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TECHNICAL REPORT

INVESTIGATIONS OF DEEP-SEA SEDIMENT CORES

II. MASS PHYSICAL PROPERTIES

ADRIAN F. RICHARDS

OCTOBER 1962

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ABSTRACT

Thirty-five gravity- and piston-type cores were collected by the Hydrographic Office in depths of 400 to 5120 m from 8 different areas in the North Atlantic, Central Pacific, and West Mediterranean Sea. Most cores were composed of terrigenous silt- and clay-size particles. Mass physical property laboratory measurements of more than 700 samples included: grain size, specific gravity of solids, wet unit weight, water content, void ratio, pore-water saturation, liquid and plastic limits, and compressive and/or vane shear strength. Also computed were porosity, liquidity index, plastic index, cohesion, sensitivity, activity, and modulus of elasticity.

Depth in cores generally was found to be directly related to wet unit weight and cohesion, inversely related to measures of water content, and a variable relation to median diameter, sand- and clay-size fraction, and plasticity index. Specific gravity of solids ranged from 2.68 to 2.89, without correction for salt content, and showed a tendency to be directly related to wet unit weight and inversely related to porosity. Wet unit weight ranged from 1.23 to 1.86 g/cm^3 and was inversely related to porosity. All samples, except one, were effectively 100 percent saturated. Water content ranged from 37 to 237 percent dry weight, corresponding to porosities of 51 to 86 percent. Surface porosities averaged by area ranged from 72 to 86 percent. Straight-line relationships between porosity and clay-size fraction and also the logarithm of cohesion are related to relative rates of deposition in the different areas. Liquid limit ranged from 25 to 109 percent and plastic limit from 15 to 46 percent, with most values between, respectively, 50 to 80 percent and 20 to 30 percent. Most samples were highly plastic; extremes of plasticity index were 1.6 and 81. In surface sediments, water content always was greater than liquid limit. Liquidity indices commonly were about 200 percent, with a few values greater than 1,200 percent. Cohesion ranged from 4.2 to 234 g/cm^2 in "undisturbed" samples. The mean of surface cohesion measurements in predominantly terrigenous sediments was about 20 g/cm^2, and in calcareous sediments about 40 g/cm^2. Sensitivities of 1.6 to 26 are reported. Porosity appeared directly related to sensitivity. Activity ranged from 0.06 to 1.7 with most values between 0.25 and 1.25. Moduli of elasticity, computed from compressive strength test measurements, ranged from 0 to 870 g/cm^2.

FOREWORD

This second report on Investigations of Deep-Sea Sediment Cores is a comprehensive study of the laboratory measurements of the mass physical properties of 35 deep-sea sediment cores from various oceanic areas of the world.

Procedures described for marine sediment core analysis are those being used at the U. S. Navy Hydrographic Office.

Results of this study are presented in this report through the cooperation of the Bureau of Public Roads and three establishments within the Navy: the Hydrographic Office, the Bureau of Yards and Docks, and the Navy Electronics Laboratory.

E. C. STEPHAN
Rear Admiral, U. S. Navy
Hydrographer

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CONTENTS

CONTENTS (Cont'd)

APPENDICES

FIGURES

PLATES

PLATES (Cont'd)

PLATES (Cont'd)

TABLES

TABLES (Cont'd)

NOTATION

a_c	activity (PI/clay-size fraction)
B	liquidity index (w-PL/PI)
c	apparent cohesion
C_a	area or Kerf ratio
C_c	compression index
C_i	inside clearance ratio
C_o	outside clearance ratio
D_e	minimum inside diameter of core nose
D_s	minimum inside diameter of core barrel or liner
D_t	outside diameter of core barrel
D_w	maximum outside diameter of core nose
e	void ratio (V_v/V_s)
e_i	initial void ratio
e_f	final void ratio
e_{sat}	void ratio at 100 percent saturation ($G_s w/100$)
G_s	specific gravity of solid particles
G_t	specific gravity of distilled water at temperature t
H	penetration of corer
l	liter
L_g	distance from top of core to core nose cutting edge
LL	liquid limit
Md	median diameter
n	porosity, in percent (V_v/V)
PI	plasticity index (LL-PL)
PL	plastic limit
p	pressure

NOTATION (Cont'd)

P_c	compressive strength
P_f	final pressure
P_i	initial pressure
pcf	pounds per cubic foot
psi	pounds per square inch
R_g	gross recovery ratio
S	percent saturation of void space
S_t	sensitivity (undisturbed strength/remolded strength)
s	shear strength
V	volume of sediment mass
V_s	volume of solid particles
V_v	volume of voids
W_c	weight of sample container
W_s	dry (110°C) weight of solid particles
W_w	weight of water in a given sediment mass
W_1	weight of volumetric flask, sediment, and air-free water
W_2	weight of volumetric flask and air-free water
W_3	weight of sample plus container
w	water content in percent dry (110°C) weight
wc	water content in percent wet weight ($W_s + W_w$)
γ	unit weight
γ_m	wet or mass unit weight of sediment
γ_w	unit weight of water
μ	micron (0.001 mm)
ρ	density
$\bar{\sigma}$	effective stress
ϕ	phi ($-\log_2$ particle diameter in mm) or, angle of shearing resistance
ϕ_{50}	phi median diameter

I. INTRODUCTION AND ACKNOWLEDGMENTS

In a recent book on marine sediments, Shepard (Shepard and others, 1960, p. 3-4) states that there are two principal methods to obtain characteristics of sediments sampled in the field: (1) microscopic and laboratory investigation of the constituents, and (2) physical and geochemical investigation of the constituents, for example, x-ray study, polargraphy, and electron microscopy. I would add an important third method, one that has been largely neglected by marine geologists: (3) physical and chemical properties of the sediment in mass. This paper considers only the mass physical properties of 35 sediment cores collected by the U. S. Navy Hydrographic Office during 1958 and 1959; it is the second in a series of three principal reports on these cores.

The first paper (Richards, 1961, -- hereafter called part one) described and discussed sampling procedure, laboratory preparation of samples for the tests, shear strength related to depth in the cores, and the practical application of shear strength and data derived from laboratory consolidation tests in the computation of bearing capacity and consolidation of sea-floor sediments when overstressed by an applied load. A third paper, in preparation, considers results of measured (laboratory) and computed (sedimentation compression -- Terzaghi, 1941, p. 215) pressure-void ratio relationships, and the influence of overburden pressure on the shear strength.

Soil mechanics terms and symbols in general conform to those published in 1958 by the joint Committee on Glossary of Terms and Definitions in Soil Mechanics of the American Society of Civil Engineers (ASCE) and the American Society for Testing Materials (ASTM). Notation has been presented. All logarithms are to the base ten unless otherwise noted.

Most of the tests reported were performed in the Soil Mechanics Laboratory of the Bureau of Yards and Docks (BUDOCKS) by personnel under the direction of Mr. C. M. Yeomans. Practically all of the size analyses and a few other tests were performed in the oceanographic laboratory of the Hydrographic Office under the direction of Mr. J. H. Recknagel. Clay mineralogy and certain other mineralogical analyses were made in the Physical Research Division of the Bureau of Public Roads under the direction of Mr. E. B. Kinter.

In addition to those persons and organizations previously acknowledged in part one, I wish to thank Messrs. E. B. Kinter and S. Diamond, Bureau of Public Roads, for performing mineralogical analyses. Dr. J. C. Hathaway, U. S. Geological Survey in Denver, reviewed the mineralogy and activity section of this report, made helpful suggestions in light of recent advances in this field, and kindly made available an unpublished report. I am particularly grateful to Mr. G. H. Keller of the

Hydrographic Office for his close cooperation and assistance in nearly all phases of the study after May 1958, and to my colleagues at the Navy Electronics Laboratory for helpful discussions on different aspects of the investigation. I also thank the numerous individuals who helped in the compilation of the data tables, performed typing, and drafted the final illustrations.

The report was written while I was a National Academy of Sciences-National Research Council Postdoctoral Resident Research Associate at the U. S. Navy Electronics Laboratory in San Diego, California.* I am pleased to acknowledge the cheerful support of many persons at the laboratory, especially Dr. E. L. Hamilton, my advisor, for his continued encouragement.

A preliminary draft of this paper was reviewed by Mr. P. P. Brown, Dr. G. H. Curl, Dr. E. L. Hamilton, Mr. G. H. Keller, Dr. R. T. Martin, Mr. D. G. Moore, Dr. G. Shumway, and Mr. C. M. Yeomans, to whom I am appreciative for helpful suggestions.

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* Author is presently a member of the staff of Office of Naval Research Branch Office, American Embassy, London, England.

II. CORE COLLECTION

Thirty-five sediment cores were collected from eight different areas of the continental shelf, continental slope, and deep-sea floor in the North Atlantic Ocean, West Mediterranean Sea, and Central Pacific Ocean (Fig. 1). Relation of cores within each area is shown in Figure 2; geographic coordinates cannot be published at this time.

Table 1 summarizes the equipment used to obtain the cores, sonic depth of water, and pertinent information about each core. The name of the corer refers to the U. S. Hydrographic Office (1955, p. 54-66) model of corers originally designed or described by Kullenberg (1947), Ewing (Heezen, 1952), and Phleger (Phleger and Parker, 1951, p. 3-5). The Hydroplastic corer was developed in the Hydrographic Office for use in this program (Richards, 1960; Richards and Keller, 1961).

The gross recovery ratio (Hvorslev, 1949, p. 100), R_g, listed in Table 1 is related to the distance from the top of the core to the core nose cutting edge, L_g, and the penetration of the corer, H, by

$$R_g = \frac{L_g}{H} \qquad (1)$$

This ratio is assumed to be 100 percent for piston cores. For gravity cores, the gross recovery ratio appears dependent on the clearance and area ratios of the corer (part one). In Table 1, this ratio is based on the extreme condition that core shortening is the same throughout the length of the core and that core penetration equals corer penetration. A further discussion of the problem has been given in part one.

No corrections for core shortening are applied to the data presented. For each and every core, the distance given in tables and graphs is the distance from the top of the core measured in the laboratory.

Hvorslev (1949, p. 105-109) defined ratios affecting performance of corers as

$$C_i = \frac{D_s - D_e}{D_e} \qquad (2)$$

where C_i is the inside clearance ratio that controls inside friction, D_s is the minimum inside diameter of the core barrel or liner, and D_e is the minimum inside diameter of

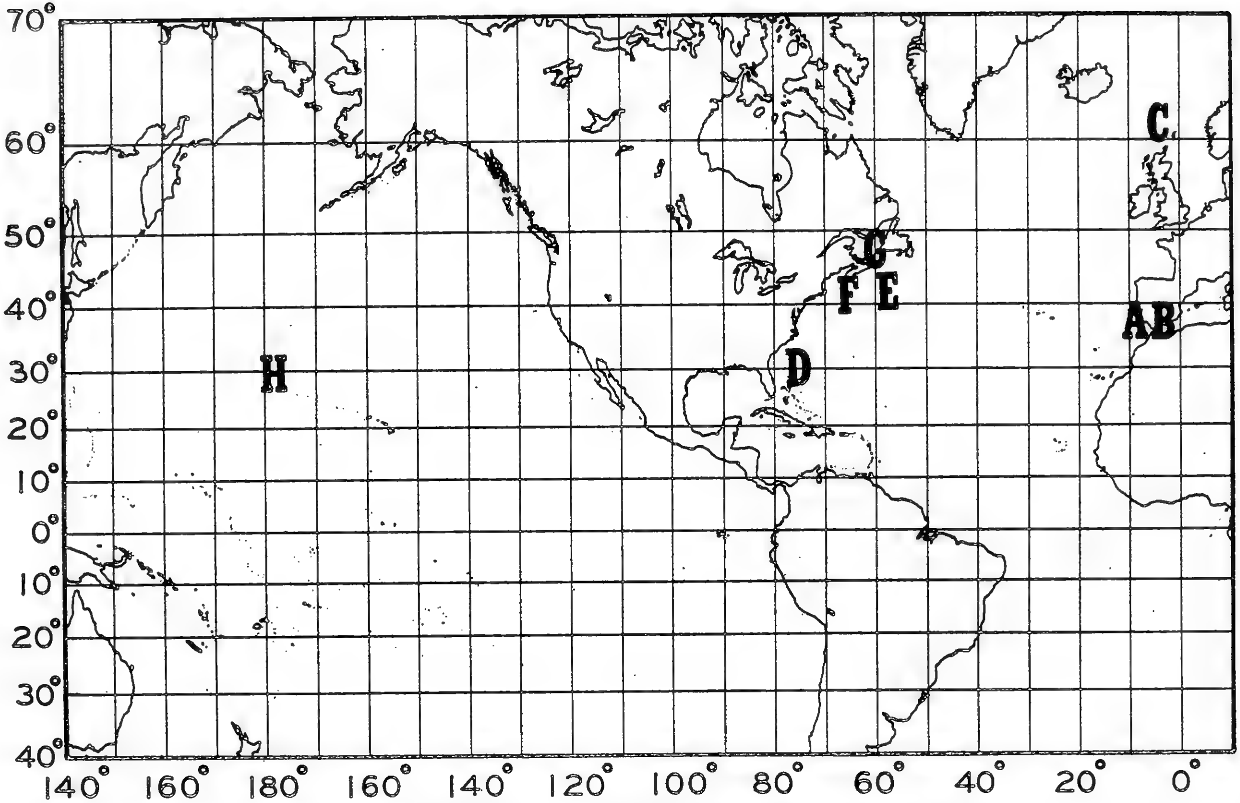

FIGURE 1. LOCATION OF AREAS WHERE CORES WERE COLLECTED

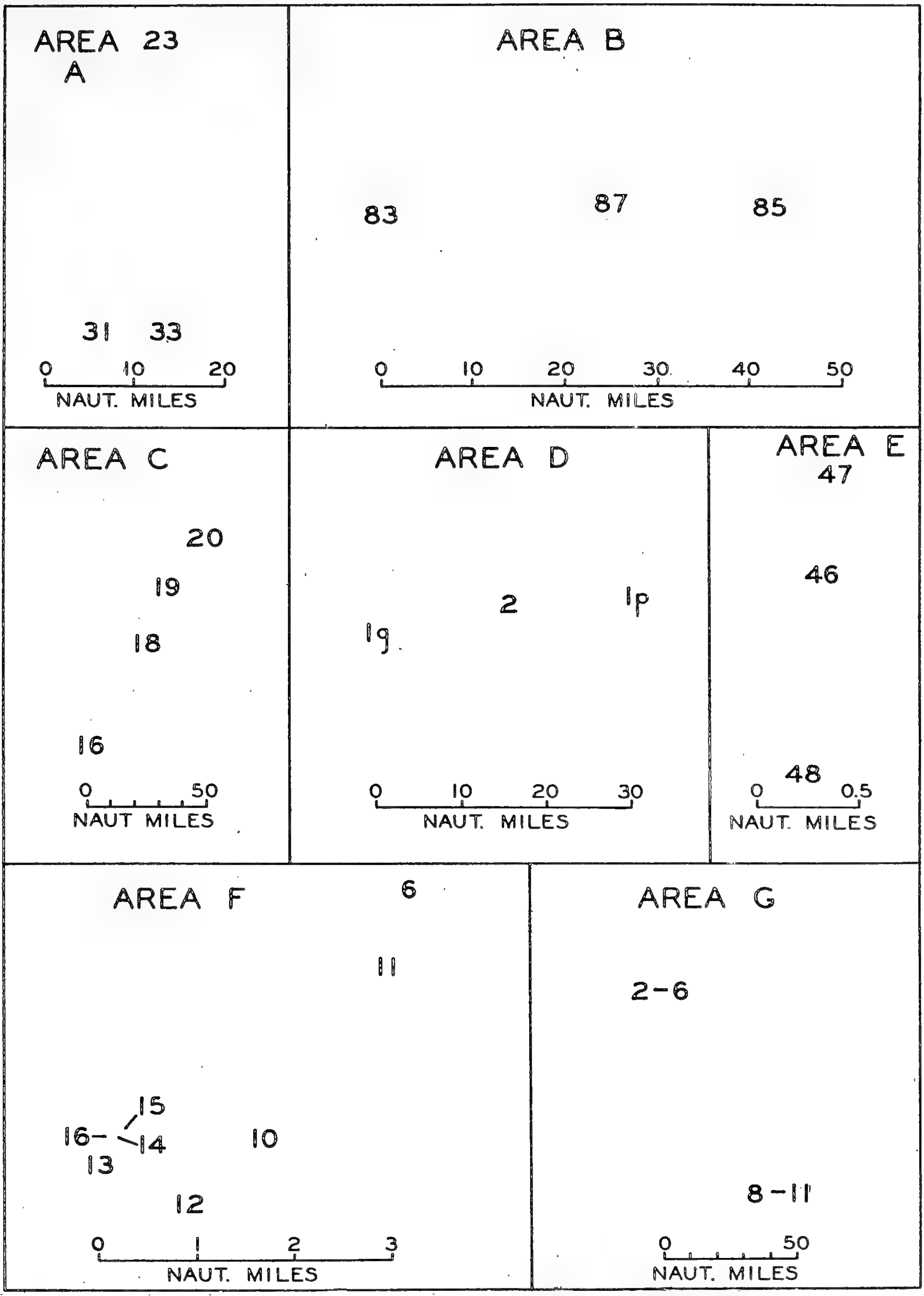

FIGURE 2. RELATION OF CORES WITHIN EACH AREA

TABLE 1. CORE AND CORER SUMMARY

Area	Core (No.)	Approx. Water Depth[1] (m)	Predominant Sediment[2] Type	Core Diameter (cm)	Core Length (cm)	Estimated Penetration (cm)	Gross Recovery Ratio, R_g[3] (%)	Corer Type[3] G = Gravity P = Piston	Inside Clearance Ratio, C_i (%)	Core Nose Outside Clearance Ratio, C_o (%)	Area Ratio, C_a (%)	Collector
A	23	1125	T, clayey silt	4.75	76	150	50	Kullenberg-G	3.6	10.1	105.5	A.F. Richards
	31	400	T, clayey silt	4.75	104	150	68	Kullenberg-G	3.6	10.1	105.5	"
	33	1060	T, silty clay	4.75	97	150	63	Kullenberg-G	3.6	10.1	105.5	"
B	83	1315	T, silty clay & clayey silt	4.75	102	180	57	Kullenberg-G	3.6	10.1	105.5	A.F. Richards
	85	730	T, clayey silt	4.75	79	180	43	Kullenberg-G	3.6	10.1	105.5	"
	87	1125	T, clayey silt	4.75	81	180	44	Kullenberg-G	3.6	10.1	105.5	"
C	16	1115	T, clayey silt	4.75	79	180	100	Kullenberg-P	3.6	10.1	105.5	A.F. Richards
	18	1115	T, clayey silt	4.75	117	170	100	Kullenberg-P	3.6	10.1	105.5	"
	19	1460	T, clayey silt	4.75	76	120	100	Kullenberg-P	3.6	10.1	105.5	"
	20	1610	T, clayey silt	4.75	51	120	100	Kullenberg-P	3.6	10.1	105.5	"
D	1	1240	C&T, clayey silt	2.5	36	75	60	Phleger-G	10.2	0	62.2	S.W. Oliver
	2	2010	C&T, sand-silt-clay	2.5	30	90	33	Phleger-G	10.2	0	62.2	"
	1	2560	C, clayey silt	6.35	511	610	100	Ewing-P	0.6	22.7	84.5	A.F. Richards
E	46	2010	T, clayey silt	4.75	142	180	78	Kullenberg-G	3.6	10.1	105.5	G.H. Knoop, Jr.
	47	2010	T, clayey silt	4.75	157	180	86	Kullenberg-G	3.6	10.1	105.5	"
	48	2195	T, clayey silt	4.75	109	180	60	Kullenberg-G	3.6	10.1	105.5	"

[1] Uncorrected sonic depth. One meter equals 0.547 fathoms or 3.28 U.S. feet.

[2] T = terrigenous source, C = calcareous source, and PC = pelagic clay source of material.

[3] See text.

TABLE 1. CORE AND CORER SUMMARY (Cont'd)

Area	Core (No.)	Approx. Water Depth[1] (m)	Predominant Sediment[2] Type	Core Diameter (cm)	Core Length (cm)	Estimated Penetration (cm)	Gross Recovery Ratio, R_g[3] (%)	Corer Type[3] G = Gravity P = Piston	Inside Clearance Ratio, C_i (%)	Core Nose Outside Clearance Ratio, C_o (%)	Area Ratio, C_a (%)	Collector
F	6	2270	T, clayey silt	8.2	269	280	100	Hydroplastic-G	1.3	13.4	56.3	A.F. Richards
	10	2450	T, clayey silt	4.75	175	180	100	Kullenberg-G	3.6	10.1	105.5	"
	11	2450	T, clayey silt	8.2	152	-	-	Hydroplastic-G	1.3	13.4	56.3	"
	12	2430	T, clayey silt	4.75	168	170	96	Kullenberg-G	3.6	10.1	105.5	"
	13	2415	T, clayey silt	4.75	142	140	100	Kullenberg-G	3.6	10.1	105.5	"
	14	2395	T, silty clay	4.75	173	140	100	Kullenberg-G	3.6	10.1	105.5	"
	15	2415	T, silty clay	4.75	155	120	100	Kullenberg-G	3.6	10.1	105.5	"
	16	2415	T, silty clay	4.75	170	130	100	Kullenberg-G	3.6	10.1	105.5	"
G	2	455	T, silty clay	6.35	557	610	100	Ewing-P	0.6	22.7	84.5	G.H. Keller
	3	455	T, silty clay	8.1	152	400	39	Hydroplastic-G	1.3	13.4	56.3	"
	4	455	T, silty clay	8.1	229	370	100	Hydroplastic-P	1.3	13.4	56.3	"
	5	455	T, silty clay	6.35	1204	1310	100	Ewing-P	0.6	22.7	84.5	"
	6	455	T, silty clay	8.1	152	210	71	Hydroplastic-G	1.3	13.4	56.3	"
	8	455	T, silty clay	8.1	244	300	100	Hydroplastic-P	1.3	13.4	56.3	"
	9	455	T, silty clay	8.1	137	210	64	Hydroplastic-G	1.3	13.4	56.3	"
	10	455	T, silty clay	8.1	81	240	75	Hydroplastic-G	1.3	13.4	56.3	"
	11	455	T, silty clay	8.1	122	210	57	Hydroplastic-G	1.3	13.4	56.3	"
H	12	5120	PC, silty clay	6.35	511	-	100	Ewing-P	0.6	22.7	84.5	R.H. Michel
	13	5120	PC, silty clay	4.75	142	-	-	Kullenberg-G	3.6	10.1	105.5	"

the core nose or core cutter;

$$C_o = \frac{D_w - D_t}{D_t} \tag{3}$$

where C_o is the outside clearance ratio that controls outside friction, D_w is the maximum outside diameter of the core nose, and D_t is the outside diameter of the core barrel; and

$$C_a = \frac{D_w^2 - D_e^2}{D_e^2} \approx \frac{\text{Volume of displaced sediment}}{\text{volume of the sample}} \tag{4}$$

where C_a is the area or Kerf ratio. These ratios, shown in Table 1, are significant, and their application to the cores collected in this program has been discussed in part one, where it was concluded that all cores are, strictly speaking, disturbed samples; those obtained with the Hydroplastic corer appear to be among the least disturbed.

III. SEDIMENT CLASSIFICATION

Index or classification properties of sediments used in this report are derived from measurements of the grain size, water content, liquid limit, and plastic limit; the latter two collectively are called Atterberg limits.

Geologists and civil engineers in the United States commonly use slightly different grain-size scales, respectively the Wentworth (1922) scale and the Massachusetts Institute of Technology or M.I.T. scale developed by Gilboy (Glossop and Skempton, 1945). These scales are compared and the scale used in this paper is given in Table 2. At the Hydrographic Office, the distinction between silts and sands follows Wentworth and is made at 62.5μ or about 4 ϕ units[1]. Clay-size particles are of particular significance in fine-grained sediments and the maximum size of clay minerals (comprising most of the clay-size fraction) appears to be nearer 2 than 4μ according to Grim (1942, p. 229; 1953, p. 1)[2].

TABLE 2. COMPARISON OF GRAIN-SIZE SCALES

	Wentworth Scale		M.I.T. Scale		Scale Used In This Paper	
	microns	phi[1]	microns	phi	microns	phi
Sand	2000 to 62.5	-1 to 4	2000 to 60	-1 to 4.06	2000 to 62.5	-1 to 4
Silt	62.5 to 3.9	4 to 8	60 to 2	4.06 to 9	62.5 to 2	4 to 9
Clay	<3.9	>8	<2	>9	<2	>9

[1]After Krumbein (1936)

Consequently, the M.I.T. silt-clay separation at 2μ or 9 ϕ is preferred (Table 2). Nomenclature (Fig. 3) follows the triangular diagram system devised by Shepard (1954). In Table 1, the modifying prefix to the name of the sediment is based on its predominant source.

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[1]In the phi notation (Krumbein, 1934, p. 76), phi is equal to the negative logarithm to the base two of the diameter in millimeters.

[2]Baver (1940, p. 14-17) relates the development of 2μ as the upper limit for clay. On the other hand, Mielenz and King (1955, p. 213-216) summarize evidence for larger clay-size particles.

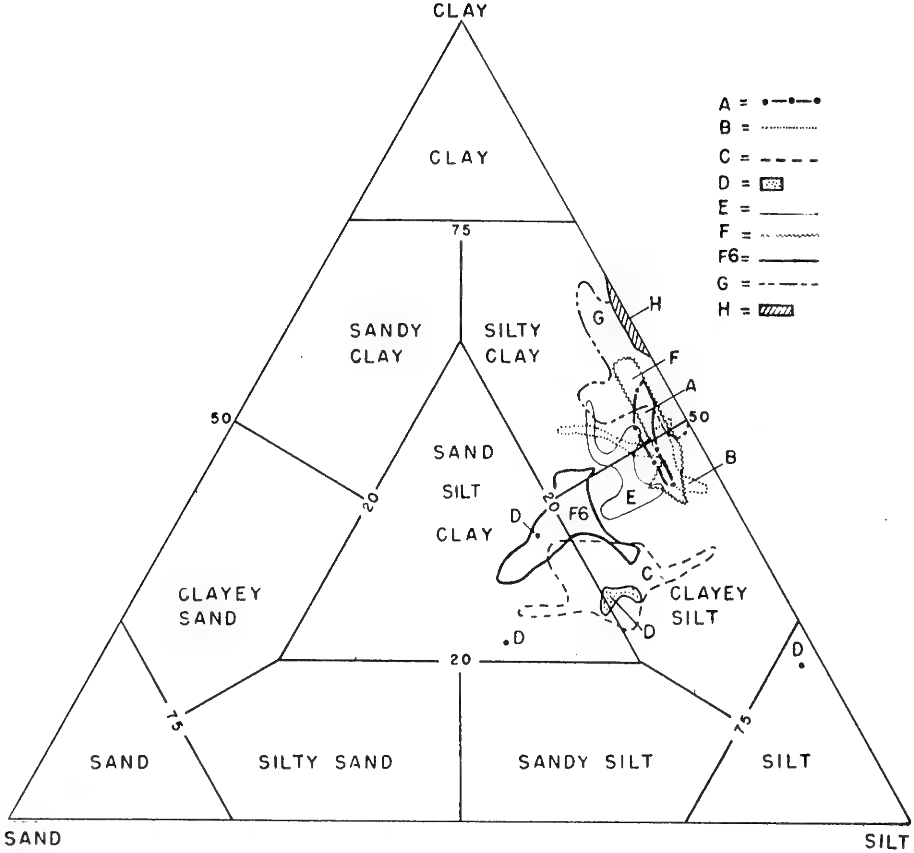

FIGURE 3. NOMENCLATURE OF SEDIMENTS BY AREA. POINTS OUTSIDE OF AREA D INDICATED BY LETTER

Atterberg (1911, p. 20-22) originally defined seven limits of plasticity. Two of his limits, the liquid limit ("Fliessgrenze") and the "roll-out" limit ("Ausrollgrenze")-- now called the plastic limit, were adapted by Terzaghi (1925a, p. 20-29; 1925b, p. 799) for use in soil mechanics. Liquid limit is defined (ASCE) as the water content (in percent of ovendry weight) corresponding to the arbitrary limit between the liquid and plastic states of consistency of a sediment; plastic limit is the water content corresponding to an arbitrary limit between the plastic and semisolid states. The numerical difference between the liquid and plastic limits was called the plasticity number by Atterberg (1911, p. 29-30; 1913, p. 293); it is now known as the plasticity index. Determination of Atterberg limits is discussed later.

A system of classification developed by Casagrande (1948) for application to design and construction of airfields uses a plasticity chart relating plasticity index to liquid limit (Fig. 4). In this chart the A-line represents an important empirical boundary (Casagrande, 1948, p. 919) between typical inorganic clays generally above the line, and plastic sediments containing organic colloids and typical inorganic silts and silty clays below it. The plasticity chart shows two especially interesting relationships that have been emphasized by Terzaghi (1955, p. 564): (1) Atterberg limits of grain-size fractions of ground minerals plot in a straight line roughly parallel to the A-line and may be located above or below the line depending on mineralogical composition, and (2) points representing different samples from a geologically well-defined sedimentary deposit also are located on such a line because of the likelihood of similar mineralogical composition of the clay-size fraction. A corollary of the last statement is that if points representing two members in the plasticity chart are located on different lines then it is almost certain that the sediments have different sources (Terzaghi, 1955, p. 565). Trask and Rolston (1950; 1951, p. 1092) confirmed these relationships for San Francisco Bay sediments. These relationships also are valid for the sediments investigated. All sediments shown in Figure 4, with two exceptions, have a similar depositional environment, despite the wide variation in water depth and geographic location. These sediments are composed of terrigenous material and plot on a line above and parallel to the A-line. One of the two exceptions was the Area D cores, which are of calcareous material, the other was core B 83, which was collected farthest from land and probably consists of mixed terrigenous material and deep-sea (Foraminifera) ooze; samples from core B 83 plot as points on and below the A-line between liquid limits of 50 and 60 percent. The marked difference in liquid limit and plasticity index of Area D gravity cores 1 and 2 (very low plasticity index) and piston core 1 (high plasticity index) probably results from the greater proportion of sand-size material in the gravity cores. It is noteworthy that samples from the calcareous D 1p core, although plotting above the A-line, fall on a dissimilar slope compared to those samples having a terrigenous origin. The sediments in Area F with low liquid limit are exclusively from core 6 and have different physical properties compared to other cores from the same area (see Fig. 3).

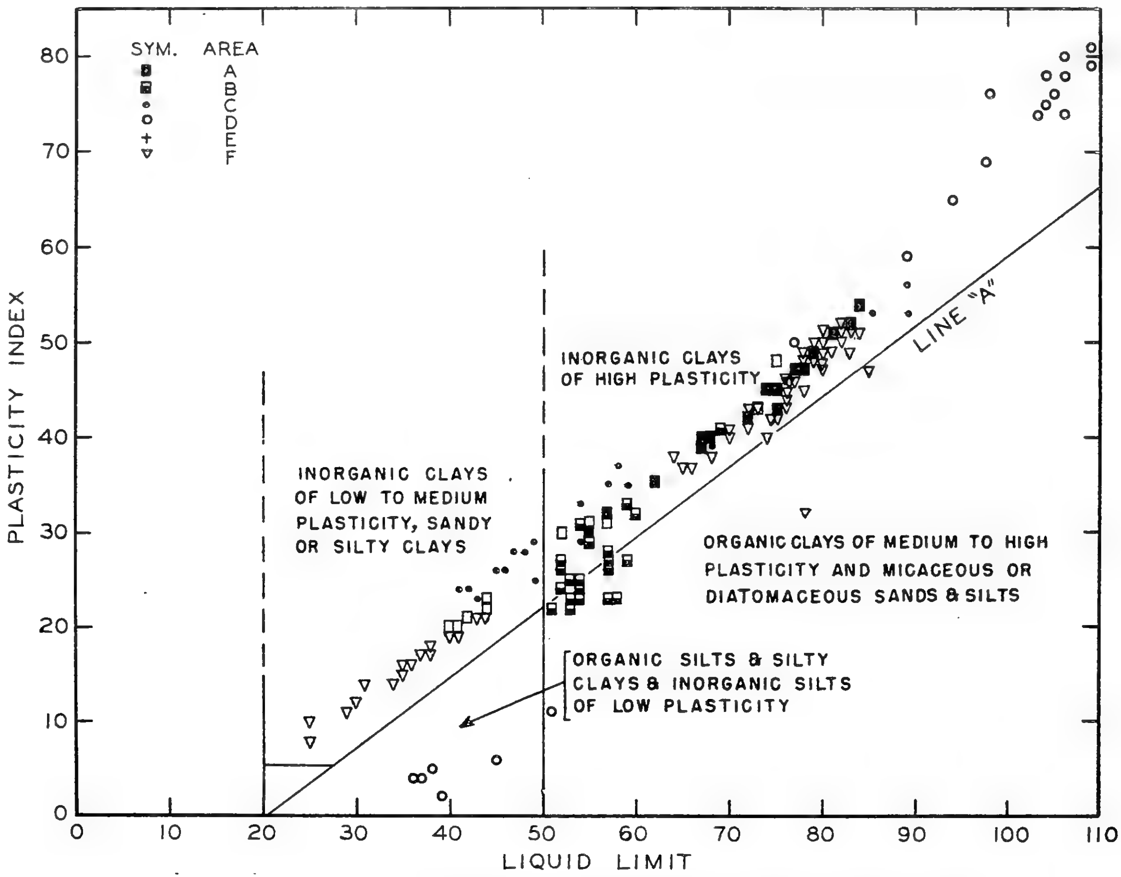

FIGURE 4. PLASTICITY CHART. THE A-LINE IS AN EMPIRICAL BOUNDARY, SEE TEXT FOR DISCUSSION

In conclusion, the use of a plasticity chart appears to provide rapid identification of similar and dissimilar depositional environments. It has been suggested (Richards, 1959) that use of a plasticity chart together with a triangular diagram provides a more satisfactory basis of marine cohesive sediment classification than by using grain size alone.

IV. MASS PROPERTIES

A. INTRODUCTION

Mass physical and classification properties of more than 700 samples from 35 cores were determined in the laboratory. The tests included measurement of: (1) grain size, (2) specific gravity of solids, (3) wet unit weight, (4) water content, (5) degree of pore space water saturation, (6) liquid and plastic limits, (7) void ratio, and (8) compressive and/or vane shear strength. From these measurements the following properties were computed: (1) percentage of sand-, silt-, and clay-size particles, (2) grain median diameter, (3) void ratio at 100 percent saturation, (4) porosity, (5) liquidity index, (6) plasticity index, (7) cohesion, (8) sensitivity, (9) activity, and (10) modulus of elasticity. The mineralogy of a few samples also was investigated.

A unit volume of any deep-sea sediment, in simple terms following the conception of Rosenqvist (1955, p. 3), may be considered a two-phase system consisting of: inorganic and organic particulate matter, principally mineral grains and skeletons of small plants and animals, and water containing soluble salts. It was not feasible to determine the quantity of salt (loosely-speaking salinity) of the interstitial water in the laboratory program, and no salt corrections have been applied. Computation of percentage of water saturation shows that the void space of samples tested can be considered 100 percent saturated with water. Consequently, water content is expressed as porosity or the volumetric weight of water. Organic content was low and gas, when it existed, was considered a negligible quantity.

Parameters measured in the laboratory are related to the measured distance below the top of each core. The length of each sample tested is graphically shown in Plates I through XXXV by a vertical line. Mid-points of sample lines are connected to show the profile, except for specific gravity where minor variations with depth would be obscured. In the plates, the abbreviations pcf and psi respectively indicate pounds per cubic foot and pounds per square inch; explanation of symbols is given in text and under notation; unless specified, all cohesions were computed from compressive strength tests. The pattern for showing the percentage of sand-, silt-, and clay-size fraction closely follows a standard soil mechanics representation (Anonymous, 1960).

B. GRAIN SIZE

Procedure -- Most samples were mechanically analyzed in the Hydrographic Office Laboratory using the following method. A 25 g representative sample having a natural water content was placed in a beaker of water and stirred by hand. The resulting suspension then was poured into a milkshake container and mechanically mixed for 15 minutes. The sample next was wet sieved in a U. S. Standard 230 mesh (4 phi) sieve. The size fraction coarser than 4 ϕ was ovendried and then sieved again for 15 minutes using a nest of sieves (openings: 2 mm, 1 mm, 0.5 mm, 250μ, 125μ, and 62.5μ) in an American Instrument shaker. The size fraction finer than 4 ϕ was placed in a cylinder of water or a solution of either sodium hexametaphosphate or sodium metaphosphate (10 g/l), and allowed to stand for several hours. Usually the samples in a pipette analysis, which in general follows the procedure of Krumbein and Pettijohn (1938, p. 166-172), were selected only at settlement times corresponding to 4, 6, and 9 phi. A pipette analysis was not made if the sample contained 85 percent or more sand-size material. Results of the grain-size analysis were graphed to show a cumulative frequency distribution by weight, from which the phi median diameter, ϕ_{50}, was selected. The few grain-size analyses made in the BUDOCKS Soil Laboratory in general follow ASTM designation D422-54T (ASTM, 1958, p. 1119-1129), except that the sample was not dried prior to testing. Several identical test samples were processed by each laboratory for a check of accuracy and precision; differences in the percentage of sand, silt, clay, and median diameter of the samples were negligible.

Practically all of the samples analyzed were sufficiently fine grained to make the 75th or 84th percentiles unobtainable by 9 ϕ. Consequently, it was impossible to compute either the Trask (1932, p. 70-72) sorting coefficient or the phi deviation measure of Inman (1952). In some instances, even the 50th percentile had to be estimated from an extrapolation of the cumulative curve. Converting phi units to microns was facilitated using a conversion table (Page, 1955).

Results -- Cores from Areas C and D and core F 6 were predominantly composed of clayey silt-size particles with more than 10 percent sand-size material (Fig. 3). Cores from Areas A, B, E, and F were predominantly composed of both silty clay- and clayey silt-size particles with less than 10 percent sand-size material. Area G and H cores almost entirely consisted of silty clay with less than 5 percent sand-size grains.

The correlation between porosity and grain median diameter is shown as a band with an eye-fitted mean line when void ratio[3] is related to median diameter in phi units (Fig. 5). This relationship is much less obvious when porosity instead of void ratio is related to grain median diameter, and when samples from other areas (Shumway, 1960; Sutton and others, 1957; and Trask, 1953) also are plotted (Fig. 6). (In converting water contents to porosity -- Table 16 in Trask 1953, a grain density of 2.7 was assumed; a density of 2.6 instead of 2.7 will change the porosity less than one percent). The range of values shown suggests that when more figures(such as shown in a

[3]Ratio of volume of voids to the volume of solids.

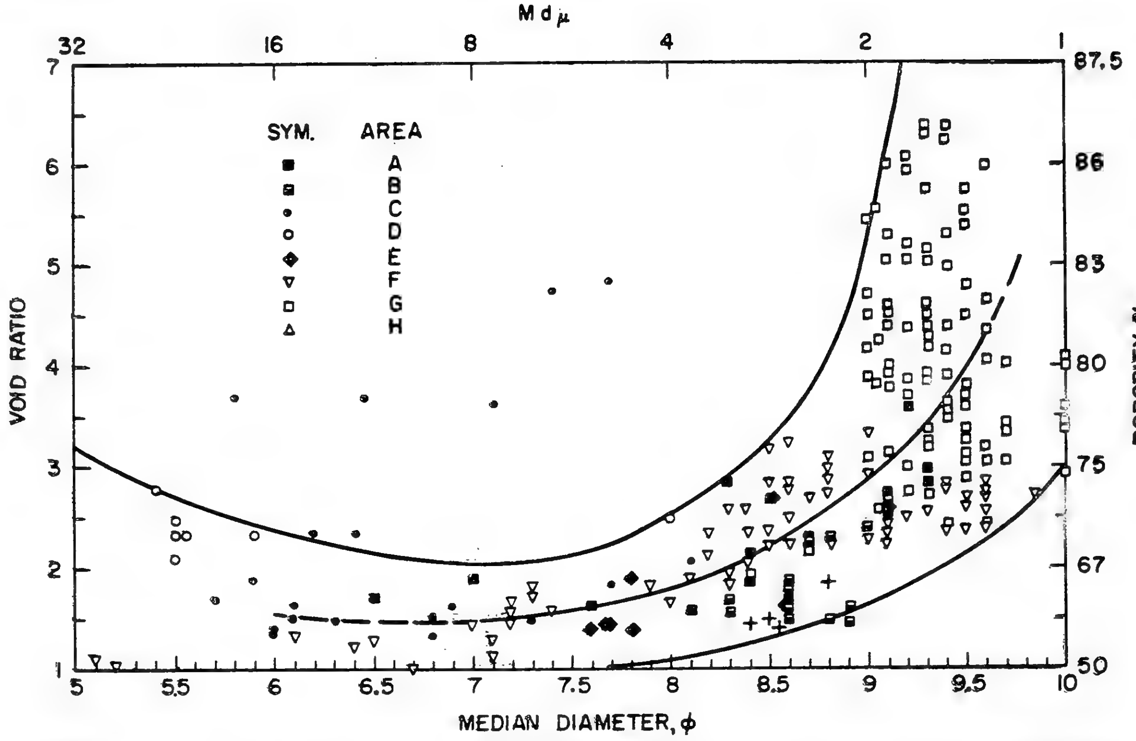

FIGURE 5. RELATION OF VOID RATIO TO MEDIAN DIAMETER. (AN EYE-FITTED CORRELATION LINE IS SHOWN BETWEEN TWO LINES DENOTING GENERALIZED LIMITS)

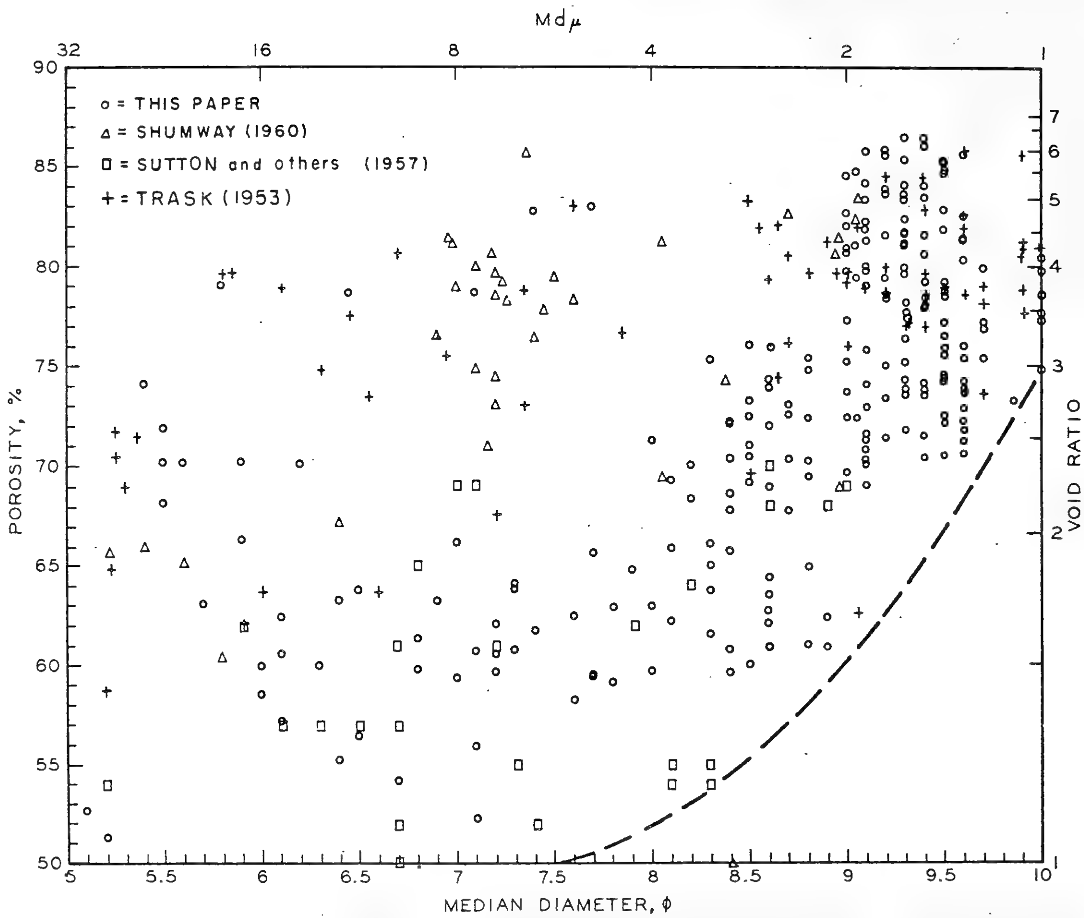

FIGURE 6. RELATION OF POROSITY TO MEDIAN DIAMETER. (THE DASHED LINE REPRESENTS A GENERALIZED LIMIT)

band by Emery, 1960, Fig. 210) are plotted the only clear relationship remaining will be that fine-grained sediments ($Md_{\phi} > 7.5$) do not have very low porosities, as indicated by the empirical dashed boundary line extending from 7.5 ϕ to 75 percent porosity in Figure 6.

Discussion -- Particle size is inversely related to particle surface area and to interstitial water content. This relation is graphically shown in Figure 5 and also in Figure 9, which will be discussed later.

C. SPECIFIC GRAVITY OF SOLIDS

Procedure -- Most samples were analyzed in the BUDOCKS Laboratory following ASTM test designation D 854-58 (ASTM, 1958, p. 1149-1151); the same procedure was used on those samples analyzed at the Hydrographic Office. Briefly, a 25 g sample was ovendried at 110°C overnight, cooled in a desiccator, weighed, and placed in distilled water. Entrapped air was removed by subjecting the sample in a volumetric flask to a partial vacuum. Afterwards, the flask was filled with air-free distilled water and then reweighed. Specific gravity of solids, G_s, was determined from

$$G_s = \frac{W_s \; G_t}{W_s - W_1 + W_2} \tag{5}$$

where W_s is the dry weight of solid particles, G_t is the specific gravity of distilled water at temperature t, W_1 is the weight of the volumetric flask, sediment, and air-free water, and W_2 is the weight of the volumetric flask and air-free water. Values reported are based on a water temperature of 20°C.

Corrections for salt content in the specific gravities were not made. A discussion of salt corrections is given in Appendix A.

Although earlier it was stated that all samples were entirely water saturated, when boiling off entrapped air an occasional sample was observed to liberate gas after all the air presumably had been expelled. Neither quantity or quality of gas was determined; the amount is considered less than 5 percent of the degree of saturation and of little importance.

Results -- Specific gravities of solids of nearly 500 samples (Fig. 7) fall between the limits of 2.68 and 2.89. The bulk of sample values are between 2.72 and 2.82. An approximate average for all samples is about 2.76 to 2.77. There is a tendency for specific gravities to be inversely related to the porosity, or water content, and

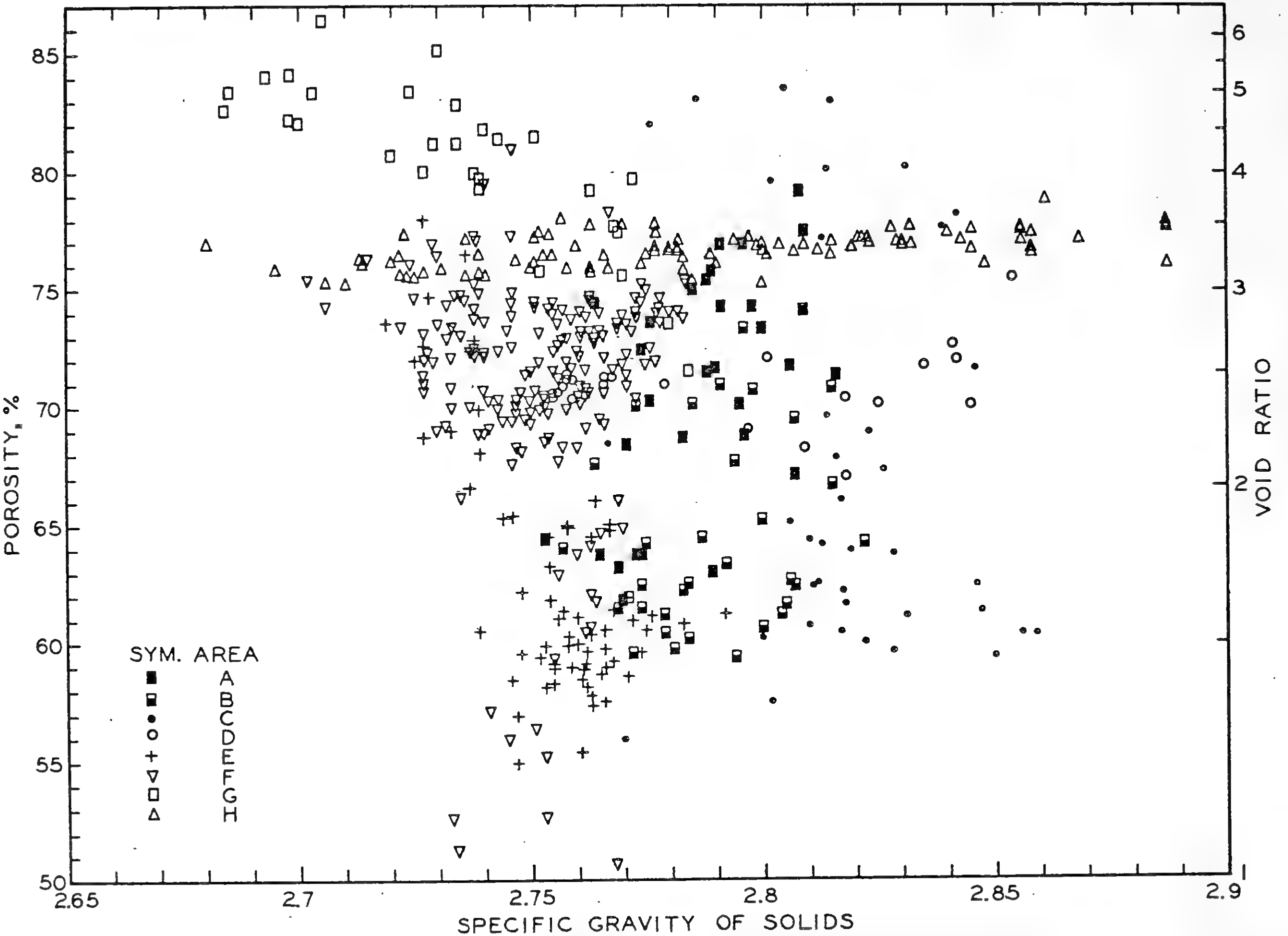

FIGURE 7. RELATION OF POROSITY TO SPECIFIC GRAVITY OF SOLIDS

directly related to the wet unit weight (Fig. 8). A particularly clear example is shown in the graph of core F 6, Plate XVII. At a depth of 208 to 248 cm (82 to 90 in), the sand-size fraction decreases from about 37 to 25 percent. Particle specific gravity decreases from a normal value of about 2.76 to 2.73 over this interval.

Discussion -- Few comparative values of the specific gravities of solids of deep-sea sediments are available. Sykes (1960, p. 31) measured specific gravities, which were not corrected for salt content, ranging from 2.78 to 2.83 in clay-size sediments.

D. WET UNIT WEIGHT

Procedure -- It is appropriate to first remark that the term density as used in physics rarely is used by soil engineers. Density, ρ, is defined as mass per unit volume, while in soil mechanics unit weight, γ, is defined as weight per unit volume. The two terms are related by equating unit weight to the product of density and the acceleration of gravity, g, ($\gamma = \rho g$). The reader is referred to soil mechanics texts (for example, Hough, 1957, p. 27; Spangler, 1960, p. 55) for further discussion.

Wet or mass unit weight, γ_m, is defined as the weight per unit of total volume of sediment mass, irrespective of the degree of saturation (ASCE), or

$$\gamma_m = \frac{W_3 - W_c}{V} \qquad (6)$$

where W_3 is the weight of the sample plus container, W_c is the weight of the container alone, and V is the volume of sediment in the container. The degree or percentage of saturation is the ratio of the volume of water in a given sediment mass to the total volume of intergranular space or voids (ASCE); its determination is given by equation 16. Although wet unit weight is semantically correct, all samples at the time of test were sufficiently close to 100 percent saturation to permit the use of the term saturated unit weight, which represents the in-place unit weight or bulk density. Values are reproducible only to 0.1 because of the difficulty in eliminating very small voids between the sample and cylinder wall with consequent loss of precision in the volumetric measurement.

Results -- Values of wet unit weight range from a maximum of 1.86 g/cm^3 at 50.35 percent porosity in Area F to a minimum of 1.23 g/cm^3 at 86.4 percent porosity in Area G.

The straight-line relationship of wet unit weight to porosity (Fig. 8) previously has been shown by Hamilton and Menard (1956, p. 760) and Nafe and Drake (1957, p. 542),

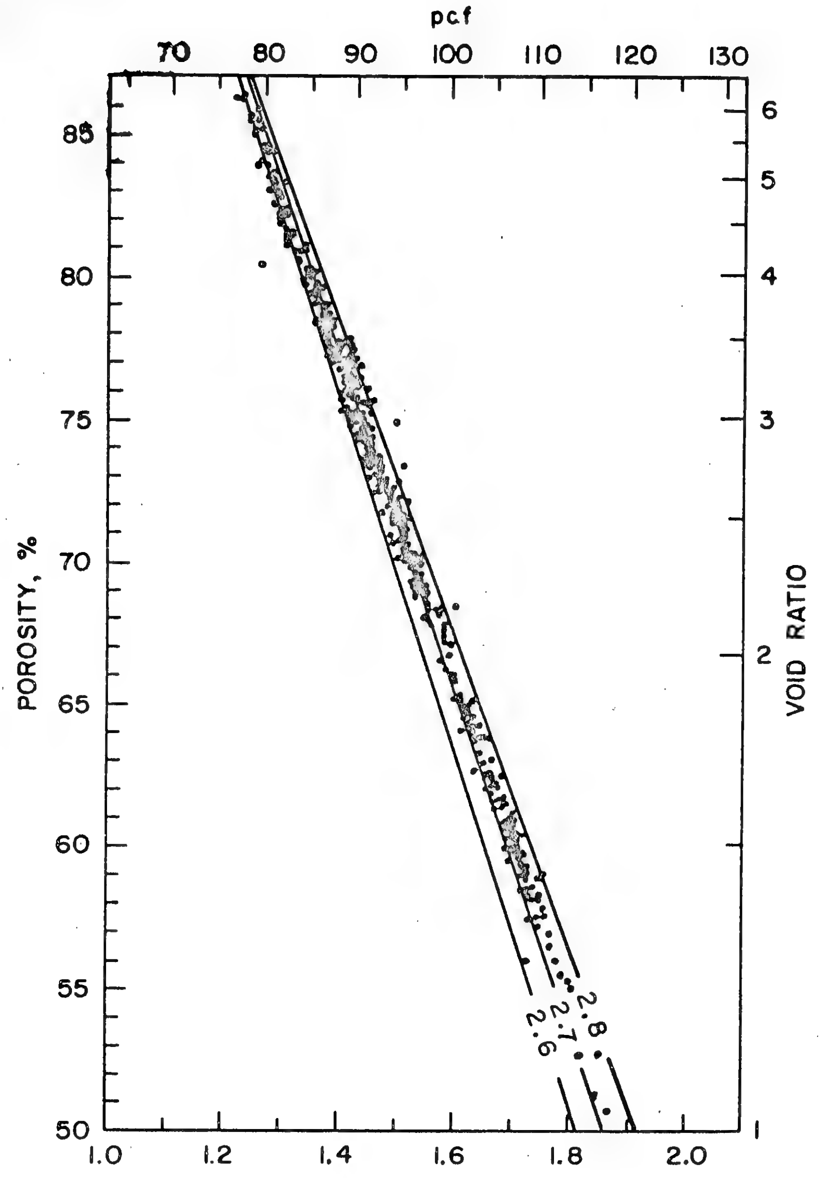

FIGURE 8. RELATION OF POROSITY TO WET UNIT WEIGHT. (SEE TEXT FOR EXPLANATION OF LINES LABELED 2.6, 2.7, and 2.8)

but with fewer data. In Figure 8, lines of equal specific gravity (2.8, 2.7, 2.6) meet at 100 percent porosity and 1.03 g/cm^3, the unit weight of sea water; at zero porosity specific gravity equals unit weight.

Discussion -- Ratcliffe (1960, p. 1538) reports quite a different relationship. His wet density-water content (in percent wet weight) line (Ratcliffe, Fig. 4) intersects zero water content (zero porosity) at about 2.1 g/cm^3, and at 1.03 g/cm^3 a water content of about 82 percent is indicated, which corresponds to a porosity of only 91 or 92 percent depending on whether 2.1 or 2.35 g/cm^3 is used for the particle density. Ratcliffe's data indicate abnormally low water contents, suggesting that the sediment tested was desiccated. Alternatively, a different test procedure may account for different values. The likelihood of this second possibility is increased with reference to wet unit weights and water contents of selected samples presented by von Herzen and Maxwell (1959, p. 1562), whose values fall to the left (low water content) of the 2.6 particle specific gravity straight line in Figure 8.

E. WATER CONTENT

Introduction -- Water content, w, used herein is the ratio, in percent, of the weight of water in a given sediment mass, W_w, to the weight of the ovendry solid particles, W_s (ASCE). It is determined by weighing a representative portion of the sample, ovendrying at 110°C overnight, cooling in a desiccator, and reweighing.

Lambe (1950, p. 494-495; 1951, p. 10-12) demonstrated that variations of temperature in different locations in non-heat distributing "constant-temperature" ovens may exceed 100°C; and that variations in the amount of water driven off at any given temperature are greatest in fine-grained sediments having a high colloid content. Investigators would do well to follow the example of Correns (1937, p. 38) and specify the percentage deviation from 105° or 110°C whenever possible. Temperature variations of 0° to -41° from 110°C were found in the BUDOCKS oven by C. M. Yeomans (1961, written communication), corresponding to a precision of water content measurement of about one percentage point. Although reproducibility may be less than indicated by the number of significant figures given in this report, these figures are retained following engineering convention.

Corrections have not been made for salt content; values of water content consequently are slightly low.

In addition to water content (also called moisture content), previously defined as

$$w = \frac{W_w}{W_s} \times 100, \tag{7}$$

two other measures commonly are employed. Geologists often use

$$wc = \frac{W_w}{W_s + W_w} \times 100 \qquad (8)$$

where wc is the water content expressed as a percentage of the total wet weight ($W_s + W_w$) of the sediment sample; a useful conversion is

$$w = \frac{100\,wc}{100 - wc} . \qquad (9)$$

The third measure, particularly applicable to water-saturated sediments, is the void ratio, e, which is the ratio of the volume of void space, V_v, to the volume of solid particles, V_s, in a given sediment mass (ASCE), or

$$e = \frac{V_v}{V_s} . \qquad (10)$$

Void ratio is determined in the laboratory from

$$e = \frac{G_s \gamma_w V}{W_s} - 1 . \qquad (11)$$

where γ_w is the unit weight of water.

In Appendix B tables, void ratio also is recomputed at 100 percent saturation from the equation

$$e_{sat.} = \frac{G_s\,w}{100} . \qquad (12)$$

Porosity, n, is the ratio in percentage of the volume of voids in a given mass, V_v, to the total volume of the sediment mass, V (ASCE), or

$$n = \frac{V_v}{V} \times 100 . \qquad (13)$$

In this report, porosity was computed from the measured void ratio using the relationship

$$n = \frac{e}{1 + e} \times 100 . \tag{14}$$

This ratio is little affected by minor numerical differences in the degree of saturation. At 100 percent saturation, water content is related to the volumetric weight or porosity (in percent) by

$$w = \frac{n}{(100 - n)\, G_s} \times 100 . \tag{15}$$

The percent or degree of saturation, S, is computed from

$$S = \frac{W_w}{\gamma_w \left(V - \dfrac{W_s}{G_s \gamma_w} \right)} \tag{16}$$

where $V - W_s/(G_s \gamma_w)$ is the volume of voids, V_v.

In Appendix B tables, saturation occasionally is shown exceeding 100 percent by a plus sign. This impossibility results from analytical errors.

It should be readily apparent that in order for values of water content to be significant the percent saturation must be stated. All too often marine geologists have assumed that water loss from cored samples is low or nil. As shown by Keller and others (1961), certain methods of sealing plastic core liners are inadequate to prevent water loss. Furthermore, even if the degree of saturation of the in-place sediment is close to, or at 100 percent, when the external hydrostatic pressure is removed, gas may be released from the water and expand the sample (Terzaghi, 1955, p. 560). If percent saturation were determined at the time water content was measured and published together with water content values, there would be no need for assumption or uncertainty by others in the use of the data.

As an expression of saturated water content, the use of void ratio, which has a constant denominator and a variable numerator, is technically preferable to porosity where both denominator and numerator are variables. Although void ratio is a more sensitive measure at high water contents, porosity is related to other parameters in this paper so that values can be compared directly to results obtained by other geologists.

It is a well known fact that water content in marine sediments may vary with depth of burial; an inverse relationship is most common. It is less well known that the length of the core sample measured affects this relationship to some extent; as the sample size increases, variations in water content may be reduced or entirely concealed. An experiment to investigate the effect of sample length in core G 5 is described by Richards and Keller (1962). They concluded that within a 10 cm (4 in) sample length of relatively homogeneous sediment, variations of water content were less than ±4 percent from the 10 cm value when sand layers of small thickness were absent. Actual variations in the upper 215 cm of core G 5 are shown in Figure 9.

Results -- The least water content measured was 50.7 percent porosity in core F 6, and the maximum 85.7 percent in core G 3. Surface porosities ranged between 56.0 percent, core C 16, and 86.5 percent, core G 2 (Table 3); the latter value was computed from equations 12 and 14 with an assumed particle specific gravity of 2.73. Average surface porosities by area are given in Table 3; they range from 71.6 percent in Area B to 85.5 percent in Area G.

Porosity in general is inversely related to depth in all cores, except those from Area F; cores from Area H and D 1p show only a very slight decrease of porosity with increasing depth. The porosity profile in core F 6 is variable with depth. In the remaining Area F cores, the porosity profile decreases down to an intermediate depth and then increases to the bottom of the core. At an unknown greater depth, an inverse relation presumably again is established. The reason for the change appears to be related to the decrease in the percentage of the clay-size fraction at mid-depth and the resulting increase in particle median diameter.

Relation of porosity to most other parameters is considered elsewhere in this report. Porosity also is directly related to percentage of the clay-size fraction (Fig. 10).

Discussion -- The fine-grained fraction in marine sediments usually is predominantly composed of minerals, particularly the platy clay minerals and/or skeletons of micro-organisms. An inverse relation of mineral particle size to surface area is well known; however, that skeletal remains of micro-organisms, particularly diatoms, have large surface areas is somewhat less well known. Electron photomicrographs of siliceous diatom shells by Helmcke (1951) and Helmcke and Krieger (1951, 1952) show that the surface area of diatoms is enormous. In a clay-mineral investigation of selected Area C samples, J. C. Hathaway (report in preparation) determined the amount of skeletal remains of diatoms, coccoliths, and other micro-organisms by electron microscopy of the fine silt- and clay-size fraction. He found that the high water contents of these samples correlated with large concentrations of skeletal remains. In samples possessing essentially identical clay mineralogy, water content appears more closely related to

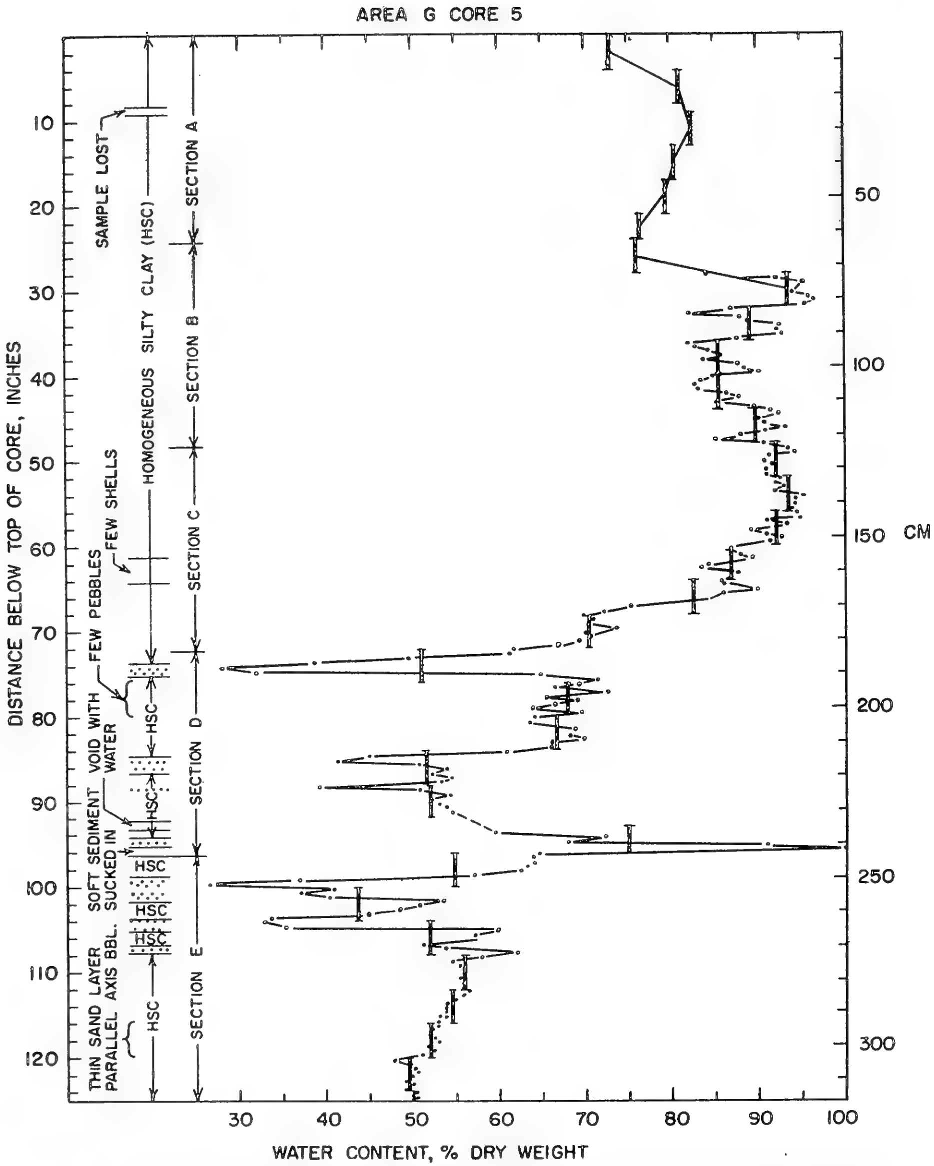

FIGURE 9. RELATION OF DEPTH IN CORE TO WATER CONTENT FOR CLOSE INTERVAL SAMPLING OF PISTON CORE G 5. (EACH DOT REPRESENTS ONE SAMPLE 0.5 INCHES LONG. AFTER RICHARDS AND KELLER (1962))

TABLE 3. SUMMARY OF SURFACE WATER CONTENT

Core	Sample (cm)	Water Content (% dry wt)	Porosity (%)	Porosity Area Average[1] (%)	Void Ratio[2] (100% sat)	Clay-size Fraction[3] (%)
A 23	0-5	125.42	78.4		3.500	--
A 31	0-5	116.10	77.0		3.246	43
A 33	0-5	135.07	79.2	78.2	3.793	53
B 83	0-5	84.13	70.8		2.354	47
B 85	0-5	95.03	73.0		2.657	50
B 87	0-5	83.79	70.9	71.6	2.359	47
C 16	0-5	41.6	56.0		1.152	34
C 18	0-5	64.31	65.2		1.804	26
C 19	0-5	161.69	82.0		4.488	33
C 20	0-5	173.57	83.1	71.8	4.836	35
D 1g	0-5	107.77	75.5		3.076	26
D 2	0-5	91.13	72.1	73.8	2.553	35
D 1p	11.5-23	87.01	70.7		2.398	ca20*
E 46	0-5	119.91	76.5		3.281	40*
E 47	0-5	113.46	75.8		3.093	52*
E 48	0-5	128.81	77.9	76.7	3.513	45*
F 6	0-11.5	48.67	57.2[4]		1.334	30*
F 10	0-5	113.25	75.5		3.060	47*
F 11	0-10	111.24	75.4		3.096	48*
F 12	0-5	140.54	79.5		3.851	46*
F 13	0-6.5	127.29	--		--	--
F 14	8-13.5	116.37	75.0		3.039	48*

[1] Excluding values not including surface.

[2] Values with only 3 significant figures are computed from assumed values of specific gravity of solid particles.

[3] Based on 0-15 cm average unless asterisk indicated, in which event see the appropriate table in Appendix B.

[4] Not included in Area F average.

TABLE 3. SUMMARY OF SURFACE WATER CONTENT (Cont'd)

Core	Sample (cm)	Water Content (% dry wt)	Porosity (%)	Porosity Area Average[1] (%)	Void Ratio[2] (100% sat)	Clay-size Fraction[3] (%)
F 15	0-5.5	121.94	77.3		3.339	50*
F 16	0-5	156.52	81.0	77.7	4.298	48*
G 2	0-10	232.28	86.5		6.33	59*
G 3	0-10	235.22	86.4		6.363	59*
G 4	0-10	226.30	86.3		6.25	58*
G 5	0-10	73.08	--		--	--
G 6	0-10	236.90	86.4		6.35	55*
G 8	0-10	206.70	84.7		5.56	55*
G 9	0-10	202.20	84.7		5.54	51*
G 10	0-10	184.00	83.6		5.04	51*
G 11	0-10	136.30	--	85.5	--	--
H 12	30.5-35.5	116.84	76.9		3.307	59*
H 13	16.5-21.5	127.06	77.8		3.528	ca64*

the quantity of free water in the interstices of micro-organism skeletal remains than with free interstitial water associated with platy clay minerals.

Practically all mass physical properties are related to the amount of interstitial water in a sediment. Although water content is very easy to determine in the laboratory, there are remarkably few published measurements of sediments collected from depths greater than 132 m (72 fms), which corresponds to the average depth of the continental shelf edge (Shepard, 1948, p. 143). The degree of saturation apparently has not been determined on previous measurements of water content. This means that all earlier data should be questioned, although many samples reported in the literature may have been protected adequately against desiccation prior to test.

An example of the effect of a small amount of desiccation is shown in Area A through C cores. These cores were less well protected from drying before testing than those collected subsequently, which shows by measurements of less than 100 percent saturation in the tables of Appendix B. Saturations greater than 95 percent in soil mechanics laboratories usually are considered to represent 100 percent, the difference being due to analytical errors (C. M. Yeomans, personal communication). Nevertheless, when protective measures were better developed it is significant that the measured percentage of saturation rarely was less than 98 percent.

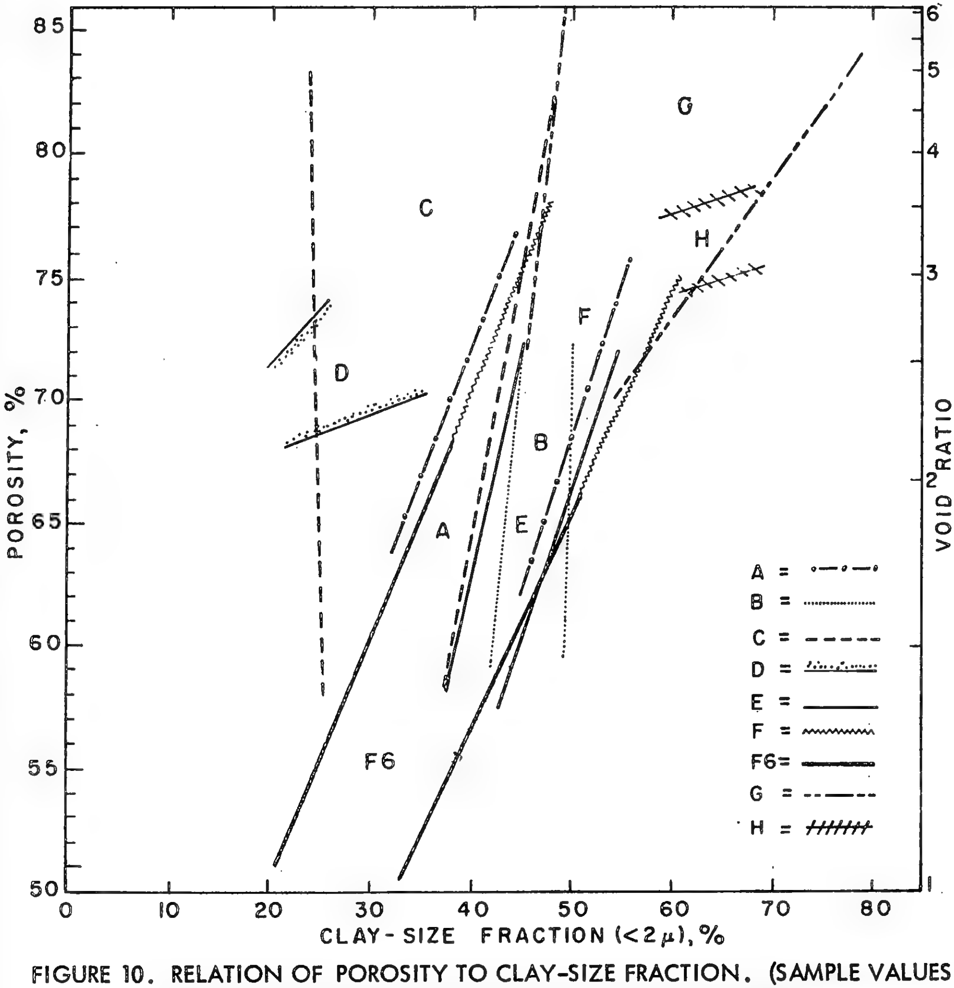

FIGURE 10. RELATION OF POROSITY TO CLAY-SIZE FRACTION. (SAMPLE VALUES FALL WITHIN THE LIMIT LINES FOR EACH AREA SHOWN)

Surficial porosities are of particular interest to investigators in sedimentation and engineering. An early study of nearshore Atlantic Ocean "muds" resulted in a range of water contents (porosity?) of 40 to 90 percent (Shaw, 1915). Terzaghi (1925c, p. 912) states that the volume of voids may be 98 percent of the total volume in clays. More recently, Emery (1960, p. 258) reported a maximum submarine sediment water content of 670 percent, corresponding to a porosity of 94.6 percent[4]; Correns (1937, p. 158) measured a maximum surficial water content of 86.6 percent wet weight, or a porosity of 94.6 percent[4], in an equatorial Atlantic pelagic clay; and Arrhenius (1952, p. 79 and his appendix plate 2.55B-2.55) illustrates a maximum surficial salinity of 105 x 10^3, corresponding to a porosity of 91.4 percent[4], in the East Pacific eupelagic area. Some examples of the more usual range of fine-grained ($Md_{\phi} > 5$) surficial porosities in sediments from water depths greater than 400 m are: an average of 86 percent off Southern California (Emery, 1960, p. 258), 35 to 84 percent in the Pacific Ocean (Arrhenius, 1952, p. 79), 60 to 86 percent in the Pacific and Arctic Oceans (Shumway, 1960, p. 458-463), 59 to 86 percent in the Gulf of Mexico (Trask, 1953, p. 103, 120), 46 to 71 percent in the North Atlantic Ocean (Sutton and others, 1957, p. 796), and, as previously mentioned, 56 to 86 percent in this investigation. Studies of shallow-water marine sediments by Moore (1931), van Andel (1954), Shepard and Moore (1955), and Füchtbauer and Reineck (Engelhardt, 1960) show a similar porosity upper limit of about 86 percent. It is apparent that approximately 86 percent appears to represent the usual maximum porosity in fine-grained submarine sediments, although exceptional values may be higher. The observation that the average porosity of a clay at the time of deposition is about 50 percent (Yoder, 1955, p. 506) is not corroborated.

Shepard and Moore (1955, p. 1580) related the deposition rate in Gulf of Mexico sedimentary environments to the slope of a straight line representing average values of water content related to the percentage of the clay-size fraction. Their data indicated that the steepness of the slope was inversely related to the rate of deposition. A similar relation was found by Seibold (1956, p. 465-467) for sediments from other areas. The application of this hypothesis to the sediments investigated by the writer is equally satisfactory[5]:

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[4] Emery's porosity values computed from equations 12 and 14, assuming a specific gravity of 2.65; Correns' porosity values from equations 8, 12, and 14, assuming a specific gravity of 2.7; and Arrhenius' porosities from his equation W = 3.7S - 24, equations 12 and 14, and an assumed specific gravity of 2.7.

[5] The following analysis admittedly is subjective. Nevertheless, the calculated relative rates cited were arrived at before Figure 10 was prepared, and the corresponding agreement later was found to be good.

Particle-by-particle, deep-sea deposition of pelagic clay, Area H, results in the slowest rate of deposition, and this area shows the least slope of a straight-line relationship between porosity and the clay-size fraction (Fig. 10). Each area in this figure is represented by two lines marking limits of plotted values. Reference is made in the following discussion to an imaginary line, which is not shown in Figure 10, located equidistant between the limit lines for each area. Area D, in the vicinity of the Blake Plateau, is in a region of slow deposition, which is shown by the presence of manganese nodules in the surficial layer of some cores and in dredge hauls collected by the Hydrographic Office. A moderate amount of pelagic deposition is indicated by the texture and mineralogy of Area C cores, and the resulting relative rate probably was fairly rapid. Area G is close to land, but swept by currents, and the expected rate of deposition is moderate. All other areas, A, B, E, and F, have similar depositional environments on the continental slope. With decreasing distance from land the relative rate of deposition should increase; this results in the sequence: F - E - B and A. However, the amount of sediment contributed from land influences the sequence and a more probable one, from slow to fast, is: E - F - B and A. The calculated relative deposition rate from these, and other less important considerations, is (relatively slow to fast): H - D - F, F 6, and G (about the same) - E - A, B, and C (about the same). The observed sequence from Figure 10 is (relatively slow to fast): H - D - F, F 6, and G - A - E - C - B. Differences between the two sequences are not considered significant.

F. PLASTICITY AND THE ATTERBERG LIMITS

Determination of limits -- Measurement of the Atterberg liquid limit, LL, was standardized three decades ago by use of a mechanical liquid limit machine designed by Casagrande (1932a). Liquid limit is arbitrarily defined by the ASTM (1958, p. 1132) as the water content at which two halves of a sediment cake will flow together for a distance of 1.25 cm (0.5 in) along the bottom of a groove separating the two halves when the cup containing the cake is dropped 25 times for a distance of 1 cm at the rate of two drops per second. An ASTM machine with a hard rubber base was used for all tests, together with an ASTM grooving tool. The plastic limit, PL, test briefly consists of measuring the lowest water content at which the sediment sample can be rolled into threads 3 mm (one-eighth in) in diameter without them breaking into pieces (ASTM, 1958, p. 1137).

Casagrande (1932a, p. 130; 1948, p. 922) reported that ovendrying fine-grained samples, as prescribed by ASTM designations D 423-54T (LL) and D 424-54T (PL), radically affects the limits of organic sediment and less markedly the limits of inorganic sediment; limits generally are higher for non-dried material. This relationship has been confirmed by Selmer-Olsen (1953) and Rosenqvist (1955, p. 72) for marine clays of normal salt content, although an opposite effect was found by Rosenqvist when clay sensitivities were greater than 8. Samples were not dried prior to testing on limit tests at BUDOCKS and the Hydrographic Office, following recommendations by Casagrande (1948, p. 922) and a recommended British test method (Norman, 1959). One other difference in test procedure from that prescribed by the ASTM is that the limits were determined from the entire size fraction rather than from only that portion finer than 1.25 ϕ (0.42 mm).

Dawson (1960) has shown that different operators may obtain slightly different results in the limit tests, despite test standardization. Furthermore, the type of material the base of the liquid limit machine is made of affects the measurement. Differences between British and American machines recently were summarized by Norman (1958). These and other problems in determining Atterberg limits are discussed by Bauer (1960).

Dr. Martin (1961, written communication) kindly informed me that the Atterberg limits of certain sediments are very sensitive to changes in interstitial water salt concentration, and that because the salt content is unknown in the samples investigated, the resulting data may be unreliable.

Results -- Measured values of liquid limit range from 25 (core F 6) to 109 percent dry weight (core D 1p). A more normal range is between 50 and 80 percent. Measured values of plastic limit range from 15 (core F 6) to 46 percent dry weight (core F 15). Most values lie between 20 and 30 percent. Emery (1960, p. 260) has reported that in cores tested at the University of Southern California the limits reflect changes in water content; cores with large variation in water content gave smaller variation for liquid limit and smallest variation for plastic limit. In general, this relationship was found in the cores tested.

The plasticity index, PI (LL-PL), affords a quantitative measurement of the plastic characteristics of a completely remolded sediment sample by defining the range of water content in which the sediment is plastic. Previously, it was mentioned that the A-line of the plasticity chart is an empirical boundary separating organic and inorganic clays, the former located below the line and the latter above. Considering only inorganic clays, those having liquid limits greater than 50 percent are highly plastic; the majority of samples tested are in this category (Fig. 4). Inorganic clays with liquid limits between 20 and 50 percent have low or medium plasticity: core F 6 and certain samples from Area C and E cores. Terzaghi and Peck (1948, p. 35) place the division between inorganic clays of low and medium plasticity at a liquid limit of 30 percent. Using this classification, only the 4 samples from core F 6 having water contents less than 40 percent have low plasticity. Burmister (1960, p. 98) considers the overall plasticity of clay sediments with plasticity indices greater than 40 to be very high.

Discussion -- Atterberg limits were determined on a number of cores collected from the continental borderland area off Southern California by Emery and his associates (Emery and Rittenberg, 1952, p. 765; Emery and Terry, 1956, p. 276-277; and Emery, 1960, p. 260-261). Reported values of water content in percent dry weight always were higher than liquid limits in the surficial sediments, although the reverse often occurred at depths greater than several feet. Emery (1960, p. 260) concluded that tops of the cores, where the water content is greater than the liquid limit, are liquid although they may not be mobile. With respect to this statement, I wish to emphasize that such sediments are "liquid" only in the remolded condition. In their undisturbed, in-place condition they may possess considerable structural strength, relative to their remolded strength; as stated by Terzaghi (1955, p. 563): "the strength of the sediment in situ at a water content equal to the liquid limit can amount to several hundred grams per square centimeter." At water contents about equal to the liquid limit, found at some distance below the top of the cores tested in the Hydrographic Office program, measured cohesion ranged from about 34 g/cm^2, core A 23, to 234 g/cm^2, core B 83[6]. With respect to the quantitative distinction between solid and liquid, the reader is referred to a discussion by Reiner (1958, p. 465-467, 542).

It is noteworthy that the only instance where the surface 0 to 5 cm water content was less than the liquid limit is in core C 16, where surface desiccation following core collection is shown by a measured 90.5 percent saturation (Appendix B).

An oft-repeated statement is that at the time of sedimentation water content approximates liquid limit (for example, Terzaghi, 1927, p. 41; Jones, 1944, p. 145; Skempton and Bishop, 1954, p. 433). On the other hand, Hough (1944, p. 1185) reports that water content is well above liquid limit in St. Lawrence River clay. Results of Emery and his associates and this paper show that the surficial sediments, often down to depths of several meters, possess water contents appreciably higher than the liquid limit. Occasionally, the liquid limit is exceeded by more than 80 percentage points (Emery, 1960, Fig. 211; this paper, core C 20). Not realizing the magnitude of this difference may lead to meaningless conclusions; for example, natural water content of a sediment a few percent higher than the liquid limit constitutes evidence that little desiccation has occurred between the time the core was collected and the time tested (Sykes, 1960, p. 49).

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[6] These values are appreciably greater than cohesion at the liquid limit reported by Skempton and Bishop (1950, p. 99).

Other relationships derived from the Atterberg limits are the liquidity index[7] (Terzaghi, 1936), B, which relates the water content to the limits and is defined as

$$B = \frac{w - PL}{PI} \times 100 \tag{17}$$

and colloidal activity (Skempton, 1953a, 1953b), a_c, which is defined by equation 21. The liquidity index denotes the ratio of excess natural water content above the plastic limit to the plasticity index (Capper and Cassie, 1960, p. 57). At a liquidity index of unity, or 100 percent when expressed as a percentage as recommended by the ASCE, the water content equals the liquid limit. Terzaghi (1955, p. 563) notes that although the liquidity index is close to 100 percent in the surficial layer of a normally consolidated[8] clay deposit, it is always greater than 200 percent in a sediment formed on the bottom of a vessel filled with a clay suspension--an under-consolidated deposit. On page 566 of his paper, however, Terzaghi mentions that marine clays in their original state have liquidity indices of about one hundred percent. The surface samples of the cores examined possess liquidity indices of approximately 200 percent. Appreciably higher liquidity indices are found in several cores. A surface layer liquidity index greater than 1,200 percent, as a result of very low plasticity index, was found in the two calcareous gravity cores from Area D. The consolidation history of the cores will be discussed in a paper being prepared, as was previously mentioned.

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[7] The liquidity index was computed for each sample having a measured water content. In most instances, the plastic limit and the plasticity index were usually averaged over several samples rather than determined on each sample because of small variability in the limits. Liquidity indices will be somewhat less than shown in Appendix B tables in the few instances where a marked decrease in water content occurs over the interval measured for liquid limit.

[8] A sediment deposit that has never been subjected to an effective pressure greater than the existing overburden pressure and one that is also completely consolidated by the existing overburden is normally consolidated (ASCE).

G. SHEAR STRENGTH[9]

Introduction -- Compressive strength and laboratory vane shear test analytical procedure and depth related to strength previously was described and discussed (part one). In brief, shear strength, s, is defined by the relation

$$s = c + \bar{\sigma} \tan \phi \qquad (18)$$

where c is the apparent cohesion, $\bar{\sigma}$ is the effective stress normal to the shear plane (total stress minus pore pressure), and ϕ is the angle of shearing resistance. Fine-grained, saturated sediments stressed without change in water content behave with respect to applied stress as if they were purely cohesive materials having an angle of shearing resistance equal to zero ($\phi = 0$). In this special instance s = c. Compressive strength, p_c, is related to the cohesion or shear strength by

$$c = \frac{P_c}{2} . \qquad (19)$$

The compressive strength test also is known as the U (for unconfined) test. Laboratory vane shear tests give results directly in shear strength.

Cohesion -- Values of cohesion in the samples tested range from 4.2 to 234 g/cm^2. Most cores have minimum cohesions near the top and maximum values usually at some depth other than the bottom. Table 4 summarizes surface or near surface cohesions. An average of the fifteen 0 to 5 cm cohesion measurements of predominantly terrigenous sediments is 19.8 g/cm^2. The stronger calcareous Area D sediments have an average of 43.2 g/cm^2 (2 measurements) in the 0 to 5 cm interval.

Cohesion generally shows a direct relationship to wet unit weight and an inverse relationship to water content or porosity. Relation to median diameter, percentage of the sand- or clay- size fraction, and plasticity index is variable, sometimes direct and sometimes inverse.

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[9]An extremely important book by the American Society of Civil Engineers (1961) on its research conference on shear strength of cohesive sediments appeared after this report was written. Unfortunately, it has not been possible to incorporate recent results reported in this paper, except for a few instances, because other commitments upon my time precluded an opportunity to assimilate its contents.

TABLE 4. SUMMARY OF SURFACE AND NEAR SURFACE COHESION

Core	Sample (cm)	Cohesion[1] (g/cm^2)	Cohesion Area Average[2] (g/cm^2)
A 23	0-5	4.2	
A 31	5-10	9.1	
A 33	0-5	7.7	6.0
B 83	0-5	23.9	
B 85	0-5	20.4	
B 87	0-5	26.0	23.4
C 16	0-5	37.3	
C 18	0-5	46.4	
C 19	0-5	6.3	30.0
C 20	5-10	11.2	
D 1g	0-5	55.5	
D 2	0-5	30.9	43.2
D 1p	11.5-23	77.3	
E 46	0-5	22.0*	
E 47	0-5	37.2*	
E 48	0-5	13.1*	24.1
F 6	0-11.5	29.5	
F 10	0-5	28.8	
F 11	0-10	28.8	
F 12	0-5	7.7	
F 13	11.5-16.5	33.8	
F 14	8-13.5	37.3	
F 15	0-5.5	21.1	
F 16	0-5	5.3*	20.2

[1]Values from compressive strength tests and equation 20 unless followed by an asterisk, which denotes vane shear test.

[2]Excluding values not including the surface.

TABLE 4. SUMMARY OF SURFACE AND NEAR SURFACE COHESION (Cont'd)

Core	Sample (cm)	Cohesion[1] (g/cm^2)	Cohesion Area Average[2] (g/cm^2)
G 3	10-20	14.4*	
G 8	20-30	25.2*	
G 9	20-30	14.3*	
G 10	20-30	17.1*	
H 13	16.5-21.5	71.7*	

The logarithm of cohesion related to porosity, with an eye-fitted straight line representing the suggested average, is shown for each area (Fig. 11). Scatter of values about the straight line varies from small in Area B to large in Areas E and G.

It was stated previously that the slopes of lines representing averages in each area, shown on a porosity-percentage of clay-size graph, denote relative rates of deposition in the sequence (from slow to rapid): H--D--F and F 6--G--A--E--C--B (Fig. 10). A similar correlation between relative rates of deposition and the slope of lines representing averages appears on a logarithm of cohesion-porosity graph (Fig. 12). The sequential relationship shown in Figure 12 is identical to that of Figure 10, except that the position of Area B and core F 6 in the sequence is reversed in Figure 12.

Since there is a clear relationship between porosity and percentage of the clay-size fraction, a similar relation between the latter and cohesion was expected but not found (Fig. 13). The variable relationship of cohesion to the percentage of the clay-size fraction in each area is shown graphically in this figure.

For most engineering purposes, cohesion or shear strength in fine-grained, cohesive sediments from a given area can be estimated with reasonable accuracy from a knowledge of the water content (compare Figs. 11 and 12) and slope of the line representing the average relationship of porosity to cohesion. Measurement of water content by neutron moderation[10] and measurement of wet unit weight by gamma-ray

[10] The number of moderated or slow neutrons detected per unit time is a measure of the concentration of hydrogen atoms that are contained in molecules of free water, assuming absence of organic material. A slow neutron count thus becomes a measure of the sediment water content.

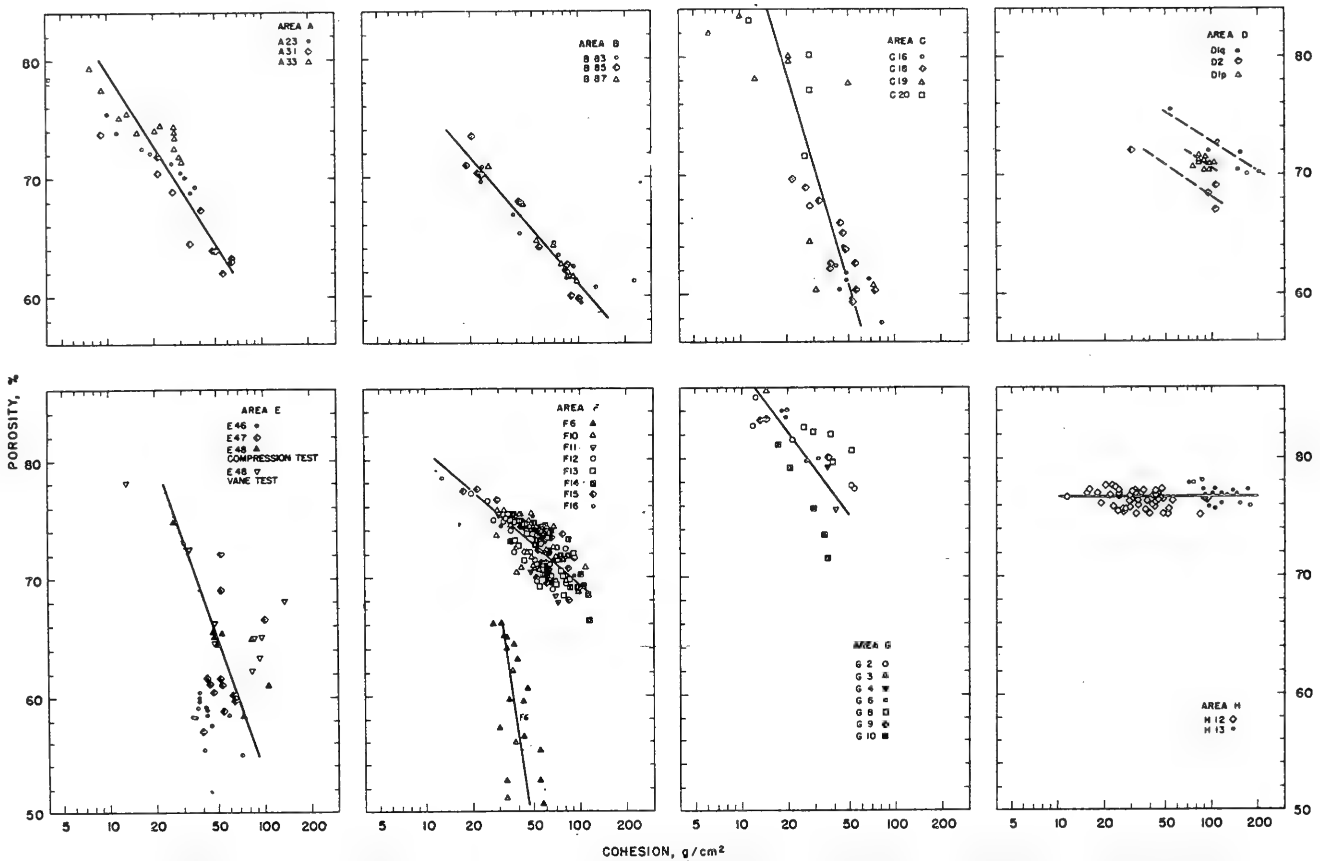

FIGURE 11. RELATION OF POROSITY TO LOGARITHM OF COHESION BY AREA. THE STRAIGHT CORRELATION LINE SHOWN FOR EACH AREA IS EYE FITTED TO THE DATA

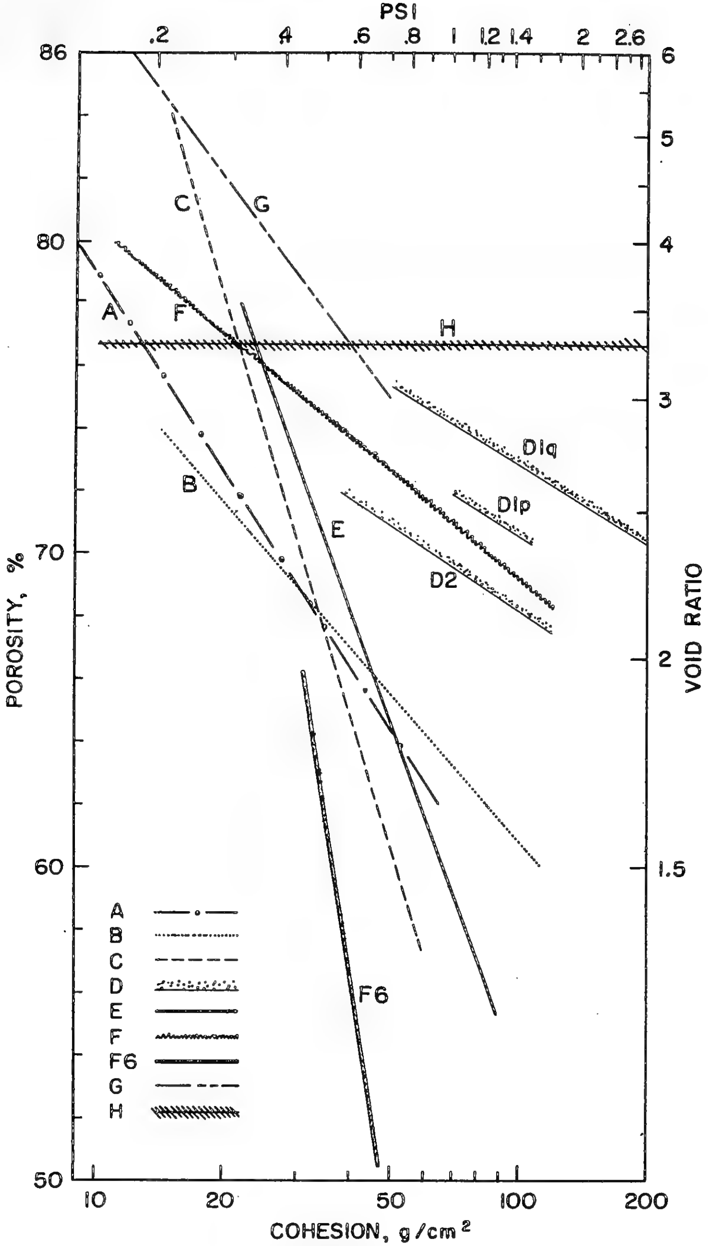

FIGURE 12. RELATION OF POROSITY TO LOGARITHM OF COHESION BY AREA AVERAGE. CORRELATION LINES FROM FIGURE 11 ARE SHOWN SUPERIMPOSED TO INDICATE DIFFERENT SLOPES

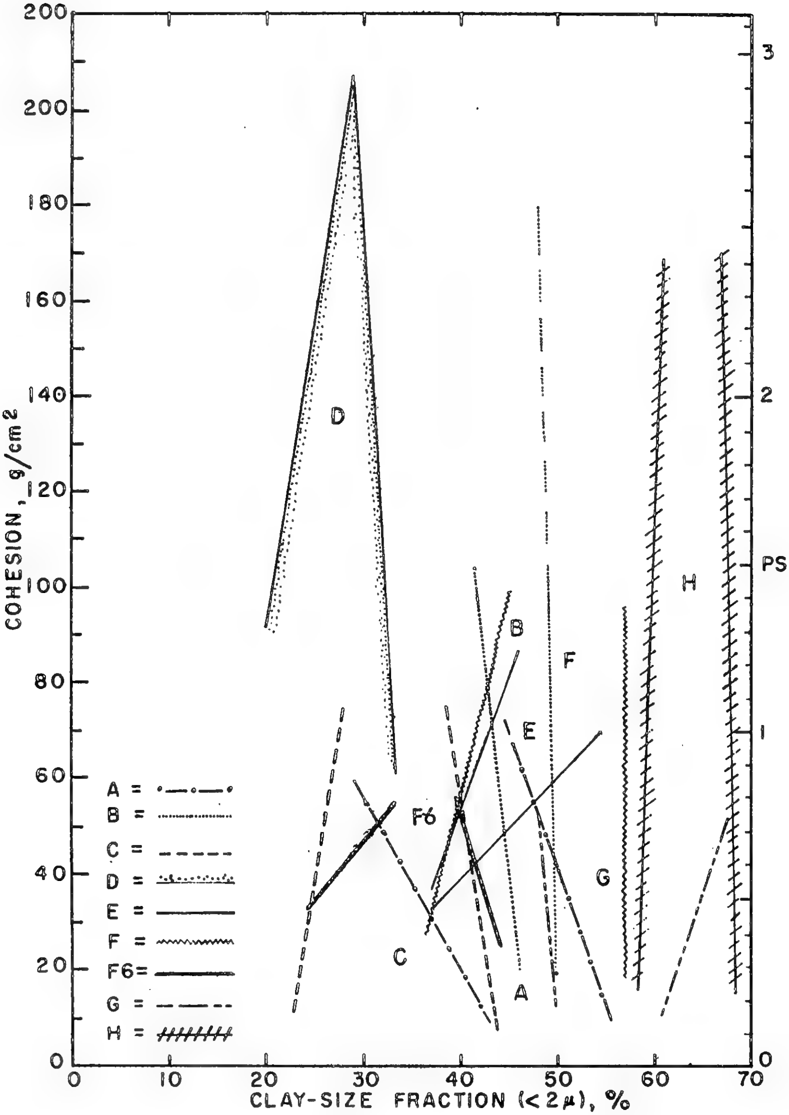

FIGURE 13. RELATION OF COHESION TO CLAY-SIZE FRACTION. SAMPLE VALUES FALL WITHIN THE LIMIT LINES FOR EACH AREA SHOWN

methods is now routine (see, for example, Kuranz, 1960; Meigh and Skipp, 1960); recently density determinations have been made on in-place marine sediments (Caldwell, 1960, p. 27-28). An extension of the method would be to estimate shear strength directly on suitable in-place or laboratory samples with a neutron probe calibrated for the water content-strength relationship of the particular sediments under investigation.

Sensitivity -- Defined by Terzaghi (1944, p. 613) as

$$S_t = \frac{\text{undisturbed strength}}{\text{remolded strength}}, \quad (20)$$

sensitivity, S_t, is a measure of the loss of strength when the structural strength of sediment is destroyed by remolding; the higher the sensitivity the greater the loss of strength in the remolded condition. A classification of sensitivity proposed by Skempton and Northey (1952, p. 31), modified by Rosenqvist (1953, p. 195), and with a percentage loss of strength added by me, is given in Table 5. Samples range from slightly insensitive to very sensitive with a few values of medium quick sensitivity in Area H cores not shown in Figure 14. Porosity possibly may be directly related to sensitivity, as shown by the dashed line between two limiting lines (Fig. 14), although the scatter of values is very large.

TABLE 5. CLASSIFICATION OF FINE-GRAINED SEDIMENT SENSITIVITY

Sensitivity	Description	Percentage of "Undisturbed" Strength Lost in Remolded State
ca 1	Insensitive	0
1 - 2	Slightly insensitive	0 to 50
2 - 4	Medium sensitive	50 to 75
4 - 8	Very sensitive	75 to 87.5
8 - 16	Slightly quick	87.5 to 93.8
16 - 32	Medium quick	93.8 to 96.9
32 - 64	Very quick	96.9 to 98.4
> 64	Extra quick	> 98.4

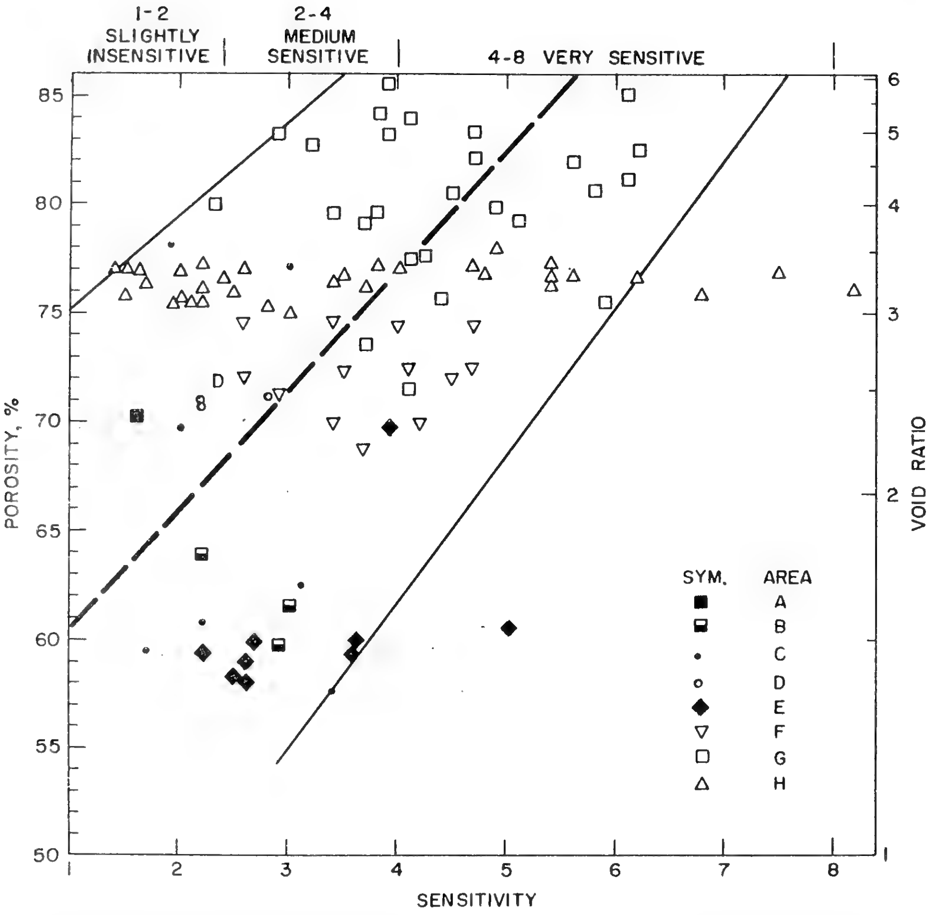

FIGURE 14. RELATION OF POROSITY TO SENSITIVITY. THE EYE-FITTED DASHED LINE REPRESENTS A SUGGESTED CORRELATION BETWEEN THE TWO LINES DENOTING GENERALIZED LIMITS

Skempton (1953b, p. 61) reported that the liquidity index, defined by equation 17, may be used as a measure of sensitivity. The available data (Fig. 15) indicate that this relationship may be valid if each area is considered separately and correlation lines are forced through the origin. Two lines are shown, however, for Area C samples. The two C 16 and bottom C 19 samples plot with those from Area F, while the C 18 and C 20 samples have lower sensitivities and plot separately. The middle C 19 sample (LI = 400) has a high plasticity index that is anomalous compared to the other Area C samples shown in Figure 15. If correlation lines are not forced through the origin, a clear relationship between the logarithm of sensitivity and liquidity index does not exist.

Discussion -- Hvorslev (1936; 1937, p. 148) established that the cohesion of saturated sediments was dependent on the water content and independent of the stress history of the sample. Rutledge (1947, p. 21, 67) showed that the logarithm of cohesion was a straight- or slightly curved-line function of water content. Trask and Rolston (1950) confirmed this relationship in sediments of San Francisco Bay. Bjerrum (1951, p. 217; 1954a, p. 60, 89, 92) reported the same relationship to be unique for normally consolidated clays. This paper gives further confirmation in deep-sea sediments.

It is difficult to assess the relative importance of subordinate factors affecting strength, such as grain size and clay type. In laboratory experiments relating clay content and grain size to strength, Trask and Close (1958) and Trask (1959) found: (1) at a given water content, strength increased from kaolin and illite (very slightly stronger than kaolin) to montmorillonite; (2) at a given water content and sand-clay ratio, strength increased as the sand grain size decreased above 2.9 ϕ (below 135μ); and (3) at a given water content and grain size, strength of all clays increased as the ratio of clay to sand increased. Comparison of clay mineralogy (see Table 6) in the 15- to 30-cm (6 to 12 in) samples of cores B 87 and C 18 suggest the reverse of condition (1) above; however, two samples are of little significance. The other two conditions cannot be compared because of the variability of parameters held constant by Trask.

Sediment structure, thixotropy, and salt content of interstitial water also affect strength and sensitivity. Until very recently it was uncertain whether the structure of cohesive sediment was principally honeycomb (Terzaghi, 1925a, p. 10-11; 1925c, p. 914; Casagrande, 1932b, p. 180-186) or cardhouse (Goldschmidt, 1926--cited by Rosenqvist; Lambe, 1953, p. 38; and others). Rosenqvist (1958, 1960) published stereo photographs, obtained with an electron microscope, of fresh water clay and remolded and undisturbed marine clay that appear to confirm the Goldschmidt-Lambe cardhouse structure hypothesis in undisturbed marine clays. The photographs show a very open mineral arrangement with principal contact between corners and planes (Rosenqvist, 1960, p. 6).

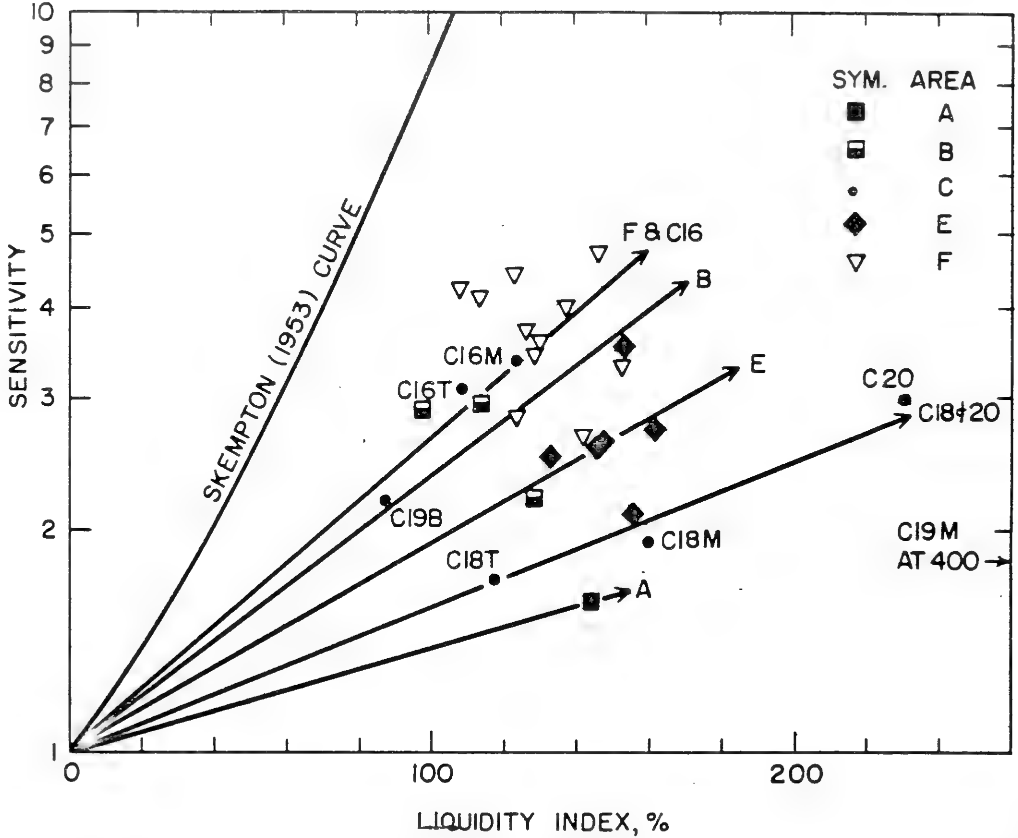

FIGURE 15. RELATION OF LOGARITHM OF SENSITIVITY TO LIQUIDITY INDEX. THE CORRELATION LINES ARE FORCED THROUGH THE ORIGIN, SEE TEXT FOR DISCUSSION. (LETTERS B, M, AND T FOLLOWING SAMPLE NUMBERS DENOTE BOTTOM, MIDDLE, AND TOP OF CORE, RESPECTIVELY)

It was mentioned previously that Hathaway (report in preparation) demonstrated that the quantity of micro-organism skeletons was directly related to the water content in selected Area C samples. It is likely that this relation also is valid in other areas subject to pelagic deposition. Both skeletons of micro-organisms and platy clay minerals are characterized by very large surface areas; the former, however, probably contribute relatively little cohesion or plasticity to a sediment, while the latter has an opposite effect. An abundance of skeletal remains in fine-grained sediments influences the structural properties, in addition to the relation of increased interstitial water content to reduced cohesion. It appears reasonable to suppose that parallel rearrangement of cardhouse structure following disturbance will be inhibited by an abundance of microskeletal remains. Consequently, it also is likely that sensitivity will tend to be inversely related to the quantity of microskeletons.

Thixotrophy is defined by the ASCE as the property of a material that enables it to stiffen in a relatively short time on standing, but upon agitation or manipulation to change to a very soft consistency or to a fluid of high viscosity, the process being completely reversible. Van der Waals forces and Coulombic forces are the principal interparticle forces affecting clay particles. Van der Waals forces normally cause attraction, but decrease with about the sixth power of the distance from the particles; Coulombic forces, decreasing with the square of the distance, are the electrostatic attraction between the positively charged edges and negatively charged faces of different particles and also the electrostatic repulsion between two edges or two faces of adjacent particles (Hvorslev, 1961, p. 170-171). A detailed discussion of these forces and their relation to cohesion is given by Lambe (1961). According to a recent hypothesis (Mitchell, 1960, p. 29-31), externally applied shearing energy in remolding causes the platy clay particles (previously in cardhouse structure) to be rearranged in a parallel structure leaving adsorbed water layers and ions in a high energy structure where the attractive forces are much greater than repulsive forces immediately after shearing stops. With time, thixotropic hardening produces structural rearrangement to a lower energy condition, and the attractive forces decrease. A new equilibrium results when water returns to a low energy structure, attractive and repulsive forces are equal, and clay minerals once again have a more or less cardhouse structure. Thixotropic strength regain may be inversely related to the abundance of microskeletons in clayey skeletons, because a large quantity of skeletal material will inhibit electrochemical forces tending to produce rearrangement of the clay minerals.

As stated in Appendix A, it is uncertain whether or not the salt content of pore water in the surface few meters of submarine sediments generally is constant or variable. Should the salt contents prove to be variable, and particularly if it should be inversely related to depth, investigations of salt leaching from marine clays reported by Rosenqvist (1946-published in English, 1953; 1955), Skempton and Northey (1952), Bjerrum (1954b), and Bjerrum and Rosenqvist (1956) may prove highly applicable to marine geological studies. The principal conclusion reached by these investigators was that reduction of pore water salt content, or leaching, decreases the undisturbed shear strength of clay and increases the sensitivity; although, Skempton and Northey (1952, p. 43) found a reduction of the remolded strength but not of the undisturbed strength. It is suggested that variability of submarine sediment sensitivity may be, at least in part, explainable by changes in pore water salt content. Measurement of interstitial water salinity is of importance, and it is to be regretted that so few measurements exist.

In conclusion, natural marine sediment, predominantly composed of mineralogenous matter, apparently has a cardhouse structure that will be rearranged into a parallel orientation if disturbed by sampling for instance. It is hypothesized that rearrangement may be directly proportional to the quantity of microskeletal remains in the fine-grained fraction. A corollary of the hypothesis is that at about the same water content sediments rich in microskeletons will tend to have lower sensitivities than those composed entirely of clay minerals. Following structural rearrangement, a regain of strength due to thixotropic hardening will occur with time. If the clay consists of an ideal, purely thixotropic plastic material, the strength regain will be complete. Skempton and Northey (1952, p. 35, 38) found that most natural clays were not purely thixotropic materials. Furthermore, coarse-grained cohesive sediments, composed of sand and possibly containing less than 5 percent clay minerals, possessing thixotropy are mentioned by Mielenz and King (1955, p. 223). It is probable that most deep-sea sediments once disturbed likewise will not completely regain lost strength. The answer to the question how much of the original strength in slightly disturbed sediment cores will be regained over a specific time will have to wait until less disturbed samples than those at present are collected, or until it proves feasible to make in-place tests on the ocean floor.

H. MODULUS OF ELASTICITY

The modulus of elasticity is defined by the ASCE as the ratio of stress to strain for a material under given loading conditions; it is numerically equal to the slope of the tangent or the secant of a stress-strain curve. Values reported in Appendix B were determined from results of the compressive strength tests; they range from 0 to 870 g/cm^2 (0 to 12.4 psi).

This modulus sometimes is used in settlement computations where deformation occurs in accordance with Hooke's law (see, for instance, Skempton and Bjerrum, 1957, p. 169, who note that the modulus of elasticity--called Young's modulus--is sensitive to sampling disturbance, especially in normally consolidated clays). Further discussion of stress, strain, elasticity, and plasticity can be found in books on these subjects (for example, Westergaard, 1952) and need not be considered here.

I. MINERALOGY AND ACTIVITY

Procedure -- A few samples were investigated for clay mineralogy to examine the relationship between clay mineralogy, clay-size fraction, and plasticity index. X-ray diffraction, differential thermal analyses, and surface area studies were made by Messrs. E. B. Kinter and S. Diamond of the Physical Research Division, Bureau of Public Roads. Their X-ray analytical procedure is described by Kinter and Diamond (1956). In these studies, a General Electric XRD-3D direct-recording X-ray diffraction machine was operated as follows: 40 KV at 20 ma, nickel-filtered CuKα radiation, scans at 2° per minute, and 1° beam and 0.2° detector slit widths. Clay mineral surface areas were determined using the method of Diamond and Kinter (1958) from glycerol retention measurements (Kinter and Diamond, 1958).

In the Hydrographic Office, the grain-size fraction coarser than 4 ϕ was cursorily examined under a binocular microscope by laboratory personnel to obtain an estimation of the percentage of skeletal material and mineral grains.

Mineralogy -- Results of the greater than 9 ϕ fraction are summarized in Table 6. Montmorillonite percentage is based on surface area measurements (Areas A and B composite sample: external area 62 m^2/g, internal area 173 m^2/g) and are believed by Kinter to be accurate within a few percent. Other percentages in this table are based on an "educated guess" by Kinter and Diamond, following similar reasoning to that made by Johns and others (1954). These estimates may be in error ± 40 percent from the stated value, although Kinter believes ± 5 percent is more reasonable. According to J. C. Hathaway (1961, written communication), who also has studied the mineralogy of certain Area C core samples, the mixed layered montmorillonite-mica contains about 30 percent mica layers. Percentage of quartz and calcite (± 5 percentage points) in the whole sample, plasticity index, and computed activity are also presented in Table 6.

Results of an estimation of carbonate content by hydrochloric acid treatment and microscope estimations of the coarse fraction are summarized in Table 7 for comparison with the data presented in Table 6. It is evident that calcareous skeletal material and shells account for the majority of material in the coarse fraction from Areas A and B, and mineral grains are more abundant than carbonate in Area C.

Activity -- More than a decade ago Skempton (1948) established a relation between the ratio of the liquid limit and the clay fraction greater than 9 ϕ (less than 2 μ), which he called activity. By activity is meant the increased surface activity of the clay fraction, for example, the increased ion exchange capacity and adsorption of water with decreasing grain size. Clays were classified as: inactive clay, $a_c < 0.75$, normal clay, $a_c = 0.75$ to 1.25, and active clay, $a_c > 1.25$. This ratio was redefined later (Skempton, 1953a, p. 42-43; 1953b, p. 58) in terms of the direct linear relationship

TABLE 6. SUMMARY OF THE GREATER THAN 9 PHI FRACTION AND WHOLE SAMPLE MINERALOGICAL ANALYSIS

Sample	% Sample > 9ϕ[1]	% Composition of > 9ϕ Fraction[2,4]		X-ray Diffraction Analysis of Whole Sample[2]		Plasticity Index[3]	Activity $\left(\frac{PI}{\text{clay fraction}}\right)$
				% quartz[5]	% calcite[5]		
A 31, 6-12 in	46	mica	40	29	9	39	0.85
A 31, 30-36 in	40	kaolinite	20	36	10	36	0.9
A 33, 6-12 in	55	mixed layered montmorillonite-mica	20	26	8	49	0.9
A 33, 30-36 in	51	calcite	5 to 10	24	11	47	0.9
B 87, 6-12 in	46	quartz, feldspar (?),		15	36	27	0.6
B 87, 24-30 in	49	and chlorite	10 to 15	19	18	32	0.65
C 18, 6-12 in	25	mixed layered montmorillonite-mica	50	--	--	26	1.0
C 20, 6-12 in	28	mica kaolinite chlorite (high Fe) quartz and feldspar	20 10 10 10	--	--	39	1.4

[1] Determined at the Hydrographic Office.

[2] Determined at the Bureau of Public Roads.

[3] Determined at the Bureau of Yards and Docks.

[4] Area A and B samples: percentage determined from X-ray analysis on each sample, augmented by differential thermal analysis (DTA), and measurement of montmorillonite surface area by glycerol retention on a composite of all samples except B 87, 24-30, which was inadvertently omitted. Area C samples: whole sample treated with acetic acid to remove calcite, hydrogen peroxide to remove organic matter, and Jackson's dithionite method to remove free iron oxide prior to X-ray diffraction analysis; DTA and glycerol treatment were not made.

[5] Percentages determined from comparison with standard dilution sample of Ottawa sand for quartz and limestone for calcite. Aragonite was not found in the diffraction.

TABLE 7. SUMMARY OF COARSE-FRACTION ANALYSIS

Sample	% Sample < 4φ[1]	% Composition of < 4φ Fraction: Carbonate Removed by HCl Treatment (< 4.25φ)[2]		Microscopic Estimation[1]: Tests, etc.[3]	Microscopic Estimation[1]: Mineral Grains[4]
A 31, 6-12 in	5	--		80	20
A 31, 30-36 in	9	minerals carbonate	60 40	85	15
A 33, 6-12 in	2	--		90	10
A 33, 30-36 in	5	--		90	10
B 87, 6-12 in	7	carbonate minerals	95 05	100	0
B 87, 24-30 in	3	--		95	05
C 18, 6-12 in	18	quartz and feldspar	90	20	80
C 20, 6-12 in	17	miscellaneous	10	35	65

[1]Determined at the Hydrographic Office.

[2]Determined at the Bureau of Public Roads.

[3]Skeletal material and shell fragments, including Foraminifera, echinoid spines, and sponge spicules identified by me in the A 31 samples.

[4]Predominantly quartz, feldspar, and mica.

between the plasticity index, instead of the liquid limit, and the clay fraction, where

$$a_c = \frac{PI}{\text{clay fraction percentage} < 2\mu} \tag{21}$$

The same activity classification was retained. Skempton (1953b, p 57) showed that the activities of a number of samples plot about a straight line that extrapolates back to the origin of a plasticity index-clay fraction graph, or activity chart.

The relationship between surface activity of colloidal particles, clay minerals, and quartz and calcite found by Skempton is shown in Figure 16 together with data from the samples investigated. Agreement of data is reasonably good. The higher montmorillonite content of the two samples from Area C is reflected in higher activities. Although the clay mineralogy of Area A and B samples was found nearly identical, the latter are less plastic and, as a result, have lower activities. Greater scatter about an average line (not drawn in Fig. 17) for samples from each area results when all available samples are plotted on an activity chart (Fig. 17). In this Figure, Hathaway (1961, written communication) is of the opinion that the term "illite" should be replaced with "mixed layered mica-montmorillonite," having a probable range of activity from about kaolinite to between Ca- and Na-montmorillonite. Yoder and Eugster (1955, p. 252-254)[11] discuss problems with the term "illite."

A further subdivision of Skempton's classification is indicated in Figure 17 with additional lines at activities of 0.25 and 1.75. A tentative activity classification of: inactive < 0.25, slightly active, 0.25 to 0.75; normal, 0.75 to 1.25; active, 1.25 to 1.75; and very active > 1.75 is suggested for sea-floor sediments. More data are needed, however, before it will be known whether or not these additional categories are significant elsewhere. Using this nomenclature, the very highly plastic Area C core samples are active. Most Area B, E, and all of the F 6 samples are slightly active. Area D samples are mostly inactive, except piston core D 1. This core is relatively homogeneous in composition and has a plasticity index of 81 and a 20 percent clay-size fraction, that results in the exceptionally high activity of 4.0, which is not plotted in Figure 17. All other samples, Area A, C, and F, have normal activity.

Elsewhere, Fisk and McClelland (1959, p. 1383) found that late Quaternary continental shelf clays off Louisiana have an activity of about 0.9 and hence are normally active.

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[11] This reference kindly was called to my attention by Dr. J. C. Hathaway.

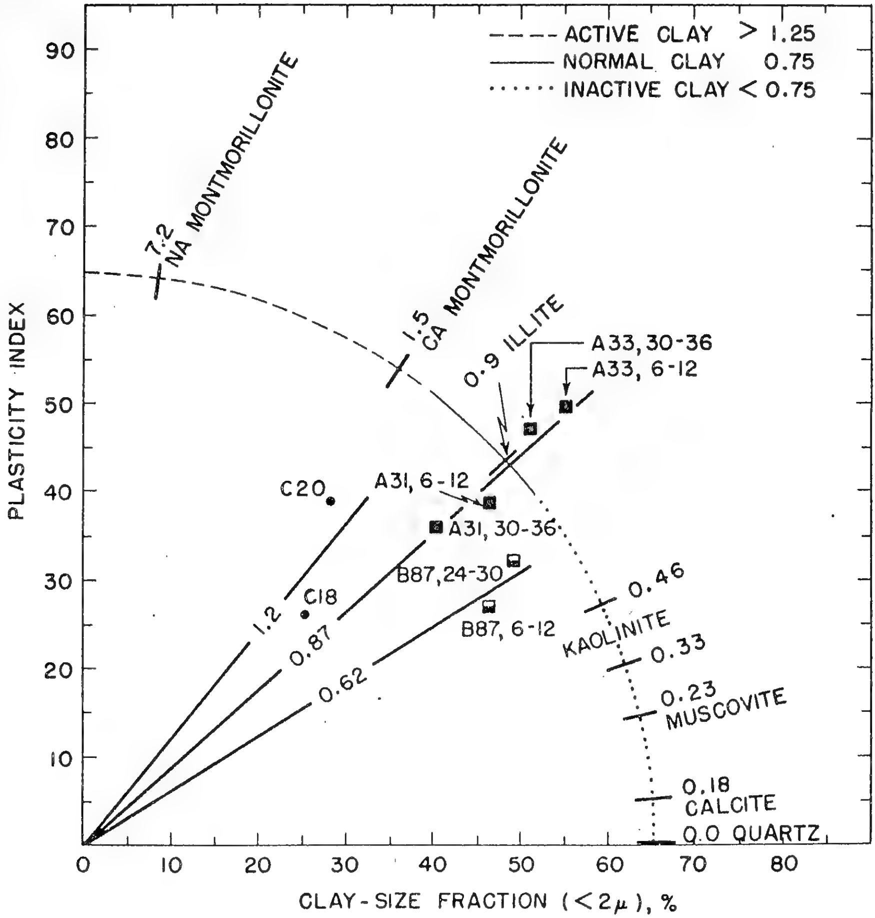

FIGURE 16. ACTIVITY CHART OF CORE SAMPLES WITH KNOWN CLAY-SIZE MINERALOGY. NUMBERS INSCRIBED ALONG THE CIRCLE REFER TO ACTIVITY. SEE TEXT FOR DISCUSSION

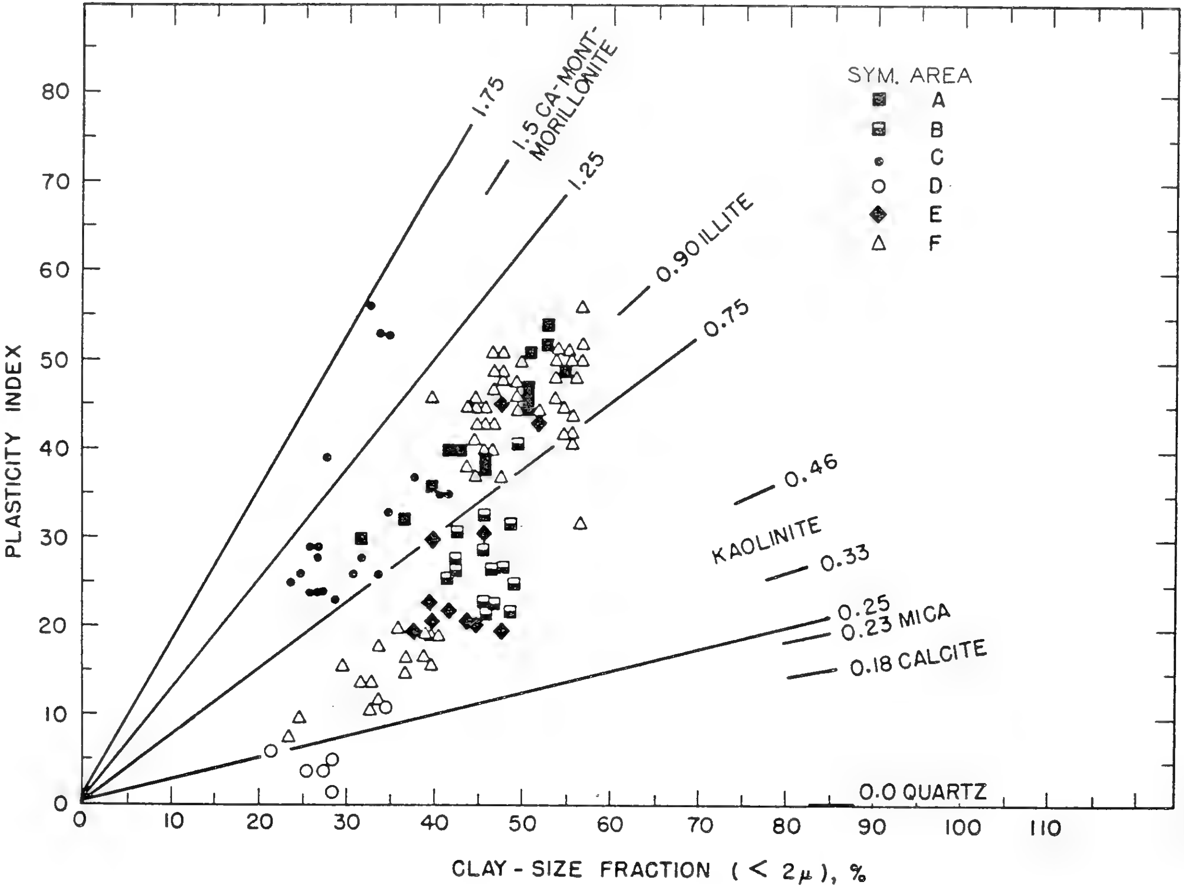

FIGURE 17. ACTIVITY CHART. NUMBERS REFER TO ACTIVITY. SEE TEXT FOR DISCUSSION

V. SUMMARY AND CONCLUSIONS

Measurements of mass physical properties were made in the laboratory on 35 gravity- and piston-type sediment cores, ranging in length from 30 to 511 cm, collected from ocean depths of 400 to 5120 m. Sample composition was predominantly silty clay- and clayey silt-size material, chiefly of terrigenous origin.

The M.I.T. grain-size scale was used in classifying sediments instead of the Wentworth scale because a silt and clay particle division at 9 ϕ or 2 μ appears more significant in mass studies. A plasticity chart is applicable to deep-sea sediments; its use, together with a triangular diagram, is recommended to marine geologists. Terrigenous inorganic sediments plot above and parallel to the empirical A-line on the plasticity chart. Mixtures of terrigenous and calcareous sediments either plot below the A-line or above it on a distinctly different axial slope from that of terrigenous inorganic sediments.

Grain-size was measured to 9 ϕ and estimated to 10 ϕ. Statistical measures other than median diameter were not applicable, because the size fraction finer than 10 ϕ was greater than 25 percent in most samples. Median diameter of particles showed a variable relation with depth, in certain cores increasing and in others decreasing or fluctuating with depth. Void ratio was found to be directly related to median diameter for all 8 areas, although values scattered widely about the averages. When porosity and median diameter data from other investigations were added to that of the present one, the only clear relationship resulting was that low porosity sediments do not have small median diameters. It was demonstrated that the field below a curvilinear line extending from 7.5 ϕ at 50 percent porosity to 10 ϕ at 75 percent porosity, in an arithmetic plot of porosity related to median diameter, was devoid of values.

Corrections for salt content of interstitial water were not made in determining the specific gravity of solids, wet unit weight (corresponding to in-place bulk density), or measures of water content, because of the uncertainty of the magnitude of variations in submarine sediments. Unfortunately, measurements of the salinity of interstitial waters were not made. Specific gravity of solids for nearly 500 samples varied between 2.68 and 2.89, with an approximate average about 2.765. A first report is made of a tendency for specific gravity of solids to be directly related to wet unit weight and inversely related to porosity.

Sediment wet unit weight ranged from 1.23 to 1.86 g/cm^3 and increased with increasing depth in most of the cores. Porosity was found to be inversely related to wet unit weight, with values corresponding to those previously cited by others. The different relationship of water content (porosity in water-saturated sediments) to wet unit weight reported by Ratcliffe (1960) is not corroborated.

It is strongly urged that if measures of water content of marine sediments are to be meaningful the following information must be concurrently published: (1) the drying temperature, (2) degree of temperature variation in the drying oven, (3) percentage of pore-space saturation, and (4) salt content. Regrettably, in the past, the latter three factors rarely have been stated. Percentage of saturation was determined each time a water content was measured, and it was found that all samples reported except one were effectively 100 percent saturated. The exception was a surface sample that had become desiccated between the time of collection and test.

Water content (porosity) generally decreases with increasing depth in the cores, although a number of exceptions were found. Porosity varied between 51 and 86 percent; surface (0 to about 5 cm) porosities averaged by area ranged from 72 to 86 percent. Measurements made by other investigators are compared to show that although the maximum reported porosity is about 95 percent the usual maximum in fine-grained surficial sediments is approximately 86 percent.

A relationship between deposition rates and correlation of water content related to percentage of the clay-size fraction was demonstrated by Shepard and Moore (1955), investigated by Seibold (1956), and further confirmed in this paper. Slowest depositional rates have the least axial slope, and fastest rates possess the greatest slope of correlation lines plotted on an arithmetic graph of porosity and percentage of clay-size material.

Measurements of the liquid limit and plastic limit showed an extreme range from 25 to 109 percent and 15 to 46 percent, respectively. A more normal range was 50 to 80 percent for liquid limit and 20 to 30 percent for plastic limit. Confirmation is given Emery's (1960) statement that the Atterberg limits reflect changes in marine sediment water content; the largest variation occurring in water content, less variation for liquid limit, and least for plastic limit.

Emery and his associates demonstrated that the water content in surficial submarine sediments always is greater than the liquid limit. His findings are confirmed by Sykes (1960) and this paper. In surficial sediments, the liquidity index commonly was found to be 200 percent or more, with a few values greater than 1,200 percent in calcareous sediments having very low plasticity indices.

It is emphasized that when the water content is greater than the liquid limit, sediment is "liquid" by definition only in the remolded condition. Sediment possesses considerable strength in an undisturbed (in-place) condition relative to the remolded strength. Even in the completely remolded state all samples tested showed measureable strength and hence strictly speaking cannot be considered liquid. It is generally recognized by workers in soil mechanics that remolded sediment at the liquid limit has a strength of a few tens of g/cm^2, and that undisturbed sediment at the liquid limit has a strength about an order of magnitude greater.

A quantitative measure of the plastic characteristics of a completely remolded sediment is afforded by computation of the plasticity index, which defines the range of water content in which sediment is plastic. Most of the predominantly inorganic sediments of terrigenous origin and one core of calcareous clayey silt possessed high plasticity (values located above the A-line on the plasticity chart with the liquid limits greater than 50 percent).

Shear strength is expressed as cohesion because tests were made on water-saturated, fine-grained cohesive sediments without change in water content during the tests. Cohesion ranged from 4.2 to 234 g/cm^2. Minimum values usually occur at the surface and maximum values at some depth other than at the bottom of the cores. An average of surface, 0 to 5 cm, measurements is about 20 g/cm^2 in predominantly terrigenous sediments and about 40 g/cm^2 in calcareous sediments.

In a given sedimentary environment, wet unit weight generally was directly proportional to porosity and inversely related to cohesion. Median diameter, the sand- or clay-size fraction, and plasticity index sometimes showed direct and sometimes an inverse relation to cohesion.

Further confirmation is given the (usually straight-line) relationship between porosity and the logarithm of cohesion. Comparison of the different axial slopes on porosity-logarithm of cohesion plots of each of the 8 areas suggests almost the same relationship of relative deposition rates found in graphs of porosity as a function of the clay-size fraction, although the porosity-logarithm of cohesion slopes are negative. Cohesion was found to have a variable relationship to the clay-size fraction.

It is a well-known fact that the logarithm of cohesion is closely related to water content. This indicates that a simple means of rapidly making a large number of shear strength measurements in suitable laboratory samples, or in-place on the sea floor, would be by measurement of the water content using a neutron probe that has been calibrated for the water content-strength relationship of the particular sediments under investigation.

Measurements of sensitivity by compression and vane tests show that porosity may be directly related to sensitivity, although there is a very large scatter of values about the suggested average. The liquidity index has been considered by others to be a measure of sensitivity. This generally is confirmed in the samples tested if each area is considered separately and correlation lines are forced through the origin; otherwise there does not appear to be a clear correlation between these two parameters.

The Goldschmidt-Lambe hypothesis of cardhouse clay mineral structure in undisturbed marine sediments recently appears confirmed. Hathaway (report in preparation) demonstrated that high water contents correlate with large concentrations of skeletal remains of diatoms, coccoliths, and other micro-organisms. It is hypothesized that cardhouse structure will be modified by the presence of microskeletons; following structural disturbance it is likely that rearrangement of cardhouse structure to a parallel orientation of platy minerals will be inhibited by microskeletons. Consequently, it is suggested that sensitivity and thixotropic strength regain will tend to be inversely related to the quantity of microskeletons.

Complete thixotropic strength regain in deep-sea sediments following disturbance caused by sampling is considered unlikely.

It is suggested that variations in submarine core sensitivity may be related to changes in pore-water salt content, however, data presently are not available for evaluation of this idea.

Modulus of elasticity, determined from compressive strength tests, ranged from 0 to 870 g/cm^2.

A few clay-size ($> 9\phi$) samples from Areas A-C were examined for clay mineralogy. In Areas A and B, mica was more common than mixed-layered montmorillonite-mica (illite) or kaolinite; in Area C, mixed-layered montmorillonite-mica was more common than either mica or kaolinite.

Skempton (1953a, 1953b) showed that the plasticity index was a function of the clay-size fraction, and he designated the ratio of the two parameters activity, which was related to clay mineralogy. This relation has been confirmed by a number of investigators, including Fisk and McClelland (1959) for late Quaternary Louisiana continental shelf clays, and it appears valid for the few submarine sediments examined. The spread of the reported data suggests a further extension of Skempton's classification, which is considered tentative until more information from submarine sediments becomes available.

A general summary of the variation of the more important parameters with increasing distance below the top of each core is presented in Table 8. Although elsewhere distances or depths are given in centimeters, in this table depths are in inches to facilitate location of values in the plates and Appendix B. The extreme ranges of the more significant measured or computed parameters found in this investigation are summarized in Table 9 for ready reference.

TABLE 8. GENERALIZED SUMMARY OF PARAMETER VARIATION WITH INCREASING DEPTH IN CORES[1]

Core	Length Tested (in)	Particle Median Diameter (phi)	Sand-Size Material (%)	Clay-Size Material (%)	Specific Gravity of Solids	Wet Unit Weight (g/cm^3)	Plastic Limit	Liquid Limit	Plasticity Index	Water Content	Cohesion Profile (g/cm^2)	Notes
A 23	30	n.d.	n.d.	n.d.	n.c.	incr.	n.c.	sl. decr.	decr. 0-24 incr. 24+	decr.	incr.	
A 31	41	decr. 18-30 incr. 30+	higher 18-30	sl. decr. 0-30 incr. 30+	n.c.	incr.	n.c.	lower 18-30	n.c. 0-18 incr. 24+	decr. 0-32 n.c. 32+	incr.	
A 33	36	n.c.	n.c.	n.d.	n.c.	incr. 0-14 n.c. 14-22 incr. 22+	n.c.	decr. 0-18 & 18+	decr. 0-18 & 18+	decr. 0-14 incr. 14-22 decr. 22+	incr.	
B 83	36	decr. 0-18 incr. 18+	higher 24-30	sl. decr. 0-18 sl. incr. 18+	n.c.	incr.	sl. decr. 0-14 n.c. 14+	sl. decr. 0-14 n.c. 14+	n.c.	decr.	decr.	
B 85	30	decr.	n.c.	n.c.	sl. decr.	incr.	n.c.	decr.	decr.	decr.	n.c. 0-10 incr. 10+	
B 87	30	decr. 0-15 incr. 15+	sl. decr.	sl. decr. 0-18 sl. incr. 18+	n.c.	incr. 0-22 sl. decr. 22+	decr. 0-18 incr. 18+	decr. 0-18 incr. 18+	n.c. 0-12 & 12+	decr. 0-22 sl. incr. 22+	incr. 0-22 decr. 22+	
C 16	30	n.c. 0-12 decr. 12+	decr. 0-18 incr. 18+	higher 0-12	incr. 0-16 decr. 16-22 incr. 22+	decr. 0-8 incr. 8-22 decr. 22+	n.c.	incr. 0-12 decr. 12-24	higher 6-12	incr. 0-8 decr. 8-14 n.c. 14+	incr.	
C 13	42	decr. 0-12 incr. 12-36 decr. 36+	decr. 0-36 incr. 36+	n.c. 0-18 incr. 18-36 decr. 36+	sl. incr. 0-16 n.c. 16+	incr. 2-14 n.c. 14-22 decr. 22-34 incr. 34+	sl. decr. 0-18 sl. incr. 18-36 decr. 36+	decr. 0-18 incr. 18-36 decr. 36+	decr. 6-16 incr. 16-36 decr. 36+	decr. 2-16 incr. 16-34 decr. 34+	incr. 2-22 decr. 22-34 incr. 34+	
C 19	30	decr. 0-18	higher 12-24	lower 12-24	n.c.	sl. incr. 2-10 n.c. 10-16 incr. 16+	n.c. 0-12 sl. decr. 12+	abrupt decr. at 12 sl. incr. 24+	high 0-12 low 12+	variable decr.	incr.	
C 20	18	decr.	sl. incr. 0-12 sl. decr. 12+	higher 0-6	sl. incr.	incr.	decr.	decr.	decr.	decr.	n.d. 0-2 incr. 2+	
D 1g	16	sl. incr.	sl. lower 8-12	sl. lower 0-4	sl. decr.	sl. incr. 0-8 n.c. 8+	higher 4-8	higher 4-8	lower 4-8	decr.	large incr.	
D 2	9	decr.	incr.	decr.	n.c.	incr. 0-6 decr. 6+	sl. decr.	decr.	decr.	decr. 0-6 incr. 6+	large incr. 0-6 small 6+	
D 1p	180	n.d.	n.d.	n.d.	n.c.	n.c.	n.c.	variable	variable	n.c.	n.c.	

TABLE 8. GENERALIZED SUMMARY OF PARAMETER VARIATION WITH INCREASING DEPTH IN CORES[1] (Cont'd)

Core	Length Tested (in)	Particle Median Diameter (phi)	Sand-Size Material (%)	Clay-Size Material (%)	Specific Gravity of Solids	Wet Unit Weight (g/cm³)	Plastic Limit	Liquid Limit	Plasticity Index	Water Content	Cohesion Profile (g/cm²)	Notes
E 46	54	n.c.	n.c.	n.c.	n.c.	incr. 0-12 n.c. 12+	n.c.	decr. 0-46 sl. incr. 46+	decr. 0-46 n.c. 46+	decr. 0-12 rel. n.c. 12+	incr. 0-12 n.c. 12+	
E 47	60	higher 0-16	lower 56+	lower 56+	sl. incr.	incr.	higher 0-16	much higher 0-16	higher 0-16 n.c. 16+	decr. 0-20 rel. n.c. 20+	incr. 0-16 & 20+	sand layer 16-20: no tests
E 48	40	sl. incr.	lower 26+	higher 26+	sl. incr.	incr. 0-20 n.c. 20+	n.c.	much higher 0-12	higher 0-12	decr. 0-20 n.c. 20+	incr. 0-10 decr. 14+	sand layer 12-14: no tests
F 6	101	decr. 4-24 incr. 24-54 decr. 54-90 variable 90+	sl. decr. 0-50 n.c. 50+ (higher 81-90)	sl. incr. 0-50 n.c. 50+ (lower 81-90)	n.c. (lower 81-90)	incr. 0-19 decr. 19-54 sl. incr. 54+	n.c. (lower 81-90)	decr. 0-19 incr. 19-54 n.c. 54+ (lower 18-90)	decr. 0-19 incr. 19-54 variable 54+	decr. 0-19 incr. 19-54 decr. 54-90 variable	incr. 0-13 decr. 13-49 sl. incr. 49+	40% sand layer 81-90
F 10	65	higher 24-36 & 47+	n.c.	higher 24-36 & 47+	sl. incr.	incr. 0-36 decr. 36+	sl. lower 24-36	decr. 0-36 n.c. 36+	lower 12-36	decr. 0-36 incr. 36+	sl. incr.	
F 11	57	lower 19-32	n.c.	higher 36+	n.c.	incr. 0-27 n.c. 27-48 decr. 48+	sl. decr. 0-36 sl. incr. 36+	decr. 0-36 sl. incr. 36+	decr. 0-36 n.c. 36+	decr. 0-27 incr. 27+	incr. 0-27 decr. 27+	
F 12	56	sl. decr. 0-34	n.c.	lower 23-30	incr.	incr. 0-32 sl. decr. 32+	n.c.	decr. 0-23 incr. 23+	decr. 0-23 incr. 23+	decr. 0-32 incr. 32+	incr.	
F 13	54	decr. 0-24 incr. 24+	n.c.	n.c. 0-48 sl. higher 48+	n.c. 0-48 sl. higher 48+	incr. 0-35 decr. 35+	sl. decr. 0-35 sl. incr. 35+	decr. 0-35 incr. 35+	decr. 0-24 incr. 24+	decr. 0-26 incr. 26+	incr. 0-47 decr. 47+	
F 14	64	sl. decr. 3-22 incr. 22+	n.c.	n.c. 3-30 sl. incr. 31+	sl. incr.	incr. 3-28 decr. 28+	n.c.	decr. 3-30 incr. 30+	decr. 3-30 incr. 30-42 n.c. 42+	decr. 3-28 incr. 28+	incr. 3-42 decr. 42+	n.d. 0-3
F 15	59	decr. 0-22 incr. 22-51 decr. 51+	n.c.	sl. decr. 0-22 sl. incr. 22+	sl. incr.	incr. 0-27 decr. 27-48 sl. incr. 48+	decr. 0-28 incr. 29-51 decr. 51+	decr. 0-29 incr. 29-51 decr. 51+	lower 18-29 & 44-51	decr. 0-27 incr. 27+	incr. 0-17 sl. incr. 17-43 decr. 42+	
F 16	62	incr.	n.c.	n.c. 0-26 sl. incr. 26+	sl. incr.	sl. incr. 0-30 sl. decr. 30+	n.c.	sl. decr. 0-36 sl. incr. 36+	decr. 0-26 incr. 26-58 decr. 58+	decr. 0-30 incr. 30-58 decr. 58+	incr. 0-40 decr. 40+	
G 2	66	n.c. 0-43 incr. 43+	n.c.	n.c. 0-43 incr. 43+	incr.*	incr. 0-46 decr. 46+	n.d.	n.d.	n.d.	large decr. 0-27 sl. decr. 27-50 incr. 50+	incr.*	*based on discont. data
G 3	29	n.c.	n.c.	n.c.	n.d.	sl. incr.	n.d.	n.d.	n.d.	large decr.	n.d.	

TABLE 8. GENERALIZED SUMMARY OF PARAMETER VARIATION WITH INCREASING DEPTH IN CORES[1] (Cont'd)

Core	Length Tested (in)	Particle Median Diameter (phi)	Sand-Size Material (%)	Clay-Size Material (%)	Specific Gravity of Solids	Wet Unit Weight (g/cm^3)	Plastic Limit	Liquid Limit	Plasticity Index	Water Content	Cohesion Profile (g/cm^2)	Notes
G 4	68	n.c.	n.c.	n.c.	n.d.	sl. incr.	n.d.	n.d.	n.d.	large decr.	n.d.	
G 5	28	sl. incr. 0-13 sl. decr. 13+	n.c.	n.c.	n.d.	sl. incr. 0-8 n.c. 8-17 sl. incr. 17+	n.d.	n.d.	n.d.	sl. incr. 0-13 sl. decr. 13+	n.d.	
G 6	59	sl. incr. 0-56	n.c.	higher 36+	sl. incr.	incr. 0-40 decr. 40-52 incr. 52+	n.d.	n.d.	n.d.	large decr. 0-40 incr. 40-52 decr. 52+	sl. incr.*	*based on discont. data
G 8	70	n.c.	n.c.	n.c.	sl. incr.*	sl. incr.	n.d.	n.d.	n.d.	decr.	incr. 0-40 n.d. 40+*	*based on discont. data
G 9	52	n.c.*	n.c.*	n.c.*	sl. incr.*	sl. incr.*	n.d.	n.d.	n.d.	decr.*	incr.*	*based on discont. data
G 10	64	variable	higher 16-60	rel. n.c.	sl. incr.*	sl. incr.	n.d.	n.d.	n.d.	decr.	sl. incr.*	*based on discont. data
G 11	46	incr. 0-16 decr. 16-30 incr. 30+	n.c.	n.c.	n.d.	sl. decr. 0-12 sl. incr. 12+	n.d.	n.d.	n.d.	incr. 0-12 decr. 12+	n.d.	
H 12	201	n.d.	n.c.	n.c.	variable	n.c.	n.d.	n.d.	n.d.	n.c.	n.c. but variable	
H 13	57	n.d.	n.c.	n.c.	variable	rel. n.c.	n.d.	n.d.	n.d.	decr. 12-16 incr. 16-39 decr. 39+	large incr. 7-16 decr. 16-37 n.c. 37-53 incr. 53+	

[1] All measurements in inches from the top of the core. Where parameter variation with increasing depth is slight or does not occur, it is omitted.

Abbrevations: n.d. = no data, n.c. = little or no change, sl. = slight, rel. = relatively, decr. = decrease, incr. = increase, discont. = discontinuous.

TABLE 9. SUMMARY OF MEASURED OR COMPUTED MINIMUM AND MAXIMUM PARAMETERS IN AREA A - H CORES

Parameter	Minimum	Maximum
Activity	0.06	1.7
Cohesion, "undisturbed," g/cm^2	4.2	234.1
Cohesion, remolded, g/cm^2	2.1	38.6
Liquid limit	25	109
Liquidity index, %	76	3274
Median diameter of particles, ø	5.1	>10
Modulus of elasticity, g/cm^2	0	870
Plastic limit	15	46
Plasticity index	1.6	81
Porosity, %	50.7	86.5
Sensitivity	1.6	25.9
Specific gravity of solids	2.68	2.89
Void ratio, 100% saturated	1.015	6.363
Water content, % dry weight	36.7	236.9
Wet unit weight, g/cm^3	1.23	1.86

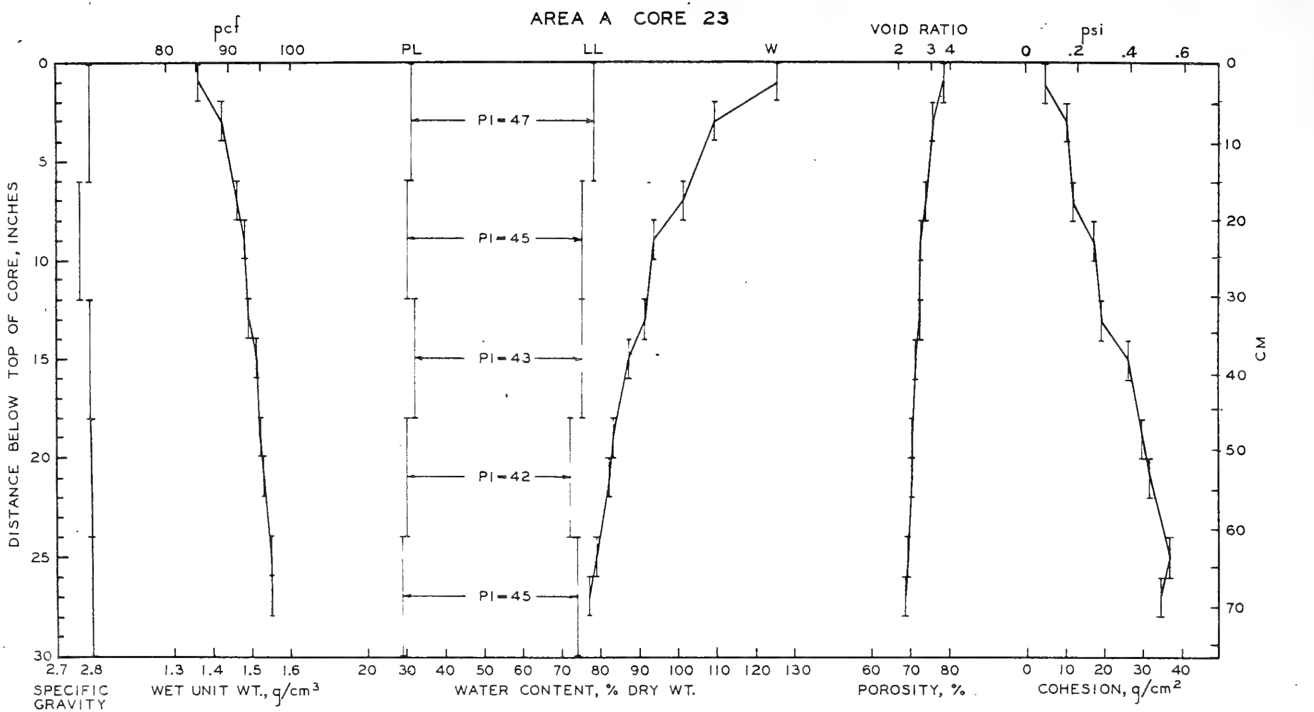

PLATE I. PARAMETERS VERSUS DEPTH FOR CORE A 23

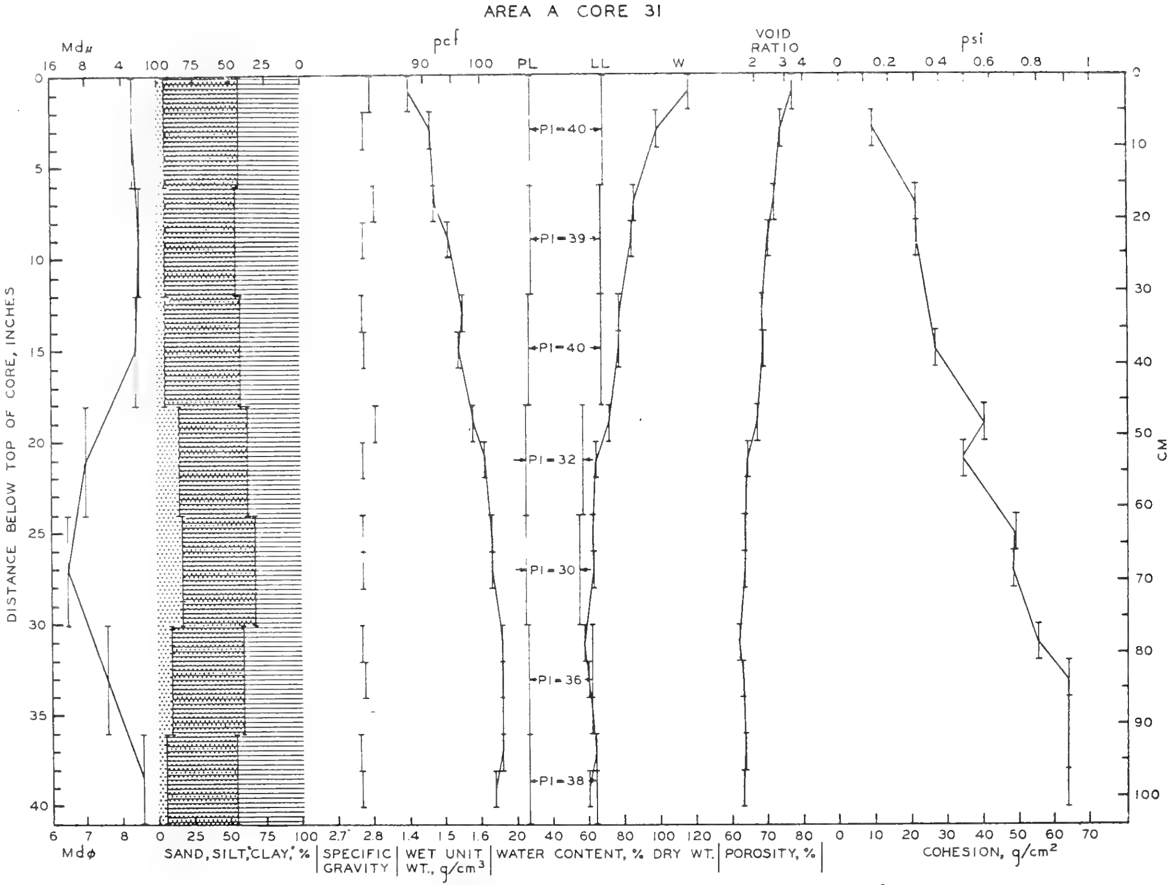

PLATE II. PARAMETERS VERSUS DEPTH FOR CORE A 31

AREA A CORE 33

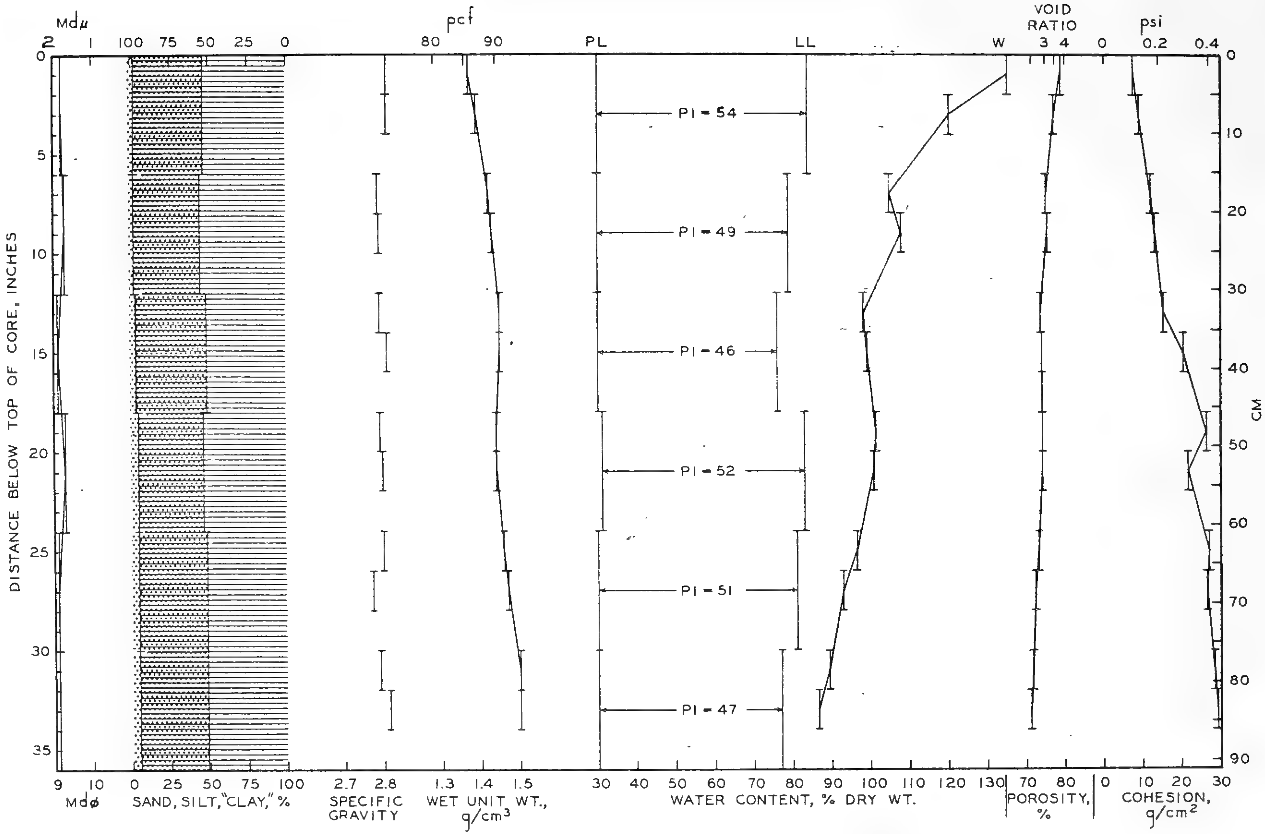

PLATE III. PARAMETERS VERSUS DEPTH FOR CORE A 33

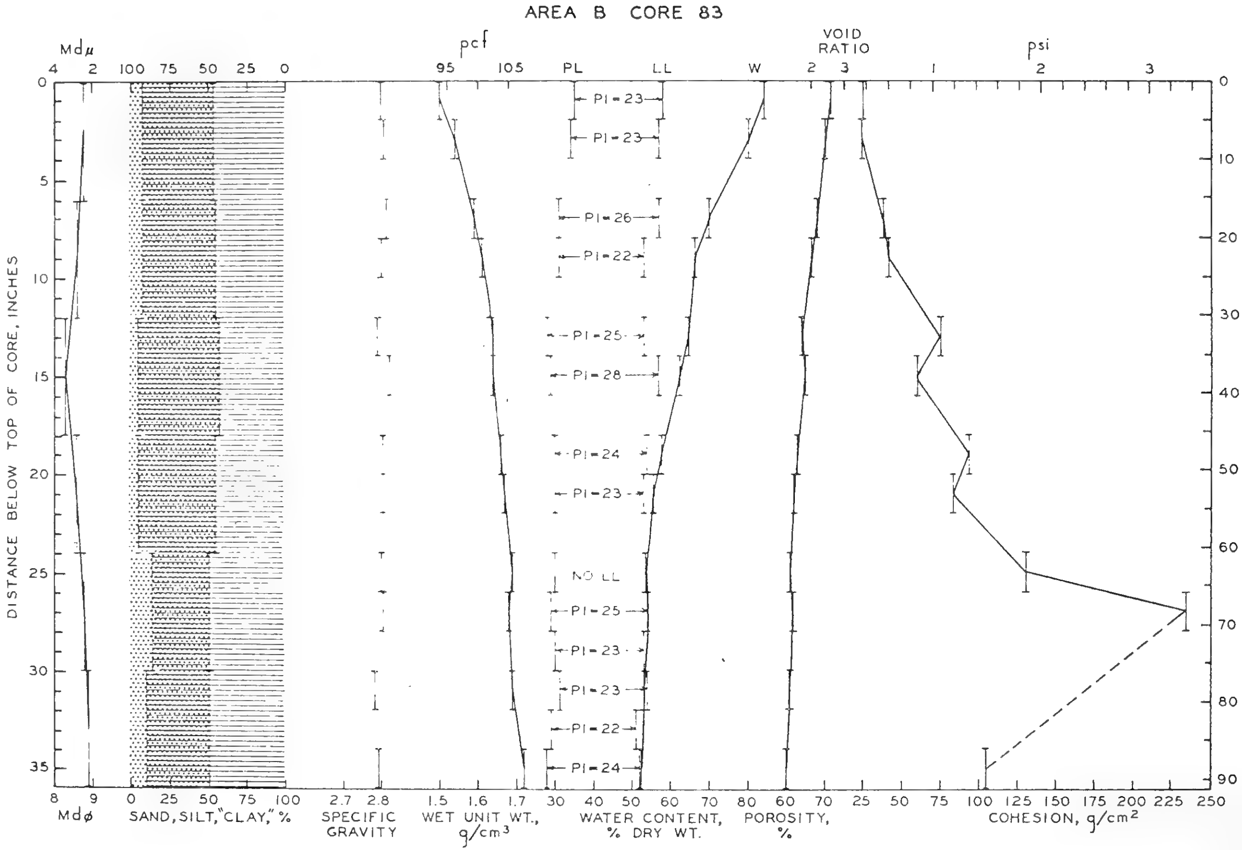

PLATE IV. PARAMETERS VERSUS DEPTH FOR CORE B 83

AREA B CORE 85

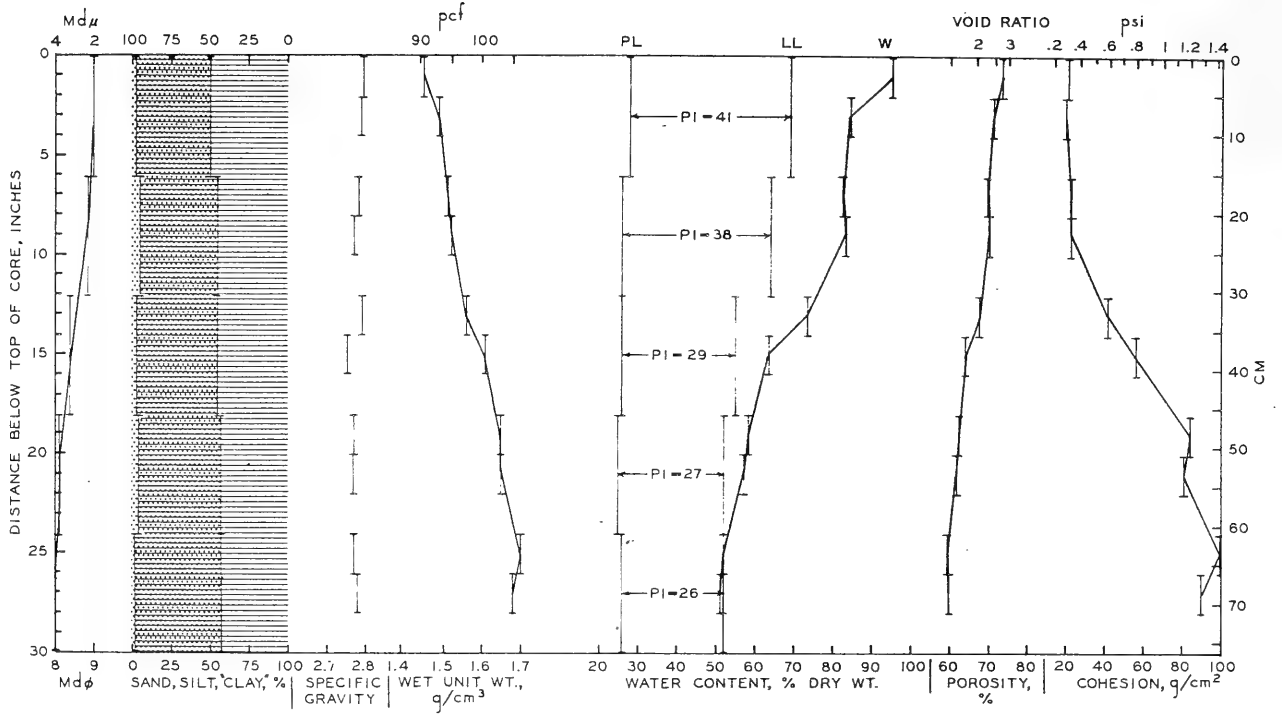

PLATE V. PARAMETERS VERSUS DEPTH FOR CORE B 85

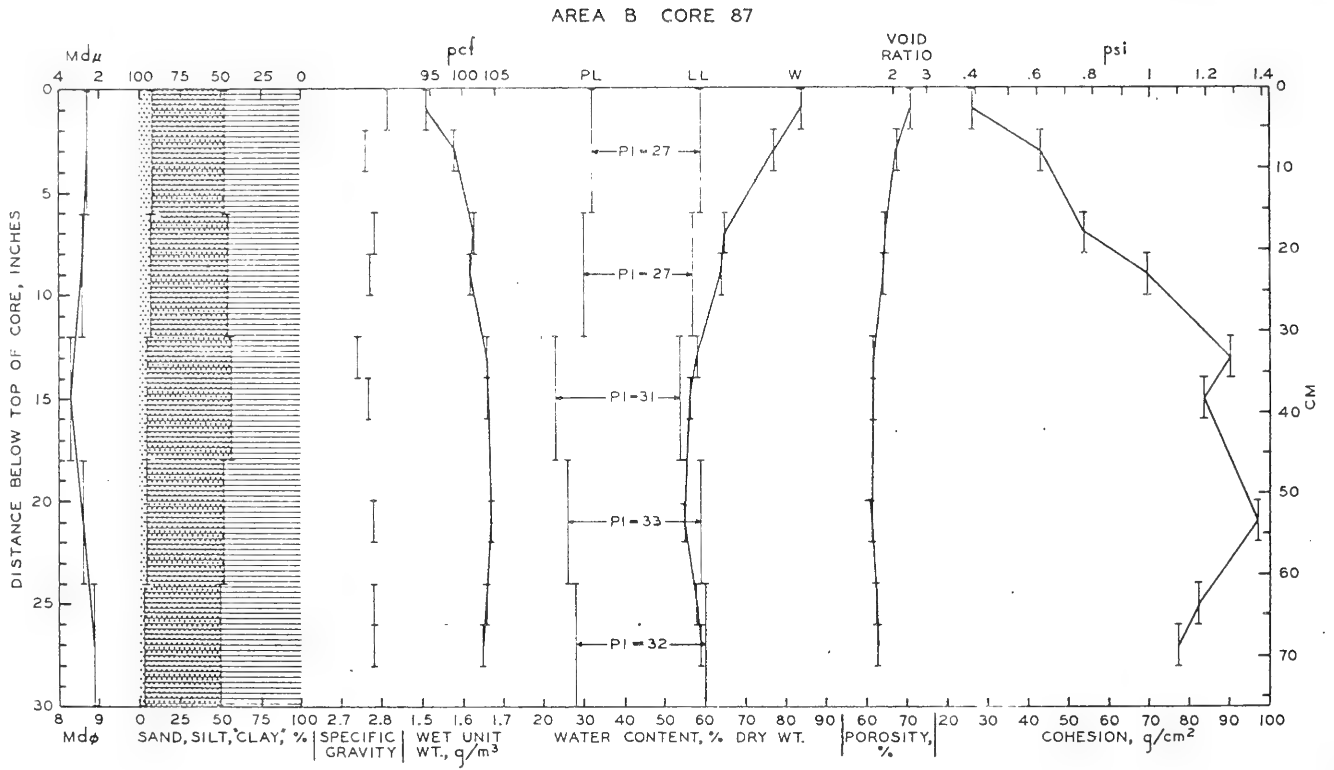

PLATE VI. PARAMETERS VERSUS DEPTH FOR CORE B 87

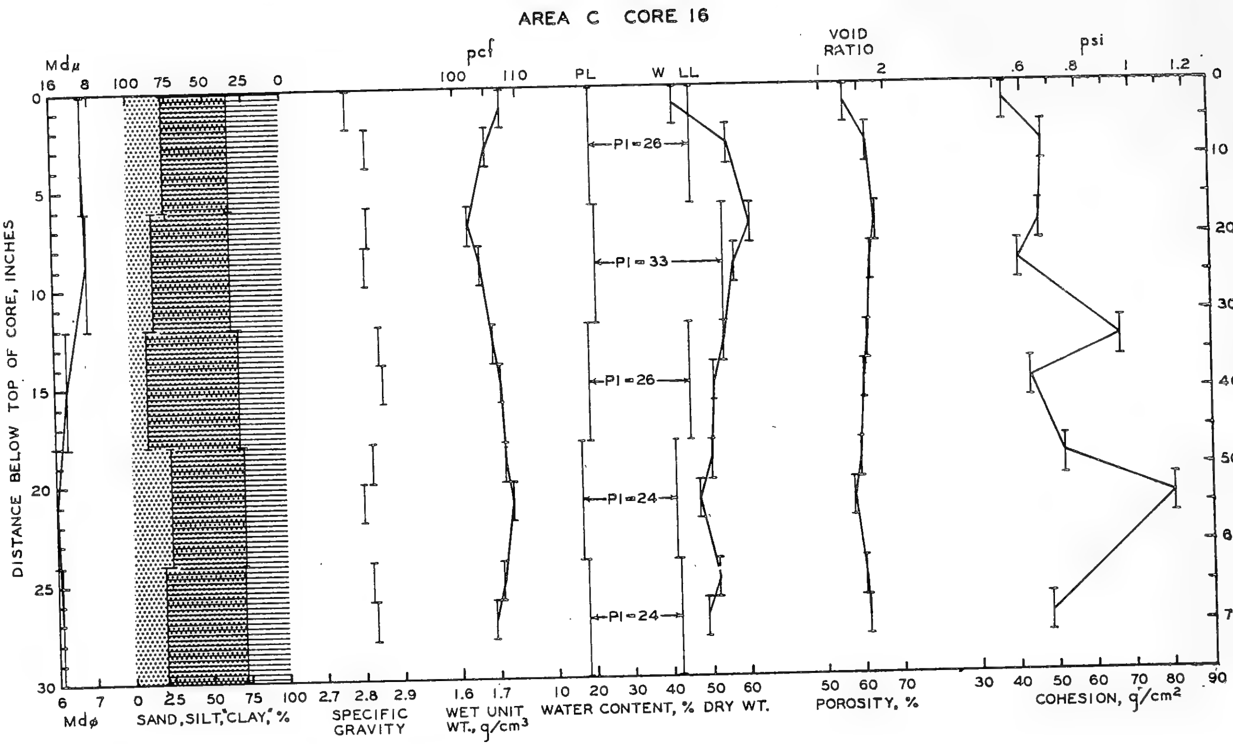

PLATE VII. PARAMETERS VERSUS DEPTH FOR CORE C 16

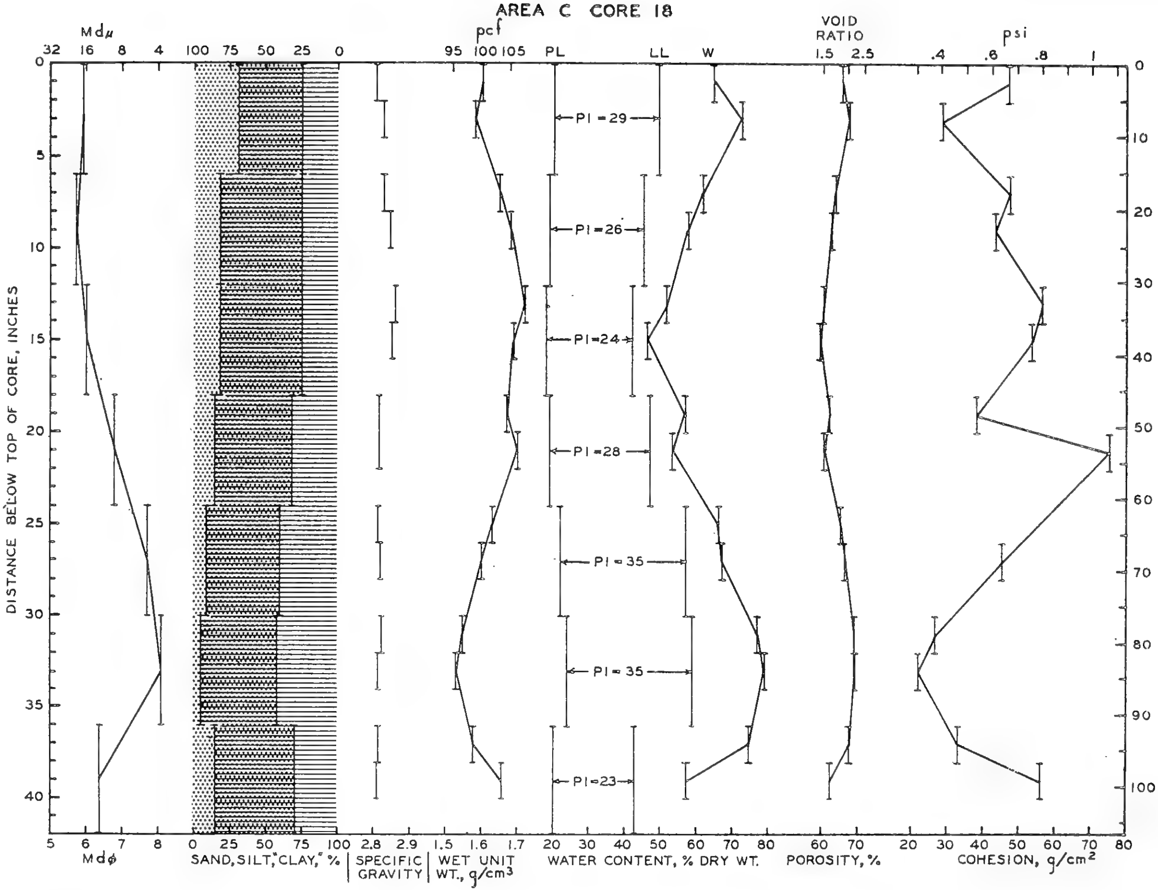

PLATE VIII. PARAMETERS VERSUS DEPTH FOR CORE C 18

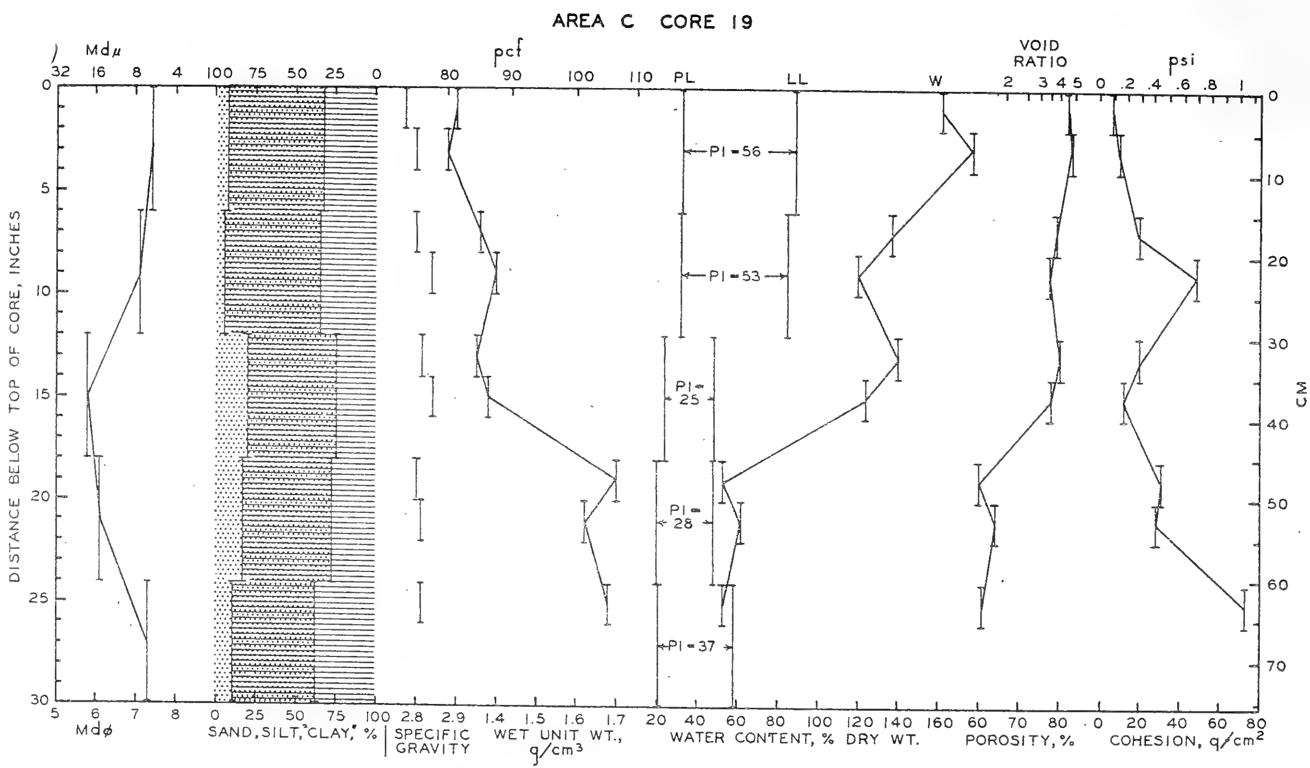

PLATE IX. PARAMETERS VERSUS DEPTH FOR CORE C 19

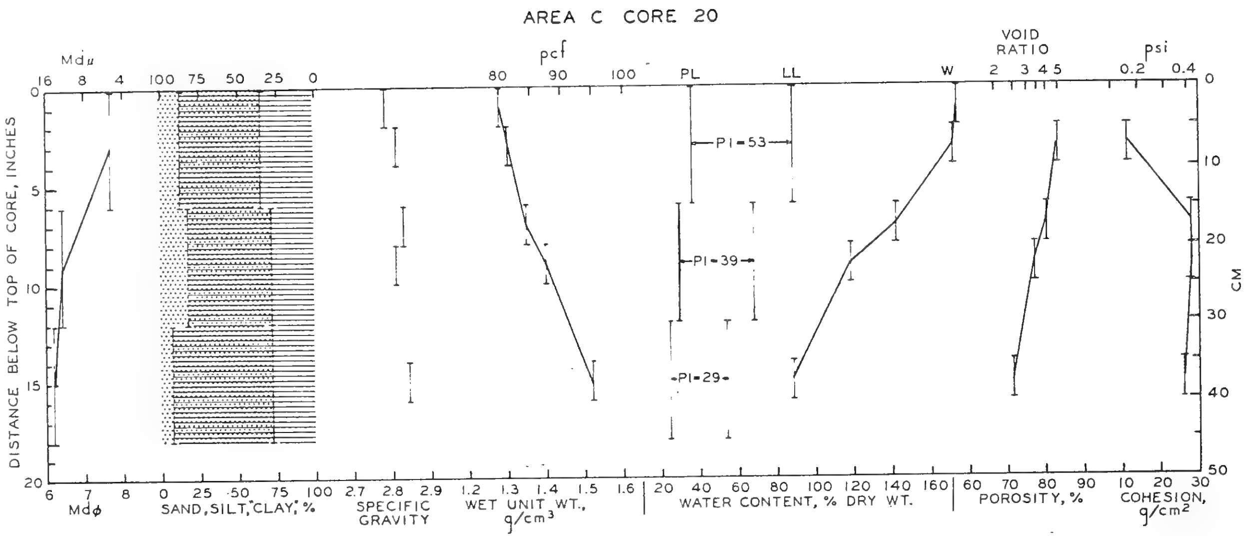

PLATE X. PARAMETERS VERSUS DEPTH FOR CORE C 20

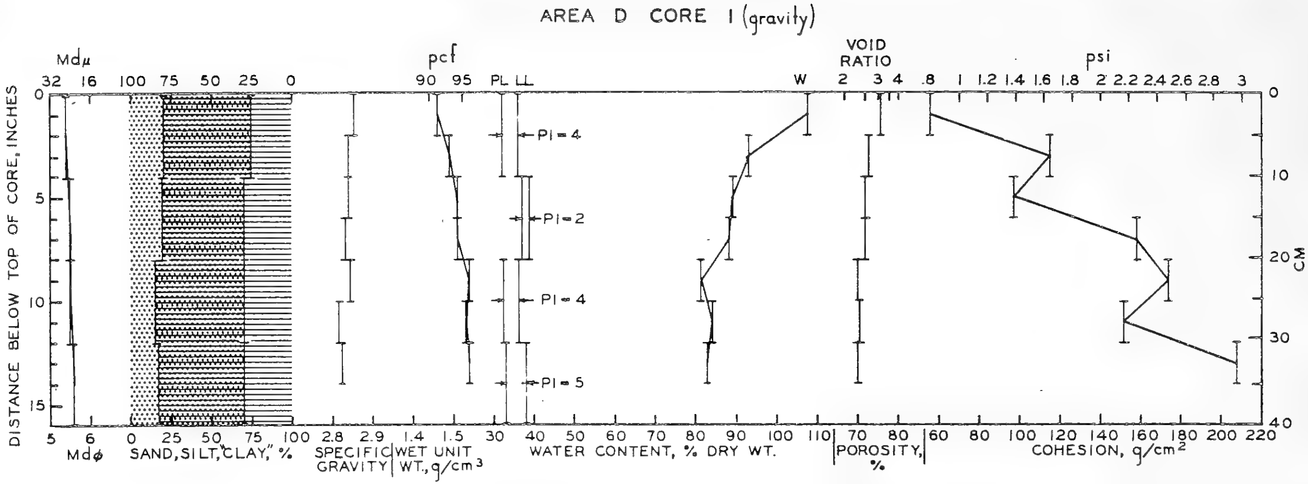

PLATE XI. PARAMETERS VERSUS DEPTH FOR CORE D 1g

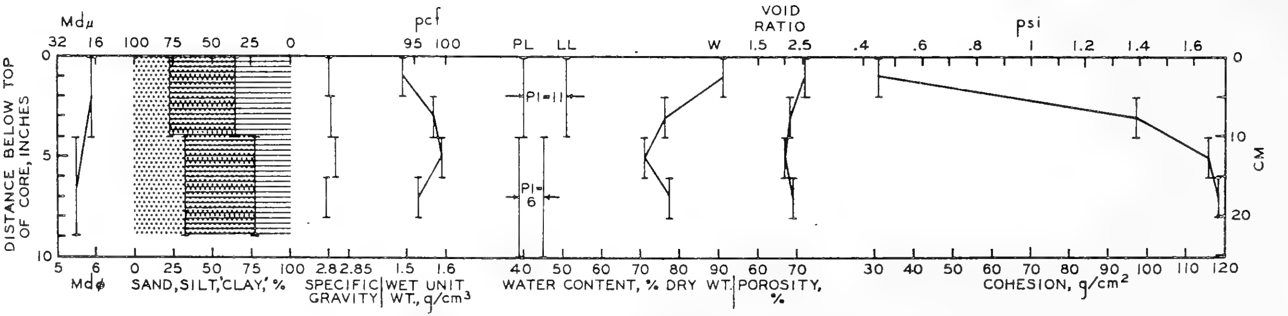

PLATE XII. PARAMETERS VERSUS DEPTH FOR CORE D 2

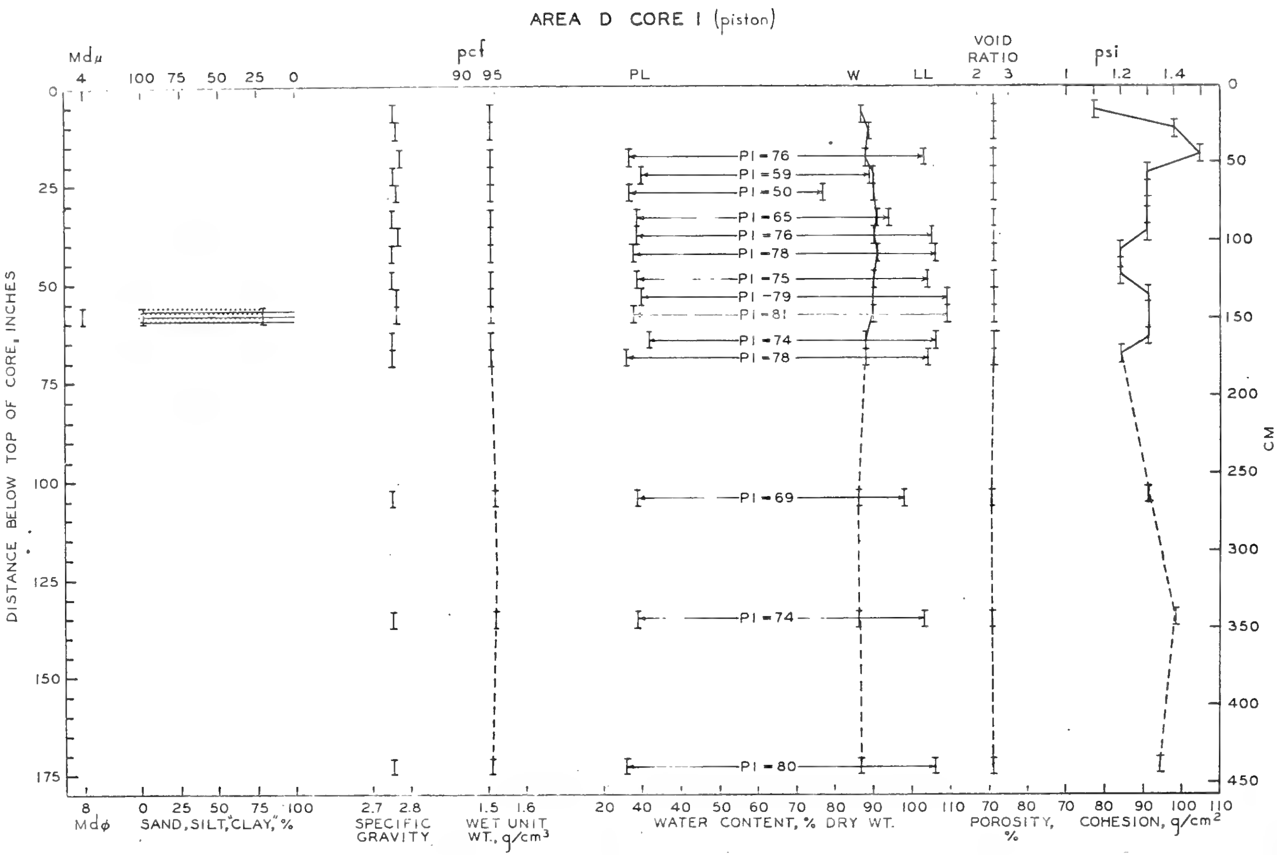

PLATE XIII. PARAMETERS VERSUS DEPTH FOR CORE D 1p

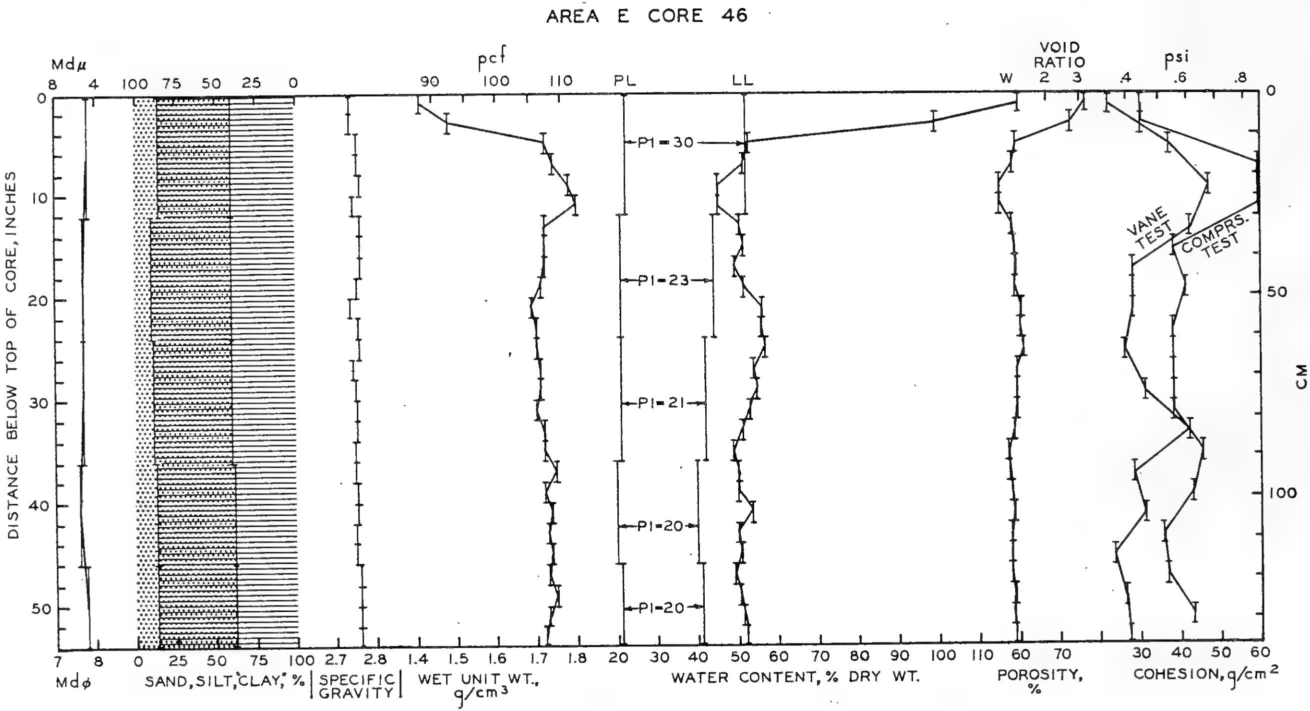

PLATE XIV. PARAMETERS VERSUS DEPTH FOR CORE E 46

AREA E CORE 47

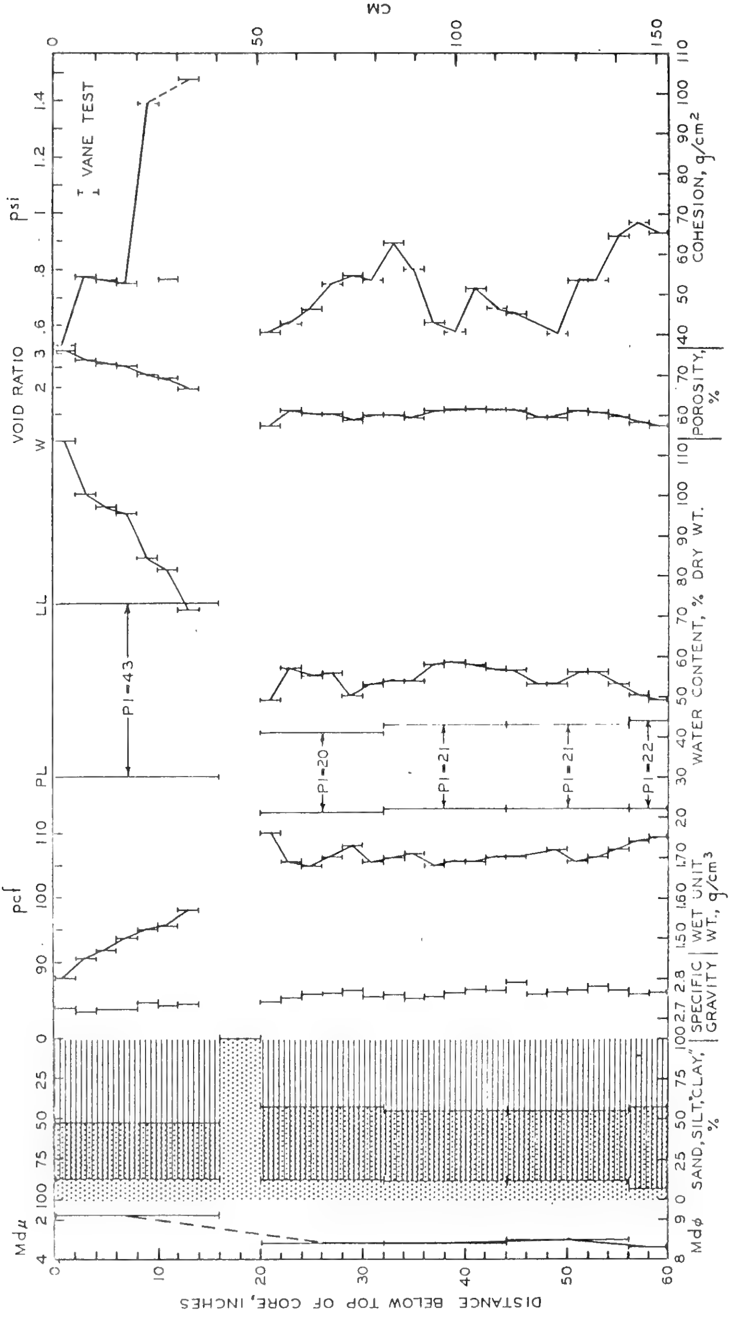

PLATE XV. PARAMETERS VERSUS DEPTH FOR CORE E 47

AREA E CORE 48

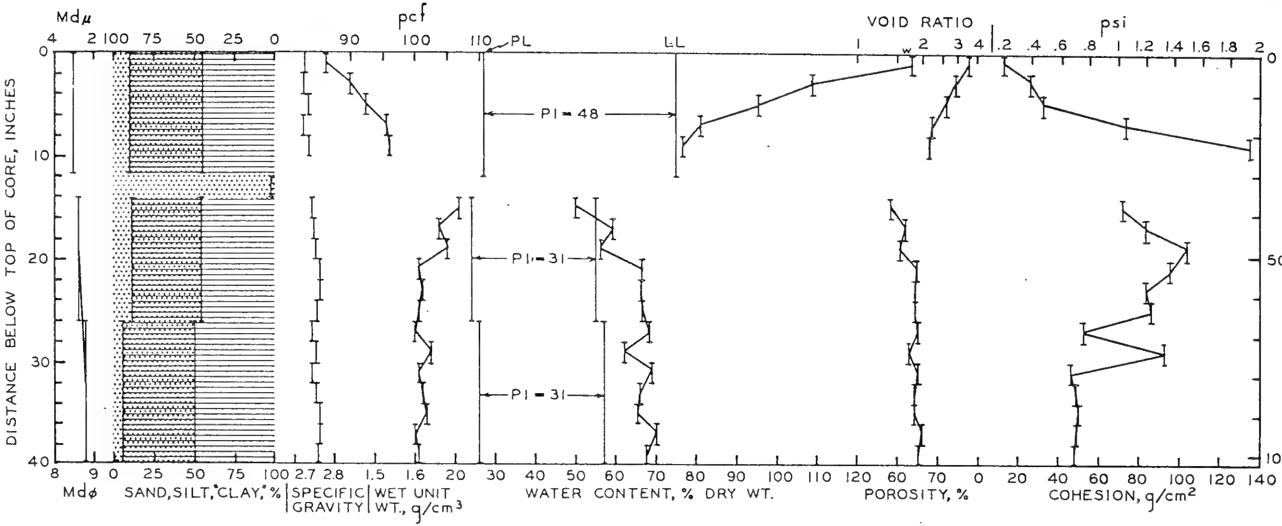

PLATE XVI. PARAMETERS VERSUS DEPTH FOR CORE E 48

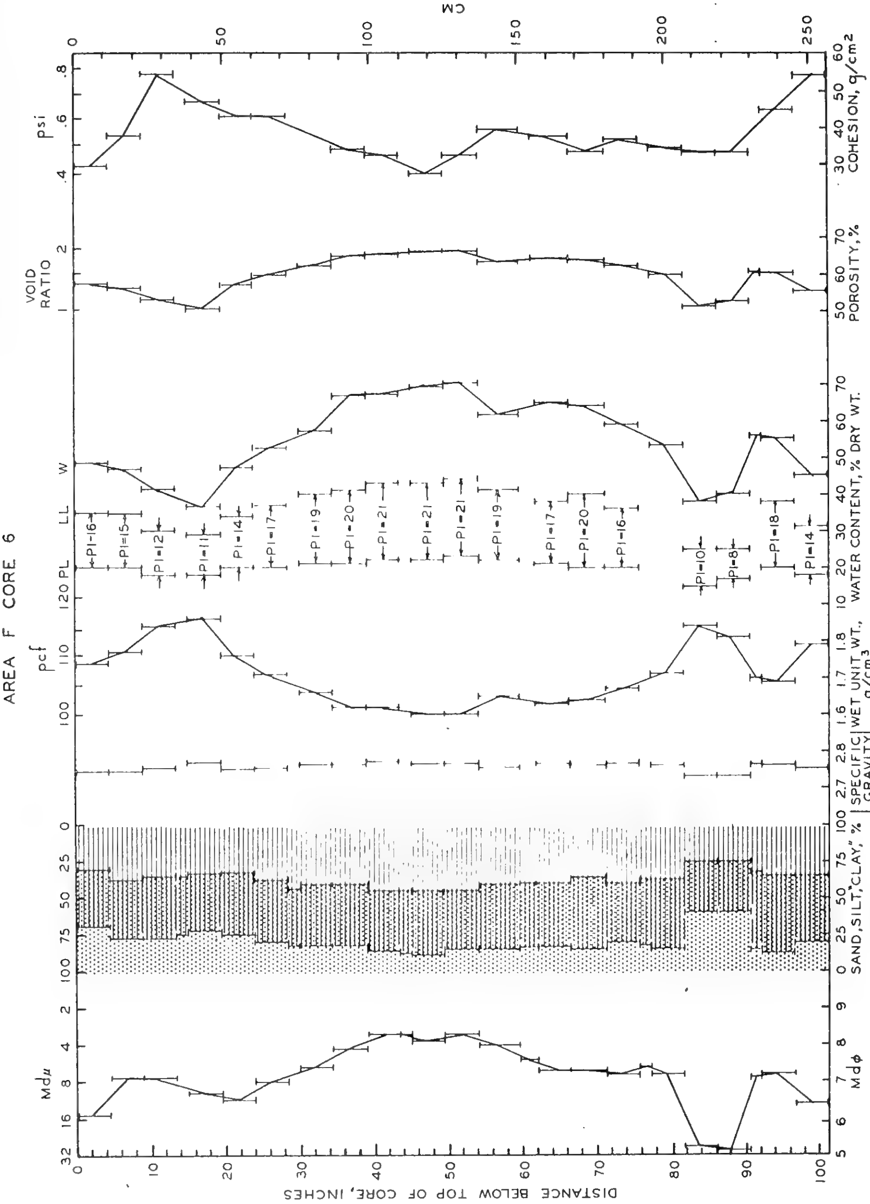

PLATE XVII. PARAMETERS VERSUS DEPTH FOR CORE F 6

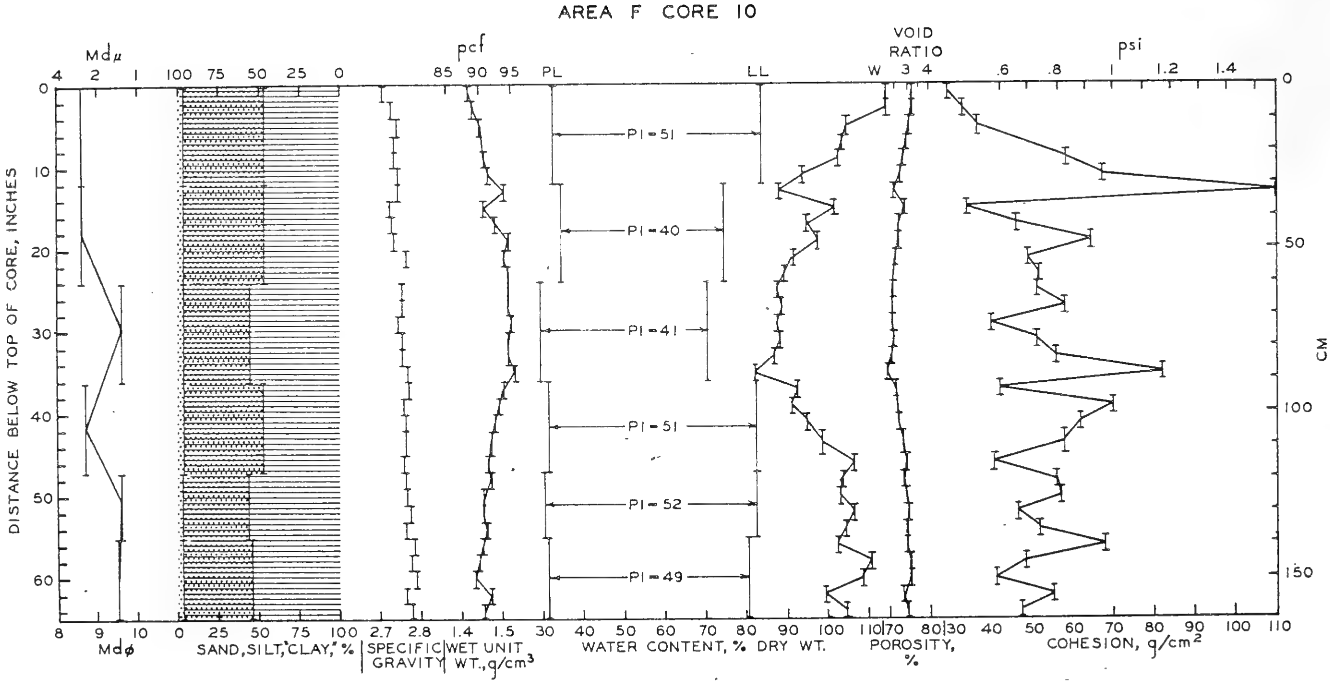

PLATE XVIII. PARAMETERS VERSUS DEPTH FOR CORE F 10

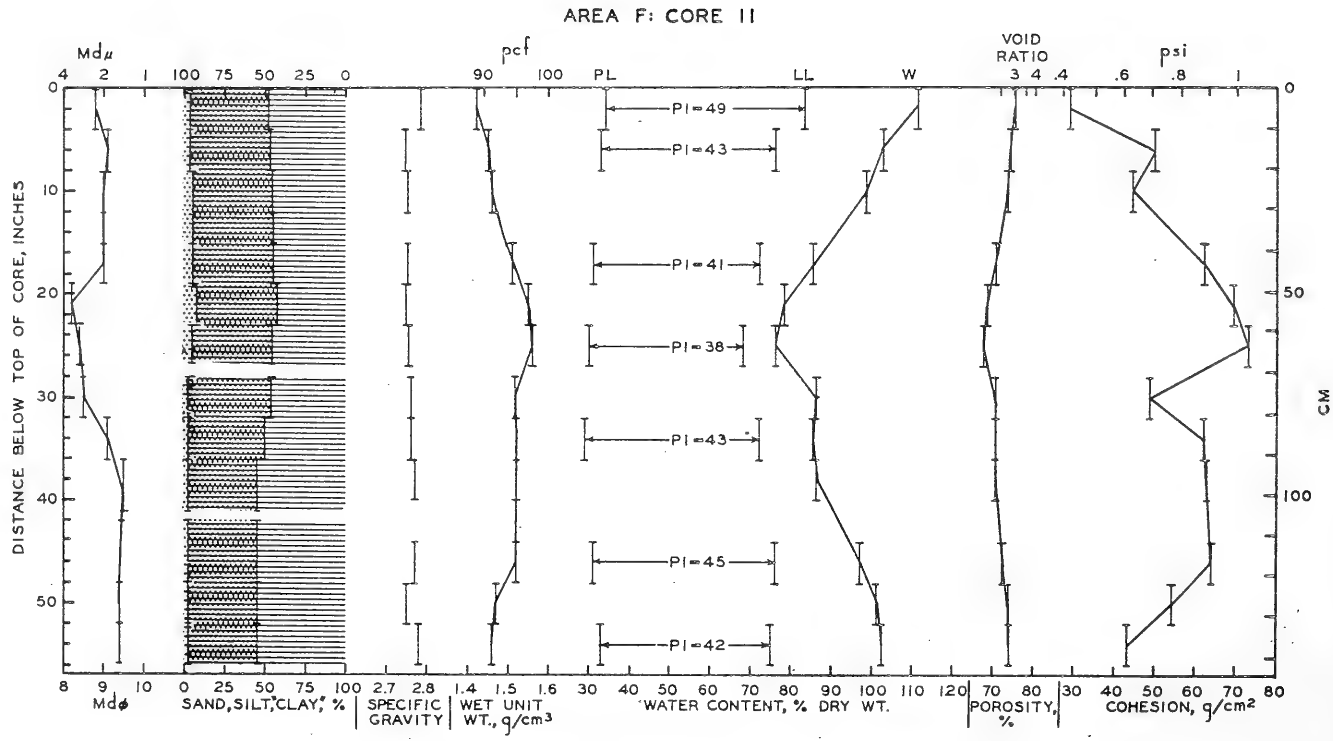

PLATE XIX. PARAMETERS VERSUS DEPTH FOR CORE F 11

AREA F CORE 12

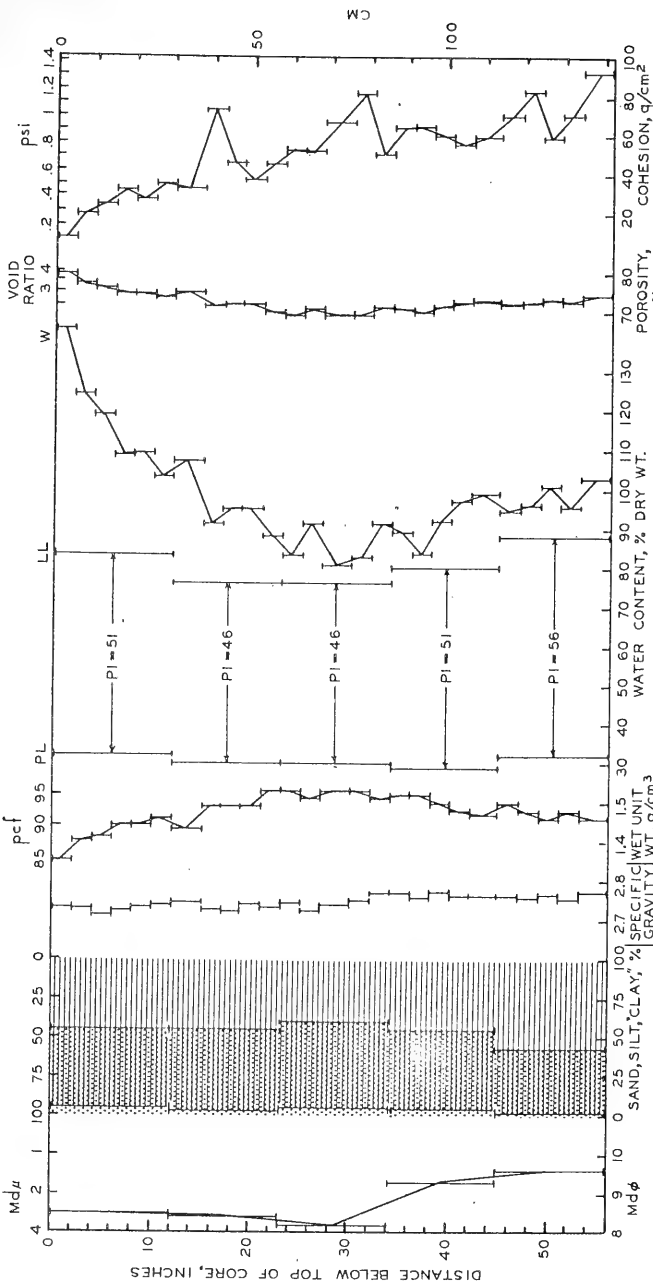

PLATE XX. PARAMETERS VERSUS DEPTH FOR CORE F 12

AREA F CORE 13

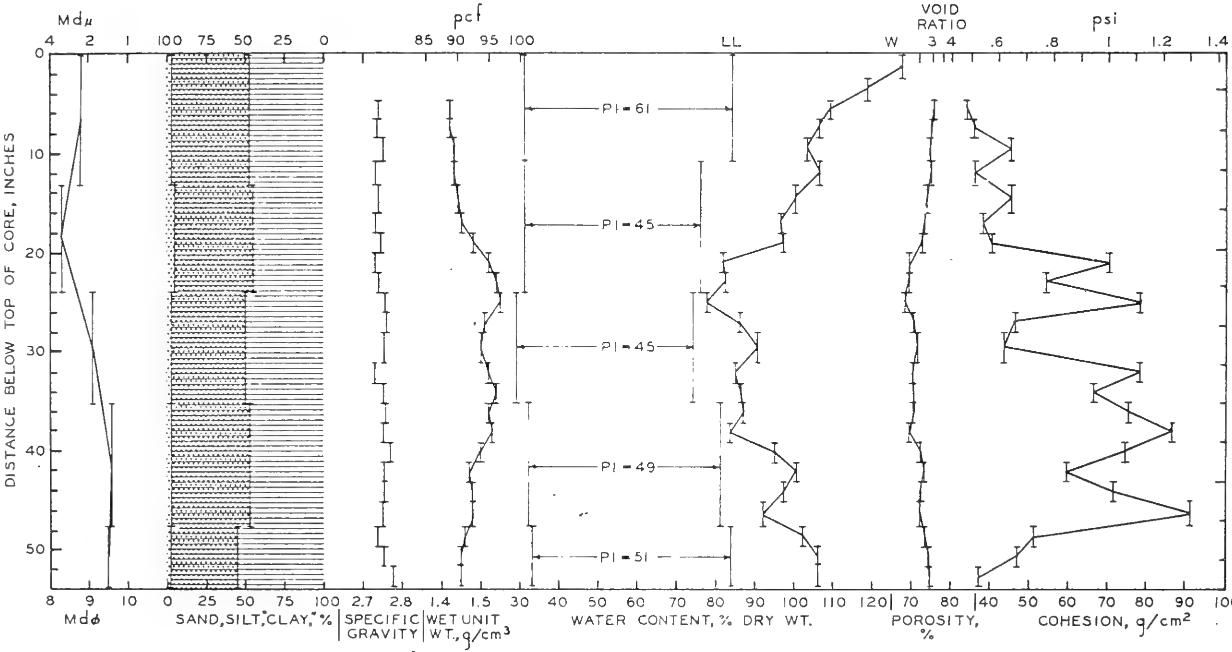

PLATE XXI. PARAMETERS VERSUS DEPTH FOR CORE F 13

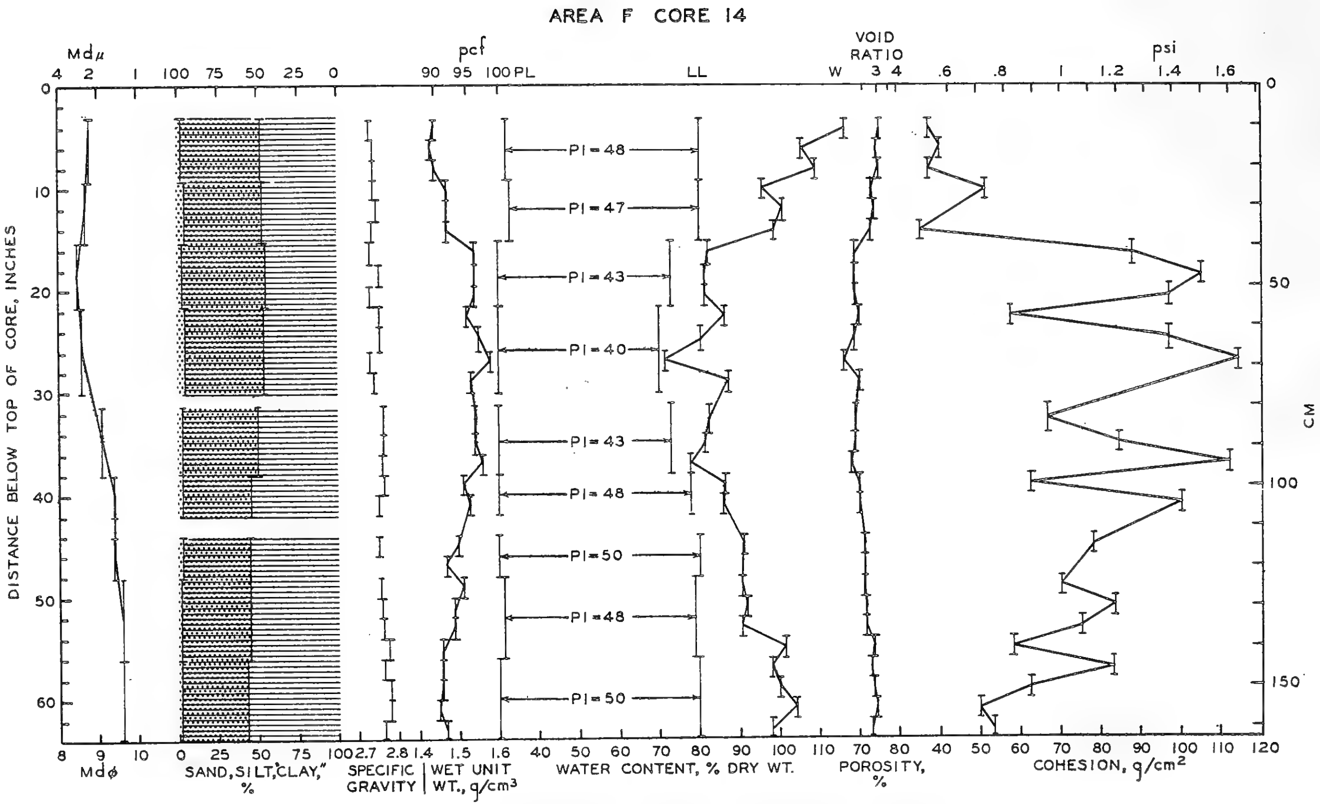

PLATE XXII. PARAMETERS VERSUS DEPTH FOR CORE F 14

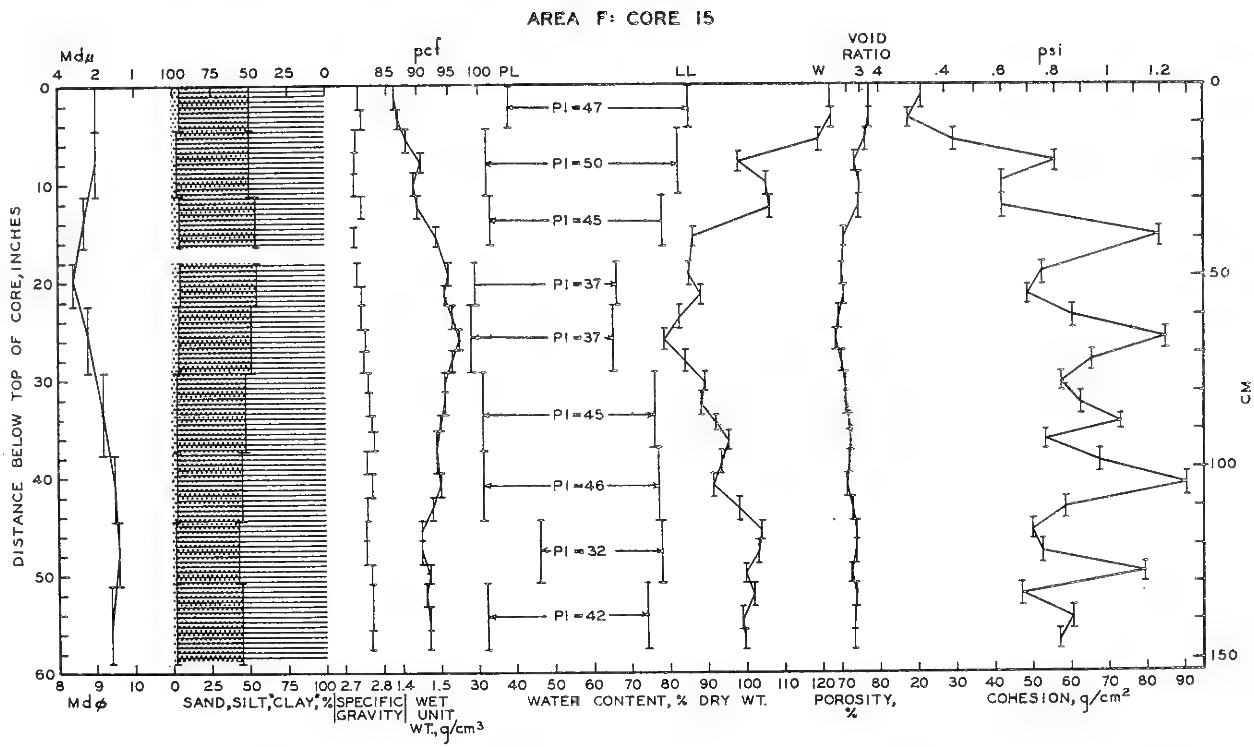

PLATE XXIII. PARAMETERS VERSUS DEPTH FOR CORE F 15

AREA F: CORE 16

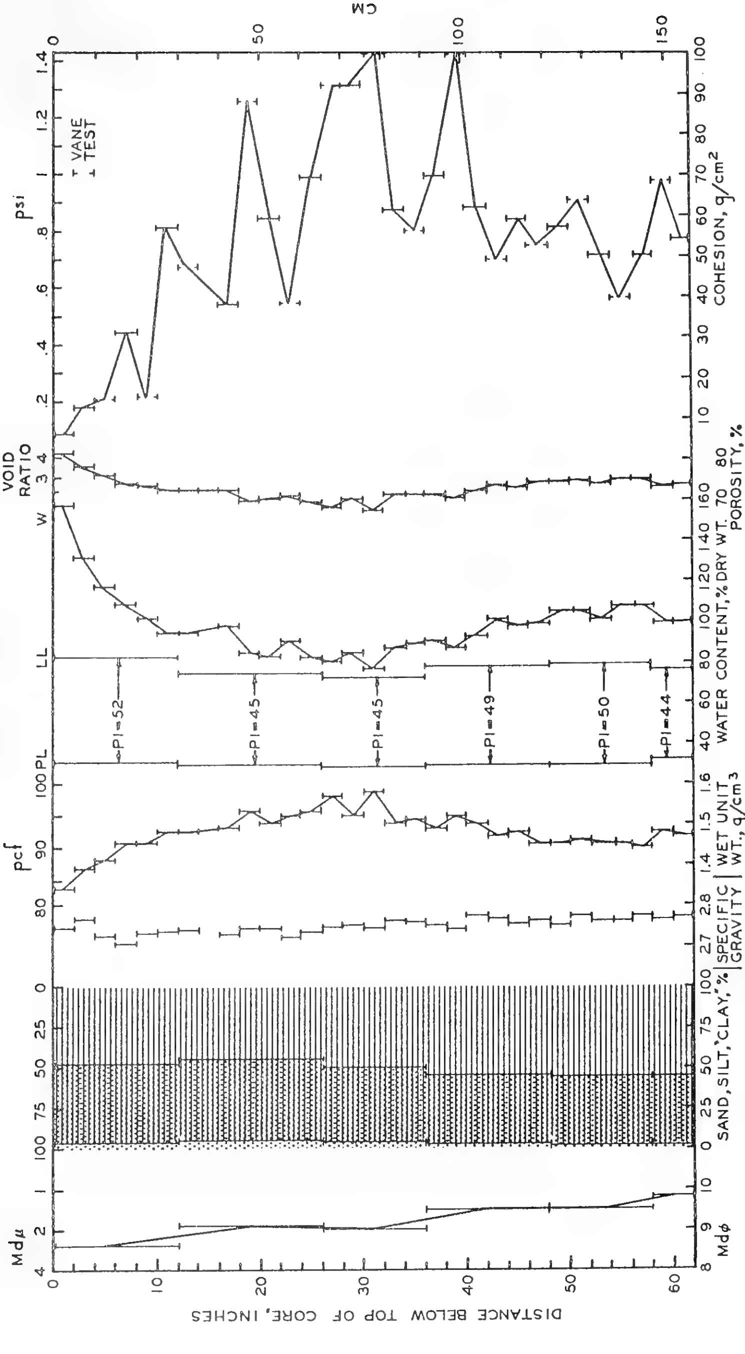

PLATE XXIV. PARAMETERS VERSUS DEPTH FOR CORE F 16

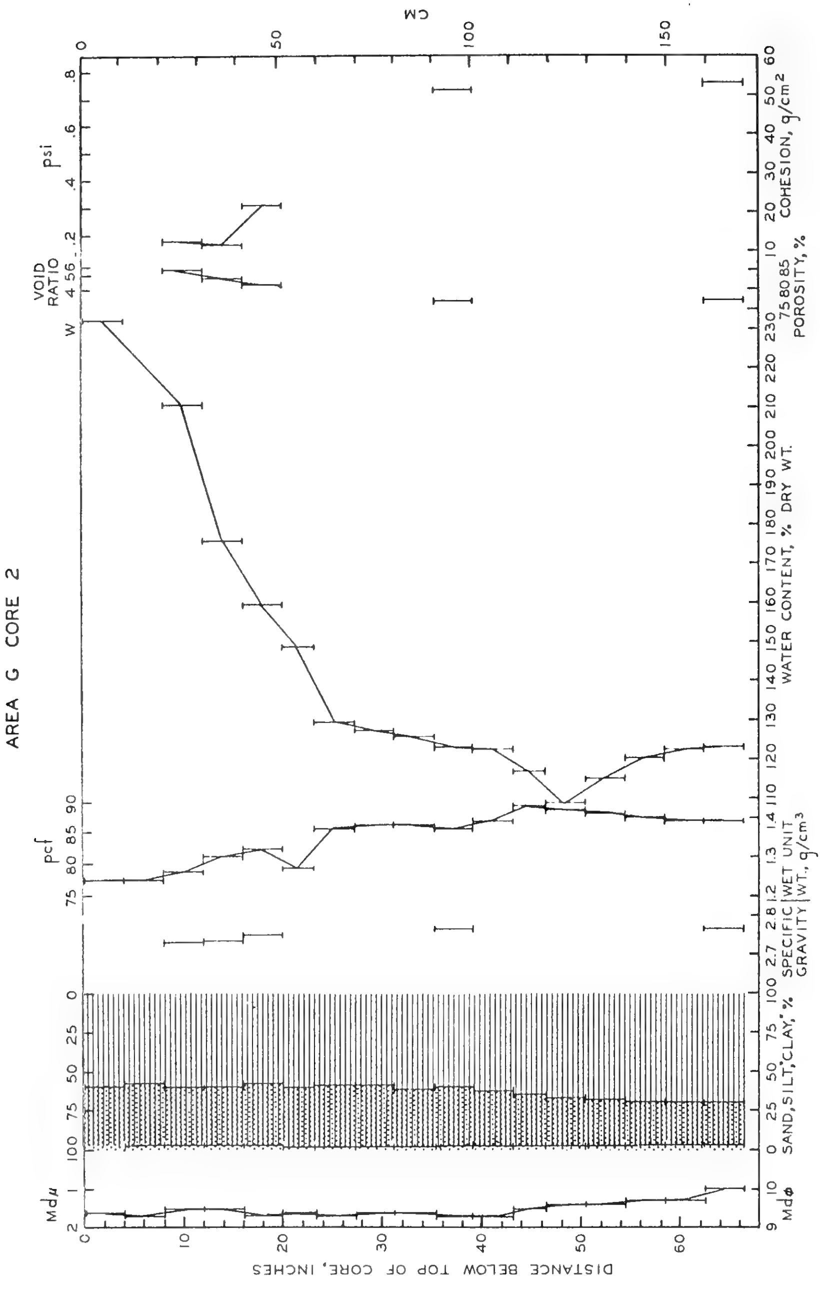

PLATE XXV. PARAMETERS VERSUS DEPTH FOR CORE G 2

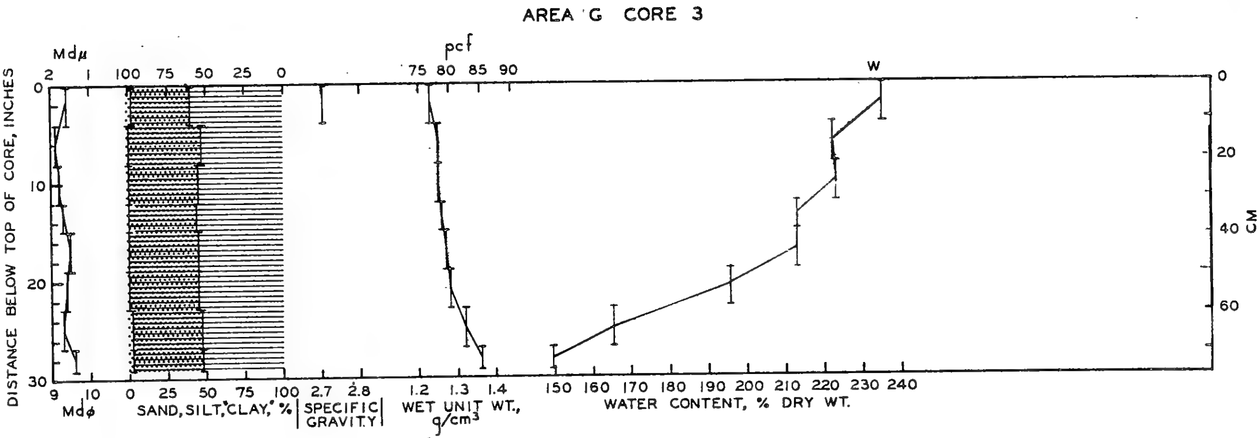

PLATE XXVI. PARAMETERS VERSUS DEPTH FOR CORE G 3

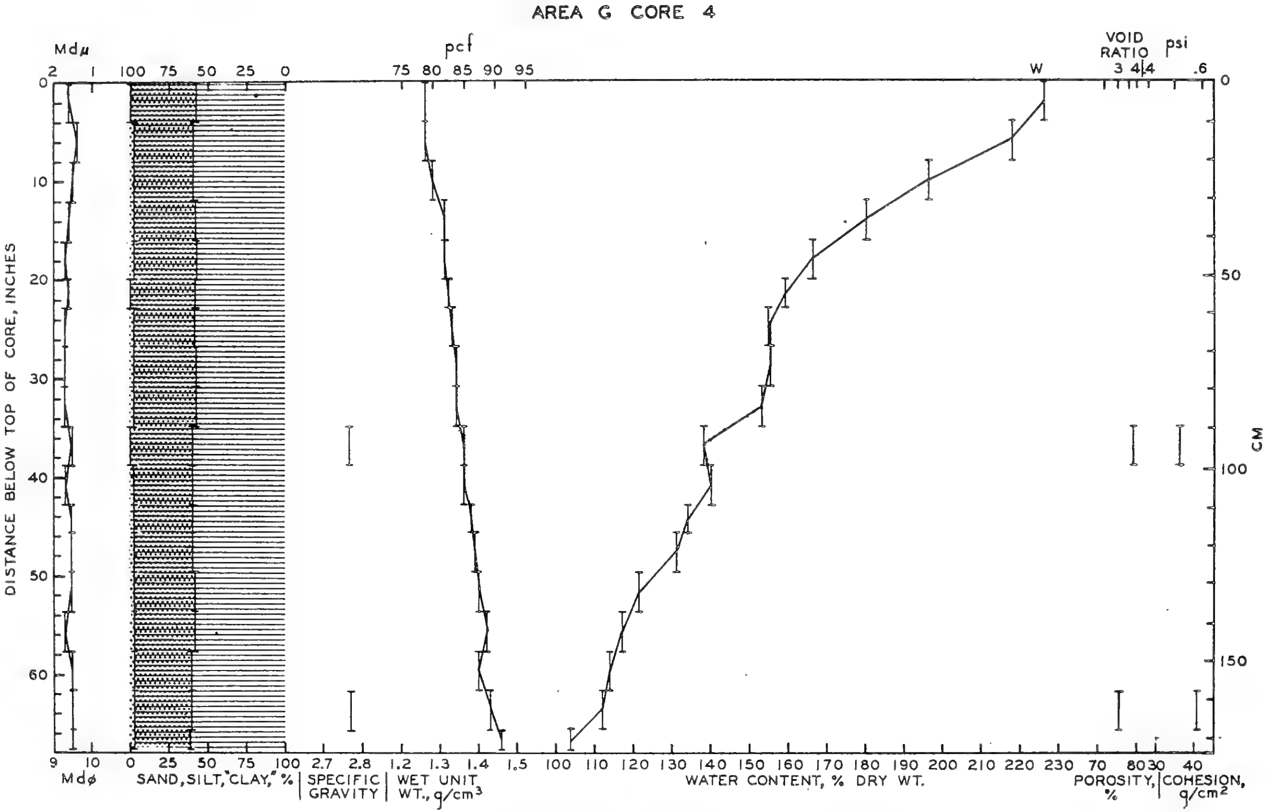

PLATE XXVII. PARAMETERS VERSUS DEPTH FOR CORE G 4

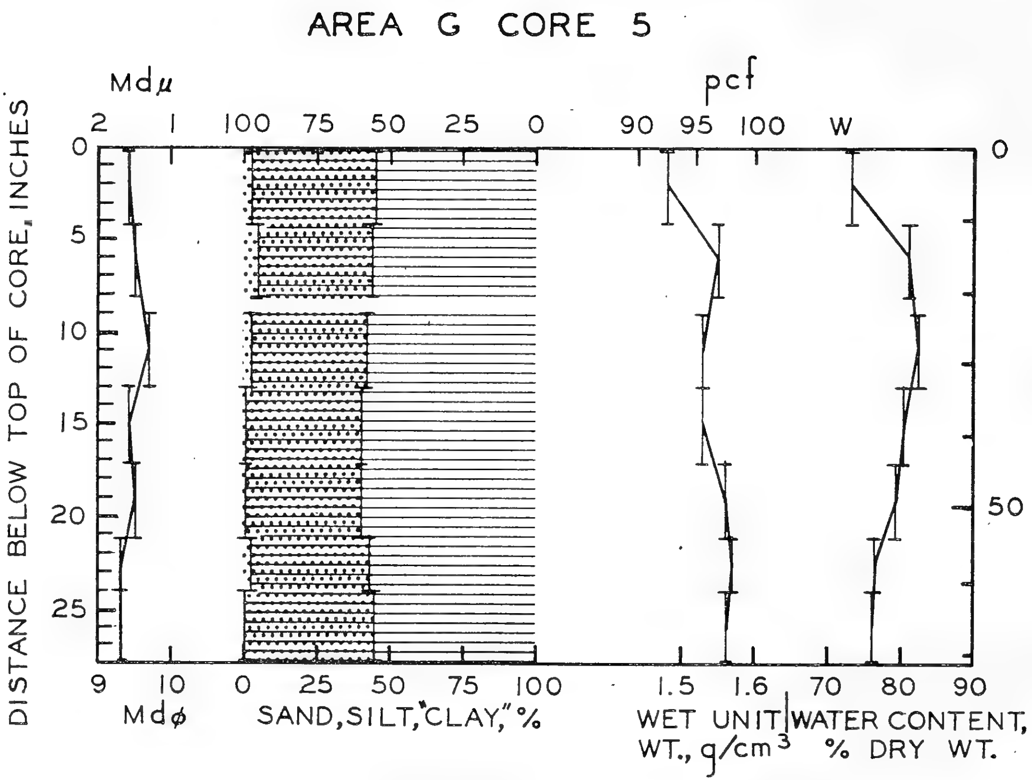

PLATE XXVIII. PARAMETERS VERSUS DEPTH FOR CORE G 5

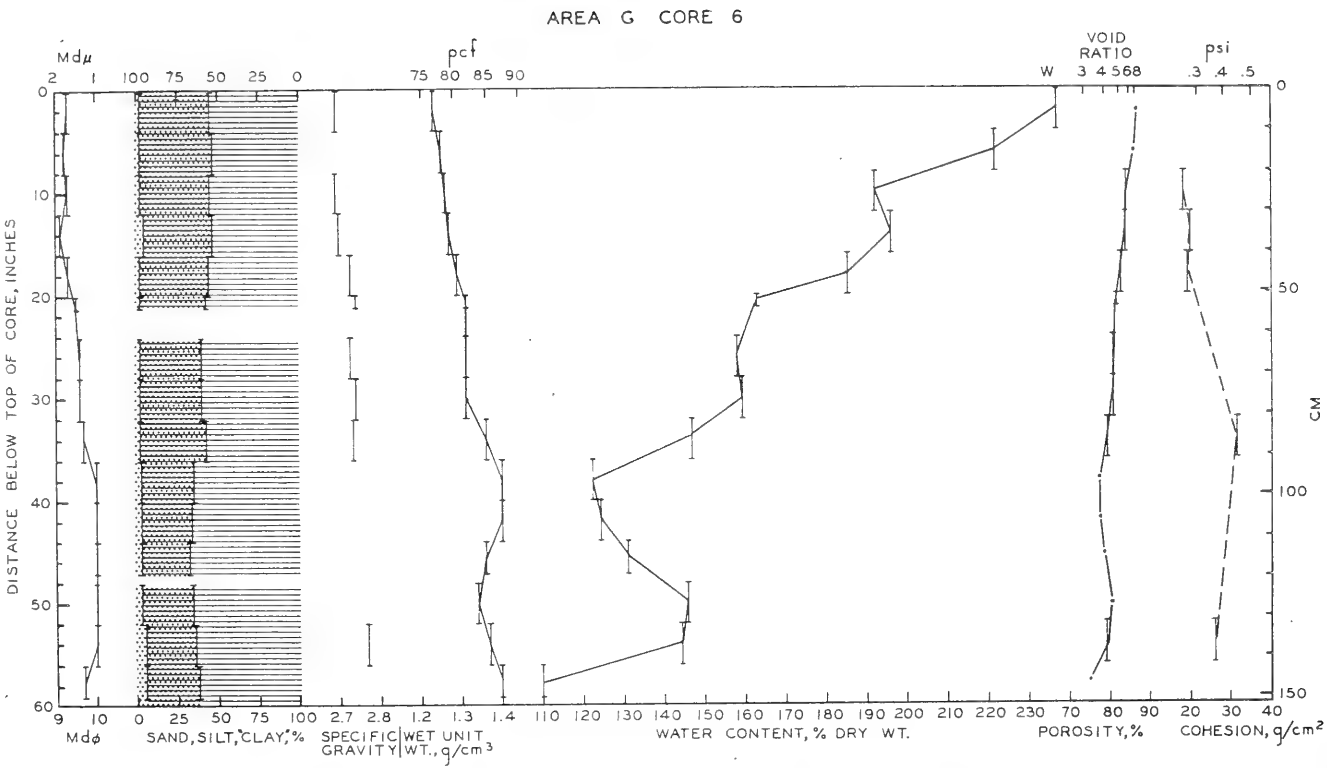

PLATE XXIX. PARAMETERS VERSUS DEPTH FOR CORE G 6

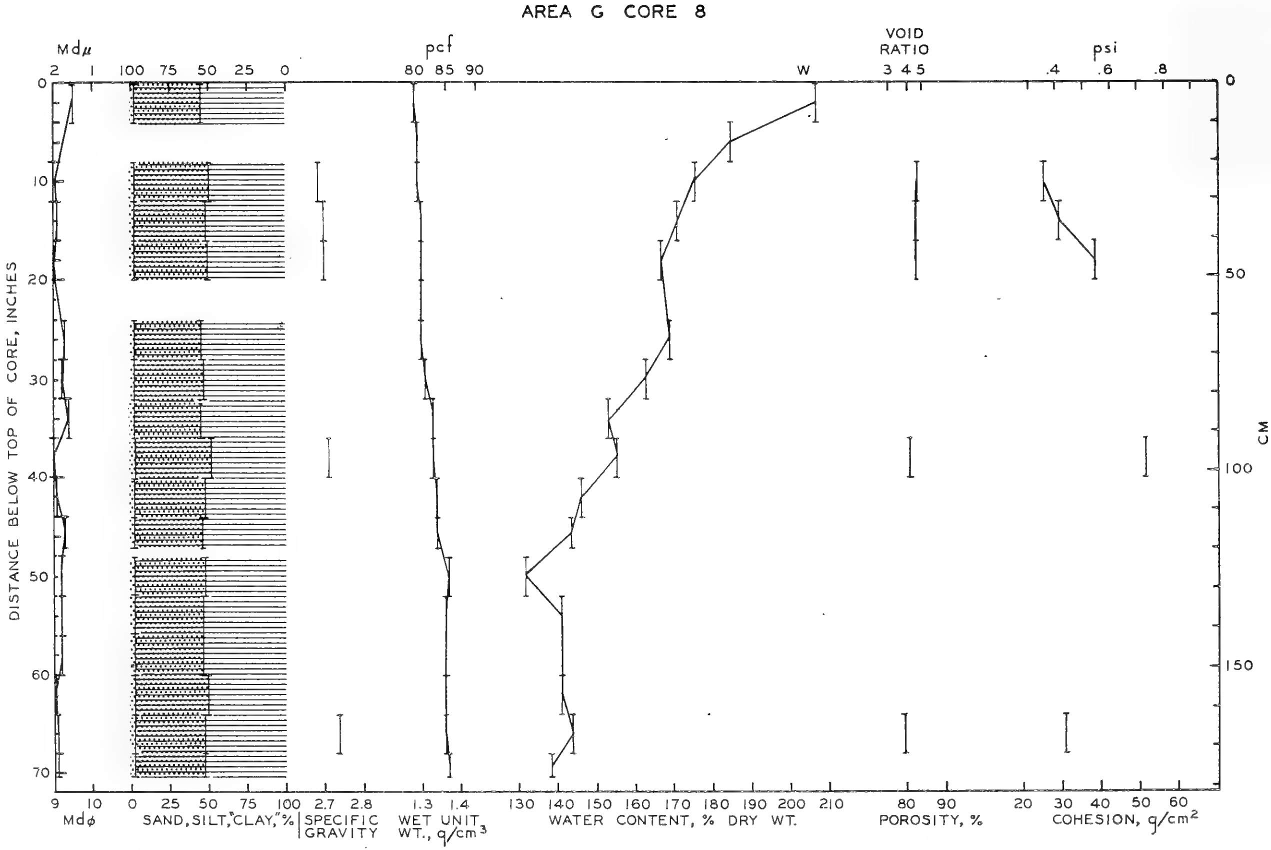

PLATE XXX. PARAMETERS VERSUS DEPTH FOR CORE G 8

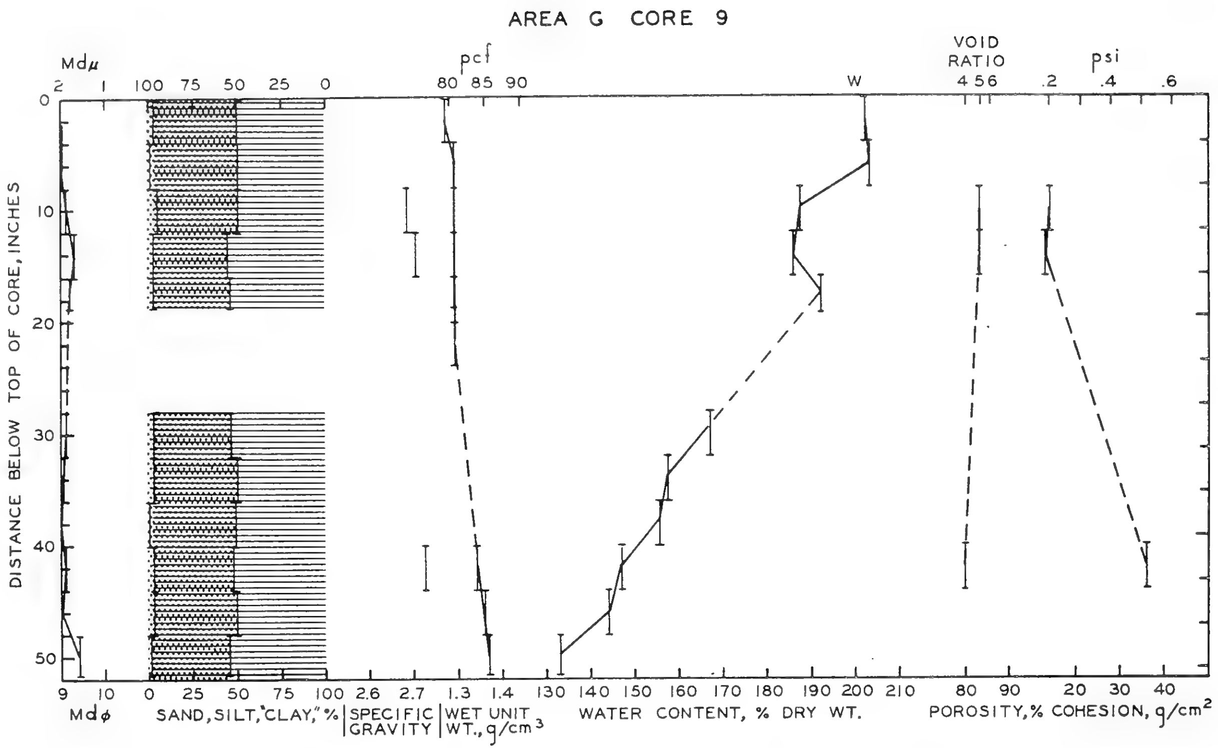

PLATE XXXI. PARAMETERS VERSUS DEPTH FOR CORE G 9

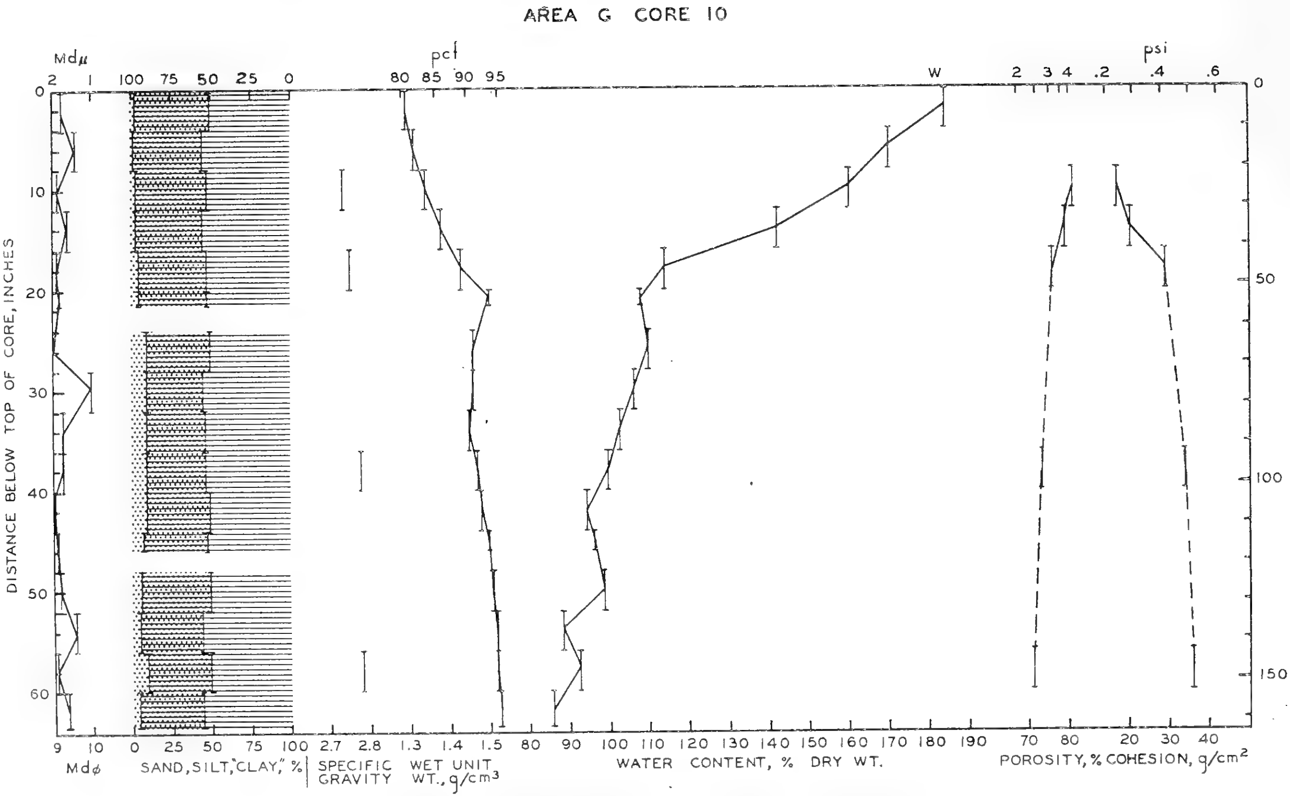

PLATE XXXII. PARAMETERS VERSUS DEPTH FOR CORE G 10

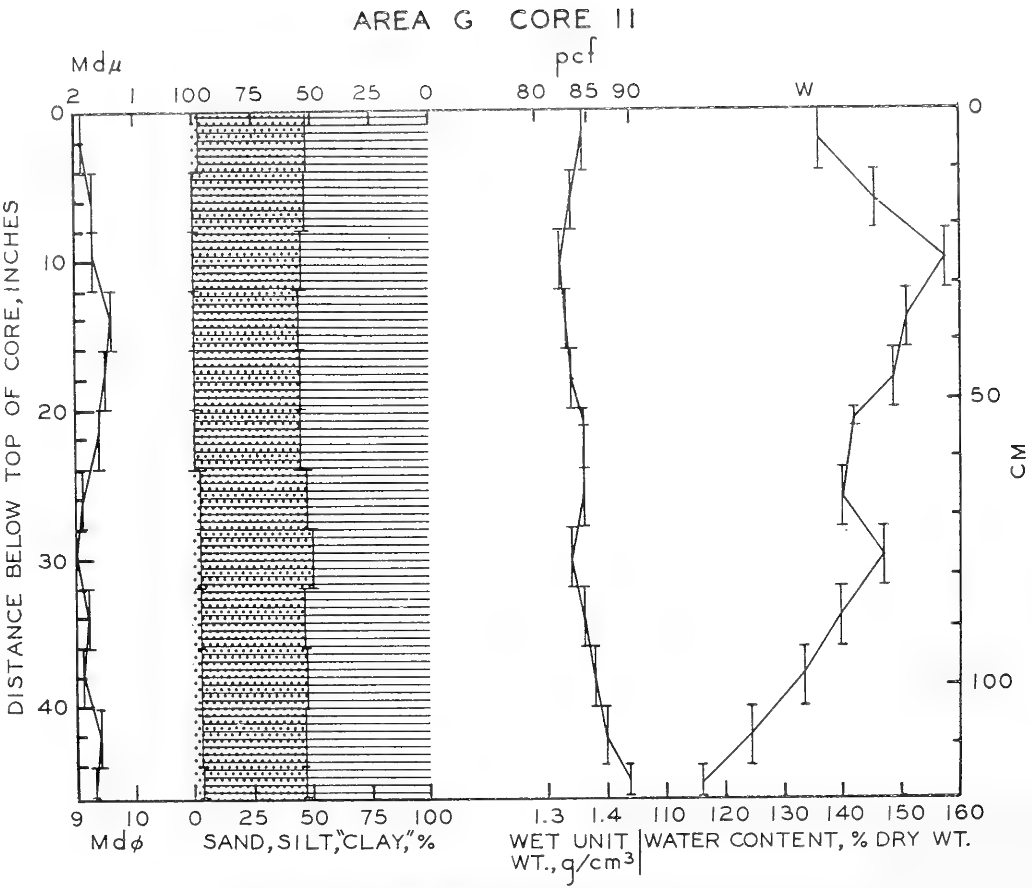

PLATE XXXIII. PARAMETERS VERSUS DEPTH FOR CORE G 11

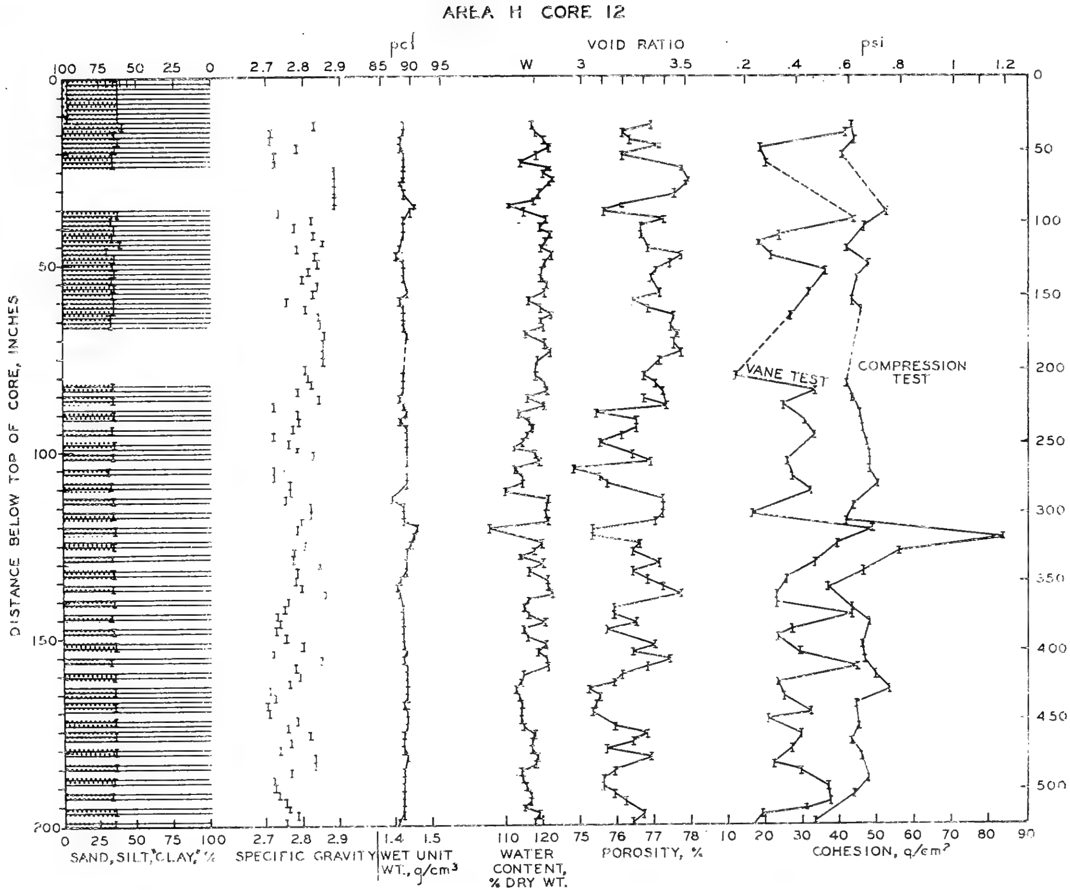

PLATE XXXIV. PARAMETERS VERSUS DEPTH FOR CORE H 12

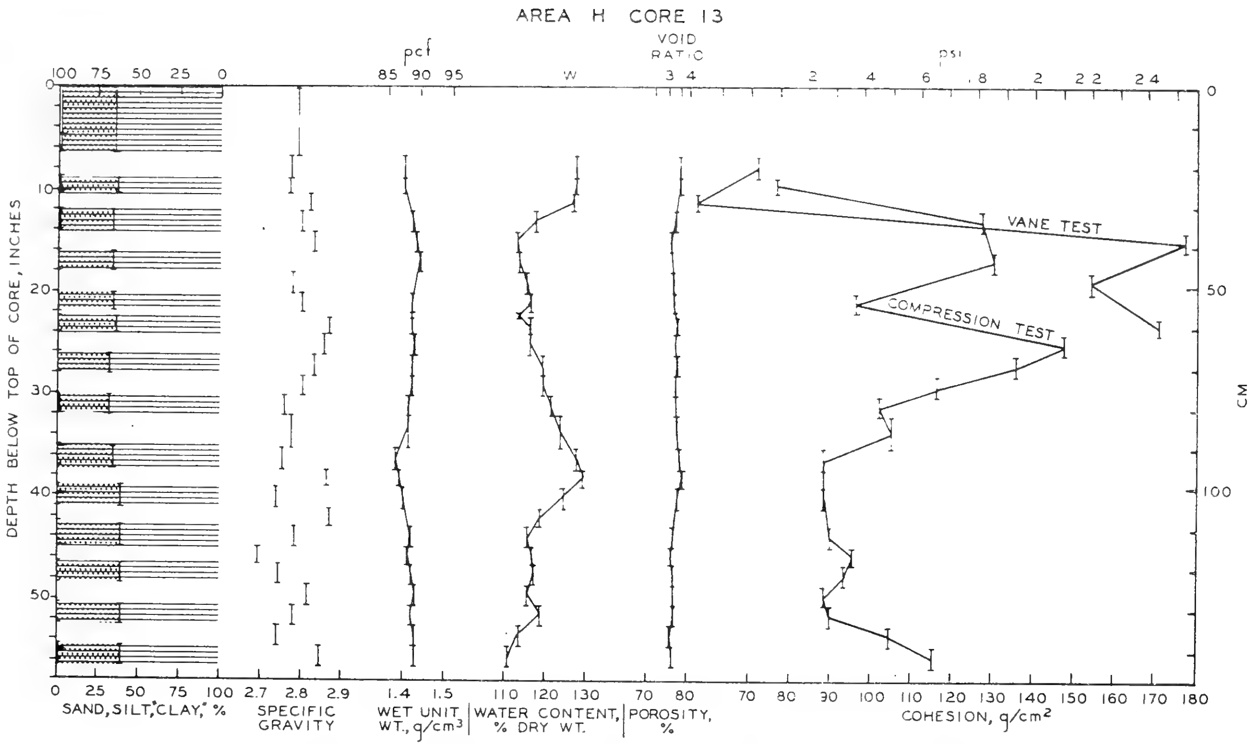

PLATE XXXV. PARAMETERS VERSUS DEPTH FOR CORE H 13

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APPENDIX A

SALINITY CORRECTION FOR SPECIFIC GRAVITY MEASUREMENTS

Unanimity of opinion does not exist at present on the salt content or salinity[12] of interstitial waters of marine sediments. Physical measurements based on assumed oceanic salinity of pore water (for example, Ratcliffe, 1960, p. 1536) may be of questionable validity until the distribution of interstitial salinity is better known. Arrhenius (1952, p. 78-79) reported a linear correlation between salinity and water content in deep-sea Pacific and Atlantic Ocean cores. Salinity varied markedly with depth in most east Pacific cores (Arrhenius, 1952, Appendix plates 1-62). Emery and Rittenberg (1952, p. 803) in studies of cores from basins off Southern California found that the salinities of interstitial waters were relatively constant with depth of burial. Pore water chlorinity was slightly greater than 19 parts per thousand (p. 788-789), which represents a salinity of about 35 parts per thousand--a normal oceanic value. A more variable relationship of salinity to depth is reported by Shepard and Moore (1955, p. 1582) and Sutton and others (1957, p. 792-793).

Hamilton and Menard (1956, p. 755) give a formula correcting grain density, or specific gravity of particles, for salt content and discuss procedure.

[12]The definition of salinity is "the total amount of solid material in grams contained in one kilogram of sea water when all the carbonate has been converted to oxide, the bromine and iodine replaced by chlorine, and all organic matter completely oxidized" (Sverdrup, and others, 1946, p. 50). Salinity, in consequence, is not strictly speaking synonymous with salt content, although it is often used in synonymy.

APPENDIX B

DATA TABLE FOR EACH CORE TESTED

All parameters listed in the data tables have been defined and discussed in the text, except the compression index and slump. The compression index, C_c, is defined (ASCE) as the slope of the linear portion of the void ratio-logarithm of pressure, p, (e-log p) curve, or

$$C_c = \frac{e_i - e_f}{\log_{10} \frac{P_f}{P_i}} \tag{23}$$

where subscripts i and f are respectively the initial and final conditions. Skempton (1944, p. 126) demonstrated a straight-line, linear relationship between the compression index and liquid limit, LL. This relation is defined (Terzaghi and Peck, 1948, p. 66) as

$$C_c = 0.009\ (LL - 10\%). \tag{24}$$

Compression indices in the tables were determined from the liquid limit in accordance with equation 24 and from the laboratory e-log p curves by equation 23. These figures will be used and discussed in the report on consolidation, which is in preparation.

Slump percentage is the ratio of the amount of height change immediately before the compressive strength test to the original height of a cylinder of the sediment. Certain samples slumped under their own weight before the compressive strength test could be started.

Porosities were estimated from assumed specific gravities (equations 12 and 14) in certain Area G cores. All such estimated data are shown within parentheses in the tables.

AREA A CORE 23

CRUISE: 1958 . SONIC DEPTH, UNCORRECTED: 620 fms. CORER: 400 lb. Gravity Kullenberg

APPROX. CORER PENETRATION: 60 IN. CORE: 30 in. LONG, DIAM. 1.875 in.

SAMPLE NUMBER		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
DISTANCE FROM TOP OF CORE, in		0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24-26	26-28	28-30
WET UNIT WEIGHT	lb ft^{-3}	84.9	89.8	-	90.9	92.5	-	93.3	94.2	-	95.1	95.7	-	96.8	96.8	-
	gcm^{-3}	1.36	1.44	-	1.46	1.48	-	1.49	1.51	-	1.52	1.53	-	1.55	1.55	-
SPECIFIC GRAVITY OF SOLIDS			2.791			2.764			2.788			2.795			2.796	
WATER CONTENT, % DRY WEIGHT		125.42	109.34	-	101.18	93.60	-	91.43	87.41	-	83.40	82.33	-	79.16	77.33	-
VOID RATIO	DETERMINED IN LAB.	3.625	3.058	-	2.818	2.608	-	2.570	2.461	-	2.364	2.323	-	2.229	2.196	-
	AT 100 % SATURATION	3.500	3.052	-	2.797	2.587	-	2.549	2.437	-	2.331	2.301	-	2.213	2.162	-
POROSITY, %		78.4	75.4	-	73.8	72.5	-	72.1	71.2	-	70.4	70.0	-	69.2	68.7	-
SATURATION, %		96.6	99.8	-	99.2	99.2	-	99.2	99.0	-	98.6	99.1	-	99.3	98.4	-
LIQUID LIMIT			78			75			75			72			74	
PLASTIC LIMIT			31			30			32			30			29	
LIQUIDITY INDEX, %		200	166	-	138	142	-	137	128	-	126	124	-	111	107	-
PLASTICITY INDEX			47			45			43			42			45	
COMPRESSION INDEX	FROM LL		0.61			0.59			0.59			0.56			0.58	
	FROM e-log p	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SLUMP, %		9.25	4.00	-	5.00	2.60	-	1.60	2.10	-	1.50	1.05	-	1.15	0.65	-
COMPRESSIVE STRENGTH	"UNDISTURBED", PSI	0.12	0.28	-	0.33	0.48	-	0.54	0.74	-	0.84	0.90	-	1.05	0.98	-
	REMOLDED, PSI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
REMOLDING SENSITIVITY		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
COHESION	PSI	0.06	0.14	-	0.17	0.24	-	0.27	0.37	-	0.42	0.45	-	0.53	0.49	-
	gcm^{-2}	4.2	9.8	-	11.6	16.8	-	19.0	26.0	-	29.5	31.6	-	36.9	34.4	-
ACTIVITY		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MODULUS OF ELASTICITY, PSI		0.4	1.2	-	1.9	4.4	-	5.3	6.4	-	6.6	7.4	-	7.3	8.9	-
GRAIN MEDIAN DIA.	phi	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	microns	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SAND, % > 60μ < 2 mm		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SILT, % > 2 μ < 60 μ		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CLAY, % < 2 μ		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SEDIMENT TYPE		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

AREA A CORE 31

CRUISE: 1958. SONIC DEPTH, UNCORRECTED: 220 fms. CORER: 400 lb. Gravity Kullenberg

APPROX. CORER PENETRATION: 60 IN. CORE: 41 in. LONG, DIAM. 1.875 in.

SAMPLE NUMBER	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
DISTANCE FROM TOP OF CORE, in	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24-26	26-28	28-30	30-32	32-34	34-36	36-38	38-40	40-41
WET UNIT WEIGHT lb ft^{-3}	86.6	91.0	-	91.7	94.2	-	96.7	96.4	-	98.6	100.6	-	101.8	102.0	-	103.9	103.5	-	103.6	102.2	-
WET UNIT WEIGHT gcm^{-3}	1.39	1.46	-	1.47	1.51	-	1.55	1.54	-	1.58	1.61	-	1.63	1.63	-	1.66	1.66	-	1.66	1.64	-
SPECIFIC GRAVITY OF SOLIDS	2.796	2.776	-	2.806	2.776	-	2.771	2.783	-	2.807	2.753	-	2.774	2.773	-	2.770	2.789	-	2.765	2.769	-
WATER CONTENT, % DRY WEIGHT	116.10	98.70	-	85.64	84.01	-	77.79	77.73	-	71.57	64.73	-	62.45	63.07	-	57.77	61.03	-	62.45	60.86	-
VOID RATIO DETERMINED IN LAB.	3.348	2.788	-	2.546	2.367	-	-	2.205	-	2.048	1.813	-	1.762	1.766	-	1.625	1.708	-	-	1.725	-
VOID RATIO AT 100% SATURATION	3.246	2.740	-	2.403	2.332	-	2.153	2.163	-	2.009	1.782	-	1.732	1.749	-	1.600	1.702	-	1.727	1.685	-
POROSITY, %	77.0	73.6	-	71.8	70.3	-	68.5	63.8	-	67.2	64.5	-	63.8	63.8	-	61.9	63.1	-	63.8	63.3	-
SATURATION, %	97.0	98.3	-	94.4	98.2	-	98.9	98.1	-	98.1	98.3	-	98.3	99.0	-	98.5	99.7	-	100	97.7	-
LIQUID LIMIT		68			67			67			57			55			62			64	
PLASTIC LIMIT		28			28			27			25			25			26			26	
LIQUIDITY INDEX, %	220	177	-	148	144	-	127	127	-	146	124	-	125	127	-	88	97	-	96	92	-
PLASTICITY INDEX		40			39			40			32			30			36			38	
COMPRESSION INDEX FROM LL		0.52			0.51			0.51			0.42			0.41			0.47			0.49	
COMPRESSION INDEX FROM e-log p	-	-	-	-	-	-	0.50	-	-	-	-	-	-	-	-	-	-	-	0.41	-	-
SLUMP, %	20.5	1.43	-	0.46	0	-	-	0.72	-	0	0	-	0.15	0.20	-	0	0	-	-	0	-
COMPRESSIVE STRENGTH "UNDISTURBED", PSI	-	0.26	-	0.60	0.60	-	-	0.76	-	1.14	0.98	-	1.40	1.38	-	1.58	1.82	-	-	1.82	-
COMPRESSIVE STRENGTH REMOLDED, PSI	-	-	-	-	0.38	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
REMOLDING SENSITIVITY	-	-	-	-	1.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
COHESION PSI	-	0.13	-	0.30	0.30	-	-	0.38	-	0.57	0.49	-	0.70	0.69	-	0.78	0.91	-	-	0.91	-
COHESION gcm^{-2}	-	9.1	-	21.1	21.1	-	-	26.7	-	40.1	34.5	-	49.2	48.5	-	55.5	64.0	-	-	64.0	-
ACTIVITY		0.93			0.65			0.95			0.86			0.94			0.90			0.83	
MODULUS OF ELASTICITY, PSI	-	4.3	-	8.8	6.2	-	-	8.9	-	15.2	15.2	-	19.8	24.6	-	17.9	23.6	-	-	25.4	-
GRAIN MEDIAN DIA. phi		8.3			8.5			3.4			7.0			6.5			7.6			8.6	
GRAIN MEDIAN DIA. microns		3.2			2.8			3.0			7.7			11.0			5.2			2.6	
SAND, % > 60μ < 2 mm		6			5			5			15			17			9			6	
SILT, % > 2μ < 60μ		51			40			53			48			51			51			48	
CLAY, % < 2μ		43			46			42			37			32			40			46	
SEDIMENT TYPE		Clayey-Silt			Clayey-Silt			Clayey-Silt			Clayey-Silt			Clayey-Silt			Clayey-Silt			Clayey-Silt	
Clay-size fraction % < 2 μ only: Mica	-	-	-		40		-	-	-	-	-	-	-	-	-		40		-	-	-
Kaolinite	-	-	-		20		-	-	-	-	-	-	-	-	-		20		-	-	-
Montmorillonite-mica	-	-	-		20		-	-	-	-	-	-	-	-	-		20		-	-	-
Calcite	-	-	-		5-10		-	-	-	-	-	-	-	-	-		5-10		-	-	-
Other Minerals	-	-	-		10-15		-	-	-	-	-	-	-	-	-		10-15		-	-	-
Calcite, % entire sample	-	-	-		9		-	-	-	-	-	-	-	-	-		10		-	-	-
Quartz, % entire sample	-	-	-		29		-	-	-	-	-	-	-	-	-		36		-	-	-

AREA A CORE 33

CRUISE: 1958. SONIC DEPTH, UNCORRECTED: 580 fms. CORER: 400 lb. Gravity Kullenberg

APPROX. CORER PENETRATION: 60 IN. CORE: 38 in. LONG, DIAM. 1.875 in.

SAMPLE NUMBER	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
DISTANCE FROM TOP OF CORE, in	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24-26	26-28	28-30	30-32	32-34	34-36
WET UNIT WEIGHT lb ft⁻³	85.7	86.8	-	88.8	89.2	-	90.5	90.5	-	90.0	90.2	-	91.2	92.0	-	93.4	93.9	-
WET UNIT WEIGHT gcm⁻³	1.37	1.39	-	1.42	1.43	-	1.45	1.45	-	1.44	1.44	-	1.46	1.47	-	1.50	1.50	-
SPECIFIC GRAVITY OF SOLIDS	2.808	2.809	-	2.789	2.788	-	2.789	2.809	-	2.791	2.798	-	2.800	2.774	-	2.790	2.816	-
WATER CONTENT, % DRY WEIGHT	135.07	12 054	-	104.99	108.19	-	98.46	99.43	-	101.44	100.93	-	96.41	92.95	-	89.55	86.87	-
VOID RATIO DETERMINED IN LAB.	3.806	3.454	-	3.012	3.065	-	2.817	2.861	-	2.898	2.889	-	2.763	2.630	-	2.533	2.497	-
VOID RATIO AT 100% SATURATION	3.793	3.386	-	2.924	3.016	-	2.746	2.793	-	2.831	2.824	-	2.699	2.578	-	2.498	2.446	-
POROSITY, %	79.2	77.5	-	75.1	75.4	-	73.8	74.1	-	74.3	74.3	-	73.4	72.5	-	71.7	71.4	-
SATURATION, %	99.6	98.0	-	97.1	98.4	-	97.5	97.6	-	97.7	97.8	-	97.7	98.0	-	98.6	98.0	-
LIQUID LIMIT		84			79			76			83			81			77	
PLASTIC LIMIT		30			30			30			31			30			30	
LIQUIDITY INDEX, %	194	168	-	153	159	-	149	151	-	135	134	-	130	123	-	127	121	-
PLASTICITY INDEX		54			49			46			52			51			47	
COMPRESSION INDEX FROM LL		0.66			0.62			0.59			0.66			0.64			0.60	
COMPRESSION INDEX FROM e-log p	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SLUMP, %	2.05	0.67	-	0	0	-	0	0.10	-	0	0.10	-	0.10	0	-	0.21	0.50	-
COMPRESSIVE STRENGTH "UNDISTURBED", PSI	0.21	0.26	-	0.34	0.38	-	0.44	0.58	-	0.65	0.61	-	0.78	0.75	-	0.82	0.83	-
COMPRESSIVE STRENGTH REMOLDED, PSI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
REMOLDING SENSITIVITY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
COHESION PSI	0.11	0.13	-	0.17	0.19	-	0.22	0.29	-	0.38	0.31	-	0.39	0.38	-	0.41	0.42	-
COHESION gcm⁻²	7.7	9.1	-	12.0	13.4	-	15.5	20.4	-	26.7	21.8	-	27.4	26.7	-	28.8	29.5	-
ACTIVITY		1.02			0.89			0.90			0.98			1.00			0.92	
MODULUS OF ELASTICITY, PSI	2.4	3.9	-	5.0	5.0	-	9.7	22.3	-	8.0	15.3	-	24.2	10.0	-	18.1	14.4	
GRAIN MEDIAN DIA. phi		9.2			9.3			9.1			9.3			9.1			9.1	
GRAIN MEDIAN DIA. microns		1.7			1.6			1.9			1.6			1.9			1.9	
SAND, % > 60μ < 2 mm		2			2			3			4			5			5	
SILT, % > 2 μ < 60 μ		45			43			46			43			44			44	
CLAY, % < 2μ		53			55			51			53			51			51	
SEDIMENT TYPE	Silty	Clay		Silty	Clay		Silty	Clay		Silty	Clay		Silty	Clay		Silty	Clay	
Clay-size fraction %2 μ only: Mica	-	-	-		40		-	-	-	-	-	-	-	-	-		40	
Kaolinite	-	-	-		20		-	-	-	-	-	-	-	-	-		20	
Montmorillonite-mica	-	-	-		20		-	-	-	-	-	-	-	-	-		20	
Calcite	-	-	-		5-10		-	-	-	-	-	-	-	-	-		5-10	
Other minerals	-	-	-		15-20		-	-	-	-	-	-	-	-	-		10-15	
Calcite, % entire sample	-	-	-		8		-	-	-	-	-	-	-	-	-		11	
Quartz, % entire sample	-	-	-		26		-	-	-	-	-	-	-	-	-		24	

AREA B CORE 83

CRUISE: 1958 . SONIC DEPTH, UNCORRECTED: 720 fms. CORER: 450 lb. Gravity Kullenberg

APPROX. CORER PENETRATION: 70 IN. CORE: 40 in. LONG, DIAM. 1.875 in.

SAMPLE NUMBER		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
DISTANCE FROM TOP OF CORE, in		0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24-26	26-28	28-30	30-32	32-34	34-36
WET UNIT WEIGHT	lb ft^{-3}	93.7	95.9	-	99.0	100.8	104.3	102.4	102.1	-	103.5	104.5	-	105.7	104.7	-	105.4	-	107.6
	gcm^{-3}	1.50	1.54	-	1.59	1.61	1.63	1.64	1.64	-	1.66	1.67	-	1.69	1.68	-	1.69	-	1.72
SPECIFIC GRAVITY OF SOLIDS		2.798	2.807	-	2.815	2.800	2.806	2.792	2.822	-	2.807	2.805	-	2.800	2.804	-	2.784	-	2.794
WATER CONTENT, % DRY WEIGHT		84.13	80.03	-	69.94	66.11	59.64	60.46	62.32	-	57.74	55.73	-	53.90	54.52	-	52.94	-	52.36
VOID RATIO	DETERMINED IN LAB.	2.425	2.289	-	2.012	1.882	-	1.732	1.801	-	1.667	1.611	-	1.545	1.584	-	1.519	-	1.680
	AT 100 % SATURATION	2.354	2.246	-	1.969	1.851	1.673	1.688	1.759	-	1.621	1.563	-	1.509	1.529	-	1.474	-	1.463
POROSITY, %		70.8	69.6	-	66.8	65.3	62.7	63.4	64.3	-	62.5	61.7	-	60.7	61.3	-	60.3	-	59.5
SATURATION, %		97.1	98.1	-	97.9	98.4	99.6	97.5	97.6	-	97.2	97.0	-	97.7	96.5	-	97.0	-	99.6
LIQUID LIMIT		58	57	-	57	53	-	53	57	-	54	53	-	-	54	53	54	51	52
PLASTIC LIMIT		35	34	-	31	31	-	28	29	-	30	30	-	30	29	30	31	29	28
LIQUIDITY INDEX, %		213	200	-	146	159	-	128	118	-	117	113	-	96	104	-	96	-	100
PLASTICITY INDEX		23	23	-	26	22	-	25	28	-	24	23	-	-	25	23	23	22	24
COMPRESSION INDEX	FROM LL	0.43	0.42	-	0.42	0.39	-	0.39	0.42	-	0.40	0.39	-	-	0.40	0.39	0.40	0.37	0.38
	FROM e-log p	-	-	-	-	-	0.35	-	-	-	-	-	-	-	-	-	-	-	-
SLUMP, %		6.21	3.87	-	1.64	-	-	1.04	0.99	-	0.84	0.84	-	0	0	-	-	-	0
COMPRESSIVE STRENGTH	"UNDISTURBED", PSI	0.68	0.65	-	1.08	1.15	-	2.12	1.67	-	2.65	2.35	-	3.70	6.65	Vertical crack in			2.95
	REMOLDED, PSI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	sample	-	-	-
REMOLDING SENSITIVITY		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
COHESION	PSI	0.34	0.33	-	0.54	0.59	-	1.06	0.84	-	1.33	1.18	-	1.85	3.33	Vertical crack in			1.48
	gcm^{-2}	23.9	23.2	-	37.9	41.5	-	74.5	59.0	-	93.5	83.0	-	130.0	234.1	sample	-	-	104.0
ACTIVITY			0.49			0.48			0.65			0.50			0.51			0.45	
MODULUS OF ELASTICITY, PSI		4.4	5.4	-	9.1	11.2	-	21.2	22.4	-	27.5	46.6	-	80.0	104.7	Vertical crack in			37.2
GRAIN MEDIAN DIA.	phi		8.8			8.6			8.3			8.6			8.8	sample		8.9	
	microns		2.3			2.5			3.2			2.5			2.3			2.1	
SAND, % > 60μ < 2mm			8			7			4			4			14			11	
SILT, % > 2μ < 60μ			45			47			53			50			37	----		40	
CLAY, % < 2μ			47			46			43			46			49			49	
SEDIMENT TYPE		Silty	Clay		Clayey	Silt		Clayey	Silt		Clayey	Silt		Silty	Clay		Silty	Clay	

AREA B CORE 85

CRUISE: 1958. SONIC DEPTH, UNCORRECTED: 400 fms. CORER: 460 lb. Gravity Kullenberg

APPROX. CORER PENETRATION: 72 IN. CORE: 31 in. LONG, DIAM. 1.875 in.

SAMPLE NUMBER		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
DISTANCE FROM TOP OF CORE, in		0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24-26	26-28	28-30
WET UNIT WEIGHT	$lb\ ft^{-3}$	90.6	93.0	-	94.6	94.5	-	97.5	100.6	-	102.9	103.3	-	106.0	104.8	-
	gcm^{-3}	1.45	1.49	-	1.51	1.52	-	1.56	1.61	-	1.65	1.65	-	1.70	1.68	-
SPECIFIC GRAVITY OF SOLIDS		2.796	2.791	-	2.785	2.773	-	2.794	2.757	-	2.774	2.771	-	2.772	2.781	-
WATER CONTENT, % DRY WEIGHT		95.03	84.39	-	82.56	83.12	-	73.46	63.56	-	58.46	57.20	-	51.97	51.32	-
VOID RATIO	DETERMINED IN LAB.	2.759	2.448	-	2.356	2.344	-	2.106	1.786	-	1.667	1.632	-	1.481	1.494	-
	AT 100 % SATURATION	2.657	2.355	-	2.299	2.305	-	2.053	1.752	-	1.622	1.585	-	1.441	1.427	-
POROSITY, %		73.4	71.0	-	70.2	70.1	-	67.8	64.1	-	62.5	62.0	-	59.7	59.9	-
SATURATION, %		96.3	96.2	-	97.6	98.3	-	97.5	98.1	-	97.3	97.1	-	97.3	95.5	-
LIQUID LIMIT			69			64			55			52			52	
PLASTIC LIMIT			28			26			26			25			26	
LIQUIDITY INDEX, %		163	137	-	149	150	-	164	129	-	124	119	-	100	97	-
PLASTICITY INDEX			41			38			29			27			26	
COMPRESSION INDEX	FROM LL		0.53			0.49			0.41			0.37			0.37	
	FROM e-log p	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SLUMP, %		0	0.21	-	1.55	0	-	0	0	-	0	0	-	0	0	-
COMPRESSIVE STRENGTH	"UNDISTURBED", PSI	0.57	0.53	-	0.53	0.66	-	1.07	1.60	-	2.19	2.32	-	2.85	2.55	-
	REMOLDED, PSI	-	-	-	-	-	-	-	0.71	-	-	-	-	-	0.87	-
REMOLDING SENSITIVITY		-	-	-	-	-	-	-	2.2	-	-	-	-	-	2.9	-
COHESION	PSI	0.29	0.27	-	0.32	0.33	-	0.59	0.80	-	1.20	1.16	-	1.43	1.26	-
	gcm^{-2}	20.4	19.0	-	22.5	23.2	-	41.5	56.3	-	84.4	81.6	-	100.5	90.0	-
ACTIVITY			0.82			0.82			0.63			0.63			0.62	
MODULUS OF ELASTICITY, PSI		14.9	14.0	-	6.3	21.8	-	19.7	26.4	-	31.3	35.0	-	34.9	28.6	-
GRAIN MEDIAN DIA.	phi		9.0			8.7			8.4			8.1			8.0	
	microns		2.0			2.4			2.9			3.5			3.8	
SAND, % > 60μ < 2 mm			2			4			3			4			2	
SILT, % > 2 μ < 60 μ			48			50			51			53			56	
CLAY, % < 2μ			50			46			46			43			42	
SEDIMENT TYPE		Clayey Silt			Clayey Silt			Clayey Silt			Clayey Silt			Clayey Silt		

AREA B CORE 87

CRUISE: 1958. SONIC DEPTH, UNCORRECTED: 620 fms. CORER: 450 lb. Gravity Kullenberg

APPROX. CORER PENETRATION: 72 in. CORE: 32 in. LONG, DIAM. 1.875 in.

SAMPLE NUMBER		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
DISTANCE FROM TOP OF CORE, in		0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24-26	26-28	28-30
WET UNIT WEIGHT	lb ft^{-3}	94.0	98.6	-	101.5	101.3	-	103.9	103.9	-	105.9	104.2	-	103.5	103.2	-
	gcm^{-3}	1.51	1.58	-	1.63	1.62	-	1.66	1.66	-	1.70	1.67	-	1.66	1.65	-
SPECIFIC GRAVITY OF SOLIDS		2.815	2.764	-	2.787	2.775	-	2.744	2.769	-	2.779	2.779	-	2.783	2.784	-
WATER CONTENT, % DRY WEIGHT		83.79	77.07	-	64.79	64.09	-	58.17	56.51	-	54.51	55.04	-	57.96	58.93	-
VOID RATIO	DETERMINED IN LAB.	2.434	2.097	-	1.823	1.805	-	1.607	1.603	-	-	1.583	-	1.650	1.675	-
	AT 100% SATURATION	2.359	2.130	-	1.806	1.778	-	1.596	1.565	-	1.515	1.530	-	1.613	1.640	-
POROSITY, %		70.9	67.7	-	64.6	64.3	-	61.6	61.6	-	60.5	61.3	-	62.3	62.6	-
SATURATION, %		96.9	100+	-	99.1	98.5	-	99.3	97.6	-	99.1	96.6	-	97.8	97.9	-
LIQUID LIMIT			59			57			54			59			60	
PLASTIC LIMIT			32			30			23			26			28	
LIQUIDITY INDEX, %		192	167	-	128	126	-	113	108	-	86	88	-	94	97	-
PLASTICITY INDEX			27			27			31			33			32	
COMPRESSION INDEX	FROM LL		0.44			0.42			0.40			0.44			0.45	
	FROM e-log p	-	-	-	-	-	-	-	-	-	0.37	-	-	-	-	-
SLUMP, %		0.44	0.25	-	0	0.10	-	0	0	-	-	0.16	-	0.15	0.10	-
COMPRESSIVE STRENGTH	"UNDISTURBED", PSI	0.73	1.22	-	1.51	1.97	-	2.55	2.36	-	-	2.76	-	2.34	2.20	-
	REMOLDED, PSI	-	-	-	-	-	-	0.84	-	-	-	-	-	-	-	-
REMOLDING SENSITIVITY		-	-	-	-	-	-	3.0	-	-	-	-	-	-	-	-
COHESION	PSI	0.37	0.61	-	0.76	0.99	-	1.28	1.19	-	-	1.38	-	1.17	1.10	-
	gcm^{-2}	26.0	42.9	-	53.4	69.6	-	90.0	83.7	-	-	97.0	-	82.3	77.3	-
ACTIVITY			0.57			0.59			0.72			0.72			0.65	
MODULUS OF ELASTICITY, PSI		19.8	9.0	-	17.3	26.0	-	24.8	25.5	-	-	49.1	-	32.6	25.4	-
GRAIN MEDIAN DIA.	phi		8.7			8.6			8.3			8.6			8.9	
	microns		2.3			2.5			3.2			2.5			2.1	
SAND, % > 60μ < 2mm			8			7			4			4			3	
SILT, % > 2μ < 60μ			45			47			53			50			48	
CLAY, % < 2μ			47			46			43			46			49	
SEDIMENT TYPE		Silty	Clay		Clayey	Silt		Clayey	Silt		Clayey	Silt		Silty	Clay	
Clay-size fraction < 2μ only	Mica	-	-	-		40		-	-	-	-	-	-		40	
	Kaolinite	-	-	-		20		-	-	-	-	-	-		20	
	Montmorillonite-mica	-	-	-		20		-	-	-	-	-	-		20	
	Calcite	-	-	-		5-10		-	-	-	-	-	-		5-10	
	Other minerals	-	-	-		10-15		-	-	-	-	-	-		10-15	
Calcite, % entire sample		-	-	-		36		-	-	-	-	-	-		18	
Quartz, % entire sample		-	-	-		15		-	-	-	-	-	-		19	

AREA 9 CORE 16

CRUISE: 1958 SONIC DEPTH, UNCORRECTED: 610 fms. CORER: 350 lb. Piston Kullenberg

APPROX. CORER PENETRATION: 70 IN. CORE: 31 in. LONG, DIAM. 1.875 in.

SAMPLE NUMBER	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
DISTANCE FROM TOP OF CORE, in	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24-26	26-28	28-30
WET UNIT WEIGHT, $lb\ ft^{-3}$	107.8	104.9	-	102.1	103.4	-	105.5	106.6	-	107.3	108.8	-	106.8	105.8	-
WET UNIT WEIGHT, gcm^{-3}	1.72	1.68	-	1.63	1.66	-	1.69	1.71	-	1.72	1.74	-	1.71	1.69	-
SPECIFIC GRAVITY OF SOLIDS	2.770	2.818	-	2.819	2.811	-	2.847	2.856	-	2.828	2.802	-	2.822	2.831	-
WATER CONTENT, % DRY WEIGHT	41.6	55.7	-	61.4	57.0	-	54.0	51.4	-	50.7	46.6	-	51.97	54.23	-
VOID RATIO, DETERMINED IN LAB.	1.273	1.611	-	1.778	1.667	-	1.591	1.532	-	1.481	1.358	-	1.506	1.575	-
VOID RATIO, AT 100% SATURATION	1.152	1.570	-	1.731	1.602	-	1.537	1.468	-	1.434	1.306	-	1.467	1.535	-
POROSITY, %	56.0	61.7	-	64.0	62.5	-	61.4	60.5	-	59.7	57.6	-	60.1	61.2	-
SATURATION, %	90.5	97.4	-	97.3	96.1	-	96.6	95.8	-	96.8	96.2	-	97.4	97.5	-
LIQUID LIMIT		46			54			45			41			42	
PLASTIC LIMIT		20			21			19			17			18	
LIQUIDITY INDEX, %	83	137	-	122	109	-	135	125	-	140	123	-	141	151	-
PLASTICITY INDEX		26			33			26			24			24	
COMPRESSION INDEX, FROM LL		0.32			0.40			0.32			0.28			0.29	
COMPRESSION INDEX, FROM e-log p	-	-	-	-	-	-	-	-	-	-	-	-	0.37	-	-
SLUMP, %	1.03	0.26	-	0.26	0	-	0.26	0.52	-	0	0.26	-	-	0	-
COMPRESSIVE STRENGTH, "UNDISTURBED", PSI	1.06	1.34	-	1.32	1.15	-	1.90	1.24	-	1.47	2.29	-	-	1.37	-
COMPRESSIVE STRENGTH, REMOLDED, PSI	-	-	-	-	0.37	-	-	-	-	-	0.68	-	-	-	-
REMOLDING SENSITIVITY	-	-	-	-	3.1	-	-	-	-	-	3.4	-	-	-	-
COHESION, PSI	0.53	0.67	-	0.66	0.58	-	0.95	0.62	-	0.74	1.15	-	-	0.69	-
COHESION, gcm^{-2}	37.3	47.1	-	46.4	40.7	-	66.8	43.6	-	52.0	80.8	-	-	48.5	-
ACTIVITY		0.76			0.94			0.84			0.89			0.86	
MODULUS OF ELASTICITY, PSI	18.0	12.4	-	22.9	15.8	-	25.4	16.4	-	16.4	36.3	-	-	17.3	-
GRAIN MEDIAN DIA., phi		6.8			6.9			6.3			6.0			6.1	
GRAIN MEDIAN DIA., microns		9.0			8.6			12.9			15.6			14.8	
SAND, % > 60μ < 2 mm		23			16			11			24			20	
SILT, % > 2μ < 60μ		43			49			58			49			52	
CLAY, % < 2μ		34			35			31			27			28	
SEDIMENT TYPE	Sand-Silt-Clay			Clayey Silt			Clayey Silt			Sand-Silt-Clay			Clayey Silt		

AREA C CORE 18

CRUISE: 1958 . **SONIC DEPTH, UNCORRECTED:** 610 fms. **CORER:** 350 lb. Piston Kullenberg

APPROX. CORER PENETRATION: 66 in. **CORE:** 46 in. LONG, DIAM. 1.875 in.

SAMPLE NUMBER	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
DISTANCE FROM TOP OF CORE, in	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24-26	26-28	28-30	30-32	32-34	34-36	36-38	38-40	40-42
WET UNIT WEIGHT, $lb\ ft^{-3}$	100.1	98.9	-	103.1	105.0	-	107.2	105.3	-	104.4	106.3	-	101.6	99.7	-	96.8	95.6	-	98.6	103.5	-
WET UNIT WEIGHT, gcm^{-3}	1.60	1.58	-	1.65	1.68	-	1.72	1.69	-	1.67	1.70	-	1.63	1.60	-	1.55	1.53	-	1.58	1.66	-
SPECIFIC GRAVITY OF SOLIDS	2.806	2.826	-	2.828	2.846	-	2.85[illegible]	2.850	-	2.817	2.817	-	2.813	2.817	-	2.823	2.814	-	2.816	2.812	-
WATER CONTENT, % DRY WEIGHT	64.31	72.21	-	61.45	57.50	-	51.62	46.11	-	56.96	53.20	-	66.10	67.22	-	77.18	79.55	-	74.93	57.55	-
VOID RATIO, DETERMINED IN LAB.	1.874	2.067	-	1.762	1.667	-	1.523	1.468	-	1.643	1.533	-	-	1.952	-	2.224	2.298	-	2.117	1.671	-
VOID RATIO, AT 100% SATURATION	1.804	2.041	-	1.738	1.636	-	1.476	1.314	-	1.605	1.499	-	1.859	1.894	-	2.179	2.238	-	2.110	1.618	-
POROSITY, %	65.2	67.4	-	63.8	62.5	-	60.4	59.5	-	62.2	60.5	-	65.2	66.1	-	69.0	69.7	-	67.9	62.6	-
SATURATION, %	96.3	98.7	-	98.6	98.2	-	96.9	89.5	-	97.7	97.8	-	99.4	97.0	-	98.0	97.4	-	99.7	96.8	-
LIQUID LIMIT		49			45			42			47			57			59			43	
PLASTIC LIMIT		20			19			18			19			22			24			20	
LIQUIDITY INDEX, %	153	180	-	163	148	-	140	117	-	136	122	-	126	129	-	152	159	-	239	163	-
PLASTICITY INDEX		29			26			24			28			35			35			23	
COMPRESSION INDEX, FROM LL		0.35			0.31			0.29			0.33			0.42			0.44			0.30	
COMPRESSION INDEX, FROM e-log p	-	-	-	-	-	-	-	-	-	-	-	-	0.50	-	-	-	-	-	-	-	-
SLUMP, %	0.41	2.74	-	0.21	0	-	0.26	1.03	-	-	0.41	-	-	0.10	-	1.39	1.81	-	0.52	0	-
COMPRESSIVE STRENGTH, "UNDISTURBED", PSI	1.32	0.79	-	1.33	1.08	-	1.60	1.51	-	1.08	2.14	-	-	1.27	-	0.76	0.62	-	0.94	1.60	-
COMPRESSIVE STRENGTH, REMOLDED, PSI	-	-	-	-	-	-	-	0.88	-	-	-	-	-	-	-	-	0.31	-	-	-	-
REMOLDING SENSITIVITY	-	-	-	-	-	-	-	1.7	-	-	-	-	-	-	-	-	2.0	-	-	-	-
COHESION, PSI	0.66	0.40	-	0.67	0.54	-	0.80	0.76	-	0.54	1.07	-	-	0.64	-	0.38	0.31	-	0.47	0.80	-
COHESION, gcm^{-2}	46.4	28.1	-	47.1	38.0	-	56.2	53.4	-	38.0	75.2	-	-	45.0	-	26.7	21.8	-	33.0	56.2	-
ACTIVITY		1.11			1.04			0.92			0.87			0.85			0.83			0.79	
MODULUS OF ELASTICITY, PSI	9.4	-	-	16.8	10.2	-	13.0	12.1	-	15.1	20.5	-	-	35.0	-	6.4	4.3	-	7.6	15.2	-
GRAIN MEDIAN DIA., phi		5.9			5.7			6.0			6.8			7.7			8.1			6.4	
GRAIN MEDIAN DIA., microns		16.7			19.5			15.6			8.8			4.7			3.6			11.8	
SAND, % > 60μ < 2mm		30			18			18			14			8			4			15	
SILT, % > 2μ < 60μ		44			57			56			54			51			54			56	
CLAY, % < 2μ		26			25			26			32			41			42			29	
SEDIMENT TYPE	Sand-Silt-Clay			Clayey-Silt			Clayey-Silt			Clayey-Silt			Clayey-Silt			Clayey-Silt			Clayey-Silt		
Clay-size fraction %<2μ only: Mica	-	-	-		20		-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Kaolinite	-	-	-		10		-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Montmorillonite-mica	-	-	-		50		-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Chlorite	-	-	-		10		-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Quartz and Feldspar	-	-	-		10		-	-	-	-	-	-	-	-	-	-	-	-	-	-	

AREA C CORE 19

CRUISE: 1958 . SONIC DEPTH, UNCORRECTED: 800 fms. CORER: 350 lb. Piston Kullenberg

APPROX. CORER PENETRATION: 48 IN. CORE: 30 in. LONG, DIAM. 1.875 in.

SAMPLE NUMBER		1	2	3	4	5	6	7	8	9	10	11	12	13	14
DISTANCE FROM TOP OF CORE, in		0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24-26	26-28
WET UNIT WEIGHT	$lb\ ft^{-3}$	81.5	80.2	-	84.7	87.2	-	84.1	86.2	-	106.1	101.2	-	105.0	-
	gcm^{-3}	1.30	1.28	-	1.36	1.40	-	1.35	1.38	-	1.70	1.62	-	1.68	-
SPECIFIC GRAVITY OF SOLIDS		2.776	2.805	-	2.802	2.839	-	2.814	2.842	-	2.800	2.810	-	2.810	-
WATER CONTENT, % DRY WEIGHT		161.69	177.35	-	137.36	120.49	-	140.23	123.75	-	53.07	62.19	-	53.22	-
VOID RATIO	DETERMINED IN LAB.	4.568	5.052	-	3.900	3.480	-	4.018	3.592	-	1.522	1.812	-	1.552	-
	AT 100% SATURATION	4.488	4.975	-	3.849	3.421	-	3.946	3.517	-	1.486	1.747	-	1.495	-
POROSITY, %		82.0	83.5	-	79.6	77.7	-	80.1	78.2	-	60.3	64.4	-	60.8	-
SATURATION, %		98.3	97.5	-	98.7	98.3	-	98.2	97.9	-	97.6	96.4	-	96.4	-
LIQUID LIMIT			89			85			49			48			58
PLASTIC LIMIT			33			32			24			20			21
LIQUIDITY INDEX, %		230	258	-	199	167	-	483	400	-	118	151	-	87	-
PLASTICITY INDEX			56			53			25			28			37
COMPRESSION INDEX	FROM LL		0.71			0.68			0.35			0.34			0.43
	FROM e-log p	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SLUMP, %		2.32	2.58	-	2.07	1.81	-	2.58	4.75	-	3.87	1.55	-	0	-
COMPRESSIVE STRENGTH	"UNDISTURBED", PSI	0.18	0.28	-	0.58	1.37	-	0.58	0.35	-	0.88	0.80	-	2.08	-
	REMOLDED, PSI	-	-	-	-	-	-	-	0.18	-	-	-	-	0.96	-
REMOLDING SENSITIVITY		-	-	-	-	-	-	-	1.9	-	-	-	-	2.2	-
COHESION	PSI	0.09	0.14	-	0.29	0.69	-	0.29	0.18	-	0.44	0.40	-	1.04	-
	gcm^{-2}	6.3	9.8	-	20.4	48.5	-	20.4	12.6	-	30.9	28.1	-	73.1	-
ACTIVITY			1.70			1.56			1.04			1.03			0.97
MODULUS OF ELASTICITY, PSI		-	1.8	-	4.7	10.0	-	3.9	2.2	-	5.1	4.6	-	39.3	-
GRAIN MEDIAN DIA.	phi		7.4			7.1			5.8			6.1			7.3
	microns		5.8			7.4			17.5			14.3			6.3
SAND, % > 60μ < 2mm			7			5			20			17			11
SILT, % > 2μ < 60μ			60			61			56			56			51
CLAY, % < 2μ			33			34			24			27			38
SEDIMENT TYPE		Clayey	Silt		Clayey	Silt		Clayey	Silt		Clayey	Silt		Clayey	Silt

AREA C CORE 20

CRUISE: 1958 . **SONIC DEPTH, UNCORRECTED:** 880 fms. **CORER:** 350 lb. Piston Kullenberg

APPROX. CORER PENETRATION: 48 **IN. CORE:** 22 in. **LONG, DIAM.** 1.875 in.

SAMPLE NUMBER		1	2	3	4	5	6	7	8	9
DISTANCE FROM TOP OF CORE, in		0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18
WET UNIT WEIGHT	lb ft^{-3}	80.2	81.0	-	84.6	87.5	-	99.7	95.0	-
	gcm^{-3}	1.28	1.30	-	1.35	1.40	-	1.60	1.52	-
SPECIFIC GRAVITY OF SOLIDS		2.786	2.815	-	2.831	2.813	-	2.767	2.846	-
WATER CONTENT, % DRY WEIGHT		173.57	171.93	-	142.02	118.87	-	78.70	88.97	-
VOID RATIO	DETERMINED IN LAB.	4.917	4.882	-	4.051	3.386	-	-	2.532	-
	AT 100% SATURATION	4.836	4.840	-	4.021	3.344	-	2.178	2.532	-
POROSITY, %		83.1	83.0	-	80.2	77.2	-	68.5	71.7	-
SATURATION, %		98.3	99.1	-	99.2	98.7	-	100	100	-
LIQUID LIMIT			89			68			54	
PLASTIC LIMIT			36			29			25	
LIQUIDITY INDEX, %		260	256	-	290	230	-	185	221	-
PLASTICITY INDEX			53			39			29	
COMPRESSION INDEX	FROM LL		0.71			0.52			0.40	
	FROM e-log p	-	-	-	-	-	-	0.60	-	-
SLUMP, %		-	2.07	-	1.29	-	-	-	1.70	-
COMPRESSIVE STRENGTH	"UNDISTURBED", PSI	-	0.31	-	0.79	0.79	-	-	0.73	-
	REMOLDED, PSI	-	-	-	-	0.26	-	-	-	-
REMOLDING SENSITIVITY		-	-	-	-	3.0	-	-	-	-
COHESION	PSI	-	0.16	-	0.40	0.40	-	-	0.37	-
	gcm^{-2}	-	11.2	-	28.1	28.1	-	-	26.0	-
ACTIVITY			1.51			1.39			1.07	
MODULUS OF ELASTICITY, PSI		-	-	-	-	-	-	-	4.5	-
GRAIN MEDIAN DIA.	phi		7.7			4.4			6.2	
	microns		4.9			11.4			13.6	
SAND, % $>60\mu<2$ mm			13			17			7	
SILT, % $>2\mu<60\mu$			52			55			66	
CLAY, % $<2\mu$			35			28			27	
SEDIMENT TYPE		Clayey Silt			Clayey Silt			Clayey Silt		

Clay-size fract. only, % $<2\mu$	1	2	3	4	5	6	7	8	9
Mica	-	-	-		20		-	-	-
Kaolinite	-	-	-		10		-	-	-
Montmorillonite-mica	-	-	-		50		-	-	-
Chlorite	-	-	-		10		-	-	-
Quartz and Feldspar	-	-	-		10		-	-	-

AREA D CORE 1g

CRUISE: 1958 . SONIC DEPTH, UNCORRECTED: 680 fms. CORER: 80 lb. Gravity Phleger

APPROX. CORER PENETRATION: 30 IN. CORE: 18 in. LONG, DIAM. 1.37 in.

SAMPLE NUMBER		1	2	3	4	5	6	7	8
DISTANCE FROM TOP OF CORE, in		0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16
WET UNIT WEIGHT	lb ft^{-3}	90.7	93.0	94.2	94.1	96.2	95.6	96.0	-
	gcm^{-3}	1.45	1.49	1.51	1.51	1.54	1.53	1.54	-
SPECIFIC GRAVITY OF SOLIDS		2.854	2.841	2.842	2.835	2.845	2.818	2.825	-
WATER CONTENT, % DRY WEIGHT		107.77	92.99	89.49	88.55	81.40	83.45	82.90	-
VOID RATIO	DETERMINED IN LAB.	3.083	2.663	2.568	2.546	2.350	2.376	2.361	-
	AT 100% SATURATION	3.076	2.641	2.543	2.510	2.316	2.352	2.342	-
POROSITY, %		75.5	72.7	72.0	71.8	70.1	70.4	70.4	-
SATURATION %		99.8	99.2	99.0	98.6	98.9	99.0	99.2	-
LIQUID LIMIT		35.8		38.7		36.5		38.2	
PLASTIC LIMIT		32.0		37.1		32.7		33.2	
LIQUIDITY INDEX, %		1994	1605	3274	3216	1281	1335	994	-
PLASTICITY INDEX		3.8		1.6		3.8		5.0	
COMPRESSION INDEX	FROM LL	0.23		0.26		0.24		0.25	
	FROM e-log p	-	-	-	-	-	-	-	-
SLUMP, %		1.28	0	0.49	0.74	0.29	0	0.74	-
COMPRESSIVE STRENGTH	"UNDISTURBED", PSI	1.58	3.22	2.78	4.49	4.93	4.31	5.92	-
	REMOLDED, PSI	-	-	-	-	-	-	-	-
REMOLDING SENSITIVITY		-	-	-	-	-	-	-	-
COHESION	PSI	0.79	1.61	1.39	2.25	2.47	2.16	2.96	-
	gcm^{-2}	55.5	113.2	97.7	158.2	173.6	151.9	208.1	-
ACTIVITY		0.15		0.06		0.14		0.17	
MODULUS OF ELASTICITY, PSI		16.9	42.2	28.2	48.7	43.7	36.6	65.9	-
GRAIN MEDIAN DIA.	phi	5.4		5.5		5.5		5.6	
	microns	23.4		22.1		22.1		20.6	
SAND, % > 60μ < 2mm		21		19		16		17	
SILT, % > 2μ < 60μ		53		52		56		54	
CLAY, % < 2μ		26		29		28		29	
SEDIMENT TYPE		Sand-silt-clay		Clayey-silt		Clayey-silt		Clayey-silt	

AREA D CORE 2

CRUISE: 1958. SONIC DEPTH, UNCORRECTED: 1100 fms. CORER: 80 lb. Gravity Phleger

APPROX. CORER PENETRATION: 36 IN. CORE: 12 in. LONG, DIAM. 1.37 in.

SAMPLE NUMBER		1	2	3	4	5			
DISTANCE FROM TOP OF CORE, in		0-2	2-4	4-6	6-8	8-9			
WET UNIT WEIGHT	lb ft^{-3}	93.2	98.1	99.0	95.8	-			
	gcm^{-3}	1.49	1.57	1.59	1.53	-			
SPECIFIC GRAVITY OF SOLIDS		2.801	2.809	2.818	2.797	-			
WATER CONTENT, % DRY WEIGHT		91.13	76.59	71.23	77.66	-			
VOID RATIO	DETERMINED IN LAB.	2.587	2.157	2.042	2.240	-			
	AT 100 % SATURATION	2.553	2.151	2.007	2.172	-			
POROSITY, %		72.1	68.3	67.1	69.1	-			
SATURATION, %		98.7	99.7	98.3	97.0	-			
LIQUID LIMIT		51.4			44.9				
PLASTIC LIMIT		40.4			38.6				
LIQUIDITY INDEX, %		1268	905	518	620	-			
PLASTICITY INDEX		11.0			6.3				
COMPRESSION INDEX	FROM LL	0.37			0.31				
	FROM e-log p	-	-	-	-	-			
SLUMP, %		2.75	0.20	0	0	-			
COMPRESSIVE STRENGTH	"UNDISTURBED", PSI	0.88	2.75	3.29	3.37	-			
	REMOLDED, PSI	-	-	-	-	-			
REMOLDING SENSITIVITY		-	-	-	-	-			
COHESION	PSI	0.44	1.38	1.65	1.69	-			
	gcm^{-2}	30.9	97.0	116.0	118.8	-			
ACTIVITY		0.11			0.29				
MODULUS OF ELASTICITY, PSI		7.6	22.9	33.3	56.2	-			
GRAIN MEDIAN DIA.	phi	5.9			5.5				
	microns	16.5			22.1				
SAND, % $> 60\mu < 2$ mm		23			33				
SILT, % $> 2\mu < 60\mu$		42			45				
CLAY, % $< 2\mu$		35			22				
SEDIMENT TYPE		Sand	- Silt	- Clay					

AREA D CORE 1P

CRUISE: 1959 . SONIC DEPTH, UNCORRECTED: 1400 fms. CORER: 1200 lb. Piston Ewing

APPROX. CORER PENETRATION: 240 IN. CORE: 201 in. LONG, DIAM. 2.5 in.

SAMPLE NUMBER		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
DISTANCE FROM TOP OF CORE, in		0 - 4.5	4.5- 9	9 - 13.5	15.5- 20	20.0 24.5	24.5- 29	31 - 35.5	35.5- 40	40 - 44.5	46.5 51	51 - 55.5	55.5- 60	62 - 66.5	66.5- 71	75.5- 77.5	102 - 106.5	106.5- 108.5	133 - 137.5	137.5- 139.5	168.5- 170.5	170.5- 175	195.5- 201
WET UNIT WEIGHT	$lb\ ft^{-3}$	-	94.3	94.5	94.6	94.3	94.4	94.1	94.1	94.1	94.1	94.1	94.1	94.2	94.1	94.4	94.6	94.3	94.8	94.7	94.9	94.2	94.8
	$g\ cm^{-3}$	-	1.51	1.51	1.52	1.51	1.51	1.51	1.51	1.51	1.51	1.51	1.51	1.51	1.51	1.51	1.52	1.51	1.52	1.52	1.52	1.51	1.52
SPECIFIC GRAVITY OF SOLIDS		-	2.756	2.766	2.779	2.759	2.769	2.758	2.770	2.758	2.758	2.766	2.768	2.757	2.757	2.747	2.755	2.741	2.759	2.756	2.759	2.755	2.755
WATER CONTENT, % DRY WEIGHT		-	87.01	88.68	87.89	89.87	89.83	90.95	89.20	91.00	89.67	89.68	89.71	88.18	88.35	89.67	86.21	89.92	85.60	87.46	87.98	86.60	87.23
VOID RATIO	DETERMINED IN LAB.	-	2.411	2.446	2.446	2.469	2.475	2.494	2.476	2.495	2.472	2.484	2.484	2.436	2.448	-	2.384	-	2.373	-	-	2.406	-
	AT 100% SATURATION	-	2.398	2.453	2.442	2.480	2.487	2.508	2.471	2.510	2.473	2.481	2.483	2.431	2.436	2.462	2.375	2.464	2.364	2.410	2.427	2.386	2.402
POROSITY, %		-	70.7	71.0	71.0	71.2	71.2	71.4	71.2	71.4	71.2	71.3	71.3	70.9	71.0	71.2	70.4	71.2	70.4	70.7	70.8	70.6	70.6
SATURATION, %		-	89.5	100+	99.9	100+	100+	100+	99.8	100+	100	99.9	100	99.8	99.5	100	99.6	100	99.6	100	100	99.2	100
LIQUID LIMIT		-	-	-	103	89	77	94	105	106	104	109	109	106	104	-	98	-	103	-	-	106	-
PLASTIC LIMIT		-	-	-	27	30	27	29	29	28	29	30	28	32	26	-	29	-	29	-	-	26	-
LIQUIDITY INDEX, %		-	-	-	80	102	126	95	79	81	81	76	76	76	80	-	83	-	77	-	-	76	-
PLASTICITY INDEX		-	-	-	76	59	50	65	76	78	75	79	81	74	78	-	69	-	74	-	-	80	-
COMPRESSION INDEX	FROM LL	-	-	-	0.65	0.56	0.49	0.59	0.66	0.67	0.66	0.69	0.69	0.67	0.66	-	0.62	-	0.65	-	-	0.67	-
	FROM e-log p	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.75	-	0.65	-	0.62	0.59	-	0.62
SLUMP, %		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
COMPRESSIVE STRENGTH	"UNDISTURBED", PSI	-	2.2	2.8	3.0	2.6	2.6	2.5	2.5	2.4	2.4	2.6	2.5	2.5	2.4	-	2.5	-	2.8	-	-	2.3	-
	REMOLDED, PSI	-	1.0	-	-	-	-	-	0.9	-	-	-	-	-	1.1	-	-	-	-	-	-	-	-
REMOLDING SENSITIVITY		-	2.2	-	-	-	-	-	2.8	-	-	-	-	-	2.2	-	-	-	-	-	-	-	-
COHESION	PSI	-	1.1	1.4	1.5	1.3	1.3	1.3	1.3	1.2	1.2	1.3	1.3	1.3	1.2	-	1.3	-	1.4	-	-	1.2	-
	$g\ cm^{-2}$	-	77.3	98.4	105.5	91.4	91.4	91.4	91.4	84.4	84.4	91.4	91.4	91.4	84.4	-	91.4	-	98.4	-	-	84.4	-
ACTIVITY		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MODULUS OF ELASTICITY, PSI		-	37.4	58.1	58.4	67.2	66.3	49.2	48.1	47.5	45.7	46.2	46.8	49.1	42.5	-	40.2	-	38.1	-	-	44.4	-
GRAIN MEDIAN DIA.	phi	-	-	-	-	-	-	-	-	-	-	-	8.0	-	-	-	-	-	-	-	-	-	-
	microns	-	-	-	-	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	-	-	-
SAND, % > 60μ < 2mm		-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-
SILT, % > 2μ < 60μ		-	-	-	-	-	-	-	-	-	-	-	78	-	-	-	-	-	-	-	-	-	-
CLAY, % < 2μ		-	-	-	-	-	-	-	-	-	-	-	20	-	-	-	-	-	-	-	-	-	-
SEDIMENT TYPE		-	-	-	-	-	-	-	-	-	-	-	Clayey Silt	-	-	-	-	-	-	-	-	-	-

AREA E CORE 46

CRUISE: 1959 . SONIC DEPTH, UNCORRECTED: 1100 fms. CORER: 300 lb. Gravity Kullenberg

APPROX. CORER PENETRATION: 72 IN. CORE: 56 in. LONG, DIAM. 1.875 in.

SAMPLE NUMBER		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
DISTANCE FROM TOP OF CORE, in		0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24-26	26-28	28-30	30-32	32-34	34-36	36-38	38-40	40-42	42-44	44-46	46-48	48-50	50-52	52-54
WET UNIT WEIGHT	lb ft^{-3}	88.2	92.5	107.6	108.5	111.3	112.2	107.5	107.1	107.3	107.0	105.1	106.5	105.9	106.5	106.8	106.2	107.4	107.6	109.0	107.4	108.4	108.1	108.5	107.9	109.1	107.7	107.3
	gcm^{-3}	1.41	1.48	1.72	1.74	1.78	1.80	1.72	1.72	1.72	1.71	1.69	1.71	1.70	1.71	1.71	1.70	1.72	1.72	1.75	1.72	1.74	1.73	1.74	1.73	1.75	1.73	1.72
SPECIFIC GRAVITY OF SOLIDS		2.736	2.738	2.755	2.755	2.761	2.747	2.761	2.762	2.762	2.755	2.739	2.758	2.760	2.748	2.753	2.766	2.765	2.763	2.763	2.755	2.759	2.753	2.754	2.762	2.762	2.765	2.766
WATER CONTENT, % DRY WEIGHT		119.91	99.29	52.95	51.48	44.97	45.21	50.36	51.53	54.52	51.68	56.17	55.90	58.19	54.10	54.93	53.12	51.31	48.90	50.16	50.14	53.44	50.48	51.08	49.52	50.68	51.59	52.01
VOID RATIO	DETERMINED IN LAB.	3.263	2.684	1.446	1.401	1.247	1.220	1.411	1.440	1.484	1.437	1.541	1.520	1.574	1.482	1.492	1.489	1.431	1.387	1.376	1.405	1.437	1.392	1.393	1.395	1.448	1.428	1.445
	AT 100% SATURATION	3.281	2.719	1.459	1.418	1.242	1.242	1.390	1.423	1.506	1.424	1.539	1.542	1.606	1.487	1.512	1.469	1.419	1.351	1.386	1.381	1.474	1.390	1.407	1.368	1.400	1.426	1.439
POROSITY, %		76.5	72.9	59.1	58.4	55.5	55.0	58.5	59.0	59.7	59.0	60.6	60.3	61.1	59.7	59.9	59.8	58.9	57.5	57.9	58.4	59.0	58.2	58.2	58.1	59.2	58.8	59.1
SATURATION, %		100+	100+	100+	100+	99.6	100+	98.5	98.8	100+	99.1	99.8	100+	100+	100+	100+	98.7	99.1	97.4	100+	98.3	100+	99.8	100+	98.7	96.7	99.9	99.6
LIQUID LIMIT				52						44						42						40					41	
PLASTIC LIMIT				22						21						21						20					21	
LIQUIDITY INDEX, %		324	258	103	98	77	77	128	133	146	133	153	152	177	158	162	153	144	133	151	150	167	152	155	148	148	153	155
PLASTICITY INDEX				30						23						21						20					20	
COMPRESSION INDEX	FROM LL			0.33						0.28						0.26						0.25					0.26	
	FROM e-log p	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SLUMP, %		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
COMPRESSIVE STRENGTH	"UNDISTURBED", PSI	-	0.86	-	1.67	-	1.71	-	1.05	-	1.17	-	1.07	-	1.08	-	1.08	-	1.3	-	1.22	-	1.00	-	1.04	-	1.22	-
	REMOLDED, PSI	-	-	-	-	-	-	-	0.41	-	-	-	-	-	-	-	0.30	-	-	-	-	-	-	-	0.40	-	-	-
REMOLDING SENSITIVITY		-	-	-	-	-	-	-	2.56	-	-	-	-	-	-	-	3.60	-	-	-	-	-	-	-	2.60	-	-	-
COHESION	PSI	-	0.43	-	0.84	-	0.86	-	0.53	-	0.59	-	0.54	-	0.54	-	0.54	-	0.65	-	0.61	-	0.50	-	0.52	-	0.61	-
	gcm^{-2}	-	30.2	-	59.1	-	60.1	-	37.3	-	41.5	-	38.0	-	38.0	-	38.0	-	45.7	-	42.9	-	35.2	-	36.6	-	42.9	-
ACTIVITY				0.75						0.58						0.53						0.53					0.53	
MODULUS OF ELASTICITY, PSI		-	7.8	-	23.0	-	20.5	-	10.7	-	9.7	-	10.6	-	10.2	-	17.3	-	14.4	-	13.2	-	7.9	-	12.3		10.3	
GRAIN MEDIAN DIA.	phi			7.8						7.7						7.7						7.6					7.8	
	microns			4.5						4.8						4.8						5.0					4.6	
SAND, % > 60μ < 2mm				14						11						12						14					14	
SILT, % > 2μ < 60μ				46						49						48						48					48	
CLAY, % < 2μ				40						40						40						38					38	
SEDIMENT TYPE				Clayey silt								Clayey Silt									Clayey silt							
Vane Shear strength	"undisturbed," psi	0.31	-	0.53	-	0.68	-	0.60	-	0.40	-	0.40	-	0.37	-	0.44	-	0.53	-	0.40	-	0.43	-	0.33	-	0.38	-	0.38
	"undisturbed," gcm^{-2}	22.0	-	37.2	-	47.0	-	42.5	-	28.2	-	28.2	-	26.0	-	30.9	-	37.2	-	28.2	-	30.5	-	23.3	-	26.5	-	26.9
	remolded, psi	-	-	-	-	-	-	-	-	0.15	-	-	-	-	-	0.20	-	-	-	-	-	-	-	0.13	-	-	-	-
Vane sensitivity		-	-	-	-	-	-	-	-	2.7	-	-	-	-	-	2.2	-	-	-	-	-	-	-	2.5	-	-	-	-

AREA E CORE 47

CRUISE: 1959 . SONIC DEPTH, UNCORRECTED: 1100 fms. CORER: 260 lb. Gravity Kullenberg

APPROX. CORER PENETRATION: 72 in. CORE: 62 in. LONG, DIAM. 1.875 in.

SAMPLE NUMBER	1	2	3	4	5	6	7	8	9	10	11	12	13	14
DISTANCE FROM TOP OF CORE, in	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-20	20-22	22-24	24-26	26-28	28-30	30-32
WET UNIT WEIGHT lb ft⁻³	87.3	90.2	91.7	93.1	94.6	95.6	97.7	-	110.0	105.4	106.1	106.2	108.0	105.7
WET UNIT WEIGHT gcm⁻³	1.40	1.45	1.47	1.50	1.52	1.53	1.57	-	1.76	1.69	1.68	1.70	1.73	1.69
SPECIFIC GRAVITY OF SOLIDS	2.725	2.719	2.727	2.725	2.739	2.733	2.737	-	2.747	2.756	2.763	2.766	2.771	2.758
WATER CONTENT, % DRY WEIGHT	113.46	100.11	96.97	95.35	84.59	81.50	71.23	-	49.42	57.33	55.15	55.99	51.10	53.25
VOID RATIO DETERMINED IN LAB.	3.138	2.767	2.641	2.570	2.320	2.240	1.995	-	1.328	1.567	1.521	1.535	1.419	1.495
VOID RATIO AT 100 % SATURATION	3.093	2.722	2.644	2.598	2.317	2.227	1.950	-	1.358	1.580	1.524	1.549	1.416	1.469
POROSITY, %	75.8	73.5	72.6	72.0	69.9	69.1	66.6	-	57.0	61.0	60.3	60.6	58.7	59.9
SATURATION, %	98.5	98.4	100+	100+	99.9	99.4	97.7	-	100+	100+	100+	100+	99.8	98.2
LIQUID LIMIT				73								41		
PLASTIC LIMIT				30								21		
LIQUIDITY INDEX, %	194	163	156	152	127	120	96	-	142	182	171	175	150	161
PLASTICITY INDEX				43								20		
COMPRESSION INDEX FROM LL				0.46								0.26		
COMPRESSION INDEX FROM e-log p	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SLUMP, %	-	-	-	-	-	-	-	-	-	-	-	-	-	-
COMPRESSIVE STRENGTH "UNDISTURBED", PSI	-	1.53	-	1.49	-	1.52	2.93	-	1.13	-	1.32	-	1.55	-
COMPRESSIVE STRENGTH REMOLDED, PSI	-	-	-	-	-	-	-	-	-	-	-	-	-	-
REMOLDING SENSITIVITY	-	-	-	-	-	-	-	-	-	-	-	-	-	-
COHESION PSI	-	0.77	-	0.75	-	0.76	1.47	-	0.57	-	0.66	-	0.78	-
COHESION gcm⁻²	-	54.1	-	52.7	-	53.4	103.4	-	40.1	-	46.4	-	54.8	-
ACTIVITY				0.83				-			0.48			
MODULUS OF ELASTICITY, PSI	-	24.2	-	11.4	-	25.2	50.7	-	12.7	-	24.2	-	27.5	-
GRAIN MEDIAN DIA. phi				9.1				-0.4			8.4			
GRAIN MEDIAN DIA. microns				1.8				1338			3.0			
SAND, % > 60µ < 2 mm				10				100			10			
SILT, % > 2 µ < 60 µ				38				0			48			
CLAY, % < 2 µ				52				0			42			
SEDIMENT TYPE			Silty clay					Sand			Clayey silt			
Vane Shear strength "undisturbed," psi	0.53	-	0.76	-	1.39	-	-	-	-	0.61	-	0.75	-	0.76
"undisturbed," gcm⁻²	3.72	-	53.4	-	97.8	-	-	-	-	42.8	-	52.7	-	53.4
remolded, psi	-	-	-	-	0.36	-	-	-	-	-	-	0.15	-	-
Vane sensitivity	-	-	-	-	3.9	-	-	-	-	-	-	5.0	-	-

SAMPLE NUMBER	15	16	17	18	19	20	21	22	23	24	25	26	27	28
DISTANCE FROM TOP OF CORE, in	32-34	34-36	36-38	38-40	40-42	42-44	44-46	46-48	48-50	50-52	52-54	54-56	56-58	58-60
WET UNIT WEIGHT lb ft⁻³	105.9	107.0	105.0	105.4	105.4	106.0	105.9	-	107.6	105.6	106.4	107.2	108.6	109.4
WET UNIT WEIGHT gcm⁻³	1.70	1.71	1.68	1.69	1.69	1.70	1.70	-	1.72	1.69	1.70	1.72	1.74	1.75
SPECIFIC GRAVITY OF SOLIDS	2.760	2.752	2.757	2.769	2.775	2.772	2.792	2.763	2.768	2.776	2.783	2.774	2.762	2.766
WATER CONTENT, % DRY WEIGHT	53.79	53.94	58.22	58.51	57.96	57.02	56.88	53.18	53.53	56.50	56.64	53.59	50.58	49.65
VOID RATIO DETERMINED IN LAB.	1.501	1.471	1.592	1.598	1.595	1.562	1.581	1.469	1.464	1.568	1.559	1.482	1.391	1.361
VOID RATIO AT 100 % SATURATION	1.485	1.484	1.605	1.620	1.608	1.581	1.588	-	1.482	1.568	1.576	1.487	1.397	1.373
POROSITY, %	60.0	59.5	61.4	61.5	61.5	61.0	61.3	59.5	59.4	61.1	60.9	59.7	58.2	57.6
SATURATION, %	98.9	100+	100+	100+	100+	100+	100+	-	100+	100	100+	100+	100+	100+
LIQUID LIMIT			43							43				44
PLASTIC LIMIT			22							22				22
LIQUIDITY INDEX, %	151	152	172	174	181	167	166	148	150	164	165	150	136	126
PLASTICITY INDEX			21							21				22
COMPRESSION INDEX FROM LL			0.27							0.27				0.28
COMPRESSION INDEX FROM e-log p	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SLUMP, %	-	-	-	-	-	-	-	-	-	-	-	-	-	-
COMPRESSIVE STRENGTH "UNDISTURBED", PSI	1.79	-	1.22	-	1.46	-	1.27	-	-	1.51	-	1.83	-	1.86
COMPRESSIVE STRENGTH REMOLDED, PSI	-	-	-	-	-	-	-	-	-	-	-	-	-	-
REMOLDING SENSITIVITY	-	-	-	-	-	-	-	-	-	-	-	-	-	-
COHESION PSI	0.89	-	0.61	-	0.73	-	0.64	-	-	0.76	-	0.92	-	0.93
COHESION gcm⁻²	62.6	-	42.9	-	51.3	-	45.0	-	-	53.4	-	64.7	-	65.4
ACTIVITY			0.48							0.47				0.52
MODULUS OF ELASTICITY, PSI	26.2	-	24.8	-	28.7	-	31.4	-	-	31.5	-	18.2	-	30.0
GRAIN MEDIAN DIA. phi			8.4							8.5				8.3
GRAIN MEDIAN DIA. microns			3.0							2.8				3.2
SAND, % > 60µ < 2 mm			9							9				7
SILT, % > 2 µ < 60 µ			47							46				51
CLAY, % < 2 µ			44							45				42
SEDIMENT TYPE			Clayey silt						Clayey silt					
Vane Shear strength "undisturbed," psi	-	0.80	-	0.58	-	0.66	-	-	0.57	-	0.76	-	0.97	-
"undisturbed," gcm⁻²	-	56.2	-	40.2	-	46.4	-	-	40.1	-	53.4	-	68.2	-
remolded, psi	-	-	-	-	-	-	-	-	0.16	-	-	-	-	-
Vane sensitivity	-	-	-	-	-	-	-	-	3.6	-	-	-	-	-

AREA E CORE 48

CRUISE: 1959 . SONIC DEPTH, UNCORRECTED: 1200 fms. CORER: 260 lb. Gravity Kullenberg

APPROX. CORER PENETRATION: 72 IN. CORE: 43 in. LONG, DIAM. 1.875 in.

SAMPLE NUMBER		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
DISTANCE FROM TOP OF CORE, in		0-2	2-4	4-6	6-8	8-10	10 - 11.7	11.7-14	14-16	16-18	18-20	20-22	22-24	24-26	26-28	28-30	30-32	32-34	34-36	36-38	38-40
WET UNIT WEIGHT	$lb\ ft^{-3}$	85.9	90.1	92.2	95.7	96.3	-	-	106.7	103.5	105.0	100.5	101.0	100.8	100.0	102.1	100.5	101.1	101.5	99.7	100.6
	gcm^{-3}	1.38	1.44	1.48	1.53	1.54	-	-	1.71	1.66	1.68	1.61	1.62	1.61	1.60	1.64	1.61	1.62	1.63	1.60	1.61
SPECIFIC GRAVITY OF SOLIDS		2.727	2.728	2.737	2.727	2.739	-	-	2.746	2.748	2.754	2.767	2.767	2.758	2.744	2.754	2.746	2.754	2.763	2.764	2.758
WATER CONTENT, % DRY WEIGHT		128.81	109.09	95.66	81.03	76.74	-	-	49.95	59.54	56.22	66.56	66.31	66.75	68.46	61.87	69.15	65.98	65.83	70.33	67.73
VOID RATIO	DETERMINED IN LAB.	3.535	2.950	2.624	2.212	2.137	-	-	1.408	1.646	1.556	1.862	1.842	1.849	1.885	1.725	1.887	1.825	1.818	1.947	1.869
	AT 100% SATURATION	3.513	2.976	2.618	2.210	2.102	-	-	1.372	1.636	1.548	1.842	1.835	1.841	1.879	1.704	1.899	1.817	1.819	1.944	1.868
POROSITY, %		77.9	74.7	72.4	68.8	68.1	-	-	58.5	62.2	60.9	65.1	64.8	64.9	65.3	63.3	65.4	64.6	64.5	66.1	65.1
SATURATION, %		99.4	100+	99.8	99.7	98.4	-	-	97.4	99.4	99.5	98.9	99.6	99.6	99.6	98.8	100+	99.6	100	99.8	99.9
LIQUID LIMIT				75							55							57			
PLASTIC LIMIT				27							24							26			
LIQUIDITY INDEX, %		212	171	143	113	104	-	-	84	115	104	137	136	138	137	116	139	129	128	143	135
PLASTICITY INDEX				48							31							31			
COMPRESSION INDEX	FROM LL			0.47							0.35							0.36			
	FROM e-log p	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SLUMP, %		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
COMPRESSIVE STRENGTH	"UNDISTURBED", PSI	-	0.74	-	2.10	-	-	-	2.06	-	2.85	-	2.38	-	1.49	-	1.32	-	1.42	-	1.35
	REMOLDED, PSI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
REMOLDING SENSITIVITY		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
COHESION	PSI	-	0.37	-	1.05	-	-	-	1.03	-	1.48	-	1.19	-	0.75	-	0.66	-	0.71	-	0.68
	gcm^{-2}	-	26.0	-	73.8	-	-	-	72.4		104.1	-	83.7	-	52.7	-	46.4	-	49.9	-	47.8
ACTIVITY				1.07								0.67						0.63			
MODULUS OF ELASTICITY, PSI		-	5.3	-	24.9	-	-	-	34.1	-	51.6	-	50.1	-	49.1	-	20.3	-	20.3	-	13.3
GRAIN MEDIAN DIA.	phi			8.5				1.0				8.6						8.8			
	microns			2.7				5.07				2.5						2.2			
SAND, % > 60μ < 2 mm				10				98				12						6			
SILT, % > 2 μ < 60 μ				45				2				42						45			
CLAY, % < 2μ				45				0				46						49			
SEDIMENT TYPE			Silty	Clay				Sand			Silty	Clay					Silty	Clay			
Vane Shear strength	"undisturbed," psi	0.19	-	0.48	-	1.94	-	-	-	1.20	-	1.36	-	1.23	-	1.34	-	0.69	-	0.69	-
	"undisturbed," gcm^{-2}	1.31	-	33.6	-	136.1	-	-	-	84.0	-	95.8	-	36.7	-	94.0	-	43.8	-	48.8	-

AREA F CORE 6

CRUISE: 1959. SONIC DEPTH, UNCORRECTED: 1240 fms. CORER: 225 lb. Gravity Hydroplastic

APPROX. CORER PENETRATION: 112 IN. CORE: 106 in. LONG, DIAM. 3.22 in.

SAMPLE NUMBER	1	2	3	4	5	6	7	8	9	10	11	12	13	14
DISTANCE FROM TOP OF CORE, in	0.-4.5	4.5-9	9-13.5	13.5-15	15-19.5	19.5-24	24-28.5	28.5-30	30-34.5	34.5-39	39-43.5	43.5-45	45-49.5	49.5-54
WET UNIT WEIGHT, lb ft^{-3}	108.9	110.7	114.9	115.2	116.3	110.0	106.5	101.5	103.8	101.4	101.1	107.0	99.9	99.8
WET UNIT WEIGHT, gcm^{-3}	1.74	1.77	1.84	1.85	1.86	1.76	1.71	1.63	1.66	1.62	1.62	1.62	1.60	1.60
SPECIFIC GRAVITY OF SOLIDS	2.741	2.745	2.743	2.740	2.768	2.751	2.755	2.766	2.764	2.765	2.770	2.765	2.764	2.769
WATER CONTENT, % DRY WEIGHT	48.67	46.79	41.45	40.34	36.67	47.24	52.54	61.51	57.27	66.81	67.22	69.81	69.5	70.39
VOID RATIO, DETERMINED IN LAB.	1.335	1.272	1.116	-	1.030	1.299	1.464	-	1.615	1.841	1.861	-	1.929	1.952
VOID RATIO, AT 100% SATURATION	1.334	1.284	1.141	1.106	1.015	1.300	1.447	1.710	1.583	1.847	1.862	1.931	1.921	1.949
POROSITY, %	57.2	56.0	52.7	52.5	50.7	56.5	59.4	62.8	61.8	64.8	65.0	65.9	65.9	66.1
SATURATION, %	99.9	100+	100+	100	98.5	100	98.9	97.4	98.0	100+	100	100+	99.6	99.9
LIQUID LIMIT	35	35	30	-	29	34	37	-	40	41	43	-	43	44
PLASTIC LIMIT	19	20	18	-	18	20	20	-	21	21	22	-	22	23
LIQUIDITY INDEX, %	195	179	195	-	170	195	191	-	191	229	215	-	224	226
PLASTICITY INDEX	16	15	12	-	11	14	17	-	19	20	21	-	21	21
COMPRESSION INDEX, FROM LL	0.22	0.22	0.19	-	0.18	0.21	0.23	-	0.26	0.26	0.27	-	0.27	0.28
COMPRESSION INDEX, FROM e-log p	-	-	-	0.29	-	-	-	0.48	-	-	-	.37-.73	-	-
SLUMP, %	-	-	-	-	-	-	-	-	-	-	-	-	-	-
COMPRESSIVE STRENGTH, "UNDISTURBED", PSI	0.93	1.68	1.55	-	1.34	1.22	1.22	-	-	0.96	0.92	-	0.78	0.91
COMPRESSIVE STRENGTH, REMOLDED, PSI	-	-	-	-	-	-	-	-	-	-	-	-	-	-
REMOLDING SENSITIVITY	-	-	-	-	-	-	-	-	-	-	-	-	-	-
COHESION, PSI	0.42	0.54	0.78	-	0.67	0.61	0.61	-	-	0.48	0.46	-	0.39	0.46
COHESION, gcm^{-2}	29.5	38.0	54.8	-	47.1	42.9	42.9	-	-	33.7	32.3	-	27.4	32.3
ACTIVITY	0.5	0.4	0.4	-	0.3	0.4	0.5	-	0.5	0.5	0.5	-	0.5	0.5
MODULUS OF ELASTICITY, PSI	9.4	20.5	29.3	3	32.6	28.1	25.6	-	-	23.0	22.5	-	20.4	26.1
GRAIN MEDIAN DIA., phi	6.1	7.1	7.1	7.1	6.7	6.5	7.0	7.1	7.4	7.9	8.3	8.3	8.1	8.3
GRAIN MEDIAN DIA., microns	14.2	7.4	7.1	7.2	9.8	10.9	7.8	3.1	6.0	4.3	3.2	3.1	3.6	3.1
SAND, % > 60μ < 2 mm	31	23	23	26	28	25	21	18	18	13	14	13	15	12
SILT, % > 2μ < 60μ	39	40	43	40	39	43	42	39	42	42	42	43	42	44
CLAY, % < 2μ	30	37	34	34	33	32	37	43	40	40	44	44	43	44
SEDIMENT TYPE		Sand	-	Silt -	Clay									
		(Pebbles)				(Pebbles)								

SAMPLE NUMBER	15	16	17	18	19	20	21	22	23	24	25	26	27
DISTANCE FROM TOP OF CORE, in	54-59.5	59.5-62	62-66.5	66.5-71	71-75.5	75.5-77	77-81.5	81.5-86	86-90.5	90.5-92	92-96.5	96.5-101	101-104
WET UNIT WEIGHT, lb ft^{-3}	102.8	103.0	101.9	102.1	104.1	104.9	106.6	114.7	113.1	106.1	105.7	111.8	106.1
WET UNIT WEIGHT, gcm^{-3}	1.65	1.65	1.63	1.64	1.67	1.68	1.71	1.84	1.81	1.70	1.69	1.79	1.70
SPECIFIC GRAVITY OF SOLIDS	2.756	2.750	2.763	2.760	2.763	2.756	2.762	2.734	2.733	2.763	2.762	2.753	2.755
WATER CONTENT, % DRY WEIGHT	61.46	63.62	64.83	64.16	59.07	57.94	53.62	38.09	40.21	56.21	55.58	45.64	58.61
VOID RATIO, DETERMINED IN LAB.	1.704	-	1.792	1.771	1.636	-	1.484	1.055	1.115	-	1.538	1.238	-
VOID RATIO, AT 100% SATURATION	1.694	1.749	1.793	1.771	1.632	1.596	1.481	1.041	1.099	1.553	1.535	1.256	1.614
POROSITY, %	63.0	63.7	64.2	63.9	62.1	61.5	59.7	51.3	52.7	60.8	60.6	55.3	61.8
SATURATION, %	99.4	100+	100	100	99.8	100+	99.8	98.7	98.6	100+	99.8	100+	100+
LIQUID LIMIT	41	-	38	40	36	-	-	25	25	-	38	31	-
PLASTIC LIMIT	22	-	21	20	20	-	-	15	17	-	20	17	-
LIQUIDITY INDEX, %	208	-	258	221	244	-	-	231	290	-	198	205	-
PLASTICITY INDEX	19	-	17	20	16	-	-	10	8	-	18	14	-
COMPRESSION INDEX, FROM LL	0.26	-	0.24	0.26	0.23	-	-	0.16	0.16	-	0.24	0.20	-
COMPRESSION INDEX, FROM e-log p	-	.43-.67	-	-	-	.41-.83	-	-	-	0.4-0.6	-	-	0.4-0.6
SLUMP, %	-	-	-	-	-	-	-	-	-	-	-	-	-
COMPRESSIVE STRENGTH, "UNDISTURBED", PSI	1.12	-	1.06	0.96	1.04	-	0.97	0.94	0.94	-	1.28	1.57	-
COMPRESSIVE STRENGTH, REMOLDED, PSI	-	-	-	-	-	-	-	-	-	-	-	-	-
REMOLDING SENSITIVITY	-	-	-	-	-	-	-	-	-	-	-	-	-
COHESION, PSI	0.56	-	0.53	0.48	0.52	-	0.49	0.47	0.47	-	0.64	0.78	-
COHESION, gcm^{-2}	39.4	-	37.3	33.7	36.6	-	34.5	33.0	33.0	-	45.0	54.8	-
ACTIVITY	0.5	-	0.4	0.6	0.4	-	-	0.4	0.3	-	0.5	0.4	-
MODULUS OF ELASTICITY, PSI	19.2	-	14.2	17.3	24.7	-	21.5	21.4	10.4	-	26.2	21.4	-
GRAIN MEDIAN DIA., phi	8.0	7.6	7.3	7.3	7.2	7.4	7.2	5.2	5.1	7.1	7.2	6.4	6.8
GRAIN MEDIAN DIA., microns	4.0	5.3	6.1	6.1	6.6	5.8	6.7	28.0	28.8	7.2	7.0	11.7	8.7
SAND, % > 60μ < 2 mm	16	16	17	15	19	18	16	41	40	15	13	24	20
SILT, % > 2μ < 60μ	43	45	44	48	41	45	48	34	36	53	53	43	44
CLAY, % < 2μ	41	39	39	36	40	37	36	25	24	32	34	33	36
SEDIMENT TYPE								Sand-silt-clay		Clayey silt		S-S-C	clayey silt
					(Pebbles)			(Pebbles)					

AREA F CORE 10

CRUISE: 1959 . SONIC DEPTH, UNCORRECTED: 1340 fms. CORER: 400 lb. Gravity Kullenberg

APPROX. CORER PENETRATION: 72 IN. CORE: 69 in. LONG, DIAM. 1.875 in.

SAMPLE NUMBER		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
DISTANCE FROM TOP OF CORE, in		0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24-26	26-28	28-30	30-32
WET UNIT WEIGHT	lb ft^{-3}	88.0	88.7	90.0	-	91.3	91.2	93.6	90.5	92.5	94.1	93.5	94.1	94.0	94.3	94.9	94.3
	gcm^{-3}	1.41	1.42	1.44	-	1.46	1.46	1.50	1.45	1.48	1.51	1.50	1.51	1.51	1.51	1.52	1.51
SPECIFIC GRAVITY OF SOLIDS		2.702	2.724	2.738	2.731	2.733	2.743	2.740	2.722	2.727	2.729	2.762	-	2.752	2.751	2.747	2.755
WATER CONTENT, % DRY WEIGHT		113.25	113.59	104.58	102.85	101.99	93.39	87.39	101.32	94.24	97.10	91.06	88.90	87.05	88.27	86.97	88.78
VOID RATIO	DETERMINED IN LAB.	3.084	3.092	2.885	-	2.774	2.630	2.423	2.778	2.573	2.569	2.521	-	2.417	2.433	2.377	2.442
	AT 100 % SATURATION	3.060	3.094	2.863	2.809	2.787	2.562	2.394	2.758	2.570	2.654	2.515	-	2.396	2.428	2.389	2.446
POROSITY, %		75.5	75.6	74.3	-	73.5	72.5	70.8	73.5	72.0	72.[illegible]	71.6	-	70.7	70.9	70.4	70.9
SATURATION, %		99.2	100+	99.3	-	100+	97.4	98.8	99.2	99.9	100+	99.8	-	99.1	99.8	100+	100+
LIQUID LIMIT				83						74						70	
PLASTIC LIMIT				32						34						29	
LIQUIDITY INDEX, %		159	160	142	139	137	120	134	168	151	158	143	137	142	145	141	146
PLASTICITY INDEX				51						40						41	
COMPRESSION INDEX	FROM LL			0.32						0.26						0.26	
	FROM e-log p	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SLUMP, %		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
COMPRESSIVE STRENGTH	"UNDISTURBED", PSI	0.82	0.91	1.02	-	1.63	1.90	3.11	0.82	1.29	1.81	1.39	1.45	1.44	1.64	1.12	1.43
	REMOLDED, PSI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
REMOLDING SENSITIVITY		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
COHESION	PSI	0.41	0.46	0.51	-	0.82	0.95	1.56	0.41	0.65	0.91	0.69	0.73	0.72	0.82	0.56	0.72
	gcm^{-2}	28.8	32.3	35.9	-	57.7	66.8	109.7	28.8	45.7	64.0	48.5	51.3	50.6	57.7	39.4	50.6
ACTIVITY					1.1					0.8							0.7
MODULUS OF ELASTICITY, PSI		6.4	9.0	9.7	-	19.6	19.0	33.2	9.4	13.1	19.2	14.2	13.7	17.0	19.0	11.6	21.1
GRAIN MEDIAN DIA.	phi				8.6					8.6							9.6
	microns				2.6					2.5							1.3
SAND, % > 60μ < 2mm					3					3							3
SILT, % > 2μ < 60μ					50					50							41
CLAY, % < 2μ					47					47							56
SEDIMENT TYPE						Clayey Silt										Silty Clay	

SAMPLE NUMBER		17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
DISTANCE FROM TOP OF CORE, in		32-34	34-36	36-38	38-40	40-42	42-45	45-47	47-49	49-51	51-53	53-55	55-57	57-59	59-61	61-63	63-65
WET UNIT WEIGHT	lb ft^{-3}	94.3	95.3	93.7	92.9	92.6	91.8	91.0	91.7	90.5	90.2	91.1	90.8	89.7	89.4	91.6	90.7
	gcm^{-3}	1.51	1.53	1.50	1.49	1.48	1.47	1.46	1.47	1.45	1.45	1.46	1.45	1.44	1.43	1.47	1.45
SPECIFIC GRAVITY OF SOLIDS		2.753	2.765	2.768	2.755	2.760	2.761	2.754	2.759	2.765	2.773	2.761	2.782	2.774	2.784	2.761	2.777
WATER CONTENT, % DRY WEIGHT		86.65	81.60	91.99	90.35	94.42	98.12	106.12	102.95	102.79	106.07	104.39	102.40	110.21	108.46	98.91	103.97
VOID RATIO	DETERMINED IN LAB.	2.400	2.230	2.539	2.522	2.616	2.718	2.892	2.810	2.866	2.953	2.865	2.870	3.056	3.051	2.741	2.897
	AT 100 % SATURATION	2.385	2.256	2.546	2.489	2.606	2.709	2.923	2.840	2.842	2.941	2.882	2.849	3.057	3.020	2.731	2.887
POROSITY, %		70.6	69.6	71.7	71.6	72.3	73.1	74.3	73.8	74.1	74.7	74.1	74.2	75.3	75.3	73.3	74.3
SATURATION, %		99.4	98.6	100+	98.7	99.6	99.7	100+	100+	99.2	99.6	100+	99.3	100	99.0	99.6	99.7
LIQUID LIMIT						82					82				80		
PLASTIC LIMIT						31					30				31		
LIQUIDITY INDEX, %		141	128	120	116	124	132	147	140	140	146	143	146	143	158	139	149
PLASTICITY INDEX						51					52				49		
COMPRESSION INDEX	FROM LL					0.32					0.33				0.31		
	FROM e-log p	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SLUMP, %		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
COMPRESSIVE STRENGTH	"UNDISTURBED", PSI	1.58	2.31	1.18	1.98	1.74	1.63	1.14	1.59	1.61	1.31	1.46	1.92	1.39	1.16	1.55	1.34
	REMOLDED, PSI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
REMOLDING SENSITIVITY		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
COHESION	PSI	0.79	1.16	0.59	0.99	0.87	0.82	0.57	0.79	0.81	0.66	0.73	0.96	0.69	0.58	0.78	0.67
	gcm^{-2}	55.5	81.6	41.5	69.6	61.2	57.7	40.1	55.5	56.9	46.4	51.3	67.5	48.5	40.8	54.8	47.1
ACTIVITY						1.1					0.9				0.9		
MODULUS OF ELASTICITY, PSI		26.2	42.9	24.2	44.8	40.5	29.9	20.6	28.9	35.2	24.7	25.6	34.5	23.8	20.3	30.4	30.0
GRAIN MEDIAN DIA.	phi					8.8					9.6				9.5		
	microns					2.3					1.3				1.4		
SAND, % > 60μ < 2mm						3					2				2		
SILT, % > 2μ < 60μ						49					41				43		
CLAY, % < 2μ						48					57				55		
SEDIMENT TYPE						Clayey Silt						Silty Clay					

AREA F CORE 11

CRUISE: 1959 SONIC DEPTH, UNCORRECTED: 1340 fms. CORER: 275 lb. Gravity Hydroplastic

APPROX. CORER PENETRATION: No data in. CORE: 60 in. LONG, DIAM. 3.22 in.

SAMPLE NUMBER		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
DISTANCE FROM TOP OF CORE, in		0-4	4-8	8-12	12-13	15-19	19-23	23-27	27-28	28-32	32-36	36-40	40-41	44-48	48-52	52-56	56-57
WET UNIT WEIGHT	lb ft^{-3}	88.8	90.6	91.4	92.2	94.2	96.7	97.5	97.9	94.9	95.1	94.8	94.6	94.6	91.5	91.1	91.6
	gcm^{-3}	1.42	1.45	1.46	1.48	1.51	1.55	1.50	1.57	1.52	1.52	1.52	1.52	1.52	1.47	1.46	1.47
SPECIFIC GRAVITY OF SOLIDS		2.783	2.746	2.752	2.740	2.753	2.747	2.750	2.742	2.761	2.761	2.773	2.764	2.771	2.783	2.780	2.761
WATER CONTENT, % DRY WEIGHT		111.24	102.63	98.6	95.9	85.4	78.4	75.9	73.93	86.6	85.6	86.0	85.72	97.0	101.3	102.6	99.17
VOID RATIO	DETERMINED IN LAB.	3.073	2.830	2.731	-	2.380	2.163	2.102	-	2.380	2.362	2.395	-	2.601	2.821	2.858	-
	AT 100% SATURATION	3.096	2.818	2.713	2.628	2.351	2.154	2.092	2.027	2.391	2.363	2.385	2.369	2.688	2.819	2.852	2.736
POROSITY, %		75.4	73.9	73.2	72.4	70.4	68.4	67.8	67.0	70.5	70.3	70.5	70.4	72.2	73.8	74.1	73.3
SATURATION, %		99.3	99.6	99.4	99.8	98.8	99.6	99.5	99.3	100+	100	100	99.6	100+	99.9	99.8	99.7
LIQUID LIMIT		83	76	-	-	72	-	68	-	-	72	-	-	76	-	75	-
PLASTIC LIMIT		34	33	-	-	31	-	30	-	-	29	-	-	31	-	33	-
LIQUIDITY INDEX, %		158	162	-	-	133	-	121	-	-	132	-	-	147	-	166	-
PLASTICITY INDEX		49	43	-	-	41	-	38	-	-	43	-	-	45	-	42	-
COMPRESSION INDEX	FROM LL	0.52	0.48	-	-	0.45	-	0.43	-	-	0.45	-	-	0.48	-	0.47	-
	FROM e-log p	-	-	-	56 .95	-	-	-	0.71	-	-	-	0.79	-	-	-	0.83
SLUMP, %		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
COMPRESSIVE STRENGTH	"UNDISTURBED" PSI	0.82	1.42	1.25	-	1.75	1.99	2.07	-	1.37	1.75	1.79	-	1.81	1.53	1.23	-
	REMOLDED, PSI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
REMOLDING SENSITIVITY		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
COHESION	PSI	0.41	0.71	0.63	-	0.88	0.99	1.04	-	0.69	0.88	0.89	-	0.91	0.77	0.62	-
	gcm^{-2}	28.8	49.9	44.3	-	61.9	69.6	73.1	-	48.5	61.9	62.6	-	64.0	54.1	43.6	-
ACTIVITY		1.0	0.9	-	-	0.9	-	8.6	-	-	0.8	-	-	0.8	-	1.8	-
MODULUS OF ELASTICITY, PSI		9.5	21.9	53.4	-	39.4	31.8	40.9	-	29.1	36.1	33.6	-	62.6	28.9	26.0	-
GRAIN MEDIAN DIA.	phi	8.8	8.6	8.5	8.5	8.5	8.2	8.4	-	8.5	9.1	9.5	-	9.5	9.4	9.4	-
	microns	2.2	2.5	2.7	2.7	2.7	3.5	3.0	-	2.7	1.8	1.4	-	1.4	1.5	1.5	-
SAND, % > 60μ < 2mm		3	3	4	4	5	8	4	-	3	3	3	-	3	2	2	-
SILT, % > 2μ < 60μ		49	50	50	51	50	50	52	-	51	46	42	-	42	43	43	-
CLAY, % < 2μ		48	47	46	45	45	42	44	-	46	51	55	-	55	55	55	-
SEDIMENT TYPE						Clayey Silt							Silty	Clay			

AREA F CORE 12

CRUISE: 1959 . SONIC DEPTH, UNCORRECTED: 1330 fms. CORER: 350 lb.Gravity Kullenberg

APPROX. CORER PENETRATION: 69 IN. CORE: 66 in. LONG, DIAM. 1.875 in.

SAMPLE NUMBER		1	2	3	4	5	6	7	8	9	10	11	12	13
DISTANCE FROM TOP OF CORE, in		0-2	2-4	4-6	6-8	8-10	10-12	12-15	15-17	17-19	19-21	21-23	23-25	25-27
WET UNIT WEIGHT	lb ft⁻³	84.5	87.7	87.8	90.0	89.9	91.1	89.2	92.9	92.9	93.1	95.4	95.8	94.1
	gcm⁻³	1.35	1.40	1.41	1.44	1.44	1.46	1.43	1.49	1.49	1.49	1.53	1.53	1.51
SPECIFIC GRAVITY OF SOLIDS		2.740	2.738	2.715	2.725	2.734	2.738	2.746	2.727	2.725	2.740	2.733	2.744	2.727
WATER CONTENT, % DRY WEIGHT		140.54	123.95	118.66	108.86	109.37	103.32	107.66	91.14	95.10	94.97	86.98	83.37	91.45
VOID RATIO	DETERMINED IN LAB.	3.867	3.363	3.221	2.945	2.974	2.812	2.991	2.502	2.574	2.582	2.343	2.277	2.462
	AT 100% SATURATION	3.851	3.394	3.223	2.966	2.990	2.829	2.956	2.485	2.591	2.602	2.377	2.288	2.494
POROSITY, %		79.5	77.1	76.3	74.7	74.8	73.8	74.9	71.4	72.0	72.1	70.1	69.5	71.1
SATURATION, %		99.6	100+	100+	100+	100+	100+	98.8	99.3	100+	100+	100+	100+	100+
LIQUID LIMIT					83					76				
PLASTIC LIMIT					32					30				
LIQUIDITY INDEX, %		213	180	170	151	152	140	169	133	142	141	130	116	134
PLASTICITY INDEX					51					46				
COMPRESSION INDEX	FROM LL				0.52					0.47				
	FROM e-log p	-	-	-	-	-	-	-	-	-	-	-	-	-
SLUMP, %		-	-	-	-	-	-	-	-	-	-	-	-	-
COMPRESSIVE STRENGTH	"UNDISTURBED", PSI	0.21	0.56	0.72	0.91	0.78	1.00	0.94	2.06	1.32	1.05	1.30	-1.49	-1.47
	REMOLDED, PSI	-	-	-	-	-	-	-	-	0.50	-	-	-	-
REMOLDING SENSITIVITY		-	-	-	-	-	-	-	-	2.6	-	-	-	-
COHESION	PSI	0.11	0.28	0.36	0.46	0.39	0.50	0.47	1.03	0.66	0.53	0.65	0.75	0.74
	gcm⁻²	7.7	19.7	25.3	32.3	27.4	35.2	33.0	72.4	46.4	37.3	45.7	52.7	52.0
ACTIVITY					1.1					1.0				
MODULUS OF ELASTICITY, PSI		-	4.5	7.2	11.3	13.3	12.9	11.9	23.8	13.7	13.6	18.4	21.3	21.9
GRAIN MEDIAN DIA.	phi				8.5					8.4				
	microns				2.7					2.9				
SAND, % > 60μ < 2mm					4					3				
SILT, % > 2μ < 60μ					50					52				
CLAY, % < 2μ					46					45				
SEDIMENT TYPE									Clayey Silt					

SAMPLE NUMBER		14	15	16	17	18	19	20	21	22	23	24	25	26
DISTANCE FROM TOP OF CORE, in		27-30	30-32	32-34	34-36	36-38	38-40	40-42	42-45	45-47	47-49	49-51	51-53	53-56
WET UNIT WEIGHT	lb ft⁻³	95.8	95.8	94.5	94.9	95.1	93.6	92.3	92.0	93.5	92.6	91.4	92.6	91.0
	gcm⁻³	1.53	1.53	1.51	1.52	1.52	1.50	1.48	1.47	1.50	1.48	1.46	1.48	1.46
SPECIFIC GRAVITY OF SOLIDS		2.740	2.750	2.771	2.771	2.758	2.775	2.764	2.763	2.766	2.760	2.769	2.755	2.773
WATER CONTENT, % DRY WEIGHT		80.58	82.66	91.62	89.22	83.62	91.85	97.01	99.56	94.43	95.99	101.25	95.60	103.13
VOID RATIO	DETERMINED IN LAB.	2.223	2.272	2.511	2.450	2.323	2.553	2.681	2.743	2.589	2.642	2.805	2.630	2.867
	AT 100% SATURATION	2.208	2.273	2.539	2.472	2.306	2.549	2.681	2.751	2.612	2.649	2.804	2.634	2.860
POROSITY, %		69.0	69.4	71.5	71.0	70.0	71.9	72.8	73.3	72.1	72.5	73.7	72.5	74.1
SATURATION, %		99.3	100	100+	100+	99.3	99.8	100	100+	100+	100+	100	100+	99.8
LIQUID LIMIT		76					80					88		
PLASTIC LIMIT		30					29					32		
LIQUIDITY INDEX, %		111	114	112	118	107	123	133	138	112	114	124	114	127
PLASTICITY INDEX		46					51					56		
COMPRESSION INDEX	FROM LL	0.47					0.50					0.55		
	FROM e-log p	-	-	-	-	-	-	-	-	-	-	-	-	-
SLUMP, %		-	-	-	-	-	-	-	-	-	-	-	-	-
COMPRESSIVE STRENGTH	"UNDISTURBED", PSI	1.89	2.31	1.44	1.81	1.86	1.72	1.58	1.67	1.85	2.35	1.70	2.02	2.64
	REMOLDED, PSI	-	-	-	-	0.44	-	-	-	-	-	-	0.49	-
REMOLDING SENSITIVITY		-	-	-	-	4.2	-	-	-	-	-	-	4.1	-
COHESION	PSI	0.95	1.16	0.72	0.91	0.93	0.86	0.79	0.84	0.93	1.16	0.85	1.01	1.32
	gcm⁻²	66.8	81.6	50.6	64.0	65.4	60.5	55.5	59.1	65.4	81.6	59.8	71.0	92.8
ACTIVITY		1.2					0.9					1.0		
MODULUS OF ELASTICITY, PSI		35.4	33.9	18.5	25.7	36.8	26.9	35.9	26.8	28.4	32.7	26.4	46.1	35.0
GRAIN MEDIAN DIA.	phi	8.2					9.3					9.6		
	microns	3.3					1.6					1.3		
SAND, % > 60μ < 2mm		5					4					2		
SILT, % > 2μ < 60μ		55					42					41		
CLAY, % < 2μ		40					54					57		
SEDIMENT TYPE									Silty Clay					

AREA F CORE 13

CRUISE: 1959. SONIC DEPTH, UNCORRECTED: 1320 fms. CORER: 300 lb. Gravity Kullenberg

APPROX. CORER PENETRATION: 56+ IN. CORE: 56 in. LONG, DIAM. 1.875 in.

SAMPLE NUMBER	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
DISTANCE FROM TOP OF CORE, in	0.-2.5	2.5-4.5	4.5-6.5	6.5-8.5	8.5-10.7	10.7-13	13-16	16-18	18-20	20-22	22-24	24-26	26-28	28-31	31-33	33-35	35-37	37-39	39-41	41-43	43-45	45-47.5	47.5-49.5	49.5-51.5	51.5-53.7
WET UNIT WEIGHT, lb ft^{-3}	-	-	88.4	88.5	89.1	89.0	89.3	90.2	92.6	95.1	96.0	96.5	94.3	93.6	95.1	96.0	94.9	95.8	93.4	91.9	92.6	92.3	91.2	90.5	90.5
WET UNIT WEIGHT, gcm^{-3}	-	-	1.42	1.42	1.43	1.43	1.44	1.45	1.48	1.52	1.54	1.55	1.51	1.50	1.52	1.54	1.52	1.53	1.50	1.47	1.48	1.48	1.46	1.45	1.45
SPECIFIC GRAVITY OF SOLIDS	-	-	2.738	2.735	2.751	2.735	2.740	2.735	2.746	2.732	2.741	2.757	2.762	2.755	2.743	2.752	2.759	2.754	2.771	2.756	2.756	2.752	2.737	2.755	2.778
WATER CONTENT, % DRY WEIGHT	127.29	118.52	109.34	106.18	103.19	106.55	99.95	96.62	97.01	81.71	82.25	77.73	85.99	90.56	85.00	86.55	87.06	84.82	95.02	100.84	97.35	91.78	102.65	106.31	106.25
VOID RATIO, DETERMINED IN LAB.	-	-	3.046	2.976	2.915	2.961	2.807	2.720	2.646	2.257	2.247	2.168	2.399	2.500	2.333	2.333	2.390	2.311	2.610	2.795	2.663	2.571	2.788	2.922	2.953
VOID RATIO, AT 100% SATURATION	-	-	2.994	2.904	2.839	2.914	2.739	2.643	2.664	2.232	2.254	2.143	2.375	2.495	2.332	2.382	2.402	2.336	2.633	2.779	2.683	2.526	2.810	2.929	2.952
POROSITY, %	-	-	75.3	74.8	74.5	74.8	73.7	73.1	72.6	69.3	69.2	68.4	70.6	71.4	70.0	70.0	70.5	69.8	72.3	73.6	72.7	72.0	73.6	74.5	74.7
SATURATION, %	-	-	98.4	97.6	97.4	98.4	97.6	97.2	100+	98.9	100+	98.8	99.0	99.8	99.9	100+	100+	100+	100+	99.4	100+	98.2	100+	100+	99.9
LIQUID LIMIT	-	-			84			76						74					81					84	
PLASTIC LIMIT	-	-			33			31						29					32					33	
LIQUIDITY INDEX, %	-	-	150	144	138	168	153	146	147	113	114	108	127	137	124	128	112	108	129	140	133	122	137	144	144
PLASTICITY INDEX	-	-			51			45						45					49					51	
COMPRESSION INDEX, FROM LL	-	-			0.53			0.48						0.47					0.51					0.53	
COMPRESSION INDEX, FROM e-log p	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SLUMP, %	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
COMPRESSIVE STRENGTH, "UNDISTURBED", PSI	-	-	0.96	1.02	1.27	1.02	1.29	1.08	1.13	2.00	1.53	2.22	1.31	1.24	2.22	1.90	2.14	2.45	2.12	1.70	1.89	2.59	1.46	1.23	1.06
COMPRESSIVE STRENGTH, REMOLDED, PSI	-	-	-	-	0.32	-	-	-	0.24	-	-	-	-	-	-	0.55	-	-	0.60	-	-	0.58	-	-	0.40
REMOLDING SENSITIVITY	-	-	-	-	4.0	-	-	-	4.7	-	-	-	-	-	-	3.4	-	-	3.5	-	-	4.5	-	-	2.6
COHESION, PSI	-	-	0.48	0.51	0.64	0.51	0.65	0.54	0.57	1.00	0.77	1.11	0.66	0.62	1.11	0.95	1.07	1.23	1.06	0.85	0.95	1.30	0.73	0.67	0.53
COHESION, gcm^{-2}	-	-	33.8	35.9	45.0	35.9	45.7	38.0	40.1	70.3	54.1	78.0	46.4	43.6	78.0	66.8	75.2	86.5	74.5	59.8	66.8	91.4	51.3	47.1	37.3
ACTIVITY	-	-			1.1				1.0					0.9						1.0				0.9	
MODULUS OF ELASTICITY, PSI	-	-	10.1	14.0	13.2	11.8	14.9	7.3	13.4	25.3	17.9	25.9	11.0	15.3	34.8	34.4	27.8	31.4	14.2	12.1	24.6	29.2	17.6	16.5	14.0
GRAIN MEDIAN DIA., phi	-	-			8.8				8.3					9.1						9.6					9.5
GRAIN MEDIAN DIA., microns	-	-			2.3				3.2					1.8						1.3				1.	4
SAND, % > 60μ < 2 mm	-	-			3				4					3						3					2
SILT, % > 2μ < 60μ	-	-			49				51					46						40				4	2
CLAY, % < 2μ	-	-			48				45					51						47				5	6
SEDIMENT TYPE			Clayey	Silt										Silty	Clay				Clayey	Silt				Silty	Clay

AREA F CORE 14

CRUISE: 1959 . SONIC DEPTH, UNCORRECTED: 1310 fms. CORER: 250 lb. Gravity Kullenberg

APPROX. CORER PENETRATION: 53+ IN. CORE: 68 in. LONG, DIAM. 1.875 in.

SAMPLE NUMBER	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
DISTANCE FROM TOP OF CORE, in	0-3.2	3.2-5.2	5.2-7.2	7.2-9.2	9.2-11.2	11.2-13.2	13.2-15.2	15.2-17.7	17.7-19.7	19.7-21.7	21.7-23.7	23.7-26	26-28	28-30	31.2-34	34-36	36-38	38-40	40-42	44-46	46-48	48-50	50-52	52-54	56-58	58-60	60-62	60-62	62-64
WET UNIT WEIGHT, lb ft^{-3}	-	90.0	89.2	89.7	91.5	91.8	91.8	95.9	95.9	96.0	94.8	97.0	98.8	95.2	96.3	96.3	97.2	94.4	95.4	93.5	92.0	94.2	93.1	93.0	91.1	91.4	91.2	90.8	92.0
WET UNIT WEIGHT, gcm^{-3}	-	1.44	1.43	1.44	1.47	1.47	1.47	1.54	1.54	1.54	1.52	1.55	1.58	1.53	1.54	1.54	1.56	1.51	1.53	1.50	1.47	1.51	1.49	1.49	1.46	1.46	1.46	1.45	1.47
SPECIFIC GRAVITY OF SOLIDS	-	2.729	2.736	2.239	2.738	2.745	2.732	2.730	2.750	2.739	2.750	2.754	2.735	2.743	2.766	2.762	2.760	2.766	2.753	2.749	-	2.756	2.759	2.762	2.773	2.762	2.778	2.778	2.766
WATER CONTENT, % DRY WEIGHT	-	111.37	105.65	109.17	95.71	100.91	98.81	82.03	81.48	81.32	86.37	80.68	71.65	87.59	82.51	81.62	78.54	86.53	85.99	91.00	-	90.74	91.89	90.66	101.46	98.20	100.00	104.28	98.06
VOID RATIO, DETERMINED IN LAB.	-	3.008	2.940	2.989	2.657	2.751	2.694	2.236	2.252	2.231	2.376	2.205	1.968	2.375	2.271	2.251	2.164	2.410	2.350	2.508	-	2.483	2.547	2.533	2.833	2.737	2.799	2.902	2.714
VOID RATIO, AT 100% SATURATION	-	3.039	2.891	2.990	2.621	2.770	2.699	2.239	2.241	2.227	2.375	2.222	1.960	2.403	2.282	2.254	2.168	2.393	2.367	2.502	-	2.501	2.535	2.504	2.813	2.712	2.778	2.896	2.712
POROSITY, %	-	75.0	74.6	74.9	72.7	73.3	73.0	69.1	69.2	69.0	70.4	68.8	66.3	70.4	69.4	69.2	68.4	70.7	70.1	71.5	-	71.3	71.8	71.7	73.9	73.2	73.7	74.4	73.1
SATURATION, %	-	100+	98.3	100	98.6	100+	100+	100+	99.5	99.8	100	100+	99.6	100+	100+	100+	100+	99.3	100+	99.7	-	100+	99.5	98.9	99.3	99.1	99.2	99.8	99.9
LIQUID LIMIT	-		80			80			73				70			73		78		80				79				80	
PLASTIC LIMIT	-		32			33			30				30			30		30		30				31				30	
LIQUIDITY INDEX, %	-	165	153	161	133	144	140	121	120	119	141	127	104	144	122	120	113	118	117	122	-	124	127	124	147	136	140	149	136
PLASTICITY INDEX	-		48			47			43				40			43		48		50				48				50	
COMPRESSION INDEX, FROM LL	-		0.50			0.50			0.46				0.44			0.46		0.49		0.50				0.50				0.50	
COMPRESSION INDEX, FROM e-log p	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SLUMP, %	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
COMPRESSIVE STRENGTH, "UNDISTURBED", PSI	-	1.05	1.14	1.06	1.46	-	1.00	2.50	3.00	2.75	1.63	2.75	3.25	-	1.90	2.40	3.20	1.78	2.85	2.25	-	2.00	2.38	2.14	1.66	2.37	1.78	1.42	1.52
COMPRESSIVE STRENGTH, REMOLDED, PSI	-	-	0.34	-	-	-	-	-	-	-	-	0.75	-	-	-	-	-	-	-	-	-	0.70	-	-	-	-	-	0.30	
REMOLDING SENSITIVITY	-	-	3.4	-	-	-	-	-	-	-	-	3.7	-	-	-	-	-	-	-	-	-	2.9	-	-	-	-	-	4.7	
COHESION, PSI	-	0.53	0.57	0.53	0.73	-	0.50	1.25	1.50	1.38	0.82	1.38	1.63	-	0.95	1.20	1.60	0.89	1.43	1.12	-	1.00	1.19	1.07	0.83	1.19	0.89	0.71	0.76
COHESION, gcm^{-2}	-	37.3	40.1	37.3	51.3	-	35.2	87.9	105.5	97.0	57.7	97.0	114.6	-	66.8	84.4	112.5	62.6	100.5	78.7	-	70.3	83.7	75.2	58.4	83.7	62.5	50.0	53.4
ACTIVITY	-		1.0			1.0			1.0				0.9			0.8		0.9		0.9			0.9					1.1	
MODULUS OF ELASTICITY, PSI	-	8.4	13.0	11.7	12.9	11.8	9.2	37.0	34.0	33.2	11.3	35.8	34.6	-	30.4	23.8	43.4	16.2	30.5	25.2	-	33.5	34.9	33.3	13.2	37.6	18.4	12.1	11.6
GRAIN MEDIAN DIA., phi	-		8.8			8.7			8.5				8.6			9.1		9.4		9.4			9.6					9.6	
GRAIN MEDIAN DIA., microns	-		2.3			2.4			2.8				2.6			1.8		1.5		1.5			1.3					1.3	
SAND, % > 60μ < 2 mm	-		2			4			3				4			3		3			3			2				2	
SILT, % > 2μ < 60μ	-		50			49			52				50			46		43		43			42					41	
CLAY, % < 2μ	-		48			47			45				46			51		54		54			56					57	
SEDIMENT TYPE				Clayey silt					Clayey silt			Clayey silt				Silty clay		Silty clay		Silty clay			Silty clay			Silty clay			

AREA F CORE 15

CRUISE: 1959 . **SONIC DEPTH, UNCORRECTED:** 1320 fms. **CORER:** 200 lb. Gravity Kullenberg

APPROX. CORER PENETRATION: 48 in. **CORE:** 61 in. LONG, DIAM. 1.875 in.

SAMPLE NUMBER	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
DISTANCE FROM TOP OF CORE, in	0-2.2	2.2-4.5	4.5-6.7	6.7-9	9-11.2	11.2-13.5	13.5-14	14.2-16.5	16.5-18	18-20.2	20.2-22.5	22.5-24.7	24.7-27	27-29.2	29.2-31.5	31.5-33.7	33.7-35.2	35.2-37.5	37.5-39.7	39.7-42	42.-44.2	44.2-46.5	46.5-48.7	48.7-51	51-53.2	53.2-55.5	55.5-57.7	57.7-59.2
WET UNIT WEIGHT lb ft⁻³	86.2	86.8	87.9	90.6	89.5	90.1	-	93.7	-	94.0	94.3	95.3	95.6	95.3	94.3	94.4	93.5	92.9	93.1	93.6	92.1	90.7	90.8	92.0	91.2	91.9	91.9	-
WET UNIT WEIGHT gcm⁻³	1.38	1.39	1.41	1.45	1.43	1.44	-	1.49	-	1.52	1.51	1.53	1.55	1.53	1.51	1.51	1.50	1.49	1.49	1.50	1.48	1.45	1.49	1.47	1.46	1.47	1.47	-
SPECIFIC GRAVITY OF SOLIDS	2.738	2.746	2.737	2.727	2.732	2.746	-	2.727	-	2.737	2.743	2.749	2.753	2.751	2.761	2.763	2.770	2.776	2.758	2.770	2.758	2.757	2.755	2.769	2.770	2.772	2.765	-
WATER CONTENT, % DRY WEIGHT	121.94	122.33	119.19	97.80	105.43	106.25	-	86.21	-	84.03	88.03	82.49	79.87	84.43	89.27	88.28	92.33	95.67	93.49	91.54	98.25	104.05	103.39	99.88	102.23	99.21	99.92	-
VOID RATIO DETERMINED IN LAB.	3.397	3.397	3.252	2.727	2.912	2.923	-	2.412	-	2.344	2.422	2.280	2.182	2.320	2.455	2.441	2.561	2.651	2.573	2.535	2.703	2.873	2.849	2.757	2.839	2.751	2.751	-
VOID RATIO AT 100% SATURATION	3.339	3.359	3.254	2.667	2.880	2.918	-	2.351	-	2.323	2.419	2.264	2.171	2.322	2.465	2.439	2.558	2.656	2.577	2.536	2.710	2.869	2.848	2.766	2.832	2.750	2.763	-
POROSITY, %	77.3	77.3	76.5	73.2	74.4	74.5	-	70.7	-	70.1	70.8	69.6	68.6	69.9	71.1	70.9	71.9	72.6	72.0	71.7	73.0	74.2	74.0	73.4	74.0	73.3	73.3	-
SATURATION, %	98.3	98.9	100	98.3	98.9	99.8	-	97.5	-	99.1	99.9	99.1	99.5	100	100	99.9	99.9	100+	100+	100+	100+	99.9	100	100+	99.7	100	100+	-
LIQUID LIMIT	85			82			78		-	66			65		76				77				78			74		
PLASTIC LIMIT	38			32			33		-	29			28		31				31				46			32		
LIQUIDITY INDEX, %	179			174			163		-	151			147		130				136				181			167		
PLASTICITY INDEX	47			50			45		-	37			37		45				46				32			42		
COMPRESSION INDEX FROM LL	0.54			0.52			0.49		-	0.42			0.41		0.48				0.49				0.49			0.47		
COMPRESSION INDEX FROM e-log p	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SLUMP, %	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
COMPRESSIVE STRENGTH "UNDISTURBED", PSI	0.60	0.50	0.84	1.59	1.20	1.20	-	2.38	-	1.50	1.52	1.72	2.42	1.86	1.64	1.78	2.07	1.52	1.91	2.58	1.65	1.42	1.49	2.26	1.34	1.71	1.62	-
COMPRESSIVE STRENGTH REMOLDED, PSI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
REMOLDING SENSITIVITY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
COHESION PSI	0.30	0.25	0.42	0.80	0.60	0.60	-	1.19	-	0.75	0.76	0.86	1.21	0.93	0.82	0.89	1.04	0.76	0.96	1.29	0.83	0.71	0.75	1.13	0.67	0.86	0.81	-
COHESION gcm⁻²	21.1	17.6	29.5	56.2	42.2	42.2	-	83.7	-	52.7	53.4	60.5	85.1	65.4	57.7	62.6	73.1	53.4	67.5	90.7	58.4	49.9	52.7	79.4	47.1	60.5	56.9	-
ACTIVITY		0.9		1.0			1.0		-	0.8			0.8		0.9				0.9				0.6			0.8		
MODULUS OF ELASTICITY, PSI	4.8	3.4	6.5	17.0	13.0	10.3	-	29.6	-	13.6	9.7	15.0	23.7	15.4	12.5	13.2	18.2	16.4	17.1	23.8	12.9	13.7	13.8	19.6	13.9	13.0	13.6	-
GRAIN MEDIAN DIA. phi		9.0		9.0			8.7		-	8.4			8.8		9.2				9.5				9.6			9.4		
GRAIN MEDIAN DIA. microns		2.0		2.0			2.4		-	3.0			2.2		1.7				1.4				1.3			1.5		
SAND, % > 60μ < 2mm		4		3			4		-	5			4		3				3				2			2		
SILT, % > 2μ < 60μ		46		47			50		-	50			48		45				43				41			42		
CLAY, % < 2μ		50		50			46		-	45			48		52				54				57			56		
SEDIMENT TYPE			Silty	Clay				Clayey		Silt			Silty clay			Silty	clay		Silty	Clay			Silty clay			Silty clay		

AREA P CORE 16

CRUISE: 1959 . SONIC DEPTH, UNCORRECTED: 1320 fms. CORER: 150 lb. Gravity Kullenberg

APPROX. CORER PENETRATION: 50+ IN. CORE: 67 in. LONG, DIAM. 1.875 in.

SAMPLE NUMBER	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
DISTANCE FROM TOP OF CORE, in	0-2	2-4	4-6	6-8	8-10	10-12	12-14	16-18	18-20	20-22	22-24	24-26	26-28	28-30	30-32
WET UNIT WEIGHT, lb ft^{-3}	83.5	86.7	88.4	90.2	90.6	92.3	92.7	92.9	95.3	93.8	95.0	95.3	98.0	95.1	98.9
WET UNIT WEIGHT, gcm^{-3}	1.34	1.39	1.41	1.45	1.45	1.48	1.48	1.49	1.53	1.50	1.52	1.53	1.57	1.52	1.58
SPECIFIC GRAVITY OF SOLIDS	2.746	2.767	2.724	2.706	2.730	2.733	2.738	2.728	2.747	2.747	2.733	2.746	2.748	2.753	2.746
WATER CONTENT, % DRY WEIGHT	156.52	131.07	117.60	108.82	101.05	94.23	95.26	97.73	84.23	83.41	90.70	82.47	78.62	84.84	76.56
VOID RATIO, DETERMINED IN LAB.	4.261	3.604	3.184	2.885	2.781	2.589	2.612	2.623	2.314	2.353	2.442	2.282	2.143	2.342	2.096
VOID RATIO, AT 100 % SATURATION	4.298	3.627	3.203	2.945	2.759	2.575	2.608	2.666	2.314	2.291	2.479	2.265	2.160	2.336	2.102
POROSITY, %	81.0	78.3	76.1	74.3	73.6	72.1	72.3	72.4	69.8	70.2	70.9	69.5	68.2	70.1	67.7
SATURATION, %	100+	100+	100+	100-	99.2	99.5	99.9	100+	100	97.4	100+	99.2	100+	99.6	100+
LIQUID LIMIT				82					74						73
PLASTIC LIMIT				30					29						28
LIQUIDITY INDEX, %	243	194	168	152	137	124	147	153	123	121	137	119	112	126	108
PLASTICITY INDEX				52					45						45
COMPRESSION INDEX, FROM LL				0.52					0.47						0.46
COMPRESSION INDEX, FROM e-log p															
SLUMP, %	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
COMPRESSIVE STRENGTH, "UNDISTURBED", PSI	-	0.36	-	0.87	-	1.61	-	1.07	-	1.68	-	1.96	-	2.61	-
COMPRESSIVE STRENGTH, REMOLDED, PSI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
REMOLDING SENSITIVITY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
COHESION, PSI	-	0.18	-	0.44	-	0.81	-	0.54	-	0.84	-	0.98	-	1.31	-
COHESION, gcm^{-2}	-	12.7	-	30.9	-	56.9	-	38.0	-	59.1	-	68.9	-	92.1	-
ACTIVITY				1.1					1.0						0.9
MODULUS OF ELASTICITY, PSI	-	3.3	-	10.0	-	28.5	-	14.9	-	21.3	-	30.1	-	40.5	-
GRAIN MEDIAN DIA., phi				8.6					9.1						9.0
GRAIN MEDIAN DIA., microns				2.5					1.8						2.0
SAND, % > 60μ < 2 mm				3					5						4
SILT, % > 2 μ < 60 μ				49					51						46
CLAY, % < 2μ				48					44						50
SEDIMENT TYPE			Clayey silt						Clayey silt					Silty clay	
Vane Shear strength, "undisturbed," psi	0.08	-	0.20	-	0.22	-	0.67	-	1.25	-	0.54	-	1.31	-	1.46
Vane Shear strength, "undisturbed," gcm^{-2}	5.3	-	14.4	-	15.3	-	47.1	-	87.7	-	38.2	-	91.8	-	100.2

SAMPLE NUMBER	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
DISTANCE FROM TOP OF CORE, in	32-34	34-36	36-38	38-40	40-42	42-44	44-46	46-48	48-50	50-52	52-54	54-56	56-58	58-60	60-62
WET UNIT WEIGHT, lb ft^{-3}	93.8	94.4	93.2	94.7	93.8	91.8	92.5	90.8	90.8	91.0	90.8	90.2	89.6	92.6	91.6
WET UNIT WEIGHT, gcm^{-3}	1.50	1.51	1.49	1.52	1.50	1.47	1.48	1.45	1.45	1.46	1.45	1.45	1.44	1.48	1.47
SPECIFIC GRAVITY OF SOLIDS	2.762	2.760	2.750	2.741	2.777	2.769	2.757	2.763	2.751	2.774	2.762	2.763	2.775	2.764	2.771
WATER CONTENT, % DRY WEIGHT	87.43	89.52	91.49	87.12	93.29	101.18	98.27	99.20	105.71	105.37	101.84	107.27	107.71	99.05	100.31
VOID RATIO, DETERMINED IN LAB.	2.444	2.458	2.526	2.380	2.573	2.787	2.686	2.784	2.891	2.905	2.837	2.961	3.018	2.703	2.782
VOID RATIO, AT 100 % SATURATION	2.415	2.471	2.516	2.388	2.591	2.802	2.709	2.741	2.908	2.923	2.813	2.964	2.989	2.738	2.780
POROSITY, %	71.0	71.1	71.6	70.4	72.0	73.6	72.9	74.6	74.3	74.5	73.9	74.8	75.1	73.0	73.6
SATURATION, %	98.8	100+	99.6	100+	100+	100-	100+	98.4	100+	100+	99.1	100+	99.0	100+	99.9
LIQUID LIMIT					78						79				76
PLASTIC LIMIT					29						29				32
LIQUIDITY INDEX, %	132	124	128	119	131	147	141	143	153	153	146	156	157	152	155
PLASTICITY INDEX					49						50				44
COMPRESSION INDEX, FROM LL					0.49						0.50				0.48
COMPRESSION INDEX, FROM e-log p												-	-	-	-
SLUMP, %	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
COMPRESSIVE STRENGTH, "UNDISTURBED", PSI	1.73	-	1.99	-	1.75	-	1.67	-	1.61	-	1.41	-	1.40	-	1.53
COMPRESSIVE STRENGTH, REMOLDED, PSI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
REMOLDING SENSITIVITY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
COHESION, PSI	0.87	-	0.99	-	0.88	-	0.84	-	0.81	-	0.71	-	0.70	-	0.77
COHESION, gcm^{-2}	61.2	-	69.6	-	61.9	-	59.1	-	56.9	-	49.9	-	49.2	-	54.1
ACTIVITY						0.9					0.9				0.8
MODULUS OF ELASTICITY, PSI	33.5	-	31.4	-	24.0	-	23.0	-	20.7	-	27.3	-	26.0	-	21.2
GRAIN MEDIAN DIA., phi						9.5					9.5				9.8
GRAIN MEDIAN DIA., microns						1.4					1.4				1.1
SAND, % > 60μ < 2 mm						3					2				2
SILT, % > 2 μ < 60 μ						42					42				42
CLAY, % < 2μ						55					56				56
SEDIMENT TYPE					Silty clay				Silty clay						
Vane Shear strength, "undisturbed," psi	-	0.79	-	1.54	-	0.69	-	0.75	-	0.91	-	0.56	-	0.98	-
Vane Shear strength, "undisturbed," gcm^{-2}	-	55.9	-	100.9	-	48.8	-	52.6	-	63.8		39.5	-	68.5	-

AREA G CORE 2

CRUISE: 1959 . SONIC DEPTH, UNCORRECTED: 250 fms. CORER: 1200 lb. Piston Ewing

APPROX. CORER PENETRATION: 240 IN. CORE: 222 in. LONG, DIAM. 2.5 in.

SAMPLE NUMBER	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
DISTANCE FROM TOP OF CORE, in	0-4	4-8	8-12	12-16	16-20	20-23.4	23.4-27.4	27.4-31.4	31.4-35.4	35.4-39.4	39.4-43.4	43.4-46.5	46.5-50.5	50.5-54.5	54.5-58.5	58.5-62.5	62.-5 66.5
WET UNIT WEIGHT, $lb\ ft^{-3}$	77.2	77.3	78.9	80.9	82.5	79.5	85.8	85.9	86.2	85.7	86.9	89.2	88.7	87.8	87.3	86.8	86.8
WET UNIT WEIGHT, gcm^{-3}	1.24	1.24	1.26	1.30	1.32	1.27	1.37	1.38	1.38	1.37	1.39	1.43	1.42	1.41	1.40	1.39	1.39
SPECIFIC GRAVITY OF SOLIDS		(2.73)	2.730	2.734	2.751			(2.76)		2.768				(2.76)			2.769
WATER CONTENT, % DRY WEIGHT	232.28	230.05	210.77	175.91	159.54	148.44	129.46	127.23	125.82	122.87	122.68	117.07	108.65	115.10	120.31	122.44	123.24
VOID RATIO, DETERMINED IN LAB.	-	-	5.714	4.822	4.401	-	-	-	-	3.493	-	-	-	-	-	-	3.442
VOID RATIO, AT 100 % SATURATION	(6.33)	(6.28)	5.754	4.809	4.388	(4.10)	(3.58)	(3.52)	(3.54)	3.401	(3.39)	(3.24)	(3.05)	(3.18)	(3.33)	(3.38)	3.413
POROSITY, %	(86.5)	(86.4)	85.1	82.8	81.5	(80.5)	(78.2)	(77.9)	(78.0)	77.7	(77.3)	(76.5)	(75.4)	(76.0)	(76.9)	(77.2)	77.5
SATURATION, %	-	-	100+	99.7	99.7	-	-	-	-	97.4	-	-	-	-	-	-	99.1
LIQUID LIMIT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PLASTIC LIMIT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LIQUIDITY INDEX, %	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PLASTICITY INDEX	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
COMPRESSION INDEX, FROM LL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
COMPRESSION INDEX, FROM e-log p	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SLUMP, %	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
COMPRESSIVE STRENGTH, "UNDISTURBED", PSI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
COMPRESSIVE STRENGTH, REMOLDED, PSI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
REMOLDING SENSITIVITY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
COHESION, PSI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
COHESION, gcm^{-2}	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ACTIVITY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MODULUS OF ELASTICITY, PSI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GRAIN MEDIAN DIA., phi	9.4	9.3	9.5	9.5	9.3	9.4	9.3	9.4	9.4	9.3	9.3	9.5	9.6	9.8	9.7	9.7	10.0
GRAIN MEDIAN DIA., microns	1.5	1.6	1.4	1.4	1.6	1.5	1.6	1.5	1.5	1.6	1.5	1.4	1.3	1.3	1.2	1.2	1.0
SAND, % > 60μ < 2mm	3	3	3	3	3	2	2	2	2	3	3	3	3	2	3	3	3
SILT, % > 2μ < 60μ	38	39	37	38	40	38	40	40	39	29	39	35	34	33	31	30	30
CLAY, % < 2μ	59	58	60	59	57	60	58	58	59	58	59	62	63	65	66	67	67
SEDIMENT TYPE								Silty	Clay								
Vane Shear strength "undisturbed", psi	-	-	0.18	0.17	0.31	-	-	-	-	0.73	-	-	-	-	-	-	0.76
Vane Shear strength "undisturbed", gcm^{-2}	-	-	12.4	11.8	21.9	-	-	-	-	51.5	-	-	-	-	-	-	53.4
Vane Shear strength remolded	-	-	0.03	0.05	0.07	-	-	-	-	0.18	-	-	-	-	-	-	0.18
Vane sensitivity	-	-	6.1	3.2	4.5	-	-	-	-	4.2	-	-	-	-	-	-	4.1

AREA G CORE 3

CRUISE: 1959 . SONIC DEPTH, UNCORRECTED: 250 fms. CORER: 300 lb. Gravity Hydroplastic

APPROX. CORER PENETRATION: 156 IN. CORE: 60 in. LONG, DIAM. 3.18 in.

		1	2	3	4	5	6	7	8
SAMPLE NUMBER		1	2	3	4	5	6	7	8
DISTANCE FROM TOP OF CORE, in		0-4	4-8	8-12	12-14.9	14.9-18.9	18.9-22.9	22.9-26.9	26.9-29
WET UNIT WEIGHT	lb ft^{-3}	76.9	78.0	78.1	78.6	79.1	80.0	82.4	85.2
	gcm^{-3}	1.23	1.25	1.25	1.26	1.27	1.28	1.32	1.36
SPECIFIC GRAVITY OF SOLIDS		2.705				(2.71)			
WATER CONTENT, % DRY WEIGHT		235.22	222.87	223.35	213.28	213.30	195.80	165.20	149.50
VOID RATIO	DETERMINED IN LAB.	-	5.989	-	-	-	-	-	-
	AT 100% SATURATION	6.363	(6.04)	(6.05)	(5.76)	(5.76)	(5.31)	(4.48)	(4.05)
POROSITY, %		(86.4)	85.7	(85.8)	(85.3)	(85.3)	(84.0)	(81.7)	(80.3)
SATURATION, %		-	100+	-	-	-	-	-	-
LIQUID LIMIT		-	-	-	-	-	-	-	-
PLASTIC LIMIT		-	-	-	-	-	-	-	-
LIQUIDITY INDEX, %		-	-	-	-	-	-	-	-
PLASTICITY INDEX		-	-	-	-	-	-	-	-
COMPRESSION INDEX	FROM LL	-	-	-	-	-	-	-	-
	FROM e-log p	-	-	-	-	-	-	-	-
SLUMP, %		-	-	-	-	-	-	-	-
COMPRESSIVE STRENGTH	"UNDISTURBED", PSI	-	-	-	-	-	-	-	-
	REMOLDED, PSI	-	-	-	-	-	-	-	-
REMOLDING SENSITIVITY		-	-	-	-	-	-	-	-
COHESION	PSI	-	-	-	-	-	-	-	-
	gcm^{-2}	-	-	-	-	-	-	-	-
ACTIVITY		-	-	-	-	-	-	-	-
MODULUS OF ELASTICITY, PSI		-	-	-	-	-	-	-	-
GRAIN MEDIAN DIA.	phi	9.4	9.1	9.2	9.3	9.5	9.4	9.3	9.6
	microns	1.5	1.8	1.7	1.6	1.4	1.5	1.6	1.3
SAND, % > 60μ < 2mm		2	1	1	1	1	1	2	2
SILT, % > 2μ < 60μ		39	47	40	38	40	40	40	41
CLAY, % < 2μ		59	52	59	61	59	59	58	57
SEDIMENT TYPE					Silty	Clay			
Vane Shear strength	"undisturbed", psi	-	0.20	-	-	-	-	-	-
	"undisturbed", gcm^{-2}	-	14.4	-	-	-	-	-	-
	remolded, psi	-	0.05	-	-	-	-	-	-
Vane Sensitivity		-	3.9	-	-	-	-	-	-

AREA G CORE 4

CRUISE: 1959. SONIC DEPTH, UNCORRECTED: 250 fms. CORER: 300 lb. Piston Hydroplastic

APPROX. CORER PENETRATION: 144 IN. CORE: 90 in. LONG, DIAM. 3.18 in.

SAMPLE NUMBER		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
DISTANCE FROM TOP OF CORE, in		0-4	4-8	8-12	12-16	16-20	20-22.7	22.7-26.7	26.7-30.7	30.7-34.7	34.7-38.7	38.7-42.7	42.7-45.5	45.5-49.5	49.5-53.5	53.5-57.5	57.5-61.5	61.5-65.5	65.5-67.5
WET UNIT WEIGHT	lb ft^{-3}	78.5	78.5	79.7	81.6	82.0	82.2	82.9	83.5	83.9	85.2	84.8	85.9	86.7	87.6	88.5	87.5	89.4	91.0
	gcm^{-3}	1.26	1.26	1.28	1.31	1.31	1.32	1.33	1.34	1.34	1.36	1.36	1.38	1.39	1.40	1.42	1.40	1.43	1.46
SPECIFIC GRAVITY OF SOLIDS						(2.76)					2.763				(2.76)			2.770	(2.77)
WATER CONTENT, % DRY WEIGHT		226.30	217.80	196.10	180.10	166.20	159.80	154.70	155.20	153.10	138.02	140.30	134.30	131.10	121.60	117.30	113.90	111.94	104.0
VOID RATIO	DETERMINED IN LAB.	-	-	-	-	-	-	-	-	-	3.819	-	-	-	-	-	-	3.098	-
	AT 100 % SATURATION	(6.24)	(6.02)	(5.41)	(4.97)	(4.58)	(4.41)	(4.27)	(4.28)	(4.23)	3.813	(3.87)	(3.71)	(3.62)	(3.36)	(3.24)	(3.14)	3.101	(2.88)
POROSITY, %		(86.3)	(85.6)	(84.5)	(83.4)	(82.3)	(81.5)	(81.0)	(81.1)	(81.0)	79.2	(79.6)	(78.8)	(78.5)	(77.2)	(76.4)	(75.9)	75.6	(74.3)
SATURATION, %		-	-	-	-	-	-	-	-	-	99.9	-	-	-	-	-	-	100+	-
LIQUID LIMIT		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PLASTIC LIMIT		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LIQUIDITY INDEX, %		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PLASTICITY INDEX		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
COMPRESSION INDEX	FROM LL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	FROM e-log p	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SLUMP, %		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
COMPRESSIVE STRENGTH	"UNDISTURBED", PSI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	REMOLDED, PSI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
REMOLDING SENSITIVITY		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
COHESION	PSI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	gcm^{-2}	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ACTIVITY		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MODULUS OF ELASTICITY, PSI		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GRAIN MEDIAN DIA.	phi	9.4	9.6	9.5	9.4	9.3	9.4	9.3	9.3	9.3	9.5	9.3	9.5	9.5	9.5	9.3	9.5	9.5	9.5
	microns	1.5	1.3	1.4	1.5	1.6	1.5	1.6	1.6	1.6	1.4	1.6	1.4	1.4	1.4	1.6	1.4	1.4	1.4
SAND, % > 60μ < 2 mm		1	2	2	2	2	1	2	2	2	1	2	1	2	2	2	3	3	3
SILT, % > 2 μ < 60 μ		41	39	39	40	41	41	40	41	41	40	39	40	39	40	40	37	37	36
CLAY, % < 2 μ		58	59	59	58	57	58	58	57	57	59	59	59	59	58	58	60	60	61
SEDIMENT TYPE										Silty	Clay								
Vane Shear strength	"undisturbed," psi	-	-	-	-	-	-	-	-	-	0.52	-	-	-	-	-	-	0.58	-
	"undisturbed," gcm^{-2}	-	-	-	-	-	-	-	-	-	36.2	-	-	-	-	-	-	40.3	-
	remolded, psi	-	-	-	-	-	-	-	-	-	0.14	-	-	-	-	-	-	0.10	-
Vane sensitivity		-	-	-	-	-	-	-	-	-	3.7	-	-	-	-	-	-	5.9	-

AREA 6 CORE 5

CRUISE: 1959 . SONIC DEPTH, UNCORRECTED: 250 fms. CORER: 1200 lb. Piston Ewing

APPROX. CORER PENETRATION: 516 IN. CORE: 474 in. LONG, DIAM. 2.5 in.

SAMPLE NUMBER	1	2	3	4	5	6	7	8
DISTANCE FROM TOP OF CORE, in	0-4	4-8	8-9	9-13	13-17	17-21	21-24	24-28
WET UNIT WEIGHT, lb ft^{-3}	92.5	96.9	-	95.7	95.8	97.1	98.3	97.2
WET UNIT WEIGHT, gcm^{-3}	1.48	1.55	-	1.53	1.53	1.56	1.57	1.56
SPECIFIC GRAVITY OF SOLIDS	-	-	-	-	-	-	-	-
WATER CONTENT, % DRY WEIGHT	73.08	81.12	-	82.52	80.44	79.65	76.50	76.12
VOID RATIO, DETERMINED IN LAB.	-	-	-	-	-	-	-	-
VOID RATIO, AT 100% SATURATION	-	-	-	-	-	-	-	-
POROSITY, %	-	-	-	-	-	-	-	-
SATURATION %	-	-	-	-	-	-	-	-
LIQUID LIMIT	-	-	-	-	-	-	-	-
PLASTIC LIMIT	-	-	-	-	-	-	-	-
LIQUIDITY INDEX, %	-	-	-	-	-	-	-	-
PLASTICITY INDEX	-	-	-	-	-	-	-	-
COMPRESSION INDEX, FROM LL	-	-	-	-	-	-	-	-
COMPRESSION INDEX, FROM e-log p	-	-	-	-	-	-	-	-
SLUMP, %	-	-	-	-	-	-	-	-
COMPRESSIVE STRENGTH, "UNDISTURBED", PSI	-	-	-	-	-	-	-	-
COMPRESSIVE STRENGTH, REMOLDED, PSI	-	-	-	-	-	-	-	-
REMOLDING SENSITIVITY	-	-	-	-	-	-	-	-
COHESION, PSI	-	-	-	-	-	-	-	-
COHESION, gcm^{-2}	-	-	-	-	-	-	-	-
ACTIVITY	-	-	-	-	-	-	-	-
MODULUS OF ELASTICITY, PSI	-	-	-	-	-	-	-	-
GRAIN MEDIAN DIA., phi	9.4	9.5	-	9.7	9.4	9.5	9.3	9.3
GRAIN MEDIAN DIA., microns	1.5	1.4	-	1.2	1.5	1.4	1.6	1.6
SAND, % > 60μ < 2mm	2	4	-	2	1	1	2	1
SILT, % > 2μ < 60μ	43	40	-	40	40	40	41	43
CLAY, % < 2μ	55	56	-	58	59	59	57	56
SEDIMENT TYPE				Silty Clay				

AREA G CORE 6

CRUISE: 1959. SONIC DEPTH, UNCORRECTED: 250 fms. CORER: 150 lb. Gravity Hydroplastic

APPROX. CORER PENETRATION: 84 in. CORE: 60 in. LONG, DIAM. 3.18 in.

SAMPLE NUMBER	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
DISTANCE FROM TOP OF CORE, in	0-4	4-8	8-12	12-16	16-20	20.-21.3	24-28	28-32	32-36	36-40	40-44	44.-47.3	48-52	52-56	56.-59.3
WET UNIT WEIGHT $lb\ ft^{-3}$	76.8	77.9	78.6	79.3	80.4	81.9	81.6	81.6	84.8	87.6	87.3	85.2	83.8	85.8	87.4
WET UNIT WEIGHT gcm^{-3}	1.23	1.25	1.26	1.27	1.29	1.31	1.31	1.31	1.36	1.40	1.40	1.36	1.34	1.37	1.40
SPECIFIC GRAVITY OF SOLIDS	(2.69)		2.693	2.698	2.724	2.740	2.729	2.743	2.738			(2.76)		2.772	(2.77)
WATER CONTENT, % DRY WEIGHT	236.90	221.70	192.06	196.69	185.47	163.32	158.65	159.27	147.14	122.70	124.70	131.10	146.40	144.83	110.20
VOID RATIO DETERMINED IN LAB.	-	-	5.242	5.299	5.040	4.497	4.329	4.369	3.977	-	-	-	-	3.937	-
VOID RATIO AT 100% SATURATION	(6.35)	(5.95)	5.172	5.307	5.052	4.475	4.330	4.369	4.029	(3.38)	(3.44)	(3.62)	(4.04)	4.015	(3.05)
POROSITY, %	(86.4)	(85.6)	84.0	84.1	83.4	81.8	81.2	81.4	79.9	(77.2)	(77.5)	(78.5)	(80.4)	79.7	(75.4)
SATURATION, %	-	-	99.7	100+	100+	99.5	99.6	99.8	100+	-	-	-	-	100+	-
LIQUID LIMIT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PLASTIC LIMIT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LIQUIDITY INDEX, %	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PLASTICITY INDEX	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
COMPRESSION INDEX FROM LL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
COMPRESSION INDEX FROM e-log p	-	-	-	1.52	1.75	1.37	1.47	1.40	1.40	-	-	-	-	-	-
SLUMP, %	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
COMPRESSIVE STRENGTH "UNDISTURBED", PSI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
COMPRESSIVE STRENGTH REMOLDED, PSI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
REMOLDING SENSITIVITY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
COHESION PSI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
COHESION gcm^{-2}	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ACTIVITY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MODULUS OF ELASTICITY, PSI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GRAIN MEDIAN DIA. phi	9.3	9.2	9.3	9.1	9.3	9.5	9.6	9.6	9.7	10.0	>10	>10	>10	>10	9.7
GRAIN MEDIAN DIA. microns	1.6	1.7	1.6	1.8	1.6	1.4	13.	1.3	1.2	1.0	0.9	0.9	0.9	0.9	1.2
SAND, % > 60μ < 2mm	2	2	2	4	2	2	2	2	2	3	3	3	3	5	5
SILT, % > 2μ < 60μ	43	45	44	43	42	41	39	39	41	33	31	30	31	31	33
CLAY, % < 2μ	55	53	54	53	56	57	59	59	57	64	66	67	66	64	62
SEDIMENT TYPE								Silty	Clay						
Vane Shear strength "undisturbed," psi	-	-	0.26	0.28	0.28	-	-	-	0.45	-	-	-	-	0.38	-
Vane Shear strength "undisturbed," gcm^{-2}	-	-	18.4	19.8	19.3	-	-	-	31.5	-	-	-	-	26.4	-
Vane Shear strength remolded, psi	-	-	0.06	0.08	0.06	-	-	-	0.09	-	-	-	-	0.11	-
Vane Sensitivity	-	-	4.1	3.3	4.7	-	-	-	4.9	-	-	-	-	3.4	-

AREA G CORE 8

CRUISE: 1959 . SONIC DEPTH, UNCORRECTED: 250 fms. CORER: 300 lb. Gravity Hydroplastic

APPROX. CORER PENETRATION: 120 IN. CORE: 96 in. LONG, DIAM. 3.18 in.

SAMPLE NUMBER		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
DISTANCE FROM TOP OF CORE, in		0-4	4-8	8-12	12-16	16-20	24-28	28-32	32-36	36-40	40-44	44 - 47.2	48-52	52-56	56-60	60-64	64-68	68 - 70.1
WET UNIT WEIGHT	lb ft^{-3}	79.6	80.5	80.4	81.1	81.1	81.2	81.9	82.9	83.1	83.6	83.4	85.4	84.8	84.8	84.6	84.9	85.5
	gcm^{-3}	1.28	1.29	1.29	1.30	1.30	1.30	1.31	1.33	1.33	1.34	1.34	1.37	1.36	1.36	1.36	1.36	1.37
SPECIFIC GRAVITY OF SOLIDS			(2.68)	2.684	2.698	2.700		(2.71)		2.710				(7.25)			2.739	(2.74)
WATER CONTENT, % DRY WEIGHT		206.70	184.60	175.49	170.96	166.90	169.20	163.20	153.10	155.29	146.50	143.70	131.80	141.10	141.00	141.60	144.07	138.70
VOID RATIO	DETERMINED IN LAB.	-	-	4.735	4.622	4.543	-	-	-	4.168	-	-	-	-	-	-	3.915	-
	AT 100 % SATURATION	(5.56)	(4.94)	4.710	4.613	4.506	(4.58)	(4.42)	(4.15)	4.208	(3.99)	(3.92)	(3.69)	(3.85)	(3.85)	(3.85)	3.946	(3.80)
POROSITY, %		(84.7)	(83.1)	82.6	82.2	82.0	(82.3)	(81.5)	(80.6)	80.7	(79.9)	(79.8)	(78.6)	(79.4)	(79.4)	(79.4)	79.7	(79.2)
SATURATION, %		-	-	99.5	99.8	99.2	-	-	-	100+	-	-	-	-	-	-	100+	-
LIQUID LIMIT		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PLASTIC LIMIT		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LIQUIDITY INDEX, %		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PLASTICITY INDEX		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
COMPRESSION INDEX	FROM LL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	FROM e-log p	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SLUMP, %		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
COMPRESSIVE STRENGTH	"UNDISTURBED", PSI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	REMOLDED, PSI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
REMOLDING SENSITIVITY		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
COHESION	PSI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	gcm^{-2}	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ACTIVITY		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MODULUS OF ELASTICITY, PSI		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GRAIN MEDIAN DIA.	phi	9.5	-	9.0	9.1	9.0	9.3	9.2	9.4	9.0	9.1	9.3	9.2	9.2	9.2	9.0	9.1	9.1
	microns	1.4	-	2.0	1.8	2.0	1.6	1.7	1.5	2.0	1.8	1.6	1.7	1.7	1.7	1.9	1.8	1.8
SAND, % > 60μ < 2 mm		2	-	2	2	2	2	2	2	3	2	2	2	2	2	2	2	2
SILT, % > 2 μ < 60 μ		43	-	49	46	47	44	45	43	49	46	44	46	45	45	47	46	46
CLAY, % < 2μ		55	-	49	52	51	54	53	55	48	52	54	52	53	53	51	52	52
SEDIMENT TYPE				Silty Clay						Clayey Silt		Silty Clay						
Vane Shear strength	"undisturbed," psi	-	-	0.36	0.42	0.55	-	-	-	0.74	-	-	-	-	-	-	0.44	-
	"undisturbed," gcm^{-2}	-	-	25.2	29.5	38.4	-	-	-	51.7	-	-	-	-	-	-	30.9	-
	remolded, psi	-	-	0.06	0.09	0.10	-	-	-	0.13	-	-	-	-	-	-	0.12	-
Vane Sensitivity		-	-	6.2	4.7	5.5	-	-	-	5.8	-	-	-	-	-	-	3.8	-

AREA G CORE 9

CRUISE: 1959. SONIC DEPTH, UNCORRECTED: 250 fms. CORER: 300 lb. Gravity Hydroplastic

APPROX. CORER PENETRATION: 84 IN. CORE: 54 in. LONG, DIAM. 3.18 in.

SAMPLE NUMBER		1	2	3	4	5	6	7	8	9	10	11	12	13
DISTANCE FROM TOP OF CORE, in		0-4	4-8	8-12	12-16	16.-18.8	20-24	24-28	28-32	32-36	36-40	40-44	44-48	48.-51.7
WET UNIT WEIGHT	lb ft^{-3}	79.4	80.4	80.3	80.5	80.8	80.7	-	-	-	-	83.9	84.7	85.7
	gcm^{-3}	1.27	1.29	1.29	1.29	1.29	1.29	-	-	-	-	1.34	1.36	1.37
SPECIFIC GRAVITY OF SOLIDS		(2.68)		2.685	2.703				(2.71)			2.727	(2.73)	
WATER CONTENT, % DRY WEIGHT		207.20	203.10	187.53	185.98	192.40	-	-	167.00	157.70	155.40	147.14	144.70	133.10
VOID RATIO	DETERMINED IN LAB.	-	-	4.994	4.993	-	-	-	-	-	-	4.009	-	-
	AT 100 % SATURATION	(5.54)	(5.44)	5.035	5.027	(5.22)	-	-	(4.53)	(4.26)	(4.22)	4.013	(3.92)	(3.61)
POROSITY, %		(84.7)	(84.5)	83.3	83.3	(83.8)	-	-	(81.8)	(81.0)	(80.8)	80.0	(79.7)	(78.4)
SATURATION, %		-	-	100+	100+	-	-	-	-	-	-	100+	-	-
LIQUID LIMIT		-	-	-	-	-	-	-	-	-	-	-	-	-
PLASTIC LIMIT		-	-	-	-	-	-	-	-	-	-	-	-	-
LIQUIDITY INDEX, %		-	-	-	-	-	-	-	-	-	-	-	-	-
PLASTICITY INDEX		-	-	-	-	-	-	-	-	-	-	-	-	-
COMPRESSION INDEX	FROM LL	-	-	-	-	-	-	-	-	-	-	-	-	-
	FROM e-log p	-	-	-	-	-	-	-	-	-	-	-	-	-
SLUMP, %		-	-	-	-	-	-	-	-	-	-	-	-	-
COMPRESSIVE STRENGTH	"UNDISTURBED", PSI	-	-	-	-	-	-	-	-	-	-	-	-	-
	REMOLDED, PSI	-	-	-	-	-	-	-	-	-	-	-	-	-
REMOLDING SENSITIVITY		-	-	-	-	-	-	-	-	-	-	-	-	-
COHESION	PSI	-	-	-	-	-	-	-	-	-	-	-	-	-
	gcm^{-2}	-	-	-	-	-	-	-	-	-	-	-	-	-
ACTIVITY		-	-	-	-	-	-	-	-	-	-	-	-	-
MODULUS OF ELASTICITY, PSI		-	-	-	-	-	-	-	-	-	-	-	-	-
GRAIN MEDIAN DIA.	phi	9.0	9.0	9.1	9.3	9.2	-	-	9.1	9.0	9.0	9.1	9.0	9.4
	microns	1.9	2.0	1.8	1.6	1.7	-	-	1.8	1.9	2.0	1.8	2.0	1.5
SAND, % > 60μ < 2 mm		2	1	4	2	2	-	-	2	2	0	2	2	1
SILT, % > 2 μ < 60 μ		47	50	46	43	45	-	-	45	48	49	46	47	45
CLAY, % < 2 μ		51	49	50	55	53	-	-	53	50	51	52	51	54
SEDIMENT TYPE		Silty Clay	Clayey Silt					Silty Clay						
Vane Shear strength	"undisturbed", psi	-	-	0.20	0.19	-	-	-	-	-	-	0.52	-	-
	"undisturbed", gcm^{-2}	-	-	14.3	13.1	-	-	-	-	-	-	36.3	-	-
	remolded, psi	-	-	0.05	0.06	-	-	-	-	-	-	0.16	-	-
Vane sensitivity		-	-	3.9	2.9	-	-	-	-	-	-	2.3	-	-

AREA G CORE 10

CRUISE: 1959 . SONIC DEPTH, UNCORRECTED: 250 fms. CORER: 300 lb. Gravity Hydroplastic

APPROX. CORER PENETRATION: 96 IN. CORE: 72 in. LONG, DIAM. 3.18 in.

SAMPLE NUMBER		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
DISTANCE FROM TOP OF CORE, in		0-4	4-8	8-12	12-16	16-20	20-21.7	24-28	28-32	32-36	36-40	40-44	44-46	48-52	52-56	56-60	60.-63.6.
WET UNIT WEIGHT	lb ft^{-3}	80.8	81.7	83.7	86.0	89.2	93.8	91.0	90.9	90.7	91.5	92.4	93.8	94.0	94.9	95.2	95.3
	gcm^{-3}	1.29	1.31	1.34	1.38	1.43	1.50	1.46	1.46	1.45	1.47	1.48	1.50	1.51	1.52	1.52	1.53
SPECIFIC GRAVITY OF SOLIDS			(2.73)	2.734	2.739	2.752			(2.77)		27 80			(2.78)		2.784	(2.78)
WATER CONTENT, % DRY WEIGHT		184.00	170.60	160.35	142.00	114.23	108.20	109.80	106.60	102.90	99.80	94.40	96.30	99.00	88.50	92.54	86.00
VOID RATIO	DETERMINED IN LAB.	-	-	4.309	3.808	3.125	-	-	-	-	2.789	-	-	-	-	2.515	-
	AT 100 % SATURATION	(5.04)	(4.66)	4.384	3.889	3.144	(3.00)	(3.09)	(2.95)	(2.84)	2.774	(2.62)	(2.68)	(2.77)	(2.46)	2.576	(2.39)
POROSITY, %		(83.6)	(82.5)	81.2	79.2	75.8	(75.0)	(75.2)	74.8	(73.9)	73.6	(72.4)	(72.8)	(73.4)	(71.2)	71.6	(70.4)
SATURATION, %		-	-	100+	100+	100+	-	-	-	-	99.5	-	-	-	-	100+	-
LIQUID LIMIT		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PLASTIC LIMIT		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LIQUIDITY INDEX, %		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PLASTICITY INDEX		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
COMPRESSION INDEX	FROM LL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	FROM e-log p	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SLUMP, %		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
COMPRESSIVE STRENGTH	"UNDISTURBED", PSI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	REMOLDED, PSI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
REMOLDING SENSITIVITY		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
COHESION	PSI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	gcm^{-2}	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ACTIVITY		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MODULUS OF ELASTICITY, PSI		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GRAIN MEDIAN DIA.	phi	9.2	9.6	9.1	9.4	9.1	9.2	9.0	>10	9.3	9.3	9.0	9.1	9.2	9.6	9.1	9.4
	microns	1.7	1.3	1.8	1.5	1.8	1.7	2.0	0.9	1.6	1.6	1.9	1.8	1.7	1.3	1.8	1.5
SAND, % > 60μ < 2 mm		3	2	4	3	4	5	9	9	10	9	10	8	7	6	10	4
SILT, % > 2 μ < 60 μ		46	43	44	43	44	43	41	37	37	38	39	40	42	39	39	41
CLAY, % < 2 μ		51	55	52	54	52	52	50	54	53	53	51	52	51	55	51	55
SEDIMENT TYPE								Silty	Clay								
Vane Shear strength	"undisturbed", psi	-	-	0.24	0.29	0.42	-	-	-	-	0.48	-	-	-	-	0.52	-
	"undisturbed", gcm^{-2}	-	-	17.1	20.7	29.2	-	-	-	-	34.1	-	-	-	-	36.2	-
	remolded, psi	-	-	0.04	0.06	0.10	-	-	-	-	0.13	-	-	-	-	0.12	-
Vane sensitivity		-	-	6.1	5.1	4.4	-	-	-	-	3.7	-	-	-	-	4.1	-

AREA G **CORE** 11

CRUISE: 1959 . **SONIC DEPTH, UNCORRECTED:** 250 fms. **CORER:** 300 lb. Gravity Hydroplastic

APPROX. CORER PENETRATION: 84 IN. **CORE:** 48 in. **LONG, DIAM.** 3.18 in.

SAMPLE NUMBER		1	2	3	4	5	6	7	8	9	10	11	12
DISTANCE FROM TOP OF CORE, in		[illegible]-4	4-8	8-12	12-16	16-20	2[illegible]-2[illegible].9	24-28	28-32	32-36	36-40	40-44	44-45.9
WET UNIT WEIGHT	lb ft⁻³	85.[illegible]	83.7	82.[illegible]	82.9	83.7	85.1	85.[illegible]	83.9	85.[illegible]	86.1	87.2	89.6
	gcm⁻³	1.33	1.34	1.32	1.33	1.34	1.35	1.36	1.34	1.36	1.38	1.40	1.44
SPECIFIC GRAVITY OF SOLIDS		-	-	-	-	-	-	-	-	-	-	-	-
WATER CONTENT, % DRY WEIGHT		136.30	145.70	157.8	150.[illegible]0	148.80	142.00	14[illegible].40	147.2	139.9[illegible]	133.80	124.60	116.70
VOID RATIO	DETERMINED IN LAB.	-	-	-	-	-	-	-	-	-	-	-	-
	AT 100% SATURATION	-	-	-	-	-	-	-	-	-	-	-	-
POROSITY, %		-	-	-	-	-	-	-	-	-	-	-	-
SATURATION %		-	-	-	-	-	-	-	-	-	-	-	-
LIQUID LIMIT		-	-	-	-	-	-	-	-	-	-	-	-
PLASTIC LIMIT		-	-	-	-	-	-	-	-	-	-	-	-
LIQUIDITY INDEX, %		-	-	-	-	-	-	-	-	-	-	-	-
PLASTICITY INDEX		-	-	-	-	-	-	-	-	-	-	-	-
COMPRESSION INDEX	FROM LL	-	-	-	-	-	-	-	-	-	-	-	-
	FROM e-log p	-	-	-	-	-	-	-	-	-	-	-	-
SLUMP, %		-	-	-	-	-	-	-	-	-	-	-	-
COMPRESSIVE STRENGTH	"UNDISTURBED", PSI	-	-	-	-	-	-	-	-	-	-	-	-
	REMOLDED, PSI	-	-	-	-	-	-	-	-	-	-	-	-
REMOLDING SENSITIVITY		-	-	-	-	-	-	-	-	-	-	-	-
COHESION	PSI	-	-	--	-	-	-	-	-	-	-	-	-
	gcm⁻²	-	-	-	-	-	-	-	-	-	-	-	-
ACTIVITY		-	-	-	-	-	-	-	-	-	-	-	-
MODULUS OF ELASTICITY, PSI		-	-	-	-	-	-	-	-	-	-	-	-
GRAIN MEDIAN DIA.	phi	9.1	9.3	9.3	9.6	9.5	9.4	9.1	9.0	9.2	9.1	9.4	9.3
	microns	1.8	1.6	1.6	1.3	1.4	1.5	1.8	2.0	1.7	1.8	1.5	1.[illegible]
SAND, % > 60μ < 2mm		2	1	1	1	1	1	2	2	2	2	2	3
SILT, % > 2μ < 60μ		46	46	45	43	44	44	46	49	45	46	45	44
CLAY, % < 2μ		52	53	54	56	55	55	52	49	53	52	53	53
SEDIMENT TYPE							Silty Clay						

AREA II CORE 12

CRUISE: 1959. SONIC DEPTH, UNCORRECTED: 2800 fms. CORER: 1200 lb. Piston Ewing

APPROX. CORER PENETRATION: n.d. IN. CORE: 203 in. LONG, DIAM. 2.5 in.

SAMPLE NUMBER	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
DISTANCE FROM TOP OF CORE, in	0-12	12-14	14-16	16-18	18-20	20-22	22-23.7	24-25	25-26.7	26.7-27.7	27.7-28.7	28.7-30.5	30.5-31.5	31.5-32.5	32.5-34.5	34.5-35.5	35.5-37.5	37.5-39.5	39.5-41.5	41.5-43.5	43.5-45.2	45.2-47.2	47.2-49.2	49.2-51.2	51.2-53.2	53.2-55.2	55.2-56.7	56.7-58.7	58.7-60.7	60.7-62.7	62.7-64.7	64.7-65.7	65.7-68.2	68.2-70	70-72.5
WET UNIT WEIGHT, lb ft^{-3}	-	88.4	88.4	88.3	88.1	88.6	-	88.9	-	88.6	88.3	-	88.9	88.7	-	90.6	89.6	88.7	88.6	88.6	-	88.3	87.6	88.6	88.8	88.6	-	89.0	88.2	88.9	88.6	-	88.6	89.5	-
WET UNIT WEIGHT, gcm^{-3}	-	1.42	1.42	1.41	1.41	1.42	-	1.42	-	1.42	1.41	-	1.42	1.42	-	1.45	1.44	1.42	1.42	1.42	-	1.41	1.40	1.42	1.42	1.42	-	1.43	1.41	1.42	1.42	-	1.42	1.43	-
SPECIFIC GRAVITY OF SOLIDS	-	2.830	2.714	2.713	2.782	2.724	2.727	2.887	2.887	2.887	2.887	2.887	2.887	2.887	2.887	2.887	2.736	2.821	2.777	2.828	2.854	2.782	2.832	2.840	2.815	2.799	2.840	2.829	2.755	2.809	2.845	2.848	2.858	2.858	2.856
WATER CONTENT, % DRY WEIGHT	-	116.84	117.72	119.92	121.23	117.89	113.62	121.52	119.63	122.37	121.43	118.67	118.98	118.58	116.96	110.09	114.63	121.03	118.37	122.30	120.28	118.99	121.94	120.88	119.96	119.70	120.92	120.20	116.60	119.00	122.05	119.14	119.87	114.71	120.93
VOID RATIO, DETERMINED IN LAB.	-	3.332	3.183	3.217	3.353	3.179	-	3.490	-	3.530	3.513	-	3.445	3.445	-	3.179	3.091	3.386	3.279	3.460	-	3.304	3.477	3.416	3.353	3.331	-	3.370	3.231	3.319	3.450	-	3.426	3.278	3.454
VOID RATIO, AT 100% SATURATION	-	3.307	3.193	3.245	3.373	3.211	-	3.508	-	3.530	3.506	-	3.435	3.423	-	3.179	3.136	3.414	3.301	3.459	-	3.310	3.453	3.433	3.377	3.351	-	3.401	3.212	3.343	3.473	-	3.426	3.278	3.454
POROSITY, %	-	76.9	76.1	76.3	77.1	[illegible]	-	77.7	-	77.9	77.8	-	77.5	77.5	-	76.1	75.6	77.2	76.6	77.6	-	76.8	77.7	77.4	77.0	76.9	-	77.1	76.4	76.8	77.5	-	77.4	76.6	77.5
SATURATION, %	-	99.2	100+	100+	100+	100+	-	100+	-	100	99.8	-	99.7	99.4	-	100	100+	100+	100+	100+	-	100+	99.3	100+	100+	100+	-	100+	99.4	100+	100+	-	100	100	100
LIQUID LIMIT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PLASTIC LIMIT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LIQUIDITY INDEX, %	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PLASTICITY INDEX	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
COMPRESSION INDEX, FROM LL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
COMPRESSION INDEX, FROM e-log p	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SLUMP, %	-	2.53	-	3.74	-	2.63	-	-	-	-	-	-	-	-	-	-	0.51	-	0	-	-	3.94	-	2.12	-	2.73	-	-	8.28	3.74	-	-	-	-	-
COMPRESSIVE STRENGTH, "UNDISTURBED", PSI	-	1.21	-	1.24	-	1.14	-	-	-	-	-	-	-	-	-	-	1.50	-	1.32	-	-	1.19	-	1.35	-	1.26	-	-	1.21	1.29	-	-	-	-	-
COMPRESSIVE STRENGTH, REMOLDED, PSI	-	-	-	0.49	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.54	-	-	0.58	-	-	-	0.55	-	-	-	-	-	-	-	-	-
REMOLDING SENSITIVITY	-	-	-	2.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.4	-	-	2.0	-	-	-	-	-	-	-	-	-	-	-	-	-
COHESION, PSI	-	0.61	-	0.62	-	0.57	-	-	-	-	-	-	-	-	-	-	0.75	-	0.63	-	-	0.59	-	0.68	-	0.63	-	-	0.61	0.65	-	-	-	-	-
COHESION, gcm^{-2}	-	42.9	-	43.6	-	40.1	-	-	-	-	-	-	-	-	-	-	52.7	-	46.4	-	-	41.5	-	47.8	-	44.3	-	-	42.9	45.7	-	-	-	-	-
ACTIVITY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MODULUS OF ELASTICITY, PSI	-	0	-	0	-	3.5	-	-	-	-	-	-	-	-	-	-	12.8	-	0	-	-	0	-	0	-	10.9	-	-	8.4	0	-	-	-	-	-
GRAIN MEDIAN DIA., phi	Greater than 10 for all samples																																		
GRAIN MEDIAN DIA., microns	Less than 1 for all samples																																		
SAND, % > 60μ < 2mm	1	0	[illegible]	[illegible]	[illegible]		[illegible]	tr.	tr.	tr.	tr.	tr.	-	-	-	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		-	-	-
SILT, % > 2μ < 60μ	36	41	35	37	[illegible]		34	-	-	-	-	-	-	-	-	-	37	33	35	33	39	32	36	33	37	33	35	33	34	35	33		-	-	-
CLAY, % < 2μ	63	59	65	63	[illegible]		66	-	-	-	-	-	-	-	-	-	63	67	65	67	61	68	64	66	63	67	65	67	64	65	67		-	-	-
SEDIMENT TYPE															Silty Clay																				
Vane Shear strength "undisturbed," psi	-	-	0.57	-	[illegible]	-	0.38	-	-	-	-	-	-	-	-	-	-	0.62	-	0.34	0.25	-	0.30	-	0.51	-	-	0.44	-	-	0.38	-	-	-	-
Vane Shear strength "undisturbed," gcm^{-2}	-	-	41.3	-	15.1	-	19.8	-	-	-	-	-	-	-	-	-	-	43.7	-	23.6	17.6	-	21.0	-	35.8	-	-	31.2	-	-	26.9	-	-	-	-
Vane Shear strength remolded, psi	-	-	[illegible]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.16	-	-	-	-	-	-	0.31	-	-	0.02	-	-	-	-	-	-	-
Vane sensitivity	-	-	8.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3.8	-	-	-	-	-	-	1.6	-	-	18.5	-	-	-	-	-	-	-

AREA B CORE 12 (Continued)

CRUISE: 1959. SONIC DEPTH, UNCORRECTED: 2800 fms. CORER: 1200 lb. Piston Ewing

APPROX. CORER PENETRATION: n.d. in. CORE: 203 in. LONG, DIAM. 2.5 in.

SAMPLE NUMBER	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53
DISTANCE FROM TOP OF CORE, in	72.5-75	75-76.7	76.7-78.7	78.7-80.7	80.7-82.7	82.7-84.7	84.7-86.7	86.7-88.7	88.7-90.7	90.7-92.7	92.7-94.7	94.7-96.7	96.7-98.7	98.7-100.2	100.2-102.2	102.2-104.2	104.2-106.2	106.2-108.2
WET UNIT WEIGHT lb ft^{-3}	-	-	-	88.9	88.9	88.6	88.0	88.8	89.1	88.2	89.1	89.1	89.1	-	89.4	89.1	89.2	89.3
WET UNIT WEIGHT gcm^{-3}	-	-	-	1.43	1.42	1.42	1.41	1.42	1.43	1.41	1.43	1.43	1.43	-	1.43	1.43	1.41	1.43
SPECIFIC GRAVITY OF SOLIDS	2.856	2.856	2.808	2.812	2.823	2.797	2.845	2.723	2.785	2.789	2.775	2.720	2.752	2.783	2.829	2.680	2.723	2.723
WATER CONTENT, % DRY WEIGHT	121.95	118.13	-	117.78	120.17	120.89	116.56	120.17	113.49	116.20	117.73	115.56	114.42	112.14	117.98	118.85	112.39	114.47
VOID RATIO DETERMINED IN LAB.	3.483	3.374	-	3.292	3.354	3.394	3.294	3.401	3.066	3.261	3.254	3.190	3.086	-	3.232	3.337	2.975	3.083
VOID RATIO AT 100% SATURATION	3.483	3.374	-	3.312	3.393	3.381	3.316	3.272	3.151	3.241	3.266	3.143	3.150	-	3.338	3.185	3.053	3.117
POROSITY, %	77.7	77.1	-	76.7	77.0	77.2	76.7	77.3	75.4	76.5	76.5	76.1	75.5	-	76.4	76.9	74.3	75.5
SATURATION, %	100	100	-	100+	100+	100+	99.0	100+	100+	99.2	100+	100+	100+	-	100+	100+	100+	100+
LIQUID LIMIT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PLASTIC LIMIT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LIQUIDITY INDEX, %	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PLASTICITY INDEX	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
COMPRESSION INDEX FROM LL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
COMPRESSION INDEX FROM e-log p	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SLUMP, %	-	-	-	-	5.15	-	6.57	-	1.52	-	8.08	-	7.07	-	0	-	0.91	-
COMPRESSIVE STRENGTH "UNDISTURBED", PSI	-	-	-	-	1.18	-	1.22	-	1.28	-	1.29	-	1.34	-	1.36	-	1.36	-
COMPRESSIVE STRENGTH REMOLDED, PSI	-	-	-	-	-	-	0.51	-	0.66	-	-	-	0.65	-	-	-	0.46	-
REMOLDING SENSITIVITY	-	-	-	-	-	-	2.4	-	1.9	-	-	-	2.1	-	-	-	[illegible]	-
COHESION PSI	-	-	-	-	0.59	-	0.61	-	0.64	-	0.65	-	0.67	-	0.68	-	0.68	-
COHESION gcm^{-2}	-	-	-	-	41.5	-	42.9	-	45.0	-	45.7	-	47.1	-	47.8	-	47.3	-
ACTIVITY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MODULUS OF ELASTICITY, PSI	-	-	-	-	0	-	0	-	0	-	12.3	-	0	-	10.1	-	3.3	-
GRAIN MEDIAN DIA. phi	Greater than 10 for all samples																	
GRAIN MEDIAN DIA. microns	Less than 1 for all samples																	
SAND, % > 60μ < 2mm	-	-	-	-	0	-	0	-	0	-	tr.	tr.	tr.	tr.	0	-	0	-
SILT, % > 2μ < 60μ	-	-	-	-	34	-	34	-	35	-	33	-	35	-	34	-	32	-
CLAY, % < 2μ	-	-	-	-	66	-	66	-	65	-	67	-	65	-	66	-	68	-
SEDIMENT TYPE																	Silty Clay	
Vane Shear strength "undisturbed," psi	-	-	-	0.16	-	0.47	-	0.35	-	0.43	-	0.47	-	-	-	0.36	-	0.38
"undisturbed, gcm^{-2}	-	-	-	11.4	-	33.3	-	24.3	-	30.4	-	32.8	-	-	-	25.2	-	25.9
remolded, psi	-	-	-	0.03	-	-	-	0.07	-	-	-	0.02	-	-	-	0.05	-	-
Vane sensitivity	-	-	-	5.4	-	-	-	5.4	-	-	-	25.9	-	-	-	7.5	-	-

SAMPLE NUMBER	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70
DISTANCE FROM TOP OF CORE, in	108.2-110.2	110.2-112	112-114	114-116	116-118	118-20	120-122	122-124	124-126	126-128	128-129.2	129.2-131.2	131.2-133.	133.5-135.5	135.5-137.5	137.5-139.5	139.5-141.2
WET UNIT WEIGHT lb ft^{-3}	89.5	-	86.8	88.6	88.3	88.6	91.1	90.6	89.9	89.1	-	89.2	89.0	88.8	88.2	88.7	-
WET UNIT WEIGHT gcm^{-3}	1.43	-	1.39	1.42	1.42	1.42	1.46	1.45	1.44	1.43	-	1.43	1.43	1.42	1.41	1.42	-
SPECIFIC GRAVITY OF SOLIDS	2.763	2.766	2.751	2.823	2.822	2.794	2.734	2.800	2.807	2.775	2.725	2.843	2.783	2.780	2.797	2.863	2.759
WATER CONTENT, % DRY WEIGHT	114.34	109.44	121.37	120.89	120.54	121.38	105.67	110.08	119.39	117.76	113.68	119.91	115.86	121.10	121.52	122.27	115.90
VOID RATIO DETERMINED IN LAB.	3.124	-	3.377	3.390	3.396	3.356	3.046	3.053	3.275	3.230	-	3.374	3.211	3.316	3.384	3.476	-
VOID RATIO AT 100% SATURATION	3.151	-	3.339	3.412	3.402	3.391	2.942	3.102	3.351	3.268	-	3.409	3.224	3.367	3.398	3.500	-
POROSITY, %	75.7	-	77.2	77.2	77.2	77.0	75.3	75.3	76.6	76.4	-	77.1	76.4	76.8	77.2	77.7	-
SATURATION, %	100+	-	98.9	100+	100+	100+	96.6	100+	100+	100+	-	100+	100+	100+	100+	100+	-
LIQUID LIMIT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PLASTIC LIMIT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LIQUIDITY INDEX, %	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PLASTICITY INDEX	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
COMPRESSION INDEX FROM LL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
COMPRESSION INDEX FROM e-log p	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SLUMP, %	1.31	-	-	4.75	-	2.83	-	0	-	0	-	-	2.12	-	3.33	-	-
COMPRESSIVE STRENGTH "UNDISTURBED", PSI	1.41	-	-	1.24	-	1.19	-	2.38	-	1.47	-	-	1.32	-	1.04	-	-
COMPRESSIVE STRENGTH REMOLDED, PSI	-	-	-	-	-	0.45	-	0.86	-	-	-	-	-	-	0.47	-	-
REMOLDING SENSITIVITY	-	-	-	-	-	2.6	-	2.77	-	-	-	-	-	-	2.21	-	-
COHESION PSI	0.71	-	-	0.62	-	0.59	-	1.19	-	0.79	-	-	0.66	-	0.52	-	-
COHESION gcm^{-2}	49.9	-	-	43.6	-	41.5	-	83.7	-	55.5	-	-	46.4	-	36.6	-	-
ACTIVITY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MODULUS OF ELASTICITY, PSI	13.7	-	-	2.1	-	4.9	-	35.5	-	0	-	-	0	-	0	-	-
GRAIN MEDIAN DIA. phi																	
GRAIN MEDIAN DIA. microns																	
SAND, % > 60μ < 2mm	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0
SILT, % > 2μ < 60μ	33	-	34	-	34	-	36	-	34	-	33	-	34	-	34	-	34
CLAY, % < 2μ	57	-	66	-	66	-	64	-	66	-	67	-	66	-	66	-	66
SEDIMENT TYPE																	
Vane Shear strength "undisturbed," psi	-	0.46	-	-	0.23	-	0.69	-	0.56	-	-	0.47	-	0.36	-	0.32	0.32
"undisturbed, gcm^{-2}	-	32.0	-	-	16.0	-	48.8	-	39.2	-	-	32.8	-	25.7	-	22.7	22.7
remolded, psi	-	0.32	-	-	0.05	-	-	-	0.09	-	-	0.33	-	-	-	-	-
Vane sensitivity	-	1.0	-	-	4.7	-	-	-	6.2	-	-	1.4	-	-	-	-	-

AREA II CORE 12 (Continued)

CRUISE: 1959. SONIC DEPTH, UNCORRECTED: 2300 fms. CORER: 1200 lb. Piston Ewing

APPROX. CORER PENETRATION: n.d. in. CORE: 203 in. LONG, DIAM. 2.5 in.

SAMPLE NUMBER	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87
DISTANCE FROM TOP OF CORE, in	141.2-143.2	143.2-145.2	145.2-147.2	147.2-149.2	149.2-151	151-153	153-155	155-157	157-159	159-161	161-163	163-165	165-167	167-169	169-171	171-172.7	172.7-173
WET UNIT WEIGHT lb ft^{-3}	88.7	88.7	88.7	88.7	-	88.9	88.[illegible]	88.[illegible]	[illegible]	[illegible]	[illegible]	89.1	89.0	89.0	89.1	-	-
WET UNIT WEIGHT gcm^{-3}	1.42	1.42	1.42	1.42	-	1.42	1.42	1.42	1.43	1.43	1.43	1.43	1.43	1.42	1.43	-	-
SPECIFIC GRAVITY OF SOLIDS	2.750	2.731	2.730	2.727	2.753	[illegible]	2.722	2.852	2.7[illegible]	2.707	2.763	2.710	2.725	2.725	2.756	2.784	-
WATER CONTENT, % DRY WEIGHT	114.56	115.81	120.47	114.63	119.59	120.93	115.25	120.07	121.08	115.58	114.05	112.44	113.46	114.2	114.06	113.90	-
VOID RATIO DETERMINED IN LAB.	3.149	3.149	3.250	3.110	-	3.344	3.212	3.452	3.323	3.182	3.141	3.032	3.076	3.067	3.057	-	-
VOID RATIO AT 100% SATURATION	3.149	3.163	3.200	3.125	-	3.387	3.210	3.447	3.3[illegible]	3.197	3.152	3.047	3.092	3.067	3.086	-	-
POROSITY, %	75.9	75.9	76.5	75.7	-	75.99	76.2	77.2	76.0	76.1	75.9	75.2	75.5	75.4	75.3	-	-
SATURATION, %	100	100+	100+	100+	-	100+	100+	100+	100+	100+	100+	100+	100+	100+	100+	-	-
LIQUID LIMIT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PLASTIC LIMIT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LIQUIDITY INDEX %	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PLASTICITY INDEX	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
COMPRESSION INDEX FROM LL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
COMPRESSION INDEX FROM e-log p	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SLUMP, %	1.72	-	2.53	-	-	2.02	-	1.31	-	1.52	-	1.72	-	2.32	-	-	-
COMPRESSIVE STRENGTH "UNDISTURBED" PSI																	
COMPRESSIVE STRENGTH REMOLDED, PSI	1.22	-	1.35	-	-	1.30	-	1.28	-	1.40	-	1.50	-	1.26	-	-	-
REMOLDING SENSITIVITY	-	-	0.56	-	-	0.78	-	-	-	0.64	-	-	-	0.58	-	-	-
COHESION PSI	-	-	2.41	-	-	1.67	-	-	-	2.19	-	-	-	2.17	-	-	-
COHESION gcm^{-2}	0.61	-	0.68	-	-	0.65	-	0.64	-	0.70	-	0.75	-	0.63	-	-	-
ACTIVITY	4.29	-	47.8	-	-	45.7	-	46.4	-	49.2	-	52.7	-	44.3	-	-	-
MODULUS OF ELASTICITY, PSI	24.3	-	0	-	-	0	-	0	-	0	-	0	-	0	-	-	-
GRAIN MEDIAN DIA. phi	Greater than 10 for all samples																
GRAIN MEDIAN DIA. microns	Less than 1 for all samples																
SAND, % > 60μ < 2mm	-	tr.	tr.	tr.	tr.	tr.	-	0	-	0	-	0	-	0	-	0	-
SILT, % > 2μ < 60μ	-	33	-	34	-	37	-	35	-	35	-	35	-	35	-	35	-
CLAY, % < 2μ	-	67	-	66	-	63	-	65	-	65	-	65	-	65	-	65	-
SEDIMENT TYPE	Silty	Clay															
Vane Shear Strength "undisturbed," psi	-	0.62	-	0.40	0.33	-	0.42	-	0.63	-	0.33	-	0.35	-	0.46	0.29	-
"undisturbed," gcm^{-2}	-	43.0	-	27.8	23.1	-	29.5	-	44.6	-	23.1	-	24.8	-	32.0	20.6	-
remolded, psi	-	-	-	-	-	-	-	-	0.18	-	-	-	-	-	-	-	-
Vane sensitivity	-	-	-	-	-	-	-	-	3.5	-	-	-	-	-	-	-	-

SAMPLE NUMBER	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103
DISTANCE FROM TOP OF CORE, in	173-175	175-177	177-179	179-181	181-183	183-184.7	184.7-186.7	186.7-188.7	188.7-190.7	190.7-192.7	192.7-194.7	194.7-196.5	196.5-198.5	198.5-200.5	200.5-202.5	202.5-202.7
WET UNIT WEIGHT lb ft^{-3}	89.1	88.9	88.8	88.6	89.1	-	88.9	88.9	88.8	88.8	88.7	-	88.6	88.2	89.0	-
WET UNIT WEIGHT gcm^{-3}	1.43	1.42	1.42	1.42	1.43	-	1.42	1.42	1.42	1.42	1.42	-	1.42	1.41	1.43	-
SPECIFIC GRAVITY OF SOLIDS	2.758	2.818	2.766	2.739	2.832	2.833	2.767	2.722	2.725	2.731	2.751	2.758	2.782	2.753	2.836	2.718
WATER CONTENT, % DRY WEIGHT	114.33	117.96	116.66	116.31	118.25	117.82	113.90	114.38	115.24	116.48	116.56	114.78	118.97	117.41	119.63	113.12
VOID RATIO DETERMINED IN LAB.	3.146	3.312	3.214	3.122	3.327	-	3.153	3.098	3.105	3.155	3.193	-	3.294	3.234	3.365	-
VOID RATIO AT 100% SATURATION	3.162	3.324	3.233	3.186	3.340	-	3.153	3.113	3.140	3.181	3.207	-	3.310	3.232	3.393	-
POROSITY, %	75.9	76.8	76.4	75.7	76.9	-	75.9	75.6	75.6	75.9	76.2	-	76.7	76.4	77.1	-
SATURATION, %	100+	100+	100+	100+	100+	-	100	100+	100+	100+	100+	-	100+	99.9	100+	-
LIQUID LIMIT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PLASTIC LIMIT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LIQUIDITY INDEX %	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PLASTICITY INDEX	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
COMPRESSION INDEX FROM LL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
COMPRESSION INDEX FROM e-log p	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SLUMP, %	0	-	2.53	-	0.01	-	-	1.01	-	0.91	-	-	-	3.44	-	-
COMPRESSIVE STRENGTH "UNDISTURBED" PSI																
COMPRESSIVE STRENGTH REMOLDED, PSI	1.28	-	1.21	-	1.30	-	-	1.36	-	1.24	-	-	-	0.94	-	-
REMOLDING SENSITIVITY	0.77	-	-	-	0.65	-	-	0.67	-	-	-	-	-	0.59	-	-
COHESION PSI	1.66	-	-	-	2.0	-	-	2.0	-	-	-	-	-	1.7	-	-
COHESION gcm^{-2}	0.64	-	0.61	-	0.65	-	-	0.68	-	0.62	-	-	-	0.47	-	-
ACTIVITY	45.0	-	42.9	-	45.7	-	-	47.8	-	43.6	-	-	-	33.0	-	-
MODULUS OF ELASTICITY, PSI	19.8	-	0	-	0	-	-	0	-	0	-	-	-	0	-	-
GRAIN MEDIAN DIA. phi																
GRAIN MEDIAN DIA. microns																
SAND, % > 60μ < 2mm	-	0	-	0	-	tr.	tr.	tr.	tr.	tr.	-	0	-	0	-	-
SILT, % > 2μ < 60μ	-	36	-	35	-	36	-	34	-	33	-	35	-	34	-	-
CLAY, % < 2μ	-	64	-	65	-	64	-	66	-	67	-	65	-	66	-	-
SEDIMENT TYPE																
Vane Shear Strength "undisturbed," psi	-	0.42	-	0.38	-	0.31	0.42	-	0.52	-	0.53	0.43	0.27	-	0.22	-
"undisturbed," gcm^{-2}	-	29.5	-	26.9	-	21.9	29.5	-	36.6	-	37.5	30.4	18.9	-	15.5	-
remolded, psi	-	-	-	-	-	-	0.06	-	-	-	0.14	-	-	-	-	-
Vane sensitivity	-	-	-	-	-	-	7.0	-	-	-	3.7	-	-	-	-	-

AREA x CORE 13

CRUISE: 1959. SONIC DEPTH, UNCORRECTED: 1800 fms. CORER: ? lb. Gravity Kullenberg

APPROX. CORER PENETRATION: n.d. IN. CORE: 56 in. LONG, DIAM. 1.875 in.

SAMPLE NUMBER		1	2	3	4	5	6	7	8	9	10	11	12	13	14
DISTANCE FROM TOP OF CORE, m		0-6.5	6.5-8.5	8.5-10.5	10.5-12	12-14	14-16	16-18	18-20	20-22	22-22.2	22.2-24.2	24.2-26.2	26.2-28.2	28.2-30.2
WET UNIT WEIGHT	lb ft^{-3}	-	87.3	87.4	-	88.5	89.5	89.9	89.5	88.9	-	88.5	89.5	88.8	88.4
	gcm^{-3}	-	1.40	1.40	-	1.42	1.43	1.44	1.43	1.42	-	1.42	1.43	1.42	1.42
SPECIFIC GRAVITY OF SOLIDS		2.791	2.777	2.770	2.820	2.800	2.783	-	2.774	2.801	-	2.868	2.858	2.830	2.804
WATER CONTENT, % DRY WEIGHT		-	127.06	127.03	126.88	117.50	112.73	113.18	115.22	116.43	113.22	116.87	116.36	119.15	119.16
VOID RATIO	DETERMINED IN LAB.	-	3.497	3.493	-	3.294	3.127	-	3.164	3.254	-	3.387	3.313	3.359	3.338
	AT 100% SATURATION	-	3.528	3.519	-	3.290	3.137	-	3.196	3.261	-	3.351	3.326	3.372	3.341
POROSITY, %		-	77.8	77.8	-	76.7	75.8	-	76.0	76.5	-	77.2	76.8	77.1	76.9
SATURATION, %		-	100+	100+	-	99.9	100+	-	100+	100+	-	98.9	100+	100+	100+
LIQUID LIMIT		-	-	-	-	-	-	-	-	-	-	-	-	-	-
PLASTIC LIMIT		-	-	-	-	-	-	-	-	-	-	-	-	-	-
LIQUIDITY INDEX, %		-	-	-	-	-	-	-	-	-	-	-	-	-	-
PLASTICITY INDEX		-	-	-	-	-	-	-	-	-	-	-	-	-	-
COMPRESSION INDEX	FROM LL	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	FROM e-log p	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SLUMP, %		-	-	1.62	-	0	-	0	-	1.52	-	-	0	0	0
COMPRESSIVE STRENGTH	"UNDISTURBED" PSI	-	-	2.09	-	3.62	-	3.70	-	2.74	-	-	4.20	3.86	3.30
	REMOLDED, PSI	-	-	-	-	-	-	-	-	0.81	-	-	-	0.92	-
REMOLDING SENSITIVITY		-	-	-	-	-	-	-	-	3.4	-	-	-	4.2	-
COHESION	PSI	-	-	1.04	-	1.81	-	1.85	-	1.37	-	-	2.10	1.93	1.65
	gcm^{-2}	-	-	73.1	-	127.3	-	130.1	-	96.3	-	-	147.6	135.7	116.0
ACTIVITY															
MODULUS OF ELASTICITY, PSI		-	-	16.9	-	79.9	-	72.7	-	30.3	-	-	123.6	89.8	39.7
GRAIN MEDIAN DIA.	phi	Greater than 10 for all samples													
	microns	Less than 1 for all samples													
SAND, % > 60μ < 2 mm		1	-	1	-	1	-	0	-	0	-	0	-	0	-
SILT, % > 2μ < 60μ		34	-	36	-	34	-	35	-	36	-	37	-	33	-
CLAY, % < 2μ		65	-	63	-	66	-	65	-	64	-	63	-	67	-
SEDIMENT TYPE												Silty	Clay		
Vane Shear strength	"undisturbed," psi	-	1.02	-	0.81	-	2.52	-	2.19	-	-	2.43	-	-	-
	"undisturbed," gcm^{-2}	-	71.7	-	57.0	-	177.2	-	154.0	-	-	170.8	-	-	-
	remolded, psi	-	-	-	-	-	0.14	-	-	-	-	-	-	-	-
Vane sensitivity		-	-	-	-	-	18.0	-	-	-	-	-	-	-	-

SAMPLE NUMBER		15	16	17	18	19	20	21	22	23	24	25	26	27
DISTANCE FROM TOP OF CORE, m		30.2-32.2	32.2-34.7	34.7-36.7	36.7-38.7	38.7-41	41-42.5	42.5-44.5	44.5-46.5	46.5-48.5	48.5-50.5	50.5-52.5	52.5-54.5	54.5-56.5
WET UNIT WEIGHT	lb ft^{-3}	87.9	88.0	86.2	86.8	87.4	-	88.6	88.2	88.4	89.0	88.6	89.0	89.5
	gcm^{-3}	1.41	1.41	1.38	1.39	1.40	-	1.42	1.41	1.42	1.43	1.42	1.43	1.43
SPECIFIC GRAVITY OF SOLIDS		2.760	2.777	2.757	2.861	2.754	2.871	2.783	2.695	2.747	2.815	2.780	2.740	2.848
WATER CONTENT, % DRY WEIGHT		121.24	123.63	127.96	129.10	124.25	118.70	115.47	116.94	117.10	115.45	118.64	113.45	110.89
VOID RATIO	DETERMINED IN LAB.	3.337	3.403	3.550	3.711	3.408	-	3.222	3.135	3.208	3.252	3.283	3.100	3.188
	AT 100% SATURATION	3.346	3.433	3.528	3.694	3.422	-	3.214	3.152	3.217	3.250	3.298	3.108	3.158
POROSITY, %		76.9	77.3	78.0	78.8	77.3	-	76.3	75.8	76.2	76.5	76.7	75.6	76.1
SATURATION, %		100+	100+	99.4	99.5	100+	-	99.7	100+	100+	99.9	100+	100+	99.1
LIQUID LIMIT		-	-	-	-	-	-	-	-	-	-	-	-	-
PLASTIC LIMIT		-	-	-	-	-	-	-	-	-	-	-	-	-
LIQUIDITY INDEX, %		-	-	-	-	-	-	-	-	-	-	-	-	-
PLASTICITY INDEX		-	-	-	-	-	-	-	-	-	-	-	-	-
COMPRESSION INDEX	FROM LL	-	-	-	-	-	-	-	-	-	-	-	-	-
	FROM e-log p	-	-	-	-	-	-	-	-	-	-	-	-	-
SLUMP, %		0.71	0	0	-	1.52	-	0	0	0.20	1.82	2.02	1.31	0.20
COMPRESSIVE STRENGTH	"UNDISTURBED" PSI	2.90	2.99	2.50	-	2.50	-	2.55	2.72	2.66	2.51	2.56	2.98	3.28
	REMOLDED, PSI	0.61	-	0.51	-	-	-	0.47	-	-	0.45	-	-	-
REMOLDING SENSITIVITY		4.8	-	4.9	-	-	-	5.4	-	-	5.6	-	-	-
COHESION	PSI	1.45	1.49	1.25	-	1.25	-	1.28	1.36	1.33	1.26	1.28	1.49	1.64
	gcm^{-2}	102.0	104.8	87.9	-	87.9	-	90.0	95.6	93.5	88.6	90.0	104.8	115.3
ACTIVITY														
MODULUS OF ELASTICITY, PSI		27.7	60.1	21.4	-	28.6	-	36.5	-	42.8	32.2	29.8	29.1	18.6
GRAIN MEDIAN DIA.	phi													
	microns													
SAND, % > 60μ < 2 mm		1	-	0	-	0	-	0	-	0	-	1	-	1
SILT, % > 2μ < 60μ		32	-	36	-	41	-	39	-	38	-	38	-	39
CLAY, % < 2μ		67	-	64	-	59	-	61	-	62	-	61	-	60
SEDIMENT TYPE														
Vane Shear strength	"undisturbed," psi	-	-	-	-	-	-	-	-	-	-	-	-	-
	"undisturbed," gcm^{-2}	-	-	-	-	-	-	-	-	-	-	-	-	-
	remolded, psi	-	-	-	-	-	-	-	-	-	-	-	-	-
Vane sensitivity		-	-	-	-	-	-	-	-	-	-	-	-	-

U. S. Navy Hydrographic Office
INVESTIGATIONS OF DEEP-SEA SEDIMENT CORES, II. MASS PHYSICAL PROPERTIES, October 1962. 146 p., including 17 figs., 35 plates, 9 tables. (H. O. TR-106).

The second of three Hydrographic Office reports describing results of an investigation of mass physical properties of 35 sediment cores collected from Hydrographic Office oceanographic ships in 1958 and 1959.

This report discusses results of laboratory measurements of the mass physical properties of more than 700 samples including: grain size, specific gravity of solids, wet unit weight, water content, void ratio, pore-water saturation, liquid and plastic limits, and compressive and/or vane shear strength. Also computed were porosity, liquidity index, plastic index, cohesion, sensitivity, activity, and modulus of elasticity.

Appendix A contains a discussion of salinity correction for specific gravity measurements.

Appendix B contains data tables for 35 cores tested.

1. Bottom Sediments - mass physical properties
2. Mass physical properties - bottom sediments
3. North Atlantic Ocean - bottom sediments
4. Western Mediterranean Sea - bottom sediments
5. Central Pacific - bottom sediments
6. Ships - USS SAN PABLO
7. Ships - USS REHOBOTH

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This report discusses results of laboratory measurements of the mass physical properties of more than 700 samples including: grain size, specific gravity of solids, wet unit weight, water content, void ratio, pore-water saturation, liquid and plastic limits, and compressive and/or vane shear strength. Also computed were porosity, liquidity index, plastic index, cohesion, sensitivity, activity, and modulus of elasticity.

Appendix A contains a discussion of salinity correction for specific gravity measurements.

Appendix B contains data tables for 35 cores tested.

1. Bottom Sediments - mass physical properties
2. Mass physical properties - bottom sediments
3. North Atlantic Ocean - bottom sediments
4. Western Mediterranean Sea - bottom sediments
5. Central Pacific - bottom sediments
6. Ships - USS SAN PABLO
7. Ships - USS REHOBOTH

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ii. Author: Adrian F. Richards

iii. H. O. TR-106

Richards, Adrian F.
AUTHOR
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