社会開発調査部報告書

No. 102

GOVERNMENT OF MALAYSIA

STUDY ON KELANTAN RIVER BASIN-WIDE FLOOD MITIGATION

PART II

FEASIBILITY STUDY ON FLOOD MITIGATION PROJECT

(MAIN REPORT)

GOVERNMENT OF MALAYSIA

STUDY
ON
KELANTAN RIVER BASIN-WIDE
FLOOD MITIGATION

FINAL REPORT

PART II

PRE-FEASIBILITY STUDY
ON
COMBINATION PLAN
OF
LEBIR DAM, KEMUBU DAM AND RIVER IMPROVEMENT

(SUPPORTING REPORT)

NOVEMBER, 1989

JAPAN INTERNATIONAL COOPERATION AGENCY

A List of Reports

1. Executive Summary

2. Master Plan Study
   (Main Report)

3. Master Plan Study
   (Supporting Report)

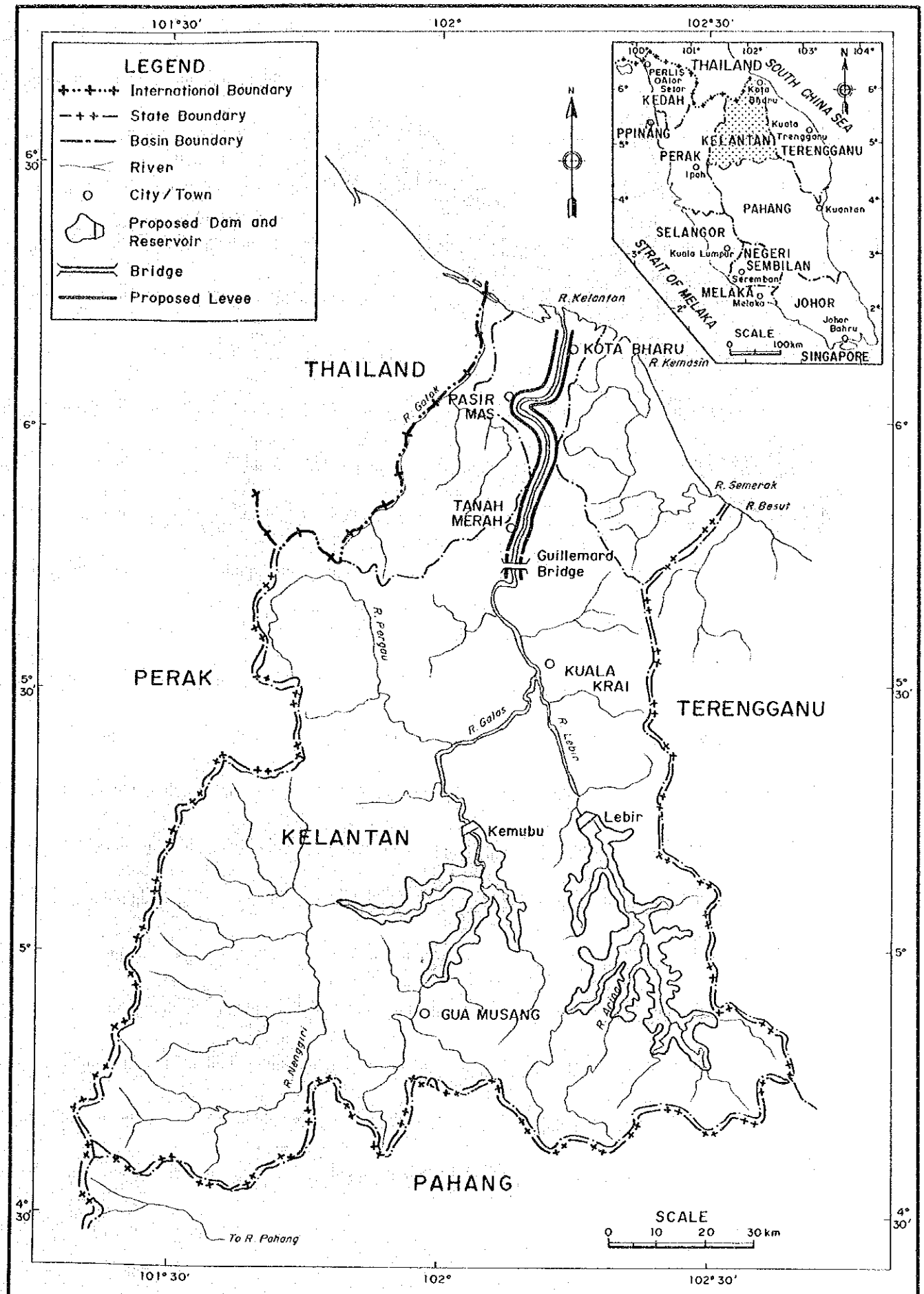
4. Pre-feasibility Study on Combination Plan
   of Lebir Dam, Kemubu Dam and River Improvement
   (Main Report)

5. Pre-feasibility Study on Combination Plan
   of Lebir Dam, Kemubu Dam and River Improvement
   (Supporting Report)

6. Additional Survey for 1988 Flood

7. Geological and Material Investigations
   for Dabong and Kemubu Damsites

8. Data Book
   (Cross Sectional Survey)



LOCATION OF PROJECT AREA

GOVERNMENT OF MALAYSIA
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ON
KELANTAN RIVER BASIN - WIDE FLOOD MITIGATION
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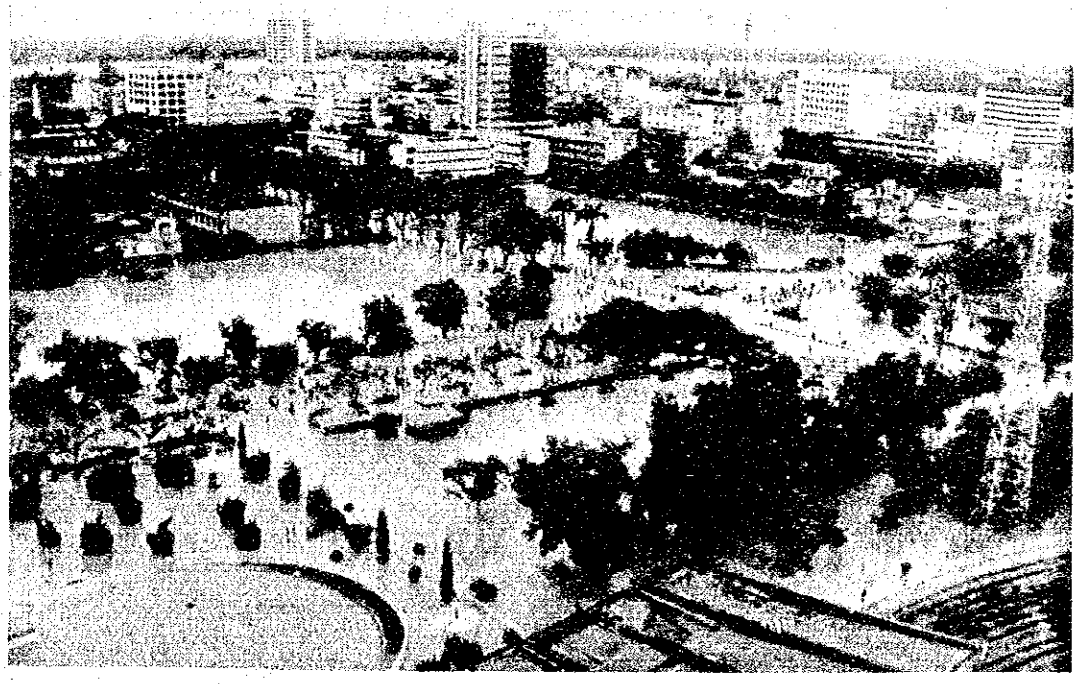
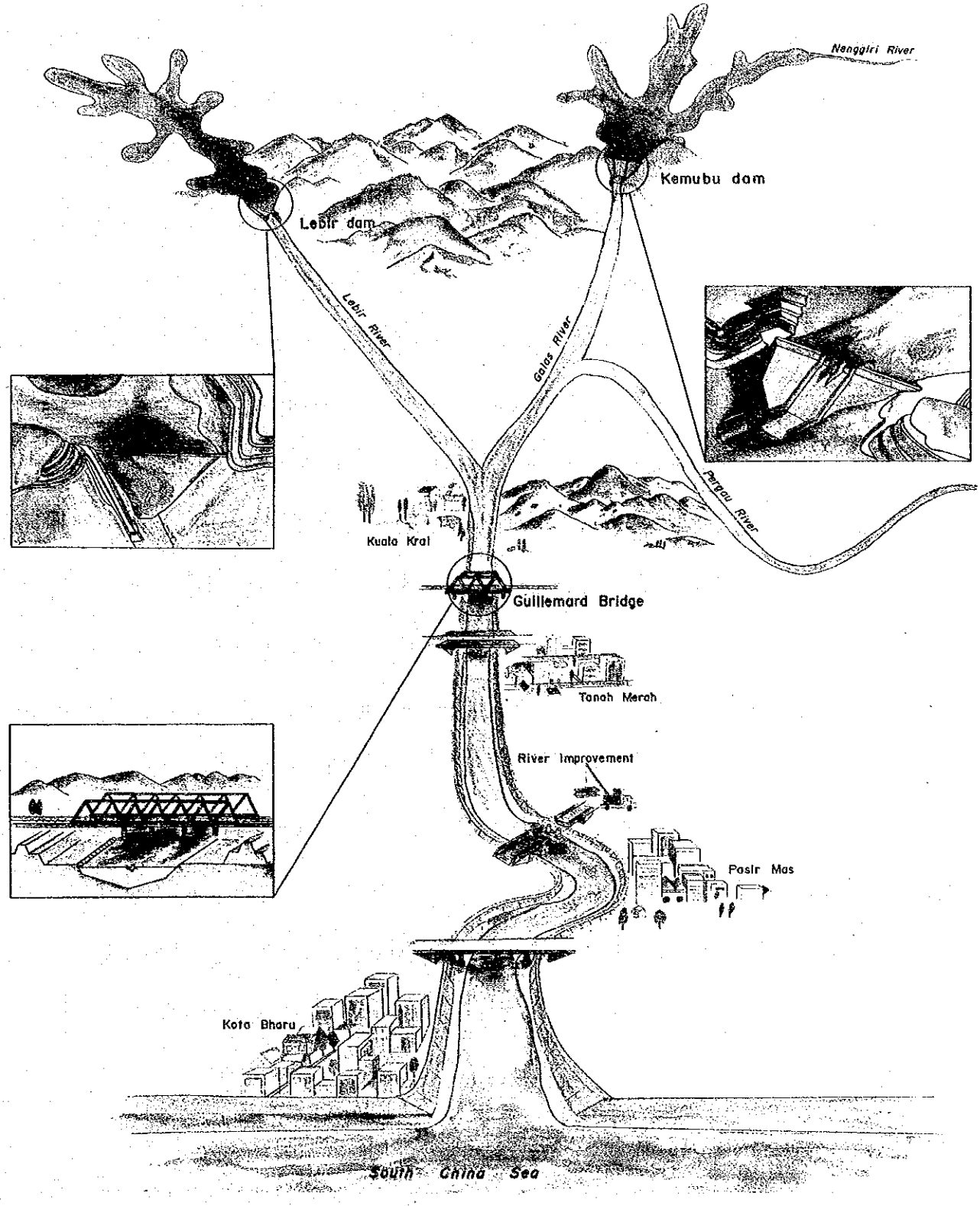
Guillemard Bridge (November 26, 1988)



Kota Bharu Town (November 26, 1988)



Master Plan of the Kelantan River Flood Mitigation

ABBREVIATIONS

Domestic Organization

DID (JPT)	:	Drainage and Irrigation Department
DOA	:	Department of Agriculture
DOE	:	Division of Environment
DOF	:	Department of Forestry
DOFS	:	Department of Fishery
DOM	:	Department of Mines
DOS	:	Department of Statistics
EPU	:	Economic Planning Unit
FAMA	:	Federal Agricultural Marketing Authority
FELCRA	:	Federal Land Consolidation and Rehabilitation Authority
FELDA	:	Federal Land Development Authority
GSD	:	Geological Survey Department
ICU	:	Implementation and Coordination Unit
JOA	:	Orang Asli Department
KADA	:	Kelantan Agricultural Development Authority
KESEDAR	:	South Kelantan Development Authority
MARDI	:	Malaysian Agricultural Research and Development Institute
MHA	:	Ministry of Home Affairs
MIDA	:	Malaysian Industrial Development Authority
MLRD	:	Ministry of Land and Regional Development
MMS	:	Malaysian Meteorological Service
MNRD	:	Ministry of National & Rural Development
MOA	:	Ministry of Agriculture
MOE	:	Ministry of Education
MOF	:	Ministry of Finance

MOH	:	Ministry of Health
MOPI	:	Ministry of Primary Industries
MPE	:	Ministry of Public Enterprises
MPKB	:	Majilis Perbandaran Kota Bharu
MRRDB	:	Malaysian Rubber Research and Development Board
NDPC	:	National Development Planning Committee
NEB (LLN)	:	National Electricity Board
PORIM	:	Palm Oil Research Institute of Malaysia
PWD (JKR)	:	Public Works Department
RDA	:	Regional Development Authority
RISDA	:	Rubber Industry Small-holders Development Authority
RRIM	:	Rubber Research Institute of Malaysia
SEDC	:	State Economic Development Corporation
S(E)PU	:	State (Economic) Planning Unit
UDA	:	Urban Development Authority

International and Foreign Organizations

ADB	:	Asian Development Bank
IBRD	:	International Bank for Reconstruction and Development
JICA	:	Japan International Cooperation Agency
MOC	:	Ministry of Construction, Japan
WMO	:	World Meteorological Organization

Others

BOD	:	Biochemical Oxygen Demand
CIF	:	Cost, Insurance and Freight
COD	:	Chemical Oxygen Demand
DFWL	:	Reservoir Design Flood Water Level
El.	:	Elevation above Mean Sea Level

Eq.	:	Equation
Fig.	:	Figure
FSL	:	Reservoir Full Supply Level
GDP	:	Gross Domestic Product
GNP	:	Gross National Product
Kg.	:	Kampung
NHWL	:	Reservoir Normal High Water Level
O&M	:	Operation and Maintenance
PMF	:	Probable Maximum Flood
PMP	:	Probable Maximum Precipitation
Ref.	:	Reference
SWL	:	Reservoir Surcharge Water Level

ABBREVIATIONS OF MEASUREMENT

Length

mm = millimetre
cm = centimetre
m = metre
km = kilometre
ft = foot
yd = yard

Area

cm^2 = square centimetre
m^2 = square metre
ha = hectare
km^2 = square kilometre
sq.km = square kilometre
$mile^2$ = square mile

Volume

cm^3 = cubic centimetre
l = lit = litre
kl = kilolitre
m^3 = cubic metre
gal. = gallon
MCM = million cubic metre

Weight

mg = milligram
g = gram
kg = kilogram
ton = metric ton
lb = pound

Time

s = sec = second
min = minute
h = hr = hour

Electrical Measures

V = Volt
A = Ampere
Hz = Hertz (cycle)
W = Watt
kW = Kilowatt
MW = Megawatt
GW = Gigawatt
kWh = kilowatt hour
GWh = Gigawatt hour

Other Measures

% = percent
^{o} = degree
' = minute
" = second
^oC = degree in centigrade
10^3 = thousand
10^6 = million
10^9 = billion (milliard)

Derived Measures

m/s = metre per second
m^3/s = cubic metre per second
cms = cubic metre per second
cusec = cubic feet per second
mg/l = milligram per litre
Mld = million litre per day
kWh = kilowatt hour
MWh = Megawatt hour
GWh = Gigawatt hour
kWh/y = kilowatt hour per year
kVA = kilovolt ampere

Money

M$ = Malaysian ringgit
US$ = US dollar

LIST OF ANNEX

ANNEX I

TOPOGRAPHIC SURVEY

TABLE OF CONTENTS

LIST OF FIGURES

I. TOPOGRAPHIC SURVEY

1. INTRODUCTION

As a result of the Kelantan River basin-wide flood mitigation study, three schemes, i.e. Lebir and Kemubu dam schemes and river improvement between Kuala Krai and the estuary, were selected to proceed in the pre-feasibility study. Topographic maps for the Kemubu dam scheme were prepared with a scale of 1 to 1,000 at the damsite area and 1 to 10,000 at the proposed reservoir area for carrying out the pre-feasibility study.

A feasibility study was carried out by NEB and JICA for the Lebir scheme aiming at hydropower generation. Topographic maps were prepared with a scale of 1 to 500 at the damsite area including the saddle dam area and 1 to 10,000 at the proposed reservoir area to carry out the feasibility study of the Lebir scheme. The pre-feasibility study with the objective of flood mitigation will be based on these maps.

Longitudinal and cross-sectional survey of the Kelantan River was carried out for the stretches of about 100 km between Kuala Krai and the estuary with a 1 km interval on an average during the master plan stage of this study as mentioned in the Annex I, Topographic Survey, of Part I. A further detailed longitudinal and cross-sectional survey was performed for the four urban stretches of Kota Bharu, Pasir Mas, Tanah Merah and Kuala Krai with a 200 m interval on an average during the course of this pre-feasibility study stage, providing further detailed topographic information of the urban stretches. The pre-feasibility study of river improvement between Kuala Krai and the estuary will be based on the longitudinal profile and cross sections including newly prepared ones.

2. TOPOGRAPHIC SURVEY FOR THE KEMUBU DAM SCHEME

2.1 Topographic Maps for Reservoir Area

Topographic maps to cover not only the Kemubu reservoir area but also the Dabong reservoir area were prepared in a scale of 1 to 10,000 using aerial photographs with a scale of 1 to 40,000 shot in the period of 1980 to 1985 by photogrammetry. The elevation contour was drawn every 5 m upto El. 100 m by tying to the national bench marks. Fig. I.2.1 depicts an area where the topographic maps were prepared with a scale of 1 to 10,000 for the Kemubu scheme, whilst Fig. I.2.2 shows the index of 1 to 10,000 scale maps.

The recent development of South Kelantan is progressed in a high pace reflecting the policy of the State Government to seek the enhancement of living standard in South Kelantan. This implies that the aerial photographs shot in 1980 to 1985 may not accurately show the current land use in the reservoir area. The work to fill this gap was carried out by incorporating the information obtained by reconnaissance to local places and collected from the local offices of the government to the 1 to 10,000 scale maps based on the aerial photographs shot in 1980 to 1985.

A video taping was carried out from air to reinforce the work to present the current land use condition of the Kemubu reservoir area shown in the 1 to 10,000 scale topographic maps. Flight routes of the helicopter are given in Fig. I.2.3.

2.2 Topographic Maps at the Damsite Area

Topographic maps with a scale of 1 to 1,000 were prepared by means of ground survey not only at the Kemubu damsite, but also at the Dabong and Lower Pergau damsites. Figs.I.2.4 to I.2.6 show the areas where the maps are prepared.

The contours drawn with a 2 m interval were connected with the national bench marks through the monument established near the damsite. Besides the topographic maps, the lateral profiles were also prepared at the proposed dam axes of the Kemubu, Dabong and Lower Pergau.

3. TOPOGRAPHIC DATA FOR THE LEBIR DAM SCHEME

As mentioned in the preceding Chapter I, Introduction, topographic maps with a scale of 1 to 10,000 were prepared for the reservoir area of the Lebir dam scheme in 1979 as part of the feasibility study for hydropower generation. The maps prepared by photogrammetry are based on the aerial photographs with a scale of 1 to 40,000 shot for the project. The elevation contour was drawn every 10 m by connecting to the national bench marks.

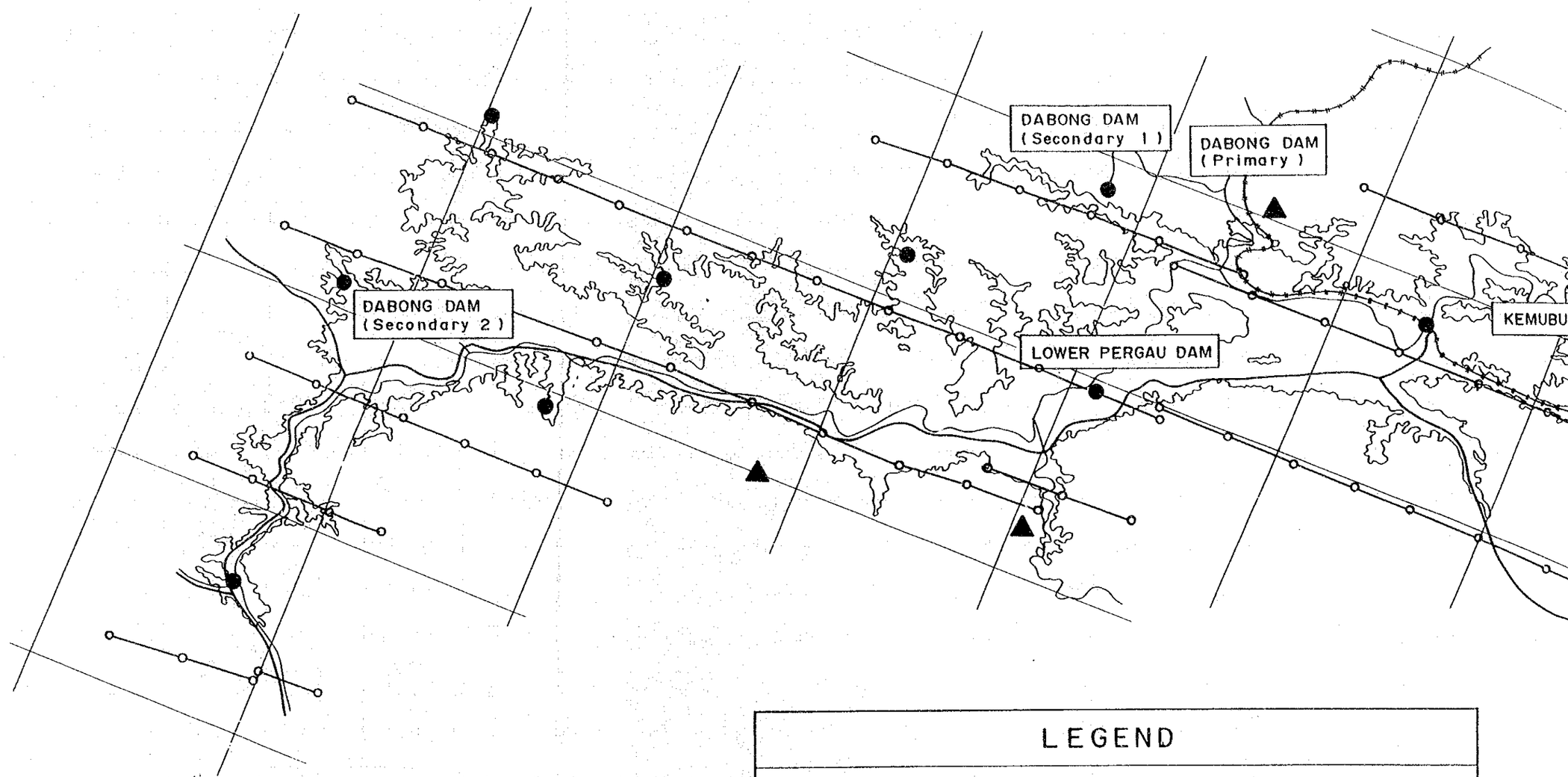
Fig. I.3.1 delineates an area where the topographic maps were prepared with a scale of 1 to 10,000 for the Lebir scheme, whilst the index of those maps is given in Fig. I.3.2.

Topographic maps with a scale of 1 to 500 were prepared by means of ground survey including the saddle damsite. Fig. I.3.3 depicts the area where the maps with a scale of 1 to 500 were prepared.

4. RIVER PROFILE AND CROSS-SECTIONAL SURVEY

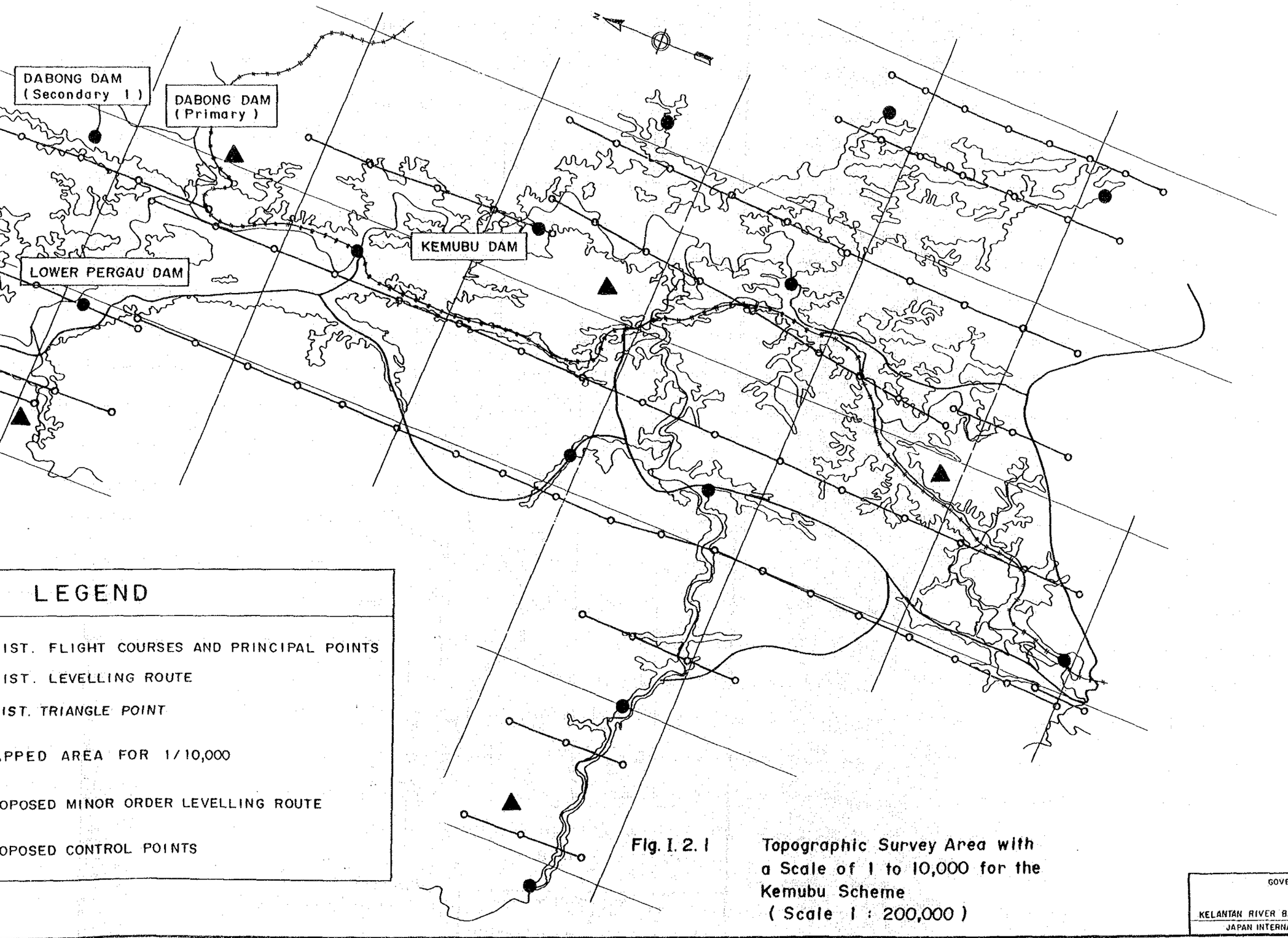
Longitudinal and cross-sectional survey with an interval of 200 m on an average was carried out at the four urban areas of Kota Bharu, Pasir Mas, Tanah Merah and Kuala Krai for supplementing the river cross sections surveyed with an interval of 1 km on an average in the master plan stage of this study.

Fig. I.4.1 shows the locations where cross-sectional survey was carried out with an interval of 200 m on an average. The outcome of the survey was compiled in V = 1:1,000 and H = 1:1,000 as did in the cross-sectional survey of the master plan stage.



LEGEND

- EXIST. FLIGHT COURSES AND PRINCIPAL POINTS
- EXIST. LEVELLING ROUTE
- EXIST. TRIANGLE POINT
- MAPPED AREA FOR 1/10,000
- PROPOSED MINOR ORDER LEVELLING ROUTE
- PROPOSED CONTROL POINTS



LEGEND

IST. FLIGHT COURSES AND PRINCIPAL POINTS

IST. LEVELLING ROUTE

IST. TRIANGLE POINT

PPED AREA FOR 1/10,000

OPOSED MINOR ORDER LEVELLING ROUTE

OPOSED CONTROL POINTS

Fig. I. 2. 1 Topographic Survey Area with a Scale of 1 to 10,000 for the Kemubu Scheme
(Scale 1 : 200,000)

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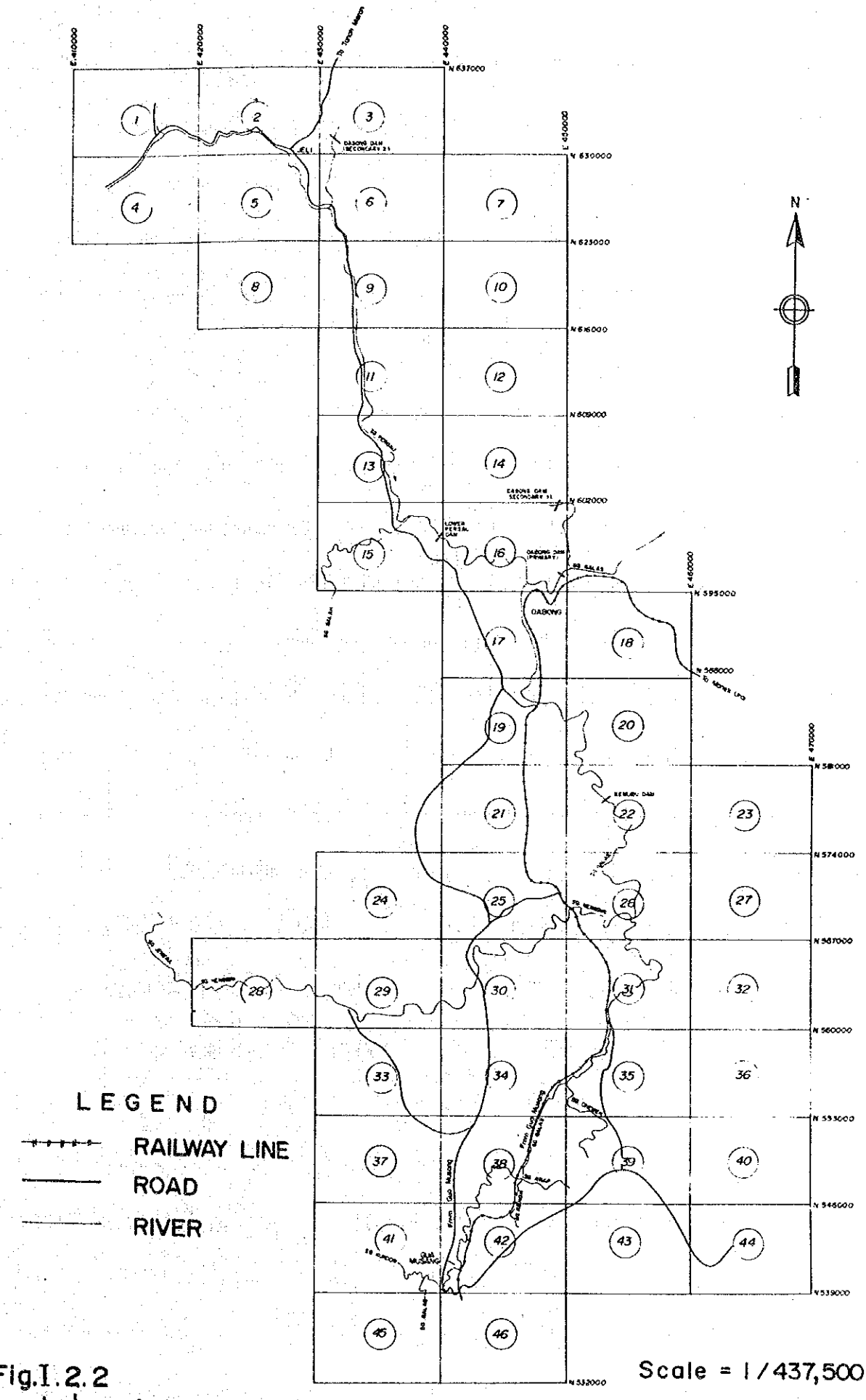
STUDY
ON
KELANTAN RIVER BASIN - WIDE FLOOD MITIGATION
JAPAN INTERNATIONAL COOPERATION AGENCY



Scale = 1 / 437,500

Fig.I.2.2
Index of the Topographic Map with a Scale of 1 to 10,000 for the Kemubu Scheme

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STUDY
ON
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JAPAN INTERNATIONAL COOPERATION AGENCY

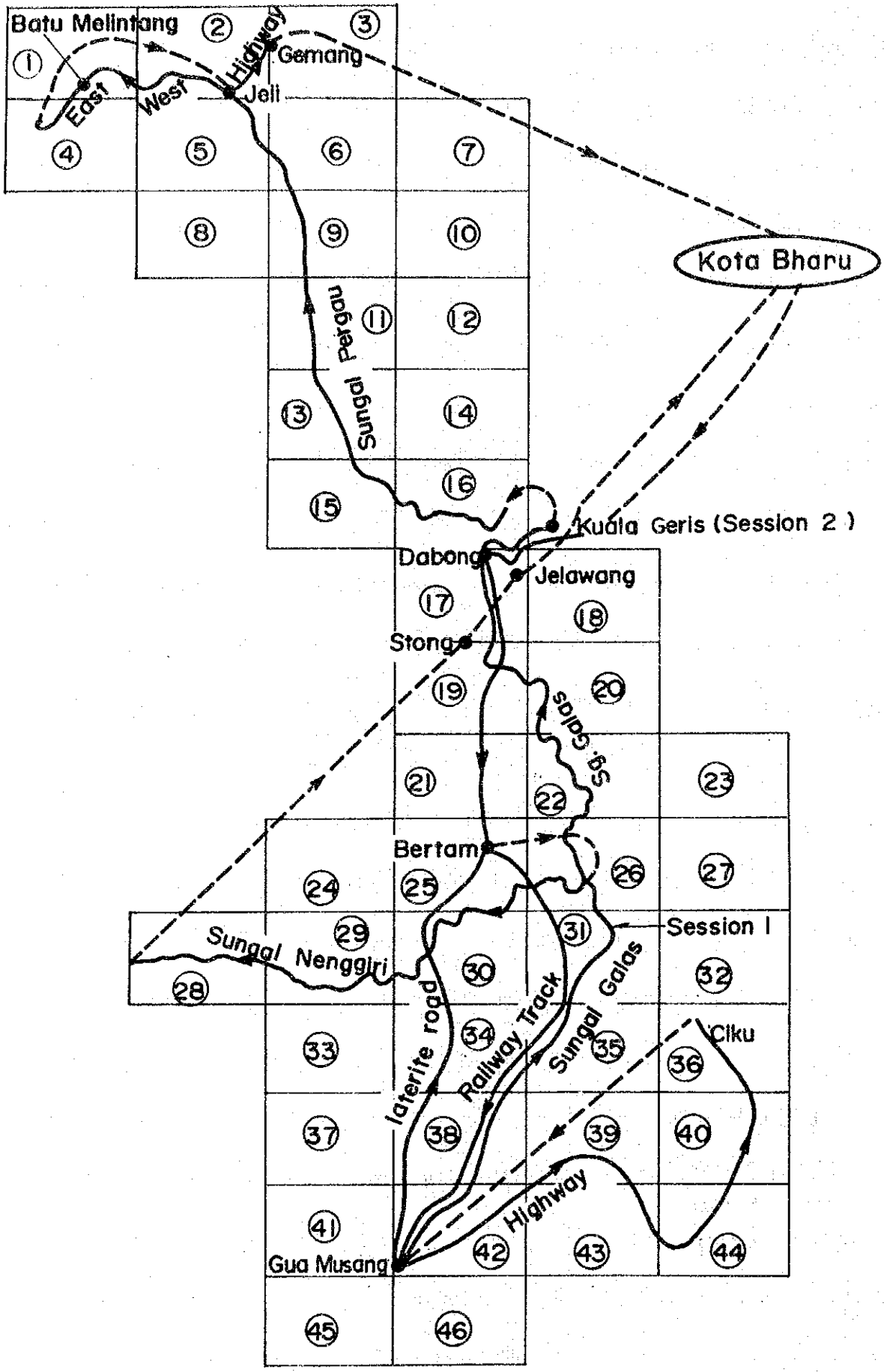

Fig. I. 2. 3
Flight Routes & Videotaping in/and around the Kemubu Reservoir

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STUDY
ON
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JAPAN INTERNATIONAL COOPERATION AGENCY

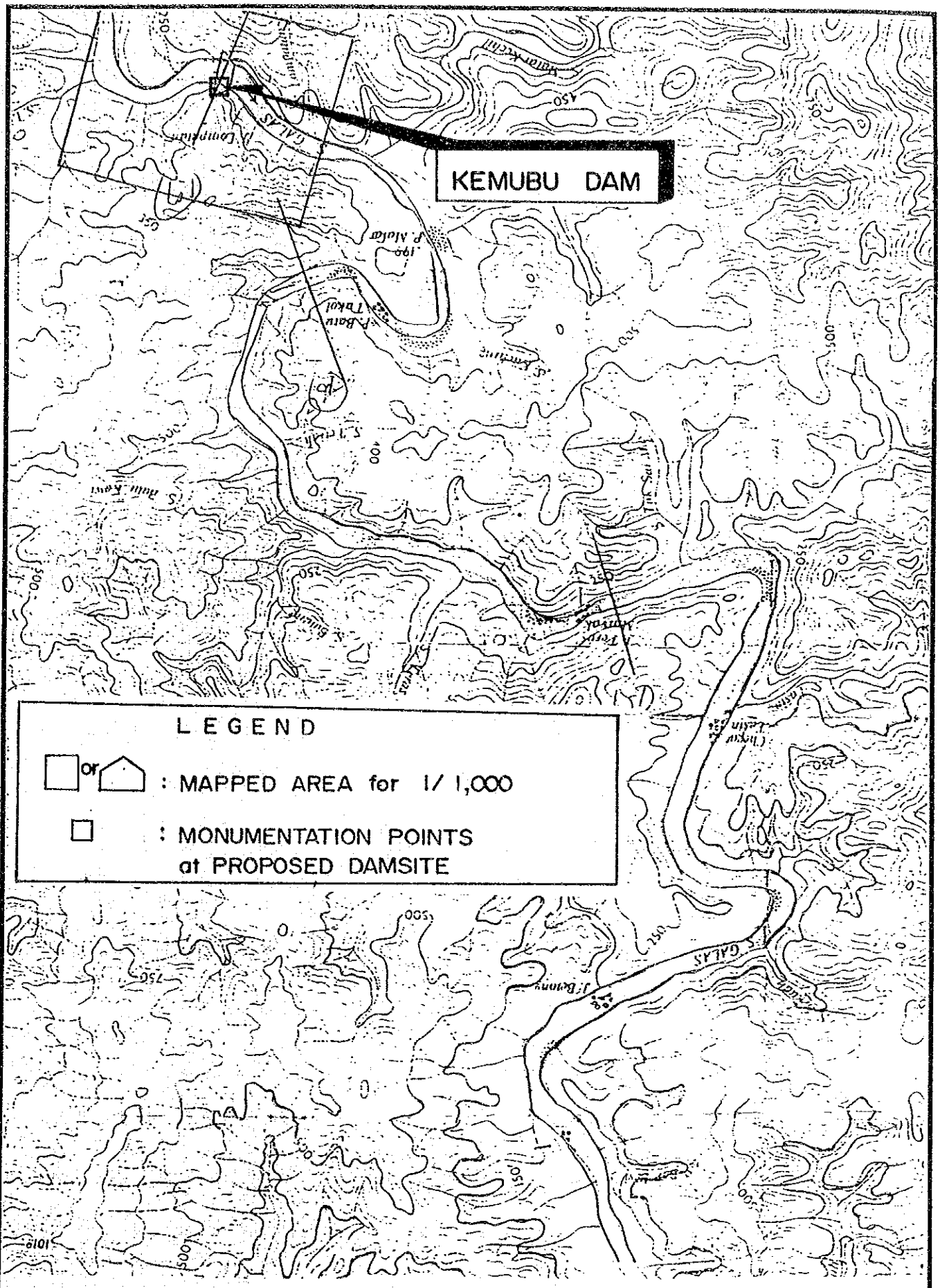

Fig. I. 2. 4

Topographic Survey Area with a Scale of 1 to 1,000 for the Kemubu Damsite

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STUDY
ON
KELANTAN RIVER BASIN - WIDE FLOOD MITIGATION
JAPAN INTERNATIONAL COOPERATION AGENCY

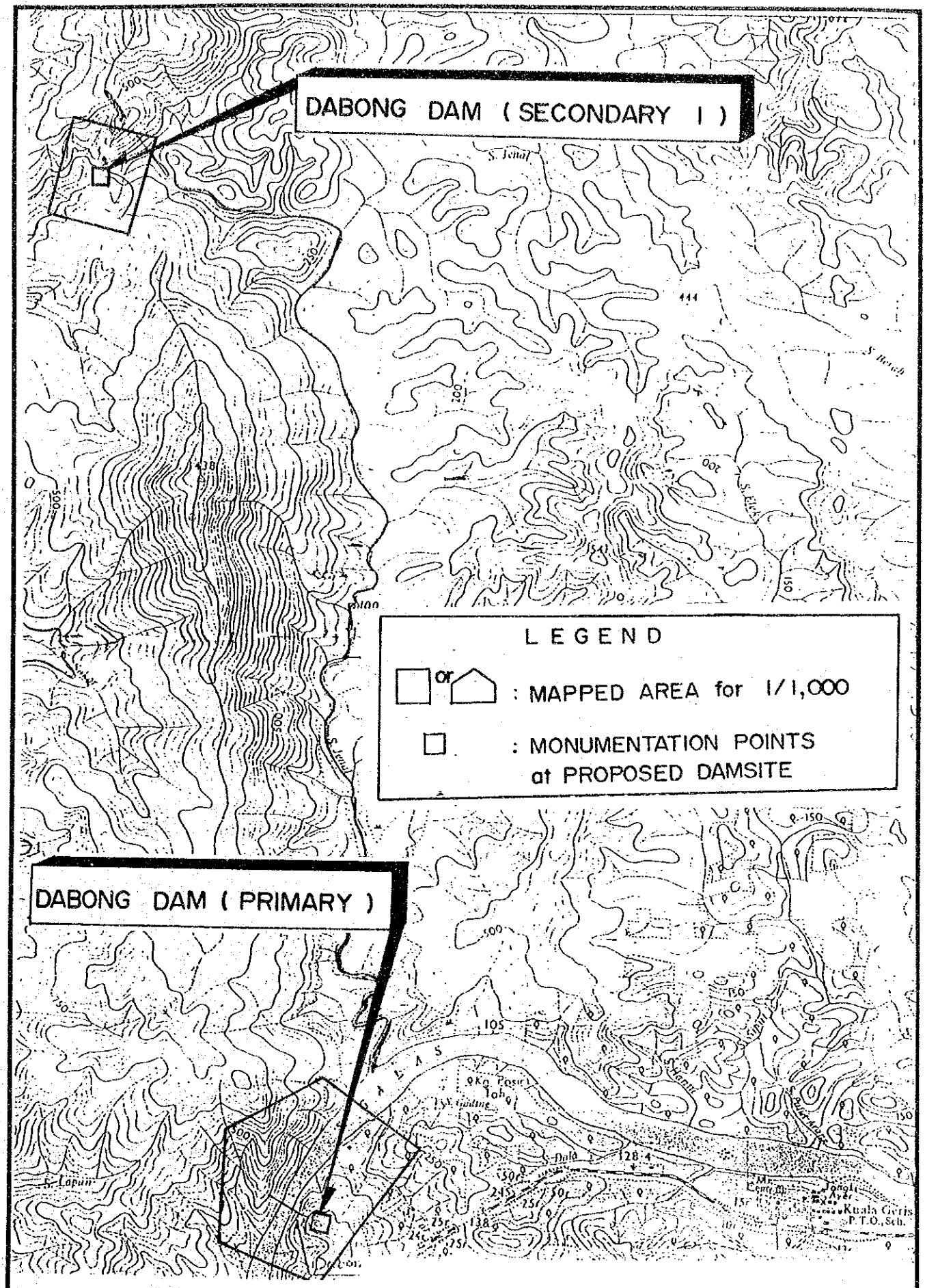

Fig. I. 2. 5 (1)

Topographic Survey Area with a Scale of 1 to 1,000 for the Dabong Damsite

Scale = 1/30,000

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STUDY
ON
KELANTAN RIVER BASIN - WIDE FLOOD MITIGATION
JAPAN INTERNATIONAL COOPERATION AGENCY

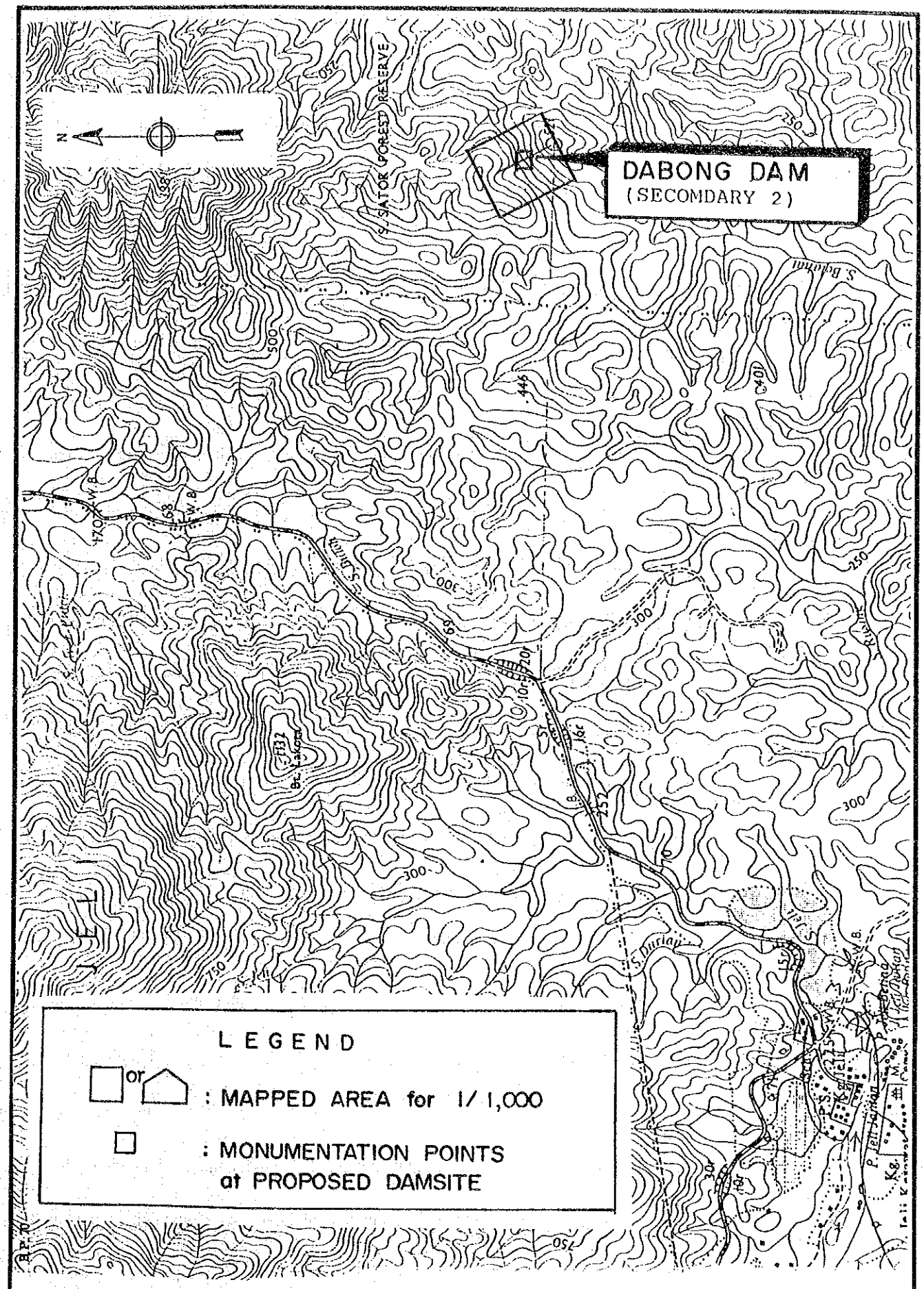

Fig. I. 2.5 (2)

Topographic Survey Area with a Scale of 1 to 1,000 for Dabong Damsite

Scale = 1/25,000

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STUDY
ON
KELANTAN RIVER BASIN - WIDE FLOOD MITIGATION
JAPAN INTERNATIONAL COOPERATION AGENCY

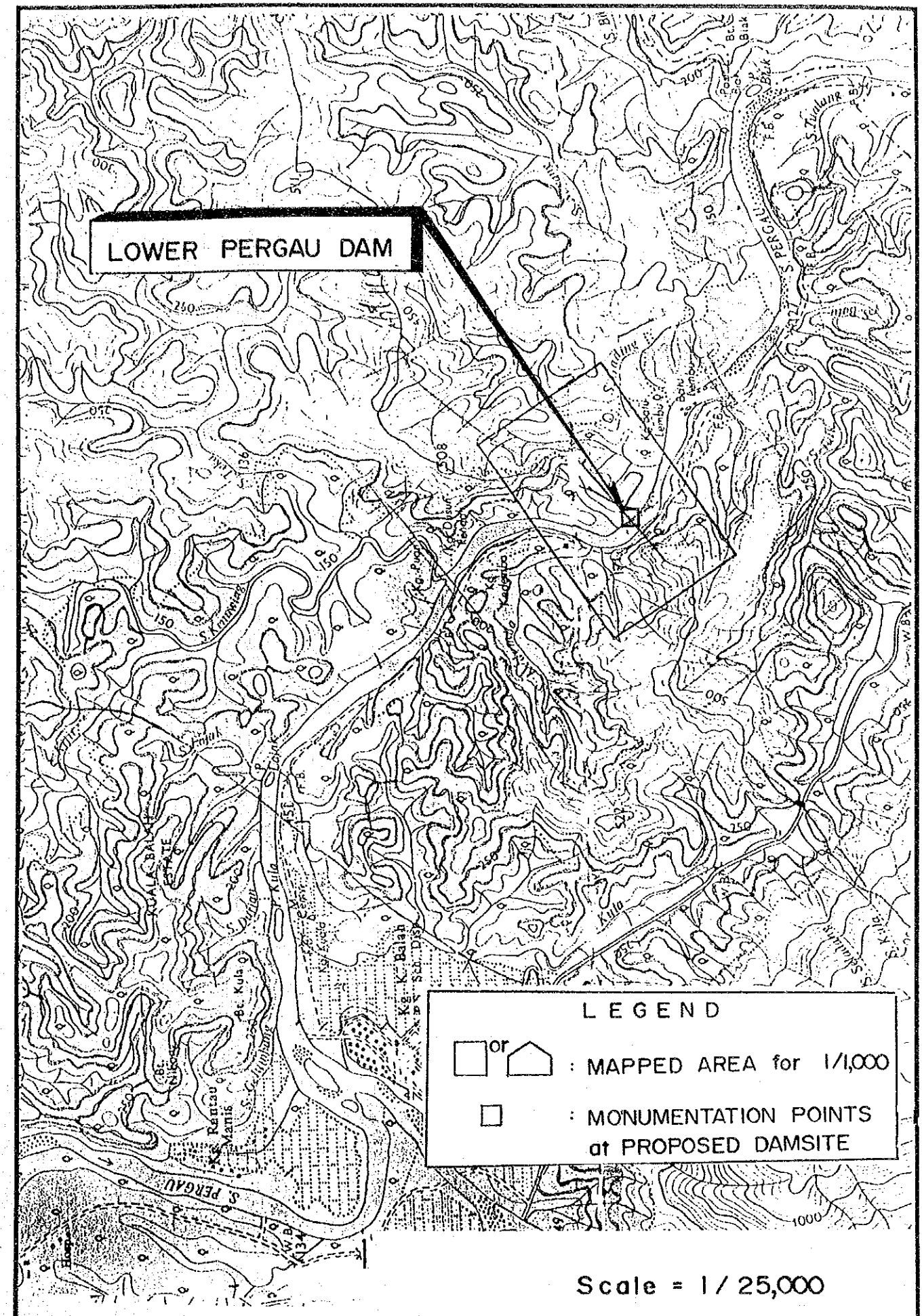

Fig. I.2.6
Topographic Survey Area with a Scale of 1 to 1,000 for the Lower Pergau Damsite

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STUDY
ON
KELANTAN RIVER BASIN - WIDE FLOOD MITIGATION
JAPAN INTERNATIONAL COOPERATION AGENCY

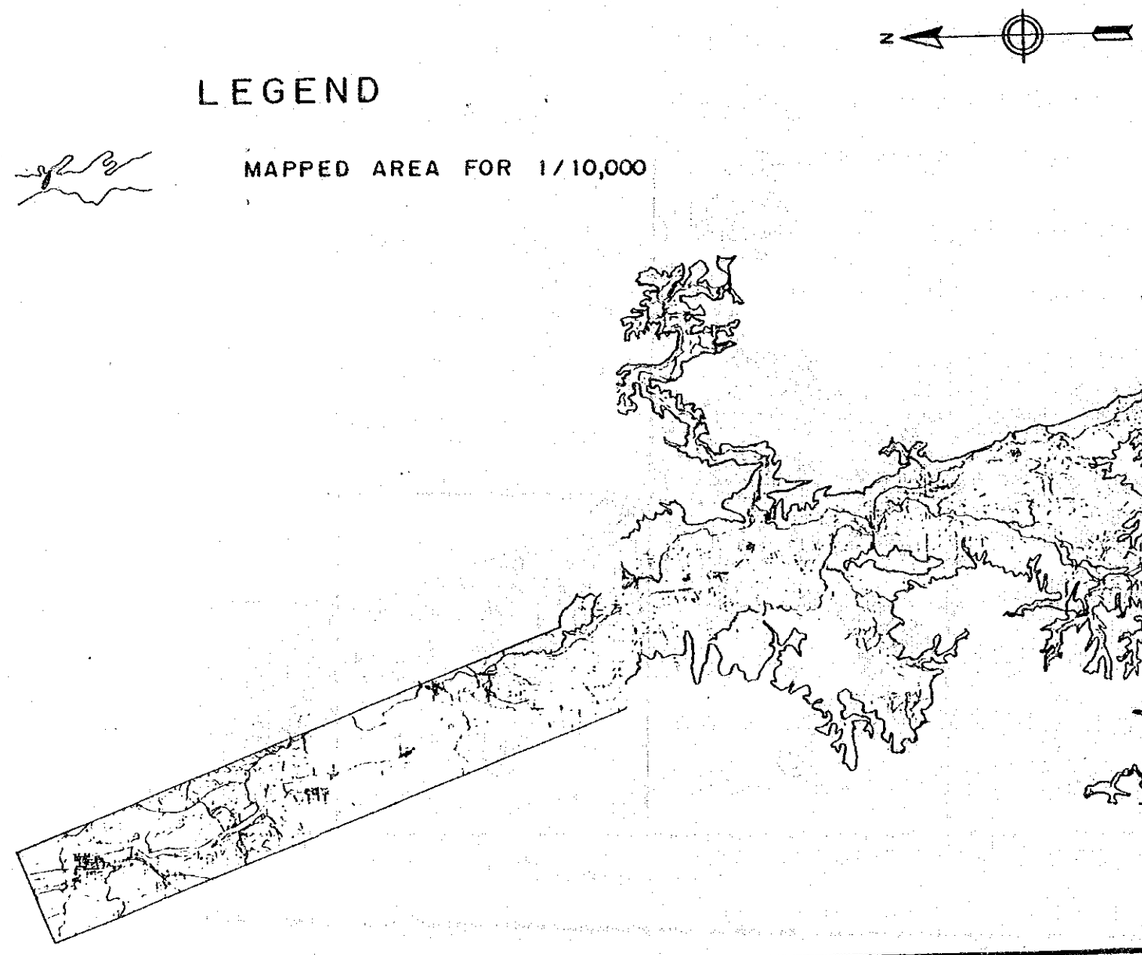

Fig. I. 3.1 Topographic Survey Area with a Scale of 1 to 10,000 for the Leblr Scheme

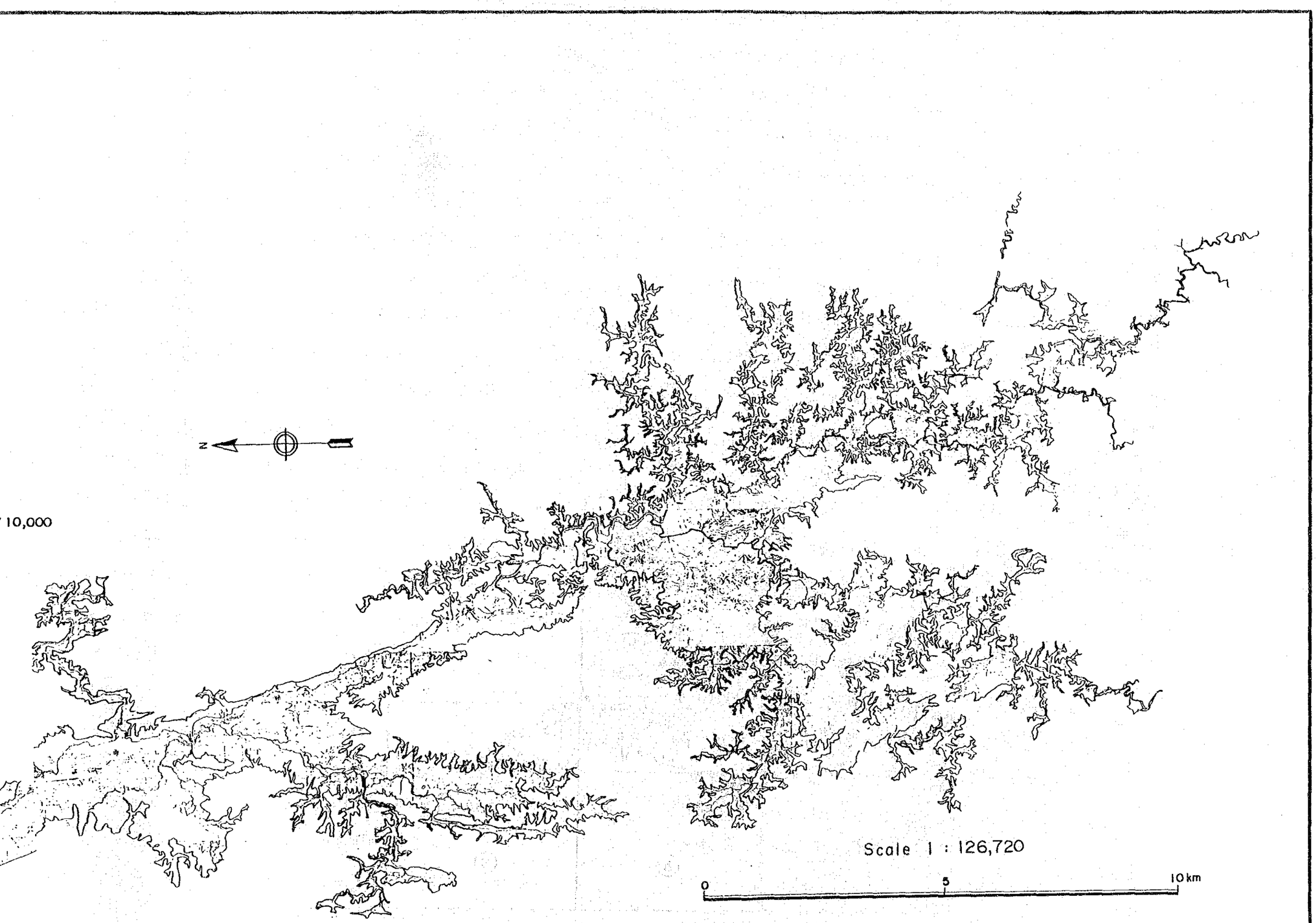

Fig. I. 3.1 Topographic Survey Area with a Scale of 1 to 10,000 for the Lebir Scheme

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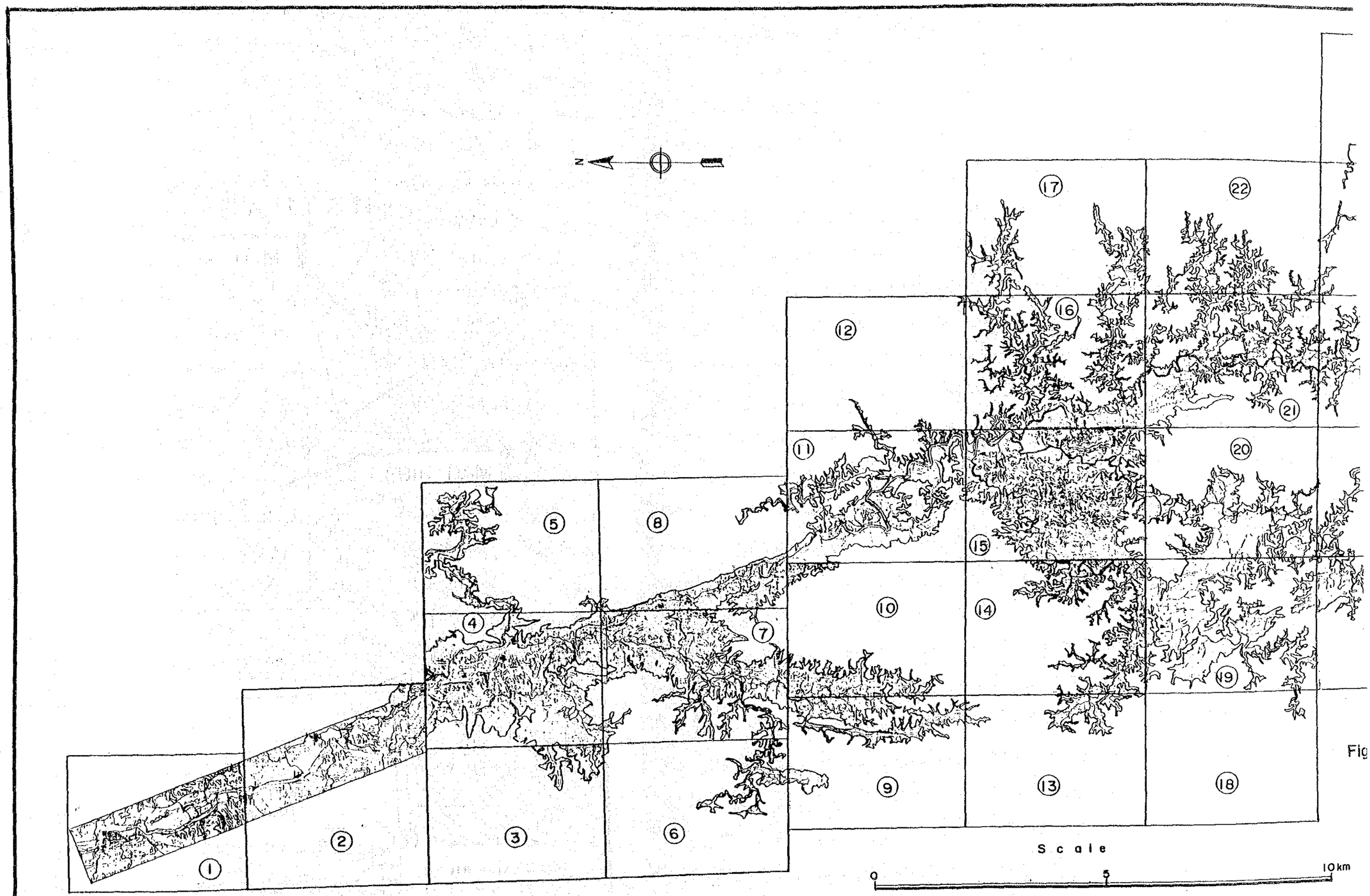
STUDY
ON
KELANTAN RIVER BASIN - WIDE FLOOD MITIGATION
JAPAN INTERNATIONAL COOPERATION AGENCY



Fig

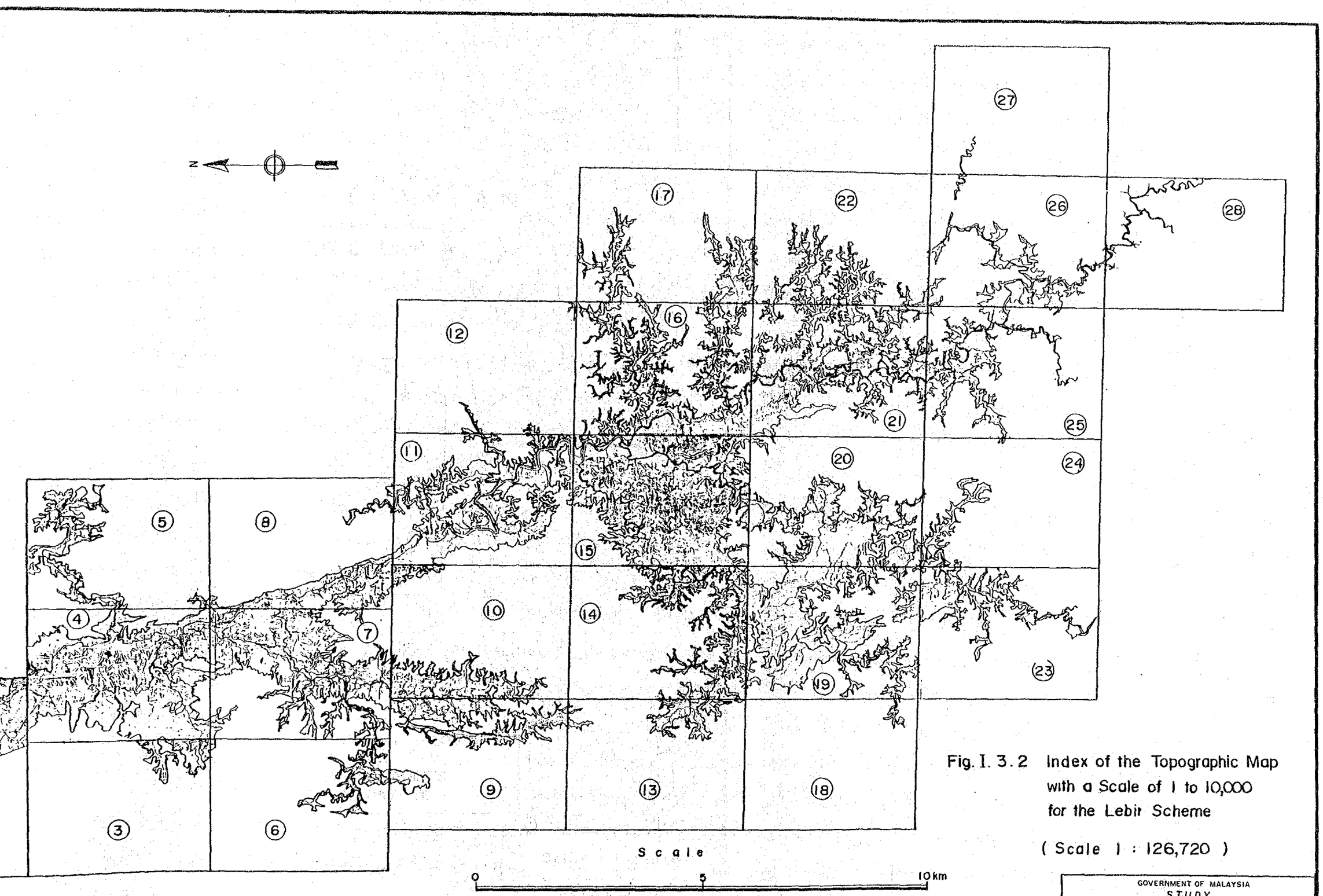


Fig. I. 3. 2 Index of the Topographic Map with a Scale of 1 to 10,000 for the Lebir Scheme

(Scale 1 : 126,720)

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STUDY
ON
KELANTAN RIVER BASIN - WIDE FLOOD MITIGATION
JAPAN INTERNATIONAL COOPERATION AGENCY

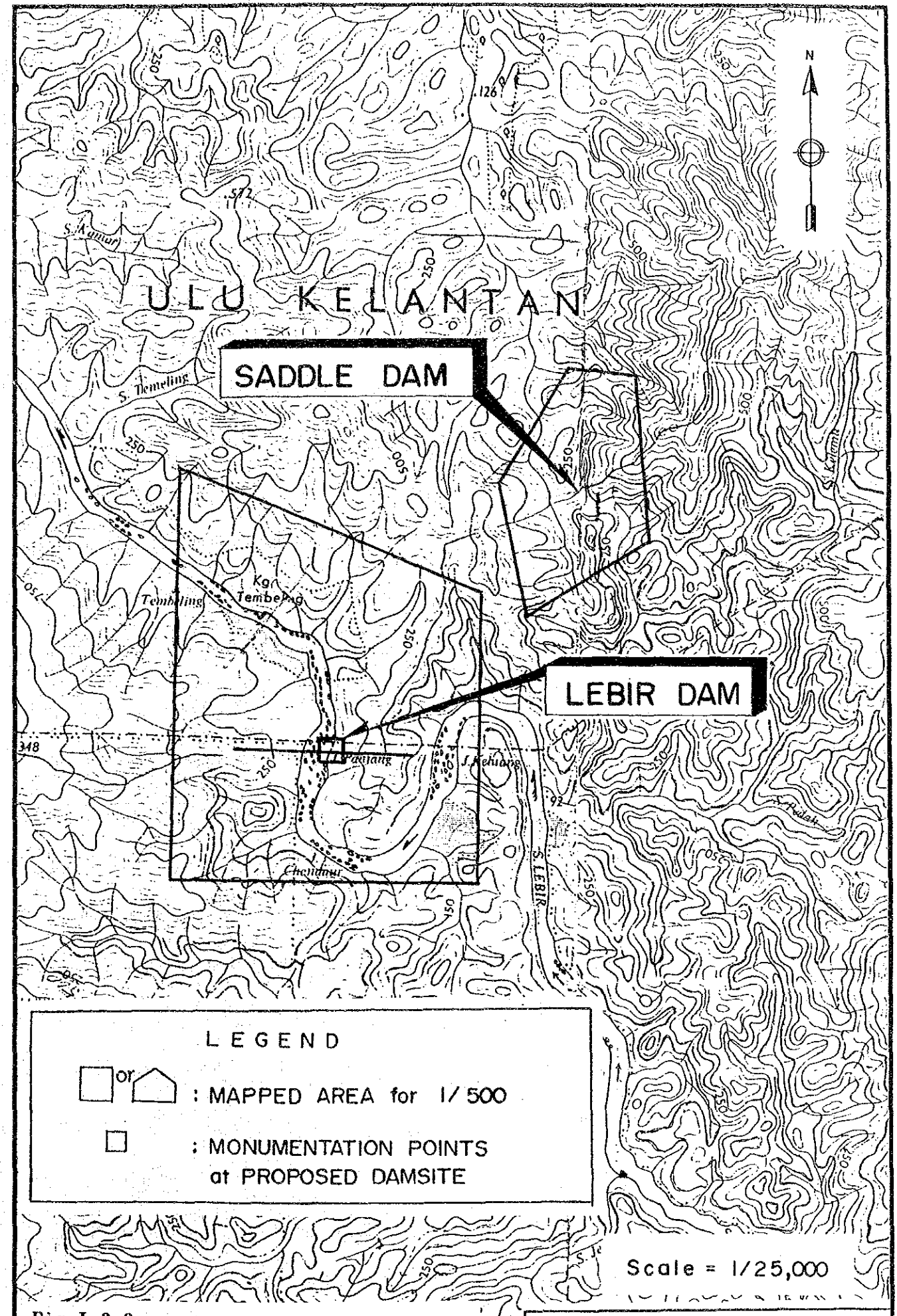

Fig. I.3.3
Topographic Survey Area with a Scale of 1 to 500 for the Lebir Damsite

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STUDY
ON
KELANTAN RIVER BASIN - WIDE FLOOD MITIGATION
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SECTION KL 3

PASIR MAS

KOTA BHARU

KUALA KRAI

CHABANG TIGA PENGKOR

BM D.0027

BM D.0029

BM D.0173

SUNGAI

LOCALITY PLAN
(KELANTAN)

SCALE

THAILAND

KELANTAN

TERENGGANU

SOUTH CHINA SEA

SHEET 1

SHEET 2

SHEET 3

SHEET 4

SUNGAI KELANTAN

KOTA BHARU

PULAU BERBAU

SECTION KL 3

SECTION KL 2