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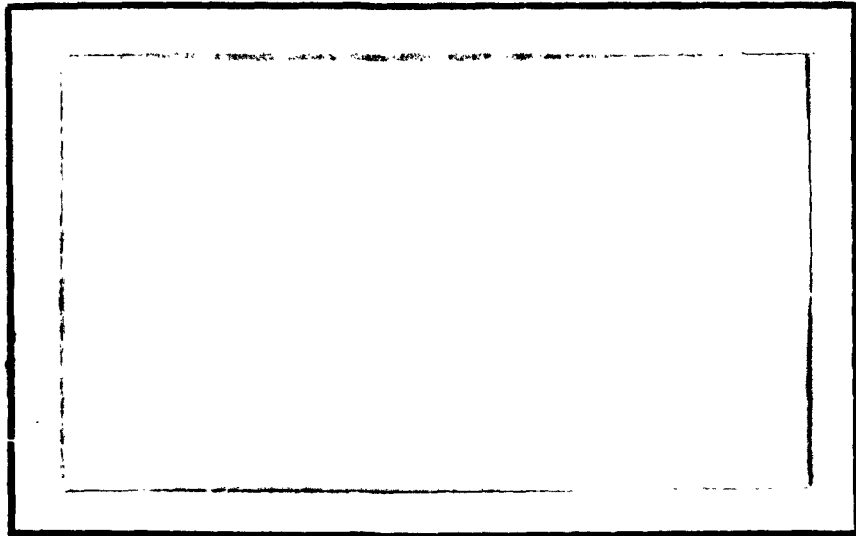
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Woods Hole, Massachusetts

Reference No. 53-15

Hydrographic Survey in the Boston
Area

Bottom Sediment Distribution,
Boston Harbor

By

William S. Butcher

Interim Report No. 16
Submitted to Geophysics Branch, Office of Naval Research
Under Contract N6onr-27712 (NR-084-008)

March 1953

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Director

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INTRODUCTION

One of the primary purposes of the Inshore Survey Program in Boston Harbor has been to present a detailed chart of the bottom sediments in the project area. The original project included the marine area west of $70^{\circ}40'$ W. Longitude. Several charts have been published previously including the area of the present study. The earliest was that of Trowbridge and Shepard (1932), compiled mostly from the Coast and Geodetic Survey bottom notations on Chart No. 1208. Stetson prepared a bottom sediment chart during World War II which included the study area (C.&G.S. Chart No. 1106-BS). This chart also was based on the Coast and Geodetic Survey charts. Most recently the U. S. Navy, Hydrographic Office, Inshore Survey Section, has presented a chart of the bottom sediments of the area based on Coast and Geodetic Survey published charts and information on file. Except for the few samples taken by Trowbridge and Shepard and the qualitative samples taken by the Coast and Geodetic Survey, no detailed study of the sediments of the area had been made.

A reconnaissance map of the area based on "scoopfish" samples was presented in WHOI Ref. No. 51-73. From this work it was obvious that a detailed study of the whole area would take longer than the time allowed for the project. Thus, detailed sampling has been limited to the area north of $42^{\circ}20'$ N. Latitude and west of $70^{\circ}40'$ W. Longitude (see Fig. 1 for the areas of reconnaissance and detailed sampling).

It is important for the purposes of this project and for the study of the sediments to have a detailed topographic chart of the bottom. It was beyond the scope of this Institution's assignment to make such a detailed chart of the area and the U. S. Coast and Geodetic Survey had surveyed a part of the area. Fig. 2 shows the areas where detailed surveying has been completed. The remainder of the area is not sounded adequately and the topography is incomplete. The contours of bottom topography shown on the bottom sediment chart are the best available at present but beyond the detailed surveys they are not accurate.

The following persons have assisted in the field and laboratory work leading to the presentation of the bottom sediment chart: Messrs. W. D. Athearn, D. F. Bumpus, J. M. Kemp, D. B. Clarke, R. C. Mellor, J. Barker, R. M. Morrison, and F. Koch. Mr. Gale G. Pasley has done much of the drafting for the study. Messrs. Athearn and Bumpus and Dr. A. C. Redfield have read and criticized the manuscript.

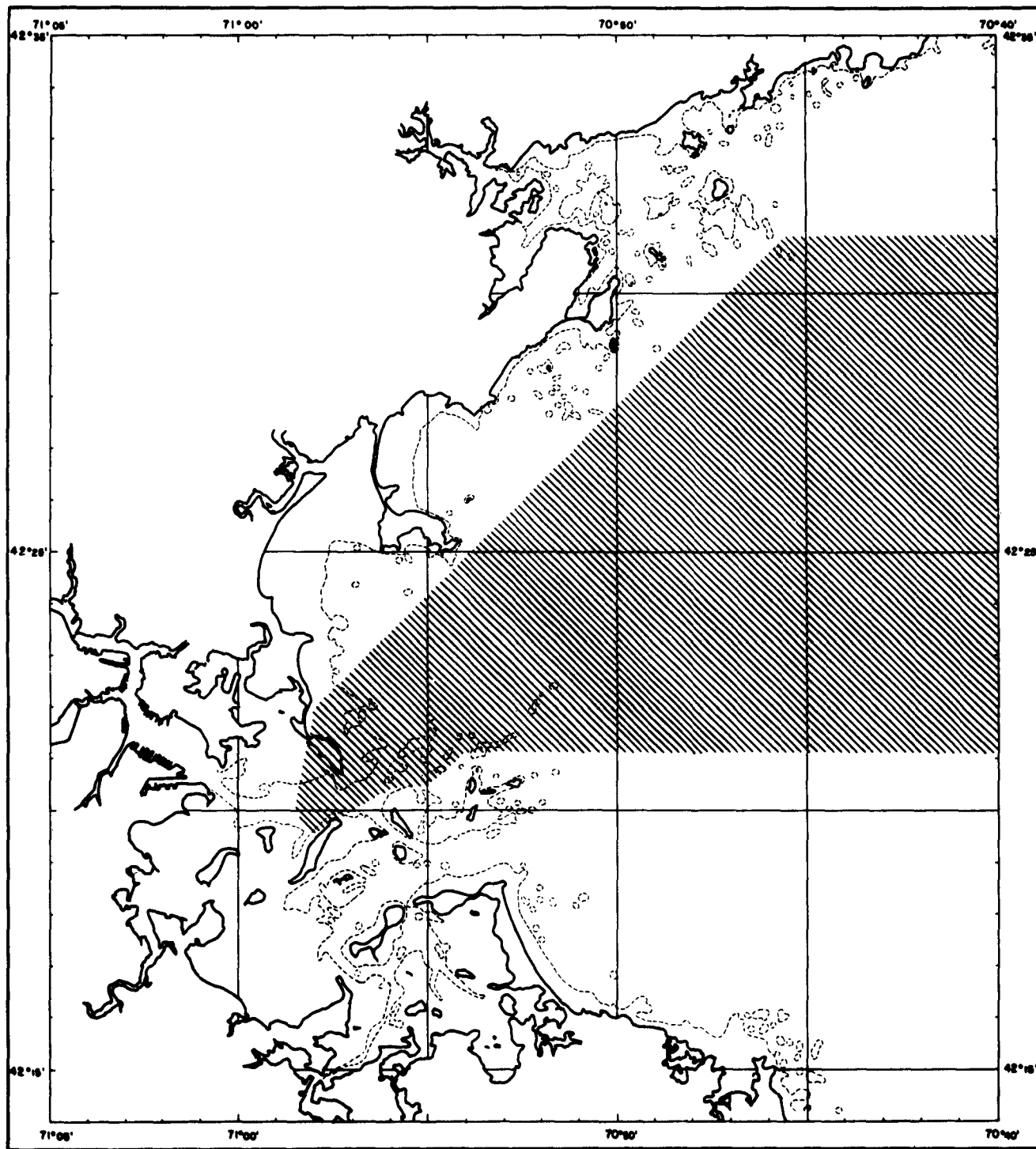


Fig. 1 Area of Boston Harbor Inshore Survey. Detailed sampling in lined area. Reconnaissance sampling in entire marine area.

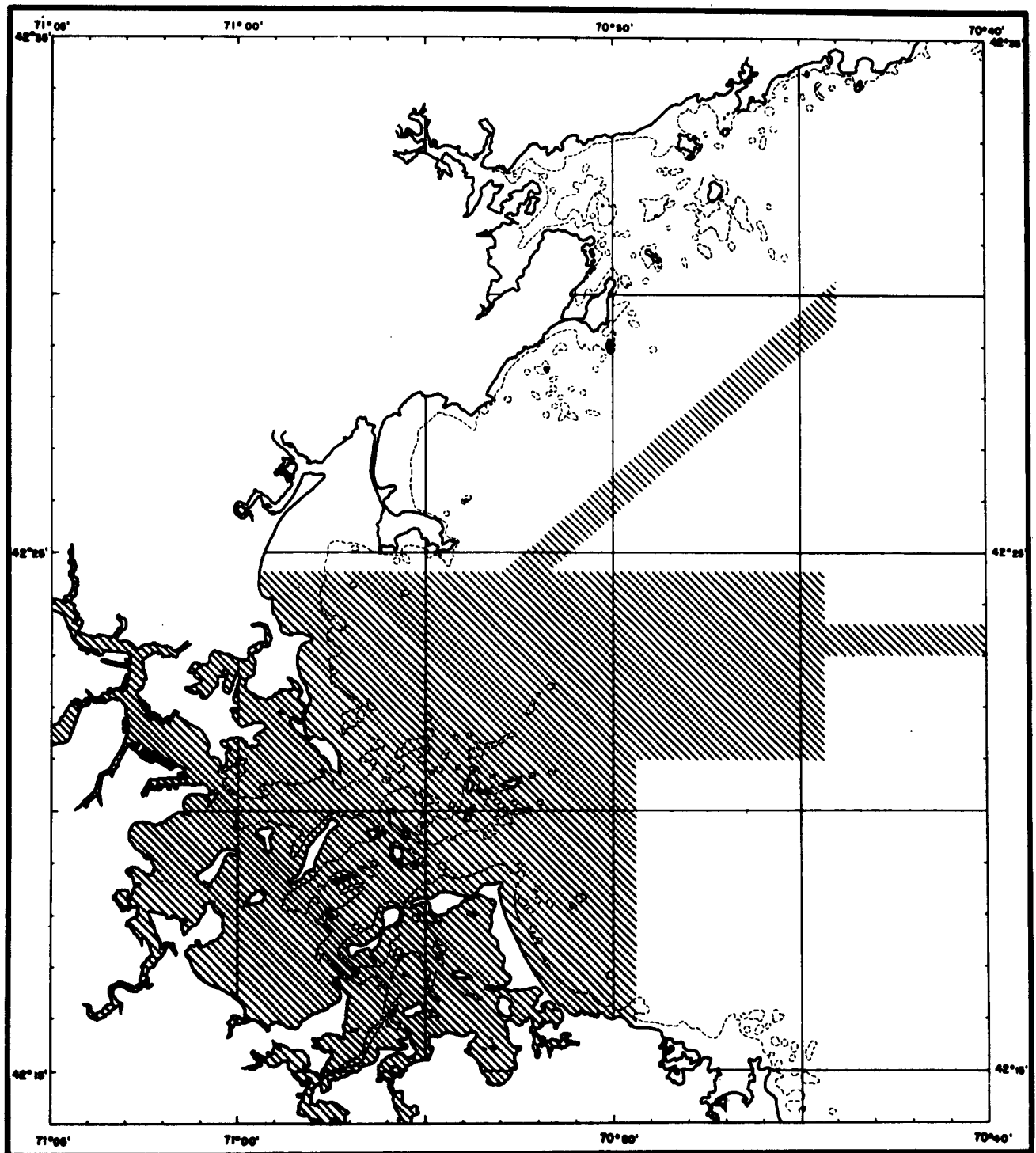


Fig. 2 Area covered by recent, detailed, bathymetric survey (lined).

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METHODS

The bottom sediment chart (Fig. 6) represents the best interpretation of the distribution of bottom sediments in Boston Harbor that can be gained up to the present with the methods used. These methods have certain limitations and inherent errors which must be borne in mind by the persons using the chart. The methods will be discussed in relation to their effect on the accuracy of the chart.

Field Methods: The accuracy of the bottom sediment chart is primarily determined by the accuracy of location of the samples. All of the stations have been located by two simultaneous sextant angles on known positions on shore. It was possible even at the greatest distance from shore to distinguish a difference in angle between positions taken from the bow and the stern of the ship or about 50 feet apart. In the laboratory successive plottings of the same angles gave errors of position that were about the same order of magnitude. It is safe to assume that the positions of the stations are all located to within ± 50 feet.

The samples analyzed to produce the bottom sediment chart were obtained with two types of sampler, the "orange peel" grab and the Kullenberg corer. In addition, a few samples were taken with the Phleger corer, but they have not been analyzed in detail. The "orange peel" grab obtains a sample that varies in depth of penetration of the bottom from nearly zero to about 6 inches. A sharp change in the upper 6 inches of the bottom would not be sampled or would be lost in the subsequent mixing of the sample. No such sharp changes are noted in either the Kullenberg or Phleger samples and there is no error involved from this source. The "orange peel" grab may lose fine-grained sediment by washing the material from the top of the sampler or through the jaws of the sampler. The loss of sediment from the top was prevented by a tight-fitting canvas cover. Where loss through the jaws of the sampler was suspected, other attempts were made until a satisfactory sample was obtained. It is not likely that there is any significant error from this source. The "orange peel" grab cannot sample any sediments which have a grain size larger than the opening of the jaws and it is not likely to break off a piece of ledge. Where repeated attempts to sample failed, the bottom must have been composed either of very coarse gravel or of ledge. Photographs (WHOI Ref. Nos. 52-38 and 52-91) have not shown any ledge material on the bottom. It has, therefore, been assumed that the failure to bring up a sample is due to the presence of very coarse gravel rather than to ledge; but only a photograph taken at the time of sampling could establish this interpretation. The "orange peel"

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grab often brings up a sample that is too large to take back to the laboratory in its entirety. Field splitting was done qualitatively. Some small error may be present in certain samples because the qualitative splitting did not duplicate the bottom conditions.

Samples taken from the top of a Kullenberg core have been disturbed in process of removing the core liner from the core barrel and in the coring operation itself. The sediment at the top of the core is mixed with the overlying water and on settling gives a graded sediment with the finer grained sediments at the surface. Samples taken at nearly the same spot by the "orange peel" grab and the Kullenberg corer should show a finer grain size at the Kullenberg station if this process is significant. However, there is no such consistent relationship and it is apparent that the areal variation in grain size is, in general, of greater importance than the sorting action of the Kullenberg samples. The clay samples shown on the bottom sediment chart have nearly as many silt size particles as clay size, and their organic content is similar to the silt size sediments at the surface elsewhere. All but two are Kullenberg samples, and the detailed log suggests that there has been considerable mixing. For these reasons, it is possible that the clay areas should be considered to be silt even though the mechanical analyses indicate that they are clays. However, they have been reported and plotted to conform to the mechanical analyses.

Bottom photographs have been used as an aid in delineating the areas of gravel bottom. Gravel can readily be determined without ambiguity in a photograph and the photograph may be used to characterize the bottom at the place where it was taken.

In addition to the location of the samples, the variability of the bottom and the sample spacing are the most important factors in determining the accuracy of a bottom sediment chart. As was mentioned in WHOI Ref. No. 52-91 the sample spacing used in this study was as close as was warranted by the time allowed by the contract. Where stations are as much as 3,000 feet apart, a line of demarcation must be drawn interpretively and the error may be as great as $\pm 1,500$ feet. It is also possible that a small area of different sediment may have been entirely missed in the interval. The bottom sediment chart is most accurate where the variability of the bottom is small and where the sample spacing is close.

Laboratory Methods: The laboratory methods are all considerably more accurate than any of the field methods. A positional error in the field could result in a gravel bottom being sampled when the bottom at the assumed position was

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actually a sand (cf. Stations 99 and 213). Mixing during coring may have changed the classification of a few samples from silt to clay. The magnitude of the laboratory error is never great enough to cause such a large change in classification. The accuracy of the chart is, thus, only dependent upon the accuracy of position, variability of the bottom, and the sample spacing. No actual test of the laboratory error has been made, but reasonable caution has been exercised in all processes. One sample which was analyzed in duplicate gave an error of only 0.3% in the median and from previous experience (Poole, Butcher, and Fisher, 1951) the total laboratory error can be estimated at about 5%.

Fig. 3 shows a flow sheet of the work in the laboratory. The steps are numbered in the order in which they are performed. A discussion of each step follows.

Step 1. The field samples were preserved in 1/2 pint ice cream cartons or in small glass jars. Large pieces of gravel were wrapped in cloth. By the time they were analyzed the samples were usually partly dry.

Step 2. The field samples were dried in their containers with the lids removed by baking in an oven at about 80°C., or on top of the oven at about 60°C. The finer sediments were then broken into fragments small enough to pass through the splitter as the next step. Care was taken to preserve intact any fragile particles.

Step 3. If there was sufficient sediment to warrant splitting, a reference sample was obtained by passing the dried field sample through a Jones'-type riffle. However, no splitting was done where the sample was too small to provide about 20 gms. for fine-grained analysis after splitting or where gravel was the predominant sediment grade. It was felt that splitting gravel sediments would lead to an unrepresentative sample.

Step 4. To determine the base for percentage measurements, all samples were weighed after splitting and before the analysis was started.

Step 5. The weighed samples were allowed to soak at least 24 hours in a dispersing agent and water. The dispersing agent, Calgon (sodium hexametaphosphate) gave satisfactory results. The soaking insured that most particles were disaggregated before the wet screening. Clean gravel samples were not soaked in the dispersant.

Step 6. All samples, insofar as possible, were stirred with the electric beater for ten minutes before wet sieving.

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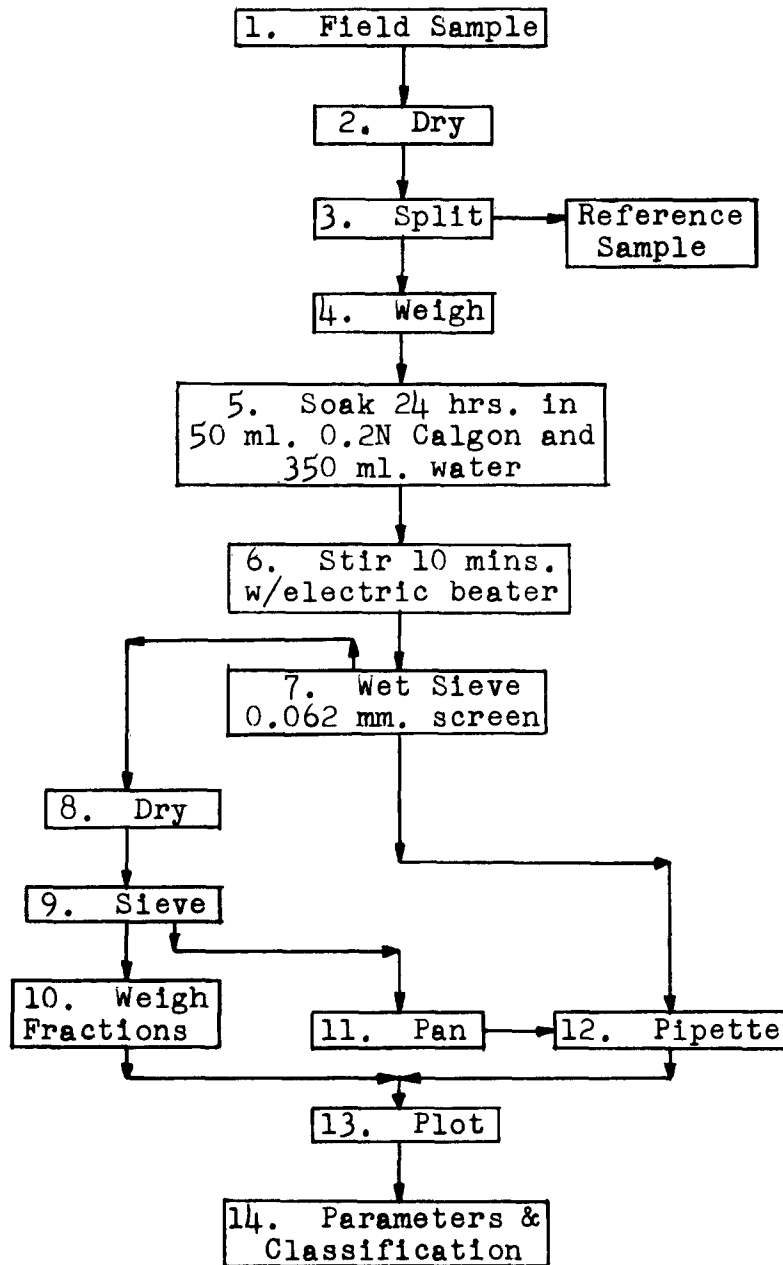


Fig. 3 Flow sheet of laboratory work

Gravel particles were removed and brushed clean before the stirring. Samples that were entirely gravel were not run through this process.

Step 7. After stirring, the sample was poured into a 0.062 mm. sieve held in a funnel that drained directly into the settling tube. In order to cause the sediment and water to pass through the screen, it was necessary to rub the screen gently with a soft paint brush. Any clay lumps that had not previously been broken down were also forced through the screen by brushing. The coarse sediment was washed from the screen to a filter paper or evaporating dish to be dried for a sieve analysis. Clean gravel samples were not wet sieved.

Step 8. The coarse-grained samples or fractions were dried at about 80°C. for the sieve analysis and then placed directly on the screens. Some samples required a light grinding in a mortar before screening.

Step 9. The samples were screened for 10 minutes in a RoTap with screens for every 1/2 ϕ unit from 4 mm. to 0.062 mm. Large gravel was removed before screening. Since much of the sediment in Boston Harbor is greater than 4 mm. in size and since our analysis starts at 4 mm., the initial percentage of the analysis may be greater than 0. If the 5 or 16% size is missing, it is not necessary to determine the 95 or 84% size, since both the 5 and 95% and 16 and 84% are needed to obtain the parameters. The following table indicates the limits to which the analysis was carried depending upon the initial percentage. The classification of the samples depends upon the percentage within any given grade size. The name of the grade size is included in the classification if there is more than 10% of that grade size in the sediment. When the detailed analysis is not carried to 90% or greater it is necessary to take additional samples to determine the percentage remaining in any given grade size, if there are any grades remaining. The table also indicates the remaining samples necessary to complete the analysis.

<u>Initial Percentage</u>	<u>Detailed Analysis Carried to</u>	<u>Additional Samples Necessary</u>
0-5	95	none
6-16	84	0,4, and 8 ϕ
17-50	50	0,4, and 8 ϕ
51-90	0 ϕ	4 and 8 ϕ
91-100	none	none

Step 10. The samples were removed from the screens and the fractions weighed and recorded. The fractions were saved for future reference.

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Step 11. Even in the most carefully wet screened samples, some sediment less than 0.062 mm. remained with the coarse fractions. This was collected in the pan and transferred to the settling tube before the fine-grained analysis was begun.

Step 12. The pipette analysis is run after the pan sediment from the sieving of the coarse-grained sediment is added and after the settling tube is filled to the 1 liter mark. The concentration of the dispersant at this point is 0.01 N or 0.010 gms./10 ml., the size of the pipette. The pipette samples were taken to give the weight fractions for every $1/2 \phi$ unit from 0.062 mm. to 0.001 mm.

The measured weight of the sediment in the pipette analysis is multiplied by a factor to obtain the corrected weight. This factor is determined by subtracting the weight of sand and gravel from the total weight, and dividing the result by the measured weight of the sediment in suspension (0 sec. pipette sample). This factor assumes that there has been no loss of sediment in the coarse-grained analysis. This is not strictly true but experience shows that the major portion of the error is in the fine-grained analysis.

Step 13. The results of the sieve and pipette analyses, tabulated on a Data Sheet (Fig. 4), were plotted on arithmetic probability paper.

Step 14. Four parameters were determined as suggested by Inman (1952), ϕ median, ϕ sorting, ϕ skewness, ϕ kurtosis. The median is reported as the millimeter equivalent by calculation from the phi size. These four values adequately describe the curve. For the word classification, the tetrahedron suggested by Krumbein and Sloss (1951) has been used. The percentage of material in the four grade sizes, gravel, sand, silt, and clay, is determined. The material occurring in the greatest percentage is used as the basic sediment name and all others occurring in amounts greater than 10% are used as modifiers.

BOTTOM SEDIMENT DISTRIBUTION

Fig. 5 shows the location of all the stations used in constructing the bottom sediment chart. The circle indicating the station location is drawn to the scale of the chart so that the size of the circle is 100 feet and indicates the possible area in which the sample might be located. The station number is listed beside each location. If there is no letter suffix the sample is an "orange peel" grab. A suffix

Fig. 4 Mechanical Analysis Data Sheet
Sieve and Pipette

Md: $\times 1/2 = \sigma$
 84: $\times 1/2 = \sigma$
 16: $\times 1/2 = \sigma$
 84 - 16: $\times 1/2 = \sigma$
 84 + 16: $\times 1/2 = \sigma$
 95: $\times 1/2 = \sigma$
 5: $\times 1/2 = \sigma$
 95 - 5: $\times 1/2 = \sigma$

Lower Limit mm	Dish No.	Tot. Wgt.	Time: hr-min-sec			Cum. %
			22°C.	24°C.	26°C.	
-2.0	4					
-1.5	2.832					
-1.0	2.000					
-0.5	1.116					
0.0	1.000					
0.5	0.706					
1.0	0.500					
1.5	0.354					
2.0	0.250					
2.5	0.177					
3.0	0.125					
3.5	0.088					
4.0	0.062					
Total						

Dish No.	Tot. Wgt.	Dish Wgt.	Samp. Wgt.	Sed. Wgt.	Fract. Wgt.	Corr. Wgt.	% Tot.	Cum. %
Tot. in Sump.								
4.5	0.004	00-00-00	00-00-00	00-00-00	00-00-00	00-00-00	00-00-00	00-00-00
5.0	0.011	00-00-55	00-00-50	00-01-45	00-01-40	00-03-30	00-03-20	00-06-40
5.5	0.022	00-01-50	00-03-30	00-07-00	00-14-00	00-27-50	00-52-20	01-46-00
6.0	0.016	00-07-20	00-14-50	00-27-50	00-52-20	01-46-00	03-32-00	07-05-00
6.5	0.011	00-29-10	00-58-30	01-50-00	03-42-00	07-27-00	14-50-00	28-20-00
7.0	0.0078	01-55-00	03-53-00	07-48-00	14-50-00	29-40-00	60-00-00	57-10-00
7.5	0.0055	03-53-00	07-48-00	14-50-00	29-40-00	60-00-00	59-30-00	56-40-00
8.0	0.0039	07-48-00	14-50-00	29-40-00	60-00-00	59-30-00	125-00-00	114-00-00
8.5	0.0028							
9.0	0.0020							
9.5	0.0015							
10.0	0.0010							
10.5	0.0007							
11.0	0.0005							
11.5	0.0003							
Amount left in cylinder								

Sample No.:
 Locality:
 Analyst:
 Date:

Size pipette: _____ ml.
 Disp. agent: _____ ml. of _____ N _____
 Diluted to: _____ ml.
 Disp. agent wgt./_____ ml.: _____ gms.

A. Tot. samp. wgt. : _____
 B. Greater than 4 μ wgt.: _____
 A-B. _____
 P. Suspension wgt. : _____
 A-B/P, correction fact. : _____

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of "b" indicates that the sample is the surface of a Kullenberg core. A suffix "p" indicates that a photograph position has been used to delineate the area. The photographs and data are presented in WHOI Ref. Nos. 52-38 and 52-91. All of the data pertaining to the sediment at a given station and the stations locations are given in Appendix A. In Appendix B are reproduced all of the cumulative curves of the sediment samples at the stations taken by "orange peel" grab where the median has occurred at less than 4 mm.

Fig. 6 shows the sediment distribution in Boston Harbor. The positions of the stations are again indicated by circles so that the accuracy of the sediment grade boundaries may be estimated. The contours are included so that the relationships to the topography may be seen.

General Distribution: The most widely distributed sediment in the Boston Harbor area is gravel. It occurs throughout the entire area but is most extensive to the east and northeast of North Channel. The next most widely distributed sediment is a fine sand. It occurs mainly along the northwest boundary of the area nearest the shore line but smaller patches are found in the gravel areas to the east. Silt and clays occur mainly along the northwest boundary of the area in the shallow water and along the eastern boundary in the deep water. The occurrence of all the sediment grades is extremely patchy suggesting that small patches of sediment may have been missed due to the 3,000 foot spacing of samples.

Relation to Topography: Outside of the main gravel area, the most striking relationship between topography and the sediment distribution is the fact that almost all of the charted hills are covered by gravel. This feature is brought out in the photographs of WHOI Ref. No. 52-91. Gravel also occurs in isolated patches that are not on the top of hills. Sands, silts, and clays are confined to the smooth deeper areas of the chart. Silt and clay generally occur in the depressions within the deeper areas. Since the lines of demarcation of the sediment types must be drawn interpretively, for the most part, the contours have been used as an aid in determining the distribution of sand, silt, and clay.

Interrelation of the Sediments: If all the sediments were being deposited at the present time, the median diameters should show a smooth gradation from the coarsest to the finest. The gravels show an abrupt change to the finer sediments; the sands, silts, and clays grade into each other. It is probable that the finer materials represent different facies of a single depositional cycle and that the gravels have a different origin. Most photographs (WHOI Ref. Nos. 52-38 and 52-91) show that organisms are growing on the gravel. This indicates that the

gravel is not now being moved over the bottom. The same photographs show that the sand and coarse silts are often rippled and that they are being moved over the bottom at the present time. These facts suggest that the sands and silts are all part of the present environment and that the gravels reached their positions at some time in the past. A more complete discussion of the interrelationship of the sediments will be presented in the report in preparation on the Kullenberg cores.

DESCRIPTION OF THE SEDIMENTS

Gravels: The great majority of the gravels samples are classified as clean gravels. Photographs (WHOI Ref. Nos. 52-38 and 52-91) have shown that the gravels reach at least 60 cm. in maximum dimensions but the largest gravel sampled is 30 cm. All of the rocks found on shore have been identified in the bottom sediments including granite, diorite, granodiorite, schist, gneiss, shale, and basalt. In addition many samples contain clay galls. The clay galls are hardened lumps of clay with a red-brown, iron-oxide, surface coating. Most of them have been bored by molluscs. They are often rounded and appear to have been transported from their place of origin. However, they are too fragile to have been transported for any great distance with the harder rocks of the gravel. They must have been formed in shallow water because of the oxidized and weathered coating, because they are partially dried clays, and because of the presence of mollusc borings. In addition sandy gravel, and clayey silty sandy gravel also occur. These sediments have all the characteristics of the clean gravel including the clay galls and apparently represent gravel diluted by the finer grained sediments. They are much less frequently found than the clean gravels. Scattered pieces of coal, cinders, glass, and broken crockery in all of these sediments indicate that debris has been dumped overboard.

Sands: Clean sands are found relatively rarely in the sediments of Boston Harbor. Those that do exist are fine sands with good to excellent sorting. The most common sediment in the sand grade is a silty sand which ranges from fine to very fine and has moderate to good sorting. Gravelly sands also occur and are the finer grained equivalent of the gravels. Silty gravelly sand, silty clayey sand, and silty clayey gravelly sand also occur. All of the sands would be classified arkose on the basis of mineralogy (WHOI Ref. No. 52-85).

Silts: The most abundant sediment in the silt size is a sandy silt which is coarse grained with moderate sorting. It is finer grained equivalent of the silty sand. Medium grained,

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poorly sorted silts are the next most abundant sediments of the silt size. Silt, clayey silt, and gravelly sandy clayey silts are also found.

Clays: A few samples were fine grained enough to be classified as silty clays. They are similar to the clayey silts, being coarse clay with poor sorting.

Shells: Shells have not been differentiated from the inorganic sedimentary particles of the same size. Shells are a minor constituent of the Boston Harbor sediments except for a few small patches south of Marblehead. The shells would undoubtedly act as inorganic particles of equal size when the mechanical and engineering properties of the sediment are considered.

RATE OF SEDIMENTATION

An estimate of the rate of sedimentation in the Inner Harbor was given in WHOI Ref. No. 51-84. A similar estimate of the rate of sedimentation in the area covered by the bottom sediment chart would depend upon the establishing of a definite time horizon within the sedimentary column. So far this has not been accomplished, but it is possible to speculate on the rate of sedimentation from other data. One of the original effluents of Boston Harbor was located at Shirley Gut, just north of Deer Island. North Channel was dredged ca. 1905. The organic content of the surface samples shows a high value at the end of North Channel and a low value off the location of Shirley Gut. At 24 inch depth the situation is reversed with higher values off Shirley Gut. This suggests that the most of the deposition of organic silts occurred off the mouth of the open channels. The rate of sedimentation from this data would be about 24 inches in 50 years, or about 1/2 inch/year. This rate is probably a maximum value for the area as it is located near the source of the organic materials and near shore where the rate of sedimentation would be expected to be high. In any case the yearly deposition of sediment is so small that military operations would not be affected.

SUMMARY

1. Gravel is the most important sediment in Boston Harbor. Most of the area to the east and northeast of North Channel is floored by gravel. Some of the gravel reaches

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sizes of 60 cm. in maximum dimensions. It is composed of the rocks found on the land together with clay galls derived more locally.

2. Silty sand and sandy silt are the next most important sediments in Boston Harbor. They are confined to the northwestern border of the area surveyed and to the deeper water at the extreme eastern edge of the area. They are generally well sorted and are probably marine sediments.

3. Shells are relatively unimportant in the Boston Harbor area and have not been separately listed. Only a few small patches south of Marblehead have any significant quantity of shells. They would undoubtedly act as inorganic particles of the same size when the mechanical and engineering properties of the sediment are considered.

4. The sands, silts, and clays are being deposited today. The gravels are representative of a past period of deposition.

5. The rate of sedimentation is not greater than about 1/2 inch/year and is certainly very much smaller for the area considered as a whole. Military operations will not be affected by deposition of sediments.

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U. S. Coast and Geodetic Survey, Chart No. 1208.

_____, Chart No. 1106-BS (confidential).

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Woods Hole Oceanographic Institution

Ref. No. 51-73, Hydrographic survey in the Boston area,
Geology of Boston Harbor and vicinity (Restricted).

— Ref. No. 51-84, Literature survey of oceanographic infor-
mation concerning Boston Harbor (Restricted).

— Ref. No. 52-38, Hydrographic survey in the Boston area,
Bottom photography (Confidential).

— Ref. No. 52-85, Hydrographic survey in the Boston area,
Mineralogy of a few sediment samples from Boston Harbor
(Confidential).

— Ref. No. 52-91, Hydrographic survey in the Boston area,
Bottom photography (cont'd.) (Confidential).

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A P P E N D I X A

Station Locations and Sedimentary Data

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Sta. #	Lat. 42°	Long. 70°	Type of Sediment	Median (mm.)	Sorting	Skewness	Kurtosis
1	22.18	55.21	sandy GRAVEL	>4	--	--	--
2	22.20	54.48	clayey Sandy SILT	0.047	3.81	0.42	--
3	21.94	53.81	no sample				
4	22.55	53.88	sandy GRAVEL	>4			
5	22.98	53.79	silty SAND	0.098	0.63	0.21	2.27
6	22.60	53.15	GRAVEL	>4			
7	23.36	52.66	sandy GRAVEL	>4			
8	22.79	52.65	silty SAND	0.123	0.99	0.16	--
9	22.64	52.54	sandy GRAVEL	>4			
10	22.89	52.41	GRAVEL	>4			
11	23.64	52.35	sandy clayey SILT	0.023	1.79	0.39	1.47
12	23.64	51.69	GRAVEL	>4			
13	23.92	52.40	GRAVEL	>4			
14	24.35	51.71	clayey sandy SILT	0.047	2.00	0.45	--
15	25.14	51.83	silty sandy GRAVEL	>4			
16	24.77	51.25	silty sandy GRAVEL	>4			
17	24.26	50.71	silty SAND	0.088	0.79	0.27	2.74
18	25.07	50.71	GRAVEL	>4			
19	25.77	50.71	clayey sandy SILT	0.047	2.20	0.21	0.99
20	25.45	50.11	silty SAND	0.156	0.98	0.52	2.67
21	25.09	49.95	silty SAND	0.066	0.63	-0.36	3.24
22	25.85	49.72	sandy SILT	0.054	1.17	0.06	2.61
23	26.49	49.76	clayey silty GRAVEL	>4			
24	28.88	40.13	GRAVEL	>4			
25	28.24	40.87	clayey sandy SILT	0.060	2.13	0.25	0.05
26	28.57	41.75	silty sandy GRAVEL	1.37			
27	28.85	41.08	clayey sandy SILT	0.038	2.08	0.30	1.23
28	29.17	41.59	GRAVEL	>4			
29	28.95	42.62	GRAVEL	>4			
30	28.51	42.46	sandy GRAVEL	>4			
31	28.17	42.15	GRAVEL	>4			
32	28.27	43.16	GRAVEL	>4			
33	27.71	43.73	GRAVEL	>4			
34	28.17	44.10	silty SAND	0.080	1.18	0.96	--
35	27.93	45.00	GRAVEL	>4			
36	27.52	44.87	no sample				
37	28.70	44.72	GRAVEL	>4			
38	20.13	57.45	GRAVEL	>4			
39	20.34	56.80	sandy GRAVEL	>4			
40	20.67	56.39	sandy GRAVEL	>4			
41	20.94	56.01	GRAVEL	>4			
42	21.45	55.69	GRAVEL	>4			
43	21.89	55.33	gravelly SAND	0.82	1.50	-0.25	--
44	25.57	48.88	GRAVEL	>4			
45	25.97	49.38	silty SAND	0.78	1.83	0.15	--
46	26.35	48.69	GRAVEL	>4			
47	26.27	47.89	clayey SILT	0.006	2.60	0.31	0.59
48	26.80	48.44	GRAVEL	>4			

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Sta. #	Lat. 42°	Long. 70°	Type of Sediment	Median (mm.)	Sorting	Skew-ness	Kurto-sis
49	27.21	48.95	silty gravelly SAND	0.102	--	--	--
50	27.04	47.86	silty SAND	0.071	0.77	0.30	4.59
51	26.95	47.00	GRAVEL	>4	--	--	--
52	27.52	47.33	gravelly SAND	0.253	--	--	--
53	28.10	47.67	silty gravelly SAND	0.130	--	--	--
54	27.58	46.67	silty SAND	0.154	0.94	0.29	0.76
55	27.30	45.84	GRAVEL	>4	--	--	--
56	27.96	46.05	GRAVEL	>4	--	--	--
57	28.34	46.65	GRAVEL	>4	--	--	--
58	28.04	45.46	sandy GRAVEL	2.75	--	--	--
59	29.16	43.94	GRAVEL	>4	--	--	--
60	28.77	43.73	GRAVEL	>4	--	--	--
61	28.31	43.57	GRAVEL	>4	--	--	--
63	30.57	39.54	sandy SILT	0.052	1.12	-0.04	1.28
64	30.60	40.05	sandy GRAVEL	>4	--	--	--
65	29.70	41.04	GRAVEL	>4	--	--	--
66	29.84	41.74	GRAVEL	>4	--	--	--
67	29.66	42.37	gravelly silty SAND	0.112	--	--	--
68	29.73	43.29	gravelly silty SAND	0.200	2.60	-0.26	--
69	29.44	44.29	silty sandy GRAVEL	>4	--	--	--
70	29.23	44.27	sandy GRAVEL	>4	--	--	--
71	29.33	44.97	silty SAND	0.126	0.98	0.26	2.42
72	29.12	45.56	gravelly SAND	0.156	1.20	-0.65	--
73	28.94	46.20	gravelly SAND	0.157	--	--	--
74	28.86	47.12	silty SAND	0.118	0.77	0.36	0.68
75	28.67	48.01	silty SAND	0.210	1.28	-0.12	--
76	28.26	48.46	silty SAND	0.166	0.89	0.30	0.92
77	27.96	48.83	silty SAND	0.154	1.63	-0.01	--
78	21.90	47.70	GRAVEL	>4	--	--	--
79	21.90	46.96	GRAVEL	>4	--	--	--
80	21.74	46.61	no sample				
81	21.83	45.86	GRAVEL	>4	--	--	--
82	22.08	44.47	GRAVEL	>4	--	--	--
83	21.99	44.27	sandy GRAVEL	>4	--	--	--
84	21.99	43.74	GRAVEL	>4	--	--	--
85	27.64	49.50	GRAVEL	>4	--	--	--
86	27.25	49.79	sandy SILT	0.056	0.63	-0.43	3.81
87	26.87	50.30	clayey sandy SILT	0.048	1.38	0.09	1.63
88	26.39	50.85	sandy GRAVEL	>4	--	--	--
89	26.04	51.16	GRAVEL	>4	--	--	--
90	25.64	51.71	sandy GRAVEL	>4	--	--	--
91	25.37	52.32	GRAVEL	>4	--	--	--
92	24.84	52.38	silty SAND	0.120	0.83	0.28	1.29
93	24.46	52.53	SILT	0.016	0.65	-0.77	3.69
94	24.38	52.97	GRAVEL	>4	--	--	--

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95	23.45	53.39	no sample				
96	22.27	55.59	no sample				
97	22.70	55.08	silty SAND	0.092	0.75	0.16	3.41
98	23.09	54.71	no sample				
99	23.45	54.27	GRAVEL	>4	--	--	--
100	23.88	53.85	sandy SILT	0.046	1.13	0.73	1.82
101	25.79	48.27	GRAVEL	>4	--	--	--
102	26.15	47.00	GRAVEL	>4	--	--	--
103	26.75	47.75	clayey SILT	0.008	1.88	0.19	0.60
104	26.51	47.85	gravelly clayey SILT	0.011	3.68	0.69	0.79
105	28.75	40.13	GRAVEL	>4	--	--	--
106	28.58	40.60	clayey sandy SILT	0.047	2.33	0.16	1.37
107	28.20	41.37	GRAVEL	>4	--	--	--
108	27.73	42.41	GRAVEL	>4	--	--	--
109	27.45	43.06	GRAVEL	>4	--	--	--
110	27.53	48.83	GRAVEL	>4	--	--	--
111	27.17	43.52	GRAVEL	>4	--	--	--
112	26.84	44.15	GRAVEL	>4	--	--	--
113	26.75	44.65	sandy GRAVEL	>4	--	--	--
114	27.34	44.67	GRAVEL	>4	--	--	--
115	27.48	45.25	GRAVEL	>4	--	--	--
116	26.97	45.16	no sample				
117	26.40	45.32	silty sandy GRAVEL	3.03	--	--	--
118	26.74	45.95	GRAVEL	>4	--	--	--
119	27.07	46.55	GRAVEL	>4	--	--	--
120	26.55	46.47	GRAVEL	>4	--	--	--
121	26.18	45.86	no sample				
122	25.86	46.51	GRAVEL	>4	--	--	--
123	25.48	47.13	GRAVEL	>4	--	--	--
124	25.27	47.65	GRAVEL	>4	--	--	--
125	25.05	48.28	GRAVEL	>4	--	--	--
126	24.89	48.95	silty clayey SAND	0.085	4.53	0.45	--
127	24.58	49.45	sandy GRAVEL	>4	--	--	--
128	23.98	51.00	clayey silty SAND	0.114	3.47	0.55	0.48
129	23.26	51.26	sandy GRAVEL	>4	--	--	--
130	23.56	50.64	clayey sandy GRAVEL	>4	--	--	--
131	23.84	49.87	GRAVEL	>4	--	--	--
132	23.21	39.93	sandy clayey gravelly SILT	0.039	--	--	--
132b	23.21	39.83	clayey SILT	0.022	2.25	0.43	--
133	23.22	40.55	clayey sandy gravelly SILT	0.052	--	--	--
133b	23.13	41.33	clayey silty SAND	0.051	4.30	0.14	--
134	23.28	41.19	silty sandy GRAVEL	>4	--	--	--
134b	23.13	41.10	silty clayey gravelly SAND	0.291	--	--	--

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135	23.23	42.16	GRAVEL	>4	--	--	--
136	23.23	42.30	sandy GRAVEL	>4	--	--	--
137	23.22	43.01	GRAVEL	>4	--	--	--
138	23.28	43.67	GRAVEL	>4	--	--	--
139	23.23	44.35	sandy GRAVEL	>4	--	--	--
140	23.30	45.21	GRAVEL	>4	--	--	--
141	23.36	45.91	GRAVEL	>4	--	--	--
142	23.27	46.73	GRAVEL	>4	--	--	--
143	23.29	47.50	GRAVEL	>4	--	--	--
144	23.10	48.22	GRAVEL	>4	--	--	--
145	23.13	48.10	GRAVEL	>4	--	--	--
146	23.16	48.54	SAND	0.189	0.42	0.00	--
146b	23.02	48.71	gravelly SAND	0.312	--	--	--
147	23.28	49.35	GRAVEL	>4	--	--	--
148	23.14	50.32	clayey sandy SILT	0.044	2.88	0.37	0.43
148b	22.93	50.34	clayey SILT	0.006	--	--	--
149	23.24	50.86	GRAVEL	>4	--	--	--
150	22.94	51.45	GRAVEL	>4	--	--	--
151	22.82	52.10	GRAVEL	>4	--	--	--
152b	23.57	40.12	gravelly clayey sandy SILT	>0.054	4.34	0.06	--
153b	23.68	39.70	sandy clayey SILT	0.022	3.05	0.35	--
154b	23.41	40.61	clayey SILT	0.006	--	--	--
155b	23.71	41.07	silty gravelly SAND	0.378	3.35	0.10	--
156	23.80	41.89	GRAVEL	>4	--	--	--
157	23.38	42.62	GRAVEL	>4	--	--	--
158	22.89	42.73	sandy GRAVEL	>4	--	--	--
159	23.33	48.28	sandy GRAVEL	>4	--	--	--
160	23.29	49.06	sandy GRAVEL	>4	--	--	--
161	23.48	49.12	GRAVEL	>4	--	--	--
162	23.68	50.31	silty SAND	0.089	0.80	0.11	2.58
162b	23.57	50.32	silty SAND	0.083	0.89	0.03	5.50
163	23.26	49.83	clayey sandy SILT	0.036	1.96	0.50	1.03
163b	23.20	49.97	silty CLAY	0.003	--	--	--
164	23.01	51.25	GRAVEL	>4	--	--	--
166b	22.44	54.36	clayey SILT	0.017	--	--	--
169b	22.80	52.60	silty CLAY	0.001	--	--	--
170	23.64	50.76	clayey sandy GRAVEL	3.32	--	--	--
170b	23.58	50.87	sandy GRAVEL	1.42	--	--	--
171	23.56	48.67	GRAVEL	>4	--	--	--
172	23.58	48.14	GRAVEL	>4	--	--	--
173	22.94	49.37	gravelly SAND	>0.237	2.14	0.79	--
173b	22.82	49.41	silty CLAY	0.003	--	--	--
174	23.03	51.15	silty SAND	0.068	0.75	0.07	4.72
174b	22.97	51.16	silty SAND	0.081	0.62	0.29	3.62
175	23.38	51.35	SAND	0.165	0.74	-0.20	0.74

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175b	23.38	51.42	silty SAND	0.092	0.65	0.46	3.89
176	23.21	52.07	GRAVEL	>4	--	--	--
177	22.62	51.91	GRAVEL	>4	--	--	--
178	22.53	52.62	sandy clayey SILT	0.025	1.68	0.37	0.95
178b	22.44	52.58	sandy clayey SILT	0.026	1.95	0.46	1.32
179	22.48	53.29	clayey gravelly sandy SILT	0.068	3.09	-0.01	--
179b	22.38	53.31	silty SAND	0.071	1.60	0.17	2.18
180	22.70	54.73	silty SAND	0.106	0.80	0.32	0.59
180b	22.68	54.69	clayey SILT	0.027	2.47	0.68	--
183b	22.22	53.81	clayey SILT	0.010	3.05	0.34	--
184b	23.07	52.77	sandy clayey SILT	0.026	3.23	0.35	--
187b	22.98	54.29	silty SAND	0.112	0.65	0.11	2.16
188b	23.47	53.97	sandy clayey SILT	0.012	3.60	0.42	--
189b	23.80	53.52	clayey SILT	0.013	--	--	--
192b	25.18	52.08	clayey sandy SILT	0.051	1.68	0.14	1.63
194b	26.10	51.28	clayey silty SAND	0.095	1.80	0.42	1.28
197b	25.68	51.78	silty CLAY	0.004	--	--	--
198b	25.35	52.34	clayey sandy SILT	0.056	1.67	0.13	1.93
200b	26.36	49.57	clayey sandy SILT	0.049	1.90	0.58	1.24
201b	26.74	49.10	clayey gravelly sandy SILT	0.083	4.97	-0.06	--
202b	26.88	48.83	silty SAND	0.062	0.03	-0.03	4.16
203b	27.33	48.21	clayey silty SAND	0.088	1.40	0.07	--
204b	27.68	47.85	clayey silty SAND	0.093	2.63	0.40	1.12
206b	28.12	47.33	silty SAND	0.113	0.80	0.58	2.56
207b	28.79	46.95	silty SAND	0.101	0.74	0.34	--
208b	28.66	46.10	sandy clayey SILT	0.018	--	--	--
209b	29.21	45.34	silty SAND	0.104	1.14	0.29	2.10
210b	22.38	55.38	silty SAND	0.123	0.85	0.48	2.34
211b	22.76	55.08	silty SAND	0.106	0.68	0.38	0.68
213b	23.47	54.29	SAND	0.189	0.58	0.34	1.53
214b	23.76	53.67	sandy SILT	0.051	0.84	0.73	3.22
216b	24.56	53.05	silty gravelly SAND	0.252	--	--	--
217b	24.79	51.87	SAND	0.185	0.62	0.00	1.45
219b	23.97	52.74	sandy clayey SILT	0.009	2.83	0.23	--
221b	23.16	53.73	silty CLAY	0.004	2.93	0.10	--
222b	22.86	54.02	silty SAND	0.124	1.01	0.30	1.59
224b	25.77	51.03	silty SAND	0.099	1.06	0.05	2.06
225b	26.53	50.09	clayey sandy SILT	0.049	3.24	0.65	--
226b	26.87	49.65	clayey silty SAND	0.059	1.14	0.23	2.52
227b	27.18	48.91	silty SAND	0.067	1.50	0.37	1.18
228b	27.35	48.26	silty SAND	0.094	0.81	0.84	3.05
229b	26.88	47.82	clayey silty sandy GRAVEL	0.119	--	--	--
231b	26.32	48.96	clayey sandy SILT	0.049	2.72	0.56	--

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233b	25.29	50.29	sandy clayey SILT	0.007	2.96	0.10	--
234b	25.68	50.28	silty SAND	0.059	1.62	0.16	1.30
235b	27.32	47.39	silty sandy GRAVEL	3.190	--	--	--
237b	28.12	46.37	silty gravelly SAND	0.188	--	--	--
238b	28.51	45.88	silty SAND	0.157	1.50	0.22	--
239b	28.85	45.16	silty sandy GRAVEL	0.192	--	--	--
241b	27.92	47.70	clayey silty gravelly SAND	0.124	--	--	--
242b	28.60	46.70	clayey SILT	0.008	--	--	--
243b	29.06	46.16	clayey SILT	0.006	--	--	--
245b	29.56	44.97	clayey SILT	0.005	--	--	--
246b	30.01	44.53	gravelly silty SAND	0.152	1.41	0.00	--
249b	29.47	44.66	silty SAND	0.126	1.13	0.27	2.85
251b	21.75	41.73	silty CLAY	0.003	--	--	--
252b	25.55	42.72	GRAVEL	>4	--	--	--
253	24.32	54.82	no sample				
254	23.78	55.21	gravelly SAND	0.228	--	--	--
255	23.44	55.79	SAND	0.233	0.62	0.13	0.77
256	23.11	56.15	GRAVEL	>4	--	--	--
257	22.76	56.71	silty SAND	0.146	0.93	-0.05	0.60
258	22.40	57.24	GRAVEL	>4	--	--	--
259	22.35	56.30	SAND	0.159	0.50	0.10	2.46
260	21.55	56.35	gravelly SAND	0.329	--	--	--
261	21.84	56.06	no sample				
262	21.79	57.18	GRAVEL	>4	--	--	--
263	22.71	55.90	clayey sandy SILT	0.030	2.15	0.28	0.68
264	22.99	55.49	GRAVEL	>4	--	--	--
265	23.32	55.07	GRAVEL	>4	--	--	--
266	24.16	48.67	GRAVEL	>4	--	--	--
267	24.52	48.26	sandy GRAVEL	>4	--	--	--
268	24.63	47.82	GRAVEL	>4	--	--	--
269	25.07	47.23	GRAVEL	>4	--	--	--
270	25.38	46.36	GRAVEL	>4	--	--	--
271	25.20	46.63	sandy GRAVEL	>4	--	--	--
272	25.95	46.09	GRAVEL	>4	--	--	--
273	25.88	45.45	SAND	0.142	0.39	0.46	7.26
274	26.34	44.19	GRAVEL	>4	--	--	--
275	26.66	43.48	GRAVEL	>4	--	--	--
276	27.02	42.99	GRAVEL	>4	--	--	--
277	27.12	42.38	GRAVEL	>4	--	--	--
278	27.38	41.83	GRAVEL	>4	--	--	--
279	27.59	41.28	sandy GRAVEL	>4	--	--	--
280	27.85	40.64	silty sandy GRAVEL	>4	--	--	--
281	28.07	40.02	GRAVEL	>4	--	--	--
282	26.27	43.22	GRAVEL	>4	--	--	--
283	26.02	43.63	GRAVEL	>4	--	--	--

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284	25.76	44.25	GRAVEL	>4	--	--	--
285	25.52	44.86	GRAVEL	>4	--	--	--
286	25.15	45.54	GRAVEL	>4	--	--	--
287	24.77	46.10	sandy GRAVEL	>4	--	--	--
288	24.44	46.70	GRAVEL	>4	--	--	--
289	24.12	47.22	GRAVEL	>4	--	--	--
290	23.79	47.73	GRAVEL	>4	--	--	--
291	23.54	48.34	GRAVEL	>4	--	--	--
292	23.64	46.91	GRAVEL	>4	--	--	--
293	23.73	46.35	GRAVEL	>4	--	--	--
294	23.78	45.69	gravelly SAND	0.348	--	--	--
295	23.83	44.99	silty clayey GRAVEL	>4	--	--	--
296	23.76	44.37	GRAVEL	>4	--	--	--
297	23.79	43.71	GRAVEL	>4	--	--	--
298	23.84	43.12	sandy GRAVEL	>4	--	--	--
299	23.85	42.50	GRAVEL	>4	--	--	--
300	23.88	41.75	silty sandy GRAVEL	3.949	--	--	--
301	24.48	40.14	GRAVEL	>4	--	--	--
302	24.36	40.79	sandy GRAVEL	>4	--	--	--
303	24.26	41.56	silty gravelly SAND	0.141	3.22	-0.21	--
304	24.34	42.14	GRAVEL	>4	--	--	--
305	24.37	42.82	GRAVEL	>4	--	--	--
306	24.42	43.43	GRAVEL	>4	--	--	--
307	24.40	44.10	sandy GRAVEL	>4	--	--	--
308	24.37	44.74	GRAVEL	>4	--	--	--
309	24.37	45.29	GRAVEL	>4	--	--	--
310	24.35	45.98	GRAVEL	>4	--	--	--
311	24.94	45.17	GRAVEL	>4	--	--	--
312	24.96	44.55	GRAVEL	>4	--	--	--
313	24.99	43.72	GRAVEL	>4	--	--	--
314	24.98	43.04	GRAVEL	>4	--	--	--
315	24.93	42.42	GRAVEL	>4	--	--	--
316	24.89	41.76	GRAVEL	>4	--	--	--
317	24.78	41.19	silty sandy GRAVEL	1.582	--	--	--
318	24.77	40.50	gravelly sandy clayey SILT	0.049	--	--	--
319	25.35	40.13	silty sandy GRAVEL	3.029	--	--	--
320	25.44	40.79	sandy silty GRAVEL	3.085	--	--	--
321	25.34	41.45	GRAVEL	>4	--	--	--
322	25.42	42.22	GRAVEL	>4	--	--	--
323	25.40	42.86	GRAVEL	>4	--	--	--
324	25.48	43.50	GRAVEL	>4	--	--	--
325	25.53	44.08	GRAVEL	>4	--	--	--
326	25.90	42.96	GRAVEL	>4	--	--	--
327	25.89	42.54	sandy GRAVEL	>4	--	--	--
328	25.85	41.94	GRAVEL	>4	--	--	--

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Sta. #	Lat. 42°	Long. 70°	Type of Sediment	Median (mm.)	Sorting	Skew-ness	Kurto-sis
329	25.87	41.30	silty sandy GRAVEL	1.416	--	--	--
330	25.81	40.51	sandy GRAVEL	>4	--	--	--
331	26.40	40.04	silty sandy GRAVEL	1.322	--	--	--
332	26.39	40.75	GRAVEL	>4	--	--	--
333	26.41	41.59	GRAVEL	>4	--	--	--
334	26.93	40.17	GRAVEL	>4	--	--	--
335	26.97	40.93	GRAVEL	>4	--	--	--
336	27.61	40.07	GRAVEL	>4	--	--	--
337	27.38	40.61	no sample				
338	27.13	41.30	sandy GRAVEL	>4	--	--	--
339	26.81	41.96	GRAVEL	>4	--	--	--
340	26.54	42.60	sandy GRAVEL	>4	--	--	--
341	26.82	43.12	GRAVEL	>4	--	--	--
342	29.98	46.42	SAND	0.136	0.49	-0.41	1.76
343	30.96	45.09	gravelly SAND	0.467	0.80	-0.25	--
344	30.46	45.28	GRAVEL	>4	--	--	--
345	30.57	44.49	silty SAND	0.083	1.24	0.19	2.55
346	30.60	43.82	sandy SILT	0.053	0.56	-0.66	1.70
347	30.59	43.23	silty SAND	0.073	0.56	0.29	4.49
348	31.10	43.13	silty SAND	0.076	0.51	0.51	3.98
349	31.07	43.75	silty SAND	0.074	0.67	0.42	3.69
350	31.03	44.51	silty SAND	0.169	1.74	0.33	1.69
351	29.72	47.27	GRAVEL	>4	--	--	--
352	29.38	47.66	GRAVEL	>4	--	--	--
353	29.03	48.04	GRAVEL	>4	--	--	--
354	28.71	48.43	SAND	0.289	0.98	-0.03	0.52
355	20.27	56.53	GRAVEL	>4	--	--	--
356	20.79	56.27	GRAVEL	>4	--	--	--
357	21.23	55.90	GRAVEL	>4	--	--	--
358	21.65	55.60	GRAVEL	>4	--	--	--
359	22.07	55.30	gravelly SAND	0.304	--	--	--
360	21.50	54.42	GRAVEL	>4	--	--	--
361	21.04	54.82	SAND	0.457	0.44	-0.11	0.86
362	20.57	55.21	clayey SILT	0.007	1.93	-0.33	0.69
363	20.50	55.86	GRAVEL	>4	--	--	--
364	20.23	57.21	sandy GRAVEL	>4	--	--	--
365	20.12	57.89	sandy GRAVEL	>4	--	--	--
366	20.05	58.53	clayey sandy GRAVEL	0.456	--	--	--
367	19.97	59.20	gravelly SAND	>0.245	1.15	-0.39	--
375	31.09	42.48	silty SAND	0.074	0.61	0.21	4.40
376	31.06	41.85	silty SAND	0.066	0.59	0.03	3.39
377	31.04	41.12	GRAVEL	>4	--	--	--
378	30.99	40.48	sandy SILT	0.051	1.12	0.16	2.08
379	31.03	39.79	sandy SILT	0.046	1.35	0.38	1.56
380	30.72	40.01	clayey sandy SILT	0.043	2.26	0.24	1.14
381	30.72	40.59	sandy SILT	0.051	1.07	0.13	2.00
382	30.66	41.60	sandy SILT	0.058	0.75	0.11	2.81

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Sta. #	Lat. 42°	Long. 70°	Type of Sediment	Median (mm.)	Sorting	Skewness	Kurtosis
383	30.62	42.22	silty sandy GRAVEL	0.649	--	--	--
384	30.61	42.74	sandy SILT	0.056	0.76	0.09	3.00
385	30.17	41.74	GRAVEL	>4	--	--	--
386	30.15	42.29	sandy SILT	0.055	0.96	0.00	2.38
387	30.08	43.14	no sample				
388	30.13	43.97	sandy SILT	0.056	0.69	-0.12	--
389	30.12	44.60	silty SAND	0.167	1.53	0.13	1.67
390	30.13	45.30	no sample				
391	30.16	46.02	gravelly SAND	0.159	--	--	--
392	30.63	46.11	SAND	0.188	0.38	-0.24	1.08
393	29.42	46.50	gravelly SAND	0.324	--	--	--
394	29.08	46.93	SAND	0.170	0.51	-0.08	2.53
395	28.36	48.98	SAND	0.175	0.83	-0.51	--
396	28.10	49.47	no sample				
397	27.74	49.88	no sample				
398	27.38	50.52	GRAVEL	>4	--	--	--
399	26.99	50.89	GRAVEL	>4	--	--	--
400	26.57	51.42	sandy GRAVEL	>4	--	--	--
401	26.26	51.83	sandy GRAVEL	>4	--	--	--
402	25.91	52.27	silty SAND	0.119	1.19	0.04	0.27
403	25.61	52.74	GRAVEL	>4	--	--	--
404	25.37	53.23	GRAVEL	>4	--	--	--
405	22.62	49.93	clayey SILT	0.010	1.55	0.15	1.50
406	22.60	49.37	GRAVEL	>4	--	--	--
407	22.68	48.67	SAND	0.186	0.44	-0.14	0.70
408	22.70	47.89	GRAVEL	>4	--	--	--
409	22.70	47.39	GRAVEL	>4	--	--	--
410	22.70	46.72	GRAVEL	>4	--	--	--
411	22.72	46.18	GRAVEL	>4	--	--	--
412	22.71	45.49	GRAVEL	>4	--	--	--
413	22.69	44.87	GRAVEL	>4	--	--	--
414	22.73	44.21	gravelly SAND	0.164	--	--	--
415	22.75	43.52	GRAVEL	>4	--	--	--
416	22.74	42.86	sandy GRAVEL	>4	--	--	--
417	22.73	42.21	gravelly SAND	0.183	--	--	--
418	22.69	41.51	gravelly SAND	0.275	--	--	--
419	22.71	40.88	GRAVEL	>4	--	--	--
420	22.68	40.27	silty GRAVEL	>4	--	--	--
421	22.09	40.01	silty sandy GRAVEL	>4	--	--	--
422	22.13	40.68	sandy GRAVEL	>4	--	--	--
423	22.10	41.28	silty SAND	0.125	0.74	0.65	2.81
424	22.20	42.00	gravelly silty SAND	0.189	--	--	--
425	22.26	42.66	sandy GRAVEL	>4	--	--	--
426	22.33	43.35	GRAVEL	>4	--	--	--
427	22.32	44.02	GRAVEL	>4	--	--	--
428	22.32	44.72	GRAVEL	>4	--	--	--
429	22.24	45.49	GRAVEL	>4	--	--	--

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Sta. #	Lat. 42°	Long. 70°	Type of Sediment	Median (mm.)	Sorting	Skew-ness	Kurto-sis
430	22.18	46.04	clayey sandy SILT	0.008	1.97	-0.24	1.16
431	22.15	46.76	GRAVEL	>4	--	--	--
432	22.25	47.48	GRAVEL	>4	--	--	--
433	22.11	48.10	GRAVEL	>4	--	--	--
434	22.11	48.63	GRAVEL	>4	--	--	--
435	22.10	49.19	GRAVEL	>4	--	--	--
436	22.11	49.86	gravelly sandy clayey SILT	0.041	3.57	-0.24	--
437	21.67	48.56	sandy GRAVEL	>4	--	--	--
438	21.73	47.98	GRAVEL	>4	--	--	--
439	21.77	47.43	GRAVEL	>4	--	--	--
440	21.76	46.78	GRAVEL	>4	--	--	--
441	21.68	46.12	GRAVEL	>4	--	--	--
442	21.63	45.22	GRAVEL	>4	--	--	--
443	21.62	44.50	GRAVEL	>4	--	--	--
444	21.63	44.01	GRAVEL	>4	--	--	--
445	21.64	43.35	GRAVEL	>4	--	--	--
446	21.63	42.70	sandy GRAVEL	>4	--	--	--
447	21.63	42.02	SAND	0.142	0.48	0.19	3.17
448	21.63	41.37	silty SAND	0.101	0.69	0.29	3.68
449	21.60	40.66	silty SAND	0.096	1.62	0.51	1.65
450	21.68	40.05	gravelly sandy clayey SILT	0.046	2.81	0.19	--
451	21.30	40.09	silty sandy GRAVEL	>4	--	--	--
452	21.24	40.72	silty SAND	0.089	0.84	0.42	3.49
453	21.20	41.33	silty SAND	0.124	0.79	0.73	2.23
454	21.21	41.96	SAND	0.133	0.99	-0.63	--
455	21.19	42.55	GRAVEL	>4	--	--	--
456	21.21	43.17	GRAVEL	>4	--	--	--
457	21.24	43.78	GRAVEL	>4	--	--	--
458	21.28	44.48	GRAVEL	>4	--	--	--
459	21.30	45.29	GRAVEL	>4	--	--	--
460	21.23	46.03	GRAVEL	>4	--	--	--

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Fig. 5 Location of Stations

Fig. 6 Bottom Sediment Chart

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out from this Institution;
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A P P E N D I X B

Cumulative Curves of "Orange Peel" Samples
(median diameter < 4 mm.)

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