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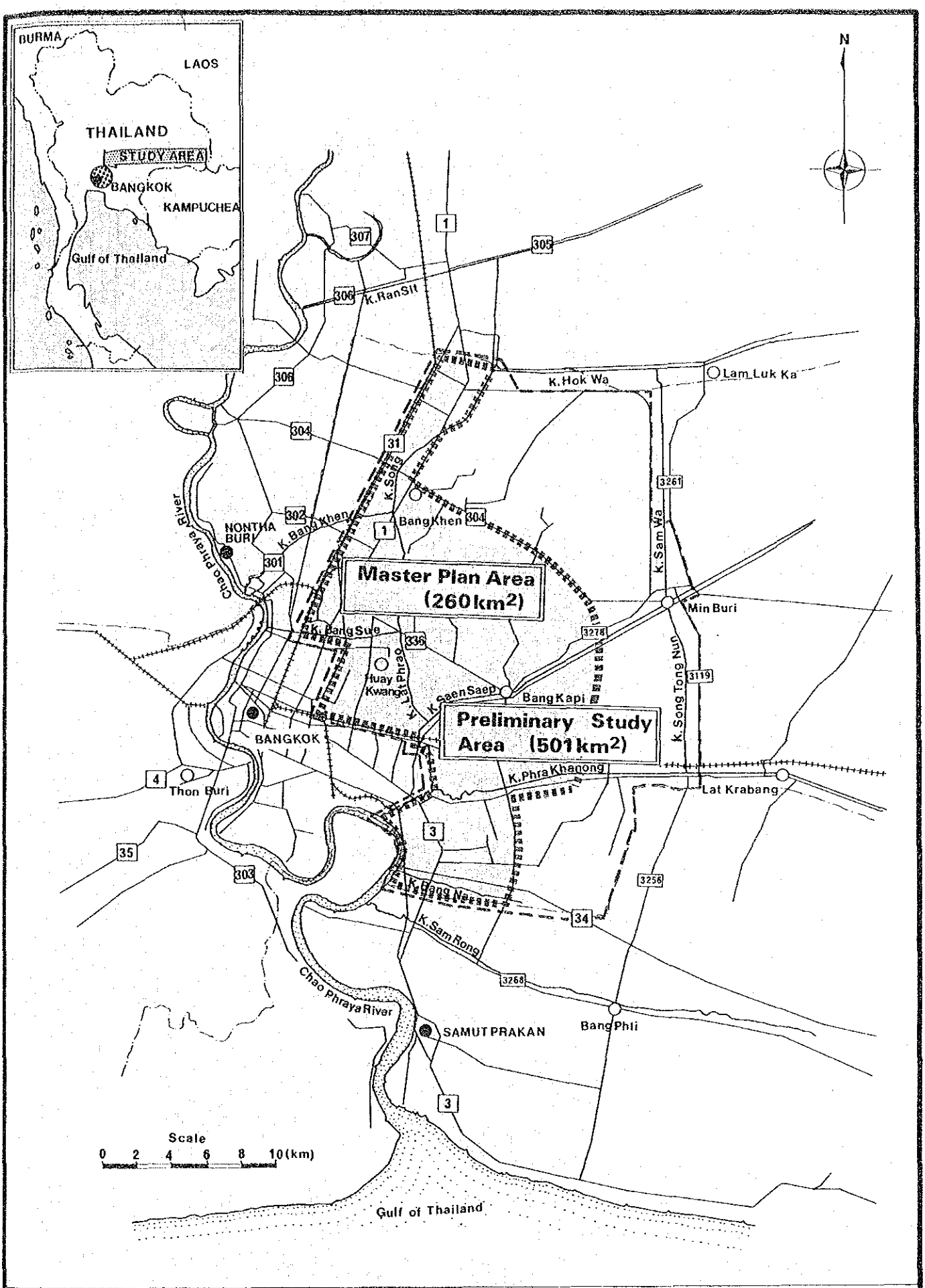

Fig. 2 . 1 MASTER PLAN AREA

MASTER PLAN ON FLOOD PROTECTION/DRAINAGE PROJECT IN EASTERN SUBURBAN-BANGKOK

JICA 2528B.E 1985A.D

Fig. 2.2 GROUND ELEVATION IN MASTER PLAN AREA IN 1984

MASTER PLAN ON FLOOD PROTECTION/DRAINAGE PROJECT IN EASTERN SUBURBAN--BANGKOK

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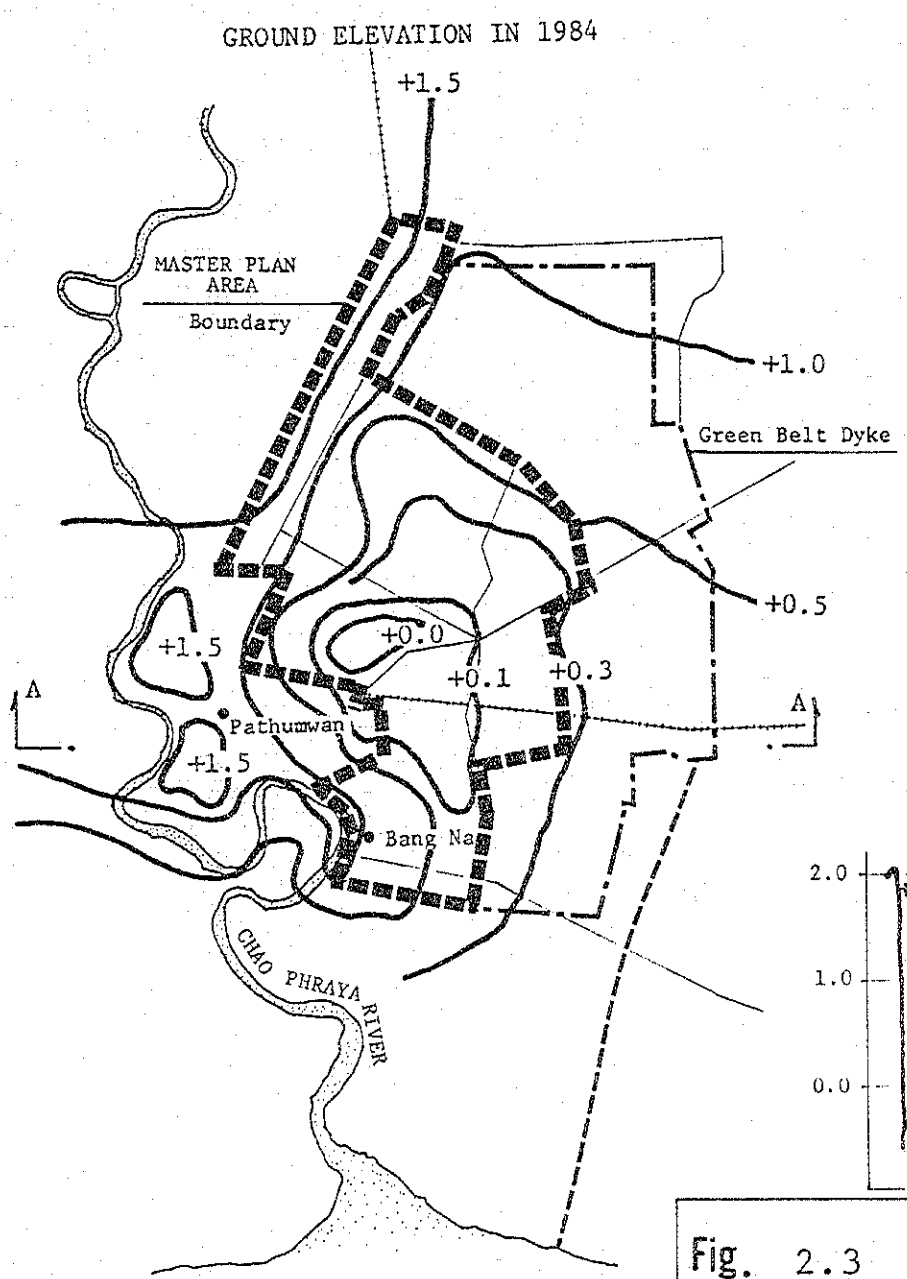
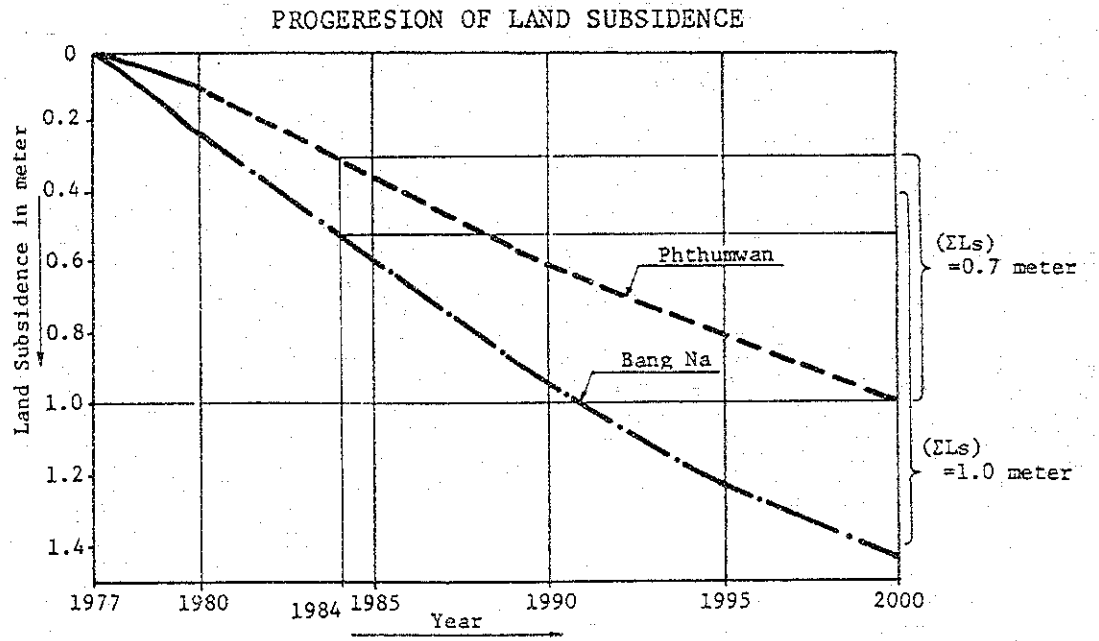




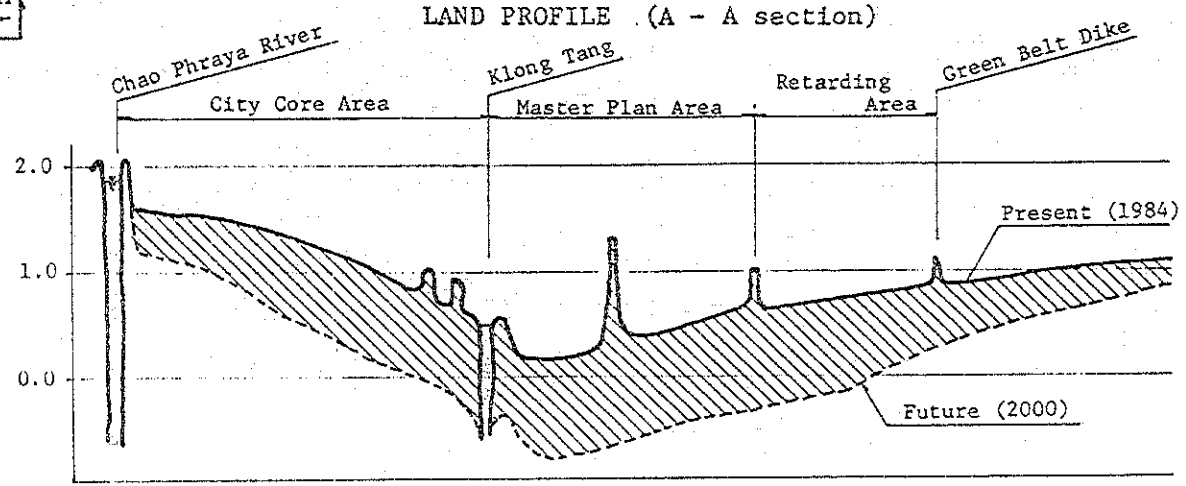


Fig. 2.3 PROGRESSION OF LAND SUBSIDENCE

MASTER PLAN ON FLOOD PROTECTION/DRAINAGE PROJECT IN EASTERN SUBURBAN-BANGKOK

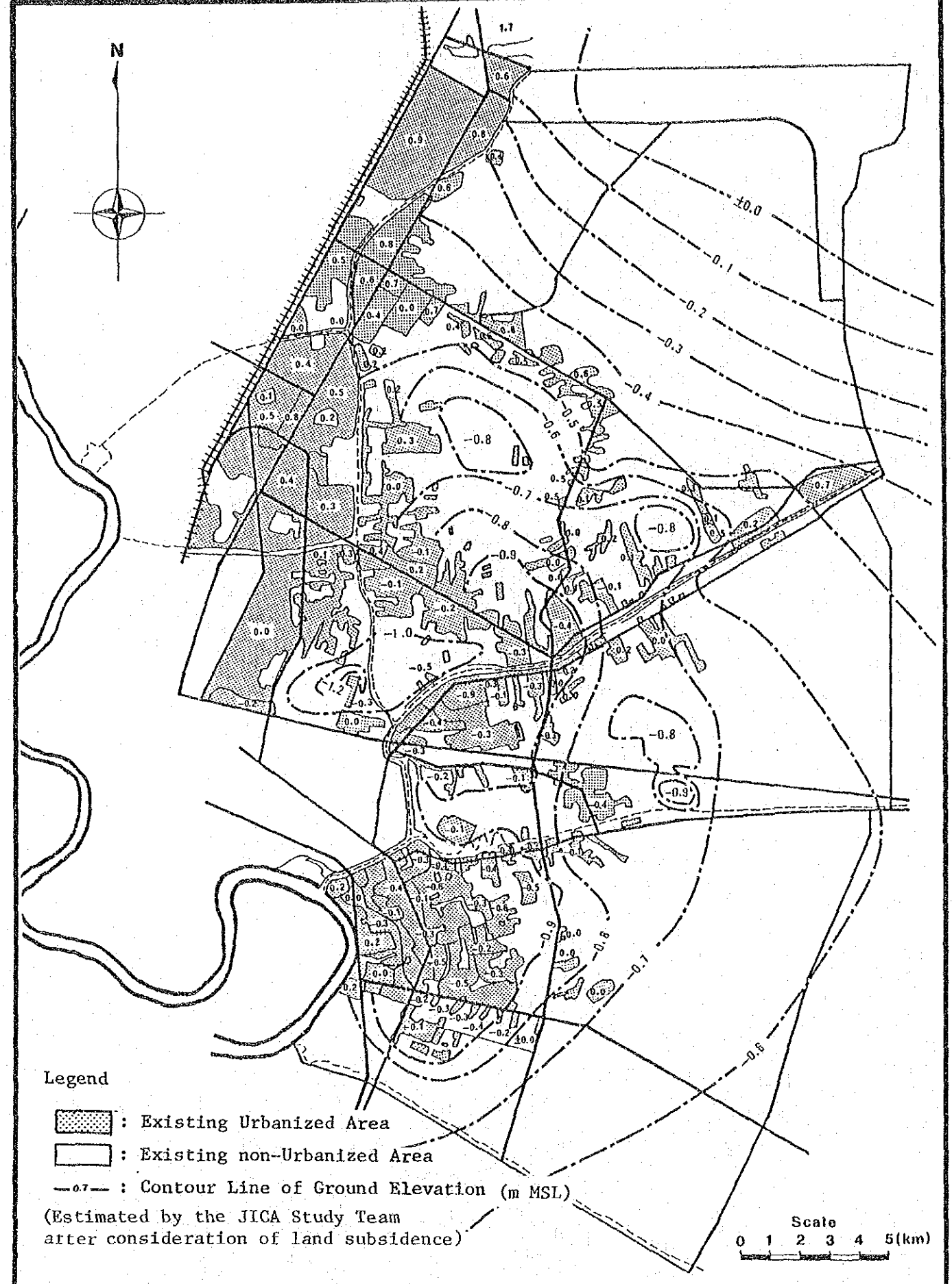
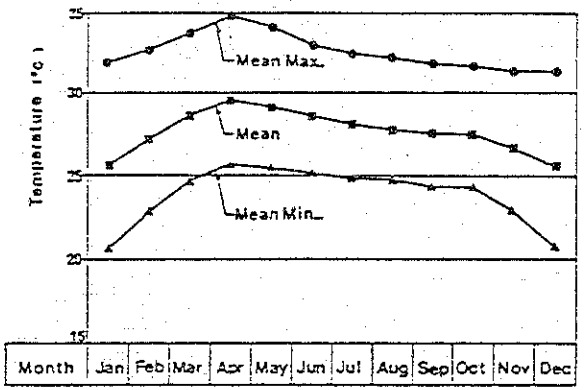


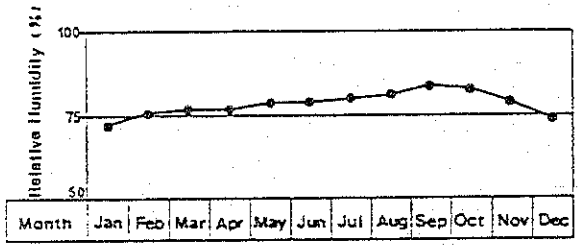
Fig. 2.4 GROUND ELEVATION IN MASTER PLAN AREA IN 2000

MASTER PLAN ON FLOOD PROTECTION/DRAINAGE PROJECT IN EASTERN SUBURBAN-BANGKOK

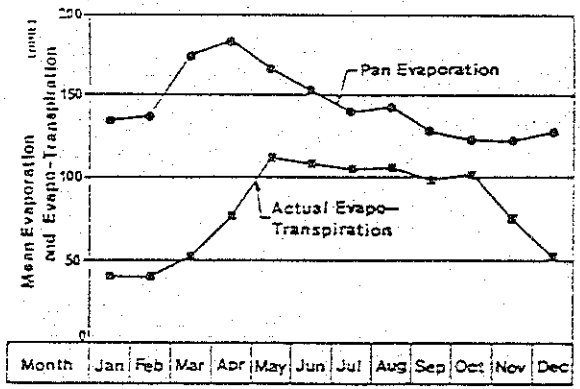
JICA 2528B.E 1985A.D



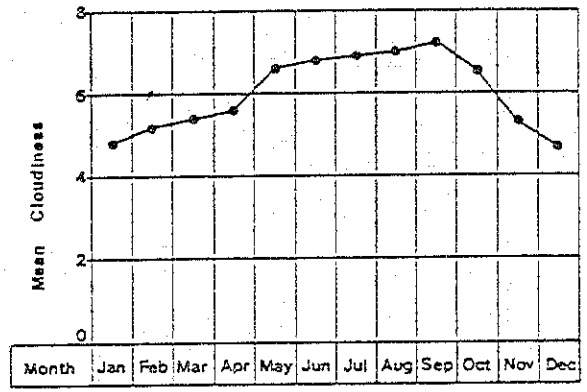
Temperature



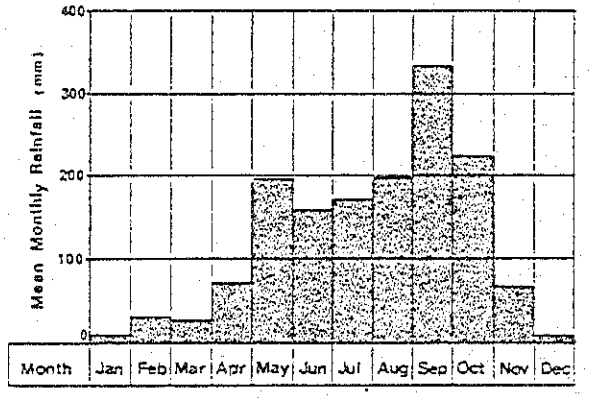
Humidity



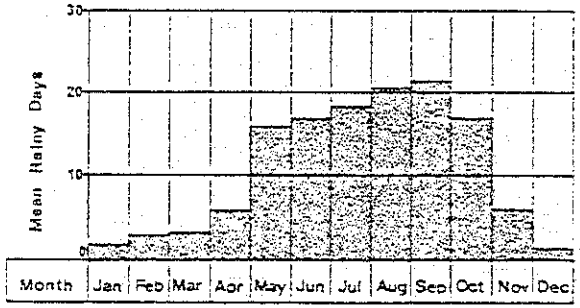
Evaporation and Evapotranspiration



Cloudines



Monthly Rainfall



Rainy Days

Note

1. Source

Evaporation: AIT, Rainfall and Evaporation Analysis of Thailand, 1980 12.

Evapotranspiration : NEB, Groundwater Resources in Bangkok Area Development and Management Study, 1982

Others: Meteorological Department

2. Period

Evaporation: 17 years

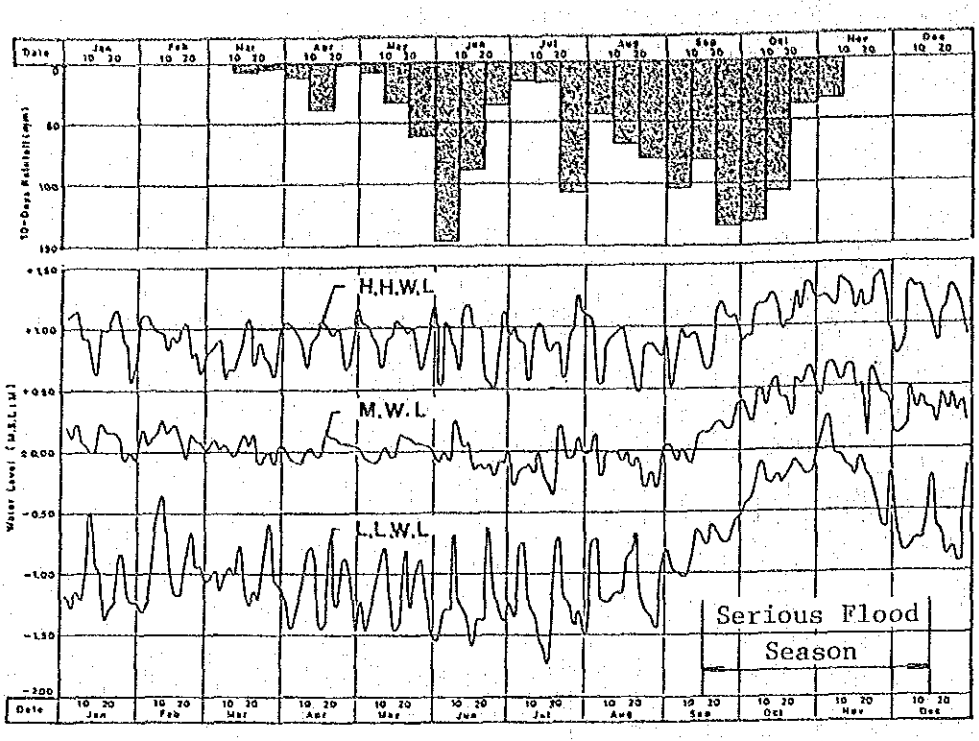
Evapotranspiration : 1956 - 1974

Rainfall and Rainy Days: 1951 - 1982

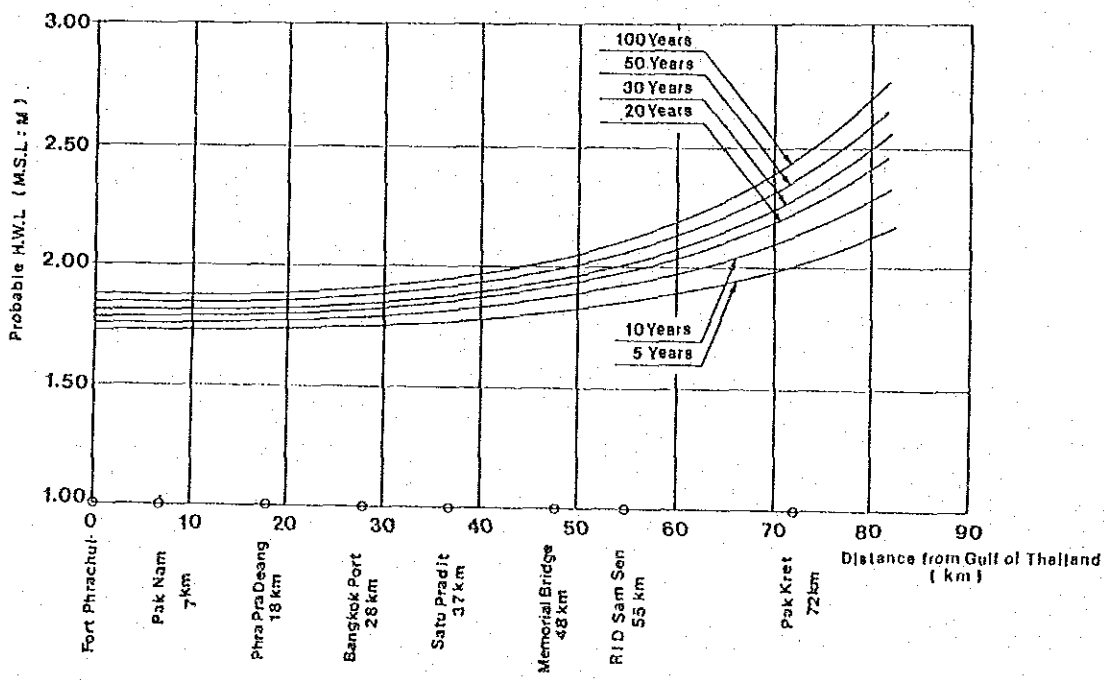
Others: 1951 - 1980

Fig. 2.5 CLIMATOLOGICAL DATA IN BANGKOK

MASTER PLAN ON FLOOD PROTECTION/DRAINAGE PROJECT IN EASTERN SUBURBAN-BANGKOK



SEASONAL CHANGES OF RAINFALL IN THE MASTER PLAN AREA AND WATER LEVEL AT BANGKOK PORT IN 1980

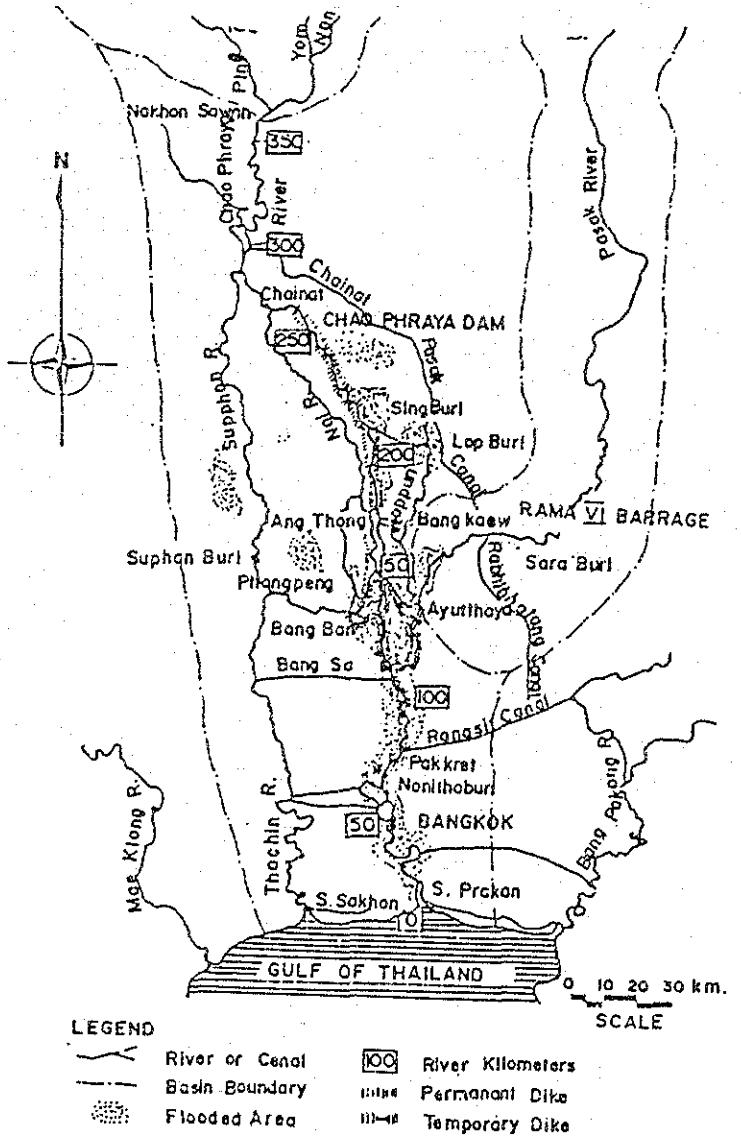


PROBABLE FLOOD WATER LEVEL OF CHAO PHRAYA RIVER

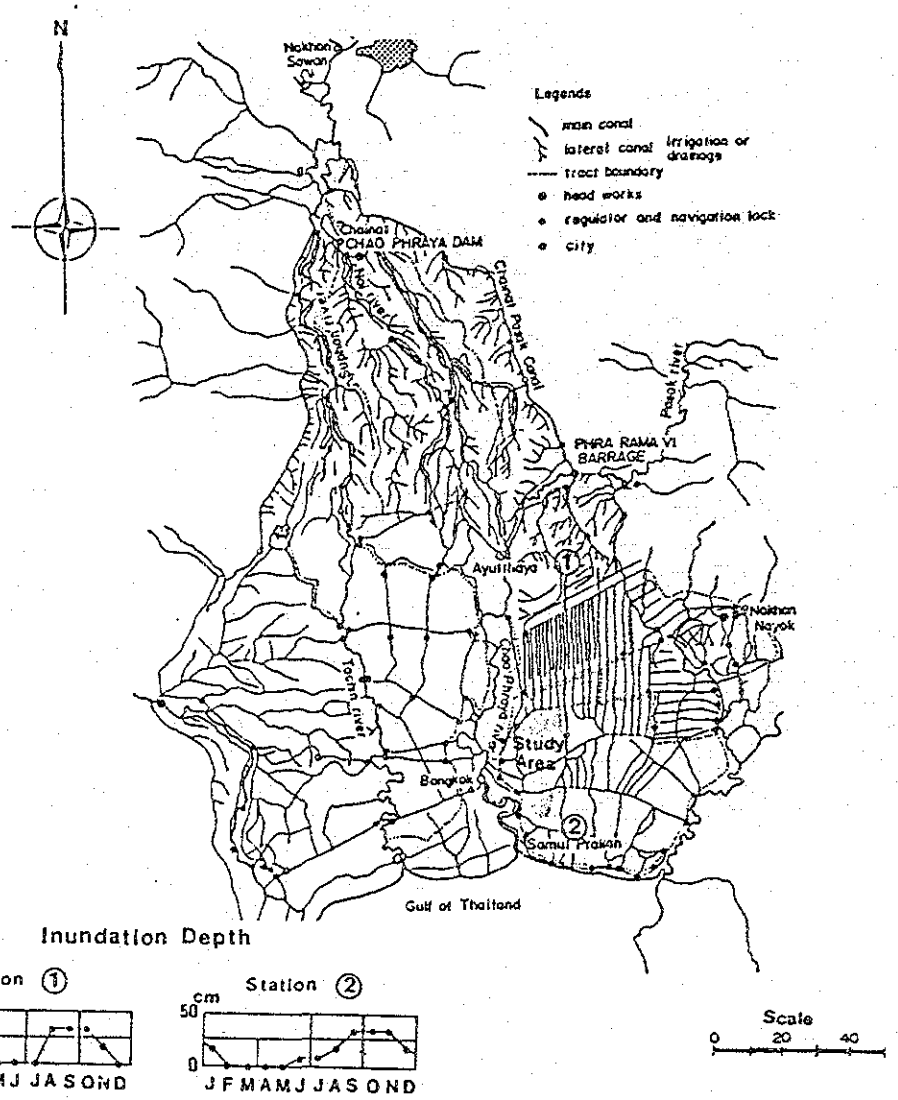
Source : Meteorological Department and Port Authority of Thailand

Fig. 2.6	WATER LEVEL OF CHAO PHRAYA RIVER

MASTER PLAN ON FLOOD PROTECTION/DRAINAGE PROJECT IN EASTERN SUBURBAN-BANGKOK



Map of Inundation of Chao Phraya and Its Diking System



(Source: RID)

Irrigation Canal Network for the Greater Chao Phraya Project

Fig. 2.7	EXISTING DIKE & IRRIGATION CANAL IN CHAO PHRAYA BASIN

MASTER PLAN ON FLOOD PROTECTION/DRAINAGE PROJECT IN EASTERN SUBURBAN-BANGKOK

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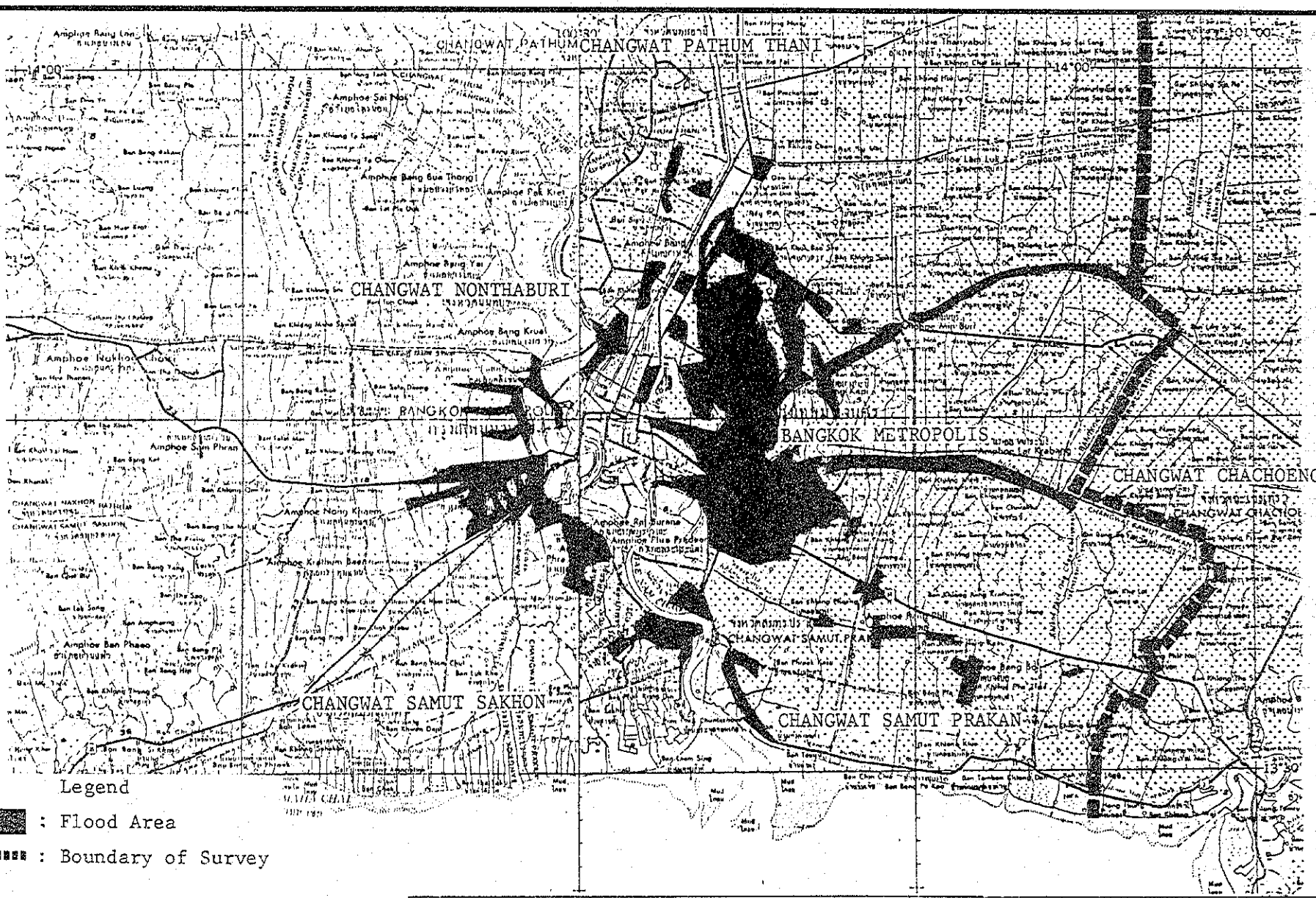

Fig. 3.1 FLOOD AREA IN GREATER BANGKOK IN 1983

MASTER PLAN ON FLOOD PROTECTION/DRAINAGE PROJECT IN EASTERN SUBURBAN-BANGKOK

JICA 2528 B.E. 1985 A.D.

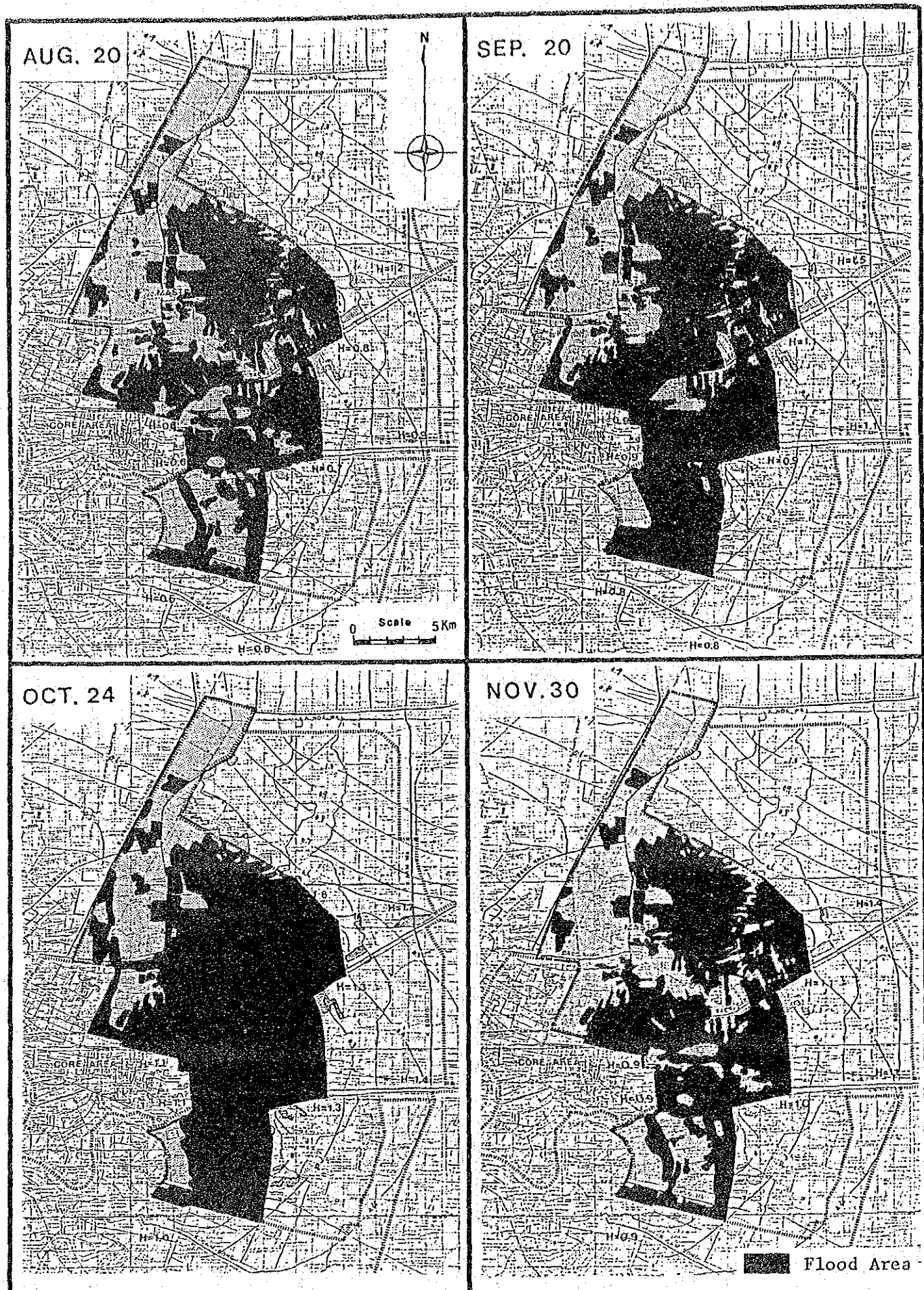

Fig. 3.2 FLOOD AREA IN MASTER PLAN AREA IN 1983

MASTER PLAN ON FLOOD PROTECTION/DRAINAGE PROJECT IN EASTERN SUBURBAN-BANGKOK

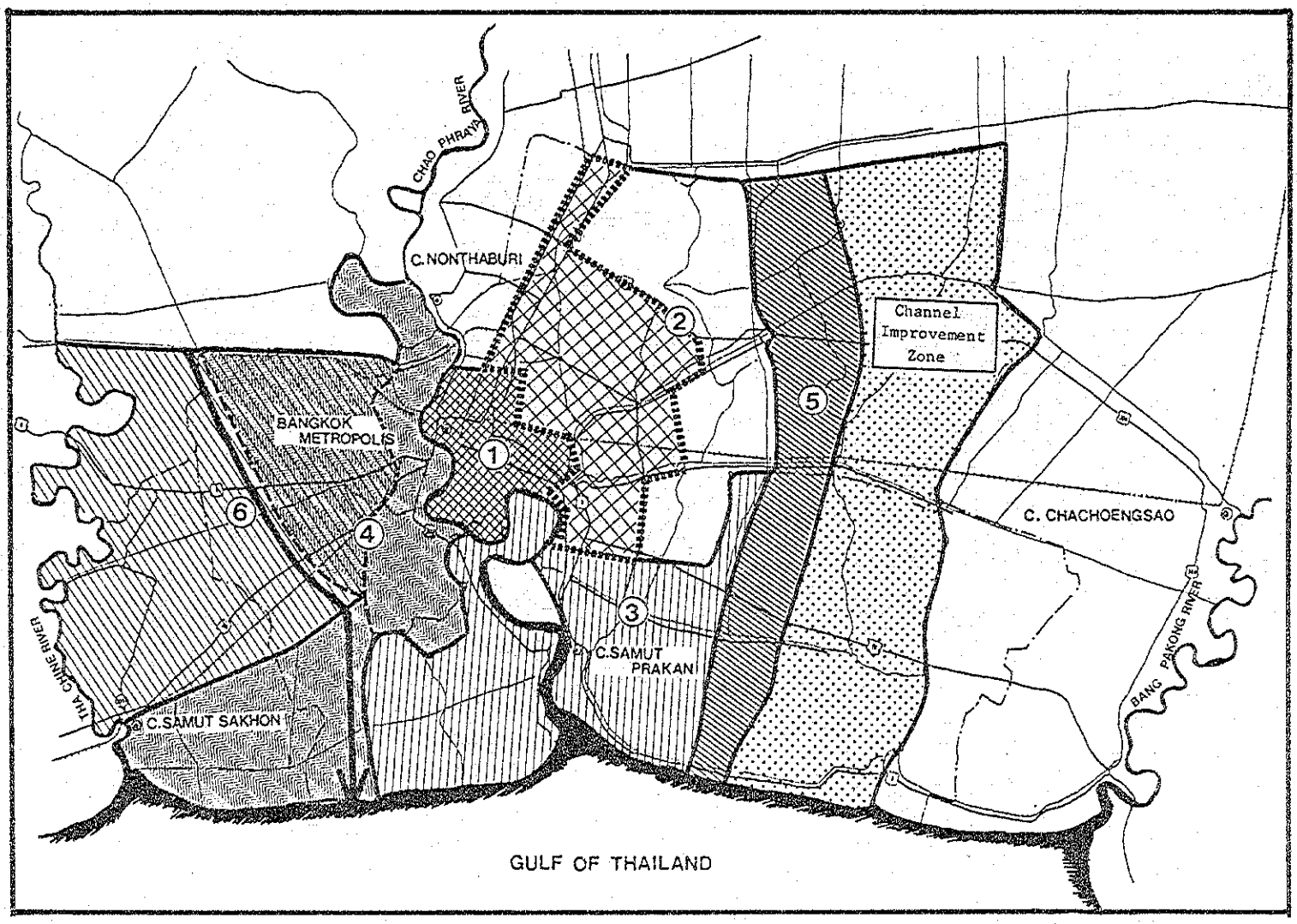

Fig. 3.3	RELEVANT PLANS AND PROJECTS (DRAINAGE SYSTEM IMPROVEMENT)
MASTER PLAN ON FLOOD PROTECTION/DRAINAGE PROJECT IN EASTERN SUBURBAN-BANGKOK	

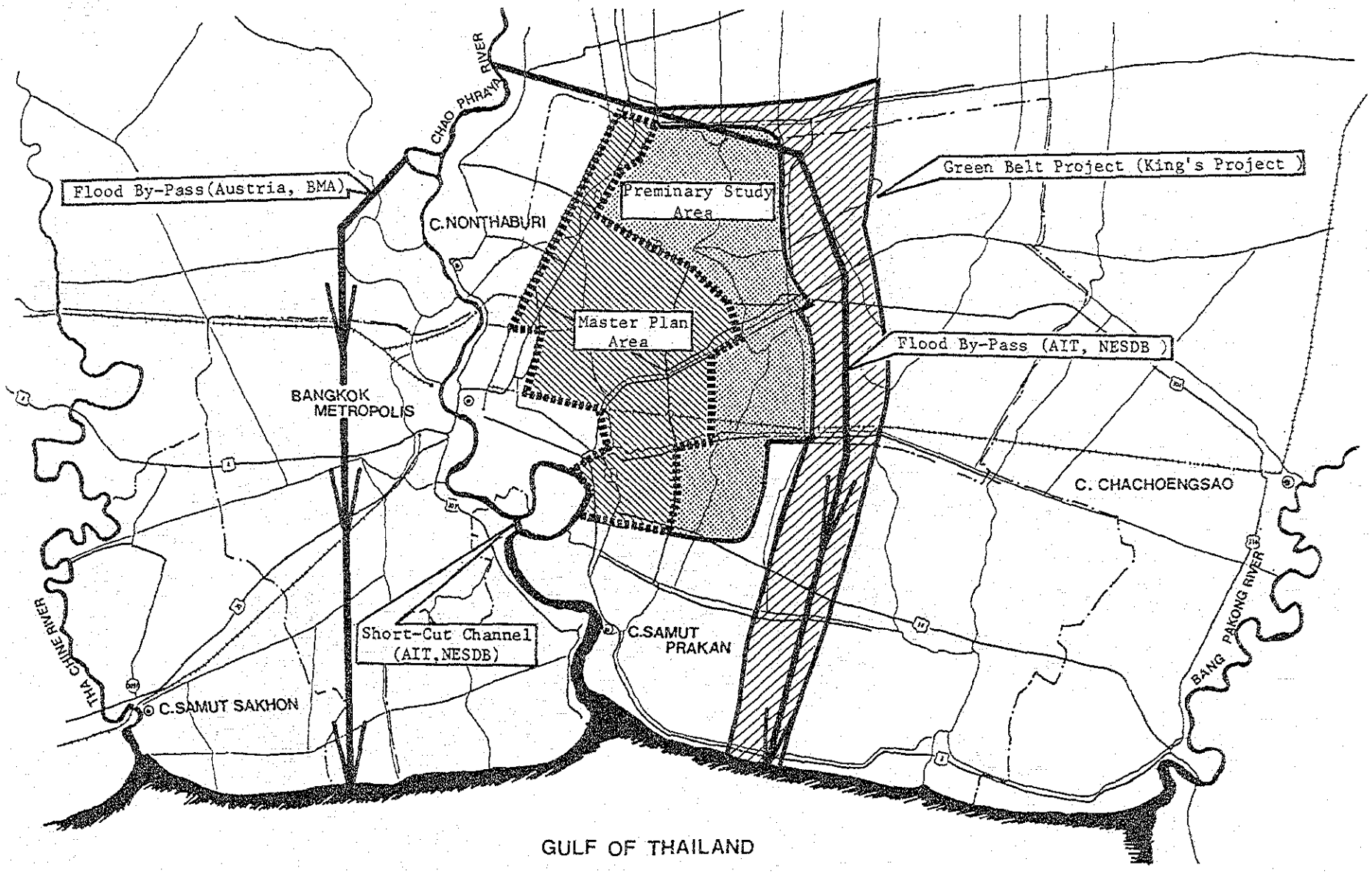

Fig. 3.4	RELEVANT PLANS AND PROJECTS (CHAO PHRAYA RIVER WATER LEVEL LOWERING PLAN)

MASTER PLAN ON FLOOD PROTECTION/DRAINAGE PROJECT IN EASTERN SUBURBAN-BANGKOK

JICA 2520B.E 1985A.D

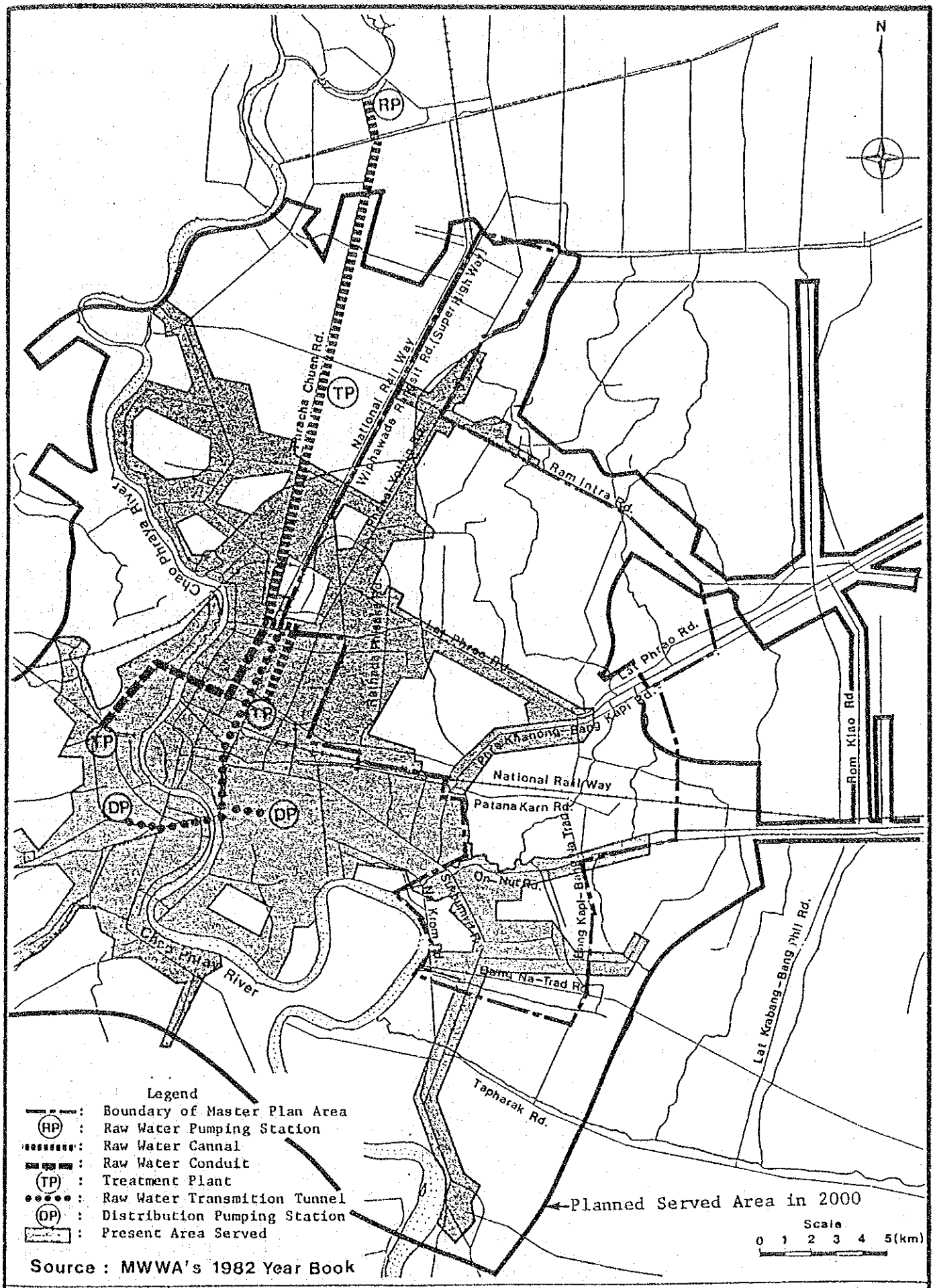

Fig. 3.5 RELEVANT PLANS AND PROJECTS (SURFACE WATER EXPANSION PLAN)

MASTER PLAN ON FLOOD PROTECTION/DRAINAGE PROJECT IN EASTERN SUBURBAN-BANGKOK

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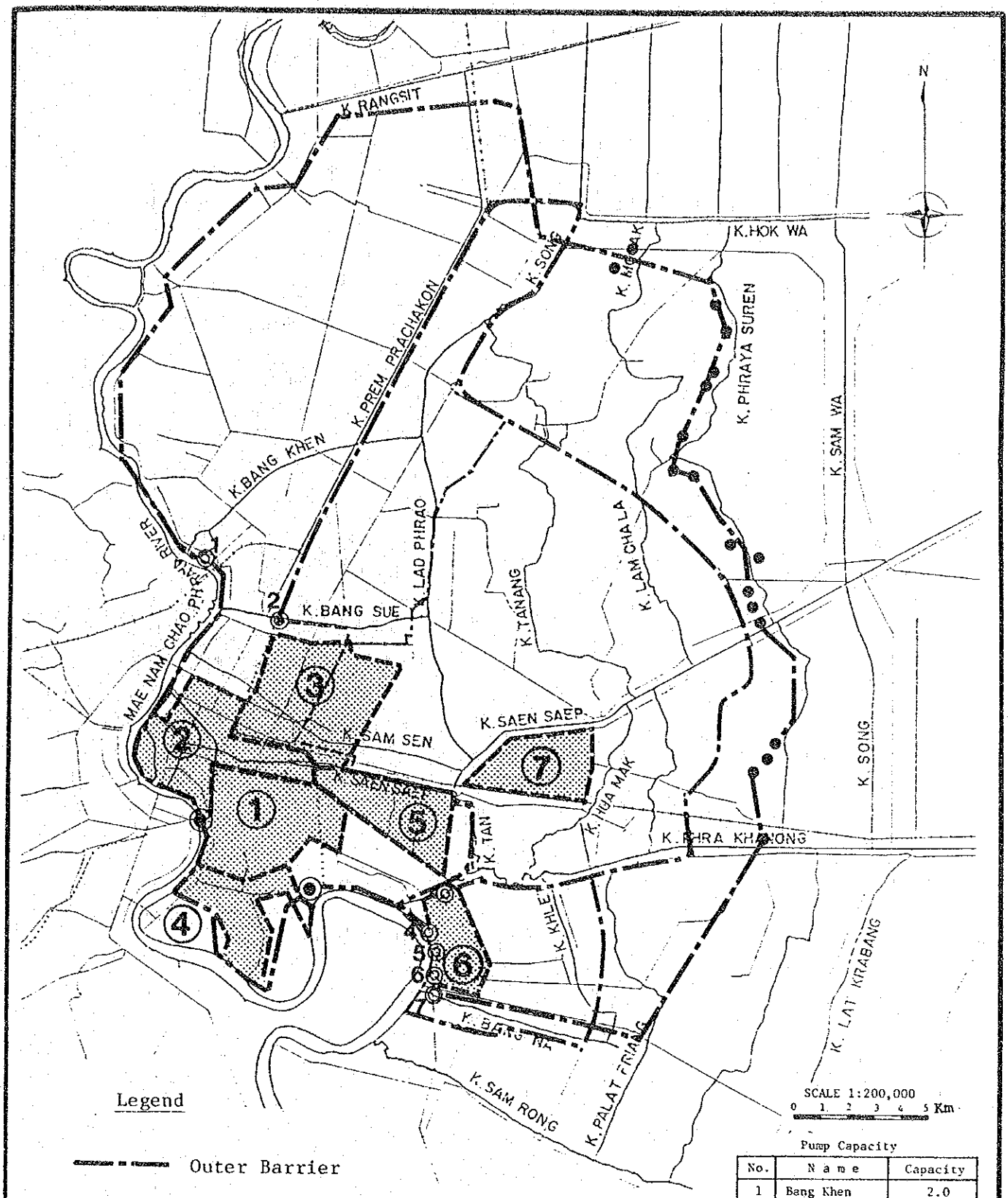

Pump Capacity

No.	N a m e	Capacity
1	Bang Khen	2.0
2	Bang Sue	4.0
3	Phra Khanong	20.4
4	Jek	1.0
5	Bang Chak	1.0
6	Bang Oa	2.0
7	Bang Na	2.0
Total		32.4

Unit ; m^3/sec

Fig. 4.1 FLOOD PROTECTION AND DRAINAGE SYSTEM IN 1983 (BEFORE URGENT MEASURES)

MASTER PLAN ON FLOOD PROTECTION/DRAINAGE PROJECT IN EASTERN SUBURBAN-BANGKOK

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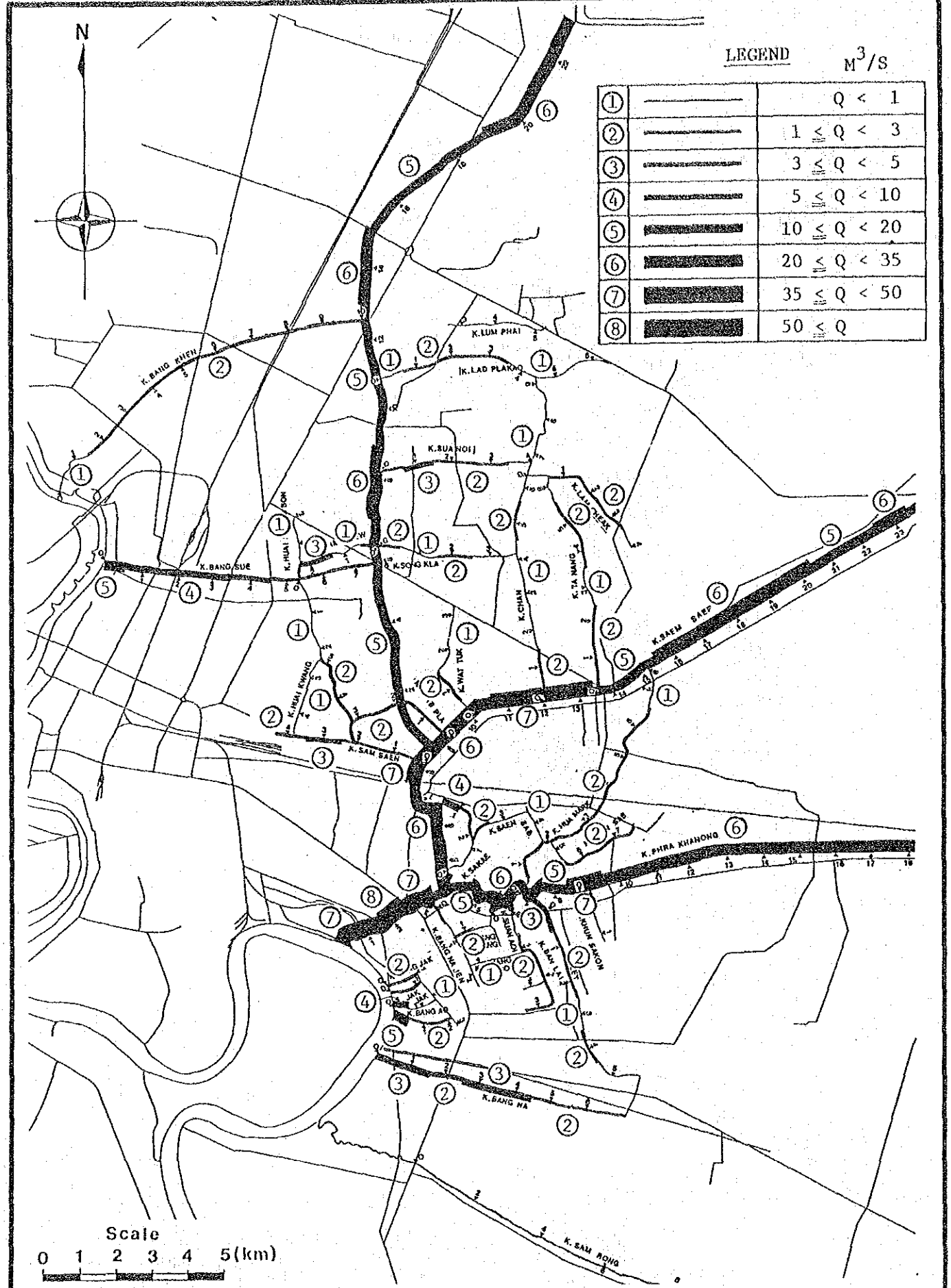

Fig. 4.2 DISCHARGE CAPACITY OF EXISTING KLONGS IN MASTER PLAN AREA

MASTER PLAN ON FLOOD PROTECTION/DRAINAGE PROJECT IN EASTERN SUBURBAN-BANGKOK

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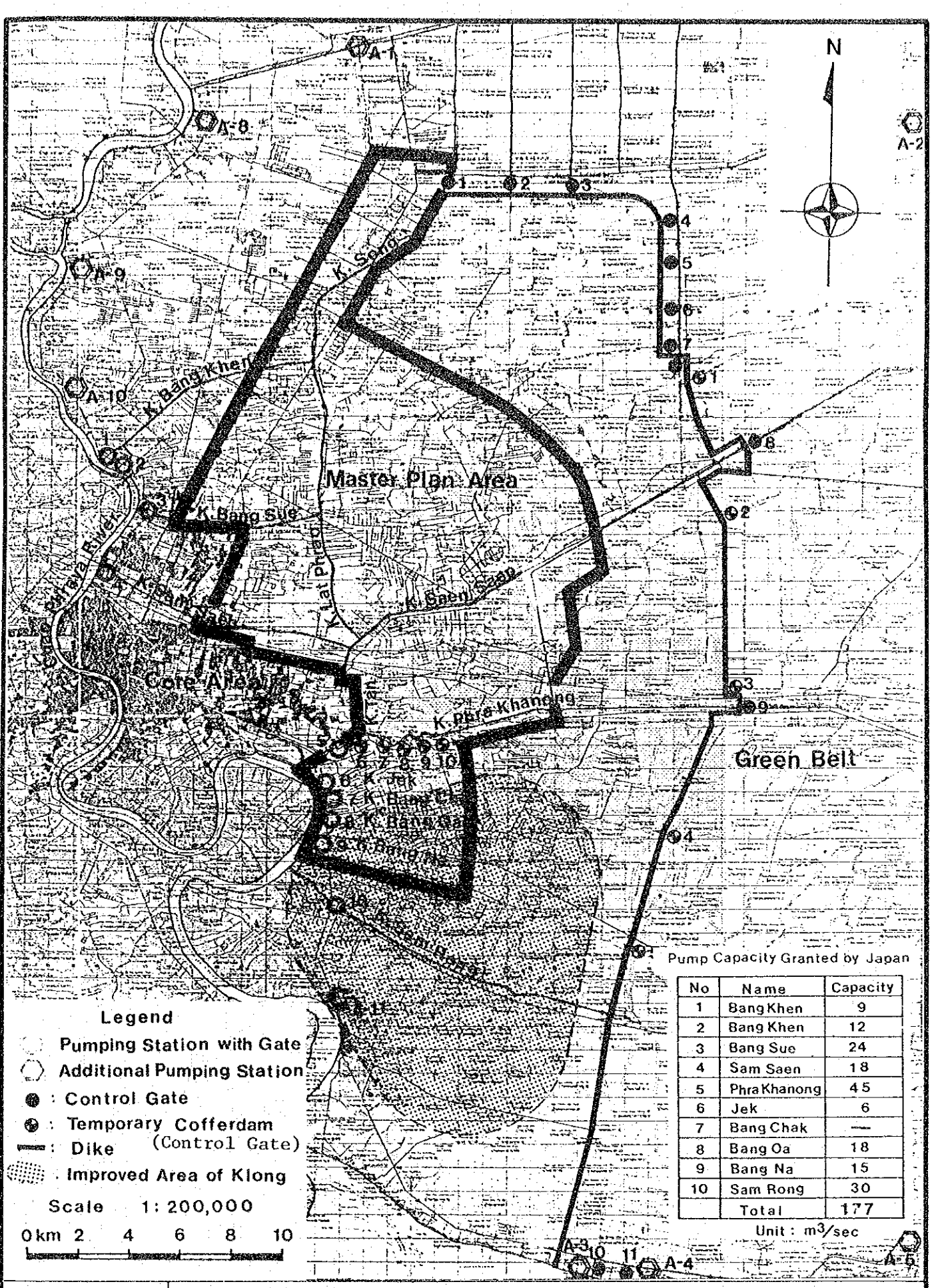

Pump Capacity Granted by Japan

No	Name	Capacity
1	Bang Khen	9
2	Bang Khen	12
3	Bang Sue	24
4	Sam Saen	18
5	Phra Khanong	45
6	Jek	6
7	Bang Chak	—
8	Bang Oa	18
9	Bang Na	15
10	Sam Rong	30
	Total	177

Unit : m^3/sec

Fig. 4.3 URGENT FLOOD PROTECTION MEASURES (1984)

MASTER PLAN ON FLOOD PROTECTION/DRAINAGE PROJECT IN EASTERN SUBURBAN-BANGKOK

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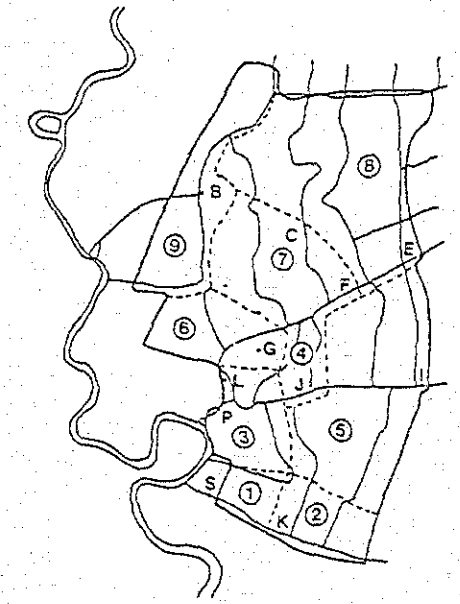
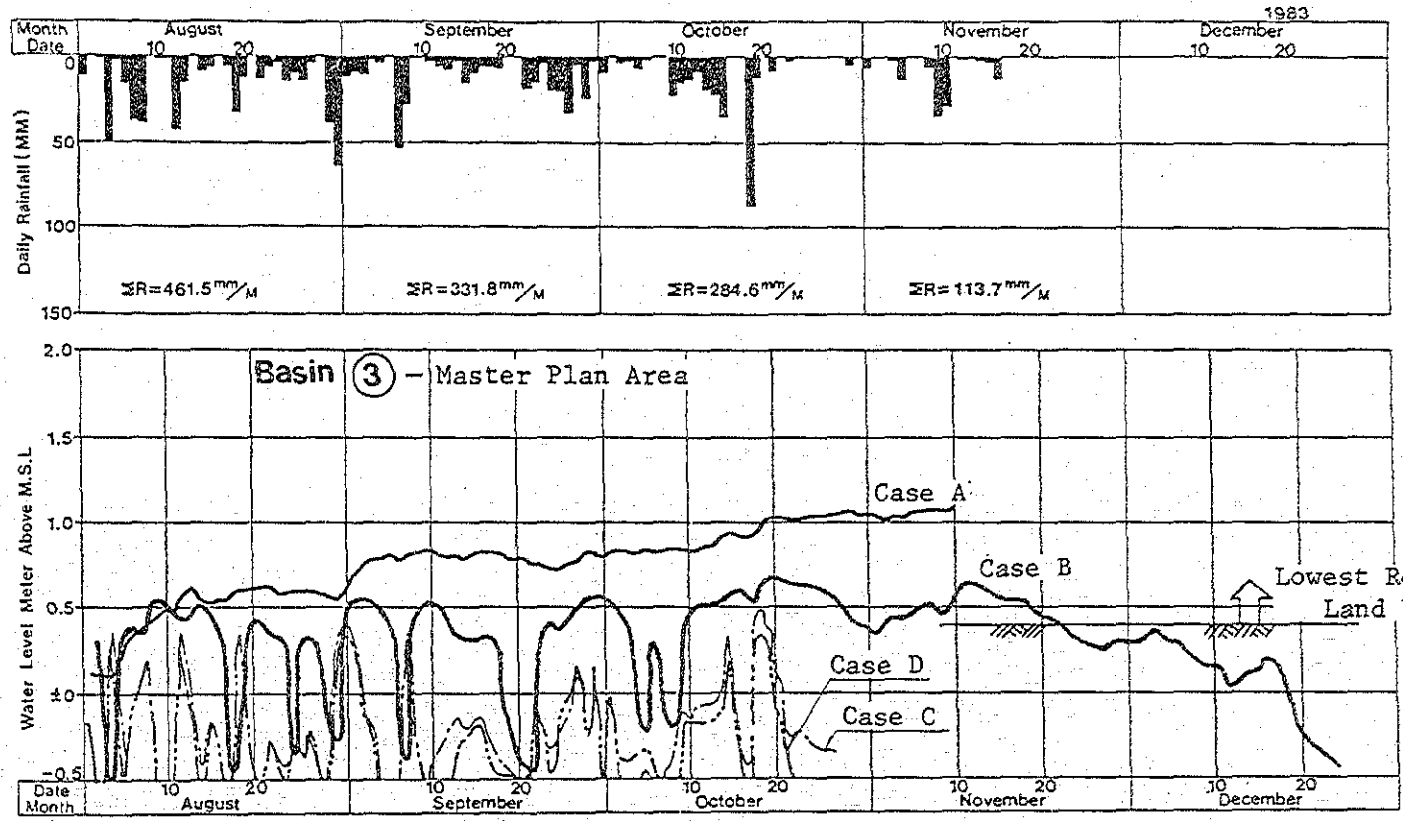
Key Map





Legend

① : Basin Number

·B : Water Level Gage station

		Rain fall	Topo-graphy	Green Belt	Urgent Pump	Inner Barrier	Pump Capa-city m³/s
CaseA	—— Observed Water Level	1983	Exist-ing	X	X	△	21
CaseB	—— Calculated Water Level	〃	〃	○	X	△	21
CaseC	–·– 〃	〃	〃	○	○	△	159
CaseD	–·– 〃	〃	〃	○	○	○	159

× : not considered

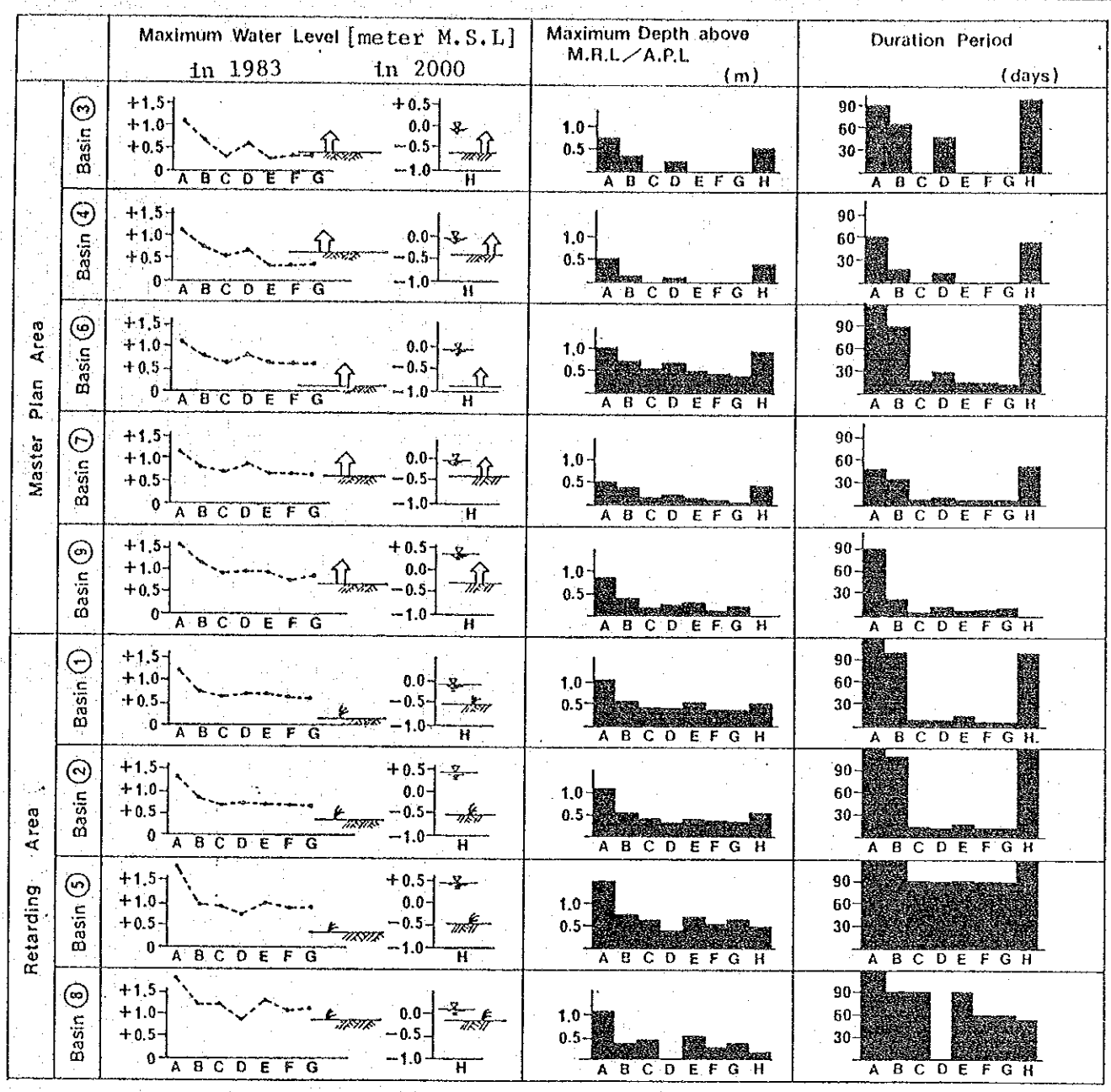
○ : considered

△ : Existing Cofferdam in K. Saen Saep and K. Phra Khanong be considered

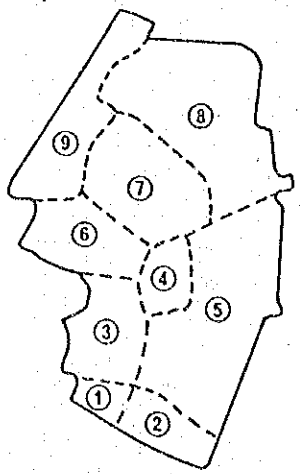
[Estimated by 9-Basin Model]

Fig. 4.4 EFFECT OF URGENT MEASURES--(1) (VARIATION OF WATER LEVEL IN BASIN 3)

MASTER PLAN ON FLOOD PROTECTION/DRAINAGE PROJECT IN EASTERN SUBURBAN-BANGKOK



1. Key Map of Basins



2. Area size of Basin

	No. of Basin	Area (km^2)	MRL/APL in 1983	MRL/APL in 2000
Master Plan Area	③	52	+0.4	-0.6
	④	22	+0.6	-0.4
	⑥	42	+0.1	-0.9
	⑦	80	+0.6	-0.4
	⑨	64	+0.7	+0.3
Retarding Area	①	19	+0.3	-0.6
	②	35	+0.3	-0.5
	⑤	105	+0.4	-0.6
	⑧	160	+0.8	-0.2

3. Condition of Calculation Case

case	A	B	C	D	E	F	G	H
Rain fall	Areal Average Rainfall in 1983 ΣR=1078mm/3M					Design Rainfall 1/N=1/5 ΣR=872mm/3M		
Topography	Existing (1983)							Future (2000)
Green Belt	×	○	○	○	○	○	○	○
Urgent Pump	×	×	○	○	○	○	○	○
Inner Barrier	△	△	△	×	○	△	○	○
Pump Capacity	CMS 21	CMS 21	CMS 159	CMS 159	CMS 159	CMS 159	CMS 159	CMS 159

× : not considered
○ : considered
△ : Existing Cofferdam in K. Saen Saep and K. Phra Khanong be considered

③ : Number of Basin

MRL : Minimum Residential-Land Level above MSL(m)

APL : Average Paddy Field Land Level above MSL(m)

Fig. 4.5

EFFECT OF URGENT MEASURES -- (2)
(MAXIMUM WATER LEVEL, DEPTH, DURATION PERIOD)

MASTER PLAN ON FLOOD PROTECTION/DRAINAGE PROJECT IN EASTERN SUBURBAN-BANGKOK

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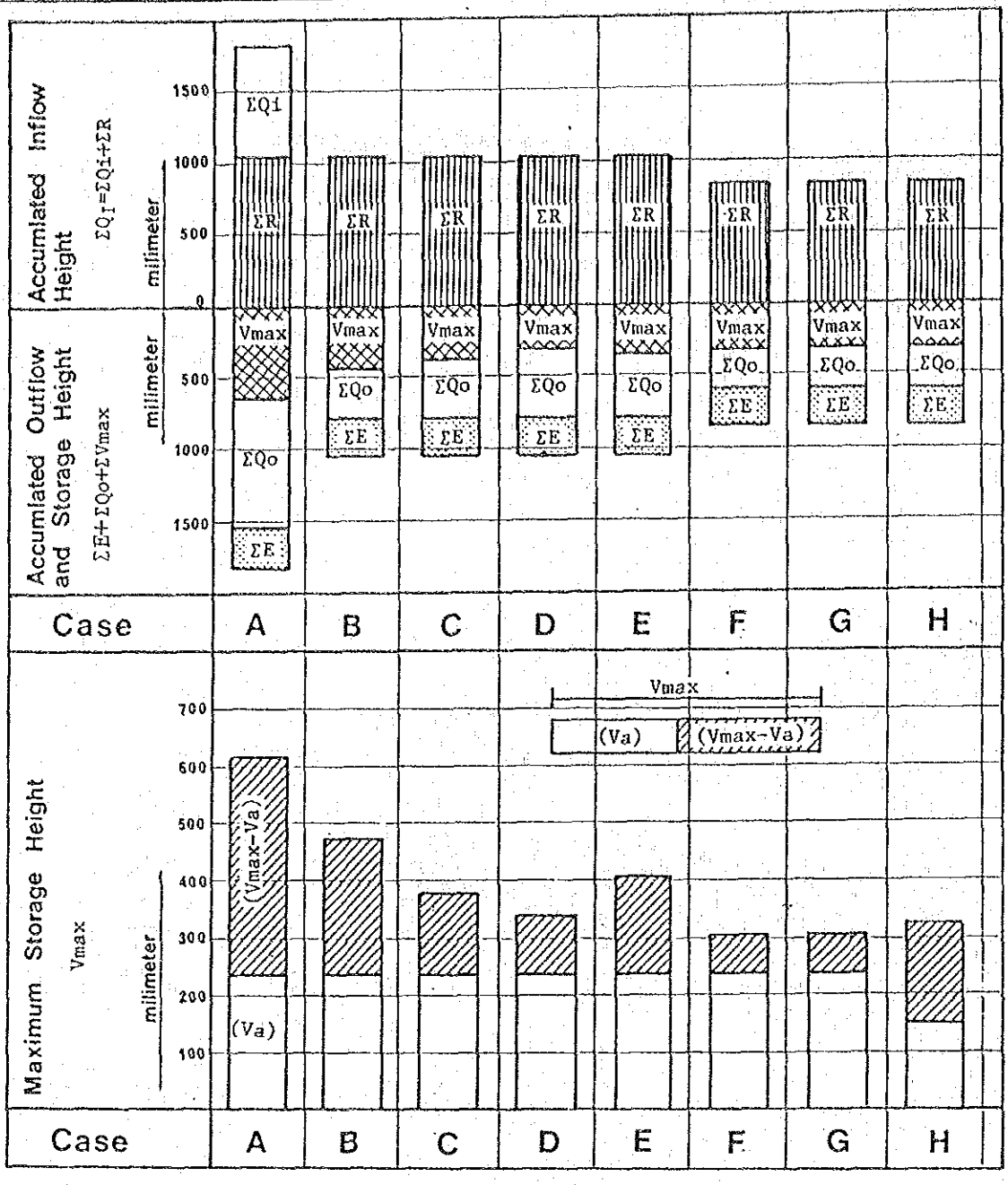

Legend

ΣQi : Inflow from Outer Area
ΣR : Rainfall
Vmax : Maximum Storage Volume
ΣQ_0 : Discharge Volume
ΣE : Evapotranspiration
Va : Allowable Storage Capacity
(under lowest residential-land level)

AREA : Preliminary Study Area (501km²)
+ Surrounding Area (104km²)
=(605km²)

Study Case

case	A	B	C	D	E	F	G	H
Rain fall	Areal Average Rainfall in 1983 ΣR=1078mm/3month					Design Rainfall 1/N=1/5 ΣR=872mm/3month		
Topo-ghraphy	Existing (1983)							Future (2000)
Green Belt	×	○	○	○	○	○	○	○
Urgent Pump	×	×	○	○	○	○	○	○
Inner Barrier	△	△	△	×	○	△	○	○
Pump Capacity	CMS 21	CMS 21	CMS 159	CMS 159	CMS 159	CMS 159	CMS 159	CMS 159

× : not considered
○ : considered
△ : Existing Cofferdam in K. Saen Saep and K. Phra-Khanong be considered

Fig. 4.6 EFFECT OF URGENT MEASURES--(3)
(MAXIMUM STORAGE HEIGHT)

MASTER PLAN ON FLOOD PROTECTION/DRAINAGE PROJECT IN EASTERN SUBURBAN-BANGKOK

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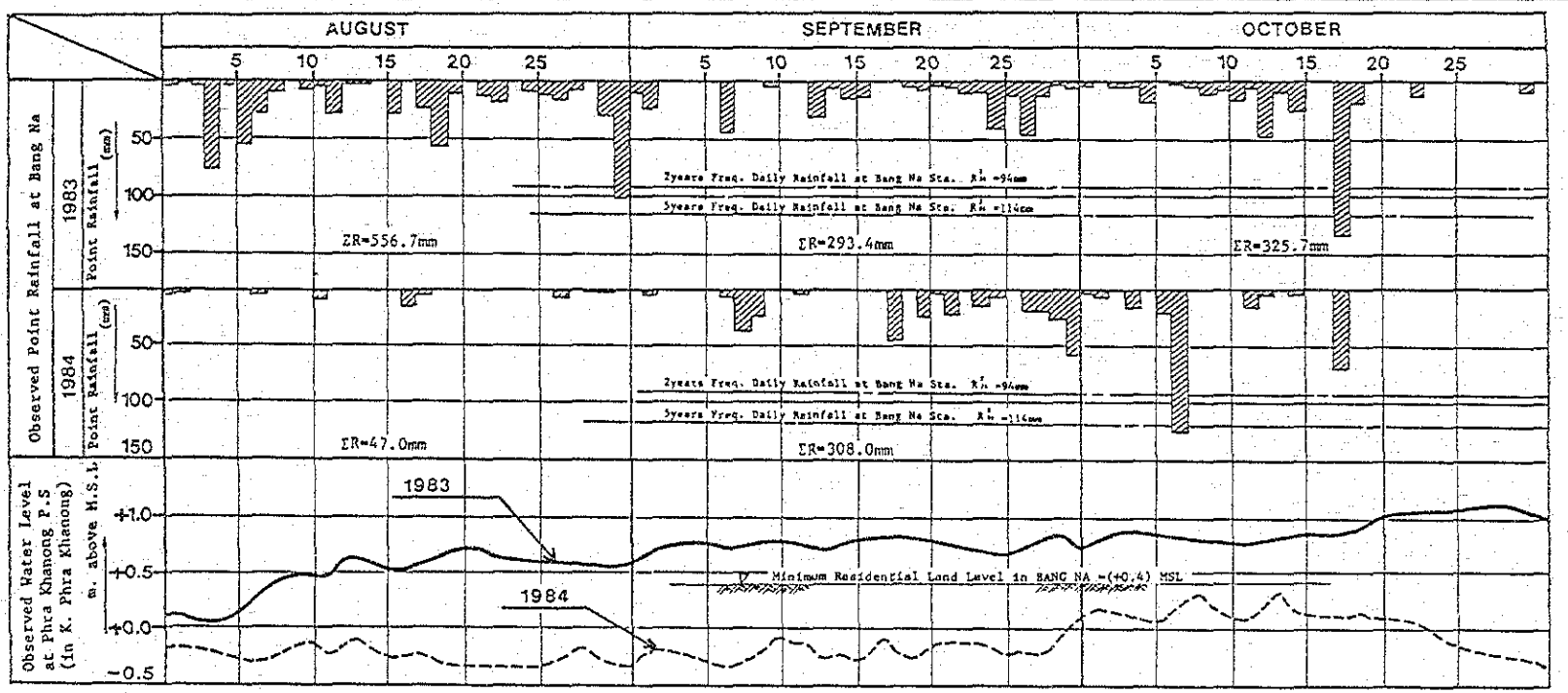

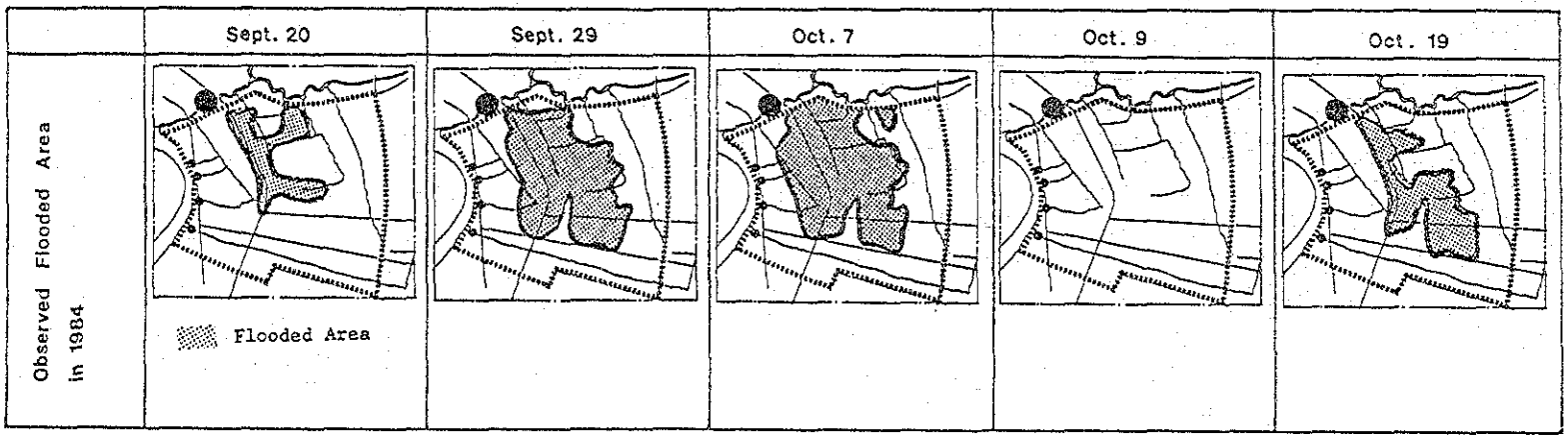

Fig. 4.7 INUNDATION CONDITION DUE TO POOR TERTIARY DRAINAGE FACILITY IN 1984 AT BANG NA AREA

MASTER PLAN ON FLOOD PROTECTION/DRAINAGE PROJECT IN EASTERN SUBURBAN-BANGKOK

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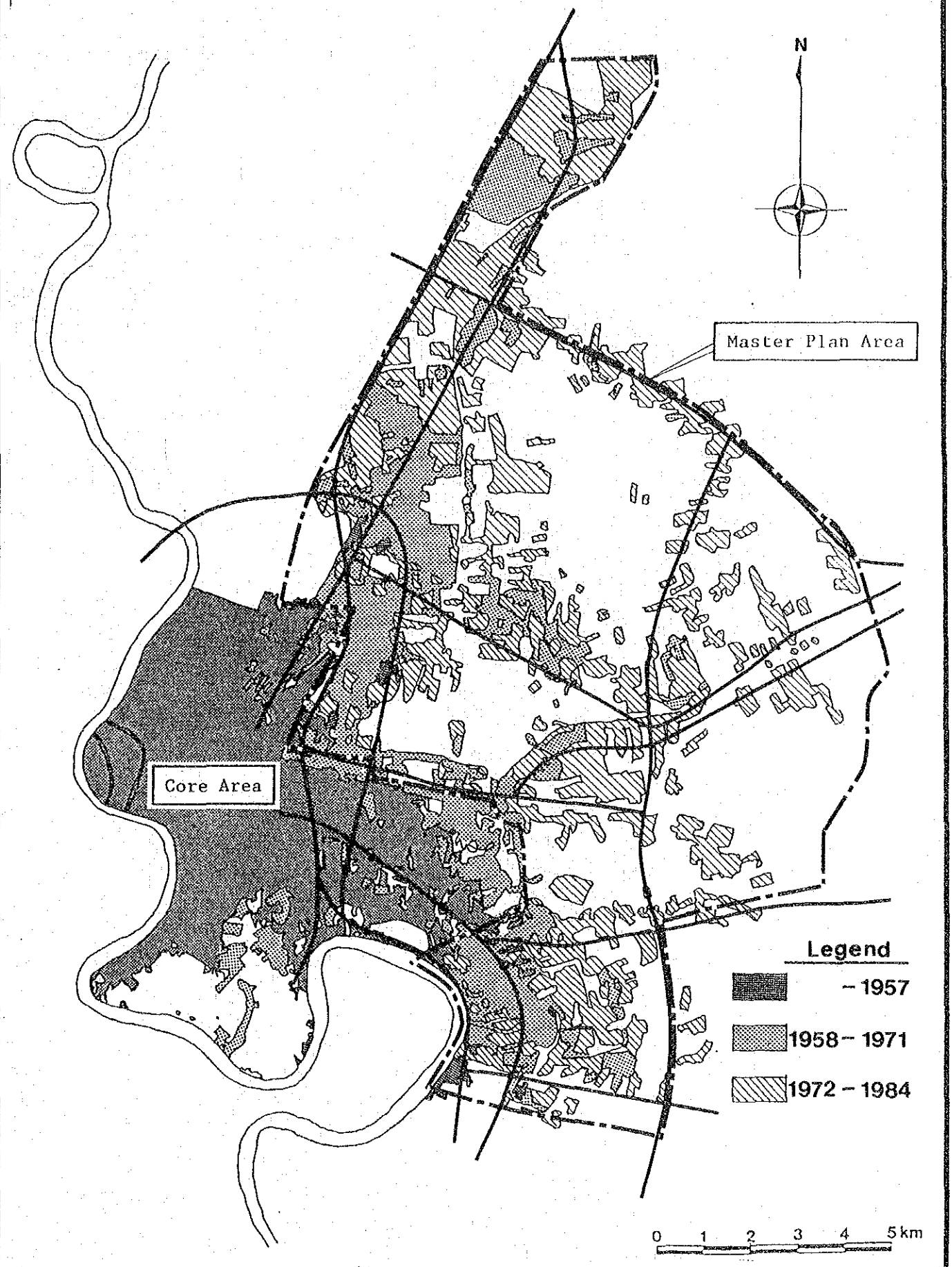

Fig. 5.1 PAST TREND OF URBANIZED AREA IN MASTER PLAN AREA

MASTER PLAN ON FLOOD PROTECTION/DRAINAGE PROJECT IN EASTERN SUBURBAN-BANGKOK

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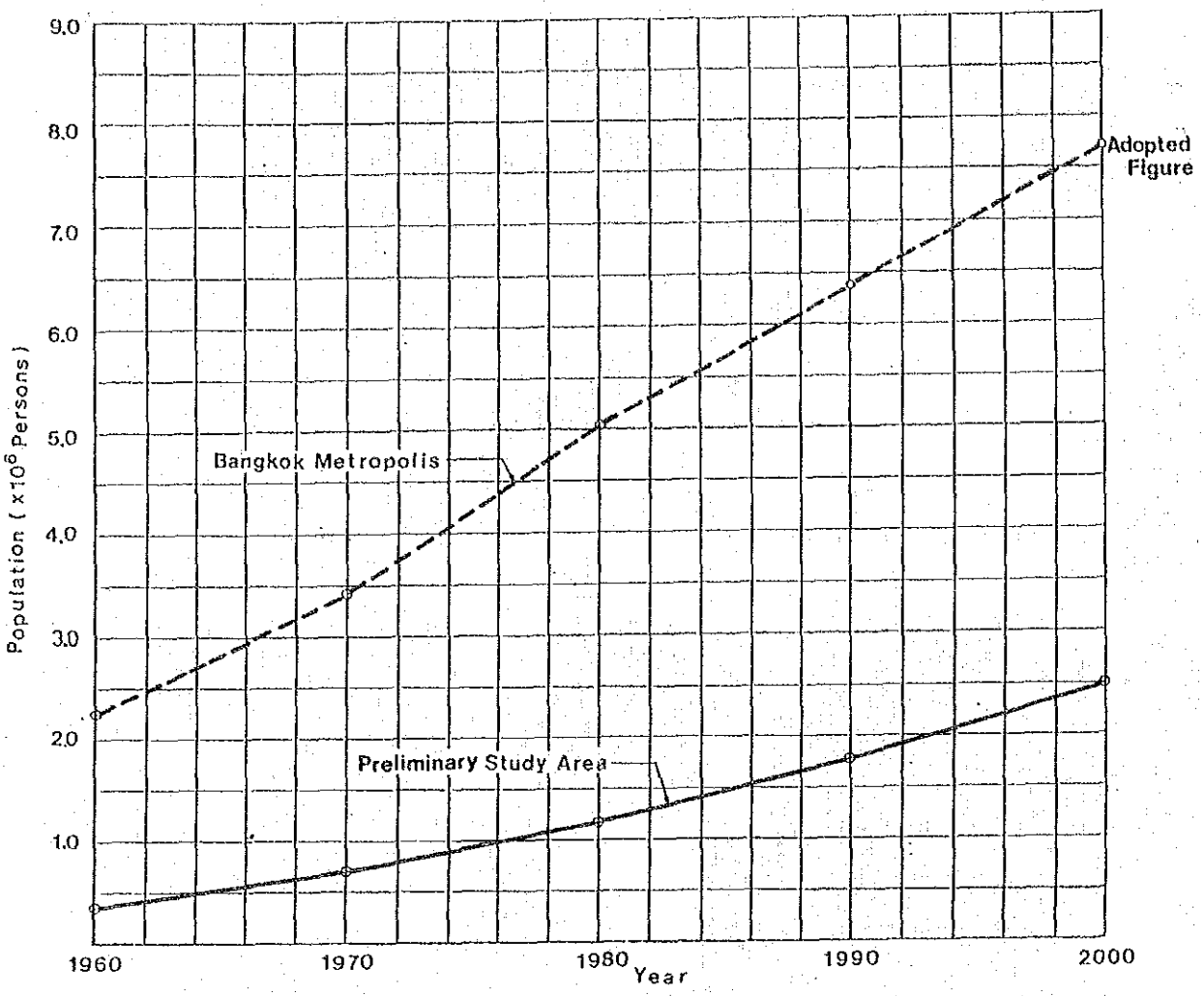

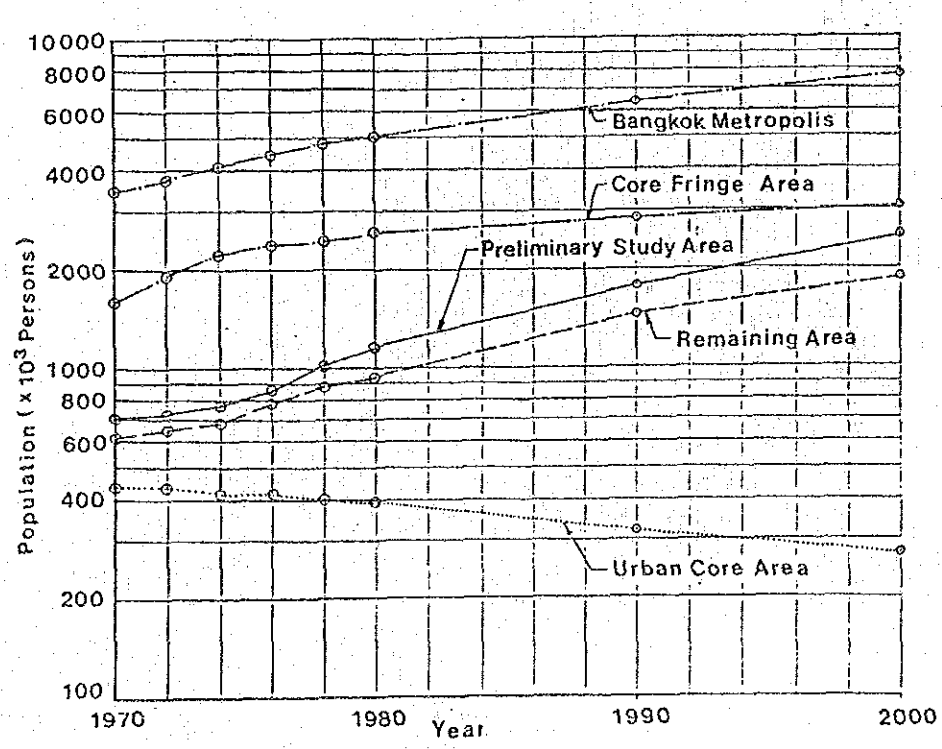

Fig. 5.2 FUTURE POPULATION IN THE STUDY AREA, 2000

MASTER PLAN ON FLOOD PROTECTION/DRAINAGE PROJECT IN EASTERN SUBURBAN-BANGKOK

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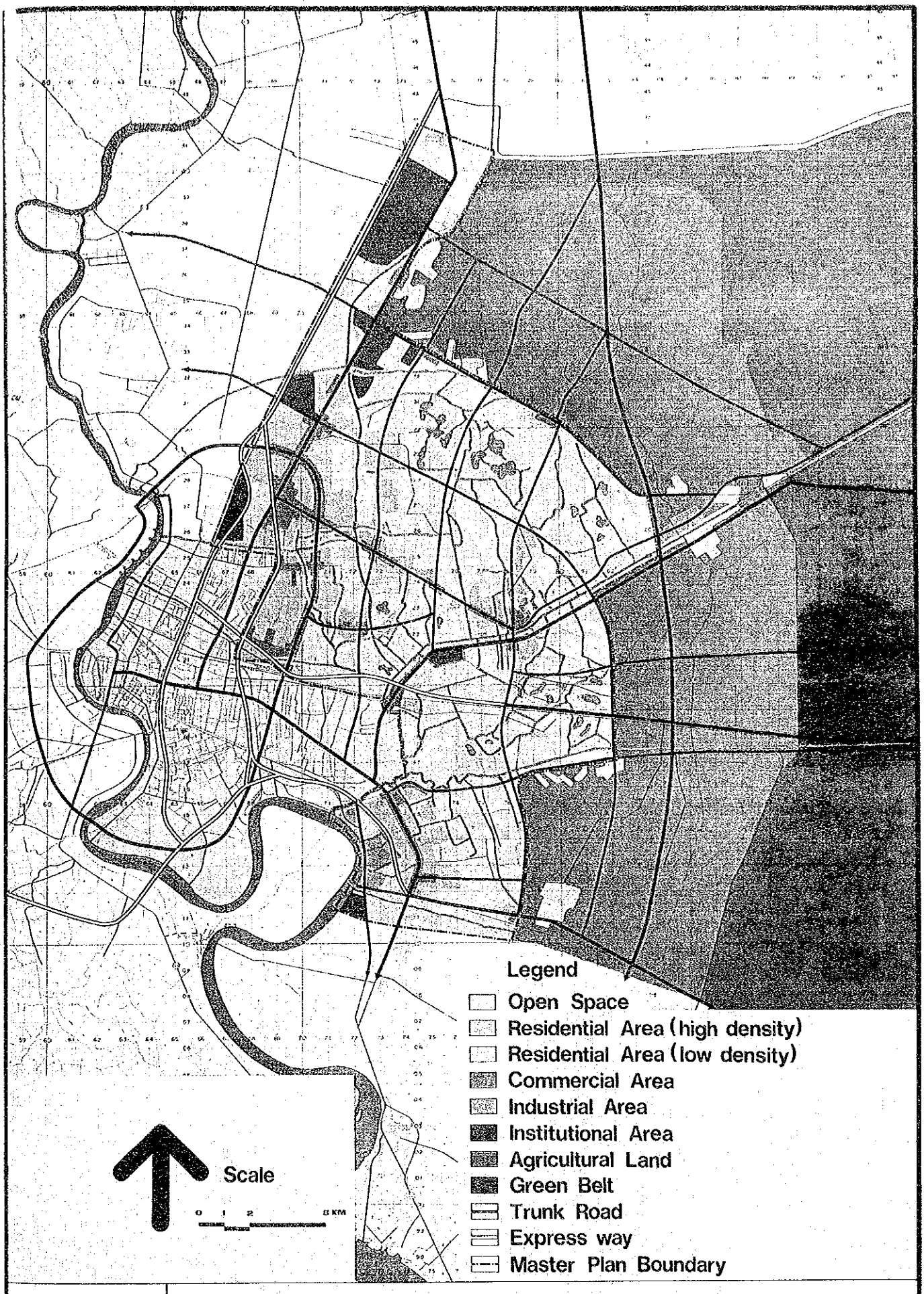

Fig. 5.3 LAND USE PLAN FOR MASTER PLAN AREA, 2000

MASTER PLAN ON FLOOD PROTECTION/DRAINAGE PROJECT IN EASTERN SUBURBAN-BANGKOK

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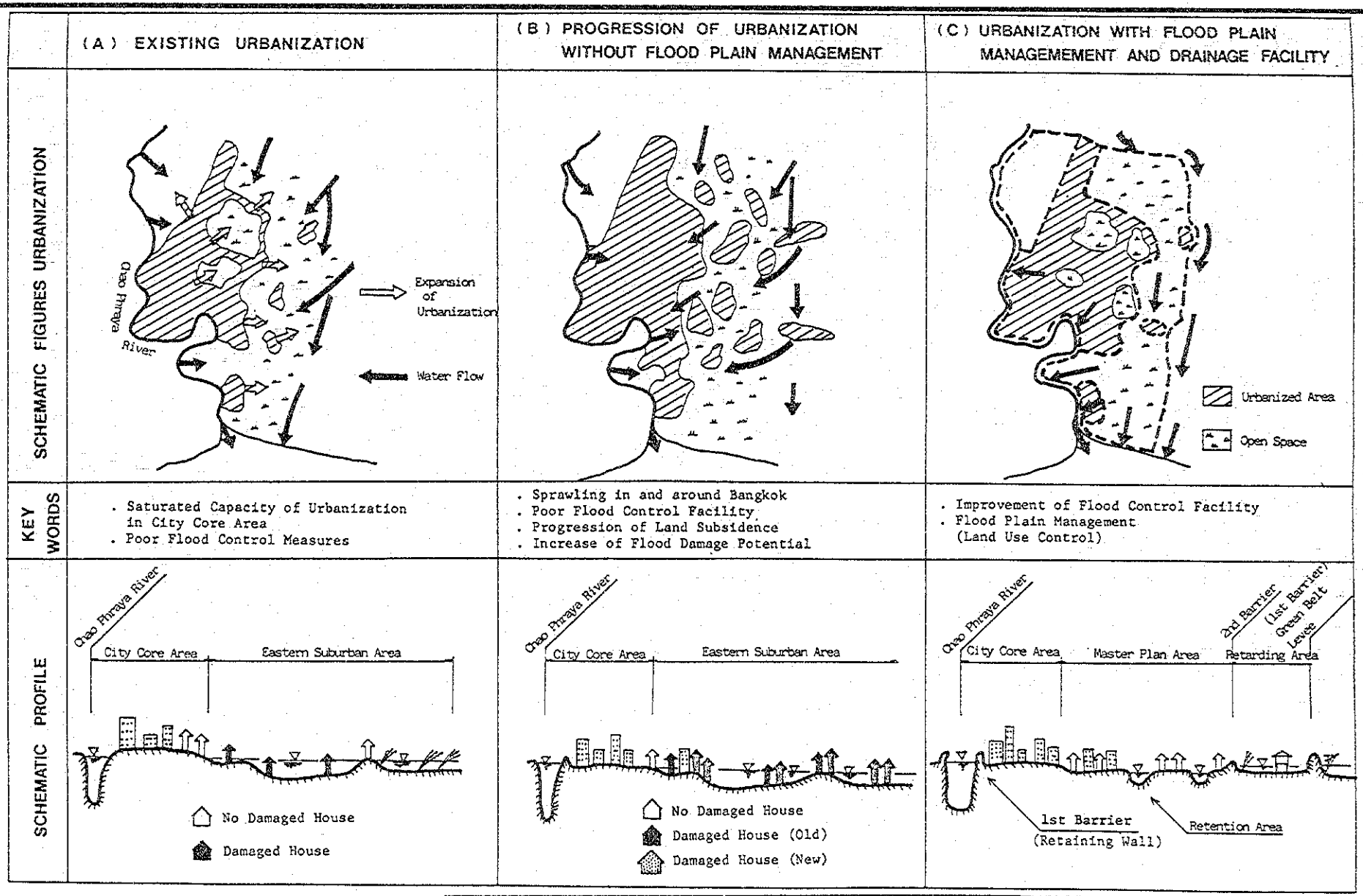
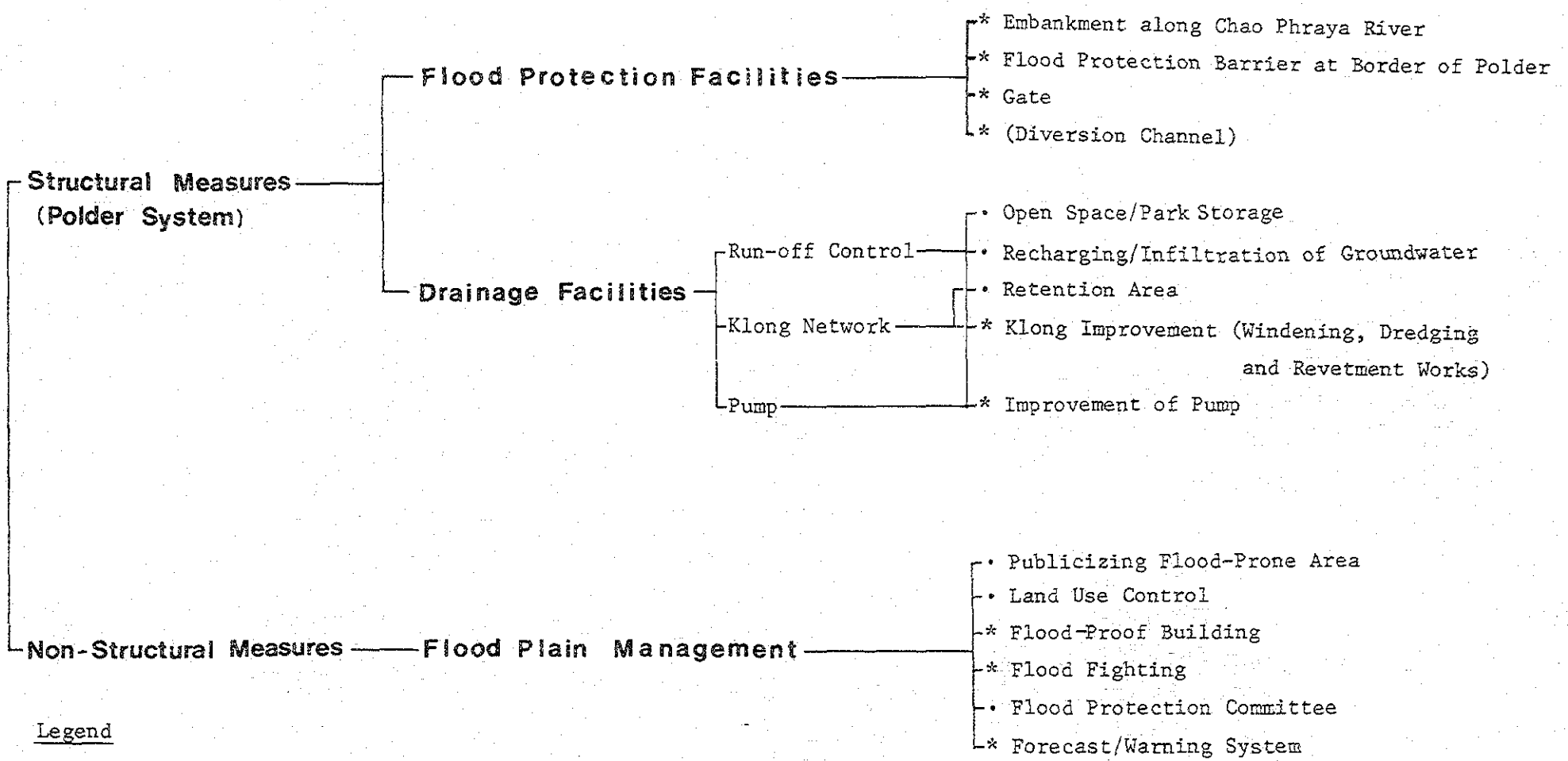


Fig. 6.1 CONCEPT OF COMPREHENSIVE FLOOD DAMAGE MITIGATION PLAN

MASTER PLAN ON FLOOD PROTECTION/DRAINAGE PROJECT IN EASTERN SUBURBAN-BANGKOK

CONCEPT OF FLOOD PROTECTION/DRAINAGE MEASURES



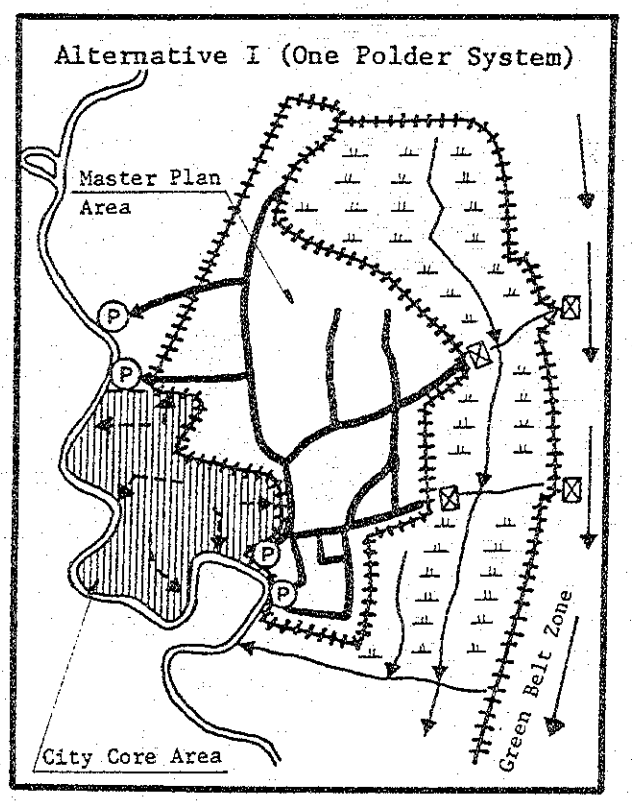
Legend

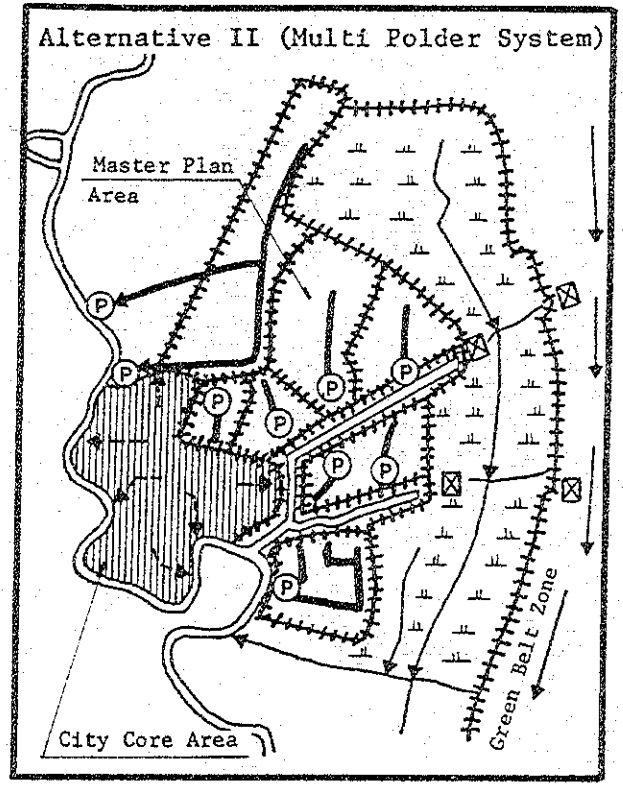
* Measures, partly executed by urgent measures.

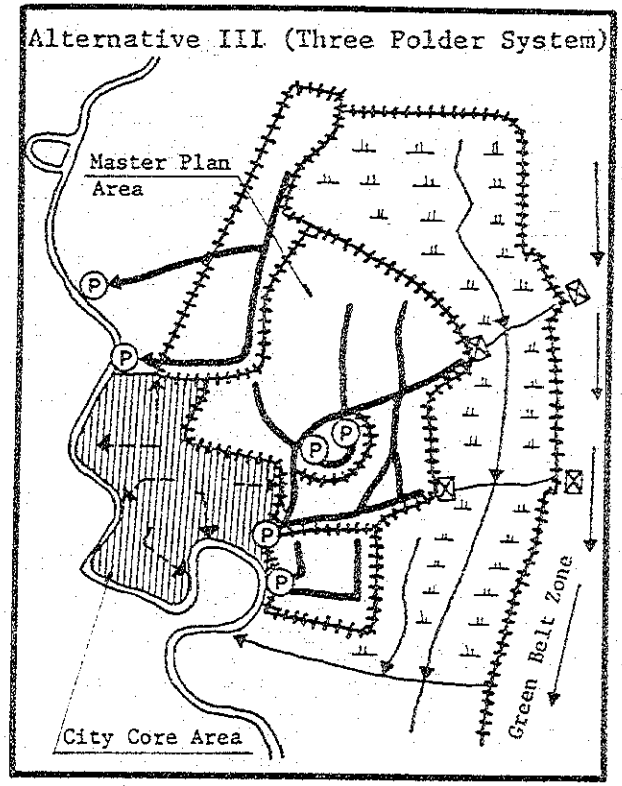
. Measures, requiring new action from now.

Fig. 6.2 CONCEPT OF FLOOD PROTECTION/DRAINAGE MEASURES

MASTER PLAN ON FLOOD PROTECTION/DRAINAGE PROJECT IN EASTERN SUBURBAN-BANGKOK







Legend

- Retarding Area
- Master Plan Area
- City Core Area
- Polder Levee (Dike, Retaining Wall)
- Gate
- Pumping Station
- Klong
- Chao Phraya River and Trunk Klong

Fig. 6.3 ALTERNATIVES OF POLDER SYSTEM

MASTER PLAN ON FLOOD PROTECTION/DRAINAGE PROJECT IN EASTERN SUBURBAN-BANGKOK

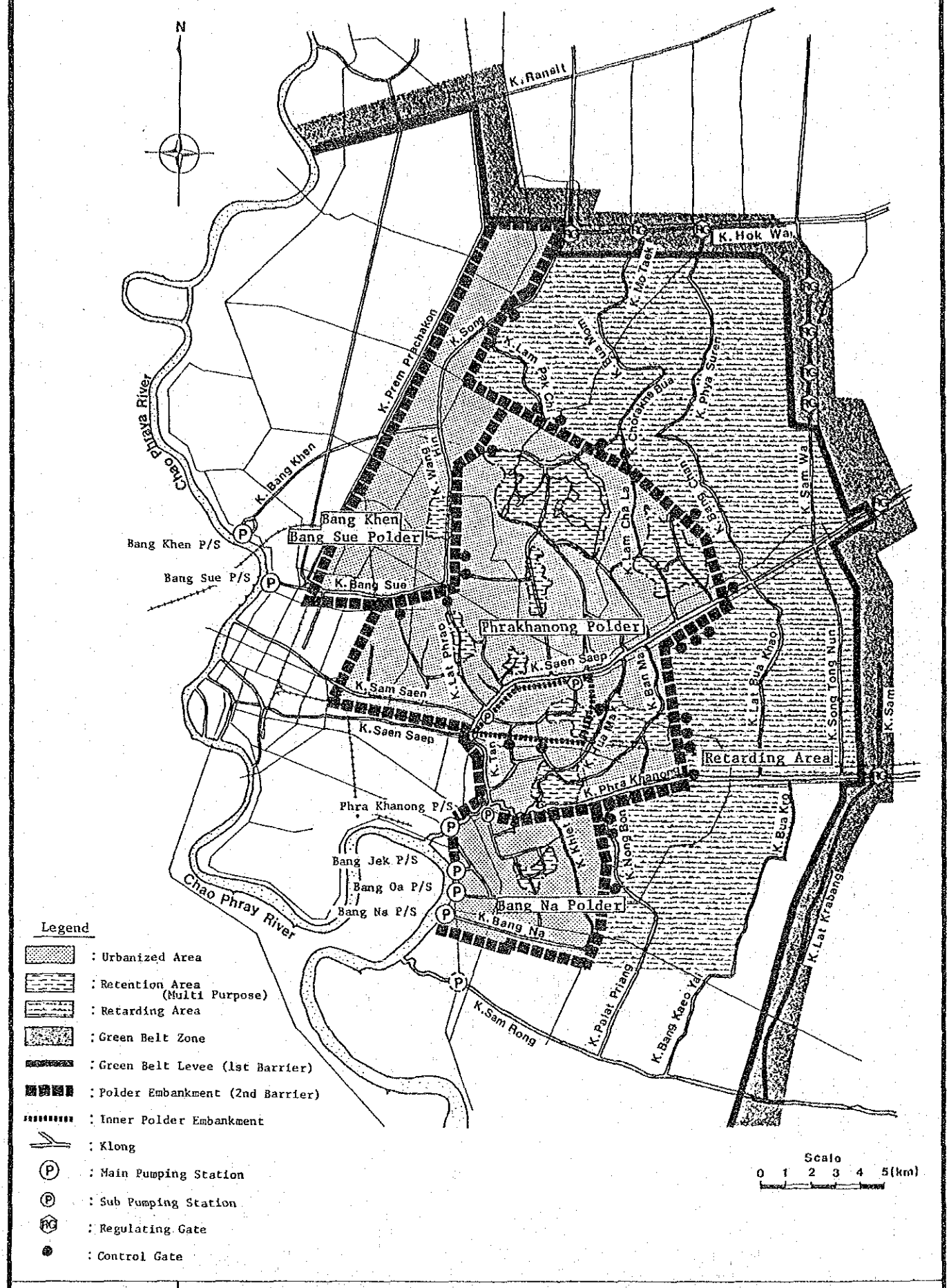
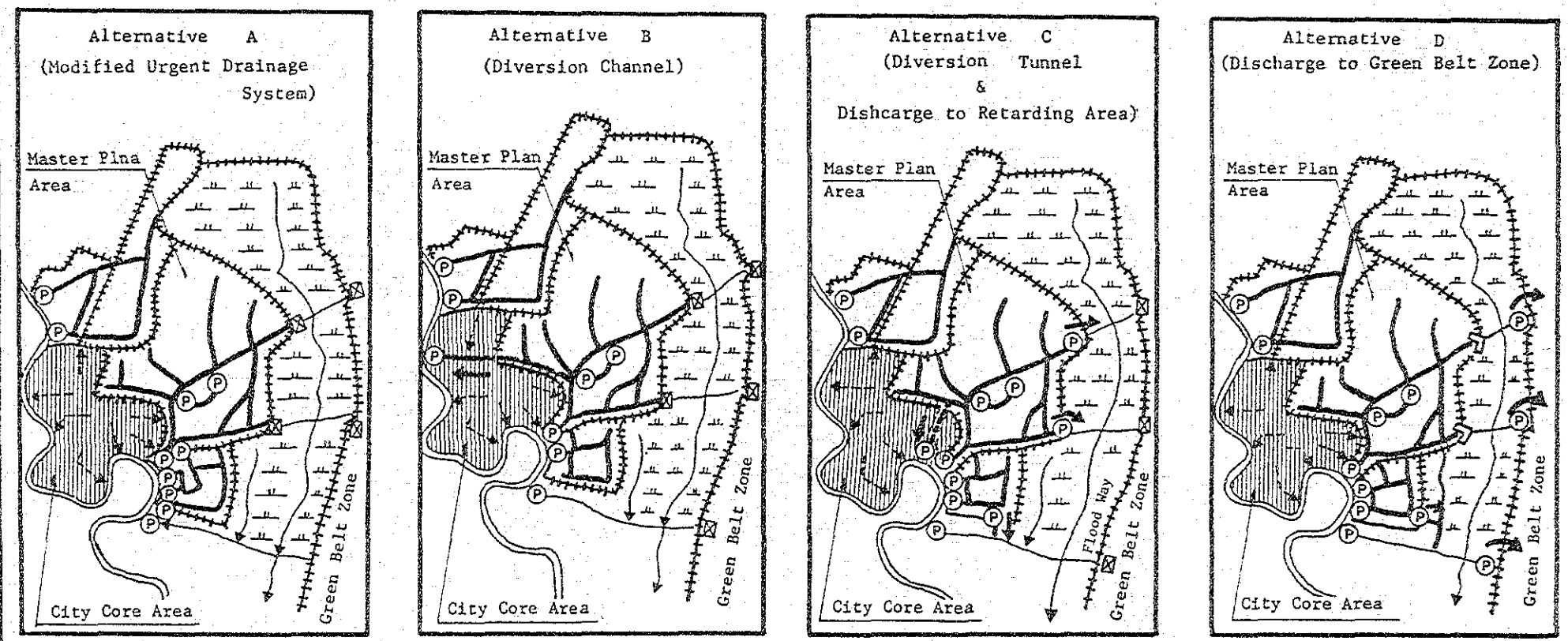


Fig. 6.4 PROPOSED FLOOD PROTECTION/DRAINAGE SYSTEM IN EASTERN SUBURBAN-BANGKOK

MASTER PLAN ON FLOOD PROTECTION/DRAINAGE PROJECT IN EASTERN SUBURBAN-BANGKOK

JICA 2528B.E 1985A.D



Legend

- Retarding Area
- Master Plan Area
- City Core Area
- Polder Levee (Dike, Retaining Wall)
- Gate
- Regulating Gate
- Pumping Station
- Diversion Tunnel
- Klong

Fig. 6.5 ALTERNATIVES OF DISCHARGE TO OUTER AREA

MASTER PLAN ON FLOOD PROTECTION/DRAINAGE PROJECT IN EASTERN SUBURBAN-BANGKOK

JICA 2528B.E 1985A.D

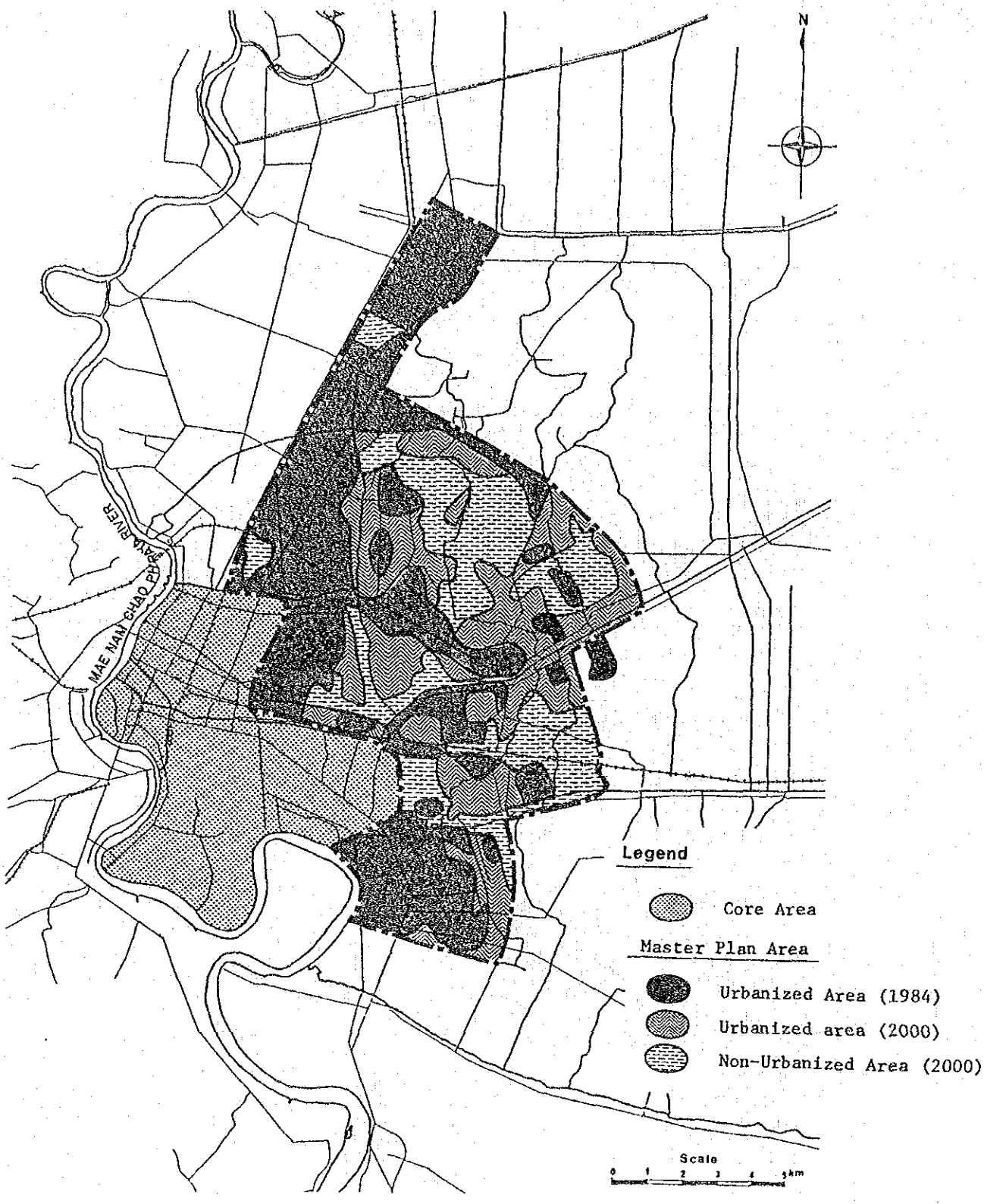


Fig. 6.6 PROPOSED LAND USE ACCORDING TO FLOOD RISK

MASTER PLAN ON FLOOD PROTECTION/DRAINAGE PROJECT IN EASTERN SUBURBAN-BANGKOK

JICA 2528B.E 1985A.D