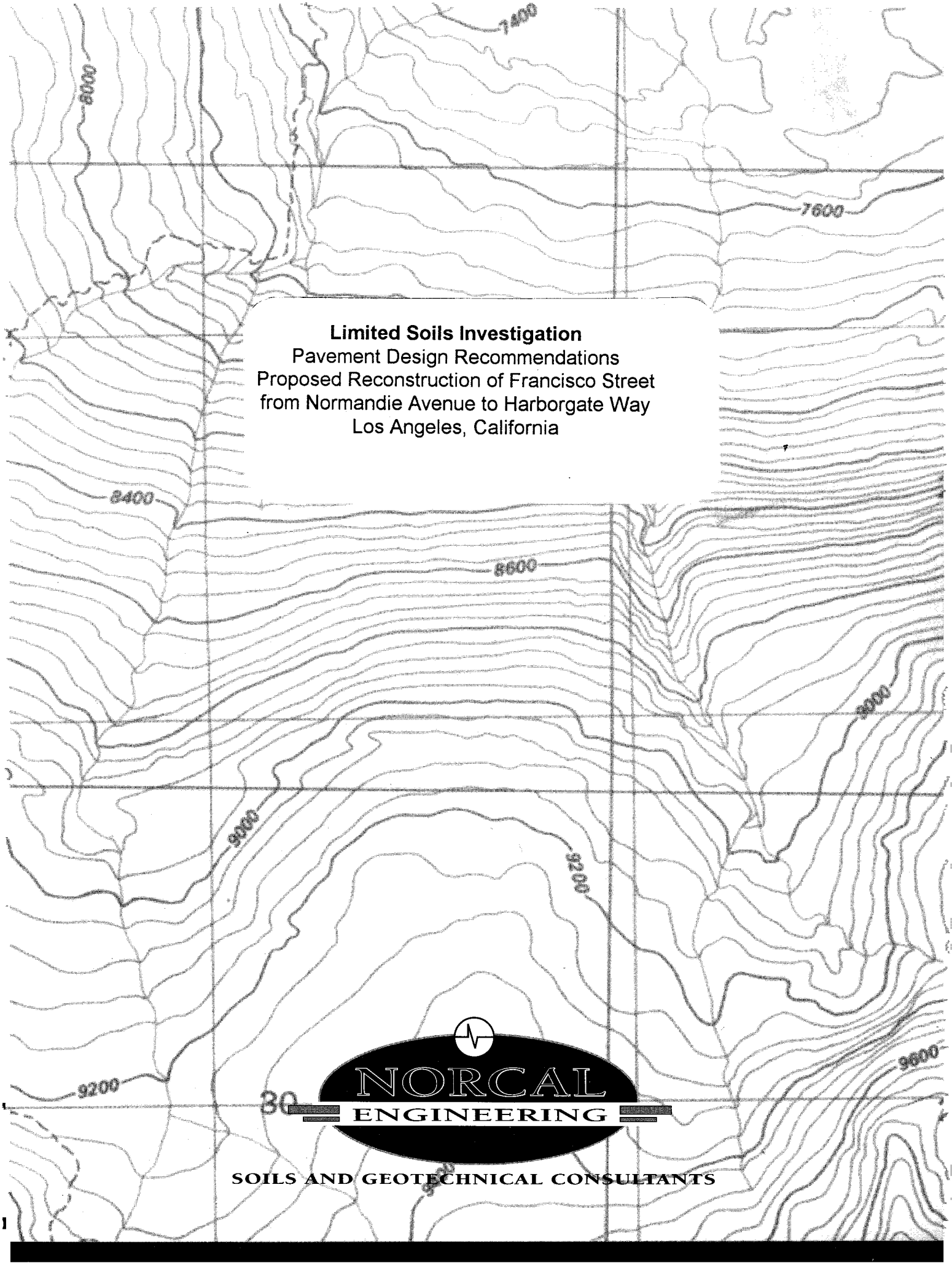

Limited Soils Investigation
Pavement Design Recommendations
Proposed Reconstruction of Francisco Street
from Normandie Avenue to Harborgate Way
Los Angeles, California

NORCAL
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Limited Soils Investigation
Pavement Design Recommendations
Proposed Reconstruction of Francisco Street
from Normandie Avenue to Harborgate Way
Los Angeles, California

Prepared For:

Boeing Realty Corporation
4060 Lakewood Boulevard, 6th Floor
Long Beach, California 90808-1700

Project Number 5936-96
October 15, 1998

NorCal Engineering

NorCal Engineering

SOILS AND GEOTECHNICAL CONSULTANTS
10641 HUMBOLT STREET LOS ALAMITOS, CA 90720
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October 15, 1998 Project Number 5936-96

Boeing Realty Corporation
4060 Lakewood Boulevard, 6th Floor
Long Beach, California 90808-1700

Attn: Mr. Mario Stavale

RE: **Limited Soils Investigation** - Pavement Design Recommendations - Proposed Reconstruction of Francisco Street, from Normandie Avenue to Harborgate Way, in the City of Los Angeles, California

Dear Mr. Stavale:
Pursuant to your request, this firm has performed a Limited Soils Investigation for the above referenced project in accordance with your authorization. The purpose of this investigation is to evaluate the geotechnical conditions of the proposed roadway area and provide recommendations for the proposed pavement section. This geotechnical engineering report presents the finding of our study along with conclusions and recommendations for development.

Site Description

The proposed roadway area is currently covered with an existing paved access road and asphaltic parking and storage areas. Pavement in the area is in relatively good condition although there are some areas where some cracking of the asphalt was noted.

Field Investigation

The purpose of the investigation was to explore the subsurface conditions and to provide preliminary geotechnical engineering design parameters for evaluation of the site with respect to the proposed improvements.

The investigation consisted of the placement of three subsurface exploratory excavations by hollow-stem auger to a maximum depth of 10 feet placed in the proposed roadway area. The explorations were visually classified and logged by a field engineer with locations of the subsurface explorations shown on the attached Site Plan. The exploratory borings revealed the existing earth materials to consist of fill and natural soil zones. A detailed description of the subsurface conditions are listed on the boring logs in Appendix A. These soils are described as follows:

Fill: Fill soils generally classifying as silty, sandy CLAY and silty SAND with occasional gravel were encountered in all borings. Fill soils ranged in depth from 6 to 12 inches and were generally noted to be medium dense to dense/stiff and moist.

Natural: Natural soils classified as silty CLAY with some sand and sandy SILT and were noted to be stiff and moist. No groundwater was encountered in the excavations.

Laboratory Tests

Relatively undisturbed samples of the subsurface soils were obtained to perform laboratory testing and analysis to determine in-place moisture/densities. These undisturbed samples consisted of one inch rings with inside diameter of 2.5 inches. Bulk bag samples were obtained in the upper soils for maximum density and R-Value tests.

A. The field moisture content (ASTM:D 2216) and the dry density of the ring samples were determined in the laboratory. This data is listed on the logs of borings.

B. Maximum density tests (ASTM: D-1557-78) were performed on typical samples of the upper soils. Results of these tests are shown on Table I.

C. Resistance 'R' Value tests were conducted on representative soil samples to determine preliminary pavement section design for the proposed driveway areas. The results of our study are included later in this report.

Conclusions and Recommendations

Based upon our evaluations, the proposed development is acceptable from a geotechnical engineering standpoint. By following the recommendations and guidelines set forth in our report, the structures will be safe from slippage and settlements under the anticipated design loadings and conditions. The proposed development shall meet all requirements of the City Building Ordinance and will not impose any adverse effect on existing adjacent structures.

It is recommended that site inspections be performed by a representative of this firm during future grading and construction of the development to verify the findings and recommendations documented in this report. Any unusual conditions which may be encountered in the course of the project development may require the need for additional study and revised recommendations.

Site Grading Recommendations

Any vegetation and demolition debris shall be removed and hauled from proposed grading areas prior to the start of grading operations. Any removed soils may be reutilized as compacted fill once any deleterious material or oversized materials (in excess of eight inches) is removed. All grading operations shall be performed in accordance with the attached "Specifications for Compacted Fill Operations".

All upper fill soils (approximately 6 to 12 inches) shall be removed to competent native soils, the exposed surface scarified to a depth of 8 inches, brought to the proper moisture content and compacted to a minimum of 90% of the laboratory standard (ASTM: D-1557-78) prior to placement of any additional compacted fill soils, slabs-on-grade and pavement.

It is likely that isolated areas of undiscovered fill not described in this report are present on site. If found, these areas should be treated as discussed earlier. A diligent search shall also be conducted during grading operations in an effort to uncover any underground structures, irrigation or utility lines. If encountered, these structures and lines shall be either removed, properly abandoned or protected prior to the proposed construction.

Care should be taken to provide or maintain adequate lateral support for all adjacent improvements and structures at all times during the demolition and grading operations and construction phase. Adequate drainage away from the structures, pavement and slopes should be provided at all times.

Temporary Excavations

Temporary unsurcharged excavations in the existing site materials may be made at vertical inclinations up to 4 feet in height and then may be trimmed at a 1 to 1(horizontal to vertical) gradient up to a maximum height of 10 feet. Cuts in excess of 10 feet must be assessed by this firm prior to excavation procedures. In areas where soils with little or no binder are encountered, where adverse geological conditions are exposed, or where excavations are adjacent to existing structures, shoring, slot-cutting, or flatter excavations may be required. The temporary cut slope gradients given above do not preclude local raveling and sloughing. All excavations shall be made in accordance with the requirements of CAL-OSHA and other public agencies having jurisdiction.

Pavement Design

Tests on the existing soils revealed an R-Value of 16. The following flexible pavement section design is provided based upon the lower of the test results. Using these values and various traffic indices, the following pavement design is provided for review.

Flexible (Asphalt) Pavement Section Design

Traffic Index	Inches Asphalt	Inches Base
6.0	4.0	10.25
7.0	4.0	14.0
8.0	4.0	18.0

All subgrade soils shall be compacted to a minimum of 90% of the laboratory maximum dry density; base material shall be compacted to at least 95%.

Closure

The recommendations and conclusions contained in this report are based upon the soil conditions uncovered in our test excavations. No warranty of the soil condition between our excavations is implied. NorCal Engineering should be notified for possible further recommendations if unexpected to unfavorable conditions are encountered during construction phase. It is the responsibility of the owner to ensure that all information within this report is submitted to the Architect and appropriate Engineers for the project.

This firm should have the opportunity to review the final plans to verify that all our recommendations are incorporated. This report and all conclusions are subject to the review of the controlling authorities for the project.

A preconstruction conference should be held between the developer, general contractor, grading contractor, city inspector, architect, and soil engineer to clarify any questions relating to the grading operations and subsequent construction. Our representative should be present during the grading operations and construction phase to certify that such recommendations are complied within the field.

This limited geotechnical investigation has been conducted in a manner consistent with the level of care and skill exercised by members of our profession currently practicing under similar conditions in the Southern California area. No other warranty, expressed or implied is made.

We appreciate this opportunity to be of service to you. If you have any further questions, please do not hesitate to contact the undersigned.

Respectfully submitted,
NORCAL ENGINEERING

Keith D. Tucker
Project Engineer
R.G.E. 841

REGISTERED PROFESSIONAL ENGINEER
KEITH D. TUCKER
No. 841
Exp. 12/31/00
GEOTECHNICAL
STATE OF CALIFORNIA

Mark A. Burkholder
Project Manager

SPECIFICATIONS FOR PLACEMENT OF COMPACTED FILL

Preparation

Any existing low density soils and/or saturated soils shall be removed to competent natural soil under the inspection of the Soils Engineering Firm. After the exposed surface has been cleansed of debris and/or vegetation, it shall be scarified until it is uniform in consistency, brought to the proper moisture content and compacted to a minimum of 90% relative compaction (in accordance with ASTM: D-1557-78).

Material For Fill

The on-site soils or approved import soils may be utilized for the compacted fill provided they are free of any deleterious materials and shall not contain any rocks, brick, asphaltic concrete, concrete or other hard materials greater than eight inches in maximum dimensions. Any import soil must be approved by the Soils Engineering firm a minimum of 24 hours prior to importation of site.

Placement of Compacted Fill Soils

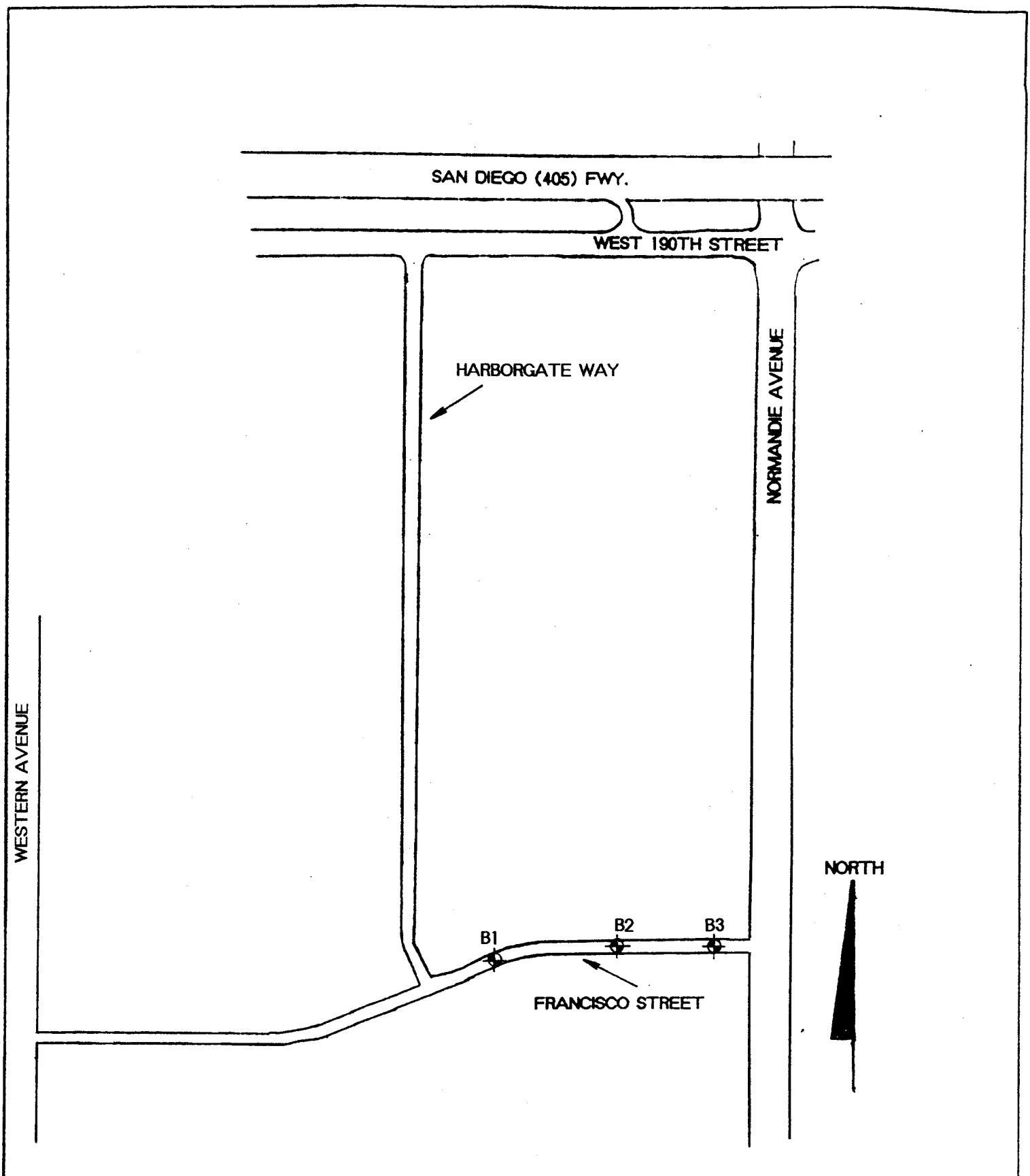
The approved fill soils shall be placed in layers not excess of six inches in thickness. Each lift shall be uniform in thickness and thoroughly blended. The fill soils shall be brought to within 15% of the optimum moisture content, unless otherwise specified by the Soils Engineering firm. Each lift shall be compacted to a minimum of 90% relative compaction (in accordance with ASTM: D-1557-78) and approved prior to the placement of the next layer of soil. Compaction tests shall be obtained at the discretion of the Soils Engineering firm but to a minimum of one test for every 500 cubic yards placed and/or for every 2 feet of compacted fill placed.

The minimum relative compaction shall be obtained in accordance with accepted methods in the construction industry. The final grade of the structural areas shall be in a dense and smooth condition prior to placement of slabs-on-grade or pavement areas. No fill soils shall be placed, spread or compacted during unfavorable weather conditions. When the grading is interrupted by heavy rains, compaction operations shall not be resumed until approved by the Soils Engineering firm.

Grading Observations

The controlling governmental agencies should be notified prior to commencement of any grading operations. This firm recommends that the grading operations be conducted under the observation of a Soils Engineering firm as deemed necessary. A 24 hour notice must be provided to this firm prior to the time of our initial inspection.

Observation shall include the clearing and grubbing operations to assure that all unsuitable materials have been properly removed; approve the exposed subgrade in areas to receive fill and in areas where excavation has resulted in the desired finished grade and designate areas of overexcavation; and perform field compaction tests to determine relative compaction achieved during fill placement. In addition, all foundation excavations shall be observed by the Soils Engineering firm to confirm that appropriate bearing materials are present at the design grades and recommend any modifications to construct footings.



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BOEING

PROJECT 5938-98 | DATE OCT. 1998

LOCATION OF FIELD EXPLORATIONS

APPENDICES

(In order of appearance)

Appendix A - Logs of Test Explorations
*Logs of Borings B1 to B3

Appendix B - Laboratory Analysis
*Table I - Maximum Dry Density Tests

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APPENDIX A

MAJOR DIVISIONS			SYMBOLS	TYPICAL NAMES
COARSE GRAINED SOILS (MORE THAN 50% OF MATERIAL IS LARGER THAN 200 SIEVE SIZE)	GRAVELS (MORE THAN 50% OF COARSE FRACTION IS LARGER THAN THE NO. 4 SIEVE SIZE)	CLEAN GRAVELS (LITTLE OR NO FINES)	GW	WELL GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES.
			GP	POORLY GRADED GRAVELS OR GRAVEL - SAND MIXTURES, LITTLE OR NO FINES.
		GRAVELS WITH FINES (APPRECIABLE AMT. OF FINES)	GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES.
			GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES.
	SANDS (MORE THAN 50% OF COARSE FRACTION IS SMALLER THAN THE NO. 4 SIEVE SIZE)	CLEAN SANDS	SW	WELL GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES.
			SP	POORLY GRADED SANDS OR GRAVELLY SANDS, LITTLE OR NO FINES.
		SANDS WITH FINES (APPRECIABLE AMT. OF FINES)	SM	SILTY SANDS, SAND - SILT MIXTURES.
			SC	CLAYEY SANDS, SAND - CLAY MIXTURES.
FINE GRAINED SOILS (MORE THAN 50% OF MATERIAL IS SMALLER THAN 200 SIEVE SIZE	SILTS AND CLAYS (LIQUID LIMIT LESS THAN 50)		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY.
			CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS.
			OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS
	SILTS AND CLAYS (LIQUID LIMIT MORE THAN 50)		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDY OR SILTY SOILS, ELASTIC SILTS.
			CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
			OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS.
HIGHLY ORGANIC SOILS			Pt	PEAT AND OTHER HIGHLY ORGANIC SOILS

BOUNDARY CLASSIFICATIONS: SOILS POSSESSING CHARACTERISTICS OF TWO GROUPS ARE DESIGNATED BY COMBINATIONS OF GROUP SYMBOLS.

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UNIFIED SOIL CLASSIFICATION SYSTEM

PROJECT | DATE

	MOISTURE (%)	DRY DENSITY (PCF)	PENETRATION RESISTANCE (BLOWS/FOOT)	SAMPLE TYPE	DEPTH (FEET)	DESCRIPTION OF SUBSURFACE MATERIALS 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 ACTUAL CONDITIONS ENCOUNTERED.	ELEVATION (FEET)
	14.7			B	0	4½" Asphaltic Concrete over 6½" Base	
	14.9	115.8	9/12	B/R		Fill CLAY sandy, silty with occasional pebbles grey/dark brown, moist, stiff	
	14.6	114.3	4/9	R	5	Native CLAY, silty with sand, dark brown, moist stiff	
						SAND clayey, silty, brown, moist, stiff	
	21.6	102.1	6/9	R	10	CLAY, sandy, light brown, moist, medium stiff Increase in sand content with depth	
					15	SAND fine grained, silty, light brown damp, medium dense	
					20		
					25		
					30		
					35		

SAMPLE TYPES

- [C] Rock Core
- [S] Standard Split Spoon
- [R] Ring Sample
- [B] Bulk Sample
- [J] Jar Sample

DATE DRILLED: 9-19-98
EQUIPMENT USED: Hollow Stem Auger
GROUNDWATER LEVEL: None Encountered

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LOG OF BORING #1

PROJECT 5936-96 | DATE

	MOISTURE (%)	DRY DENSITY (PCF)	PENETRATION RESISTANCE (BLOWS/FOOT)	SAMPLE TYPE	DEPTH (FEET)	DESCRIPTION OF SUBSURFACE MATERIALS 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 ACTUAL CONDITIONS ENCOUNTERED.	ELEVATION (FEET)
	14.7	107.7		R	0	5" Aspahltic Concrete over 4" Base Disturned Top Soils to 0.5' Brown, moist, medium dense	
					5	Native Soils SAND fine grained, silty brown, moist, medium dense	
					10	CLAY silty with sand, light brown, moist stiff	
					15		
					20		
					25		
					30		
					35		

SAMPLE TYPES

- [C] Rock Core
- [S] Standard Split Spoon
- [R] Ring Sample
- [B] Bulk Sample
- [J] Jar Sample

DATE DRILLED: 9-19-98
EQUIPMENT USED: Hollow Stem Auger
GROUNDWATER LEVEL: None Encountered

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LOG OF BORING #2

PROJECT 5936-96 | DATE

	MOISTURE (%)	DRY DENSITY (PCF)	PENETRATION RESISTANCE (BLOWS/FOOT)	SAMPLE TYPE	DEPTH (FEET)	DESCRIPTION OF SUBSURFACE MATERIALS 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 ACTUAL CONDITIONS ENCOUNTERED.	ELEVATION (FEET)
	18.9	110.3		R	0	6½" Asphaltic Concrete over 7½" Base Fill Soils SAND fine grained, silty with occasional small pebbles, brown, moist, medium dense	
					5	Native Soils CLAY silty with sand, brown, moist, stiff	
					10		
					15		
					20		
					25		
					30		
					35		

SAMPLE TYPES

- C Rock Core
- S Standard Split Spoon
- R Ring Sample
- B Bulk Sample
- J Jar Sample

DATE DRILLED: 9-19-98
EQUIPMENT USED: Hollow Stem Auger
GROUNDWATER LEVEL: None Encountered

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PROJECT 5936-96 | DATE

LOG OF BORING #3

APPENDIX B

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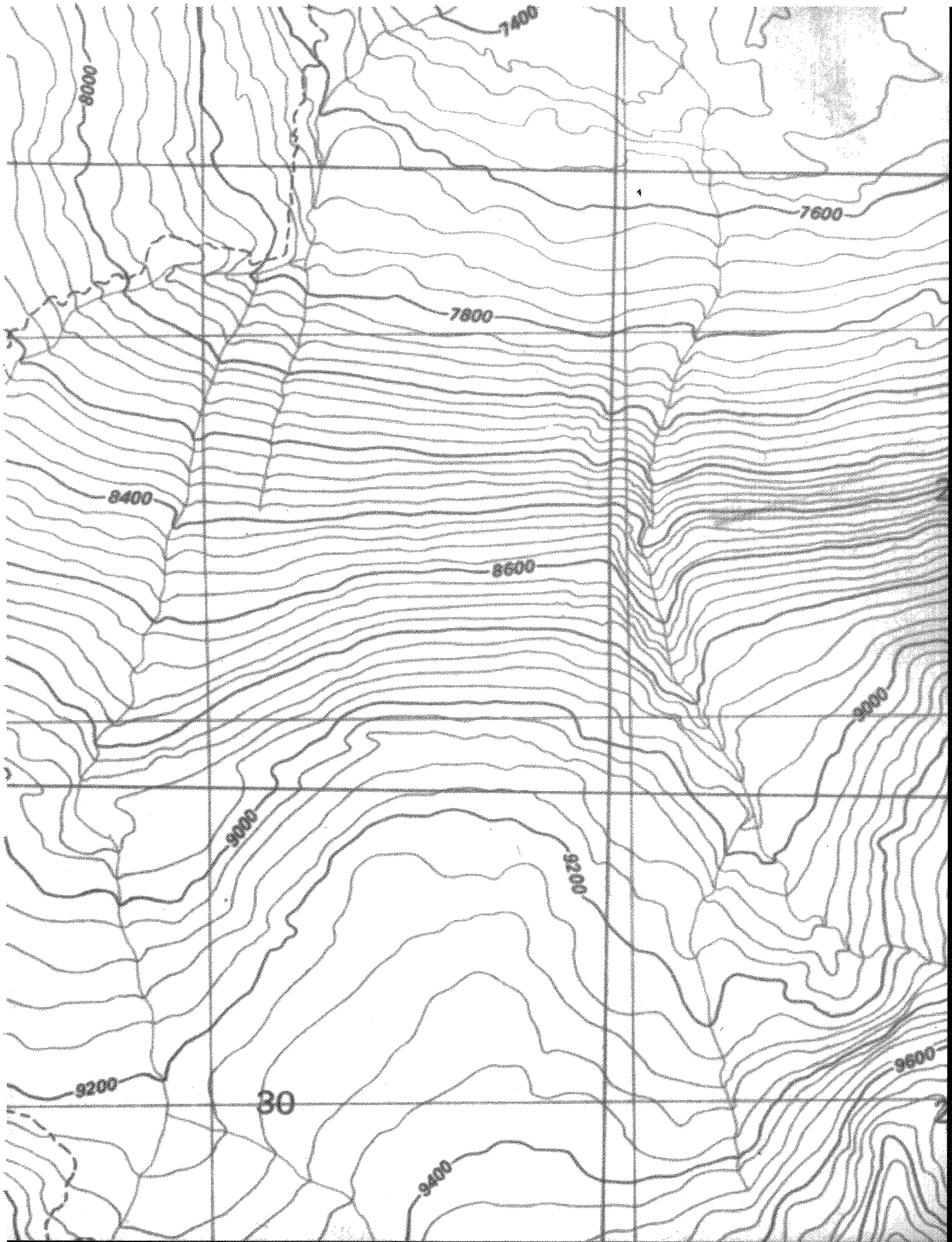
TABLE I
MAXIMUM DENSITY TESTS
(ASTM: D-1557-78)

Sample	Classification	Optimum Moisture	Maximum Dry Density (lbs./cu.ft.)
B1 @ 0-2'	silty CLAY with sand	14.5	118.5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7800
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9600
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9400