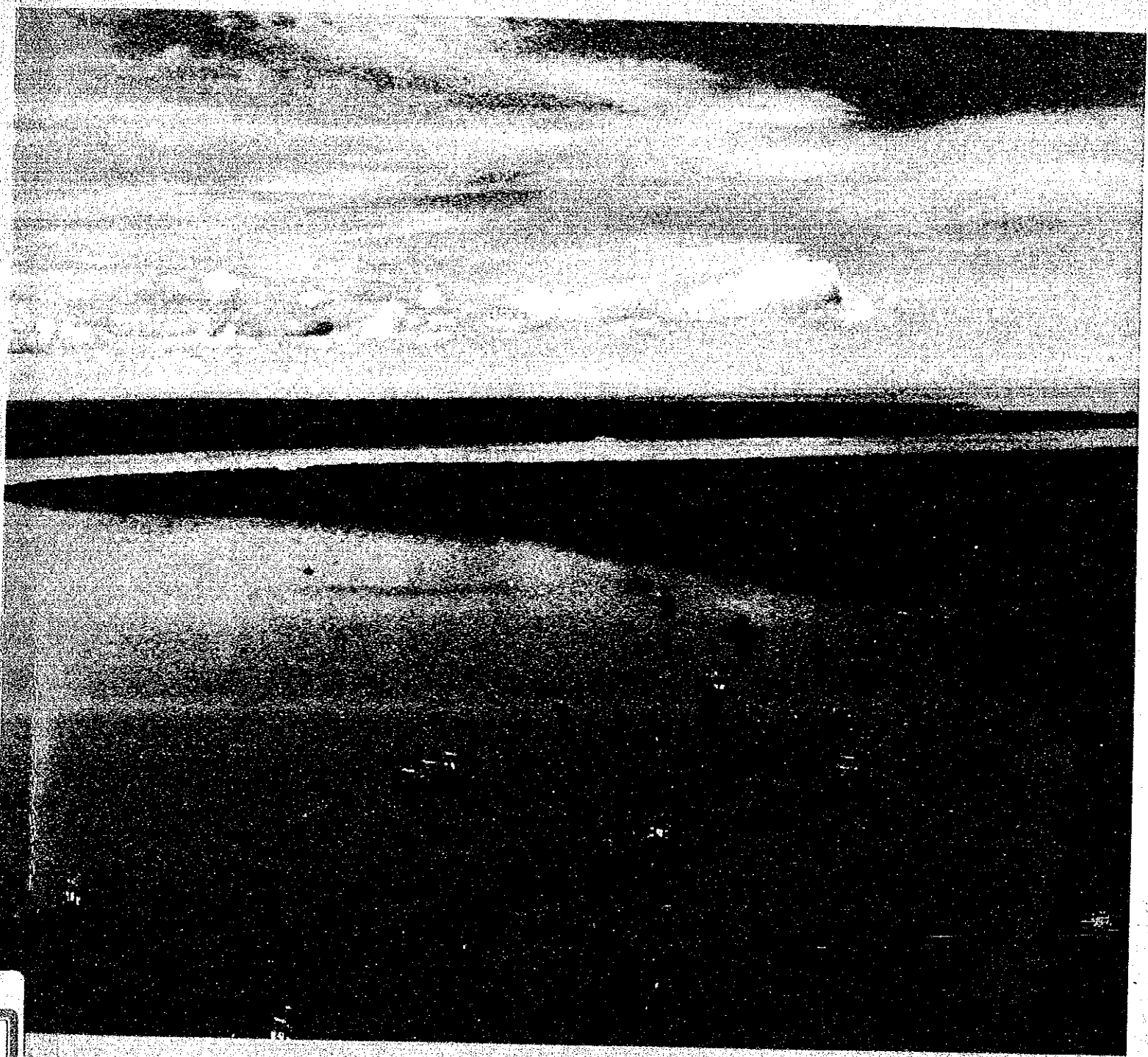
社会開発調査部報告書

No. 52

THE STUDY ON THE DEVELOPMENT OF RAJANG PORT IN MALAYSIA

VOLUME V APPENDICES



FEBRUARY 1992

JAPAN INTERNATIONAL COOPERATION AGENCY

Final Report

THE STUDY ON THE DEVELOPMENT OF RAJANG PORT

IN

MALAYSIA

VOLUME V APPENDICIES

FEBRUARY, 1992

J I C A

Japan International Cooperation Agency

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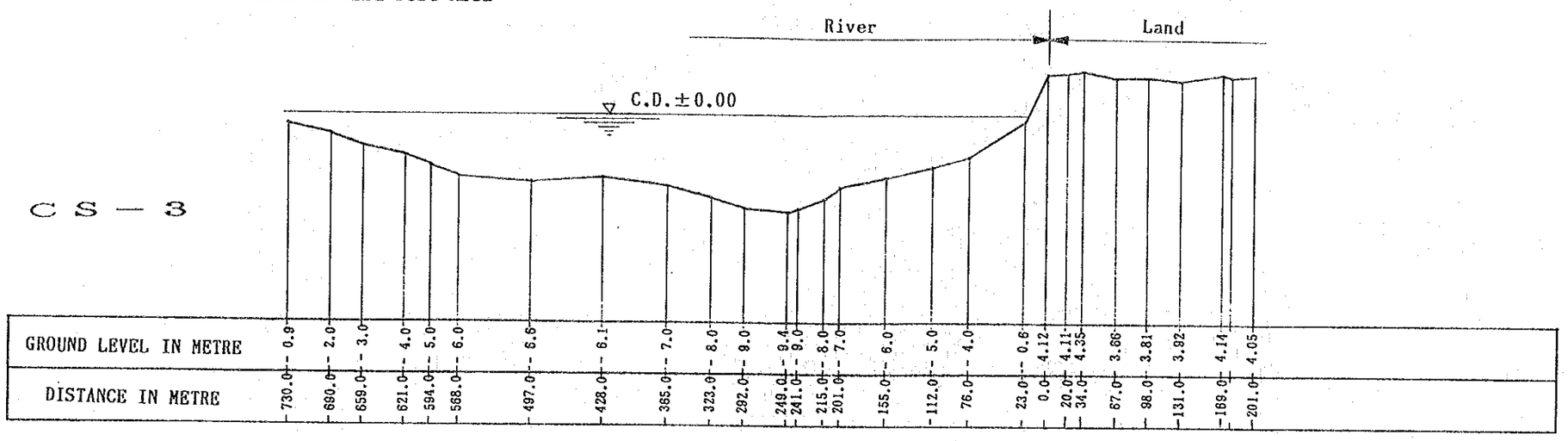

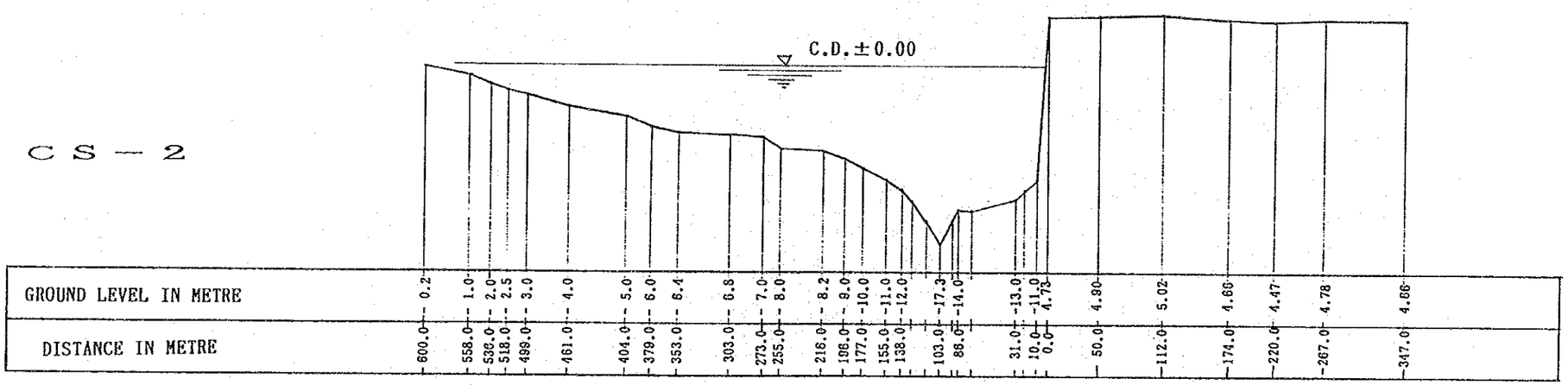

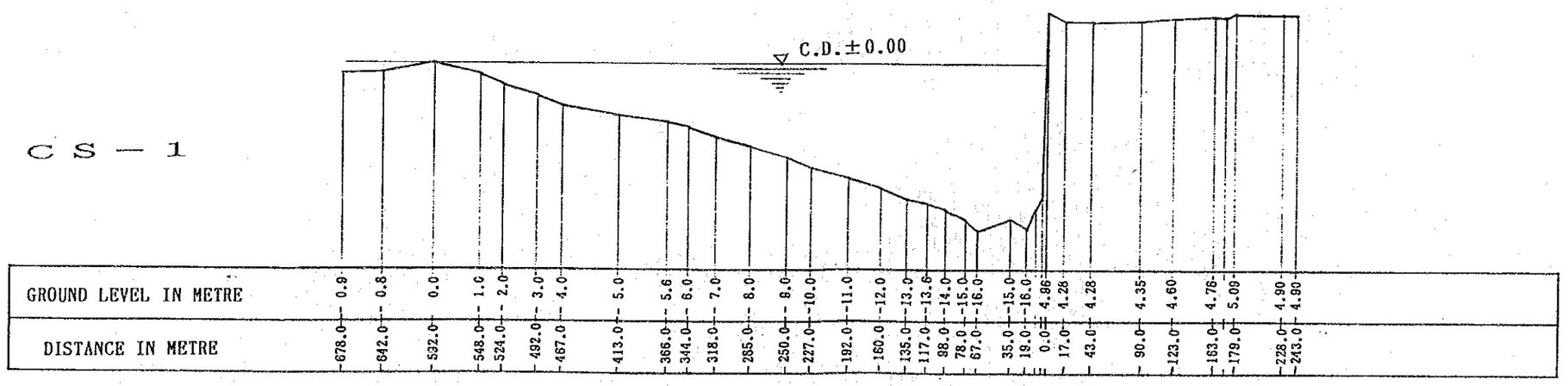

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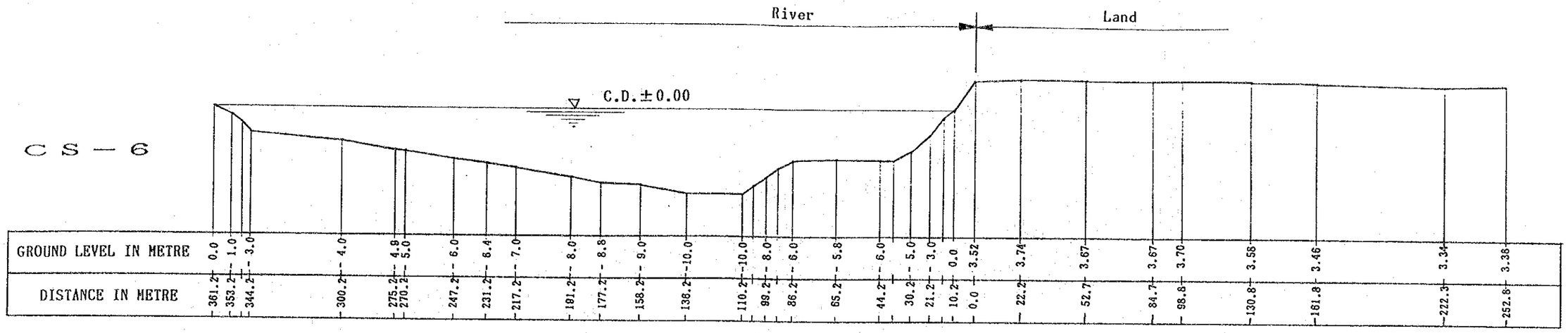
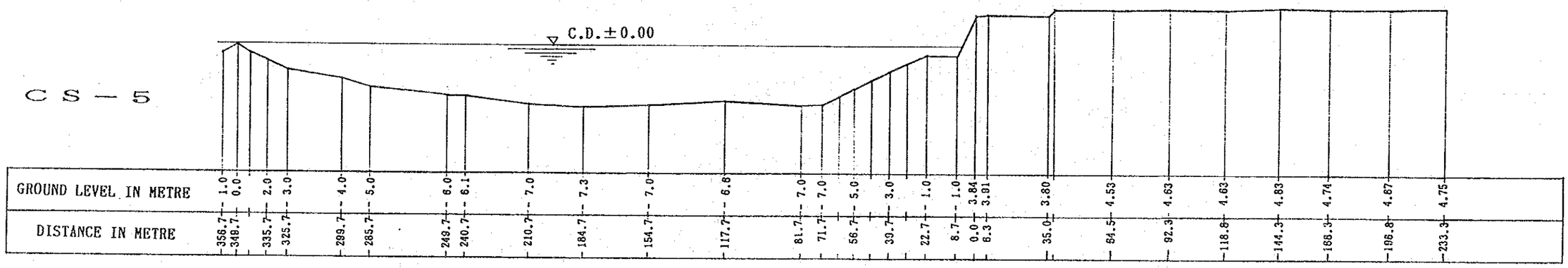
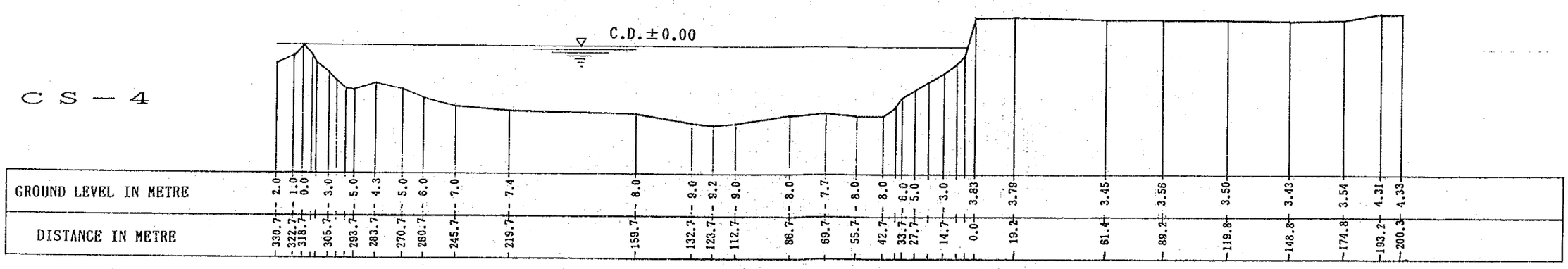
Appendix-I.2.1.2 Cross-section of Sungai Merah Area







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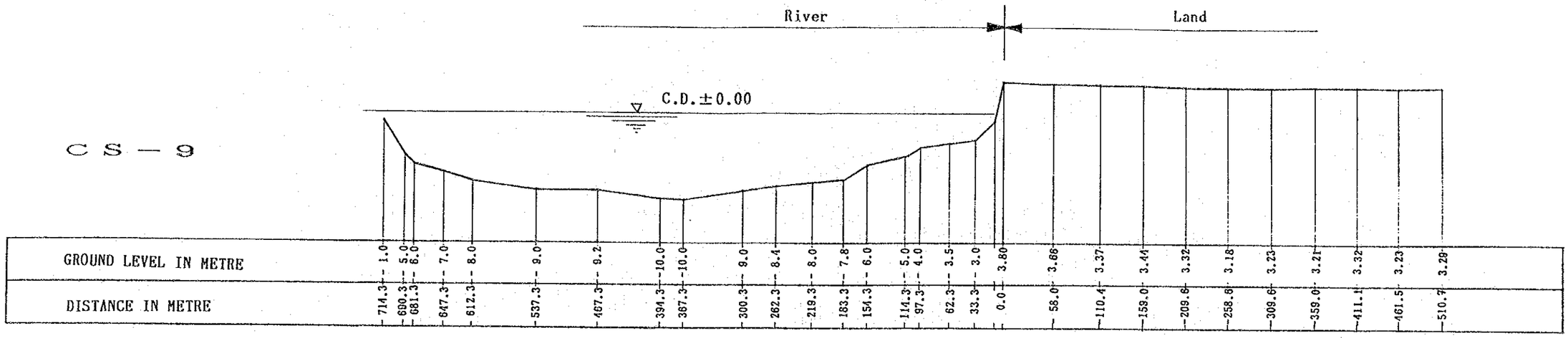
Appendix-I.2.1.3 Cross-section of Tanjung Kumper (South Sibu)



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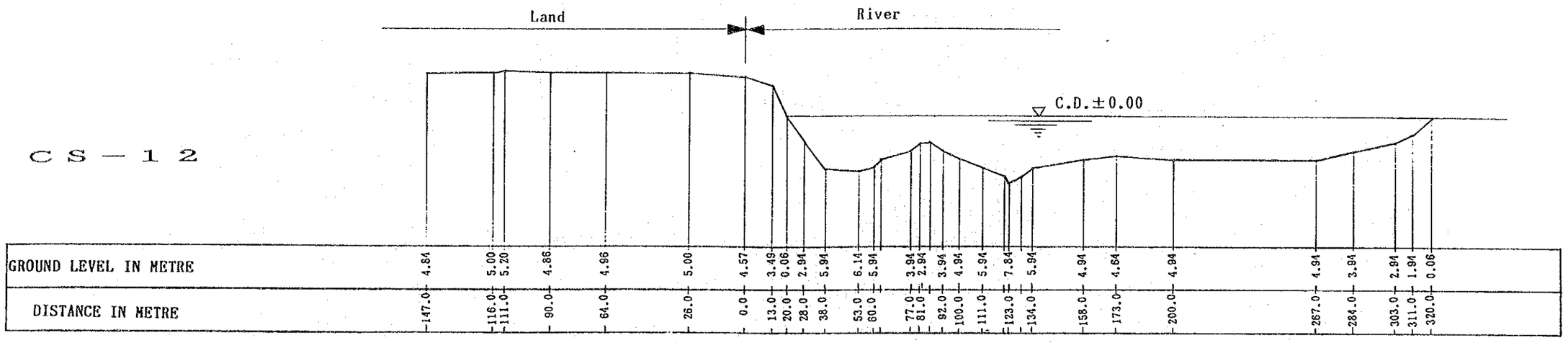
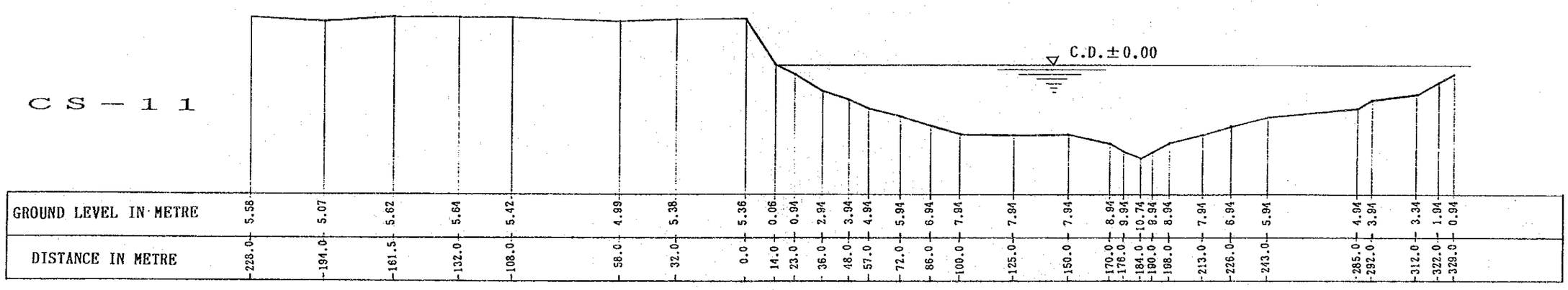
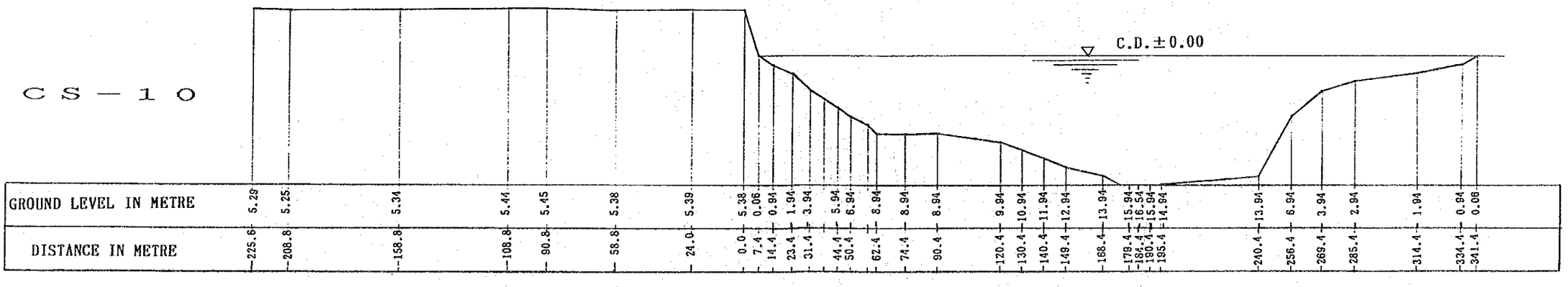
Appendix-I.2.1.4 Cross-section of Bintangor

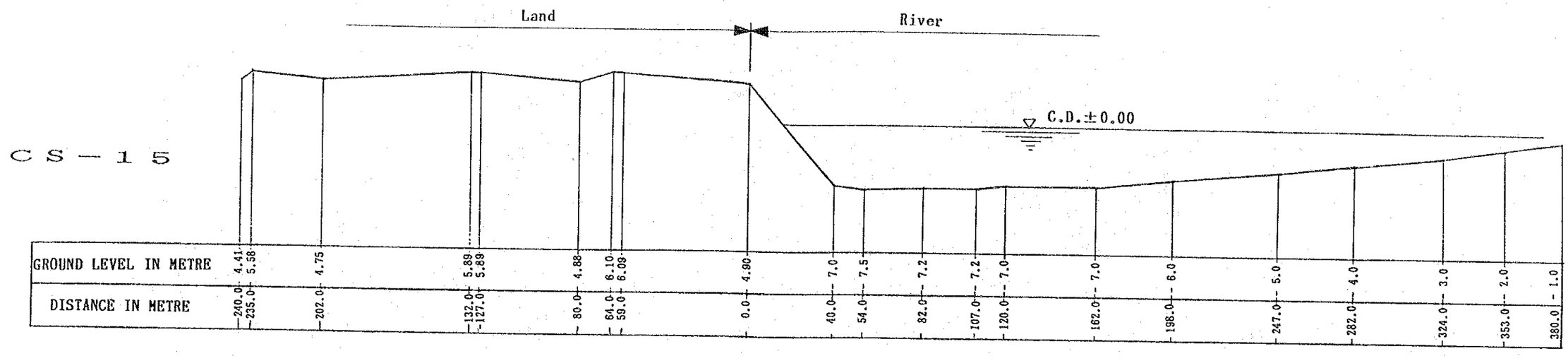


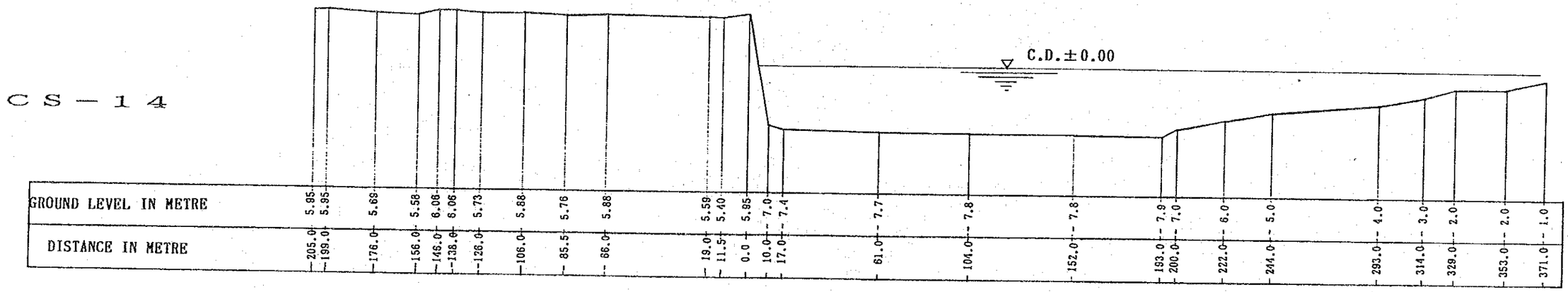


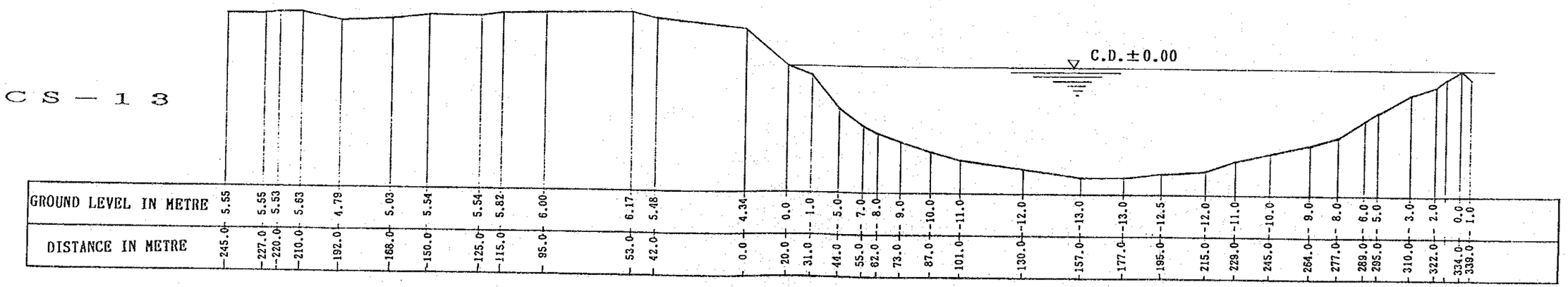


Scale ; Horiz. 1/2,000 Vert. 1/500

Appendix-I.2.1.5 Cross-section of Sarikei







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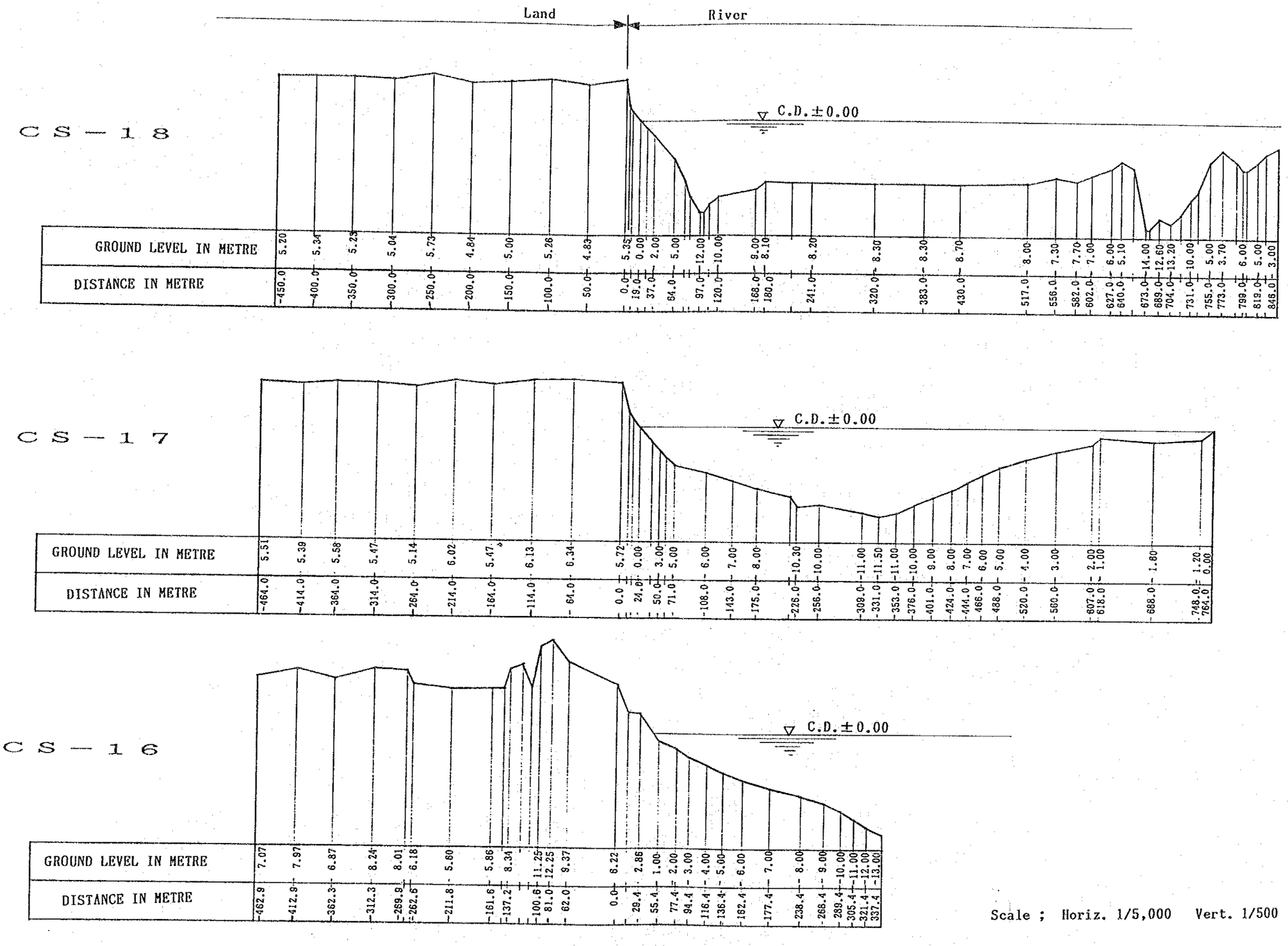
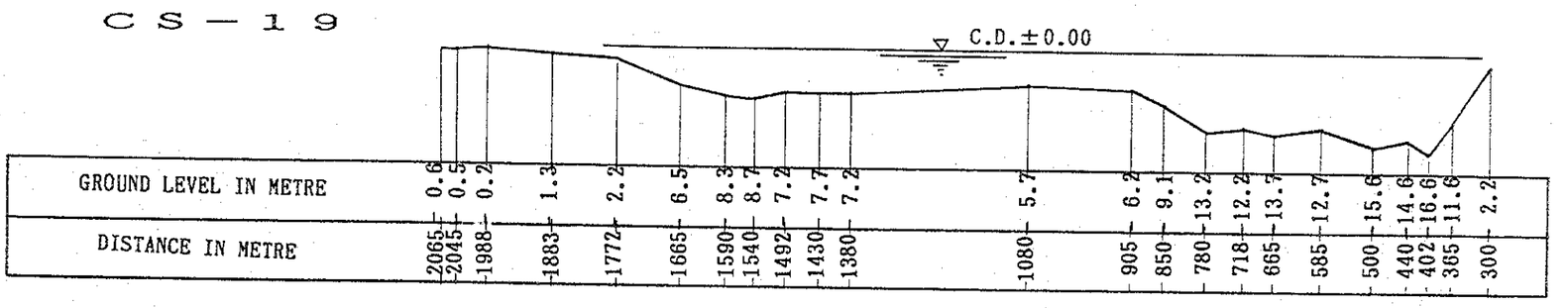
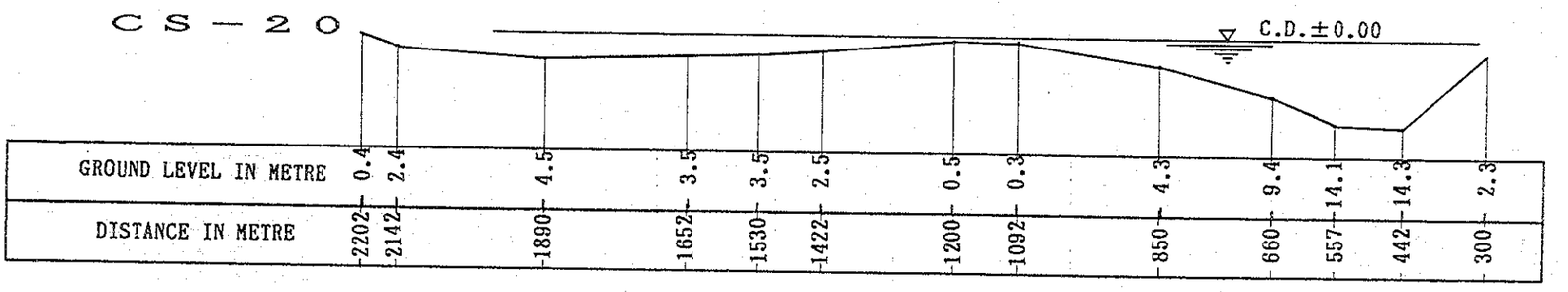
Appendix-I.2.1.6 Cross-section of Tanjung Manis

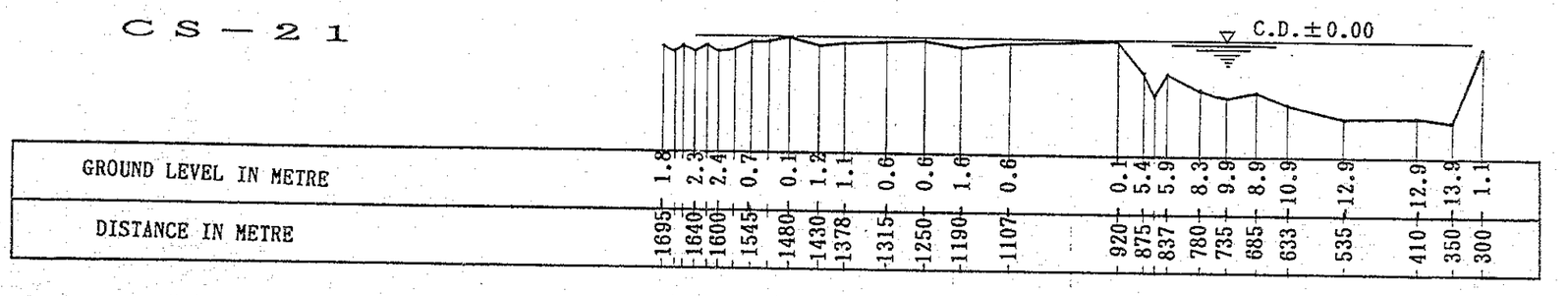


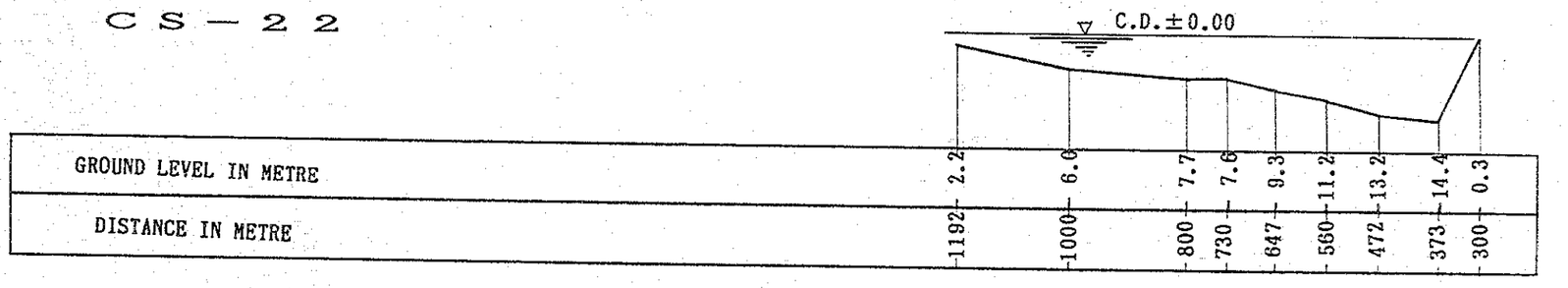
Scale ; Horiz. 1/5,000 Vert. 1/500

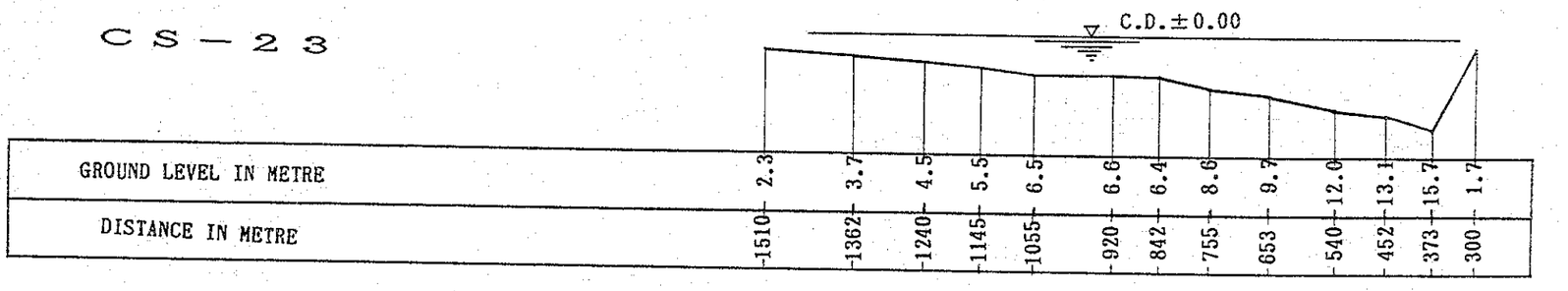
Appendix-I.2.1.7 Cross-section of Tanjung Sebubal

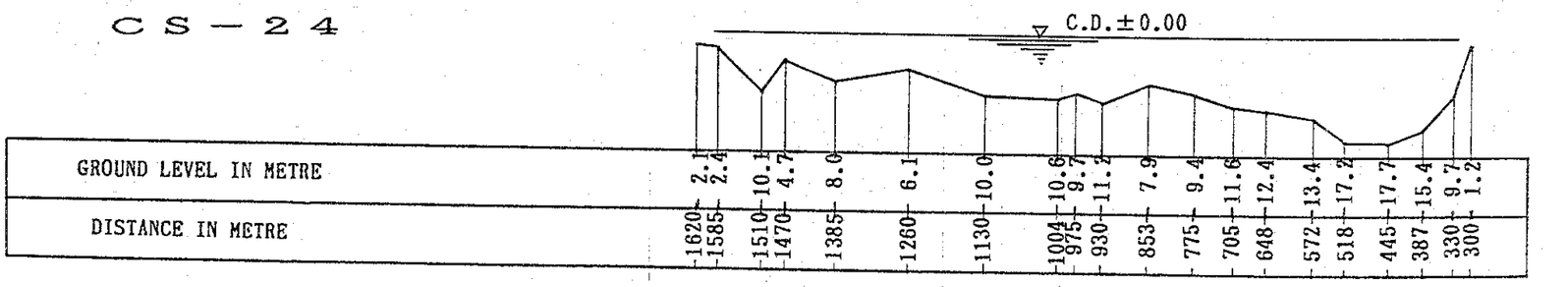






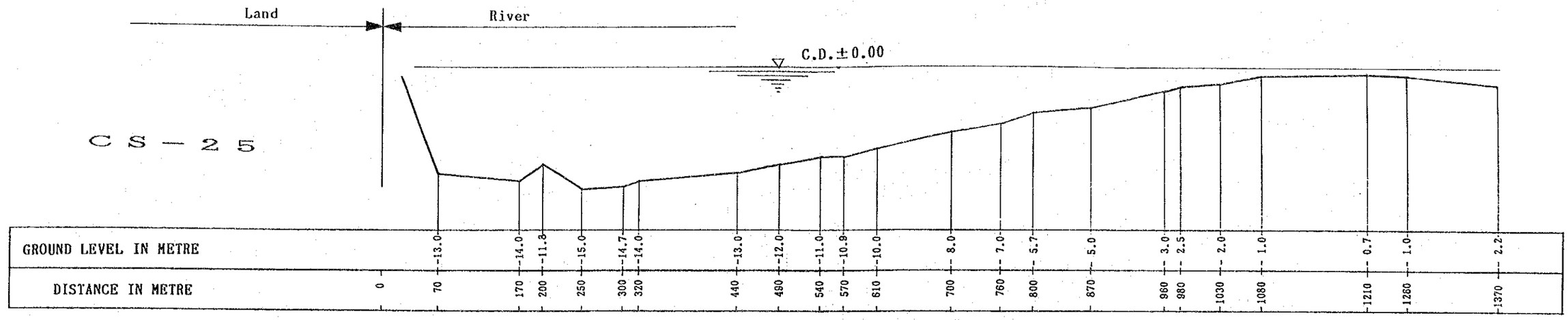


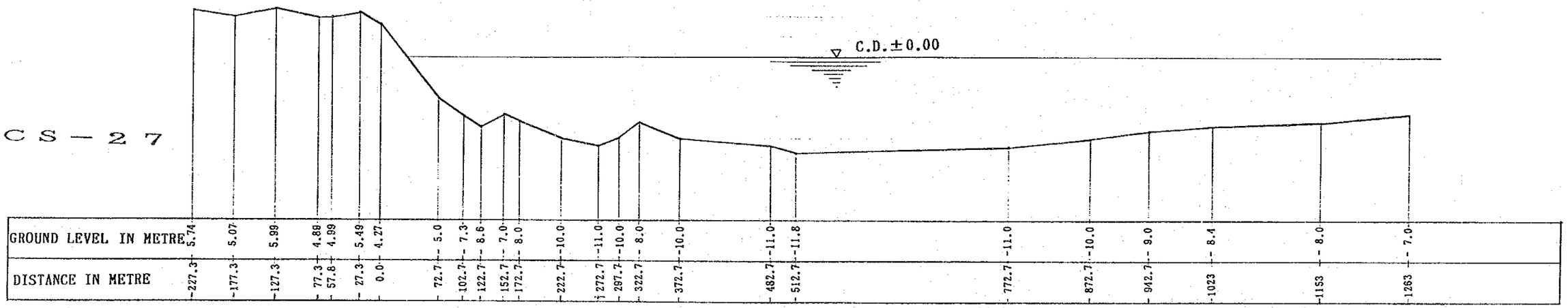


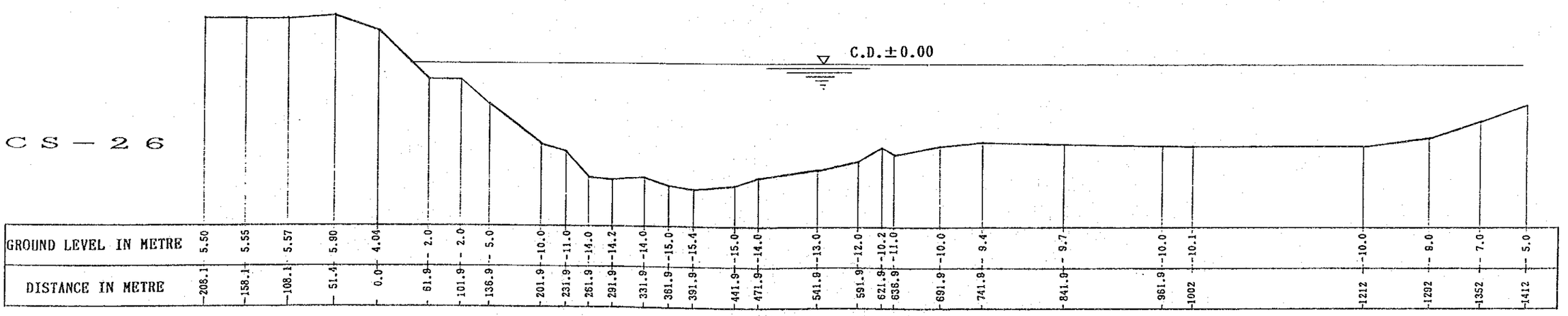


Scale ; Horiz. 1/10,000 Vert. 1/1,000

Appendix-I.2.1.8 Cross-section of Opposite Side of Tg. Sebubal







Scale ; Horiz. 1/5,000 Vert. 1/500

Appendix-I.2.1.9 Erosion on the Site for the Development

The change in the shoreline and river bed was examined in three areas. Location of the three areas is shown in **Figure-I.2.1.9** (1).

Upper Tanjung Sebubal (Eastward from 111°20'30" E) has three conspicuous features in relation to erosion and sedimentation --- sedimentated area, stable or eroded area originating in the east.

At the Middle Tanjung Sebubal, the shoreline and river bed close to the shoreline are comparatively eroded.

At the opposite side of Tanjung Sebubal, sedimentation occurs in the eastern half and slight erosion occurs in the western half.

Following analyses were performed for the three areas.

① Comparison of river bed profile
② Horizontal change of river bed
③ Vertical change of river bed
④ Change in the edges of deep waterway of more than C.D. -10m
⑤ Change of river bed analyzed from contour maps

The shoreline at Upper Tanjung Sebubal has retreated less than 10 meters in the past eleven (11) years. So far, the extent of the erosion seems to be much.

The shoreline between 111°20'45" E and 111°21'30" E has remained constant. judging from **Figures-I.2.1.1(2)** and **Figure-I.2.1.9(3)**.

The shoreline around 111°20'371.5", where the river sharply weaves at Tanjung Sebubal, is the first impact point of current energy during ebb tide and the last impact point during flood tide. (See **Figure-I.2.1.9(12), (13)**)

The erosion begins here and continues up to the south fringe of Middle Tanjung Sebubal.

The coast eastward from 111°12'E forms the estuary of Semareng stream. The river bed around this area seems to change by year and/or by season.

Comparing the data of 1979 and 1990, the area close to the shore has a large volume of sedimentation. On the other hand, a large amount erosion has arisen at about 250m offshore from the area of sedimentation.

At Middle Tanjung Sebubal, the shoreline may have retreated, but not to a great degree. However, the edge of the slope and the bed nearby were remarkably eroded. Some sections have eroded more than 50 meters by horizontal scale (Most of the parts changed more than 5 meters in vertical range - See **Figure-I.2.1.9(5), (6).** There are three sedimented places in the area. Two of them are located in the deep waterway (deeper than CD -10m.) Please refer to **Figure-I.2.1.9** (7).

Another is located in the shallow area close to the opposite side (Tanjung manis).

Opposite side of Tanjung Sebubal (111°19'E - 111°20'E) is located near the estuary of Sungai Limut river. In general, sedimentation prevails over erosion at the coast close to the estuary area. The river bed alongside the shoreline as well as at the estuary of Upper Tanjung Sebubal is covered with sedimentation.

At the opposite side of the sedimentation coast, the shore between 111°19'30" and 111°19'37.5" seems to have receded about 30 meters. (See **Figure-I.2.1.9(8), (9)).**

The following are considered to be the main reasons for the receding shoreline:

① Water comes up to deeper inland and goes out during high tide because the land levels are comparatively low.
② Discharging water brings out the soil, because the surface of the bank consists of soft cohesive soil.
③ Due to reason 1 and 2 above, new creeks are easily made up or the stream changes itself. Thus the surface soil is eroded and the coast line recedes.

When the river meanders, the main stream collides against the outer bank. (See **Figure-I.2.1.9(11), (12)**) Deep waterway and the erosion area are, therefore, observed along the outer side. (See **Figure-I.2.1.9(4), (7)**)

The opposite side (inner side) of the river is shallow, which results in sedimentation. (See **Figure-I.2.1.9(4), (7), (10)**)

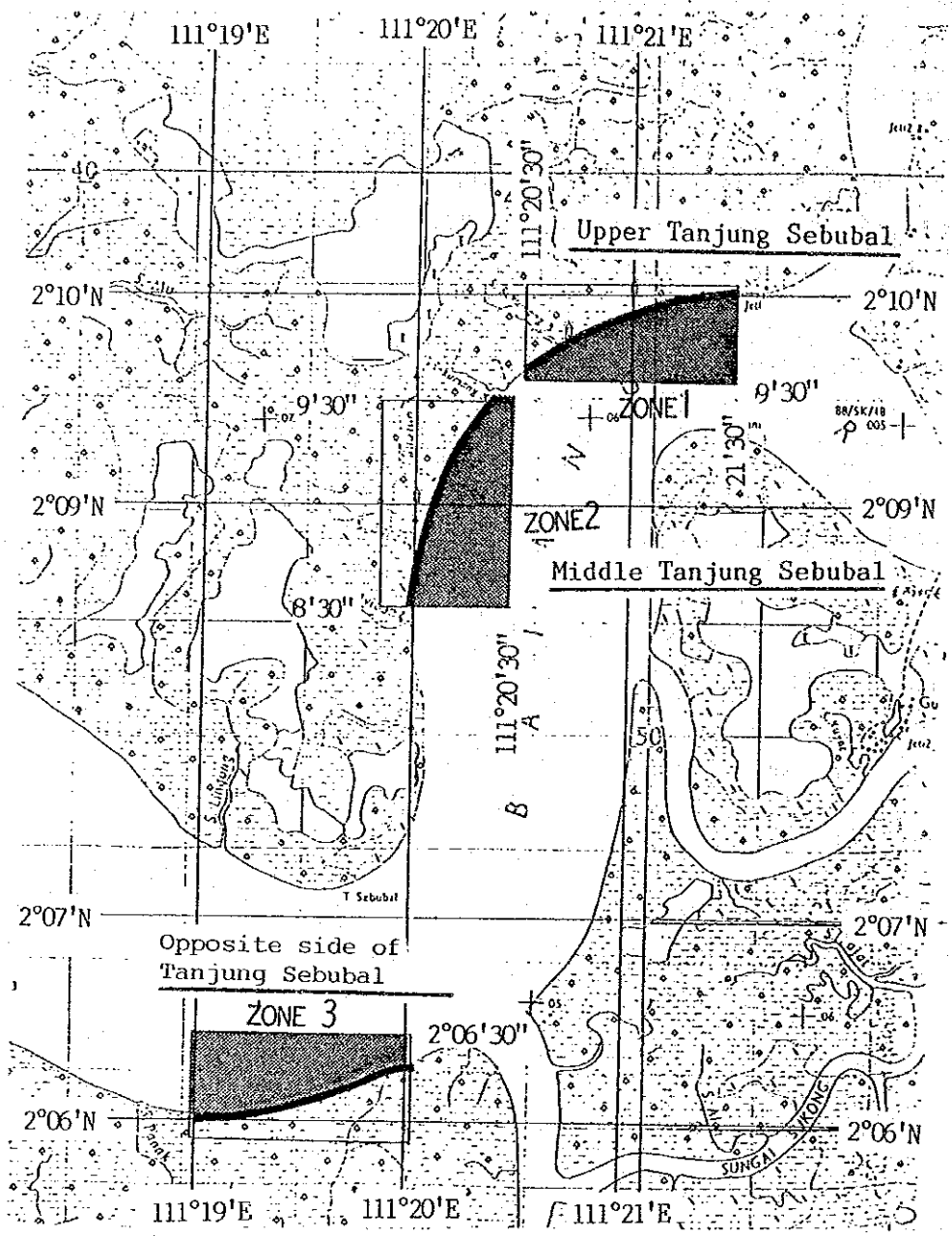
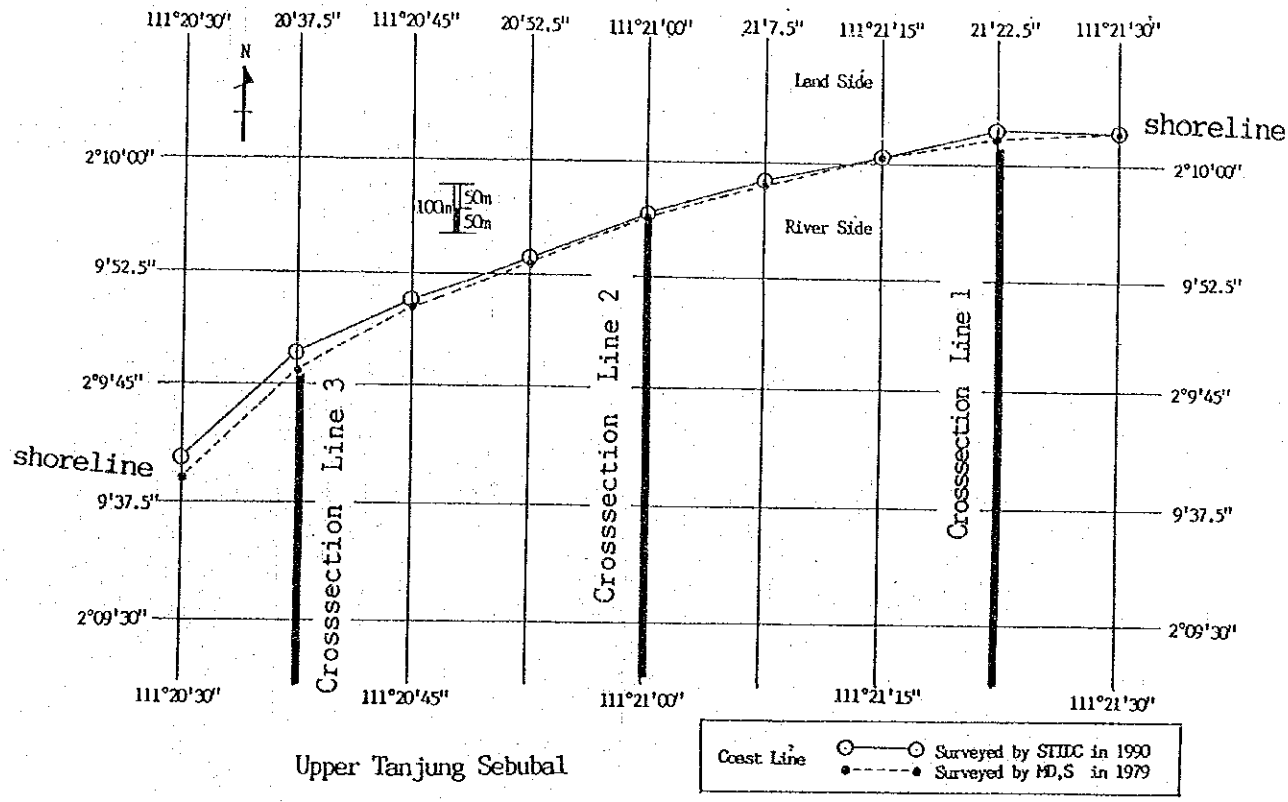
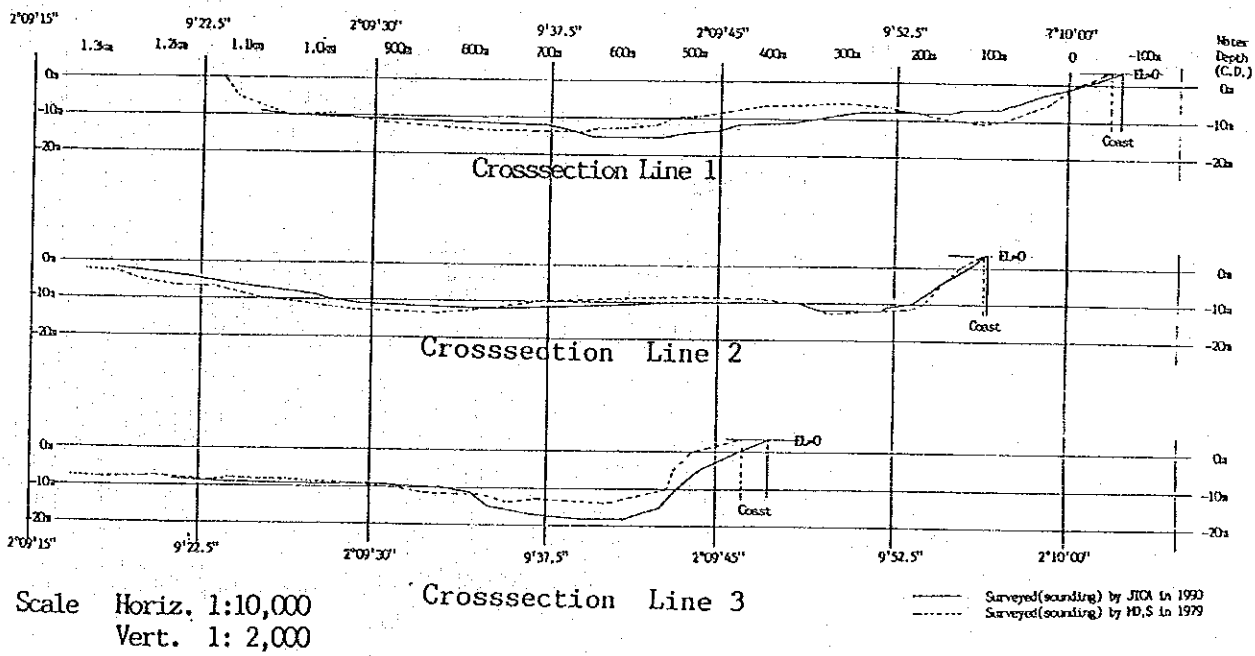


Figure-I.2.1.9(1) Location Map of the Study Area for Erosion and Sedimentation



Location map of crosssection lines Scale 1 : 15,000

ZONE 1



Scale Horiz. 1:10,000
Vert. 1: 2,000

Figure-I.2.1.9(2) River Bed Profile at Upper Tg. Sebubal

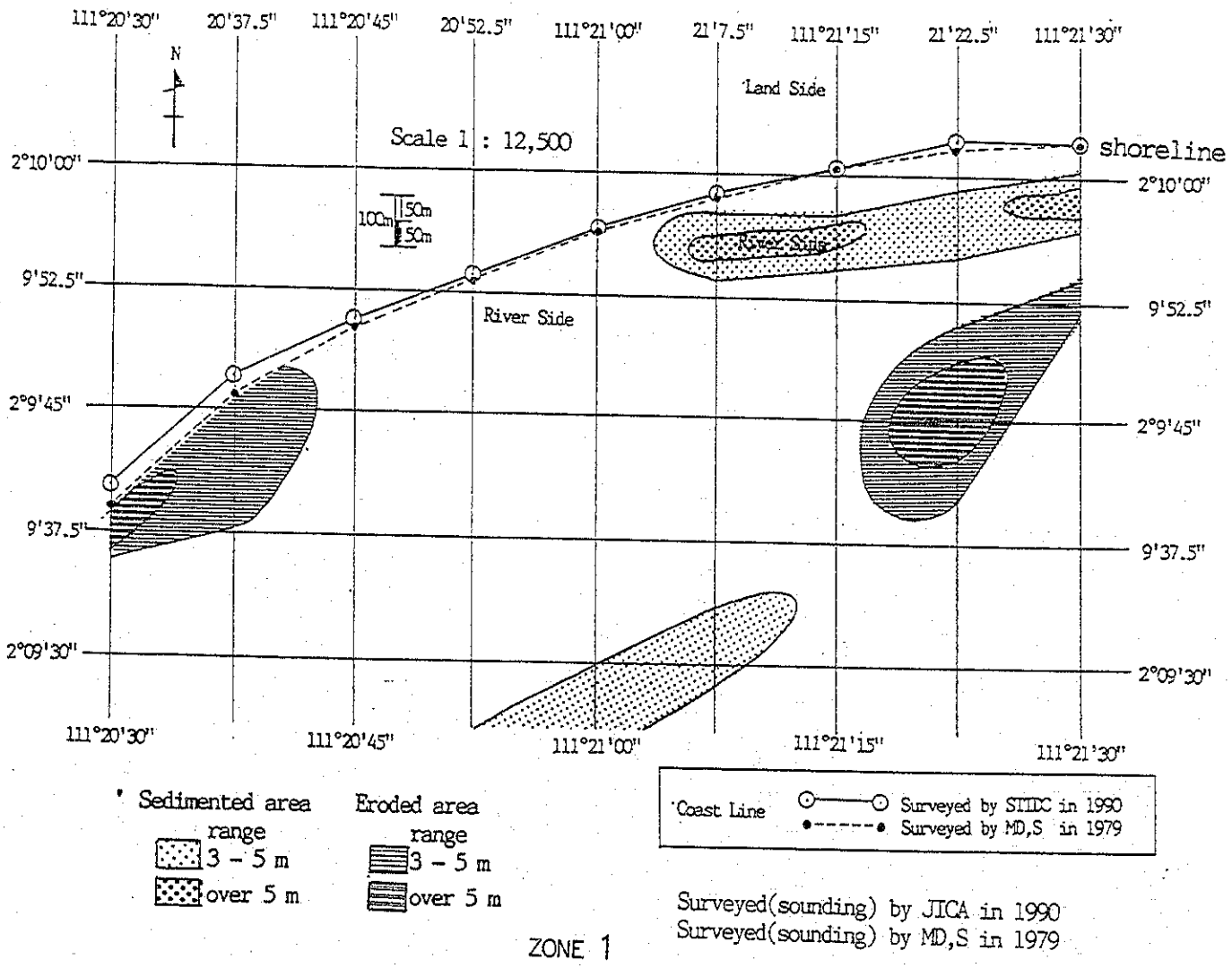
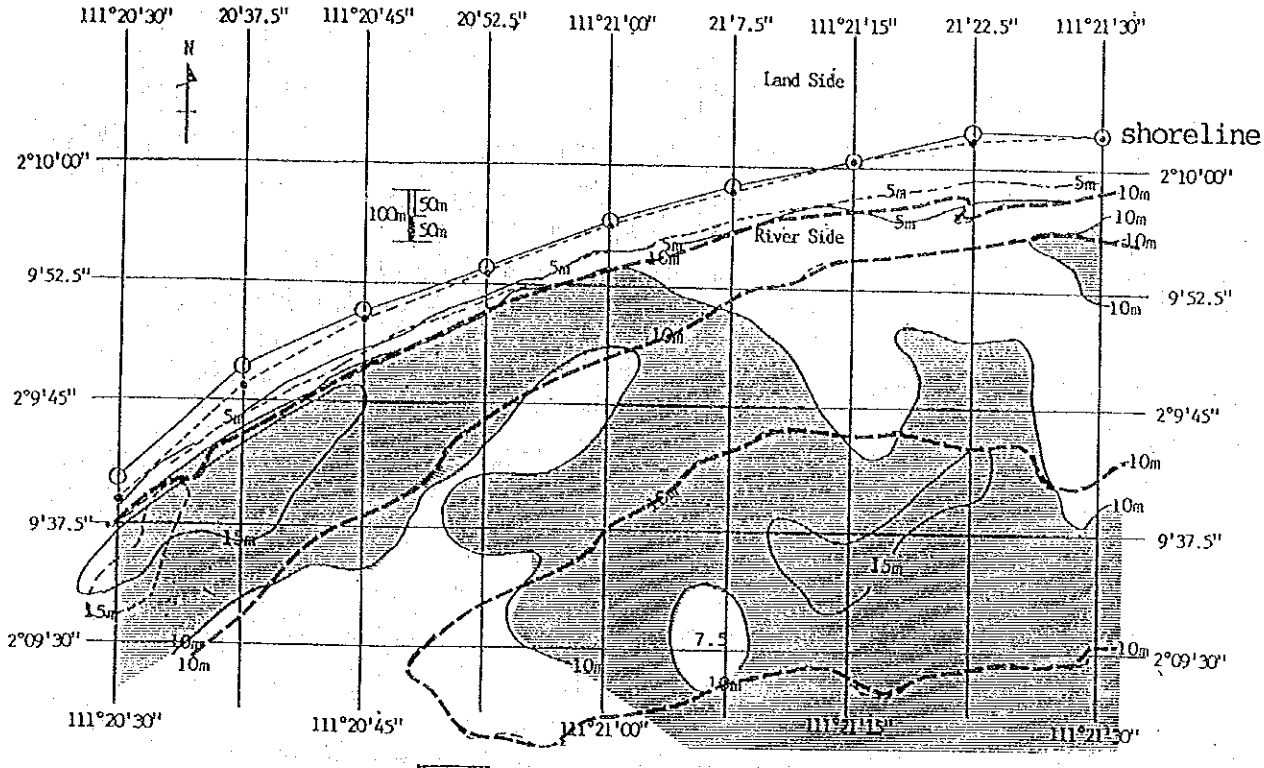


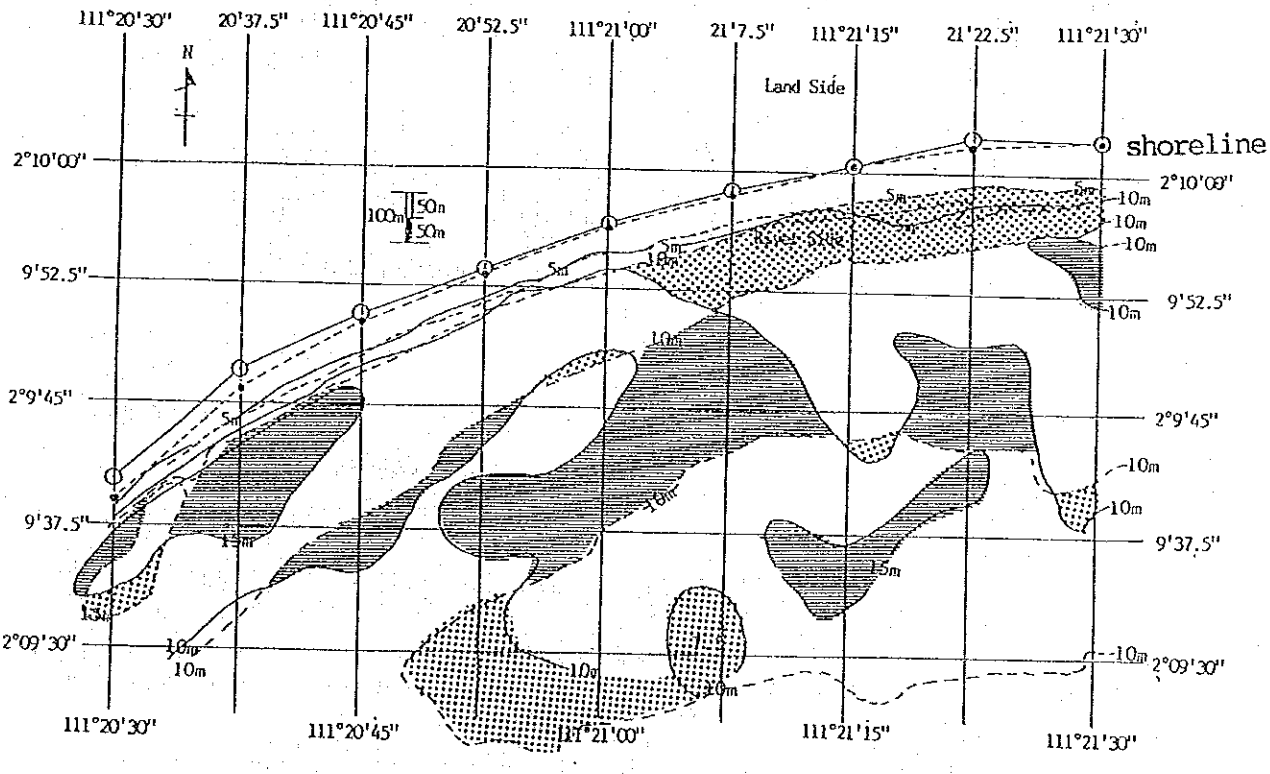
Figure-I.2.1.9(3) Changes with the Passage of Time regarding the Shoreline and River Bed at Upper Tg. Sebubal



Deep waterway more than C.D.-10m in 1990

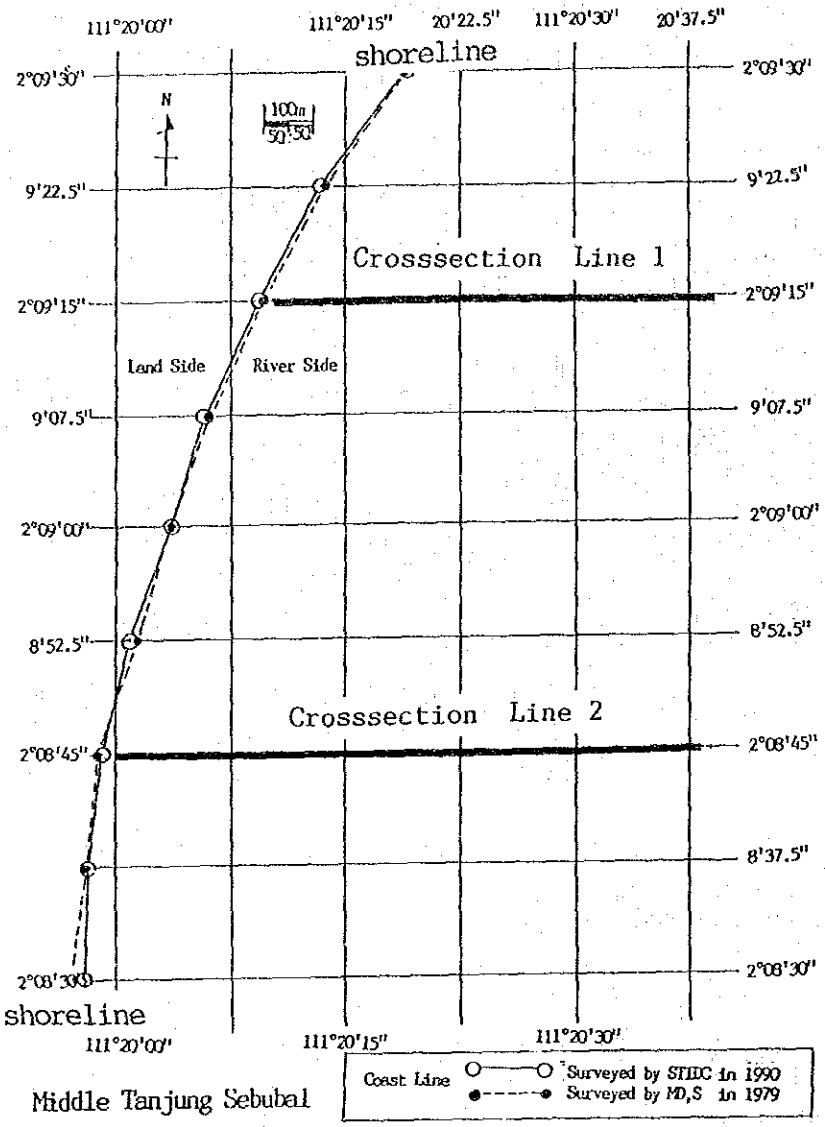
ZONE 1

Contour line of C.D.-10m in 1979



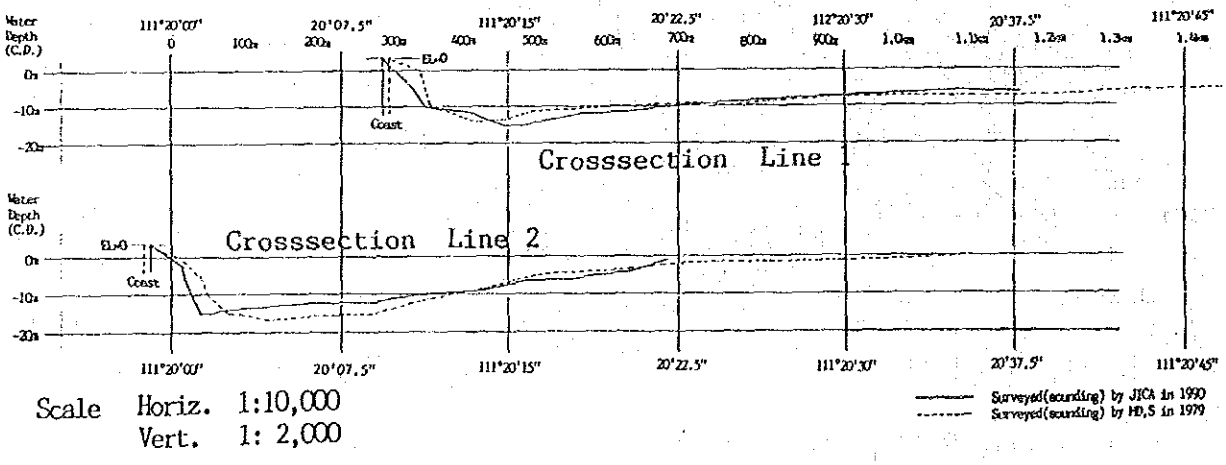
Eroded area Sedimented area

Figure-I.2.1.9(4) Comparison of Deep Waterway and River Bed between in 1979 and 1990 at Upper Tg. Sebubal



Location map of crosssection lines Scale 1 : 15,000

ZONE 2



Scale Horiz. 1:10,000
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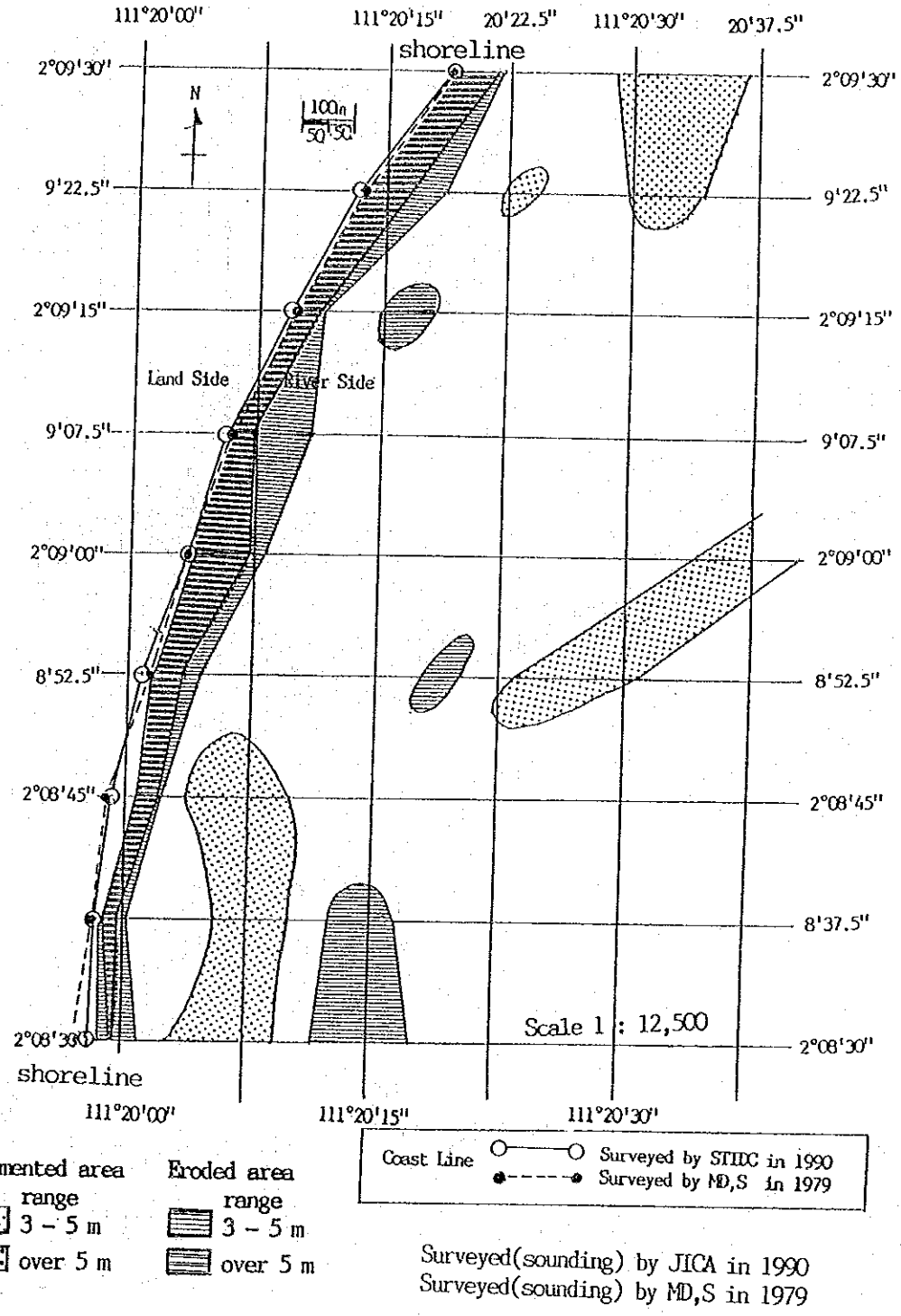
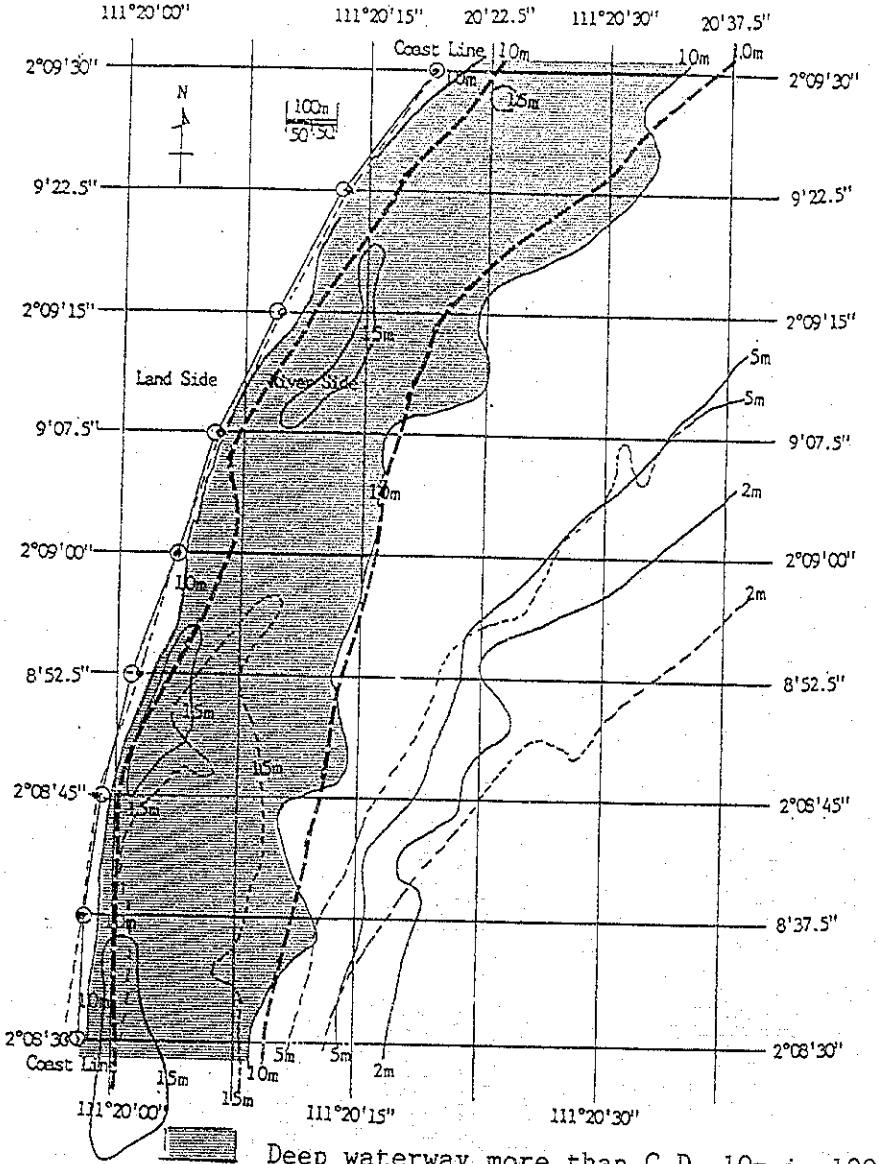
Figure-I.2.1.9(5) River Bed Profile at Middle Tg. Sebubal



ZONE 2

Figure-I.2.1.9(6) Changes with Passage of Time regarding Shoreline and River Bed at Middle Tg. Sebubal



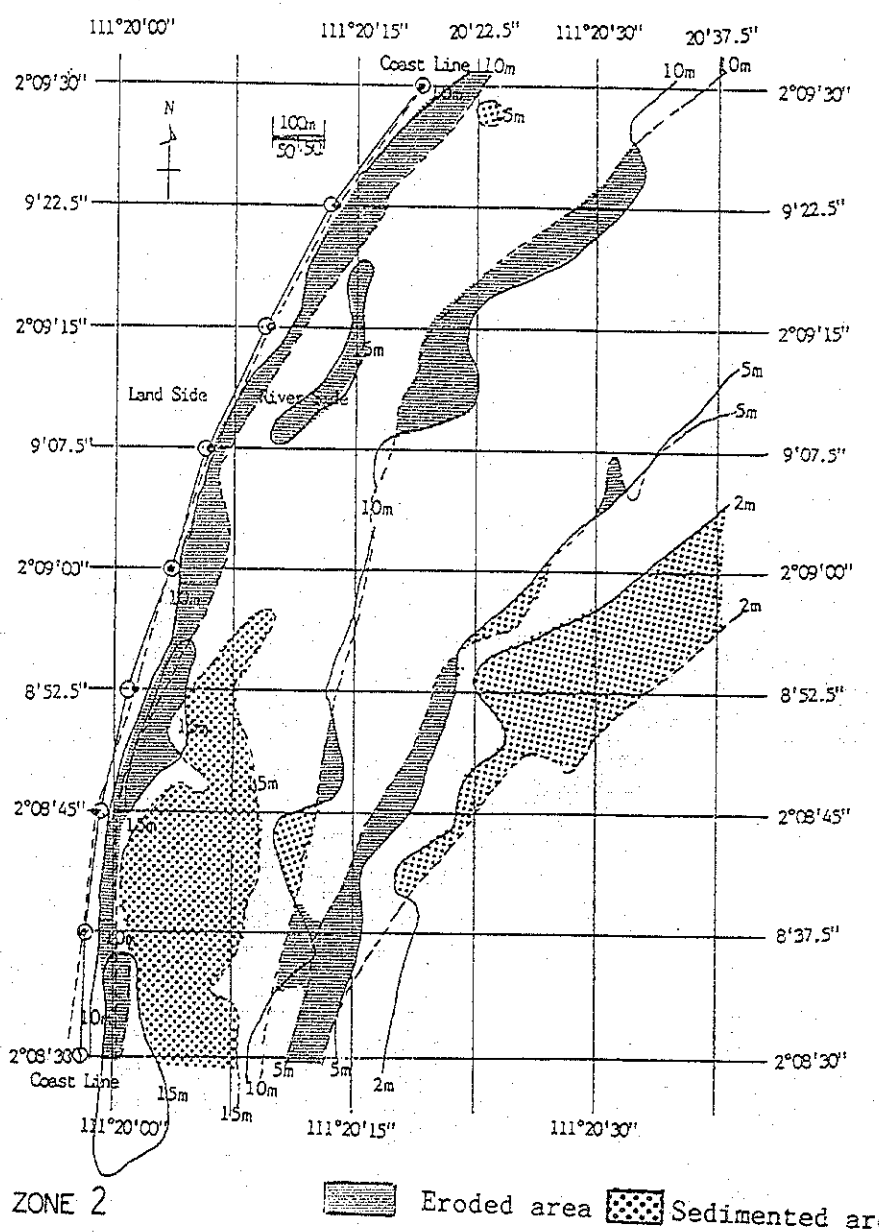
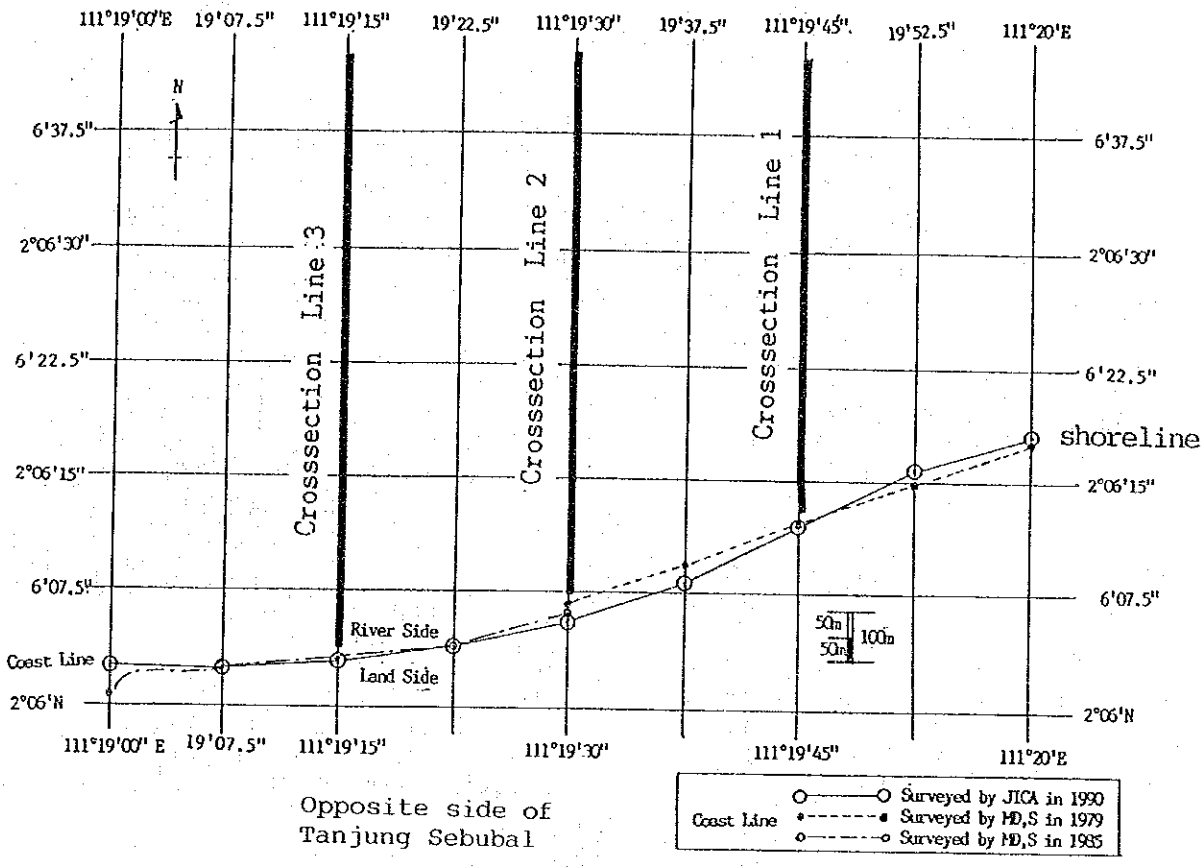


Figure-I.2.1.9(7) Comparison of Deep Waterway and River Bed between in 1979 and 1990 at Middle Tg. Sebubal



Location map of crosssection lines Scale 1 : 15,000

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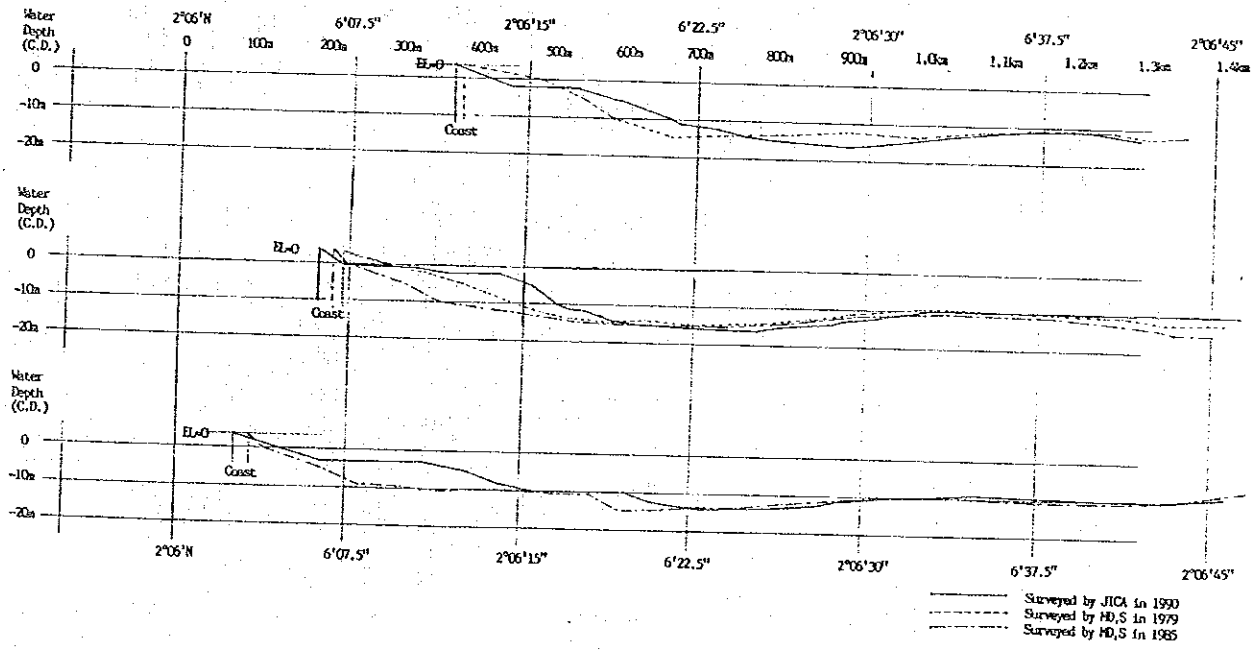


Figure-I.2.1.9(8) River Bed Profile at Opposite Side of Tg. Sebubal

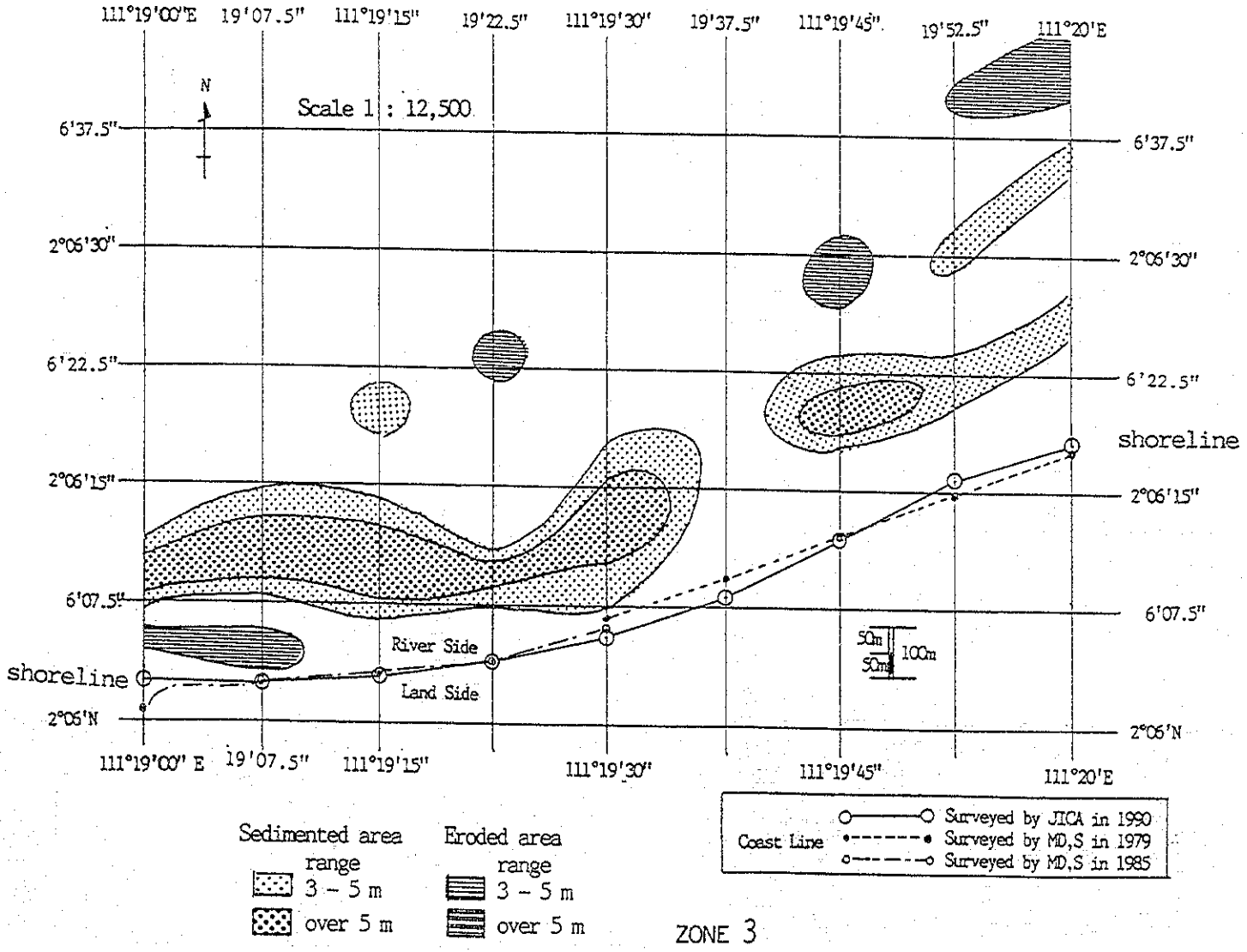
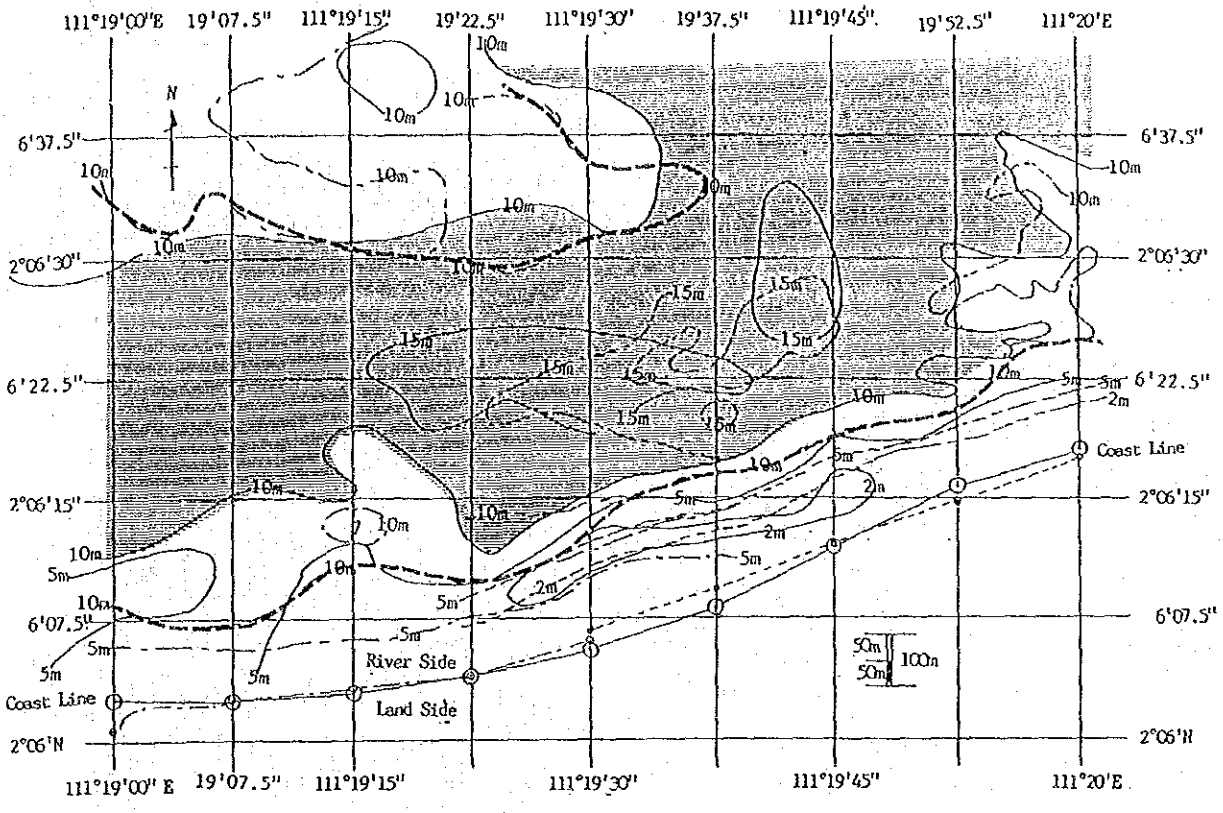


Figure-I.2.1.9(9) Changes with the Passage of Time regarding Shoreline and River Bed at Opposite Side of Tg. Sebubal



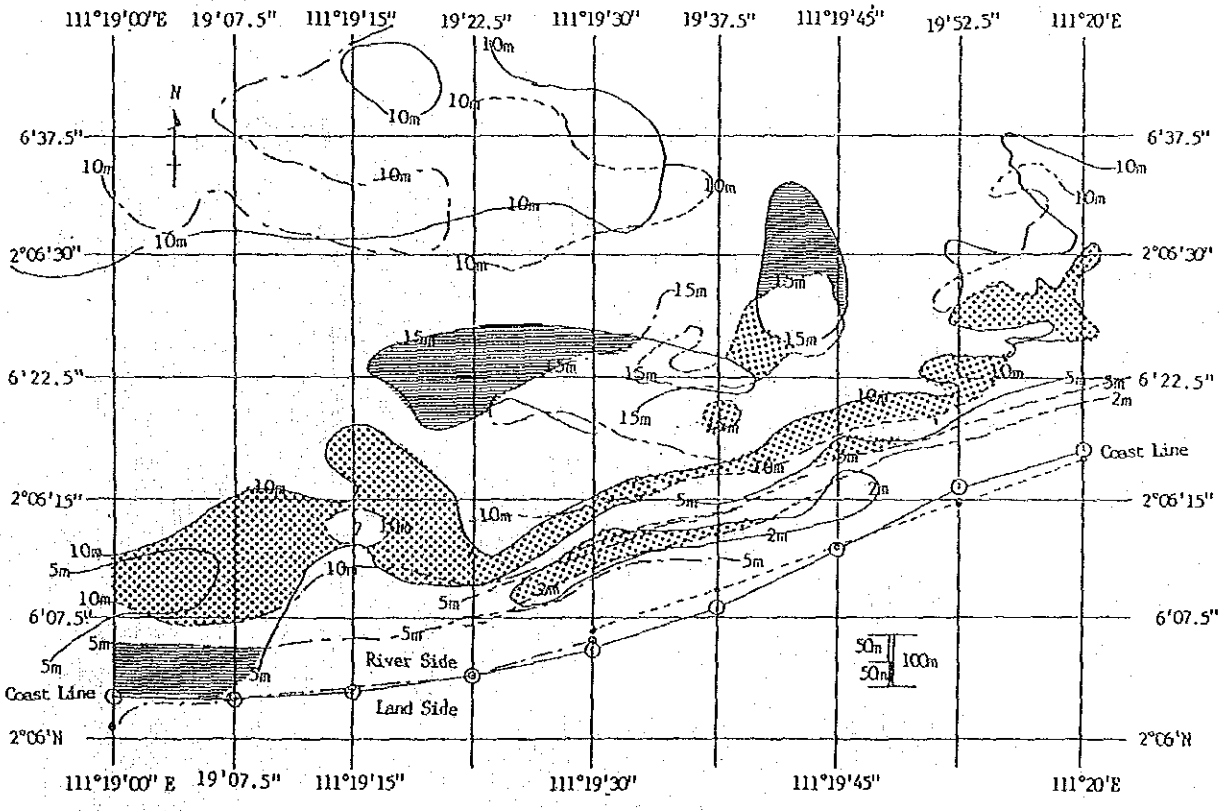


Figure-I.2.1.9(10) Comparison of Deep Waterway and River Bed between 1979, 1985 and 1990 at Oppposite Side of Tg. Sebubal

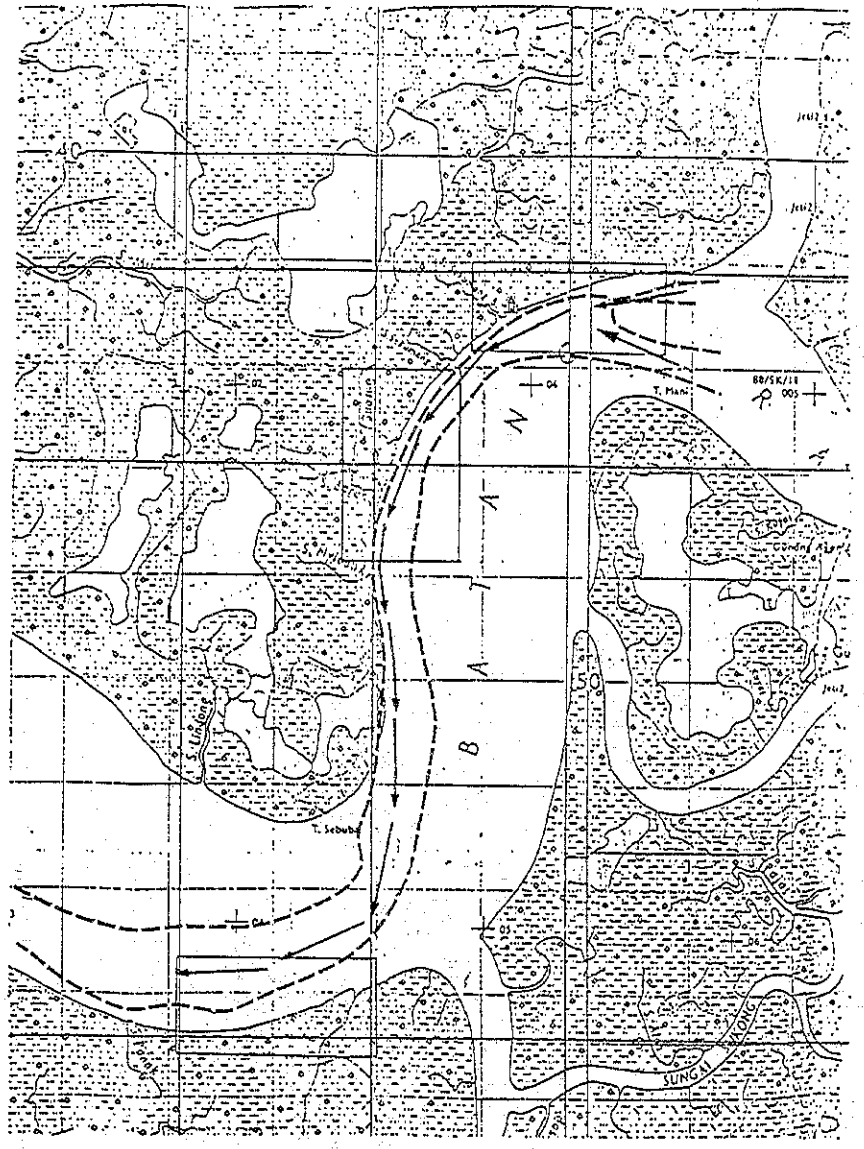


Figure-I.2.1.9(11) Deep Waterway more than C.D.-10m and Rough Gravity Center in the Deep Waterway

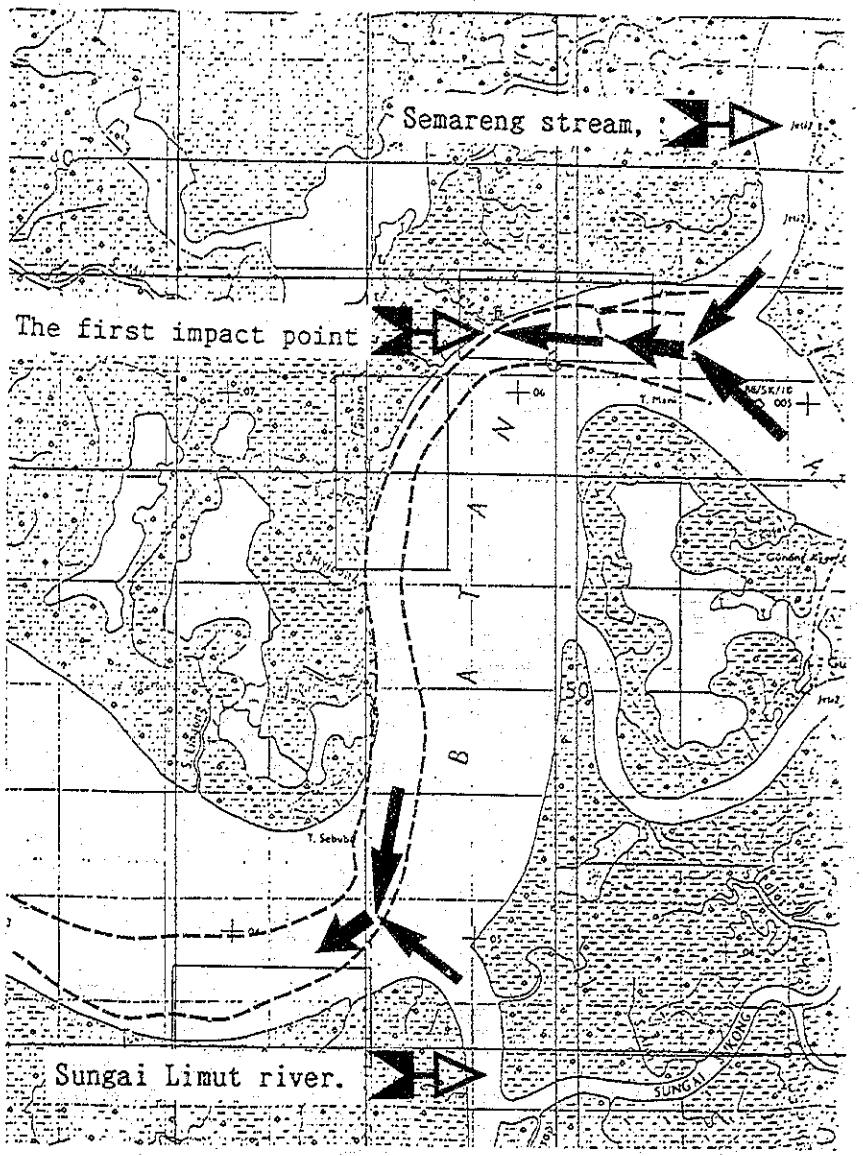
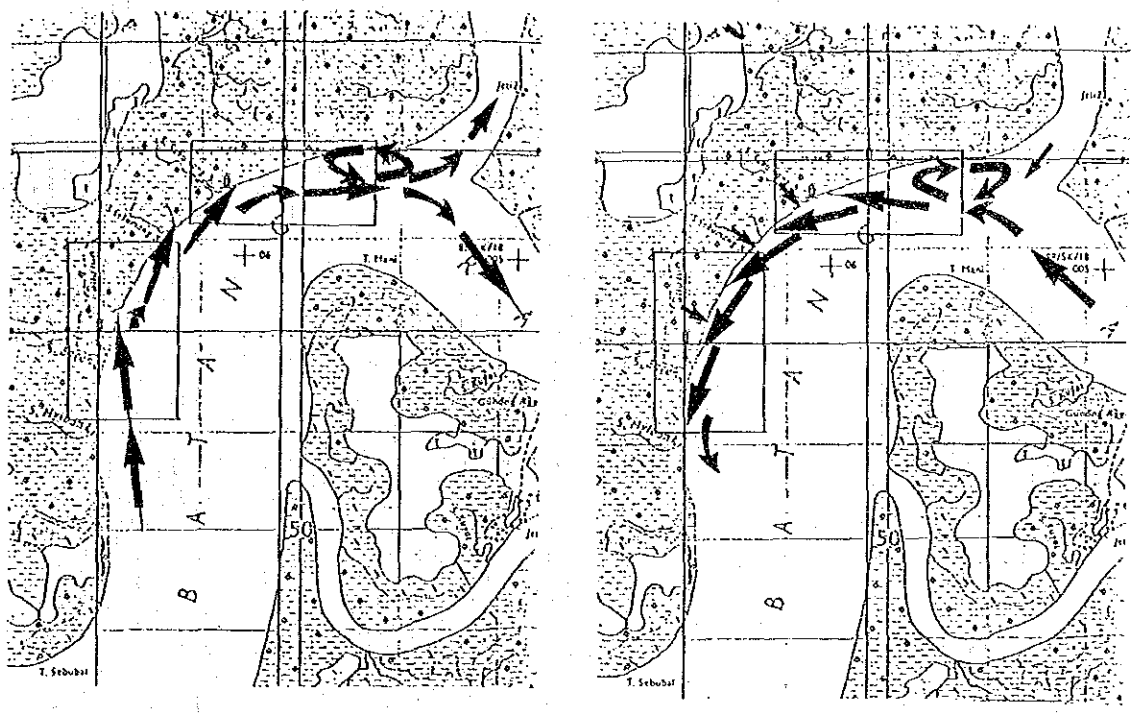
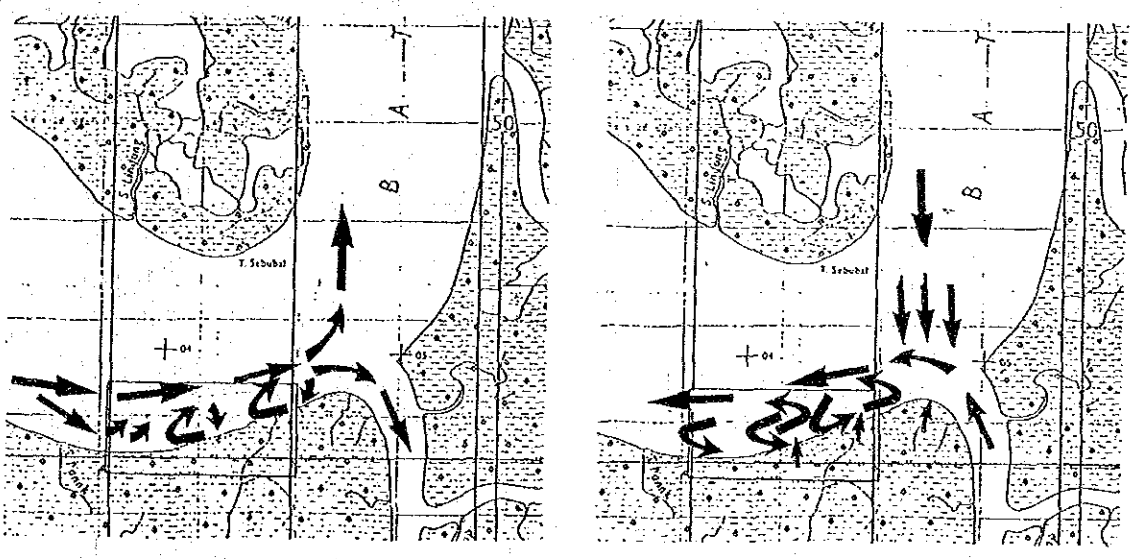


Figure-I.2.1.9(12) Sketch of the Tidal Current Crossing at Estuaries during Ebb Tide



During flood tide　　During ebb tide

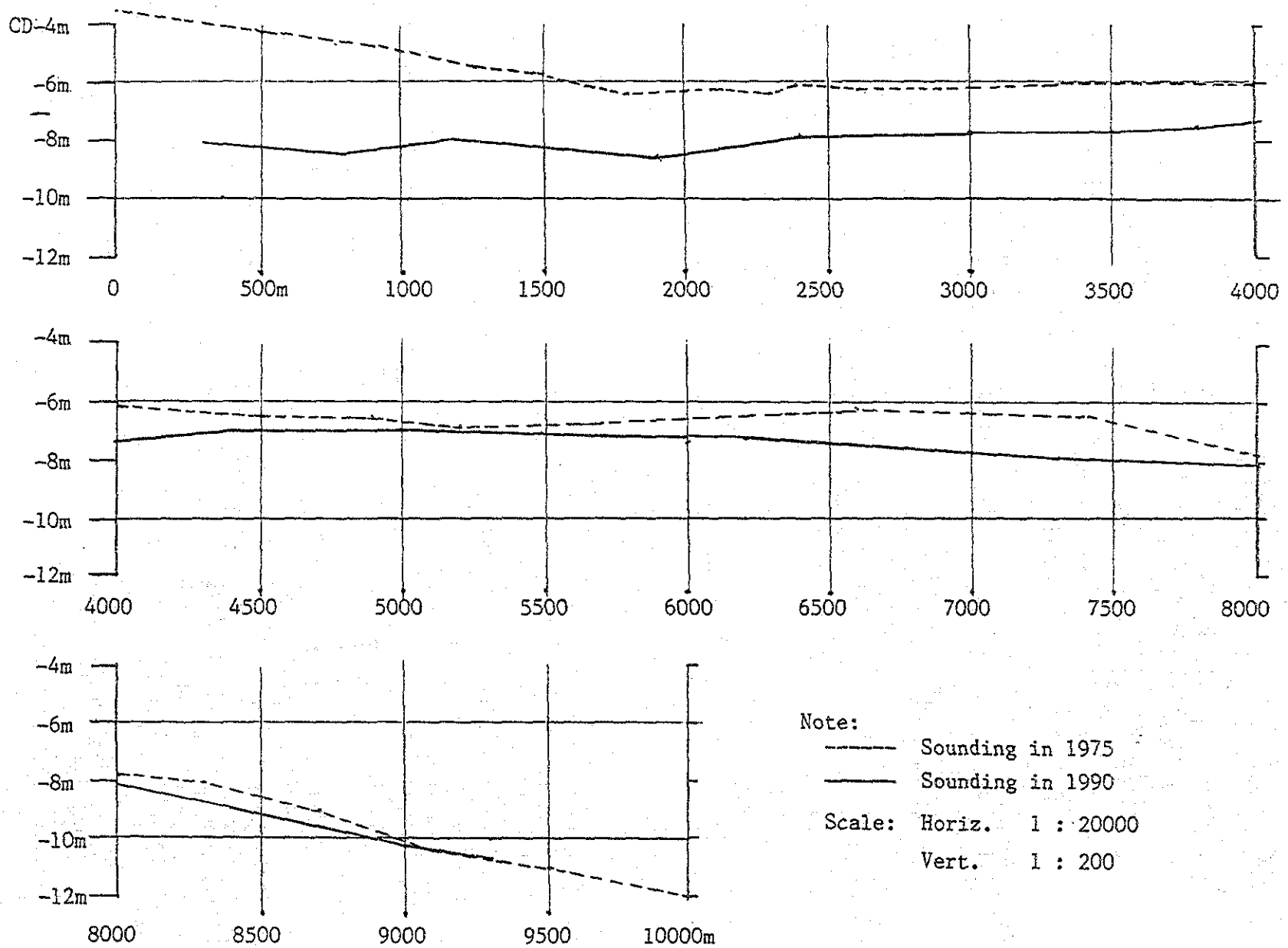
Major river current at Tanjung Sebubal



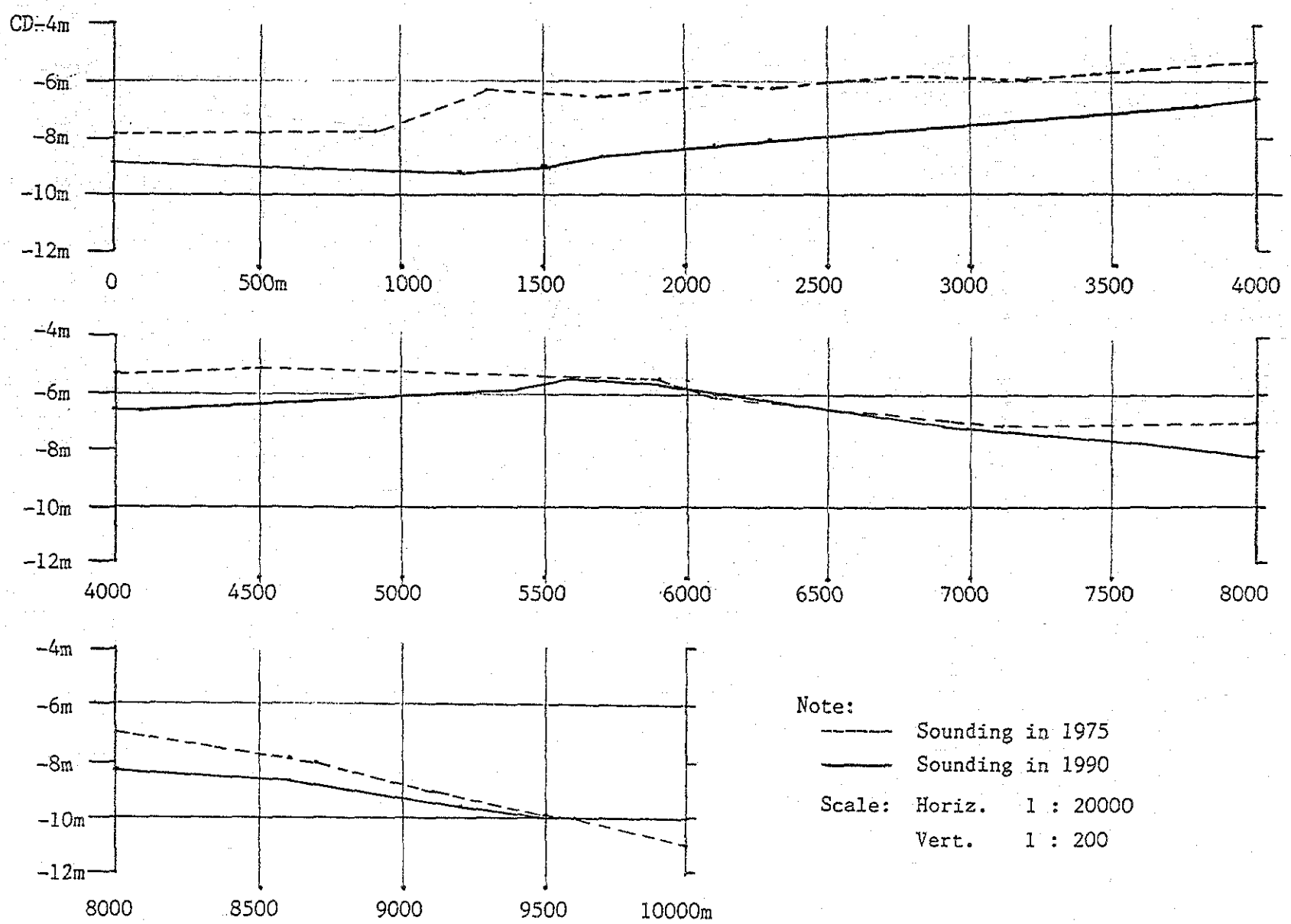
During flood tide　　During ebb tide

Figure-I.2.1.9(13) Major River Current at Opposite Side of Tg. Sebubal

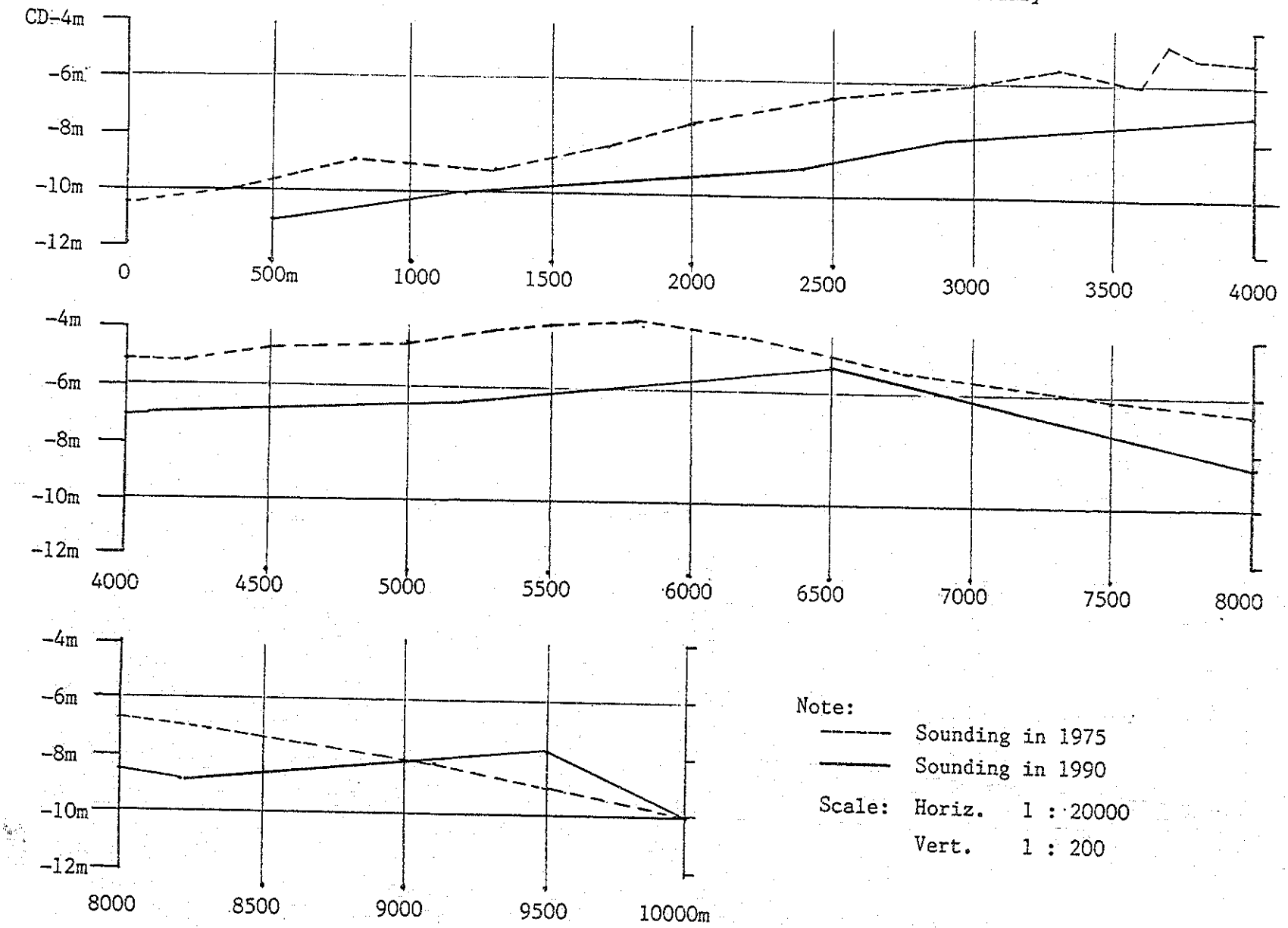
Appendix-I.2.1.10 Bottom Profile of Section A at the Estuary



Appendix-I.2.1.11 Bottom Profile of Section B at the Estuary



Appendix-I.2.1.12 Bottom Profile of Section C at the Estuary



Appendix-I.2.2.1 Records of Surface Wind Mean Speed (Sibu)

STATION : SIBU AERODROME
LATITUDE : 2° 20' N
LONGITUDE : 111° 50' E
HEIGHT ABOVE MSL : 7.5 m

UNIT ; METER PER SECOND

YEAR \ MONTH	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
1981	0.9	0.8	0.7	0.6	0.7	0.6	0.7	0.7	0.9	0.7	0.9	1.1	0.8
1982	1.1	0.8	0.8	0.7	0.5	0.6	0.5	0.7	0.7	0.9	0.7	0.7	0.7
1983	1.2	1.2	1.0	0.6	0.6	0.8	0.8	0.7	0.9	0.8	0.8	0.7	0.8
1984	0.8	0.7	0.7	0.7	0.7	0.8	0.8	0.7	0.8	0.9	0.7	0.6	0.7
1985	0.9	0.6	0.6	0.7	0.5	0.7	0.6	0.5	0.5	0.7	0.7	0.7	0.6
1986	0.7	0.6	0.7	0.6	0.5	0.6	0.7	0.7	0.6	0.5	0.6	0.5	0.6
1987	0.6	0.7	0.4	0.5	0.5	0.7	0.7	0.8	0.5	0.6	0.8	0.8	0.6
1988	0.7	0.7	0.8	0.8	0.7	0.7	0.8	0.7	0.7	0.8	0.9	0.8	0.8
1989	0.8	1.0	0.9	0.8	0.9	0.7	1.1	1.0	1.0	1.0	1.0	0.9	0.9
1990	0.8	0.5	0.9	0.6	0.6	0.7	0.8	0.8					0.7
AVERAGE	0.9	0.7	0.8	0.7	0.6	0.7	0.8	0.7	0.7	0.8	0.8	0.8	0.7

SOURCE ; METEOROLOGICAL DEPARTMENT, SARAWAK

Appendix-I.2.2.2 Monthly Maximum Surface Wind

STATION : SIBU AERODROME

UNIT ; DEGREE / METER PER SECOND

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	EXTREME
1964	N.A.	N.A.	360/11.6	130/13.0	270/16.5	280/12.1	230/15.6	230/13.4	260/20.1	200/12.5	250/17.9	250/12.5	N.A.
1965	040/14.7	350/12.5	230/14.6	360/14.9	330/16.4	360/20.8	240/13.0	230/14.2	360/13.3	160/18.7	180/17.2	310/19.7	360/20.6
1966	180/14.7	320/10.7	350/18.2	350/15.7	280/13.5	240/13.0	260/16.0	230/13.4	240/14.6	310/14.1	220/18.1	240/14.7	350/18.2
1967	290/14.0	360/13.2	200/18.0	320/13.5	130/16.1	300/16.2	280/19.2	190/30.0	340/19.6	210/14.0	180/13.5	040/12.4	190/30.0
1968	220/14.0	010/12.3	010/15.7	120/15.2	320/14.6	210/13.7	260/14.4	260/16.3	330/16.5	210/17.2	220/18.0	260/20.5	260/20.5
1969	190/13.5	8 1/8/11.6	240/15.8	250/17.0	330/14.3	330/12.5	360/14.0	360/16.8	010/16.7	240/14.7	120/14.1	300/14.2	250/17.0
1970	060/13.0	350/10.5	330/12.4	310/14.1	300/13.7	270/13.9	020/24.8	220/15.5	090/16.2	280/19.7	270/12.7	310/14.1	020/24.8
1971	230/12.6	230/13.3	310/14.0	290/14.8	220/13.8	250/14.7	290/12.7	N.A.	210/11.8	250/23.1	220/21.7	350/14.0	250/23.1
1972	350/11.0	090/14.0	010/13.0	340/15.5	150/13.5	290/16.8	260/12.1	160/17.0	280/19.2	050/15.9	350/13.4	290/14.7	280/19.2
1973	340/12.5	260/11.9	220/16.0	290/19.3	070/16.6	210/12.8	280/17.2	170/17.1	030/17.0	120/15.7	320/14.0	220/14.2	290/19.3
1974	200/13.3	020/14.5	050/25.6	320/12.5	270/15.8	300/17.4	300/12.6	190/14.7	340/14.5	280/15.4	250/21.1	040/18.9	050/25.6
1975	190/12.9	330/13.5	320/15.8	050/16.1	210/15.0	270/16.2	320/14.5	320/22.4	290/14.3	310/14.5	100/17.1	340/13.4	320/22.4
1976	330/12.9	320/13.4	240/14.0	180/15.0	340/19.7	120/14.7	230/16.0	220/16.0	050/16.7	270/20.8	270/12.6	340/13.6	270/20.8
1977	020/14.0	030/12.9	020/14.2	300/14.2	090/15.2	200/16.7	290/12.4	260/16.9	210/22.2	240/14.7	350/13.5	160/14.5	210/22.2
1978	360/13.5	080/14.8	180/16.8	130/13.7	280/10.5	250/14.6	270/12.0	240/18.2	160/15.2	160/14.7	310/14.0	020/11.2	240/18.2
1979	010/11.5	290/14.7	180/14.2	350/13.3	330/12.7	210/14.7	360/23.2	330/12.5	050/20.1	290/13.8	310/12.1	200/14.1	360/23.2
1980	340/10.4	330/12.8	150/13.8	340/20.5	020/16.0	160/15.3	250/16.4	360/16.6	250/17.3	340/13.5	260/15.4	230/17.9	340/20.5
1981	340/11.5	010/13.1	030/14.7	280/12.0	240/12.1	170/25.8	310/18.7	250/13.5	330/19.0	230/14.9	350/14.5	010/14.4	170/25.8
1982	030/12.9	330/10.0	340/14.9	330/13.0	230/14.7	230/14.7	350/12.5	350/12.3	320/14.3	050/14.6	020/18.7	330/13.6	020/18.7
1983	190/11.2	050/13.5	250/15.0	190/12.8	110/16.7	230/14.3	200/13.1	340/19.3	030/10.7	330/11.6	340/13.7	240/14.0	340/19.3
1984	230/12.1	150/17.6	310/14.8	300/14.5	200/11.3	280/13.0	280/14.1	260/23.0	280/21.4	230/17.0	280/13.0	220/12.5	260/23.0
1985	230/13.7	290/16.0	1 6/8/12.3	250/13.1	270/12.4	260/17.3	030/14.9	300/17.0	170/13.4	270/14.2	260/18.0	270/12.3	260/18.0
1986	360/11.2	350/14.4	070/11.6	080/14.6	300/14.0	230/17.0	240/16.1	310/18.3	220/13.6	070/15.6	330/16.7	010/10.7	310/18.3
1987	030/12.3	280/13.0	300/12.2	220/13.1	310/16.7	230/13.5	240/20.0	310/13.0	250/18.8	030/15.1	270/14.3	040/18.0	240/20.0
1988	340/13.0	030/11.8	040/11.2	360/15.7	280/17.0	310/15.1	290/18.8	130/17.7	340/12.2	280/22.9	280/21.4	360/13.1	280/22.9
1989	310/12.8	060/12.7	250/15.9	350/20.5	280/20.7	270/14.0	260/16.6	190/24.5	140/15.8	160/15.0	020/15.1	210/18.7	190/24.5
1990	070/13.0	350/11.2	280/14.2	070/15.2	290/16.9	290/16.0	330/14.6						

SOURCE ; METEOROLOGICAL DEPARTMENT, SARAWAK

Appendix-I.2.3.1 Summary of Laboratory Test Results

(1)

Location : Tanjung Manis

Boring No.			BH 1	BH 1	BH 1	BH 1	BH 1	BH 1	BH 1
Sample No.			U 1	U 2	U 3	U 4	U 5	P 1	P 2
Sample Depth		m	1.20 1.80	4.20 4.80	7.10 7.70	10.00 10.60	13.00 13.60	14.40 14.85	16.00 16.45
Natural Water Content		%	76	83	26	38	42	23	18
Specific Gravity			2.60	2.49	2.74	2.70	2.69	2.66	2.64
Wet Density		Mg/m^3	1.53	1.53	1.93	1.81	1.89		
Dry Density		Mg/m^3	0.93	0.86	1.32	1.30	1.42		
Atterberg Limits	Liquid Limit	%	79	77	49	46	33		
	Plastic Limit	%	40	32	26	13	19		
	Plasticity Index		39	45	33	33	14		
Grain Size Distribution	Gravel	%	1	0	0	5	0	4	2
	Sand	%	10	5	47	27	6	46	55
	Silt	%	64	69	29	5	53	31	26
	Clay & Colloid	%	25	26	24	33	41	19	17
Soil Classification			M V	C V	C I	C I	C L		
Unconfined Compression Test	U - Sample	KN/m^2	21.85	31.00	26.50	42.67	46.81		
	R - Sample	KN/m^2	12.31	17.66	8.83	12.26	18.92		
	Sensitivity Ratio		1.77	1.76	2.94	2.48	2.47		
	Strain at Failure	%	U: 13.50 R: 20.00	U: 5.00 R: 20.00	U: 7.25 R: 20.00	U: 9.00 R: 16.75	U: 9.25 R: 15.25		
Consolidation Test	Preconsolidation Pressure	KN/m^2		70		95			
	Compression Index			0.77		0.37			

Remarks ; U = Undisturbed R = Remoulded SI= Sample Insufficient
D = Disturbed NP= Non-plastic

Location : Tanjung Manis

Boring No.			BH 2	BH 2	BH 2	BH 2	BH 2	BH 2	BH 2
Sample No.			U 1	U 2	U 3	U 4	P 1	P 2	U 5
Sample Depth		m	3.00 3.60	6.00 6.60	9.00 9.60	12.00 12.60	13.50 13.95	15.00 15.45	16.50 17.10
Natural Water Content		%	64	64	83	62	28	28	51
Specific Gravity			2.63	2.58	2.54	2.61	2.66	2.62	2.61
Wet Density		Mg/m^3	1.62	1.63	1.68	1.62			1.64
Dry Density		Mg/m^3	0.99	1.01	1.06	1.00			1.05
Atterberg Limits	Liquid Limit	%	69	70	71	64			61
	Plastic Limit	%	42	41	25	37	NP	NP	37
	Plasticity Index		27	29	46	27			24
Grain Size Distribution	Gravel	%	0	0	0	0	1	1	0
	Sand	%	12	4	7	8	67	75	7
	Silt	%	67	68	68	74	23	16	59
	Clay & Colloid	%	21	28	25	18	9	9	34
Soil Classification			M H	MH/MV	C V	M H	S M	S M	M H
Unconfined Compression Test	U - Sample	KN/m^2	18.55	55.03	46.88	52.26			25.84
	R - Sample	KN/m^2	12.83	14.83	8.96	12.83			21.73
	Sensitivity Ratio		1.45	3.71	5.23	4.07			1.19
	Strain at Failure	%	U: 5.00 R: 20.00	U: 9.25 R: 20.00	U: 9.00 R: 20.00	U: 14.75 R: 20.00			U: 2.00 R: 20.00
Consolidation Test	Preconsolidation Pressure	KN/m^2		95		85			120
	Compression Index			0.68		0.67			0.59

Remarks ; U = Undisturbed R = Remoulded SI= Sample Insufficient
D = Disturbed NP= Non-plastic

Location : Tanjung Manis

Boring No.			BH 2	BH 2	BH 2	BH 2	BH 2	BH 3	BH 3
Sample No.			P 3	U 6	P 4	P 5	P 6	U 1	U 2
Sample Depth		m	18.00 18.45	19.50 20.10	21.00 21.45	22.50 22.95	24.00 24.25	2.30 2.90	5.50 6.10
Natural Water Content		%	54	51	59	24	12	88	72
Specific Gravity			2.62	2.62	2.60		2.75	2.62	2.62
Wet Density		Mg/m^3		1.73				1.48	1.48
Dry Density		Mg/m^3		1.16				0.79	0.83
Atterberg Limits	Liquid Limit	%		50		-	-	83	76
	Plastic Limit	%		32		NP	*NP	40	38
	Plasticity Index			18		-	-	43	38
Grain Size Distribution	Gravel	%	0	0	0	1	6	0	0
	Sand	%	3	10	4	69	48	3	5
	Silt	%	64	51	63	23	32	72	73
	Clay & Colloid	%	33	39	33	7	14	25	22
Soil Classification				MI/MH				M V	M V
Unconfined Compression Test	U - Sample	KN/m^2		98.01				8.52	24.49
	R - Sample	KN/m^2		35.59				2.97	7.88
	Sensitivity Ratio			2.75				2.87	3.11
	Strain at Failure	%		U: 6.25 R: 20.00				U: 15.25 R: 18.00	U: 7.25 R: 14.75
Consolidation Test	Preconsolidation Pressure	KN/m^2							45
	Compression Index								0.79

Remarks ; U = Undisturbed R = Remoulded SI= Sample Insufficient
D = Disturbed NP= Non-plastic

Location : Tanjung Manis

Boring No.			BH 3	BH 3	BH 3	BH 3	BH 3	BH 3	BH 3
Sample No.			U 3	U 4	U 5	U 6	P 1	P 2	P 3
Sample Depth		m	8.60 9.20	11.70 12.30	14.80 15.40	17.90 18.50	19.40 19.85	20.90 21.35	22.60 22.85
Natural Water Content		%	56	34	51	50	21	19	17
Specific Gravity			2.62	2.71	2.63	2.61	2.69	2.73	2.74
Wet Density		Mg/m^3	1.68	1.85	1.73	1.70			
Dry Density		Mg/m^3	1.07	1.38	1.15	1.12			
Atterberg Limits	Liquid Limit	%	65	44	56	59	-		
	Plastic Limit	%	29	22	35	34	NP		
	Plasticity Index		36	22	21	25	-		
Grain Size Distribution	Gravel	%	1	1	0	0	3	15	
	Sand	%	7	7	2	4	63	43	
	Silt	%	73	48	57	57	19	29	
	Clay & Colloid	%	19	44	41	39	15	13	
Soil Classification			C H	C I	M H	M H			
Unconfined Compression Test	U - Sample	KN/m^2	49.80	47.40	55.52	54.12			
	R - Sample	KN/m^2	11.73	26.37	26.64	21.11			
	Sensitivity Ratio		4.25	1.80	2.10	2.56			
	Strain at Failure	%	U: 4.75 R: 20.00	U: 12.25 R: 20.00	U: 4.25 R: 19.00	U: 8.75 R: 20.00			
Consolidation Test	Preconsolidation Pressure	KN/m^2		110					
	Compression Index			0.31					

Remarks ; U = Undisturbed R = Remoulded SI= Sample Insufficient
D = Disturbed NP= Non-plastic

Location : Tanjung Manis

Boring No.			BH 4	BH 4	BH 4	BH 4	BH 4	BH 4	BH 5
Sample No.			U 1	U 2	U 3	U 4	P 3	P 4	U 1
Sample Depth		m	2.70 3.30	5.80 6.40	8.90 9.50	12.00 12.60	18.70 18.99	20.40 20.73	3.00 3.60
Natural Water Content		%	93	81	71	71	21	17	34
Specific Gravity			2.71	2.56	2.63	2.61	2.67	2.70	2.63
Wet Density		Mg/m^3	1.60	1.52	1.52	1.60			1.68
Dry Density		Mg/m^3	0.95	0.83	0.92	0.92			1.13
Atterberg Limits	Liquid Limit	%	80	64	72	52	-	-	35
	Plastic Limit	%	40	37	31	27	NP	NP	16
	Plasticity Index		40	27	41	25	-	-	19
Grain Size Distribution	Gravel	%	0	0	0	0	9	0	2
	Sand	%	24	16	14	11	59	65	51
	Silt	%	60	67	67	69	23	25	30
	Clay & Colloid	%	16	17	19	20	9	10	17
Soil Classification			M V	M H	C I	C H	S M	S M	CL/CI
Unconfined Compression Test	U - Sample	KN/m^2	6.21	16.11	25.50	37.68			19.32
	R - Sample	KN/m^2	2.52	4.07	9.15	8.00			5.30
	Sensitivity Ratio		2.46	3.96	2.79	4.71			3.65
	Strain at Failure	%	U: 10.00 R: 19.00	U: 11.00 R: 15.75	U: 9.75 R: 20.00	U: 9.00 R: 17.25			U: 13.75 R: 15.25
Consolidation Test	Preconsolidation Pressure	KN/m^2	25		40				65
	Compression Index		0.61		0.61				0.47

Remarks ; U = Undisturbed R = Remoulded SI= Sample Insufficient
D = Disturbed NP= Non-plastic

Location : Tanjung Manis

Boring No.			BH 5	BH 5	BH 5	BH 5	BH 5	BH 5	BH 5
Sample No.			P 2	P 3	U 2	P 4	U 4	U 5	U 6
Sample Depth		m	6.30 6.75	8.10 8.55	10.00 10.60	15.20 15.65	16.80 17.40	18.00 18.60	19.50 20.10
Natural Water Content		%	30	42	37	41	40	51	45
Specific Gravity			2.60	2.64	2.70	2.62	2.67	2.53	2.52
Wet Density		Mg/m^3			1.78		1.83	1.68	1.94
Dry Density		Mg/m^3			1.25		1.26	1.11	1.38
Atterberg Limits	Liquid Limit	%			42		49	60	41
	Plastic Limit	%			20		25	33	23
	Plasticity Index				22		24	27	18
Grain Size Distribution	Gravel	%	0	0	1	0	1	1	1
	Sand	%	61	4	4	0	2	8	13
	Silt	%	24	52	44	54	52	66	61
	Clay & Colloid	%	15	44	51	46	45	25	24
Soil Classification					C I		C I	M H	C I
Unconfined Compression Test	U - Sample	KN/m^2			41.54		20.90	47.34	40.39
	R - Sample	KN/m^2			13.60		9.61	14.77	23.79
	Sensitivity Ratio				3.05		2.17	3.21	1.70
	Strain at Failure	%			U: 11.00 R: 20.00		U: 18.75 R: 20.00	U: 15.25 R: 18.00	U: 17.75 R: 20.00
Consolidation Test	Preconsolidation Pressure	KN/m^2			65				
	Compression Index				0.37				

Remarks ; U = Undisturbed R = Remoulded SI= Sample Insufficient
D = Disturbed NP= Non-plastic

Location : Tanjung Manis

Boring No.			BH 5	BH 6	BH 6	BH 6	BH 6	BH 6	BH 6
Sample No.			P 5	U 1	U 2	U 3	U 4	P 1	U 5
Sample Depth		m	20.90 21.33	3.60 4.10	6.90 7.50	9.90 10.50	13.20 13.80	14.90 15.35	16.40 17.00
Natural Water Content		%	31	41	52	42	56	84	84
Specific Gravity			2.60	2.64	2.67	2.60	2.59	2.35	2.68
Wet Density		Mg/m^3		1.84	1.63	1.79	1.68		1.92
Dry Density		Mg/m^3		1.27	1.04	1.25	1.07		1.44
Atterberg Limits	Liquid Limit	%		42	56	44	66		41
	Plastic Limit	%		23	24	40	42		21
	Plasticity Index			19	32	4	24		20
Grain Size Distribution	Gravel	%	1	0	0	0	0	2	0
	Sand	%	43	35	2	21	2	17	11
	Silt	%	38	49	39	54	52	51	44
	Clay & Colloid	%	18	16	59	25	45	30	45
Soil Classification				C I	C H	H I	H H		C I
Unconfined Compression Test	U - Sample	KN/m^2		46.90	34.78	45.20	63.08		71.44
	R - Sample	KN/m^2		16.18	11.50	13.41	19.92		21.19
	Sensitivity Ratio			2.90	3.02	3.37	3.17		3.37
	Strain at Failure	%		U: 7.75 R: 20.00	U: 13.25 R: 14.75	U: 8.75 R: 20.00	U: 5.75 R: 20.00		U: 8.25 R: 14.25
Consolidation Test	Preconsolidation Pressure	KN/m^2			220		60		
	Compression Index				0.72		0.47		

Remarks ; U = Undisturbed R = Remoulded SI= Sample Insufficient
D = Disturbed NP= Non-plastic

Location : Tanjung Manis

Boring No.		BH 6	BH 6	BH 6	BH 6	BH 7	BH 7	BH 7
Sample No.		P 2	P 3	P 4	P 5	U 1	U 2	U 3
Sample Depth	m	19.20 19.65	20.60 21.05	22.00 22.45	22.90 23.32	3.00 3.60	6.00 6.60	9.00 9.60
Natural Water Content	%	45	26	15	12	58	65	22
Specific Gravity		2.58	2.73	2.70	2.75	2.65	2.65	2.65
Wet Density	Mg/m^3					1.58	1.63	2.08
Dry Density	Mg/m^3					0.95	1.00	1.72
Atterberg Limits	Liquid Limit %					64	62	22
	Plastic Limit %					40	39	17
	Plasticity Index					24	23	5
Grain Size Distribution	Gravel %	2	0	0	30	2	1	0
	Sand %	8	14	72	44	10	12	40
	Silt %	56	56	14	14	72	67	31
	Clay & Colloid %	34	30	14	12	16	20	29
Soil Classification						M H	M H	M L
Unconfined Compression Test	U - Sample KN/m^2					16.64	40.47	61.24
	R - Sample KN/m^2					11.60	19.28	44.35
	Sensitivity Ratio					1.43	2.10	1.38
	Strain at Failure %					U: 19.00 R: 20.00	U: 9.00 R: 19.25	U: 14.75 R: 20.00
Consolidation Test	Preconsolidation Pressure KN/m^2					50		55
	Compression Index					0.58		0.11

Remarks ; U = Undisturbed R = Remoulded SI= Sample Insufficient
D = Disturbed NP= Non-plastic

Location : Tanjung Manis

Boring No.		BH 7	BH 7	BH 7	BH 7	BH 7	BH 7	BH 7
Sample No.		P 1	P 2	P 3	P 4	P 5	P 6	P 7
Sample Depth	m	10.50 10.95	12.00 12.45	13.50 13.95	15.00 15.45	16.50 16.95	18.00 18.45	19.50 19.95
Natural Water Content	%	25	26	23	42	37	31	47
Specific Gravity					2.59	2.56	2.60	2.63
Wet Density	Mg/m^3							
Dry Density	Mg/m^3							
Atterberg Limits	Liquid Limit %	-	-	-				
	Plastic Limit %	NP	NP	NP				
	Plasticity Index	-	-	-				
Grain Size Distribution	Gravel %	1	0	1	0	2	8	1
	Sand %	74	95	87	7	27	8	2
	Silt %	25	5	12	68	41	41	64
	Clay & Colloid %				25	30	43	33
Soil Classification								
Unconfined Compression Test	U - Sample KN/m^2							
	R - Sample KN/m^2							
	Sensitivity Ratio							
	Strain at Failure %							
Consolidation Test	Preconsolidation Pressure KN/m^2							
	Compression Index							

Remarks ; U = Undisturbed R = Remoulded SI= Sample Insufficient
D = Disturbed NP= Non-plastic

Location : Tanjung Manis

Boring No.		BH 7	BH 7	BH 7	BH 7	BH 7	BH 7	
Sample No.		P 8	P 9	P 10	P 11	P 12	P 13	
Sample Depth	m	21.00 21.45	22.50 22.95	24.00 24.45	25.50 25.95	27.00 27.45	28.50 28.80	
Natural Water Content	%	41	39	39	22	20	18	
Specific Gravity		2.62	2.62	2.60	2.75	2.77	2.74	
Wet Density	Mg/m^3							
Dry Density	Mg/m^3							
Atterberg Limits	Liquid Limit %							
	Plastic Limit %							
	Plasticity Index							
Grain Size Distribution	Gravel %	1	0	1	0	0	0	
	Sand %	2	3	5	6	6	20	
	Silt %	66	48	53	69	68	62	
	Clay & Colloid %	31	49	41	25	26	18	
Soil Classification								
Unconfined Compression Test	U - Sample KN/m^2							
	R - Sample KN/m^2							
	Sensitivity Ratio							
	Strain at Failure %							
Consolidation Test	Preconsolidation Pressure KN/m^2							
	Compression Index							

Remarks ; U = Undisturbed R = Remoulded SI= Sample Insufficient
D = Disturbed NP= Non-plastic

Location : Tanjung Manis

Boring No.			BH 8	BH 8	BH 8	BH 8	BH 8	BH 8	
Sample No.			U 1	P 1	P 2	U 2	U 3	P 3	
Sample Depth		m	1.20 1.80	2.60 3.05	4.00 4.45	5.40 6.00	12.40 13.00	15.50 15.83	
Natural Water Content		%	91		52	44	32	18	
Specific Gravity			2.61		2.67	2.67	2.66	2.68	
Wet Density		Mg/m^3	1.66	No recovery of sample		1.56	1.61		
Dry Density		Mg/m^3	1.17			0.93	1.03		
Atterberg Limits	Liquid Limit	%	89			42	41		
	Plastic Limit	%	62			28	28		
	Plasticity Index		27			14	13		
Grain Size Distribution	Gravel	%	2		0	0	0	30	
	Sand	%	11		13	18	17	35	
	Silt	%	62		65	58	58	19	
	Clay & Colloid	%	25		22	24	25	16	
Soil Classification			M V			M I	M I		
Unconfined Compression Test	U - Sample	KN/m^2	61.76			66.20	21.73		
	R - Sample	KN/m^2	14.41			24.82	21.02		
	Sensitivity Ratio		4.29			2.67	1.03		
	Strain at Failure	%	U: 4.75 R: 14.00			U: 5.50 R: 20.00	U: 11.75 R: 20.00		
Consolidation Test	Preconsolidation Pressure	KN/m^2	80			120	100		
	Compression Index		0.54			0.68	0.64		

Remarks ; U = Undisturbed
D = Disturbed
R = Remoulded
NP= Non-plastic
SI= Sample Insufficient

Location : Tanjung Manis

Boring No.			BH 9	BH 9	BH 9	BH 9	BH 9	BH 9	BH 9
Sample No.			U 1	U 2	P 1	P 2	P 3	P 4	P 5
Sample Depth		m	3.00 3.60	6.00 6.60	9.00 9.45	10.50 10.45	12.00 12.45	13.50 13.95	15.00 15.45
Natural Water Content		%	49	46	82	37	34	30	27
Specific Gravity			2.67	2.60	2.53	2.68	2.67	2.65	2.65
Wet Density		Mg/m^3	1.68	1.68					
Dry Density		Mg/m^3	1.13	1.16					
Atterberg Limits	Liquid Limit	%	51	52		-	-	-	-
	Plastic Limit	%	35	32		NP	NP	NP	NP
	Plasticity Index		16	20		-	-	-	-
Grain Size Distribution	Gravel	%	0	0	1	5	5	0	0
	Sand	%	5	11	18	68	71	75	72
	Silt	%	73	68	62	18	18	18	20
	Clay & Colloid	%	22	21	19	9	6	7	8
Soil Classification			M H	M H					
Unconfined Compression Test	U - Sample	KN/m^2	33.78	49.39					
	R - Sample	KN/m^2	17.66	11.48					
	Sensitivity Ratio		1.91	4.30					
	Strain at Failure	%	U: 15.00 R: 20.00	U: 6.50 R: 20.00					
Consolidation Test	Preconsolidation Pressure	KN/m^2	65	80					
	Compression Index		0.48	0.49					

Remarks ; U = Undisturbed R = Remoulded SI= Sample Insufficient
D = Disturbed NP= Non-plastic

Location : Tanjung Manis

Boring No.			BH 9	BH 9	BH 9				
Sample No.			P 6	U 3	P 7				
Sample Depth		m	16.00 16.45	18.00 18.60	19.50 19.78				
Natural Water Content		%	36	41	12				
Specific Gravity			2.65	2.62	2.68				
Wet Density		Mg/m^3		1.76					
Dry Density		Mg/m^3		1.25					
Atterberg Limits	Liquid Limit	%	-	36	-				
	Plastic Limit	%	NP	26	NP				
	Plasticity Index		-	10	-				
Grain Size Distribution	Gravel	%	0	3	2				
	Sand	%	75	51	62				
	Silt	%	16	32	26				
	Clay & Colloid	%	9	14	10				
Soil Classification				M I					
Unconfined Compression Test	U - Sample	KN/m^2		38.66					
	R - Sample	KN/m^2		12.51					
	Sensitivity Ratio			3.09					
	Strain at Failure	%		U: 4.75 R: 20.00					
Consolidation Test	Preconsolidation Pressure	KN/m^2							
	Compression Index								

Remarks ; U = Undisturbed D = Disturbed R = Remoulded NP= Non-plastic SI= Sample Insufficient

Location : Sarikei

Boring No.			BH 10	BH 10	BH 10	BH 10	BH 10		
Sample No.			U 1	U 2	U 3	U 4	P 1		
Sample Depth		m	0.90 1.50	3.90 4.50	6.90 7.50	10.00 10.60	13.00 13.45		
Natural Water Content		%	75	69	60	52	24		
Specific Gravity			2.64	2.60	2.59	2.59	2.74		
Wet Density		Mg/m^3	1.53	1.53	1.68	1.60			
Dry Density		Mg/m^3	0.84	0.93	1.04	1.07			
Atterberg Limits	Liquid Limit	%	76	76	76	60			
	Plastic Limit	%	48	48	45	37			
	Plasticity Index		28	28	31	23			
Grain Size Distribution	Gravel	%	2	7	1	0			
	Sand	%	18	15	49	2			
	Silt	%	65	65	36	60			
	Clay & Colloid	%	15	13	14	38			
Soil Classification			M V	M V	M V	M H			
Unconfined Compression Test	U - Sample	KN/m^2	17.54	31.49	64.53	57.46			
	R - Sample	KN/m^2	9.28	14.96	26.37	20.05			
	Sensitivity Ratio		1.89	2.10	2.45	2.87			
	Strain at Failure	%	U: 10.00 R: 20.00	U: 7.00 R: 20.00	U: 7.25 R: 20.00	U: 4.75 R: 20.00			
Consolidation Test	Preconsolidation Pressure	KN/m^2		70		140			
	Compression Index			0.75		0.59			

Remarks ; U = Undisturbed D = Disturbed R = Remoulded NP= Non-plastic SI= Sample Insufficient

Location : Bintangor

Boring No.			BH 11	BH 11	BH 11	BH 11	BH 11		
Sample No.			U 1	U 2	U 3	U 4	P 1		
Sample Depth		m	3.20 3.80	6.30 6.90	9.60 10.20	11.50 12.00	13.20 13.55		
Natural Water Content		%	62	65	59	56	15		
Specific Gravity			2.57	2.58	2.59	2.58	2.73		
Wet Density		Mg/m^3	1.54	1.64	1.61	1.68			
Dry Density		Mg/m^3	0.97	0.95	1.05	1.07			
Atterberg Limits	Liquid Limit	%	49	64	53	58			
	Plastic Limit	%	35	44	38	39			
	Plasticity Index		14	20	15	19			
Grain Size Distribution	Gravel	%	0	0	0	0			
	Sand	%	12	17	11	8			
	Silt	%	74	71	75	75			
	Clay & Colloid	%	14	12	14	17			
Soil Classification			M I	M H	M H	M H			
Unconfined Compression Test	U - Sample	KN/m^2	42.32	43.65	46.63	61.35			
	R - Sample	KN/m^2	8.25	12.38	10.51	12.64			
	Sensitivity Ratio		5.13	3.53	4.44	4.85			
	Strain at Failure	%	U: 10.75 R: 20.00	U: 8.50 R: 20.00	U: 8.50 R: 20.00	U: 10.50 R: 20.00			
Consolidation Test	Preconsolidation Pressure	KN/m^2	55		85				
	Compression Index		0.59		0.60				

Remarks ; U = Undisturbed R = Remoulded SI= Sample Insufficient
D = Disturbed NP= Non-plastic

Location : Sungai Merah

Boring No.			BH 12	BH 12	BH 12	BH 12	BH 12	BH 12	BH 12
Sample No.			D 1	P 1	P 2	P 3	P 4	P 5	P 6
Sample Depth		m	0.00 0.10	1.50 1.95	3.00 3.45	4.50 4.95	6.00 6.45	7.50 7.95	9.00 9.45
Natural Water Content		%	61	59	30	40		30	30
Specific Gravity			2.55	2.55			No recovery of sample		
Wet Density		Mg/m^3							
Dry Density		Mg/m^3							
Atterberg Limits	Liquid Limit	%			-	-		-	-
	Plastic Limit	%			NP	NP		NP	NP
	Plasticity Index				-	-		-	-
Grain Size Distribution	Gravel	%	0	0	1	4		0	0
	Sand	%	5	15	98	90		87	99
	Silt	%	78	71	1	6		13	1
	Clay & Colloid	%	16	13					
Soil Classification									
Unconfined Compression Test	U - Sample	KN/m^2							
	R - Sample	KN/m^2							
	Sensitivity Ratio								
	Strain at Failure	%							
Consolidation Test	Preconsolidation Pressure	KN/m^2							
	Compression Index								

Remarks ; U = Undisturbed D = Disturbed R = Remoulded NP= Non-plastic SI= Sample Insufficient

Location : Sungai Merah

Boring No.			BH 12	BH 12	BH 12	BH 12	BH 12	BH 12	BH 12
Sample No.			P 7	P 8	P 9	P 10	P 11	P 12	P 13
Sample Depth		m	10.50 10.95	13.50 13.95	16.50 16.95	19.50 19.95	22.50 22.95	25.50 25.95	28.50 28.95
Natural Water Content		%	30	34	30	36	37	SI	
Specific Gravity									
Wet Density		Mg/m^3							No recovery of sample
Dry Density		Mg/m^3							
Atterberg Limits	Liquid Limit	%	-	-	-	-	-		
	Plastic Limit	%	NP	NP	NP	NP	NP		
	Plasticity Index		-	-	-	-	-		
Grain Size Distribution	Gravel	%	0	1	1	0	1		
	Sand	%	85	94	96	97	94		
	Silt	%	15	5	3	3	5		
	Clay & Colloid	%							
Soil Classification									
Unconfined Compression Test	U - Sample	KN/m^2							
	R - Sample	KN/m^2							
	Sensitivity Ratio								
	Strain at Failure	%							
Consolidation Test	Preconsolidation Pressure	KN/m^2							
	Compression Index								

Remarks ; U = Undisturbed R = Remoulded SI= Sample Insufficient
D = Disturbed NP= Non-plastic

Location : Sungai Merah

Boring No.		BH 12	BH 12	BH 12	BH 12			
Sample No.		P 14	P 15	P 16	P 17			
Sample Depth	m	31.50 31.95	34.50 34.95	37.50 37.95	40.50 40.95			
Natural Water Content	%	24	25		48			
Specific Gravity				No recovery of sample				
Wet Density	Mg/m^3							
Dry Density	Mg/m^3							
Atterberg Limits	Liquid Limit %	-	-		-			
	Plastic Limit %	NP	NP		NP			
	Plasticity Index	-	-		-			
Grain Size Distribution	Gravel %	0	1		2			
	Sand %	100	93		84			
	Silt %	0	6		14			
	Clay & Colloid %							
Soil Classification								
Unconfined Compression Test	U - Sample KN/m^2							
	R - Sample KN/m^2							
	Sensitivity Ratio							
	Strain at Failure %							
Consolidation Test	Preconsolidation Pressure KN/m^2							
	Compression Index							

Remarks ; U = Undisturbed R = Remoulded SI= Sample Insufficient
D = Disturbed NP= Non-plastic

Location : RPA Sibu Port

Boring No.			BH 13	BH 13	BH 13	BH 13	BH 13	BH 13	BH 13
Sample No.			U 1	P 1	P 2	P 3	P 4	P 5	P 6
Sample Depth		m	3.00 3.60	6.00 6.45	9.00 9.45	12.00 12.45	15.00 15.45	18.00 18.45	21.00 21.45
Natural Water Content		%	52	SI	82	43	27	22	21
Specific Gravity			2.59						
Wet Density		Mg/m^3	1.73						
Dry Density		Mg/m^3	1.13						
Atterberg Limits	Liquid Limit	%	48		-	-	-	-	-
	Plastic Limit	%	34		NP	NP	NP	NP	NP
	Plasticity Index		14		-	-	-	-	-
Grain Size Distribution	Gravel	%	1			0	3	1	1
	Sand	%	24			78	84	90	88
	Silt	%	63			22	13	9	11
	Clay & Colloid	%	12						
Soil Classification			M I						
Unconfined Compression Test	U - Sample	KN/m^2	22.55						
	R - Sample	KN/m^2	5.74						
	Sensitivity Ratio		3.92						
	Strain at Failure	%	U: 6.50 R: 17.25						
Consolidation Test	Preconsolidation Pressure	KN/m^2							
	Compression Index								

Remarks ; U = Undisturbed R = Remoulded SI= Sample Insufficient
D = Disturbed NP= Non-plastic

Location : RPA Sibu Port

Boring No.		BH 13	BH 13	BH 13	BH 13	BH 13	BH 13	BH 13
Sample No.		P 7	P 8	P 9	P 10	P 11	P 12	P 13
Sample Depth	m	24.00 24.45	27.00 27.45	30.00 30.45	33.00 33.45	36.00 36.45	39.00 39.45	42.00 42.25
Natural Water Content	%		22	22	27	35	27	19
Specific Gravity		No recovery of sample					2.68	2.54
Wet Density	Mg/m^3							
Dry Density	Mg/m^3							
Atterberg Limits	Liquid Limit %		-	-	-	-	-	-
	Plastic Limit %		NP	NP	NP	NP	NP	NP
	Plasticity Index		-	-	-	-	-	-
Grain Size Distribution	Gravel %		0	0	1	0	8	5
	Sand %		97	84	79	97	24	53
	Silt %		3	16	20	3	43	30
	Clay & Colloid %						25	14
Soil Classification								
Unconfined Compression Test	U - Sample KN/m^2							
	R - Sample KN/m^2							
	Sensitivity Ratio							
	Strain at Failure %							
Consolidation Test	Preconsolidation Pressure KN/m^2							
	Compression Index							

Remarks ; U = Undisturbed R = Remoulded SI= Sample Insufficient
D = Disturbed NP= Non-plastic

Location : South Sibu

Boring No.			BH 14	BH 14	BH 14	BH 14	BH 14	BH 14	BH 14
Sample No.			P 1	P 2	P 3	P 4	P 5	W 1	W 2
Sample Depth		m	1.50 1.95	3.00 3.45	4.50 4.95	6.00 6.45	7.50 7.95	9.00	10.50
Natural Water Content		%	34	25	54	63	68	27	19
Specific Gravity			2.68		2.59				
Wet Density		Mg/m^3							
Dry Density		Mg/m^3							
Atterberg Limits	Liquid Limit	%	40	-	32	-	-	-	-
	Plastic Limit	%	26	NP	26	NP	NP	NP	NP
	Plasticity Index		14	-	6	-	-	-	-
Grain Size Distribution	Gravel	%	0	2	0	4	21	0	0
	Sand	%	14	86	57	92	63	100	100
	Silt	%	52	12	35	4	16	0	0
	Clay & Colloid	%	34		8			0	0
Soil Classification			M I	M L					
Unconfined Compression Test	U - Sample	KN/m^2							
	R - Sample	KN/m^2							
	Sensitivity Ratio								
	Strain at Failure	%							
Consolidation Test	Preconsolidation Pressure	KN/m^2							
	Compression Index								

Remarks ; U = Undisturbed
D = Disturbed
R = Remoulded
NP= Non-plastic
SI= Sample Insufficient
W = Washed Sample

Location : South Sibu

Boring No.			BH 14	BH 14	BH 14	BH 14	BH 14	BH 14	BH 14
Sample No.			W 3	W 4	P 10	W 5	P 12	W 6	W 7
Sample Depth		m	12.00	13.50	15.00 15.45	16.50	18.00 18.45	19.50	21.00
Natural Water Content		%	28	26	23	25	23	25	20
Specific Gravity									
Wet Density		Mg/m^3							
Dry Density		Mg/m^3							
Atterberg Limits	Liquid Limit	%	-	-	-	-	-	-	-
	Plastic Limit	%	NP	NP	NP	NP	NP	NP	NP
	Plasticity Index		-	-	-	-	-	-	-
Grain Size Distribution	Gravel	%	0	0	0	0	0	0	0
	Sand	%	100	97	87	97	100	99	98
	Silt	%	0	3	13	3	0	1	2
	Clay & Colloid	%							
Soil Classification									
Unconfined Compression Test	U - Sample	KN/m^2							
	R - Sample	KN/m^2							
	Sensitivity Ratio								
	Strain at Failure	%							
Consolidation Test	Preconsolidation Pressure	KN/m^2							
	Compression Index								

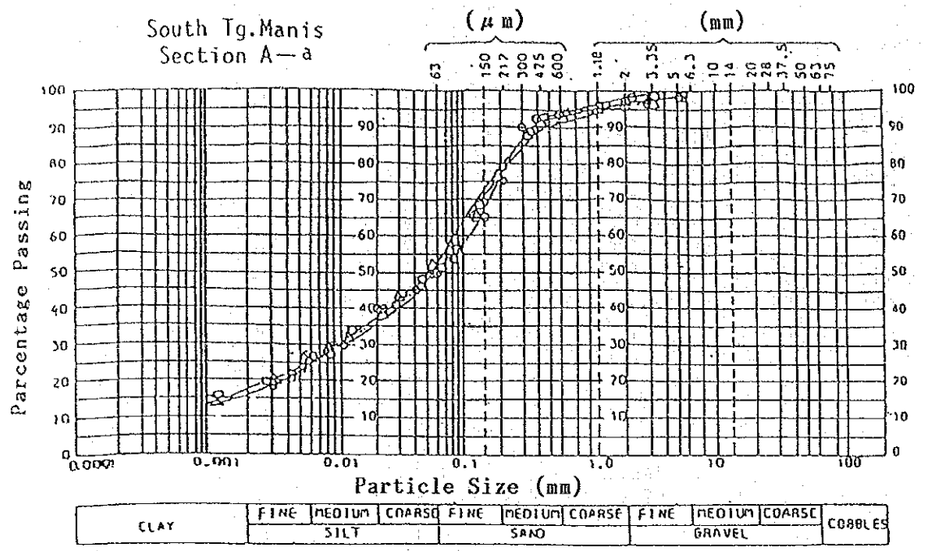
Remarks ; U = Undisturbed R = Remoulded SI= Sample Insufficient
D = Disturbed NP= Non-plastic W = Washed Sample

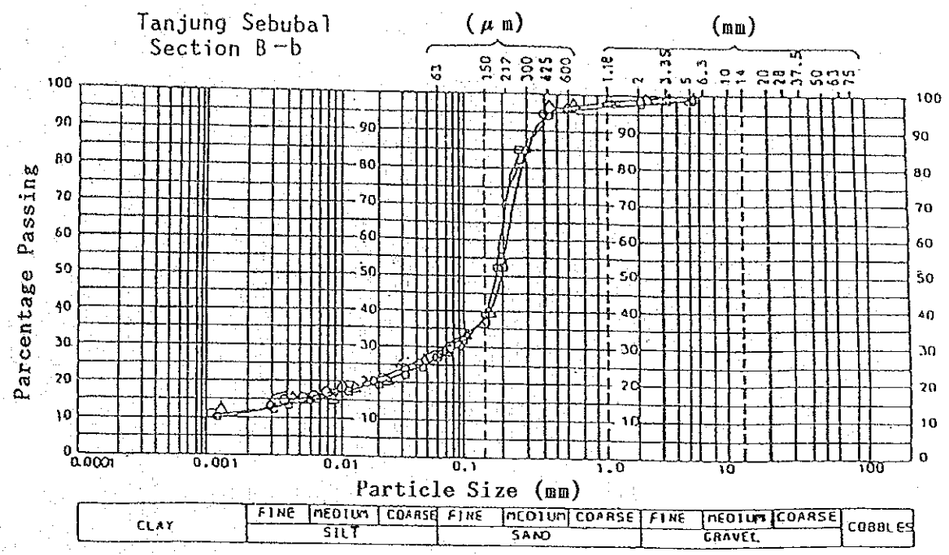
Location : South Sibu

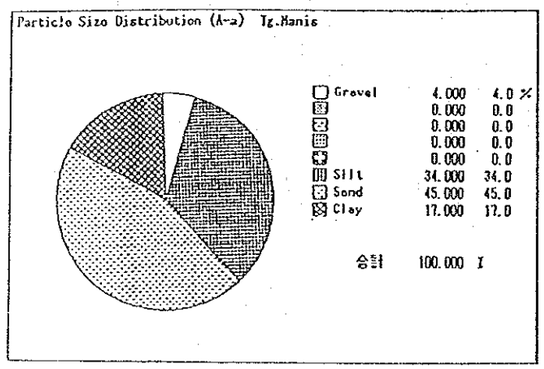
Boring No.			BH 14	BH 14	BH 14	BH 14	BH 14	BH 14	
Sample No.			P 15	P 16	W 8	P 18	P 19	P 20	
Sample Depth		m	22.50 22.95	24.00 24.45	25.50 25.95	27.00 27.45	28.50 28.94	29.50 29.65	
Natural Water Content		%	22	33	SI	40	SI	8	
Specific Gravity						2.62		2.67	
Wet Density		Mg/m^3							
Dry Density		Mg/m^3							
Atterberg Limits	Liquid Limit	%	-	-					
	Plastic Limit	%	NP	NP					
	Plasticity Index		-	-					
Grain Size Distribution	Gravel	%	8	1		2		43	
	Sand	%	86	99		22		30	
	Silt	%	6	0		41		16	
	Clay & Colloid	%				35		11	
Soil Classification									
Unconfined Compression Test	U - Sample	KN/m^2							
	R - Sample	KN/m^2							
	Sensitivity Ratio								
	Strain at Failure	%							
Consolidation Test	Preconsolidation Pressure	KN/m^2							
	Compression Index								

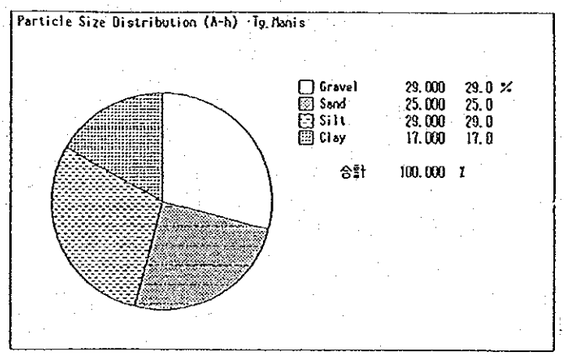
Remarks ; U = Undisturbed D = Disturbed R = Remoulded NP= Non-plastic SI= Sample Insufficient W = Washed Sample

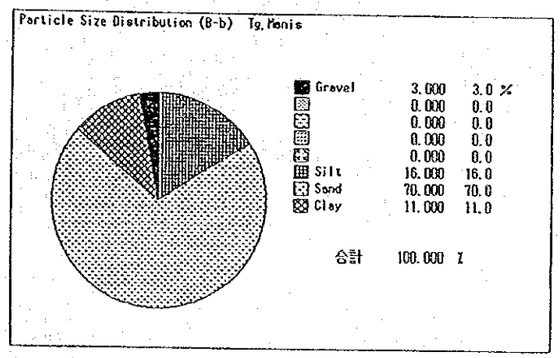
Appendix-I.2.3.2 Grain Size Distribution of River Bottom Sediments

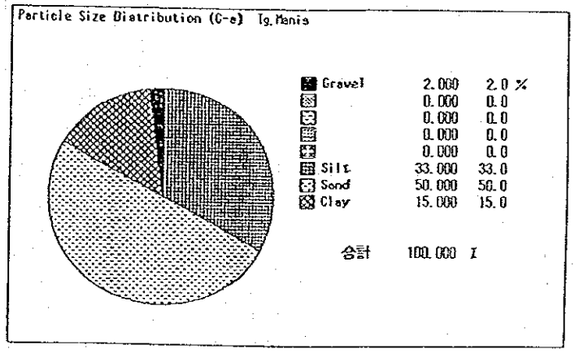


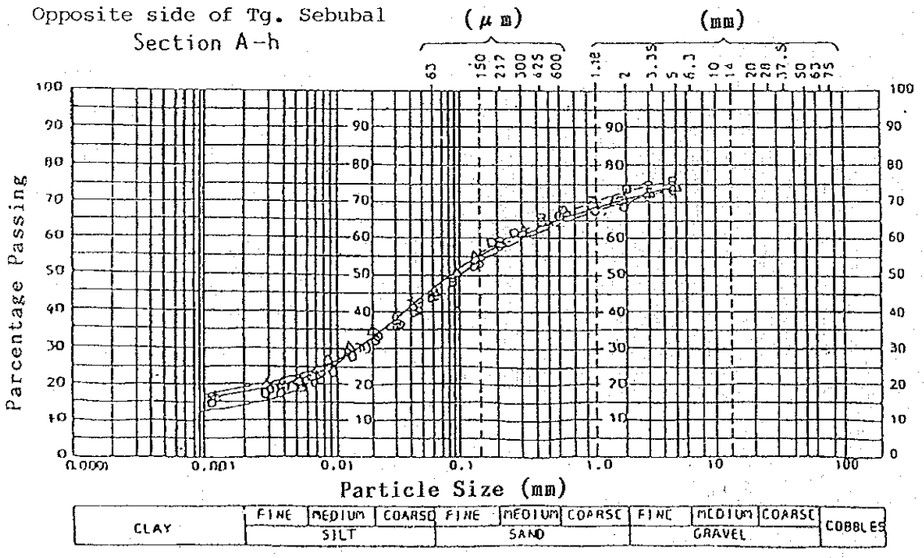


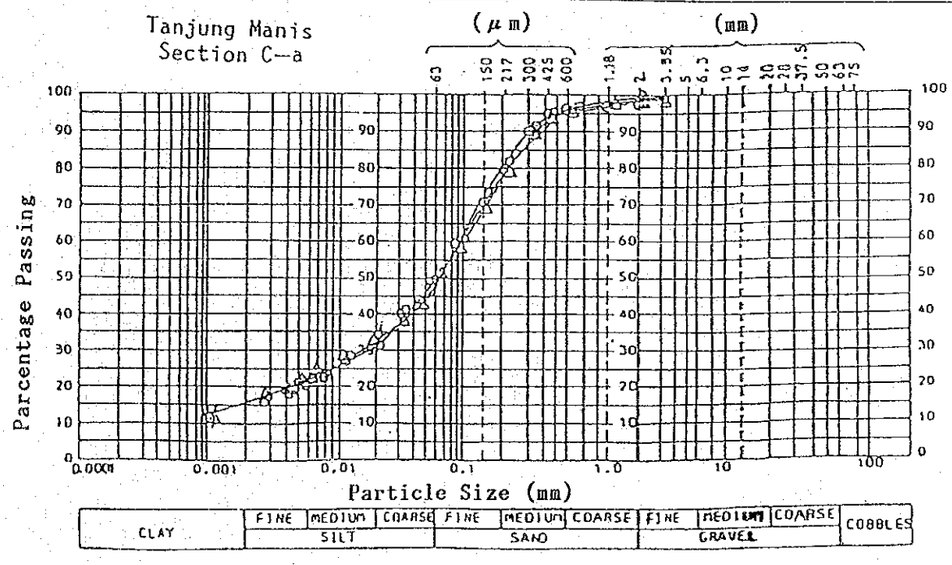












Appendix-I.2.4.1 Wave Data

(1)

NO.	DATE	TIME	HS(m)	TZ(sec)	HMAX(m)	UBED(m/s)
1	11/OCT/90	14:00				
2	11/OCT/90	17:00	0.05	3.89	0.10	0.01
3	11/OCT/90	20:00				
4	11/OCT/90	23:00	0.05	3.99	0.11	0.01
5	12/OCT/90	02:00				
6	12/OCT/90	05:00	0.05	4.23	0.10	0.02
7	12/OCT/90	08:00	0.06	4.64	0.11	0.02
8	12/OCT/90	11:00	0.06	4.96	0.12	0.03
9	12/OCT/90	14:00				
10	12/OCT/90	17:00	0.06	4.93	0.11	0.02
11	12/OCT/90	20:00	0.07	4.68	0.14	0.03
12	12/OCT/90	23:00	0.19	4.20	0.37	0.05
13	13/OCT/90	02:00	0.25	4.32	0.49	0.08
14	13/OCT/90	05:00	0.20	4.27	0.39	0.06
15	13/OCT/90	08:00	0.15	4.35	0.29	0.06
16	13/OCT/90	11:00	0.13	4.74	0.25	0.05
17	13/OCT/90	14:00				
18	13/OCT/90	17:00	0.09	4.66	0.18	0.04
19	13/OCT/90	20:00				
20	13/OCT/90	23:00	0.09	4.73	0.18	0.04
21	14/OCT/90	02:00	0.12	4.40	0.24	0.04
22	14/OCT/90	05:00				
23	14/OCT/90	08:00				
24	14/OCT/90	11:00	0.11	4.54	0.22	0.04
25	14/OCT/90	14:00	0.11	4.80	0.21	0.05
26	14/OCT/90	17:00				
27	14/OCT/90	20:00				
28	14/OCT/90	23:00				
29	15/OCT/90	02:00				
30	15/OCT/90	05:00				
31	15/OCT/90	08:00				
32	15/OCT/90	11:00				
33	15/OCT/90	14:00				
34	15/OCT/90	17:00				
35	15/OCT/90	20:00				
36	15/OCT/90	23:00				
37	16/OCT/90	02:00				
38	16/OCT/90	05:00				
39	16/OCT/90	08:00				
40	16/OCT/90	11:00				
41	16/OCT/90	14:00				
42	16/OCT/90	17:00				
43	16/OCT/90	20:00				
44	16/OCT/90	23:00				
45	17/OCT/90	02:00				

HS ; Significant wave height
TZ ; Mean zero up-crossing period
HMAX; Maximum wave height
UBED; Velocity near the sea bed

NO.	DATE	TIME	HS(m)	TZ(sec)	HMAX(m)	UBED(m/s)
46	17/OCT/90	05:00				
47	17/OCT/90	08:00				
48	17/OCT/90	11:00				
49	17/OCT/90	14:00				
50	17/OCT/90	17:00				
51	17/OCT/90	20:00				
52	17/OCT/90	23:00				
53	18/OCT/90	02:00				
54	18/OCT/90	05:00				
55	18/OCT/90	08:00				
56	18/OCT/90	11:00				
57	18/OCT/90	14:00				
58	18/OCT/90	17:00				
59	18/OCT/90	20:00				
60	18/OCT/90	23:00				
61	19/OCT/90	02:00				
62	19/OCT/90	05:00				
63	19/OCT/90	08:00				
64	19/OCT/90	11:00				
65	19/OCT/90	14:00	0.09	5.03	0.18	0.04
66	19/OCT/90	17:00				
67	19/OCT/90	20:00				
68	19/OCT/90	23:00				
69	20/OCT/90	02:00				
70	20/OCT/90	05:00				
71	20/OCT/90	08:00				
72	20/OCT/90	11:00				
73	20/OCT/90	14:00				
74	20/OCT/90	17:00				
75	20/OCT/90	20:00				
76	20/OCT/90	23:00				
77	21/OCT/90	02:00				
78	21/OCT/90	05:00				
79	21/OCT/90	08:00				
80	21/OCT/90	11:00				
81	21/OCT/90	14:00				
82	21/OCT/90	17:00	0.07	5.11	0.14	0.03
83	21/OCT/90	20:00	0.06	5.34	0.13	0.03
84	21/OCT/90	23:00				
85	22/OCT/90	02:00				
86	22/OCT/90	05:00	0.13	3.79	0.27	0.03
87	22/OCT/90	08:00	0.28	4.09	0.55	0.07
88	22/OCT/90	11:00	0.21	4.08	0.42	0.06
89	22/OCT/90	14:00				
90	22/OCT/90	17:00	0.16	4.10	0.32	0.04

NO.	DATE	TIME	HS(m)	TZ(sec)	HMAX(m)	UBED(m/s)
91	22/OCT/90	20:00	0.13	4.19	0.26	0.04
92	22/OCT/90	23:00				
93	23/OCT/90	02:00				
94	23/OCT/90	05:00				
95	23/OCT/90	08:00				
96	23/OCT/90	11:00				
97	23/OCT/90	14:00	0.09	4.21	0.19	0.03
98	23/OCT/90	17:00				
99	23/OCT/90	20:00				
100	23/OCT/90	23:00				
101	24/OCT/90	02:00				
102	24/OCT/90	05:00	0.07	4.31	0.14	0.02
103	24/OCT/90	08:00				
104	24/OCT/90	11:00				
105	24/OCT/90	14:00	0.09	5.03	0.18	0.04
106	24/OCT/90	17:00				
107	24/OCT/90	20:00				
108	24/OCT/90	23:00				
109	25/OCT/90	02:00				
110	25/OCT/90	05:00				
111	25/OCT/90	08:00				
112	25/OCT/90	11:00				
113	25/OCT/90	14:00				
114	25/OCT/90	17:00				
115	25/OCT/90	20:00				
116	25/OCT/90	23:00				
117	26/OCT/90	02:00				
118	26/OCT/90	05:00	0.22	3.83	0.45	0.05
119	26/OCT/90	08:00	0.18	3.79	0.36	0.04
120	26/OCT/90	11:00				
121	26/OCT/90	14:00				
122	26/OCT/90	17:00				
123	26/OCT/90	20:00				
124	26/OCT/90	23:00				
125	27/OCT/90	02:00				
126	27/OCT/90	05:00				
127	27/OCT/90	08:00	0.13	3.82	0.27	0.03
128	27/OCT/90	11:00	0.11	3.83	0.22	0.02
129	27/OCT/90	14:00	0.09	3.86	0.17	0.02
130	27/OCT/90	17:00				
131	27/OCT/90	20:00	0.08	4.02	0.17	0.02
132	27/OCT/90	23:00	0.11	4.03	0.22	0.03
133	28/OCT/90	02:00	0.10	4.08	0.19	0.03
134	28/OCT/90	05:00				
135	28/OCT/90	08:00				

NO.	DATE	TIME	HS(m)	TZ(sec)	HMAX(m)	UBED(m/s)
136	28/OCT/90	11:00				
137	28/OCT/90	14:00				
138	28/OCT/90	17:00				
139	28/OCT/90	20:00	0.09	4.10	0.18	0.02
140	28/OCT/90	23:00	0.07	4.31	0.15	0.02
141	29/OCT/90	02:00				
142	29/OCT/90	05:00				
143	29/OCT/90	08:00				
144	29/OCT/90	11:00				
145	29/OCT/90	14:00				
146	29/OCT/90	17:00				
147	29/OCT/90	20:00				
148	29/OCT/90	23:00				
149	30/OCT/90	02:00				
150	30/OCT/90	05:00				
151	30/OCT/90	08:00				
152	30/OCT/90	11:00				
153	30/OCT/90	14:00				
154	30/OCT/90	17:00				
155	30/OCT/90	20:00				
156	30/OCT/90	23:00	0.07	4.99	0.14	0.03
157	31/OCT/90	02:00				
158	31/OCT/90	05:00				
159	31/OCT/90	08:00				
160	31/OCT/90	11:00				
161	31/OCT/90	14:00	0.07	4.71	0.15	0.03
162	31/OCT/90	17:00				
163	31/OCT/90	20:00				
164	31/OCT/90	23:00				
165	01/NOV/90	02:00				
166	01/NOV/90	05:00				
167	01/NOV/90	08:00				
168	01/NOV/90	11:00				
169	01/NOV/90	14:00				
170	01/NOV/90	17:00				
171	01/NOV/90	20:00				
172	01/NOV/90	23:00				
173	02/NOV/90	02:00				
174	02/NOV/90	05:00				
175	02/NOV/90	08:00				
176	02/NOV/90	11:00				
177	02/NOV/90	14:00	0.08	4.88	0.15	0.03
178	02/NOV/90	17:00	0.08	4.41	0.15	0.03
179	02/NOV/90	20:00	0.15	4.32	0.30	0.05
180	02/NOV/90	23:00	0.15	3.99	0.29	0.04

NO.	DATE	TIME	HS(m)	TZ(sec)	HMAX(m)	UBED(m/s)
181	03/NOV/90	02:00	0.14	3.97	0.29	0.03
182	03/NOV/90	05:00	0.18	4.18	0.36	0.05
183	03/NOV/90	08:00	0.21	4.41	0.41	0.07
184	03/NOV/90	11:00	0.21	4.01	0.41	0.05
185	03/NOV/90	14:00	0.16	4.04	0.32	0.04
186	03/NOV/90	17:00	0.13	4.10	0.25	0.03
187	03/NOV/90	20:00	0.15	4.42	0.29	0.05
188	03/NOV/90	23:00	0.37	4.15	0.74	0.10
189	04/NOV/90	02:00	0.28	4.18	0.56	0.08
190	04/NOV/90	05:00	0.21	4.22	0.42	0.06
191	04/NOV/90	08:00	0.19	4.43	0.37	0.06
192	04/NOV/90	11:00				
193	04/NOV/90	14:00	0.14	4.43	0.28	0.05
194	04/NOV/90	17:00				
195	04/NOV/90	20:00				
196	04/NOV/90	23:00				
197	05/NOV/90	02:00				
198	05/NOV/90	05:00				
199	05/NOV/90	08:00				
200	05/NOV/90	11:00				
201	05/NOV/90	14:00				
202	05/NOV/90	17:00	0.12	4.21	0.25	0.04
203	05/NOV/90	20:00				
204	05/NOV/90	23:00	0.18	4.35	0.36	0.06

NO.	DATE	TIME	HS(m)	TZ(sec)	HMAX(m)	UBED(m/s)
1	03/FEB/91	13:56				
2	03/FEB/91	16:56	0.13	7.67	0.25	0.13
3	03/FEB/91	19:56	0.13	8.32	0.25	0.13
4	03/FEB/91	22:56	0.11	7.14	0.21	0.10
5	04/FEB/91	01:56				
6	04/FEB/91	04:56	0.14	7.05	0.26	0.13
7	04/FEB/91	07:56	0.13	7.62	0.25	0.12
8	04/FEB/91	10:56	0.10	7.15	0.19	0.09
9	04/FEB/91	13:56				
10	04/FEB/91	16:56	0.10	6.93	0.20	0.10
11	04/FEB/91	19:56	0.11	7.39	0.22	0.11
12	04/FEB/91	22:56	0.10	6.70	0.19	0.09
13	05/FEB/91	01:56	0.13	4.97	0.26	0.10
14	05/FEB/91	04:56	0.15	6.00	0.28	0.12
15	05/FEB/91	07:56	0.13	6.56	0.26	0.12
16	05/FEB/91	10:56	0.11	6.68	0.21	0.10
17	05/FEB/91	13:56	0.12	5.12	0.23	0.09
18	05/FEB/91	16:56	0.10	6.07	0.20	0.09
19	05/FEB/91	19:56	0.12	6.74	0.23	0.11
20	05/FEB/91	22:56	0.11	6.99	0.21	0.10
21	06/FEB/91	01:56	0.10	6.84	0.19	0.09
22	06/FEB/91	04:56				
23	06/FEB/91	07:56	0.13	6.91	0.24	0.11
24	06/FEB/91	10:56	0.11	6.76	0.20	0.10
25	06/FEB/91	13:56	0.11	5.84	0.21	0.09
26	06/FEB/91	16:56	0.09	6.50	0.17	0.08
27	06/FEB/91	19:56	0.12	7.48	0.22	0.11
28	06/FEB/91	22:56				
29	07/FEB/91	01:56	0.10	5.72	0.19	0.08
30	07/FEB/91	04:56	0.09	6.79	0.17	0.08
31	07/FEB/91	07:56	0.10	7.47	0.19	0.09
32	07/FEB/91	10:56				
33	07/FEB/91	13:56				
34	07/FEB/91	16:56				
35	07/FEB/91	19:56	0.08	6.46	0.16	0.07
36	07/FEB/91	22:56				
37	08/FEB/91	01:56				
38	08/FEB/91	04:56				
39	08/FEB/91	07:56				
40	08/FEB/91	10:56				
41	08/FEB/91	13:56	0.07	6.12	0.14	0.06
42	08/FEB/91	16:56				
43	08/FEB/91	19:56	0.07	5.67	0.13	0.05
44	08/FEB/91	22:56				
45	09/FEB/91	01:56				

NO.	DATE	TIME	HS(m)	TZ(sec)	HMAX(m)	UBED(m/s)
46	09/FEB/91	04:56				
47	09/FEB/91	07:56				
48	09/FEB/91	10:56				
49	09/FEB/91	13:56				
50	09/FEB/91	16:56				
51	09/FEB/91	19:56				
52	09/FEB/91	22:56				
53	10/FEB/91	01:56				
54	10/FEB/91	04:56				
55	10/FEB/91	07:56				
56	10/FEB/91	10:56				
57	10/FEB/91	13:56				
58	10/FEB/91	16:56				
59	10/FEB/91	19:56				
60	10/FEB/91	22:56				
61	11/FEB/91	01:56				
62	11/FEB/91	04:56				
63	11/FEB/91	07:56				
64	11/FEB/91	10:56				
65	11/FEB/91	13:56				
66	11/FEB/91	16:56				
67	11/FEB/91	19:56				
68	11/FEB/91	22:56				
69	12/FEB/91	01:56				
70	12/FEB/91	04:56				
71	12/FEB/91	07:56				
72	12/FEB/91	10:56				
73	12/FEB/91	13:56				
74	12/FEB/91	16:56				
75	12/FEB/91	19:56				
76	12/FEB/91	22:56				
77	13/FEB/91	01:56				
78	13/FEB/91	04:56				
79	13/FEB/91	07:56	0.08	4.18	0.16	0.04
80	13/FEB/91	10:56				
81	13/FEB/91	13:56				
82	13/FEB/91	16:56				
83	13/FEB/91	19:56				
84	13/FEB/91	22:56				
85	14/FEB/91	01:56				
86	14/FEB/91	04:56				
87	14/FEB/91	07:56				
88	14/FEB/91	10:56				
89	14/FEB/91	13:56				
90	14/FEB/91	16:56				

NO.	DATE	TIME	HS(m)	TZ(sec)	HMAX(m)	UBED(m/s)
91	14/FEB/91	19:56				
92	14/FEB/91	22:56	0.13	3.91	0.27	0.06
93	15/FEB/91	01:56	0.09	4.04	0.19	0.05
94	15/FEB/91	04:56	0.08	4.21	0.16	0.04
95	15/FEB/91	07:56				
96	15/FEB/91	10:56				
97	15/FEB/91	13:56				
98	15/FEB/91	16:56				
99	15/FEB/91	19:56				
100	15/FEB/91	22:56	0.09	3.90	0.17	0.04
101	16/FEB/91	01:56				
102	16/FEB/91	04:56				
103	16/FEB/91	07:56				
104	16/FEB/91	10:56				
105	16/FEB/91	13:56				
106	16/FEB/91	16:56				
107	16/FEB/91	19:56				
108	16/FEB/91	22:56	0.11	3.92	0.21	0.05
109	17/FEB/91	01:56	0.07	4.11	0.15	0.04
110	17/FEB/91	04:56				
111	17/FEB/91	07:56				
112	17/FEB/91	10:56				
113	17/FEB/91	13:56				
114	17/FEB/91	16:56				
115	17/FEB/91	19:56				
116	17/FEB/91	22:56				
117	18/FEB/91	01:56				
118	18/FEB/91	04:56				
119	18/FEB/91	07:56				
120	18/FEB/91	10:56				
121	18/FEB/91	13:56				
122	18/FEB/91	16:56				
123	18/FEB/91	19:56				
124	18/FEB/91	22:56				
125	19/FEB/91	01:56				
126	19/FEB/91	04:56				
127	19/FEB/91	07:56				
128	19/FEB/91	10:56				
129	19/FEB/91	13:56				
130	19/FEB/91	16:56	0.06	4.32	0.12	0.03
131	19/FEB/91	19:56				
132	19/FEB/91	22:56				
133	20/FEB/91	01:56				
134	20/FEB/91	04:56	0.05	4.50	0.10	0.03
135	20/FEB/91	07:56				

NO.	DATE	TIME	HS(m)	TZ(sec)	HMAX(m)	UBED(m/s)
136	20/FEB/91	10:56				
137	20/FEB/91	13:56				
138	20/FEB/91	16:56	0.07	4.35	0.13	0.04
139	20/FEB/91	19:56				
140	20/FEB/91	22:56				
141	21/FEB/91	01:56	0.08	4.16	0.17	0.05
142	21/FEB/91	04:56				
143	21/FEB/91	07:56				
144	21/FEB/91	10:56				
145	21/FEB/91	13:56	0.07	4.60	0.14	0.05
146	21/FEB/91	16:56	0.07	5.01	0.14	0.05
147	21/FEB/91	19:56	0.06	5.57	0.13	0.05
148	21/FEB/91	22:56				
149	22/FEB/91	01:56	0.13	4.02	0.25	0.06
150	22/FEB/91	04:56				
151	22/FEB/91	07:56	0.10	4.59	0.19	0.06
152	22/FEB/91	10:56				
153	22/FEB/91	13:56	0.08	4.72	0.16	0.05
154	22/FEB/91	16:56				
155	22/FEB/91	19:56	0.09	5.53	0.18	0.07
156	22/FEB/91	22:56	0.10	5.71	0.20	0.08
157	23/FEB/91	01:56	0.08	5.41	0.16	0.07
158	23/FEB/91	04:56	0.06	5.88	0.12	0.05
159	23/FEB/91	07:56	0.07	6.82	0.14	0.07
160	23/FEB/91	10:56	0.10	7.90	0.20	0.10
161	23/FEB/91	13:56	0.10	6.86	0.19	0.09
162	23/FEB/91	16:56				
163	23/FEB/91	19:56	0.10	6.84	0.20	0.09
164	23/FEB/91	22:56	0.10	6.93	0.20	0.09
165	24/FEB/91	01:56				
166	24/FEB/91	04:56	0.10	4.93	0.19	0.07
167	24/FEB/91	07:56	0.09	5.43	0.18	0.07
168	24/FEB/91	10:56	0.13	6.75	0.25	0.12
169	24/FEB/91	13:56	0.15	7.28	0.29	0.14
170	24/FEB/91	16:56	0.12	7.22	0.22	0.11
171	24/FEB/91	19:56	0.11	7.39	0.20	0.10
172	24/FEB/91	22:56	0.13	7.55	0.25	0.12
173	25/FEB/91	01:56	0.12	7.13	0.24	0.11
174	25/FEB/91	04:56	0.15	4.73	0.29	0.10
175	25/FEB/91	07:56	0.13	4.86	0.26	0.09
176	25/FEB/91	10:56	0.13	5.92	0.25	0.11
177	25/FEB/91	13:56	0.15	7.10	0.28	0.14
178	25/FEB/91	16:56				
179	25/FEB/91	19:56	0.11	6.26	0.22	0.10
180	25/FEB/91	22:56	0.13	6.55	0.25	0.12

NO.	DATE	TIME	HS(m)	TZ(sec)	HMAX(m)	UBED(m/s)
181	26/FEB/91	01:56	0.13	7.35	0.26	0.12
182	26/FEB/91	04:56				
183	26/FEB/91	07:56				
184	26/FEB/91	10:56	0.10	7.36	0.20	0.10
185	26/FEB/91	13:56	0.11	7.39	0.22	0.11
186	26/FEB/91	16:56	0.12	7.54	0.24	0.12
187	26/FEB/91	19:56	0.10	6.27	0.19	0.09
188	26/FEB/91	22:56	0.10	6.95	0.19	0.09
189	27/FEB/91	01:56	0.11	7.59	0.21	0.10
190	27/FEB/91	04:56				
191	27/FEB/91	07:56	0.09	6.75	0.17	0.08
192	27/FEB/91	10:56	0.07	6.89	0.13	0.06
193	27/FEB/91	13:56				
194	27/FEB/91	16:56				
195	27/FEB/91	19:56				
196	27/FEB/91	22:56				
197	28/FEB/91	01:56				
198	28/FEB/91	04:56				
199	28/FEB/91	07:56	0.09	5.31	0.17	0.07
200	28/FEB/91	10:56				
201	28/FEB/91	13:56				
202	28/FEB/91	16:56	0.08	6.16	0.15	0.06
203	28/FEB/91	19:56				
204	28/FEB/91	22:56				
205	01/MAR/91	01:56				
206	01/MAR/91	04:56	0.06	6.37	0.12	0.06
207	01/MAR/91	07:56				
208	01/MAR/91	10:56				
209	01/FEB/91	13:56				
210	01/MAR/91	16:56				
211	01/MAR/91	19:56				
212	01/MAR/91	22:56				
213	02/MAR/91	01:56				
214	02/MAR/91	04:56				
215	02/MAR/91	07:56				
216	02/MAR/91	10:56				
217	02/MAR/91	13:56	0.05	5.95	0.10	0.05
218	02/MAR/91	16:56				
219	02/MAR/91	19:56				
220	02/MAR/91	22:56				
221	03/MAR/91	01:56				
222	03/MAR/91	04:56				
223	03/MAR/91	07:56				
224	03/MAR/91	10:56				
225	03/MAR/91	13:56				

NO.	DATE	TIME	HS(m)	TZ(sec)	HMAX(m)	UBED(m/s)
226	03/MAR/91	16:56				
227	03/MAR/91	19:56				
228	03/MAR/91	22:56	0.08	4.41	0.15	0.05
229	04/MAR/91	01:56				
230	04/MAR/91	04:56				
231	04/MAR/91	07:56				
232	04/MAR/91	10:56				
233	04/MAR/91	13:56				
234	04/MAR/91	16:56				
235	04/MAR/91	19:56				
236	04/MAR/91	22:56				
237	05/MAR/91	01:56				
238	05/MAR/91	04:56				
239	05/MAR/91	07:56				
240	05/MAR/91	10:56	0.10	4.06	0.21	0.05
241	05/MAR/91	13:56	0.10	4.12	0.21	0.06
242	05/MAR/91	16:56	0.08	4.21	0.16	0.05
243	05/MAR/91	19:56				
244	05/MAR/91	22:56				
245	06/MAR/91	01:56				

Appendix-I.2.4.2 Wave Direction by Visual Observation

(1)

Date	Time	Direction	Date	Time	Direction	Date	Time	Direction
13/10/90	07 00 17 00	240° 235°	14/10/90	07 00 17 00	235° 235°	15/10/90	07 00 17 00	240° 235°
16/10/90	07 00 17 00	220° 230°	17/10/90	07 00 17 00	240° 245°	18/10/90	07 00 17 00	240° 235°
19/10/90	07 00 17 00	230° 280°	20/10/90	07 00 17 00	225° 300°	21/10/90	07 00 17 00	280° 305°
22/10/90	07 00 17 00	260° 210°	23/10/90	07 00 17 00	250° 225°	24/10/90	07 00 17 00	260° 280°
25/10/90	07 00 17 00	260° 285°	26/10/90	07 00 17 00	275° 285°	27/10/90	07 00 17 00	285° 295°
28/10/90	07 00 17 00	285° 280°	29/10/90	07 00 17 00	275° 300°	30/10/90	07 00 17 00	275° 310°
31/10/90	07 00 17 00	280° 285°	1/11/90	07 00 17 00	295° 285°	2/11/90	07 00 17 00	300° 270°
3/11/90	07 00 17 00	280° 295°	4/11/90	07 00 17 00	285° 280°	5/11/90	07 00 17 00	270° 270°
6/11/90	07 00 17 00	280° 265°	7/11/90	07 00 17 00	330° 280°	8/11/90	07 00 17 00	280° 300°
9/11/90	07 00 17 00	250° 305°	10/11/90	07 00 17 00	310° 290°	11/11/90	07 00 17 00	300° 295°
12/11/90	07 00 17 00	305° 285°	13/11/90	07 00 17 00	315° 305°	14/11/90	07 00 17 00	310° 300°
15/11/90	07 00 17 00	265° 295°	16/11/90	07 00 17 00	280° 270°	17/11/90	07 00 17 00	260° 270°
18/11/90	07 00 17 00	265° 295°	19/11/90	07 00 17 00	270° 280°	20/11/90	07 00 17 00	285° 300°
21/11/90	07 00 17 00	275° 290°	22/11/90	07 00 17 00	265° 280°	23/11/90	07 00 17 00	305° 295°
24/11/90	07 00 17 00	300° 285°						

Date	Time	Direction	Date	Time	Direction	Date	Time	Direction
04/02/91	07 00 17 00	310° 295°	05/02/91	07 00 17 00	290° 275°	06/02/91	07 00 17 00	285° 280°
07/02/91	07 00 17 00	300° 290°	08/02/91	07 00 17 00	265° 270°	09/02/91	07 00 17 00	305° 295°
10/02/91	07 00 17 00	280° 285°	11/02/91	07 00 17 00	275° 260°	12/02/91	07 00 17 00	295° 270°
13/02/91	07 00 17 00	300° 285°	14/02/91	07 00 17 00	310° 280°	15/02/91	07 00 17 00	260° 250°
16/02/91	07 00 17 00	255° 270°	17/02/91	07 00 17 00	270° 295°	18/02/91	07 00 17 00	280° 310°
19/02/91	07 00 17 00	265° 270°	20/02/91	07 00 17 00	275° 285°	21/02/91	07 00 17 00	285° 270°
22/02/91	07 00 17 00	260° 280°	23/02/91	07 00 17 00	255° 260°	24/02/91	07 00 17 00	270° 295°
25/02/91	07 00 17 00	265° 280°	26/02/91	07 00 17 00	255° 270°	27/02/91	07 00 17 00	250° 295°
28/02/91	07 00 17 00	275° 300°	01/03/91	07 00 17 00	245° 270°	02/03/91	07 00 17 00	280° 265°
03/03/91	07 00 17 00	260° 305°	04/03/91	07 00 17 00	300° 275°	05/03/91	07 00 17 00	310° 285°

Appendix-I.2.4.3 Wave Hight at the Coast of Delta

《 Hearing from the fishermen 》

Month	Wave height	Frequency
January	2 ~ 3 m	daily
February	2 ~ 3 m	daily
End of February	1 ~ 2 m	daily
March	0.5~1.5 m	daily
April	0.5~1.0 m	daily
	1.0~1.5 m	once or twice a month
May	- do -	- do -
June	- do -	- do -
July	0.5~1.0 m	daily
	1.0~1.5 m	five or six days a month
August	- do -	- do -
September	0.5~1.0 m	daily
	1.0~1.5 m	one week
October	- do -	- do -
November	1.0~1.5 m	daily
	1.5~2.0 m	ten days
December	1.0~1.5 m	daily
	1.5~2.5 m	two weeks

Appendix-I.2.4.4 Wave forecasting by S-M-B method

The S-M-B method is one of the wave forecasting method proposed by Sverdrup and Munk and modified by Bretschneider.

The method is appricable only when the wind field is stationary. It estimates the wave height and period of significant waves in deep water from the wind velocity, duration and fetch length in a wind field by using the chart shown in **Figure-2.4.4.1.**

The chart shown in the Figure is drawn according to the formulas I.2.1 and I.2.2 below, modified by Wilson in 1965.

$$\frac{g \cdot H_{1/3}}{U^2} = 0.30 \left[1 - \frac{1}{\left\{ 1 + 0.004 \left(\frac{g \cdot F}{U^2} \right)^{1/2} \right\}^2} \right] \quad \cdots\cdots\cdots\cdots \text{(I.2.1)}$$

$$\frac{g \cdot T_{1/3}}{2\pi U} = 1.37 \left[1 - \frac{1}{\left\{ 1 + 0.008 \left(\frac{g \cdot F}{U^2} \right)^{1/3} \right\}^5} \right] \quad \cdots\cdots\cdots\cdots \text{(I.2.2.)}$$

where $H_{1/3}$: Significant wave height (m)
$T_{1/3}$: Significant wave period (s)
U : Wind velocity at 10 m above sea surface (m/s)
F : Fetch length (m)
g : Acceleration of gravity (m/s^2), g=9.8 m/s^2

In estimating the wave height and period, two pairs of values shall be obtained from the chart, namely the values obtained from combination of wind velocity and duration, and those from combination of the velocity and fetch length, and the smaller pair of values shall be taken as the generated wind conditions.

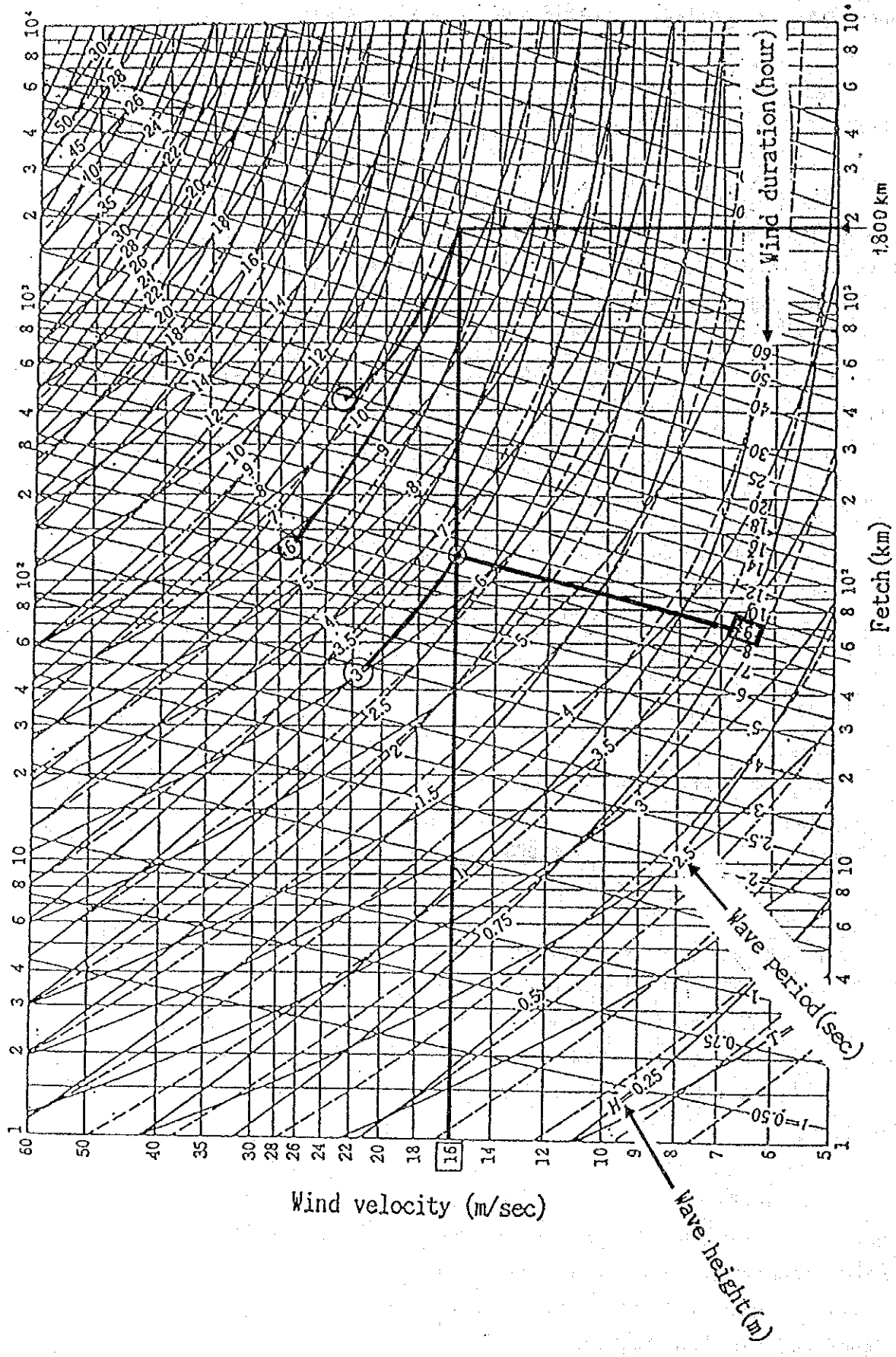


Figure-2.4.4.1 Curves of Wave Forecasting by S-M-B Method