APPENDIX C

SUMMARY OF GRANULAR AND FINE GRAINED SOIL COMPONENTS

Boring No.	Depth (ft.)	Soil Type	Percentage Sand/Gravel	Percentage Silt/Clay
S-1	2.0	ML	25	75
S-1	21	CL-ML	25	75
S-4	10	CL-ML	2	98
S-7	20	SP	96	4
S-10	5	CL-ML	19	81
S-10	10	SM	55	45
S-12	10	CL-ML	20	80
S-12	15	CL-ML	27	73
S-13	25	SP-SM	91	9
TU-5	14	SM	86	14

EXPANSION TEST RESULTS

Boring No.	Depth (ft.)	Soil Type	Expansion (%)		
			Air Dried/Field	Field/Saturated	Air Dried/ Saturated
C-4	18	CL	9.0	4.4	13.4
S-1	2	CL	4.9	0.9	5.8
S-7	4	CL	12.2	2.4	14.6
S-9	5	CL	9.0	1.0	10.0
PL-7	20	CL	12.1	5.0	17.4

APPROVED BY: DATE: PREPARED BY: CHECKED BY:

SAND EQUIVALENT TEST

Boring No.	Depth (ft.)	Soil Type	Sand Equivalent
C-12	11	ML	4
PL-2	17	SM	9
PL-4	21	SM	38
PL-5	16	ML	2
PL-6	18	SP-SM	48
PL-8	15	SM	30
SP-2	13	SM	8

DIRECT SHEAR TEST RESULTS

Boring No.	Depth (ft.)	Soil Type	Normal Stress (pcf)	Shear Strength (pcf)
S-7	6	ML	250	280
S-7	6	ML	1000	400
S-7	6	ML	2000	1000
S-7	11	SM	500	300
S-7	11	SM	1200	1850
S-7	11	SM	2200	1900

R VALUE TEST RESULTS

Boring No.	Depth (ft.)	Soil Type	R Value
B-3	11	CL	3
PL-5	16	CL	4
PL-8	15	SM	63

APPROVED BY: DATE: PREPARED BY: CHECKED BY:

UNCONFINED COMPRESSION TEST RESULTS

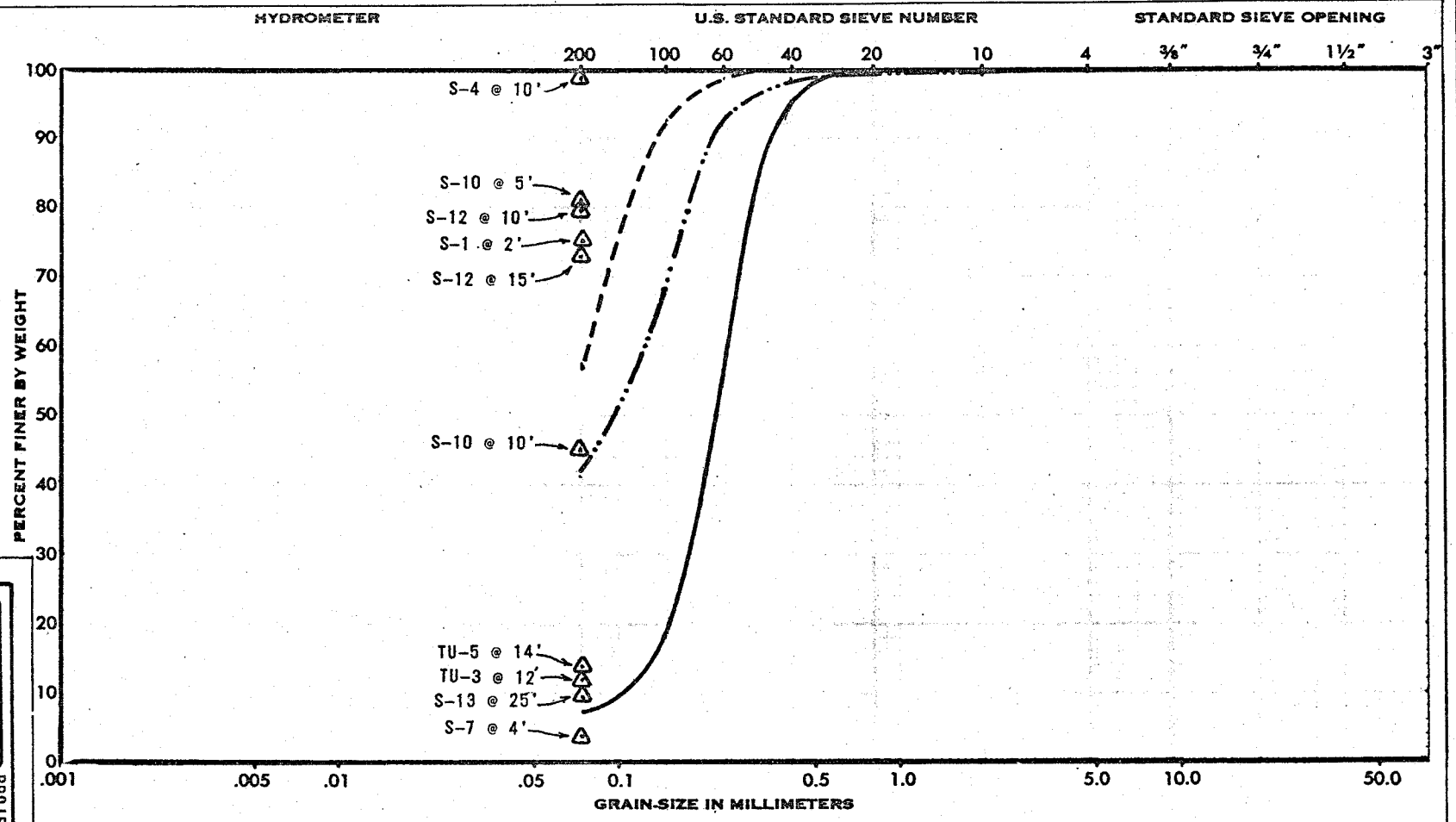
Boring No.	Depth (ft.)	Soil Type	Unconfined Compressive Strength (psf)	Cohesion (psf)
S-10	1	SC	26,035	13,017
S-12	3	CL	10,080	5,040
S-12	5	CL	29,400	14,700
S-12	7	CL	7,056	3,528
TU-1	27	CH	3,348	1,674*
TU-3	12	SP-SM	1,180	590**

* Failure occurred primarily in 1"-2" sand seam.

** When dried, similar sample collapsed before testing.

APPROVED BY: DATE: PREPARED BY: CHECKED BY:

FUGRO, Inc. PREPARED BY: M.R. Andelin CHECKED BY: M.R. APPROVED BY: _____ DATE: _____



SILT OR CLAY	SAND			GRAVEL	
	FINE	MEDIUM	COARSE	FINE	COARSE

SYMBOL	BORING NUMBER	SAMPLE NUMBER	SAMPLE INTERVAL	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	SOIL TYPE
———	S-5	6	14-15	—	—	—	SP-SM
– – –	S-13	6	14-15	—	—	—	CL
—·—·—	SP-2	BAG	13-14	—	—	—	SM

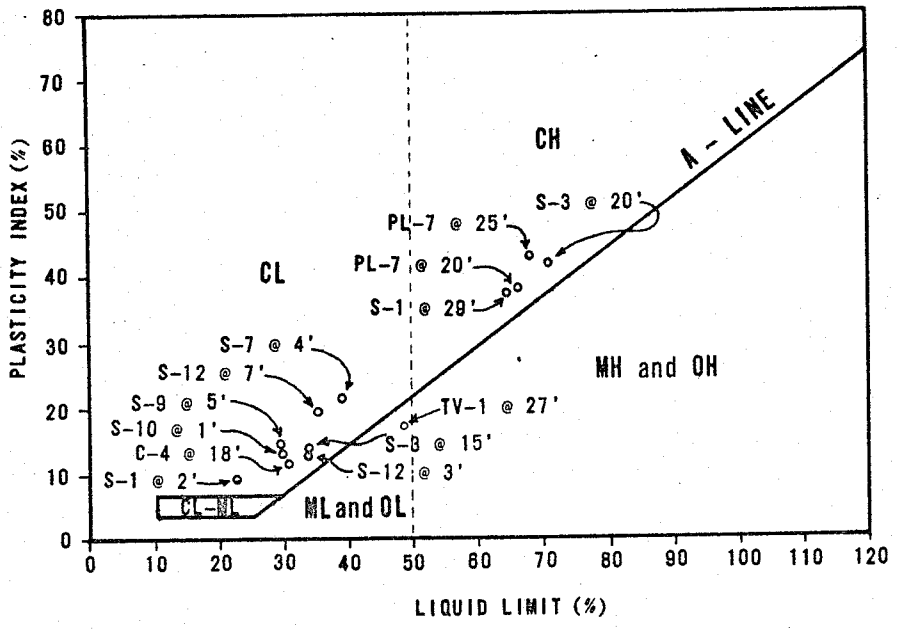
△ WASH TEST RESULT

GRAIN SIZE SUMMARY

PROJECT NO.: 75-083-E

LOS ANGELES COUNTY SANITATION DISTRICT

PLATE C-4



Boring No.	Depth (ft.)	Liquid Limit (%)	Plastic Limit (%)	Plastic Index (%)
C-4	18	31	18	13
PL-7	20	66	28	38
PL-7	25	68	24	44
S-1	2	24	15	9
S-1	29	65	27	38
S-3	15	34	20	14
S-3	20	71	30	41
S-7	4	39	17	22
S-9	5	30	17	13
S-10	1	30	16	14
S-12	3	34	21	13
S-12	7	35	16	19
TU-1	27	49	32	17

PROJECT NO.: 75-083-E

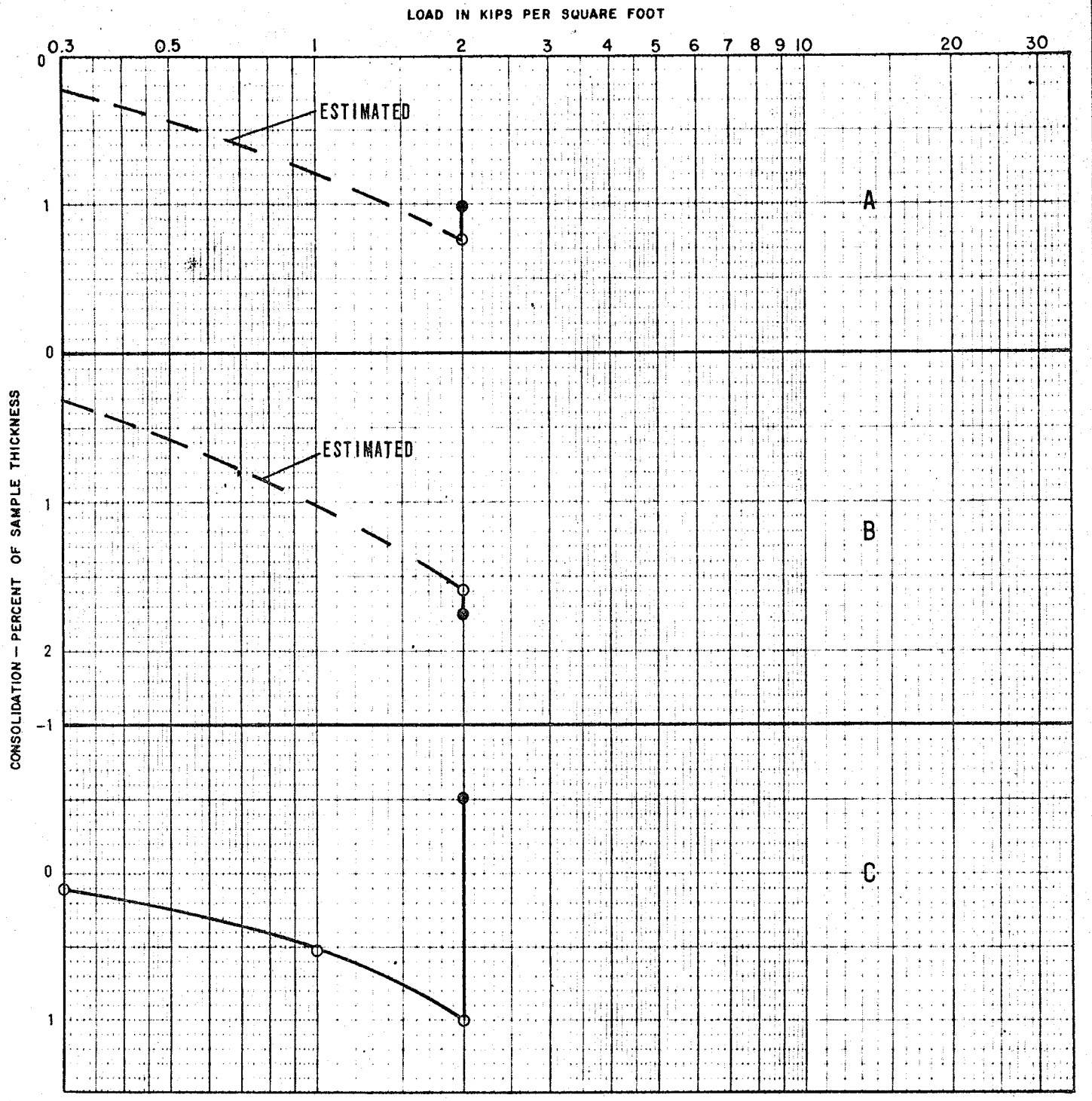
LOS ANGELES COUNTY
SANITATION DISTRICT

SUMMARY
OF
ATTERBERG LIMITS TESTS

PLATE C-5

PROJECT NO: 75-083-E

MODIFIED CONSOLIDATION TEST RESULTS



SYMBOL	BORING NUMBER	SAMPLE INTERVAL	TYPE OF SAMPLE	SOIL TYPE	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	e_o
A	C-5	21-22	RING	ML-CL	109.1	18.7	.51
B	C-8	20-21	RING	SP	104.7	3.4	.64
C	PL-7	20-21	RING	CL	91.8	32.5	.80

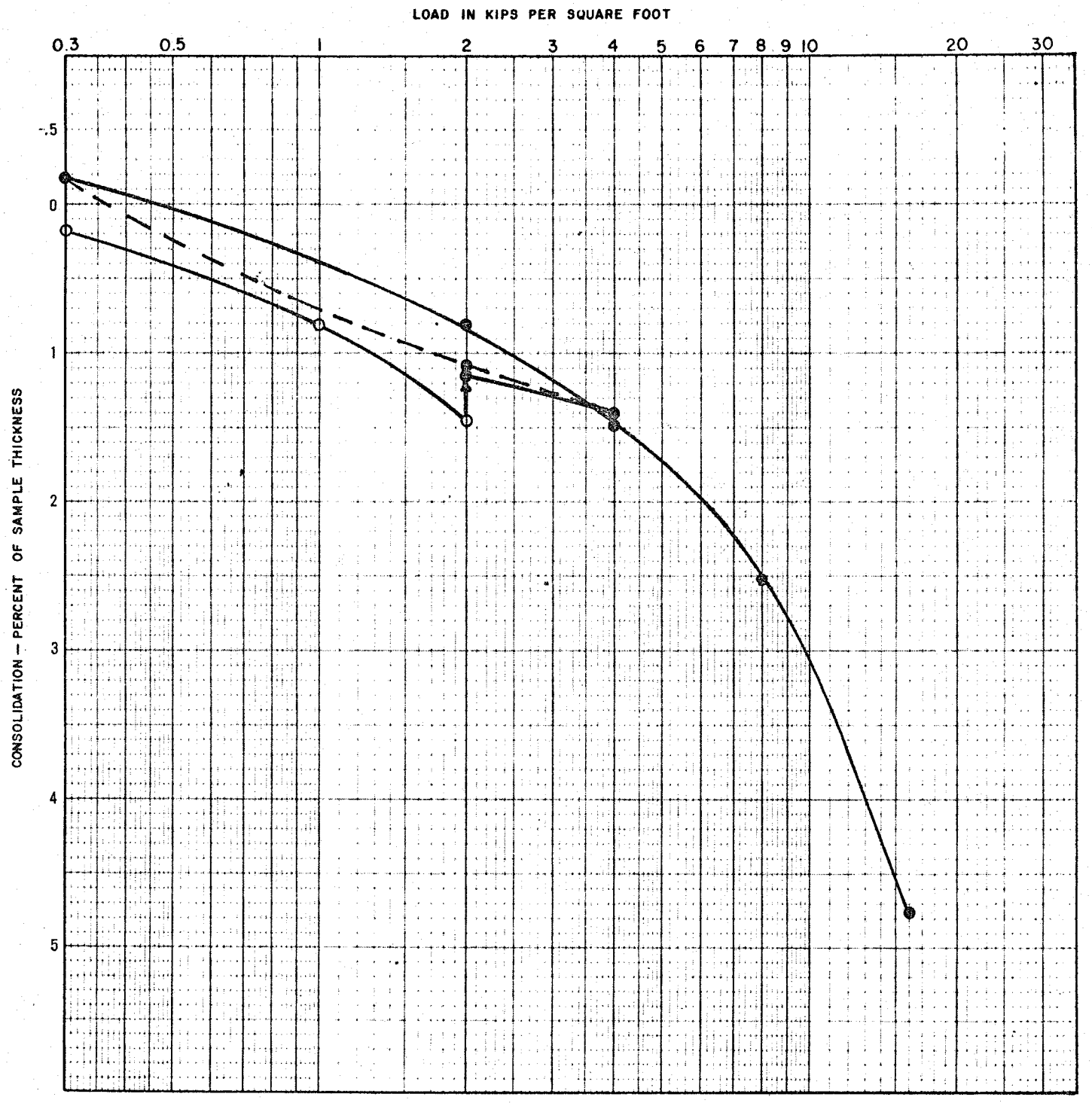
● SAMPLE SATURATED

○ SAMPLE AT FIELD MOISTURE

APPROVED BY _____ DATE _____ PREPARED BY _____ CHECKED BY _____

PROJECT NO: 75-083-E

CONSOLIDATION TEST RESULT



SYMBOL	BORING NUMBER	SAMPLE INTERVAL	TYPE OF SAMPLE	SOIL TYPE	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	e_o	C_c	C_r
	S-7	3.6-4.3	RING	CL	115.8	17.0	.43	.12	.02

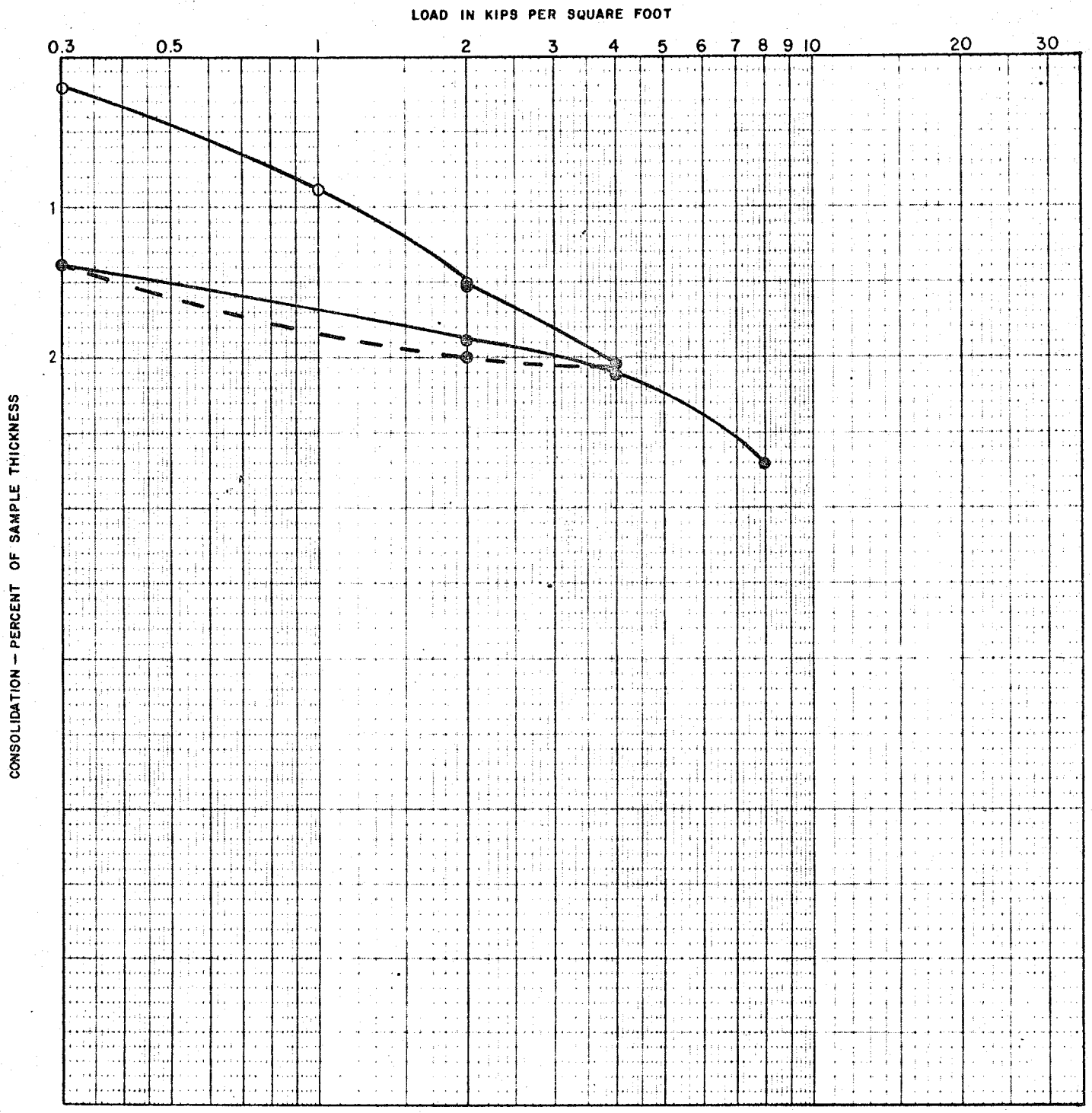
● SAMPLE SATURATED

○ SAMPLE AT FIELD MOISTURE

APPROVED BY _____ DATE _____ PREPARED BY _____ CHECKED BY _____

PROJECT NO: 75-083-E

CONSOLIDATION TEST RESULT



APPROVED BY _____ DATE _____ PREPARED BY _____ CHECKED BY _____

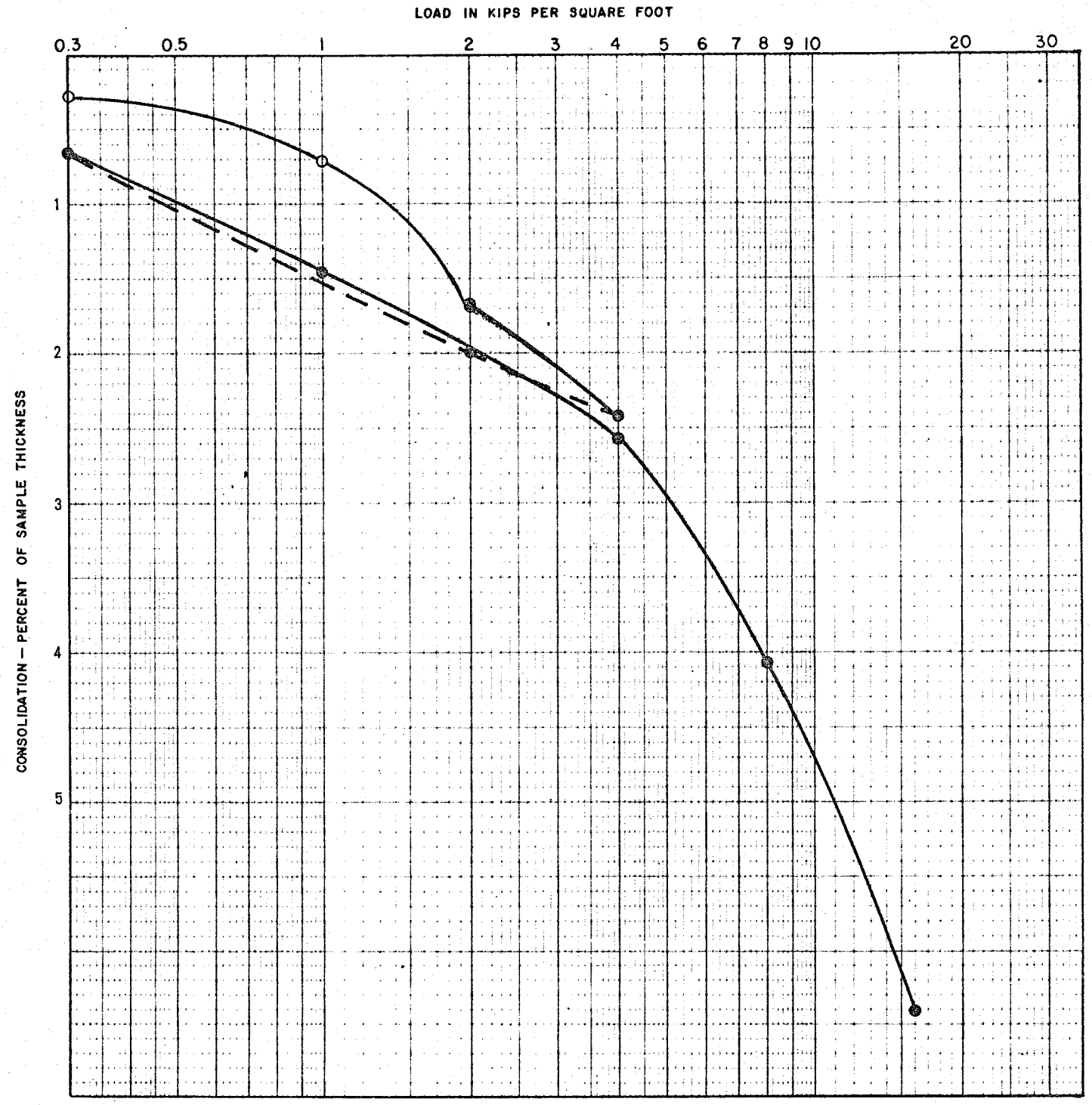
SYMBOL	BORING NUMBER	SAMPLE INTERVAL	TYPE OF SAMPLE	SOIL TYPE	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	e_o	C_c	C_r
	S-7	19.6-20.3	RING	SP-SM	108.4	3.9	0.52	.01	.004

● SAMPLE SATURATED

○ SAMPLE AT FIELD MOISTURE

PROJECT NO: 75-083-E

CONSOLIDATION TEST RESULT



SYMBOL	BORING NUMBER	SAMPLE INTERVAL	TYPE OF SAMPLE	SOIL TYPE	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	e_o	C_c	C_r
	S-9	5-6	RING	ML	110.3	18.0	.50	.11	.02

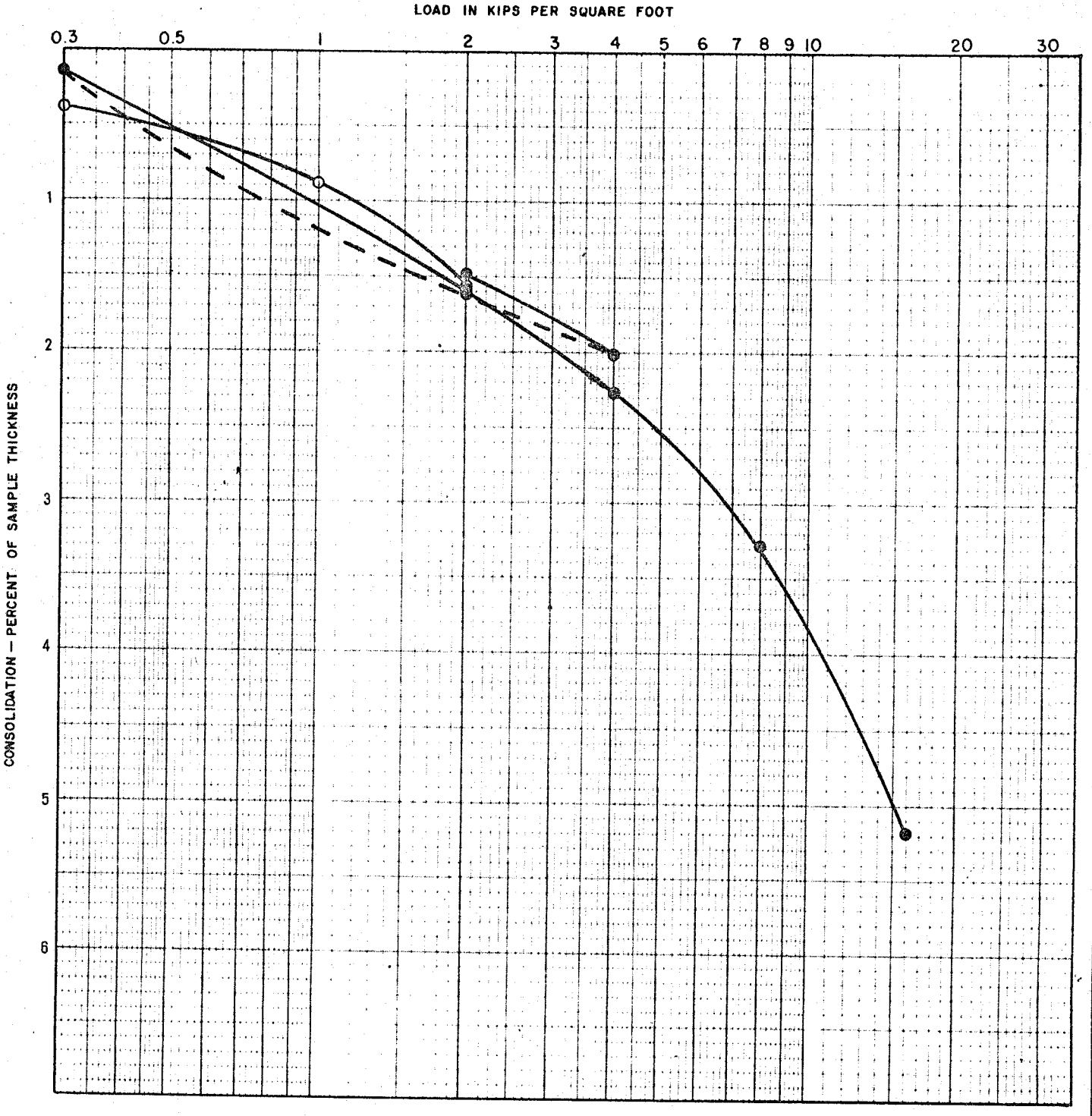
● SAMPLE SATURATED

○ SAMPLE AT FIELD MOISTURE

APPROVED BY _____ DATE _____ PREPARED BY _____ CHECKED BY _____

PROJECT NO: 75-083-E

CONSOLIDATION TEST RESULT



SYMBOL	BORING NUMBER	SAMPLE INTERVAL	TYPE OF SAMPLE	SOIL TYPE	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	e_o	C_c	C_r
	S-12	14.6-15.3	RING	CL	96.6	24.7	.71	.13	.03

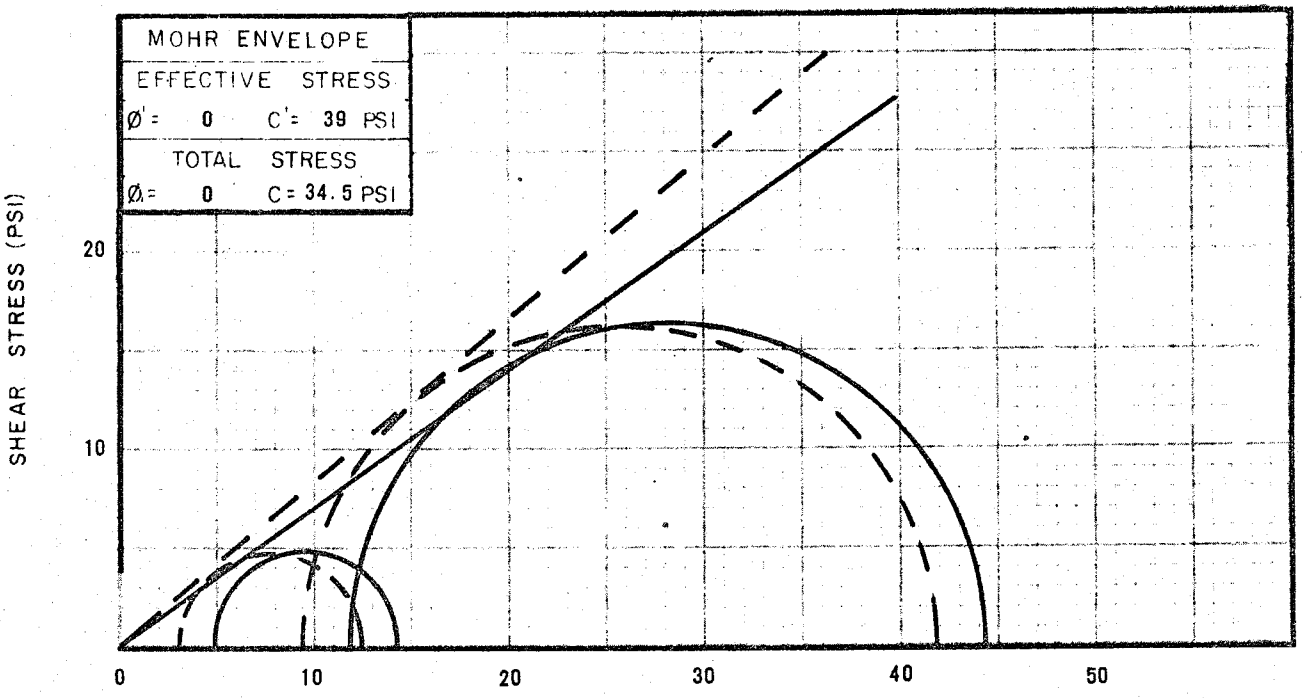
● SAMPLE SATURATED

○ SAMPLE AT FIELD MOISTURE

APPROVED BY _____ DATE _____ PREPARED BY _____ CHECKED BY _____

AXIAL STRAIN (%)

AXIAL STRAIN (%)



SYMBOL	BORING NUMBER	SAMPLE NUMBER	SAMPLE INTERVAL	TYPE OF SAMPLE	SOIL TYPE	TYPE OF TEST	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	CONFINING PRESSURE (PSI)	MAXIMUM DEVIATOR STRESS σ1 - σ3 (PSI)	STRAIN RATE (%/min)	BACK PRESSURE (psi)
	TU-5	3	14-15	RING	SP	CU	108	12.5	5	4.9	.03	100
		SAME	SAMPLE:	SECOND	STAGE				12	16.3	.03	100

COMMENTS:

——— TOTAL STRESS DATA

— — — EFFECTIVE STRESS DATA

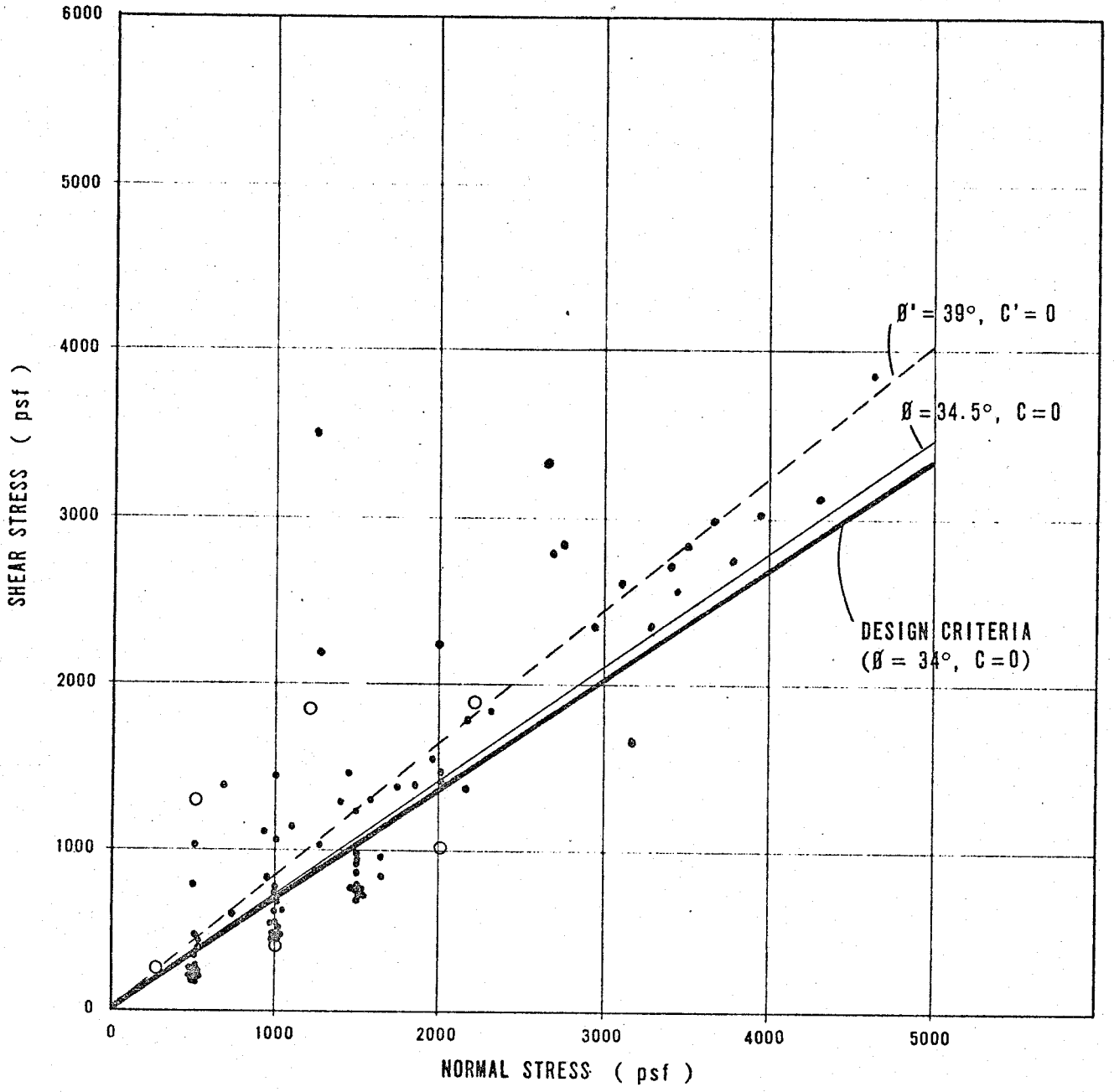
fugro

PROJECT NO.: 75-083-E

LOS ANGELES COUNTY SANITATION DISTRICT

TWO-STAGE TRIAXIAL COMPRESSION TEST RESULT

PLATE C-11



DIRECT SHEAR TEST DATA

- • PREVIOUS INVESTIGATIONS
- ○ THIS INVESTIGATION

TRIAXIAL TEST DATA

——— TOTAL STRESS

– – – – EFFECTIVE STRESS

APPROVED BY _____ DATE _____ PREPARED BY Jim King CHECKED BY W. R. Reed

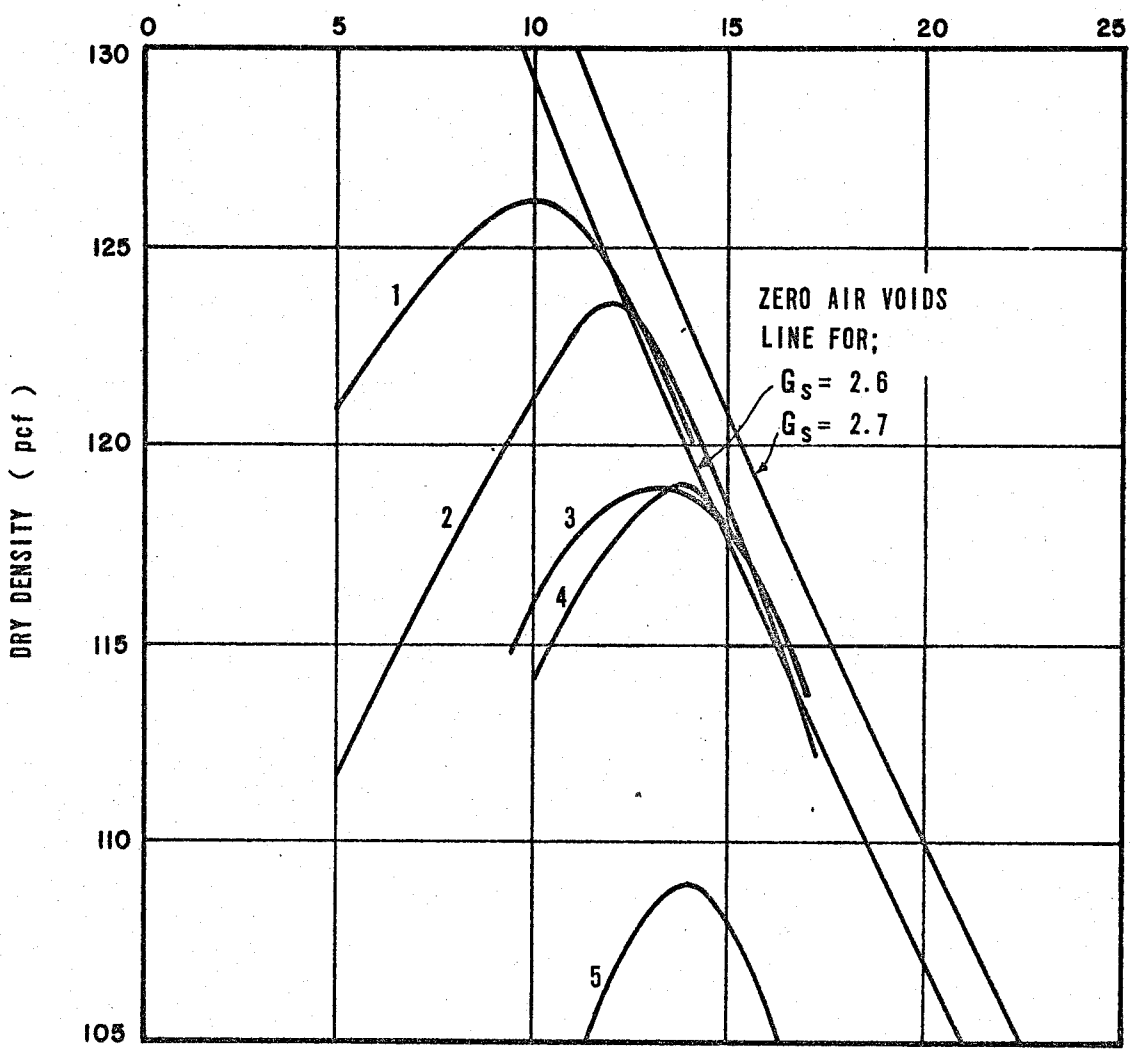
FUGRO

PROJECT NO.: 75-083-E

LOS ANGLES COUNTY SANITATION DISTRICT

SHEAR STRENGTH DATA SUMMARY
COHESIONLESS SOILS

PLATE C-12



SYMBOL	BORING NO.	DEPTH (ft)	SOIL TYPE	OPTIMUM MOISTURE CONTENT (%)	MAXIMUM DRY DENSITY (pcf)
1	S-12	1	CL-ML	11	126
2	SP-2	13	SM	12	124
3	PL-5	16	ML	13	119
4	PL-2	17	SM	14	119
5	PL-8	15	SP-SM	14	109

APPROVED BY: _____ DATE: _____ PREPARED BY: M.R. CHECKED BY: MR

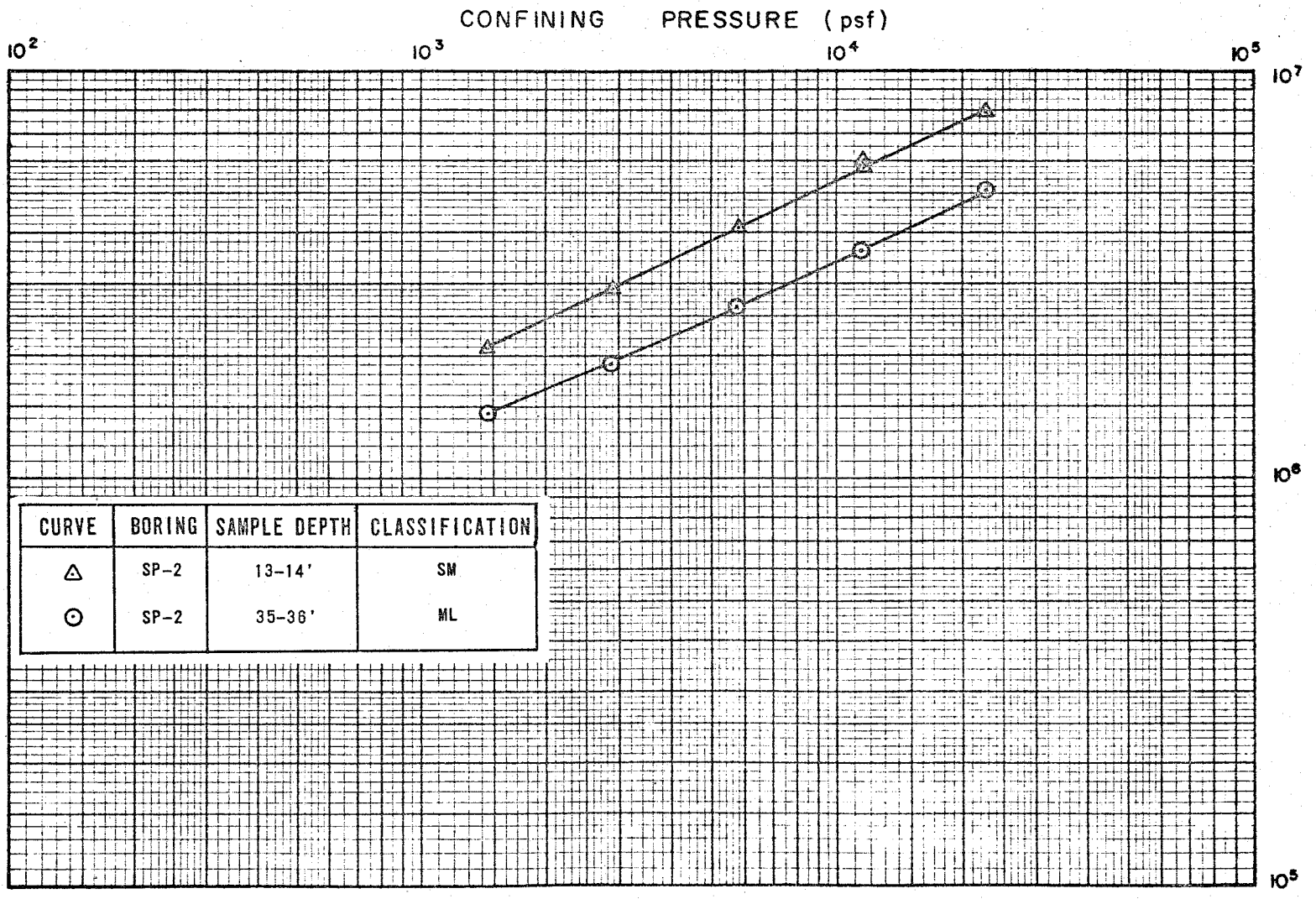
PROJECT NO.: 75-083-E

LOS ANGELES COUNTY
SANITATION DISTRICT

COMPACTION TEST RESULTS

PLATE C-13

SHEAR STRAIN (%)	SOIL TYPE	SYMBOL
≈ 0.0001	UNDISTURBED SILT	⊙
	RECOMPACTED SAND	△

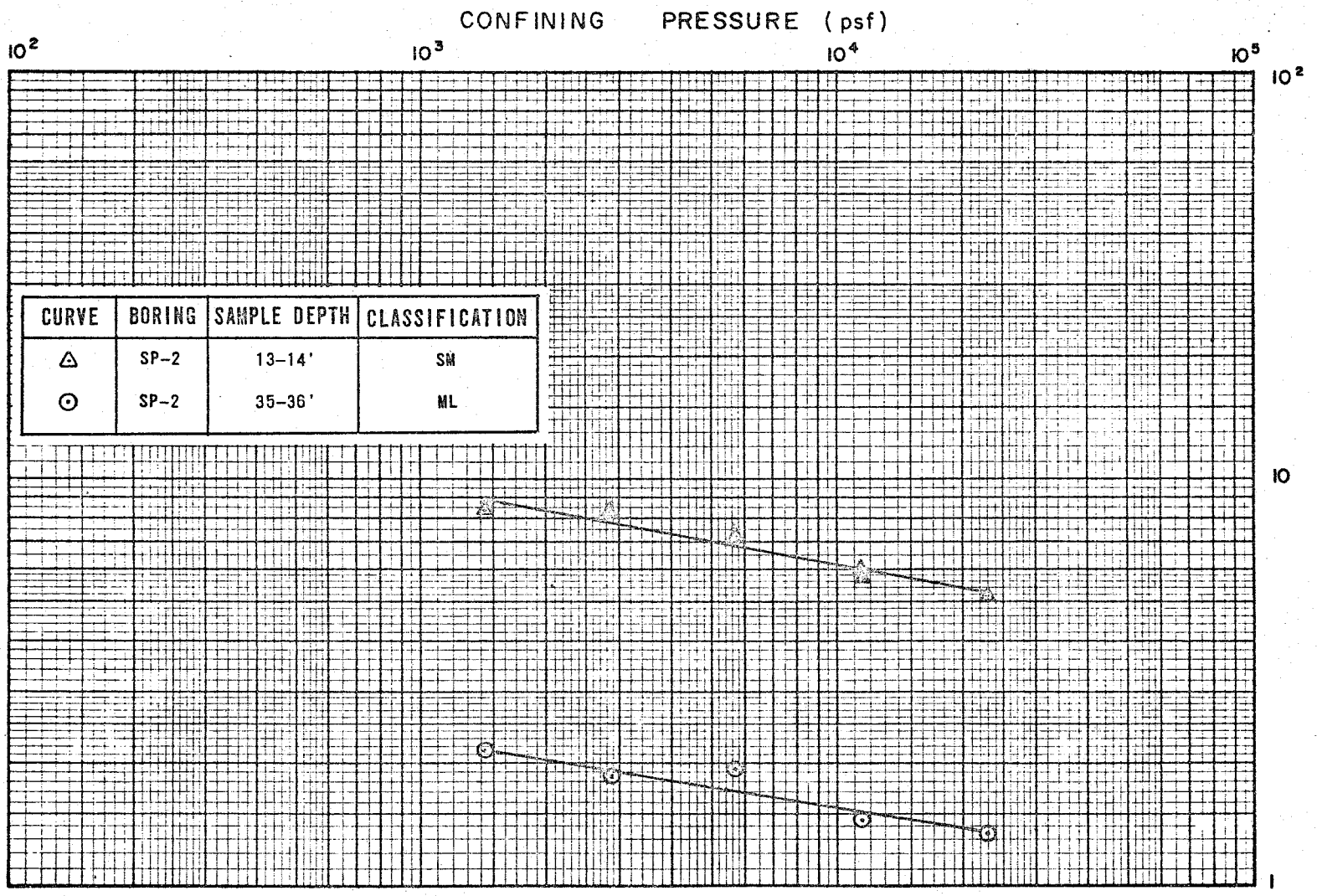


CURVE	BORING	SAMPLE DEPTH	CLASSIFICATION
△	SP-2	13-14'	SM
⊙	SP-2	35-36'	ML

SHEAR MODULUS VERSUS CONFINING PRESSURE FOR UNDISTURBED SILT AND RECOMPACTED SAND

PLATE C-14

SHEAR STRAIN (%)	SOIL TYPE	SYMBOL
≈ 0.0001	UNDISTURBED SILT	⊙
	RECOMPACTED SAND	△



MATERIAL DAMPING VERSUS CONFINING PRESSURE FOR UNDISTURBED SILT AND RECOMPACTED SAND

Report 2

GEOTECHNICAL ENGINEERING REPORT

GDC Project No. L-236

November 5, 1999

GROUP DELTA CONSULTANTS

Geotechnical and Environmental Assessments Report
Proposed Environmental Laboratory Building
Joint Water Pollution Control Plant
Carson, California

Prepared For:

County Sanitation Districts of Los Angeles County
1955 Workman Mill Road
Whittier, CA 90607

Prepared By:

Group Delta Consultants, Inc.
2341 West 205th Street
Suite 103
Torrance, CA 90501

GROUP DELTA CONSULTANTS

Certified DBE/MBE

Geotechnical Engineering
Geology
Hydrogeology
Coastal Engineering
Hydrology
Hydraulics
Environmental Engineering

County Sanitation Districts of
Los Angeles County
1955 Workman Mill Road
Whittier, CA 90607

November 5, 1999
Project No. L-236

Attention: **Mr. Paul Stoppelmann**

Subject: **Geotechnical and Environmental Assessments Report**
Proposed Environmental Laboratory Building
Joint Water Pollution Control Plant
Carson, California

Mr. Stoppelmann:

GROUP DELTA CONSULTANTS, INC. (GDC) is herewith submitting the Geotechnical and Environmental Assessments Report for the subject project. The authorized scope of services include field exploration, laboratory testing, engineering analysis and preparation of this report. It should be noted that the exploration program was based on the original design of the building, which consisted of constructing additional laboratory space and a two-story underground parking structure. The intended footings were originally at approximately 30 feet below existing surface. In addition, hand-auger drilling was required for the first 7 feet. The design was then modified to concrete slab-on-grade with no underground parking structure. Due to the significant changes in design and lack of shallow data, we recommend an additional investigation consisting of two borings to 20 feet in depth and additional lab work. The findings from the additional investigation program, if approved, will be submitted in an addendum.

We appreciate the opportunity to provide geotechnical services for this project. If you have any questions pertaining to the report, or if we can be of further services, please do not hesitate to contact GDC.

Respectfully Submitted,
GROUP DELTA CONSULTANTS, INC.

Long Bao Nguyen
Project Engineer

Michael D. Reader, G.E. #2259
Project Manager

Steven H. Kolthoff, C.E.G. #1965
Senior Geologist

REGISTERED GEOLOGIST
STEVEN HARM KOLTHOFF
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STATE OF CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER
MICHAEL DAVID READER
NO. GE 2259
EXP. 3-31-02
GEOTECHNICAL
STATE OF CALIFORNIA

L236 LACSD Report.doc

Distribution: (8) Addressee

TABLE OF CONTENTS

1.1 General

This report presents the results of the geotechnical and environmental investigations performed by **Group Delta Consultants, Inc. (GDC)** for the proposed Environmental Laboratory Building Project at the Joint Water Pollution Control Plant (JWPCP) in the City of Carson, California. The project locations are depicted on Figure 1, Vicinity Map.

The purpose of this investigation was to:

1. Evaluate the subsurface site condition.

2. Provide recommendations for the foundation and geotechnically related construction procedures.

3. Evaluate the presence of potential contaminants related to worker safety and construction operations.

4. Prepare this report addressing our findings and recommendations.

This report has been prepared solely for the County Sanitation Districts of Los Angeles County (CSDLA) for the purposes stated above.

1.2 Scope of Work

The scope of work for the subject project includes the following tasks:

- Data Review – Review of available data from previous reports.

- Geophysical Survey – Process of locate underground utilities.

- Subsurface Exploration – Drilling, sampling, and logging of 4 geotechnical borings and 1 environmental boring using a hollow stem auger drill rig.

- Laboratory Testing – Laboratory testing of collected soil samples at selected depths to evaluate engineering properties of the materials.

- Analytical Testing – Analytical testing of collected soil samples to evaluate the presence of possible contaminants at the subject site.

1.3 Project Description

The subject site is located at 25401 Figueroa Street, City of Carson, California. The site is currently known as the Joint Water Pollution Control Plant. The site is bounded by Sepulveda Boulevard to the north, Main Street to the east, Lomita Boulevard to the south, and the Harbor Freeway to the west.

The CSDLA is planning to expand the existing environmental laboratory at the JWPCP in Carson, California. The design of the expansion was not available at the time of this report. Based on the discussion with the design team, however, it is our understanding that the expansion could consist of constructing a structural steel-frame building with masonry cladding; a masonry, shear/load bearing wall building. The height of the masonry wall or cladding would be approximately 30 feet. The maximum dead load for the column is anticipated to be 60,000 pounds. The foundation of the building will be slab-on-grade with individual column footings and/or strip footings for masonry walls.

A depiction of the site is presented on Figure 1, Vicinity Map and Figure 2, Site Plan.

2.1 General

Prior to our investigation, we collected and reviewed several available geotechnical reports previously prepared for the development within the vicinity of the subject site. Our findings from the reviewed reports are as followed:

Final Report of Geotechnical and Environmental Subsurface Assessments for the Cryogenic Oxygen Generation Plant, Air Flotation Tank Facilities, Force Main Expansion, and East-Side Tunnel at the Joint Water Pollution Control Plant. (AES, 1999)

The report was prepared by Advanced Earth Science (AES) dated January 1999. AES performed a geotechnical investigation to evaluate the subsurface foundation conditions for the above listed developments. The field exploration included drilling of 14 geotechnical/environmental borings to depths ranging from 40 to 60 feet below existing surface. During the exploration, AES encountered 6 to 20 feet of artificial fill which generally consisted of clay, sandy clay, and silty sand. Below the fill, 6 to 28 feet of alluvium sediments were encountered which generally consisted of lean clay, sandy silt, and sand. The Lakewood Formation was encountered below the fill and alluvium to bottom of all borings. The Formation generally consisted of fine-grained native sand and silty sand. Groundwater was encountered at depths ranging from 54 to 63 feet below existing surface. The groundwater was relatively stable with less than 1-foot fluctuation. Boring C-2 of this investigation is included in Figure 2, Site Plan and Appendix A.

Preliminary Geotechnical Investigation for the Expansion of Water Treatment Facilities (GLA, 1995).

GLA performed a preliminary geotechnical investigation to evaluate foundation conditions for the proposed expansion. The field exploration included drilling, logging and sampling 70 borings at the site to depths ranging from 15 to 65 feet. Sands, silty sands, sandy silts, and silts were encountered to depths of up to 65 feet in the borings. Lakewood Formation material consisting of dense alluvium was encountered at a depth of 40 feet below ground surface. Free groundwater was encountered in some borings at depths between 58 and 64 feet. A majority of the existing fills encountered was considered undocumented and unsuitable for structure foundations.

Field Characterization Report for JWPCP (GLA, 1995).

This exploration was performed for the purposes of environmental assessment of the site and included drilling 45 borings to an average depth of 30 feet. Selected soil samples were analyzed for Pesticides and PCBs, Petroleum, Hydrocarbons, and Metals.

The report concluded that:

- Pesticide-contaminated soils were present on site; however, the concentration and volume were too small to pose a significant risk.

- Of the 112 samples analyzed, 51 had detectable levels of petroleum hydrocarbons at concentration levels ranging between 11 and 7,400 mg/kg. The maximum volume of hydrocarbon-contaminated soils was estimated to be less than 16,000 cubic yards.

- Based on the measurements, soils contaminated with metals are relatively restricted in volume and spatial distribution and are unlikely to pose a significant risk.

3.1 General

Field exploration for this project was conducted on July 21 and 22, 1999 by utilizing a hollow stem auger drill rig. Prior to the exploration a geophysical survey was conducted to help locate underground utilities and a buried abandoned oil well. A total of 4 geotechnical/environmental borings and 1 solo environmental boring were drilled to depths ranging from 25 to 61 feet below the existing surface. The approximate boring locations are depicted on Figure 2, Site Plan. Details of the materials encountered are presented in Appendix A, Log of Test Borings.

3.2 Geophysical Survey

A geophysical survey was performed at the drilling and oil well sites by Advanced Geosciences, Inc. (AGI) as a sub-consultant to GDC. The survey's purpose was conducted to locate the abandoned Hamilton Oil Well No. 2 and existing subsurface utilities at each of the geotechnical borehole locations.

To locate the abandoned oil well, a magnetometer survey was performed in the open area shown on Figure 2, Site Plan. A GeoMetrics G856AX magnetometer was used to record measurements of the total magnetic field. This measurements were made on a 10-foot (north-south) by 5-foot (east-west) grid in the vicinity of the oil well. The magnetic measurements recorded across this grid were downloaded to a field computer to prepare a contour map showing the resulting magnetic field pattern. This contour map is shown on Figure D-2 in Appendix D.

After the magnetometer survey, Ground Penetrating Radar (GPR) profiles were performed across the well location. These profiles were used to search for radar reflection patterns indicating evidence of an isolated steel object. The profiles were recorded using a GeoPhysical Survey Systems Inc. SIR-3, GPR unit equipped with 120 and 500 Mega-Hertz antennas.

GPR surveys were also performed to within a 25-foot square area surrounding each of five drilling locations to locate existing underground utilities. Several GPR profiles (with 120 and 500 Mega-Hertz antennas) were recorded across each area to search for metal pipelines and other subsurface utilities. A Geonics EM-31D terrain conductivity meter and Fischer Gemini-3 metal detector were also used to scan the areas for the presence of shallow metal pipelines.

In summary, the results of this survey confirmed the location of the Hamilton Oil Well No. 2 near the position marked by SCDLA. In addition, a metal pipeline was detected near B-2G boring location. The boring was relocated to avoid possible damage to the pipeline.

3.3 Drilling, Sampling, and Logging

The subsurface exploration included drilling, sampling and logging of 5 borings to depths ranging between 26 and 61 feet below existing surface. The objective of drilling borings B-1 through B-4 was to evaluate the geotechnical conditions of the subsurface soils to 61 feet below the ground surface. This included evaluating conditions during possible excavation, and to determine soil characteristics for geotechnical design of the proposed structure. The objective of drilling boring B-5 was to evaluate the subsurface soils in the vicinity of the abandoned oil well for environmental concerns.

Environmental samples were also obtained from each of the geotechnical borings as a part of our scope of work. Representative drive samples for environmental and geotechnical testing were obtained alternatively at 2.5-foot intervals beginning at a depth of 7 feet below existing surface. No environmental samples were collected below 26.5 feet in any of the borings.

The proposed boring locations were originally marked in the field by CSDLA representative. Based on the results of geophysical surveys and involved utility companies, boring B-3 was moved approximately 15 feet to the north to avoid possible utility conflict with an underground Chevron oil pipeline. The approximate boring locations are shown on Figure 2, Site Plan.

On-site drilling was performed by Layne Christensen Company (LCC), as a subcontractor to GDC, under the full-time field supervision of a GDC field engineer. The borings were drilled using a CME750 drill rig utilizing a 7.5-inch outside diameter (OD) hollow-stem auger. The upper 7 feet of each boring were drilled using a hand auger to minimize the risk of penetrating any utilities/buried structures with the drill rig.

Geotechnical Sampling – Relatively undisturbed drive samples and bulk samples were collected for geotechnical logging and testing purposes. The samples were obtained by driving a 3.25-inch O.D. by 18-inch-long, California-Modified split barrel (CM) sampler lined with 2.5-inch O.D. by 1-inch-long brass rings. Split-spoon samples were obtained in conjunction with the Standard Penetration Test (SPT). In general, samples were obtained at 5-foot intervals, alternating between the SPT and California drive samplers. The first geotechnical sample was obtained at a depth of 7.5 feet and at 5-foot intervals to the bottom of borings. Modified-California and SPT samplers were driven 12 and 18 inches, respectively, into the soil by successive blows of a 140-pound hammer with a 30-inch stroke. The number of blows for each 6 inches of penetration is recorded on the boring log.

In addition to the drive samples, bulk samples of representative soil cuttings were obtained at selected depths for laboratory testing.

Boring cuttings were logged using a combination of visual observation, close examination of soil samples, and equipment behavior. All logs were completed at the exploration site, following recovery of each sample. Soils were classified by

GDC field engineer in accordance with the United Soil Classification System (USCS). Boring logs are presented in Appendix A.

Environmental Sampling – Environmental samples were obtained from each of the geotechnical borings by driving a 2-5-inch O.D. by 18-inch log split-barrel sampler, fitted with 2-inch O.D. by 6-inch long brass liners at the desired sampling depth. The first environmental sample was obtained at a depth of 5 feet and sampling continued at 5-foot intervals thereafter to the bottom of all borings. The sampler was driven 18 inches by a 140-pound hammer having a 30-inch stroke. And the number of blows for each 6 inches of penetration was recorded on the boring log. The collected samples were placed in a cooler and transported to laboratory for testing.

3.4 Boring Destruction

The borings were destroyed by backfilling with bentonite chips. Potable water was added during the backfilling process to hydrate the chips. The borings were capped with cold patch asphalt or grassy sod where applicable.

3.5 Cleanup and Decontamination

All drilling and sampling equipment used during the field investigation were decontaminated prior to use at the site. The hollow stem augers were decontaminated onsite with a portable steam cleaner. In order to minimize the potential for cross-contamination between individual samples, sampling equipment was thoroughly decontaminated between sampling events. The decontamination procedures for the soil sampling equipment (sampler and liners) consisted of the following:

- Washed and scrubbed with Alconox^{TM} detergent solution.
- Double rinsed with potable water.
- Rinsed with distilled water.

3.6 Soil Corrosivity

The scope of this study was limited to an evaluation of soil corrosivity and general corrosion control recommendations for materials likely to be used for construction.

As part of the current investigation, GDC conducted a corrosivity evaluation that included field and laboratory resistivity test. Laboratory testing was performed on soils collected from the site. In-place soil resistivity tests were performed in the field by Advanced Geoscience, Inc. (AGI).

The electrical resistivity of the soil was estimated at 3 locations using a Wenner Four Electrode Method (described in ASTM G 57-95a). This procedure required that four electrodes be placed into the soil with equal separation along a straight line. The outer electrodes are used to introduce a DC current into the ground and the inner electrodes are used to measure the resulting voltage potential. The electrode spacing (or "A-spacing") is increased after each measurement of resistance is made

(i.e. voltage/applied current). The measured resistance is roughly equal to the "average" resistance to a depth equal to the electrode spacing.

For these surveys electrode spacing of 2.5, 5, 7.5, 10, 12.5, and 15 feet were used. The average resistance measured at each of these electrode spacings was used to calculate soil layer resistivities using the Barnes Method (Telford, Applied Geophysics, 1976). Table B-7, in Appendix B, provides a spreadsheet with these estimated layer resistivities. These calculations assume the electrode spacing is equal the depth of the base of the soil layer.

The Wenner measurements were performed at three locations identified as Sites 1, 2 and 3 in Figure 2, Site Plan. The approximate locations of these sites are shown in Figure 2. Each site was positioned to avoid interference from electrically conductive underground utilities.

The measurements were made using the MineRes earth resistivity meter manufactured by L&R Instruments. The electrodes consisted of 0.475-inch diameter stainless steel stakes. To avoid polarization effects at the electrodes the current was reversed and the resulting measurements were averaged.

3.7 Soil Boring Survey

The locations of the borings were surveyed by the representative of CSDLA, Mr. Towner, on August 20, 1999. The results of the survey are listed in Table 3.6.1, Boring Surveying.

Table 3.7.1 Boring Surveying

Boring	Coordinates	Elevation (feet)*
B-1G	N. - 253.46	44.20
	E. 1455.84	
B-2G	N. - 495.34	42.47
	E. 1465.05	
B-3G	N. - 592.50	41.19
	E. 1533.83	
B-4G	N. - 294.25	39.87
	E. 1596.73	
B-5E	N. – 648.83	41.99
	E. 1549.06	

* Elevation is in feet above mean sea level

It should be noted that the coordinates of the borings were based on local plant coordinate system.

4.1 Geotechnical Testing

Geotechnical laboratory testing was performed to aid in evaluating the engineering properties of subsurface materials at the site. The performed geotechnical tests are listed in Table 4.1.1, Geotechnical Testing. The results of the tests are presented in Appendix B, Geotechnical Laboratory Testing.

Table 4.1.1 Geotechnical Testing

Test	Test Procedure
Moisture Content & Dry Unit Weight	ASTM D2216
Maximum Dry Density	ASTM D1557-91
Shear Strength	ASTM D3080-90
Consolidation Test	ASTM D2435-90
Soil Corrosivity	ASTM D512-89, CTM 417, CTM 643
Resistance Value (R-Value)	CTM 301
Expansion Index	ASTM D4829
Atterberg Limits	ASTM D4318
-200 Sieve Wash	ASTM D1140
Specific Gravity	ASTM D854

4.2 Analytical Testing

Soil cuttings and fluid generated from the drilling were placed in steel drums for later disposal. Prior to disposal, these materials were tested in an analytical laboratory to provide some indication as to the nature and concentration of contaminants present in the cuttings. The test procedures performed on the cuttings were listed in Table 4.2.1, Analytical Testing. The analytical testing was performed by EMAX Laboratory. The details of sampling protocol and type of analytical tests performed and the test results are presented in Appendix C, Analytical Testing.

Table 4.2.1 Analytical Testing

Boring	Depth	Test Procedures
B-1	10'-25'	EPA 8081A, EPA M8015, EPA 5030A/M8015
B-2	10'-25'	EPA 8081A, EPA M8015, EPA 5030A/M8015
B-3	10'-25'	EPA 8081A, EPA M8015, EPA 5030A/M8015
B-4	10'-25'	EPA 8081A, EPA M8015, EPA 5030A/M8015
B-5	7'-25'	EPA 8081A, EPA M8015, EPA 5030A/M8015, EPA 418.1

Based on the results of analytical testing, the soil cuttings from the field exploration were either not contaminated or below the legal limits of contamination.

5.1 General

Generally, the site consists of 4 to 6 feet of fill materials. The encountered fill materials were described as Silty Sand, Silt, and Clayey Sand.

Below the fill, terrace deposit materials were encountered. This material consisted of Silty Sand and Siltly Clay to depths of 4 to 11 feet.

Below the terrace deposits, Lakewood Formation (CDWR, 1961) materials, described as alternating layers of Silty Sand and Sandy Silt with some Sand layers were encountered. In general, the Lakewood Formation materials were described as slightly compact to stiff based on SPT N-Values.

San Pedro Formation (Poland, 1959) soils were encountered below the Lakewood Formation at depths of approximately 45 feet from the surface. In general, the San Pedro Formation materials are described as Sand and Silty Sand with minor Sandy Silt.

Refer to the Figure 3 and boring logs in Appendix A, Field Exploration for a detailed description of the materials encountered.

5.2 Groundwater Condition

No groundwater was encountered in borings during the investigation. Consequently, groundwater is not a factor in design and construction.

6.1 General

The project site is located in the general proximity of active and potentially active faults typical of southern California. Earthquakes occurring within 60 miles of this site are capable of generating ground shaking of engineering significance to the proposed construction.

6.2 Local Faulting and Seismicity

The site is not located within a currently established Alquist-Priolo Special Studies Zone. Neither field observation nor a literature search disclosed active faulting through the project. The closest fault to the site is the Palos Verdes Fault, which is approximately 1.5 miles from the site. The next two closest faults to the site are the Newport-Inglewood and Cabrillo Faults, which are approximately 4.0 to 5.4 miles from the site. The Palos Verdes and Cabrillo Faults are not considered active but the Newport-Inglewood Fault is considered active at the present time.

An evaluation was performed of faults in the vicinity of the site capable of generating significant ground motion. The evaluation included researching and analyzing published literature pertaining fault locations, characteristics, current ground motion analyses methods, and using GDC's in-house data, program and experience. This evaluation is not intended as a design tool, but as a point of information. A soil factor for design is presented in a subsequent section.

The results of the evaluation are contained in Table 6.2.1, Characteristics of Active and Potentially Active Faults of Seismic Significance to the subject site, which also lists the pertinent characteristics of the fault used in this analyses. As noted on Table 6.2.1, the Palos Verdes Fault is the closest known fault to the site. This fault is at a distance of about 1.5 miles from the site. The next two closest faults to the site are Newport-Inglewood and Cabrillo Faults, located approximately 4.0 and 5.5 miles from the site, respectively.

If the aforementioned faults had a seismic event, the estimated maximum moment magnitude of **M** = 7.0, 7.0, and 6.5, respectively could be recorded. Since groundwater was not encountered in all borings, the potential for liquefaction is considered to be low.

A seismicity analysis also evaluates the potential ground shaking at a site using historically measured earthquakes in the region, within 60 miles of a particular site. To perform this analysis, GDC maintains an in-house database of over 8,000 earthquake records in the State of California dating back to the year 1800. The database is a subset of records maintained at the National Earthquake Center in Golden, Colorado. It should be noted that for this analysis, only earthquakes of magnitude 5.0 or greater are included. The results of this analysis are presented on Figure 6.2.2, Locations of Historical Seismicity.

TABLE 6.2.1

Characteristics of Active and Potentially Active Faults
of Seismic Significance to the Site

SITE LONGITUDE (E-W)	118.2833
SITE LATITUDE (N-S)	33.8008
PROJECT NAME	JWPCP Lab Building
PROJECT NUMBER	L-236

Fault	DIST. TO FAULT(mi.) (1)	MAX. CREDIBLE MAGNITUDE	HORIZONTAL ACCEL.(g) (2)	TYPE	LENGTH (KM.)	Slip Rate (MM/YR)
PALOS VERDES	1.5	7	0.597	RR(?)	100	0.7
NEWPORT-INGLEWOOD A	4.5	6.9	0.433	RV(?)	36	1
NEWPORT-INGLEWOOD B	4	6.8	0.432	RV(?)	22	1
CABRILLO	5.5	6	0.241		20	0.05
LOS ALAMITOS	9.5	6	0.162		9	0.05
ELSINORE A (WHITTIER)	19	7.3	0.161	RL	46	4
SAN PEDRO BASIN	18	7	0.146		67	0.5
SANTA MONICA	18	6.7	0.124	R?	24	0.3
NORWALK	13.5	6	0.116		28	0.05
ANACAPA-SANTA CRUZ ISLAND	26.5	7.4	0.115	R	124	0.9
HOLLYWOOD	19.5	6.4	0.097	R?	26	0.5
RAYMOND	23	6.7	0.094	LR?	15	0.15
NEWPORT-INGLEWOOD O.Z.D.	24	6.7	0.089	RV(?)	54	1
VERDUGO FAULT	23	6.6	0.089	R?	21	0.05
MALIBU COAST	26.5	6.9	0.088	R	25	0.1
COYOTE HILLS	18.5	6	0.083		3	0.05
EAGLE ROCK-SAN RAFEAL	22	6.3	0.08	R?	10	0.05
SAN ANDREAS-Hwy 166 to Cajon Pass	49.5	8.25	0.078	RL	201	34
SAN FERNANDO	30.5	7	0.078	R	28	3
DUARTE	28.5	6.5	0.065	R?	11	1
SIERRA MADRE	27.5	6.4	0.065	R?	67	4
SAN JOSE A	31.5	6.6	0.061		20	0.05
NORTHRIDGE	30	6.5	0.061		14	0.1
SANTA CRUZ/CATALINA RIDGE	37.5	7	0.06		71	0.5
SAN GABRIEL B	33	6.7	0.06	RL	30	3
SANTA SUSANA	36	6.9	0.06	R	35	3
CHINO	35	6.8	0.059	RR	20	0.1
INDIAN HILL	31.5	6.5	0.057		16	0.05
SIMI FAULT	40	6.9	0.052		33	0.05
CHATSWORTH RESERVIOR	34	6.4	0.049		11	0.1
SAN GABRIEL A	43.5	7	0.048	RL	47	3
ELSINORE B	53	7.5	0.047	RL	53	4
SUNLAND	31	6	0.045	R	6	0.5

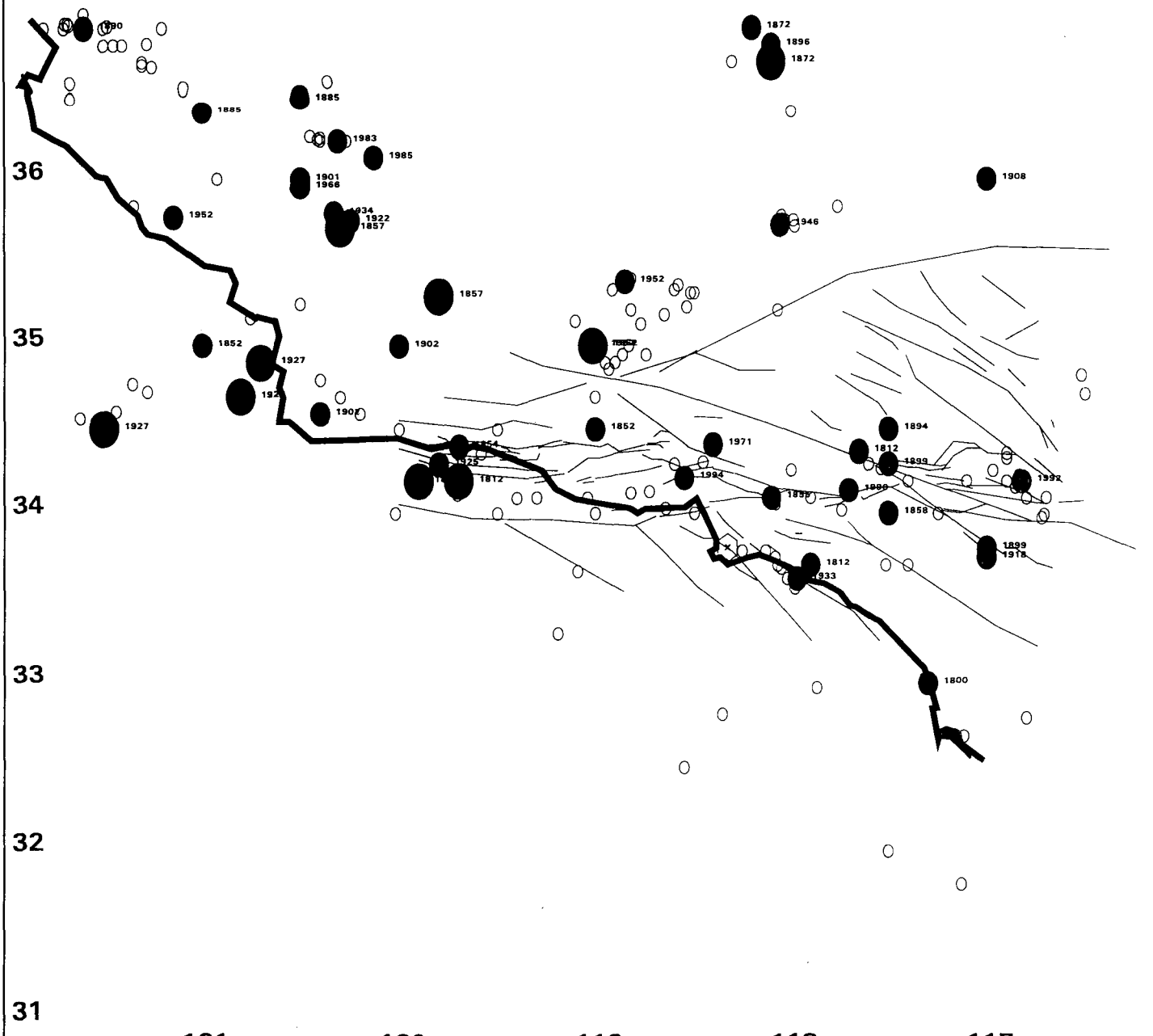
Fault Type: R-Reverse, N-Normal, RL-Right Lateral, LL-Left Lateral, RR-Right Reverse, LR-Left Reverse, RV-Right Vertical, LV-Left Vertical, RN-Right Normal, LN-Left Normal

Note: Distance to fault are calculated by LKR's program FAULTS, which is used to calculate seismic hazards from faults on a regional scale. Distances should be considered accurate to ±0.5 mile.

References: (1) Wesnousky, 1986

(2) Joyner and Boore, 1988, mean attenuation curve
Greater of 2 Horizontal Components

LOCATIONS OF HISTORICAL SEISMICITY



LEGEND:

- M > 7
- 6< M >7
- 5 < M >6
- 4 < M >5
- ⊗ - SITE LOCATION
- ACTIVE/POTENTIALLY ACTIVE FAULT
- CALIFORNIA COASTLINE/BORDER

GROUP DELTA COSULTANTS, INC.

PROJECT NUMBER: L-236

FIGURE NUMBER 6.2.2

7.1 Bearing Capacity and Settlements

Our recommendations were based on the provided information by the CSDLA. Based on the provided information, it is understood that development could consist of constructing a structural steel-frame building with masonry cladding; a masonry, shear/load bearing wall building. The height of the masonry wall or cladding would be approximately 30 feet. The maximum dead load for the column is anticipated to be 60,000 pounds. The foundation of the building will be slab-on-grade with individual column footing and/or strip footings for masonry walls. In addition, the following conditions were assumed for design:

1. All existing fill is removed and replaced with granular compacted fill.
2. All footings are founded on dense native soils or compacted fill.
3. All footings are embedded at least 24 inches into dense native soils or compacted fill
4. All footings are 5 feet by 5 feet or greater

Based on the provided and assumed information, field exploration, laboratory testing, and engineering analysis, an allowable bearing capacity of **4,500 psf** is recommended for footing design.

The estimated consolidation settlement of the foundation under its anticipated foundation pressure consists of primary and secondary settlements within the zone of influence of the foundation. In addition, it is based on the estimated compressibility characteristics of the underlying soils and the thickness of the compressible layer. Consolidation settlement analyses were performed by using GDC in-house computer program, which generally computes the settlement of 3-foot soil layers from the footing to approximately 20 feet below the proposed subgrade.

It is our assumption that the proposed expansion will generate a maximum anticipated foundation pressure of 4,500 psf. Based on this assumed pressure, provided design information, laboratory testing, and engineering analysis, the maximum total settlement is estimated to be 1.0 inch at the center and the maximum differential settlement is anticipated at 0.5 inch. The foundation for the proposed structure should be designed to withstand these settlements.

7.2 Lateral Resistance

For footings placed in compacted fill or dense native sand on level ground, we recommend an ultimate passive fluid pressure of 360 pcf. We recommend a sliding friction coefficient of 0.40 for design. Passive and sliding resistance may be used in combination without reduction.

7.3 Slope Excavations

Temporary excavations may be either sloped back or shored, depending on the availability of space surrounding the structures. Based on the provided information, no temporary slope excavation is proposed into the terrace deposits or Lakewood Formation materials. Temporary slopes with heights less than 15 feet that are excavated in stiff artificial fills and do not expose cohesionless (running or raveling) sands may be excavated at a 1:1 slope ratio. All slope excavations should be observed by the Geotechnical Engineer. Based on encountered field conditions, the slope configuration may have to be modified. Excavations should not extend into the zone of influence of adjacent structures, unless the excavation is shored or the depth of excavation is less than 5 feet. In general, the zone of influence may be obtained by projecting a live sloping outwards and downwards at 1:1 down to the edge of the existing structure. All stockpiles of excavated materials should be kept away from the top of the excavation. If surcharge loads were anticipated at the top of the excavation, the design of slopes would have to be modified accordingly.

In addition to the recommendations in this report, all slope excavation shall conform to current Federal and State regulations.

7.4 Shored Excavations

The preliminary recommended parameters for shoring design are described in Table 7.4, Soil Parameters for Shoring Design.

Table 7.4 Soil Parameters for Shoring Design

Unit Weight (pcf)	Friction Angle (Degree)	K_A	K_P	K_O	$K\phi$
125	30	0.33	3.0	0.5	0.40

K_A Active Pressure Coefficient
K_P Passive Pressure Coefficient
K_O At-rest Pressure Coefficient
$K\phi$ Coefficient of Friction

The recommendations for shoring design might be adjusted when detailed design of the proposed structure is available.

7.5 Retaining Walls

All wall foundations should be embedded a minimum of 24 inches into approved compacted fill or dense native soils. For foundations so constructed, a bearing value of 4,500 psf may be used for design. Compacted fill should extend laterally at least one footing width, minimum 5.0 feet, below and beyond all footings.

If the recommendations in this report are executed properly, the total settlement of the wall foundations should be less than 1 inch. Differential settlement between similarly loaded foundations should be less than 0.5 inch.

For design purposes, soil parameters for backfill are presented in Table 7.5 Retaining Wall Soil Parameters. It should be emphasized that the data provided is based on structural backfill. The allowable bearing pressure is recommended based on a total settlement of 1.0 inch. The structural backfill materials should be in accordance to Caltrans Standard Specifications.

TABLE 7.5 RETAINING WALL SOIL PARAMETERS

Unit Weight of Backfill (pcf)	Allowable ϕ' for Backfill and Foundation Materials (Degree)	Cohesion of the Backfill (ksf)	Allowable Passive Resistance of Soils (psf/ft.)	Coefficient of Friction Between the Soil & Concrete Footing	Allowable Bearing Capacity (ksf)
125	34	0	360	0.40	4.5

For lateral considerations, the recommended design parameters for the walls are as followed:

- Active Pressure: **33 pcf**
- Passive Pressure: **360 pcf**
- At-Rest Pressure: **50 pcf**

If actual conditions are different, the equivalent fluid pressures provided above should be re-evaluated by the geotechnical engineer. All related factors should be taken into consideration in calculating the earth pressures.

The magnitude of lateral pressure on retaining structures depends on their freedom for lateral movement. The values of at-rest conditions should be used in the design if the wall is prevented from lateral movement at the top (e.g., basement walls). If the wall is unrestrained and allowed to move at least 0.001H at the top of the wall (where H is the height of the wall), active pressure should be used in the design of retaining structures.

Passive pressure parameters are used to compute lateral soil resistance developed against lateral structural movement. Relatively large movements are required to mobilize the passive resistance. A safety factor should be applied to the ultimate passive resistance in cases of limited movement. If passive pressures and friction (sliding resistance) are combined to provide lateral resistance, a factor of safety of 3 should be used to the passive pressure.

Passive pressure should not be considered unless a key is included in the footing design. If the resultant load falls within the middle one-third of the footing, the allowable load may be increased one-third (1/3) as long as the average between the maximum and minimum does not exceed the allowable.

In area where truck traffic will be located adjacent to the top of retaining walls, a traffic surcharge should be added to the wall design.

All backfill materials shall be free draining sand, and have an expansion index of less than 20. The existing on-site clayey soils are not suitable for use as wall backfill materials. A more specific specification would be to require that structural fill in accordance with Section 300-3.5.1 of Standard Specifications For Public Works Construction (Green Book) be placed at 90% relative compactive except for 12 inches below the concrete slab should be compacted to at least 95% relative compaction.

7.6 Asphalt Concrete Pavement

Recommendations for Asphalt Concrete Pavement Structural Sections are based on an assumed Traffic Index (TI) of 6 to 8. Flexible (asphalt concrete) pavement structural sections were calculated in general accordance with Caltrans Highway Design Manual. Laboratory tests were conducted to obtain a Resistance Value (R-value) for the subgrade soils. An R-Value of 17 was used in calculating the structural pavement thickness. The aggregate base used for design purposes was an R-Value of 78. Based on pavement design criteria, recommendations for pavement structural sections are as follows:

TABLE 7.6 ASPHALT CONCRETE PAVEMENT

Traffic Index (TI)	AC / CAB or CMB
6	0.25'/0.95' (0.70' ACor Full Depth)
7	0.30'/1.10' (0.85' AC for Full Depth)
8	0.40/1.40' (1.25' AC for Full Depth)

AC- Asphalt Concrete
CAB- Crushed Aggregate Base
CMB- Crushed Miscellaneous Base

Asphalt concrete and aggregate base shall conform to Standard Specifications for Public Works Construction (Green Book) or Caltrans Standard Specifications, and shall be compacted in accordance with Section 8.0, Earthwork Requirement and Section 9.2, Pavement Construction, of this report.

Ground water was not encountered at the time of our investigation. However, any free seeping water in the subgrade soils, if revealed during grading operation, should not be permitted to migrate through the subgrade and any saturated soils should be removed and replaced.

Positive surface drainage should be provided on the pavement to reduce water infiltrating into underlying soils. Finished pavement should be sloped down-and-away to facilitate drainage. All drainage should be directed to appropriate discharge areas via non-erosive devices. A regular maintenance program should be implemented to keep drainage devices in good working condition.

7.7 Portland Cement Concrete Pavement

Recommendations for Concrete Pavement Structural Sections are based on an assumed Traffic Index (TI) of 6 to 12. Concrete pavement structural sections were calculated in general accordance with Caltrans Highway Design Manual. A k-value of 250 pci is recommended for design purposes.

Based on pavement design criteria, recommendations for concrete pavement structural sections are as follows:

TABLE 7.7 CONCRETE PAVEMENT

Traffic Index (TI)	PCCP / CAB or CMB
6-7	0.50'/0.50'
7.5-8	0.60'/0.50'
8.5-10	0.70'/0.60'
10.5-12	0.75'/0.60'

PCCP- Portland Cement Concrete Pavement
CAB- Crushed Aggregate Base
CMB- Crushed Miscellaneous Base

7.8 Concrete Slabs-On-Grade

It is expected that footing excavation will generate expansive clayey soils. These soils shall not be used for fill below any concrete slab-on-grade. Prior to constructing the slab, a minimum of 2 feet of existing fill should be removed and replaced with approved non-expansive (EI<20) compacted fill materials. For design of concrete slab-on-grade, a coefficient of subgrade modulus of 250 pci may be used.

Where a moisture-sensitive floor covering is planned, or where slab dampness can not be tolerated, it is suggested that the floor slab be supported on a 4-inch layer of gravel or on any impermeable membrane of at least six-millimeter thickness as a capillary break. The sand should be kept moist but not saturated prior to pouring concrete. A suggested gradation for the gravel layer is as follows:

TABLE 7.8 SUGGESTED BASE GRADATION FOR SLABS-ON-GRADE

Sieve Size	Percent Passing (%)
¾ inch	90-100
No.4	0-10
No.100	0-3

In lieu of the suggested base gradation in Table 7.8, materials that meet Green Book specifications for CAB or CMB may be used.

The soils exposed at subgrade level should be kept moist (but not saturated) during construction. Care should be taken during the placement and curing of all concrete slabs. Excessive slump (water-cement ratio) in the concrete and/or improper curing procedures during either hot or cold weather conditions could lead to excessive shrinkage, cracking or curling of the slabs.

7.9 Underground Utilities

Excavation for the pipeline shall be by open trench. Based on the GDC field exploration, standard excavation equipment may be used to excavate trenches for the utility installations. The maximum and minimum width of the trench shall be in accordance with the plans. If the maximum width is exceeded, the additional cost of bedding and backfill shall be borne by the contractor.

In order to provide a smooth, firm and uniform foundation for the utility lines, the lines should be bedded on competent compacted fill, select sand, or native materials, if feasible. The bedding thickness, shaping and/or placement should be as necessary to satisfy design requirements. The bedding shall be water densified by jetting prior to backfilling. This jetting will be sufficient to saturate the bedding material around the pipe.

Generally, the encountered materials at time of exploration are not suitable for use as bedding materials. The materials used for at the base of the pipe should conform to the gradation No. 3 or 4 for concrete aggregate as specified in the 1997 Standard Specifications for Publics Works Construction (Green Book). The maximum size of this aggregate shall not exceed 3/4". Bedding which extends up to 12-inches above the pipe shall consist of material with a maximum size of 4 inches. In both cases, the backfill materials shall have a Sand Equivalent (SE) greater than 20.

In general, the encountered materials during exploration are considered suitable for use as backfill materials. Backfill shall be considered as starting at 12 inches above the pipe. All backfill in the trench should be compacted throughout to the specified geotechnical requirements. Flooding or jetting is not allowed as the compaction method for backfill materials. Mechanical compaction will be required to accomplish compaction for fine-grained, cohesive backfill, and should be the sole method to achieve compaction in the street-zone along the entire alignment.

All backfill, particularly materials within the street-zone, should be moisture conditioned to, or slightly above, optimum moisture content, placed in lifts not exceeding six to eight inches in thickness, and compacted throughout to at least 90 percent of the maximum dry density as determined by the ASTM D1557-91. The exception is that the compaction requirement within the street zone (24-inches below bottom of pavement structural section) should be increased to 95 percent of the ASTM D1557-91 maximum dry density.

7.10 Corrosion and Chemical Attack Resistance

To evaluate the corrosion potential of the near-surface soils, we used the following correlation between electrical resistivity and corrosion potential:

Electrical Resistivity (Ohm-cm)	Corrosion Potential
Less than 1,000	Severe
1,000 – 2,000	Corrosive
2,000 – 10,000	Moderate
Greater than 10,000	Mild

Fill resistivity survey results indicate resistivities ranging from 1,800 to 8,000 Ohm-cm. These results indicate a moderately corrosive to corrosive environment for ferrous metals. The sulfate attack hazard is moderate for existing near-surface soils. Type II cement and water ratio of 0.45 would be appropriate for design of footing in contact with near-surface soils. Any imported fill soil which may be in contact with the near-surface soils shall be tested for sulfate content, and an appropriate concrete mix selected based on the results.

7.11 Groundwater

Ground water was not encountered at the time of our investigation. Consequently, ground water is not a factor in the design and construction of the proposed development.

All earthwork and grading performed within the subject site will be subject to approval of this office and must conform to the requirements of the owners and the following recommendations:

1. The general or grading contractor is responsible for notifying the owner, the appropriate governmental agency, and the geologist/geotechnical engineer of the planned start of the site clean-up, the start of grading operations and anytime grading is resumed after an interruption. Each phase of the operations described below must be approved in a specific area by the geologist/geotechnical engineer before proceeding with the work. Where such approval is not obtained, the contractor at his own expense will re-do the work at the discretion of the geologist/geotechnical engineer.

2. The fill materials at the site should be removed. Based on the field exploration, the depth of the fill materials ranges from 4 to 6 feet below existing surface. All areas to receive fill, slabs, or pavement shall be stripped and cleared of all vegetation, debris, or other soft, porous or unsuitable material. For soils that have Expansive Index (EI) greater than 20 shall not be used as fill material below any concrete slab-on-grade.

3. The resulting bottom shall then be observed by the project geotechnical engineer and the controlling governmental agency, if required, prior to placing any fill.

4. After the required observations, the approved excavation bottom shall be scarified to a depth of 8 inches, moisture conditioned to or maximum of +3% of the optimum moisture content, and compacted to 90% relative compaction as determined by ASTM D1557-91.

5. All fill to be placed shall be free of organic, debris or rocks greater than 3 inches in size, non-expansive (EI<20), and shall be approved by the project geotechnical engineer. If conforming to these requirements, the on-site soils shall be considered suitable for use as compacted fill. All import to the project site, in addition to conforming to these requirements, shall be non-expansive and shall be approved by the project geotechnical engineer prior to being imported to the site.

6. Fill soils shall be placed in thin layers, well mixed, and moisture conditioned to ± 3% of the optimum moisture content and compacted using suitable compaction equipment to a relative compaction of 90% as determined by ASTM D1557-91. The resulting compacted layer shall be no more than 6 inches in thickness. Compaction equipment and techniques shall be selected by the contractor to achieve the required compaction and shall take into consideration, among other factors, the material type and the working limits of the projects. In no case will flooding or jetting be allowed.

7. All material used as asphalt concrete and base below paving shall conform to the "1997 Standard Specifications for Public Works Construction" (Green Book) or the equivalent, and shall be compacted to 95% relative compaction.

8. Unless otherwise specified, all earthwork and grading will be performed under the continuous observation of the project geotechnical engineer. Compaction testing of the fill soils shall be performed at the discretion of the project geotechnical engineer. Testing should be performed approximately every 2 feet in fill thickness or every 2000 cubic yard of compacted fill, whichever occurs first. If specified compaction is not achieved, additional compactive effort, moisture conditioning of the fill soils, and/or removal and recompaction of the below-minimum-compaction soils will be required at the expense of the contractor.

9. If during the course of the grading, conditions are encountered which, in the opinion of the project geotechnical engineer, differ significantly from those described in the geotechnical report, work shall be stopped and the condition(s) evaluated. Revaluation might include further investigations.

10. If, in the opinion of the project geotechnical engineer, contractor or owner, an unsafe condition is created or encountered during grading, all work in the area will be stopped until measures can be taken to mitigate the unsafe condition. An unsafe condition shall be considered any condition, which might create a danger to workers, on-site structures or construction, or any off-site properties or persons.

Prior to any grading operation, the existing fill soils at the site should be removed. Based on our exploration, the depth of the existing fill ranged from 4 to 6 feet below existing surface. The excavation bottom should be observed and approved by the project geotechnical engineer prior to any backfill.

No abandoned line was encountered during field exploration. If abandoned utility lines were to be revealed during grading operation, however, they shall be cut off at the property lines, filled with a pressure-pumped sand-cement slurry (minimum 2-bag mix) and sealed at the property lines or demolished and incorporated into the fills in accordance with Section 7.0 this report.

The Contractor shall conform to all applicable occupational and health standards, rules, regulations and orders established by the State of California and the Federal Government. Specifically, the Contractor should provide details of the design of shoring, bracing, sloping or other provisions for worker protection during excavation as provided in Section 5-1.02a of Caltrans Standard Specifications, or Section 306-1.1.6 of Standard Specifications for Public Works Construction.

10.1 Temporary Shoring

Excavations during construction should be carried out in such a manner that failure or excessive ground movement will not occur. The short-term stability of excavation depends on many factors including engineering characteristics of the soils, height of the excavation and length of time the excavation remains unsupported and exposed to equipment vibrations, rainfall and desiccation.

Where spacing permits and providing that adjacent facilities are adequately supported, open cuts may be considered for construction. In general, unsupported slopes for temporary construction may stand vertically up to 5 feet in height.

Surcharge loads such as vehicular traffic or stockpiled materials should be kept away from the top of temporary excavations a horizontal distance equal to at least the depth of excavation. Surface drainage should be controlled along the top of temporary excavations to preclude wetting of the soils and erosion of the excavation walls. Even with the implementation of the above recommendations, sloughing of the surface of the temporary excavations may still occur, and workmen should be adequately protected from such sloughing.

It is important that the structural integrity of the adjacent pavements be maintained. Therefore, the contractor should provide support and backfill with a sand slurry mix any portions of the excavation face that experience sloughing.

Where there is insufficient space for sloped excavations, shoring should be used to support the excavation.

10.2 Pavement Construction

Prior to placing pavement or base, the subgrade shall be scarified and compacted to a depth of at least 12 inches. The relative compaction shall be at least 95% of maximum density per ASTM D1557-91. The subgrade soil shall be at or near optimum when compaction is required. Asphalt concrete (AC) and aggregate base (AB), shall be compacted to 95% of maximum density.

It is recommended that the paved areas be properly sloped to the curbs and gutters and surface drainage facilities provided to minimize water percolation and subsequent saturation of the subgrade soils. Surfaces should be sloped to drain water to gutters or other positive drainage facilities to minimize ponding.

Final project plans and specifications should be reviewed by the project geotechnical engineer prior to construction to confirm that the full intent of the recommendations presented herein have been applied to the design.

Following review of plans and specifications, sufficient and timely observation during construction should be performed. These functions are required to confirm subsurface conditions identified during the investigation phase.

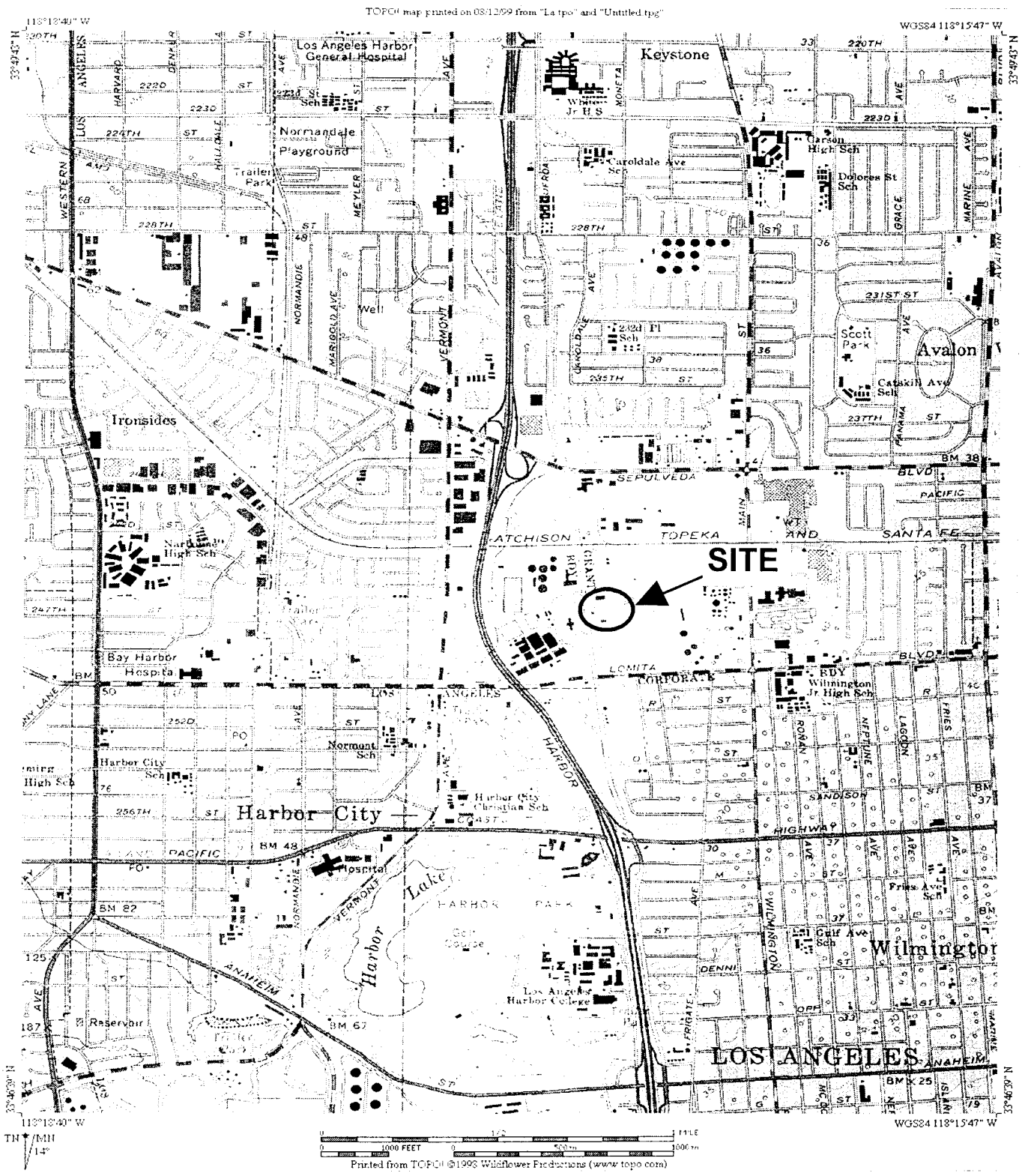
This report is based on the project as described and the information obtained from seven borings as indicated on the plan at the specified date. The findings are based on the results of the field, laboratory and office investigations and analyses, combined with an interpolation and extrapolation of soil conditions between and beyond the test pits. The results reflect this office's interpretations of the limited direct evidence obtained. This firm should be notified of any pertinent change in the project or foundation conditions are found to differ from those described herein, it may require a re-evaluation of the recommendations.

The recommendations for this site are, to a high degree dependent upon proper quality control of fill placement and foundation installation. Consequently, the foundation recommendations are made contingent on the opportunity of GDC to observe grading operations and foundation excavations for this phase of construction. If parties other than GDC are engaged to provide such services, they must be notified that they will be required to assume complete responsibility for the geotechnical phase of the project by concurring with the recommendations in this report or provide alternate recommendations.

This report has not been prepared for use by parties or projects other than those named or described above. It may not contain sufficient information for other parties or other purposes. It has been prepared in accordance with generally accepted geotechnical practice and makes no other warranties, either expressed or implied, as to the professional advice or data included in it.

California Department of Water Resources, 1961, Planned Utilization of the Ground Water Basins of the Coastal Plain of Los Angeles County, Appendix A – Ground Water Geology, Bulletin 104.

Poland, J., Garrett, A. and Sinnott, A, 1959, Geology, Hydrology and Chemical Character of Ground Waters in the Torrance-Santa Monica Area, California, Geological Survey Water-Supply Paper 1461.

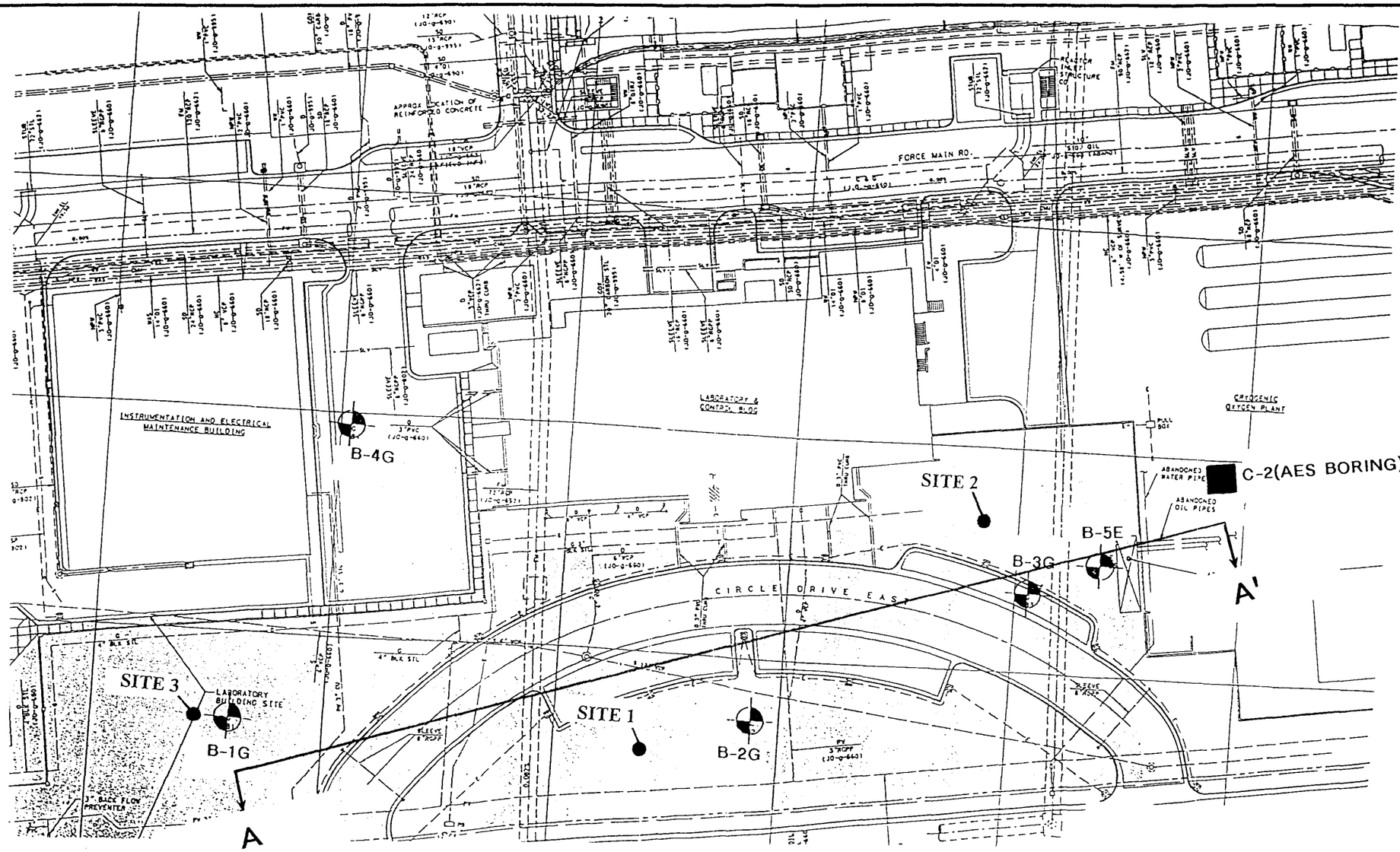


VICINITY MAP

Reference: Topo Map 1997

Group Delta Consultants, Inc.

Project Number:	L-236		
Project Name:	LACSD - JWPCP in Carson	Figure	1
Date:	08/13/99		



LEGEND

- B-1G — GDC Geotechnical Boring Locations
- B-5E — GDC Environmental Boring Locations
- AGI Resistivity Test Sites
- C-2 — AGI Geotechnical Boring Locations

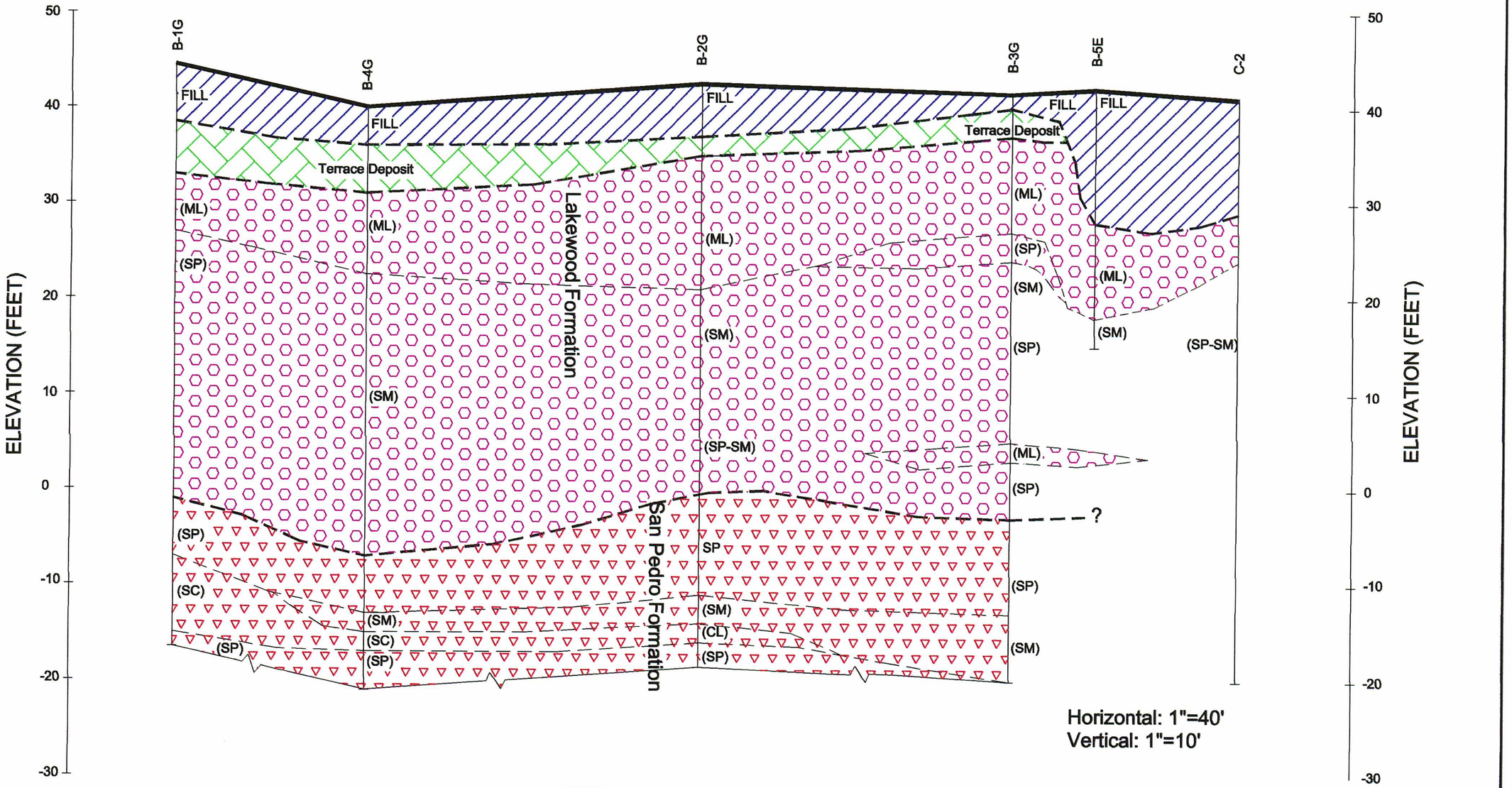
REFERENCE: Site Plan, Joint Water Pollution Control Plant, Environmental Laboratory Building

SITE PLAN

Laboratory Expansion - Carson JWPCP

PROJECT NUMBER:	L-236
DATE:	11/2/99
SCALE:	1" = 50'
DRAWN BY:	LBN
APPROVED BY:	MDR
REVISION:	
FIGURE NUMBER:	2

GROUP DELTA CONSULTANTS, INC.



Note: Soil Type was classified in accordance to Unified Soil Classification System

CROSS SECTION A-A'

Laboratory Expansion - Carson JWPCP

PROJECT NUMBER:	L-236
DATE:	11/2/99
SCALE:	As Shown
DRAWN BY:	LBN
APPROVED BY:	MDR
REVISION:	
FIGURE NUMBER:	3

GROUP DELTA CONSULTANTS, INC.

APPENDIX A
FIELD EXPLORATION

The field exploration was performed on July 21 and 22, 1999 utilizing a truck mounted hollow stem auger drill rig. The field exploration consisted of observing subsurface conditions in 5 borings to depths ranging from 26 to 61 feet below existing ground surface. Subsurface materials encountered were recorded by a GDC field engineer after classifying the material visually in accordance with the Unified Soil Classification System (USCS).

Relatively undisturbed samples and bulk samples of the encountered materials were obtained in the borings as noted on the boring logs. Relatively undisturbed samples were obtained by driven 2.41-inch inside diameter sampler with a 140-pound hammer free-falling 30 inches free drop, retained in brass rings of 1-inch in height, and placed in sealed plastic cans to prevent loss of moisture. Bulk samples were obtained and placed in polyethylene bags.

Approximate locations of the boring were determined by tape measurement from existing property boundary and existing surface structures, and are presented on Figure 2, Log of Test Borings. Pertinent details of subsurface materials encountered in each boring are presented in Figures A-1 through A-6, Log of Test Borings.

LOG OF TEST BORING

PROJECT	PROJECT NUMBER	HOLE NUMBER
LACSD - Laboratory Expansion	L-236	**LEGEND**

SITE	BEGUN	COMPLETED	SHEET NO.
Carson, California			1 of 2

DRILLER	DRILL METHOD	LOGGED BY	CHECKED BY

DRILL EQUIPMENT	BORING DIA.	TOTAL DEPTH	GROUND ELEV.	DEPTH/*ELEV.* GROUND WATER
		45.0 ft.		▼

SAMPLING METHOD

NOTES

DEPTH (feet)	ELEVATION	PENETRATION RESISTANCE (BLOWS/FOOT)	MOISTURE (%)	DRY DENSITY (pcf)	OTHER TESTS	GRAPHIC LOG	SAMPLE TYPE	DESCRIPTION AND CLASSIFICATION

FILL - Soil material not native to the location.

NATIVE - Soil material naturally deposited at the location.

BULK 1, R-2, S-3 - Refers to the type and sequence in which the sample was taken.

GRAB, MC, SPT - Refers to the method in which the sample was obtained.

GRAB - Refers to collecting sample by method of placing loose soil material into a plastic bag.

MC (CALIFORNIA MODIFIED) - Refers to collecting the sample by method of a 2.4" inside diameter by 12" long cylindrical sampler driven into the soil by a downward force, usually provided by a free falling hammer.

SPT (STANDARD PENETRATING TEST) - Refers to collecting the sample by method of a 1.4" inside diameter by 18" long cylindrical sampler driven into the soil by a downward force, usually provided by a free falling hammer.

GDC_LOG_BORING_2 L236LACS.GPJ GDC_WLOG.GDT 11/5/99

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THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF THE ACTUAL CONDITIONS ENCOUNTERED.

FIGURE A-0a

LOG OF TEST BORING

PROJECT	PROJECT NUMBER	HOLE NUMBER
LACSD - Laboratory Expansion	L-236	**B-1**

SITE	BEGUN	COMPLETED	SHEET NO.
Carson, California	07/22/99	07/22/99	1 of 2

DRILLER	DRILL METHOD	LOGGED BY	CHECKED BY
Layne Christensen	Hollow Stem Auger	NN	SHK

DRILL EQUIPMENT	BORING DIA.	TOTAL DEPTH	GROUND ELEV.	DEPTH/*ELEV.* GROUND WATER
CME 750 Alterain	8"	61.0 ft.	44.20	▼

SAMPLING METHOD
140-lb, 30-in Free Falling Hydraulic Hammer

NOTES

SAMPLE ID.	PENETRATION RESISTANCE (BLOWS/FOOT)	MOISTURE (%)	DRY DENSITY (pcf)	OTHER TESTS	ELEVATION	DEPTH (feet)	GRAPHIC LOG	SAMPLE TYPE	DESCRIPTION AND CLASSIFICATION
Bulk 1 GRAB				AL CO EI					FILL (SC) Olive brown, fine, Clayey SAND, slightly micaceous. 0' - 7' Hand Auger
					39	5			TERRACE DEPOSIT
R-1 MC	9	13.6	79.6						(SM) Reddish brown, fine, Silty SAND, with some Clay, micaceous, moist
S SPT	6				34	10			(CL) Olive brown, soft, Silty CLAY, slightly micaceous, moist LAKEWOOD FORMATION
R-2 MC	19	23.6	99.1	CS					(ML) Olive gray, Clayey SILT to SILT, with orangish brown stain, micaceous, moist
S SPT	19				29	15			(ML) Olive brown, stiff, SILT, with light gray and orange stains, micaceous, slightly moist
R-3 MC	20	4.9	96.1						(SP) Olive, fine SAND, with some Silt, slightly micaceous, slightly moist,
S SPT	22				24	20			color change to light olive gray, compact, slightly moist
Bulk 2 GRAB									
R-4 MC	19	2.8	89.0	WA SG					some orange staining, slightly moist to dry
S SPT	17				19	25			slightly compact, slightly moist to dry
R-5 MC	24	16.0	97.3		14	30			slightly moist to dry with some Clay balls

GDC_LOG_BORING L236LACS.GPJ GDC_WLOG.GDT 11/2/99

GROUP DELTA CONSULTANTS, INC.

FIGURE A-1a

LOG OF TEST BORING

PROJECT	PROJECT NUMBER	HOLE NUMBER
LACSD - Laboratory Expansion	L-236	B-1

SITE	BEGUN	COMPLETED	SHEET NO.
Carson, California	07/22/99	07/22/99	2 of 2

DRILLER	DRILL METHOD	LOGGED BY	CHECKED BY
Layne Christensen	Hollow Stem Auger	NN	SHK

DRILL EQUIPMENT	BORING DIA.	TOTAL DEPTH	GROUND ELEV.	DEPTH/*ELEV.* GROUND WATER
CME 750 Alterain	8"	61.0 ft.	44.20	▼

SAMPLING METHOD
140-lb, 30-in Free Falling Hydraulic Hammer

NOTES

SAMPLE ID.	PENETRATION RESISTANCE (BLOWS/FOOT)	MOISTURE (%)	DRY DENSITY (pcf)	OTHER TESTS	ELEVATION	DEPTH (feet)	GRAPHIC LOG	SAMPLE TYPE	DESCRIPTION AND CLASSIFICATION
									(SM) Olive, fine to coarse, Silty SAND, with some Clay, slightly micaceous, moist
R-6 MC	48	4.1	100.7		9	35			(SP) Light olive orange, fine to coarse, SAND, with some Silt and Clay, moist to slightly moist
R-7 MC	40	3.7	92.6	DS	4	40			(SP) Light brown, fine SAND, with Silt, micaceous, slightly moist
R-8 MC	30	4.2	95.1		-1	45			(SP) Olive, fine to coarse, SAND, with Silt, slightly moist SAN PEDRO FORMATION (SP) Orange, fragmented weathered sea shells with medium to coarse SAND, slightly moist to dry
R-9 MC	22	15.6	108.0		-6	50			(SP) Light olive gray, medium to coarse SAND with weathered sea shell fragments, some carbonate (SC) Olive, fine to medium, Clayey SAND, with sea shells, slightly micaceous, with orange stain, moist
R-10 MC	56	5.2	93.9		-11	55			(ML) Olive brown, fine Sandy SILT, micaceous, slightly moist to moist
R-11 MC		12.1	101.3		-16	60			(SM) Olive orange brown, fine Silty SAND, with sea shells, micaceous, some carbonate, slightly moist to moist Bottom of B-1 @ 61 feet No groundwater was observed. The boring was backfilled with medium bentonite chips and capped with grassy soil. The boring cuttings were placed into DOT drums.

GDC_LOG_BORING L236LACS.GPJ GDC_WLOG.GDT 11/2/99

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FIGURE A-1b

LOG OF TEST BORING

PROJECT	PROJECT NUMBER	HOLE NUMBER
LACSD - Laboratory Expansion	L-236	**B-2**

SITE	BEGUN	COMPLETED	SHEET NO.
Carson, California	07/21/99	07/21/99	1 of 2

DRILLER	DRILL METHOD	LOGGED BY	CHECKED BY
Layne Christensen	Hollow Stem Auger	NN	SHK

DRILL EQUIPMENT	BORING DIA.	TOTAL DEPTH	GROUND ELEV.	DEPTH/*ELEV.* GROUND WATER
CME 750 Alterain	8"	61.0 ft.	42.47	▼

SAMPLING METHOD
140-lb, 30-in Free Falling Hydraulic Hammer

NOTES

SAMPLE ID.	PENETRATION RESISTANCE (BLOWS/FOOT)	MOISTURE (%)	DRY DENSITY (pcf)	OTHER TESTS	ELEVATION	DEPTH (feet)	GRAPHIC LOG	SAMPLE TYPE	DESCRIPTION AND CLASSIFICATION
Bulk 3 GRAB				AL CO RV					FILL (CL) Reddish brown, Silty CLAY, with medium to fine Sand, slightly micaceous, moist 0' to 7' Hand Auger
					37	5			TERRACE DEPOSIT (SM) Orange brown, fine Silty SAND, with Clay
R-1 MC Bulk 1 GRAB	10	12.7	105.9						LAKEWOOD FORMATION (ML) Light olive brown, Clayey SILT, micaceous, slightly moist
S SPT	18			RV	32	10			stiff, increase in Clay content, moist
R-2 MC Bulk 2 GRAB	17	22.0	99.7	DS	27	15			color change to olive gray, with orange stains, moist
S SPT	18								stiff, moist
R-3 MC	16	21.4	100.2						slightly moist to moist
S SPT	18				22	20			stiff, slightly moist
R-4 MC	19	13.0	115.5						(SM) Olive brown, fine Silty SAND, with orange stains, micaceous, moist
S SPT	32				17	25			compact, slightly moist to moist
R-5 MC	35			DS	12	30			color change to light grayish brown, moist

GDC_LOG_BORING_L236LACS.GPJ GDC_WLOG.GDT 11/2/99

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FIGURE A-2a

LOG OF TEST BORING

PROJECT	PROJECT NUMBER	HOLE NUMBER
LACSD - Laboratory Expansion	L-236	B-2

SITE	BEGUN	COMPLETED	SHEET NO.
Carson, California	07/21/99	07/21/99	2 of 2

DRILLER	DRILL METHOD	LOGGED BY	CHECKED BY
Layne Christensen	Hollow Stem Auger	NN	SHK

DRILL EQUIPMENT	BORING DIA.	TOTAL DEPTH	GROUND ELEV.	DEPTH/*ELEV.* GROUND WATER
CME 750 Alterain	8"	61.0 ft.	42.47	▼

SAMPLING METHOD
140-lb, 30-in Free Falling Hydraulic Hammer

NOTES

SAMPLE ID.	PENETRATION RESISTANCE (BLOWS/FOOT)	MOISTURE (%)	DRY DENSITY (pcf)	OTHER TESTS	ELEVATION	DEPTH (feet)	GRAPHIC LOG	SAMPLE TYPE	DESCRIPTION AND CLASSIFICATION
R-6 MC	29	3.7	97.7		7	35			(SM - SP) Light grayish brown, fine to medium, Silty SAND to SAND, slightly micaceous, slightly moist to moist
R-7 MC	30	12.5	92.6	WA SG	2	40			micaceous, moist
									SAN PEDRO FORMATION
R-8 MC	30	6.5	95.3		-3	45			(SP) Orange brown, medium to fine SAND, with sea shell fragments, micaceous, moist
R-9 MC	32	3.6	105.5		-8	50			with weathered sea shell and mica fragments, moist
R-10 MC	54	15.2	101.8		-13	55			(SM) Olive brown, fine Silty Sand, with some Clay, moist to very moist (CL) Olive gray, Silty CLAY, moist to slightly moist
R-11 MC	45	6.6	107.4		-18	60			(SP) Orange brown, fine to medium, SAND, with some Silt and weathered sea shell fragment, moist

Bottom of B-2 @ 61 feet
No groundwater was observed.
The boring was backfilled with medium bentonite chips and capped with grassy soil.
The boring cuttings were placed into DOT drums.

GDC_LOG_BORING L236LACS.GPJ GDC_WLOG.GDT 11/2/99

GROUP DELTA CONSULTANTS, INC.

FIGURE A-2b

LOG OF TEST BORING

PROJECT	PROJECT NUMBER	HOLE NUMBER
LACSD - Laboratory Expansion	L-236	B-3

SITE	BEGUN	COMPLETED	SHEET NO.
Carson, California	07/21/99	07/21/99	1 of 2

DRILLER	DRILL METHOD	LOGGED BY	CHECKED BY
Layne Christensen	Hollow Stem Auger	NN	SHK

DRILL EQUIPMENT	BORING DIA.	TOTAL DEPTH	GROUND ELEV.	DEPTH/*ELEV.* GROUND WATER
CME 750 Alterain	8"	61.0 ft.	41.19	▼

SAMPLING METHOD: 140-lb, 30-in Free Falling Hydraulic Hammer

NOTES:

SAMPLE ID.	PENETRATION RESISTANCE (BLOWS/FOOT)	MOISTURE (%)	DRY DENSITY (pcf)	OTHER TESTS	ELEVATION	DEPTH (feet)	GRAPHIC LOG	SAMPLE TYPE	DESCRIPTION AND CLASSIFICATION
									6" Asphalt 6" Olive Base TERRACE DEPOSIT (CL) Dark gray brown, Silty CLAY, slightly moist 1' - 7' Hand Auger LAKEWOOD FORMATION
					36	5			(ML) Olive brown, Clayey SILT, slightly micaceous, moist
R-1 MC		11.2	102.9						organic, micaceous, slightly moist
S SPT	29				31	10			very stiff, slightly moist to dry
R-2 MC	28	8.6	116.7						(ML) Grayish brown, fine sandy SILT, with orange stains, micaceous, slightly moist
S SPT	25				26	15			(SP) Olive brown, compact, fine SAND, with Silt, micaceous, slightly moist
R-3 MC	28	8.1	104.8						(SM) Grayish brown, fine Silty SAND, slightly micaceous, slightly moist
S SPT Bulk 1 GRAB	30				21	20			(SP) Olive brown, compact, fine, SAND, slightly micaceous, with Clay balls, slightly moist
R-4 MC	43	2.2	92.6	CO WA DS					color change to olive gray, slightly moist to dry
S SPT	36				16	25			gradates to a medium to fine, dense, slightly moist to dry
R-5 MC Bulk 2 GRAB	33	5.5	89.2	CS	11	30			slightly moist to moist

GDC_LOG_BORING L236LACS.GPJ GDC_WLOG.GDT 11/2/99

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FIGURE A-3a

LOG OF TEST BORING

PROJECT	PROJECT NUMBER	HOLE NUMBER
LACSD - Laboratory Expansion	L-236	B-3

SITE	BEGUN	COMPLETED	SHEET NO.
Carson, California	07/21/99	07/21/99	2 of 2

DRILLER	DRILL METHOD	LOGGED BY	CHECKED BY
Layne Christensen	Hollow Stem Auger	NN	SHK

DRILL EQUIPMENT	BORING DIA.	TOTAL DEPTH	GROUND ELEV.	DEPTH/*ELEV.* GROUND WATER
CME 750 Alterain	8"	61.0 ft.	41.19	▼

SAMPLING METHOD
140-lb, 30-in Free Falling Hydraulic Hammer

NOTES

SAMPLE ID.	PENETRATION RESISTANCE (BLOWS/FOOT)	MOISTURE (%)	DRY DENSITY (pcf)	OTHER TESTS	ELEVATION	DEPTH (feet)	GRAPHIC LOG	SAMPLE TYPE	DESCRIPTION AND CLASSIFICATION
				MA					
R-6 MC		21.9	101.4		-6	35			moist (ML) Olive brown, Clayey SILT, micaceous, some orange staining, moist
R-7 MC	52	4.8	94.5		-1	40			(SP) Olive brown, fine SAND, with Silt and orange stains, moist
									SAN PEDRO FORMATION
R-8 MC	21	7.0	98.4		-4	45			(SP) Orange brown, fine to medium, SAND, with weathered sea shells, slightly moist to moist
R-9 MC	33 37	4.4	105.0		-9	50			color change to light olive orange, micaceous, moist
R-10 MC	75	4.1	104.6		-14	55			(SM) Light grayish, brown, fine to medium, Silty SAND, some weathered sea shell fragments, micaceous, moist
R-11 MC	81	5.7	96.9		-19	60			color change to olive brown, fine grain, slightly moist
									Bottom of B-3 @ 61 feet No groundwater was observed. The boring was backfilled with medium bentonite chips, and capped with cold patch asphalt. The boring cuttings were placed into DOT drums.

GDC_LOG_BORING L236LACS GPJ GDC_WLOG.GDT 11/2/99

GROUP DELTA CONSULTANTS, INC.

FIGURE A-3b

LOG OF TEST BORING

PROJECT	PROJECT NUMBER	HOLE NUMBER
LACSD - Laboratory Expansion	L-236	**B-4**

SITE	BEGUN	COMPLETED	SHEET NO.
Carson, California	07/22/99	07/22/99	1 of 2

DRILLER	DRILL METHOD	LOGGED BY	CHECKED BY
Layne Christensen	Hollow Stem Auger	NN	SHK

DRILL EQUIPMENT	BORING DIA.	TOTAL DEPTH	GROUND ELEV.	DEPTH/*ELEV.* GROUND WATER
CME 750 Alterain	8"	61.0 ft.	39.87	▼

SAMPLING METHOD
140-lb, 30-in Free Falling Hydraulic Hammer

NOTES

SAMPLE ID.	PENETRATION RESISTANCE (BLOWS/FOOT)	MOISTURE (%)	DRY DENSITY (pcf)	OTHER TESTS	ELEVATION	DEPTH (feet)	GRAPHIC LOG	SAMPLE TYPE	DESCRIPTION AND CLASSIFICATION
									6" of Asphalt 1' thick olive Base
									FILL
									(CL) Dark olive brown, fine Sandy CLAY, with Gravel up to 5/8", moist 1.5' to 7' Hand Auger
					35	5			(ML) Olive brown, Clayey SILT, micaceous, moist
R-1 MC	30	13.9	110.2	DS					with Gravel up to 3/4", moist to slightly moist
									LAKEWOOD FORMATION
S SPT	22				30	10			very stiff, fine grain Sandy SILT, with some Clay, micaceous, moist
R-2 MC	29	8.0	103.7						color change to orange olive, moist
S SPT	18				25	15			color change to olive gray, stiff, moist
									color change to dark gray, with some carbonates, moist
R-3 MC	17	22.0	86.6						(SM) Light olive, fine Silty SAND, micaceous, dry to slightly moist
S SPT	22				20	20			compact, slightly moist to dry
R-4 MC	21	13.7	93.5						color change to olive and orange, with some Clay, moist to slightly moist
S SPT Bulk 1 GRAB	40				15	25			color change to light yellowish brown, dense, slightly moist to dry
				MA CO					
R-5 MC	44	5.0	92.9		10	30			moist to slightly moist

GDC_LOG_BORING L236LACS.GPJ GDC_WLOG.GDT 11/2/99

GROUP DELTA CONSULTANTS, INC.

FIGURE A-4a

LOG OF TEST BORING

PROJECT	PROJECT NUMBER	HOLE NUMBER
LACSD - Laboratory Expansion	L-236	B-4

SITE	BEGUN	COMPLETED	SHEET NO.
Carson, California	07/22/99	07/22/99	2 of 2

DRILLER	DRILL METHOD	LOGGED BY	CHECKED BY
Layne Christensen	Hollow Stem Auger	NN	SHK

DRILL EQUIPMENT	BORING DIA.	TOTAL DEPTH	GROUND ELEV.	DEPTH/*ELEV.* GROUND WATER
CME 750 Alterain	8"	61.0 ft.	39.87	▼

SAMPLING METHOD
140-lb, 30-in Free Falling Hydraulic Hammer

NOTES

SAMPLE ID.	PENETRATION RESISTANCE (BLOWS/FOOT)	MOISTURE (%)	DRY DENSITY (pcf)	OTHER TESTS	ELEVATION	DEPTH (feet)	GRAPHIC LOG	SAMPLE TYPE	DESCRIPTION AND CLASSIFICATION
R-6 MC	68	5.2	93.3		5	35		⊠	slightly moist to dry
R-7 MC	56	4.8	88.7		0	40		⊠	slightly moist to dry
R-8 MC	73				-5	45		⊠	moist (ML) olive, Clayey SILT, with orange stains, micaceous, moist
R-9 MC	76			DS	-10	50		⊠	SAN PEDRO FORMATION ? (SM) Light yellowish brown, fine Silty SAND, with some orange stains, micaceous, slightly moist (ML) Olive and orange, fine Sandy SILT, with Clay, micaceous, slightly moist
R-10 MC	53				-15	55		⊠	(SM) Olive to yellowish brown, fine to medium, Silty SAND, micaceous, moist
R-11 MC	79				-20	60		⊠	moist Bottom of B-4 @ 61 feet No groundwater was observed. The boring was backfilled with medium bentonite chips, and capped with cold patch asphalt. The boring cuttings were placed into DOT drums.

GDC_LOG_BORING L236LACS.GPJ GDC_WLOG.GDT 11/2/99

GROUP DELTA CONSULTANTS, INC.

FIGURE A-4b

LOG OF TEST BORING

PROJECT	PROJECT NUMBER	HOLE NUMBER
LACSD - Laboratory Expansion	L-236	**B-5**

SITE	BEGUN	COMPLETED	SHEET NO.
Carson, California	07/21/99	07/21/99	1 of 1

DRILLER	DRILL METHOD	LOGGED BY	CHECKED BY
Layne Christensen	Hollow Stem Auger	NN	SHK

DRILL EQUIPMENT	BORING DIA.	TOTAL DEPTH	GROUND ELEV.	DEPTH/*ELEV.* GROUND WATER
CME 750 Alterain	8"	26.5 ft.	41.99	▼

SAMPLING METHOD
140-lb, 30-in Free Falling Hydraulic Hammer

NOTES

SAMPLE ID.	PENETRATION RESISTANCE (BLOWS/FOOT)	MOISTURE (%)	DRY DENSITY (pcf)	OTHER TESTS	ELEVATION	DEPTH (feet)	GRAPHIC LOG	SAMPLE TYPE	DESCRIPTION AND CLASSIFICATION
									FILL (SC) Olive Brown, fine, Clayey SAND, with some Silt and gravel up to 5/8"
					37	5			TERRACE DEPOSIT ? / FILL
S SPT	14								(SC) Reddish brown, Clayey SAND, slightly micaceous color change to brown, slightly compact, moist
S SPT	9				32	10			loose, moist
									LAKEWOOD FORMATION
S SPT	28				27	15			(ML) Olive brown, very stiff, fine Sandy SILT, slightly micaceous, moist to slightly moist
S SPT	21				22	20			(ML) Olive gray, very stiff, Clayey SILT, with orange stain, micaceous, slightly moist to dry
S SPT	35				17	25			(SM) Olive brown, dense, fine to medium, Silty SAND, slightly micaceous, slightly moist
					12	30			Bottom of B-5 @ 26.5 feet No groundwater was observed. The boring was backfilled with medium bentonite chips and capped with grassy soil. The boring cuttings were placed into a DOT drum.

GDC_LOG_BORING_L236LACS.GPJ GDC_WLOG.GDT 11/2/99

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FIGURE A-5

Advanced Earth Sciences, Inc.
Geotechnical and Environmental Consultants

Log of Boring C-2

Project: Geotechnical and Environmental Assessments at the JWPCP
Location: Carson, California
Client: County Sanitation Districts of Los Angeles County

Project Number: 98-104

Location: Joint Water Pollution Control Plant			Elevation and Datum: 40.95 MSL
Coordinates: N 681.25 E 1590.38	Depth to Groundwater (ft): None		Total Depth (ft): 61.0
Drilling Equipment/Method: CME 75 HT Hollow-Stem Auger			Date Started: 6/1/98
Drilling Contractor: ABC Liovin Drilling	Borehole Diameter: 7.25 inches		Date Completed: 6/1/98
Hammer Information: 140 lb automatic	Logged By: Grant Miller		Checked By: Saroj Weeraratne

Depth (feet)	Sample Type	Sample Number	Blow Count	Recovery (%)	Lithologic Log	Material Description	Unified Soil Classification	Dry Density (pcf)	Moisture Content (%)	OVA Reading	Remarks
0						ARTIFICIAL FILL (AF):					Bulk sample 0-20'; comp
		B-1				**LEAN CLAY**; very dark grayish-brown to dark brown, moist, firm, medium plastic, trace to some fine-grained sand, non-stratified, no odor	CL			7.5 --- 6.5	
5		E-2	4 10 13	100		As above, brown, calcareous filaments and coated surfaces, no odor	CL			7.5 ---- 5.5	Pocket pen = 3.25 TPH = ND Total DDT = ND
		S-3	4 5 7	100		**SILT**; light olive-brown to olive-brown, moist, firm to stiff, low plastic fines, some fine-grained sand, some clay, micaceous, non-stratified, no odor	ML/CL			8.5 --- 5.5	
10		E-4	6 14 19	83		**LEAN CLAY**; olive-brown, moist, stiff, medium plastic, trace fine-grained sand, trace gravel-sized cemented fragments, non-stratified, no odor	CL			9.0 ---- 5.5	Pocket pen >4.5 TPH = ND Total DDT = ND
						ALLUVIUM (Qa):					
		D-5	20 24	75		**SANDY SILT**; olive-brown with olive-gray mottling, moist, stiff, low plastic fines, fine-grained sand, micaceous, non-stratified, no odor	ML	102	8	8.5 --- 5.5	Pocket pen >4.5
15						See next page					

This borehole log is based on field classification, on visual soil description, and on the results of laboratory classification tests, where available. The data presented represent conditions only at the location of this borehole and at the time of drilling. Subsurface conditions may differ at other locations in the vicinity of this borehole and may change at this location with the passage of time.

Project: Geotechnical and Environmental Assessments at the JWPCP
Location: Carson, California
Client: County Sanitation Districts of Los Angeles County

Project Number: 98-104

Depth (feet)	Sample Type	Sample Number	Blow Count	Recovery (%)	Lithologic Log	Material Description	Unified Soil Classification	Dry Density (pcf)	Moisture Content (%)	OVA Reading	Remarks
15		E-6	5 9 21	100		**VARIES FROM LEAN CLAY TO SANDY SILT;** light olive-brown, moist, stiff, medium plastic fines to low plastic fines (sandy silt), fine-grained sand, micaceous, stratified, no odor	CL/ML			7.5 --- 5.5	Pocket pen >4.5
						<u>LAKEWOOD FM(Qlw):</u>					
		S-7	9 17 27	100		**SILTY SAND;** light olive-brown with yellowish-brown mottling, moist, dense, low plastic fines, fine-grained sand, micaceous, non-stratified, no odor	SM			6.5 — 4.5	
20		E-8	19 31 50	100		**SAND WITH SILT TO SILTY SAND;** light olive-brown, moist, dense, fine-grained sand, micaceous, non-stratified, no odor	SP/SM			5.5 --- 3.5	TPH = ND Total DDT - ND
		D-9	50/6"	67		**SAND;** light olive-brown, moist, dense to very dense, fine- to medium-grained sand, micaceous, non-stratified, no odor	SP/SW	103	5	5.0 --- 4.5	COMP
25		E-10	11 17 22	100		**VARIES FROM SILTY SAND, SANDY SILT TO SAND WITH SILT;** light yellowish-brown with yellowish-brown mottling/staining, moist, very dense, low plastic fines, fine- to medium-grained sand, trace coarse sand, buiturbated, no odor	SM ML SP			3.5 — 2.0	
		S-11	14 20 27	100		**SAND WITH SILT;** light yellowish-brown, moist, dense to very dense, fine-grained sand, micaceous, non-stratified, no odor	SP/SM			3.5 --- 2.5	
30		D-12	50/6"	67		As above	SP/SM			3.5 --- 1.5	

Project: Geotechnical and Environmental Assessments at the JWPCP
Location: Carson, California
Client: County Sanitation Districts of Los Angeles County

Project Number: 98-104

Depth (feet)	Sample Type	Sample Number	Blow Count	Recovery (%)	Lithologic Log	Material Description	Unified Soil Classification	Dry Density (pcf)	Moisture Content (%)	OVA Reading	Remarks
35		S-13	11 20 24	100		As above, laminated, no odor	SP/SM			3.5 0.5	
40		D-14	50/6"	67		As above, no odor	SP/SM			4.0 3.5	
45		S-15	18 24 31	100		As above, light olive-brown, fossiliferous, no odor	SP/SM			4.5 3.5	
50											

Advanced Earth Sciences, Inc.
Geotechnical and Environmental Consultants

Log of Boring C-2

Project: Geotechnical and Environmental Assessments at the JWPCP
Location: Carson, California
Client: County Sanitation Districts of Los Angeles County

Project Number: 98-104

Depth (feet)	Sample Type	Sample Number	Blow Count	Recovery (%)	Lithologic Log	Material Description	Unified Soil Classification	Dry Density (pcf)	Moisture Content (%)	OVA Reading	Remarks
50		D-16	50/5"	60		As above, light olive gray, fossiliferous, no odor	SP/SM			3.3 0.8	
55		S-17	5 12 17	100		As above, fossiliferous, partly cemented, no odor	SP/SM			2.8 0.3	
60		D-18	50/6"	100		As above, no fossils, no odor	SP/SM			4.5 3.5	
						Boring terminated at 60 feet. Backfilled with bentonite chips to the ground surface.					
65											

FIGURE A-6

APPENDIX B
GEOTECHNICAL LABORATORY TESTING

General

The laboratory testing performed for this investigation included determination of Moisture Content and Dry Unit Weight, Percent Passing No. 200 Sieve, Maximum Dry Density, Shear Strength, Corrosion Test, Consolidation Test, and Resistance Value. Descriptions of these tests are given below.

Moisture and Dry Unit Weight

The field moisture and dry unit weight of each relatively undisturbed sample was determined in general accordance with ASTM D2216. Results of these tests are presented in the Log of Test Borings.

Maximum Dry Density

The maximum dry density and optimum water content for compacted soils were determined in accordance with ASTM D1557-91. Results of the tests are listed in Table B-1, Maximum Dry Density.

Shear Strength

Selected samples were remolded to 90 percent relative compaction based on results of Maximum Dry Density tests to determine the shear strength by performing Direct Shear Tests in general accordance with ASTM D3080-90. Results of the tests are listed in Figure B-2 through B-3, Direct Shear Test.

Corrosion Testing

The soluble Sulfate and Chloride content, the Minimum Resistivity, and pH values were determined in accordance with ASTM D512-89, CTM 417, and CTM 643, respectively. The test data are presented in Table B-2, Corrosion.

Consolidation Test

The consolidation characteristics of the foundation soils were determined by performing in general accordance with ASTM D 2435-90, using a floating ring consolidometer and dead weight system. Results of the tests are listed in Figures B-4 and B-5, Consolidation vs. Pressure.

Resistance Value

A Resistance Value (R-Value) test was performed on the representative subgrade soil sample in accordance with the CTM 301

procedure. Results of the test are presented in Table B-3, Resistance Values.

Expansion Index

Selected soil samples were tested to evaluate the Expansion Index (EI) in accordance with ASTM D4829. Results are present in Table B-4, Expansion Index.

Specific Gravity

Selected soil samples were tested to evaluate the Specific Gravity in accordance with ASTM D854. Results are present in Table B-6, Specific Gravity.

-200 Sieve Wash

Selected soil samples were tested to evaluate the amount particle finer than 75 μm in the soils in accordance with ASTM D1140. Results are present in Table B-5, -200 Sieve Wash.

Atterberg Limits

Selected soil samples were tested to evaluate their plasticity in accordance with ASTM D4318. Results are present in Figure B-1.

TABLE B-1 - MAXIMUM DRY DENSITY

Location	**Depth** (feet)	**Maximum Dry Density** (pcf)	**Optimum Moisture Content** (%)
B-3	30-35	125.0	12.0
B-4	25-30	120.0	11.5

TABLE B-2 - CORROSION

Location	Depth (feet)	Soluble Sulfate (mg/kg)	Soluble Chloride (mg/kg)	Ph
B-1	0-3.5	13	<10	7.6
B-2	0-4	<10	<10	8.0
B-3	20-25	26	<10	8.7
B-4	25-30	17	<10	8.9

TABLE B-3 - RESISTANCE VALUE

Boring No.	Depth (feet)	R-Value
B-2	0-4	15
B-2	7-12	17

TABLE B-4 – EXPANSIVE INDEX (EI)

Boring No.	Depth (feet)	EI
B-1	0-35	8

TABLE B-5 - -200 SIEVE WASH

Location	Depth (feet)	Description	% Passing
B-1	22	(SP) Tan fine Silty Sand	3
B-2	40	(SM) Tan fine Silty Sand	16
B-3	22	(SP) Brown medium Sand	3
B-4	50	(SP) Brown medium Sand	3

TABLE B-6 - SPECIFIC GRAVITY

Location	Depth (feet)	Description	Specific Gravity
B-1	22	(SP) Tan fine Silty Sand	2.63
B-2	40	(SM) Tan fine Silty Sand	2.65

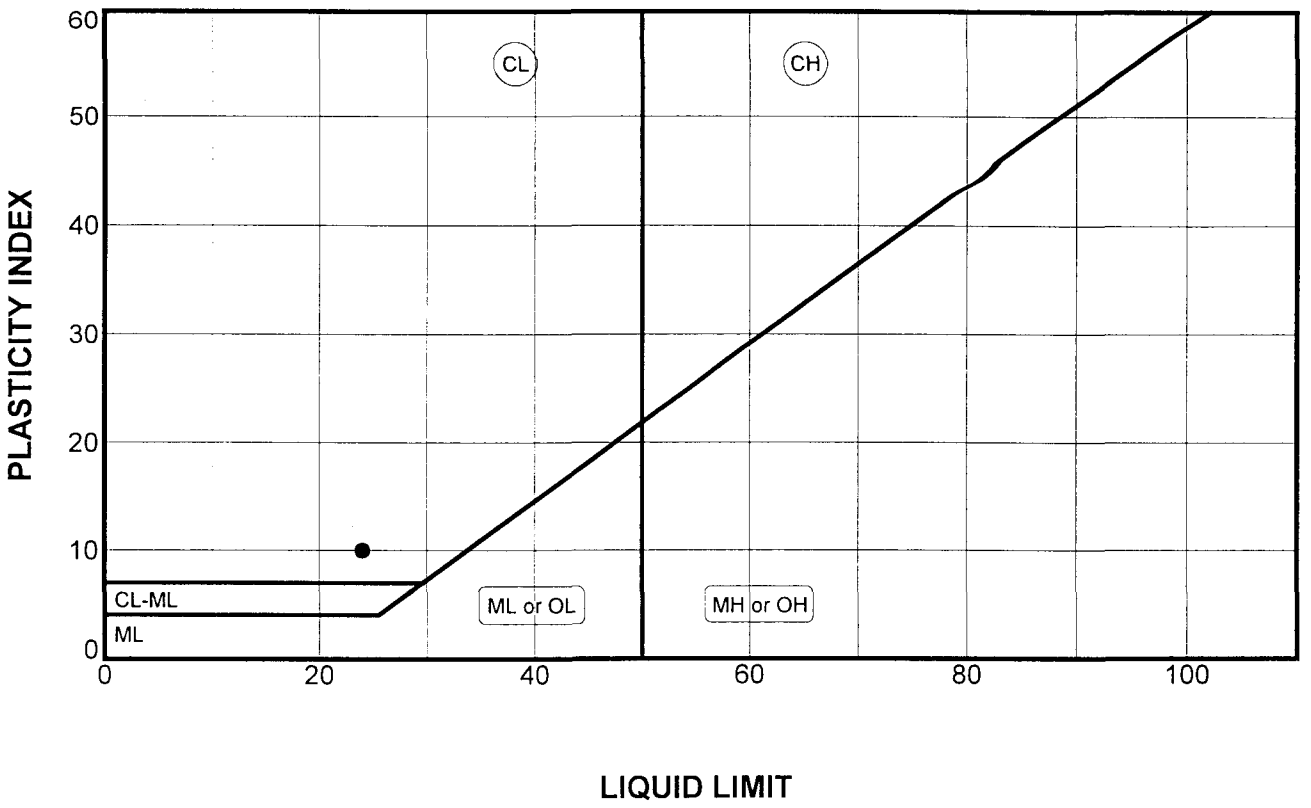
TABLE B-7 – ESTIMATED LAYER RESISTIVITY

Electrode Spacing "A-Spacing" (ft)	**Measured "Average Resistance" (Ohms)**	**Estimated Layer Resistance (Ohms)**	**Estimated Layer Resistivity (Ohm-meters)**
2.5	4.11	4.11	19.68
5.00	2.38	5.65	22.79
7.5	1.46	3.78	20.97
10.00	1	3.17	19.15
12.5	0.85	5.67	20.35
15.00	0.63	2.43	18.10

Electrode Spacing "A-Spacing" (ft)	Measured "Average Resistance" (Ohms)	Estimated Layer Resistance (Ohms)	Estimated Layer Resistivity (Ohm-meters)
2.5	17.34	17.34	83.02
5.00	3.92	5.07	37.54
7.5	1.92	3.76	27.58
10.00	1.15	2.87	22.02
12.5	0.82	2.86	19.63
15.00	0.67	3.66	19.25

Electrode Spacing "A-Spacing" (ft)	Measured "Average Resistance" (Ohms)	Estimated Layer Resistance (Ohms)	Estimated Layer Resistivity (Ohm-meters)
2.5	11.39	11.39	54.53
5.00	4.38	7.12	41.94
7.5	1.91	3.39	27.43
10.00	1.03	2.24	19.73
12.5	0.77	3.05	18.43
15.00	0.66	4.62	18.96

Barns Method assumes that N^{th} "A-Spacing" measures "Average Resistance" to the bottom of the N^{th} "Layer". The following calculations were used:
N^{th} Layer Resistance = 1(1/N^{th} Average Resistance- 1/N-1^{th} Average Resistance)
N^{th} Layer Resistivity = 2*Pi*Eletrode Spacing*N^{th} Layer Resistance/3.28



Sym	BORING	Depth (ft)	Elev. (ft)	LL	PL	PI	LI	w%	Description
●	B-2	0.0		24	14	10			(SC) Light Brown Clayey Sand

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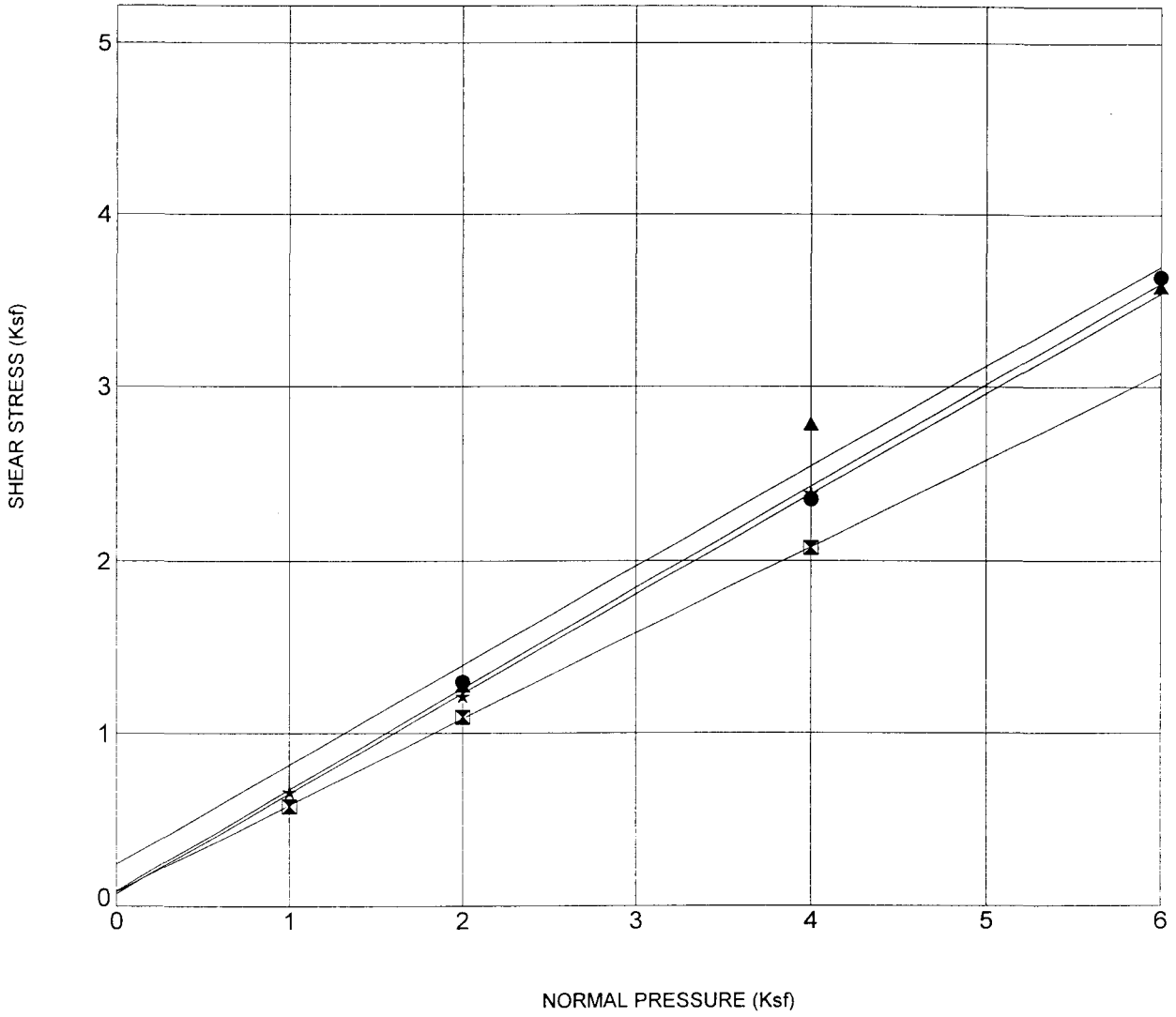
ATTERBERG LIMITS

GROUP DELTA CONSULTANTS, INC.

Project: LACSD - Laboratory Expansion
Location: Carson, California
Number: L-236

FIGURE B-1



SYM	BORING	Depth(ft)	DESCRIPTION	γ_d lb/ft^3	MC % Before	MC % After	c KSF	ϕ deg
●	B-1	40.0	(SM) Light Brown Silty Fine Sand	92.6	3.7	27.1	0.09	30.3
⧗	B-2	15.0	(CL) Olive Brown Silty Clay	88.7	22.0	36.0	0.08	26.5
▲	B-2	30.0	(SM) Light Gray Silty Sand	78.8		26.0	0.24	29.9
★	B-3	22.0	(SM) Brownish Tan Silty Sand	76.2	2.2	25.4	0.07	30.0

NOTE: All samples submerged unless otherwise noted
Shear Strength are Ultimate with less than 0.25 inch deflection

GDC DIRECT SHEAR L236LACS.GPJ GDC WLOG.GDT 8/9/99

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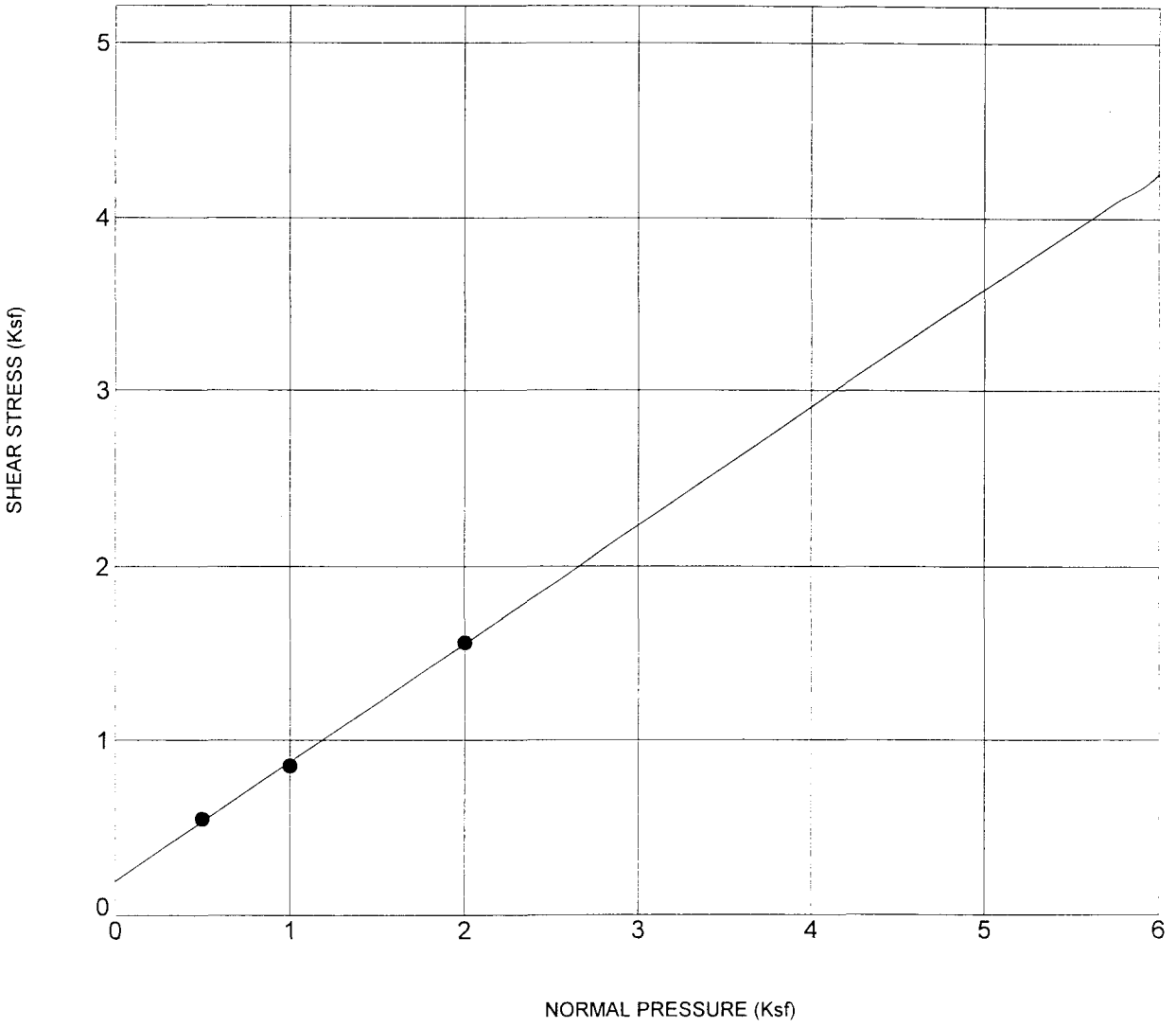
DIRECT SHEAR TEST

GROUP DELTA CONSULTANTS, INC.

Project: LACSD - Laboratory Expansion
Location: Carson, California
Number: L-236

FIGURE B- 2



SYM	BORING	Depth(ft)	DESCRIPTION	γ_d lb/ft^3	MC % Before	MC % After	c KSF	ϕ deg
●	B-4	7.0	(CL) Tan Clay with Silt	110.2	13.9	25.6	0.20	34.1

NOTE: All samples submerged unless otherwise noted
Shear Strength are Ultimate with less than 0.25 inch deflection

GDC_DIRECT_SHEAR_L236LACS.GPJ GDC_WLOG.GDT 8/9/99

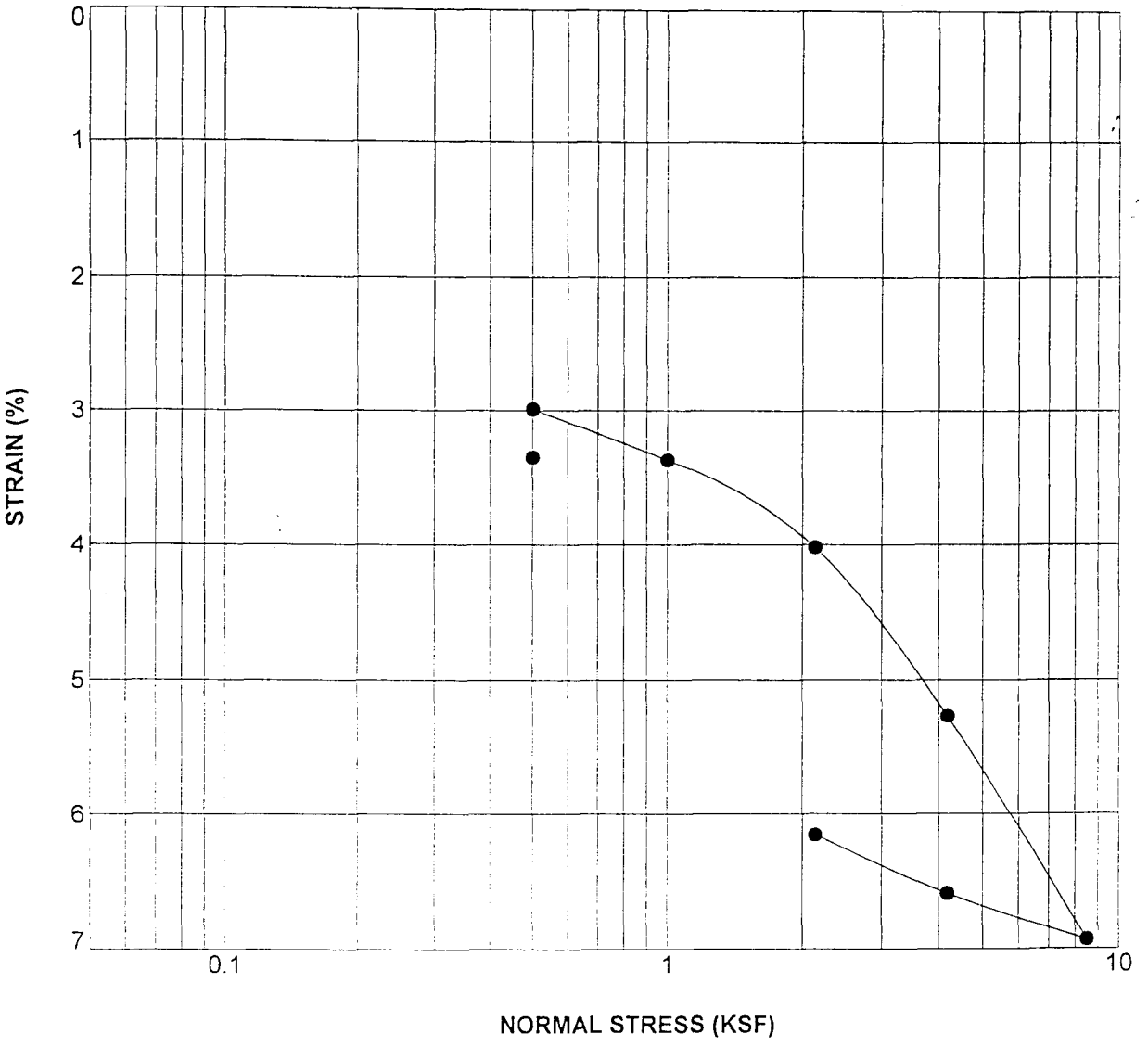
GROUP DELTA CONSULTANTS

DIRECT SHEAR TEST

GROUP DELTA CONSULTANTS, INC.

Project: LACSD - Laboratory Expansion
Location: Carson, California
Number: L-236

FIGURE B- 3



SYMBOL	BORING	DEPTH (ft)	DESCRIPTION	Liquid Limit	Plastic Limit
●	B-3	35.0	(SM) Olive Green Silty Sand		

	Moisture Content (%)	Dry Density (pcf)	Percent Saturation (%)	Void Ratio
INITIAL	19.8	104.2	86.6	0.617
FINAL	23.5	107.7	100.0	0.564

Specific Gravity: 2.7

Remark: SAMPLE SATURATED AT .5 KSF

GDC CON_STRNVSSTRS L236LACS.GPJ GDC_WLOG.GDT 8/26/99

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CONSOLIDATION TEST

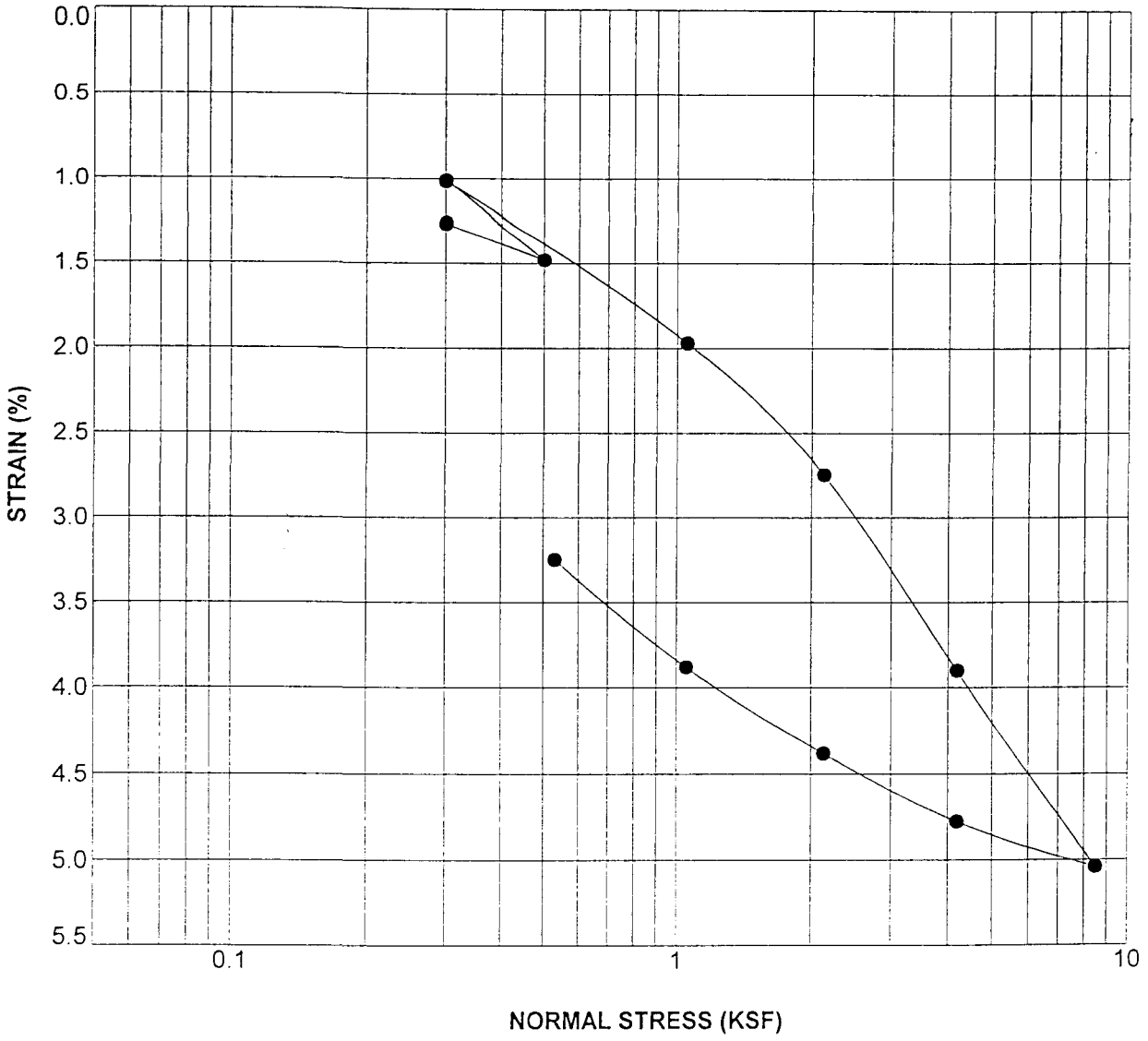
GROUP DELTA CONSULTANTS, INC.

Project: LACSD - Laboratory Expansion

Location: Carson, California

Number: L-236

FIGURE **B-4**



SYMBOL	BORING	DEPTH (ft)	DESCRIPTION	Liquid Limit	Plastic Limit
●	B-1	12.0	(ML) Light Brown Sandy Silt		

	Moisture Content (%)	Dry Density (pcf)	Percent Saturation (%)	Void Ratio
INITIAL	22.9	97.6	85.1	0.726
FINAL	24.0	99.9	94.4	0.686

Specific Gravity: 2.7

Remark: SAMPLE SATURATED AT 0.3 KSF

GDC_CON_STRNVSSTRS_L236LACS.GPJ GDC_WLOG.GDT 8/26/99

GROUP DELTA CONSULTANTS

CONSOLIDATION TEST

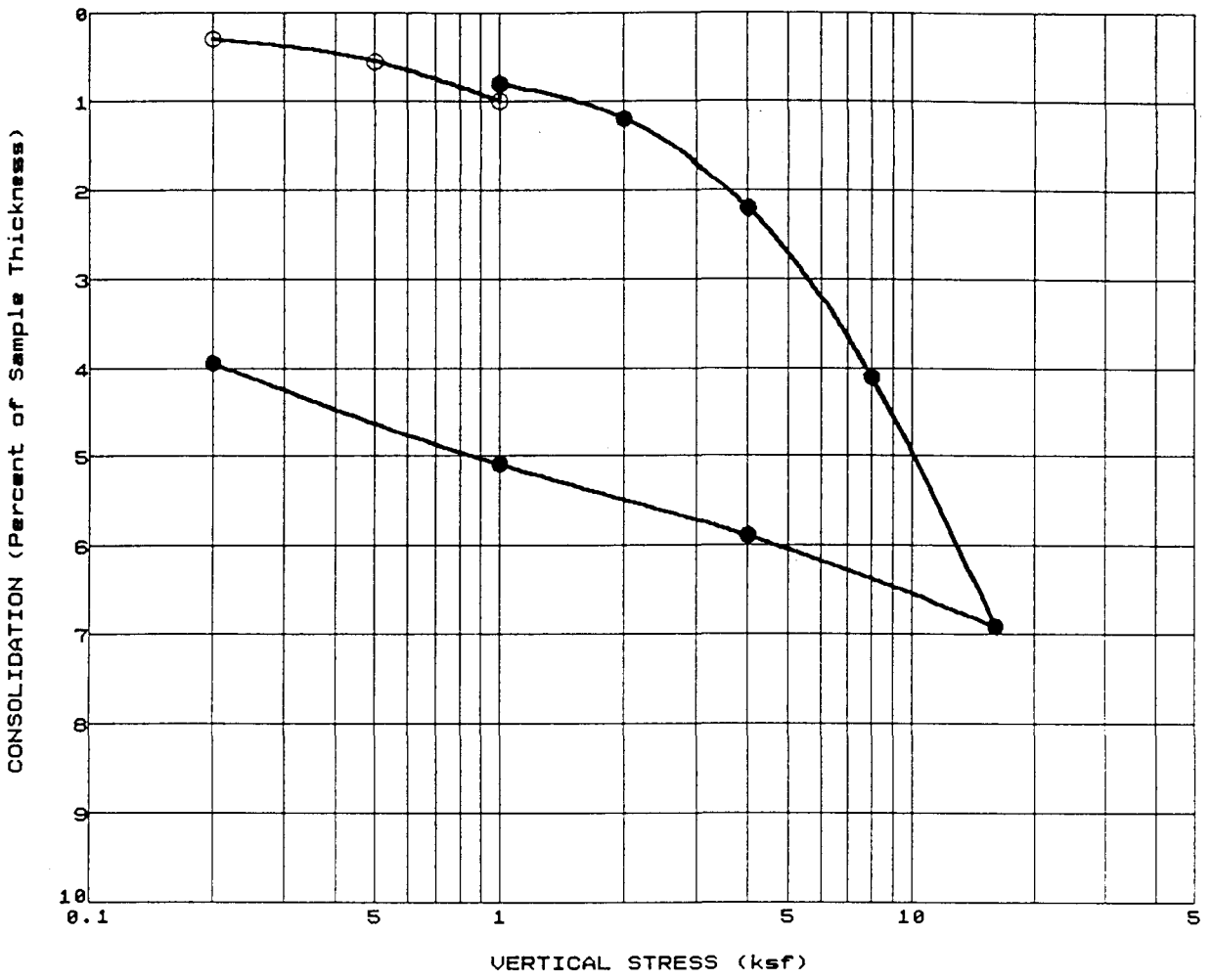
GROUP DELTA CONSULTANTS, INC.

Project: LACSD - Laboratory Expansion

Location: Carson, California

Number: L-236

FIGURE B-5

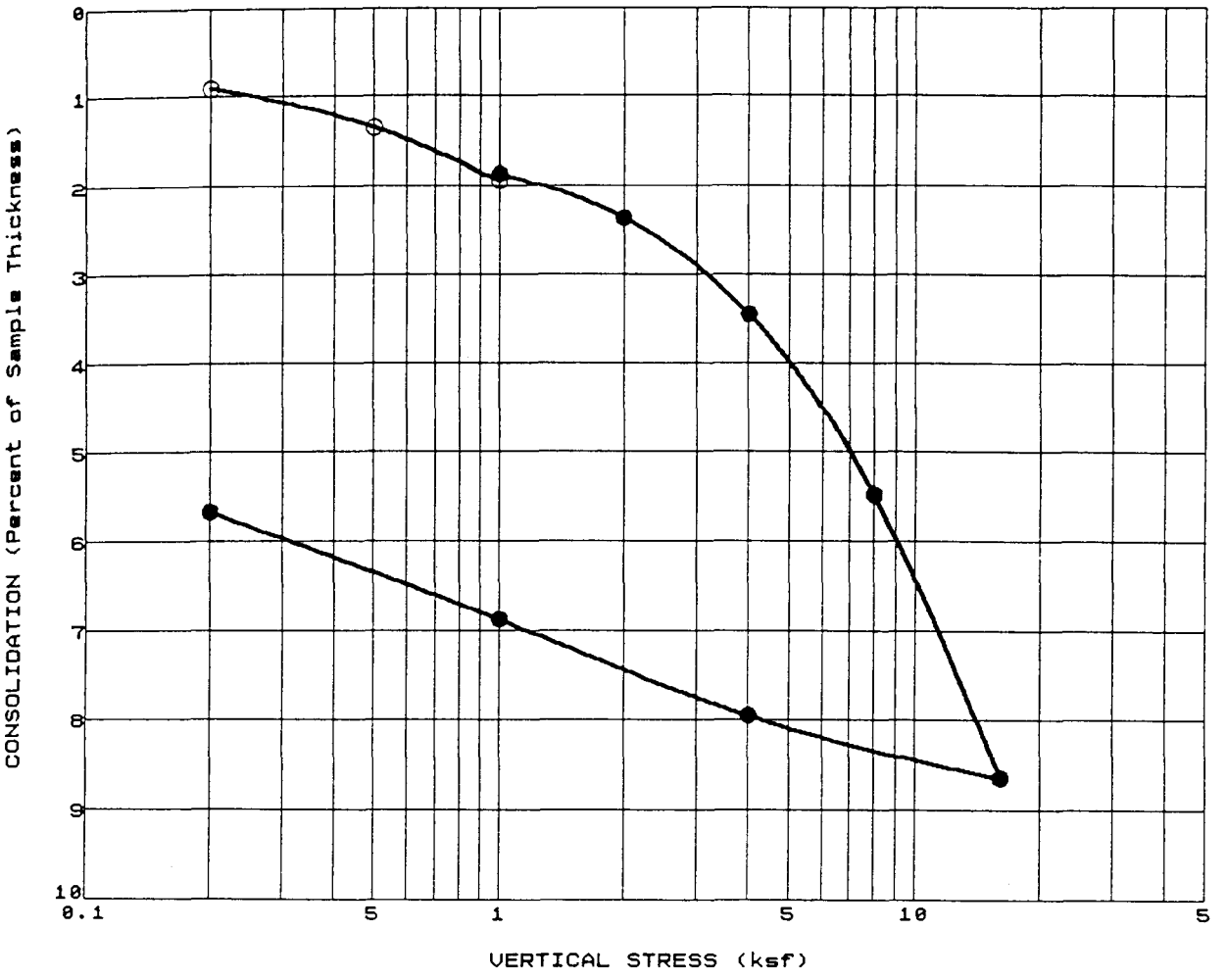


LEGEND: ○ At Field Moisture
● After Addition of Water

Boring No.	C-1	Initial Dry Density (pcf)	85.3
Sample No.	D-3	Moisture Content (%):	
Depth (feet)	7.5	Before	26.8
Soil Type	CL	After	25.0
Soil Description	Olive Brn Clay trace Silt		

CONSOLIDATION CURVE
ASTM D 2435

Project No. 98-104
Project Name Geot. and Env. Assessment at JWPCP
Date 7/27/98 Figure No. B-6



LEGEND: ○ At Field Moisture
● After Addition of Water

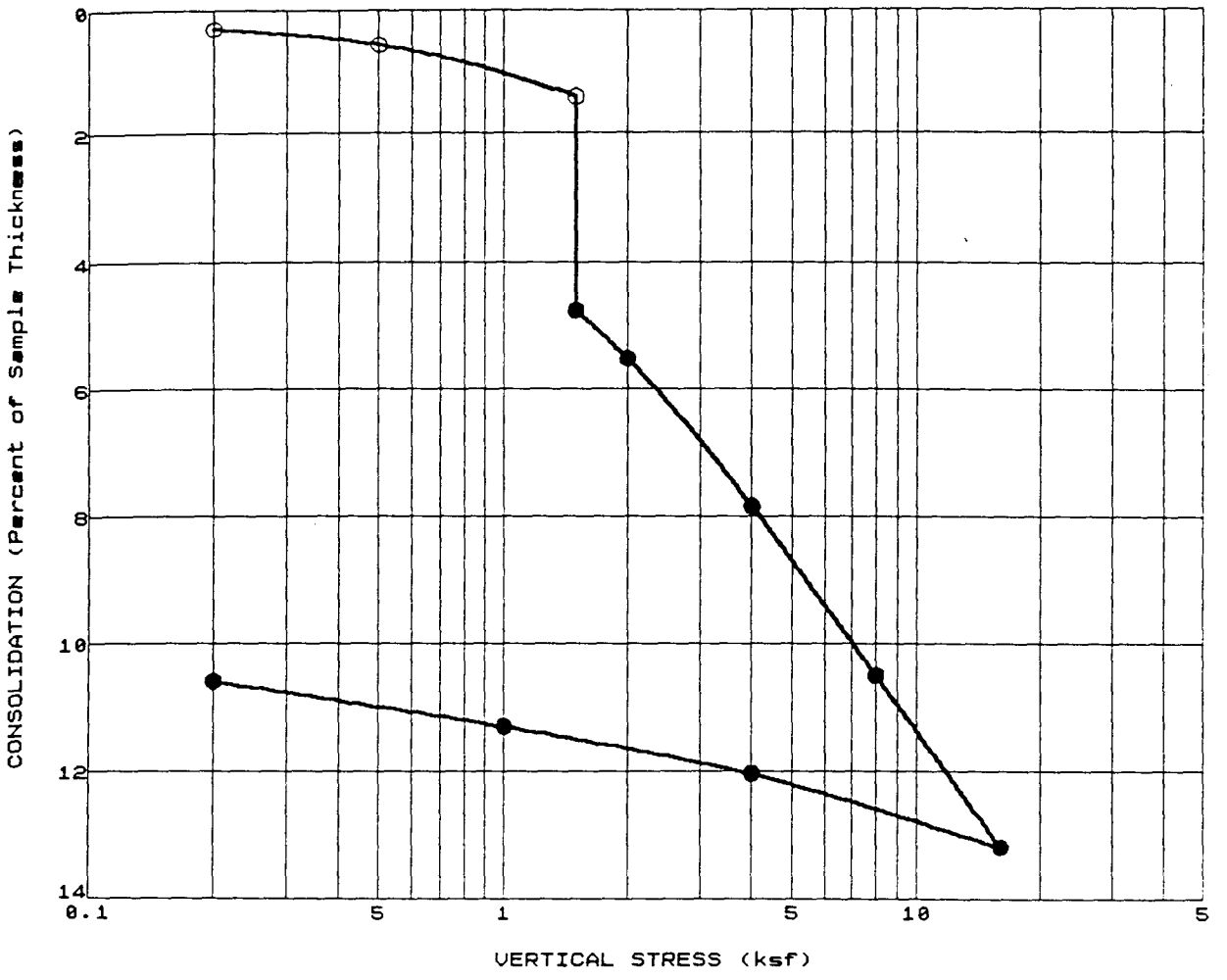
Boring No.	C-4	Initial Dry Density (pcf)	91.8
Sample No.	D-11	Moisture Content (%):	
Depth (feet)	27.5	Before	32.3
Soil Type	CL	After	25.2
Soil Description	Olive Brn Silty Clay		

CONSOLIDATION CURVE
ASTM D 2435

Project No. 98-104

Project Name Geot. and Env. Assessment at JWPCP

Date 7/27/98 Figure No. B-7

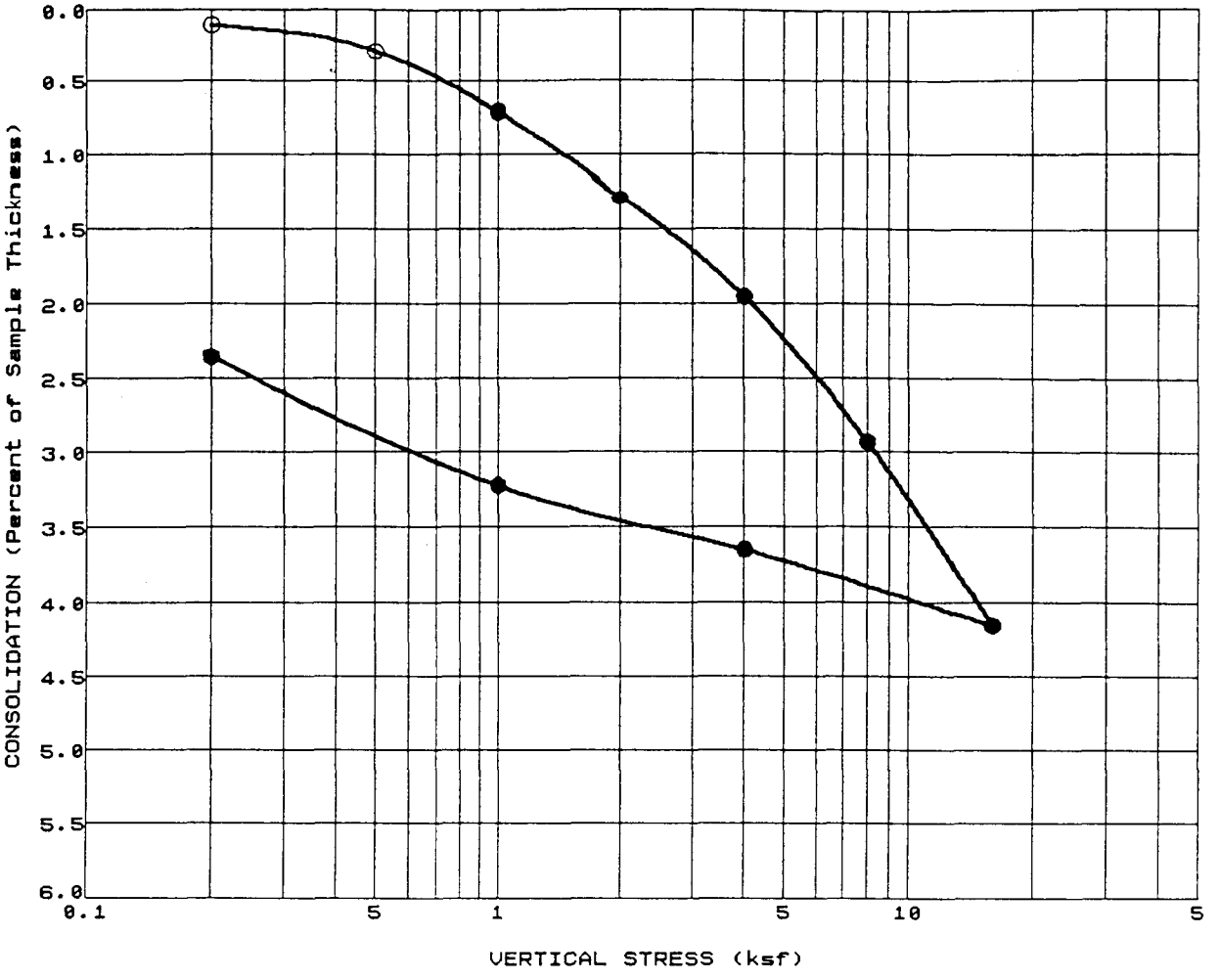


LEGEND: ○ At Field Moisture
● After Addition of Water

Boring No.	SB-3	Initial Dry Density (pcf)	93.4
Sample No.	D-11	Moisture Content (%):	
Depth (feet)	27.5	Before	10.2
Soil Type	SP	After	22.3
Soil Description	Brn Sand w/Siltstone		

CONSOLIDATION CURVE
ASTM D 2435

Project No. 98-104
Project Name Geot. and Env. Assessment at JWPCP
Date 8/3/98 Figure No. B-8



LEGEND: ○ At Field Moisture
● After Addition of Water

Boring No.	F-2	Initial Dry Density (pcf)	106.7
Sample No.	D-12	Moisture Content (%):	
Depth (feet)	30	Before	12.1
Soil Type	SM	After	23.7
Soil Description	Olive Brn Silty Sand		

CONSOLIDATION CURVE
ASTM D 2435

Project No. 98-104
Project Name Geot. and Env. Assessment at JWPCP
Date 8/5/98 Figure No. B-9

APPENDIX C
ANALYTICAL LABORATORY TESTING

EMAX
LABORATORIES, INC.
630 Maple Ave.
Torrance, CA 90503
Telephone: (310) 618-8889
Fax: (310) 618-0818

Date: 08-17-1999
EMAX Batch No.: 99G072

Attn: Steven Kolthoff

Group Delta Consultants
2341 W. 205th. Street
Torrance CA 90501-1459

Subject: Laboratory Report
Project: LACSD Lab

Enclosed is the Laboratory report for samples received on 07/23/99. The data reported include :

Sample ID	Control #	Col Date	Matrix	Analysis
B1@10-25'(COMP.1)	G072-01	07/22/99	Soil	EPA 8081A (Pesticides) EPA M8015 EPA 5030A/M8015
B2@10'-25'(COMP.2)	G072-05	07/21/99	Soil	EPA M8015 EPA 5030A/M8015 EPA 8081A (Pesticides)
B3@10'-25'(COMP.3)	G072-09	07/21/99	Soil	EPA 5030A/M8015 EPA M8015 EPA 8081A (Pesticides)
B4@10'-25'(COMP.4)	G072-13	07/22/99	Soil	EPA 8081A (Pesticides) EPA M8015 EPA 5030A/M8015
B5@7'-25'(COMP.5)	G072-17	07/21/99	Soil	EPA 8081A (Pesticides) EPA 418.1 EPA 5030A/M8015 EPA M8015

The results are summarized on the following pages.

Please feel free to call if you have any questions concerning these results.

Sincerely yours,

Kam Y. Pang, Ph.D.
Laboratory Director

EMAX Laboratories, Inc.
630 Maple Ave., Torrance, CA 90503
Tel # 310-618-8889 Fax # 310-618-0818
Email emaxlabs@ix.netcom.com

CHAIN OF CUSTODY RECORD

Sample Storage RM

Lab Batch Control # 22872

CLIENT Group Delta Consultants
PROJECT LACSD Lab TEL
COORDINATOR FAX
SEND REPORT TO Steven Kalhoff
EMAIL SteveK@GroupDelta.com
COMPANY Group Delta Consult. TEL 310-320-5720
ADDRESS 2394 W. 205th St. FAX 310-320-2118
Torrance.
EMAX PM

Matrix Codes		Preservative Codes	
DW = Drinking Water	SS = Soil/Sediments	IC = Ice	
GW = Ground Water	SD = Solid Waste	HC = HCl	
WW = Waste Water	SL = Sludge	HS = H_2SO_4	
AR = Air	PP = Pure Products	HN = HNO_3	
WP = Wipes	OT = Others	SH = NaOH	
		ST = $Na_2S_2O_3$	
		ZA = ZnAc	

Analysis Required: 2080, 2015

TAT: ☐ RUSH ____hrs ☐ RUSH ____days ☑ 7 days ☐ 14 days ☐ 21 days ☐ 30 days ☐ ☐

Lab	Sample ID Client	Sampling Date	Sampling Time	Container No.	Container Size	Container Type	Matrix Code	QC	Preservative Code	Comments
1	B1 @ 10'	7/22/99	7:03	1	6"x1"	BR	SS		Composite	Composite #1
2	B1 @ 15'		8:16	1		BR	SS		Composite	
3	B1 @ 20'		8:28	1		BR	SS		Composite	
4	B1 @ 25'		8:40	1		BR	SS		Composite	
5	B2 @ 10'	7/21/99	12:23	1		BR	SS		Composite	Composite #2
6	B2 @ 15'		12:57	1		BR	SS		Composite	
7	B2 @ 20'		13:13	1		BR	SS		Composite	
8	B2 @ 25'		13:21	1		BR	SS		Composite	
9	B3 @ 10'		8:49	1		BR	SS		Composite	Composite #3
10	B3 @ 15'		9:02	1		BR	SS		Composite	B3 @ 20' & 25'

Instructions
Composite B-1, Composite B-2, Composite B-3 Composite B-4, Composite B-5

Sampler	No. of Coolers	Courier/Airbill	Cooler Temp.(°C) 2°C

Relinquished By	Date	Time	Received By	(Notes for samples sent out)

NOTICE: Turn-Around-Time (TAT) for samples shall not begin until all discrepancies have been resolved. For samples received and discrepancies resolved after 1600 hrs, TAT shall start at 0800 hrs the next business day. The client is responsible for all costs associated with sample disposal. Samples shall be disposed of as soon as practical (but not prior to fifteen (15) calendar days) after issuance of analytical report unless a different sample disposal schedule is pre-arranged with EMAX. Disposal fee for samples defined by CA Title 22 as non-hazardous shall be $5.00 per sample. EMAX will return hazardous samples to the client at the client's expense unless directed in writing otherwise.

P.2

CHAIN OF CUSTODY RECORD

EMAX Laboratories, Inc.

630 Maple Ave., Torrance, CA 90503
Tel # 310-618-8889 Fax # 310-618-0818
Email emaxlabs@ix.netcom.com

Sample Storage [illegible]

Lab Batch Control # [illegible]

CLIENT	Group Delta Consultants
PROJECT	CPSD
TEL	
COORDINATOR	
FAX	
SEND REPORT TO	Teven Kolthoff
EMAIL	[illegible]
COMPANY	[illegible]
TEL	[illegible]
ADDRESS	[illegible]
FAX	[illegible]
EMAX PM	

Matrix Codes		Preservative Codes	
DW = Drinking Water	SS = Soil/Sediments	IC =	Ice
GW = Ground Water	SD = Solid Waste	HC =	HCl
WW = Waste Water	SL = Sludge	HS =	H_2SO_4
AR = Air	PP = Pure Products	HN =	HNO_3
WP = Wipes	OT = Others	SH =	NaOH
		ST =	$Na_2S_2O_3$
		ZA =	ZnAc

Analysis Required: 8260 (BTEX); 8015 (TPH-G)

TAT:
- ☐ RUSH ____ hrs
- ☐ RUSH ____ days
- ☑ 7 days
- ☐ 14 days
- ☐ 21 days
- ☐ 30 days
- ☐
- ☐

Lab	Sample ID: Client	Sampling: Date	Sampling: Time	Container: No.	Container: Size	Container: Type	Matrix Code	QC	Preservative Code	Comments
1	B3 @ 20'	7/21/99	9:12	1	6"x1"	BR	SS		Pour Pour	Composite B-3
2	B3 @ 25'	↓	9:26	1	↓	↓	↓		↓ ↓	B3 @ 10' + 15'
3	B-4 @ 10'	7/20/99	11:51	1						
4	B4 @ 15'	↓	12:00	1						
5	B4 @ 20'		12:09	1						
6	B4 @ 25'	↓	12:21	1						
7	B5 @ 7'	7/21/99	15:35	1						
8	B5 @ 10'	↓	15:37	1						
9	B5 @ 15'		15:41	1						
10	B5 @ 25'	↓	15:49	1	↓	↓	↓			

Instructions

Please store the Remains for Composite Boring B-2 Composite B-3 Composite B-4 Composite Boring B-5

Sampler	No. of Coolers	Courier/Airbill	Cooler Temp.(°C) 2 °C

Relinquished By	Date	Time	Received By	(Notes for samples sent out)

NOTICE: Turn-Around-Time (TAT) for samples shall not begin until all discrepancies have been resolved. For samples received and discrepancies resolved after 1600 hrs, TAT shall start at 0800 hrs the next business day. The client is responsible for all costs associated with sample disposal. Samples shall be disposed of as soon as practical (but not prior to fifteen (15) calendar days) after issuance of analytical report unless a different sample disposal schedule is pre-arranged with EMAX. Disposal fee for samples defined by CA Title 22 as non-hazardous shall be $5.00 per sample. EMAX will return hazardous samples to the client at the client's expense unless directed in writing otherwise.

CHAIN OF CUSTODY RECORD
REQUEST FOR ANALYSIS

CLIENT NAME: GROUP DELTA CONSULTANTS, INC
ADDRESS: 2341 W. 205 th ST
TORRANCE, CA
PHONE NO. (310) 320-5100 FAX NO. (310) 320-2118
PROJECT NAME: LACSD - CARSON
SEND REPORT TO:

DATE: 7-22-99
PAGE 1 OF 1

C K Y incorporated
Environmental Services
3942 Valley Avenue, Suite F
Pleasanton, CA 94566
Tel: 510-846-3188
Fax: 510-846-1236

SAMPLER NAME/SIGNATURE

TURN AROUND TIME
NORMAL ☐
RUSH ☐

SAMPLE NUMBER	SAMPLING DATE/TIME	PRESER-VATIVE	CONTAINER SIZE/TYPE	SAMPLE DESCRIPTION WATER	SOIL	OTHER	418.1	M8015	8010/601	8020/602	8080/608	8240/624	8270/625	CAM Metals	6010
B5@25'	7/21/99 15:54				X						X				X

COMMENTS: Composite with ~~B5@~~ all of B-5

Relinquished by: (Signature)	Date:	Received by: (Signature)	Date:	Relinquished by: (Signature)	Date:	Received by: (Signature)	Date:
	7-22-99				7-23-99		7-23-99
Company: CKY	Time: 17:30	Company:	Time:	Company:	Time: 10:30	Company: ENTHX	Time: 13:35

Storage/Disposal of Samples: Sample will be stored at CKY for 30 days at no charge and at $10/sample/month thereafter. Disposal of sample by the Laboratory will be charged at $10/sample.

ANALYSIS REQUEST FORM
(Additional/Cancellation)

Name: Delta Group
EMAX Control: 990072
Date Requested: 7-26-99
Requested by:

EMAX CONTROL NUMBER	ANALYSIS REQUESTED	TAT	COMMENTS
9907 2-05	8015E/8015P	5	
Do not	open an additional folder.		

BCN:	99G072	Date	7-23-99	Reviews	
Client	GROUP DELTA	Time	13:30	Sample Labeling	SITNIKOV
Project	LACSD LABS	Recipient	PHIL HATCHER	SRF	
				CRO	

Type of Sample Delivery to EMAX		
☐ EMAX Courier	☑ Client Delivery	☐ Third Party/Airbill No.
By :		
Date :	SEE COC	
Time :		
Comments:		

COC Inspection (Check for presence)		
☑ Client Name	☑ Sampler Name/Signature	☑ Sampling Date/Time
☑ Address	☑ Courier Signature w/ Date & Time	☑ Analysis Required
☑ Tel # / FAX #	☑ TAT	☑ Sample Container
☑ Proj Name/Contact Person	☑ Sample ID	☑ Matrix
Safety Issue(s) ☑ None ☐	☐ High concentrations expected	☐ Superfund Site Samples
Comments:		

Packaging Inspection				
Container :	☑ Cooler ONE	☐ Box	☐	
Condition :	☐ Custody Seal NONE	☑ Intact	☐ Damaged	☐
Packaging:	☐ Bubble Pack	☐ Styro Foam	☑ PLASTIC BAG	☑ Sufficient
Temperature(s)	☑ 2.0° C	☐	☐	☐
Comments:				

Sample Inspection				
Container:	☐ Custody Seal NONE	☑ Intact	☐ Damaged	☑ Appropriate
Identity:	☑ Client Sample ID	☑ Sampling Date/Time	☑ Sampler Initial	☑ Analysis
Preservation:	☐ NaOH [pH≥12]	☐ HNO_3 [pH≤2]	☐ H_2SO_4 [pH≤2]	☑ Holding Time OK
Sample:	☑ Sufficient	☐ Not enough(see comment)	☑ Appropriate	☐
Comment:				

Sample Control #	Client ID	Discrepancy	Corrective Action

LABORATORY REPORT FOR

GROUP DELTA CONSULTANTS

LACSD LAB

METHOD 5030A/M8015
TOTAL PETROLEUM HYDROCARBONS BY PURGE & TRAP

SDG#: 99G072

CASE NARRATIVE

CLIENT : **GROUP DELTA CONSULTANTS**

PROJECT : **LACSD LAB**

SDG : **99G072**

Method 5030A/M8015
Gasoline

Samples received on 07/23/99 include five(5) soil for Gasoline Analysis by USEPA SW846 and Leaking Underground Fuel Tank (LUFT) Field Manual, SWRCB, Dept. of Health Services, CA(1988).

1. Holding Time

   Analytical holding time was met.

2. Calibration

   A five-point Initial Calibration curve was performed. All QC requirements were met.

   Continuing Calibrations were carried out at 10-sample interval. All QC requirements were met.

3. Method Blank

   The method blank was free of contamination.

4. Surrogate Recovery

   All surrogates were within the QC limit.

5. Laboratory Control Sample And Laboratory Control Sample Duplicate

   All recoveries were within QC limits.

6. Matrix Spike And Matrix Spike Duplicate

   Sample 99G072-01 was analyzed for MS/MSD. All recoveries were within the QC limits, except its surrogates.

7. Sample Analysis

   Samples were analyzed according to the prescribed QC procedures. All requirements were met.

METHOD 5030A/M8015
TOTAL PETROLEUM HYDROCARBONS BY PURGE & TRAP

Client : GROUP DELTA CONSULTANTS
Project : LACSD LAB
Batch No. : 99G072

Matrix : SOIL
Instrument ID : GCT039

SAMPLE ID	EMAX SAMPLE ID	RESULTS (mg/kg)	SURR (%)	DLF	MOIST	RL (mg/kg)	MDL (mg/kg)	Analysis DATETIME	Extraction DATETIME	LFID	CAL REF	PREP BATCH	Collection DATETIME	Received DATETIME
MBLK1S	VAG1639B	ND	86	1	NA	.5	.088	07/26/9914:01	07/26/9914:01	EG12-3	EG12-2	VAG1639	NA	NA
LCS1S	VAG1639L	5.88	98	1	NA	.5	.088	07/26/9914:36	07/26/9914:36	EG12-4	EG12-2	VAG1639	NA	NA
LCD1S	VAG1639C	6.03	99	1	NA	.5	.088	07/26/9915:11	07/26/9915:11	EG12-5	EG12-2	VAG1639	NA	NA
B1@10'(COMP.1)	G072-01	ND	83	1	11.4	.564	.0993	07/26/9915:46	07/26/9915:46	EG12-6	EG12-2	VAG1639	07/22/99	07/23/99
B1@10'(COMP.1)MS	G072-01M	6.46	97	1	11.4	.564	.0993	07/26/9918:41	07/26/9918:41	EG12-11	EG12-2	VAG1639	07/22/99	07/23/99
B1@10'(COMP.1)MSD	G072-01S	6.88	98	1	11.4	.564	.0993	07/26/9919:16	07/26/9919:16	EG12-12	EG12-2	VAG1639	07/22/99	07/23/99
B2@10'(COMP.2)	G072-05	ND	84	1	13.7	.579	.102	07/26/9916:56	07/26/9916:56	EG12-8	EG12-2	VAG1639	07/21/99	07/23/99
B3@10'(COMP.3)	G072-09	ND	85	1	5.4	.529	.093	07/26/9916:21	07/26/9916:21	EG12-7	EG12-2	VAG1639	07/21/99	07/23/99
B4@10'(COMP.4)	G072-13	ND	85	1	12.4	.571	.1	07/26/9917:31	07/26/9917:31	EG12-9	EG12-2	VAG1639	07/22/99	07/23/99
B5@7'(COMP.5)	G072-17	ND	86	1	9.7	.554	.0975	07/26/9918:06	07/26/9918:06	EG12-10	EG12-2	VAG1639	07/21/99	07/23/99

RL : Reporting Limit
QC LIMIT : BFB(%SURR) SOIL 50-136%; WATER 55-144%

EMAX QUALITY CONTROL DATA
MS/MSD ANALYSIS

CLIENT: GROUP DELTA CONSULTANTS
PROJECT: LACSD LAB
BATCH NO.: 99G072
METHOD: METHOD 5030A/M8015

MATRIX:	SOIL			% MOISTURE:	11.4
DILUTION FACTOR:	1	1	1		
SAMPLE ID:	B1@10'(COMP.1)				
LAB SAMP ID:	G072-01	G072-01M	G072-01S		
LAB FILE ID:	EG12-6	EG12-11	EG12-12		
DATE EXTRACTED:	07/26/9915:46	07/26/9918:41	07/26/9919:16	DATE COLLECTED:	07/22/99
DATE ANALYZED:	07/26/9915:46	07/26/9918:41	07/26/9919:16	DATE RECEIVED:	07/23/99
PREP. BATCH:	VAG1639	VAG1639	VAG1639		
CALIB. REF:	EG12-2	EG12-2	EG12-2		

ACCESSION:

PARAMETER	SMPL RSLT (mg/kg)	SPIKE AMT (mg/kg)	MS RSLT (mg/kg)	MS % REC	SPIKE AMT (mg/kg)	MSD RSLT (mg/kg)	MSD % REC	RPD (%)	QC LIMIT (%)	MAX RPD (%)
Gasoline	ND	6.21	6.46	104	6.21	6.88	111	6	57-146	50

SURROGATE PARAMETER	SPIKE AMT (mg/kg)	MS RSLT (mg/kg)	MS % REC	SPIKE AMT (mg/kg)	MSD RSLT (mg/kg)	MSD % REC	QC LIMIT (%)
Bromofluorobenzene	.282	.274	97	.282	.275	98	50-136

EMAX QUALITY CONTROL DATA
LCS/LCD ANALYSIS

CLIENT: GROUP DELTA CONSULTANTS
PROJECT: LACSD LAB
BATCH NO.: 99G072
METHOD: METHOD 5030A/M8015

MATRIX:	SOIL			% MOISTURE:	NA
DILUTION FACTOR:	1	1	1		
SAMPLE ID:	MBLK1S				
LAB SAMP ID:	VAG1639B	VAG1639L	VAG1639C		
LAB FILE ID:	EG12-3	EG12-4	EG12-5		
DATE EXTRACTED:	07/26/9914:01	07/26/9914:36	07/26/9915:11	DATE COLLECTED:	NA
DATE ANALYZED:	07/26/9914:01	07/26/9914:36	07/26/9915:11	DATE RECEIVED:	
PREP. BATCH:	VAG1639	VAG1639	VAG1639		
CALIB. REF:	EG12-2	EG12-2	EG12-2		

ACCESSION:

PARAMETER	BLNK RSLT (mg/kg)	SPIKE AMT (mg/kg)	BS RSLT (mg/kg)	BS % REC	SPIKE AMT (mg/kg)	BSD RSLT (mg/kg)	BSD % REC	RPD (%)	QC LIMIT (%)	MAX RPD (%)
Gasoline	ND	5.5	5.88	107	5.5	6.03	110	3	57-146	50

SURROGATE PARAMETER	SPIKE AMT (mg/kg)	BS RSLT (mg/kg)	BS % REC	SPIKE AMT (mg/kg)	BSD RSLT (mg/kg)	BSD % REC	QC LIMIT (%)
Bromofluorobenzene	.25	.246	98	.25	.249	99	50-136

LABORATORY REPORT FOR

GROUP DELTA CONSULTANTS

LACSD LAB

METHOD M8015
TOTAL PETROLEUM HYDROCARBONS BY EXTRACTION

SDG#: 99G072

CASE NARRATIVE

CLIENT: **GROUP DELTA CONSULTANTS**

PROJECT: **LACSD LAB**

SDG: **99G072**

METHOD M8015
TOTAL PETROLEUM HYDROCARBONS BY EXTRACTION

Five (5) composite soil samples were received on 7/23/99 to be analyzed for Total Petroleum Hydrocarbons by M8015 in accordance with USEPA SW846.

1. Holding Time

   Analytical holding time was met.

2. Method Blank

   There was no contamination detected in the Method Blank above the reporting limit.

3. Surrogate Recovery

   All surrogates were within the QC limit.

4. Matrix Spike and Matrix Spike Duplicate

   Sample 99G072-01 was analyzed for MS/MSD. All recoveries were within the QC limits.

5. Laboratory Control Sample and Laboratory Control Sample Duplicate

   All recoveries were within QC limits.

6. Calibration

   There was an initial five-point calibration. Continuing calibrations were carried out at 10 sample intervals. All QC requirements were met.

7. Sample Analysis

   All sample analyses were performed within QC requirements except as aforementioned.

METHOD M8015
TOTAL PETROLEUM HYDROCARBONS BY EXTRACTION

Client : GROUP DELTA CONSULTANTS
Project : LACSD LAB
Batch No. : 99G072

Matrix : SOIL
Instrument ID : GCT035

SAMPLE ID	EMAX SAMPLE ID	RESULTS (mg/kg)	SUR1 (%)	SUR2 (%)	DLF	MOIST	RL (mg/kg)	MDL (mg/kg)	Analysis DATETIME	Extraction DATETIME	LFID	CAL REF	PREP BATCH	Collection DATETIME	Received DATETIME
MBLK1S	DSG018SB	ND	100	102	1	NA	10	.834	07/30/9906:01	07/27/9910:30	DG19-16	DG19-15	DSG018S	NA	07/27/99
LCS1S	DSG018SL	463	97	96	1	NA	10	.834	07/30/9906:41	N07/27/910:30	DG19-17	DG19-15	DSG018S	NA	07/27/99
LCD1S	DSG018SC	430	90	90	1	NA	10	.834	07/30/9907:21	07/27/9910:30	DG19-18	DG19-15	DSG018S	NA	07/27/99
B1@10-25'(COMP.1)	G072-01	ND	110	108	1	11.4	11.3	.941	07/30/9908:01	07/27/9910:30	DG19-19	DG19-15	DSG018S	07/22/99	07/23/99
B1@10-25'(COMP.1)MS	G072-01M	640	118	114	1	11.4	11.3	.941	07/30/9908:41	07/27/9910:30	DG19-20	DG19-15	DSG018S	07/22/99	07/23/99
B1@10-25'(COMP.1)MSD	G072-01S	600	113	109	1	11.4	11.3	.941	07/30/9909:22	07/27/9910:30	DG19-21	DG19-15	DSG018S	07/22/99	07/23/99
B2@10'-25'(COMP.2)	G072-05	ND	105	105	1	13.7	11.6	.966	07/30/9910:02	07/27/9910:30	DG19-22	DG19-15	DSG018S	07/21/99	07/23/99
B3@10'-25'(COMP.3)	G072-09	ND	105	106	1	5.4	10.6	.882	07/30/9910:43	07/27/9910:30	DG19-23	DG19-15	DSG018S	07/21/99	07/23/99
B4@10'-25'(COMP.4)	G072-13	ND	109	106	1	12.4	11.4	.952	07/30/9911:23	07/27/9910:30	DG19-24	DG19-15	DSG018S	07/22/99	07/23/99
B5@7'-25'(COMP.5)	G072-17	ND	107	105	1	9.7	11.1	.924	07/30/9912:04	07/27/9910:30	DG19-25	DG19-15	DSG018S	07/21/99	07/23/99

RL : Reporting Limit
SURR1 : Bromobenzene
SURR2 : Hexacosane

Parameter	H-C Range
JP5	C7 -C18
Diesel	C10-C24
Motor Oil	C18-C34
Gas	C6 -C12

EMAX QUALITY CONTROL DATA
MS/MSD ANALYSIS

CLIENT: GROUP DELTA CONSULTANTS
PROJECT: LACSD LAB
BATCH NO.: 99G072
METHOD: METHOD M8015

MATRIX:	SOIL			% MOISTURE:	11.4
DILUTION FACTOR:	1	1	1		
SAMPLE ID:	B1@10-25'(COMP.1)				
LAB SAMP ID:	G072-01	G072-01M	G072-01S		
LAB FILE ID:	DG19-19	DG19-20	DG19-21		
DATE EXTRACTED:	07/27/9910:30	07/27/9910:30	07/27/9910:30	DATE COLLECTED:	07/22/99
DATE ANALYZED:	07/30/9908:01	07/30/9908:41	07/30/9909:22	DATE RECEIVED:	07/23/99
PREP. BATCH:	DSG018S	DSG018S	DSG018S		
CALIB. REF:	DG19-15	DG19-15	DG19-15		

ACCESSION:

PARAMETER	SMPL RSLT (mg/kg)	SPIKE AMT (mg/kg)	MS RSLT (mg/kg)	MS % REC	SPIKE AMT (mg/kg)	MSD RSLT (mg/kg)	MSD % REC	RPD (%)	QC LIMIT (%)	MAX RPD (%)
Diesel	ND	564	640	113	564	600	106	6	51-153	50

SURROGATE PARAMETER	SPIKE AMT (mg/kg)	MS RSLT (mg/kg)	MS % REC	SPIKE AMT (mg/kg)	MSD RSLT (mg/kg)	MSD % REC	QC LIMIT (%)
Bromobenzene	113	133	118	113	128	113	60-140
Hexacosane	113	128	114	113	123	109	55-150

EMAX QUALITY CONTROL DATA
LCS/LCD ANALYSIS

CLIENT: GROUP DELTA CONSULTANTS
PROJECT: LACSD LAB
BATCH NO.: 99G072
METHOD: METHOD M8015

MATRIX:	SOIL			% MOISTURE:	NA
DILUTION FACTOR:	1	1	1		
SAMPLE ID:	MBLK1S				
LAB SAMP ID:	DSG018SB	DSG018SL	DSG018SC		
LAB FILE ID:	DG19-16	DG19-17	DG19-18		
DATE EXTRACTED:	07/27/9910:30	N07/27/910:30	07/27/9910:30	DATE COLLECTED:	NA
DATE ANALYZED:	07/30/9906:01	07/30/9906:41	07/30/9907:21	DATE RECEIVED:	07/27/99
PREP. BATCH:	DSG018S	DSG018S	DSG018S		
CALIB. REF:	DG19-15	DG19-15	DG19-15		

ACCESSION:

PARAMETER	BLNK RSLT (mg/kg)	SPIKE AMT (mg/kg)	BS RSLT (mg/kg)	BS % REC	SPIKE AMT (mg/kg)	BSD RSLT (mg/kg)	BSD % REC	RPD (%)	QC LIMIT (%)	MAX RPD (%)
Diesel	ND	500	463	93	500	430	86	7	51-153	50

SURROGATE PARAMETER	SPIKE AMT (mg/kg)	BS RSLT (mg/kg)	BS % REC	SPIKE AMT (mg/kg)	BSD RSLT (mg/kg)	BSD % REC	QC LIMIT (%)
Bromobenzene	100	97	97	100	90.3	90	60-140
Hexacosane	100	96.1	96	100	90.5	90	55-150

LABORATORY REPORT FOR

GROUP DELTA CONSULTANTS

LACSD LAB

METHOD 418.1
TOTAL RECOVERABLE PETROLEUM HYDROCARBONS

SDG#: 99G072

CASE NARRATIVE

CLIENT: GROUP DELTA CONSULTANTS

PROJECT: LACSD LAB

SDG: 99G072

METHOD 418.1
TRPH

One (1) soil sample was received on 07/23/99 for total recoverable petroleum hydrocarbon analysis by Method 418.1 in accordance with "Methods for Chemical Analysis of Water and Wastewater", USEPA 600-79-020, 1993.

1. Holding Time

   Analytical holding time was met.

2. Method Blank

   Method blank was free of contamination.

3. Matrix Spike/Matrix Spike Duplicate

   All MS/MSD recoveries were within QC limit.

4. Lab Control Sample

   Lab control result was within QC limit.

5. Calibration

   Initial calibration was at six-point and continuing calibration were carried out at 10-samples interval. All QC requirements were met.

6. Sample Analysis

   Sample analysis was done within QC requirements.

METHOD 418.1
TOTAL RECOVERABLE PETROLEUM HYDROCARBONS

CLIENT:	Group Delta Consultants	DATE COLLECTED:	07/21/99
PROJECT:	LACSD Lab	DATE RECEIVED:	07/23/99
BATCH NO.:	99G072	DATE EXTRACTED:	07/27/99
MATRIX:	SOIL	DATE ANALYZED:	07/27/99

SAMPLE ID	CONTROL NO	RESULT (mg/kg)	DL FACTOR	MOIST (%)	RL (mg/kg)
B5@7'-25'(COMP.5)	G072-17	ND	1	9.7	11.1
MBLK1S	TRG003SB	ND	1	NA	10

RL: Reporting Limit

EMAX QUALITY CONTROL DATA
MS/MSD ANALYSIS

CLIENT: Group Delta Consultants
PROJECT: LACSD Lab
METHOD: METHOD 418.1
MATRIX: SOIL
% MOISTURE: 9.7

BATCH NO.: 99G072
SAMPLE ID: 85@71-25'(COMP.5)
CONTROL NO.: G072-17

DATE RECEIVED: 07/23/99
DATE EXTRACTED: 07/27/99
DATE ANALYZED: 07/27/99

ACCESSION:

PARAMETER	SMPL RSLT (mg/kg)	SPIKE AMT (mg/kg)	MS RSLT (mg/kg)	MS % REC	SPIKE AMT (mg/kg)	MSD RSLT (mg/kg)	MSD % REC	RPD %	QC LIMIT %	RPD LIMIT %
TRPH	ND	166.00	169.00	102	166.00	166.00	100	2	65-135	30

EMAX QUALITY CONTROL DATA
LCS ANALYSIS

CLIENT: Group Delta Consultants
PROJECT: LACSD Lab
METHOD: METHOD 418.1
MATRIX: SOIL
% MOISTURE: NA

BATCH NO.: 99G072
SAMPLE ID: LCS1S
CONTROL NO.: TRG003SL

DATE RECEIVED: NA
DATE EXTRACTED: 07/27/99
DATE ANALYZED: 07/27/99

ACCESSION:

PARAMETER	BLNK RSLT (mg/kg)	SPIKE AMT (mg/kg)	LCS RSLT (mg/kg)	LCS % REC	QC LIMIT (%)
TRPH	ND	150.00	148.00	98	75-125

LABORATORY REPORT FOR

GROUP DELTA CONSULTANTS

LACSD LAB

METHOD 8081A
PESTICIDES

SDG#: 99G072

CASE NARRATIVE

CLIENT: GROUP DELTA CONSULTANTS

PROJECT: LACSD LAB

SDG: 99G072

METHOD 8081A
PESTICIDES

Five (5) soil samples were received on 07/23/99 to be analyzed for Pesticides by method 8081A in accordance with USEPA SW846.

1. Holding Time

   Samples were extracted and analyzed within holding time.

2. Surrogate Recovery

   All surrogate recoveries were within QC limit.

3. Matrix Spike/Matrix Spike Duplicate

   Recoveries were within QC limit.

4. Lab Control Sample

   All recoveries were within QC limit.

5. Method Blank

   Method blank was free of contamination.

6. Instrument Performance and Calibration

   Initial calibration was at five-point for Pesticides, the RSD were all within QC limits. Continue calibration was done at 10 samples interval. All %D were within QC limit.

7. Sample Analysis

   Sample analyses were done within QC requirements.

METHOD 3550A/8081A
PESTICIDES

CLIENT:	Group Delta Consultants	DATE COLLECTED:	07/22/99
PROJECT:	LACSD Lab	DATE RECEIVED:	07/23/99
BATCH NO.:	99G072	DATE EXTRACTED:	07/27/99
SAMPLE ID:	B1@10-25'(COMP.1)	DATE ANALYZED:	07/30/99
CONTROL NO.:	G072-01	MATRIX:	SOIL
% MOISTURE:	11.4	DILUTION FACTOR:	1

PARAMETERS	RESULTS (ug/kg)	RL (ug/kg)
alpha-BHC	ND	1.88
gamma-BHC (Lindane)	ND	1.88
beta-BHC	ND	1.88
Heptachlor	ND	1.88
delta-BHC	ND	1.88
Aldrin	ND	1.88
Heptachlor Epoxide	ND	1.88
gamma-Chlordane	ND	1.88
alpha-Chlordane	ND	1.88
Endosulfan I	ND	1.88
4,4'-DDE	ND	1.88
Dieldrin	ND	3.76
Endrin	ND	3.76
4,4'-DDD	ND	3.76
Endosulfan II	ND	3.76
4,4'-DDT	ND	3.76
Endrin aldehyde	ND	3.76
Endosulfan Sulfate	ND	3.76
Methoxychlor	ND	18.8
Toxaphene	ND	181

SURROGATE PARAMETER	% RECOVERY	QC LIMIT
Tetrachloro-m-xylene	66	35-135
Decachlorobiphenyl	78	25-143

RL: Reporting Limit

METHOD 3550A/8081A
PESTICIDES

CLIENT:	Group Delta Consultants	DATE COLLECTED:	07/21/99
PROJECT:	LACSD Lab	DATE RECEIVED:	07/23/99
BATCH NO.:	99G072	DATE EXTRACTED:	07/27/99
SAMPLE ID:	B2@10'-25'(COMP.2)	DATE ANALYZED:	07/30/99
CONTROL NO.:	G072-05	MATRIX:	SOIL
% MOISTURE:	13.7	DILUTION FACTOR:	1

PARAMETERS	RESULTS (ug/kg)	RL (ug/kg)
alpha-BHC	ND	1.94
gamma-BHC (Lindane)	ND	1.94
beta-BHC	ND	1.94
Heptachlor	ND	1.94
delta-BHC	ND	1.94
Aldrin	ND	1.94
Heptachlor Epoxide	ND	1.94
gamma-Chlordane	ND	1.94
alpha-Chlordane	ND	1.94
Endosulfan I	ND	1.94
4,4'-DDE	ND	1.94
Dieldrin	ND	3.86
Endrin	ND	3.86
4,4'-DDD	ND	3.86
Endosulfan II	ND	3.86
4,4'-DDT	ND	3.86
Endrin aldehyde	ND	3.86
Endosulfan Sulfate	ND	3.86
Methoxychlor	ND	19.4
Toxaphene	ND	185

SURROGATE PARAMETER	% RECOVERY	QC LIMIT
Tetrachloro-m-xylene	76	35-135
Decachlorobiphenyl	77	25-143

RL: Reporting Limit

METHOD 3550A/8081A
PESTICIDES

CLIENT:	Group Delta Consultants	DATE COLLECTED:	07/21/99
PROJECT:	LACSD Lab	DATE RECEIVED:	07/23/99
BATCH NO.:	99G072	DATE EXTRACTED:	07/27/99
SAMPLE ID:	B3@10'-25'(COMP.3)	DATE ANALYZED:	07/30/99
CONTROL NO.:	G072-09	MATRIX:	SOIL
% MOISTURE:	5.4	DILUTION FACTOR:	1

PARAMETERS	RESULTS (ug/kg)	RL (ug/kg)
alpha-BHC	ND	1.77
gamma-BHC (Lindane)	ND	1.77
beta-BHC	ND	1.77
Heptachlor	ND	1.77
delta-BHC	ND	1.77
Aldrin	ND	1.77
Heptachlor Epoxide	ND	1.77
gamma-Chlordane	ND	1.77
alpha-Chlordane	ND	1.77
Endosulfan I	ND	1.77
4,4'-DDE	ND	1.77
Dieldrin	ND	3.52
Endrin	ND	3.52
4,4'-DDD	ND	3.52
Endosulfan II	ND	3.52
4,4'-DDT	ND	3.52
Endrin aldehyde	ND	3.52
Endosulfan Sulfate	ND	3.52
Methoxychlor	ND	17.7
Toxaphene	ND	169

SURROGATE PARAMETER	% RECOVERY	QC LIMIT
Tetrachloro-m-xylene	72	35-135
Decachlorobiphenyl	77	25-143

RL: Reporting Limit

METHOD 3550A/8081A
PESTICIDES

CLIENT:	Group Delta Consultants	DATE COLLECTED:	07/22/99
PROJECT:	LACSD Lab	DATE RECEIVED:	07/23/99
BATCH NO.:	99G072	DATE EXTRACTED:	07/27/99
SAMPLE ID:	B4@10'-25'(COMP.4)	DATE ANALYZED:	07/30/99
CONTROL NO.:	G072-13	MATRIX:	SOIL
% MOISTURE:	12.4	DILUTION FACTOR:	1

PARAMETERS	RESULTS (ug/kg)	RL (ug/kg)
alpha-BHC	ND	1.91
gamma-BHC (Lindane)	ND	1.91
beta-BHC	ND	1.91
Heptachlor	ND	1.91
delta-BHC	ND	1.91
Aldrin	ND	1.91
Heptachlor Epoxide	ND	1.91
gamma-Chlordane	ND	1.91
alpha-Chlordane	ND	1.91
Endosulfan I	ND	1.91
4,4'-DDE	ND	1.91
Dieldrin	ND	3.8
Endrin	ND	3.8
4,4'-DDD	ND	3.8
Endosulfan II	ND	3.8
4,4'-DDT	ND	3.8
Endrin aldehyde	ND	3.8
Endosulfan Sulfate	ND	3.8
Methoxychlor	ND	19.1
Toxaphene	ND	183

SURROGATE PARAMETER	% RECOVERY	QC LIMIT
Tetrachloro-m-xylene	80	35-135
Decachlorobiphenyl	80	25-143

RL: Reporting Limit

METHOD 3550A/8081A
PESTICIDES

CLIENT:	Group Delta Consultants	DATE COLLECTED:	07/21/99
PROJECT:	LACSD Lab	DATE RECEIVED:	07/23/99
BATCH NO.:	99G072	DATE EXTRACTED:	07/27/99
SAMPLE ID:	B5@7'-25'(COMP.5)	DATE ANALYZED:	07/30/99
CONTROL NO.:	G072-17	MATRIX:	SOIL
% MOISTURE:	9.7	DILUTION FACTOR:	1

PARAMETERS	RESULTS (ug/kg)	RL (ug/kg)
alpha-BHC	ND	1.85
gamma-BHC (Lindane)	ND	1.85
beta-BHC	ND	1.85
Heptachlor	ND	1.85
delta-BHC	ND	1.85
Aldrin	ND	1.85
Heptachlor Epoxide	ND	1.85
gamma-Chlordane	ND	1.85
alpha-Chlordane	ND	1.85
Endosulfan I	ND	1.85
4,4'-DDE	ND	1.85
Dieldrin	ND	3.69
Endrin	ND	3.69
4,4'-DDD	ND	3.69
Endosulfan II	ND	3.69
4,4'-DDT	ND	3.69
Endrin aldehyde	ND	3.69
Endosulfan Sulfate	ND	3.69
Methoxychlor	ND	18.5
Toxaphene	ND	177

SURROGATE PARAMETER	% RECOVERY	QC LIMIT
Tetrachloro-m-xylene	74	35-135
Decachlorobiphenyl	79	25-143

RL: Reporting Limit

METHOD 3550A/8081A
PESTICIDES

CLIENT:	Group Delta Consultants	DATE COLLECTED:	NA
PROJECT:	LACSD Lab	DATE RECEIVED:	NA
BATCH NO.:	99G072	DATE EXTRACTED:	07/27/99
SAMPLE ID:	MBLK1S	DATE ANALYZED:	07/30/99
CONTROL NO.:	CPG025SB	MATRIX:	SOIL
% MOISTURE:	NA	DILUTION FACTOR:	1

PARAMETERS	RESULTS (ug/kg)	RL (ug/kg)
alpha-BHC	ND	1.67
gamma-BHC (Lindane)	ND	1.67
beta-BHC	ND	1.67
Heptachlor	ND	1.67
delta-BHC	ND	1.67
Aldrin	ND	1.67
Heptachlor Epoxide	ND	1.67
gamma-Chlordane	ND	1.67
alpha-Chlordane	ND	1.67
Endosulfan I	ND	1.67
4,4'-DDE	ND	1.67
Dieldrin	ND	3.33
Endrin	ND	3.33
4,4'-DDD	ND	3.33
Endosulfan II	ND	3.33
4,4'-DDT	ND	3.33
Endrin aldehyde	ND	3.33
Endosulfan Sulfate	ND	3.33
Methoxychlor	ND	16.7
Toxaphene	ND	160

SURROGATE PARAMETER	% RECOVERY	QC LIMIT
Tetrachloro-m-xylene	70	35-135
Decachlorobiphenyl	79	25-143

RL: Reporting Limit

EMAX QUALITY CONTROL DATA
LCS ANALYSIS

CLIENT: Group Delta Consultants
PROJECT: LACSD Lab
METHOD: METHOD 3550A/8081A
MATRIX: SOIL
% MOISTURE: NA

BATCH NO.: 99G072
SAMPLE ID: LCS1S
CONTROL NO.: CPG025SL

DATE RECEIVED: NA
DATE EXTRACTED: 07/27/99
DATE ANALYZED: 07/30/99

ACCESSION:

PARAMETER	BLNK RSLT (ug/kg)	SPIKE AMT (ug/kg)	LCS RSLT (ug/kg)	LCS % REC	QC LIMIT (%)
gamma-BHC	ND	16.70	15.70	94	42-136
Heptachlor	ND	16.70	13.80	83	35-138
Aldrin	ND	16.70	15.10	91	33-146
Dieldrin	ND	33.30	34.00	102	32-142
Endrin	ND	33.30	31.50	95	33-144
4,4'-DDT	ND	33.30	31.30	94	25-153

SURROGATE PARAMETER	SPIKE AMOUNT (ug/kg)	LCS RESULT (ug/kg)	LCS % REC	QC LIMIT %
Tetrachloro-m-xylene	13.30	11.20	84	35-135
Decachlorobiphenyl	13.30	10.70	81	25-143

EMAX QUALITY CONTROL DATA
MS/MSD ANALYSIS

CLIENT: Group Delta Consultants
PROJECT: LACSD Lab
METHOD: METHOD 3550A/8081A
MATRIX: SOIL
% MOISTURE: 11.4

BATCH NO.: 99G072
SAMPLE ID: B1@10-25'(COMP.1)
CONTROL NO.: G072-01

DATE RECEIVED: 07/23/99
DATE EXTRACTED: 07/27/99
DATE ANALYZED: 07/30/99

ACCESSION:

PARAMETER	SMPL RSLT (ug/kg)	SPIKE AMT (ug/kg)	MS RSLT (ug/kg)	MS % REC	SPIKE AMT (ug/kg)	MSD RSLT (ug/kg)	MSD % REC	RPD %	QC LIMIT %	RPD LIMIT %
gamma-BHC	ND	18.80	17.00	90	18.80	15.00	80	12	42-136	50
Heptachlor	ND	18.80	16.00	80	18.80	15.00	74	6	35-138	50
Aldrin	ND	18.80	15.00	80	18.80	14.00	74	7	33-146	50
Dieldrin	ND	37.60	33.00	88	37.60	33.00	88	0	32-142	50
Endrin	ND	37.60	34.00	90	37.60	34.00	90	0	33-144	50
4,4'-DDT	ND	37.60	33.00	88	37.60	33.00	88	3	25-153	50

SURROGATE PARAMETER	SPIKE AMT (ug/kg)	MS RSLT (ug/kg)	MS % REC	SPIKE AMT (ug/kg)	MSD RSLT (ug/kg)	MSD % REC	QC LIMIT %
Tetrachloro-m-xylene	15.00	12.00	82	15.00	11.00	72	35-135
Decachlorobiphenyl	15.00	12.00	80	15.00	13.00	84	25-143

APPENDIX D
GEOPHYSICAL SURVEY

ADVANCED GEOSCIENCE, INC.

Specializing in Engineering Geophysics and Geology
Subsurface Exploration • Non-Destructive Evaluation

1711 Via El Prado, Suite 301
Redondo Beach, California 90277
USA
(310) 316-8192 Telephone
(310) 316-9441 Fax

RECEIVED
JUL 26 1999

July 21, 1999

Group Delta Consultants
2341 West 205th Street
Suite 103
Torrance, California 90501

Attention: Mr. Steven Kolthoff, C.E.G.

Summary Report
Geophysical Surveys
For Proposed Building Site
Los Angeles County Sanitation Districts JWPCP
Carson, California

This report summarizes the geophysical surveys recently completed by Advanced Geoscience at the LACSD's Carson Joint Water Pollution Control Plant (JWPCP). These surveys were performed as part of Group Delta Consultants' geotechnical investigation of the proposed building site, located near the existing Laboratory and Control Building (Figure 1).

The geophysical surveys were used to search for evidence of an abandoned oil well identified as the Hamilton Oil No. 2 well. The surveys were also used to investigate shallow subsurface utilities at the proposed locations of five test borings.

The following provides a summary of our survey procedures and the results of our search for the abandoned Hamilton Oil No. 2 well.

SURVEY PROCEDURES

Search for Abandoned Hamilton Oil No. 2 Well

A stake was placed south of the Laboratory & Control Building to mark the presumed location of the Hamilton Oil No. 2 well (Figure 1). This site was marked by the LACSD using the surveyed coordinates of the well provided at the time of its abandonment. According to the LACSD, a steel plate was welded to the top of the casing at 7 feet below the surface.

To search for evidence of the abandoned well at this location, a magnetometer survey was performed in the open area shown on Figure 1. This survey was used to investigate evidence of a vertical steel casing beneath the surface.

A GeoMetrics G856AX magnetometer was used to record measurements of the total magnetic field. These measurements were made on a 10-foot (north-south) by 5-foot (east-west) grid setup in the survey area. The magnetic measurements recorded across this grid were downloaded to a field computer to prepare a contour map showing the resulting magnetic field pattern. This contour map is shown in Figure 2.

Following the magnetometer survey, GPR profiles were recorded across the marked location of the well. These profiles were used to search for radar reflection patterns indicating evidence of an isolated steel object. The profiles were recorded using a Geo-Physical Survey Systems Inc. SIR-3, GPR unit equipped with 120 and 500 Mega-Hertz antennas. Copies of these GPR profiles are available in our project files.

Investigation of Shallow Subsurface Utilities

Geophysical surveys were also performed to investigate shallow utilities within a 25-foot square area surrounding each of the five drilling sites. Several GPR profiles (with 120 and 500 MHz antennas) were recorded across each area to search for metal pipelines and other subsurface features. A Geonics EM-31D terrain conductivity meter and Fischer Gemini-3 metal detector were also used to scan the areas for the presence of shallow metal pipelines.

New drilling locations were selected if evidence of subsurface utilities (or other obstacles) was detected near the proposed drilling location. These new locations were marked and positioned in areas where evidence of such objects was not detected.

SURVEY RESULTS

Search for Abandoned Hamilton Oil No. 2 Well

The magnetometer survey detected evidence of a vertical steel object near the marked location of the Hamilton Oil No. 2 well. The contour map of the magnetic field pattern shown in Figure 2 reveals a "circular magnetic anomaly", believed to be caused by a vertical steel object buried beneath the surface. The stake marking the location of the Hamilton Oil No. 3 well is at the center of this circular magnetic anomaly.

The GPR profiles recorded across the center of this circular anomaly did not detect reflection patterns indicating an isolated, vertical steel object. Several, closely-spaced,

east-west, GPR profiles were recorded across the center of this anomaly. These profiles did not show "point-like reflection patterns" from a steel well cap buried 7 feet below the surface.

The GPR profiles across this area did detect evidence of different soil conditions surrounding the marked location of the abandoned well. In this area, anomalous reflection patterns were detected that indicated more conductive, clayey soils. These reflections could be due to fill soils placed in the excavation at the time of the well's abandonment. Based on this finding, boring B-3 was positioned near the abandoned well location, in the area showing these differing soil conditions.

In summary, the results of this geophysical survey help to confirm the location of the Hamilton Oil No.2 well near the position marked by the LACSD. This conclusion is based on the detection of a circular magnetic anomaly near this location.

§

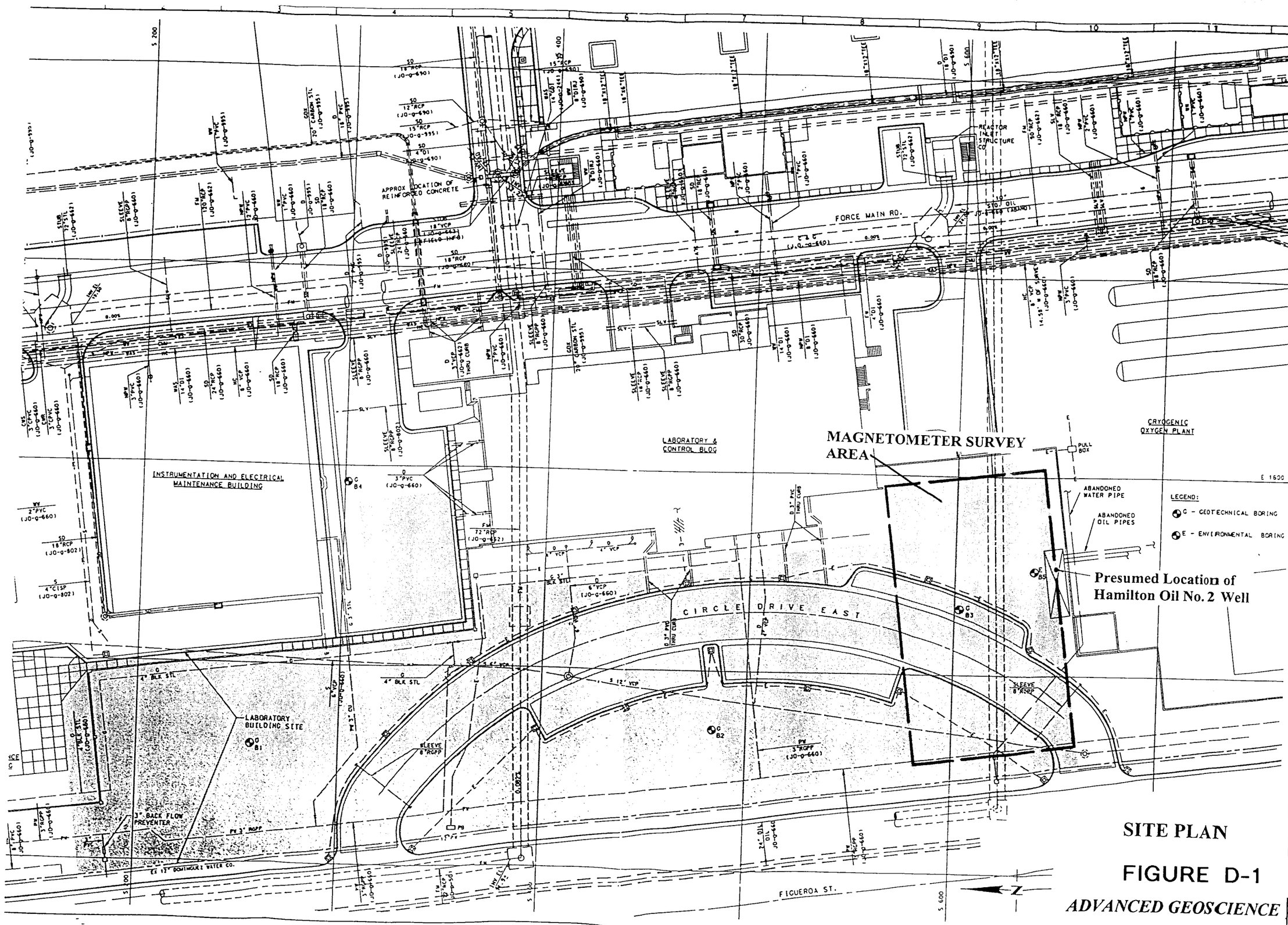
Advanced Geoscience appreciates the opportunity to be of service to Group Delta Consultants and the Los Angeles County Sanitation Districts. If you have any questions concerning this report please contact the undersigned. Thank you.

Sincerely,

Advanced Geoscience, Inc.

Mark G. Olson, R.Gp., R.G., C.H.G.
Principal Geophysicist

Attachments: Figures 1 and 2



COUNTY SANITATION DISTRICT NO. 2
OF LOS ANGELES COUNTY, CALIFORNIA

DESIGNED
DRAWN
CHECKED
REVIEWED

REFERENCE DWG. NO./JOB NO.

FIELD BOOK NO.

REVISIONS

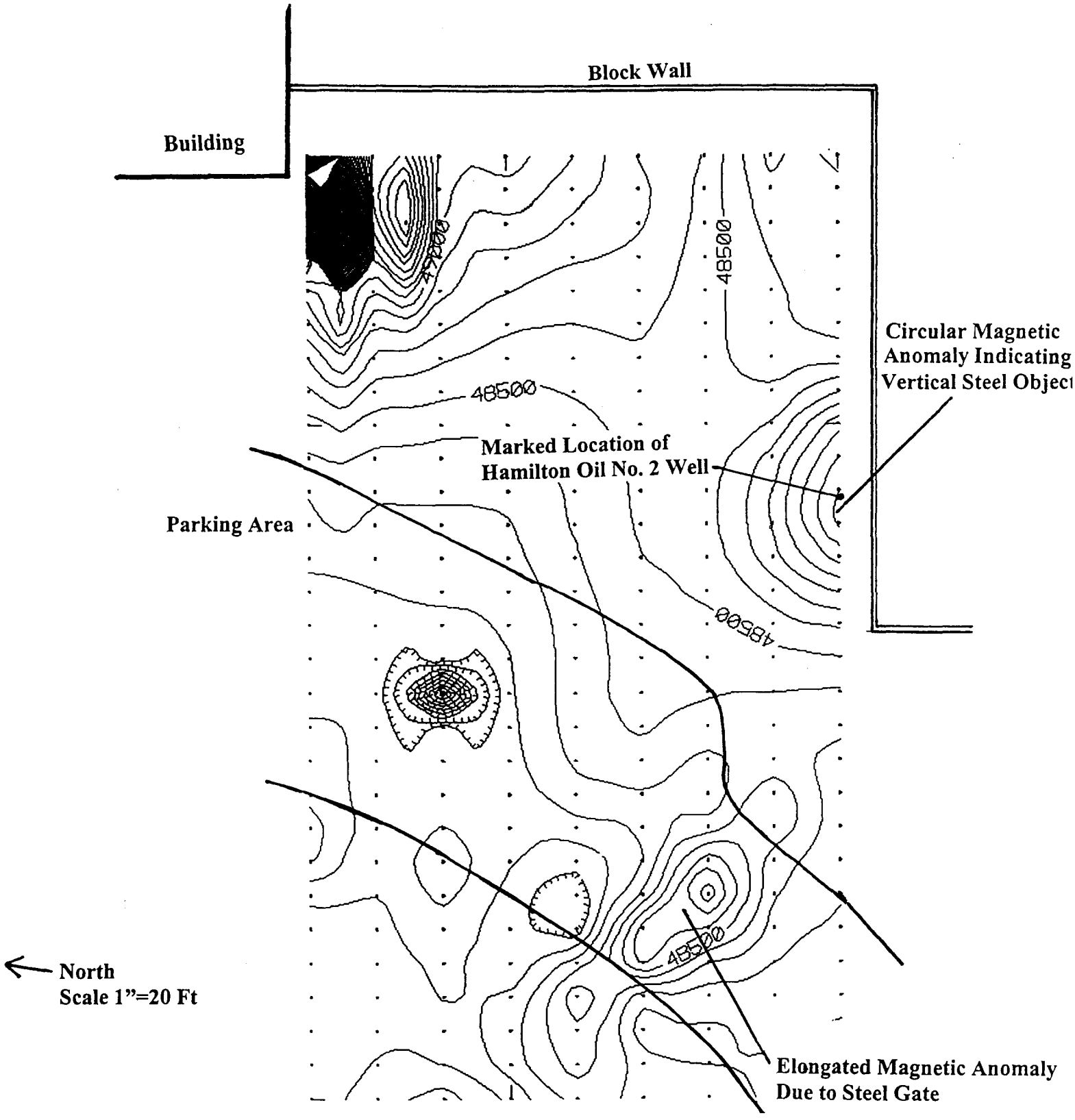
JOINT WATER POLLUTION CONTROL PLANT
ENVIRONMENTAL LABORATORY BUILDINGS

SITE PLAN

SITE PLAN

FIGURE D-1

ADVANCED GEOSCIENCE



CONTOUR MAP SHOWING RESULTS OF MAGNETOMETER SURVEY

Measured Total Magnetic Field
Contour Interval = 100 nT/m

FIGURE D-2

ADVANCED GEOSCIENCE

PROJECT ADDENDUM

GROUP DELTA CONSULTANTS

Certified DBE/MBE

Geotechnical Engineering
Geology
Hydrogeology
Coastal Engineering
Hydrology
Hydraulics
Environmental Engineering

To:	**Mrs. Alice Hou, Project Engineer** **County Sanitation Districts of Los Angeles Co**	Date: Nov. 20, 1999 FAX 562.699.4515
From:	**Steven Kolthoff, CEG** **Group Delta Consultants, Inc.**	
Subject:	**Seismic Soil Parameters – Proposed Enviro. Laboratory Building**	
Project No:	**L-236**	

Mrs. Hou,

As per my discussion with Mr. Paul Stoppelmann, it is our understanding that additional information has been requested by the Structural and Architectural Design Section. This letter is to provide the soil and seismic information that your group requested.

The site is located in Seismic Zone 4. For facilities, which are designed, to the seismic provisions of the Uniform Building Code (UBC, 1994), we recommend a site coefficient, S of 1.2 for the site. For seismic analysis in accordance with the provisions of the UBC, 1997 and using the Palos Verdes Fault that is 2.5 km from the site and with average N values between 15 and 50, we recommend the following seismic design parameters:

Paarameters	Values	UBC Reference
Seismic Zone Factor	0.4	Table 16 I
Soil Profile Type	S_D	Table 16 J
Seismic Source Type	B	Table 16 U
Seismic Coefficient, Na	1.25	Table 16 S
Seismic Coefficient, Nv	1.53	Table 16 T
Seismic Coefficient, Cv	0.98	Table 16 R
Seismic Coefficient, Ca	0.55	Table 16 Q

This addendum shall only be used in conjunction with our geotechnical report dated November 5, 1999. Should you have any question or if there is further information needed, please do not hesitate to contact the GDC at (310) 320-5100.

Respectfully submitted,
GROUP DELTA CONSULTANTS, INC.

Steven H. Kolthoff
Senior Geologist

L236 Addendum1

GROUP DELTA CONSULTANTS

Certified DBE/MBE

Geotechnical Engineering
Geology
Hydrogeology
Coastal Engineering
Hydrology
Hydraulics
Environmental Engineering

Project Memo

To: Paul Stoppleman – CSDLAC

From: Tom Swantko

CC: Alice Hou – CSDLAC; Phillip Wong – CSDLAC; Dan Weingart – Martin & Martin

Date: 1/27/00

Re: Supplemental Geotechnical Recommendations for Environmental Lab Building; GDC Project No. L-236B

Reference: Addendum, Foundation Recommendations, Geotechnical Assessments Report, Proposed Environmental Laboratory Building, Joint Water Pollution Control Plant, Carson, California, Dated 1/05/00, GDC Project No. L-236B

Following discussions with Paul Stoppleman and Dan Weingart, this memo provides supplemental analysis and discussion of foundation settlements and grading issues relative to the proposed environmental laboratory building.

Settlements

We understand that preliminary column loads for the new lab building range up to a maximum of 115 kips. Footings will be sized using an allowable bearing pressure of 3,500 psf. Therefore, the footing for a 115 k column load will be 5.7' x 5.7'. Based on our analyses, we anticipate that the settlement under a 115 k column load will be on the order of 1 inch. Differential settlement between similarly loaded footings should be less than 0.5 inch. The settlement under a 60 k column will be about ½-inch. Settlements will occur rapidly and should be essentially complete shortly after application of the full load.

Excavation of Existing Fill

The site for the new lab building is underlain at the surface with about 4 to 6 feet of existing uncertified fill. The uncertified fill will be removed and replaced with granular compacted fill. The new building will be connected to the existing Laboratory and Control Building, and the excavation to remove the fill may extend below the existing footings. We understand that the existing footings extend about 2.5 to 3 feet below the existing grade.

At this time we do not know how deep the removals will need to be adjacent to the existing building, but the excavation could extend 1 to 2 feet below the existing

2340 Vosbeth Street, Suite 103 ▲ Torrance, California 90501-1459 ▲ (310) 320-5100 *voice* ▲ (310) 320-2118 *fax*
Aliso Viejo, California ▲ (949) 609-1020 San Diego, California ▲ (858) 573-1777
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footings. Based on the boring information we have, the existing fill and upper native soils are generally clayey and silty. It is our opinion that the removals can be made in slots up to 8 feet long. However, the removals should be made and the area backfilled within the same work shift. In addition, we recommend that GDC should inspect the excavation as it is made to evaluate the limits for the removals, and provide modifications to the grading recommendations, if applicable.

If you have any questions regarding this memo, please give us a call.

Sincerely,
GROUP DELTA CONSULTS, INC.

Thomas D. Swantko, G.E. #813
Associate Geotechnical Engineer

L-236B - Memo

GROUP DELTA CONSULTANTS

Certified DBE/MBE

Geotechnical Engineering
Geology
Hydrogeology
Coastal Engineering
Hydrology
Hydraulics
Environmental Engineering

Project Memo #2

To: Paul Stoppleman – CSDLAC

From: Tom Swantko

CC: Alice Hou – CSDLAC; Phillip Wong – CSDLAC; Dan Weingart – Martin & Martin

Date: 02/03/00

Re: Supplemental Geotechnical Recommendations for Environmental Lab Building; GDC Project No. L-236B

Reference: Addendum, Foundation Recommendations, Geotechnical Assessments Report, Proposed Environmental Laboratory Building, Joint Water Pollution Control Plant, Carson, California, Dated 1/05/00, GDC Project No. L-236B

This memo documents our discussions concerning grading and pavement design issues relative to the proposed environmental laboratory building.

Grading and Excavations

To remove the existing fill within the proposed building area will require an excavation extending to a depth of up to 4 to 6 feet. Our borings indicate that the excavation will generally encounter soils consisting of silty clay, clayey sand, and sandy clay. Excavations up to 6 feet deep in these soils can be made with a side slope of ¾ (horizontal) to 1 (vertical); with the exception that the lower 2 feet of the excavation can be made vertical. However, the excavation and maintenance of safe and stable slope angles are the responsibility of the contractor, and should consider the actual subsurface conditions encountered and the contractor's method of operation. No surcharge loads, including traffic loads, should be allowed within a 2 to 1 plane extending up from the toe of the excavation.

Pavement Areas

We understand it is desirable not to have to remove all of the existing fill within planned parking areas. From a practical standpoint, it should be possible do partial removal of the fill and minimize any potential maintenance problems. Within pavement areas, the existing fill may be excavated to a depth of 2 feet below the finished subgrade elevation. The exposed surface should then be wheel rolled using heavy equipment. Any loose or soft soils, or any areas of "pumping" subgrade should be excavated and recompacted to at least 95 percent. Following wheel rolling, the area should be scarified to a depth of at least 8 inches; moisture conditioned to near optimum moisture, and recompacted to at least 95

2361 W. 205th Street, Suite 103 ▲ Torrance, California 90501-1459 ▲ (310) 320-5100 *voice* ▲ (310) 320-2118 *fax*
Aliso Viejo, California ▲ (949) 609-1020 San Diego, California ▲ (858) 573-1777
www.GroupDelta.com

percent. Acceptable backfill is not available on-site and will need to be imported. The recommended pavement sections are provided on page 15 of our initial report dated November 5.

If you have any questions regarding this memo, please give us a call.

Sincerely,
GROUP DELTA CONSULTS, INC.

Thomas D. Swantko, G.E. #813
Associate Geotechnical Engineer

L-236B - Memo

GROUP DELTA CONSULTANTS, INC.

2291 W. 205th Street, Suite 105
Torrance, California 90501-1459
Phone: (310) 320-5100
Fax: (310) 320-2118

FACSIMILE TRANSMITTAL

If you do not receive the number of pages indicated, please contact us at the number above.

To:	PAUL STOPPELMANN	**Sent By:**	TODD ARMSTRONG
Company:		**Project:**	
Fax No.:	562 692 2941	**Project No.:**	L-236
No. of Pages :	3 (including this page)	**Date:**	1/15/03

MESSAGE:

ATTACHED LETTER REGARDING DENSITY TESTING ON SUBGRADE AT LAB BUILDING IN CARSON.

92 Argonaut, Suite 120, Aliso Viejo, CA 92656-4121 ♦ (949) 609-1020 voice ♦ (949) 609-1030 fax
11545 W. Bernardo Court, Suite 200, San Diego, CA 92127 ♦ (858) 524-1500 voice ♦ (858) 524-1599 fax

GROUP DELTA CONSULTANTS

Certified MBE

Geotechnical Engineering
Geology
Hydrogeology
Earthquake Engineering
Materials Testing & Inspection
Forensic Services

January 9, 2003

County Sanitation District of Los Angeles
1955 Workman Mill Road
Whittier, CA 90601

Attention: Mr. Paul Stoppelmann

Subject: Insitu Moisture and Density Test Results
Proposed Environmental Laboratory Building
Joint Water Pollution Control Plant
Carson, California

Dear Mr. Stoppelmann:

As requested, we are providing results of the field density tests conducted at four test locations on April 17, 2002. The tests were performed to evaluate insitu moisture content and dry density of exposed native subgrade following removal of unsuitable soils and proof rolling. The results are presented in the following table:

Test No:	Date	Test Elevation (ft)	Moisture (%)	Density (pcf)
1	4/17/02	37	21.0	94.4
2	4/17/02	33	10.7	118.9
3	4/17/02	33	15.7	107.0
4	4/17/02	33	13.7	109.9

At the time of the test, our field technician noted the poor condition of the subgrade, especially at El. +37 feet.

We also performed a compaction test (ASTM D-1557) on a sample of the subgrade material provided to us by the general contractor, Amoroso Construction. The compaction test results indicated a maximum dry density of 122 lb/ft^3 at 10.5% moisture content. However, the nature of the subgrade was observed to be variable and we do not consider these values representative of all subgrade soils exposed.

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If you have any questions pertaining to the letter, or if we can be of further service to you, please do not hesitate to contact the undersigned at (310) 320-5100.

Respectfully submitted,
GROUP DELTA CONSULTANTS, INC.

Todd Armstrong, P.E.
Project Engineer

Distribution: (1) Addressee

L-236B Test Results

GROUP DELTA CONSULTANTS