

6. OPERATION AND MAINTENANCE

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Operation and Maintenance of The Water Supply Facilities

1) Operation and Maintenance of Treatment Plant Facilities

a) Organization

The operation and maintenance of fourteen (14) treatment plant facilities are directly administrated by the Production Division (Bidang Produksi) at the Head Office.

There are three(3) sections under the Production Division as follows:

- Mechanical/Electrical Engineering Section
- Water Quality Control Section
- Material Control Section

There are also four(4) sections in the treatment plant and executing daily operation and maintenance of each treatment plant. The four(4) sections are as follows:

- Technical Section
- Laboratory Section
- Maintenance Section
- Administration Section

b) Operation

The 24 hour operation of the treatment plant is being executing by the shift watch operators. Basically shift watch is organized three shift and one stand-by shift.

c) Maintenance

The maintenance of the treatment plant facilities mainly covers inspection works of mechanical/electrical facilities. The present status of inspection works at five(5) major treatment plants (Pejompongan I & II, Cilandak, Pulo Gadung, and Buaran) is shown in Table-1 together with recommended maintenance period and items in Annex-21.

d) Rehabilitation and Improvement

A "Report on Improvement of Process, Operation, and Maintenance at PAM JAYA's Water Treatment Plants" was prepared in January 1993 under the OECF financed portion of PJSIP (PAM JAYA System Improvement Project).

The report dealt with four (4) of PAM JAYA's water treatment plants (Pejompongan I & II, Cilandak, and Pulo Gadung) and set out recommendation on:

- Operational improvement and rehabilitation requirements
- Interim measures to overcome pollution of the raw water sources
- Prioritizing remedial actions
- Equipment to be procured for implementation of the recommendation

The major part of these recommendations was implemented as shown in Table-2 in Annex-21.

2) Operation and Maintenance of Transmission/Distribution Facilities

a) Organization

The maintenance and control of the transmission/distribution system are executed by the Distribution Division at Head Office, Branch Office (Cabang), and Sub-Branch (Rayon).

There are four(4) sections under the Distribution Division as follows:

- Disruption/Disturbance Service Section
- Distribution Management Section
- Network Maintenance Section
- Control Section

Also there are four (4) sections in the branch office as follows :

- Technical Planning Section
- Consumer Service Section
- Technical Section
- Bill Collection & Administration Section

The maintenance and control of transmission and distribution system are divided based on the diameter of pipe as follows:

- Pipe diameter $D \geq 300$ mm (primary pipeline) is the responsibility of Distribution Division at Head Office.

- Pipe diameter $300\text{mm} > D \geq 150\text{mm}$ (secondary pipeline) is the responsibility of Branch Office.
- Pipe diameter $D < 150\text{mm}$ (tertiary pipeline) is the responsibility of SubBranch.

In case of emergency situation such as big leakage by damage of pipeline, the accident shall be reported to Distribution Division, Branch Office or Sub-Branch Office depend on the diameter of the pipe as mentioned above. However, the Distribution Division sometimes handles the problem of pipe of diameter less than 300mm if the branch office or sub-branch office is fully occupied to handle such problem, or if the accident is considered too difficult to be handled by branch or sub-branch office.

b) Maintenance

The inspection of transmission and distribution facilities should always be conducted to prevent them from any accidents that will cause suspension or decline of water supply service.

The following are the present inspection system conducted by PAM JAYA.

i) Pipeline

There is no routine pipeline inspection conducted by PAM JAYA. The inspection is conducted only if there is any disruption occurred at site based on the report received by PAM JAYA and also at certain location where any disruption are likely to occur.

ii) Valves

The inspection of valves is conducted every month only at certain locations (main pipeline) and if any disruption occurred at site. This is only for the butterfly valve, gate valve and air valve at the transmission and distribution main of which it is recorded by the Network Maintenance Section. The summary of valve operational activity conducted in March 1995 is shown in Table-3 in Annex- 21.

iii) Fire Hydrant

The inspection of fire hydrants has never been conducted by PAM JAYA, since it is fully the responsibility of Fire Section of DKI Jakarta.

iv) Water Quality

PAM JAYA checks several important parameters of the water quality of the following locations:

- treatment plants; every three (3) days for big treatment plants and once a week for the miniplants
- booster pumping station; once a week
- distribution pipeline network; water quality in each Zone is checked once a week and water quality at the fixed sampling points are checked once a month

The location of water quality analysis at customer tap is determined in accordance with the regulation issued by Ministry of Health and sampling points are in public facilities and one sample for every 10,000 house connections.

v) Pressure

The pressure monitoring is conducted at the treatment plant, transmission and distribution main every month by Network Maintenance Section. The location of routine pressure monitoring point and measured data are shown in Table-4 and Table-5 in Annex-21. PAM JAYA uses pressure gauge station of which the pressure is read by the manometer or by using pressure recorder.

vi) Flow Rate

The flow meter installed at the treatment plant is checked by the staff of treatment plant. The bulk and district meter has been checked / surveyed under PJSIP.

c) Drawing

The transmission / distribution pipeline network of PAM JAYA is complicated, and furthermore the drawings of pipeline to be used for maintenance are not provided properly. The following are the explanation of the pipeline drawings at present.

i) Diameter

The pipeline drawing are only available for large diameter of pipeline (primary and secondary), although some of the tertiary pipeline drawings can be obtained at branch office.

- ii) **Pipe Material**

The information of the pipe material is not complete since PAM JAYA has only the data of new pipes which were installed by new projects such as PJSIP and Buaran Project which are kept by the Distribution Division.
- iii) **Installation Year**

The information of the installation year is not complete, except primary pipeline installed since 1985 and for pipes installed by new projects such as Pulo Gadung, PJSIP and Buaran.
- iv) **Air Valve**

The information and drawings of the air valve are under making improvements.
- v) **Blow Off Valve**

The information and drawings of the blow off valve are under making improvements.
- vi) **Fire Hydrant**

The information and drawings of the fire hydrant are under making improvements, since fire hydrants are the responsibility of the Fire Section of DKI for the maintenance and control. The diameter of hydrant conveyance pipe is 75 mm while the diameter of the hydrant is 100mm, and installed at every 300m² area. The number of fire hydrant in DKI Jakarta and the existing condition is shown in Table-6 in Annex-21.
- vii) **Pressure Reducing Valve**

The drawing of pressure reducing valve is available.
- viii) **Pipe Bridge**

Some of the drawing of pipe bridge are kept by the Distribution Division such as PJSIP, Buaran and Pulo Gadung drawings. The information on location of main pipe bridge is available as shown in Table-7 in Annex-21.
- ix) **Lining / coating**

The information of pipe lining is not available.
- x) **Flow Meter**

The information and drawing of flow meter are not complete.

d) **Inventory**

The inventory shall be controlled properly to avoid any delay of delivery of materials required and to maintain an optimum stock level. This inventory control is conducted by Logistic Division of PAM JAYA as the following:

- A description of material items
- A continuous record of the quantity of each item in stock
- Identification of each item as to the quantity, date of order, and purchase order number
- A record of purchase by quantity, date and source
- A record of disbursements from stock by quantity, date and purpose
- A record of the unit costs of items
- A record of the location of items in stores

The above information has been arranged by using manual card file and the Logistic Division submits the report every month to Accounting Division to be input to computer. The Logistic Division only controls the pipe materials which are purchased by PAM JAYA, while the pipe materials purchased by foreign loan are controlled by each project.

The main pipeline length and secondary/tertiary pipeline length are listed respectively in Table-8 and Table-9 in Annex-21.

e) **Rehabilitation and Improvement**

For the purpose of a) rehabilitation of existing distribution system, b) extension of the distribution system, and c) strengthening the management, operation, maintenance and financial system of PAM JAYA for reduction of unaccounted for water (UFW), PJSIP is being implementing.

The PJSIP covers the following works:

- Rehabilitation
- Infil / Rehabilitation
- Augmentation of primary distribution mains
- Institutional Development

Detailed description of PJSIP is attached in Annex-21.

Monitoring System

The present status of PAM JAYA's monitoring is described in the following section dividing into two(2) categories of treatment plant and transmission/distribution facilities.

1) Treatment Plant

At the treatment plant the operators are monitoring current operation status by monitor and control panel or direct monitoring, and at the Head Office monitoring is being executed mainly by the monthly and annual report prepared by the treatment plant.

a) Monitoring at Treatment Plant

At the newly built treatment plants such as Buaran and Pulo Gadung, various kinds of necessary information/data are being monitored by the monitor and control panel in the treatment plant. This monitoring is contributing appropriate operation of the treatment plant in response to such current situation as change of raw water turbidity, power failure, and change of operation condition. Also the monitoring provides alarm system of high and low of water level at specified water tank, flow rate, water pressure, and chlorine gas leakage for safe operation of the plant.

At the other treatment plants operators are hourly monitoring the operation and facilities of raw water intake, sedimentation, and filters.

b) Monitoring at Head Office

The monitoring at the head office is being executed by the monthly and annual reports prepared by each treatment plant.

The report generally covers the following items:

- Pumping record of raw water and clear water
- Consumption of chemicals and electricity
- Amount of filter wash water
- Record of chemical receiving and consumption
- Record of raw water analysis
- Record of clear water analysis

- Record of chemical dosing
- Record of lubrication for mechanical/electrical equipment
- Record of repair and overhaul of mechanical/electrical equipment
- List of staff according to rank
- Disbursement of budget
- Maintenance cost

c) Report Prepared by the Head Office

The Production Division is preparing monthly and annual report addressing to the Director of Technical and Production including the following items:

- Evaluation of production
- Production cost
- List of power failure at treatment plant
- Amount of raw water intake and expense paid
- Amount and cost of clear water buying from other authorities
- Data of water quality together with data not satisfied standard
- Record of repair, replacement, and installation of facility/equipment at treatment plant

d) Monitoring at Buaran Treatment Plant

In order to operate transmission system smoothly and appropriately, at the Buaran Treatment Plant information/data are being collected not only from Buaran Plant but also outside facilities such as Surge Towers No.2, No.3 and Distribution Center which are facilities of transmission system for Zone 3.

This system is a computerized on-line, real-time automatic data collecting system utilizing telemeter equipment, data transmission by radio network and leased telephone line, and software of SCADA (Supervisory Control and Automatic Data Acquisition).

This system was introduced so as to integrate into the comprehensive monitoring system in future as a part of sub-system of total monitoring system.

2) **Transmission and Distribution Facilities**

At present the monitoring of transmission/distribution facilities is only a monthly pressure measurement at fixed monitoring points as previously mentioned in v),b),2) except flow measurement of bulk water receiving.

The Distribution Division is monitoring the result of operation and maintenance of transmission/distribution facilities by the monthly report prepared by Branch Offices.

a) **Report Prepared by the Head Office**

The Distribution Division is preparing monthly and annual report addressing to the commercial director of transmission/distribution facilities based on the report prepared by Branch Offices.

The report includes the following items:

- Leakage from pipeline
- Damage of Pipeline
- Consumption of electricity
- Records of contracted works
- Records of valve operation
- Data of pressure measurement
- Records of pipe rehabilitation

Meter and Meter Work Shop

1) Water Meter

There are four (4) different small size of meters, 0.5", 0.75", 1" and 1.5", and eight (8) numbers of large size meters, 2", 3", 4", 6", 8", 10", 12", and 16" in use. As of September 1995, total number of service connections is 354,232, out of this 352,684 (99.6%) number of connections are with small size meters, 1,548 (0.4%) number of connections are with large size meters. The manufacture and type of meter is described in Table-M.1.

Table-M.1 LIST OF MANUFACTURER AND TYPE OF METER

METER SIZE	MANUFACTURER	TYPE OF METER
Small	LINFLOW	Multi Jet
	AQUINDO	
	TIRAS	
	DR & CF	
	PKM	
Large	Aichi Tokai	Waltman
	METRON	
	WR	

Note : This list not include the meter installed under PJSIP .

PAM JAYA Water Meter Code is listed in Table-M.2.

Table-M.2 PAM JAYA WATER METER CODE

CODE	SIZE	NUMBER OF POINTER	MANUFACTURER
1	0.5	4	P
2	0.75	5	BR
3	1		SH
4	1.5		BOSCO
5	2		AS
6	3		AM
7	4		PJ
8	6		KENT
9	0.5,8	4,	METRON
0	-		SLUITSTUK
A	10		POSON
B	12		CENTURY
C	14		AQUA
D	16		KIMMON
E			AICHI TOKEI
F	5,6,7	6	SCHLUMBERG
G			SHINHAN
H			ZACCHI
I			PAM
J	0.5	4	LINFLOW
K			FUJI
L			Y.T
M			S.S
N			RECIFLO
O			SSH
P			HANOVER
Q	5	6	KKI
R	0.5	4	PKM
S			TIRAS
T	0.5	4	TIAN CIEN (TC)
U	0.5	4	AKUINDO

2) Meter Replacement Under PJSIP

a) Objectives

The meter replacement work is being implemented by on-going PJSIP for the following purposes :

- to reduce the unaccounted for water (non physical losses) due to unserviceable or inaccurate meters
- to introduce a systematic procedure of regular
 - i) testing and re-conditioning of large meters
 - ii) random selection and calibration of all small sizes of meters according to model, size, period of service and location

b) Implementation of meter replacement for Zone 1,2 and 4,5

The meter replacement program consists of Crash Program and Routine Program.

i) Crash Program

The crash program is aimed at early replacement, within five (5) years, of all old and unserviceable meters and stop cocks. As a result of the field consumer survey, the following works is being conducted.

- replacement of all unserviceable meters and stop cocks
- installation of meters at any point where water is distributed, even if not billed
- installation of meters on all illegal connections
- installation of stop cocks where missing

On the other hand, a special program is being conducted. Concerning the large meters which will be systematically calibrated. It is pointed out that this program will not only be limited to the customer meters but will also concern the production facilities metering and is planned to be performed within two (2) years.

The large meter team is conducting the following works :

- replacement of meter
- in-site calibration

- installation of a strainer before each meter

ii) Routine Program

This program consists in a systematic calibration of about 1% per month of installed meters. Result of both, field consumer surveys conducted in the four (4) Pilot areas and rehabilitation of consumer meters implemented in Pluit area, show that about 60% of the meters are not working and should be replaced during the crash program. This program should allow the testing of the overall meters in approximately 8 years.

The number of meter to be replaced is estimated 120,600 units.

c) Implementation of meter replacement for Zone 3,6

The meter and fitting rehabilitation work consists of four (4) steps of field inspection and meter reading, assessment of rehabilitation, meter and fitting replacement, and meter reading.

i) Field Inspection and Meter Reading

- visit all properties in a waste meter area
- uniquely coding of each property and meter
- meter reading and pressure measurement
- check the meter size for large meter
- visible inspection of large meter

ii) Assessment of Rehabilitation

- trace pipework from street to meter
- check pipework for visible leaks
- sound fittings
- check all necessary fittings present and working
- isolate property and check leaks from ferrule if possible
- check fittings
- decide the fittings which are not working
- check large meter fault or not
- replace of fittings
- remove and clean strainer
- repair / replace of ferrule

iii) Meter Reading

- read meter

The number of meter to be replaced is estimated 25,000 units.

3) Meter Repair Shop

a) Equipment

At present PAM JAYA is equipped with the following meter test benches as listed in Table-M.3.

Table-M.3 METER TEST BENCH

NO.	SIZE	CAPACITY	NUMBER OF UNIT	PURCHASE YEAR	REMARKS
1	1/2" - 1"	24	2	1988	Good Condition for Operation
2	1/2" - 1"	24	1	1990	Not Operation
3	2"	4	1	1990	Not Operation
Combined Test Bench for					
4	1/2" - 1 - 1/2"	20	1	1981	Good Condition
	2" - 6"	4 for 2"	1	1981	Good Condition for Operation
		1 for 6"			

Note : No.1 and No.4 are installed at Meter Repair Shop Building, and No.2 and No.3 are stored at Logistic Division Building, because electric power capacity is not enough to operate these equipment.

b) Operation and Staff

At present three (3) persons of staff are only testing meter at customer's request.

Average number of meter tested is about 150 meter per month.

c) Space for the Meter Shop

The layout of existing meter shop is under planning to improve including space for storage and workshop.

Storage and Stock Yard

Each cabang has a closed storage for piping materials for service connection and tertiary pipes including service saddles, fitting valves, accessories, small size DCIP, SP, PVC pipes, limited numbers of flow meters of 50 - 100, valve covers, etc. which are authorized to use under the responsibility of cabang for installation of new service connection and replacement of defective part of the service lines. Storage and stock yard maintained under control of Logistic Division are listed in Table-S.1.

Table-S.1 STORAGE AND STOCK YARD

NO.	LOCATION	TYPE	SPACE	MATERIAL STORED
1	GUDANG A (Pejompongan)	closed	± 1,490m ²	Pipe, Accessories
		open	± 1,990m ²	
2	GUDANG B (Pejompongan)	closed	± 872m ²	Chemicals
		open	± 60m ²	
3	GUDANG D (Kp. Rambutan)	closed	± 224m ²	Pipe
		open	± 5,950m ²	
4	GUDANG H (Pandjaitan)	open	± 7,399m ²	Pipe, Accessories
5	GUDANG METER AIR (Pejompongan)	closed	± 140m ²	Meter

Table-1 PRESENT STATUS OF MAINTENANCE AT TREATMET PLANTS
(I : Pejompongan I, II : Pejompongan II, III : Cilandak, IV : Pulogadung, V : Buaran)

MAINTENANCE PERIOD AND ITEMS (RECOMMENDED)	PRODUCTION FACILITY				
	I	II	III	IV	V
Transmission/Distribution Pump					
<u>Daily Inspection</u>					
Bearing	M	X	O	M	M
Gland Packing	M	X	X	M	M
Meters	O	X	O	M	
Operation Status	O	X	X	M	O
<u>Annual Inspection</u>					
Gland Packing	-	X	X	-	-
Lubrication Oil	M	X	O	M	D
Meters					
<u>Periodical Inspection</u>					
Bearing	-	X	X	-	-
Gear Coupling	A	X	X	-	W
Case	A	X	O	M	W
Impeller	A	X	O	M	W
Slurry Pump					
<u>Daily Inspection</u>					
Delivery Pressure	O	A	-	W	O
Flow Rate	O	A	-	W	O
Noise	-	A	-	W	O
Vibration	-	A	-	W	O
Bearing	-	A	-	M	A
Electrical Current	-	A	-	M	-
<u>Monthly Inspection</u>					
Gland Packing	A	A	-	-	-
Bearing	-	A	-	-	-
<u>Periodical Overhaul</u>					
Disassembling Check	O	A	-	M	M
Attrition	O	A	-	M	A
Liner Ring	O	A	-	M	A
Motor Bearing	A	A	-	M	M
Vacuum Pump					
<u>Daily Inspection</u>					
Vacuum Meter	-	-	-	O	-
Noise	-	-	-	O	W
Vibration	-	-	-	O	W
Electrical Current	-	-	-	O	W
Supplemental Water	-	-	-	M	-
<u>Monthly Inspection</u>					
Gland Packing	-	-	-	O	O
Bearing	-	-	-	O	A
<u>Periodical Overhaul</u>					
Disassembling Check	-	-	-	O	M
Damage	-	-	-	M	O
Liner Ring	-	-	-	M	O

Note O:Executing, -: Not executing
W: Weekly Inspection, M: Monthly Inspection, A: Annual Inspection
D: Daily Inspection P: Periodical Overhaul

MAINTENANCE PERIOD AND ITEMS (RECOMMENDED)	PRODUCTION FACILITY				
	I	II	III	IV	V
Motor Valve					
<u>Monthly Inspection</u>					
Drive Unit	P	-	-	W	-
<u>6-Month Inspection</u>					
Drive Unit	-	-	-	-	-
Screw	P	-	-	W	-
<u>Annual Inspection</u>					
Opening Indicator	W	-	-	W	W
Motor	W	-	-	W	W
Limit Switch	M	-	-	W	M
Painting	M	-	-	O	O
<u>Periodical Overhaul</u>					
Lubrication Oil	A	-	-	W	W
Drive Unit	-	-	-	-	O
Disassembling Check	O	-	-	A	O
Flush Mixer					
<u>Daily Inspection</u>					
Drive Unit	P	3M	-	W	W
Meter	-	-	-	W	-
Bearing	M	3M	-	W	W
<u>Annual Inspection</u>					
Drive Unit	P	-	-	-	-
Mixer	O	3M	-	W	O
<u>Periodical Overhaul</u>					
Drive Unit	O	-	-	-	-
Mixer	A	-	-	-	-
Painting	O	3M	-	O	O
Crane					
<u>Monthly Inspection</u>					
Rail	-	-	A	O	W
Hook Block	-	-	-	O	W
Wirerope	O	-	A	A	W
Brake	W	-	A	A	W
Grease	O	W	W	O	W
Motor	O	-	A	O	A
Switch	W	-	W	O	W
Fuse	W	-	W	O	O
Magnetic Contactor	W	W	W	O	O
Relay	O	-	W	O	O
Controller	W	-	-	O	O
Limit Switch	O	-	-	O	W
No Load Test	P	-	A	O	W
<u>Annual Inspection</u>					
Structure	-	-	-	M	O
Rail	-	-	-	-	-
Coupling	O	W	-	M	P
Gear	O	-	-	M	M
Wheel	O	-	O	M	O
Bearing	M	-	O	M	O
Hook Block	-	-	-	-	-
Wirerope	-	-	-	-	-
Grease	-	-	-	-	-
Motor	-	-	-	-	-
Fuse	-	-	-	-	-
Switch	-	-	-	-	-
Magnetic Contactor	-	-	-	-	-

MAINTENANCE PERIOD AND ITEMS (RECOMMENDED)	PRODUCTION FACILITY				
	I	II	III	IV	V
Crane					
<u>Annual Inspection</u>					
Relay	-	-	-	-	-
Resister	-	-	-	M	-
Electric Wiring	O	-	-	M	-
Limit Switch	-	-	-	-	-
Trolley	-	-	O	M	O
No Load Test	-	-	-	M	-
Insulation Test	-	-	O	M	O
Power Receiving/Distribution Panel					
<u>Weekly Inspection</u>					
Surface Dirt	D	-	M	O	D
Switches	O	-	M	O	D
Noise	D	-	O	D	A
Locking Device	O	-	-	O	A
<u>Annual Inspection</u>					
Terminal	M	-	O	W	O
Wiring	W	-	O	M	O
Supporting Insulator	W	-	-	M	O
Bolt-Nut	O	-	M	M	O
Foreign Matter	W	-	-	M	O
Dirt	D	-	W	M	O
Insulation Resistance	-	-	O	M	M
Grounding Resistance	-	-	O	M	O
Motor and Control Panel					
<u>Daily Inspection</u>					
Meters	O	-	-	W	M
Indication Lamp	O	-	A	W	M
Indicator	O	-	-	W	M
Relay	W	-	A	W	M
<u>Annual Inspection</u>					
Dirt	W	-	W	W	M
Wiring	D	-	M	M	O
Terminal	W	-	M	M	O
Tag	M	-	-	M	O
Accuracy of Meter	O	-	O	M	O
Relay	-	-	-	-	-
Protection Relay					
<u>Weekly Inspection</u>					
Appearance	D	-	-	M	M
Noise	D	-	-	M	A
Vibration	O	-	-	M	A
Target Indication	O	-	-	M	A
<u>Annual Inspection</u>					
Terminal	M	-	-	M	O
Manual Reset	M	-	-	M	O
Inside Dirt	W	-	-	M	O
Control Spring	P	-	-	M	M
Contactors	O	-	-	M	O
Gear	O	-	-	M	O
Insulation Resistance	-	-	-	M	O
Performance Test	O	-	-	M	M
Confirmation of Setting Value	-	-	-	M	O

MAINTENANCE PERIOD AND ITEMS (RECOMMENDED)	PRODUCTION FACILITY				
	I	II	III	IV	V
Air Circuit Breaker					
<u>Weekly Inspection</u>					
Appearance	D	-	-	M	M
Air Leakage (Packing)	M	-	-	M	A
<u>Annual Inspection</u>					
Appearance	-	-	-	-	-
Air Leakage (Packing)	-	-	-	-	-
<u>Periodical Overhaul</u>					
Disassembling Check	O	-	-	M	O
Function Test	D	-	-	W	A
Disconnecter					
<u>Weekly Inspection</u>					
Appearance	D	-	A	O	M
Indicator	D	-	A	O	A
Operating Structure	D	-	P	O	M
<u>Annual Inspection</u>					
Supporting Insulator	W	-	O	W	O
Contactor	W	-	M	W	M
Connector	M	-	O	W	M
Supplementary Switch	M	-	O	W	P
Interlock	M	-	O	W	O
Measurement of Insulation Resistance	-	-	O	W	O
Switch					
<u>Weekly Inspection</u>					
Appearance	D	-	A	M	M
<u>Annual Inspection</u>					
Supporting Insulator	W	-	M	M	O
Contactor	W	-	O	W	M
Connector	M	-	O	W	M
Measurement of Insulation Resistance	-	-	O	M	O
Contactor					
<u>Weekly Inspection</u>					
Appearance	D	-	A	M	M
Noise	D	-	O	O	A
Abnormal Heat	O	-	-	O	M
<u>Annual Inspection</u>					
Abnormal Heat	O	-	-	W	-
Spring	O	-	-	W	O
Case	O	-	O	W	O
Supplemental Switch	O	-	O	W	O
Measurement of Insulation Resistance	-	-	O	M	O
Potential Transformer					
<u>Weekly Inspection</u>					
Appearance	D	A	-	M	P
Noise	D	A	-	M	P
Oil Leakage	O	A	-	M	P
<u>Annual Inspection</u>					
Terminal	M	O	-	W	P
Grounding	M	O	-	M	P
Measurement of Insulation Resistance/Grounding Resistance	-	O	-	M	P

MAINTENANCE PERIOD AND ITEMS (RECOMMENDED)	PRODUCTION FACILITY				
	I	II	III	IV	V
Lightning Arrester					
<u>Weekly Inspection</u>					
Appearance of Insulator	-	-	-	M	M
Noise	-	-	-	M	P
Dirt	-	-	-	M	P
<u>Annual Inspection</u>					
Terminal	-	-	-	M	P
Grounding	-	-	-	M	P
Measurement of Insulation Resistance/	-	-	-	M	P
Grounding Resistance	-	-	-	M	P
Underground Cable					
<u>Weekly Inspection</u>					
Insulation Condition	P	A	P	A	A
Ground Condition	A	A	P	A	A
Cable Head	A	A	P	A	A
Manhole	D	A	P	A	A
Connector	P	A	P	A	A
Indicator	P	A	P	P	A
Other Construction Work	P	A	P	A	A
<u>Annual Inspection</u>					
Terminal	-	O	P	O	O
Grounding	P	O	P	O	O
Conduit Pipe	-	O	P	O	O
Measurement of Insulation Resistance/	-	O	P	O	O
Grounding Resistance	-	O	P	O	O
Surface Cable					
<u>Weekly Inspection</u>					
Cable Protection	O	A	A	A	A
Ground Sinking	A	A	A	A	A
Indicator	D	A	A	A	M
<u>Annual Inspection</u>					
Drainage	P	O	W	O	M
Pull Box	O	O	O	O	O
Terminal	-	O	O	O	O
Grounding	-	O	O	O	O
Measurement of Insulation Resistance/	-	O	O	O	O
Grounding Resistance	-	O	O	O	O
Transformer					
<u>Daily Inspection</u>					
Voltage	O	A	O	M	M
Frequency	O	A	O	M	M
Current	O	A	O	M	M
Power Factor	-	A	O	M	M
Temperature	O	A	W	M	M
Load Consumption	O	A	O	M	M
Dirt	W	A	W	M	A
Noise	W	A	M	M	A
Vibration	M	A	M	M	A
Abnormal Odor	M	A	W	M	A
Terminal	M	A	A	M	A

MAINTENANCE PERIOD AND ITEMS (RECOMMENDED)	PRODUCTION FACILITY				
	I	II	III	IV	V
Transformer					
<u>Weekly Inspection</u>					
Insulator	M	A	A	M	A
Foreign Matter	M	A	A	M	M
Vibration	O	A	D	M	M
Cooling Fan	O	A	-	M	O
Oil Level	M	A	O	A	-
Nitrogen Pressure	-	A	-	M	M
Humidity Absorber	-	A	-	A	A
Oil Leakage	-	A	O	A	A
Water Leakage	M	A	-	A	A
Temperature of Cooling Water	-	A	-	M	A
<u>Annual Inspection</u>					
Appearance	D	O	-	M	O
Insulator	M	O	O	M	O
Terminal	-	O	O	M	O
Anti-shock Device	-	O	-	O	O
Cooling Fan	-	O	-	-	-
Temperature	-	O	-	-	-
Relay	W	O	O	M	M
Valve	A	O	-	O	M
Measurement of Insulation Resistance/	M	O	O	M	O
Grounding Resistance	-	O	O	O	O
Oil Level/Pressure	W	O	O	O	M
Gas Detecting Relay	-	O	-	M	M
Cooling Water	D	O	-	M	M
Purity of Nitrogen	-	O	-	M	O
Insulation Test of Oil	P	O	P	M	O
Total Oxidation Test of Oil	P	O	O	M	O
Motor					
<u>Daily Inspection</u>					
Operation Status	O	A	O	M	O
Bearing	M	A	A	M	M
Cooling Facility	O	A	-	M	A
Environment	A	A	-	M	M
<u>Annual Inspection</u>					
Appearance	D	O	O	M	D
Bearing	-	-	O	-	-
Slip Ring	W	O	-	M	M
Flow Meter (Differential Pressure Type)					
<u>Annual Inspection</u>					
Appearance of Wiring/Piping/Transmitter	D	O	-	M	M
Measurement of Insulation Resistance	-	O	O	O	O
Air Release	W	O	-	M	P
Zero Point Adjustment	-	O	P	M	O
Span Adjustment	-	O	-	M	O
Calibration	O	O	O	O	O

MAINTENANCE PERIOD AND ITEMS (RECOMMENDED)	PRODUCTION FACILITY				
	I	II	III	IV	V
Level Meter (Pressure Type) <u>Annual Inspection</u>					
Appearance of Wiring/Piping/ Transmitter	D	O	P	O	D
Measurement of Resistance	-	O	P	O	W
Air Release	-	O	-	O	W
Zero Point Adjustment	D	O	P	O	M
Span Adjustment	-	O	-	O	M
Calibration	O	O	P	O	O
Level Meter (Electrode Type) <u>Annual Inspection</u>					
Appearance of Wiring/ Connector/Electrode	D	O	P	M	O
Relay Test	O	O	P	M	M
Pressure Meter <u>Annual Inspection</u>					
Appearance of Wiring/ Senser/Transmitter	D	O	O	M	W
Measurement of Insulation Resistance	-	O	O	M	M
Zero Point Adjustment	D	O	O	M	M
Span Adjustment	-	O	O	M	-
Calibration	O	O	O	O	O
Temperature Meter <u>Annual Inspection</u>					
Appearance of Wiring/ Senser/Transmitter	-	O	O	M	M
Measurement of Insulation Resistance	-	O	O	M	M
Zero Point Adjustment	-	O	O	M	M
Span Adjustment	-	O	-	M	M
Calibration	-	O	O	O	M
pH Meter <u>Weekly Inspection</u>					
Appearance of Wiring/ Transmitter	D	-	-	M	O
Zero Point Adjustment	D	-	-	M	M
Span Adjustment	-	-	-	M	M
Calibration	A	-	-	M	A
<u>6-Month Inspection</u>					
Appearance of Wiring/ Connector	W	-	-	M	W
<u>Annual Inspection</u>					
Appearance of Wiring/ Connector	-	-	-	M	-
Measurement of Insulation Resistance	-	-	-	M	M
Turbidity Meter <u>Daily Inspection</u>					
Appearance of Lamp/Cleaner	O	W	P	M	W
<u>Weekly Inspection</u>					
Appearance of Transmitter	-	O	M	M	O
Zero Point Adjustment	D	O	M	M	O
Debubbling Case	-	O	-	M	O

MAINTENANCE PERIOD AND ITEMS (RECOMMENDED)	PRODUCTION FACILITY				
	I	II	III	IV	V
Turbidity Meter					
<u>Monthly Inspection</u>					
Appearance of Transmitter	-	-	-	O	-
Zero Point Adjustment	-	-	-	O	-
Calibration	A	-	-	O	-
Debubbling Case	-	-	-	O	-
<u>6-Month Inspection</u>					
Appearance of Piping	W	W	P	M	-
<u>Annual Inspection</u>					
Appearance of Piping	-	-	-	-	O
Measurement of Insulation Resistance	-	-	O	M	O
Residual Chlorine Meter					
<u>Daily Inspection</u>					
Appearance of Metering Pump	O	O	-	O	W
Reagent Volume	O	O	-	O	W
Cleaning	O	O	-	O	W
<u>Weekly Inspection</u>					
Overflow Tank	O	D	-	D	O
<u>3-Month Inspection</u>					
Appearance of Transmitter	M	D	-	W	M
Zero Point Adjustment	D	D	-	W	M
Span Adjustment	-	D	-	W	A
Calibration	-	D	-	M	A
<u>6-Month Inspection</u>					
Appearance of Piping/ Connector	W	D	-	M	A
<u>Annual Inspection</u>					
Appearance of Piping/ Connector	-	-	-	-	O
Measurement of Insulation Resistance	-	D	-	M	O
Indicator/Recorder					
<u>Daily Inspection</u>					
Appearance of Recorder/Pen/ Ink	O	A	-	W	W
<u>6-Month Inspection</u>					
Appearance of Moving Part/ Sliding Part	-	A	-	W	W
<u>Annual Inspection</u>					
Appearance of Piping/ Connector	W	O	-	M	M

Table-2 STATUS OF RECOMMENDED REMEDIAL ACTION

PEJOMPONGAN I

RECOMMENDED REMEDIAL ACTION	CURRENT STATUS
<u>Raw Water Intake</u>	
1.a) Divert Kali Krukut to downstream of sluice gates.	Under construction of pipe line
1.b) Set up fish toxicity test	Tested
2. Install on-line monitors for pH, turbidity and conductivity	Installed
3. Repair activated carbon feed line	Under processing
4. Powered activated carbon should be kept dry.	Proposed
<u>Plant Inlet</u>	
5.a) New annubar meters installed but still under commissioning.	Installed but not functioning
5.b) The existing venturi meter could be refurbished using on ultrasonic level sensor.	Not in program
6.a) Provide pre chlorination facility using chlorine gas	New chlorine house was installed
6.b) A new back up calcium hypochlorite dosing system should be provided	Not provided
<u>Coagulation/Flocculation/Sedimentation</u>	
7. The coagulation process and plant through put could be improve by use of a synthetic organic coagulant in combination with alum e.g. polyamide or polydadac.	By use Lt35s
Suggest that manufacturer's be invited to carry out plant trials.	Already done
8.a) At high alum doses pH may become too low (preliming required). The need for high alum dose(and preliming)could be avoided by action 7.	Not installed
8.b) On-line pH monitoring required to control coagulation process.	Under requesting
9. Improve settlement characteristic. Can be obtained using action 7.	By use Lt22s
10. Warms should be removed regularly.	Continuous activity Replaced but not functioning
11. Replace faulty control equipment.	50% replaced
<u>Filtration</u>	
12. Replace control valves.	50% replaced
13. Replace obsolete equipment.	50% replaced
14. Filter head loss meter should be replaced.	

15.A) Check effectiveness of air/water distribution regularly.	Continuous activity
15.b) Rake sand surface(once/month)	Continuous activity
15.c) Remove and clean sand if necessary.	Continuous activity
<u>Chlorine</u>	
16. Replace evaporators.	Replaced
17. Replace standby chlorinators.	Replaced
18. Install automatic chlorine tank change over.	Manual operation
19. Provide separate system or auto change over for chlorine leak detection equipment and auto shutdown .	Provided
20. Install chlorine gas evacuation or neutralization system.	Installed
21. Implement chlorine safety training immediately. Organize through chlorine manufacturers and chlorine equipment supplier.	Already done
22. Contract out maintenance to qualified chlorination equipment contractor.	Already done
23. Install proper gantry system for moving drums.	Installed
<u>Alum</u>	
24. Overhaul air mixing system .	Overhauled regularly
25. Install dose measuring tank.	Not installed
26. Replace alum dosing system with metering pump system.	Proposed
<u>Lime</u>	
27.a) Measurement of slurry strength carried out ant plant give better information .Central lab should coordinate and collate information.	Already done
27.b) Kepala instrasi should be authorized to reject unsatisfactory loads of lime.	Depend on team
28.a) Install special non clogging valves e.g. full bore weirless valve or pinch valves & fittings and minimize the number of joints.	Non clogging valve
28.b) Use flexible feed pipes with quick release couplings (keep as short as possible)	Not provided
28.c) Maintain adequate velocity in pumping lines.	Maintaining

29. Lime dosing should be set to keep water within acceptable stability range. Stability index should be calculate each shift.	Tried
30.a) Improve dilution water supply capacity.	Not provided
30.b) Install dilution water flow meter.	Not provided
30.c) Replace all pipework.	Proposed
30.d) Use hydrate lime. When available.	Tried
30.e) Consider direct dosing of slurry to process water.	About 80%
31. Replace lime slurry dosing equipment	Not provided
<u>Calcium hydrochlorine</u>	Not provided
32. Install new solution preparation and dosing facilities.	
<u>Laboratory</u>	Provided
33. To be specified in separate document for additional equipment.	Trained
34. Prepare necessary equipment and train staff for aluminum residuals measured.	
35. Replace or repair as below,	
<u>Raw Water</u>	Provided
Turbidity monitor	Not provided
pH monitor	Not provided
Conductivity monitor	
<u>Coagulation Stage</u>	Not provided
pH monitor	
<u>Treated Water</u>	Installed
Turbidity monitor	Not functioning
pH monitor	Not functioning
Chlorine residual monitor	

PEJOMPONGAN II

RECOMMENDED REMEDIAL ACTION	CURRENT STATUS
<p><u>Intake</u></p> <p>1.a) Divert Kali Krukut to downstream of sluice gates.</p> <p>1.b) Set up fish toxicity test</p> <p>2. Install on-line monitor for pH, turbidity, and conductivity.</p> <p>3. New flow meter installed but may not be suitable, because the sensor is liable to blockage. An electromagnetic type is suggested as an alternative.</p> <p>4.a) Check efficiency of raw water pumps.</p> <p>4.b) Install additional pumping capacity and upgrade power supply.</p> <p><u>Coagulation/Flocculation/Sedimentation</u></p> <p>5.a) The coagulation process could be improved and plant throughput could be increased by use of synthetic organic coagulants in combination with alum, e.g. Polymides or polyadmacs.</p> <p>5.b) On-line pH monitor required to ensure accurate control of preliming.</p> <p>6. Fit basket screen on raw water pumps.</p> <p>7. Recommendation 5 above also applies.</p> <p>Synthetic coagulations can improve floc settleability and enable increase plant throughput.</p> <p>8. Presedimentation facilities only adequate to remove larger particles (grit and fine sand). If silt accumulation is a problem more frequent draining and cleaning is required.</p> <p>The pulsator units installed at Buaran I have a modified desludging facility. If successful pulsators at Instrasi II could be modified.</p> <p>9. Replace filter control valves.</p> <p>10. Replace partialization boxes.</p> <p>11. Replace head loss meters.</p> <p>12.a) Check effectiveness of air/water distribution regularly.</p> <p>12.b) Rake sand surface regularly.</p> <p>12.c) Remove and clean.</p>	<p>Under construction of pipe line</p> <p>Already tried Installed and functioning</p> <p>Installed but not functioning</p> <p>Based on the pump capacity</p> <p>Under progress</p> <p>Tried by use L122s</p> <p>Installed</p> <p>Unsatisfaction By use Magna Flock</p> <p>Continuous activity</p> <p>Not planned</p> <p>Replaced Replaced Replaced Continuous activity</p> <p>Continuous activity Continuous activity</p>

Chlorine	
13. Install automatic chlorine tank change over.	Manual
14. Install chlorine leak detection equipment.	Installed
15. Refurbish chlorine gas evacuation system.	Refurbished
16. Install chlorine neutralization system.	Installed
17. Implement chlorine safety training immediately.	Provided
Organize through chlorine manufacturers and equipment suppliers.	
18. Contract out maintenance to qualified chlorine equipment contractor.(should have certification from major chlorination equipment manufacturer).	Provided
Lime	
19.a) Measurement of slurry strength carried out at plant could give better information. Central lab should coordinate and collate information.	Already done
19.b) Kepala Instrasi should be authorized to reject unsatisfactory loads of lime.	Depend on team
20.a) Install special non clogging valves e.g. full bore weirless valves or pinch valve & fittings & minimize number of joints.	No clogging valve
20.b) Use flexible feed pipes with quick release couplings (keep as short as possible).	Provided
20.c) Maintain adequate velocity in pumping lines.	Maintaining
21. Lime dosing should be set to keep water within acceptable stability range. Stability index should be calculated each shift.	Already done
22.a) Use hydrate lime	Not yet done
22.b) Consider direct dosing of slurry to process water.(only if 95% Ca(OH) ₂ available).	About 80%
22.c) If necessary redesign saturator control equipment.	Not yet done

<u>Calcium Hypochlorite</u>	
23. Purchase new transfer pump	Not yet done
24. Consider use of Bentonite as cheaper alternative.	Not yet done
25.a) Provide dry storage facilities	Not provided
25.b) Do not keep bags of activated carbon lying around.	Already done
26. Replace carbon silo.	Proposed
27. Overhaul slurry preparation tank and equipment.	Proposed
<u>Clear Water Tank</u>	
28. Refurbish outlet valves .	Proposed
<u>Laboratory</u>	
29. To be specified in separate document for additional equipment.	Provided
30. Prepare necessary equipment and train staff for aluminum residuals measured.	Already done
31.a) Replace/repair or install as below,	Replaced and functioning
<u>Raw Water</u>	
pH	
Conductivity	
Turbidity	
<u>Coagulation Stage</u>	
pH	
<u>Treated Water</u>	
pH	
Turbidity	
Chlorine residuals	
31.b) Locate on-line monitors near sample source and bring signal back to central source. Do not pipe samples back to central point.	Under progress
<u>Flow meters</u>	
32. Ensure meters function correctly before final acceptance.	Already done
33. Staff training in maintenance required. Suggest establishment of special maintenance section for instrumentation.	Already done

CILANDAK

RECOMMENDED REMEDIAL ACTION	CURRENT STATUS
<p><u>Raw Water Intake</u></p> <p>1.a) Fencing all of river bank 5 km up stream.</p> <p>1.b) Provide river bank dwellers with on site sanitation facilities.</p> <p>1.c) Stronger pollution control laws, and law enforcement.</p> <p>1.d) PAM Jaya should approach Jabotabek authorities to take steps to protect this source.</p> <p>1.e) Set up fish toxicity test.</p> <p><u>Intake/Presedimentation</u></p> <p>2. Better pump gantry arrangement required.</p> <p><u>Plant Inlet</u></p> <p>3. Replace flow meters, four pieces.</p> <p><u>Coagulation/Flocculation/Sedimentation</u></p> <p>4. Use synthetic coagulation(e.g. polymines or polydadmacs) in combination or as a total replacement to alum would improve coagulation performance.</p> <p><u>Filtration</u></p> <p>5. Repair or replace compressor/blower.</p> <p><u>Treated Water Storage/Distribution</u></p> <p>6.a) Test for free and total chlorine.</p> <p>6.b) Secure and lock lids on treated water storage tanks.</p> <p>6.c) Check break point chlorination requirement.</p> <p>6.d) Always ensure minimum retention of 2 hours in clean water tanks.</p> <p>7. Conduct survey of distribution system.</p> <p>8. Install baffle walls in tank.</p> <p>9. Relocate sample point of final water.</p> <p><u>Chlorine</u></p> <p>10.a) Exclude non authorized personnel from site by erection of fencing.</p> <p>10.b) Enclose chlorine equipment inside building or fence off.</p> <p><u>Alum</u></p> <p>11. Repair or replace stirrer.</p>	<p>Raw water quality still meet the raw water quality standard.</p> <p>Most of the river upstream of Cilandak falls outside DKI Jakarta jurisdiction.</p> <p>Aquarium is relocated.</p> <p>Two(2) units of gantry pumps are operated.</p> <p>Proposed to replace.</p> <p>PAC has been using.</p> <p>All of them still in good condition and ready for operation.</p> <p>Total chlorine is analyzed hourly.</p> <p>Reservoir screen and retention time meet the requirement.</p> <p>The quality of water is checked at the customer periodically.</p> <p>Baffle walls were installed.</p> <p>Sample point was relocated.</p> <p>Fencing for chlorine equipment was installed.</p> <p>Stirrers are in good function.</p>

<p>12. PAC dosing pumps will be provided for PAC trials. If trials not successful new alum dosing pumps should be purchased.</p> <p>13. Dose can be set roughly based on water color and turbidity.</p> <p><u>Lime</u></p> <p>14. No change suggested unless good quality hydrate lime can be obtained. Sodium hydroxide may be considered as additional means of alkalinity and pH adjustment.</p> <p><u>Soda Ash</u></p> <p>15.a) Optimize dose based on water stability (not just pH).</p> <p>15.b) Look for source of good quality hydrate lime.</p> <p>15.c) Conduct lab trials using lime, soda ash and sodium hydroxide to determine optimum means of water stabilization.</p> <p><u>Laboratory</u></p> <p>16. To be specified in separate document for additional equipment.</p> <p>17. Prepare necessary equipment and train staff for aluminum residuals measurement.</p> <p>18. All lab equipment should be kept in full working order.</p>	<p>PAC has been using and new equipment was installed.</p> <p>Jar test doing 3 times a day minimum.</p> <p>Good quality hydrate lime has not been obtained yet.</p> <p>Pejompongan I WTP is still trying to use Soda Ash and Lime. We have been waiting for the result.</p> <p>Aluminum residuals are measured.</p> <p>All laboratorium equipment are tried to operate in full working order.</p>
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PULO GADUNG

RECOMMENDED REMEDIAL ACTION	CURRENT STATUS
<p><u>Raw Water Intake</u> Protection of water sources not PAM Jaya responsibility, but P Jaya need to put pressure on local authorities to implement steps such as:</p> <p>a) Install interceptor mains for domestic and industrial effluent along river banks. b) Enforce existing laws as far as possible. c) Implement stronger pollution laws. d) Fencing off of river banks. Additional raw water monitoring can be done by PAM Jaya scch as: Fish toxicity testing.</p> <p><u>Intake/Pre Sedimentation</u> 2. Repair or install on-line monitors for pH,turbidity, conductivity. 3.a) Prechlorination practice should be reviewed if tri halo methanes prove to be a problem. 3.b) Investigate the use of Bentonite as an alternative to activated carbon. 3.c) Improve coagulation process. 3.d) On-line pH and turbidity monitoring.</p> <p><u>Coagulation / Flocculation / Sedimentation</u> Alum foam on top of floc chambers is common inconvenience rather than a problem. a) Continue removals as at present. b) Renovate scum troughs. (Adjust height). c) Repair all flocculator stirrer mechanisms. d) Repair spray system in flocculation basins. e) Reduce mixing turbulence at mixing well by adjusting weir height. 5. Replace broken or obsolete flocculators paddles and other equipment. 6.a) If high alum dose are used preliming will be necessary.</p>	<p>No firm date</p> <p>Problem</p> <p>By KLH laws Fencing was installed.</p> <p>Finished</p> <p>Not provided</p> <p>Not provided</p> <p>Continuous activity</p> <p>No change</p> <p>Not yet repaired</p> <p>No spray now</p> <p>Normal condition</p> <p>Not yet replaced</p> <p>Preliming was installed</p>

6.b) It would be better to use low alum dose along with a synthetic coagulant.	Finished
7.a) Operate scrapers more frequently.	Under operation
7.b) Monitor result of increase frequency of scraper operation.	Prepared
7.c) If necessary replace scrapers with continuous operation type.	Proposed
7.d) Stop sludge disposal to river.	Problem
8. Repair discharge lauder weirs and make level. Install synthetic performed weir lips.	Under progress
9. Aluminum residuals measurement should initiate immediately.	Measuring
10. Repair or install on-line pH monitor.	Under progress
<u>Filtration</u>	
11. Repair/replace valves/control equipment.	Not yet replaced.
12. In absence of head loss monitors etc. set maximum run period , say 48 hrs.	2x24 hours
13.a) Replace/repair instrumentation.	Some of them are not function
13.b) Specialist maintenance contract.	Self maintenance
14. Replacc/repair filter flow control/level control equipment.	Replaced
15. Repair/replace of surface wash pipes.	Replaced
<u>Chlorine House</u>	Provided
16. Repair/replace chlorine tank weighing equipment.	Functioning
17. Replace chlorine gas detector.	Trained
18. Implement training immediately.	House left open
19. Review safety aspects of this practice.	Under contract
20. The chlorination and chlorine evaporator system should receive regular and very careful inspection and specialized maintenance. Contract out.	
<u>Alum</u>	
21. Install alum dose calibration tank.	Only jar test
22. Operator's task would be easier if solution concentration is kept constant.	Proposed
23. Rough settling of alum dose can be done based on color and turbidity. This method should be check against jar test.	3 shift
24. Prepare new charts of alum dosing.	Prepared

<u>Lime</u>	
25.a) Measurement of slurry strength carried out at plant is more accurate.	Already done
25.b) Ka. Instrasi should be authorized to reject unsatisfactory loads of lime.	Team in charge
26.a) Install special non clogging valves & fittings & minimize number of joints.	Installed
26.b) Use flexible feed pipes (keep as short as possible)	Installed
26.c) Maintain adequate velocity in pump lines.	Provided,maintaining
27. Lime dosing should set to keep water within acceptable stability range.	
28.a) Look for better quality quicklime.	Tried
28.b) Use good quality hydrated lime as alternative (no slaking required)	Proposed
28.c) Consider direct dosing of slurry to process water.(if 95% Ca(OH) ₂ available.	Tried
28.d) If necessary redesign saturator control equipment.	Proposed
29. Overhaul preliming equipment for use when high alum dose required. See also item 6.	Available
30. Replace missing or broken pumps.	Not yet replaced.
<u>Calcium Hypochlorite</u>	
31. Overhaul or replace flow meters.	Not use
32. Install stirrers for make -up tanks.	Not installed
<u>Laboratory</u>	
33. To be specified in separate document for additional equipment.	Provided
34. Prepare necessary equipment and train staff for aluminum residuals measurement.	Not provided
35.a) Prepare or repair or provide as below:	
<u>Raw Water</u>	
Turbidity	Under construction
pH	ditto
Conductivity	ditto
<u>Coagulation Stage</u>	
pH	Under construction
<u>Treated Water</u>	
Chlorine Residual(Free)	Under construction
pH	ditto
Turbidity	ditto

34.b) Locate on-line monitors near sample source and bring signal back to central point. Do not pipe sample back to central point.	Provided
<u>Flow Meters</u>	
37. Ensure meters function correctly before final acceptance.	Installed
38.a) Staff training in maintenance required (instrument specialist) or maintenance contract.	Trained
38.b) Annubar sensors should be removed frequently for cleaning.	Continuous activity
38.c) Replace annubar type with electromagnetic type meter for raw water.	Not proposed

Table-3 OPERATIONAL ACTIVITY (VALVE ARRANGEMENT),
SUB-SECTION PIPE NETWORK MAINTENANCE, MATCH 1995

NO	REFERENCE NUMBER	LOCATION	REGION	DATE	DIA-METER	NOTE
1	PE	Jl. Sudirman/BNI	Pusat	1	250	Valve of Jl Sudirman direction :fully opened
2	PE	Jl. Sudirman/BNI	Pusat	1	250	Valve of Jl Setiabudi direction :fully opened
3	PE	Jl.S.Parmar/Jl.T.Duren	Barat	6	250	Valve opened 10 rotation
4	PE	Jl.S.Parmar/Citra Land	Barat	6	800	Valve opened 100%
5	PE	Jl.S.Parmar/Citra Land	Barat	6	400	Valve opened 100%
6	PU	Jl.G.Sahari/Kali Mati	Utara	7	300	Valve opening arrangement from 35 to 14 rotation
7	PU	Jl. Lodan Lel KA	Utara	7	400	Valve:full opened
8	PU	Jl.Lodan/Jembatan	Utara	7	400	Valve of Pakin direction:opened 37 rotation
9	PU	Jl.Bugis	Utara	8	400	Valve of Sindang direction:reduce from full to 50%
10	PU	Jl.Enim (PTI)	Utara	8	400	Vale of Pelabuhan direction:opened to 20 rotation
11	PU	Jl.R.E Martadinata/Rel	Utara	9	250	Checked alve opening at Pelabuhan direction
12	PE	Jl.Gelong Baru Utara	Barat	10	200	Valve of Darnala direction was fully opened
13	PE	Jl.Tomang Raya	Barat	13	300	Valve opened from 8 to 22 rotation
14	PU	Jl.RE Martadinata/Ancol Timur	Utara	13	600	Checked valve at Ancol Timur:good flow condition
15	PE	Jl. Karet Tengsin	Pusat	14	200	Valve of Darnala direction was fully opened
16	PE	Jl.Laturharhari/Garut	Pusat	15	400	Valve was fully opened
17	PE	Jl.Sukabumi	Pusat	15	400	Valve was fully opened
18	PE	Jl.Tanjung Duren	Barat	16	250	Valve arrangement from full to 30% opening
19	PE	Jl.EMPANG Bahagia	Barat	17	200	Valve arrangement from 100% to 50%
20	PE	Jl.D.Situaksan	Pusat	17	150	Valve was fully opened
21	PU	Instalasi Pulo Gadung	Timur	17	1,500	Valve opening (95%-85%)
22	PU	Instalasi Pulo Gadung	Timur	17	800	Valve opening (95%-85%)
23	PU	Jl.Jatinegara	Timur	24	1,000	Valve was fully opened (100%)
24	PE	Jl.Daan Mogot/Gf Macan	Barat	17	200	Reduced to increase the pressure at Jl Tb Angke
25	PU	Jl.A Yani/Pulo Mas	Timur	23	350	Valve was opened 3 rotation
26	PU	Jl.Perintis/ASMI	Timur	23	400	Valve arrangement from 21 to 4 rotation
27	PU	Jl.Perintis/Kelapa Gading	Timur	23	400	Valve arrangement from 20 to 10 rotation
28	PU	Jl.Perintis/Vespa	Timur	23	250	Valve arrangement from 15 to 10 rotation
29	PU	Jl.Pramuka Sari	Pusat	23	250	Valve of Rawasari direction was fully opened
30	PE	Jl.Latumenten/Jemb.II	Barat	23	250	Valve was opened 10 rotation
31	PE	Jl.Bandengan/Tlk Gong	Utara	27	400	Valve arrangement was opened 4 rotation
32	PU	Instalasi Pulo Gadung	Timur	27	1,500	Valve opening (84%-83*)
33	PU	Instalasi Pulo Gadung	Timur	27	800	Valve opening (78%-76*)

Table-4 LOCATION OF ROUTINE PRESSURE MONITORING

No.	LOCATION
1	Pejompongan I Treatment Plant
2	Jl. KS Tubun / Pintu Air
3	Jl. Jati Baru / Cideng
4	Jl. Kebon Sirih (Patung Pak Tani)
5	Senen Intersection
6	Jl.H Samanhudi
7	Ancol
8	Pejompongan II Treatment Plant
9	Pejompongan Tunnel
10	Tomang (Jl. S Parman), Apotik Prima
11	Grogol (Jl. Satria)
12	Jl. Latumeten / Jembatan II
13	Jembatan III
14	Booster pump, Taman Buaya
15	Jl. KH Wahid Hasyim
16	Jl. Veteran / Juanda
17	Jl. Gajah Mada / Hayam Wuruk
18	Jl. Laturhary
19	Jl. H Rasuna Said
20	Buaran I Treatment Plant
21	Jl. DI Panjaitan Intersection
22	Jl. Jatinegara Intersection
23	Jl. Otto Iskandar Dinata
24	Jl.Sahardjo
25	Jl. Patra
26	Jl. Casablanca
27	Pulogadung Treatment plant
28	Jl. Jatinegara Kaum
29	Jl. Bekasi Timur / Perintis Kemerdekaan
30	Jl. Raya Bekasi
31	Jl. Cakung (Intake)
32	Jl. Cakung Cilincing (Rorotan)
33	Distribution Center Cakung
34	Jl. Pemuda
35	Jl. Perintis Kemerdekaan / Jl. Yos Sudarso
36	Jl. Yos Sudarso (Honda)
37	Jl. Melati / Yos Sudarso
38	Booster Pump Sindang
39	Jl. Letjen Suprpto
40	Booster Pump Semmur Batu
41	Jl. Sunter C
42	booster Pump Sungai Bambu
43	Jl. Raya Pelabuhan

Table - 5 LIST OF PRESSURE MEASUREMENT August 1995

LOCATION	AREA	DIAMETER (mm)	DATE	PRESSURE (ATM)	REMARKS
Jl. Gunung Sahari	Pusat	600	1	0.45	
Jl. Gunung Sahari	Pusat	600	3	0.50	
Jl. Cacing / KBN	Utara	250	3	0.60	
Jl. Cacing / Dewa Ruci	Utara	600	3	0.30	
Jl. Yos Sudarso / Honda	Utara	600	3	2.20	
Jl. Bekasi Tmr / Stasiun	Timur	800	6	2.80	
Jl. Bekasi Tmr / Rel. K. A.	Timur	800	6	3.20	
Jl. Gunung Sahari	Pusat	600	6	0.70	
Jl. Gunung Sahari / Kalimati	Utara	600	6	0.40	
Jl. R. E. Martadinata	Utara	600	6	0.30	
Jl. A. Yani / Bea & Cukai	Timur	1,000	10	1.80	
Jl. Yos Sudarso / Honda	Utara	600	10	2.60	
Jl. Agung perkasa	Utara	600	10	0.90	
Jl. Agung Perkasa	Utara	350	10	0.40	
Jl. Sumur Batu / Booster	Pusat	600	10	0.60	Input
Jl. Sumur Batu / Booster	Pusat	600	10	2.70	Output
Jl. Sumur Batu / Booster	Pusat	350	10	0.80	Output
Instalasi Pulo Gadung	Timur	1,500	11	4.60	
Instalasi Pulo Gadung	Timur	800	11	4.60	
Jl. Yos Sudarso / Honda	Utara	600	11	2.70	
Jl. Agung Perkasa	Utara	600	11	0.95	
Jl. Agung Perkasa	Utara	350	11	0.40	
Jl. G. Sahari / Samanhudi	Pusat	600	13	0.70	
Jl. Gunung Sahari / Kalimati	Utara	600	13	0.30	
Jl. R. E. Martadinata	Utara	600	13	0.10	
Jl. Agung Perkasa	Utara	600	13	0.90	
Jl. Agung Perkasa	Utara	350	13	0.40	
Jl. Sumur Batu / Booster	Pusat	600	13	0.50	Input
Jl. Sumur Batu / Booster	Pusat	600	10	3.80	Output
Jl. Sumur Batu / Booster	Pusat	350	10	1.00	Output
Jl. Yos Sudarso	Utara	600	6	2.10	
Jl. Jatinegara Timur	Timur	800	7	2.80	
Jl. Jatinegara Timur	Timur	1,000	7	2.65	
Jl. Pisangan Baru	Timur	150	7	1.70	
Instalasi Pulo Gadung	Timur	1,500	11	4.50	
Instalasi Pulo Gadung	Timur	800	11	4.40	
Jl. Let Jend Suprpto	Pusat	600	11	1.10	
Jl. Let Jend Suprpto	Pusat	350	11	0.40	
Jl. Sumur Batu / Booster	Pusat	600	11	0.40	
Jl. Jatinegara Kaum	Timur	1,350	11	4.10	
Jl. Suprpto / Galur	Pusat	600	14	0.20	
Jl. Suprpto / Galur	Pusat	350	14	0.10	
Jl. Suprpto / Kabel	Pusat	600	14	1.10	
Jl. Suprpto / Kabel	Pusat	350	14	0.30	
Jl. Yos Sudarso	Utara	600	14	1.70	
Jl. Simur Batu / Booster	Pusat	600	18	0.35	
Jl. Booster Rawasari	Pusat	250	19	0.20	Input
Jl. Suprpto	Pusat	600	20	1.55	
Jl. Suprpto	Pusat	350	20	0.95	
Jl. Sumur Batu	Pusat	600	20	0.60	
Jl. Sunter Java	Utara	600	20	1.00	
Jl. Sunter Java	Utara	350	20	0.35	
Jl. Danau Sunter	Utara	600	20	0.70	
Jl. Danau Sunter	Utara	350	20	0.40	
Jl. Suprpto	Pusat	600	21	1.55	

LOCATION	AREA	DIAMETER (mm)	DATE	PRESSURE (ATM)	REMARKS
Jl. Suprpto / Pos Polisi	Pusat	800	21	1.70	
Jl. Penjernihan I	Pusat	1,000	25	2.50	
Jl. Penjernihan I	Pusat	1,200	25	1.90	
Jl. G. Sahari / Samanhudi	Pusat	600	25	0.50	
Jl. Dipenogoro / Kimia	Pusat	500	26	1.75	
Instalasi Pulo Gadung	Timur	1,500	31	4.40	
Instalasi Pulo Gadung	Timur	800	31	4.40	
Jl. Jatinegara / Kaum	Timur	1,350	31	4.10	
Jl. Bekasi Raya	Timur	800	31	3.40	
Jl. Suprpto / Pos Polisi	Pusat	800	31	1.60	

Table-6 NUMBER OF FIRE HYDRANTS IN DKI JAKARTA

NO.	AREA	NUMBER OF HYDRANTS			CONDITION		
		TOTAL	LOST	AVAILABLE	GOOD	DISCONNECTED	BROKEN
1	Jakarta Pusat	88	10	78	72	3	3
2	Jakarta Utara	64	0	64	64	0	0
3	Jakarta Barat	89	9	80	71	0	9
4	Jakarta Selatan	76	7	69	64	1	4
5	Jakarta Timur	78	2	76	76	0	0
TOTAL		395	28	367	347	4	16

Source : Fire Section of DKI Jakarta

Table-7 SUMMARY OF MAIN PIPE BRIDGES PAM JAYA

No	Region	Location	Diameter (1-10) m	(11-20)m	(21-30)m	>30 m	Construction	Note
1	PUSAT	Jl. Penjerminan I (Barat)	1200	-	24	-	Reinforced concrete	Concrete/riverstone
2		Jl. KH Mansyur	1200	-	-	32	Reinforced concrete	Concrete/riverstone
3		Jl. Wahid Hasyim	1000	20	-	-	Steel 1-20 & plate 8,5mm-10cm	Concrete
4		Jl. Penjerminan I (Timur)	1000	-	21,5	-	Reinforced concrete	Concrete
5		Jl. Perintis Kemerdekaan/Polsek	1000	-	-	-	Reinforced concrete	Concrete
6		Jl. Inspeksi	900	-	30	-	Reinforced concrete	Concrete
7		Jl. KS Tubum/ Jembatan Tinggi	2X900	-	-	-	Reinforced concrete	Concrete/riverstone
8		Jl. Jatibaru	900	-	22	-	Reinforced concrete	Concrete
9		Jl. Kendal	800	13	-	-	Reinforced concrete	Concrete
10		Jl. Cideng Barat	800	-	-	-	Reinforced concrete	Concrete
11		Jl. Prapatan/ Selatan	800	-	27	-	Reinforced concrete	Concrete
12		Jl. Suprpto	800	-	-	-	Reinforced concrete	Concrete
13		Jl. Kyai Caringin	900	15	-	-	Steel 1-45	Concrete/riverstone
14		Jl. Ir. H Juanda	800	-	-	-	-	-
15		Jl. Latharhari	600	-	-	-	Reinforced concrete	Concrete/riverstone
16		Jl. Suryo Pranoto	600	13	-	-	Steel 1-45	Concrete/riverstone
17		Jl. Balikpapan	600	5,5	-	-	-	Concrete
18		Jl. Jatibaru	800	-	24	-	-	Concrete/riverstone
19		Jl. Let. Jend. Suprpto/Utara	600	-	13,5	-	Reinforced concrete	Concrete/riverstone
20		Jl. Sumur Batu/Timur	600	-	13,8	-	Reinforced concrete	Concrete/riverstone
21		Jl. Sumter Kemayoran/Timur	600	-	-	45	Reinforced concrete	Concrete/riverstone
22		Jl. Ir. H Juanda	600	-	14	-	Supporting const. of steel II-40	On the road found.
23		Jl. Kyai Caringin	600	15	-	-	-	-
24		Jl. Gajah Mada/Jl. Hayam Wuruk	600	-	11	-	Reinforced concrete	On the road found.
25		Jl. Diponegoro	500	-	-	37,8	Reinforced concrete	Concrete/riverstone
26		Jl. Paseban/Jl. Salemba Tengah	550	11,5	-	-	Reinforced concrete	Concrete/riverstone
27		Jl. Pramuka	500	10,7	-	-	Reinforced concrete	Concrete/riverstone
28		Jl. Prapatan/ Utara	450	-	30	-	Steel d meter 5mmx5cm & anchor 5/8"	On the road found.
29		Jl. Latharhari/Jl. Garut	400	-	-	-	-	-
30		Jl. Ir. H Juanda	450	-	14	-	Supporting const. from steel II-40	On the road found.
31		Jl. Slamet Riyadi	400	-	-	-	Reinforced concrete	Concrete/riverstone
32		Jl. Bendungan Hilir/Utara	400	-	11	-	Anchor steel 5/8 & 80"	On the road found.
33		Jl. Bendungan Hilir/Selatan	2X400	-	11	-	Reinforced concrete	On the road found.
34		Jl. Matraman	400	-	-	-	-	-
35		Jl. Let. Jend. Suprpto/Selatan	350	-	11	-	Welded joint	On the road found.
36		Jl. Sumur Batu/Barat	350	-	13,8	-	Steel 1-40	Concrete/riverstone
37		Jl. Sumter Kemayoran/Barat	350	-	-	36	-	Concrete/riverstone

No	Region	Location	Diameter (1-10) m	(11-20)m	(21-30)m	>30 m	Construction	Note
38		Jl. Parmasi	350	-	-	-	-	-
39		Jl. Jembatan Serpong, Samanhudi	300	-	-	-	-	-
40		Jl. Jatibaru	-	-	-	-	-	-
41		Jl. Pramuka	-	-	-	-	-	-
42	BARAT	Jl. S Parman Tomang	800	14	-	-	-	Concrete
43		Jl. S Parman (Tanjung Duren)	800	-	-	-	-	-
44		Jl. S Parman (Daan Mogot)	800	18	-	-	-	Concrete
45		Jl. Satria	800	-	-	-	-	-
46		Jl. Jembatan Besi	800	-	-	-	-	-
47		Jl. Kyal Tapa (Tri Sakti)	600	18	-	-	-	Concrete
48		Jl. S Parman (Tri Sakti)	600	18	-	-	Reinforced concrete	Concrete
49		Jl. Kyal Tapa Haji Ling	600	-	-	-	-	-
50		Jl. Pertiagaan (Ujung Jl. Angke)	600	20	-	-	Steel L.100.100.10 & L.50.50.5	Concrete/riverstone
51		Jl. Angke	600	-	-	-	-	-
52		Jl. Pejagalan	600	7.6	-	-	Reinforced concrete	Concrete/riverstone
53		Jl. Kopi	600	-	21	-	Reinforced concrete	Concrete/riverstone
54		Jl. Kopi (between Jl. Kali Besar Barat and Jl. Kali Besar Timur)	600	-	30	-	Reinforced concrete	Concrete/riverstone
55		Jl. Let. Jend. S Parman	550	6.5	-	-	-	On bridge found.
56		Jl. Kemurnian VII	400	-	-	-	-	-
57		Jl. Hayam Wuruk/Gajah Mada	400	-	-	-	-	-
58		Jl. Latumeten I (Kali Banjir Kanal Jembatan Besi)	350	-	-	55.5	Steel framework	Concrete/riverstone
59		Jl. Latumeten (Jl. Angke Jaya)	350	12.8	-	-	Steel framework L.50.50.5	On bridge found.
60		Jl. Latumeten	800	-	-	-	-	-
61		Jl. Jembatan Dua (Tubagus Angke)	350	-	-	-	Steel II-30	On road found.
62		Jl. Jembatan Tiga (between Jl. Bandengan Utara-Jl. Bandengan Selatan)	350	8	-	-	Steel I-30	On bridge found.
63		Jl. Dr. Makaliwe	350	12	-	-	Supporting steel L.100.100.10	Concrete/riverstone
64		Jl. Latumeten (Pintu Air)	350	10	-	-	Reinforced concrete	Concrete/riverstone
65	UTARA	Jl. Inspeksi (S. Bumbu) Timur	600	12	-	-	Reinforced concrete	Concrete/riverstone
66		Jl. Inspeksi (S. Bumbu) Timur/market	600	14	-	-	Reinforced concrete	Concrete/riverstone
67		Jl. Bugis	600	-	-	36	Steel I]	Concrete
68		Jl. Yos Sudarso/ Honda	600	-	-	36	-	Concrete
69		Jl. Ancol / Hai Lay	600	-	-	45	Reinforced concrete	Concrete/riverstone
70		Jl. Jampea	400	-	-	-	-	Concrete

No	Region	Location	Diameter	(1-10) m	(11-20)m	(21-30)m	>30 m	Construction	Note
71		Jl. Cilincing/ Kali Kresek	400	-	-	-	-	-	-
72		Jl. Muara Karang/ Selatan	400	-	-	-	32	-	Concrete
73		Jl. Kmp. Bاندان/ Kunir	400	-	-	27	-	-	Concrete/riverstone
74		Jl. Kmp. Bاندان/Jl. Loda Raya	400	-	-	-	45	Reinforced concrete	Concrete
75		Jl. Loda / Ancol Barat	400	-	-	-	-	-	-
76		Jl. Yos Sudarso/Jembatan Bunting	400	-	-	-	-	-	-
77		Jl. Enim	400	-	-	-	32	Steel 1-22	Concrete/riverstone
78		Jl. Perintis Kemerdekaan/Kip Gading	400	-	-	28	-	Steel framework	Concrete/riverstone
79		Jl. Inspeksi (S.Bambu) Barat	350	-	15	-	-	Steel 1-30 & 1-8	Concrete
80		Jl. Inspeksi (S.Bambu) Barat/market	350	-	12.55	-	-	-	Concrete
81		Jl. Tenggiri	350	-	-	22	-	Steel L.80.80.8 & 50.50.5	Concrete/riverstone
82		Jl. Muara Karang/Utara	300	-	-	-	-	Steel profile I	Concrete
83		Jl. Muara Baru/Timur	300	-	-	22	-	-	Concrete
84		Jl. Muara Baru/Barat	300	-	-	22	-	-	Concrete
85		Jl. Tipar/Kali...	250	-	-	22	-	-	Concrete
86		Jl. Plumpang	250	-	-	28	-	-	Concrete
87		Jl. Bulog	250	-	-	28	-	-	Concrete
88		Jl. Antara Blok A/B	250	-	-	-	-	-	-
89		Jl. Martadinata	250	-	-	30	-	Steel I	Concrete
90		Pasar Ikan	250	-	-	-	-	Steel I	Concrete
91		Muara Angke	250	-	18	-	-	Steel I	Concrete
92		Kelapa Gading Pratama	250	-	12	-	-	Steel I	Concrete
93		Jl. Muara Baru	250	-	12	-	-	Siphon	Concrete
94		Jl. Pegangsaan II	250	-	20	-	-	Steel I	Concrete
95		Kali Mat	250	-	-	-	-	Steel I	Concrete
96	TIMUR	Jl. Bekasi Barat Raya	1000	-	-	-	-	-	-
97		Jl. Bekasi Timur Raya/Pom Bensin	1000	-	18	-	-	Reinforced concrete	Concrete
98		Jl. Bekasi Timur/ Kawasan P.Gadung	1000	-	20	-	-	-	Concrete
99		Jl. Jatnegara Kaum	800	-	-	22	-	-	Concrete
100		Jl. Bekasi Barat Raya	800	-	18	-	-	-	Concrete
101		Jl. Cakung Cilincing	800	-	18	-	-	-	Syphon
102		Jl. Cakung Cilincing/Banjir Kanal	800	-	14	-	-	-	Concrete
103		Jl. Pemuda	600	6.1	-	-	-	Steel profile WF.40. 1.20	Syphon
104		Jl. Jakarta Bogor Kramat Jati	2x600	-	-	-	-	-	Concrete
105		Jl. Kampung Melayu	600	-	-	-	-	-	-
106		Jl. Raya Bogor (Kp.Gedung/Condet)	350	-	-	30	-	Reinforced concrete	Concrete
107		Jl. Pemuda	500	-	-	24.5	-	Reinforced concrete	Concrete/riverstone

No	Region	Location	Diameter	(1-10) m	(11-20)m	(21-30)m	>30 m	Construction	Note
108	SELATAN	Jl. Gatot Subroto	1000	-	-	-	-	-	-
109		Jl. Sultan Agung	600	-	-	30.6	-	Steel constr. L.80.80.8	Concrete/riverstone
110		Jl. H.R Rasuna Said	600	2.8	-	-	-	-	Concrete/riverstone
111		Kompleks Miniplant Cilandak	400	9.2	-	-	-	Steel I-30	Concrete/riverstone
112		Jl. Pela	300	4.6	-	-	-	-	On road found.
113		Jl. Simprug	300	9	-	-	-	Anchor steel 5/6"	On road found.

Table-8 LIST OF MAIN PIPE LINE LENGTH OF PAM JAYA

NO.	DIAMETER (mm)	YEAR / LENGTH OF PIPE (m)								TOTAL
		1920-1968	1969-1978	1979-1984	1985-1987	1988-1990	1991-1992	1993-1995		
1	300	6,174	11,679	-	-	17	130	17,750	35,750	
2	350	15,156	16,741	-	-	-	-	-	31,897	
3	400	11,764	28,022	-	1,750	453	350	1,352	43,691	
4	450	13,275	-	-	-	-	-	-	13,275	
5	475	8,755	-	-	-	-	-	-	8,755	
6	500	14,988	9,519	-	-	-	-	48	24,555	
7	550	32,092	-	-	-	-	-	-	32,092	
8	600	45,166	18,038	4,200	2,400	32,366	120	1,234	103,524	
9	800	2,350	5,913	3,240	13,790	2,841	70	-	28,204	
10	900	9,500	1,600	-	-	-	2,980	1,440	15,520	
11	1,000	-	5,000	-	9,800	-	5,060	-	19,860	
12	1,100	-	-	-	-	-	3,400	-	3,400	
13	1,200	-	-	-	-	-	3,030	-	3,030	
14	1,250	-	500	-	-	-	-	-	500	
15	1,350	-	-	-	-	-	-	-	-	
16	1,500	-	-	-	-	-	-	2,754	2,754	
17	1,650	-	-	-	2,000	-	-	11,767	13,767	
18	1,800	-	-	-	500	-	-	3,900	4,400	

Note : Not included pipe length of TJSIP Zone 3,4,5 & 6

Table-9 LIST OF SECONDARY AND TERTIARY PIPELINE LENGTH

NO.	DIAMETER	TYPE OF PIPE / LENGTH (m)						
		STEEL	CIP/DCIP	ACP	PVC	GIP	PB	PE
1	50	-	-	-	160,514	78	-	-
2	80	-	175	-	212,133	102	-	-
3	100	-	322	-	181,880	168	-	-
4	150	-	19,675	-	64,798	-	-	-
5	200	-	12,408	-	25,818	-	-	-
6	250	18	4,399	-	10,760	-	-	-

Note : Not included pipe length of PJSIP Zone 3, 4, 5 & 6

7. RESULTS OF QUESTIONNAIRE SURVEY

Kabupaten	Kecamatan	Kelurahan	Nos	
[71] JAKARTA SELATAN				
	[011] PESANGGRAHAN	[001] BINTARO	19	
		[002] PESANGGRAHAN	19	
		[003] ULUJAMI	39	
		[004] PETUKANGAN SELATAN	18	
		[005] PETUKANGAN UTARA	1	
	[020] CILANDAK	[001] LEBAK BULUS	55	
		[002] PONDOK LABU	53	
	[031] JAGAKARSA	[001] CIGANJUR	25	
		[002] SRENGSENG SAWAH	25	
		[003] JAGAKARSA	25	
		[004] LENTENG AGUNG	25	
	JAKARTA SELATAN-Total			304
	[72] JAKARTA TIMUR			
	[010] PASAR REBO	[001] PEKAYON	14	
		[003] BARU	14	
	[011] CIRACAS	[001] CIBUBUR	33	
		[012] CIPAYUNG	[001] PONDOK RANGGON	4
	[003] MUNJUL		4	
	[004] CIPAYUNG		4	
	[005] SETU		4	
	[007] CEGER		4	
	[021] MAKASAR	[008] LUBANG BUAYA	4	
		[001] PINANG RANTI	9	
		[002] MAKASAR	9	
		[004] HALIM PERDANA KUSUMA	9	
		[005] CIPINANG MELAYU	9	
	[030] JATINEGARA	[002] CIPINANG CEMPEDAK	34	
		[003] CIPINANG BESAR SELATAN	34	
	[031] DUREN SAWIT	[001] PONDOK BAMBU	16	
		[002] DUREN SAWIT	16	
[003] PONDOK KELAPA		16		
[004] PONDOK KOPI		16		
[060] CAKUNG		[003] PULO GEBANG	17	
	[004] UJUNG MENTENG	17		
	[005] CAKUNG TIMUR	17		
JAKARTA TIMUR-Total			304	
[74] JAKARTA BARAT				
	[011] KEMBANGAN	[001] JOGLO	12	
		[002] SRENGSENG	13	
		[003] MERUYA UDIK	13	
		[004] MERUYA ILIR	12	
		[005] KEMBANGAN SELATAN	12	
	[020] CENGKARENG	[001] DURI KOSAMBI	55	
		[006] CENGKARENG BARAT	55	
	[021] KALI DERES	[001] SEMANAN	14	
		[002] KALI DERES	14	
		[003] PEGADUNGAN	13	
		[004] TEGAL ALUR	13	
		[005] KAMAL	14	
	JAKARTA BARAT-Total			240
	[75] JAKARTA UTARA			
		[010] PENJARINGAN	[001] KAMAL MUARA	6
[002] KAPUK MUARA			6	
[003] PEJAGALAN			6	
[004] PLUIT			11	
[005] PENJARINGAN			6	
[011] PADEMANGAN		[001] PADEMANGAN TIMUR	8	
		[002] PADEMANGAN BARAT	9	
		[003] ANCOL	8	
[020] TANJUNG PRIOK		[001] SUNTER AGUNG	20	
		[003] KEBON BAWANG	10	
		[005] WARAKAS	10	
		[007] TANJUNG PRIUK	10	
		[002] RAWA BADAK	8	
[030] KOJA		[003] TUGU UTARA	8	
		[004] LAGOA	8	
		[005] KOJA SELATAN	8	
		[040] CILINCING	[002] ROROTAN	7
	[003] MARUNDA		7	
[004] CILINCING	7			
[005] SEMPER TIMUR	7			
[007] KALI BARU	7			
JAKARTA UTARA-Total			177	
D.K I JAKARTA-Total			1025	

No	Item	Field	Contents
BASIC INFORMATION			
	Survey Date	-	
	Caban Code	-	
	Rayon Code	-	
	Kodja Code	2	
	Kecamatan Code	3	
	Leturahan Code	4	
	RW Number	-	
	RT Number	-	
	Address	-	
	Person in Charge	-	
CONDITION of BUILDING			
	Area of Land	5	-1/No answer, >=0/m ³
	Area of Building	6	-1/No answer, >=0/m ³
	Type of Building	7	-1/No answer, 1/Permanent, 2/Semi permanent, 3/Temporary
	Type of Possession	8	-1/No answer, 1/Own, 2/Rental
	The Purchase Price/Rental Fee	9	-1/No answer, >0 (Own: 1000000Rp, Rental: 1000Rp/month)
	Type of Street	10	-1/No answer, 1/Path, 2/1-car, 3/2-car, 4/Street
DOMESTIC			
	Type of Housing	11	-1/No answer, 1/Luxurious, 2/Middle-class, 3/Simple, 4/Very simple
	Salary per Month	12	-1/No answer, >0/1000Rp/month
	Number of Family	13	-1/No answer, >0/Orang
	Monthly Expenditure	14	-1/No answer, >0/1000Rp/month
	Food & Cloths	-	
	Housing Maintenance	-	
	Telephone	-	
	Electricity	-	
	Water	15	-1/No answer, >0/1000Rp/month
	etc.	-	
PRESENT WATER SOURCES			
	Source		
	PAM	16	-1/No answer, 0/No, 1/Yes
	Well + Pump	17	-1/No answer, 0/No, 1/Yes
	Well	18	-1/No answer, 0/No, 1/Yes
	Vendor	19	-1/No answer, 0/No, 1/Yes
	Volume	20	-1/No answer, >0/Nos
	Unit Price	21	-1/No answer, >0/Price/unit
	Neighbor / Public	22	-1/No answer, 0/No, 1/Yes
	Others	23	-1/No answer, 0/No, 1/Yes
	Water Consumption per Day	24	-1/No answer, >0/l/day
	Cost of Water per Month	25	-1/No answer, >0/1000Rp/month
CONDITION of MAIN WATER SOURCE			
	Source	26	1/PAM, 2/Well+Pump, 3/Well(including with Hand pump), 4/Vendor, 5/W.Treatment
	Quality	27	-1/No answer, 1/Good, 2/Usual, 3/Bad
	Quantity	28	-1/No answer, 1/Good, 2/Usual, 3/Bad
	Cost	29	-1/No answer, 1/Cheep, 2/Usual, 3/Expensive
	Cut off	30	-1/No answer, 1/No, 2/Sometimes, 3/Often
	Others	No ans	
	Duration of Water Use	-	
	Major Using Time	-	
CONDITION of SUB WATER SOURCE			
	Source	31	0/Non, 1/PAM, 2/Well+Pump, 3/Well(*), 4/Vendor, 5/W.Treatment, 6/AQUA
	Quality	32	-1/No answer, 1/Good, 2/Usual, 3/Bad
	Quantity	33	-1/No answer, 1/Good, 2/Usual, 3/Bad
	Cost	34	-1/No answer, 1/Cheep, 2/Usual, 3/Expensive
	Cut off	35	-1/No answer, 1/No, 2/Sometimes, 3/Often
	Others	No ans	
	Duration of Water Use	-	
	Major Using Time	-	
	Reason of Using Other Source	36	-1/No answer, 1/Quantity, 2/Quality, 3/Cost, 4/Good well, 5/Emergency
KNOWLEDGE of PAM			
	Supply	37	-1/No answer, 0/No, 1/Yes
	Registration	38	-1/No answer, 0/No, 2/Yes
	Loan Payment	39	-1/No answer, 0/No, 3/Yes
	Willingness as PAM Customer	40	-1/No answer, 0/No, 4/Yes
	Connection Fee	41	-1/No answer, >=0/1000Rp
	Monthly Payment	42	-1/No answer, >=0/1000Rp
	Terms of Install	43	-1/No answer, 1/Cost, 2/Quality, 3/Quantity, 4/Service
OTHERS			
	Comment	-	

*Including well with Hand pump

Value Nmb	Item	Field	Contents
DOMESTIC			
0	0	Type of Housing	11 -1/No answer, 1/Luxurious, 2/Middle-class, 3/Simple, 4/Very simple
1		Salary per Month	12 -1/No answer, >0/1000Rp/month
2		Number of Family	13 -1/No answer, >0/Orang
3		Monthly Expenditure	14 -1/No answer, >0/1000Rp/month
4		Water	15 -1/No answer, >0/1000Rp/month
PRESENT WATER SOURCES			
5		Water Consumption per Day	24 -1/No anser, >0/l/day
6		Cost of Water per Month	25 -1/No answer, >0/1000Rp/month
CONDITION of MAIN WATER SOURCE			
1		Source	26 1/PAM, 2/Well+Pump, 3/Well(including with Hand pump), 4/Vendor, 5/W.Treatment
2		Quality	27 -1/No anser, 1/Good, 2/Usual, 3/Bad
3		Quantity	28 -1/No anser, 1/Good, 2/Usual, 3/Bad
4		Cost	29 -1/No anser, 1/Cheep, 2/Usual, 3/Expensive
		Cut off	30 -1/No anser, 1/No, 2/Sometimes, 3/Often
CONDITION of SUB WATER SOURCE			
5		Source	31 0/Non, 1/PAM, 2/Well+Punip, 3/Well(*), 4/Vendor, 5/W.Treatment, 6/AQUA
6		Quality	32 -1/No anser, 1/Good, 2/Usual, 3/Bad
7		Quantity	33 -1/No anser, 1/Good, 2/Usual, 3/Bad
8		Cost	34 -1/No anser, 1/Cheep, 2/Usual, 3/Expensive
KNOWLEDGE of PAM			
9		Supply	37 -1/No anser, 0/No, 1/Yes
10		Registration	38 -1/No anser, 0/No, 2/Yes
11		Loan Payment	39 -1/No anser, 0/No, 3/Yes
12		Willingness as PAM Customer	40 -1/No anser, 0/No, 4/Yes
7		Connection Fee	41 -1/No anser, >=0/1000Rp
8		Monthly Payment	42 -1/No anser, >=0/1000Rp
13		Terms of Install	43 -1/No anser, 1/Cost, 2/Quality, 3/Quantity, 4/Service

*)including well with Hand pump

Main Source : Source

Category	PAM	Well+Pump	Well	Vendor	Others	No answer	Total
Luxurious	23	84	0	0	6	0	113
	20%	74%	0%	0%	5%	0%	
Middle	59	269	7	15	0	0	350
	17%	77%	2%	4%	0%	0%	
Simple	80	364	52	20	0	0	516
	16%	71%	10%	4%	0%	0%	
Very simple	0	14	17	1	0	0	32
	0%	44%	53%	3%	0%	0%	
Total	162	731	76	36	6	0	1,011
	16%	72%	8%	4%	1%	0%	

Main Source : Quality

Category	Good	Usual	Bad	No answer	Total
Luxurious	87	15	11	0	113
	77%	13%	10%	0%	
Middle	239	78	33	0	350
	68%	22%	9%	0%	
Simple	380	105	31	0	516
	74%	20%	6%	0%	
Very simple	19	12	1	0	32
	59%	38%	3%	0%	
Total	725	210	76	0	1,011
	72%	21%	8%	0%	

Main Source : Quantity

Category	Good	Usual	Bad	No answer	Total
Luxurious	94	18	1	0	113
	83%	16%	1%	0%	
Middle	237	93	20	0	350
	68%	27%	6%	0%	
Simple	305	185	25	1	516
	59%	36%	5%	0%	
Very simple	19	13	0	0	32
	59%	41%	0%	0%	
Total	655	309	46	1	1,011
	65%	31%	5%	0%	

Main Source : Cost

Category	Cheep	Usual	Expensive	No answer	Total
Luxurious	21	18	4	70	113
	19%	16%	4%	62%	
Middle	37	34	20	259	350
	11%	10%	6%	74%	
Simple	48	67	35	366	516
	9%	13%	7%	71%	
Very simple	2	0	2	28	32
	6%	0%	6%	88%	
Total	108	119	61	723	1,011
	11%	12%	6%	72%	

Sub Source : Source

Category	PAM	Well+Pump	Well	Vendor	Others	No answer	Total
Luxurious	6	6	0	1	63	37	113
	5%	5%	0%	1%	56%	33%	
Middle	26	10	3	60	38	213	350
	7%	3%	1%	17%	11%	61%	
Simple	5	16	14	95	7	379	516
	1%	3%	3%	18%	1%	73%	
Very simple	0	0	0	8	1	23	32
	0%	0%	0%	25%	3%	72%	
Total	37	32	17	164	109	652	1,011
	4%	3%	2%	16%	11%	64%	

Sub Source : Quality

Category	Good	Usual	Bad	No answer	Total
Luxurious	69	5	2	37	113
	61%	4%	2%	33%	
Middle	101	21	7	221	350
	29%	6%	2%	63%	
Simple	104	12	20	380	516
	20%	2%	4%	74%	
Very simple	9	0	0	23	32
	28%	0%	0%	72%	
Total	283	38	29	661	1,011
	28%	4%	3%	65%	

Sub Source : Quantity

Category	Good	Usual	Bad	No answer	Total
Luxurious	52	23	0	38	113
	46%	20%	0%	34%	
Middle	82	42	2	224	350
	23%	12%	1%	64%	
Simple	69	62	2	383	516
	13%	12%	0%	74%	
Very simple	7	2	0	23	32
	22%	6%	0%	72%	
Total	210	129	4	668	1,011
	21%	13%	0%	66%	

Sub Source : Cost

Category	Cheep	Usual	Expensive	No answer	Total
Luxurious	21	46	6	40	113
	19%	41%	5%	35%	
Middle	19	57	40	234	350
	5%	16%	11%	67%	
Simple	19	41	53	403	516
	4%	8%	10%	78%	
Very simple	1	3	5	23	32
	3%	9%	16%	72%	
Total	60	147	104	700	1,011
	6%	15%	10%	69%	

PAM : Supply

Category	No	Yes	No answer	Total
Luxurious	11	67	35	113
	10%	59%	31%	
Middle	21	246	83	350
	6%	70%	24%	
Simple	74	357	85	516
	14%	69%	16%	
Very simple	10	22	0	32
	31%	69%	0%	
Total	116	692	203	1,011
	11%	68%	20%	

PAM : Registration

Category	No	Yes	No answer	Total
Luxurious	76	2	35	113
	67%	2%	31%	
Middle	231	36	83	350
	66%	10%	24%	
Simple	387	43	86	516
	75%	8%	17%	
Very simple	32	0	0	32
	100%	0%	0%	
Total	726	81	204	1,011
	72%	8%	20%	

PAM : Loan payment

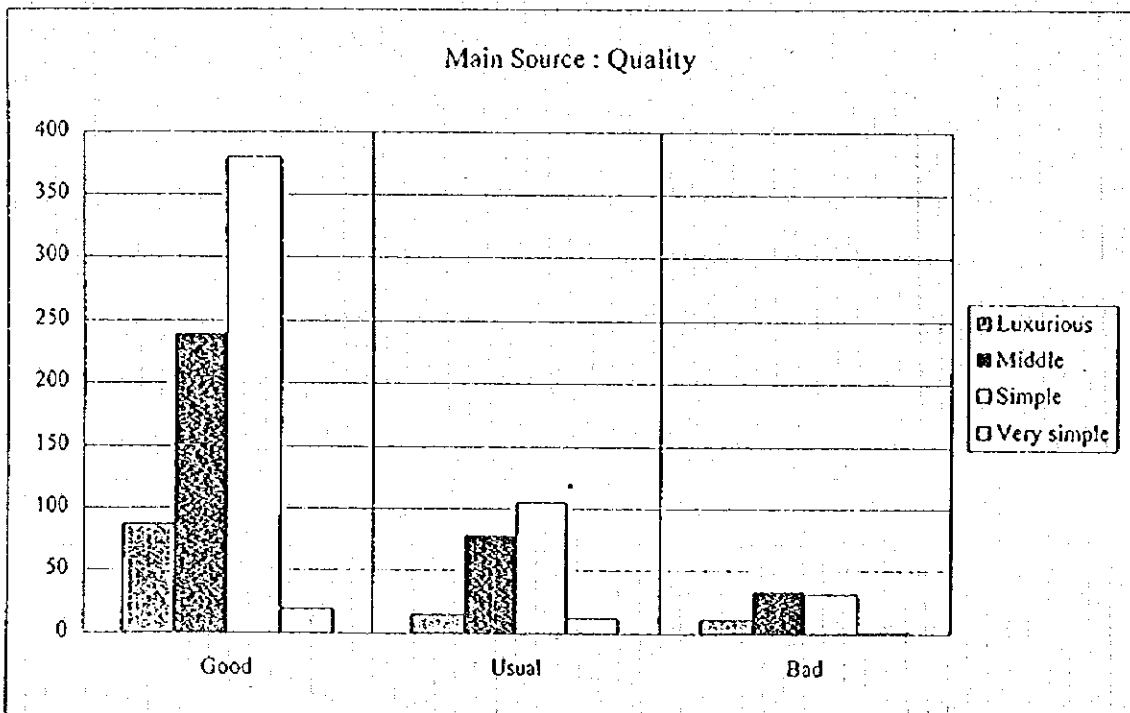
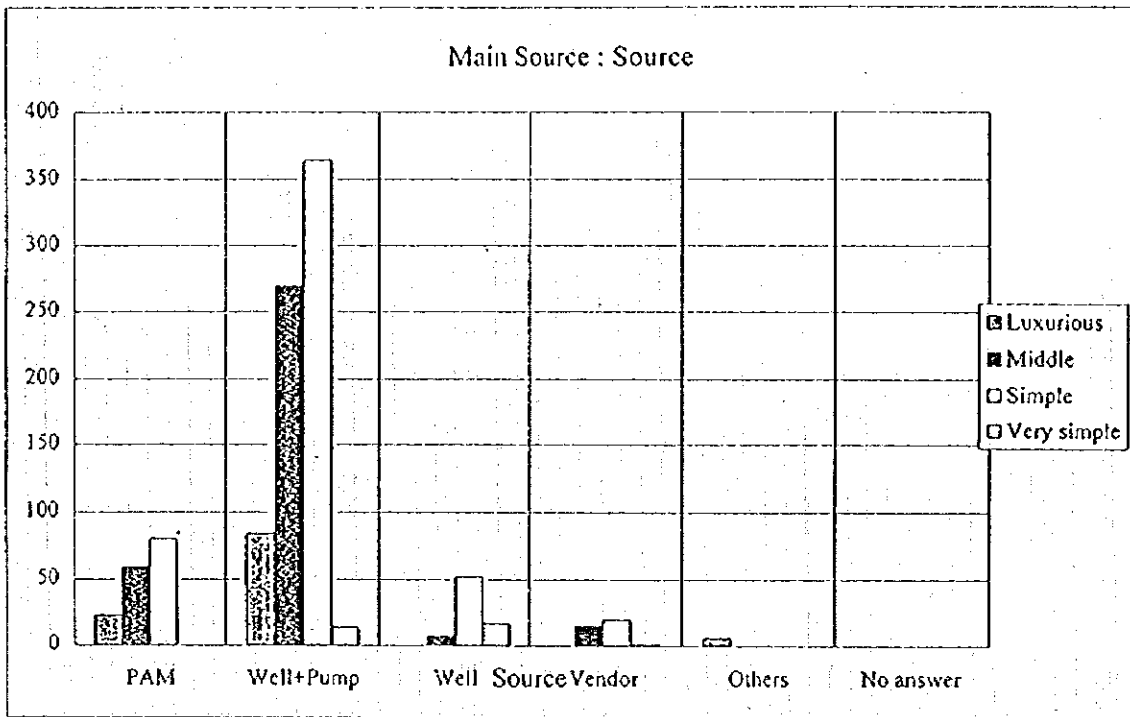
Category	No	Yes	No answer	Total
Luxurious	66	11	36	113
	58%	10%	32%	
Middle	151	109	90	350
	43%	31%	26%	
Simple	278	131	107	516
	54%	25%	21%	
Very simple	28	4	0	32
	88%	13%	0%	
Total	523	255	233	1,011
	52%	25%	23%	

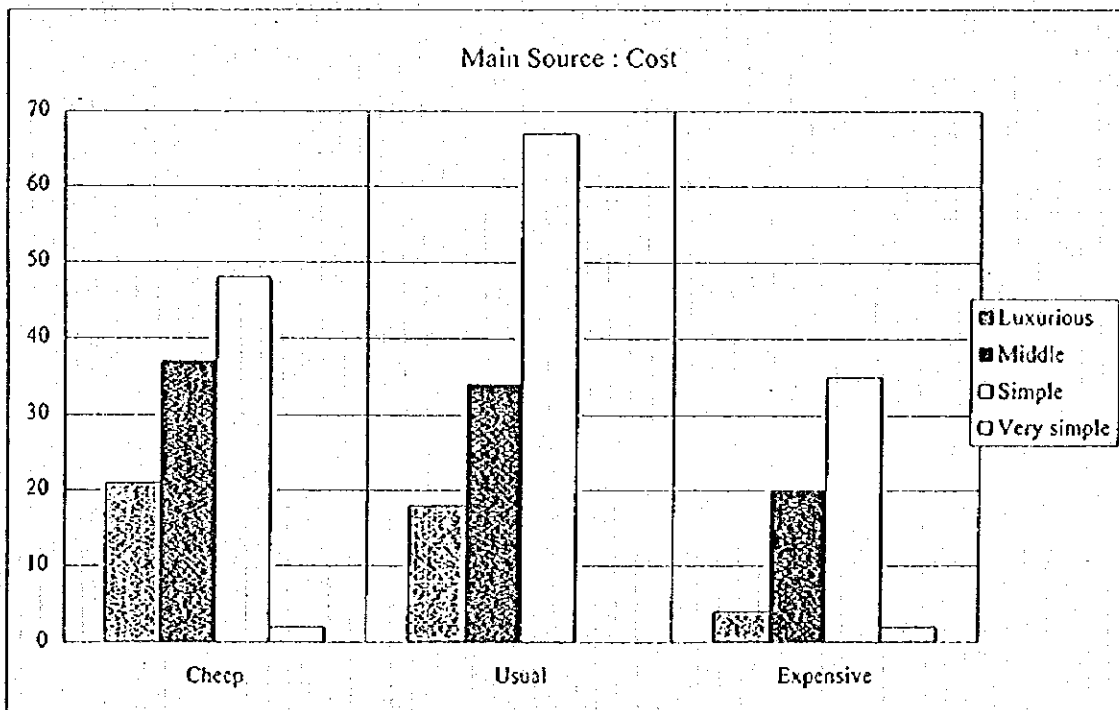
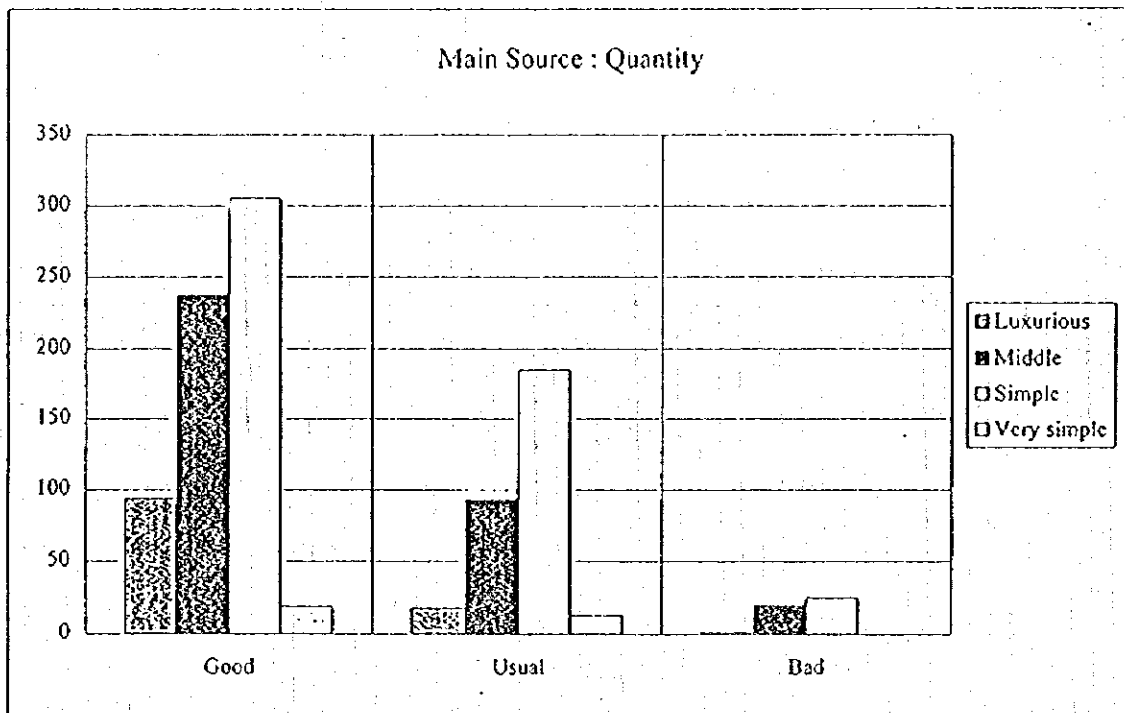
PAM : Willingness as PAM Customer

Category	No	Yes	No answer	Total
Luxurious	48	29	36	113
	42%	26%	32%	
Middle	116	145	89	350
	33%	41%	25%	
Simple	242	186	88	516
	47%	36%	17%	
Very simple	24	8	0	32
	75%	25%	0%	
Total	430	368	213	1,011
	43%	36%	21%	

PAM : Terms of Install

Category	Cost	Quality	Quantity	Service	No answer	Total
Luxurious	11	18	7	0	77	113
	10%	16%	6%	0%	68%	
Middle	28	72	6	1	243	350
	8%	21%	2%	0%	69%	
Simple	19	90	4	1	402	516
	4%	17%	1%	0%	78%	
Very simple	3	2	0	0	27	32
	9%	6%	0%	0%	84%	
Total	61	182	17	2	749	1,011
	6%	18%	2%	0%	74%	





<i>Domestic : Salary</i>		1,000Rp/Month		
Category	Numbers	Min	Max	Average
Luxurious	27	400	7,500	2,152
Middle	195	0	2,000	762
Simple	288	0	1,000	431
Very simple	16	125	450	231
Total	526	0	7,500	636

<i>Domestic : Number of Family</i>				
Category	Numbers	Min	Max	Average
Luxurious	112	3	17	6.4
Middle	349	2	14	5.6
Simple	513	2	14	5.4
Very simple	32	2	10	4.4
Total	1006	2	17	5.5

<i>Domestic : Expenditure</i>		1,000Rp/Month			
Category	Numbers	Min	Max	Average	/Salary
Luxurious	57	155	5,310	1,368	63.6%
Middle	297	31	1,758	620	81.3%
Simple	470	39	1,260	348	80.6%
Very simple	29	80	543	205	88.7%
Total	853	31	5,310	506	79.5%

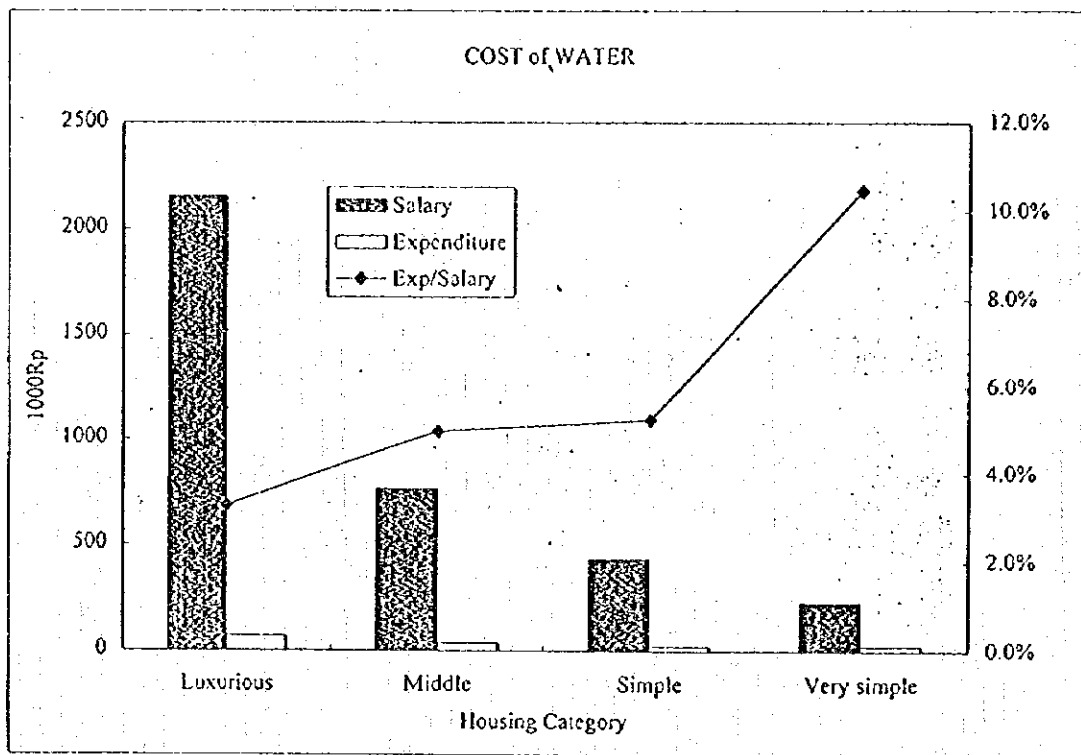
<i>Domestic : Expenditure(Water)</i>		1,000Rp/Month				
Category	Numbers	Min	Max	Average	/Total	/Salary
Luxurious	75	6	359	71	5.2%	3.3%
Middle	178	2	174	38	6.1%	5.0%
Simple	201	2	180	23	6.5%	5.2%
Very simple	11	8	50	24	11.8%	10.5%
Total	465	2	359	36	7.2%	5.7%

<i>Water Source : Consumption</i>					l/Day	LCD
Category	Numbers	Min	Max	Average	/Capita	
Luxurious	104	250	5,000	1,105	173	
Middle	320	150	8,000	736	131	
Simple	476	100	2,500	579	107	
Very simple	25	150	1,500	434	99	
Total	925	100	8,000	688	124	

<i>Water Source : Cost</i>		1,000Rp/Month			Rp/l
Category	Numbers	Min	Max	Average	/Consump.
Luxurious	67	6	296	72	65
Middle	160	2	160	37	50
Simple	193	4	80	24	42
Very simple	10	8	90	26	61
Total	430	2	296	36	53

<i>PAM : Connection Fee</i>				1,000Rp
Category	Numbers	Min	Max	Average
Luxurious	0	***	***	***
Middle	42	0	300	141
Simple	24	50	250	121
Very simple	0	***	***	***
Total	66	0	300	134

<i>PAM : Monthly Payment</i>				1,000Rp/Month
Category	Numbers	Min	Max	Average
Luxurious	0	***	***	***
Middle	28	10	100	21
Simple	23	6	50	16
Very simple	0	***	***	***
Total	51	6	100	19



PAM_USER ONLY

Main Source : Source

Category	PAM	Well+Pump	Well	Vendor	Others	No answer	Total
Luxurious	23	6	0	0	0	0	29
	79%	21%	0%	0%	0%	0%	
Middle	59	20	0	7	0	0	86
	69%	23%	0%	8%	0%	0%	
Simple	79	2	1	1	0	0	83
	95%	2%	1%	1%	0%	0%	
Very simple	0	0	0	0	0	0	0
	***	***	***	***	***	***	
Total	161	28	1	8	0	0	198
	81%	14%	1%	4%	0%	0%	

PAM_MAIN_USER ONLY

Main Source : Quality

Category	Good	Usual	Bad	No answer	Total
Luxurious	10	8	5	0	23
	43%	35%	22%	0%	
Middle	30	24	5	0	59
	51%	41%	8%	0%	
Simple	47	20	12	0	79
	59%	25%	15%	0%	
Very simple	0	0	0	0	0
	***	***	***	***	
Total	87	52	22	0	161
	54%	32%	14%	0%	

Main Source : Quantity

Category	Good	Usual	Bad	No answer	Total
Luxurious	15	7	1	0	23
	65%	30%	4%	0%	
Middle	21	26	12	0	59
	36%	44%	20%	0%	
Simple	29	37	13	0	79
	37%	47%	16%	0%	
Very simple	0	0	0	0	0
	***	***	***	***	
Total	65	70	26	0	161
	40%	43%	16%	0%	

Main Source : Cost

Category	Cheep	Usual	Expensive	No answer	Total
Luxurious	8	12	3	0	23
	35%	52%	13%	0%	
Middle	22	26	8	3	59
	37%	44%	14%	5%	
Simple	16	39	24	0	79
	20%	49%	30%	0%	
Very simple	0	0	0	0	0
	***	***	***	***	
Total	46	77	35	3	161
	29%	48%	22%	2%	

Sub Source : Source

Category	PAM	Well+Pump	Well	Vendor	Others	No answer	Total
Luxurious	0	6	0	0	12	5	23
	0%	26%	0%	0%	52%	22%	
Middle	0	8	3	1	6	41	59
	0%	14%	5%	2%	10%	69%	
Simple	0	8	12	4	1	54	79
	0%	10%	15%	5%	1%	68%	
Very simple	0	0	0	0	0	0	0
	***	***	***	***	***	***	
Total	0	22	15	5	19	100	161
	0%	14%	9%	3%	12%	62%	

Sub Source : Quality

Category	Good	Usual	Bad	No answer	Total
Luxurious	18	0	0	5	23
	78%	0%	0%	22%	
Middle	13	2	3	41	59
	22%	3%	5%	69%	
Simple	10	3	12	54	79
	13%	4%	15%	68%	
Very simple	0	0	0	0	0
	***	***	***	***	
Total	41	5	15	100	161
	25%	3%	9%	62%	

Sub Source : Quantity

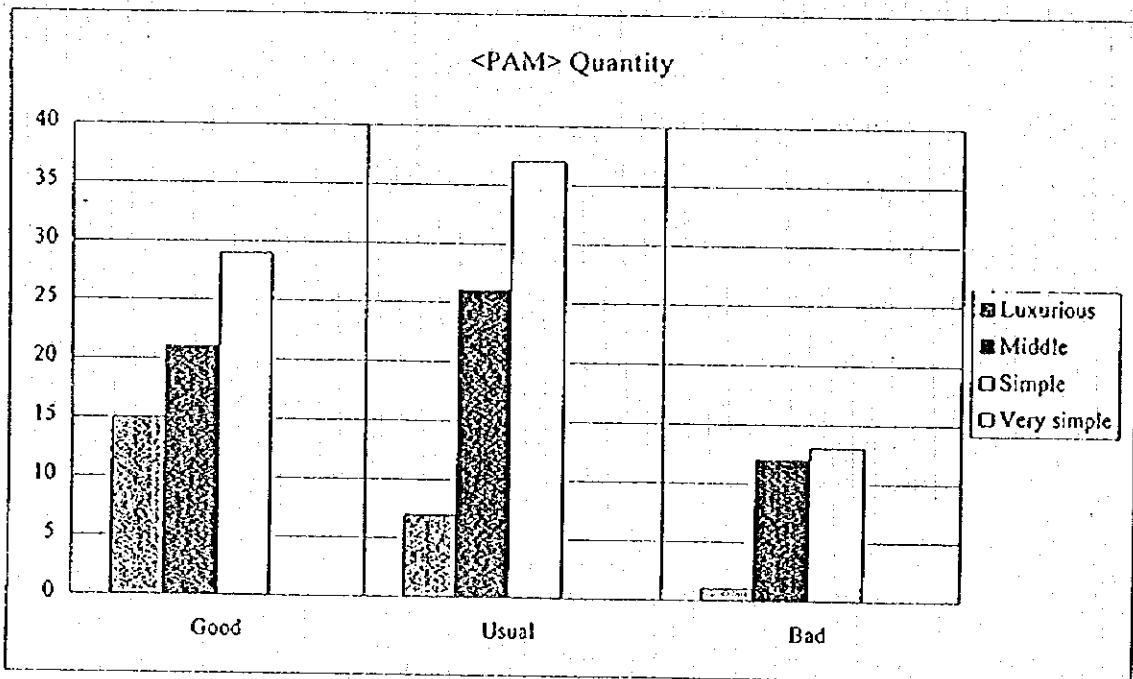
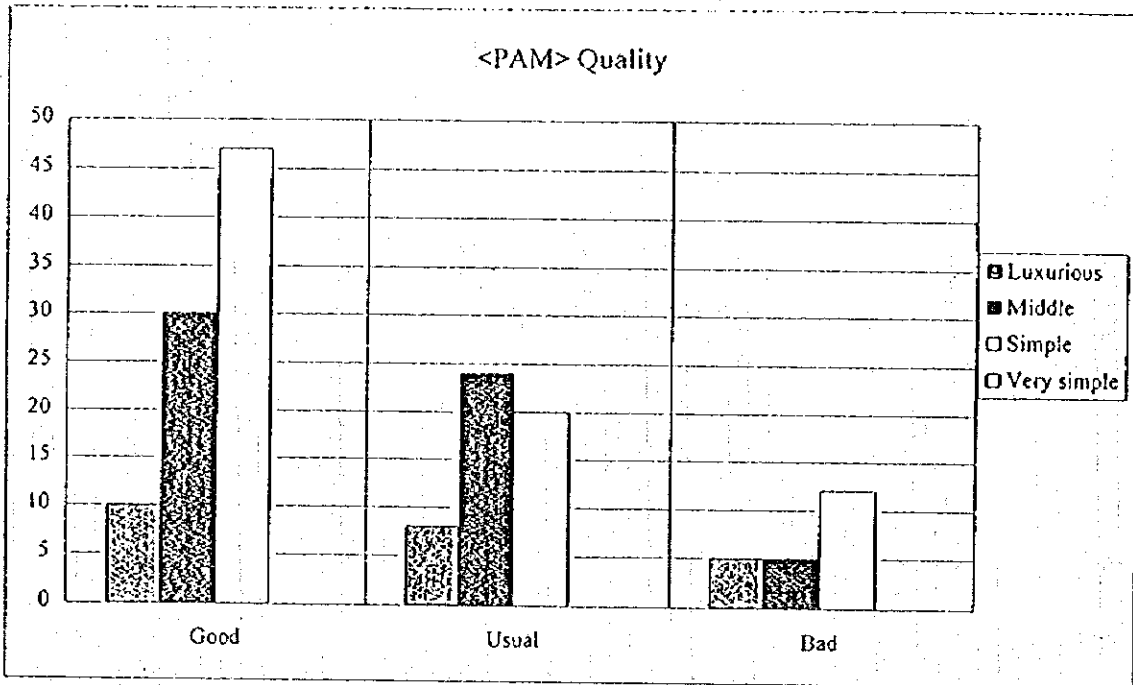
Category	Good	Usual	Bad	No answer	Total
Luxurious	13	5	0	5	23
	57%	22%	0%	22%	
Middle	12	6	0	41	59
	20%	10%	0%	69%	
Simple	5	20	0	54	79
	6%	25%	0%	68%	
Very simple	0	0	0	0	0
	***	***	***	***	
Total	30	31	0	100	161
	19%	19%	0%	62%	

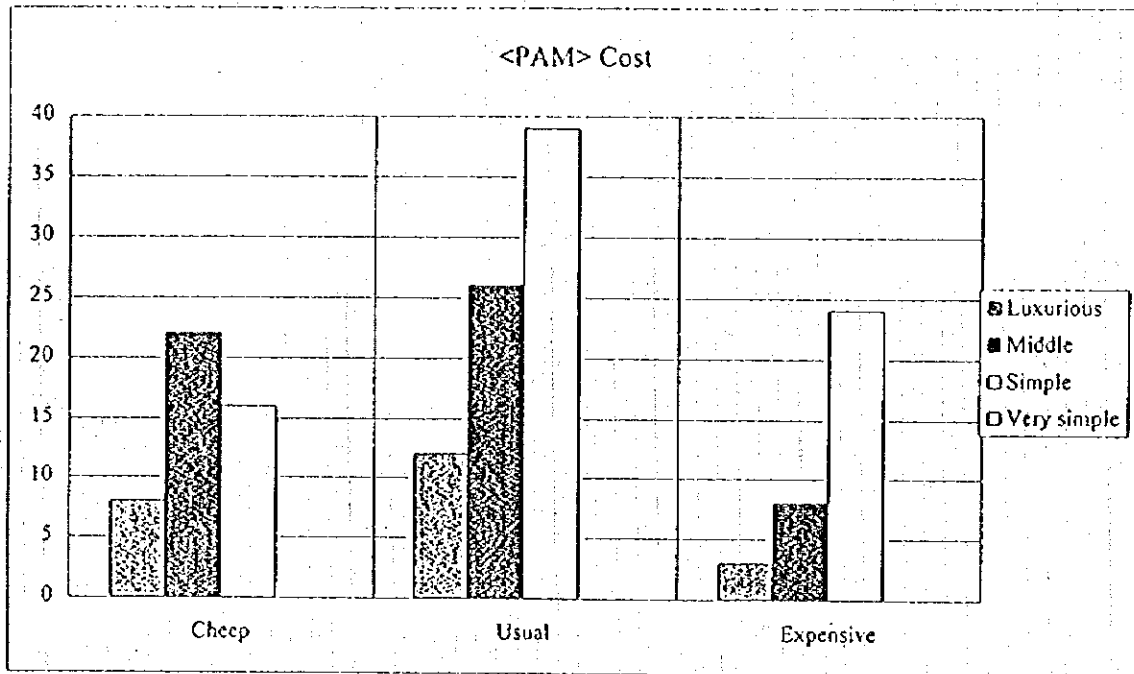
Sub Source : Cost

Category	Cheep	Usual	Expensive	No answer	Total
Luxurious	3	13	1	6	23
	13%	57%	4%	26%	
Middle	4	6	2	47	59
	7%	10%	3%	80%	
Simple	2	7	4	66	79
	3%	9%	5%	84%	
Very simple	0	0	0	0	0
	***	***	***	***	
Total	9	26	7	119	161
	6%	16%	4%	74%	

PAM : Terms of Install

Category	Cost	Quality	Quantity	Service	No answer	Total
Luxurious	5 22%	8 35%	6 26%	0 0%	4 17%	23
Middle	14 24%	29 49%	5 8%	0 0%	11 19%	59
Simple	10 13%	54 68%	2 3%	0 0%	13 16%	79
Very simple	0 ***	0 ***	0 ***	0 ***	0 ***	0
Total	29 18%	91 57%	13 8%	0 0%	28 17%	161





**8. RESULTS OF DATA PROCESSING FOR PAST
QUESTIONNAIRE SURVEY**

Item	Field	Format	Contents	Nos	Value	Contents
GENERAL						
Zone Number	1	Number				
Primary Cell Number	2	Number				
Kelurahan Code	3	String				
CONDITION OF BUILDING						
Area of Land	4	Number				
Type of Building	5	String	A/Permanent, B/Semi permanent, C/Temporary			
DOMESTIC						
Salary per Month	6	Number				1 Nos, Min, Max, Average (*1000Rp)
Number of Family	7	Number				2 Nos, Min, Max, Average
NON DOMESTIC						
Category	8	String	A/Industry, B/Commercial/Bussiness, C/Institute, D/Others	(1,4)		Nos of each category
Number of Employee	9	Number				3 Nos, Min, Max, Average
PRESENT WATER SOURCES						
Source						
Well+Pump	10	String	Y/Yes, T/No		1	
Well	11	String	Y/Yes, T/No		2	
Vendor	12	String	Y/Yes, T/No		3	
Neighbor	13	String	Y/Yes, T/No		4	
Others	14	String	Y/Yes, T/No		5	
Water Consumption per Day	15	Number				4 Nos, Min, Max, Average (l/day)
Cost of Water per Month	16	Number				5 Nos, Min, Max, Average (*1000Rp)
Problems on present water source						
Quality	17	String	Y/Yes, T/No		6	Nos of each problem
Quantity	18	String	Y/Yes, T/No		7	
Cost	19	String	Y/Yes, T/No		8	
Black out	20	String	Y/Yes, T/No		9	
Willingness as PAM Customer	21	String	Y/Yes, T/No		10	Nos of Y
Connection Fee	22	Number				6 Nos, Min, Max, Average (*1000Rp)
Monthly Payment	23	Number				7 Nos, Min, Max, Average (*1000Rp)
Loan payment	24	String	Y/Yes, T/No		11	Nos of Y
OTHERS						
Person in charge	25	String	B/Father, I/Mother, P/Servant, L/Others			

Nos of Samples

Zone	Housing Category	Numbers
3	Permanent	10,751
	Semi permanent	2,723
	Temporary	218
	No answer	3,117
	Sub total	16,809
6	Permanent	16,185
	Semi permanent	2,985
	Temporary	228
	No answer	193
	Sub total	19,591
Total	Permanent	26,936
	Semi permanent	5,708
	Temporary	446
	No answer	3,310
	Total	36,400

Salary per Month

Zone	Housing Category	Numbers	Min	Max	Average
3	Permanent	0	0	0	0
	Semi permanent	0	0	0	0
	Temporary	0	0	0	0
	Sub total	0	0	0	0
6	Permanent	889	0	3,000	192
	Semi permanent	232	0	900	131
	Temporary	41	0	300	174
	Sub total	1,162	0	300	179
Total	Permanent	889	0	3,000	192
	Semi permanent	232	0	900	131
	Temporary	41	0	300	174
	Total	1,162	0	300	179

Family number

Zone	Housing Category	Numbers	Min	Max	Average
3	Permanent	10,489	1	150	5.1
	Semi permanent	2,681	1	44	5.1
	Temporary	218	1	11	4.2
	Sub total	13,388	1	11	5.1
6	Permanent	15,874	1	600	5.7
	Semi permanent	2,956	1	160	5.4
	Temporary	225	1	10	4.8
	Sub total	19,055	1	10	5.7
Total	Permanent	26,363	1	600	5.5
	Semi permanent	5,637	1	160	5.3
	Temporary	443	1	11	4.5
	Total	32,443	1	11	5.4

Water Source

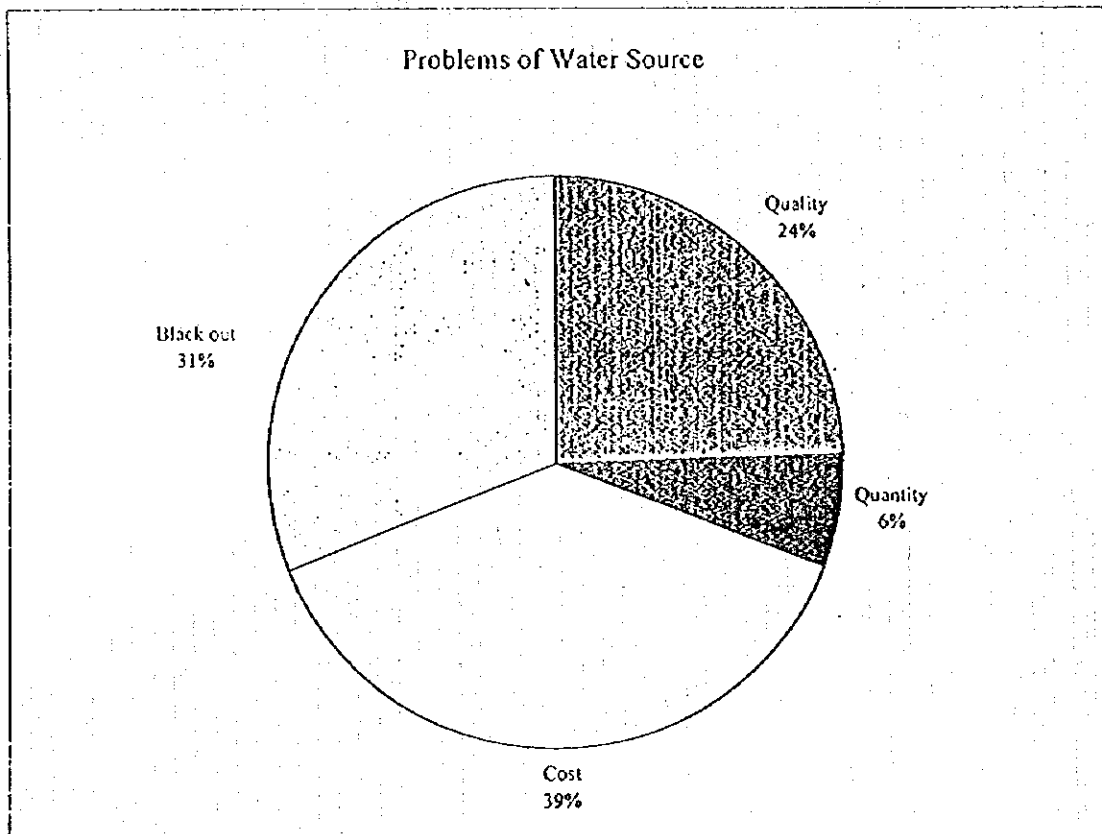
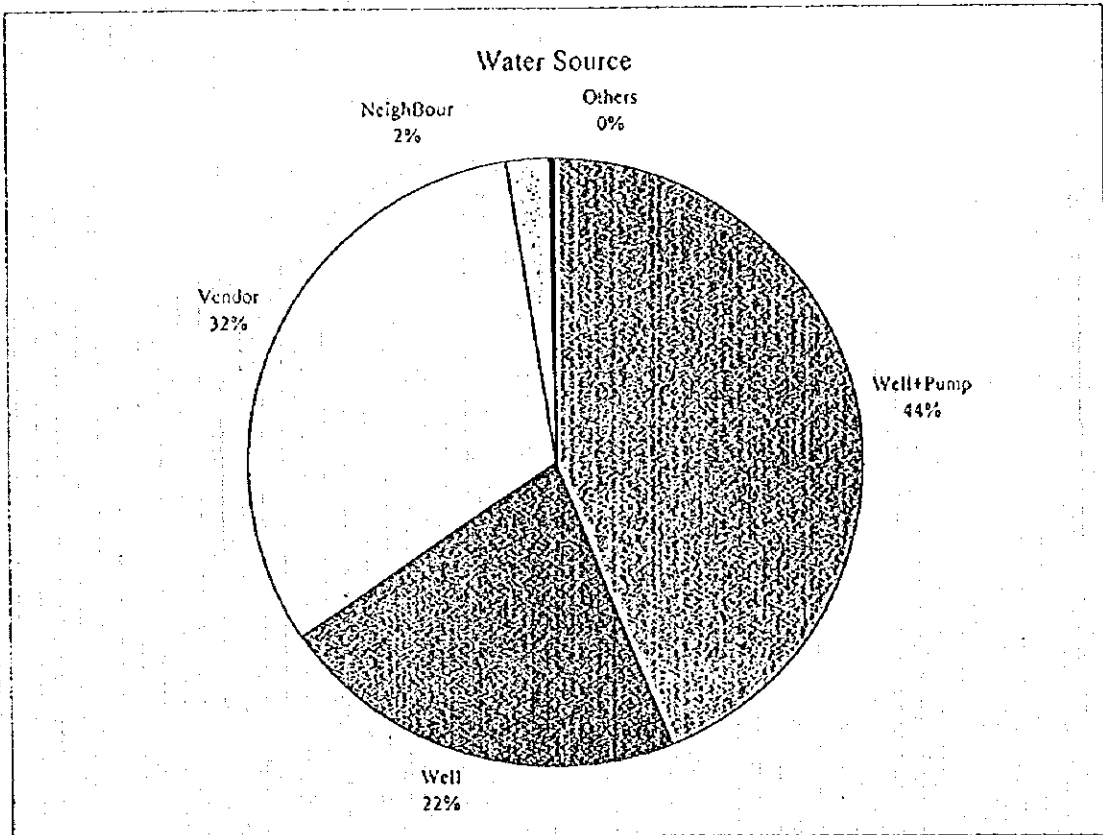
Zone	Housing Category	Well+Pump	Well	Vendor	Neighbor	Others	Total
3	Permanent	1,660	2,541	9,839	479	56	14,575
	Semi permanent	141	742	2,675	118	18	3,694
	Temporary	6	103	211	12	2	334
	Sub total	1,807	3,386	12,725	609	76	18,603
6	Permanent	11,973	4,184	75	199	22	16,453
	Semi permanent	958	1,948	8	47	10	2,971
	Temporary	95	129	0	3	0	227
	Sub total	13,026	6,261	83	249	32	19,651
Total	Permanent	13,633	6,725	9,914	678	78	31,028
	Semi permanent	1,099	2,690	2,683	165	28	6,665
	Temporary	101	232	211	15	2	561
	Total	14,833	9,647	12,808	858	108	38,254

Problems of Water Source

Zone	Housing Category	Quality	Quantity	Cost	Black out	Total
3	Permanent	2,553	665	5,400	778	9,396
	Semi permanent	455	52	986	14	1,507
	Temporary	96	3	68	4	171
	Sub total	3,104	720	6,454	796	11,074
6	Permanent	916	256	30	3,662	4,864
	Semi permanent	209	37	9	307	562
	Temporary	99	39	0	78	78
	Sub total	1,224	332	39	4,047	5,504
Total	Permanent	3,469	921	5,430	4,440	14,260
	Semi permanent	664	89	995	321	2,069
	Temporary	195	42	68	82	387
	Total	4,328	1,052	6,493	4,843	16,716

Willingness as PAM user

Zone	Housing Category	Numbers	Yes	Percentage
3	Permanent	10,751	2,705	25.2%
	Semi permanent	2,723	674	24.8%
	Temporary	218	38	17.4%
	Sub total	13,692	3,417	25.0%
6	Permanent	16,185	4,848	30.0%
	Semi permanent	2,985	757	25.4%
	Temporary	228	24	10.5%
	Sub total	19,398	5,629	29.0%
Total	Permanent	26,936	7,553	28.0%
	Semi permanent	5,708	1,431	25.1%
	Temporary	446	62	13.9%
	Total	33,090	9,046	27.3%



Item	Field	Format	Contents	Nmbr	Value	Contents
GENERAL						
Zone Number	1	Number				
Primary Cell Number	2	Number				
Kelurahan Code	3	String				
CONDITION OF BUILDING						
Area of Land	4	Number				
Type of Building	5	String	A/Permanent, B/Semi permanent, C/Temporary			
PAM						
Quality	6	String	A/Good, B/Fair, C/Bad		1/3	
Quantity	7	String	A/Good, B/Sufficient, C/Bsd, D/Very Bad, E/Not flow		2/5	
Other source	8	String	A/Well, B/Dry, C/Neighbor, D/Others		3/4	
Well quality	9	String	A/Good, B/Fair, C/Bad		4/3	
Percentage of PAM	10	Number				1 Nos, Min, Max, Average
Reason of other source	11	String	A/Quality, B/Quantity, C/Cost, D/Good Well, E/Emergency		5/5	
USER						
Number of Family / Employee	12	Number				2 Nos, Min, Max, Average
Meter Card	13	String	A/Yes, B/No, C/Not found		6/3	
Billing Card	14	String	A/Yes, B/No, C/Not found		7/3	
Registered Category	15	String	1A,1B,2A,2B,3A,3B,4A,4B			
Real Category	16	String	1A,1B,2A,2B,3A,3B,4A,4B		8/8	
Water Usage per Month	17	Number m3				3 Nos, Min, Max, Average
Average Payment per Month	18	Number Rp				4 Nos, Min, Max, Average
Illegal Customer	19	String	Y/Yes, T/No		9/2	
Not yet Registered	20	String	Y/Yes, T/No		10/2	
Disconnected	21	String	Y/Yes, T/No		11/2	
Not Billed	22	String	Y/Yes, T/No		12/2	
METER						
Meter	23	String	A/Yes, T/No		13/2	
Inaccessible	24	String	P/Permanent, S/Temporary		14/2	
Function	25	String	Y/Yes, T/No		15/2	
SERVICE PIPE						
Material	26	String	P/PVC, G/GIP, L/Others		16/3	
Condition	27	String	A/Good, B/Fair, C/Bad		17/3	
Electric Pump	28	String	Y/Yes, T/No		18/2	
Reservoir	29	String	Y/Yes, T/No		19/2	
Elevated Tank	30	String	Y/Yes, T/No		20/2	
OTHERS						
Person in charge	31	String	B/Father, I/Mother, P/Servant, L/Others			

Nos of Samples

Zone	Category	Numbers	Numbers
3	1A Commonly social	86	0.46%
	1B Special social	1	0.01%
	2A Household	18,606	98.80%
	2B Non commercial	26	0.14%
	3A Small commercial	82	0.44%
	3B Big commercial	28	0.15%
	4A Small industry	2	0.01%
	4B Big industry	1	0.01%
	No answer	18,976	-
	Sub total	37,808	
6	1A Commonly social	8	0.10%
	1B Special social	1	0.01%
	2A Household	8,345	99.87%
	2B Non commercial	1	0.01%
	3A Small commercial	1	0.01%
	3B Big commercial	0	0.00%
	4A Small industry	0	0.00%
	4B Big industry	0	0.00%
	No answer	4,131	-
	Sub total	12,487	
Total	1A Commonly social	94	0.35%
	1B Special social	2	0.01%
	2A Household	26,951	99.13%
	2B Non commercial	27	0.10%
	3A Small commercial	83	0.31%
	3B Big commercial	28	0.10%
	4A Small industry	2	0.01%
	4B Big industry	1	0.00%
	No answer	23,107	-
	Total	50,295	

Quality

Zone	Category	Nos	Good	Fair	Bad
3	1A Commonly social	86	56	29	1
	1B Special social	1	1	0	0
	2A Household	18,406	13,189	4,551	666
	2B Non commercial	24	19	5	0
	3A Small commercial	82	55	26	1
	3B Big commercial	27	24	3	0
	4A Small industry	2	2	0	0
	4B Big industry	1	1	0	0
Sub total		18,629	13,347	4,614	668
6	1A Commonly social	6	5	0	1
	1B Special social	1	1	0	0
	2A Household	8,287	6,719	1,250	318
	2B Non commercial	1	1	0	0
	3A Small commercial	1	0	1	0
	3B Big commercial	0	0	0	0
	4A Small industry	0	0	0	0
	4B Big industry	0	0	0	0
Sub total		8,296	6,726	1,251	319
Total	1A Commonly social	92	61	29	2
	1B Special social	2	2	0	0
	2A Household	26,693	19,908	5,801	984
	2B Non commercial	25	20	5	0
	3A Small commercial	83	55	27	1
	3B Big commercial	27	24	3	0
	4A Small industry	2	2	0	0
	4B Big industry	1	1	0	0
Total		26,925	20,073	5,865	987

Quantity

Zone	Category	Nos	Good	Sufficient	Bad	Very bad	Not flow
3	1A Commonly social	86	32	48	6	0	0
	1B Special social	1	0	1	0	0	0
	2A Household	18,362	9,773	6,528	1,931	85	45
	2B Non commercial	25	15	8	1	0	1
	3A Small commercial	82	35	31	16	0	0
	3B Big commercial	27	22	5	0	0	0
	4A Small industry	2	2	0	0	0	0
	4B Big industry	1	1	0	0	0	0
Sub total		18,586	9,880	6,621	1,954	85	46
6	1A Commonly social	6	5	1	0	0	0
	1B Special social	1	1	0	0	0	0
	2A Household	8,268	6,996	1,177	94	1	0
	2B Non commercial	1	1	0	0	0	0
	3A Small commercial	1	0	1	0	0	0
	3B Big commercial	0	0	0	0	0	0
	4A Small industry	0	0	0	0	0	0
	4B Big industry	0	0	0	0	0	0
Sub total		8,277	7,003	1,179	94	1	0
Total	1A Commonly social	92	37	49	6	0	0
	1B Special social	2	1	1	0	0	0
	2A Household	26,630	16,769	7,705	2,025	86	45
	2B Non commercial	26	16	8	1	0	1
	3A Small commercial	83	35	32	16	0	0
	3B Big commercial	27	22	5	0	0	0
	4A Small industry	2	2	0	0	0	0
	4B Big industry	1	1	0	0	0	0
Total		26,863	16,883	7,800	2,048	86	46

Other Source

Zone	Category	Nos	Well	Buy	Neighbor	Others
3	1A Commonly social	1	0	0	0	1
	1B Special social	0	0	0	0	0
	2A Household	3,932	2,035	203	4	1,690
	2B Non commercial	4	0	3	0	1
	3A Small commercial	17	6	6	0	5
	3B Big commercial	15	2	0	0	13
	4A Small industry	1	0	0	0	1
	4B Big industry	1	0	0	0	1
Sub total		3,971	2,043	212	4	1,712
6	1A Commonly social	3	3	0	0	0
	1B Special social	0	0	0	0	0
	2A Household	4,892	2,935	15	8	1,934
	2B Non commercial	0	0	0	0	0
	3A Small commercial	0	0	0	0	0
	3B Big commercial	0	0	0	0	0
	4A Small industry	0	0	0	0	0
	4B Big industry	0	0	0	0	0
Sub total		4,895	2,938	15	8	1,934
Total	1A Commonly social	4	3	0	0	1
	1B Special social	0	0	0	0	0
	2A Household	8,824	4,970	218	12	3,624
	2B Non commercial	4	0	3	0	1
	3A Small commercial	17	6	6	0	5
	3B Big commercial	15	2	0	0	13
	4A Small industry	1	0	0	0	1
	4B Big industry	1	0	0	0	1
Total		8,866	4,981	227	12	3,646

Reason to use Other Source

Zone	Category	Nos	Quality	Quantity	Cost	Well	Emergency
3	1A Commonly social	1	0	1	0	0	0
	1B Special social	0	0	0	0	0	0
	2A Household	3,898	193	137	2,223	432	913
	2B Non commercial	4	0	0	2	0	2
	3A Small commercial	16	3	0	9	0	4
	3B Big commercial	15	0	0	8	1	6
	4A Small industry	1	0	0	0	1	0
	4B Big industry	1	0	0	0	0	1
Sub total		3,936	196	138	2,242	434	926
6	1A Commonly social	4	0	1	0	0	3
	1B Special social	0	0	0	0	0	0
	2A Household	5,010	40	189	2,076	934	1,771
	2B Non commercial	0	0	0	0	0	0
	3A Small commercial	0	0	0	0	0	0
	3B Big commercial	0	0	0	0	0	0
	4A Small industry	0	0	0	0	0	0
	4B Big industry	0	0	0	0	0	0
Sub total		5,014	40	190	2,076	934	1,774
Total	1A Commonly social	5	0	2	0	0	3
	1B Special social	0	0	0	0	0	0
	2A Household	8,908	233	326	4,299	1,366	2,684
	2B Non commercial	4	0	0	2	0	2
	3A Small commercial	16	3	0	9	0	4
	3B Big commercial	15	0	0	8	1	6
	4A Small industry	1	0	0	0	1	0
	4B Big industry	1	0	0	0	0	1
Total		8,950	236	328	4,318	1,368	2,700

Percentage of PAM

Zone	Category	Nos	Min	Max	Average
3	1A Commonly social	85	50	100	99
	1B Special social	1	100	100	100
	2A Household	18,385	1	100	78
	2B Non commercial	25	50	100	96
	3A Small commercial	82	10	100	86
	3B Big commercial	27	50	100	81
	4A Small industry	2	90	100	95
	4B Big industry	1	90	90	90
	Sub total	18,608	1	100	78
	6	1A Commonly social	6	80	100
1B Special social		1	100	100	100
2A Household		8,206	1	100	70
2B Non commercial		1	100	100	100
3A Small commercial		1	100	100	100
3B Big commercial		0	0	0	0
4A Small industry		0	0	0	0
4B Big industry		0	0	0	0
Sub total		8,215	0	100	70
Total		1A Commonly social	91	50	100
	1B Special social	2	100	100	100
	2A Household	26,591	1	100	76
	2B Non commercial	26	50	100	97
	3A Small commercial	83	10	100	86
	3B Big commercial	27	0	100	81
	4A Small industry	2	0	100	95
	4B Big industry	1	0	90	90
	Total	26,823	0	100	76

Number of Family/Employee

Zone	Category	Nos	Min	Max	Average
3	1A Commonly social	25	1	12	5.7
	1B Special social	1	8	8	8.0
	2A Household	17,911	1	150	4.5
	2B Non commercial	22	2	130	34.3
	3A Small commercial	78	2	500	11.9
	3B Big commercial	26	1	47	5.5
	4A Small industry	2	5	21	13.0
	4B Big industry	1	1	1	1.0
	Sub total	18,066	1	500	4.6
	6	1A Commonly social	6	2	20
1B Special social		1	2	2	2.0
2A Household		8,191	1	85	5.2
2B Non commercial		1	2	2	2.0
3A Small commercial		1	10	10	10.0
3B Big commercial		0	0	0	0.0
4A Small industry		0	0	0	0.0
4B Big industry		0	0	0	0.0
Sub total		8,209	0	85	5.2
Total		1A Commonly social	31	1	20
	1B Special social	2	2	8	5.0
	2A Household	26,102	1	150	4.7
	2B Non commercial	23	2	130	32.9
	3A Small commercial	79	2	500	11.9
	3B Big commercial	26	0	47	5.5
	4A Small industry	2	0	21	13.0
	4B Big industry	1	0	1	1.0
	Total	26,266	0	500	4.8

Water Usage

Zone	Category	Nos	Min	Max	m ³ /month		
					Average	Person	LCU(30days)
3	1A Commonly social	75	8	1,541	268	5.7	1,563
	1B Special social	0	0	0	0	8.0	0
	2A Household	15,383	1	7,045	24	4.5	180
	2B Non commercial	19	9	1,534	260	34.3	253
	3A Small commercial	66	2	273	42	11.9	117
	3B Big commercial	21	4	329	42	5.5	252
	4A Small industry	2	65	199	132	13.0	338
	4B Big industry	1	3	3	3	1.0	100
	Sub total	15,567	0	7,045	26	5	189
6	1A Commonly social	7	5	62	34	11.2	101
	1B Special social	0	0	0	0	2.0	0
	2A Household	6,566	1	7,871	59	5.2	375
	2B Non commercial	1	42	42	42	2.0	700
	3A Small commercial	1	38	38	38	10.0	127
	3B Big commercial	0	0	0	0	-	-
	4A Small industry	0	0	0	0	-	-
	4B Big industry	0	0	0	0	-	-
	Sub total	6,575	0	7,871	59	5	375
Total	1A Commonly social	82	5	1,541	248	6.8	1,222
	1B Special social	0	0	0	0	5.0	0
	2A Household	21,949	1	7,871	35	4.7	244
	2B Non commercial	20	9	1,534	249	32.9	253
	3A Small commercial	67	2	273	42	11.9	117
	3B Big commercial	21	0	329	42	5.5	252
	4A Small industry	2	0	199	132	13.0	338
	4B Big industry	1	0	3	3	1.0	100
	Total	22,142	0	7,871	36	5	249

Monthly Payment

Zone	Category	Nos	Min	Max	1000Rp/month	
					Average	
3	1A Commonly social	50	8	400	95	
	1B Special social	0	0	0	0	
	2A Household	8,891	0	1,112	15	
	2B Non commercial	16	6	1,072	185	
	3A Small commercial	48	1	380	53	
	3B Big commercial	22	2	3,309	184	
	4A Small industry	2	20	330	175	
	4B Big industry	0	0	0	0	
	Sub total	9,029	0	3,309	16	
6	1A Commonly social	6	15	36	25	
	1B Special social	0	0	0	0	
	2A Household	6,336	0	400	13	
	2B Non commercial	1	20	20	20	
	3A Small commercial	1	51	51	51	
	3B Big commercial	0	0	0	0	
	4A Small industry	0	0	0	0	
	4B Big industry	0	0	0	0	
	Sub total	6,344	0	400	13	
Total	1A Commonly social	56	8	400	88	
	1B Special social	0	0	0	0	
	2A Household	15,227	0	1,112	14	
	2B Non commercial	17	6	1,072	175	
	3A Small commercial	49	1	380	53	
	3B Big commercial	22	0	3,309	184	
	4A Small industry	2	0	330	175	
	4B Big industry	0	0	0	0	
	Total	15,373	0	3,309	15	

With Electric Pump

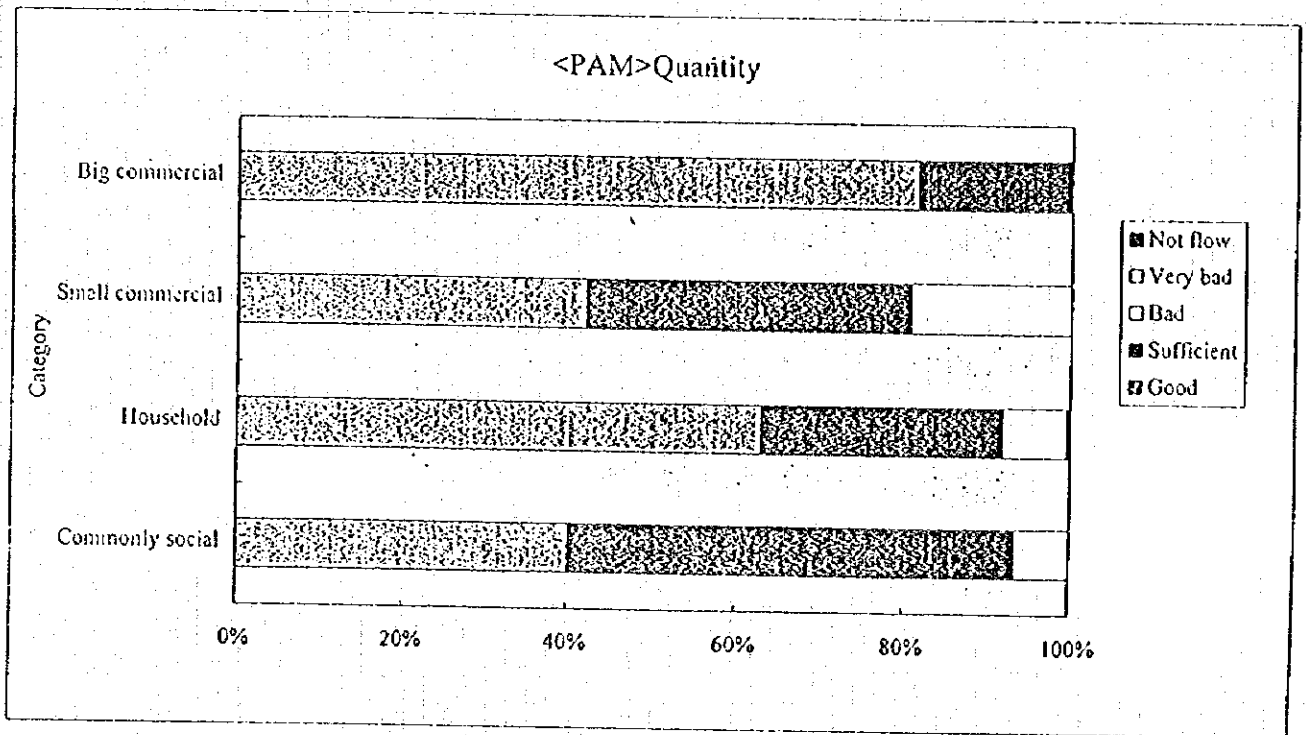
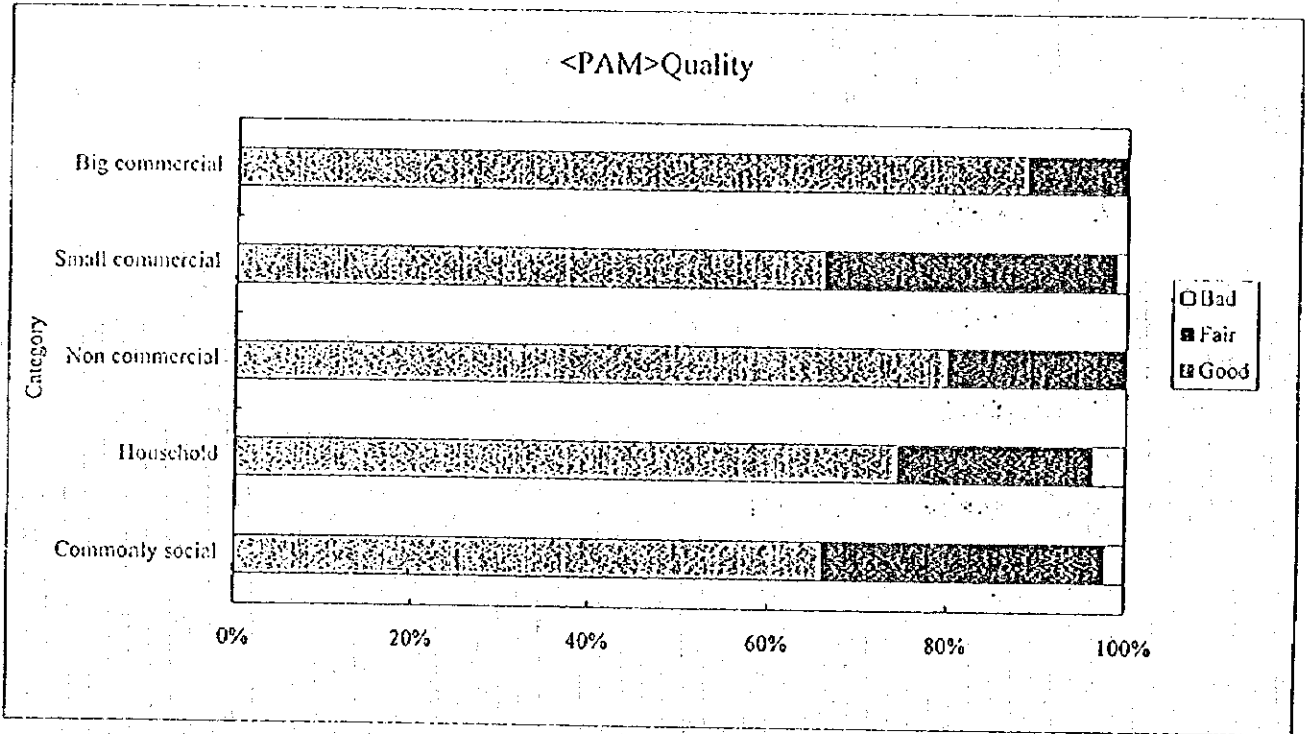
Zone	Category	Nos	Yes	No	
3	1A	Commonly social	86	30	56
	1B	Special social	1	0	1
	2A	Household	18,427	5,851	12,576
	2B	Non commercial	24	10	14
	3A	Small commercial	82	35	47
	3B	Big commercial	27	21	6
	4A	Small industry	2	2	0
	4B	Big industry	1	1	0
	Sub total		18,650	5,950	12,700
6	1A	Commonly social	6	0	6
	1B	Special social	1	0	1
	2A	Household	8,326	4,295	4,031
	2B	Non commercial	1	0	1
	3A	Small commercial	1	0	1
	3B	Big commercial	0	0	0
	4A	Small industry	0	0	0
	4B	Big industry	0	0	0
	Sub total		8,335	4,295	4,040
Total	1A	Commonly social	92	30	62
	1B	Special social	2	0	2
	2A	Household	26,753	10,146	16,607
	2B	Non commercial	25	10	15
	3A	Small commercial	83	35	48
	3B	Big commercial	27	21	6
	4A	Small industry	2	2	0
	4B	Big industry	1	1	0
	Total		26,985	10,245	16,740

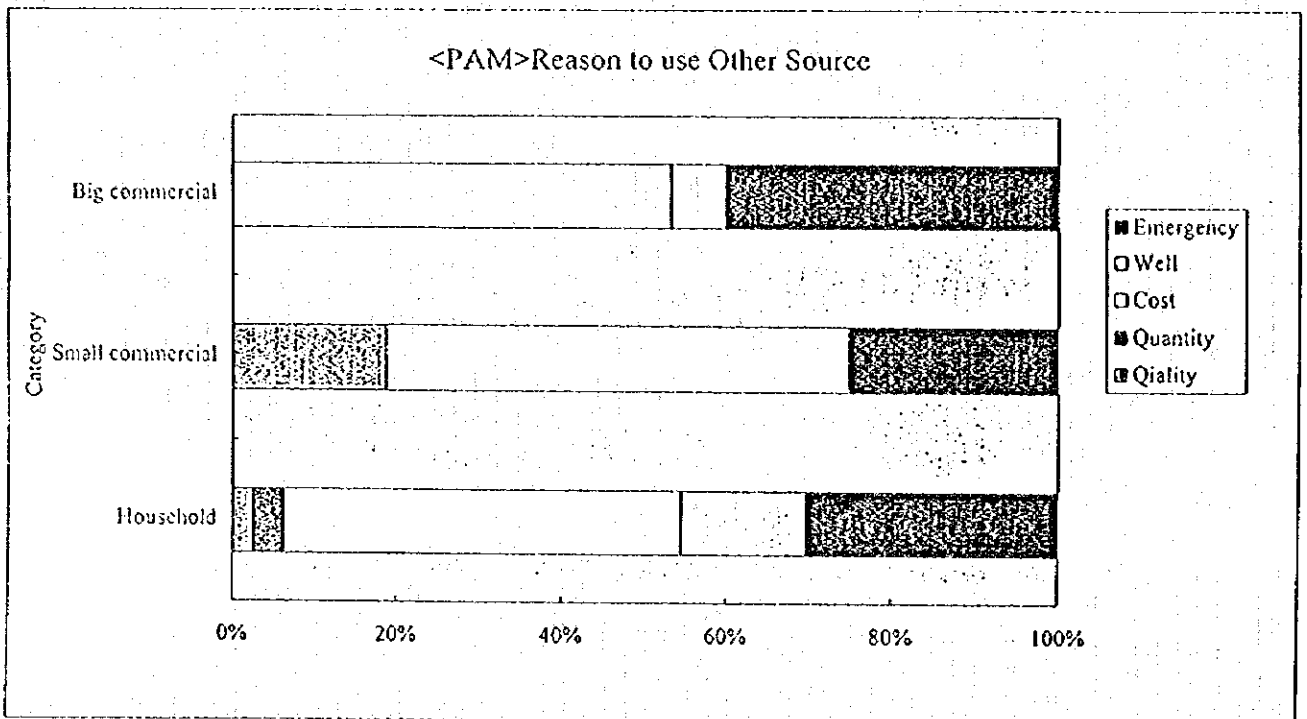
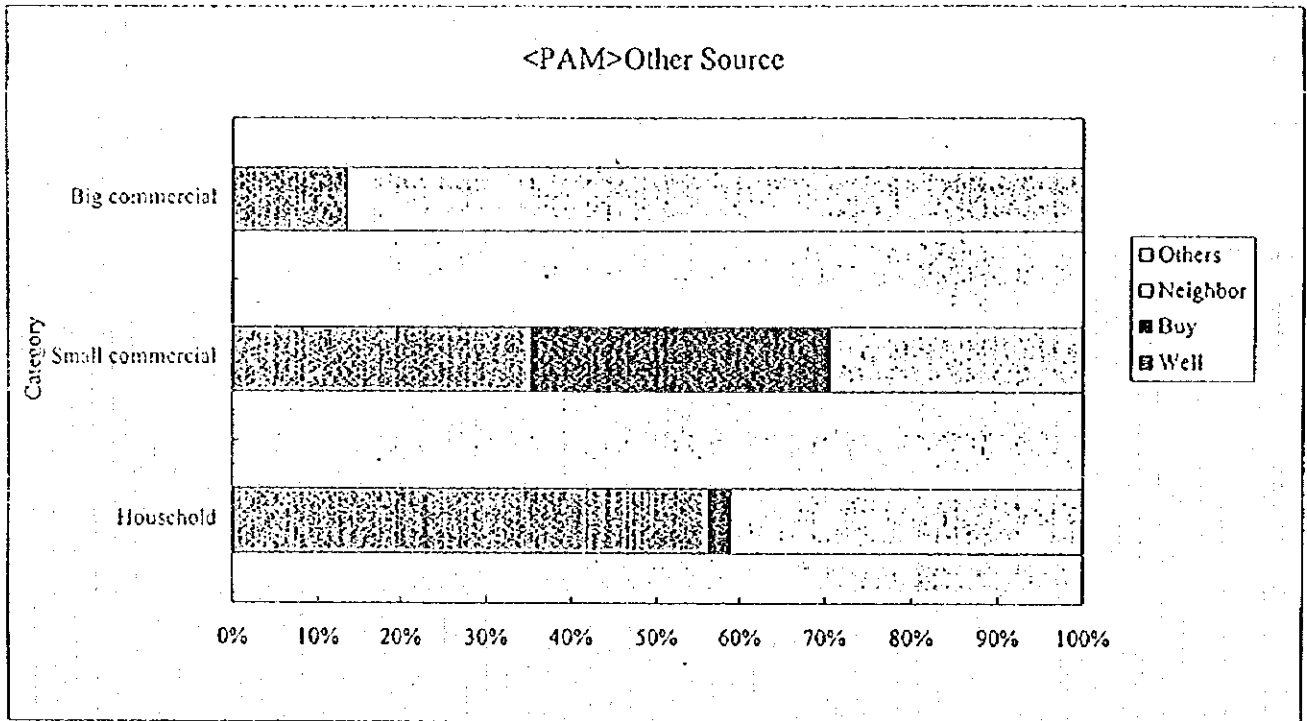
With Reservoir

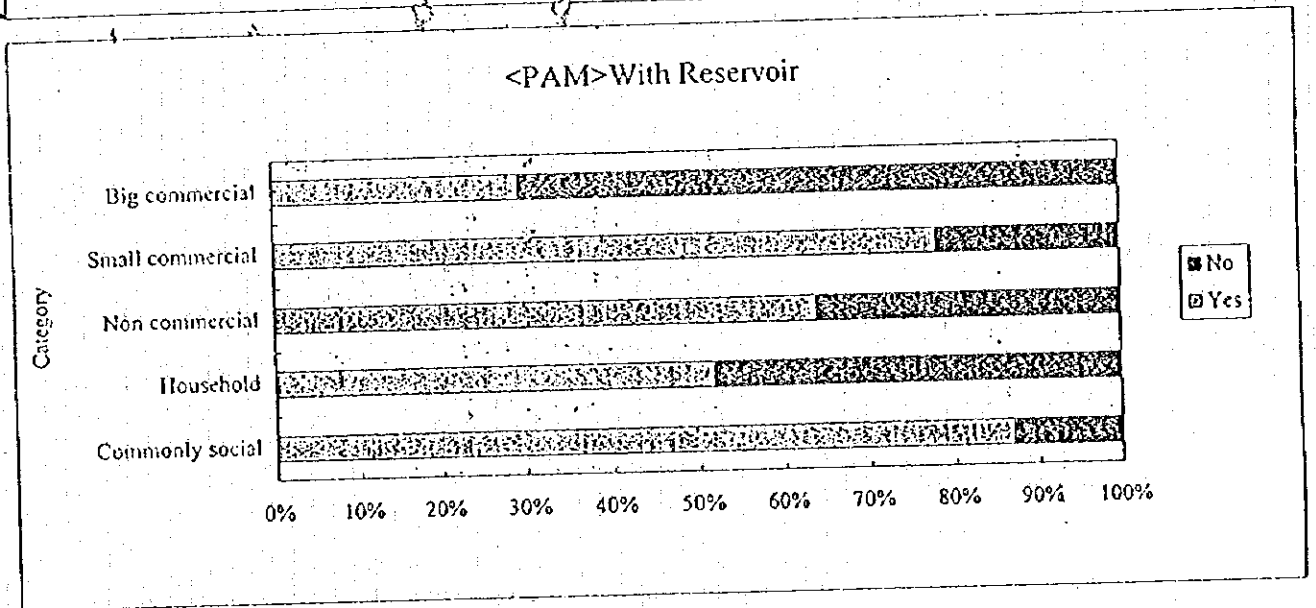
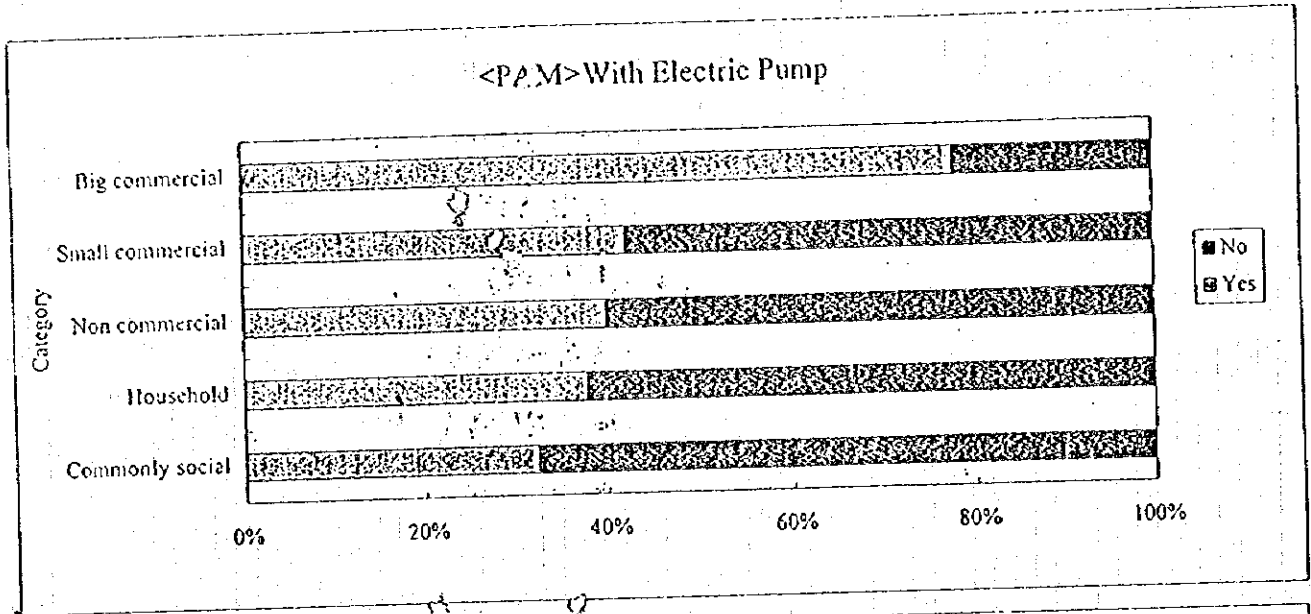
Zone	Category	Nos	Yes	No	
3	1A	Commonly social	86	79	7
	1B	Special social	1	1	0
	2A	Household	18,407	13,830	4,577
	2B	Non commercial	24	16	8
	3A	Small commercial	81	64	17
	3B	Big commercial	27	8	19
	4A	Small industry	2	1	1
	4B	Big industry	1	1	0
	Sub total		18,629	14,000	4,629
6	1A	Commonly social	6	1	5
	1B	Special social	1	0	1
	2A	Household	8,317	25	8,292
	2B	Non commercial	1	0	1
	3A	Small commercial	1	0	1
	3B	Big commercial	0	0	0
	4A	Small industry	0	0	0
	4B	Big industry	0	0	0
	Sub total		8,326	26	8,300
Total	1A	Commonly social	92	80	12
	1B	Special social	2	1	1
	2A	Household	26,724	13,855	12,869
	2B	Non commercial	25	16	9
	3A	Small commercial	82	64	18
	3B	Big commercial	27	8	19
	4A	Small industry	2	1	1
	4B	Big industry	1	1	0
	Total		26,955	14,026	12,929

With Elevated Tank

Zone	Category	Nos	Yes	No
3	1A Commonly social	86	0	86
	1B Special social	1	0	1
	2A Household	18,392	579	17,813
	2B Non commercial	24	2	22
	3A Small commercial	81	3	78
	3B Big commercial	27	0	27
	4A Small industry	2	0	2
	4B Big industry	1	0	1
	Sub total	18,614	584	18,030
6	1A Commonly social	6	0	6
	1B Special social	1	0	1
	2A Household	8,316	292	8,024
	2B Non commercial	1	0	1
	3A Small commercial	1	0	1
	3B Big commercial	0	0	0
	4A Small industry	0	0	0
	4B Big industry	0	0	0
	Sub total	8,325	292	8,033
Total	1A Commonly social	92	0	92
	1B Special social	2	0	2
	2A Household	26,708	871	25,837
	2B Non commercial	25	2	23
	3A Small commercial	82	3	79
	3B Big commercial	27	0	27
	4A Small industry	2	0	2
	4B Big industry	1	0	1
	Total	26,939	876	26,063







**9. ORGANIZATION, MANAGEMENT, AND FINANCE OF PAM
JAYA**

COMPOSITION OF PERSONNEL BY EDUCATION, STATUS AND PLACE OF
ASSIGNMENT

COMPOSITION OF PERSONNEL BY AGE AND EDUCATION

YEARS OF EXPERIENCE OF PAM JAYA PERSONNEL

PRESENT BASIC SALARY STRUCTURE OF PAM JAYA

ALLOWANCE PAID FOR JANUARY 1993 - DECEMBER 1993

KINDS OF TRAINING COURSES BY NUMBER OF TRAINEES (1992 - 1994)

CALCULATION OF TARIFFS

FLOWCHART OF BILLING AND COLLECTION SYSTEM FOR RAYON CONSUMERS

FLOW CHART OF BILLING AND COLLECTION SYSTEM FOR BIG METER UNIT

CONSUMERS WHO PAY AT BANK (NOT INCLUDING MILITARY AND GOVERNMENT
AGENCIES)

**COMPOSITION OF PERSONNEL BY EDUCATION,
STATUS AND PLACE OF ASSIGNMENT**

Education	PAMJAYA					PNS (Government Civil Servant)					Grand Total
	Head	Cabang	Rayon	Plant	Total	Head	Cabang	Rayon	Plant	Total	
Elementary School											
Not graduated	0	0	0	0	0	1	1	6	6	14	14
Graduated	19	13	81	35	148	24	11	76	26	137	285
Junior High School											
General	13	8	71	17	109	12	7	33	6	58	167
Technical	5	1	15	19	40	1	0	5	6	12	52
Non-technical	0	0	0	0	0	0	0	0	0	0	0
Senior High School											
General	102	28	210	58	398	30	22	78	10	140	538
Technical	102	36	97	140	375	32	20	48	28	128	503
Non-Technical	29	10	74	4	117	13	8	16	0	37	154
DIPLOMA											
D-3 Exact Science	10	1	2	4	17	6	1	2	5	14	31
D-3 Non-Exact Science	20	11	16	3	50	14	2	14	0	30	80
University											
Stratum - I											
Exact											
Applied											
S-1 Civil Engineer	23	8	8	1	40	9	0	3	1	13	53
S-1 Mechanical/Electrical	17	1	4	6	28	1	0	2	1	4	32
S-1 Sanitary/Environmental	16	4	0	6	26	4	1	0	0	5	31
S-1 Computer	5	4	0	0	9	1	0	0	0	1	10
Exact											
Pure											
S-1 Chemistry	8	0	1	12	21	0	0	0	0	0	21
S-1 Biology	1	0	0	2	3	0	0	0	0	0	3
S-1 Mathematical	1	0	1	0	1	0	0	0	0	0	1
Non-Exact											
S-1 Economics/Accountancy	26	5	16	0	47	9	0	1	0	10	57
S-1 Law/Sociology	24	9	16	2	51	26	10	15	1	52	103
S-1 Others	2	2	0	0	4	0	0	0	0	0	4
Total	423	141	612	309	1454	183	83	299	90	655	2159

COMPOSITION OF PERSONNEL BY AGE AND EDUCATION

Education	AGES								Total
	15 - 20	21 - 25	26 - 30	31 - 35	36 - 40	41 - 45	46 - 50	> 50	
Elementary School									
Not Graduated	0	0	0	0	0	0	0	14	14
Graduated	0	0	2	34	74	54	48	73	285
Junior High School									
General	0	0	18	31	45	41	18	13	167
Technical	0	0	0	15	22	6	4	5	52
Non-technical	0	0	0	0	0	0	0	0	0
Senior High School									
General	1	10	77	156	133	63	71	27	538
Technical	0	32	77	102	150	85	35	11	503
Non-Technical	1	0	12	41	52	37	9	2	154
DIPLOMA									
D-3 Exact Science	0	0	2	5	6	15	2	1	31
D-3 Non-Exact Science	0	2	2	28	11	22	9	6	80
University									
Stratum - I									
Exact									
Applied									
S-1 Civil Engineer	0	0	3	21	15	6	5	3	53
S-1 Mechanical/Electrical	0	0	0	10	13	7	1	1	32
S-1 Sanitary/Environmental	0	0	5	10	8	3	3	2	31
S-1 Computer	0	1	4	3	1	1	0	0	10
Exact									
Pure									
S-1 Chemistry	0	0	1	8	12	0	0	0	21
S-1 Biology	0	0	0	1	0	1	1	0	3
S-1 Mathematical	0	0	1	0	0	0	0	0	1
Non-Exact									
S-1 Economics/Accountancy	0	0	7	23	15	7	2	3	57
S-1 Law/Sociology	0	0	5	17	28	28	16	9	103
S-1 Others	0	0	0	2	1	0	1	0	4
Total	2	45	216	507	597	376	226	170	2159

YEARS OF EXPERIENCE OF PAM JAYA PERSONNEL

YEARS OF EXPERIENCE	0 - 4	5 - 8	9 - 12	13 - 16	17 - 20	21 - 24	> 24	TOTAL
Number of employees	187 (9%)	372 (17%)	223 (10%)	590 (28%)	267 (12%)	292 (14%)	208 (10%)	2139 (100%)
Engineers (University Graduate)	57 (31%)	66 (36%)	12 (7%)	22 (12%)	11 (6%)	10 (5%)	4 (3%)	182 (100%)
Non-engineers (University Graduate)	15 (6%)	54 (22%)	32 (13%)	46 (19%)	24 (10%)	45 (18%)	28 (11%)	244 (100%)

ALLOWANCE PAID FOR JANUARY 1993 - DECEMBER 1993

PARTICULARS	AMOUNT IN RP.
Position Allowance	539,735,000
Company Allowance	732,884,850
Electricity, Water, Telephone and Gas (EWTG) Allowance	638,027,000
Work Allowance	1,316,647,175
Transportation Allowance	641,751,281
Food Allowance	1,554,728,450
Functional Allowance	157,725,000
Family Allowance	63,000,000
Holiday Allowance	359,061,340
Production Allowance	1,636,686,535
TOTAL	7,640,246,631

N.B. Basic salary paid for January 1993 - December 1993 : Rp. 2,600,262,482

KINDS OF TRAINING COURSES BY NUMBER OF TRAINEES (1992 - 1994)

TRAINING PROGRAM	COURSES	NO. OF TRAINEES
1. Induction Courses (New)	7	92
2. Induction Course (Elder)	2	97
3. Training of Trainers	4	56
4. HRD Training	1	6
5. Work Supervision A	7	107
6. UFW A	2	24
7. UFW Controller	3	45
8. UFW Leak Detector	5	76
9. Water Quality A	5	76
10. Customer Management A	15	233
11. New House Connection	10	149
12. Supervisory Management A	3	19
TOTAL	64	980

CALCULATION OF TARIFFS

In this section we examine how water tariffs for 1994 to 1997 period were determined by PAM JAYA and in the process we shall see financial performance which were projected based on different costs.

Assumptions of PAM JAYA for the tariff setting period of 1994 to 1997 are given on Table-1 (in millions of Rupiah and M3):

Table-1 ASSUMPTIONS OF PAM JAYA FOR TARIFF SETTING

	1994	1995	1996
Total Cost	197,000	267,000	305,000
UFW	47%	46%	45%
PUF	87%	89%	90%
Max Available for Sale	180.02	224.77	267.40
Volume Sold	175.90	192.83	210.65
Volume Produced	331.89	357.09	383.00
KADPP 5 %	16.59	17.85	19.15

- i) Estimate total cost for the period, usually three years, during which new tariff schedule will apply. Total cost includes operating and administrative expenses and interest expense.
- ii) Calculate production volume by dividing forecast volume sold or maximum volume of water available for sale (max available for sale), which ever is lower, by *projected accounted-for-water*.

For 1994 Accounted-for-water = (1 - UFW)
(1-47%) = 331.89 (in Million m³)

- iii) Divide total cost by production volume to determine average production cost for each projected year.

$$\begin{aligned} 197,000 (\text{total cost})/331.89(\text{production volume}) &= \text{Rp. } 593.57/\text{m}^3 \\ 267,000/357.09 &= \text{Rp. } 747.71/\text{m}^3 \\ 305,000/383.00 &= \text{Rp. } 796.34/\text{m}^3 \end{aligned}$$

- iv) Average production cost for the new tariff schedule period (3 years) is arrived at summing total costs, and then dividing the total costs by the combined unit production costs adjusted by KADPP of 5%.

KADPP comprises 3.5% of back wash and 1.5% of non-back wash.

1994

$331.89 \text{ (Production volume)} \times 5\% = 16.59 \text{ (in million m}^3\text{)}$

$197,000 + 267,000 + 305,000 \text{ (total costs)} / (331.89 - 16.59 + 357.09 - 17.85 + 383.00 - 19.15) =$
Rp.755.12

This average production cost is used as the benchmark for the further determination.
(Step 1)

- v) Average production cost of Rp. 755.12 was adjusted upwardly to Rp. 775 by Water Tariff Arrangement Team of PAM JAYA, which are under the leadership of Finance Director and Commercial Director. (Step 2)
- vi) This adjusted average production cost is multiplied by an index (see Table-2) on each category of consumer to determine *water tariffs*, for instance:

For household A (to the first 15 m³)

$775 \times 0.5 = \text{Rp. } 387.5$

For large scale industry (to the first 15m³)

$775 \times 3 = \text{Rp. } 2325$

Table-2 CROSS-SBUSIDY

KINDS OF CONSUMERS	CONSUMPTION BLOCK (m ³ /month)			
	0 - 15	16 - 30	31 - 50	> 50
I. Social Class				
1. Social-General	0.5	0.5	0.5	0.5
2. Social-Special	0.8	0.8	1.2	1.2
II. Non-Commercial				
1. Household A	0.5	0.5	1.0	1.1
2. Household B	1.0	1.0	1.3	1.5
3. Household C	1.2	1.2	1.5	1.7
4. Household D	1.5	1.5	2.0	2.3
5. Embassy/Consulate	2.0	2.0	2.5	2.9
6. Government office	1.5	1.5	2.5	2.5
III. Commercial				
1. Small Scale	2.0	2.0	2.8	2.8
2. Large Scale	3.0	3.0	4.0	4.0
IV. Industry				
1. Small Scale	1.5	1.5	3.0	3.0
2. Large Scale	3.2	3.2	4.2	4.2
V. Special				
1. Water Station	1.2	1.2	1.2	1.2
2. Harbor	5.5	5.5	6.5	6.5
3. Water Tanker	3.3	3.3	3.4	3.4
4. Hydrant & Public Stand Pipe	0.9	0.9	1.0	1.0

Water tariffs proposed by PAM JAYA are presented in Table-3.

Table-3 TARIFFS PROPOSED BY PAM JAYA

KINDS OF CONSUMERS	CONSUMPTION BLOCK (m ³ /month)			
	0 - 15	16 - 30	31 - 50	> 50
I. Social Class				
1. Social-General	387.5	387.5	387.5	387.5
2. Social-Special	620.0	620.0	390.0	930.0
II. Non-Commercial				
1. Household A	387.5	387.5	775.0	852.0
2. Household B	775.0	775.0	1,007.5	1,162.5
3. Household C	930.0	930.0	1,162.5	1,317.5
4. Household D	1,162.5	1,162.5	1,550.0	1,782.5
5. Embassy/Consulate	1,550.0	1,550.0	1,937.5	1,937.5
6. Government office	1,162.5	1,162.5	1,937.5	1,937.5
III. Commercial				
1. Small Scale	1,550.0	1,550.0	2,170.0	2,170.0
2. Large Scale	2,325.0	2,325.0	3,100.0	3,100.0
IV. Industry				
1. Small Scale	1,162.5	1,162.5	2,325.0	2,325.0
2. Large Scale	2,480.0	2,480.0	3,255.0	3,255.0
V. Special				
1. Water Station	930.0	930.0	930.0	930.0
2. Harbor	4,262.5	4,262.5	5,037.5	5,037.5
3. Water Tanker	2,557.5	2,557.5	2,635.0	2,635.0
4. Hydrant & Public Stand Pipe	697.5	697.5	775.0	775.0

- vii) Tariffs and consumer categories proposed by PAM JAYA were modified at the Water Tariff Adjustment Meeting attended by 4 responsible members from Ministry of Home Affairs, Law bureau, DKI and PAM JAYA. Current water tariff structure was finalized by this meeting. As Table-4 shows, tariffs of most categories were adjusted upwardly and categories of consumers were increased.

CURRENT WATER TARIFFS (FROM JUNE 1994)

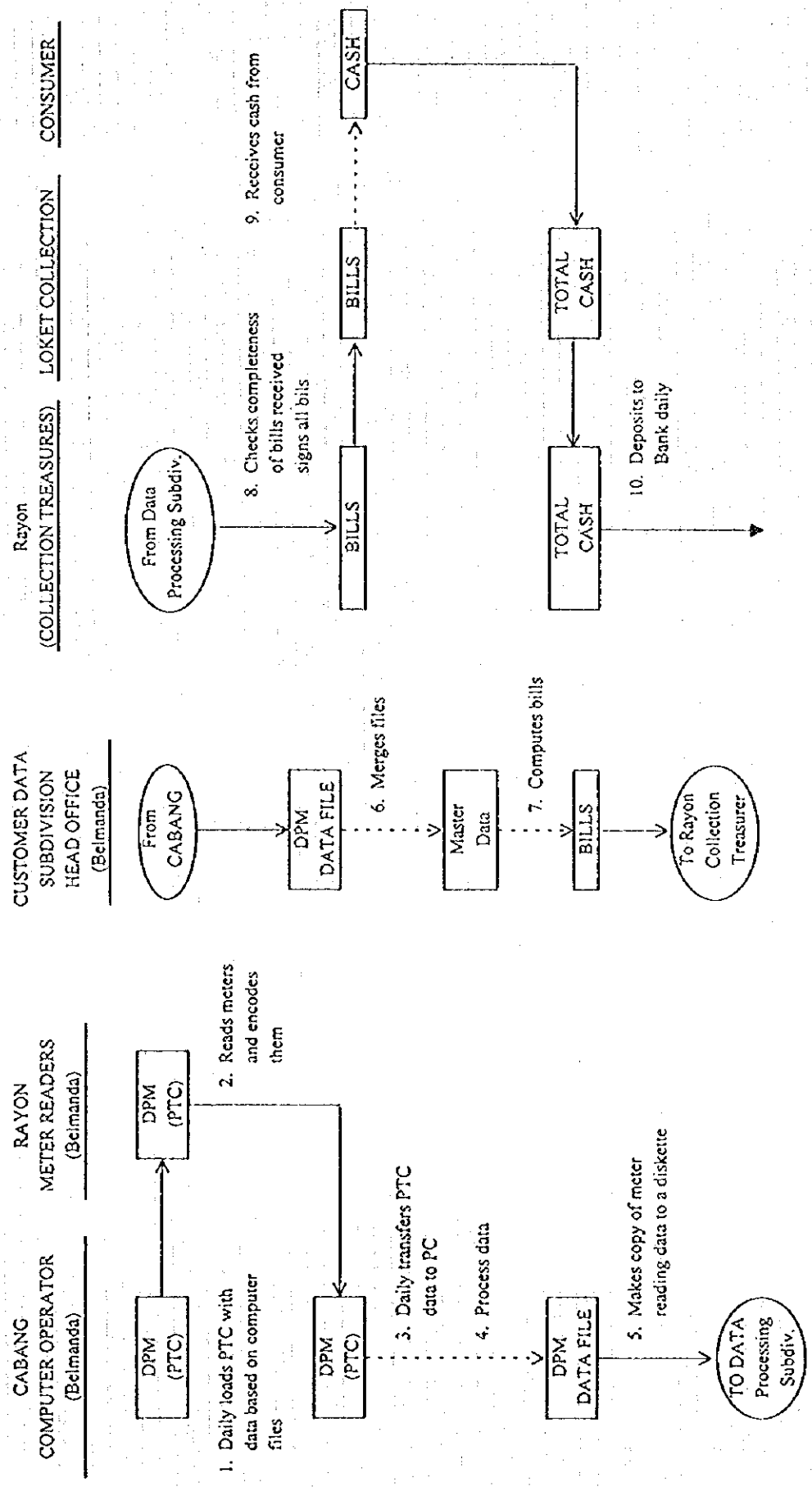
CODE	CONSUMER CATEGORY	Rp/M3		
		0 - 30	31-50	> 51
1	SOCIAL			
	A. Social General			
1A	Social Welfare	390	390	390
1B	Orphanage	390	390	390
1C	Praying Place	390	390	390
	B. Social Special			
1D	Public Hospital	625	930	930
2	NON COMMERCIAL			
	A. Household			
2A1	Very Small House	390	775	875
2A2	Simple House	775	1,100	1,295
2A3	Large House	930	1,175	1,410
2A4	Luxurious House	1,175	1,550	1,845
2B	Embassy/Consulate	1,550	1,950	2,340
	B. Government Office			
2C	Government Office	1,175	1,950	1,950
2D	Foreign Agency	1,175	1,950	1,950
2E	Non Commercial Private Organization	1,175	1,950	1,950
2F	Education Institution	1,175	1,950	1,950
2G	Armed Forces	1,175	1,950	1,950
3	COMMERCIAL			
	Small Commercial (A)			
3A	Small Shops	1,350	1,900	1,900
3B	Small Garage	1,350	1,900	1,900
3C	Small Enterprise	1,350	1,900	1,900
3D	Home Industry and Cheap Hotel	1,350	1,900	1,900
3E	Barber	1,350	1,900	1,900
3F	Taylor	1,350	1,900	1,900
	Small Commercial (B)			
3G	Small Restaurant	1,550	2,200	2,200
3H	Private Hospital and Laboratories	1,550	2,200	2,200
3I	Physician	1,550	2,200	2,200
3J	Lawyer	1,550	2,200	2,200
3K	Inn (No Star)	1,550	2,200	2,200
	Large Commercial (A)			
3L	Hotel 1 to 3 Stars and Motel	2,900	2,900	2,900
3M	Steambath	2,900	2,900	2,900
3N	Night Club	2,900	2,900	2,900
3O	Bank	2,900	2,900	2,900
3P	Large Garage and Gas Station	2,900	2,900	2,900
3Q	Trading Company	2,900	2,900	2,900
	Large Commercial (B)			
3R	Hotel 4 - 5 Stars	3,100	3,100	3,100
3S	High-rise Building and Condominium	3,100	3,100	3,100
4	INDUSTRY			
4A	Small Industry	1,175	2,325	2,325
	Big Industry			
4B	Ice Factory	3,275	3,275	3,275
4C	Food and Beverage Factory	3,275	3,275	3,275
4D	Chemical/Pharmaceutical/ Cosmetic Factory	3,275	3,275	3,275
4E	Factory and Warehouse	3,275	3,275	3,275
4F	Textile Factory	3,275	3,275	3,275
4G	Other Industry	3,275	3,275	3,275
5	SPECIAL			
5A	Hydrant	780	780	780
5B	Water Station & Water Tank Truck	930	930	930
5C	Water Tanker	2,950	2,950	2,950
5D	Harbor	5,050	5,050	5,050

ACTIONS FOR LATE PAYMENT OR NONPAYMENT

PERIOD	ACTION
Day 20th to Day 25th of each month	Penalty ranging from Rp. 5,000 (for household) to Rp. 65,000 (for harbor) is imposed
Day 25th to Day 30th of each month	Temporary disconnection Reconnection can be done after payment: - unpaid water bill - installation fee - penalty
After Day 30th	Permanent disconnection. Reconnection can be done after payment: - unpaid water bill - new connection fee and administration fee - cost of excavation of pipeline

Disconnection for government agencies has not been implemented.

FLOW CHART OF BILLING AND COLLECTION SYSTEM FOR RAYON CONSUMERS

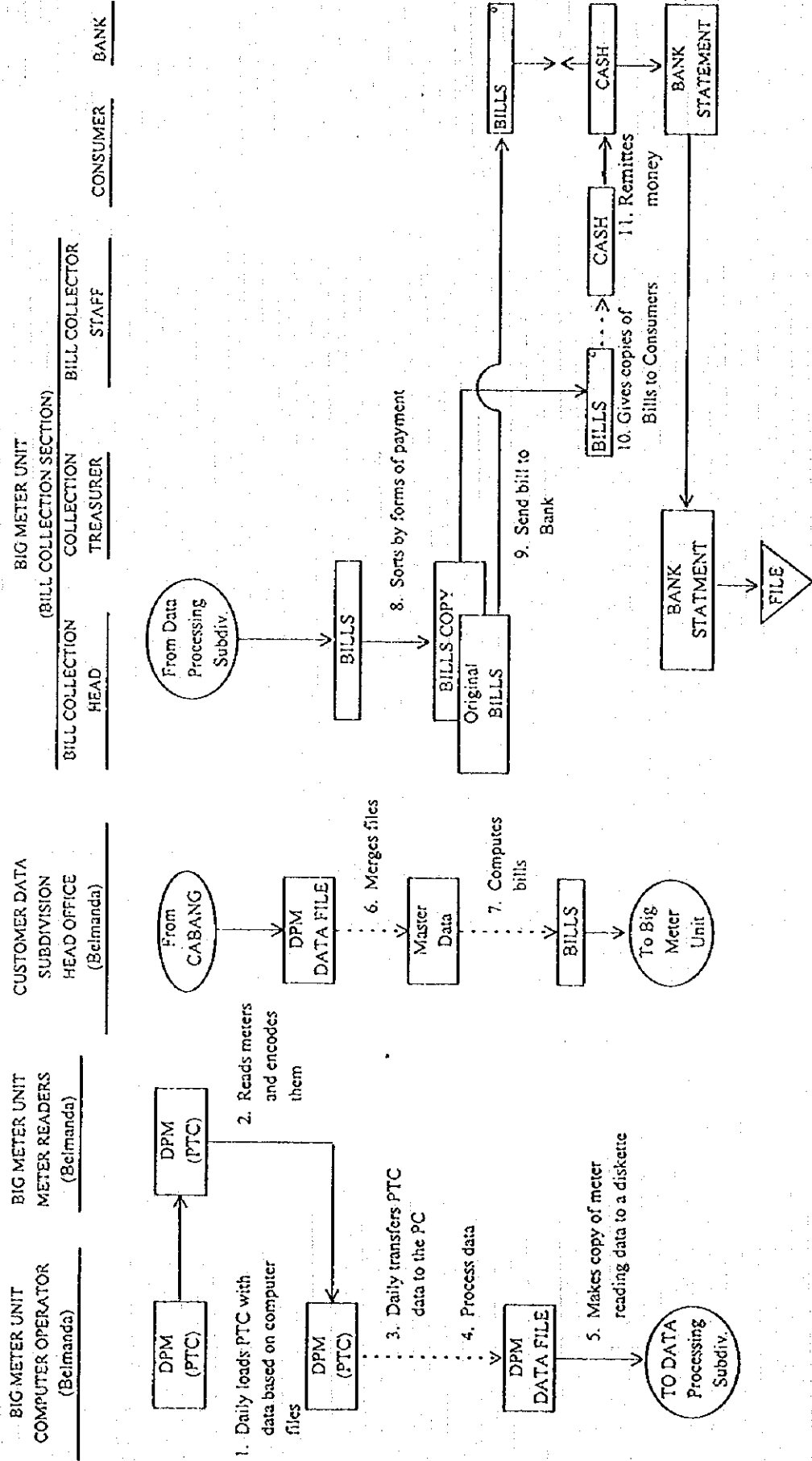


From Day 1 through Day 20 of the following month

4 days after receiving data from Cabang

From Day 1 through Day 20

FLOW CHART OF BILLING AND COLLECTION SYSTEM FOR BIG METER UNIT CONSUMERS WHO PAY AT BANK (not including Military and Government Agencies)



From Day 28 of the previous month to day 21

4 days after receiving data from Cabang

From Day 1 through Day 20 of the following month