sheet 1 of 1**	**Quantum Geotechnical Inc.** 1110 Burnett Avenue., Ste. B Concord, CA, 94520

Date(s) Drilled	**04/15/25**	Logged By	**JF**	Checked By	
Drilling Method	**Solid Flight Augers**	Drill Bit Size/Type	**4" O.D.**	Total Depth of Borehole	**10 feet bgs**
Drill Rig Type	**Bobcat**	Drilling Contractor	**Stapleton Engineering**	Approximate Surface Elevation	
Groundwater Level and Date Measured	**2' after drilling, initially about 5.5'**	Sampling Method(s)	**Modified California, SPT**	Hammer Data	**Automatic Trip**
Borehole Backfill	**Grout**	Location	**See Site Plan**		

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	Material Type	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, pcf	Percent Fines	LL, %	PI, %	UC, ksf
	0				Grass SOD CL		3-inches thick Sandy CLAY with Gravel (CL) - brown, moist, stiff, fine to coarse sand, little fine subrounded gravel to 1-inch size						
	5		1	38									
					GC		Clayey GRAVEL and Sand (GC) - brown and gray, wet, fine to coarse sand, medium dense, little fine to coarse sand, rounded gravel to 2-inch size						
			2	29									
	10						Bottom of Borehole (BOB) at 10 feet below the ground surface (bgs). Following drilling groundwater level 2 feet bgs. Backfilled with cuttings and grout per Sonoma County.						
	15												
	20												
	25												
	30												

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Project: **Sonoma** Project Location: **20455 East 5th Street, Sonoma** Project Number: **M024.G**	Key to Log of Boring **Sheet 1 of 1**	**Quantum Geotechnical Inc.** 1110 Burnett Avenue., Ste. B Concord, CA, 94520

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	Material Type	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, pcf	Percent Fines	LL, %	PI, %	UC, ksf
1	2	3	4	5	6	7	8	9	10	11	12	13	14

COLUMN DESCRIPTIONS

1 Elevation (feet): Elevation (MSL, feet).
2 Depth (feet): Depth in feet below the ground surface.
3 Sample Type: Type of soil sample collected at the depth interval shown.
4 Sample Number: Sample identification number.
5 Sampling Resistance, blows/ft: Number of blows to advance driven sampler one foot (or distance shown) beyond seating interval using the hammer identified on the boring log.
6 Material Type: Type of material encountered.
7 Graphic Log: Graphic depiction of the subsurface material encountered.
8 MATERIAL DESCRIPTION: Description of material encountered. May include consistency, moisture, color, and other descriptive text.
9 Water Content, %: Water content of the soil sample, expressed as percentage of dry weight of sample.
10 Dry Unit Weight, pcf: Dry weight per unit volume of soil sample measured in laboratory, in pounds per cubic foot.
11 Percent Fines: The percent fines (soil passing the No. 200 Sieve) in the sample. WA indicates a Wash Sieve, SA indicates a Sieve Analysis.
12 LL, %: Liquid Limit, expressed as a water content.
13 PI, %: Plasticity Index, expressed as a water content.
14 UC, ksf: Unconfined compressive strength, in kips per square foot.

FIELD AND LABORATORY TEST ABBREVIATIONS

CHEM: Chemical tests to assess corrosivity
COMP: Compaction test
CONS: One-dimensional consolidation test
LL: Liquid Limit, percent
PI: Plasticity Index, percent
SA: Sieve analysis (percent passing No. 200 Sieve)
UC: Unconfined compressive strength test, Qu, in ksf
WA: Wash sieve (percent passing No. 200 Sieve)

MATERIAL GRAPHIC SYMBOLS

Fat CLAY, CLAY w/SAND, SANDY CLAY (CH)
Lean CLAY, CLAY w/SAND, SANDY CLAY (CL)
Clayey GRAVEL (GC)
SILT, SILT w/SAND, SANDY SILT (ML)
Clayey SAND (SC)

TYPICAL SAMPLER GRAPHIC SYMBOLS

Auger sampler
Bulk Sample
3-inch-OD California w/ brass rings
CME Sampler
Grab Sample
2.5-inch-OD Modified California w/ brass liners
Pitcher Sample
2-inch-OD unlined split spoon (SPT)
Shelby Tube (Thin-walled, fixed head)

OTHER GRAPHIC SYMBOLS

Water level (at time of drilling, ATD)
Water level (after waiting, AW)
Minor change in material properties within a stratum
Inferred/gradational contact between strata
Queried contact between strata

GENERAL NOTES

1: Soil classifications are based on the Unified Soil Classification System. Descriptions and stratum lines are interpretive, and actual lithologic changes may be gradual. Field descriptions may have been modified to reflect results of lab tests.
2: Descriptions on these logs apply only at the specific boring locations and at the time the borings were advanced. They are not warranted to be representative of subsurface conditions at other locations or times.

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Figure B-1