ENVIRONMENTAL IMPACT STATEMENT

FOR

SHORELINE ENHANCEMENT PROJECT

NEAR SHORE AREAS

ADJACENT TO AND INCLUDING

WEHELAU'ULU FISH POND AT

MANAWAI - KONA DISTRICT, MOLOKAI

MAUI COUNTY

Prepared by

Gene T. Blackburn

July 26, 1972

Project Location

The project area is located 11 miles ESE of Kaunakakai. The land area abuts the highway to the north and extends southward to the sea. Immediately to the west are the remains of two joined fishponds, Kaunaliko'oku and an unnamed pond extending to the south. Adjoining to the east, is Puhaloa Pond.

Area Description

The beach and nearshore area are approximately 1000 feet in length bearing generally east to west. Sand extends from the berm to the low water mark along all save the westerly 100 feet and the easterly 100 feet. To the west sandy mud and rocks to 15" diameter are present and in the eastern extremity debris, mud and a lesser amount of sand extend to the high water mark. The easterly wall of Wehelau'ulu pond is partially exposed near shore at low water and mangroves have begun to grow along the top of the wall approximately 50 feet from shore. The project area

continues 100 feet eastward to and along the western wall of Puhaloa Fish Pond. The pond walls remaining are not exposed at low tide.

The Project

Application has been made to enhance the area by removing debris mud, sediment, silt and coral rubble out to the seaward extremity of Wehelau'ulu pond and along the westerly wall of Puhaloa Pond. This would be accomplished by dredging to an average depth of 4 feet.

Spoiling of the dredged material will be accomplished by removing the material to adjacent property lying to the east controlled by Manawai Corporation where it will be allowed to leach and subsequently remain as fill, or be disposed of as otherwise directed by D.L.N.R.

The size and nature of the material to be removed indicates that it may make good fill material. The topography of the spoiling area shows it to be of slightly less elevation than the berm and a good distance mauka. It is therefore doubtful that the material will return to the sea.

Impact of Dredging

Some 30,000 cubic yards of sediment, debris, coarse sand, basaltic pebbles and coral rubble will be removed. The environment of the nearshore area will no longer be that of a muddy flat area. Presently this area supports few fishes and crustaceans. Removal of the sediment, etc. may very well be beneficial as it will provide a deep water refugium in an almost featureless dead coral shelf. Additionally the undesirable swimming, wading etc. conditions which currently exist will be remedied. *

Impact of Material Disposal

Disposal is to be made mauka of the shoreline. The size and nature of the dredged material indicate that it could remain as fill material.

There appears to be little chance of it returning to the sea even in heavy rain conditions.

Impact of Dredging on Historical Sites

Restoration of the beach area is not likely to have any detrimental effects on sites of historical/archaeological value. The Bishop Museum has offered to make periodic checks during the dredging operation to insure proper handling of any valuable material. This is, however, thought to be a most unlikely occurrence.

Adverse Environmental Effects which Cannot be Avoided Should the Project be Implemented

No permanent adverse effects of the proposed beach improvement project are anticipated. Conditions conducive to increased marine life populations are likely to result. Sediment settling rate analysis indicates that 99% of the fine sediments encountered will settle within 6 hours. 92.5% within minutes on site. Some turbidity will result over a longer period due to a small percentage of organic fines, this however represents less than 1% of the total.

Alternatives to the Proposed Action

By foregoing the proposed project the area could be left as is, and silting and debris accumulation might continue. This action would result in the complete filling in of portions of the area. This would occur over a specifically unknown period of time. Mangrove trees have taken root on the east wall and the fish pond immediately to the east has been filling in and aerial photographs show that approximately half the area has filled in 12 years. Acceleration of this process is experienced as more mangroves take root and hold the sediment.

Mangroves are also in competition for nutrients in the water which are food sources for other marine biota.

The Relationship Between Local Short Term Use of Man's Environment and the Maintenance and Enhancement of Long Term Productivity

Partial restoration of the nearshore area and the cleaning up of the environment to the east (to the adjacent fish pond wall) are the basis for both short and long term recreational usage. Further the enhancement of the dead coral reef flat and its maintenance in an improved condition, may offer habitat area to additional species of marine life. Placement of low wall, similar to existing fish pond walls, across the gap that exists from the west wall of Puhaloa pond to the east corner of Wehelau'ulu pond will limit the introduction of new sediment to the area and is recommended. This will help preserve the improved environmental condition of the area.

Any Irreversible and Irretrievable Commitments of Resources Which Would be Involved in the Proposed Action Should it be Implemented

30,000 cubic yards of fill material will be committed to utilization in adjacent land areas.

Overall Conclusions

1. In light of sediment sampling and analysis turbidity will be minimal and 99% of the sediments will settle in 6 hours or less. On the average, currents of 10 cm/sec, will move portions of 6.5% of the sediments a maximum of about 2 miles.

2. Few if any adverse effects to marine life may be anticipated in the general area of the dredging site; to the contrary, positive effects may result.

3. An enhancement of the beach area will provide increased use opportunities for a multiplicity of recreational purposes.

4. There is no evidence that long range adverse effects will result.

5. The removal of all the sediment debris and mud out to about 350 feet will help prevent its transport into the deeper nearshore recreation area.

6. The total amount of material to be removed has been reduced from approximately 90,000 cu. yds. to approximately 30,000 cu. yds. This results in sizeable reductions in total time, turbidity and spoiling requirements.

Appendix

1. Nevin, Charles (1946), Competency of moving water to transport debris. Bull. Geol. Soc. Amer., Vol. 57, pp. 651-674.

2. Current Data; personal communication, Dr. Klaus Wyrtki, July 1972, Current estimates on site and integrating current meter observations S. E. Molokai. August 1966 - Dr. Robert Harvey.

3. Marine life data, Murphy, Garth, Ph.D. At site, July 1972.

4. Sediment data, Hydrophysics Corp. On site, July 1972 - 115 jetting stations, 7 sediment samples.

5. Communication with local residents and fishermen.

6. Historical considerations; personal communication, Dr. Emory, Bishop Museum.

7. Molokai Studies; Preliminary Research in Human Ecology, Henry T. Lewis, 1970

8. Endangered Hawaiian Archaelogoical Sites Within Maui County; Kenneth P. Emory, Robert J. Hommon, February 1972.

9. Molokai; A Site Survey, Catherine C. Summers, April 1972.

* Fish Counts - three 4" Barracuda less than ten IAO Pranesus Insularum & less than ten Surgeon Fish, widely scattered.

EFFECT ON MARINE LIFE

Apart from the localized effect of the several old fish ponds in the area, the substrate is a typical leeward dead coral reef type. The reef is wide. It is almost without relief for at least 500 yards offshore of the proposed dredging area. Identical habitat extends at least 500 yards east and west of the proposed excavation.

Though the bottom is unrelieved with respect to vegetation, there are patches of coral sand; but these are generally thin. An occasional football-sized piece of coral rubble supporting benthic algae can be found, and more rarely patches of benthic algae growing directly on the sand occur.

Visibility is poor owing to wave disturbance of coral fines. This is apparently the normal condition when high tides occur during the day. (Secchi disc readings are maximally 5 feet.)

Dead coral reef flats with no relief are not favorable habitats for most Hawaiian fishes. This, combined with the poor visibility, accounts for the failure to see any fish during the survey except for small (less than three inches) surgeon fish associated with the occasional coral rubble.

Inside the "pond" the bottom is fairly hard terrigenous sand with occasional patches of benthic plants. There must be a fair amount of fresh water seepage as the salinity along shore is depressed (32o/oo). A few adult Iao (Pranesus insularum) were seen in the pond area, and three 4" barracudas (Sphyraena barracuda) were seen just west of the pond.

Interviews with shoreside residents suggest that mullet are occasionally taken on the coral flat, and that a few octopuses (erroneously called squid) are taken in the general area.

It is difficult to project any adverse effects to marine life from the proposed excavation. Fines are almost absent from the sediments in question,

and even if they were present, the near absence of silt-sensitive organisms such as corals would suggest that there would be little damage, even of a temporary nature. The proposed excavation might, in fact, be beneficial as it would provide a deep water refugium in an otherwise almost featureless dead coral shelf. Fishes might take refuge there during low tide and forage over the flats during higher tides. This appears to happen in Kaneohe Bay following the creation of small channels.

SEDIMENT ANALYSIS

A total of seven sediment samples were taken in the area to be dredged. Samplings were spaced across the area to yield a concept of (1) the lateral distribution of the present sediment and (2) the mode and direction of sediment transport through the region.

Results of this sediment analysis indicate an average of 7.5% fine grains with the median being larger in the coarse to medium silt range. In 90 minutes, 75% of the fine material settled one foot. In less than 12 hours all the particles that will settle under lab conditions will have settled. The remainder was less than 1% of the sediment and this fraction will remain suspended in the water.

(a) Current measurements.

Observations on the site and previous measurements along the coast (5 miles west) just outside the reef are in close agreement and show a predominant current of 10 cm/sec setting to the west. Tidal currents fluctuate in east-west directions. Currents of 10 cm/sec will hold in suspension particles of less than 0.06 mm diameter (Nevin, 1946).

Conclusion

All of the coarse sediments (92.5% of total) will be redeposited within minutes at the dredging site. Approximately 6.5% will be caught up in coastal eddies and will form flocculent precipitates that will cause settling to the bottom within 6 hours.

The remaining 1%, composed of colloidal material and organic debris, will remain in suspension until it decomposes weeks after leaving the Molokai area.

SEDIMENT ANALYSIS

Introduction

A total of seven sediment samples were taken in the project area. The sampling was distributed in such a way as to yield a concept of (1) the lateral distribution of present sediments and (2) the mode and direction of sediment transport through the region.

All samples were dried and run through a series of sieves to determine the distribution by weight percentage of the various grain sizes down to 4 phi (0.062 mm diameter). The fine fraction, below 4 phi, was then analyzed in settling columns, using colorimetric testing for turbidity in a centrifuge.

Results

The weight percentages of various grain sizes in seven samples are listed in the Appendix.

In the coarse fraction, samples 1, 2, 4, and 6 were found to consist of 50% or more of very coarse sand, granules, and pebbles. Samples 3, 5, and 7 are somewhat finer, but the median is still in the coarse to medium sand range.

The fine fraction (smaller than 4 phi) comprises an average of 7.5% of the samples sediments. The maximum percentage of fine grains was in sample 3 (10%) and the minimum was sample 1 (5%).

The grain-size distribution within the fine fraction is very similar for all samples. The median is in the coarse to medium silt range. Sample 4 was chosen for more detailed testing in a settling tube because it had a size distribution very close to the average for all the samples. The histogram and cumulative curve of sample 4 is shown in Figure 1.

Figure 2 shows the results of settling tests on Sample 4. The curve shows that over 50% of the fine material (over 96% of the total sediment) settles one foot in less than 15 minutes. In 90 minutes over 75% of the fine material (and over 98% of the total sediment) has settled one foot. In less than twelve hours all the particles that will settle in a stable water-filled column have settled, the remaining less than 1% of the sediment will stay in suspension in the water.

The fine fraction of Sample 4 was also soaked in concentrated hydrogen peroxide (H_2O_2) to dissolve and remove the organic material. It was found that about one-half the fine fraction was composed of organic debris.

Current measurements on the site, and measurements taken earlier by a current meter at another site on the same coast are in close agreement and show a predominant current of 10 cm/sec to the west along the coast. An additional current, caused by tides and averaging about 20 cm/sec, fluctuates east and west depending on the segment of the tidal cycle.

Laboratory and field studies have shown that a current of 10 cm/sec will hold in suspension particles smaller than 2.5 phi (Nevin, 1946).

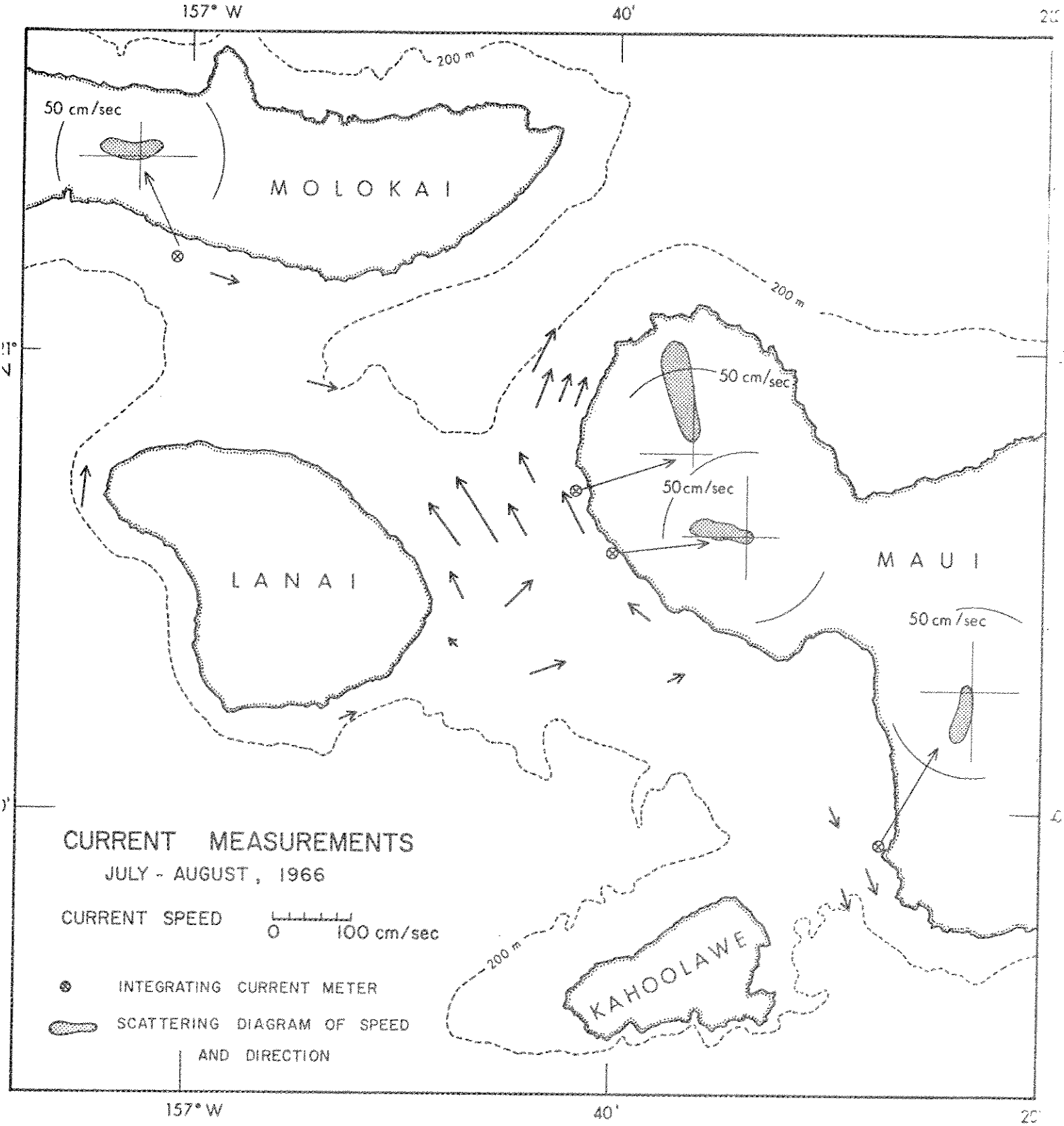
Conclusions

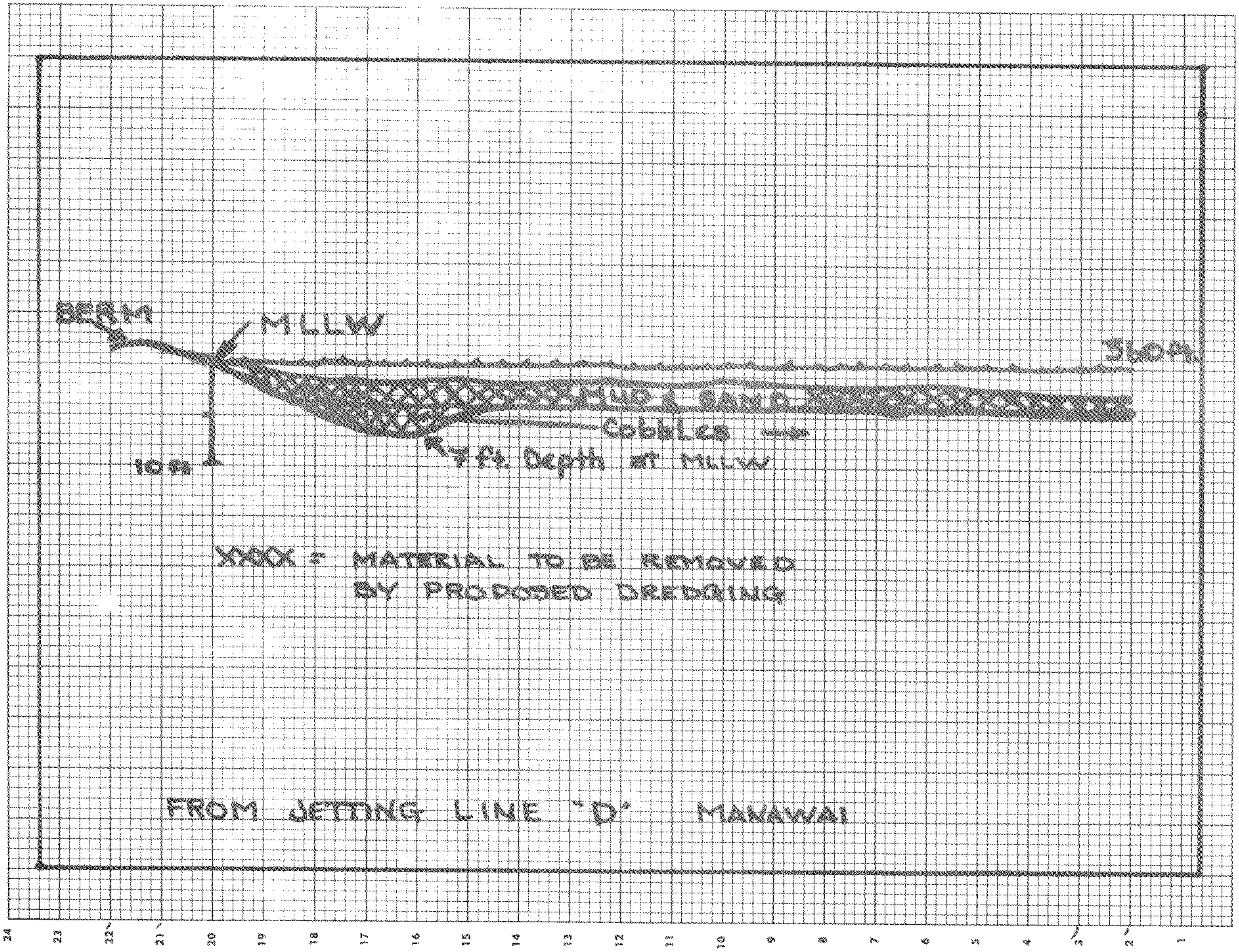
All the coarse fraction of the sediments (over 92.5%) that is stirred up will be redeposited within minutes right at the dredge site. The remaining sediment will, theoretically, be held in suspension by the current and carried out to the open sea where, in the absence of nearshore currents, it would be redeposited.

In practice, however, about 6.5% of the sediment will be caught in eddies and will form flocculent precipitates that will cause it to settle to the bottom within six hours. During this time it will settle primarily

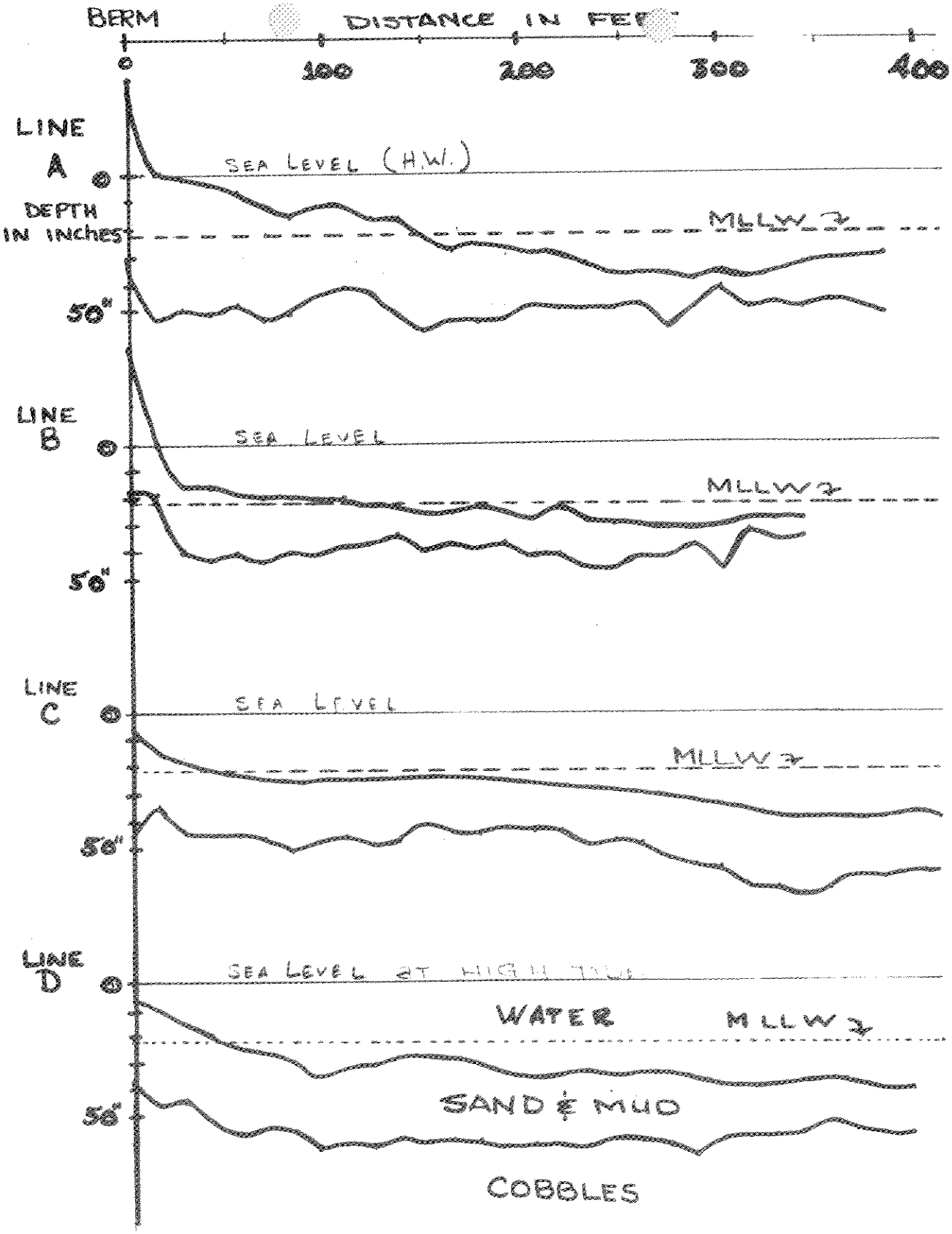
on the property of the applicant and that of the adjacent owners to the west. These latter are in full agreement with the project.

The remaining 1% of the sediment will be composed of colloidal material and organic debris that will remain in suspension in the water until it decomposes weeks after leaving the Molokai area.


157° W
40'
200 m
50 cm/sec
MOLOKAI
200 m
50 cm/sec
50 cm/sec
LANAI
MAUI
50 cm/sec
CURRENT MEASUREMENTS
JULY - AUGUST, 1966
CURRENT SPEED
0
100 cm/sec
INTEGRATING CURRENT METER
SCATTERING DIAGRAM OF SPEED AND DIRECTION
200 m
KAHOOLAWE
157° W
40'

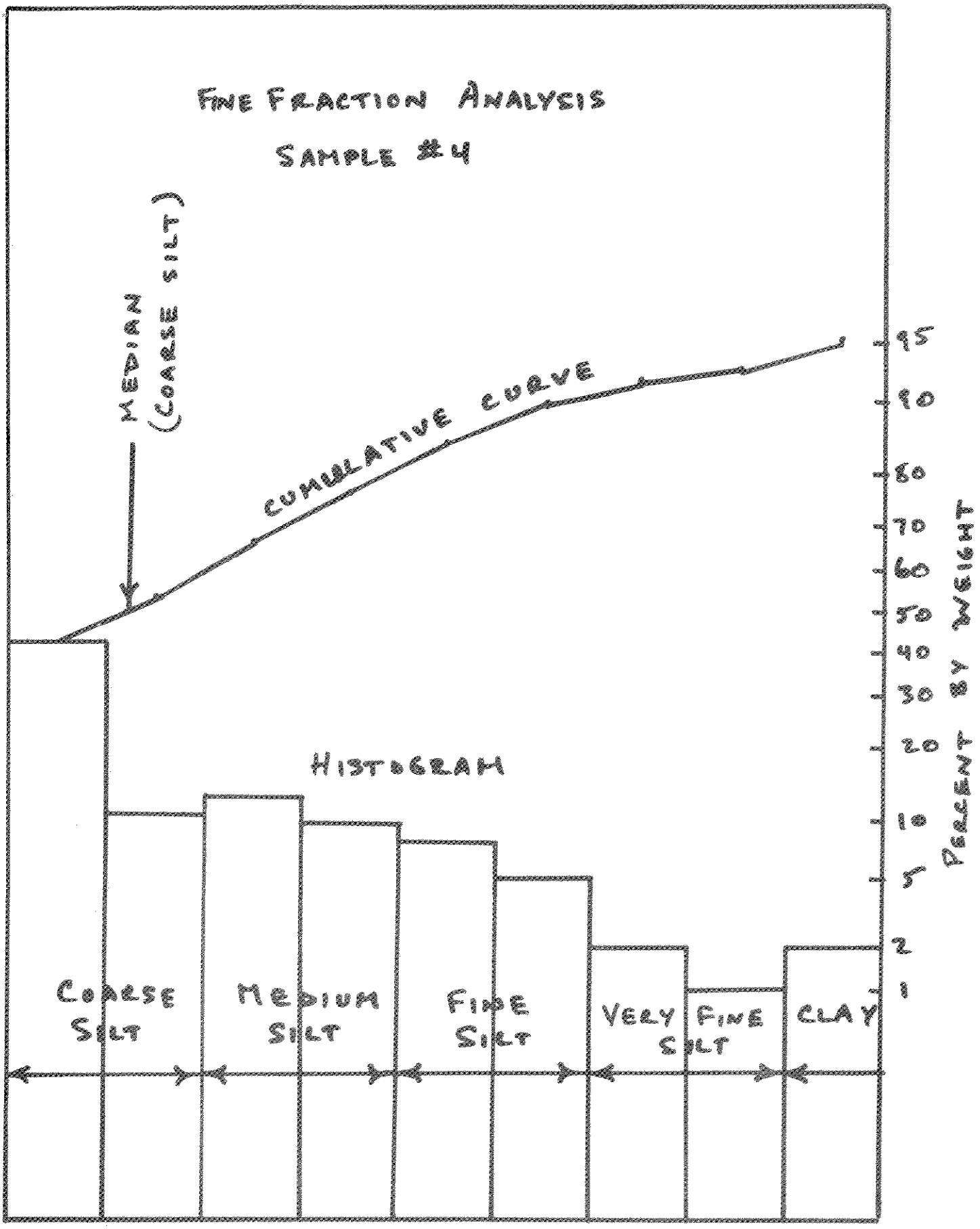


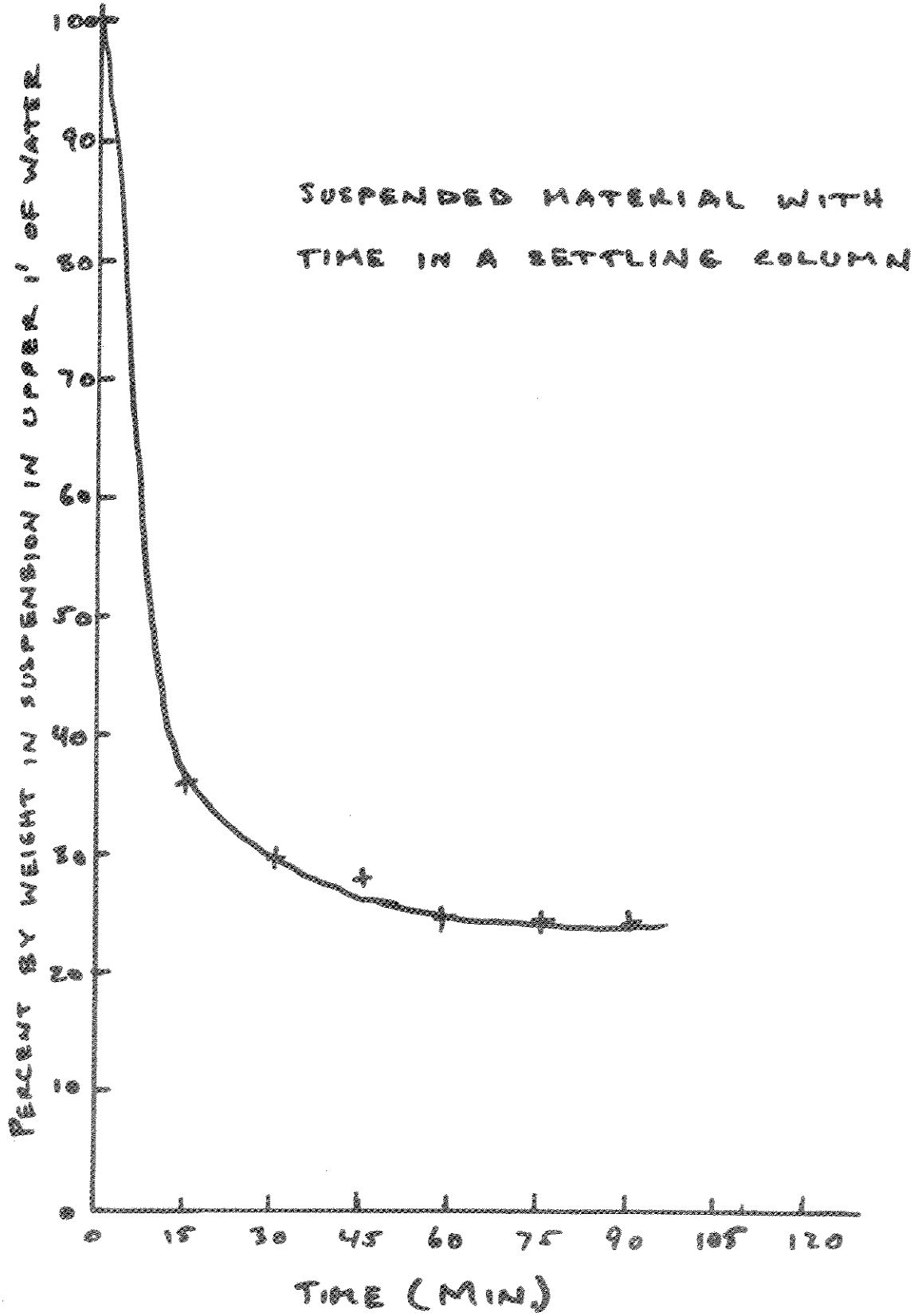
BERM
MLLW
360ft.
MUD & SAND
Cobbles
10 ft
7 ft. Depth at MLLW
XXXX = MATERIAL TO BE REMOVED
BY PROPOSED DREDGING
FROM JETTING LINE "D" MAKAWAI

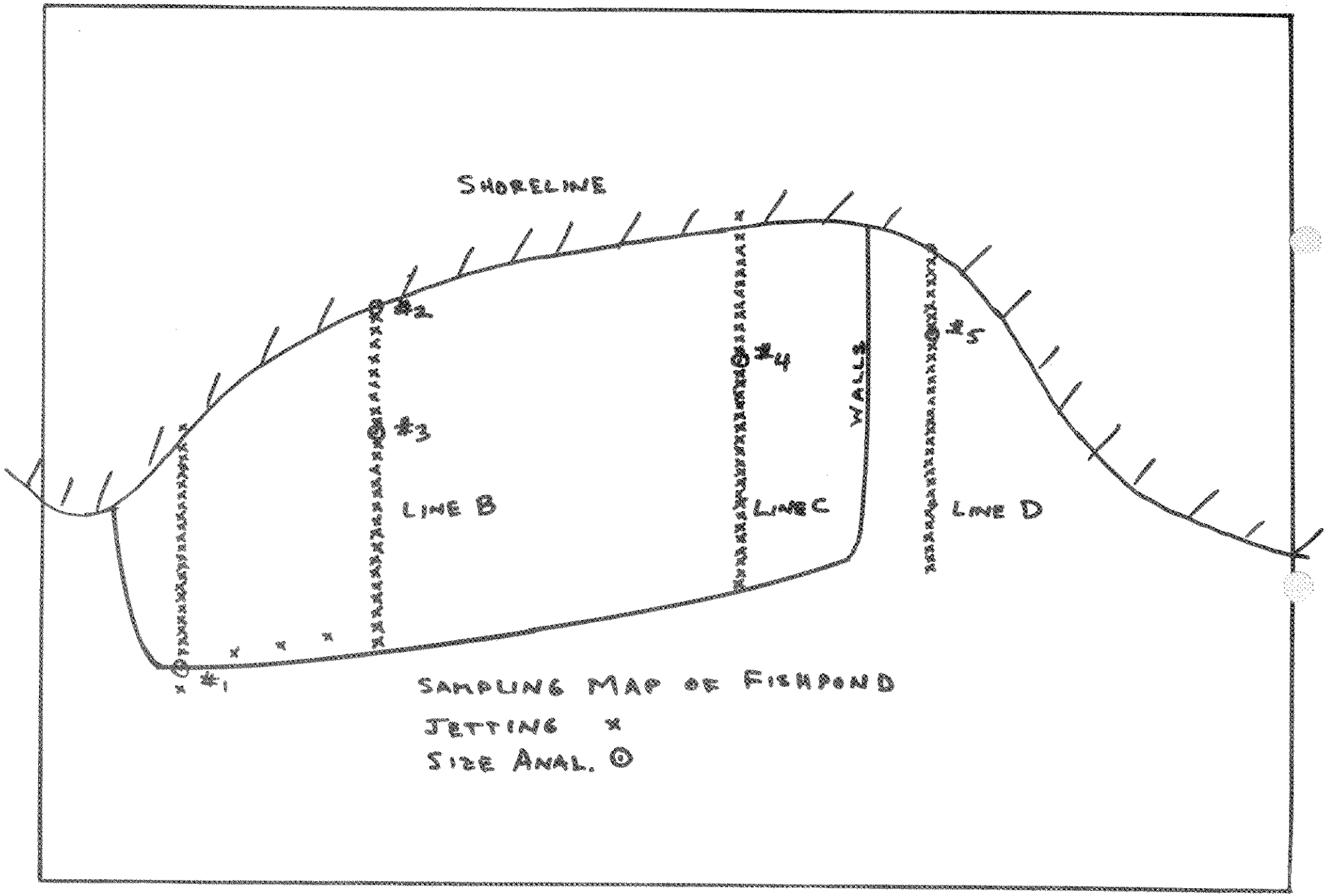


INDICATIONS OF SEDIMENT DEPTH & DISTRIBUTION AT MANAWAI PROJECT SITE

117 JETTING STATIONS


FINE FRACTION ANALYSIS
SAMPLE #4
MEDIAN (COARSE SILT)
CUMULATIVE CURVE
95
90
80
70
60
50
40
30
20
10
5
2
1
PERCENT BY WEIGHT
HISTOGRAM
COARSE SILT
MEDIUM SILT
FINE SILT
VERY FINE SILT
CLAY

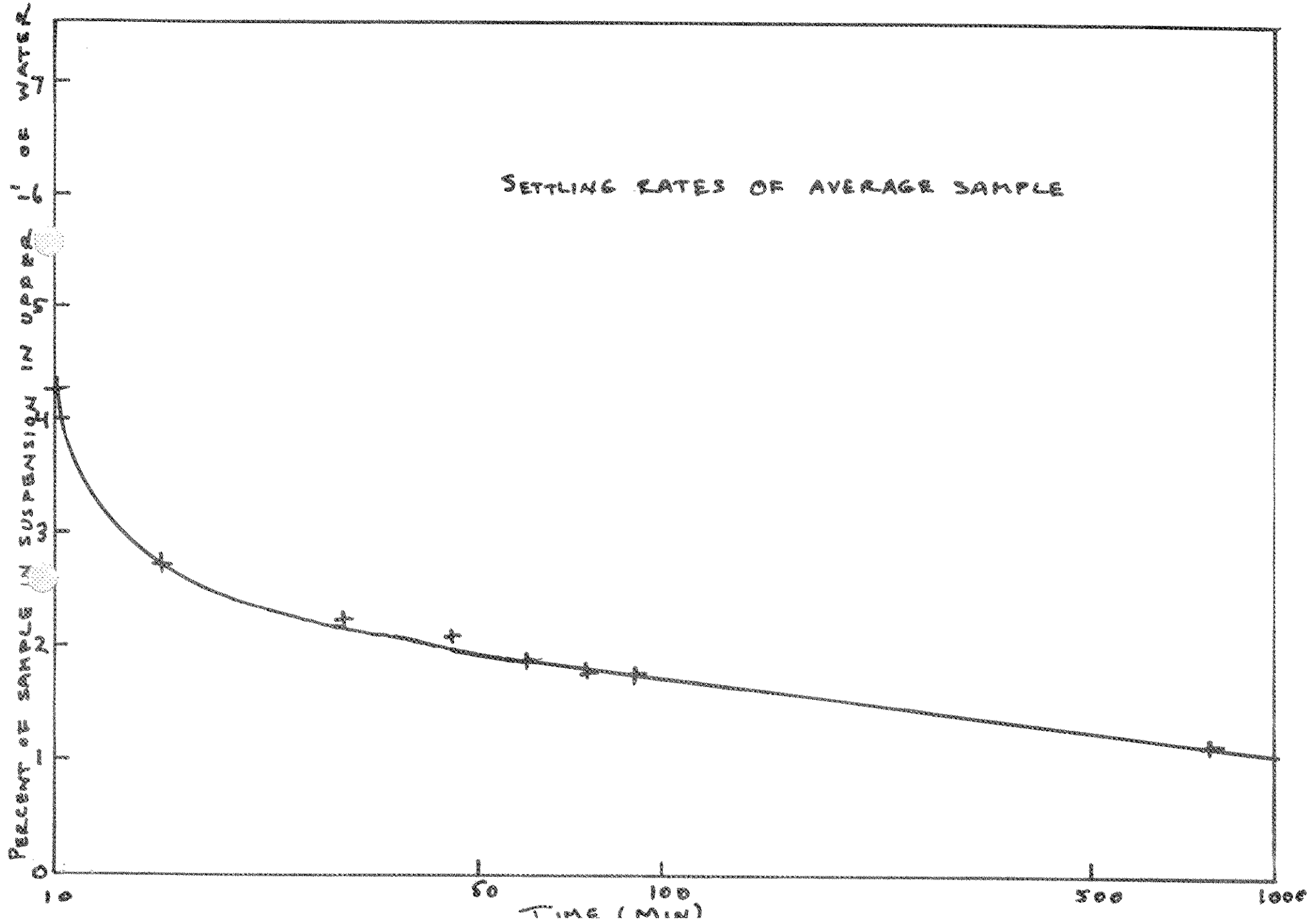

SUSPENDED MATERIAL WITH TIME IN A SETTLING COLUMN
PERCENT BY WEIGHT IN SUSPENSION IN UPPER 1" OF WATER
100
90
80
70
60
50
40
30
20
10
0
0
15
30
45
60
75
90
105
120
TIME (MIN)



SAMPLING MAP OF FISHPOND

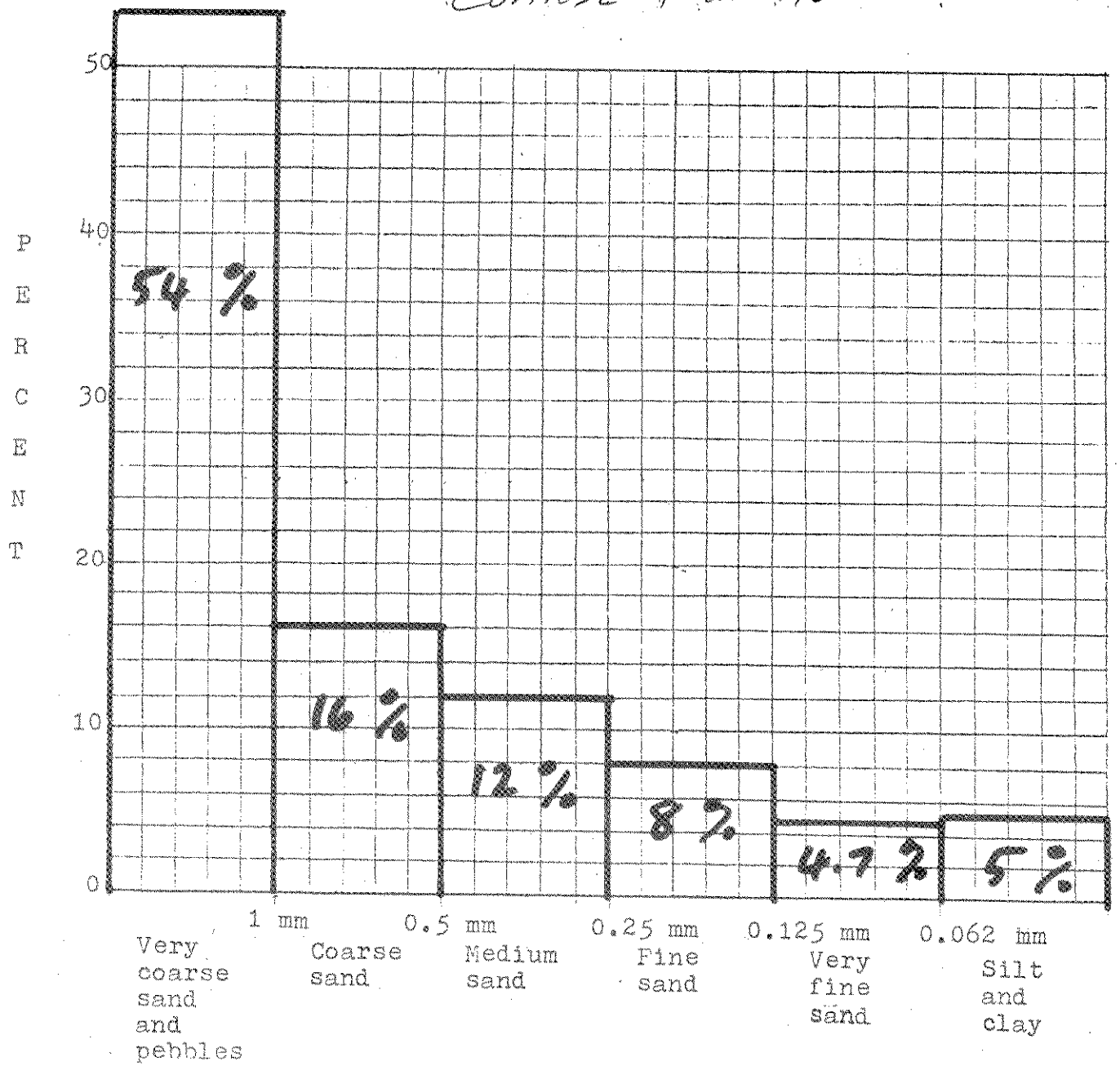
JETTING ×

SIZE ANAL. ⊙


SETTLING RATES OF AVERAGE SAMPLE
PERCENT OF SAMPLE IN SUSPENSION IN UPPER 1" OF WATER
0
1
2
3
4
5
6
7
10
50
100
500
1000
TIME (MIN)

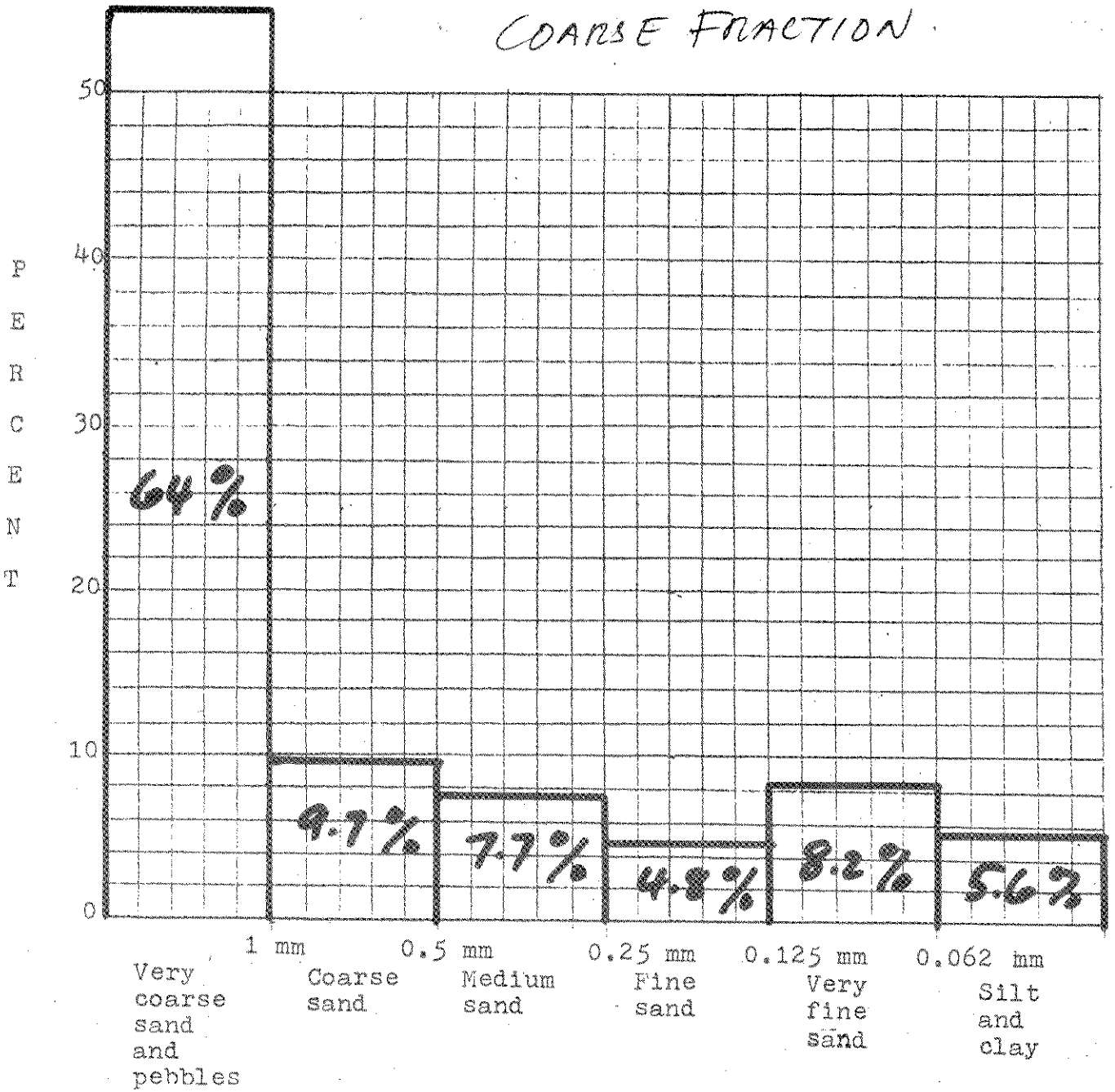
COARSE FRACTION

Sample #1



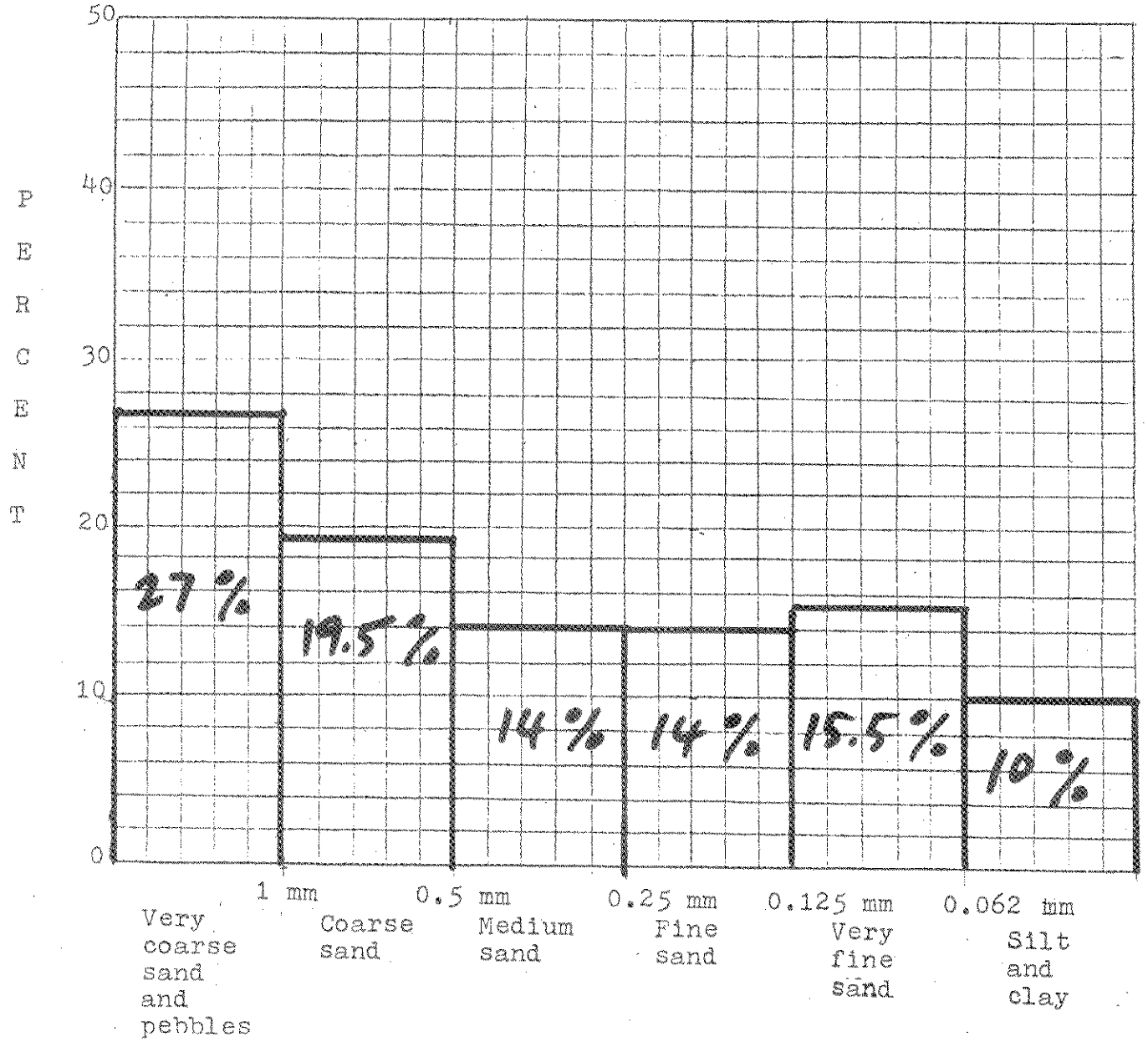
COARSE FRACTION

Sample #2



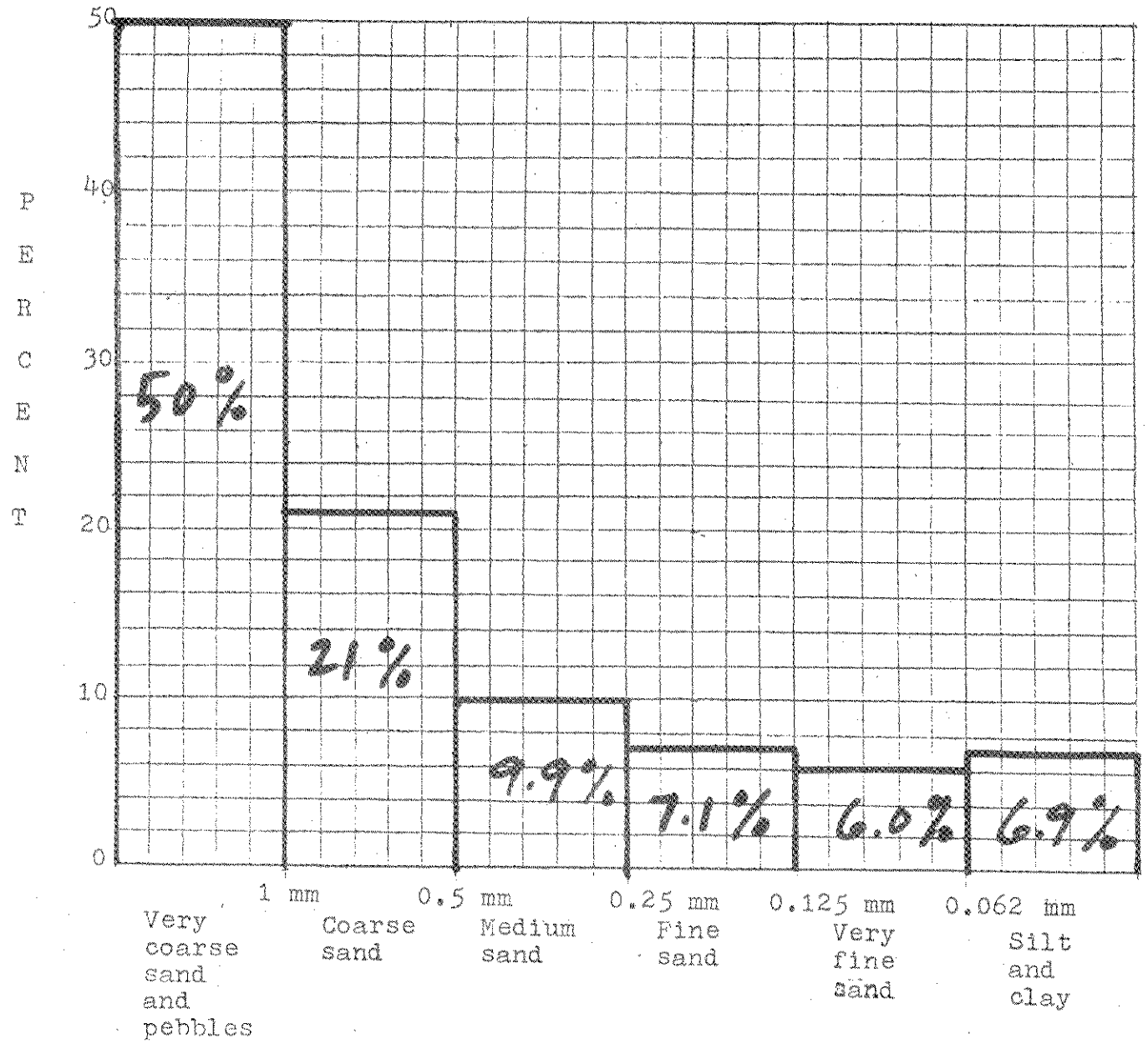
COARSE FRACTION

Sample #13



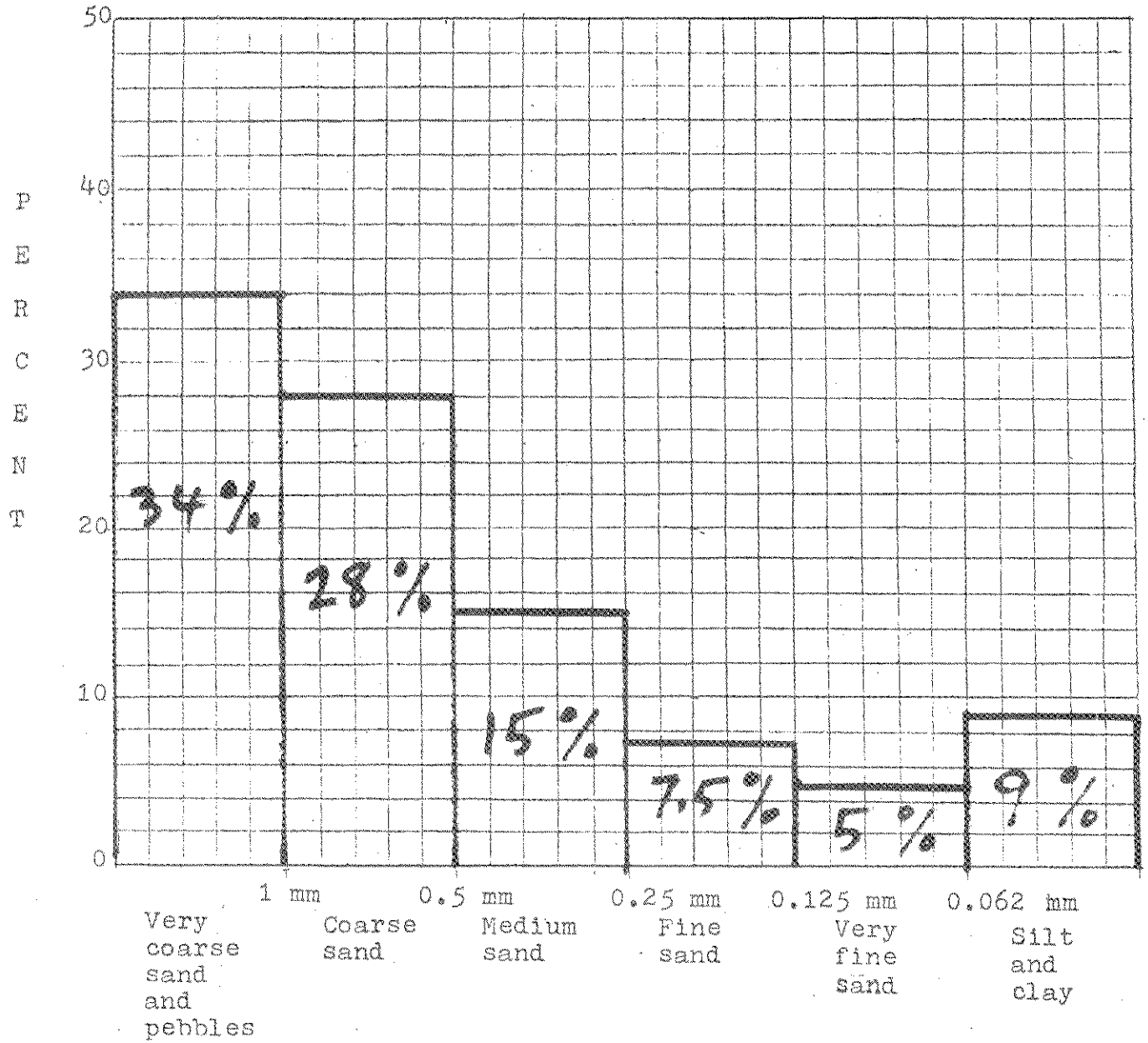
COARSE FRACTION

Sample # 4



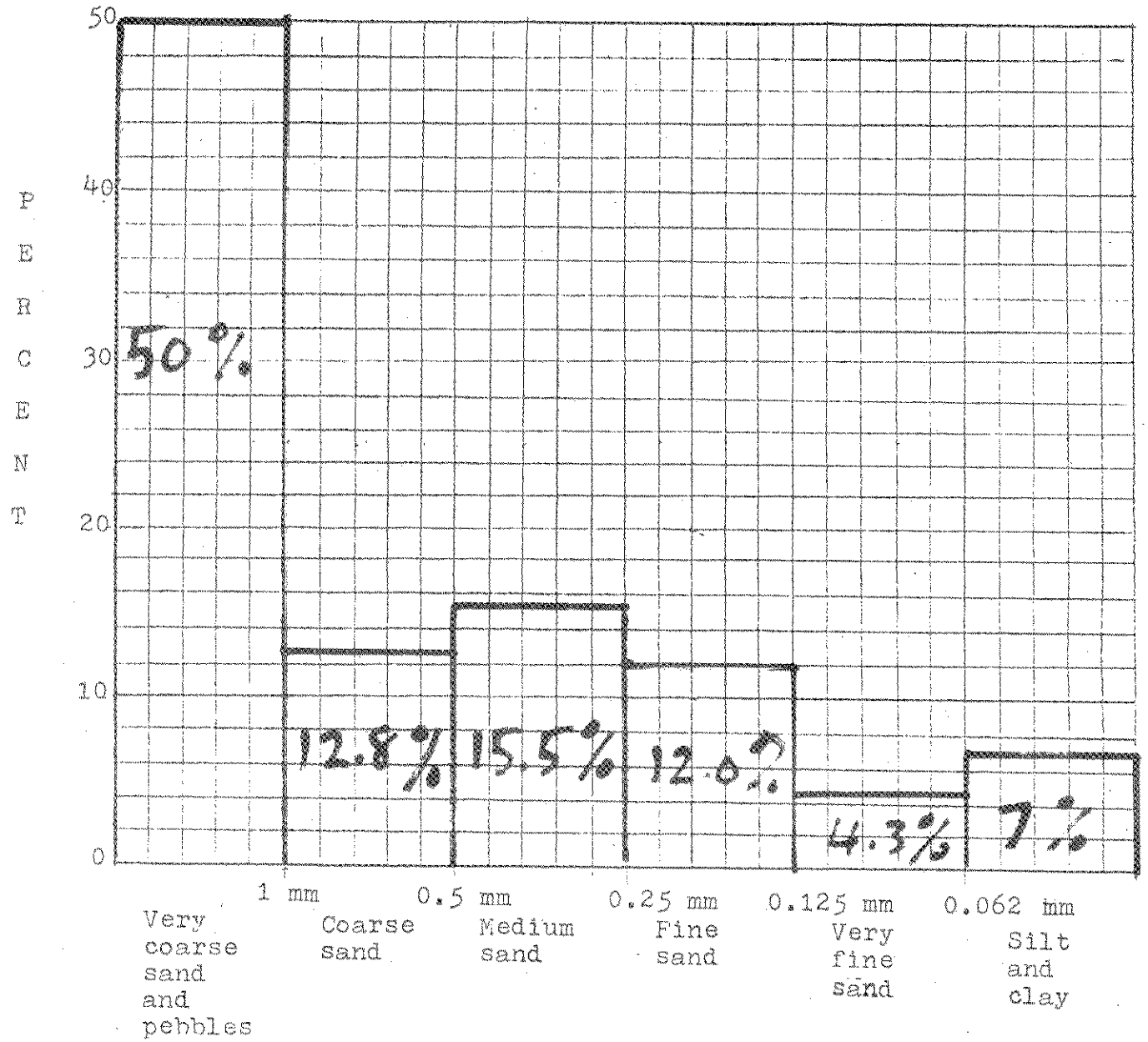
COARSE FRACTION

Sample # 5



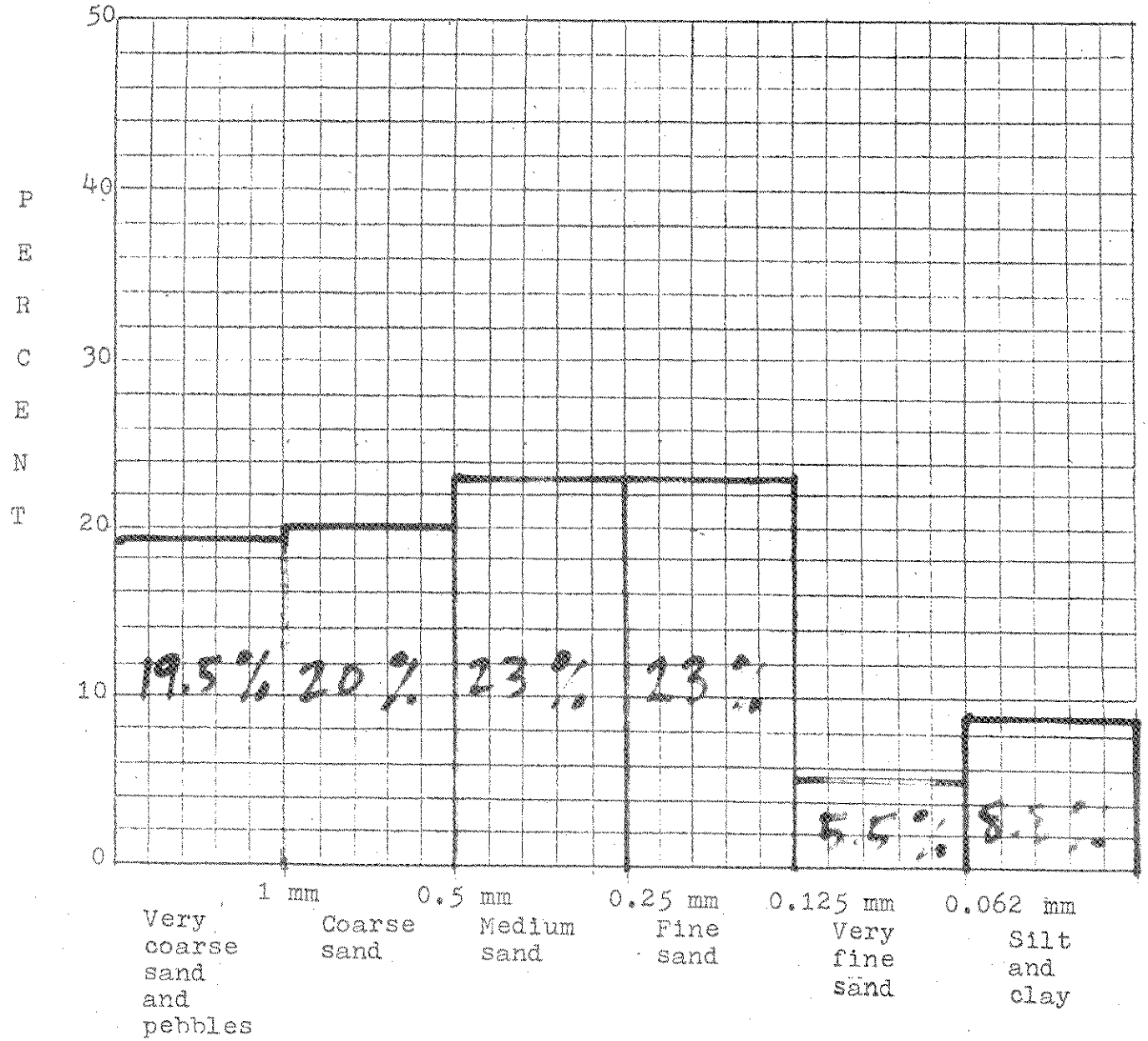
COARSE FRACTION

Sample # 6



COARSE FRACTION

Sample #7



Sample No.: Lat.: Long.:

Water Depth:

Description: Size Fraction:

ø Size	Ordinates	Ordinate differences	Jx	Wn	Individual percent	Cumulative percent
4.0-4.5	92	10	43.65	436.5	28	28
4.5-5.0	82	8	27.78	222.24	14	42
5.0-5.5	74	8	18.22	145.76	9	51
5.5-6.0	56	26	11.31	294.06	18	69
6.0-6.5	30	29	7.00	203	12	81
6.5-7.0	74	32	4.83	154.56	9	90
7.0-7.5	42	30	3.22	96.6	6	96
7.5-8.0	12	6	2.44	14.64	0 1	97
8.0-8.5	6	6	1.65	9.9	0 1	98
8.5-9.0			0.90			
9.0 +			0.30			
			Σ Wn = 1577.26			Mø =

Figure 5 -- Data sheet for photometric centrifuge

Sample No.: 1 Lat.: Long.:

Water Depth:

Description: Size Fraction:

ø Size	Ordinates	Ordinate differences	Jx	Wn	Individual percent	Cumulative percent
4.0-4.5	120	20	43.65	873	42	42
4.5-5.0	80	8	27.78	222.24	11	53
5.0-5.5	72	14	18.22	255.08	12	65
5.5-6.0	58	21	11.31	237.51	12	77
6.0-6.5	37	27	7.00	189	9	86
6.5-7.0	10	27	4.83	130.41	6	91
7.0-7.5	58	29	3.22	93.38	5	96
7.5-8.0	29	11	2.44	26.84	1	97
8.0-8.5	18	18	1.65	29.7	1	98
8.5-9.0			0.90			
9.0 +			0.30			
			ΣWn = 2157.16			Mø =

Figure 5 -- Data sheet for photometric centrifuge

Sample No.: 3 Lat.: Long.:

Water Depth:

Description: Size Fraction:

ø Size	Ordinates	Ordinate differences	Jx	Wn	Individual percent	Cumulative percent
4.0-4.5	90	20	43.65	873	44	44
4.5-5.0	70	10	27.78	277.8	14	58
5.0-5.5	60	13	18.22	236.86	11	69
5.5-6.0	47	16	11.31	180.96	9	78
6.0-6.5	29	21	7.00	147	7	85
6.5-7.0	8	23	4.83	111.09	5	90
7.0-7.5	62	26	3.22	83.72	4	94
7.5-8.0	36	13	2.44	31.72	2	96
8.0-8.5	23	23	1.65	37.95	2	98
8.5-9.0			0.90			
9.0 +			0.30			
			Σ Wn =	1960.1		Mø =

Figure 5 -- Data sheet for photometric centrifuge

Sample No.: 4 Lat.: Long.:

Water Depth:

Description: Size Fraction:

ø Size	Ordinates	Ordinate differences	Jx	Wn	Individual percent	Cumulative percent
4.0-4.5		19	43.65	829.35	43	43
4.5-5.0	76	8	27.78	222.24	11	54
5.0-5.5	68	14	18.22	255.08	13	67
5.5-6.0	54	18	11.31	203.58	10	77
6.0-6.5	36	23	7.00	161	8	85
6.5-7.0	13	23	4.83	111.09	6	91
7.0-7.5	67	16	3.22	51.52	3	94
7.5-8.0	41	10	2.44	24.4	1	95
8.0-8.5	31	31	1.65	51.15	3	98
8.5-9.0			0.90			
9.0 +			0.30			
			ΣWn = 1909.41			Mø =

Figure 5 -- Data sheet for photometric centrifuge

Sample No.: 5 Lat.: Long.:

Water Depth:

Description: Size Fraction:

ø Size	Ordinates	Ordinate differences	Jx	Wn	Individual percent	Cumulative percent
4.0-4.5		19	43.65	829.35	43	43
4.5-5.0	51	9	27.78	250.02	13	56
5.0-5.5	42	14	18.22	255.08	13	69
5.5-6.0	28	16	11.31	180.96	9	78
6.0-6.5	12	20	7.00	140	7	85
6.5-7.0	64	23	4.83	111.09	5	90
7.0-7.5	46	34	3.22	77.28	4	94
7.5-8.0	24	12	2.44	29.28	1	95
8.0-8.5	12	12	1.65	19.8	1	96
8.5-9.0			0.90			
9.0 +			0.30			
			Σ Wn = 1892.86			Mø =

Figure 5 -- Data sheet for photometric centrifuge

Sample No.: 6 Lat.: Long.:

Water Depth:

Description: Size Fraction:

ø Size	Ordinates	Ordinate differences	Jx	Wn	Individual percent	Cumulative percent
4.0-4.5	96	14	43.65	611.10	33	33
4.5-5.0	82	7	27.78	194.46	10	43
5.0-5.5	75	15	18.22	273.30	15	58
5.5-6.0	60	20	11.31	226.20	12	70
6.0-6.5	40	26	7.00	182.00	10	80
6.5-7.0	14	30	4.83	144.9	8	88
7.0-7.5	63	29	3.22	93.38	5	93
7.5-8.0	34	21	2.44	51.24	2	95
8.0-8.5	13	13	1.65	21.45	1	96
8.5-9.0			0.90			
9.0 +			0.30			
			Σ Wn = 1798.03			Mø =

Figure 5 -- Data sheet for photometric centrifuge

Sample No.: 7 Lat.: Long.:

Water Depth:

Description: Size Fraction:

ø Size	Ordinates	Ordinate differences	Jx	Wn	Individual percent	Cumulative percent
4.0-4.5		15 x	43.65	654.7	33	33
4.5-5.0	75	10 x	27.78	277.9	14	47
5.0-5.5	65	18	18.22	327.9	16	63
5.5-6.0	47	25	11.31	282.7	14	77
6.0-6.5	22	24	7.00	168.0	08	85
6.5-7.0	74	28	4.83	135.2	06	91
7.0-7.5	46	26	3.22	83.7	04	95
7.5-8.0	20	11	2.44	26.8	01	96
8.0-8.5	9	9	1.65	14.8	~~01~~	
8.5-9.0			0.90			
9.0 +			0.30			
			Σ Wn = 1971.6			Mø =

Figure 5 -- Data sheet for photometric centrifuge

John H. McAuliffe, Jr. & Associates, Inc.

Architects & Planners ROOM 577, ALEXANDER YOUNG BUILDING · HONOLULU, HAWAII 96813 · PHONE 531-5391

John H. McAuliffe, Jr., AIA
PRESIDENT

Susumu Kato AIA
VICE-PRESIDENT

Richard K. Nagashima
PLANNER

PROJECT SUMMARY

Application for Restoration of Shoreline

MANAWAI, MOLOKAI

Manawai Corporation is the owner of 29.22 acres located at Manawai, Molokai.

The Corporation is presently performing site work for the commencement of development of an approximate 300 unit fee condominium project called "Wavecrest", upon the westerly 10 acres of the property. The first increment will be 54 units.

The structure will be three story, having a wood shingle roof, wood exterior and drywall interior, with the first floor of wood elevated above ground.

Wavecrest Development Characteristics

1. Shoreline Restoration

(a) Our application and the Environmental Impact Statement called "EIS", of July 26, 1972 indicates that our primary and only purpose is to clean up the shoreline.

(b) The E.I.S. points out that regardless of the method of removal of the material turbidity (during the estimated work period of 90 days) will be minimal and within acceptable limits since 92.5% of sediments will be redeposited within minutes at the work site, 6.5% will settle within 6 hours and the remainder 1% will suspend until it naturally decomposes.

(c) The present muddy, smelly,unuseable shoreline will be cleaned up.

(d) A shoreline of positive values, esthetically, environmentally, and functionally will be created for the public.

(e) The work of cleanup will not disturb any present bird or fish life in the area which is now nonexistent or slight in that regard.

(f) The clean up will not affect any factor in respect to historical or archeological consideration.

(g) The restoration may offer habitat area to improve species of marine life not now in evidence.

(h) A short stone wall below low water mark from the easterly end of the work area will assist in preserving the restored shoreline against the introduction of new sediment from offshore. This will help to avoid future maintenance because of the general mud flat condition on the shoreline of Molokai.

(i) Not more than 30,000 cubic yards of material will be removed rather than the original estimate of 90,000 cubic yards.

(j) The depth of removal is only to be as feasible to remove the mud and debris deposited over the natural shoreline as it existed prior to the severe erosion of mauka land. Within about 125 feet of the shoreline the excavation area will gradually go to a minus 7 feet and taper back to about an average depth of 3.5 feet for the remainder clean up of the overall 350 feet offshore. This profile can act as a silting basin for possible future maintenance of the restored area.

2. Spoil Area

The material (unless otherwise directed by the DLNR) will be wasted upon our land in the 19.22 acre area easterly of the Wavecrest 10 acres, shown upon the drawing to our application. The material is of a kind which may satisfactorily remain as fill without any probability of eroding back into the sea. The material will be evenly spread for leaching of salt content and the area

planted with a grass as soon as practicable. Spreading only 30,000 cubic yards maximum over 19.22 acres will minimally affect existing grade and will not significantly alter existing drainage patterns.

3. Public Access to the Beach

The Master Site Plan for the Project specifically sets aside a six foot public pedestrian way from Kamehameha V Highway to the seashore upon the Easterly side of the Project. There is no present public right of way in the area. The pedestrian way will lead only to a mud flat and unuseable shoreline unless our Restoration Application is approved. The pedestrian way will be set aside permanently in our subdivision map or conveyance of deed or easement as the State or County may direct.

4. Grading

The grading plan for Wavecrest provides that finish grade will not exceed at the buildings more than about 1 foot above existing grade. We will basically create an earth balance on site by the removal and relocation of about 12 inches of topsoil, with a possible small quantity of fill as necessary for landscaping purposes.

We do not require any of the spoil material for our Project. It is unsatisfactory material until leached, and in any event the buildings will be under construction much before our Restoration Application is hopefully approved for the offshore clean up.

5. Drainage

There are no natural drainage courses across any part of our 29.22 acres which will be materially affected by the offshore clean up and the wasting thereof in the spoil area. No drainage structures or system is being installed on shore.

There is an existing natural drainage channel upon the Westerly edge of our Project which discharges Westerly and downwind thereof. We will not alter its natural flow line. On our side of the channel we will protect our project against a possible rupture of the channel as has historically occurred. This will enhance preserving the shoreline clean up from future deposit of mauka erosion.

Surface runoff will occur substantially as in its present condition except any ponding area will be beneficially eliminated.

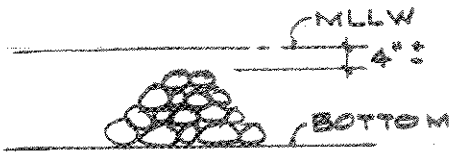
6. Landscaping

The plan is to plant a maintained lawn to high water mark which will be attractive and effective against erosion from present surface water runoff at the seashore.

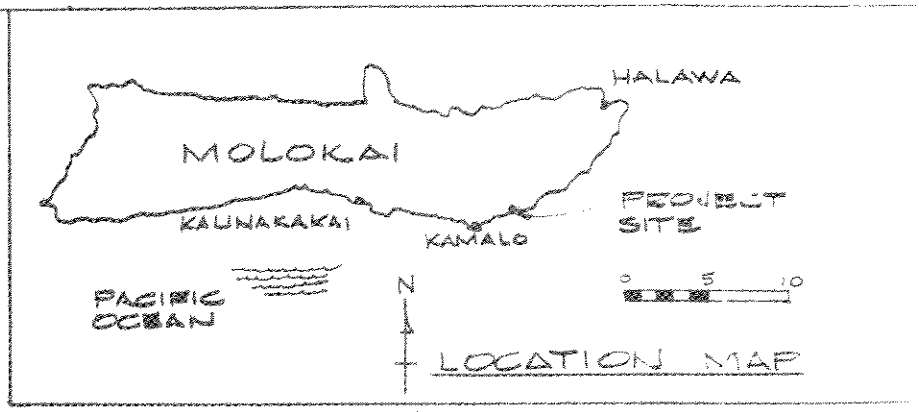
Trees and shrubs will be generally located in harmonious groupings compatible with the open space quality or our Project.

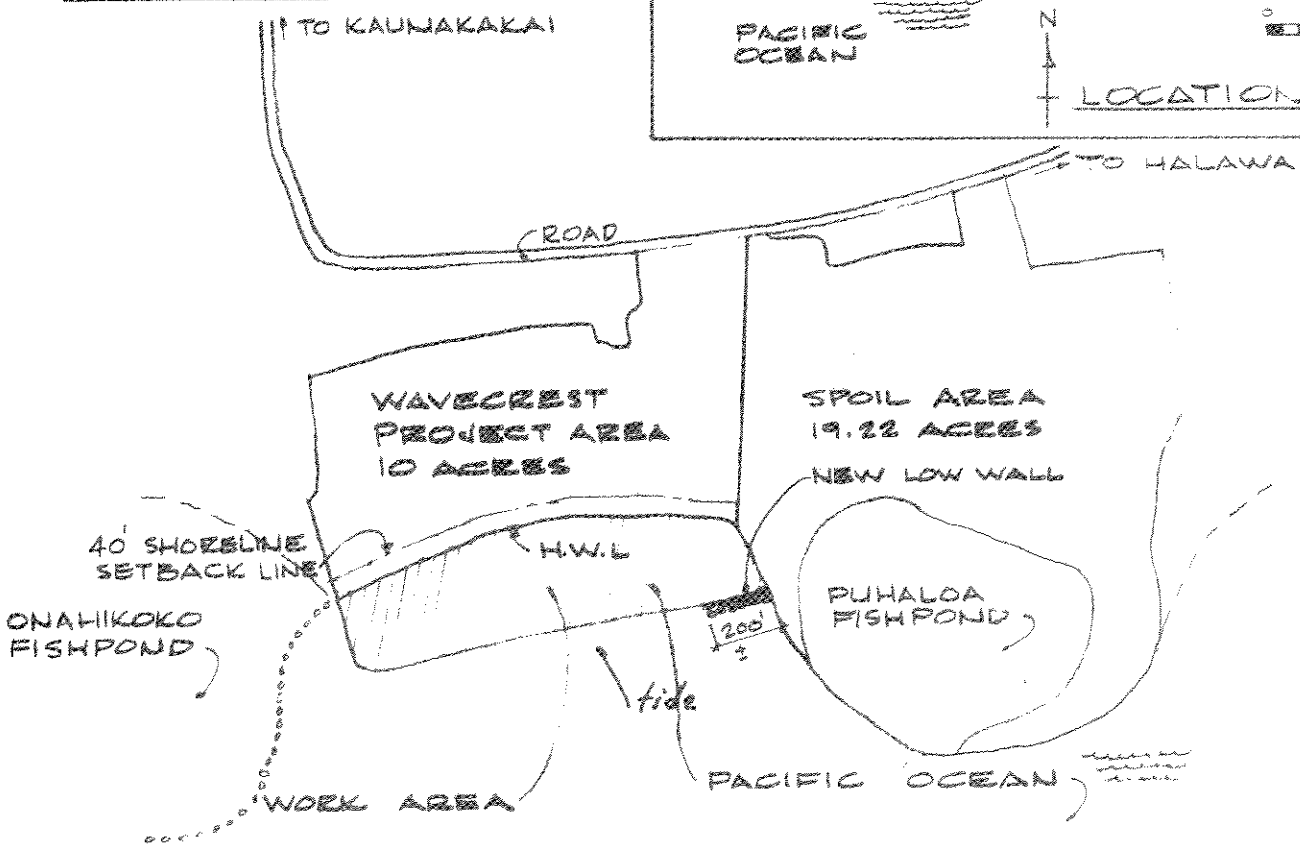
JOHN H. McAULIFFE, JR.

August 10, 1972



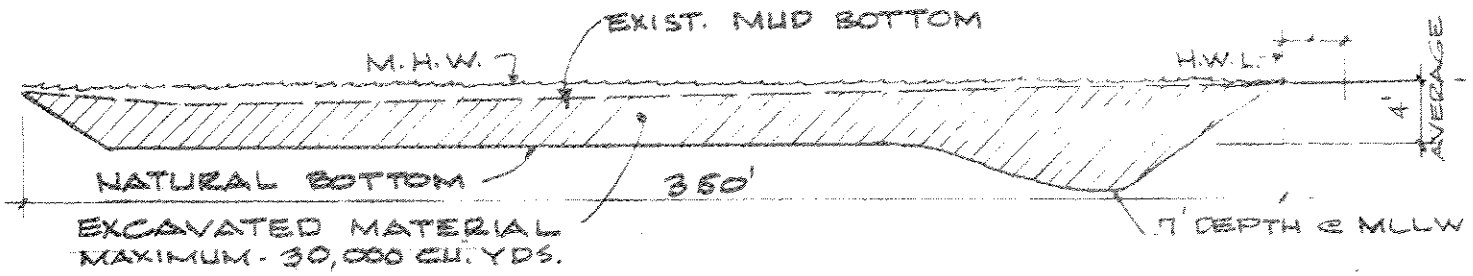
SEC. C NEW LOW STONE WALL





N

PLAN
NO SCALE



PROFILE
NO SCALE

MLLW = +1'-0"

MAXIMUM EXTENT OF PROPOSED UNDERWATER EXCAVATION AT MANAWAI, MOLOKAI, HAWAII

TAX MAP KEY: 5-6-04: 27 (PORTION)

APPLICATION BY: MANAWAI CORP

SHEET 1 OF 1

DATE: 4-27-72
REV: 8-10-72