APPENDIX G

GEOTECHNICAL LABORATORY TESTING PROCEDURES AND RESULTS

APPENDIX G

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APPENDIX G

GEOTECHNICAL LABORATORY TESTING PROCEDURES AND RESULTS

G.1. GENERAL

This appendix contains descriptions of the procedures and the results of the geotechnical laboratory tests for the project. Samples recovered from the borings were tested to evaluate the basic index and engineering properties and strength of the subsurface soils and bedrock. Geotechnical laboratory testing of recovered soils included visual classifications, water content determinations, grain size and hydrometer analyses, compressive strength, Atterberg limits, and corrosion. The laboratory testing was performed in general accordance with ASTM International (ASTM) standard test procedures.

G.2. VISUAL CLASSIFICATION

Each soil and bedrock sample recovered from the borings was visually classified in our laboratory. The soil samples were classified using a system based on the ASTM Designation: D 2487-98, Standard Test Method for Classification of Soil for Engineering Purposes, and/or ASTM Designation: D 2488-00, Standard Recommended Practice for Description of Soils (Visual-Manual Procedure) (ASTM, 2007). These ASTM standards generally use the Unified Soil Classification System. Sample classifications have been incorporated into the soil and bedrock descriptions on the boring logs presented in Appendix C.

G.3. WATER CONTENT

The natural water content of selected soil and bedrock samples recovered from the borings was determined in general accordance with ASTM D 2216-98, Standard Method of Laboratory Determination of water (Moisture) Content of Soil, Rock, and Soil-Aggregate Mixtures (ASTM, 2007). Comparison of natural water content of a soil with its index properties can be useful in characterizing soil unit weight, consistency, compressibility, and strength. Water contents are presented on the boring logs in Appendix C.

G.4. GRAIN SIZE ANALYSIS

The grain size distribution of selected samples was tested using sieves and a hydrometer in general accordance with the ASTM D 422, Standard Test Method for Particle-Size Analysis of Soils (ASTM, 2007). This test is useful for classifying soil, for providing correlation with soil properties, and for evaluating liquefaction potential.

Grain size analysis results could be affected by sample type and drilling method. The inside diameter of the sampler, directly impacts the maximum particle size that can be sampled. For example, the largest diameter particle that can be sampled by a 2-inch SPT sampler (1.375 inch I.D.) is approximately 1.3 inches, regardless of the maximum particle size of the soil unit being sampled. By comparison, the sonic core samples can obtain maximum particle sizes up to 3 to 4 inches. The drilling method could also potentially impact grain size analysis data. During mud rotary drilling, drilling mud can infiltrate open deposits of sand and gravel. This process can affect the sample by "cleaning" the sample (removing fines), adding bentonite clay (contained in the drilling mud) to the sample, or varying degrees of both. Field staff removes drilling mud from mud rotary borings to the extent practical; however, it is often impossible to completely clean the sample.

Results of these analyses are presented as grain size distribution curves in Figure G-1. Each gradation sheet provides the boring number, sample depth, USCS group symbol, and the Atterberg limits. The percent passing the No. 200 sieve (0.075 mm) is shown on the exploration logs included in Appendix C.

G.5. ATTERBERG LIMITS

Atterberg Limit tests were performed on 8 selected samples of fine-grained soil in general accordance with ASTM Designation: D 4318, Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils. The Atterberg Limits include Liquid Limit (LL), Plastic Limit (PL), and Plasticity Index (PI=LL-PL). They are generally used to assist in classification of soil, to indicate soil consistency (when compared with natural water content), and to provide correlation to soil properties including compressibility and strength.

The results of the Atterberg Limits tests are shown in the appropriate boring logs in Appendix C, and in the plasticity charts presented in Figures G-2.

G.6. UNIAXIAL COMPRESSIVE STRENGTH

The unconfined compressive strength provides an index of the hardness of the rock and an indication of the strength of the intact rock material, which is the strength of the rock not considering joints and other planes of weakness. In an unconfined compressive test, a cylindrical sample (often in the form of a rock core) is compressed parallel to its longitudinal axis. Procedures for this test are provided in the American Society of Testing and Materials (ASTM) D2938.

A total of 6 unconfined compression tests were performed on rock core samples obtained from brings B-10 and B-11. The tests were performed by Geo-Logic Associates, of Orange County, California, under subcontract to Shannon & Wilson in general accordance with ASTM D 2938, Unconfined Compressive Strength of Intact Rock Core Specimens. Samples were selected from lengths of core where planes of weakness were not visible, and an attempt was made in the field to select samples that were representative of the core. In addition to the unconfined compression tests, unit weight measurements were made on each unconfined compression test sample in general accordance with ASTM-D-2216, Unit Weight of Rock. The test results are presented in Figure G-3.

G.7. CORROSIVITY TESTING

Soil samples for corrosion testing were selected and submitted to AP Engineering & Testing, Inc., which tested the samples for corrosion parameters, including pH, resistivity, and chloride and sulfate concentrations. The tests were performed in accordance with California Test Methods 417, 422, 532, and 643 (CTM, 1978, 2006a, 2006b, 2007). The results of the corrosion tests are presented in AP's report, dated August 7, 2012, presented herein as Figure G-4.

G.8. REFERENCES

ASTM International (ASTM), 2007, Annual book of ASTM standards: soil and rock, building stone; geosynthetics: Philadelphia, Pa., ASTM International, v. 04.08 and 4.09.

ASTM International (ASTM), 2010, Annual book of ASTM standards: Standard test method for compressive strength and elastic moduli of intact rock core specimens under varying states of stress and temperatures: Philadelphia, Pa., ASTM International, v. 04.09.

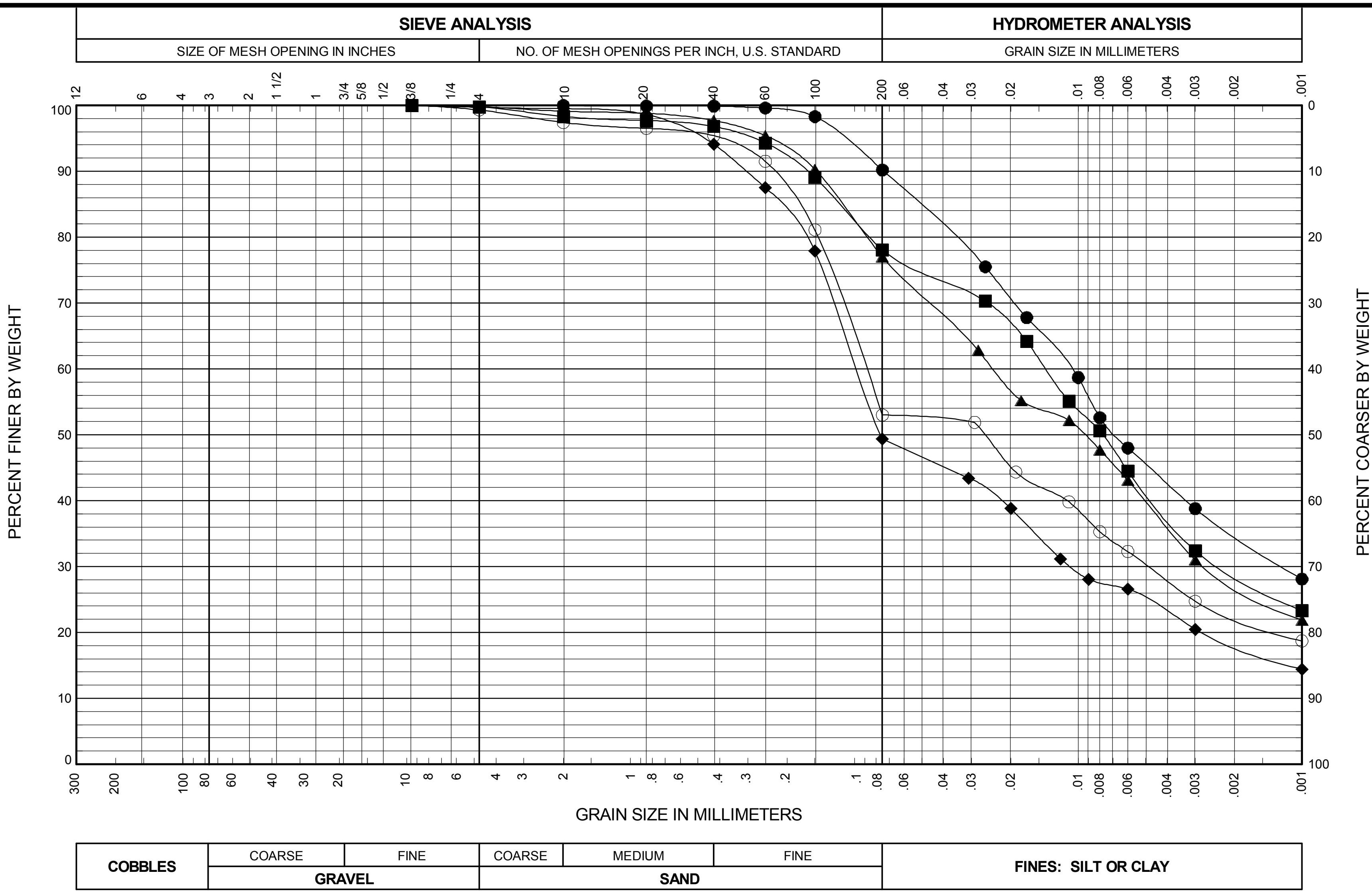
ASTM International (ASTM), 2006, Annual book of ASTM standards: Standard test method for torsional ring shear test to determine drained residual shear strength of cohesive soils: Philadelphia, Pa., ASTM International, v. 04.09.

California Test Methods (CTM), 1978, Materials Engineering and Testing Services - California Test Methods: Method for Estimating the Time to Corrosion of Reinforced Concrete Structures: Sacramento, Ca., California Department of Transportation.

California Test Methods (CTM), 2006a, Materials Engineering and Testing Services - California Test Methods: Method of Testing Soils and Waters for Sulfate Content: Sacramento, Ca., California Department of Transportation.

California Test Methods (CTM), 2006b, Materials Engineering and Testing Services - California Test Methods: Method of Testing Soils and Waters for Chloride Content: Sacramento, Ca., California Department of Transportation.

California Test Methods (CTM), 2007, Materials Engineering and Testing Services - California Test Methods: Method for Determining Field and Laboratory Resistivity and pH Measurements for Soil and Water: Sacramento, Ca., California Department of Transportation.



BORING AND SAMPLE NO.	DEPTH (feet)	U.S.C.S. SYMBOL	SAMPLE DESCRIPTION	FINES %	NAT. W.C. %	LL %	PL %	PI %
● B-10, S-10	50.7	CH	Slightly sandy CLAY; CH.	90.2	30.6	66	32	34
■ B-10, S-11	60.2	CH	Soft silty CLAY; CH.	78.1	29.2	67	31	36
▲ B-10, S-12	60.7	CH	Soft silty CLAY; CH.	77.0	27.9	59	26	33
◆ B-10, S-18	93.0	CH	Sandy CLAY; CH.	49.4	12.9	55	23	32
○ B-10, S-19	99.5	CH	Sandy CLAY, trace gravel; CH.	53.0	12.9	59	24	35

White Point Landslide
San Pedro District
Los Angeles, California

GRAIN SIZE DISTRIBUTION

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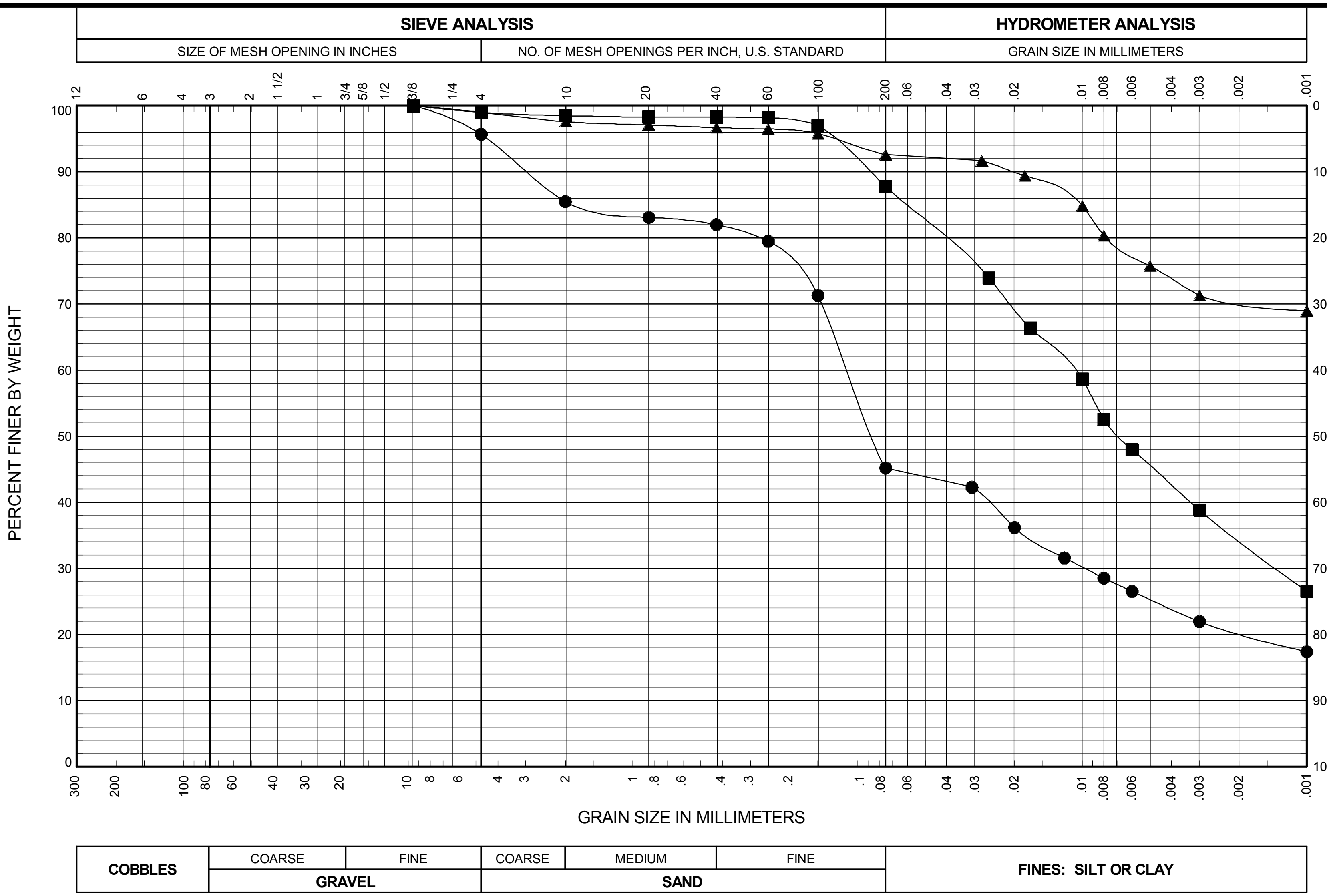
FIG. G-1
Sheet 1 of 2

FIG. G-1



BORING AND SAMPLE NO.	DEPTH (feet)	U.S.C.S. SYMBOL	SAMPLE DESCRIPTION	FINES %	NAT. W.C. %	LL %	PL %	PI %
● B-11, S-6	30.8	CL	Sandy CLAY; CL.	45.2	22.2	33	23	10
■ B-11, S-8	40.8	CH	Silty CLAY seam; CH.	87.8	33.3	62	30	32
▲ B-11, S-15	77.4	CH	Slightly sandy CLAY, trace gravel; CH.	92.6	41.2	92	41	51

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GRAIN SIZE DISTRIBUTION

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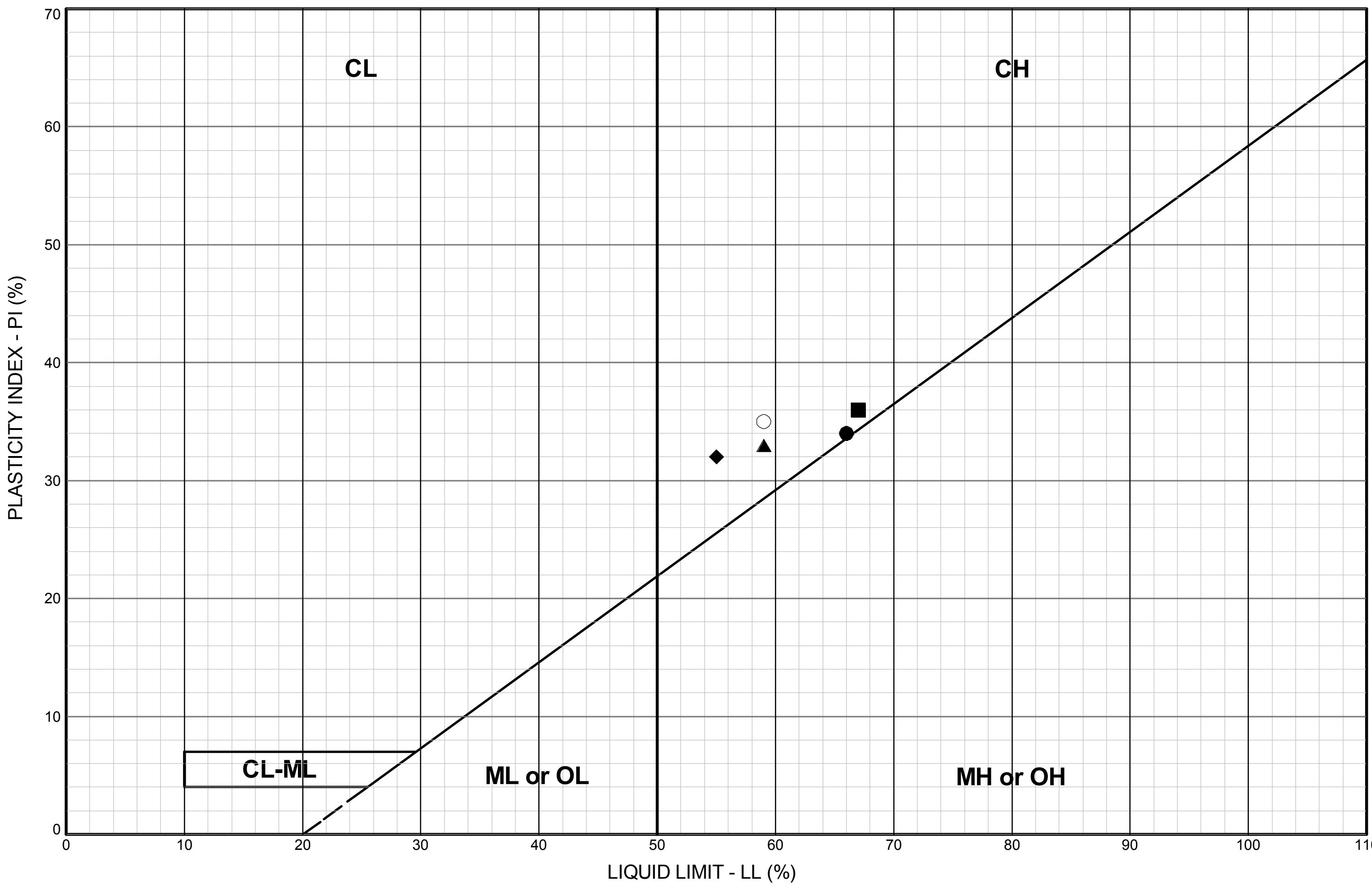
FIG. G-2
Sheet 2 of 2

FIG. G-2

GSA_MAIN 51-1-10052 SAN PEDRO LANDSLIDE.GPJ SHAN_WIL.GDT 12/12/12



LEGEND

CL: Low plasticity inorganic clays; sandy and silty clays

CH: High plasticity inorganic clays

ML or OL: Inorganic and organic silts and clayey silts of low plasticity

MH or OH: Inorganic and organic silts and clayey silts of high plasticity

CL-ML: Silty clays and clayey silts

BORING AND SAMPLE NO.	DEPTH (feet)	U.S.C.S. SYMBOL	SOIL CLASSIFICATION	LL %	PL %	PI %	NAT. W.C. %	PASS. #200, %
● B-10, S-10	50.7	CH	Slightly sandy CLAY; CH.	66	32	34	30.6	90.2
■ B-10, S-11	60.2	CH	Soft silty CLAY; CH.	67	31	36	29.2	78.1
▲ B-10, S-12	60.7	CH	Soft silty CLAY; CH.	59	26	33	27.9	77.0
◆ B-10, S-18	93.0	CH	Sandy CLAY; CH.	55	23	32	12.9	49.4
○ B-10, S-19	99.5	CH	Sandy CLAY, trace gravel; CH.	59	24	35	12.9	53.0

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Los Angeles, California

PLASTICITY CHART

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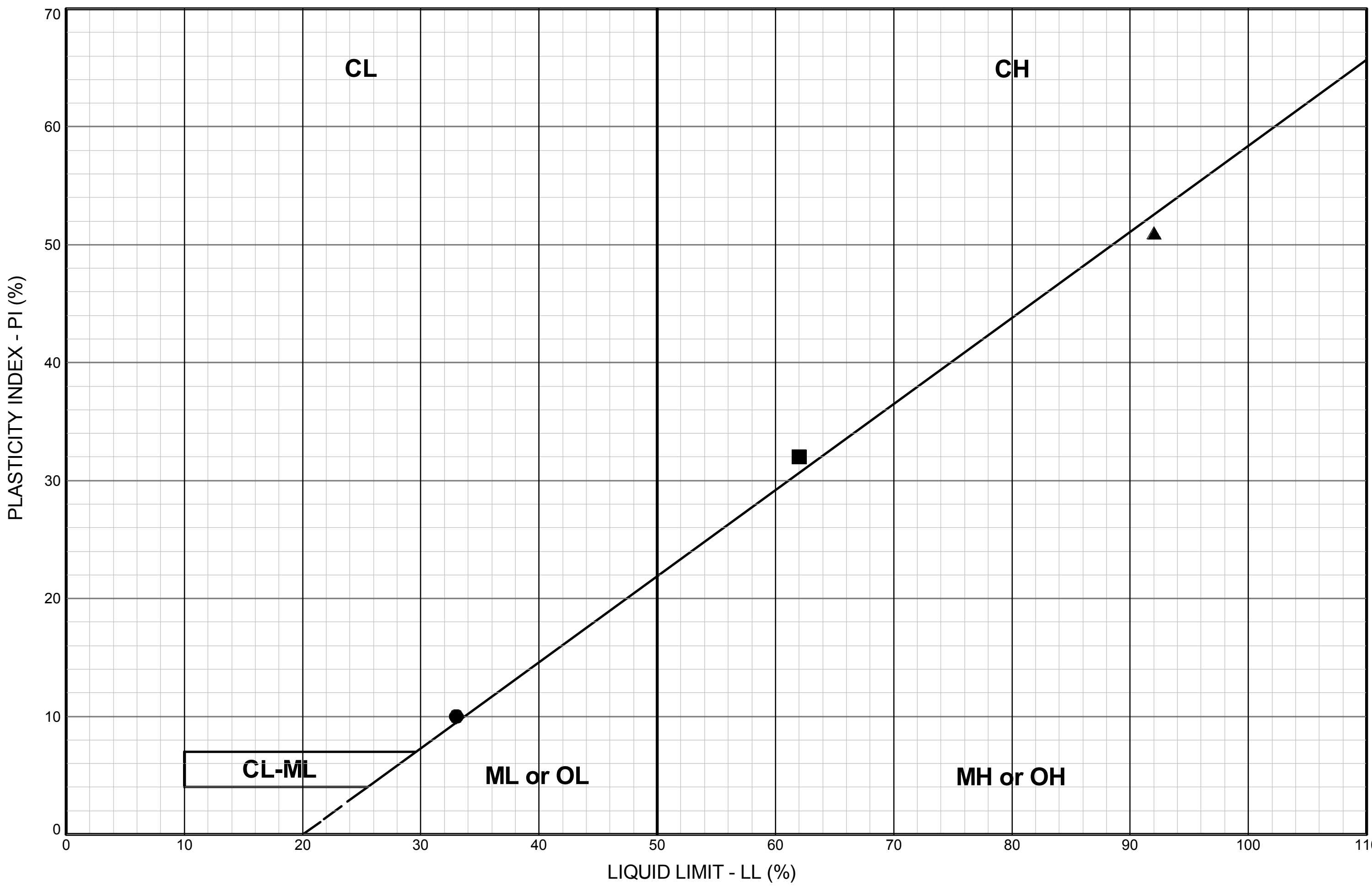
FIG. G-2
Sheet 1 of 2

City of Los Angeles

FIG. G-2



LEGEND

CL: Low plasticity inorganic clays; sandy and silty clays

CH: High plasticity inorganic clays

ML or OL: Inorganic and organic silts and clayey silts of low plasticity

MH or OH: Inorganic and organic silts and clayey silts of high plasticity

CL-ML: Silty clays and clayey silts

BORING AND SAMPLE NO.	DEPTH (feet)	U.S.C.S. SYMBOL	SOIL CLASSIFICATION	LL %	PL %	PI %	NAT. W.C. %	PASS. #200, %
● B-11, S-6	30.8	CL	Sandy CLAY; CL.	33	23	10	22.2	45.2
■ B-11, S-8	40.8	CH	Silty CLAY seam; CH.	62	30	32	33.3	87.8
▲ B-11, S-15	77.4	CH	Slightly sandy CLAY, trace gravel; CH.	92	41	51	41.2	92.6

White Point Landslide
San Pedro District
Los Angeles, California

PLASTICITY CHART

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FIG. G-2
Sheet 1 of 2

City of Los Angeles

Unconfined Compressive Test of Rock Core - ASTM D2938

Client: Shannon & Wilson, Inc.
White Point Landslide
51-1-10052-021

GLA Job No. 2012-0119
Date: 08/23/12
Tested by: LD

Boring	Depth	Heigth (in)	Diam. (in)	Weight (gr.)	Unit Weight (pcf)	Max. Load (lbs)	Compressive Strength (psi)
B-10	81' - 82.5'	5.012	2.385	872.8	148.6	6185	1385
B-10	104.1' - 105.1'	5.016	2.380	951.7	162.6	12530	2818
B-10	128.1' - 130.1'	5.037	2.400	716.3	119.8	1730	383
B-11	60.5' - 61.1'	5.032	2.390	800.1	135.1	4515	1007
B-11	70.9' - 71.5'	5.035	2.386	682.2	115.5	2585	578
B-11	110.5' - 111.2'	5.059	2.392	856.2	143.5	13330	2968

*** Loading rate: 20 lbs / sec*

Geo-Logic Associates

Filename: I:\PROJECTS\10052 San Pedro Landslide\021 DW - Geotechnical Design\Graphics\FIG G-3.dwg Date: 11-13-2012 Login: Louis Larios

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FIG. G-3

AP Engineering & Testing, Inc.

CORROSION TEST RESULTS

Client Name: Shannon & Wilson, Inc.
Project Name: White Point Landslide
Project No.: 51-1-10052-021

AP Job No.: 12-0773
Date 08/07/12

Boring No.	Sample No.	Depth (feet)	Soil Type	Minimum Resistivity (ohm-cm)	pH	Sulfate Content (ppm)	Chloride Content (ppm)
B-10	N/A	27.4	SM	626	5.6	2541	195
B-10	N/A	46.5	SM	329	7.5	2623	301
B-10	N/A	91.2	SM	302	7.2	3158	18
B-11	N/A	30.1	SM	354	5.2	6078	444
B-11	N/A	68.7	SM	309	7.4	1603	139
B-11	N/A	125.2	SM	297	7.2	2911	13

NOTES:
Resistivity Test and pH: California Test Method 643
Sulfate Content : California Test Method 417
Chloride Content : California Test Method 422
ND = Not Detectable
NA = Not Sufficient Sample
NR = Not Requested

2607 Pomona Boulevard, Pomona, CA 91768
Tel. (909) 869-6316 Fax. (909)869-6318

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FIG. G-4