2. Conceptual Design of STP

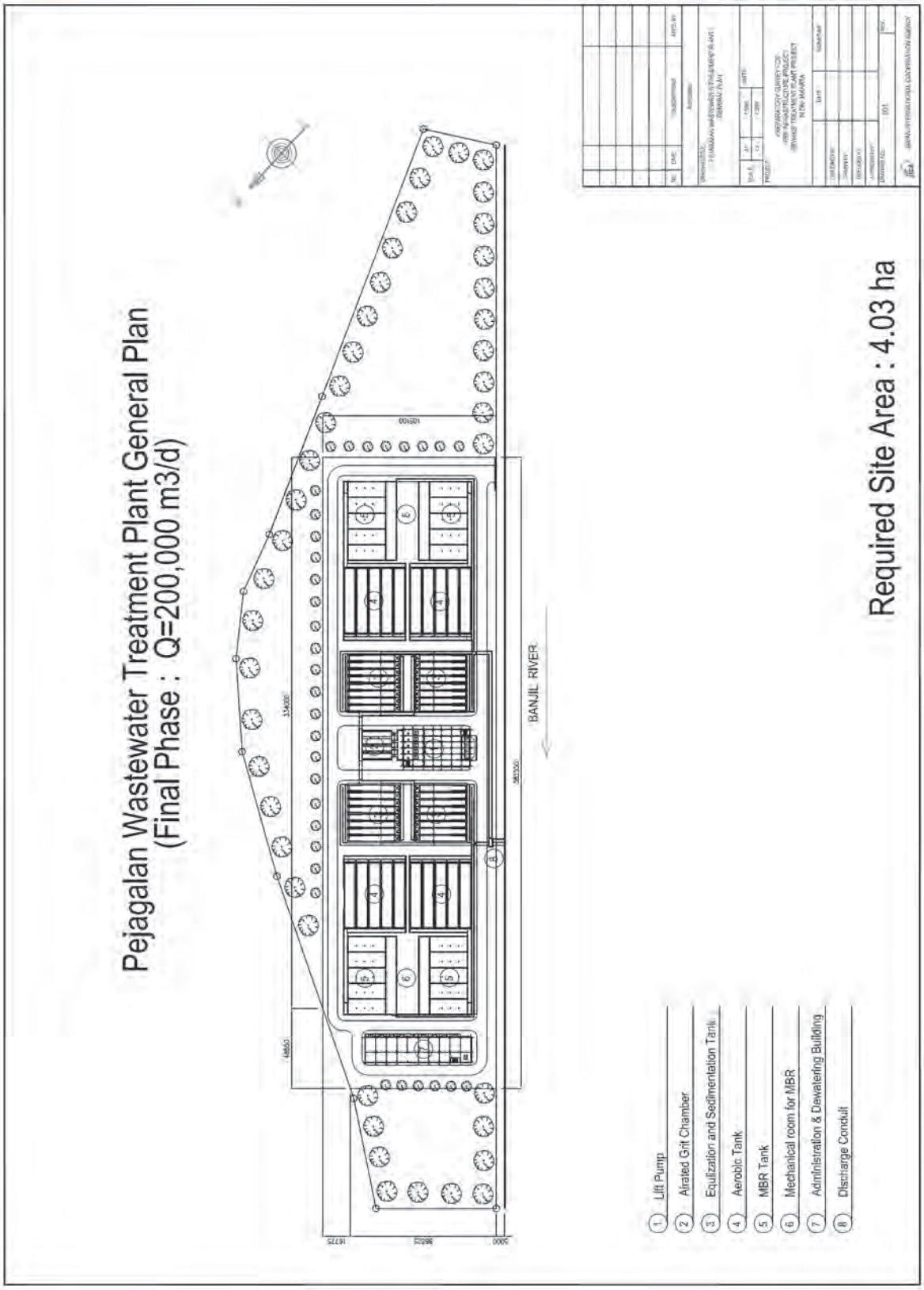
(1) Drawings

(2) Capacity Calculation

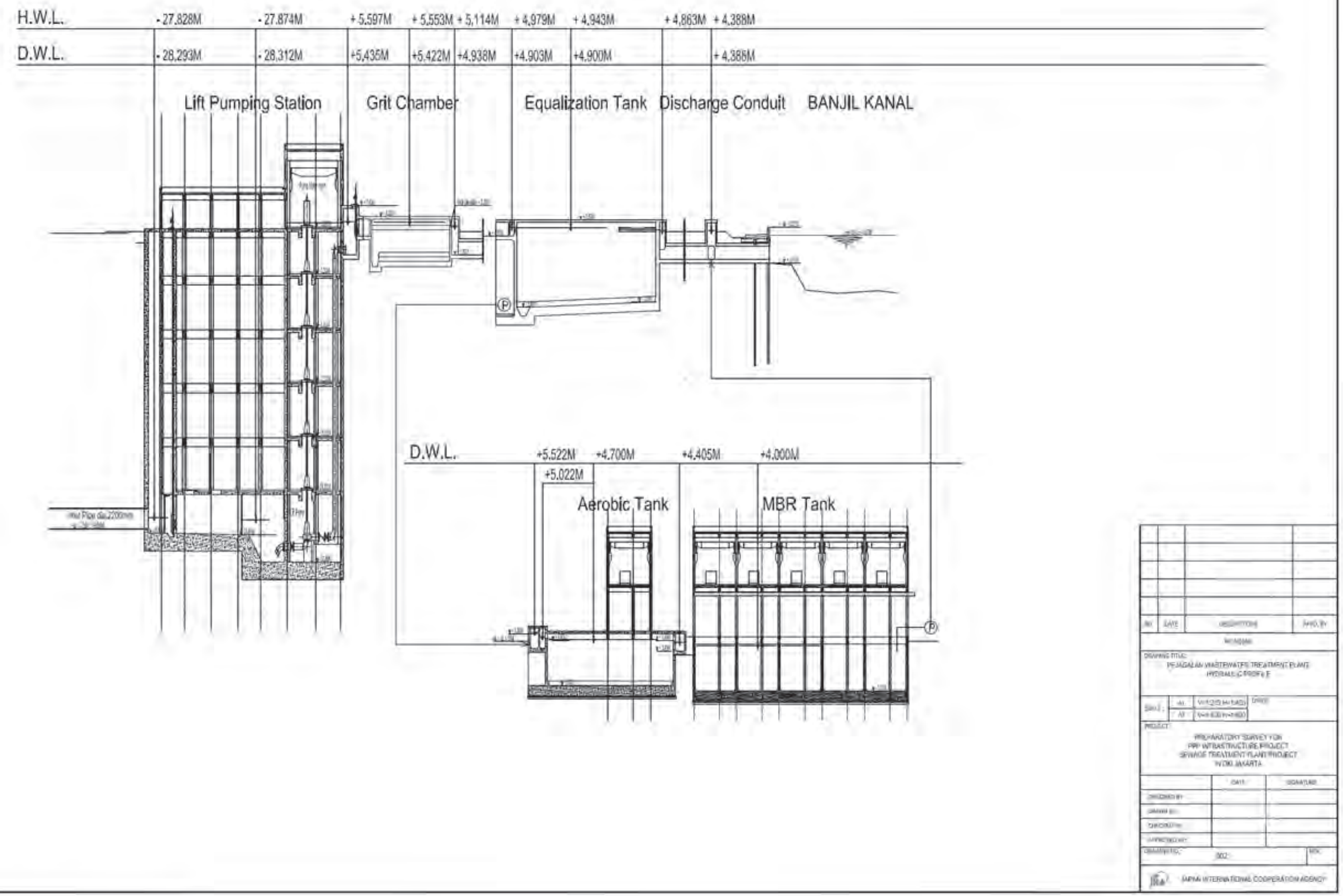
(3) Main Equipment List

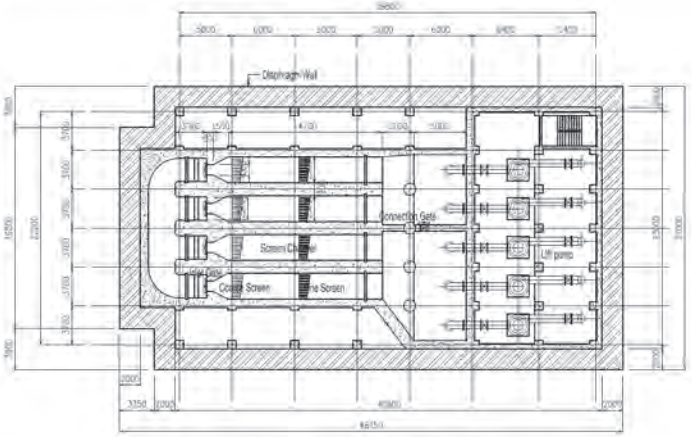
(4) Hydraulic Calculation

(1) Drawings

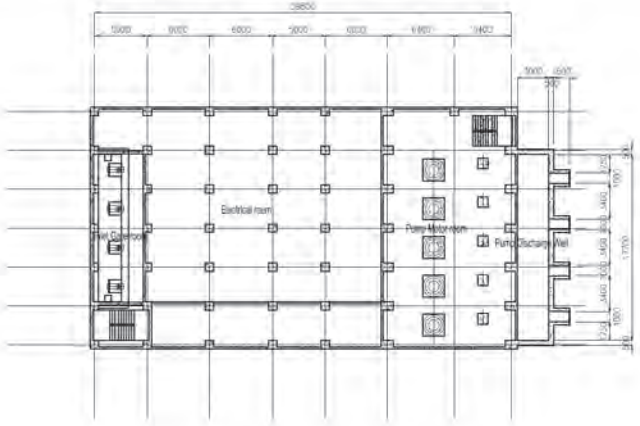

Pejagalan Wastewater Treatment Plant General Plan
(Final Phase : Q=200,000 m3/d)
BANJIL RIVER
Required Site Area : 4.03 ha
1 Lift Pump
2 Airated Grit Chamber
3 Equilization and Sedimentation Tank
4 Aerobic Tank
5 MBR Tank
6 Mechanical room for MBR
7 Administration & Dewatering Building
8 Discharge Conduit

HYDRAULIC PROFILE

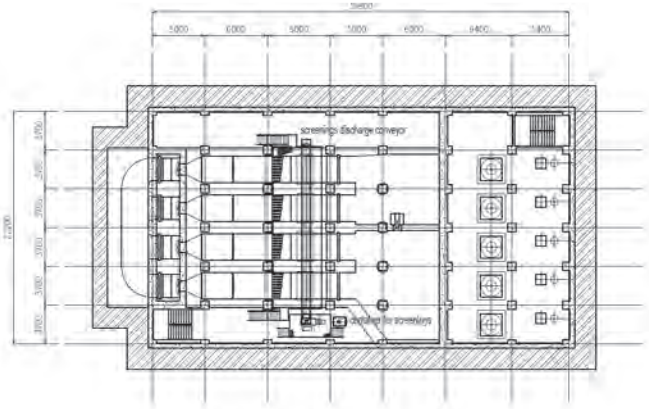




Lift Pumping Station Plan (Lower)



Lift Pumping Station Plan (Ground Floor)



Lift Pumping Station Plan (Middle)

NO.	DATE	DESCRIPTIONS	APPD. BY
		REVISIONS	

DRAWING TITLE:
PEJAGALAN WASTEWATER TREATMENT PLANT
LIFT PUMPING STATION
PLAN

SCALE:	A1	1:200	WEIGHT:
	A3	1:400	

PROJECT:
PREPARATORY SURVEY FOR
PPP INFRASTRUCTURE PROJECT
SEWAGE TREATMENT PLANT PROJECT
IN DKI JAKARTA

	DATE	SIGNATURE
DESIGNED BY		
DRAWN BY		
CHECKED BY		
APPROVED BY		

DRAWING NO.: 003 REV.

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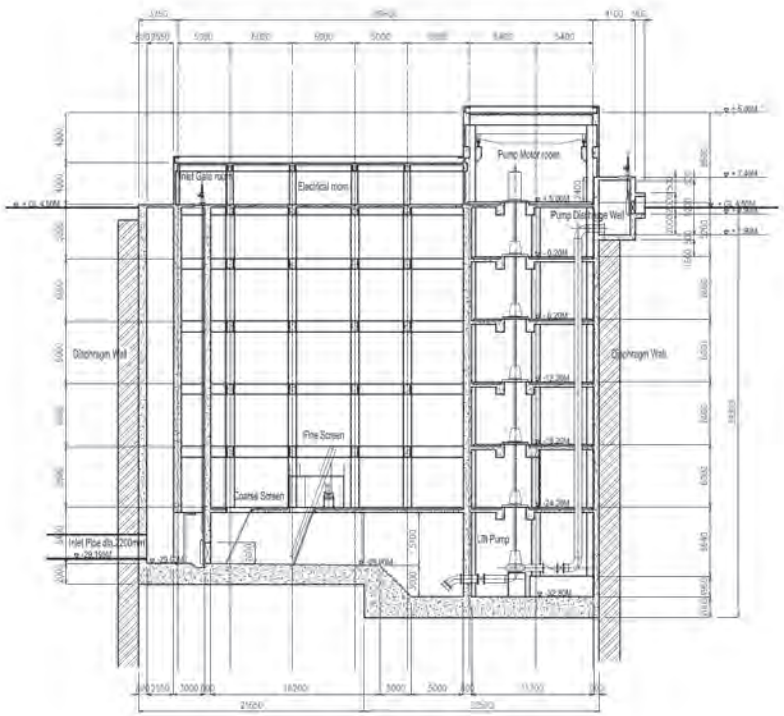


Lift Pumping Station Section

NO.	DATE	DESCRIPTIONS	APPD. BY
		REVISIONS	

DRAWING TITLE:
PEJAGALAN WASTEWATER TREATMENT PLANT
LIFT PUMPING STATION
SECTION

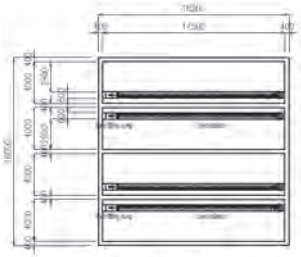
SCALE: A1 1:200 UNIT:
A3 1:400

PROJECT:
PREPARATORY SURVEY FOR
PPP INFRASTRUCTURE PROJECT
SEWAGE TREATMENT PLANT PROJECT
IN DKI JAKARTA

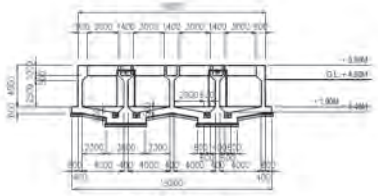
	DATE	SIGNATURE
DESIGNED BY		
DRAWN BY		
CHECKED BY		
APPROVED BY		

DRAWING NO.: 004 REV.

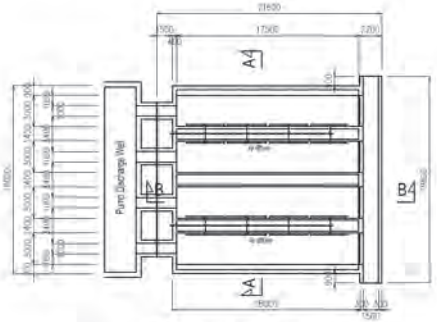
JICA JAPAN INTERNATIONAL COOPERATION AGENCY



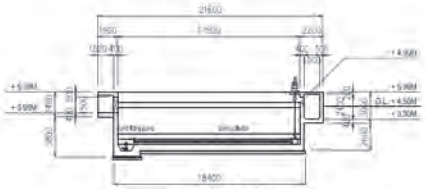
Grit Chamber Plan (Lower)



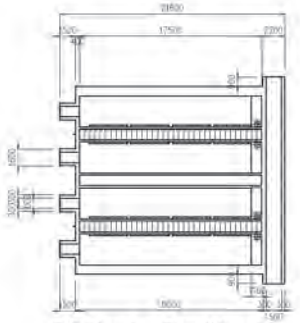
Section A - A



Grit Chamber Plan (middle)



Section B - B



Grit Chamber Plan (Upper)

NO.	DATE	DESCRIPTIONS	APPD. BY

DRAWING TITLE:
PEJAGALAN WASTWATER TREATMENT PLANT
AERATED GRIT CHAMBER
PLAN and SECTION

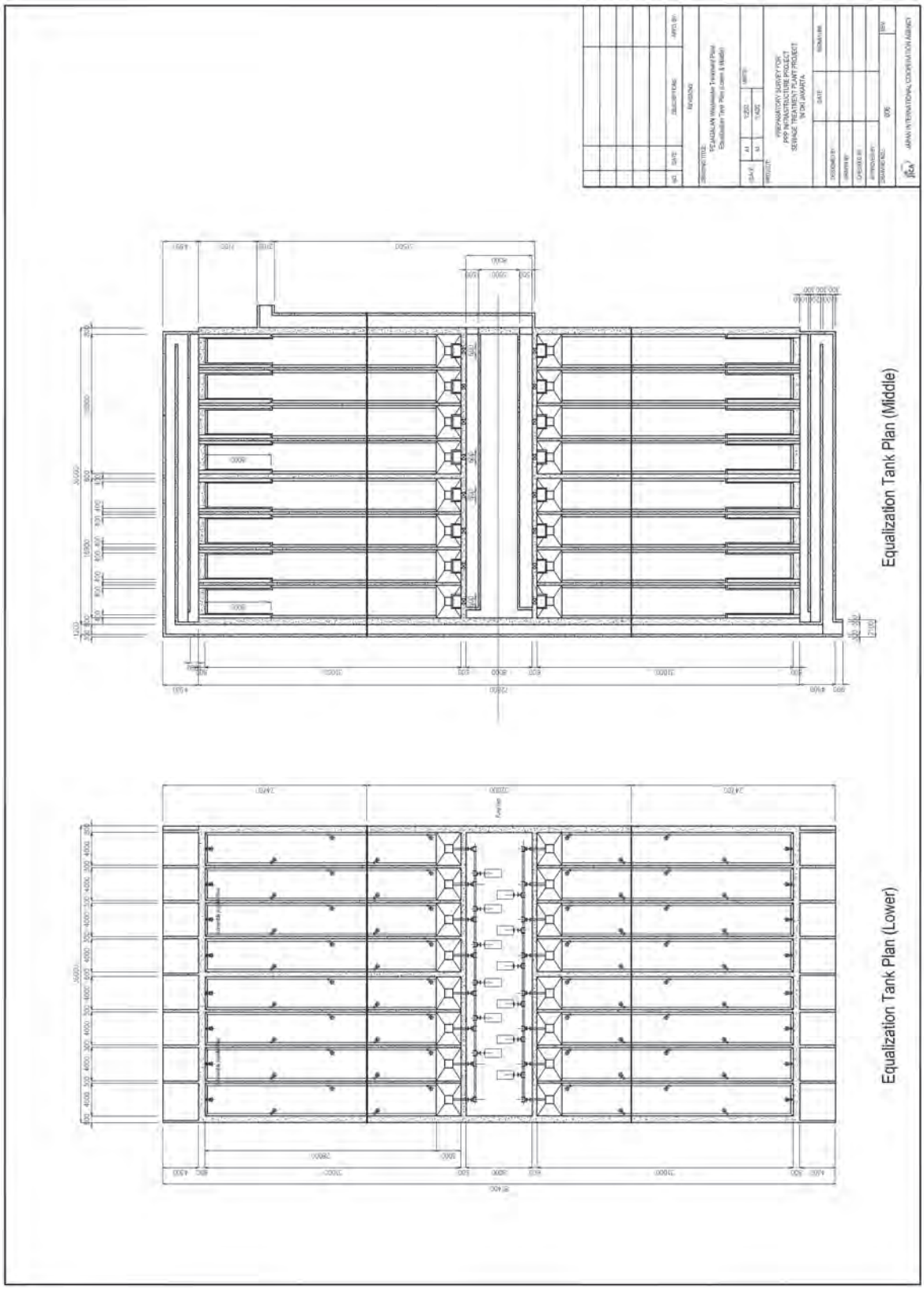
SCALE:	A1	1:200	UNITS:
	A3	1:400	

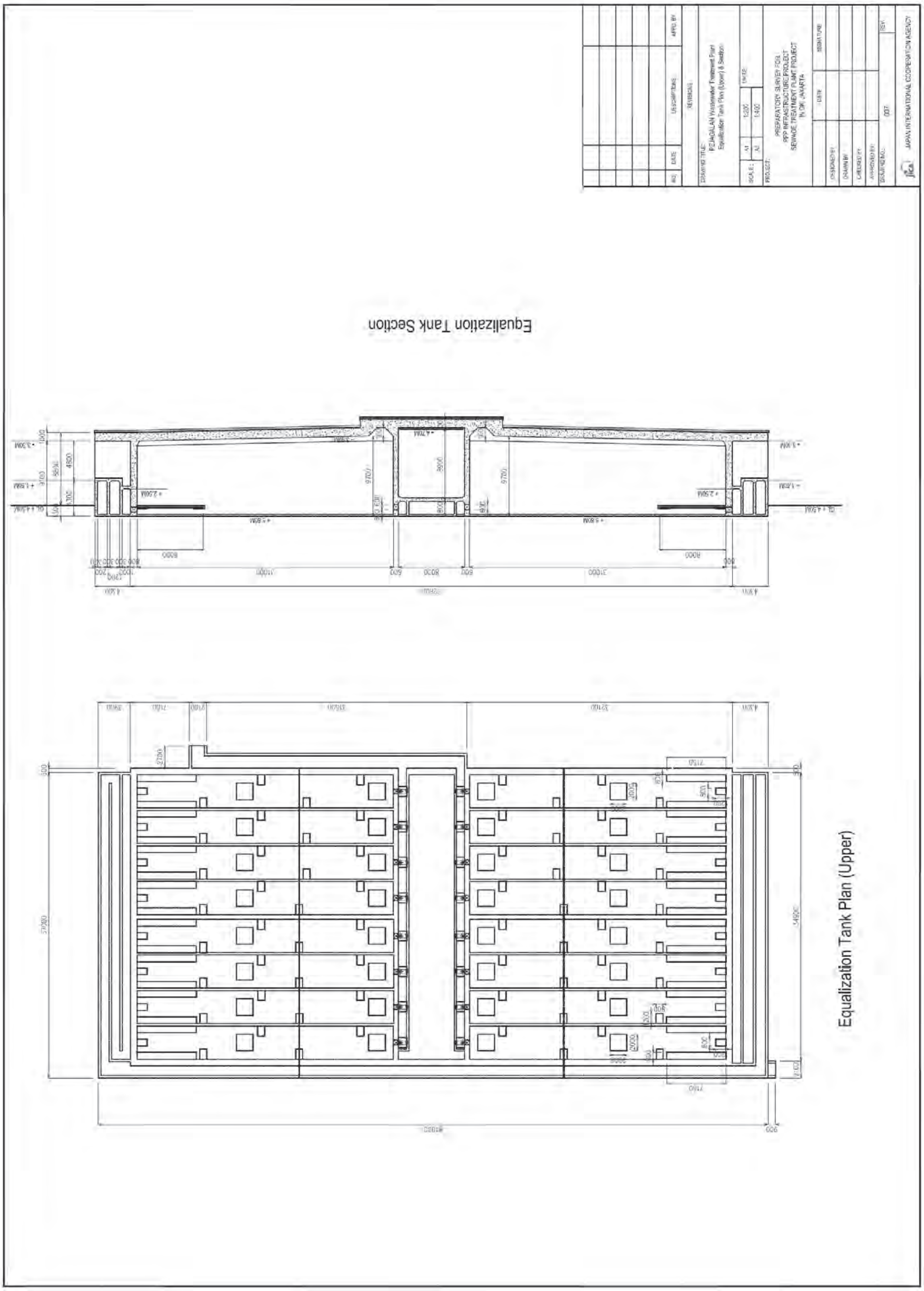
PROJECT:
PREPARATORY SURVEY FOR
PPP INFRASTRUCTURE PROJECT
SEWAGE TREATMENT PLANT PROJECT
IN DKI JAKARTA

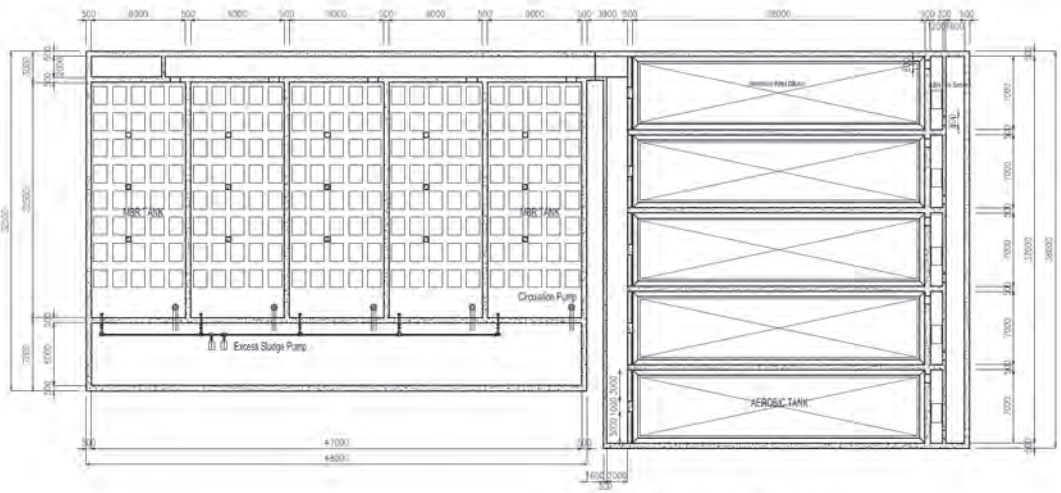
	DATE	SIGNATURE
DESIGNED BY		
DRAWN BY		
CHECKED BY		
APPROVED BY		

DRAWING NO.: 005 REV.

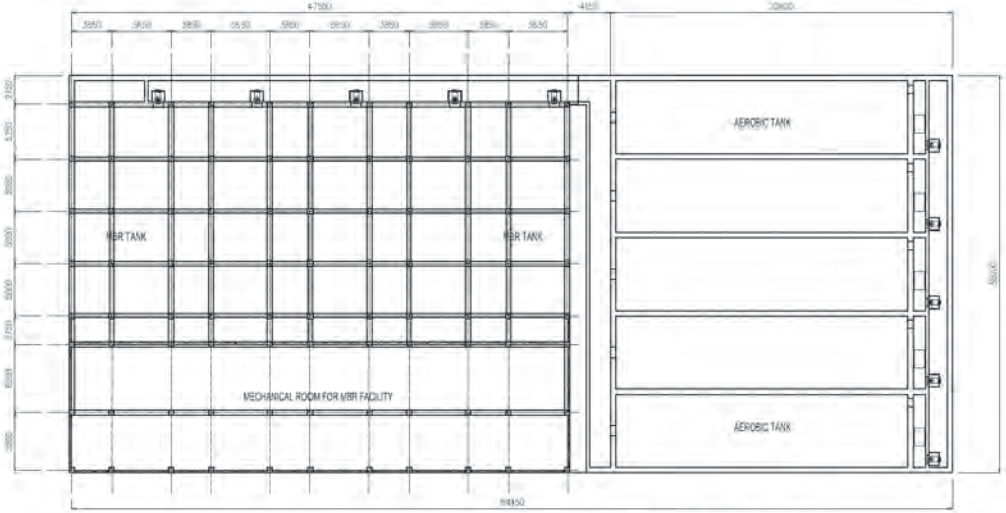
JAPAN INTERNATIONAL COOPERATION AGENCY


Equalization Tank Plan (Middle)
Equalization Tank Plan (Lower)


Equalization Tank Section
Equalization Tank Plan (Upper)
PREPARATORY SURVEY FOR PPP INFRASTRUCTURE PROJECT SEWAGE TREATMENT PLANT PROJECT IN DKI JAKARTA
JAPAN INTERNATIONAL COOPERATION AGENCY



Membrane Bio Reactor Plan (Lower)



Membrane Bio Reactor Plan (Upper)

NO.	DATE	DESCRIPTIONS	APPD.BY
		REVISIONS	

DRAWING TITLE:
PEGADALAN Wastewater Treatment Plant
Membrane Bio Reactor Plan (Lower & Upper)

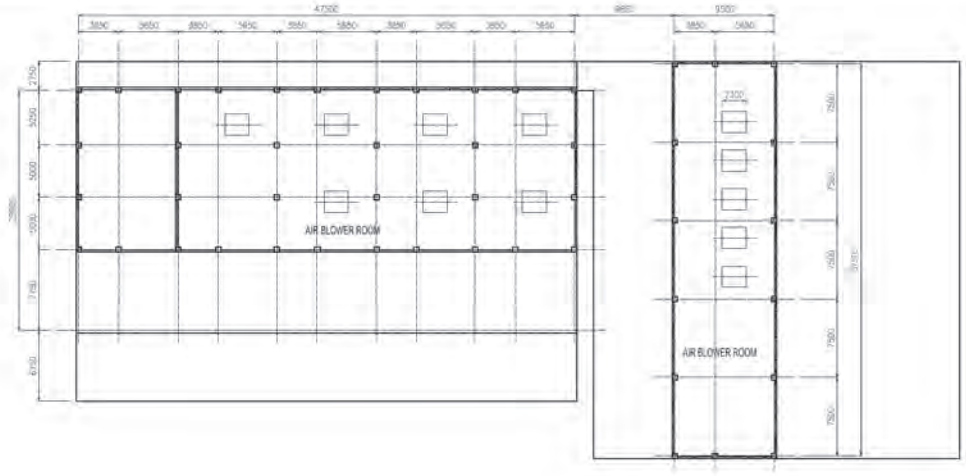
SCALE: A1 1:200 UNITS:
A3 1:400

PROJECT:
PREPARATORY SURVEY FOR
PPP INFRASTRUCTURE PROJECT
SEWAGE TREATMENT PLANT PROJECT
IN DKI JAKARTA

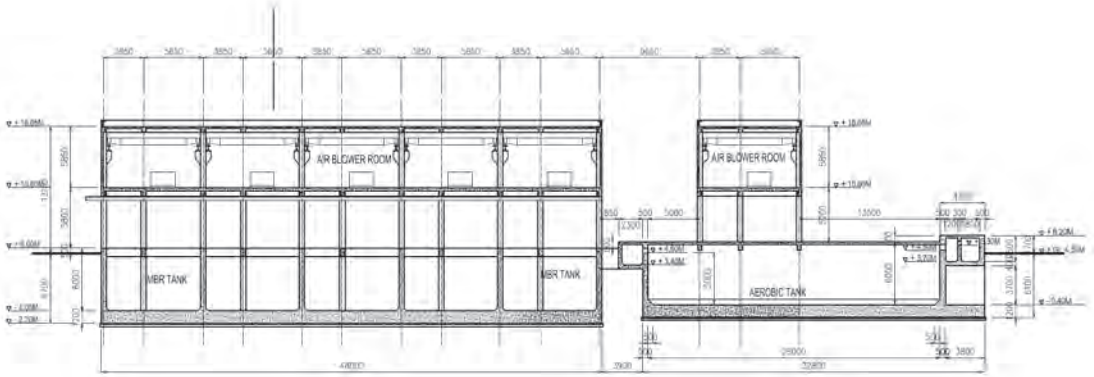
	DATE	SIGNATURE
DESIGNED BY:		
DRAWN BY:		
CHECKED BY:		
APPROVED BY:		

DRAWING NO.: 008 REV.:

JICA JAPAN INTERNATIONAL COOPERATION AGENCY



Membrane Bio Reactor Plan (Mechanical Floor)



Membrane Bio Reactor Section

NO.	DATE	DESCRIPTIONS	APP'D BY
		REVISIONS	

DRAWING TITLE:
PELANGILAN Wastewater Treatment Plant
Membrane Bio Reactor Plan (First Floor) & Section

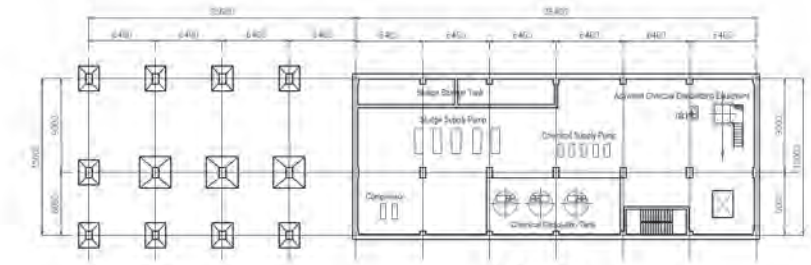
SCALE:	W1	1/200	UNITS:
	A3	1/400	

PROJECT:
PREPARATORY SURVEY FOR
PPP INFRASTRUCTURE PROJECT
SEWAGE TREATMENT PLANT PROJECT
IN DKI JAKARTA

	DATE	SIGNATURE
DESIGNED BY		
DRAWN BY		
CHECKED BY		
APPROVED BY		

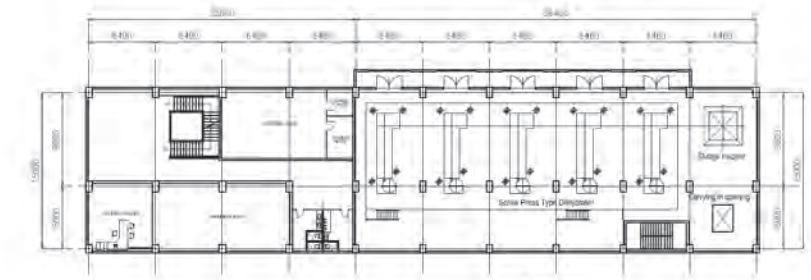
DRAWING NO.: 609 REV.:

JAPAN INTERNATIONAL COOPERATION AGENCY



B1 floor Plan

Ground floor Plan



1st. floor Plan

NO.	DATE	DESCRIPTIONS	APPD. BY
		APPROVED	

DRAWING TITLE:
TEGANGAN WASTEWATER TREATMENT PLANT
DEWATERING BUILDING
PLAN and SECTION

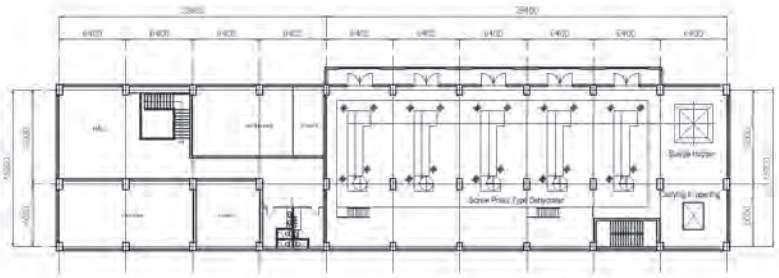
SCALE:	A1	1/200	UNITS:
	A3	1/400	

PROJECT:
PREPARATORY SURVEY FOR
RPP INFRASTRUCTURE PROJECT
SEWAGE TREATMENT PLANT PROJECT
IN DKI JAKARTA

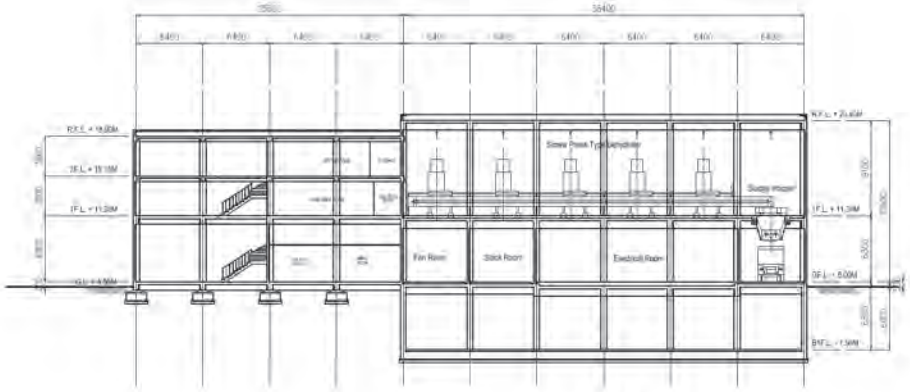
	DATE	SIGNATURE
DESIGNED BY		
DRAWN BY		
CHECKED BY		
APPROVED BY		

DRAWING NO.: 011 REV.:

JAPAN INTERNATIONAL COOPERATION AGENCY



2nd. floor Plan



A - A Section

NO.	DATE	DESCRIPTION	APPD. BY
		REVISION	

DRAWING TITLE:
PEJAGALAN WASTEWATER TREATMENT PLANT
DEWATERING BUILDING
PLAN and SECTION

SCALE :	A1	1/200	DATE
	A3	1/400	

PROJECT :
PREPARATORY SURVEY FOR
PPP INFRASTRUCTURE PROJECT
SEWAGE TREATMENT PLANT PROJECT
IN DKI JAKARTA

	DATE	SIGNATURE
DESIGNED BY :		
DRAWN BY :		
CHECKED BY :		
APPROVED BY :		

DRAWING NO. : 012 : REV.

JAPAN INTERNATIONAL COOPERATION AGENCY

(2) Capacity Calculation

Pejagalan Wastewater Treatment Plant Design Concept

1. Basic Design Condition

(1) Inflow Waste water Quantity

Inflow rate based on Revised Master Plan are as follows.

Average Daily Flow rate	**198,000 m^3/d**
Maximum Daily Flow rate	**264,000 m^3/d**
Maximum Hourly Flow rate	**396,000 m^3/d**

Inflow rate for our design will be determined the same value as Revised Master Plan.

According to Pipe construction plan, phased inflow rate are determined as follows

	Final Phase	**Phase 1**
Average Daily Flow rate	**200,000**	**100,000**
Maximum Daily Flow rate	**264,000**	**132,000**
Maximum Hourly Flow rate	**400,000**	**200,000**

(2) Inflow Waste water Quality

The inflow wastewater qualities are determined by actual data in JAKARTA.

BOD	**120**	**mg/L**
TSS	**120**	**mg/L**

(3) Effluent Quality

Effluent qualities are in accordance with Effluent Quality Standards established in INDONESIA.
Source: Quality standard of liquid waste (DKI Jakarta Governor decree No.122, 2005)

BOD	<50	mg/L
TSS	<50	mg/L
Ammonia	<10	mg/L

Target treated water qualities are set as follows

BOD	**<10**	**mg/L**
TSS	**<10**	**mg/L**
Ammonia	**<5**	**mg/L**

* Denitrification process is carried out in the future, does not perform immediate.

In the future **T-N** **<15** **mg/L**

(4) Wastewater Treatment Process

As No 1 priority of the site constraints, we choose the Treatment Process.
As a result, to adopt the following treatment process.

MBR (Membrane Bioreactor) Process

(5) Sludge Treatment Process

Since adopting the MBR process, the thickening process is omitted.
Therefore only the Dewatering process is established.

Excess sludge ----- Dewatering ----- to Dump site

(6) Inflow Conduit

Dimension	diameter	2200 mm	
Bottom Elevation	about	PP - 29.20 M	(GL - 33.70m)

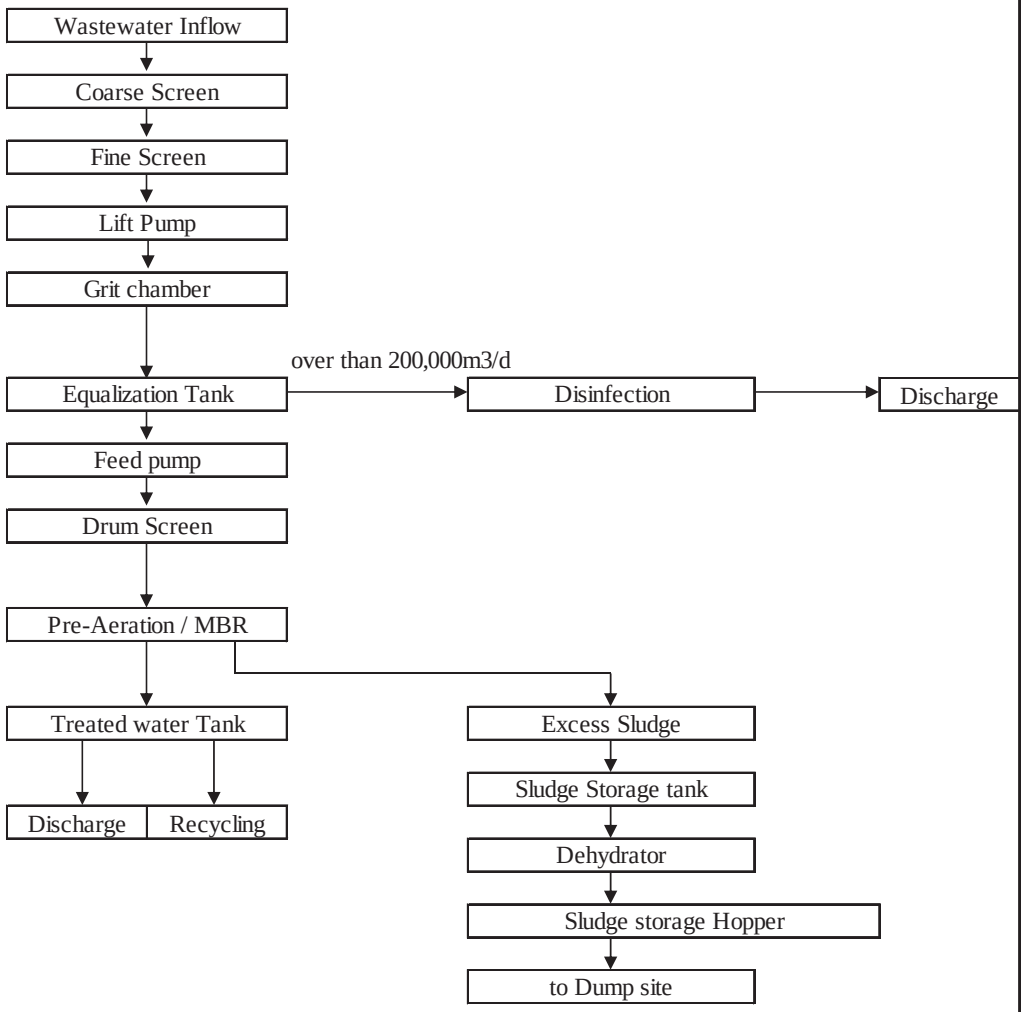
(7) Discharge facility

Discharge stream	to BANJIL KANAL
Conduit Dimension	$2{,}000mm^{H}$ x $1{,}500mm^{W}$
Highest water level at Discharge point	PP + 4.30 M

(8) Site Ground Elevation

Ground Elevation	PP + 4.50 M

2. Process Flow Diagram



3. Design criteria for each facilities

(1) Coarse Screen

opening	100 mm
operation	Manual

(2) Fine Screen

opening	20 mm
operation	Mechanical

(3) Grit Chamber

type	Aerated Grit Chamber	
Detention Time	3 minute	(for maximum Hourly)
Grit collector	Screw type	
Grit lifter	Sand pump	

(4) Lift Pump

type		Volute type mixed flow pump			
capacity	No.1	Diamater	700 mm		70m3/min
Pump head	about	35 m	(assumed value)		

(5) Drum Screen

opening	1 mm

(6) Equalization Tank

Retention Time	4 hr
Having a function of spillway and disinfection	

(7) Membrane Bioreactor Tank

a) In the immediate

Membrane placement	inside the activated sludge reactor	
MLSS in reactor tank	9,000	mg/L
Design Flux	0.5~0.6	$m^3/m^2/d$
Excess Sludge production rate	70	%
BOD removal rate	0.12	kg-BOD/kg-SS/d
BOD removal rate per unit volume	1.44	kg-BOD/m^3/d
Nitrification rate	0.025	kg-N/kg-SS/d
Nitrification rate per unit volume	0.3	kg-N/m^3/d

(8) Oxygen requirement

a) for BOD removal

Required unit oxygen for BOD removal	0.5	kg-O_2/kg-BOD

b) for Nitrification

Required unit oxygen for nitrification	64/14	kg-O_2/kg-N

c) for endogenous respiration

Required unit oxygen for endogenous respiration		0.12 kg-O_2/kg-VSS
MLVSS/MLSS	0.7~0.75	

(9) Treated water Tank

a) for Back wash

about	400	m^3

b) for recycling (in the future)

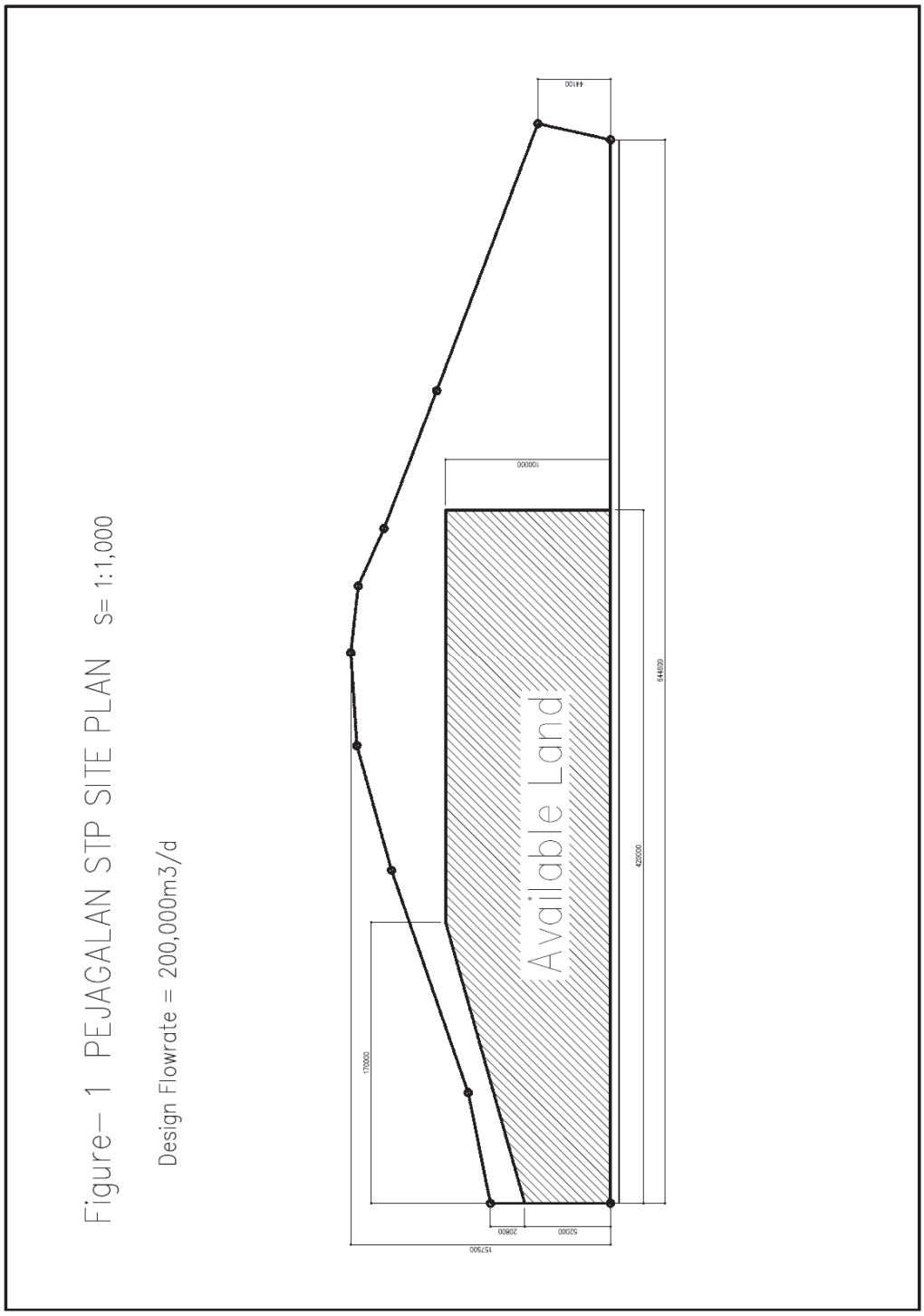
20,000m^3/d*8hr	6,700	m^3

(10) Dewatering Facility

Dehydrator Type	Pressing Rotary Outer Cylinder-Type Screw Press	
Influent Sludge Concentration	0.9	%
Dewatered Sludge Concentration	83	%
Operation time	24	hr
capability of Screw Press		

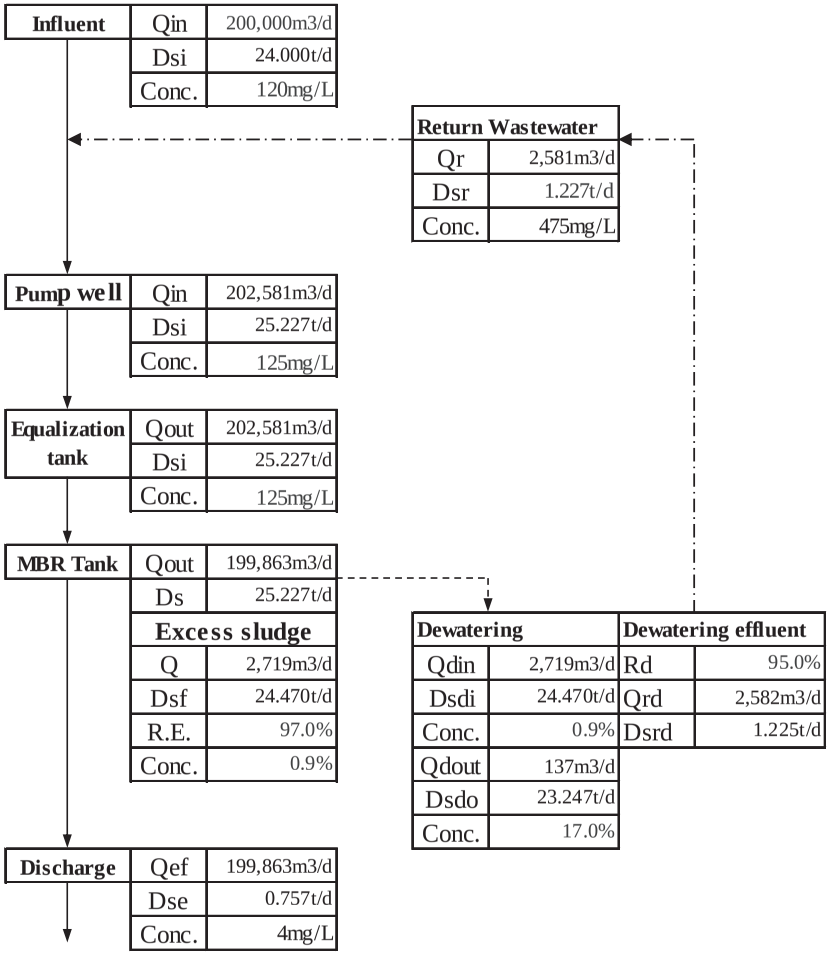
(11) Available Land for STP

Available land is shown in Figure -1.

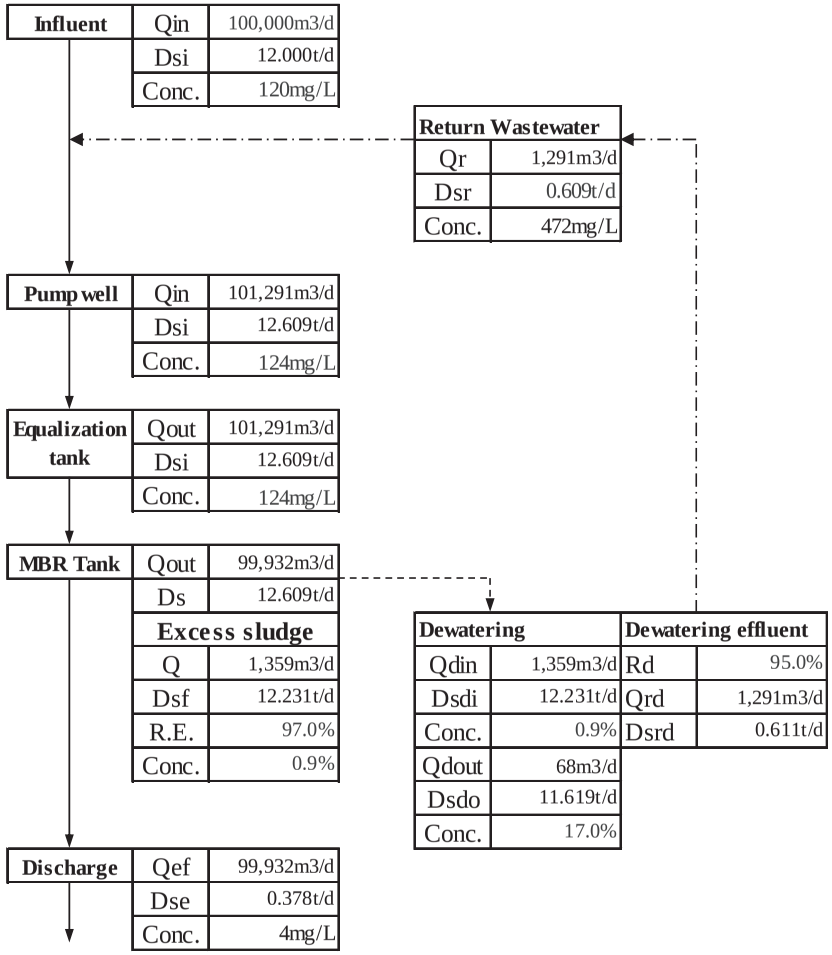


Sludge Mass Balance Calculation Sheet

<Final Phase>



<Phase 1>



Item	Final Phase Calculation	Phase 1 Calculation
1. Inlet Pipe		
1.1 Pipe Condition		
Design Flow rate		
Avegrage Daily Flow rate	= 200,000 m^3/d = 2.315 m^3/s	= 100,000 m^3/d = 1.157 m^3/s
Maximum Daily Flow rate	= 264,000 m^3/d = 3.056 m^3/s	= 132,000 m^3/d = 1.528 m^3/s
Maximum hourly Flow rate	= 400,000 m^3/d = 4.63 m^3/s	= 200,000 m^3/d = 2.315 m^3/s
Pipe Diameter	= 2,200 mm	= 2,200 mm
Pipe Gradient	= 1.1 permillage	= 1.1 permillage
Invert Level	= -29.199 M	= -29.199 M
Manning's "n" value	= 0.013	= 0.013
Full Flow rate	= 7.602 m^3/s	= 7.602 m^3/s
Full Flow Velocity	= 2.000 m/s	= 2.000 m/s
Water Depth		
Avegrage Daily Flow rate	= 0.906 m	= 0.580 m
Maximum Daily Flow rate	= 1.060 m	= 0.669 m
Maximum hourly Flow rate	= 1.371 m	= 0.833 m
Water Level (above sea level)		
Avegrage Daily Flow rate	= -29.199 + 0.906 = -28.293 M	= -29.199 + 0.580 = -28.619 M
Maximum Daily Flow rate	= -29.199 + 1.060 = -28.139 M	= -29.199 + 0.669 = -28.530 M
Maximum hourly Flow rate	= -29.199 + 1.371 = -27.828 M	= -29.199 + 0.833 = -28.366 M
1.2 Inlet Chamber		
Invert Elevation	= -30.000 M (above sea level)	= -30.000 M (above sea level)
Water depth at upstream of inlet Gate		
Avegrage Daily Flow rate	= 1.707 m	= 1.381 m
Maximum hourly Flow rate	= 2.172 m	= 1.634 m
2. Inlet Gate		
Invert Elevation	= -30.000 M (above sea level)	= -30.000 M (above sea level)
Gate Width	= 0.800 m	= 0.800 m
Gate Height	= 2.000 m	= 2.000 m
Number of Gate	= 4 Nos.	= 2 Nos.
Passing Velocity		
Avegrage Daily Flow rate	= 2.315 /(0.80 x 1.707 x 4) = 0.424 m/s	= 1.157 /(0.80 x 1.381 x 2) = 0.524 m/s
Maximum hourly Flow rate	= 4.630 /(0.80 x 2.172 x 4) = 0.666 m/s	= 2.315 /(0.80 x 1.634 x 2) = 0.885 m/s

Item	Final Phase Calculation	Phase 1 Calculation
Headloss at Inlet Gate		
Avegrage Daily Flow rate	= 1.5 x 0.424 ^2 / 19.6 = 0.014 m	= 1.5 x 0.524 ^2 / 19.6 = 0.021 m
Maximum hourly Flow rate	= 1.5 x 0.666 ^2 / 19.6 = 0.034 m	= 1.5 x 0.885 ^2 / 19.6 = 0.060 m
Water Level at downstream of inlet Gate		
Avegrage Daily Flow rate	= -28.293 - 0.014 = -28.307 M	= -28.619 - 0.021 = -28.640 M
Maximum hourly Flow rate	= -27.828 - 0.034 = -27.862 M	= -28.366 - 0.06 = -28.426 M
3. Screen		
3.1 Coarse Screen		
Openning	= 100 mm	= 100 mm
Type	= Manual Rake	= Manual Rake
Bottom Elevation	= -30.050 M	= -30.050 M
Channel width	= 2.000 m	= 2.000 m
Number of Screen	= 4 Nos.	= 2 Nos.
Approch water depth		
Avegrage Daily Flow rate	= -28.307 - -30.050 = 1.743 m	= -28.640 - -30.050 = 1.410 m
Maximum hourly Flow rate	= -27.862 - -30.050 = 2.188 m	= -28.426 - -30.050 = 1.624 m
Approch velocity		
Avegrage Daily Flow rate	= 2.315 / (2.00 x 1.743 x 4) = 0.166 m/s	= 1.157 / (2.00 x 1.410 x 2)= 0.205 m/s
Maximum hourly Flow rate	= 4.630 / (2.00 x 2.188 x 4) = 0.265 m/s	= 2.315 / (2.00 x 1.624 x 2)= 0.356 m/s
Headloss at coarse screen	= neglect	= neglect
3.2 Fine Screen		
Openning	= 15 mm	= 15 mm
Type	= Mechanical Rake	= Mechanical Rake
Bottom Elevation	= -30.150 M	= -30.150 M
Channel width	= 2.000 m	= 2.000 m
Number of Screen	= 4 Nos.	= 2 Nos.
Approch water depth		
Avegrage Daily Flow rate	= -28.307 - -30.150 = 1.843 m	= -28.640 - -30.150 = 1.510 m
Maximum hourly Flow rate	= -27.862 - -30.150 = 2.288 m	= -28.426 - -30.150 = 1.724 m
Approch velocity		
Avegrage Daily Flow rate	= 2.315 / (2.00 x 1.843 x 4) = 0.157 m/s	= 1.157 / (2.00 x 1.510 x 2)= 0.192 m/s
Maximum hourly Flow rate	= 4.630 / (2.00 x 2.288 x 4) = 0.253 m/s	= 2.315 / (2.00 x 1.724 x 2)= 0.336 m/s

Item	Final Phase Calculation	Phase 1 Calculation
Headloss at fine screen		
Avegrage Daily Flow rate	= 2.34 x sin70 x (9/15)^(4/3) x(0.157 x 2)^2 / 19.6 = 0.005	= 2.34 x sin70 x (9/15)^(4/3) x(0.192 x 2)^2 / 19.6 = 0.007
Maximum hourly Flow rate	= 2.34 x sin70 x (9/15)^(4/3) x(0.253 x 2)^2 / 19.6 = 0.012	= 2.34 x sin70 x (9/15)^(4/3) x(0.336 x 2)^2 / 19.6 = 0.021
Water Level at downstream of Fine screen		
Avegrage Daily Flow rate	= -28.307 - 0.005 = -28.312 M	= -28.640 - 0.007 = -28.647 M
Maximum hourly Flow rate	= -27.862 - 0.012 = -27.874 M	= -28.426 - 0.021 = -28.447 M
4. Lift Pump		
Type	Vertical shaft Volute type mixed flow pump	
Design Flow rate		
Average Daily Flow rate	= 200,000 m^3/d = 139 m^3/min	= 100,000 m^3/d = 69 m^3/min
Maximum Daily Flow rate	= 264,000 m^3/d = 183 m^3/min	= 132,000 m^3/d = 92 m^3/min
Maximum hourly Flow rate	= 400,000 m^3/d = 278 m^3/min	= 200,000 m^3/d = 139 m^3/min
Pump Capacity		
Number of Pump	= 4 nos	= 2 nos
Pump Capacity	= 278.0 / 4 = 70 m^3/min	= 139.0 / 2 = 70 m^3/min
Pump Diameter	= 146 × (70.0 / 3)^0.5 = 705 = 700 mm	= 146 × (70.0 / 3)^0.5 = 705 = 700 mm
Pump Head		
Discharge water level	= 5.500 M	= 5.500 M
Suction water level	= -27.500 M	= -27.800 M
Actual Pump Head	= 5.500 − -27.500 = 33.000 m	= 5.500 − -27.800 = 33.300 m
Others head loss	= 2.000 m (assumed)	= 2.000 m (assumed)
Total Pump Head	= 33.000 + 2.000 = 35.000 m	= 33.300 + 2.000 = 35.300 m
Motor output	$P = \frac{\rho \times g \times Q \times H}{60 \times 1000 \times \eta} \times (1 + \alpha)$	

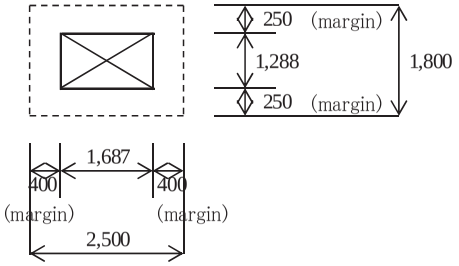
Item	Final Phase Calculation	Phase 1 Calculation
	ρ : Water Density 1,000 kg/m3 g : Acceleration of Gravity 9.8 m/sec2 Q : Flow rate 70 m3/min H : Pump head 35.00 m η : Pump Efficiency 0.8 α : Surplus ratio 0.15	
	$= \frac{1{,}000 \times 9.8 \times 70.0 \times 35.0}{60 \times 1{,}000 \times 0.8} \times (1 + 0.15)$	= Same left
	= 575.2 → 580 kW	= same left
Lift Pimp Specification	Type Vertical shaft Volute type mixed flow pump Diamater 700 mm Capacity 70 m3/min Pump Head 35.00 m Motor output 580 kW Numbers 5 nos (Include 1 stand-by)	Type Vertical shaft Volute type mixed flow pump Diamater 700 mm Capacity 70 m3/min Pump Head 35.30 m Motor output 580 kW Numbers 3 nos (Include 1 stand-by)
5. Grit Chamber		
Type	Aerated Grit Chamber	Aerated Grit Chamber
Design Flow rate		
Avegrage Daily Flow rate	= 264,000 m^3/d	= 132,000 m^3/d
Maximum hourly Flow rate	= 400,000 m^3/d	= 200,000 m^3/d
Detention Time (For Maximum Hourly Flow rate)	= 3 min	= 3 min
Required Volume	= 400,000 ÷ 1,440 × 3 = 834 m^3	= 200,000 ÷ 1,440 × 3 = 417 m^3
No. of basin	= 4 basins	= 2 basins
Required Chamber Volume (each)	= 834 ÷ 4 = 209 m^3	= 417 ÷ 2 = 209 m^3

Item	Final Phase Calculation	Phase 1 Calculation
Depth	= 3.0 m	= 3.0 m
Width	= 4.0 m	= 4.0 m
Length	= 17.5 m	= 17.5 m
Actual Volume	= 4.0 mW × 3.0 mH × 17.5 mL = 210 m^3	= 4.0 mW × 3.0 mH × 17.5 mL = 210 m^3
Required Air (each)	= 17.5 m × 0.3 m^3/min/m = 5.3 m^3/min	= 17.5 m × 0.3 m^3/min/m = 5.3 m^3/min
Total Air supply required	= 5.3 × 4 = 21.2 m^3/min	= 5.3 × 2 = 10.6 m^3/min
Airation Blower		
Number of Blower	= 2 units	= 1 unit
Blower capacity	= 11 m^3/min	= 11 m^3/min
Discharge Pressure		
Diffuser Depth	= 3,000 mmAq	= 3,000 mmAq
Loss of Diffuser	= 750 mmAq	= 750 mmAq
Other loss	= 500 mmAq	= 500 mmAq
Total Pressure	= 4,250 mmAq = 42 kpa	= 4,250 mmAq = 42 kpa
Blower Specification		
Type	= Rotary Roots Blower	= Rotary Roots Blower
Diameter	= 150 mm	= 150 mm
Capacity	= 11 m^3/min	= 11 m^3/min
Discharge Pressure	= 42 kpa	= 42 kpa
Motor Output	= 22 kW	= 22 kW
Qantity	= 3 units (including stand-by 1 unit)	= 2 units (including stand-by 1 unit)
Quantity of Grit at peak flow	Assume a value of 0.05m3/1000m3 at peak flow = 400,000 × 0.05 ÷ 1,000 = 20.0 m^3/d	Assume a value of 0.05m3/1000m3 at peak flow = 200,000 × 0.05 ÷ 1,000 = 10.0 m^3/d

Item		Final Phase Calculation	Phase 1 Calculation
5. Equalizer Tank			
Retention Time		= 4 hour	= 4 hour
Required Volume		= 200,000 / 24 × 4 = 33,333 m^3	= 100,000 / 24 × 4 = 16,667 m^3
Number of Tanks		= 8 tanks	= 4 tanks
Tank volume (each)		= 33,333 / 8 = 4,167 m^3	= 16,667 / 4 = 4,167 m^3
Surface loading		= 50 $m^3/m^2/d$	= 50 $m^3/m^2/d$
Required surface Area		= 200,000 / 50 = 4,000 m^2	= 100,000 / 50 = 2,000 m^2
Tank depth		= 33,333 / 4,000 = 8.30 m	= 16,667 / 2,000 = 8.30 m
Tank Dimension	Width	= 16.0 m	= 16.0 m
	Length	= 31.0 m	= 31.0 m
	Depth	= 8.5 m	= 8.5 m
	Number	= 8 basins	= 4 basins
Actual total surface		= 16.0 × 31.0 × 8 = 3,968 m^2	= 16.0 × 31.0 × 4 = 1,984 m^2
Actual total volume		= 3,968 × 8.5 = 33,728 m^3	= 1,984 × 8.5 = 16,864 m^3
Constant rate Pump		Install Five (5) Pumps per twe (2) tanks	
Pump capacity		= 200,000 / 20 / 1,440 = 6.9 m^3/min	= 100,000 / 8 / 1,440 = 8.7 m^3/min
Pump diameter		= 146 × √(6.9 / 2.5) = 243 mm = 250 mm	= 146 × √(8.7 / 3) = 249 mm = 250 mm
Pump Type		Nonclogging pump	
Pump head		Actual Pump head = 10 m Piping head loss = 4 m Total Pump head = 14 m	
Motor output		$P = \frac{\rho \times g \times Q \times H}{60 \times 1000 \times \eta} \times (1+\alpha)$ $= \frac{1,000 \times 9.8 \times 6.9 \times 14}{60.0 \times 1,000 \times 0.6} \times (1 + 0.2)$	

Item	Final Phase Calculation	Phase 1 Calculation
	= 31.6 → 37 kW	
Pump Specification		
Type	= Nonclogging pump	= Nonclogging pump
Diameter	= 250 mm	= 250 mm
Capacity	= 6.9 m^3/min	= 8.7 m^3/min
Head	= 14 m	= 14 m
Motor output	= 37 kW	= 37 kW
Numbers	= 24 nos. (including 4 standby)	= 12 nos. (including 2 standby)
Mixer for antisettling		
Type	= Submersible propeller Mixer	= Submersible propeller Mixer
Propeller Diameter	= 300 mm	= 300
Motor output	= 2.8 kW	= 2.8
Numbers	= 5 nos./each channel × 4 × 8 = 160 nos.	= 5 nos./each channel × 4 × 4 = 80 nos.
6. Disinfection Tank		
Design Flow (maximum)	= 200,000 m^3/d	= 100,000 m^3/d
Retention Time	= 5 min	= 5 min
Required Tank volume	= 200,000 / 1,440 × 5 = 694 m^3	= 100,000 / 1,440 × 5 = 347 m^3
Tank size Width	= 1.20 m	= 1.20 m
Length	= 70.0 m	= 70.0 m
Depth	= 2.10 m	= 2.10 m
number	= 4 tanks	= 2 tanks
Actual tank volume	= 706 m^3	= 353 m^3
Disinfection chemicals	= Sodium hypochlorite	
Effective chlorine density (β)	= 10 %	
Specific gravity	= 1.1 10% density	
Dosing ratio (α)	= 10 mg/L	

Item	Final Phase Calculation	Phase 1 Calculation
Dosage Capacity		
Maximum consunption q	= Q × α × 10^{-6} × (100 / β) × (1 / γ) = 200,000 × 0.00001 × (100 / 10) × (1 / 1.1) = 18.18 m^3/d = 12.6 L/min	= Q × α × 10^{-6} × (100 / β) × (1 / γ) = 100,000 × 0.00001 × (100 / 10) × (1 / 1.1) = 9.09 m^3/d = 6.3 L/min
Storage tank capacity	2 daays storage, and 1train 1 tank	
Required tank capacity	= 18.18 × 2 / 4 = 9.1 m^3	= 9.09 × 2 / 2 = 9.1 m^3
Number of pump	1 train 1pump and 1 stanby	
Required pump capacity	= 12.6 / 4 = 3.15 L/min	= 6.3 / 2 = 3.15 L/min

Item	Final Phase Calculation	Phase 1 Calculation
6. Membrane Bioreactor Tank (MBR Tank)		
6.1 Tank Volume		
1) MBR tank Volume		
Design flow rate	= 200,000 m^3/d	= 100,000 m^3/d
Design Flux	= 0.42 $m^3/m^2/d$	= 0.42 $m^3/m^2/d$
Required Area of Membrane	= 200,000 / 0.42 = 476,190 m^2	= 100,000 / 0.42 = 238,095 m^2
Membrane Area per unit	= 600 m^2/unit	= 600 m^2/unit
Required number of Membrane unit	= 476,190 / 600 = 794 nos	= 238,095 / 600 = 397 nos
Number of Basin	= 20 basins	= 20 basins
Number of Membrane unit per basin	= 794 / 20 = 40 units	= 397 / 20 = 20 units
Membrane unit size		
Length	= 1,288 mm	= 1,288 mm
Width	= 1,687 mm	= 1,687 mm
Depth	= 2,852 mm	= 2,852 mm
		
Membrane tank size		
Length	= 20.0 m (2.50m x 8units = 20.00m)	= 20.0 m (2.50m x 8units = 20.00m)
Width	= 9.0 m (1.80m x 5units = 9.00m)	= 9.0 m (1.80m x 5units = 9.00m)
Depth	= 5.0 m	= 5.0 m
Numbers	= 20 nos	= 10 nos
Membrane tank volume per unit	= 900 m^3	= 900 m^3
Membrane tank volume	= 900 × 20 = 18,000 m^3	= 900 × 10 = 9,000 m^3
MLSS in Membrane Tank	= 9,000 mg/L	= 9,000 mg/L

Item	Final Phase Calculation	Phase 1 Calculation
3) Aerobic tank volume for BOD removal		
3)-1 BOD removal in Aerobic tank		
Design flow rate	= 200,000 m^3/d	= 100,000 m^3/d
Influent BOD concentration	= 120 mg/L	= 120 mg/L
Influent SS concentration	= 120 mg/L	= 120 mg/L
BOD load	= 200,000 × 120 / 1,000 = 24,000 kg/d	= 100,000 × 120 / 1,000 = 12,000 kg/d
BOD removal rate	= 0.14 kg-BOD/kg-SS/d (25 degrees C)	= 0.14 kg-BOD/kg-SS/d (25 degrees C)
MLSS in MBR tank	= 9,000 mg/L	= 9,000 mg/L
BOD removal rate per unit volume	= 0.14 × 9,000 / 1,000 = 1.26 kg-BOD/m^3	= 0.14 × 9,000 / 1,000 = 1.26 kg-BOD/m^3
Required Aerobic tank volume for BOD	= 24,000 / 1.26 = 19,048 m^3	= 12,000 / 1.26 = 9,524 m^3
3)-2 Nitrification in Aerobic tank		
Design flow rate	= 200,000 m^3/d	= 100,000 m^3/d
Influent BOD concentration	= 120 mg/L	= 120 mg/L
Influent SS concentration	= 120 mg/L	= 120 mg/L
Influent T-N concentration	= 40 mg/L	= 40 mg/L
MLSS in Aerobic tank	= 9,000 mg/L	= 9,000 mg/L
BOD load	= 200,000 × 120 / 1,000 = 24,000 kg/d	= 100,000 × 120 / 1,000 = 12,000 kg/d
T-N load	= 200,000 × 40 / 1,000 = 8,000 kg/d	= 100,000 × 40 / 1,000 = 4,000 kg/d
Excess sludge production rate	= 100 %	= 100 %
Nitrogen concentration in sludge	= 6 %	= 6 %
Nitrogen in excess sludge	= 200,000 × 120 × 0.06 / 1,000 = 1,440 kg/d	= 100,000 × 120 × 0.06 / 1,000 = 720 kg/d
T-N load for nitrification	= 8,000 - 1,440 = 6,560 kg/d	= 4,000 - 720 = 3,280 kg/d
Nitrification rate	= 0.037 kg-N/kg-SS/d (25 degrees C)	= 0.037 kg-N/kg-SS/d (25 degrees C)
MLSS in MBR tank	= 9,000 mg/L	= 9,000 mg/L
Nitrification rate per unit volume	= 0.037 × 9,000 / 1,000 = 0.33 kg-N/m^3	= 0.037 × 9,000 / 1,000 = 0.33 kg-N/m^3
Nitrification in MBR tank	= 19,600 × 0.33 = 6,527 kg-N/d -OK-	= 9,000 × 0.33 = 2,997 kg-N/d
Aerobic tank size		
Length	= 28.0 m	= 28.0 m
Width	= 7.0 m	= 7.0 m
Depth	= 5.0 m	= 5.0 m
Numbers	= 20 nos	= 10 nos
Pre-aeration tank volume per unit	= 980 m^3	= 980 m^3
Pre-aeration tank volume	= 980 × 20 = 19,600 m^3	= 980 × 10 = 9,800 m^3

Item	Final Phase Calculation	Phase 1 Calculation
6.2 Required Air Volume		
1) Oxygen for biological treatment		
1)-1 Required Oxygen for BOD removal		
Design Flow rate	= 200,000 m^3/d	= 100,000 mg/L
Influent BOD concentration	= 120 mg/L	= 120 mg/L
BOD load	= 24,000 kg-BOD/d	= 12,000 kg-BOD/d
Required unit Oxygen for BOD removal	= 0.5 kg-O_2/kg-BOD	= 0.5 kg-O_2/kg-BOD
Required Oxygen for BOD removal	= 24,000 × 0.5 = 12,000 kg-O_2/d	= 12,000 × 0.5 = 6,000 kg-O_2/d
1)-2 Required Oxygen for nitrification		
T-N load for nitrification	= 6,560 kg-N/d	= 3,280 kg-N/d
Required unit Oxygen for nitrification	= 64/14 kg-O_2/kg-N	= 64/14 kg-O_2/kg-N
Required Oxygen for nitrification	= 6,560 × 64/14 = 29,989 kg-O_2/d	= 3,280 × 64/14 = 14,994 kg-O_2/d
1)-3 Required Oxygen for endogenous respiration		
Pre-aeration tank Volume	= 19,600 m^3	= 9,800 m^3
Total tank Volume	= 19,600 m^3	= 9,800 m^3
MLSS in tank	= 9,000 mg/L	= 9,000 mg/L
MLVSS/MLSS	= 0.75	= 0.75
Quantity of MLVSS	= 9,000 × 19,600 × 0.750 / 1,000	= 9,000 × 9,800 × 0.750 / 1,000
	= 132,300 kg/d	= 66,150 kg/d
Required unit Oxygen for endogenous respiration	= 0.12 kg-O_2/kg-VSS	= 0.12 kg-O_2/kg-VSS
Required Oxygen for endogenous respiration	= 132,300 × 0.12 = 15,876 kg-O_2/d	= 66,150 × 0.12 = 7,938 kg-O_2/d
1)-4 Total required Oxygen for biological treatment (AOR)	= 12,000 + 29,989 + 15,876 = 57,865 kg-O_2/d	= 6,000 + 14,994 + 7,938 = 28,932 kg-O_2/d
1)-5 Standard Oxygen Requirement (SOR)	$= \frac{AOR \times Csw \times r \times 760}{1.024^{(T-20)} \times \alpha \times (\beta \cdot Cs \cdot r - CA) \times P}$	

Item		Final Phase Calculation	Phase 1 Calculation
		C_{SW} ; Oxygen saturation concentration in clean water at 20 Celsius = 8.84 mg/L Ca ; Average DO = 1.5 mg/L Cs ; Oxygen saturation concentration in clean water at 25 Celsius = 8.39 mg/l T ; water temperature = 25 degees C r ; Coefficient of water depth $r = 1 + \frac{(H/2)}{10.332} = 1.23$ H ; Average depth of air diffuser = 4.80 m α ; 0.93 β ; 0.97 P ; 760	
	SOR	= 70,585 kg as O_2/d	= 35,292 kg as O_2/d
1)-6 Required Air Volime (Gs)			
	Gs	$= \frac{SOR}{E_A \times \rho \times Ow} \times \frac{273 + T}{273}$ E_A ; Oxygen Transfer Efficiency (28 %) ρ ; Air Density (1.293 kg/m^3N-Air) Ow ; Oxygen Content in Air (0.232 kg-O_2/m^3N-Air) T ; water temperature = 25 degees C	
	Gs	$= \frac{70,585}{28 \times 1.293 \times 0.232} \times 100 \times \frac{273 + 25}{273}$	$= \frac{35,292}{28 \times 1.293 \times 0.232} \times 100 \times \frac{273 + 25}{273}$
		= 917,321 Nm^3/d = 637 Nm^3/min = 32 Nm^3/min/each tank	= 458,654 Nm^3/d = 319 Nm^3/min = 32 Nm^3/min/each tank

Item		Final Phase Calculation		Phase 1 Calculation	
2) Air volume for Membrane air scrubbing					
Air volume of one(1) membrane unit		= 0.18	Nm^3/min/module x 20module/unit	= 0.18	Nm^3/min/module x 20module/unit
		= 3.6	Nm^3/min/unit	= 3.6	Nm^3/min/unit
Number of unit		= 800	units	= 400	units
Total Air volume for membrane		= 800 × 3.6 =	2,880 Nm^3/min	= 400 × 3.6 =	1,440 Nm^3/min
		= 144	Nm^3/min/each tank	= 144	Nm^3/min/each tank
7. Aeration Blowers					
7.1 Required Air Volume per each Tank					
		consider about 10% allowance			
for Aeration Tank		= 32 × 1.1 = 35	Nm^3/min/each tank	= 32 × 1.1 = 35	Nm^3/min/each tank
for MBR Tank		= 144 × 1.1 = 158	Nm^3/min/each tank	= 144 × 1.1 = 158	Nm^3/min/each tank
7.2 Number of Actual working Blower per each tank					
for Aeration Tank	N	= 1	unit	= 1	unit
for MBR Tank	N	= 4	unit	= 4	unit
7.3 Blower Capacity					
for Aeration Tank	G	= 32 / 1 = 32	m^3/min	= 32 / 1 = 32	m^3/min
for MBR Tank	G	= 144 / 4 = 36	m^3/min	= 144 / 4 = 36	m^3/min
7.4 Discharge pressure					
1) for Aeration Tank					
Diffuser Depth		= 4,800	mmAq	= 4,800	mmAq
Loss of Diffuser		= 1,100	mmAq	= 1,100	mmAq
Other loss		= 1,000	mmAq	= 1,000	mmAq
Total Pressure		= 6,900 mmAq =	68 kpa	= 6,900 mmAq =	68 kpa
2) for MBR Tank					
Diffuser Depth		= 4,800	mmAq	= 4,800	mmAq
Loss of Diffuser		= 750	mmAq	= 750	mmAq
Other loss		= 1,000	mmAq	= 1,000	mmAq
Total Pressure		= 6,550 mmAq =	64 kpa	= 6,550 mmAq =	64 kpa

Item	Final Phase Calculation	Phase 1 Calculation
7.5 Blower Specification		
1) for Aeration Tank		
Type	Turbo Blower (single stage oilless)	Turbo Blower (single stage oilless)
Diameter	200 mm	200 mm
Capacity	120 m^3/min	120 m^3/min
Discharge Pressure	5000 mmAq	5000 mmAq
Motor Output	220 kW	220 kW
Qantity	10 units (including stand-by 2 units)	5 units (including stand-by 1 units)
2) for MBR Tank		
Type	Turbo Blower (single stage oilless)	Turbo Blower (single stage oilless)
Diameter	200 mm	200 mm
Capacity	245 m^3/min	245 m^3/min
Discharge Pressure	5000 mmAq	5000 mmAq
Motor Output	450 kW	450 kW
Qantity	14 units (including stand-by 2 units)	7 units (including stand-by 1 units)
7.6 Excess Sludge pump		
Drawing Sludge Volume	= 2,719 m^3/d = 1.9 m^3/min	= 1,359 m^3/d = 0.9 m^3/min
Number of Pump	1 pump per 1 train (5 Tanks)	
Type	Non-clog type sludge pump	Non-clog type sludge pump
Diameter	100 mm	100 mm
Capacity	1.0 m^3/min	1.0 m^3/min
Discharge Pressure	12 m	12 m
Motor Output	11 kW	11 kW
Qantity	8 nos. Including 4 standby	4 nos. Including 2 standby

Item	Final Phase Calculation	Phase 1 Calculation
8. Dewatering Facility		
8.1 Design Condition		
Input Sludge Solids quantity	= 24.462 t/d	= 12.237 t/d
Input Sludge Solids Concentration	= 0.9 %	= 0.9 %
Input Sludge Volume	= 2,718 m^3/d	= 0 m^3/d
Operation time	= 23 hr/d	= 23 hr/d
Dehydrater Type	= Pressing Rotary Outer Cylinder-type Screw Press (Hybrid type)	= Pressing Rotary Outer Cylinder-type Screw Press (Hybrid type)
Screen Diameter	= 800 mm	= 800 mm
Filtration rate	= 320 kg-DS/hr	= 320 kg-DS/hr
8.2 Required number of Dehydrater	= 24.462 / 0.32 / 23 = 3.3 = 4 nos	= 12.237 / 0.32 / 23 = 1.7 = 2 nos
8.3 Dehydrater Specifications		
Type	= Pressing Rotary Outer Cylinder-type Screw Press (Hybrid type)	= Pressing Rotary Outer Cylinder-type Screw Press (Hybrid type)
Screen Diameter	= 800 mm	= 800 mm
Input Sludge Concentration	= 0.9 %	= 0.9 %
Filtration rate	= 320 kg-DS/hr	= 320 kg-DS/hr
Operation time	= 23 hr/d	= 23 hr/d
Dosage type	= Organic Polymer (Cation)	= Organic Polymer (Cation)
Dosage rate	= 1.7 %	= 1.7 %
Total Motor power	= 1.7 kW/1 unit	= 1.7 kW/1 unit
Numbers	= 5 nos. including 1 standby	= 3 nos. including 1 standby

(3) Main Equipment List

Facility : Lift Pump and Grit Chamber Facility

No.	Equipment	Brief Spec.	Quantity			Motor output (kW)	Remarks
			Phase I	Final Phase			
				Expan-sion	Total		
1	Inflow gate	Electrical motor operation cast iron sluice gate 1.0mW x 2.0mH	2	2	4	3.7	
2	Coarse screen	Flat bar screen (manual raking) Spacing 100mm (2.5mW x 4.8mH, 65 deg installation)	2	2	4	-	
3	Fine Screen	Single rake automatic Screen Spacing 15mm (2.5mW x 4.8mH, 70 deg installation)	2	2	4	2.2	
4	Lift pump	Vertical shaft Volute type mixed flow pump 700mm x 70.0m3/min x 34.5mH	3	2	5	570	Include 1 standby
5	Flow meter	Ultrasonic type Diameter 700mm	3	2	5		
6	Hoist	Electric motor operation hoist lifting capacity : 10 ton	1	0	1	5.0 0.85	(hoisting) (traveling)
8	Pump up well connection gate	Manual operation cast iron sluice gate 1.5 mW x 1.5 mH	1	0	1	-	
9	Outflow gate	Electrical motor operation cast iron sluice gate 1.0 mW x 1.2 mH	4	0	4	3.7	
10	Grit collector	Screw type collector screw diameter 300mm, length 15.0m	2	2	4	5.5	
11	Grit lifting Pump	Submersible sludge pump 80mm x 0.5m3/min x 10m	2	2	4	5.5	
12	Air Blower	Rotary Roots Blower 150mm x 11m3/min x 42kpa	2	1	3	22	Including 1 standby

Facility : Equalization Tank Facility

No.	Equipment	Brief Spec.	Quantity			Motor output (kW)	Remarks
			Phase I	Final Phase			
				Expan-sion	Total		
1	Inflow weir gate	Manual operation cast iron weir type gate 0.6 mW x 0.6 mH	16	16	32		
2	Constant rate pump	Nonclogging pump 250mm x 8.7m3/min x 14m	12	12	24	44	Phase1 including 4 standby Final phase including 4 standby
3	Mixer for antisettling	Submersible propeller type propeller diameter 300mm	80	80	160	2.8	

Facility : Membrane Reactor process Facility

No.	Equipment	Brief Spec.	Quantity			Motor output (kW)	Remarks
			Phase I	Final Phase			
				Expan-sion	Total		
1	Ultra fine screen	Drum Screen Spacing 1mm capacity 420m3/h or more	10	10	20	0.4	
2							
3	Aerobic tank Air diffuser	Membrane panel type Whole floor aeration	10	10	20	-	
4	Aeration Blower for BOD removal	Turbo Blower (single stage oilless) 120m3/min x 68kps	5	5	10	220	Phase1 including 1 standby Final phase including 2 standby
5	Membrane unit	Hollow fiber membrane Membrane area 600m2/unit	20	20	40		
6	Permeate pump	centrifugal pump 11m3/min x 7m	10	10	20	22	
7	Aeration Blower for membrane scrubbing	Turbo Blower (single stage oilless) 245m3/min x 64kps	7	7	14	450	Phase1 including 11 standby Final phase including 2 standby
9	Excess Sludge Pump	Non-clog type Sludge Pump	4	4	8	11	Phase1 including 2 standby Final phase including 2 standby

Facility : Disinfection Facility

No.	Equipment	Brief Spec.	Quantity			Motor output (kW)	Remarks
			Phase I	Final Phase			
				Expan-sion	Total		
1	Sodium hypochlorite storage tank	Fiberglass plastic construction cylindrical tank 10m3	2	2	4		
2	Sodium hypochlorite dosing pump	Diaphragm pump 15mm dia. x 3.2L/min x 0.2MPa	4	4	8	0.4	Phase1 including 2 standby Final phase including 2 standby

Facility : Dewatering Facility

No.	Equipment	Brief Spec.	Quantity			Motor output (kW)	Remarks
			Phase I	Final Phase			
				Expan-sion	Total		
1	Excess sludge mixer	Vertical shaft paddle mixer	2	0	2	11	
2	Excess sludge feed pump	Progressive cabity pump 125mm x 4.3 - 35m3/h	3	2	5	11	including 1 standby
3	Dehydrater	Pressing Rotary Outer Cylinder -type Screw Press (Hybrid type) Screen diameter 800 mm	3	2	5	1.7	including 1 standby

Facility : Electrical Facility

No.	Equipment	Brief Spec.	Quantity			Motor output (kW)	Remarks
			Phase I	Final Phase			
				Expan-sion	Total		
1	Transfformer	20kV/380V 50Hz 3,200kVA	2	2	4		
2	Generater	380V 50Hz 3,700kVA Gas turbine engine 4,000Ps or more	1	1	2		

(4) Hydraulic Calculation

1. Basic Conditions

（１） Name of WWTP　JKT Central treatment Plant
（２） Wastewater Treatment Process　Conventional Activated Sludge
（３） Design Flowrate

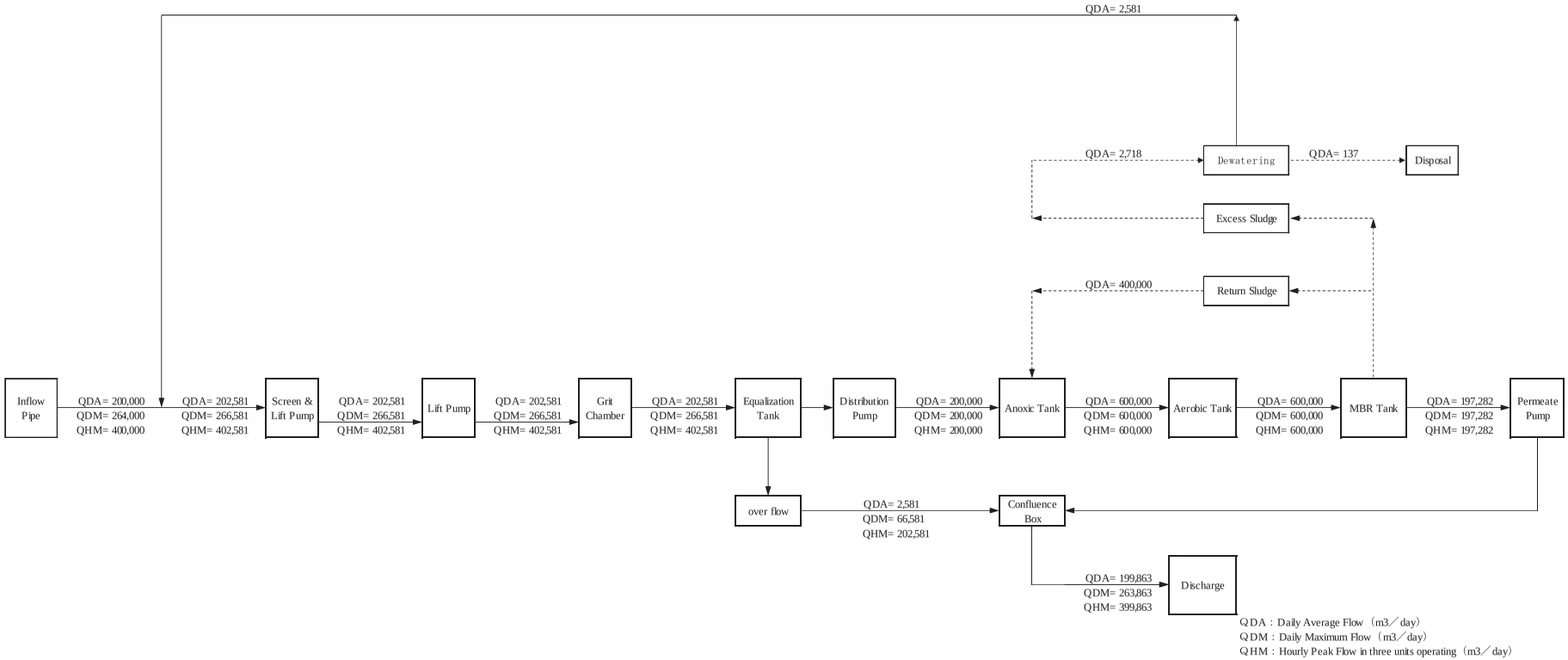
Design Flowrate	Final Phase		First Phase	
	m^3/d	m^3/s	m^3/d	m^3/s
Average Daily Flowrate	200,000	2.315	100,000	1.157
Maximum Daily Flowrate	264,000	3.056	132,000	1.528
Maximum Hourly Flowrate	400,000	4.630	200,000	2.315

（４） Inflow Pipe
Pipe Diameter　φ2,200mm

（５） Discharge
River　BANJIL KANAL
Design High Water Level　+4.30 M

（６） Planned Ground Level
Existing Ground Level　+4.30 M ～　+4.50 M
Planned Ground Level　+4.50 M

2. Water Mass Balance



Point ［Discharge Conduit (1)］　※Gravity flow

Formula:Manning

Content		Symbol	Case		
			Q DM	Q HM	
Flowrate	(m^3/d)	Q	200,000	400,000	
	(m^3/s)		2.315	4.630	
Number of pipes	(pipe)	n	1	2	
Flowrate/pipe	(m^3/s)	q	2.315	2.315	
Schematic Diagram			Box Culvert 2 serises Width 1.5 m Depth 1.5 m		
Length	(m)	L	9	n=0.014	
Invert Elevation	(M)	FH	+1.500		
Water Depth	(m)	H'	1.500	1.500	Ho-FH
Cross Section	(m^2)	A	2.25	2.25	
Wetted Perimeter	(m)	P	6.00	6.00	
Hydraulic Radius	(m)	R	0.375	0.375	A/P
Velocity	(m/s)	V	1.029	1.029	q/A
Hydraulic Gradient	(‰)	I	0.767	0.767	$(n*V/R^{2/3})^2$
Down stream WL	(M)	Ho	+4.300	+4.300	
HEAD LOSS Outflow	(m)		0.054	0.054	$1.0*(V^2/2g)*(Nm+1)$
Friction	(m)		0.007	0.007	I*L
Inflow	(m)		0.027	0.027	$0.5*(V^2/2g)*(Nm+1)$
Total	(m)	h	0.088	0.088	
Water Level	(M)	H	+4.388	+4.388	Ho+h

Point ［Discharge Conduit (2)］　※Gravity flow

Formula:Manning

Contents		Symbol	Case		
			Q DM	Q HM	
Flowrate	(m^3/d)	Q	100,000	200,000	
	(m^3/s)		1.157	2.315	
Number of pipes	(pipe)	n	1	1	
Flowrate/pipe	(m^3/s)	q	1.157	2.315	
Schematic Diagram			Box Culvert 1 serises Width 1.5 m Depth 1.5 m		
Length	(m)	L	130.00	n=0.014	
Invert Elevation	(M)	FH	+1.500		
Water Depth	(m)	H'	1.500	1.500	Ho-FH
Cross Section	(m^2)	A	2.25	2.25	B*H'
Wetted Perimeter	(m)	P	6.00	6.00	2*H'+B
Hydraulic Radius	(m)	R	0.375	0.375	A/P
Velocity	(m^3/s)	V	0.514	1.029	p/A
Hydraulic Gradient	(‰)	I	0.191	0.767	$(n*V/R^{2/3})^2$
Down stream WL	(M)	Ho	+4.388	+4.388	
HEAD LOSS Outflow	(m)		0.013	0.054	$1.0*(V^2/2g)*1$
HEAD LOSS Friction	(m)		0.025	0.100	I*L
HEAD LOSS Refraction (90^o)	(m)		0.013	0.053	$0.99*(V^2/2g)*1$
HEAD LOSS Inflow	(m)		0.007	0.027	$0.5*(V^2/2g)*(Nm+1)$
HEAD LOSS Total	(m)	h	0.058	0.234	
Water Level	(M)	H	+4.446	+4.622	Ho+h

Point ［Discharge Channel (1)］　※Gravity flow

Formula:Manning

Contents		Symbol	Case		
			Q DM	Q HM	
Flowrate	(m^3/d)	Q	0	50,000	
	(m^3/s)		0	0.579	
Number of pipes	(pipe)	n	1	1	
Flowrate/pipe	(m^3/s)	q	0.000	0.579	
Schematic Diagram			Channel 1 serises Width 1.0 m Depth 2.0 m		
Length	(m)	L	73.80	n=0.014	
Invert Elevation	(M)	FH	+2.500		
Water Depth	(m)	H'	1.946	2.122	Ho-FH
Cross Section	(m^2)	A	1.946	2.122	B*H'
Wetted Perimeter	(m)	P	4.89	5.24	2*H'+B
Hydraulic Radius	(m)	R	0.398	0.405	A/P
Velocity	(m^3/s)	V	0	0.273	p/A
Hydraulic Gradient	(‰)	I	0.000	0.049	$(n*V/R^{2/3})^2$
Down stream WL	(M)	Ho	+4.446	+4.622	
HEAD LOSS Outflow	(m)		0.000	0.004	$1.0*(V^2/2g)*1$
HEAD LOSS Friction	(m)		0.000	0.004	I*L
HEAD LOSS					
HEAD LOSS Inflow	(m)		0.000	0.002	$0.5*(V^2/2g)*(Nm+1)$
HEAD LOSS Total	(m)	h	0	0.01	
Water Level	(M)	H	+4.446	+4.632	Ho+h

Point ［Discharge Channel (2)］　※Gravity flow

Formula:Manning

Contents		Symbol	Case		
			Q DM	Q HM	
Flowrate	(m^3/d)	Q	0	50,000	
	(m^3/s)		0	0.579	
Number of pipes	(pipe)	n	1	1	
Flowrate/pipe	(m^3/s)	q	0.000	0.579	
Schematic Diagram			Channel 1 serises Width 1.0 m Depth 2.0 m		
Length	(m)	L	17.00	n=0.014	
Invert Elevation	(M)	FH	+2.500		
Water Depth	(m)	H'	1.946	2.132	Ho-FH
Cross Section	(m^2)	A	1.946	2.132	B*H'
Wetted Perimeter	(m)	P	4.89	5.26	2*H'+B
Hydraulic Radius	(m)	R	0.398	0.405	A/P
Velocity	(m^3/s)	V	0	0.272	p/A
Hydraulic Gradient	(‰)	I	0.000	0.048	$(n*V/R^{2/3})^2$
Down stream WL	(M)	Ho	+4.446	+4.632	
HEAD LOSS Outflow	(m)		0.000	0.004	$1.0*(V^2/2g)*1$
HEAD LOSS Friction	(m)		0.000	0.001	I*L
HEAD LOSS					
HEAD LOSS Inflow	(m)		0.000	0.002	$0.5*(V^2/2g)*(Nm+1)$
HEAD LOSS Total	(m)	h	0	0.007	
Water Level	(M)	H	+4.446	+4.639	Ho+h

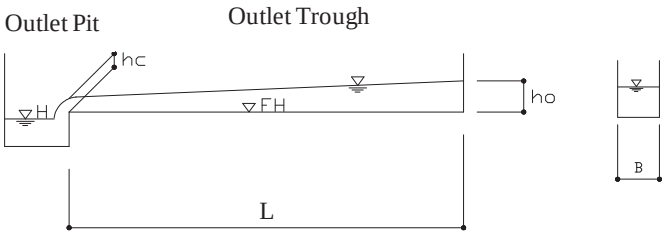
Point ［Discharge Channel (3)］　※Gravity flow

Formula:Manning

Contents		Symbol	Case		
			Q DM	Q HM	
Flowrate	(m^3/d)	Q	0	25,000	
	(m^3/s)		0	0.289	
Number of pipes	(pipe)	n	1	1	
Flowrate/pipe	(m^3/s)	q	0.000	0.289	
Schematic Diagram			Channel 1 serises Width 1.0 m Depth 2.0 m		
Length	(m)	L	17.00	n=0.014	
Invert Elevation	(M)	FH	+2.500		
Water Depth	(m)	H'	1.946	2.139	Ho-FH
Cross Section	(m^2)	A	1.946	2.139	B*H'
Wetted Perimeter	(m)	P	4.89	5.28	2*H'+B
Hydraulic Radius	(m)	R	0.398	0.405	A/P
Velocity	(m^3/s)	V	0	0.135	p/A
Hydraulic Gradient	(‰)	I	0.000	0.012	$(n*V/R^{2/3})^2$
Down stream WL	(M)	Ho	+4.446	+4.639	
HEAD LOSS Outflow	(m)		0.000	0.001	$1.0*(V^2/2g)*1$
HEAD LOSS Friction	(m)		0.000	0.000	I*L
HEAD LOSS					
HEAD LOSS Inflow	(m)		0.000	0.000	$0.5*(V^2/2g)*(Nm+1)$
HEAD LOSS Total	(m)	h	0	0.001	
Water Level	(M)	H	+4.446	+4.640	Ho+h

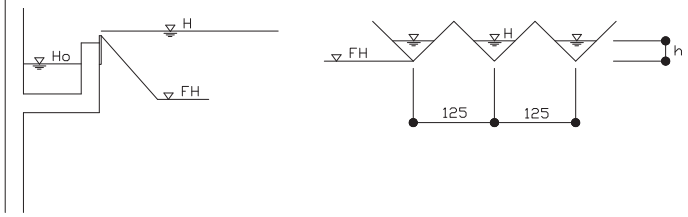
Point ［Equalization Tank］ Outflow Though

Formula : Thomas Gump

Contents		Symbol	Case		
			Q DM	Q HM	
Flowrate	(m^3/d)	Q	0	50,000	
	(m^3/s)		0.000	0.579	
Number of pipes	(pipe)	n	16	16	
Flowrate/pipe	(m^3/s)	q	0	0.0361875	
Schematic Diagram					
Length	(m)	L	8.000 m		
Width	(m)	B	0.400		
Invert Elevation	(M)	FH	+4.700		
Critical depth	(m)	hc	0	0.094	$(q^2/9.8*B^2)^{1/3}$
Upper Water Depth	(m)	ho	0.000	0.163	$\sqrt{}$3*hc
Lower Water Level	(M)	Ho	+4.446	+4.640	
HEAD LOSS					
Water Level	(M)	H	+4.700	+4.863	FH+ho

Point ［Equalization Tank］　Outflow V-notch

Formula：Thompson

Contents		Symbol	Case		
			Q DM	Q HM	
Flowrate	(m^3/d)	Q	0	50,000	
	(m^3/s)		0	0.579	
Number of pipes	(pipe)	n	1040	1040	
Flowrate/pipe	(m^3/s)	q	0.000 ×10^{-5}	55.673 ×10^{-5}	
Schematic Diagram			Outlet Trough　Final Sedimentation Tank 		
Length	(m)	D	128.00	m (8.00 × 16)	
Number of Notch		n	1040	(8.0m / 0.125m = 64)	
Weir Elevation	(M)	FH	+4.900		
Lower Water Level	(M)	Ho	+4.700	+4.863	
WATER DEPTH	Complete Overflow (m)	h	0	0.043	(q/1.42)^(2/5)
Water Level	(M)	H	+4.900	+4.943	FH+h
Equalization Tank Base Level			-3.100		H-8.00

Point ［Equalization Tank］ Inflow gate

Formula:Manning

Contents		Symbol	Case		
			Q DM	Q HM	
Flowrate	(m^3/d)	Q	50,000	100,000	
	(m^3/s)		0.579	1.157	
Number of pipes	(pipe)	n	8	8	
Flowrate/pipe	(m^3/s)	q	0.072	0.145	
Schematic Diagram					
Gate Width	(M)	B	0.400	m	
Bottom Elevation	(M)	FH	+4.400		
Water Depth	(m)	H'	0.500	0.543	Ho-FH
Cross Section	(m^2)	A	0.2	0.2172	B*H'
Velocity	(m^3/s)	V	0.362	0.666	q/A
Down stream WL	(M)	Ho	+4.900	+4.943	
HEAD LOSS					
	Outflow (m)		0.007	0.023	$1.0*(V^2/2g)*1$
	Inflow (m)		0.003	0.011	$0.5*(V^2/2g)*(Nm+1)$
	Total (m)	h	0.003	0.034	
Water Level	(M)	H	+4.903	+4.977	FH+h

Point ［Equalization Tank］ Distribution Channel (1)

Formula:Manning

Contents		Symbol	Case		
			Q DM	Q HM	
Flowrate	(m^3/d)	Q	25,000	50,000	
	(m^3/s)		0.289	0.579	
Number of pipes	(pipe)	n	1	1	
Flowrate/pipe	(m^3/s)	q	0.289	0.579	
Schematic Diagram			Channel 1 serises Width 1.5 m Depth 2.0 m		
Length	(m)	L	17.00	n=0.014	
Invert Elevation	(M)	FH	+4.000		
Water Depth	(m)	H'	0.903	0.977	Ho-FH
Cross Section	(m^2)	A	1.3545	1.4655	B*H'
Wetted Perimeter	(m)	P	3.31	3.45	2*H'+B
Hydraulic Radius	(m)	R	0.410	0.424	A/P
Velocity	(m^3/s)	V	0.213	0.395	p/A
Hydraulic Gradient	(‰)	I	0.029	0.096	$(n*V/R^{2/3})^2$
Down stream WL	(M)	Ho	+4.903	+4.977	
HEAD LOSS					
	Friction (m)		0.000	0.002	I*L
	Total (m)	h	0	0.002	
Water Level	(M)	H	+4.903	+4.979	Ho+h

Point ［Equalization Tank］ Distribution Channel (2)

Formula:Manning

Contents		Symbol	Case		
			Q DM	Q HM	
Flowrate	(m^3/d)	Q	50,000	100,000	
	(m^3/s)		0.579	1.157	
Number of pipes	(pipe)	n	1	1	
Flowrate/pipe	(m^3/s)	q	0.579	1.157	
Schematic Diagram			Channel 1 serises Width 1.5 m Depth 2.0 m		
Length	(m)	L	17.00	n=0.014	
Invert Elevation	(M)	FH	+4.000		
Water Depth	(m)	H'	0.903	0.979	Ho-FH
Cross Section	(m^2)	A	1.3545	1.4685	B*H'
Wetted Perimeter	(m)	P	3.31	3.46	2*H'+B
Hydraulic Radius	(m)	R	0.410	0.425	A/P
Velocity	(m^3/s)	V	0.427	0.788	p/A
Hydraulic Gradient	(‰)	I	0.117	0.381	$(n*V/R^{2/3})^2$
Down stream WL	(M)	Ho	+4.903	+4.979	
HEAD LOSS					
	Friction (m)		0.002	0.006	I*L
	Inflow (m)		0.005	0.016	$0.5*(V^2/2g)*(Nm+1)$
	Total (m)	h	0.007	0.022	
Water Level	(M)	H	+4.910	+5.001	Ho+h

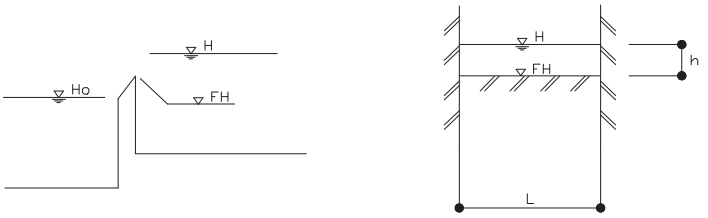
Point ［Equalization Tank to Grit chamer］ Connection conduit (1)

Formula:Manning

Contents		Symbol	Case		
			Q DM	Q HM	
Flowrate	(m^3/d)	Q	100,000	200,000	
	(m^3/s)		1.157	2.315	
Number of pipes	(pipe)	n	1	1	
Flowrate/pipe	(m^3/s)	q	1.157	2.315	
Schematic Diagram			Channel 1 serises Width 1.5 m Depth 1.5 m		
Length	(m)	L	42.00	n=0.014	
Invert Elevation	(M)	FH	+1.500		
Water Depth	(m)	H'	1.500	1.500	Ho-FH
Cross Section	(m^2)	A	2.25	2.25	B*H'
Wetted Perimeter	(m)	P	6.00	6.00	2*H'+B
Hydraulic Radius	(m)	R	0.375	0.375	A/P
Velocity	(m^3/s)	V	0.514	1.029	p/A
Hydraulic Gradient	(‰)	I	0.191	0.767	$(n*V/R^{2/3})^2$
Down stream WL	(M)	Ho	+4.910	+5.001	
HEAD LOSS Outflow	(m)		0.013	0.054	$1.0*(V^2/2g)*(Nm+1)$
HEAD LOSS Friction	(m)		0.008	0.032	I*L
HEAD LOSS					
HEAD LOSS Inflow	(m)		0.007	0.027	$0.5*(V^2/2g)*(Nm+1)$
HEAD LOSS Total	(m)	h	0.028	0.113	
Water Level	(M)	H	+4.938	+5.114	Ho+h

Point ［Grit Chamber］　Outfall weir

Formula：Francis

Contents		Symbol	Case		
			Q DM	Q HM	
Flowrate	(m^3/d)	Q	200,000	400,000	
	(m^3/s)		2.315	4.63	
Number of pipes	(pipe)	n	4	4	
Flowrate/pipe	(m^3/s)	q	0.579	1.158	
Schematic Diagram					
Weir Width	(m)	B	3.00		
Weir Height	(M)	FH	+5.200		
Lower Water Level	(M)	Ho	+4.938	+5.114	
WATER DEPTH	Complete Overflow (m)	h	0.222	0.353	(q/1.84*L)^(2/3)
Water Level	(M)	H	+5.422	+5.553	FH+h

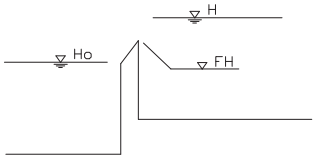
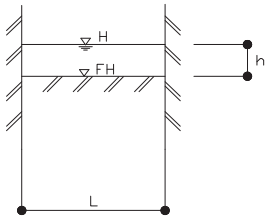
Point ［Grit Chamber］ Inflow Channel

Formula:Manning

Contents		Symbol	Case		
			Q DM	Q HM	
Flowrate	(m^3/d)	Q	200,000	400,000	
	(m^3/s)		2.315	4.630	
Number of pipes	(pipe)	n	4	4	
Flowrate/pipe	(m^3/s)	q	0.579	1.158	
Schematic Diagram			Channel 1 serises Width 1.0 m Depth 2.0 m		
Length	(m)	L	4.50	n=0.014	
Invert Elevation	(M)	FH	+4.000		
Water Depth	(m)	H'	1.422	1.553	Ho-FH
Cross Section	(m^2)	A	1.422	1.553	B*H'
Wetted Perimeter	(m)	P	4.34	4.61	2*H'+B
Hydraulic Radius	(m)	R	0.327	0.337	A/P
Velocity	(m^3/s)	V	0.407	0.746	p/A
Hydraulic Gradient	(‰)	I	0.144	0.465	$(n*V/R^{2/3})^2$
Down stream WL	(M)	Ho	+5.422	+5.553	
HEAD LOSS Outflow	(m)		0.008	0.028	$1.0*(V^2/2g)*(Nm+1)$
Friction	(m)		0.001	0.002	I*L
Inflow	(m)		0.004	0.014	$0.5*(V^2/2g)*(Nm+1)$
Total	(m)	h	0.013	0.044	
Pump Discharge Well Water Level	(M)	H	+5.435	+5.597	Ho+h

Point ［Grit Chamber］ Inflow Channel

Formula：Francis

Contents		Symbol	Case		
			Q DM	Q HM	
Flowrate	(m^3/d)	Q	150,000	200,000	QDM=Q*1/4, QHM=Q*1/3
	(m^3/s)		1.736	2.315	
Number of pipes	(pipe)	n	2	2	
Flowrate/pipe	(m^3/s)	q	0.868	1.158	
Schematic Diagram			 		
Weir Width	（m）	L	0.50		
Weir Height	(M)	FH	+4.000		
Lower Water Level	(M)	Ho	+5.422	+5.553	
WATER DEPTH Complete Overflow	(m)	h	0.962	1.165	(q/1.84*L)^(2/3)
WATER DEPTH					
WATER DEPTH					
WATER DEPTH					
Water Level	(M)	H	+4.962	+5.165	FH+h
Base Level			+4.000		

3. Results of Survey for Affordability and WTP of Household

【Outline of Affordability Survey】

Affordability: To evaluate affordability by examining the cost of relevant consumables in household expenditure as same value as exploited by water environment improvement.

【Outline of WTP , Willingness to Pay, Survey】

Background of WTP and CVM

CVM (Contingent Valuation Method): to valuate extensive role of infrastructure, value of which is not prevalent to commercial market.

Role of Sewerage System: to improve sanitation and public health, to mitigate storm water inundation, to conserve water environment and water resource, and to create aesthetic urban view and amenity spot

WTP (Willingness to Pay): to evaluate the willingness to pay examined by statistical analysis of contingent valuation, CVM questionnaire survey

Study Scheme and Procedure of Survey

RDD（Random Digit Detecting）extracts recipients and questionnaire is mailed.

Survey area: Planned Central Sewerage Served Area in Jakarta

Sampling number: 60 samples, which is equivalent to 87% of reproducibility

Questionnaire is designed to “Double-Bounded Dichotomous Choice” and elaborated by pre-test.

Contingent situation of “Assumption of water environment” is carefully explained to Questionee since “Relation of water environment and role of sewerage” or “Before/after of sewerage system” is sometimes difficult to be understood.

Table-1 Presented Amount to Double-Bounded Dichotomous Choice of CVM Survey

Bound	**Presented Amount (IDR. /month/household)**											
1st bound	5,000		10,000		15,000		20,000		30,000		50,000	
2nd bound	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
	2,500	7,500	5,000	15,000	10,000	20,000	15,000	25,000	20,000	40,000	30,000	70,000
Sample Number	10		10		10		10		10		10	

(Reference)

Table-2 Sample Number of household of PD PAL Jaya customers classified in monthly income.

Group	Type A	Type B	Type C	Type D	Total
Electricity consumption	450～ 900VA	900～ 1,300VA	1,300～ 2,200VA	2,200VA～	-
Number of Customer of PD Pal Jaya	896 (79%)	196 (17%)	20 (2%)	25 (2%)	1,137
Income Level	Low	Middle	High		-

Sample number of 60 is allocated to three income levels as same rate as PD Pal Jaya customer Type A through Type D.

(Reference No._____)

Questionnaire "Affordability & WTP" Survey
on
Wastewater Management in DKI Jakarta

Part-1 General Information of Questionee

Please check by (✓) on Yes( ) No ( ) of Q-1 through Q-5.

Address Kec. Kel.
No. of Family Member: persons Area of Floor: m^2
Monthly Household Income IDR/month
Monthly Household Income IDR/month
Immovable property tax (Asset tax) IDR/year
Electricity Consumption (✓)

Type-A	Type-B	Type-C	Type-D
( ) 450-900 VA	( ) 900-1,300 VA	( ) 1,300-2,200 VA	( ) 2,200 VA ~

Q-1

Which is your water supply? ( ) Piped(Tap) water ( ) Well ( ) Both
How much do you pay for water supply? IDR/month
How many and how much pay of 5 gallon-bottled water? bottles IDR/month

Q-2

Do you know water pollution caused by wastewater discharge of household and municipality activities?

Yes( ) No( )

Q-3

Do you know the role of sewerage system as followings?

Yes( ) No( )

Roles of sewerage system:

to improve sanitation and public health,
to mitigate storm water inundation,
to conserve water environment and water resource, and
to create aesthetic urban view and amenity spot

Part-2 Affordability Survey and WTP (Willingness to Pay) Survey

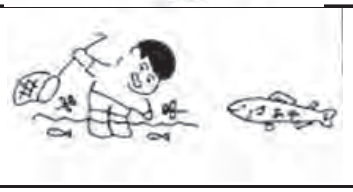
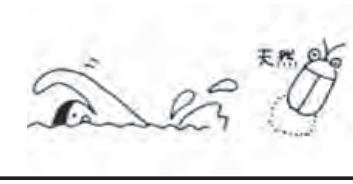
Please answer to Q-4 and Q-5&6, on the assumption that water environment is polluted and sewerage system restores as follows.

Present water environment is (D-level)
- Polluted and offensive odor
- Debris deposits
- Unhygienic and caused habitual diarrhea

After sewerage system improves water quality level to:
- Boatable（C）
- Fishable（B）

Water cleaned up to "Boatable"

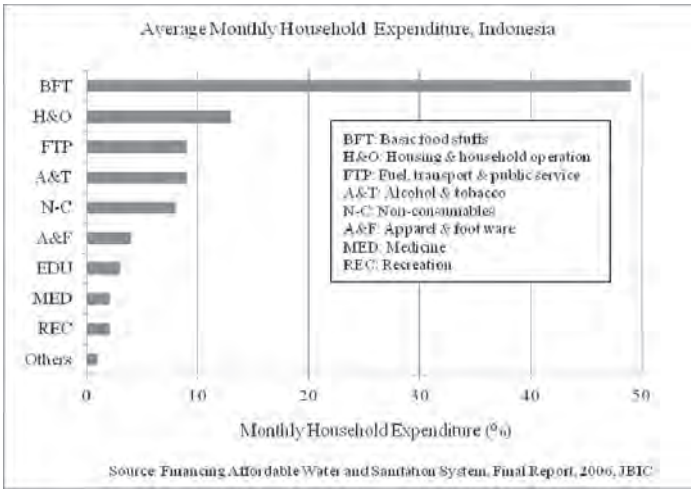
Relation between water quality level and water life

Water quality level		
Polluted ↑	D – level Polluted Offensive odor	
	C – level Raise to boatable/ fishable level	
	B – level Raise to playing in water /bio-diversity level	
↓ Clean	A – level Raise to swimmable	

【Affordability Survey】

Q-4: How much do you pay? Please refer Figure and check (✓) one from (1) through (10).

(1) BFT: Basic food stuffs
(2) H&O: Housing & household operation
(3) FTP: Fuel, transport & public service
(4) A&T: Alcohol & tobacco
(5) N-C: Non-consumables
(6) A&F: Apparel & foot ware
(7) MED: Medicine
(8) REC: Recreation
(9) Others
(10) No



【WTP, Willingness to Pay, Survey】

How much do you pay for sewerage service?

Q-5 "1st Bound"

Do you pay for sewerage service? IDR/month 1st Bound Amount of Table-1

Please check (✓)

Yes( ) No( )

Q-6 "2nd Bound"

Do you pay for sewerage service?

IDR/month "Yes" 2nd Bound Amount Table-1	IDR/month "No" 2nd Bound Amount Table-1
Please check (✓) Yes( ) No( )	Please check (✓) Yes( ) No( )

Household Survey (1/4)

No.	Kecamatan	Kelurahan	Family Member	Floor Area (m^2)	Household Income (IDR/month)	Household Expenditure (IDR/month)	Asset Tax (IDR/year)
1	Tanah Abang	Kebon Kacang	13	300	3,000,000	1,000,000	2,000,000
2	Sawah Besar	Kartini	5	42	3,000,000	2,400,000	100,000
3	Sawah Besar	Kartini	8	40	1,000,000	800,000	100,000
4	Tambora	Tambora	4	6	1,500,000	1,300,000	N/A
5	Taman Sari	Glodok	6	18	1,000,000	1,000,000	50,000
6	Gambir	Petojo Selatan	15	105	4,400,000	4,400,000	N/A
7	Penjaringan	Pejagalan	6	60	900,000	900,000	137,500
8	Menteng	Kebon Sirih	5	42	3,000,000	2,500,000	70,000
9	Menteng	Kebon Sirih	5	72	1,000,000	1,000,000	150,000
10	Menteng	Kebon Sirih	4	56	1,500,000	1,300,000	220,000
11	Penjaringan	Pejagalan	2	60	800,000	800,000	205,000
12	Gambir	Petojo Utara	7	90	4,000,000	3,500,000	90,000
13	Taman Sari	Glodok	3	20	1,500,000	1,000,000	N/A
14	Tambora	Tambora	7	42	3,000,000	2,000,000	100,000
15	Sawah Besar	Kartini	3	60	2,000,000	1,500,000	400,000
16	Sawah Besar	Kartini	4	20	2,000,000	2,000,000	100,000
17	Penjaringan	Pejagalan	4	60	2,000,000	2,000,000	160,000
18	Menteng	Cikini	5	20	1,500,000	1,500,000	120,000
19	Menteng	Cikini	10	28	4,500,000	3,000,000	120,000
20	Menteng	Cikini	6	60	2,000,000	2,000,000	200,000
21	Menteng	Cikini	5	28	900,000	900,000	50,000
22	Tanah Abang	Kebon Kacang	3	50	5,000,000	4,500,000	100,000
23	Tambora	Tambora	2	6	450,000	450,000	N/A
24	Taman Sari	Glodok	2	16	600,000	600,000	N/A
25	Sawah Besar	Kartini	7	60	5,200,000	4,600,000	150,000
26	Sawah Besar	Kartini	3	24	1,000,000	1,000,000	60,000
27	Gambir	Petojo Selatan	6	50	3,000,000	1,500,000	60,000
28	Penjaringan	Pejagalan	8	75	3,000,000	2,700,000	N/A
29	Penjaringan	Pejagalan	4	75	3,000,000	2,000,000	300,000
30	Penjaringan	Pejagalan	4	175	1,500,000	1,500,000	N/A
31	Menteng	Cikini	9	56	2,000,000	2,000,000	185,000
32	Menteng	Cikini	8	90	2,000,000	2,000,000	300,000
33	Tanah Abang	Kebon Kacang	5	60	2,000,000	1,500,000	N/A
34	Tambora	Tambora	3	10	700,000	500,000	160,000
35	Taman Sari	Glodok	4	12	600,000	600,000	N/A
36	Sawah Besar	Kartini	11	30	1,000,000	1,000,000	60,000
37	Sawah Besar	Kartini	5	9	1,000,000	900,000	30,000
38	Gambir	Petojo Utara	5	54	3,000,000	3,000,000	80,000
39	Penjaringan	Pejagalan	7	195	4,500,000	4,000,000	240,000
40	Menteng	Cikini	12	100	9,000,000	8,000,000	200,000
41	Menteng	Cikini	6	50	1,500,000	1,500,000	135,000
42	Penjaringan	Pejagalan	5	60	1,500,000	1,200,000	200,000
43	Penjaringan	Pejagalan	3	78	1,500,000	1,000,000	265,000
44	Tambora	Tambora	3	9	1,200,000	1,200,000	N/A
45	Taman Sari	Glodok	8	16	1,800,000	1,800,000	N/A
46	Sawah Besar	Kartini	4	9	800,000	600,000	N/A
47	Tanah Abang	Kebon Kacang	4	60	1,500,000	1,000,000	200,000
48	Sawah Besar	Kartini	5	36	2,000,000	1,800,000	250,000
49	Gambir	Petojo Utara	5	120	3,000,000	2,500,000	320,000
50	Penjaringan	Pejagalan	4	48	3,000,000	3,000,000	200,000
51	Penjaringan	Pejagalan	9	48	4,000,000	3,800,000	250,000
52	Menteng	Cikini	6	200	2,500,000	2,500,000	1,000,000
53	Penjaringan	Pejagalan	5	35	3,000,000	2,500,000	N/A
54	Menteng	Kebon Sirih	9	46	3,000,000	3,000,000	125,000
55	Tambora	Tambora	4	6	950,000	800,000	N/A
56	Tanah Abang	Kebon Kacang	5	160	1,500,000	1,500,000	400,000
57	Taman Sari	Glodok	2	30	3,000,000	3,000,000	50,000
58	Sawah Besar	Kartini	5	18	1,500,000	1,300,000	60,000
59	Sawah Besar	Karang Anyar	4	24	800,000	800,000	40,000
60	Gambir	Petojo Utara	6	60	3,000,000	2,000,000	150,000
61	Menteng	Kebon Sirih	5	45	6,000,000	4,000,000	190,000
62	Penjaringan	Pejagalan	6	90	7,000,000	6,000,000	400,000
63	Penjaringan	Pejagalan	4	140	10,000,000	7,000,000	400,000
64	Penjaringan	Pejagalan	8	120	8,000,000	6,000,000	560,000
65	Menteng	Cikini	5	200	20,000,000	20,000,000	300,000

Household Survey (2/4)

No.	Electricity Consumption				Q-1					
					Water Source			Water supply cost (IDR/month)	Bottled Water	
	450-900vA	900-1300vA	1300-2200vA	>2200vA	Piped water	Well	Both		Quantity (gallon/month)	Cost (IDR/month)
1			1			1		0	15	60,000
2	1					1		0	4	52,000
3		1					1	180,000	0	0
4	1					1		0	4	16,000
5	1				1			60,000	0	0
6			1		1			100,000	12	144,000
7	1				1			80,000	0	0
8	1						1	70,000	6	72,000
9	1						1	12,000	0	0
10	1				1			120,000	0	0
11			1				1	17,000	0	0
12			1		1			200,000	15	180,000
13	1					1		0	8	96,000
14			1		1			100,000	2	22,000
15	1						1	46,000	3	36,000
16	1					1		0	10	110,000
17			1				1	65,000	0	0
18		1					1	35,000	6	78,000
19		1				1		0	8	104,000
20		1				1		0	10	35,000
21			1			1		0	0	0
22		1			1			225,000	8	96,000
23	1				1			9,000	3	36,000
24	1					1		0	8	28,000
25	1					1		0	3	13,500
26	1						1	50,000	0	0
27		1			1			50,000	0	0
28		1			1			150,000	0	0
29				1	1			120,000	0	0
30			1		1			45,000	0	0
31		1					1	60,000	9	99,000
32			1				1	50,000	10	120,000
33	1				1			200,000	8	24,000
34			1				1	15,000	2	24,000
35	1					1		0	0	0
36		1			1			50,000	0	0
37	1						1	30,000	0	0
38		1			1			25,000	8	96,000
39			1		1			150,000	8	92,000
40		1					1	120,000	0	0
41			1			1		0	3	36,000
42			1				1	17,000	0	0
43			1				1	100,000	0	0
44	1						1	20,000	4	16,000
45	1					1		0	4	48,000
46	1						1	90,000	8	25,500
47		1			1			250,000	3	36,000
48	1					1		0	10	120,000
49		1			1			100,000	6	72,000
50			1		1			100,000	10	120,000
51			1		1			200,000	0	0
52				1		1		0	5	60,000
53			1		1			100,000	5	60,000
54		1					1	45,000	2	26,000
55	1					1		0	4	16,000
56		1			1			300,000	12	48,000
57		1					1	30,000	2	24,000
58		1					1	30,000	0	0
59	1						1	70,000	20	70,000
60	1				1			200,000	16	192,000
61			1				1	100,000	8	88,000
62				1	1			150,000	10	110,000
63				1	1			300,000	12	132,000
64				1	1			200,000	15	82,500
65				1	1			125,000	10	120,000

Household Survey (3/4)

No.	Q-2		Q-3		Q-4									
	Yes	No	Yes	No	BFT	H&O	FTP	A&T	N-C	A&F	MED	REC	OTHERS	NO
1	1		1										1	
2		1	1											1
3	1		1			1								
4		1	1			1								
5	1		1										1	
6	1		1								1			
7	1			1									1	
8	1			1							1			
9	1		1									1		
10	1		1										1	
11	1		1							1				
12		1		1		1								
13	1			1										1
14	1		1										1	
15	1			1										1
16	1		1			1								
17	1			1		1								
18		1		1						1				
19	1			1					1					
20	1		1										1	
21	1			1									1	
22	1		1										1	
23		1		1										1
24		1	1											1
25		1	1			1								
26	1		1										1	
27	1		1										1	
28	1			1				1						
29	1			1		1								
30	1		1									1		
31	1			1										1
32	1		1					1						
33	1		1			1								
34	1		1											1
35	1		1											1
36	1		1										1	
37	1		1									1		
38		1	1			1								
39		1		1							1			
40	1			1								1		
41	1		1					1						
42	1			1										1
43	1		1										1	
44	1		1											1
45		1		1									1	
46	1		1											1
47	1		1								1			
48	1		1					1						
49	1		1				1							
50	1			1										1
51	1		1											1
52	1		1										1	
53	1		1						1					
54	1		1										1	
55		1	1						1					
56		1	1										1	
57	1		1							1				
58	1		1			1								
59		1	1											1
60		1	1								1			
61	1			1		1								
62	1		1										1	
63	1			1		1								
64	1			1									1	
65	1		1			1								

Household Survey (4/4)

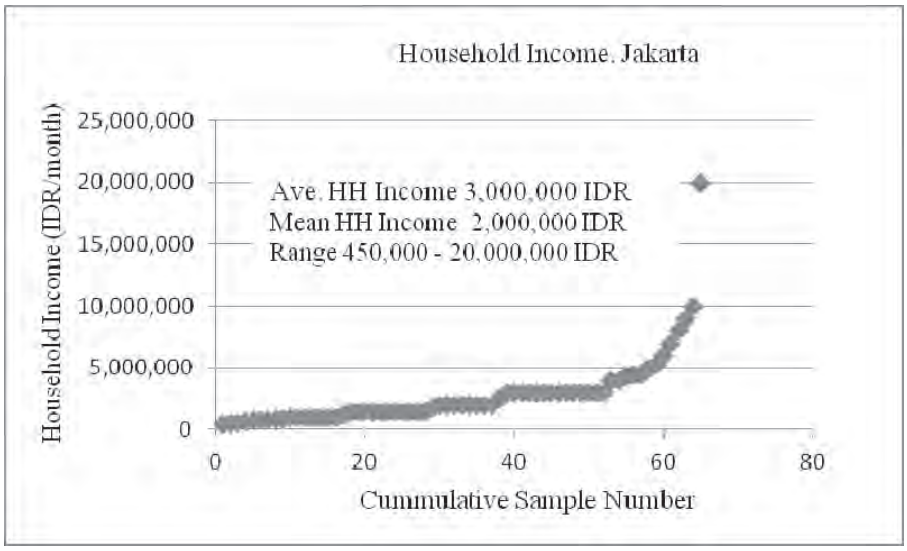
No.	Q-5		Q-6a		Q-6b		1 stbound
	Yes	No	Yes	No	Yes	No	
1	1		1				5,000
2		1				1	5,000
3	1		1				5,000
4	1		1				5,000
5	1		1				5,000
6	1		1				5,000
7	1		1				5,000
8	1		1				5,000
9	1		1				5,000
10	1		1				5,000
11	1		1				5,000
12	1		1				10,000
13		1				1	10,000
14	1		1				10,000
15		1				1	10,000
16	1		1				10,000
17	1			1			10,000
18	1		1				10,000
19	1		1				10,000
20	1			1			10,000
21	1			1			10,000
22	1		1				15,000
23		1				1	15,000
24		1				1	15,000
25	1		1				15,000
26	1		1				15,000
27	1			1			15,000
28	1		1				15,000
29	1			1			15,000
30	1			1			15,000
31		1				1	15,000
32	1		1				15,000
33	1		1				20,000
34		1				1	20,000
35		1				1	20,000
36	1		1				20,000
37	1		1				20,000
38	1		1				20,000
39	1			1			20,000
40	1			1			20,000
41	1			1			20,000
42		1				1	20,000
43	1			1			20,000
44		1				1	30,000
45	1			1			30,000
46		1				1	30,000
47	1			1			30,000
48		1				1	30,000
49		1				1	30,000
50		1				1	30,000
51		1				1	30,000
52	1		1				30,000
53	1			1			30,000
54	1		1				30,000
55	1		1				50,000
56		1				1	50,000
57		1				1	50,000
58		1			1		50,000
59		1				1	50,000
60		1				1	50,000
61	1			1			50,000
62	1			1			50,000
63	1		1				50,000
64	1			1			50,000
65	1			1			50,000

Household Income

Average: 3,000,000 IDR/HH/month

Mean Value: 2,000,000 IDR/HH/month

75 % of Existing Survey "5,295 USD（2008, Mizuho Research Institute." which does not include apartment

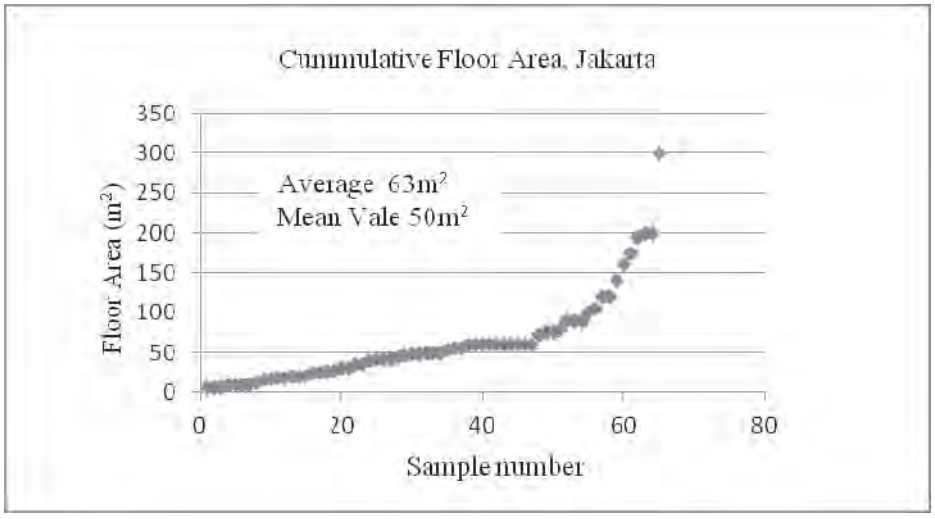


House Floor Area

Average: 63 m^2/HH

Mean Value: 50m^2/HH

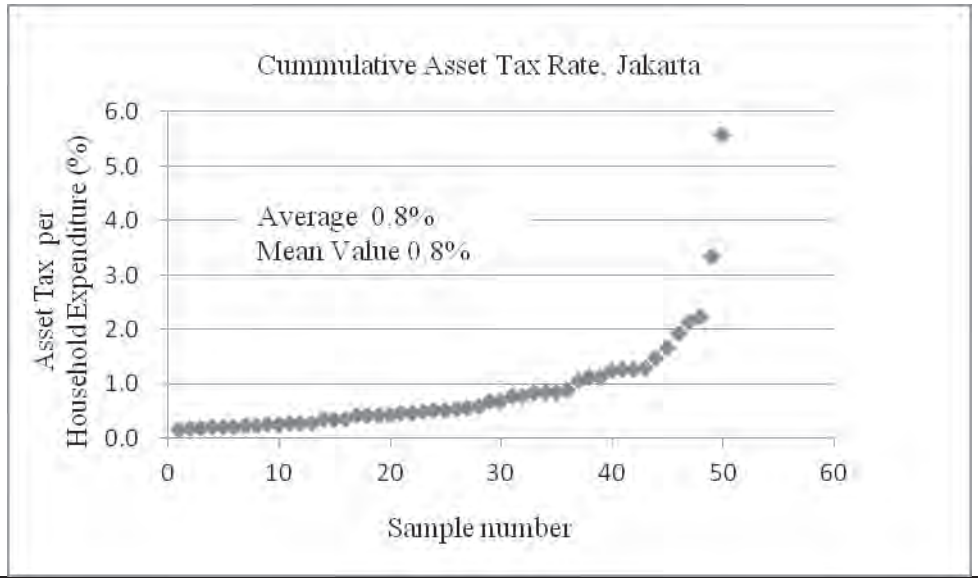
Modest household lives in single room house which does not equip toilet, bath room or laundry. Accordingly MCK is replaced to them.



Property Tax Rate on Household Expenditure

Average: 0.8%

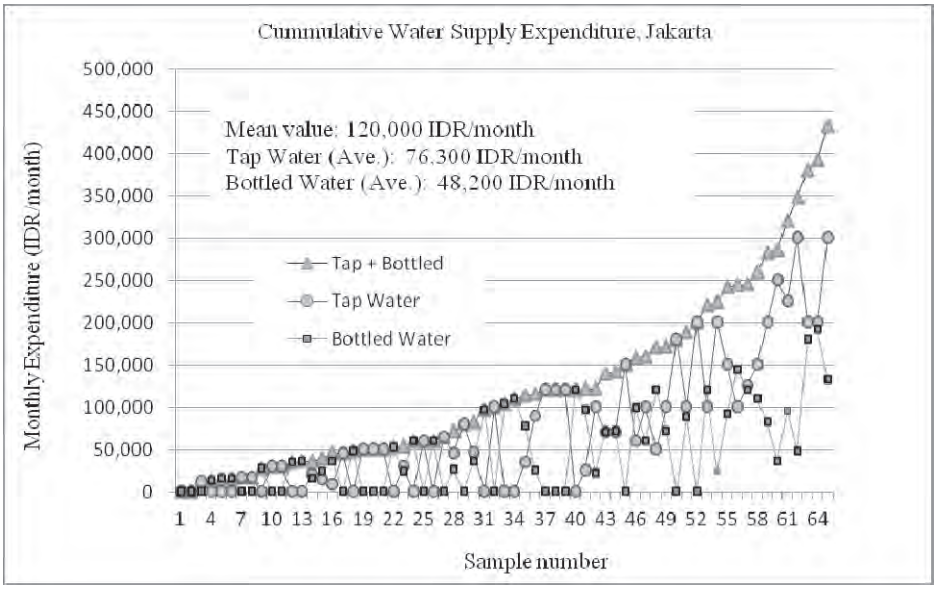
Mean Value: 0.8%



Water Supply Cost of Tap water and Bottled water

Average monthly cost: 124,500 IDR/HH/month, Mean value: 124,000 IDR/HH/month

Tap water: 76.300 IDR/HH/month Bottled water: 48,200 IDR/HH/month

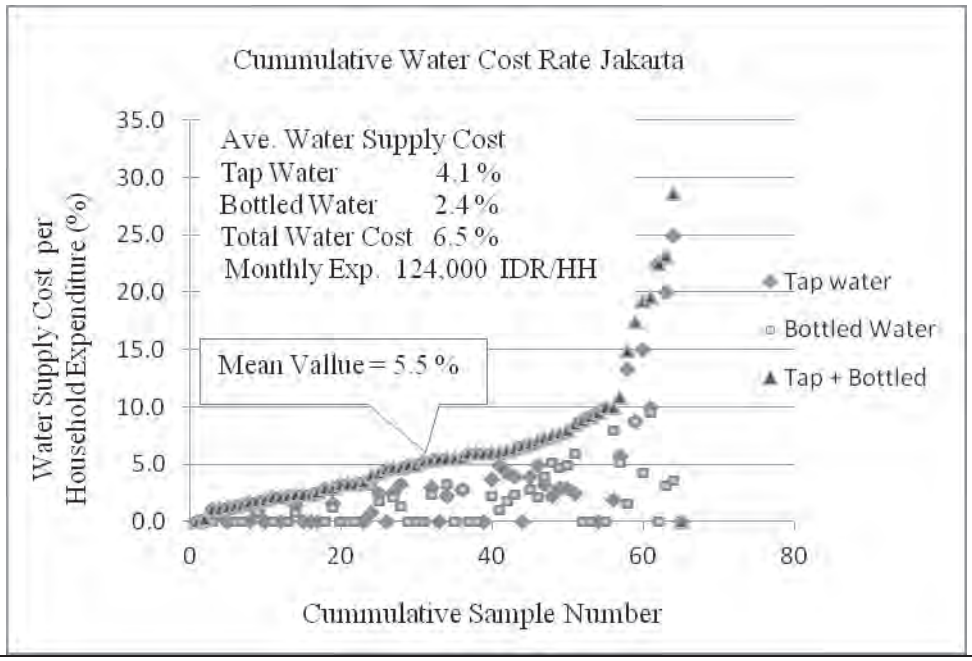


Rate of Water supply cost of Tap water & Bottled water on Household expenditure

Average: 6.5% (Tap water 4.1 % and Bottled water 2.4 %)

Mean vale: 5.5%

Water supply cost (Average) is 124,000 IDR/HH/month

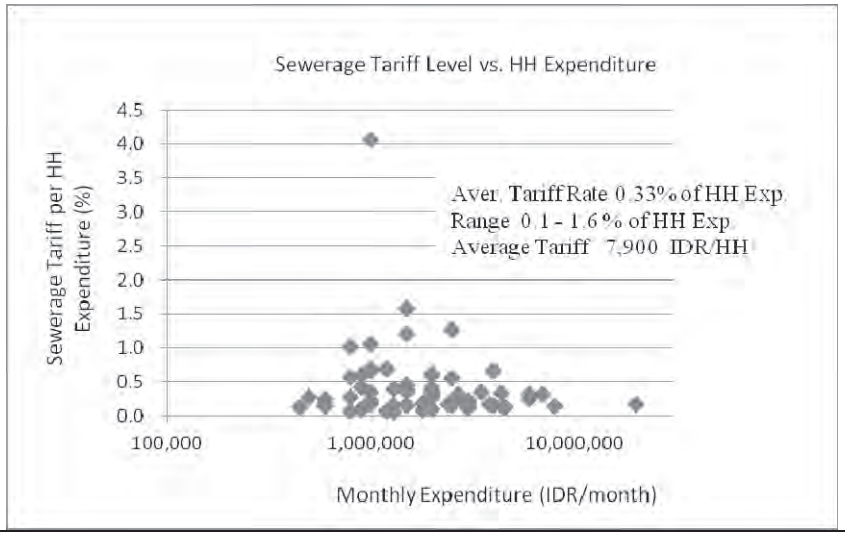


Sewerage tariff rate per Household expenditure

Average: 0.33%×HH Exp.

Range: 0.1～1.6 %×HH Exp.

（Estimated by Existing Tariff System）

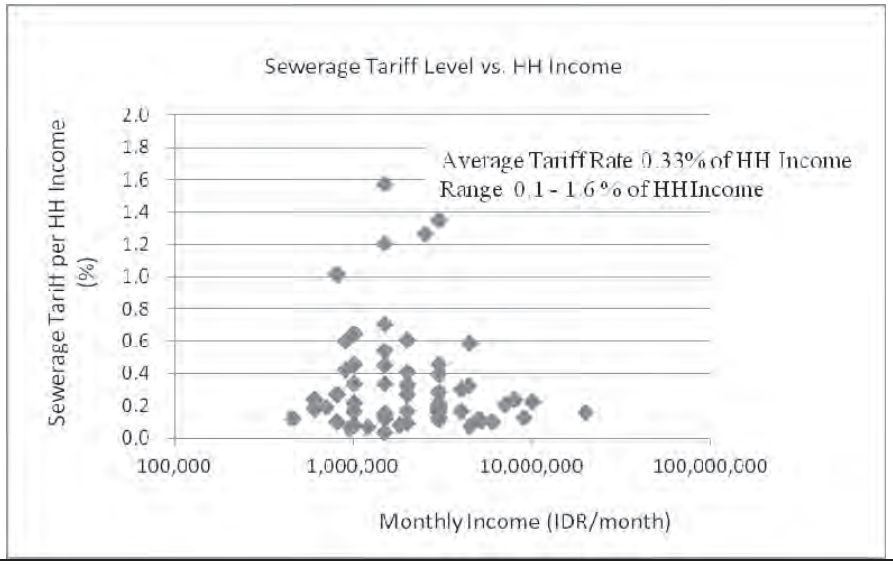


Sewerage tariff rate per Household income

Average: 0.33%×HH Income

Range: 0.1～1.6%×HH Income

（Estimated by Existing Tariff System）

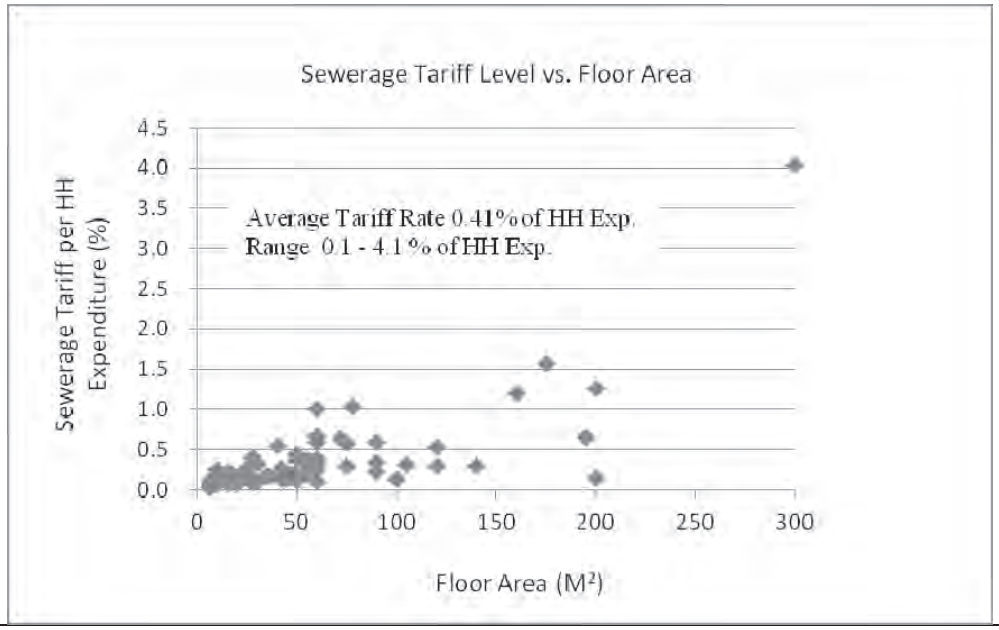


Sewerage tariff rate per Household expenditure classified by floor area

Average: 0.41%×HH Exp.

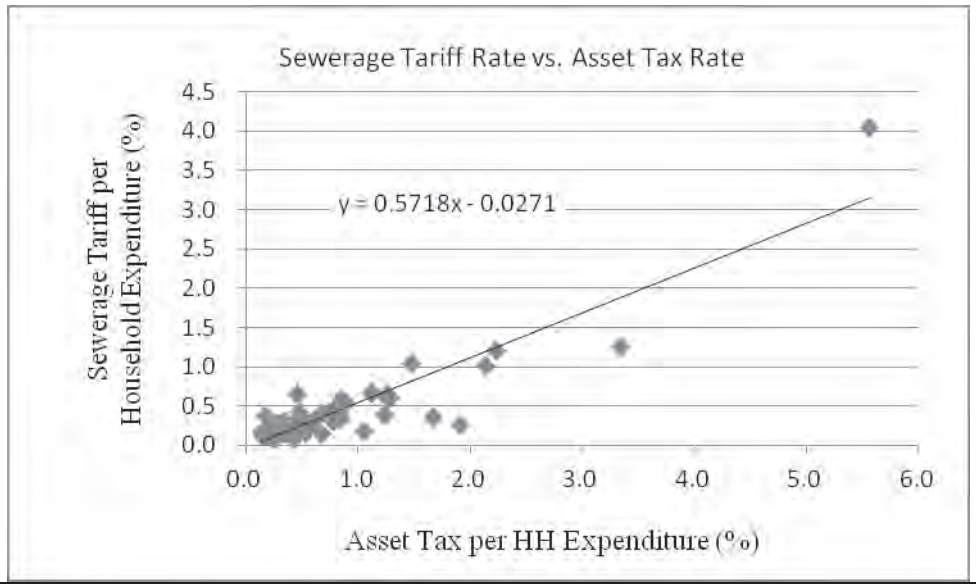
Less than average floor area (63m^2): 1.0% ×HH Exp.

Less than mean value (50m^2): 0.5%×HH Exp.



Sewerage tariff rate per Property tax

Sewerage tariff is equivalent to 55% of Property tax.



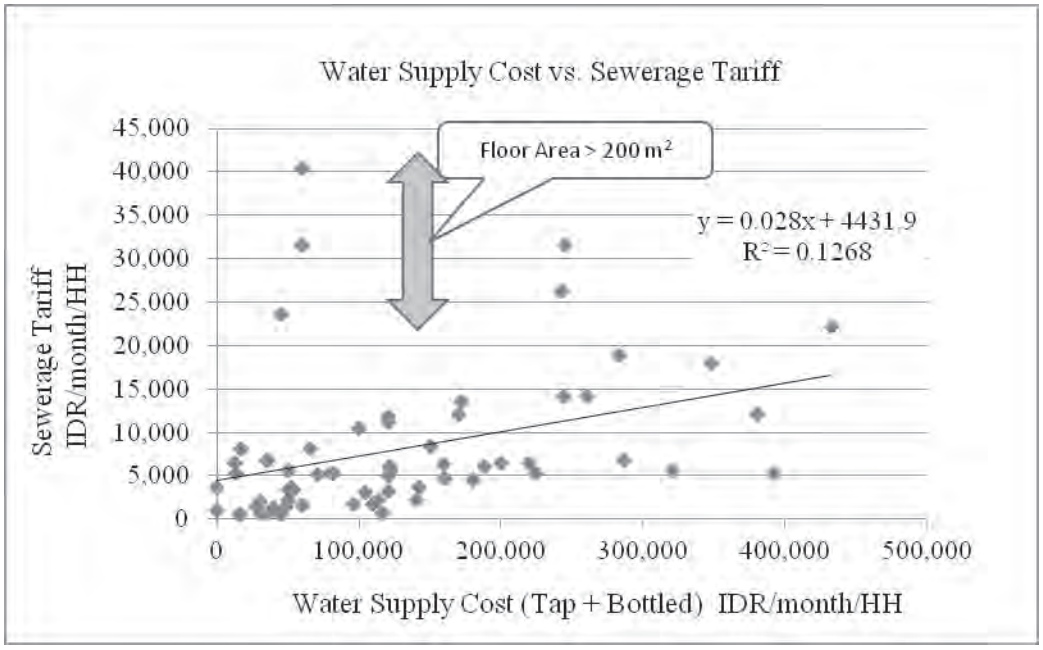
Sewerage tariff rate vs. Water supply cost

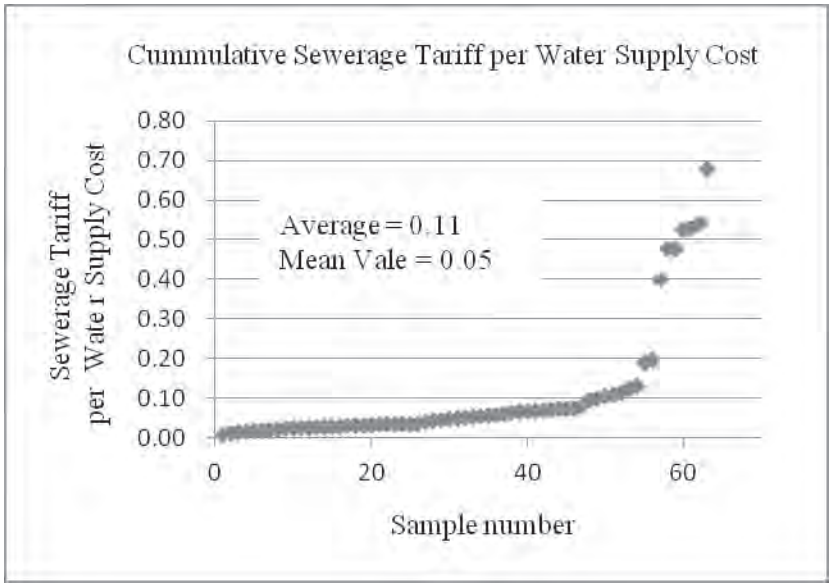
Sewerage tariff rate is equivalent to 2.8% of water supply cost plus 4,400 IDR.

Sewerage tariff per water supply：Average 11% Mean value 5%

High rate tariff household：House owner of large house area more than 200m^2.

Only shallow well user (2HH of surveyed 65HH): Sewerage tariff is newly levied , accordingly poverty mitigation is required.

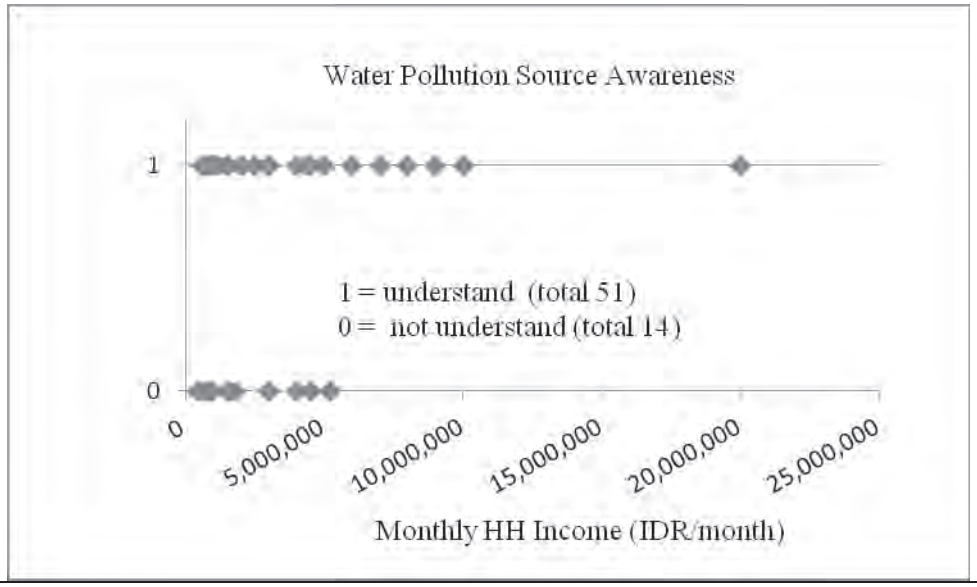




Understanding on Water pollution source

Yes “understanding” : 78% No “not understanding” : 22%

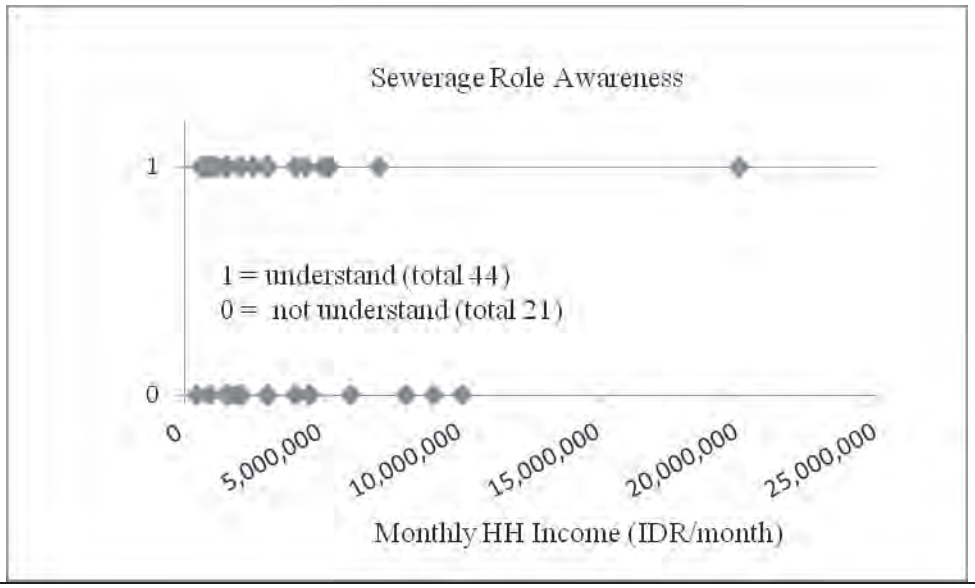
Respondents range over low income to high income.

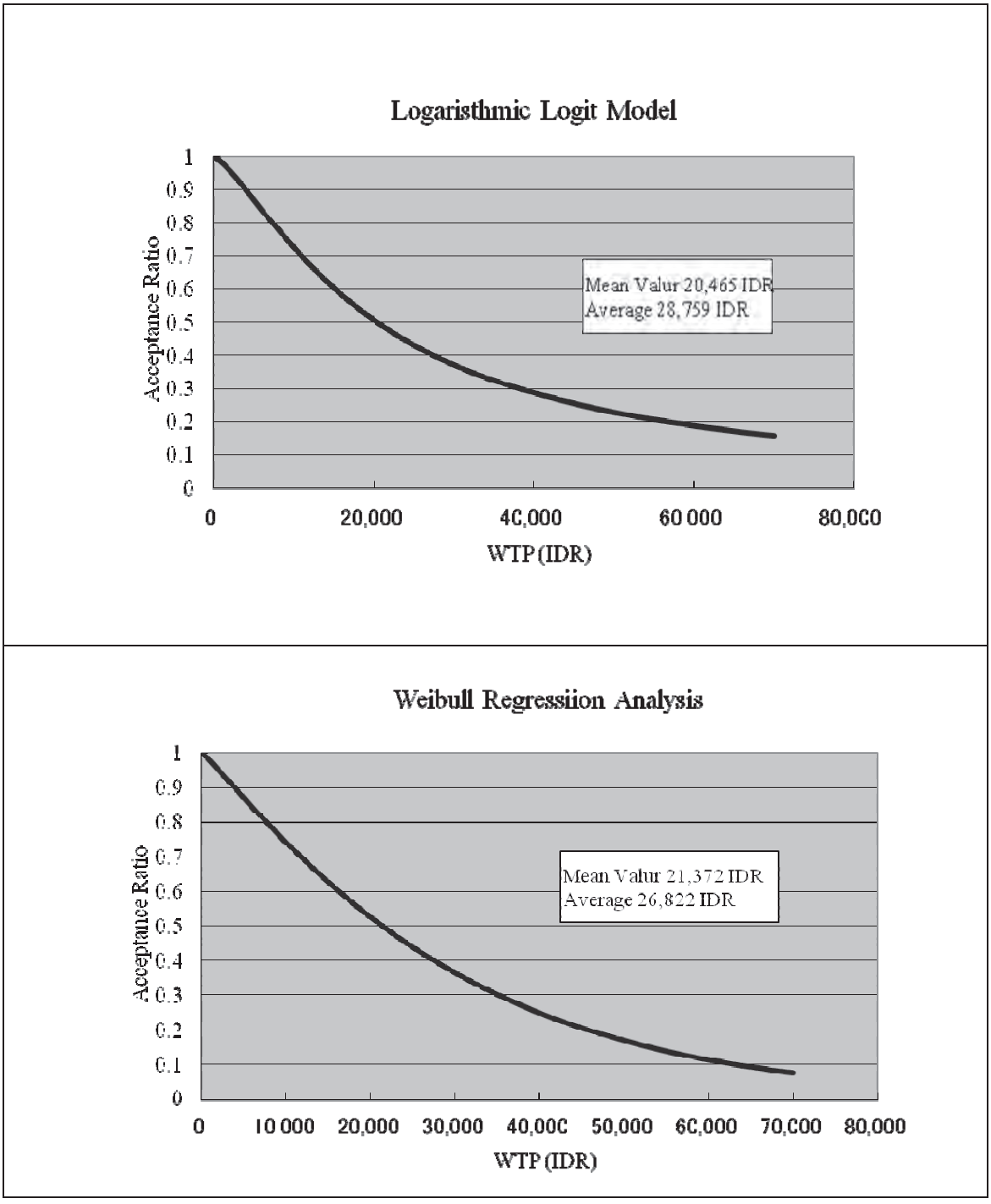


Understanding on Sewerage

Yes “understanding” : 68% No “not understanding” : 32%

Respondents range over low income to high income.




Logaristhmic Logit Model
Acceptance Ratio
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
Mean Valur 20,465 IDR
Average 28,759 IDR
0
20,000
40,000
60 000
80,000
WTP (IDR)
Weibull Regressiion Analysis
Acceptance Ratio
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
Mean Valur 21,372 IDR
Average 26,822 IDR
0
10 000
20,000
30,000
40,000
50,000
60,000
70,000
80,000
WTP (IDR)

Affordability Survey

Among respondents of 65 HH,

Yes "have willingness": 78.5% of Alcohol & tobacco, medicine and recreation.

Most frequent response is "Others".

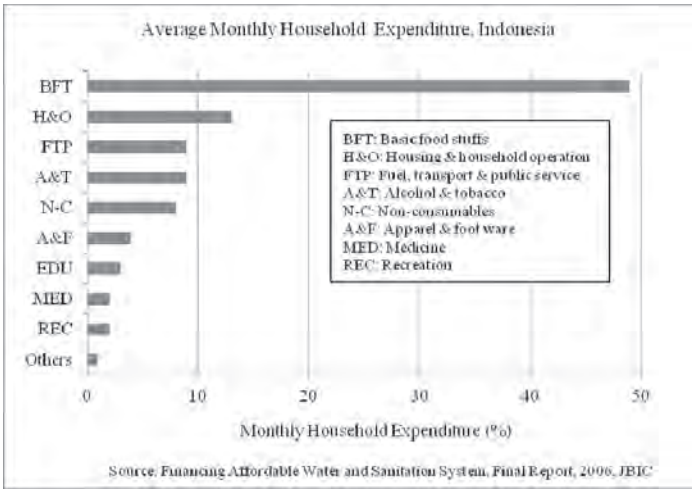
No "have not willingness" : 21.5%

AFT : Approx. 1.0-1.5% of household expenditure.

Q-4 (ATP)										
Responded Nos.& %	BFT	H&O	FTP	A&T	N-C	A&F	MED	REC	OTHERS	NO
Total = 65	0	13	1	4	3	3	5	4	18	14
%	0	0.2	0.015	0.062	0.046	0.046	0.077	0.062	0.277	0.215

Questionnaire

(1) BFT: Basic food stuffs
(2) H&O: Housing & household operation
(3) FTP: Fuel, transport & public service
(4) A&T: Alcohol & tobacco
(5) N-C: Non-consumables
(6) A&F: Apparel & foot ware
(7) MED: Medicine
(8) REC: Recreation
(9) Others
(10) No



Affordability (Conclusion)

- Sewerage tariff (Ave. 7,900 IDR/HH) is 2.4 % of water supply cost (Tap water & Bottled water) of 124,000 IDR. Water supply cost is 6.5% of HH expenditure.
- AFT & WTP is estimated to apprx. 1% of HH expenditure through existing surveies in overseas.
- No willingness is approx. 20% of respondents.
- Sewerage tariff level is estimated to 0.41% of household expenditure and less than 1.6% for 99% of respodents. Sewerage tariff levy requires poverty mitigation.

4. Results of Survey for Buildings

(1) Buildings in Central Sewerage Area

(2) Building Sewer Management Survey-1

(3) Building Sewer Management Survey-2

(1) Buildings in Central Sewerage Area

(A) Building List

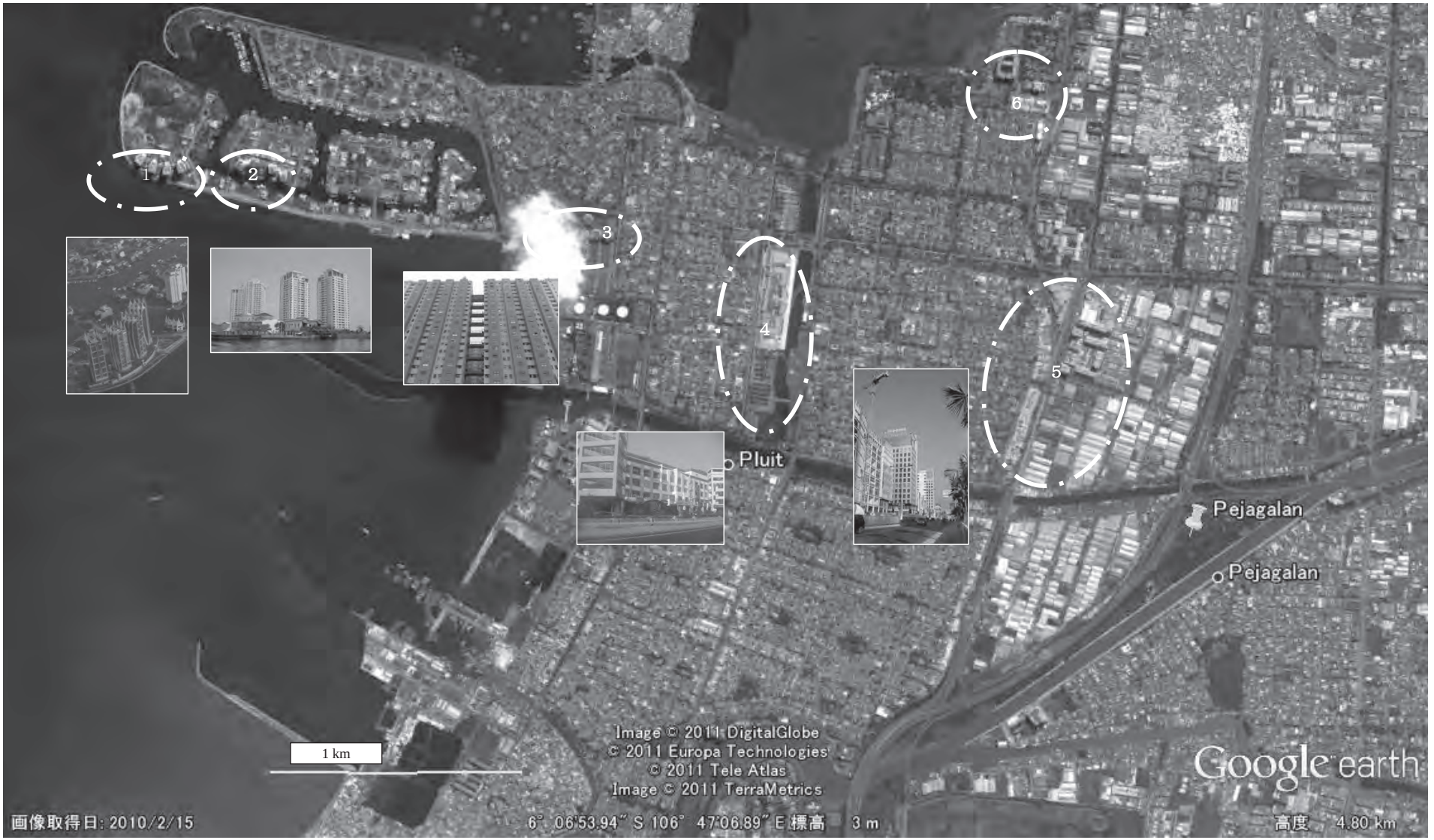
No.	Building Name	Location	City	Floor
1	Kempinski Residences	Jl. MH. Thamrin	Jakarta Pusat	57
2	BCA Tower	Jl. MH. Thamrin	Jakarta Pusat	56
3	UOB Plaza	Jl. MH. Thamrin	Jakarta Pusat	42
4	The Plaza Tower	Jl. MH. Thamrin	Jakarta Pusat	41
5	Plaza BII Tower II	Jl. MH. Thamrin	Jakarta Pusat	39
6	Alamanda Tower	Jl. Kebon Kacang, Thamirin	Jakarta Pusat	39
7	Bougenville Tower	Jl. Kebon Kacang, Thamrin	Jakarta Pusat	39
8	Crysant Tower	Jl. Kebon Kacang, Thamrin	Jakarta Pusat	39
9	Daisy Tower	Jl. Kebon Kacang, Thamrin	Jakarta Pusat	39
10	Edelweiss Tower	Jl. Kebon Kacang, Thamrin	Jakarta Pusat	39
11	Monaco Residence Kemayoran	Kota Baru Bandar Kemayoran Blok B2	Jakarta Utara	36
12	Istana Harmoni Apartment	Jl. Suryopranoto, No.2, Gambir	Jakarta Pusat	35
13	The View Executive Residences	Kemayoran	Jakarta Utara	35
14	Apartemen Mediterania Marina Tower 1	Jl. Lodan Raya, Pademangan	Jakarta Utara	32
15	Apartemen Mediterania Marina Tower 2	Jl. Lodan Raya, Pademangan	Jakarta Utara	32
16	Apartemen Mediterania Marina Tower 3	Jl. Lodan Raya, Pademangan	Jakarta Utara	32
17	City Lofts Glodok	Jl. Gajahmada	Jakarta Pusat	32
18	City Lofts	Jl. KH Mas Mansyur	Jakarta Pusat	32
19	The Sumit	Kelapa Gading	Jakarta Utara	32
20	Apartemen Batavia I	Jl. KH Mas Mansyur	Jakarta Pusat	32
21	Apartemen Batavia II	Jl. KH Mas Mansyur	Jakarta Pusat	32
22	Menara Batavia	Jl. KH Mas Mansyur Kavling 126	Jakarta Pusat	32
23	Bank Bumi Daya Plaza	Jl. Imam Bonjol Kavling 61	Jakarta Pusat	32
24	Wisma Nusantara	Jl. MH. Thamrin	Jakarta Pusat	30
25	Metro Marina Ancol Tower 1	Ancol	Jakarta Utara	30
26	Metro Marina Ancol Tower 2	Ancol	Jakarta Utara	30
27	Mapple Park Apartment Tower 1	Kemayoran	Jakarta Utara	29
28	Mapple Park Apartment Tower 2	Kemayoran	Jakarta Utara	29
29	Pavillion Apartments Tower 1	Jl. KH Mas Mansyur Kav 24	Jakarta Pusat	28
30	Pavillion Apartments Tower 2	Jl. KH Mas Mansyur Kav 24	Jakarta Pusat	28
31	Pavillion Apartments Tower 3	Jl. KH Mas Mansyur Kav 24	Jakarta Pusat	28
32	Pavillion Apartments Tower 4	Jl. KH Mas Mansyur Kav 24	Jakarta Pusat	28
33	Robinson Apartment Tower 1	Jl. Jembatan Dua Raya No.2	Jakarta Utara	28
34	Robinson Apartment Tower 2	Jl. Jembatan Dua Raya No.2	Jakarta Utara	28
35	Aston Mangga Dua Hotel & Residence	Jl. Mangga Dua Abdad, Sawah Besar	Jakarta Utara	28
36	Salemba Residence Tower A	Jl. Salemba Tengah II No 10	Jakarta Pusat	28
37	Salemba Residence Tower B	Jl. Salemba Tengah II No 10	Jakarta Pusat	28
38	Gajah Mada Plaza	Jl. Gajah Mada	Jakarta Pusat	27
39	Apartment Puri Kemayoran	Puri Kemayoran	Jakarta Pusat	27
40	Mitra Bahari Tower 1	Jl. Pakin, No.1, Penjaringan	Jakarta Utara	26
41	Mitra Bahari Tower 2	Jl. Pakin, No.1, Penjaringan	Jakarta Utara	26
42	Bank Indonesia Tower 1	Jl. MH Thamrin	Jakarta Pusat	26
43	Bank Indonesia Tower 2	Jl. MH Thamrin	Jakarta Pusat	26
44	Gedung Menara BTN	Jl. Gajah Mada	Jakarta Pusat	26
45	Royal Tower Riverside Apartment Tower A	Royal Tower Riverside Apartment	Jakarta Utara	25
46	Royal Tower Riverside Apartment Tower B	Royal Tower Riverside Apartment	Jakarta Utara	25
47	Royal Tower Riverside Apartment Tower C	Royal Tower Riverside Apartment	Jakarta Utara	25
48	Royal Tower Riverside Apartment Tower D	Royal Tower Riverside Apartment	Jakarta Utara	25
49	Puri Kemayoran Tower 1	Jl. Benyamin Suaeb, A-6, Kemayoran,	Jakarta Pusat	25
50	Puri Kemayoran Tower 2	Jl. Benyamin Suaeb, A-6, Kemayoran,	Jakarta Pusat	25
51	Departemen Pariwisata, Pos dan Telekomunikasi	Jl. Medan Merdeka Barat No. 16-19	Jakarta Pusat	24
52	Thamrin Resort Residence Tower 1	Jl. H. Fachruddin, Tanah Abang	Jakarta Pusat	24
53	Thamrin Resort Residence Tower 2	Jl. H. Fachruddin, Tanah Abang	Jakarta Pusat	24
54	The Regatta Dubai Tower	Jl. Pantai Mutiara	Jakarta Utara	24
55	The Regatta Monte Carlo Tower	Jl. Pantai Mutiara	Jakarta Utara	24
56	The Regatta Miami Tower	Jl. Pantai Mutiara	Jakarta Utara	24
57	The Regatta Rio de Janeiro Tower	Jl. Pantai Mutiara	Jakarta Utara	24
58	The Regatta Tokyo Tower	Jl. Pantai Mutiara	Jakarta Utara	24
59	The Regatta Acapulco Tower	Jl. Pantai Mutiara	Jakarta Utara	24
60	The Regatta Sydney Tower	Jl. Pantai Mutiara	Jakarta Utara	24

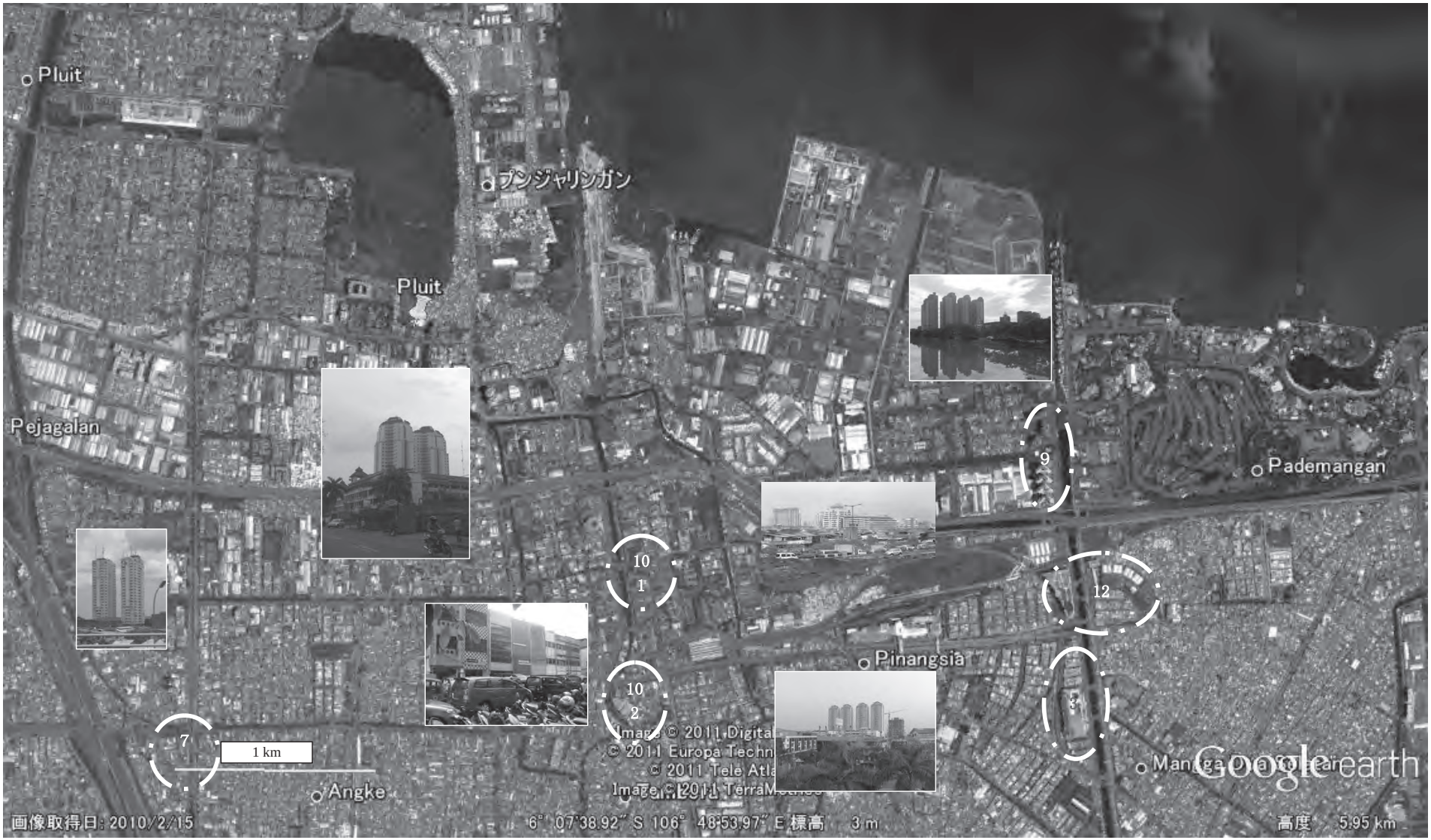
No.	Building Name	Location	City	Floor
61	The Regatta New York Tower	Jl. Pantai Mutiara	Jakarta Utara	24
62	The Regatta Shanhai Tower	Jl. Pantai Mutiara	Jakarta Utara	24
63	Graha Reformed Millenium	Jl. Kemayoran	Jakarta Pusat	24
64	Star City Apartment Tower 1	Jl. Gajahmada No 188	Jakarta Utara	24
65	Star City Apartment Tower 2	Jl. Gajahmada No 188	Jakarta Utara	24
66	Laguna Apartment	Pluit	Jakarta Utara	24
67	Menara Salemba Batavia Tower 1	Jl. Matraman	Jakarta Pusat	22
68	Menara Salemba Batavia Tower 2	Jl. Matraman	Jakarta Pusat	22
69	Menara Salemba Batavia Tower 3	Jl. Matraman	Jakarta Pusat	22
70	Allson Residence I	Jl. Senen Raya No. 135-137	Jakarta Pusat	21
71	Allson Residence 2	Jl. Senen Raya No. 135-137	Jakarta Pusat	21
72	Allson Residence 3	Jl. Senen Raya No. 135-137	Jakarta Pusat	21
73	Hayam Wuruk Plaza Tower	Jl. Hayam Wuruk No. 8, Kebon Kelapa Village	Jakarta Pusat	21
74	DKI Jakarta Government Office	Jl. Merdeka Selatan	Jakarta Pusat	21
75	Wisma Kosgoro	Jl. MH Thamrin	Jakarta Pusat	20
76	Gedung Sapta Pesona	Jl. Medan Merdeka Barat No. 17	Jakarta Pusat	20
77	Sheraton Media Hotel & Towers	Jl. Gunung Sahari Raya No. 3	Jakarta Utara	19
78	Wisma Antara	Jl. Medan Merdeka Selatan. No. 17, Gambir	Jakarta Pusat	18
79	BCA Wisma Asia II	Jl. S Parman Kav 79	Jakarta Pusat	18
80	Borobudur Jakarta Hotel	Jl. Lapangan Banteng Selatan No.1	Jakarta Pusat	18
81	Emporium Pluit	Pluit	Jakarta Utara	17
82	Hayam Wuruk Residence	Jl. Hayam Wuruk	Jakarta Pusat	17
83	Mediterania Lagoon Residences Tower 2	Jl. Benyamin Sueb St. Pademangan	Jakarta Pusat	16
84	Dusit Mangga Dua Mall	Jl. Mangadua	Jakarta Utara	16
85	Mahkamah Konstitusi	Jl. Medan Merdeka Barat No. 6	Jakarta Pusat	16
86	Menteng Park Apartment Tower 1	Jl. Pegangsaan Barat Kav. 6-12 Menteng	Jakarta Pusat	16
87	Menteng Park Apartment Tower 2	Jl. Pegangsaan Barat Kav. 6-12 Menteng	Jakarta Pusat	16
88	Menteng Park Apartment Tower 3	Jl. Pegangsaan Barat Kav. 6-12 Menteng	Jakarta Pusat	16
89	Menteng Park Apartment Tower 4	Jl. Pegangsaan Barat Kav. 6-12 Menteng	Jakarta Pusat	16
90	Sahid Sahirman Memorial Hospital	Sahid Puri Kencana Superblock	Jakarta Pusat	15
91	Dinas Teknis Abdul Muis	Jl. Abdul Muis No. 66, Petojo Selatan Village,	Jakarta Pusat	15
92	Surya Building	Jl. MH. Thamrin, Kav. 9, Menteng	Jakarta Pusat	15
93	CBD Pluit Office Tower 1	Jl. Pluit Selatan Raya	Jakarta Utara	15
94	CBD Pluit Office Tower 2	Jl. Pluit Selatan Raya	Jakarta Utara	15
95	Dusit Mangga Dua Hotel	Jl. Arteri Mangga Dua Raya	Jakarta Utara	14
96	PT. Pelayaran Nasional Indonesia	Jl. Gajah Mada. No.14, Gambir	Jakarta Pusat	14
97	Ratu Prabu	Jl. Jend. Sudirman. Kav.9, Tanah Abang	Jakarta Pusat	14
98	Wisma Hayam Wuruk	Jl. Hayam Wuruk. No. 8, Gambir	Jakarta Pusat	14
99	Apartemen Mangga Dua Court I	Jl. Mangga Dua Raya,	Jakarta Utara	14
100	Apartemen Mangga Dua Court 2	Jl. Mangga Dua Raya,	Jakarta Utara	14
101	Hotel Sari Pan Pacific	Jl. MH Thamrin	Jakarta Pusat	13
102	Wisma BII	Jl. MH Thamrin	Jakarta Pusat	13
103	Menteng I	Kecamatan Menteng,	Jakarta Pusat	12
104	Menteng II	Kecamatan Menteng,	Jakarta Pusat	12
105	Menteng III	Kecamatan Menteng,	Jakarta Pusat	12
106	Wisma BSG	Jl. Abdul Muis Kavling 40	Jakarta Pusat	12
107	Departemen Luar Negeri		Jakarta Pusat	12
108	Exim Melati	Jl. MH. Thamrin, Kav. 8-9, Kebon Melati Villa	Jakarta Pusat	12
109	Jaya Building	Jl. MH. Thamrin, No.12, Menteng	Jakarta Pusat	12
110	Plaza BII Tower II	Jl. MH. Thamrin	Jakarta Pusat	12
111	Lion Air Tower	Jl. Gajah Mada, No. 7	Jakarta Pusat	12
112	Komite Olahraga Nasional Indonesia (KONI) Pusa	Jl. Pintu 1 Gelora Bung Karno, Tanah Abang	Jakarta Pusat	12
113	Graha Adira	Jl. Raya Menteng, No. 21, Menteng	Jakarta Pusat	12
				24.1

Source: JICA PPP Study Team

(B) Number & Distribution of Buildings

District	No. of Building	Building use	District	No. of Building	Building use
1	5	High rise Apartment & Hotel	21	4	Medium Commercial
2	4	High rise Apartment	22	2	Large Hotel & Government
3	4	High rise Apartment	23	8	High rise Apartment
4	1	Large Commercial	24	3	Large Hotel & High rise Apartment
5	14	Medium Commercial	25	6	High rise Apartment & Commercial
6	3	High rise Apartment & Hotel	26	5	Commercial & Hospital
7	2	High rise Apartment	27	30	Large Commercial & Hotel
8	2	High rise Apartment	28	2	Large Commercial
9	7	High rise Apartment	29	8	High rise Apartment & Commercial
10	2	Medium Commercial & Hotel	30	5	Medium Commercial & Government
11	7	Large Commercial	31	12	Medium Commercial
12	1	Large Commercial	32	8	Medium Apartment & Commercial
13	1	Large Commercial	33	13	High rise Apartment & Commercial
14	1	Large Commercial	Sub-total	225	
15	12	Large Commercial & Hotel			
16	2	High rise Apartment	34	1	Large Commercial & Government
17	13	Medium Commercial & Government	35	13	Large Commercial & Apartment
18	9	High rise Commercial & Hotel	Sub-total	13	
19	6	Large & Medium Commercial			
20	23	Medium Commercial	Total	238	


1
2
3
4
5
6
Pluit
Pejagalan
Pejagalan
1 km
Image © 2011 DigitalGlobe
© 2011 Europa Technologies
© 2011 Tele Atlas
Image © 2011 TerraMetrics
Google earth
画像取得日: 2010/2/15
6° 06'53.94" S 106° 47'06.89" E 標高 3 m
高度 4.80 km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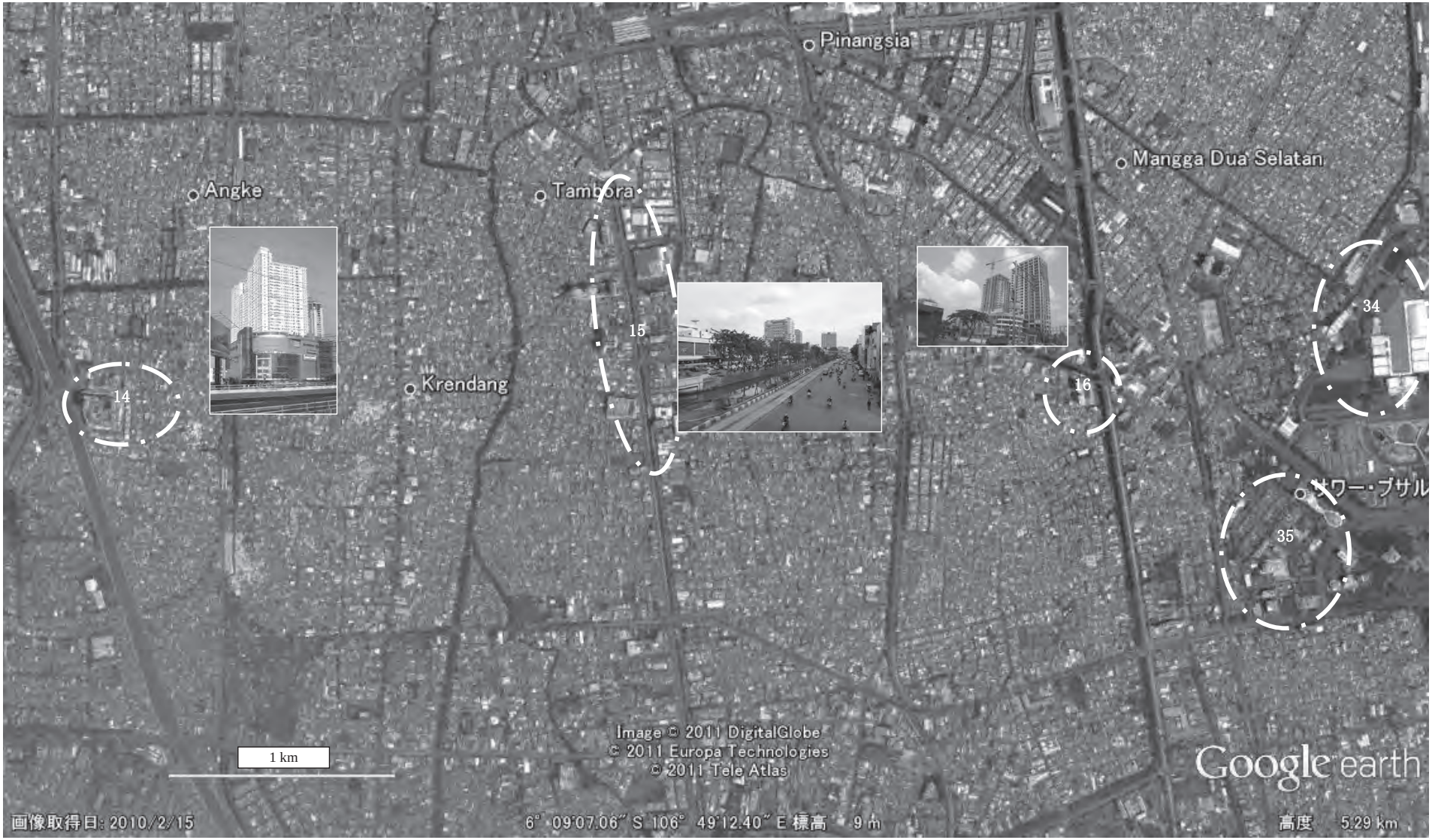
高度 5.95 km
Google earth


Pinangsia
Angke
Tambora
Mangga Dua Selatan
Krendang
14
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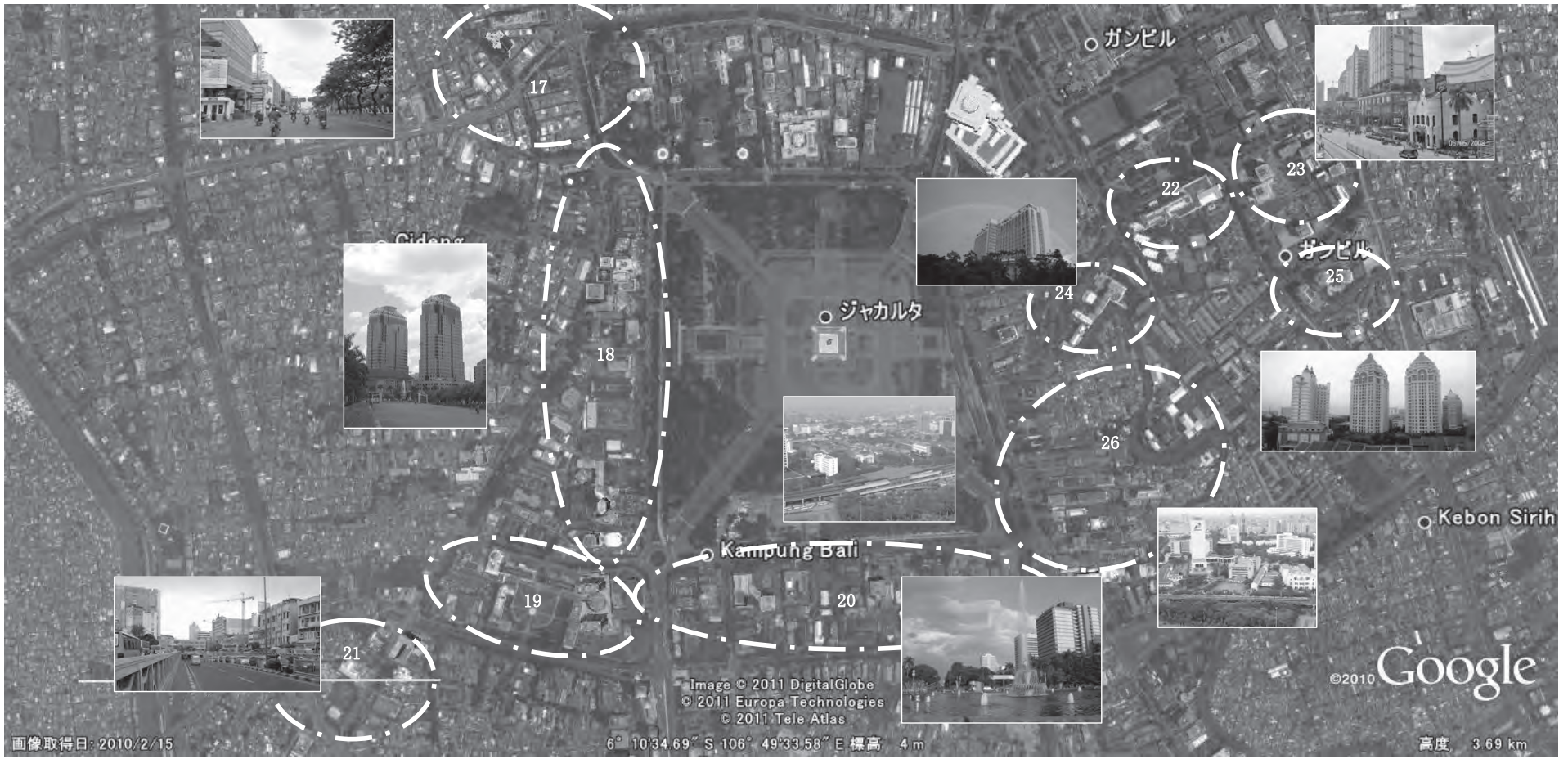
16
34
35
1 km
Image © 2011 DigitalGlobe
© 2011 Europa Technologies
© 2011 Tele Atlas
Google earth
画像取得日: 2010/2/15
6° 09'07.06" S 106° 49'12.40" E 標高 9 m
高度 5.29 km


ガンビル
17
22
23
ガンビル
25
24
ジャカルタ
18
26
Kebon Sirih
Kampung Bali
19
20
21
Image © 2011 DigitalGlobe
© 2011 Europa Technologies
© 2011 Tele Atlas
©2010 Google
画像取得日: 2010/2/15
6° 10'34.69" S 106° 49'33.58" E 標高 4 m
高度 3.69 km


27
28
29
30
31
32
Melati Pond
タナ・アバン
Setia Budi
スティア・ブディ
1 km
Image © 2011 DigitalGlobe
© 2011 Europa Technologies
© 2011 Tele Atlas
©2010 Google
画像取得日: 2010/2/15
6° 11'45.52" S 106° 49'42.84" E 標高 7 m
高度 4.99 km

(2) Building Sewer Management Survey-1

Questionnaire

QUESTIONNAIRE ON BUILDING SEWERAGE COST
ON WASTEWATER MANAGEMENT IN DKI JAKARTA

PART-1 GENERAL INFORMATION OF QUESTIONEE

SKYLINE BUILDING

Address Jl. MH. Thamrin No.9 Kel. Kebon Sirih Kec. Menteng
No. of Floors 18 Floors
Area of Building Floor 21.195,97 m^2
Immovable property tax (Asset tax) N/A IDR/year

Water Sourc : Piped-water
Monthly Water Consumption 3.791 m^3/month 47.729.620 IDR/month

PART-2 INDIVIDUAL INFORNATION ON TREATMENT FACILITIES

Q1

Installation Cost of Wastewater Treatment Plant

TOTAL	0 x 1.000.000 IDR	(no data)
ME	0 x 1.000.000 IDR	(no data)
CIVIL	0 x 1.000.000 IDR	(no data)

Installation Date : December 1975

Treatment Capacity 100 m^3/day
Type of Treatment Process : Extended Aeration Process

Q2

Management Cost of Wastewater Treatment Plant

Monthly O&M 2,700,000 IDR (excl. Labor Cost)
Number of O&M Staff 1 People

History and Cost of Repair, Rehabilitation and/or Replacement

	(Content and/or reasons)	(month/year)	
1	Renovation of Sewage Treatment (septic tank)	Oct-87	38,730,000 IDR
2	Engine Replacement	2008	19,750,000 IDR
3	Engine Replacement	2009	18,150,000 IDR
4	Pipe & Valve Replacement	2010	5,850,000 IDR

Q3

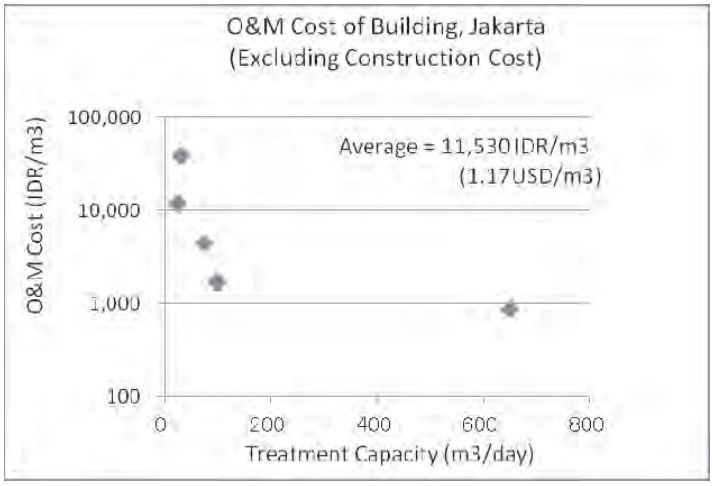
Any Action in order to comply with the effluent standards

1	Examination of water sample in the laboratory every month	115,000 IDR
2	Examination of water sample in the laboratory every three months	300,000 IDR
3	Emptying septic tank once a year	300,000 IDR

Survey Results

Building		SK	WBM	SPP	GR	GP	MB
No. of Floor	stories	18	9	21	5	9	23
Floor Area	m2	21,196	2,500	11,370	7,800	76,822	29,000
Property tax	IDR/year	N.A.	53,751,250	N.A.	65,000,000	2,320,000,000	373,000,000
Property Tax per Area & Month	IDR/m2/month		1,792		694	2,517	1,072
Monthly Water Consumption	m3/month	3,791	200	24,000	500	2,400	2,952
	IDR/month	47,729,620	2,500,000	301,200,000	6,500,000	30,120,000	37,000,000
	IDR/m3	12,590	12,500	12,550	13,000	12,550	12,534
Installation Cost (Total)		N.A.	N.A.	N.A.	19,000,000	240,000,000	N.A.
ME		N.A.	N.A.	N.A.	8,000,000	140,000,000	N.A.
Civil		N.A.	N.A.	N.A.	11,000,000	100,000,000	N.A.
Treatment Capacity	m3/day	100	32	650	26	75	70
Treatment Process		Extended Aeration	Septic Tank	Extended Aeration	Septic Tank	Extended Aeration	Activated Sludge
Monthly O&M excld. Labor Cost	IDR/month	2,700,000	150,000	2,000,000	1,000,000	1,500,000	N.A.
Number of Staff		1	3	4	2	3	2
Repair Cost	IDR/year	10,937,500	N.A.	85,000,000	N.A.	10,903,750	N.A.
Sampling Test	IDR/year	2,580,000	N.A.	3600000	N.A.	913,000	N.A.
Desludging	IDR/year	1,200,000	1,000,000	20,000,000	N.A.	7,200,000	N.A.
O&M Total Cost	IDR/year	77,117,500	92,800,000	252,600,000	72,000,000	127,016,750	

O&M Cost of Building excluding Construction Cost



Wastewater Management Cost per Floor Area excluding Construction Cost

Wastewater Management Cost of Construction & OM per Floor Area

Wastewater Management Cost per Property Tax excluding Construction Cost

(3) Building Sewer Management Survey-2

Questionnaire "Building Sewer Management" Survey
on
Wastewater Management in DKI Jakarta

Part-1 General Information of Questionee

Address _____ Kec. _____ Kel. _____

No. of Floor: _____ Floors Area of Building Floor: _____ m^2

Immovable property tax (Asset tax) _____ IDR/year

Water Source (✓)

( ) Piped-water ( ) Shallow well ( ) Deep well

Monthly Water Consumption _____ m^3/month _____ IDR/month

Part-2 Individual Information of Building Sewer Management

Q-1

Wastewater Treatment Plant (✓)

( ) Individual ( ) Communal owned

Treatment Capacity m^3/day

Type of Treatment Process _____

Q-2

Cleansing & Desludging of Treatment Plant

_____ times/year _____ m^3 tank truck /each time

Cleaning Cost _____ IDR/year

Please check (✓) ( ) Private Septic Plumber ( ) Public (Dinas Kebersihan)

Q-3

What bothers you on wastewater disposal and facility management?

( ) Offensive Odor, ( ) Maintenance, ( ) Cost, ( ) Expertise Staff, ( ) Floor Area

(in detail) _____

Q-4

Do you know the role of sewerage system as followings?

Yes ( ) No ( )

Q-5

Do you want to continue owned treatment plant or to connect to public sewer, if public sewerage system is developed?

Yes ( ) No ( ) ( ) depends on the Tariff (IDR/month)

Present water environment is (D-level)

Polluted and offensive odor

Debris deposits

Unhygienic and caused habitual diarrhea

After sewerage system improves water quality level to:

Boatable（C）

Fishable（B）

Water cleaned up to “Boatable”

Relation between water quality level and water life

Water quality level		
↑ Polluted	D – level Polluted Offensive odor	
	C – level Raise to boatable/ fishable level	
	B – level Raise to playing in water /bio-diversity level	
↓ Clean	A – level Raise to swimmable	

Commecial Building Survey (1/3)

ID no.	Kecamatan	Kelurahan	GENERAL INFORMATION									note
						Water Source				Water Consumption		
			No. of Floor	Area of Building Floor (m^2)	Asset Tax (IDR/year)	Piped water	Shallow water	Deep well	Recycled water	volume (m^3/month)	cost (IDR/month)	
1	Menteng	Kebon Sirih	18	21195,97 (gross); 15137,93 (nett)	N/A	✓				3,791	47,729,620	
2	Tanah Abang	Tanah Abang	26	33,000	1,000,000,000	✓				5,000	65,000,000	water consumption cost is around Rp 60.000.000 - 70.000.000
3	Tanah Abang	Karet Tengsin	19 & 26	49,000	1,257,000,000	✓		✓		11,500	144,325,000	Volume of water consumption is around 60% from tap water 40% from ground water. The answer just cover volume for tap water, because they didn;t know exactly volume for ground water usage
4	Menteng	Gondangdia	11 & 30	77,000	3,200,000,000	✓			✓	15,000	188,250,000	
5	Tanah Abang	Gelora	29	50,000	N/A	✓			✓	1,500	18,825,000	
6	Senen	Kenari	9	2,500	53,751,250	✓		✓		200	2,500,000	They use ground water just for back up (irregulary used)
7	Gambir	Petojo Utara	23	29,000	373,000,000	✓		✓		2,952	37,000,000	They use ground water just for back up (irregulary used)
8	Menteng	Kebon Sirih	21	11,370	N/A	✓		✓		24,000	301,200,000	They use ground water just for back up (irregulary used)
9	Setiabudi	Kuningan Timur	5	7,800	65,000,000	✓		✓		500	6,500,000	They use ground water just for back up (irregulary used)
10	Taman Sari	Mangga Besar	9	76,822	2,320,000,000	✓		✓		2,400	30,120,000	They use ground water mostly. Supply from tap water use for just 3rd & 4th floor

Commecial Building Survey (2/3)

ID no.	Q-1						note	Q-2				note
	Waste Treatment Plant			Treatment capacity (m^3)	Treatment capacity (m^3/10,000m^2)	Type of treatment process		Frequency of desludging (times/year)	Cleaning cost (IDR/year)	Cleaning method		
	Individual	Communal	Already connect to sewerage pipe							Private	Public	
1	✓			100		extended aeration process		2	5,250,000		✓	
2			✓		0							
3			✓									
4	✓			400	52	aeration & bioreactor		1	25,000,000		✓	They do desludging every 9 months; cleaning cost is included in all STP operational&maintenance cost per month
5	✓			1000	200	aeration & membran		12	36,000,000	✓		
6	✓			32	128	septic tank		2	1,200,000	✓		
7	✓			70	24	aeration process & active sludge method		1	2,000,000	✓		
8	✓			650	572	extended aeration process & septic tank		3	25,000,000		✓	
9	✓			26	33	septic tank		1	1,500,000	✓		
10	✓			75	10	extended aeration process		2	2,000,000	✓		

Commecial Building Survey (3/3)

ID no.	Q-3							note	Q-4		Q-5			note
	Offensive Odor	Maintenance	Cost	Expertise staff	Floor area	Don't have problem	in detail		Yes	No	Yes	No	Depends on tariff	
1						✓			✓		✓			they think if using sewerage system will make operational&maintenance easier to handle.
2						✓	Because of already connected to sewerage piped, so far they don't have any problem.		✓		✓			
3						✓	Because of already connected to sewerage piped, so far they don't have any problem.		✓		✓			
4		✓	✓	✓					✓			✓		For now, they still using own facility. The reason is because high demand on water consumption while supply of tap water is vey low and unstable.
5		✓					usually problem about machinery failure. Some broken equipments or blower		✓		✓			
6		✓							✓		✓			
7		✓					Not enough capacity of blower. So aeration process is not going well		✓		✓			
8		✓	✓	✓			Existing treatment facility is kind a out of dated, so there are some leaks that occur in the outlet pipe		✓			✓		They already had plan to build recycled treatment.
9		✓							✓		✓			
10		✓					Broken pump caused by too much solid waste flow into pump. It cause overflowed to aeration tank (so aeration didn't perform maximum process)		✓		✓			

Result of Commercial Building Survey

		Water source
Piped water	10	Waster consumption 7 – 800 m^3/day
Shallow well	0	Small office: 10 – 20 m^3/day
Deep well	6	Large office: 100 – 300 m^3/day
Recycled water	2	Hotel: 500 – 800 m^3/day
		Water supply cost: 12,600 IDR/m^3
		Estimated sewerage tariff cost: 25 – 60 % of water supply

	Wastewater treatment
Treatment process	Extended aeration Trickling filter, Aeration & RO (filtration) Septic tank
Treatment capacity	26 – 1,000 m^3/day Mode: 70 – 100 m^3/day
Sludge disposal	1 – 3 times/year, most frequent 12 times/year Sludge volume: 5 - 50 m^3/time Cleansing Cost: 42,000 - 200,000 IDR/m^3 Ave. Cost: 170,000 IDR/m^3

Problem on O&M	Yes	Detailed comment
Offensive odor	0	・ Usually problem about machinery failure. Some broken equipments or blower ・ Not enough capacity of blower. So aeration process is not going well Existing treatment facility is kind a out of dated, so there are some leaks that occur in the outlet pipe ・ Broken pump caused by too much solid waste flow into pump. It cause overflowed to aeration tank (so aeration didn't perform maximum process)
Maintenance	7	
Cost	2	
Expertise staff	2	
Floor area	0	
No problem	3	

Awareness of Sewerage			
	Yes	No	Detailed comment
Sewerage role	10	0	
Public sewerage	8	2	・They think if using sewerage system will make operational & maintenance easier to handle. ・For now, they still using own facility. The reason is because high demand on water consumption while supply of tap water is very low and unstable.(Majority is miscellaneous use = low quality water) ・They already had plan to build recycled treatment.

Asset Tax	700 – 3,500 IDR/m^2 Average: 2,200 IDR/m^2

Estimated Sewerage Tariff Level	
Water Supply	25 – 60 % of water supply
Asset Tax	30 % of Asset Tax

Additional Opinion on Commercial Building Survey

JICA PPP Study Team

Building Name	Opinion	Questioner impression
WBM	Actually they are willing to connect to sewerage pipe as long as it is indeed the terms set by the government. But if that is an option, it will be a consideration. They will connect as long as cost still makes sense. They think the waste water that has been produced is not a problem. Because office occupancy rate is low enough, then the domestic waste produced is also not much.	In my opinion, building owner was not aware that the existing system they use can pollute the environment especially ground water. They still use a conventional septic tank with absorption into the soil. It is automatically contaminate groundwater. In addition, the government seems not strictly apply the rules. (probably it caused by location of the office not on a business or commercial district)
MBTN	They have a problem with broken existing equipment (machinery failure) and limited budget for the renovation. Because of it, they think sewerage pipe is a better solution. If they connect to sewerage pipe, building owner is no longer thinking about STP maintenance issue. Would be better is the tariff are cheaper than STP maintenance and operational costs.	Overall, the existing STP is on good condition. But somehow, their blower does not perform maximum capacity. They have 2 blowers and it run one by one (switch every 2 hours). They told me that blower capacity not enough to process all of wastewater. Sometimes, effluent water appear turbid and bit smelly.
SPPH	Basically building owner was still considering about connect to sewerage pipe. They had a plan to build recycled water treatment this year. The plant automatically requires a supply from STP output. They are willing to connect with condition that existing STP not to be closed. In other word, waste water that will be flowed to sewerage pipe are the rest of the recycled water treatment. Actually they think sewerage pipe is a good idea to manage general drainage condition in Jakarta. During this time, each building flow waste water onto city drainage pipe. The pipe often becomes clogged due to many solid wastes. When rainy season comes, the pipe becomes overloaded and cause flooding. This is caused waste water drain back onto building pipe. It is of course aesthetically disturbing and may cause sanitation problems. Then with the sewerage pipe is expected to be an alternative for better drainage system.	

Building Name	Opinion	Questioner impression
GR	For the building owner this plan is very welcomed. With the condition of old buildings, existing STP has been renovated several times. So in their opinion, sewerage pipe facilitate their needs. They are no longer deal with wastewater treatment problem because it has been handled by government. Besides they have a plan to expand building area, so the area should be allocated for STP can be used for other purposes given the relatively high land prices.	
GP	Sewerage pipe feel quite necessary to be realized. Building use as a shopping center then wastewater generated was quite a lot. Building owner find it difficult to deal with problems caused by STP. If they connect to sewerage pipe, then they would not provide expert staff to handle the problems.	Based on the info obtained, the building was often reprimanded by BPLHD because the quality of effluent water does out of standard. They have several problems of broken blower, pump, even leak pipe. STP is overloaded and does not have enough capacity to treat waste water. So, before waste water is properly processed in one tank, it will be overflow to the next tank.

5. Summary of Environmental Survey on Road Conditions

SUMMARY OF ROAD CONDITION WHICH THAT WILL INSTALLING SEWERAGE PIPELINE

Surveyed on : Saturday-Sunday, 1-2 July 2012 (Holiday)

Surveyed by : Ade Erfansyah

STA.	Location/Name of Road Segment	Description of Road Condition				
		Geometric	Traffic Condition and Public Trans	Majority Usage of Side Walk and Roadside	Underground Infrastructure	Photo Doc
1.	Jln Tambak (2 way), Kelurahan Pegangsaan, Jkt Pusat	ROW 20 m TW 14 m TL 7 m SW 0.8 m DR 0.5 m (C)	• Relatively dense on workday and smoothly on holyday. • P-156, AC-60, P-116, Steady Safe 936 (Manggarai-Psr Baru), • Steady Safe AC-47 (Manggarai-Senen)	• Poles of street lighting, electricity, and billboard • Roadside usage are Small shop, business and town house	• Telephone Cable and • Drinking water pipe (PAM)	
2.	Jln Bandengan Utara (1 way), Penjaringan, Jkt Utara	ROW 15 m TW 10 m TL 5 m SW 1 m DR 0.7 m (C) SR 0.8 m	• Relatively dense on workday and smoothly on holyday. • Mikrolet M-13 (Kalideres-Kota) • Ojeg (free route)	• Poles of street lighting, electricity, billboard, telephone, traffic sign, trees, bridge crossed • Roadside usage are Small shop, business, school, gov't office and town house	• Telephone Cable • Drinking water pipe (PAM)	
3.	Jln Proklamasi (1 way), Kelurahan Pegangsaan, Jkt Pusat	ROW 15 m TW 10 m TL 5 m SW 1,5 m DR 0.8 m SR 0.3 m	• Relatively dense on workday and smoothly on holyday. • Trans Jkt coridor V (Kp. Melayu-Ancol) • Bus Sinar Jaya P-156 (Kp. Rambutan – Psr Baru), Bus AC P-16 (Rawamangun – Lebak bulus), Mayasari 905 (Pulo Gadung – Dr Wahidin), • Steady Safe 962 and AC-54 (Pulo Gdg-Kota), • Metromini T-49 (Pulo Gadung – Manggarai),	• Poles of street lighting, electricity, billboard, telephone, traffic sign, trees, • Roadside usage are university and town house	• Telephone Cable • Gas pipe • Drinking water pipe (PAM) • Electricity cable	
4	Jln. Bandengan Utara (1 way), Kelurahan Penjaringan, Jakarta Utara	ROW TW 6m TL 6 m SW - DR 1m SR 0.6m	• Relatively dense on workday and smoothly on holyday. • Mikrolet M-13 (Kalideres-Kota)	• Poles of street lighting and crossing bridge • Roadside usage are retail, warong and town house	• Telephone Cable • Electricity cable	

STA.	Location/Name of Road Segment	Description of Road Condition				
		Geometric	Traffic Condition and Public Trans	Majority Usage of Side Walk and Roadside	Underground Infrastructure	Photo Doc
5	Jl. Pegangsaan Barat (2 way), Kelurahan Pegangsaan, Jakarta Pusat	ROW TW 7 m TL 7 m SW 1m DR 1m SR 0.6 m	• Relatively dense on workday and smoothly on holyday. • U 07, T 502 , U 13	• Parking on right sidewalk • Roadside usage are offices, Apartment, Puskesmas. Sebrang jln: Taman, Station Kereta Cikini	• Gas pipe • Drinking water pipe (PAM)	
6	Jln. KH. Moch. Yamin (1 way), Kelurahan Menteng, Jakarta Pusat	ROW TW 6m TL 6m SW 1 m DR 2 m SR -	• Relatively dense on workday and smoothly on holyday • Kopaja T-502 (Kp. Rambutan – Tanah Abang)	• Poles of street lighting, electricity, billboard, telephone, traffic sign, trees, • Roadside usage is Elite settlement	• Drinking water pipe (PAM)	
7	Jl. Pejalan (1 way), kecamatan Roa Malaka, Jakarta Utara	ROW TW 6m TL 6 m SW DR 0.8 m SR 6 m	• Relatively dense on workday and smoothly on holyday • Mikrolet M-10 (Tanah Abang-Kota)	• Poles of street lighting, the big pots • Roadside usage are Commercial building, and retail	• Drinking water pipe (PAM) • Electricity cable	
8	Jln. KH. Moch. Yamin (1 way), Kelurahan Menteng, Jakarta Pusat	ROW TW 6m TL 6 m SW DR 0.8 m SR 6m	• Relatively dense on workday and smoothly on holyday • P73, P20, p158, P116, 52, 507, 906, P7, 507	• Poles of street lighting, electricity, telephone, trees, • Roadside usage are Elite settlement, elite settlement and embassy office	• Drinking water pipe (PAM) • Telephone fiber optic Cable	
9	Jl. Perniagaan Barat, kecamatan Roa Malaka, Jakarta Utara	ROW TW 5 m TL 5 m SW DR 0.8 m SR 1 m	• Relatively dense on workday and holyday • Mikrolet M-10 (Tanahabang-Kota) • Many Ojeg in the traditional market area	• Poles of street lighting, electricity, telephone, trees, • Roadside usage are townhouse, retail, office, warehouse, and traditional market (pasar pagi) includes parking and waste area	• Drinking water pipe (PAM)	

STA.	Location/Name of Road Segment	Description of Road Condition				
		Geometric	Traffic Condition and Public Trans	Majority Usage of Side Walk and Roadside	Underground Infrastructure	Photo Doc
10	Jln. KH. Moch. Yamin (1 way), Kelurahan Menteng, Jakarta Pusat	ROW TW 6m TL 6 m SW DR 0.8 m SR 6m	• Relatively dense on workday and smoothly on holyday • P73, P20, p158, P116, 52, 507, 906, P7, 507	• Poles of street lighting, electricity, telephone, trees, • Roadside usage are Elite settlement, elite settlement and embassy office	• Drinking water pipe (PAM) • Telephone fiber optic Cable	
11	Jln. KH. Moch. Masyur (2 way), Kelurahan Tambora, Jakarta Barat	ROW 10 m TW 10 m TL 5 m SW 3 m DR 0.8 m SR 1 m	• Relatively dense on workday and smoothly on holyday	• Poles of street lighting, electricity, telephone, trees, • Roadside usage are townhouse, retail, office, warehouse, and traditional market includes parking and school	• Drinking water pipe (PAM)	
12	Jl. H. Agus Salim (2 way), Kelurahan Menteng, Jakarta Pusat	ROW TW 10m TL 5m SW - DR 2 m SR	• Relatively smoothly on workday and holyday • PPD 916 (Kp Melayu-Tanah Abang	• Poles of street lighting, electricity, telephone, trees, • Roadside usage are Elite settlement, elite settlement and embassy office	• Drinking water pipe (PAM)	
13	Jln. KH. Moch. Masyur (2 way), Kelurahan Tambora, Jakarta Barat	ROW TW 10 m TL 5 m SW 3 m DR 0.8 m SR 1 m	• Relatively dense on workday and smoothly on holyday	• Poles of street lighting, electricity, telephone, trees, • Roadside usage are townhouse, retail, office, warehouse, and traditional market includes parking and school	• Drinking water pipe (PAM)	
14	Jl. Sumenep.(1 way), Kelurahan Menteng- Jakarta Pusat	ROW TW 6 m TL 6 m SW 0.3 m DR 0.8 m SR 0.3 m	• Relatively smoothly on workday and holyday	• Poles of street lighting, electricity, telephone, trees, • Roadside usage are Elite settlement, elite settlement and embassy office	Telephone fiber optic Cable	

STA.	Location/Name of Road Segment	Description of Road Condition				
		Geometric	Traffic Condition and Public Trans	Majority Usage of Side Walk and Roadside	Underground Infrastructure	Photo Doc
15	Jl. Purworejo .(1 way), Kelurahan Menteng- Jakarta Pusat	ROW TW 6 m TL 6 m SW 0.7 m DR 4 m SR 0.6 m MD 0.3 m	• Relatively smoothly on workday and holyday	• Poles of street lighting, electricity, telephone, trees, • Roadside usage are Elite settlement, elite settlement	Telephone fiber optic Cable	
16	Jl. Blora .(1 way), Kelurahan Menteng- Jakarta Pusat	ROW TW 12 m TL 12 m SW DR 1 m SR 0.3 m MD	• Relatively smoothly on workday and holyday	• Poles of street lighting, electricity, telephone, trees, • Roadside usage are townhouse , restaurant, pot and un- formal retail	• Telephone fiber optic Cable • Gas pipe • Drinking water pipe (PAM) • Electricity cable	
17	Jl. Teluk Betung (2 way), Kelurahan Kebon Melati- Jakarta Pusat	ROW TW 8 m TL 4 m SW 0.7 m DR 1.5 m SR 0.8 m MD	• Relatively dense on workday and smoothly on holyday	• Poles of street lighting, electricity, telephone, trees, • Roadside usage are townhouse , restaurant, pot and un- formal retail	• Telephone fiber optic Cable • Drinking water pipe (PAM)	
18	Jl. Kebon Kacang (2 way), Kelurahan Kebon Melati- Jakarta Pusat	ROW TW 12 m TL 7 m SW 0.3 cm DR 3 m SR 0.3m MD	• Relatively dense on workday and smoothly on holyday	• Poles of street lighting, electricity, telephone and, trees • Roadside usage are townhouse , hotel, apartment, and mall	• Drinking water pipe (PAM)	

STA.	Location/Name of Road Segment	Description of Road Condition				
		Geometric	Traffic Condition and Public Trans	Majority Usage of Side Walk and Roadside	Underground Infrastructure	Photo Doc
19	Noname Road (1 way), Kelurahan Kebon Melati- Jakarta Pusat	ROW TW 6 m TL 6 m SW DR SR MD	• Relatively dense on workday and smoothly on holyday	• Poles of street lighting, electricity, telephone • Roadside usage are townhouse , mall and Street parking (2 road side)	• Drinking water pipe (PAM)	
20	Jl. Kebon Kacang (2 way), Kelurahan Kebon Melati- Jakarta Pusat	ROW TW 7 m TL 7 m SW 0.3 m DR - SR 0.8 m MD	• Relatively dense on workday and smoothly on holyday	• Poles of street lighting, electricity, telephone, trees, • Roadside usage are townhouse , hotel, apartment, and mall	• Drinking water pipe (PAM)	
21	Jl. KH. Mas Mansyur (2 way), Kelurahan Kebon Melati- Jakarta Pusat	ROW TW 12 TL 6 SW - DR 1 m SR MD	• Relatively dense on workday and smoothly on holyday • Steady Safe P-133 (Grogol-Kelender) • Kopaja S-608 (Blok M-Tanahabang), Kopaja S-615 (lebak Bulus-Tanahabang) and Mikrolet M-38 (Grogol-Tanah abang)	• Poles of street lighting, electricity, telephone and, trees • Roadside usage are townhouse , offices and retail /informal retail (kaki lima)	• Telephone fiber optic Cable • Drinking water pipe (PAM)	
22	Jl. Abdul Muis (2 way), kelurangan Petojo Selatan, Jakarta Selatan	ROW TW 6 m TL 3 m SW DR 1 m SR 0.6 m MD	• Relatively dense on workday and smoothly on holyday • Mayasari Bakti 507 (Pulo Gadung-Tanahabang), Steady Safe 939 (Blok M-Veteran), Steady Safe AC-110 (Tj. Priok-Tanahabang) and Mikrolet M-08 (Tanahabang-Kota).	• Poles of street lighting, electricity, telephone and, trees • Roadside usage are townhouse , offices and retail /informal retail (kaki lima)	• Telephone fiber optic Cable • Drinking water pipe (PAM)	

STA.	Location/Name of Road Segment	Description of Road Condition				
		Geometric	Traffic Condition and Public Trans	Majority Usage of Side Walk and Roadside	Underground Infrastructure	Photo Doc
23	Jl. Suryopranoto (2 way), kelurangan Petojo Selatan, Jakarta Selatan	ROW TW 12 m 6 m TL (3m busway) SW DR 1 m SR 0.8 m MD	• Relatively dense on workday and smoothly on holyday • Bus way corridor III (Kalideres-harmoni) • PPD 504 (Pulo Gadung-Grogol), PPD P-25 (Senen-Tangerang) and Kopaja P-12 (Senen-Kalideres)	• Poles of street lighting, electricity, telephone and, trees • Roadside usage are townhouse , offices, settlement and retail /informal retail (kaki lima)	• Telephone fiber optic Cable • Drinking water pipe (PAM)	
24	Jl. Ir. H. Juanda (1 way), kelurahan Gambir, Jakarta Pusat	ROW TW 10 m TL 10 m SW 0.8 m DR 4 m SR 0.8 m MD	• Relatively dense on workday and smoothly on holyday • Bus way corridor II (Pulo Gadung-Harmoni), Koridor III (Kalideres-Harmoni) • Steady Safe 936 (Manggarai-Psr Baru), Steady Safe 939 (Blok M-Veteran), PPD 12 (Blok M-Senen), PPD P1 (bekasi-Harmoni)	• Poles of street lighting, electricity, and telephone • Roadside usage are townhouse , offices and settlement	• Telephone fiber optic Cable • Drinking water pipe (PAM)	
25	Jl. Veteran (1 way), kelurahan Gambir, Jakarta Pusat	ROW TW 7 m 7 m TL (3 m busway) SW DR 1 m SR - MD	• Relatively smooth on workday and holyday • PPD P1 (Bekasi-Harmoni), PPD P43 (Banteng Utara-Depok)	• Poles of street lighting, electricity, telephone and, trees • Roadside usage are Elite settlement on the side back of President Palace	• Telephone fiber optic Cable • Drinking water pipe (PAM)	
26	Jl. Teluk Gong (2 way), kelrahan Pejagalan, Jakarta utara	ROW TL 14 m SW 7 m DR 1 m SR 60 cm 1 m MD	• Relatively dense on workday and smoothly on holyday • M25 (Grogol –Kota) , B01 (grogol-angke)	• Poles of street lighting, electricity, telephone and, trees • Roadside usage are townhouse , offices and settlement	• Telephone fiber optic Cable • Drinking water pipe (PAM)	

Source : Field Survey, 1-2 July 2012

SUMMARY OF ROAD CONDITION WHICH THAT WILL INSTALLING SEWERAGE PIPELINE

Surveyed on : Saturday -Sunday, 1-2 July 2012 (Holiday)

Surveyed by : Randi Suhendi

STA.	Location/Name of Road Segment	Description of Road Condition				
		Geometric	Traffic Condition and Public Transportation Route	Majority Usage of Side Walk and Road Side	Underground Infrastructure	Photo Doc
1.	Jl. Moh Mansyur	ROW m TW 6 m TL 2 m SR 1 m SW - DR 1.5 m	• The traffic relatively dense on workday and smoothly on holyday. • Metro mini No. 80 Kali Deres Jembatan Lima • Mikrolet M 10 Tanah Abang-Kota	• Poles of street lighting, electricity, and billboard • Roadside usage are glassware market on ± 100 m corridor in the morning and vegetables in the evening (PasarJembatan Lima)	• Telephone Cable and • Drinking water pipe (PAM)	
2.	Jl. Latumenten Raya	ROW m TW 16 m TL 4 m SR 6 m SW - DR 1 m	• The traffic relatively dense on workday and smoothly on holyday. • Busway corridor • Mikrolet 25 and 01 Grogol-Muarakarang	• Poles of street lighting, electricity, and billboard • Roadside usage are townhouse, office and retail	• Telephone Cable and • Drinking water pipe (PAM)	
3.	Jl. Bendungan Utara	ROW m TW 10 m TL 4 m SR 3 m SW 5 m DR -	• The traffic relatively dense on workday and smoothly on holyday.	• Poles of street lighting, electricity, and billboard • Roadside usage are townhouse, office and retail	• Telephone Cable and • Drinking water pipe (PAM)	
4.	Jl. Tubagus Angke	ROW m TW 8 m TL 2 m SR 1,5 m SW - DR 1 m	• The traffic relatively dense on workday and smoothly on holyday. • Metro mini 86 and 29, Mikrolet 02	• Poles of street lighting, electricity, and billboard • Roadside usage are townhouse, retail and settlement along the river side	• Telephone Cable and • Drinking water pipe (PAM)	

STA.	Location/Name of Road Segment	Description of Road Condition				
		Geometric	Traffic Condition and Public Transportation Route	Majority Usage of Side Walk and Road Side	Underground Infrastructure	Photo Doc
5.	Jl. Tubagus Angke Jembatan Lima	ROW m TW 5 m TL 2 m SR - SW 1 m DR 20 m	• The traffic relatively dense on workday and smoothly on holyday. • Metro mini 86 and 29, Mikrolet 02	• Poles of street lighting, electricity, and billboard and an existing train crossing • Roadside usage are townhouse, retail and settlement	• Telephone Cable and • Drinking water pipe (PAM)	
6.	Jl. Jembatan 2 Raya	ROW m TW 12 m TL 3 m SR 1 m SW - DR 1 m	• The traffic relatively dense on workday and smoothly on holyday. • Metro mini 83, and Mikrolet 25 Grogol-Kota	• Poles of street lighting, electricity, and billboard • Roadside usage are townhouse, retail and settlement	• Telephone Cable and • Drinking water pipe (PAM)	
7.	Jl. Gedong Panjang 2	ROW m TW 19 m TL 3 m SR - SW 1,5 m DR 2 m	• The traffic relatively dense on workday and smoothly on holyday. • Metro mini 84 and Mikrolet M 25 Kota-Kapuk	• Poles of street lighting, electricity, and billboard • Roadside usage are townhouse, retail and settlement, as well as informal retail (Kaki lima)	• Telephone Cable and • Drinking water pipe (PAM)	
8.	Jl. Gedong Panjang 1	ROW m TW 15 m TL 5 m SR - SW 1,5 m DR 2 m	• The traffic relatively dense on workday and smoothly on holyday. • Busway Pluit Pinang Ranti Corridor • Metro Mini 84 (Kali Deres-Kota), No. 87 (Muara Baru-Kali Deres) • Mikrolet 01 MuaraKarang – Grogol	• Poles of street lighting, electricity, and billboard • Roadside usage are townhouse, retail and office	• Telephone Cable and • Drinking water pipe (PAM)	

STA.	Location/Name of Road Segment	Description of Road Condition				
		Geometric	Traffic Condition and Public Transportation Route	Majority Usage of Side Walk and Road Side	Underground Infrastructure	Photo Doc
9.	Jl. Teluk Gong Raya	ROW m TW 6 m TL 2 m SR 6 m SW - DR 1 m	• The traffic relatively dense on workday and smoothly on holyday. • Mikrolet 01 MuaraKarang – Grogol	• Poles of street lighting, electricity, and billboard • Roadside usage are townhouse, retail and office	• Telephone Cable and • Drinking water pipe (PAM)	
10.	Jl. Raya Jembatan 3	ROW m TW 15 m TL 5 m SR - SW - DR 5m	• The traffic relatively dense on workday and smoothly on holyday. • 100 m to crossing with traditional market and 200 m to overfly	• Poles of street lighting, electricity, and billboard • Road side usage are townhouse, retail and office as well as informal retail (kaki lima)	• Telephone Cable and • Drinking water pipe (PAM)	
11.	Jl. Pluit Utara Raya	ROW m TW 12 m TL 2 m SR 4 m SW - DR 1 m	• The traffic relatively dense on workday and smoothly on holyday. • Mikrolet 01 Grogol – Angke	• Poles of street lighting, electricity, and billboard • Road side usage are settlement and retail	• Telephone Cable • Drinking water pipe (PAM) • Electricity cable	
12.	Jl. Pantai Mutiara 1	ROW m TW 6 m TL 2 m SR 2 m SW - DR 1 m	• The traffic relatively smooth on workday and on holyday. • Ojeg	• Poles of street lighting, electricity • Road side usage are housing t	• Electricity cable	

STA.	Location/Name of Road Segment	Description of Road Condition				
		Geometric	Traffic Condition and Public Transportation Route	Majority Usage of Side Walk and Road Side	Underground Infrastructure	Photo Doc
13.	Jl. Pantai Mutiara	ROW m TW 8 m TL 2 m SR 2,5 m SW 1,5 m DR -	• The traffic relatively dense on workday and smoothly on holyday.	• Poles of street lighting, electricity • Road side usage are houses complex	• Telephone Cable • Drinking water pipe (PAM) • Electricity cable	
14.	Jl. Mandala Bahari	ROW m TW 8 m TL 2 m SR 2 m SW - DR 1 m	• The traffic relatively dense on workday and smoothly on holyday.	• Poles of street lighting, electricity • Road side usage are dock, market, and town-house	• Telephone Cable • Drinking water pipe (PAM) • Electricity cable	
15.	Jl. Pasar Muara Angke	ROW m TW 7 m TL 2 m SR 1 m SW - DR 1 m	• The traffic relatively dense on workday and smoothly on holyday.	• Poles of street lighting, electricity • Road side usage are traditional market (Pasar Muara Angke) and fish storage ass well as town house	• Drinking water pipe (PAM)	
16.	Jl. Kapau	ROW m TW 20 m TL 4 m SR - SW - m DR - m	• The traffic relatively dense on workday and smoothly on holyday.	• Poles of street lighting, electricity • Road side usage are townhouse and settlement in a long the river corridor	• Telephone Cable • Drinking water pipe (PAM)	

STA.	Location/Name of Road Segment	Description of Road Condition				
		Geometric	Traffic Condition and Public Transportation Route	Majority Usage of Side Walk and Road Side	Underground Infrastructure	Photo Doc
17.	Jl. Lodan Raya	ROW m TW 20 m TL 4 m SR - SW - m DR - m	• The traffic relatively dense on workday and smoothly on holyday.	• Poles of street lighting, electricity • Road side usage are retail and warehouse	• Telephone Cable • Drinking water pipe (PAM)	
18.	Jl. Pakin	ROW m TW 20 m TL 40 m SR - SW DR 4 m	• The traffic relatively dense on workday and smoothly on holyday. • Mitro mini 02 (Senen- Muara Karang) and Mikrolet M 15	• Poles of street lighting, electricity and billboard • Road side usage are townhouse, retail and housing complex Muara Angke	• Telephone Cable • Drinking water pipe (PAM)	
19.	Jl. Jalan Muara Baru (jalan raya)	ROW m TW 10 m TL 2 m SR - SW 1,2m DR 1 m	• The traffic relatively dense on workday and smoothly on holyday. • Mitro mini O2 (Senen- Muara Karang)	• Poles of street lighting, electricity and billboard • Road side usage are warehouse, apartment and settlement	• Telephone Cable • Drinking water pipe (PAM)	
20.	Jl. Muara Baru	ROW m TW 10 m TL 2 m SR - SW - DR -	• The traffic relatively dense on workday and smoothly on holyday. • Mikrolet U 11 (Muara Baru – Muara Angke)	• Poles of street lighting and electricity • Road side usage are Settlement on the right and left road corridor	• Telephone Cable • Drinking water pipe (PAM)	

STA.	Location/Name of Road Segment	Description of Road Condition				
		Geometric	Traffic Condition and Public Transportation Route	Majority Usage of Side Walk and Road Side	Underground Infrastructure	Photo Doc
21.	Jl. Pluit Raya	ROW m TW 10 m TL 3 m SR 6 m SW 1,5 m DR 1,5 m	• The traffic relatively dense on workday and smoothly on holyday. • Metro mini 02 and Mikrolet U 11 (Muara Baru – Muara Angke)	• Poles of street lighting and electricity • Road side usage are Settlement on the right and left road corridor	• Telephone Cable • Drinking water pipe (PAM)	
22.	Jl. Pluit Raya	ROW m TW 8 m TL 2 m SR 3m SW 3,5 m DR 3,5 m	• The traffic relatively dense on workday and smoothly on holyday. • Metro mini 02 and Mikrolet U 11 (Muara Baru – Muara Angke)	• Poles of street lighting and electricity • Road side usage are Settlement on the right and left road corridor	• Telephone Cable • Drinking water pipe (PAM)	
23.	Jl. Mandala Bahari	ROW m TW 10 m TL 2 m SR 1 m SW - DR 1 m	• The traffic relatively dense on workday and smoothly on holyday.	• Poles of street lighting and electricity • Road side usage are Settlement on the right and left road corridor	• Telephone Cable • Drinking water pipe (PAM)	
24.	Jl. Pluit Karang Barat	ROW m TW 10 m TL 2 m SR 4 m SW - DR 2 m	• The traffic relatively dense on workday and smoothly on holyday. • Bis (kota-Muara Angke) and Mikrolet 01(Grogol – Muara Angke)	• Poles of street lighting and electricity • Road side usage are townhouse, retail and settlement	• Telephone Cable • Drinking water pipe (PAM)	

STA.	Location/Name of Road Segment	Description of Road Condition				
		Geometric	Traffic Condition and Public Transportation Route	Majority Usage of Side Walk and Road Side	Underground Infrastructure	Photo Doc
25.	Jl. Komplek Karang Elok	ROW m TW 8 m TL 2 m SR 2 m SW - DR 2 m	• The traffic relatively dense on workday and smoothly on holyday.	• Poles of street lighting and electricity • Road side usage are Housing Komplek of Karang Elok	• Telephone Cable • Drinking water pipe (PAM) • IPAL pipeline of Housing complex	
26.	Jl. Muara Karang Utara Raya	ROW m TW 24 m TL 4 m SR 4 m SW - DR 2 m	• The traffic relatively dense on workday and smoothly on holyday.	• Poles of street lighting and electricity • Road side usage are Settlement on the right and left road corridor	• Telephone Cable • Drinking water pipe (PAM)	
27.	Jl. Permai Raya	ROW m TW 14 m TL 3 m SR 4 m SW - DR 1 m	• The traffic relatively dense on workday and smoothly on holyday.	• Poles of street lighting and electricity • Road side usage are settlement, retail and Mall	• Telephone Cable • Drinking water pipe (PAM)	
28.	Jl. Pluit Utara Raya	ROW m TW 12 m TL 2 m SR 4 m SW - DR 1 m	• The traffic relatively dense on workday and smoothly on holyday. • Bus Way Corridor 9 • Metro mini 02 (Bendungan-Kota), and Mikrolet 01 (Grogol – Angke)	• Poles of street lighting and electricity • Road side usage are Settlement on the right and left road corridor	• Telephone Cable • Drinking water pipe (PAM)	

STA.	Location/Name of Road Segment	Description of Road Condition				
		Geometric	Traffic Condition and Public Transportation Route	Majority Usage of Side Walk and Road Side	Underground Infrastructure	Photo Doc
29.	Jl. Tambora	ROW m TW 5,5 m TL 2 m SR 1 m SW 1,5 m DR 1,5 m	• The traffic relatively dense on workday and smoothly on holyday. • KWK 02 (Kota-Cengkareng)	• Poles of street lighting and electricity • Road side usage are Settlement on the right and left road corridor	• Telephone Cable • Drinking water pipe (PAM)	
30.	Jl. Tanah Serial	ROW m TW 6,5 m TL 2 m SR 1 m SW - DR 1 m	• The traffic relatively dense on workday and smoothly on holyday. • Metromini M 41 Kota Grogol	• Poles of street lighting and electricity • Road side usage are Settlement on the right and left road corridor	• Telephone Cable • Drinking water pipe (PAM)	
31.	Jl. Krendeng Raya	ROW m TW 6 m TL 2 m SR 1 m SW - DR 1 m	• The traffic relatively dense on workday and smoothly on holyday.	• Poles of street lighting and electricity • Road side usage are Settlement on the right and left road corridor	• Telephone Cable • Drinking water pipe (PAM)	
32.	Jl. Krendeng Barat	ROW m TW 6 m TL 2 m SR 1 m SW - DR 1 m	• The traffic relatively dense on workday and smoothly on holyday.	• Poles of street lighting and electricity • Road side usage are Settlement on the right and left road corridor	• Telephone Cable • Drinking water pipe (PAM)	

STA.	Location/Name of Road Segment	Description of Road Condition				
		Geometric	Traffic Condition and Public Transportation Route	Majority Usage of Side Walk and Road Side	Underground Infrastructure	Photo Doc
33.	Jl. Jembatan Besi awal	ROW m TW 6 m TL 2 m SR 2 m SW - DR 2 m	• The traffic relatively dense on workday and smoothly on holyday. • Mikrolet M 41 (Kota-Grogol)	• Poles of street lighting and electricity • Road side usage are Settlement on the right and left road corridor	• Telephone Cable • Drinking water pipe (PAM)	
34.	Jl. Jembatan Besi akhir	ROW m TW 10 m TL 2 m SR 1 m SW 1,5 m DR 2 m	• The traffic relatively dense on workday and smoothly on holyday. • Mikrolet M 41 (Kota-Grogol)	• Poles of street lighting and electricity and billboard • Road side usage are townhouse and retail	• Telephone Cable • Drinking water pipe (PAM)	
35.	Jl. Lutumenten	ROW m TW 14,5 m TL 4 m SR 4 m SW 3 m DR - m	• The traffic relatively dense on workday and smoothly on holyday. • KWK 25 and 01, Bus Way (Muara Karang-Kampung Rambutan) and Kopaja 86	• Poles of street lighting and electricity and billboard • Road side usage are townhouse, retail and office • Existing artificial lake, toll bridge and river	• Telephone Cable • Drinking water pipe (PAM)	
36.	Jl. Mohammad mansyur (tembusan Hasyim Akbar)	ROW m TW 7 m TL 2 m SR - SW 3 m DR 2 m m	• The traffic relatively dense on workday and smoothly on holyday. • Angkot M 10 (Tanah Abang-Kota) and Metro mini 80 (Grogol-Kali Deres)	• Poles of street lighting and electricity and billboard • Road side usage are townhouse, retail and office	• Telephone Cable • Drinking water pipe (PAM)	

STA.	Location/Name of Road Segment	Description of Road Condition				
		Geometric	Traffic Condition and Public Transportation Route	Majority Usage of Side Walk and Road Side	Underground Infrastructure	Photo Doc
37.	Jl. Veteran	ROW m TW 5,5 m TL 1 m SR 2 m SW - DR 1 m	• The traffic relatively dense on workday and smoothly on holyday.	• Poles of street lighting and electricity • Road side usage are Settlement on the right and left road corridor	• Telephone Cable • Drinking water pipe (PAM)	
38.	Jl. Pecenongan	ROW m TW 12 m TL 2 m SR 1 m SW - DR 1,5 m	• The traffic relatively dense on workday and smoothly on holyday.	• Poles of street lighting and electricity and billboard • Road side usage are townhouse, retail and office	• Telephone Cable • Drinking water pipe (PAM)	
39.	Jl. POS	ROW m TW 12 m TL 4 m SR 2 m SW 4 m DR 3 m	• The traffic relatively dense on workday and smoothly on holyday. • Metromini (Senen –Benhil) and Bus way (Blok M – Kali Deres and Priuk – Blok M)	• Poles of street lighting and electricity and billboard • Road side usage are townhouse, retail and office	• Telephone Cable • Drinking water pipe (PAM)	
40.	Jl. Taman Sahari	ROW m TW 8 m TL 3 m SR 1 m SW 1,5 m DR 2,5 m	• The traffic relatively dense on workday and smoothly on holyday.	• Poles of street lighting and electricity and billboard • Road side usage are townhouse, retail and office • Existing train station	• Telephone Cable • Drinking water pipe (PAM)	

STA.	Location/Name of Road Segment	Description of Road Condition				
		Geometric	Traffic Condition and Public Transportation Route	Majority Usage of Side Walk and Road Side	Underground Infrastructure	Photo Doc
41.	Jl. Mangga Besar 5	ROW m TW 8,5 m TL 2 m SR 2 m SW - DR 1 m	• The traffic relatively dense on workday and smoothly on holyday. • Angkot 01 (Pasar Baru- Kota)	• Poles of street lighting and electricity and billboard • Road side usage are townhouse, retail and office	• Telephone Cable • Drinking water pipe (PAM)	
42.	Jl. Buni	ROW m TW 8,5 m TL 2 m SR 2 SW 3 m DR 1 m	• The traffic relatively dense on workday and smoothly on holyday. • Angkot 01 (Pasar Baru Kota)	• Poles of street lighting and electricity and billboard • Road side usage are townhouse, retail and office	• Telephone Cable • Drinking water pipe (PAM)	
43.	Jl. Manggis	ROW m TW 5,5 m TL 1 m SR - m SW - DR 1 m	• The traffic relatively dense on workday and smoothly on holyday.	• Poles of street lighting and electricity • Road side usage are setllement	• Telephone Cable • Drinking water pipe (PAM)	
44.	Jl. Jayakarta	ROW m TW 10 m TL 3 m SR 1 m SW - DR 1,5 m	• The traffic relatively dense on workday and smoothly on holyday.	• Poles of street lighting and electricity and billboard • Road side usage are townhouse, retail and office	• Telephone Cable • Drinking water pipe (PAM)	

STA.	Location/Name of Road Segment	Description of Road Condition				
		Geometric	Traffic Condition and Public Transportation Route	Majority Usage of Side Walk and Road Side	Underground Infrastructure	Photo Doc
45.	Jl. Gunung Sahari	ROW m TW 10 m TL 4 m SR 2 m SW 4 m DR - m	• The traffic relatively dense on workday and smoothly on holyday. • Angkot 53 (pulo gadung-kota), Metro mini 02 (muara karang-senen) and bus way (Ancol - Kampung Melayu)	• Poles of street lighting and electricity and billboard • Road side usage are townhouse, retail and office	• Telephone Cable • Drinking water pipe (PAM)	
46.	Jl. Mangga Besar Raya	ROW m TW 8 m TL 3 m SR 1 m SW 2 m DR 3 m	• The traffic relatively dense on workday and smoothly on holyday.Angkot 53 pulo gadung kota	• Poles of street lighting and electricity and billboard • Road side usage are townhouse, retail and office	• Telephone Cable • Drinking water pipe (PAM)	

6. JCC Presentation Material

Preparatory Survey for PPP Infrastructure Project
Sewage Treatment Plant Project in DKI Jakarta

JKT Sewerage Zone-1 PPP-FS Working Group Meeting

18 June 2012

1

AGENDA of Working Group #1

A. Technical: Zone-1 sewerage facilities

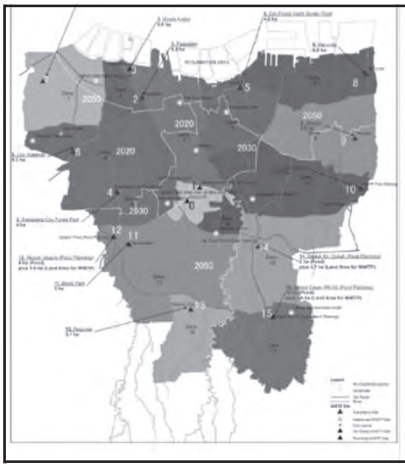
- A-1 Sewer line routes
- A-2 Prediction of sewage inflow based on sewer construction progress
- A-3 WWTP capacities to be balanced with sewage inflow
- A-4 Zone-1 development phasing plan

B. Financial:

- B-1 Consideration for PPP model
- B-2 Construction cost and Service fee
- B-3 Preliminary Analysis on Cost sharing
- B-4 Key to Success of the Project

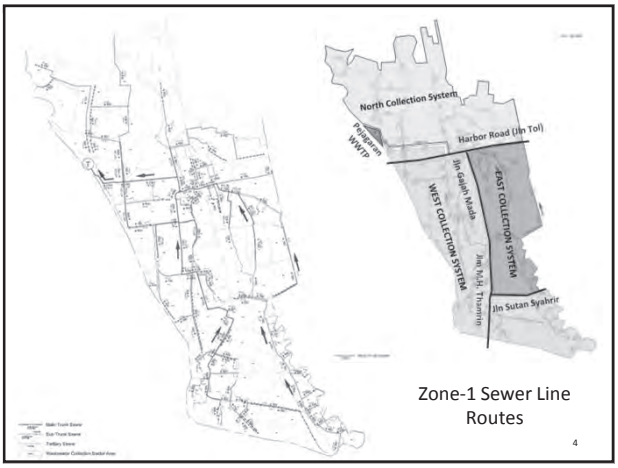
C. Subsequent PPP-FS schedule

2



SEWERAGE ZONING
IN DKI JAKARTA
(Source: JICA MP Review)

3



Zone-1 Sewer Line Routes

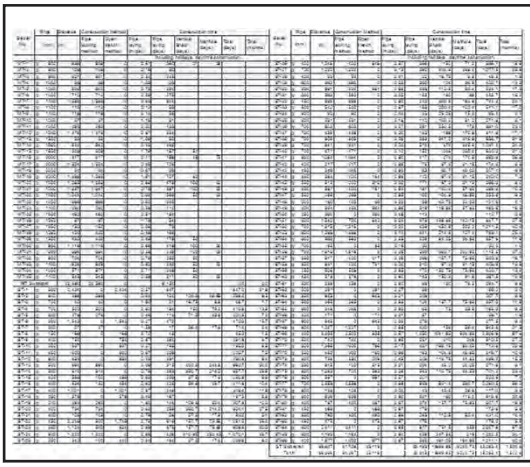
4

Zone-1 Primary & Secondary Sewers
(Source: JICA PPP-FS)

Pipe Diameter (mm)	Distance (m)	Construction Method: Pipe jacking method	Construction Method: Open trench method	Pipe Slope (‰)	Distance of Pipe Jacking Method: 3 m	5 m	7 m	9 m	10 m	>10m	SubTotal	Distance of Pipe Open Trench Method: 1.5 m	3 m	5 m	SubTotal	Nos of Manhole: Type 1	Type 2	Type 3	Type 4	SubTotal	Nos of DC
ϕ 150	168	0	168	3.0	0	0	0	0	0	0	0	168	0	0	168	2	0	0	0	2	5
ϕ 200	1,397	713	684	3.0	100	613	0	0	0	0	713	0	684	0	684	7	14	0	0	21	15
ϕ 250	1,478	508	969	2.8	0	508	0	0	0	0	508	0	969	0	969	11	8	0	0	19	8
ϕ 300	5,972	1,891	4,082	2.8	0	1,891	0	0	0	0	1,891	2,471	1,610	0	4,082	42	31	0	0	73	30
ϕ 350	7,830	2,996	4,835	4.0	800	2,196	0	0	0	0	2,996	588	4,247	0	4,835	51	49	0	0	100	54
ϕ 400	10,931	5,658	5,273	3.5	100	1,324	1,734	0	2,500	0	5,658	752	4,521	0	5,273	44	106	0	0	150	69
ϕ 450	5,113	1,820	3,293	3.0	246	500	1,074	0	0	0	1,820	602	2,691	0	3,293	38	30	0	0	68	50
ϕ 500	7,104	3,441	3,663	2.8	0	665	0	1,220	814	742	3,441	2,434	1,228	0	3,663	33	53	0	0	86	58
ϕ 600	6,520	5,222	1,298	2.6	0	637	1,222	2,951	411	0	5,222	0	1,298	0	1,298	13	67	0	0	80	24
ϕ 700	10,915	10,850	65	2.4	1,616	560	2,537	2,558	803	2,776	10,850	65	0	0	65	0	0	139	0	139	30
ϕ 800	9,399	8,610	789	2.2	0	3,723	278	0	1,368	3,241	8,610	0	789	0	789	0	0	53	0	53	23
ϕ 900	4,371	4,371	0	2.0	0	704	1,116	0	0	2,552	4,371	0	0	0	0	0	0	18	0	18	36
ϕ 1,000	7,165	7,165	0	1.8	0	1,647	1,285	0	38	4,196	7,165	0	0	0	0	0	0	20	0	20	32
ϕ 1,100	3,283	3,283	0	1.6	0	0	629	0	0	2,654	3,283	0	0	0	0	0	0	11	0	11	2
ϕ 1,200	1,810	1,810	0	1.6	0	0	0	0	0	1,810	1,810	0	0	0	0	0	0	7	0	7	0
ϕ 1,350	1,130	1,130	0	1.5	0	0	0	0	0	1,130	1,130	0	0	0	0	0	0	4	0	4	6
ϕ 1,500	466	466	0	1.4	0	0	0	0	0	466	466	0	0	0	0	0	0	2	0	2	0
ϕ 1,650	970	970	0	1.3	0	0	0	0	0	970	970	0	0	0	0	0	0	4	0	4	0
ϕ 1,800	0	0	0	1.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ϕ 2,000	1,941	1,941	0	1.2	0	0	0	0	0	1,941	1,941	0	0	0	0	0	0	5	0	5	0
ϕ 2,200	1,423	1,423	0	1.1	0	0	0	0	0	1,423	1,423	0	0	0	0	0	0	5	0	5	2
Total	89,386	64,267	25,119		2,862	14,967	9,875	6,730	5,934	23,900	64,267	7,081	18,038	0	25,119	241	358	258	10	867	444

1)	Design Flow (daily average & peak)	m³/d	200,000
2)	Design Flow (Timely peak)	m³/d	300,000
3)	Max permissible overload for mechanical pretreatment and STP bypass	% of design value	Not decided

5



Sewer construction analysis (Source: JICA PPP-FS)

6

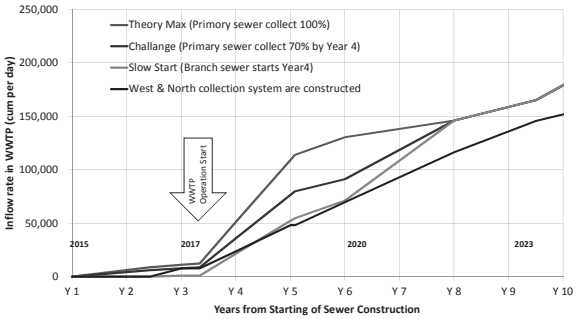
JCC-1 Presentation Material

Sewer construction prediction

Pipe Dia.	Small Diameter Pipe Jacking Method		
	(mm)	(m/day)	(m/day)	(m/day)
ϕ	150	-	-	3.70
ϕ	200	3.34	-	3.62
ϕ	250	3.17	-	3.46
ϕ	300	3.08	-	3.27
ϕ	350	2.98	-	3.01
ϕ	400	4.34	-	2.87
ϕ	450	4.31	-	2.67
ϕ	500	4.29	-	2.57
ϕ	600	3.99	-	2.33
ϕ	700	3.89	-	2.16
ϕ	800	-	1.80	2.07
ϕ	900	-	1.76	1.93
ϕ	1,000	-	1.75	1.78
ϕ	1,100	-	1.75	-
ϕ	1,200	-	1.69	-
ϕ	1,350	-	1.57	-
ϕ	1,500	-	1.56	-
ϕ	1,650	-	1.49	-
ϕ	1,800	-	1.43	-
ϕ	2,000	-	1.37	-
ϕ	2,200	-	1.30	-

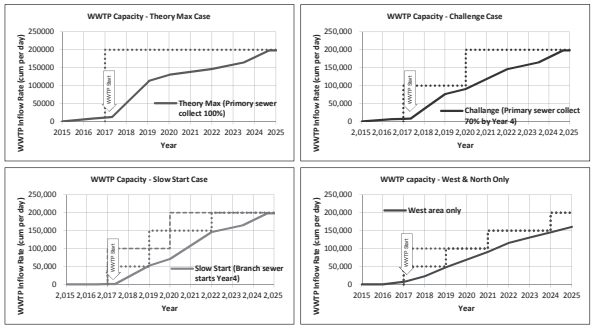
7

Prediction of Sewage Inflow to WWTP
(Source: JICA PPP-FS)



8

Zone-1 Development Phasing (Source: JICA PPP-FS)

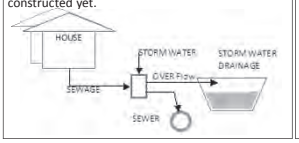


9

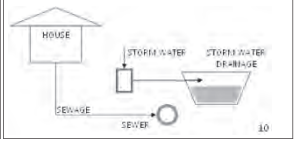
Zone-1 Sewer Development Strategy

- Sewer development procedure is deeply involved in the optimization of project feasibility.
- As the inflow rate in WWTP is depending upon progress of house connection, because delay of house connection makes delay of revenue.
- Slow growth of sewage inflow into WWTP is the biggest obstruction factor for recovery of investment due to postponement of full use of WWTP.
- In order to avoid such adverse effects, this PPP-FS propose scenario of sewer development as follows;

Early stage (approx. year 1 to 10)
a.Primary sewers are constructed from downstream in whole Zone-1.
b.Secondary sewers and manholes are constructed for collection of sewage from drainage.
c.House connection and sewers in between house connection and secondary sewers are not constructed yet.

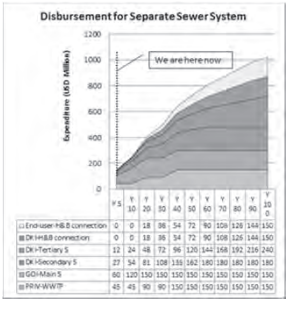


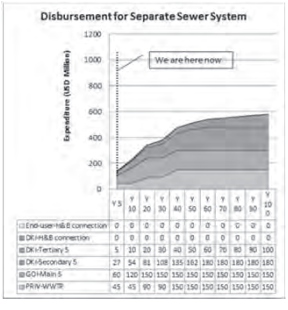
Later stage (after Year 10)
a. Secondary sewers, tertiary sewers and further small sewers are constructed gradually in Zone-1.
b. Manholes to connect sewers and house connection are constructed gradually.



10

(Reference Only)
Cost Comparison between Separate Sewer & Interceptor Sewer





11

Proposal on Business Model
JICA PPP-FS Zone1
(for Pre-JCC1 Meeting)

1. **Conditions and Constraints**
2. **Cases of Phasing Construction of WWTP**
3. **Points to be discussed in related to Cases of Phasing Construction**

June , 2012
JICA PPP-FS Study Team

12

Conditions given by Indonesian sides in Zone 1 Sewerage Development

A. Policy Target of Sewerage Service Coverage in DKI Jakarta shall be at 20% by 2020
⇒Sewage Treatment Required in 2020
= 20% × Total discharge in JKT
= 403,462m3/d(this figure based on M/P Draft Final)

B. Zone 1 contribution
= 198,000m3/average day
= 49 % of Sewage Treatment required in 2020

C. WWTP Operation shall be started in 2017

D. Treated Sewage Effluent Water Quality shall be complied with Environmental Regulations.

13

Physical Constraints for PPP Driver in Zone 1 Sewerage Development

(A) Taking into account JICA ODA Loan Standard Process, sewer pipe construction will be started in 2015.

(B) Then the estimated Zone-1 WWTP inflow rate in the end of 2016 is estimated to be 6,039m3/average-day.

(C) As well as the above (B), the estimated WWTP inflow rate in the end of 2018 is about 79,926m3/average-day at the completion of Trunk Sewers Construction.

14

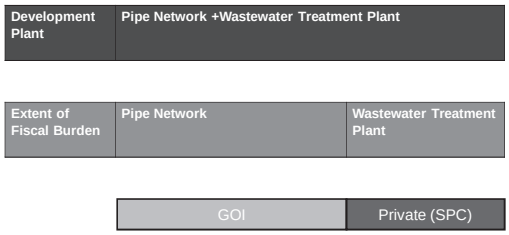
Financial Constraints in Sewerage Development in Zone 1

(A) Construction Period for Sewer Pipe; within 10 Years (Grace Period of JICA ODA Loan is Maximum 10 Years)

(B) Shortening the Schedule for necessary Procedures for JICA ODA Loan is limited
ex)EIA Procedure before Commencement of Construction

15

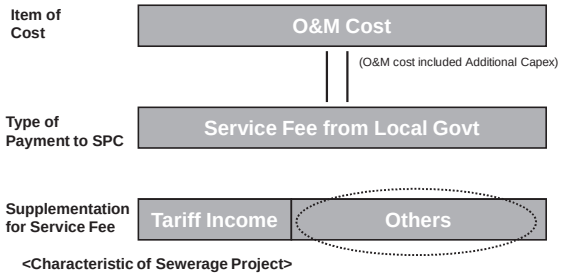
CAPEX-sharing Proposal



・Construction of Pipe Network is public business.
・Construction of Wastewater Treatment Plant is private business.

16

Item of Cost, Type of Payment to SPC and Supplementation for Service Fee (in O&M Period)



<Characteristic of Sewerage Project>
- Initial and Additional capex・・・Huge
- Full cost recovery by Tariff・・・Impossible
- The financial gap should be supplemented in Construction Period and/or in O&M Period

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Cases of Phasing Construction of WWTP

Assumption; based on Conditions and Constraints

Treatment Capacity	198,000(m3/d)	99,000(m3/d)	49,500(m3/d)
WWTP Initial Capex (IDR, in case of MBR)	1.7 trillion (IDR)	1.1 trillion (IDR)	0.8 trillion (IDR)
WWTP Construction Period (Years)	3 Years	2.5 Years	2.5 Years
Main Sewer Pipe Initial Capex	1.6 trillion (IDR)		
Main Sewer Pipe Construction Period	10 Years		
Estimated Effluent Water Quantity in 2024	197,878 (m3/d, Average Daily Flow)		
Estimated Effluent Water Quantity in 2020	118,675 (m3/d, Average Daily Flow)		
Operation Ratio of WWTP in 2017	14%	29%	58%

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Points to be discussed in related to Cases of Phasing Construction①

- **Based on the current Pipe Network Plan, Estimated Effluent Water Quantity (Average Daily Flow) will much increase in 3～4 years.**
  in 2 Years(2016); 6,039m3/d
  in 3 Years(2017); 28,525m3/d
  in 4 Years(2018); 79,926m3/d
- **In 2020 (after 6 Years since the Commencement of Pipe Network Construction by JICA ODA Loan), Estimated Effluent Water Quantity is 118,675m3/d.**
- **High Operation Ratio of WWTP is important, but if the number of Phasing Construction increase, we will have more Inflation Risk in the future.**

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Points to be discussed in related to Cases of Phasing Construction②

- **For the increase of WWTP Operation Ratio, additional Construction for Sewer Pipe Networks is necessary.**
- **Shortening the Schedule for necessary Procedures for JICA ODA Loan is limited.**
  We want to ask DKI to priorly invest to Sewer Pipe Networks (for example, 2 Years Prior Invest)
- **We want to discuss the extent of Fiscal Burden by GOI and DKI .**
  Possible Amount of Initial Capex Investment will determine Phasing Construction Pattern.

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Thank you for your attention!!

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B. Financial: Zone-1 financial structures

B-1 Consideration for PPP model

B-2 Construction cost and Service fee

B-3 Preliminary Analysis on Cost sharing

B-4 Key to success of the Project

(for your references)

- Finance for Sewerage in Japan and USA
- Tariff level all over the World and Concept of Full cost recovery
- Development Strategy of Manila Water
- Step-wised House Connection in JKT Sewerage

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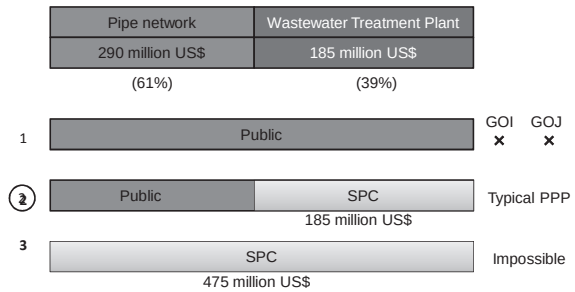
B-1. Consideration for PPP model



Note: GOI is very negative to increase "Foreign Debt".
GOJ is very positive to accelerate "PPP by Japanese Companies".

B-1. Consideration for PPP model

Proposed Demarcation of Zone-1 PPP development

	Budgetary source	Management	Implementation
Construction of WWTP	**Private**	DKI Jakarta	**Private**
Construction of Sewers	**ODA Loan**	GOI / DKI Jakarta	GOI / DKI Jakarta
O&M of WWTP	Tariff / Subsidy	DKI Jakarta	**Private**
O&M of Sewers	Tariff / Subsidy	DKI Jakarta	DKI Jakarta

Note:
1. O&M Company will be set up jointly by DKI Jakarta and Japanese Investor.
2. One agreement to cover EPC and O&M is applied to WWTP.

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JCC-1 Presentation Material

B-2. Construction cost and Service fee

No	Facility Name	Dimension
1	Lift Pump	23,000mmL x 40,800mmW x 1set
2	Aerated Grit Chamber	18,000mmL x 26,600mmW x 1set
3	Equalization Tank	37,000mmL x 40,700mmW x 4sets
4	Anoxic Tank	32,000mmL x 38,000mmW x 4sets
5	Aerobic Tank	29,000mmL x 38,000mmW x 4sets
6	MBR Tank	48,000mmL x 26,000mmW x 4sets
7	Mechanical room of MBR	51,400mmL x 20,000mmW x 4sets
8	Dewatering Building	19,000mmL x 46,800mmW x 1set
9	Administration Building	26,350mmL x 20,350mmW x 1set
10	Discharge Conduit	5,700mmL x 2,800mmW x 1set

B-2. Construction cost and Service fee

Source: JICA PPP-FS

Item	Cost Estimate		
Pipe Network	290 million $ (Primary & Secondary sewer)		
WWTP (198,000 m3/d)	MBR: 185 mil.$ (934 $/m3) ※ needs 3.3 ha	ASP: 198 mil.$ (1,000 $/m3) ※needs 7 ha ※Per-m^3 cost by JICA M/P Rev.	MBBR: (under-requesting to supplier) ※needs 4 ~ 6 ha
WWTP (99,000 m3/d)	MBR: 117 mil.$ (1,182 $/m3)		
WWTP (49,500 m3/d)	MBR: 92 mil.$ (1,859 $/m3)		

Note: Private sector has large allowance in pricing for sophisticated technologies such as MBR.

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B-2. Construction cost and Service fee

Basis of Service fee

Item	Breakdown	
O&M Cost (OPEX)	Item of Expenses	a. Administration, Labor cost, Others b. Utility (electricity, water) c. Consumable (chemical, fuel) d. Quality assurance (legal Inspection) e. Sludge Disposal f. Repairs & Yard Maintenance g. Others
Repayment of CAPEX	Principal	WWTP construction cost
	Interest	Interest of WWTP construction cost

Payment formula : Fixed + Variable(1)*Qin + Variable(2)*Qs + …

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B-3. Preliminary Analysis on Cost sharing

Payment in OM period (DKI ⟶ SPC): Service Fee

Break down of Cost Item: O&M Cost (OPEX) | Repayment of CAPEX Replacement, Funding Cost

Supplementation for Service Fee: Tariff Income ⟵ ⟶ Shortfall

<Characteristic of Sewerage Project>
- Initial and Additional capex・・・Huge
- Full cost recovery by Tariff・・・Impossible
- The financial gap (Shortfall) should be supplemented in Construction Period and/or in O&M Period

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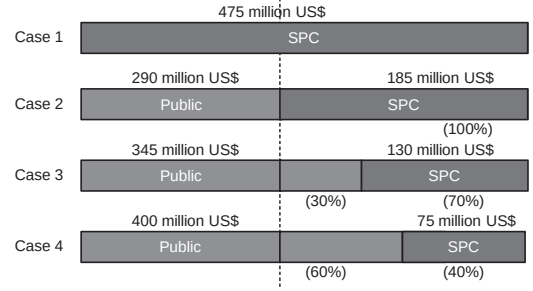
B-3. Preliminary Analysis on Cost sharing

Case Study: PPP 4 Model

	Pipe Network	Wastewater Treatment Plant
Management	Public	SPC
Construction Cost	290 million US$	185 million US$



B-3. Preliminary Analysis on Cost sharing

Basic Assumptions (Tentative)

O&M Period	20 years
Additional CAPEX (Replacement)	included
Inflation	not considered
Sludge Disposal Unit Fee	100 USD/m^3
Currency Exchange Rate	IDR 9,012.5 = USD 1.0 IDR 8,570 = USD 1.0
Bank Loan or Project Finance Interest Rate	10%(Annual Interest) Note: to be explored more in the study.
Bank Loan Grace Period	3 years
Repayment Period	18 years (Principal & Interest Equal Basis)
Tariff Revenue: 616 mil. USD (Total for 20 years) Commercial - 2.5 times, Residents – same as it is today	

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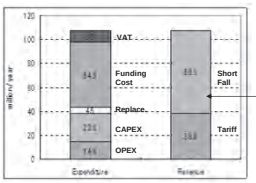
JCC-1 Presentation Material

B-3. Preliminary Analysis on Cost sharing



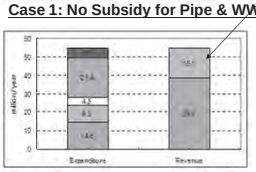
DKI Total Expenditure in 2011
= USD 3,093 mil.

2.2 %

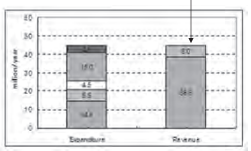
0.5 %

0.2 %

Case 1: No Subsidy for Pipe & WWTP

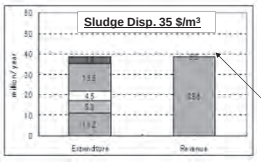


Case 2: No Subsidy for WWTP



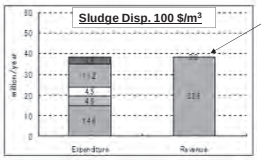
Case 3: 30% Subsidy for WWTP

B-3. Preliminary Analysis on Cost sharing



Case 4-1: VGF around 40%

Viability Gap Fund:
can achieve full cost recovery only with Tariff



Case 4-2: VGF around 50%

B-3. Preliminary Analysis on Cost sharing

Summary on Service fee Variation

	Assumptions			Subsidy in OM Period (milli.USD/y)	Ration for DKI Budget
	WWTP investment	Interest of Private fund	Sewer Investment		
Case 1	Private	10% Annu.	Private	68.9	2.2%
Case 2	Private	-ditto-	Public	16.1	0.5%
Case 3	70 % Private 30 % Public	-ditto-	Public	6.0	0.2%
Case 4-1	60 % Private 40 % VGF	-ditto-	Public	0.0	0.0%
Case 4-2	50 % Private 50 % VGF	-ditto-	Public	0.0	0.0%

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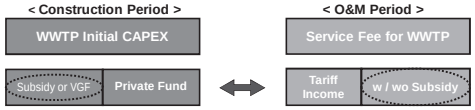
B-4. Key to Success of the Project

Action by Public Sector

- Introduction of BOT ➡ deduct 10 ～ 15% of construction cost
- Conducting Open Bidding ➡ get the Lowest Price with Quality
- Consideration for optimized balance of Subsidy or VGF



Action by Private Sector

- Large allowance in pricing for sophisticated technologies
- Optimized financing arrangement through JICA/PSIF, PIP, IIG, PTSMI

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B-4. Key to Success of the Project

Issues to be discussed in JCC#2

- Appropriate Tariff Level ➡ Analysis based on ATP, WTP
- FIRR, EIRR ➡ Analysis based on Shadow Income
- Implementation Diagram ➡ Permitting process, Contracts, Others
- Risk Management ➡ Risk allocation and Insurance

Key Events

- JCC #2 in July
- G - G Consultation in September
- JICA Pre-Appraisal in October
- JICA Appraisal in December

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Terimakasi banyak!

36 36

Preparatory Survey for PPP Infrastructure Project
Sewage Treatment Plant Project in DKI Jakarta

JKT Sewerage Zone-1 PPP-FS
J C C Meeting 2 nd

26 July 2012

Japan International Cooperation Agency

1

AGENDA of JCC 2

A. Standard of Sewerage: Lesson learned in other countries
- *A-1 Economies of Scale/Proper Volume & Sewer Type*
- *A-2 Financial Support for Sewerage Development/Subsidy or Charge*
- *A-3 Affordable Tariff Level and Cross-subsidy*
- *A-4 Practice and Issues of Other Cities in Indonesia*

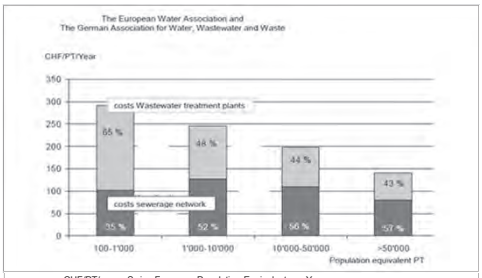
B. Financial Simulation: Affordable Tariff & Impact of Subsidy
- *B-1 Evaluation of Treatment Process for Pejagaran/MBR, MBBR, ASP*
- *B-2 Tariff Settings and Affordability*
- *B-3 Impact Analysis of Subsidy and VGF*
- *B-4 Evaluation of Cost Recovery by EIRR*

C. Implementation Structures and Short Term Schedule

2

A-1. Economies of Scale: Lesson learned for WWTP

Scale merit of Sewerage system / Development in EU



CHF/PT/year : Swiss Franc per Population Equivalent per Year
Source: The European Water Association and The German Association for Water, Wastewater and Waste

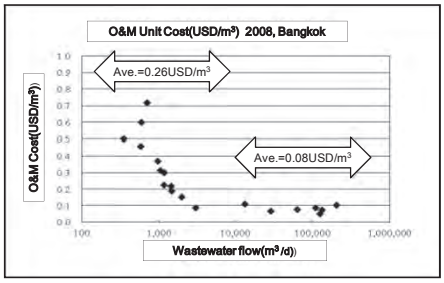
Lesson :

1. Life cycle cost of per capita 50,000 PE is approximately 50 % of 1,000 PE.
2. Catchment areas with bigger WWTPs are more efficient
- both in terms of cost and pollution control.

3

A-1. Economies of Scale: Lesson learned for WWTP

Scale merit for O&M Cost / Example in Bangkok
(Without repair cost and replace cost)



Source : Bangkok wastewater works review, JICA, 2010

Lesson :

O&M cost of small scale treatment plant of 5,000 m³/day or less is 0.26 USD/m³ and large scale treatment plant is 0.08 USD/m³, which is equivalent to 1/3 of small scale.

4

A-1. Economies of Scale: Lesson learned for WWTP

Policy change to large scale plant / Example in Malaysia

5.5 Implementation of Capital Works Programme towards Regionalisation of Sewerage Services

The sewerage infrastructure and facilities in the country has gradually moved towards regionalisation with construction of plants with advanced treatment facilities. Through financial support given by government through each Malaysia Plan, rationalisation and upgrading of existing plants had paved ways for centralised facilities incorporated with state of the art sewage treatment technologies i.e. tertiary treatment that can remove nitrogen and phosphate and mechanical sludge dewatering facilities, to be built. This can help to further reduce the environmental impacts from sewage sources.

Source: Corporate Sustainability Report 2007, 13 years of Environmental Accomplishments 1994-2007

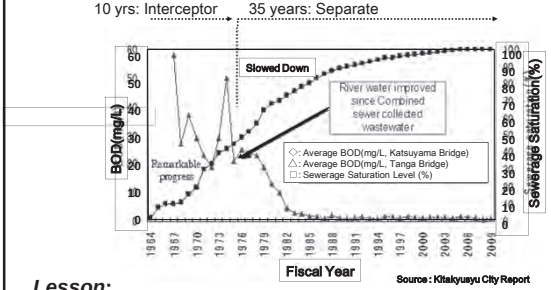
Lesson :

1. Small scale treatment plant is troublesome in water quality control and O&M of equipments in Malaysia.
2. Gov. of Malaysia changed its policy and has developed large scale treatment plant of advanced treatment for nitrogen & phosphorous removal and mechanical dewatering

5

A-1. Proper Sewer Type: Lesson learned for Sewer

Interceptor in the 1st stage and Separate in 2nd stage / Kitakyushu, Japan



Source : Kitakyusyu City Report

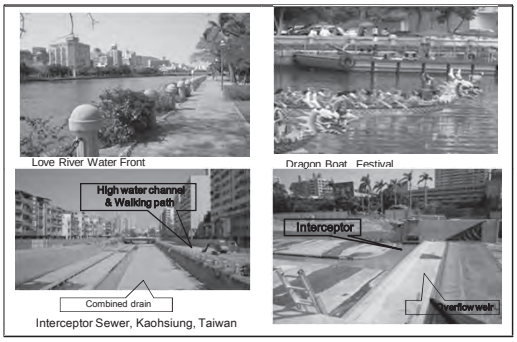
Lesson:

1. Interceptor can be easily installed in a short time and have big contribution to water quality.
2. Separate sewer needs long period for installation and huge cost.

6

A-1. Proper Sewer Type: Lesson learned for Sewer

Interceptor & Combined, no Separate / Kaohsiung, Taiwan



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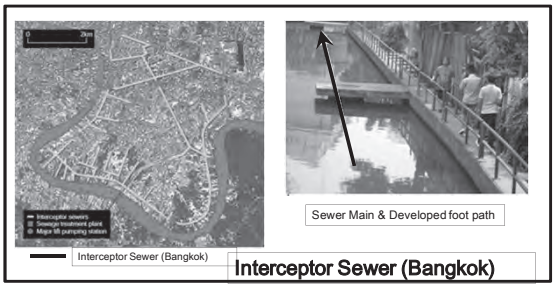
A-1. Proper Sewer Type : Lesson learned for Sewer

Developed from the same situation as of DKI JKT / Bangkok



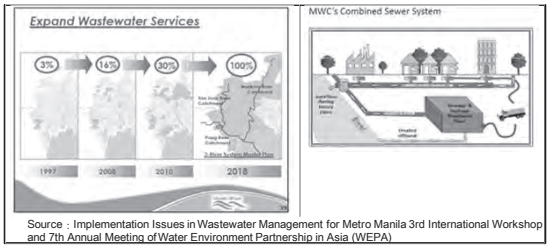
Lesson :

1. **Sewerage system in Bangkok focuses on pollution control of municipal gray water.**
2. **Therefore sewerage system consists interceptor (sewer main) and STP.**
3. **Sewer mains are laid in canal where wastewater is discharged .**

8

A-1. Proper Sewer Type : Lesson learned for Sewer

Conversion from Separate & Small plants to Combined & Large plants / Manila



Source : Implementation Issues in Wastewater Management for Metro Manila 3rd International Workshop and 7th Annual Meeting of Water Environment Partnership in Asia (WEPA)

Lesson :

1. **Combined sewerage system has been replacing separate one due to provide 100 % collection of wastewater urgently and to reduce project cost .**
2. **Combined sewerage system is defined to "a transitional provision for wastewater collection until separate systems are in place".**

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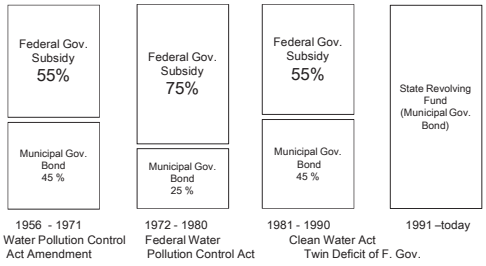
A-2. Financial Support of Sewerage Development

Change of Financial Support of Federal Gov. / USA



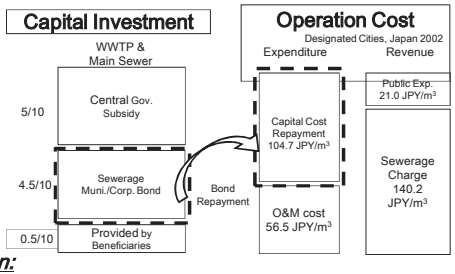
Lesson :

1. **Legal system is amended from wastewater treatment/pollution control to sound water environment.**
2. **Subsidy system has enhanced municipality to accelerate WWTP installation.**

10

A-2. Financial Support of Sewerage Development

Cost Sharing by Central Gov, Municipality, Citizens /Japan



Lesson:

1. **Considering sewerage role as national infrastructure, financing source is shared by Central Gov, Municipality, and Users.**
2. **Sewerage improve "Housing environment" for people, therefore, levies house connection cost, Taxes, and Sewerage charge on Beneficiaries.**
3. **Since sewerage contributes to public water environment and urban aesthetic, Municipality shares on a part of O&M cost.**

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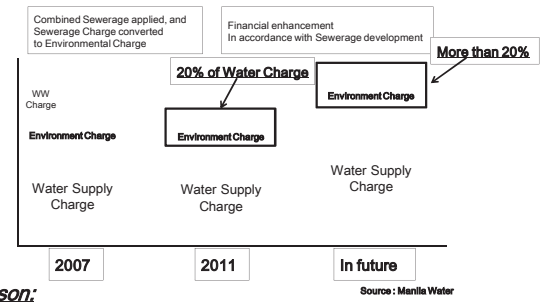
A-2. Financial Support of Sewerage Development

"Environmental Charge" from "Sewerage Charge" / Manila



Lesson:

1. **Environmental Charge is introduced because Combined sewer collect "Gray water" in whole area regardless of house-connections.**
2. **"Environmental Charge" from "Sewerage Charge" is necessary to secure sustainability of service and fair burden for public environment of area.**

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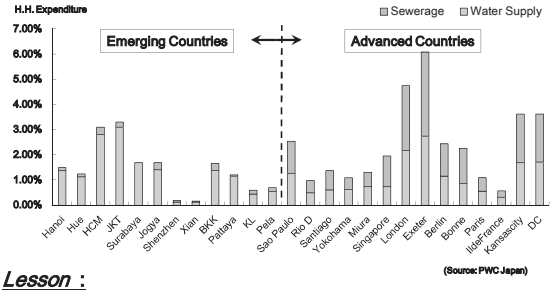
A-3. Affordable Tariff Level and Cross-subsidy

Water & Sewerage tariff level for Household Expenditure



(Source: PWC Japan)

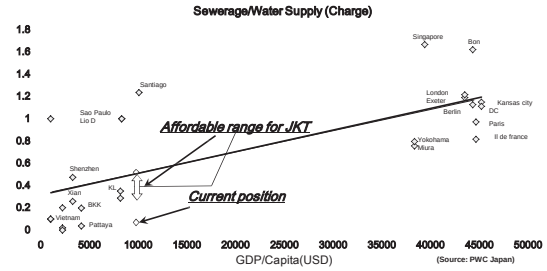
Lesson **:**

1. **There is actually no big difference for Water supply tariff between countries but sewerage tariff is very different mainly because of applied technologies.**
2. **Tariff for sewerage should be around 1% or more for HE when an advanced technology is introduced.**

13

A-3. Affordable Tariff Level and Cross-subsidy

Ratio of Water & Sewerage tariff



(Source: PWC Japan)

Lesson **:**

1. **Sewerage tariff is almost same as water supply one in advanced countries.**
2. **The Star Mark in the figure is the position of DKI JKT and it means 50% of water supply tariff is reasonable as sewerage one .**

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A-3. Affordable Tariff Level and Cross-subsidy

Recommendation for DKI JKT

Current Tariff level in DKI JKT:

Water supply tariff is 3.2% of monthly HE.
Sewerage tariff is merely 0.2% of monthly HE.

Lesson learned:

Sewerage tariff should be 1% to 3.3% for monthly HE.
Cross-subsidy is applied from Commercial to residents in almost all countries.

Analysis for DKI JKT:

1% to 1.6% of monthly HE is quite Affordable for residents.
Sewerage tariff equivalent to 1 % is 5 times of current one .
For commercial, 2.5 times of tariff increase is still affordable.

Recommendation:

For commercial facilities, it should be raised 2.5 times.
For residents, it can be kept in the current level.

15

A-4. Practice & Issues of Other Cities in Indonesia

1. *Treatment process*
   Aerated lagoon in most cities.(Lagoon 10, RBS 1,and ASP 1)
2. *Sewer type*
   Sewer mains are constructed first and construction of house connection has been just started.
3. *Finance*
   STP and main sewers are constructed by APBN (Central government fund).
   Branch sewers are constructed by either APBN (Central government fund) or APBD (Local government fund).
   House connections are constructed by APBD.
4. *Operation and maintenance*
   O&M cost are owned by APBD.
5. *Tariff system*
   Flat rate or Per-floor rate
   Ratio of resident tariff / **commercial tariff** are various between 1 to **2.5 – 6.0**.
   Ratio of resident tariff / industrial tariff are also various between 1 to 4 – 20.

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A-Summary: Lessons learned to Sewerage System in DKI JKT

Lessons learned from foreign countries

1) ***Bigger treatment plants are obviously efficient on any points.***

2) Interceptor and Combined Sewer is Standard in all Asian Cities.

3) Sewerage charge is collected without house-connection in all Asian Cities.

4) Central Gov. Subsidy is necessary and 55 – 75% for WWTP.

5) Affordable tariff and Cross-subsidy is key for sustainability.

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A-Summary: Recommendation to Sewerage System in DKI JKT

- ***Appropriate development way of Sewerage System in DKI JKT***

a) Step-wising and sewer main construction in advance

Sewer main collects wastewater (gray water), which is a principal pollution load, quickly and widely.

b) Setting of Affordable tariff and Cross-subsidy

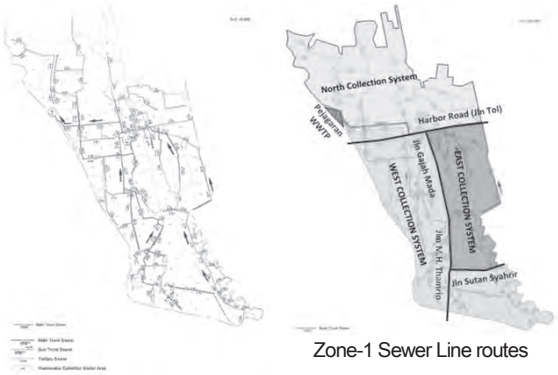
Tariff for Commercial should be raised 2.5 times at the beginning of the project according to the installation of sewer mains and regularly based on the GDP growth.

Collaboration with urban development project

Effluent quality of on-site systems should be monitored, then encourage Commercial to access to public sewer connection.
Sewer main will provide public sewer connection to urban development & re-development projects (= Separate sewer).

18

A-Summary:
Sewer mains cover area rapidly and collect Tariff without House connection

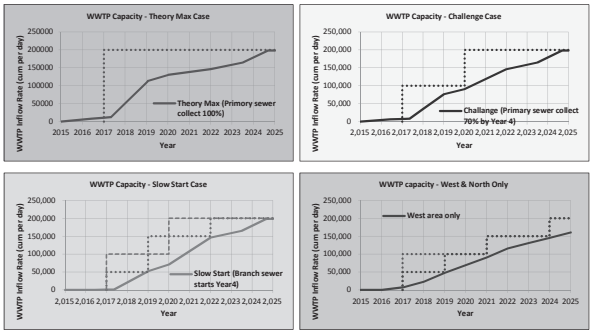


Zone-1 Sewer Line routes

19

A-Summary:
Step-wising development makes proper investment plan possible

Zone-1 Development Phasing (Source: JICA PPP-FS)



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AGENDA of JCC 2

A. Standard of Sewerage: Lesson learned in other countries

A-1 Economies of Scale/Proper Volume & Sewer Type
A-2 Financial Support for Sewerage Development/Subsidy or Charge
A-3 Affordable Tariff Level and Cross-subsidy
A-4 Practice and Issues of Other Cities in Indonesia

B. Financial Simulation: Affordable Tariff & Impact of Subsidy

B-1 Evaluation of Treatment Process for Pejagaran/MBR, MBBR, ASP
B-2 Tariff Settings and Affordability
B-3 Impact Analysis of Subsidy and VGF
B-4 Evaluation of Cost Recovery by EIRR

C. Implementation Structures and Short Term Schedule

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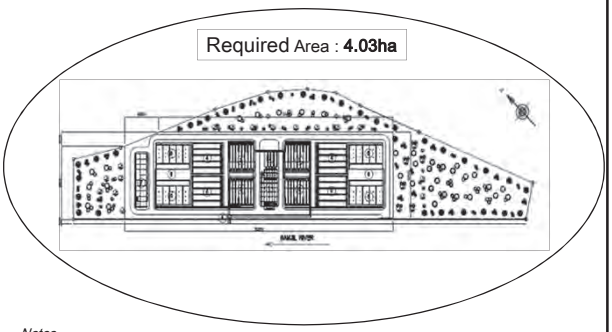
B-1. Evaluation of Treatment Process for Pejagaran

Pejagaran WWTP General Plan for MBR System
(Final Phase : 198,000m³/d as the daily average Inflow)



Notes
① Lift Pump ② Grit Chamber ③ Equalization and Sedimentation Tank ④ Aerobic Tank
⑤ MBR Tank ⑥ Mechanical room for MBR ⑦ Administration & Dewatering Building ⑧ Discharge Conduit

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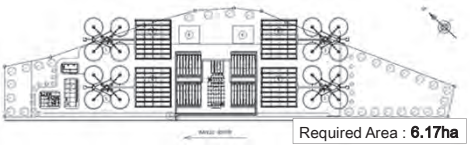
B-1. Evaluation of Treatment Process for Pejagaran

Pejagaran WWTP General Plan for ASP System

Notes
① Lift Pump
② Grit Chamber
③ Equalization and Sedimentation Tank
④ Aerobic Tank
⑤ 2nd Settlement Tank
⑥ Blower Building
⑦ Dewatering Building
⑧ Administration Buil.
⑨Discharge Conduit

Pejagaran WWTP General Plan for MBBR System



Notes
① Lift Pump
② Grit Chamber
③ Equalization and Sedimentation Tank
④ Aerobic Tank
⑤ 2nd Settlement Tank
⑥ Blower Building
⑦ Dewatering Building
⑧ Administration Buil.
⑨Discharge Conduit

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B-1. Evaluation of Treatment Process for Pejagaran

Comparison of each treatment process

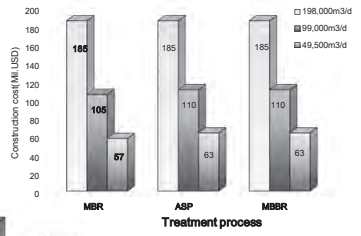
Item / Process		ASP	MBBR	MBR
Required area	Area(ha)	7.52	6.17	**4.03**
	Ratio to ASP(-)	1.0	0.82	**0.54**
Effluent Quality	BOD(mg/L)	< 20	< 20	**< 5**
	SS(mg/L)	< 20	< 20	**< 5**
Construction cost (Mil.USD)	198,000m3/d	185	185	**185**
	99,000m3/d	110	110	**105**
	49,500m3/d	63	63	**57**
Operation cost(USD/m³)		0.18	0.18	**0.16**
Replacement cost(Mil.USD)		125	125	**122**

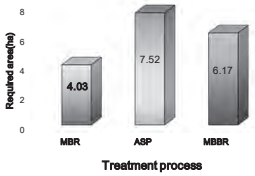
Notes
1) Each system was designed without removal N and P.
2) Construction cost , repair and replacement cost were estimated by JICA team.
3) Operation cost includes repair cost and is for 198,000m3/d. Operation & replacement cost are for 20 years.

24

B-1. Evaluation of Treatment Process for Pejagaran

Estimated ***construction cost*** for each treatment process



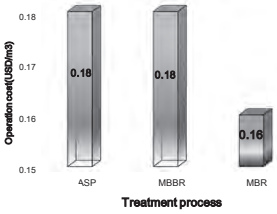


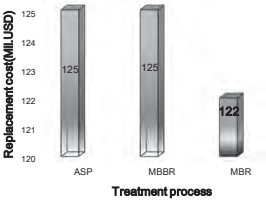
Required area for each treatment process

25

B-1. Evaluation of Treatment Process for Pejagaran

Estimated ***Operation cost*** including repair cost for 20 years (In case of 198,000m³)





Estimated ***Replacement cost*** for 20 years (In case of 198,000m³)

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B-2. Tariff Settings and Affordability

Recommendation from A-3:

*For commercial facilities, it should be raised **2.5 times**.*
*For residents, it can be kept in **the current level**.*

Common condition:

1. *Interceptor is widely installed in Zone-1 in 2007.*
2. *Therefore, DKI JKT starts collection of tariff in 2007.*
3. *GDP increase of DKI JKT is the same as National average (6%).*

For Commercial:

Tariff is raised 2.5 times from current one in 2017.
Then, it is raised by cumulative GDP increase every 3 years.
Commercial floors increase with GDP increase every year.

For Residents:

Tariff is the same as current one. (0.16% of monthly HE)
Then, it is raised by cumulative GDP increase every 3 years.
Burden is same or lower than current level through Project period.

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B-2. Tariff Settings and Affordability

Comparison between MP review and PPP/FS

Unit(Mil. IDR)

O&M Period	2017	2018	2019	2020	2030	2034	2036
O&M Cost	22,391	37,433	54,292	61,106	162,381	146,415	188,900
Repairs	0	0	5,133	1,754	16,178	2,950	24,365
Total O&M Cost ①	22,391	37,433	59,426	62,860	178,559	149,365	213,265
Tariff Revenue②	0	0	130,701	137,931	403,686	508,413	802,060
Balance ②-①	-22,391	-37,433	71,275	75,071	225,127	359,047	588,795
MP Review/HH					37,892	37,892	45,130
/None HH					451,126	451,126	537,405
PPP/FS/HH					17,243	20,536	24,559
/None HH					386,444	487,876	777,600

Less than half mostly

Less than Estimate of MP Review for 14 years

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B-3. Impact Analysis of Subsidy and VGF : Review of JCC1

Case Study: PPP 4 Model

Item	Pipe Network	Wastewater Treatment Plant
Management	Public	SPC
Construction Cost	290 million US$	185 million US$

	475 million US$		
Case 1	SPC		
	290 million US$	185 million US$	
Case 2	Public	SPC	
		(100%)	
	345 million US$	130 million US$	
Case 3	Public		SPC
		(30%)	(70%)
	400 million US$		75 million US$
Case 4	Public		SPC
		(60%)	(40%)

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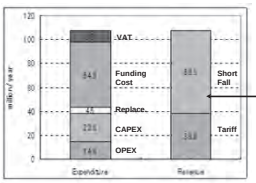
B-3. Impact Analysis of Subsidy and VGF : Review of JCC1

Basic Assumptions (Tentative)

O&M Period	20 years
Additional CAPEX (Replacement)	included
Inflation	**not considered**
Sludge Disposal Unit Fee	100 USD/m³
Currency Exchange Rate	IDR 9,012.5 = USD 1.0 IDR 8,570 = USD 1.0
Bank Loan or Project Finance Interest Rate	10%(Annual Interest) Note: to be explored more in the study.
Bank Loan Grace Period	3 years
Repayment Period	18 years (Principal & Interest Equal Basis)
Tariff Revenue: 616 mil. USD (Total for 20 years) Commercial - 2.5 times, Residents – same as it is today	

30

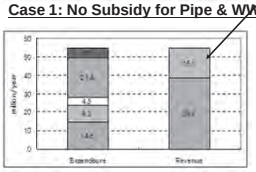
B-3. Impact Analysis of Subsidy and VGF : Review of JCC1



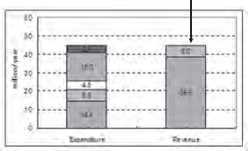
DKI Total Expenditure in 2011
= USD 3,093 mil.

2.2% 0.5% 0.2%

Case 1: No Subsidy for Pipe & WWTP

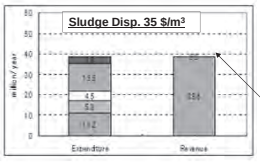


Case 2: No Subsidy for WWTP



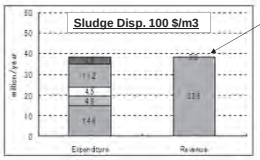
Case 3: 30% Subsidy for WWTP

B-3. Impact Analysis of Subsidy and VGF : Review of JCC1



Case 4-1: VGF around 40%

Viability Gap Fund:
can achieve full cost recovery only with Tariff



Case 4-2: VGF around 50%

B-3. Impact Analysis of Subsidy and VGF : Review of JCC1

Summary on Service fee Variation

	Assumptions			Subsidy in OM Period (milli.USD/y)	Ration for DKI Budget
	WWTP investment	Interest of Private fund	Sewer Investment		
Case 1	Private	10% Anu.	Private	68.9	2.2%
Case 2	Private	-ditto-	Public	16.1	0.5%
Case 3	70 % Private 30 % Public	-ditto-	Public	6.0	0.2%
Case 4-1	60 % Private 40 % VGF	-ditto-	Public	0.0	0.0%
Case 4-2	50 % Private 50 % VGF	-ditto-	Public	0.0	0.0%

B-3. Impact Analysis of Subsidy and VGF
Basic assumptions for Financial Analysis

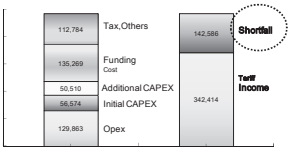
- O&M Period : 20 years
- Additional CAPEX(Replacement) : Included
- Inflation : **Included**
- Sludge Disposal Unit Fee : 60 USD/Dry-t
- Currency Exchange Rate : IDR 9,012.5=USD 1.0
- Loan Interest Rate : **9%**(IDR/Annual Interest)
- Bank Loan Grace Period : 5 years
- Repayment Period : 18 years(Principal & Interest Equal Basis)
- Tariff Revenue : **759** Mil.USD(Total for 20 years)

Commercial – 2.5times, Residents – Same as it today

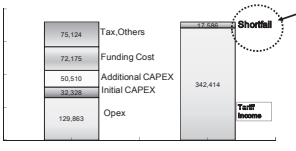
B-3. Impact Analysis of Subsidy and VGF

Impact of Subsidy for Initial Construction

30% Subsidy for Initial CAPEX



60% Subsidy for Initial CAPEX (VGF)



Nearly 0(Zero)

Shortfall will be vanished by bidding

B-3. Impact Analysis of Subsidy and VGF

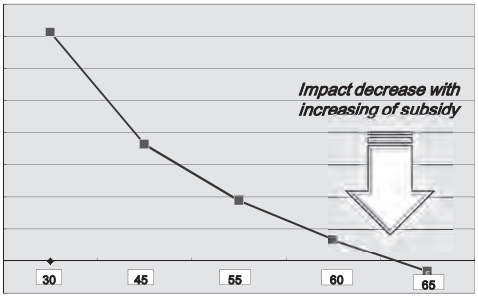
Impact of Subsidy for Initial Construction and Replacement

Subsidy for		Short Fall (Mil.IDR/y)	Service Fee (Mil.IDR/y)
Initial CAPEX (%)	Total CAPEX (%)		
30	18	142,586	485,000
45	28	77,586	420,000
55	34	37,586	380,000
60	**37**	**17,586**	**360,000**
65	40	-2,414	340,000

Notes
1) Total CAPEX means Initial CAPEX + Additional CAPEX.
2) Subsidy for Total CAPEX is much lower than one for Initial CAPEX.

B-3. Impact Analysis of Subsidy and VGF

Impact of Subsidy for Initial Construction



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B-4. Evaluation of Cost Recovery by EIRR

Assumption for Economic Analysis:

1. *Construction Start at 2014 and Operation Start at 2017.*
2. *Project Life; 23years(2014 ~ 2036)*
3. *Capital Opportunity Cost; 12%*

Economic Benefits;

① Reduced O&M Cost of Septic Tanks
② Effect of Improvement in Public Sanitation
③ Effect on Improvement of living Environment
⇒ ② & ③ ; calculated by Amount of Willingness to Pay (WTP) Survey through Contingent Valuation Method(CVM)
④ Usage of Treated Water from WWTP
⑤ Effect of Rise in Land Value
⑥ Effect on Tourism Recuperation

Economic Cost;

1) Initial CAPEX for WWTP and Sewer Pipe
2) Additional CAPEX for WWTP
3) O&M cost for WWTP

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B-4. Evaluation of Cost Recovery by EIRR

Financial and Economical Evaluation

Construction Stage	Subsidy for Initial CAPEX	FIRR ① (Project IRR)	EIRR ②	B/C ③
1 Time	0%	4.33%	171.4%	3.21
	30%	6.71%		
	60%	10.72%		
2 Times	0%	3.51%	195.9	3.19
	30%	6.22%		
	60%	10.81%		

Notes:
①; Sewer pipe construction cost is not included.
②,③; sewer pipe construction cost is included.

Mainly by Rise of Land Value and Opportunity cost

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B-4. Evaluation of Cost Recovery by EIRR

Estimation of Additional Cash Inflow

Item / Year	2017	2020	2023	2034	2036
WTP for Environmental Improvement	0	85,108	99,766	172,500	182,348
Increase of **Land Tax**	30,042	35,780	42,615	71,997	85,749
Revenue from selling Treated Water	0	3,842	4,511	7,977	8,794
Increasing of Income Tax from increased Tourism Income by improving Hotel Occupancy	0	1,713	3,088	6,619	7,297
Increasing of VAT from increased Tourist Expenditure by decreasing Rate of Water-Borne Disease	0	36	67	155	171
Additional Cash Inflow⇒	**30,042**	**126,479**	**150,047**	**259,246**	**284,358**

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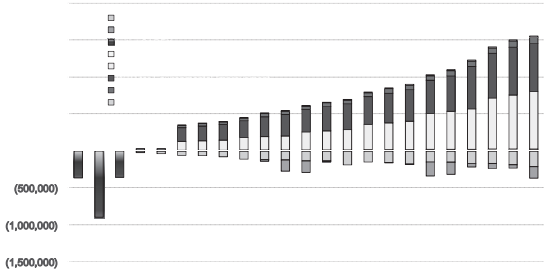
B-4. Evaluation of Cost Recovery by EIRR

Sewerage in Zone-1 is indirectly over Full- cost recovery



Remarks: Funding cost & tax are not considered.

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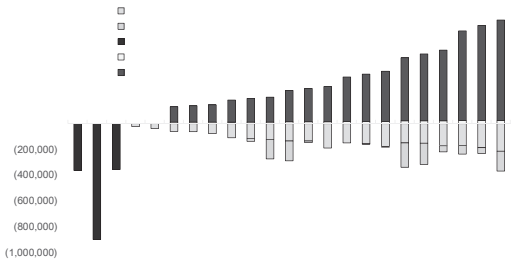
B-4. Evaluation of Cost Recovery by EIRR

Sewerage in Zone-1 is directly Full- cost recovery



Remarks: Funding cost & tax are not considered.

42

B-4. Evaluation of Cost Recovery by EIRR

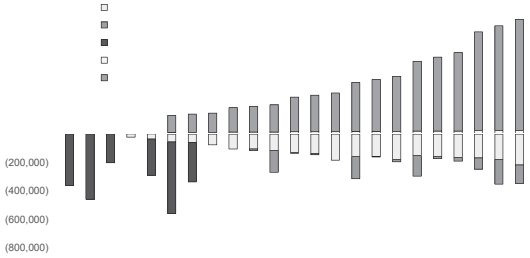
Sewerage in Zone-1 is indirectly over Full- cost recovery

Remarks: Funding cost & tax are not considered.

43

B-4. Evaluation of Cost Recovery by EIRR

Sewerage in Zone-1 is directly Full- cost recovery



Remarks: Funding cost & tax are not considered.

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B-Summary:
Recommendation to Sewerage System in DKI JKT

Appropriate development way of Sewerage System in DKI JKT

a) Treatment Process for Pejagaran

1. *MBR is the best from the points of Cost Performance, Area Constraints, and Easy O&M.*

b) Subsidy and VGF

1. *Impact of Subsidy decrease with its increasing volume.*
2. *35–40% Subsidy is enough for construction and replacement in Zone-1, which is equivalent to 60% subsidy of 1 time in BOT.*

c) Cost Recovery

1. *Sewerage in Zone-1 is viable because of positive EIRR.*
2. *Sewerage in Zone-1 is indirectly full-cost recovery project.*

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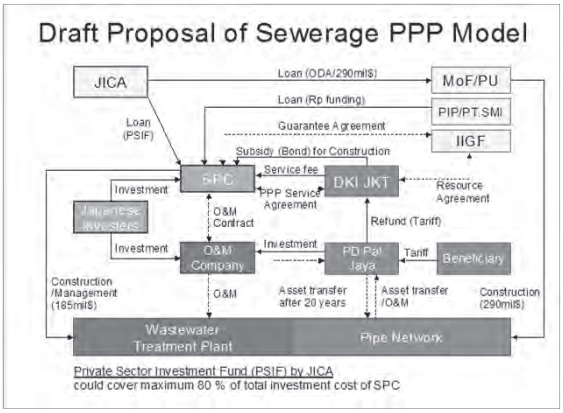
C. Implementation Structures



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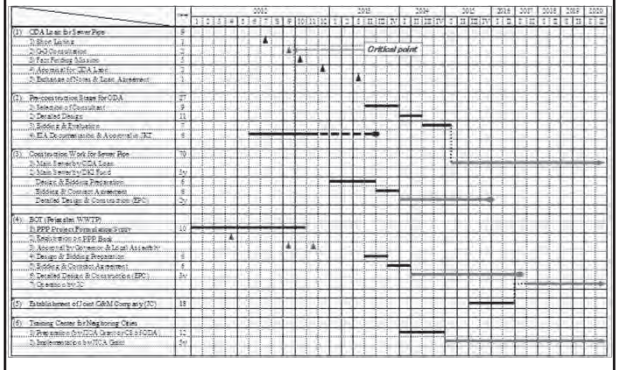
Mid - term schedule



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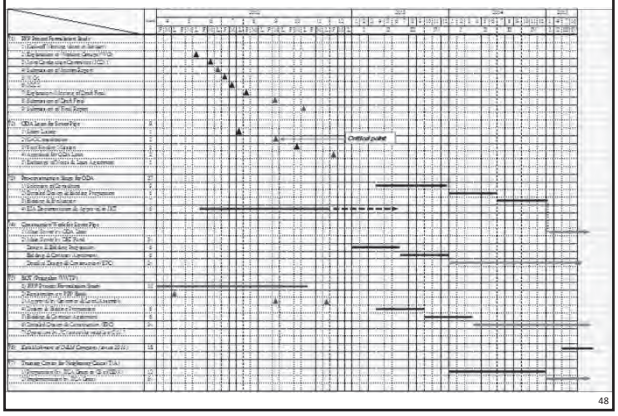
Short - term schedule



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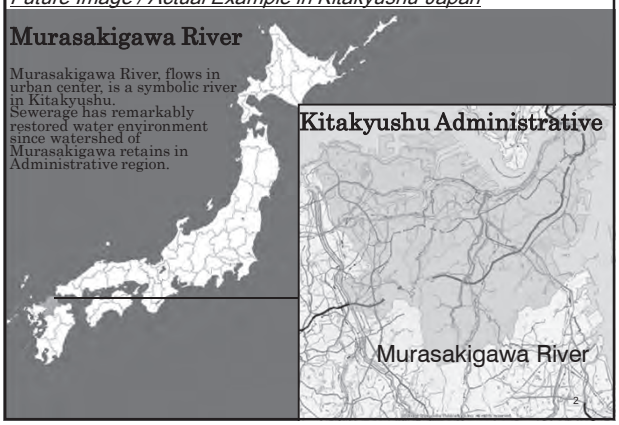
Sewerage PPP Project in DKI JKT

- Future Image of the Goal
- Issues and Solutions
- Cost, Revenue, and Fund Resource
- Steps to the Initiation

December 5, 2012
JICA PPP Study Team

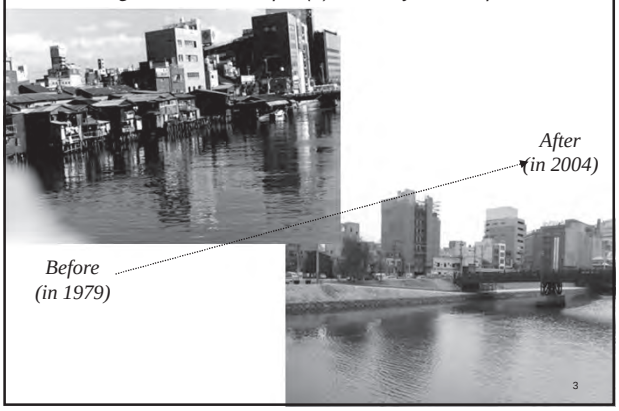
1

Future Image of the Goal:
Future Image / Actual Example in Kitakyushu-Japan



2

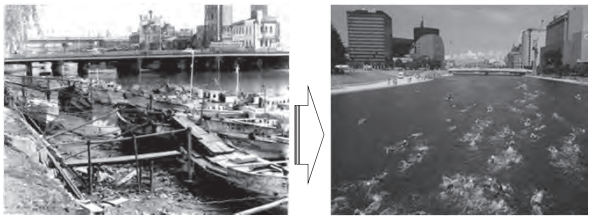
Future Image of the Goal:
Future Image / Actual Example (1) in Kitakyushu-Japan



3

Future Image of the Goal:
Future Image / Actual Example (2) in Kitakyushu-Japan

Before (in 1979) → After (in 2008)

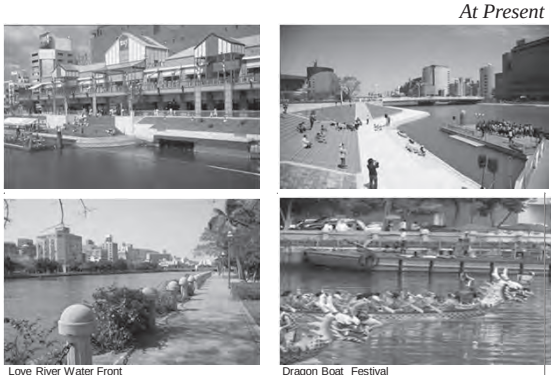


Drastically restored water quality of Murasakigawa River in accordance with sewerage system development

4

Future Image of the Goal:
Future Image / kitatakyushu-Japan & Caoshiung-Taiwan

At Present



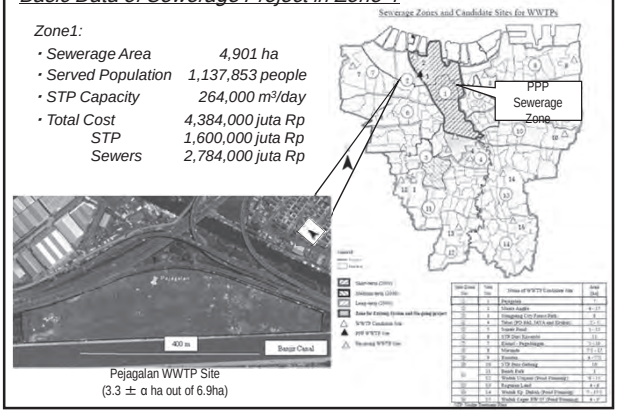
Love River Water Front | Dragon Boat Festival

5

Issues& Solutions:
Basic Data of Sewerage Project in Zone-1

Zone1:

・Sewerage Area	4,901 ha
・Served Population	1,137,853 people
・STP Capacity	264,000 m³/day
・Total Cost	4,384,000 juta Rp
STP	1,600,000 juta Rp
Sewers	2,784,000 juta Rp



Pejagalan WWTP Site
(3.3 ± α ha out of 6.9ha)

JCC-3 Presentation Material

Issues & Solutions:

Issues for Sewerage Development in DKI JKT

- Physical Issues
  - ◆ *Traffic Jam* → Difficulties for *Sewer* Construction
  - ◆ Lack of *Land Space* → Difficulties for *Treatment Plants* Construction
  - ◆ Consistency with *City Development* → Influence of *MRT* Construction
  - ◆ Huge Number of *Terraced Houses* → Difficulties of *House-connection*
- Financial Issues
  - ◆ Remarkable *Inflation* → *Cost* Increase by Implementation Delay
  - ◆ Lack of *Budget* → Shortage of Necessary & Timely *Investment*
- Social Issues
  - ◆ Lack of *Environmental Consciousness* → *Low Interest* for Sewerage
  - ◆ Huge Unbalance of *Revenue* → Difficulties of *Tariff* Setting

Issues & Solutions:

◆ *Traffic Jam* → Difficulties for *Sewer* Construction
◆ Huge Number of *Terraced Houses* → Difficulties of *House-connection* installment

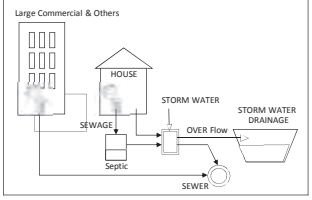
Solution (1) in Planning

> *Step-wised Sewer Development*

First stage (approx. year 1 to 10)

→ *Main Sewer* & *Existing Drainage*

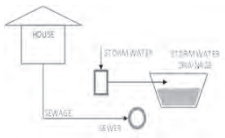
Outcome (1) *: Rapid Increase of Wastewater Collection*
Outcome (2) *: Improvement of Cost Performance*



Second stage (after Year 10)

→ Development of *House-connection*

Outcome (3) *: Completion of House-connections*



8

Solution (1) in Planning

> *Step-wised Sewer Development*

Zone-1 Sewer Line routes

9

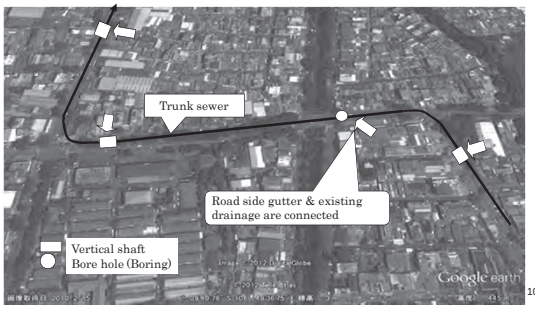
Issues & Solutions:

◆ *Traffic Jam &* Lack of *Land Space* → Difficulties of *Sewer Construction*

Solution (2) in Technology

> *Curb & Long-distance Pipe Jacking Method*

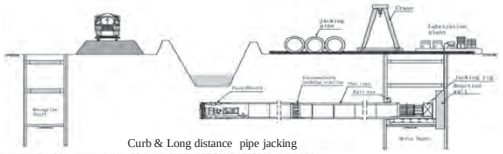
⇨ *Outcome (1) : Remarkable Mitigation of Traffic jam*
Outcome (2) : Rapid Increase of Wastewater Collection



10

Solution (2) in Technology

> *Curb & Long-distance Pipe Jacking Method*



Cut & Fill　　Curb & Long distance pipe jacking

11

Issues & Solutions:

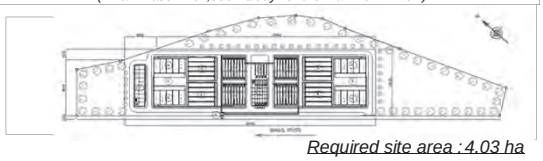
◆ *Lack of Land Space* → Difficulties for *Treatment Plants* Construction
◆ Remarkable *Inflation* → *Cost Increase* by Implementation Delay

Solution (3) in Technology

> *MBR (Membrane Bio-reactor)*

⇨ *Outcome (1) : Small Foot Print of WWTP*
Outcome (2) : Applicability of Recycled Water
Outcome (3) : Easiness of O&M

Pejagaran WWTP General Plan for MBR System
(Final Phase : 264,000m3/day for the maximum Inflow)



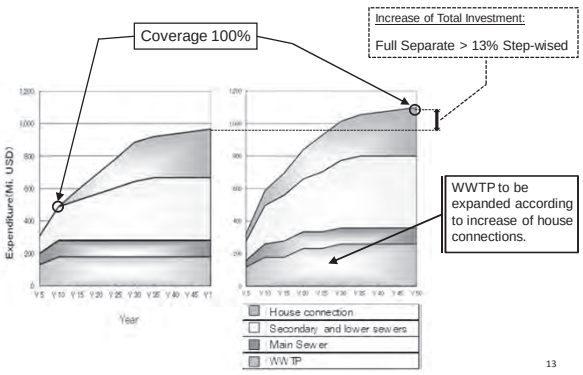
Required site area : 4.03 ha

Notes
① Lift Pump ② Grit Chamber ③ Equalization and Sedimentation Tank ④ Aerobic Tank
⑤ MBR Tank ⑥ Mechanical room for MBR ⑦ Administration & Dewatering Building ⑧ Discharge Conduit

12

Issue & Solutions:

Cost Comparison bw. Step-wised and Full Separate

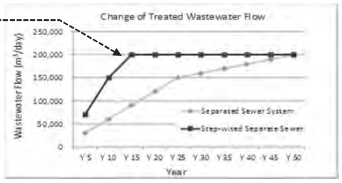


13

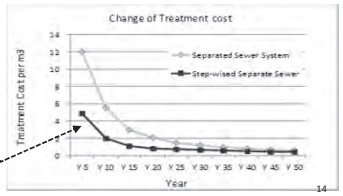
Issue & Solutions:

Cost Factors (1) for Step-wised vs. Full Separate

Rapid Increase of *Wastewater Collection*



Remarkable Improvement of *Cost Performance*

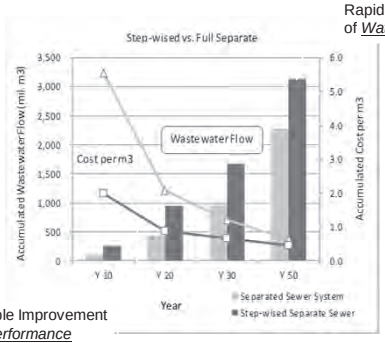


14

Issue & Solutions:

Cost Factors (2) for Step-wised vs. Full Separate

Rapid Improvement of *Water Environment*

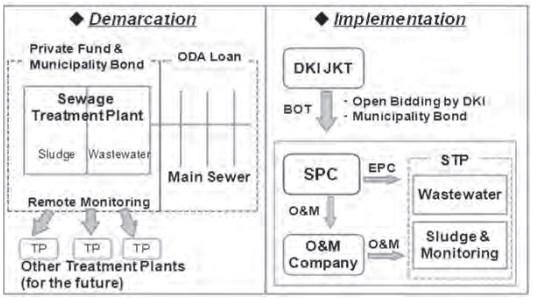


Remarkable Improvement of *Cost Performance*

15

Affordable Tariff and Finance:

Role Sharing of Sewerage Development in Zone1



Toward the sustainability:

⇨ *Key of Role Sharing is Cost Sharing.*

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Affordable Tariff and Finance:

Cost Sharing of Sewerage Development in Zone1 (1)

	Budgetary source	Management	Implementation
Construction of WWTP	*Private / Public*	GOI / DKI Jakarta	*Private*
Construction of Sewers	*ODA Loan*	GOI / DKI Jakarta	GOI / DKI Jakarta
O&M of WWTP	Tariff / Subsidy	DKI Jakarta	*Private*
O&M of Sewers	Tariff / Subsidy	DKI Jakarta	DKI Jakarta

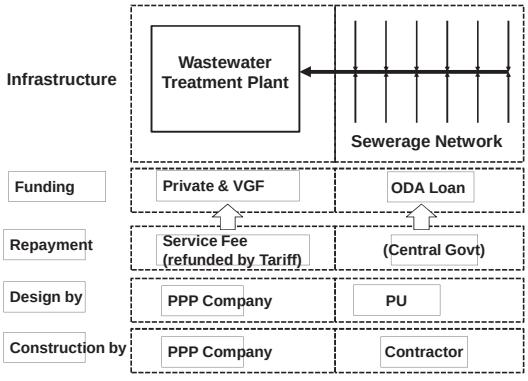
Toward the sustainability:

⇨ *Cost Sharing to be fixed based on Finance Affordability*

17

Affordable Tariff and Finance:

Cost Sharing of Sewerage Development in Zone1 (2)

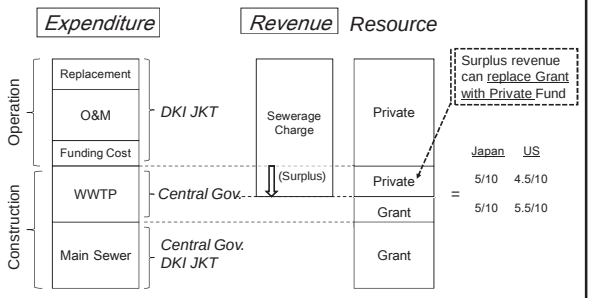


18

JCC-3 Presentation Material

Affordable Tariff and Finance:

Cost Sharing for Sewerage by Govt, DKI JKT, and Users



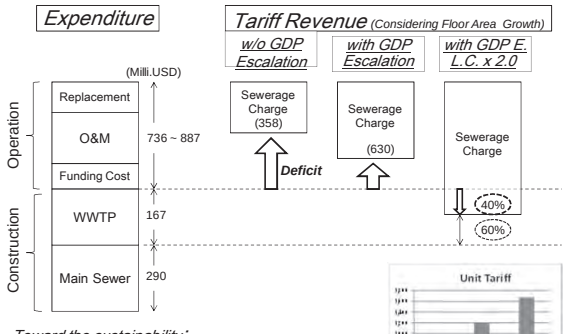
Toward the sustainability:

Private Fund Availability to be fixed properly.

19

Affordable Tariff and Finance:

Impact & Necessity of Tariff Increase for Large Commercial



Toward the sustainability:

Tariff for Large Commercial is Key.

20

Affordable Tariff and Finance:

Impact of Private Fund and VGF

	Pipe Network	Wastewater Treatment Plant
Management	Public	SPC
Construction Cost	290 million US$	167 million US$

	457 million US$		
Case 0	Public		
	290 million US$		67 million US$
Case 1	Public		SPC
	(100%)	(60%)	(40%)
	340 million US$		84 million US$
Case 2	Public		SPC
	(100%)	(50%)	(50%)
	390 million US$		117 million US$
Case 3	Public		SPC
	(100%)	(30%)	(70%)

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Affordable Tariff and Finance:

Basic Assumption of Financial Analysis

- O&M Period : 20 years
- Additional CAPEX(Replacement) : Included
- Inflation : **Included**
- Sludge Disposal Unit Fee : 60 USD/Dry-t
- Currency Exchange Rate : IDR 9,012.5 = USD 1.0
- Loan Interest Rate : **9%** (IDR/Annual Interest)
- Bank Loan Grace Period : 5 years
- Repayment Period : 18 years
- Tariff Revenue : **940** Mil.USD

1) Total for 20 years
2) New unit tariff adopted
3) GDP E & L.C. x 2.0
4) Floor Area Growth

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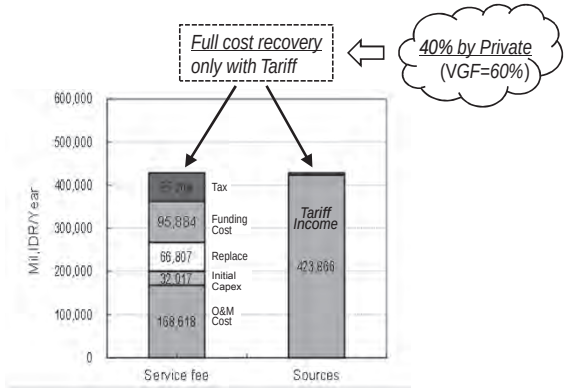
Affordable Tariff and Finance:

Impact of Private Fund for Initial Construction



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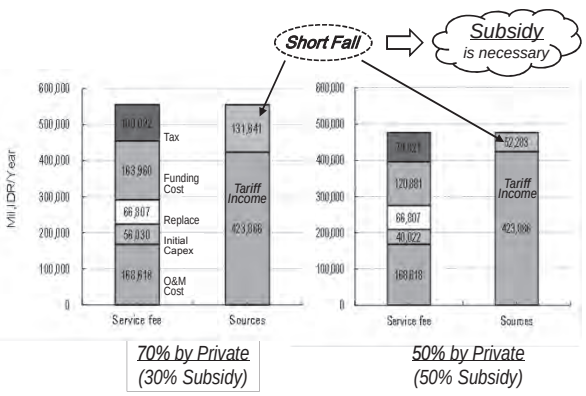
Affordable Tariff and Finance:

Impact of Private Fund for Initial Construction



70% by Private (30% Subsidy)

50% by Private (50% Subsidy)

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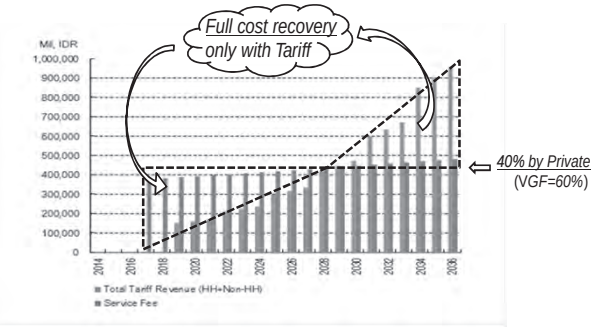
JCC-3 Presentation Material

Affordable Tariff and Finance:

Service Fee and Tariff Revenue throughout BOT period

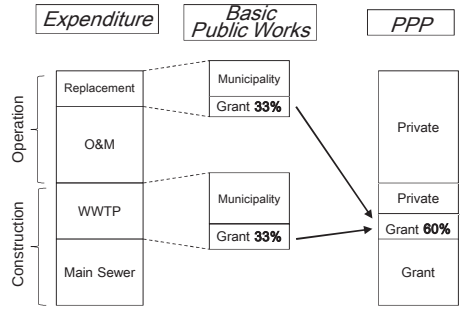


⇨ *Toward the sustainability:*

BOT deducted total cost by 15-20% in England

Affordable Tariff and Finance:

Key point of consideration / Actual Subsidy and VGF for PPP



⇨ *Subsidies are united into 1 time VGF in PPP*

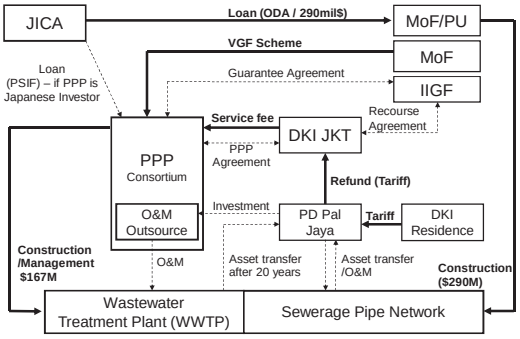
Conclusion:

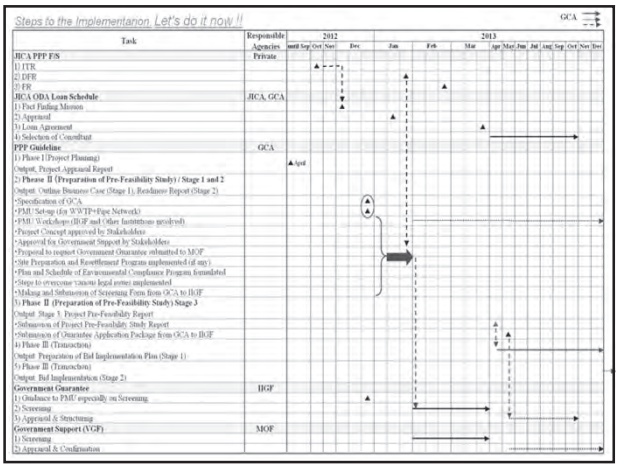
Recommendation to Sewerage Development in DKI JKT

1) *Cost for Sewer Development* > *STP: 1,600,000 juta Rp.*
Sewer: 2,784,000 juta Rp.
2) *Sewer Development* > *Step-wised sewer development*
3) *Treatment Process* > *MBR (Membrane Bio-reactor)*
4) *Implementation Structure* > *BOT with Open Bidding*
5) *Tariff Setting* > *Cross-subsidy from Commercial*
6) *Provision of Private Fund* > *40% of Construction cost for STP*

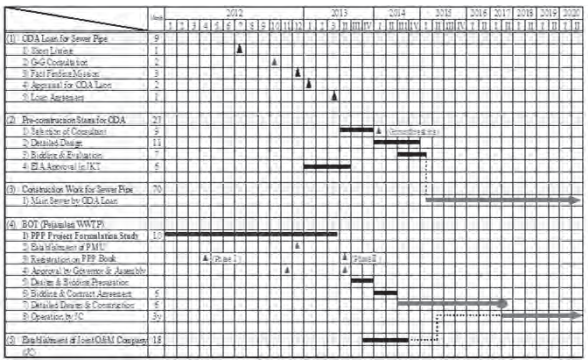
Steps to the Initiation:

Stake-holders of Sewerage PPP Model

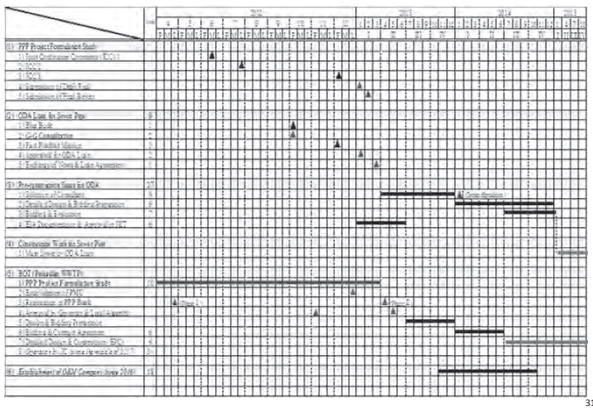




Mid - term schedule (Draft)



Short - term schedule (Draft)



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Terima Kasih !

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Solicited projects or Unsolicited

Whether the Project is classified as a solicited or unsolicited project under Indonesian rules and regulations?

*The proposed project is considered a **solicited project**, given that it is contained a master plan for sewerage sector in Jakarta and listed in the 2012 PPP Book.*

In case of solicited projects,

- *procurements for PPP services must be open bidding (public tender) by the Government*
- *project companies may be granted government support.*

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Solicited projects or Unsolicited

[Details]

- The PPP Presidential Regulation acknowledges two types of PPP projects, namely those which have been indicated by the Government (solicited) and those who have not (unsolicited).
- One of the requirements for unsolicited project is "not included in the master plan of the relevant sector";
- The PPP Presidential Regulation states that Solicited projects are openly published and accessible. In the 2012 PPP Book, the Project is included as solicited project.

[Relevant Laws]

- Presidential Regulation No. 67 of 2005 on Cooperation between the Government and Private Entities in Infrastructure Procurement as amended by Presidential Regulation No. 13 of 2010 and lastly amended by Presidential Regulation No. 56 of 2011

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7. Memorandum of JCC

MINUTES OF MEETING

JOINT COORDINATION COMMITTEE

JUNE 21, 2012

SS1 BAPPENAS

Chair of the Meeting: Dr. Dedy S. Priatna, Deputy to the Minister of Bappenas

Participants: Members of the JCC (See Attached List of Participants)

Presentation: (1) Technical Aspect (Mr. Suzuki, See attachments)

(2) Financial Aspect (Mr. Yamamoto, See attachments)

Comments and Discussion:

Dr. Dedy S. Priatna, Deputy o the Minister - Bappenas:

1. On the Summary of Service fee Variation (page 33): In the case 4.1, it is stated that the subsidy required for service fee in the operation and maintenance period is 0 per year. This situation can be achieved by cost sharing in Capital Expenditure for WWTP between the private (SPC, 60 %) and public (DKI Jakarta Government, 40%). This option shows that the DKI Jakarta will choose providing "Government Support" for the construction of the WWTP at the initial stage instead of giving subsidy for the service fee to the SPC annually. Several questions can be raised as follows. Will the DKI Jakarta accept this option? Do we believe to the consultant? Is the Japanese standard quality applied in this case not too expensive?

2. In the scenario of the report, pipeline sewerage will be provided through the public fund. How about lessons learned from other countries such as Taiwan, Vietnam and others?

3. According to the consultant, the technical model applied for the proposed WWTP is a membrane system. How is the trade - off between the cost and performance? What are models employed for other countries?

4. Options for staging in the construction period of the WWTP proposed by the consultant are very important. Which one should be chosen for optimizing the capacity of the plant and the cost which should be paid?

5. Comment on the assumption on flat tariff for the residential uses during the o & m period: A scenario for gradual increase on tariff should be employed in the calculation of affordability to pay of the Jakarta Government for service fee.

Mr. Syukrul Amien, Director - Ministry of Public Works

1. Prior to giving comments, Mr. Amien Reported to the Chair of the JCC regarding last week meeting between the MPW and the consultant.
2. Based on the scenario proposed by the consultant, the construction of sewerage pipelines will be conducted by the government through the public fund (either loan or APBN) due to various reasons. Although the consultant should be responsible to the JICA, the scope of the PPP project should include a particular section or coverage area of the sewerage pipeline.
3. Zone 1 is characterized by the domination of commercial activities and accordingly potential for high revenue for a PPP project. Sewerage zones in Jakarta are different from the Zone 1 and many of them are dominated by residential uses. Therefore, replication of the PPP approach employed in the Zone 1 to other zones should consider the characteristic of such zones.
4. Comment on the option of construction staging of the WWTP: To build a full capacity of the WWTP at the initial stage will be ineffective because there will be idle capacity of the facility. Accordingly, option no 4 (staging approach) is more appropriate.
5. Comment on membrane technology for the WWTP: Membrane technology is very good but expensive. If possible the construction cost should be minimized and staging approach to the construction should be applied.

Mrs. Driah Head of Physical Sub Directorate – Bappeda, DKI Jakarta

1. Comment on Operation and Maintenance: Are the operation and maintenance proposed by the consultant is only limited to the WWTP or they include the sewerage pipeline? As a system, O & M suppose to be conducted by one provider, to ensure continues supply of waste water intake to the WWTP.
2. On tariff and its relation to the revenue: Based on current survey, an initial model on the relationship between tariff and potential revenue in some zones is available.
3. PPP project scheme requires involvement of various agencies in the management and implementation processes. Therefore, the FS report should clearly describe their roles, tasks and responsibilities.

Mr. Adi A. Head of Economic Bureau – Bappeda, DKI Jakarta

1. Since the PPP project will deal with big asset and high value, therefore institutional arrangements for the project management is crucial and should be comprehensively included in the report.

Mr. Andono Warih BPLHD–DKI Jakarta

1. Subsidy from the Government (GOI and DKI Jakarta) should be minimized.

Mr. Fadly H. Tanjung Ministry of Environment

1. Consultant should take into account the relationship between Zona 1 and other Zones in the management processes including its environmental impacts.

Mr. I Wayan Sutana Ministry of Finance

1. Up till now there is no formal regulation on Viability of Gap Funding (VGF) from the MOF. RPMK (Rencana Peraturan Menteri Keuangan/ Draft Regulation of the MOF) will be issued within 2 -3 months later.

Mr Nugroho, Director of Settlements and Sanitation – Bappenas

1. Based on lessons learned (practices), up till today, there is no Sewerage Projects in the world, Financially Feasible (no subsidy).
2. The sewerage system projects are based on principle of improving the welfare of the society or on social-economic benefit. In this case the government support or subsidy is categorized as sunk cost.
3. It should be emphasized here that the principle of matching grant will be employed in the case of grant from the Government to the local government.

Mr. Bastary , Director of PPP – Bappenas

1. Experiences in several cities in Indonesia show that provision of Sewerage System through merely public fund, does not work well due to the limited budget of the national as well as local governments.

2. The WWTP PPP DKI Jakarta project may be considered as a “good potential project” since it is not purely public fund but a combination of both the private and public funds.

Mr. Syukrul Amien, Director - Ministry of Public Works

1. Repeated his comments and messages in English language.
2. Emphasized that the Study is a grant from the JICA to the GOI. Therefore the project will be treated as a solicited project and will be delivered through a competitive open tender.

Conclussion: Mr Dedy S. Priatna, Deputy to the Minister – Bappenas

1. Possible options proposed by the consultant in the report will be carefully scrutinized and taken into account in the decision making process by the government of DKI Jakarta, Ministry of Public Works, Bappenas and other main stakeholders.
2. Suggestion to the government of DKI Jakarta: Annual subsidy to fulfill the gap between service fee (payment for SPC for Opex and Capex of the WWTP) and revenue from tariff should be avoided. Instead, DKI should provide initial Capex for the WWTP as a sunk cost).
3. Consultant should include in the report other countries experiences in providing and managing sewerage facilities.
4. Consultant should include a scenario on a package of PPP project in which WWTP and the sewerage pipeline (covers a certain area probably dominated by commercial uses) are bundled, utilizing private fund.
5. The DKI Jakarta government will explore the possibility of utilization of VGF from the Ministry of Finance.
6. Indonesian consultant, in this regard Mr. Windu is assigned to complete and submit the minutes of meeting.

Responses from Mr. Yamamoto

1. In responding to the technology employed in the project: China adopts the membrane system and there is no objection to such a method so far.
2. Further response will be conducted by the consultant after receiving the translation of MoM

3. The second JCC meeting will be conducted before Ramadhan

Limited Discussion After the JCC

1. Participants: Dr Dedy (Bappenas),(Mrs Yani (Bappeda DKI Jakarta), Mr. Windu H (Consultant), Kawik Sugiana (Consultant)
2. Result of the Discussion:
    a. Comments from Ibu Yani:
        i. Sewer Development Strategy, on early stage: rain water will go to the sewer pipe, therefore it will increase the volume of waste water flowing to the WWTP.
        ii. The facilities and building should be shifted toward north direction within the site
    b. Dr Dedy request Mr Windu to include the result of the limited discussion in the Minutes of Meeting of JCC.

Kawik Sugiana Ph.D

MINUTES OF MEETING
JOINT COORDINATION COMMITTEE 2
SS 1, Bappenas

Date: July 26, 2012
Agenda: See attachment
Chair: Dr. Dedy S. Priatna, Deputy to the Minister of Bappenas on Infrastructure Affairs
Participants: See attachment
Reporter: Kawik Sugiana Ph.D

OPENING

Opening Speech by Dr. Dedy S. Priatna, Bappenas

- Well come to the participants
- Introduced the JICA consultants responsible for formulating the FS of Sewerage Treatment Plants in Zone 1 and Zone 6, DKI-Jakarta
- Both teams were asked to present the progress of their studies in the JCC 2 meeting,
- The Zone 1 is implemented through PPP, while Zone 6 is managed through the ODA loan or Public-funding. Based on those two studies, the GOI will then determine, which approach should be more appropriate for the case of DKI Jakarta

Overview from representative of the JICA-Jakarta

- Several Studies have been conducted under the Master Plan of the DKI-Jakarta. Some of them will be implemented through PPP approach, including the WWTP of the Zone 1.
- Emphasized the different management approaches employed in Zone 1 and Zone 6.

PRESENTATION

Presentation of Zone 1: Mr. Kenichi Yamamoto, Orix

- See attachment

Presentation of Zone 6: Yachio Consultant

- See attachment

DISCUSSION

Dr. Dedy S. Priatna, Bappenas

- He was surprised with the time schedule proposed by the Zone 6 team. Why does the Zone 6 require longer period in the project completion (project formulation, procurement and construction) in comparison with the Zone 1 which adopts the PPP approach? The period of project completion in the case of Zone 6 was too long according to Dr.Dedy
- Two main financial alternatives proposed by the team of the Zone 1, they are: (1) go by loan/public fund and (2) some parts will be funded through private sector.
- Asked the representative of JICA-Jakarta to request the Zone 6 team to conduct financial-calculation similar to the Zone 1 team, to include both the project financing scenarios through public funding and PPP model.

Representative of the JICA-Jakarta

- Agreed with the request of Dr. Dedy; the Zone 1 team will include both the project financing scenarios through public funding and PPP model

Mr. Syukrul Amien, Director - Ministry of Public Works

Prior to give comments he reported the last week meeting and discussion with the two consultants. Since these projects concern with big investment, decision from related higher decision makers will be required.

- In the JCC1, an option for a step by step construction process was discussed, since there were constraints/problems related to house-connections. However, he had an objection if the construction of WWTP should be divided into 4 steps. A single step for constructing the WWTP is preferable; however, the scope of the water sewage treatment will be the grey water.
- Based on the proposal for the Zone 1, 60 % of the CAPEX of WWTP will come from the government and another 40 % from the SPC, and 100 % CAPEX of the pipe network will be provided by the government, if O % of subsidy is required in the Operation and Maintenance. In this scenario, therefore, around 400 + 110 million IDR is required from the government fund. Accordingly, careful consideration and decision should be conducted by the government of Indonesia, since the decision will concern with huge investment.

- The Zone 6 team offered the cost-sharing scheme between the central and the local governments.

Mrs. Yani, Head of the Bappeda DKI-Jakarta

- The government of Jakarta would be very glad with the initiative to solve the environmental matters.
- There are 15 zones in Jakarta. Therefore, the systems and technologies employed across those zones should be designed in such a way to maintain their harmony and consistency. The investment cost for Zone 1 is approximately 4.5 trillion IDR.
- As discussed in the previous limited meeting, the site-plan of the project should be modified towards the north-west direction. The project location is still the same with the initial design.
- In the case of piping network, the existing network and the new one are combined in order to reduce the cost.
- Further clarification was needed: (1) will the black water be channeled through special pipes? Whether user charge will be imposed on the grey water?
- Social study on social- behavior change is required in relation to the burden of tariff imposed on the house-holds. Currently, the tariff for house hold is only 10 – 15 thousand IDR per month and about 40% of costumers have not paid the bill yet.
- To keep the house hold's tariff similar with the existing charge as proposed by the consultant was inappropriate according to her, since this would not educate the people.
- The DKI-Jakarta government may not be able to solve its environmental problems. Accordingly, support from the central government is strongly required.

Dr. Dedy S. Priatna, Bappenas

- Emphasized the need for in-depth social study to influence the behavioral change.

Ms. Lily, PD IPAL DKI-Jakarta

- Needed further clarification regarding the technologies and systems applied in Zone 1 and Zone 6; one is using a combined system while the other using a separated system. In the case of the 15 Zones in Jakarta, variation of technologies and systems employed in each zone will complicate the operation of services.

- According to the Consultant, tariff for the commercial users will be increased 2,5 times from the current one. Two issues should be taken into account: (1) Currently, the government of DKI-Jakarta attempts to increase 15 % of the commercial tariff; many of commercial users oppose to such a policy; (2) The proposed tariff should be less than the cost for individual treatment. In this regard, individual septic tank is still allowed according to the environmental law
- Option not to increase the house hold tariff during the concession period should be further elaborated.

Dr. Dedy S. Priatna , Bappenas

- Option for keeping the tariff is absolutely wrong, because citizens should appreciate efforts to improve the quality of their environment which in turns will give benefit to them

Mr. Adi A, Head of Economic Bureau – DKI Jakarta

- In principal agreed with the proposed scheme presented by consultant.

Mrs. Tyas DKI-Jakarta

- Questioned on the Project Cost of Zone 1 and Zone 6: whether the cost includes cost for removal of the existing buildings and facilities.
- DKI-Jakarta government couldn't afford to bear the budget for its development by itself. As a Special Capital District, according to the law, DKI – Jakarta is eligible to get financial support from central government

Mr. Syukrul Amien, Ministry of Public Works

- Suggested consultants to handle gray water and black water in Zone 1 and Zone 6.
- To treat black water requires significant cost and intensive participation from society. Therefore black water will be treated through stages. In Stage 1, grey water will be treated. In the absence of black water treatment facility, septic tanks can be used instead. In the sub-sequent stage, black water treatment will be provided.
- Tariff across zones should be similar otherwise protest from consumers will arise.

Ms. Lily, PD IPAL DKI-Jakarta

- Back to the Spatial Plan of the DKI-Jakarta. The drainage (for water storm) should be separated from the sewerage. Shall we still consistent with that principle?

- If both of them should be combined, what kind of technology will be used?

Mrs. Yani, Head of the Bappeda DKI-Jakarta

- The case of other countries: At the initial stage, a combined system between drainage and sewerage is employed. Later the separated one will be used.
- If the staging approach is more expensive, why not to choose the separated system at the initial stage?

Mr. Nugroho, Director of Settlements and Sanitation – Bappenas :

- Explained that it would be ideal if we use the separated system. However, in practice the construction will be very very slow, unless for the new housing complex.
- There are 2 ways could be applied in the combined system:
    1. Install the interceptor at the end of the system
    2. Install the interceptor on each house, on the outlet system. This way costs less than the first one
- Population will also get other benefits in the Zone 6 method, such as better quality of environment, increasing land value etc.
- Prior to determine whether a system is cheap or expensive, see page 33 of the presentation ("**Preparatory Survey for PPP Infrastructure Project Sewage Treatment Plant Project in DKI Jakarta. JKT Sewerage Zone-1 PPP-FS**"). Several options of payment are shown: at the beginning, while construction/operation, or at the end of operation or concession period. The more we delay to provide the infrastructure, the more expensive the cost will be.
- Based on best practice in the developed countries, Wastewater tariff should be around 70%-80% of the clean water tariff.

Mrs. Yani, Head of the Bappeda DKI-Jakarta

- No other choice, but we have to start immediately.

Mr. Bastary, Director of PPP Bappenas

- PPP is not merely a budget oriented based approach, in which private parties will share the budget for infrastructure provision and services.
- Other objective for encouraging private sectors to participate in infrastructure provision is to improve the performance of public services.

- Therefore, efforts to encourage PPP approach in the WTP should be highly appreciated. Of course the tariff is not fix yet,and further analysis will be required.

Mr. Kawik Sugiana, Consultant

- Stated that many other issues should be discussed and decided by the JCC members, in addition to technical, financial and environmental matters. If we take a look at page 43 from the presentation of "**Preparatory Survey for PPP Infrastructure Project Sewage Treatment Plant Project in DKI Jakarta. JKT Sewerage Zone-1 PPP-FS**", several questions may arise related to legal aspect, institutional aspect etc.
- When those matters will be discussed?

Dr. Dedy S. Priatna, Bappenas

- Consultant should provide options. The decision is on government's hands, including the payment method

Mr. Nugroho Director of Settlements and Sanitation – Bappenas

- Stated that unfortunately, we had only few days to read the report. At least 2 weeks prior to the discussion, report should be distributed to members of JCC. We need more time to learn, to produce a good decission.

Dr. Dedy S. Priatna, Bappenas

- Asked both consultants to take into account issues and decisions in the meeting in the study and to complete the reports
- If a combined system (a combination of drainage and sewerage)is applied, each consultant should collect information on people's opinion.
- Closing the discussion.

MINUTES OF MEETING
JOINT COORDINATION COMMITTEE 3
Sewerage Treatment Plant/ STP PPP Project in DKI Jakarta
Akmani Hotel, Jakarta

Date: December 05, 2012
Agenda: See attachment
Venue: Lentini and Amalfi rooms,
Akmani Hotel, Jl. KH Wahid Hasyim 91, Jakarta
Chair: Dr. Dedy S. Priatna,
Deputy to the Minister of Bappenas on Infrastructure Affairs
Participants: See attachment
Reporter: Kawik Sugiana Ph.D

OPENING

Opening Speech by Dr. Dedy S. Priatna, Bappenas

- Well come to the participants
- Team leader was asked to present the progress of the study in the JCC 3 meeting,
- The GOI expected that Project Ground Breaking would be conducted in the end of 2013

PRESENTATION

Presentation: Mr. Kenichi Yamamoto, Orix

- Material of presentation for the meeting included: Future Image of the Goal, Issues and solutions, Costs, Revenues and Funding resources, Steps to the initiation (see attachment)
- Because of the time limitation for the meeting, the presentation and discussion were focused on issues related to *the time schedule* and *finance*.

Schedule

- ✓ The Minister of Public Works and the new Governor of DKI Jakarta have agreed on the Sewerage PPP project in DKI Jakarta
- ✓ The construction period would take within 3 years started from the end of 2014 and completed in 2017 (see draft mid-term schedule, presentation 05 Dec, 2005 in the attachment))
- ✓ Based on the above time schedule for the construction, Mr. Yamamoto emphasized the importance of fulfilling the readiness criteria for the PPP project, i.e., clarification of the Government Contracting Agency /GCA, establishment of the Project Management Unit/PMU), formulation of the Pre-Feasibility Study, registration for the next 2013 PPP book (see also Steps to Implementation. Presentation 05 Dec, 2005 in the attachment).

Financial Issue

- ✓ Financial analysis is shown in page 18 to 27 of the presentation:
    - o Cost for the STP would be funded through government (1 time VGF) and private sector. The proportion of the private sector would be further discussed and decided in the discussion (initial proposal VGF : SPC = 60% : 40%)
    - o PPP structure: BOT
    - o Tariff setting: Cross-subsidy from commercial
- ✓ Clear and appropriate tariff setting was required and tariff adjustment should be conducted. Cross-subsidy approach with increasing tariff (2 x) for the large commercial business would be applied. The tariff should be lower than the cost for Independent Treatment Plant/ITP of large commercial (see page 18}.

DISCUSSION

Dr. Dedy S. Priatna, Bappenas

- He was confused with the figures: He asked the team to clarify how much money should be the portion of the MPW and the DKI government respectively.
- He also requested further clarification on the basis of the tariff formulation
- With regard to the tariff escalation: whether the escalation would be based on annual escalation or certain period escalation.

Mr. Yamamoto

- Projection of tariff revenue was based on Floor Area growth of commercial areas.
- Three scenario of tariff escalation was presented by the team namely: (1) W/O GDP escalation; (2) With GDP escalation 6 % annually; (3) 2 X of tariff of large commercial with GDP escalation 6 % annually.

Dr. Dedy S. Priatna, Bappenas

- Tariff adjustment based on the escalation of GDP may be reasonable, however the impact of tariff adjustment on the subsidy provided by the DKI government should be further discussed with the new governor of DKI Jakarta. Escalation of subsidy every year would be difficult for the government of the DKI Jakarta.
- He suggested that the team should make a simulation for the investment cost; it should be provided within one time or per year payment and their impact to the DKI Jakarta Government. Again, the provision of investment cost per year would create problem to the DKI government since it has to deal with the Provincial Legislative Body.
- However, which option would be taken, the decision would be dependent on the Jakarta government itself.

Mr. Budiyuwono, DG-Ciptakarya, MPW

- For this STP PPP project, VGF could be provided by the central government in the form of loan from overseas.
- With regard to tariff adjustment, he was unsure whether the provincial government of Jakarta could easily increase the tariff.

Mrs Lily, PD IPAL DKI-Jakarta

- Principally, the government of DKI Jakarta intended to utilize Full-Separated system in the future for both the commercial buildings as well as residential areas.
- She also concerned about technological solutions to sewerage system on the using of interceptor (combined system) versus full separated system (page 8 – 14). The government of Jakarta should carefully review the options offered by the team prior to making the decision.
- Interceptor would be utilized in the high density populated residential areas.

Mr. Nugroho, Director of Settlements and Sanitation – Bappenas :

- Explained that it would be ideal if Full-Separated system would be applied. However, in practice the construction process would be very slow, unless for the new housing complex.

Dr. Dedy S. Priatna, Bappenas

- He urged the consultant to show the data, calculation, and simulation to the government of DKI Jakarta and MPW. This activity should be followed by presenting all the figures to the New Governor of DKI Jakarta
- Prior to do so, working group discussion should be conducted to elaborate the following issues and to achieve agreement:
    - ✓ Technological solutions including house connections and interceptors
    - ✓ Financial issue: the team should check the regulation on VGF with staff of the Ministry of Finance
    - ✓ Schedule

Mr. Bastary, Panji Indra, Director of PPP Bappenas

- Comment on the schedule: the team should indicate who would be responsible for activities described in the schedule
- The team should also clearly state the amount of VGF needed for the PPP project to the MoF
- He also asked about the tendering process in the construction of STP funded through VGF and Private: Will the tender be conducted through a simultaneous process or separated process?
- How the integration of the tendering process, construction and operation between STP and sewerage piping projects?

- He also reminded that according to the PPP guideline, the governor of DKI Jakarta should request VGF to the Minister of Finance
- Above all, the team should devote its efforts to convince the new governor of DKI Jakarta that PPP approach to infrastructure provision is beneficial for the DKI Jakarta government

Mr. Fajar, Dinas PU, DKI Jakarta

- Issues and materials presented in the meeting (i.e., reasons for adopting PPP approach, return of investment, tariff setting) have not been recognized and well understood by the majority of staff in Dinas PU DKI Jakarta as well as in other government agencies. Therefore, dissemination of such materials should be conducted.
- According to his opinion, subsidy that should be provided by the government of DKI every year could become a big burden. He also mentioned that some groups in the society might not receive the subsidy and the benefit. Therefore, the formulation of subsidies should be conducted carefully and wisely, to avoid social problems in the future.

Dr. Dedy S. Priatna, Bappenas

- He invited other comments and inputs from the participants of the meeting

Mr. Arianto Wibowo, Indonesian Infrastructure Guarantee Fund (IIGF)

- He was interested in the project risks since these issues were very important beside the financial and technical issues. He asked about further elaboration of the risk profiles and how should they be mitigated.
- He also concerned with the project risk associated with “connectivity” between the STP and the sewerage piping system. It was critical because there would be two different parties involving in the construction as well as operation processes.
- For the purpose of providing the government guarantee the DKI Jakarta government should clarify who would be the CGA (e.g., Dinas Public Works Jakarta, Bappeda). He seemed to have objection if PD PAL Jaya would be assigned as the GCA .
- He recommended that since in the beginning the JICA team should continuously discuss and work together with IIGF particularly on issues related to compliance of the STP PPP project with the PPP guideline. A schedule on this collaboration (particularly with ibu Cintya) should immediately be made.

Assistant Deputy, Environmental Agency, DKI Jakarta Provincial Government

- Agreed with Dr. Dedy’s recommendations that the JICA team should provide options and their consequences.

Dr. Dedy S. Priatna, Bappenas

- He wanted to discuss the schedule again and clarify the responsibility of the central government, the DKI Jakarta provincial government and the private sector.
- The central government would be responsible for the overseas loan.

- The DKI Jakarta provincial government should calculate its capacity in investment cost of the project based on the provincial tax/ non tax revenues and other possible sources.
- He reminded that the ground-breaking would be at the end of 2013 or the beginning of 2014.

Mr. Ogawa, Representative of JICA

- JICA would carry on the loan in the pipe-line of the projects.
- Fact findings would be conducted in next week.

Mr. Syukrul Amien, Director - Ministry of Public Works

- He expected that sources of the project funding and sharing would be clearly and fully understood by the respective parties.
- He asked whether the procurement process of DED for the construction of the sewerage system could be accelerated by JICA.

Dr. Dedy S. Priatna, Bappenas

- Based on the current "Blue Book", the amount of loan for this project was USD 144 Million and the rest would be provided in Rupiah currency.
- To get more information about the VGF, the JICA team should contact Mr. Freddy Saragih at the Risk Management Unit/ RMU- MOF.

Mr. Kobayasi, Representative of the JICA Team

- On behalf of the Team, he appreciated the participation of the stakeholders in the discussion and he believed that it was very productive.
- He also stated to maintain the compliance of the project to the PPP regulations and guideline and also the ODA requirements.
- The team would follow up the result of the discussion, and would start to have a working group meeting tomorrow.