CHAPTER 5 COMPREHENSIVE WATER SUPPLY PROJECT

CHAPTER 5

COMPREHENSIVE WATER SUPPLY PROJECT

5-1 General

The comprehensive water supply project of Bangkok will be planned to cover not only the 9 Amphoes to be supplied by the separate system but the 8 adjacent industrial and/or residential areas around the nine Amphoes.

The districts to be served are roughly divisible into the right and left bank areas which sandwich the Chao Phraya river and spread far and wide with the central system at the center. When the water source and the facilities of water transmission and distribution are taken into account, it seems most desirable to plan an independent comprehensive water supply system for either area. Accordingly, the plan to build two independent comprehensive water supply systems on the right and left banks of the Chao Phraya river will be dealt with in this chapter.

The water sources for this water supply project include surface water, groundwater and water diverted from the central system, as discussed in Chapter 4. Taking into consideration the limitations of these water sources with the water demand in 2000, six possible combinations of each served area and water sources for both the right and left bank areas will be studied in this chapter.

If water is to be obtained from one source, there will be no alternatives from which to choose, and all that remains to be done is to decide upon an optimum route of transmission main from the water source to each service reservoir.

But, if water is to be obtained from more than one source, there will be various combinations of water sources and service reservoirs. Thus, it will be necessary to choose one, studying the feasibility and economics of each combination.

As all the water sources considered were shown to be feasible in Chapter 4, an optimum choice will be made among the alternative cases from an economic analysis. The plan to divert water from the central system to the separate system will be reviewed later, using the additional data collected. And the above planning work will be crystallized into recommendation of the most feasible comprehensive water supply project.

5-2 Conditions of Alternative Cases

5-2-1 Water Sources :

The water sources which were shown in Chapter 4 to be suitable in either quantity or quality for the comprehensive water supply project, include the followings:

(1) Right Bank :

1) Wells.
2) Klong Mae Nam Om.
3) Nakhon Chai Si river.
4) Water diverted from the central system.

(2) Left Bank:

1) Wells.
2) Klong Sam Wa and Sip Sam.
3) Water diverted from the central system.

Judging from the results of the groundwater survey, it seems desirable to use the wells within the confines of the Amphoes if groundwater is to be relied upon as one of the water sources of the comprehensive water supply project. However, Bang Chan, which belongs to the adjacent development area, should be made an exception: because the development project has already entered the stage of construction and water demand is relatively small. In Amphoe Nong Khaem, on the other hand, the groundwater must be abandaned because the groundwater in this Amphoe is contaminated by saline water.

Accordingly, the area where groundwater can be used consists of nine district areas as follows:

Amphoes : Sai Noi, Bang Bua Thong, Bang Yai, Nong Chok, Min Buri, Lat Krabang, Bang Phli, and Bang Bo.

Adjacent development Area: Bang Chan.

The Klong Mae Nam Om which directly branches off the Chao Phraya river in the right bank area poses no problem as to the quantity of water, and its water quality seems to be the same as that of the Chao Phraya river. The water intake is planned to be located upstream of the community of Bang Yai. At this point the intake will be near the three northern districts, but a conduit must be extended for a long distance to convey water to Non Khaem.

The Nakhon Chai Si river, which is a tributary of the Chao Phraya river, can furnish an ample supply of water; but, on account of the intrusion of sea water into the river, the water intake must be at a distance of about 80 km from the estuary so that a long transmission line will be required.

The Klong Sam Wa and Sip Sam that flow in the left-bank area are relatively large having gates which supply water for agricultural use and provide navigation purpose. If water is to be taken at a rate of 1.5 m^3/sec or less, the Klong Sam Wa alone will serve the purpose, and if the draw rate exceeds 1.5 m^3/sec, it will be necessary to use both Klongs for the water source. As these Klongs flow near the northern boundary of the served area, a long transmission line will be required to transport water to the two southern districts.

The central system will be a very advantageous water source, when water is diverted from it, but it is a problem whether its construction proceeds fast enough or not. Since Tha Phra Reservoir and it's transmission line from Bang Khen Treatment Plan has been under construction which construction will be completed in near future, it will be possible to divert purified water to proposed served areas from 1982 when the Separate System will start to supplying water, in the right bank of Chao Phraya River. As far as left bank is concerned, Bang Thon Lang Reservoir, Pak Bo Reservoir and Samrong Reservoir are presently planned as future program implementation. Among these, construction of Bang Thon Lang Reservoir is not expected in the near future, so that it seems impossible to utilize this reservoir as a water source for the Separate System in the left bank of Chao Phraya river.

5-2-2 Division of Served Area into Blocks :

(1) Right Bank :

The served area on the right bank consists of 4 Amphoes and one adjacent development area. These districts are divided into two blocks according to the geographic conditions.

1) Block of 3 Northern Amphoes:

3 Amphoes of Sai Noi, Bang Bua Thong and Bang Yai

2) Block of Nong Khaem and the adjacent development area:

Amphoe Nong Khaem and Bang Khun Thian housing complex in the adjacent development area.

(2) Left Bank :

The served area on the left bank consists of 5 Amphoes and 7 adjacent development area. If all these districts are considered individually, there will be too many cases to be studied.

The 12 districts are therefore grouped into 4 blocks according to the purpose of use of water and geographic conditions as follows:

1) Block of 3 Eastern Amphoes and Bang Chan :

Amphoes of Nong Chok, Min Buri and Lat Krabang, and the Bang Chan industrial and housing complexes.

2) Block of 2 Southern Amphoes :

Amphoes of Bang Phli and Bang Bo.

3) Block of Eastern adjacent development area :

Lat Krabang industrial and housing complexes, and new airport area.

4) Block of Southern adjacent development area :

Industrial and housing complexes planned between Bang Phli and Bang Bo, Bang Poo industrial and housing complexes, and Klong Dan industrial complex.

5-2-3 Basic Conditions for Comparison of the Alternative Cases :

(1) Right Bank:

1) Wells will be developed within the confines of the 3 Amphoes in the northern district.

2) Nong Khaem and Bang Khun Thian will not be supplied using groundwater.

3) The Klong Mae Nam Om and Nakhon Chai Si rivers will not be tapped together.

4) If the 3 northern districts are to be supplied with water diverted from the central system, other districts will be served likewise.

5) If Nong Khaem is to be supplied with water diverted from the central system, its transmission line will be branched at a suitable point to supply the district of Bang Khun Thian.

(2) Left Bank :

1) Wells will be developed within the confines of the 3 eastern Amphoes, 2 southern Amphoes and Bang Chan.

2) Wells will be developed in the 3 eastern Amphoes and 2 southern Amphoes alike, if they are to be used at all.

3) The districts where wells can be used, will be supplied with surface water or water diverted from the central system, if such is available, on condition that the adjacent development areas are supplied likewise.

4) Far away districts such as southern district will not be supplied with water taken from the Klongs.

5-3 Alternative Plans

5-3-1 Combinations of Water Sources :

The comprehensive water supply project was reviewed from the standpoint of the basic conditions made in Sec. 5-2-3, and as a result, six possible combinations of water sources for either the right or left banks were selected, as shown in Tables 5-1 and 5-2.

Each combination is based on the estimate of water demand in 2000. The amount of water to be taken from the wells and the central system is assumed to equal the demand in the service area, however, the amount of water to be taken from the river and Klong is assumed to be the demand in the served area plus 10%.

5-3-2 Illustrations of Water Source Combinations :

The six alternative plans of water source combinations are represented in map form in Figs. 5-1 to 5-12. The maps show the types of water sources, intake sites and routes of water transmission to the service reservoirs, and are shown separately for the right and left banks.

(1) Right Bank

Table 5-1 COMBINATION OF ALTERNATIVES

Case \ District	North 3 Districts	Nong Khaem District
Case - 1	W	N
Case - 2	N	N
Case - 3	K	K
Case - 4	W	C
Case - 5	K	C
Case - 6	C	C

Notes

W : Well

N : Nakhon Chai Si River

K : Klong Mae Nam Om

C : Central System

(2) Left Bank

Table 5-2 COMBINATION OF ALTERNATIVES

Case \ District	East 3 Districts & Bang Chan	South 2 Districts	East Developments	South Developments
Case - 1	W	W	K	K
Case - 2	K	K	K	K
Case - 3	W	W	K	C
Case - 4	K	C	K	C
Case - 5	W	W	C	C
Case - 6	C	C	C	C

Notes :

W : Well

K : Klong Sam Wa and/or Klong Sip Sam

C : Central System

Fig 5 – 1

RIGHT BANK
CASE – 1

WATER SOURCE

WELL 11,100 CMD

SURFACE 49,800 CMD

(NAKHON CHAI SI RIVER)

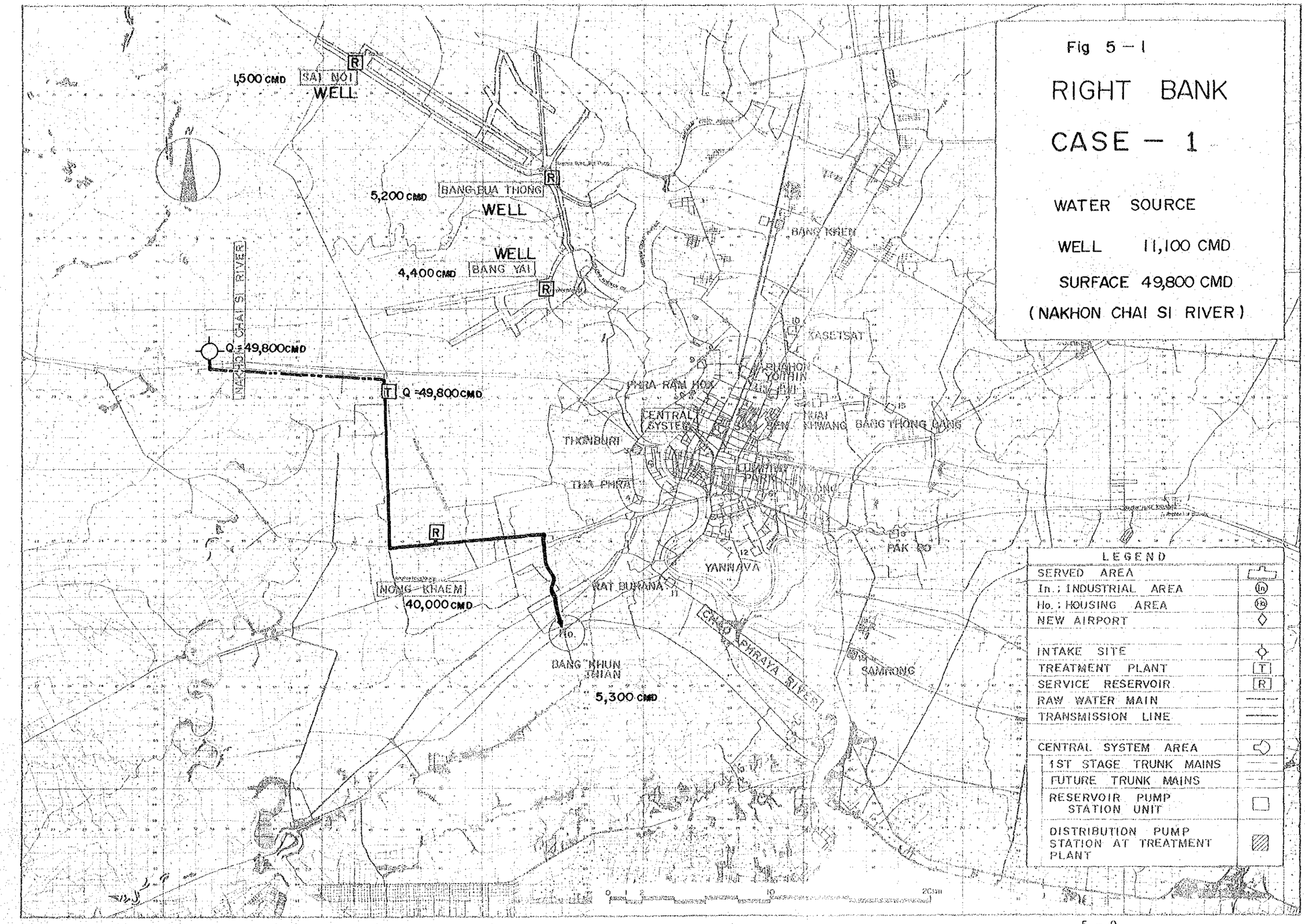


Fig 5 – 2

RIGHT BANK

CASE – 2

WATER SOURCE

SURFACE 62,000 CMD

(NAKHON CHAI SI RIVER)

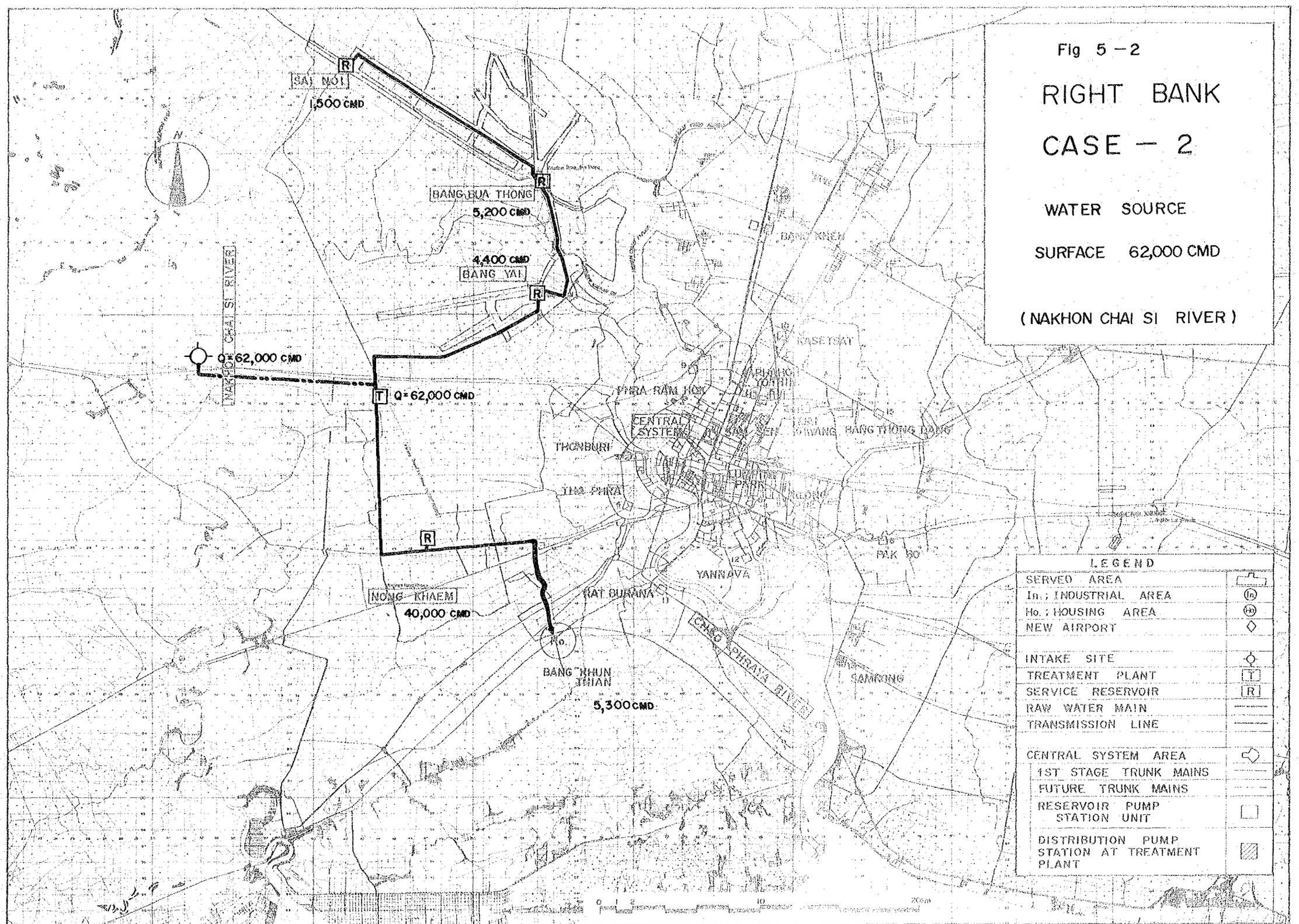


Fig 5 – 3

RIGHT BANK

CASE – 3

WATER SOURCE

SURFACE 62,000 CMD

(KLONG MAE NAM OM)

SAI NOI
1,500 CMD

BANG RUA THONG
5,200 CMD

4,400 CMD
BANG YAI

Q 62,000 CMD

KLONG MAE NAMOM

NAKHON CHAI SI RIVER

BANG KHEN

KASETSAT

RAMA RAM HOSP

CENTRAL SYSTEM

THONBURI

THA PHRA

NONG KHAEM
40,000 CMD

BANG KHUN THIAN
5,300 CMD

CHAO PHRAYA RIVER

SAMRONG

PAK KO

YANNAVA

RAT BURANA

LEGEND

SERVED AREA	
In. ; INDUSTRIAL AREA	In
Ho. ; HOUSING AREA	Ho
NEW AIRPORT	◇
INTAKE SITE	
TREATMENT PLANT	T
SERVICE RESERVOIR	R
RAW WATER MAIN	
TRANSMISSION LINE	
CENTRAL SYSTEM AREA	
1ST STAGE TRUNK MAINS	
FUTURE TRUNK MAINS	
RESERVOIR PUMP STATION UNIT	
DISTRIBUTION PUMP STATION AT TREATMENT PLANT	

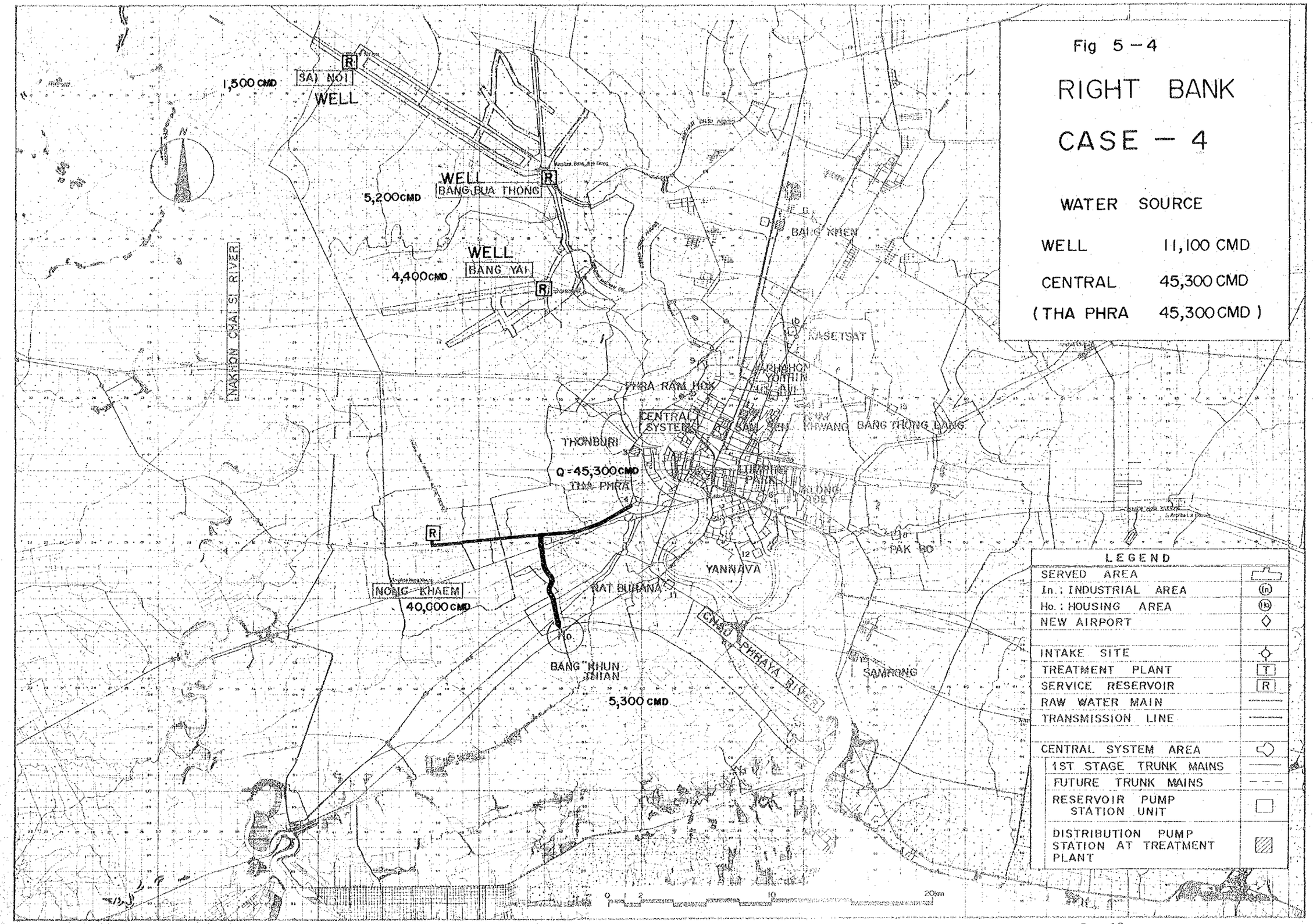
0 1 2 10 20km

Fig 5 – 4

RIGHT BANK
CASE – 4

WATER SOURCE

WELL	11,100 CMD
CENTRAL	45,300 CMD
(THA PHRA	45,300 CMD)



LEGEND

SERVED AREA	
In. : INDUSTRIAL AREA	In
Ho. : HOUSING AREA	Ho
NEW AIRPORT	◇
INTAKE SITE	
TREATMENT PLANT	T
SERVICE RESERVOIR	R
RAW WATER MAIN	
TRANSMISSION LINE	
CENTRAL SYSTEM AREA	
1ST STAGE TRUNK MAINS	
FUTURE TRUNK MAINS	
RESERVOIR PUMP STATION UNIT	
DISTRIBUTION PUMP STATION AT TREATMENT PLANT	

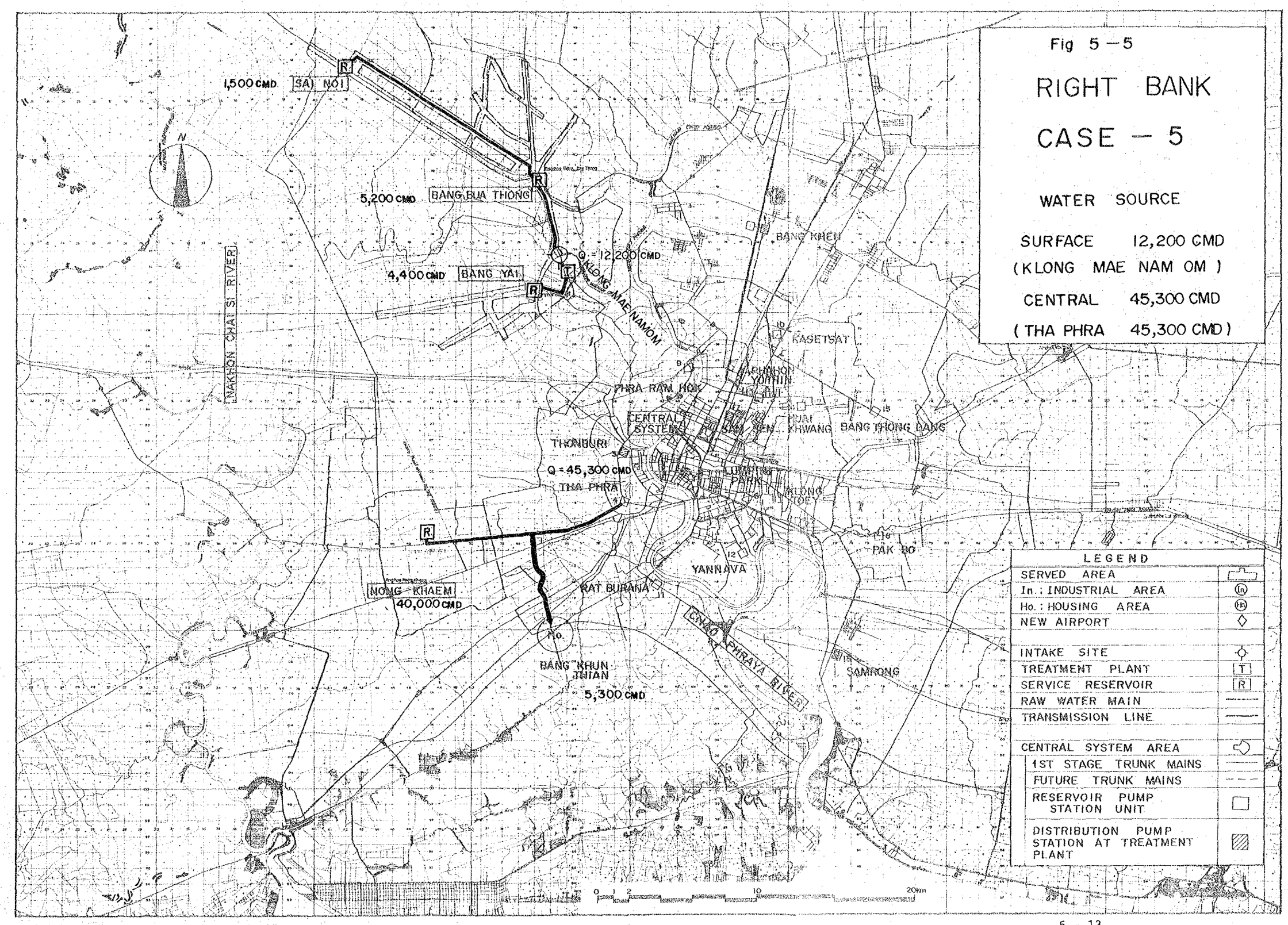
Fig 5 – 5

RIGHT BANK

CASE – 5

WATER SOURCE

SURFACE	12,200 CMD
(KLONG MAE NAM OM)	
CENTRAL	45,300 CMD
(THA PHRA	45,300 CMD)



LEGEND

SERVED AREA	
In.: INDUSTRIAL AREA	(In)
Ho.: HOUSING AREA	(Ho)
NEW AIRPORT	◇
INTAKE SITE	⊖
TREATMENT PLANT	T
SERVICE RESERVOIR	R
RAW WATER MAIN	
TRANSMISSION LINE	
CENTRAL SYSTEM AREA	
1ST STAGE TRUNK MAINS	
FUTURE TRUNK MAINS	
RESERVOIR PUMP STATION UNIT	
DISTRIBUTION PUMP STATION AT TREATMENT PLANT	

Fig 5 – 6

RIGHT BANK
CASE – 6

WATER SOURCE

CENTRAL	56,400 CMD
(PHRA RAM HOK	11,100 CMD)
THA PHRA	45,300 CMD

1,500 CMD SA) NOI

5,200 CMD BANG BUA THONG

4,400 CMD BANG YAI

Q = 11,100 CMD

Q = 45,300 CMD

5,300 CMD

BANG KHUN THIAN

NAKHON CHAI SI RIVER

CHAO PHRAYA RIVER

PHRA RAM HOK

CENTRAL SYSTEM

THONBURI

THA PHRA

BANG KHEN

KASETSAT

PHAHON YOTHIN

SAM SEN

BANG THONG DANG

LUMPINI PARK

KLONG TOEI

PAK KO

YANNAVA

SAMPHONG

NONG KHAEM

RAT BURANA

0 1 2 10 20km

LEGEND

SERVED AREA	
In. : INDUSTRIAL AREA	In
Ho. : HOUSING AREA	Ho
NEW AIRPORT	◇
INTAKE SITE	◇
TREATMENT PLANT	T
SERVICE RESERVOIR	R
RAW WATER MAIN	
TRANSMISSION LINE	
CENTRAL SYSTEM AREA	
1ST STAGE TRUNK MAINS	
FUTURE TRUNK MAINS	
RESERVOIR PUMP STATION UNIT	
DISTRIBUTION PUMP STATION AT TREATMENT PLANT	

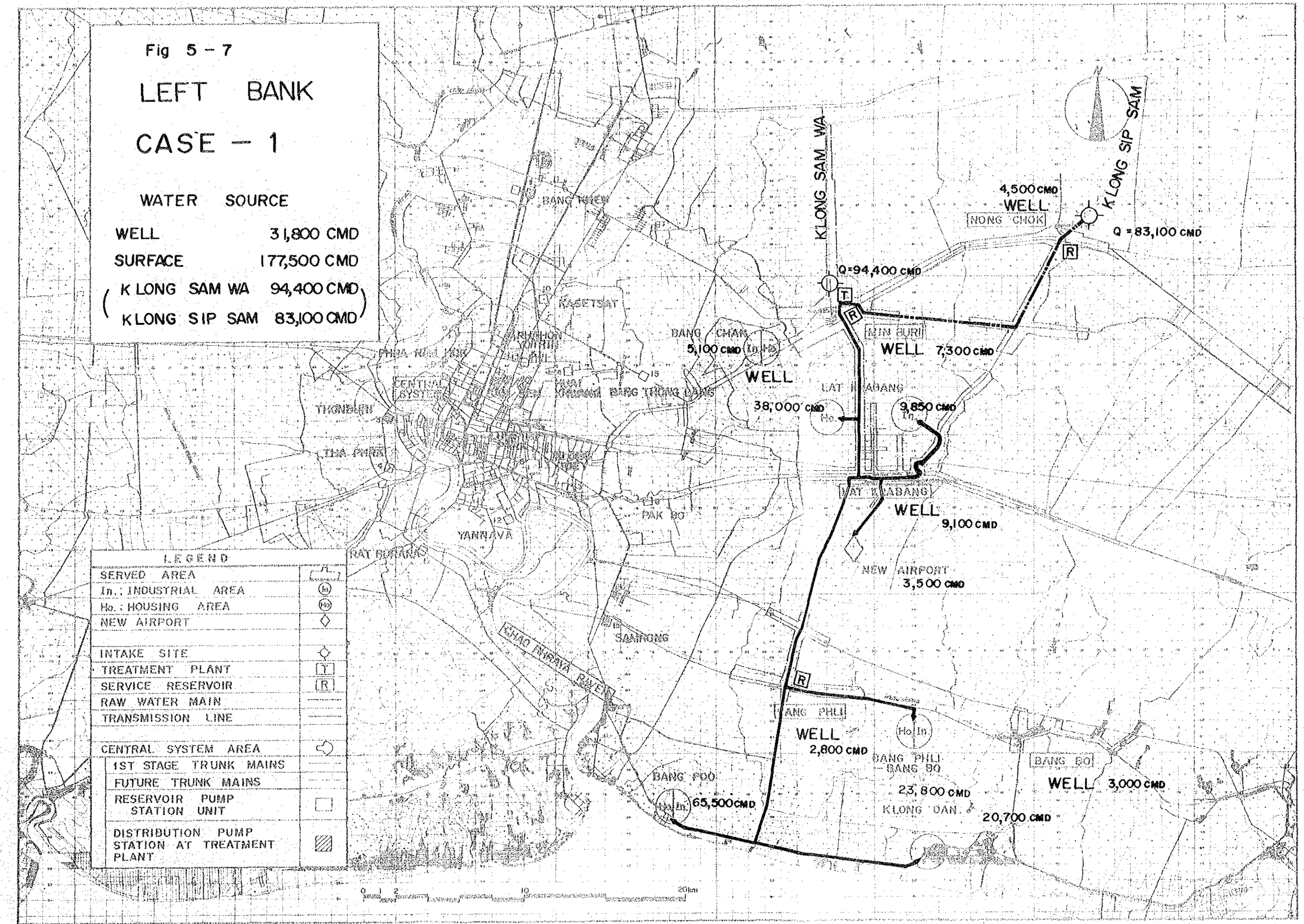
Fig 5 - 7

LEFT BANK

CASE - 1

WATER SOURCE

WELL	31,800 CMD
SURFACE	177,500 CMD
(K LONG SAM WA	94,400 CMD)
(K LONG SIP SAM	83,100 CMD)



LEGEND	
SERVED AREA	
In.: INDUSTRIAL AREA	(In)
Ho.: HOUSING AREA	(Ho)
NEW AIRPORT	◇
INTAKE SITE	◇
TREATMENT PLANT	T
SERVICE RESERVOIR	R
RAW WATER MAIN	
TRANSMISSION LINE	
CENTRAL SYSTEM AREA	
1ST STAGE TRUNK MAINS	
FUTURE TRUNK MAINS	
RESERVOIR PUMP STATION UNIT	
DISTRIBUTION PUMP STATION AT TREATMENT PLANT	

Fig 5 - 8

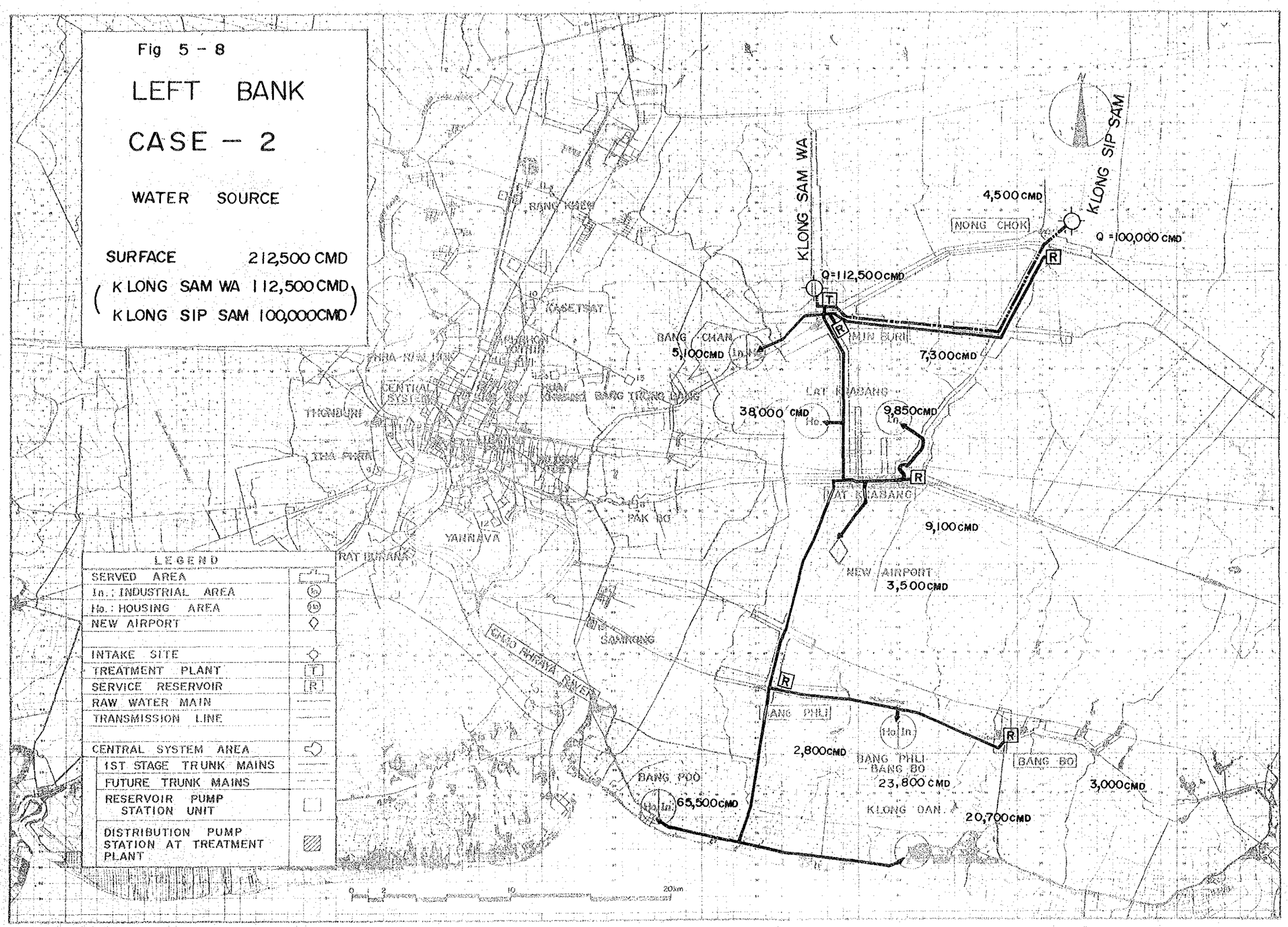
LEFT BANK

CASE - 2

WATER SOURCE

SURFACE 212,500 CMD

(KLONG SAM WA 112,500 CMD
KLONG SIP SAM 100,000 CMD)



LEGEND

SERVED AREA	
In.: INDUSTRIAL AREA	In
Ho.: HOUSING AREA	Ho
NEW AIRPORT	
INTAKE SITE	
TREATMENT PLANT	T
SERVICE RESERVOIR	R
RAW WATER MAIN	
TRANSMISSION LINE	
CENTRAL SYSTEM AREA	
1ST STAGE TRUNK MAINS	
FUTURE TRUNK MAINS	
RESERVOIR PUMP STATION UNIT	
DISTRIBUTION PUMP STATION AT TREATMENT PLANT	

Fig 5 - 9

LEFT BANK

CASE - 3

WATER SOURCE	
WELL	31,800CMD
SURFACE (KLONG SAM WA)	56,500CMD
CENTRAL (SAMRONG)	110,000CMD

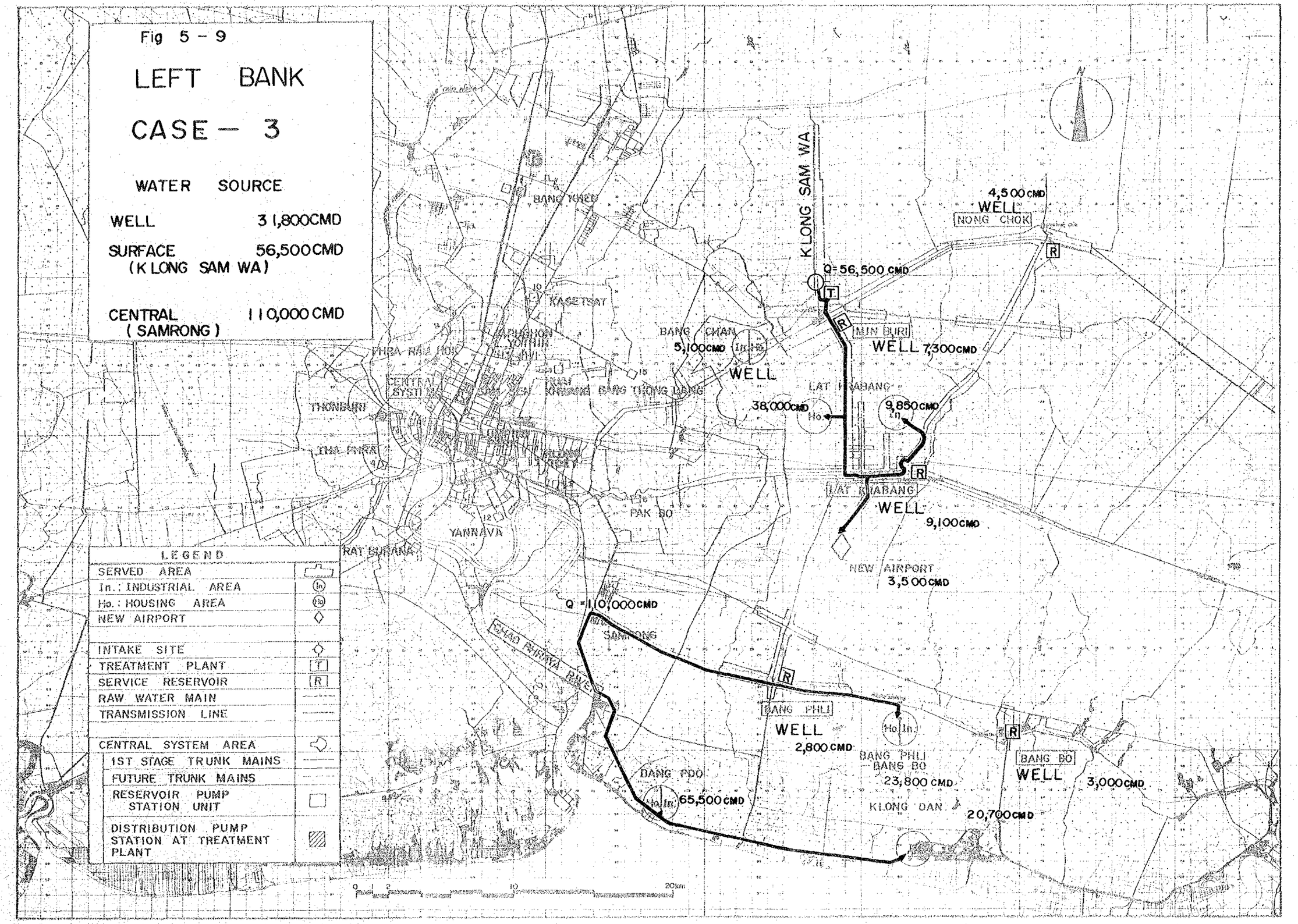


Fig 5 – 10

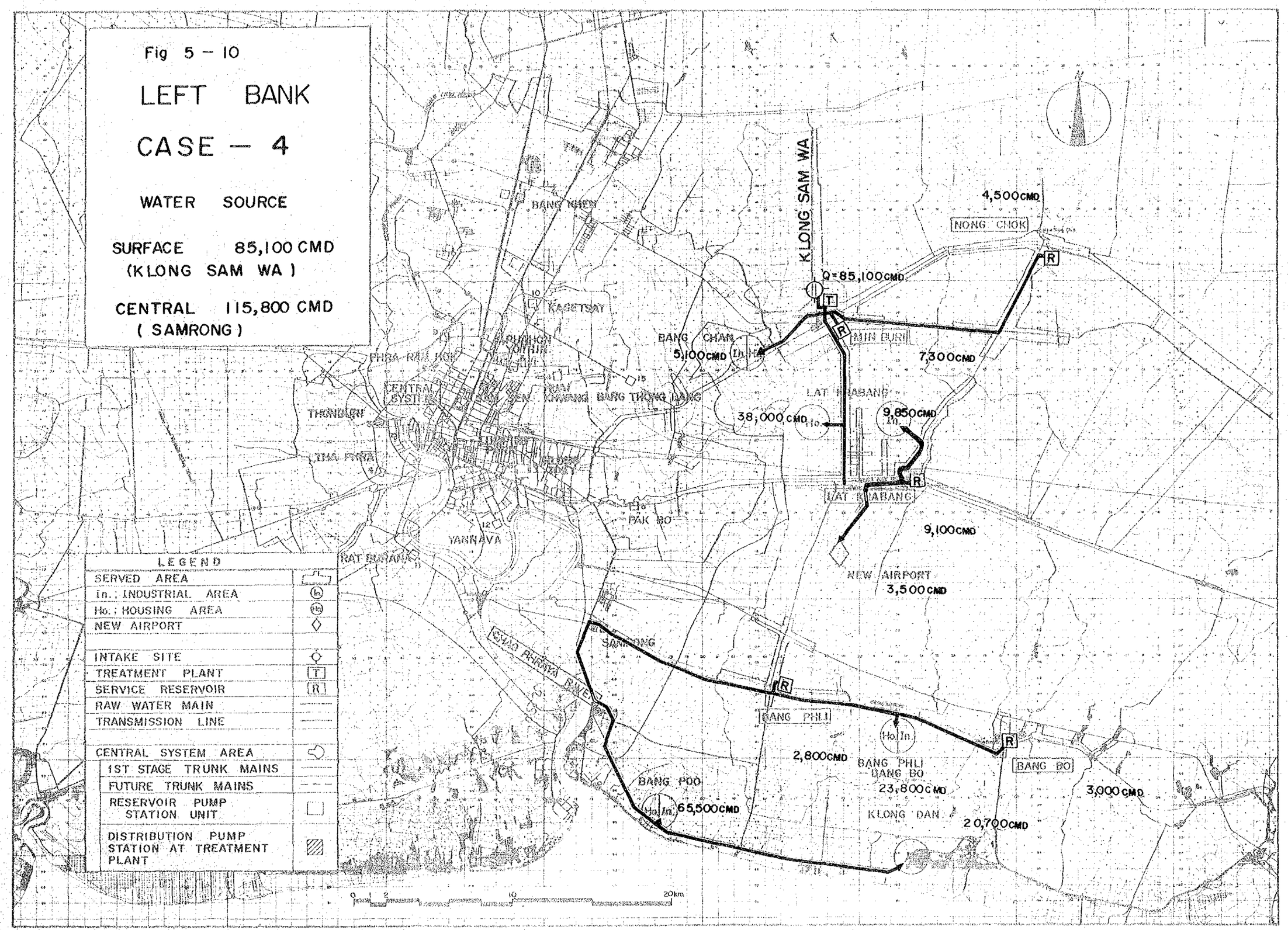
LEFT BANK

CASE – 4

WATER SOURCE

SURFACE 85,100 CMD
(KLONG SAM WA)

CENTRAL 115,800 CMD
(SAMRONG)



LEGEND

SERVED AREA	
In.: INDUSTRIAL AREA	In
Ho.: HOUSING AREA	Ho
NEW AIRPORT	◇
INTAKE SITE	◇
TREATMENT PLANT	T
SERVICE RESERVOIR	R
RAW WATER MAIN	——
TRANSMISSION LINE	——
CENTRAL SYSTEM AREA	
1ST STAGE TRUNK MAINS	——
FUTURE TRUNK MAINS	– – –
RESERVOIR PUMP STATION UNIT	□
DISTRIBUTION PUMP STATION AT TREATMENT PLANT	▨

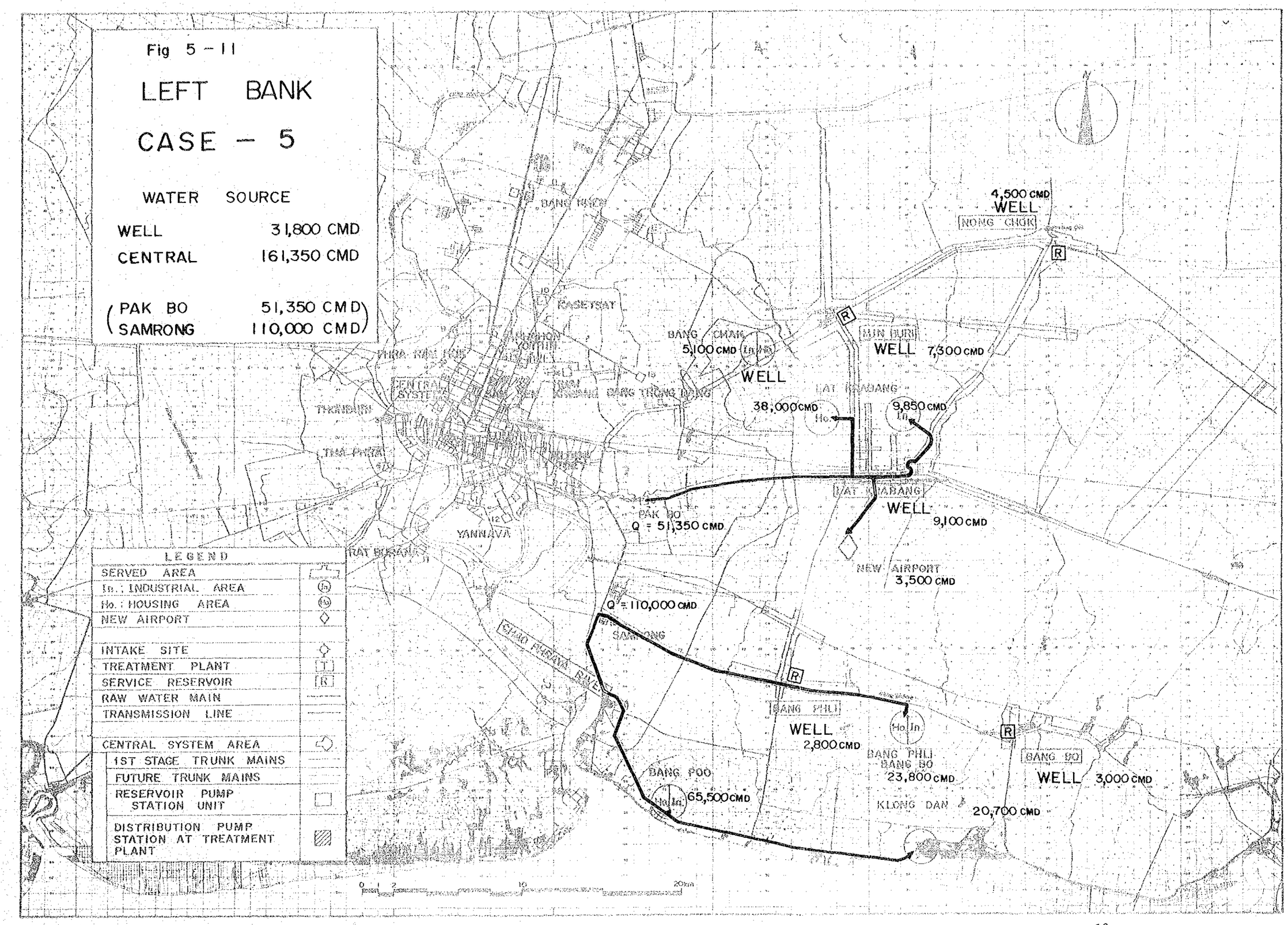
Fig 5 - 11

LEFT BANK

CASE - 5

WATER SOURCE

WELL	31,800 CMD
CENTRAL	161,350 CMD
(PAK BO	51,350 CMD)
SAMRONG	110,000 CMD



LEGEND

SERVED AREA	
In. : INDUSTRIAL AREA	(In)
Ho. : HOUSING AREA	(Ho)
NEW AIRPORT	◇
INTAKE SITE	◇
TREATMENT PLANT	T
SERVICE RESERVOIR	R
RAW WATER MAIN	
TRANSMISSION LINE	
CENTRAL SYSTEM AREA	
1ST STAGE TRUNK MAINS	
FUTURE TRUNK MAINS	
RESERVOIR PUMP STATION UNIT	□
DISTRIBUTION PUMP STATION AT TREATMENT PLANT	▨

Fig 5 – 12

LEFT BANK

CASE – 6

WATER SOURCE

CENTRAL	193,150 CMD
BANG THONG LANG	16,900 CMD
PAK BO	60,450 CMD
SAMRONG	115,800 CMD