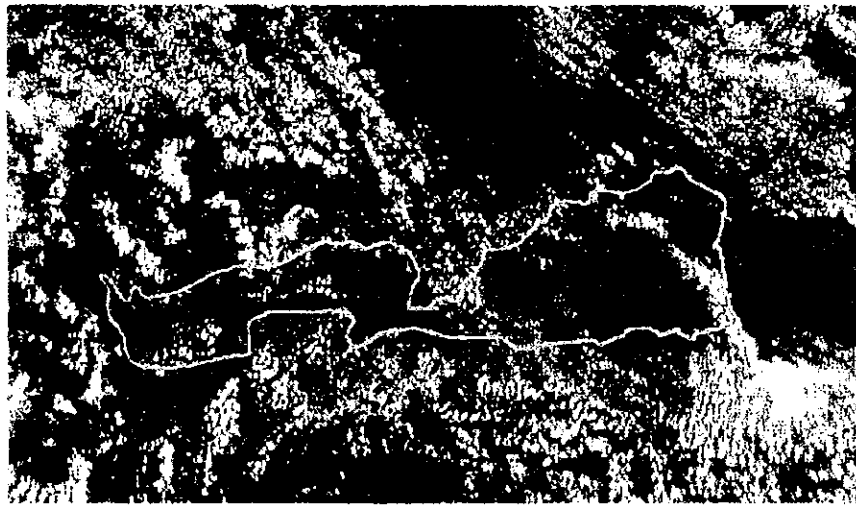
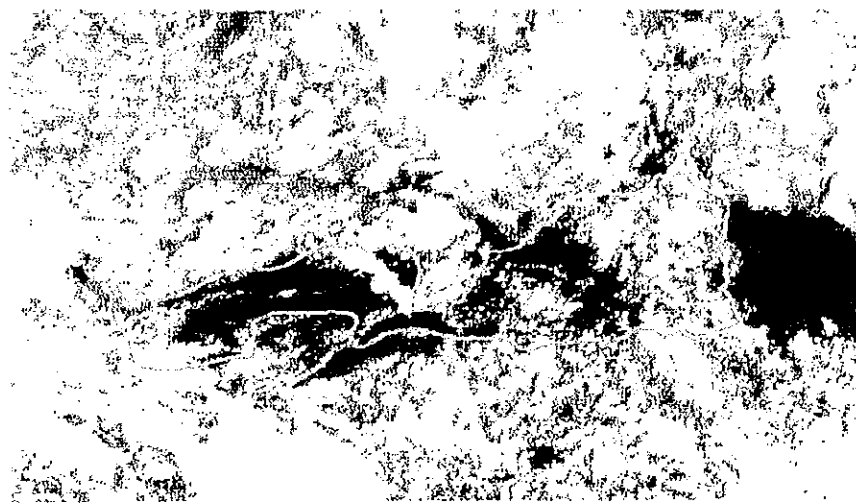


6/NOV/1995



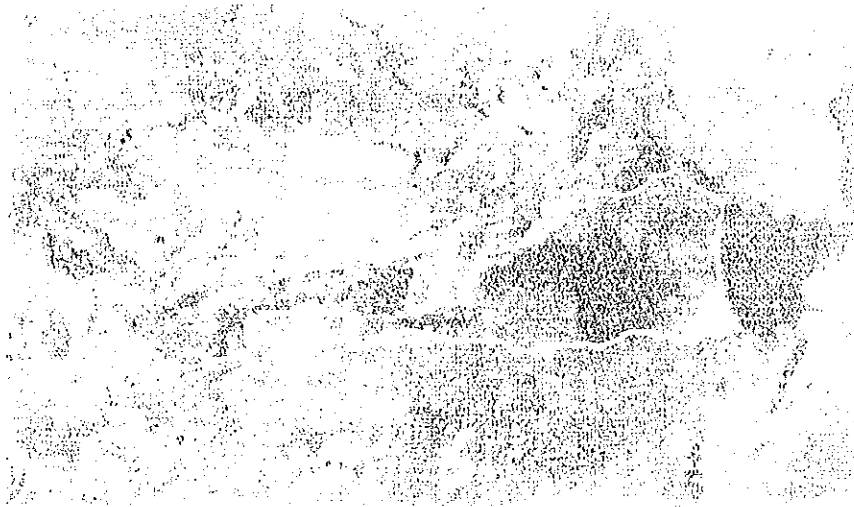
22/OCT/1995



22/SEP/1995

STUDY ON INTEGRATED PLAN FOR FLOOD  
MITIGATION IN CHAO PHRAYA RIVER BASIN  
CTI ENGINEERING CO., LTD. AND INA CORPORATION

Fig. 2.4.3(1/2) TRADITION OF FLOOD  
INUNDATION AREA IN 1995 BY  
NOAA FALSE COLOP IMAGE



06 NOV 1995



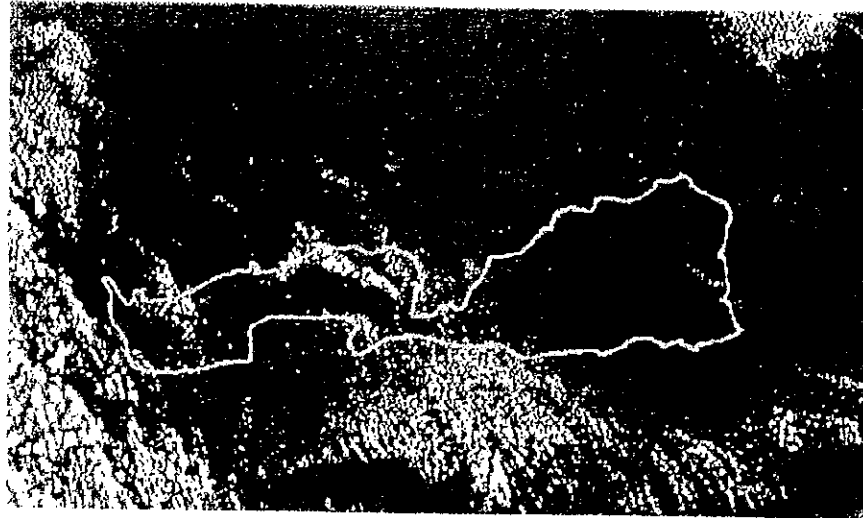
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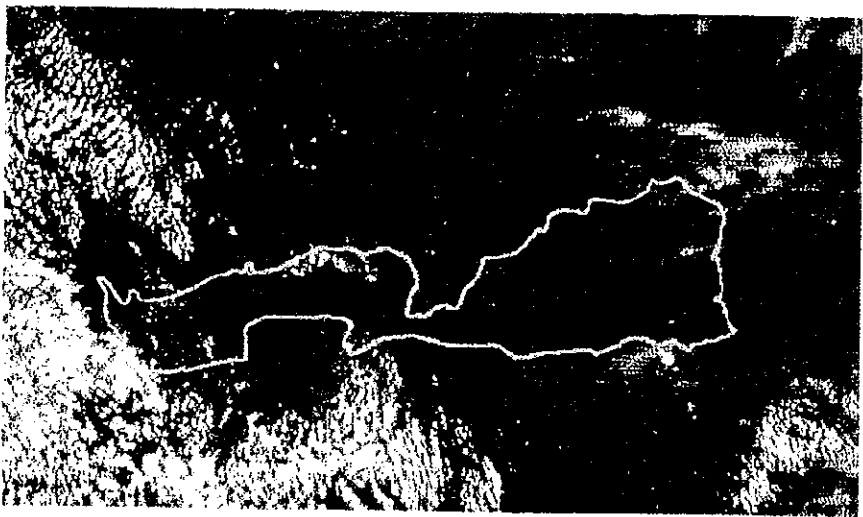
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STUDY ON INTEGRATED PLAN FOR FLOOD  
MITIGATION IN CHAO PHRAYA RIVER BASIN  
CTI ENGINEERING CO., LTD. AND INA CORPORATION

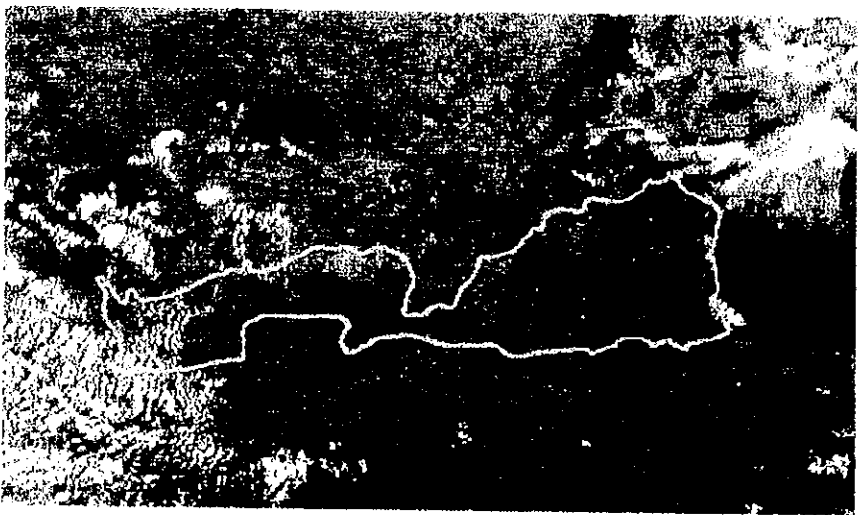
Fig. 24.30. 2) TRADITION OF FLOOD  
INUNDATION AREA IN 1995 BY  
NOAA FALSE COLOP IMAGE



24/DEC/1995



7/DEC/1995

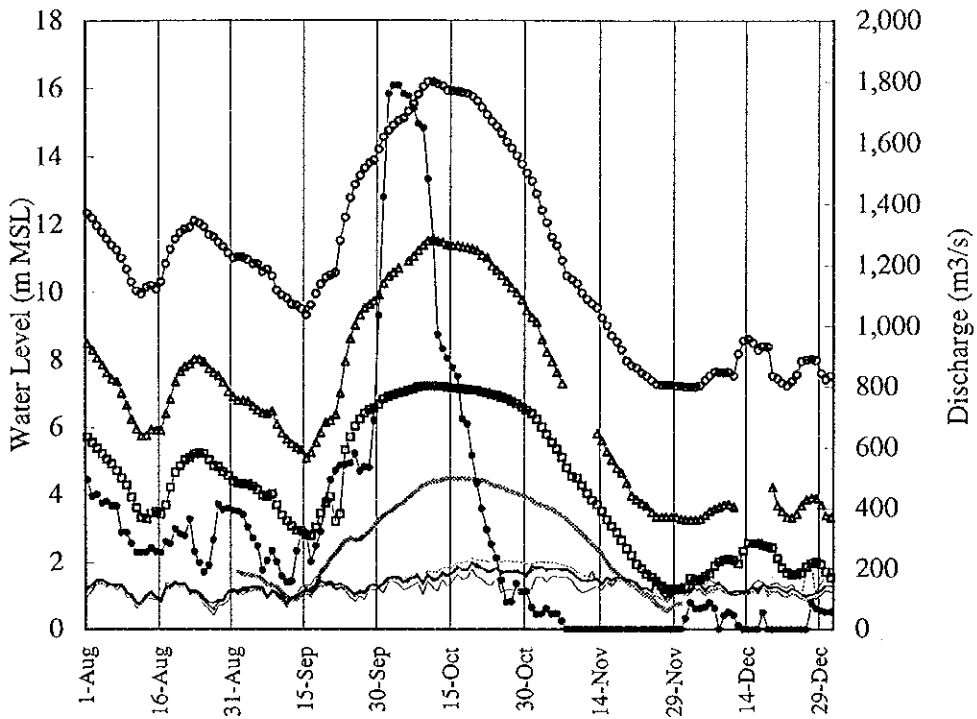


25/NOV/1995

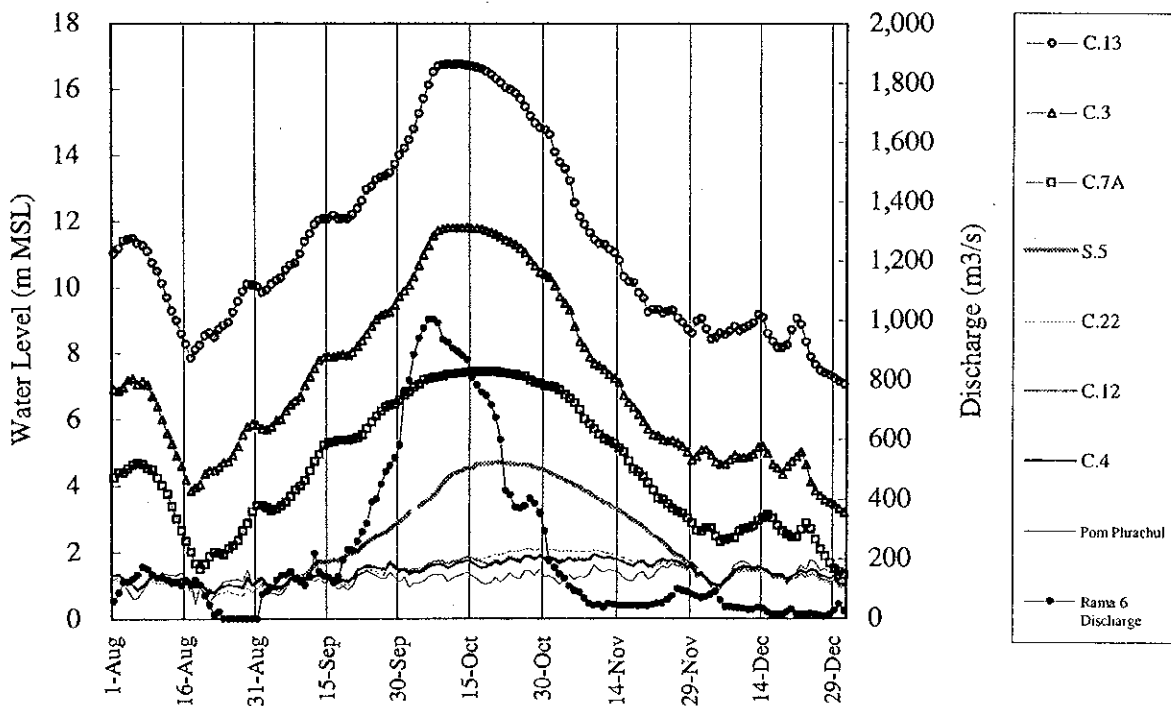
STUDY ON INTEGRATED PLAN FOR FLOOD  
MITIGATION IN CHAO PHRAYA RIVER BASIN  
CTI ENGINEERING CO., LTD. AND INA CORPORATION

Fig. 2.4.3(2/2) TRADITION OF FLOOD  
INUNDATION AREA IN 1995 BY  
NOAA FALSE COLOP IMAGE

## 1978 FLOOD



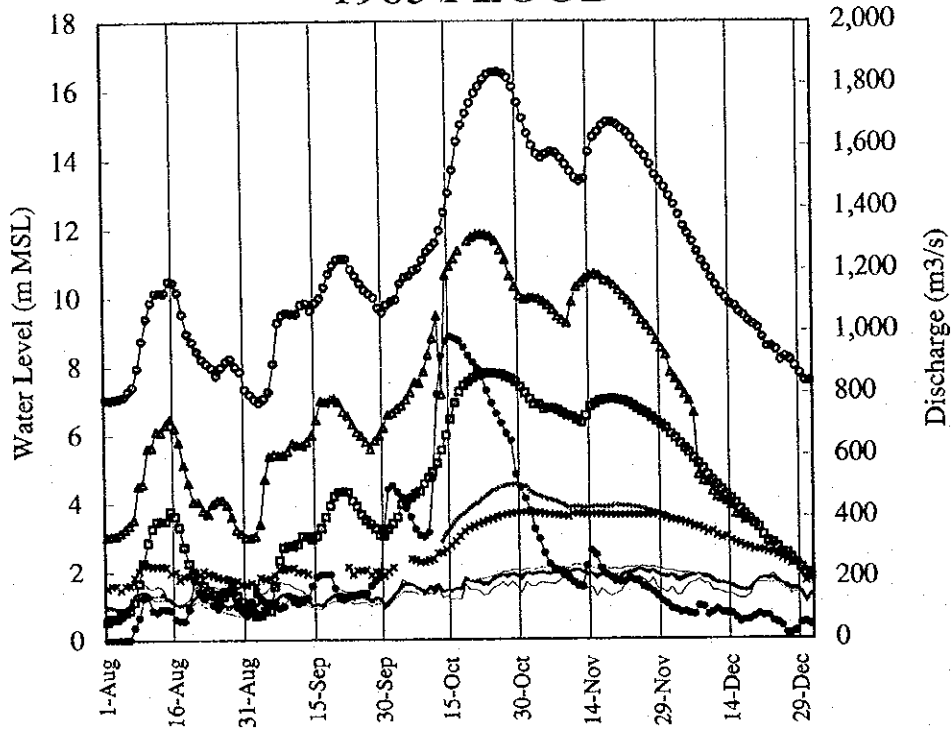
## 1980 FLOOD



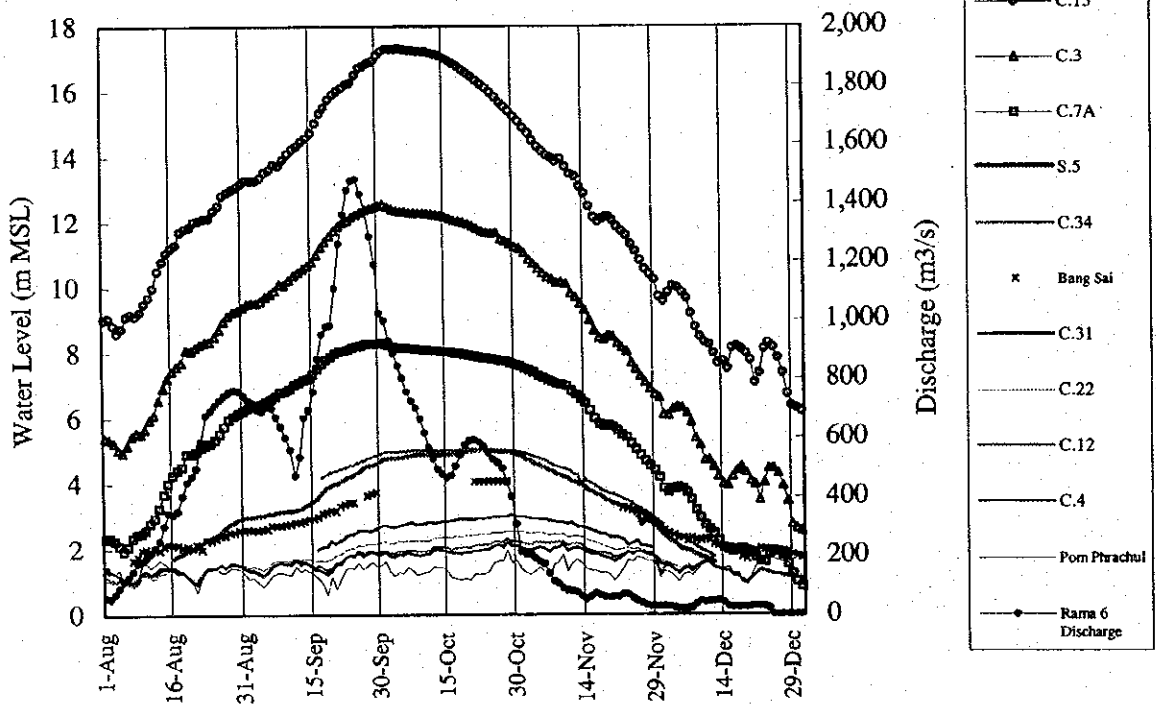
STUDY ON ON INTEGRATED PLAN FOR FLOOD  
MITIGATION IN CHAOPHRAYA RIVER BASIN  
CTI ENGINEERING CO., LTD & INA CORPORATION

Fig. 2.4.4(1/3) DAILY MAXIMUM WATER  
LEVEL IN LOWER CHAO  
PHRAYA RIVER

### 1983 FLOOD



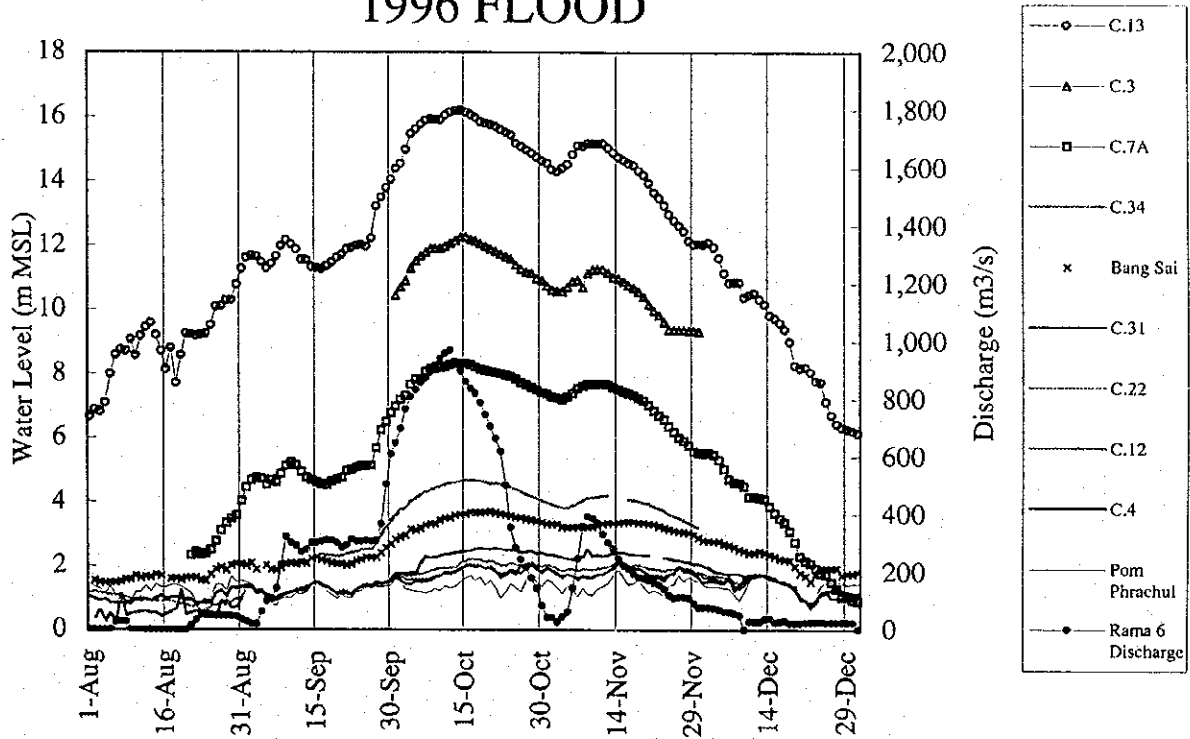
### 1995 FLOOD



STUDY ON ON INTEGRATED PLAN FOR FLOOD  
 MITIGATION IN CHAOPHRAYA RIVER BASIN  
 CTI ENGINEERING CO., LTD & INA CORPORATION

Fig. 2.4.4(2/3) DAILY MAXIMUM WATER  
 LEVEL IN LOWER CHAO  
 PHRAYA RIVER

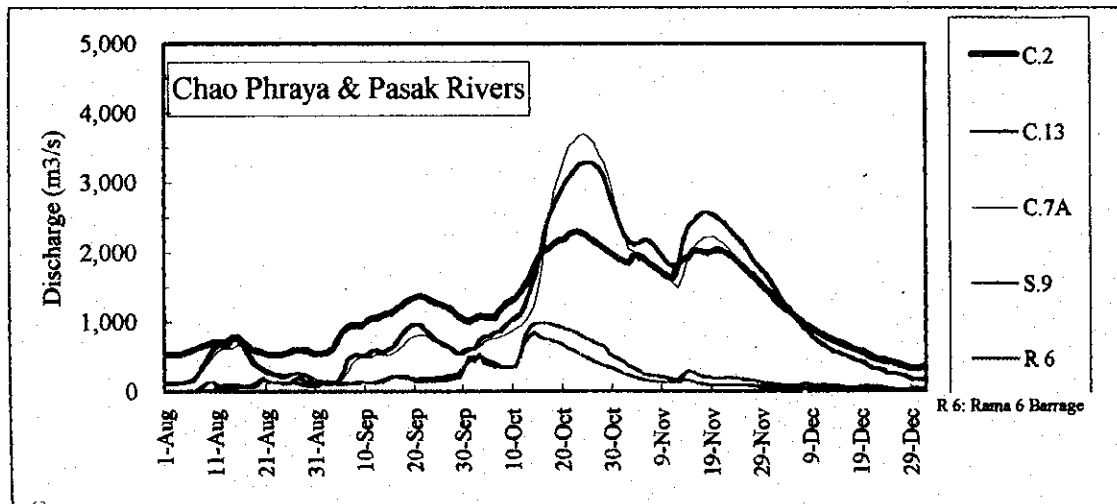
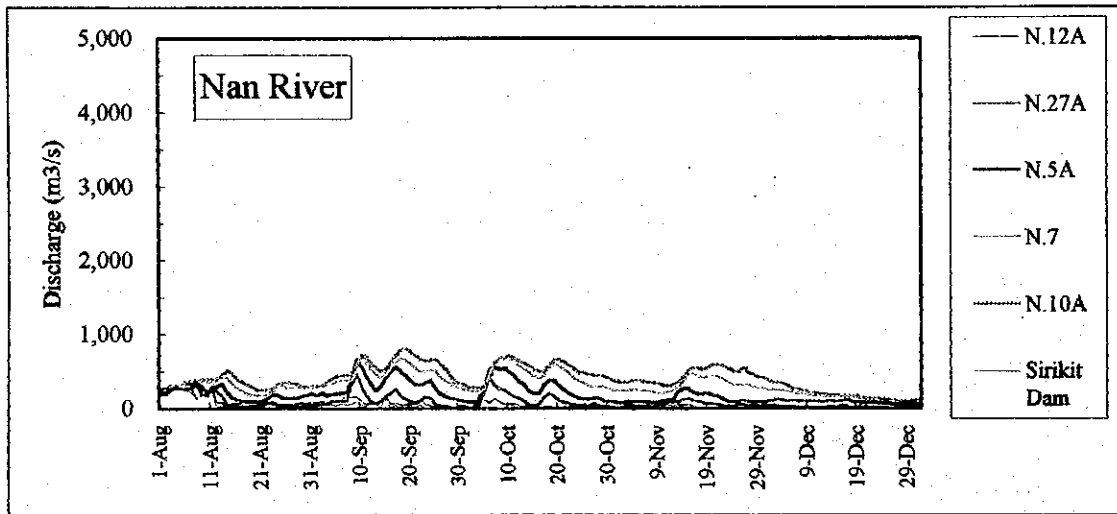
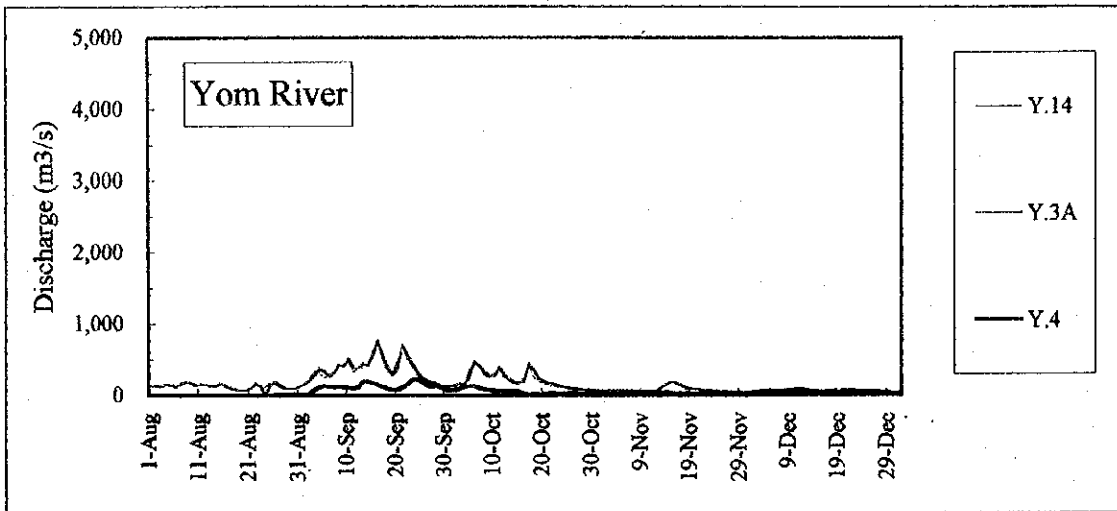
# 1996 FLOOD



STUDY ON ON INTEGRATED PLAN FOR FLOOD  
 MITIGATION IN CHAOPHRAYA RIVER BASIN  
 CTI ENGINEERING CO. , LTD & INA CORPORATION

Fig. 2.4.4(3/3) DAILY MAXIMUM WATER  
 LEVEL IN LOWER CHAO  
 PHRAYA RIVER

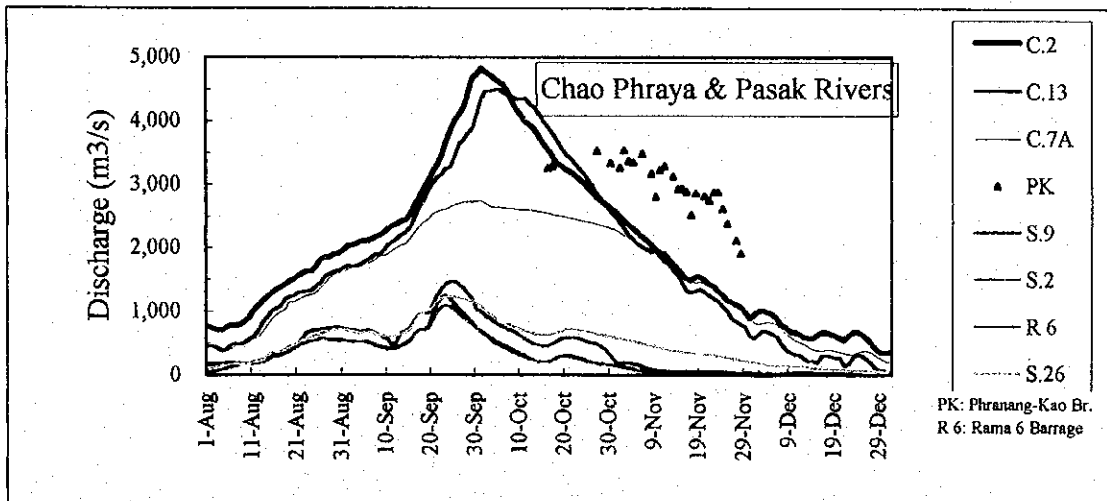
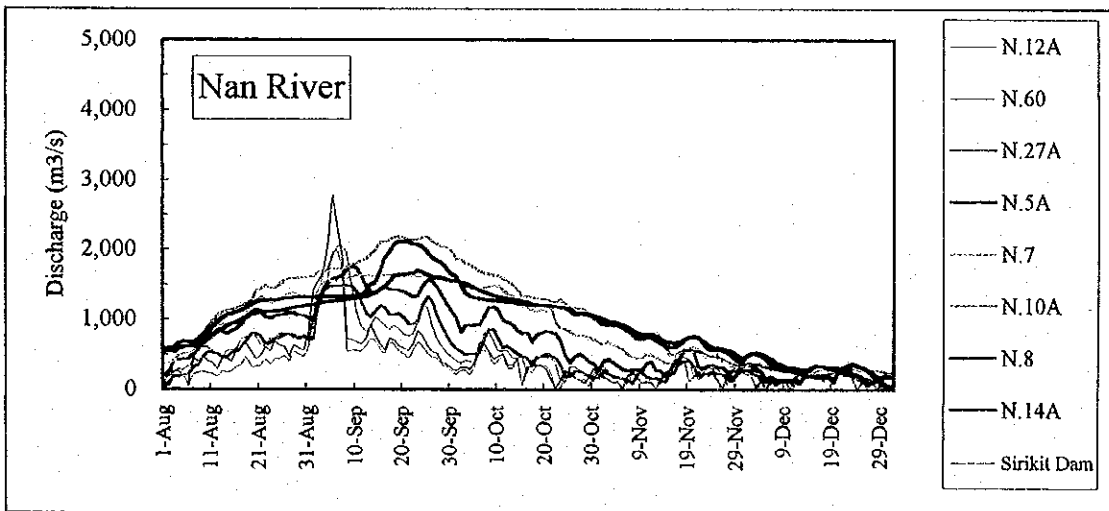
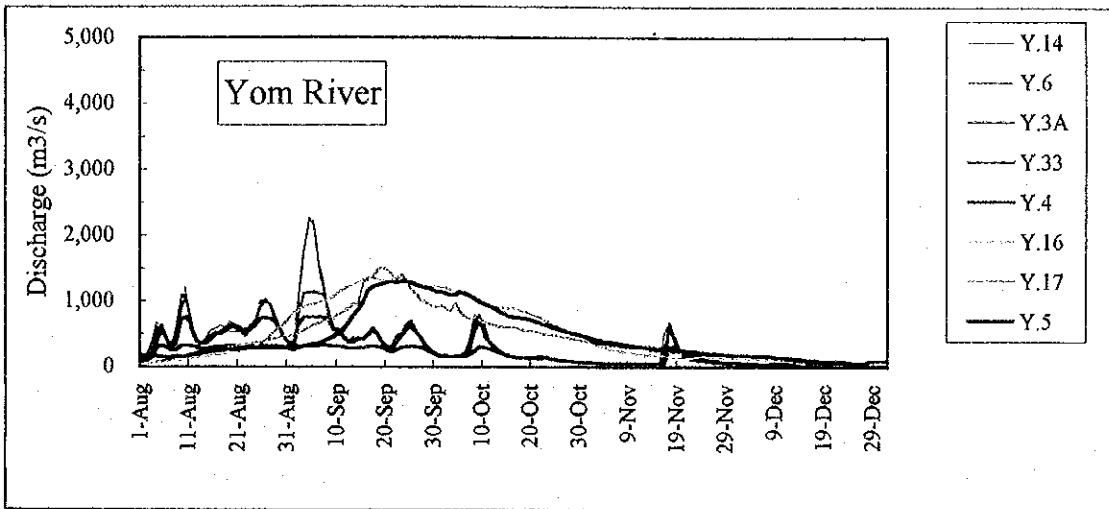
# 1983 FLOOD



STUDY ON ON INTEGRATED PLAN FOR FLOOD  
MITIGATION IN CHAOPHRAYA RIVER BASIN  
CTI ENGINEERING CO., LTD & INA CORPORATION

Fig. 2.4.5(1/3) FLOOD DISCHARGE  
HYDROGRAPH

# 1995 FLOOD

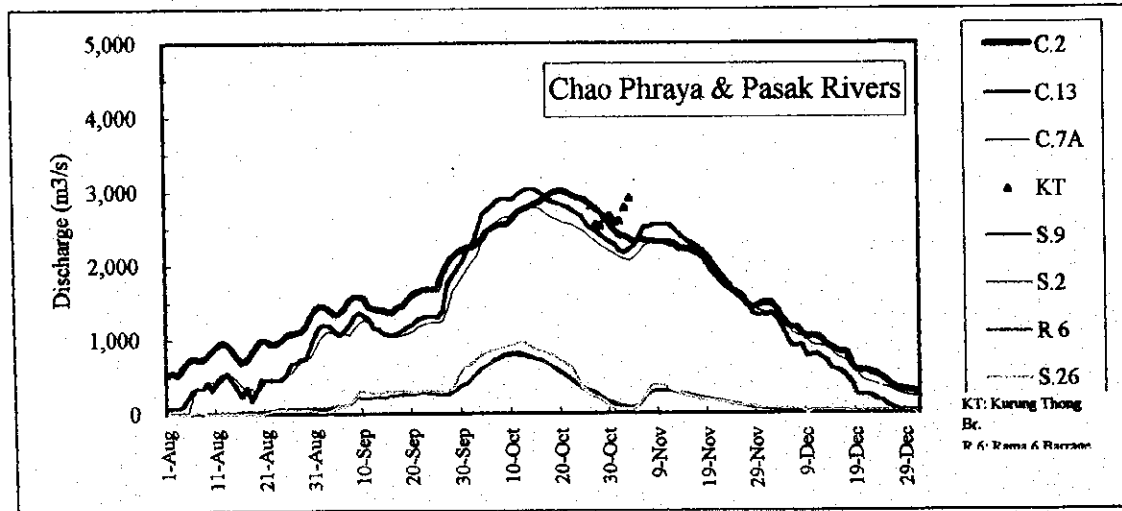
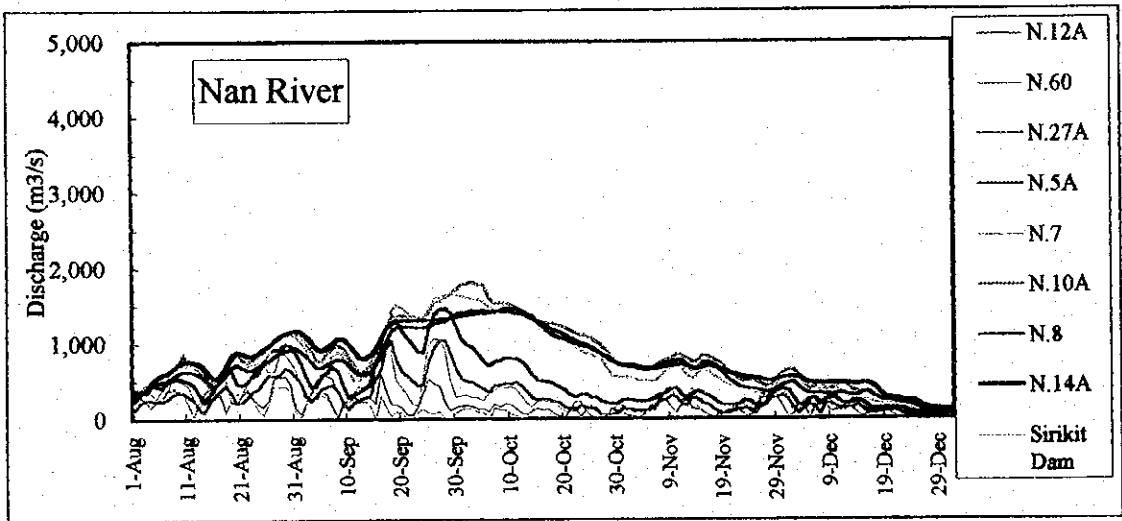
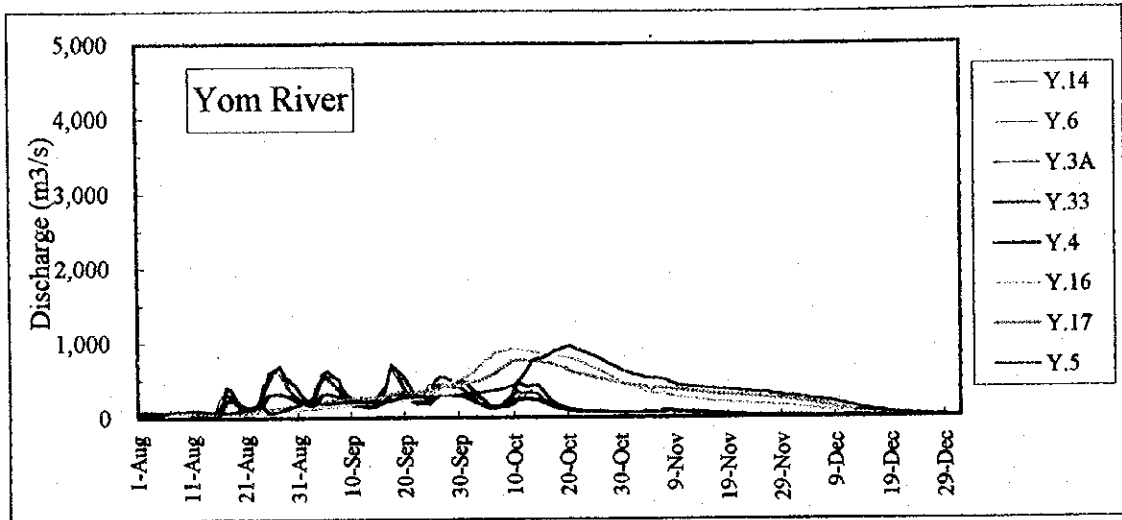


STUDY ON ON INTEGRATED PLAN FOR FLOOD  
MITIGATION IN CHAOPHRAYA RIVER BASIN  
CTI ENGINEERING CO., LTD & INA CORPORATION

Fig. 2.4.5(2/3) FLOOD DISCHARGE  
HYDROGRAPH



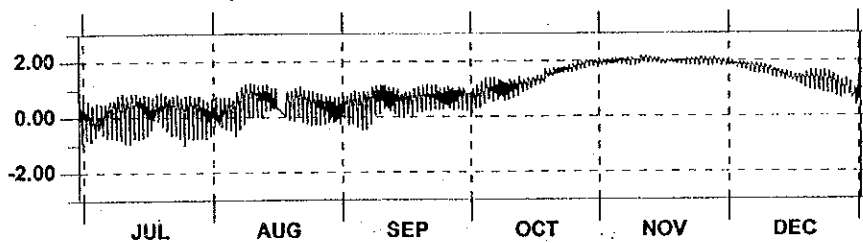
## 1996 FLOOD



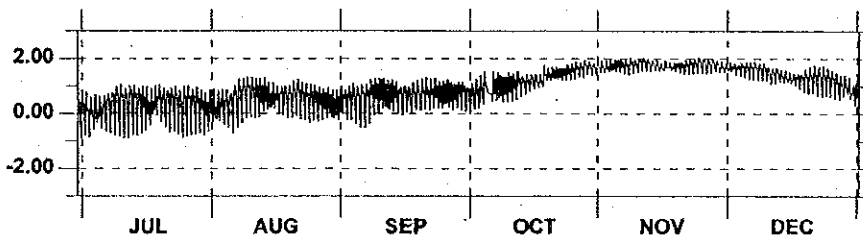
STUDY ON ON INTEGRATED PLAN FOR FLOOD  
MITIGATION IN CHAOPHRAYA RIVER BASIN  
CTI ENGINEERING CO., LTD & INA CORPORATION

Fig. 2.4.5(3/3) FLOOD DISCHARGE  
HYDROGRAPH

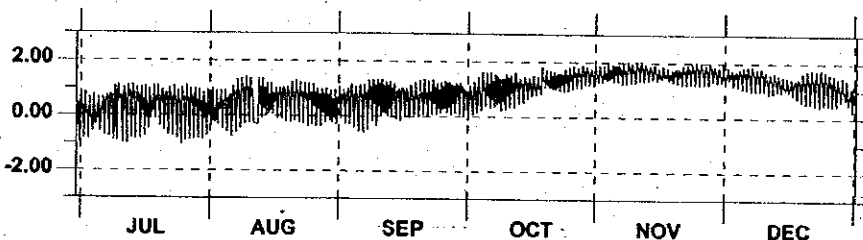
C.22 1983 FLOOD  
WATER LEVEL, METER



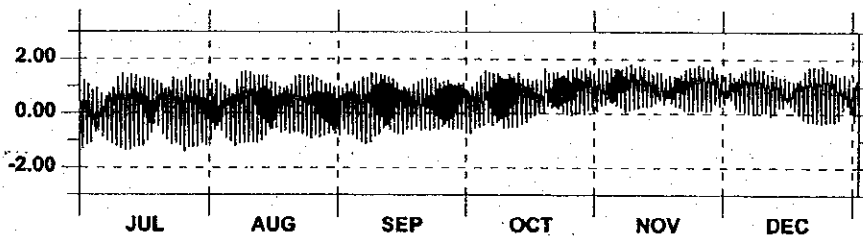
C.12 WATER LEVEL, METER



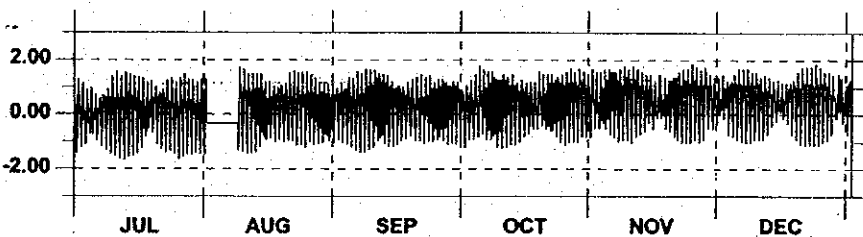
C.4 WATER LEVEL, METER



BKK PORT WATER LEVEL, METER



POM PHRA WATER LEVEL, METER



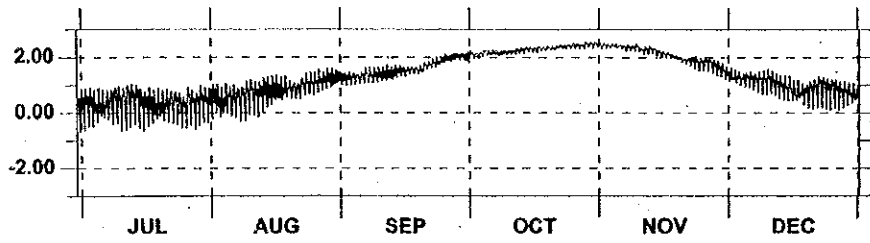
STUDY ON INTEGRATED PLAN FOR FLOOD  
MITIGATION IN CHAO PHRAYA RIVER BASIN

CTI ENGINEERING CO., LTD. AND INA CORPORATION

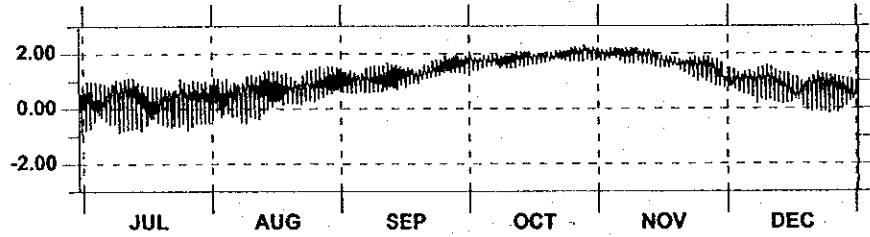
Fig. 2.4.6(1/3) TIDAL HYDROGRAPH ON  
LOWER CHAO PHRAYA RIVER

# 1995 FLOOD

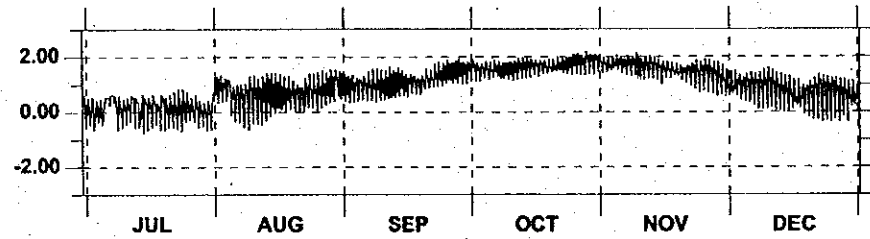
C.22  
WATER LEVEL, METER



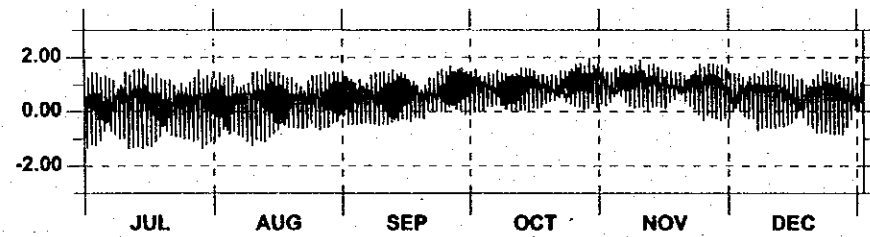
C.12  
WATER LEVEL, METER



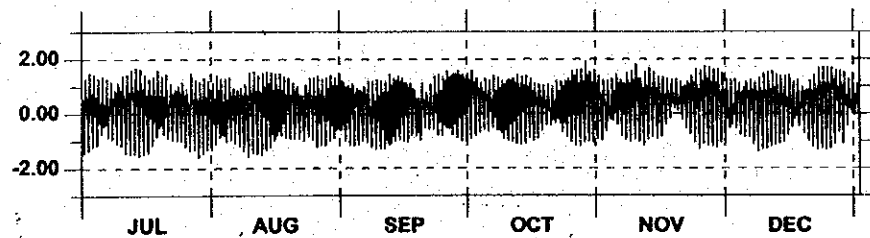
C.4  
WATER LEVEL, METER



BKK PORT  
WATER LEVEL, METER



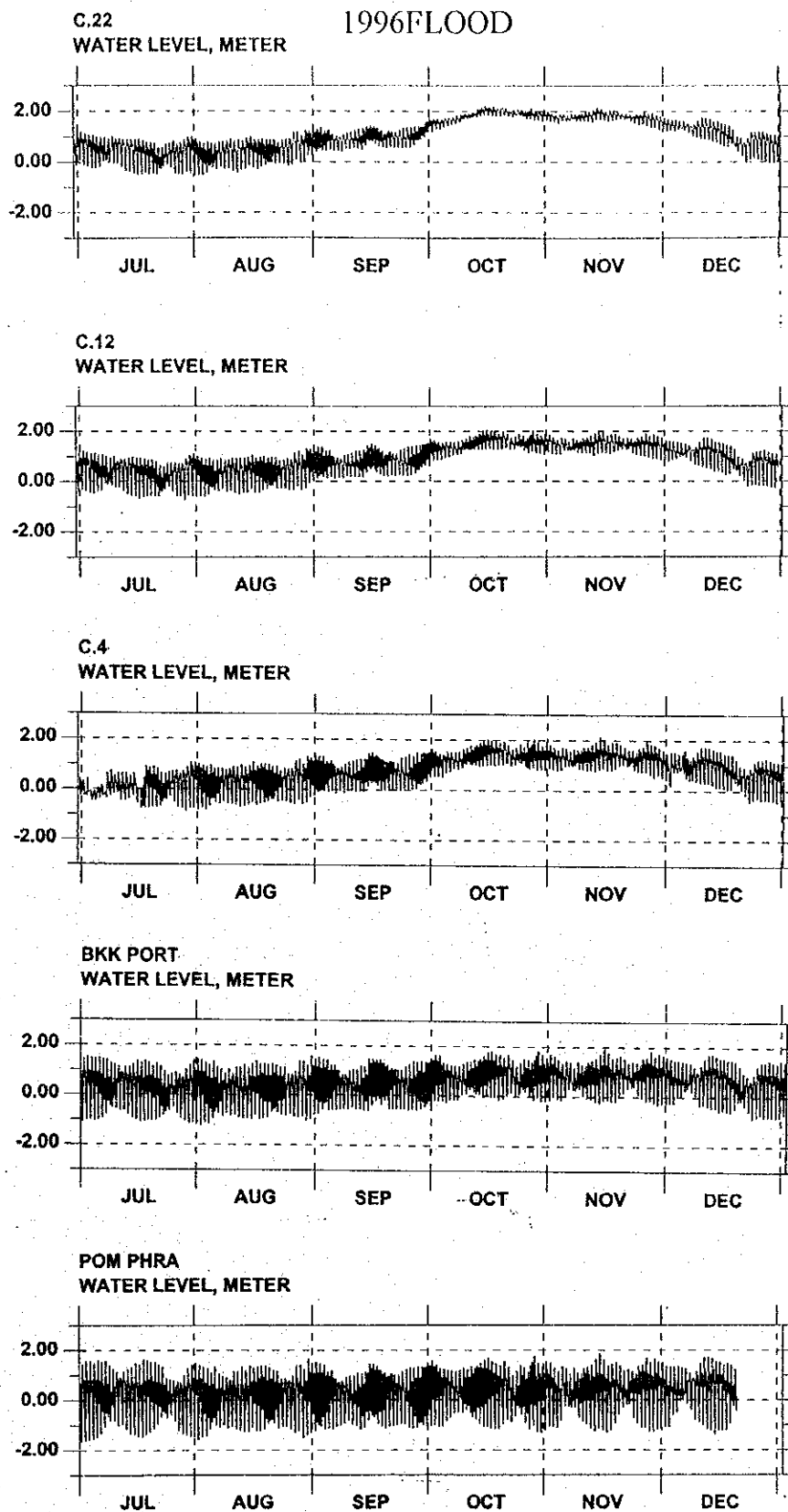
POM PHRA  
WATER LEVEL, METER



STUDY ON INTEGRATED PLAN FOR FLOOD  
MITIGATION IN CHAO PHRAYA RIVER BASIN

CTI ENGINEERING CO., LTD. AND INA CORPORATION

Fig. 2.4.6(2/3) TIDAL HYDROGRAPH ON  
LOWER CHAO PHRAYA RIVER



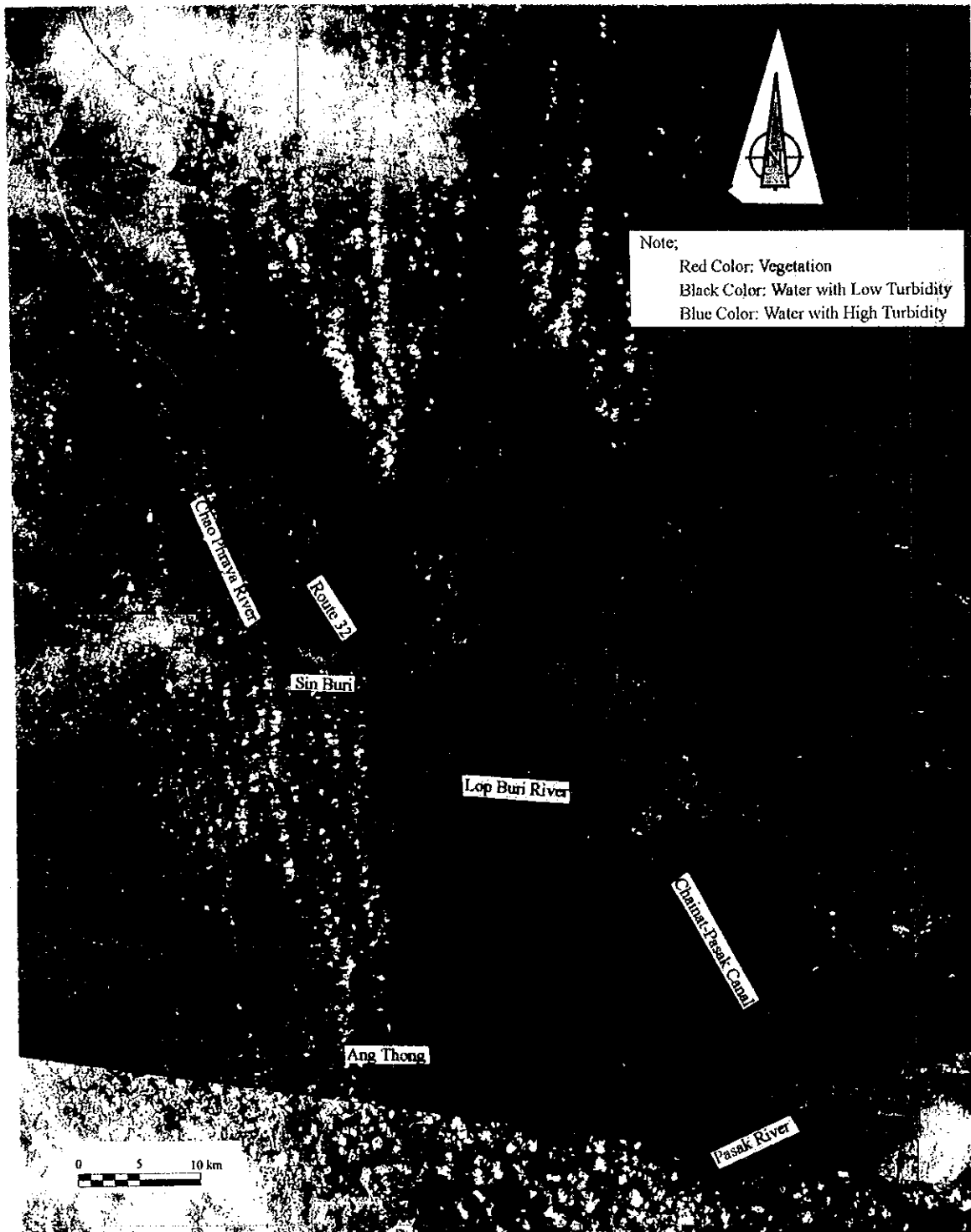
STUDY ON INTEGRATED PLAN FOR FLOOD  
MITIGATION IN CHAO PHRAYA RIVER BASIN

Fig. 2.4.6(3/3)

TIDAL HYDROGRAPH ON  
LOWER CHAO PHRAYA RIVER

CTI ENGINEERING CO., LTD. AND INA CORPORATION

# ROUTE 32 AND CHAINAT-PASAK CANAL



Landsat TM False Color Image (1995.Oct.12)

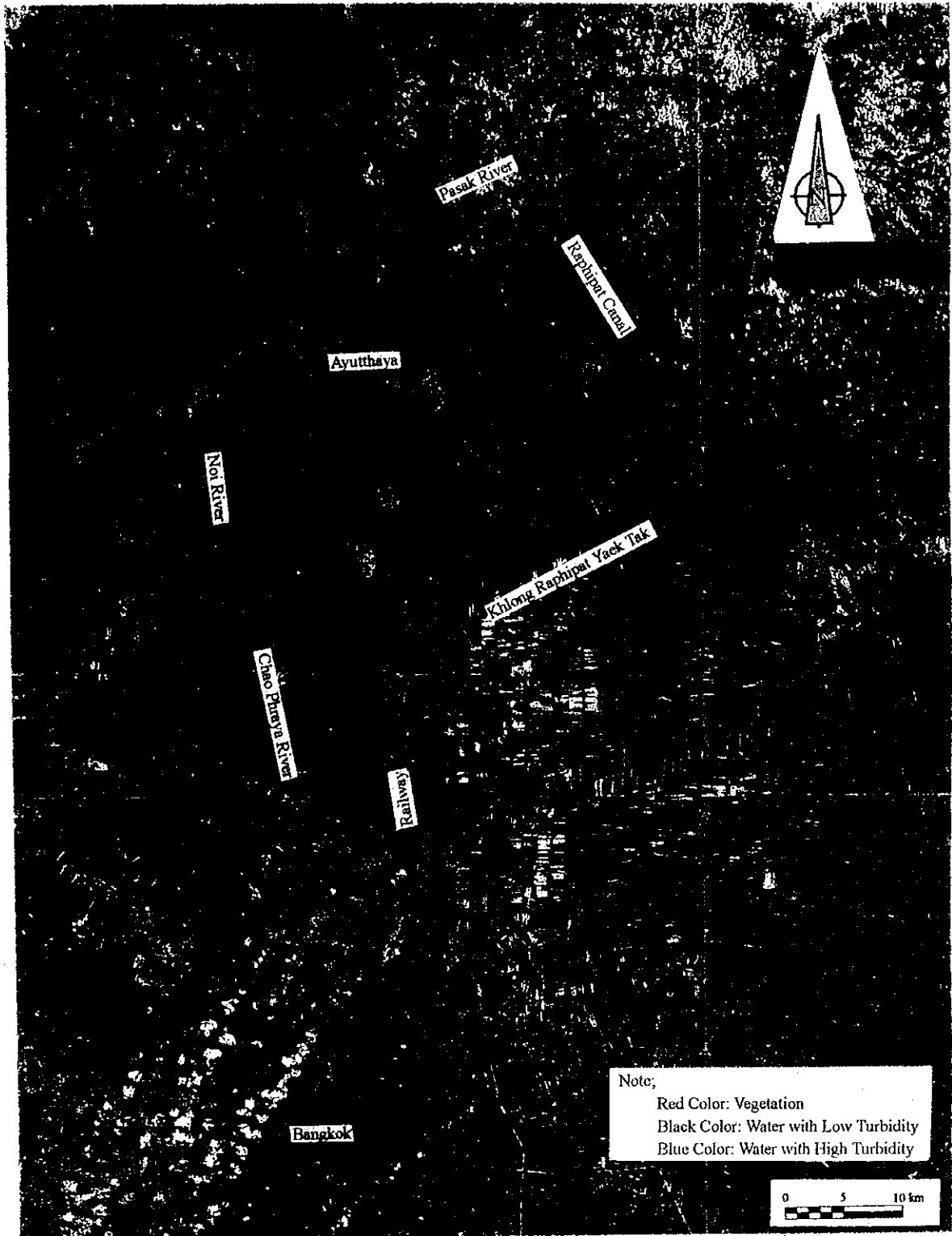
STUDY ON INTEGRATED PLAN FOR FLOOD MITIGATION IN CHAO PHRAYA RIVER BASIN

Fig. 2.4.7(1/2)

EMBANKMENT AFFECTING FLOODING CONDITION

CTI ENGINEERING CO., LTD. AND INA CORPORATION

# K.RAPHIPAT YAEK TAK AND RAILWAY



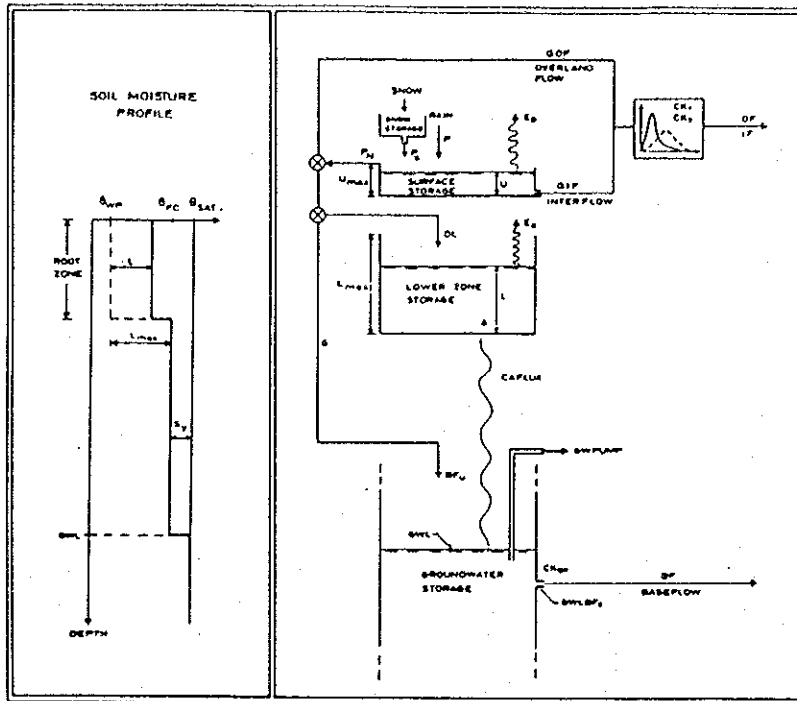
Landsat TM False Color Image (1996.Nov.15)

STUDY ON INTEGRATED PLAN FOR FLOOD  
 MITIGATION IN CHAO PHRAYA RIVER BASIN

Fig. 2.4.7(2/2)

EMBANKMENT AFFECTING FLOODING  
 CONDITION

CTI ENGINEERING CO., LTD. AND INA CORPORATION



a) NAM Model



Legend

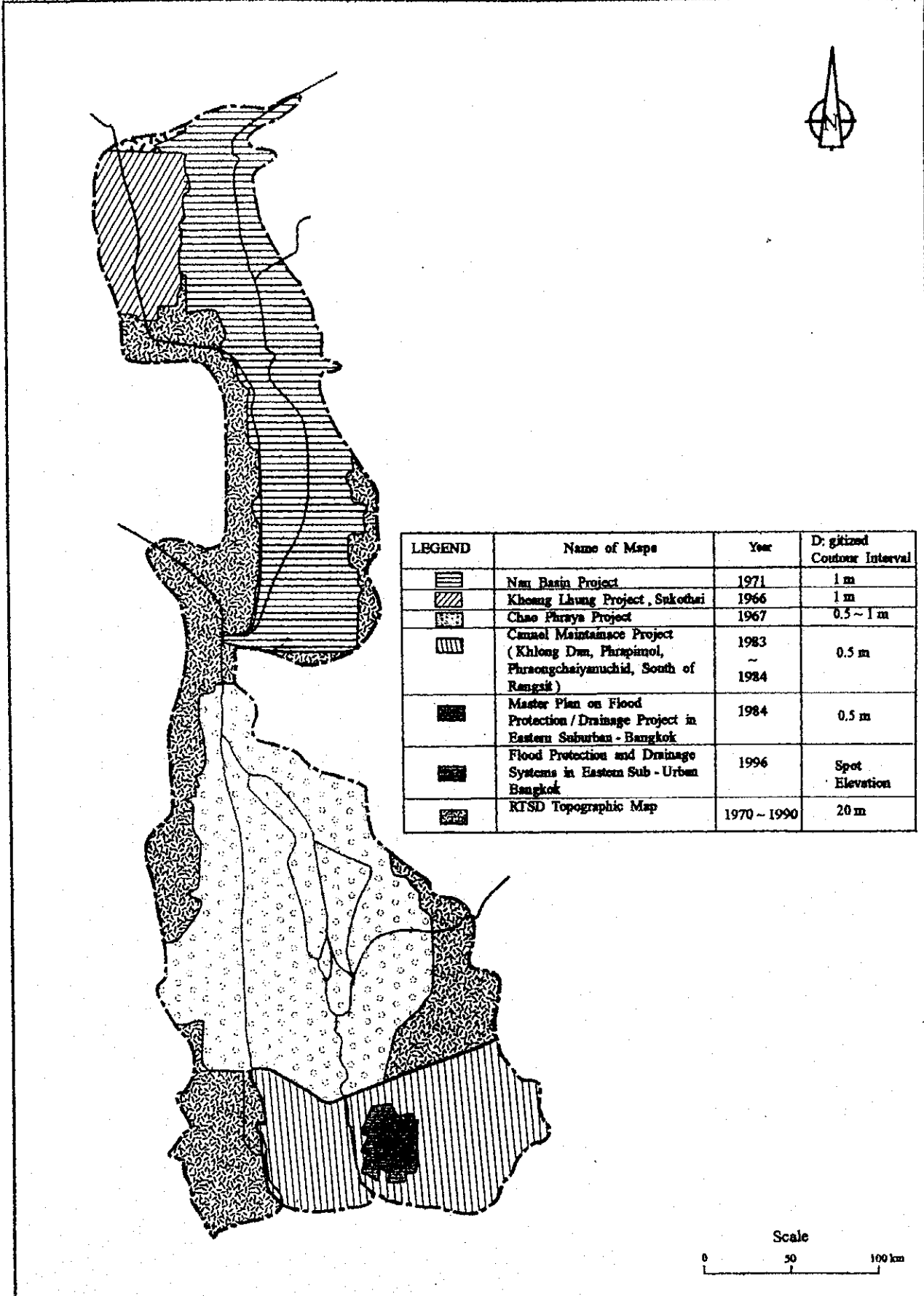
- Water level point of flood plain cell
- Discharge point

b) Modeling of River Network and Flood Plain by HD Module

Source: "Brochure of MIKE11, DHI"

STUDY ON INTEGRATED PLAN FOR FLOOD MITIGATION IN CHAO PHRAYA RIVER BASIN  
CTI ENGINEERING CO., LTD. AND INA CORPORATION

Fig. 3.3.1 NAM MODULE STRUCTURE AND MODELING OF RIVER NETWORK AND FLOOD PLAIN



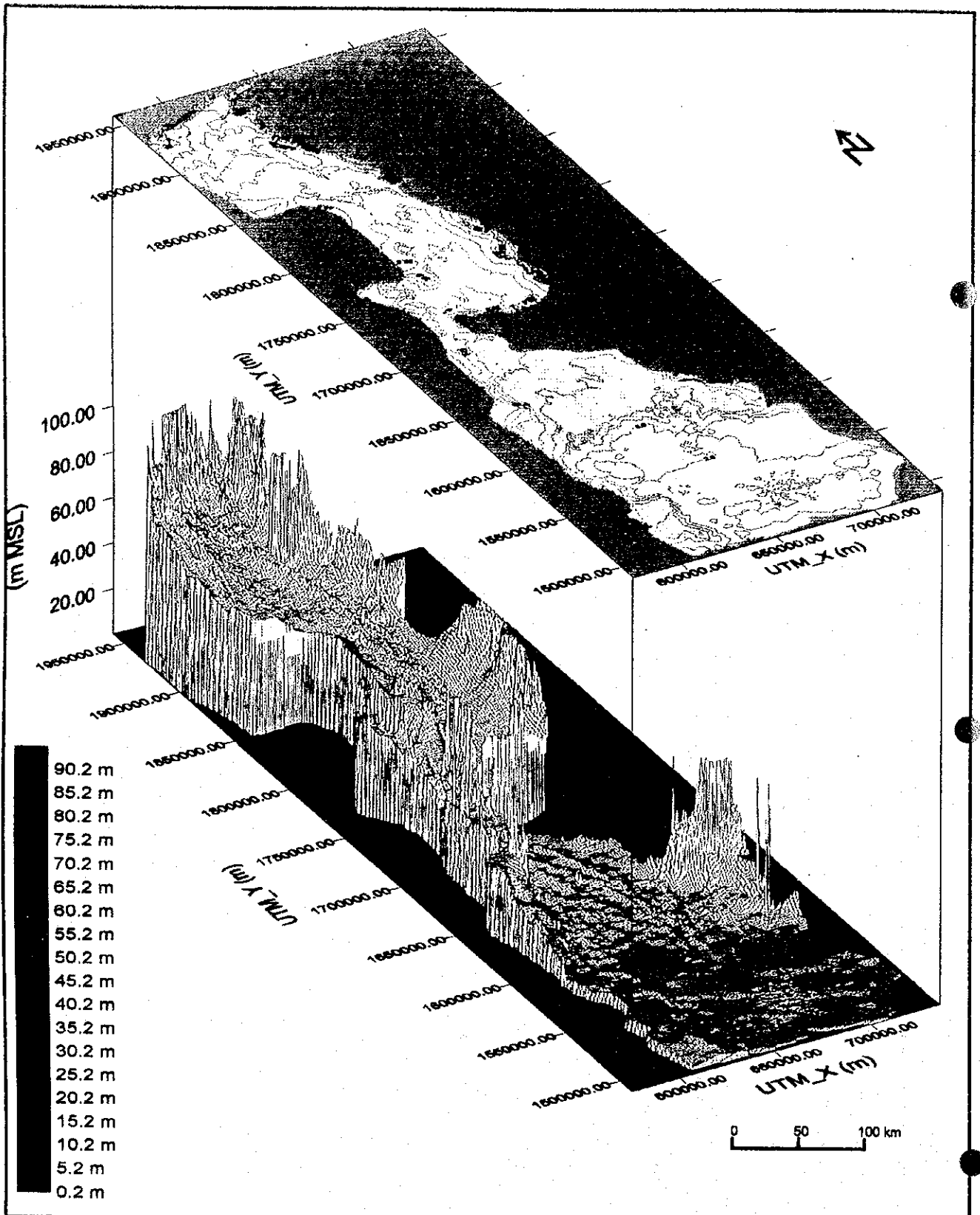
LEGEND	Name of Maps	Year	Digitized Contour Interval
	Nau Basin Project	1971	1 m
	Khesang Lhung Project, Sukothai	1966	1 m
	Chao Phraya Project	1967	0.5 ~ 1 m
	Canal Maintenance Project (Khlong Dam, Phrajanol, Phraongchaiyanuchid, South of Rangsit)	1983 ~ 1984	0.5 m
	Master Plan on Flood Protection / Drainage Project in Eastern Suburban - Bangkok	1984	0.5 m
	Flood Protection and Drainage Systems in Eastern Sub - Urban Bangkok	1996	Spot Elevation
	RTSD Topographic Map	1970 ~ 1990	20 m

**STUDY ON INTEGRATED PLAN FOR FLOOD MITIGATION IN CHAO PHRAYA RIVER BASIN**

CTI ENGINEERING CO., LTD AND INA CORPORATION

Fig. 3.3.2  
INDEX OF TOPOGRAPHIC MAPS

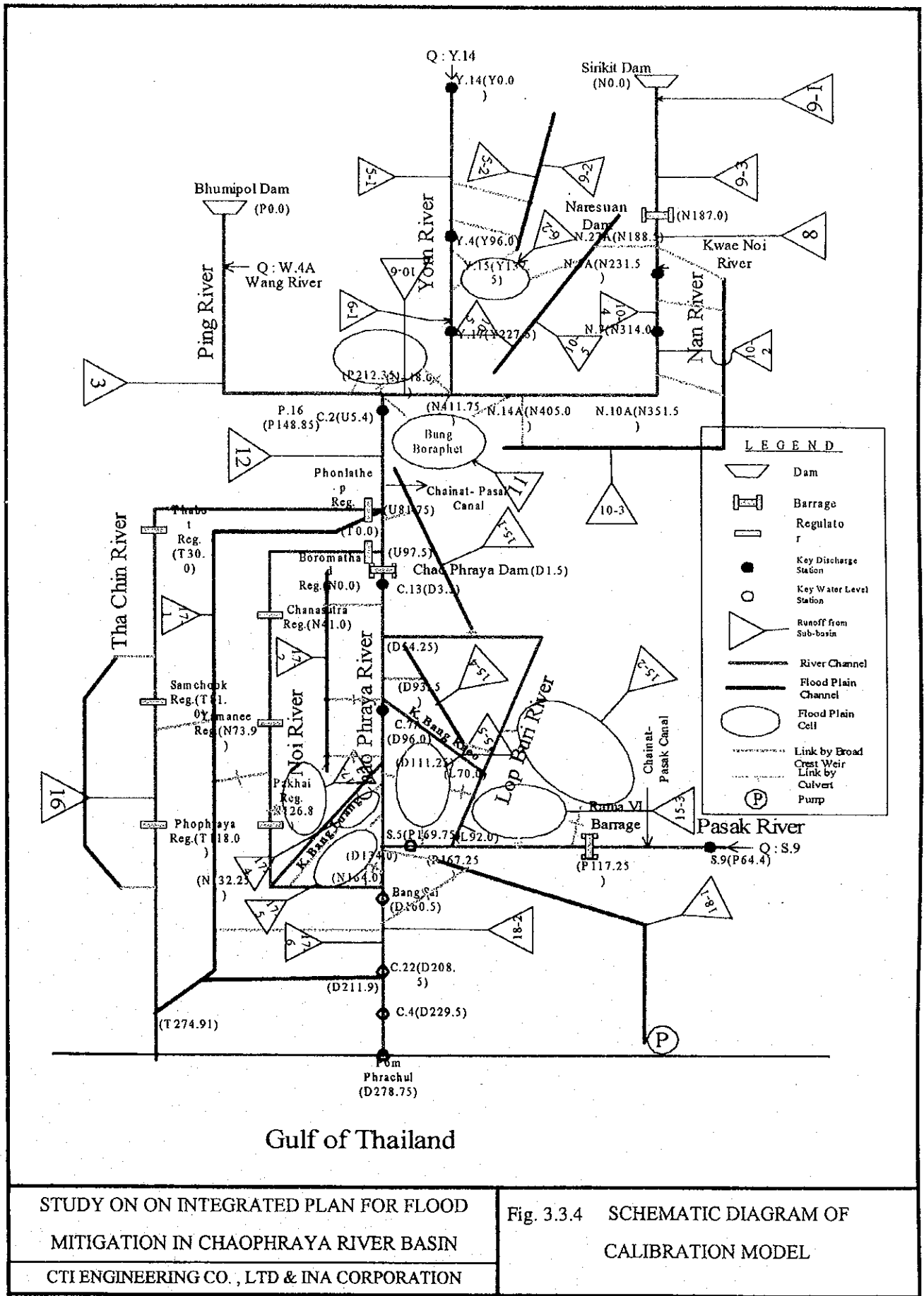




STUDY ON INTEGRATED PLAN FOR FLOOD MITIGATION IN CHAO PHRAYA RIVER BASIN

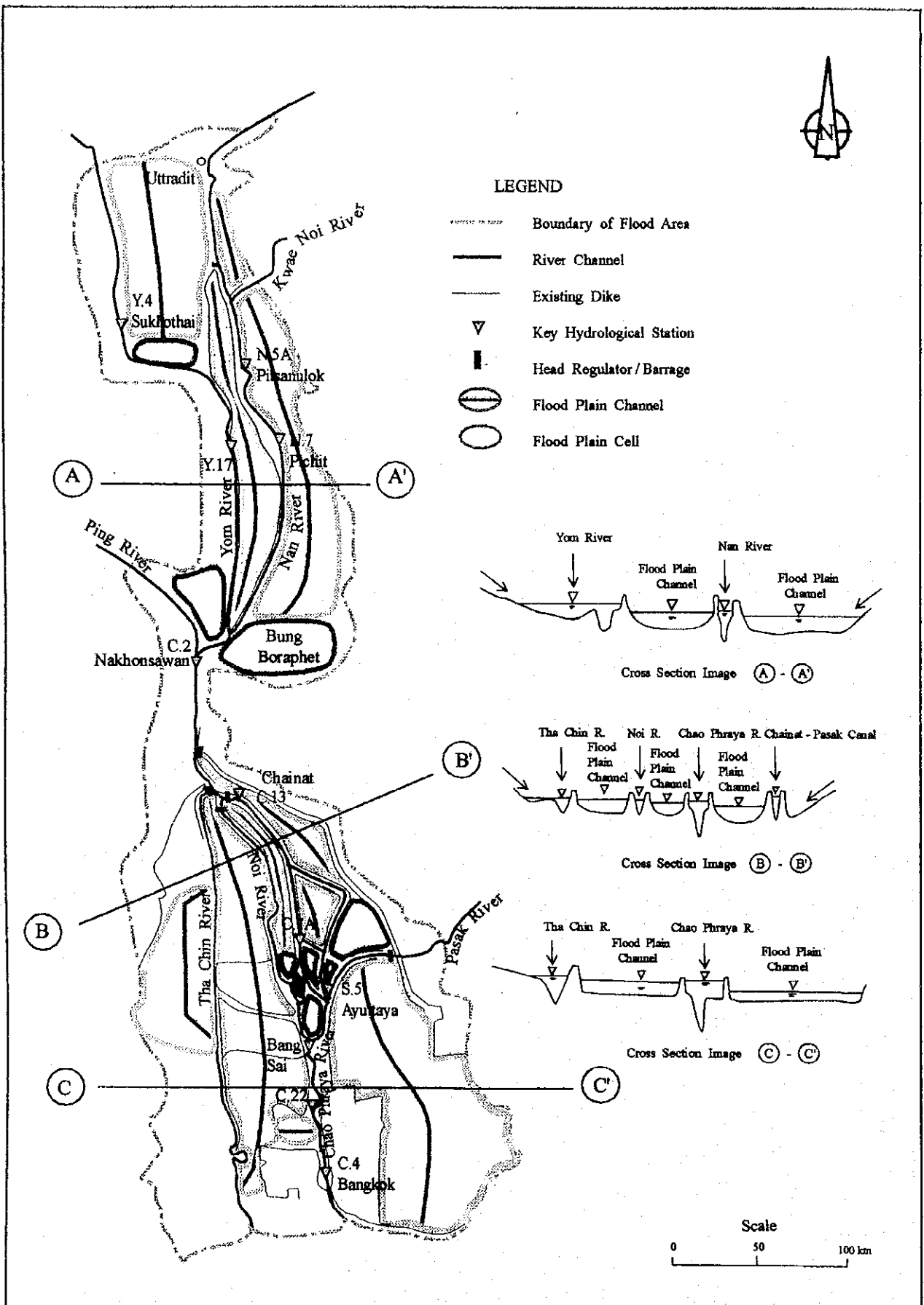
CTI ENGINEERING CO., LTD. AND INA CORPORATION

Fig. 3.3.3 THREE DIMENSIONAL VIEW OF PROBABLE MAXIMUM FLOOD AREA



STUDY ON ON INTEGRATED PLAN FOR FLOOD MITIGATION IN CHAOPHRAYA RIVER BASIN  
 CTI ENGINEERING CO., LTD & INA CORPORATION

Fig. 3.3.4 SCHEMATIC DIAGRAM OF CALIBRATION MODEL

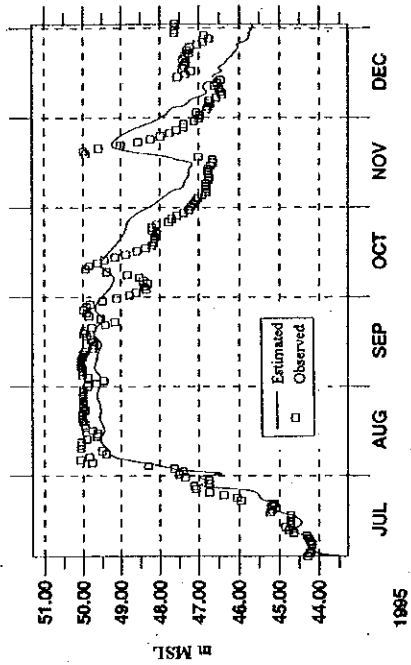


**STUDY ON INTEGRATED PLAN FOR FLOOD MITIGATION IN CHAO PHRAYA RIVER BASIN**

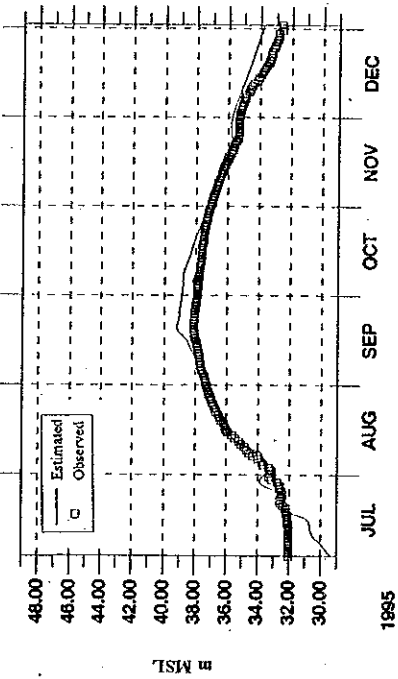
CTI ENGINEERING CO., LTD AND INA CORPORATION

**Fig. 3.3.5 FLOOD PLAIN DIVISION FOR MODELING**

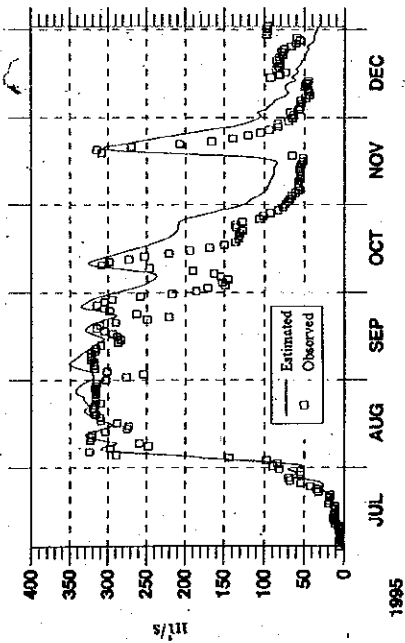
Y.4 Water Level



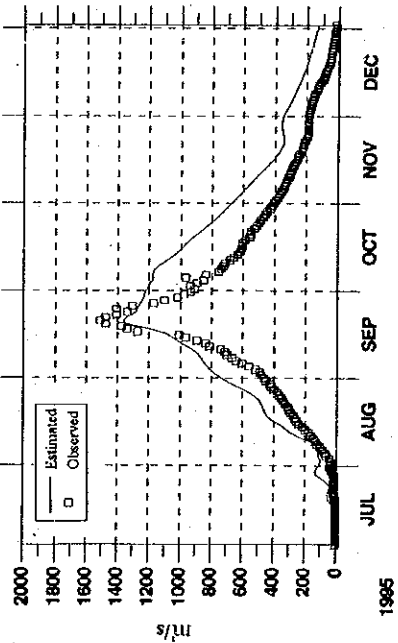
Y.17 Water Level



Y.4 Discharge



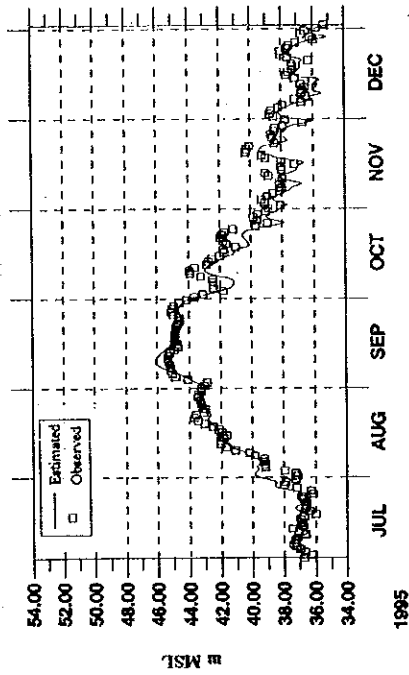
Y.17 Discharge



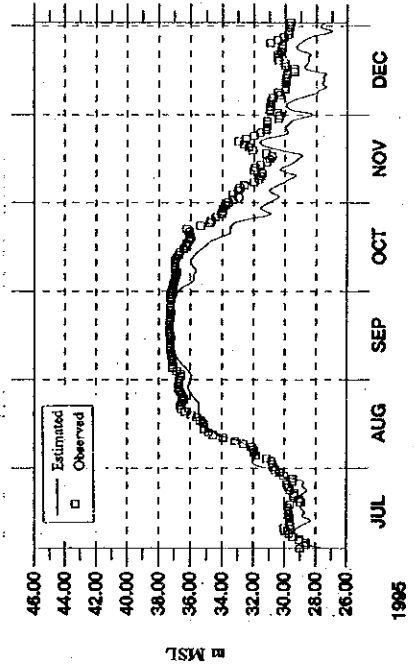
STUDY ON ON INTEGRATED PLAN FOR FLOOD  
MITIGATION IN CHAOPHRAYA RIVER BASIN  
CTI ENGINEERING CO., LTD & INA CORPORATION

Fig. 3.3.6(1/6) RESULT OF 1995 FLOOD SIMULATION

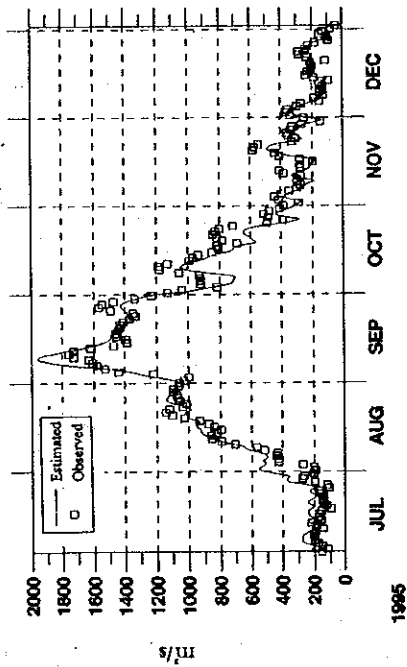
N.5A Water Level



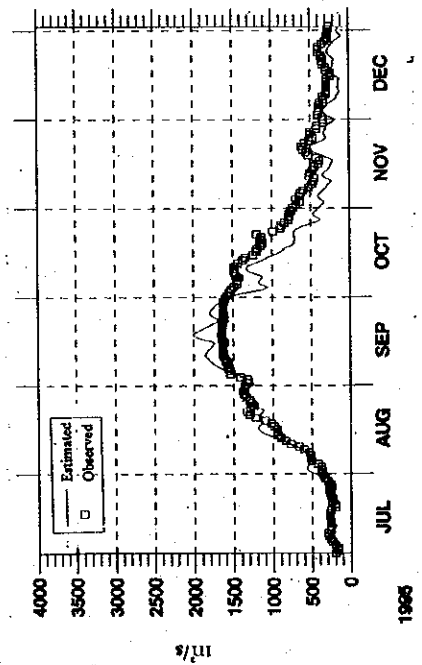
N.7 Water Level



N.5A Discharge



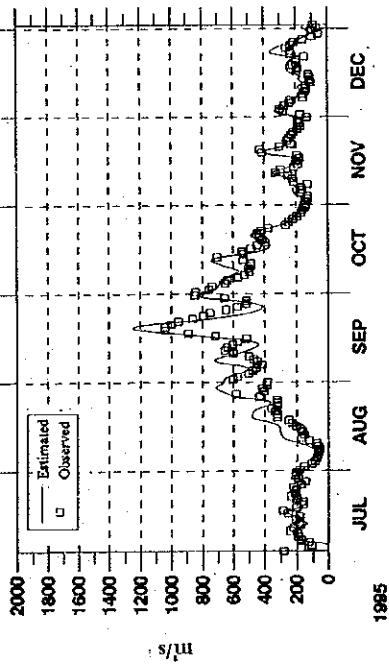
N.7 Discharge



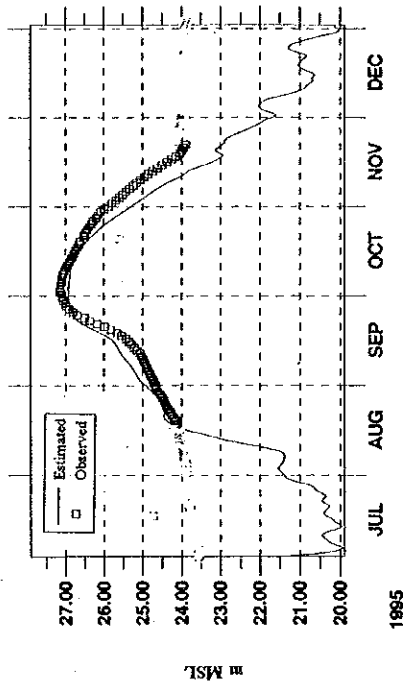
STUDY ON ON INTEGRATED PLAN FOR FLOOD  
 MITIGATION IN CHAOPHRAYA RIVER BASIN  
 CTI ENGINEERING CO., LTD & INA CORPORATION

Fig. 3.3.6(2/6) RESULT OF 1995 FLOOD SIMULATION

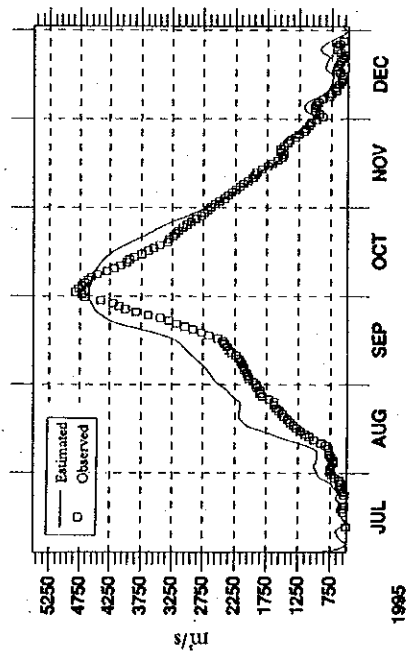
P.17 Discharge



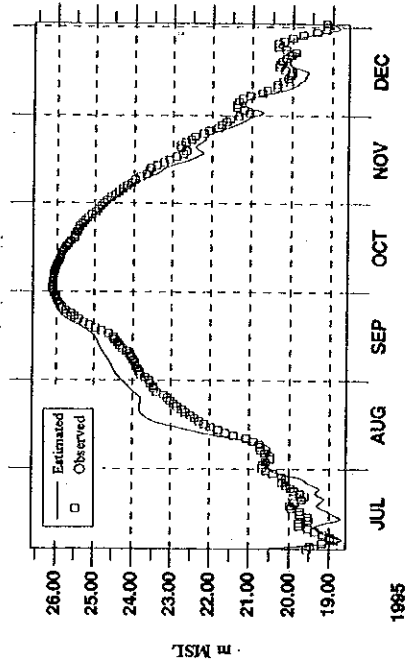
Bung Boraphet Water Level



C.2 Discharge



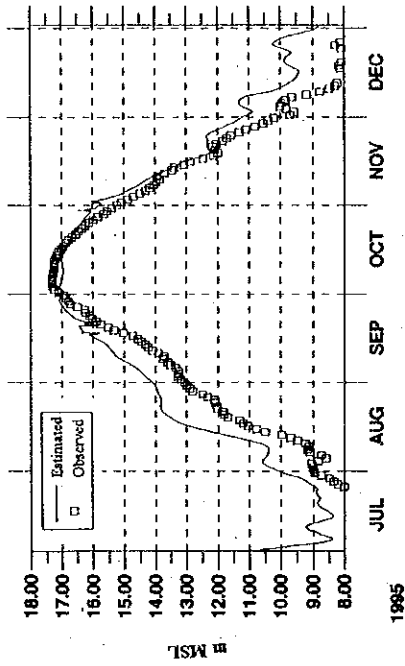
C.2 Water Level



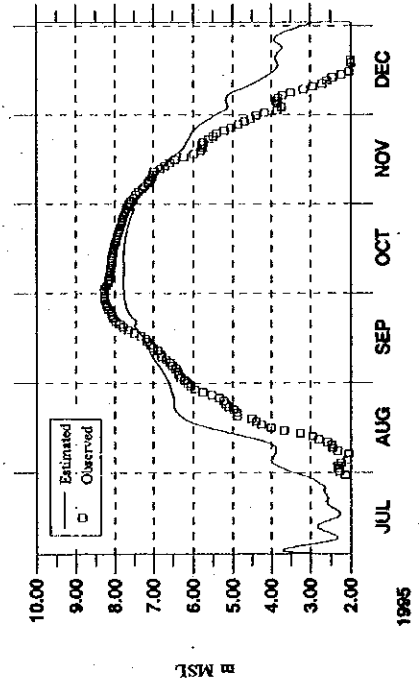
STUDY ON ON INTEGRATED PLAN FOR FLOOD  
 MITIGATION IN CHAOPHRAYA RIVER BASIN  
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Fig. 3.3.6(3/6) RESULT OF 1995 FLOOD SIMULATION

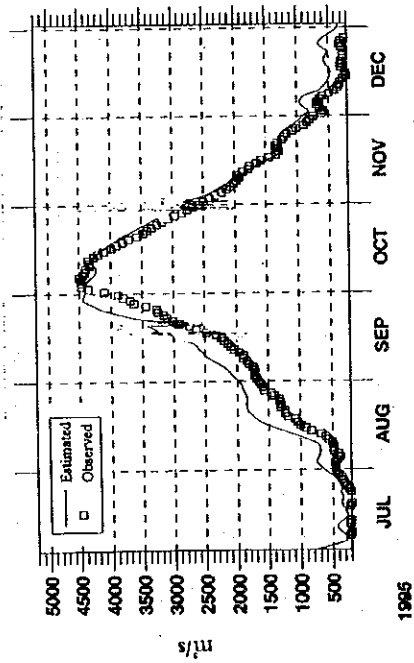
C.13 Water Level



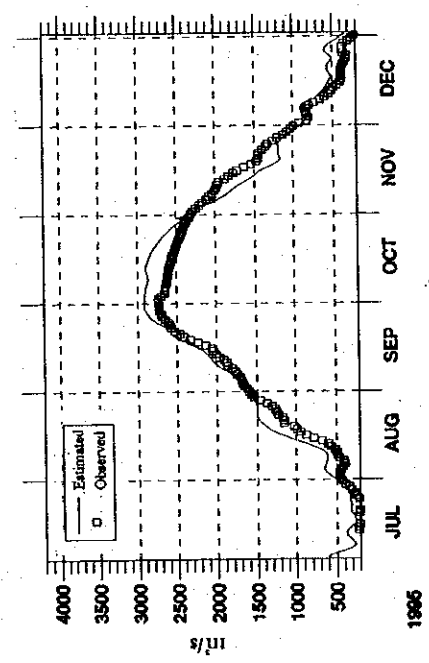
C.7A Water Level



C.13 Discharge



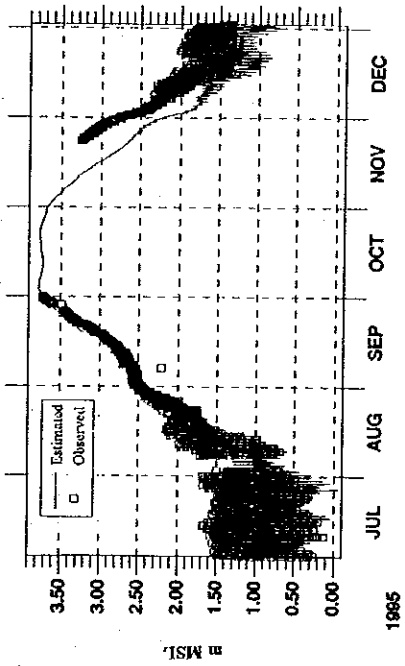
C.7A Discharge



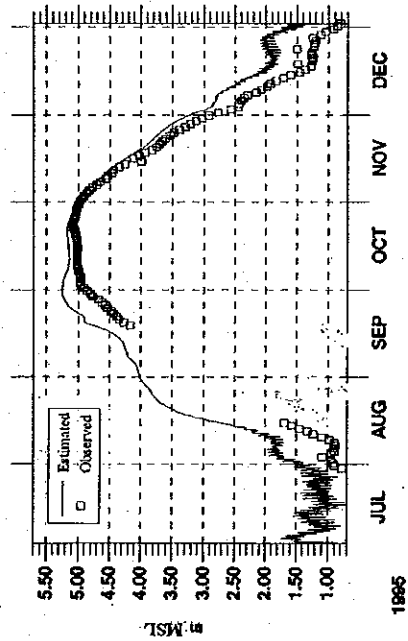
STUDY ON ON INTEGRATED PLAN FOR FLOOD  
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 CTI ENGINEERING CO., LTD & INA CORPORATION

Fig. 3.3.6(4/6) RESULT OF 1995 FLOOD SIMULATION

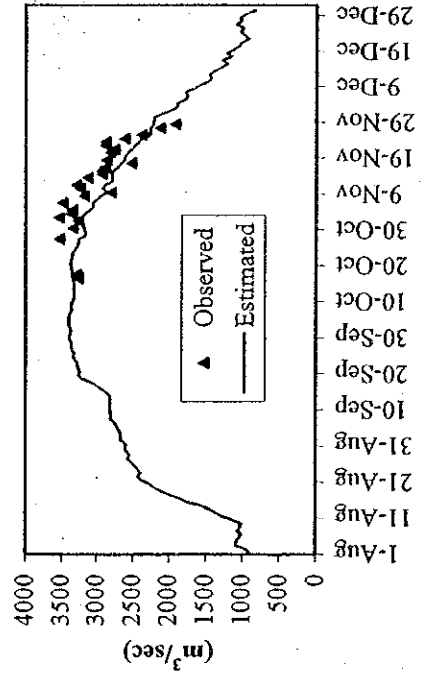
Bang Sai Water Level



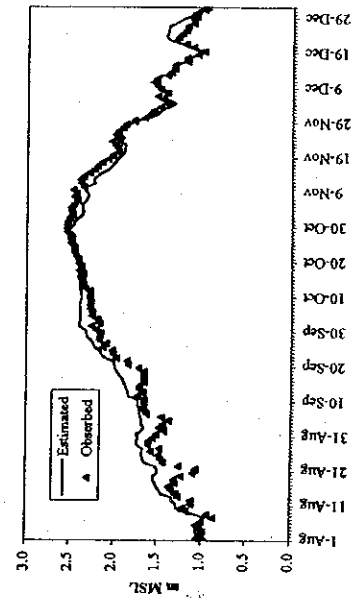
C.34 Water Level



Daily Mean Discharge at Phranang Klao Bridge



C.22 Daily Maximum Waterlevel

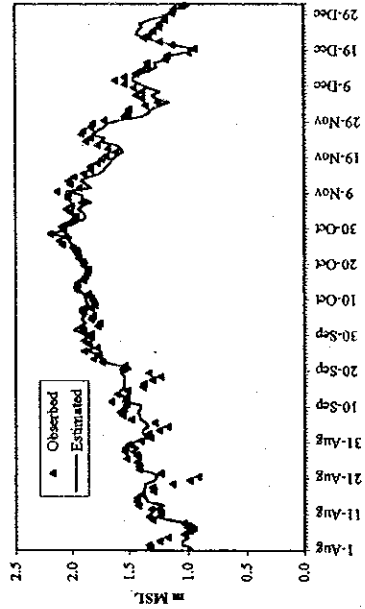


STUDY ON ON INTEGRATED PLAN FOR FLOOD  
MITIGATION IN CHAOPHRAYA RIVER BASIN  
CTI ENGINEERING CO., LTD & INA CORPORATION

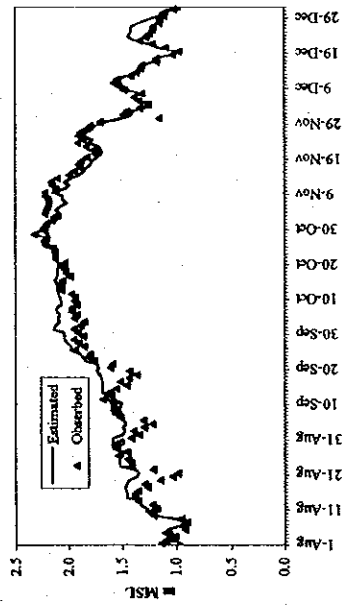
Fig. 3.3.6(5/6) RESULT OF 1995 FLOOD SIMULATION



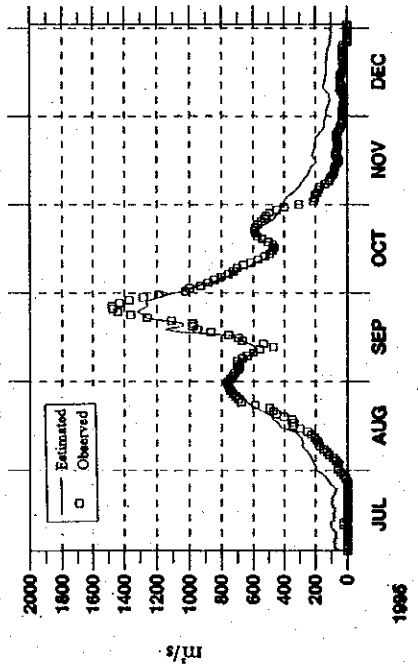
C.4 Daily Maximum Waterlevel



C.12 Daily Maximum Waterlevel



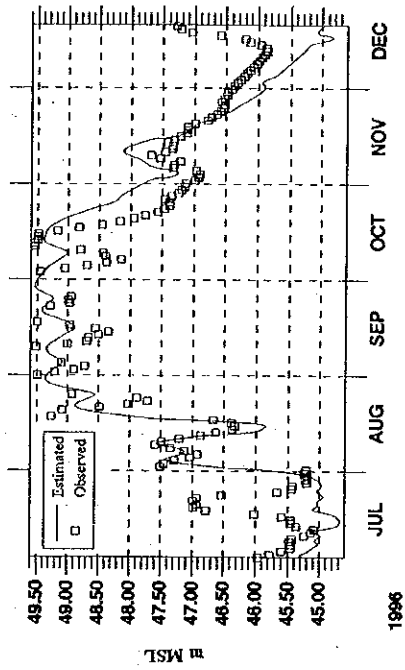
Rama VI Barrage Discharge



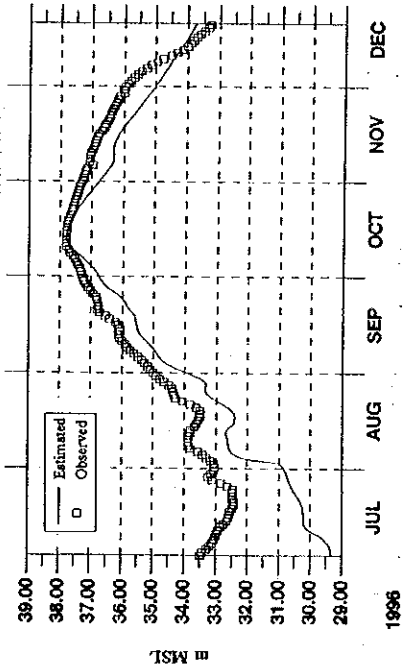
STUDY ON ON INTEGRATED PLAN FOR FLOOD  
 MITIGATION IN CHAOPHRAYA RIVER BASIN  
 CTI ENGINEERING CO., LTD & INA CORPORATION

Fig. 3.3.6(6/6) RESULT OF 1995 FLOOD SIMULATION

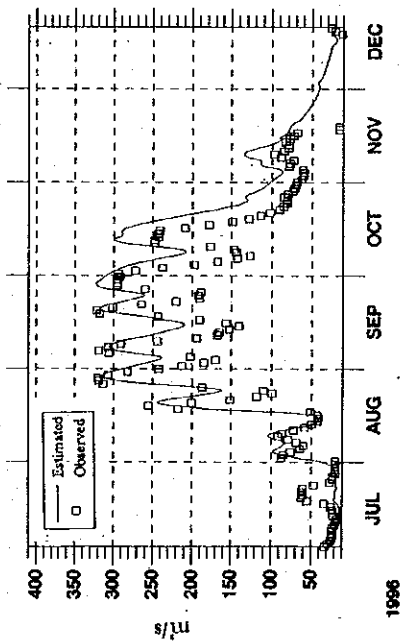
Y.4 Water Level



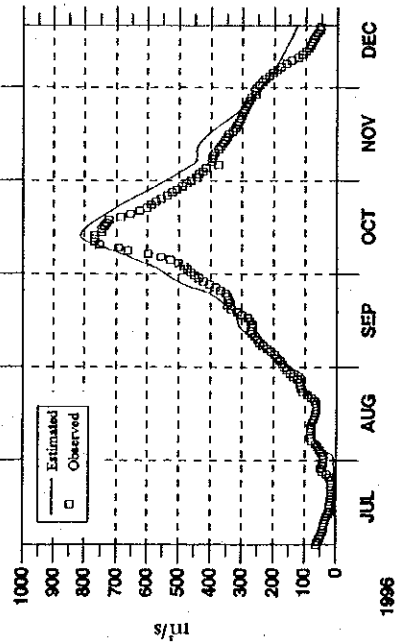
Y.17 Water Level



Y.4 Discharge



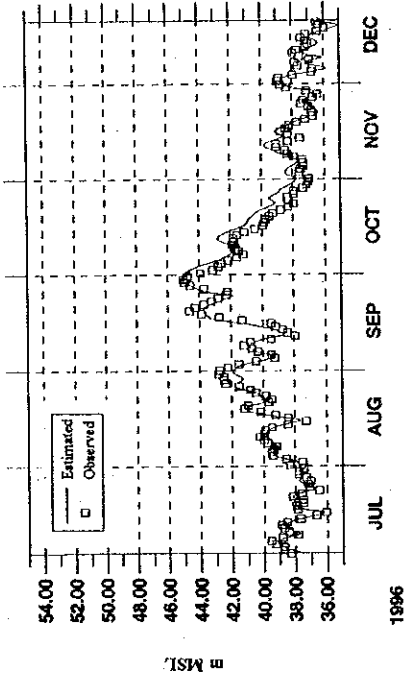
Y.17 Discharge



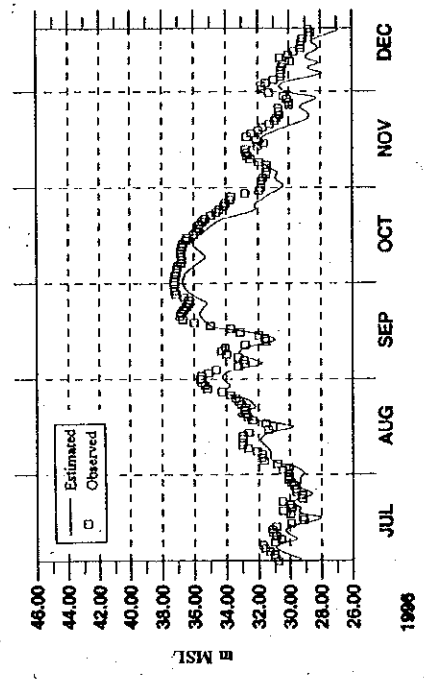
STUDY ON ON INTEGRATED PLAN FOR FLOOD  
MITIGATION IN CHAOPHRAYA RIVER BASIN  
CTI ENGINEERING CO., LTD & INA CORPORATION

Fig. 3.3.7(1/6) RESULT OF 1996 FLOOD SIMULATION

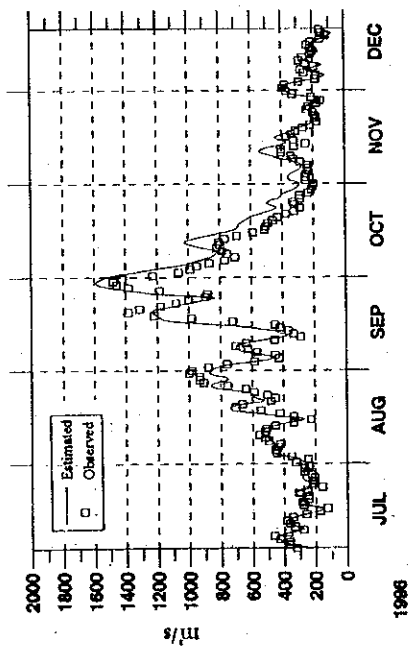
N.5A Water Level



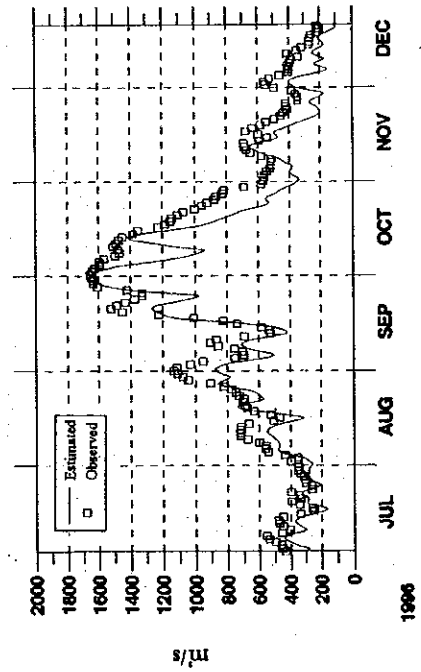
N.7 Water Level



N.5A Discharge



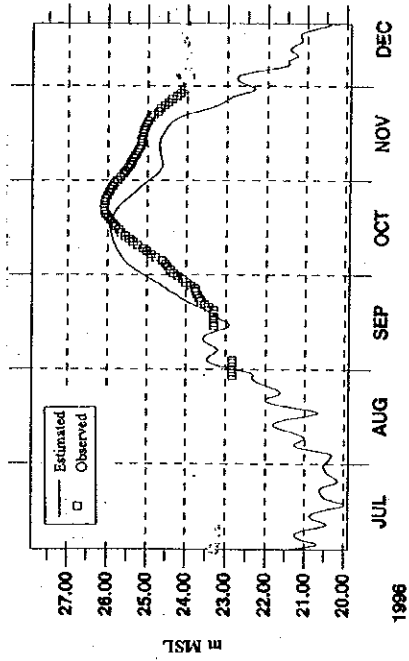
N.7 Discharge



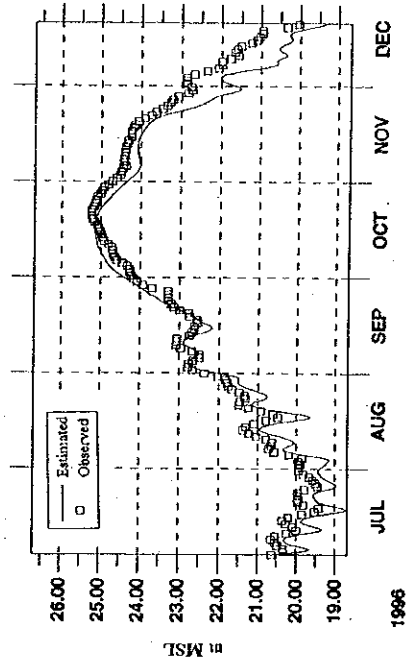
STUDY ON ON INTEGRATED PLAN FOR FLOOD  
 MITIGATION IN CHAOPHRAYA RIVER BASIN  
 CTI ENGINEERING CO., LTD & INA CORPORATION

Fig. 3.3.7(2/6) RESULT OF 1996 FLOOD SIMULATION

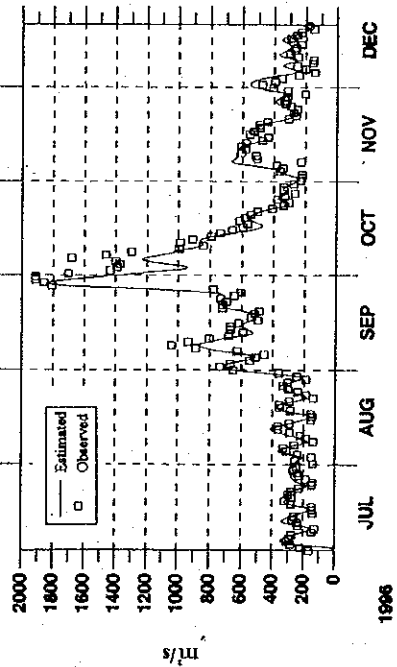
Bung Boraphet Water Level



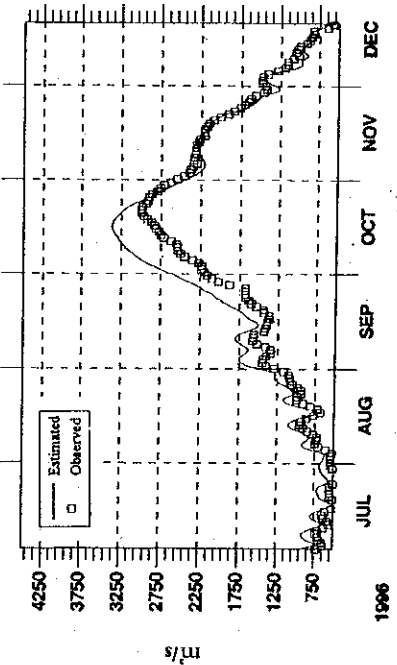
C.2 Water Level



P.17 Discharge



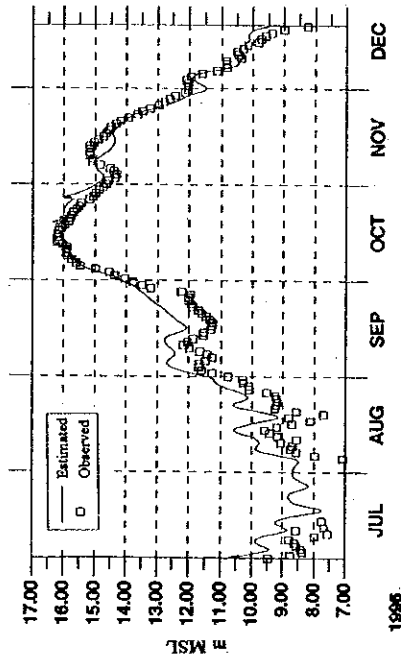
C.2 Discharge



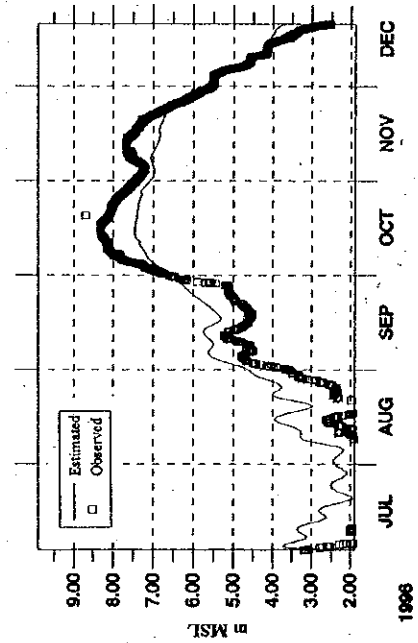
STUDY ON ON INTEGRATED PLAN FOR FLOOD  
 MITIGATION IN CHAOPHRAYA RIVER BASIN  
 CTI ENGINEERING CO., LTD & INA CORPORATION

Fig. 3.3.7(3/6) RESULT OF 1996 FLOOD SIMULATION

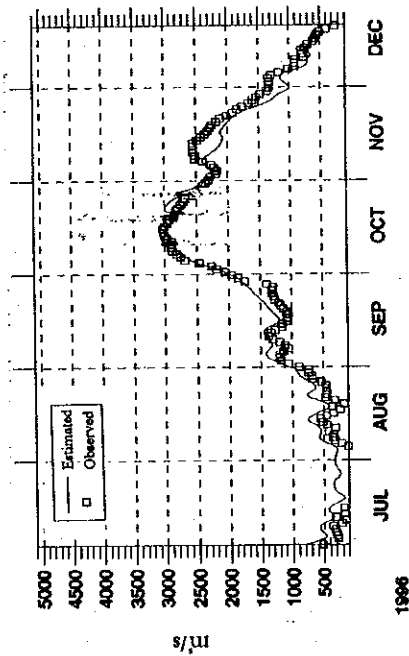
C.13 Water Level



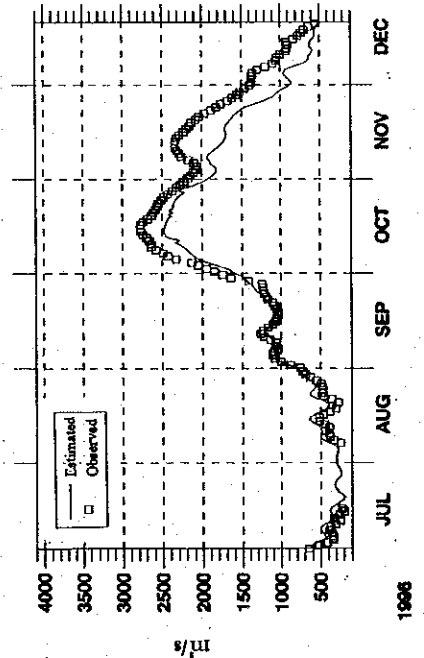
C.7A Water Level



C.13 Discharge

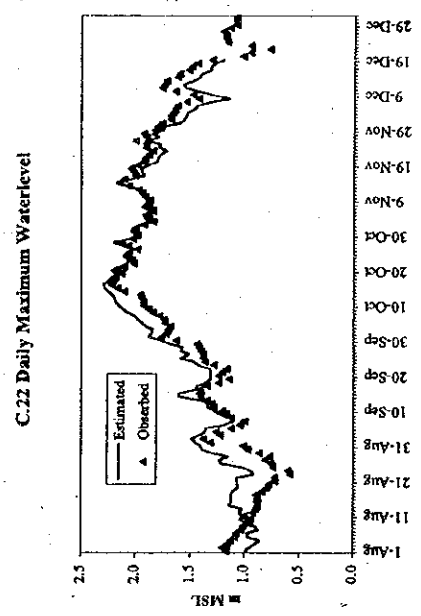
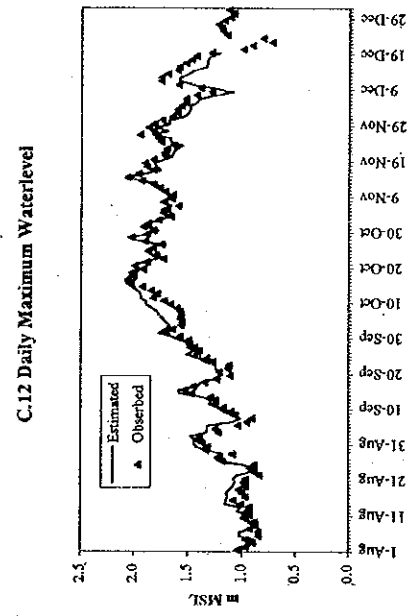
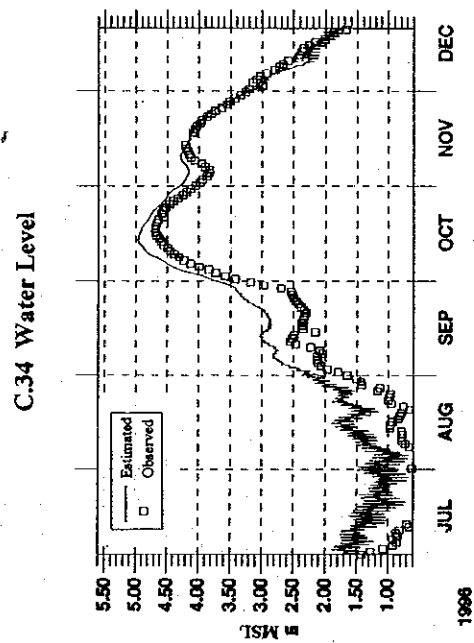
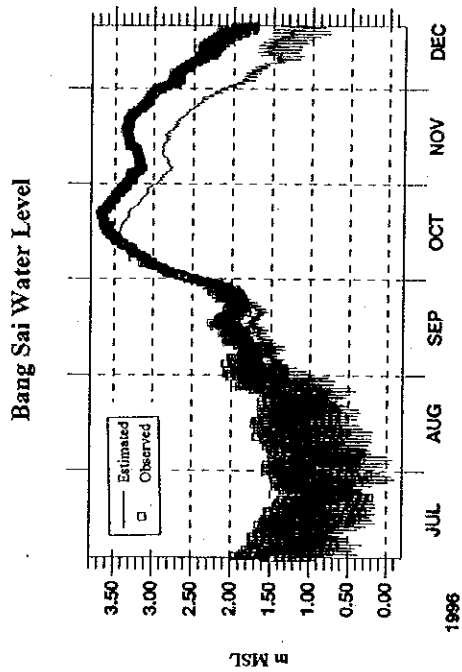


C.7A Discharge



STUDY ON ON INTEGRATED PLAN FOR FLOOD  
 MITIGATION IN CHAOPHRAYA RIVER BASIN  
 CTI ENGINEERING CO. , LTD & INA CORPORATION

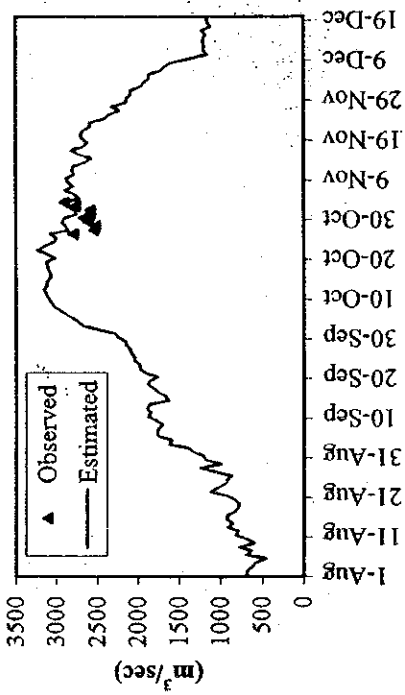
Fig. 3.3.7(4/6) RESULT OF 1996 FLOOD SIMULATION



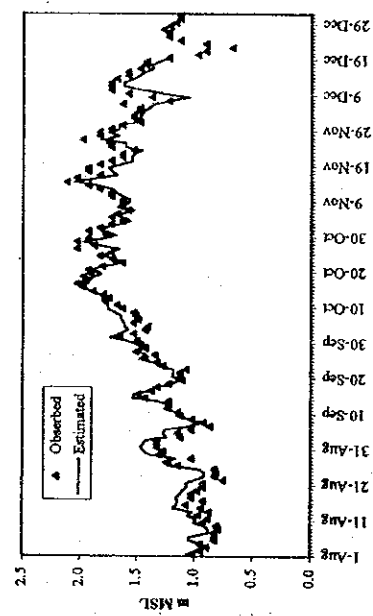
STUDY ON ON INTEGRATED PLAN FOR FLOOD  
 MITIGATION IN CHAOPHRAYA RIVER BASIN  
 CTI ENGINEERING CO., LTD & INA CORPORATION

Fig. 3.3.7(5/6) RESULT OF 1996 FLOOD SIMULATION

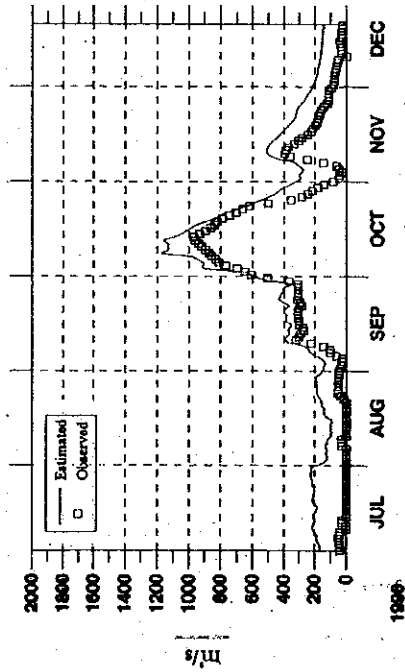
Daily Mean Discharge at Kurung Thong Bridge



C.4 Daily Maximum Waterlevel

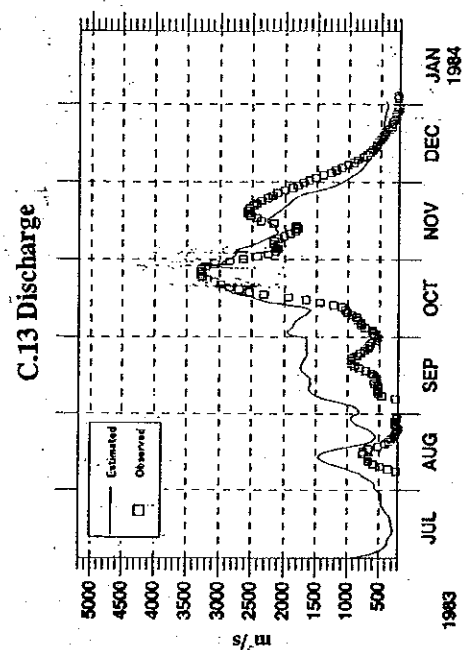
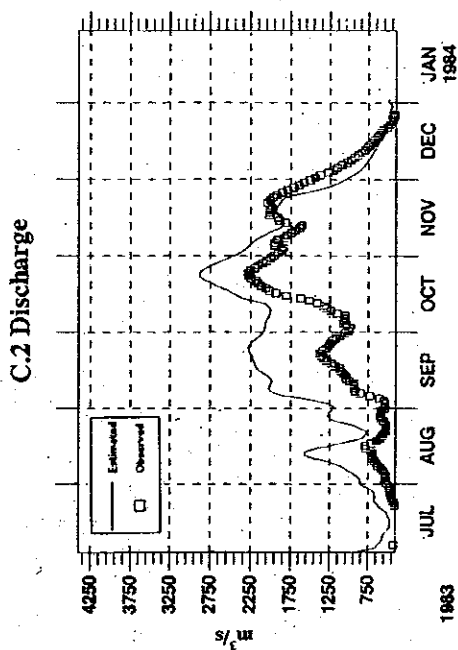
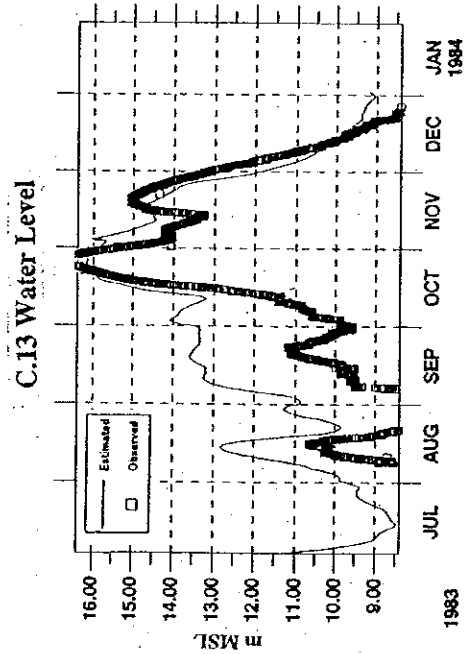
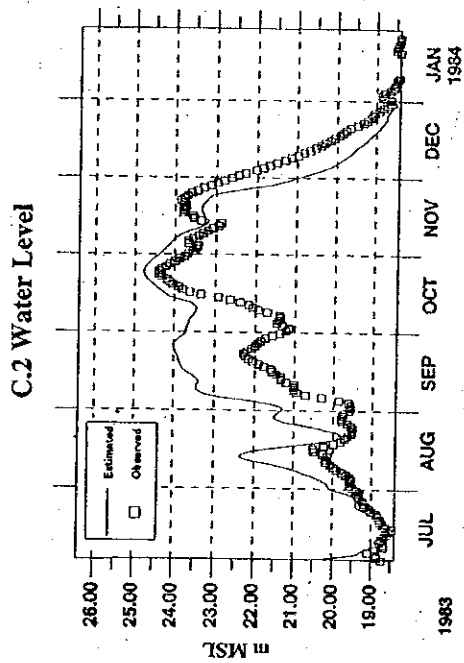


Rama Vi Barrage Discharge



STUDY ON ON INTEGRATED PLAN FOR FLOOD  
 MITIGATION IN CHAOPHRAYA RIVER BASIN  
 CTI ENGINEERING CO. , LTD & INA CORPORATION

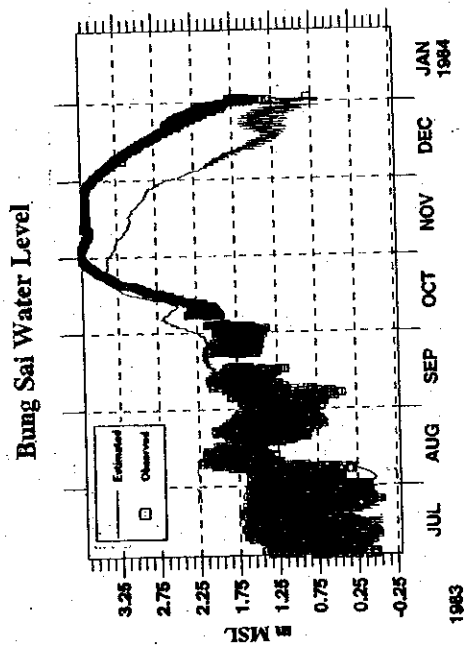
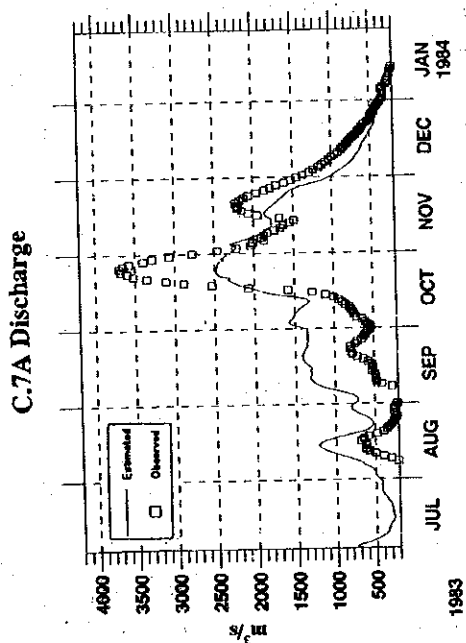
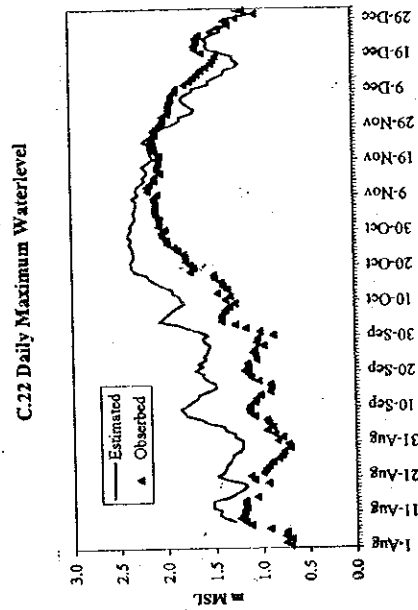
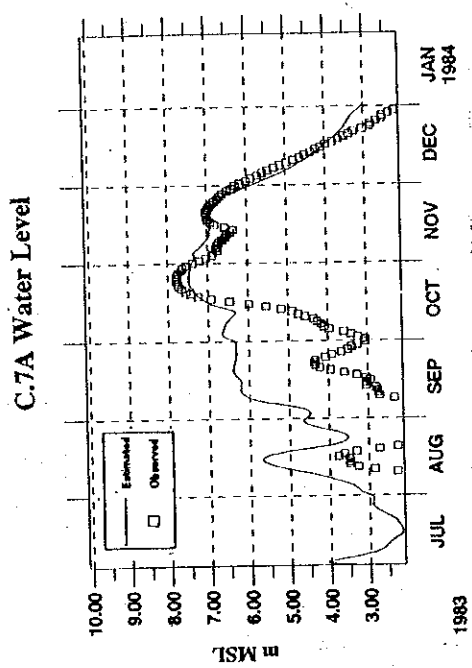
Fig. 3.3.7(6/6) RESULT OF 1996 FLOOD SIMULATION



STUDY ON INTEGRATED PLAN FOR FLOOD MITIGATION IN CHAO PHRAYA RIVER BASIN  
CTI ENGINEERING CO., LTD. AND INA CORPORATION

Fig. 3.3.8(1/3)  
RESULT OF 1983 FLOOD SIMULATION

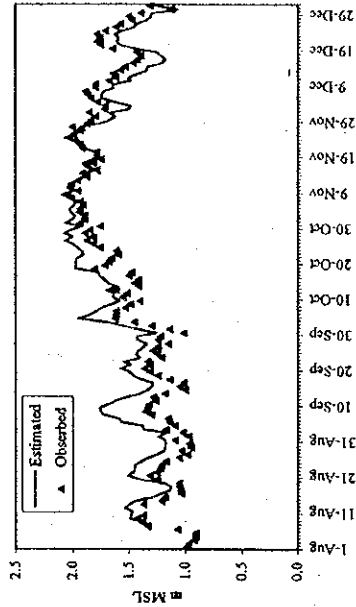




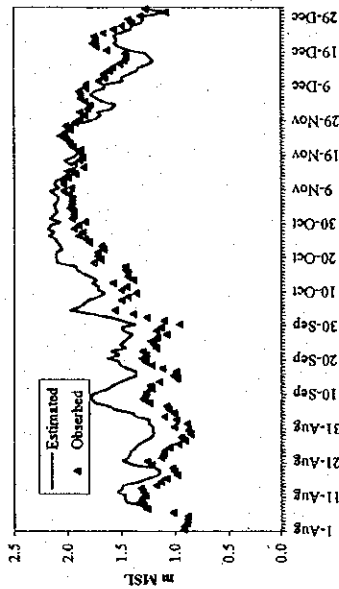
STUDY ON INTEGRATED PLAN FOR FLOOD  
 MITIGATION IN CHAO PHRAYA RIVER BASIN  
 CTI ENGINEERING CO., LTD. AND INA CORPORATION

Fig. 3.3.8(2/3)  
 RESULT OF 1983 FLOOD SIMULATION

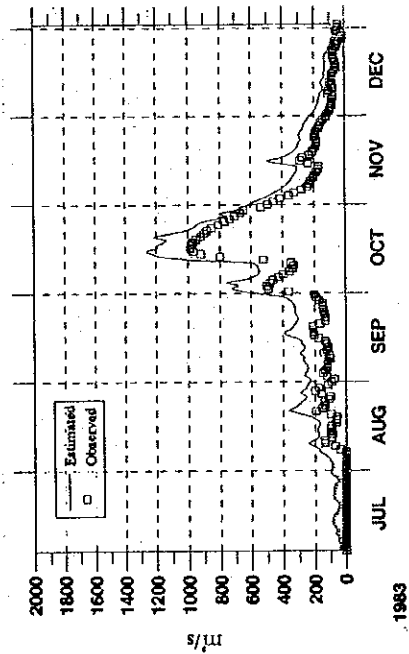
C.4 Daily Maximum Waterlevel



C.12 Daily Maximum Waterlevel



Rama VI Barrage Discharge



STUDY ON INTEGRATED PLAN FOR FLOOD MITIGATION IN CHAO PHRAYA RIVER BASIN  
 CTI ENGINEERING CO., LTD. AND INA CORPORATION

Fig. 3.3.8(3/3)

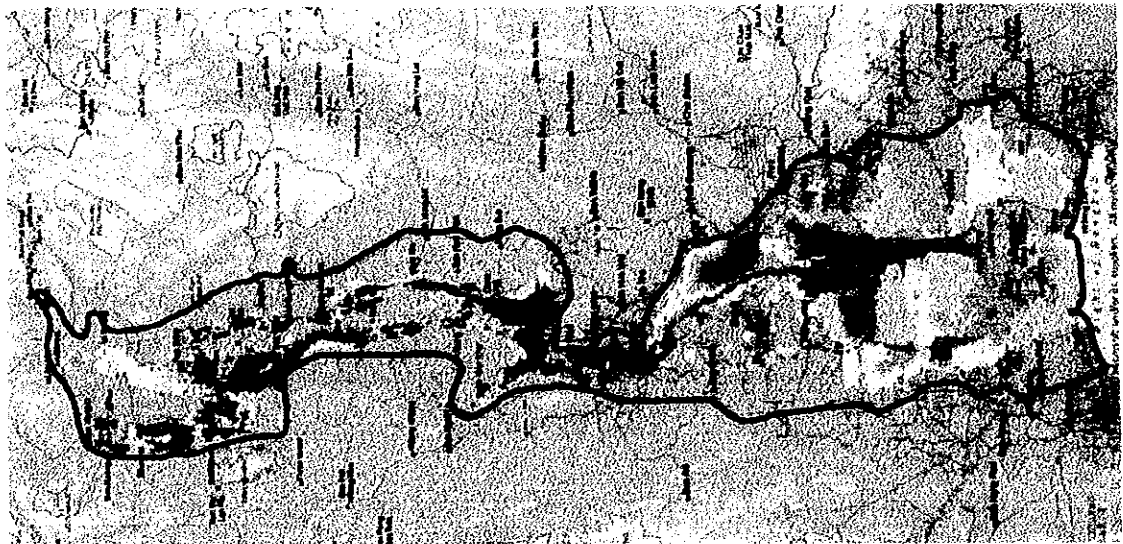
RESULT OF 1983 FLOOD SIMULATION

FLOOD MAP BASED ON SATELLITE IMAGES AND INTERVIEW SURVEY



Water Depth < 1m  
Water Depth ≥ 1m

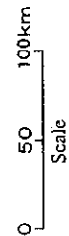
SIMULATED FLOOD MAP



1995

Boundary of Probable  
Maximum Flood Area

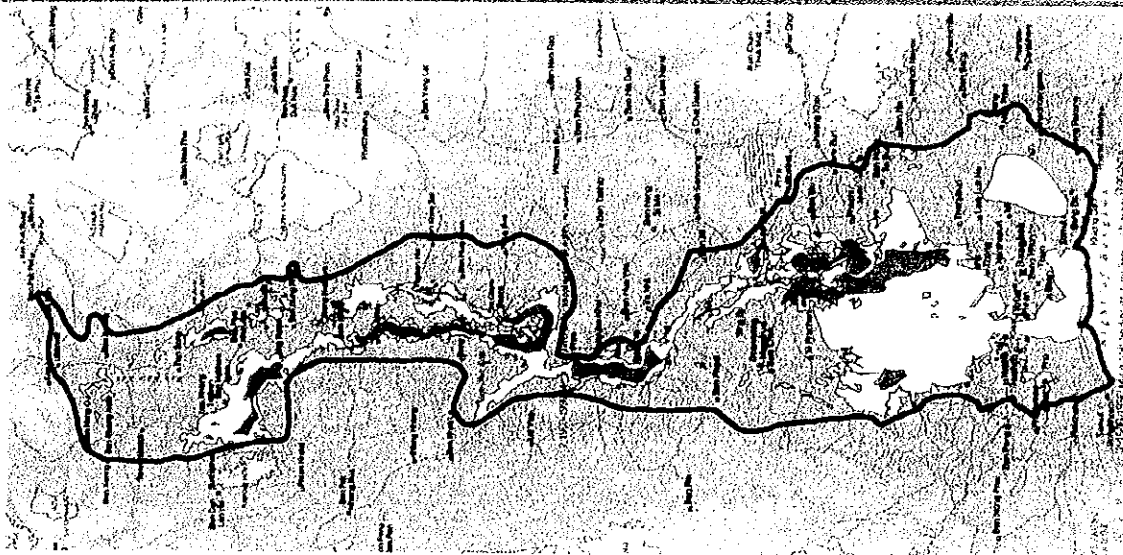
Water Depth (m)



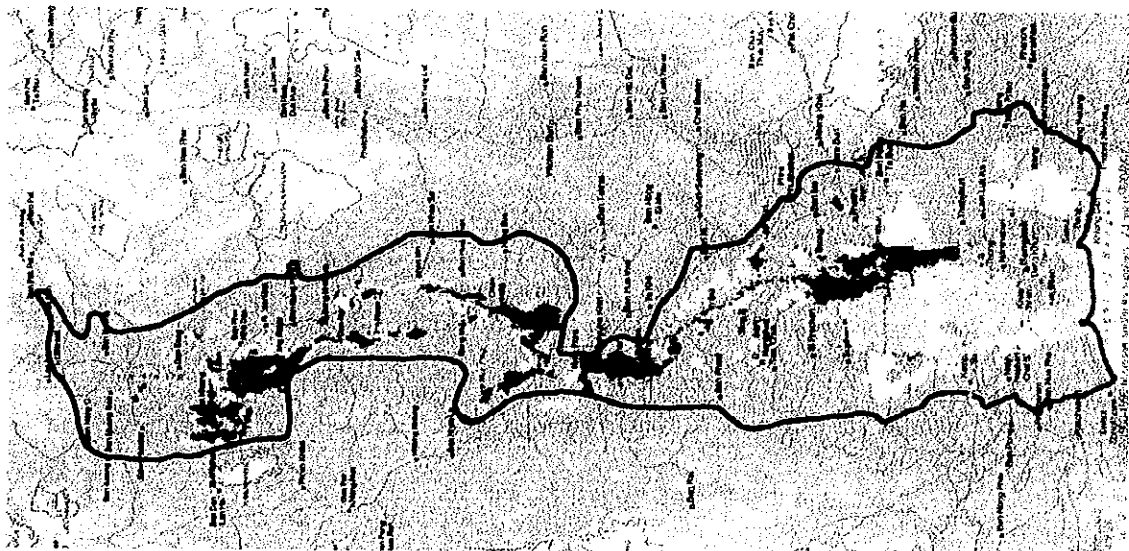
STUDY ON INTEGRATED PLAN FOR FLOOD MITIGATION IN CHAO PHRAYA RIVER BASIN  
CTI ENGINEERING CO., LTD. AND INA CORPORATION

Fig. 3.3.9(1/3)  
ESTIMATED FLOOD INUNDATION MAP

FLOOD MAP BASED ON SATELLITE IMAGES AND INTERVIEW SURVEY



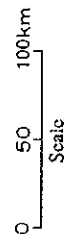
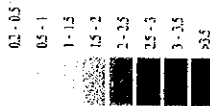
SIMULATED FLOOD MAP



1996

□ Boundary of Probable Maximum Flood Area

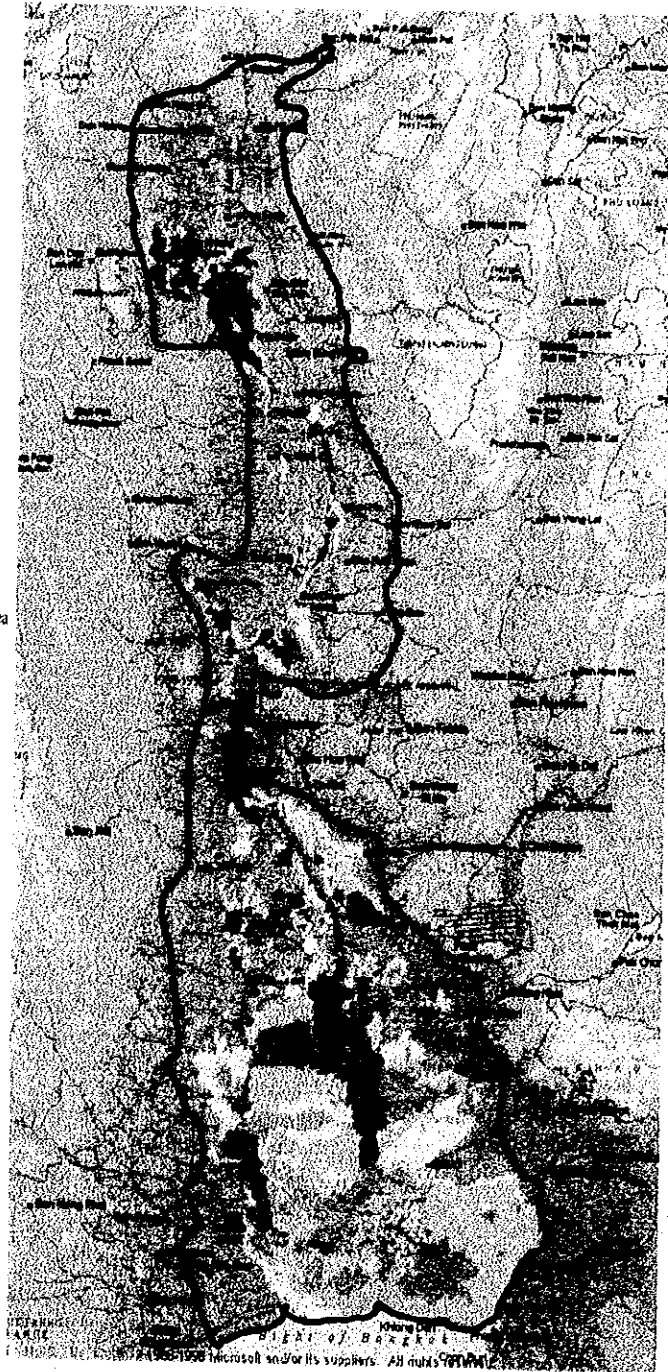
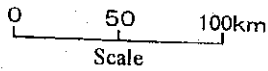
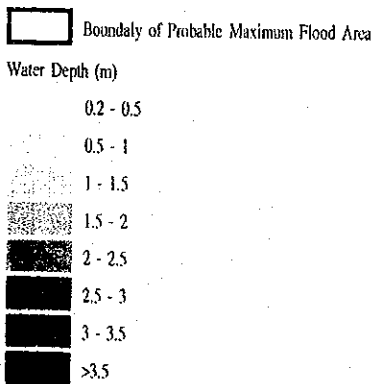
Water Depth (m)



STUDY ON INTEGRATED PLAN FOR FLOOD MITIGATION IN CHAO PHRAYA RIVER BASIN  
CTI ENGINEERING CO., LTD. AND INA CORPORATION

Fig. 3.3.9(2/3)  
ESTIMATED FLOOD INUNDATION MAP

# SIMULATED FLOOD MAP - 1983

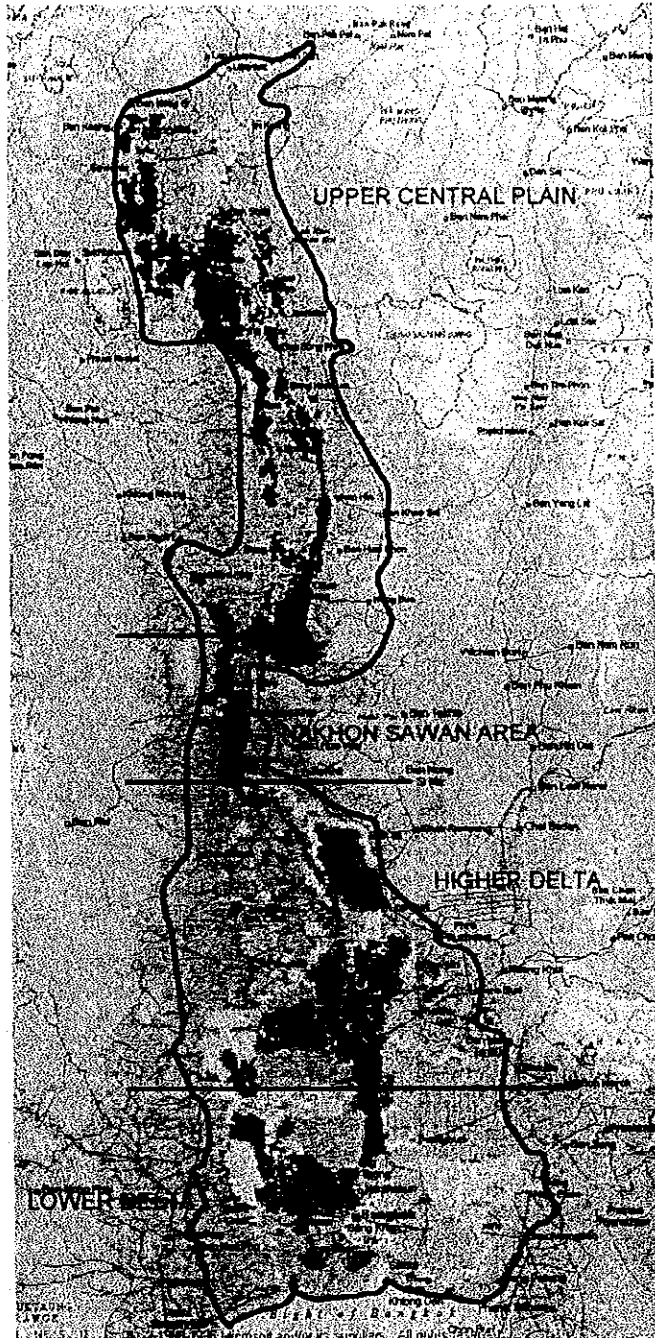
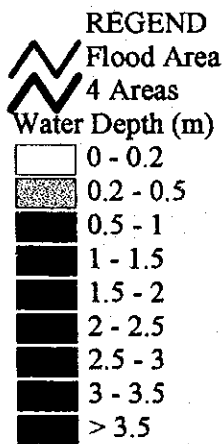
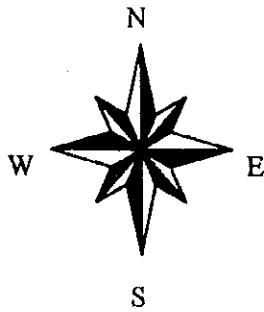


STUDY ON INTEGRATED PLAN FOR FLOOD  
 MITIGATION IN CHAO PHRAYA RIVER BASIN  
 CTI ENGINEERING CO., LTD. AND INA CORPORATION

Fig. 3.3.9(3/3)  
 ESTIMATED FLOOD INUNDATION MAP



# SIMULATED FLOOD MAP IN 1995



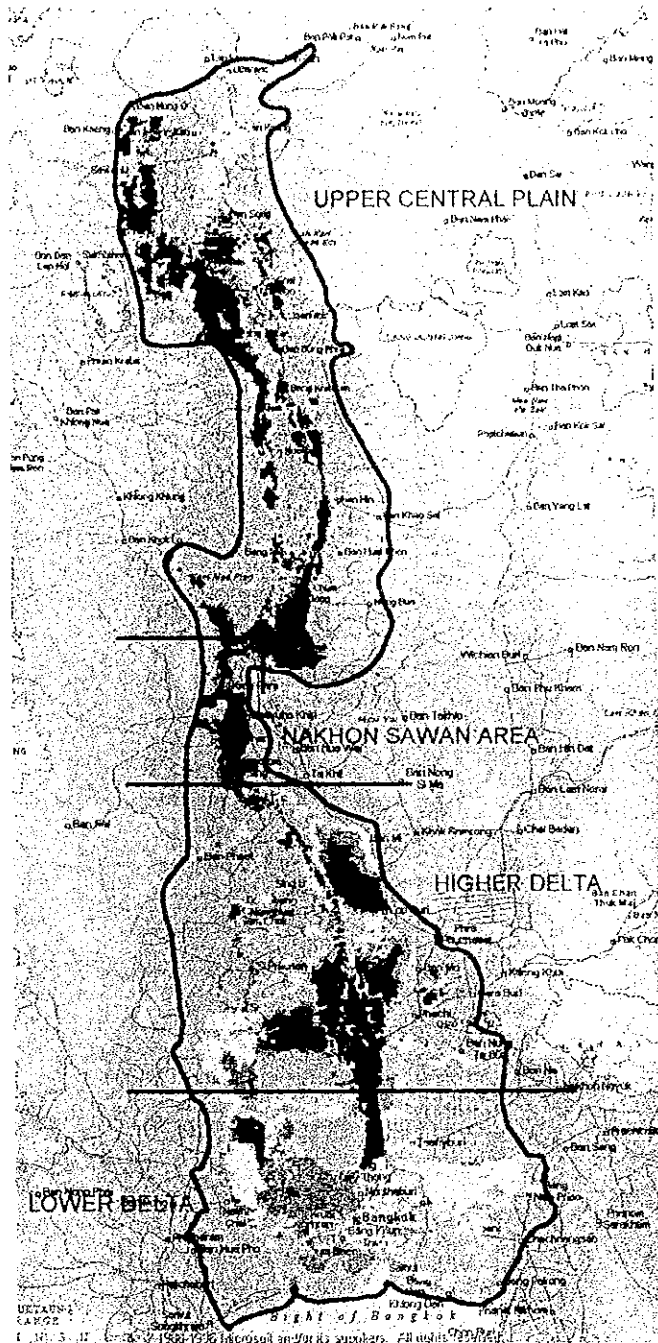
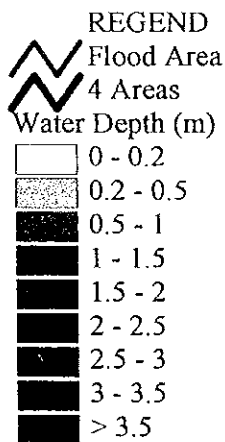
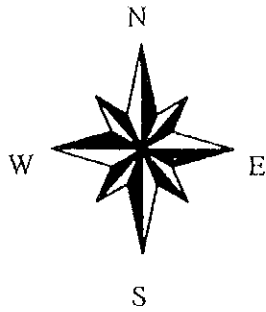
STUDY ON INTEGRATED PLAN FOR FLOOD MITIGATION IN CHAOPHRAYA RIVER BASIN

CTI ENGINEERING CO LTD., & INA CORPORATION

Fig.3.4.1

FOUR DIVITION AREAS OF FLOOD INUNDATION AREA

# SIMULATED FLOOD MAP IN 1995



STUDY ON INTEGRATED PLAN FOR FLOOD MITIGATION IN CHAO PHRAYA RIVER BASIN

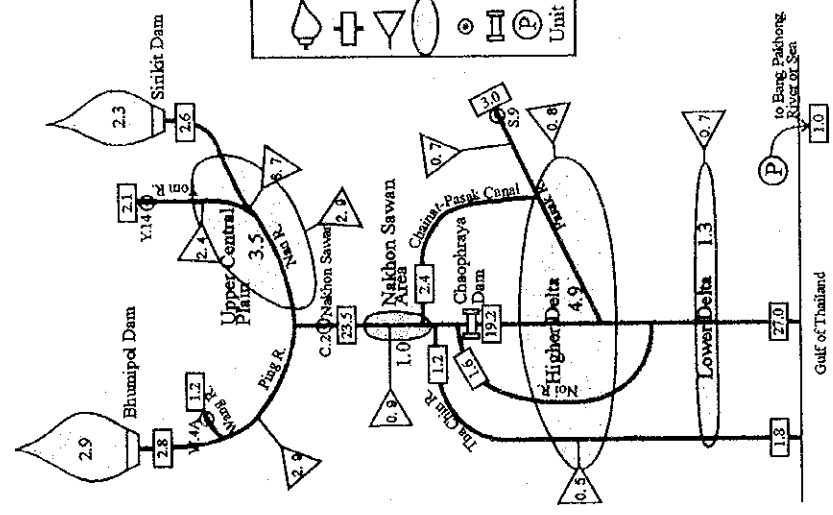
CTI ENGINEERING CO.LTD., & INA CORPORATION

Fig.3.4.1

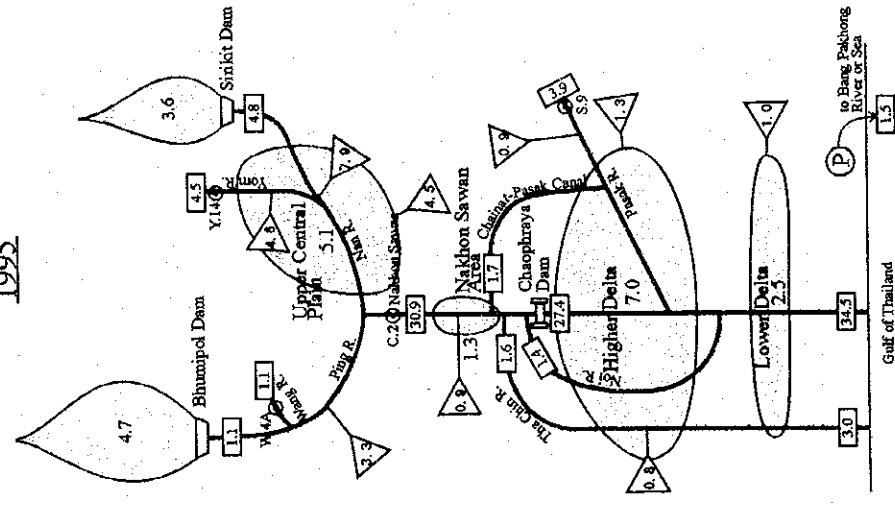
FOUR DIVITION AREAS OF FLOOD INUNDATION AREA



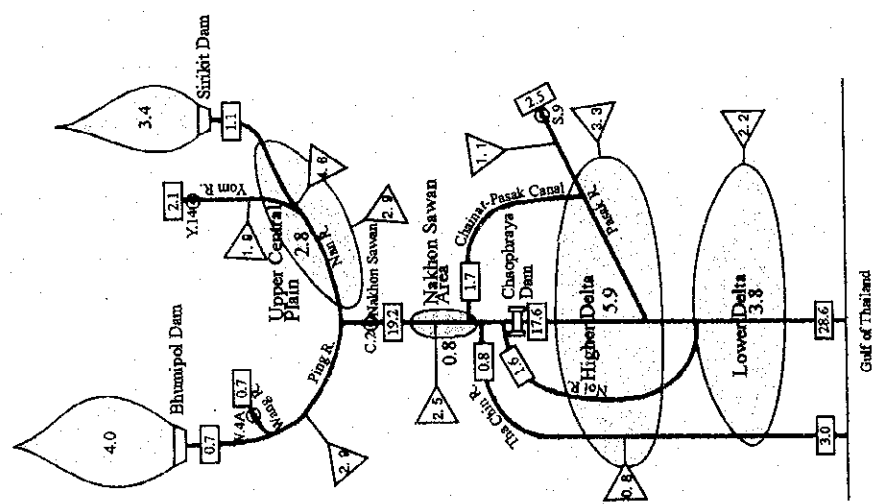
1996



1995



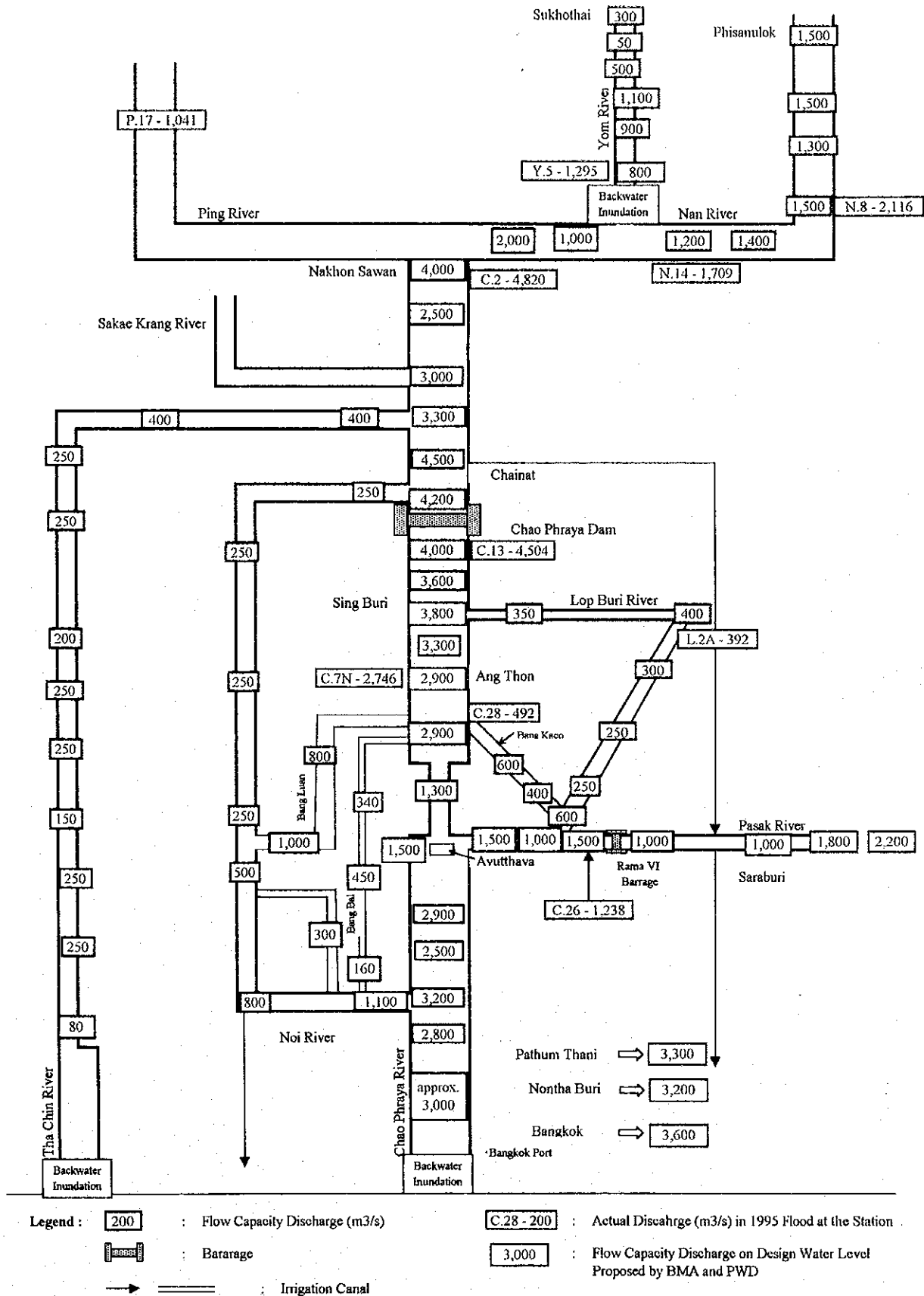
1983



STUDY ON INTEGRATED PLAN FOR FLOOD MITIGATION IN CHAO PHRAYA RIVER BASIN  
 CTI ENGINEERING CO., LTD AND INA CORPORATION

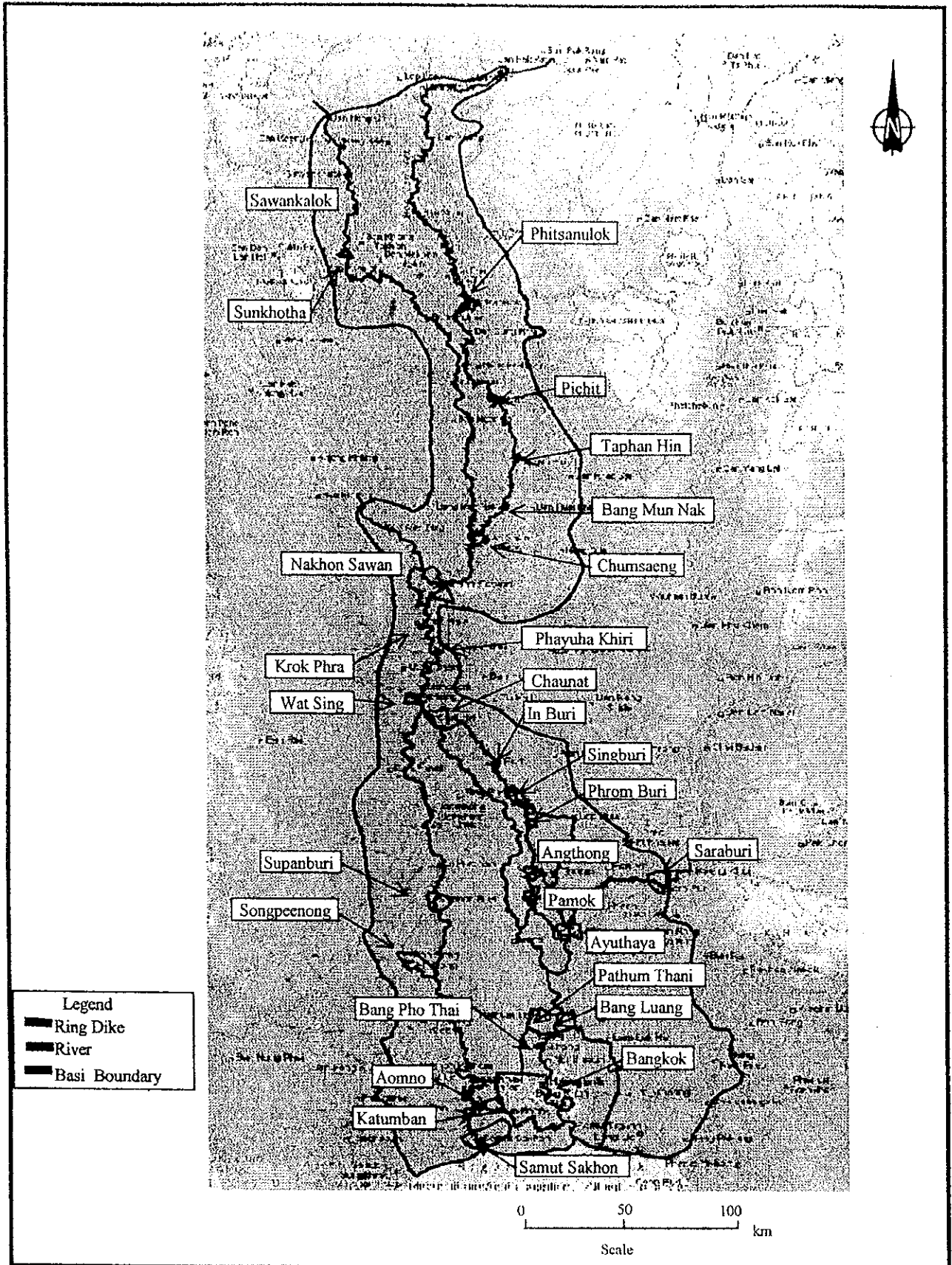
Fig. 3.4.2 ESTIMATED WATER BALANCE FROM JULY TO DECEMBER

**Flow Capacity of Present River Condition in Chao Phraya River Basin in High Tide**



**STUDY ON INTEGRATED PLAN FOR FLOOD MITIGATION IN CHAO PHRAYA RIVER BASIN**  
 CTI ENGINEERING CO., LTD AND INA CORPORATION

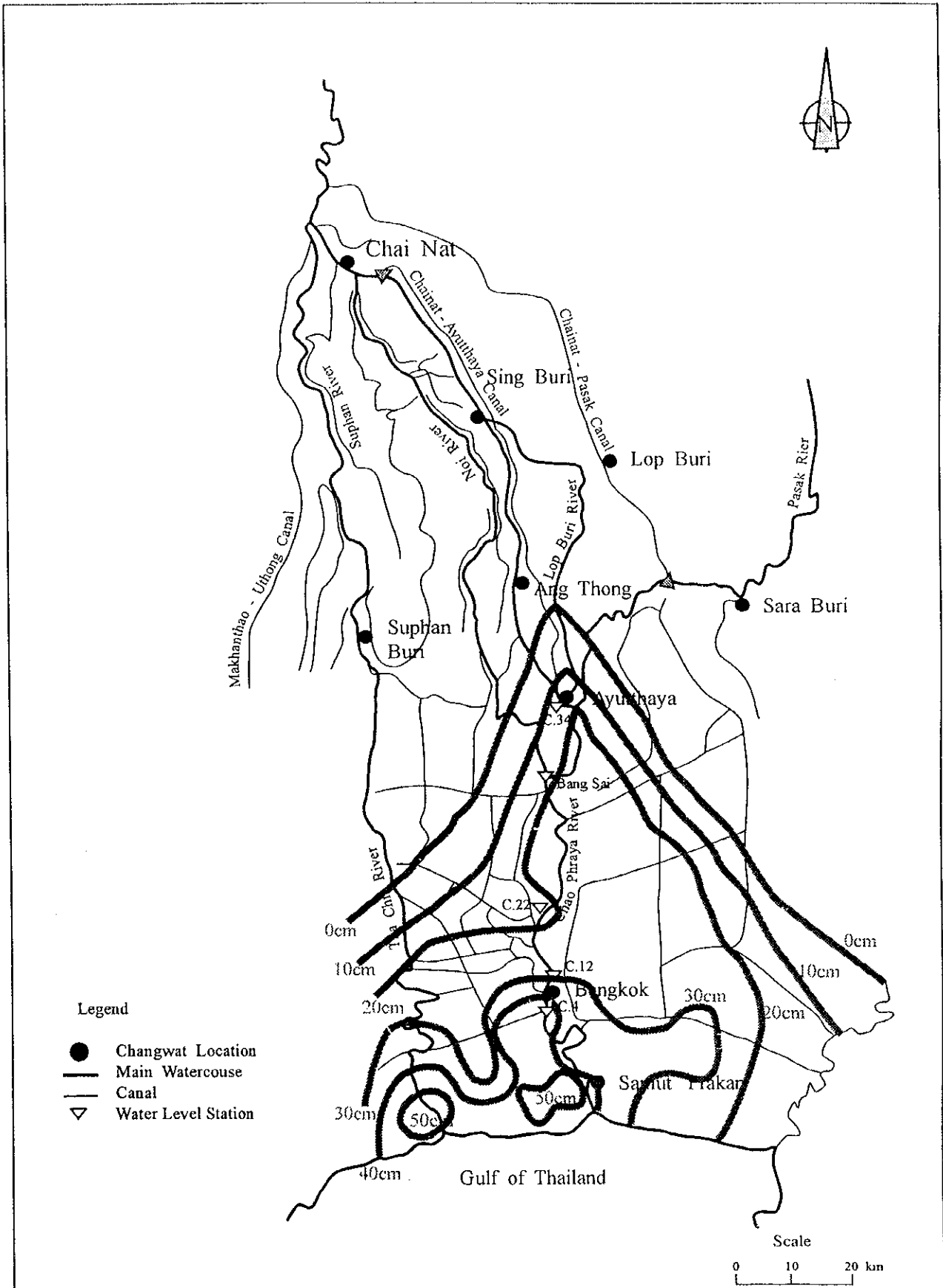
**Fig. 3.4.3**  
 FLOW CAPACITY OF PRESENT RIVER CONDITION



STUDY ON INTEGRATED PLAN FOR FLOOD MITIGATION IN CHAO PHRAYA RIVER BASIN

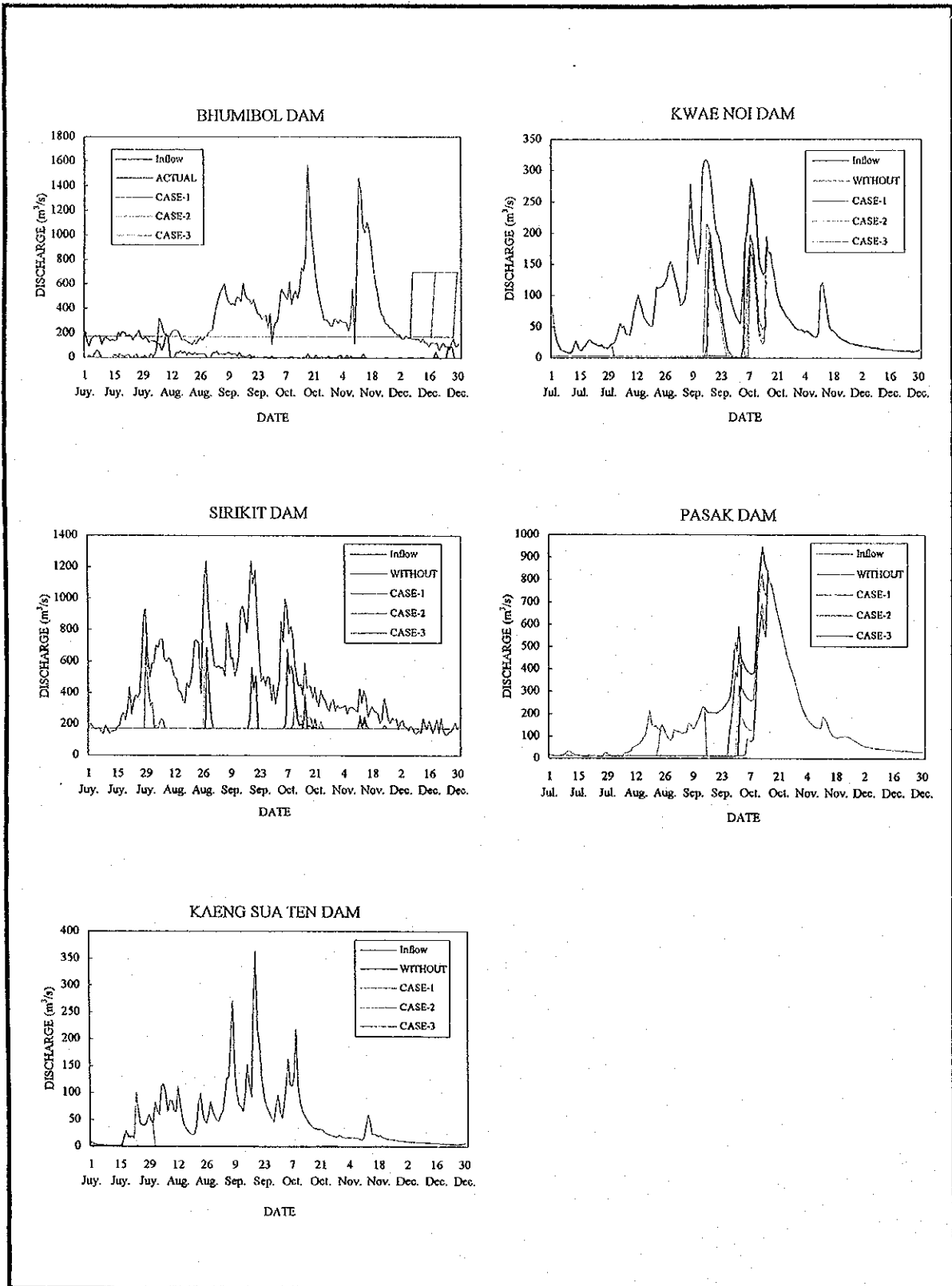
CTI ENGINEERING CO., LTD AND INA CORPORATION

Fig. 4.1.1  
URBAN AREAS PROTECTED BY RING DIKES AND DRAINAGE PUMPS



Note: This assumption is based on scenario-5B of JICA study (1995)

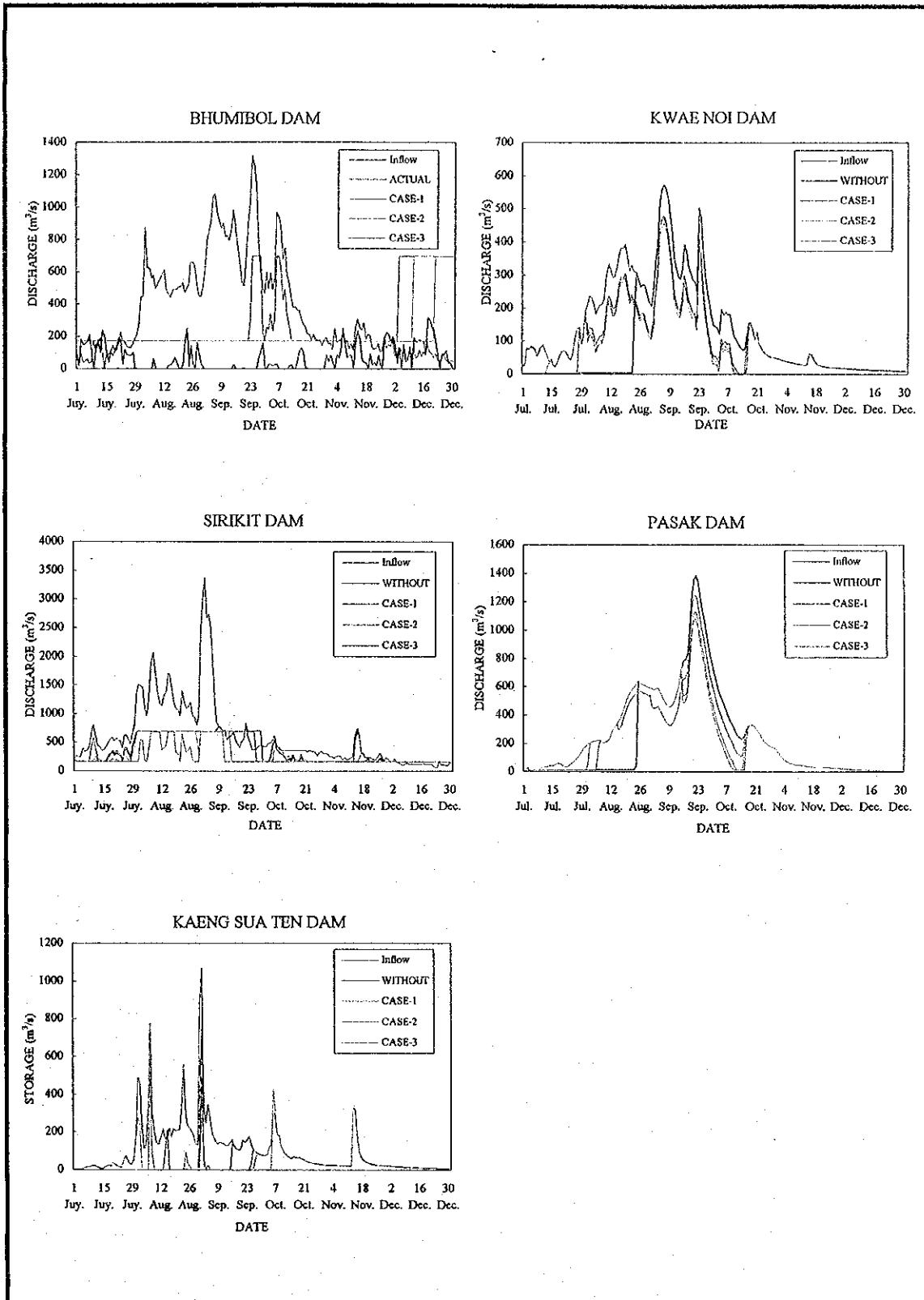
<p>STUDY ON INTEGRATED PLAN FOR FLOOD MITIGATION IN CHAO PHRAYA RIVER BASIN</p>	<p>Fig. 4.1.2 ASSUMED FUTURE LAND SUBSIDENCE FROM 1988 TO 2018</p>
<p>CTI ENGINEERING CO., LTD AND INA CORPORATION</p>	



**STUDY ON INTEGRATED PLAN FOR FLOOD MITIGATION IN CHAO PHRAYA RIVER BASIN**

CTI ENGINEERING CO, LTD. AND INA CORPORATION

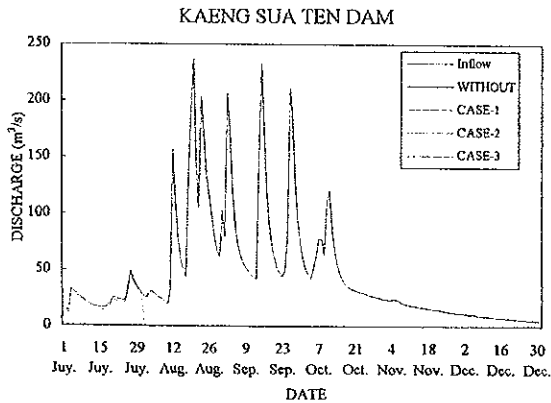
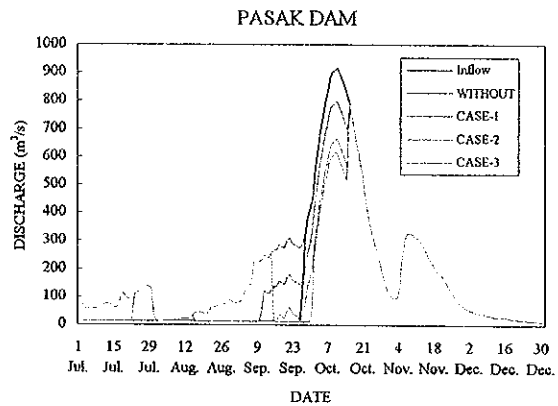
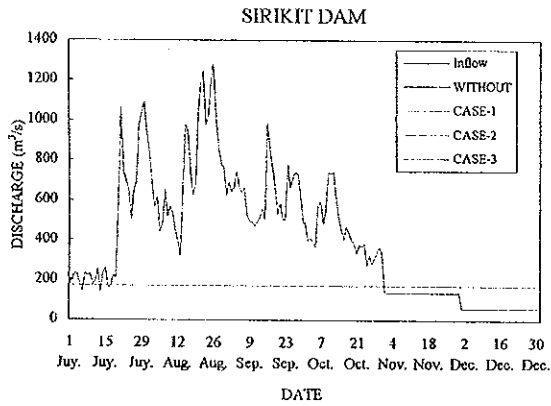
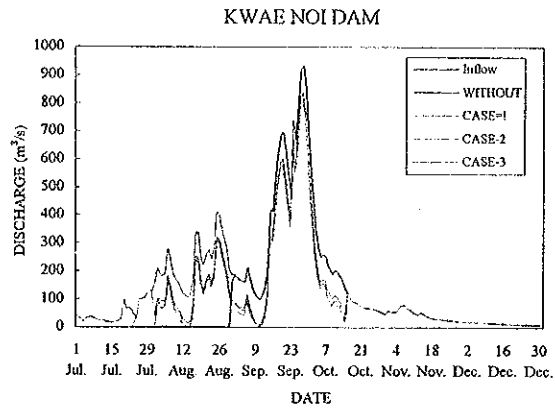
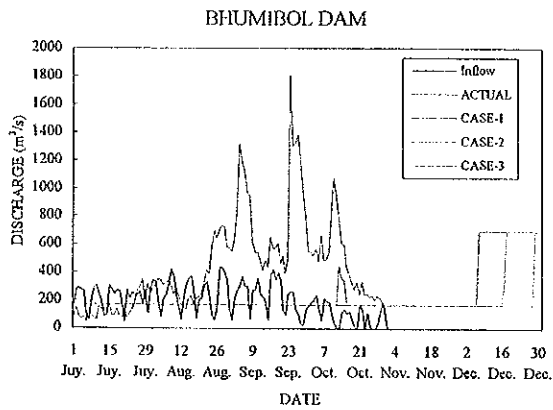
Fig. 4.1.3 (1/3)  
DAM OUTFLOW FOR DIFFERENT OPERATION CASE (1995 FLOOD)



**STUDY ON INTEGRATED PLAN FOR FLOOD MITIGATION IN CHAO PHRAYA RIVER BASIN**

**Fig. 4.1.3 (2/3)  
DAM OUTFLOW FOR DIFFERENT OPERATION CASE (1995 FLOOD)**

**CTI ENGINEERING CO, LTD. AND INA CORPORATION**



**STUDY ON INTEGRATED PLAN FOR FLOOD  
MITIGATION IN CHAO PHRAYA RIVER BASIN**

CTI ENGINEERING CO, LTD. AND INA CORPORATION

**Fig. 4.1.3 (3/3)  
DAM OUTFLOW FOR DIFFERENT  
OPERATION CASE (1995 FLOOD)**