FEASIBILITY STUDY FOR
JAKARTA WATER SUPPLY DEVELOPMENT PROJECT

F3. APPENDIX F1V-3

DRAWINGS

DRAWING LIST

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DWG- 2 Intake Bay (Serpong)
DWG- 3 Grit Chamber (Serpong)
DWG- 4 Pump House (Serpong)
DWG- 5 Single Line Diagram (Serpong)
DWG- 6 Raw Water Transmission Pipeline
DWG- 7 General Layout of Buaran Treatment Plant
DWG- 8 General Layout of Lebakbulus Treatment Plant
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DWG-10 Filter
DWG-11 Clear Water Reservoir
DWG-12 Pump House (Buaran)
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DWG-14 Chemical Building (Buaran)
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DWG-18 Chlorination System (Buaran)
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DWG-38 Treated Water Transmission Pipeline (Lebak-DC.R4)
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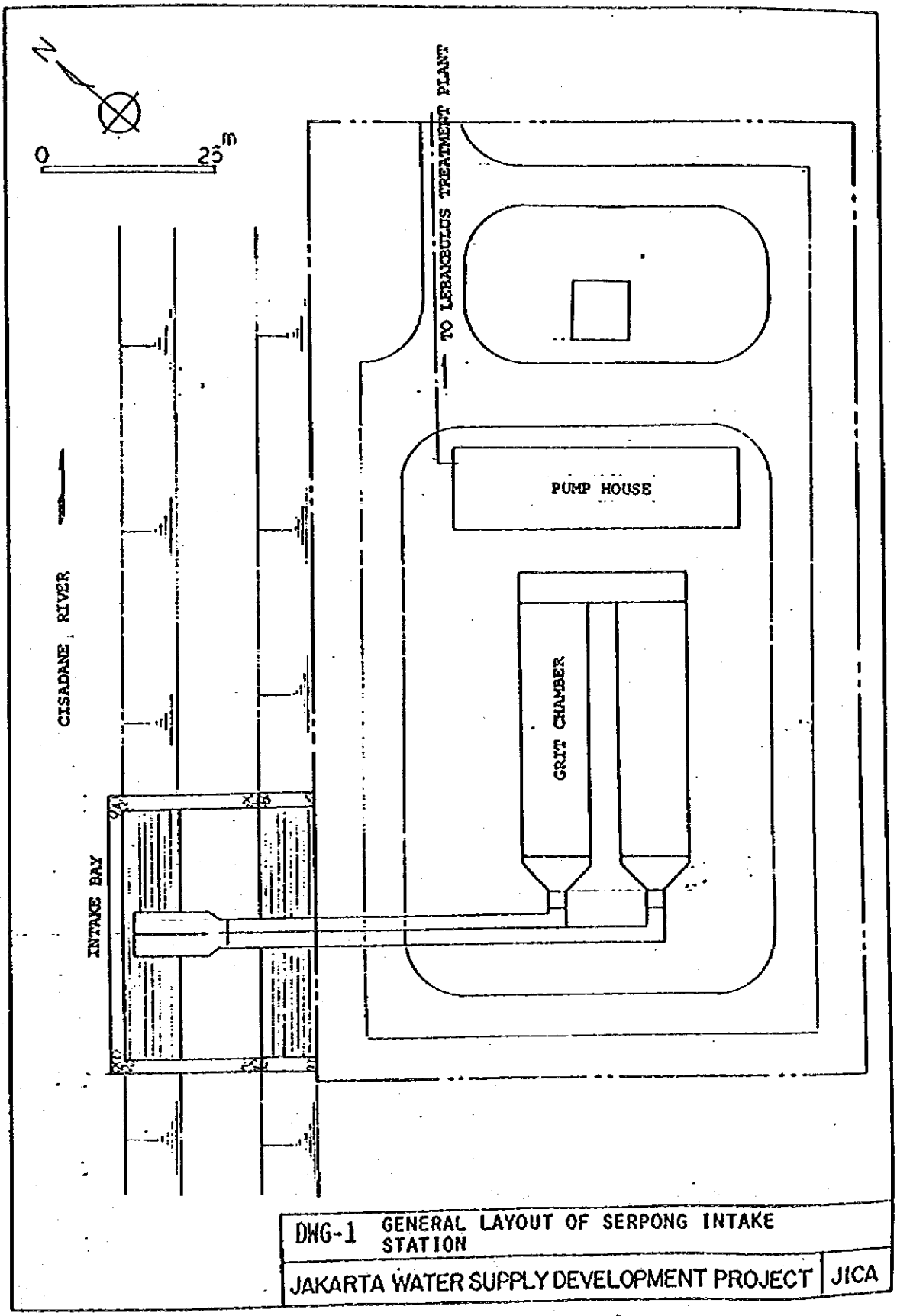
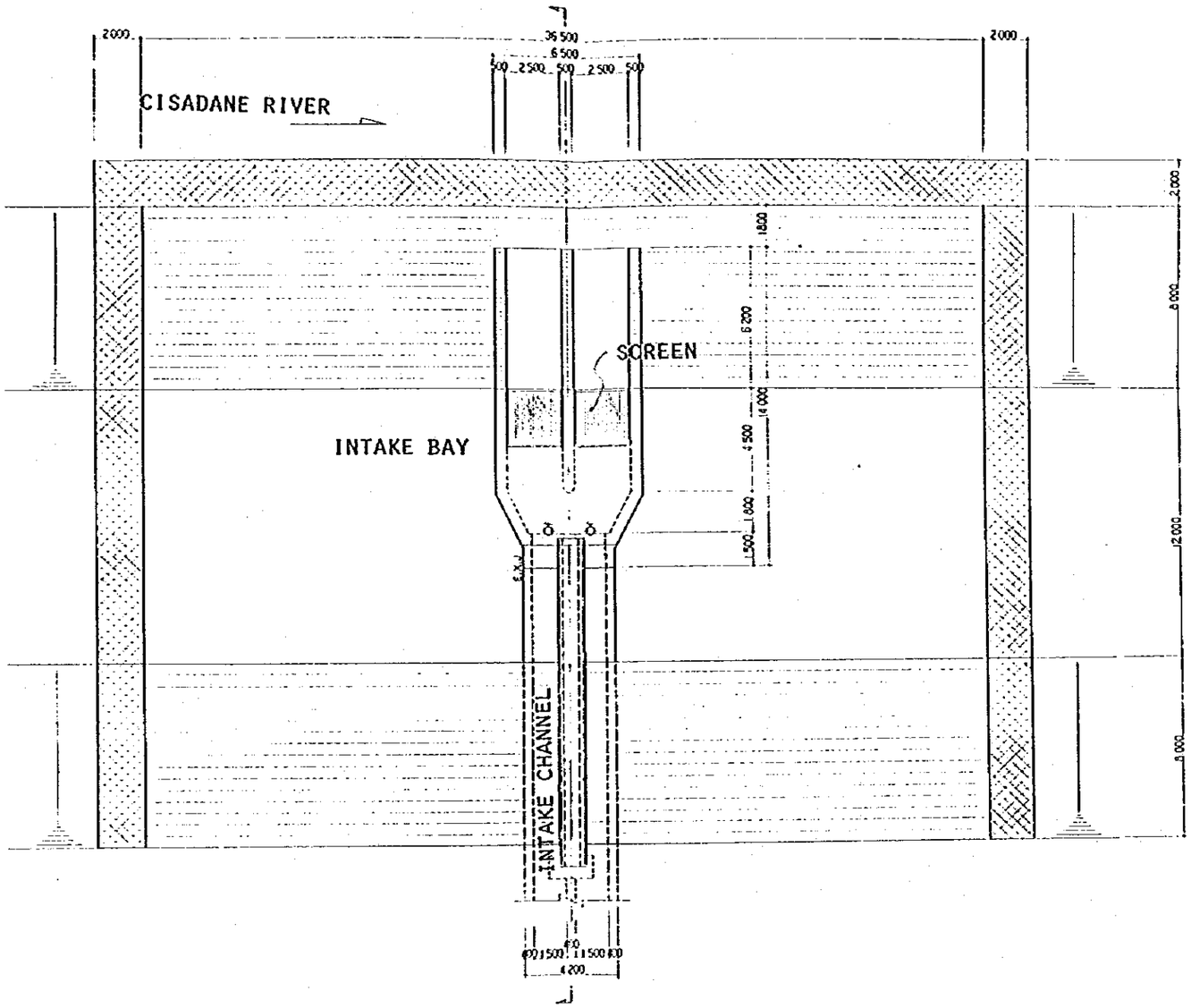
DWG-40 General Layout of Distribution Center R4
DWG-41 Clear Water Reservoir
DWG-42 Pump House (DC,R1)
DWG-43 Chlorination System-1 (DC.R1)
DWG-44 Chlorination System-2 (DC.R1)
DWG-45 Single Line Diagram (DC,R1)
DWG-46 Pump House (DC.R1)
DWG-47 Chlorination System-1 (DC,R4)
DWG-48 Chlorination System-2 (DC.R4)
DWG-49 Single Line Diagram (DC.R4)

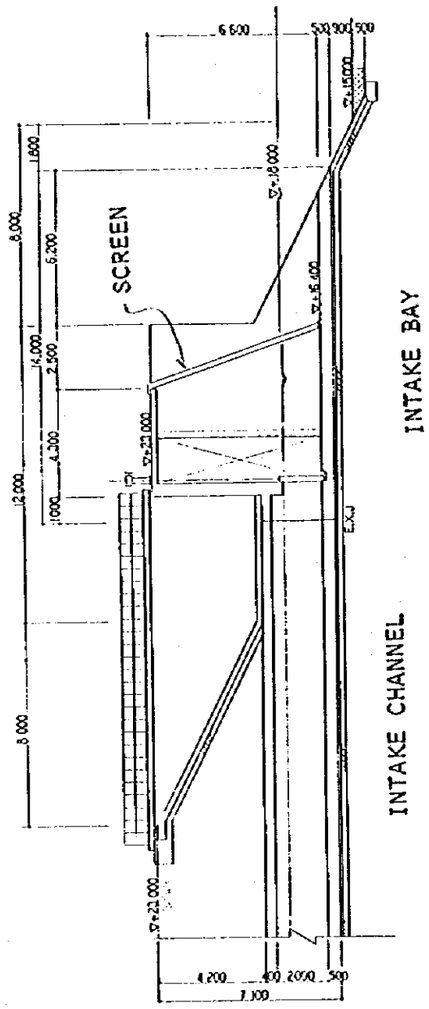


DWG-1 GENERAL LAYOUT OF SERPONG INTAKE STATION

JAKARTA WATER SUPPLY DEVELOPMENT PROJECT | JICA



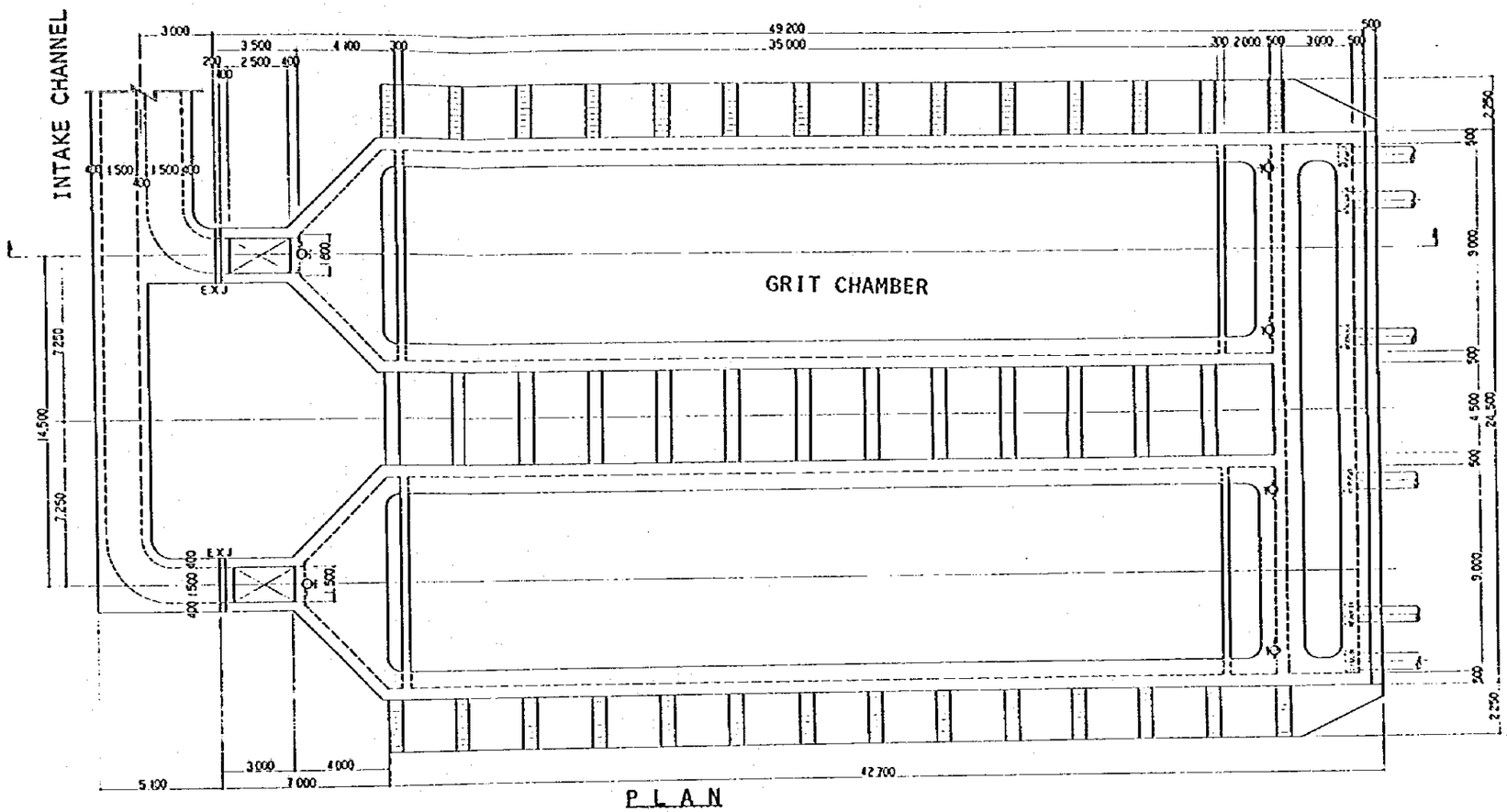
PLAN



SECTION

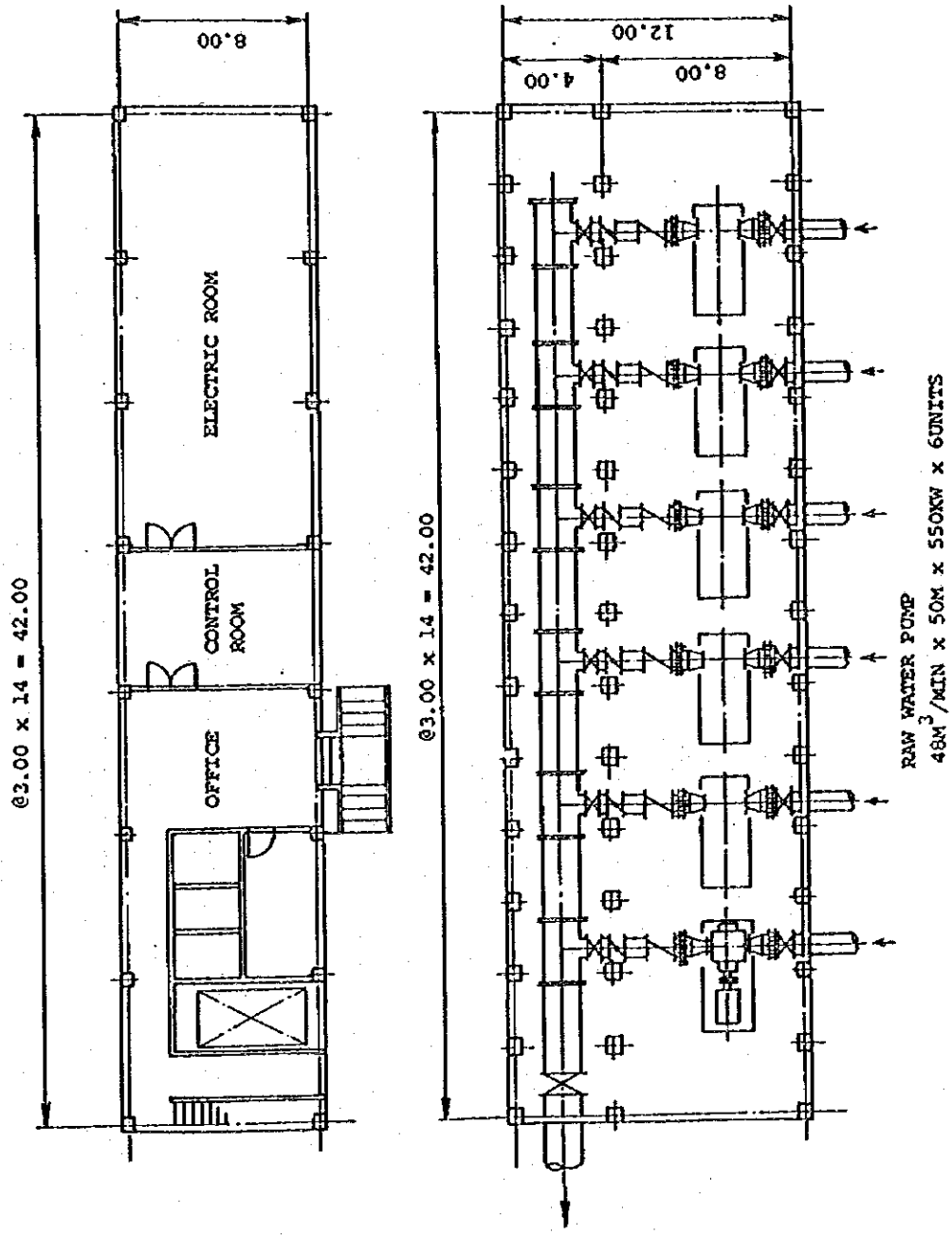
DWG-2 INTAKE BAY (SERPONG)

JAKARTA WATER SUPPLY DEVELOPMENT PROJECT | JICA



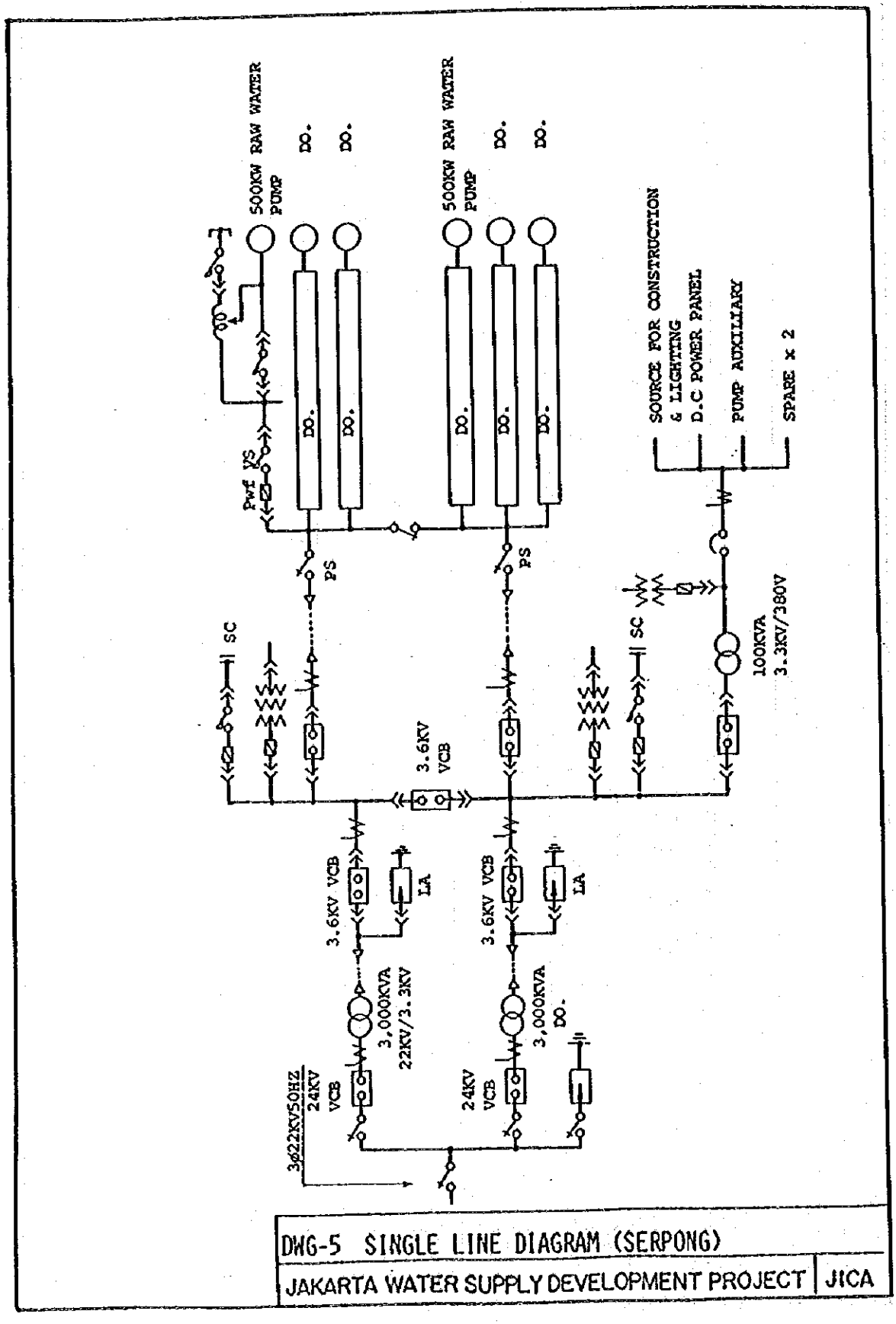
DWG-3 GRIT CHAMBER (SERPONG)

JAKARTA WATER SUPPLY DEVELOPMENT PROJECT | JICA



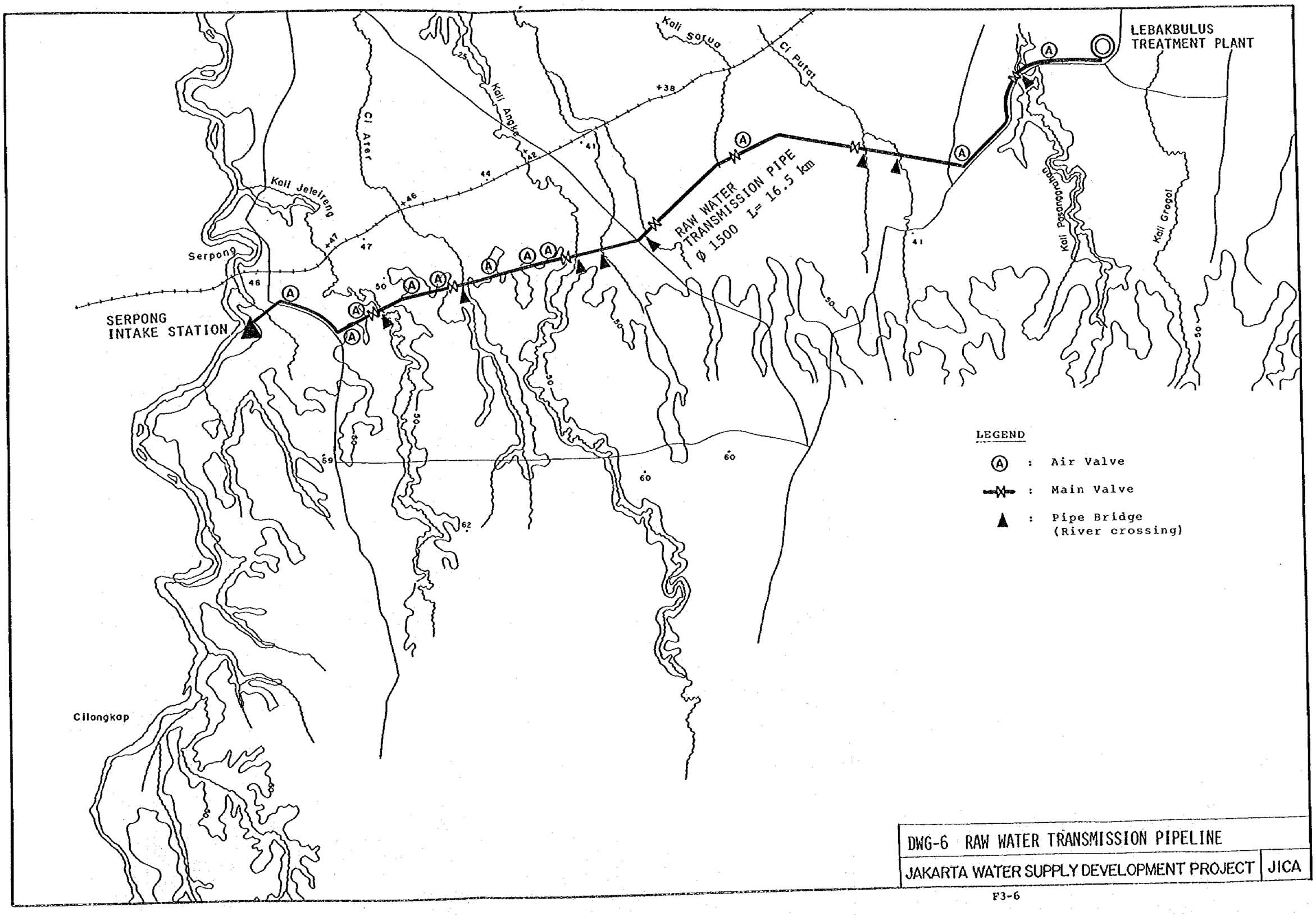
DWG-4 PUMP HOUSE (SERPONG)

JAKARTA WATER SUPPLY DEVELOPMENT PROJECT | JICA



DWG-5 SINGLE LINE DIAGRAM (SERPONG)

JAKARTA WATER SUPPLY DEVELOPMENT PROJECT | JICA



DWG-6 RAW WATER TRANSMISSION PIPELINE

JAKARTA WATER SUPPLY DEVELOPMENT PROJECT | JICA

RESERVOIR

PUMPHOUSE

TO R1 DISTRIBUTION CENTER

FLOCCULATION
SEDIMENTATION BASIN

FILTER

CHLORINE

LIME

ALUM

RECEIVING
WELL

RAYA KALI MALANG

JALAN

West Tarum Canal

DKI BOUNDARY

N

0 50 100 m

LOCATION MAP

DWG-7 GENERAL LAYOUT OF BUARAN TREATMENT PLANT

JAKARTA WATER SUPPLY DEVELOPMENT PROJECT | JICA

TO R4 DISTRIBUTION CENTER

OUTER LINK ROAD

RESERVOIR

PUMPHOUSE

LIME

CHLORINE

RECEIVING WELL

FROM SERPONG INTAKE

ALUM

FLOCCULATION SEDIMENTATOON BASIN

FILTER

WASTE WATER POND

DISTRIBUTION MAIN

JALAN NIAGA HIJAU RAYA

BUKIT HIJAU

Tanah Kosong

Sedang Dibanguh

Tanah Kosong

Kebun

Kebun

JALAN RAYA LEBAK BULUS

JALAN PASAR JUMAT

JALAN METRO PONDOK INDAH

30 31 32 33 34 35

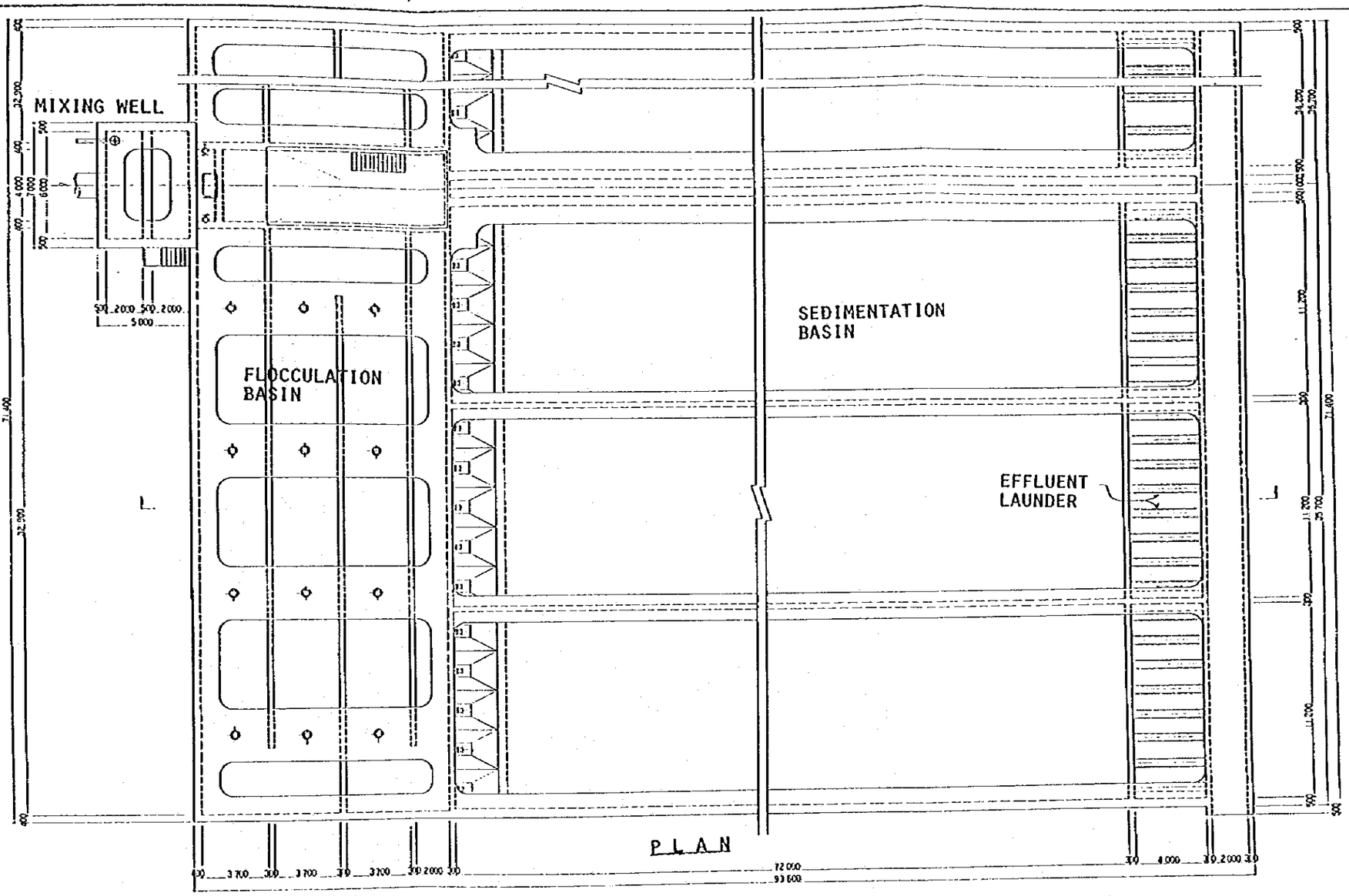
N

0 50 m

LOCATION MAP

DWG-8 GENERAL LAYOUT OF LEBAKBULUS TREATMENT PLANT

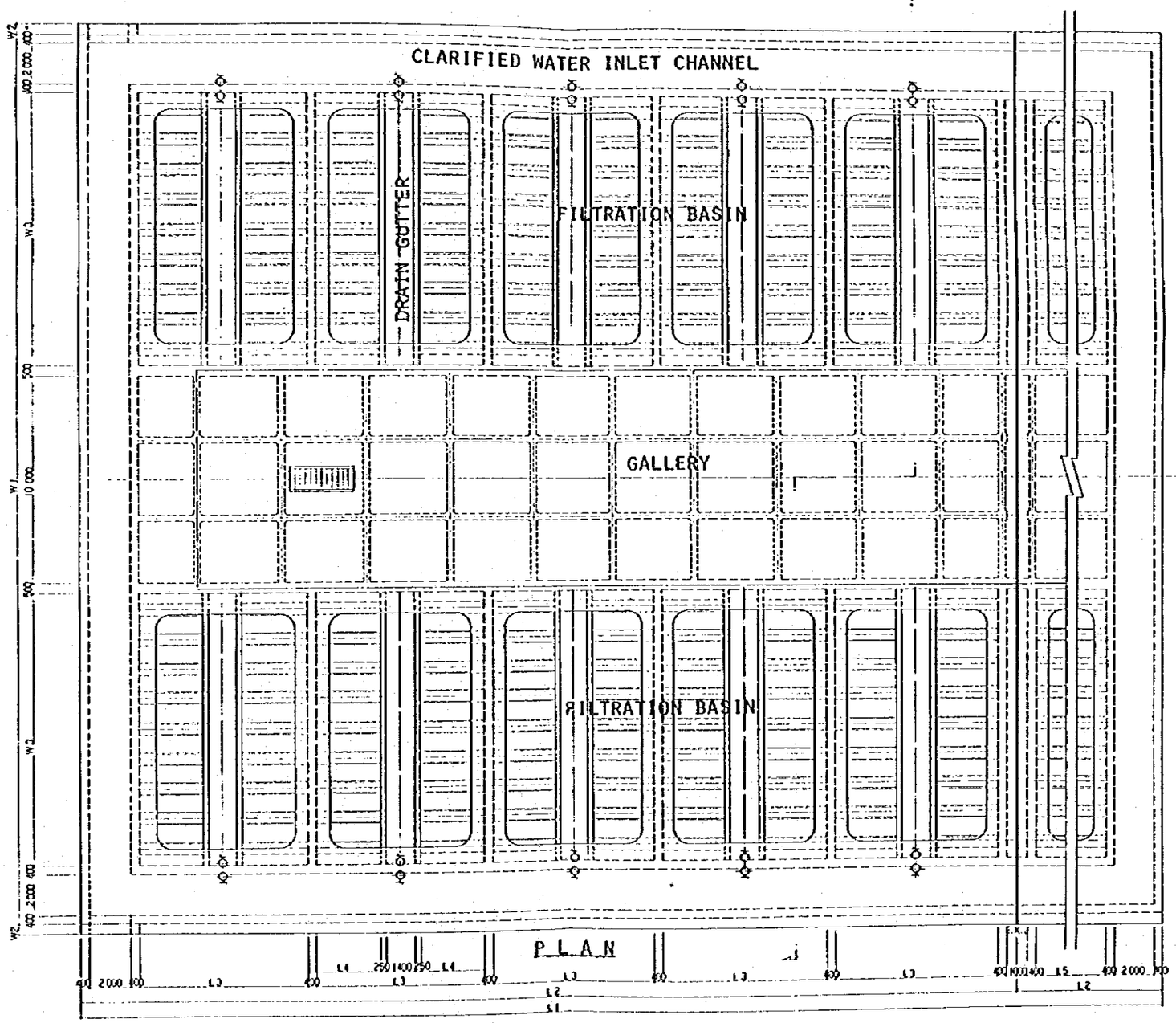
JAKARTA WATER SUPPLY DEVELOPMENT PROJECT | JICA

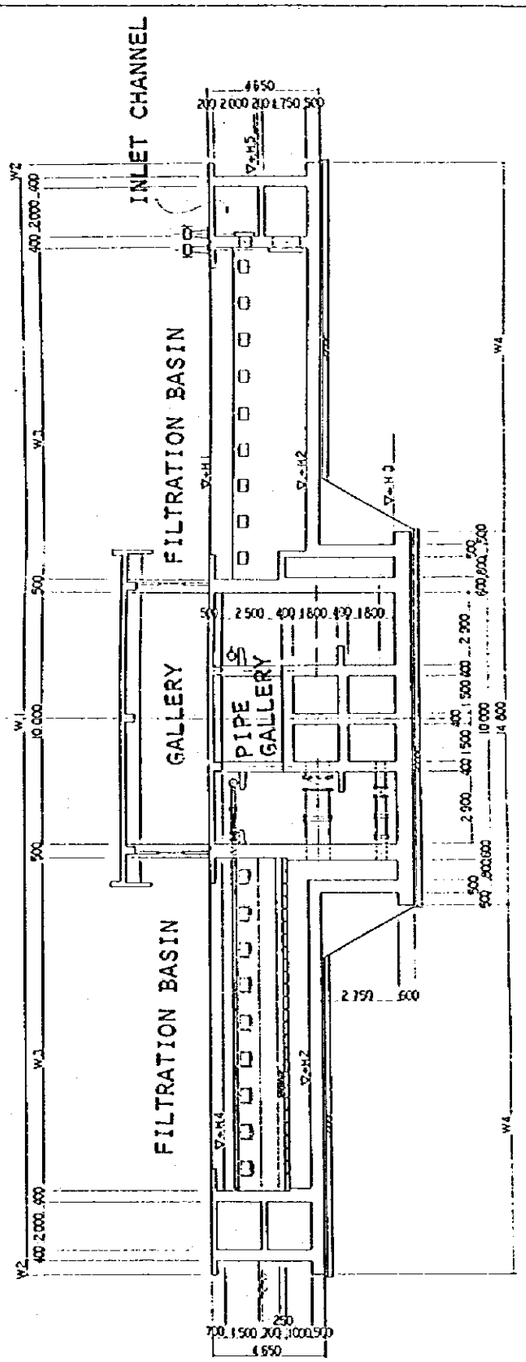


PLANT	H1	H2	H3	H4	H5	H6
LEBAKBULUS	+36.5	+33.6	+32.0	+29.5	+36.1	+35.6
BUARAN	+15.4	+12.5	+10.9	+ 8.4	+15.0	+13.6

DWG-9 FLOCCULATION AND SEDIMENTATION BASIN

JAKARTA WATER SUPPLY DEVELOPMENT PROJECT | JICA



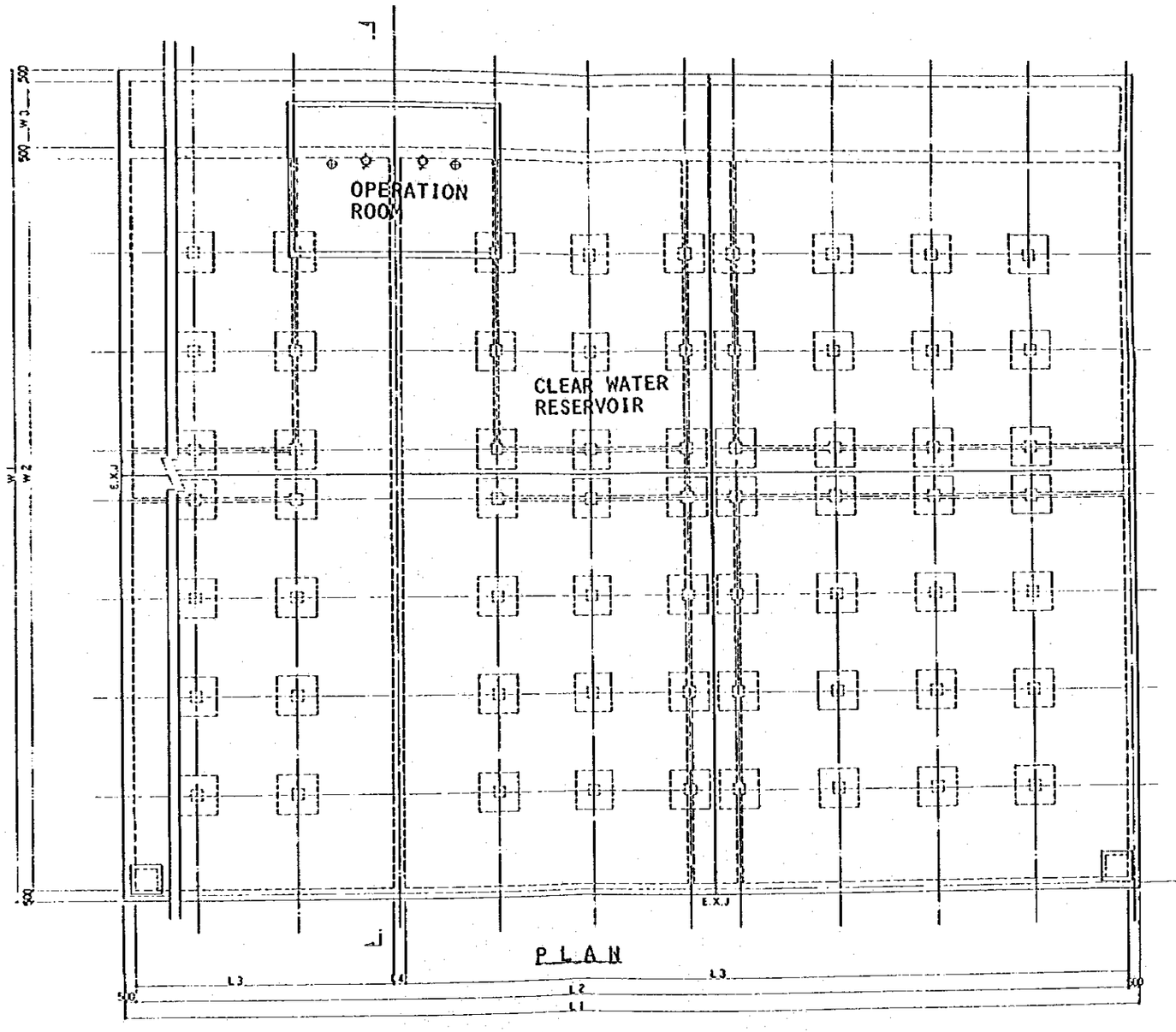


SECTION

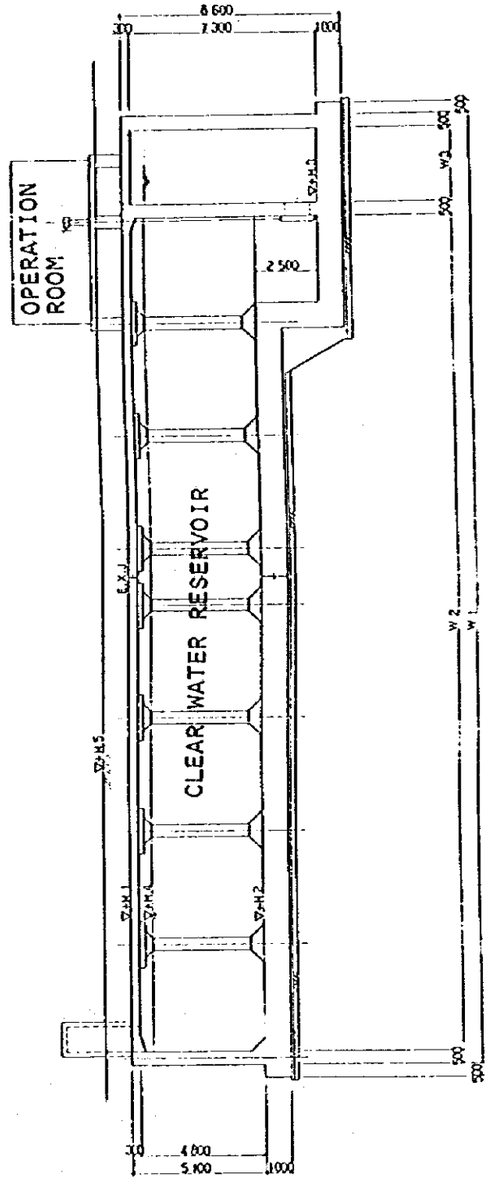
PLANT	W1	W2	W3	L1	L2	L3	L4	L5	H1	H2	H3	H4
LEBAKBULUS	44100	0	13250	99600	49800	8900	3500	46100	+36.5	+33.35	+30.6	+35.8
BUARAN	46400	500	14400	93600	49800	8300	3200	46100	+15.4	+11.25	+ 8.5	+14.7

DWG-10 FILTER

JAKARTA WATER SUPPLY DEVELOPMENT PROJECT | JICA



PLAN

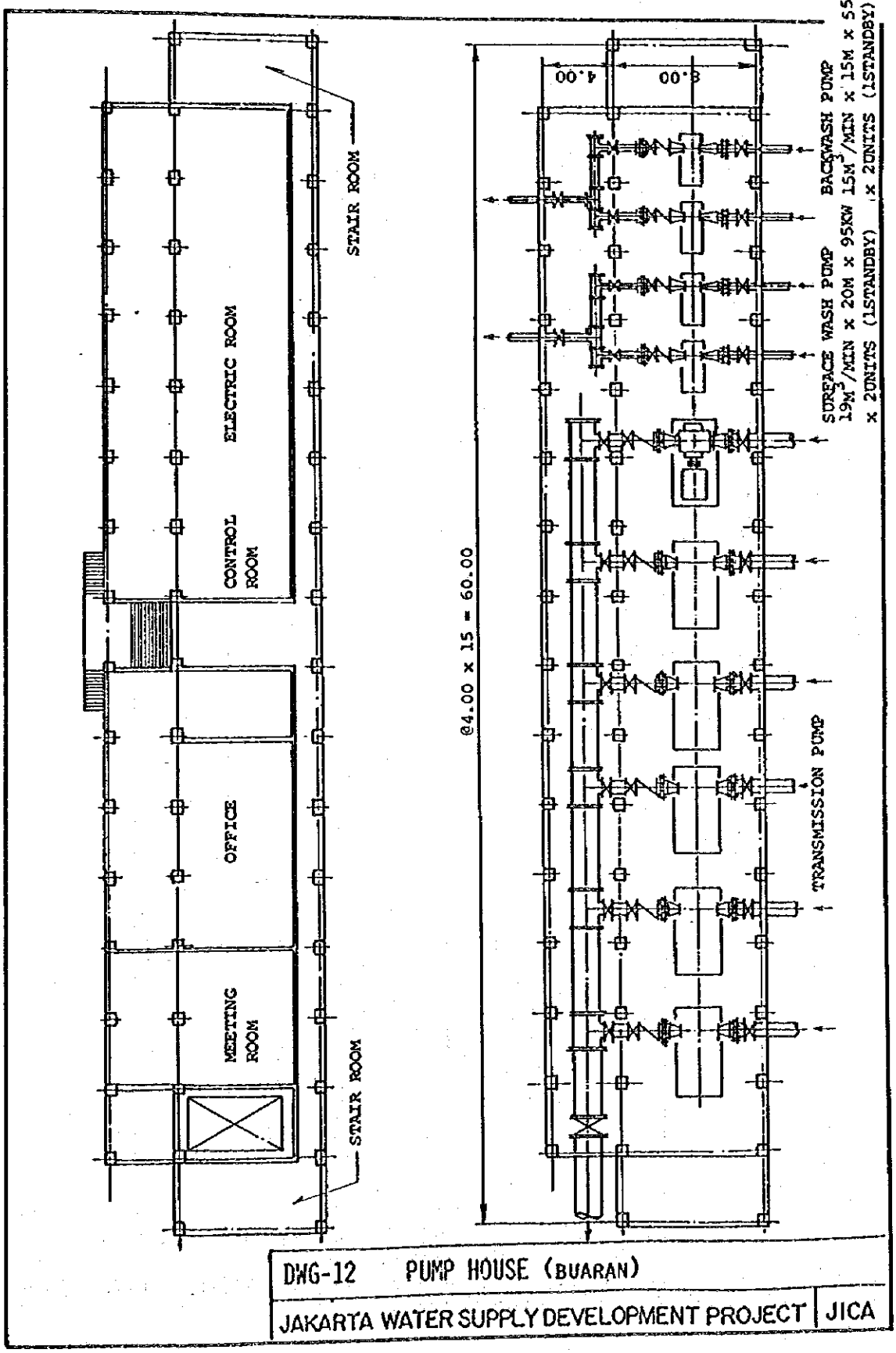


SECTION

FACILITIES	W1	W2	W3	L1	L2	L3	L4	H1	H2	H3	H4	H5	H6
LEBAKBULUS	68000	61500	6000	87000	86000	42750	500	+33.75	+28.7	+26.2	+33.0	+34.85	+29.0
BUARAN	47750	34250	13000	86000	85000	42500	0	+12.6	+ 7.5	+ 5.0	+11.8	+13.6	+ 7.8
DC(Zone 3)	52000	48500	3000	87500	86500	43250	0	+3.15	- 1.9	- 4.4	+ 2.4	+3.75	- 1.6
DC(Zone 4)	48000	44500	3000	69500	68500	34500	500	+12.65	+ 7.6	+ 5.1	+11.9	+13.25	+ 7.9

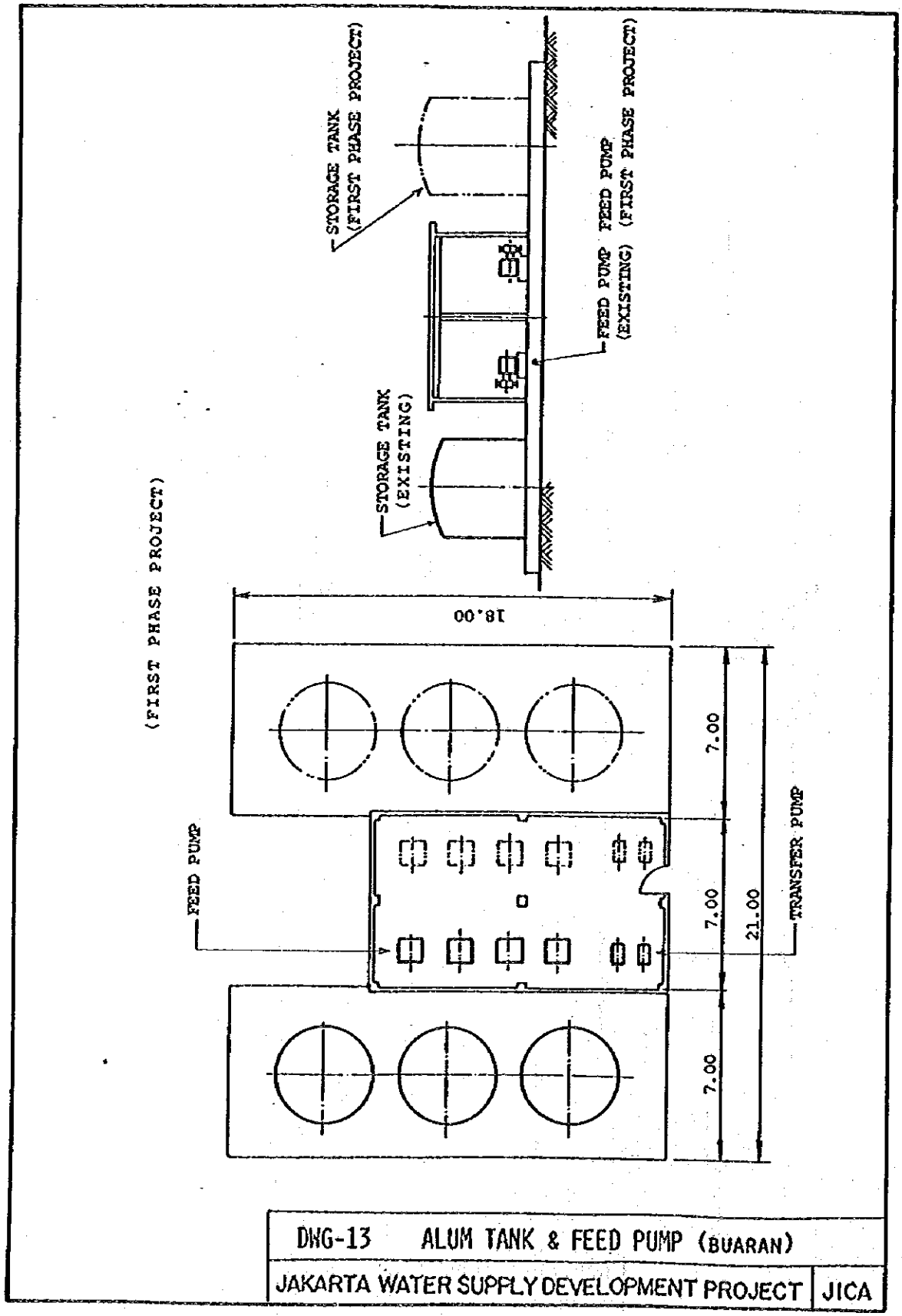
DWG-11 CLEAR WATER RESERVOIR

JAKARTA WATER SUPPLY DEVELOPMENT PROJECT | JICA



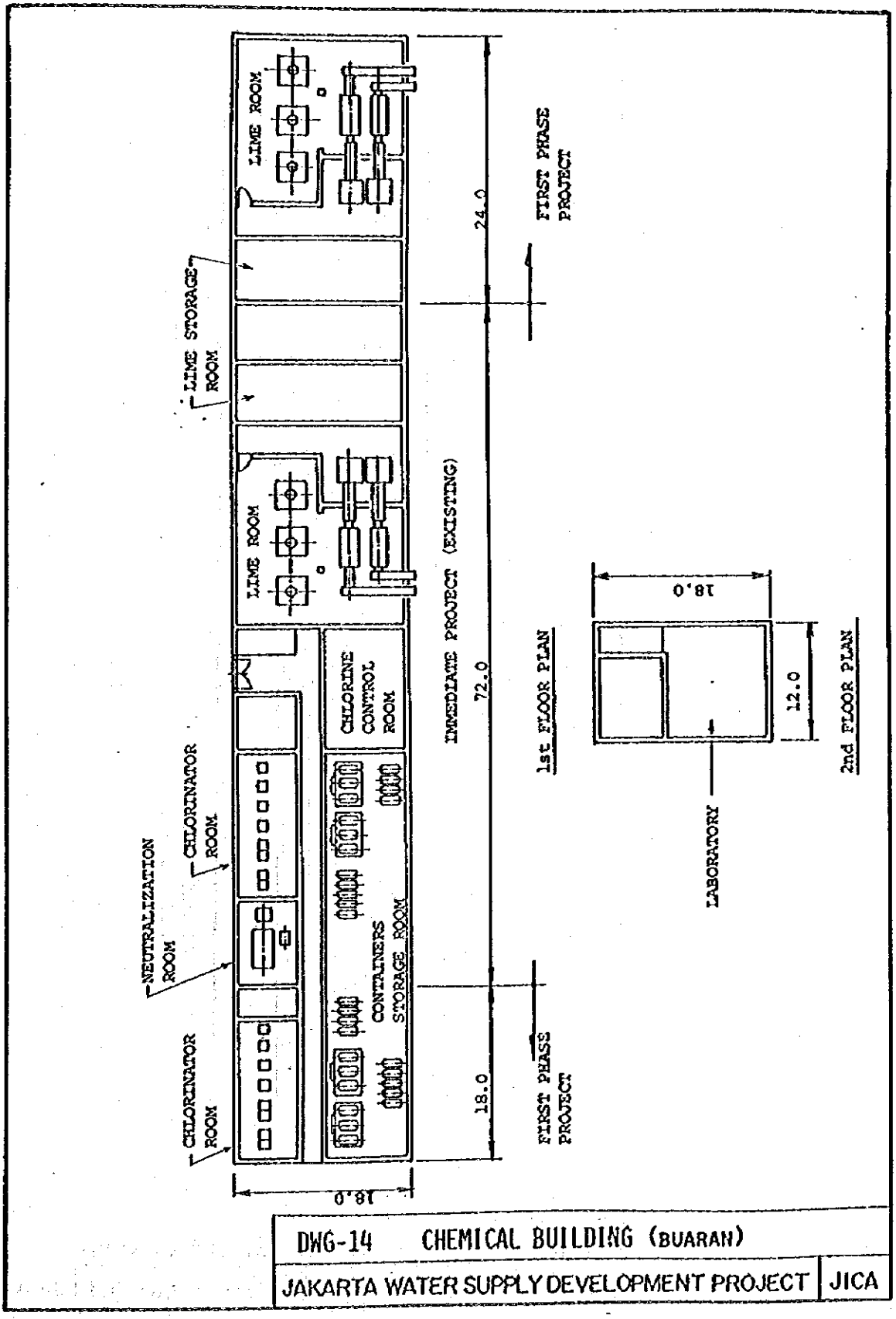
DWG-12 PUMP HOUSE (BUARAN)

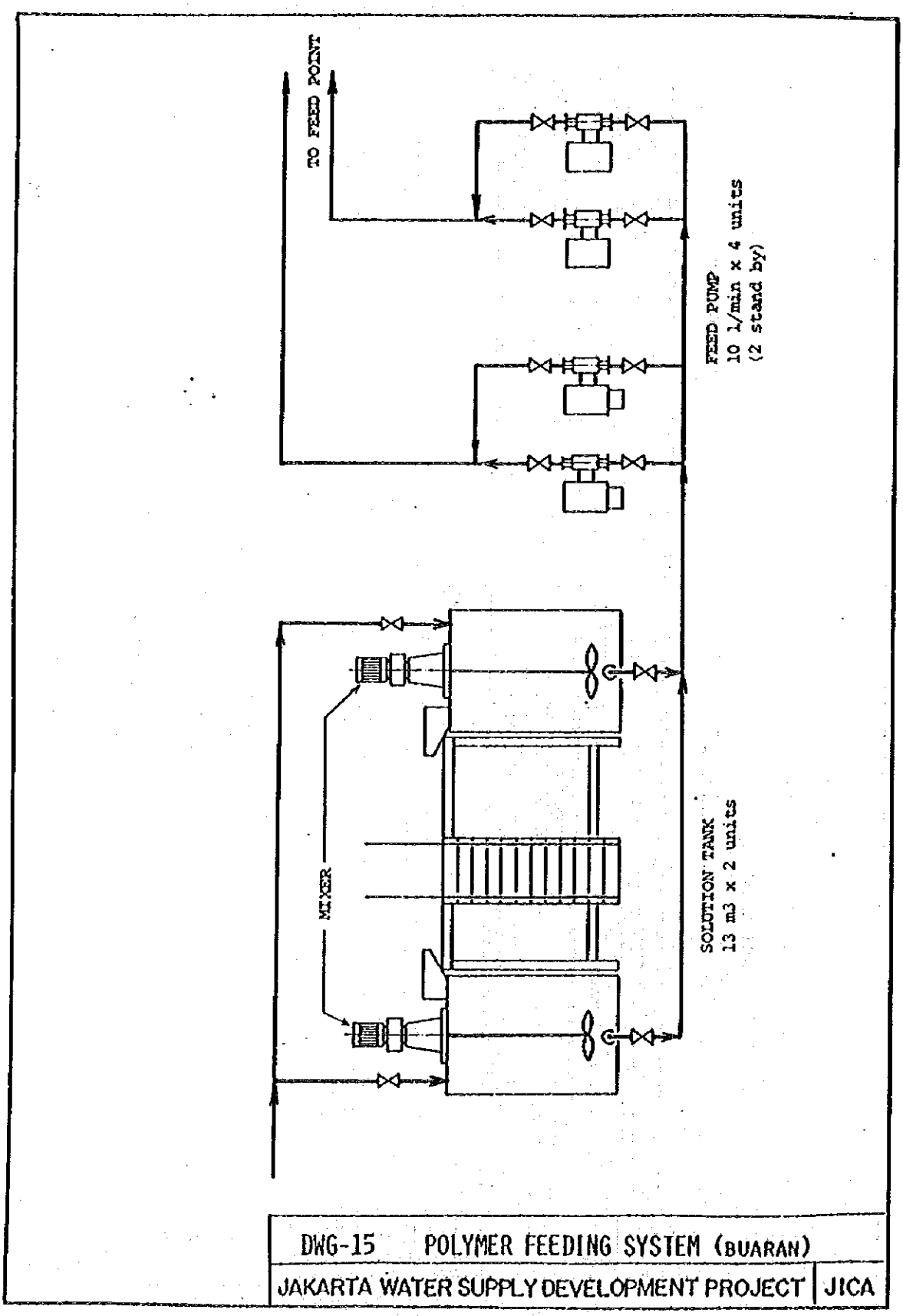
JAKARTA WATER SUPPLY DEVELOPMENT PROJECT | JICA



DWG-13 ALUM TANK & FEED PUMP (BUARAN)

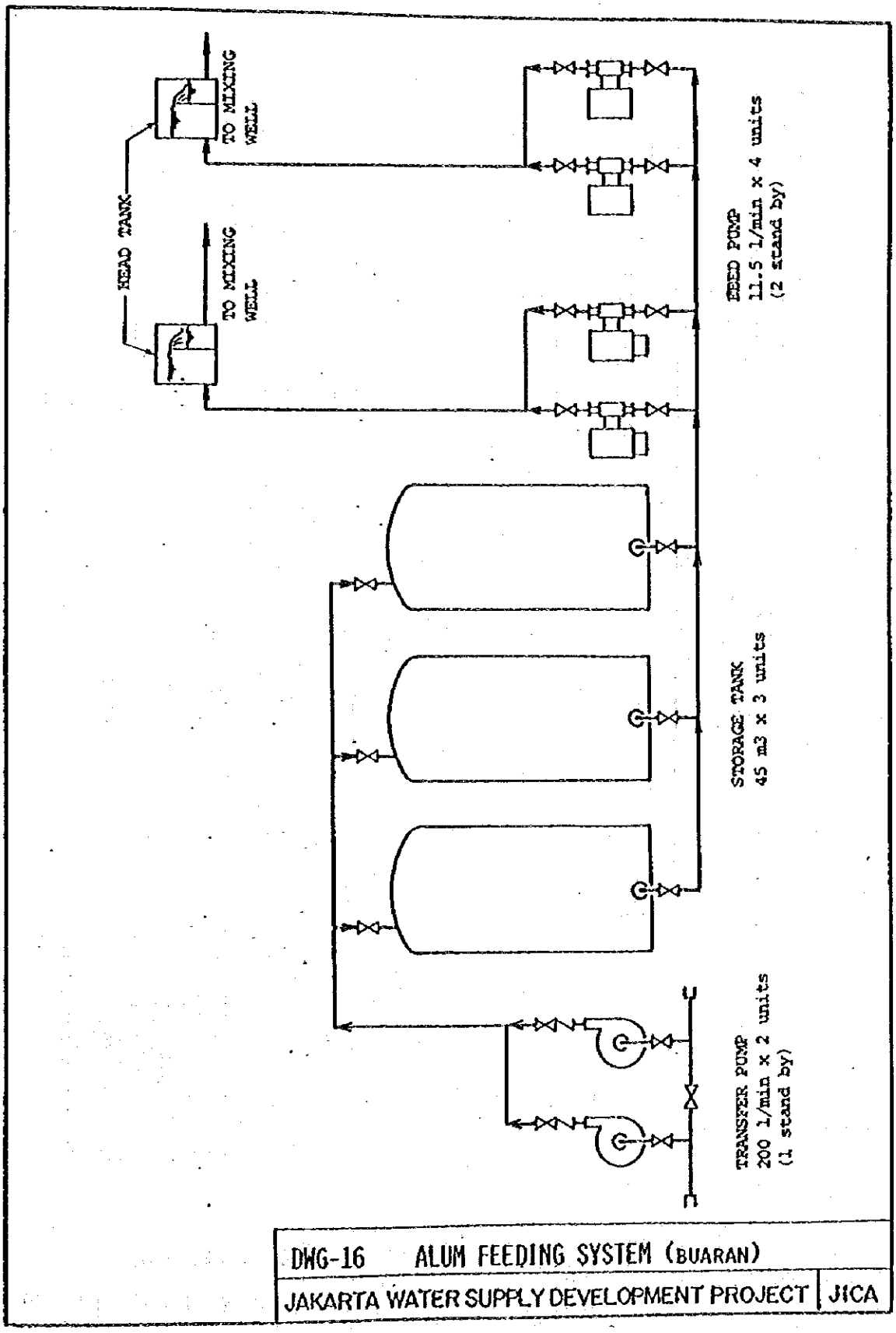
JAKARTA WATER SUPPLY DEVELOPMENT PROJECT | JICA


LIME ROOM
LIME STORAGE ROOM
LIME ROOM
CHLORINE CONTROL ROOM
CHLORINATOR ROOM
NEUTRALIZATION ROOM
CHLORINATOR ROOM
CONTAINERS STORAGE ROOM
IMMEDIATE PROJECT (EXISTING)
FIRST PHASE PROJECT
FIRST PHASE PROJECT
24.0
72.0
18.0
18.0
1st FLOOR PLAN
18.0
12.0
LABORATORY
2nd FLOOR PLAN
DWG-14 CHEMICAL BUILDING (BUARAN)
JAKARTA WATER SUPPLY DEVELOPMENT PROJECT
JICA



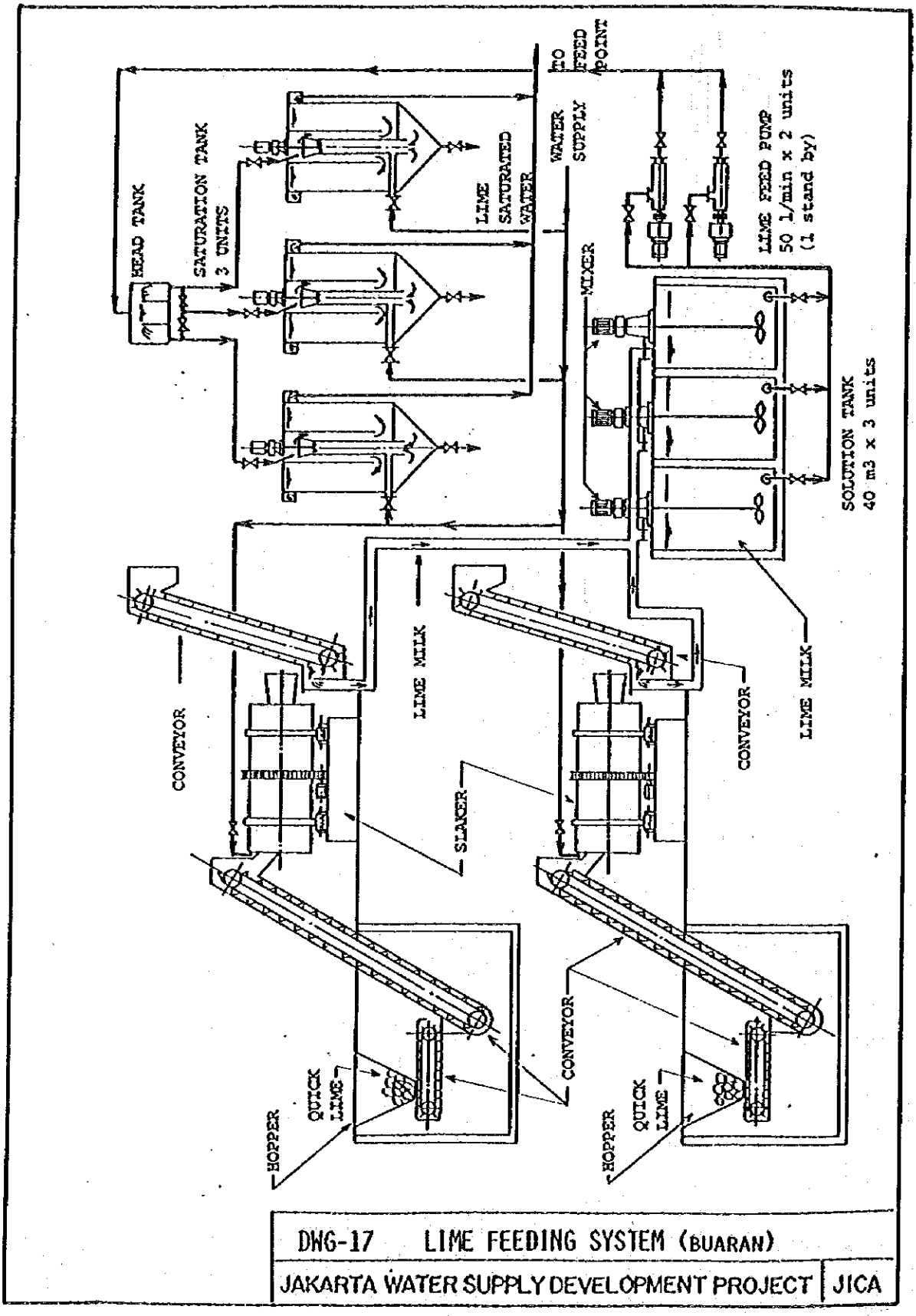
DWG-15 POLYMER FEEDING SYSTEM (BUARAN)

JAKARTA WATER SUPPLY DEVELOPMENT PROJECT | JICA



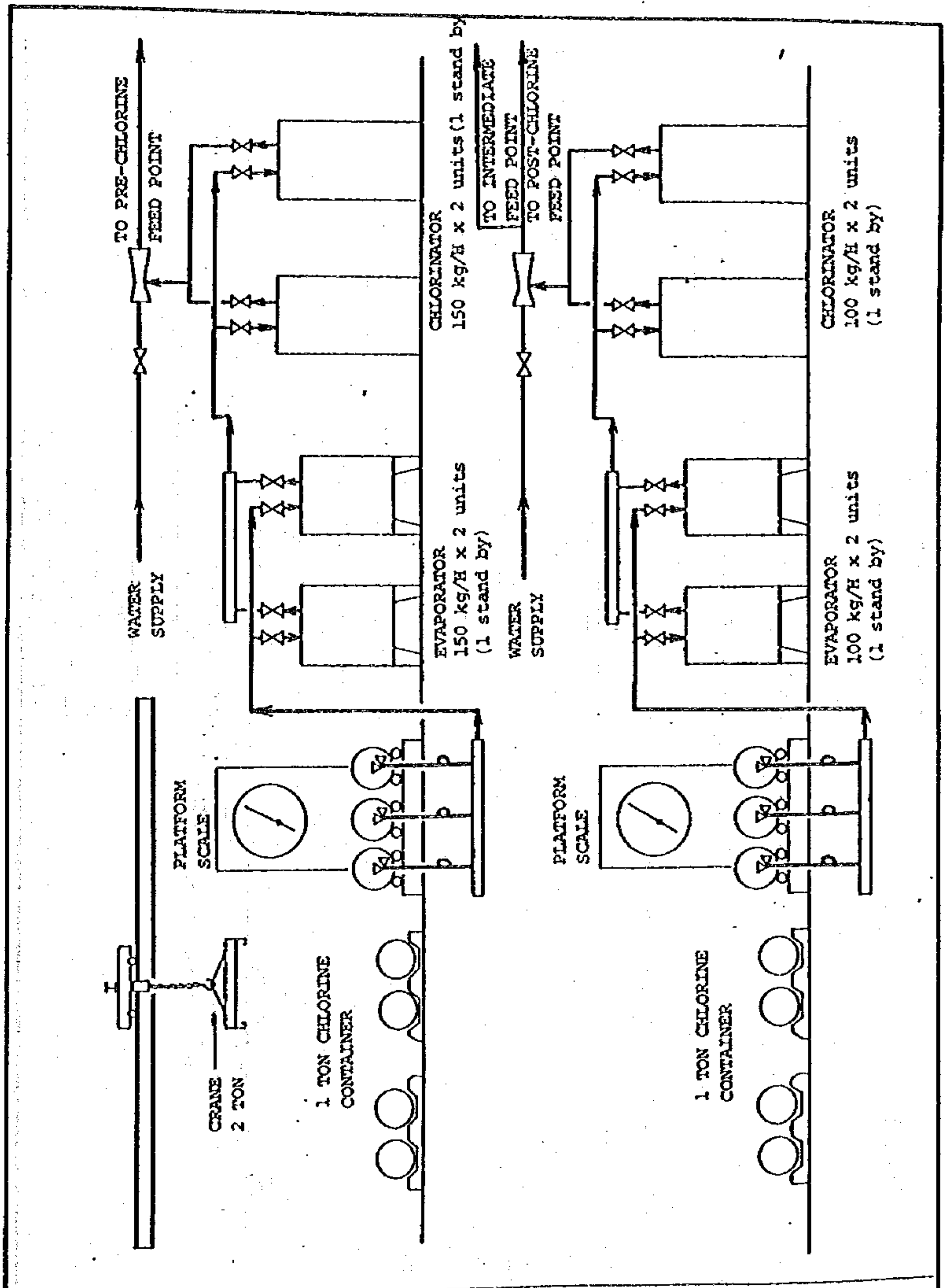
DWG-16 ALUM FEEDING SYSTEM (BUARAN)

JAKARTA WATER SUPPLY DEVELOPMENT PROJECT | JICA



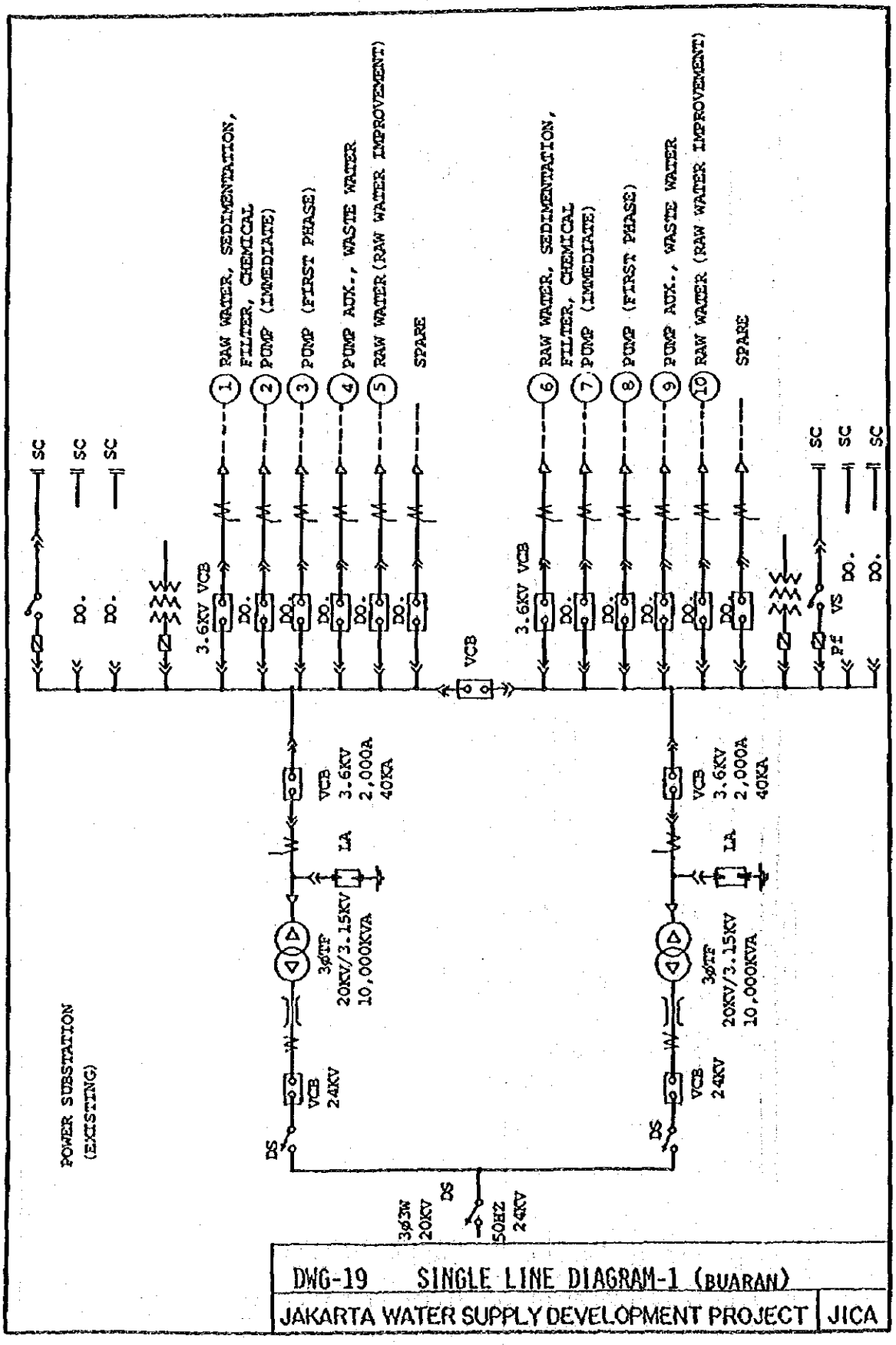
DWG-17 LIME FEEDING SYSTEM (BUARAN)

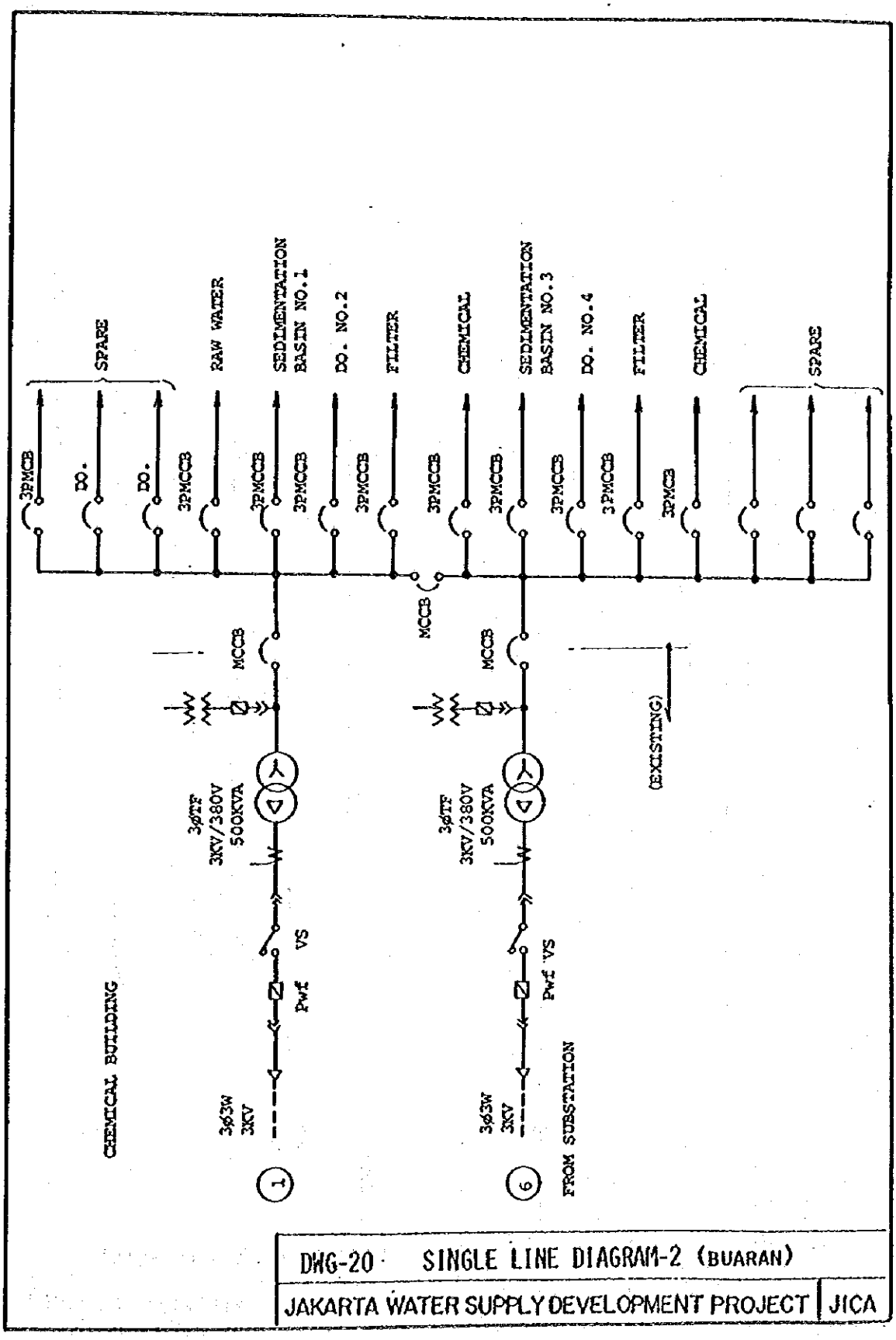
JAKARTA WATER SUPPLY DEVELOPMENT PROJECT | JICA

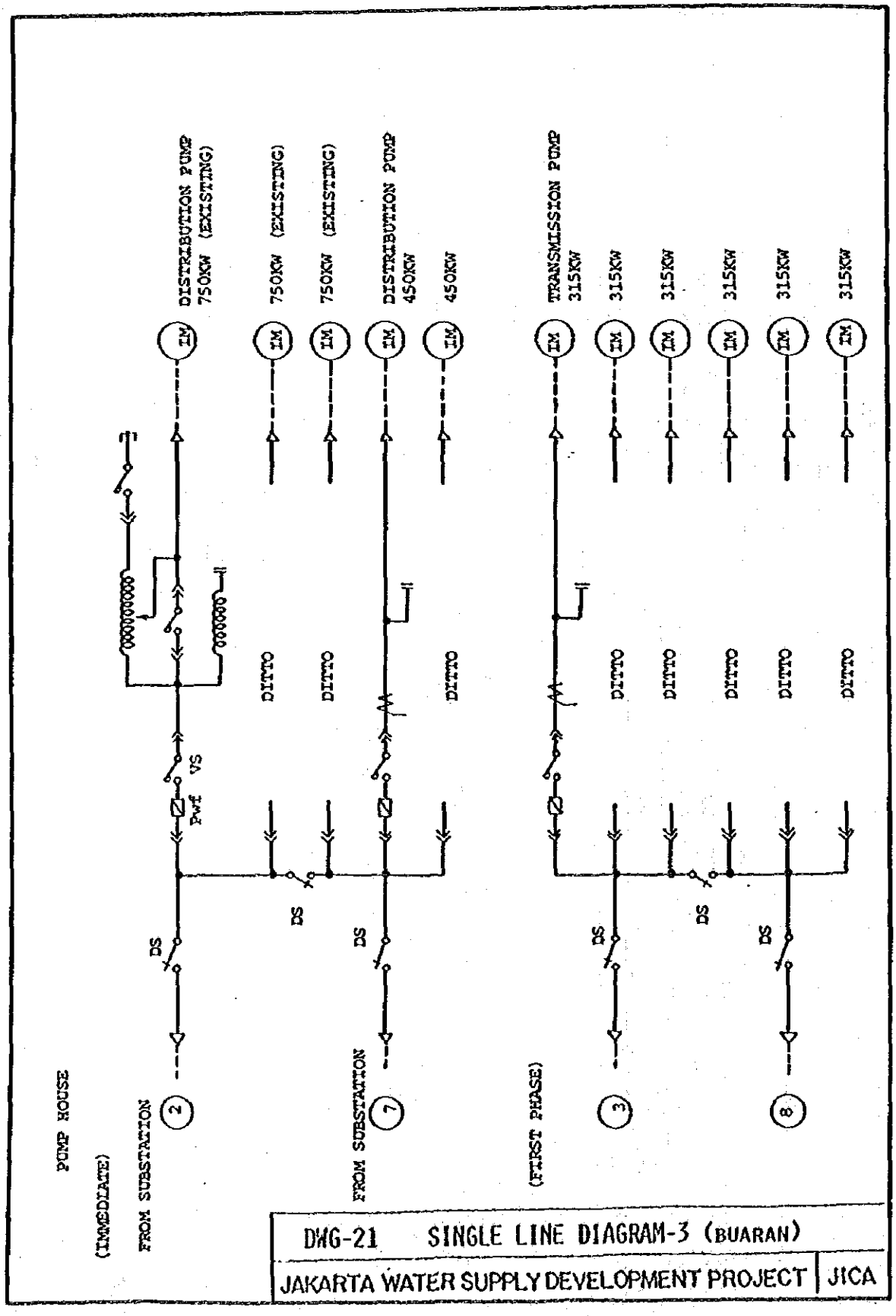


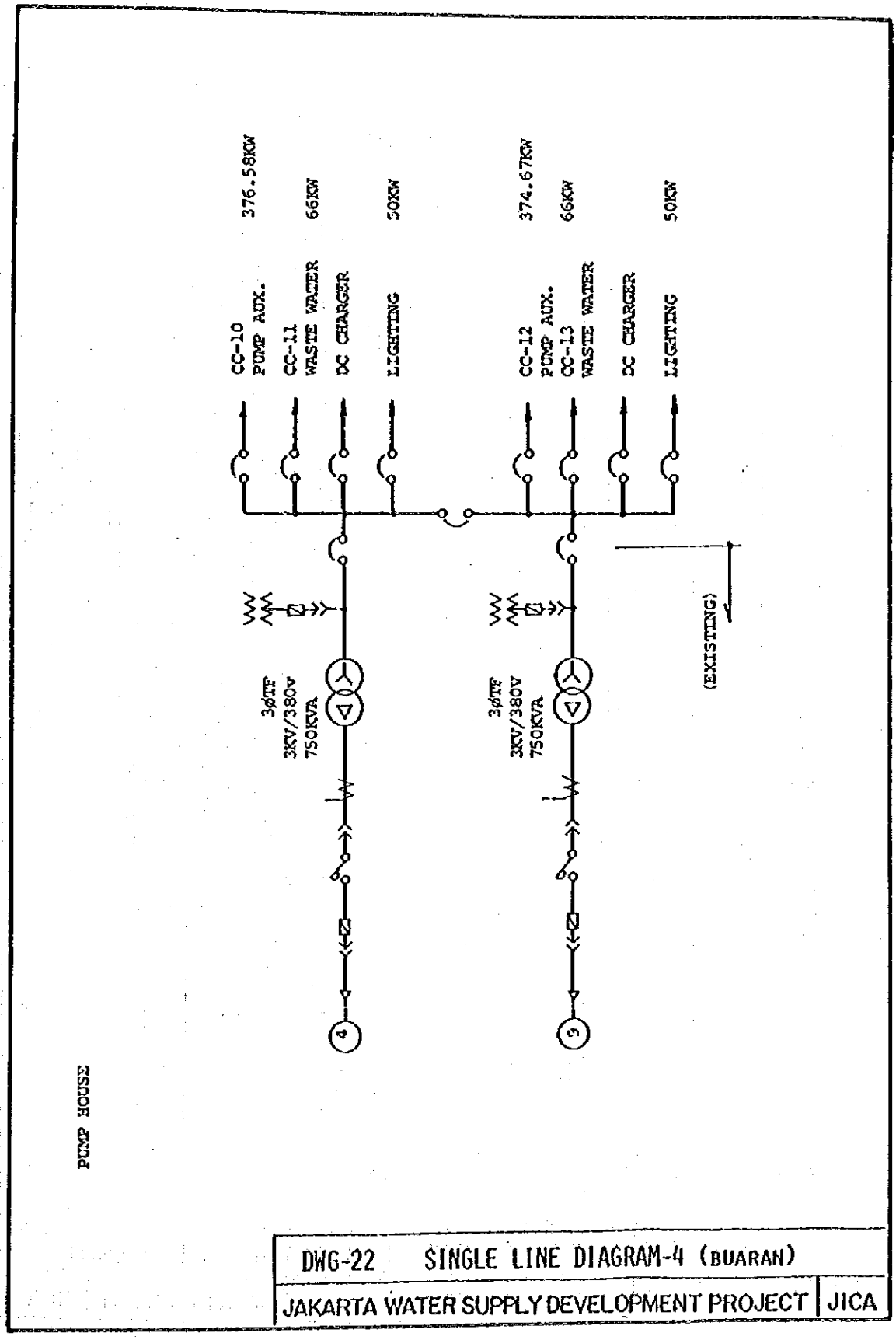
DWG-18 CHLORINATION SYSTEM (BUARAN)

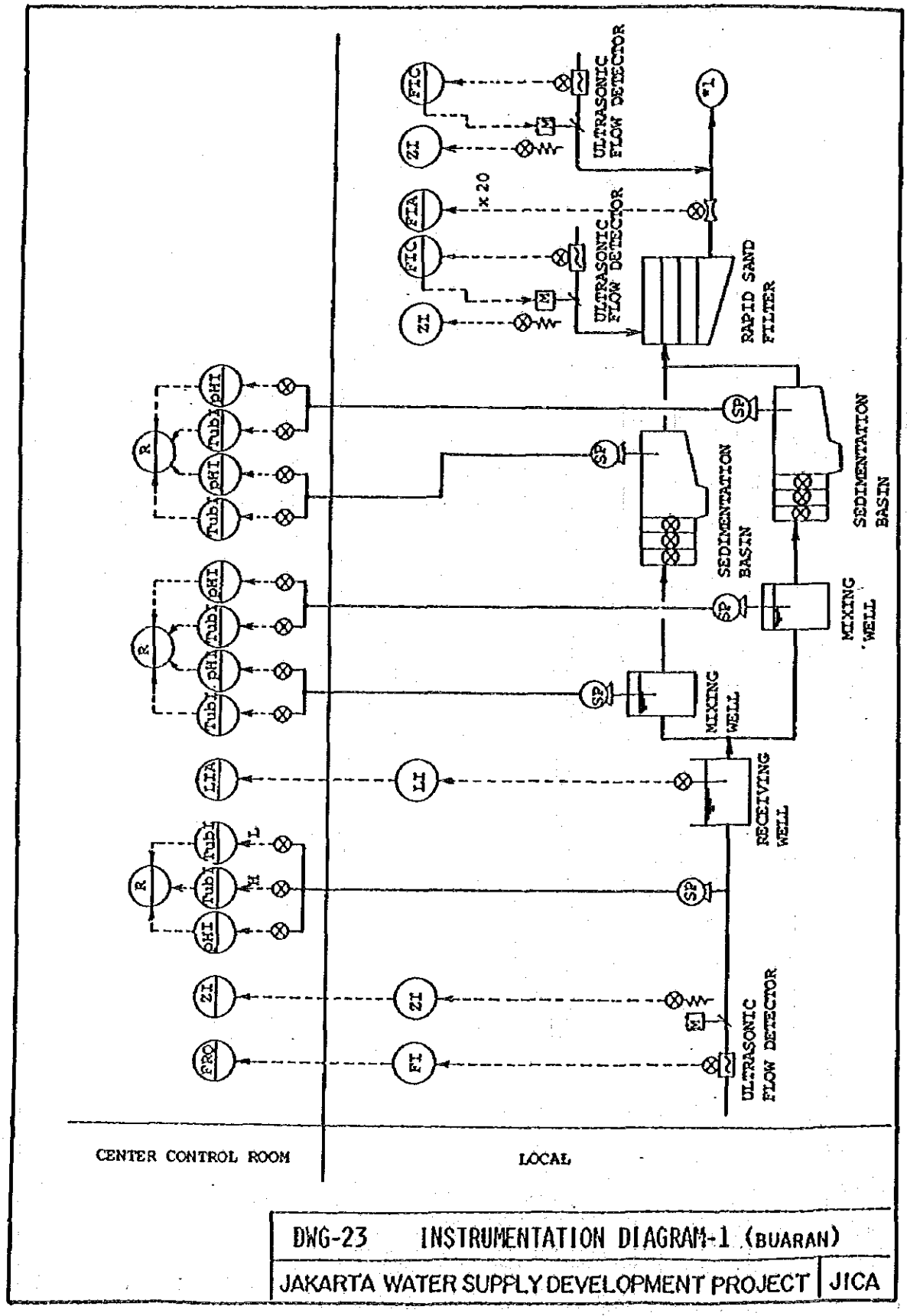
JAKARTA WATER SUPPLY DEVELOPMENT PROJECT | JICA


POWER SUBSTATION
(EXISTING)
3φ3W
20KV
50HZ
24KV
DS
VCB
24KV
3φTF
20KV/3.15KV
10,000KVA
LA
VCB
3.6KV
2,000A
40KA
3.6KV VCB
1 RAW WATER, SEDIMENTATION, FILTER, CHEMICAL
2 PUMP (IMMEDIATE)
3 PUMP (FIRST PHASE)
4 PUMP AUX., WASTE WATER
5 RAW WATER (RAW WATER IMPROVEMENT)
SPARE
6 RAW WATER, SEDIMENTATION, FILTER, CHEMICAL
7 PUMP (IMMEDIATE)
8 PUMP (FIRST PHASE)
9 PUMP AUX., WASTE WATER
10 RAW WATER (RAW WATER IMPROVEMENT)
SPARE
SC
PT
VS
DWG-19 SINGLE LINE DIAGRAM-1 (BUARAN)
JAKARTA WATER SUPPLY DEVELOPMENT PROJECT
JICA


3PMCB
DO.
SPARE
DO.
3PMCB
RAW WATER
3PMCB
SEDIMENTATION BASIN NO.1
3PMCB
DO. NO.2
3PMCB
FILTER
3PMCB
CHEMICAL
3PMCB
SEDIMENTATION BASIN NO.3
3PMCB
DO. NO.4
3PMCB
FILTER
3PMCB
CHEMICAL
SPARE
MCCB
MCCB
MCCB
3φTF
3KV/380V
500KVA
3φTF
3KV/380V
500KVA
VS
Pwf
VS
Pwf
(EXISTING)
CHEMICAL BUILDING
3φ3W
3KV
3φ3W
3KV
FROM SUBSTATION
1
6
DWG-20 SINGLE LINE DIAGRAM-2 (BUARAN)
JAKARTA WATER SUPPLY DEVELOPMENT PROJECT
JICA

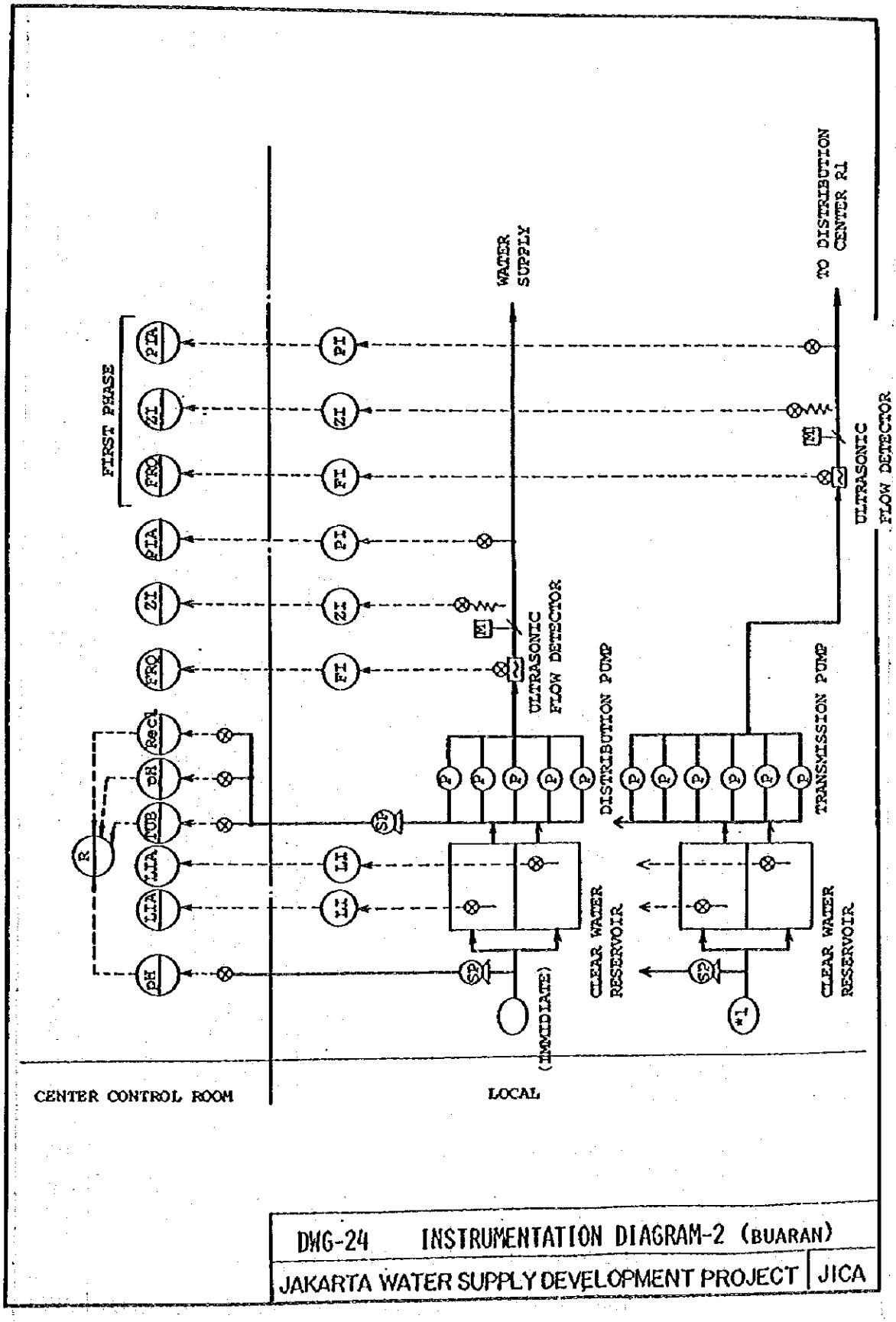

PUMP HOUSE
(IMMEDIATE)
FROM SUBSTATION
2
DS
PwF
VS
DISTRIBUTION PUMP
750KW (EXISTING)
IM
DITTO
750KW (EXISTING)
750KW (EXISTING)
DISTRIBUTION PUMP
450KW
450KW
BS
FROM SUBSTATION
7
(FIRST PHASE)
TRANSMISSION PUMP
315KW
315KW
315KW
315KW
315KW
315KW
3
8
DWG-21 SINGLE LINE DIAGRAM-3 (BUARAN)
JAKARTA WATER SUPPLY DEVELOPMENT PROJECT
JICA


CC-10
PUMP AUX.
376.58KW
CC-11
WASTE WATER
66KW
DC CHARGER
LIGHTING
50KW
CC-12
PUMP AUX.
374.67KW
CC-13
WASTE WATER
66KW
DC CHARGER
LIGHTING
50KW
3ΦTF
3KV/380V
750KVA
3ΦTF
3KV/380V
750KVA
(EXISTING)
PUMP HOUSE
DWG-22 SINGLE LINE DIAGRAM-4 (BUARAN)
JAKARTA WATER SUPPLY DEVELOPMENT PROJECT
JICA



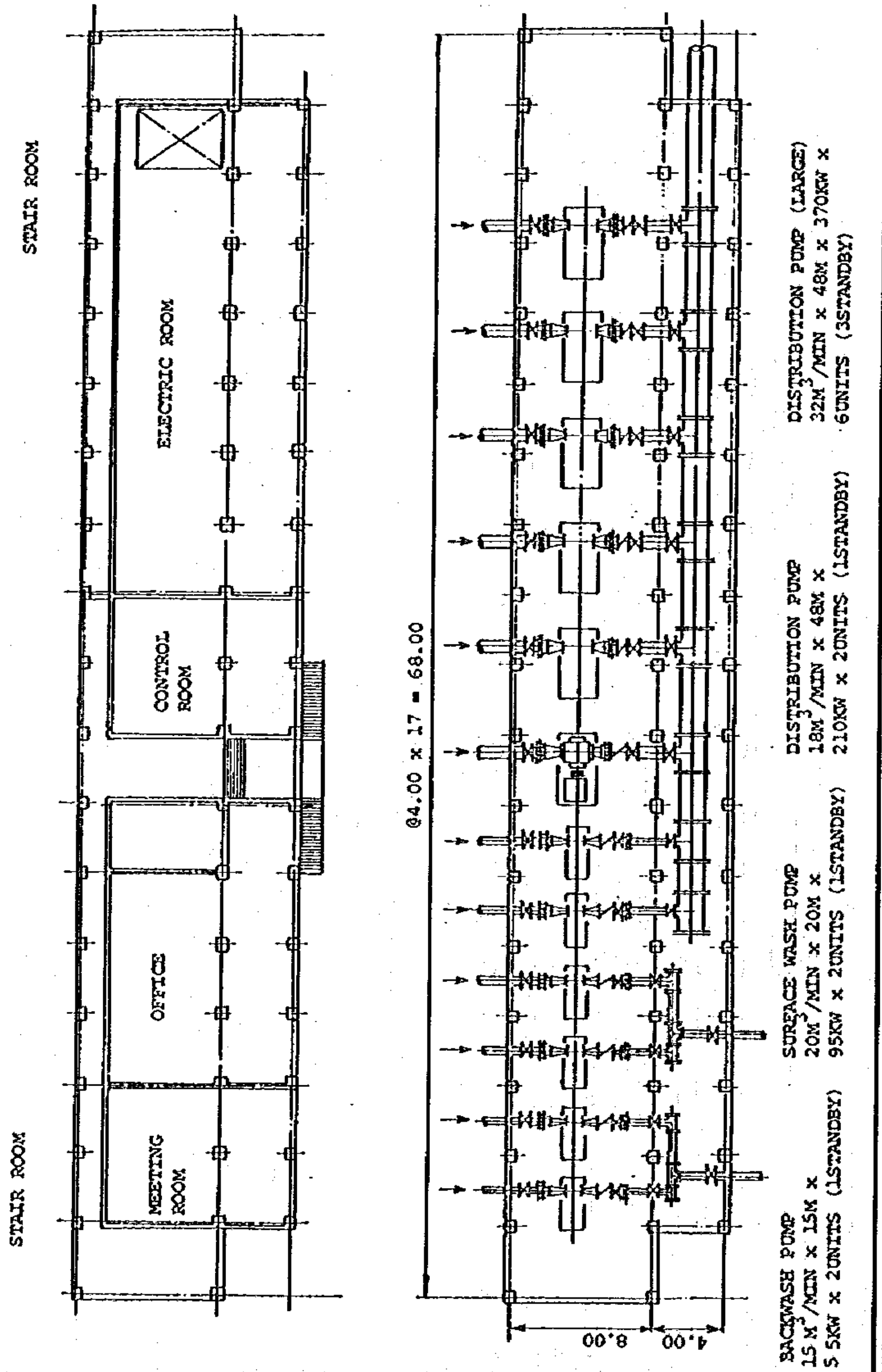
DWG-23 INSTRUMENTATION DIAGRAM-1 (BUARAN)

JAKARTA WATER SUPPLY DEVELOPMENT PROJECT | JICA



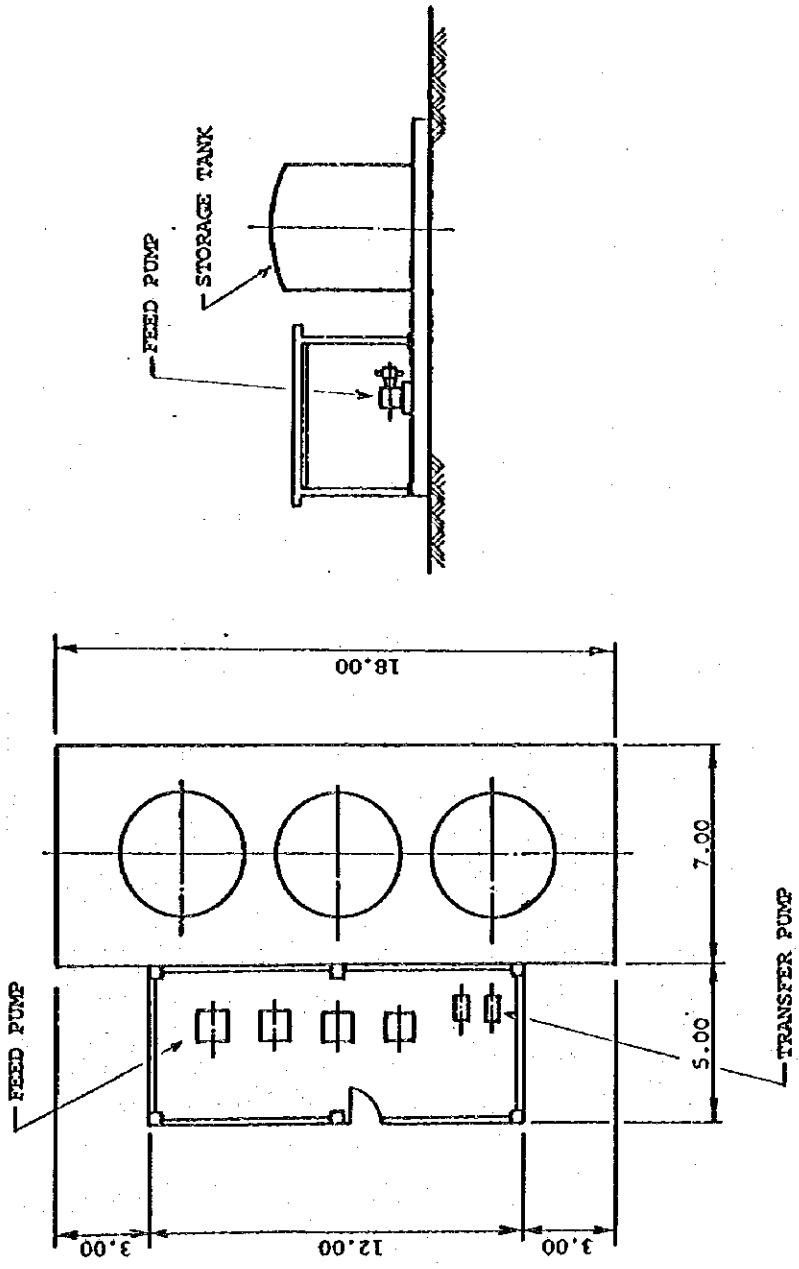
DWG-24 INSTRUMENTATION DIAGRAM-2 (BUARAN)

JAKARTA WATER SUPPLY DEVELOPMENT PROJECT | JICA



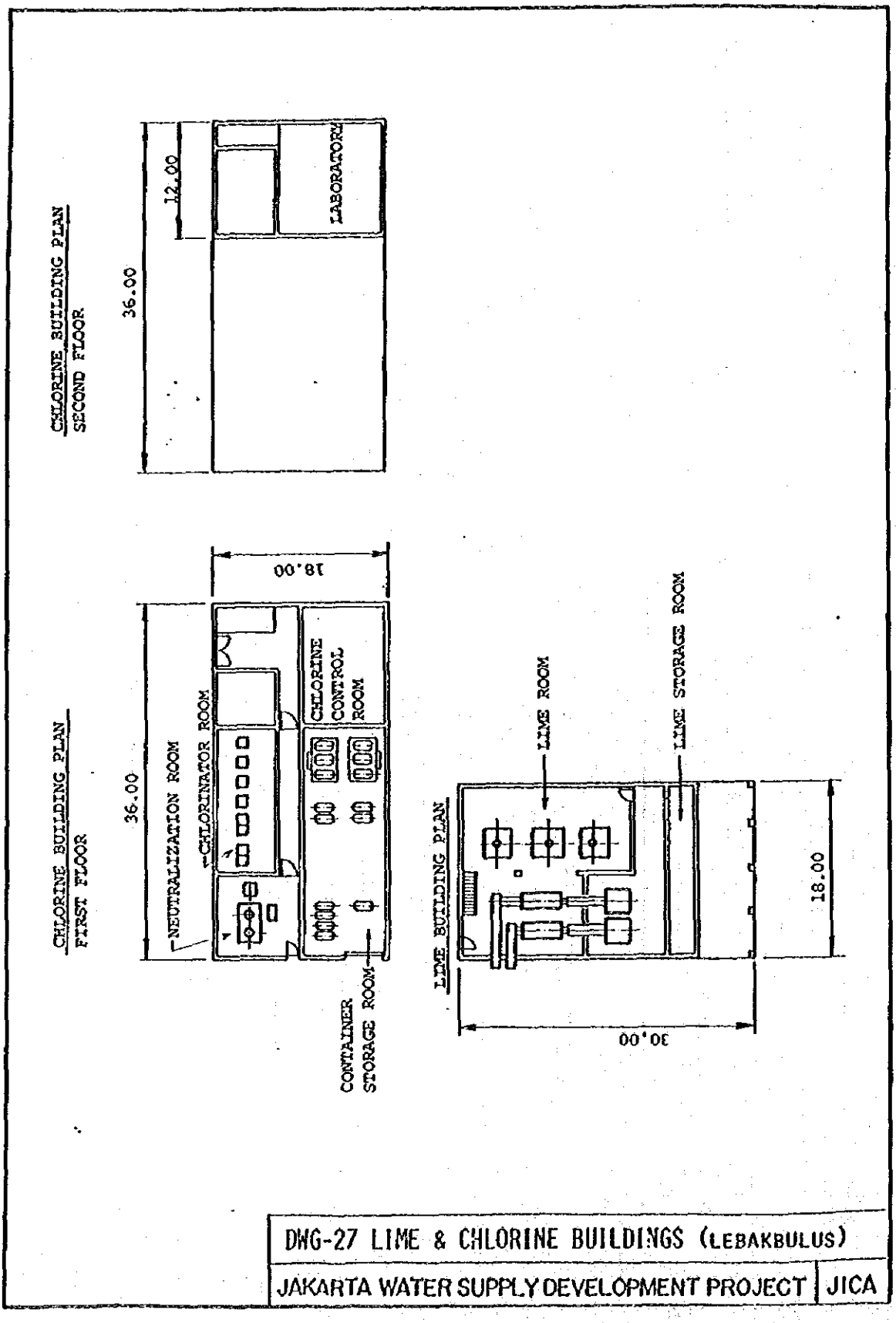
DWG-25 PUMP HOUSE (LEBAKBULUS)

JAKARTA WATER SUPPLY DEVELOPMENT PROJECT | JICA



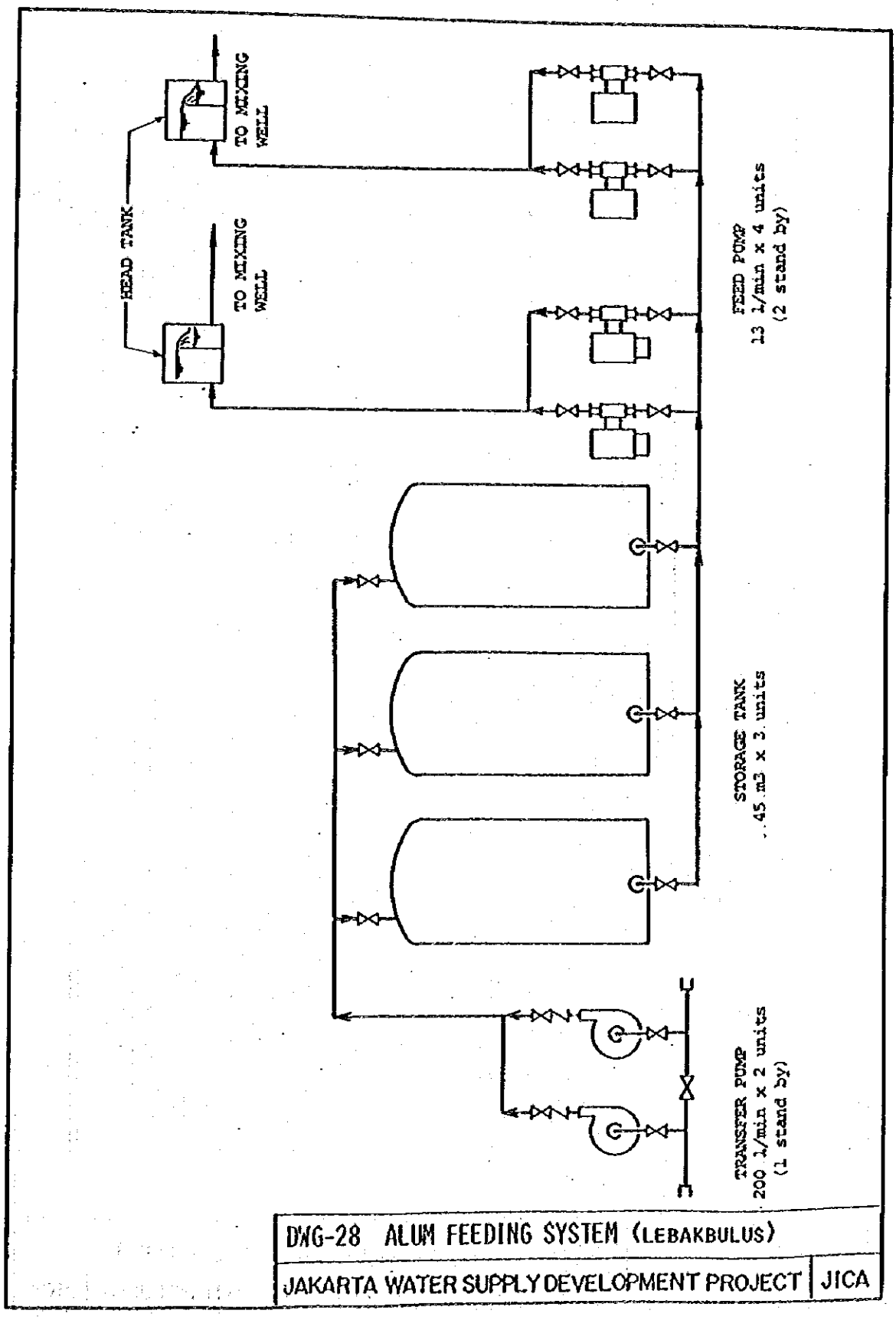
DWG-26 ALUM TANK & FEED PUMP (LEBAKBULUS)

JAKARTA WATER SUPPLY DEVELOPMENT PROJECT | JICA



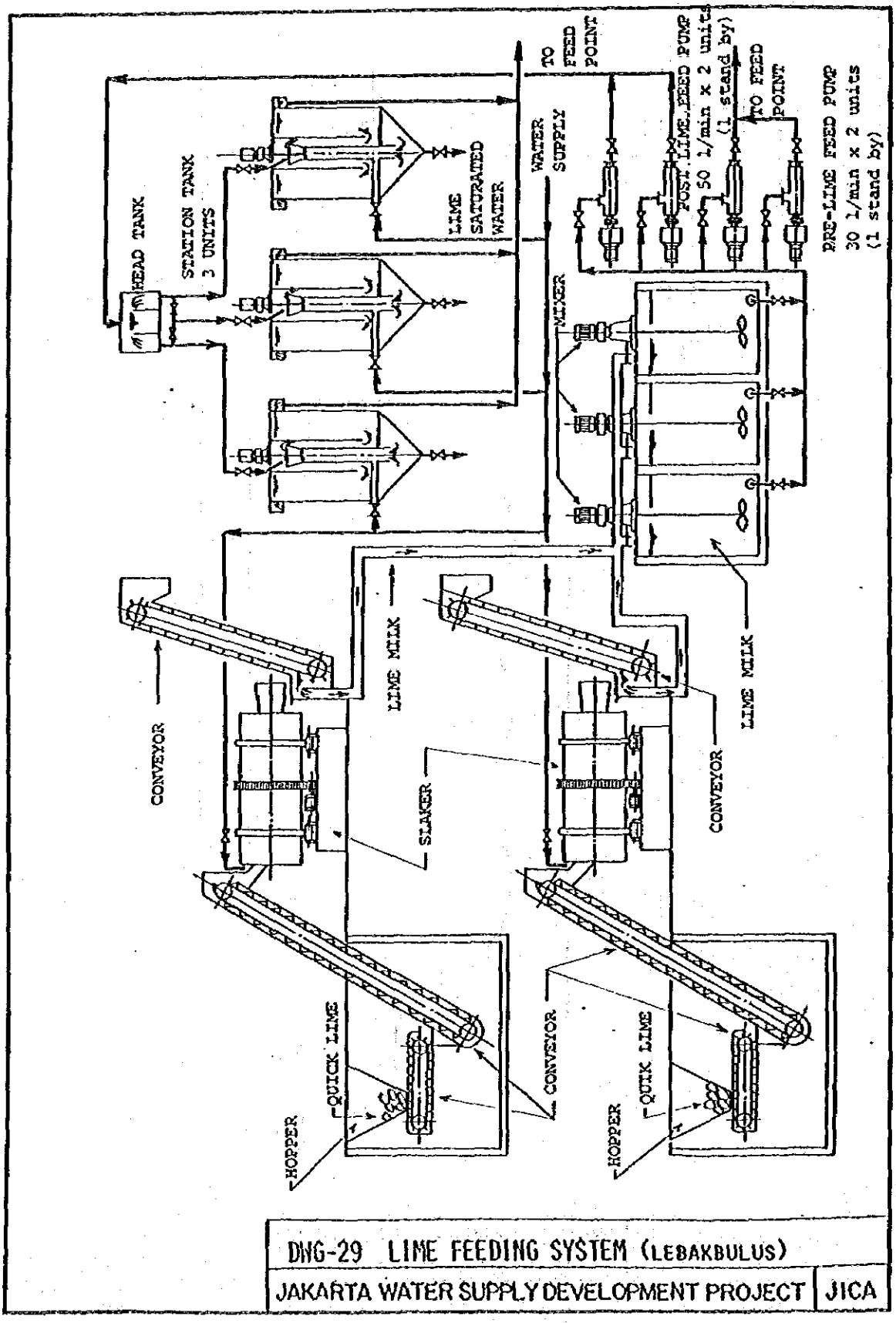
DWG-27 LIME & CHLORINE BUILDINGS (LEBAKBULUS)

JAKARTA WATER SUPPLY DEVELOPMENT PROJECT | JICA



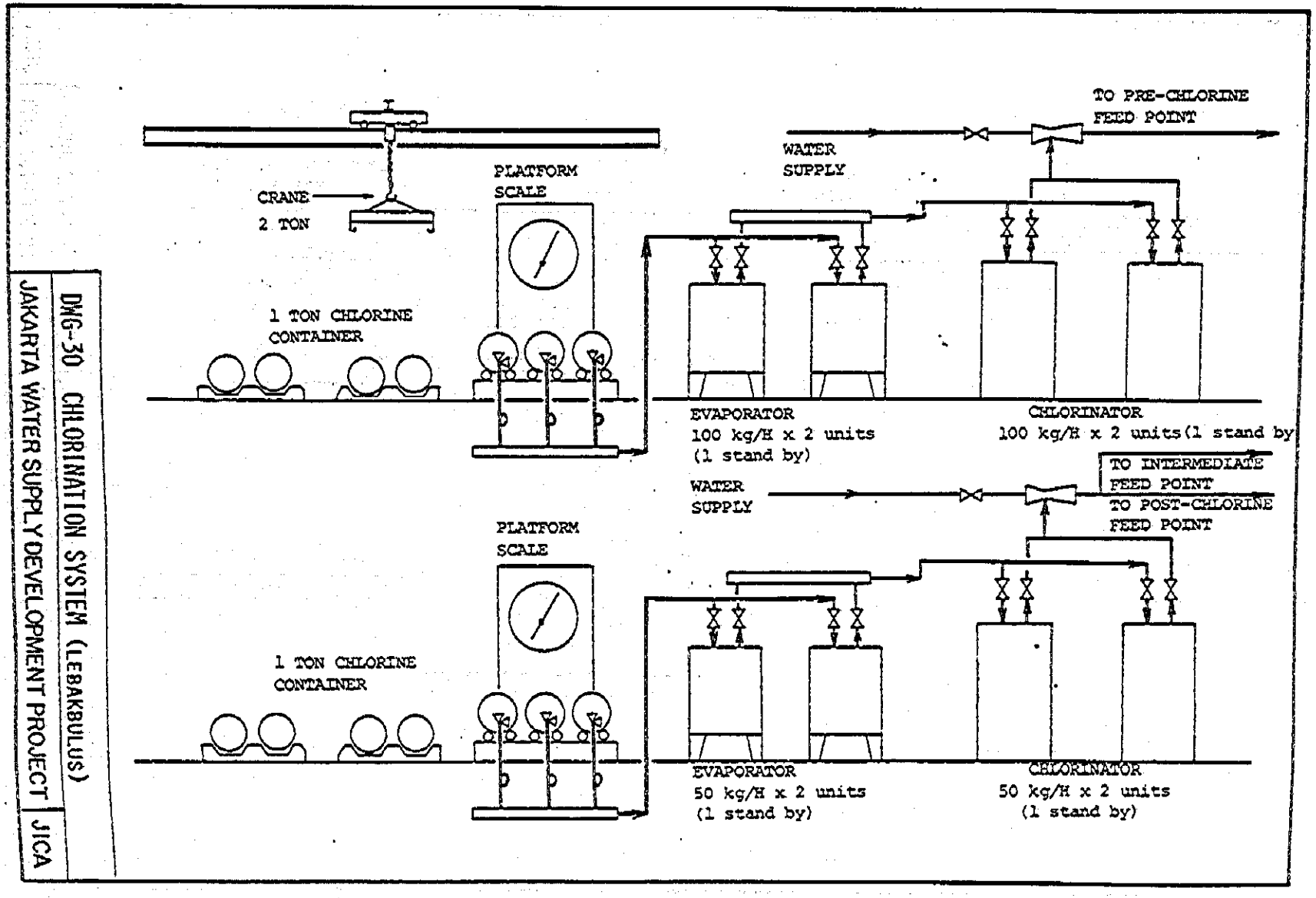
DWG-28 ALUM FEEDING SYSTEM (LEBAKBULUS)

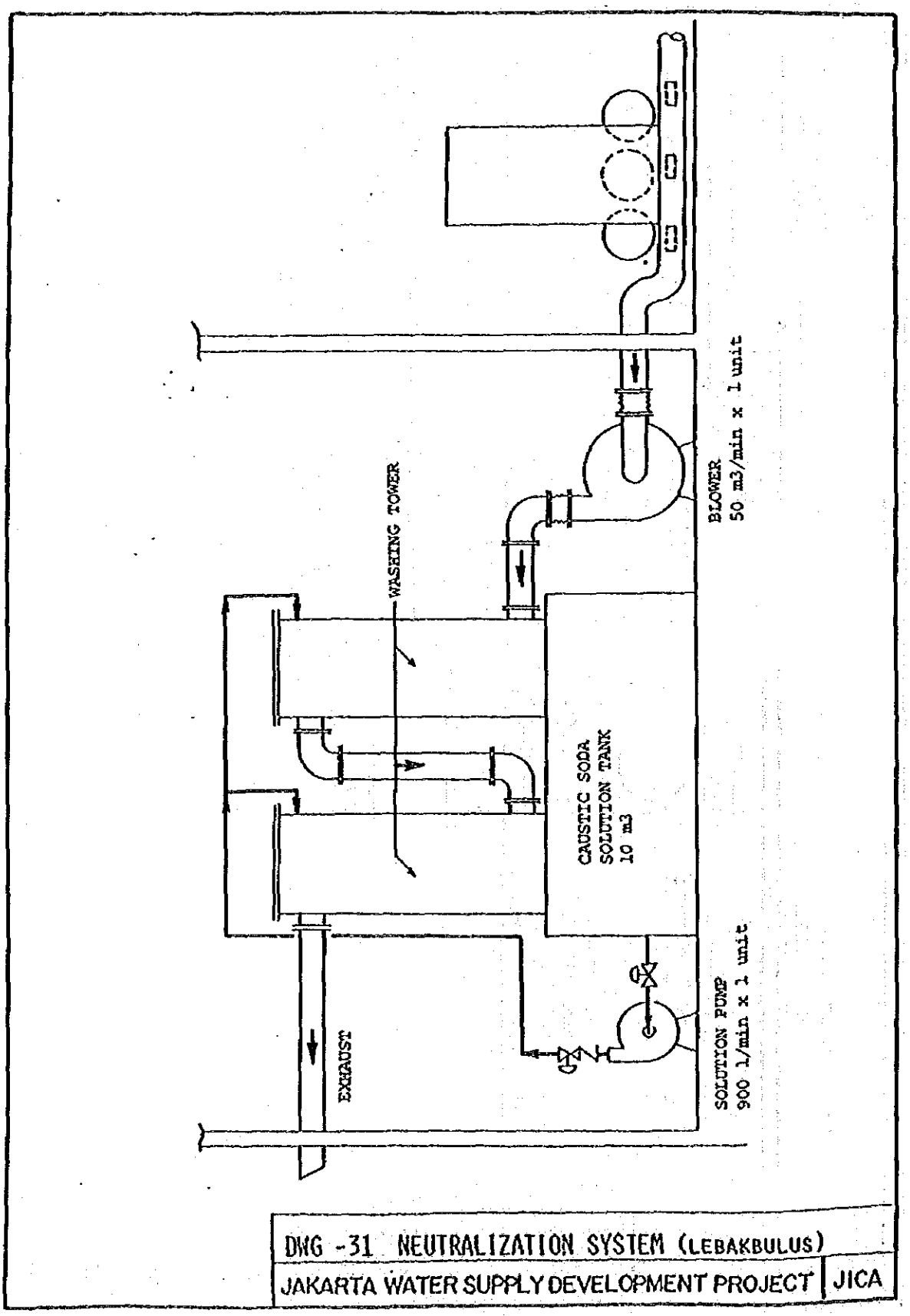
JAKARTA WATER SUPPLY DEVELOPMENT PROJECT | JICA



DWG-29 LIME FEEDING SYSTEM (LEBAKBULUS)

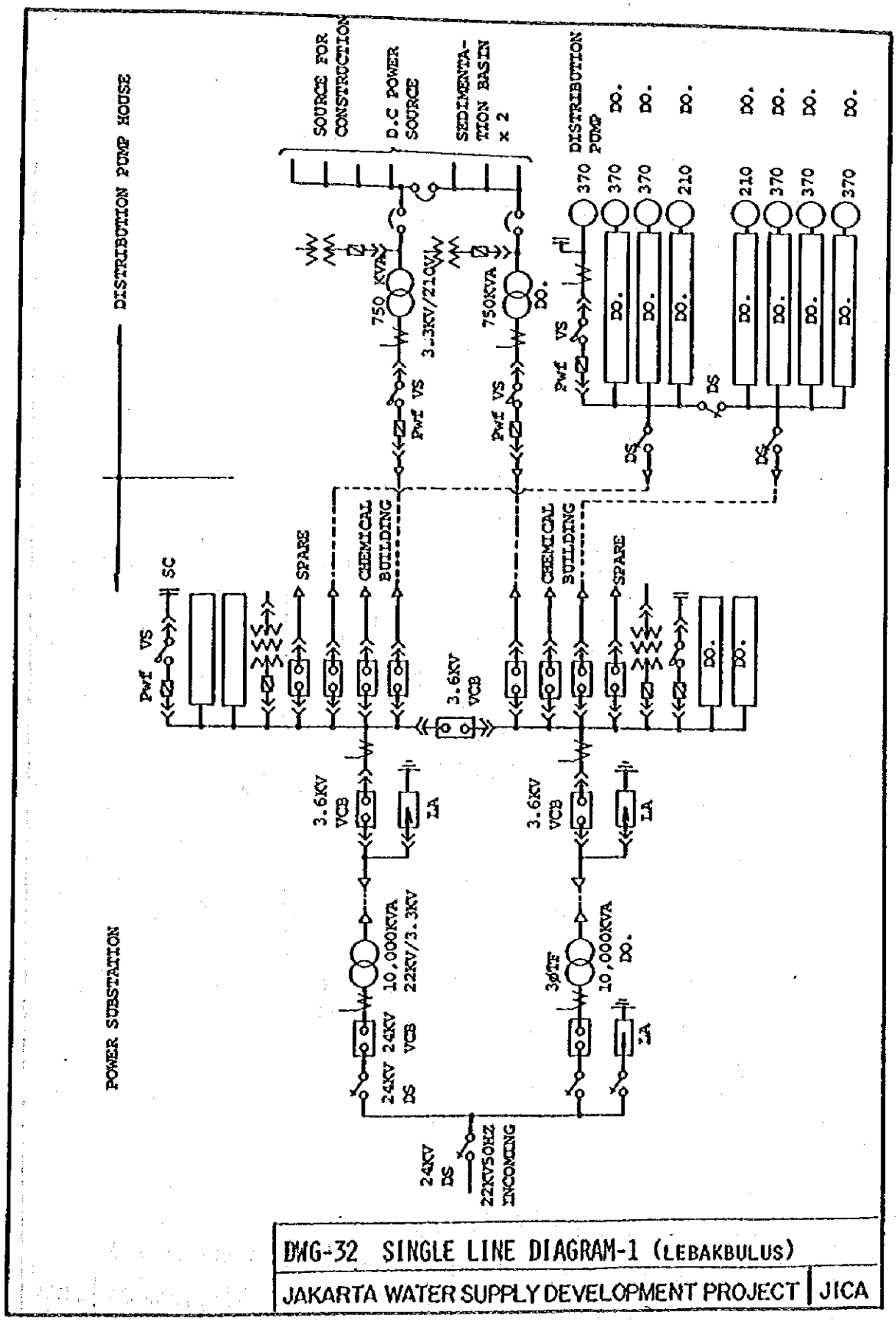
JAKARTA WATER SUPPLY DEVELOPMENT PROJECT | JICA


DWG-30 CHLORINATION SYSTEM (LEBAKBULUS)
JAKARTA WATER SUPPLY DEVELOPMENT PROJECT
JICA
CRANE
2 TON
PLATFORM
SCALE
1 TON CHLORINE
CONTAINER
WATER
SUPPLY
TO PRE-CHLORINE
FEED POINT
EVAPORATOR
100 kg/H x 2 units
(1 stand by)
CHLORINATOR
100 kg/H x 2 units(1 stand by
WATER
SUPPLY
TO INTERMEDIATE
FEED POINT
TO POST-CHLORINE
FEED POINT
PLATFORM
SCALE
1 TON CHLORINE
CONTAINER
EVAPORATOR
50 kg/H x 2 units
(1 stand by)
CHLORINATOR
50 kg/H x 2 units
(1 stand by)



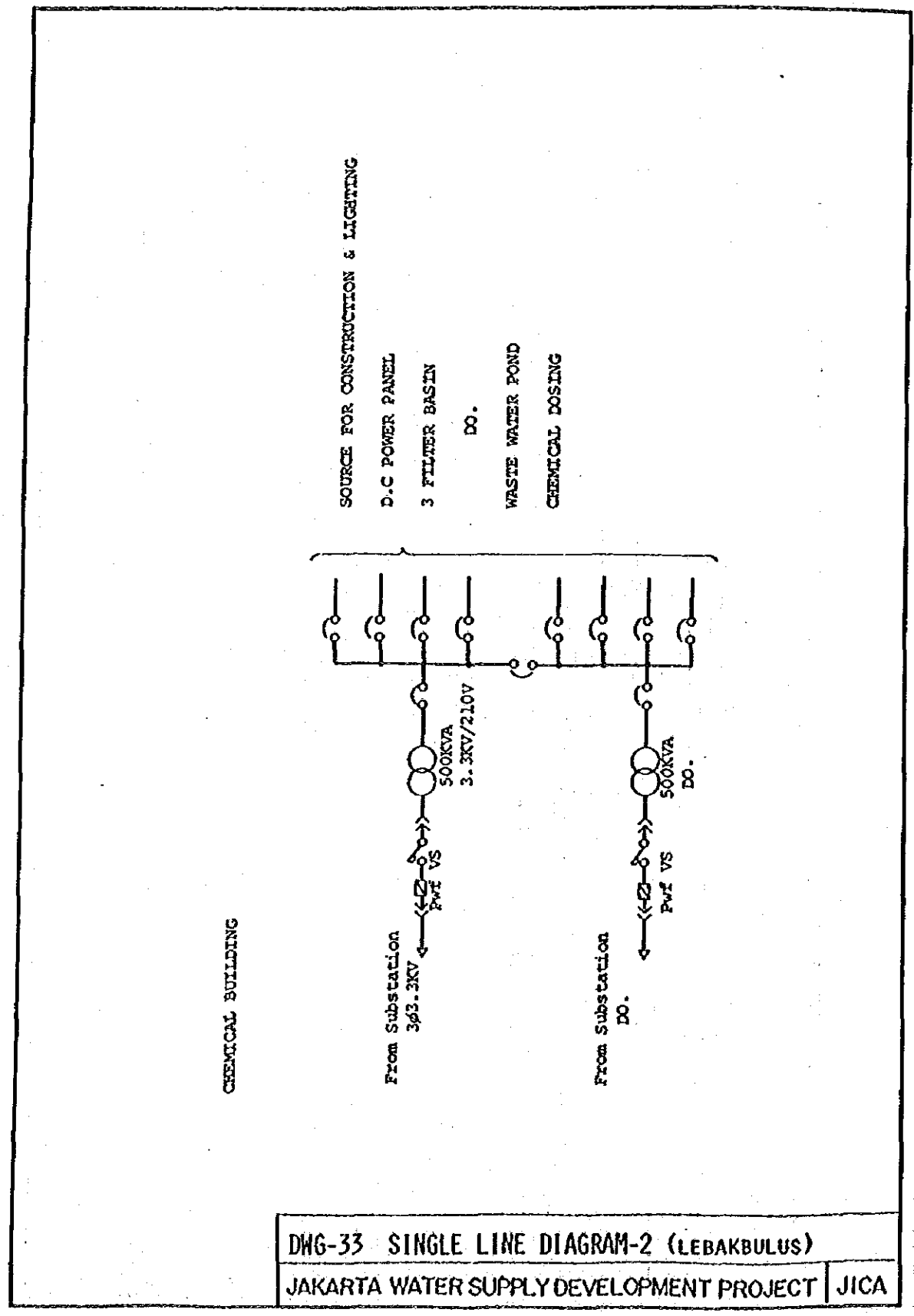
DWG -31 NEUTRALIZATION SYSTEM (LEBAKBULUS)

JAKARTA WATER SUPPLY DEVELOPMENT PROJECT | JICA



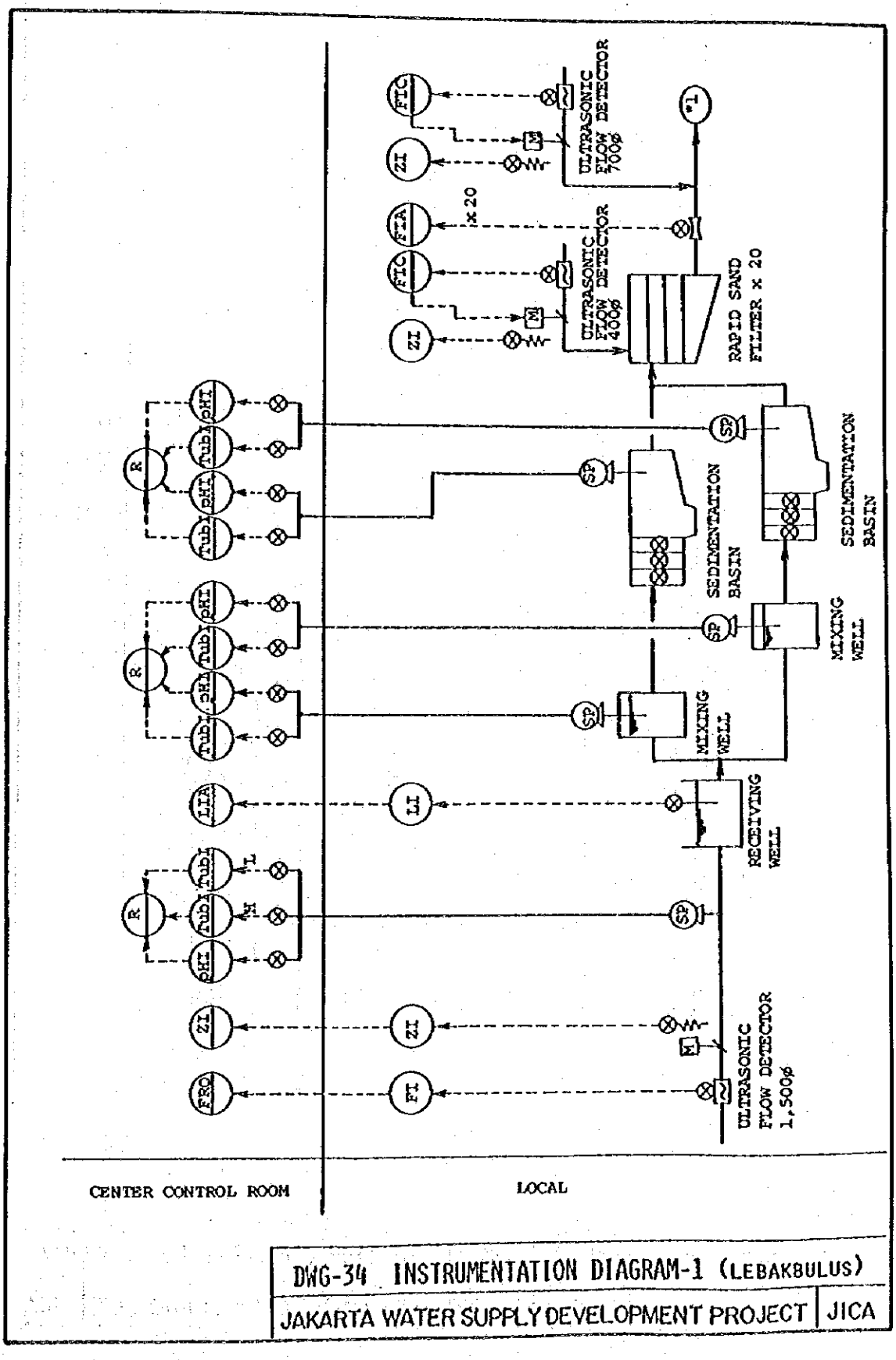
DWG-32 SINGLE LINE DIAGRAM-1 (LEBAKBULUS)

JAKARTA WATER SUPPLY DEVELOPMENT PROJECT | JICA



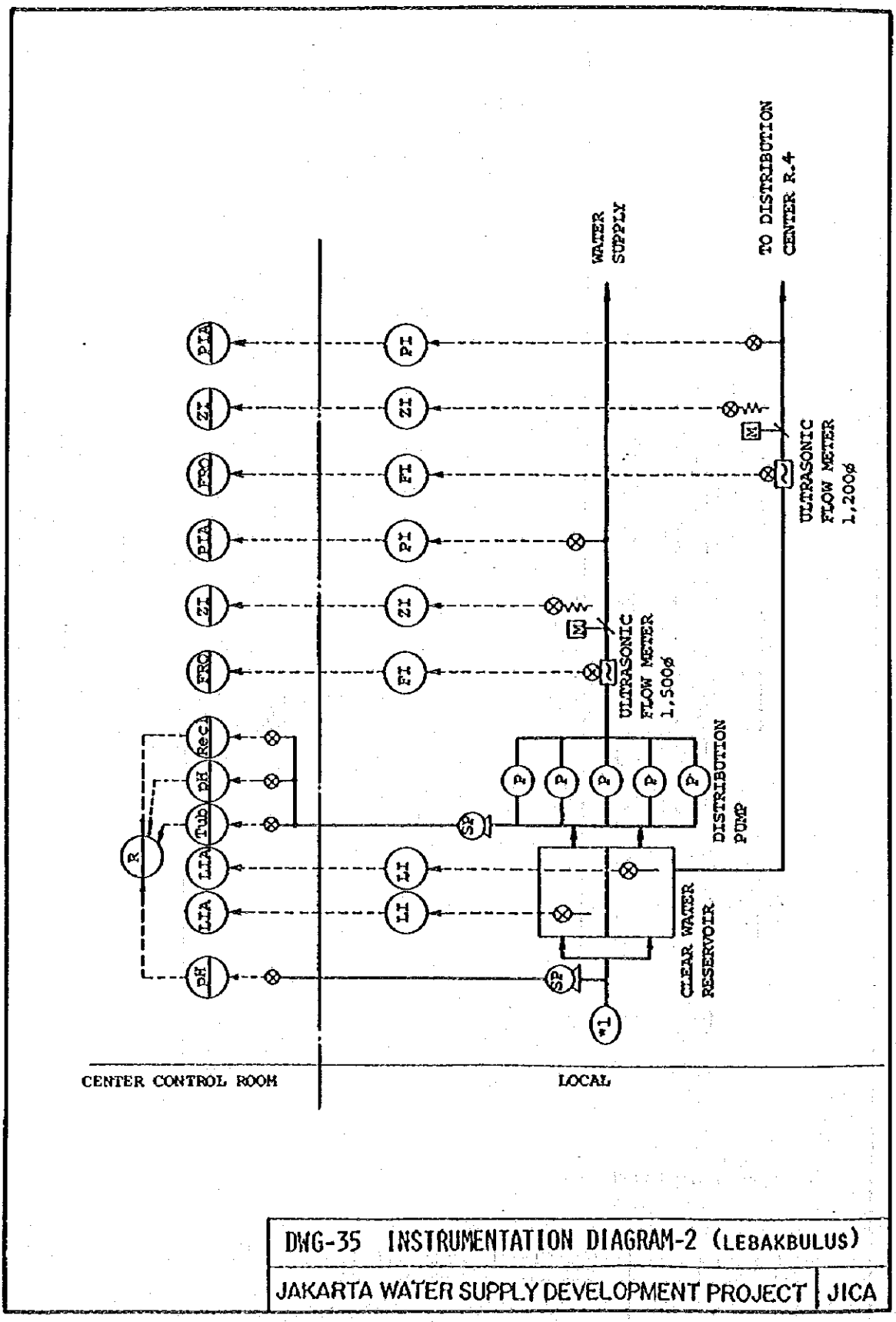
DWG-33 SINGLE LINE DIAGRAM-2 (LEBAKBULUS)

JAKARTA WATER SUPPLY DEVELOPMENT PROJECT | JICA



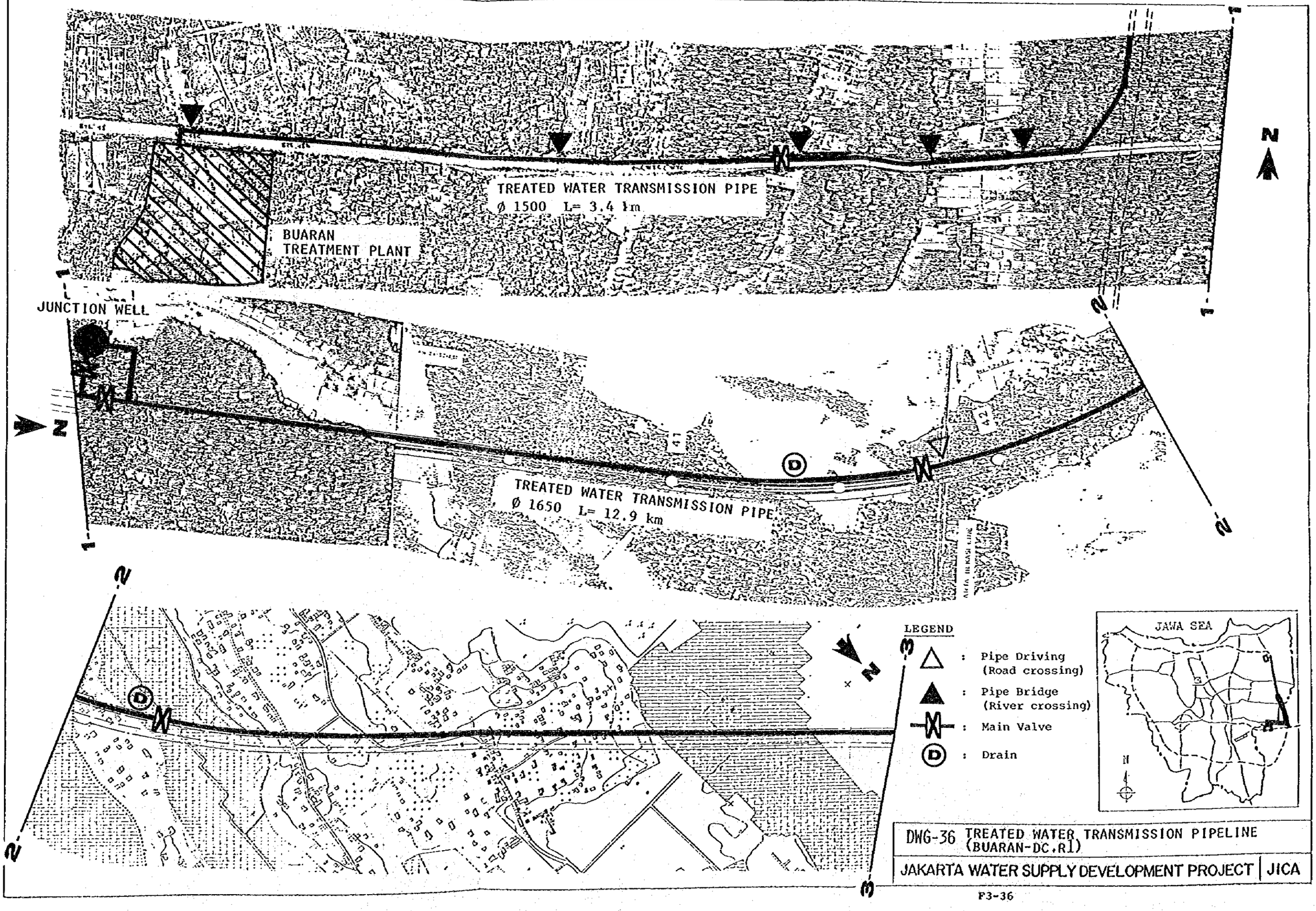
DWG-34 INSTRUMENTATION DIAGRAM-1 (LEBAKBULUS)

JAKARTA WATER SUPPLY DEVELOPMENT PROJECT | JICA



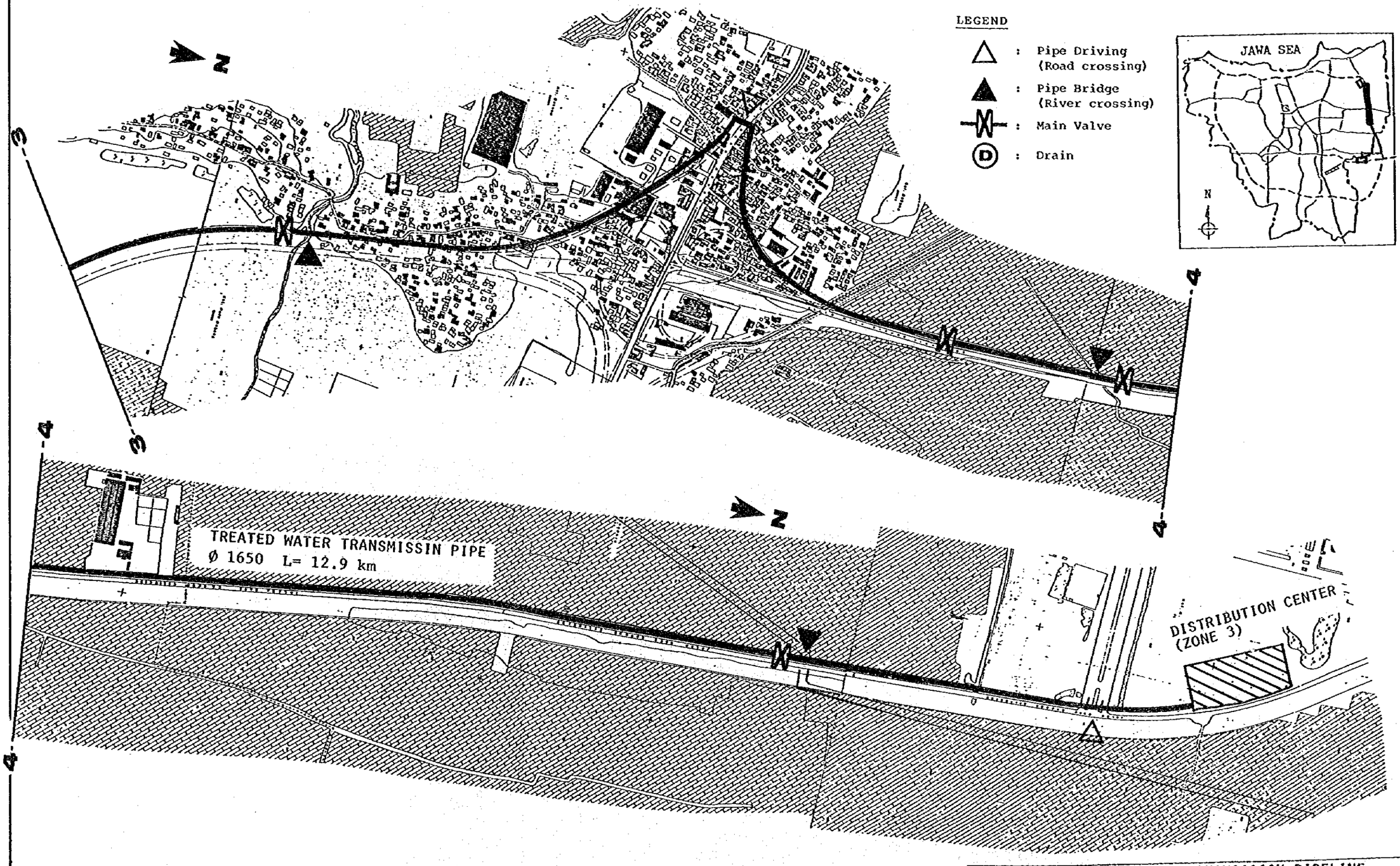
DWG-35 INSTRUMENTATION DIAGRAM-2 (LEBAKBULUS)

JAKARTA WATER SUPPLY DEVELOPMENT PROJECT | JICA



DWG-36 TREATED WATER TRANSMISSION PIPELINE (BUARAN-DC.R1)

JAKARTA WATER SUPPLY DEVELOPMENT PROJECT | JICA



DWG-37 TREATED WATER TRANSMISSION PIPELINE (BUARAN-DC,R1)

JAKARTA WATER SUPPLY DEVELOPMENT PROJECT | JICA

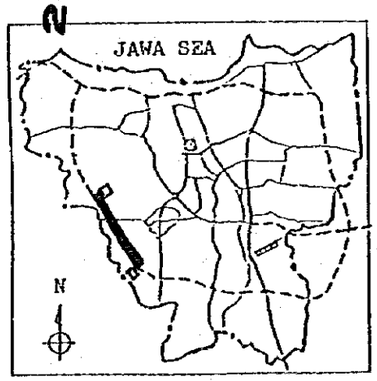
LEBAKBULUS
TREATMENT PLANT

TREATED WATER TRANSMISSION PIPE
Ø 1200 L= 9.1 km

DISTRIBUTION CENTER
(ZONE 4)

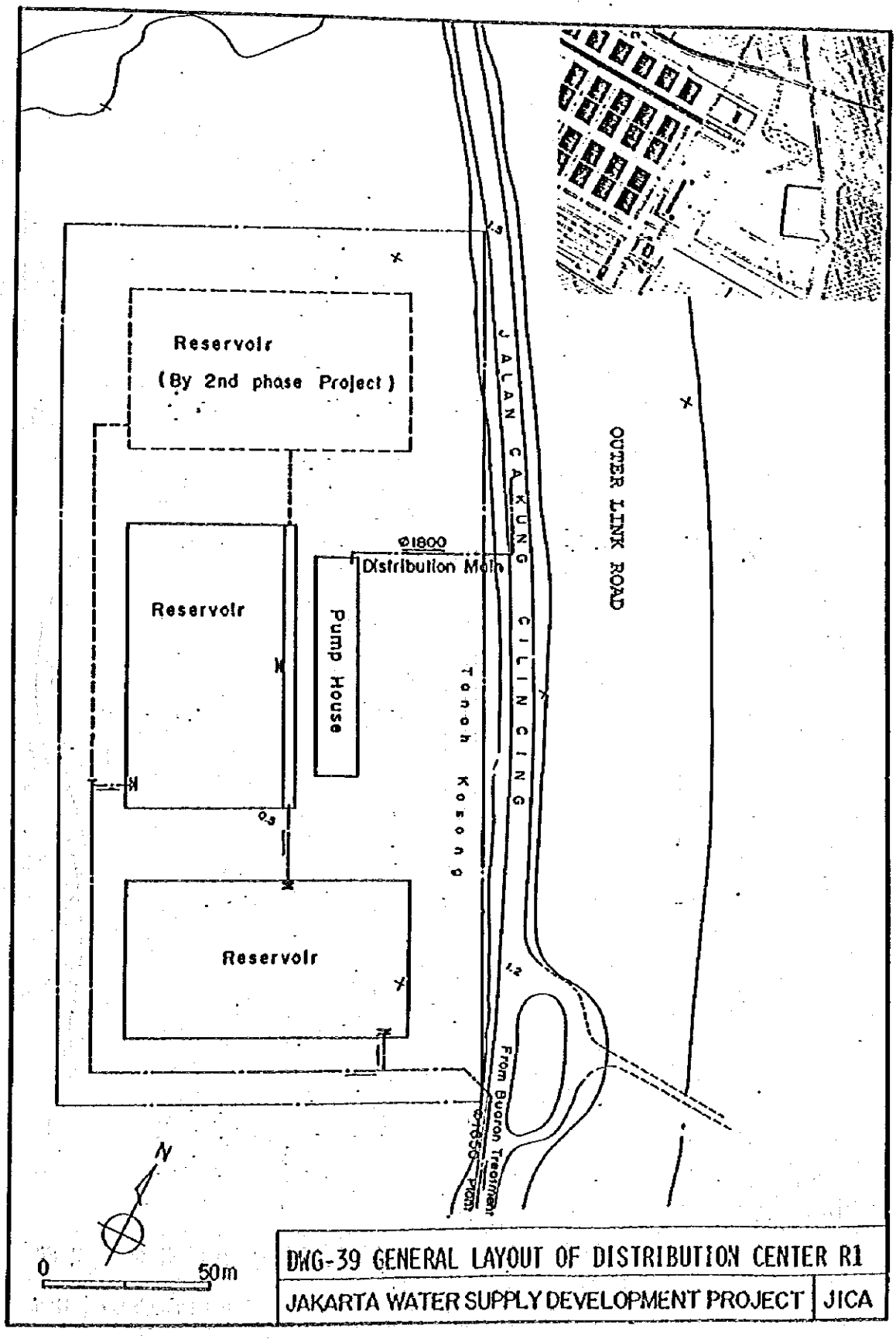
LEGEND

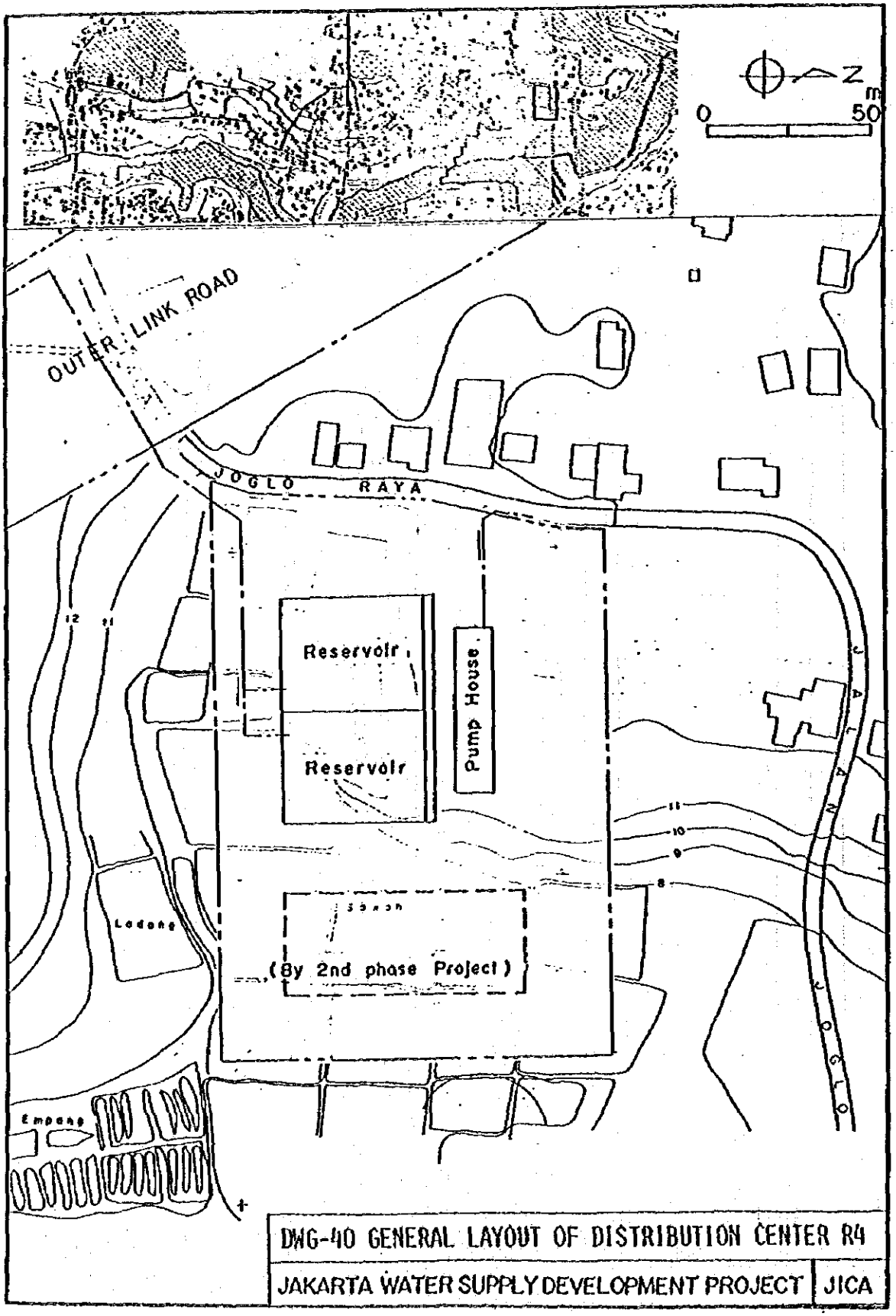
- △ : Pipe Driving (Road crossing)
- ▲ : Pipe Bridge (River crossing)
- ⋈ : Main Valve
- Ⓓ : Drain
- Ⓐ : Air Valve

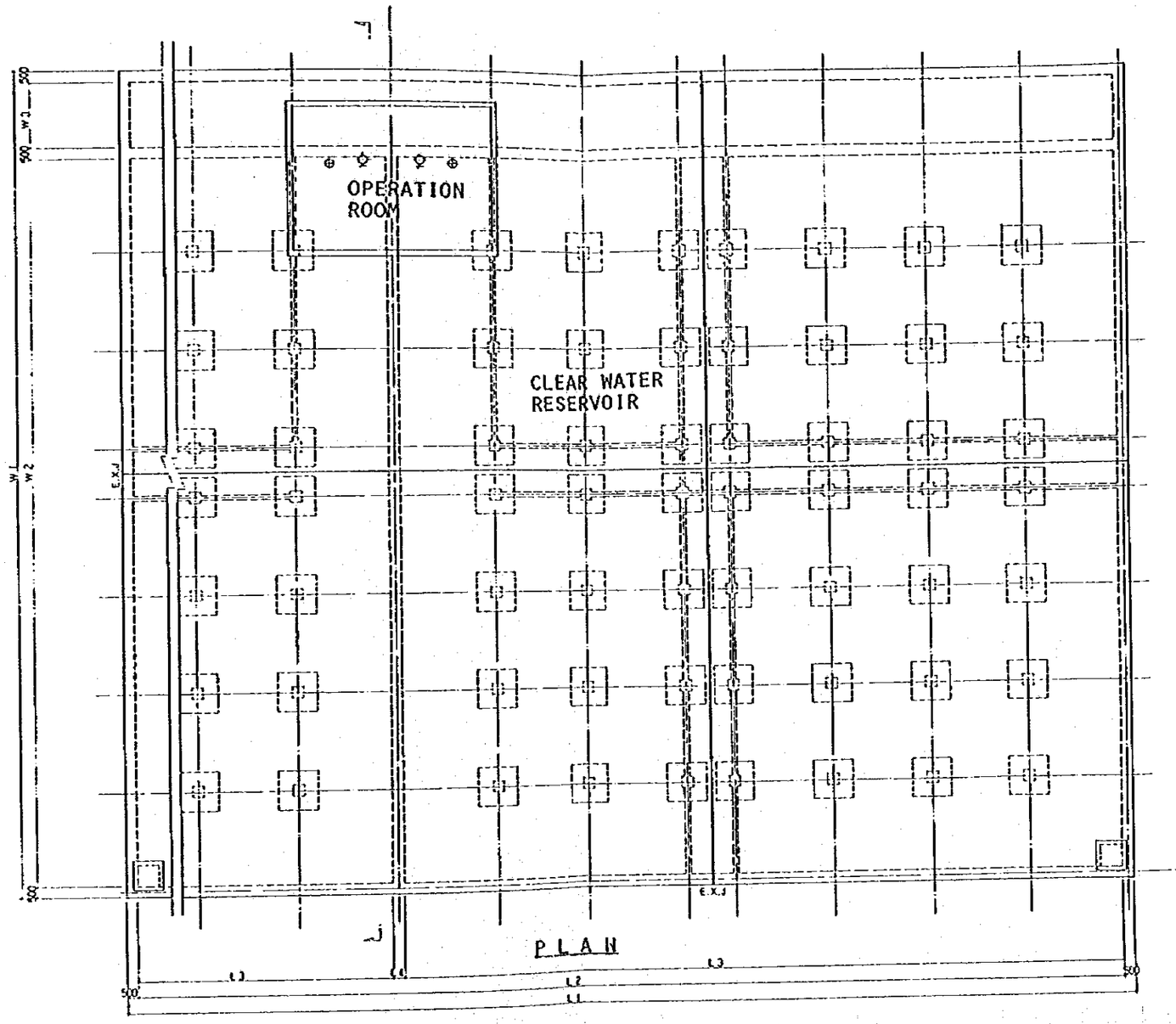


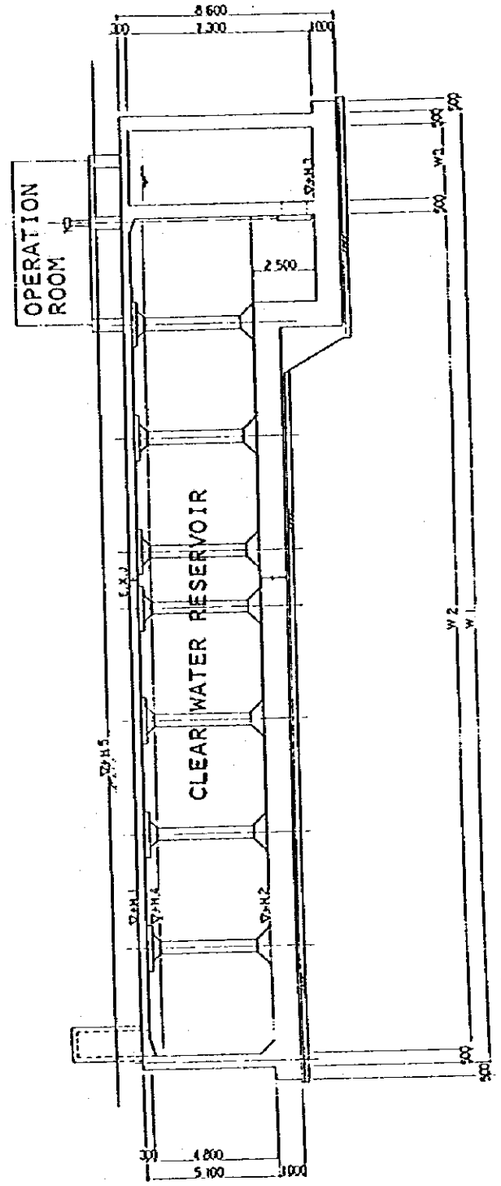
DWG-38 TREATED WATER TRANSMISSION PIPELINE (LEBAK-DC.R4)

JAKARTA WATER SUPPLY DEVELOPMENT PROJECT | JICA


Reservoir
(By 2nd phase Project)
Reservoir
Reservoir
Pump House
ø1800
Distribution Main
JALAN CAKUNG CILINCING
OUTER LINK ROAD
Tanah Kosong
From Buaran Treatment Plant
ø1650
N
0
50m
DWG-39 GENERAL LAYOUT OF DISTRIBUTION CENTER R1
JAKARTA WATER SUPPLY DEVELOPMENT PROJECT
JICA


N
0
50
m
OUTER LINK ROAD
JOGLO RAYA
Reservoir
Reservoir
Pump House
(By 2nd phase Project)
Ladang
Empang
JAKARTA
JOGLO
DWG-40 GENERAL LAYOUT OF DISTRIBUTION CENTER R4
JAKARTA WATER SUPPLY DEVELOPMENT PROJECT
JICA



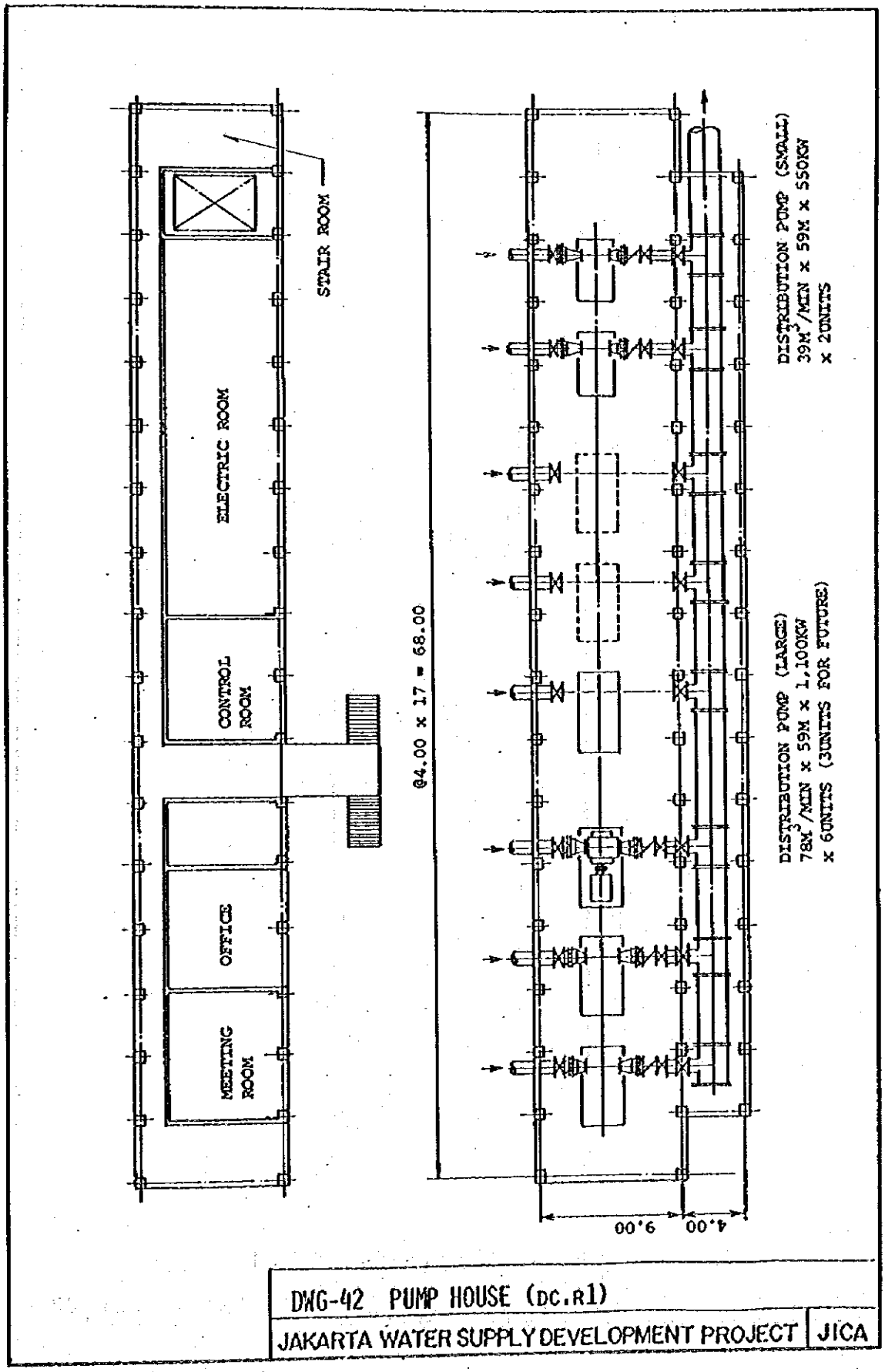


SECTION

FACILITIES	W1	W2	W3	L1	L2	L3	L4	H1	H2	H3	H4	H5	H6
LEBAKBULUS	68000	61500	6000	87000	86000	42750	500	+33.75	+28.7	+26.2	+33.0	+34.85	+29.0
BUARAN	47750	34250	13000	86000	85000	42500	0	+12.6	+ 7.5	+ 5.0	+11.8	+13.6	+ 7.8
DC (Zone 3)	52000	48500	3000	87500	86500	43250	0	+3.15	- 1.9	- 4.4	+ 2.4	+3.75	- 1.6
DC (Zone 4)	48000	44500	3000	69500	68500	34500	500	+12.65	+ 7.6	+ 5.1	+11.9	+13.25	+ 7.9

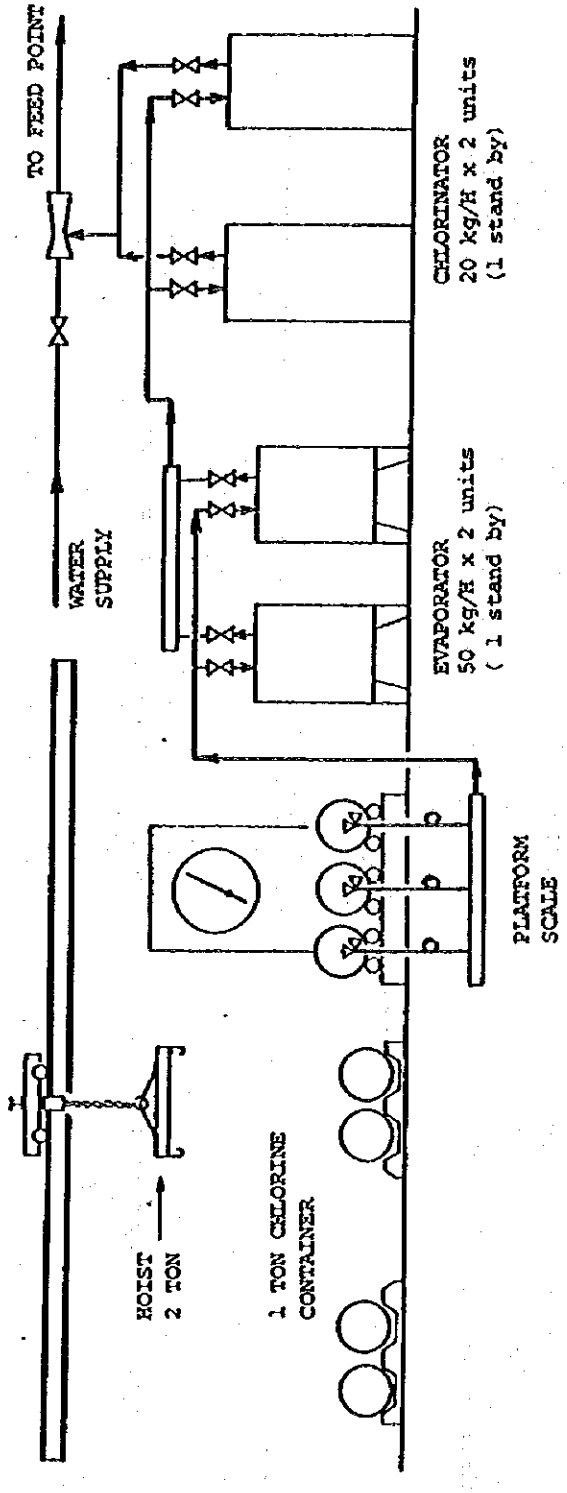
DWG-41 CLEAR WATER RESERVOIR

JAKARTA WATER SUPPLY DEVELOPMENT PROJECT | JICA



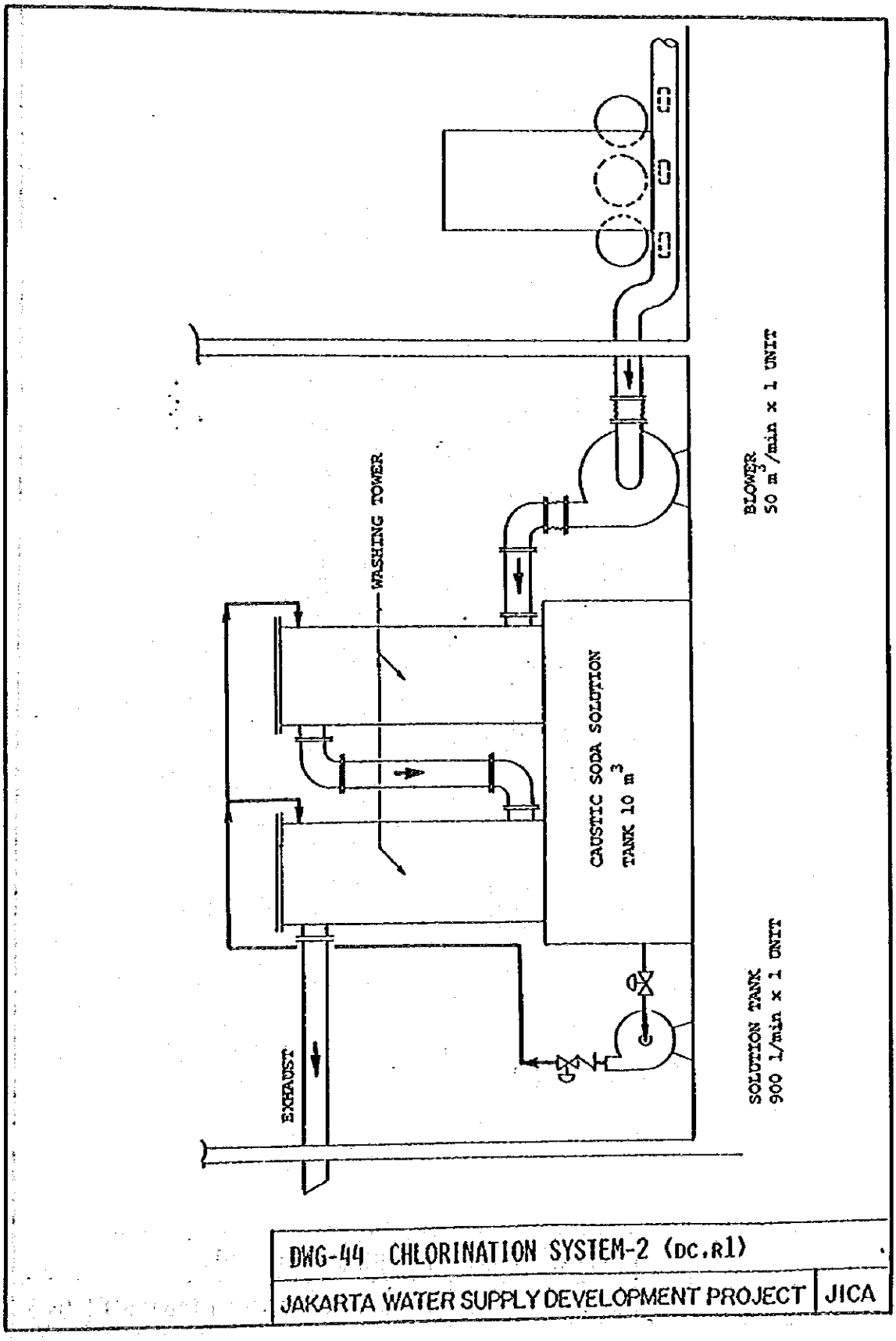
DWG-42 PUMP HOUSE (DC.R1)

JAKARTA WATER SUPPLY DEVELOPMENT PROJECT | JICA



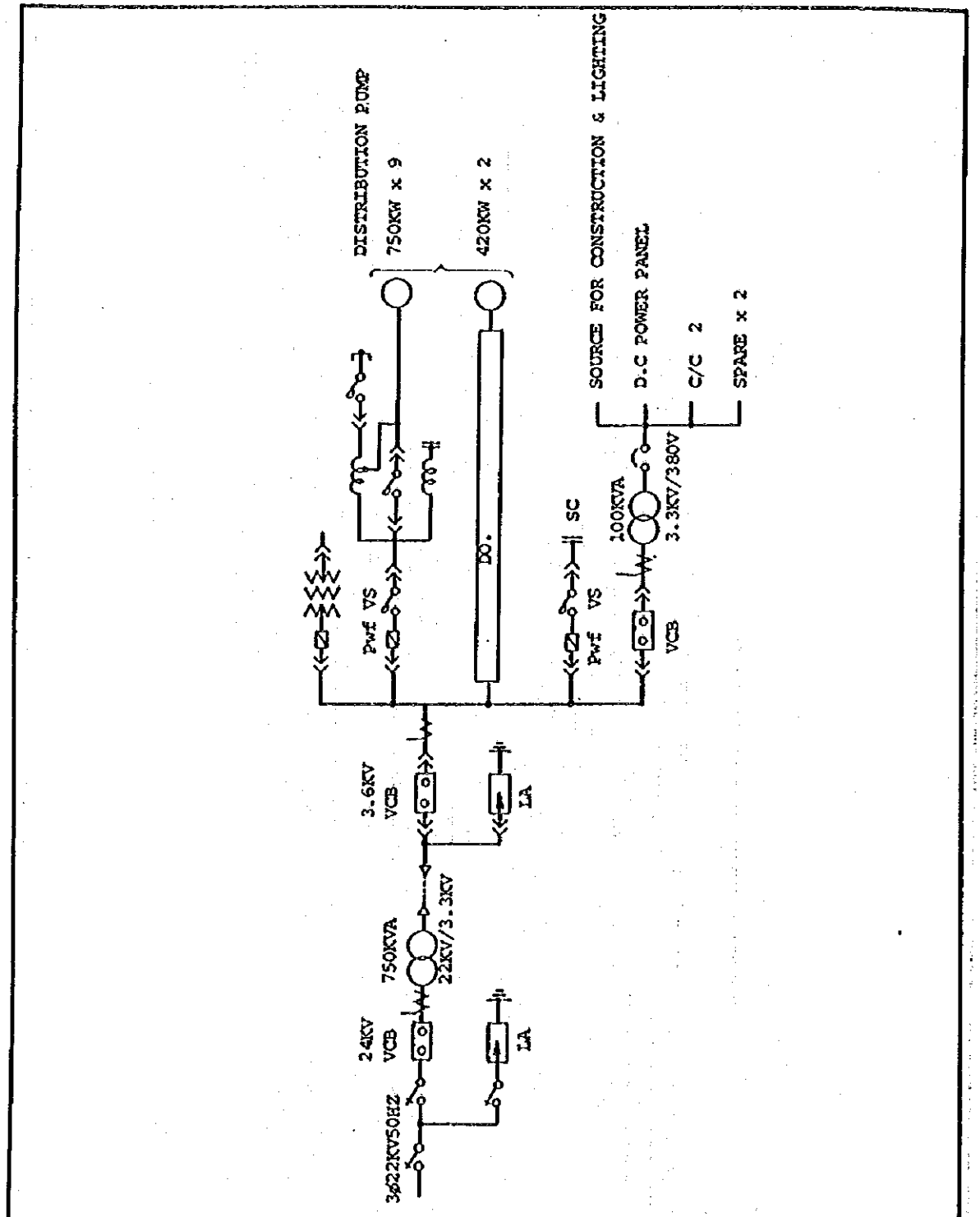
DWG-43 CHLORINATION SYSTEM-1 (DC.R1)

JAKARTA WATER SUPPLY DEVELOPMENT PROJECT | JICA



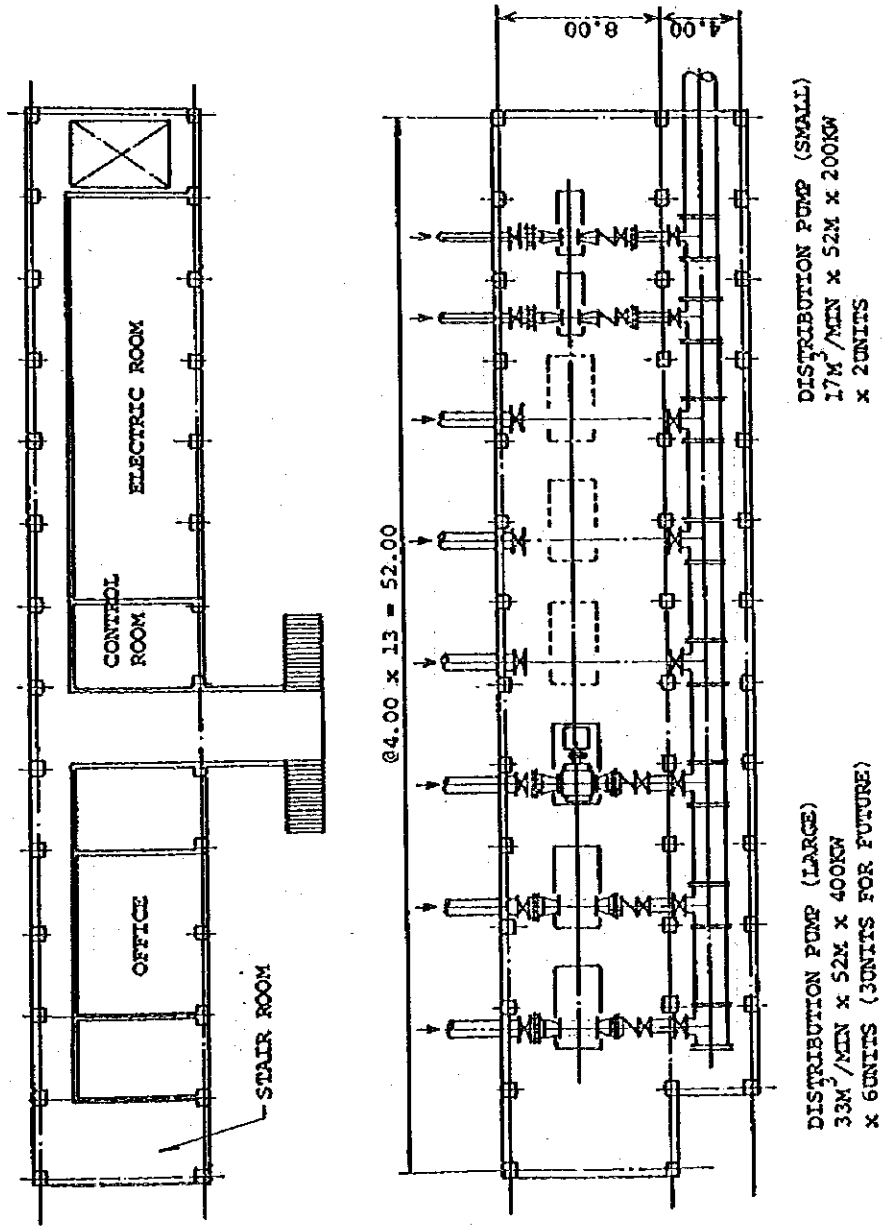
DWG-44 CHLORINATION SYSTEM-2 (DC.R1)

JAKARTA WATER SUPPLY DEVELOPMENT PROJECT | JICA



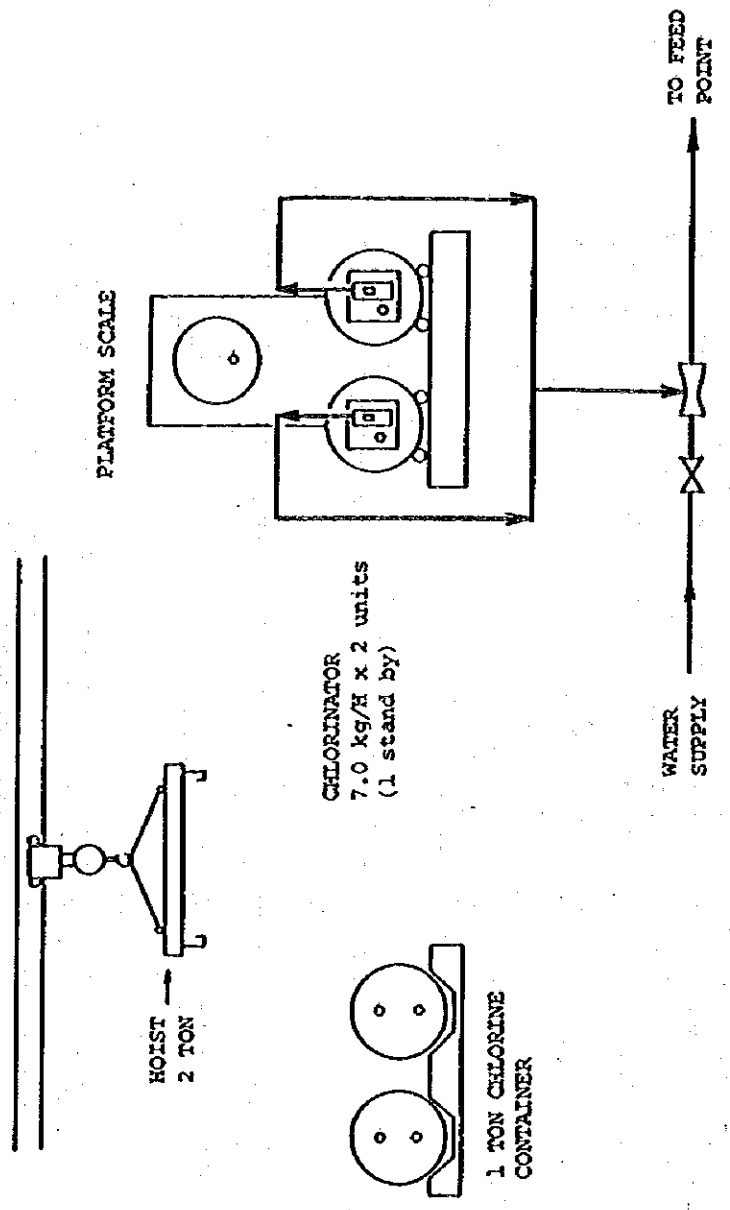
DWG-45 SINGLE LINE DIAGRAM (DC.R1)

JAKARTA WATER SUPPLY DEVELOPMENT PROJECT | JICA



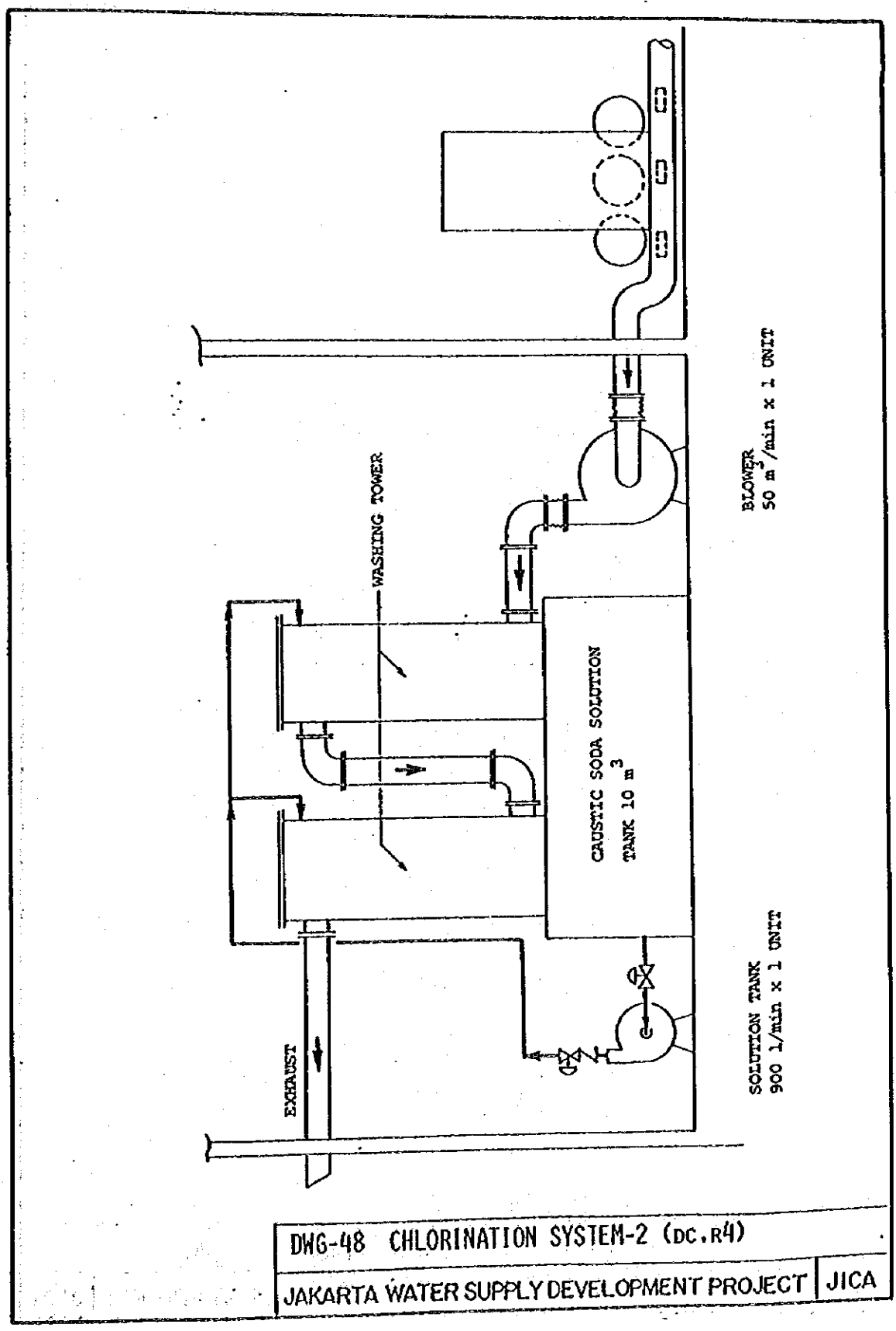
DNG-46 PUMP HOUSE (DC.R4)

JAKARTA WATER SUPPLY DEVELOPMENT PROJECT | JICA



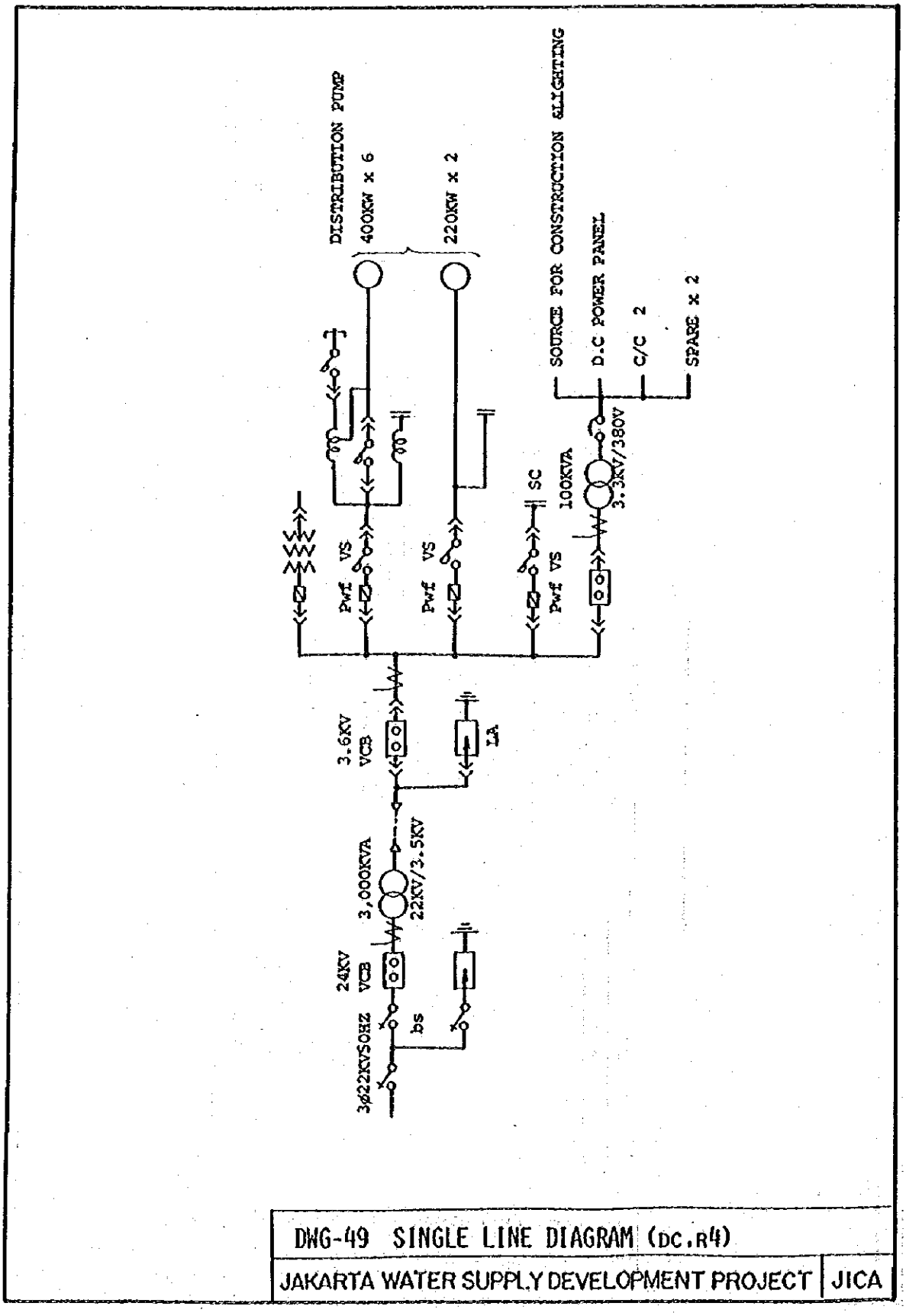
DWG-47 CHLORINATION SYSTEM-1 (DC.R4)

JAKARTA WATER SUPPLY DEVELOPMENT PROJECT | JICA



DWG-48 CHLORINATION SYSTEM-2 (DC.R4)

JAKARTA WATER SUPPLY DEVELOPMENT PROJECT | JICA



DWG-49 SINGLE LINE DIAGRAM (DC.R4)

JAKARTA WATER SUPPLY DEVELOPMENT PROJECT | JICA

FEASIBILITY STUDY FOR

JAKARTA WATER SUPPLY DEVELOPMENT PROJECT

F4. APPENDIX FV-1

COST DATA

1. Introduction

This Appendix presents basic cost data used for cost estimates of facilities for the First Phase of the Second Stage Project. All the costs presented here are based on those prevailing in Jakarta as of March 1984. All the unit costs are broken down into local and foreign currency components.

Table 1 shows cost break down of facilities of the project including land and power receiving costs.

Table 2 shows the costs of major materials locally produced needed for construction of civil work structures and labor.

Table 3 shows the costs of land, power receiving and handling and local transportation for imported materials and equipments.

Table 4 shows the unit costs for pipe materials and installation.

Table 1-1 Cost Break Down

No.	ITEM	F/C		L/C
		(mill. Yen)		(mill. Rp)
1.	LAND AQUISITION	0.0	(0)	4,146
	Surpong Intake	0.0		56
	RawWater Trans.Main	0.0		460
	Lebakbulus T.P (3 m3/s)	0.0		1,719
	Buaran T.P (3 m3/s)	0.0		1,280
	Distri.Center-Zone 3	0.0		386
	Distri.Center-Zone 4	0.0		245
2.	SUPPLY & CONSTRUCT.	0.0		
	1)Surpong Intake	665.3	(2970)	1,780
	SITE PREPARAT.	0.0		73
	INTAKE BAY	10.1		83
	INTAKE CHANNEL	0.0		79
	GRIT CHAMBER	21.9		580
	BUILDING	34.0		457
	YARD PIPING	32.3		12
	LAND SCAPING	0.0		123
	Handling & Inland trans.	0.0		40
	MECHANICAL EQUIP	247.0		0
	Handling & Inland trans.	0.0		33
	Install	0.0		81
	ELECTRICAL EQIP	320.0		0
	Handling & Inland trans.	0.0		43
	Install	0.0		176
	2)RawWater Trans.Main	2,285.0	(10201)	3,721
	PIPE LAYING	2,164.1		2,021
	PIPE BRIDGE	104.7		176
	PIPE DRIVING	16.2		21
	INSPECT. ROAD	0.0		582
	Handling & Inland trans.	0.0		921
	3) Buaran T.P (3 m3/s)	1,959.9	(8749)	10,337
	SITE PREPARAT.	0.0		358
	RECEIVING WELL	29.6		69
	SEDIMENT. BASIN	136.9		2,994
	FILTER BASIN	344.0		2,089
	RESERVOIR	30.2		1,644
	WASTE POND	6.7		247
	BUILDING	42.8		1,067
	BACKWASH TANK	11.4		117
	YARD PIPING	231.3		91
	LAND SCAPING	0.0		672
	Handling & Inland trans.	0.0		336
	MECHANICAL EQUIP	557.0		0
	Handling & Inland trans.	0.0		75
	Install	0.0		185
	ELECTRICAL EQIP	570.0		0
	Handling & Inland trans.	0.0		77
	Install	0.0		316

Table 1-2 Cost Break Down

No.	ITEM	F/C		L/C
		(mill. Yen)		(mill. Rp)
4)	Lebakbulus T.P(3m3/s	2,117.1	(9451)	8,889
	SITE PREPARAT.	0.0		129
	RECEIVING WELL	18.5		59
	SEDIMENT. BASIN	136.9		2,331
	FILTER BASIN	344.0		1,825
	RESERVOIR	15.3		1,530
	WASTE POND	6.7		219
	BUILDING	48.5		1,044
	BACKWASH TANK	11.4		117
	YARD PIPING	288.8		110
	LAND SCAPING	0.0		437
	Handling & Inland trans.	0.0		351
	MECHANICAL EQUIP	547.0		0
	Handling & Inland trans.	0.0		74
	Install	0.0		181
	ELECTRICAL EQIP	700.0		0
	Handling & Inland trans.	0.0		94
	Install	0.0		387
5)	T.W.Trans.(LE-DC4)	807.8	(3606)	1,325
	PIPE LAYING	784.0		933
	PIPE BRIDGE	12.5		27
	PIPE DRIVING	11.3		38
	Handling & Inland trans.	0.0		326
6)	T.W.Trans.(BU-DC3)	2,867.0	(12799)	3,859
	PIPE LAYING	441.7		416
	PIPE BRIDGE	62.2		106
	PIPE DRIVING	15.3		21
	PIPE LAYING	2,195.6		1,800
	PIPE BRIDGE	56.4		91
	PIPE DRIVING	58.8		68
	JUNCTION WELL	37.0		200
	Handling & Inland trans.	0.0		1,157
7)	Distri.Center-Zone 4	466.9	(2084)	2,128
	SITE PREPARAT.	0.0		85
	DIST. RESERVOIR	12.3		1,067
	BUILDING	38.5		549
	YARD PIPING	33.1		18
	LAND SCAPING	0.0		144
	Handling & Inland trans.	0.0		34
	MECHANICAL EQUIP	143.0		0
	Handling & Inland trans.	0.0		19
	Install	0.0		47
	ELECTRICAL EQIP	240.0		0
	Handling & Inland trans.	0.0		32
	Install	0.0		133

Table 1-3 Cost Break Down

No.	ITEM	F/C		L/C
		(mill. Yen)		(mill. Rp)
8)	Distri.Center-Zone 3	756.4	(3377)	5,102
	SITE PREPARAT.	0.0		78
	DIST. RESERVOIR	18.6		3,326
	BUILDING	71.0		969
	YARD PIPING	109.8		48
	LAND SCAPING	0.0		277
	Handling & Inland trans.	0.0		80
	MECHANICAL EQUIP	267.0		0
	Handling & Inland trans.	0.0		36
	Install	0.0		89
	ELECTRICAL EQIP	290.0		0
	Handling & Inland trans.	0.0		39
	Install	0.0		160
9)	Dist. Trunk Main	7,984.1	(35643)	24,383
	(ZONE - 1)			
	Pipe Dia 300 L= 19.9 km	248.8		959
	Pipe Dia 400 L= 7.0 km	133.7		389
	Pipe Dia 500 L= 4.0 km	106.8		479
	Pipe Dia 600 L= 2.6 km	91.5		353
	Pipe Dia 800 L= 5.7 km	301.5		898
	Pipe Dia 900 L= 3.0 km	198.6		502
	Handling & Inland trans.	0.0		436
	(ZONE - 2)			
	Pipe Dia 300 L= 16.2 km	202.5		781
	Pipe Dia 400 L= 3.9 km	74.5		216
	Pipe Dia 600 L= 3.5 km	123.2		476
	Handling & Inland trans.	0.0		161
	(ZONE - 3)			
	Pipe Dia 300 L= 11.3 km	141.3		545
	Pipe Dia 600 L= 5.8 km	204.2		788
	Pipe Dia 900 L= 2.5 km	165.5		419
	Pipe Dia 1100 L= 6.0 km	568.8		1,177
	Pipe Dia 1350 L= 1.2 km	161.5		276
	Pipe Dia 1650 L= 2.7 km	577.5		765
	Pipe Dia 1800 L= 3.0 km	752.1		921
	Handling & Inland trans.	0.0		1,037
	(ZONE - 4)			
	Pipe Dia 300 L= 7.2 km	90.0		347
	Pipe Dia 400 L= 7.8 km	149.0		433
	Pipe Dia 500 L= 6.3 km	168.2		754
	Pipe Dia 600 L= 6.2 km	218.2		843
	Pipe Dia 800 L= 8.1 km	428.5		1,276
	Pipe Dia 900 L= 1.6 km	105.9		268
	Pipe Dia 1200 L= 2.6 km	279.8		541
	Pipe Dia 1500 L= 1.8 km	292.0		447
	Handling & Inland trans.	0.0		698

Table 1-4 Cost Break Down

No.	ITEM	F/C		L/C
		(mill. Yen)		(mill. Rp)
	(ZONE - 5)			
	Pipe Dia 300 L= 18.2 km	227.5		877
	Pipe Dia 500 L= 2.1 km	56.1		251
	Pipe Dia 600 L= 10.8 km	380.2		1,468
	Pipe Dia 800 L= 3.9 km	206.3		614
	Pipe Dia 900 L= 4.9 km	324.4		820
	Pipe Dia 1350 L= 2.5 km	336.5		576
	Pipe Dia 1500 L= 0.9 km	146.0		224
	Handling & Inland trans.	0.0		677
	(ZONE - 6)			
	Pipe Dia 300 L= 5.2 km	65.0		251
	Pipe Dia 400 L= 6.5 km	124.2		361
	Pipe Dia 800 L= 2.7 km	142.8		425
	Pipe Dia 1000 L= 2.4 km	191.5		443
	Handling & Inland trans.	0.0		211
10)	Dist. Secondary Main	532.0	(2375)	2,049
	D 200 - 250 mm L= 70 km	532.0		1,834
	Handling & Inland trans.	0.0		215
11)	Dist. Tertiary Main	3,000.0	(13393)	14,860
	D 50 - 150 mm L= 1500 km	3,000.0		13,650
	Handling & Inland trans.	0.0		1,210
12)	Zonal Meter	179.7	(802)	862
	Meter Chamber 200 pls	147.0		790
	Flow Meter 12 Nos	32.7		0
	Handling & Inland trans.	0.0		72

Table 2 Unit Cost for Civil Works

	Item	Unit	Cost/Price
1	MATERIAL PRICE		
	Portland Cement	kg	80
	Aggregate (10-20 mm)	m3	14,150
	Aggregate (30-40 mm)	m3	12,800
	Sand	m3	9,900
	Reinforcing Steel Bar	kg	375
	Wood	m3	43,000
	Clay Brick (large)	pc	27
	Clay Brick (small)	pc	23
	Ply Wood (t= 12 mm)	plate	5,800
2	LABOR COST		
	General Worker	day	1,500
	Mason	day	2,500
	Steel Bar Fixer	day	3,500
	Plumber	day	3,500
	Foreman for Construction	day	3,500
	Foreman for Pipe Install	day	4,000
3	UNIT COST OF CIVIL WORKS		
	Excavation (excavator)	m3	832
	Excavation (manpower)	m3	1,455
	Backfill	m3	604
	Disposal	m3	836
	Concrete (slab)	m3	175,200
	Concrete (wall)	m3	160,700
	Concrete (base)	m3	79,200
	Concrete (column)	m3	255,700
	Concrete Pile 400 Ø	m	35,100
	Concrete Pile 450 Ø	m	43,100
	Concrete Pile 500 Ø	m	52,000

Table 3 Unit Cost for Land Acquisition, Power Receiving and Handling and Local Transportation

ITEMS	UNIT	COST/PRICE
		(Rp.)
1. LAND PRICE		
Serpong Intake	m2	5,000
Lebakbulus T.P	m2	26,000
Distribution Center(Z-4)	m2	12,000
Buaran T.P	m2	10,000
Distribution Center(Z-3)	m2	11,000
Raw Water Transmission	m2	5,000
2. POWER RECEIVING		
Power Substation	kVA	40,000
Power Transmissioon Cable	km	40,000,000
3 HANDRING & TR. COST FOR IMPORTED MATERIAL		
Machineries & Equipment		
- up to 5 m3/ton	B.L.	450,000
- 6 m3/ton and over	m3/ton	22,500
Pipes		
- up to 10 m3/ton	B.L.	450,000
- 11 m3/ton and over	m3/ton	20,000

Table 4 Pipe Materials and Installation

	DIA	UNIT	F/C	L/C
			(Yen)	(Rp.)
1. Distribution Pipe Materials and Installation Cost				
Pipe Diameter	300	m	12,500	48,200
Pipe Diameter	350	m	15,000	51,700
Pipe Diameter	400	m	19,100	55,500
Pipe Diameter	450	m	22,700	59,600
Pipe Diameter	500	m	26,700	119,700
Pipe Diameter	600	m	35,200	135,900
Pipe Diameter	700	m	42,200	148,500
Pipe Diameter	800	m	52,900	157,500
Pipe Diameter	900	m	66,200	167,400
Pipe Diameter	1000	m	79,800	184,500
Pipe Diameter	1100	m	94,800	196,200
Pipe Diameter	1200	m	107,600	207,900
Pipe Diameter	1350	m	134,600	230,300
Pipe Diameter	1500	m	162,200	248,400
Pipe Diameter	1600	m	200,100	272,700
Pipe Diameter	1650	m	213,900	283,500
Pipe Diameter	1800	m	250,700	306,900
2. Cost for Secondary Main and Tertiary Main				
Secondary (200-250 mm)		m	7,600	26,200
Tertiary (50 - 75 mm)		m	2,000	9,100
3. Cost for Zonal Meter				
Meter Chamber		place	735,000	3,205,000
Flow Meter		Nos	2,725,000	0

FEASIBILITY STUDY FOR
JAKARTA WATER SUPPLY DEVELOPMENT PROJECT

F5. APPENDIX FVII-1

FINANCIAL AND ECONOMIC ANALYSIS

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Table 7.6 Income Statement

(Unit: Rp. million)

Year	1981/82	1982/83	1983/84	1984/85	1985/86	1986/87	1987/88	1988/89	1989/90	1990/91	1991/92	1992/93	1993/94	1994/95	1995/96
Production Capacity (ℓ/sec.)	5,700	6,700	6,700	6,750	7,585	7,585	10,585	10,585	12,585	12,585	18,585	18,585	18,585	18,585	18,585
Production Capacity (million m^3/year)	180	211	211	213	239	239	334	334	397	397	586	586	586	586	586
Plant Utilisation Factor (%)	100	95	91	95	95	95	90	95	95	95	78	83	90	95	95
Water Production (million m^3/year)	180	200	192	202	227	227	301	317	377	377	460	486	527	557	557
Accounted-for Water Ratio (%)	48	47	47	48	50	53	55	56	58	60	61	63	64	66	67
Sold Water (million m^3/year)	86	93	90	97	114	120	166	177	219	226	281	306	337	368	373
Inflation Rate (%)	10	12	10	15	11	7	7	7	7	7	7	7	7	7	7
Water Rate: Real Term (Rp./m^3)	122	110	233	219	218	227	235	243	253	262	271	281	292	292	292
Water Rate: Nominal Term (Rp./m^3)	99	100	233	252	279	310	344	381	423	469	520	577	641	685	733
Number of Connections: Increase (thousands)	8	6	8	10	13	20	30	34	37	40	43	45	47	48	50
Number of Connections: Total (thousands)	120	126	134	144	157	177	207	241	278	318	361	406	453	501	551
Operating Revenues															
Water Sales	8,600	9,310	20,937	24,444	31,806	37,200	57,104	67,437	92,637	105,994	146,120	176,562	216,017	252,080	273,409
Connection Charges	1,712	3,429	2,410	2,898	3,406	4,860	6,660	6,834	6,549	6,080	5,375	4,365	3,102	1,584	0
Others	437	983	338	978	1,272	1,488	2,284	2,697	3,705	4,240	5,845	7,062	8,641	10,083	10,936
Total Billings	10,749	13,722	23,685	28,320	36,484	43,548	66,048	76,968	102,891	116,314	157,340	187,989	227,760	263,747	284,345
Less: Bad Debts	-	-	2,994	2,933	3,817	4,464	5,710	6,744	9,264	10,599	14,612	17,656	21,602	25,208	27,341
Net Operating Revenues	10,749	13,722	20,691	25,387	32,667	39,084	60,338	70,224	93,627	105,715	142,728	170,333	206,158	238,539	257,004
Operating Expenses															
Personnel	2,688	2,775	3,451	5,760	6,736	7,763	9,346	10,812	12,750	14,862	17,446	19,974	22,351	25,900	29,314
Chemicals	886	1,920	2,055	2,378	6,077	7,090	10,166	11,875	14,163	10,187	11,994	14,004	16,064	18,243	19,485
Power	1,244	1,761	2,534	2,933	4,508	5,272	7,182	8,090	10,671	10,117	15,308	20,326	23,299	26,151	27,931
Raw Water	-	-	47	1,150	1,265	1,380	1,495	2,100	4,070	5,842	9,300	10,125	11,774	13,578	15,444
Maintenance	1,217	1,466	1,216	2,910	3,280	4,150	4,475	6,131	6,448	7,095	10,384	12,949	14,970	16,036	17,176
Administration	507	709	1,423	2,304	2,694	3,105	3,738	4,325	5,100	5,945	6,978	7,990	8,940	10,360	11,726
Sales	1,253	620	830	489	636	744	1,142	1,349	1,853	2,120	2,922	3,531	4,320	5,042	5,468
Others	-	1,078	1,533	288	337	388	467	541	638	743	872	999	1,118	1,295	1,466
Total Operating Expenses	7,795	10,329	13,089	18,212	25,533	29,892	38,011	45,223	55,693	56,911	75,204	89,898	102,836	116,605	128,010
Operating Income before Depreciation	2,954	3,393	7,602	7,175	7,134	9,192	22,327	25,001	37,934	48,804	67,524	80,435	103,322	121,934	128,994
Less: Depreciation: (Historic Cost)	1,461	1,731	(2,854)	(3,577)	(3,799)	(6,566)	(6,834)	(12,519)	(13,320)	(14,296)	(26,021)	(33,814)	(38,625)	(38,926)	(39,241)
Revalued Cost	-	-	6,600	7,955	8,964	11,344	12,232	16,758	17,625	19,392	28,383	35,395	40,917	43,833	46,949
Income before Interest	1,493	1,662	1,002	-780	-1,830	-2,152	10,095	8,243	20,309	29,412	39,141	45,040	62,405	78,101	82,045
Less: Interest	-	-	-	576	1,141	2,160	3,287	5,383	5,176	9,051	8,669	27,306	39,341	45,663	43,590
Less: Tax	-	-	-	614	296	0	3,423	930	5,149	7,135	8,260	2,561	4,078	8,237	11,283
Net Income	1,493	1,662	1,002	-1,970	-3,267	-4,312	3,385	1,930	9,984	13,226	22,212	15,173	18,986	24,201	27,172
Average Net Plant: Historic Cost	15,849	18,076	33,949	38,064	42,180	61,320	79,317	117,871	157,474	158,447	241,426	369,667	435,888	439,168	405,976
Revalued Cost	-	-	108,938	119,035	133,652	159,759	183,852	230,457	272,900	279,255	378,053	530,786	632,226	676,161	683,993
Working Ratio (%)	73	75	63	72	78	76	63	64	59	54	53	53	50	49	50
Operating Ratio: Historic Cost (%)	86	88	77	86	90	93	74	82	74	67	71	73	69	65	65
Revalued Cost (%)	0	0	95	103	106	106	83	88	78	72	73	74	70	67	68
Rate of Return: Historic Cost (%)	9	9	3	6	4	1	11	5	9	12	10	5	5	7	9
Revalued Cost (%)	0	0	1	-2	-2	-3	2	1	4	5	6	3	3	4	4

Table 7.7 Balance Sheet

(Unit: Rp. million)

Year	1981/82	1982/83	1983/84	1984/85	1985/86	1986/87	1987/88	1988/89	1989/90	1990/91	1991/92	1992/93	1993/94	1994/95	1995/96
Assets															
Fixed Assets: (Historic Cost)	25,290	28,859	(46,404)	(57,693)	(61,276)	(105,901)	(110,232)	(201,923)	(214,840)	(230,573)	(419,686)	(545,383)	(622,987)	(627,831)	(632,934)
Revalued Cost	-	-	159,413	194,019	218,645	276,672	298,336	408,724	429,866	472,974	692,273	863,297	997,982	1,069,086	1,145,096
Less Accumulated Depreciation:															
(Historic Cost)	8,133	9,864	(12,455)	(15,514)	(19,095)	(25,442)	(32,057)	(44,357)	(57,458)	(71,062)	(96,346)	(129,389)	(167,205)	(205,278)	(243,536)
Revalued Cost	-	-	50,475	64,888	80,472	95,327	111,978	134,169	158,621	185,709	223,433	270,565	326,263	388,483	457,714
Net Fixed Assets in Operation:															
(Historic Cost)	17,157	18,995	(33,949)	(42,179)	(42,181)	(80,459)	(78,175)	(157,566)	(157,382)	(159,511)	(323,340)	(415,994)	(455,782)	(422,553)	(389,398)
Revalued Cost	-	-	108,938	129,131	138,173	181,345	186,358	274,555	271,245	287,265	468,840	592,732	671,719	680,603	687,382
Construction in Progress	-	-	28,051	30,509	50,457	58,130	108,704	72,477	181,545	271,281	153,381	64,787	11,783	12,569	13,947
Total Fixed Assets	17,157	18,995	136,989	159,640	188,630	239,475	295,062	347,032	452,790	558,546	622,221	657,519	683,502	693,172	701,329
Cash/Bank	2,389	1,923	4,446	3,925	3,730	-3,573	-5,139	-9,349	-8,777	-4,181	3,772	10,227	17,657	27,100	38,551
Accounts Receivable	3,347	4,007	3,141	3,667	4,771	5,580	8,566	10,116	13,896	15,899	21,918	26,484	32,403	37,812	41,011
Other Receivables/Advance Payments	1,623	436	2,039	2,345	2,590	2,793	2,977	3,181	3,405	3,650	3,915	4,180	4,465	4,792	5,118
Inventories	2,743	3,584	4,855	5,821	6,559	8,300	8,950	12,262	12,896	14,189	20,768	25,899	29,939	32,073	34,535
Total Current Assets	10,102	9,950	14,481	15,758	17,650	13,100	15,354	16,210	21,420	29,557	50,373	66,790	84,464	101,777	119,033
Total Assets	27,259	28,945	151,470	175,398	206,280	252,575	310,416	363,242	474,210	588,103	672,594	724,309	767,966	794,949	820,363
Liabilities															
Reserves	9,707	10,252	20,757	21,553	24,451	23,917	32,700	38,869	51,729	58,577	63,295	96,110	66,663	72,106	78,490
Revaluation Surplus	-	-	74,989	86,952	95,992	100,886	108,183	116,989	113,863	127,754	145,500	176,738	215,937	258,050	297,984
Central Government Equity	9,012	9,012	9,012	9,012	9,012	9,012	9,012	9,012	9,012	9,012	9,012	9,012	9,012	9,012	9,012
Local Government Equity	6,579	8,235	10,733	10,733	10,733	10,733	10,733	10,733	10,733	10,733	10,733	10,733	10,733	10,733	10,733
Total Equity	25,298	27,499	115,491	128,250	140,188	144,548	160,628	175,603	185,337	206,076	228,540	292,593	302,345	349,901	396,219
Long-Term Borrowings: 1st Phase/2nd Stage	-	-	-	-	-	5,711	12,045	42,916	148,187	248,105	314,786	339,758	346,867	331,605	316,343
Others	-	-	34,524	44,871	62,900	98,579	132,992	139,070	133,724	126,808	119,867	112,898	105,899	98,867	91,799
Accounts Payable	1,961	1,446	1,455	2,277	3,192	3,737	4,751	5,653	6,962	7,114	9,401	11,237	12,855	14,576	16,001
Total Debts	1,961	1,446	35,979	47,148	66,092	108,027	149,788	187,639	288,873	382,027	444,054	431,716	465,621	445,048	424,143
Total Liabilities	27,259	28,945	151,470	175,398	206,280	252,575	310,416	363,242	474,210	588,103	672,594	724,309	767,966	794,949	820,362
Debt/Debt & Equity Ratio (%)	0	0	23	26	31	42	47	51	60	65	66	59	60	55	51

Table 7.8 Funds Flow Statement

(Unit: Rp. million)

Year	1981/82	1982/83	1983/84	1984/85	1985/86	1986/87	1987/88	1988/89	1989/90	1990/91	1991/92	1992/93	1993/94	1994/95	1995/96
Sources															
Income before Interest	1,493	1,662	1,002	-780	-1,830	-2,152	10,095	8,243	20,309	29,412	39,141	45,040	62,405	78,101	82,045
Depreciation	1,461	1,731	6,600	7,955	8,964	11,344	12,232	16,758	17,625	19,392	28,383	35,395	40,917	43,833	46,949
Internal Cash Generation	2,954	3,393	7,602	7,175	7,134	9,192	22,327	25,001	37,934	48,804	67,524	80,435	103,322	121,934	128,994
Long-Term Borrowings: 1st Phase/2nd Stage	-	-	-	-	-	5,711	6,334	30,871	105,271	99,918	66,681	32,177	19,323	-	-
Others	-	-	15,003	10,426	18,199	36,348	35,654	8,387	-	-	-	-	-	-	-
Local Government Equity	1,917	1,656	2,498	-	-	-	-	-	-	-	-	-	-	-	-
Increase in Accounts Payable	-228	-515	9	822	915	545	1,014	902	1,309	152	2,287	1,836	1,618	1,721	1,425
Total Sources	4,643	4,534	25,112	18,423	26,248	51,796	65,329	65,161	144,514	148,874	136,492	114,448	124,263	123,655	130,419
Applications															
Investment: 1st Stage	-	-	15,003	10,426	16,999	28,544	13,877	2,032	-	-	-	-	-	-	-
Immediate	-	-	-	-	1,200	7,804	21,777	6,355	-	-	-	-	-	-	-
1st Phase/2nd Stage	-	-	-	-	-	5,711	6,334	30,871	105,271	99,918	66,681	32,177	19,323	-	-
Rehabilitation/Pipe Extension	-	-	-	-	1,920	6,658	10,419	13,842	13,292	3,370	2,124	2,267	2,422	2,599	2,776
Routine Construction	4,079	3,568	3,801	3,839	2,630	4,800	2,717	2,583	3,641	2,873	3,145	3,420	3,664	3,974	4,598
Total Investment	4,079	3,568	18,804	14,265	22,749	53,517	55,124	55,683	122,204	106,161	71,950	37,874	25,409	6,573	7,374
Debt Service: 1st Phase/2nd Stage: Interest	-	-	-	-	-	-	-	-	-	-	-	19,021	31,453	38,156	36,477
Amortization	-	-	-	-	-	-	-	-	-	-	-	7,205	12,214	15,262	15,262
Others: Interest	-	-	-	576	1,141	2,160	3,287	5,383	5,176	9,051	8,669	8,285	7,888	7,507	7,113
Amortization	-	-	-	79	170	669	1,241	2,309	5,346	6,916	6,941	6,969	6,999	7,032	7,068
Total Debt Service	-	-	-	655	1,311	2,829	4,528	7,692	10,522	15,967	15,610	41,480	58,554	67,957	65,920
Increase in Accounts Receivable	77	-527	3,347	832	1,349	1,012	3,170	1,754	4,004	2,248	6,284	4,831	6,204	5,736	3,525
Increase in Inventories	349	841	1,271	966	738	1,741	650	3,312	634	1,293	6,579	5,131	4,040	2,134	2,280
Tax	-	-	-	614	296	0	3,423	930	5,149	7,135	8,260	2,561	4,078	8,237	11,283
Contribution to DKI Budget	1,235	1,118	-	779	0	0	0	0	1,429	11,474	19,856	16,116	18,548	23,575	28,586
Others	26	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Applications	5,766	5,000	23,422	18,111	26,443	59,099	66,895	69,371	143,942	144,278	128,539	107,993	116,833	114,212	118,968
Increase in Cash	-1,123	-466	1,690	312	-195	-7,303	-1,566	-4,210	572	4,596	7,953	6,455	7,430	9,443	11,451
Cash at Beginning	3,512	2,389	1,923	3,613	3,925	3,730	-3,573	-5,139	-9,349	-8,777	-4,181	3,772	10,227	17,657	27,100
Cash at End	2,389	1,923	3,613	3,925	3,730	-3,573	-5,139	-9,349	-8,777	-4,181	3,772	10,227	17,657	27,100	38,551
Debt Service Coverage (times)	-	-	-	11.0	5.4	3.2	4.9	3.3	3.6	3.1	4.3	1.9	1.8	1.8	2.0

1. Notes and Assumptions for Financial Projections

Coverage of Financial Projections

1) Period covered by this financial projection is from 1984/85 to 1995/96. The figures for 1981/82 and 1982/83 shown in the tables are actual and obtained from PDAM's external audit reports. Those for 1983/84 are also actual and obtained from PDAM's internal report before the external audit; however, they are slightly modified for the purpose of this financial projection in addition to the modifications made in the master plan report. (see Appendix MIII-5 of Master Plan Report.)

2) Projects covered by this financial projection are those up to the First Phase of the Second Stage Project. Accordingly, the Immediate Project is included here; however, the Raw Water Improvement Project is not recognized as PDAM's capital investment project. Instead, PDAM is assumed to pay charges for the raw water to be supplied by the Improvement Project. The costs for reducing leakages are included in the routine investment costs.

Inflation

3) Price escalation for local costs is estimated at 15.0 % for 1984, 11 % for 1985, and 7 % per annum thereafter, and for foreign costs at 7.5 % for 1984, 7.0 % for 1985, and 6.0 % thereafter. For projecting future prices, these rates are used uniformly unless otherwise specified.

Income Statement

4) Production capacity: As mentioned in 2., increases in capacity after completion of the First Phase of the Second Stage Project are not considered.

5) Capacity utilization factor is defined as the water output from the treatments plant divided by the rated plant capacity. It should be noted that plant can produce, in a short run, at maximum 115 percent of the rated capacity, and the upper limit of utilization factor for a year is considered to be 87 percent of the maximum capacity, that is, 100 percent of the rated capacity (115 percent times 87 percent).

6) Water output is determined applying four constraints; the demand, the utilization factor of plant capacity, the allowances for time to reach full operation after completion of plant construction, and the availability of distribution pipes and service house connections to supply water to consumers.

7) Unaccounted-for water is assumed to be reduced by 20 percent for 12 years from 53 percent in 1983 to 33 percent in 1995.

8) Water rate in real term (end 1983/84 price) is assumed to be raised to Rp. 292/m3 in 1993 from Rp. 252/m3 in 1983 and be kept constant thereafter. Average tariff in nominal term is assumed to be increased, in addition to the real term increase, keeping pace with domestic inflation rates.

9) Connection charges are shown as net of connection costs. The gross connection charges are computed as projected increases in number of connections times an average rate of connection charges (Rp. 535,000 in 1983/84). This unit rate (nominal term) is held constant throughout the projection period for the purpose of reducing the connection charges in real term and, eventually, accelerating installment of new connections. On the other hand, the connection costs are computed as projected increase in number of connections times an average connection cost. The average costs in 1983/84 is Rp. 214,000 per connection, which is derived based on PDAM's information that 40 percent of the connection charge is the connection cost, and is escalated at the rate of domestic inflation.

10) Other revenues are estimated, based on PDAM's past records, at 4 percent of the water sales.

11) Bad debts are estimated, based on PDAM's past records, at 12 percent of the water sales and are expected to be improved to 10 percent in 1987. These bad debts are deducted from the total billings to obtain the net operating revenues.

12) Personnel expenses here include Production service/Pension fund in addition to the "personnel cost estimated in Table 5.2". The share of the production service/pension fund in "personnel expenses" is 19.9 percent which is as same as the percentage reported in the external andit report for 1982.

13) Chemicals costs are detailed in Table 5-3 of Chapter 5.

14) Power costs are detailed in Table 5-4 of Chapter 5.

15) Raw water costs A unit rate is as shown below:

Year	Rate
1984-1987	Rp.10/m3
1988-	Rp.15/m3

(1984 Constant price)

16) Maintenance costs are projected, based on PDAM's past records and considering data of other water enterprises, at 1.5 percent of the fixed assets (gross): revalued cost.

17) Administration costs are projected, based on PDAM's past records, at 40 percent of the personnel expenses.

18) Sales expenses are projected, based on PDAM's suggestion provided to JICA Study Team taking account of the past records and future planning, at 2 percent of the water sales.

19) Other operating expenses are projected at 5 percent of the personnel expenses.

20) Depreciation of the fixed assets: historic cost and revalued cost are provided on a straight-line basis at 6.2 percent and 4.1 percent, respectively. For process of deriving these rates, see Table 7-9 of Appendix.

21) Taxes are calculated according to the following schedule:

Net Income	Tax Rate
Rp. 0 - 10 million	15 percnet
Rp. 10 - 50 million	25 percent
Rp. more than 50 million	35 percent

Note that the depreciation rate used for deriving the net income for taxation purpose is 8.4 percent, which is different from the rates mentioned in 21. above.

22) Working ratio is defined as :

$$\frac{\text{Operation Expenses}}{\text{Operating Revenues}}$$

23) Operating ratio is defined as :

$$\frac{\text{Operating Expenses + Depreciation}}{\text{Operating Revenues}}$$

24) Rate of Return is defined as :

$$\frac{\text{Net Operating Income after Tax}}{\text{Average Net Fixed Assets in Operation}}$$

Balance Sheet

25) Revaluation of fixed assets is made for the year 1983/84 taking account of the inflation effects before that year and including the assets which were not recorded in PDAM's book. (For details, see Appendix MIII-5 of Master Plan). Revaluation is also made every year after 1983/84 assuming that the value of fixed assets increases at the rate of domestic inflation. The difference between the revalued and historic cost of net fixed assets in operation is entered into the liability side as revaluation surplus.

26) Construction in progress includes PDAM's routine construction of the year and of the preceding year and the investment works being constructed by the central government.

27) Accounts receivable are estimated at 15 percent of water sales.

28) Other receivables/Advance payments: Its large fluctuations in the past records make it difficult to predict its future sizes. Accordingly, the value recorded in 1983/84 is escalated at the rate of domestic inflation.

29) Inventories are estimated, based on PDAM's past records, at 3 percent of the fixed assets (gross): revalued cost.

30) Central Government equity is not expected to be increased from the level of 1981/82.

31) Local government equity is not increased after 1983/84 in this financial projection. In reality, PDAM is expected to receive equity (a part of ground water charges which PDAM collects on behalf of DKI Jakarta - see Master Plan 3.9.2). However, projection of equity receipts is very difficult since it is determined every year by the negotiation between DKI and PDAM.

32) Account payables are estimated, based on the past records, at 12.5 percent (1.5-months worth) of operating expenses.

33) Debt/Debt & Equity Ratio is defined as:

$$\frac{\text{Long-Term Debt}}{\text{Long-Term Debt + Equity}}$$

34) Routine Construction after 1985/86 does not include any rehabilitation and pipe extension work.

Funds Flow Statement

35) Debt-service of 1st Phase/2nd Stage is calculated applying the likely terms and conditions, i.e., 30-year repayment period including 6-year grace period at 11 percent interest rate, no interest during construction, equal installments of the principal.

36) Contribution to DKI budget is computed at 71 percent of cash surplus after tax payments. In reality, PDAM pays out 50 percent of the cash surplus to DKI, 30 percent for production service/pension funds, and retain 20 percent as its reserves. In this financial projection, however, production service/pension funds is integrated into personnel expenses as mentioned before. Accordingly, the surplus cash is to be used only for contribution to DKI and reserves with the ratio of 50 percent to 20 percent.

37) Debt service coverage is defined as:

$$\frac{\text{Internal Cash Generation}}{\text{Total Debt Service}}$$

Table 7-9 Composite Rate of Depreciation

Items	(1) Yearly Depreciation (%)		(2) % Composition in Fixed Assets		(3) (1) x (2)		
					Financial Projection		Tax Calculation
	Financial Projection	Tax Calculation	Historic Cost	Revalued Cost	Historic Cost	Revalued Cost	Historic Cost
Lands	-	-	1.8	20.8	-	-	-
Buildings, Structures, Mini-plants, etc	2.5	5.0	14.1	8.5	0.35	0.21	0.71
Treatment Plants	7.0	8.0	54.9	33.3	3.84	2.33	4.39
Pipes	2.5	10.0	18.0	31.3	0.45	0.78	1.80
Technical/office Equipment, Deep Wells, Hydrants, etc	10.0	10.0	7.1	3.8	0.71	0.38	0.71
Meters, Vehicles, etc	20.0	20.0	4.0	2.2	0.80	0.44	0.80
Total			100.0	100.0	6.15	4.14	8.41

2. Notes on Long-Term Marginal Cost

Long-term marginal cost was computed using the average incremental cost method (AIC) based on the conditions and assumptions described below. The incremental streams of sold water and costs are shown in Table 7-10 after this Notes.

1) Service life of facilities

30 years after completion of the treatment plants in 1991.

2) Price

Constant price at the end of 1983/84.

3) Discount rate

8 percent, 10 percent, 12 percent

4) Discounted back to:

1986

5) Accounted-for water

14 percent improvement between 1991 (61 percent) and 2005 (75 percent).

6) Computation of Increments

The incremental water supply by the proposed treatment plants can be recognized as the total water supply less the maximum possible water supply (not actual supply), given each year's accounted-for water ratio, from the treatment plants constructed before 1991. This incremental water supply consists of two components: one is the increments attributable to the expanded capacity and the other is increments due to improvement in the accounted-for water ratios. Accordingly, for avoiding under-estimation of marginal cost, a part of the investment costs for the leakage-reduction program was included in the incremental investment costs.

The same principle as above was applied to compution of incremental operation costs and incremental working capital requirements.

Table 7-10 Long-Term Marginal Cost

Year	Water Sales (million m³) Total	Increment	Incremental Costs (Rp. million) Investment	Operating Cost	Working Capital	Total
1986	120	-	4,368	-	-	4,368
1987	166	-	4,529	-	-	4,529
1988	177	-	21,299	-	-	21,299
1989	219	-	69,728	-	-	69,728
1990	226	-	60,381	-	-	60,381
1991	281	51	37,868	9,009	4,334	51,211
1992	306	69	17,489	12,279	5,095	34,863
1993	337	96	10,643	15,026	5,417	31,086
1994	368	119	1,185	15,734	4,141	21,060
1995	373	121	1,230	16,320	2,880	20,430
1996	379	122	1,230	16,483	-	17,713
1997	384	124	1,230	16,646	-	17,876
1998	384	124	1,230	16,810	-	18,040
1999	390	126	1,230	16,973	-	18,203
2000	395	128	1,230	17,299	-	18,529
2001	401	130	1,230	17,462	-	18,692
2002	407	131	1,230	17,626	-	18,856
2003	407	131	1,230	17,789	-	19,019
2004	412	133	1,230	17,952	-	19,182
2005						
	418	135	-	18,278	-	18,278
2019						
2020	418	135	-	18,278	-21,867	-3,589

Discount Rate (1)	Present Value Incremental Water Sales (2)	Incremental Cost (3)	Marginal Cost (3)/(2) (4)
8%	955	319,397	Rp.334/m³
10%	726	275,285	Rp.379/m³
12%	565	241,355	Rp.427/m³

Table 7-11 Financial Internal Rate of Return

(Unit: Rp. million)

Year	Revenues	Investment	Operating Cost	Working Capital	Net Cashflow
1986	-	4,368	-	-	-4,368
1987	-	4,529	-	-	-4,529
1988	-	21,299	-	-	-21,299
1989	-	69,728	-	-	-69,728
1990	-	60,381	-	-	-60,381
1991	13,362	37,868	9,009	4,334	-37,849
1992	18,699	17,489	12,279	5,095	-16,164
1993	26,976	10,643	15,026	5,417	-4,110
1994	34,748	1,185	15,734	4,141	13,688
1995	35,332	1,230	16,320	2,880	14,902
1996	35,624	1,230	16,483	-	17,911
1997	36,208	1,230	16,646	-	18,332
1998	36,208	1,230	16,810	-	18,168
1999	36,792	1,230	16,973	-	18,589
2000	37,376	1,230	17,299	-	18,847
2001	37,960	1,230	17,462	-	19,268
2002	38,252	1,230	17,626	-	19,396
2003	38,252	1,230	17,789	-	19,233
2004	38,836	1,230	17,952	-	19,654
2005					
	39,420	-	18,278	-	21,142
2019					
2020	39,420	-	18,278	-21,867	43,009

IRR = 5.8 percent

Note: The basic assumptions for computation of FIRR is same as those for the marginal cost.

Table 7-12 Sensitivities under Alternative Assumptions

(Unit: percent, Rp. billion)

	1984	1985	1986	1987	988	1989	1990	1991	1992	1993	1994	1995
Base Case												
. Rate of return: Historic Cost	6	4	1	11	5	9	12	10	5	5	7	9
. Revalued Cost	-2	-2	-3	2	1	4	5	6	3	3	4	4
. Change in Cash	1.7	.1	-7.3	1.9	-3.3	7.2	23.2	36.1	25.1	30.1	41.3	51.3
. Cash at End	5.3	5.4	-1.9	-0.0	-3.3	3.8	27.0	63.1	88.2	118.3	159.6	210.9
Case 1												
Revenues increased by 10%												
. Rate of Return: Historic Cost	11	10	7	17	10	13	16	14	8	8	11	13
. Revalued Cost	-0	-1	-0	4	3	6	7	9	5	5	6	7
. Change in Cash	.8	.6	-3.8	.8	.2	2.5	6.8	10.9	10.0	11.7	14.4	16.8
. Cast at End	4.5	5.1	1.3	2.1	2.4	4.9	11.7	22.6	32.5	44.2	58.6	75.3
Case 2												
Tax and DKI contributions exempted												
. Rate of Return: Historic Cost	8	5	1	15	6	12	16	14	5	6	9	11
. Revalued Cost	-1	-2	-3	4	1	6	7	8	3	4	5	6
. Change in Cash	1.7	.1	-7.3	1.9	-3.3	7.2	23.2	36.1	25.1	30.1	41.3	51.3
. Cash at End	5.3	5.4	-1.9	-0.0	-3.3	3.8	27.0	63.1	88.2	118.3	159.6	210.9
Case 3												
Connection charge halved 1/												
. Rate of Return: Historic Cost	2	-1	-5	8	3	8	11	10	5	5	7	10
. Revalued Cost	-3	-4	-5	+0	+0	3	4	6	3	3	4	5
. Change in Cash	-.6	-2.4	-10.7	-4.4	-7.3	-.1	4.2	7.8	6.6	7.9	10.3	12.7
. Cash at End	3.0	.6	-10.1	-14.5	-21.7	-21.8	-17.7	-9.9	-3.3	4.6	14.8	27.5
Case 4												
Investment increased by 10%												
. Rate of Return: Historic Cost	6	4	1	11	5	9	12	9	4	4	6	7
. Revalued Cost	-2	-2	-3	2	1	4	5	6	2	3	3	3
. Change in Cash	.3	-.2	-7.3	-1.6	-4.2	.6	4.6	7.8	5.5	6.0	7.8	9.8
. Cash at End	3.9	3.7	-3.6	-5.1	-9.3	-8.8	-4.2	3.6	9.1	15.1	22.9	32.7
Case 5												
Operating Expenses increased by 10%												
. Rate of Return: Historic Cost	3	-1	-4	8	2	7	9	8	3	3	5	7
. Revalued Cost	-3	-4	-5	+0	-1	2	3	5	2	2	2	3
. Change in Cash	+.0	-2.4	-10.2	-3.9	-7.7	-1.5	3.5	6.6	4.7	5.6	7.3	9.1
. Cash at End	3.6	1.3	-9.0	-12.9	-20.6	-22.1	-18.5	-11.9	-7.3	-1.7	5.6	14.7
Case 6												
Accounted-for water improved only 50% of targeted rate												
. Rate of return: Historic Cost	6	3	-2	8	2	5	7	6	-0	-1	-0	2
. Revalued Cost	-2	-3	-4	+0	-1	2	2	3	-1	-1	-0	+0
. Change in Cash	.3	-.6	-8.8	-3.7	-8.3	-3.2	2.6	5.2	1.5	1.0	2.1	4.0
. Cash at End	3.9	3.4	-5.5	-9.2	-17.5	-20.7	-18.1	-12.8	-11.4	-10.4	-8.3	-4.3
Case 7												
Revenues decreased by 10%												
. Rate of return: Historic Cost	+0	-3	-6	6	-1	5	7	6	+0	1	2	4
. Revalued Cost	-4	-5	-5	-0	-2	1	2	3	-0	+0	1	1
. Change in Cash	-1.1	-3.5	-11.7	-5.9	-11.0	-4.7	2.4	5.0	1.8	2.1	4.3	6.2
. Cash at End	2.5	-1.1	-12.7	-18.6	-29.6	-34.2	-31.8	-26.8	-25.0	-22.9	-18.6	-12.5

Note: 1/ The level of connection charge in 1993 is halved and kept constant in real term thereafter.

Table 7.13 Installment Plan for Connection Charges

(Unit: Rp. million)

Year	Total Connetion Charges	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	Total	Balance
1985	6,955	-5,161													-5,161	-5,161
1986	10,700	1,794	-7,939												-6,145	-11,306
1987	16,050	1,794	2,761	-11,909											-7,354	-18,660
1988	18,190	1,794	2,761	4,141	-13,497										-4,801	-23,461
1989	19,795	1,794	2,761	4,141	-4,693	-14,688									-1,299	-24,760
1990	21,400		2,761	4,141	4,693	5,107	-15,879								-823	-25,583
1991	23,005			4,141	4,693	5,107	5,521	-17,070							2,394	-23,189
1992	24,075				4,693	5,107	5,521	5,935	-17,864						3,392	-19,797
1993	25,145					5,107	5,521	5,935	6,211	-18,658					4,116	-15,681
1994	25,680						5,521	5,935	6,211	6,487	-19,055				5,099	-10,582
1995	26,750							5,935	6,211	6,487	6,625	-19,849			5,409	-5,173
1996	29,195								6,211	6,487	6,625	6,902	-21,663		4,562	-611
1997	31,851									6,487	6,625	6,902	7,532	-23,633	3,913	3,302

Capital Recovery

Interest Rate: 11.00% per annum
0.87% per month

Repayment Period: 5-year; monthly payment

Year	Disbursement	Repayment	Net Cash Flow
N	-1.000	.258	-.742
N+1		.258	.258
N+2		.258	.258
N+3		.258	.258
N+4		.258	.258

FEASIBILITY STUDY FOR
JAKARTA WATER SUPPLY DEVELOPMENT PROJECT

F6. APPENDIX FVIII-1

SUGGESTED PERSONNEL TRAINING FOR PDAM STAFF

SUGGESTED TRAINING PROGRAM

Management Director

Training for:

- Setting objectives and targets for technical, financial and manpower performance;
- developing efficient operating procedures and standards;
- monitoring and reviewing work performance against targets;
- reporting arrangements and the interpretating of management information.

Training Courses

Series of intensive executive seminors with 2 - 3 weeks in the areas of policy planning and decision making run by foreign technical assistance advisors, consultants, and where appropriate local institutions such as NTC. To improve the ability and knowledge of the Director and Top Management Staff of PDAM in analysing, processing data and making decisions through a general information system, technical, financial, manpower date and time. Short duration overseas courses in water management.

Training Plans

Plan to train 5 key personnel in PDAM during 1985 at management seminor.

Chief Engineer

Training as for Top Management with emphasis on technical aspects.

Management development training to develop general and specific management skills related to the organization's requirements and an individual's performance review action plan.

Training Courses

Series of 2-weeks seminars as for Top Management.

Management Development Program to be planned for individual managers due for promotion or requiring development in special skills.

Training Plans

Plan to train 14 over period 1985 - 1990.

Engineers/Senior Technicians

Management development training to provide knowledge of management skills.

Technical training to provide advanced technical knowledge and including familialization with recent innovation and practices.

Training Courses

One week technical courses including;

- treatment process, design and operation;
- water distribution practices;
- courses developed by NTC to meet particular requirements

Training Plans

Plan to train 147 engineers over period 1985 - 1990.

Meter Readers

Job related skills: to provide basic skills and knowledge of the duties of a meter reader including reading a prepared route card, reading a meter, simple computations, recognizing and recording faulty meters and record keeping.

Training Plans

Plan to train 20 - 40 each year from 1984 onward.

Instalators

Job related skills: to provide training in basic skills and duties required of an inspector including control and operation of distribution, leak detection, inspection of installations, etc.

Training Courses

On-the-job supervised training for 1 - 2 weeks between courses and 1 week after the final course. Where possible training will be in association with rehabilitation team's activities on the distribution system on which the trainee will subsequently work.

Training Plans

Plan to train 50 instalators inspectors each year up to 1990.

Treatment Plant Operators

Job related skills: to provide basic knowledge and skills of operations and maintenance including pumping, chemical handling and treatment, filter operations, maintenance of equipment and record keeping.

Training Courses

On-the-job training for a period of 1 to 2 months based on a training plan drawn up against the requirements of a plant operating manual.

Training Plans

Plan to train 20 distribution operators and 20 plant operators over the period of 1985 to 1990.

Senior Accountants

Management development: to provide knowledge of job-related management skills and opportunities to develop skills.

Technical aspects: to prepare for the changing content of work including familialization with the accounting procedures.

Training Courses

2-week courses provided by NTC and other organizations including modern management practice. PDAM will develop short courses on selected management topics and a series of short courses to cover all aspects of the accounting procedures for water supply.

Training Plans

Identify suitable candidate for promotion from on neutral and existing staff.

Chief Accountants

Management development: training to increase and develop the individual's general management skills and awareness and selectively to develop key areas, in particular, management information systems and accounting procedures.

Training Courses

Series of intensive executive seminars with 2 - 3 weeks in the area of management and accounting.

Training Plans

Plan to train 8 chief accountants by 1990 from existing staff and new recruits.

Senior Clerks

Supervision: to provide knowledge and understanding of the role of a supervisor including planning and organization of work, responsibility for selection and training of subordinates.

Training: to provide the senior clerks and supplies officers with the skills and knowledge to provide on-the-job training for subordinates.

Technical: to provide job-related knowledge and skills.

Training Courses

A one-week course for each of the main work areas will be provided for senior clerks - payroll, internal audit, cash and ledger control.

Supplies officers will receive special training in all aspects of supply, inventory and stores procedures.

Training Plans

Plan to train 10 senior clerks each year up to 1990.

Chemist

Chemists will require training in monitoring, control and operation of treatment process. New entrants will require familialization with aspects of chemistry and microbiology specific to water supply.

Training Courses

A series of up to 2 - 3 weeks technical courses at PDAM or NTC.

Training Plans

Total requirement of 10 chemists by 1996. Plan to train 1 each year by 1990 and 1 each year thereafter.

Legal, Personnel and Administrative Officers

Entrants to this job group will normally be recruited as training staff and will only require familialization with water supply and with job related system.

Training Courses

A short series of up to 3 one-week courses including "An introduction to the water supply", "Modern Management Practice" and "Accounting Procedures for non-accountants."

Training Plans

Plan to train 4 staff by 1996 and 2 staff each year thereafter.

Technicians

Technicians will require training in the technical aspects of their work; some senior member of the job group will require training in supervision and training methods for training subordinates.

Training Courses

To train technicians PDAM will initially make full use of standard or specially-designed training courses run by NTC.

Training Plans

Plan to train 200 staff by 1990 on system operation course.