6.3 Existing and Abandoned Submarine Cables and Pipelines

6.3.1 Existing and Abandoned Submarine Cables

Submarine cables which are in use at present and also those which have been abandoned, and which are located adjacent to the proposed cable route are as follows: (Refer to Fig. II-6-3.)

(1) Submarine Cables in Use at Present

ASEAN M.S.T Cable	
(Malaysia - Singapore/Thailand):	laid in 1983
Kuantan - Kuching Cable:	laid in 1979
ASEAN P.S Cable	
(Philippines - Singapore):	laid in 1978

(2) Abandoned Submarine Cables

SEACOM-A Cable	
(Singapore - Kota Kinabalu):	abandoned in 1983
SEACOM-B Cable	
(Hong Kong - Kota Kinabalu):	abandoned in 1983
Telegraph Cables (four lines):	abandoned

(3) Submarine Cable under Construction

S.H Segment of S.H.T Cable
(Singapore - Hong Kong - Taiwan)

The proposed cable route crosses ASEAN P.S cable, S.H Segment of S.H.T Cable, SEACOM-A and Telegraph Cables. It is important to protect the existing submarine cables at the time of execution of cable burying survey, cable laying and cable burying works.

For the purpose of obtaining the exact position of crossing among the existing cables, the survey for cable search were carried out by using the Proton Magnetometer on the basis of existing charts, data collected in Japan, and information obtained from JTM.

As a results of the survey for existing cable search, the positions of the existing ASEAN P.S and S.H Segment submarine cables on the proposed cable route were confirmed. (Refer to Fig. II-6-3.) The abandoned SEACOM-A cable could not be found because Proton Magnetometer is not applicable at the deep sea area.

The crossing points of each submarine cable on the proposed cable route are shown in Table II-6-1.

Table II-6-1 Position List of Crossing Points on the Proposed Cable Route

Cable	Position (Degs. Mins.)	
	Latitude (N)	Longitude (E)
ASEAN P.S Cable (in use)	4°50'00"	106°43'10"
S.H Segment Cable (under construction)	4°50'00"	106°34'40"
Remarks: Positioning data are based on WGS-72.		

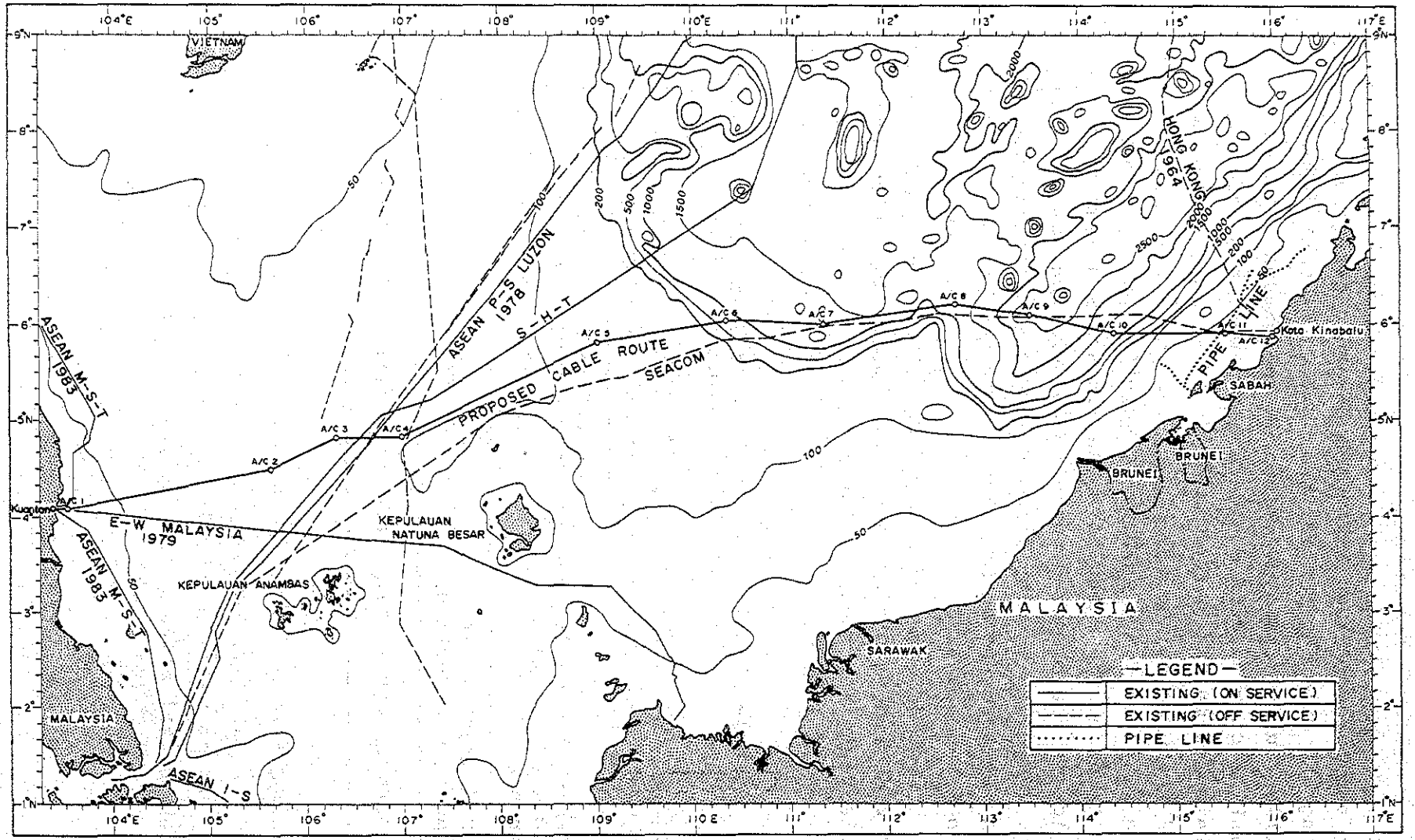


Fig. II-6-3 Existing and Abandoned Submarine Cable and Pipelines

6.3.2 Existing Oil/Gas Pipelines

(1) Sunda Shelf Area

There are many mining areas being actively exploited in the area between the east coast of Peninsula Malaysia and the Natuna Island.

Oil/gas pipelines have been laid from Kerteh which is located to the north of Cherating, to the ESSO and PETORONAS blocks, located at 120 nm northeast and 80 nm east-northeast, respectively off Kerteh. However, the proposed cable route passes at least 30 nm to the south of these pipelines. (Refer to Fig. II-6-2(2/4).) However, as there are many concession blocks, it is necessary to take sufficient measures for the protection of the cable after cable laying, against resources development activities.

(2) Kota Kinabalu Slope Area

Oil/gas pipelines have already been laid in each concession blocks of Sabah SHELL, PECTEN and ESSO. They are located from between 30 nm to 60 nm offing of Kota Kinabalu and are connected with Labuan Island. (Fig. II-6-2(4/4)) The oil/gas pipeline is 24 inches in diameter and 120 nm in total length.

The proposed cable route will cross the oil/gas pipelines at the point of about 32 nm off Kota Kinabalu. The existence of the oil/gas pipelines were verified by using a Side Scan Sonar on the going-run survey, and the position of crossing point is about 1.5 nm west of A/C 11. The position is as indicated on the chart No.71323

issued by the U.S.A. The two pipelines exposed on the seabed are parallel 100 m apart. The coordinates of crossing point on the proposed cable route is latitude 5°55.4'N and longitude 115°28.6'E.

6.4 Ammunition Dumping Area

There are two ammunition dumping areas to the west of Kota Kinabalu. Therefore, the route was planned to avoid these ammunition dumping areas. The locations of the dumping areas are as follows:

An area surrounded by the following latitude and longitude. (Refer to Fig. II-6-4.)

(1) Dumping Area

5°40.5'N	113°59.0'E
5°26.0'N	114°16.0'E

(2) Disused Dumping Area

6°19.0'N	114°29.0'E
5°58.5'N	114°50.0'E

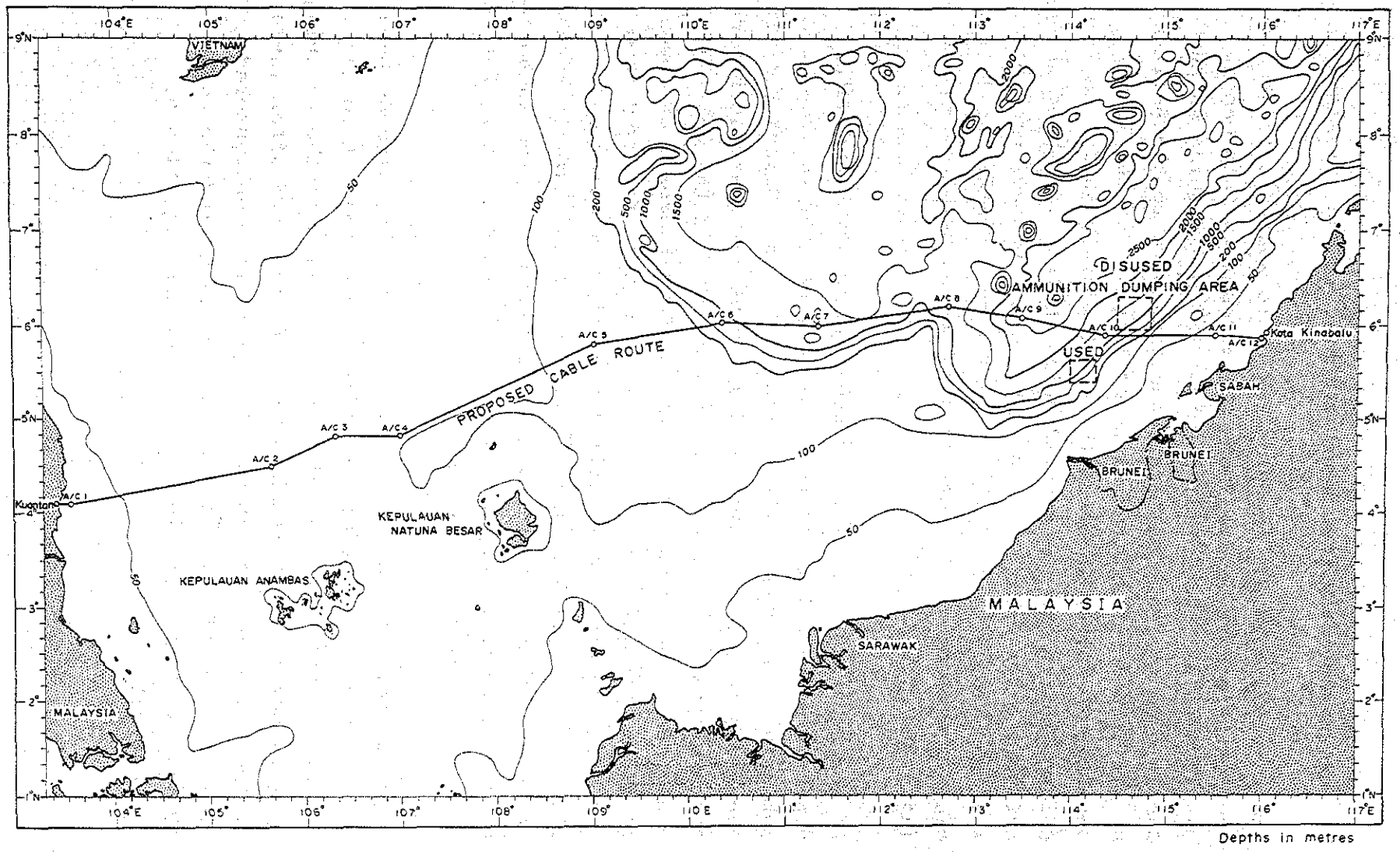


Fig. II-6-4 Ammunition Dumping Area

6.5 Shipping Activities

The survey area along the proposed cable route is located in the southern part of the South China Sea. In this Ocean area, there are two normal passages for ocean going ships. One is from the Malacca Strait and Singapore to the Balitang Strait (the northern area of Luzon Island) and the Taiwan Strait. The other is along the coast of Palawan Island from Borneo, and is for low powered ships (mainly low-speed ships) during the northeast monsoon. The former passage crosses with the middle part of the proposed cable route; the latter crosses with it on the coastal area to the north of Borneo. (Refer to Fig. II-6-5.)

As these passages are for the ocean going ships and water depth is large, it would not cause any hazards to the submarine cable due to the ship's anchoring. However, it is necessary to consider the possibility of temporary anchoring of some local or coastal boats which occur in the coastal area. Both the ports of Kuantan and Kota Kinabalu are open to large ships, but as these ports are quite far away from the cable landing routes, the large ships arriving and leaving these ports do not directly cause any hazards to the cable due to anchorage. Also it is judged that the anchoring area of both ports may not affect the submarine cable for the same reason as mentioned above.

In addition, the prohibited anchoring area has already been established along the cable landing route adjacent to the Cherating cable landing point for protection of the existing cables, but it is desirable to expand this area after laying of the new submarine cable. The survey ship encountered various types of ships and fishing gears during the ocean survey, as summarized in Table II-6-2 and Fig. II-6-5, respectively.

Table II-6-2 Number of Ships Observed Along the Proposed Cable Route During Ocean Survey

Section (Longitude E)	Number of Observed Ships	Number of Work Days	Q'ty of Ships/Day
103° - 104°	16	1.0	16
104° - 105°	6	1.9	3
105° - 106°	0	2.5	0
106° - 107°	46	2.8	16.5
107° - 108°	20	2.5	8
108° - 109°	5	1.1	4.5
109° - 110°	3	3.5	1
110° - 111°	1	1.6	0.5
111° - 112°	0	2.1	0
112° - 113°	0	1.9	0
113° - 114°	1	1.4	0.5
114° - 115°	7	2.3	3
115° - 116°	8	2.1	4

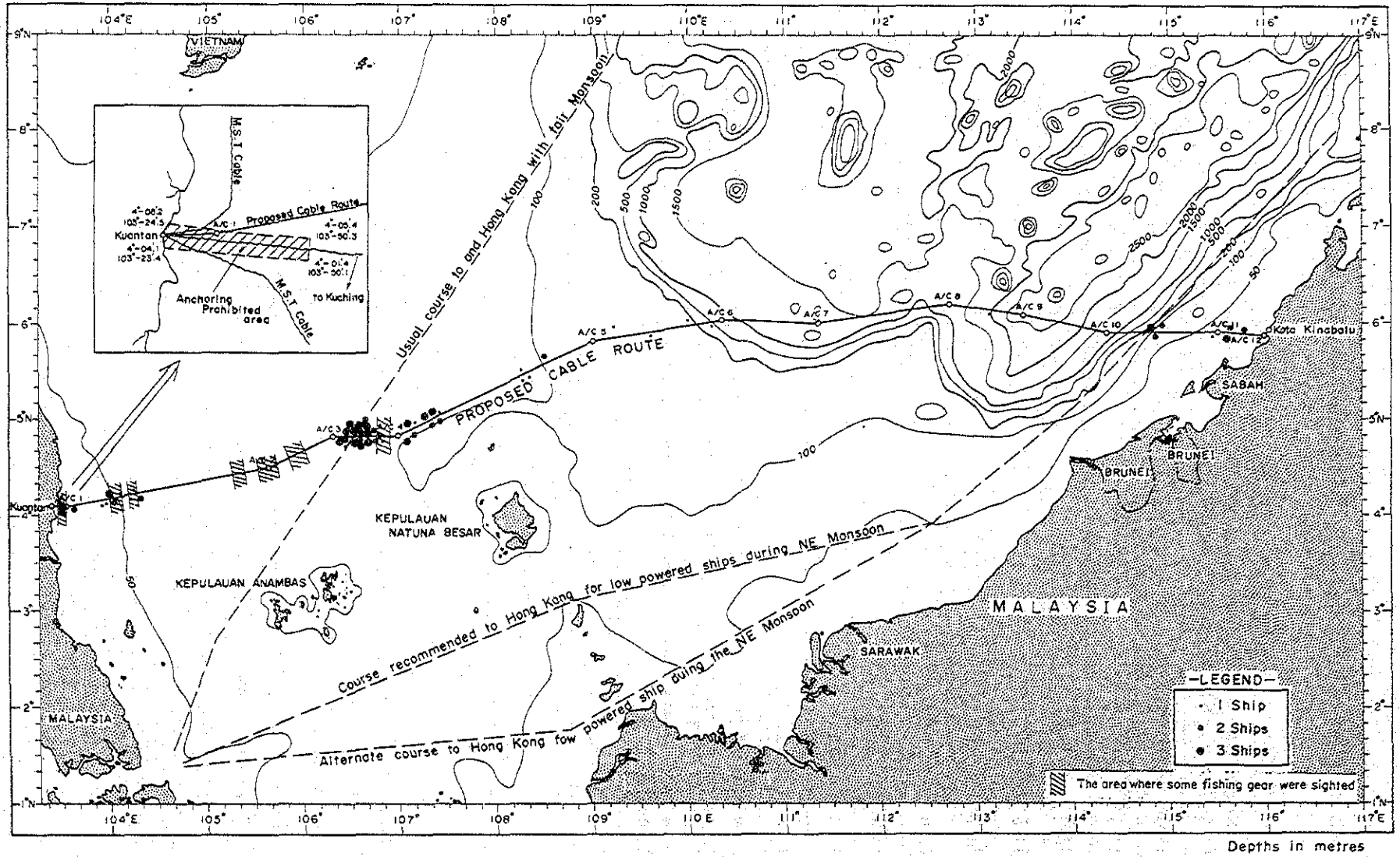


Fig. II-6-5 Number of Ships and Fishing Gears Observed During Ocean Survey

7. LANDING SITES

7. Landing Sites

7.1 Land and Earth Cable Routes

7.1.1 Kuantan (Cherating) Landing Site

The Kuantan (Cherating) landing site had already been selected earlier as the suitable landing points for the Kuantan - Kuching and ASEAN M.S.T (Malaysia - Singapore/ Thailand) submarine cable systems, and was also selected for this Kuantan - Kota Kinabalu submarine cable system.

The results of the site survey are given in Table II-7-1.

As shown in Figs. II-7-1 and II-7-2, the land cable and earth cable run almost in a straight line along the cable routes of the existing cables from the beach. The distance from the terminal station (S.P) to the landing point was measured as 326.6 m, and the distance from the cable terminal station to the earth bed point (E.P 2) was measured as 363.3 m.

The mean ground level of landing site was about 5 m higher than low tide water level, as shown in Fig. II-7-1.

The angles between the proposed cable route and fixed reference targets such as light house, top of isolated reef at landing point of Cherating are shown in Fig. II-7-3.

Table II-7-1 Results of Landing Site Survey in Cherating

Point	WGS-72		West Malaysia - Kertau		Distance (m)
	Latitude(N)	Longitude(E)	Latitude(N)	Longitude(E)	
L.P	4°06'20.201	103°23'04.125	4°06'21.516	103°23'09.493	37.52
B.M/H	20.427	23'02.930	21.744	23'08.298	262.68
L.M/H	20.643	22'54.416	21.961	22'59.783	26.40
S.P	21.496	22'54.437	22.820	22'59.804	
B.M/H	4°06'20.427	103°23'02.930	4°06'21.744	103°23'08.298	74.19
E.P 2	19.283	23'05.044	20.592	23'10.412	

7.1.2 Kota Kinabalu (Tg. Aru) Landing Site

The communication land cable route was selected along the land portion cables of abandoned SEACOM and Telegraph cables, to the SEACOM cable terminal station. The land earth cable route was also selected near the SEACON earth cable.

The results of the site survey are given in Table II-7-2. Relations between both cable routes and building, wire fence, trees, etc. standing along the cable routes were investigated, and the results are shown in Fig. II-7-4.

The total distance from the SEACOM cable terminal station (S.P) to the landing point along the proposed land cable route was measured as 373.9 m, and the total distance from S.P to earth bed point (E.P) was measured as 158.5 m.

The mean ground level of landing site was about 2.6 m higher than low tide water level, as shown in Fig. II-7-4.

The angles between the proposed cable route and fixed reference targets such as beacon, building at landing point of Kota Kinabalu site are shown in Fig. II-7-5.

Table II-7-2 Results of Landing Site Survey in Tg. Aru

Point	WGS-72		West Malaysia - Timbalai		Distance (m)
	Latitude(N)	Longitude(E)	Latitude(N)	Longitude(E)	
L.P	5°57'03.447	116°02'37.646	5°57'06.910	116°02'27.923	17.22
T.1	03.940	37.907	07.406	28.184	26.22
T.2	04.490	38.555	07.960	28.833	82.76
T.3	06.096	40.708	09.577	30.985	72.60
T.4	08.206	39.673	11.701	29.950	20.16
T.5	08.856	39.633	12.356	29.910	66.72
T.6	10.956	40.133	14.469	30.411	70.82
T.7	13.185	40.660	16.714	30.397	16.80
S.P.	13.061	41.192	16.589	31.469	20.50
T.8	13.213	40.543	16.741	30.820	138.00
E.P.	17.557	41.571	21.115	31.849	

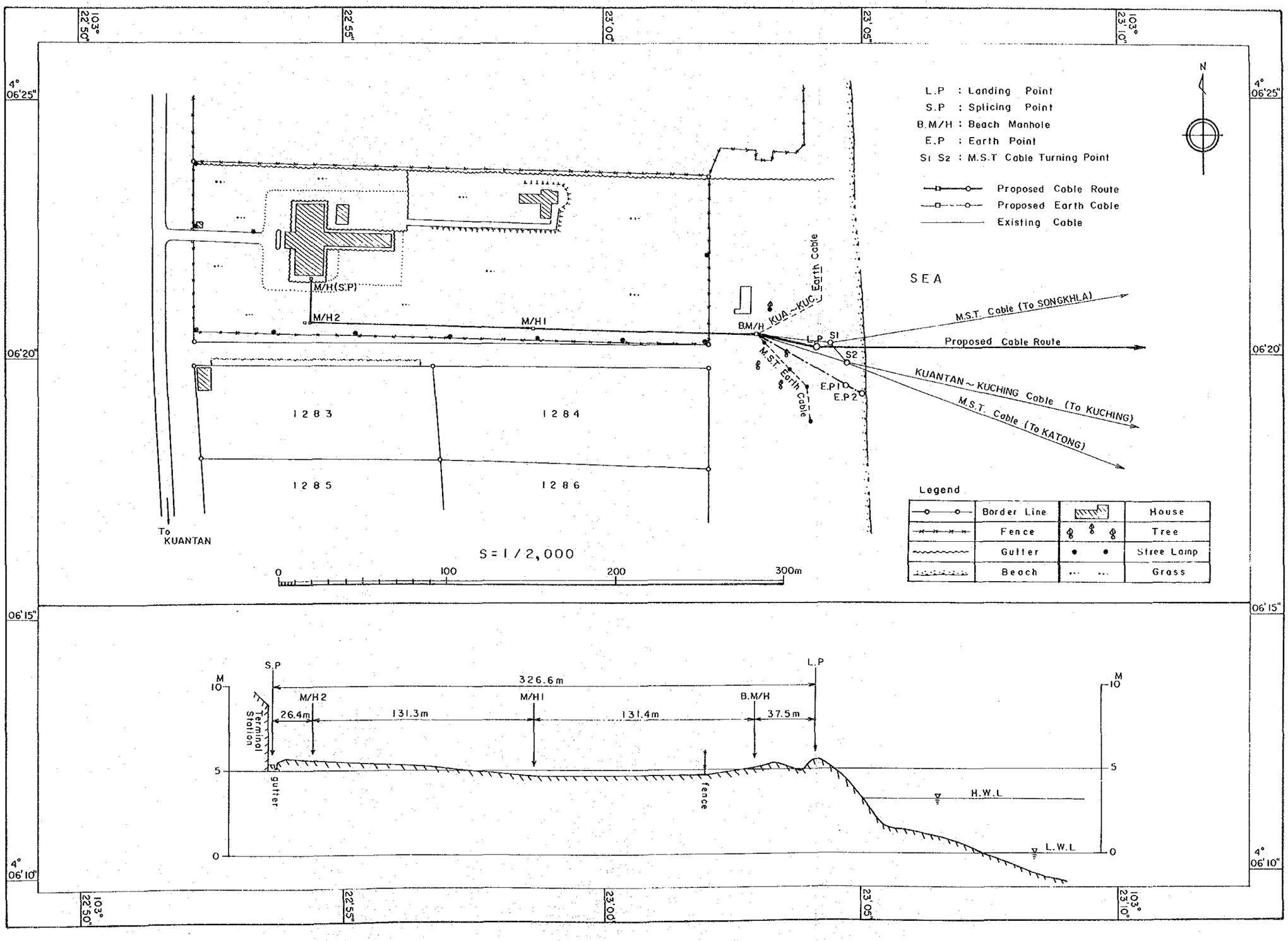
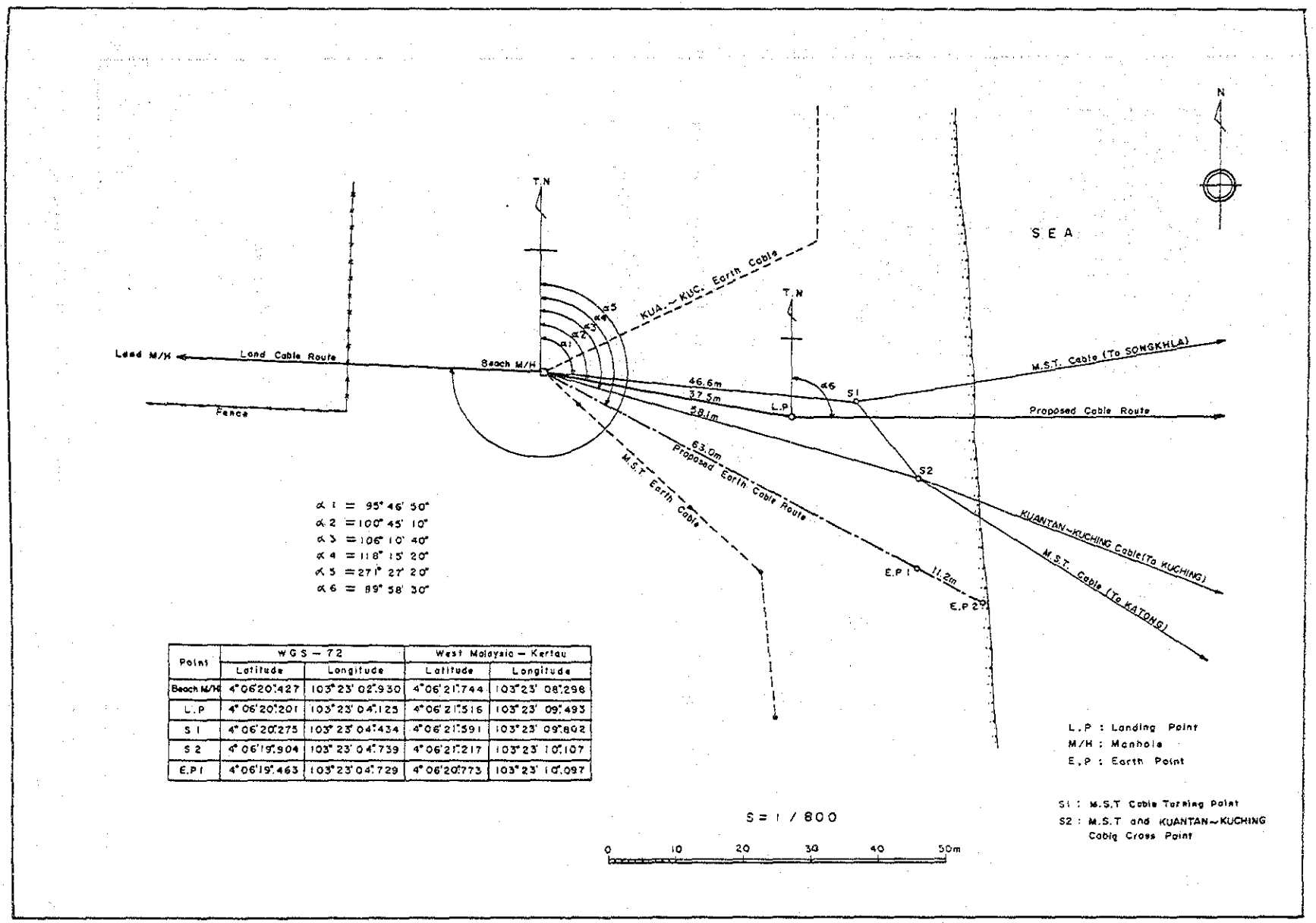


Fig. II-7-1 Proposed Land and Earth Cable Routes in Cherating



Point	WGS – 72		West Malaysia – Kertau	
	Latitude	Longitude	Latitude	Longitude
Beach M/H	4°06'20".427	103°23' 02".930	4°06'21".744	103°23' 08".298
L.P	4°06'20".201	103°23' 04".125	4°06'21".516	103°23' 09".493
S 1	4°06'20".275	103°23' 04".434	4°06'21".591	103°23' 09".802
S 2	4°06'19".904	103°23' 04".739	4°06'21".217	103°23' 10".107
E.P 1	4°06'19".463	103°23' 04".729	4°06'20".773	103°23' 10".097

Fig. II-7-2 Detailed Location of Existing and Proposed Cable Route in Cherating

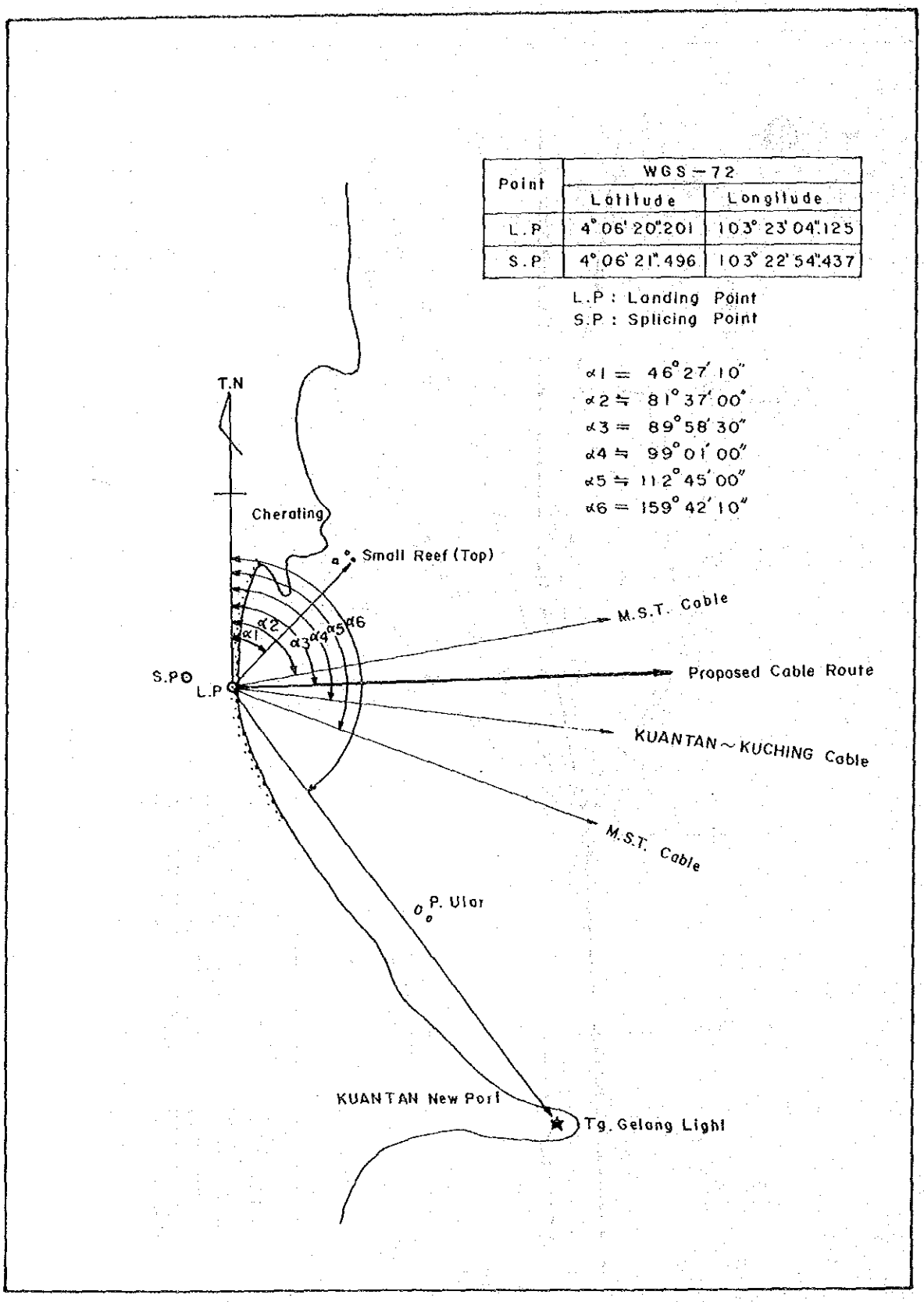


Fig. II-7-3 Bearings of Cable Route in Cherating

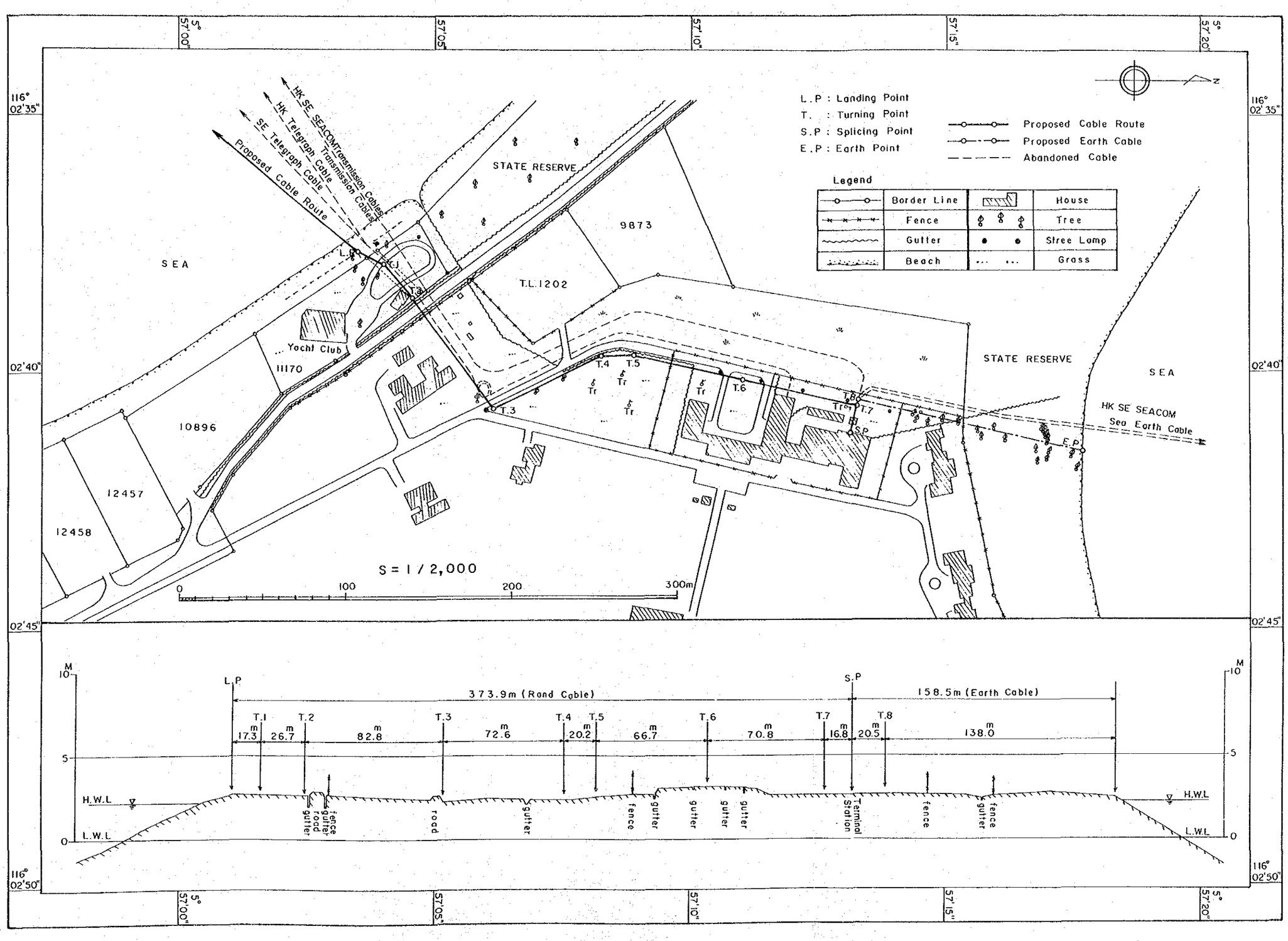
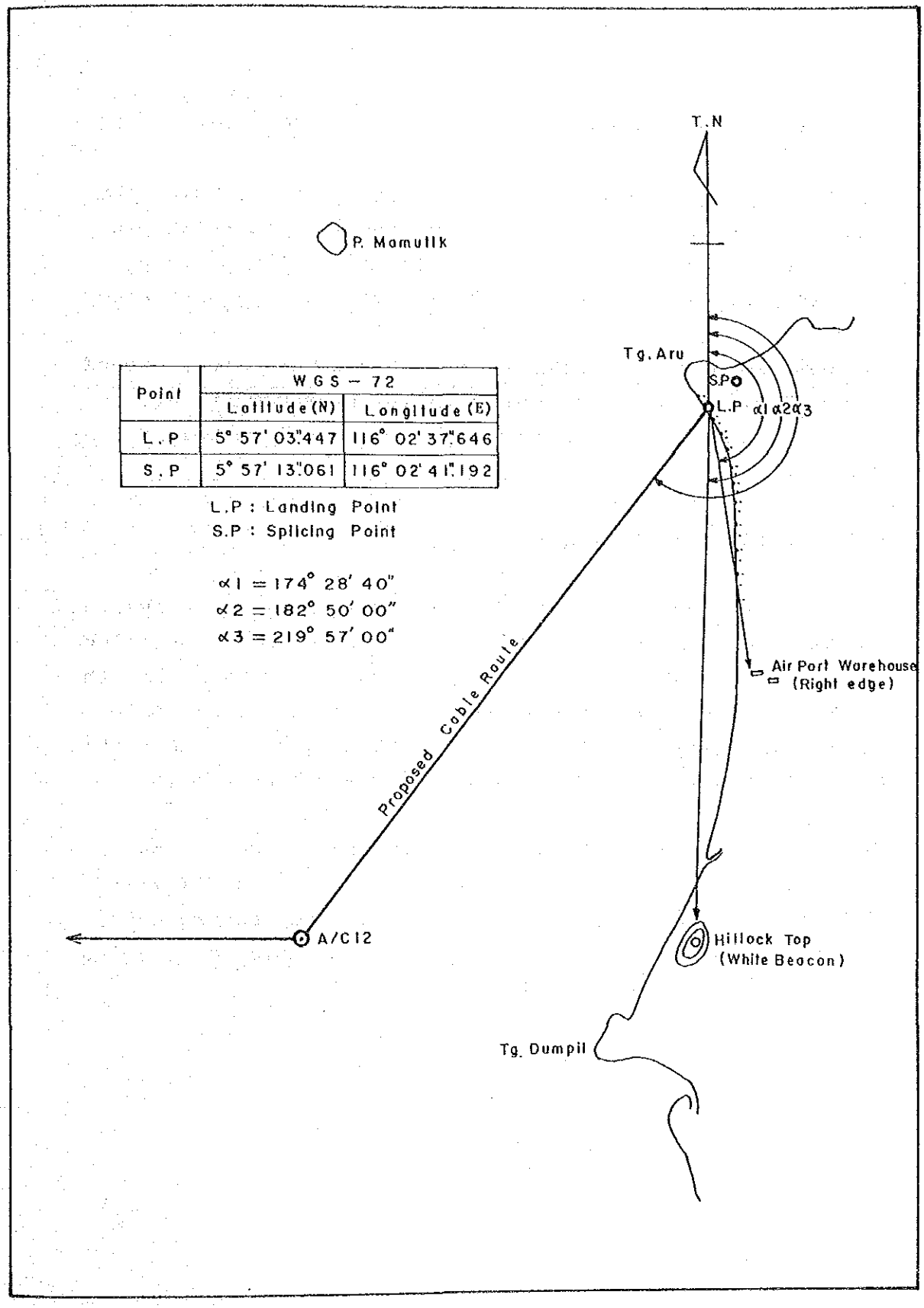


Fig. II-7-4 Proposed Land and Earth Cable Routes in Tg. Aru



Point	WGS – 72	
	Latitude (N)	Longitude (E)
L.P	5° 57' 03".447	116° 02' 37".646
S.P	5° 57' 13".061	116° 02' 41".192

L.P : Landing Point
S.P : Splicing Point

$\alpha 1 = 174° 28' 40"$
$\alpha 2 = 182° 50' 00"$
$\alpha 3 = 219° 57' 00"$

Fig. II-7-5 Bearings of Cable Route in Tg. Aru

7.2 Earth Resistivity Measurement

Earth resistivity measurement was carried out by using the Wenners four driven-rod electrode-method to find suitable location of earth ground in order to design the earth electrode system near the beach of both cable landing sites.

The designs of Power Feeding Ground System and Ocean Ground on the basis of data obtained from the measurements are described in Part IV, Subsections 3.8 and 4.6 in Volume 3 of this report.

7.2.1 Kuantan (Cherating)

At the Cherating site, the PFE earth systems for the Kuantan - Kuching and ASEAN M.S.T cables had already been installed at the beach. It is the proposal of the Study Team that the earth bed point for the new Kuantan - Kota Kinabalu cable system be installed near the shoreline to get low and stable earth resistance and to avoid existing earth systems.

The measurement was carried out at two earth bed points, i.e., E.P 1 and E.P 2, (refer to Figs. II-7-1 and II-7-2) near the shoreline. From the results of the measurements, the second earth bed point, E.P 2, was suitable for the PFE earth system, as shown in Table II-7-3.

Table II-7-3 Result of Earth Resistivity Measurement in Cherating, Kuantan

	Earth Bed Point No.1 (E.P 1)		Earth Bed Point No.2 (E.P 2)	
a(m)	R(ohm)	2πaR(ohm-m)	R(ohm)	2πaR(ohm-m)
0.5	-	-	4.3 x1	13.50
1	15.7 x10	985.96	26.0 x0.1	16.33
1.5	7.65x10	720.63	15.5 x0.1	14.60
2	4.05x10	508.68	9.7 x0.1	12.18
3	14.6 x10	275.06	5.0 x0.1	9.42
5	5.0 x10	157.0	27.1 x0.01	8.51
6	3.65x1	137.53	23.95x0.01	9.02
7	21.8 x0.1	95.83	21.6 x0.01	9.50
10	14.2 x0.1	89.18	15.65x0.01	9.83
15	5.2 x0.1	48.98	8.35x0.01	7.87
20	21.8 x0.01	27.38	6.15x0.01	7.72
30	3.8 x0.01	7.16	3.60x0.01	6.78

a: Equal intervals among four electrodes (m)
R: Resistance measured between potential electrode (ohm)
2πaR: Earth resistivity (ohm-m)

7.2.2 Kota Kinabalu (Tg. Aru)

At Tg. Aru site, the measurement was carried out at the beach to the north of terminal station, where the abandoned SEACOM sea earth cable had already been laid. According to the result of the measurement, the earth resistivity at this point indicated an extremely low value, which is the most suitable condition for the earth bed point. (Refer to Table II-7-4.)

Table II-7-4 Result of Earth Resistivity Measurement in Tg. Aru, Kota Kinabalu

a (m)	R (ohm)	2πaR (ohm-m)
0.5	5.3 x 0.1	1.66
1	24.0 x 0.01	1.51
1.5	16.0 x 0.01	1.51
2	14.0 x 0.01	1.76
3	10.0 x 0.01	1.88
5	7.0 x 0.01	2.20
7	6.0 x 0.01	2.64
10	5.0 x 0.01	3.14
15	4.0 x 0.01	3.77
20	3.0 x 0.01	3.77
30	2.0 x 0.01	3.77

a: Equal intervals among four electrodes (m)

R: Resistance measured between potential electrode (ohm)

2πaR: Earth resistivity (ohm-m)

ANNEXES

ANNEX-1 SELECTION OF THE PLANNED SURVEY ROUTE

Selection of the Planned Survey Route

The planned survey route was selected based on existing data and information, with considerable attention to the following:

(1) To select the shortest route possible between both landing points

The route distance of the straight line between both landing points is 1,419 km, however the route distance of the planned survey route is 1,448 km, which is 29 km longer than the straight line.

(2) To select the shortest route possible in the shallow water portion

Most of hazards to the submarine cable are man-made, such as fishing activities and ship's anchoring, and usually the damage to the submarine cable occur in the shallow sea area. Therefore it is important to protect the cable in the shallow area, after considering the following disadvantage.

(a) Cable burial: It takes longer to bury the cable considering that the speed is reduced to an average of 1.5 kt. compared to 4 to 5 kt. for normal cable laying.

(b) Armour cable: This type of cable is expensive and takes double the space in the cableship as compared to armourless type.

From the view point of the above-mentioned, the best route in Kota Kinabalu side should be selected toward the northwest of the landing point. However, the route was selected toward the west of the landing points after considering the following points:

(a) The cable route length becomes longer.

(b) The conditions of topography and geology become worse.

(c) Leave sufficient space for future cables (e.g. Kota Kinabalu - Hong Kong, Kota Kinabalu - Philippines, etc.).

Note: The lengths of the planned survey route and straight line route in shallow sea portion are 908 km and 1,224 km, respectively.

(3) To avoid complicated seabed topography

The contour of 100 m depth to the north of Kepulauan Island is complicated, therefore the route was selected further to the north of this area.

There are many sea mountains in the northern part of the South China Sea Basin, therefore, the route was selected to the south of this area.

(4) To select the route to cross the depth contour line with a right angle in the steep slope area

In the southern slope of Palawan Trough, the depth contour lines run east to west, therefore the route was selected in the deep portion of the trough to cross the contour line at a right angle.

(5) To avoid obstacles, such as outcrops, sunken vessels, oil/gas tower

The planned survey route was selected to avoid islands where there are considerable outcrops, and areas where the route may be parallel to continental shelf margins. The survey route was also selected to have some clearances from any sunken vessels or oil/gas towers.

(6) To select the route which crosses the existing cables and oil/gas pipelines, as close to a right angle as possible

On the Sunda Continental Shelf, the existing cables (ASEAN P.S cable and S.H segment cable) run northeast to southwest. Therefore, A/C 3 and A/C 4 were set to cross the existing cables as close to a right angle as possible (more than 45°), in this area. The route was selected to avoid crossing the existing ASEAN M.S.T and Kuantan - Kuching cables in the area adjacent to Cherating landing point. On the Continental Shelf offing of Kota Kinabalu, the existing pipelines run northwest to southeast, therefore the route was selected to cross the pipelines as close to a right angle as possible.

(7) To avoid foreign Territorial Water areas and Exclusive Economic Zones

The Exclusive Economic Zones of Indonesia and Vietnam overlap each other in the Sunda Shelf area, and it was impossible to avoid both of them. Therefore, the survey route was selected to avoid Indonesian's Territorial Water and Vietnam's Exclusive Economic Zone.

(8) To avoid ammunition dumping areas

There are two ammunition dumping areas on the eastern slope of the South China Sea Basin, therefore the route which avoided these areas was selected.

(9) To avoid the areas which have a strong current, especially around the islands, and areas with complicated seabed topography, such as sand waves

ANNEX-2 VESSEL'S POSITION FIXING

Vessel's Position Fixing

The geodetic system being used in Sabah/Sarawak is different from that used in Peninsular Malaysia. The positioning systems available in the survey area, consisting of the Global Positioning System (G.P.S.), NNSS, and OMEGA, are based on WGS-72 (World Geodetic System 1972), which is different from the geodetic systems used in Malaysia. Several ways are possible to adopt the geodetic systems for the position plotting sheets in this condition; however, the geodetic constants of WGS-72 were adopted for making the position plotting sheets because the conversion of both WGS-72 and East/West Malaysia geodetic systems were possible. Therefore, all latitude and longitude positions shown in this report were calculated used on geodetic constants of WGS-72. Also, the charts used for survey were prepared based on the Mercator's Projection Method, taking 5°N in standard parallel.

The equatorial axis and the flattening of the geodetic systems of WGS-72 and the East/West Malaysia are as follows:

Geodetic System	Equatorial Axis	Flattening
Sabah/Sarawak	6377298.565 m	1/300.8017
Peninsular Malaysia	6377304.063 m	1/300.8017
WGS-72	6378135 m	1/298.26

The conversion from the coordinates presented by WGS-72 to the coordinates by the East/West Malaysia geodetic system requires the algebraic calculation using the values shown in Fig. A-2-1 (1/2-2/2).

The deviations are different in some places: In the geodetic system of Sabah/Sarawak, the deviation near A/C 1 is +2.7 seconds in latitude and -15.5 seconds in longitude, and that near A/C 12 is +3.2 seconds in latitude and -10.2 seconds in longitude.

Also, in the geodetic system of Peninsular Malaysia, the deviation near A/C 1 is +1.1 seconds in latitude and +6.9 seconds in longitude, and that near A/C 12 is +1.4 seconds in latitude and is +12.3 seconds in longitude.

During the actual ocean survey, the vessel's position fixing was made by mainly using the G.P.S. For the duration in which the vessel was unable to receive signals from satellites for G.P.S., a hybrid navigation system using the NNSS and OMEGA were used in determining the survey vessel's position.

In the survey area, the signals for the G.P.S., which has an extremely high positioning accuracy, could be continuously received for 10 to 12 hours daily, and the average daily interval for a clear NNSS transmission was approximately 80 minutes. The receivable condition of both the positioning systems mentioned above are as shown in Figs. A-2-2 and A-2-3. The positioning accuracy during sailing is within 0.1 nm for the G.P.S., and approximately 0.5 nm for the NNSS. At both inshore areas, the positioning of the boat used was by the Microwave Ranging System, which has an accuracy of within few meters.

The accuracy of the position of the observations which is required as the basis for the ocean survey, may give serious affects on the results of survey.

In the ocean survey, satisfactory positioning accuracy was maintained by using G.P.S. This system proved highly effective for precise survey in the complicated topography, existing cable search and fixed point measurement which calls for particularly high positioning accuracy.

The G.P.S. is still under development in the U.S. at present time. However, in the future, it can be to use at any region and anytime on the globe. Therefore, highly accurate positioning may be made by using this system at the time of cable laying.

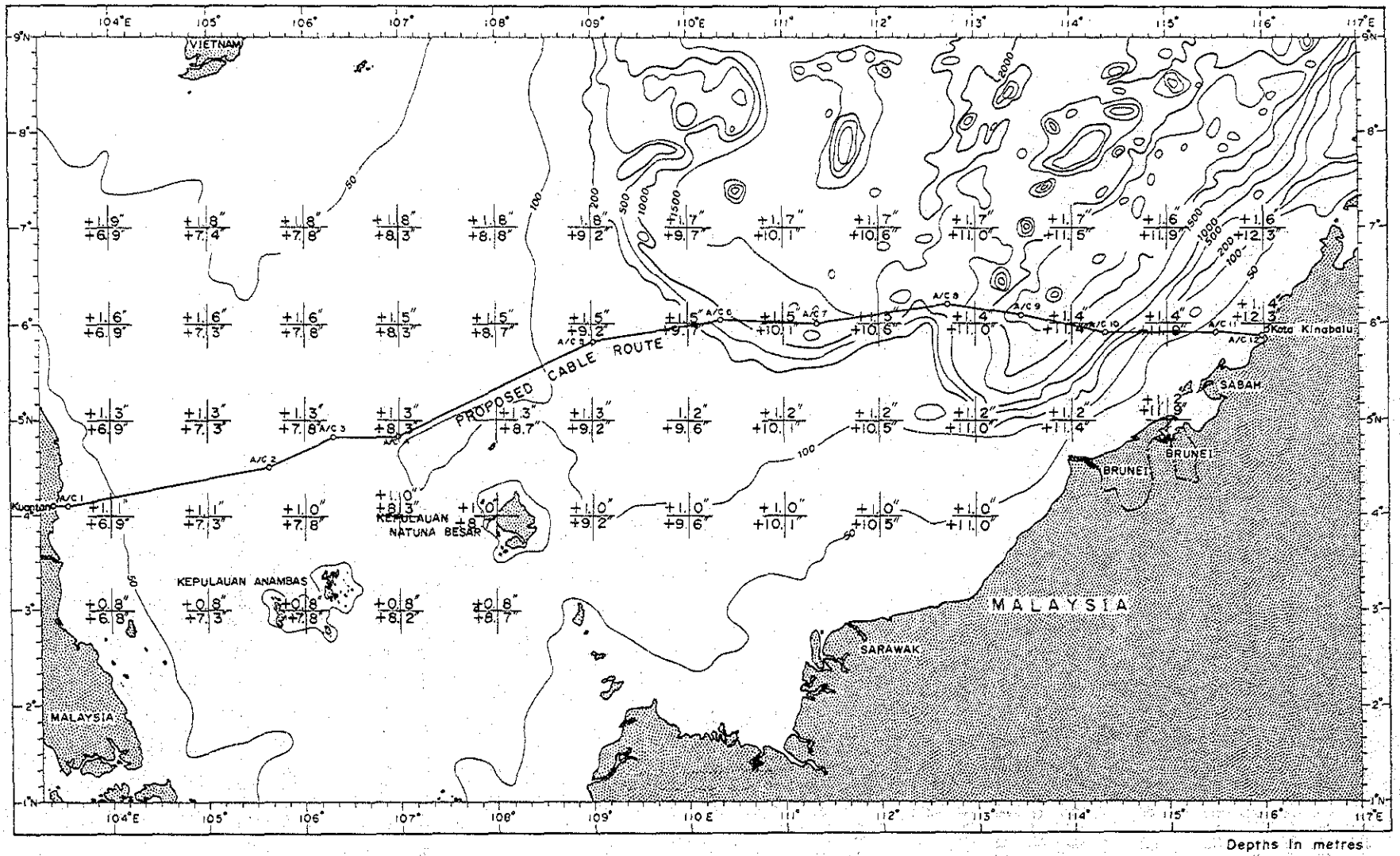


Fig. A-2-1 (1/2) Coordinates Conversion Diagram from WGS-72 to Peninsula Malaysia Geodetic System

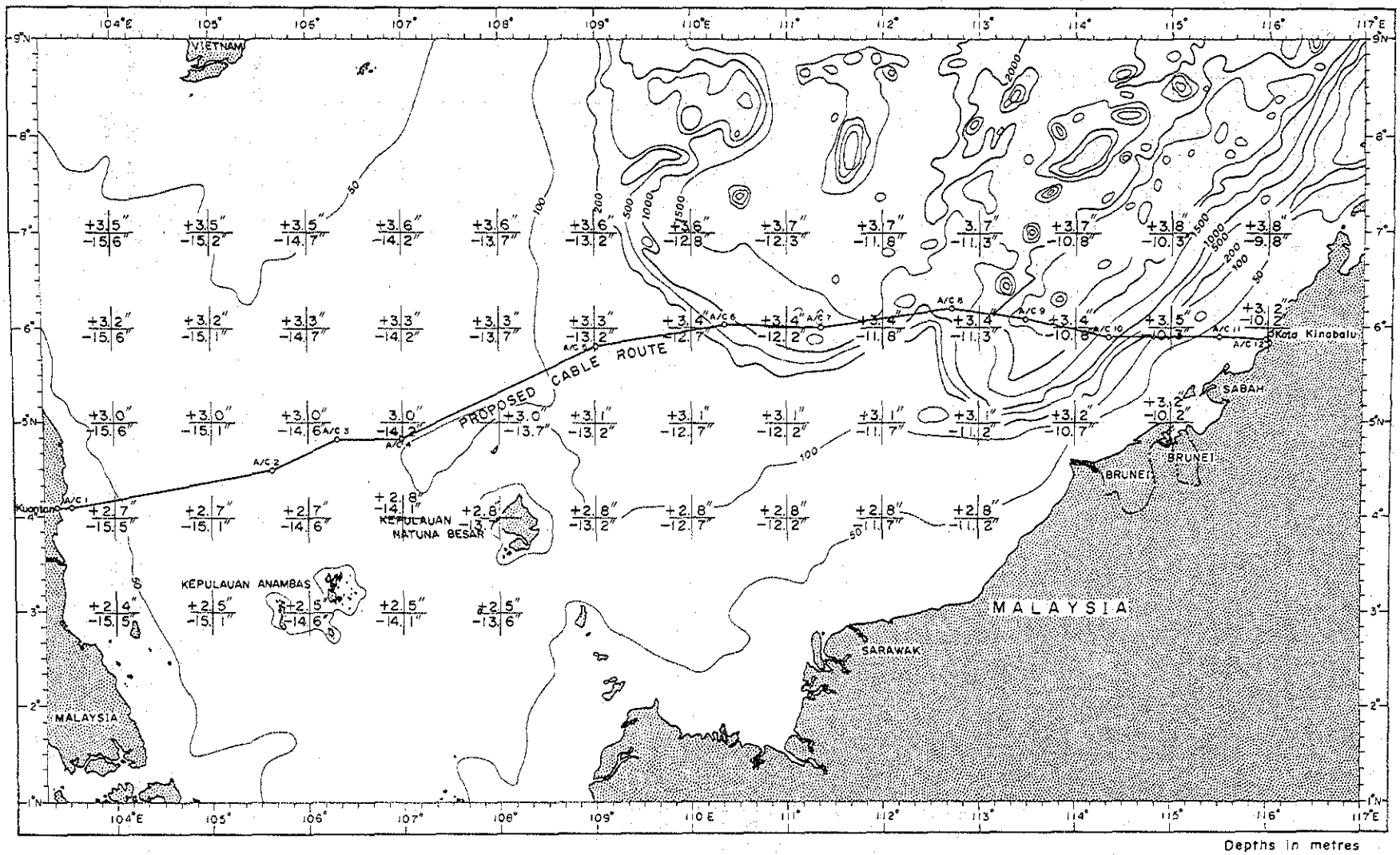


Fig. A-2-1 (2/2) Coordinates Conversion Diagram from WGS-72 to Peninsula Malaysia Geodetic System

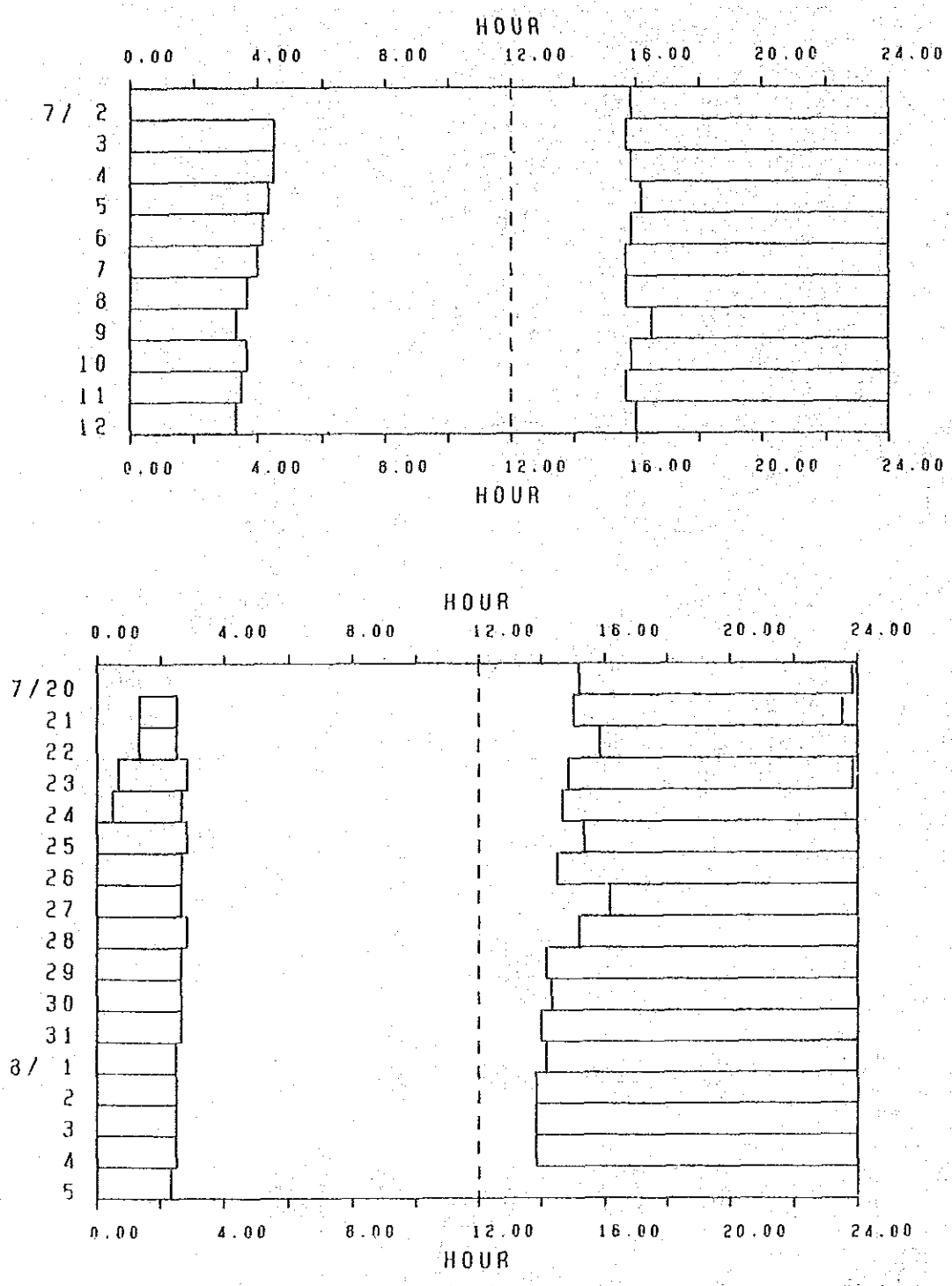


Fig. A-2-2 Available Time Period for Positioning by G.P.S. Satellite Signals During the Ocean Survey

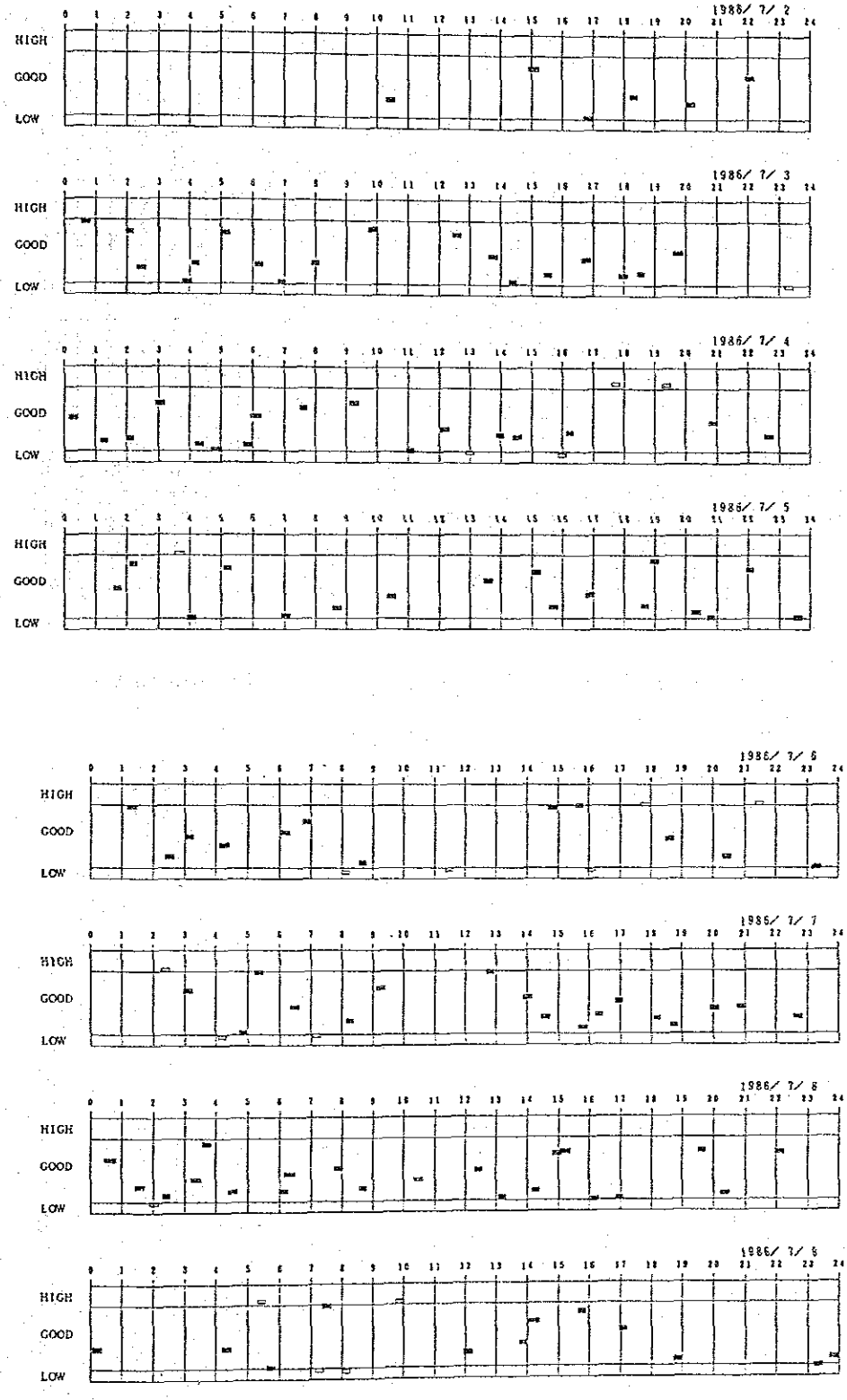


Fig. A-2-3 (1/4) Satellite Pass Frequency

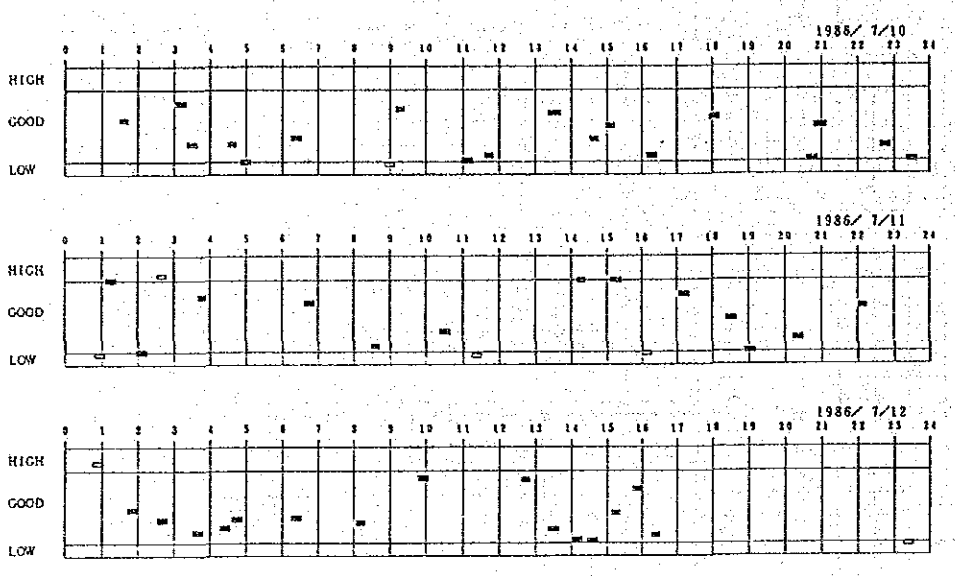


Fig. A-2-3 (2/4) Satellite Pass Frequency

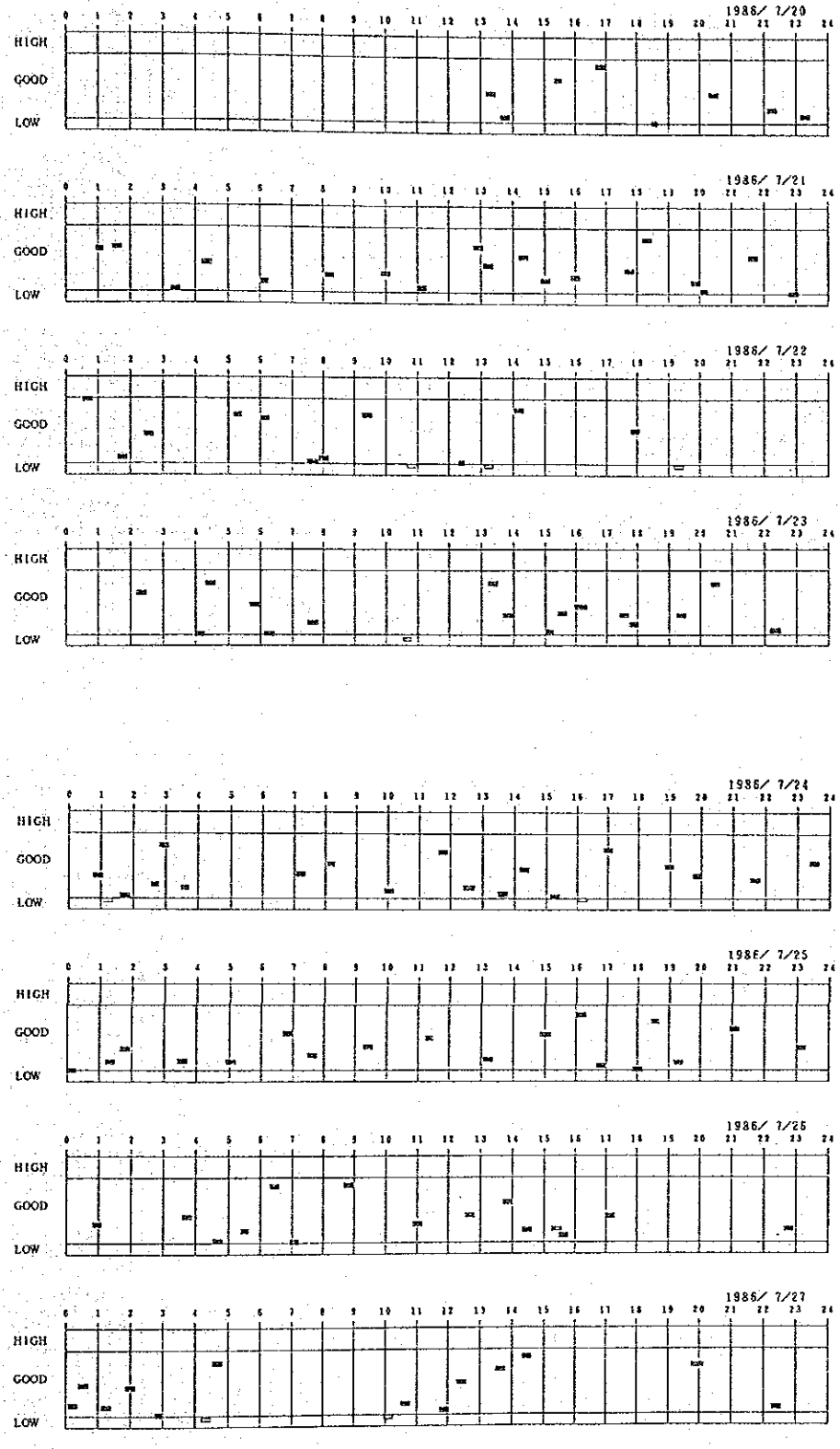


Fig. A-2-3 (3/4) Satellite Pass Frequency

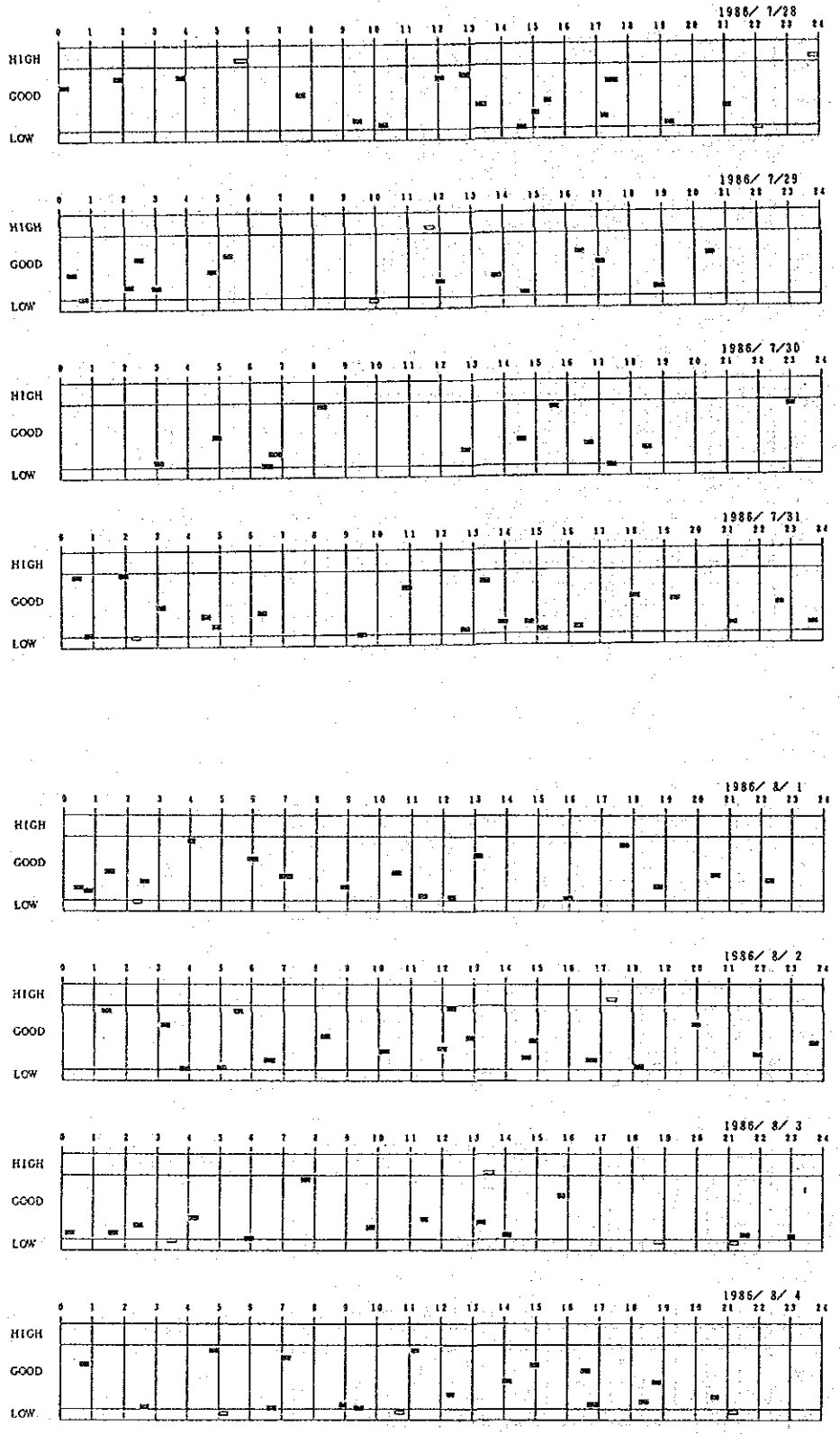


Fig. A-2-3 (4/4) Satellite Pass Frequency

ANNEX-3 SUMMARY OF OCEAN SURVEY AND LANDING SITES SURVEY

Summary of Ocean Survey and Landing Sites Survey

Survey Item		Survey Equipment	Survey Area
1	Control Point Survey	Transit Distance Meter	o Tg. Aru landing site o Cherating landing site
2	Sounding	Echo-sounder for shallow sea	o Both inshore areas and the following areas less than 200 m in depth (1) Cherating Slope (2) Sunda Continental Shelf (3) Kota Kinabalu Slope and others
		Echo-sounder for deep sea	o South China Sea Basin and others
3	Seabed Scanning	Side Scan Sonar (I) Side Scan Sonar (II) (Refer to Annex-5)	o Both inshore areas o Area less than 200 m in depth
4	Sub Bottom Profiling	Sonoprobe Raytheon	o Both inshore area o Shallow sea area less than 200 m in depth o Deep sea area deeper than 200 m in depth
5	Bottom Sampling	Sampling by divers Grab Sampler Piston Corner Vibro Corner Dredger	o Both inshore areas o Area of sandy sediments around A/C 5 o Area of muddy sediments between P-1 and P-29 o Area shallower than 50 m between A/C 1 and A/C 2 o Continental Shelf between A/C 5 and A/C 6, and the outcropped rocks area on the Kota Kinabalu Slope

Survey Item		Survey Equipment	Survey Area
6	Seabed Photographing	Under Water Camera Deep Sea Camera	o Both inshore areas o Ocean area
7	Water Thermometry	Electric Thermometer Continuous Auto Thermometer	o Both inshore areas o Ocean area
8	Current Observation	Continuous Auto Recording Current Meter	o Whole survey areas
9	Landing Site Survey	Level Plane Table	o Both landing sites
10	Earth Resistivity Measurement	Earth Resistance Meter	o Sand beach in front of Cherating L.P. o Beach at the east side of Kota Kinabalu terminal station
11	Existing Cable Search	Cable Locator Proton Magnetometer	o Laid area of existing cable on land o Crossing point of existing submarine cable
12	Cable Burying Survey	1/2 scale model Cable Burier	o Areas shallower than 200 m in depth

ANNEX-4 SURVEY ITEMS AND OBJECTIVES OF EACH SURVEY ITEM

Survey Items and Objectives of Each Survey Item

System Item	Objective
Control Point Survey	o To obtain the geographical position of the landing point for cable laying. o To determine the direction of cable route and obtaining the direction of survey lines.
Sounding	o To clarify the seabed topography along the cable route for cable laying and security. o To obtain the seabed profile. o To clarify the topography around the cable route.
Seabed Scanning	o To confirm the presence of any obstacles, e.g. rocks, sunken ships, etc. o To clarify micro-topography and seabed material.
Sub Bottom Profiling	o To clarify the geological structure in the upper part under seabed. o To clarify the hazardous outcropped areas for the cable security after due consideration seabed scanning results. o To confirm the possibility of cable burying. o To obtain the sub bottom profile along the cable route.
Bottom Sampling	o To clarify the nature of bottom materials by visual observation, physical test and chemical test. o To compare and confirm the data obtained by the seabed scanning and sub bottom profiling.

System Item	Objective
Seabed Photographing	o To observe directly seabed condition on the cable route. o To compare seabed conditions with information obtained by scanning and sounding.
Water Thermometry	o To observe the water temperature in coastal area and in ocean area. o To obtain the necessary data for the design of cable piece length.
Current Observation	o To predict the current conditions at the time of cable laying and the annual current conditions based on each data of observation and existence.
Topographic Survey Around Landing Point	o To obtain the topographic plain map as necessary basic data for the arrangement of terminal station and facilities at landing point.
Earth Resistivity Measurement	o To clarify the distribution of earth resistivity horizontally and vertically and to obtain basic data for designing the earth bed facilities.
Existing Cable Search	o To clarify the relative positions between the new cable route and existing cables, to prevent any accidental damage to the existing cables during cable burying survey and cable laying.
Cable Burying Survey	o To investigate the suitability of cable burying, and to obtain data for burying depth and tension at the time of cable laying and burying.

ANNEX-5 SURVEY EQUIPMENT AND SURVEY METHODS

Survey Equipment and Survey Methods

Survey Item	Name of Equipment	Q'ty	Manufacturer and Type	Description
Sounding	Echo-sounder for deep sea	1	Raytheon 12/34 kHz	The measurement of the water depth is based on the time taken for a sound wave to be transmitted from the ship, reflected at the seabed, and received back by the ship. Accuracy: 0.3 m
	Echo-sounder for shallow	1	Senbon Denki PDR 101	Same as above. Accuracy: 0.2 m
Seabed Scanning	Side Scan Sonar	1	EG & G SMS 960	The seabed conditions are measured by acoustic pulse which was sent out from "tow fish" toward diagonally/vertically and reflected at seabed. The acoustic pulse covers wide area of the seabed. Resolution: 0.5 m
	Side Scan (I) Sonar (II)	1 1	EG & G MARK 1-B	Same as above. Resolution: 0.50 m
Sub Bottom Profiling	Profiler (Electric strain)	1	Raytheon 3.5 kHz	Seabed and sub bottom condition are measured by low-frequency acoustic pulse which was sent out from transmitter and reflected on the surface of seabed and under seabed. Resolution: 0.5 m
	Profiler (Magnet strain)	1	Kaijyo Denki Sonoprobe SP-3	Same as above. Resolution: 0.3 m

Survey Item	Name of Equipment	Q'ty	Manufacturer and Type	Description
Existing Cable Search	Proton Magnet Meter	1	Balinger Model-123	The variations of total magnetic forces are measured by towing sensor on the seabed. Resolution: ±1 gamma
Positioning	G.P.S.	1	JRC JLR 4000	The vessel's position is determined by measuring time-delay of radio wave which is transmitted from the geodestic satellite. Accuracy: 30 - 100 m
	NNSS	1	JRC JEL 3850	The vessel's position is determined by measuring strain of radio wave in available Doppler's effect of radio wave which is transmitted from the navigation satellite.
	OMEGA	1	JRC JLA	The vessel's position is determined by radio wave (VLF) which is transmitted from the stations on land. Accuracy: Day time: 1 nm Night time: 2 nm
	Rader	1	JRC JMA 259	The direction and distance of the target is measured by the reflected radio wave. Distance resolution: less than 20 m
	Audister	1	Tellurometer Hydro-flex	The position is determined by microwave ranging system which measure the distances between master station on ship and two slave stations on land. Accuracy: 1 m $\pm 3 \times 10^{-6}$ D cm D: the measured distance

Survey Item	Name of Equipment	Q'ty	Manufacturer and Type	Description
Positioning	Audister	1	Shimada Rika Kogyo 9D 010	The position is determined by microwave ranging system which measure the distances between master station on ship and two slave stations on land. Accuracy: $1 \text{ m} \pm 3 \times 10^{-6} \text{ D cm}$ D: the measured distance
	Personal Computer Plotter	1	NEC PC-9801 MUTO Ind. F-900	The devices are used to compute and analyze data for positioning and to output the information in graphic form.
Cable Burying Survey	1/2 Scale Model Cable Burier	1	Yamamoto Kensetsu KS-II (1/2 scale model)	Cable burier is used for measuring the towing tension, digging depth and inclination of stabilizer.
	Personal Computer Pen-Recorder	1	NEC PC-9801 Yokogawa-Hokushin 3056-31 Type	Data recording and processing.
Sampling	Piston Corer	1	Rigosha Piston type	Seabed material is taken in the columnar sample.
	Grab-sampler	1	Rigosha Grab type	Muddy sediment is grasped by the grabber.
Seabed Photo-graphing	Deep Sea Camera	1	Benthos Standard	The device is used for taking a photograph of deep water seabed surface.
	Under Water Camera	1	Nikon Nikonos	The device is used for taking a photograph of shallow water seabed surface by diver.
Water Temperature Measurement	Electric Thermometer	1	Toho Dentan ET-5	Water temperature adjacent to the sea surface are vertically measured.

Survey Item	Name of Equipment	Q'ty	Manufacturer and Type	Description
Current Observation	Auto-recording Type Current Meter	5	Aanderaa RCM-4 (Available for 200 m in depth)	Measurement of current direction, velocity and water temperature in the shallow sea area.
	Auto-recording Type Current Meter	3	Aanderaa RCM-5 (Available for 6,000 m in depth)	Measurement of current direction, velocity and water temperature in the deep sea area.
	Portable Current Meter	1	Kyowa Shoko CM-2	Measurement of current direction and velocity at upper layer in the shallow sea area.
	Acoustic Releaser	3	EG & G Sea-link 723A	Automatical releaser for releasing RCM 4/5 from mooring system or sinker, under water.
Landing Sites Survey	Earth Resistance Meter	1	Yokogawa-Hokushin	Measurement of earth resistivity near the beach of landing site.
	Distance Meter	1	Yokogawa-Hewlett-Packard 3808A	Measurement of distance between two points.
	Transit	1	Sokkisha	Measurement of angle in direction between two points.
	Plain Board	1	Tamaya	For preparing plain map based on the direction, distance and height.
	Level	1	Sokkisha Auto Level	Measurement of difference of elevation between two points.
	Sextant	2	Tamaya	Measuring of angle in horizontal between two targets.

Cable Burier (See Fig. A-5)

Cable burier used in the survey is KDD model (1/2 scale). Specifications of this cable burier are as follows:

(1) Digging Part

- o Output of Clinometer: -5 to +5 V, 0.1 per degree
- o Tension Meter: 0 to +5 V, 1 V per ton and 5 tons in maximum

(2) Micro Computer

- o CPU Board: Z 80 CPU (2.5 MHz) with 4 k bytes ROM and 2 k bytes RAM
- o A/D Converter: 8 bit 256 resolution Accuracy is 0.5 degree.
- o I/O: 20 mA current loop, centronics parallel, RS-232C half duplex

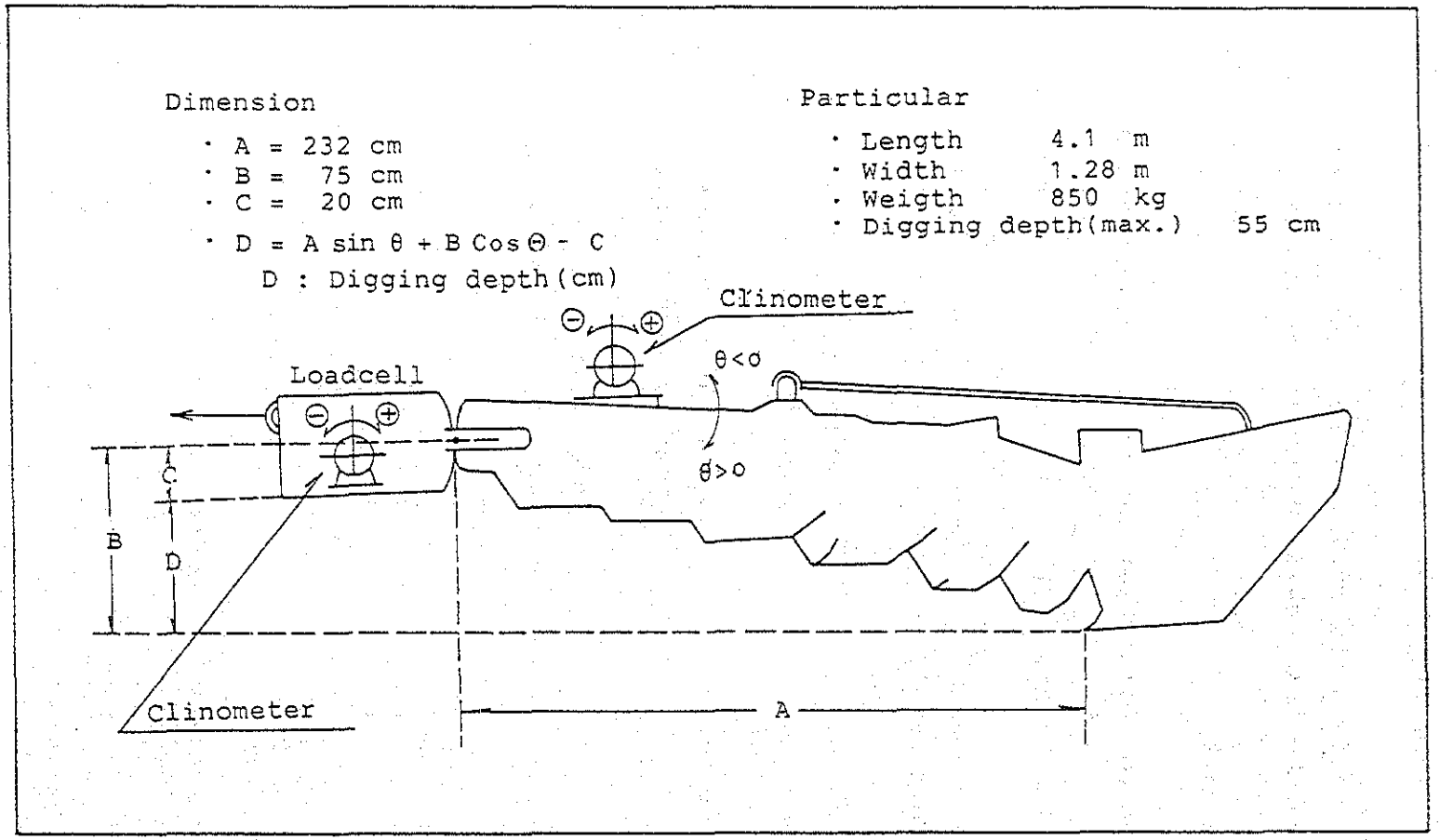


Fig. A-5-1 Cable Burier (KDD Model 1/2 Scale)

ANNEX-6 OUTFITTING OF SURVEY VESSELS

Outfitting of Survey Vessels

When conducting the cable route survey, the survey ship "Kaiko Maru NO.5" was used in ocean area, and the dinghy (workboat "Toba No.11" mounted aboard the Kaiko Maru No.5) was used in inshore area. The ship was sufficiently equipped for cable route survey work. Particulars of ships used for the cable route survey are given below, and general arrangement of Kaiko Maru No.5 is shown in Fig. A-6.

Survey Ship "Kaiko Maru No.5"

(Tokai Salvage Co., Ltd.), Japan

Gross Tonnage:	499.59 gross tons
Principal Dimensions:	48.3 x 10 x 4.6 m
Draught (Designed):	3.5 m
Main Engines:	1,600 BHP x 2 sets
Propeller:	Changeable Pitch Propeller (CPP) x 2 sets in Kort Nozzle
Bow Thruster:	Lateral Thrust 2.3 tons
Crusing Speed:	13 kts.
Navigational Aids:	G.P.S., NNSS, OMEGA, Rader, LORAN, etc.
Communication Aids:	SSB Internal Telephone MARISAT, etc.

Dinghy (Workboat "Toba No.11")

Gross Tonnage:	4.9 gross tons
Principal Dimensions:	8 x 2.5 x 1.2 m
Draught (Designed):	0.8 m

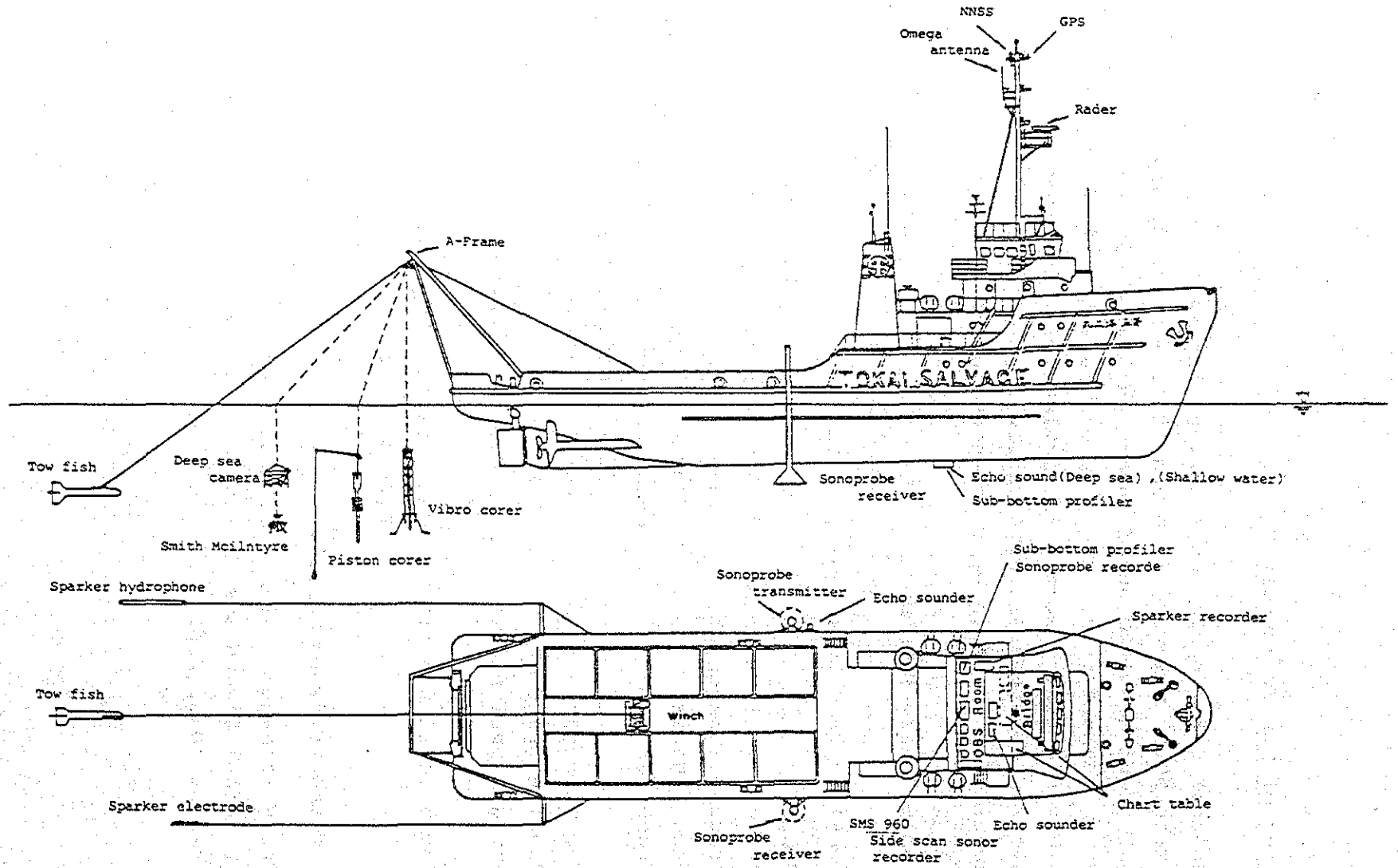


Fig. A-6-1 Outfitting of "KAIKO MARU No.5" for Surveying

ANNEX-7 SUMMARY OF SURVEY VESSEL'S LOG BOOK

Summary of Survey Vessel's Log Book

The survey vessel's (KAIKO MARU No.5) log book states the ocean survey from the date the vessel entered the Kota Kinabalu port on June 25th, to the date the vessel departed from Kota Kinabalu port on August 9th, 1986, after completion of survey.

The following contents of the survey works were abstracted from the Survey Vessel's Log Book.

The Summary of Survey Vessel's Log Book

N.P ..... Noon Position
Wr ..... Weather
Sc ..... Sea Condition
W.D ..... Wind Direction
W.F ..... Wind Forces
* The observation was made at noon.

1986

Jun. 25th Wed. N.P: off Kota Kinabalu
Wr: fine, W.D: N, W.F: 4, Sc: smooth
06:50 Pilot boarded.
07:45 The survey vessel entered the Kota Kinabalu port.
10:45 Food and Fuel were supplied.

Jun. 26th Thu. N.P: Kota Kinabalu port
Wr: cloudy, W.D: N, W.F: 1, Sc: smooth
11:15 Fresh water was supplied.
13:00 Preparation of survey instruments.

Jun. 27th Fri. N.P: Lat. 5°56'N, Long. 116°01.8'E
Wr: fine, W.D: WSW, W.F: 1, Sc: smooth
07:00 The survey vessel left Kota Kinabalu port for Tg. Aru offshore.
09:00 The survey vessel arrived at Tg. Aru offshore.
o Fixed Point Observation.
Setting up of current meters at two fixed points.
Inshore and landing site survey commenced.
Survey items:
o Investigation of existing land cable.
o Rigging of a dinghy and adjustment of survey instrument.
o Earth specific resistivity measurement.

Jun. 28th Sat. N.P: Lat. 5°56.3'N, Long. 116°02.0'E
Wr: fine, W.D: SW, W.F: 3, Sc: slight
06:00 Inshore and landing site survey.
Survey items:
o Sounding, Sub Bottom Profiling and Sea Bottom Scanning.
o Topographic Survey.

Jun. 29th Sun.
N.P: Lat. 5°56.3'N, Long. 116°02.0'E
Wr: fine, W.D: SW, W.F: 1, Sc: smooth
06.00 Inshore and landing site survey.
Survey items:
- o Sounding, Sub Bottom Profiling and Sea Bottom Scanning.
- o Traverse Survey and Topographic Survey.

Jun. 30th Mon.
N.P: Lat. 5°56.3'N, Long. 116°02.0'E
Wr: fine, W.D: SW, W.F: 2, Sc: slight
06:00 Inshore and landing site survey.
- o Beachline Survey.
- o Fixed Point Observation.
  Bottom Sampling, Seabed Photographing, Observation of Sedimentary thickness by penetration of steel pipe, Water Thermometry.
- o Levelling Survey.
  The survey performed from L.P to the earth point.
- o Recovery of Current Meters.

Jul. 1st Tue.
N.P: Lat. 5°56.2'N, Long. 116°02.0'E
Wr: cloudy, W.D: SW, W.F: 1, Sc: slight
- o Survey team members and 3 counterparts embarked.

Jul. 2nd Wed.
N.P: Lat. 5°54.9'N, Long. 116°51.7'E
Wr: cloudy, W.D: SSW, W.F: 3, Sc: slight
08:20 Weigh anchor.
10:00 Ocean Survey commenced.
Survey items:
- o Route survey.
  Sounding, Sub Bottom Profiling, Sea Bottom Scanning. (Commenced at area 6 km offshore)
- o Supplementary Survey. (Around A/C 11)

Jul. 3rd Thu.
N.P: Lat. 5°53.7'N, Long. 114°56.3'E
Wr: cloudy, W.D: SW, W.F: 2, Sc: slight
Ocean survey was continuously conducted.
Survey items:
- o Supplementary survey. (Around A/C 11)
- o Route Survey.

Jul. 4th Fri.
N.P: Lat. 6°12.6'N, Long, 112°44.6'E
Wr: blue sky, W.D: WSW, W.F: 5, Sc: moderate
Survey items:
- o Route Survey.
  Sounding, Sub Bottom Profiling.
- o Supplementary Survey. (Around A/C 8)

Jul. 5th Sat.

N.P: Lat. 5°59.2'N, Long. 110°41.7'E
Wr: blue sky, W.D: SW, W.F: 3, Sc: slight
Survey items:
o Route Survey.
Sounding, Sub Bottom Profiling.
o Current Observation. (Fixed point at P-18)

Jul. 6th Sun.

N.P: Lat. 5°45.7'N, Long. 109°16.0'E
Wr: blue sky, W.D: SW, W.F: 2, Sc: smooth
Survey items:
o Route Survey.
Sounding, Sub Bottom Profiling Sea Bottom Scanning. (200 m in depth - A/C 5)
o Supplementary Survey. (Around A/C 5)

Jul. 7th Mon.

N.P: Lat. 5°56.0'N, Long. 109°13.4'E
Wr: blue sky, W.D: SSW, W.F: 3, Sc: slight
Survey items:
o Supplementary Survey.
Sounding, Sub Bottom Profiling, Sea Bottom Scanning. (Around A/C 5)
o Route Survey. (A/C 5 - A/C 4)

Jul. 8th Tue.

N.P: Lat. 5°08.0'N, Long. 107°37.0'E
Wr: blue sky, W.D: SW, W.F: 3, Sc: slight
Survey items:
o Sounding, Sub Bottom Profiling, Sea Bottom Scanning. (A/C 5 - A/C 4)
o Existing Cable Search.
(Around Ex 1) Ex 1 ... abandoned cable

Jul. 9th Wed.

N.P: Lat. 4°47.0'N, Long. 106°41.0'E
Wr: blue sky, W.D: SW, W.F: 3, Sc: slight
Survey items:
o Existing Cable Search.
(Around Ex 2 and Ex 3) Ex 2 ASEAN P-S Cable
o Route Survey.
Sounding, Sub Bottom Profiling, Sea Bottom Scanning.

Jul. 10th Thu.

N.P: Lat. 4°51.0'N, Long. 106°34.0'E
Wr: fine, W.D: WSW, W.F: 4, Sc: moderate
Survey items:
o Route Survey.
Sounding, Sub Bottom Profiling, Sea Bottom Scanning.
o Existing Cable Search.
(Around Ex 3) Ex 3 ... S.H.T cable

Jul. 11th Fri. N.P: Lat. 4°38.6'N, Long. 105°58.6'E
Wr: fine, W.D: SW, W.F: 4, Sc: moderate
Survey items:
- o Sounding, Sub Bottom Profiling, Sea Bottom Scanning.
- o Existing Cable Search.
  (Around Ex 4) Ex 4 ... abandoned cable

Jul. 12th Sat. N.P: Lat. 4°13.3'N, Long. 104°16.9'E
Wr: fine, W.D: SW, W.F: 4, Sc: moderate
Survey items:
- o Sounding, Sub Bottom Profiling, Sea Bottom Scanning.

Jul. 13th Sun. N.P: off Kuantan
Wr: blue sky, W.D: SSE, W.F: 2, Sc: smooth

06:00	Installation of current meters.
10:00	Pilot boarded.
10:30	The survey vessel entered the Kuantan port.
11:10	Food and Fuel were supplied.
11:30	3 counterparts disembarked.
15:00	Survey team members disembarked.

Jul. 14th Mon. N.P: Kuantan
Wr: fine, W.D: SSE, W.F: 2, Sc: smooth

09:00	Preparation for inshore survey.

Jul. 15th Tue. N.P: Lat. 4°03.0'N, Long. 103°25.2'E
Wr: cloudy, W.D: SW, W.F: 1, Sc: smooth

08:30	The survey vessel left Kuantan port.
10:00	The survey vessel arrived at Ular Island offshore.

Inshore and landing site survey commenced.
Survey items:
- o Rigging of a dinghy.
- o Sounding, Sub Bottom Profiling, Sea Bottom Scanning.
- o Specific Earth Resistance Measurement.
- o Traverse Survey.

Jul. 16th Wed. N.P: Lat. 4°03.0'N, Long. 103°25.2'E
Wr: cloudy, W.D: S, W.F: 3, Sc: slight

07:00	Inshore and landing site survey.

Survey items:
- o Sounding, Sub Bottom Profiling, Sea Bottom Scanning.
- o Topographic Survey.

Jul. 17th Thu. N.P: Lat. 4°03.0'N, Long. 103°25.2'E
Wr: cloudy, W.D: SSE, W.F: 3, Sc: slight
07:00 Inshore survey.
Survey items.
- o Fixed Point Survey.
  Bottom sampling, seabed photographing, Observation of sedimentary thickness by penetration of steel pipe. Water thermometry. The investigation performed from L.P to the 6 km offshore every 1 km.
- o Beachline Survey.

Jul. 18th Fri. N.P: Lat. 4°03.0'N, Long. 103°25.2'E
Wr: fine, W.D: SSE, W.F: 4, Sc: slight
07:00 Inshore survey.
Survey items:
- o Equipments removed from small boat.
- o Preparation for Ocean Survey.
- o Data processing of inshore and landing site survey.
- o Recovery of current meters.

Jul. 19th Sat. N.P: Lat. 4°03.0'N, Long. 103°25.2'E
Wr: fine, W.D: SSE, W.F: 4, Sc: slight
- o Survey team members and 3 counterparts embarked.
- o Preparation for ocean survey.

Jul. 20th Sun. N.P: Lat. 4°03.0'N, Long. 103°25.2'E
Wr: fine, W.D: SSE, W.F: 4, Sc: slight
Survey items:
- o Preparation for cable burying survey.
- o Route Survey.
  Sounding, Sea Bottom Profiling, Sea Bottom Scanning.
- o Fixed Point Survey.
  Bottom sampling Seabed photographing.
  (Fixed point at P-1)
- o Sounding.

Jul. 21st Mon. N.P: Lat. 4°11.9'N, Long. 104°13.7'E
Wr: fine, W.D: SSE, W.F: 5, Sc: moderate
Survey items:
- o Sounding.
- o Fixed Point Survey.
  Bottom sampling. (Fixed point at P-2, P-3)
  Seabed photographing. (Fixed point at P-3)
- o Cable Burying Survey.

Jul. 22nd Tue.

N.P: Lat. 4°16.2'N, Long. 104°26.0'E
Wr: blue sky, W.D: SSE, W.F: 2, Sc: calm
Survey items:
- o Cable Burying Survey.
- o Supplementary Survey.
  Sounding, Sub Bottom Profiling, Sea Bottom Scanning. (Around A/C 2)
- o Sounding Survey.
- o Fixed Point Survey.
  Bottom sampling. (Fixed point at P-4, P-5)
  Seabed photographing. (Fixed point at P-5)

Jul. 23rd Wed.

N.P: Lat. 4°20.5'N, Long. 105°13.9'E
Wr: fine, W.D: S, W.F: 2, Sc: calm
Survey items:
- o Sounding.
- o Fixed Point Survey.
  Bottom sampling. (Fixed point at P-6)
- o Cable Burying Survey.

Jul. 24th Thu.

N.P: Lat. 4°34.1'N, Long. 105°47.8'E
Wr: fine, W.D: S, W.F: 2, Sc: clam
Survey items:
- o Cable Burying Survey.
- o Supplementary Survey.
  Sounding, Sub Bottom Profiling, Sea Bottom Scanning. (Around A/C 2)
- o Fixed Point Survey.
  Bottom sampling. (Fixed point at P-5, P-7)
  Seabed photographing. (Fixed point at P-7)
- o Sounding.

Jul. 25th Fri.

N.P: Lat. 4°55.3'N, Long. 107°09.9'E
Wr: fine, W.D: SWS, W.F: 2, Sc: clam
Survey items:
- o Sounding.
- o Fixed Point Survey.
  Bottom sampling. (Fixed point at P-9, P-10)
  Seabed photographing. (Fixed point at P-9)
  Current measurement. (Fixed point at P-10)
- o Cable Burying Survey.

Jul. 26th Sat.

N.P: Lat. 4°56.3'N, Long. 107°17.6'E
Wr: rainy, W.D: SSS, W.F: 2, Sc: clam
Survey items:
- o Cable Burying Survey.
- o Sounding Survey.
- o Point Observation.
- o Fixed Point Survey.
  Bottom sampling. (Fixed point at P-11, P-12)
  Seabed photographing. (Fixed point at P-11)

Jul. 27th Sun.

N.P: Lat. 5°48.3'N, Long. 108°57.4'E
Wr: fine, W.D: --, W.F: 0, Sc: calm
Survey items:
- o Sounding.
- o Fixed Point Survey.
  Bottom sampling. (Fixed point at P-13, P-14)
  Seabed photographing. (Fixed point at P-13)
- o Sounding.
- o Supplementary Survey.
  Sounding, Sub Bottom Profiling, Sea Bottom Scanning. (Around A/C 5)

Jul. 28th Mon.

N.P: Lat. 5°52.9'N, Long. 109°09.6'E
Wr: fine, W.D: W, W.F: 1, Sc: calm
Survey items:
- o Supplementary Survey.
  Sounding, Sub Bottom Profiling, Sea Bottom Scanning. (Around A/C 5)
- o Fixed Point Survey.
  Bottom sampling. (Fixed point at P-15, P-16, P-17)
  Seabed photographing. (Fixed point at P-16)

Jul. 29th Tue.

N.P: Lat. 6°07.7'N, Long. 110°49.3'E
Wr: fine, W.D: WSW, W.F: 4, Sc: slight
Survey items:
- o Fixed Point Survey.
  Seabed photographing. (Fixed point at P-13)
- o Route Survey.
  Sounding, Sub Bottom Profiling, Sea Bottom Scanning. (Around A/C 5)
- o Supplementary Survey.
  Position, Sounding, Sub Bottom Profiling, Sea Bottom Scanning. (Around A/C 7)

Jul. 30th Wed.

N.P: Lat. 6°19.8'N, Long. 111°56.3'E
Wr: cloudy, W.D: W, W.F: 4, Sc: slight
Survey items:
- o Supplementary Survey.
  Sounding, Sub Bottom Profiling.

Jul. 31st Thu.

N.P: Lat. 6°01.2'N, Long. 111°06.8'E
Wr: cloudy, W.D: WSW, W.F: 4, Sc: slight
Survey items:
- o Supplementary Survey.
  Sounding, Sub Bottom Profiling.
  (Around A/C 7 - A/C 8)
- o Fixed Point Survey.
  Bottom sampling. (Fixed point at P-20)

Aug. 1st Fri. N.P: Lat. 6°04.1'N, Long. 111°40.6'E
Wr: cloudy, W.D: WSW, W.F: 5, Sc: moderate
Survey items:
o Supplementary Survey.
Sounding, Sub Bottom Profiling.
(Around A/C 7 - A/C 8)
o Fixed Point Survey.
Bottom sampling. (Fixed point at P-21, P-22)
Seabed photographing. (Fixed point at P-22)
o Sounding. (Around A/C 8 - A/C 9)

Aug. 2nd Sat. N.P: Lat. 5°58.5'N, Long. 114°01.8'E
Wr: cloudy, W.D: S, W.F: 5, Sc: moderate
Survey items:
o Supplementary Survey.
Sounding.
(Around A/C 8 - A/C 11)

Aug. 3rd Sun. N.P: Lat. 5°55.4'N, Long. 115°09.2'E
Wr: cloudy, W.D: SW, W.F: 5, Sc: moderate
Survey items:
o Fixed Point Survey.
Bottom sampling. (Fixed point at P-25, P-26)
Seabed photographing. (Fixed point at P-26)
o Supplementary Survey.
Sounding, Sub Bottom Scanning. (Around A/C 11)
o Sounding. (Around A/C 11 - A/C 10)

Aug. 4th Mon. N.P: Lat. 6°01.1'N, Long. 113°28.2'E
Wr: rainy, W.D: SW, W.F: 6, Sc: rough
Survey items:
o Fixed Point Survey.
Installation of current meter. (Fixed point at P-24)
Bottom sampling. (Fixed point at P-23)
Seabed photographing. (Fixed point at P-23)
Current measurement. (Fixed point at P-23)
o Sounding. (Around A/C 10 - A/C 9)

Aug. 5th Tue. N.P: Lat. 5°58.0'N, Long. 114°42.0'E
Wr: rainy, W.D: SW, W.F: 4, Sc: moderate
Survey items:
o Fixed Point Survey.
Bottom profiling.
(Fixed point at P-24, P-24-2, P-25-2, P-25-3, P-27)
Recovery of current meter. (From P-24)
Seabed photographing.
(Fixed point at P-24, P-24-2, P-27)

o Sounding. (Around A/C 9)
o Sounding, Sub Bottom Profiling.
(Around A/C 9 - A/C 10)
o Supplementary Survey. (Around P-24-2)

Aug. 6th Wed.
N.P: Lat. 6°02.4'N, Long. 116°01.9'E
Wr: cloudy, W.D: SSW, W.F: 3, Sc: slight
Survey items:
o Fixed Point Survey.
Bottom sampling. (Fixed point at P-28, P-29)
o The survey vessel anchored off Kota Kinabalu port.
o The all survey data processing was made and the survey instruments were cleared up.

Aug. 7th Thu.
N.P: Kota Kinabalu port
Wr: cloudy, W.D: NW, W.F: 2, Sc: smooth
o Data processing was carried out, and the survey instruments were cleared up.
11:40 o Pilot boarded.
12:00 o The survey vessel entered the Kota Kinabalu port.
o 3 counterparts disembarked.

Aug. 8th Fri.
N.P: Kota Kinabalu port.
o Survey team members disembarked.
o Food, Water and Fuel were supplied.

Aug. 9th Sat.
06:00 KAIKO MARU No.5 departed for Kota Kinabalu port and sailed to Japan.