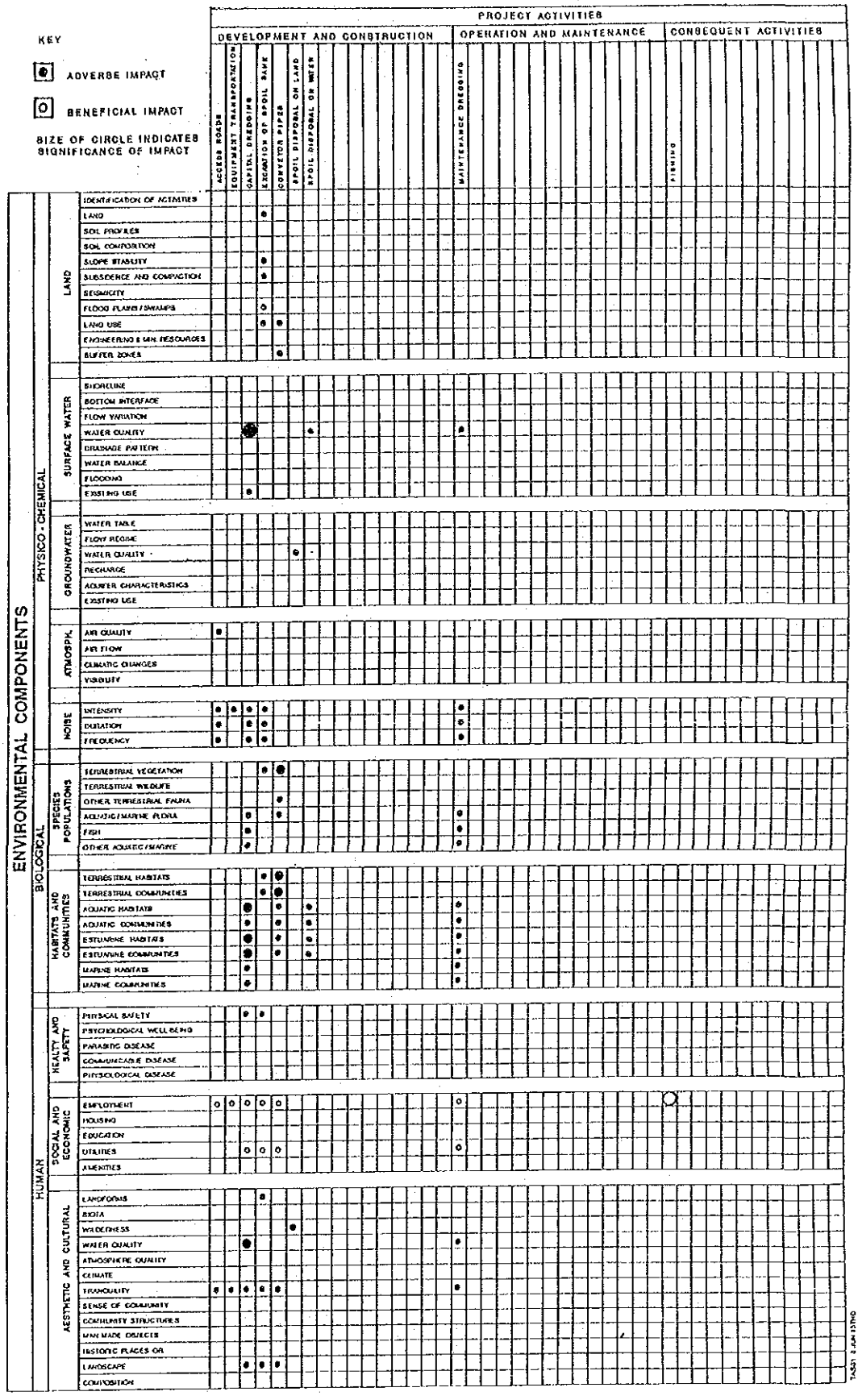
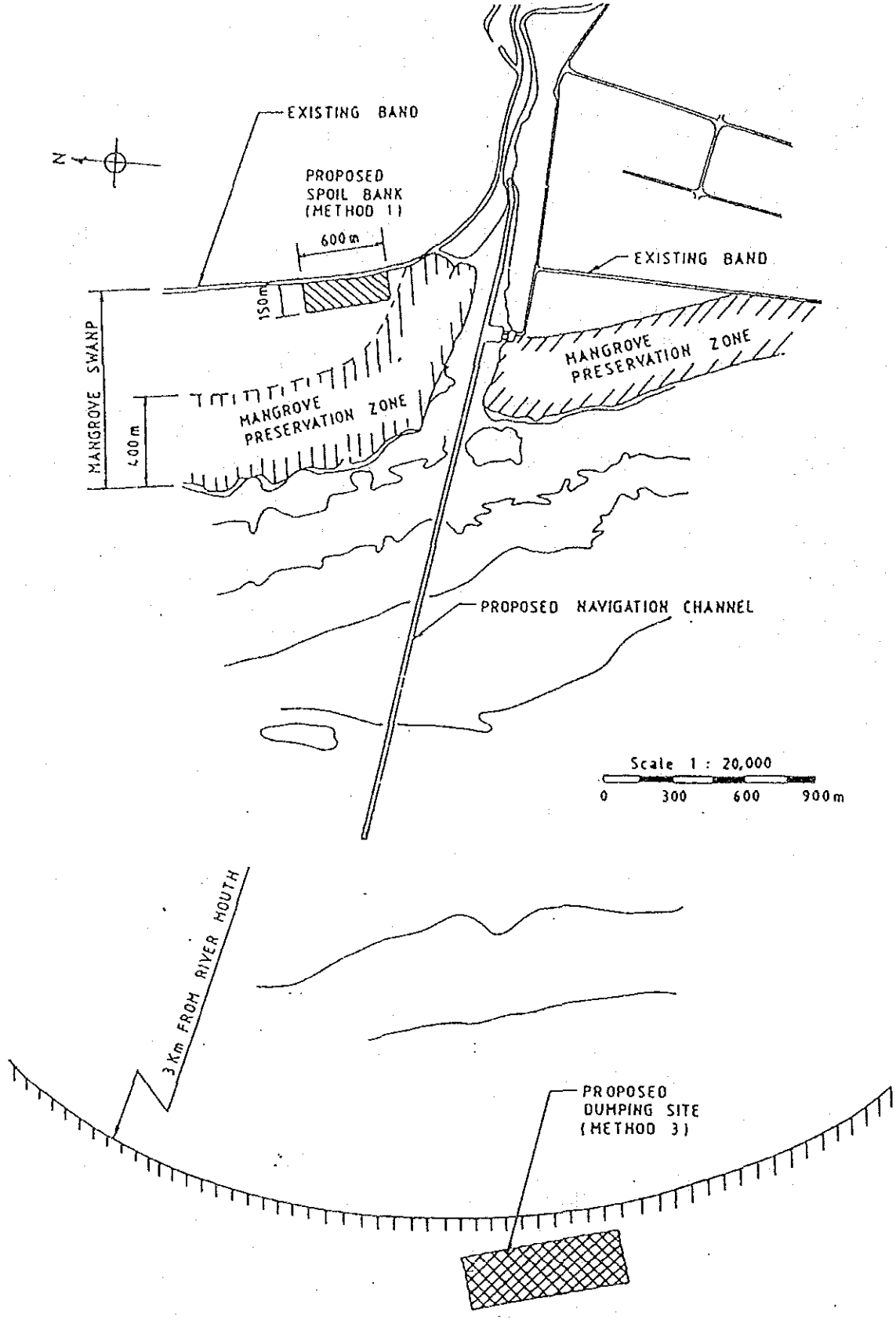
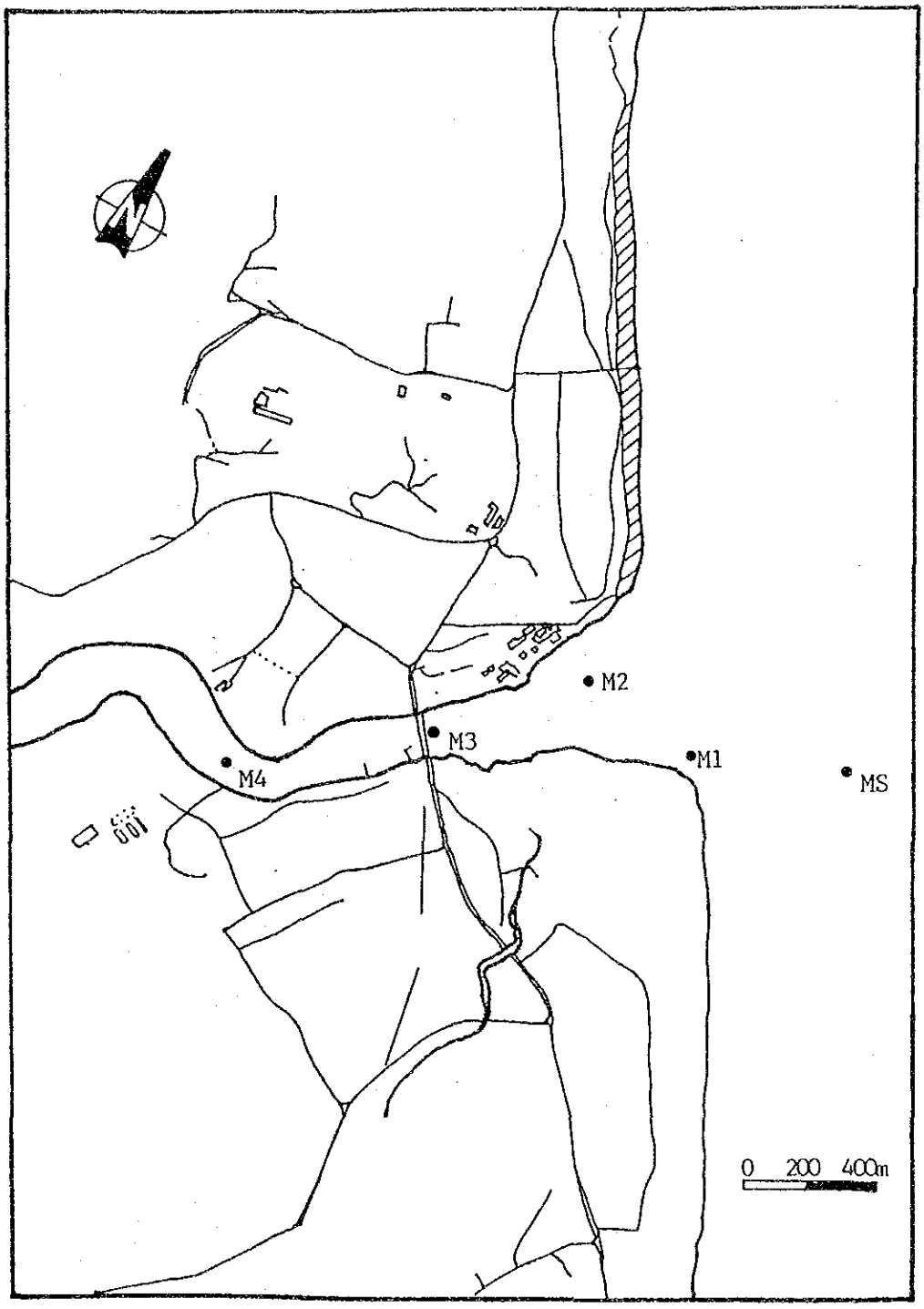
TANJUNG PIANDANG



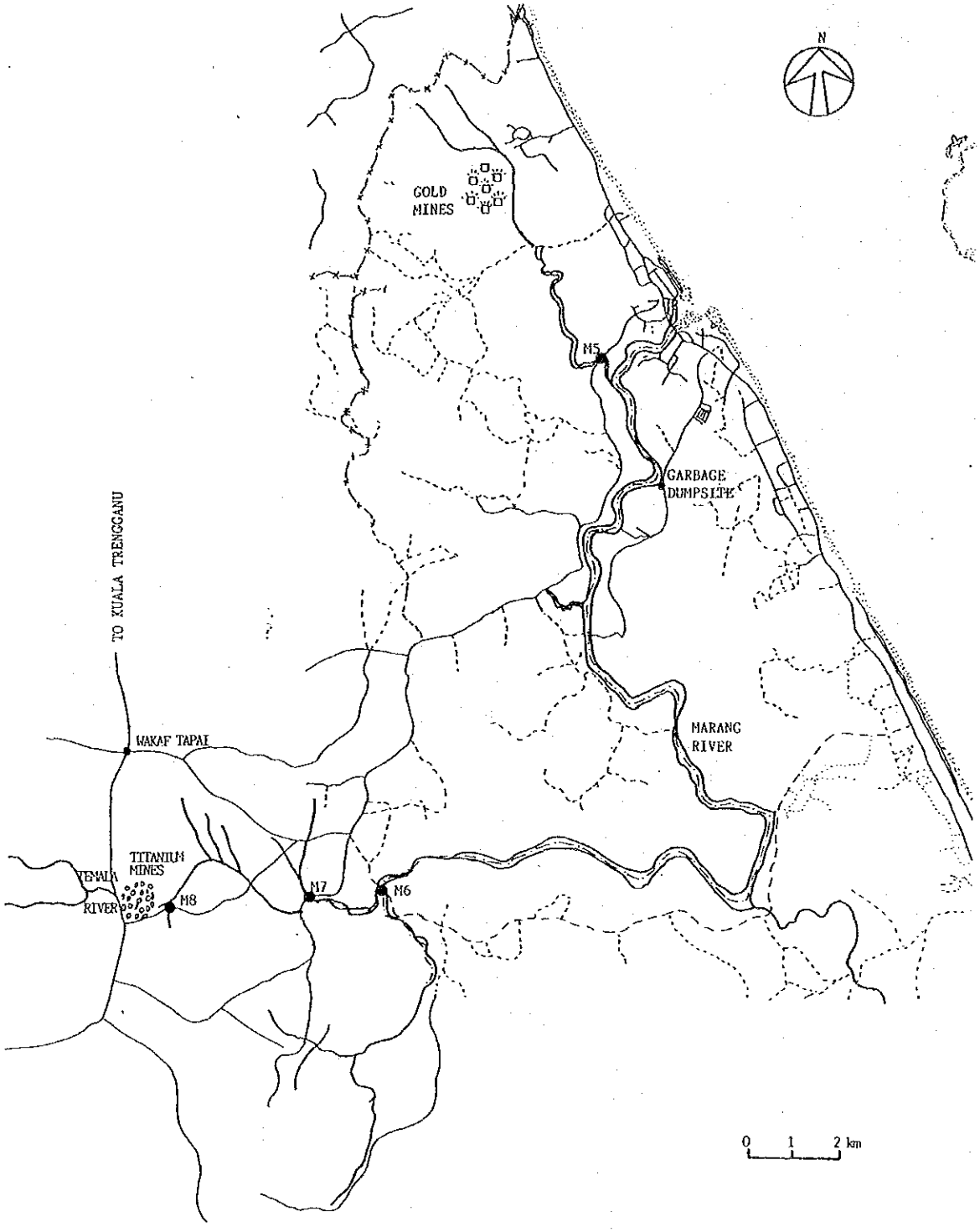
THE NATIONAL RIVER MOUTHS STUDY IN MALAYSIA	IMPACT MATRIX FOR SG. TG. PIANDANG RIVER MOUTH IMPROVEMENT WORKS
JAPAN INTERNATIONAL COOPERATION AGENCY	Fig. 9.2-7



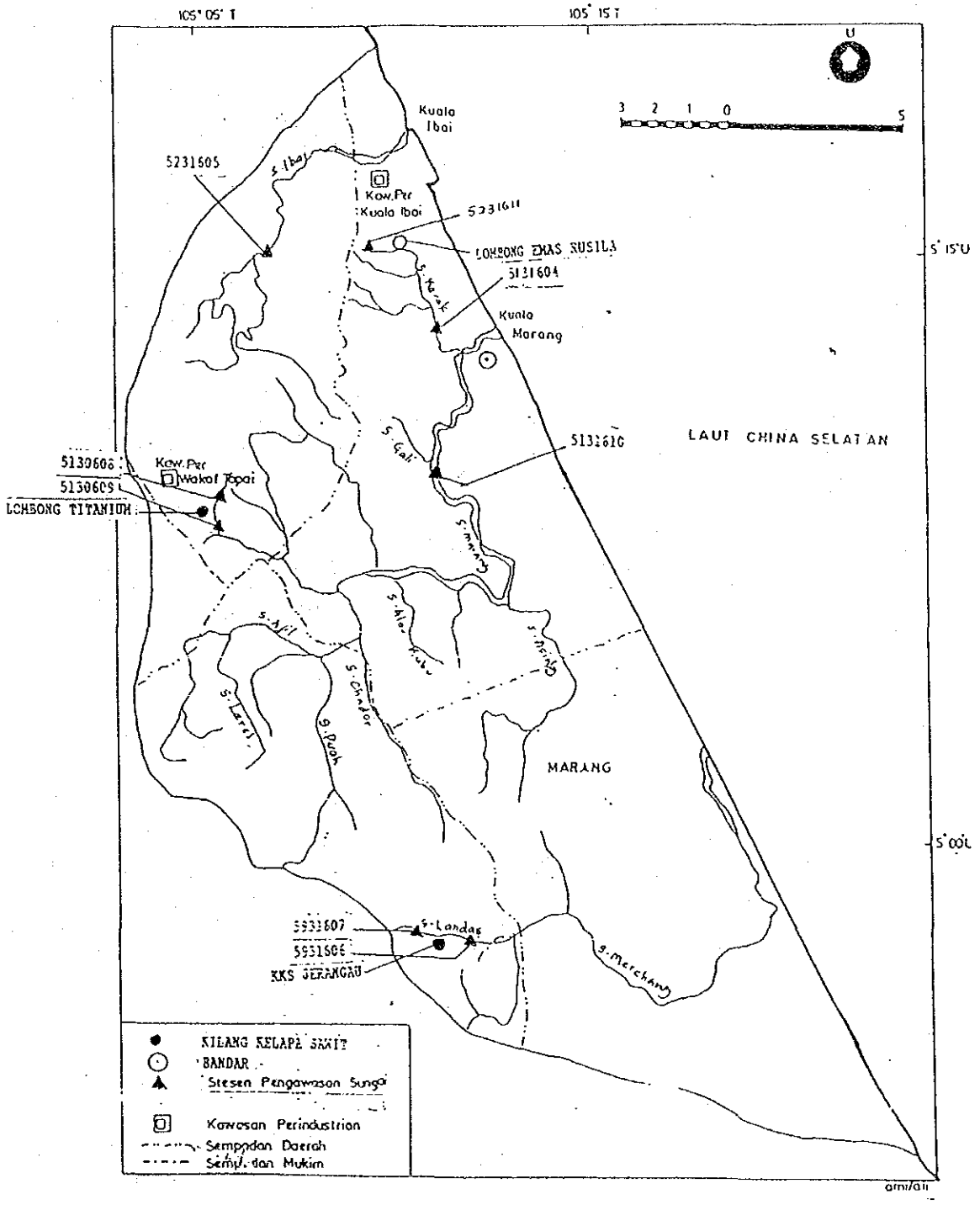
THE NATIONAL RIVER MOUTHS STUDY IN MALAYSIA	PROPOSED DUMPING SITE OF DREDGED MATERIALS
JAPAN INTERNATIONAL COOPERATION AGENCY	Fig. 9.2-8



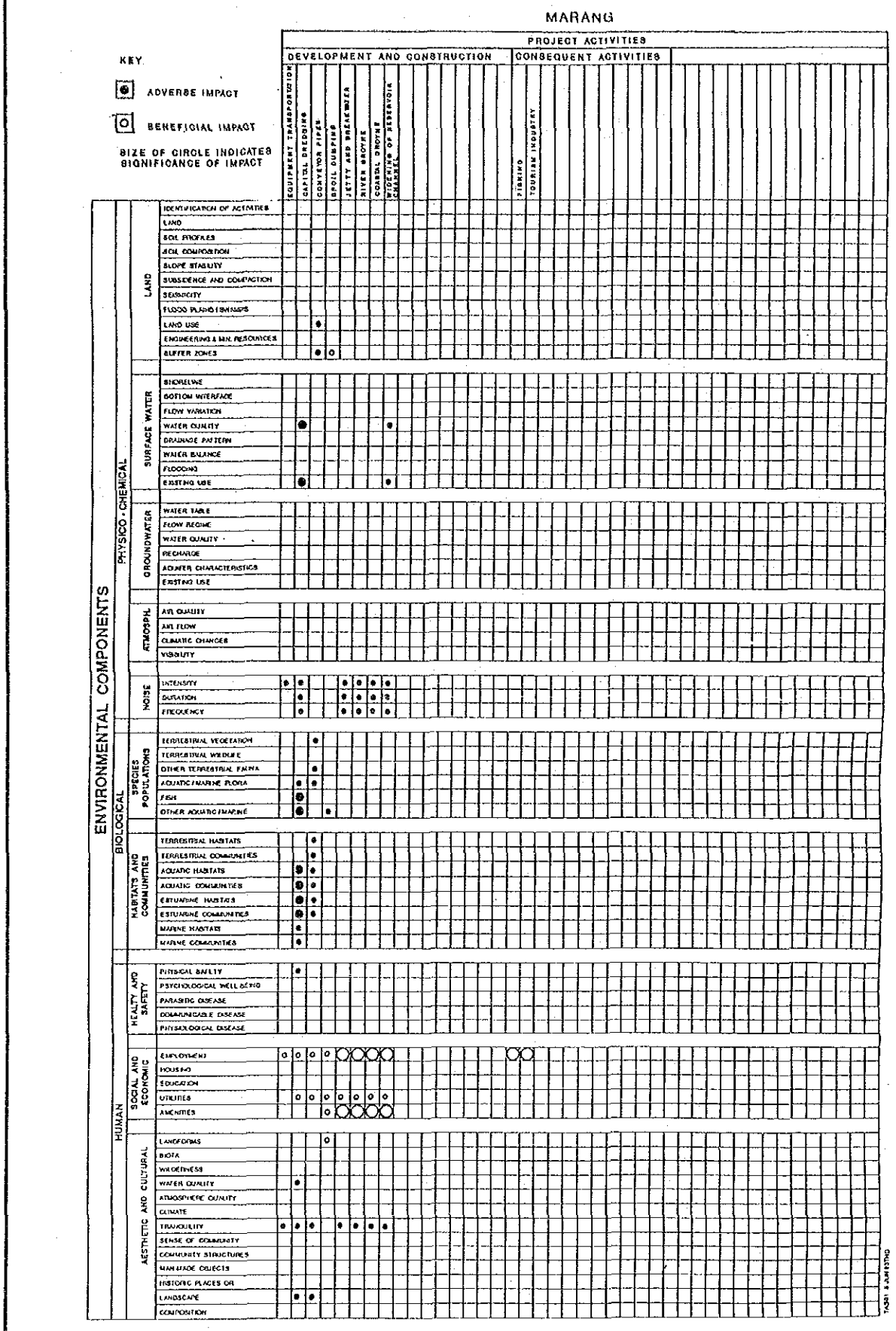
THE NATIONAL RIVER MOUTHS STUDY IN MALAYSIA JAPAN INTERNATIONAL COOPERATION AGENCY	SAMPLING STATIONS AT MARANG RIVER MOUTH Fig. 9.2-9



THE NATIONAL RIVER MOUTHS STUDY IN MALAYSIA	SAMPLING STATIONS FOR MARANG RIVER
JAPAN INTERNATIONAL COOPERATION AGENCY	Fig. 9.2-10



THE NATIONAL RIVER MOUTHS STUDY IN MALAYSIA JAPAN INTERNATIONAL COOPERATION AGENCY	DEPARTMENT OF ENVIRONMENT'S WATER QUALITY MONITORING STATIONS FOR MARANG, IBAI AND MERCHANG RIVERS Fig. 9.2-11



THE NATIONAL RIVER MOUTHS STUDY IN MALAYSIA

JAPAN INTERNATIONAL COOPERATION AGENCY

IMPACT MATRIX FOR MARANG RIVER MOUTH IMPROVEMENT WORKS

Fig. 9.2-12

ANNEXES

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DATA SOURCES, CONSULTATION AND PUBLIC PARTICIPATION

Acknowledgements

The assistance of the following persons and agencies are gratefully acknowledged :

1. En. Haji Long b. A. Rahman AMT,PJC,PJK and En. Ishamudin b. Hashim of the District Office, Marang.

2. En. Abdul Malik b. Othman of the Fisheries Department, Marang District.

3. En. Baharom b. Mat Amin, En. Mahmud b. Ibrahim and En. Asman b. Mohd. Nor of the LKIM (Malaysian Fisheries Authority) Fish Complex, Marang.

4. En. Kamaruddin b. Ibrahim of the Marine Fishery Resources Development and Management Department, Southeast Asian Fisheries Development Center, Chendering.

5. Tuan Haji Jamaludin Mahmud Abu Bakar, Director, Department of Environment (States of Terengganu and Kelantan).

6. En. Lee Heng Keng, Director, Department of Environment (Perak Branch).

APPENDICES A

CHECKLIST OF BIRDS OCCURING ALONG THE COAST AND THE COASTAL INLAND AREAS OF TERANGGANU

Key: M - Migrant R - Resident C - Commom U - Uncommom
FC - Fairly Commom RA - Rare
P - Protected under Malaysian Laws
LP - Limited Protection - license needed to hold the bird in captivity and to hund during the open season.
N - No protection under Malaysian Laws

NAME	SPECIES	STATUS
ARTIC WARBLER	Phylloscopus borealis	M C P
ASHY DRONGO	Dicrurus leucophaeus	R U P
ASHY TAILORBIRD	Orthotomus ruficeps	R C P
ASIAN DOWITCHER	Limnodromus semipalmatus	M U LP
ASIAN PALM-SWIFT	Cypsiurus batasiensis	R C P
BAR-TAILED GOTWIT	Limosa lapponica	M U LP
BARN OWL	Tyto alba	R U P
BARN SWALLOW	Hirundo rustica	M C P
BARRED BUTTONQUAIL	Turnix suscitator	R C LP
BAY OWL	Phodilus badius	R RA P
BAYA WEAVER	Ploceus philippinus	R C N
BLACK BITTERN	Dupetor flavicollis	M U P
BLACK-CAPPED KINGFISHER	Hylcyon pileata	M FC P
BLACH HORNBILL	Anthracoceros malayanus	M FC P
BLACK-NAPED ORIOLE	Oriolus chinensis	R C P
BLACK-NAPED TERN	Sterna sumatrana	R FC P
BLACK-SHOULDERED KITE	Elanus caeruleus	R RA P
BLACK-TAILED GOTWIT	Limosa limosa	M U LP
BLUE-TAILED BEE-EATER	Merops philippinus	R C P
BLUE-THROATED BEE-EATER	Merops viridis	R C P
BRAHMINY KITE	Haliastur indus	R C P
BROAD-BILLED SANDPIPER	Limicola falcinellus	M U LP
BROWN-HEADED GULL	Larus brunnicephalus	M U P
BROWN SHRIKE	Lanius cristatus	M C P
BROWN HAWK-OWL	Ninox scutulata	R U P
BROWN-CAPPED WOODPECKER	Picoides moluccensis	R U P
BROWN-THROATED SUNBIRD	Aethreptes malacensis	R C P
BUFFY FISH-OWL	Ketupa ketupu	R U P
CATTLE EGRETT	Bubulcus ibis	M U P
CHESTNUT MUNIA	Lonchura malacca	R C N
CHESTNUT-BELLIED MALKOHA	Phaenicophaeus sumatranus	R FC P
CHESTNUT-BREASTED MALKOHA	Phaenicophaeus curvirostris	R U P
CHINESE EGRET	Bubulcus ibis	M RA P
CHINESE POND-HERON	Ardelola bacchus	M U P

NAME	SPECIES	STATUS
CINNAMON BITTERN	Ixobrychus cinnomoneus	R U P
COLLARED KINGFISHER	Hylcyon chloris	R C P
COMMON GOLDENBACK	Dinopium javanense	R C P
COMMON GREENSHANK	Tringa nebularia	M RA LP
COMMON IORA	Aegithina tiphia	R C P
COMMON KINGFISHER	Alcedo atthis	R FC P
COMMON KOEL	Eudynamys scolopacea	R C P
COMMON MYNA	Acridotheres tristis	R C N
COMMON REDSHANK	Tringa totanus	M U LP
COMMON SANDPIPER	Actitis hypoleucos	M C LP
COMMON TAILORBIRD	Orthotomus sutorius	R C P
COMMON TERN	Sterna hirundo	M U P
CRESTED SERPENT-EAGLE	Spilornis cheela	R U P
CURLEW SANDPIPER	Calidris ferruginea	M C LP
DOLLARBIRD	Eurystomus orientalis	R C P
EURASIAN CURLEW	Numenis arquata	M U LP
EURASIAN TREE-SPARROW	Passer montanus	R C N
EYE-BROWED THRUSH	Turdus sibirica	M RA P
FLYEATER	Gerygone sulphurea	R FC P
FOREST WAGTAIL	Dendronanthus indicus	M C P
FORKTAIL SWIFT	Apus pacificus	M C P
GRAY PLOVER	Pluvialis squatarola	M C LP
GREY-HEADED FISH-EAGLE	Icthyophaga ichthyaetus	R U P
GREY-RUMPED TATTLER	Heteroscelus brevipes	M RA LP
GREAT EGRET	Casmerodius albus	R U P
GREAT REED WARBLER	Acrocephalus arundinaceus	M C P
GREAT CRESTED TERN	Sterna bergii	M U P
GREATER COUCAL	Centropus sinensis	R C P
GREATER GOLDENBACK	Chrysocolaptes lucidus	R U P
GREATER SANDPLOVER	Charadrius leschenaultii	M C LP
GREEN-BILLED MALKHOA	Phaenicophaeus tristis	R FC P
HOUSE SWIFT	Apus affinis	R C P
JAPANESE SPARROWHAWK	Accipiter gularis	M U P
JUNGLE MYNA	Acridotheres tuscus	R FC N
KENTISH PLOVER	Charadrius alexandrinus	M U LP
LACED WOODPECKER	Picus vittatus	R FC P
LANCEOLATED WARBLER	Lacustella lanceolata	M U P
LARGE-BILLED CROW	Corvus macrorhynchos	R C N
LARGE-TAILED NIGHTJAR	Caprimulgus macrurus	R C P
LESSER ADJUTANT	Leptoptilos javanicus	R RA P
LESSER COUCAL	Centropus bengalensis	R C P
LESSER CRESTED TERN	Sterna bengalensis	M U P
LESSER GOLDEN PLOVER	Pluvialis dominica	M C LP
LITTLE EGRET	Egretta garzetta	M RA P
LITTLE GREEN PIGEON	Treron olay	R U LP
LITTLE HERON	Butorides stratus	R U P
LITTLE RINGED PLOVER	Charadrius dubius	M C LP
LITTLE TERN	Sterna albiforns	R C P
LONG-TAILED PARAKEET	Psittacula longicauda	R FC LP

NAME	SPECIES	STATUS
LONG-TOED STINT	Calidris subminuta	M U LP
MAGPIE ROBIN	Copsychus saularis	M C N
MALAYAN BRONZE CUCKOO	Chrysococcyx minutillus	R FC P
MANGROVE BLUE FLYCATCHER	Cyornis ruficastra	R FC P
MARSH SANDPIPER	Tringa stagnatilis	M U LP
MONGOLIAN PLOVER	Charadrius mongolus	M C LP
OLIVE-BACKED SUNBIRD	Nectarinia calcostetha	R C P
ORIENTAL PRATINCOLE	Glareola maldivarum	R RA LP
ORIENTAL WHITE-EYE	Zosterops palpebrosa	R FC LP
OSPREY	Pandion haliaetus	R U P
PACIFIC REEF EGRET	Egretta sacra	R U P
PACIFIC SWALLOW	Hirundo tahitica	R C P
PEACEFUL DOVE	Geopelia striata	R C N
PHILIPPINE GLOSSY STARLING	Aplonis panayensis	R C N
PIED FANTAIL	Rhipidura javanica	R C P
PIED TRILLER	Lalage nigra	R C P
PINK-NECKED PIGEON	Treron vernans	R C LP
PINTAIL SNIPE	Gallinago stenura	M C LP
PLAINTIVE CUCKOO	Cacomantis merulinus	R C P
RED JUNGLEFOWL	Gallus gallus	R U LP
RED KNOT	Calidris tenuirostris	M U LP
RED-LEGGED CRAKE	Rallina fasciata	M U LP
RED-WATTLED LAPWING	Vanellus indicus	R R LP
RICHARD'S PIPIT	Anthus novaeseelandiae	R C P
ROFOUS-NECKED STINT	Calidris ruficollis	M C LP
RUDDY TURNSTONE	Arenaria interpres	M FC P
RUFF	Philomachus pugnax	M RA LP
SCALY-BREASTED MUNIA	Lonchura punctulata	R C N
SCARLET-BACKED FLOWERPECKER	Dicaeum cruentatum	R C P
SHARP-TAILED SANDPIPER	Calidris acuminata	M RA LP
SLATY-BREASTED RAIL	Rallus striatus	R C LP
SPOTTED DOVE	Stredtopelia chinensis	R C N
STORK-BILLED KINGFISHER	Halcynon capensis	R C P
TEREK SANDPIPER	Xenus comereus	M C LP
WHIMBERL	Numenius phaeopus	M RA LP
WHISKERED TERN	Chlidonias hybrida	M U P
WHITE-BELLIED SEA-EAGLE	Haliaeetus leucogaster	R C P
WHITE-BELLIED SWIFTLET	Collocalia esculen	R C P
WHITE-BREASTED WATERHEN	Amaurornis phoenicurus	R C LP
WHITE-HEADED MUNIA	Lonchura maja	R C N
WHITE-RUMPED MUNIA	Lonchura striata	R FC N
WHITE-THROATED KINGFISHER	Hylcyon smyrnensis	R C P
WHITE-WINGED TERN	Chlidonias leucopterus	M FC P
WOOD SANDPIPER	Tringa glareola	M C LP
YELLOW BITTEN	Ixobrychus sinensis	R R P
YELLOW WAGTAIL	Motacilla flava	M C P
YELLOW-BELLIED PRINIA	Criniger phaeocephalus	R C P
YELLOW-VENTED BULBUL	Pycnonotus goiavier	R C N
ZITTING CISTICOLA	Cisticola juncidis	R C P

APPENDIX B. Combined fish list of Sungai Tanjung Piandang and Sungai Marang estuaries.

Species	Tg. Piandang	Marang	Local Names
Ambassidae			
Ambassis dayi Bleeker	x	x	seriding
Ariidae			
Arius caelutus Valenciennes		x	duri
A. sagor (Hamilton-Buchanan)	x	x	duri sagur
A. venosus (Valenciennes)	x	x	duri ngong
Arius spp.		x	
Osteogoneisus militaris (L.)	x		tegak misai
Atherinidae			
Allanetta forskalis (Ruppell)		x	paku/keriok-keriok
Apogonidae			
Apogon thermalis Cuvier		x	sebekah
Belonidae			
Tylosurus crocodilus (Le Sueur)		x	todak
T. strongylurus (Van Hasselt)		x	todak
Bothidae			
Pseudorhombus spp.		x	sebelah
Carangidae			
Decapterus russelli (Ruppell)		x	selayang
Selar mate (Cuvier)	x	x	selar gelek
selar malam Bleeker	x	x	selar papan
Caranx ignobilis (Forskal)		x	among-among
Clupeidae			
Ilisha elongata (Bennet)	x		tamban keling
Cynoglossidae			
Cynoglossus brachycephalus	x		
C. bilineatus	x		
C. lingua Hamilton-Buchanan	x		lidah
Engraulidae			
Setipinna taty (Valenciennes)	x		kasai janggut
Thryssa hamiltonii (Gray)	x	x	bakok daun
T. kammalensis (Bleeker)	x		jemedi
Coilia sp.	x		kasai bulu ayam
Stolephorus sp.	x		bilis
Gerridae			
Gerres abreviatus Bleeker		x	kapas-kapas
G. filamentosus Cuvier		x	kapas laut

Species	Tg. Piandang	Marang	Local Names
Harpadontidae			
Harpadon nehereus (Hamilton-Buchanan)	x		lumi-lumi
Hemiramphidae			
Hemiramphus far (Forskal)		x	jolong-jolong
Latidae			
Lates calcarifer (Bloch)	x		siakap
Leiognathidae			
Leignathus splendens (Cuvier)		x	kekek kilau
L. equulus (Forskal)		x	kekek kuda
L. brevirostris (Valenciennes)		x	kekek dam
Secutor insidiator (Bloch)	x		kekek jalur
Gazza minuta (Bloch)		x	kekek labu
Lethrinidae			
Lethrinus variegatus		x	
Lutjanidae			
Lutjanus johni (Bloch)		x	jenahak
L. argentimaculatus (Forskal)		x	kakap merah
Megalopidae			
Megalops cyprinoides (Broussart)	x		bulan
Mugilidae			
Liza subviridis (Valenciennes)	x	x	belanak anding
Valamugil cunnesius (Valenciennes)	x		kedera
Mullidae			
Upeneus sulphureus Cuvier	x		biji nangka
Orectolobidae			
Chiloscyllium indicum (Gmelin)	x		yu bodoh
Plotosidae			
Plotosus anguillaris (Bloch)	x	x	sembilang
P. canius Hamilton-Buchanan		x	sembilang
Platycephalidae			
Thysanophrys indicus (L.)		x	baji
Scatophagidae			
Scatophagus argus (L.)	x		ketang karang

Species	Tg. Piandang	Marang	Local Names
Sciaenidae			
Bahaba taipingensis (Herre)	x		gelama pisang
Johnius coitor (Hamilton-Buchanan)	x		gelama papan
Otolithus ruber (Schneider)	x		tengkerong
Synopodidae			
Trachinocephalus myops		x	
Serranidae			
Ephinephalus tauvina (Forskal)		x	kerapu
Siganidae			
Siganus javus (L.)		x	dengkis
S. canaliculatus (Park)		x	dengkis
Soleidae			
Brachirus orientalis (Bloch)		x	lidah
B. commersoni (Swainson)	x		lidah
Sillaginidae			
Sillago sihama (Forskal)		x	puntong damar
Sphyraenidae			
Sphyraena jello Cuvier		x	kacang lopek
Stromateidae			
Pampus argenteus (Euphrasen)	x		bawal putih
Synodontidae			
Saurida tumbil (Bloch)		x	mengkarong
Theraponidae			
Therapon jarbua (Forskal)	x	x	kerong-kerong
Eutherapon theraps (Cuvier)		x	kerong-kerong
Toxotidae			
Toxotes jaculatrix (Pallas)		x	sumpit-sumpit
Trichiuridae			
Trichiurus haumela (Forskal)	x		timah
Trypauchenidae			
Trypauchen vagina (Bloch & Schneider)	x		belachak arus

x - indicates presence

10. INSTITUTIONS AND REGULATIONS

THE NATIONAL RIVER MOUTHS STUDY
IN MALAYSIA

SUPPORTING REPORT NO. 10

INSTITUTIONS AND REGULATIONS

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SUPPORTING REPORT NO. 10

INSTITUTIONS AND REGULATIONS

1. GENERAL ASSESSMENT OF INSTITUTIONS AND REGULATIONS

An institution with the appropriate administrative and legislative powers to make it effective is essential to ensure the proper management and conservation of river mouths in Malaysia. General assessments of the institutional and legal requirements are given in the following sections.

1.1 Main Functions at River Mouth and Related Activities

In general, the functions of a river mouth and the related activities are as given below (refer to Table 10.1-1):

(1) Drainage Outlet of River Flow

The principal function of a river mouth is to drain flood discharge and normal flow safely into the sea. This function has to be maintained without any disturbance by other activities and, for that purpose, various structures are provided at the river mouth such as dikes, revetments, groins, gates and pumps.

(2) Navigation

River mouths play an important role as a part of the navigation route for fishing and shipping which sometimes encounter difficulty in navigating through the river mouth due to siltation, as well as strong and turbulent waves and river flow. It is therefore essential to keep the river mouth in favorable and navigable condition to maintain the economic activities of the region.

To maintain the river mouth for navigation, provided are works such as dredging, jetty, breakwater, training wall, and navigation facilities like the beacon and so on.

(3) Port and Mooring Place for Boats

As a link between land transportation and marine transportation, river mouths serve as port for loading and unloading of cargoes as well as mooring for boats. For this purpose, port and mooring facilities such as jetty, berth, wharf, dock, warehouse and so on are provided.

(4) Land Development Zone

The area around the river mouth could provide a zone for land development because of its geological advantage, strategic significance of industrial development, etc., and the main purposes include agriculture, urban, industrial, aquaculture, water resources, resort development and others. Several works are then carried out such as land reclamation, land clearing, and provision of several facilities including intake and drainage.

(5) Mining

River flow transports a large volume of sand and deposits them at the river mouth. Sand mining for construction materials is one of the vivid activities, and sand mining facilities are sometimes provided at the river mouth.

(6) Natural Preservation Zone

Natural ecology systems which should be protected from destructive activities exist around the river mouth. Artificial facilities except those for preserving the ecology system are not specified for this function.

1.2 Existing Government Institutions

Government institutions and agencies concerned in Malaysia have been provided to ensure the functions and activities at the river mouth (refer to Table 10.1-1). Those concerned in such functions are as described below.

(1) Drainage Outlet of River Flow

To control rivers and streams in Malaysia, the Water Enactment has been provided as a state legislation. This law regulates and controls the use of rivers and streams, and imposes rigid prohibition against the unauthorized use of rivers and the alteration or diversion of river banks and river courses. To prevent the blockage of river waters and pollution of these waters, the act of discharging or emitting any deposit or waste into any river is prohibited. Further, construction of walls and buildings on banks of rivers or within flood channels is restricted.

The law is also applied to assure the function of the river mouth as a drainage outlet of river flow. Although there is another law regarding drainage works, namely; the Drainage Works Ordinance which includes such stipulations as declaration of drainage area, imposing of drainage rate, etc., it may not be much concerned in the river mouth function.

As for the agencies concerned in this function, DID and JKR are mainly involved. DID is the agency responsible for coping with the inundation by flood and drainage problems under the Waters Enactment and it has been constructing breakwaters or tidal gates at river mouths as a part of regional development projects including flood control and drainage. JKR is sometimes involved in maintaining the river mouth through protection works for bank erosion in the context of coastal protection works as seen in the Marang River Mouth.

(2) Navigation Route

The Merchant Shipping Ordinance has been provided for matters relating to merchant shipping including registry of ships, preservation of safety, wreck and salvage, lighthouse, etc. Under this ordinance, the port limit for minor ports which should be managed by the Marine Department is stipulated.

The River Launches Enactment covers the control of launches used on rivers; namely, declaration of rivers, launches to be licensed, penalty for breach of rules, etc.

To assure the function of a river mouth as a navigation route, the Marine Department and DID are engaged in the dredging of navigation channels. The former agency covers the area of port limit which is used mainly for commercial boats, while the latter maintains the navigation route for fishing boats upon request of the Department of Fisheries.

Besides, the Marine Department installs facilities to show the navigation route such as beacons, lighthouses, buoys, etc. DID undertakes construction works to maintain the navigation channel at the river mouth such as construction of breakwater, jetty, training wall, groin, etc.

JKR is sometimes involved in the works to maintain the navigation channel through the construction of jetties, groins, etc., as seen in the case of the Inanam River Mouth in Sabah.

(3) Port and Mooring Place for Boats

The Merchant Shipping Ordinance and River Launches Enactment are also concerned in this function. The Marine Department, JKR, LKIM and DOF are the main agencies related on this matter.

(4) Land Development Zone

Regarding land use control, various laws have been enacted such as the National Land Code, the Land Acquisition Act, the Town and Country Planning Act, and the Land Conservation Act.

The National Land Code has been enacted to clarify the right of authorization regarding land tenure, registration of title to land, collection of revenue, etc. This law stipulates the power of the Federation and of Federal officers, power of the States and of state officers, classification and use of land, etc.

The Land Acquisition Act, which has been provided to clarify matters regarding the acquisition of land, assessment of compensation on account of such acquisition and other matters incidental thereto, describes the acquisition of land, declaration of intended acquisition, procedure of inquiry, payment of compensation, restoration of land and so on.

The Town and Country Planning Act has been provided for the proper control and regulation of town and country planning in local authority areas, etc. This law stipulates the general planning policy, local planning authority, development plans, declaration of development area, prohibition of development without planning permission, etc.

The Land Conservation Act has been provided with the purpose of conservation of hilly land, protection of soil from erosion and the inroad of silt, etc. This law stipulates the declaration of hilly land, restrictions on clearing and cultivation of hilly land, control of silt and erosion, authority to make orders and nature of orders, etc.

As the term of land development implies, most of the governmental agencies, especially the state government, are concerned in this function.

(5) Mining

The Mining Enactment has been provided to control and manage the disordered development of mining resources. This act provides the authority for issuance of licenses, right to remove and dispose of minerals, control of water vested rights in the Ruler of Sate, etc.

In addition to land development, the state government is also concerned in mining.

(6) Natural Preservation Zone

To preserve the natural condition in the area around the river mouth, several laws have been provided, namely; the Environmental Quality Act, the Waters Enactment, the National Land Code, the Land Conservation Act, the

Protection of Wild Life Act, the National Parks Act, the Forest Enactment, the Mining Enactment, etc. These laws provide restrictions and control of development to preserve the natural condition as the title of the law implies.

The Environmental Quality Act which is related to the prevention, abatement and control of pollution and enhancement of the environment, etc., is essential to the preservation of the natural zone. Most of the government agencies engaged in the work related to development or preservation of natural conditions are concerned in this function.

1.3 Institutional Arrangement in Japan

As an example of institutional arrangement, that in Japan is described herein. As in Malaysia, an institutional arrangement exclusively dealing with river mouth problems is not provided in Japan and river mouth problems are taken as a part of the management of a river channel, port or coast.

Institutional Arrangement for Each Function

For comparison with Malaysia, the related law and agencies are shown in Table 10.1-2 according to river mouth functions described below.

(1) Drainage Outlet of River Flow

In Japan, it is a principal function of the river mouth to drain flood discharge and normal flow safely into the sea. The safe drainage of flood discharge is the main concern of the Japanese Government and, for that purpose, various structures are provided at the river mouth such as dikes, revetments, groins, gates, pumps and jetties.

For effective management, the River Law was promulgated in 1894 and revised in 1964 to comprehensively administer all the rivers in Japan, so that occurrence of disasters due to floods and high tides may be prevented and that proper utilization and normal functions of river water may be assured.

The River Law stipulates the administration of rivers classified into three classes, delimitation of river stretch for the administration, regulation concerning construction of riparian structures, authorization or permission for water use and so on.

The Flood Fighting Act was enacted in 1948 and this act stipulates the flood fighting system, the flood forecasting and warning system, the organization of flood fighting troops and the financial aspects of such activities.

In accordance with the River Law, the Ministry of Construction (MOC) has the responsibility of administering major rivers designated as first class rivers, while the local governments have the responsibility for the other classes of rivers.

As to flood fighting, MOC and the Meteorological Agency have the joint responsibility for the dissemination of flood forecasting and warning, while the responsibility for the organization of flood fighting troops is burdened to the local government.

(2) Navigation Route

Although river mouths in Japan do not play the role of navigation route so much, especially for fishing boats compared with those in Malaysia, several facilities to ensure the navigation of boats have been provided. For the smooth navigation including management of these facilities, provided were the Port and Harbour Law in 1950, the Fishing Port and Harbour Law in 1950, the Maritime Traffic Safety Law in 1972, the Aid to Navigation Law in 1949, etc. The Ministry of Transportation (MOT), the Ministry of Agriculture, Forestry and Fisheries and local governments are concerned in this function.

(3) Port and Mooring Place for Boats

In Japan, the major ports are mostly located in bay areas or coasts and the river mouths are usually used as minor ports. The Port and Harbour Law applying for both major and minor ports was enacted in order to develop marine transportation, to provide the necessary facilities in orderly manner, and to manage the port and mooring place appropriately. The law stipulates that the

delimitation of the port area is handled by the MOT or the local government. The formulation of the port development plan and permission of construction in the port area are also stipulated in this law. The Fishing Port and Harbour Law was provided specifically for fishing boats.

The MOT, the Ministry of Agriculture, Forestry and Fisheries, and local governments are among the major agencies concerned in this function.

(4) Land Development Zone

Historically, the area around the river mouth has been developed more in Japan than in Malaysia because of geological advantage, political significance, etc.

For the land development, several laws were promulgated such as the Basic Land Act in 1988, which defines the basic concept of land and the obligations of the central and local governments on land use; the National Land Use Planning Act in 1974, which stipulates the fundamental matters to formulate the land use plan and control and regulation on land use, etc.; the City Planning Law in 1968 to contribute to orderly urban development and to enhance social welfare; the State Water Reclamation Law in 1921, which defines state water, permission for reclamation, restrictions on use of reclaimed land, etc. Therefore, most of the agencies engaged in land development are concerned in this function.

(5) Mining

For sand mining, the Sand and Gravel Mining Law was promulgated in 1968. The law stipulates the application and permission of sand mining which are handled by local governments or the MOC depending on the area administered.

(6) Natural Preservation Zone

As in Malaysia, several laws have been provided to preserve the natural condition in the area around the river mouth, though they were enacted not only for river mouths but also the area concerned.

The laws include the Natural Environment Preservation Act of 1972, the Basic Act for Environment Pollution Control of 1970, the Water Pollution Control Act of 1970, the Natural Park Act of 1957 and others.

As the name implies, the Natural Environment Preservation Act stipulates the basic concept for the preservation of the natural environment and the fundamental matters to preserve the natural environment to ensure the current and future healthy cultural life. In this connection, activities which may bring about the destruction of favorable natural environment such as the construction of facilities, reclamation of water surface, change of the water level and water quantity, and land clearing are strictly prohibited.

The main agency handling this matter is the Environment Agency, although most of the agencies engaged in development are concerned also in this function.

Comparison of Institutional Arrangements between Malaysia and Japan

Although they are not provided to specifically cope with the river mouth problem, Malaysia and Japan in principle have provided the necessary laws as well as the agencies responsible. Therefore, the institutional arrangement in Japan can be made as reference for the improvement of that in Malaysia through a detailed comparative study between both systems. On the other hand, it is necessary to understand the different backgrounds of developing the system in both countries.

The difference of the institutional arrangements between Malaysia and Japan may be found in the following points:

(1) The main administration body of the river is the local government in Malaysia, while it is the central government in Japan.

(2) The main function of the river mouth relating to the main river mouth problem seems to be the navigation of fishing boats in Malaysia, while the main function is as drainage outlet for flood discharge in Japan.

(3) The development of the function of the river mouth is still under progress in Malaysia, while it is coming to the optimal stage in Japan.

Thus, the emphasis on river mouth management is slightly different between Malaysia and Japan.

1.4 General Assessment

River Mouth Problem Due to Lack of Effective Institution

For the river mouth problems whose cause and consequences could be easily identified, i.e., navigation problem for fishing boats and commercial boats due to river mouth siltation, shifting of river mouth due to the development of sand spit, etc., the agency responsible is relatively clear. The present institutional system in Malaysia seems to function well, especially in the case where a single agency is solely responsible.

However, the present institutional system seems not to function well where the agency responsible is not clear because the causes and consequences are hardly identified due to the compound factors involved, and several agencies are concerned in these problems. These may be found in the following examples:

(1) After land development in the upper basin, the river mouth siltation problem became severe.

(2) After construction of river structures such as weir, dam, tidal barrage, etc., the river mouth siltation problem became severe.

(3) After land reclamation in the river mouth area, drastic change in configuration of the river mouth and the ecology system emerged.

(4) After land development, demise of mangrove was observed.

(5) Sand mining and dredging of navigation channel brought about intrusion of seawater resulting in water quality problems for irrigation or domestic water and change of the ecology system. Also, this brought about coastal erosion in the neighboring area.

As main causes for these consequences, the following are pointed out in the present system:

(1) Lack of coordination and less opportunity for exchange of information among agencies concerned.

(2) Lack of suitable engineering consultation and shortage of qualified engineers.

(3) Indistinct scope of responsibility of the agencies concerned, especially for the compound issues on cause and consequences.

Recommendation of Measures in Terms of Institution

As pointed out in the main causes for consequences on the river mouth problem, the establishment or consolidation of a suitable organization for coordination is needed, subdivided into committees to seek solutions individually in terms of engineering, administration and legislation.

Engineering expertise on river mouth problems including coastal engineering and river engineering are in shortage and there is a need to train more local engineers on the specialized field of river and coastal engineering.

The scope of responsibility of the agencies concerned should be spelled out to avoid confusion. In the case of land development, each agency tends to execute the plan considering only the direct influence of the development and to prescribe solution only for the direct influence based on their scope of responsibility. For secondary or compound influences, sometimes no measure is undertaken.

Although legislation on such a compound issue may not be an easy matter, it is necessary to cope with the problem in the long term prospect. For that purpose, data compilation on issues attributed to the indistinct scope of responsibility should be made.

2. DETAIL COVERAGE OF INSTITUTIONS AND REGULATIONS

2.1 Existing Legislation and Institutions

2.1.1 Constitutional Framework

The distribution of legislative power between Federal and State governments is set out in the Federal Constitution. The Parliament may pass laws for the whole or any part of the Federation and laws having effects outside as well as within the Federation. The legislature of a State may make laws for the whole or any part of that State.

Article 74 of the Federal Constitution stipulates the legislative power between Federal and State governments, as follows:

(1) "Parliament may make laws with respect to any of the matters enumerated in the Federal List or the Concurrent List (that is to say, the First or Third List set out in the Ninth Schedule)."

(2) "The legislature of a State may make laws with respect to any of the matters enumerated in the State List (that is to say, the Second List set out in the Ninth Schedule) or the Concurrent List."

If any State law is inconsistent with a Federal law, the Federal law shall prevail and the State law, to the extent of the inconsistency, be void. Any matter not enumerated in any of the Lists set out in the Ninth Schedule, comes within the legislative power of the State Government.

2.1.2 Constitutional Provisions Relating to Jurisdiction over River Mouths

River mouths are not directly enumerated in any of the three Lists of the Ninth Schedule. However, depending on activities in the estuarine areas, river mouths could come under Federal or State jurisdiction.

When a river mouth is considered as an integral part of a river and the river is wholly within the State, it is included in the State List. If a river mouth is dredged solely for

the purpose of silt control, it is again under State jurisdiction. These are enumerated under Item 6 of the State List in the Ninth Schedule, as follows:

> "State works and water, that is to say - (c) Subject to the Federal List, water (including water supplies, rivers and canals) control of silt, riparian rights."

On the other hand, a river mouth can be under Federal jurisdiction when it is included under Item 11 of the Federal List, which provides as follows:

> "Federal works and power including water supplies, rivers and canals, except those wholly within one State or regulated by an agreement between all the States concerned;"

The activities of shipping, navigation, and fisheries in the river mouth areas are enumerated in the Federal List under Items 9(a), 9(b), 9(d) and 10(d) and 10(e). These are stated as follows:

"9. Shipping, navigation and fisheries, including -

(a) shipping and navigation on the high seas and in tidal and inland water.

(b) ports and harbours; foreshores.

(c) maritime and estuarine fishing and fisheries, excluding turtles."

"10. Communications and transport, including -

(d) regulation of traffic by land, water and air other than rivers outside harbour areas wholly within one State.

(e) carriage of passengers and goods by land, water and air."

From the above, it is quite clear that the States have jurisdiction over river mouths and control of silt in river mouths which are wholly within their States. However, the Federal Government's jurisdiction over the river mouths is derived from shipping and navigation on the high seas and in tidal and inland waters; ports and harbours; foreshores, and from fisheries including maritime and estuarine fishing and fisheries, excluding turtles.

2.1.3 Existing Legislation

There are a number of existing State and Federal laws which control and regulate development and activities within the river mouth areas, as well as outside which could have adverse impacts in the river mouths.

The Waters Enactment of 1920 (Cap 146) and the subsequent Water Act of 1920 (Revised, 1989) are the basic legislation for the management of rivers and the utilization of river water. The Land Conservation Act of 1960 has provisions for the conservation of hill land and the protection of soil from erosion and control of silt. Both the above laws are administered by the Land Office in the District.

The Environmental Quality Act of 1974 (Amended, 1985) is the Federal law which regulates all development activities to minimize or eliminate any adverse impact on the environment. Under the Environmental Quality (Prescribed Activities) (Environmental Impact Assessment) Order 1987, construction of ports or expansion of existing ports involving an increase of more than 50% in handling capacity requires Environmental Impact Assessment reports to be submitted to the Department of Environment for approval.

In addition, General Administrative Circular No. 5 of 1987 issued by the Prime Minister's Department requires all developments in the coastal zone to be referred to the Coastal Engineering Branch of the Department of Irrigation and Drainage for comment.

The Town and Country Planning Act of 1976 can be of relevance to the problem of river mouth siltation, if an integrated approach to the planning, siting and development of fishing ports is to be considered.

Laws which control and regulate activities within the river mouth and estuarine waters are the Fisheries Act of 1985 and the Merchant Shipping Ordinance of 1952. The Fisheries Act regulates fisheries activities in Malaysian waters, while the Merchant Shipping Ordinance relates mainly to marine transportation and merchant shipping.

2.1.4 Existing Institutions

The responsibility for the improvement of river mouths is shared between the Department of Irrigation and Drainage and the Marine Department. The responsibility of the Department of Irrigation and Drainage is on river mouths where the benefits from improvement works are for flood mitigation and for better fishing boats access to landing facilities in the rivers. The Marine Department is in charge of river mouths leading into gazetted commercial ports.

The Coastal Engineering Branch of the Department of Irrigation and Drainage is directly responsible for the dredging of river mouths. Its main activities are:

(1) To submit dredging programme to the Ministry of Agriculture for assignment of priority and approval;

(2) To carry out data collection, surveys and investigation works on river mouths scheduled for dredging;

(3) To prepare design sections for dredging works;

(4) To call for tenders, appoint contractors and monitor progress; and

(5) To monitor post dredging conditions of river mouths.

There are more than 50 commercial ports in Malaysia. Five of these ports, namely Port Kelang, Penang, Johor, Kuantan and Bintulu are each administered by a Port Authority, except Penang which is by a Port Commission. The remaining ports are

under the Marine Department, which is responsible for the safety of navigation for merchant ships and to provide shipping services to vessels entering Malaysian ports.

The Dredging and Hydrographic Activity Branch of the Marine Department is responsible for the maintenance of river mouths and channels leading to the ports. To ensure that commercial vessels can access the ports at all times, the Marine Department provide their own dredgers at a few important ports to carry out year round dredging.

The Fisheries Department is responsible for the planning of fisheries development through the preparation of the Fisheries Plans. Under the Fisheries Act of 1985, it is in charge of the issuance of annual fishing licenses, control of foreign fishing vessels in Malaysian fisheries waters, enforcement of the Fisheries Act, promote the development of inland fisheries, aquaculture and the establishment of marine parks.

The objectives of the Fisheries Development Authority of Malaysia are to improve the socio-economic status of fishermen, in particular to increase their income, and to expand and to develop the fishing industry of Malaysia. To achieve the above objectives, LKIM develops large integrated fish landing complexes at selected locations comprising modern storage and marketing facilities including boat repairs and construction workshops and other related fisheries industries. In accordance with the National Agriculture Policy, LKIM is promoting deep-sea fishing utilizing boats of 40 GRT and above.

The Ministry of Agriculture through its River Mouth Dredging Committee coordinates the river mouth dredging programme by determining the priority order of the river mouths to be dredged. The Committee is composed of the representative of the Ministry of Agriculture who is the Chairman, and the representatives of the Department of Irrigation and Drainage, the Fisheries Department and the Fisheries Development Authority of Malaysia. The Committee meets to finalize the programme for each Malaysian Plan and whenever necessary.

Details of the objective and functions of existing institutions, either directly or indirectly related to river mouths are shown in Annexes I to V which are hereto attached. These are extracted from the "Dealing with the Malaysian Civil Service"

published by the Malaysian Administrative Modernization and Planning Unit and the Prime Minister's Department.

2.2 Dredging Activities

2.2.1 Financing

The dredging of river mouths by the Department of Irrigation and Drainage is submitted as a five-year programme under each of the Malaysia Development Plan. Thus, funds for the dredging of river mouths are from the Federal Development Fund. No funds are provided from the operating budget and hence all river mouth dredging are considered as capital works. Neither the Department of Irrigation and Drainage nor the Fisheries Development Authority of Malaysia submit annual operating budgets for the maintenance of the river mouths after capital dredging works have been completed.

Funds for the dredging of river mouths by the Marine Department are all from its annual operating budget. Since all dredging works are carried out by its own dredgers, the annual budget provided is for the operation and maintenance of these dredgers. The initial capital for the purchase of dredgers is provided from the Development Fund under the Malaysia Development Plan.

State governments do not provide any funds for the dredging or maintenance of river mouths. State governments look upon dredging as an unsatisfactory solution for the problem of river mouth siltation, as the dredged sections are silted up again within a year or so, thereby requiring additional funds for maintenance dredging. States prefer structural measures as a means to overcome river mouth siltation problems as such measures will have little or no necessity for maintenance.

2.2.2 River Mouth Dredging

Over the years, river mouth problems have aggravated due mainly to:

(1) increased upstream and coastal zone development resulting in increased siltation; and

(2) increase in sizes and drafts of commercial and fishing vessels due to expansion of marine transportation and fisheries.

Due to the above two reasons, many river mouths have become inaccessible, particularly during low tide. Thus, except for small boats with outboard motors, most boats have to wait at sea until high tide before being able to land. The only solution to this problem is to deepen the river mouths.

Desilting or deepening of river mouths is normally carried out by dredging, although structural works have been constructed in a few river mouths in Kelantan to prevent siltation through harnessing the river flows. However, the very high capital cost for structural measures and the possibilities for inducing coastal erosion have made dredging the preferred option.

While deepening of river mouths by dredging is relatively low-cost and simple to carry out, the main disadvantage is that the dredged sections are silted up again very quickly, often within a year. Maintenance dredging has to be carried out on an annual basis. Thus, compared to structural measures which have low maintenance cost, maintenance dredging cost is often as high as the capital dredging carried out initially.

Another problem faced by river mouth dredging is the lack of technical basis on which dredging works are carried out. There is very little collection of technical data or monitoring of river mouth siltation problems. Regular monitoring programmes will provide information for a better understanding that the current status is as predicted in the design, as well as a means to verify the behaviour of the river mouths after completion of dredging works.

The need for technical information is therefore very important as they provide the basic input for increasing the knowledge on the phenomenon of river mouth siltation problems and the effectiveness of the countermeasures for solving the problems. There is at present no formal mechanism for the gathering, developing and disseminating technical information on river mouth siltation.

The question of whether dredging works should be carried out by private contractors or government-owned dredgers should be resolved. Due to low volume of work and

high maintenance cost, the Department of Irrigation and Drainage found that its dredgers were operating at a rather low efficiency. It has now phased out all its dredgers and has contracted out all its river mouth dredging works to privately-owned dredgers.

The Marine Department on the other hand, still has four dredgers carrying out desilting works in Kuala Perlis, Kuala Kedah and Kuala Terangganu. Since the dredging works are on a continuous year round basis at fixed sites, the efficiency of the dredgers should be higher due to little mobilization cost and high volume of work. However, statistics of the Marine Department show that it is not so and in fact, dredging by private contractors is less costly and more efficient.

The issue of proper disposal of the dredged material so as not to cause any adverse impact had to be addressed. Increased intrusion of waves into the dredged river mouth as a result of increased water depth could cause damage to facilities and boats moored in the river. This problem too, has to be considered.

2.3 Planning of Fishing Ports

The main problem of river mouth maintenance is to provide sufficient water depths for fishing and commercial boats to land, at all times, at the ports located in the rivers.

For commercial ports, the Ministry of Transport has a master plan for the location and development of ports in the country.

LKIM's development plans for fishing ports up to year 2000 show that only 18 locations will be expanded to cater for deep-sea fishing for boats of 40 GRT and above. Of these 18 locations, 5 are in the West Coast, 8 are in the East Coast, 4 are in Sarawak and probably one in Sabah. The existing LKIM fishing ports which are not to be expanded, will remain as they are. As such, any expansion in size of existing fishing boats in other rivers will have to utilize landing facilities in one of the 18 large landing facilities to be developed by LKIM. The location of the 18 fishing ports planned for upgrading and expansion by LKIM is shown is Annex V.

In the planning for the development of fishing ports, LKIM has selected the least cost option, which is to identify existing ports for upgrading and expansion without taking into consideration the dredging cost for maintenance of the river mouths. Many of these existing ports are located in river mouths which are subjected to serious silting problems. If the dredging cost is included in the project cost and in the operating cost in subsequent years, most of the selected ports will prove to be not viable for development. By leaving out the dredging cost, LKIM is actually passing both the cost and responsibility to the Department of Irrigation and Drainage to solve the siltation problem in river mouths.

Existing fishing ports located in some river mouths, therefore, may not be the best option, especially where much dredging works is required annually. In such cases, a properly sited fishing port in the coast, complete with breakwaters for protection against rough seas will be more viable. Although the capital development cost of the project will be high, the reduction in or the elimination of annual maintenance dredging can be very attractive.

For some fishing ports in river mouths, the construction of breakwaters and jetties together with capital dredging can provide a viable solution, which will require minimal maintenance dredging after completion of the project.

From the above, it is obvious that a comprehensive integrated approach to the planning and location of fishing ports has to be adopted. A national master plan for fishing and commercial ports should be formulated within an integrated coastal zone management plan. The master plan should take into consideration development plans of other sectors, the risk of coastal erosion, the potential damage to mangrove swamps and the needs of the fishing industry and commercial navigation.

2.4 Proposed Institutional Setup

The existing arrangement where the Marine Department is the agency responsible for the maintenance of river mouths for commercial ports and the Department of Irrigation and Drainage for fishing boats access is clear and should not be changed.

The Coastal Engineering Branch of the Department of Irrigation and Drainage, which is already responsible for executing river mouth maintenance works, should assume in full, the technical responsibilities for river mouth problems in Malaysia. Its responsibilities should be expanded to include the collection of basic data related to river mouths, some of which are already being gathered under its coastal data collection programme. A regular comprehensive monitoring programme of the siltation rates of river mouths, both prior to and after dredging works should be implemented.

As the technical center for river mouths, the Branch will be responsible for feasibility studies and detailed designs for river mouth dredging and structural works. The availability of the Hydraulics Laboratory in DID Ampang is an additional asset, as physical modelling and research programmes could be carried out there.

In addition, the Coastal Engineering Branch should commence shifting its focus of attention from engineering measures for coastal erosion to management of the coastal zone with comprehensive integrated coastal zone management. This is to ensure that any works in connection with river mouth improvement and port development will not result in increased coastal erosion and in turn other development projects in and outside the coastal zone will not adversely affect the river mouth. The Branch will therefore be in a position to provide technical advice on the actions to be taken to reduce or eliminate undesirable effects on the coastal zone that will occur due to natural or human-induced actions both upstream and within the coastal zone itself.

The role of the Dredging Committee and the Fisheries Development Committee of the Ministry of Agriculture should be maintained, since they are the most appropriate bodies to establish the policy for the dredging of river mouths as well as to finalize and approve the dredging programme.

The Marine Department shall continue with its responsibility of maintenance of river mouths and river channels leading to commercial ports. In view of the availability of private dredgers, the Marine Department may wish to contract out its dredging works as is being practiced by the Department of Irrigation and Drainage. The possibility of

establishing a private national dredging company to carry out the works of both Departments should be considered.

The increased volume and the assurance of a long term contract based on a continuous dredging programme, will most probably increase efficiency and reduce costs.

2.5 Financial Considerations

The present dredging programme is drawn up based on the demands and needs of the fishermen. As such, almost all river mouths with fisheries activities require improvement. However, in many cases, the more feasible and less costly option is to move the fishing activities elsewhere and allow the existing problem to remain rather to solve it.

In accordance with the National Agriculture Policy, future development of the fisheries sector will stress on deep-sea fishing, which will mainly be concentrated in the East Coast of Malaysia. This fact is confirmed by the development plans of both LKIM and the Fisheries Department, which show the development of large LKIM fishing ports and the projection of expansion of fishing boat size to be mainly concentrated in the East Coast of Malaysia.

In view of the development plans of the Fisheries Department and LKIM, it is proposed that the status quo of existing river mouths which have not been identified for expansion of landing facilities be maintained. This means that only nominal dredging works need to be carried out to maintain or restore accessibility for existing boats of 10 GRT and below.

For river mouths where fishing facilities are to be expanded, it is important that more permanent solutions are recommended for implementation. In any case, all proposed projects should undergo feasibility studies before proceeding to detail design and implementation.

At present, the Federal Government finances all capital works on river mouths, whether it is dredging or structural works. The State Government provide no funding, and neither do the beneficiaries contribute towards the cost of the capital works.

However, siltation of river mouths is a natural and continuous phenomenon. Hence, even after dredging, further maintenance dredging on a regular basis has to be carried out in order to ensure that the dredged channel remains accessible throughout the year. The financing of this maintenance dredging is now in contention.

As a result of lack of funding for capital dredging, no such dredging works are carried out in the ensuing years, resulting in the dredged river mouths becoming inaccessible again within a year or two.

The existing practice of funding for capital dredging through the Malaysia Plan is adequate and should be maintained. However, the provision of funds for maintenance dredging has to be seriously considered. Some of the options available area:

(1) Federal Government to finance both capital and maintenance dredging costs.

(2) Federal Government and State Government to share the cost of maintenance dredging in the proportion to be mutually agreed.

(3) State Governments to finance maintenance dredging cost.

(4) The beneficiaries, i.e., the fishing boat owners, to contribute towards the cost of maintenance dredging.

(5) Only commercial fishing boats of 40 GRT and above are to contribute towards the cost of maintenance dredging.

In considering the above options, it should be noted that rivers are basic infrastructures provided by nature at no cost to the communities. One of the normal and natural functions of a river is to provide navigation to boats. Thus, compared to roads and highways which are developed at very high costs, rivers are available for transportation of people and goods at no capital cost. From this perspective, it is therefore reasonable that public funds are provided to maintain rivers in their natural form, especially when the deterioration to a river's navigational capacity is due to adverse impacts of development.

However, for deepening and maintenance of river mouths and channels beyond their natural or normal capacities, in order to cater for increased boat sizes, then it is logical and fair that the beneficiaries should contribute either in full or partially for the cost of the capital and maintenance works.

2.6 Conclusion

The existing institutional setup is adequate and no drastic changes are necessary. However, in view of the lack of an effective mechanism for gathering of technical information, research and development, it is recommended that the Coastal Engineering Branch of the Department of Irrigation and Drainage be strengthened to take over these responsibilities.

The lack of clear policy objectives and directions for resolving river mouth problems makes the selection and financing of river mouth improvement projects even more difficult than it is. The recently organized Fisheries Development Committee at the Ministry of Agriculture should establish policy guidelines for the approval of requests for river mouth improvement and on financing the projects. Projects could be categorized into either social or commercial, and the standards, cost and financing of the projects could then be set based on the policy guidelines established.

For the execution of dredging works, the practice of using departmental dredgers is slowly being phased out. Most dredging works today are being undertaken by private contractors. The establishment of a national dredging company to carry out all dredging works throughout the country should be seriously considered, as in the long term, it would increase efficiency and reduce costs.

A comprehensive integrated approach to the planning and location of fishing ports should be adopted in order to achieve a more rational and viable solution to the problem of river mouth siltation. The development of new fishing ports and the expansion of existing ones should be considered within an integrated coastal zone management plan. The recurring siltation problem in river mouths should be assessed in the context of development in the upper catchment and within the coastal zone. The

Coastal Engineering Branch of the Department of Irrigation and Drainage should be assigned the responsibility for coastal zone management.

The question of partial or full recovery of cost for both capital and maintenance dredging or only for maintenance should be carefully examined. For fishing ports constructed for deep-sea fishing, there is justification to recover at least a major portion of the maintenance cost from the large fishing boats of 40 GRT and above. For commercial ports, part of the cost for maintenance dredging could be recovered through a nominal charge on passengers.

TABLES

Table 10.1-1 ACTIVITIES RELATED TO RIVER MOUTH

Function	Activities	Related Facilities	Related Law and Regulation		Agencies Concerned
			Federal	State	
Drainage Outlet of River Flow	Flood Discharge and Maintenance Discharge	Dike, Revetment, Groyin, Gate, Pump, etc.	Drainage Works Ordinance	Water Enactment	DID, JKR
Navigation Access	Navigation for Fishing Boat and Commercial Boat	Navigation Canal and Navigation Facilities	Merchant Shipping Ordinance	River Launches Enactment	MOT, MD, DOF, DID, JKR, Navy
Port of Boat and Mooring Place	Fishing Boat and Commercial Boat	Jetty, Breakwater, Loading and Unloading Facilities Mooring Facilities	Merchant Shipping Ordinance	River Launches Enactment	MD, LKIM, DOF, DID, JKR
Land Development Zone	Agriculture, Residential Area, Industrial Area, Aquaculture and Resort Area	Intake facilities, Drainage Facilities, Land Reclamation, Lesure Facilities	Land Consevation Act, National Land Code, Land Acquisition Act, Town and Country Planning Act		Most of Agencies concerned with development
Mining	Sand Mining	Sand Mining Facilities		Mining Enactment	State Government
Natural Preservation Zone	Preservation of Ecology System	Natural Preservation Facilities	Environmental Quality Act, Protection of Wild Life Act, Land Conservation Act, National Land Code, National Parks Act	Water Enactment, Forest Enactment, Mining Enactment	Most of Agencies concerned with development

Table 10.1-2 RELATED LAWS AND AGENCIES IN JAPAN

Function	Related Law and Regulation	Agencies Concerned
Drainage Outlet of River Flow	River Law Flood Fighting Act	Ministry of Construction Meteorological Agency
Navigation Access	Port and Harbour Law, Fishing Port and Harbour Law, Maritime Traffic Safety Law	Ministry of Transportation, Ministry of Agriculuture, Forestry and Fisheries, Local Government
Port of Boat and Mooring Place	Port and Harbour Law, Fishing Port and Harbour Law	Ministry of Transportation, Ministry of Agriculture, Forestry and Fisheries, Local Government
Land Development Zone	Basic Land Act, National Land Use Planning Act, City Planning Law, State Water Reclamation Law	Most of Agencies concerned with Development
Mining	Sand and Gravel Mining Law	Ministry of Transportation, Local Government
Natural Preservation Zone	Natural Environment Preservation Act, Basic Act for Environment Pollution Control, Water Pollution Control Act, Natural Park Act	Environment Agency, Most of Agencies concerned with Development

ANNEXES

ANNEX I

DEPARTMENT OF FISHERIES

OBJECTIVES

(1) To increase fish production;

(2) To rationally manage the resources through effective management practices, and upgrade monitoring and conservation of inshore fisheries resources;

(3) To upgrade the deep-sea fishing industry via modernization of fishing techniques and exploitation of new areas not limited to the country's Exclusive Economic Zone (EEZ) only;

(4) To speed up aquaculture development by encouraging a commercial industry to maximize production; and

(5) To maximize income from the fisheries industry with focus on increase of productivity.

FUNCTIONS

(1) To formulate policies, strategies and fisheries development plan as a whole with emphasis on extension of the deep-sea fisheries industry and enhancement of aquaculture development;

(2) To conduct research in capture fisheries and aquaculture as a scientific base for fisheries development as well as providing technical advice to the industry;

(3) To motivate changes in the target group and industry via technology transfer, technical advice and technology development;

(4) To manage and conserve fisheries resources via programmes such as licensing, artificial reefs, establishment of Marine Parks (Marine Reserves to ensure perpetuity of marine resources);

(5) To protect the fishery resources through enforcement of the Fisheries Act of 1985 and the EEZ Act of 1984; and

(6) To train fishermen and farmers in various fields through short/long term courses, study tours, demonstrations and other extension activities.

Source: Dealing with the Malaysian Civil Service; Malaysian Administrative Modernization and Planning Unit and the Prime Minister's Department.

ANNEX II

DEPARTMENT OF IRRIGATION AND DRAINAGE

OBJECTIVES

(1) To provide engineering infrastructures and services in irrigation and drainage areas so as to increase agricultural productivity;

(2) To provide flood mitigation works in order to minimize flood damage in the rural areas as well as to carry out similar works in the urban areas on behalf of the local authorities;

(3) To conserve and improve river flow so as to ensure that hydraulic efficiency is maintained; and

(4) To collect and analyze hydrological data for the evaluation of water resources in the country and to disseminate hydrological data for water resources development.

FUNCTIONS

(1) To provide irrigation facilities for padi cultivation and other crops;

(2) To provide drainage facilities for the advancement of agricultural activities;

(3) To maintain and to improve river flow which includes flood mitigation works;

(4) To undertake research and to execute coastal erosion works, to improve river mouth and to carry out data collection, to verify and disseminate coastal engineering data;

(5) To collect, process and disseminate hydrological data for studies to evaluate the development and management of water resources; and

(6) To provide engineering support services to other departments and agencies under the Ministry of Agriculture.

Source: Dealing with the Malaysian Civil Service; Malaysian Administrative Modernization and Planning Unit and the Prime Minister's Department.

ANNEX III

FISHERIES DEVELOPMENT AUTHORITY OF MALAYSIA

OBJECTIVES

(1) To improve the socio-economic status of fishermen, in particular, to increase their income; and

(2) To expand and develop the nation's fishing industry.

FUNCTIONS

(1) To promote and develop efficient and effective management of fishery enterprises and marketing of fish;

(2) To create and provide credit facilities for fish production and to ensure that such facilities are being ultimately utilized;

(3) To engage in fishery enterprise and in such undertaking to take part in boat construction, the production and supply of fishing gears and equipment;

(4) To promote, facilitate and undertake economic and social development of Fishermen's Associations;

(5) To register, control and supervise the Fishermen's Associations (and Fishing Cooperatives) and to make provisions for matters related thereto; and

(6) To control and coordinate the performance of the aforesaid activities.

Source: Dealing with the Malaysian Civil Service; Malaysian Administrative Modernization and Planning Unit and the Prime Minister's Department.

ANNEX IV

MARINE DEPARTMENT PENINSULAR MALAYSIA

OBJECTIVES

(1) To ensure a safe and regulated maritime transportation system.

FUNCTIONS

(1) To ensure safety of navigation for merchant ships;

(2) To provide shipping services to merchant shipping, i.e., ships survey, certification, registration and licensing;

(3) To provide shipping services to vessels entering Malaysian ports;

(4) To undertake transportation of passengers; and

(5) To conduct examinations for seafarers.

Source: Dealing with the Malaysian Civil Service; Malaysian Administrative Modernization and Planning Unit and the Prime Minister's Department.

ANNEX V

LIST OF FISHING LANDING COMPLEXES IDENTIFIED BY LKIM FOR DEVELOPMENT TO CATER FOR FISHING BOATS OF 40 GRT AND ABOVE

1. Kuala Perlis
2. Kuala Kedah
3. Batu Maung
4. Lumut
5. Port Kelang
6. Sedili Besar
7. Endau
8. Kuantan
9. Kemaman
10. Chedering
11. Kuala Terengganu
12. Besut
13. Kuala Besar
14. Kuching
15. Muka
16. Bintulu
17. Miri
18. One in Sabah State

Source: LKIM

11. DATABASE

THE NATIONAL RIVER MOUTHS STUDY
IN MALAYSIA

SUPPORTING REPORT NO. 11

DATABASE

[MANUAL OF RIVER MOUTH INFORMATION MANAGEMENT SYSTEM]
(RMOUTH)

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SUPPORTING REPORT NO. 11

DATABASE

[MANUAL OF RIVER MOUTH INFORMATION MANAGEMENT SYSTEM] (RMOUTH)

1. GENERAL

A data input and retrieval system has been established in the Master Plan Study. The name of the system is River Mouth Information Management System (RMOUTH). The purpose of establishment of the system is to store all relevant information in a database for easy retrieval in the management of the river mouth.

Some parts of the data retrieval system were used during the Master Plan Study. Accordingly, it contains not only the final value but also the basic and raw information from various sources, e.g., government organizations and interviewees.

The system is designed to simply retrieve information to a computer screen and to print out by a printer. Data input to the system under the National River Mouths Study (the Study) include the results of the inventory survey entrusted by the Jica Study Team (the Team) during the Study. Upgrading of the system for future management of river mouths is easy, with this system as the basic structure.

The software and hardware used to establish the RMOUTH are those supplied and lent by the Japan International Cooperation Agency (JICA) for the Study. They are as follows:

(1) Software

(a) dBase IV Ver. 1.5

(b) IBM (MS) DOS Ver. 5.0

(2) Hardware

(a) Computer

IBM PS/2 Model 70/386 (Memory, 4MB; Hard Disk, 80MB)

(b) Printer

HP LaserJet III

The manual gives the outline and method of operation of the established system, as well as the data items covered by the created database files. It does not include explanation for dBASE IV. For the operation of dBase IV, refer to the manual that comes with the program.

2. DATABASE FILES

The database files are broadly divided into two; namely, the results of the inventory survey and the additional information. The following database files have been created.

Results of Inventory Survey

(1) Part 1 Data

Part 1 Data consists of data and information collected mainly at relevant government organizations, e.g., the State Office of the Department of Irrigation and Drainage (DID) and the Department of Fisheries (DOF). **RESEAR_1.DBF** and **RES_1_F1.DBF** to **RES_1_F6.DBF** are the database files for Part 1 Data. Database structures and contents of the data field for **RESEAR_1. DBF** are given in Table 11.2-1. Those for **RES_1_F1.DBF** to **RES_1_F6.DBF** are given in Table 11.2-2 to Table 11.2-7.

(2) Part 2 Data

Part 2 Data consists of the results of interview with four local residents at the site. The data are stored in **RESEAR_2.DBF**. Database structures and explanations of the data field for **RESEAR_2.DBF** are given in Table 11.2-8.

(3) Part 3 Data

Part 3 Data consists of the results of field investigation by the local consultant and are compiled in **RESEAR_3.DBF**. Database structures and explanations of the data field for **RESEAR_3.DBF** are given in Table 11.2-9.

Additional Information

Additional information collected by the Team is stored in a database file under the name **ADD_INFO.DBF**. This database file includes the value applied for the Study after examining the raw data collected through the inventory survey. The database file named **MAPPHOTO.DBF** consists of information on topographical maps and aerial photographs by river mouth, e.g., Series No., Sheet No. and Scale. Database structures and explanations of the data field for **ADD_INFO.DBF** and **MAPPHOTO.DBF** are given in Table 11.2-10 and Table 11.2-11, respectively.

3. OUTLINE OF INFORMATION MANAGEMENT SYSTEM

This section describes the outline and major functions of the RMOUTH. For details on the method of operation, refer to Section 4, Operation of Management System.

The RMOUTH consists of five major procedures, as illustrated in Fig. 11.3-1. When the RMOUTH starts, a bar menu appears at the top of the screen. This is the main menu. The main menu allows you a choice from five procedures: Process, Card View, Browse View, Maintenance, and End. Functions assigned to each procedure are given below.

Process

[Process] amends data in the database files or inputs new data to the files. This procedure can be accessed only with a password given in the procedure **[Maintenance]** mentioned below. The password system applied to RMOUTH is just to avoid accidental destruction of database files. It is a simple one and is not the one provided by dBase IV. The password is saved in a database file under the name **_PW.DBF**. If the password is entered, the system collates it with the same password saved in **_PW.DBF**. Accordingly, even if you forget the password, you can know it from **_PW.DBF**.

Card View

This procedure is to view information in a card type output to the screen for a designated river mouth. The screen image can be hard copied to the printer. When you select this form, a sub-menu appears and asks for an objective river mouth. You can input the Serial No. of the objective river mouth, or input "?" if you do not know the serial number and you want to proceed to name search.

Browse View

This option is to browse and print out 100 river mouths information for a designated aspect, e.g., river features, river mouth geomorphology, navigation and fisheries, etc.

Maintenance

This procedure is for maintenance of the system and includes sub-menus: **[Change Password]**, **[Backup File to Floppy]**, and **[Restore File from Floppy]**.

End

This is to end the session with option to return to dBASE control center or to DOS.

4. OPERATION OF MANAGEMENT SYSTEM

Initial Screen

(1) When you start RMOUTH, an initial screen appears (refer to Fig. 11.4-1). Press <Enter> if you want to proceed.

(2) When you press <Enter>, the system asks whether or not you want to initialize the printer (Fig. 11.4-2). If you are going to use the printer in the succeeding procedure, on-line the printer, input "Y" and press <Enter>. If not, just press <Enter>. When you input "Y" here, the system initializes the printer to the following condition:

- Reset all printer settings
- Set PC-8 Font to be used
- Print 60 lines per page
- Print 12 cpi (characters per inch)
- Use A-4 size paper
- Set page orientation to portrait mode
- Set left margin to 11
- Set top margin to 4

Main Bar Menu

(3) The system then displays the main bar menu, as shown in Fig. 11.4-3. From this main bar menu, you can select any of the following five procedures; namely, **[Process]**, **[Card view]**, **[Browse view]**, **[Maintenance]** and **[End]**. Position the cursor to the desired procedure and press <Enter> to execute the procedure.

Process

(4) When you select **[Process]**, the system requests you to input a password, as shown in Fig. 11.4-4. Be sure that the password is case sensitive, then enter

the password. If the entered passwork is not correct, the system returns to the main bar menu after displaying a message, as shown in Fig. 11.4-5. If the password is correct, the system displays the sub-menu for the procedure **[Process]**, as shown in Fig. 11.4-6.

(5) The sub-menu for the procedure **[Process]** contains two options, **[Amend data]** and **[Add new record]**. Position the cursor to the desired procedure and press <Enter>. When you choose **[Amend data]**, the system displays another sub-menu, as shown in Fig. 11.4-7. In this sub-menu, **[RESEAR_1]**, **[RESEAR_2]** and **[RESEAR_3]** have sub-menus, as shown in Fig. 11.4-8, Fig. 11.4-9 and Fig. 11.4-10, respectively.

(6) Fig. 11.4-11 is an example of the procedure **[Amend data]** for **ADD_INFO.DBF**.

(7) When you enter data to a memo field, follow this procedure (refer to reference manuals of dBASE IV for details of memo field). Move the cursor to the desired memo field, as shown in Fig. 11.4-12. Data in memo fields cannot be amended directly as in the case of other fields. When you amend data in a memo field, first press <F9> (ZOOM). When you press <F9>, a ruler appears in the memo field window, as shown in Fig. 11.4-13, and you can then amend input data. If you want to see and amend data in a full screen, press <F9> again. Fig. 11.4-14 is an example of a full screen editor for the memo field. Press <Alt>+<Exit> when you finish data input/amendment in the memo field and then select sub-menu **[Save changes and exit]** or **[Abandon changes and exit]**.

(8) You can amend data from either edit or browse screens. The edit screen shows one record at a time and can extend to more than one screen. It is useful for finding or entering particular data in particular records. The browse screen shows multiple records in a table, as shown in Fig. 11.4-15. You can toggle between the two screens with the <F2> key (refer to reference manuals of dBASE IV for the details of edit and browse screens).

(9) When you select **[Add new records]** from the **[Process]** sub-menu, a sub-menu appears to select **[MAPPHOTO]**, as shown in Fig. 11.4-16. When you select **[MAPPHOTO]**, you can add data to **MAPPHOTO.DBF** from the screen, as shown in Fig. 11.4-17.

Card view

(10) When you select **[Card view]** from the main bar menu, the system asks you for the objective river mouth, as shown in Fig. 11.4-18. You can enter either the serial number of the objective river mouth or "?" if you do not know the serial number of the objective river mouth and you want to proceed to name search.

(11) When you enter "?" to the prompt as shown in Fig. 11.4-18, the next message appears as shown in Fig. 11.4-19. Here, you can input the name of the objective river mouth or you can input a part of the name if you are not sure of the exact name. Examples are shown in Fig. 11.4-19 and Fig. 11.4-20. If you input "M" for the name search as shown in Fig. 11.4-19, river mouths with names starting with the character "M" will be listed in alphabetical order with their serial number and the State where they belong for your selection, as shown in Fig. 11.4-20. From the list, you can highlight the objective river mouth and select.

(12) When the objective river mouth is selected by either entering the serial number or selecting the name through name search, the serial number and name of the selected river mouth is displayed at the bottom of the screen, as shown in Fig. 11.4-21. At the same time, the system displays a sub-menu for the **[Card view]** of the main bar menu, as shown in Fig. 11.4-21. The sub-menu allows you a choice from the following procedures. An item followed by dots "..." like **[River mouth features...]** has another sub-menu.

- River mouth name and state
- Map/photo data
- River features
- River mouth features...

- Navigation and fishery
- Socioeconomic condition...
- Present problems
- Researcher's comments
- Categorization and countermeasure

(13) When you select **[River mouth name and state]**, the system displays the serial number, name, belonging state, division (only for those in Sarawak) and district, as shown in Fig. 11.4-22. If you want to hard copy the screen image, confirm that the printer is on-line and press <Shift> and <PrtSc> keys at the same time as indicated at the bottom of the screen. If you want to return to the previous menu, press <Esc> key.

(14) When you select **[Map/photo data]** from the sub-menu **[Card view]**, the information for each data item will be displayed. For example, if nine data are available for a certain river mouth, the nine pages of data will be displayed page by page, as shown in Fig. 11.4-23. You can toggle between pages using <PgUp> or <PgDn> key. If you want to hard copy the screen image, confirm that the printer is on-line and press <Shift> and <PrtSc> keys at the same time as indicated at the bottom of the screen. If you want to return to the previous menu, press <Esc> key.

(15) When you select **[River features]** from sub-menu **[Card view]**, the features of the river will be displayed, as shown in Fig. 11.4-24. If you want to hard copy the screen image, confirm that the printer is on-line and press <Shift> and <PrtSc> keys at the same time as indicated at the bottom of the screen. If you want to return to the previous menu, press <Esc> key.

(16) When you select **[River mouth features...]** from sub-menu **[Card view]**, another sub-menu appears, as shown in Fig. 11.4-25. You can then choose from the following three items:

- Geomorphology
- Oceanographic data

- Structures...

[Structures...] contains another sub-menu.

(17) When you select **[Geomorphology]** from the sub-menu **[River mouth features...]**, the system displays a one-page information on river mouth geomorphological features, as shown in Fig. 11.4-26. If you want to hard copy the screen image, confirm that the printer is on-line and press <Shift> and <PrtSc> keys at the same time as indicated at the bottom of the screen. If you want to return to the previous menu, press <Esc> key.

(18) When you select **[Oceanographic data]** from the sub-menu **[River mouth features...]**, the system displays a one-page information on river mouth oceanographic features, as shown in Fig. 11.4-27. If you want to hard copy the screen image, confirm that the printer is on-line and press <Shift> and <PrtSc> keys at the same time as indicated at the bottom of the screen. If you want to return to the previous menu, press <Esc> key.

(19) When you select **[Structures...]** from the sub-menu **[River mouth features...]**, the system displays another sub-menu to select **[General information]** or **[Details]**, as shown in Fig. 11.4-28. If you select **[General information]**, a two-page information on structures at the river mouth will be displayed, as shown in Fig. 11.4-29. Information on dredging is included in the second page of this item. You can toggle between the pages with <PgUp> or <PgDn> key. If you want to hard copy the screen image, confirm that the printer is on-line and press <Shift> and <PrtSc> keys at the same time as indicated at the bottom of the screen. If you want to return to the previous menu, press <Esc> key.

(20) If you select **[Details]**, a two-page detailed information on structures at the river mouth will be displayed, as shown in Fig. 11.4-30. You can toggle between the pages with <PgUp> or <PgDn> key. If you want to hard copy the screen image, confirm that the printer is on-line and press <Shift> and <PrtSc> keys at the same time as indicated at the bottom of the screen. If you want to return to the previous menu, press <Esc> key.

(21) When you select **[Navigation and fishery]** from the sub-menu **[Card view]**, the number of commercial boats, number of fishing boats by size, number of fishermen and location of fishing will be displayed in one page, as shown in Fig. 11.4-31. If you want to hard copy the screen image, confirm that the printer is on-line and press <Shift> and <PrtSc> keys at the same time as indicated at the bottom of the screen. If you want to return to the previous menu, press <Esc> key.

(22) When you select **[Socioeconomic condition...]** from the sub-menu **[Card view]**, another sub-menu appears, as shown in Fig. 11.4-32. You can then select from the following items:

- Water use
- Land use, vegetation and urban centers
- Development plans
- Fauna/flora
- Activities and others

(23) When you select **[Water use]** from the sub-menu **[Socioeconomic condition...]**, the system displays a one-page information on water use in the river basin, as shown in Fig. 11.4-33. If you want to hard copy the screen image, confirm that the printer is on-line and press <Shift> and <PrtSc> keys at the same time as indicated at the bottom of the screen. If you want to return to the previous screen, press <Esc> key.

(24) When you select **[Land use, vegetation and urban centers]** from the sub-menu **[Socioeconomic condition...]**, the system displays a two-page information, as shown in Fig. 11.4-34. You can toggle between pages using <PgUp> or <PgDn> key. If you want to hard copy the screen image, confirm that the printer is on-line and press <Shift> and <PrtSc> keys at the same time as indicated at the bottom of the screen. If you want to return to the previous menu, press <Esc> key. If there is no information on the selected item for the objective river mouth, the system displays a message, as shown in Fig. 11.4-35.

(25) When you select **[Development plans]** from the sub-menu **[Socioeconomic condition...]**, the system displays a two-page information, as shown in Fig. 11.4-36. You can toggle between pages using <PgUp> or <PgDn> key. If you want to hard copy the screen image, confirm that the printer is on-line and press <Shift> and <PrtSc> keys at the same time as indicated at the bottom of the screen. If you want to return to the previous menu, press <Esc> key.

(26) When you select **[Fauna/flora]** from the sub-menu **[Socioeconomic condition...]**, the system displays a one-page information, as shown in Fig. 11.4-37. If you want to hard copy the screen image, confirm that the printer is on-line and press <Shift> and <PrtSc> keys at the same time as indicated at the bottom of the screen. If you want to return to the previous menu, press <Esc> key.

(27) When you select **[Activities and others]** from the sub-menu **[Socioeconomic condition...]**, the system displays a four-page information, as shown in Fig. 11.4-38. The information includes existence of activity, kind of activity and local interviewees memo on socioeconomic condition of the river mouth. If you want to hard copy the screen image, confirm that the printer is on-line and press <Shift> and <PrtSc> keys at the same time as indicated at the bottom of the screen. If you want to return to the previous menu, press <Esc> key.

(28) When you select **[Present problems]** from the sub-menu **[Card view]**, the system displays a four-page information on present problems at the river mouth which include river mouth clogging condition, existence of commercial navigation difficulty, complaint from fishermen, existence of flooding problem, water supply difficulty and water pollution source, as shown in Fig. 11.4-39. If you want to hard copy the screen image, confirm that the printer is on-line and press <Shift> and <PrtSc> keys at the same time as indicated at the bottom of the screen. If you want to return to the previous menu, press <Esc> key.

(29) When you select **[Researcher's Comments]** from the sub-menu **[Card view]**, the system displays a three-page researcher's comments, each page consisting of socioeconomic effects of the Project, applicable countermeasures and

researcher's comment, respectively, as shown in Fig. 11.4-40. All the information is on a memo field. Accordingly, if any information is not visible on screen, you can zoom into the screen by pressing <F9>, as shown in Fig. 11.4-41. If you want to hard copy the screen image, confirm that the printer is on-line and press <Shift> and <PrtSc> keys at the same time as indicated at the bottom of the screen. If you want to return to the previous menu, press <Esc> key.

(30) When you select **[Categorization and countermeasure]** from the sub-menu **[Card view]**, the system displays a one-page information including the category to which the objective river mouth belongs, design boat size, and net present value of cost and benefit in the Master Plan, as shown in Fig. 11.4-42. If you want to hard copy the screen image, confirm that the printer is on-line and press <Shift> and <PrtSc> keys at the same time as indicated at the bottom of the screen. If you want to return to the previous menu, press <Esc> key.

Browse view

(31) When you select **[Browse view]** from the main bar menu, the system displays a sub-menu, as shown in Fig. 11.4-43. The sub-menu allows you a choice from the following procedures. An item with dots "..." like **[River mouth features...]** has another sub-menu.

- River mouth list
- River features
- River mouth features...
- Navigation and fishery
- Socioeconomic conditions...
- Present problems
- Categorization and countermeasure

(32) When you select any item from the sub-menu, a message appears and prompts you to input whether or not the printer is ready, as shown in Fig. 11.4-44. The

system then asks you to which device you want to output, as shown in Fig. 11.4-45. Select **[LPT1]** to print out the information.

(33) The sub-menu **[River mouth features...]** contains four options; namely, **[Geomorphology]**, **[Classification]**, **[Oceanographic data]** and **[Structures]**, as shown in Fig. 11.4-46. The sub-menu **[Socioeconomic conditions...]** consists of two options, **[Land use]** and **[Major urban centers]**, as shown in Fig. 11.4-47.

(34) An example of printout for **[River mouth list]** in the **[Browse view]** menu is given in Table 11.4-1.

(35) An example of printout for **[River features]** in the **[Browse view]** menu is given in Table 11.4-2.

(36) An example of printout for **[Geomorphology]** in the sub-menu **[River mouth features...]** is given in Table 11.4-3.

(37) An example of printout for **[Classification]** in the sub-menu **[River mouth features...]** is given in Table 11.4-4.

(38) An example of printout for **[Oceanographic data]** in the sub-menu **[River mouth features...]** is given in Table 11.4-5.

(39) An example of printout for **[Structures]** in the sub-menu **[River mouth features...]** is given in Table 11.4-6.

(40) An example of printout for **[Navigation and fishery]** in the **[Browse view]** menu is given in Table 11.4-7.

(41) An example of printout for **[Land use]** in the sub-menu **[Socioeconomic conditions...]** is given in Table 11.4-8.

(42) An example of printout for **[Major urban centers]** in the sub-menu **[Socioeconomic conditions...]** is given in Table 11.4-9.

(43) An example of printout for **[Present problems]** in the **[Browse view]** menu is given in Table 11.4-10.

(44) An example of printout for **[Categorization and countermeasure]** in the **[Browse view]** menu is given in Table 11.4-11.

Maintenance

(45) When you select **[Maintenance]** from the main bar menu, a sub-menu appears giving you a choice from **[Change password]**, **[Back up file to floppy]** and **[Restore file from floppy]**, as shown in Fig. 11.4-48.

(46) Select **[Change password]** when you want to change the password. If you select this item, the system requests you to input the old passwork, as shown in Fig. 11.4-49. Be sure that the password is case sensitive, then enter the old password. If the entered password is not correct, the system returns to show the main bar menu after displaying a message, as shown in Fig. 11.4-50. If the password is correct, the system requests you to enter a new password, as shown in Fig. 11.4-51. The entered password will be saved in a database file under the name **_PW.DBF**.

(47) When you select **[Back up file to floppy]** from the **[Maintenance]** menu, the system gives you a message to confirm the action, as shown in Fig. 11.4-52. If you want to proceed to back up the file, input "Y" and press <Enter>. If not, just press <Enter>.

(48) When you select **[Restore file to floppy]** from the **[Maintenance]** menu, the system gives you a message to confirm the action, as shown in Fig. 11.4-53. If you want to proceed to back up the file, input "Y" and press <Enter>. If not, just press <Enter>.

End

(49) When you select **[End]** from the main bar menu, a sub-menu appears giving you a choice from **[End session]** or **[Quit to DOS]**, as shown in Fig. 11.4-54.

(50) When you select **[End session]** from the **[End]** menu, the system resets all settings to default value and gives control to the location where the system was started. If you started the system from the control center of dBASE IV, it returns to the control center. If you started the system from the dot prompt, it returns to the dot prompt.

(51) When you select **[Quit to DOS]**, the system resets all settings to default value, ends dBASE IV and returns to the MS-DOS prompt.

5. PROGRAMS

The following programs comprise the RMOUTH:

(1) **R_M_BAT.PRG** (ANNEX 2)

(2) **R_MOUTH.PRG** (ANNEX 3)

(3) **RMPROC.PRG** (ANNEX 4)

The specification for the **R_MOUTH.PRG** is in **R_MOUTH.DOC**, as shown in ANNEX 5.

TABLES

Table 11.2-1(1/3) STRUCTURE OF DATABASE FILE RESEAR_1.DBF

No.	Name	Type *1	Width	Decimal	Index	Explanation
1	SERIAL	N	3		Y	Serial No. of the objective river mouth
2	NAME	C	12		Y	Name of the objective river mouth
3	STATE	C	10		N	Name of the state where the objective river mouth belongs
4	DIVISION	C	12		N	Name of the division where the objective river mouth belongs (only for Sarawak)
5	DISTRICT	C	15		N	Name of the district where the objective river mouth belongs
6	SURVEYOR	C	20		N	Name of the surveyor who conducted the inventory survey
7	ENGINEER	C	20		N	Name of the engineer who conducted the inventory survey
8	DATE	D	8		N	Date when the inventory survey was conducted
9	TIME	C	9		N	Time when the inventory survey was conducted
10	WEATHER	C	2		N	Weather during the inventory survey
11	LOCATION	C	100		N	Location of the inventory survey
12	INT_NAME_1	C	20		N	Name of interviewee No.1
13	INT_NAME_2	C	20		N	Name of interviewee No.2
14	INT_POSI_1	C	25		N	Position of interviewee No.1
15	INT_POSI_2	C	25		N	Position of interviewee No.2
16	INT_ORGANI	C	70		N	Organization which the interviewees belong
17	INT_ADDRES	C	100		N	Address for the organization
18	INT_TELFAX	C	50		N	Telephone and facsimile number of the organization
19	INT_OTHER	C	80		N	Other information of the organization
20	C_AREA	N	7	1	N	Catchment area of the river basin for the objective river mouth
21	R_LENGTH	N	6	1	N	River length of the river basin for the objective river mouth
22	R_GRADIENT	N	5		N	Riverbed gradient of the river stretch near the mouth for the objective river mouth
23	F_CAPACITY	N	4		N	Flow capacity of the river stretch near the mouth for the objective river mouth
24	Q_DATA_F1	L	1		N	Availability of discharge data of the river
25	R_DATA_F1	L	1		N	Availability of rainfall data in the catchment area
26	WL_DATA_F1	L	1		N	Availability of water level data of the river
27	SAND_DT_F1	L	1		N	Availability of sediment supply data for the catchment
28	RB_MATERI	C	2		N	Riverbed material
29	RM_MATERI	C	2		N	River mouth material
30	RM_LOCATI	C	2		N	River mouth location
31	RM_LOC_F2	L	1		N	Availability of the map for the river mouth location
32	RM_FORM	C	2		N	River mouth form
33	RM_WIDTH	N	5	1	N	River mouth width
34	RM_DEPTH	N	5	1	N	River mouth depth
35	RM_CROSS_S	L	1		N	Availability of river mouth cross section
36	RM_CROS_F2	L	1		N	Availability of river mouth cross section in Form 1-2
37	BCH_CONDI	C	2		N	Beach condition
38	BCH_F2	L	1		N	Availability of beach condition information in Form 1-2
39	SHO_CONDI	C	2		N	Shoreline condition
40	SHO_F2	L	1		N	Availability of shoreline condition information in Form 1-2
41	SB_MATERI	C	2		N	Seabed material
42	LIT_MATERI	C	2		N	Littoral material

Note *1: C:Character N:Numerical L:Logical

Table 11.2-1(2/3) STRUCTURE OF DATABASE FILE RESEAR_1.DBF

No.	Name	Type *1	Width	Dec-imal	Index	Explanation
43	WAVE_DT_F1	L	1		N	Wave data availability in Form 1-1
44	TIDE_DT_F1	L	1		N	Tide data availability in Form 1-1
45	WIND_DT_F1	L	1		N	Wind data availability in Form 1-1
46	CURT_DT_F1	L	1		N	Current data availability in Form 1-1
47	LANDUSE_F2	L	1		N	Land use data availability in Form 1-1
48	URBAN_AREA	C	40		N	Major urban areas near the objective river mouth
49	URBAN_F3	L	1		N	Availability of information in Form 1-3 on major urban areas near the objective river mouth
50	DEMOGRA_F2	L	1		N	Availability of demographical data in Form 1-2
51	NAV_FREQ	C	2		N	Frequency of navigation at the river mouth
52	NAV_F4	L	1		N	Availability of navigation information in Form 1-4
53	FIS_FREQ	C	2		N	Frequency of fishery
54	FIS_F4	L	1		N	Availability of fishery information in Form 1-4
55	FIS_LOCATI	C	8		N	Fishery location
56	W_USE	C	11		N	Purpose of river water use near the objective river mouth
57	W_USE_MEMO	M	10		N	Additional information on river water use near the objective river mouth
58	URB_W_PROB	C	5		N	Urban water problem near the objective river mouth
59	URB_W_MEMO	M	10		N	Additional information on urban water problem near the objective river mouth
60	DEVELOP_P	L	1		N	Existence of development plans near the objective river mouth
61	DEV_P_F5	L	1		N	Availability of information on development plans in Form 1-5
62	HYD_STRUCT	C	17		N	Existence of hydraulic structures near the objective river mouth
63	HYD_ST_F6	L	1		N	Availability of information on hydraulic structures in Form 1-5
64	FLORAFAUNA	L	1		N	Existence of flora and fauna information near the objective river mouth
65	FF_F2	L	1		N	Availability of flora and fauna information in Form 1-2
66	W_QUALI_F1	L	1		N	Availability of water quality information in Form 1-1
67	CLG_CONDI1	C	2		N	River mouth clogging condition for cause No.1
68	CLG_CONDI2	C	2		N	River mouth clogging condition for cause No.2
69	CLG_CAUSE1	C	2		N	River mouth clogging cause No.1
70	CLG_CAUSE2	C	2		N	River mouth clogging cause No.2
71	CLG_PERIO1	C	2		N	River mouth clogging period for cause No.1
72	CLG_PERIO2	C	2		N	River mouth clogging period for cause No.2
73	CLG_FREQ1	C	2		N	River mouth clogging frequency for cause No.1
74	CLG_FREQ2	C	2		N	River mouth clogging frequency for cause No.2
75	CLG_LOCAT1	C	8		N	River mouth clogging location for cause No.1
76	CLG_LOCAT2	C	8		N	River mouth clogging location for cause No.2
77	CLG_DAMAGE	C	11		N	Kind of damage caused by clogging
78	RR_DIFFIC	C	8		N	The sector affected by clogging
79	NAV_DIFFIC	C	8		N	Reason of navigation difficulty
80	FIS_DIFFIC	C	8		N	Reason of fishery difficulty
81	NAV_FIS_MM	M	10		N	Additional information on navigation and fishery
82	FLD_Y_OR_N	L	1		N	Existence of flooding damage in the objective river mouth area

Note *1: C:Character N:Numerical L:Logical

Table 11.2-1(3/3) STRUCTURE OF DATABASE FILE RESEAR_1.DBF

No.	Name	Type *1	Width	Decimal	Index	Explanation
83	FLD_FREQ	C	2		N	Food frequency for the past 20 years
84	FLD_LOCATI	C	2		N	Location of flood
85	FLD_AREA	N	5	1	N	Historical maximum flooding area
86	FLD_DMG_MX	N	7		N	Historical maximum flood damage
87	FLD_MX_OCC	N	4		N	Year for the historical maximum flood occurrence
88	FLD_DMG_YR	N	7		N	Annual average flood damage
89	FLD_CAUSE	C	5		N	Major flood cause
90	FLD_CITY	C	50		N	Name of the city damaged by the flood
91	W_SUP_DIFF	C	11		N	The sector in which water supply difficulty occurs
92	W_SUP_MEMO	M	10		N	Additional information on water supply
93	W_POLLUTI	C	5		N	The kind of water pollution near the objective river mouth
94	W_PUL_MEMO	M	10		N	Additional information on water pollution
95	DRA_Y_OR_N	L	1		N	Existence of drainage system near the objective river mouth
96	DRA_PURPOS	C	8		N	The purpose of drainage system
97	STR_Y_OR_N	L	1		N	Existence of river mouth structures
98	STR_PURPOS	C	11		N	Purpose of structure
99	STR_WORK	C	2		N	Working condition of the structure
100	STR_CONDI	C	2		N	Condition of the structure
101	STR_F6	L	1		N	Availability of information on structures in Form 1-6
102	MAINTE_Y_N	L	1		N	Existence of maintenance work for the structure
103	MAINTE_F5	L	1		N	Availability of maintenance work information in Form 1-5
104	PROPOSE	L	1		N	Existence of structure installation proposal
105	PROP_F5	L	1		N	Availability of information in Form 1-5 on structure installation proposal

Note *1: C:Character N:Numerical L:Logical

Table 11.2-2 STRUCTURE OF DATABASE FILE RES_1_F1.DBF

No.	Name	Type *1	Width	Decimal	Index	Explanation
1	SERIAL	N	3		Y	Serial No. of the objective river mouth
2	DT_ITEM_1	C	2		N	Data item No.1
3	DT_ITEM_2	C	2		N	Data item No.2
4	STATION	C	50		N	Name of the station
5	STA_SERIAL	C	25		N	Serial No. of the station
6	OBSV_START	C	8		N	Date of observation start
7	OBSV_END	C	8		N	Date of observation end
8	OBSV_METHO	C	20		N	Observation method
9	OBSV_FREQ	C	2		N	Observation frequency
10	BOOK_TITLE	C	200		N	Title of reference material
11	OFFICE_SEC	C	50		N	Section of management office
12	OFFICE_DEP	C	50		N	Department of management office
13	OFFIC_CITY	C	25		N	City where the management office is located
14	MEMO	M	10		N	Additional information

Note *1: C:Character N:Numerical L:Logical

Table 11.2-3 STRUCTURE OF DATABASE FILE RES_1_F2.DBF

No.	Name	Type *1	Width	Dec-imal	Index	Explanation
1	SERIAL	N	3		Y	Serial No. of the objective river mouth
2	DT_ITEM_1	C	2		N	Data item No.1
3	DT_ITEM_2	C	2		N	Data item No.2
4	YEAR	C	5		N	Investigation/survey year
5	TITLE	C	200		N	Title of the map or drawing
6	PAGE_NO	C	7		N	Page number
7	OFFICE_SEC	C	50		N	Section of management office
8	OFFICE_DEP	C	50		N	Department of management office
9	OFFIC_CITY	C	20		N	City where the management office is located
10	MEMO	M	10		N	Additional information

Note *1: C:Character N:Numerical L:Logical

Table 11.2-4 STRUCTURE OF DATABASE FILE RES_1_F3.DBF

No.	Name	Type *1	Width	Decimal	Index	Explanation
1	SERIAL	N	3		Y	Serial No. of the objective river mouth
2	DT_ITEM_1	C	2		N	Data item No.1
3	CITY_NAME	C	50		N	Name of the city
4	LOCATION	C	50		N	Location of the city
5	DISTANCE	N	3		N	Distance of the city from the objective river mouth
6	POPULATION	N	7		N	Population of the city
7	DEP_DEGREE	N	3		N	Degree of dependence of the river mouth to the city
8	MEMO	M	10		N	Additional information

Note *1: C:Character N:Numerical L:Logical

Table 11.2-5 STRUCTURE OF DATABASE FILE RES_1_F4.DBF

No.	Name	Type *1	Width	Dec-imal	Index	Explanation
1	SERIAL	N	3		Y	Serial No. of the objective river mouth
2	DT_ITEM_1	C	2		N	Data item No.1
3	DT_ITEM_2	C	2		N	Data item No.2
4	NO_SHIPS	N	4		N	Number of ships
5	SHIP_SIZE	C	100		N	Size of ships
6	SHIP_VOLUM	N	4		N	Shipping volume at the river mouth
7	SHIP_V_MAX	N	4		N	Maximum shipping volume at the river mouth
8	SHIP_V_MIN	N	4		N	Minimum shipping volume at the river mouth
9	SHIP_VUNIT	C	15		N	Unit of shipping volume
10	PORT_LOCAT	C	25		N	Location of the nearest port
11	PORT_CAPAC	C	10		N	Capacity of the port
12	PORT_DIMEN	C	15		N	Dimension of the port
13	FISH_YIELD	C	10		N	Fish yield for the river mouth
14	FISH_YYEAR	N	4		N	Annual fish yield for the river mouth
15	MEMO	M	10		N	Additional information

Note *1: C:Character N:Numerical L:Logical

Table 11.2-6 STRUCTURE OF DATABASE FILE RES_1_F5.DBF

No.	Name	Type *1	Width	Decimal	Index	Explanation
1	SERIAL	N	3		Y	Serial No. of the objective river mouth
2	DT_ITEM_1	C	2		Y	Data item No.1
3	DT_ITEM_2	C	2		N	Data item No.2
4	PROJECT	C	200		N	Name of the project
5	OBJECTIVE	C	50		N	Objective of the project
6	WORK_START	C	8		N	Starting year of the work
7	WORK_END	C	8		N	Ending year of the work
8	WORK_PERIO	C	20		N	Work period
9	WORK_VOL	C	200		N	Work volume
10	OFFICE_SEC	C	50		N	Section of management office
11	OFFICE_DEP	C	50		N	Department of management office
12	OFFIC_CITY	C	25		N	City where the management office is located
13	COST	N	10		N	Construction cost
14	ADDRESS	C	50		N	Address of the management office
15	MEMO	M	10		N	Additional information

Note *1: C:Character N:Numerical L:Logical

Table 11.2-7 STRUCTURE OF DATABASE FILE RES_1_F6.DBF

No.	Name	Type *1	Width	Dec-imal	Index	Explanation
1	SERIAL	N	3		Y	Serial No. of the objective river mouth
2	DT_ITEM_1	C	2		N	Data item No.1
3	DT_ITEM_2	C	2		N	Data item No.2
4	FACILITY	C	2		N	Name of the facility
5	PURPOSE	C	100		N	Purpose of the facility
6	LOCATION	C	100		N	Location of the facility
7	SIZE_DIMEN	C	15		N	Size (Dimension)
8	SIZE_H	N	4	1	N	Size (Height)
9	SIZE_W	N	4	1	N	Size (Width)
10	SIZE_L	N	7	1	N	Size (Length)
11	STARTED	C	8		N	Started year of construction
12	COMPLETION	C	8		N	Completion year of construction
13	CONST_COST	N	10		N	Construction cost
14	OFFICE_SEC	C	50		N	Section of management office
15	OFFICE_DEP	C	50		N	Department of management office
16	OFFIC_CITY	C	35		N	City where the management office is located
17	MEMO	M	10		N	Additional information

Note *1: C:Character N:Numerical L:Logical

Table 11.2-8(1/2) STRUCTURE OF DATABASE FILE RESEAR_2.DBF

No.	Name	Type *1	Width	Decimal	Index	Explanation
1	SERIAL	N	3		Y	Serial No. of the objective river mouth
2	INTVIEW_NO	N	1		Y	Interviewee No.
3	SURVEYOR	C	15		N	Name of the surveyor who conducted the interview
4	ENGINEER	C	15		N	Name of the engineer who conducted the interview
5	DATE	D	8		N	Date when the interview was conducted
6	TIME	C	9		N	Time when the interview was conducted
7	WEATHER	C	2		N	Weather during the interview
8	LOCATION	C	50		N	Location where the interview was conducted
9	INT_NAME	C	30		N	Name of the interviewee
10	INT_POSI	C	40		N	Position of the interviewee
11	INT_ORGANI	C	30		N	Organization which the interviewee belongs
12	INT_ADDRES	C	100		N	Address of the interviewee
13	INT_TELFAX	C	20		N	Telephone/fax No. of the interviewee
14	INT_OTHER	C	50		N	Other information on the interviewee
15	RM_LOCATI	C	2		N	River mouth location
16	RM_FORM	C	2		N	River mouth form
17	RM_WID_DRY	C	10		N	River mouth width during dry season
18	RM_WID_RAI	C	10		N	River mouth width during rainy season
19	RM_DEP_DRY	C	10		N	River mouth depth during dry season
20	RM_DEP_RAI	C	10		N	River mouth depth during rainy season
21	BCH_CLASS	C	2		N	Classification of beach
22	BCH_CHANGE	C	2		N	Beach change condition
23	SHO_MOVE	C	2		N	Shoreline moving condition
24	BCH_REASON	C	8		N	Main reason of beach change
25	CRT_FROM	C	2		N	Current direction (coming from)
26	CRT_TO	C	2		N	Current direction (going to)
27	IND_S_NO	C	9		N	Number of industrial and commercial ship
28	IND_S_SIZE	C	25		N	Size of industrial and commercial ship
29	IND_S_KIND	C	8		N	Kind of industrial and commercial ship
30	IND_S_VOL	C	25		N	Volume of transportation for industrial and commercial ship
31	FIS_S_NO	C	9		N	Number of fishing ship
32	FIS_S_SIZE	C	25		N	Size of fishing ship
33	FIS_S_KIND	C	8		N	Kind of fishing ship
34	FIS_S_VOL	C	25		N	Volume of fishing ship
35	SER_S_NO	C	9		N	Number of service and other ship
36	SER_S_SIZE	C	25		N	Size of service and other ship
37	SER_S_KIND	C	8		N	Kind of service and other ship
38	SER_S_VOL	C	25		N	Volume of service and other ship
39	W_QUALI	L	1		N	Existence of water quality problem in the river mouth area
40	W_Q_CHANGE	C	4		N	Frequency of water quality change
41	CLG_CONDI1	C	2		N	River mouth clogging condition for cause No.1
42	CLG_CONDI2	C	2		N	River mouth clogging condition for cause No.2
43	CLG_CAUSE1	C	2		N	River mouth clogging cause No.1
44	CLG_CAUSE2	C	2		N	River mouth clogging cause No.2
45	CLG_PERIO1	C	2		N	River mouth clogging period for cause No.1
46	CLG_PERIO2	C	2		N	River mouth clogging period for cause No.2
47	CLG_FREQ1	C	2		N	River mouth clogging frequency for cause No.1
48	CLG_FREQ2	C	2		N	River mouth clogging frequency for cause No.2

Note *1: C:Character N:Numerical L:Logical

Table 11.2-8(2/2) STRUCTURE OF DATABASE FILE RESEAR_2.DBF

No.	Name	Type *1	Width	Dec-imal	Index	Explanation
49	CLG_LOCAT1	C	8		N	River mouth clogging location for cause No.1
50	CLG_LOCAT2	C	8		N	River mouth clogging location for cause No.2
51	CLG_DAMAGE	C	11		N	Kind of damage caused by clogging
52	RR_DIFFIC	C	8		N	The sector affected by clogging
53	CLG_MEMO	M	10		N	Additional information for river mouth clogging
54	NAV_DIFFIC	C	8		N	Reason of navigation difficulty
55	FIS_DIFFIC	C	8		N	Reason of fishing difficulty
56	FLD_Y_OR_N	L	1		N	Existence of flooding damage in the objective river mouth area
57	FLD_FREQ	C	2		N	Flood frequency for the past 10 years
58	MAX_INUN	C	2		N	Maximum inundation depth during the flood
59	FLD_DURA	C	4		N	Duration of flooding
60	DMG_ITEM	C	20		N	Damaged items of indoor effects
61	DMG_COST	C	20		N	Estimated flood damage on indoor effects
62	W_SUP_DIFF	C	11		N	Kind of water supply difficulty
63	W_POLLUTI	C	5		N	Kind of water pollution difficulty
64	W_MEMO	M	10		N	Additional information on water utilization
65	NAV_FREQ	C	2		N	Frequency of navigation at the river mouth
66	FIS_FREQ	C	2		N	Frequency of fishing
67	FIS_LOCATI	C	8		N	Fishery location
68	W_USE	C	11		N	Purpose of river water use near the objective river mouth
69	URB_W_PROB	C	5		N	Urban water problem near the objective river mouth
70	ACTIVITY	L	1		N	Existence of activity at the river mouth
71	ACT_KIND	C	8		N	Kind of activity
72	SOCIO	M	10		N	Socioeconomic affects including culture, special custom, etc.

Note *1: C:Character N:Numerical L:Logical

Table 11.2-9(1/2) STRUCTURE OF DATABASE FILE RESEAR_3.DBF

No.	Name	Type *1	Width	Decimal	Index	Explanation
1	SERIAL	N	3		Y	Serial No. of the objective river mouth
2	SURVEYOR	C	25		N	Name of the surveyor who conducted the field investigation survey
3	ENGINEER	C	25		N	Name of the engineer who conducted the field investigation survey
4	DATE	D	8		N	Date when the field investigation survey was conducted
5	TIME	C	9		N	Time when the field investigation survey was conducted
6	WEATHER	C	2		N	Weather during the field investigation survey
7	LOCATION	C	100		N	Location of the field investigation survey
8	INT_NAME	C	25		N	Name of interviewee
9	INT_POSI	C	25		N	Position of interviewee
10	INT_ORGANI	C	50		N	Organization which the interviewee belongs
11	INT_ADDRES	C	100		N	Address of the interviewee
12	INT_TELFAX	C	30		N	Telephone and facsimile number of the interviewee
13	INT_OTHER	C	100		N	Other information on the interviewee
14	RM_MATERI	C	4		N	Riverbed material
15	MATE_PHOTO	C	5		N	Photograph No. of riverbed material
16	RM_LOCATI	C	2		N	Location of river mouth
17	LOC_PHOTO	C	5		N	Photograph No. for river mouth location
18	RM_FORM	C	2		N	River mouth form
19	FORM_PHOTO	C	5		N	Photograph No. for river mouth form
20	RM_WIDTH	N	5	1	N	River mouth width surveyed during the field investigation survey
21	RM_DEPTH	N	4	1	N	River mouth depth surveyed during the field investigation survey
22	RM_WD_DATE	D	8		N	Date of river mouth width/depth survey
23	RM_WD_TIME	C	5		N	Time of river mouth width/depth survey
24	BCH_PHOTO	C	5		N	Photograph No. for beach condition
25	SHO_PHOTO	C	5		N	Photograph No. for shoreline condition
26	LIT_MATERI	C	4		N	Littoral material
27	LIT_PHOTO	C	5		N	Photograph No. for littoral condition
28	LUSE_PHOTO	C	5		N	Photograph No. for land use condition
29	HYD_STRUCT	C	16		N	Kind of hydraulic structure
30	HYD_ST_F6	L	1		N	Availability of information in Form 1-6 for hydraulic structures
31	HYD_PHOTO	C	5		N	Photograph No. for hydraulic structures
32	W_TURBID	C	2		N	Water quality survey results (turbidity)
33	W_COLOR	C	2		N	Water quality survey results (color)
34	W_ODOR	C	2		N	Water quality survey results (odor)
35	W_TEMPERA	N	2		N	Water quality survey results (temperature)
36	W_PHOTO	C	5		N	Photograph No. for water in the river mouth area
37	ACTIVITY	L	1		N	Existence of activities at the river mouth
38	ACT_KIND	C	8		N	Kind of the activities
39	ACT_PHOTO	C	5		N	Photograph No. for the activities
40	FLD_MARK	L	1		N	Existence of flood mark
41	FLD_M_DATE	D	8		N	Date of the marked flood
42	FLD_M_HIGH	N	3	1	N	Elevation of the flood mark
43	FLD_PHOTO	C	5		N	Photograph No. for the flood mark
44	STR_Y_OR_N	L	1		N	Existence of river mouth structures
45	STR_PURPOS	C	11		N	Purpose of the structure

Note *1: C:Character N:Numerical L:Logical

Table 11.2-9(2/2) STRUCTURE OF DATABASE FILE RESEAR_3.DBF

No.	Name	Type *1	Width	Dec-imal	Index	Explanation
46	STR_WORK	C	2		N	Working condition of the structure
47	STR_CONDI	C	2		N	Condition of the structure
48	STR_F6	L	1		N	Availability of information on structures in Form 1-6
49	STR_PHOTO	C	5		N	Photograph No. for the structure
50	CLG_CONDI1	C	2		N	River mouth clogging condition for cause No.1
51	CLG_CONDI2	C	2		N	River mouth clogging condition for cause No.2
52	CLG_CAUSE1	C	2		N	River mouth clogging cause No.1
53	CLG_CAUSE2	C	2		N	River mouth clogging cause No.2
54	CLG_PERIO1	C	2		N	River mouth clogging period for cause No.1
55	CLG_PERIO2	C	2		N	River mouth clogging period for cause No.2
56	CLG_FREQ1	C	2		N	River mouth clogging frequency for cause No.1
57	CLG_FREQ2	C	2		N	River mouth clogging frequency for cause No.2
58	CLG_LOCAT1	C	8		N	River mouth clogging location for cause No.1
59	CLG_LOCAT2	C	8		N	River mouth clogging location for cause No.2
60	CLG_DAMAGE	C	11		N	Kind of damage caused by clogging
61	RR_DIFFIC	C	8		N	The sector affected by clogging
62	NAV_DIFFIC	C	8		N	Reason of navigation difficulty
63	W_SUP_DIFF	C	8		N	The sector in which water supply difficulty occurs
64	W_POLLUTI	C	8		N	The kind of water pollution near the objective river mouth
65	SOCIO	M	10		N	Investigator's view on socioeconomic aspect
66	APPLI_MEAS	M	10		N	Investigator's view on applicable countermeasures
67	COMMENTS	M	10		N	Investigator's comments on the overall aspects

Note *1: C:Character N:Numerical L:Logical

Table 11.2-10(1/2) STRUCTURE OF DATABASE FILE ADD_INFO.DBF

No.	Name	Type *1	Width	Decimal	Index	Explanation
1	SERIAL	N	3		Y	Serial No. of the objective river mouth
2	C_AREA	N	5		N	Catchment area of the river basin for the objective river mouth
3	SOILLOSS	N	4		N	Annual average surface soil loss of the river basin
4	RM_WIDTH	N	6	1	N	River mouth width
5	RM_DEPTH	N	5	1	N	River mouth depth
6	RM_D_MIN	N	4	1	N	Minimum river mouth depth
7	TIDE_PORT	C	20		N	The nearest standard port of tidal level
8	TIDE_L	N	5	1	N	Stretch of tidal influence at the river mouth
9	TIDE_B	N	4		N	Mean width of the river for the tidal influence stretch
10	TIDE_H	N	3	1	N	Astronomical maximum tidal range at the river mouth
11	TIDE_P	N	5		N	Tidal prism volume at the river mouth
12	FACILITYRM	C	5		N	River mouth improvement facilities at the mouth
13	FACILITYOT	C	8		N	Other facilities at the river mouth
14	DREDGE	M	10		N	Historical dredging record
15	COASTFORM	C	5		N	Coastal geomorphology (classification on natural condition)
16	WAVECLASS	C	2		N	Wave class (classification on natural condition)
17	TIDECLASS	C	2		N	Tide class (classification on natural condition)
18	CACLASS	C	2		N	Catchment area class (classification on natural condition)
19	RIVERFORM	C	2		N	River course pattern (classification on natural condition)
20	SHOREFORM	C	2		N	Shoreline formation (classification on natural condition)
21	COASTMATER	C	2		N	Coastal material (classification on natural condition)
22	MOUTHCONDI	C	2		N	River mouth condition (classification on natural condition)
23	PHISICONDI	C	1		N	Categorized physical condition of the river mouth (very serious, serious, fair)
24	COM_S_NO	N	4		N	Number of commercial boat at the river mouth
25	FIS_S_NO1	N	4		N	Number of fishing boat (non-powered)
26	FIS_S_NO2	N	4		N	Number of fishing boat (outboard engine)
27	FIS_S_NO3	N	4		N	Number of fishing boat (inboard and <11GRT)
28	FIS_S_NO4	N	4		N	Number of fishing boat (inboard, 11=< and <21GRT)
29	FIS_S_NO5	N	4		N	Number of fishing boat (inboard, 21=< and <31GRT)
30	FIS_S_NO6	N	4		N	Number of fishing boat (inboard, 31=< and <41GRT)
31	FIS_S_NO7	N	4		N	Number of fishing boat (inboard, 41GRT=<)
32	FIS_S_NO	N	4		N	Total number of fishing boat
33	FIS_S_NO_E	L	1		N	Yes/No for whether the total number of fishing boat is estimated value or not
34	FIS_S_SIZE	C	1		N	Maximum size of fishing boat
35	FISHMEN	N	4		N	Total number of fishermen
36	FISHMEN_E	L	1		N	Yes/No for whether the total number of fishermen is estimated value or not
37	LANDUSE	C	8		N	Classified land use near the river mouth
38	CATEGORY	C	1		N	Overall category of the river mouth (critical, significant and acceptable)
39	D_BOATSIZE	N	3		N	Design boat size

Note *1: C:Character N:Numerical L:Logical

Table 11.2-10(2/2) STRUCTURE OF DATABASE FILE ADD_INFO.DBF

No.	Name	Type *1	Width	Dec-imal	Index	Explanation
40	NPV_COST	N	5		N	Net present value of the construction cost for the master plan
41	NPV_BENEFI	N	5		N	Net present value of the project benefit for the master plan
42	PROB_FLOOD	L	1		N	Existence of flood problem
43	PROB_C_NAV	L	1		N	Existence of commercial boat navigation problem
44	COMPLAIN_F	N	1		N	Existence and magnitude of complaint from fishermen

Note *1: C:Character N:Numerical L:Logical

Table 11.2-11 STRUCTURE OF DATABASE FILE MAPPHOTO.DBF

No.	Name	Type *1	Width	Decimal	Index	Explanation
1	SERIAL	N	3		Y	Serial No. of the river mouth
2	M_P	C	1		N	Map or Aerial photograph or Navigation chart
3	AREA	C	9		N	Peninsula or Sarawak or Sabah
4	SERIES	C	7		N	Series No.
5	SCALE	N	11		N	Scale
6	FLIGHTLINE	C	35		N	Flight line No.
7	SHEET_NO	C	10		N	Sheet No.
8	CEB_NO	C	15		N	CEB No.
9	DATE	C	6		N	Date
10	TIME	C	5		N	Time (for aerial photograph)
11	SOURCE	C	3		N	Source
12	INPUTNO	N	4		Y	Input No.

Note *1: C:Character N:Numerical L:Logical

Table 11.4-1(1/2) BASIC INFORMATION OF OBJECTIVE RIVER MOUTH

Serial	Name	State	Division	District
1	Perlis	Perlis	-	Kuala Perlis
2	Baru	Perlis	-	Simpang Empat
3	Sanglang	Kedah	-	
4	Jerlun	Kedah	-	
5	Kedah	Kedah	-	
6	Yan	Kedah	-	
7	Melaka	Kedah	-	
8	Cenang	Kedah	-	
9	Muda	P.Pinang	-	
10	Perai	P.Pinang	-	
11	Kerian	P.Pinang	-	
12	Pinang	P.Pinang	-	
13	Bayan Lepas	P.Pinang	-	
14	Tg. Piandang	Perak	-	
15	Gula	Perak	-	
16	Sangga	Perak	-	
17	Larut	Perak	-	
18	Terong	Perak	-	
19	Beruas	Perak	-	
20	Batu	Perak	-	
21	Dinding	Perak	-	
22	Lekir	Perak	-	
23	Selangor	Selangor	-	
24	Kapar Besar	Selangor	-	
25	Langat	Selangor	-	
26	Sepang Kecil	Selangor	-	
27	Sepang	Selangor	-	
28	Lukut	N.Sembilan	-	
29	Raya	N.Sembilan	-	
30	Linggi	N.Sembilan	-	
31	Baru	Melaka	-	
32	Melaka	Melaka	-	
33	Duyong	Melaka	-	
34	Umbai	Melaka	-	
35	Merlimau	Melaka	-	
36	Muar	Johor	-	
37	Parit Jawa	Johor	-	
38	Sarang Buaya	Johor	-	
39	Batu Pahat	Johor	-	
40	Senggarang	Johor	-	
41	Rengit	Johor	-	
42	Benut	Johor	-	
43	Pontian Keci	Johor	-	
44	Sedili Besar	Johor	-	
45	Mersing	Johor	-	
46	Endau	Johor	-	
47	Pontian	Pahang	-	
48	Rompin	Pahang	-	
49	Merchong	Pahang	-	
50	Nenasi	Pahang	-	

Table 11.4-1(2/2) BASIC INFORMATION OF OBJECTIVE RIVER MOUTH

Serial	Name	State	Division	District
51	Pahang	Pahang	-	
52	Terus	Pahang	-	
53	Kuantan	Pahang	-	
54	Beserah	Pahang	-	
55	Kemaman	Terengganu	-	
56	Kemasik	Terengganu	-	
57	Kerteh	Terengganu	-	
58	Paka	Terengganu	-	
59	Dungun	Terengganu	-	
60	Mercang	Terengganu	-	
61	Marang	Terengganu	-	
62	Terengganu	Terengganu	-	
63	Merang	Terengganu	-	
64	Keluang	Terengganu	-	
65	Gali	Kelantan	-	
66	Pak Amat	Kelantan	-	
67	Kelantan	Kelantan	-	
68	Rulah	Kelantan	-	
69	Sematan	Sarawak	Kuching	
70	Kayan	Sarawak	Kuching	
71	Sempadi	Sarawak		
72	Rambungan	Sarawak		
73	Sibu Laut	Sarawak		
74	Salak	Sarawak		
75	Santubong	Sarawak		
76	Buntal	Sarawak		
77	Bako	Sarawak		
78	Sadong	Sarawak		
79	Kabong	Sarawak		
80	Oya	Sarawak		
81	Mukah	Sarawak		
82	Balingian	Sarawak		
83	Serupai	Sarawak		
84	Tatau	Sarawak		
85	Suai	Sarawak		
86	Niah	Sarawak		
87	Sibuti	Sarawak		
88	Lawas	Sarawak		
89	Padas	Sabah	-	
90	Papar	Sabah	-	
91	Inanam	Sabah	-	
92	Tuaran	Sabah	-	
93	Bandau	Sabah	-	
94	Bongan	Sabah	-	
95	Sugut	Sabah	-	
96	Segama	Sabah	-	
97	Kalumpang	Sabah	-	
98	Tawau	Sabah	-	
99	Umas-Umas	Sabah	-	
100	Kalabakan	Sabah	-	

Table 11.4-2(1/2) RIVER FEATURES

Serial	Name	Catchment km2	Length km	Gradient at mouth	Flow Capacity m3/s	Soil Loss ton/km2/year
1	Perlis	600	13.1	1/ 5,714	50	351
2	Baru	80	27.0	1/20,000	56	
3	Sanglang	80	16.0	1/10,000	57	
4	Jerlun	40	21.0	1/10,000	42	
5	Kedah	4,040	115.0	1/10,000		415
6	Yan	10	12.0	1/ 3,000	22	
7	Melaka	40	13.8	1/ 1		531
8	Cenang	10	1.1	1/ 1,000		
9	Muda	4,300	127.0	1/		448
10	Perai	450	24.0	1/		911
11	Kerian	1,420	90.0	1/		1,006
12	Pinang	20	3,750.0	1/		1,267
13	Bayan Lepas	7	3.5	1/ 900		
14	Tg. Piandang	9	2.5	1/		
15	Gula	30	13.0	1/		
16	Sangga	170	36.5	1/		
17	Larut	170	20.0	1/		
18	Terong	60	22.0	1/		
19	Beruas	240	35.0	1/		
20	Batu	70	12.0	1/		
21	Dinding	370	38.0	1/		
22	Lekir	5	5.0	1/		
23	Selangor	1,820	96.0	1/		725
24	Kapar Besar	110	6.0	1/	425	
25	Langat	1,815	104.0	1/		846
26	Sepang Kecil	50	8.0	1/		
27	Sepang	90	20.0	1/		567
28	Lukut	120	5.6	1/		
29	Raya	10	11.1	1/		
30	Linggi	1,270	78.9	1/		263
31	Baru	25	11.5	1/ 2,500		
32	Melaka	500	10.0	1/		531
33	Duyong	40	10.6	1/ 1,000		
34	Umbai	20	4.3	1/ 1,000		
35	Merlimau	30	5.0	1/ 3,000		
36	Muar	6,160	232.0	1/		513
37	Parit Jawa	80	6.0	1/		
38	Sarang Buaya	170	16.0	1/		
39	Batu Pahat	2,230	0.0	1/		445
40	Senggarang	70	13.0	1/		
41	Rengit	100	12.0	1/		
42	Benut	440	44.0	1/		
43	Pontian Keci	40	15.0	1/		529
44	Sedili Besar	1,445	92.0	1/		540
45	Mersing	250	60.0	1/		194
46	Endau	4,740	95.0	1/		286
47	Pontian	240	37.8	1/		
48	Rompin	3,980	204.0	1/		266
49	Merchong	500	80.0	1/		
50	Nenasi	860	86.7	1/		

Table 11.4-2(2/2) RIVER FEATURES

Serial	Name	Catchment km2	Length km	Gradient at mouth	Flow Capacity m3/s	Soil Loss ton/km2/year
51	Pahang	29,140	372.0	1/		282
52	Terus	40	16.7	1/		
53	Kuantan	1,710	72.0	1/		197
54	Beserah	20	7.0	1/		
55	Kemaman	1,775	72.0	1/		83
56	Kemasik	40	14.0	1/		
57	Kerteh	240	36.0	1/		
58	Paka	850	82.0	1/		432
59	Dungun	1,875	146.3	1/		138
60	Mercang	150	34.4	1/		
61	Marang	460	44.4	1/		421
62	Terengganu	4,650	142.0	1/		439
63	Merang	210	7.0	1/		
64	Keluang	80	33.0	1/		
65	Gali	10	3.9	1/		
66	Pak Amat	20	14.4	1/		
67	Kelantan	12,900	300.0	1/		138
68	Rulah	20	5.5	1/		
69	Sematan	210	12.0	1/		
70	Kayan	1,020	84.0	1/		1,657
71	Sempadi	90	12.0	1/		
72	Rambungan	120	12.0	1/		
73	Sibu Laut	120	15.0	1/		
74	Salak	80	18.0	1/		
75	Santubong	60	24.0	1/		
76	Buntal	40	12.0	1/		
77	Bako	40	3.0	1/		
78	Sadong	3,100	144.0	1/		2,835
79	Kabong	1,500	78.0	1/		
80	Oya	1,820	132.0	1/		3,263
81	Mukah	2,150	120.0	1/		1,849
82	Balingian	2,520	84.0	1/		
83	Serupai	200	6.0	1/		
84	Tatau	4,780	168.0	1/		859
85	Suai	1,400	108.0	1/		567
86	Niah	1,270	66.0	1/		1,687
87	Sibuti	830	60.0	1/		3,094
88	Lawas	930	54.0	1/		1,229
89	Padas	8,600	398.0	1/		219
90	Papar	770	78.0	1/		39
91	Inanam	10	0.0	1/		
92	Tuaran	970	0.0	1/		2,199
93	Bandau	290	0.0	1/		
94	Bongan	470	0.0	1/		1,777
95	Sugut	2,900	0.0	1/		405
96	Segama	4,300	0.0	1/		331
97	Kalumpang	970	0.0	1/		431
98	Tawau	130	0.0	1/		498
99	Umas-Umas	370	0.0	1/		557
100	Kalabakan	1,340	0.0	1/		403

Table 11.4-3(1/2) RIVER MOUTH GEOMORPHOLOGY

Serial	Name	Location	Condition of Change		Form	Width	Min. Depth		Bed Material		
			Beach	Shore			Depth		Sea	Littoral	River Mouth
		*1	*2		*3	m	m	m		*4	
1	Perlis	OB	FR	FR	OW	513.0	1.8	0.6		CL/SS	SS/ SS
2	Baru	OB	FR	FR	ST	100.0	0.3	0.2		CL/ST	CL/ST ST
3	Sanglang	OB	FR	FR	ST	120.0	1.0	0.8		CL/ST	CL/ST ST
4	Jerlun	OB	FR	FR	ST	130.0	1.4	1.1		CL/SS	CL/ST ST
5	Kedah	OB	FR	FR	OW	1,220.0	2.3	1.8		CL/ST	CL/ST ST
6	Yan	OB	NP	NP	ST	13.0	0.4	0.1		CL/SS	CL/ST SS
7	Melaka	OB	FR	FR	ON	70.0	0.0	0.0	FS	CL/SS	CL/SS CL
8	Cenang	OB	FR	FR	ON	23.0	0.0	0.0	FS	CL/SS	CL/SS CL
9	Muda	OB	SR	SR	ON	200.0	3.2	1.0		CL/SS	CL/SS
10	Perai	OB	FR	FR	OW	210.0	2.9	2.3		CL/ST	CL/ST ST
11	Kerian	OB	SR	SR	OW	780.0	2.2	1.8	ST	CL/ST	CL/ST ST
12	Pinang	OB	NP	NP	OW	52.0	0.0	0.0		CL/ST	CL/ST ST
13	Bayan Lepas	IB	NP	FR	OW	30.0	0.0	0.3	FS	CL/	CL/MS FS
14	Tg. Piandang	OB	SR	SR	OW	300.0	0.2	0.2	ST	CL/ST	CL/ST ST
15	Gula	IB	SR	SR	OW	379.0	1.4	1.1	CL	CL/ST	CL/ST CL
16	Sangga	OB			OW	915.0	2.0	1.6	ST	CL/ST	CL/ST ST
17	Larut	IB	SR	SR	OW	120.0	1.5	1.2	ST	CL/ST	CL/ST ST
18	Terong	IB	FR	FR	OW	265.0	3.6	2.9	ST	CL/ST	CL/ST ST
19	Beruas	IB			OW	140.0	1.1	0.9	SS	CL/ST	CL/ST SS
20	Batu	IB	SR	SR	OW	5.0	0.1	0.1		CL/	CL/ ST
21	Dinding	OB			OW	1,105.0	12.3	3.9		MS/	MS/
22	Lekir	OB	FR	FR	ON	70.0	0.0	0.0		CL/SS	CL/ST SS
23	Selangor	OB	FR	FR	OW	483.0	1.5	1.2	ST	ST/	ST/ ST
24	Kapar Besar	OB		SR	OW	571.0	0.0	0.0	ST	ST/	ST/ ST
25	Langat	OB		SR	OW	473.0	2.7	2.2	SS	SS/	ST/ ST
26	Sepang Kecil	OB		VS	ON	162.0	2.3	1.8	SS	SS/	ST/ ST
27	Sepang	OB		VS	OW	141.0	8.0	2.6	FS	SS/	ST/ ST
28	Lukut	IB	FR	FR	OW	30.0	0.0	0.0	SS	SS/	CS/GR ST
29	Raya	IB	FR	FR	OW	10.0	0.6	0.5	SS	CL/ST	CL/SS ST
30	Linggi	IB	NP	NP	ON	320.0	0.0	0.0	SS	SS/	SS/GR SS
31	Baru	OB	VS	VS	ST	115.0	0.1	0.0	CS	MS/	MS/ CS
32	Melaka	OB	FR	FR	ST	85.0	1.5	1.2	CL	MS/	ST/ CL
33	Duyong	OB	SR	SR	OW	45.0	0.7	0.6	CL	CL/	CL/ CL
34	Umbai	OB	SR	SR	OW	25.0	0.6	0.5	CL	CL/	CL/ CL
35	Merlimau	OB	FR	FR	ST	10.0	0.5	0.4	ST	ST/	ST/ ST
36	Muar	OB	FR	FR	OW	1,780.0	2.6	2.1		CL/	CL/ CL
37	Parit Jawa	OB			OW	100.0	0.6	0.5		CL/	CL/ CL
38	Sarang Buaya	OB	FR	FR	OW	150.0	1.4	1.1		CL/	CL/ CL
39	Batu Pahat	OB			OW	2,120.0	1.3	1.0		CL/SS	CL/
40	Senggarang	OB	FR	FR	OW	70.0	0.7	0.6		MS/	MS/ CL
41	Rengit	OB	FR	FR	OW	120.0	0.6	0.5		CL/	CL/ CL
42	Benut	OB	SR	SR	OW	300.0	1.0	0.8		CL/	CL/ CL
43	Pontian Keci	OB	FR	FR	OW	120.0	1.2	1.0		CL/	CL/ CL
44	Sedili Besar	IN	FR	FR	ON	210.0	5.5	1.8		SS/GR	CL/SS
45	Mersing	OB	SR	SR	OW	122.0	2.5	0.8	MS	SS/	SS/ CL
46	Endau	OB	NP	NP	OW	850.0	4.2	1.3		MS/	FS/ MS
47	Pontian	OB	FR	FR	OW	255.0	2.8	0.9	FS	MS/	SS/ FS
48	Rompin	OB	FR	FR	OW	607.0	5.4	1.7	FS	MS/	SS/ FS
49	Merchong	OB	FR	FR	ON	115.0	2.3	0.7	FS	MS/	SS/ FS
50	Nenasi	OB	FR	FR	OW	45.0	5.2	1.7	FS	MS/	SS/ FS

*1 IN:Inner Bay OB:Outside Bay
*2 VS:Very Serious SR:Serious FR:Fair NP:No Problem
*3 OW:Open Wide ON:Open Narrow ST:Straight CL:Closed Narrow CD:Closed
*4 CL:Clay ST:Silt SS:Silt&Sand VS:Very Fine Sand FS:Fine Sand
MS:Medium Sand CS:Coarse Sand GR:Gravel BD:Boulder

Table 11.4-3(2/2) RIVER MOUTH GEOMORPHOLOGY

Serial	Name	Location	Condition of Change		Form	Width	Depth	Min. Depth	Bed Material		
			Beach	Shore					Sea	Littoral	River Mouth
		*1	*2		*3	m	m	m	*4		
51	Pahang	OB	FR	FR	ON	415.0	5.7	1.8	FS	MS/ SS/	FS
52	Terus	OB	VS	VS	ON	570.0	1.1	0.4	FS	MS/ SS/	FS
53	Kuantan	IN	FR	FR	OW	284.0	8.0	2.6	FS	MS/ SS/	FS
54	Beserah	IB	FR	FR	CL	4.0	0.0	0.0	FS	MS/ SS/	FS
55	Kemaman	OB	VS	VS	ON	575.0	9.6	1.9	FS	MS/ SS/	SS
56	Kemasik	OB	FR	FR	CL	15.0	0.1	0.0	FS	MS/ SS/	FS
57	Kerteh	OB	FR	FR	ON	54.0	1.7	0.5	FS	MS/ MS/	SS
58	Paka	IB	FR	FR	ON	161.0	4.9	1.6	FS	MS/ SS/	FS
59	Dungun	IB	SR	SR	OW	428.0	4.1	1.3	FS	MS/ SS/	SS
60	Mercang	OB	FR	FR	OW	46.0	0.6	0.2	FS	MS/ SS/	SS
61	Marang	OB	FR	FR	ON	244.0	1.6	0.5	FS	MS/ SS/	SS
62	Terengganu	OB	SR	SR	ON	141.0	10.2	3.3	FS	MS/ SS/	SS
63	Merang	OB	SR	SR	CD	440.0	0.7	0.2	FS	MS/ SS/	SS
64	Keluang	OB	FR	FR	ON	146.0	2.0	0.6	FS	MS/ BD/MS	ST
65	Gali	IB	FR	FR	ST	86.0	1.2	0.4	FS	SS/ MS/	FS
66	Pak Amat	OB	FR	FR	CL	113.0	0.4	0.1	FS	MS/ MS/	SS
67	Kelantan	OB	FR	FR	OW	367.0	5.2	1.7	FS	MS/ MS/	SS
68	Rulah	IB	SR	SR	ON	468.0	1.2	0.4	FS	SS/ SS/	SS
69	Sematan	IB	FR	FR	CL	633.0	4.6	1.5	FS	FS/ SS/	SS
70	Kayan	IB	FR	FR	OW	1,650.0	5.3	1.7	FS	FS/ SS/	SS
71	Sempadi	IB	FR	FR	OW	730.0	1.6	0.5	SS	SS/ SS/	SS
72	Rambungan	IB	FR	FR	ST	676.0	10.9	3.5	FS	FS/ FS/	FS
73	Sibu Laut	IB	FR	FR	ON	1,209.0	16.2	5.2	FS	SS/ SS/	FS
74	Salak	IB	FR	FR	OW	1,362.0	6.0	1.9	SS	SS/ CL/ST	ST
75	Santubong	IB	FR	FR	ON	869.0	6.5	2.1	SS	SS/ SS/	ST
76	Buntal	IB	FR	FR	OW	556.0	0.7	0.6	SS	SS/ CL/ST	FS
77	Bako	IB	VS	VS	OW	1,834.0	1.5	1.2	SS	SS/ CL/ST	ST
78	Sadong	IB	SR	SR	OW	4,500.0	4.4	1.4	SS	SS/ CL/ST	ST
79	Kabong	OB	FR	FR	ON	919.0	10.4	3.3	SS	SS/ SS/	SS
80	Oya	OB	SR	SR	OW	1,399.0	3.6	1.2	FS	FS/ SS/	FS
81	Mukah	OB	FR	FR	OW	272.0	3.7	1.2	FS	SS/ SS/	FS
82	Balingian	IB	SR	SR	OW	780.0	2.9	0.9	SS	SS/ ST/	SS
83	Serupai	OB	FR	FR	CL	59.0	2.5	0.8	FS	FS/ SS/	SS
84	Tatau	OB	FR	FR	ON	334.0	3.7	1.2	FS	FS/ SS/	SS
85	Suai	OB	FR	FR	ON	135.0	4.7	1.5	FS	FS/ SS/	SS
86	Niah	OB	FR	SR	CL	305.0	3.2	1.0	FS	FS/ FS/	FS
87	Sibuti	OB	FR	FR	ON	112.0	4.9	1.6	FS	FS/ FS/	FS
88	Lawas	IB	FR	FR	ON	541.0	3.2	1.0	SS	SS/ SS/	SS
89	Padas	IB	FR	FR	OW	190.0	2.4	0.8	SS	CL/MS CL/	SS
90	Papar	OB	FR	FR	OW	100.0	2.0	0.6	FS	MS/ MS/	FS
91	Inanam	IB			OW	360.0	1.1	0.4		MS/ GS/	
92	Tuaran	OB			ON	470.0	1.7	0.5		MS/ MS/	
93	Bandau	IB			ST	1,020.0	3.9	3.1		ST/ ST/	
94	Bongan	IB			ST	200.0	0.6	0.5		CL/ CL/	
95	Sugut	OB			OW	130.0	3.2	2.6		MS/ MS/	
96	Segama	OB			OW	1,170.0	5.6	4.5		MS/ MS/	
97	Kalumpang	OB			OW	390.0	8.0	6.4		CL/ CL/	
98	Tawau	OB			OW	30.0	0.0	0.0		MS/ MS/	
99	Umas-Umas	IB			ST	450.0	6.3	2.5		CL/ CL/	
100	Kalabakan	IB			OW	900.0	5.4	2.2		CL/ CL/	

*1 IN:Inner Bay OB:Outside Bay
*2 VS:Very Serious SR:Serious FR:Fair NP:No Problem
*3 OW:Open Wide ON:Open Narrow ST:Straight CL:Closed Narrow CD:Closed
*4 CL:Clay ST:Silt SS:Silt&Sand VS:Very Fine Sand FS:Fine Sand
MS:Medium Sand CS:Coarse Sand GR:Gravel BD:Boulder

Table 11.4-4(1/2) CLASSIFICATION OF 100 RIVER MOUTHS BASED ON NATURAL CONDITIONS

Serial	Name	Coastal Geomor-phology	Wave	Tide	C.A.	River Course Pattrn.	Shore-line Form	Coastal Material	River Mouth Condi.
		*1	*2	*3	*4	*5	*6	*7	*8
1	Perlis	SC	LW	LP	LC	MD	ST	SM	OP
2	Baru	SC	LW	SP	MC	SR	ST	MU	OP
3	Sanglang	SC	LW	SP	MC	SR	ST	MU	OP
4	Jerlun	SC	LW	SP	MC	SR	ST	MS	OP
5	Kedah	PR	LW	LP	LC	MD	CV	MU	OP
6	Yan	SI	LW	SP	MC	MD	ST	SM	OP
7	Melaka	HL	LW	SP	MC	MD	CV	SA	PC
8	Cenang	SI	LW	SP	MC	MD	ST	SA	PC
9	Muda	PR	LW	LP	LC	MD	ST	SA	PC
10	Perai	PRSI	LW	LP	LC	MD	ST	MU	OP
11	Kerian	ES	LW	LP	LC	MD	CC	MU	OP
12	Pinang	SC	LW	SP	MC	SR	ST	MU	OP
13	Bayan Lepas	HL	LW	SP	MC	SR	ST	SM	OP
14	Tg. Piandang	PR	LW	SP	LC	SR	ST	MU	OP
15	Gula	EB	LW	LP	MC	MD	CC	MU	OP
16	Sangga	ES	LW	LP	LC	MD	CC	MU	OP
17	Larut	ES	LW	LP	LC	MD	CC	MU	OP
18	Terong	ES	LW	LP	MC	MD	CC	MU	OP
19	Beruas	HL	LW	LP	LC	MD	CC	MU	OP
20	Batu	HL	LW	SP	MC	MD	ST	MU	OP
21	Dinding	HLSI	LW	LP	LC	SR	ST	SA	OP
22	Lekir	SC	LW	SP	MC	SR	ST	MU	OP
23	Selangor	SC	LW	LP	LC	MD	CC	MU	OP
24	Kapar Besar	SI	LW	SP	LC	SR	ST	MU	OP
25	Langat	SC	LW	LP	LC	MD	ST	MS	OP
26	Sepang Kecil	SC	LW	SP	MC	MD	ST	MU	SS
27	Sepang	SC	LW	SP	MC	MD	ST	SM	PC
28	Lukut	HL	LW	SP	LC	MD	ST	MU	OP
29	Raya	HL	LW	SP	MC	SR	ST	MU	SS
30	Linggi	HL	LW	LP	LC	SR	ST	MU	SS
31	Baru	SC	LW	SP	MC	SR	ST	SA	PC
32	Melaka	SC	LW	SP	LC	SR	CV	MS	OP
33	Duyong	SC	LW	SP	MC	MD	ST	MU	OP
34	Umbai	SC	LW	SP	MC	MD	ST	MU	OP
35	Merlimau	SC	LW	SP	MC	MD	ST	MU	OP
36	Muar	ES	LW	LP	LC	MD	CC	MU	OP
37	Parit Jawa	SC	LW	SP	MC	SR	ST	MU	OP
38	Sarang Buaya	SC	LW	SP	LC	SR	ST	MU	OP
39	Batu Pahat	ESHL	LW	LP	LC	MD	CC	MU	OP
40	Senggarang	SC	LW	SP	MC	SR	ST	MU	OP
41	Rengit	SC	LW	SP	LC	SR	ST	MU	OP
42	Benut	SC	LW	SP	LC	SR	ST	MU	OP
43	Pontian Keci	SC	LW	SP	MC	MD	ST	MU	OP
44	Sedili Besar	HL	WO	LP	LC	MD	OB	SA	PC
45	Mersing	SI	WO	LP	LC	MD	ST	SA	SS
46	Endau	HL	WO	LP	LC	MD	ST	SA	SS
47	Pontian	SC	WS	SP	LC	MD	OB	SA	SS
48	Rompin	SC	WS	LP	LC	MD	OB	SA	SS
49	Merchong	PT	WO	SP	LC	MD	OB	SA	PC
50	Nenasi	PT	WO	LP	LC	MD	OB	SM	PC

*1 SC:Straight Coast PR:Protruding Coast EB:Embayed Coast ES:Estuary
HL:Headland SI:Sheltered by Island DL:Delta Formation PT:Sand Spit
*2 WS:High Straight Wave WO:High Oblique Wave LW:Low Wave
*3 LP:Large Tidal Prism SP:Small Tidal Prism
*4 LC:Large Catchment Area MC:Small Catchment Area
*5 SR:Straight River MD:Meandering River
*6 CV:Convex Shoreline ST:Straight Shoreline CC:Concave Shoreline
OB:One Side Bar
*7 SA:Sandy MU:Muddy SM:Sand Predominant Mixed MS:Mud Predominant Mixed
*8 CL:Completely Closed by Sand Bar PC:Partially Closed by Sand Bar
SS:Shallowed by Submerged Bar OP:Open to the Sea

Table 11.4-4(2/2) CLASSIFICATION OF 100 RIVER MOUTHS BASED ON NATURAL CONDITIONS

Serial	Name	Coastal Geomor-phology	Wave	Tide	C.A.	River Course Pattrn.	Shore-line Form	Coastal Material	River Mouth Condi.
		*1	*2	*3	*4	*5	*6	*7	*8
51	Pahang	DL	WS	LP	LC	MD	OB	SA	PC
52	Terus	PT	WO	LP	MC	MD	OB	SA	CL
53	Kuantan	HL	WO	LP	LC	MD	OB	SA	SS
54	Beserah	PT	WO	SP	MC	MD	OB	SA	SS
55	Kemaman	HL	WO	LP	LC	MD	OB	SA	SS
56	Kemasik	SI	WO	SP	MC	MD	OB	SA	PC
57	Kerteh	HL	WO	SP	MC	MD	OB	SA	CL
58	Paka	HLPT	WO	LP	LC	MD	OB	SA	SS
59	Dungun	HL	WO	LP	LC	MD	OB	SA	SS
60	Mercang	PT	WO	LP	LC	MD	ST	SA	CL
61	Marang	SC	WS	LP	LC	MD	ST	SA	PC
62	Terengganu	PR	WS	LP	LC	MD	OB	SA	PC
63	Merang	PR	WO	SP	LC	MD	ST	SA	CL
64	Keluang	HL	WO	LP	MC	MD	ST	SA	OP
65	Gali	SC	WS	SP	MC	SR	ST	SA	OP
66	Pak Amat	SC	WO	SP	MC	MD	ST	SA	CL
67	Kelantan	DL	WO	LP	LC	MD	CV	SA	PC
68	Rulah	DLPT	WO	SP	MC	MD	OB	SM	PC
69	Sematan	ES	WO	LP	LC	MD	OB	SM	PC
70	Kayan	ES	WO	LP	LC	MD	OB	SM	PC
71	Sempadi	ES	WO	LP	MC	MD	CC	SM	OP
72	Rambungan	ES	WS	LP	LC	MD	CC	SM	OP
73	Sibu Laut	ES	WS	LP	LC	MD	CC	SM	OP
74	Salak	ESHL	LW	LP	MC	MD	CC	SM	OP
75	Santubong	ESHL	LW	LP	MC	MD	CC	SM	OP
76	Buntal	ESHL	LW	LP	MC	MD	CC	MU	OP
77	Bako	ESHL	LW	LP	MC	MD	CC	MU	OP
78	Sadong	ES	LW	LP	LC	MD	CC	SM	OP
79	Kabong	ES	LW	LP	LC	MD	CC	SM	OP
80	Oya	SC	WO	LP	LC	MD	CC	SA	OP
81	Mukah	SC	WS	LP	LC	MD	CC	SA	OP
82	Balingian	SC	WS	LP	LC	MD	CC	SA	OP
83	Serupai	SC	WS	SP	LC	SR	CC	SA	OP
84	Tatau	SC	WS	LP	LC	MD	OB	SA	PC
85	Suai	SC	WO	SP	LC	MD	OB	SA	PC
86	Niah	SC	WO	SP	LC	MD	OB	SA	PC
87	Sibuti	SC	WO	SP	LC	MD	OB	SA	PC
88	Lawas	PR	LW	LP	LC	MD	CV	SA	OP
89	Padas	ES	LW	LP	LC	MD	ST	SM	OP
90	Papar	PRPT	WO	SP	LC	MD	OB	SA	PC
91	Inanam	EB	WO	SP	MC	MD	ST	SA	OP
92	Tuaran	SC	WO	LP	LC	MD	ST	SA	OP
93	Bandau	EB	LW	SP	LC	MD	ST	MU	OP
94	Bongan	EB	LW	SP	LC	MD	ST	MU	OP
95	Sugut	PR	WS	LP	LC	MD	ST	MS	OP
96	Segama	ES	WO	LP	LC	MD	ST	MS	OP
97	Kalumpang	ES	LW	LP	LC	MD	CC	MS	OP
98	Tawau	SI	LW	SP	LC	MD	ST	SA	PC
99	Umas-Umas	EB	LW	LP	LC	MD	ST	MU	OP
100	Kalabakan	EB	LW	LP	LC	MD	CC	MU	OP

*1 SC:Straight Coast PR:Protruding Coast EB:Embayed Coast ES:Estuary
HL:Headland SI:Sheltered by Island DL:Delta Formation PT:Sand Spit
*2 WS:High Straight Wave WO:High Oblique Wave LW:Low Wave
*3 LP:Large Tidal Prism SP:Small Tidal Prism
*4 LC:Large Catchment Area MC:Small Catchment Area
*5 SR:Straight River MD:Meandering River
*6 CV:Convex Shoreline ST:Straight Shoreline CC:Concave Shoreline
OB:One Side Bar
*7 SA:Sandy MU:Muddy SM:Sand Predominant Mixed MS:Mud Predominant Mixed
*8 CL:Completely Closed by Sand Bar PC:Partially Closed by Sand Bar
SS:Shallowed by Submerged Bar OP:Open to the Sea

Table 11.4-5(1/2) RIVER MOUTH OCEANOGRAPHICAL FEATURES

Serial	Name	Wave Class *1	Nearest Standard Tidal Port	Tidal Prism Length km	Width m	High m	Volume 1,000m3
1	Perlis	LW	Pulau Langkawi	15.0	60	3.5	1,040
2	Baru	LW		1.0	20	3.5	23
3	Sanglang	LW		1.0	20	3.5	23
4	Jerlun	LW		6.3	30	3.5	218
5	Kedah	LW	Pulau Langkawi	12.0	200	3.5	2,772
6	Yan	LW		1.3	10	3.5	15
7	Melaka	LW		3.2	6	3.5	22
8	Cenang	LW		3.2	10	3.5	37
9	Muda	LW		10.2	150	3.5	1,767
10	Perai	LW		20.0	170	3.5	3,927
11	Kerian	LW		28.0	130	3.5	4,204
12	Pinang	LW		2.0	40	3.5	92
13	Bayan Lepas	LW		1.0	15	3.5	17
14	Tg. Piandang	LW	Pulau Pinang	3.2	25	3.5	92
15	Gula	LW		14.0	130	3.5	2,102
16	Sangga	LW		8.3	300	3.5	2,876
17	Larut	LW		9.0	200	1.5	2,079
18	Terong	LW		10.0	250	3.5	2,888
19	Beruas	LW	Lumut	7.0	50	3.5	404
20	Batu	LW		1.6	10	3.5	18
21	Dinding	LW		20.0	800	3.5	18,480
22	Lekir	LW		1.3	30	3.5	45
23	Selangor	LW		34.0	130	5.5	8,022
24	Kapar Besar	LW		6.4	10	5.5	116
25	Langat	LW		90.0	140	4.5	18,711
26	Sepang Kecil	LW		7.7	15	4.5	172
27	Sepang	LW		15.0	30	4.5	668
28	Lukut	LW		15.0	20	3.5	347
29	Raya	LW		2.0	5	3.5	12
30	Linggi	LW		18.0	100	3.5	2,079
31	Baru	LW		1.5	15	3.5	26
32	Melaka	LW		13.0	20	3.5	300
33	Duyong	LW		6.5	20	3.5	150
34	Umbai	LW		2.0	10	3.5	23
35	Merlimau	LW		6.0	5	3.5	35
36	Muar	LW		120.0	150	3.5	20,790
37	Parit Jawa	LW		0.3	150	3.5	52
38	Sarang Buaya	LW		3.2	20	3.5	74
39	Batu Pahat	LW		40.0	50	3.5	2,310
40	Senggarang	LW		5.1	15	3.5	88
41	Rengit	LW		3.2	20	3.5	74
42	Benut	LW		7.0	50	4.5	520
43	Pontian Keci	LW		7.0	20	4.5	208
44	Sedili Besar	WO		70.0	120	3.5	9,702
45	Mersing	WO		20.0	50	3.5	1,155
46	Endau	WO		85.0	150	3.5	14,726
47	Pontian	WS		25.0	30	3.5	866
48	Rompin	WS		100.0	80	3.5	9,240
49	Merchong	WO		25.0	20	3.5	578
50	Nenasi	WO		30.0	40	3.5	1,386

*1 WS:High Straight Wave WO:Oigh Oblique Wave LW:Low Wave

Table 11.4-5(2/2) RIVER MOUTH OCEANOGRAPHICAL FEATURES

Serial	Name	Wave Class *1	Nearest Standard Tidal Port	Tidal Prism Length km	Width m	High m	Volume 1,000m3
51	Pahang	WS		25.0	500	3.5	14,437
52	Terus	WO		18.0	70	3.5	1,455
53	Kuantan	WO	Tg. Gelang	26.0	130	3.5	3,904
54	Beserah	WO		1.5	10	3.5	17
55	Kemaman	WO		25.0	110	3.5	3,176
56	Kemasik	WO		4.5	30	2.5	111
57	Kerteh	WO	Tg. Gelang	17.0	30	2.5	421
58	Paka	WO		20.0	90	3.5	2,079
59	Dungun	WO		22.0	130	3.5	3,303
60	Mercang	WO		16.0	60	3.5	1,109
61	Marang	WS	Cendering	12.0	80	3.5	1,109
62	Terengganu	WS	Cendering	22.0	200	3.5	5,082
63	Merang	WO		8.0	40	3.5	370
64	Keluang	WO		10.0	90	3.5	1,040
65	Gali	WS		2.5	5	3.5	14
66	Pak Amat	WO		10.0	60	2.5	495
67	Kelantan	WO		18.0	300	2.5	4,455
68	Rulah	WO		0.0	0	0.0	0
69	Sematan	WO		17.0	350	4.5	8,836
70	Kayan	WO		47.0	300	4.5	20,938
71	Sempadi	WO		14.0	300	5.5	7,623
72	Rambungan	WS		25.0	250	5.5	11,343
73	Sibu Laut	WS		43.0	300	5.5	23,413
74	Salak	LW		35.0	250	5.5	15,881
75	Santubong	LW		23.0	450	5.5	18,785
76	Buntal	LW		21.0	130	5.5	4,955
77	Bako	LW		17.0	100	5.5	3,086
78	Sadong	LW		20.0	700	5.5	25,410
79	Kabong	LW		35.0	500	5.5	31,762
80	Oya	WO	Kota Kinabalu	25.0	150	2.5	3,094
81	Mukah	WS		25.0	100	2.5	2,063
82	Balingian	WS		28.0	100	2.5	2,310
83	Serupai	WS		6.0	30	2.5	149
84	Tatau	WS		14.0	100	2.5	1,155
85	Suai	WO		15.0	75	2.5	928
86	Niah	WO		15.0	50	2.5	619
87	Sibuti	WO		10.0	50	2.5	413
88	Lawas	LW		17.0	150	2.5	2,104
89	Padas	LW		10.0	100	2.5	825
90	Papar	WO	Kota Kinabalu	5.0	30	2.5	124
91	Inanam	WO		8.0	70	2.5	462
92	Tuaran	WO		12.0	130	2.5	1,287
93	Bandau	LW		15.0	40	2.5	495
94	Bongan	LW		8.0	50	2.5	330
95	Sugut	WS		18.0	100	2.5	1,485
96	Segama	WO		9.0	1,000	2.5	7,425
97	Kalumpang	LW		15.0	150	2.5	1,856
98	Tawau	LW		2.0	20	3.5	46
99	Umas-Umas	LW		18.0	150	3.5	3,119
100	Kalabakan	LW		25.0	120	3.5	3,465

*1 WS:High Straight Wave WO:Oigh Oblique Wave LW:Low Wave

Table 11.4-6(1/2) EXISTING STRUCTURES AT THE RIVER MOUTH

Serial	Name	Structures *1 River Mouth Protection	Structures *1 Other Purposes	Dredging
1	Perlis		DM/	'86,'87,'90,'91,(Schd'92) by MD
2	Baru		TG/	
3	Sanglang		TG/	
4	Jerlun		TG/	
5	Kedah		TG/DM/	Schd in '92 by MD
6	Yan		TG/	
7	Melaka			
8	Cenang	JT/	TG/	
9	Muda		TG/	'86 by DID
10	Perai		TG/	
11	Kerian		TG/	
12	Pinang			
13	Bayan Lepas			
14	Tg. Piandang		TG/	
15	Gula			
16	Sangga			
17	Larut			
18	Terong			
19	Beruas			'88-90 by DID
20	Batu			
21	Dinding			'86 by MD
22	Lekir			
23	Selangor			
24	Kapar Besar			
25	Langat			
26	Sepang Kecil			
27	Sepang			
28	Lukut		TG/	
29	Raya		TG/	
30	Linggi		TG/	
31	Baru			
32	Melaka	JT/	DM/	
33	Duyong		TG/	
34	Umbai		TG/	
35	Merlimau			
36	Muar			
37	Parit Jawa		TG/	
38	Sarang Buaya		TG/	
39	Batu Pahat		DM/	
40	Senggarang		TG/	
41	Rengit		TG/	
42	Benut		DM/	
43	Pontian Keci			
44	Sedili Besar			
45	Mersing			'81,(Schd'92) by MD
46	Endau		DM/	
47	Pontian		DM/	
48	Rompin			
49	Merchong			
50	Nenasi			

*1 JT:Jetty TL:Training Levee RV:Revetment TG:Tidal Gate GR:Groyne
DM:Dam

Table 11.4-6(2/2) EXISTING STRUCTURES AT THE RIVER MOUTH

Serial	Name	Structures *1		Dredging
		River Mouth Protection	Other Purposes	
51	Pahang		DM/GR/RV	
52	Terus			Schd'93 by DID
53	Kuantan			
54	Beserah			
55	Kemaman	JT/		
56	Kemasik	TL/		
57	Kerteh			'91 by DID
58	Paka		DM/	
59	Dungun		DM/RV/	'89,'90 by MD
60	Mercang			'91 by DID
61	Marang			'79 by MD
62	Terengganu	RV/	DM/	'76,'87,'88,'91,(Schd'92) by MD
63	Merang			'75,'76,'77 by DID
64	Keluang			
65	Gali	JT/		
66	Pak Amat			'91 by DID
67	Kelantan		DM/RV/GR	'91 by DID, '86,'88,'89,(Schd'92) by MD
68	Rulah			
69	Sematan			
70	Kayan			
71	Sempadi			
72	Rambungan			
73	Sibu Laut			
74	Salak			
75	Santubong			
76	Buntal			
77	Bako			
78	Sadong			
79	Kabong			
80	Oya			
81	Mukah			
82	Balingian			
83	Serupai			
84	Tatau			
85	Suai			
86	Niah			
87	Sibuti			
88	Lawas			
89	Padas			
90	Papar			
91	Inanam		RV/	
92	Tuaran			
93	Bandau			
94	Bongan			
95	Sugut			
96	Segama			
97	Kalumpang			
98	Tawau			
99	Umas-Umas			
100	Kalabakan			

*1 JT:Jetty TL:Training Levee RV:Revetment TG:Tidal Gate GR:Groyne
DM:Dam

Table 11.4-7(1/2) NUMBER OF BOAT AND FISHERMEN

Serial	Name	Comcial Boat	<---Number of Fishing Boat---Size> No Power	Out Engn	<11	11 <21	21 <31	31 <41	41-	Total Est. *1	*2	No. of Fishermen Est. *1
			<---Inboard Engine---->									
1	Perlis	20	0	62	89	96	58	51	76	432N	L	2,333Y
2	Baru		0	32	43	0	0	25	4	104N	L	561Y
3	Sanglang		42	3	175	11	3	3	1	238N	L	762Y
4	Jerlun		0	25	28	10	0	0	0	63N	M	202Y
5	Kedah	77	1	82	72	82	80	104	115	536N	L	1,716Y
6	Yan		2	86	63	2	1	0	0	154N	M	493Y
7	Melaka		0	0	3	0	0	0	0	3N	M	10Y
8	Cenang		0	40	4	0	0	0	0	44N	M	141Y
9	Muda		0	28	169	2	1	1	0	201N	M	504Y
10	Perai	16	0	0	0	0	0	0	0	26Y	M	50N
11	Kerian		0	72	163	1	1	0	8	245N	L	693N
12	Pinang		2	139	41	0	0	0	0	182N	M	700N
13	Bayan Lepas		0	50	14	0	5	45	8	122N	L	50N
14	Tg. Piandang		1	28	452	5	0	0	0	486N	M	1,042N
15	Gula		19	23	174	0	0	0	0	216N	M	308N
16	Sangga		0	0	39	0	0	0	0	39N	M	76N
17	Larut		8	4	337	362	21	11	9	752N	L	140N
18	Terong		1	3	1	0	0	0	0	5N	M	166N
19	Beruas		0	0	0	0	0	0	0	655Y	L	1,595N
20	Batu		0	16	0	0	0	0	0	16N	S	21N
21	Dinding		2	24	13	1	0	0	0	40N	M	83N
22	Lekir		2	16	8	0	0	0	0	26N	M	55Y
23	Selangor		7	9	167	3	2	1	0	189N	M	397Y
24	Kapar Besar		2	68	3	0	0	0	0	77N	M	67Y
25	Langat		1	11	21	1	0	0	0	34N	M	158Y
26	Sepang Kecil		0	4	88	13	0	0	0	23N	S	26Y
27	Sepang		0	23	0	0	0	0	0	105N	M	95Y
28	Lukut		4	10	21	0	0	0	0	35N	M	79N
29	Raya		0	0	0	0	0	0	0	5Y	M	10Y
30	Linggi		3	39	21	0	0	0	0	63N	M	20Y
31	Baru		10	30	52	0	0	0	0	92N	M	170N
32	Melaka		3	18	11	0	0	0	0	32N	L	311N
33	Duyong		0	2	109	0	0	0	0	111N	M	95N
34	Umbai		3	31	4	0	0	0	0	38N	M	62N
35	Merlimau		0	34	1	0	0	0	0	35N	M	69N
36	Muar		15	69	82	1	0	0	0	167N	M	251Y
37	Parit Jawa		4	21	81	10	1	0	0	117N	M	176Y
38	Sarang Buaya		2	19	14	0	0	0	0	35N	M	53Y
39	Batu Pahat		3	21	38	2	0	0	0	64N	M	96Y
40	Senggarang		4	24	7	0	0	0	0	35N	M	53Y
41	Rengit		0	7	12	29	9	0	0	57N	M	86Y
42	Benut		3	8	36	12	2	0	0	61N	M	92Y
43	Pontian Keci		0	3	108	132	4	0	0	247N	M	370Y
44	Sedili Besar		1	14	39	34	6	0	0	311N	M	467Y
45	Mersing	154	0	1	152	59	5	37	36	290N	L	435Y
46	Endau		1	1	16	16	8	43	133	218N	L	327Y
47	Pontian		0	6	9	2	0	0	0	17N	M	28N
48	Rompin		0	11	28	16	10	25	17	107N	L	405N
49	Merchong		1	0	3	0	0	0	0	4N	M	11N
50	Nenasi		5	0	40	18	3	4	10	75N	L	228N

*1 Estimated Value? (Y/N)
*2 S:Small(Non-powered and Out board Engine)
M:Medium(Inboard Engine below 41 GRT)
L:Large(Inboard Engine 41 GRT and above)

Table 11.4-7(2/2) NUMBER OF BOAT AND FISHERMEN

Serial	Name	Comcial Boat	<--------Number of Fishing Boat--------Size> No Power	Out Engn	<---Inboard Engine----> <11	11 <21	21 <31	31 <41	41-	Total Est. *1	*2	No. of Fishermen Est. *1
51	Pahang		0	1	92	44	6	2	14	164N	L	666N
52	Terus		0	0	0	0	0	0	0	34Y	S	86N
53	Kuantan	45	0	1	0	10	3	25	124	163N	L	570Y
54	Beserah		0	2	1	2	1	0	0	6N	M	21Y
55	Kemaman	8	3	0	62	19	1	1	11	97N	L	1,338N
56	Kemasik		1	1	29	11	0	0	0	42N	M	175N
57	Kerteh	23	2	3	41	7	0	0	0	53N	M	140N
58	Paka		1	1	59	20	1	1	0	83N	M	267N
59	Dungun		0	0	31	29	3	1	2	66N	L	848N
60	Mercang		1	0	18	4	0	0	0	23N	M	50N
61	Marang		1	0	139	42	5	1	0	188N	M	715N
62	Terengganu	161	0	3	35	32	7	10	20	107N	L	417Y
63	Merang		0	14	18	2	0	0	0	34N	M	66N
64	Keluang		0	0	0	0	0	0	0	10Y	S	39Y
65	Gali		0	0	0	0	0	0	0	8Y	S	15N
66	Pak Amat		0	0	0	0	0	0	0	28Y	L	30N
67	Kelantan		2	25	76	67	2	9	27	208N	L	666Y
68	Rulah		0	0	0	0	0	0	0	15Y	M	35N
69	Sematan		0	0	3	0	1	0	0	4N	M	97N
70	Kayan		0	0	0	0	0	0	0	45Y	M	104Y
71	Sempadi		0	0	2	2	3	0	0	7N	M	49N
72	Rambungan		0	0	0	0	0	0	0	0N	S	27N
73	Sibu Laut		0	0	0	0	0	0	0	0N	S	47N
74	Salak		2	5	0	1	0	0	0	8N	S	54N
75	Santubong		0	0	0	0	0	0	0	0N	S	50N
76	Buntal		0	0	4	0	0	0	1	5N	L	122N
77	Bako		0	0	10	4	0	0	0	92Y	S	93N
78	Sadong		0	0	0	0	0	0	0	867Y	M	751N
79	Kabong		0	2	0	0	0	0	0	207Y	M	239N
80	Oya		0	0	0	0	0	0	0	104Y	M	292N
81	Mukah		0	0	0	0	0	0	0	199Y	M	556N
82	Balingian		0	0	0	0	0	0	0	33Y	M	92N
83	Serupai		0	0	0	0	0	0	0	3Y	S	7Y
84	Tatau		0	0	0	0	0	0	0	43Y	L	142N
85	Suai		0	0	0	0	0	0	0	4Y	S	12N
86	Niah		0	0	0	0	0	0	0	4Y	M	12N
87	Sibuti		0	0	0	0	0	0	0	31Y	L	99N
88	Lawas		0	0	0	0	0	0	0	161Y	M	167N
89	Padas		0	0	387	13	0	0	0	400N	M	509N
90	Papar		0	0	123	0	0	0	0	123N	M	34N
91	Inanam		0	0	21	0	0	0	0	21N	M	50N
92	Tuaran		0	0	120	0	0	0	0	120N	M	120N
93	Bandau		0	0	52	2	0	0	0	54N	M	54N
94	Bongan		0	0	47	0	0	0	0	47N	M	42N
95	Sugut		0	0	196	15	0	0	0	211N	M	211N
96	Segama		0	0	26	0	0	0	0	26N	M	28N
97	Kalumpang		0	0	10	0	0	0	0	10N	M	105N
98	Tawau		0	0	60	0	0	0	0	60N	M	400N
99	Umas-Umas		0	0	15	0	0	0	0	15N	L	60N
100	Kalabakan		0	0	5	0	0	0	0	5N	M	98N

*1 Estimated Value? (Y/N)
*2 S:Small(Non-powered and Out board Engine)
M:Medium(Inboard Engine below 41 GRT)
L:Large(Inboard Engine 41 GRT and above)

Table 11.4-8(1/2) LAND USE CONDITION AROUND THE RIVER MOUTH

Serial	Name	Land Use *1
1	Perlis	UR/VI/AG
2	Baru	VI/AG
3	Sanglang	VI/AG
4	Jerlun	VI/AG
5	Kedah	UR/VI/AG
6	Yan	VI/AG
7	Melaka	VI/AG
8	Cenang	VI/AG
9	Muda	VI/SW/AG
10	Perai	UR/SW/AG
11	Kerian	VI/SW/AG
12	Pinang	UR/VI/AG
13	Bayan Lepas	VI/AG
14	Tg. Piandang	VI/AG/SW
15	Gula	VI/SW/AG
16	Sangga	VI/SW
17	Larut	VI/SW
18	Terong	VI/SW
19	Beruas	UR/SW/AG
20	Batu	VI/SW
21	Dinding	VI/SW/AG
22	Lekir	VI/SW/AG
23	Selangor	UR/SW/AG
24	Kapar Besar	VI/SW/AG
25	Langat	VI/SW
26	Sepang Kecil	VI/FO/AG
27	Sepang	VI/FO/AG
28	Lukut	VI/FO
29	Raya	VI/SW/AG
30	Linggi	VI/SW
31	Baru	VI/AG
32	Melaka	UR
33	Duyong	VI/SW/AG
34	Umbai	VI/SW/AG
35	Merlimau	VI/SW/AG
36	Muar	UR/SW/AG
37	Parit Jawa	VI/AG
38	Sarang Buaya	VI/SW/AG
39	Batu Pahat	UR/SW/AG
40	Senggarang	VI/AG
41	Rengit	VI/SW/AG
42	Benut	VI/SW/AG
43	Pontian Keci	VI/SW/AG
44	Sedili Besar	VI/SW
45	Mersing	UR/SW/AG
46	Endau	VI/SW/AG
47	Pontian	VI/SW/AG
48	Rompin	VI/SW/AG
49	Merchong	VI/SW
50	Nenasi	VI/SW

*1 UR:Urban Area VI:Village AG:Agricultural Lands FO:Forest
SW:Swamps UN:Unused Land

Table 11.4-8(2/2) LAND USE CONDITION AROUND THE RIVER MOUTH

Serial	Name	Land Use *1
51	Pahang	UR/SW/AG
52	Terus	VI/SW
53	Kuantan	UR/SW
54	Beserah	VI
55	Kemaman	UR/SW
56	Kemasik	VI/SW
57	Kerteh	VI/SW
58	Paka	VI/SW
59	Dungun	UR/SW/AG
60	Mercang	VI
61	Marang	VI
62	Terengganu	UR/AG
63	Merang	VI/FO
64	Keluang	VI/SW/FO
65	Gali	VI/FO
66	Pak Amat	VI/AG
67	Kelantan	UR/FO/AG
68	Rulah	VI/AG
69	Sematan	VI/SW
70	Kayan	VI/SW
71	Sempadi	VI/SW
72	Rambungan	VI/SW
73	Sibu Laut	VI/SW
74	Salak	VI/SW
75	Santubong	VI/SW
76	Buntal	VI/SW
77	Bako	VI/SW
78	Sadong	VI/SW
79	Kabong	VI/SW
80	Oya	VI/SW
81	Mukah	VI/SW
82	Balingian	VI/FO
83	Serupai	VI/FO/AG
84	Tatau	VI/FO/AG
85	Suai	VI
86	Niah	VI/SW/AG
87	Sibuti	VI/FO/AG
88	Lawas	VI/SW/FO
89	Padas	VI/SW
90	Papar	VI/SW
91	Inanam	VI/UN
92	Tuaran	VI/SW/UN
93	Bandau	VI/SW
94	Bongan	SW
95	Sugut	SW
96	Segama	SW
97	Kalumpang	SW
98	Tawau	UR
99	Umas-Umas	SW
100	Kalabakan	SW

*1 UR:Urban Area VI:Village AG:Agricultural Lands FO:Forest
SW:Swamps UN:Unused Land

Table 11.4-9(1/3) MAJOR URBAN CENTERS NEAR THE RIVER MOUTH

Serial	Name	City Name	Distance from the mouth km	Population
1	Perlis	Kangar	10	12,956
2	Baru	Kangar	10	12,956
2	Baru	Port Dickson	35	24,035
3	Sanglang	Alor Setar	30	71,682
3	Sanglang	Jitra	30	13,840
4	Jerlun	Alor Setar	18	71,682
4	Jerlun	Jitra	22	13,840
5	Kedah	Alor Setar	11	71,682
6	Yan	Yan	1	5,479
6	Yan	Gurun	15	5,995
7	Melaka	Kuah	18	2,815
9	Muda	Sungai Petani	20	45,987
10	Perai	Butterworth	3	76,651
10	Perai	Georgetown	5	250,578
10	Perai	Perai	2	9,810
11	Kerian	Nibong Tebal	10	5,492
12	Pinang	Georgetown	25	250,578
13	Bayan Lepas	Glugor	12	13,484
14	Tg. Piandang	Pkn.Tg.Piadang	3	
14	Tg. Piandang	Parit Buntar	8	6,793
14	Tg. Piandang	Nibong Tebal	16	5,492
14	Tg. Piandang	Tg. Piandang	0	4,945
15	Gula	Bagan Serai	12	9,402
16	Sangga	Taiping	15	149,282
17	Larut	Taiping	20	149,282
17	Larut	Kuala Sepetang	3	
18	Terong	Taiping	26	149,282
19	Beruas	Beruas	25	3,876
20	Batu	Beruas	28	3,876
21	Dinding	Sitiawan	14	7,771
22	Lekir	Sitiawan	18	7,771
23	Selangor	Kuala Selangor	1	2,956
24	Kapar Besar	Kapar	6	
24	Kapar Besar	Kelang	14	196,200
25	Langat	Banting	12	6,342
26	Sepang Kecil	Sg. Pelek	6	5,206
27	Sepang	Sungai Pelek	6	5,206
28	Lukut	Port Dickson	6	24,035
29	Raya	Kuala Selangor	1	6,000
29	Raya	Pasir Panjang	4	
29	Raya	Port Dickson	35	24,035
30	Linggi	Lubok China	25	
30	Linggi	Pasir Panjang	7	
31	Baru	Pekan K.Sg.Baru	1	
31	Baru	Melaka	35	88,073
32	Melaka	Melaka	0	80,073
33	Duyong	Melaka	10	80,073
33	Duyong	Padang Temu Town	0	
34	Umbai	Melaka	15	80,073

Table 11.4-9(2/3) MAJOR URBAN CENTERS NEAR THE RIVER MOUTH

Serial	Name	City Name	Distance from the mouth km	Population
35	Merlimau	Merlimau Town	3	
36	Muar	Muar	0	65,775
37	Parit Jawa	Muar	14	65,775
38	Sarang Buaya	Batu Pahat	20	66,022
39	Batu Pahat	Batu Pahat	8	66,022
40	Senggarang	Batu Pahat	17	66,022
41	Rengit	Batu Pahat	40	66,022
41	Rengit	Renggam	40	4,266
42	Benut	Simpang	24	4,266
42	Benut	Renggam	0	
43	Pontian Keci	Pekan nanas	24	9,485
44	Sedili Besar	Pekan Sedili/Tanung Lembu	1	
44	Sedili Besar	Kota Tinggi	35	13,672
45	Mersing	Mersing town	0	13,899
46	Endau	Endau Town	1	4,161
47	Pontian	Kuala Rompin Endau	18	4,161
48	Rompin	Kuala Rompin Endau	18	4,161
49	Merchong	Pekan	54	5,170
49	Merchong	Nenasi	15	
49	Merchong	Kuala Rompin	26	
50	Nenasi	Pekan	40	5,170
50	Nenasi	Kuala Rompin	40	
50	Nenasi	Nenasi	4	
51	Pahang	Pekan	7	6,170
52	Terus	Pekan	9	5,170
53	Kuantan	Kuantan	2	136,625
54	Beserah	Kuantan	7	136,625
55	Kemaman	Chukai	4	46,711
56	Kemasik	Bandar Baru Kerteh	9	6,449
56	Kemasik	Kijal	12	3,840
57	Kerteh	Bandar Baru, Kerteh	3	6,449
58	Paka	Paka	3	4,339
58	Paka	Kijal	12	3,840
59	Dungun	Dungun	0	29,569
60	Mercang	Dungun	35	29,569
61	Marang	Marang	1	4,366
62	Terengganu	Kuala Terengganu	1	186,608
63	Merang	Kuala Terengganu	38	186,608
63	Merang	Bandar Permaisuri	32	2,825
64	Keluang	Kuala Raja	3	3,148
64	Keluang	Kuala Besut	7	4,003
65	Gali	Tumpat	10	10,037
66	Pak Amat	Kota Baharu	18	170,559
67	Kelantan	Kota Baharu	10	170,559
68	Rulah	Tumpat	3	10,037
69	Sematan	Sematan	1	900
70	Kayan	Lundu	15	150
71	Sempadi	Lundu	20	

Table 11.4-9(3/3) MAJOR URBAN CENTERS NEAR THE RIVER MOUTH

Serial	Name	City Name	Distance from the mouth km	Population
72	Rambungan	Kuching	30	306,000
73	Sibu Laut	Kuching	28	306,000
74	Salak	Kuching	20	306,000
75	Santubong	Kuching	20	306,000
75	Santubong	Santubong	0	2,000
76	Buntal	Kuching	25	306,000
77	Bako	Kuching	34	306,000
78	Sadong	Kota Samarahan	40	
78	Sadong	Pendam	0	850
81	Mukah	Mukah	1	
82	Balingian	Balingian	20	332
93	Bandau	Bandau town	7	2,800
94	Bongan	Tandek	4	304
94	Bongan	Kota Marudu	12	
96	Segama	Sandakan	85	42,413