MGGB09005025

(Laboratory Item)390

70-0903

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A SUMMARY OF SEDIMENT SIZE AND ENGINEERING PROPERTIES OF A CORE FROM CHESAPEAKE BAY OCTOBER 1969

ENGINEERING PROPERTIES
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Sediment Size
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Prepared for:
Naval Ordnance Laboratory

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Geological Laboratory-Laboratories Branch
Nearshore Surveys Division
Oceanographic Surveys Department

U. S. Naval Oceanographic Office,
Washington, D. C. 20390

LEGEND

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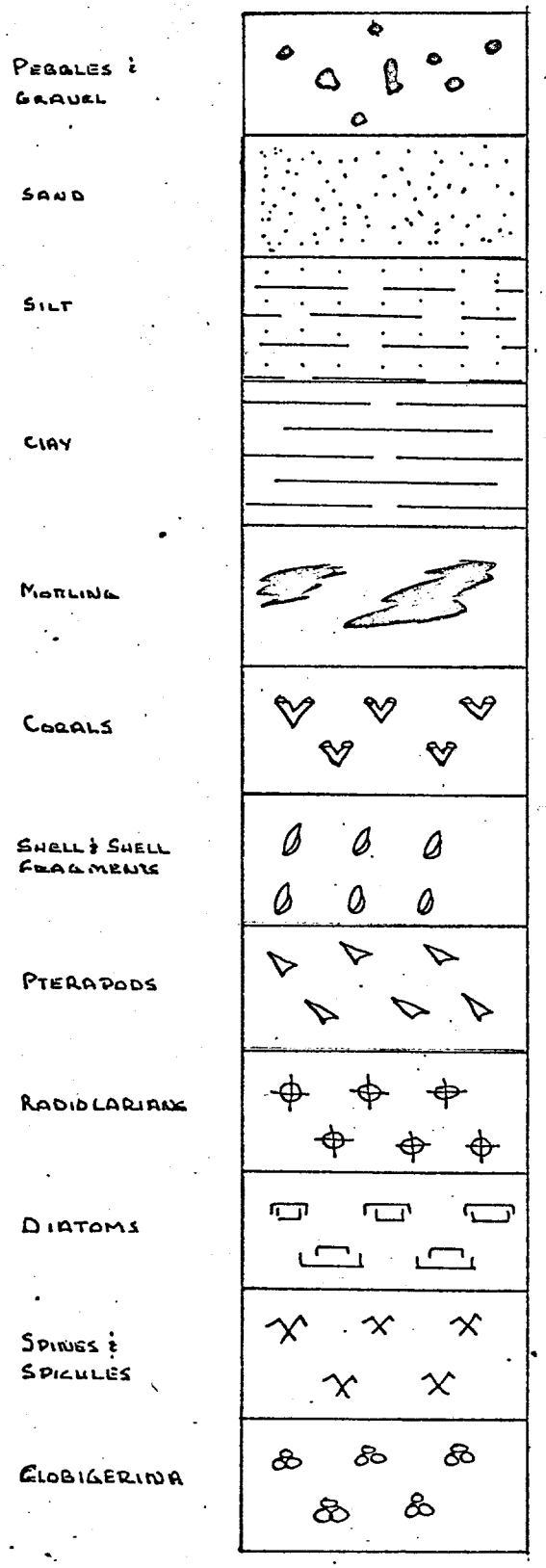

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EXPLANATION OF DATA PAGES
CORE ANALYSIS SUMMARY SHEET
Engineering Properties
NAVOCEANO (EXP) 3167/18B (Rev. 1-63)

Results of engineering properties, core analysis performed by the U. S. Naval Oceanographic Office Geological Laboratory are recorded on Core Analysis Summary Sheet Engineering Properties.

The following is a description of the terms employed on the Core Analysis Summary Sheet:

1. Cruise Number. A number assigned to each cruise for identification purposes.

2. Latitude. Expressed in degrees, minutes, and seconds.

3. Longitude. Expressed in degrees, minutes, and seconds.

4. Sample Number. A consecutive number, commencing with 1 applied to each core taken successively throughout the cruise.

5. Date Taken. Day (GMT), month, and year.

6. Water Depth (m). The uncorrected sonic sounding recorded in meters.

7. Type Corer. Identified by the name of device employed.

8. Core Length (cm). Recorded in centimeters as observed in the laboratory.

9. Core Penetration (cm). Recorded in centimeters as observed in the field.

10. Subsample Depth in Core (cm). Interval of subsample as measured in centimeters from the top of the core.

11. Wet Unit Weight (g/cm^3). The weight (solids plus water) per unit volume of the sediment mass.

12. Specific Gravity of Solids. The ratio of weight in air of a given volume of a sediment at 20°C to the weight in air of an equal volume of distilled water at 20°C.

13. Water Content (% dry weight). The ratio, in percent, of the weight of water in a given mass of the sediment sample to the weight of the solid particles.

14. Void Ratio. The ratio of the volume of void spaces to the volume of solid particles in the sediment sample as computed from Wet Unit Weight, Specific Gravity of Solids, and Water Content.

15. Saturated Void Ratio. The Void Ratio at 100 percent saturation as computed from Water Content and Specific Gravity of Solids.

$$\text{Saturated Void Ratio} = \frac{\text{Water Content X Specific Gravity of Solids}}{100}$$

16. Porosity (%). The ratio, usually expressed as a percentage, of the volume of voids of a sediment mass to the total volume of the sediment mass.

17. Liquid Limit. Water Content, in percent, at which a pat of sediment cut by a groove of standard dimension will flow together for a distance of 1/2 inch under the impact of 25 blows in a standard liquid limit apparatus.

18. Plastic Limit. Water Content, in percent, at which a sediment will just begin to crumble when rolled into a thread approximately 1/8 inch in diameter.

19. Plasticity Index. The numerical difference between the Liquid Limit and Plastic Limit of the sediment mass.

20. Liquidity Index. The ratio, expressed in percentage, of (1) the natural water content of the sediment sample minus its Plastic Limit to (2) its Plasticity Index.

21. Compression Index. The slope of the linear portion of the Pressure-Void Ratio curve on a semi-log plot.

22. Compressive Strength. The load per unit area required to shear an unconfined, natural or remolded, sediment mass.

23. Cohesion. The shearing strength per unit area under zero externally applied load.

24. Sensitivity. The ratio of the natural to the remolded strength. It is a measure of the loss of strength due to remolding the sediment mass.

25. Angle of Internal Friction (°). The angle between the abscissa and the tangent of the curve representing the relationship of "shearing resistance to "normal stress" acting within a sediment mass.

26. Activity. The ratio of the Plasticity Index to the clay fraction percentage ($<$.002mm) of the sediment mass.

27. Modulus of Elasticity. The ratio of stress to strain of the sediment mass.

28. Slump (%). The ratio, in percent, of the amount of height change immediately before the compressive strength test to the original height of a cylinder of sediment.

The results of the sediment size and composition analyses are printed out in tabular form.

The following is an explanation of the terms encountered on the data printout sheet:

CRUISE	A number assigned to each cruise for identification purposes.
SAMPLE	A consecutive number applied to each core taken successively throughout the cruise.
LATITUDE	Expressed in degrees, minutes, and tenths of minutes.
LONGITUDE	Expressed in degrees, minutes and tenths of minutes.
TAKEN	Date in day, month, and year that core was taken.
CORER TYPE	Letters corresponding to sampling device code below.

Corers		Grabs	
HYP	Hydroplastic piston	SPK	Shipek Sediment Sampler
HYG	Hydroplastic gravity	HLP	Alpine Heavy Duty Grab
KUP	Kullenberg piston	SMS	Small Mud Snapper
KUG	Kullenberg gravity	VVS	Van Veen Grab
PHL	Phlegar gravity	BED	Birge-Ekman Dredge
MEG	Modified Ewing gravity	DLS	Dietz-LaFond Snapper
MEP	Modified Ewing piston	OPG	Orange Peel Grab
VIB	Vibrocorer	SBS	Scoopfish Bottom Sampler
BOM	Boomerang		
EWP	Ewing piston		
EWG	Ewing gravity		

LENGTH	Length of core recorded in centimeters as observed in the laboratory.
PENETRATION	Penetration of coring device recorded in centimeters as observed in the field.
DEPTH	The uncorrected sonic sounding in meters.
ANALYZED	Date in day, month, and year that core was analyzed in the laboratory.
I.D. No.	Three or four digit laboratory project number followed by consecutive number assigned to each subsample analyzed.
INTERVAL	Interval of subsample as measured in centimeters from the top of the core.
MM	Particle diameter size intervals based on Wentworth size grades in millimeters.
PER	Percent of total sample weight within the given size interval.

GRAVEL, SAND SILT, CLAY — Percent of total sample weight within the four size classes.

Class ranges are:

1. Gravel - coarser than 2 mm
2. Sand - 2 to 0.0625 mm
3. Silt - 0.0625 to 0.0039 mm
4. Clay - finer than 0.0039

MEAN (MM) — The geometric mean of the distribution expressed in millimeters.

MEAN(PHI) — The logarithmic mean of the distribution expressed in phi units ($-\log_2$) of the diameter in millimeters.

STAN DEV — Standard deviation. A measure of the degree of spread or dispersion of the distribution about the mean expressed in phi units.

$$s = \sqrt{\sum f \quad (X_i - X)^2 / 100}$$

SKEWNESS — A measure of the asymmetry of the distribution. Positive values denote skewness of the distribution toward the fine particles; negative values denote skewness toward the coarse particles. A normal distribution has a skewness of 0.

$$\text{Skewness} = \frac{1}{100} \quad 2\ s^{-3} \sum f \quad (X_i - X)^3$$

KURTOSIS — A measure of the peakedness of the distribution. Positive values denote a "leptokurtic" distribution more "peaked" than normal. Negative values denote a "platykurtic" distribution, or a distribution more "flat" than normal. A normal curve has a kurtosis of 0.

$$\text{Kurtosis} = \frac{1}{100} \quad s^{-4} \quad \sum f \quad (X_i - X)^4 - 3$$

$CaCO_3$ — Percent calcium carbonate of the total weight as determined by the insoluble residue method.

ORG CARBON — Percent organic carbon of the total sample weight as determined by the Allison method

COLOR — Wet sediment color, based on the Geological Society of America Rock-Color Chart, as determined in the laboratory.

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DOM CONST	Dominant constituent (s) comprising the sample assemblage.
SEC CONST	Secondary constituent (s) comprising the sample assemblage.

CORE DESCRIPTION SHEET

NAVOCEANO-3167/93 (3-68)

SAMPLE NO. BS-1 LOCATION: CHESAPEAKE BAY SAMPLER TYPE: KULLENBERG

LATITUDE 38° ° 11' N ' WATER DEPTH (M): 5.2

LONGITUDE 76° ° 0' W ' CORE LENGTH (CM): 141 MGG09005025

DATE CORED (D,M,Y): 17 NOV. 69 CORE PENETRATION (CM):

LOGGED BY: E. ACHSTETTER ITEM NO: 390 DATE LOGGED IN (D,M,Y): 2 DEC. 69

REMARKS: (Odor, bedding, shells, structures, mottling, disturbance, etc.)	DEPTH (CM)	CORE SKETCH	COLOR (GSA)	LAB. NO.	SAMPLE INTERVAL (CM)	SEDIMENT TYPE (Visual)
FLUID CONDITION (0-8CM.) POSSIBLE DISTURBANCE FORMATION OF H_2S (0-60CM.)			5G5/1 GREENISH GRAY	390-1	0-8	SILTY CLAY
	10					
	20					
SEDIMENT CHANGE (30-38CM.) POCKETS OF ORGANIC MATTER WITH COLOR CHANGE TO N3. PEBBLES & SHELL FRAGMENTS (30-38CM.)	30		5GY6/1 GREENISH GRAY	390-2	30-38	MEDIUM TO COARSE SAND
	40					
	50					
TIGHT PACKING OF GRAINS (60-68CM.)	60		5GY6/1 GREENISH GRAY	390-3	60-68	MEDIUM TO COARSE SAND
	70					
	80					
VARIEGATED COLORS AT (90-98CM.) VERY PUNGENT ODOR. PEBBLES-LOOSELY PACKED.	90		5GY6/1 TO 5Y6/4 GREENISH GRAY TO DUSKY YELLOW	390-4	90-98	MEDIUM TO COARSE SAND
	100					

CORE DESCRIPTION SHEET

NAVOCEANO-3167/93 (3-68)

SAMPLE NO. BS-1 LOCATION CHESAPEAKE BAY SAMPLER TYPE: KULLENBERG

LATITUDE 38° 11' N' WATER DEPTH (M): 5.2 09005025

LONGITUDE 76° 0' W' CORE LENGTH (CM): 141

DATE CORED (D,M,Y): 17 NOV. 69 CORE PENETRATION (CM):

LOGGED BY: E. ACHSTETTER ITEM NO: 390 DATE LOGGED IN (D,M,Y): 2 DEC. 69

REMARKS: (Odor, bedding, shells, structures, mottling, disturbance, etc.)	DEPTH (CM)	CORE SKETCH	COLOR (GSA)	LAB. NO.	SAMPLE INTERVAL (CM)	SEDIMENT TYPE (Visual)
	10					
	20		5G4/6/1 GREENISH GRAY	390 - 5	120 - 128	MEDIUM TO COARSE SAND
	30					
	40	141CM.				
	50					
	60					
	70					
	80					
	90					
	00					

SEDIMENT SIZE AND COMPOSITION DATA

COURSE CHES SAMPLE BS-1 LATITUDE 38 11.0 N LONGITUDE 76 0.0 W TAKEN 17NOV69 MARSDEN SQ. 116
CORER TYPE KUL LENGTH 141.0 PENETRATION 0.0 DEPTH 5.2 ANALYZED 2DEC69

ID. NO.	390 1	390 2	390 3	390 4	390 5	
INTERVAL	0.0- 8.0	30.0- 38.0	60.0- 68.0	90.0- 98.0	120.0-128.0	
MM	PER	PER	PER	PER	PER	PER
16.0000	0.000	0.000	0.000	0.000	0.000	
8.0000	0.000	0.000	0.000	0.000	0.000	
4.0000	0.000	0.528	0.000	2.700	0.000	
2.0000	0.000	2.572	0.000	1.939	0.643	
1.0000	0.000	2.503	0.245	1.708	1.311	
0.5000	0.000	10.795	9.436	7.062	9.411	
0.2500	0.000	28.503	48.979	31.387	39.136	
0.1250	0.000	25.218	29.657	32.218	26.356	
0.0625	0.200	5.145	4.371	5.054	5.451	
0.0312	3.004	6.477	3.023	7.085	6.506	
0.0156	1.001	2.871	0.817	1.385	0.771	
0.0078	7.677	2.675	0.613	1.039	1.286	
0.0039	11.682	2.297	0.408	0.923	1.157	
0.0020	10.013	1.378	0.000	0.923	0.771	
0.0010	13.017	0.919	0.000	1.269	1.414	
0.0010-	53.405	7.120	2.451	5.303	5.786	
GRAVEL	0.000	2.101	0.000	4.639	0.643	
SAND	0.200	72.164	92.688	77.429	81.666	
SILT	23.364	15.319	4.861	10.432	9.720	
CLAY	76.435	9.417	2.451	7.501	7.971	
MEAN (MM)	0.0016	0.1216	0.2201	0.1570	0.1455	
MEAN (PHI)	9.2677	3.0402	2.1838	2.6715	2.7805	
STA. DEV.	1.6498	2.9031	1.6722	2.6292	2.5422	
SKEWNESS	-0.6115	0.6376	1.6394	0.7377	0.9604	
KURTOSIS	0.6002	1.0882	13.0636	2.7681	3.2017	
CACO3	0.000	0.000	0.000	0.000	0.000	
ORG CARBON	0.000	0.000	0.000	0.000	0.000	
COLOR	5G5/1	5GY6/1	5GY6/1	5GY6/1	5GY6/1	
DCB CONST						
SEC CONST						

REMARKS 1 -
REMARKS 2 -

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PRNC-NAVOCEANO-3167/18 B (4-63)

CORE ANALYSIS SUMMARY SHEET
ENGINEERING PROPERTIES

ANALYZED BY E. ACHSTETTER
DATE 4 DECEMBER 1969

116-86

1. CRUISE NO. N.O.L. - CHESAPEAKE BAY
2. LATITUDE 38° 11' N "
3. LONGITUDE 76° 0' W "
4. SAMPLE NO. BS-1
5. DATE TAKEN (Day, month, year) 17 NOVEMBER 1969
6. WATER DEPTH (m) 5.2
7. TYPE CORER KULLENBERG
8. CORE LENGTH (cm) 141
9. CORER PENETRATION (cm) ____

10. SUBSAMPLE DEPTH IN CORE (cm)	0-8	30-38	60-68	90-98	120-128							
11. WET UNIT WEIGHT (g/cm³)	1.436	2.079	2.130	2.117	2.091							
12. SPECIFIC GRAVITY OF SOLIDS	2.72	2.66	2.64	2.68	2.65							
13. WATER CONTENT (% dry weight)	104.09	19.20	17.87	18.08	18.66							
14. VOID RATIO	2.87	0.52	0.46	0.49	0.50							
15. SATURATED VOID RATIO	2.83	0.51	0.47	0.48	0.49							
16. POROSITY (%)	74.13	34.38	31.51	32.97	33.52							
17. LIQUID LIMIT												
18. PLASTIC LIMIT												
19. PLASTICITY INDEX												
20. LIQUIDITY INDEX												
21. COMPRESSION INDEX FROM LL												
22. COMPRESSIVE STRENGTH NATURAL (g/cm²)												
REMOLD (g/cm²)												
23. COHESION NATURAL (g/cm²)	____	150.0	770.4	170.5	61.4							
REMOLD (g/cm²)	____	40.9	184.1	27.3	27.3							
24. SENSITIVITY	____	3.7	4.2	6.2	2.2							
25. ANGLE OF INTERNAL FRICTION (°)												
26. ACTIVITY												
27. MODULUS OF ELASTICITY												
28. SLUMP (%)												

29. REMARKS NOTE: COHESION VALUES WERE OBTAINED BY PERFORMING VANE SHEAR TEST, EVEN THOUGH THIS TEST IS NOT RECOMMENDED AS A SHEAR TEST FOR SANDS DUE TO THE INCREASED FRICTION CAUSED BY THE SAND AGAINST THE WALL OF THE LINER AND A SLIGHT UPLIFT ON THE SURFACE OF THE SPECIMEN. VALUES OBTAINED WOULD HAVE BEEN SOMEWHAT LESS, HAD UNCONFINED COMPRESSION TESTS BEEN PERFORMED, BUT TO EXTRUDE SANDY SEDIMENT FOR THIS TEST WOULD HAVE CAUSED COMPACTION AND DISTURBANCE OF THE GRAINS.

ITEM No. 390

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