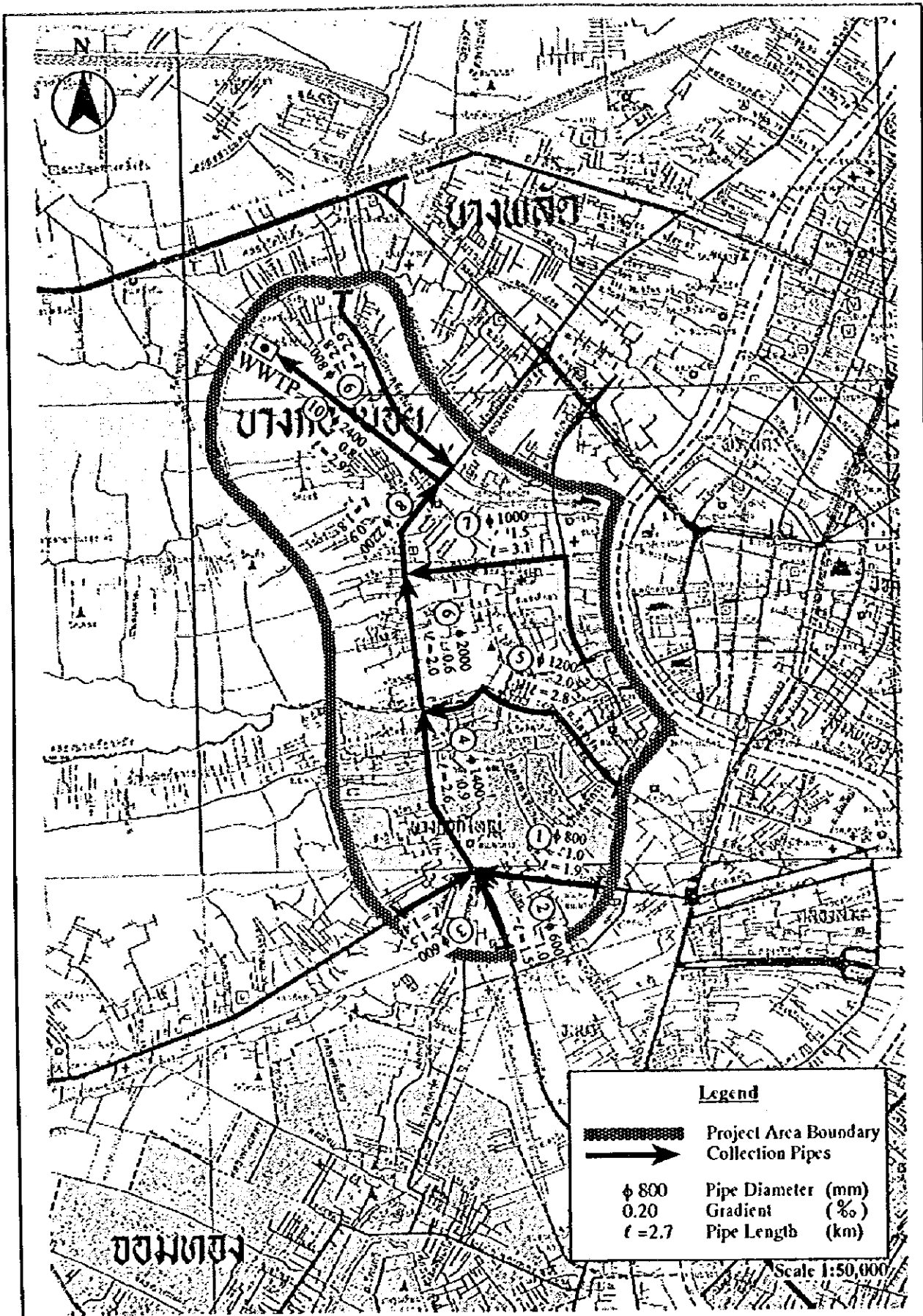


THE STUDY FOR MASTER PLAN ON
SEWAGE SLUDGE TREATMENT / DISPOSAL AND
RECLAIMED WASTEWATER REUSE IN BANGKOK

JAPAN INTERNATIONAL COOPERATION AGENCY

Figure 6.1.4.1

PLAN OF MAJOR INTERCEPTOR
SEWERS FOR THONBURI SOUTH

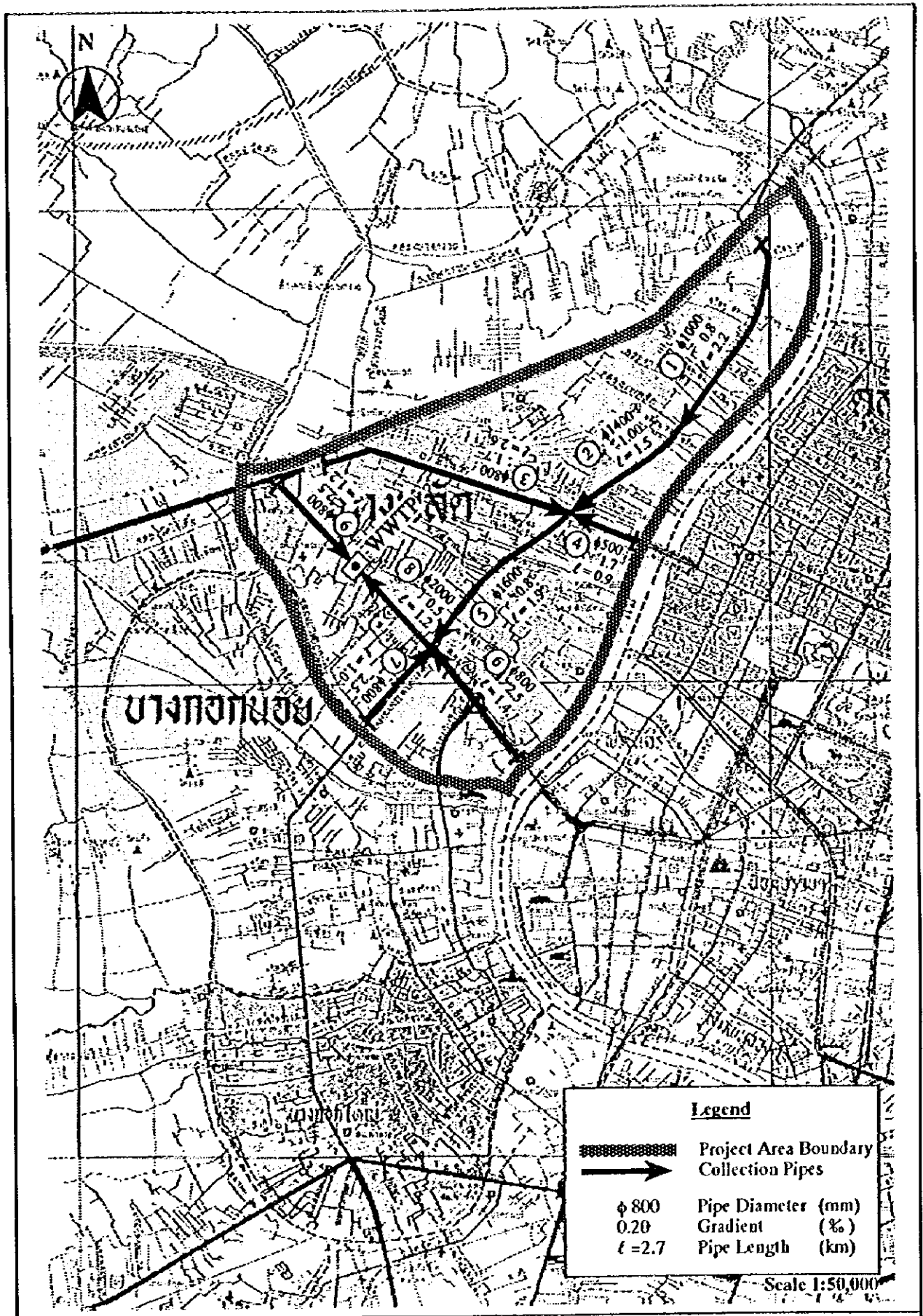


THE STUDY FOR MASTER PLAN ON
SEWAGE SLUDGE TREATMENT / DISPOSAL AND
RECLAIMED WASTEWATER REUSE IN BANGKOK

JAPAN INTERNATIONAL COOPERATION AGENCY

Figure 6.1.4.2

PLAN OF MAJOR INTERCEPTOR
SEWERS FOR THONBURI CENTRAL

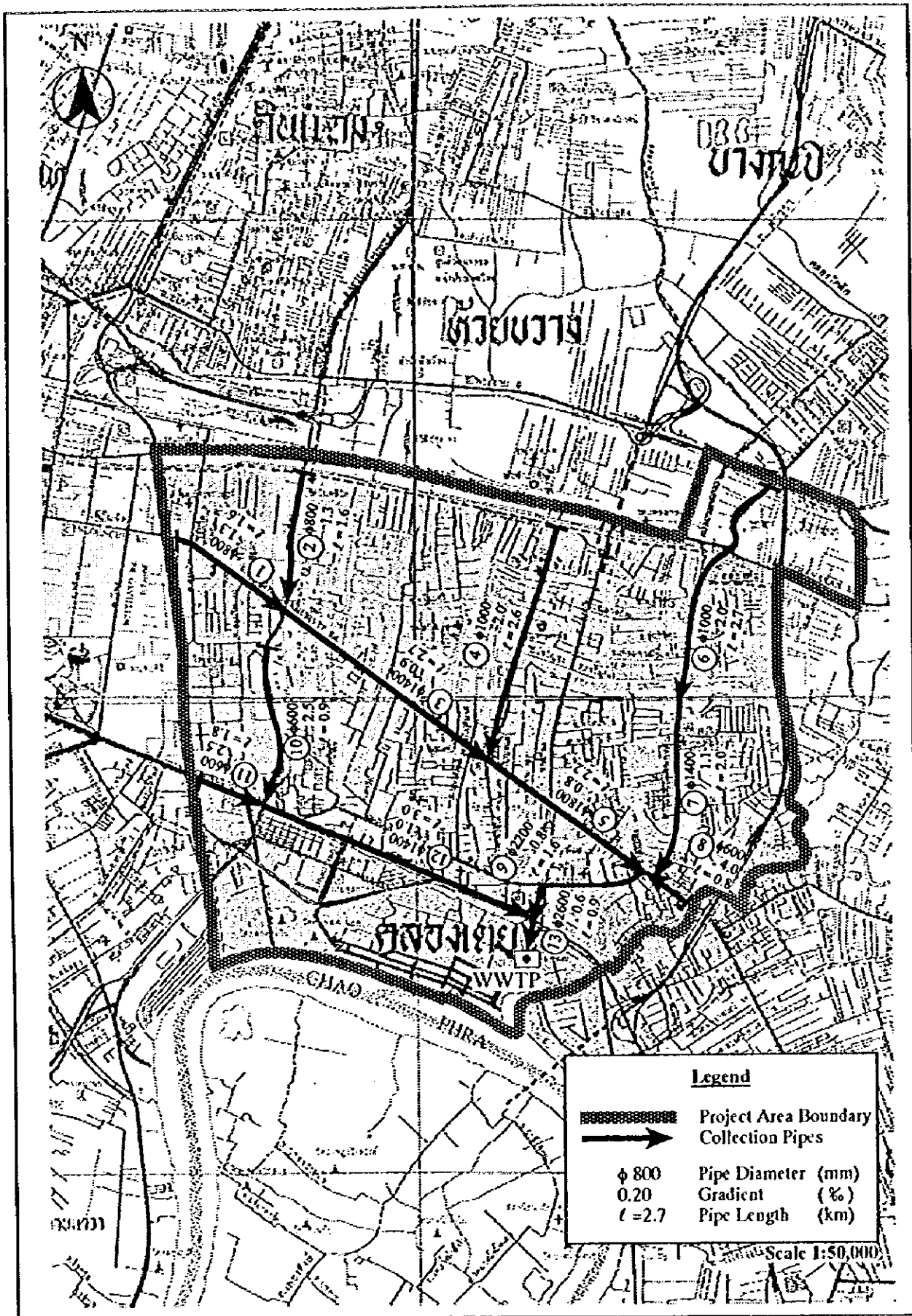


THE STUDY FOR MASTER PLAN ON
SEWAGE SLUDGE TREATMENT / DISPOSAL AND
RECLAIMED WASTEWATER REUSE IN BANGKOK

JAPAN INTERNATIONAL COOPERATION AGENCY

Figure 6.1.4.3

PLAN OF MAJOR INTERCEPTOR
SEWERS FOR THONBURI NORTH

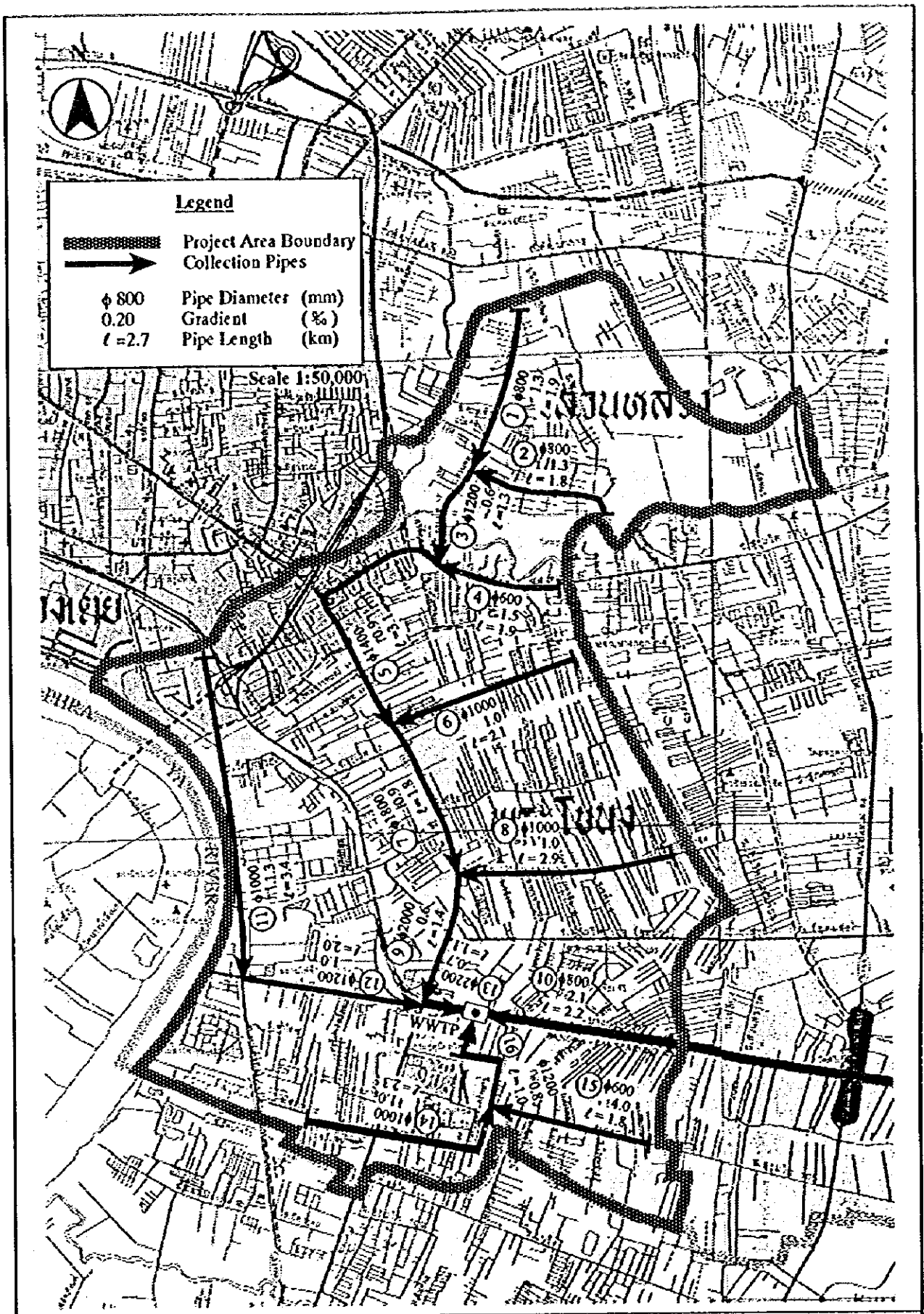


THE STUDY FOR MASTER PLAN ON
SEWAGE SLUDGE TREATMENT / DISPOSAL AND
RECLAIMED WASTEWATER REUSE IN BANGKOK

JAPAN INTERNATIONAL COOPERATION AGENCY

Figure 6.1.4.4

PLAN OF MAJOR INTERCEPTOR
SEWERS FOR KLONG TOEY WEST

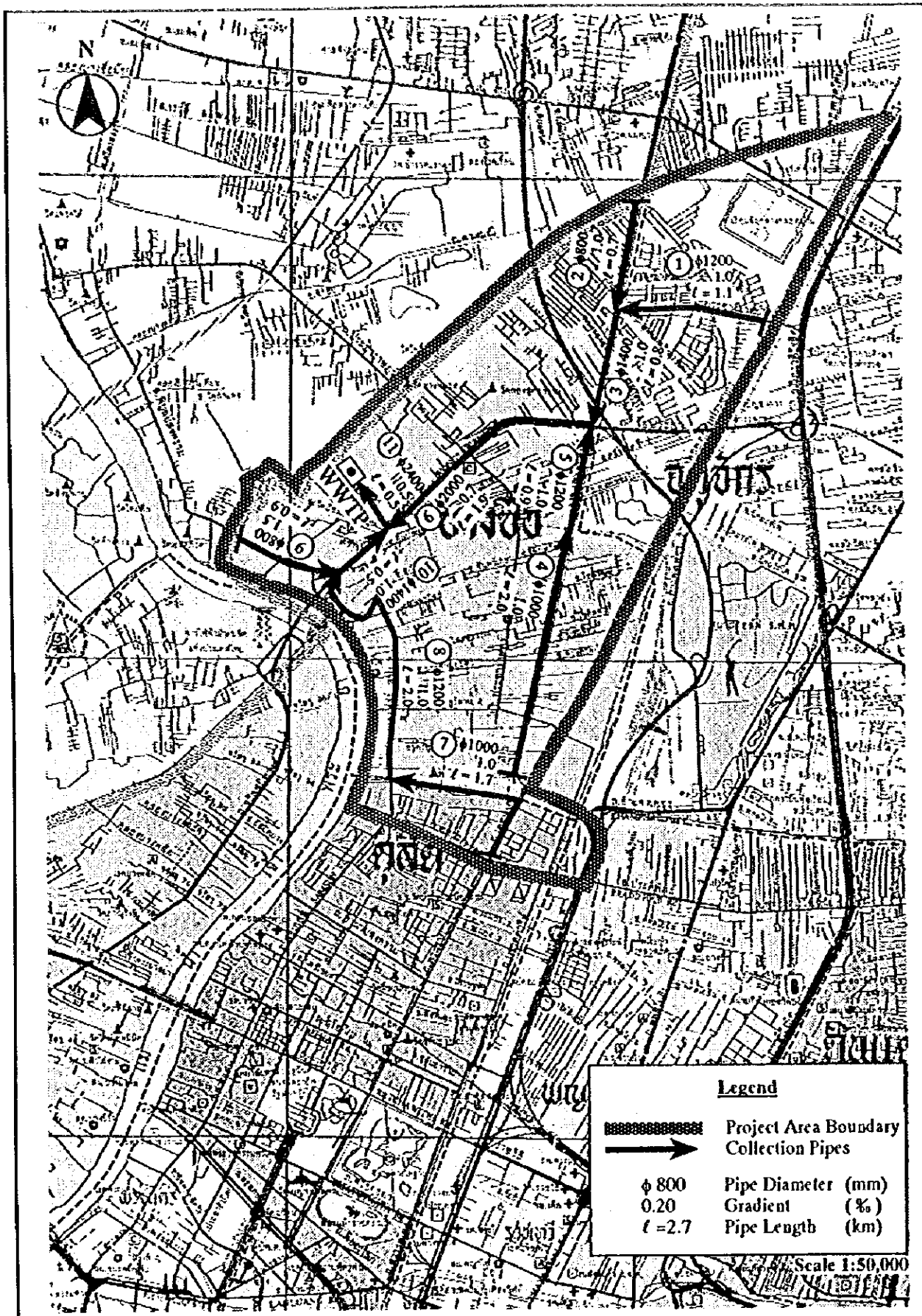


THE STUDY FOR MASTER PLAN ON
SEWAGE SLUDGE TREATMENT / DISPOSAL AND
RECLAIMED WASTEWATER REUSE IN BANGKOK

JAPAN INTERNATIONAL COOPERATION AGENCY

Figure 6.1.4.5

PLAN OF MAJOR INTERCEPTOR
SEWERS FOR KLONG TOEY EAST

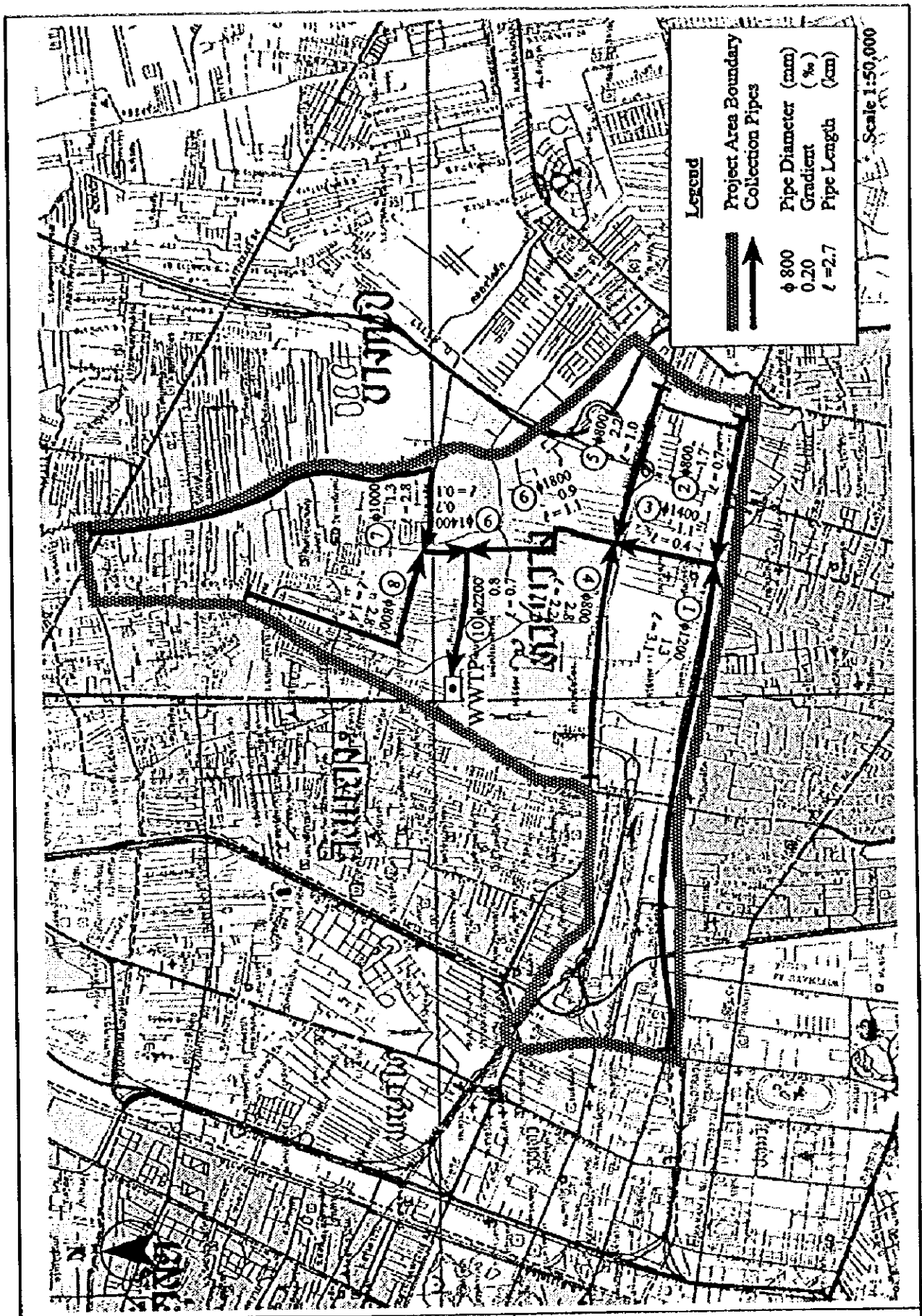


THE STUDY FOR MASTER PLAN ON
SEWAGE SLUDGE TREATMENT / DISPOSAL AND
RECLAIMED WASTEWATER REUSE IN BANGKOK

JAPAN INTERNATIONAL COOPERATION AGENCY

Figure 6.1.4.6

PLAN OF MAJOR INTERCEPTOR
SEWERS FOR BANG SUE

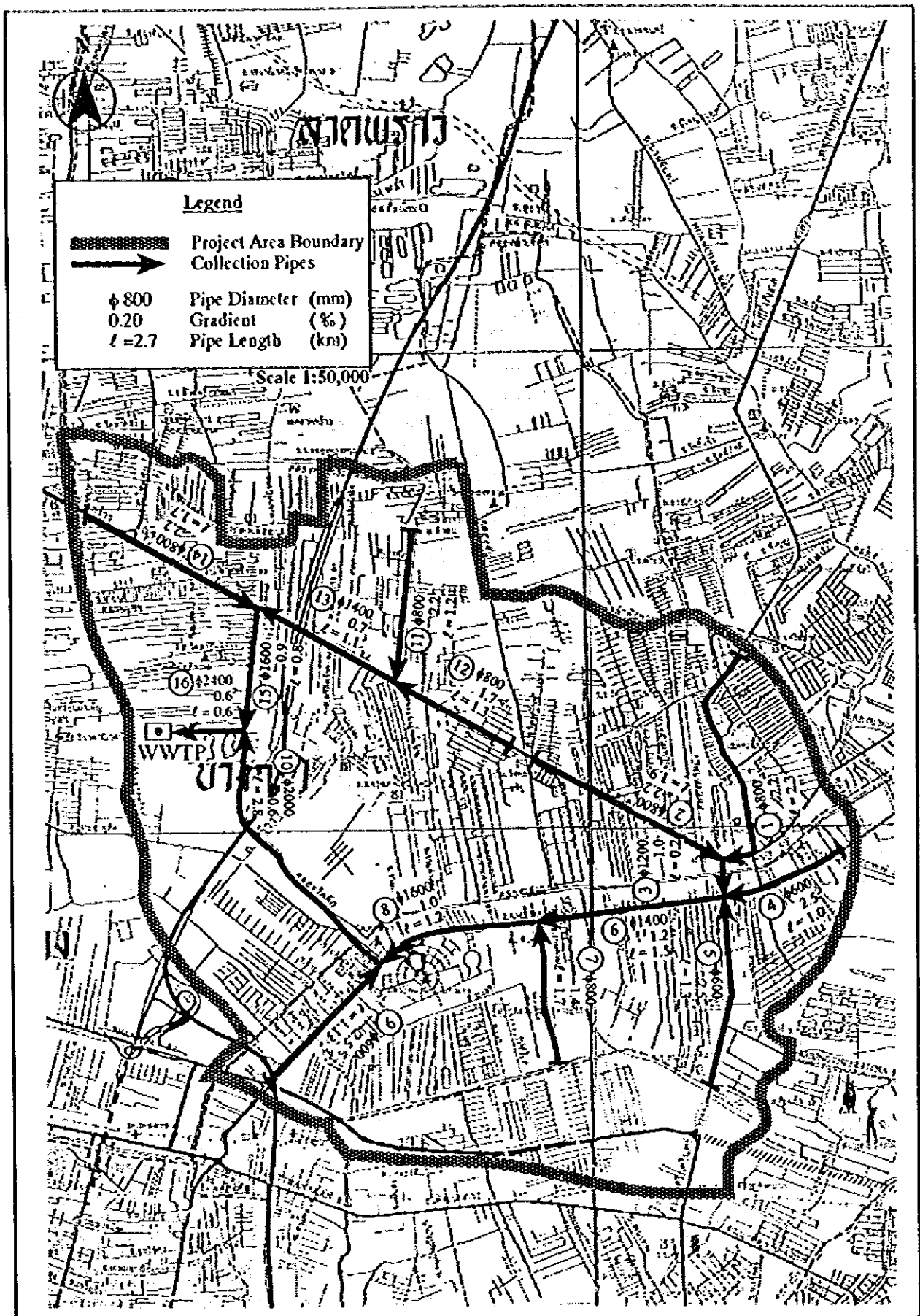


THE STUDY FOR MASTER PLAN ON
SEWAGE SLUDGE TREATMENT / DISPOSAL AND
RECLAIMED WASTEWATER REUSE IN BANGKOK

JAPAN INTERNATIONAL COOPERATION AGENCY

Figure 6.1.4.7

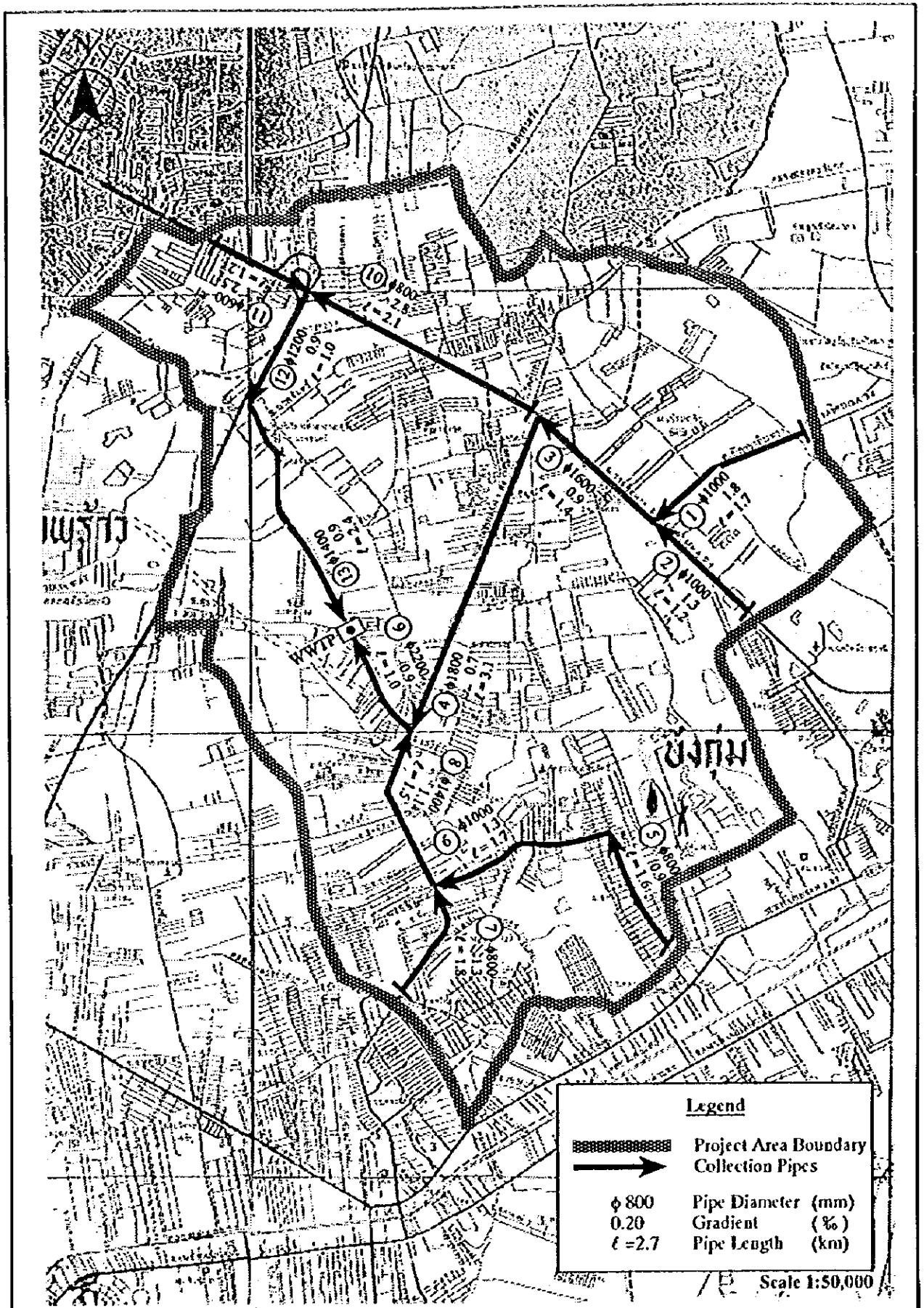
PLAN OF MAJOR INTERCEPTOR
SEWERS FOR HUAY KWUANG



THE STUDY FOR MASTER PLAN ON
SEWAGE SLUDGE TREATMENT / DISPOSAL AND
RECLAIMED WASTEWATER REUSE IN BANGKOK

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Figure 6.1.4.8
PLAN OF MAJOR INTERCEPTOR
SEWERS FOR WANG THONG LANG



THE STUDY FOR MASTER PLAN ON
SEWAGE SLUDGE TREATMENT / DISPOSAL AND
RECLAIMED WASTEWATER REUSE IN BANGKOK

JAPAN INTERNATIONAL COOPERATION AGENCY

Figure 6.1.49
PLAN OF MAJOR INTERCEPTOR
SEWERS FOR BUNG KUM

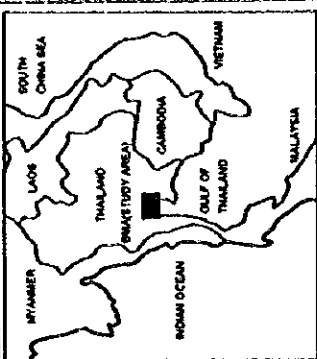
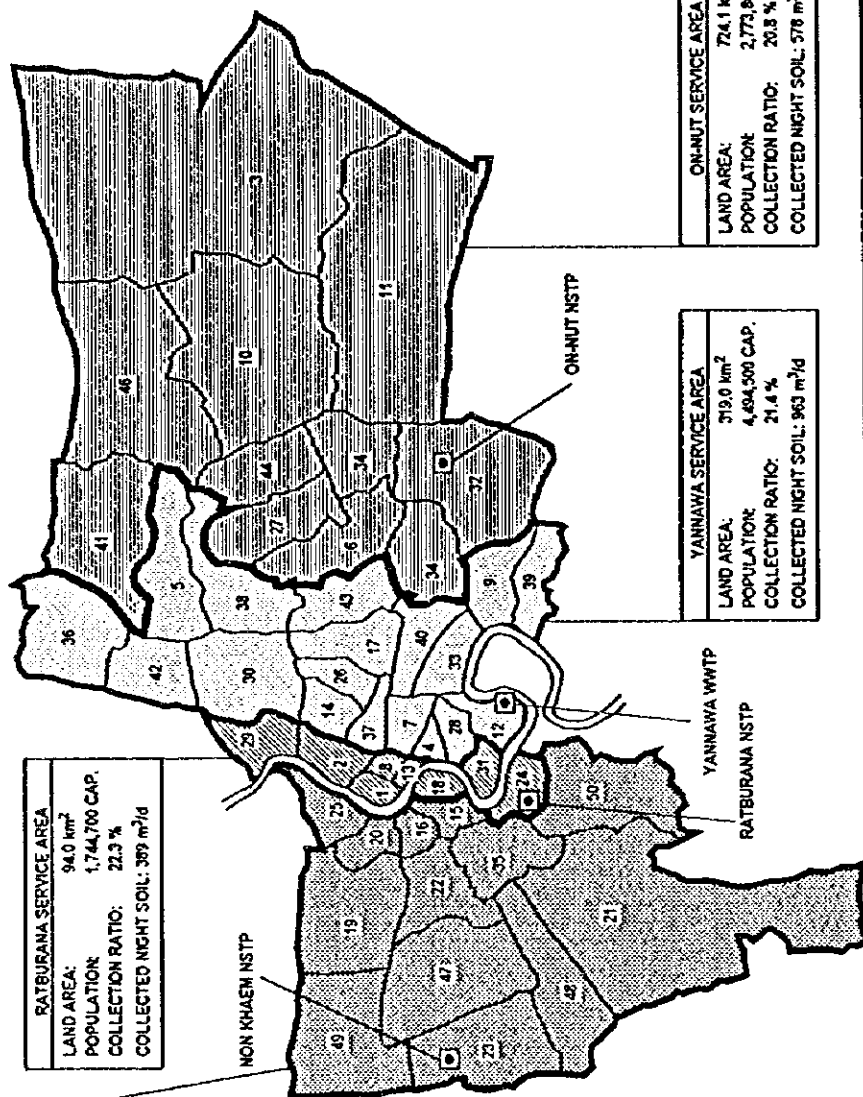
NO	DISTRICT NAME
1	PHRA NAKHON
2	DUSIT
3	NONG JOK
4	BANG RAK
5	BANG KHEN
6	BANG KAPI
7	PATUMVANI
8	POM PRAP SATTRU PHAI
9	PHRA KHANONG
10	MIN BURI
11	LAT KRABANG
12	YAN NAWA
13	SAMPHANTHAWONG
14	PHAYA THAI
15	THON BURI
16	BANGKOK YAI
17	HUAY KWUANG
18	KHLONG SAN
19	TALING CHAN
20	BANGKOK NOI
21	BANG KHUN THIAN
22	PHASI CHAROEN
23	NONG KHAEM
24	RAT BURANA
25	BANG PHLAT
26	DIN DAENG
27	BUNG KUM
28	SATHORN
29	BANG SUE
30	CHATUCHAK
31	BANG KHO LAEM
32	PRAWET
33	KHLONG TOEY
34	SUAN LUANG
35	CHOM THONG
36	DON MUANG
37	RATCHATHEWI
38	LAT PHRAO
39	BANG NA
40	VAOHANA
41	SAI MAI
42	LAK SI
43	WANG THONG LANG
44	KHANNA YAO
45	SAPHAN SONG
46	SAMWA
47	BANG KAE
48	BANG BON
49	THAWI WATTANA
50	THUNG KRUE

NONG KHAEM SERVICE AREA	
LAND AREA:	432.0 km ²
POPULATION:	2,843,000 CAP.
COLLECTION RATIO:	18.1 %
COLLECTED NIGHT SOIL:	316 m ³ /d

RATBURANA SERVICE AREA	
LAND AREA:	94.0 km ²
POPULATION:	1,744,700 CAP.
COLLECTION RATIO:	22.3 %
COLLECTED NIGHT SOIL:	389 m ³ /d

YANNAWA SERVICE AREA	
LAND AREA:	319.0 km ²
POPULATION:	4,684,500 CAP.
COLLECTION RATIO:	21.4 %
COLLECTED NIGHT SOIL:	963 m ³ /d

ON-NUT SERVICE AREA	
LAND AREA:	724.1 km ²
POPULATION:	2,773,800 CAP.
COLLECTION RATIO:	20.8 %
COLLECTED NIGHT SOIL:	570 m ³ /d



**THE STUDY FOR MASTER PLAN ON
SEWAGE SLUDGE TREATMENT / DISPOSAL AND
RECLAIMED WASTEWATER REUSE IN BANGKOK
JAPAN INTERNATIONAL COOPERATION AGENCY**

**Figure 6.2.2.1
EXPANSION PLAN FOR NIGHT SOIL
COLLECTION AND TREATMENT IN 2020**

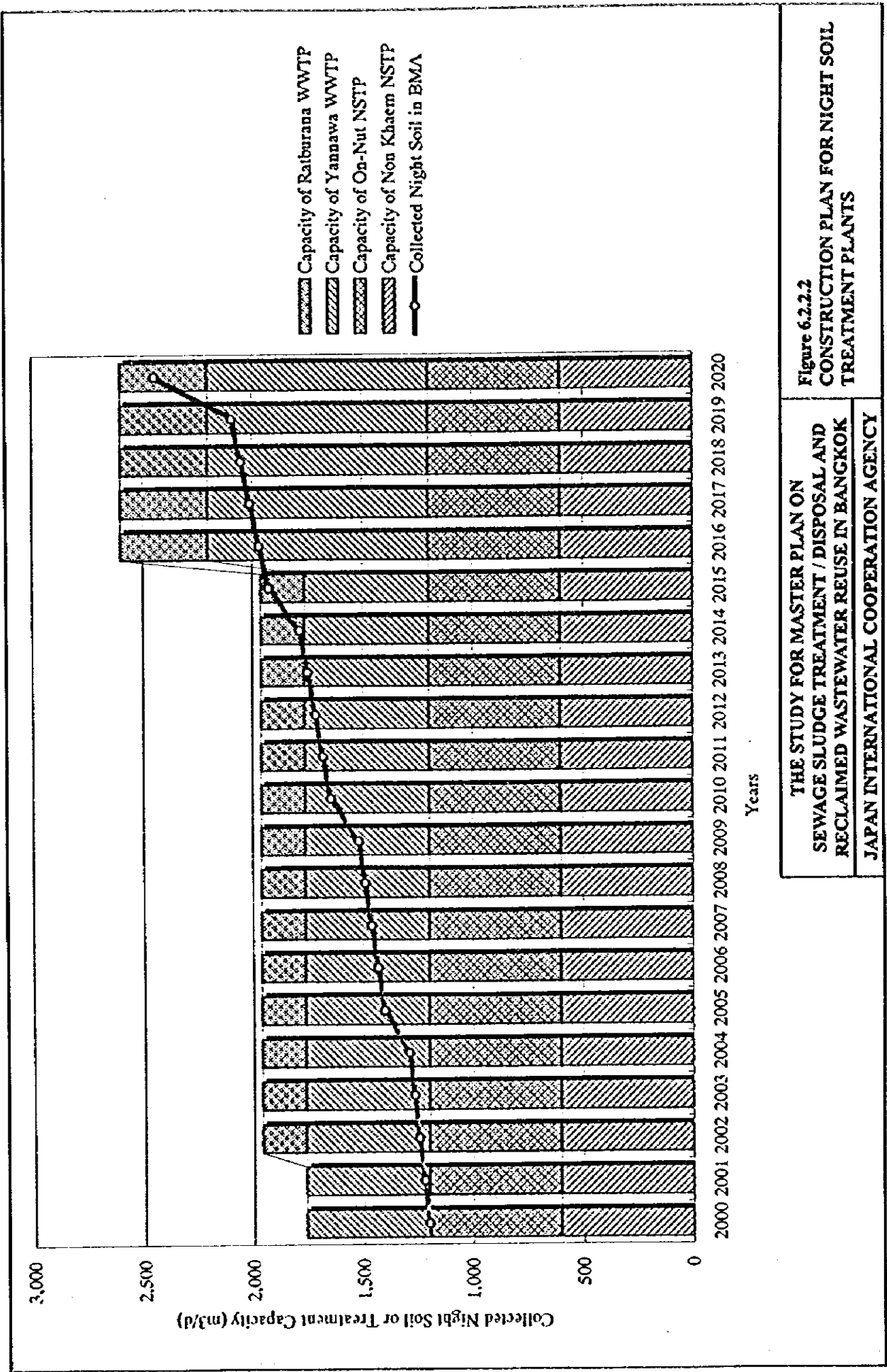


Figure 6.2.2.2
CONSTRUCTION PLAN FOR NIGHT SOIL TREATMENT PLANTS

THE STUDY FOR MASTER PLAN ON SEWAGE SLUDGE TREATMENT / DISPOSAL AND RECLAIMED WASTEWATER REUSE IN BANGKOK
JAPAN INTERNATIONAL COOPERATION AGENCY

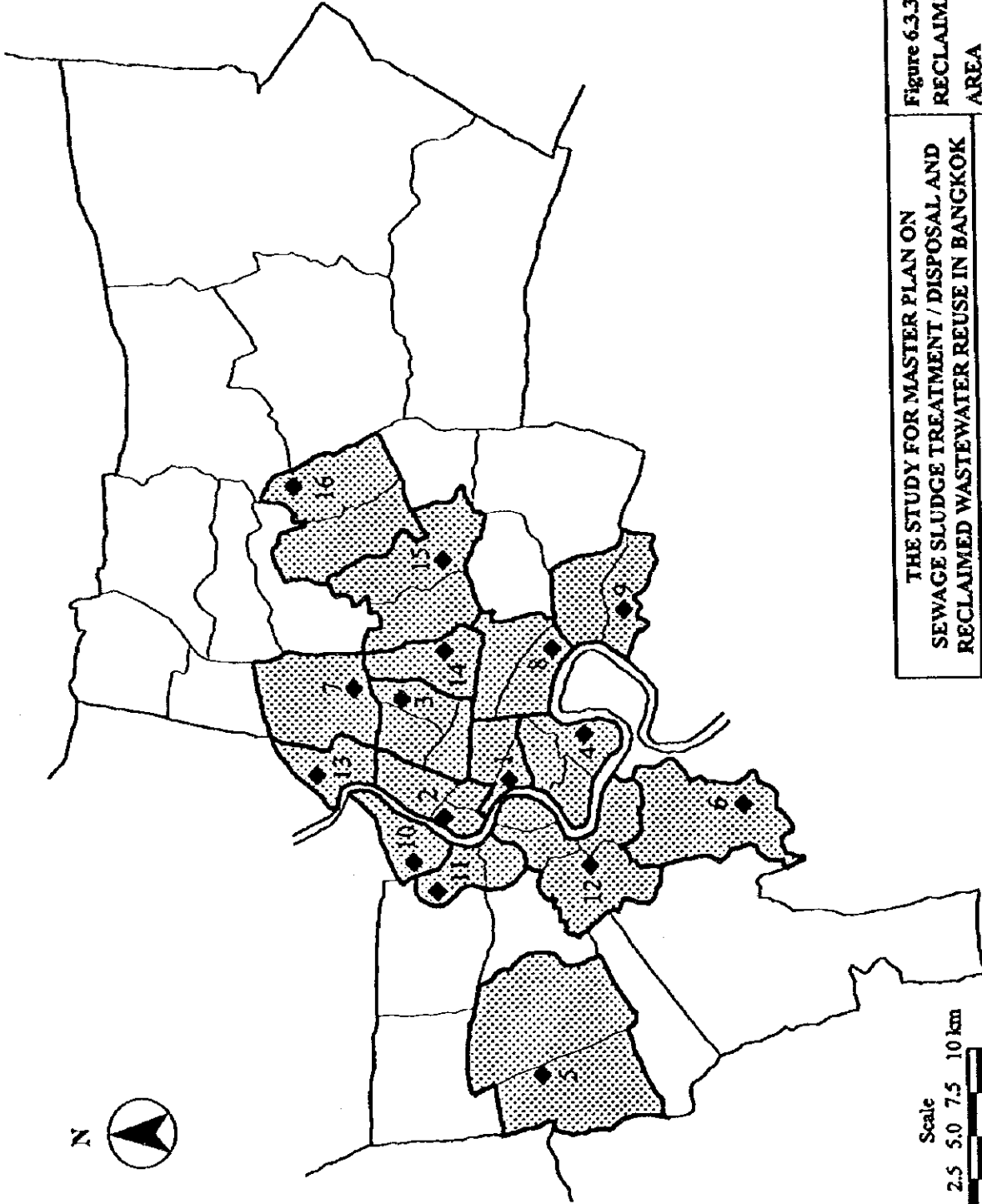
Legend

No. Name of WWTP

1. Si Phraya
2. Ratanakosin
3. BKK Central
4. Yannawa
5. Nong Khaem
6. Ratburana
7. Chatuchak
8. Khlong Toey West
9. Khlong Toey East
10. Thonburi North
11. Thonburi Central
12. Thonburi South
13. Bang Sue
14. Huay Kwuang
15. Wang Thong Lang
16. Bung Kum

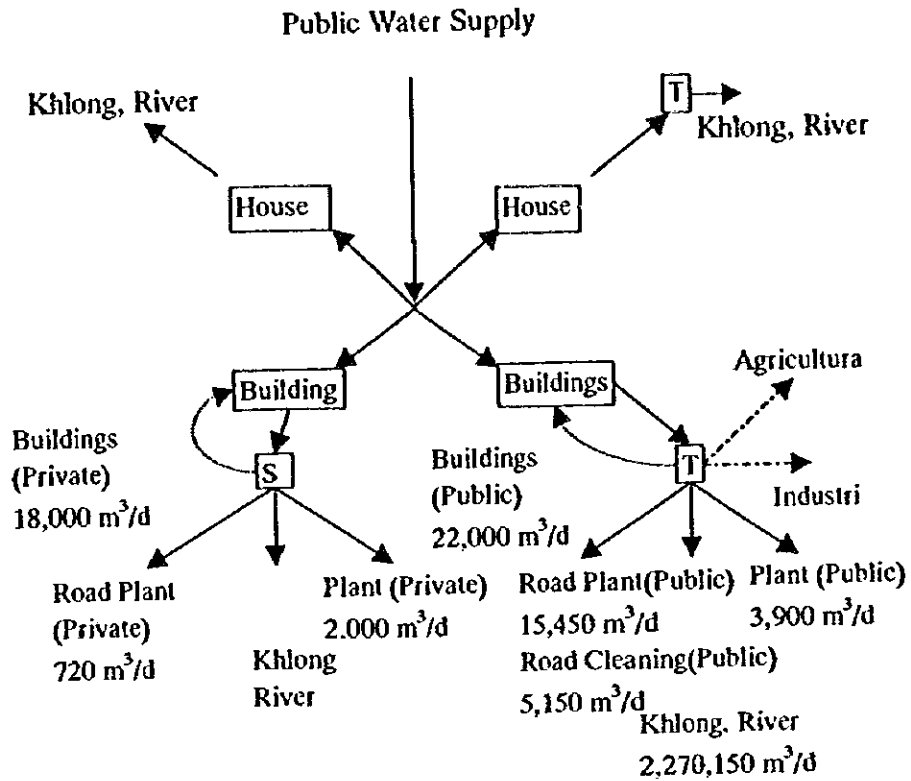
◆ WWTP

▨ Reclaimed Wastewater Service Area from Each WWTP



**Figure 6.3.3.1
RECLAIMED WASTEWATER SERVICE
AREA**

**THE STUDY FOR MASTER PLAN ON
SEWAGE SLUDGE TREATMENT / DISPOSAL AND
RECLAIMED WASTEWATER REUSE IN BANGKOK
JAPAN INTERNATIONAL COOPERATION AGENCY**



Legend

Road Plant	Road Plant Watering
Road Cleaning	Road Cleaning
Buildings	Buildings Miscellaneous Water
Plant	Plant Watering (Parks, Golfcourse etc.)
Khlong	Purification of Khlong
Agricultural	Agricultural Water
Industrial	Industrial Water

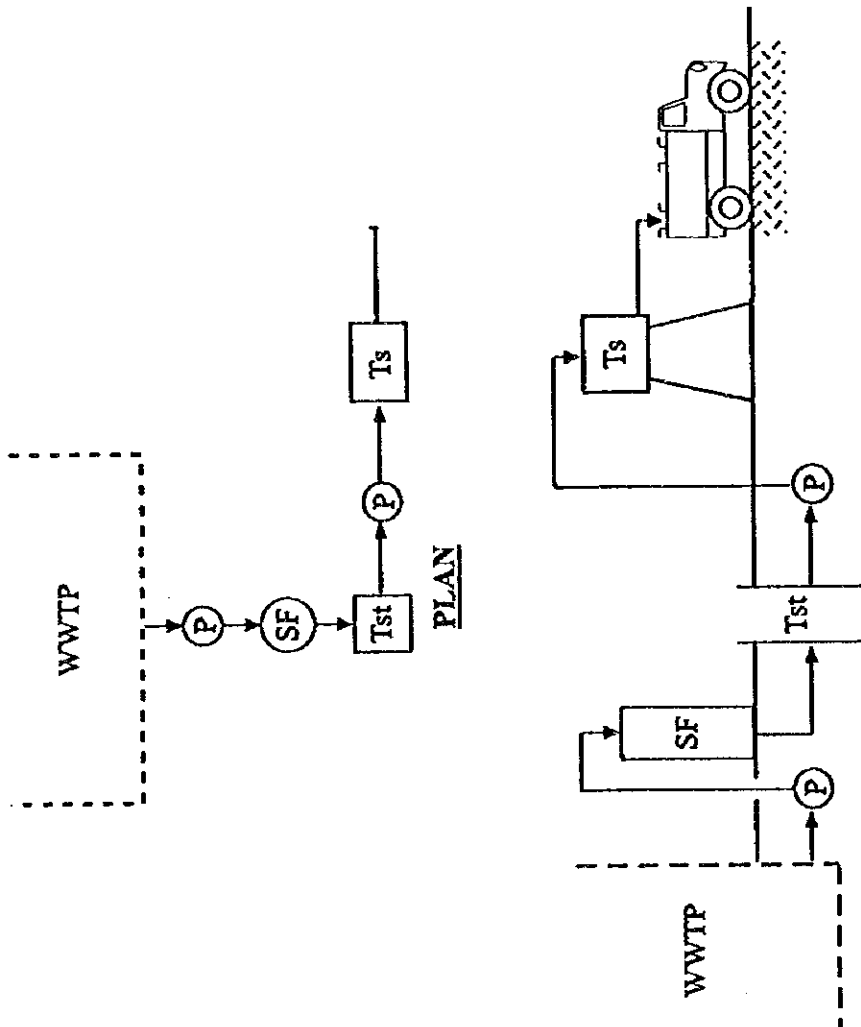
T
S

Public Wastewater Treatment Plant
Wastewater Treatment Facilities in buildings

**THE STUDY FOR MASTER PLAN ON
SEWAGE SLUDGE TREATMENT/ DISPOSAL AND
RECLAIMED WASTEWATER REUSE IN BANGKOK**

JAPAN INTERNATIONAL COOPERATION AGENCY

**Figure 6.3.3.2
RECLAIMED WASTEWATER REUSE BY
EACH ITEM(2020)**



Legend

WWTP: Wastewater Treatment Plant
 AC: Activated Carbon Filter
 SF: Sand Filter
 Tst: Storage Tank
 Ts: Service Tank
 P: Pump

SECTION

THE STUDY FOR MASTER PLAN ON SEWAGE SLUDGE TREATMENT / DISPOSAL AND RECLAIMED WASTEWATER REUSE IN BANGKOK

JAPAN INTERNATIONAL COOPERATION AGENCY

Figure 6.3.5.1 RECLAIMED WASTEWATER REUSE FOR ROAD PLANT WATERING AND ROAD CLEANING (PLAN A)

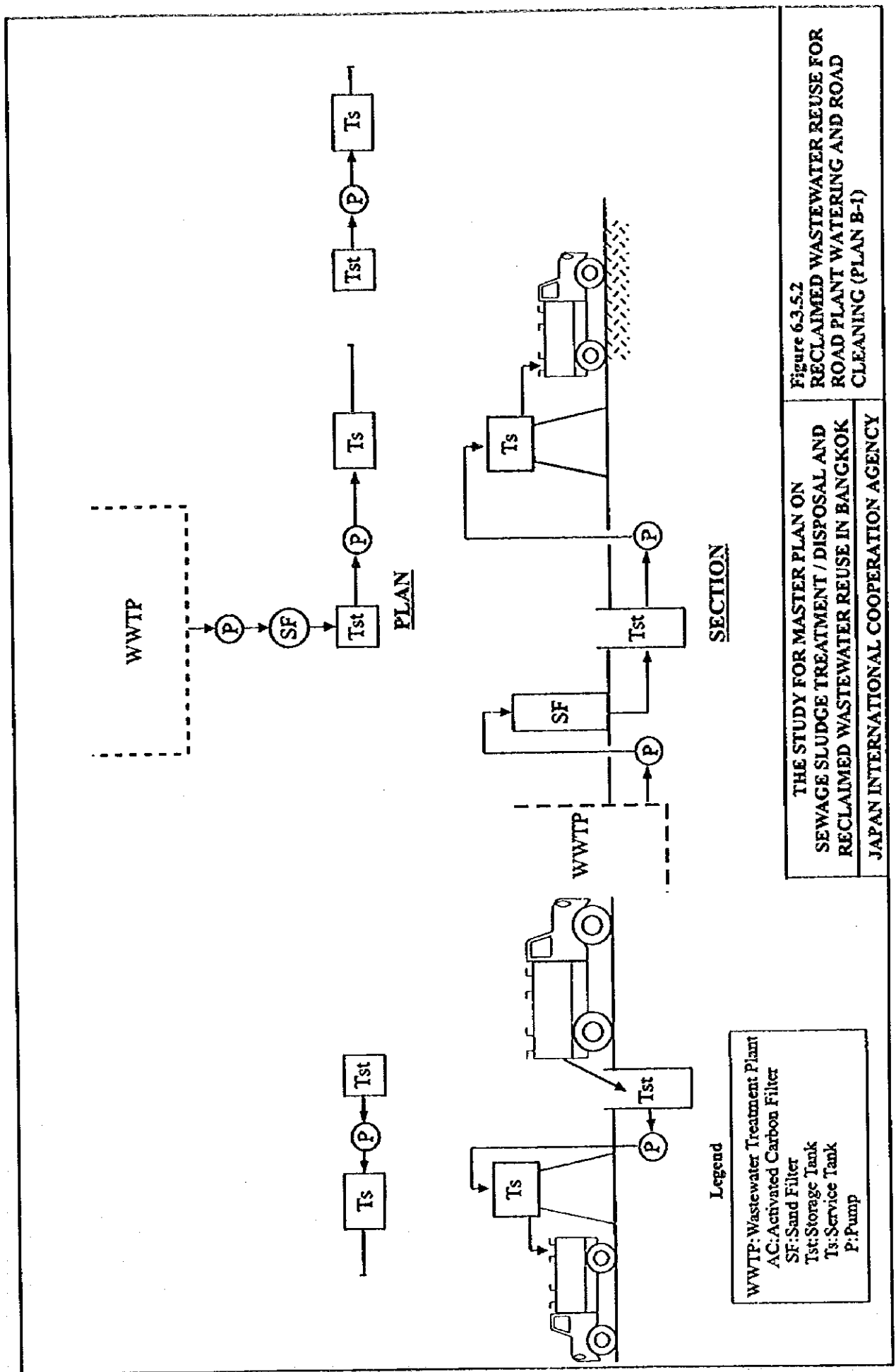
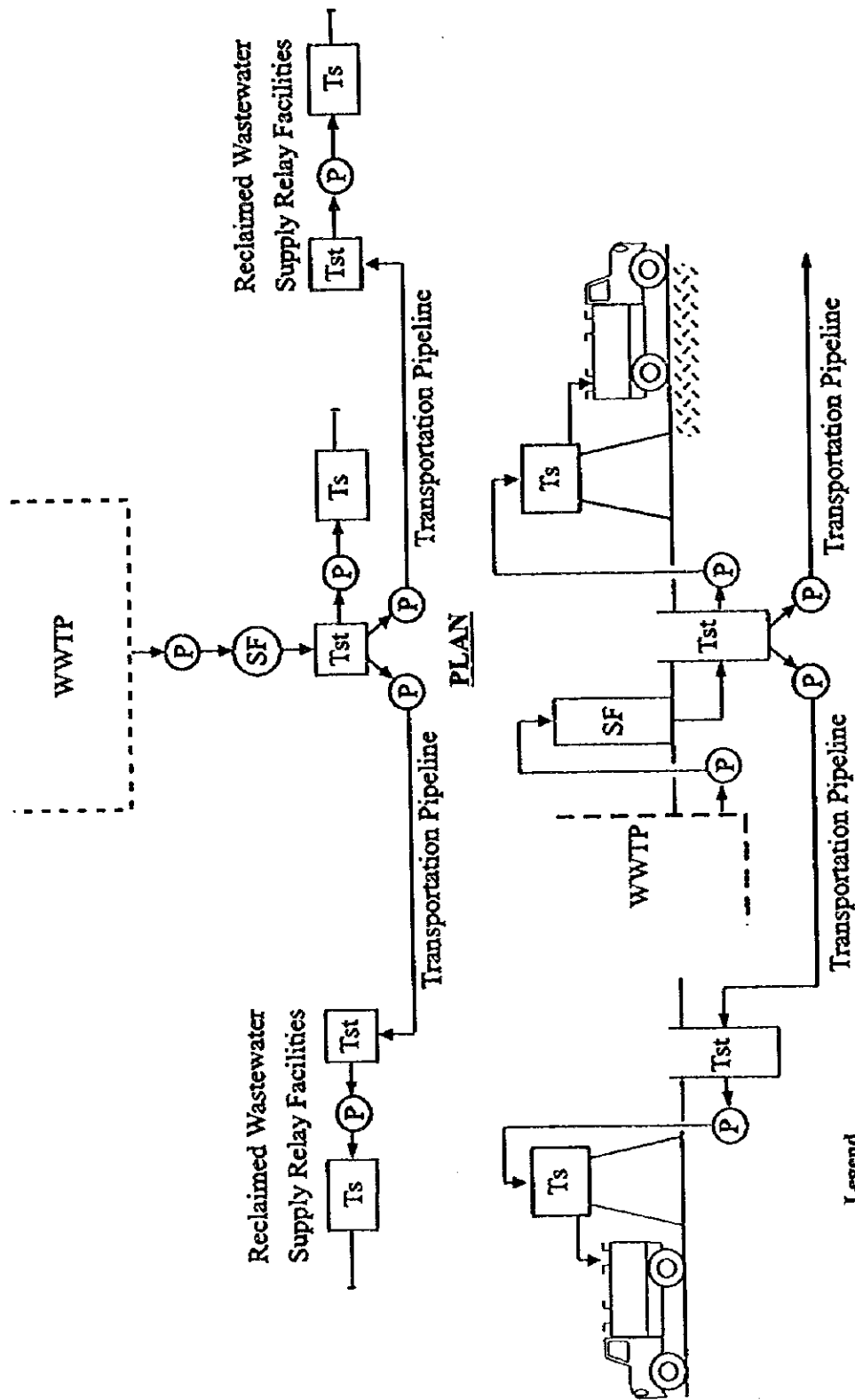


Figure 6.3.5.2
 RECLAIMED WASTEWATER REUSE FOR
 ROAD PLANT WATERING AND ROAD
 CLEANING (PLAN B-1)

THE STUDY FOR MASTER PLAN ON
 SEWAGE SLUDGE TREATMENT / DISPOSAL AND
 RECLAIMED WASTEWATER REUSE IN BANGKOK
 JAPAN INTERNATIONAL COOPERATION AGENCY



Legend

WWTP: Wastewater Treatment Plant
 AC: Activated Carbon Filter
 SF: Sand Filter
 Tst: Storage Tank
 Ts: Service Tank
 P: Pump

SECTION

THE STUDY FOR MASTER PLAN ON
 SEWAGE SLUDGE TREATMENT / DISPOSAL AND
 RECLAIMED WASTEWATER REUSE IN BANGKOK
 JAPAN INTERNATIONAL COOPERATION AGENCY

Figure 6.3.5.3
 RECLAIMED WASTEWATER REUSE FOR
 ROAD PLANT WATERING AND ROAD
 CLEANING (PLAN B-2)

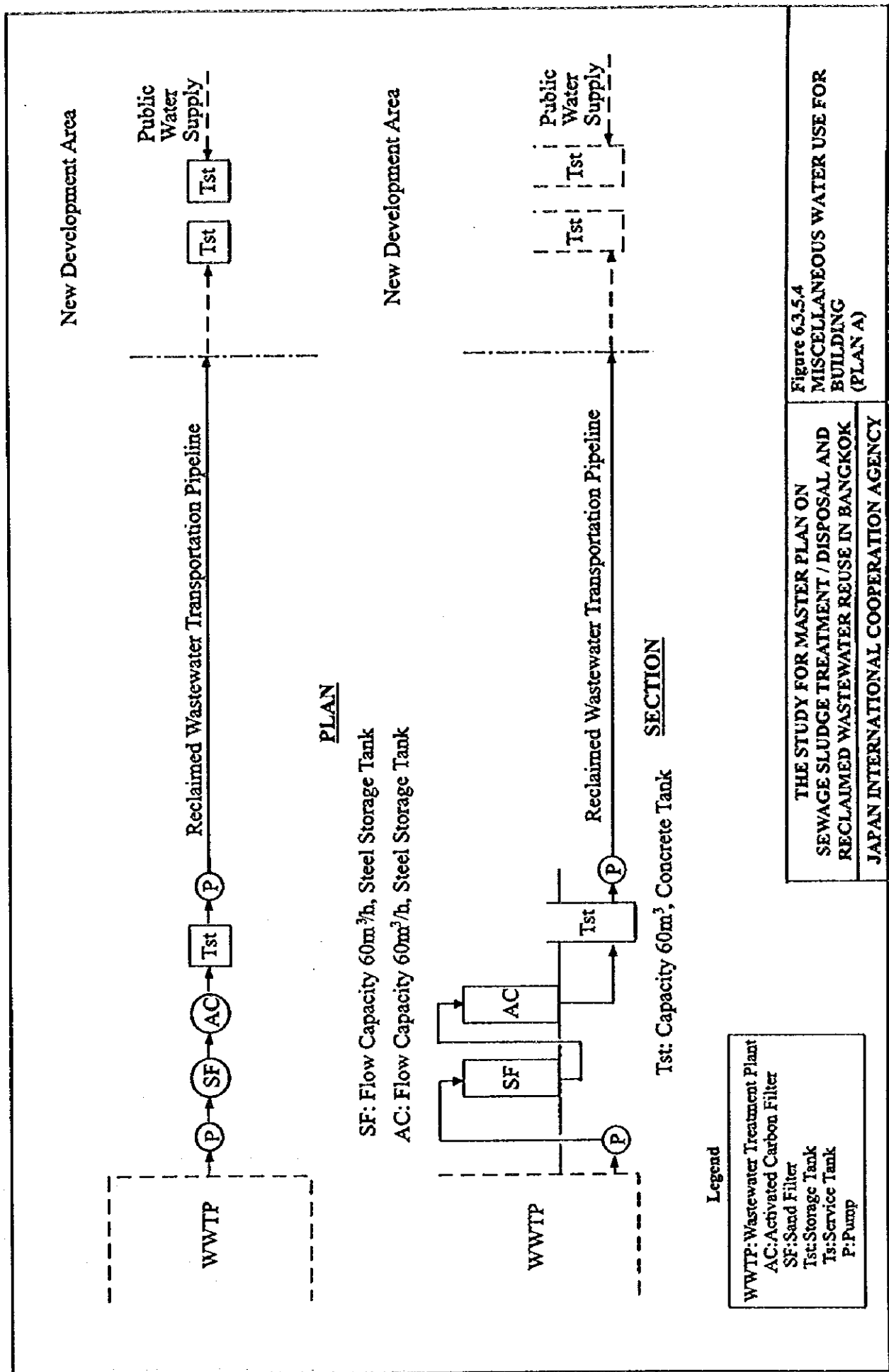


Figure 6.3.5.4
MISCELLANEOUS WATER USE FOR BUILDING (PLAN A)

THE STUDY FOR MASTER PLAN ON SEWAGE SLUDGE TREATMENT / DISPOSAL AND RECLAIMED WASTEWATER REUSE IN BANGKOK
JAPAN INTERNATIONAL COOPERATION AGENCY

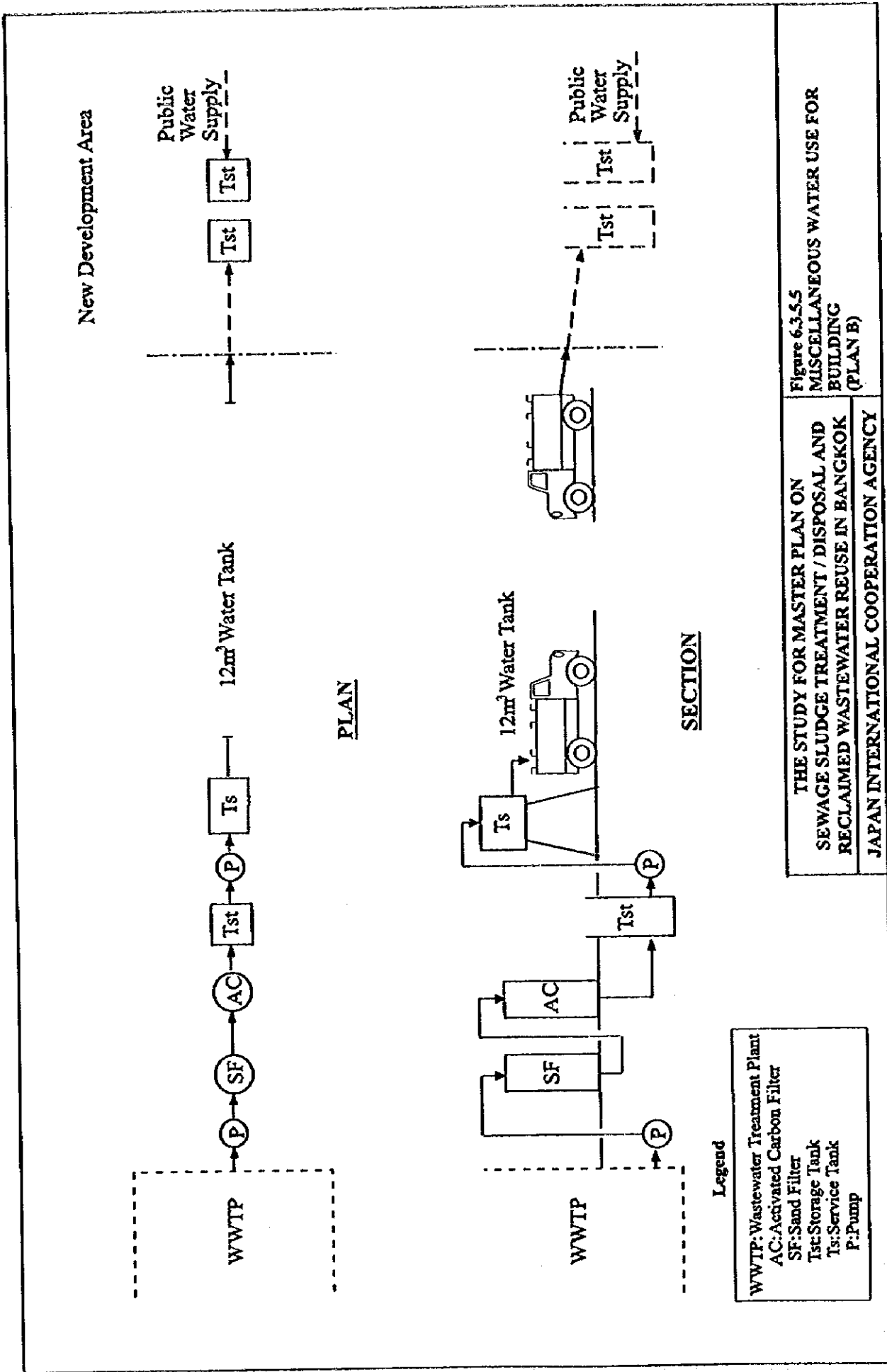
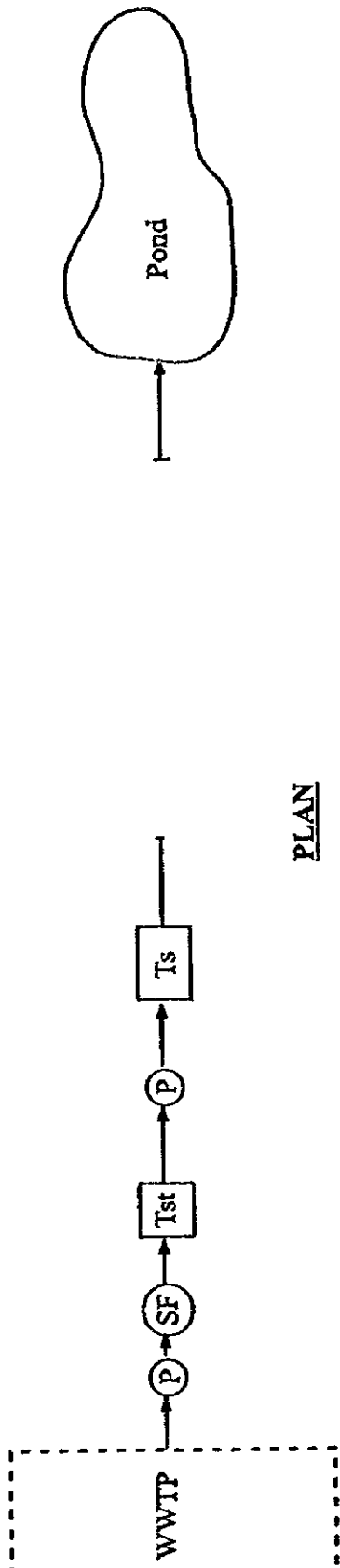


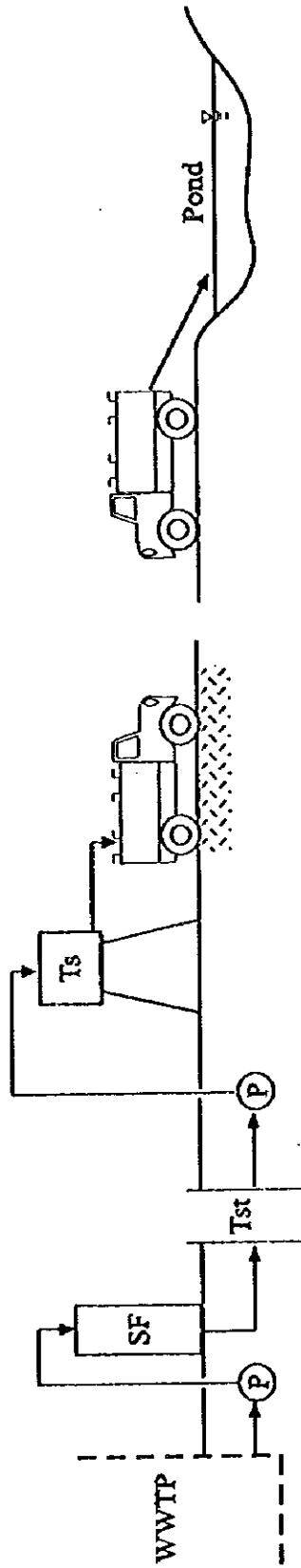
Figure 6.3.5.5
MISCELLANEOUS WATER USE FOR BUILDING (PLAN B)

THE STUDY FOR MASTER PLAN ON SEWAGE SLUDGE TREATMENT / DISPOSAL AND RECLAIMED WASTEWATER REUSE IN BANGKOK

JAPAN INTERNATIONAL COOPERATION AGENCY



PLAN



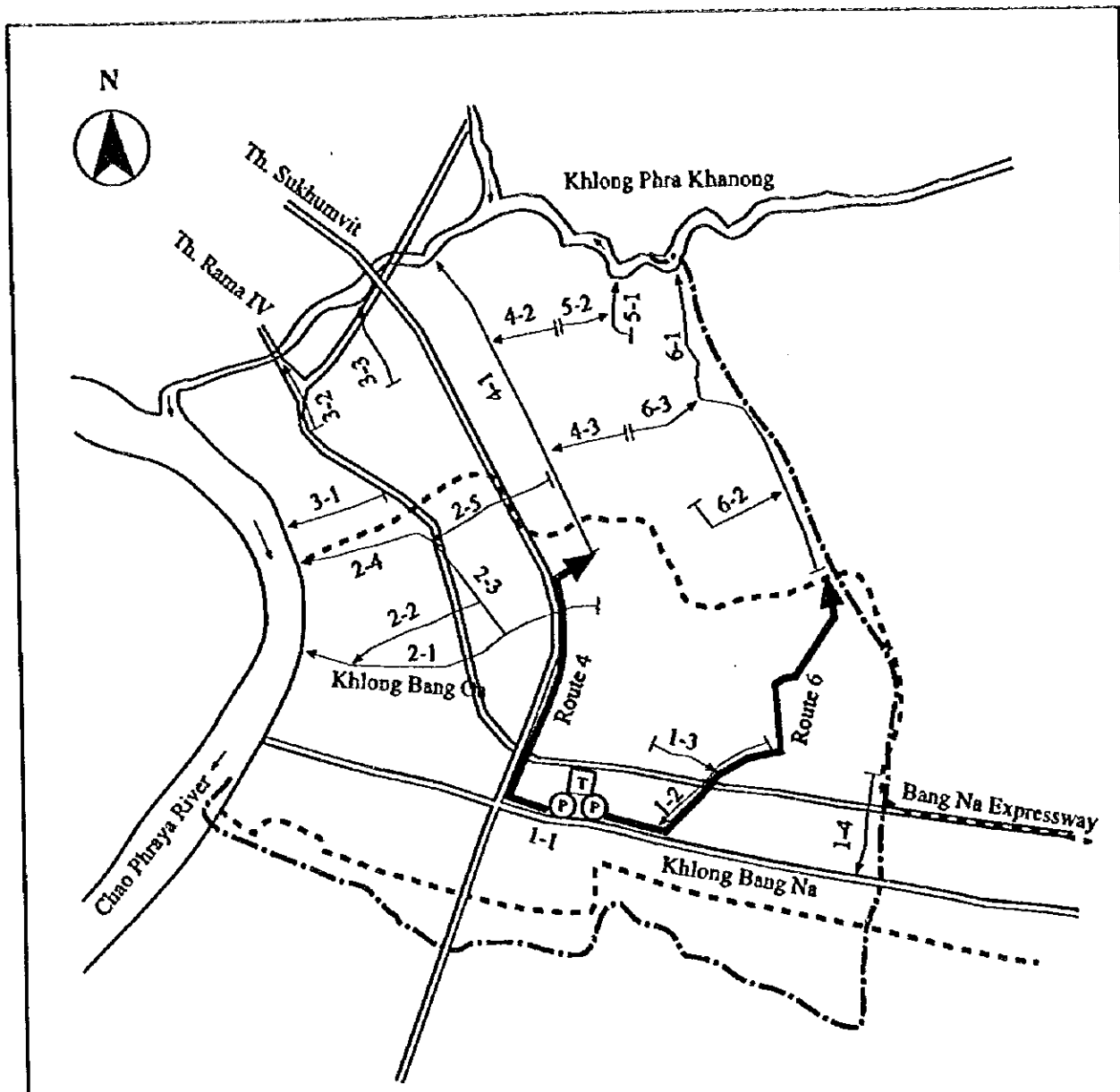
SECTION

Legend

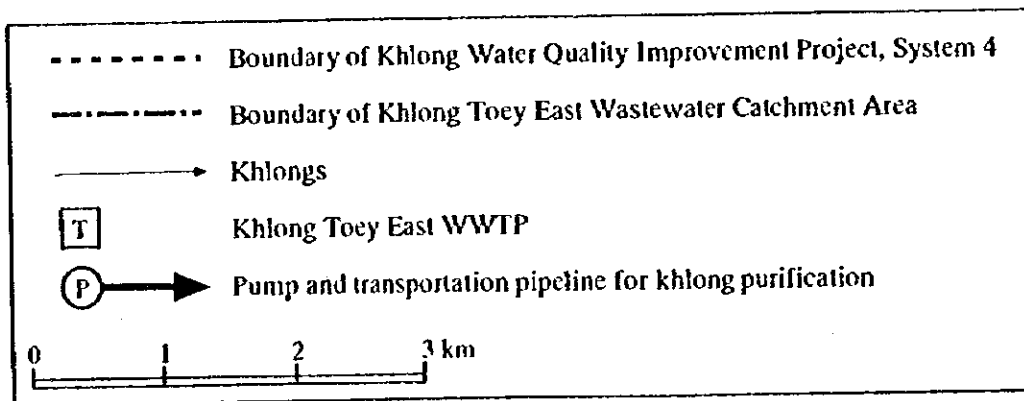
- WWTP: Wastewater Treatment Plant
- AC: Activated Carbon Filter
- SF: Sand Filter
- Tst: Storage Tank
- Ts: Service Tank
- P: Pump

Figure 6.3.5.6
**PLANT WATERING
(PARKS, GOLF COURSE, ETC.)
(BY TANKER)**

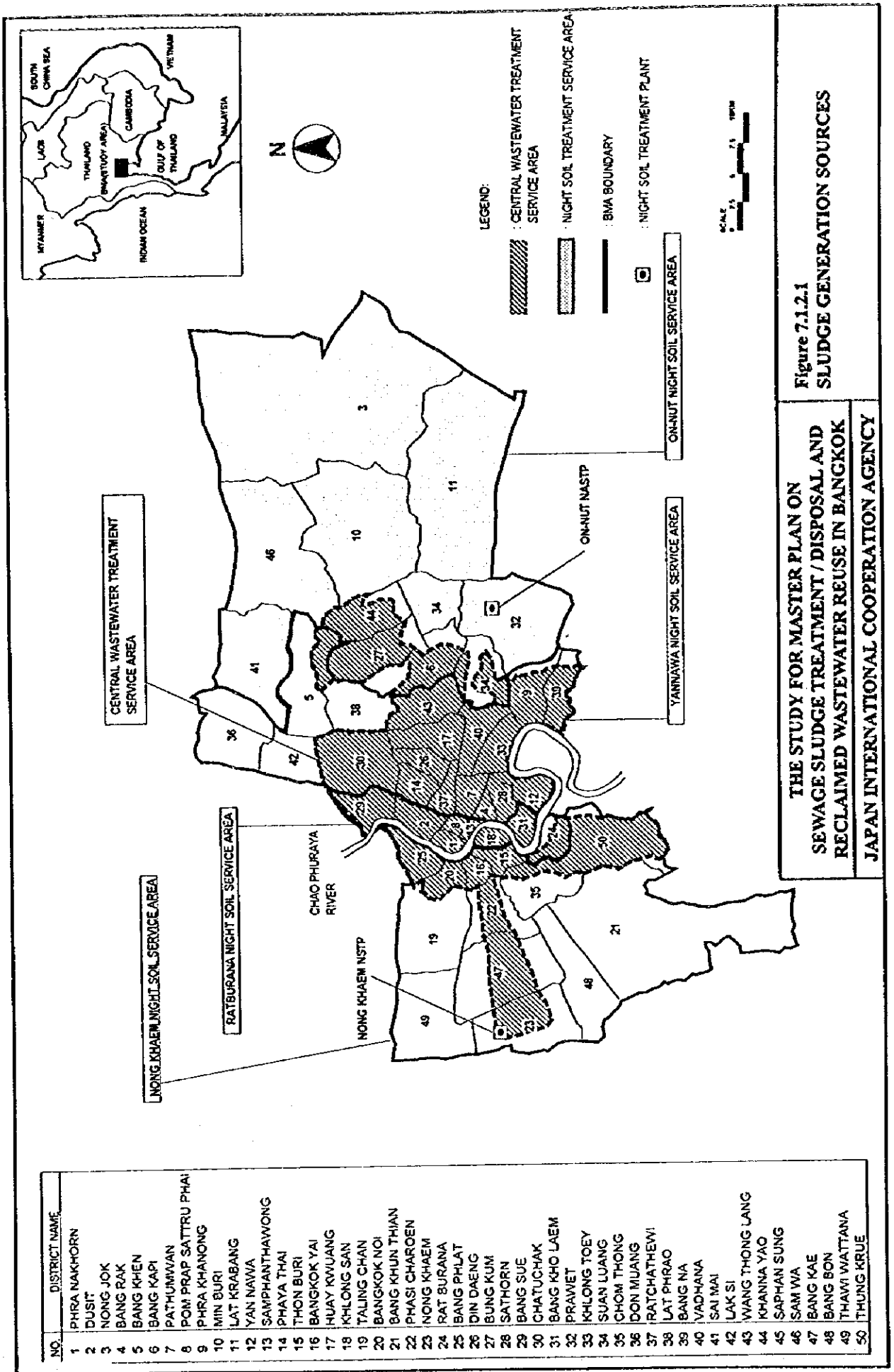
**THE STUDY FOR MASTER PLAN ON
SEWAGE SLUDGE TREATMENT / DISPOSAL AND
RECLAIMED WASTEWATER REUSE IN BANGKOK
JAPAN INTERNATIONAL COOPERATION AGENCY**



Legend



<p>THE STUDY FOR MASTER PLAN ON SEWAGE SLUDGE TREATMENT / DISPOSAL AND RECLAIMED WASTEWATER REUSE IN BANGKOK</p>	<p>Figure 6.3.5.7 RECLAIMED WASTEWATER REUSE PLAN FOR KHLONG PURIFICATION (KHLONG TOEY EAST CATCHMENT AREA)</p>
<p>JAPAN INTERNATIONAL COOPERATION AGENCY</p>	



NO.	DISTRICT NAME
1	PHRA NAKHORN
2	DUSIT
3	NONG JOK
4	BANG RAK
5	BANG KHEN
6	BANG KAPI
7	PATUMVAN
8	POM PRAP SATTRU PHAI
9	PHRA KHANONG
10	MIN BURI
11	LAT KRABANG
12	YAN NAWA
13	SAMPHANTHAWONG
14	PHAYA THAI
15	THON BURI
16	BANGKOK YAI
17	HUAY KWUANG
18	KHLONG SAN
19	TALING CHAN
20	BANGKOK NOI
21	BANG KHUN THIAN
22	PHASI CHAROEN
23	NONG KHAEM
24	RAT BURANA
25	BANG PHLAT
26	DIN DAENG
27	BUNG KUM
28	SATHORN
29	BANG SUE
30	CHATUCHAK
31	BANG KHO LAEM
32	PRAWET
33	KHLONG TOEY
34	SUAN LUANG
35	CHOM THONG
36	DON MUANG
37	RATCHATHEWI
38	LAT PHRAO
39	BANG NA
40	VADHANA
41	SAI MAI
42	LAK SI
43	WANG THONG LANG
44	KHANNA YAO
45	SAPHAN SUNG
46	SAM WA
47	BANG KAE
48	BANG BON
49	THAWI WATTANA
50	THUNG KRUE

THE STUDY FOR MASTER PLAN ON
SEWAGE SLUDGE TREATMENT / DISPOSAL AND
RECLAIMED WASTEWATER REUSE IN BANGKOK
JAPAN INTERNATIONAL COOPERATION AGENCY

Figure 7.1.2.1
SLUDGE GENERATION SOURCES

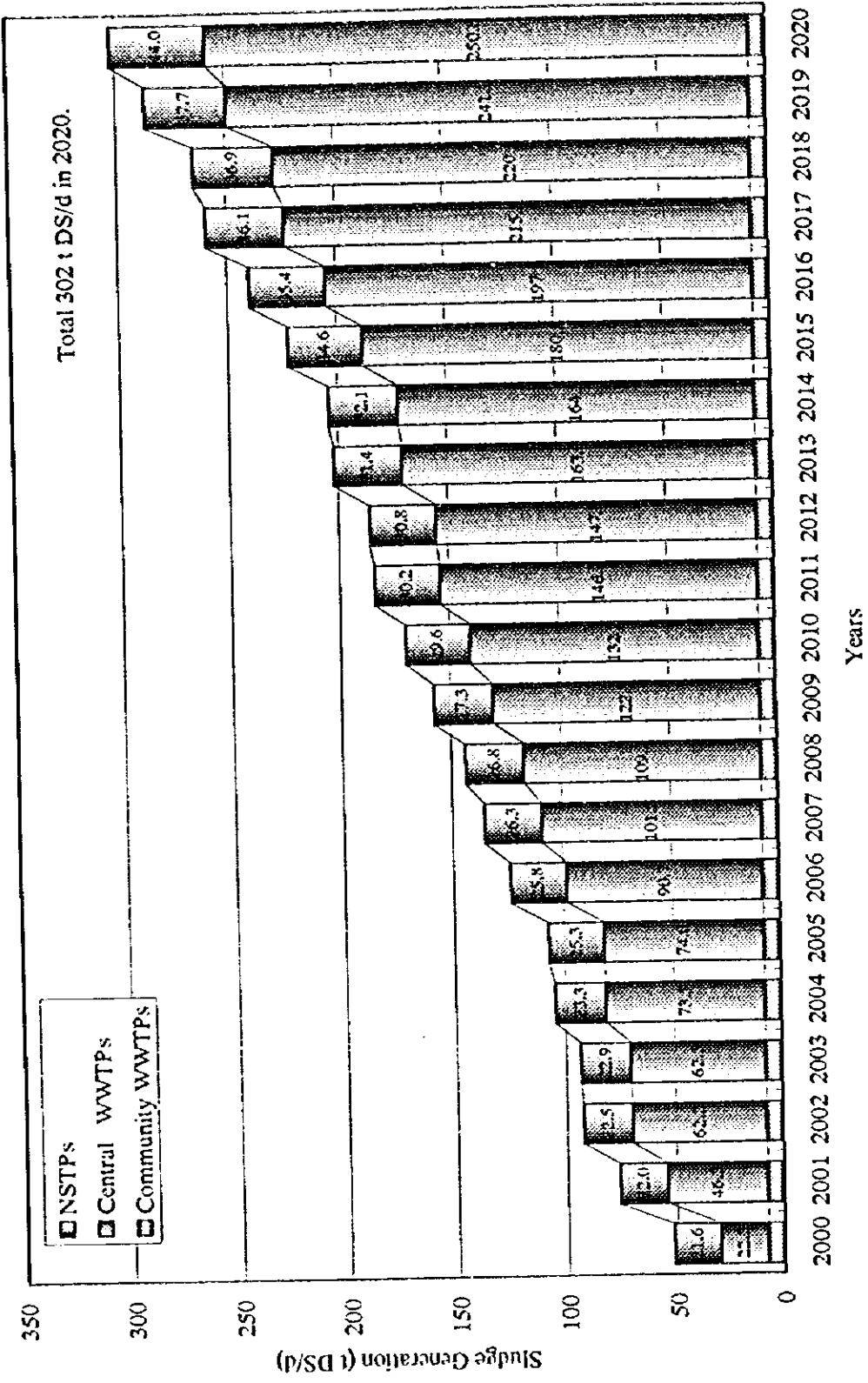


Figure 7.1.3.1
TRANSITION OF SLUDGE GENERATION
IN BMA

THE STUDY FOR MASTER PLAN ON
SEWAGE SLUDGE TREATMENT / DISPOSAL AND
RECLAIMED WASTEWATER REUSE IN BANGKOK
JAPAN INTERNATIONAL COOPERATION AGENCY

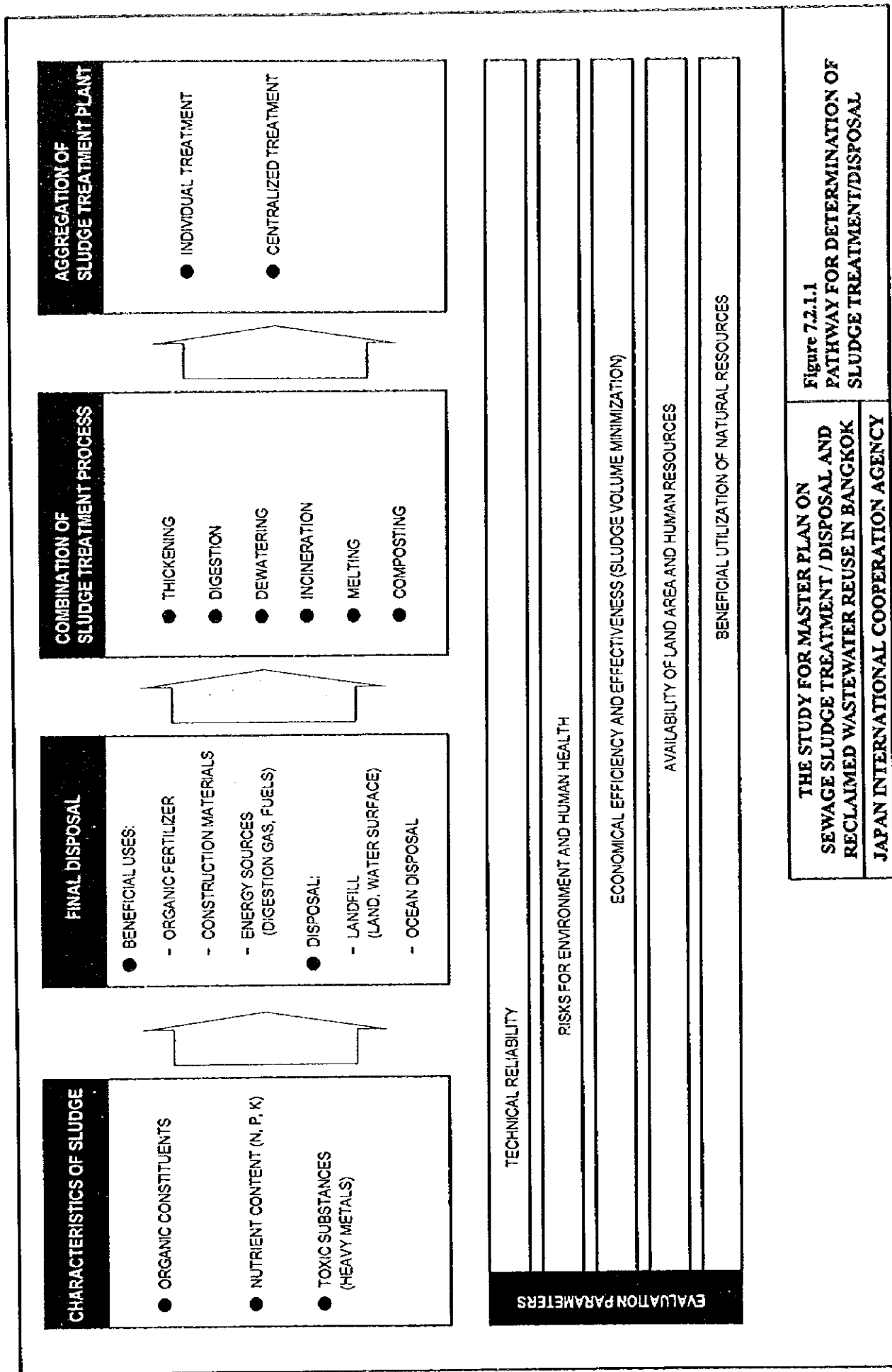
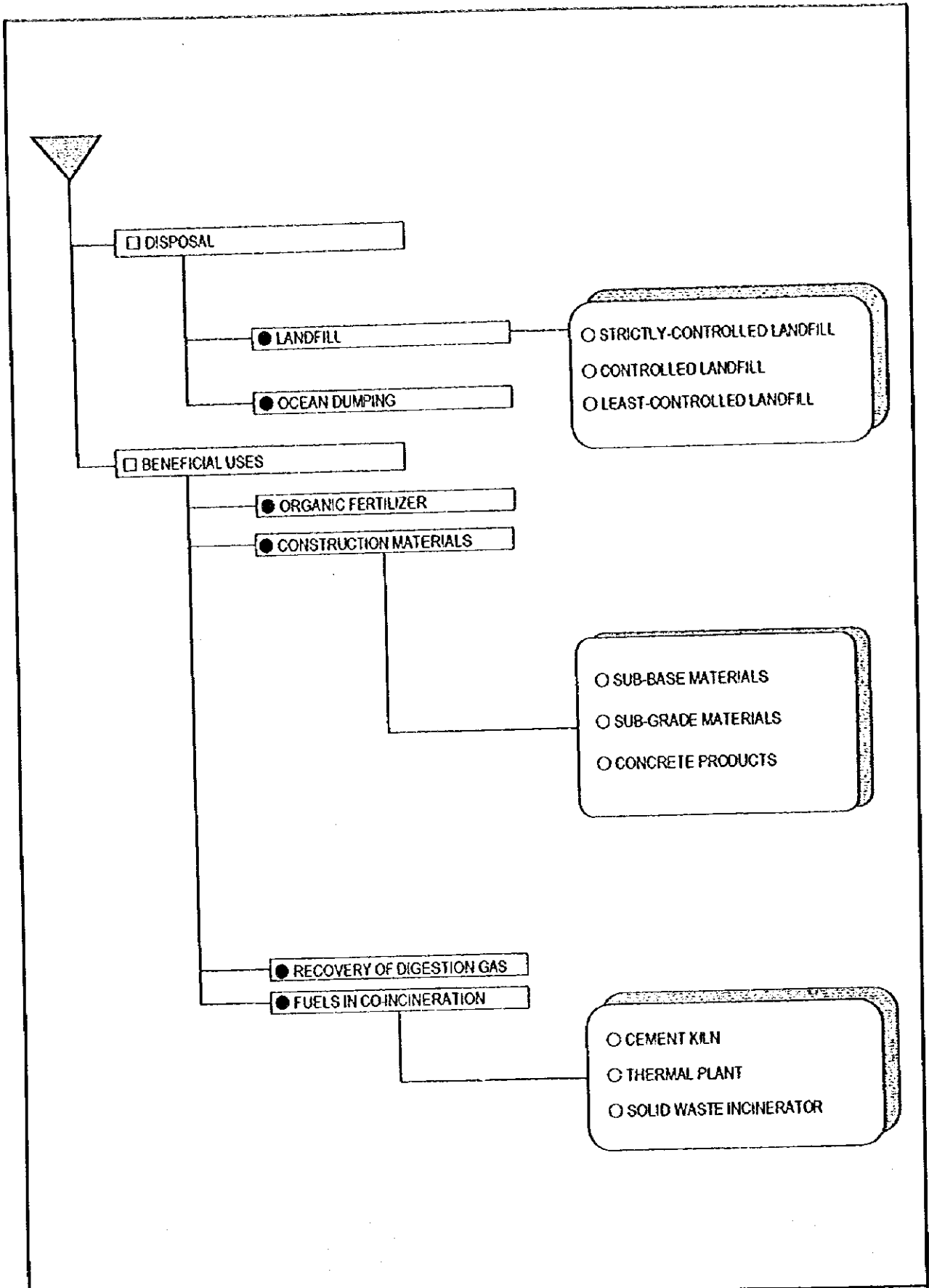


Figure 7.2.1.1
 PATHWAY FOR DETERMINATION OF
 SLUDGE TREATMENT/DISPOSAL

THE STUDY FOR MASTER PLAN ON
 SEWAGE SLUDGE TREATMENT / DISPOSAL AND
 RECLAIMED WASTEWATER REUSE IN BANGKOK
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THE STUDY FOR MASTER PLAN ON
SEWAGE SLUDGE TREATMENT / DISPOSAL AND
RECLAIMED WASTEWATER REUSE IN BANGKOK
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Figure 7.2.2.1
OPTIONS OF ULTIMATE SLUDGE
DISPOSAL

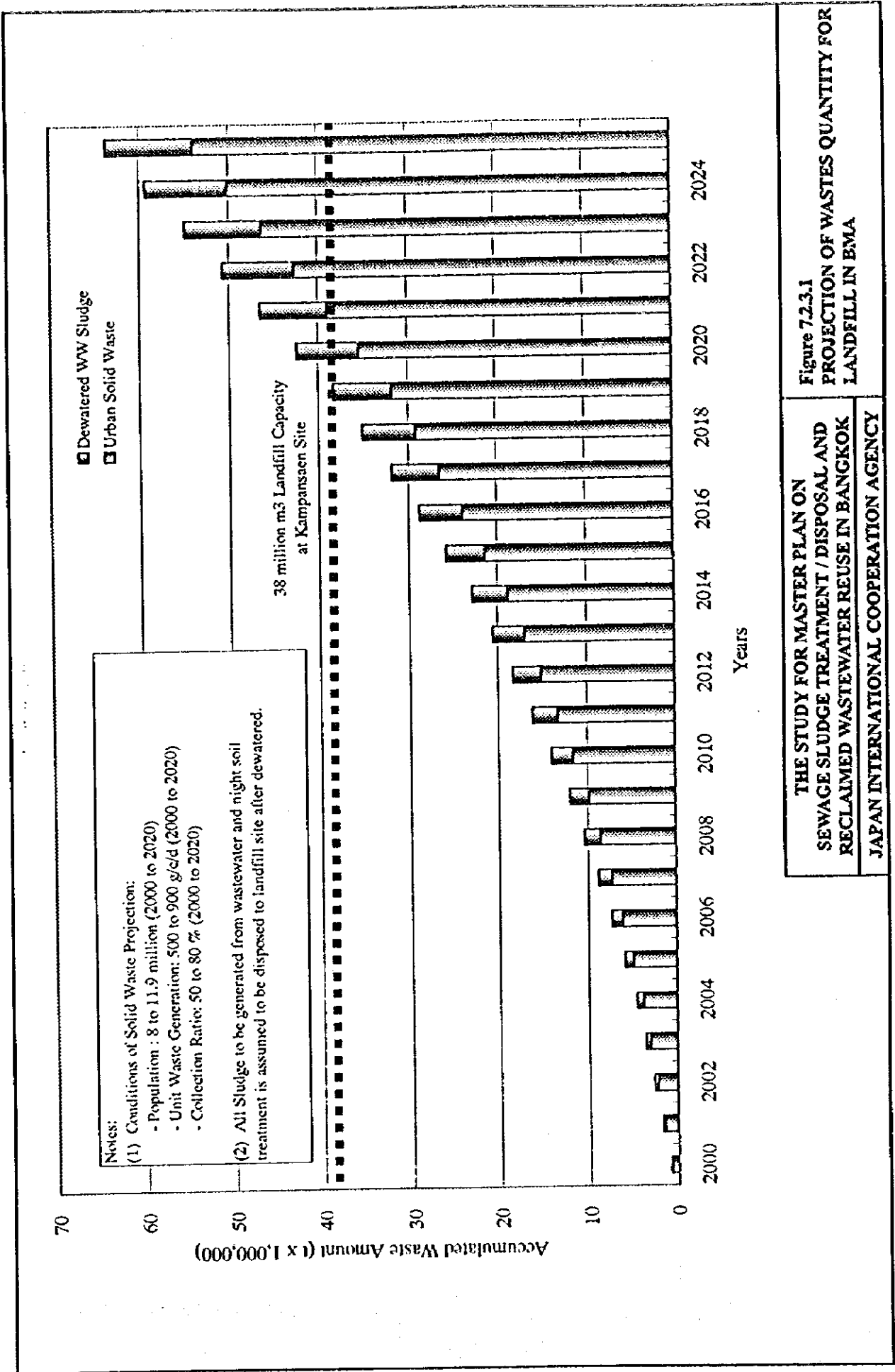
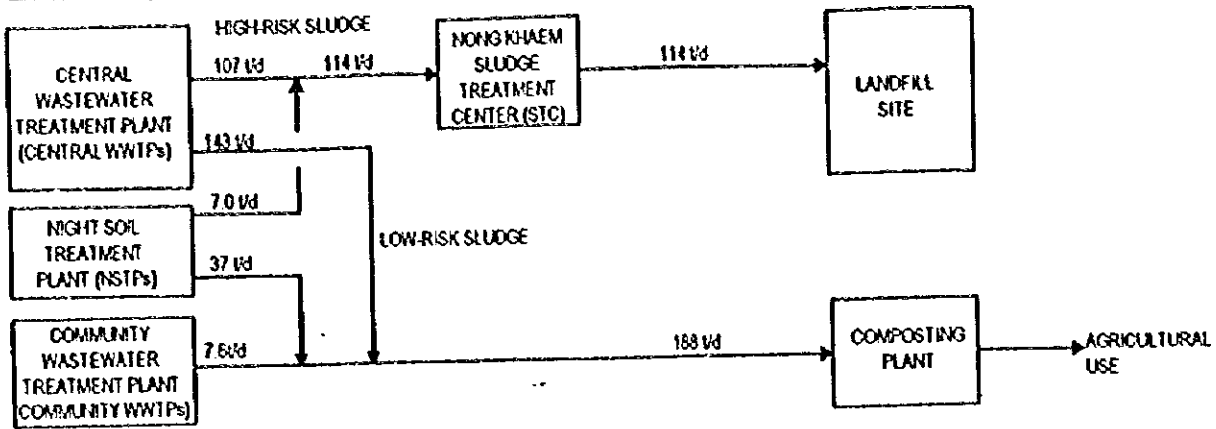


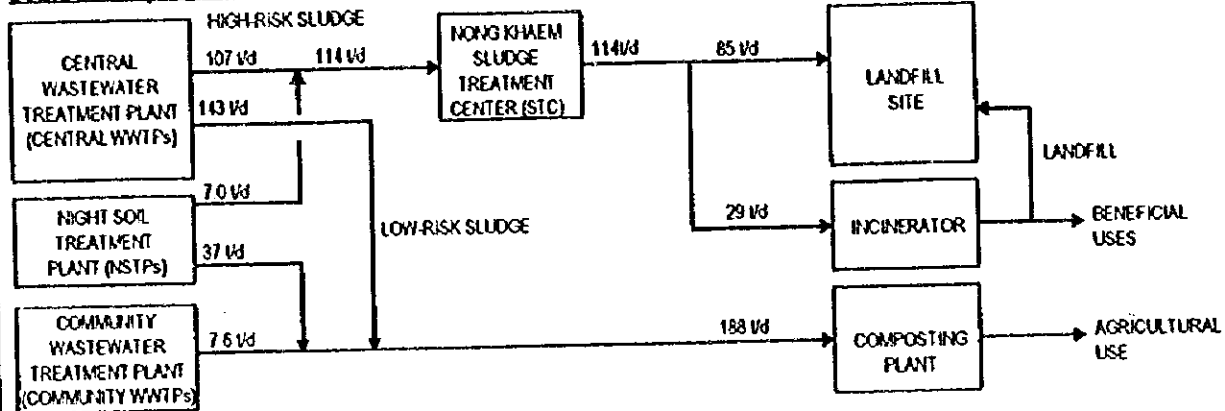
Figure 7.2.3.1
 PROJECTION OF WASTES QUANTITY FOR
 LANDFILL IN BMA

THE STUDY FOR MASTER PLAN ON
 SEWAGE SLUDGE TREATMENT / DISPOSAL AND
 RECLAIMED WASTEWATER REUSE IN BANGKOK
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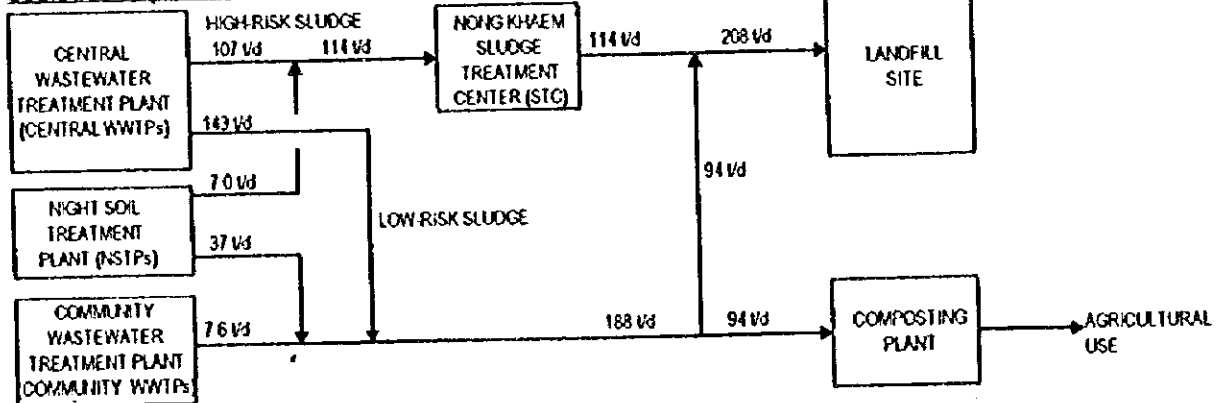
SCENARIO 1 (TOTAL SLUDGE 302 tDS/d)



SCENARIO 2 (TOTAL SLUDGE 302 tDS/d)



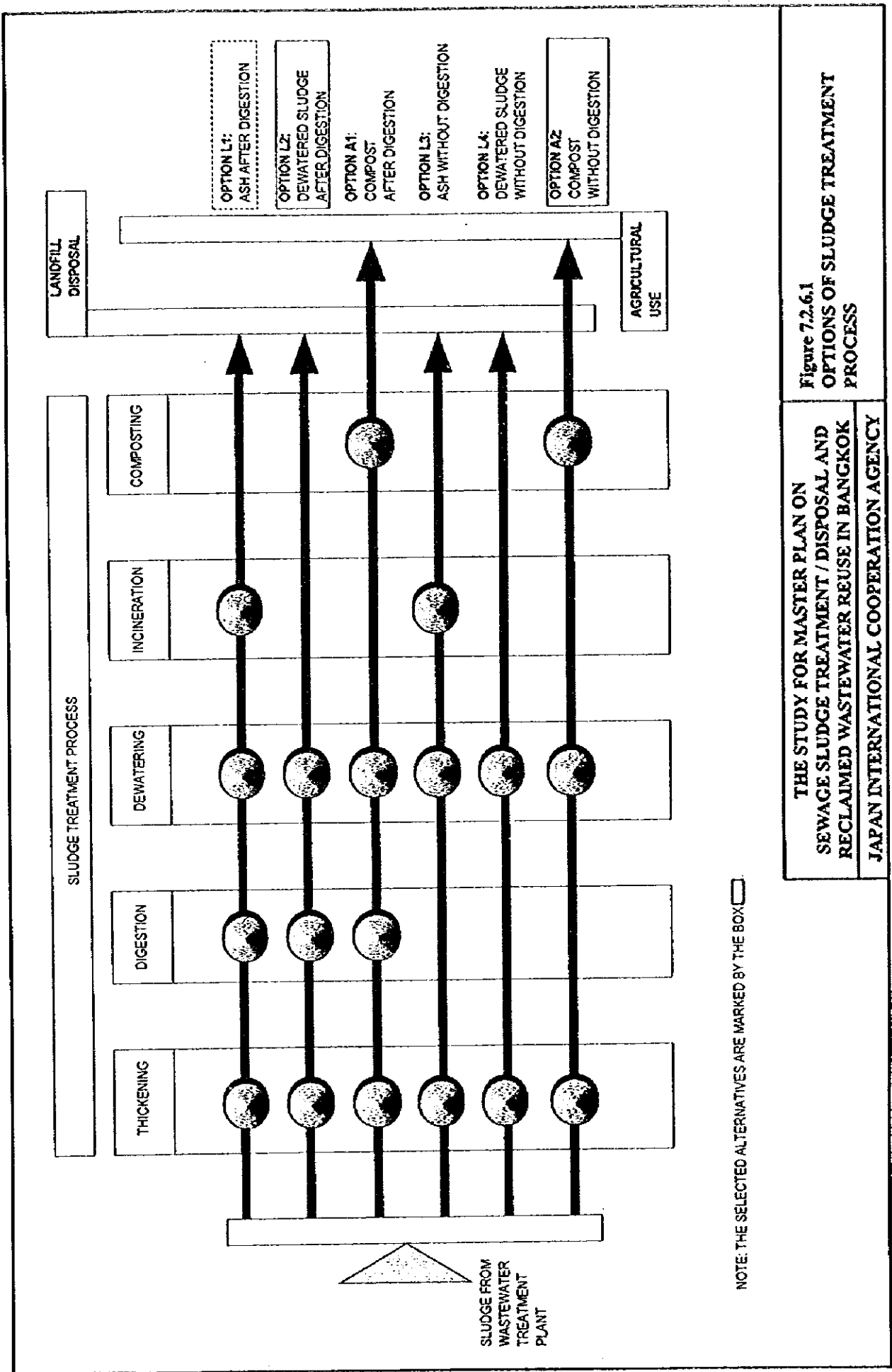
SCENARIO 3 (TOTAL SLUDGE 302 tDS/d)



Note :

- 1) The values of sludge flow are based on the generated sludge, without accounting the Dry Solids reduction in digestion and incineration.
- 2) The unit : Tonne Dry Sludge.

Figure 7.2.5.1
SLUDGE MASS FLOW BALANCE IN BMA
IN 2020



NOTE: THE SELECTED ALTERNATIVES ARE MARKED BY THE BOX

THE STUDY FOR MASTER PLAN ON SEWAGE SLUDGE TREATMENT / DISPOSAL AND RECLAIMED WASTEWATER REUSE IN BANGKOK
 JAPAN INTERNATIONAL COOPERATION AGENCY

Figure 7.2.6.1
 OPTIONS OF SLUDGE TREATMENT PROCESS

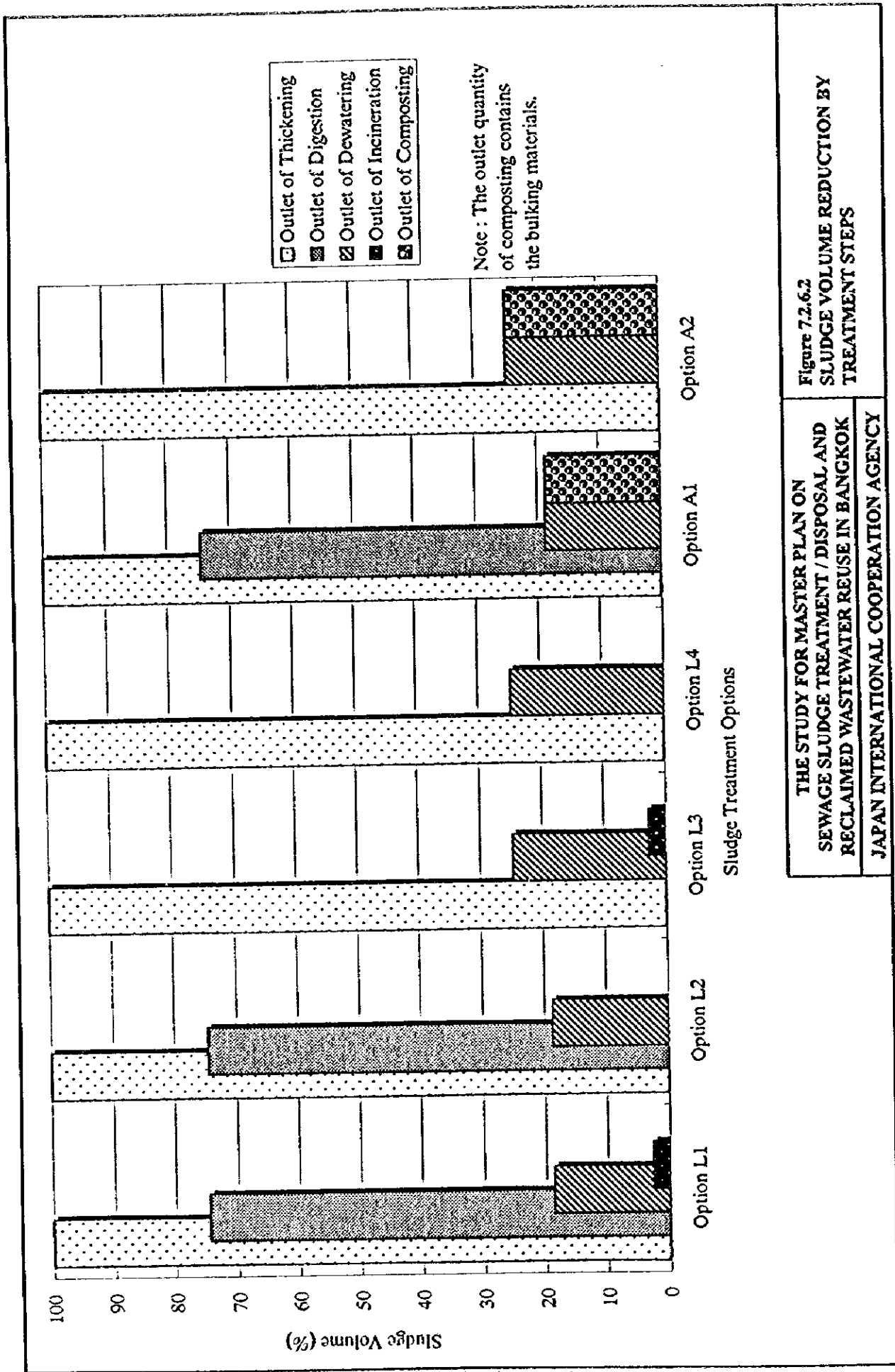


Figure 7.2.6.2
SLUDGE VOLUME REDUCTION BY TREATMENT STEPS

THE STUDY FOR MASTER PLAN ON SEWAGE SLUDGE TREATMENT / DISPOSAL AND RECLAIMED WASTEWATER REUSE IN BANGKOK
JAPAN INTERNATIONAL COOPERATION AGENCY

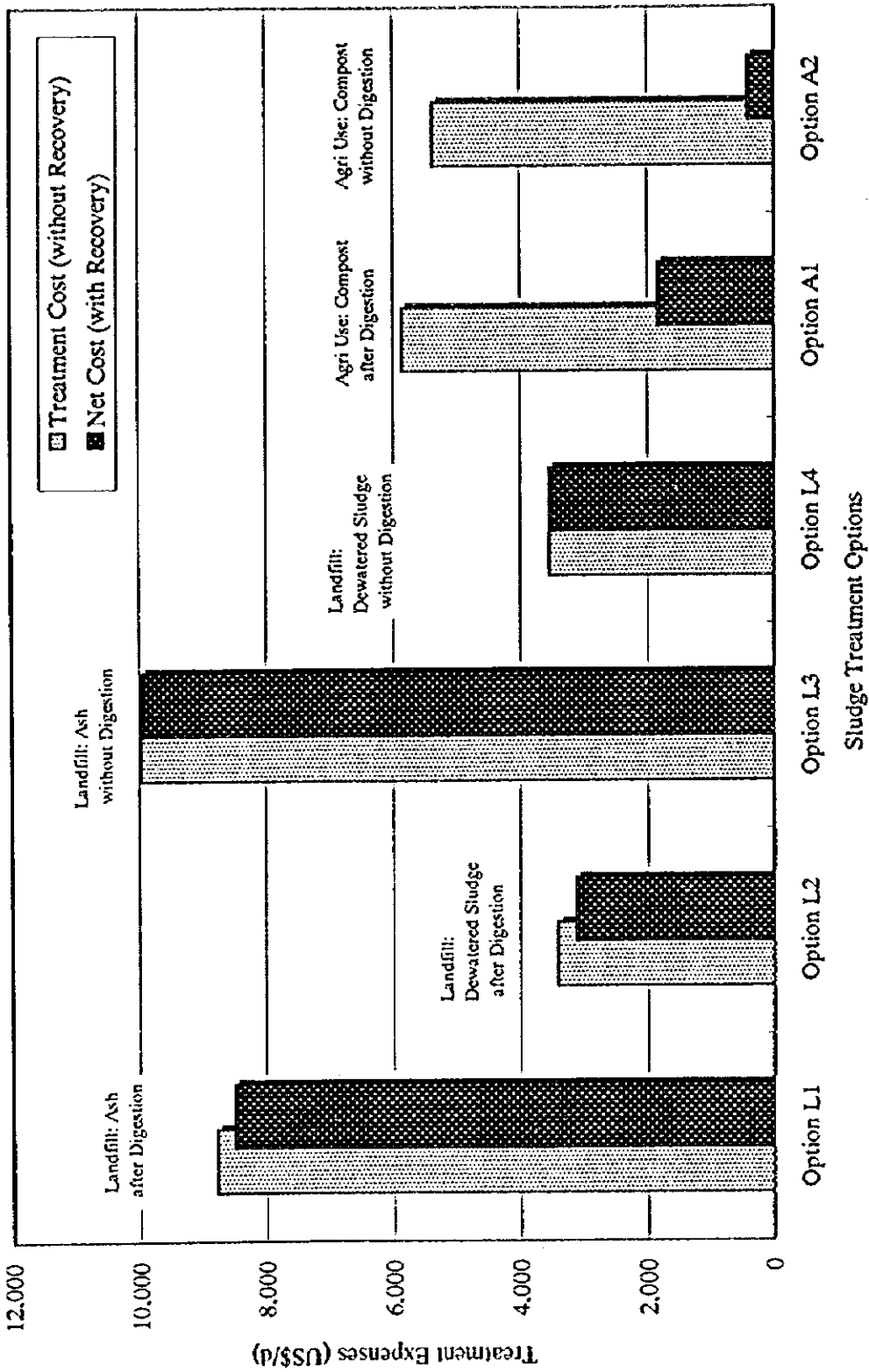
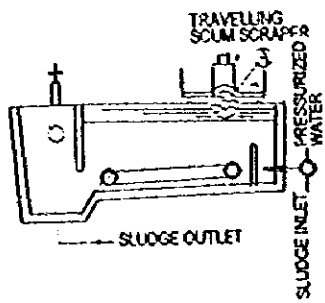
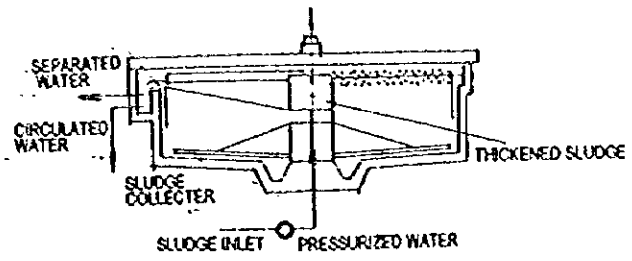


Figure 7.2.6.3
COST COMPARISON BETWEEN SLUDGE TREATMENT OPTIONS

THE STUDY FOR MASTER PLAN ON SEWAGE SLUDGE TREATMENT / DISPOSAL AND RECLAIMED WASTEWATER REUSE IN BANGKOK
JAPAN INTERNATIONAL COOPERATION AGENCY

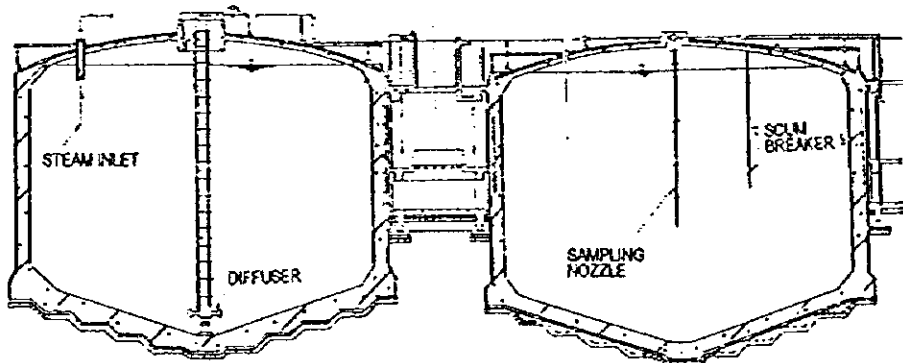
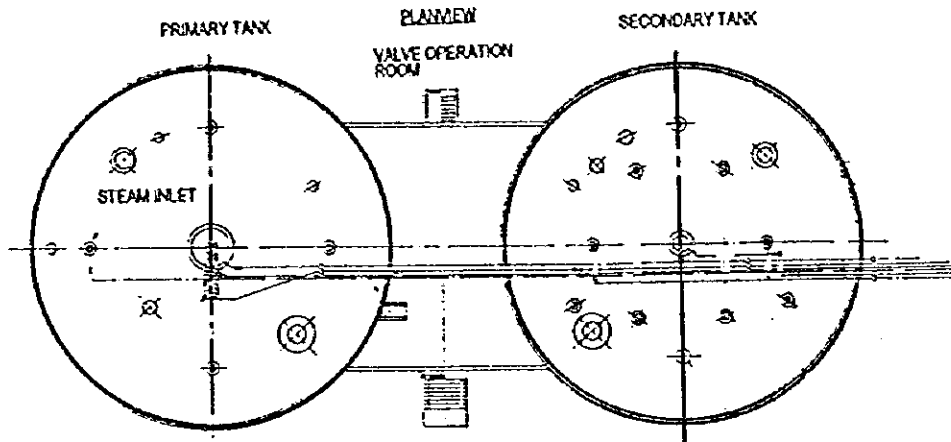


RECTANGULAR TYPE



CYLINDRICAL TYPE

FLOATATION THICKENER



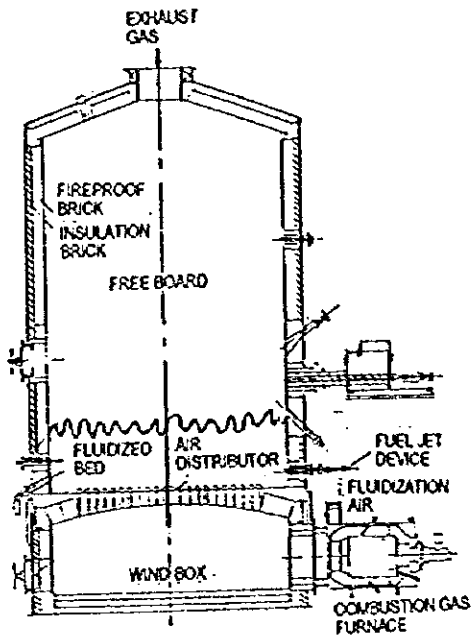
SIDE VIEW

GAS MIXING TYPE DIGESTER

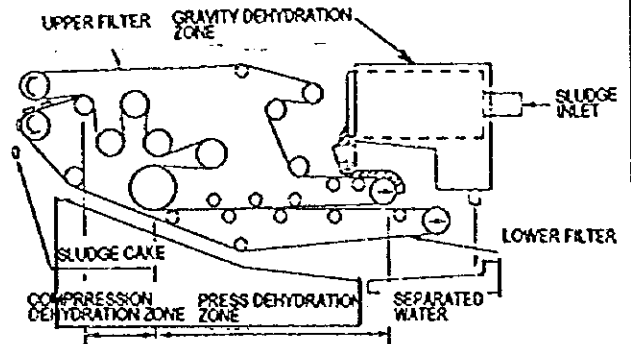
THE STUDY FOR MASTER PLAN ON
SEWAGE SLUDGE TREATMENT / DISPOSAL AND
RECLAIMED WASTEWATER REUSE IN BANGKOK

JAPAN INTERNATIONAL COOPERATION AGENCY

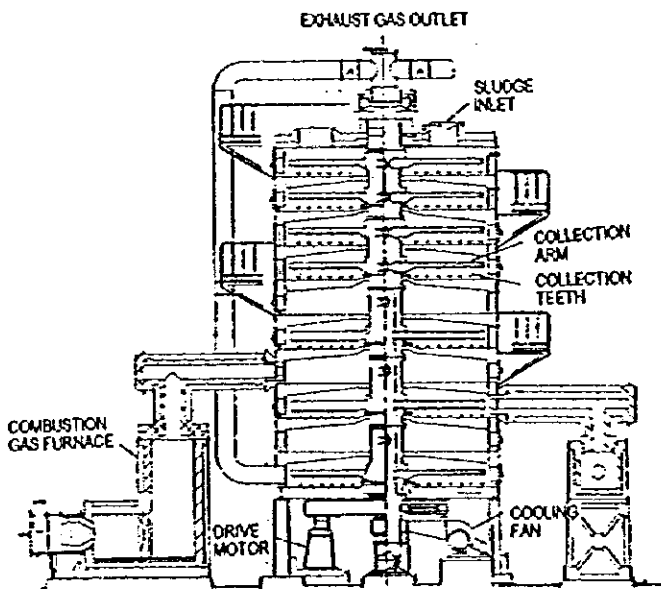
Figure 7.2.6.4
CONFIGURATION OF SELECTED SLUDGE
TREATMENT UNIT PROCESS (1/2)



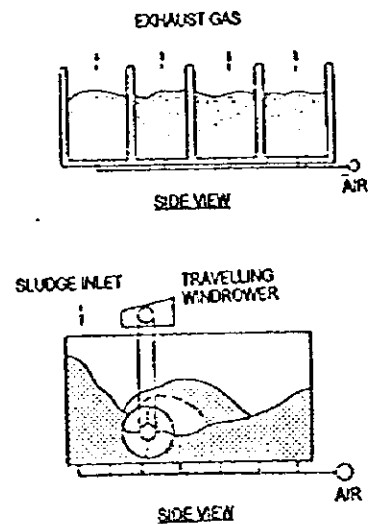
FLUIDIZED BED TYPE INCINERATOR



BELT PRESS TYPE DEHYDRATOR



MULTI HEARTH TYPE INCINERATOR



HORIZONTAL PADDLE TYPE COMPOSTING FERMENTER

**THE STUDY FOR MASTER PLAN ON
SEWAGE SLUDGE TREATMENT / DISPOSAL AND
RECLAIMED WASTEWATER REUSE IN BANGKOK**

JAPAN INTERNATIONAL COOPERATION AGENCY

**Figure 7.2.6.4
CONFIGURATION OF SELECTED SLUDGE
TREATMENT UNIT PROCESS (2/2)**

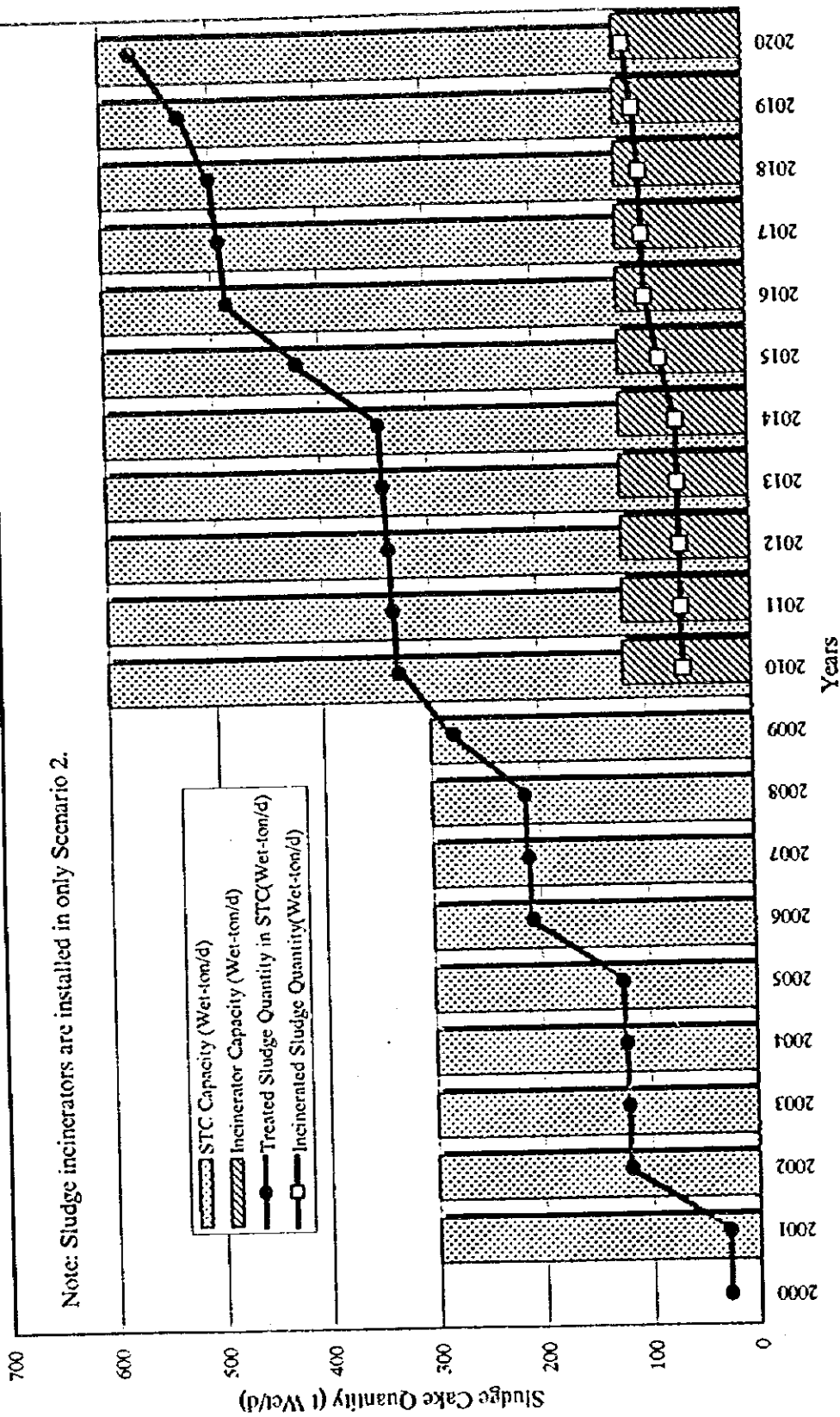
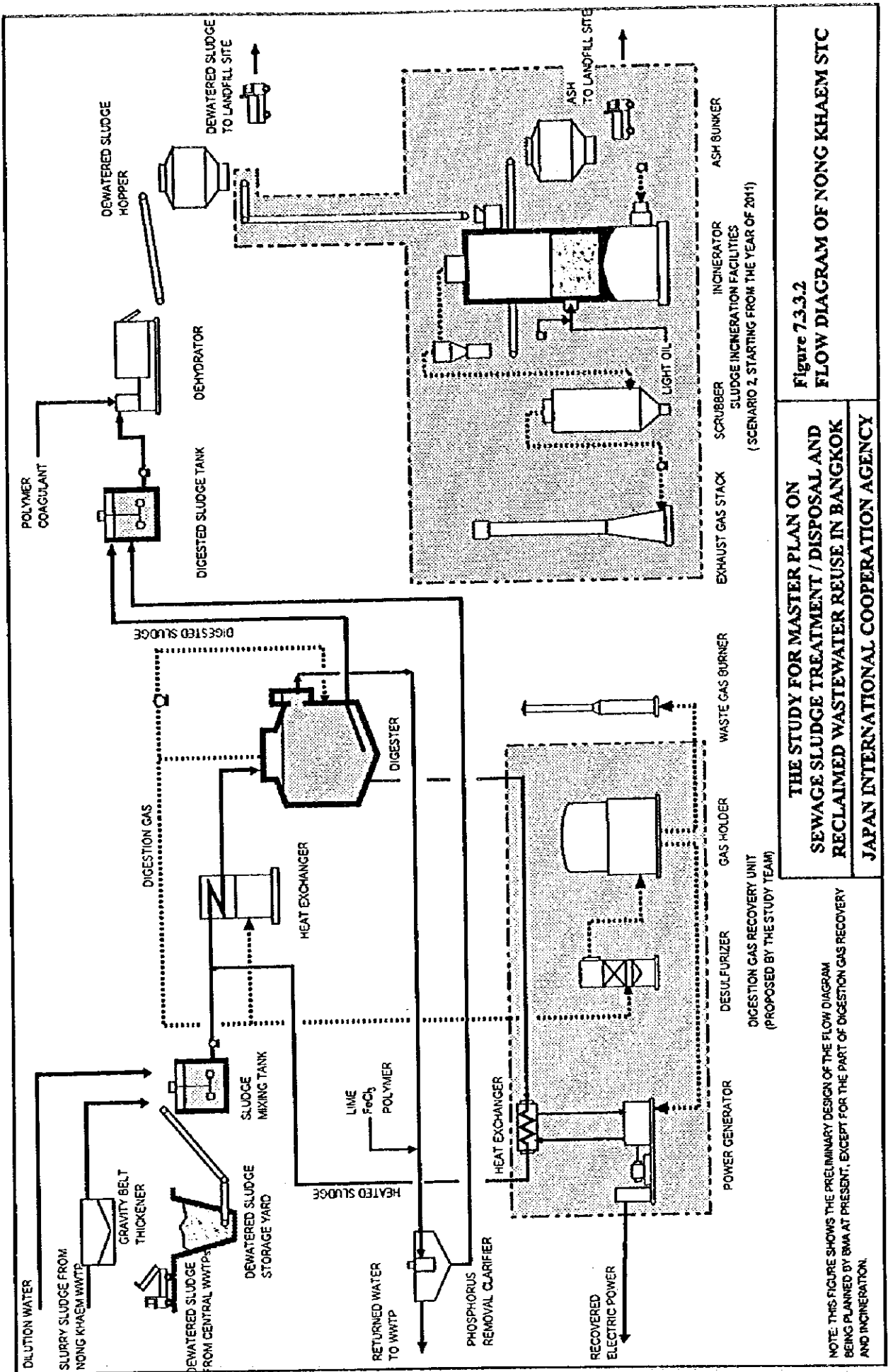


Figure 7.3.3.1
CONSTRUCTION SCHEDULE OF NONG
KHAEM STC

THE STUDY FOR MASTER PLAN ON
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RECLAIMED WASTEWATER REUSE IN BANGKOK
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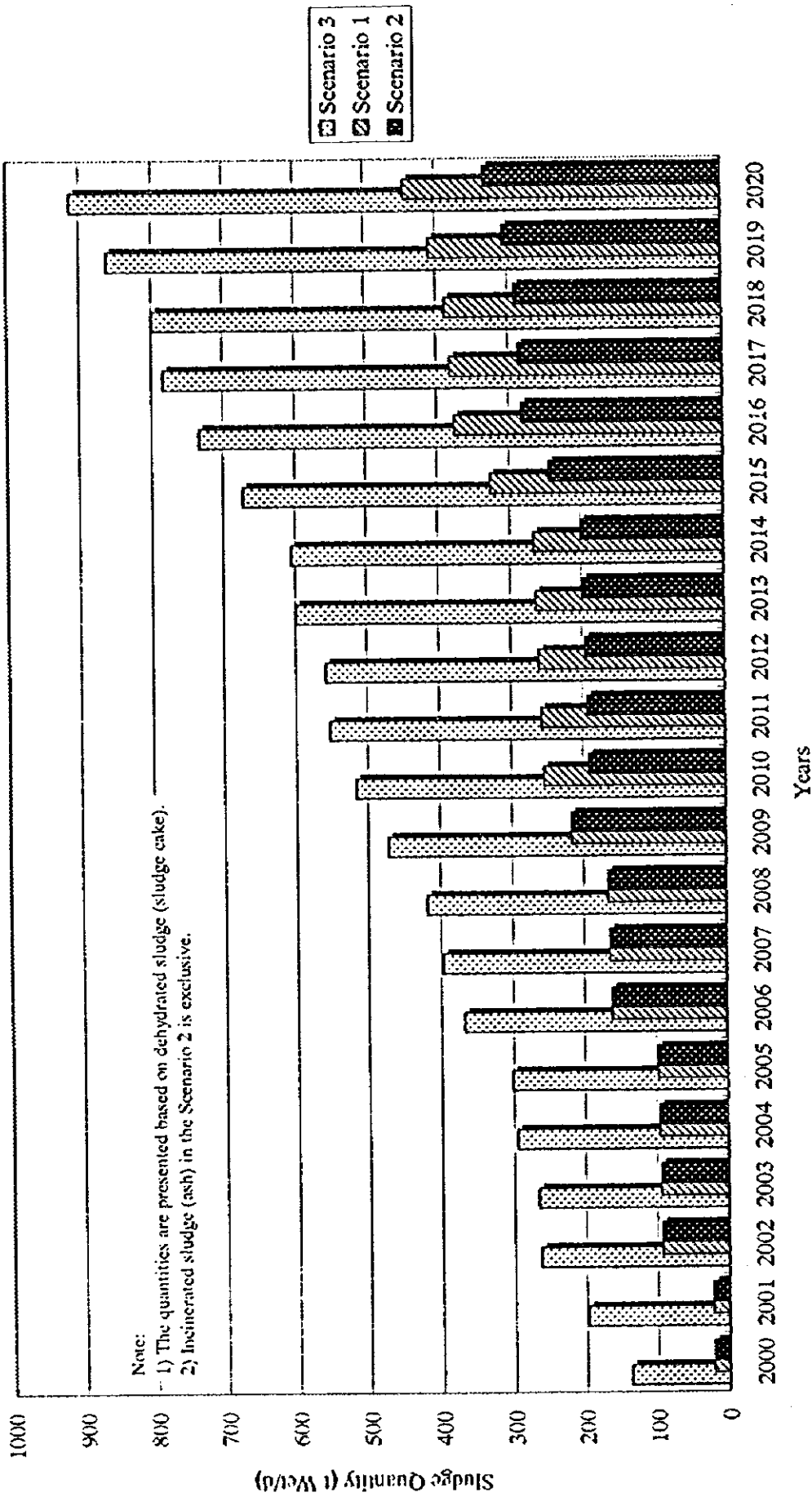


Figure 7.3.7.1
 TRANSITION OF SLUDGE QUANTITY FOR
 LANDFILL DISPOSAL

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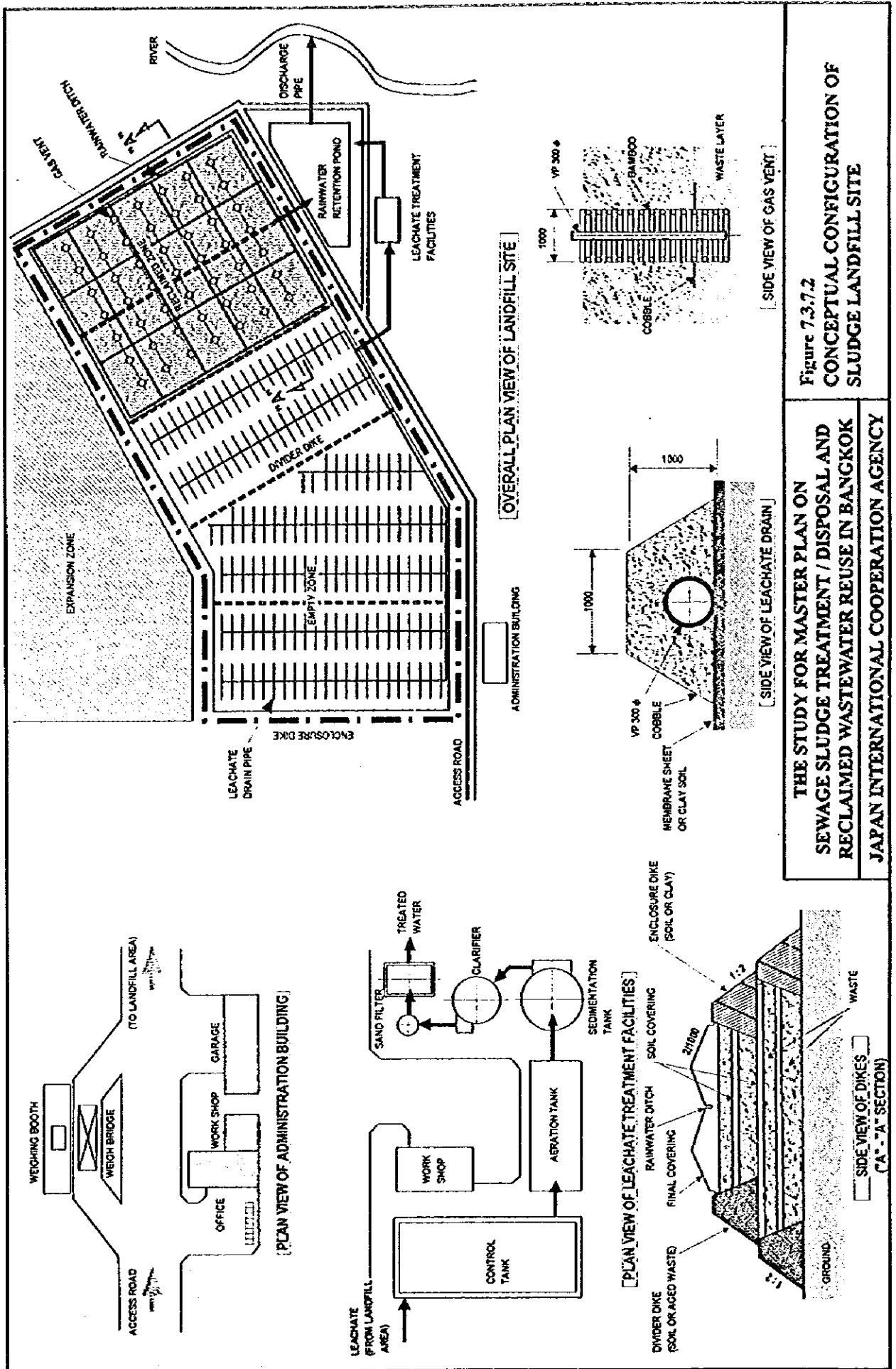


Figure 7.3.7.2
CONCEPTUAL CONFIGURATION OF
SLUDGE LANDFILL SITE

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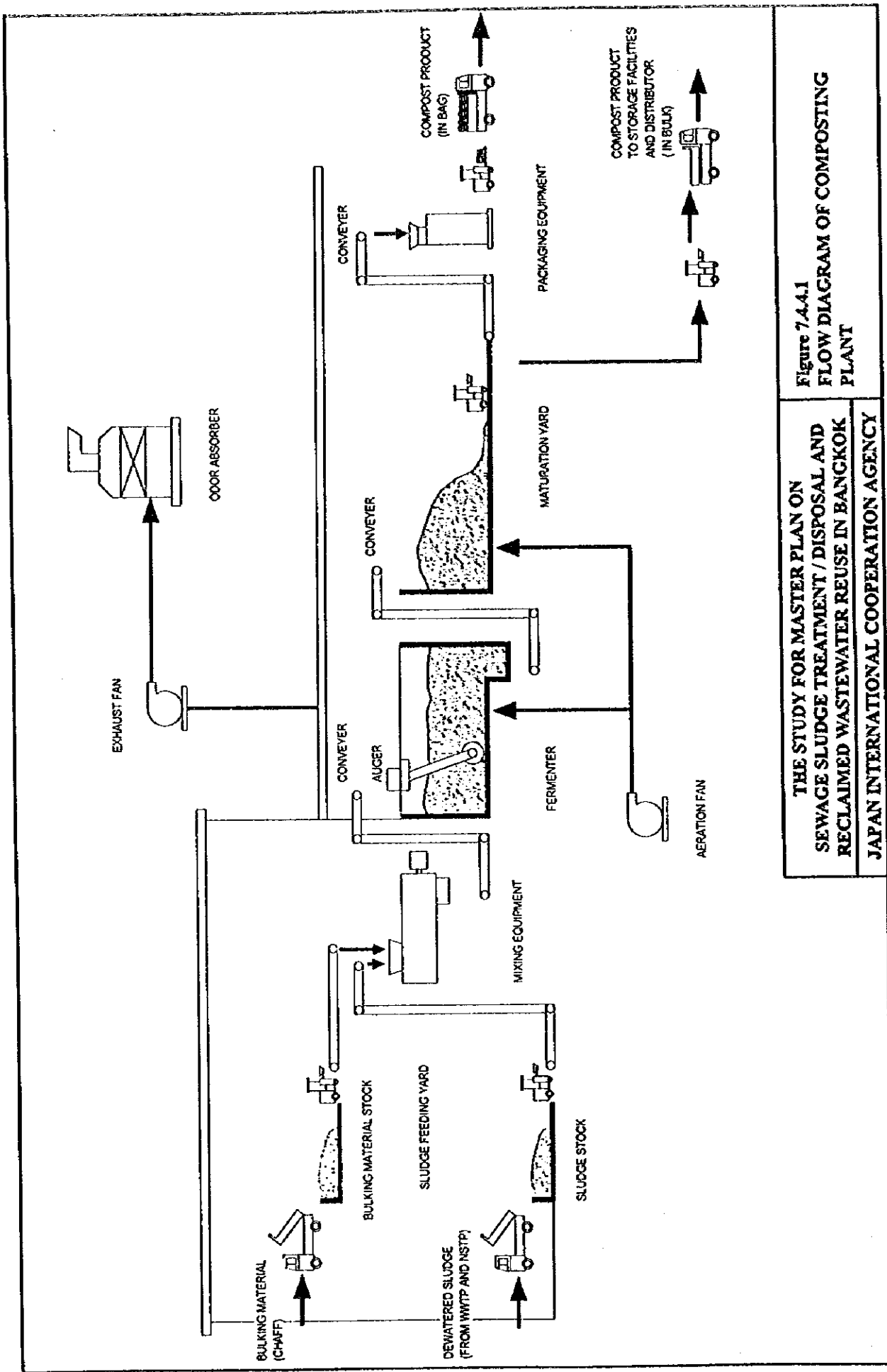
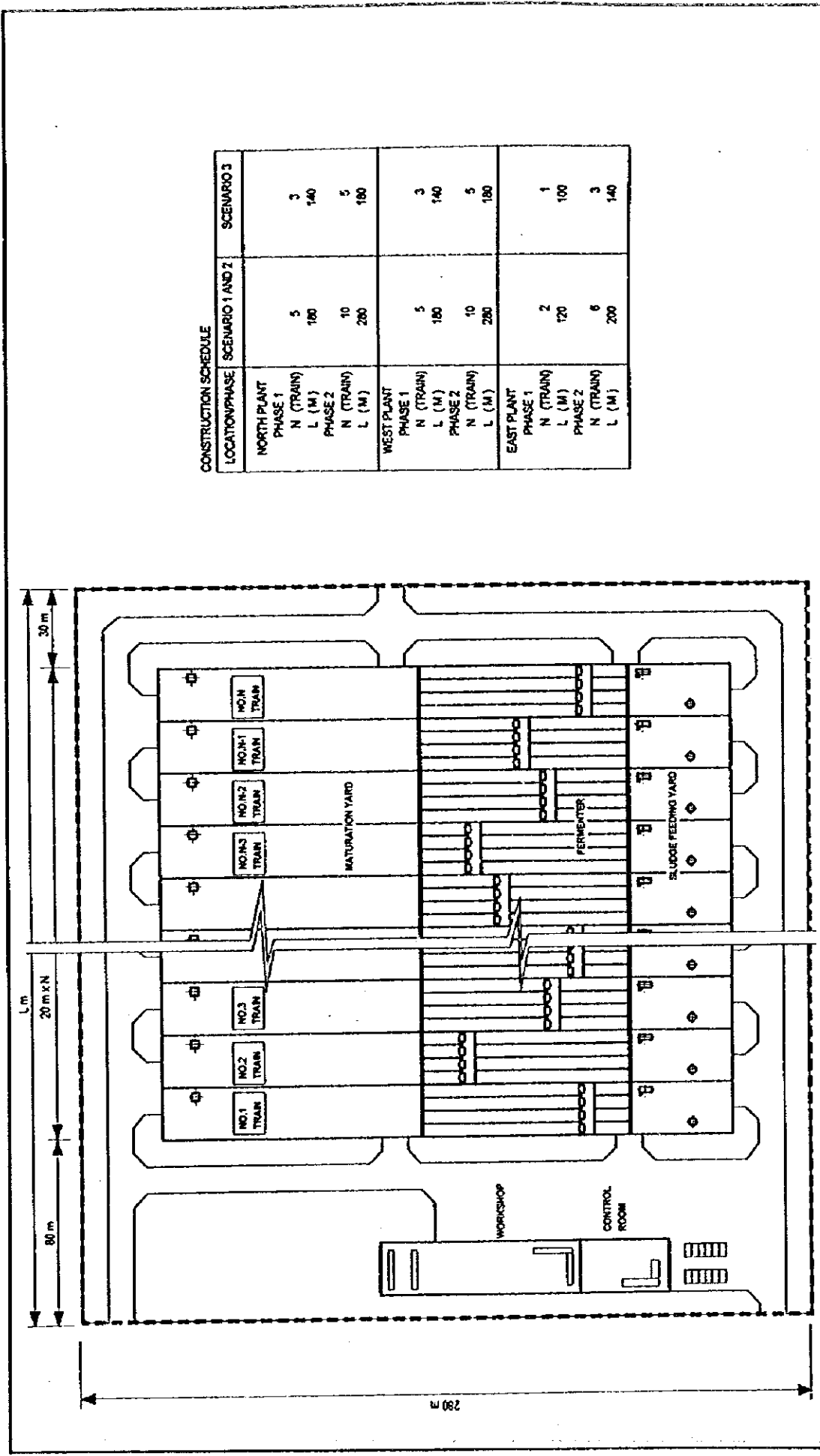


Figure 7.4.4.1
FLOW DIAGRAM OF COMPOSTING PLANT

**THE STUDY FOR MASTER PLAN ON
 SEWAGE SLUDGE TREATMENT / DISPOSAL AND
 RECLAIMED WASTEWATER REUSE IN BANGKOK
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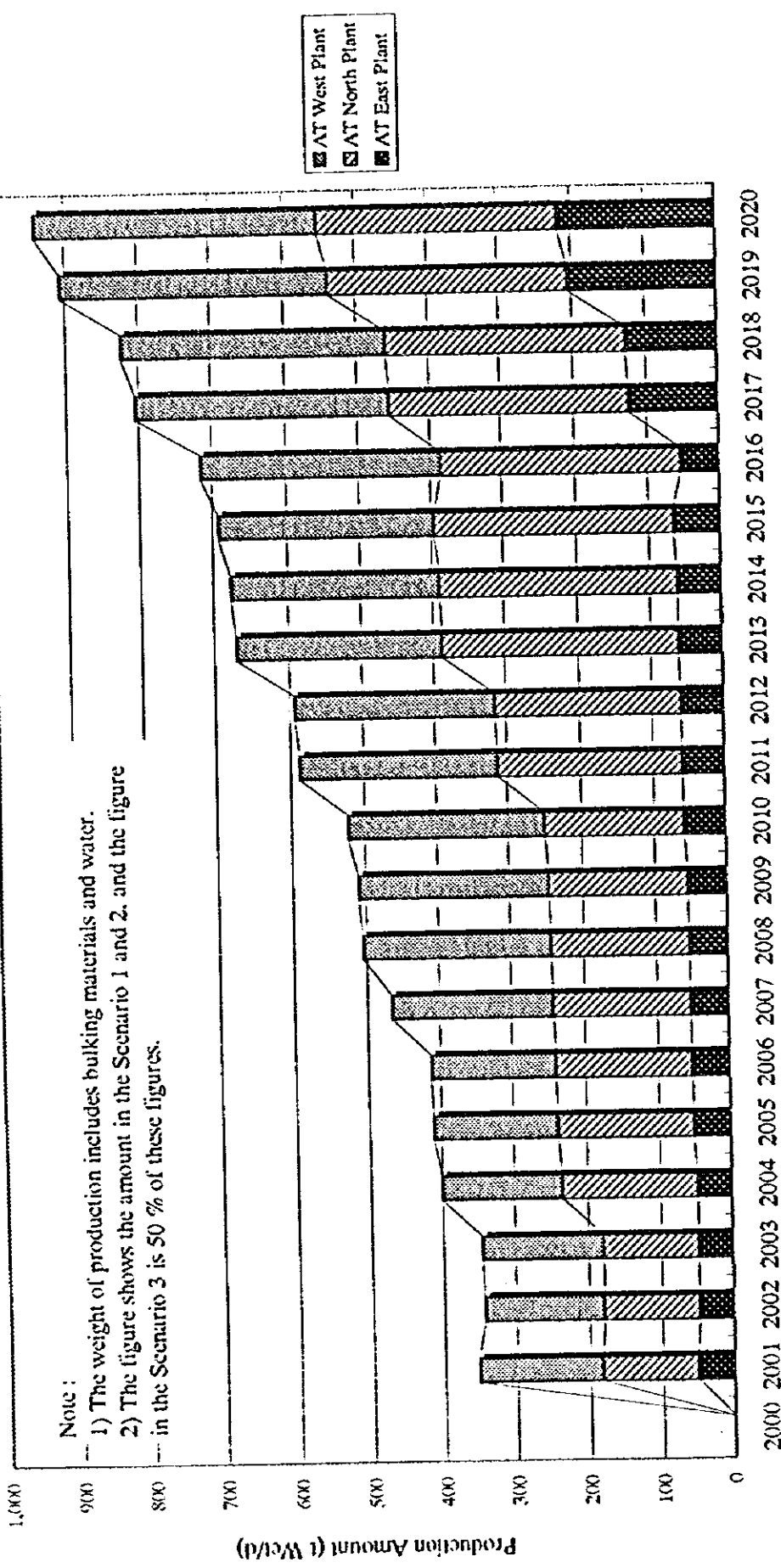
CONSTRUCTION SCHEDULE

LOCATION/PHASE	SCENARIO 1 AND 2	SCENARIO 3
NORTH PLANT		
PHASE 1		
N (TRAIN)	5	3
L (M)	100	140
PHASE 2		
N (TRAIN)	10	5
L (M)	200	180
WEST PLANT		
PHASE 1		
N (TRAIN)	5	3
L (M)	180	140
PHASE 2		
N (TRAIN)	10	5
L (M)	280	180
EAST PLANT		
PHASE 1		
N (TRAIN)	2	1
L (M)	120	100
PHASE 2		
N (TRAIN)	6	3
L (M)	200	140

**THE STUDY FOR MASTER PLAN ON
SEWAGE SLUDGE TREATMENT / DISPOSAL AND
RECLAIMED WASTEWATER REUSE IN BANGKOK
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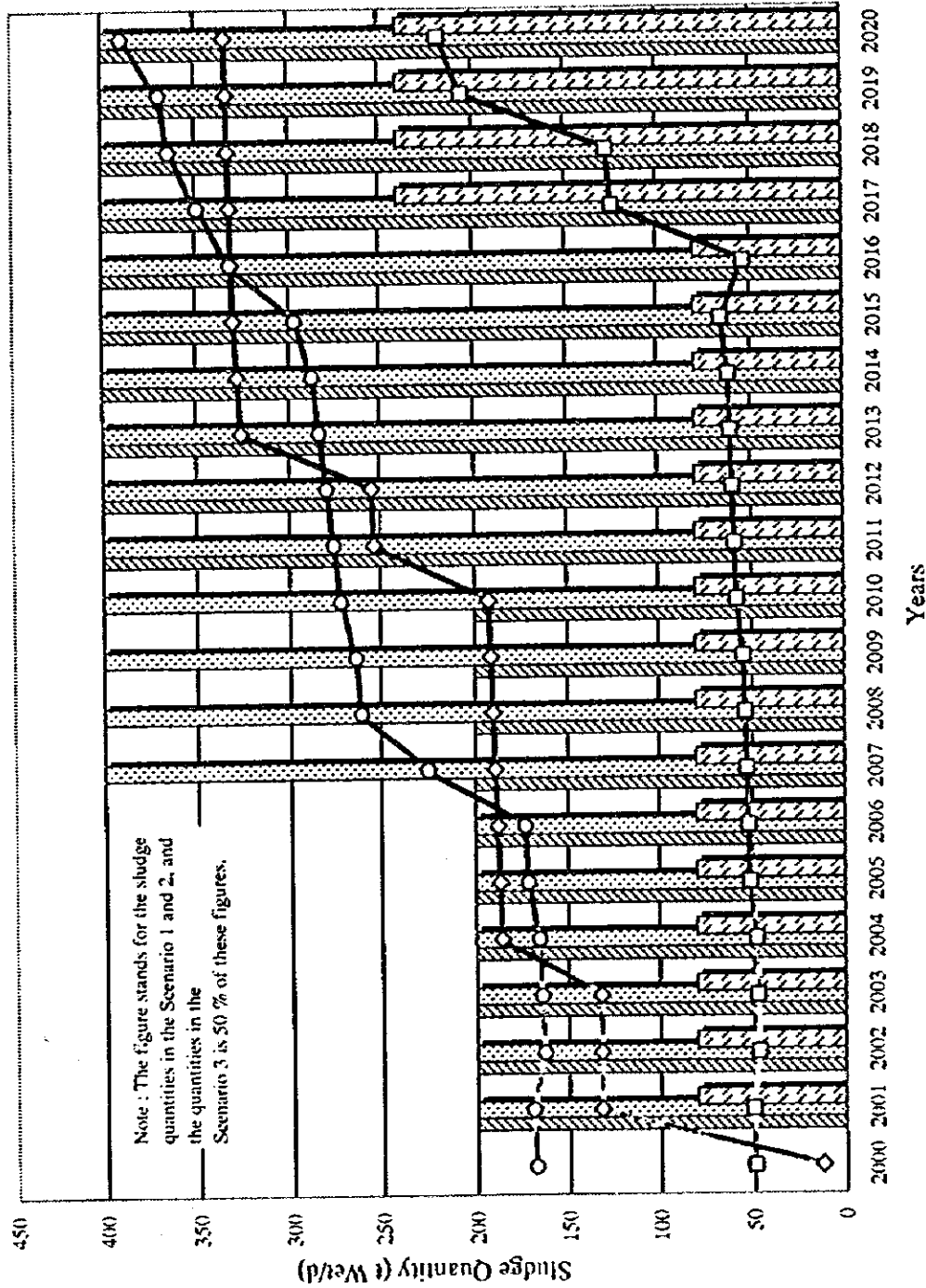
PLAN VIEW

**Figure 7-4.4.2
LAYOUT PLAN OF COMPOSTING PLANT**



**Figure 7.4.4.3
PRODUCED AMOUNT OF SLUDGE
COMPOST**

**THE STUDY FOR MASTER PLAN ON
SEWAGE SLUDGE TREATMENT / DISPOSAL AND
RECLAIMED WASTEWATER REUSE IN BANGKOK
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Treatment Capacity of North Plant
 Treatment Capacity of West Plant
 Treatment Capacity of East Plant
 Inlet Sludge for East Plant
 Inlet Sludge for North Plant
 Inlet Sludge for West Plant

Figure 7.4.4.4
 CONSTRUCTION SCHEDULE OF
 COMPOSTING PLANTS

THE STUDY FOR MASTER PLAN ON
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