SOIL AND MATERIAL TESTING LABORATORY
OF NORTH COUNTY, INC.

423 HALE AVE. — ESCONDIDO, CALIF. 92025
ESCONDIDO — 746-2333

1 June 1979

State of California
Department of Real Estate
107 South Broadway, Room 8003
Los Angeles, California 90012

Attention: Subdivision Section

RE: Job No. 79-15
Proposed Commercial Subdivision
Carolyn Circle & Mission Avenue
Oceanside, California

SUBJECT: Soil Condition Report

Gentlemen:

This is to report that we have made a Preliminary Soils Investigation to determine the soils conditions on the proposed commercial subdivision legally described as a Portion of SW$\frac{1}{4}$, Sec. 18, T11S, R4W, S.B.B. & M, City of Oceanside, County of San Diego, State of California.

The condition of the natural soils and properly compacted fill ground to be placed on the property is such that structural damage is not likely to result provided the recommendations and specifications contained in our Preliminary Soils Investigation dated 1 June 1979 are followed.

Respectfully submitted,

SOIL AND MATERIAL TESTING
LABORATORY OF NORTH COUNTY, INC.

Claude B. Parker

CLAUDE B. PARKER
Registered Civil Engineer #18,987
Certified Engineering Geologist #922

CBP:mg

SOIL AND MATERIAL TESTING LABORATORY
OF NORTH COUNTY, INC.

423 HALE AVE. — ESCONDIDO, CALIF. 92025
ESCONDIDO — 746-2333

1 June 1979

Roymar Land Company
3130 San Luis Rey Road
Oceanside, California 92054

Attention: Mr. Robert Rollett

RE: Job No. 79-15
Proposed Commercial Subdivision
Carolyn Circle & Mission Avenue
Oceanside, California

Dear Mr. Rollett:

Enclosed is our report of the Preliminary Soil Investigation done in accordance with your instructions for the above referenced site legally described as a Portion of SW¼, Sec. 18, T11S, R4W, S.B.B. & M, City of Oceanside, County of San Diego, State of California.

The investigation consists of nine test pits dug to depths of 8 to 11 feet below the existing ground surface. Appropriate laboratory testing and engineering analyses were performed.

The results of this investigation along with our recommendations are to be found in the accompanying report. In summary, it is our opinion that there are no unusual soil or geologic conditions, except compaction of the loose alluvial soil and possible ground water conditions in deep cuts which would hinder the development of the project.

If there are any questions or problems, please feel free to contact us in the future.

Respectfully submitted,

SOIL AND MATERIAL TESTING
LABORATORY OF NORTH COUNTY, INC.

Claude B. Parker

CLAUDE B. PARKER
Registered Civil Engineer #18,987

PRELIMINARY SOIL INVESTIGATION
PROPOSED COMMERCIAL SUBDIVISION
CAROLYN CIRCLE AND MISSION AVENUE
OCEANSIDE, CALIFORNIA

FOR
ROYMAR LAND COMPANY
3130 SAN LUIS REY ROAD
OCEANSIDE, CALIFORNIA

1 JUNE 1979

JOB NO. 79-15

SOIL AND MATERIAL TESTING LABORATORY
OF NORTH COUNTY, INC.

TABLE OF CONTENTS

APPENDIX

PRELIMINARY SOIL INVESTIGATION
PROPOSED COMMERCIAL SUBDIVISION
CAROLYN CIRCLE AND MISSION AVENUE
OCEANSIDE, CALIFORNIA

I. GENERAL INFORMATION

A preliminary soil investigation has been completed for the proposed 11 acre commercial subdivision legally described as a Portion of SW¼, Sec. 18, T11S, R4W, S.B.B. & M., City of Oceanside, County of San Diego, State of California.

Details of the structures or grading were not available at the writing of this report. It is understood that the site will tentatively be used for one and two story light commercial buildings. There may be several feet of imported fill used to elevate the existing surface for drainage and stability.

II. PURPOSE OF INVESTIGATION

The purpose of this investigation is to determine the following:

1 - the existing soil conditions,

2 - the presence and effect of any expansive soil, existing fill, or loose alluvial material,

3 - the allowable soil bearing pressures,

4 - the presence of near surface groundwater or bedrock,

5 - any geologic problems,

6 - any construction problems that can be anticipated, and to make appropriate foundation recommendations.

III. FIELD INVESTIGATION

A. Surface Conditions

The subject site is a semielliptical flat parcel of approximately 11 acres whose shape is shown on Plate 1 (from the Specific Plan No. 69 by E. Brian Smith, Engineers, Carlsbad). The site

is located on the southern portion of the San Luis Rey River floodplain. At the time of the investigation the site was planted with oats. There are no structures or dense vegetation which would hinder grading. The surface soil is a loose granular material with excellent drainage characteristics.

B. Test Pits

Nine exploratory test pits were dug with a backhoe on May 17, 1979 at the approximate locations indicated on Plate 1. Samples of the soils excavated were obtained for laboratory analyses. The soils were visually classified by field identification procedure in accordance with the Unified Soil Classification. A simplified version of the Unified Soil Classification is included in the Appendix. Continuous logs of the soils encountered in the test pits were recorded in the field. The logs of the test pits shown on Plates 2 thru 10 are based on the field logs, on inspection of the samples and on the laboratory test results.

C. Subsurface Conditions

The site is in an area of relative geologic stability. There are no known faults or other geologic hazards in the general area. The nearest active fault is the Elsinore Fault approximately 21 miles to the northeast.

The general soil profile as determined from the nine test pits consists of 5 to 6 feet of loose alluvial sandy silt. Layers of firmer clay and sand are encountered at various depths throughout the site as indicated on the enclosed logs. Groundwater was found at approximately 6 feet in some of the test pits.

There were essentially three soil types based on similar engineering properties as described on the logs which were encountered during the investigation. The three soil types are referred to later in the report as Soil Type 1, Soil Type 2, and Soil Type 3.

Soil Type	Soil Description	Unified Soil Classification
1	Gray Brown Sandy Silt	ML
2	Gray Brown Silty Clay	ML-CL
3	Gray Brown Silty Sand	SM

IV. TESTS AND RESULTS

A. Grain Size Analyses

Five grain size analyses were performed on representative soils encountered according to ASTM D422-63 for classification purposes and as a guide for general engineering properties. The test results follow:

GRAIN SIZE ANALYSIS

Location	Soil Type	Percent Passing U.S. Standard Sieve 4	10	40	100	200	Unified Soil Classification
TP 1 @ 1½'	1	100	100	99	90	61	ML
TP 3 @ 3'	1	100	100	99	83	49	ML
TP 3 @ 10'	3	100	100	97	78	47	SM
TP 5 @ 2'	1	100	100	98	87	72	ML
TP 8 @ 5'	3	100	100	98	67	32	SM

TP = Test Pit

B. Density Tests

1 - Laboratory Compaction

One laboratory compaction test was made on the most

abundant upper soil to determine the maximum dry density and optimum moisture content as specified by ASTM D1557-64T, (method A). This test uses the minus #4 sieve soil in a 4 inch diameter 4 inch high cylindrical mold. The sample is formed with a 10 pound hammer falling 18 inches for 25 blows on each of 5 layers.

LABORATORY COMPACTION

Location	Soil Type	Maximum Dry Density (pcf)	Optimum Moisture Content (%)
TP 1 @ 1½'	1	110.5	16.4

TP = Test Pit

These results may be used during grading.

2 - Density Tests

Six field density tests were taken in the loose upper soil by the sand cone method ASTM D1556-64.

Direct measurements of moisture and density were also made on thirteen representative paraffin coated undisturbed samples by the water displacement method. The ratio of the field dry density to the laboratory maximum dry density is defined as the relative compaction. These results are presented on the logs, Plates 2 thru 10.

C. Consolidation Tests

Two consolidation tests were performed on undisturbed ring samples of Soil Type 1 taken from compressible strata as an indication of possible settlement. Both samples were placed in the consolidation apparatus and loaded with loads of .25, .5, 1.0, 2.0 and 4.0 KSF then unloaded to .2 and .1 KSF. The plots of the load vs. consolidation are presented on Plate 11.

The tests using conservative assumptions indicate a three foot fill with the building could consolidate an assumed 10 foot layer 2 to 3 inches. Due to the sandy nature of the soil, the consolidation should be accomplished during construction or at least by several months.

D. Direct Shear Test

A direct shear test was performed on a sample of Soil Type 1 for strength parameters in the bearing capacity and slope stability calculations. Three specimens of Soil Type 1 were prepared by remolding the soils in $2\frac{1}{2}$ inch diameter 1 inch high rings to 90% of the maximum dry densities at 3% over optimum moisture contents. These conditions approximate the compacted fill condition. The specimens were loaded with normal loads of .5, 1.0 and 1.5 KSF respectively and sheared to failure in undrained shear. The results follow:

DIRECT SHEAR TEST

Location	Soil Type	Unit Density (pcf)	Angle of Internal Friction(°)	Apparent Cohesion (psf)
TP 1 @ $1\frac{1}{2}$'	1	110	31	500

TP = Test Pit

V. BEARING CAPACITY

The values of internal friction and apparent cohesion derived from the direct shear test were used in the Terzaghi Formula in accordance with the procedure outlined in Reference 1, page 170, to compute the allowable bearing capacity.

Terzaghi Formula:

$$\text{Bearing Capacity} = 2/3cN'_c + \gamma D_f N'_q + \tfrac{1}{2}\gamma B N'_\gamma$$

Assumptions:

Depth of Footing, $D_f = 1.0'$

Width of Continuous Footing, $B = 1.0'$

N'_c, N'_q, N'_γ = dimmensionless parameters found from Fig. 75, Ref. 1.

Factor of Safety = 3.

ALLOWABLE BEARING CAPACITY

Soil Type	Soil Description	Bearing Capacity (psf)
1	Gray Brown Sandy Silt	2574

VI. CONCLUSIONS AND RECOMMENDATIONS

1 - It is recommended that all grading and the preparation of native soil be done in accordance with the enclosed "Specifications for Construction of Controlled Fills" except if superseded by the following recommendations.

Any unreported trash piles, septic tanks or other large buried objects uncovered during grading should be dug out and the voids backfilled with compacted fill under our supervision. This laboratory should be notified for backfill recommendations of any wells.

2 - The main soil problem on the site will be the treatment of the loose upper soil. It is recommended that the loose soil under the building and for at least 10 feet outside the perimeters be excavated and recompacted to a depth of 2 to 3 feet prior to placing a building or any new fill.

The exact depth of excavation and recompaction in these

areas should be determined by the soil technician in the field upon consideration of the grading plan and actual field conditions.

Our tests indicate a large shrinkage due to the loose nature of the soil may occur during recompaction. Experience with similar projects indicate the soil may shrink 7 to 10 inches from the original level.

3 - It is recommended that all footings contain at least two #5 reinforcing rods. Place one rod 3 inches from the bottom and the other 3 inches from the top of the footings.

Use 6X6/10X10 wire mesh in the center of all slabs.

4 - Although there are no known active faults through the site or in the area, the site, as is the entire San Luis Rey floodplain, is subject to possible liguifaction in the event of a large earthquake.

It is our opinion that the several feet of compacted native soil and several feet of compacted fill with adequate reinforcing and construction in accordance with the Uniform Building Code, Seismic Zone IV should be sufficient to maximize conditions for human safety in the event of an earthquake.

5 - Our tests and calculations indicate the recompacted soil can sustain a bearing capacity in the order of 2574 psf for the proposed footings. Experience and good engineering practice, however, would limit this to 1500 psf.

This value should be verified on import lots where the fill varies from the native soil.

The bearing of any deep footings (over 4 feet) should be checked by this laboratory.

6 - Direct and maintain drainage so that water is not allowed to pond around the foundation or at top of slopes.

7 - Additional tests will be required on the imported soil and if soils other than those described in this report are encountered.

VII. REFERENCE

1 - Terzaghi and Peck, Soil Mechanics in Engineering Practice, John Wiley & Son, N.Y., 1948.

Respectfully submitted,

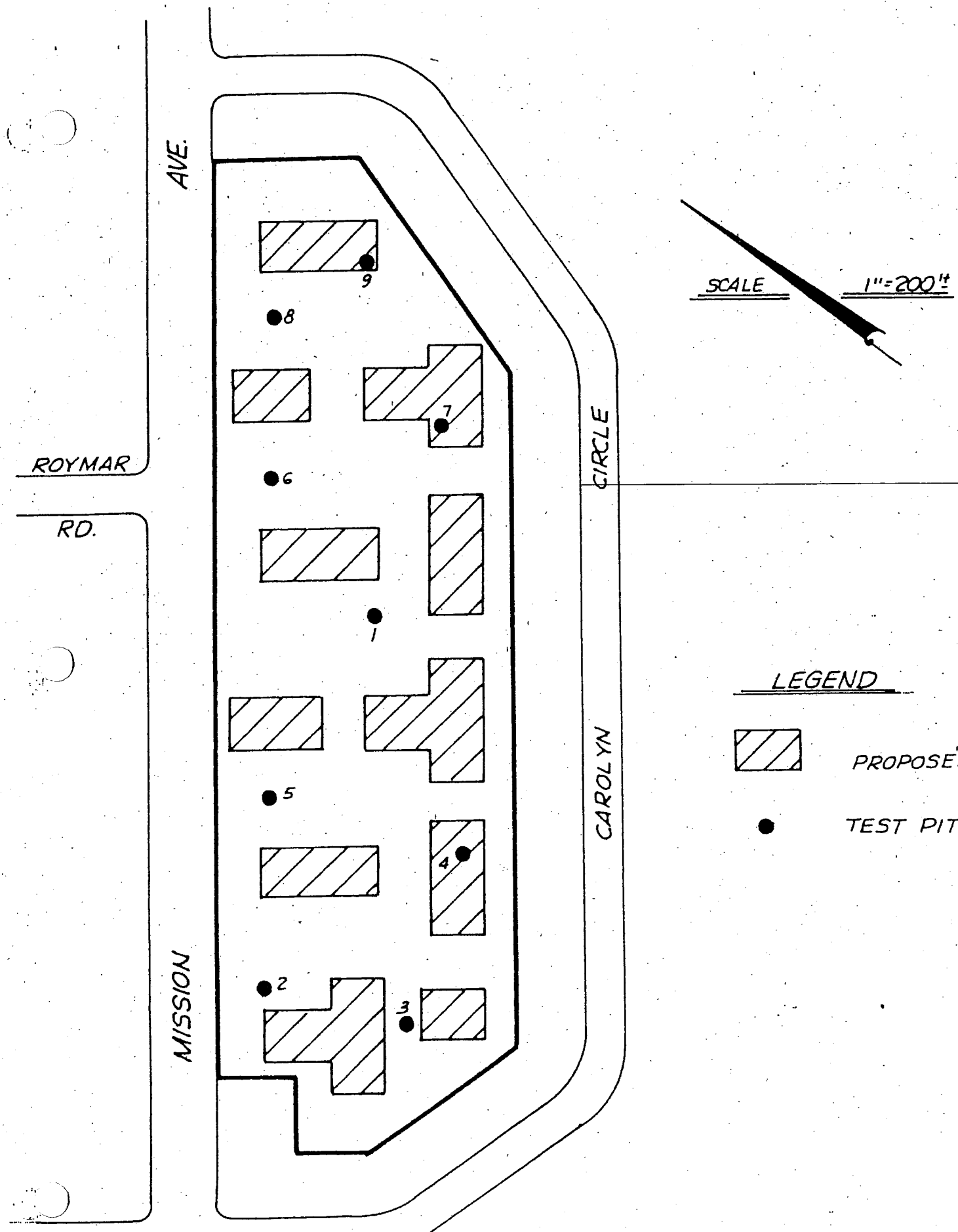
SOIL AND MATERIAL TESTING
LABORATORY OF NORTH COUNTY, INC.

Claude B. Parker

CLAUDE B. PARKER
Registered Civil Engineer #18,987
Certified Engineering Geologist #922

CBP:mg

Distribution: 6 Addressee
2 Nasland Engineering
Attn: Rod Imming



SOIL AND MATERIAL TESTING LABORATORY
OF NORTH COUNTY, INC.

TEST PIT LOCATIO
FOR
ROYMAR LAND C
OCEANSIDE CALI

LOG OF BORING

BORING NO. 1
ELEVATION
SAMPLING METHOD Backhoe

DEPTH IN FEET	SAMPLE NUMBER	BLOW COUNT		SOIL CLASSIFICATION	FIELD MOISTURE (% Dry Weight)	DRY DENSITY (pcf)	RELATIVE COMPACTION (%)
1			Gray Brown Sandy Silt				
			loose				
	□	⬭	Q_u = .8 TSF		22.0	83.2	75.3
2			moderately firm @ 2'				
				ML			
3			uniform				
4			moist				
5	△		▽ Water ST1		33.5	86.2	78.0
6	△		Gray Brown Silty Clay		94.7	26.4	
			moderately firm				
7			Q_u = 1.2 TSF	CL-ML			
8			grades browner and more silty				
			Q_u = 1.0 TSF				
9	△		walls cave ST2				
10			BOTTOM				
11							

△ = Undisturbed sample

□ = Disturbed sample

⬭ = Field Density Test

Q_u = unconfined compressive strength per SOILTEST penetrometer CL-700

Date: 17 May 1979
By: Claude B. Parker

Roymar Commercial Site
Carolyn Circle & Mission
Oceanside, California

Job No. 79-15
Plate No. 2

SOIL & MATERIAL TESTING-LABORATORY
OF NORTH COUNTY INC.

LOG OF BORING

BORING NO. 2
ELEVATION
SAMPLING METHOD Backhoe

DEPTH IN FEET	SAMPLE NUMBER	BLOW COUNT	SOIL CLASSIFICATION	FIELD MOISTURE (% Dry Weight)	DRY DENSITY (pcf)	RELATIVE COMPACTION (%)
1	⬭		Gray Brown Sandy Silt top 24" loose Q_U = 1.0 TSF	18.5	79.8	72.2
2			moderately firm			
3			ML			
4	△		uniform	29.8	86.3	78.1
5						
6			moist			
7	△		Q_U = .9 TSF	34.4	87.7	79.4
8	△		Q_U = 1.5 TSF	28.3	95.8	86.7
9			slow water seeps @ 9' walls cave			
10			BOTTOM			
11						

Date: 17 May 1979
By: Claude B. Parker

Roymar Commercial Site
Carolyn Circle & Mission
Oceanside, California

Job No. 79-15
Plate No. 3

SOIL & MATERIAL TESTING-LABORATORY
OF NORTH COUNTY INC.

LOG OF BORING

BORING NO. 3
ELEVATION
SAMPLING METHOD Backhoe

DEPTH IN FEET	SAMPLE NUMBER	BLOW COUNT	SOIL CLASSIFICATION	FIELD MOISTURE (% Dry Weight)	DRY DENSITY (pcf)	RELATIVE COMPACTION (%)
1	△		Gray Brown Sandy Silt top 24" loose	16.1	89.7	81.2
2			grades moderately firm			
3	△		moist ML			
4			1' zone of gray sand @ 3' Q_u = 1.2 TSF			
5						
6						
7	△		water seeps @ 7' ST1			
8	△		Gray Brown Silty Clay wet Q_u = .8 TSF soft ST2 CL-ML			
9			Gray Brown Silty Sand walls cave			
10	△		ST3 SM BOTTOM			

Date: 17 May 1979
By: Claude B. Parker

Roymar Commercial Site
Carolyn Circle & Mission
Oceanside, California

Job No. 79-15
Plate No. 4

SOIL & MATERIAL TESTING-LABORATORY
OF NORTH COUNTY INC.

LOG OF BORING

BORING NO. 4
ELEVATION
SAMPLING METHOD Backhoe

DEPTH IN FEET	SAMPLE NUMBER	BLOW COUNT		SOIL CLASSIFICATION	FIELD MOISTURE (% Dry Weight)	DRY DENSITY (pcf)	RELATIVE COMPACTION (%)
1–2	⬭		Gray Brown Sandy Silt top 24" loose moist ST1	ML	26.6	82.7	74.8
3–6	△ △		Gray Brown Silty Sand wet – sandy uniform	SM	28.1	92.8	
7			some water seeps @ 8' ST 3				
8			BOTTOM				

Date: 17 May 1979
By: Claude B. Parker

Roymar Commercial Site
Carolyn Circle & Mission
Oceanside, California

Job No. 79-15
Plate No. 5

LOG OF BORING

BORING NO. 5
ELEVATION
SAMPLING METHOD Backhoe

DEPTH IN FEET	SAMPLE NUMBER	BLOW COUNT	SOIL CLASSIFICATION	FIELD MOISTURE (% Dry Weight)	DRY DENSITY (pcf)	RELATIVE COMPACTION (%)
1			Gray Brown Sandy Silt top 24" loose, moist			
2	⬭		Q_u = 1.0 TSF	33.3	70.7	64.0
			grades more sandy			
3	△		ML	22.2	85.3	77.2
4						
5						
6			ST1			
			water seeps @ 7'			
7	△		Gray Brown Sandy Clay Q_u = 1.0TSF			
			moderately firm			
8			CL-ML			
			ST2			
9			BOTTOM			

Date: 17 May 1979
By: Claude B. Parker

Roymar Commercial Site
Carolyn Circle & Mission
Oceanside, California

Job No. 79-15
Plate No. 6

SOIL & MATERIAL TESTING-LABORATORY
OF NORTH COUNTY INC.

LOG OF BORING

BORING NO. 6
ELEVATION
SAMPLING METHOD Bakchoe

DEPTH IN FEET	SAMPLE NUMBER	BLOW COUNT		SOIL CLASSIFICATION	FIELD MOISTURE (% Dry Weight)	DRY DENSITY (pcf)	RELATIVE COMPACTION (%)
1–4	△		Gray Brown Sandy Silt top 18" loose, moist Q_u = 1.2 TSF moderately firm ST1	ML	23.1	66.0	60.1
5–6	△		Gray Brown Silty Clay moderately firm Q_u = 1.5 TSF ST2	CL-ML	29.3	86.7	
7–9	△		Gray Brown Silty Sand water seeps @ 8' walls cave BOTTOM	SM			
10							

Date: 17 May 1979
By: Claude B. Parker

Roymar Commercial Site
Carolyn Circle & Mission
Oceanside, California

Job No. 79-15
Plate No. 7

SOIL & MATERIAL TESTING LABORATORY
OF NORTH COUNTY INC.

LOG OF BORING

BORING NO. 7
ELEVATION
SAMPLING METHOD Backhoe

DEPTH IN FEET	SAMPLE NUMBER	BLOW COUNT	SOIL CLASSIFICATION	FIELD MOISTURE (% Dry Weight)	DRY DENSITY (pcf)	RELATIVE COMPACTION (%)
1–5	⬭ △		Gray Brown Sandy Silt top 24" loose, moist moderately firm water seeps @ 5½' ST1	20.8	84.5	76.5
			ML			
6–8	□		Gray Brown Silty Sand saturated – loose walls cave ST3 BOTTOM			
			SM			

Date: 17 May 1979
By: Claude B. Parker

Roymar Commercial Site
Carolyn Circle & Mission
Oceanside, California

Job No. 79-15
Plate No. 8

SOIL & MATERIAL TESTING-LABORATORY
OF NORTH COUNTY INC.

LOG OF BORING

BORING NO. 8
ELEVATION
SAMPLING METHOD Backhoe

DEPTH IN FEET	SAMPLE NUMBER	BLOW COUNT		SOIL CLASSIFICATION	FIELD MOISTURE (% Dry Weight)	DRY DENSITY (pcf)	RELATIVE COMPACTION (%)
1–2	⬭		Gray Brown Sandy Silt loose, moist ST1	ML	26.5	72.2	65.3
3–4	△		Gray Brown Sandy Clay moderately firm Q_u = 1.8 TSF ST2	CL–ML	31.2	79.2	
5–9	□ △		Gray Brown Silty Sand moderately firm water trapped in pockets @ 7' walls cave ST3 BOTTOM	SM			
10							

Date: 17 May 1979
By: Claude B. Parker

Roymar Commercial Site
Carolyn Circle & Mission
Oceanside, California

Job No. 79-15
Plate No. 9

SOIL & MATERIAL TESTING-LABORATORY
OF NORTH COUNTY INC.

LOG OF BORING

BORING NO. 9
ELEVATION
SAMPLING METHOD Backhoe

DEPTH IN FEET	SAMPLE NUMBER	BLOW COUNT	SOIL CLASSIFICATION	FIELD MOISTURE (% Dry Weight)	DRY DENSITY (pcf)	RELATIVE COMPACTION (%)
1	△		Gray Brown Sandy Silt top 24' loose, moist Q_u = 1.5 TSF	15.9	77.7	70.3
2			grades clayey			
3			moderately firm ML			
4	△			18.5	92.3	75.6
5						
6			grades sandy @ 6' ST1			
7	□		Gray Brown Silty Sand - saturated water seeps SM			
8			walls cave			
9			ST3			
			BOTTOM			
10						

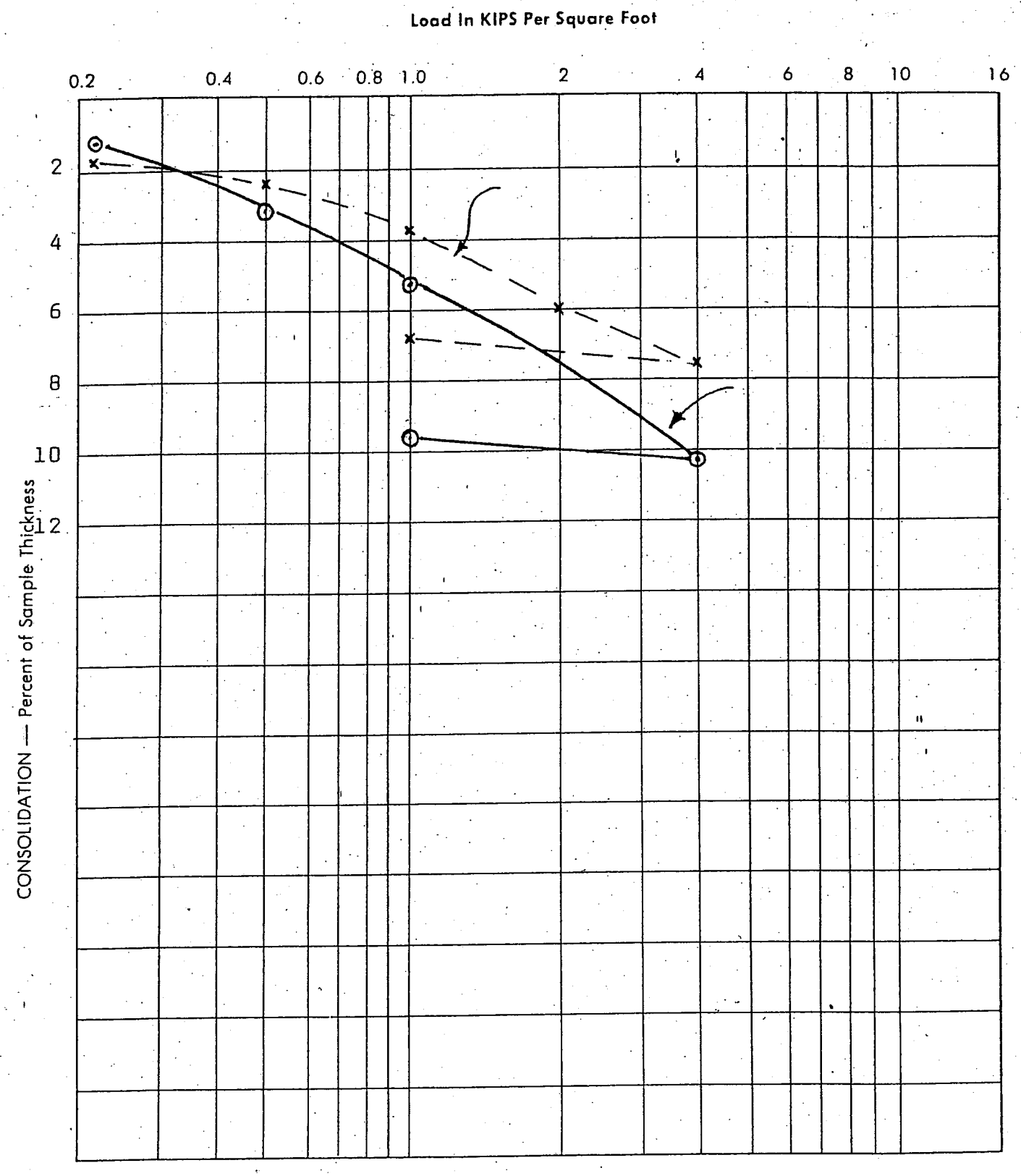
Date: 17 May 1979
By: Claude B. Parker

Roymar Commercial Site
Carolyn Circle & Mission
Oceanside, California

Job No. 79-15
Plate No. 10

SOIL & MATERIAL TESTING-LABORATORY
OF NORTH COUNTY INC.

CONSOLIDATION CURVES



Date: May 1979	Roymar Commercial Site Carolyn Circle & Mission Oceanside, California	Job No. 79-15
By: I. Jennings		Plate No. 11

SOIL AND MATERIAL TESTING LABORATORY
OF NORTH COUNTY, INC.

423 HALE AVE. — ESCONDIDO, CALIF. 92025
ESCONDIDO — 746-2333

SPECIFICATIONS FOR CONSTRUCTION OF CONTROLLED FILLS

GENERAL DESCRIPTION: The construction of controlled fills shall consist of adequate preliminary soil investigations, and clearing, removal of existing structures and foundations, preparation of land to be filled, excavation of earth and rock from cut area, compaction and control of the fill, and all other work necessary to complete the grading of the filled areas to conform with the lines, grades, and slopes as shown on the accepted plans.

CLEARING AND PREPARATION OF AREAS TO BE FILLED:

(a) All fill control projects shall have a preliminary soil investigation or a visual examination, depending upon the nature of the job, by a qualified soil engineer prior to grading.

(b) All timber, trees, brush, vegetation, and other rubbish shall be removed, piled and burned, or otherwise disposed of to leave the prepared areas with a finished appearance free from unsightly debris.

(c) Any soft, swampy or otherwise unsuitable areas, shall be corrected by drainage or removal of compressible material, or both, to the depths indicated on the plans or as directed by the soil engineer.

(d) The natural ground which is determined to be satisfactory for the support of the filled ground shall then be plowed or scarified to a depth of at least six inches (6") or deeper as specified by the soil engineer, and until the surface is free from ruts, hummocks, or other uneven features which would tend to prevent uniform compaction by the equipment to be used.

(e) No fill shall be placed until the prepared native ground has been approved by the soil engineer.

(f) Where fills are made on hillsides with slopes greater than 5 (horizontal) to 1 (vertical), horizontal benches shall be cut into firm undisturbed natural ground to provide lateral and vertical stability. The initial bench at the toe of the fill shall be at least 10 feet in width on firm undisturbed natural ground at the elevation of the toe stake. The soil engineer shall determine the width and frequency of all succeeding benches which will vary with the soil conditions and the steepness of slope.

(g) After the natural ground has been prepared, it shall be brought to the proper moisture content and compacted to not less than 90% of maximum density, A.S.T.M. D1557-64T.

(h) Expansive soils may require special compaction specifications directed in the preliminary soil investigation by the soil engineer.

(i) The cut portions of building pads in which rock-like material exists may require excavation and recompaction for density compatibility with the fill as directed by the soil engineer.

MATERIALS: The fill soils shall consist of select materials graded so that at least 40 percent of the material passes the No. 4 sieve. The material may be obtained from the excavation, a borrow pit, or by mixing soils from one or more sources. The material used shall be free from vegetable matter, and other deleterious substances, and shall not contain rocks or lumps greater than 6 inches in diameter. If excessive vegetation, rocks, or soils with unacceptable physical characteristics are encountered, these materials shall be disposed of in waste areas designated on the plans or as directed by the soil engineer. If soils are encountered during the grading operation which were not reported in the preliminary soil investigation, further testing will be required to ascertain their engineering properties. Any special treatment recommended in the preliminary or subsequent soil reports not covered herein shall become an addendum to these specifications.

No material of a perishable, spongy, or otherwise unstable nature shall be used in the fills.

PLACING, SPREADING AND COMPACTING FILL MATERIAL:

(a) The selected fill material shall be placed in layers which shall not exceed six inches (6") when compacted. Each layer shall be spread evenly and shall be thoroughly blade-mixed during the spreading to insure uniformity of material and moisture in each layer.

(b) When the moisture content of the fill material is below that specified by the soil engineer, water shall be added until the moisture content is near optimum as determined by the soil engineer to assure thorough bonding during the compacting process.

(c) When the moisture content of the fill material is above that specified by the soil engineer, the fill material shall be aerated by blading and scarifying, or other satisfactory methods until the moisture content is near optimum as determined by the soils engineer.

(d) After each layer has been placed, mixed and spread evenly, it shall be thoroughly compacted to not less than the specified maximum density in accordance with A.S.T.M. D1557-64T. Compaction shall be by means of tamping or sheepsfoot rollers, multiple-wheel pneumatic-tired rollers, or other types of rollers. Rollers shall be of such design that they will be able to compact the fill to the specified density. Rolling of each layer shall be continuous over its entire area and the roller shall make sufficient passes to obtain the desired density. The entire area to be filled shall be compacted to the specified density.

(e) Fill slopes shall be compacted by means of sheepsfoot rollers or other suitable equipment. Compacting operations shall be continued until the slopes are stable but not too dense for planting and until there is no appreciable amount of loose soil on the slopes. Compacting of the slopes shall be accomplished by backrolling the slopes in increments of 3 to 5 feet in elevation gain or by other methods producing satisfactory results.

(f) Field density tests shall be made by the soil engineer for approximately each foot in elevation gain after compaction, but not to exceed two feet in vertical height between tests. The location of the tests in plan shall be spaced to give the best possible coverage and shall be taken no farther than 100 feet apart. Tests shall be taken on corner and terrace lots for each two feet in elevation gain. The soil engineer may take additional tests as considered necessary to check on the uniformity of compaction. Where sheepsfoot rollers are used, the tests shall be taken in the compacted material below the disturbed surface. No additional layers of fill shall be spread until the field density tests indicate that the specified density has been obtained.

(g) The fill operation shall be continued in six inch (6") compacted layers, as specified above, until the fill has been brought to the finished slopes and grades as shown on the accepted plans.

SUPERVISION: Supervision by the soil engineer shall be made during the filling and compacting operations so that he can certify that the fill was made in accordance with accepted specifications.

The specifications and soil testing of subgrade, subbase, and base materials for roads, or other public property shall be done in accordance with specifications of the governing agency.

SEASONAL LIMITS: No fill material shall be placed, spread, or rolled during unfavorable weather conditions. When the work is interrupted by heavy rain, grading shall not be resumed until field tests by the soil engineer indicate that the moisture content and density of the fill are as previously specified. In the event that, in the opinion of the engineer, soils unsatisfactory as foundation material are encountered, they shall not be incorporated in the grading and disposition will be made at the engineer's discretion.

UNIFIED SOIL CLASSIFICATION CHART

IDENTIFYING CRITERIA	GROUP SYMBOL	SOIL DESCRIPTION
I. COARSE GRAINED (More than 50% #200 sieve)		
GRAVELS (More than 50% #4 sieve but smaller than 3 inches)	GW	GRAVEL, well graded gravel-sand mixture, little or no fines.
	GP	GRAVEL, poorly graded gravel-sand mixture, little or no fines.
Non Plastic	GM	GRAVEL, SILTY, poorly graded gravel-sand-silt mixtures.
	GC	GRAVEL, CLAYEY, poorly graded gravel-sand-clay mixture.
SANDS (More than 50% smaller than #4 sieve)	SW	SAND, well graded, gravelly sands, little or no fines.
	SP	SAND, poorly graded, gravelly sands, little or no fines.
Non Plastic	SM	SAND, SILTY, poorly graded sand-silt mixtures.
	SC	SAND, CLAYEY, poorly graded sand-clay mixtures.
II. FINE GRAINED (More than 50% smaller than #200 sieve)	ML	SILT, INORGANIC, silt and fine sand, sandy silt or clayey-silt-sand mixtures with slight plasticity.
Liquid Limit less than 50	CL	CLAY, INORGANIC, clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.
	OL	SILT, ORGANIC, silts and organic silt-clays of low plasticity.
Liquid Limit greater than 50	MH	SILT, INORGANIC, silts micaceous or dictomaceous fine sandy or silty soils, elastic silts.
	CH	CLAY, INORGANIC, clays of medium to high plasticity, fat clays.
	OH	CLAY, ORGANIC, clays of medium to high plasticity.
III. HIGHLY ORGANIC SOILS	PT	PEAT, other highly organic swamp soils.