GEOTECHNIQUES
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January 23, 2023
Project No. 1003.046

Moorpark College
Facilities, Maintenance & Operations
7075 Campus Road
Moorpark, California 93021

Attention: Mr. John Sinutko, Director of Facilities, Maintenance & Operations

Subject: Geotechnical Update, Volleyball Court Light Standards, Moorpark College, Moorpark, California

Dear Mr. Sinutko:

This letter report serves as an update to the original geotechnical study[1] and grading report[2] to provide recommendations for the design of foundation support for Musco lights planned around the perimeter of the proposed volleyball courts at Moorpark College. For this update, we have reviewed pertinent boring logs and laboratory data from the original study and the original grading plan and compaction test data to provide recommendations for foundation design for the new light standards.

PROPOSED PROJECT

The existing six tennis courts located south of the gymnasium will be converted to sand volleyball courts. The proposed Musco lights are anticipated to be up to about 60 feet high and will be located at or near the four corners and at regular intervals along both sides of the long axis of the court pad area perimeter. The Musco lights will be supported by drilled pier foundations. The asphalt concrete surface of the tennis courts will be removed to be replaced by a sand substrate for the 'beach' volleyball courts. The layout of the Musco lights relative to the volleyball courts is shown on Plate 1 – Site Layout Plan.

SITE CONDITIONS

The existing tennis courts are constructed on a level, graded fill pad with between about 8 and 16 feet of fill from the north to the south, respectively, according to the original grading plan (1965) which has been superimposed as the gray background on Plate 1.

Onsite sandy clay to clayey sand was used as fill during original grading and this material was to be compacted to a minimum of 90 percent of the maximum dry density[1]. Compaction test data from the grading report[2] is consistent with the recommendations of the original geotechnical report[1].

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[1] LeRoy Crandall and Associates (1965), "Report of Foundation Investigation, Proposed Moorpark College, Portions of Sections 36 and 36, T3N, R19W, for the Ventura County Junior College District," LCA Job No. A-65001, dated May 24.

Subsurface Conditions at Athletic Field

Earth materials encountered in the borings from the geotechnical study for the adjacent parking structure advanced in the immediate vicinity of the proposed volleyball courts[3] consist of sandy clay (CL) to clayey sand (SC). The logs of boring nos. 1 and 2 are included in the Appendix herein as Plates 2.1 through 2.4, and the approximate locations of those borings relative to the proposed volleyball courts are shown on Plate 1. The depth of fill approximated on the boring logs is consistent with fill depths shown on the original grading plan (1965) on Plate 1, and is noted thereon.

A direct shear test on a remolded sample of clayey sand fill taken from a backhoe trench ("T-2" on Plate 1) excavated adjacent to the easterly end of the courts for the parking structure site had an ultimate friction angle of 35 degrees. The results of that test are summarized on Plate 3.

ASCE 7-22 / 2022 CALIFORNIA BUILDING CODE SEISMIC PARAMETERS

Seismic design parameters for the west campus area were generated using site coordinates 34.2989° N, -118.8372° W, and in accordance with 2022 CBC and ASCE 7-22 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 7-22 and Section 1613.2.2 of the 2022 CBC).

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

Seismic Parameter[1]	Value (g)	CBC Source (or Other)
Mapped Spectral Response Acceleration		
S_s	2.25	Figure 1613.2.1 (1)
S_1	0.76	Figure 1613.2.1 (2)
S_{MS}	2.27	Equation 16-20
S_{M1}	1.71	Equation 16-21
Design Spectral Response Acceleration		
S_{DS}	1.51	Equation 16-22
S_{D1}	1.14	Equation 16-23
PGA (MCE_G)	0.87	(ASCE 7)

Because the mapped spectral response acceleration parameter at 1-second period, S_1, is greater than 0.75g, Seismic Design Category E is appropriate for Risk Category II structures.

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[2] LeRoy Crandall and Associates (1966), "Control of Compacted Fill, Proposed Moorpark College, Portions of Sections 35 and 36, T3N, and R19W, Ventura County, California," LCA Job No. B-65216, dated September 21

[3] Geotechniques (2011), "Geotechnical Study, Parking Structure, Moorpark College, Moorpark, California," Project No. 1003.026, February 25.

FOUNDATION RECOMMENDATIONS

Drilled cast-in-place concrete piers that embed the light base should be designed to derive all lateral support from compacted fill and/or native soil encountered below a design embedment starting 2 feet below the adjacent grade[4]. Light foundations should be set back a minimum horizontal distance of 5 feet from the top of the descending slope along the south/southeast side of the court pad area. 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), below the upper 2 feet, may be used when designing relatively short concrete drilled pier foundations, with a maximum value limited to 4,500 psf. A coefficient of friction of 0.4 may be combined with the passive resistance without reduction in the total resistance.

Allowable Bearing. An allowable bearing capacity of 2,500 psf is recommended for end-bearing on clayey sand fill and native materials. A one-third increase is allowed for transient loading conditions.

Drilled Shaft Construction Considerations. Drilled shafts for light foundations should be excavated to the minimum design embedment depth determined by others. The bottom of the drilled shaft should consist of clayey sand/sandy clay soil 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 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**. 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 OR PAVEMENT

The upper 1 foot of soil subgrade in areas to receive new on-grade concrete or pavement 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. Subgrade and base course in pavement areas should be firm and unyielding when proof-rolled with a full water truck.

[4] The upper 2 feet of embedment (with respect to lowest adjacent finish grade) should be neglected for lateral resistance.

UTILITY TRENCHES

Grass and root mat along utility trench alignment should be stripped and wasted offsite prior to excavating trench. Trench excavations should be braced or sloped in accordance with the requirements of (Cal) OSHA.

Bedding sand should, at a minimum, have an as-compacted thickness of 4 inches below the pipe invert, and pipe zone sand should have an as-compacted thickness of 12 inches over the top of pipe. Bedding and pipe zone sand should have a minimum Sand Equivalent of 30.

Trench backfill consisting of onsite excavated clayey sand should be moisture conditioned (or aerated, as needed) between 0 and 3 percent over optimum moisture content prior to placing in trench. Backfill should be compacted to a minimum of 90 percent relative compaction as determined from ASTM D1557, and 95 percent in the upper 1 foot of subgrade in concrete and pavement areas.

Rock larger than 3 inches in maximum dimension should be excluded from backfill. Jetting of trench backfill materials should not be permitted.

CLOSURE

The recommendations in this letter are specific to the scope of the proposed volleyball court area presented herein. Additionally, data, evaluations, and recommendations by Geotetchniques[3] in the referenced original study not specifically presented herein should be considered applicable to the subject site and should be considered to constitute the baseline geotechnical study for and applicable to this project.

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

Sincerely,

Geotechniques

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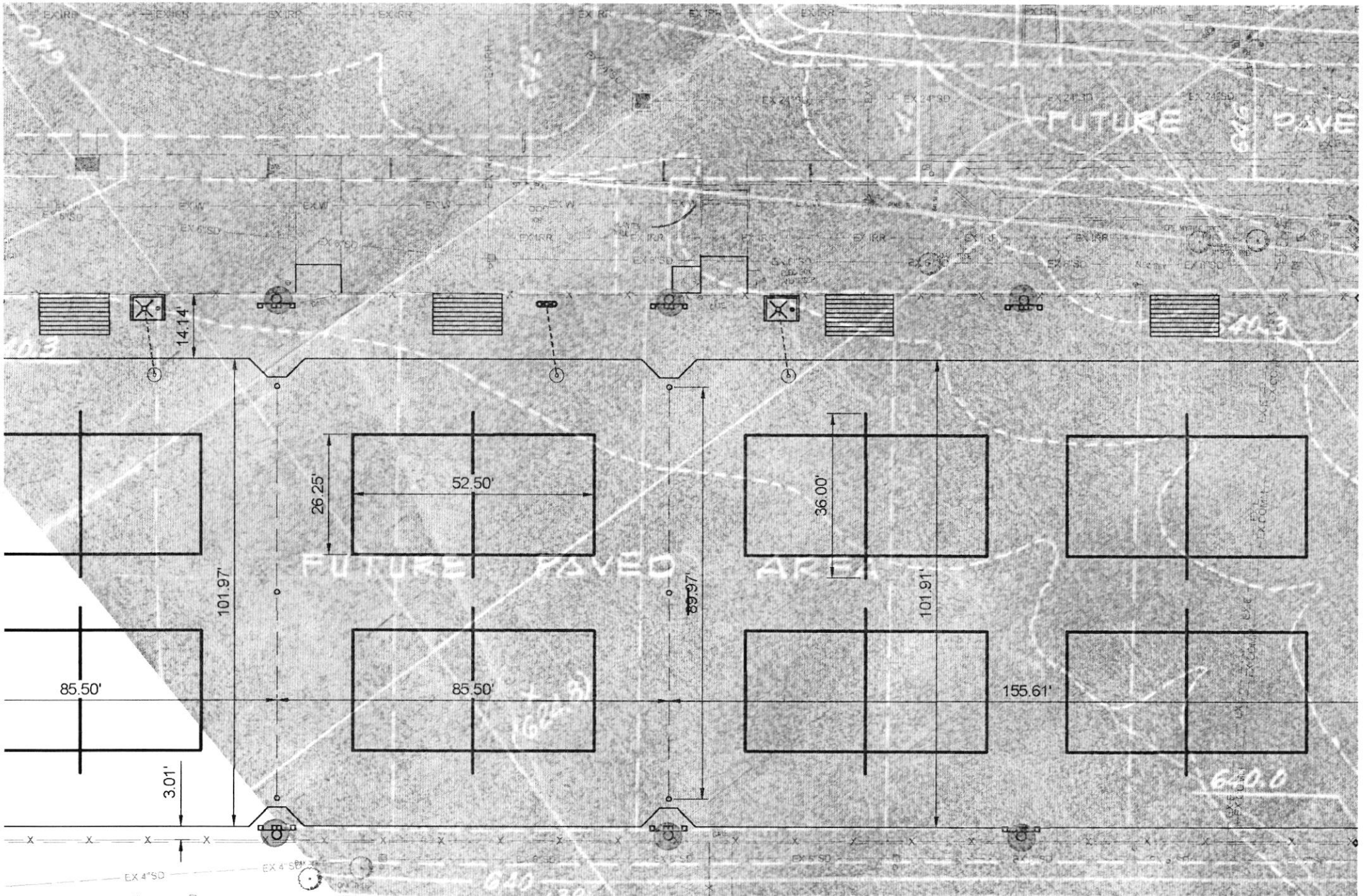
Encl: Appendix

Plate 1 - Site Layout Plan
Plates 2.1- 2.4 - Logs of Borings B-1 and B-2 from Parking Structure Study[3]
Plate 3 - Direct Shear Test

APPENDIX



riginal grading plan from 1965, showing then-existing (dashed lines) elevation contours
cal datum. (Current 1988 ["NAVD"] vertical datum is 2.6 feet higher.)

GEOTECHNIQUES
LOG OF EXPLORATORY BORING

PROJECT NO.:	1003.026	**DRILLER:**	Martini Drilling	**LOGGED BY:**	CW
PROJECT NAME:	Parking Structure	**DRILL METHOD:**	8-inch Hollow Stem Auger	**OPERATOR:**	Gene/Brandon
LOCATION:	South Campus, Moorpark College	**HAMMER:**	140 pound auto-trip	**RIG TYPE:**	CME 75
ELEVATION:	642 feet (approx.)			**DATE:**	11/12/2010

BORING NO.: B-1

Depth (ft)	SAMPLES: Sample Type	Blows/ 6"	SPT N-value	Sample Number	Graphical Log	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Laboratory Testing: Water Content (%)	Dry Density (pcf)	% Finer #200 Sieve/ Atterberg Limits
5		10 15 25	40	1		SC:	**ARTIFICIAL FILL (Qaf):** Very clayey SAND (SC): Medium red-brown, very dense, moist - mottled black, brown, orange-brown in sampler nose, at 6'	9	111.6	EI = 2
10		3 4 7	11	2		CL	**OLDER ALLUVIUM (Qoa):** Fine sandy lean CLAY (CL): Medium brown, stiff, moist - dark red-brown in sampler nose, at 11'	12	102	
15		4 5 8	13	3			- medium red-brown, medium stiff, at 15'	13	112	20/ LL ~ 26 PI ~ 10
20		3 3 2	5	4			- cuttings color change to medium brown, at 21'			
25		6 10 19	29	5		SC	Clayey fine SAND (SC): Medium brown, dense, moist	9	113	
							- drilling difficulty encountered, at 26'			
						SM	Very silty fine SAND (SM): Medium red-brown, very dense, with gravel, moist, occasional clay pods			

Legend: -Ring; -Disturbed Ring; - SPT; -- Bulk; - No Recovery; - Groundwater

check: cw 01/03/11

PLATE 2.1

GEOTECHNIQUES
LOG OF EXPLORATORY BORING

PROJECT NO.:	1003.026	**DRILLER:**	Martini Drilling	**LOGGED BY:**	CW
PROJECT NAME:	Parking Structure	**DRILL METHOD:**	8-inch Hollow Stem Auger	**OPERATOR:**	Gene/Brandon
LOCATION:	South Campus, Moorpark College	**HAMMER:**	140 pound auto-trip	**RIG TYPE:**	CME 75
ELEVATION:	642 feet (approx.)			**DATE:**	11/12/2010

Depth (ft)	SAMPLES: Sample Type	Blows/ 6"	N-value	Sample Number	Graphical Log	USCS Symbol	BORING NO.: B-1 (continued) / MATERIAL DESCRIPTION AND COMMENTS	Laboratory Testing: Water Content (%)	Dry Density (pcf)	Others
30	▨ ☒	3 13 16	29	6		SM	Very silty fine SAND (SM): Medium red-brown, very dense, with angular gravel, moist, occasional clay pods			
35	▨	18 18 51	69	7			- light red-brown to pink, very dense, slightly cemented, $CaCO_3$ and clay pods, at 35'	24	102	
40	▨ ☒	9 15 27	42	8			- very dense, at 40'			
45	▨	12 29 38	67	9			- very dense, at 45'	23	108	
50	☒	25 51		10			- pink to tan, very dense, cemented, with fine to medium gravel-sized shards, at 45'			
55							**TOTAL DEPTH 50.5 FEET** **GROUNDWATER NOT ENCOUNTERED** BORING BACKFILLED WITH CUTTINGS UPON COMPLETION.			

Legend: ▨ -Ring ▨ ' - Disturbed Ring ☒ '-Bulk ☐ -No Recovery ▽ -Groundwater

check: cw 01/03/11

PLATE 2.2

GEOTECHNIQUES
LOG OF EXPLORATORY BORING

PROJECT NO.:	1003.026	**DRILLER:**	Martini Drilling	**LOGGED BY:**	CW
PROJECT NAME:	Parking Structure	**DRILL METHOD:**	8-inch Hollow Stem Auger	**OPERATOR:**	Gene/Brandon
LOCATION:	South Campus, Moorpark College	**HAMMER:**	140 pound auto-trip	**RIG TYPE:**	CME 75
ELEVATION:	639 feet (approx.)			**DATE:**	11/12/2010

BORING NO.: B-2

Depth (ft)	SAMPLES: Sample Type	Blows/ 6"	SPT N-value	Sample Number	Graphical Log	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Laboratory Testing: Water Content (%)	Dry Density (pcf)	% Passing #200 Sieve
5		8 16 36	52	11		CL	**ARTIFICIAL FILL (Qaf):** Fine sandy lean CLAY (CL): Mottled medium - brown, light tan, and black , very dense, very moist	18	115	
10		7 6 13	19	12			- mottled dark brown and black, at 10'	17	114	
15		4 7 10	17	13		SC	**OLDER ALLUVIUM (Qoa):** Clayey fine SAND (SC): Medium to dark red brown, medium dense, moist	14	--	16
20		6 11 12	23	14		SC/ SM	Fine SAND with silt and clay (SC/SM): Medium orange-brown, dense, moist	12	113	
25		7 30 19	49	15		SP	- drilling chatter from gravel, at ~22.5 - ~23.5' Fine to medium SAND with gravel and cobbles (SP): Medium light brown, very dense, moist - with clay and fine gravel in nose, at 26' - drilling chatter, between ~26' and ~29'			

Legend: -Ring; -Disturbed Ring; - SPT; -- Bulk; - No Recovery; - Groundwater

check: cw 01/03/11

PLATE 2.3

GEOTECHNIQUES
LOG OF EXPLORATORY BORING

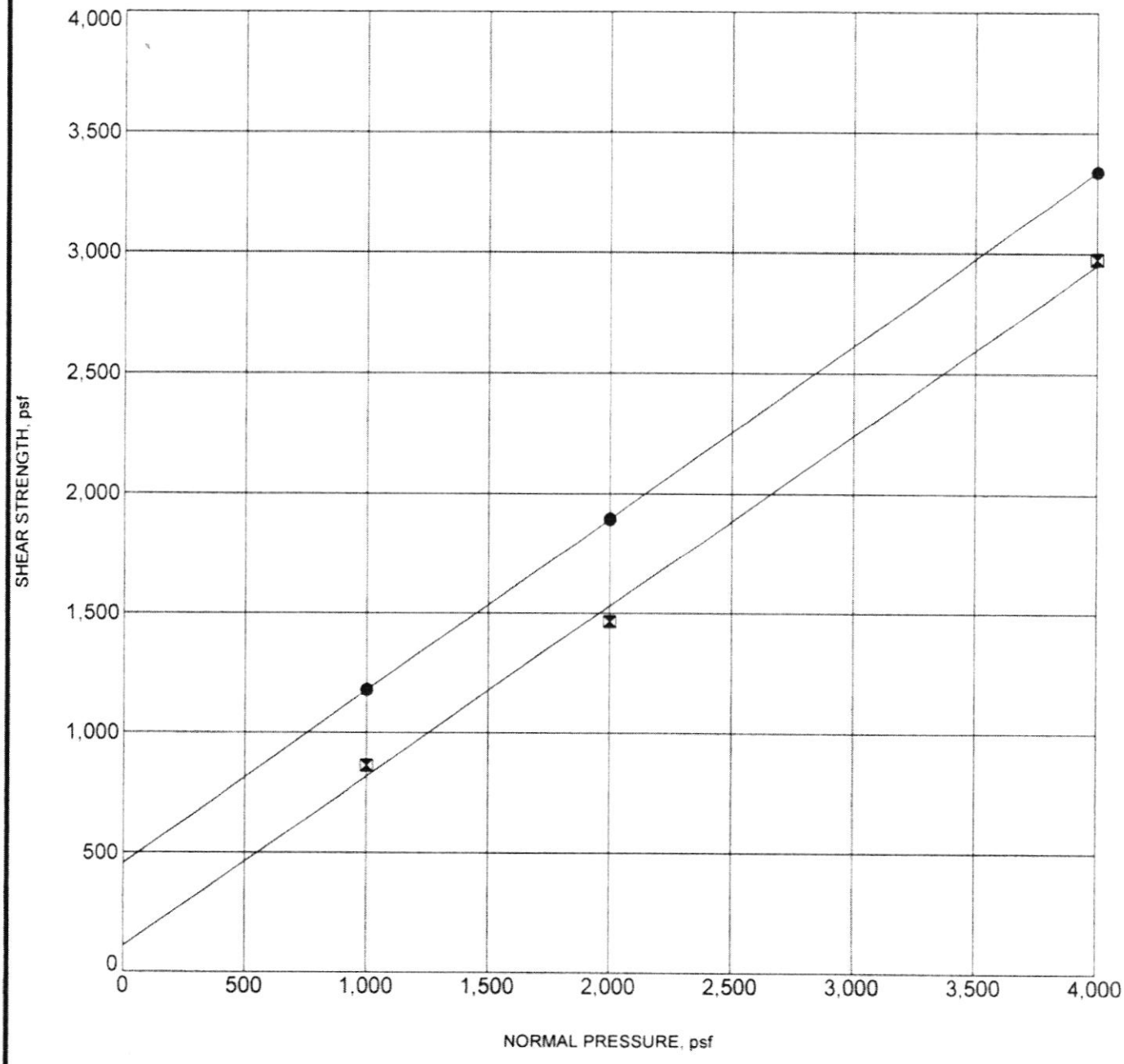
PROJECT NO.:	1003.026	**DRILLER:**	Martini Drilling	**LOGGED BY:**	CW
PROJECT NAME:	Parking Structure	**DRILL METHOD:**	8-inch Hollow Stem Auger	**OPERATOR:**	Gene/Brandon
LOCATION:	South Campus, Moorpark College	**HAMMER:**	140 pound auto-trip	**RIG TYPE:**	CME 75
ELEVATION:	639 feet (approx.)			**DATE:**	11/12/2010

Depth (ft)	SAMPLES: Sample Type	Blows/ 6"	N-value	Sample Number	Graphical Log	USCS Symbol	BORING NO.: B-2 (continued) / MATERIAL DESCRIPTION AND COMMENTS	Laboratory Testing: Water Content (%)	Dry Density (pcf)	% Finer #200 Sieve/ Atterberg Limits
30		9				SP	Fine to medium SAND with gravel and cobbles (SP): Medium light brown, very dense, moist			
		4								
	☒	2	6	16		CL	Fine sandy lean CLAY (CL): Light yellow-brown, medium stiff, very moist	20	--	33/ LL ~ 27 PI ~ 11
35		14				SM	Silty fine SAND (SM): Light yellow brown, very dense, trace fine gravel, moist			
		17								
	☒	25	42	17						
40		10								
		30					-with fine to medium rounded gravel, at 40'			
	☒	37	67	18						
	☒	>50		19			Fine SAND with clay (SC): Red-brown, very dense, moist			
45							- Refusal, at 45'			
							TOTAL DEPTH 45 FEET			
							GROUNDWATER NOT ENCOUNTERED			
							BORING BACKFILLED WITH CUTTINGS UPON COMPLETION			
50										
55										

Legend: ▪ -Ring ▨ ' - Disturbed Ring ▪ ☒ '-Bulk ☐ -No Recovery ▽ -Groundwater

check: cw 01/03/11

PLATE 2.4



Shear Strength Parameters

	Peak	Ultimate
Cohesion, C (psf):	455	110
Friction Angle, Ø (deg):	36	35

Sample No.: 2
Sample Location: east trench at Parking Structure
Sample Description: Sandy CLAY with silt (CL)
Strain Rate (in./min): 0.005
Dry Density (pcf): 116.8

Initial Moisture (%): 13.3
Final Moisture (%): 13.9

GEOTECHNIQUES

DIRECT SHEAR TEST

Moorpark College Parking Structure
Moorpark, California

Project No. 1003.026	REPORT DATE November 2012	PLATE 3