(2) Safe navigational facilities

The navigational channel is a gut channel that stretches from the center flow of the Endau river mouth, and curves slightly southward towards the offshore waters. The narrowest areas of this channel, deeper than three meters, are estimated to be about 50 to 60 meters wide during ebb tide. Presently, there are two beacon lights in operation. However, due to the curving navigational route, they are considered insufficient, particularly in bad weather conditions and for fishing boats operating at night. Additional measures which will ensure safe navigation of these waters is recommended.

6.4 Endau Boat Traffic and Berthing Study

(1) Boat entry movement

A study on port entry and unloading conditions of fishing boats at the Endau port was conducted. The study findings are presented below.

1) Location and date of study

The study was conducted from September 10 to 16, 1992 for a period of seven days from 6:00 to 19:00 at the Endau river mouth.

2) Study approach

The number of boats passing through the river mouth every hour was tallied and categorized according to class.

3) Study findings

a) The total number of fishing boats entering the port during the seven days was 122 (50 boats in the morning, 72 boats in the afternoon).

b) Tidal conditions during the study are given below.

High tide:	From September 10	8:34 hr	2.57 meters
	To September 16	10:22 hr	2.26 meters
Low tide:	From September 10	15:15 hr	1.16 meters
	To September 16	17:16 hr	0.86 meters

c) Fishing boats did not concentrate their port entry at a particular time period, but dispersed them. A few large class C, C2 fishing boats also distributed their entry into the port during ebb tide.

d) The ratio of fishing boats entering the port during the morning hours was 41 percent and the ratio for large fishing boats was 42 percent.

e) Fresh fish earmarked for local consumption and fish landings of small fishing boats are traded in the early morning hours in cash payment. For boats entering the port during afternoon hours, particularly the large fishing boats, the fish catch is refrigerated and kept on board for trading the following morning. However, for fish traded by direct consignment to distant markets such as Singapore, Johor, etc., the catch is landed in the evening, packed in ice, and transported overland to their destinations.

(2) Berthing tidal condition at the jetties

In studying the relationship between tide levels and water depth at the jetties according to boat category, the majority of the jetties can be utilized when the tide levels are higher than 1.6 meters (see Fig.II.6.5 and Table II.6.8). The tide levels have been divided into three levels and the number of jetties which can be used at these levels are shown in Table II.6.8.

6.5 Survey on the Natural Conditions of Endau River

(1) Topography of Endau

A layout plan of the Endau project site is given in Fig. II.6.6 and the topographical survey map is shown in Fig. II.6.8.

1) The topographic survey datum is by Land Survey Datum No. 1179 established in Pahang state.

2) The width of the river from the existing LKIM complex to the lower reaches of the Endau River near the bridge on Route 3, is uniformly about 400 meters. From this point, the river widens from about 500 to 550 meters; and it exceeds 600 meters at the river mouth.

3) On the right bank of Endau River, there is a LKIM complex, a shipyard, a fish meal plant, private jetty, etc., continuing into mangroves and coastal waters dotted with rocky reefs.

4) The private jetties, shipyard, and mangrove trees are found on the left bank which continues on into an eroding beach line. Much of the land in the inner area of the mangroves is low and swampy. With the exception of the eroding shoreline, there are no signs of damage due to floods, high tides, high waves, etc. (see Fig. II.6.7).

5) Around the existing LKIM complex and downstream from the bridge, the deepest part of the river exceeds seven meters. There is a water channel near the right bank of the river mouth.

(2) Offshore river mouth profile survey

1) The bathymetry gradually inclines from the northern coast of the river mouth to the ocean bottom. The coastal bottom surveyed is dotted with shallow sandbars exceeding 2 km in width. These sandbar shoals act as wave dissipaters against incoming ocean waves.

2) A portion of the rocky reefs is exposed in the offshore waters off the southern coast.

3) The water channel is on the southern side of the shoals and curves slightly to the south before stretching out into offshore waters.

(3) Survey of flow conditions, suspended sediment, and distribution of sea bottom material

Two surveys were carried out (Phase I and II) near the river mouth and the Project site. The maximum flow velocity of the river moving downstream during high tide was 2.8 meters/sec (Oct 1) and surpassed the maximum figure of 1.2 meters/sec recorded (May 24) during the Phase I study.

High levels of suspended sediment were observed in one area near the earth bank of the construction site for the ferry boat jetty, located on the left bank of Endau River near the Project site. However, the volume of suspended sediment was low, in view of the high flow velocity. According to the findings of the Phase I survey on sea bottom material, suspended sediment was not observed. Subsequently, it was concluded that blockage of the river mouth by silted deposition was not possible (Fig. II.6.9)

(4) Survey on soil conditions

A survey on soil conditions was carried out by boring in three locations on land and in two locations under water, in order to grasp the soil conditions essential for Project design.

According to the findings of the Standard Penetration Test, there was a thick deposition of sand at the Project site, typical of the soil conditions at the river mouth. The upper layer (7 to 8 meters deep) was composed of loose clay and the lower layer was a mixture of sand and gravel. Thirty meters below this level the soil was made up of a layer of weathered fractured rock. Further penetration tests beyond this depth were not possible using standard testing methods.

Although the load on the soil layer created by the layer of overlying soil is at least 30 tons/m^2, the ratio of increased load created by the new facilities is small. Moreover, in observations of the soil conditions near the bridge intersecting National Route 3, it was concluded that a bearing layer of 30 meters would support the pile foundation of the new facilities without any adverse effects (Fig. II.6.10).

(5) Survey on tide level

Observations on tide levels were carried out for 30 days, 1.5 kilometers from the river mouth; and harmonic constraints were obtained from a harmonic analysis. In utilizing the Lowest Astronomical Tide (L.A.T.) as the datum lines, which is equivalent to the datum of a marine chart, the average high water level was +2.66 meters and the average low water level was +0.72 meters. The Land Survey Datum (L.S.D.) which is the low datum line of land, was +1.459 meters. The relationship between these datum lines are given In Fig.II.6.11.

(6) Survey on coastline transformation

No noticeable changes in the coastline have been observed during the two survey periods.

(7) Wind

The winds are rather moderate from the months of April to October, while they are slightly stronger and blow from the north or northeast during the monsoon season. However, they are not an obstacle to fishing port plans for the reasons given below.

1) The wind velocity is below 7.9 m/sec which is not considered as strong. (Strong winds generally have a velocity higher than 10 m/sec.)

2) If the direction of the quaywall runs from northeast to southwest (in the case of the downstream area from the bridge), direct impact from the prevailing monsoon winds will be lessened. Therefore, damage incurred by boats being pushed by the wind and colliding into the quaywall is avoided.

(8) Rainfall

1) Observation records of the rainfall at the proposed project site of Mersing District indicate that the total amount of annual rainfall from 1951 to 1991 was 2,736 mm, of which half of this volume fell during the monsoon months of November, December, and January. Subsequently, the average monthly rainfall during this three month period was 442 mm, in contrast to the average monthly rainfall of 157 mm for the

remaining nine months of the year. In conclusion, the average monthly rainfall during the monsoon season was three times higher than that in the inter-monsoon season.

2) The observation records of the three DID stations, Sungei Labon, Bridge, and Pasir, have recorded similar levels of rainfall.

(9) Wave conditions

In an analysis of the wave conditions recorded for 1989, the average height of the waves moving into the Endau river mouth from the northeast is one to two meters during the monsoon season. Currently, many jetties are located 1.5 to 2.5 km upstream from the river mouth because of reduced wave energy from the open sea. This energy dissipation is due to the following reasons given below.

1) The scattered shoals offshore from the northern shoreline of the river mouth act as breakers against offshore waves entering the river mouth.

2) Between the shoals off the northern and the southern coasts of the river mouth, a trench has been formed. The offshore waves which have been cut off by the sandbars on the northern coast, either diffract or push the waves further upstream of the river along the trench. The incoming waves are only a small portion of the offshore waves and in view of the decrease in river water, the wave conditions are not an impediment to port planning.

3) Based on data obtained from the topographical, weather, and marine surveys, the degree of calm water within the river was analyzed. It was discovered that during the monsoon season, the shoals function as breakwaters where the waves are refracted, diffracted, and transformed by changes in water depth to become waves with a comparatively short period when they reach the planned port site (Endau river mouth).

It was estimated that the waves downstream from the bridge near the planned site, have a wave height of 0.4 meters, one third the maximum height; and upstream near the Project site they decrease to one fourth their maximum height.

4) The findings recorded from an observation study in October support the aforementioned findings that the degree and tendency of the waves is to decrease as they move upstream.

An analysis of the aforementioned data is given in Table II.6.9 and Fig.II.6.12.

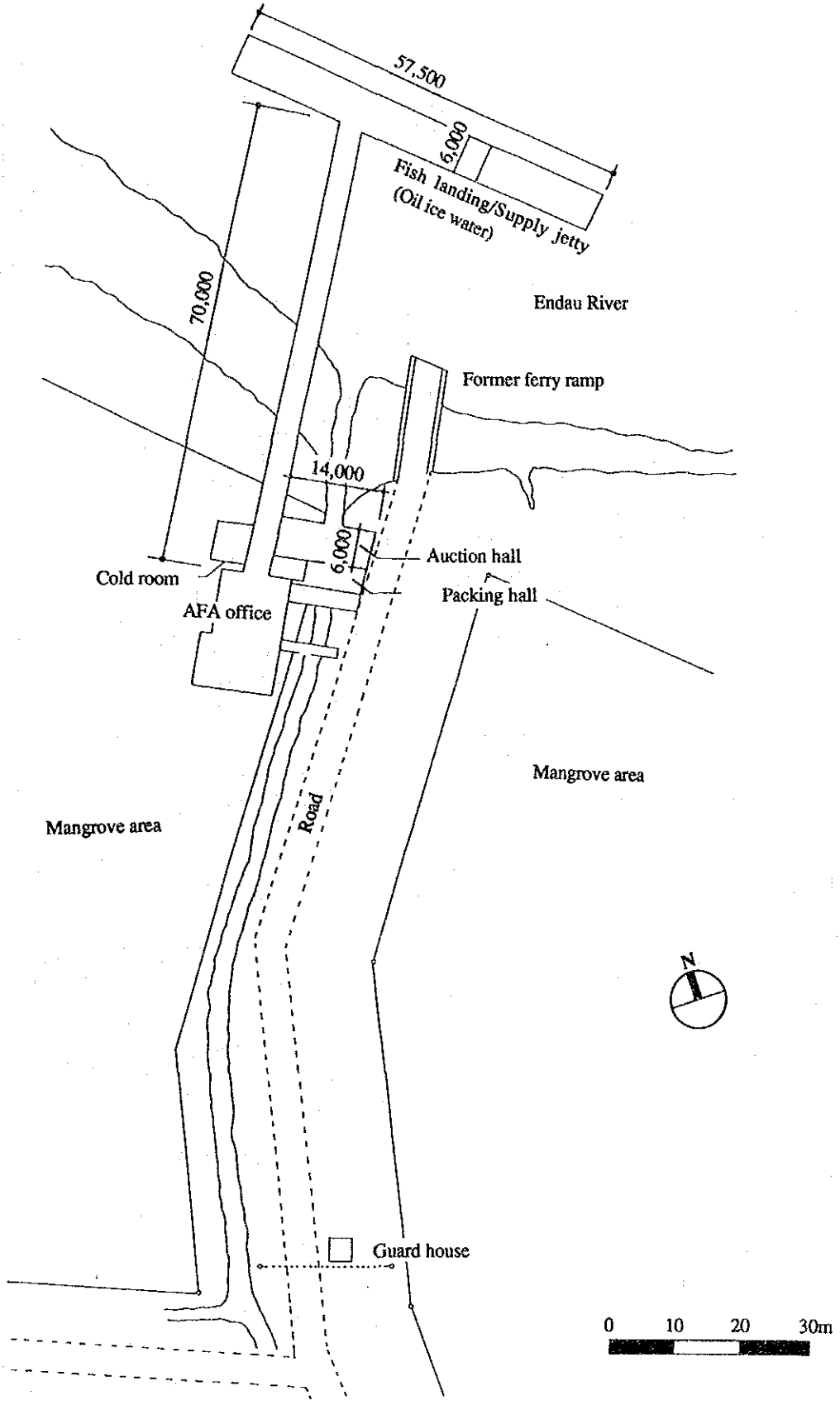

Fig.II.6.1 Existing LKIM Complex at Endau

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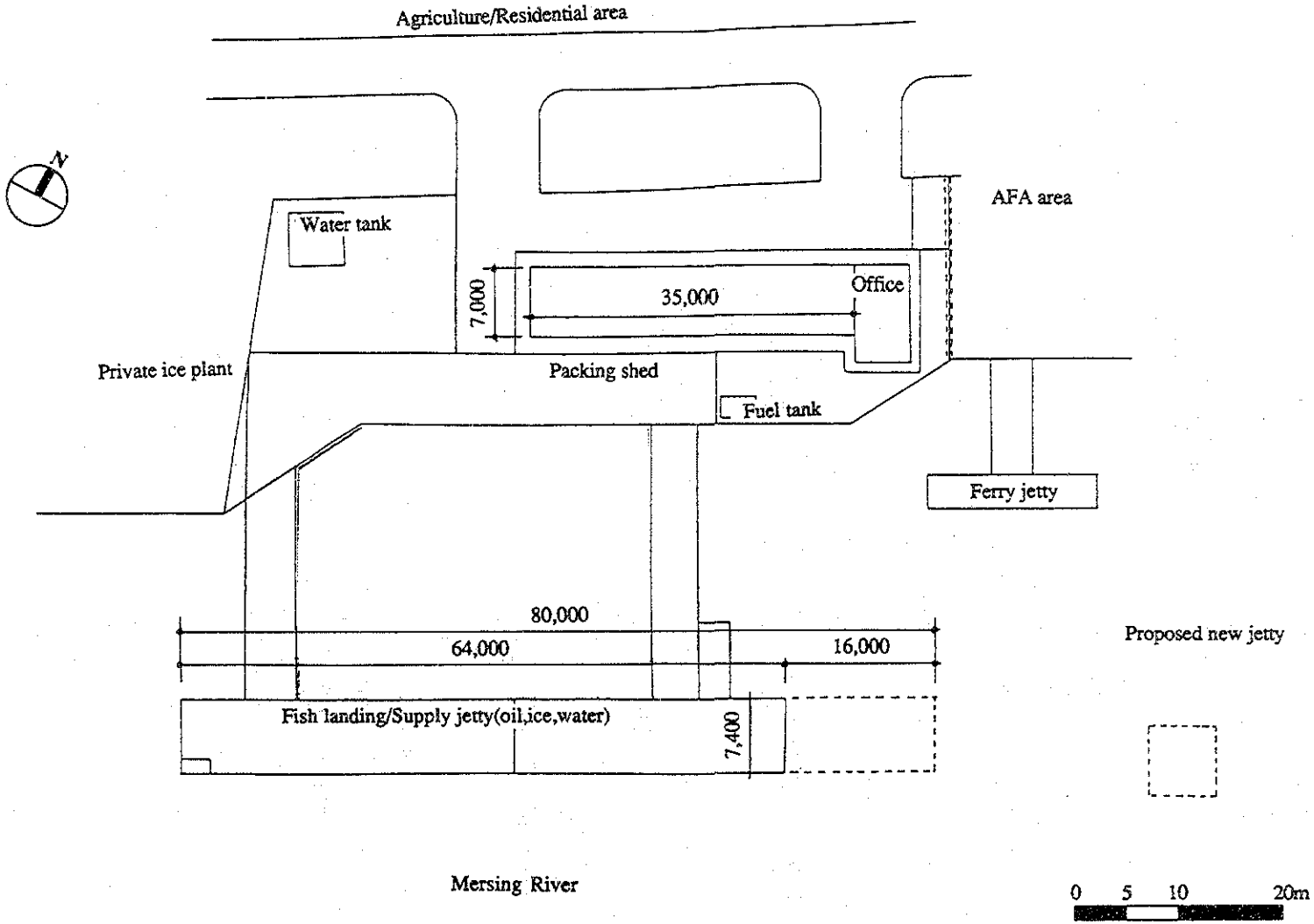

Fig.II.6.2. Existing LKIM Complex at Mersing

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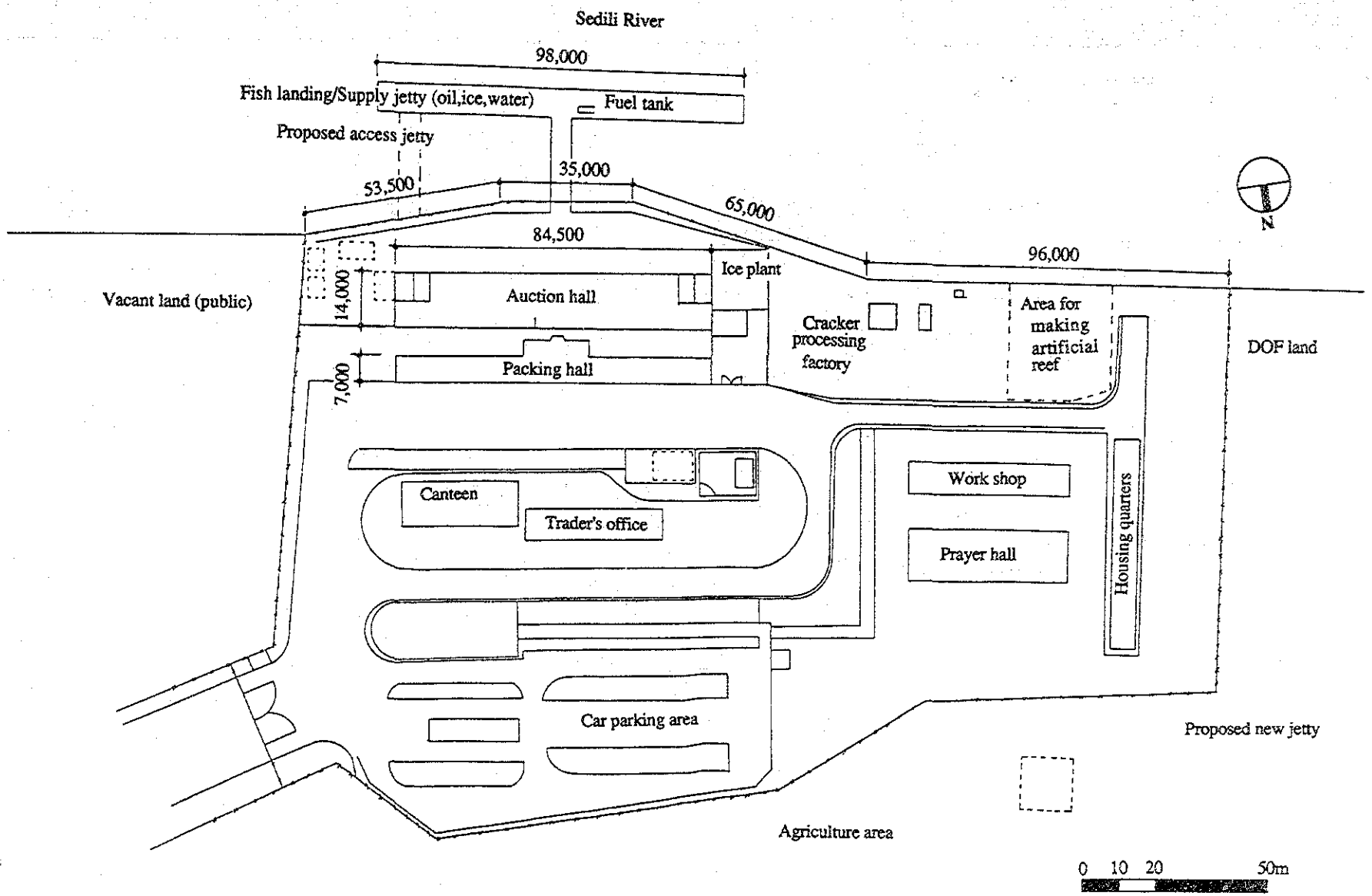

Fig.II.6.3. Existing LKIM Complex at Kuala Sedili

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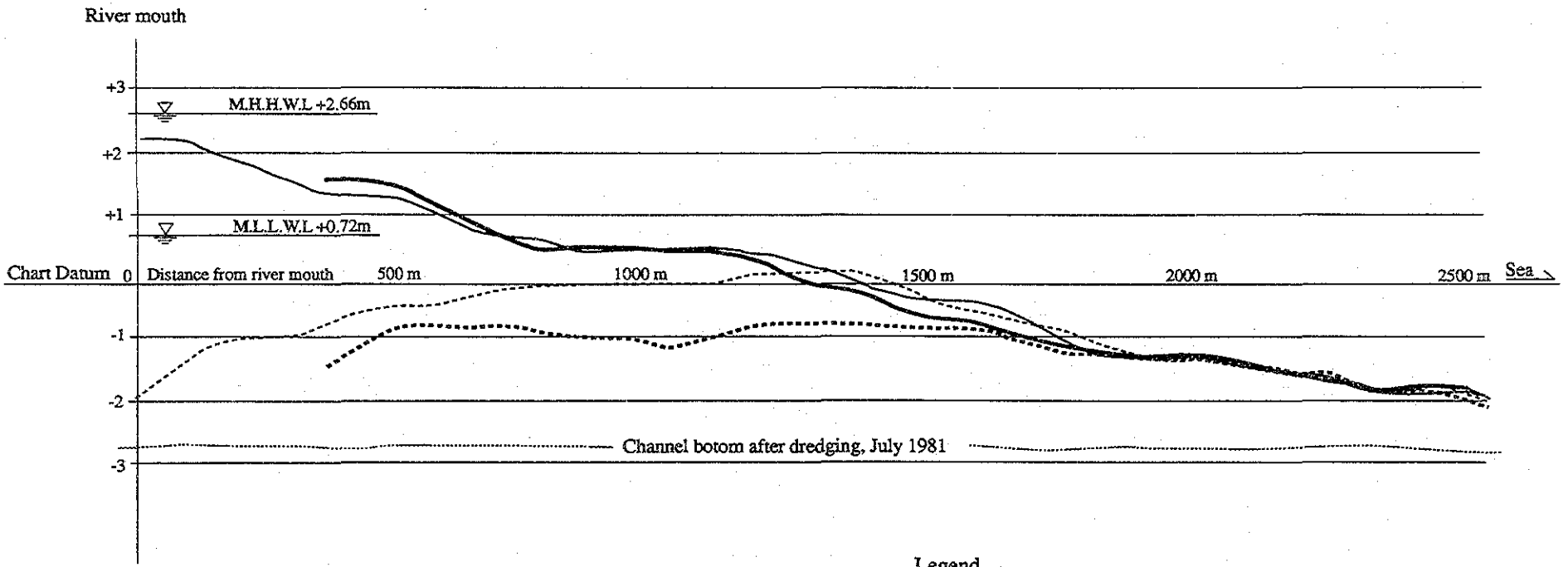

Scale ; Vertical 1 : 100
Horizontal 1 : 10,000

Legend

M.H.H.W.L ; Mean Higher High Water Level

M.L.L.W.L ; Mean Lower Low Water Lebel

	May 1980	April 1982
Depth off "channel" (no dredging done)	——	▬▬
Depth in "channel" (dredging in July 1981)	-----	▪▪▪▪▪

Source ; Report on Mission to Malaysia 26 March to 11 April 1984
Economic and Social Commission for Asia and Pacific

Fig. II.6.4 Mersing River Mouth Bottom Profile Before & After Dredging

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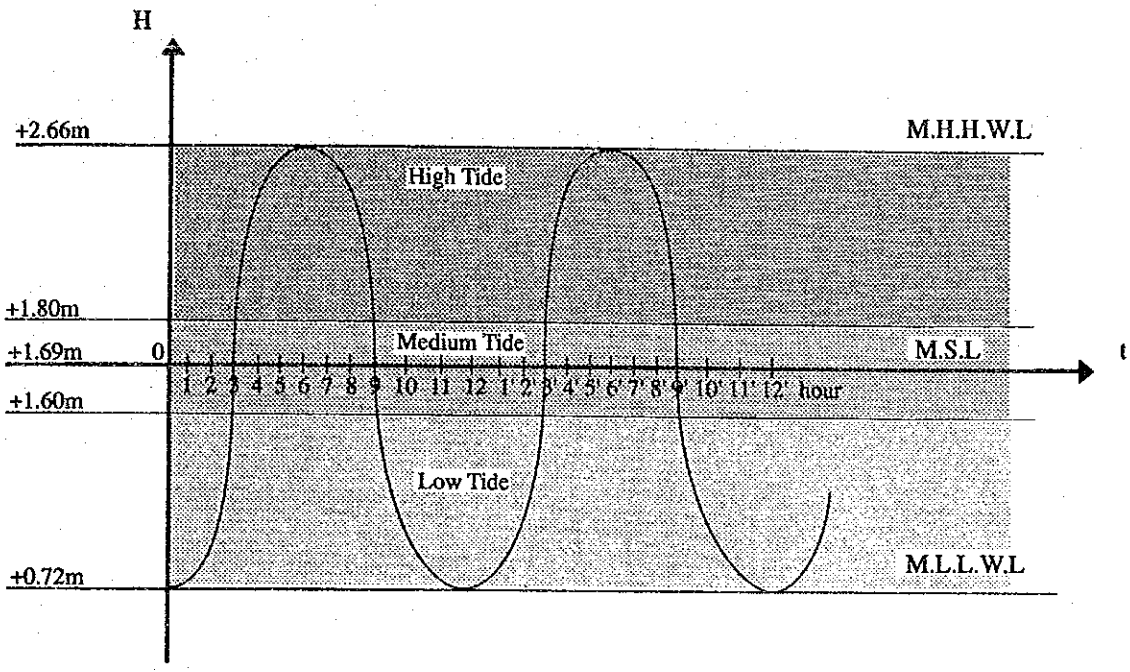

Remarks

1) Tidal curve is assumed the typical sine curve repeated each 12 hours.

2) H ; Height of tide (Reference Datum ; L.A.T)
t ; time
M.H.H.W.L ; Mean Higher High Water Level
M.S.L ; Mean Sea Level
M.L.L.W.L ; Mean Lower Low Water Level

Fig. II.6.5 Model Pattern of Tidal Curve

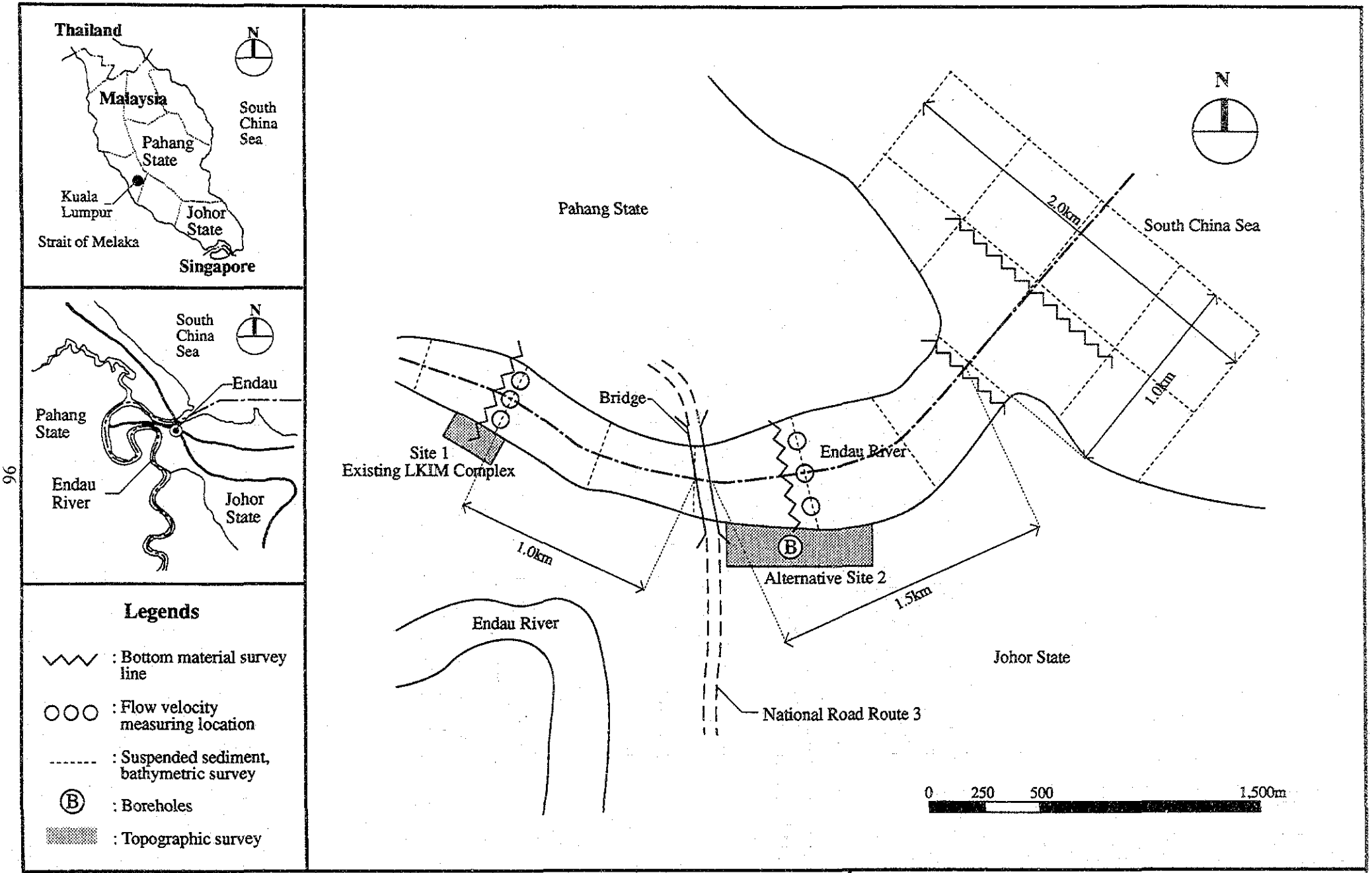

Fig. II.6.6 Natural Condition Survey Area and Alternative Site of the Pilot Project

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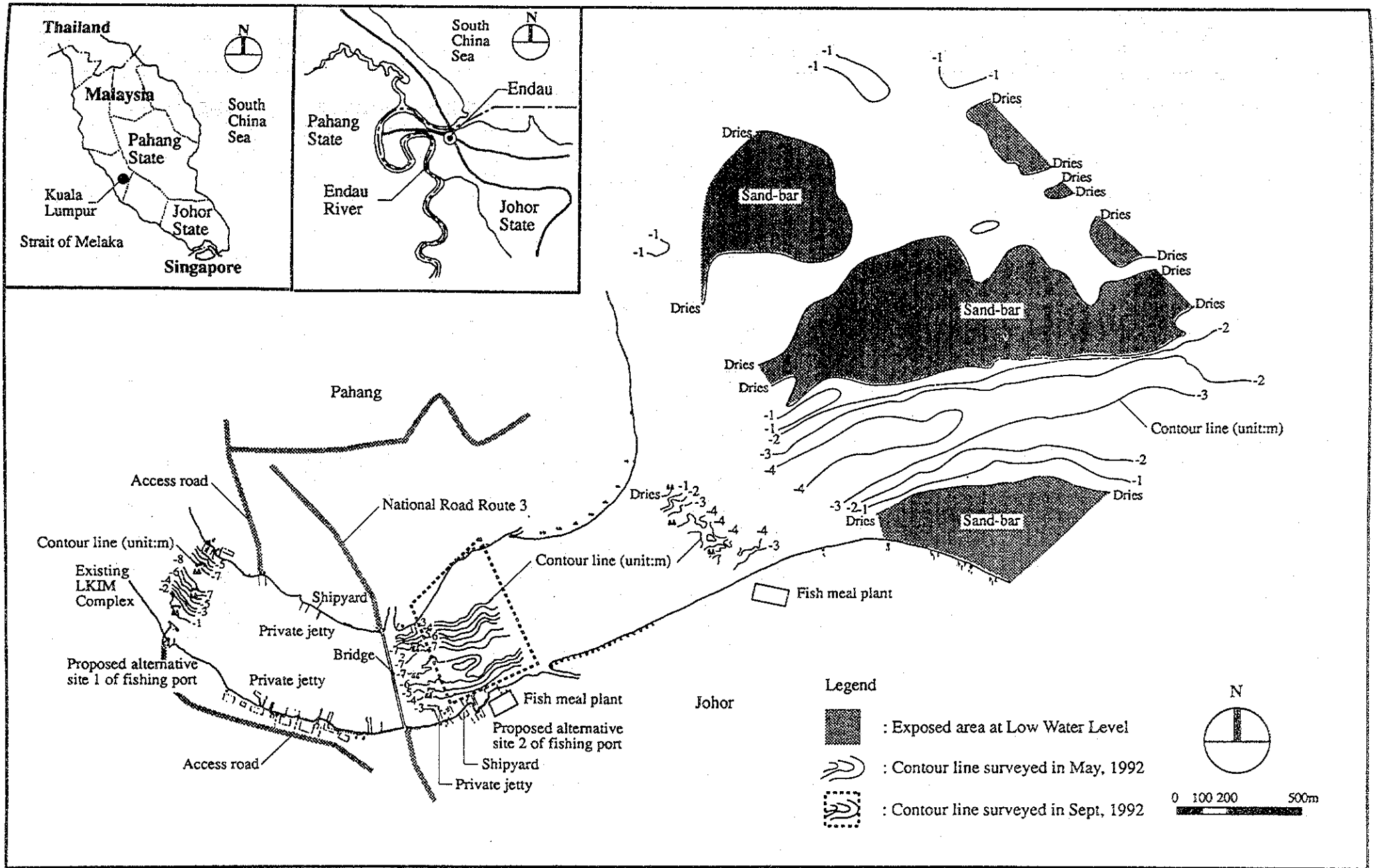

Fig. II.6.7 Hydrography of Project Area

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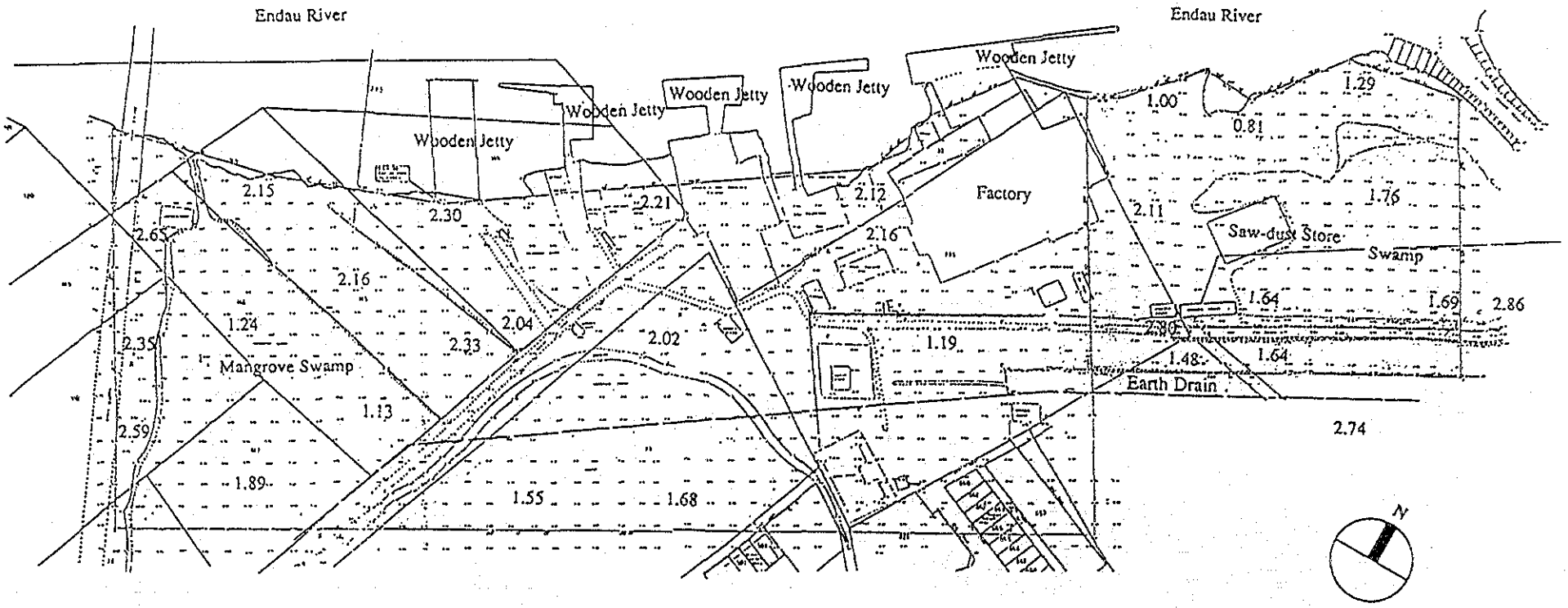

Remarks : Figures refers to elevation in meter (Land survey datum)

Fig.II.6.8. Topographic Survey of Site

Endau Fishing Port Complex

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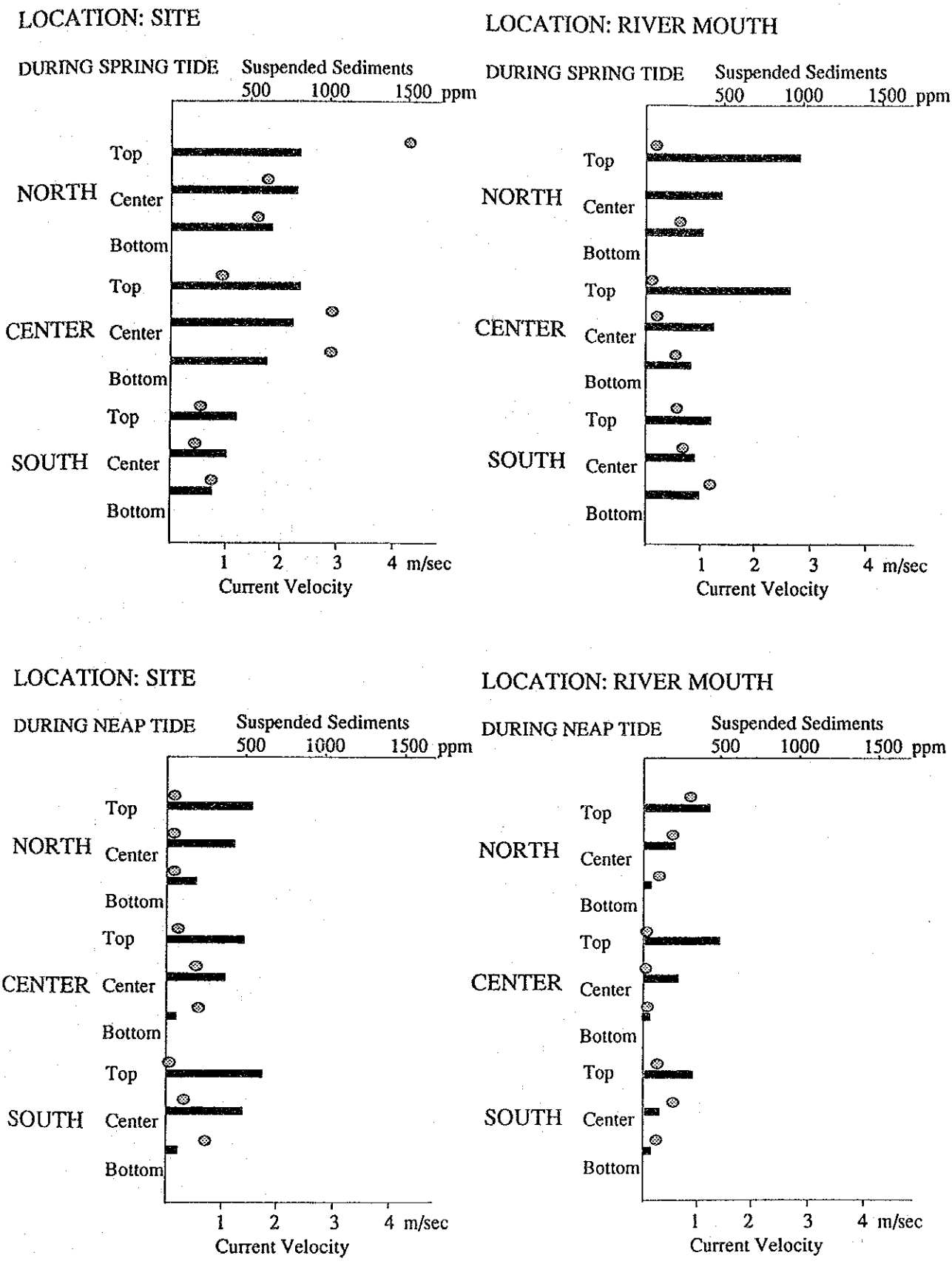
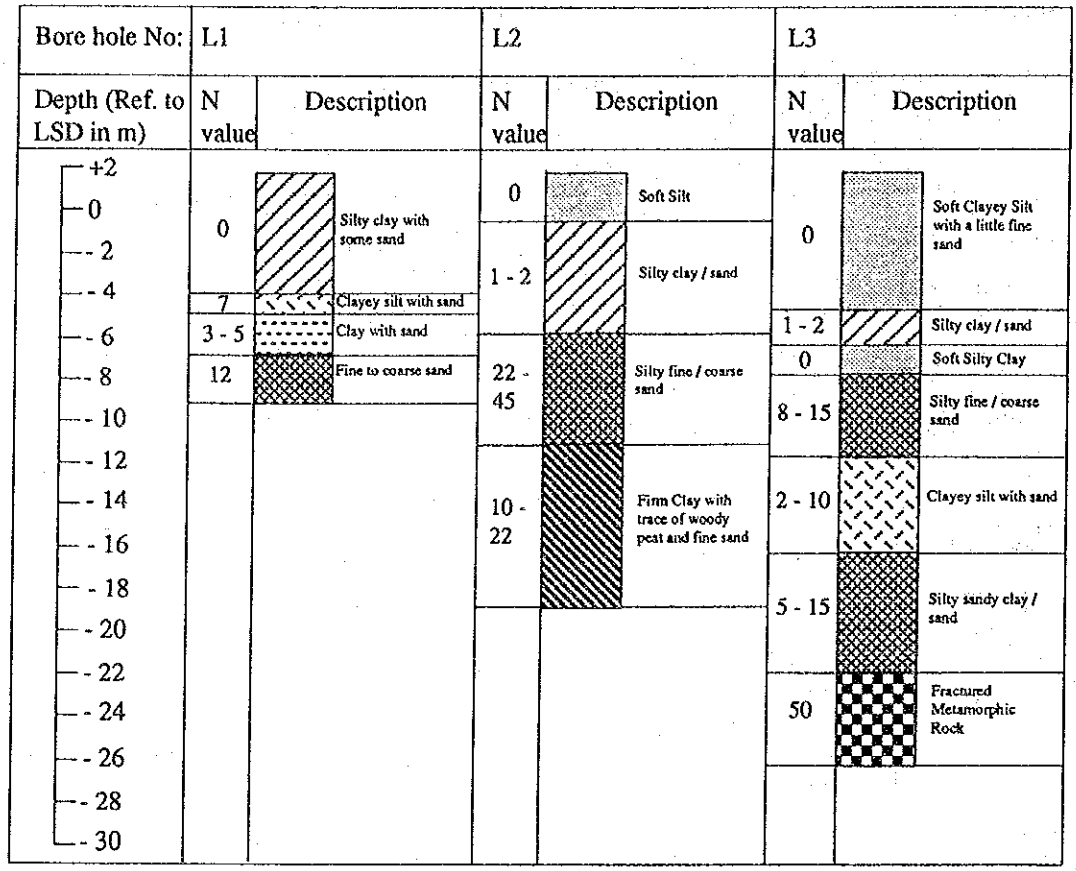
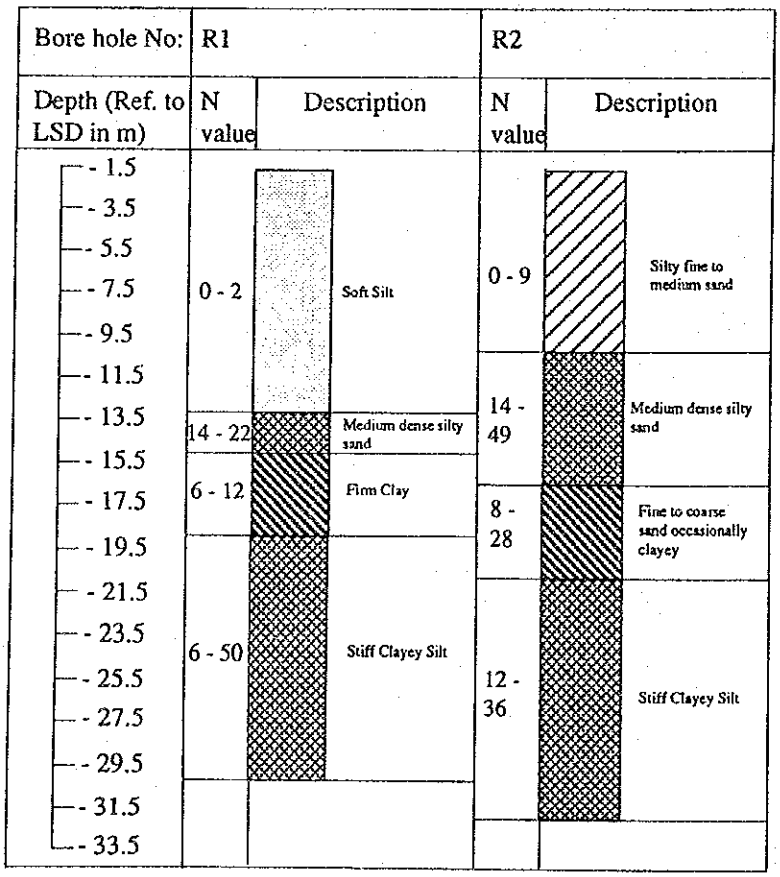
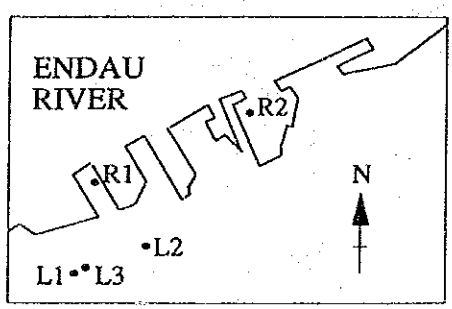


Fig. II. 6. 9 Current Velocity and Suspended Sediments of Endau River



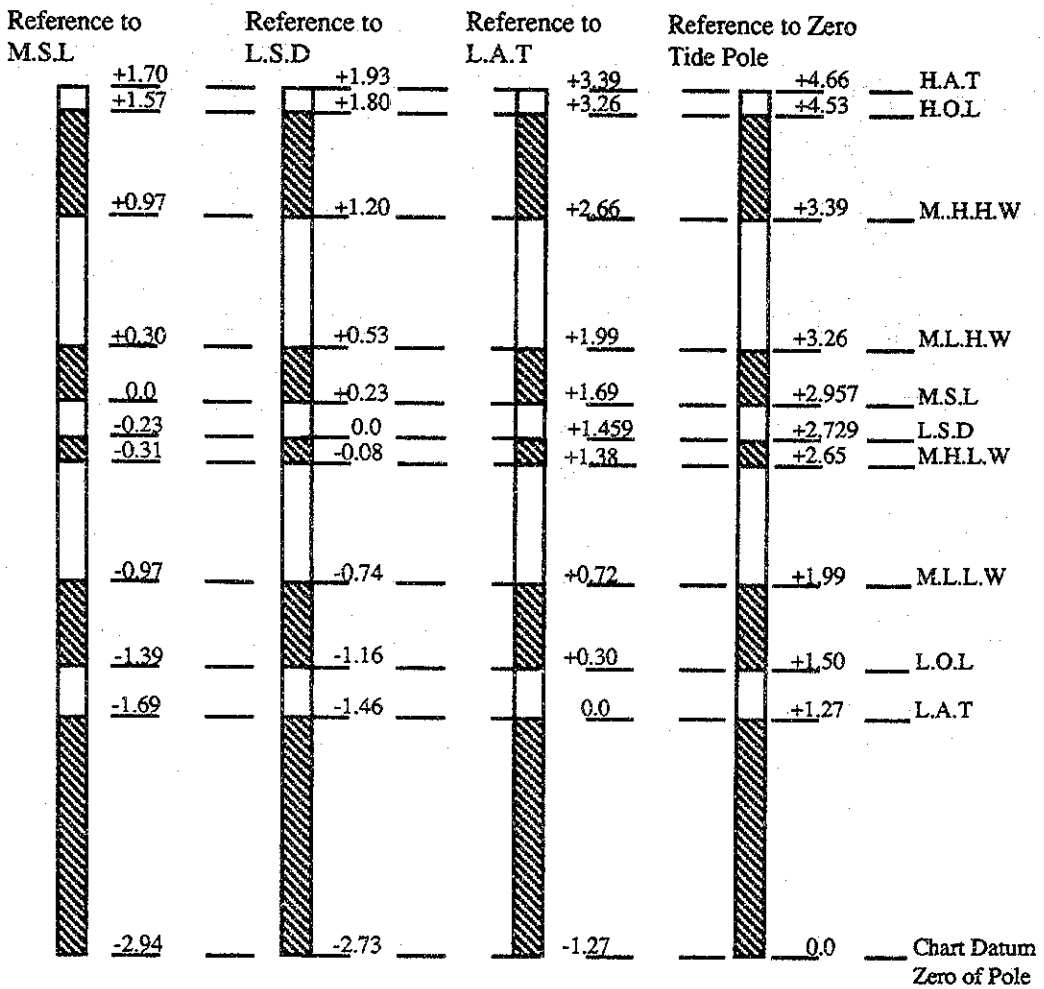


Location Map of Boreholes



Remarks: LSD is Land Survey Datum

Fig. II.6.10 Borehole Logs at Endau



Remarks:

H.A.T	-	Highest Astronomical Tide
H.O.L	-	Highest Observed Water Level
M.H.H.W	-	Mean Higher High Water
M.L.H.W	-	Mean Low High Water
M.S.L	-	Mean Sea Level
L.S.D	-	Land Survey Datum (Standard M.S.L)
M.H.L.W	-	Mean Higher Low Water
M.L.L.W	-	Mean Lower Low Water
L.O.L	-	Lowest Observed Water Level
L.A.T	-	Lowest Astronomical Tide (refer to Chart Datum)

Figures refer to elevation in metres

Fig. II.6.11 Tidal Level References for Endau, Johor

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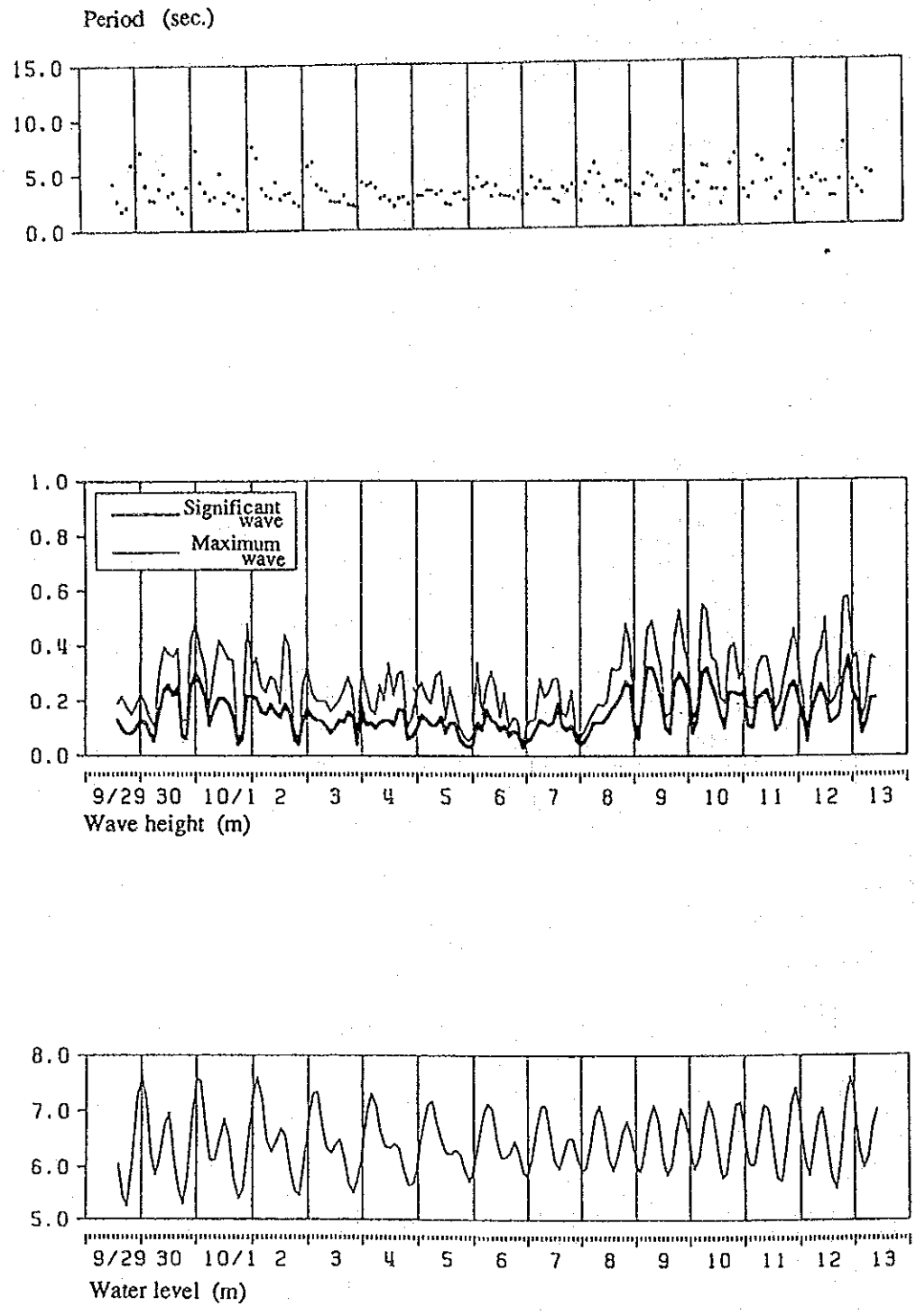


Fig. II.6.12 Wave Characteristics at Endau, Sept - Oct 1992

Table II.6.1 Present Status of Ice Plant in the Study Area

State	Pahang	Johor	Johor
Municipality	Endau, Pahang	Mersing	K. Sedeli
Name of company	SKABE/MACHINO	JOHOR ICE PLANT	LKIM ICE PLANT
Construction year x cost	1978	-	1985 x 1.5 million
Plant capacity			
Rated cap (ton/day)	200 (50 +150)	60, max 90	80 18,078 MT/year in 1991
Ice storage (ton)	300 (100 x 3 rooms)	-	-
Cold storage	-	Rent to processor (Fish-ball & frozen sotong)	-
Marketing			
Selling price	6ct/kg. RM6/BLK(102 kg) 4ct/kg in Endau area	6ct/kg. RM6.2/BLK(102 kg)	5.2ct/kg. RM7/BLK(135 kg) RM49/MT 7BLK/ton
Sector sold	Fishing industry 100%	-	-
Destination	Mersing (AFA) 10% Rompin 20% Endau 70%	Mersing 100%	K. Sedili 90% K. Tinggi 5% Others 5%
Ice supply	Enough Shortage for only one-week in peak season	Over supply	Enough
Problem	1. Shortage of water	1. Sales of ice is very low	1. Electricity cut off
Remarks	1. 1 block = 100 kg 2. 50% operation in monsoon season 3. No existing ice plat in Endau, Johor 4. Total production volume: 26,839 MT in 1991 25,093 MT in 1990 5. Production volume in peak month: 4,277 MT/month in Oct. 1991	1. Production in peak season: 40-50 ton/day 2. At present 20 ton/day 4 out of 6 brine tanks are closed	1. Operation cost in 1991 Salary & wages RM343,200 Electricity RM311,981 Water RM 45,319 Maintenance RM 4,207 RM704,707 2. Sales RM885,822 3. Operation ratio $\frac{18078}{80 \times 300} = 0.75$

Source: Field Survey Phase 1 (The Feasibility Study on the Pilot Project for Improvement of Fish Marketing and Distribution System in Malaysia, April/May 1992)

Table II.6.2 Present Status of Fish Processing Plants in the Study Area (Frozen Cuttle Fish)

State	Johor	Johor
Municipality	Mersing	Mersing
Name of company	Hong Son Marine Product	Minobe Fishery Product
Construction year x cost	1986, RM300 x 10^3 (Equipment)	1991, RM0.3 billion, Not yet operation
Type of Product	Frozen Fish	Frozen Fish
Type of Factory	Semi-Modern	Modern
Production Cap	1.5 ton/day (9HR)	2.5 ton/2 shift/day
Raw Materials		
Species	Sotong Katak	Sotong Katak / Udang Harimau
Volume	720 MT/year (last year)	4-6 ton/day / 0.85 ton/day
Origin	Mersing, K. Terengganu, K. Sedili Thai 60% 20% 20%	Endau / Indonesia 100% / Malaysia
Price (size)	Big / Medium / Small	>200g/pce / <200g/pce / <31 pcs/kg
(RM/kg)	5.0 / 4.0 / 3.0	4.0~5.0 / 0.85 / 28.0~31.0
Product		
Destination	Japan	Japan / Japan, Australia
Volume	360 MT/year (last year)	2-3 ton/day / 0.5 ton/day
Price (Form)	Fillet	-
(Size)	Big / Medium / Small / Geso	
(RM/kg, C&F)	7.0 / 6.2 / 5.8 / 1.3~1.7	7.7 / -
Convertion factor	0.28 / 0.22	0.5 / 0.6
Number of employee	44 persons	166 persons
Facilities	BF: 0.8 ton/4HR, CF: 0.5 ton x 3 sets	BSF: 1 MT/HR BT=-45°C, PT =-20°C
Facilities	CS: 60 MT x 2 sets	BF: 55HP x 2 sets, IP: 22 ton/day/12 HR CS: 100 ton x 2 sets, Generator: 240 KW
Problem	-	No approval of operation by State Gov.
Remarks	1. Supply of Raw Materials Jul, Aug, Sept, Oct 100% Mar, Apr, may, June 60% Nov, Dec, Jan, Feb 50% 2. Utility: RM40,000/mon. Packing Cost Carton box (1kg) RM0.18 Carton box (12kg) RM2.5 3. Transportation cost by Ref. Container Net 10 ton Inland (Mers. to Singapore) RM1,000 Ocean (Singapore to Japan) RM6,000	1. Land Price RM 93,000/acre 2. Production target 1000 ton/year 3. Construction cost Bldg.: 50% Equip.: 50% 4. Product packing: Vacuum pack 5. Primary processing in Endau 100 persons. Secondary processing in Mersing 60 persons.

Remarks: (1) Abbreviation
BF : Blast Freezer, CF: Contact Freezer
BSF : Brine Submerge Freezer, IP: Ice plant
CS : Cold Storage, BT: Brine Temperature
PT : Product temperature

Source: Field Survey Phase 1 (The Feasibility Study on the Pilot Project for Improvement of Fish Marketing and Distribution System in Malaysia, April/May 1992)

Table II.6.3 Present Status of Fish Processing Plants in the Study Area (Head Cutting)

State	Johor	Johor	Johor
Municipality	Endau	Mersing	Mersing
Name of company	NIAP HWA FISHERY	CHO HAI FONG	SAA HUP KEE SDN BHD
Construction year	1988	1980	1987
Type of product	Head cutting	Head cutting	Head cutting/Fish ball
Type of factory	Traditional	Traditional	Traditional
Production Cap. (Raw)	15 box/day (100 kg/box) 3-4 days/month	100 box/day (100 kg/box)	5-20 box/day (100 kg/box) Last year 200 box/month MAX
Raw material			
Species	Kerisi Other	Kerisi Lolong Chono Cachan	Kerisi Lolong Chono
Volume	50% 50%	70% 10% 10% 10%	
Origin	Endau	Mersing	Mersing, Endau
Price (RM/kg)	0.35	0.4 0.6 0.4 0.4	0.5 0.7 0.4
Product			
Destination	Singapore, J/Bharu	Singapore, J/Bharu	Singapore, J/Bahru
Volume	50% 50%	50% 50%	50% 50%
Price RM (plantside)	0.80/kg	1.0 1.2 1.0 1.0/kg	1.2-1.5/kg
Transport cost RM -			
S'pore	17.0/box	21.0/box	16.0/box
- JHB	11.0/box	13-14.0/box	11.0/box
Packing - Box	RM5.0/box, 2 times used	RM9.0/box, 2 times used	RM5.0/box, 2 times used
Ice	-	RM6.0/box	RM4.0/box
Labour	7ct/kg (head cutting)	RM8.0/box (packing) 8ct/kg (head cutting)	RM8ct/kg (head cutting) RM350/month
Convertion factor	60%	60%	60%
Number of employee	-	4	2
Problem	1. Supply of raw material is not enough. 2. Fish pond operators buy small fish for feed.	1. Fish catch going down	1. Supply of raw material is not enough
Remarks	1. Singapore export cost includes 5% export tax.	1. Owner of 8-C2 boats 2. He is also wholesaler & exporter 3. Operation day: 15 day/month because fish unloaded is only by his boats 4. Fish catch in monsoon season is a half of other month	1. No holidays, 8 hours operation 2. Production Jun-Oct 5 month 200 box/month Nov-May 7 month 100 box/month

Remarks: Total marketing volume for processing at Singapore & JHB is as follows.

15 x 100 x 4 x 12	=	72,000 x 0.5	=	36,000
100 x 100 x 15 x 8	=	1,200,000 x 0.7	=	840,000
100 x 0.5 x 100 x 15 x 4	=	300,000 x 0.7	=	210,000
200 x 100 x 5	=	100,000 x 0.5	=	50,000
100 x 100 x 7	=	70,000 x 0.5	=	35,000
Total		1,742,000 kg	Kerisi total	1,171,000 kg

Source: Field Survey Phase 1 (The Feasibility Study on the Pilot Project for Improvement of Fish Marketing and Distribution System in Malaysia, April/May 1992)

Table II.6.4 Present Status of Fish Processing Plants in the Study Area and Related Processing Plant in other Area (Surimi Base Products)

State	Johor			Penang	
Municipality	Mersing			Butterworth	
Name of company	SAA HUP KEE SDN BHD			SUGIYO SDN BHD	
Construction Year	1987			Nov. 1991 x 1.2 Billion yen	
Type of product	Fish Ball/Head cutting			Crab stick	
Type of factory	Traditional			Modern	
Production Cap. (Raw)	500 kg/day (5 box/day)			Max 5,555 ton/year	
(Prod.)	200kg/day			Max 5,000 ton/year (3 shift)	
	3-4 days/month				
Raw material				Surimi	
Species	Kerisi	Lolong	Chono	Kerisi	Cod
Volume	-	-	-	70%	30%
Origin	Mersing, Endau			Thailand	USA
Price (RM/kg)	0.5	0.7	0.4	US$3.0-2.7	4.5-4.8
Product					
Destination	Johor Bharu			Europe	
Volume	200kg/day			5,000 MT/year	
Price RM (plantside)	3.5-4.0/kg			US$4.0/kg (C&F)	
Transport cost RM - S'PORE	16.0.box (100kg)			-	
- JHB	11.0 box (100kg)			-	
Packing - Box (RM/box)	900/box, life span = 3 years			-	
Ice (RM/box)	4/box (100kg)			-	
Labour	8/box (100kg)			-	
Processing cost RM/kg	11/box (100kg)			-	
Convertion factor	40%			90%	
Number of employee	2			180	
Problem	1. Supply of raw material is not enough			1. Labour supply is not enough	
Remarks	2. Packing box (Fiberglass) 1.35 x 0.75 x 0.75mH capacity 500kg/box			2. Marketing condition	
	3. Retail price RM10/kg			(1). Surimi price in Thailand 3 years ago US$1.9/kg, last year US$4.5/kg	
				(2). Crab stick demand USA 120,000-130,000 ton/year Europe 40,000-45,000 ton/year	
				(3). Existing surimi plant is only one with 2 MT/day capacity in Kedah	
				(4) New surimi plant with 10 MT/day capacity is under construction in K. Perlis.	

Source: Field Survey Phase 1 (The Feasibility Study on the Pilot Project for Improvement of Fish Marketing and Distribution System in Malaysia, April/May 1992)

Table II.6.5 Present Status of Fish Processing Plants in the Study Area (Dried/Salted Fish, Fish Meal)

State	Johor					Johor	
Municipality	Mersing					Endau	
Name of company	MINLEE FISHERY					SING HONG HEN	
Construction year	1970					1973	
Type of product	Dried/salted					Fish Meal	
Type of factory	Traditional					Modern	
Production Cap.	3 MT/mon. (Product) 4 months (Monsoon season) are not operational					40 MT/day (10,670 MT/year in 1991) 8 hr operation/day 3 shifts in peak season	
Raw Materials							
Species	Talong	Pari	Gelama	Merah	Duri	Ikan Baja	
Volume (MT/month)	2.5	1.25	1.25	1.75	0.75	4,000	
Origin	Pahang	Mers.	Mers.	Mers.	Mers.	Endau, Mersing, K. Sedili, Rompin, Kuantan	
Price	2.0	0.5-1.0	1.0	5.0-7.0	1.0	0.2	
Product							
Destination	Penang	Johor	Penang	Johor	Johor	Domestic, 90%	Singapore, 10% Poultry : 55%
Volume (MT/month)	1.0	0.5	0.5	0.7	0.3		
Price (RM/kg)	5.0	2.0	2.0	15.0	2.5	1.2	
Convertion factor	54%	20%	54%	54%	40%	25%	
Number of employee	6 persons					80 persons	
Problem	1. Collection of raw material is very difficult					1. No constant supply of raw material 2. Raw material are spoiled	
Remarks	1. Salt consumption RM200/mon. RM10/bag (50kg), 1 ton/month Salt/Fish = 1/3 2. Packing cost Carton box RM0.6/box (50kg) 3. Transportation cost Penang 25.4ct/kg Johor 10ct/kg					1. Monthly production May, Jun, July, Aug, Sept 100% Apr, Oct 60% Mar, Nov 40% Dec, Jan, Feb 20% 2. Quality of product Protein 55-50% 3. Operation cost Electricity : RM30,000 Water : RM1,200 Salary : RM12,000	

Remarks: There are two dried/salted fish stores for tourist mainly from Singapore. Retail price in these stores is as follows: Pari: RM4-5/kg, Gelama: RM4-8/kg, Merah: RM16/kg, Sotong: RM50/kg, Layaran: RM48/kg, Kurau: RM30/kg, Udang: RM22/kg

Source: Field Survey Phase 1 (The Feasibility Study on the Pilot Project for Improvement of Fish Marketing and Distribution System in Malaysia, April/May 1992)

Table II.6.6 Present Status of Ship Yard in the Study Area

State	Johor	Pahang	Johor
Municipality	Endau	Endau	Mersing
Name of company	CHUAC HING BOAT	PROSPECT SERVICES	MUTIARA INDAH
Construction year	1980	1991	1991
Construction cost RM	25,000	1.0	Rent from LKIM
Type of yard	Boat Builder	Boat repairing	Boat repairing
Type of boat,	Fishing boat (wooden)	Fishing boat (wooden)	Fishing boat (wooden)
Capacity of Yard			
Max cap. of boat	120 GT	200 GT	100 GT
No of work bay	B class x 3	C_2 class x 6	C_2 class x 2
Actual results of last year	B class x 6	C, C_2 class x 180	B, C, C_2 x 15 - 18/month
New boat building cost			
RM1,000	B class:58, C:85, C_2:138	-	-
Period	3 month		
Preparing boat			
Painting, dockingxcost (RM)		3 days x B:1,300,C:1,675	2 days x B:990, C:1,480
Big repair		15 days	
Docking cost (RM/day)		First day:500	150-200/day
		After second day:150	100-70
Facilities			
Area of yard	0.5 acre	6 acre	
Slipway	-	3mWx120mLx24kwx2 sets	2.5mwx42mLx100tonx2sets
Workshop	Handtool	Handtool	Lath x 2m x 1
			Drill x 134 x 1
			Cutting, welder leath,
			air compressor x 1
No. of employee (carpenter)	Skilled RM70/day	15 persons	Part time 4 persons
	Semi RM20/day, 16 persons	Other staff 4 persons	
Income statement			
Income	250,000		18,000/month
Expenditure	200,000		16,000/month
Problem	Skilled carpenter go to abroad (Taiwan).	Not enough boat coming.	Rental contract is made every two years by tender.
Remarks	Building cost is only hull cost. Boat owners directly order the equipment such as engine from other shop.	Boat owners get the repairing of engine done by mechanics in the town.	Leaseholder cannot employee mechanics and invest in equipment.

Source: Field Survey Phase 1 (The Feasibility Study on the Pilot Project for Improvement of Fish Marketing and Distribution System in Malaysia, April/May 1992)

Table II.6.7 Present Status of Infrastructure in the Study Area

Item	Endau		Mersing	K. Sedeli
	Site 1	Site 2		
Water supply				
Source	Lanbok Lake		Congok Dam	Gambut River
Treatment	5,450 m^3/day	5,450 m^3/day	7,130 m3/day	7,570 m^3/day
Intake	Existing 3" pipe	Branch from 8" main	Existing 3" pipe	Existing 4" pipe
Quality	Pass WHO standard	Pass WHO standard	Pass WHO standard	Pass WHO standard
Supply	Enough	Enough	Enough	Enough
Cutout	Seldom	Seldom	Sometime	Seldom
Electricity supply				
Power source		Tai Hong Dam Hydro Power		
Capacity		15 MVA in Mersing and Endau		30MVA
Power intake	Existing substation	Existing neighbour fish meal plant station	Existing substation	Existing substation
Electric supply	Enough	Enough	Enough	Enough
Blackout	Seldom	Seldom	Seldom	Frequently
Access road	Concrete pavement is necessary	New access road must be constructed	Concrete pavement is necessary	Good

Remarks: 1. Water charge is same throughout the country
Industry/commercial rate <20m^3 RM1.2/m^3
>20m^3 RM1.6/m^3
2. Electricity charge is same throughout the country
Commercial rate Tarif B 24ct/KWH
Industrial rate Tarif Ez 16ct/KWH
3. Electric supply
Main line 11 kv x 3 wire
Motor 400/440 V x 3 wire
Light 220V x 1ct

Source: Field Survey Phase 1 (The Feasibility Study on the Pilot Project for Improvement of Fish Marketing and Distribution System in Malaysia, April/May 1992)

Table II.6.8 Usable/Non-usable Jetties in Endau according to Tidal Conditions

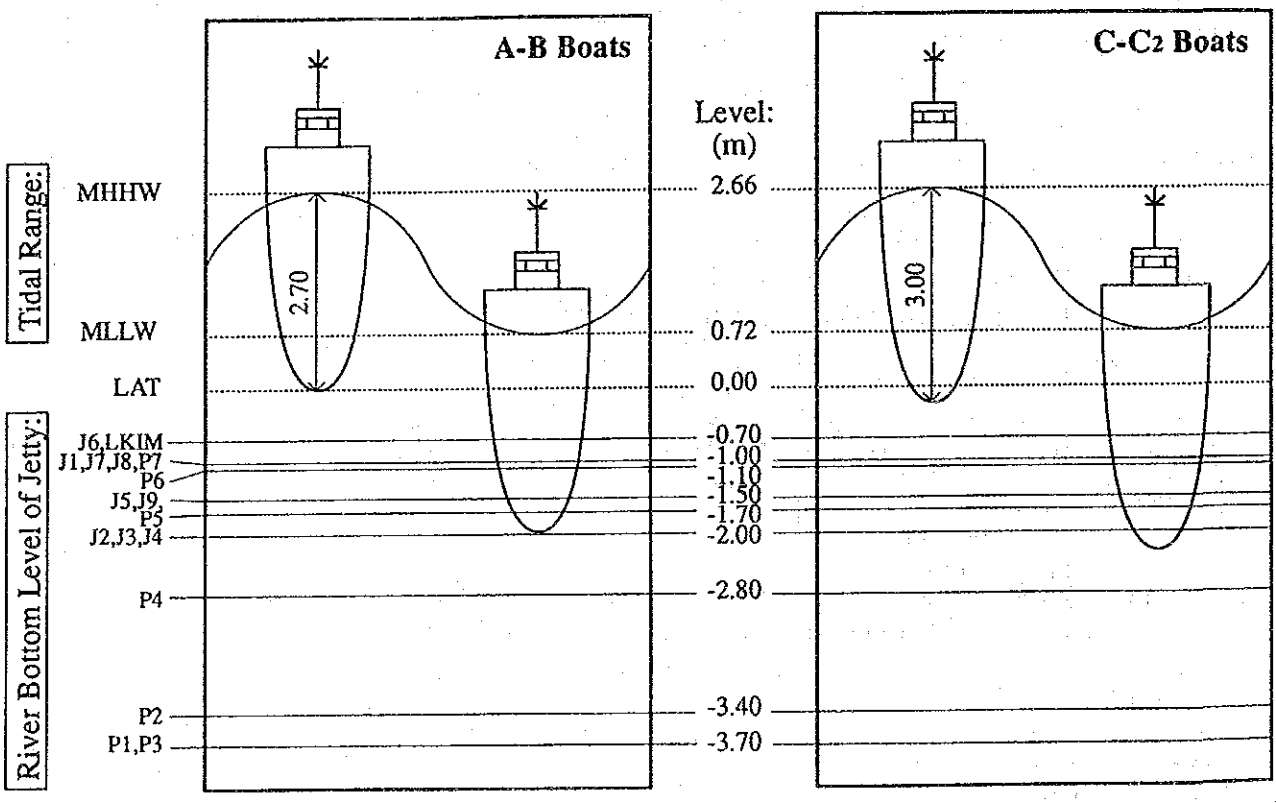
Jetty Name	LKIM	J1	J2	J3	J4	J5	J6	J7	J8	J9	P1	P2	P3	P4	P5	P6	P7
River Bottom Level of Jetty (ref.to LAT)	-0.7	-1.0	-2.0	-2.0	-2.0	-1.5	-0.7	-1.0	-1.0	-1.5	-3.7	-3.4	-3.7	-2.8	-1.7	-1.1	-1.0

A & B Boats

Tidal Condition:	Usable Jetties		Non-Usable Jetties		Probability Waiting Time (Hr)
	Names	No.	Names	No	To Attain Tidal Condition
High Tide (2.66 - 1.8 m)	All jetties	17	Nil	0	4.5
Medium Tide (1.8 - 1.6 m)	J1, J2, J3, J4, J5, J7, J8, J9, P1, P2, P3, P4, P5, P6, P7	15	LKIM, J6	2	3.0
Low Tide (1.6 - 0.72 m)	J2, J3, J4, J5, J9, P1, P2, P3, P4, P5	10	LKIM, J1, J6, J7, J8, P6, P7	7	1.5

C & C2 Boats

Tidal Condition:	Usable Jetties		Non-Usable Jetties		Probability Waiting Time (Hr)
	Names	No.	Names	No	To Attain Tidal Condition
High Tide (2.66 - 1.8 m)	All jetties	17	Nil	0	4.5
Medium Tide (1.8 - 1.6 m)	J2, J3, J4, J5, J9, P1, P2, P3, P4, P5	10	LKIM, J1, J6, J7, J8, P6, P7	7	3.0
Low Tide (1.6 - 0.72 m)	J2, J3, J4, J5, J9, P1, P2, P3, P4, P5	10	LKIM, J1, J6, J7, J8, P6, P7	7	1.5



Remarks:

1 MHHW means Mean Higher High Water.
2 MLLW means Mean Lower Low Water.
3 LAT means Lowest Astronomical Tide.
4 Draft requirement of A & B boats is 2.7 m.
5 Draft requirement of C & C2 boats is 3.0 m.
6 River bottom level of jetties based on survey conducted during phase 2.
7 Probability Waiting Time is the statistical calculated time that a boat will have to wait if it arrives at the jetty during tidal condition other than that specified. For example, boats arriving during medium or low tide (other than high tide) will probably have to wait 4.5 hrs to use jetties only usable during high tide.

Table II.6.9 Wave Condition Observed at Endau, Oct 1992

Date/ Time of Survey	Wave Recorded at River Mouth		Wave Observed at Site (m)	Video No.	Picture No.
	Heigth (m)	Period (sec)			
1992/10/9 11:50 - 12:10	0.32	3.9	Below 0.05	1	1
1992/10/9 15:50 - 16:10	0.16	2.5	Calm	1	2
1992/10/9 17:50 - 18:10	0.43	4.7	0.05 - 0.1	1	3
1992/10/10 9:50 - 10:10	0.36	6.3	0.05 - 0.1	1	4
1992/10/10 11:50 - 12:10	0.34	3.4	0.05	1	5
1992/10/10 13:50 - 14:10	0.21	3.2	0.05 - 0.1	1	6
1992/10/10 15:50 - 16:10	0.19	1.9	Calm	2	1
1992/10/11 9:50 - 10:10	0.36	5.2	0.05 - 0.1	2	2
1992/10/11 11:50 - 12:10	0.28	2.6	0.05	2	3
1992/10/11 13:50 - 14:01	0.16	4.1	Calm	2	4
1992/10/11 15:50 - 16:05	0.20	2.2	Calm	2	5
1992/10/11 16:05 - 16:10	0.20	2.2	Calm	3	1
1992/10/12 9:50 - 10:10	0.39	2.2	0.05 - 0.1	3	2
1992/10/12 11:50 - 12:10	0.30	2.4	0.05 - 0.1	3	3
1992/10/12 13:50 - 14:10	0.18	3.4	Calm	3	4
1992/10/12 15:50 - 16:10	0.21	2.5	Calm	3	5

Remarks:

1) Wave Recorded at River Mouth was by a Wave Recorder instrument.
2) Wave Observed at Site was by observation against a tide pole and recorded on video tape and photographs.
3) The wave created by passing boats at the Site is between 10 - 20 cm.

III. PLANNING

III PLANNING

1. Projection

1.1 Projection of Fish Landing Volume in the Study Area

(1) Projection method

The projection method for the following three cases is based on the assumptions, presented below.

1) Base year (1990): 1990 fisheries data according to the Annual Fisheries Statistics, 1991 DOF was used.

2) Case 1

Countermeasures in fishery resource management are not adopted. Based on the fish landing volume and fish catch of the study area for the years 1989 to 1990, over fishing has been conspicuous. If this situation continues, growth in fish landing volume for the targeted year 2020 cannot be anticipated and in some cases, it will stop at 1990 levels .

3) Case 2

a) Nationwide: The projected value established by DOF for the entire domestic fish landing volume of 1.2 million tons by the year 2010 (the target from 2010 to 2020) was utilized. Hence, it was projected that from 1990 to 2010, fish landing volume would increase steadily .

b) East coast of peninsular Malaysia: The national projected value was calculated from the production share of the two coasts. In this case two hypotheses were considered, i.e. the ratio of production of both coasts were fixed and relative production growth was unchangeable. These hypotheses are based on the assumption that fishery resource management has succeeded on the west coast. The volume of fish in the east coast was projected modestly in view of current potential fishery resource.

c) Study area: The fish landing ratio between each of the states on the east coast from 1990 to the present will not change. This is assumed that the states will not differ in their promotion of fishing.

d) Mersing district: The major fish landing sites in the study area are Mersing, Endau, Penyabong and Kuala Sedili. Of these landing sites, three are in the Mersing

District. It was decided to concentrate fish landings in the Mersing District where fish distribution and marketing facilities are being improved. Endau is the largest fish landing site in the Mersing District. It is expected to expand its functions as a fishing base in future, in order to maintain a high volume of fish landings.

4) Case 3

a) East coast of peninsular Malaysia: In a comparison of the regional structural ratio, based on the fish landing volume from 1990 to the present, it is projected that fish landing volumes on the west coast will decline and it will increase rapidly (due to its fishery resources and development potential) on the east coast

b) Study area: Among the fish landing ratios of the states on the east coast from 1990 to the present, the area of east Johor state is projected as slightly higher, if differences in fishing industry promotion within each state is taken into consideration.

c) Mersing district: The major fish landing sites in the study area are Mersing, Endau, Penyabong and Kuala Sedili. It was decided to concentrate fish landings in the Mersing District where fish distribution and marketing facilities are being improved. Endau is the largest fish landing site in the Mersing District. It is expected to expand its functions further as a fishing base in future, fish landing volume will continue to grow at high levels, and the area will increase in importance. In addition, improvements in fishery resource management and fish distribution/marketing will continue at Penyabong; and its fish landing volume will expand to an even greater level than in Case 2, to levels nearing those at Mersing.

(2) Projection of fish landing volume

In the two year period from 1988 to 1990, the fish landing volume for the entire nation increased annually at an average of 7.5 percent. Although fish landing volume will continue to grow, its annual growth rate will decline slightly to approximately 3 to 4 percent and by the year 2010, it will decline further. The projected marine landings of Malaysia is shown in Table III.1.1.

Projections on fish landing volume for the east coast of the peninsula, and east Johor is shown in Table III.1.2. Projections on marine fish landings in the Mersing district based on the three cases outlined above, are presented in Tables III.1.3 to III.1.5. Of the three cases delineated above, case 2 was used as the planning value of the project.

1.2 Projection of the Number of Boats in the Study Area

(1) Projection method

The following conditions were considered for projection of the number of boats.

1) The number of boats was determined according to the targeted fish landing volume.

2) Class A fishing boats will gradually disappear (particularly, trawlers) and after the year 2000, Class A trawlers and purse seiners will completely vanish. They will be replaced by new fishing methods (stationary, hook and line, etc.) and in turn, fishery resources will stabilize and the livelihoods of fishermen will be preserved.

3) Fishing efficiency will rise due to the use of modern large-sized fishing boats.

4) Fishing methods (trawling nets and purse seines), ratio of boats, composition of fish species, fishery resource volume, etc. were taken into account for the period of 1989 to 1990 in the Mersing District.

5) Special characteristics that distinguish Mersing as a focus of purse seiners, Endau as the center for trawlers, and Penyabong as a center for other forms of petty fishing, were considered.

6) With the development and protection of fishery resources, emphasis was shifted from the production of demersal to pelagic fish.

(2) Projections

Projections on the number of boats required to achieve the fish landing volume of Case 2 is shown in Tables III.1.6 and III.1.8. According to DOF data, there were 218 boats in Endau, and the change in the number and class of boats in 1995 and 2010 is shown in Table III.1.7.

1) Trawlers

The number of trawlers in 1990 and 1995 will not change, but the ratio among the boat class will vary. About half of class A trawlers (12) will be transferred to Penyabong which will be the base for class A boats, and eight class A trawlers will change their fishing method to other fishing gears (traps, hook & lines). Therefore, in 1995 there will be only five class A trawlers, and eventually these five trawlers will be gradually transferred to Penyabong.

Of the class B trawlers, nine boats will be decategorized to class C, thereby reducing the number to 30 trawlers in 1995. The remaining 30 will be gradually changed to class C from 1995. In 2010, there will be no class B trawlers in Endau. Similarly 27 class C trawlers will be declassified to class C2 by 1995, and there will 60 class C trawlers in 1995. With these changes and introduction of eight new boats, the number of class C2 trawlers will increase to 84 in 1995. From 1995, 30 class B boats will be declassified to class C and 20 class C will be converted to class C2. Therefore, with the changes and introduction of new boats, there will be 70 class C and 120 class C2 trawlers in 2010.

2) Purse seines

There were 17 purse seiners in 1990 and the number is expected to increase to 20 in 1995 with the transfer of two class A to Penyabong and introduction of new boats (two in class B and three in class C2). In 2010 there will be 35 purse seiners with the upgrading and introduction new boats.

3) Boats using other fishing gears

The 22 class A and B fishing boats in 1990 will increase to 30 after the transfer of eight class A trawlers from Endau, and in 2010 there will be only 20 class B boats after the transfer of 10 class A boats to Penyabong.

1.3 Projection of Fish Landing Volume at the LKIM Complex in East Johor

1.3.1 Distribution of Projected Fish Landings of LKIM Complex

(1) Projected distribution volume of trash and food fish

The projected distribution volume of trash and food fish, based on the 1990 actual value, reflects the complex's competitive viability with the private jetties. The ratio of trash fish for each fish landing site, based on the 1989 achievement value, was determined as 50 percent for the base year of 1990. Without implementation of this project, the ratio was projected to remain uniform until 2020. With the project, the ratio of trash fish will gradually diminish and by the targeted year of 2020, it will be only 25 percent of the total fish landing volume.

The ratio of trash fish of the total fish landing volume

Unit: Percent

	Endau	Mersing	Kuala Sedili
1. 1990 (Actual)	50	50	50
2. 1995			
1) Without Project	50	50	50
2) With Project	40	40	40
3. 2000			
1) Without Project	50	50	50
2) With Project	30	30	25
4. 2010			
1) Without Project	50	50	50
2) With Project	25	25	25
5. 2020			
1) Without Project	50	50	50
2) With Project	25	25	25

(2) Fish landing distribution of food fish at LKIM complex and private jetties

The fish landing distribution of food fish at the LKIM complex and the private jetties are projected for the years 1995, 2000, 2010 and 2020, with project and without project.

1) 1995

a) Without project:

The fish landing ratio of all the complexes increased from 1990 to 1991, due to the rationalization measures which have been implemented in their operations. This is an example of a small measure of success brought about by rationalization.

b) With project:

The following projections were made based on the assumption that the fishing port and fish distribution/marketing facilities at Endau have been completed; and reforms in fishermen organizations and financial institutions at the other two complexes have also been implemented.

Endau: Approximately half of the fish landings in this area will take place at the new fishing port (actual conditions of Mersing).

Mersing, Kuala Sedili: There will be slight increase in the distribution ratio at the complex.

2) 2000

a) Without project:

Fish landing volume will remain at 1995 levels. Since the capacity of the facilities is not expected to change, fish landing volume and the number of boats using the port will maintain the same levels of 1990. Any increase in fish landing

volume will be absorbed by the private jetties. Hence, the fish landing ratio of the LKIM complex will decline.

b) With project

The new fishing port and its industrial complex and reforms in organization and financial institutions will be in effect at Endau. Only reforms in organization and financial institutions will be underway at the other two complexes.

3) 2010

a) Without project

The same conditions as in the year 2000 will prevail.

b) With project

The new fish distribution/marketing system instituted in 2000 will be in full operation.

4) 2020

a) Without the project

The same conditions as in the year 2000 will prevail.

b) With the project

Private jetties will completely disappear and the complexes will enter a period of stability.

The ratio of food fish landings at LKIM complex

Unit: Percent

	Endau	Mersing	Kuala Sedili
1. 1989 (Actual)	8.4	36.3	29.4
2. 1990 (Actual)	7.3	35.3	28.4
3. 1991 (Actual)	9.0	47.6	30.8
4. 1995			
1) Without Project	10	50	35
2) With Project	50	60	40
5. 2000			
1) Without Project			
a. 1995 (landing)	10	50	35
b. 1995-2000 (increase)	Private Jetty	Private jetty	Private Jetty
2) With Project	70	70	60
6. 2010			
1) Without Project			
a. 1995 (landing)	10	50	35
b. 1995-2000 (increase)	Private Jetty	Private jetty	Private jetty
2) With Project	90	90	90
7. 2020			
1) Without Project			
a. 1995 (landing)	10	50	35
b. 1995-2000 (increase)	Private jetty	Private jetty	Private jetty
2) With Project	100	100	100

Remarks: 1) Planned value of this project except for 1995.
2) Fish landing excludes trash fish

1.3.2 Projected Landing Volume of Food Fish at LKIM and Private Jetties

Based on the aforementioned assumptions and conditions, the projected marine landings at the LKIM complexes (excluding Penyabong) and private jetties in East Johor are shown in Tables III.1.9 and III.1.10.

1.4 Supply/Demand and Origin/Destination of Fish Products

Assumptions for the future supply/demand and origin/destination of fish products in east Johor are given below.

a) The production of fish (excluding aquaculture) is based on the projections delineated above for the study area.

b) The supply of food fish (excluding trash fish) is based on the reduction of the trash fish ratio, which is dependent on resource management.

c) There are no imports in the study area.

d) The estimated per capita consumption volume for peninsular Malaysia, based on the annual fisheries statistics (1990), is 44.07 kg per year, and it does not differ greatly from the value (44.1 kg) estimated in the Nationwide M/P FMDS Study (1991). Therefore, the per capita consumption value of 44.4 kg estimated for the other areas (Nationwide M/P FMDS Study, 1991) was used for east Johor.

e) The population of east Johor (Mersing and Kota Tinggi districts), according to the Population and Housing Census (1991), was 37,526, corresponding to about 12 percent of Johor state's population of 2,074,297. This population was adjusted to the 1990 per capita consumption estimate. The population was projected at a growth rate of 2.2 percent per annum, based on growth projection in the Sixth Malaysia Plan.

f) The income elasticity of 0.0 was applied, as in Case 2 of Nationwide M/P FMDS study (1991), because it is assumed that income elasticity has been low in recent years. It was also assumed that the per capita consumption volume of fish would not change; hence per capita volume of 1990 was utilized as the future fish consumption estimate.

g) Exports, especially to Singapore, are assumed to increase in future, from current 50 percent to 60 percent, due to increase in import, decrease in local production, and increase in per capita consumption in Singapore.

1.4.1 Supply/Demand in East Johor

The supply/demand of fish in east Johor based on the Case 2 estimate for fish production, is shown in Table III.1.11. The consumption volume was estimated for Mersing and Kota Tinggi Districts using the per capita consumption volume of 44.4 kg (M/P FMDS Study, 1991). Export of fish to Singapore, which is about 50 percent of the fish landed in east Johor, is expected to increase to 60 percent in future due to the promotion of exports by the Project. In 1990 there was a surplus of 9,562 MT, and the surplus is expected to fall to 7,173 MT and increase from 11,366 MT in 2000 to 12,595 MT in 2010 and 14,111 MT in 2020.

1.4.2 Origin and Destination of Fishery Products of East Johor

The origin/destination/ of fishery products in East Johor is shown in Table III.1.11. Of the 38,927 MT of food fish landed in east Johor in 1990, it is estimated that 19,464 MT (50%) were exported to Singapore and the rest were consumed domestically. Of the 19,464 MT consumed domestically, 9,901 MT (51%) was estimated to be distributed within Mersing/Kota Tinggi districts and Johor state. It is expected that exports to Singapore would increase to 60 percent in future. Consequently, in 1995 29,034 MT of the total food fish volume of 48,390 MT landed, would be exported to Singapore and the rest consumed domestically; and with the increase in landings in Endau, exports to Singapore would increase from 29,034 MT in 1995 to 54,000 MT in 2020.

1.5 Landing Volume at LKIM and Private Jetty in Endau

(1) Landing volume in Endau-Johor

The projected marine landings at LKIM complex and the private jetties in Endau are shown in Table III.1.9 for both with and without the project. In 1990, 30,392 MT of fish were landed, of which 15,500 MT were food fish and the remaining 14,892 MT were trash fish. Of the total volume of food fish (15,500 MT), 1,150 MT ((7.3%) were landed at the LKIM complex and the remaining, 14,350 MT (92.7%) were landed at the private jetties. The projected marine landings for 1995 is 36,400 MT, 44,100 MT in 2000, and 52,500 MT in 2010. With the expected decrease in trash fish from 40 percent in 1995 and 25 percent from 2000 onwards (based on resource management policy), food fish is projected to increase from 21,840 MT in 1995 to 50,400 in 2020. Anticipated fish landings at the LKIM complex in 1995 are 50 percent and 70 percent in 2000, 90 percent in 2010 and 100 percent in 2020, with the project. Therefore, fish landings at the LKIM complex would

increase from 10,920 MT in 1995 to 54,000 MT in 2020. The landings at private jetties would decrease from 10,920 MT in 1995 to 3,938 MT in 2010. In 2020, the private jetties will be eliminated and replaced by the improved capacity and services of the LKIM complex.

(2) Landing volume in Endau-Rompin

The projected landings of boats registered in the Rompin district are shown in Table III.1.10. These landings are included here since these boats land at private jetties located on both sides of the Endau River.

Table III.1.1 Projection of Marine Landings of Malaysia (1990-2020)

Unit: MT

	1990	1995	2010	2020
Sabah, Sarawak, Labuan	131,000	135,000	140,000	150,000
West Coast	510,000	580,000	660,000	710,000
East Coast	309,000	350,000	390,000	440,000
Malaysia	950,000	1,065,000	1,190,000	1,300,000

Remarks: Including trash fish
Source: 1990 Data from Annual Fisheries Statistics1992, DOF

Table III.1.2 Projection of Marine Landings of East Coast (1990-2020) (Case 2)

Unit: MT

	1990	1995	2010	2020
Kelantan	31,557	35,000	40,000	44,000
Terengganu	97,236	108,000	132,000	140,000
Pahang	105,370	107,000	128,000	136,000
East Johor	75,269	80,000	100,000	120,000
East Coast	309,432	330,000	400,000	440,000

Remarks: Including trash fish
Source: 1990 Data from Annual Fisheries Statistics1992, DOF

Table III.1.3 Projection of Marine Fish Production in Mersing District (1990-2020) (Case-1)

Unit: MT

	1990	1995	2000	2010	2020
1. Mersing District					
1) Penyabong	1,063 (2%)	1,194 (3%)	1,194 (3%)	1,194 (3%)	1,194 (3%)
2) Mersing	13,595 (30%)	14,080 (29%)	14,080 (29%)	14,080 (29%)	14,080 (29%)
3) Endau	30,392 (67%)	32,480 (68%)	32,480 (68%)	32,480 (68%)	32,480 (68%)
Sub-total	45,050 (100%)	47,754 (100%)	47,754 (100%)	47,754 (100%)	47,754 (100%)
2. Other Area	30,219	31,746	31,746	31,746	31,746
East Johor	75,269	79,500	79,500	79,500	79,500

Remarks: Including trash fish
Source: 1990 Data from DOF Mersing

Table III.1.4 Projection of Marine Fish Production in Mersing District (1990-2020) (Case-2)

Unit: MT

	1990	1995	2000	2010	2020
1. Mersing District					
1) Penyabong	1,063 (2%)	2,600 (5%)	3,150 (5%)	3,750 (5%)	4,800 (5%)
2) Mersing	13,595 (30%)	13,000 (25%)	15,750 (25%)	18,750 (25%)	24,000 (25%)
3) Endau	30,392 (67%)	36,400 (70%)	44,100 (70%)	52,500 (70%)	67,200 (70%)
Sub-total	45,050 (100%)	52,000 (100%)	63,000 (100%)	75,000 (100%)	96,000 (100%)
2. Other Area	30,219	28,000	27,000	25,000	24,000
East Johor	75,269	80,000	90,000	100,000	120,000

Remarks: Including trash fish
Source: 1990 Data from DOF Mersing

Table III.1.5 Projection of Marine Fish Production in Mersing District (1990-2020) (Case-3)

Unit: MT

	1990	1995	2000	2010	2020
1. Mersing District					
1) Penyabong	1,063 (2%)	2,340 (4%)	4,200 (6%)	8,625 (10%)	10,000 (10%)
2) Mersing	13,595 (30%)	16,380 (28%)	17,500 (25%)	17,250 (20%)	20,000 (20%)
3) Endau	30,392 (67%)	39,780 (68%)	48,300 (69%)	60,500 (70%)	70,000 (70%)
Sub-total	45,050 (100%)	58,500 (100%)	70,000 (100%)	86,375 (100%)	100,000 (100%)
2. Other Area	30,219	31,500	30,000	28,625	25,000
East Johor	75,269	90,000	100,000	115,000	125,000

Remarks: Including trash fish
Source: 1990 Data from DOF Mersing

Table III.1.6 Number of Boats, Trips and Fish Catch in Endau, Mersing and Penyabong (1990-2010) (1/3)

Endau

	1990					1995					2010				
	No. of Boats	Trips Per Year	Days Per Trip	Catch Per/Year (MT)	Catch/ Boat/Trip (MT)	No. of Boats	Trips Per Year	Days Per Trip	Catch Per/Year (MT)	Catch/ Boat/Trip (MT)	No. of Boats	Trips Per Year	Days Per Trip	Catch Per/Year (MT)	Catch/ Boat/Trip (MT)
Trawler															
Class-A	25	105	1.2	802	0.31	5	100	1.3	150	0.30	-	-	-	-	-
Class-B	39	48	4.6	5,876	3.14	30	40	4.5	3,600	3.00	-	-	-	-	-
Class-C	78	31	5.7	12,650	5.23	60	40	5.0	12,000	5.00	70	40	4.5	15,200	5.43
Class-C2	37	25	6.6	7,417	8.02	84	25	7.0	17,400	8.29	120	25	9.0	30,000	10.00
Total	179			26,745		179			33,150		190			45,200	
P.Seine															
Class-A	2	84	1.2	105	0.63	-	-	-	-	-	-	-	-	-	-
Class-B	3	97	1.2	384	1.32	5	60	1.5	390	1.30	-	-	-	-	-
Class-C	10	114	1.3	3,006	2.64	10	50	2.0	1,250	2.50	25	50	2.0	4,500	3.60
Class-C2	2	-	-	-	-	5	30	4.0	1,240	8.27	10	30	4.0	2,500	8.33
Total	17			3,495		20	-	-	2,880	-	35	-	-	7,000	-
Others															
Class-A	2	240	1.0	12	0.03	10	240	1.0	120	0.05	-	-	-	-	-
Class-B	20	180	1.0	140	0.04	20	180	1.5	250	0.07	20	180	1.5	300	0.08
Class-C	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Class-C2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	22	-	-	152	-	30			370		20			300	
TOTAL	218			30,392		229			36,400		245			52,500	

Source: Data 1990 from DOF Mersing

Table III.1.6 Number of Boats, Trips and Fish Catch in Endau, Mersing and Penyabong (1990-2010) (2/3)

Penyabong

	1990					1995					2010				
	No. of Boats	Trips Per Year	Days Per Trip	Catch Per/Year (MT)	Catch/ Boat/Trip (MT)	No. of Boats	Trips Per Year	Days Per Trip	Catch Per/Year (MT)	Catch/ Boat/Trip (MT)	No. of Boats	Trips Per Year	Days Per Trip	Catch Per/Year (MT)	Catch/ Boat/Trip (MT)
Trawler															
Class-A	25	110	1	1,063	0.39	-	-	-	-	-	-	-	-	-	-
Class-B	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Class-C	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Class-C2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	25			1,063											
P.Seine															
Class-A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Class-B	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Class-C	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Class-C2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	0			0		-	-	-	-	-	-	-	-	-	-
Others															
Class-A	-	-	-	-	-	20	240	1.0	800	0.17	40	240	1.0	1,050	0.11
Class-B	-	-	-	-	-	25	180	1.0	1,800	0.40	50	180	1.5	2,700	0.30
Class-C	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Class-C2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	-	-	-	-	-	45			2,600		90			3,750	
TOTAL	25			1,063		45			2,600		90			3,750	

Source: Data 1990 from DOF Mersing

Table III.1.6 Number of Boats, Trips and Fish Catch in Endau, Mersing and Penyabong (1990-2010) (3/3)

Mersing

	1990					1995					2010				
	No. of Boats	Trips Per Year	Days Per Trip	Catch Per/Year (MT)	Catch/ Boat/Trip (MT)	No. of Boats	Trips Per Year	Days Per Trip	Catch Per/Year (MT)	Catch/ Boat/Trip (MT)	No. of Boats	Trips Per Year	Days Per Trip	Catch Per/Year (MT)	Catch/ Boat/Trip (MT)
Trawler															
Class-A	150	121	1.3	2,863	0.16	5	120	1.2	90	0.15	-	-	-	-	-
Class-B	32	48	4.5	4,514	2.94	30	50	4.0	4,200	2.80	20	50	4.0	3,000	3.00
Class-C	12	39	5.4	1,763	3.77	40	40	5.0	6,420	4.01	50	40	5.0	10,000	5.00
Class-C2	12	25	6.6	1,872	6.24	-	-	-	-	-	-	-	-	-	-
Total	206			11,012		75			10,710		70			13,000	
P.Seine															
Class-A	2	92	1.4	103	0.56	-	-	-	-	-	-	-	-	-	-
Class-B	3	65	1.8	233	1.19	5	60	1.5	360	1.20	5	60	1.5	900	3.00
Class-C	9	98	1.4	2,247	2.55	10	50	2.0	1,250	2.50	10	50	2.0	2,500	5.00
Class-C2	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	14			2,583		15	-	-	1,610	-	15	-	-	3,400	-
Others															
Class-A	-	-	-	-	-	100	200	1.0	200	0.01	100	220	1.0	880	0.04
Class-B	-	-	-	-	-	100	160	1.0	480	0.03	100	180	1.5	1,470	0.08
Class-C	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Class-C2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	-	-	-	-	-	200			680		200			2,350	
TOTAL	220			13,595		290			13,000		285			18,750	

Source: Data 1990 from DOF Mersing

Table III.1.7 Changes in Number and Class of Boats in Endau with the New Fishing Port (1995 & 2010)

	1990	To Penya.	From Mer	B-->C	C-->C2	New	1995 Total	To Penya.	From Mer	B-->C	C-->C2	New	2010 Total
Trawler													
Class-A	25	-12 -8					5	-5					-
Class-B	39			-9			30			-30			-
Class-C	78			+9	-27		60			+30	-20		70
Class-C2	37		+12		+27	+8	84				+20	+16	120
Sub-total	179						179						190
P. Seine													
Class-A	2	-2					-						-
Class-B	3					+2	5			-5			-
Class-C	10						10			+5	-5	+15	25
Class-C2	2					+3	5				+5		10
Sub-total	17						20						35
Others													
Class-A	2	+8					10	-10					-
Class-B	20						20						20
Class-C	-						-						-
Class-C2	-						-						-
Sub-total	22						30						20
Total	218						229						245

Remarks: 1) B-->C = class-B boats changed/upgraded to class-C boats.

2) C-->C2 =s class-C boats changed/upgraded to class-C 2 boats.

Source: Data 1990 from DOF Mersing

Table III.1.8 Projected Number of Fishing Boats in Mersing District (1990-2010)

Unit: Boats

	1990	1995	2010
Endau			
Class-A	29	15	0
Class-B	62	55	20
Class-C	88	70	95
Class-C2	39	89	130
Total	218	229	245
Penyabong			
Class-A	25	20	40
Class-B	0	25	50
Class-C	0	0	0
Class-C2	0	0	0
Total	25	45	90
Mersing			
Class-A	152	105	100
Class-B	35	135	125
Class-C	21	50	60
Class-C2	12	0	0
Total	220	290	285

Remarks: Projection of number of boats is based on case 2 (Table III.1.4).
Source: Data 1990 from DOF Mersing

Table III.1.9 Marine Landing Projection at LKIM Complex and Private Jetty in East Johor (1990-2020)

Unit; MT

				Without Project		With Project	
	Marine Landing	Trash Fish	Food Fish	Landing at LKIM	Landing at Private Jetty	Landing at LKIM	Landing at Private Jetty
Endau-Johor							
1990	30,392	14,892	15,500	1,150	14,350	1,150	14,350
1995	36,400	14,560	21,840	2,184	19,656	10,920	10,920
2000	44,100	13,230	30,870	3,087	27,783	21,609	9,261
2010	52,500	13,125	39,375	3,938	35,438	35,438	3,938
2020	67,200	16,800	50,400	5,040	45,360	50,400	0
Mersing							
1990	13,595	6,558	7,037	1,710	5,327	1,710	5,327
1995	13,000	5,200	7,800	3,900	3,900	4,680	3,120
2000	15,750	4,725	11,025	5,513	5,513	7,718	3,308
2010	18,750	4,688	14,063	7,031	7,031	12,656	1,406
2020	24,000	6,000	18,000	9,000	9,000	18,000	0
Kuala Sedili							
1990	30,219	14,578	15,641	4,395	11,246	4,395	11,246
1995	28,000	11,200	16,800	5,880	10,920	6,720	10,080
2000	27,000	8,100	18,900	6,615	12,285	11,340	7,560
2010	25,000	6,250	18,750	6,563	12,188	16,875	1,875
2020	24,000	6,000	18,000	6,300	11,700	18,000	0

Remarks: 1) Share of trash fish of total landings: 50% (1990); 40 %(1995); 30% (2000); 25 %(2010 & 2020).
2) Landing of Penyabong is excluded.
Source: Data 1990 from DOF Mersing

Table III.1.10 Marine Landing Projection of Endau-Rompin at LKIM Complex and Private Jetty (1990-2020)

Unit: MT

Pahang	Marine Landing	Trash Fish	Food Fish	Without Project Landing at LKIM	Without Project Landing at Private Jetty	With Project Landing at LKIM	With Project Landing at Private Jetty
Endau-Rompin							
1990	9,474	4,642	4,832	0	4,832	0	4,832
1995	11,051	4,420	6,631	0	6,631	3,315	3,315
2010	15,370	3,843	11,527	0	11,527	10,374	1,153

Remarks: 1) Share of trash fish of total landings; 40% (1995) and 25% (2010).
2) Food fish landings: 1995 - Private jetty (50%) and LKIM (50%).
2010 - Private jetty (10%) and LKIM (90%).

Source: Data 1990 from DOF Mersing

Table III.1.11 S/D Balance of Fisheries Products in East Johor (1990-2010)

Unit:MT

	Fish Supply			Fish Demand			
	Production	Import	Sub-total	Local	Others	Export	Sub-total
1990	38,927	0	38,927	9,901	9,562	19,464	38,927
1995	48,390	0	48,390	12,183	7,173	29,034	48,390
2000	63,157	0	63,157	13,897	11,366	37,894	63,157
2010	75,000	0	75,000	17,405	12,595	45,000	75,000
2020	90,000	0	90,000	21,889	14,111	54,000	90,000

Remarks: 1) Production data excludes trash fish but includes aquaculture.
2) The per capita consumption volume of 44.4 kg estimated during Nationwide M/P FMDS (1991) was used.
3) Income elasticity = 0.0
4) Local refers to local consumption estimated for East Johor (Mersing and Kota Tinggi Districts).
5) Other refers to consumption outside Mersing & Kota Tinggi Districts and outside Johor State.
6) Data exclude Rompin-Endau landings.

Source: Data 1990 from Annual Fisheries Statistics 1992, DOF

2. Planning

2.1 Fishery Resource Management Plan

Although a survey on fishery resource management is not the main focus of this study, it is hypothesized that the underlying cause in the decrease in fish catch volume in recent years is due to over fishing of coastal fishery resources. Therefore, it is necessary to carry out a survey for the formulation of M/P that would include the possibility of implementing the following measures.

(1) Urgent measures

It is necessary to implement the following measures in order to maintain current resource levels, and to effectively use the potential resources.

1) Carry out a trial operation of lobster cage fishing (if this measure is successful, lobster trawling would be prohibited).

2) Prohibit trawling in fishing grounds located within five miles off the coastline.

3) Regulate the cord mesh of all trawl nets (half mesh-size of more than 30m/m, with square-mesh mounting).

4) Install artificial reefs: The purpose of the fish aggregating device (FAD) in this instance is to keep out large trawlers from the area as well as to provide a sanctuary for fingerlings and fish spawning.

(2) Measures to organize a fishery resource management structure

1) Biological survey of fishery resources (spawning, growth, food, age groups, etc.)

2) Reinforce the propagation of fishery resources
Fish fry propagation and release of major fish species.

3) Increase in fish production volume due to improvements in fishing technology

Under present conditions, it is impossible for boat owners to take the initiative in remodeling the fishing boat. Therefore, by encouraging the remodeling of private AFA boats and by employing experienced, foreign experts such as the captain, engineer, boatswain, etc. on a contract basis will help promote the interest of those engaged in the fishing industry.

a) Both trawlers and purse seiners will be of the stern type (transfer the bridge to the stern to secure working space). As trawling nets require a stroking action,

and a stern type of boat cannot be introduced a tunnel type will be used.(Fig. III.2.1.1).

b) A fish-pond will be installed in the space on the deck (for sorting of fish).

c) A warp or purse-line will replace the steel-wire with a drum-type, system reel type which can also be used as a net roller.

d) In the case of stern-type boats, crew quarters will be located at the bow or will be adapted at the upper stair, if the upper deck housing is of a tunnel type.

e) Create space for sorting. Partition and create five to six different areas. Firstly, sort the fish. Secondly, wash the fish thoroughly in sea water and store them in fish boxes.

f) Stacking fish boxes in the fish hold will prevent fish from being crushed.

g) Placing ice on top of the fish will allow the melted ice water to chill and wash the fish.

h) Fish must always be washed in offshore sea water and careful attention must be paid to avoid contamination with dirty river water.

4) Introduction of new fishing methods and equipment

Fishery resources can be protected and fish production increased by replacing fishing gears currently employed by class A small fishing boats to new methods and equipment (Fig. III.2.1.2).

a) Production capability can be increased by enlarging the "bubu", a small stationary trap. The stationary trap will be upgraded to small bottom set nets.

b) Introduce shrimp cage fishing.

c) Introduce fish culture

5) The marine park as a means of environmental protection

The Malaysian government has designated the offshore islands of Mersing district as an ocean preserve. The government is planning a marine park resort that will enrich the lives of the population, by protecting and cultivating the rare plants and animals that inhabit the nearby islands.

Currently, the DOF, in joint cooperation with the state governments where the marine park is located, is managing the plant and animal life within this preserve. Although the aim of the park is to instruct and enhance the public's awareness of the natural environment, its relationship with the fishing industry is weak.

In future the activities of the marine park must be expanded to include not only the cultivation of rare plants and animals, but protection of valuable fishery

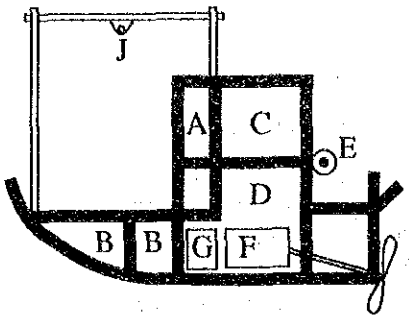
resources as well. Constructive utilization of the natural environment to its fullest will require increased stability of fish propagation in the surrounding waters.

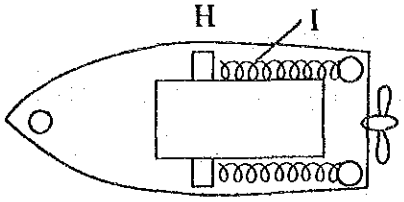
It is also necessary for the state governments, with the cooperation of DOF, to set up facilities that will enhance public understanding of the ocean through experiences encountered at the beach, i.e. building an aquarium that will also function as a fishery research center.

It is essential to study the possibility of developing a recreational resort such as a seaside resort with camping and fishing grounds, a sea farm, etc. while carrying out the production of fish fry for artificial release or other fish culture activities to manage fishery resources relevant to the fishing industry.

2.2 Fish Marketing Plan

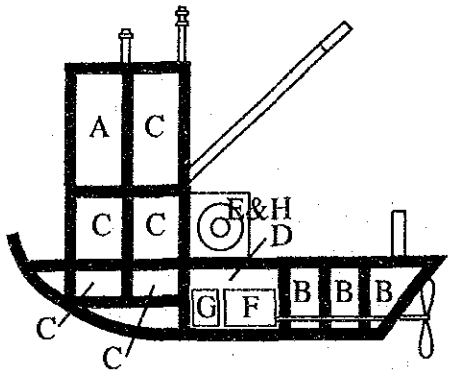
Currently about 24 percent of the landed volume at the LKIM complex in Endau is marketed through AFA auction and the rest (77%) is consigned directly. Fish landed at private jetties are directly consigned by boat owner to their contacts in the consumption area. In 1990, AFA auctioned about 270 MT (23%) of 1,150 MT of food fish landed at the LKIM complex. There was no auction by fish traders. The planned marketing system, similar to the Kuantan marketing system, is shown in Fig. III.2.2.1. With the new complex, 14, 235 MT in 1995 and 45,812 MT in 2010 are projected to be landed at the complex (Table III.2.2.1). In order to stimulate the competition at the auctions, the AFA should initiate a market-linked credit program using a revolving fund and increase the number of licenses issued to fish traders.



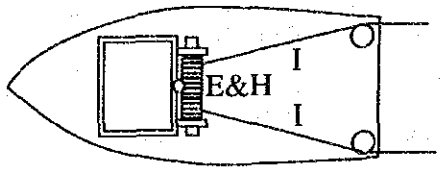


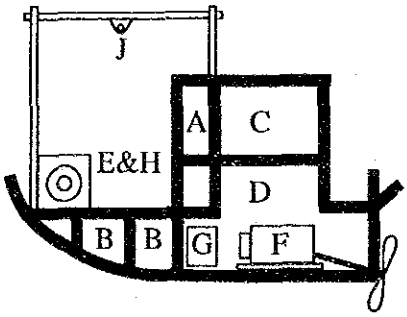
Actual-Type

Legend
A : Bridge
B : Fish Hold
C : Crew's Room
D : Engine Room
E : Net Hauler
F : Main Engine
G : Generator
H : Winch
I : Warp
J : Triangle Plate
K : Tunnel

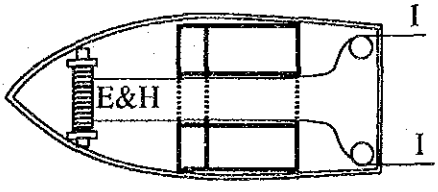


Stern-Type





Tunnel-Type



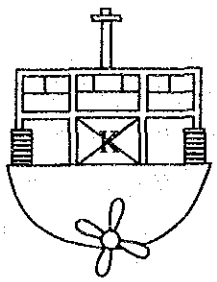
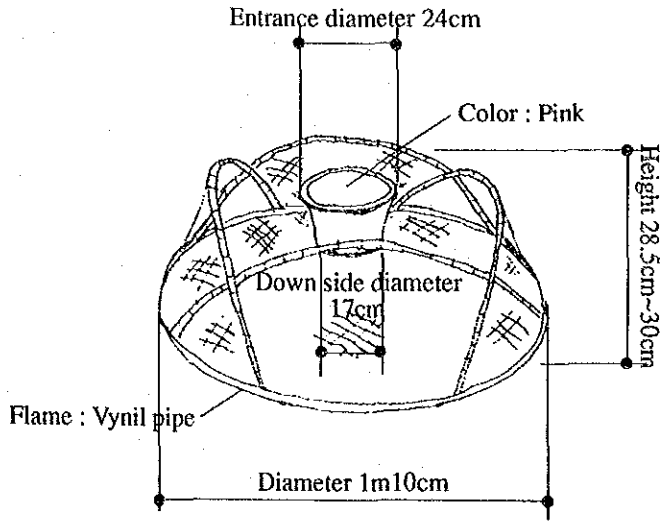


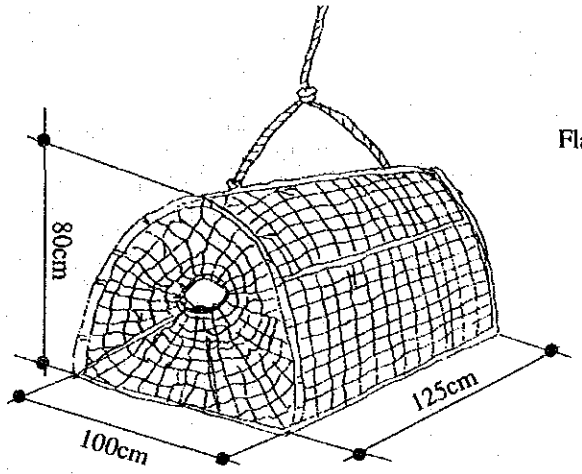
Fig. III.2.1.1 Fishing Boat Improvement Plan

GOVERNMENT OF MALAYSIA
THE FEASIBILITY STUDY ON THE PILOT PROJECT FOR IMPROVEMENT OF FISH MARKETING AND DISTRIBUTION SYSTEM IN MALAYSIA
JAPAN INTERNATIONAL COOPERATION AGENCY

Shrimp Trap-Cage



Fish Trap-Cage



Bottom Set Trap-Net

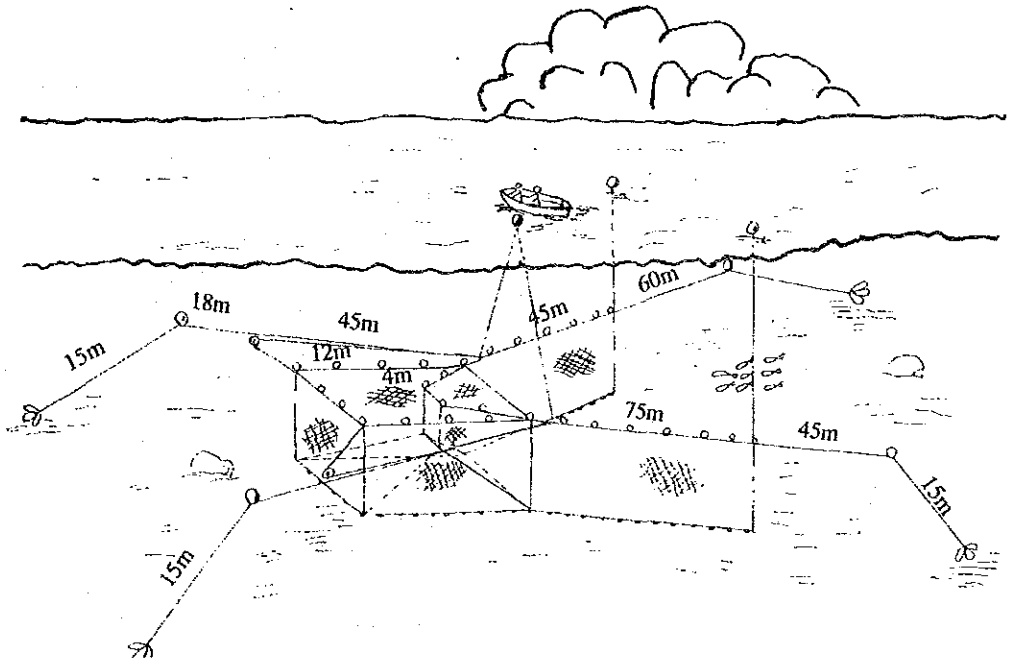


Fig. III.2.1.2 Introduction of New Fishing Gear

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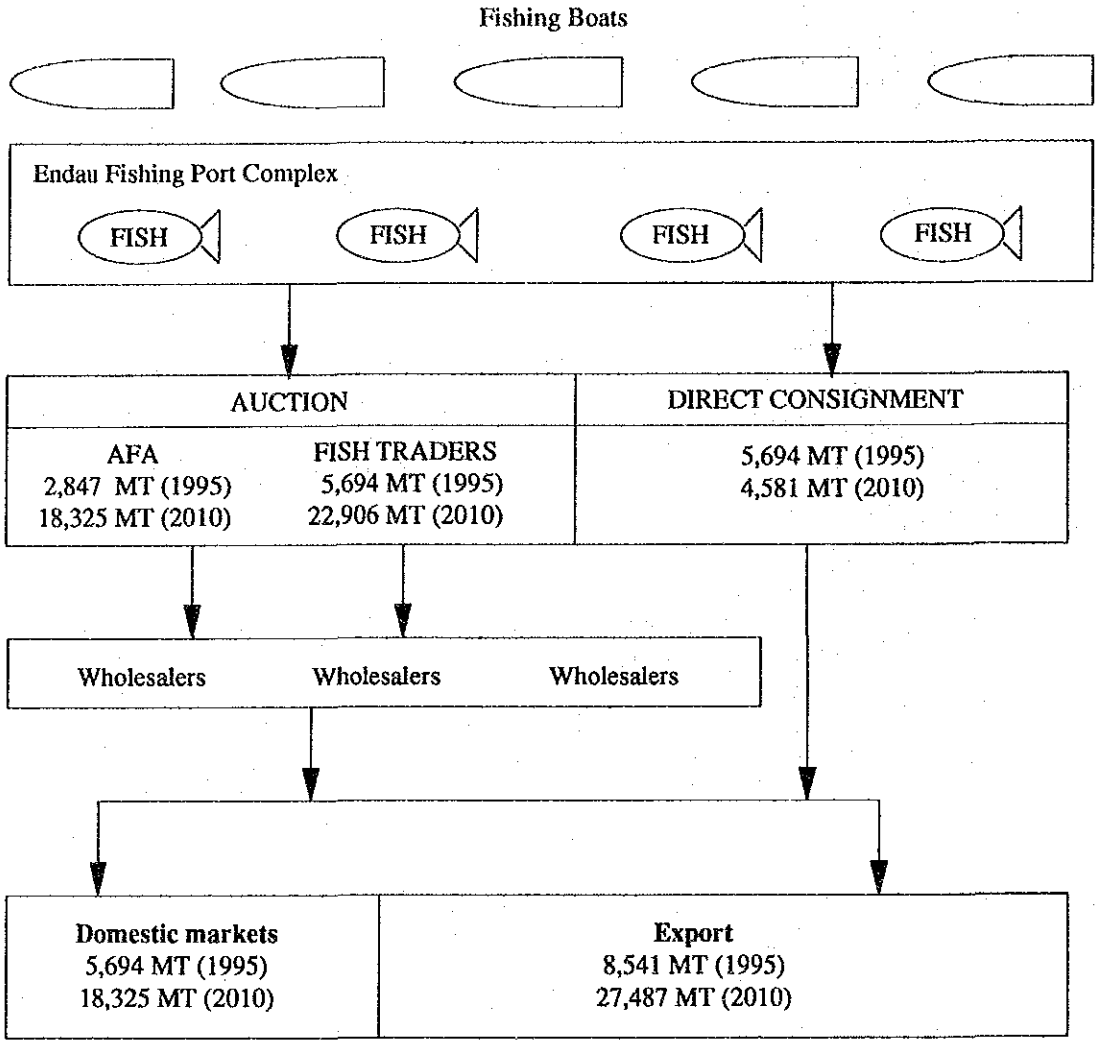


Fig. III.2.2.1 Endau Fish Marketing System

Table III.2.2.1 Auction volume by AFA and Fish Traders and Direct Consignment Volume of Food Fish Landed at LKIM Complex (1990-2010)

Unit: MT

	Auction Volume (MT)		Direct	Total
	AFA	Fish Traders	Consignment	Food Fish
1990	270 (23%)	0 (0%)	880 (77%)	1,150
1995	2,847 (20%)	5,694 (40%)	5,694 (40%)	14,235
2000	6,820 (20%)	13,640 (40%)	13,640 (40%)	34,100
2010	18,325 (40%)	22,906 (50%)	4,581 (10%)	45,812

Remarks: 1) For 1990 - present condition
2) For 1995 - Planned: auction share AFA (20%) traders (40%) and direct consignment ((40%).
3) For 2010 - Planned: auction share AFA (40%) traders (50%) and direct consignment ((10%).
4) 1995 and 2010 data include Endau-Rompin landings.

Source Data 1990 - Log Book of LKIM, Endau 1992

2.3 Fish Marketing Information System (FMIS)

The FMIS revisions implemented by LKIM will not make it easier to obtain accurate on-site data from the fish landing sites, wholesale markets, etc. In addition, collecting and sending data to the LKIM central office by the LKIM complexes and state offices, and to have this data fed back once again to them, will produce a time lag. Due to this factor, it would not be effective to apply the data provided by the central FMIS, to market strategy which is aimed at revising the distribution system. It would be more appropriate to utilize it as statistical data, to help grasp market movements throughout Malaysia in policy making decisions. In addition, it would place a heavy burden on the LKIM complexes at the fish landing sites, if they are required to send their data to the central office on a daily basis. Therefore, only high priority data collected from the site will be sent to the central office.

An outline of the FMIS plan in the study area is given in Fig.III.2.3.1. Portable telephones will continue to be the means of communication for class B, C, and C2 fishing boats during fishing operations. Telephones will generally be used at fish landing sites and wholesale markets. However, class A fishing boats will not require a means of communication during their fishing operations, since they do not need fish price information as their fish landing jetties are fixed and the cost of portable telephones far exceed the revenue from their fish catch.

The computer section of the administrative personnel department of the new fishing port management will be responsible for inputting and storing data on fish distribution obtained from fishing boat owners, traders, the AFA, etc.; and this data base will be utilized in policy decisions of the complex, in future projections, etc. Information on the previous day's wholesale market conditions will be available from the computer section to fishing boats out at sea, as a point of reference in their negotiations with the fish landing site, or to fish traders and the AFA, in their negotiations with the wholesale market.

Concurrently, the AFA will continue to play the role of fishing boat owner and fish trader by continuing their fishing boat operations and fish auctions. Furthermore, an AFA staff member will be assigned to information management within the association. He will be responsible for inputting and storing data on fishing operations of AFA boats and the auction (fish price, volume, etc.). In addition, he will be responsible for disseminating information concerning the auction of the previous day, to fishing boats out at sea upon their request.

Devising an open information system as delineated above, will accelerate free competition in fish marketing within the Project model area.

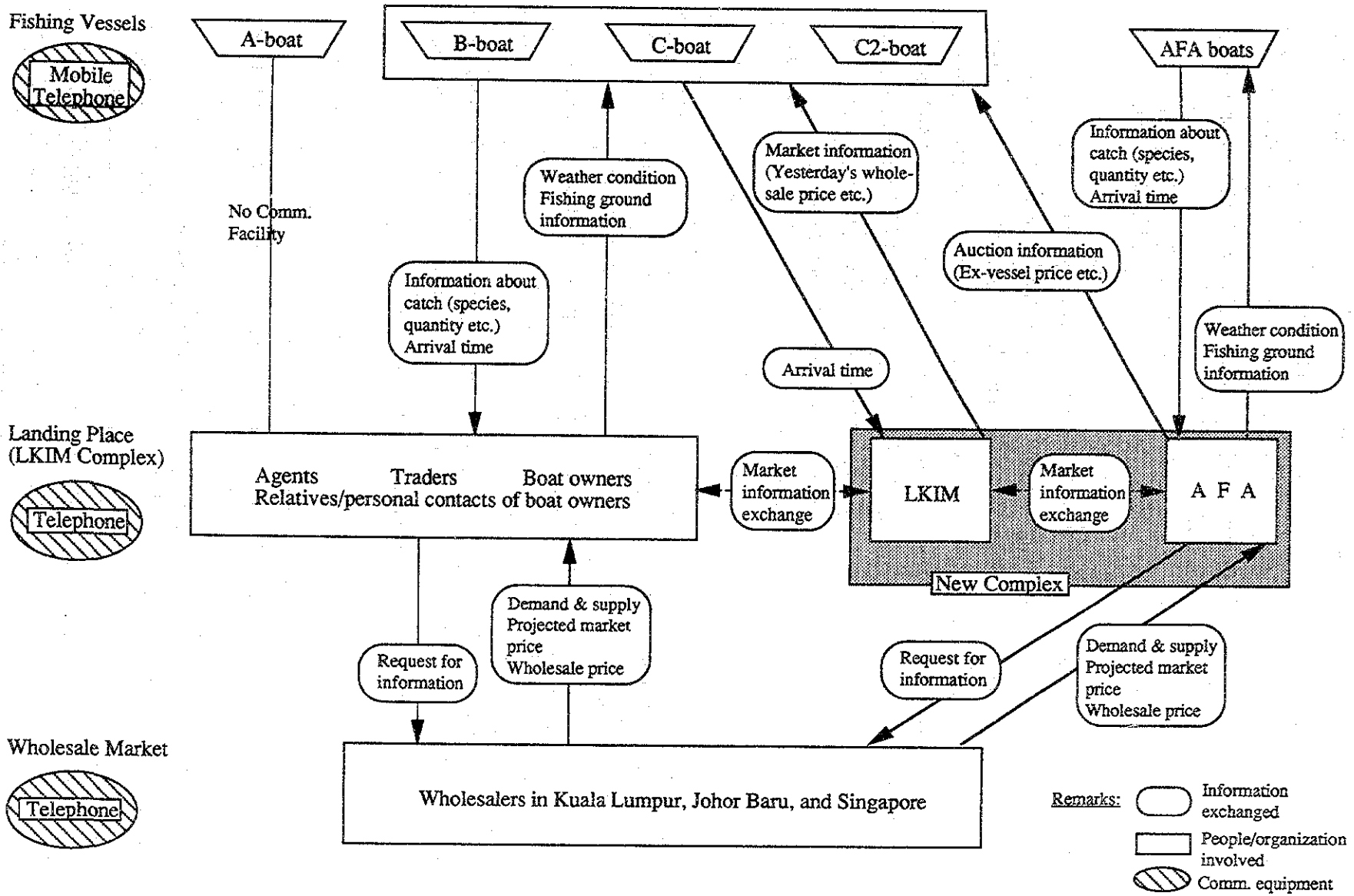


Fig. III.2.3.1 FMIS Improvement Plan

2.4 Improvements in Organization and System

2.4.1 Objectives

The objectives are to accelerate AFA participation in fish distribution and to strengthen the organization of the AFA.

2.4.2 Strategy

The aims are to strengthen the AFA, increase fishing opportunities, promote participation in fish distribution activities, and improve fishermen incomes. In order to achieve these goals, measures to improve the operation level of each AFA activity and to strengthen its organization/system will be devised. Although the assistance of government bodies such as the LKIM and BPM will be required during the initial stages of the newly organized AFA, it will be managed independently by fishermen as a completely private organization in future. Another issue which will be resolved over the long-term, is the acceleration of AFA participation in fishery resource management.

2.4.3 Summary of the Plan

(1) AFA membership revisions

AFA membership will be composed of members who are bound by the same interests. In particular, members whose interests conflict with the economic activities of the association will either be excluded from membership or restricted from directly participating in its management.

It will be necessary to create a steering committee comprised of representatives from MOA, LKIM, NFA, SFA, AFA, and various representatives of fishermen who will assist in formulating a system of membership revisions.

1) Member qualifications

a) Members will be divided into full and associate members.
b) Membership will be centered on fishermen who are actually engaged in fishing activities at sea.
c) All fishing crew members will be given full membership status.
d) Fish traders/distributors will either be accorded associate membership status or completely excluded from the association.
e) Among the associate members, those who contribute to upgrading the livelihood of professional fishermen and who are cooperative with AFA management, will be given full member status with the approval of the board of directors.
f) Under the system of full and associate memberships, full members of the AFA

will be granted all the rights and obligations as set forth under the current AFA Act. In addition, although associate members will not be permitted to participate in the election of AFA board members or to run for office, they will also be granted all other rights and obligations guaranteed by the AFA Act.

2) Optional plan on member qualifications

	Option 1	Option 2	Option 3	Option 4
1. Full Member				
11(1) A	All	All	All	All
11(1) C	Only boat owners	Only boat owners	Only boat owners	Only boat owners
11(1) B	Excluded	Only processors	Excluded	Excluded
11(2)	Excluded	Excluded	Excluded	Excluded
2. Quasi Member				
11(1) B	All	Only fish traders	Excluded	Only processors
11(1) C	Exclude boat owners	Exclude boat owners	Excluded	Excluded
11(2)	All	All		All
Advantages	1. Decrease the influence of traders & processors 2. No objection to bringing in system; keep current member composition	1. Decrease the influence of traders 2. Secure cooperation of processors 3. No objection to bringing in system; keep current member composition	1. Eliminate the influence of traders & processors 2. Easy to devise economic strategy due to member fishermen only 3. Easier management of AFA	1. Eliminate the traders and decrease the influence of processors 2. Easy to devise economic strategy due to member fishermen only 3. Secure cooperation of processors 4. Easier management of AFA
Disadvantage	Difficult to administer AFA due to member composition	Difficult to administer AFA due to member composition	High resistance to major reforms	

Remarks:
11(1)A : Any person engaged in catching, harvesting or culture of aquatic organisms for a minimum period of ninety days a year.
11(1)B : Any person who is a fish processor, handler or dealer.
11(1)C : Any person who receives sixty percent or more of their total income from the fishing industry.
11(2) : Any person who conducts research or is engaged in development and improvement of the fishing industry will be eligible for associate member.

3) Priority options

a) Selection factors: AFA strategy, goals which can be achieved without too much difficulty, expansion opportunities for AFA activities

b) Order of priority: 1. option IV
2. option II,
3. option I,
4. option III

(2) Revisions of the credit system

The following policies will be adhered to in the area of credit system revisions.

1) In order to avoid confusion on the financial market, the existing credit system will be utilized.

2) In view of the difficult administrative banking procedures, public funds will not be directly given to the AFA.

In accordance with these policies, the existing BPM credit system for large development loans (for shipbuilding, etc.) will be reinforced to include small operating loans (for fishing boat operations and repairs, etc. of boats and fishing equipment), which will be provided to members via the newly introduced AFA revolving fund system.

Financial resources for fishermen will be comprised of AFA capital and the BPM revolving fund. The shortage of capital for the pilot project will be partially offset by government subsidy. This subsidy will support only the initial inception period of the pilot project. The subsidy amount will furnish the operating capital for the first two months of the project.

The AFA will procure its own capital through a system of fish consignment contracts between the association and its members and through collection of loans to fishermen.

Based on the findings of the interview survey, it was found that about 60 percent of the total number of fishermen are in need of loans as of 1992; and it is projected that by 1995 these needs can be met.

Petty fishing boats and fishermen who are cooperative with the AFA will be given loan priority.

Details of a BPM to AFA system of financing is outlined in the following pages.

1) Loan beneficiaries

Fishermen who will be eligible for BPM loans are AFA members who have signed a fish sales consignment contract with the association and who have joined the fishing boat insurance plan through the AFA.

2) Interest

The interest rates on BPM loans to the AFA and on AFA loans to the fishermen will be kept as low as possible.

3) Types of collateral

a) Amount of a loan

The maximum amount of a loan without collateral is RM5,000 (estimated to be the amount required to purchase an outboard engine for small scale fishing operations). The only requirement is the guarantee of two people.

b) Loans which exceed RM5,000 require collateral. The types of collateral accepted are fishing boats, fishing equipment, and fishing boat insurance.

4) Loan repayment methods

Loans will be collected by offsetting the amount from consignment sales via the AFA, in accordance with the consignment contract signed between the fisherman and the association. Loans will be collected according to a plan worked out between the AFA and the fisherman on the duration and percentage of repayment. It is projected that 10 percent of the total amount of sales generated from one fish landing will be the collection rate.

5) Loan reserve fund

A loan reserve fund, equivalent to two months operating capital of all eligible fishing boats will be prepared.

6) Credit for diesel oil and ice

If interest is added to the sale of diesel oil and ice, it is feared that many of the fishing boats would transfer their business to the private jetties which also offer interest free credit for diesel oil and ice. One possible solution to this dilemma would be to collect a three percent handling fee for consigned fish sold through auctions or to collect interest on fishermen's savings accounts.

(3) Strengthening expansion measures on AFA economic activities

1) Strengthening fresh fish sales activities

a) Providing operating loans for fishing boats

AFA activities to market fresh fish will be expanded by implementing measures to provide operating loans to fishing boats. In an interview survey of fishermen, 72 percent of the boat owners were willing to sell their fish through the AFA, if the AFA were able to provide operating funds. Therefore, it is anticipated that with the availability of operating loans to fishermen, the volume of fresh fish sales transacted by the AFA will increase.

b) Systematization of consignment contracts for fresh fish

A fish consignment contract will be signed between the AFA and beneficiaries of operating loans and thereby, increase the fish sale volume of the AFA.

According to interview survey findings, fishermen support for an AFA fish consignment contract between themselves and the association was only 38 percent. However, this figure is expected to rise with the introduction of AFA operating loans for its members.

c) Employ and educate a fish marketing specialist

An AFA fish distribution specialist who is knowledgeable on market distribution conditions of each area will either be employed or trained. Another possibility is to commission the work to qualified personnel in the private sector.

d) Strengthening measures to educate wholesalers and retailers

Measures will be implemented to increase the number of wholesalers and retailers who are cooperative with the AFA in marketing fresh fish.

e) Strengthening fishing operations of AFA owned boats

The volume of fresh fish transacted through AFA auctions will be increased through fishing operations of large fishing boats owned by the AFA, in order to make the auctions more attractive for fish traders.

2) Strengthening purchasing activities (diesel oil and ice)

a) The ratio of fishing boats landing their fish at the LKIM complex will grow with the implementation of a new credit system (operating loans), education of members, etc.

b) In addition to diesel oil from the NFA, the AFA will also purchase spot oil in order to maintain a competitive edge over the private jetties.

3) Strengthening independent AFA fishing operations

Fishing operations by large fishing boats owned by the AFA will be continued, in order to enable the association to secure a source of revenue from fish landings and to revitalize the fish auctions.

4) Mediating sport fishing

The AFA will act as a mediator between sport fishing customers and Class A boat owners, in order to enable petty fishing boats to earn additional revenue apart from their fishing activities. A uniform system of fees based on the number of hours the boat is chartered, the distance traveled, the number of customers, etc. will be established. If such supplementary revenue can be guaranteed for A class boats, it may induce them to give up trawling activities. This may be a contributing factor for an early resolution to the issue of declining fishery resources.

At present the law stipulates that all boats are required to have a passenger boat license before they can take in passengers. Under the existing law, fishing boats are not eligible to receive a passenger boat license; and therefore, this law must be revised.

Meetings will be held between the LKIM and AFA and other relevant government bodies to expand the eligibility rules to include fishing boats. By specifically restricting the licenses to sport fishing, the rights of passenger boat licensees will not be violated by allowing fishing boats to obtain passenger boat licenses. This stipulation may make it easier to receive approval of licenses for sport fishing boat.

(4) Comprehensive social activities

Formulation of comprehensive social activities will not only increase the merits of member participation, but will stimulate the growth of a spirit of cooperation.

1) Initiation of social welfare activities based on members' savings plan

A social welfare plan based on members' savings plan can be initiated by increasing pension premiums, which cover educational assistance for children of fishermen and monetary compensation in the event of accident or death for fishermen families, and by allotting two-thirds to one-half of the premium to a savings plan. This measure will help increase social welfare benefits, in addition to encouraging an awareness to save.

Measures to revise the existing compensation on death or disaster, educational assistance, and other social welfare activities will be implemented by increasing pension premiums of members and instituting a premium based savings plan.

2) Movement to encourage member savings

In order to expand AFA operational capital and to stabilize the livelihood of its members, AFA members will be encouraged to save. Members will be persuaded to voluntarily open savings accounts with the AFA and AFA staff members will periodically make the rounds of members to collect money for their savings accounts.

3) Education of AFA members

Various cultural lectures will be held for members in order to elevate their social knowledge and to foster a spirit of cooperation. Films and videos on fishing operations from around the world, fishing village life, activities of fishing associations, etc. will be used.

4) Fishing management guidance

Guidance on fishing management practices in the areas of fish production, capital, etc. will be introduced. AFA personnel, trained by LKIM officers, will periodically conduct lectures and offer personal guidance and supervision to fishermen.

(5) Strengthening administrative ability of AFA

1) Establish an educational system for employees of cooperatives

An educational system for employees of cooperatives will be established, in order to carry out intensive training programs for AFA management and office personnel, and in particular, the cultivation of middle management personnel.

a) Educational facilities

The Training Center at Camal Laut, belonging to the LKIM will be utilized as an educational facility for AFA personnel.

b) Period of study

The educational programs will all be short-term, lasting from three to six months. Each proposed curriculum will require 10-15 hours.educational

c) Proposed curriculum of an educational program

- Malaysian fishing cooperative law, fishing regulations, cooperative law, regulations of laws relevant to fishing
- Fishing laws of advanced nations, fishing regulations, etc. Commercial law, banking law, etc.
- Theory on cooperative (principles of cooperatives of the world, movements, history, structure, operations, etc.), general economics, economic theory (economic management, financial administration, etc.), financing, etc.
- Fisheries economics, theory on natural resources (brief summary)
- Shorthand, statistics, etc. required in AFA administrative duties
- Fishing, fishing laws, fishing equipment (hands on training)
- Computer technology (operation)
- Other subjects considered necessary by the Malaysian government

d) Teaching staff

Instructors will be selected from universities, relevant government agencies, and the business sector.

e) Students

Participants who are eligible for the educational programs are AFA managers, assistant managers, and persons in charge of various areas of the AFA.

f) Educational program costs

Educational program costs will mainly be covered by LKIM investment funds, in addition to joint investment by the NFA, SFA, and the AFA.

g) Lecture fees, room and board costs

There will be no lecture fees and the costs of room and board will be met by the participant's respective AFA.

2) Administration of the AFA

The administration of the AFA will be assisted by a few reinforcements in middle management personnel for the time being. These middle management personnel will remain with the association until such personnel can be fostered within the AFA itself. They will be LKIM employees or personnel from the private sector, who will be hired by the LKIM on a contract basis.

In conjunction with the progress and development of an AFA educational program, the association will gradually shift to autonomous management when their personnel begin to take over the duties of the assisting LKIM officers.

3) Systematization of management

The conditions surrounding AFA members will be accurately grasped and this information will become the base on which AFA management will evolve. An individual data file will be compiled for each member, (information on boat ownership, scope and condition of fishing boat, party with whom fish is transacted, other source of income, occupation, number of fishing crew members, names of fishing crew, social status, family background, etc.) and put into the computer.

4) Increase membership dues

Membership dues will be increased to levels in keeping with the conditions of the Malaysian economy and a spirit of cooperation among members will be fostered (an awareness of joint management).

In the interview survey of fishermen, 54 percent of the respondents agreed to an increase in membership dues. Furthermore, in discussions with the Endau AFA, it was agreed that the issue would be put to a vote in its general meeting.

The amount of the increase in dues would be left to the independent discretion of each AFA.

(6) Administrative operation

The highest decision making body within the AFA is the general meeting. AFA activities are approved by the board of directors who are elected at the general meeting. The general manager who is appointed by the chairman of the board submits reports on administrative matters, policies on activity operations, etc. and carries them out on receiving approval of the general meeting.

The administration of each AFA activity is carried out by AFA employees who have been hired with the approval of the board of directors, and are under the direction of the general manager and assistant general manager.

In addition to an accounting and economic affairs division, the AFA will acquire a social activities and a credit division, which will enlarge the number of staff members to a total of 39 personnel. Of this number, six personnel will be based at the branch office in Penyabong to oversee AFA services for Class A fishing boats.(See Fig. III.2.4.1)

1) General Manager (1)

In view of the present educational level of the fishermen, recruiting an individual appropriate for the position of general manager from among them, is difficult. Therefore, the general manager will be recruited from the private sector (with talented administrative abilities and management "sense") or from the LKIM. The general manager will be entrusted with the sole responsibility for the actual operation of all AFA activities.

2) Assistant general manager (1)

The assistant general manager will administer the AFA with the cooperation of the general manager and he will fulfill the role of general manager in his absence. In addition to carrying out his duties under the direction of the general manager, he will be responsible for carrying out an administrative survey of the "East Johor Public Fishing Port Complex".

3) Administrative personnel department (4)

a) Department chief: Administrative, financial, and general accounting duties

b) One financial/accountant officer and three clerical workers

4) Economic affairs division (23)

a) Division chief (1): General management of all economic activities

b) Sale of diesel oil and water (5)

Division chief (1): Promoting sales, managing storage facilities

Workers: Clerical (1), assisting boats (1), fueling (1), water supply (1)

c) Fish trading (6)

Division chief (1)

Clerk (1)

Auction personnel (2), fish landing and transport (2)

d) Sale of Ice (5)

Division chief (1): General administration

Clerk (1)

Workers: Buyer (1), transport (1), Sales (1)

e) AFA owned fishing boat operation (2)

Division chief (1): General administration

Management and operations (1)

5) Social activities division (1)

6) Credit division (3, of which 2 personnel will also work for the social activities division)

a) Division chief (1): General administration

b) Loan officer (1): BPM loans, collection, loans to members (including social welfare activities)

c) Savings officer (1): Members' savings accounts (including social welfare activities)

7) Penyabong branch office (6)

a) Sale of diesel oil and water (2)

b) Fish transactions (2)

c) Sale of ice (2)

(7) Long-term strategy

The long-term strategy of the AFA is to achieve a participating role in fishery resource management activities. Under the supervision of the DOF, AFA will be commissioned exclusive fishing rights of a specific ocean area within its allocated area. In exchange for these exclusive fishing rights, it will be responsible for the management and use of the fishing grounds, as well as for measures propagating fishery resources.

1) Necessity of exclusive fishing grounds

Current DOF measures on issuing fishing boat licenses, fishing equipment licenses, and demarcating the ocean area by fishing operations, are insufficient in terms of fishery resource management and propagation. It would be more effective to systematize fishery resource management of the coastal areas by establishing exclusive fishing grounds and allowing them to be maintained as

fishing areas while implementing measures to manage and propagate its fishery resources.

2) Allocate a portion of coastal fishery resource management to the AFA

Allocating the management of fishing grounds and its fishery resources along the coastal areas to the AFA, would encourage the awareness of joint management and use of the fishing grounds and its resources by fishermen.

3) Formulating fishing rights

As countermeasures against depleting fishery resources, the AFA will drop artificial reefs and artificially release fish fry in order to help propagate resources. In exchange for such measures, the AFA will be granted exclusive fishing rights for use of the fishing grounds by its members. In order to realize these fishing rights, "a steering committee on formulating fishing rights" will be set up to deliberate on the scope and category of fishing rights to be granted.

In addition, the AFA will be required to get DOF approval of their plans to use and manage the fishing grounds before implementing them. An outline of the proposed fishing rights are given below.

a) AFA joint fishing rights: all forms of traditional fishing such as hook and line, gill net, trap, long-line, cage, etc., with the exception of purse seines

b) Demarcation on AFA fishing rights: all forms of fish culture activity

4) Fishing rights and fishing area

The ocean area and scope of AFA fishing rights will be set up by a "committee in charge of ocean demarcation" and its proposals will be studied. This committee will be composed of representatives from DOF, LKIM, AFA, SFA, state and local government officials, and various AFA fishermen representatives.

5) Establishing joint fishing rights (the right to jointly use fishing grounds)

When fishing grounds must be shared with an adjoining AFA or when the fishing grounds of one AFA are unevenly distributed, joint fishing rights will be established upon deliberation.

6) Fishing fees

a) A nominal fee will be collected for use of exclusive fishing grounds. This fee will be used to cover the cost of managing the grounds, implementing artificial release of fry, dropping artificial reefs, etc.

b) This fee will be collected by the AFA and divided between DOF and AFA.

7) Example of resource management method

An example of AFA management of exclusive fishing grounds and its resources in the model area of Penyabong is shown in Figs. III.2.1.2 and III.2.4.3.

a) Establishing exclusive AFA fishing grounds

- Prohibit trawling within exclusive fishing grounds
- Prohibit fishing operations by non-AFA members within exclusive fishing grounds
- Prohibit fishing operations by fishing boats registered in other AFAs
- Prohibit fishing operations in areas where artificial reefs have been dropped or fish fry have been released by AFA

b) Institute fishing licenses

- Joint fishing rights

The AFA will independently establish restrictions on the number of fishing licenses issued, according to fishing methods, the number of fishing equipment, and will establish fishing grounds and fishing period. Fishing grounds and its resources will be managed through implementation of these measures.

	Number of Boats with License	Number of Gears with License	Fishing Season	License Period	Fishing Area	Number of gears used (Decision by AFA)
a. Small set net	50	100	All Year	5 years	Zone-I	10 cages/set
b. Kelong	-	50	All Year	5 years	Zone-I-A	one/person
c. Gill net	50	250	All Year	5 years	Zone-I	5 sets/boat 10 pcs/boat
d. Drift net	50	150	All Year	5 years	Zone-I	3 set/boat 500 m/set
e. Hook/line	50	-	All Year	5 years	Zone-I	No regulation

- Exclusive fishing grounds

Exclusive fishing grounds will be managed by implementing restrictions on the number of fishing licenses issued, designating the fishing area covered by the license, establishing the effective period of the license, and specifying the boundaries of the fishing area within the fishing grounds.

	Aquaculture Areas	Aquaculture Season	Licensed Area	Approved Area
a. Fish culture	10	10 years	Zone-I-B	15,000 m^2
b. Mussel culture.	5	5 years	Zone-I-C	500 acres

Remarks: 1) The dimensions of area used in fish culture of various fish species for one operator which is covered by the license is about 150 m x 100 m = 15,000 sq. m. These are the actual dimensions of one fish culturist operating in the offshore waters of Penyabong

2) The dimension of the area used in the fish culture of mussels was based on the dimensions used in the culture of Kerang by NFA (NEKMAT).

- Establish a protected fishing area (prohibit fishing in areas where activities propagating resources are taking place)

Fishing will be prohibited in areas where large artificial reefs have been dropped to propagate fishery resources.

Number of Fishing Area	Protected Area	Protected Zone
5	1 area X 1 square kilometer	Zone-I-D - D-5

Remarks The aforementioned parameters proposed for a protected area were taken from the Himejima Fishermens' Cooperative in Oita Prefecture, Japan. This fishermen's' cooperative is a fishing cooperative for fishermen using traditional fishing methods such as hook and line, gill nets, and long-lines. They have 169 small scale fishing boats of three to five tons in operation. In 1979 six areas covering a total of three square kilometers of ocean were designated as protected areas after artificial reefs were dropped. In 1974 the maximum fish landing volume of these areas was 984 tons. In 1979 the maximum fish landing volume was 1,426 tons, a record increase of approximately 45 percent.

It will be necessary to conduct surveys on the fishing grounds and fishery resources and to take such factors as the structure of fish production in the area, area of fishing operation by fishing boats, type of fishing operation, and customary fishing operations into consideration, before establishing a system of fishing rights. Subsequently, the values given in the aforementioned tables on fishing laws pertaining to fishing rights, the number of fishing boats, the number fishing equipment licenses, effective period of licenses, permitted fishing area, restrictions on the number of fishing equipment to be used, etc. are for reference only.

An example of the fishing rights to be established in the fishing area bordering Mersing district is shown in Fig. III 2.4.2 and 2.4.3.

2.4.4 Implementation Schedule

An implementation program of the Endau AFA institutional reform outlining the enforcement items and task is shown in Fig. III.2.4.4.

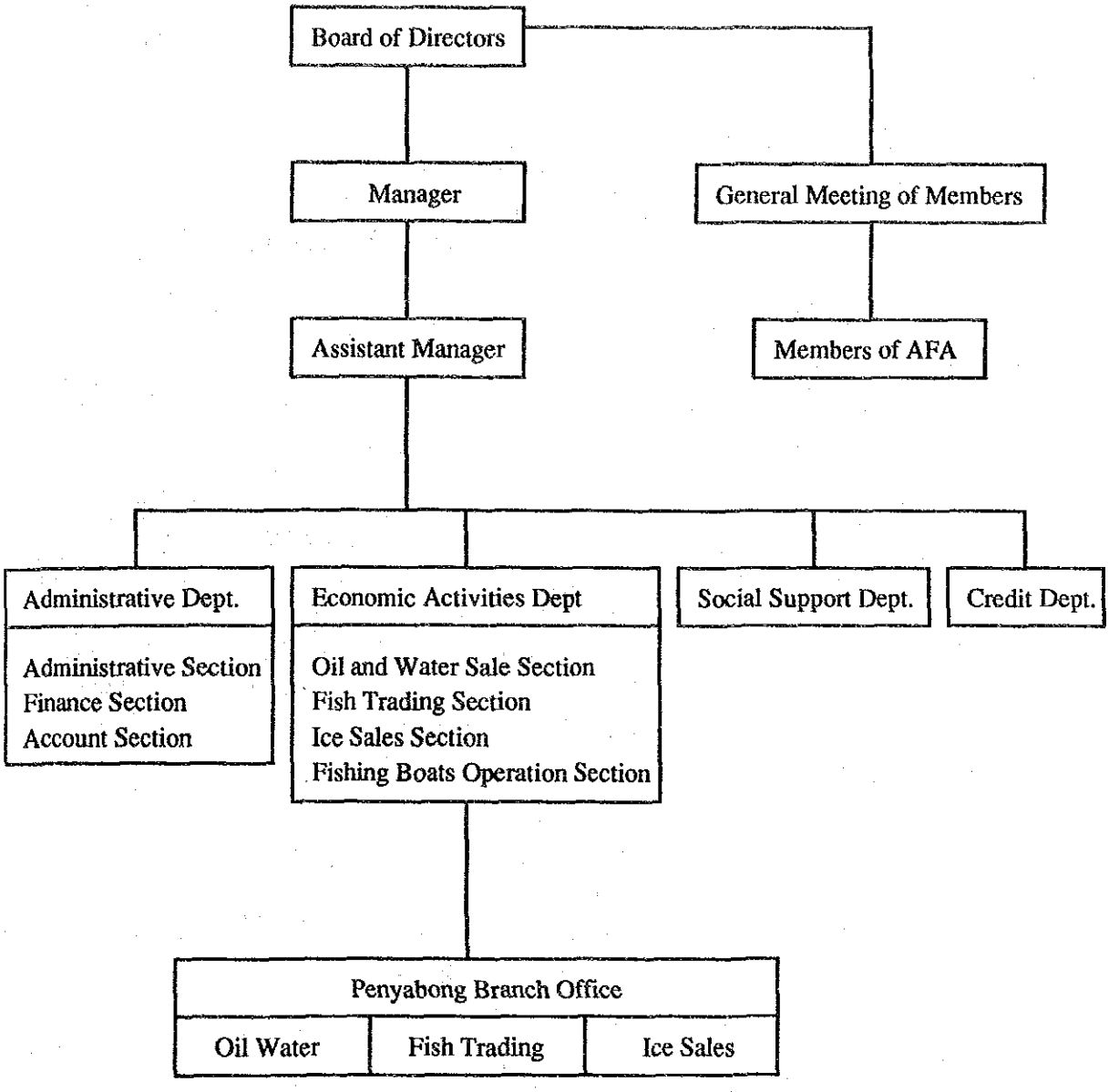
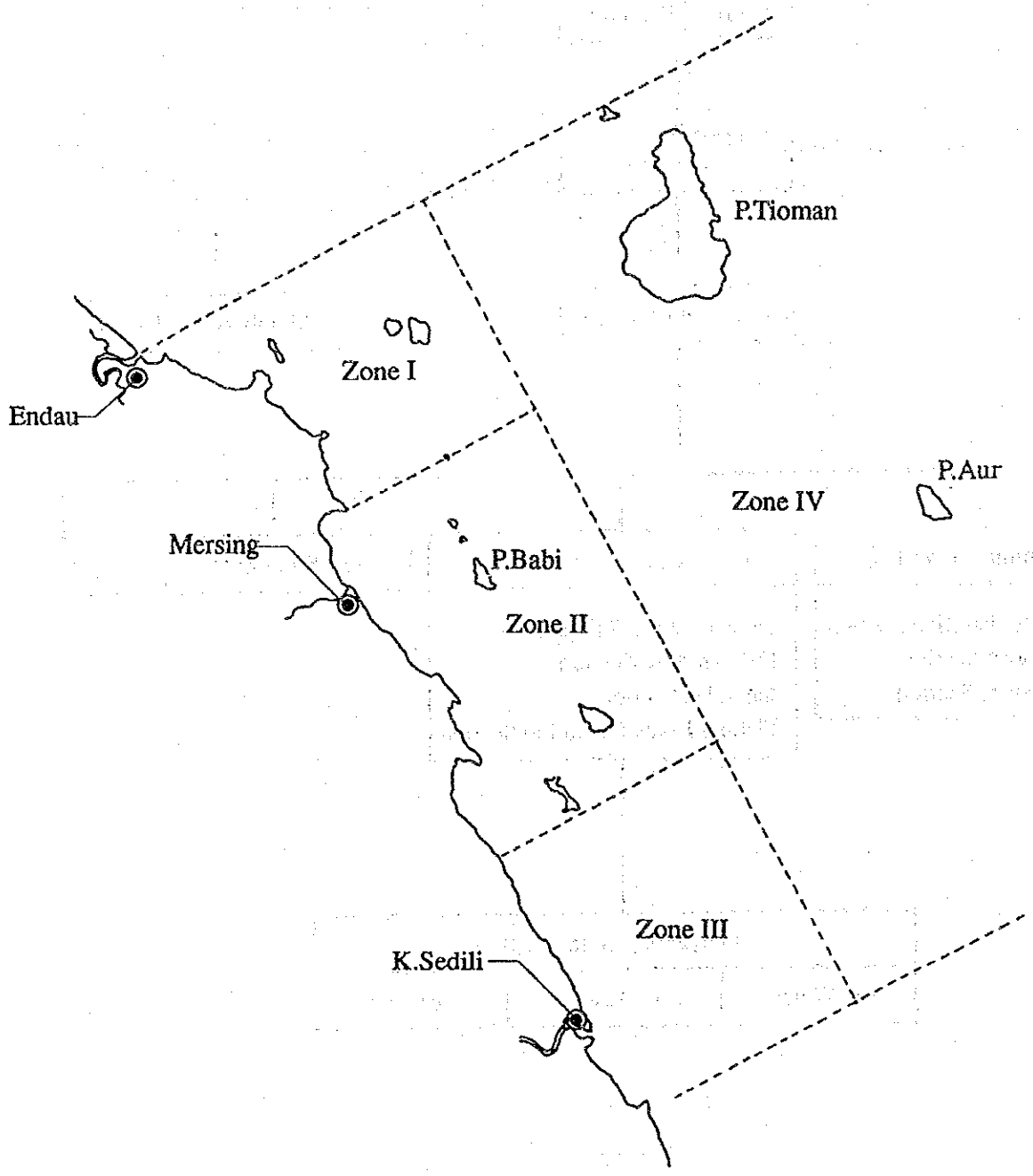


Fig. III.2.4.1 AFA Future Organization Chart



Legends:

I : Endau AFA Exclusive Fishing Ground

II : Mersing AFA Exclusive Fishing Ground

III : K.Sedili AFA Exclusive Fishing Ground

IV : Open Fishing Ground

N

0 10 20 40km

Fig. III.2.4.2 Example of AFA Fishing Ground in Mersing District

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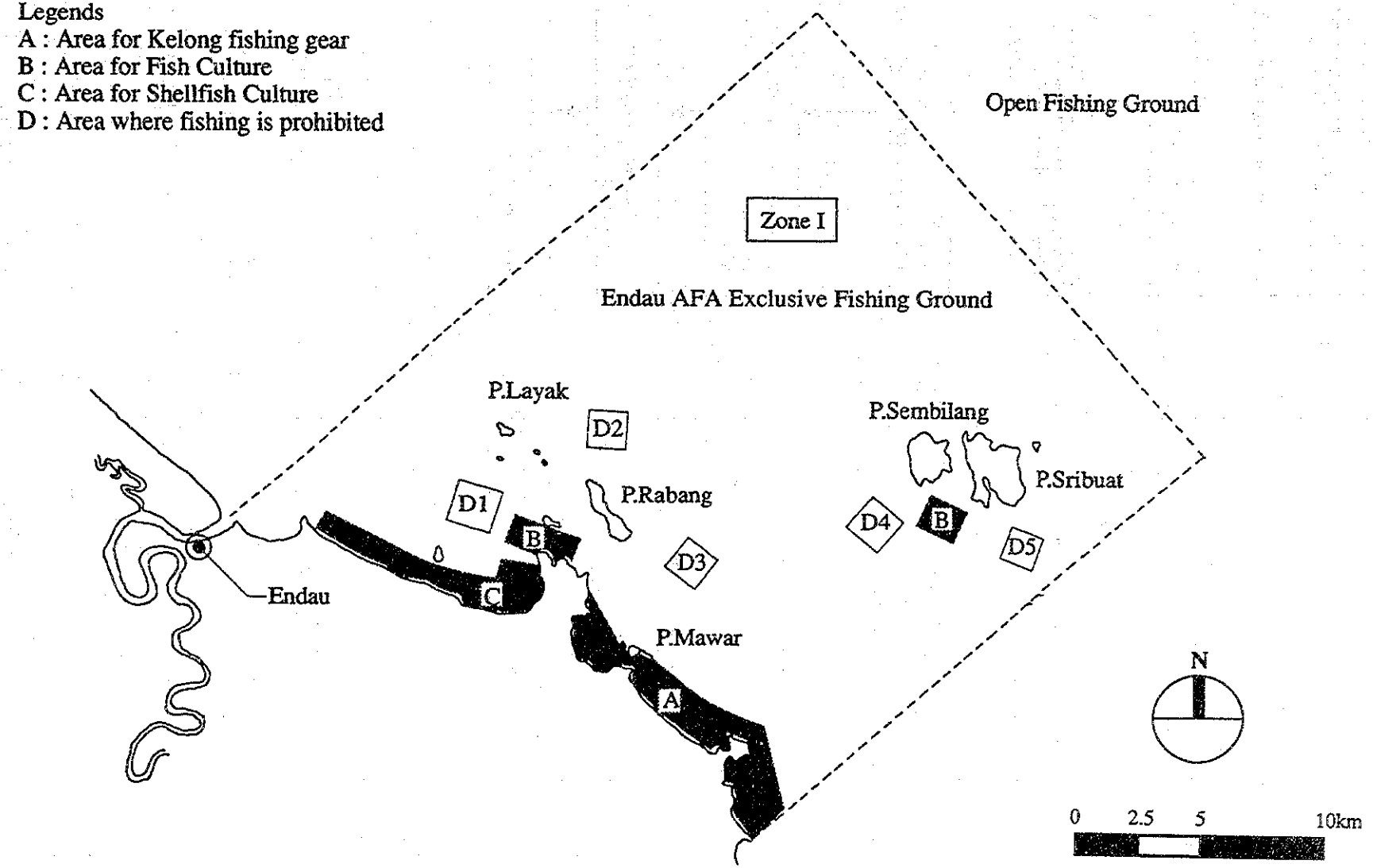

Fig. III.2.4.3 Example of AFA Fishing Ground in Endau

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THE FEASIBILITY STUDY ON THE PILOT PROJECT FOR IMPROVEMENT OF FISH MARKETING AND DISTRIBUTION SYSTEM IN MALAYSIA
JAPAN INTERNATIONAL COOPERATION AGENCY

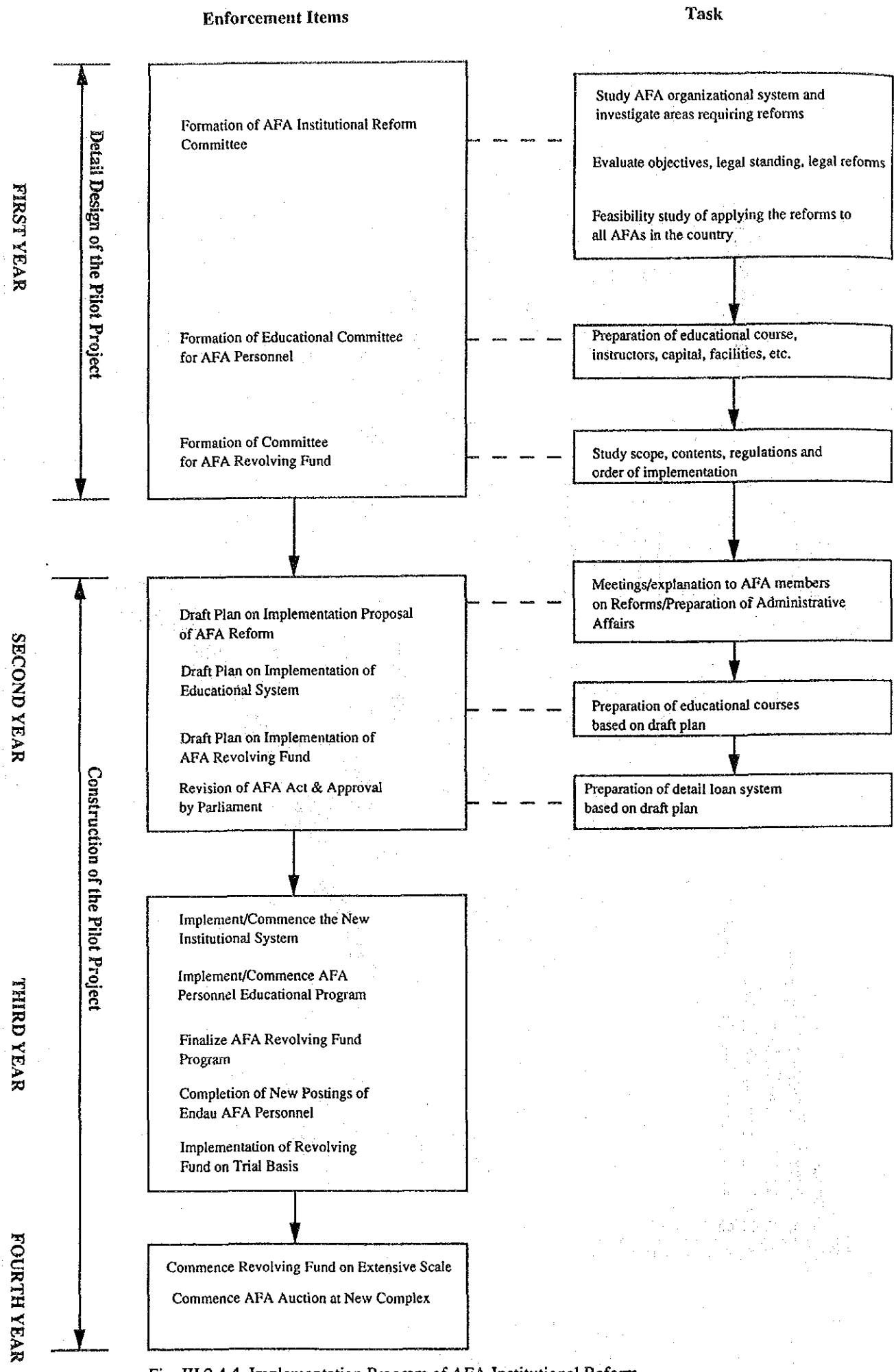

Fig. III.2.4.4 Implementation Program of AFA Institutional Reform

2.5 Improvements to Fishing Port and Fish Marketing Facilities

2.5.1 Development Concept

East Johor will become one of the largest fishing bases on the entire east coast of peninsular Malaysia; and it will be a fishing base centered on fish exportation with an integrated fishing port containing fish landing, distribution, and processing facilities. The Endau fishing port will be the focal center of the area and the adjacent Penyabong will be designated as its satellite. The fishing ports of Mersing and Kuala Sedili will function as sub centers. This arrangement will enable small and large fishing boats to be separated according to fishing port, and allow the fishing base to function more efficiently. The Pilot Project will be concerned only with implementing new facilities and improvements to the focal center, Endau.

(1) Area strategic planning

1) Center

The Endau fishing port will be designated as the center of the fishing industry in east Johor and it will mainly be a base for offshore fisheries.

2) Sub center

The fishing ports of Mersing and Kuala Sedili will be the sub center of the area and they will function mainly as a base for coastal fisheries.

3) Satellite

Penyabong has traditionally been a fishing base for coastal fisheries; and due to its close vicinity to the Endau fishing port, it has been designated as its satellite center of operations. It will mainly handle high priced fish as a port for small fishing boats.

(2) Characteristics of the Endau fishing port

1) The fishing port will mainly service large fishing boats of 40 MT or more (class C, C2).

2) The fishing port will be a modern fish processing export base.

3) The fishing port will be the focus of a pilot project instituting reforms in the fish distribution system of Malaysia.

(3) Projected fish landing volume of Endau fishing port

The projected fish landing volume of the Endau fishing port is given below.

Unit: MT

Year	Food Fish	Landing at	
		LKIM	Private Jetty
1990	15,500	1,150	14,350
1995	28,471	14,235	14,236
2010	50,903	45,812	5,091

Remarks: 1995/2010 data includes Endau/Rompin landings.
Source: Data of 1990 from DOF, Mersing

(4) Projected number of fishing boats at Endau fishing port

The projected number of fishing boats at Endau fishing port are shown below, according to class of boats.

Unit: Boats

Year	Class-A	Class-B	Class-C	Class-C2	Total
1990	37	76	125	50	288
1995	23	68	96	115	302
2010	0	29	119	171	319

Remarks: 1995/2010 data includes boats of Endau/Rompin.
Source: Data of 1990 from DOF, Mersing

(5) Selection of Project site

In a comparative analysis of the two candidate sites and the alternative plans, it was concluded that site 2 was more appropriate than site 1 as a Project site (see Fig.III.2.5.1).

1) In comparison to site 2, the distance required to secure sufficient water depth at site 1 was further; and the area of level ground was narrower. Moreover, the site was surrounded by mangroves.

2) The estimated construction cost of basic facilities at site 1 was higher than the estimated cost at site 2.

	Site 1 Expansion of existing LKIM complex	Site 2 Construction site near river mouth
1) Location	About 1 km upstream from the National Road 3 Endau bridge, near the existing LKIM complex on the right bank	About 100 m downstream from the National Road 3 Endau bridge on the right bank
2) Topography, sounding		
- Bottom slope	About 4/100	About 7/100
- Standard depth necessary for large fishing boat's draft (under -3.5 m at the lowest water level)	Required depth located about 130 m from the right bank.	Required depth located about 90 m from the right bank.
- Flat ground	Available area near existing LKIM complex 25 m x 20 m + 500 m^2	About 14,000m^2
- Road	Existing gravel road with 14 m width will be available if repaired	Flat ground adjoins the National Road 3. Construct the access road from Road 3.
- Environment around the site	Mangrove swamp around the flat ground and road	Upstream from the site: National Road 3. Downstream from the site: Private jetty, fish meal plant.
- Meteorological, maritime condition	Waves entering through the river decrease in height upstream. Very small waves remain.(results of estimation).	Waves entering through the river decrease in height upstream. Small waves remain (results of estimation)
3) Alternative plan on outline of facilities		
a) Unloading/preparation jetty	Length: 160 m Width: 20 m Bridge : 100 m length	Length: 160 m Width: 20 m
Revetment	Length: 300 m	Length: 300 m
b) Mooring jetty	23 sets upstream from National Road 3 bridge	23 sets upstream from National Road 3 bridge

2.5.2 Basic Facilities

The new fishing port planned at Endau is located along the river near the river mouth; and the natural conditions of the land, river, and sea need to be considered in the design. The objective of the port plan is to skillfully exploit this unique situation, by limiting the man-made facilities to a minimum and destroying as little as possible, of the existing balance in natural conditions. Measures to protect these unique features were taken into consideration.

The content and scope of the various facilities are explained below.

(1) Outside facilities

In many instances, in order to secure sufficiently calm waters near the channel, anchorage and mooring facilities, etc., breakwaters are required at the outside facilities. In the case of Endau, it was concluded that artificial breakwaters were not required, according to the reasons given in the survey on natural conditions delineated in Section II.5.2 (9) of this report. The shoals near the river mouth functioned sufficiently as breakwaters; and the danger of changing the balance between the topography, river flow, waves, and drifting sand by installing artificial facilities was avoided.

(2) Facilities in the water area

1) Channel

a) Channel width

The channel width at the port entrance was determined according to the dimensions of the large class C2 fishing boats (length 21.3 meters, maximum width 6.7 meters). The channel width is usually six to eight times wider than the width of the fishing boat. The channel width of the Endau port was established at 50 meters, seven times the width of the fishing boat.

b) Channel depth

Since the full draft of the largest fishing boat to utilize the Endau port (class C2) was -3.0 meters, an additional safety factor of 0.5 meters was added, to establish a water depth of -3.5 meters for the fishing port being planned.

c) Location

The existing trench will be utilized as the channel (see Fig.III.2.5.2).

2) Ship turning basin and anchorage

a) Ship turning basin

In order to enable the fishing boat to safely turn in front of the landing and preparation jetties, the water area width of the turning basin in front of the wharf will be five times longer than the boat length; and the water depth will be -3.5 meters.

b) Mooring

Mooring wharf will be provided 100 meters upstream from the bridge of National Route 3 to the existing LKIM jetty. The navigational channel will be located in the center of the river.

The required water depth of the mooring wharf is -3.5 meters; and the mooring area will encompass the area between both banks of the river (see Fig.III.2.5.2).

(3) Wharf

1) Required wharf length

The wharf length has been calculated on the assumption that the boats using it will be berthed broadside and not at the bow for the following reasons; if the boats are berthed at their bow, the boats are more susceptible to be moved by the wave, wind and current resulting in unstable berthed position. Berthing at the bow will also make loading/unloading and boarding/un-boarding both inconvenient and dangerous. The required length for each wharf is given below.

a) Unloading wharf

The fish landing wharf is used by fishing boats when they unload their fish catch from the boat to the land. The wharf length has been calculated according to the following formula.

Required length = $\sum N/r \times L$, where;

L: Berth length = boat length + surplus
N: Average number of operated boats per day
r: Berth turnover rate = available time for fish landing/unloading time per boat

Allocated available time to use berth for unloading has been set at 4.6 hours in order that all unloading operations will be completed in the morning (Table III..5.1)

b) Preparation wharf

The preparation wharf is used to supply diesel oil, ice, etc. to the fishing boats and requires special facilities in order to carry out this work. Therefore, the required wharf length was also calculated according to the following formula.

Required length = $\sum N'/r' \times L$, where;

L: Berth length = boat length + surplus
N': Average number of operated boats per day
r:' Berth turnover rate = available time for wharf use/preparation time per boat

Allocated available time to use the berth for preparation has been set at 4.6 hours, in order that all preparations will be completed in a half-day (Table III.2.5.1).

c) Mooring wharf

The mooring wharf is used to moor fishing boats and it was calculated according to the following formula.

Required length = $\sum n \cdot B$, where;

n: number of mooring boats per day
B: required berth length per boat

The mooring wharf will be able to accommodate all boats during rough sea conditions, when fishing operations are not possible. In this case, the berth for unloading and preparation (total 13 berths) will also be used for mooring. The figures in the brackets (Table III.2.5.1) show the number of boats using the mooring facilities during normal conditions.

The required length of the wharf, calculated according to the aforementioned formula, is given in Table III.2.5.1.

2) Wharf depth

The wharf depth will be the same depth as the channel and the anchorage, -3.5 meters (Reference Datum: LAT). However, a segment of the wharf which will be used by small boats will have a depth of -3.0 meters.

3) Wharf crown height

The wharf crown height was determined by adding the calculated height to the H.H.W.L (2.66 m). This calculated height takes the tidal difference and boat types into consideration, in order to ensure ease of use and to avoid inundation.

Tide Difference = 2.33 (M.H.W.L) - 1.05 (M.L.W.L) = 1.28
Considering this tide difference, and the types of boat that will be using the wharf, the additional height to be added to H.H.W.L is 1.1 m.

Therefore, the wharf crown height is approximately = 2.66 (H.H.W.L) + 1.1 = 3.8 m

However, in the case of small fishing boats, a portion of the wharf crown height was reduced to about +3.3 meters for more convenient unloading.

4) Apron

Due to the use of fork-lifts in the unloading work at the new facility, the width of the apron was fixed at six meters.

2.5.3 Functional Facilities

(1) Land and preparatory work at the main site

The total area required for the planned site is approximately 7.7 hectares, of which 1.4 hectares (about 18 percent) have already been acquired by LKIM. Although the port compound includes the road owned by JKR and the earth drain owned by JPS, much of the required land is privately owned. In addition to the 7.7 hectares of land required, approximately 0.29 hectares must be acquired to relocate the aforementioned JPS earth drain (See Fig.III.2.5.5), as the proposed construction site runs into a segment of the JPS earth drain. The relocation of the JPS earth drain will also involve the re-routing of the present access road to this drain.

The layout design of the new facilities is shown in Fig.III.2.5.4; and the stage wise construction process of the site is given in Fig.III.2.5.5.

The mangroves within the site will need to be removed, but the mangroves in the back lot will be preserved as much as possible. After the swamp land has been drained, the ground may need to be improved pending soil investigation to be conducted during the detailed design stage. The drainage of the mangrove swamp in the back lot will be reconnected to the relocated JPS earth drain.

All the private jetties in the site will need to be removed and the two existing fish meal plants will be relocated to an area outside the site.

The elevation of the planned site was fixed at 2.5 m (above Land Survey Datum) based on the existing ground level, existing road, the surrounding area ground level, drainage of the site and the floor level of the proposed wharf.

(2) Market hall

1) Projected fish landing volume for food fish to be handled by the Market Hall, excluding trash fish, is as follows:

1995: 14,300 MT/year
2010: 45,800 MT/year

2) The Market Hall will be in operation 360 days of the year, with two landings per day. Eighty percent of the fish catch will be landed in the morning and 20 percent in the afternoon.

3) Fish boxes used in the Market Hall will be made of wood with a maximum storing capacity of 100 kg of fish.

4) The area required for auctions and direct consignments will have the same dimensions.

5) A storage area for boxes prior to shipping and an aisle will be included in the layout plan.

(3) Landing and handling area of trash fish

As a rule, trash fish will be landed at the jetties exclusively owned by the fish meal plants.

(4) Offices

1) The operating office will be located on the second floor of the Market Hall and the administrative office will be housed in a separate structure within the port compound.

2) A locker rest room for temporary workers will be prepared in a separate building. The number of staff members for the LKIM and AFA office are presented below.

Unit: Person

Organization	Administrative Office	Operation Office	Rest Office for Temporary Labor	Total
LKIM	16	10	-	26
AFA	14	19	8	41
Agents	-	-	30	30
Total	30	29	38	97

3) The office for fish traders will be located on the second floor of the Market Hall and it will be enlarged to 5m x 5m from the existing standard LKIM trader's office size. The total number of fish traders who will be based at the port is estimated at 32; and this figure includes the new fish traders and the existing 22 private jetties owners currently in operation.

(5) Ice plant

An ice plant with a production capacity of 50 MT/ day will be constructed based on the operating conditions of the existing ice plant, future demand, and the following assumptions on S/D.

1) The production capacity of the existing ice plant is 200 MT/day; and its operational ratio is 70 percent of its present capacity.

2) The future distribution ratio of the existing ice plant at the Endau area will remain at 70 percent.

Daily requirement volume of ice

Unit: MT

		Demand			
Year	Supply	Fish Catch	Marketing	Total	Balance
1995	98	32	55	88	11
2010	98	47	98	145	-47

(6) Ice storage

Four small ice storage facilities will be placed throughout the Market Hall to ensure a convenient supply of ice, since the new fish landing jetty will be quite long. Ice will be transported in from the new ice plant by mini vans.

1) The daily volume of required ice is given in the aforementioned table.

2) The storage capacity of the ice storage will accommodate one to two deliveries per day from the existing and new ice plants.

(7) Cold storage

Due to the long length of the fish landing jetty, four cold storage facilities will be located conveniently throughout the Market Hall, in conjunction with the ice storage facilities.

1) It is estimated that 30 percent of the daily fish landing volume will be placed in cold storage. The storage volume is given below.

1995: 12 MT/day
2010: 38 MT/day

2) The turnover rate of the stored fish is estimated to be once every four days.

3) Partitions will be installed within the cold storage facilities to divide them into 30 or more sections for lease to fish traders.

4) Loading will be carried out manually.

(8) Freezing plant

1) The two species of fishery products that will be processed by the freezing plant are cuttlefish and round scad.

2) Processed cuttlefish will be exported to Japan and round scad will be processed for domestic consumption.

3) The processed volume of cuttlefish is given below.

a) The current ratio of processed cuttlefish is 55 percent of the local fish landing volume.

b) Seventy percent of exported cuttlefish processed in Kuantan and exported to Thailand will be processed in Endau in the future.

c) The production capacity of the existing processing plant is 720 MT per year and the volume of required the raw material is 1,440 ton/year. The ratio of locally supplied raw materials will be the same as the present ratio of 60 percent or 864 MT.

Unit: MT/Year

	Local fish	Supply for Processing			Existing Plant		Required Capacity
	landing volume	Local Supply	Kuantan	Total	raw material demand	Balance	Per Day
1995	2,081	1,145	627	1,772	864	908	1.5
2010	3,705	2,083	1,116	3,199	864	2,335	3.9

Remarks: 1. Conversion factor = 50 percent
2. Operation day of Plant = 300 days per year

4) The volume of processed round scad is given below.

a) The current ratio of fishing landing volume during the five month peak fishing season is 44 percent of the total annual fish landing volume; and this ratio will remain the same in future.

b) Fifty percent of the fish landing volume during the five month peak fishing season will be processed.

Unit: MT

Year	Local fish Landing Volume	Peak season Landing Volume	Supply for Freezing	Required New Processing Capacity MT/day
1995	3,750	1,659	830	8.3
2010	5,625	2,475	1,240	12.4

Remarks: Operation days of Plant = 20 day/month x 5 months = 100 days

(9) Surimi processing plant

1) The major species of fish used in surimi processing is threadfin breams.

2) The present volume of fish which is head cut, exported and processed in Singapore, will be processed locally.

3) The volume of raw material currently exported to Thailand from Kuantan will be processed locally.

4) The processed product will be transported to the secondary processing plant for surimi-based products in Penang or it will be exported.

Unit: MT/Year

Year	Local Threadfin landing volume	Supply for Processing			Required New production capacity MT/day
		Local Supply	Kuantan	Total	
1995	8,386	1,477	130	1,607	1.1
2010	15,000	3,329	216	3,545	2.4

Remarks: 1. Conversion factor = 20 %
2. Operation day of Plant = 300 days per year

(10) Dried/salted fish processing plant

1) The dried fish processing plant will be capable of producing high quality dried / salted fish through use of a low temperature drying unit.

2) The major species of fish which will be used are ray, queenfish, jew fish, red snapper, and marine catfish.

3) The annual processed volume capacity of this plant will only be 23 MT, and it will also be capable of developing new products on a trial basis.

(11) Fish meal plant

In terms of the available supply volume of raw materials, the scope of the existing plants is satisfactory. The volume of trash fish which is the raw material for fish meal, is projected to decline in future. Therefore a new plant will not be necessary. The two existing plants located at the port construction site will be relocated.

(12) Stockpiling area for fish boxes

1) The number of required fish boxes will correspond to the fish landing volume of one day.
1995: 40 MT/day
2010: 127 MT/day

2) The number of 100 kg boxes to be stockpiled will be the amount required for one day and they will be stacked in three layers.

3) An aisle will be created in the stockpiling area, in order to facilitate loading activities.

(13) Fishing gear repairing area

1) Small repairs will be carried out on board the boat, while large repairs will be done on land.

2) It is estimated that 10 percent of all boats coming into the fishing port daily will undergo major repairs.

3) The total number of fishing nets which will undergo repair have been projected below. Each repair will take three days per day

Year	Trawl Nets/Other Gears	Purse Seine	Total
1995	7	1	8
2010	9	2	11

Remarks: 1) Area required for repairing of trawl nets = 40 sq.m
2) Area required for repairing of purse seines nets = 96 sq.m
3) Area required for repairing of other fishing gears = 20 sq.m

(14) Fishing gear storage facility

1) The agents are mainly fishing boat owners, possessing several fishing boats who are in need of storage facilities for their fishing gear. There are 30 agents and therefore, storage facilities in 30 different lots are required. These lots will be available for their exclusive use.

2) Other fishing boat owners will store their fishing gear at the LKIM facilities; and there will be twenty fishing gear storage facilities managed by the LKIM.

(15) Shipyard

1) The shipyard will also engage in boat construction as well as fishing boat repair.

2) A dock type slipway will be constructed.

3) The repair dock will undertake engine and electrical instrument repair and installation of equipment.

4) The capacity of the existing ship yard will be taken into consideration in the construction of the new shipyard.

5) The projected number of fishing boats which will undergo repair or construction are presented below.

Unit: Boats/Year

	Number of Boats	Repair		Sub-total	New Boats Construction
		Painting	Major Repair		
1995	347	87	22	109	2
2010	409	164	41	205	2

Remarks: No of boats include those in Penyabong

(16) Fuel oil supply facilities

1) The supply volume of fuel oil was estimated according to the number of fishing boats projected to use the LKIM complex.

2) The oil supply pump will be a large capacity pump, capable of supplying 125 liters per minute.

3) The daily projected volume of diesel oil is as follows:

1995: 31 kiloliters
2010: 115 kiloliters

4) The diesel oil tank will be supplied by Shell Oil Company.

(17) Electric power station

1) The electric power station will be divided into three substations according to the reasons delineated below.

a) To prevent a voltage drop in the low voltage supply line due to its extended length in the port compound.

b) Countermeasure against substation breakdowns

2) Installation of generators capable of producing the minimum electrical demand as an emergency countermeasure.

(18) City water reservoir

1) As a preventive measure against water cutoffs, the capacity of the reservoir will be equivalent to the consumption volume of one half day.

2) Both an underground water reservoir and an elevated water tank will be installed.

(19) Well water supply facilities

1) Well water will be used for washing the market floors to minimize the use of city water.

2) The reservoir will have the capacity to store a one day water supply .

3) A pressure tank system will be introduced to the water supply facility.

(20) Waste water treatment facilities

1) Waste water will be treated according to the activated sludge method.

2) Treated water will be discharged in accordance with the standards set by the national environmental laws of Malaysia.

3) Daily waste water will be treated by small treatment units installed at each facility.

4) The source and volume of waste water are given below.

Unit: m^3/day

Year	Freezing Plant	Surimi Plant	Dried/salted Fish Processing Plant	Market Hall	Total
1995	23	52	1	22	98
2010	47	113	1	109	270

2.5.4 Required and Planned Capacity of Each Facility

The required projected capacity and planned capacity of each facility are shown in Table III.2.5.2 and III.2.5.3, respectively.

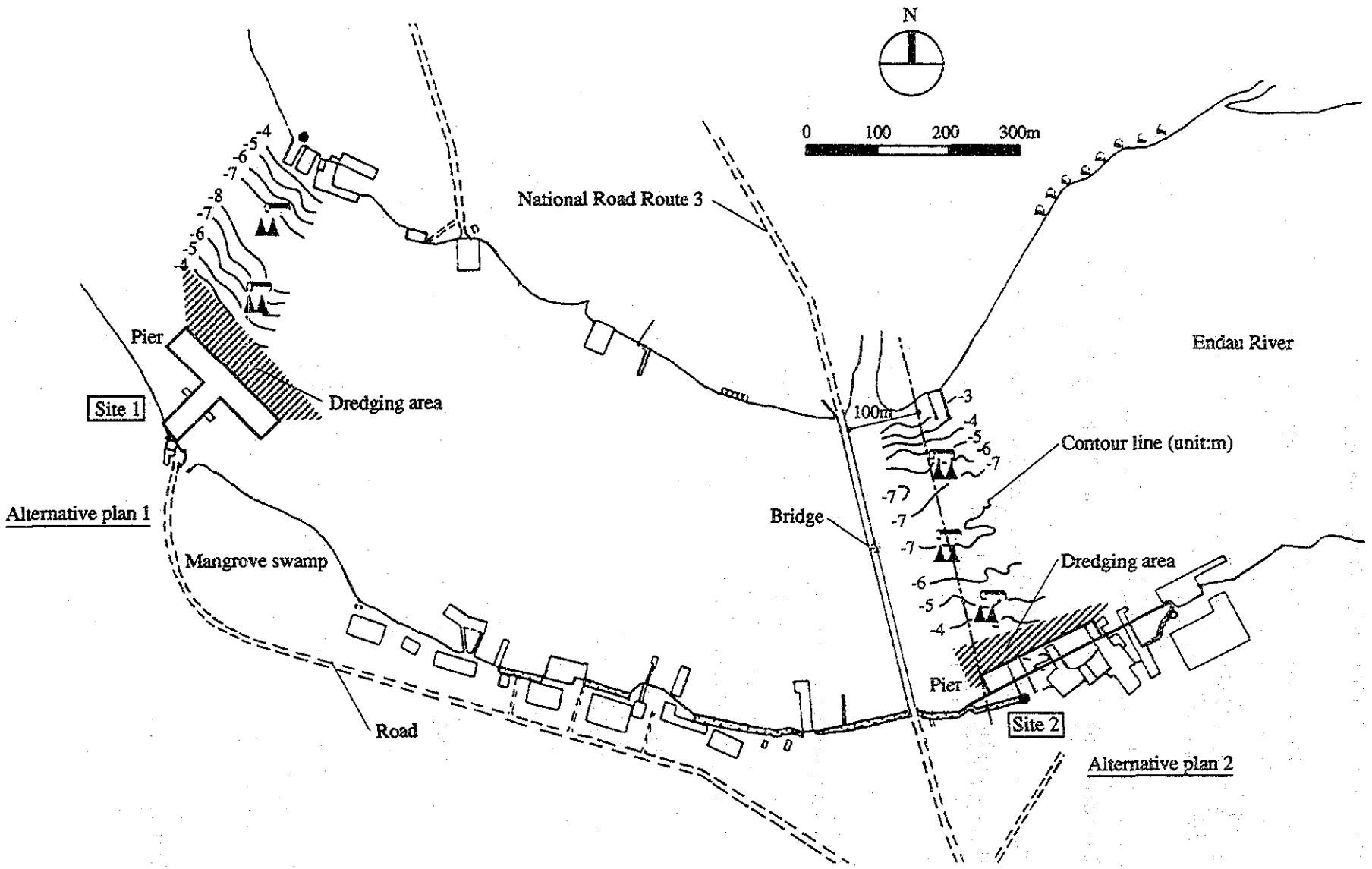

Fig. III.2.5.1 Location Map of Alternative Sites of the Pilot Project and their Hydrographic Condition

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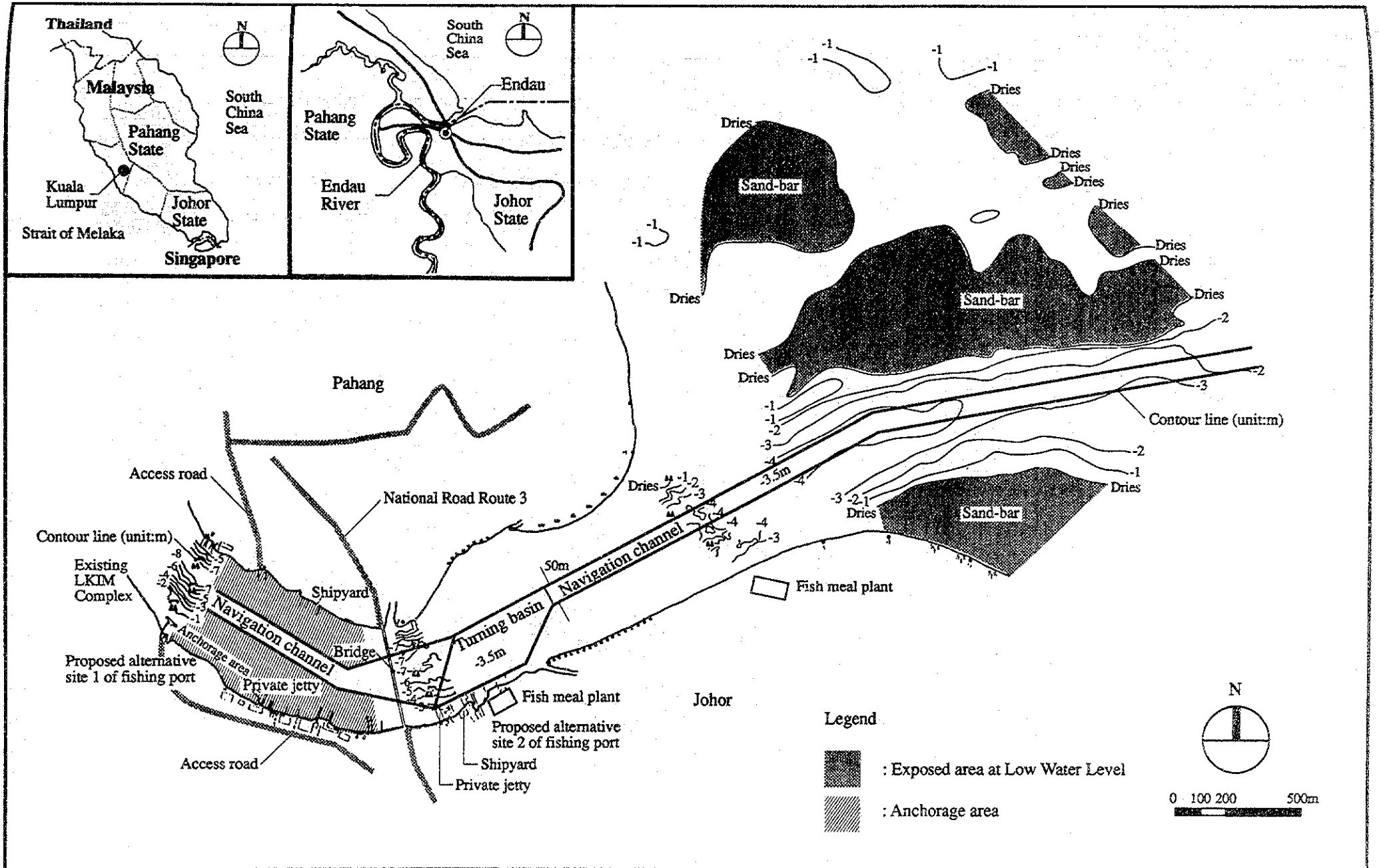

Fig. III.2.5.2 Layout Plan of the Anchorage and Navigation Channel

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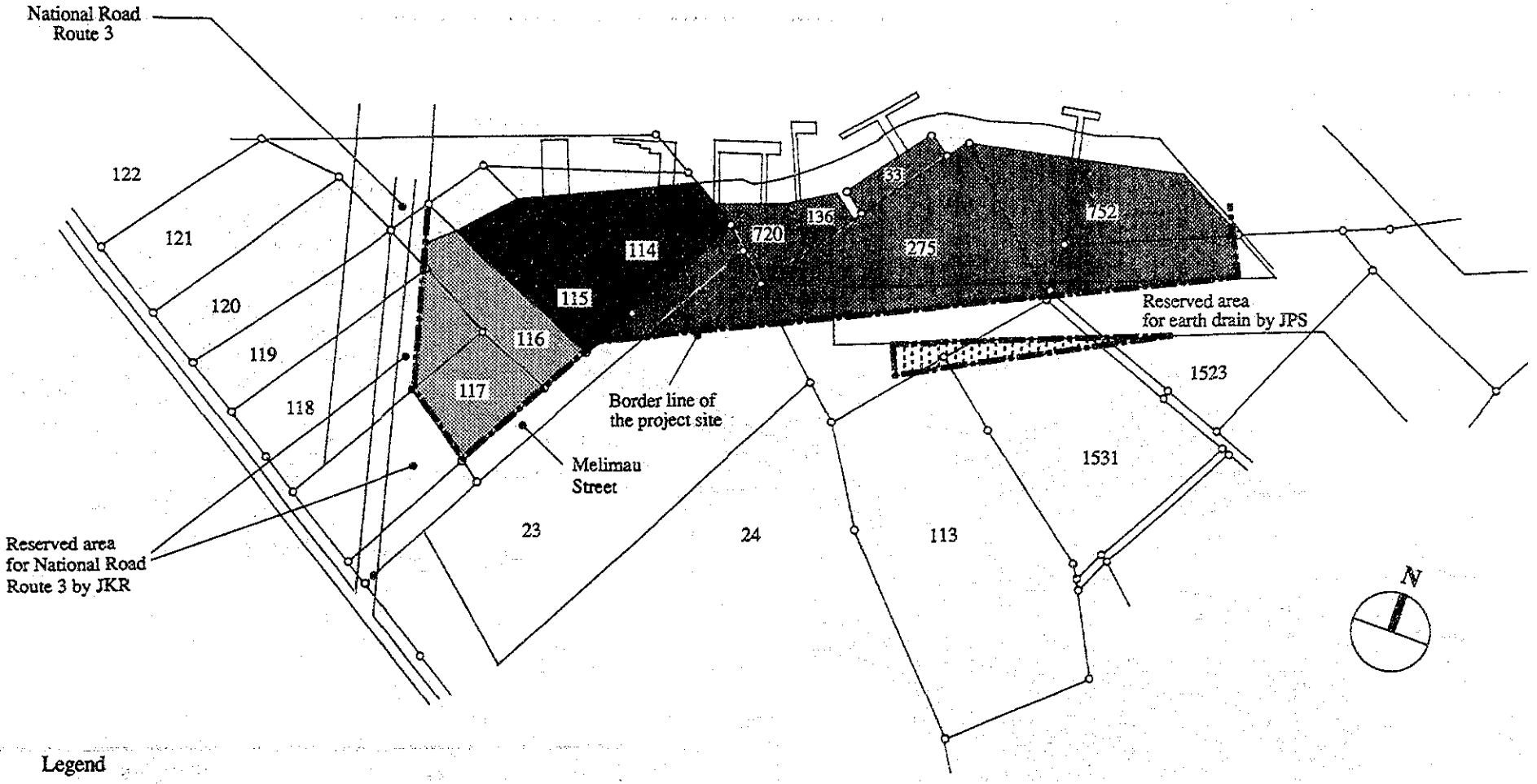

Legend

: Land already acquired by LKIM

: Area in the process of acquisition by LKIM

: Additional area required to be acquired by LKIM for the project

: Area to be acquired for the relocation of DID drain

Source : Pejabat Tanah Daerah (Land Office) Mersing, 26 Sept. 1992

Fig. III.2.5.3 Land Requirement for Endau Fishing Port S=1/5,000

Endau Fishing Port Complex

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