Appendix B Foundation Investigation Report

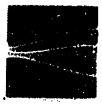
APPENDIX C

REPORT ON FOUNDATION INVESTIGATION PROPOSED MOLA OFFICE COMPLEX

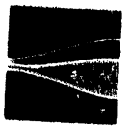
Prepared by: Lerdy Crandall and Associates

REPORT OF FOUNDATION INVESTIGATION
PROPOSED MOLA OFFICE COMPLEX
BEACH BOULEVARD AND WARNER AVENUE
HUNTINGTON BEACH, CALIFORNIA
FOR THE
MOLA DEVELOPMENT CORPORATION
(OUR JOB NO. A-81064)

P. O. Box 190
Huntington Beach, CA 92648



LeROY CHANDALL AND ASSOCIATES consulting geotechnical engineers, 111 n alvarado st, los angeles, ca. 90026, (213) 413-3550, telex



April 8, 1981

Mola Development Corporation
808 Adams Avenue
Huntington Beach, California 92648

(Our Job No. A-81064)

Attention: Mr. Frank Mola

Gentlemen:

Our "Report of Foundation Investigation, Proposed Mola Office Complex, Beach Boulevard and Warner Avenue, Huntington Beach, California, for the Mola Development Corporation" is herewith submitted.

The scope of the investigation was planned in collaboration with Mr. Jot Lloyd of Albert C. Martin and Associates. We were advised of the structural features of the proposed buildings by personnel of Albert C. Martin and Associates.

Existing shallow fill soils were encountered in most of the exploration borings. The natural soils beneath the site consist of clay, silt, silty sand, and sand, and are generally moderately firm to firm. Water was encountered at depths of 19 to 27 feet below the existing grade.

The soils are not considered suitable for support of the proposed office towers or parking structure on spread footings because of settlement considerations. To provide support for these buildings with minimum settlement, piling may be used. Since the shallow water level would restrict the lengths of conventional drilled cast-in-place concrete piling, driven friction piling should be the most suitable foundation type. The proposed two- and three-story wings and the proposed one-story theater may be supported on spread footings established in either the undisturbed natural soils or properly compacted fill. In our opinion, the possibility of liquefaction occurring within the underlying soil deposits during a major earthquake is considered to be remote.

Recommendations for foundation design, for grading, and for floor slab and paving support are presented in the report.

Respectfully submitted,

LeROY CRANDALL AND ASSOCIATES

by
P. A. Maljian, R.C.E. 14938
Project Engineer

by
J. D. Kirkgard, R.C.E. 10441
Executive Vice President

JK-PM/pa
(2 copies submitted)

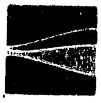
cc: (5) Albert C. Martin and Associates

REPORT OF FOUNDATION INVESTIGATION
PROPOSED MOLA OFFICE COMPLEX
BEACH BOULEVARD AND WARNER AVENUE
HUNTINGTON BEACH, CALIFORNIA
FOR THE
MOLA DEVELOPMENT CORPORATION

SCOPE

This report presents the results of a foundation investigation at the site of the subject building development. The locations of the proposed buildings and our exploration borings are shown on Plate 1, Plot Plan.

This investigation was authorized to determine the static characteristics of the soils beneath the site for design purposes and to provide recommendations for foundation design and floor slab support for the proposed buildings. Our investigation was to include an evaluation of the liquefaction potential at the site. However, the scope of this investigation did not include geologic and seismic studies or detailed site response studies for dynamic structural design. As an additional item, corrosion studies were to be performed by M. J. Schiff & Associates, Consulting Corrosion Engineers. The results of the corrosion studies will be submitted under separate cover. The results of the field explorations and laboratory tests, which form the basis of our recommendations, are presented in the attached Appendix.



Our professional services have been performed using that degree of care and skill ordinarily exercised, under similar circumstances, by reputable geotechnical engineers practicing in this or similar localities. No other warranty, expressed or implied, is made as to the professional advice included in this report. This report has been prepared for the Mola Development Corporation and their design consultants to be used solely in the design of the proposed buildings. The report has not been prepared for use by other parties, and may not contain sufficient information for purposes of other parties or other uses.

STRUCTURAL CONSIDERATIONS

The proposed development will consist of 15-story and 20-story office towers with adjoining two- and three-story wings, a five-level parking structure, and a one-story theatre. The buildings are identified and shown in plan on Plate 1.

The 15- and 20-story towers will be of steel frame construction with metal deck and concrete fill floors. Maximum column loads will be on the order of 1,600 kips for the 20-story tower and 1,200 kips for the 15-story tower. The adjoining two- and three-story wings will be of steel frame construction. Column loads will be on the order of 100 to 150 kips.

The proposed five-level parking structure will be of precast or poured-in-place post-tensioned concrete. Column loads will be on the order of 600 kips. The one-story theatre will have concrete or masonry walls, and steel trusses supporting either a wood or metal deck roof. Wall loads will be less than 5 kips per lineal foot.

The ground floors of the building will be established at approximately the existing grade. Basements are not planned.

SITE CONDITIONS

The easterly half of the site is occupied by a vacant school; there are baseball fields in the westerly half of the site. There may have been other buildings on the site in the past; evidence of such prior construction such as backfilled basements may be encountered during site grading. Underground utility lines traverse the site. Although no evidence was observed, there may be abandoned septic tanks and cesspools on the site. Elevations of the existing grade at selected locations are shown on Plate 1.

SOIL CONDITIONS

Existing fill soils ranging up to three feet in thickness were encountered in most of the borings. The existing fill consists of clay and silty sand, and was generally free of debris and moderately firm to firm at the boring locations. Deeper and/or poorer quality fill could occur between boring locations. A thin concrete slab and a 12-inch concrete footing were encountered in Boring 6; other evidence of prior construction may be present on the site.

The natural soils beneath the site consist of clay, silt, silty sand, and sand. The natural soils are generally moderately firm to firm. The clay soils are somewhat expansive.

Water was measured in the borings at depths of 19 to 27 feet below the existing grade. Data relative to the water levels are presented on the boring logs in the Appendix.

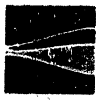
LIQUEFACTION POTENTIAL

The liquefaction analyses of the soils underlying the site were based on the consideration of various factors, which include the water level, soil type, gradation, relative density, intensity of ground shaking, and duration of shaking.

Liquefaction potential has been found to be the greatest where the ground water level is shallow and loose fine sands occur within a depth of about 50 feet or less. Liquefaction potential decreases with increasing grain size and clay and gravel content, but increases as the ground acceleration and duration of shaking increase.

As stated previously, the water level was measured at a depth of about 20 feet below the existing grade. The soils below the water level consist primarily of clay, silt, and silty sand, with lesser amounts of sand. Based on the sampler blow counts, standard penetration blow counts, and shear tests, the deeper sandy soils are generally dense with relative densities greater than 90% and are not susceptible to liquefaction. The silty sand soils just below the water level have relative densities on the order of 75% indicating these soils are medium dense.

The liquefaction potential of the soils was evaluated by a computer program developed by N. Donovan and distributed by the National Information Service Earthquake Engineering, Computer Program Applications. The program compares the shear stresses induced by postulated earthquakes at a given depth with the shear stresses required to cause liquefaction at that depth. The postulated earthquakes used to estimate the shear stresses are described in the table below.



Postulated Design Earthquakes

Design Earthquake	Fault	Estimated Magnitude	Distance From Fault to Site (Miles)	Peak Ground Acceleration (g's)
Maximum Credible:				
A	San Andreas	8.3	48	0.14
B	Newport-Inglewood	7.0	1.4	0.40
Maximum Probable: (50-year recurrence interval)				
C	Newport-Inglewood	6.6	1.4	0.38

Based on the analyses, liquefaction would be remote in the event of any of the postulated earthquakes. Thus, the probability of liquefaction occurring during the lifetime of the structure would be low.

RECOMMENDATIONS

FOUNDATIONS

GENERAL

The natural soils beneath the site are not considered suitable for support of the proposed office towers and parking structure on spread footings because of settlement considerations. To provide support for these buildings with minimum settlement, driven friction piling may be used. The shallow water level would restrict the lengths of conventional drilled cast-in-place concrete piling. If the grading recommendations are followed, the proposed two- and three-story wings and the proposed one-story theatre may be supported on spread footings established in either the undisturbed natural soils or properly compacted

fill. The two- and three-story wings should be structurally separated from the pile-supported office towers.

DRIVEN PILING

Driven Pile Capacities

The downward and upward capacities of two types of driven piles are presented on Plate 2, Driven Pile Capacities. Dead plus live load capacities are shown; a one-third increase may be used when considering wind or seismic loads. All piles should extend at least 30 feet below pile cap. The pile capacities presented on Plate 2 are based on the strength of the soils; the compressive and tensile strength of the pile section itself should be checked to verify the structural capacity of the piles.

Piles in groups should be spaced at least 2½ diameters or widths on centers (measured at the butt), but in no event less than three feet on centers. If the piles are so spaced, no reduction in the downward capacity of the piles due to group action need be considered in design.

Settlement

The settlement of the proposed office towers (maximum column load of 1,600 kips), supported on driven piling as recommended, will be less than one inch. The settlement of the parking structure (maximum column load of 600 kips) will be on the order of one-half inch.

Lateral Loads

Lateral loads may be resisted by the piles, by soil friction on the floor slab, and by the passive resistance of the soils. It may be

assumed that the soils adjacent to a concrete pile at least 30 feet long having a butt diameter or width of 12 inches can safely resist horizontal loads imposed at the top of the pile up to 12,000 pounds. The lateral resistance of other sizes of piles may be assumed to be proportional to the diameter or width of the pile.

In calculating the maximum bending moment in a pile due to a lateral load imposed at the top of the pile, the load may be multiplied by an assumed moment arm of five feet. For design, it may be assumed that the maximum bending moment will occur at or near the top of the pile and that the bending moment will decrease to zero at a depth of 20 feet below the pile cap. The lateral capacity and reduction in the bending moment are based in part on the assumption that any required backfill adjacent to the pile caps and grade beams will be properly compacted.

A coefficient of friction of 0.5 may be used between the floor slabs and the supporting soils. The passive resistance of the natural soils or properly compacted fill against pile caps and grade beams may be assumed to be equal to the pressure developed by a fluid with a density of 250 pounds per cubic foot. A one-third increase in the quoted passive value may be used for wind or seismic loads.

The resistance of the piles, the passive resistance of the soils, and the frictional resistance between the floor slabs and the supporting soils may be combined without reduction in determining the total lateral resistance. If the actual lateral loads on the structure

can be resisted by any combination of these elements, it is our opinion that foundation tie-beams or an equivalent floor slab between piles will not be necessary unless there are other reasons for including them.

Installation

All piles should be driven to the predetermined design lengths as shown on Plate 2, except as may be modified on the basis of the driving criteria defined on Plate 3, Pile Driving Criteria. The driving criteria presented on Plate 3 may be taken only as a guide. Prior to ordering the production piles, we recommend that several indicator piles be driven near boring locations to evaluate the driving resistance. These piles may be actual foundation piling driven in their final position. The driving criteria can be modified as needed based on the results of these indicator piles, and any necessary adjustments can be made to the design lengths presented on Plate 2. We recommend that the installation of the piling be observed by our firm.

SPREAD FOOTINGS ONE-, TWO- AND THREE-STORY BUILDINGS

Bearing Value

Footings established in undisturbed natural soils or properly compacted fill may be designed to impose a net dead plus live load pressure of 2,500 pounds per square foot. A one-third increase in the bearing value may be used for wind or seismic loads. Exterior footings should extend at least two feet below the lowest adjacent final grade; adjacent to any planters, exterior footings should extend at least three feet below the planter grade. Interior footings should extend at least

two feet below the top of the adjacent floor slab. Since the recommended bearing value is a net value, the weight of concrete in the footings may be assumed to be 50 pounds per cubic foot, and the weight of soil backfill may be neglected when determining the downward load on the footings.

While the actual bearing value of the fill will depend on the materials used and the compaction methods employed, the quoted bearing value should be applicable if acceptable soils are used and are compacted as recommended. The bearing value of the fill should be confirmed after completion of the grading.

Settlement

The settlement of the proposed one-, two-, and three-story buildings (maximum column load of 150 kips), supported on spread footings in the manner recommended, will be less than three-fourths inch.

Footing Observation

All footing excavations should be observed by personnel of our firm to verify penetration into satisfactory supporting soils. Footings should be deepened if necessary to extend into satisfactory soils.

Backfill

All required footing backfill and utility trench backfill within the building areas should be mechanically compacted; flooding should not be permitted. The exterior grades should be sloped to drain away from the buildings to minimize ponding of water adjacent to foundations.

Lateral Loads

Lateral loads may be resisted by soil friction and by the passive resistance of the soils. A coefficient of friction of 0.4 may be used between footings or the floor slabs and the supporting soils. The passive resistance of the undisturbed natural soils or properly compacted fill against footings may be assumed to be equal to the pressure developed by a fluid with a density of 250 pounds per cubic foot. A one-third increase in the passive value may be used for wind or seismic loads. The frictional resistance and the passive resistance of the soils may be combined without reduction in determining the total lateral resistance.

GRADING

To provide improved support for the ground floor slabs and adjacent walks and for paving, and to provide support for footings for the one-, two- and three-story buildings, all existing fill and any disturbed natural soils should be excavated and replaced as properly compacted fill. Also, any required additional fill should be properly compacted. The upper natural soils are moderately expansive, and we recommend that at least the upper 1½ feet of fill beneath the building floor slabs and adjacent walks consist of relatively non-expansive and preferably predominantly granular soils.

After clearing the site and stripping any existing vegetation, all existing fill soils and disturbed natural soils should be excavated. Next, the natural soils within building areas should be excavated to a depth of at least one foot below the existing grade or 1½ feet below the

proposed subgrade level, whichever is lower. (Excavation of the natural soils will not be necessary in paved areas except to remove any disturbed natural soils. However, existing fill deposits should be excavated, the natural soils reworked, and fill compacted as recommended below.) The soils should be carefully inspected to verify the removal of all unsuitable deposits. Next, the exposed natural soils should be scarified to a depth of six inches and rolled with heavy compaction equipment. The upper six inches of natural soils should be compacted to 90% of the maximum density obtainable by the ASTM Designation D1557-70 method of compaction. The moisture content of the soils should be brought to between optimum and 3% over optimum moisture content prior to compaction.

After compacting the exposed natural soils, all required fill should be placed in loose lifts not more than eight inches in thickness and compacted to at least 90%. It is recommended that the moisture content of the on-site clay soils at the time of compaction be brought to between optimum and 3% over optimum moisture content. On-site or imported granular soils should be compacted at a moisture content varying no more than 2% below or above optimum moisture content.

We recommend that all required imported fill and at least the upper 1½ feet of fill beneath the building floor slabs and beneath adjacent concrete walks and slabs consist of relatively non-expansive and predominantly granular soils such as a silty sand. (The expansion index of the select material should be less than 35 and no more than 50%

of the material should pass a No. 200 sieve.) The on-site soils, except for any organic matter or debris within the existing fill, may be used in required fills except for the upper 1½ feet of fill in the building areas and beneath adjacent concrete walks and slabs. Proper control of the moisture content will be required to achieve compaction of the on-site soils.

The reworking of the upper soils and the compaction of all required fill should be observed and tested by our firm. Imported fill material should be approved prior to importing.

FLOOR SLAB SUPPORT

If the subgrade is prepared as recommended, and at least the upper 1½ feet of supporting soils are relatively non-expansive compacted fill, the building floor slabs may be supported on grade.

Where a floor covering that would be critically affected by moisture, such as vinyl, is to be used, we suggest that the floor slabs be supported on a four-inch-thick layer of gravel or on an impermeable membrane as a capillary break. (If the gravel is used, the thickness of select fill beneath the gravel may be reduced from 1½ feet to 14 inches.) A suggested gradation for the gravel layer would be as follows:

Sieve Size	Percent Passing
3/4"	90 - 100
No. 4	0 - 10
No. 100	0 - 3

If a membrane is used, a low-slump concrete should be used to minimize possible curling of the slabs. The concrete slabs should be allowed to cure properly before placing vinyl or other moisture-sensitive floor covering.

PAVING

To provide support for paving, the subgrade soils should be prepared as recommended in the previous section on Grading. Proper compaction of the subgrade soils will be critical for the performance of the paving. Also, proper drainage of the paved areas should be provided since this will reduce moisture infiltration into the subgrade and increase the life of the paving.

To provide data for design of asphaltic paving, stabilometer tests ("R" value tests) were performed on two samples of the upper soils. The tests were performed for us by the Smith-Emery Company. The tests indicate "R" values of 3 and 6 for the samples tested; the results are presented in the attached Appendix.

Assuming that the paving subgrade will consist of the on-site soils, compacted to at least 90% as recommended, parking areas subject to automobile traffic (assumed Traffic Index of 4) may be paved with three inches of asphaltic paving and four inches of base course placed on the compacted subgrade. Driveways and areas subject to light truck traffic (assumed Traffic Index of 5) may be paved with three inches of asphaltic paving and eight inches of base course placed on the compacted

subgrade. Careful inspection is recommended to verify that the recommended thicknesses or greater are achieved, and that proper construction procedures are used.

The base course should meet the specifications for Class 2 Aggregate Base as defined in Section 26 of the State of California, Department of Transportation, Standard Specifications, dated January, 1975. The base course should be compacted to 95%.

-oOo-

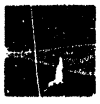
The following Plates and Appendix are attached and complete this report:

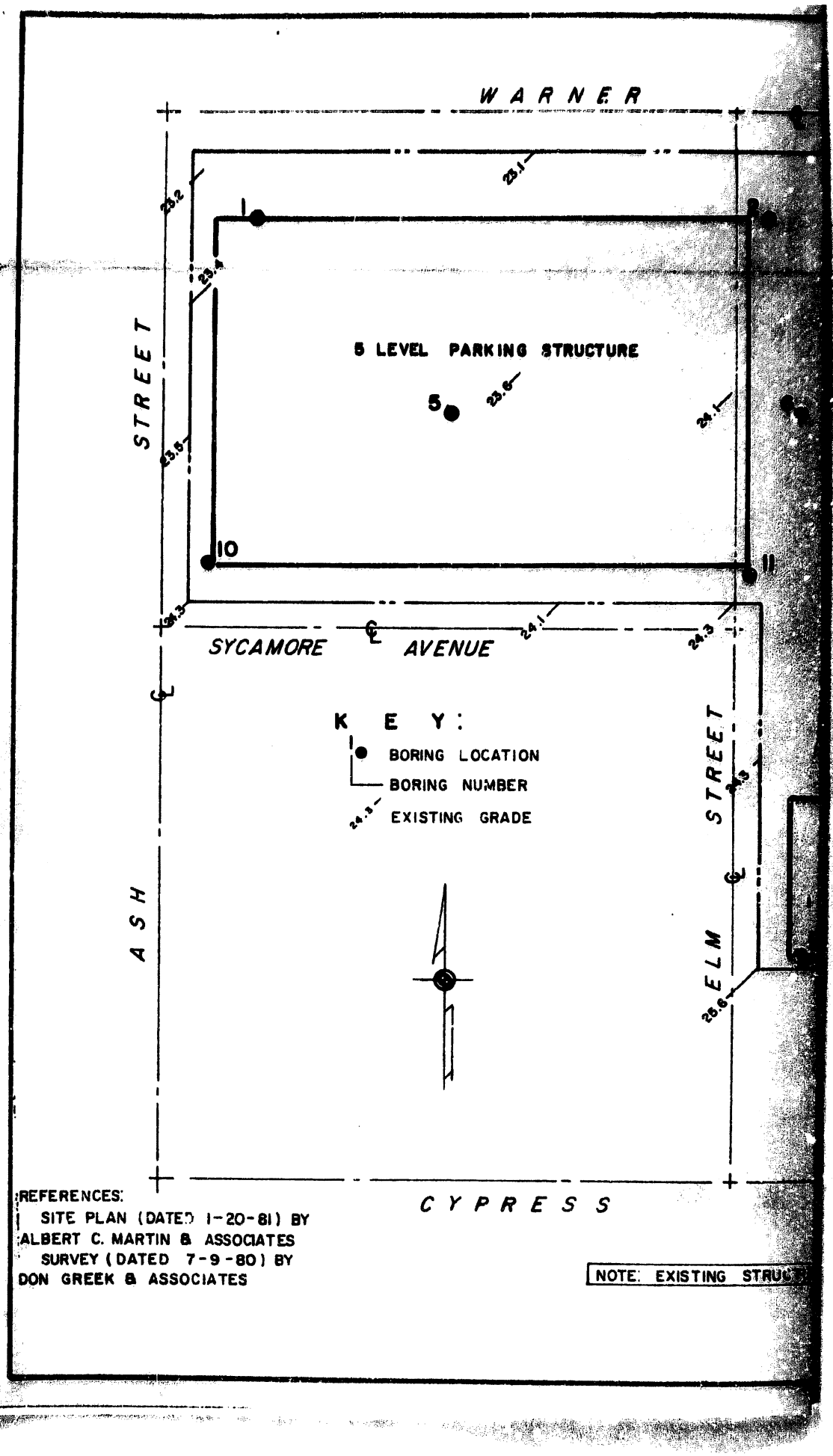
Plate 1 ---------- Plot Plan

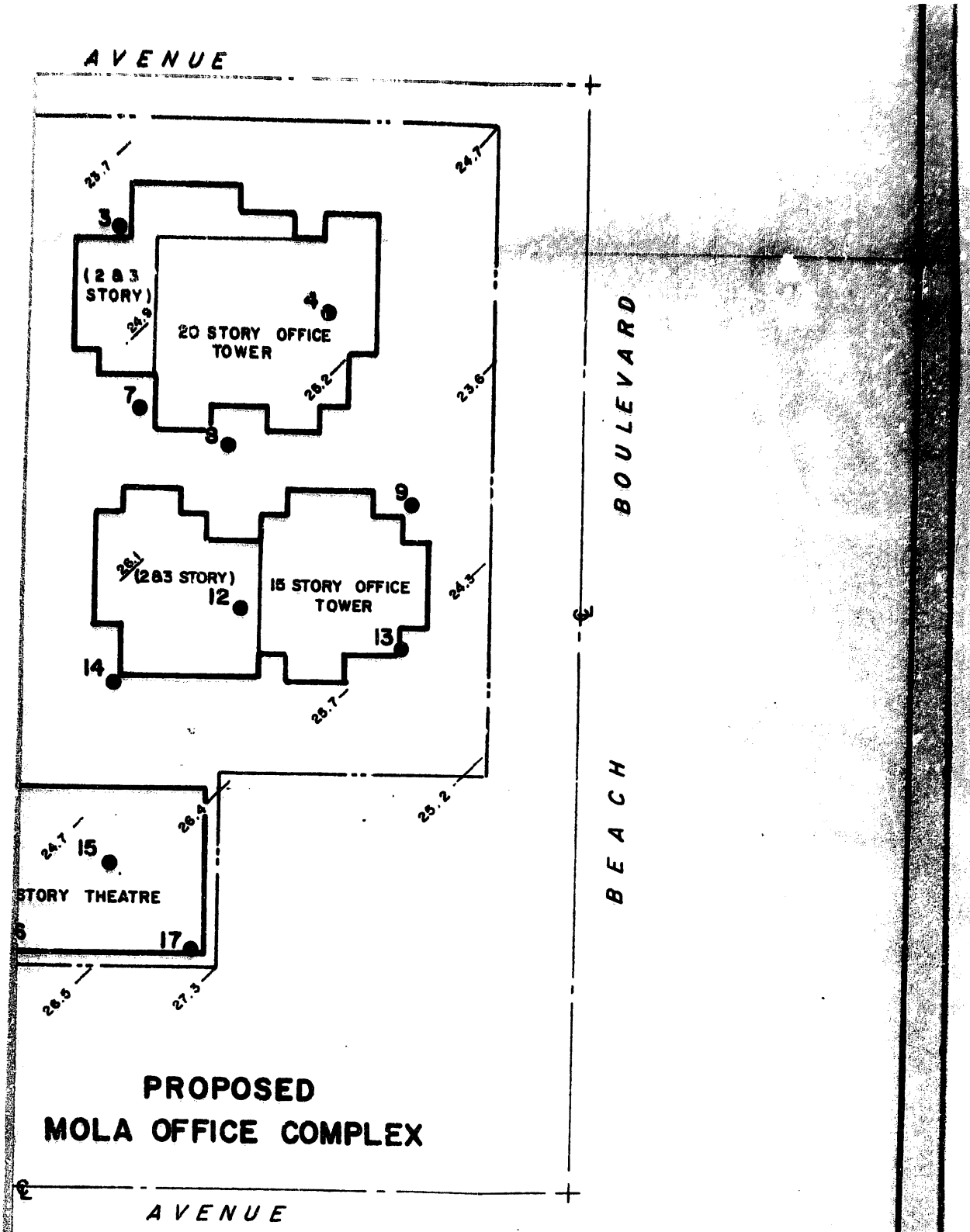
Plate 2 ---------- Driven Pile Capacities

Plate 3 ---------- Pile Driving Criteria

Appendix ---------- Explorations and Laboratory Tests




WARNER
25.1
25.2
25.4
STREET
5 LEVEL PARKING STRUCTURE
5
23.6
24.1
23.5
10
11
24.3
24.1
24.3
SYCAMORE AVENUE
KEY:
BORING LOCATION
BORING NUMBER
24.3 EXISTING GRADE
ASH
STREET
24.3
ELM
25.6
CYPRESS
REFERENCES:
SITE PLAN (DATED 1-20-81) BY
ALBERT C. MARTIN & ASSOCIATES
SURVEY (DATED 7-9-80) BY
DON GREEK & ASSOCIATES
NOTE: EXISTING STRUC



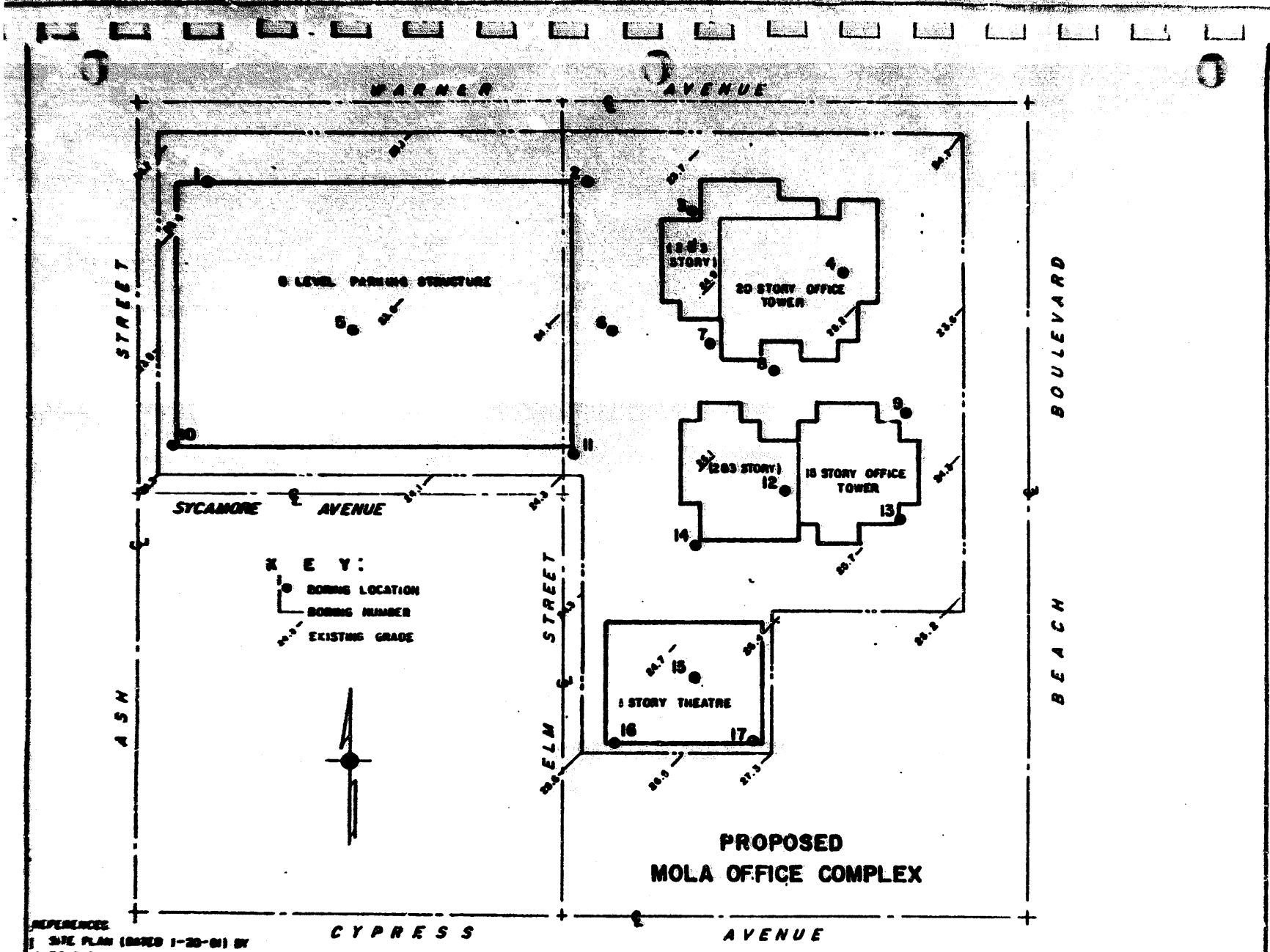
RES NOT SHOWN

PLOT PLAN

SCALE: 1" = 80'

LeRoy CRANDALL & ASSOCIATES

10 PLATE 1



REFERENCES:
1. SITE PLAN (DATED 1-20-61) BY ALBERT C. MARTIN & ASSOCIATES
2. SURVEY (DATED 7-2-60) BY DON GREEN & ASSOCIATES

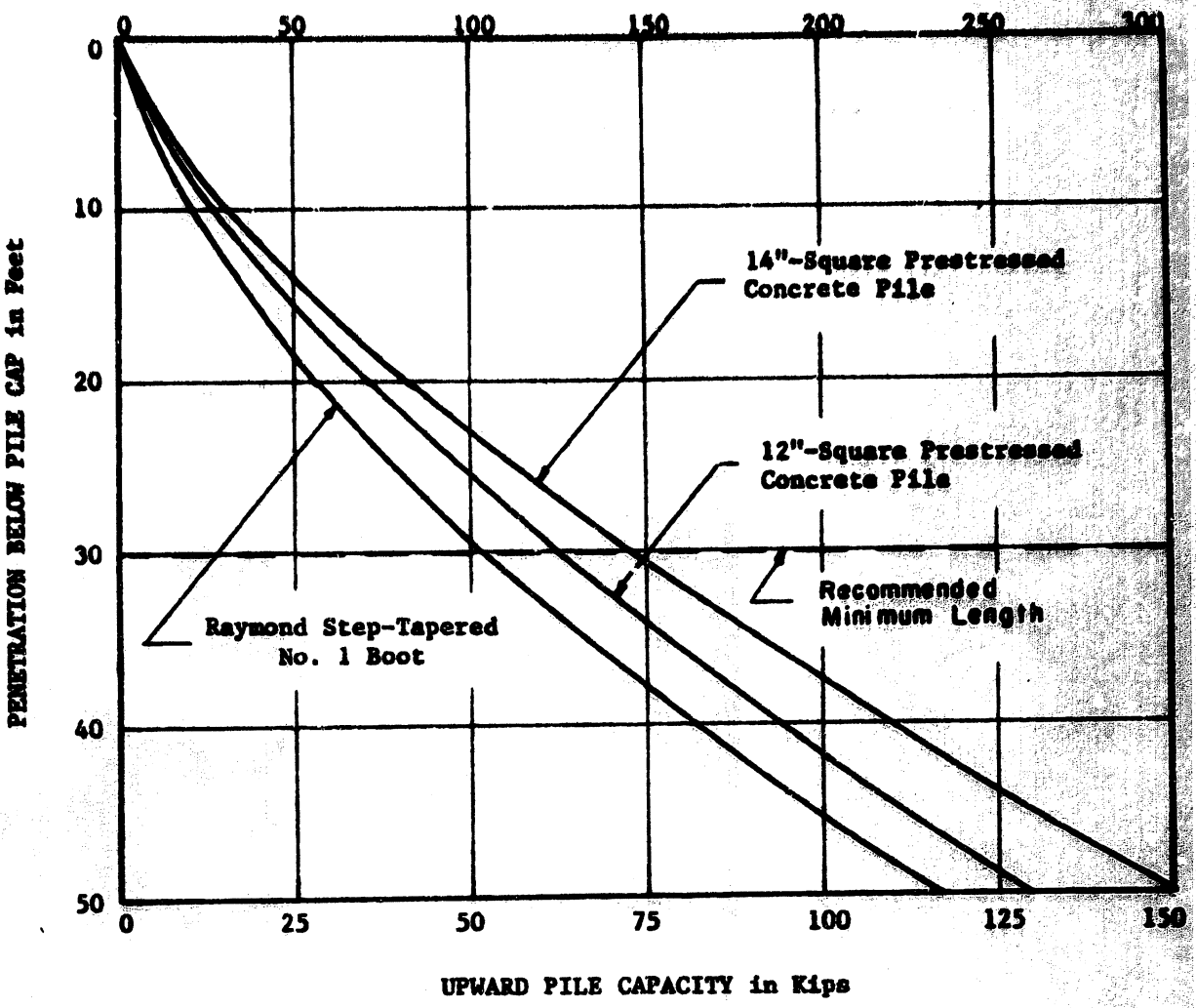
NOTE: EXISTING STRUCTURES NOT SHOWN

PLOT PLAN

SCALE: 1" = 80'

LeROY CRANDALL & ASSOCIATES

PLATE 1



NOTES:

(1) The indicated values refer to the total of dead plus live loads; a one-third increase may be used when considering wind or seismic loads.

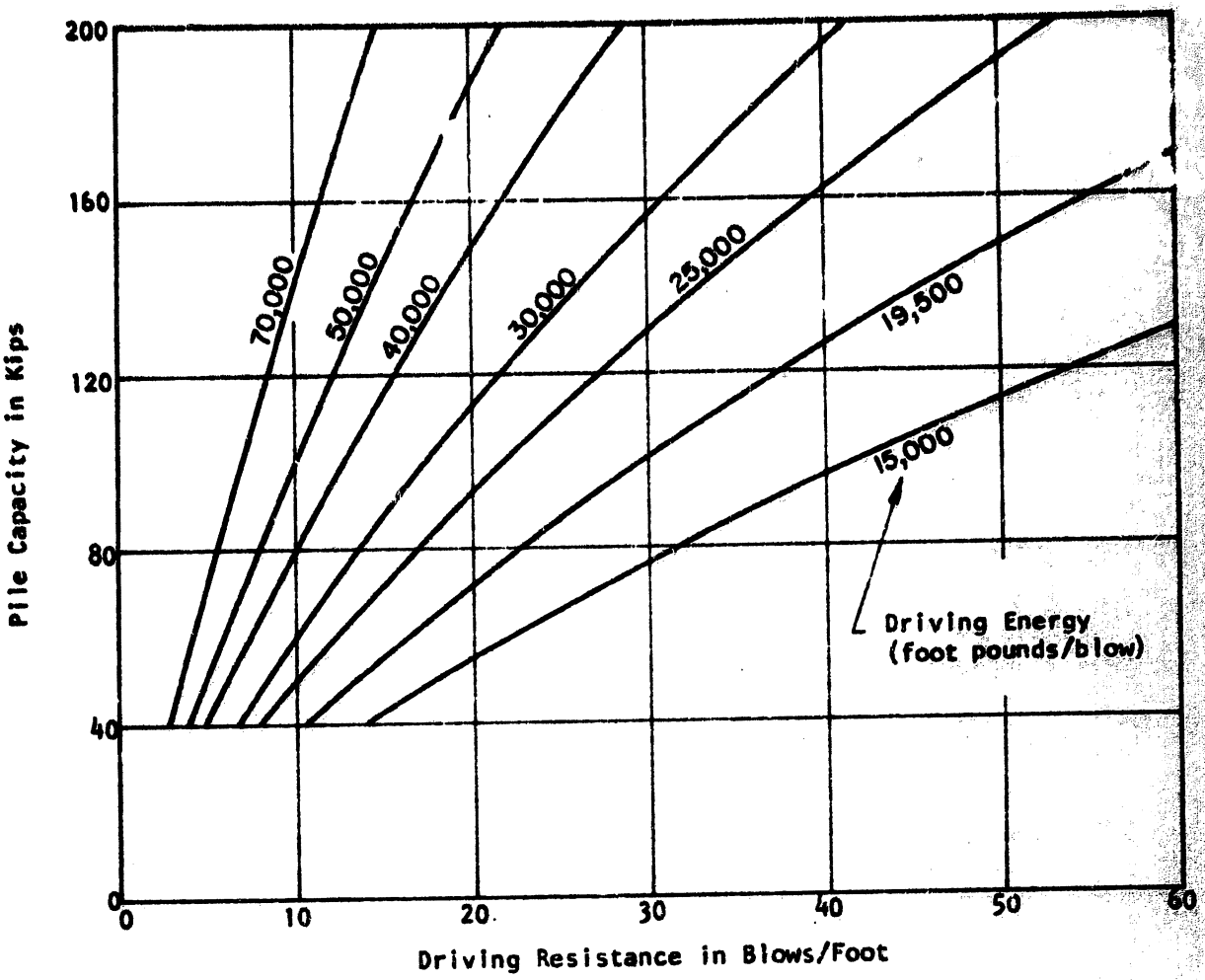
(2) Piles in groups should be spaced a minimum of 2½ diameters, but not less than 3 feet, on centers.

(3) The indicated values are based on the strength of the soils; the actual pile capacities may be limited to lesser values by the strength of the piles.

DRIVEN PILE CAPACITIES

LeROY CRANDALL AND ASSOCIATES

PLATE 2



NOTES:

1) The above driving resistance should be obtained for the last foot of driving at design pile length. If the driving resistance at the design length is less than above, the piles should be lengthened until the desired driving resistance is obtained.

2) As an alternate to lengthening when low driving resistance is obtained, the piles may be allowed to set overnight and the number of blows to drive the pile one inch the following day should be determined. If the restarting resistance is at least two times the above criteria, the pile may be considered satisfactory.

3) If driving resistance of three times the above criteria is encountered within five feet of design length, the pile driving may be stopped.

PILE DRIVING CRITERIA

LeROY CRANDALL AND ASSOCIATES

PLATE 3

APPENDIX

EXPLORATIONS

The site of the proposed development was explored by drilling 17 borings at the locations shown on Plate 1. Boring 6 and Borings 14 through 17 were drilled to depths of 19 to 32 feet below the existing grade using 24-inch-diameter bucket-type drilling equipment. The remaining borings were drilled to depths of 50 to 100 feet below the existing grade using 5-inch-diameter rotary wash-type drilling equipment. Raveling and caving occurred in several of the bucket borings during drilling; drilling mud was used with the rotary wash-type equipment to prevent caving.

The soils encountered were logged by our field technician, and undisturbed and loose samples were obtained for laboratory inspection and testing. The logs of the borings are presented on Plates A-1.1 through A-1.17; the depths at which undisturbed samples were obtained are indicated to the left of the boring logs. The energy required to drive the Crandall sampler twelve inches is indicated on the logs. Standard penetration tests were performed in Borings 5, 8, and 13; the results are presented on the boring logs. The soils are classified in accordance with the Unified Soil Classification System described on Plate A-2.

LABORATORY TESTS

The field moisture content and dry density of the soils encountered were determined by performing tests on the undisturbed samples. The results of the tests are shown to the left of the boring logs.

Direct shear tests were performed on selected undisturbed samples to determine the strength of the soils. The samples were tested at field and increased moisture contents and at various surcharge pressures. The yield-point values determined from the direct shear tests are presented on Plate A-3, Direct Shear Test Data.

Confined consolidation tests were performed on ten undisturbed samples to determine the compressibility of the soils. Water was added to three of the samples during the tests to illustrate the effect of moisture on the compressibility. The results of the tests are presented on Plates A-4.1 through A-4.5, Consolidation Test Data.

The optimum moisture content and maximum dry density of the upper soils were determined by performing compaction tests on samples from Borings 6 and 13. The tests were performed in accordance with the ASTM Designation D1557-70 method of compaction. The results of the tests are presented on Plate A-5, Compaction Test Data.

Expansion tests were performed on four undisturbed samples to determine the volume change of the soils due to changes in the moisture content. The samples were confined under a nominal surcharge pressure, soaked, and the resulting expansion was measured. Next, the samples were allowed to air-dry and the resulting shrinkage was measured. The results of the expansion tests are presented on Plates A-6.1 and A-6.2, Expansion Test Data.

The expansion index of the soils was determined by performing tests on two remolded samples in accordance with the Uniform Building

Code Standard No. 29-2 method. The results of the tests are shown on Plate A-7, Expansion Index Test Data.

To determine the particle size distribution of the soils and to aid in classifying the soils, mechanical analyses were performed on six samples. The results of the mechanical analyses are presented on Plates A-8.1 through A-8.3, Particle Size Distribution.

To provide information for paving design, stabilometer tests were performed on samples obtained from Borings 4 and 6. The tests were performed for us by the Smith-Emery Company. The results of the tests are presented on Plates A-9.1 and A-9.2.

-oOo-

BORING 1

DATE DRILLED: February 23, 1981

EQUIPMENT USED: 5"-Diameter Rotary Wash

ELEVATION 23*

ELEVATION (ft)	DEPTH (ft)	"q" VALUE STD. PEN. TEST	MOISTURE (% of dry wt.)	DRY DENSITY (lbs./cu. ft.)	DRIVE ENERGY (ft.-lbs./ft.)	SAMPLE LOC.		
20	0						CL	FILL - SANDY CLAY - brown
			20.1	106	6		CL	SILTY CLAY - some very fine Sand, dark grey and brown
	5		15.9	115	8			Greyish-brown
			17.9	113	7		ML	CLAYEY SILT - some fine Sand, greyish-brown
15			17.9	106	7		ML	SANDY SILT - some Clay, brown
	10		15.5	111	13			Sandier
10								Less Clay
	15		24.4	97	21			Lenses of Silty Sand, very fine
5							SM	SILTY SAND - fine, grey and brown
	20		18.3	105	16			Lenses of Sandy Silt
0							CL	SANDY CLAY - greyish-brown
	25		24.9	101	6			
-5							ML	SANDY SILT - light grey and brown
	30		27.0	97	21			Lenses of Silty Sand
-10							CL	SILTY CLAY - some cemented lumps, grey
	35		25.8	99	12			
-15							ML	SANDY SILT - light grey and brown
	40		26.1	99	12			

*Elevations refer to datum of reference drawing; see Plate 1.

(CONTINUED ON FOLLOWING PLATE)

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

LOG OF BORING

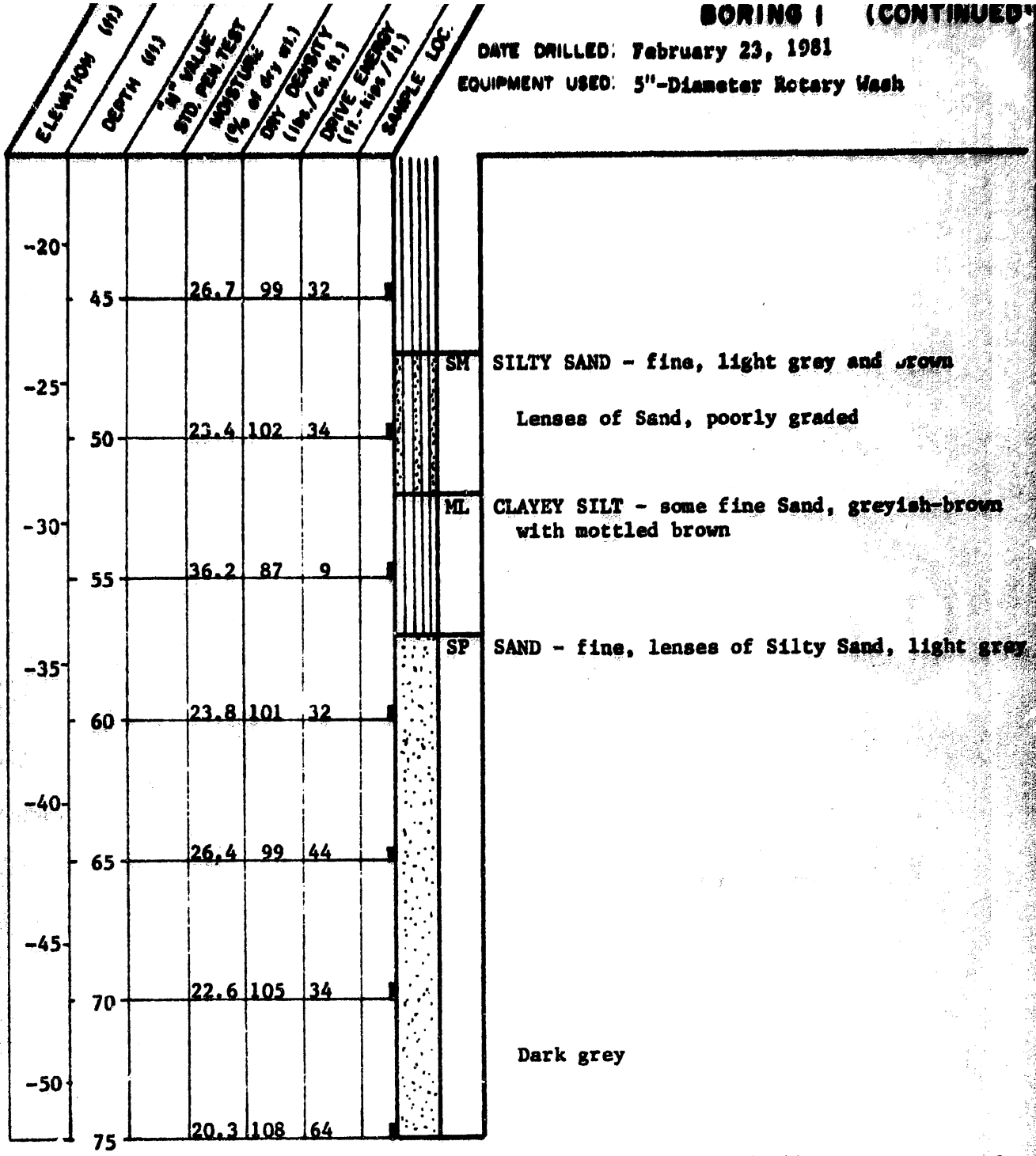
LeROY CRANDALL AND ASSOCIATES

PLATE A-1.1a

BORING 1 (CONTINUED)

DATE DRILLED: February 23, 1981

EQUIPMENT USED: 5"-Diameter Rotary Wash



SILTY SAND - fine, light grey and brown

Lenses of Sand, poorly graded

CLAYEY SILT - some fine Sand, greyish-brown with mottled brown

SAND - fine, lenses of Silty Sand, light grey

Dark grey

NOTE: Drilling mud used in drilling process. Mud removed to 25' at completion of drilling. Water level measured at 19' on 2-24-81.

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES

LOG OF BORING

LeROY CRANDALL AND ASSOCIATES

PLATE A-1.1b

BORING 2

DATE DRILLED: February 24, 1981

EQUIPMENT USED: 5"-Diameter Rotary Wash

ELEVATION 24

ELEVATION (ft)	DEPTH (ft)	"N" VALUE STD. PEN. TEST	MOISTURE (% of dry wt.)	DRY DENSITY (lbs./cu. ft.)	DRIVE ENERGY (ft.-lbs./ft.)	SAMPLE LOC.		
20	5		28.5	95	4		CL	FILL - SILTY CLAY - few gravel, some roots, grey
			17.2	114	2		CL	SILTY CLAY - grey and brown Reddish-brown
15	10		20.8	107	4		CL	SANDY CLAY - greyish-brown
			16.0	115	13		SC	CLAYEY SAND - reddish-brown
10	15		28.3	93	3		CL	SILTY CLAY - grey and brown Cemented lumps, light brown and grey
			24.8	99	16			
5	20		17.2	111	20		SM	SILTY SAND - fine, light brown
0	25						ML	SANDY SILT - light greyish-brown

(CONTINUED ON FOLLOWING PLATE)

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

LOG OF BORING

LeROY CRANDALL AND ASSOCIATES

PLATE A-1.2a

BORING 2 (CONTINUED)

DATE DRILLED: February 24, 1981

EQUIPMENT USED: 5"-Diameter Rotary Wash

ELEVATION (ft.)	DEPTH (ft.)	"N" VALUE STD. PEN. TEST	MOISTURE (% of dry wt.)	DRY DENSITY (lbs./cu. ft.)	DRIVE ENERGY (ft.-lbs./ft.)	SAMPLE LOC.		
			28.1	95	19			Some Clay
-5	30		24.6	100	38		SM	SILTY SAND - lenses of Sandy Silt, light greyish-brown
							CL	SILTY CLAY - grey with light brown
-10	35		30.9	91	7			
-15								Cemented lumps
	40		22.4	104	11		ML	SANDY SILT - some Clay, greyish-brown
							CL	SILTY CLAY - reddish-brown with grey
-20	45		36.8	84	19			Brown
							SM	SILTY SAND - fine, light brown
-25	50		24.4	100	41			
-30	55							

NOTE: Drilling mud used in drilling process. Mud removed to 25' at completion of drilling. Water level measured at 20' on 2-25-81.

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

LOG OF BORING

LeROY CRANDALL AND ASSOCIATES

PLATE A-1.26

BORING 3

DATE DRILLED: February 27, 1981

EQUIPMENT USED: 5"-Diameter Rotary Wash

ELEVATION 25

ELEVATION (ft.)	DEPTH (ft.)	2½" SPLIT SPOON STD. PEN. TEST	MOISTURE (% of dry wt.)	DRY DENSITY (lbs./cu. ft.)	DRIVE ENERGY (ft.-kips/ft.)	SAMPLE LOC.		
							SM	14" Asphaltic Paving FILL - SILTY SAND - fine, brown
			13.0	116	4		CL	SILTY CLAY - dark grey
			17.9	114	3			Some Sand, brown
20	5						CL	SANDY CLAY - brownish-grey
			19.0	112	3			
			16.7	114	8			
15	10						ML	SANDY SILT - brown
			14.4	115	11			
							ML	CLAYEY SILT - light greyish-brown
10	15		26.4	97	17			
							SM	SILTY SAND - fine to very fine, light grey and brown
5	20		17.3	114	13			
								Lenses of fine Sand
0	25		30.0	92	21			
							CL	SILTY CLAY - greyish-brown
-5	30		19.6	103	16		SP	SAND - fine, light brown
-10	35		23.7	93	11		CL	SILTY CLAY - greyish-brown
								Cemented lumps
-15	40							

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

(CONTINUED ON FOLLOWING PLATE)

LOG OF BORING

LeROY CRANDALL AND ASSOCIATES

PLATE A-1.3a

BORING 3 (CONTINUED)

DATE DRILLED: February 27, 1981

EQUIPMENT USED: 5"-Diameter Rotary Wash

ELEVATION (ft)	DEPTH (ft)	"N" VALUE STD. PEN. TEST	MOISTURE (% of dry wt.)	DRY DENSITY (lbs./cu. ft.)	DRIVE ENERGY (ft.-lbs./ft.)	SAMPLE LOC.		
			24.9	101	21			Light grey
							CL	CLAYEY SILT - greyish-brown
-20	45		31.7	91	11		ML	SANDY SILT - greyish-brown
								Some Clay
-25	50		30.3	93	21			
-30	55		26.3	97	19		SP	SAND - fine, reddish-brown
							ML	CLAYEY SILT - some Sand, greyish-brown
-35	60		22.0	107	11			Clayier
-40	65		32.5	91	16		ML	SANDY SILT - light greyish-brown
							SM	SILTY SAND - fine to very fine, greyish-brown
-45	70		25.4	100	37			
-50	75		23.2	105	37			
-55	80							

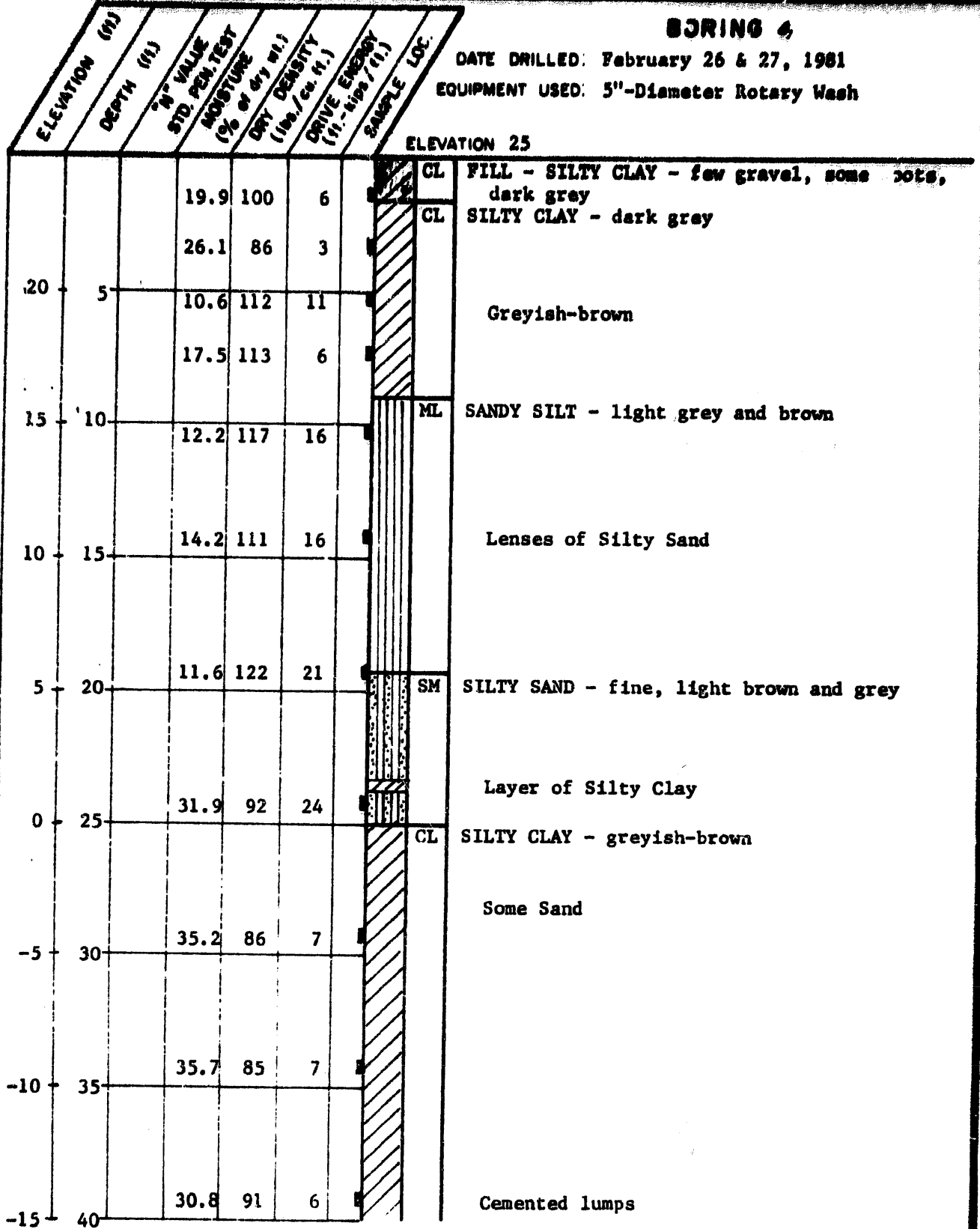
NOTE: Drilling mud used in drilling process. Mud removed to 25' at completion of drilling. Water level measured at 21' on 3-4-81.

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

LOG OF BORING

LeROY CRANDALL AND ASSOCIATES

PLATE A-1.3b



NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

(CONTINUED ON FOLLOWING PLATE)

LOG OF BORING

LeROY CRANDALL AND ASSOCIATES

PLATE A-1.4a

BORING 4 (CONTINUED)

DATE DRILLED: February 26 & 27, 1981
EQUIPMENT USED: 5"-Diameter Rotary Wash

ELEVATION (ft.)	DEPTH (ft.)	"N" VALUE STD. PEN. TEST	MOISTURE (% of dry wt.)	DRY DENSITY (lbs./cu. ft.)	DRIVE ENERGY (ft.-kips/ft.)	SAMPLE LOG		
-20	45	34.6	88	13				
-25	50	31.3	92	11				Layer of Clayey Silt
						SP		SAND - fine to very fine, light brown
-30	55	25.8	98	45				
						SM		SILTY SAND - very fine, brown and grey
-35	60	28.5	95	27				
								Light grey
-40	65	30.9	92	21				Lenses of poorly graded Sand
						ML		SANDY SILT - greyish-brown
-45	70	23.3	103	21				
						ML		CLAYEY SILT - light greyish-brown
-50	75	29.8	94	21				SILTY SAND - fine to very fine, greyish-brown

NOTE: Drilling mud used in drilling process. Mud removed to 25' at completion of drilling. Water level measured at 21' on 3-4-81.

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

LOG OF BORING

LeROY CRANDALL AND ASSOCIATES

PLATE A-1.4b

BORING 8

DATE DRILLED: February 25, 1981

EQUIPMENT USED: 5"-Diameter Rotary Wash

ELEVATION 23½

ELEVATION (ft.)	DEPTH (ft.)	"N" VALUE STD. PEN. TEST	MOISTURE (% of dry wt.)	DRY DENSITY (lbs./cu. ft.)	DRIVE ENERGY (ft.-lbs./ft.)	SAMPLE LOC.		
20	0		18.9	106	8		SC	FILL - SANDY CLAY - reddish-brown
							CL	SILTY CLAY - some Sand, dark grey
			9.4	119	21			Some cemented lumps, light brown and grey
	5		11.7	121	16		CL	SANDY CLAY - grey and brown
15			13.9	115	14			
	10		10.0	111	9		SM	SILTY SAND - fine to very fine, light brown
							CL	SILTY CLAY - cemented lumps, light grey
10			20.6	104	9		SM	SILTY SAND - very fine, lenses of Sandy Silt, light brown
	15						ML	SANDY SILT - light brown
5		23						Some Clay, cemented lumps
	20						ML	CLAYEY SILT - grey and brown
0			36.7	84	9			
	25							
-5		39					ML	SANDY SILT - grey and brown
	30						CL	SILTY CLAY - some Sand, grey and brown
-10			25.6	99	16			
	35							
-15		30						
	40							

(CONTINUED ON FOLLOWING PLATE)

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

LOG OF BORING

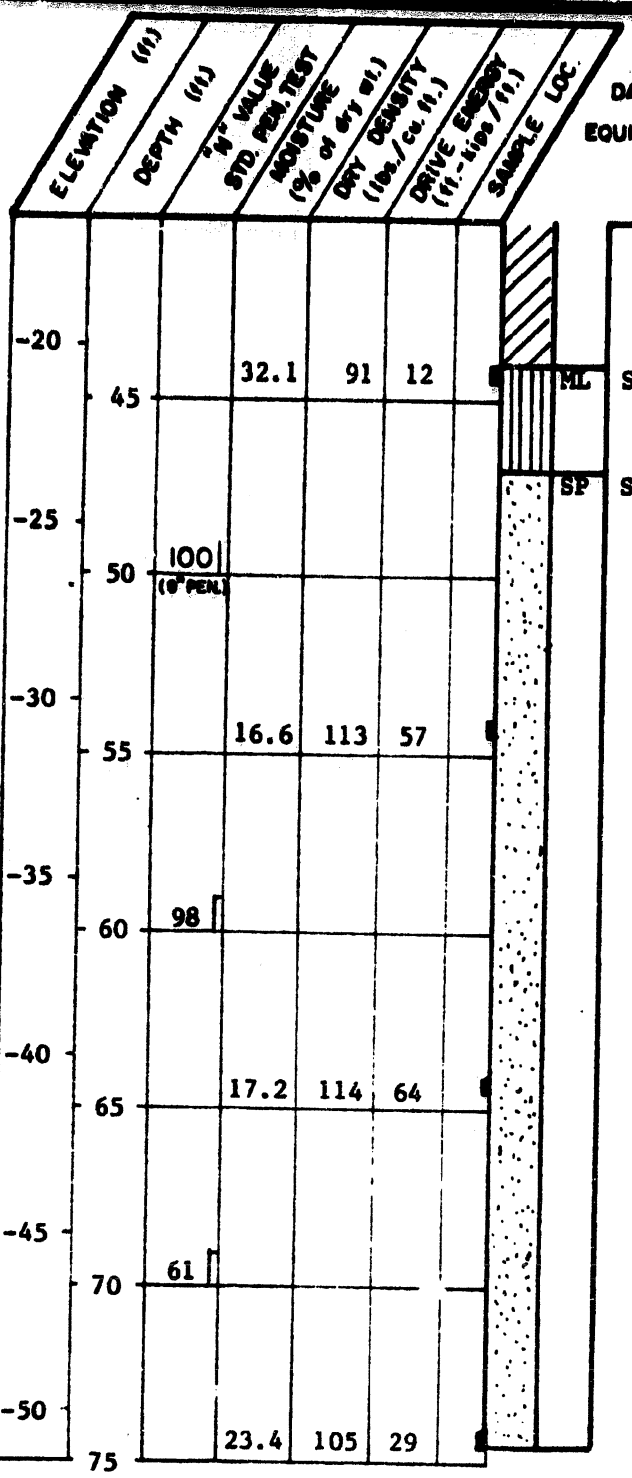
LeROY CRANDALL AND ASSOCIATES

PLATE A-1.5a

BORING 5 (CONTINUED)

DATE DRILLED: February 25, 1981

EQUIPMENT USED: 5"-Diameter Rotary Wash



ML	SANDY SILT - grey	
SP	SAND - fine, light brown	
	Lenses of Silty Sand	
	Fine to medium Sand	
	Medium to coarse	
	Fine	

NOTE: Drilling mud used in drilling process. Mud removed to 25' at completion of drilling. Water level measured at 20' on 2-26-81.

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

LOG OF BORING

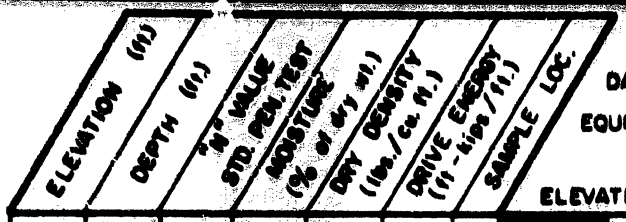
LeROY CRANDALL AND ASSOCIATES

PLATE A-1.5b

BORING 6

DATE DRILLED: February 27, 1981

EQUIPMENT USED: 24"-Diameter Bucket



ELEVATION 24

ELEVATION (ft.)	DEPTH (ft.)	"N" VALUE STD. PEN. TEST	MOISTURE (% of dry wt.)	DRY DENSITY (lbs./cu. ft.)	DRIVE ENERGY (ft.-kips/ft.)	SAMPLE LOC.		
								FILL - SILTY SAND (about 2") - fine, brown
								2" Concrete Slab
			16.5	94	6		CL	12" Footing
								FILL - SILT and CLAY - mottled brown
20			9.1	96	3			SILTY CLAY (Possible Fill) - lenses of Clayey Silt, dark grey
	5							Light brown
			12.5	111	6			Siltier
			13.0	119	11			
15							ML	CLAYEY SILT - some fine Sand, light brown
	10		14.9	104	6			
20							CL	SILTY CLAY - streaks of alkali, grey and brown
	15		24.7	100	8			Light brown
							ML	SANDY SILT - layers of Clayey Silt, light brown
5							SM	SILTY SAND - fine, light brown
	20		15.6	112	11			
								Layer of Sandy Silt
0								Lenses of poorly graded Sand, grey and brown
	25		30.0	90	6			
							ML	CLAYEY SILT - some Sand, light brown and light grey
-5								
	30		30.7	92	5			Clayier
-10								
	35							

NOTE: Slight water seepage encountered at 22½'. Water seepage encountered from 23½' to 25½'. Water level measured at 29½' at completion of drilling and 22' 30 minutes after completion of drilling. Caving and sloughing from 22½' to 25½'.

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

LOG OF BORING

LeROY CRANDALL AND ASSOCIATES

PLATE A-1.6

BORING 7

DATE DRILLED: February 27 & 28, 1981

EQUIPMENT USED: 5"-Diameter Rotary Wash

ELEVATION 24

ELEVATION (ft.)	DEPTH (ft.)	"N" VALUE STD. PEN. TEST	MOISTURE (% of dry wt.)	DRY DENSITY (lbs./cu. ft.)	DRIVE ENERGY (ft.-lbs./ft.)	SAMPLE LOC.		
							SM	2" Asphaltic Paving FILL - SILTY SAND - fine, light brown
			18.4	106	2		CL	SILTY CLAY - dark grey
			23.2	100	6			Some Sand, dark to light grey
20	5		19.5	110	3		CL	SANDY CLAY - reddish-brown with grey
			18.5	113	5			Sandier
15	10		5.9	107	13		SM	SILTY SAND - fine, brown
10	15		13.6	102	20		SP	SAND - fine to very fine, brown Light brown
5	20		15.1	114	21			
0	25		29.3	93	12		SM	SILTY SAND - very fine, greyish-brown
-5	30		29.5	94	23		ML	SANDY SILT - greyish-brown
-10	35		38.1	83	4		CL	SILTY CLAY - some Sand, brown
-15	40		23.4	105	64			Cemented lumps, light grey

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

LOG OF BORING

LeROY CRANDALL AND ASSOCIATES

PLATE A-1.7a

BORING 7 (CONTINUED)

DATE DRILLED: February 27 & 28, 1981
EQUIPMENT USED: 5"-Diameter Rotary Wash

ELEVATION (ft.)	DEPTH (ft.)	"N" VALUE STD. PEN. TEST	MOISTURE (% of dry wt.)	DRY DENSITY (lbs./cu. ft.)	DRIVE ENERGY (ft.-lbs./ft.)	SAMPLE LOC.		
-20	45		32.8	90	9			Grey with brown
-25	50						SP	SAND - fine, lenses of Silty Sand, grey and brown
-30	55		24.2	101	71			
-35	60		25.4	99	10		SC	CLAYEY SAND - greyish-brown
-40	65		28.5	96	27		SM	SILTY SAND - fine to very fine, greyish-brown
-45	70		31.0	91	17		ML	SANDY SILT - greyish-brown
-50	75		25.5	101	64		SP	SAND - very fine, greyish-brown

NOTE: Drilling mud used in drilling process. Mud removed to 25' at completion of drilling. Water level not established.

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

LOG OF BORING

LeROY CRANDALL AND ASSOCIATES

PLATE A-1.7b

BORING 8

DATE DRILLED: February 25 & 26, 1981

EQUIPMENT USED: 5"-Diameter Rotary Wash

ELEVATION 25

ELEVATION (ft.)	DEPTH (ft.)	"N" VALUE STD. PEN. TEST	MOISTURE (% of dry wt.)	DRY DENSITY (lbs./cu. ft.)	DRIVE ENERGY (ft.-lbs./ft.)	SAMPLE LOC.		
			15.6	112	3		CL	FILL - SANDY CLAY - brown and grey
			27.7	92	6		CL	SILTY CLAY - dark grey
20	5		15.8	118	6			Some fine Sand, reddish-brown
			17.2	113	6			
15	10		15.7	114	7		SC	CLAYEY SAND - fine, brown
							ML	SANDY SILT - brown
10	15	10						
							SM	SILTY SAND - fine to medium, light reddish-brown
5	20		16.1	107	15			
							ML	SANDY SILT - grey and brown
0	25	26						
								Some Clay
-5	30		23.4	95	15			Sandier
							CL	SILTY CLAY - some fine Sand, some cemented lumps, light grey
-10	35	20						

(CONTINUED ON FOLLOWING PLATE)

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

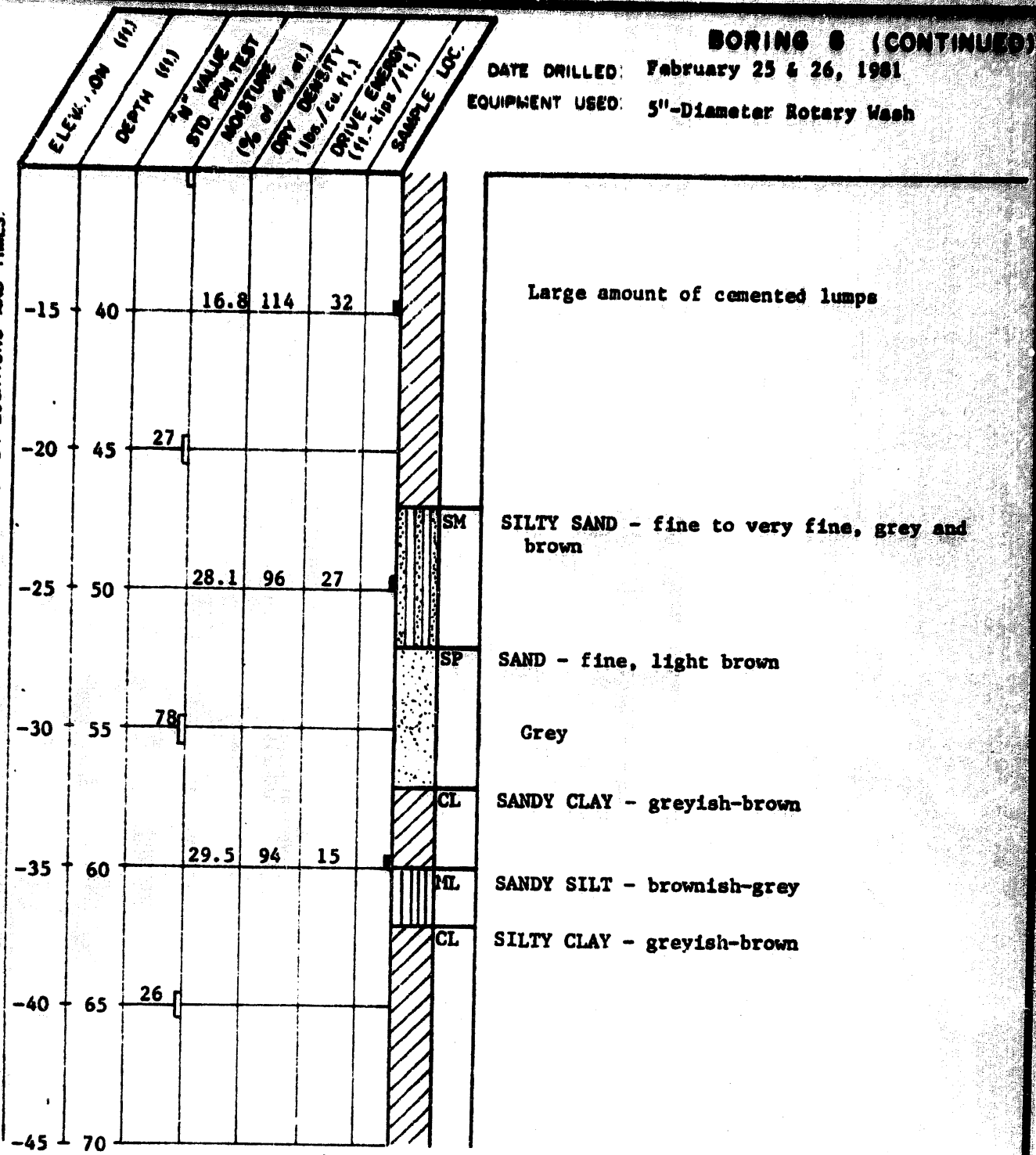
LOG OF BORING

LeROY CRANDALL AND ASSOCIATES

BORING 8 (CONTINUED)

DATE DRILLED: February 25 & 26, 1981

EQUIPMENT USED: 5"-Diameter Rotary Wash



(CONTINUED ON FOLLOWING PLATE)

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

LOG OF BORING

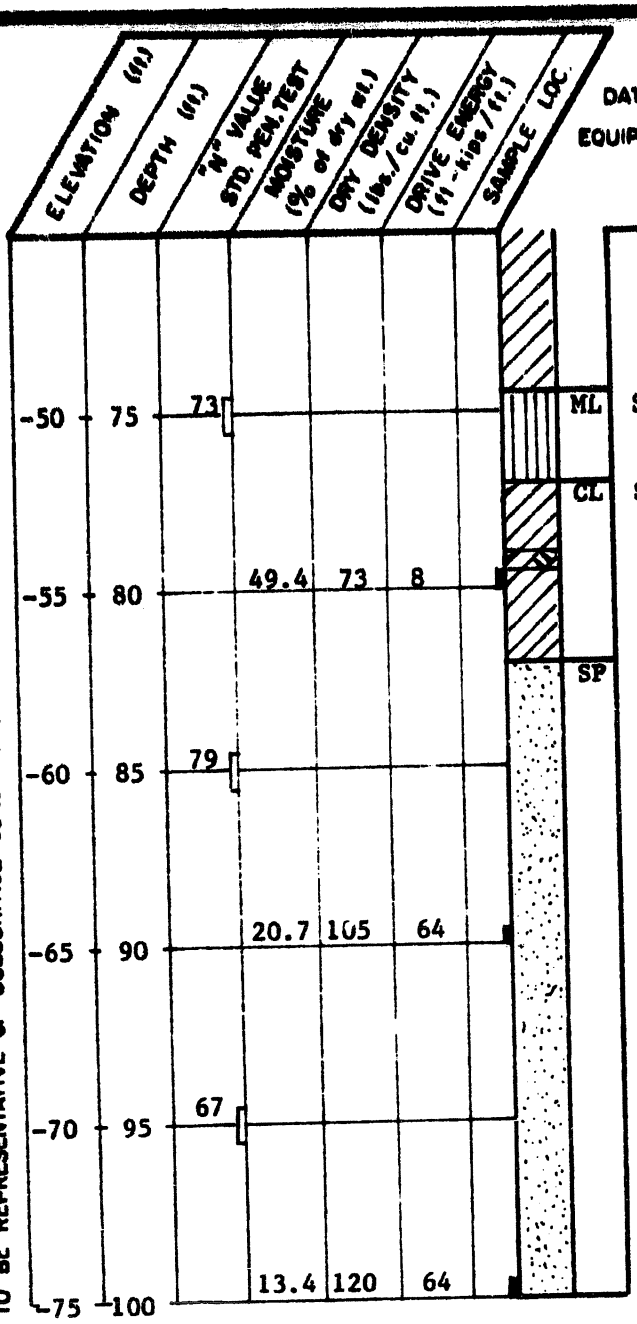
LeROY CRANDALL AND ASSOCIATES

PLATE A-1.8b

BORING 8 (CONTINUED)

DATE DRILLED: February 25 & 26, 1981

EQUIPMENT USED: 5"-Diameter Rotary Wash



SANDY SILT - greyish-brown

SILTY CLAY - dark grey

Layer of peat

SAND - fine, grey and brown

Lenses of Silty Sand

Light greyish-brown

Medium to coarse Sand

NOTE: Drilling mud used in drilling process. Water level not established. Installed 2" diameter PVC casing to a depth of 100' for downhole seismic survey. Annular space backfilled with pea gravel.

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

LOG OF BORING

LeROY CRANDALL AND ASSOCIATES

PLATE A-1.8c

BORING 9

DATE DRILLED: March 3, 1961

EQUIPMENT USED: 5"-Diameter Rotary Wash

ELEVATION 25

ELEVATION (ft.)	DEPTH (ft.)	"N" VALUE STD. PEN. TEST	MOISTURE (% of dry wt.)	DRY DENSITY (lbs./cu. ft.)	DRIVE ENERGY (ft.-lbs./ft.)	SAMPLE LOC.		
			16.8	80	6		CL	SILTY CLAY - dark grey with light brown
20	5		10.8	111	11			Streaks of alkali, cemented lumps, light brown
			17.7	106	5			
15	10		23.2	100	7			
			7.1	109	13		SM	SILTY SAND - fine, light brown
10	15							
			7.6	102	24			Light mottled brown
5	20							
			18.3	110	34		SP	SAND - fine, light brown and grey
0	25						CL	SILTY CLAY - light greyish-brown
			31.6	90	10			
-5	30							Layer of Silty Sand
			28.7	95	9			Cemented layers
-10	35							
			21.5	106	14			Lenses of Sandy Clay
-15	40							

(CONTINUED ON FOLLOWING PLATE)

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

LOG OF BORING

LeROY CRANDALL AND ASSOCIATES

BORING 8 (CONTINUED)

DATE DRILLED: March 3, 1981
EQUIPMENT USED: 5"-Diameter Rotary Wash

ELEVATION (ft.)	DEPTH (ft.)	"N" VALUE STD. PEN. TEST	MOISTURE (% of dry wt.)	DRY DENSITY (lbs./cu. ft.)	DRIVE ENERGY (ft.-lbs./ft.)	SAMPLE LOC.		
-20	45		28.4	94	8			Light grey and brown
							ML	SANDY SILT - some cemented lumps, light greyish-brown
-25	50		27.4	96	17			
							SM	SILTY SAND - fine, lenses of poorly graded Sand, light brown
-30	55		24.0	101	41			
								Lenses of Clayey Silt, light brown
-35	60		32.1	89	30			
							ML	SANDY SILT - light brown
-40	65		30.9	91	21			
-45	70		29.2	94	34		CL	SILTY CLAY - light grey
-50	75		24.7	99	19			

NOTE: Drilling mud used in drilling process. Mud removed to 30' at completion of drilling. Water level measured at 21' on 3-4-81.

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES

LOG OF BORING

LeROY CRANDALL AND ASSOCIATES

PLATE A-1.9b

BORING 10

DATE DRILLED: February 23, 1981

EQUIPMENT USED: 5"-Diameter Rotary Wash

ELEVATION 24

ELEVATION (ft)	DEPTH (ft)	"N" VALUE STD. PEN. TEST	MOISTURE (% of dry wt.)	DRY DENSITY (lbs./cu. ft.)	DRIVE ENERGY (ft.-lbs./ft.)	SAMPLE LOC.		
							CL	FILL - SANDY CLAY - greyish-brown
			11.8	112	8			
20							CL	SILTY CLAY - streaks of alkali, brown with light grey
	5		17.9	109	5			
							ML	CLAYEY SILT - some Sand, brown and grey
			12.9	112	6			
15			13.7	101	6			
	10						ML	SANDY SILT - light brownish-grey
			23.3	100	7		SP	SAND - fine, light grey and light brown
10								
	15		7.6	98	11			
							SM	SILTY SAND - fine to very fine, grey and light reddish-brown
5								
	20		29.6	93	11			
0								Layer of Clay
	25		24.6	101	17		SP	SAND - fine, light brown
							CL	SILTY CLAY - grey
-5								
	30		28.2	94	9			
-10								Cemented lumps, light grey
	35		29.8	96	9			
-15								Grey with light reddish-brown
	40							

(CONTINUED ON FOLLOWING PLATE)

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

LOG OF BORING

LeROY CRANDALL AND ASSOCIATES

PLATE A-1.10a

BORING 10 (CONTINUED)

DATE DRILLED: February 23, 1981

EQUIPMENT USED: 5"-Diameter Rotary Wash

ELEVATION (ft.)	DEPTH (ft.)	"N" VALUE STD. PEN. TEST	MOISTURE (% of dry wt.)	DRY DENSITY (lbs./cu. ft.)	DRIVE ENERGY (ft.-lbs./ft.)	SAMPLE LOC.		
-20	45		38.1	82	6		SM	SILTY SAND - fine, greyish-brown
			21.9	106	21			
-25	50		20.6	106	21			
-30	55		19.7	109	27			Lenses of poorly graded Sand
-35	60		38.1	84	6		CL	SILTY CLAY - grey
-40	65		23.5	100	5		CL	SANDY CLAY - dark grey
								Sandier, light grey
-45	70		23.2	104	11		SP	SAND - fine, lenses of Clayey Sand, greyish-brown
-50	75		19.2	109	32			Light grey and brown
-55	80							

NOTE: Drilling mud used in drilling process. Mud removed to 25' at completion of drilling. Water level measured at 20½' on 2-24-81.

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

LOG OF BORING

LeROY CRANDALL AND ASSOCIATES

PLATE A-1.10b

BORING 11

DATE DRILLED: February 24, 1981

EQUIPMENT USED: 5"-Diameter Rotary Wash

ELEVATION 24

ELEVATION (ft.)	DEPTH (ft.)	"N" VALUE STD. PEN. TEST	MOISTURE (% of dry wt.)	DRY DENSITY (lbs./cu. ft.)	DRIVE ENERGY (ft.-lbs./ft.)	SAMPLE LOC.		
							CL	1½" Asphaltic Paving SILTY CLAY - dark grey
			27.4	94	4			Reddish-brown
20			25.6	98	2			Greyish-brown
	5							
			24.3	101	2		CL	SANDY CLAY - lenses of Clayey Sand, greyish-brown
			23.3	104	7			
15							SP	SAND - fine, light brown
	10							
			12.4	110	19			
10								
	15		17.4	109	14		SM	SILTY SAND - fine, light brown
							ML	SANDY SILT - greyish-brown
5								
	20		27.5	94	13			
0								
	25		31.6	91	9		CL	SILTY CLAY - greyish-brown

(CONTINUED ON FOLLOWING PLATE)

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

LOG OF BORING

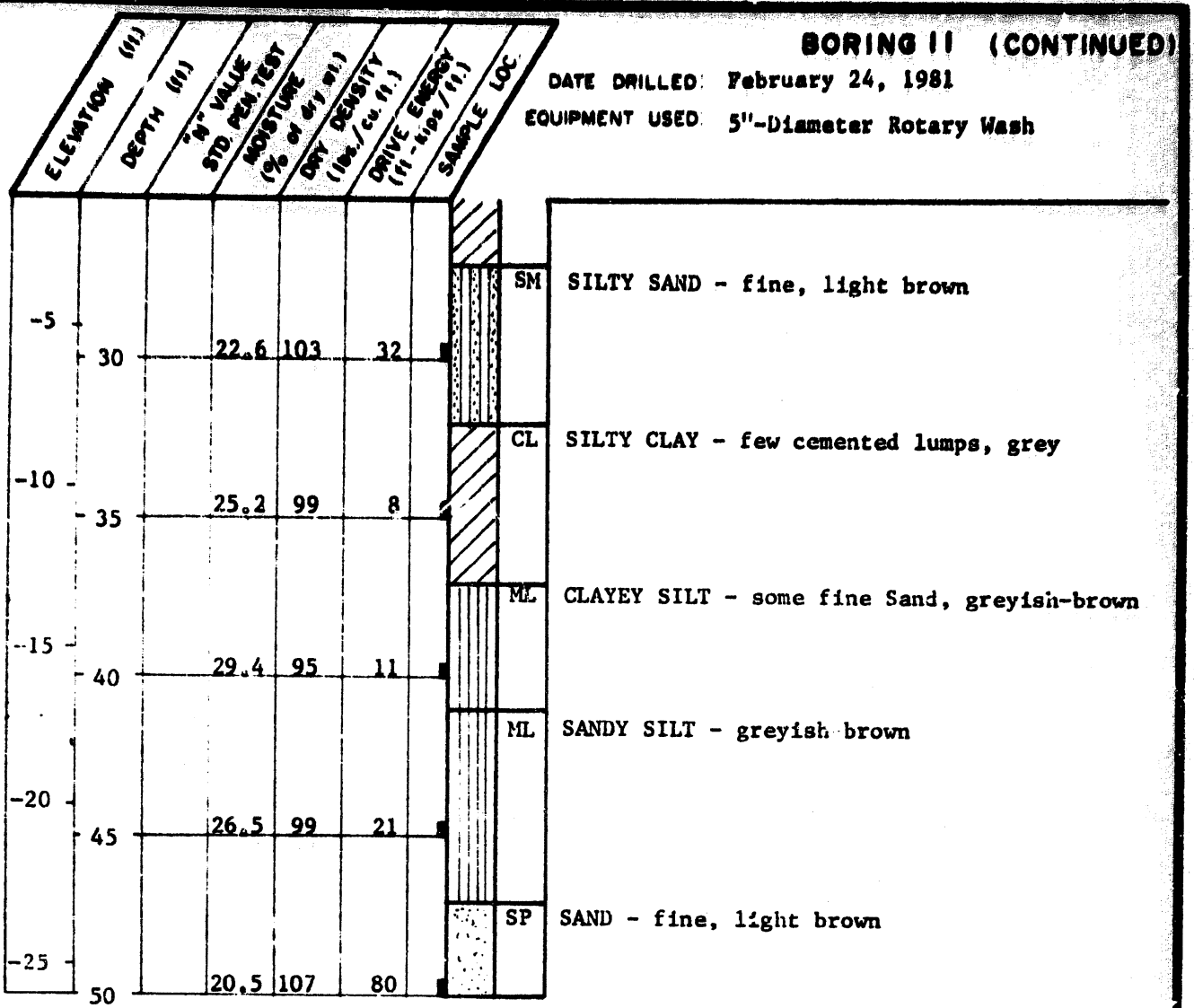
LeROY CRANDALL AND ASSOCIATES

PLATE A-1.11a

BORING 11 (CONTINUED)

DATE DRILLED: February 24, 1981

EQUIPMENT USED: 5"-Diameter Rotary Wash



NOTE: Drilling mud used in drilling process.
Mud removed to 25' at completion of drilling.
Water level measured at 20' on 2-25-81.

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES

LOG OF BORING

LeROY CRANDALL AND ASSOCIATES

PLATE A-1.11b

BORING 12

DATE DRILLED: March 3, 1981

EQUIPMENT USED: 5"-Diameter Rotary Wash

ELEVATION 26

ELEVATION (ft.)	DEPTH (ft.)	"N" VALUE STD. PEN. TEST	MOISTURE (% of dry wt.)	DRY DENSITY (lbs./cu. ft.)	DRIVE ENERGY (ft.-lbs./ft.)	SAMPLE LOC.		
25							SM	2" Asphaltic Paving FILL - SILTY SAND - fine, some Clay, brown
			27.2	95	2		CL	SILTY CLAY - dark grey
			19.6	106	4			Brown
20	5							
			21.4	105	4			Grey and brown
			29.5	90	2		ML	CLAYEY SILT - some fine Sand, light grey-brown
15	10						CL	SILTY CLAY - light greyish-brown
							SP	SAND - fine, light brown
10	15		11.1	105	23		CL	SILTY CLAY - light greyish-brown
	20		22.0	98	16		SM	SILTY SAND - fine, light brown and greyish-brown
5								
	25		34.7	87	11		ML	SANDY SILT - some Clay, some cemented lumps, light greyish-brown
0								
	30		29.5	92	14			
-5							CL	SILTY CLAY - some cemented lumps, light greyish-brown
	35		21.0	107	12			
-10								
	40		27.4	96	16		ML	SANDY SILT - light brown

(CONTINUED ON FOLLOWING PLATE)

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

LOG OF BORING

LeROY CRANDALL AND ASSOCIATES

PLATE A-1.12a

BORING 12 (CONTINUED)

DATE DRILLED March 3, 1981

EQUIPMENT USED 5"-Diameter Rotary Wash

ELEVATION (ft.)	DEPTH (ft.)	"N" VALUE STD. PEN. TEST	MOISTURE (% of dry wt.)	DRY DENSITY (lbs./cu. ft.)	DRIVE ENERGY (ft.-lbs./ft.)	SAMPLE LOC		
-15	45		38.4	84	5		CL	SILTY CLAY - light greyish-brown
-20	50		27.1	97	27		SM	SILTY SAND - fine to very fine, light brown and grey
-25	55		28.6	95	24			Light grey
								Layers of Silty Clay, light greyish-brown
-30	60		27.7	97	16			
-35	65		41.6	80	11		CL	SILTY CLAY - light greyish-brown
-40	70		36.9	85	14			Siltier
-45	75		24.1	100	37		SM	SILTY SAND - fine, light brown

NOTE: Drilling mud used in drilling process. Mud removed to 30' at completion of drilling. Water level measured at 21' on 3-4-81.

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES

LOG OF BORING

LeROY CRANDALL AND ASSOCIATES

PLATE A-1.12b

BORING 13

DATE DRILLED: March 4, 1981

EQUIPMENT USED: 5"-Diameter Rotary Wash

ELEVATION 25

ELEVATION (ft)	DEPTH (ft)	"N" VALUE STD. PEN. TEST	MOISTURE (% of dry wt.)	DRY DENSITY (lbs./cu. ft.)	DRIVE ENERGY (ft.-lbs./ft.)	SAMPLE LOC.		
			30.2	98	4		CL	2" Asphaltic Paving SILTY CLAY - dark grey to black Light brown
20	5		22.5	103	3			
			11.9	116	3			Some Sand
15	10	23						Cemented lumps
			7.3	101	14		SP	SAND - fine, light brown
10	15						CL	SILTY CLAY - some cemented lumps grey and brown
		21					SM	SILTY SAND - fine, some cemented lumps, light brown
5	20						ML	SANDY SILT - light brown
			34.4	87	8			
0	25						ML	CLAYEY SILT - some Sand, light brown
		34					SM	SILTY SAND - fine, some cemented lumps, light brown
-5	30						CL	SILTY CLAY - some cemented lumps, light greyish-brown
			23.6	102	12			
-10	35							Cementations
		56						Layers of Silty Sand, fine, light brown
-15	40							

(CONTINUED ON FOLLOWING PLATE)

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

LOG OF BORING

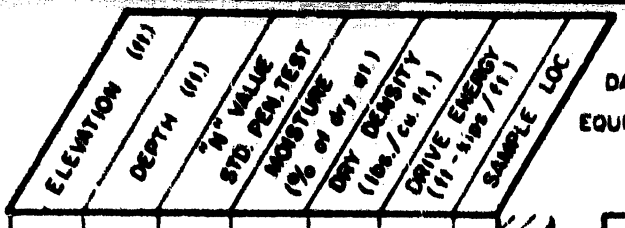
LeROY CRANDALL AND ASSOCIATES

PLATE A-1.13a

BORING 13 (CONTINUED)

DATE DRILLED March 4, 1981

EQUIPMENT USED 5"-Diameter Rotary Wash



ELEVATION (ft.)	DEPTH (ft.)	"N" VALUE STD. PEN. TEST	MOISTURE (% of dry wt.)	DRY DENSITY (lbs./cu. ft.)	DRIVE ENERGY (ft.-lbs./ft.)	SAMPLE LOC
			33.5	90	13	
-20	45					
		48				
-25	50					
			26.1	97	64	
-30	55					
		47				
-35	60					
			40.4	81	13	
-40	65					
-45	70					
			7.9	102	13	
-50	75					

Light brown

Lenses of Clayey Silt

Layers of Silty Sand, fine, light brown

SM SILTY SAND - fine, light brown

ML CLAYEY SILT - light greyish-brown

Lenses of Sandy Silt
Clayier

ML SANDY SILT - light brown and grey

NOTE: Drilling mud used in drilling process. Mud removed to 30' at completion of drilling. Water level measured at 21' on 3-4-81.

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES

LOG OF BORING

LeROY CRANDALL AND ASSOCIATES

PLATE A-1.13b

BORING 14

DATE DRILLED: February 27, 1981

EQUIPMENT USED: 24"-Diameter Bucket

ELEVATION 25

Elevation (ft)	Depth (ft)	"N" Value Std. Pen. Test	Moisture (% of dry wt.)	Dry Density (lbs./cu. ft.)	Drive Energy (ft.-kips/ft.)	Sample Loc.		
							PM	2" Asphaltic Paving
							CL	FILL - SILTY SAND - fine, light brown
								SILTY CLAY - grey and brown
			18.9	104	1			Light brown
								Some cemented lumps
20	5		20.5	106	6		CL	SANDY CLAY - light reddish-brown
			17.8	109	3			Streaks of alkali, some lumps
15	10		22.6	103	6		SM	SILTY SAND - fine, light brown
							CL	SILTY CLAY - large amount of alkali, grey
			7.8	110	14			Light brown
10	15						SM	SILTY SAND - fine, light brown
								Layer of Sandy Silt
			12.3	108	18			
5	20							Layers of Sandy Silt
			27.7	91	6			Light reddish-brown
0	25						CL	SILTY CLAY - lenses of Silty Sand, light greyish-brown
			30.5	95	8			
-5	30							

NOTE: Water seepage encountered at a depth of 24½'. Water level measured at 28' at completion of drilling and 26½' 10 minutes after completion of drilling. Caving and sloughing from 24' to 26'.

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

LOG OF BORING

LeROY CRANDALL AND ASSOCIATES

PLATE A-1.14

BORING 15

DATE DRILLED February 27, 1981

EQUIPMENT USED 24"-Diameter Bucket

ELEVATION 25

ELEVATION (ft.)	DEPTH (ft.)	"N" VALUE STD. PEN. TEST	MOISTURE (% of dry wt.)	DRY DENSITY (lbs./cu. ft.)	DRIVE ENERGY (ft.-lbs./ft.)	SAMPLE LOC		
							CL	2" Asphaltic Paving - 2" Base Course SILTY CLAY - dark grey with brown
			19.7	107	3			Light brown and grey
20	5		20.1	109	2			Some Sand
			22.2	102	2			Siltier
							SM	SILTY SAND - fine, some Clay, light brown
15	10		26.4	75	3		CL	SILTY CLAY - light greyish-brown
							SM	SILTY SAND - fine to very fine, light brown
			10.8	98	5			
10	15							Layer of Silty Clay, grey to dark grey
								Thin layers of Sandy Silt
			31.3	92	6			Lenses of poorly graded Sand
5	20							
			30.8	91	3		ML	SANDY SILT - light greyish-brown
0	25							
			23.0	97	10			Layer of fine Sand, light brown
-5	30							

NOTE: Water seepage encountered at depths of 23½' and 25½' to 29½'. Water level measured at 30' at completion of drilling and 27½' 10 minutes after completion of drilling. Caving and sloughing from 22½' to 23½' and 25½' to 29'.

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

LOG OF BORING

LeROY CRANDALL AND ASSOCIATES

PLATE A-1.15

BORING 16

DATE DRILLED: February 27, 1981

EQUIPMENT USED: 24"-Diameter Bucket

ELEVATION 26

ELEVATION (ft.)	DEPTH (ft.)	"N" VALUE STD. PEN. TEST	MOISTURE (% of dry wt.)	DRY DENSITY (lbs./cu. ft.)	DRIVE ENERGY (ft.-lbs./ft.)	SAMPLE LOC.		
25							CL	2" Asphaltic Paving SILTY CLAY - black
			22.4	104	< 1			Light brown
	5		18.3	112	2			
20			17.3	111	2			Streaks of alkali, some cemented lumps Siltier
	10		20.0	108	8			Greyish-brown
15							SM	SILTY SAND - fine, light reddish-brown
			6.9	107	8			
	15							Some alkali, cementations
10								Light grey and brown
			12.4	102	6			
20								

NOTE: Water not encountered. No caving.

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

LOG OF BORING

LeROY CRANDALL AND ASSOCIATES

PLATE A-1.16

BORING 17

DATE DRILLED: February 27, 1981

EQUIPMENT USED: 24"-Diameter Bucket

ELEVATION 25

ELEVATION (ft.)	DEPTH (ft.)	"N" VALUE STD. PEN. TEST	MOISTURE (% of dry wt.)	DRY DENSITY (lbs./cu. ft.)	DRIVE ENERGY (ft.-lbs./ft.)	SAMPLE LOC.		
			24.2	96	1		CL	2" Asphaltic Paving - 3" Base Course SILTY CLAY - streaks of alkali, dark grey to black
			20.4	106	1			Light brown
20	5		20.5	108	5			Some Sand
			16.5	104	3		SM	SILTY SAND - fine, light brown
15	10		19.7	107	6		CL	SILTY CLAY - some Sand, light greyish-brown
							SM	SILTY SAND - fine, lenses of poorly graded Sand, light brown
10	15		5.7	94	6			
5	20		12.1	103	18			

NOTE: Water not encountered. No caving.

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

LOG OF BORING

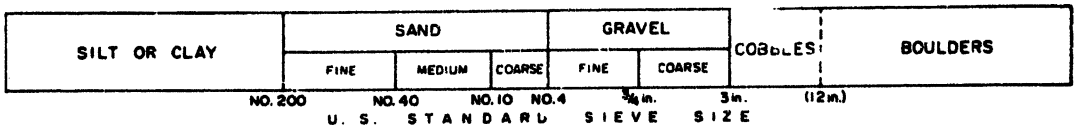
LeROY CRANDALL AND ASSOCIATES

PLATE A-1.17

MAJOR DIVISIONS			GROUP SYMBOLS	TYPICAL NAMES
COARSE GRAINED SOILS (More than 50% of material is LARGER than No. 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 (Little or no fines)	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 No. 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 of low plasticity.
	SILTS AND CLAYS (Liquid limit GREATER 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.

PARTICLE SIZE LIMITS

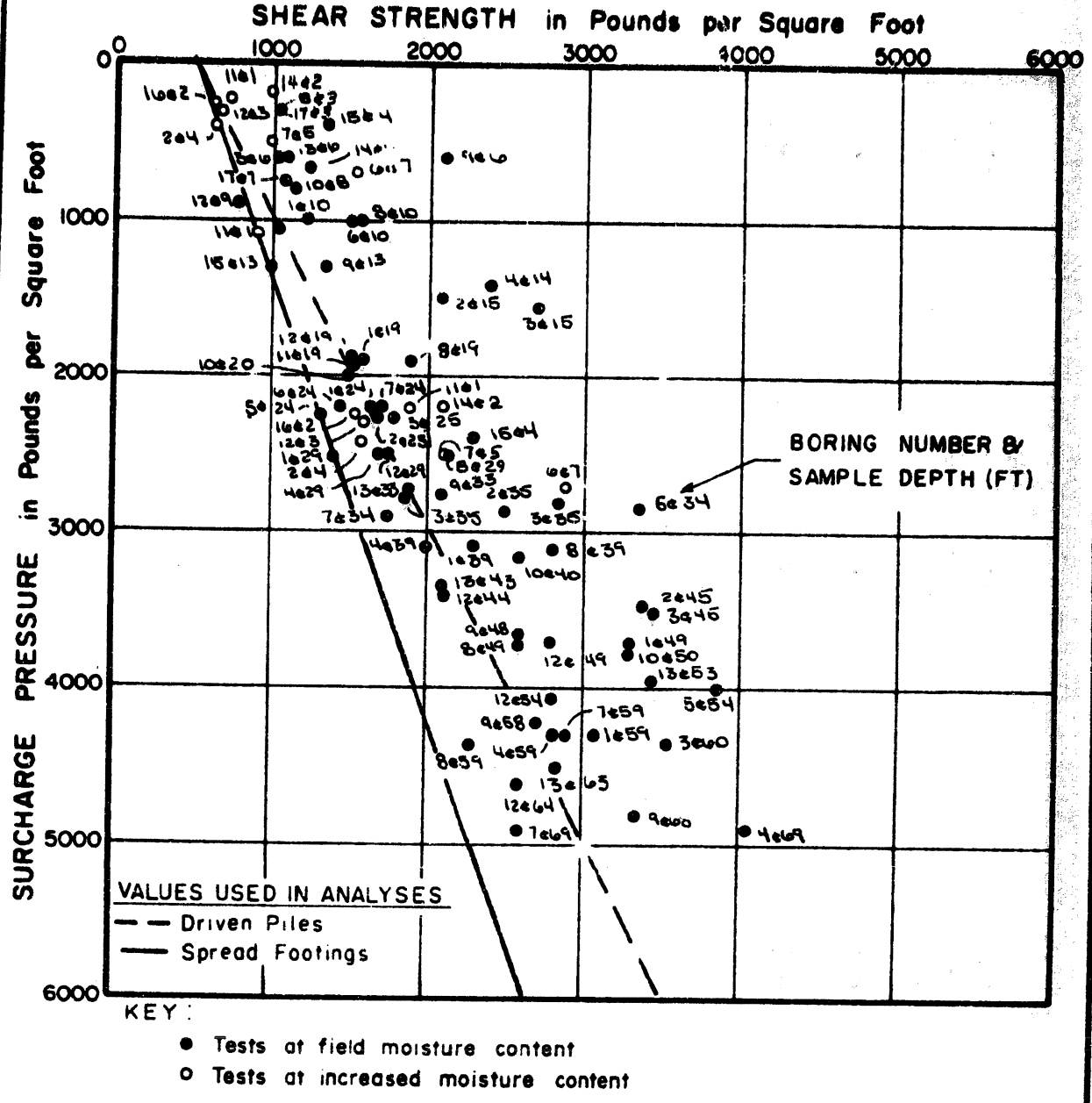


UNIFIED SOIL CLASSIFICATION SYSTEM

Reference:
The Unified Soil Classification System, Corps of Engineers, U. S. Army Technical Memorandum No 3-357, Vol. I, March, 1953. (Revised April, 1960)

LEROY CRANDALL AND ASSOCIATES

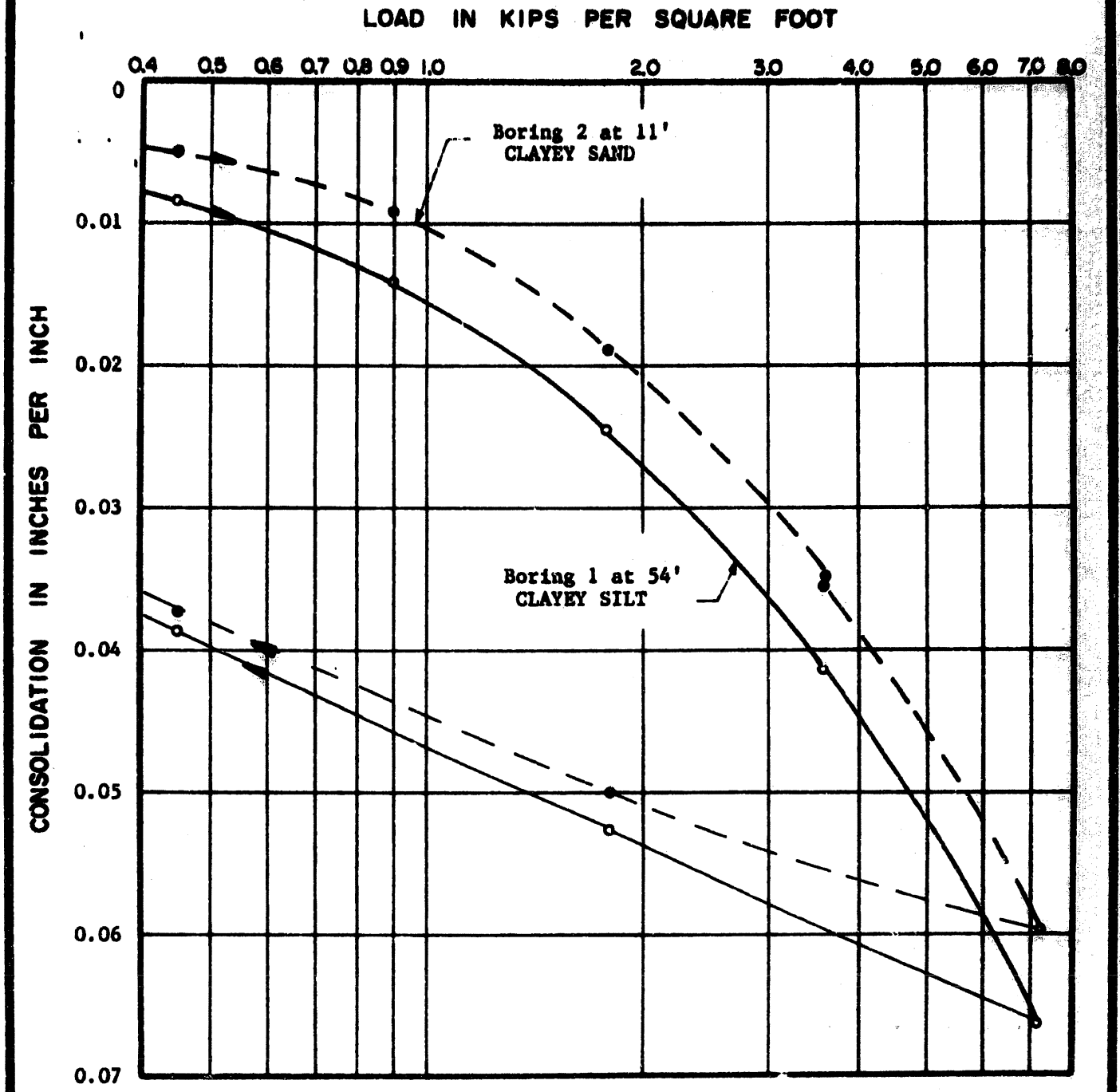
PLATE A-2



DIRECT SHEAR TEST DATA

LEROY CRANDALL & ASSOCIATES

PLATE A-3

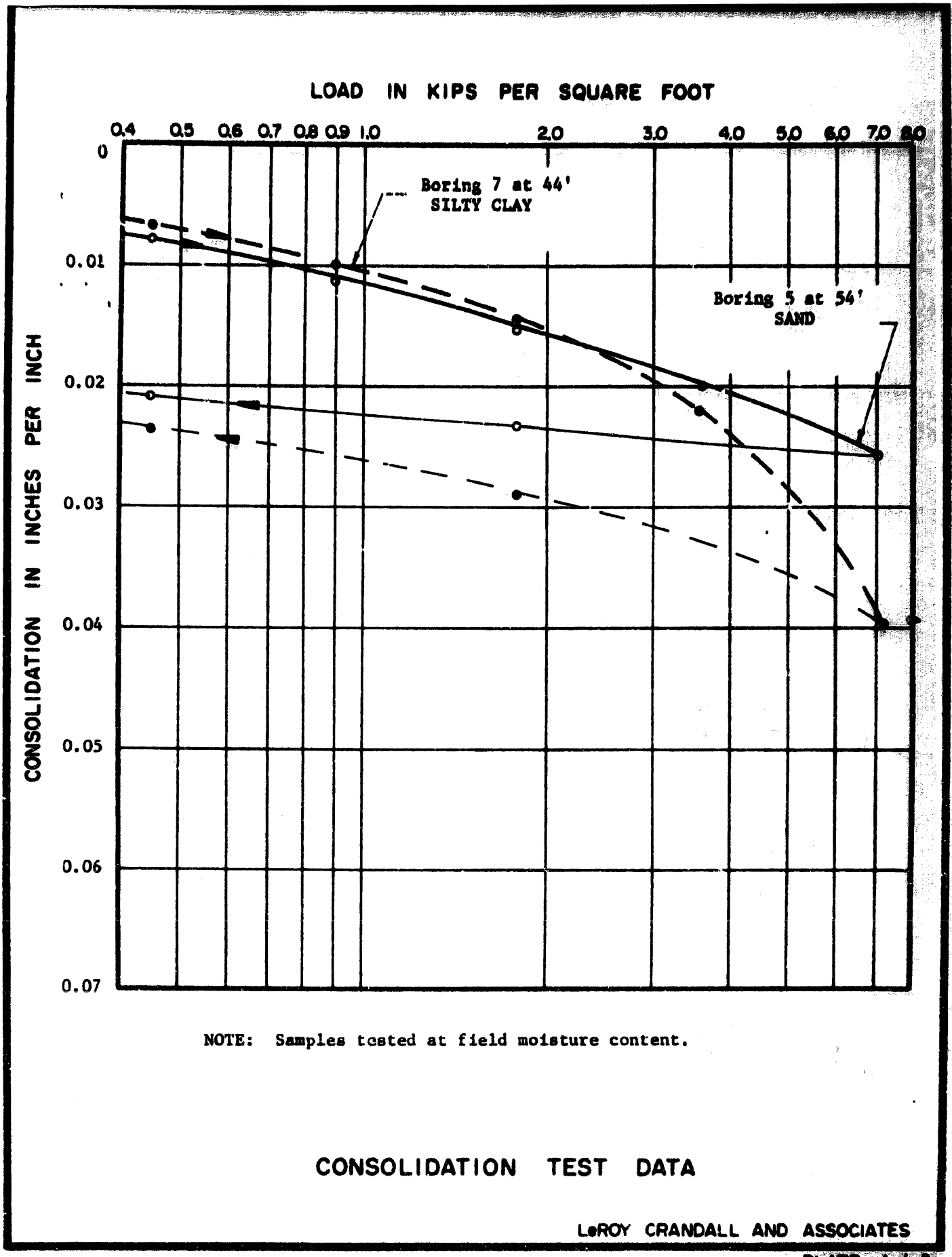


NOTE: Water added to sample from Boring 2 after consolidation under a load of 3.6 kips per square foot. The other sample tested at field moisture content.

CONSOLIDATION TEST DATA

LeROY CRANDALL AND ASSOCIATES

PLATE A-4.1



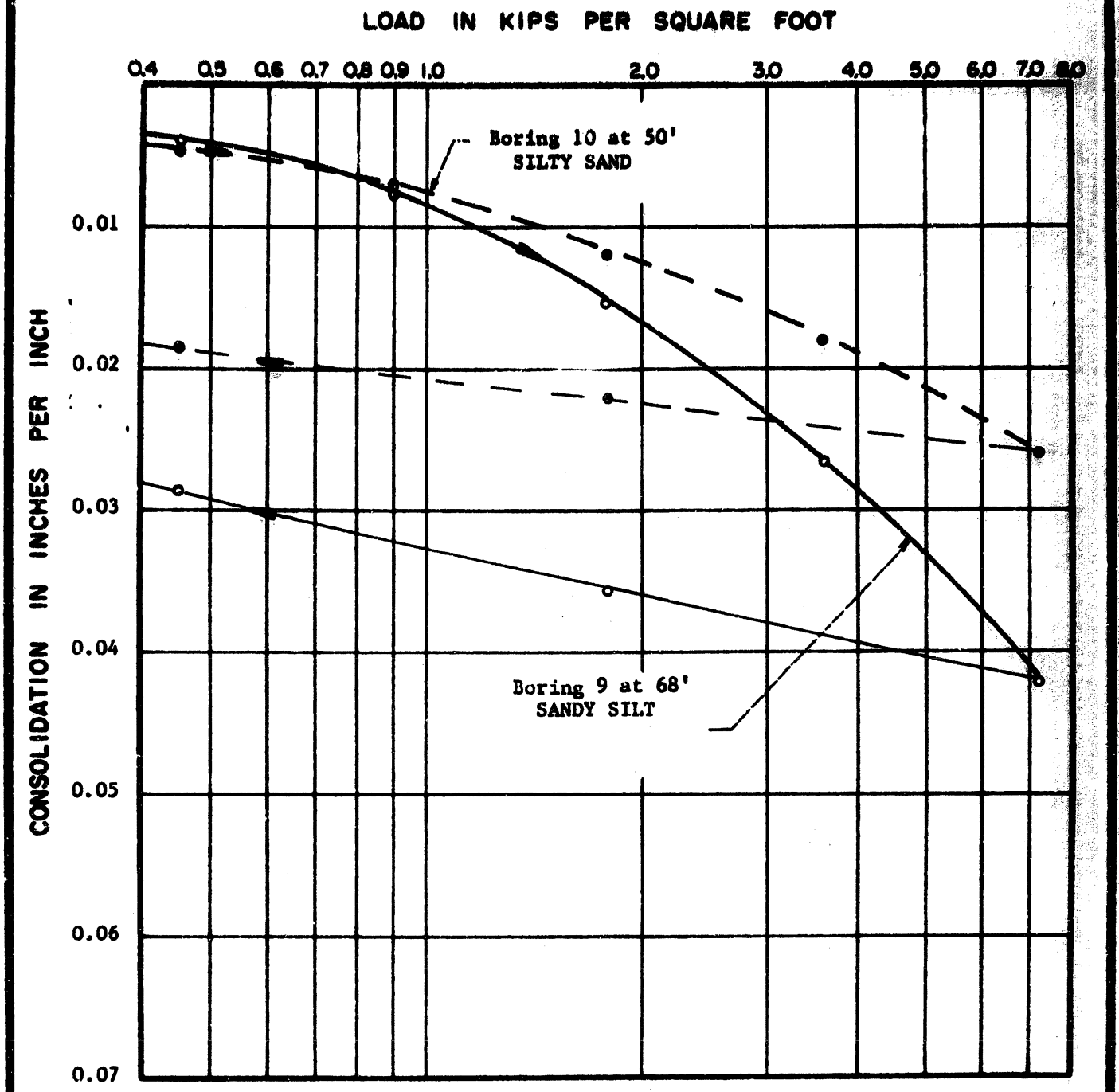
NOTE: Samples tested at field moisture content.

CONSOLIDATION TEST DATA

LeROY CRANDALL AND ASSOCIATES

PLATE A-4.2

JOB # 81064 DATE 3/18/81 DR. JOHN CH.E. MH W.P. JPR CHKD JPR

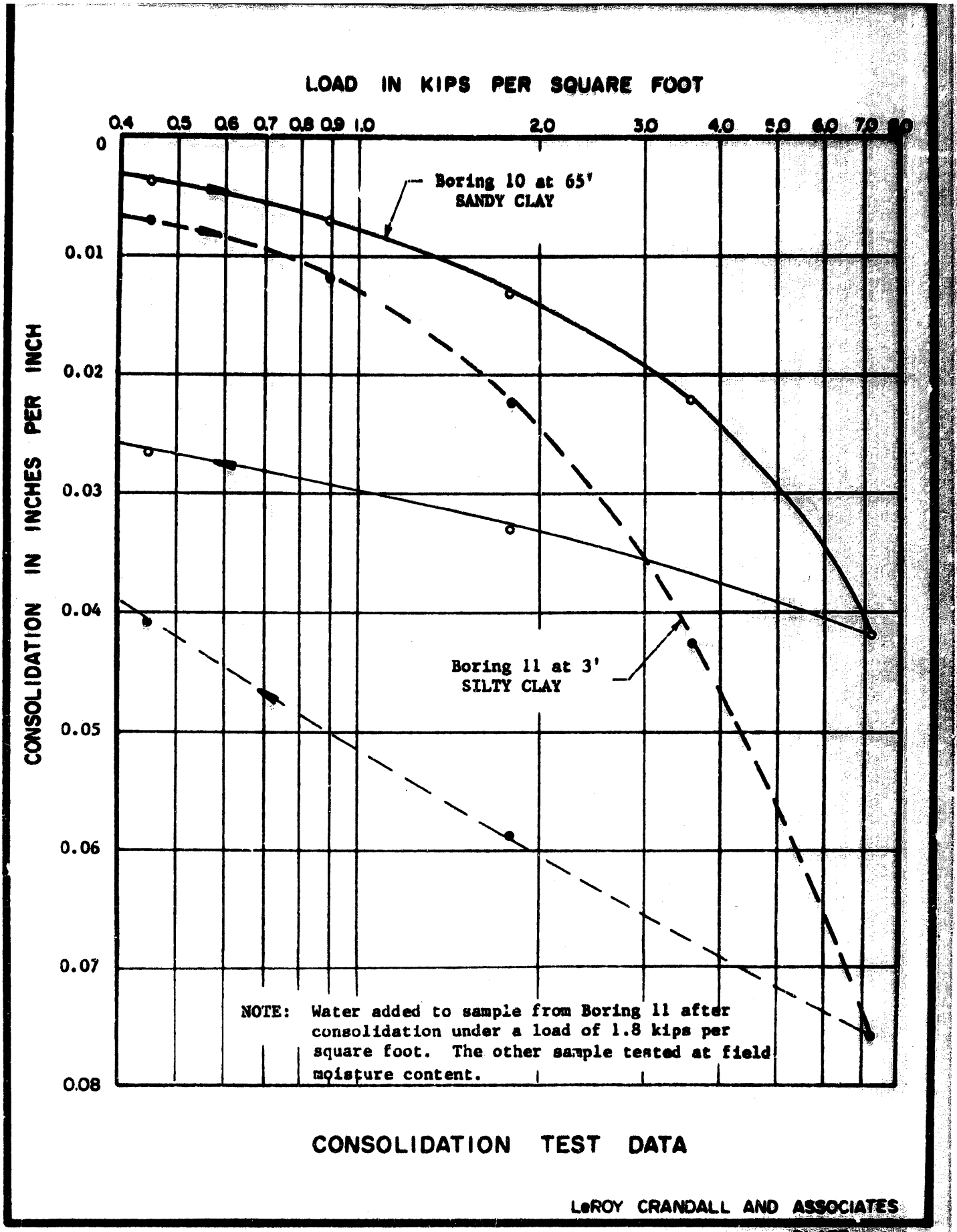


NOTE: Samples tested at field moisture content.

CONSOLIDATION TEST DATA

LeROY CRANDALL AND ASSOCIATES

PLATE A-4.3

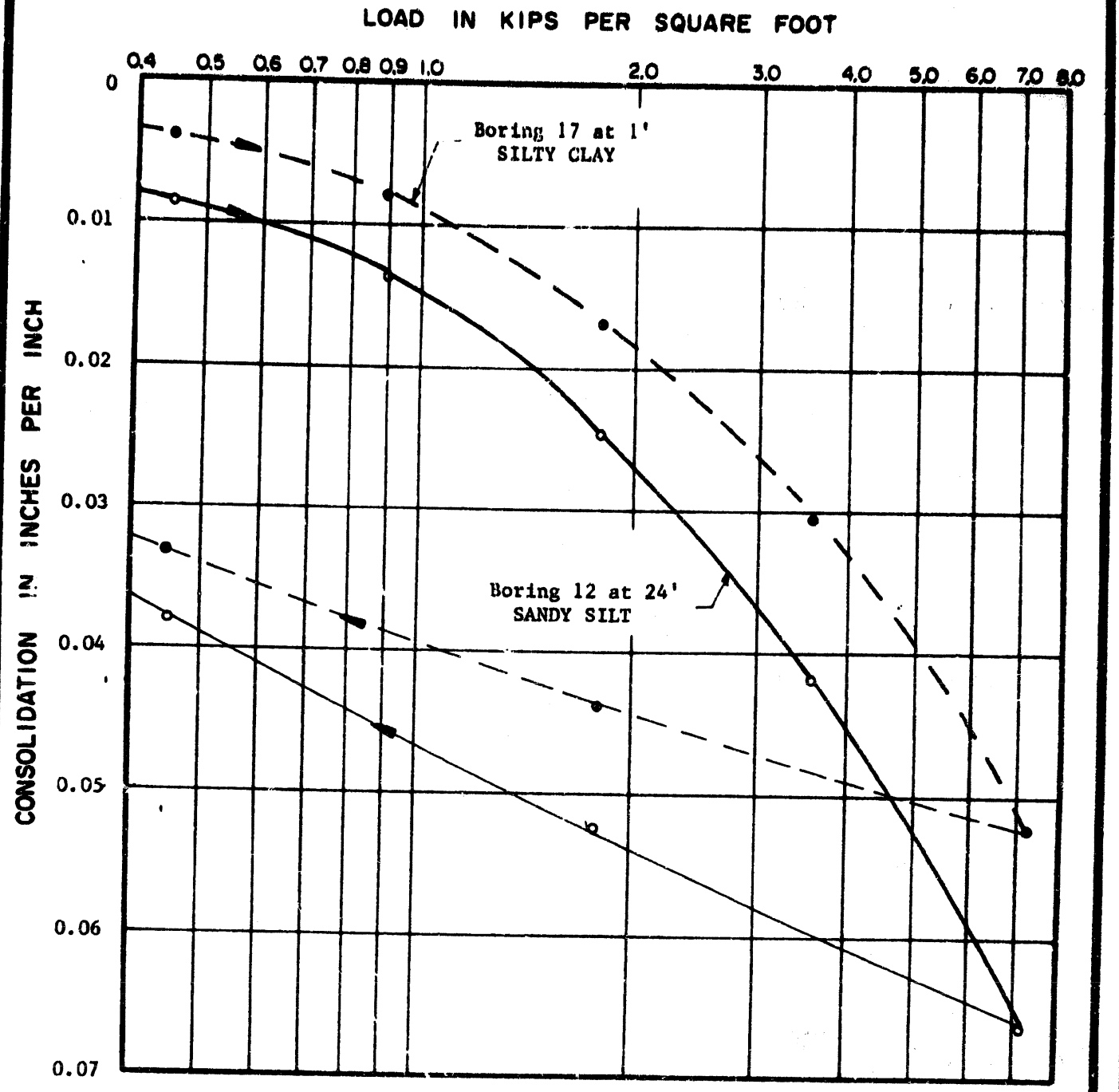


CONSOLIDATION TEST DATA

LeROY CRANDALL AND ASSOCIATES

PLATE A-4.4

JOB A-8004 DATE 3/18/81 DR. O.E. W.P. C. CHKD



NOTE: Water added to sample from Boring 17 after consolidation under a load of 1.8 kips per square foot. The other sample tested at field moisture content.

CONSOLIDATION TEST DATA

LeROY CRANDALL AND ASSOCIATES

PLATE A-4.5

BORING NUMBER AND SAMPLE DEPTH:	Boring 6 at 1½' to 3½'	Boring 13 at 0' to 2'
SOIL TYPE:	SILTY CLAY	SILTY CLAY
MAXIMUM DRY DENSITY: (LBS./CU. FT.)	117	120
OPTIMUM MOISTURE CONTENT: (% OF DRY WT.)	13	11

TEST METHOD: ASTM DESIGNATION D1557-70.

COMPACTION TEST DATA

LeROY CRANDALL AND ASSOCIATES

PLATE A-5

JOB A-81064 DATE 3/19/81 DR O.E. MD W.P. CHKD

BORING NUMBER AND SAMPLE DEPTH :	Boring 2 at 4'	Boring 4 at 3'
SOIL TYPE.	SILTY CLAY	SILTY CLAY
CONFINING PRESSURE : (LBS. / SQ. FT.)	200	200
FIELD MOISTURE CONTENT : (%)	17.2	26.1
EXPANSION FROM FIELD TO SOAKED MOISTURE CONTENT : (%)	0	2.6
SOAKED MOISTURE CONTENT : (%)	17.2	34.3
SHRINKAGE FROM FIELD TO AIR-DRIED MOISTURE CONTENT : (%)	9.6	9.9
AIR-DRIED MOISTURE CONTENT : (%)	2.7	4.8
TOTAL VOLUME CHANGE : (%)	9.6	12.5

JOB 8108A DATE 3/19/81 DR O.E. MD W.P. CHKD FOR

EXPANSION TEST DATA

LeROY CRANDALL AND ASSOCIATES

PLATE A-6.1

BORING NUMBER AND SAMPLE DEPTH:	Boring 11 at 1'	Boring 15 at 2'
SOIL TYPE:	SILTY CLAY	SILTY CLAY
CONFINING PRESSURE: (LBS / SQ. FT.)	200	200
FIELD MOISTURE CONTENT: (%)	27.4	19.7
EXPANSION FROM FIELD TO SOAKED MOISTURE CONTENT: (%)	0.3	1.2
SOAKED MOISTURE CONTENT: (%)	28.3	21.0
SHRINKAGE FROM FIELD TO AIR-DRIED MOISTURE CONTENT: (%)	13.9	13.6
AIR-DRIED MOISTURE CONTENT: (%)	6.5	4.1
TOTAL VOLUME CHANGE: (%)	14.2	14.8

JOB A-810064 DATE 3/10/81 DR O.E. M.M.D. W.P. CHKD

FORM

EXPANSION TEST DATA

LEROY CRANDALL AND ASSOCIATES

PLATE A-6.2

JOB A-81064 DATE 3/19/81 DR. ___ O.E. MM/LL W.P. JJ CHKD ___

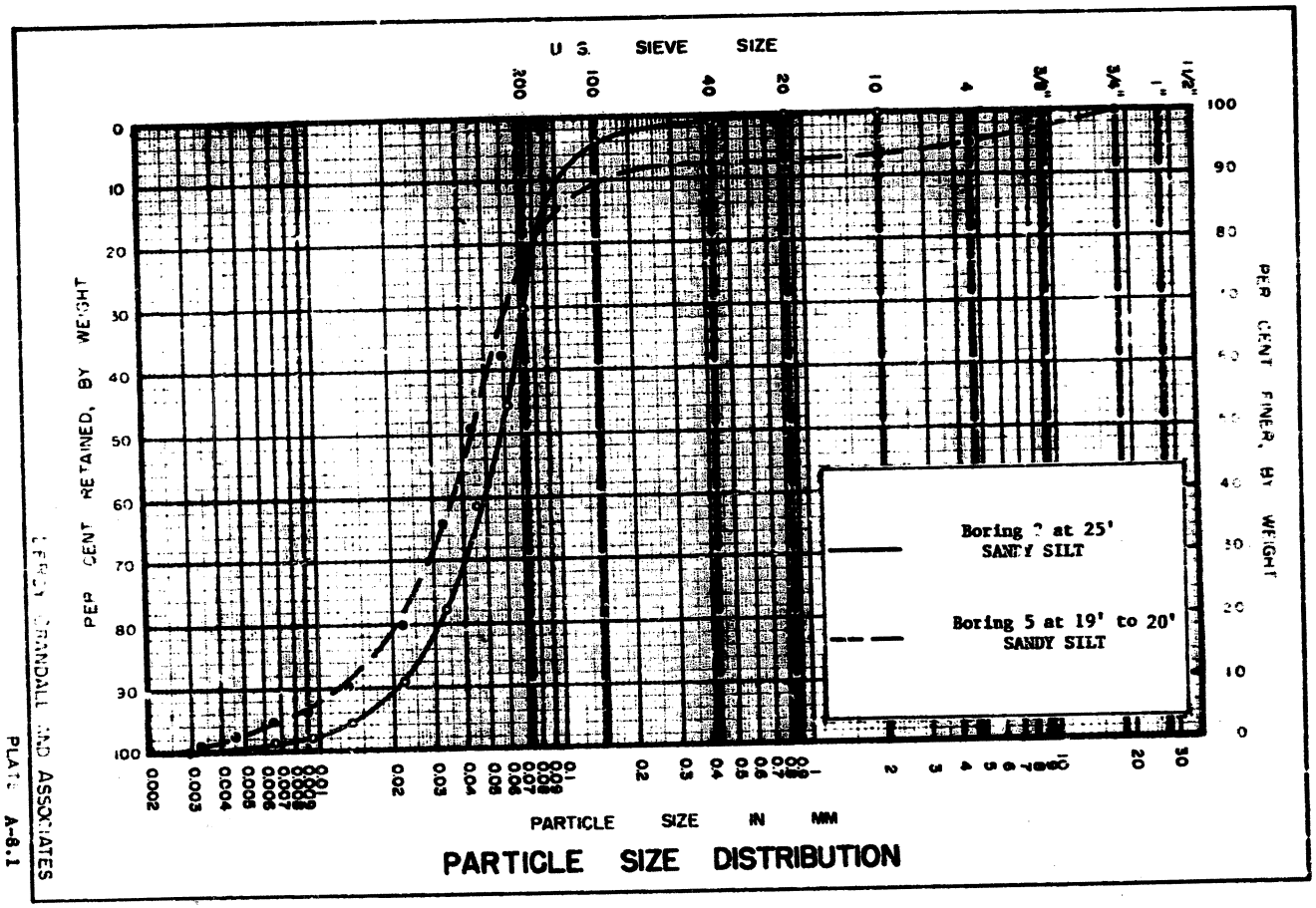
BORING NUMBER AND SAMPLE DEPTH:	Boring 6 at 1½' to 3½'	Boring 13 at 0' to 2'
SOIL TYPE:	SILTY CLAY	SILTY CLAY
CONFINING PRESSURE: (LBS./SQ. FT.)	144	144
INITIAL MOISTURE CONTENT: (%)	10.9	11.3
FINAL MOISTURE CONTENT: (%)	23.8	21.8
DRY DENSITY: (LBS./CU. FT.)	104	107
EXPANSION INDEX:	57	31

TEST METHOD: UNIFORM BUILDING CODE STANDARD NO. 29-2, EXPANSION INDEX TEST.

EXPANSION INDEX TEST DATA

LeROY CRANDALL AND ASSOCIATES

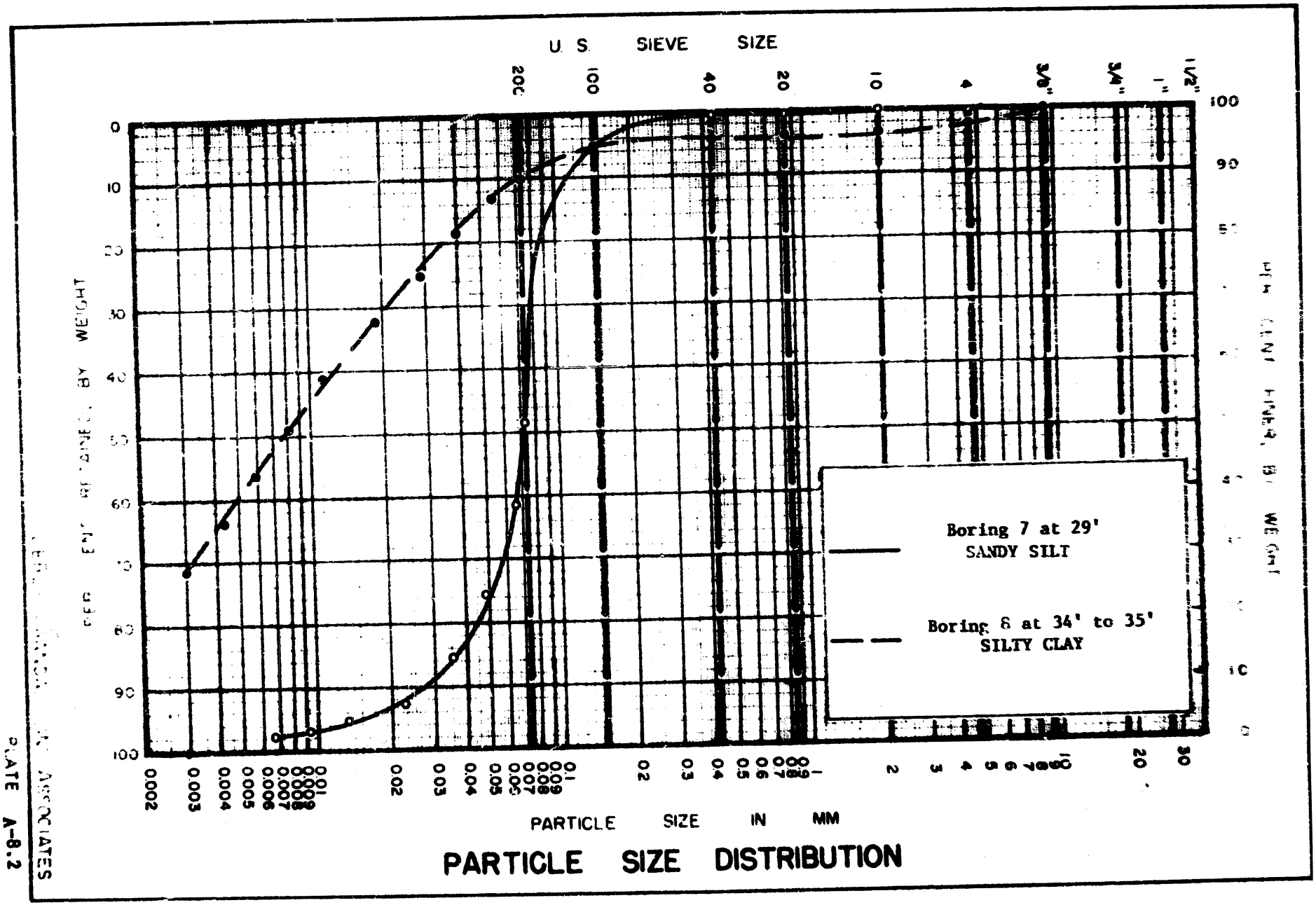
PLATE A-7



PARTICLE SIZE DISTRIBUTION

LEROY CRANDALL AND ASSOCIATES

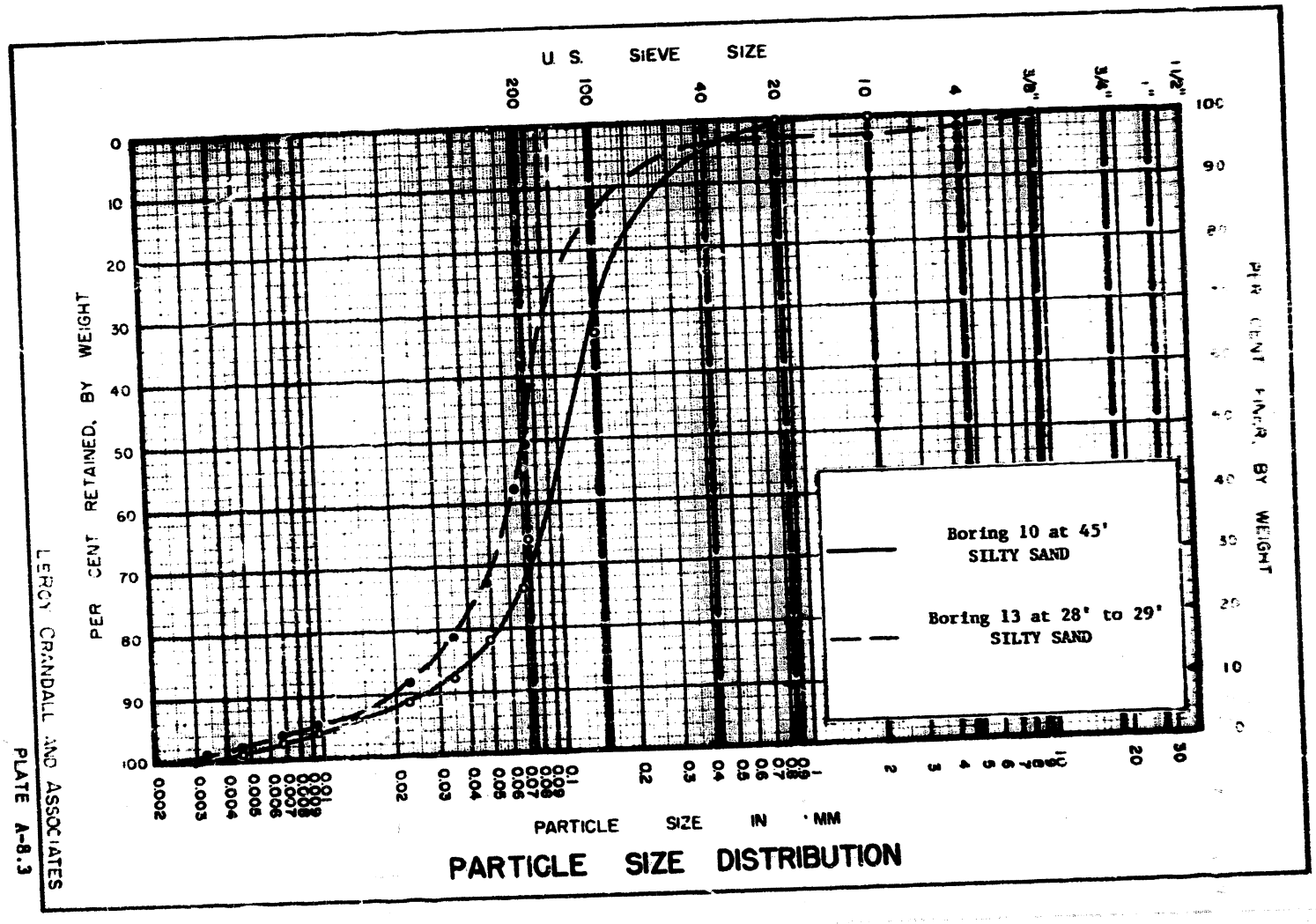
PLATE A-8.1



PARTICLE SIZE DISTRIBUTION

PLATE A-8.2

Form 403-B



PARTICLE SIZE DISTRIBUTION

LERCH CRANDALL AND ASSOCIATES

PLATE A-8.3

SMITH-EMERY COMPANY *An Independent Commercial Testing Laboratory Established 1910*

File No. 8030
Lab No. 0-801-178

Date Received 3/17/81
Date of Report 3/25/81

Project 781064 Type Mat'l. Soil

Charge LE ROY CRANDALL & ASSOC.

Boring No. 4 Depth 0'-2' T.I. 4.0 assumed Gf 1.0 assumed

"R" VALUE DETERMINATION

Dry Wt. 1006.5

Mold	1	2	3	4
Water Added (+)	90	75	50	30
Net Wet Wt.	1290	1275	1250	1230
% Water	28.2	26.7	24.2	22.2
Gage Pressure	6	10	15	23
Gage Pressure (Corr.)	90	150	230	350
Exudation Press.	135	165	265	320
Height	2.60	2.50	2.55	2.45
Mold Gross Wt.	3071	3030	3068	3056
Mold Tare	2105	2090	2094	2094
Mold Net Wet Wt.	966	940	974	962
Defl. by Exp. Press.	48	52	71	91
G. E. by Exp. Press.	1.60	1.73	.237	3.03
Stab. @ 80 PSI (1000)	56	55	45	41
Stab. @ 160 PSI (2000)	133	130	112	103
Turns Displacement	5.60	5.60	5.30	4.80
R-Value (Uncorrected)	8	10	17	22
R-Value (Corrected)	8	10	17	22
G.E. by Stab.	1.18	1.06	1.06	1.00
G.E. by Expan.	1.60	1.73	2.37	3.03
Mold Net Dry Wt.	754	743	781	787
Dry Density	88.5	90.0	93.3	97.5

R-value by exudation pressure 20

R-value by expansion pressure 3

R-value at Equilibrium 3 By: Exud. Exp.

Remarks:

As Received

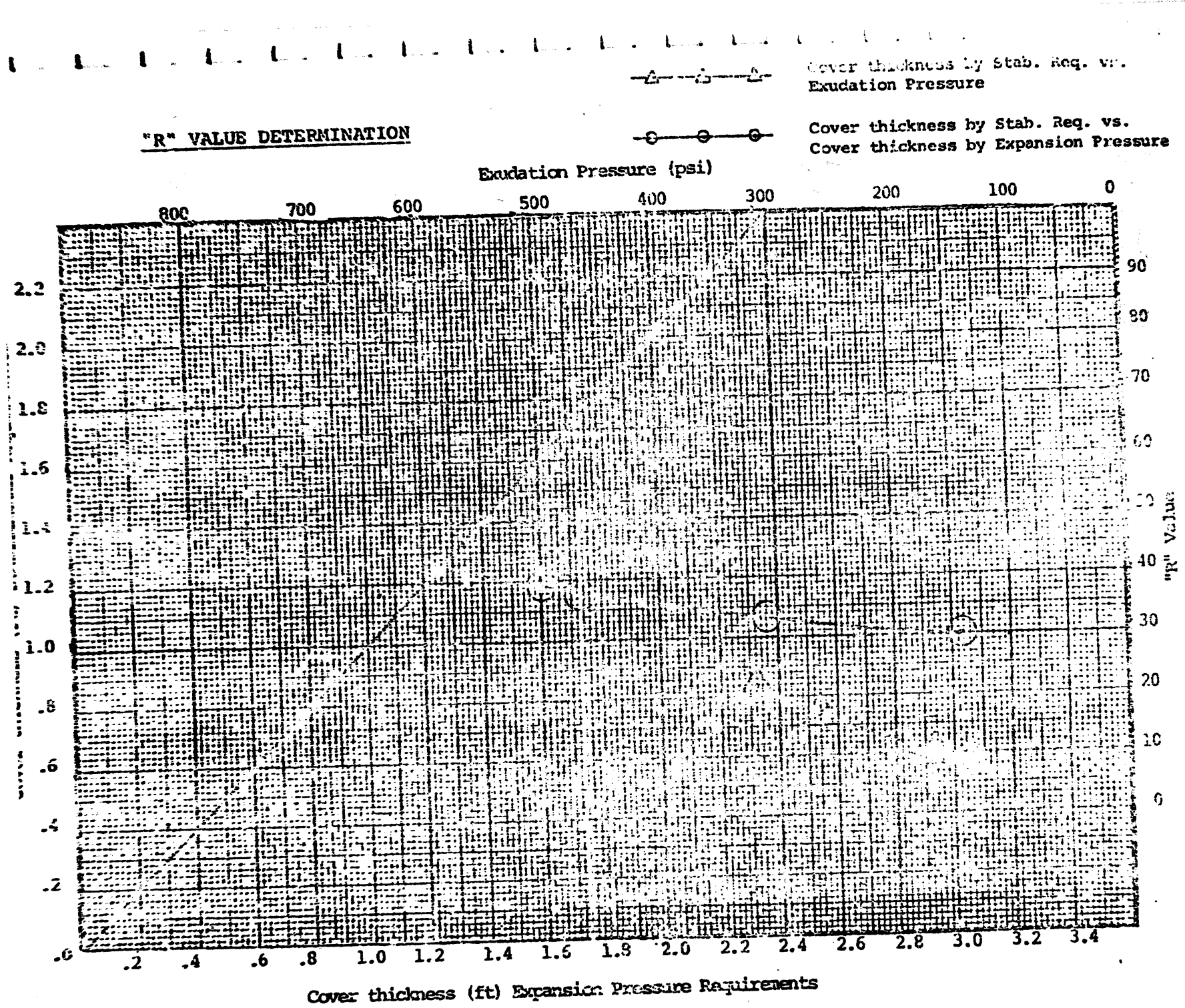
Size	Wt.	% Ret'd.	% Pass'g.
1½			
1			
3/4			
1/2			
3/8			
4			
Total Dry Wt.			

As Used*	Corr. %Pass.	Corr. %Ret.	GM
1½			
1			
3/4			
3/8			
4			
Total Dry Wt.			

Size	Wt.	% Ret.	% Pass.	X % Pass.4	Total % Pass
8					
16					
30					
50					
100					
200					
Dry Wt. #4					

*For R-Value Batching When 10% Rock

PLATE A-9.1


Cover thickness by Stab. Req. vs. Exudation Pressure
Cover thickness by Stab. Req. vs. Cover thickness by Expansion Pressure
"R" VALUE DETERMINATION
Exudation Pressure (psi)
800
700
600
500
400
300
200
100
0
2.2
2.0
1.8
1.6
1.2
1.0
.8
.6
.4
.2
90
80
70
60
40
30
20
10
0
"R" Value
.2
.4
.6
.8
1.0
1.2
1.4
1.6
1.8
2.0
2.2
2.4
2.6
2.8
3.0
3.2
3.4
Cover thickness (ft) Expansion Pressure Requirements

SMITH-EMERY COMPANY

An Independent Commercial Testing Laboratory Established 1916

File No. 8030
Lab No. 0-81-179

Date Received 3/17/81
Date of Report 3/25/81

Type Mat'l. Soil

Project A81064

Charge LE ROY CRANDALL & ASSOC.

Boring No. 6 Depth 1½ - 3½ T.I. 4.0 assumed G.E. 1.0 assumed

"R" VALUE DETERMINATION

Dry Wt. 1068.0

Mold	7	8	9
Water Added (+)	50	70	90
Net Wet Wt.	1250	1220	1290
% Water	17.0	18.9	20.8
Gage Pressure	12	6	4
Gage Pressure (Corr.)	180	90	55
Exudation Press.	365	320	230
Height	2.40	2.51	2.58
Mold Gross Wt.	3117	3132	3128
Mold Tare	2100	2094	2092
Mold Net Wet Wt.	1017	1038	1036
Defl. by Exp. Press.	16	5	0
G. E. by Exp. Press.	0.53	0.17	0
Stab. @ 80 PSI (1000)	54	61	67
Stab. @ 160 PSI (2000)	127	139	148
Turns Displacement	3.95	4.50	5.40
R-Value (Uncorrected)	14	8	3
R-Value (Corrected)	14	8	3
G.E. by Stab.	1.10	1.18	1.24
G.E. by Expan.	0.53	0.17	0
Mold Net Dry Wt.	869	873	868
Dry Density	110.0	105.5	100.8

R-value by exudation pressure 6

R-value by expansion pressure 22

R-value at Equilibrium 6 By: Exud. Exp.

Remarks:

As Received

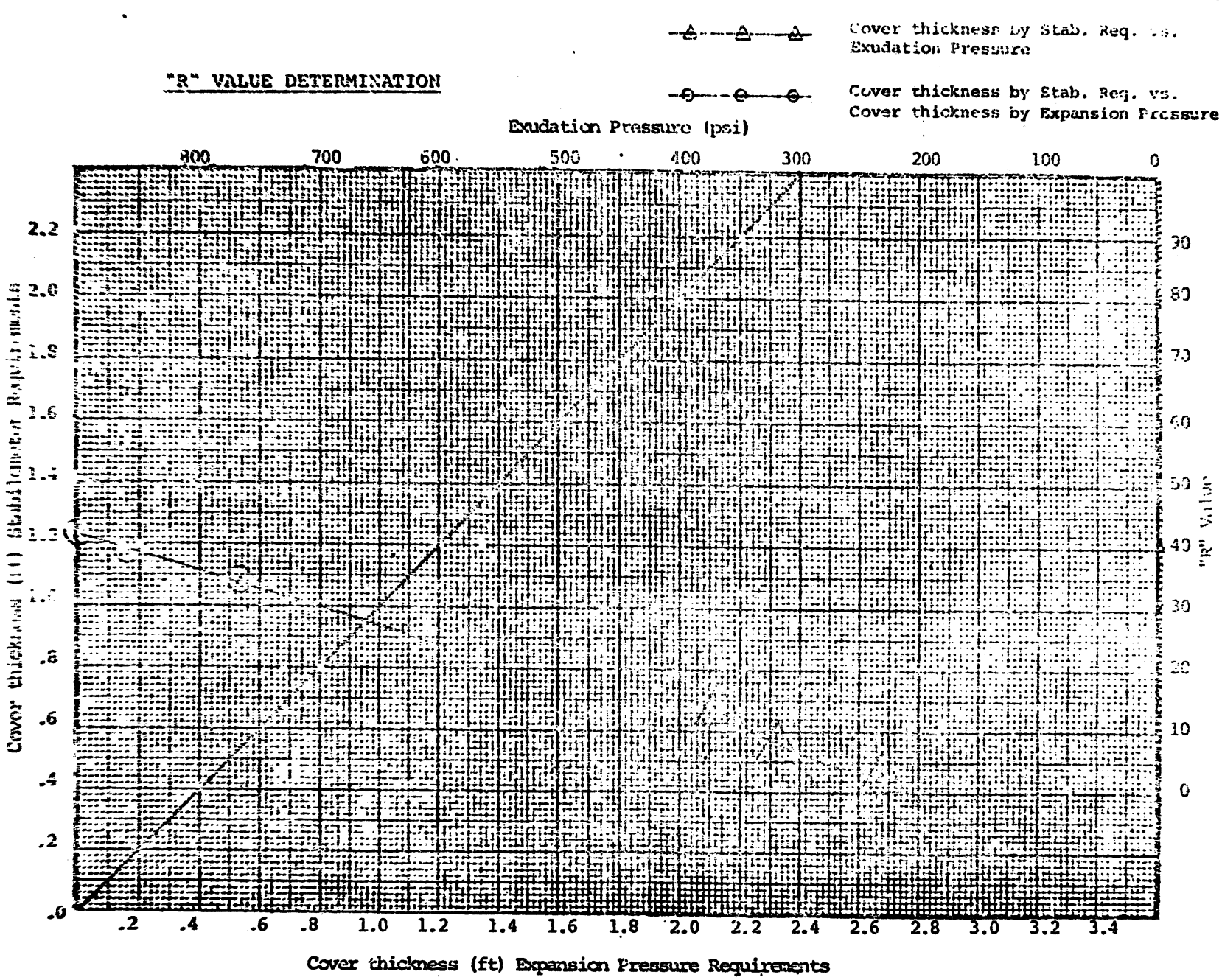
Size	Wt.	% Ret'd.	% Pass'g.
1½			
1			
3/4			
1/2			
3/8			
4			
Total Dry Wt.			

As Used*	Corr. %Pass.	Corr. %Ret.	GM
1½			
1			
3/4			
3/8			
4			
Total Dry Wt.			

Size	Wt.	% Ret.	% Pass.	X % Pass.#	Total % Pass
8					
16					
30					
50					
100					
200					
Dry Wt. #4					

*For R-Value Batching When 10% Rock

PLATE A-9.2


"R" VALUE DETERMINATION
Cover thickness by Stab. Req. vs. Exudation Pressure
Cover thickness by Stab. Req. vs. Cover thickness by Expansion Pressure
Exudation Pressure (psi)
800
700
600
500
400
300
200
100
0
2.2
2.0
.8
.6
.4
.2
.0
30
80
70
60
50
40
30
20
10
0
"R" Value
.2
.4
.6
.8
1.0
1.2
1.4
1.6
1.8
2.0
2.2
2.4
2.6
2.8
3.0
3.2
3.4
Cover thickness (ft) Expansion Pressure Requirements