GEOTECHNIQUES
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October 29, 2022 (revised November 2022)
Project No. 1003.055.03

Ventura College
Facilities, Maintenance & Operations
4667 Telegraph Road
Ventura, California 93003

Attention: Mr. Jess Sluder, Director of Facilities, Maintenance & Operations

Subject: Geotechnical Update, Outdoor Workout Shade Structure, Athletic Field Bleacher Area, West Campus Way, Ventura College, Ventura, California

Dear Mr. Sluder:

This letter report serves as an update to the original geotechnical study[1] to provide recommendations for the design of foundation support for the two proposed metal shade structures at the Athletic Field at Ventura College. For this update, we have reviewed pertinent boring logs and laboratory data from the original study to provide recommendations for foundation design and construction.

PROPOSED PROJECT

The two proposed 80-foot by 36-foot metal shade structures will be located immediately north of the existing Athletic Field bleachers constructed in 2008. The shade structures will be supported by drilled pier foundations.

SITE CONDITIONS

The site is currently used as a relatively level, open-air work-out area located immediately north of the bleachers. Surface conditions consist of asphalt concrete and on-grade concrete.

Subsurface Conditions at Athletic Field

Earth materials encountered in the borings from the original study advanced in the immediate vicinity of the proposed outdoor workout area[1] consist of stiff to very stiff fine sandy silt with clay (ML) (Boring Nos. 15, 17-20), with clay content ranging from about 10 to 30 percent. Groundwater was not encountered to the maximum exploration depth of 51.5 feet (Borings Nos. 15, 16). The logs for those borings, along with a site plan showing the approximate location of those borings relative to the proposed shade structures are included in the Appendix to this report.

Engineering Properties of Site Soils

Dry densities of samples of the sandy silt with clay encountered in the upper 30 feet of the original study[1] ranged from about 95 to 120 pounds per cubic foot (pcf), and moisture contents of those samples ranged from about 6 to 18 percent. Field (uncorrected) blow counts from driving resistance during sampling of those stiff materials typically ranged from about 11 to 29 blows per foot

[1] Earth Systems Southern California (2003), "Geotechnical Engineering Report for Ventura College Track and Field, Ventura, California" Project No. VT- 23039-01, dated November 25.

(bpf), with an average blow count between depths of 5 and 15 feet of about 14 bpf, corrected for overburden, and sampler and hammer type. Ultimate friction angles estimated by direct shear tests performed on relatively undisturbed samples of the fine sandy silt ranged from about 28 to 38 degrees.

Geohazards Potential at Athletic Field Site

Geohazards such as fault rupture potential and liquefaction potential were evaluated for the subject site in the original geotechnical study[1] and numerous other studies for significant structures proximal to the Athletic Field, which found that the Athletic Field site does not lie within a fault rupture hazard zone and liquefaction potential is precluded by absence of groundwater in the upper 50 feet of soils. Although groundwater was not encountered in the upper 51.5 feet of soils in the original study for the Athletic Field, a liquefaction evaluation was performed in that study assuming an historic groundwater level of 30 feet based on the then-current seismic hazard report[2] which has proven to be inaccurate based on a paucity of data[3] from hundreds of borings and drilled pile shafts excavated on the campus since 1952. Based on that assumption, liquefaction-induced settlement was estimated at 0.3 inch in a 1½-foot-thick sandy lens encountered at a depth of 40 feet in Boring No. 16 on the southwestern corner of the Athletic Field, but not encountered (i.e., not noted) in Boring No. 15 at the subject site. Surface effects of the liquefaction in this deep, thin layer and consideration to differential settlement between the two borings (i.e., Nos. 15 and 16) would reduce this settlement to less than ¼-inch, or a negligible potential were the groundwater level to rise to 40 feet, which is not likely and not supported by historic data.

ASCE 7-16 / 2019 CALIFORNIA BUILDING CODE SEISMIC PARAMETERS

Seismic design parameters for the west campus area were generated using site coordinates 34.2773˚ N, -119.2347˚ W, and in accordance with 2019 CBC and ASCE 7-16. Soil conditions are consistent with Site Class D, characterized by undrained shear strengths typically between about 1,000 and 2,000 pounds per square foot (psf) and average (uncorrected) blow counts between 15 and 50 (in accordance with Table 20.3-1 in Chapter 20 of ASCE 7-16 and Section 1613.2.2 of the 2019 CBC).

[2] California Geological Survey (“CGS”) (2002), “Seismic Hazard Zone Report for the Ventura 7.5-Minute Quadrangle, Ventura County, California,” Seismic Hazard Zone Report 067.

[3] Geotechniques (2011), “Geotechnical Study, Applied Science Center, Ventura College,” Project No. 1003.028), p.6, “Historical Groundwater Data,” report dated June 30.

The following seismic parameters are recommended for design for Risk Category II for Site Class "D" soil profile:

Seismic Parameter[1]	Value	CBC Source	ASCE 7-16 Source
Mapped Spectral Response Acceleration			
S_s	1.993	Figure 1613.2.1 (1)	Figure 22-1
S_1	0.75	Figure 1613.2.1 (2)	Figure 22-2
S_{MS}	1.993	Equation 16-36	Equation 11.4-1
S_{M1}	1.275	Equation 16-37	Equation 11.4-2
Design Spectral Response Acceleration			
S_{DS}	1.329	Equation 16-39	Equation 11.4-3
S_{D1}	0.85	Equation 16-40	Equation 11.4-4
PGA (MCE_G)	0.876g		Figure 22-9

[1] S_{M1} , S_{D1} were calculated per Table 1613.2.3(2) in Section 16.4.4 of the 2019 CBC assuming that site-specific ground motion analysis is not required per ASCE 7-16, Sec. 11.4.8. Ref.: https://hazards.atcouncil.org

FOUNDATION RECOMMENDATIONS

Drilled cast-in-place concrete piers that embed the metal shade column base should be designed to derive all lateral support from compacted and/or native soil encountered below the finished grade, i.e., below on-grade concrete. Drilled piers may be designed, at a minimum, consistent with Type 3 soils in accordance with 2019 CBC Table 1806.2. Drilled shafts should be observed by the geotechnical representative during excavation at each foundation location to confirm design assumptions.

Passive and Frictional Resistance. An allowable passive resistance of 300 pounds per square foot per foot of depth (psf/ft) may be used when designing relatively short concrete drilled pier foundations, with a maximum value limited to 4,500 psf. The upper 1 foot should be neglected for resistance for foundations not surrounded by on-grade concrete such as in landscape areas. A coefficient of friction of 0.35 may be combined with the passive resistance without reduction in the total resistance.

Allowable Bearing. An allowable bearing capacity of 3,000 psf is recommended for end-bearing on native materials. A one-third increase is allowed for transient loading conditions.

Allowable Uplift Capacity. Allowable uplift capacity of drilled cast-in-place concrete piers should be taken as 350 psf from shaft resistance, plus the weight of the concrete pier. The upper 1 foot of embedment should be neglected in calculating uplift capacity for piers excavated in landscape areas. Allowable shaft resistance incorporates a factor of safety of 2.

Drilled Shaft Construction Considerations. Drilled shafts for shade column foundations should be excavated to the minimum design embedment depth determined by others. The bottom of the drilled shaft should consist of clayey silt that is not disturbed by the drilling auger. This should be achieved by using a bucket auger and clean-out bucket for excavating and cleaning the final 18 inches of native undisturbed materials from the shaft excavation bottom. Note that backspinning of

flight auger is not an acceptable alternative to use of a bucket auger/clean-out bucket. The drilling operation should be observed by Geotechniques.

All loose slough and disturbed materials and any water accumulated on the shaft bottom should be removed prior to setting pole base and/or reinforcement and prior to concrete placement. Pole base/reinforcement should be centered securely in shaft prior to concrete placement.

Drilled shafts should be concreted the same day as excavation and **should not be left open overnight**. The drilling Contractor should have casing on hand during drilling to help mitigate sidewall caving in the event 'running' sandy lenses are encountered. The outer diameter of the casing should be at least as large as the diameter of the drilled shaft so that the casing is in contact with the shaft sidewall. Casing should be withdrawn during concrete placement and should not be left in place. Drilled pier construction should be performed in accordance with the latest edition of ACI 336.1, "Standard Specifications for Construction of Drilled Piles."

ON-GRADE CONCRETE

The upper 1 foot of soil subgrade in areas to receive new on-grade concrete should be compacted to a minimum of 95 percent of the maximum dry density determined by ASTM D1557. The subgrade should be scarified or removed, as necessary, and processed to pea-sized consistency or finer at between 0 and 2 percent above optimum moisture content prior to compaction. The aggregate base course beneath on-grade concrete should have a minimum as-compacted thickness of 4 inches. Aggregate base should be compacted to a minimum of 95 percent of the maximum dry density, as determined by ASTM D1557.

CLOSURE

The recommendations in this letter are specific to the scope of the proposed Athletic Field outdoor workout area metal shade structures presented herein. Additionally, field and laboratory data in the referenced original study[1] should be considered applicable to the subject site and were used to develop our recommendations herein.

We appreciate the opportunity to be of service to Ventura College and the Ventura County Community College District. Please call if you have any questions concerning this letter.

Sincerely,

Geotechniques

Carole Wockner, P.E.
Associate Engineer
R.C. E. No. 74407, exp 09/30/23

Brian D. Skyers, G.E.
Geotechnical Engineer
R.G.E. 2627, exp 12/31/22

Encl: Appendix
Logs of Boring Nos. 15-20
Site Plan Showing Boring Locations Relative to Site

APPENDIX

Earth Systems Southern California
1731-A Walter Street, Ventura, California 93003
PHONE: (805) 642-6727 FAX: (805) 642-1325

BORING NO: 15
PROJECT NAME: Ventura College Track & Field
PROJECT NUMBER: VT-23039-01
BORING LOCATION: Per Plan

DRILLING DATE: October 2, 2003
DRILLING METHOD: 6" Hollow Stem Auger
DRILL: CME-75
LOGGED BY: Wesley Smith

Vertical Depth	Sample Type: Bulk	Sample Type: SPT	Sample Type: Mod. Calif.	PENETRATION RESISTANCE (BLOWS/6")	SYMBOL	USCS CLASS	UNIT DRY WT. (pcf)	MOISTURE CONTENT (%)	DESCRIPTION OF UNITS
0									**SURFACE:** 4.0" of Asphalt on no base.
	X		■	7/7/9		ML	102.5	8.9	**ALLUVIUM:** Fine sandy silt, trace clay, moist, stiff, light olive to light yellowish brown.
	X		■	5/6/7		ML	100.5	8.8	Same as above, exept trace rootlets.
5			■	5/6/9		ML	101.9	13.8	**ALLUVIUM:** Fine sandy silt with seams of fine to coarse sand, trace clay, slightly moist, stiff, moderate yellowish brown to light yellowish brown.
10			■	9/7/9		SM	110.2	17.8	**ALLUVIUM:** Very silty fine to medium sand, trace fine gravel, very moist, loose, light yellowish brown.
15			■	5/9/9		ML	106.4	14.8	**ALLUVIUM:** Fine sandy silt, trace caliche and clay, moist, stiff, moderate yellowish brown to moderate brown.
20			■	5/15/18		SM	120.0	6.3	**ALLUVIUM:** Very silty fine to coarse sand with fine to medium gravel, slightly moist, medium dense, light yellowish brown.
25			■	9/12/14		SM	104.2	6.5	**ALLUVIUM:** Silty fine sand, slightly moist, very stiff, light yellowish brown.
30			■	6/10/11		ML	103.5	14.7	**ALLUVIUM:** Fine sandy SILT, trace clay, moist, very stiff, moderate olive brown to moderate yellowish brown.
35			■	11/12/15		ML	110.8	10.8	**ALLUVIUM:** Fine sandy SILT, moist, very stiff, light olive brown to moderate yellowish brown.

Note: The stratification lines shown represent the approximate boundaries between soil and/or rock types and the transitions may be gradual.

Earth Systems Southern California
1731-A Walter Street, Ventura, California 93003
PHONE: (805) 642-6727 FAX: (805) 642-1325

BORING NO: 15 Continued
PROJECT NAME: Ventura College Track & Field
PROJECT NUMBER: VT-23039-01
BORING LOCATION: Per Plan

DRILLING DATE: October 2, 2003
DRILLING METHOD: CME-75
DRILL: 6" Hollow Stem Auger
LOGGED BY: Wesley Smith

Vertical Depth	Sample Type: Bulk	Sample Type: SPT	Sample Type: Mod. Calif.	PENETRATION RESISTANCE (BLOWS/6"	SYMBOL	USCS CLASS	UNIT DRY WT. (pcf)	MOISTURE CONTENT (%)	DESCRIPTION OF UNITS
40			■	7/12/13		ML	105.7	18.1	**ALLUVIUM:** Silt, some fine sand, trace caliche and clay, very moist, very stiff, dark brown to moderate brown.
45			■	7/11/20		ML	110.4	17.8	**ALLUVIUM:** Fine sandy silt, very moist, very stiff, light olive to light yellowish brown.
50			■	1/2/3		CL	106.9	19.9	**ALLUVIUM:** Fine sandy clay with silt, non to low plasticity, very moist, medium stiff, dark brown.
55									Final Depth: 51.5 feet Groundwater was not encountered.
60									
65									
70									
75									

Note: The stratification lines shown represent the approximate boundaries between soil and/or rock types and the transitions may be gradual.

Earth Systems Southern California
1731-A Walter Street, Ventura, California 93003
PHONE: (805) 642-6727 FAX: (805) 642-1325

BORING NO: 16
PROJECT NAME: Ventura College Track & Field
PROJECT NUMBER: VT-23039-01
BORING LOCATION: Per Plan

DRILLING DATE: October 2, 2003
DRILLING METHOD: 6" Hollow Stem Auger
DRILL: CME-75
LOGGED BY: Wesley Smith

Vertical Depth	Sample Type: Bulk	Sample Type: SPT	Sample Type: Mod. Calif.	PENETRATION RESISTANCE (BLOWS/6")	SYMBOL	USCS CLASS	UNIT DRY WT. (pcf)	MOISTURE CONTENT (%)	DESCRIPTION OF UNITS
0						SM			**FILL (Track):** Silty fine to coarse sand with fine to coarse gravel, slightly moist, dense, moderate yellowish brown to reddish brown.
			■	8/13/16		ML	113.1	14.5	
			■	5/5/6		ML	111.3	13.7	**DISTURBED SOIL:** Silt, some clay, trace fine sand, slightly moist, very stiff, dark brown.
5			■	3/4/7		ML	97.9	12.5	**ALLUVIUM:** Fine to coarse sandy silt, trace fine to medium gravel, slightly moist, stiff, grayish brown to dark brown.
									ALLUVUIM: Fine sandy silt, moist, stiff, moderate to light yellowish brown. Hydro from 0 to 5 feet: 25% Clay, 45% Silt, 30% Sand, 0% Gravel.
10			■	4/6/6		ML	95.1	13.5	**ALLUVIUM:** Clayey fine sandy silt, moist, stiff, light to moderate brown. (HYDRO: 22% clay, 39% silt, 39% sand, 0% gravel)
15			■	5/6/8		ML	--	--	**ALLUVIUM:** Fine sandy silt, some clay, moist, stiff, light yellowish brown. (HYDRO: 14% clay, 51% silt, 35% sand, 0% gravel)
20			■	5/8/11		ML	--	--	**ALLUVIUM:** Clayey fine sandy Silt, trace caliche, moist, stiff, dark brown to dark yellowish brown. (HYDRO: 23% clay, 40% silt, 37% sand, 0% gravel)
25			■	7/7/9		ML	106.5	7.4	**ALLUVIUM:** Fine sandy silt, trace medium to coarse sand, slightly moist, stiff, light yellowish brown. (HYDRO: 10% clay, 49% silt, 41% sand, 0% gravel)
30			■	5/12/13		ML	--	--	**ALLUVIUM:** Clayey fine sandy silt, moist, very stiff, moderate yellowish brown. (HYDRO: 18% clay, 43% silt, 39% sand, 0% gravel)
35			■	5/8/8		ML	101.0	15.5	**ALLUVIUM:** Fine sandy silt, moist, stiff, moderate yellowish brown to light yellowish brown. Hydro: 23% Clay, 38% Silt, 39% Sand, 0% Gravel.

Note: The stratification lines shown represent the approximate boundaries between soil and/or rock types and the transitions may be gradual.

Earth Systems Southern California
1731-A Walter Street, Ventura, California 93003
PHONE: (805) 642-6727 FAX: (805) 642-1325

BORING NO: 16 Continued
PROJECT NAME: Ventura College Track & Field
PROJECT NUMBER: VT-23039-01
BORING LOCATION: Per Plan

DRILLING DATE: October 2, 2003
DRILLING METHOD: 6" Hollow Stem Auger
DRILL: CME-75
LOGGED BY: Wesley Smith

Vertical Depth	Sample Type: Bulk	Sample Type: SPT	Sample Type: Mod. Calif.	PENETRATION RESISTANCE (BLOWS/6")	SYMBOL	USCS CLASS	UNIT DRY WT. (pcf)	MOISTURE CONTENT (%)	DESCRIPTION OF UNITS
40			■	10/12/13		SM	--	--	**ALLUVIUM:** Silty fine sand, some clay, moist, medium dense, moderate yellowish brown to light yellowish brown. (HYDRO: 10% clay, 42% silt, 48% sand, 0% gravel)
45			■	5/7/9		ML	--	--	**ALLUVIUM:** Clayey silt, trace fine sand, very moist, stiff, dark yellowish brown.
50			■	6/5/6		CL	--	--	**ALLUVIUM:** Fine sandy silty clay, very moist, stiff, moderate yellowish brown. (HYDRO: 30% clay, 39% silt, 31% sand, 0% gravel)
55									Final Depth: 51.5 feet Groundwater was not encountered.
60									
65									
70									
75									

Note: The stratification lines shown represent the approximate boundaries between soil and/or rock types and the transitions may be gradual.

Earth Systems Southern California
1731-A Walter Street, Ventura, California 93003
PHONE: (805) 642-6727 FAX: (805) 642-1325

BORING NO: 17
PROJECT NAME: Ventura College Track & Field
PROJECT NUMBER: VT-23039-01
BORING LOCATION: Per Plan

DRILLING DATE: October 2, 2003
DRILLING METHOD: 6" Hollow Stem Auger
DRILL: CME-75
LOGGED BY: Wesley Smith

Vertical Depth	Sample Type: Bulk	Sample Type: SPT	Sample Type: Mod. Calif.	PENETRATION RESISTANCE (BLOWS/6")	SYMBOL	USCS CLASS	UNIT DRY WT. (pcf)	MOISTURE CONTENT (%)	DESCRIPTION OF UNITS
0									**TOPSOIL:** Grass and fine sandy silt.
			■	11/13/14		ML	106.9	7.1	**ALLUVIUM:** Fine sandy silt, trace rootlets, strongly cemented, dry to slightly moist, very stiff, moderate brown to moderate yellowish brown.
5			□						
			■	3/5/7		ML	107.0	13.2	Same as above, except no rootlets, moist, stiff.
			■	5/6/8		ML	–	–	Same as above.
10									Final Depth: 9.5 feet Groundwater was not encountered.
15									
20									
25									
30									
35									

Note: The stratification lines shown represent the approximate boundaries between soil and/or rock types and the transitions may be gradual.

Earth Systems Southern California
1731-A Walter Street, Ventura, California 93003
PHONE: (805) 642-6727 FAX: (805) 642-1325

BORING NO: 18
PROJECT NAME: Ventura College Track & Field
PROJECT NUMBER: VT-23039-01
BORING LOCATION: Per Plan

DRILLING DATE: October 2, 2003
DRILLING METHOD: 6" Hollow Stem Auger
DRILL: CME-75
LOGGED BY: Wesley Smith

Vertical Depth	Sample Type: Bulk	Sample Type: SPT	Sample Type: Mod. Calif.	PENETRATION RESISTANCE (BLOWS/6")	SYMBOL	USCS CLASS	UNIT DRY WT. (pcf)	MOISTURE CONTENT (%)	DESCRIPTION OF UNITS
0									**TOPSOIL:** Grass and fine sandy silt.
			■	6/7/8		ML	--	--	**ALLUVIUM:** Silt, trace clay, fine sand and rootlets, moist, stiff, moderate brown to moderate yellowish brown.
5			■	3/5/6		ML	--	--	**ALLUVIUM:** Fine sandy silt, moist, stiff, moderate yellowish brown.
			■	5/6/8		SM	--	--	**ALLUVIUM:** Silty fine to coarse sand, moist, loose, light yellowish brown.
10									Final Depth: 8.5 feet Groundwater was not encountered.
15									
20									
25									
30									
35									

Note: The stratification lines shown represent the approximate boundaries between soil and/or rock types and the transitions may be gradual.

Earth Systems Southern California
1731-A Walter Street, Ventura, California 93003
PHONE: (805) 642-6727 FAX: (805) 642-1325

BORING NO: 19
PROJECT NAME: Ventura College Track & Field
PROJECT NUMBER: VT-23039-01
BORING LOCATION: Per Plan

DRILLING DATE: October 2, 2003
DRILLING METHOD: 6" Hollow Stem Auger
DRILL: CME-75
LOGGED BY: Wesley Smith

Vertical Depth	Sample Type: Bulk	Sample Type: SPT	Sample Type: Mod. Calif.	PENETRATION RESISTANCE (BLOWS/6")	SYMBOL	USCS CLASS	UNIT DRY WT. (pcf)	MOISTURE CONTENT (%)	DESCRIPTION OF UNITS
0									**TOPSOIL:** Grass and fine sandy silt.
			■	7/8/8		SM	108.1	3.6	**ALLUVIUM:** Silty fine to medium sand, dry to slightly moist, stiff, moderate yellowish brown.
5									
			■	5/7/9		ML	104.0	14.5	**ALLUVIUM:** Fine sandy silt, some clay, moist, stiff, moderate yellowish brown.
			■	3/6/7		ML			Same as above, except more fine sand.
10									Final Depth: 9.5 feet
									Groundwater was not encountered.
15									
20									
25									
30									
35									

Note: The stratification lines shown represent the approximate boundaries between soil and/or rock types and the transitions may be gradual.

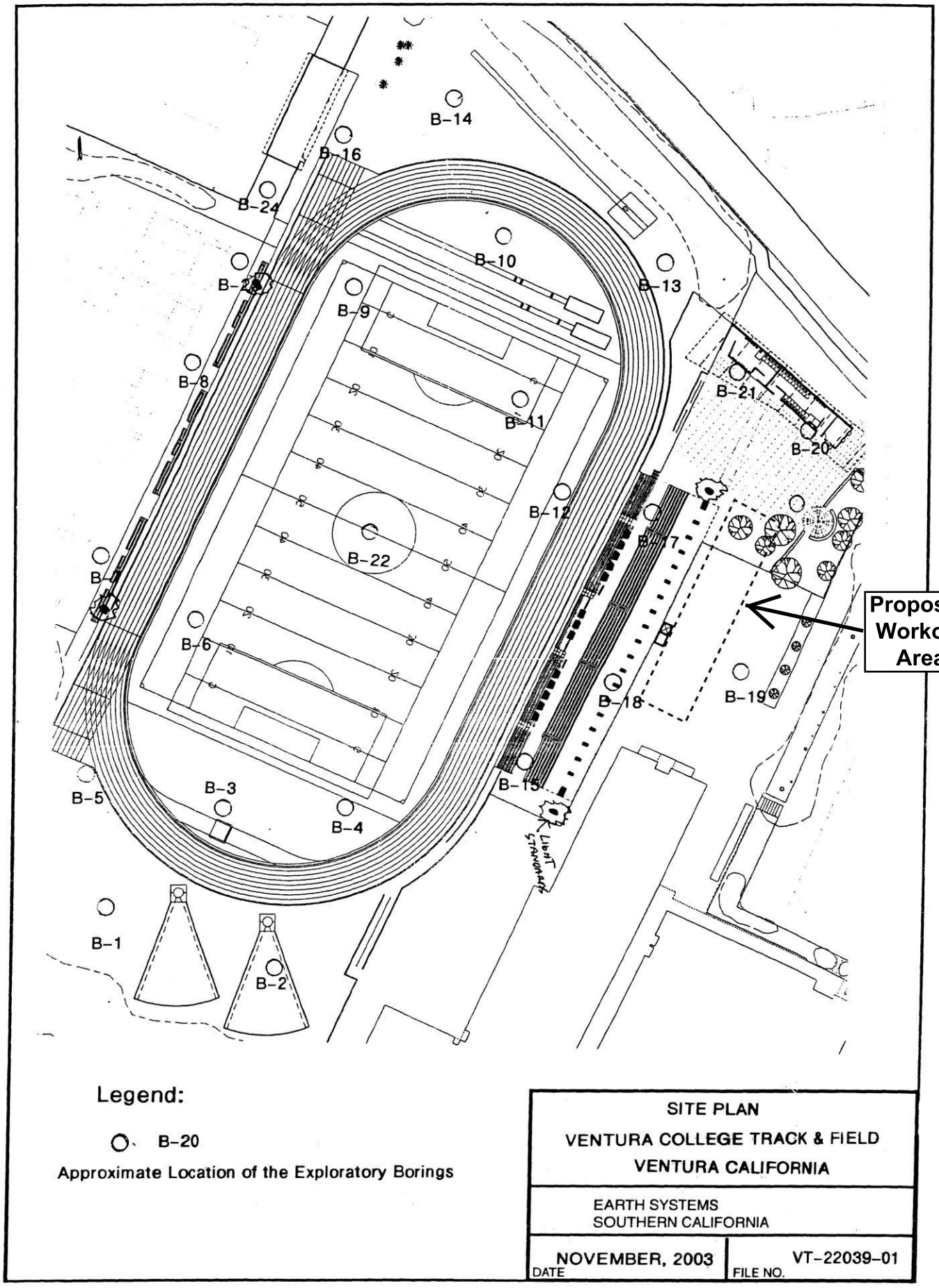
Earth Systems Southern California
1731-A Walter Street, Ventura, California 93003
PHONE: (805) 642-6727 FAX: (805) 642-1325

BORING NO: 20
PROJECT NAME: Ventura College Track & Field
PROJECT NUMBER: VT-23039-01
BORING LOCATION: Per Plan

DRILLING DATE: October 2, 2003
DRILLING METHOD: 6" Hollow Stem Auger
DRILL: CME-75
LOGGED BY: Wesley Smith

Vertical Depth	Sample Type: Bulk	Sample Type: SPT	Sample Type: Mod. Calif.	PENETRATION RESISTANCE (BLOWS/6"	SYMBOL	USCS CLASS	UNIT DRY WT. (pcf)	MOISTURE CONTENT (%)	DESCRIPTION OF UNITS
0									**TOPSOIL:** Grass and silty fine sand.
	X		■	8/10/11		SM	--	--	**ALLUVIUM:** Silty fine sand, moderately cemented, dry to slightly moist, medium dense, light yellowish brown.
	X		■	7/10/13		SM	106.3	5.2	Same as above.
5									
			■	6/9/12		SM	--	--	Same as above, except with 1/2" tree root running throughout sample.
10									Final Depth: 8.5 feet Groundwater was not encountered.
15									
20									
25									
30									
35									

Note: The stratification lines shown represent the approximate boundaries between soil and/or rock types and the transitions may be gradual.



SITE PLAN SHOWING BORING LOCATIONS RELATIVE TO WORKOUT AREA