4-3 Equipment Provision Plan

The equipment that will be incorporated into the Project are those already described in Chapter 3 as follows:.

1) Training Equipment:

- Equipment for general training
- Equipment for creating training materials
- Equipment for the laboratory for water quality analysis
- Equipment for the water treatment workshop
- Equipment for the electrical, machine and pump workshops
- Equipment for the pipe laying workshop
- Equipment for the environmental sanitation workshop
- Vehicles for training
- Equipment for training

2) Equipment for General Use

- Equipment for conferences
- Dormitory and dining room furniture

4-3-1 Equipment for General Training

(1) Description of Training and Necessary Equipment

The types of training to be conducted in the lecture rooms and exercise room include lectures, audio-visual training, exercises discussions as well as practical trainings carried out in the computer training room and the laboratories and workshops, and outdoor training. This subsection will describe the equipment necessary in the lecture rooms, the exercise room and the computer training room.

Audio-visual training will mainly be given using, slides and videotapes created for training. It is therefore necessary to provide with slide projectors, video decks and a 16 mm projector for this purpose. An overhead projector will also be necessary for lecture in order to ensure the understanding of trainees.

Use of personal computers for training on data processing for water quality analysis, environmental sanitation planning and hydraulic calculations for the design of water distribution system, is useful in order to heighten both the effect and the efficiency of the training. Moreover, explanation panels of the waterworks system, the water treatment system and the system for the collection and treatment of solid waste and night soil will be provided to help increae the effect of the training.

(2) Quantity and Grade

Three sets of slide projectors and overhead projectors are necessary to be provided to one each of the lecture rooms and exercise room. One video deck will be provided for each of the two lecture rooms.

One personal computer will be provided to each of the trainees, thus the number thereof amounts to 20 sets in total. 16-bit popular models of computors which is commonly used in Indonesia will be provided.

4-3-2 Equipment for Creating Training Materials

(1) Types of Training Materials and Necessary Equipment

The training materials include lecture textbooks, video tapes, slides, sheets for the overhead projectors, panels and others, and will all be created at the Center except the panels.

The compilation of the training textbooks will require a set of printing and binding devices and a personal computer which will be used for processing words and data and storing data necessary for preparing text books. A photocopier will be provided for copying materials and for creating sheets for the overhead projector.

A microscope photographic device will be required to take photographs of microbacteria to be used as a training material. An X-Y plotter and a digitalizer, as well as software programs for personal computer will also be provided, which are required for the piping network calculations, and for statistical data processing.

(2) Quantity and Grade

The printers will have a speed of 60 to 120 sheets per minute. The video camera will be of VHS type and have a X6 zoom function. The photocopier has to be a locally-produced product equipped with a sorter. The personal computer is required to be the same as those used for training, and to be a 16-bit machine popularly used in Indonesia. The Quantity of each item of equipment is one for these.

4-3-3 Equipment for Laboratory for Water Quality Analysis

(1) Description of Training and Equipment Necessary

The laboratories will be used to perform training for the physical chemical analysis, the analysis of dissolved heavy metals, biological analysis and the analysis of microorganisms. The training will involve collecting samples, performing pretreatment and storage thereof, adjusting the amounts of test chemicals, and analysis testing and the use of spectroscopes using various types of measuring equipment.

Samples for analysis will be obtained from river water, tap water, the source and treated water obtained from the compact water treatment plant of the Center, leachate from the sanitary landfill plant, the source and treated water obtained from the wastewater treatment plant at the Center, etc.

Water quality analysis items for these types of water are shown below. These items include not only those required by the drinking water standards of WHO but also those for analyzing the component of wastewater and leachate (such as the BOD, COD, etc.) Water quality items are shown as follows.

Analysis Classification	Water Quality Items
Physical and Chemical	Temperature, Appearance, Turbidity, Color, Odor, Taste, pH, Alkalinity, Acidity, Free Carbon Dioxide, Dissolved Oxygen, $KMnO_2$ Consumption, COD, BOD, Nitrate Nitrogen, Nitrite Nitrogen, Ammonium Nitrogen, Albuminoid Nitrogen, Organic Nitrogen, Hardness, Evaporation Residue (Total Solids), Suspended Solids, Dissolved Solids, Electrical Conductivity, Residual Chlorine, Chlorine Requirement, Fluorine, Chlorine Ion, Sulfate Ion, Phosphate Ion, Silicate, Cyanogen, Magnesium, Aluminum, Calcium, Phenols, Anionic Surfastants, Organic Phosphorous, Normal Hexane Abstract
Heavy Metal	Chromium, Manganese, Iron, Nickel, Copper, Zinc, Arsenic, Selenium, Cadmium, Barium, Mercury, Organic Mercury
Biological	Bacteria, Coliform Group, Iron Bacteria, General Biological Test, Chlorophyl
Micro Organic Substances	Organic Chlorine, Acrylamide

The Center will, therefore, be provided with a spectrophotometer, an atomic absorption flame spectroscope, and gas chromatographic apparatus and other equipment for the measurement and analysis of the above-mentioned water quality items, including the materials necessary for performing test, consumables, such as glass wares, and test chemicals, etc.

(2) Quantity and Grade

The quantities of equipment will differ according to the methods of training. The Center will provide trainings by group experiments in principle. There will be five groups of two persons.

Only one for those items of equipment that will not be used frequently will be provided as long as this does not ob- struct the smooth performance of analytical test. Those items which will be frequently used will be provided one set each for every one or two groups, so that the efficiency of testing does not drop. Consumable and chemicals will be provided for one year use.

The measuring devices has to be easily operated since fine operation is necessary. This is especially required for the major testing devices such as spectrophotometer, atomic absorption flame spectrophotometer and gas chromatographic apparatus. Sophisticated data processing devices are not required for the training.

4-3-4 Equipment for the Water Treatment Workshop

(1) Description of Training and Necessary Equipment

A compact water treatment plant will be installed at the water treatment workshop for use in performing various types of training. The following types of equipment will be used with this plant:

> Equipment for training of sieving filter media, Equipment for training in sampling filter media after filtration, Equipment for training in jar testing (a test to determine the amounts of chemicals to be fed in the water treatment processes), Equipment for testing the filtration characteristics of sludge, Equipment for measuring sludge concentration, Equipment for measuring turbidity, pH and electrical conductivity and zeta potential measuring devices for measuring the coagulability.

Among the equipment listed above, those items of equipment for measuring turbidity, pH and electrical conductivity are also provided at physicochemical laboratory. These items of equipment are provided here again, because the quick understand and analysis of these water analysis items is need at the workshop for the proper operation of the compact water treatment plant.

(2) Quantity and Grade

The quantities of this equipment will be determined in the same way as those of the physical-chemical analysis laboratory, using group testing system. Trainees will be divided into five groups in this training, and each group will be provided with one unit of the equipment which is assumed to be used frequency. As for the other items of equipment, one each will be provided for joint use.

(2) Description of Training on Mechanical Facilities and Necessary Equipment

1) Basic Training in the Dismantling, Assembly and Measurement Techniques for Pumps

Used pumps will be dismantled and then reassembled in order to understand their structure. In addition, training in measurement techniques will also be given to determine the diameters of shafts and external measurements, etc. The equipment necessary for this will include general tools, verniers, steel measures and the like. The used pumps will not be included in the procurement items of this Project. Ten trainees will be divided into five groups of two persons when this training is conducted. Five sets of measurement equipment will therefore be required.

2) Pump Installation Training

Pump installation training will be performed using the pump operation training devices. The basic items in the pump installation work include confirmation of the degree of levelness and centering using surface plates, surface gauges, normal set squares, etc. One set of piping valves will be provided for each pump.

3) Training for the Understanding of Pump Structure and Mechanisms

Cross-sectional models of pumps, valves, fire hydrants and air valves and the like will be used to understand the structure and mechanisms.

(3) Quantity and Grade

Since the electrical and mechanical equipment to be used in this training can be used among all trainees (ten) in turn without disturbing the proper proceeding of the training, only one set each will be provided to the Center except tools.

The grade of the equipment will be at the same level as that used in the analysis laboratories, and will be chosen so as to facilitate operation.

4-3-5 Equipment for the Electrical, Mechanical and Pump Workshop

(1) Description of Training on Electrical Facilities, and Necessary Equipment

1) Training in Periodic Inspection Techniques for Electrical Circuits

This training will be conducted to confirm the safety of electrical circuits and their protector circuits. The equipment required for this training are voltmeters, ammeters, frequency meters, wattmeters, power factor meters and other basic equipment used in the test of electrical circuits.

2) Training in Inspection and Daily Maintenance Techniques for Electrical Circuits

This training will be performed for the acquisition of techniques for the daily maintenance and inspection of current leaks in the insulation of electrical circuits. The equipment necessary for this includes insulation testers, leak testers, etc.

3) Training on the Basic Principles of Instrumentation

This is training will be conducted for understanding the process of conversion of current and voltage signals into the displays of differential voltage instruments. The instruments that will be used for this training include VI converters, instrumentation signal transmitters, voltmeters and ammeters, etc.

The equipment has to be easy to use and failure-free. All equipment is to be in conformity with the following standards: the Japan Industrial Standards (JIS), the Standards of the Japan Electrical Manufacturers' Association (JEM), and the Standards of the Japanese Electrotechnical Committee (JEC).

4-3-6 Equipment for the Piping Workshop

(1) Description of Training, and Necessary Equipment

1) Training on Piping Works of Distribution and Service Pipe

In this workshop, the jointing and processing training for distribution pipes and training for the use of various types of joints will be given through the jointing of straight pipes, and the connection of valves, fire hydrants and fittings. Water pressure test will also be performed in order to confirm the workmanship of connection. The pipe types handled will be ductile cast steel pipes (A-type and T-type), galvanized steel pipes and polyvinyl chloride pipes.

The necessary materials will be the above pipes, various types of joints and valves, air valves and fire hydrants, etc.. In addition, hand pumps for water pressure test, cutting equipment and welding equipment will also be provided.

Piping training for service pipes will use a typical model house with a concrete foundation of house, and training will be conducted for the actual processing and piping work for simulated conditions for distribution and service piping work.
The necessary materials include processing and piping tools including 13 mm diameter PVC pipes used as the service pipes, galvanized steel pipes, fittings and valves, etc.

2) Training in Testing Water Meters

Training in the installation of water meters and their connection to service pipes, and the test of the water meters (both fixed and portable) will be implemented in order to check the accuracy of water meters. The necessary equipment includes water meters and water meter testing devices.

3) Leak Survey Training

The leak survey training will be conducted to confirm the positions of buried pipes, to understand the use of leak detectors to determine the places of water leaks. Measurement of the amount of leakage will be performed by measuring the water pressure. The equipment necessary to perform this includes pipe locators (for metallic and non-metallic pipes), leakage detectors, pressure gauges and flowmeters.

(2) Quantities and Grade

1) Equipment for Distribution/Service Pipe Processing and Piping Training

The pipe processing and piping training will be alternately performed by two groups using three types of pipes. In the training for one course, one piece of pipe of each three types will be used up for pipe cutting, processing and connecting training. Therefore, the same number of pipes of each three types as that of courses conducted is necessary for a year.

The service pipe training involves the cutting, processing and connecting by using one straight service pipe. Therefore, the number of straight pipe will be used at the rate determined by the number of trainees per year.

The PVC distribution and service pipes used are to be local products, while pipes of other materials, the valves and equipment used is to be in conformity with the Japan Industrial Standards (JIS) and Japan Water Works Association (JWWA) Standards.

2) Equipment for Water Meter Testing Training

Only one water meter testing device is to be provided since it can be used for the testing of 10 or more water meters at the same time. Ten water meters which are the same with the number of trainees will be provided in total.

The grade of the equipment is to be in conformity with JIS.

3) Equipment for Leakage Survey Training

One pipe locator and one leakage detector are to be provided for every group of two persons. As for the pressure gauge and flowmeter are to be provided two each for each influent and effluent pipe to and from the leakage survey training yard, since, the measurement will be conducted simultaneously.

The grade of the materials is to be such that the use of the water leakage detectors is facilitated.

4-3-7 Environmental Sanitation Workshop Equipment

(1) Description of Training, and Necessary Equipment

The environmental sanitation workshop will perform training for the collection, treatment, disposal and analysis of solid waste and night soil.

l) Training in Waste Collection, Disposal and Analysis

The following training will be performed for the collection, processing and analysis of waste.

a) Training in the actual collection of municipal wastes using a garbage collection truck
b) Sanitary landfill training using the collected wastes
c) Stabilization training for the solid wastes using household plastic buckets
d) Training in the analysis of the wastes, the analysis of the landfill leachate, and the gases generated at the sanitary landfill site.

The necessary equipment includes the garbage collection vehicle and household plastic buckets, and also the various types of equipment necessary for the analysis of the quality of the solid waste, leachate and gases. In addition, the equipment to be supplied at the sanitary landfill site must include a belt conveyor, tampers and shovels. the analysis equipment to be supplied includes the following items, but those items for water quality analysis for which workshop analysis is not necessary will be performed at the physical chemical and biological laboratories.

a) Garbage quality:
   Composition, Bulk specific gravity, Water content, Combustibles, Heat generation, Carbon-Hydrogen, Chlorine-Sulfur, Lead, Cadmium, Arsenic, Hexavalent Chromium
b) Leachate quality:
   Organic phosphatic compounds, Lead, Cadmium, Arsenic, Hexavalent Chromium, Microorganism, Bacteria, Oxidation-reduction potential, pH, BOD, COD, Dissolved oxygen, Suspended solids (SS)
c) Gas quality:
   Odorous compounds such as mercaptans

2) Night-soil Treatment and Quality Analysis Training

The training for night-soil treatment will use the various types of wastewater treatment plants (for details, refer to the facility plan) provided at the Center. The training will be implemented to perform and understand water quality analysis for differences in the quality of the treated water due to the type of structure, and the treatment methods. In addition, the small-scale wastewater treatment unit for night soil etc. will be used to perform actual wastewater treatment as part of the training for understanding the wastewater treatment process and for the analysis of the quality of the treated water.

(2) Quantity and Grade

The quantities of the equipment to be provided in the workshop are basically set according to the group training system, in the same way as was considered for the physical chemical analysis laboratory and the water treatment workshop. Trainees will be divided into four groups, and the amounts of the equipment will be determined by taking the frequency of use and the usage time into account.

In addition, the grade of the equipment will be set in the same manner as was adopted for the physical chemical analysis laboratory, so as not to cause any obstruction for operation.

4-3-8 Other Equipment

(1) Vehicles for Training

The inspection of water treatment plants and garbage treatment plants will be performed as part of the training in the waterworks and the environmental sanitation basic course (20 trainees). In the advanced course (10 trainees), training will also be performed to take samples from rivers and dams and diagnose the actual state through observing the conditions at waste landfill sites.

To perform this training, one microbus (28 passengers) to be used for site observation, and two jeeps (6 persons) to be used for site training will be provided. These vehicles will be locally produced.

In addition, a packer type garbage collection truck will also be provided.

(2) Furniture for Training

Six-person workbenches will be provided on the assumption of two groups in the electrical, machine and pump workshop, and the piping workshop.

Work tables will be provided for the creation of training materials and the preparation of devices and equipment in the Maintenance and Logistics Section, the analysis laboratory equipment storeroom and the pump workshop.

Cabinets will be provided for storing the precision measuring equipment at the laboratories, water treatment workshop, environmental sanitation waorkshop, electrical mechanical pump workshop, respectively.

Shelves will be provided for the storage of various types of glass ware, consumable items and parts, and will be provided in the laboratories and each workshop. They will also be provided in the preparation room for the lecture rooms for storing training materials.

The desks and chairs to be used by the trainees in the exercise rooms will be of a size suitable for draining and others desk works while referring to other materials. A set of 20 desks and chairs will be provided in the personal computer training room along with 20 personal computer sets (CRT + main unit, keyboard, printer). The lecture rooms adjoining the workshops will have a lecture type table and chairs, as well as a white board.

Desks and chairs for the instructors will be provided in the lecture rooms, the exercise room, the lecture rooms adjoining the workshops, and in the computer training room.

There will be two sets of (6 person) reading desks and chairs in the library, as well as open shelves for 5,000 volumes.

(3) Equipment for Seminars and Conference

There will be one overhead projector, one conference table, 20 chairs provided for use at conferences and meetings. A total of 80 folding chairs will also be provided for use on formal occasions.

(4) Furniture for Dormitories and Canteen

Beds, desks, chairs and lockers will be provided in each of the dormitory rooms and in the caretakers' flat. The dining room will be equipped with dining tables and chairs for 75 persons.

LIST OF TRAINING EQUIPMENT

A. GENERAL TRAINING EQUIPMENT

	ITEM	SPECIFICATION	QUANTITY
1.	Slide Projector	Circular tray type, 80 slides holder, with a recorder and a table	3
2.	Overhead Projector	Stage with zoom: 280 x 280 mm	3
3.	Color TV Set and VTR	With PAL, VHS and Beta	2
4.	16mm Sound Projector	350W Xenon-arc lamp, channel leading mechanism	1
5.	Personal Computer	16-bit CPU with 14" CRT, Printer and software	20
6.	Ovehead Projector	Reflection type, portable	1
7.	Pannel	Water Supply System, Solid Waste Disposal System, etc.	1 lot
8.	Curivimeter & Planimeter		20

B. TEACHING MATERIAL MAKING EQUIPMENT

	ITEM	SPECIFICATION	QUANTITY
1.	Offset Priniting Machine	60-120 sheets/min. with accessories	1
2.	Plate Making Machine	Plate making speed: 41-46 sec/plate	1
3.	Paper Cutter		1
4.	Bookbinding Machine	Including stapler and punch	1
5.	Photomicroscope	Microscope and Camera with automatic exposure controller	1
6.	Video Camera	VHS, 6:1 Power Zoom Lens	1
7.	Photo Copy Machine with Table	Max. A3 size, with sorter	1
8.	Slide Making Machine	Blue Slide	1
9.	Digitizer	A2 size	1
10.	XY Plotter	A1 size	1
11.	Personal Computer	16-bit CPU with CRT & printer	1
12.	Software	Network Analysis, Statistic Calculation	1

C. WATER QUALITY EXAMINATION EQUIPMENT

	ITEM	SPECIFICATION	QUANTITY
	ANALYSIS AND MEASUREMENT EQUIPMENT		
1.	Table Balance	Max. measurement: 2 kg Sensitivity: 0.1 g to 10 g and 10 g to 2 kg	2
2.	Top Loading Balance	0-4100 g and 0-600 g, Min. 0.01 g	2
3.	Analytical Balance with Table	0-200 g, Min. 0.1 mg	2
4.	Rotary Evaporator	With 4 l Water Bath and Glassware set	2
5.	Spectrophotometer	Wave length: 200-2000 nm Repeatablity: 2 nm	5
6.	Atomic Absorption Flame Spectrophotometer	With CRT, Wave length: 190-900 nm	1
7.	COD Reflux Apparatus	With Erlenmayer flask	2
8.	Nitrate Nitrogen Heating Chamber	Automatic Temperature Control System With movable distillation tray	1
9.	Phenol Distillation Apparatus	Automatic Temperature Contorl System movable distillation tray	2
10.	pH Meter	Range: 0-14 pH, Accuracy: 0.01 pH	5
11.	Gas Chromatographic Apparatus	ECD, TCD-FID	1
12.	Portable Residual Chlorine Meter	Range: 0-10 mg/l, Accuracy: 0.1 ppm (10-30°C)	5
13.	Thermometer	0-300°C and -20 - 100°C each	10
14.	Turbidity Meter	3 Range, Max. 0-500 NTU	1
15.	Conductivity Meter	3 Range, Max. 0-10 S/cm	1
16.	DO Meter	Range: 0-19.99 ppm, Accuracy: 0.1 ppm	1
17.	Florine Ion Concentration Meter		1
18.	pH Comparatus	Range: 4.0-5.8, 5.0-7.4, 6.8-8.4	2
19.	Portable Water Analysis Kit	Degital direct reading type 50 items of water quality	1
20.	Ammonium Ion Distilling Apparatus		2

C. WATER QUALITY EXAMINATION EQUIPMENT (Cont'd)

	ITEM	SPECIFICATION	QUANTITY
21.	Kjeldahl Nitrogen Distilling Apparatus		2
22.	Aspirator	12 l/min	2
23.	Bioassay Tank		1
24.	Microscope	Binocular, 45° Inclined, magnification adjustment	5
25.	Accessories for Microscope	Slide and cover glass	5
26.	Colony Counter	Count No.: Max. 9.999 Petri dish: Max 124 mm	5
27.	Stereoscopic Microscope	Binocular, 55° Inclined, zoom	2
	GENERAL EQUIPMENT		
1.	Water Still with Table	1.8 l/hr, Still & Ion Exchange Method	2
2.	Chemical Storage Cabinet	2-14°C, 700 l	2
3.	Toxic Chemical Storage Cabinet	With key	1
4.	Desicator	Plastic ware	20
5.	Drying Oven	40-200°C, 150 l	1
6.	Hot Plate	50-350°C, Aluminum-plate with thermistor	2
7.	Shaker	Horinzontal shaking type	2
8.	Water Bath	5-110°C, 0.2-0.4°C, 8 l	5
9.	Electric Muffle Furnace	100-1150°C, 1.5°C	1
10.	Incubator	BOD, 20°C 0.5°C, 332 l	1
11.	Incubator (Low Temperature)	-10 - 60°C, 1°C, 250 l	1
12.	Incubator	Room temperature +5-60°C, 300 l	2
13.	Drying Sterilizer	Max. temperature 250°C, 300 l	1
14.	Autoclave	100-130°C, 1.7 kg/cm2	1

C. WATER QUALITY EXAMINATION EQUIPMENT (Cont'd)

	ITEM	SPECIFICATION	QUANTITY
15.	Magnetic Stirrer	200-2500 rpm	10
16.	Multi Magnetic Stirrer	300-2500 rpm, 100-100 ml x 6	2
17.	Centrifuge	Max. speed: 5,000 rpm, Max. force: 4,500 x G	2
18.	Ultrasonic Cleaner	30 l	1
19.	Stabilizer	3 KVA, AC 220V	1
20.	Ion Exchanger	25 l/hr	1
21.	Vacuum Pump	635 mm Hg	2
22.	Laboratory Wastewater Treatment Apparatus	Acid, alkali, heavy metal 20-50 l/cycle	1
23.	Ice Machine		1
	MISCELLANEOUS EQUIPMENT		
1.	Ryroth Type Water Sampler	Stainless steel, 1,000 ml, 500 ml	2
2.	Water Sampler	Kitahara, Van Dorn and Inversion type	1
3.	Bottom Sludge Sampler	Stainless steel	1
4.	Current Meter	Propeller type, magnetic type	1
5.	Plankton Net	Kitahara type	2
6.	Miscellaneous Sampling Equipment	Sampling bottle, cooler-box, etc.	1 lot
7.	Miscellaneous Laboratory Equipment	Funnel support, stand, etc.	1 lot
8.	Laboratory Glassware	Beaker, flask, pipet, test tube, etc.	1 lot
9.	Plastic & Other Water	Plastics, rubber goods, etc.	1 lot
10.	Filter Paper	Filter paper, membrane filter, etc.	1 lot
	CHEMICALS		
1.	Chemicals	For one year	1 lot

C. WATER QUALITY EXAMINATION EQUIPMENT (Cont'd)

	ITEM	SPECIFICATION	QUANTITY
	OTHERS		
1.	Washing Shelf	Stainless steel	3
2.	Stop Watch		10
3.	Plastic Container	660x420x100, 10 boxes/set	1
4.	Lab-Cart	Stainless steel, with caster and stopper	1
5.	Hand Truck	Max. 300 kg, stainless steel	1
6.	Laboratory Tools	Pliers, nippers, etc.	1 lot
7.	Laboratory Wear	White robe, M-size-10, L-size-10	2 set
8.	Laboratory Glove		20
9.	Mercury Barometer		1

D. WATER PURIFICATION WORKSHOP EQUIPMENT

	ITEM	SPECIFICATION	QUANTITY
1.	Sieve Shaker with Sieves	Mesh 3 1/2-60 (10 types)	1
2.	Sampling Tube for Filter Sand	Stainless steel, 20 x 1200 mm	5
3.	Stainless Measuring Cup for Filter Sand & Gravell	500 ml	20
4.	Table Balance	Max. 2 kg Sensitivty: 0.1 g to 10 g and 10 g to 2 kg	1
5.	Top Loading Balance	0-4100 g and 0-600 g, Min. 0.01 g	1
6.	Enameled Tray for Filter Material	Stainless steel, 2 types	5
7.	Evaporating Dish	Porcelain, 90 mm & 110 mm	50
8.	Magnetic Stirrer	200-2500 rpm	5
9.	Jar Tester	6 pcs beakers/unit, stainless steel	5
10.	Filtrability Test Kit	With vacuum pump & glassware	1
11.	Box Shaker	500 x 400 x 150mm, with 15 pcs glass flask	1
12.	Turbidity Meter	3 ranges, 0-500 NTU	1
13.	Centrifuge	Max. 500 rpm, 4,500 x G	1
14.	Drying Oven	400-200°C, 150 l	1
15.	pH Meter	Range: 0-14 pH, 0.01 pH	5
16.	Water Still with Table	1.8 l/hr, Still & Ion Exchange Method	1
17.	Ultrasonic Cleaner	30 l	1
18.	Hand Truck	Max. 300 kg, Stainless steel	1
19.	Test Tube Support	Stainless steel, 24 bottles	4
20.	Specific Gravity Meter	19 pcs/set, Min. 0.001	2
21.	Conductivity Meter	3 Range, Max. 0-10 s/cm	1
22.	Zeta Potential Measuring Apparatus	Cell, ceill holder, and electrode	5

D. WATER PURIFICATION WORKSHOP EQUIPMENT (Cont'd)

	ITEM	SPECIFICATION	QUANTITY
23.	Ladder	Aluminum, H 21.5 m	1
24.	Clock	Battery type tableclock	2
25.	Glassware	Miscellaneous glassware for one year	1 lot
26.	Water Bath	20 l	1

E. ELECTRICAL, MECHANICAL & PUMP WORKSHOP EQUIPMENT

	ITEM	SPECIFICATION	QUANTITY
	ELECTRICAL TRAINING EQUIPMENT		
1.	Oscilloscope	CRT8 x 10 div(1 div=1cm) CH1, CH2	1
2.	Portable DC Potentiometer	(10.0mV to 111.1V) in 4 or 5 digits	1
3.	Standard Resister	1 ohm, 4-terminals, Accuracy: 0.005%	1
4.	Portable Wheatstone Bridge	Range: 1000 ohm to 10 M ohm	1
5.	Portable Double Bridge	Range: 0.1 m ohm to 110 ohm	1
6.	Galvanometer	Sensitivity: 0.9 micro A/div. 0.1%, 540 micro V/div. 15%	1
7.	Portable Standard Voltmeter	Accuracy: 0.5%, 5 Range	2
8.	Portable Standard Ammeter	Accuracy: 0.5%, 6 Range	2
9.	Portable Volt-Ammeter	Accuracy: 0.5%, Volt: 13 Range Current: 17 Range	2
10.	Portable Frequency Meter	Accuracy: 0.2%, 45-65 Hz	1
11.	Portable Standard Wattmeter	Accuracy: 0.5%, 3 Range	1
12.	Portable Power Factor Meter	Accuracy: 3.0%, 240V, 1/5A	1
13.	Insulation Tester	500V/100M ohm, 10%, 0-600U	1
14.	Earth Tester	Accuracy: earth voltage 5%	1
15.	Circuit Tester	Max. 1250V, 30 M ohm, 500 mA	1
16.	Clamp Meter	Max. AC 800A, AC 600V, 50 K ohm	1

E. ELECTRICAL, MECHANICAL & PUMP WORKSHOP EQUIPMENT (Cont'd)

	ITEM	SPECIFICATION	QUANTITY
17.	Leakage Current Tester	Accuracy: 2.5%, with test box	1
18.	Digital Voltage & Current Checker	DC/AC-V 5 Rang, DC/AC-A2 Range	1
19.	DC Power Supply Unit	AC 220V 400W, DC 25.8V 0.5%	1
20.	VI Converter	Accuracy: 0.5%, DC1-5V	1
21.	System Power Supply Unit For Instrumentation Signal	0-5 V, 0-20 mA, 5%	1
22.	Electrical Tools	Wiring tools (Plyers, nipper, etc.)	1 lot
	MECHANICAL TRAINING EQUIPMENT		
1.	Venier Caliper	0-200 mm with dial & gauge	5
2.	Dial Gauge	Dial indicator & magnetic base Range: 0-1 mm, 0-5 mm	1
3.	Steel Rule	Range: 0-30 cm, 0-100 cm Min. graudation: 0.5 mm	5
4.	Surface Plate	Cast iron, 600x600x100 mm	1
5.	Portable Electric Drill	6.5 mm steel 2 pcs, 2500 rpm	1
6.	Portable Engine Pump	80mm, 1.2 m3/min, 24m, with 5 l Fuel Tank	1
7.	Surface Gauge	250 mm	1
8.	Square	Tempered steel I beam type	1
9.	Mechanical Tools	Mechanical tool set	5
10.	Cut Model	Centirfugal pump	1
11.	Cut Model	Fire hydrant	1
12.	Cut Model	Sluce valve, air valve	1
13.	Vibration Meter	Range: 10-1000 Hz, Accuracy: 5%	1
14.	Noise Meter	Range: 30-130 dB(A)	1

F. PIPE WORKSHOP EQUIPMENT

	ITEM	SPECIFICATION	QUANTITY
	PIPING TRAINING EQUIPMENT		
1.	Ductile Iron Pipe	Dia. 100 mm, A type, Class 3	11
2.	Ductile Iron Pipe	Dia. 100 mm, T type, Class 3	11
3.	Specials	Dia. 100 mm, A type	1 lot
4.	Specials	Dia. 100 mm, T type	1 lot
5.	Valve	Dia. 100 mm, Sluice valve	2
6.	Valve	Dia. 75 mm, Sluice valve	2
7.	Valve	Dia. 13 mm, Stop valve	2
8.	Air Valve	Dia. 25 mm, single	2
9.	Fire Hydrant	Dia. 75 mm, single	2
10.	Lubricant	For jointing	2
11.	Galvanized Steel Pipe	Dia. 300 mm	8
12.	Galvanized Steel Pipe	Dia. 100 mm, SP for threading	11
13.	Galvanized Steel Pipe	Dia. 100 mm, SP for welding	11
14.	Specials	Dia. 100 mm, Specials for threading	1 lot
15.	Valve	Dia. 13 mm, Stop valve	2
16.	Polyvinyl Chloride Pipe	Dia. 100 mm, RR type	9
17.	Specials	Dia. 100 mm, RR type	1 lot
18.	Valve	Dia. 13 mm, Stop valve	2
19.	Repairing Saddle	For leakage repairing	2
	SERVICE PIPE		
1.	Polyvinyl Chloride Pipe	Dia. 13 mm, TS type	80
2.	Galvanized Steel Pipe	Dia. 13 mm, SP for threading	80
3.	Specials	Dia. 13 mm, Polyvinyl chlolide pipe	1 lot
4.	Specials	Dia. 13 mm, Galvanized steel pipe	1 lot
5.	Valve	Dia. 13 mm, Stop valve	10
6.	Faucet	Dia. 13 mm	10

F. PIPE WORKSHOP EQUIPMENT (Cont'd)

	ITEM	SPECIFICATION	QUANTITY
	EQUIPMENT & TOOLS		
1.	Pipe Threading Machine	Motor: 700 W, 26 rpm Stroke: 135 mm With accessories	1
2.	Pipe Cutter	Dia. 13-100 mm, Engine type With spare teeth	2
3.	Pipe Cutter for PVC Pipe	Dia. 40-100 mm, with spare teeth	2
4.	Gas Welding Machine	Gas welder, gas cylinder & accessories	1
5.	Arc Welding Machine	Welding power supply, torch, horses & accessories	1
6.	Air Compressor	3.7 KW, 3 phase, 9.9 kg/cm2(Max) 2 Cylinders	1
7.	Movable Crane	2 tons, effective lifting height: 2.7 m	2
8.	Chain Block	2 tons, Manual	2
9.	Disc Grinder	Center wheel: 180 mm, 1050 W	2
10.	Grinder		1
11.	Pipe Jointing Tools	Feeler gauge, brush, wire rope, Tie-jack, etc.	1 lot
12.	Pipe Wrench		1 lot
13.	Pipe Stand	Wooden, square timber	15 set
14.	Welding Machine for PVC	Including PVC plate	1
	WATER METER TESTING EQUIPMENT		
1.	Water Meter Testing Equipment	Water tank, flowmeter, work table, pipes & valves	1 unit
2.	Water Meter	Dia. 13 mm, Vane wheel type	10
3.	Portable Water Meter Tester	2.4 m3/hr Accuracy: 4% (10 to 100 1/hr) 2% (100 to 2000 1/hr)	1
4.	Water Pressure Gauge	For water tap	5

F. PIPE WORKSHOP EQUIPMENT (Cont'd)

	ITEM	SPECIFICATION	QUANTITY
	LEAKAGE SURVEY TRAINING EQUIPMENT		
1.	Leak Detector	Headphone, amplifier, sensor	5
2.	Pipe Locator	For metal pipe, electromagnetic wave type, transmitter, receiver & antenna	5
3.	Piple Locator	For metal & non-metal pipe, sound wave type, oscillator, vibrator receiver & sensor	1
4.	Water Pressure Gauge	For ground type fire-hydrant, Max. 7 kg/cm2	2
5.	Portable Flowmeter	Ultrasonic flowmeter with printer	4

G. ENVIRONMENTAL SANITATION WORKSHOP EQUIPMENT

	ITEM	SPECIFICATION	QUANTITY
1.	Bucket	Plastic, 25 l	10
2.	Platform Scale	Range: 0-50 kg	1
3.	Table Balance	Range: 0-2 kg	1
4.	Tray	Stainless steel, 2 kinds	10
5.	Top Loading Balance	0-4100 g & 0-600 g, Min. 0.01 g	1
6.	Pulverizer	Wiley's pulverizer: 2.5 kg/hr	1
7.	Electric Muffle Furnace	100-1150°C, Automatic temperature control type	1
8.	Desicator	Plastic	10
9.	Calorimeter	Automatic calorimeter with oxygen cylinder	1
10.	Thermometer	Beckman type	2
11.	Drying Oven	40-200°C, 150 l	1
12.	C/H Analyzer	Standard type	1
13.	S/cl Analyzer	Standard type	1
14.	Hand Truck	Max. 300 kg, Stainless steel	1
15.	Home Compositing Apparatus	Plastic, 33 lit	10
16.	Oxidation-Reduction Potential Meter		1

G. ENVIRONMENTAL SANITATION WORKSHOP EQUIPMENT (Cont'd)

	ITEM	SPECIFICATION	QUANTITY
17.	pH Meter	Range: 0-14 pH, Accuracy: 0.01 pH	2
18.	pH Comparator	Range: 4.0-5.8, 5.0-7.4, 6.8-8.4	2
19.	COD Reflux Apparatus	With Erlenmayer flask	2
20.	Incubator (Low Temperature)	-10-60°C, 1°C, 250 l	1
21.	BOD Bottle	100 cc	250
22.	DO Bottle	100 cc	100
23.	DO Meter	Range: 0-19.99 ppm, Accuracy: 0.1 ppm	1
24.	Transparency Meter		5
25.	Water Still with Table	Distillation Method, 2 l/hr	1
26.	Magnetic Stirrer	200-2500 rpm	5
27.	Titration Apparatus	Manual titrator, vol. buratte: 50, 100 ml	2
28.	Laboratory Glassware	Miscellaneous glassware for one year	1 lot
29.	Helmet		20
30.	Gloves	Rubber	20
31.	Rubber Boots		20
32.	Belt Conveyor	60 cm x 5 m	1
33.	Tamper	3 ps, Compaction force: 5.5 t (max.)	1
34.	Shovel		5
35.	Experimental Apparatus For Waste Water Treatment	Activated Sludge Method, and Rotating Biological Contact Method	2 set

H. VEHICLE

	ITEM	SPECIFICATION	QUANTITY
1.	Microbus	28-seater	1
2.	Garbage Collection Vehicle	2 ton rear-loaded compaction type	1
3.	Jeep	6-seater	2

I. FURNITURE FOR TRAINING

ITEM	SPECIFICATION	QUANTITY
1. Bed	Wooden 1,000 W x 2,000 L	84
2. Desk & Chair	Wooden 700 W x 1,200 L	84
3. Locker	Wooden 600 W x 600 L	84
4. Dining Table & Chair	Wooden 900 W x 1,800 L	12
5. Desk & Chair for Exercise Room	Wooden 600 W x 900 L	20
6. Desk for Computor Room	Steel (2 seats) 700 W x 900 L	20
7. Chair	Steel, office chair	20
8. Lecture Table	Wooden 600 W x 900 L	6
9. Desk & Chair for Lecture Room	Steel 450 W x 600 L	60
10. Working Bench	Steel, with linoleum, 1,200W x 2,500L	6
11. Working Table	Steel, with melamine, 700W x 1,200L	4
12. Desk & Chair for Reading Room	Wooden (6 seats) 900 W x 1,800 L	2
13. Bookshelf	Steel 2,000W x 300L x 2,200H	10
14. Cabinet	Sttel, with a glass door, 1,800W x 450L x 1,800H	13
15. Steel Shelf	6 shelves, 1,800W x 450L x 1,800H	22
16. Meeting Table	Steel, with melamine, 1.600W x 762L	12
17. Meeting Chair	Steel, with leather	24
18. White Boad	1,800 W x 1,200 L	7
19. Folding Chair for Seminar	Steel	100
20. Rostrum	Wooden	1

CHAPTER 5 PROJECT IMPLEMENTATION PLAN

CHAPTER 5 PROJECT IMPLEMENTATION PLAN

5-1 Method of Project Implementation

5-1-1 Implementation Structure

(1) Main Implementing Body

The main implementing body for the Project is the Directorate General of Human Settlements of the Department of Public Works. Important matters will be decided by an Executive Board , which is to be headed by the Director General and composed of the Secretary of the Directorate General and the Directors of Planning and Programming, Water Supply, Environmental Sanitation, and Public Building. The Director of Water Supply will be the central figure in project implementation, with an Implementing Committee to be organized under him for detailed implementation, consisting of members of the various Directorates within the Directorate General.

(2) The Consultant

After the Exchange of Notes (E/N) between the two countries, a Japanese consulting firm will, pursuant to Japan's procedures for grant-aid, conclude a consulting services contract with the Directorate General of Human Settlements, based on which the consultants will undertake the following works:

1) Detailed Design Stage
   Preparation of detailed design drawings, specifications, and tender documents

2) Bidding Stage
   Cooperation in the selection of contractor and contract

3) Construction Stage
   Supervision of construction work and equipment procurement

(3) The Contractor

A Japanese firm, selected by competitive bidding, will handle the construction work as well as the production, supply, and transport of the required equipment based on the Contract. In addition, upon delivery of the facility and equipment, it will provide technical guidance in operation and maintenance of the facilities.

(4) Japan International Cooperation Agency (JICA)

The Grant-aid Project Management Department of JICA, together with its Indonesian office, will provide guidance to the consulting firm and the contractor to ensure that the Project is implemented in accordance with Japan's system for grant-aid. It will generally facilitate Project implementation and will hold discussions, as necessary, with the Indonesian implementing body.

5-1-2 Scope of the Project

The construction of the Center will be implemented on the basis of reciprocal cooperation between Japan and the Republic of Indonesia. The scope of the Project to be implemented on the basis of the grant-aid program of the Government of Japan and the undertakings to be carried out under the responsibility of the Republic of Indonesia are as outlined below:

(1) Scope of the Project to be Covered by the Japanese Grant-Aid

1) Consulting services

a) Detailed design of facilities and selection of equipment to be covered by the Japanese grant-aid; preparation of detailed design documents and drawings (in the Indonesian language), as required for the building permit

b) Preparation of the tender instructions

c) Cooperation in connection with the selection of and contract with the contractor

d) Supervision of construction work and equipment procurement, including both general supervision from Japan and resident supervision in Indonesia

2) Construction work

a) Buildings:
main building, 2 workshop buildings, 2 dormitories, 1 canteen, and 5 ancillary buildings for staff rest, garages, and storage.

b) Exterior facilities:
on-premise roads, parking area, outdoor facilities for water supply and drainage, outdoor electrical facilities (excluding PLN substation)

c) Training plants:
indoor and outdoor training plants

3) Equipment procurement

a) Training equipment:
to include general training equipment, equipment to produce instructional materials, laboratory equipment, equipment for practical training, vehicles and furniture for training use, as shown in the equipment list in Chapter 4

b) General use equipment:
equipment for conference use, furniture for use in dormitories and canteen, as shown in the equipment list in Chapter 4

(2) Undertakings of the Government of Indonesia

The Government of Indonesia will be responsible for the following activities, which will not be undertaken by the Government of Japan:

1) Consulting Services

a) Design and supervision of construction work of facilities to be constructed by Indonesia, including the preparation of tender documents

b) Obtaining of building permits for the Project facilities and handling the required filing procedures for these permits

2) Construction Work

a) Buildings:

PLN substation and all other buildings and facilities not included in the Japanese scope

b) Exterior work:

Fencing and gates; landscape and gardening work

c) Infrastructure work:

--- Power receiving and transforming facilities
--- Telephone lines
--- Wells on site or water intake facility from city main, including piping work up to the receiving tank
--- Drain ditch to be located at the front of the site
--- Paving of approach road

3) Equipment Procurement

a) Equipment for general use:

vehicles other than for training use; office equipment for general use

b) Furniture:

general office furniture, office supplies, sheets, blankets, other linens, curtains, carpets, tableware, kitchen equipment, electric fans, refrigerator

4) Tax Exemptions:

a) Duty exemption for equipment and materials imported from Japan in connection with the Project

b) Exemption from or assumption of VAT (value-added taxes) which may generally be imposed in connection with project implementation

c) Exemption from customs duties, internal taxes, and other surcharges usually assessed in Indonesia for Japanese nationals entering the country to carry out functions in connection with the Project

5) Assumption of Miscellaneous Charges

a) Commissions in connection with the Banking Arrangement

b) Costs in connection with 1) - 3) above

c) Expenses in connection with tax exemption procedures

d) Other charges apart from those to be assumed by Japan

6) Provision of Facilities

a) Extending necessary facilities in connection with immigration and residence of Japanese nationals entering and residing in Indonesia to carry out functions related to the Project

b) Extending facilities in relation to the prompt customs clearances and internal transport formalities for materials and equipment imported from Japan

5-1-3 Implementation Methods

(1) Selection of Consulting Firm and Description of Consulting Services

The Government of Indonesia shall select and contract with a consulting firm (individual or corporation) of Japanese nationality, based on a direct negotiation system.

The Japanese consultants will provide implementation designs and supervision for the Project in accordance with the Contract with the Directorate General of Human Settlements. "Implementing design " refers to establishing the detailed specifications for facilities and equipment, based on this Basic Design Study, and preparing tender documents which consist of detailed design drawings, specifications, tender instructions, and draft contracts, including cost estimates for the construction and procurement work.

"Supervision" refers to confirming that the contracting work is being implemented in accordance with the contract documents; insuring that the contract is being properly carried out in all its details; providing impartial guidance, advice, and coordination services to expedite the Project. These supervisory services will include the following:

1) To carry out all necessary procedures for the selection of the contractor, including the implementation of tenders and witnessing the contract

2) To inspect and approve shop drawings, specifications, and other documents for materials and equipment to be used, as submitted by the Contractor

3) To inspect and approve the quality and performance of equipment to be installed and materials to be used

4) To provide overall supervision of the construction and procurement work

5) To control the progress of the work and report to the implementing body

6) To carry out an interim inspection and final inspection and witness the turnover of the Project

In addition to the above, the consultants will periodically report to JICA and other concerned officials of the Government of Japan on progress of the work and other aspects of the Project.

(2) Selection of Contractor and Contracting System

The firms involved in the construction work and equipment procurement will be selected on the basis of competitive bidding opened to consortiums of a general contractor and trading company of Japanese nationality, subject to pre-qualification.

The system of contract will be a lump-sum contract with the successful bidding consortium.

5-2 Construction Plan

5-2-1 Basic Policy and Special Considerations

As mentioned above, the construction of facilities for the Project is essentially to be carried out on the basis of reciprocal cooperation between the companies concerned in Japan and Indonesia which will undertake their respective areas of responsibility.

Since the target facilities of the Project must be completed within a time period limited by the Japanese fiscal system, the construction work shall be carried out on schedule and efficiently with due regard to the following points:

1) The on-site drainage work, which forms part of the Indonesian undertakings, should be started as soon as possible so as to avoid any interruption in the construction work due to temporary flooding of the site area from heavy rains.

2) In order to ensure progress in the construction work, paving work on the approach road, including strengthening of the load capacity of the existing bridge near the site, which is also part of Indonesia's responsibilities, should similarly be started at the earliest possible time.

3) Special care should be taken to avoid disrupting the daily lives of residents in the vicinity of the construction area, particularly with respect to the safe operation of construction vehicles.

5-2-2 Construction and Supervisory Systems

(1) Construction System

Work for the Project is to be carried out under a lump-sum contract by a consortium of Japanese registry, under the management of the West Java Construction Supervision Office of the Directorate General of Human Settlements and supervision by the Consultants. For this purpose, the construction consortium should be made up at least of the following members, who will be required to be present on the site during the required periods in accordance with their respective responsibilities:

Function	Number of Persons	Period
Field superintendent	1	From start of construction to facility turnover
Construction engineers	2	Ditto
Electrical engineer	1	From completion of foundation work to turnover
Mechanical engineer	1	Ditto
Plant installation engineers	2	At time of installation
Equipment manager	1	At time of installation
Administrative manager	1	From start to turnover

It is desirable that the consortium carry out the construction work with maximum possible cooperation from the Indonesian construction companies.

(2) Supervisory System

The consultants will supervise the construction work of the consortium by dispatching at least one resident supervisor who will supervise the work on behalf of the implementing body (Directorate General of Human Settlements) and as the representative of the Consultant. This resident engineer will provide technical guidance to the contractor and supervise the progress of the work. He will also submit progress reports to the implementing body and JICA, maintain liaison with concerned government agencies, and serve as a coordinator between the Contractor and the implementing body.

5-2-3 Procurement Plan for Materials and Equipment

(1) Facilities

The Project facilities have been planned to apply general construction methods prevailing in Indonesia. For this reason, it should be possible to procure many of the construction materials within the country. However, in the case of certain metal products and electrical/mechanical equipment that are not produced in Indonesia or are felt to pose quality problems in terms of constructing stable buildings, sourcing will be done in Japan.

In the case of the small-size water treatment plant for training use and the pump training plant, since these systems are to be assembled, local products can be used to some extent, but the majority of the component elements will come from Japan.

The sourcing breakdown for materials and equipment to be used in the facility construction work is outlined below (cf. Table 5-1):

Table 5-1 Procurement Breakdown for Facilities and Equipment

Work stage	To be Procured in Japan	To be Procured in Indonesia
Building work	Metal work products, hardware, steel shutters, rock-wool acoustical boards	Cement, aggregate, steel frames, R-bars, lumber, plywood, bricks, metal fittings, wooden fittings, tile, terrazzo blocks, paint, glass, hardboard, water-proofing materials, roof tiles
Electrical work	Coaxial cables, rigid polyethylene pipes, boards, mercury lamps, TV antenna, fire alarm equipment, loudspeakers, telephone switchboard	Wires, cables, PVC cable pipes, fluorescent lighting, incandescent lighting
Mechanical work	Air-conditioning packages (1.5 Hp or over), air-conditioning ducts, ventilators, underwater pumps, valves, insulating materials, drainage hardware, drainage neutralizing equipment, well water filters, combination-type cleaning tank equipment	Air conditioning packages (1 Hp or less), ventilating fans, galvanized iron sheets, land pumps, distribution pipes, rigid polyvinyl pipes, concrete pipes, distribution measures, sanitary utensils, independent cleaning tank, man-hole covers
Training plant work	Component equipment and parts for small-scale water treatment plant Component equipment for training in pump operations, Ductile cast-iron pipes Small-scale equipment for waste water treatment	Steel frames, paint, aggregate, cement, R-bars, general purpose pipes, measures, man-hole covers

(2) Equipment

The following items of equipment can be procured in Indonesia, the remainder are to be obtained from Japan.

Equipment Categories	Items
General training equipment	Not applicable
Equipment for preparation of instructional materials	Copiers
Laboratory equipment	Not applicable
Equipment for the water treatment workshop	Not applicable
Equipment for the electrical/mechanical/ pump workshop	Not applicable
Equipment for the water pipe workshop	Metal saws, files adhesives, pipes
Equipment for the environmental sanitation workshop	Helmets, rubber boots, shovels, gloves, polyethylene buckets
Vehicles for training use	Microbus, jeeps
Furniture for training use	Complete set
Equipment for seminar room	Furniture for conference and seminar use
Furniture for canteen and dormitories	Complete set

With regard to personal computers, models from a third country have been selected, since they are in wide use in Indonesia

5-3 Project Implementation Schedule

5-3-1 Implementation Stages

If the Project is approved at a Cabinet meeting of the Government of Japan and the two countries exchange Notes, the work will be conducted in the following sequence:

1) Exchange of Notes

2) Banking arrangement between the Government of Indonesia and a Japanese foreign exchange bank regarding the disbursement of funds by Japan for this Project

3) Conclusion of a consulting service contract between the Directorate General of Human Settlements, Department of Public Works, representing the Government of Indonesia, and a Consultant of Japanese nationality.

4) Verification of the above contract and payment approval therefor by the Government of Japan; payment authorization by the Government of Indonesia to the Japanese foreign exchange bank

5) Detailed design and preparation of tender documents by the Consultants

6) Approval of tender documents by the Directorate General of Human Settlements and preparation for tenders by the consultants

7) Calls for tender and evaluation of tenders

8) Conclusion of contract between the Directorate General of Human Settlements and a Contractor of Japanese nationality

9) Verification of the above contract and payment approval therefor by the Government of Japan; payment authorization by the Government of Indonesia to the Japanese foreign exchange bank

10) Implementation of construction work and equipment procurement under supervision of the Consultants

11) Completion and turnover

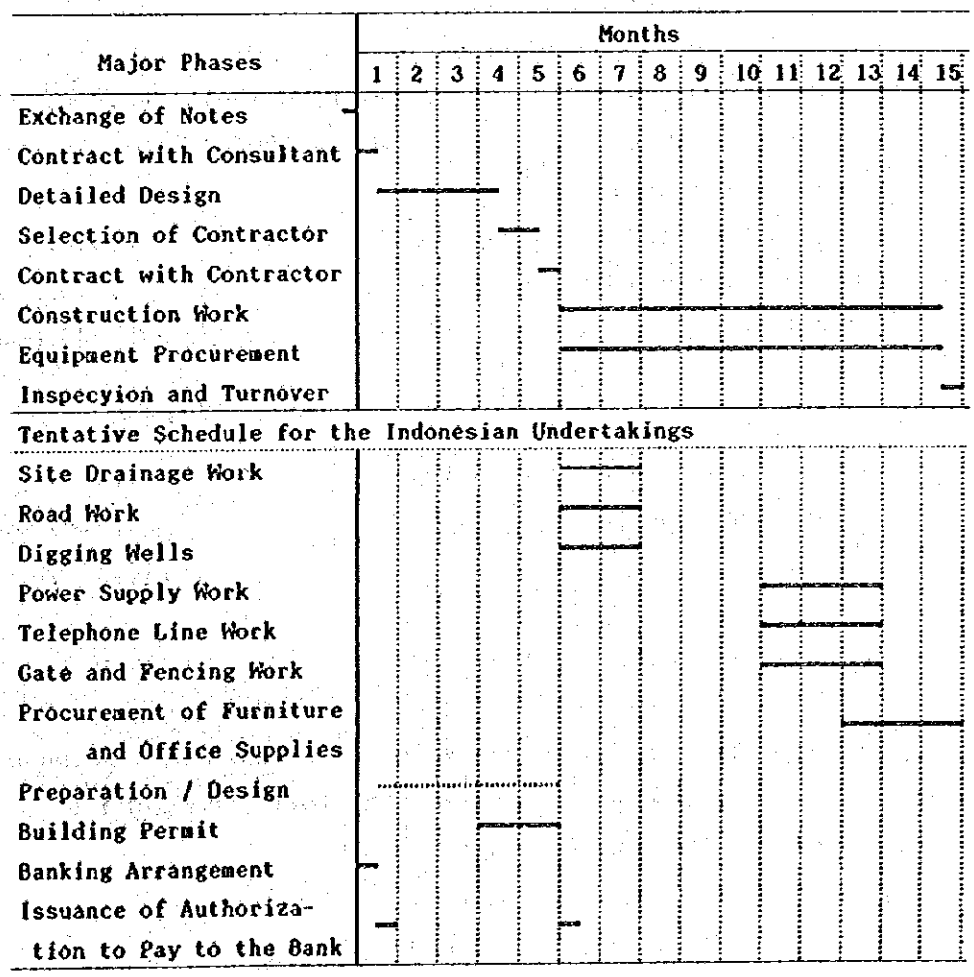
5-3-2 Implementation Schedule

The times required to implement the various phases of the Project after the Exchange of Notes are as shown below:

	No. of Months
1) Up to the conclusion of a consulting contract	0.5
2) Detailed design work	3.0
3) Selection of contractor	1.0
4) Review of tenders, contracting, start of construction	0.5
5) Construction and equipment procurement	9.5
6) Inspection and turnover procedures	0.5
Total	15.0

A project implementation schedule is shown in Table 5-2 below.

Table 5-2 Tentative Schedule for the Project Implementation



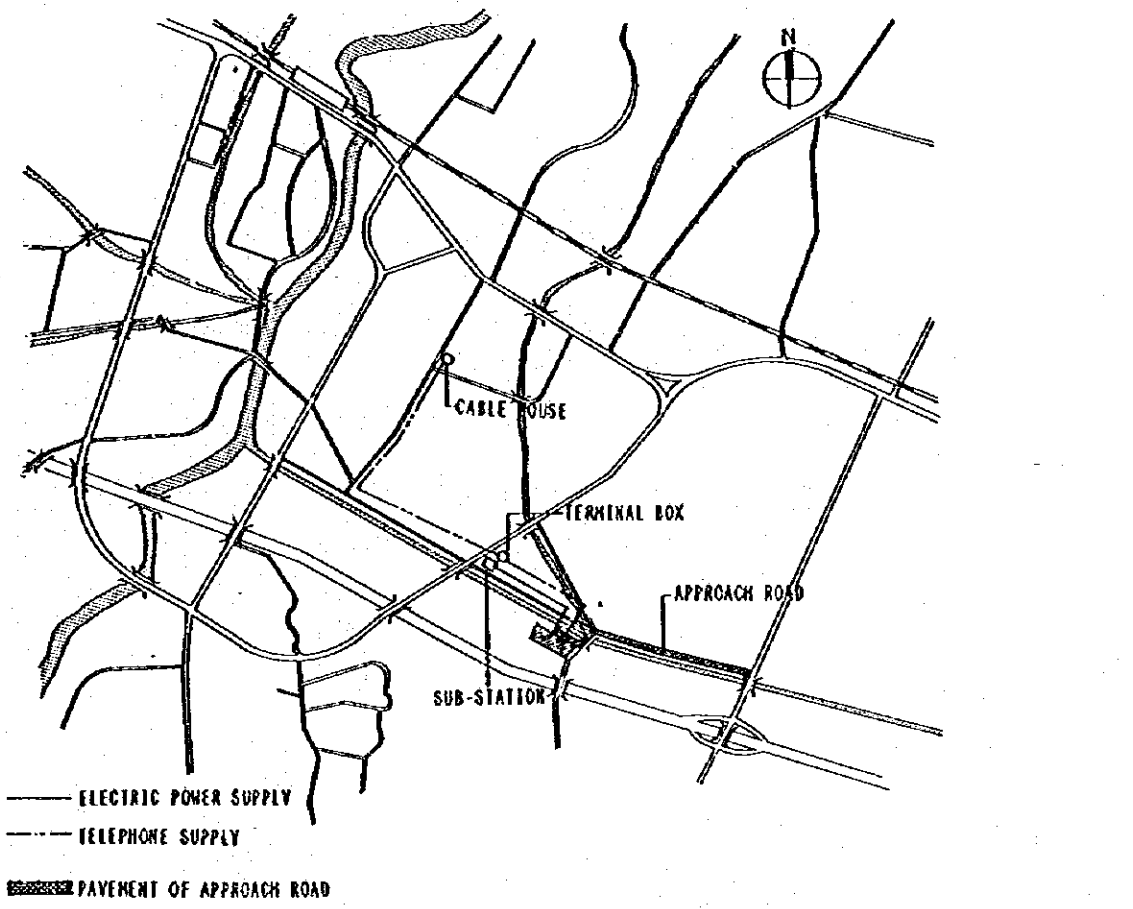
5-4 Estimated Costs to be Borne by the Republic of Indonesia

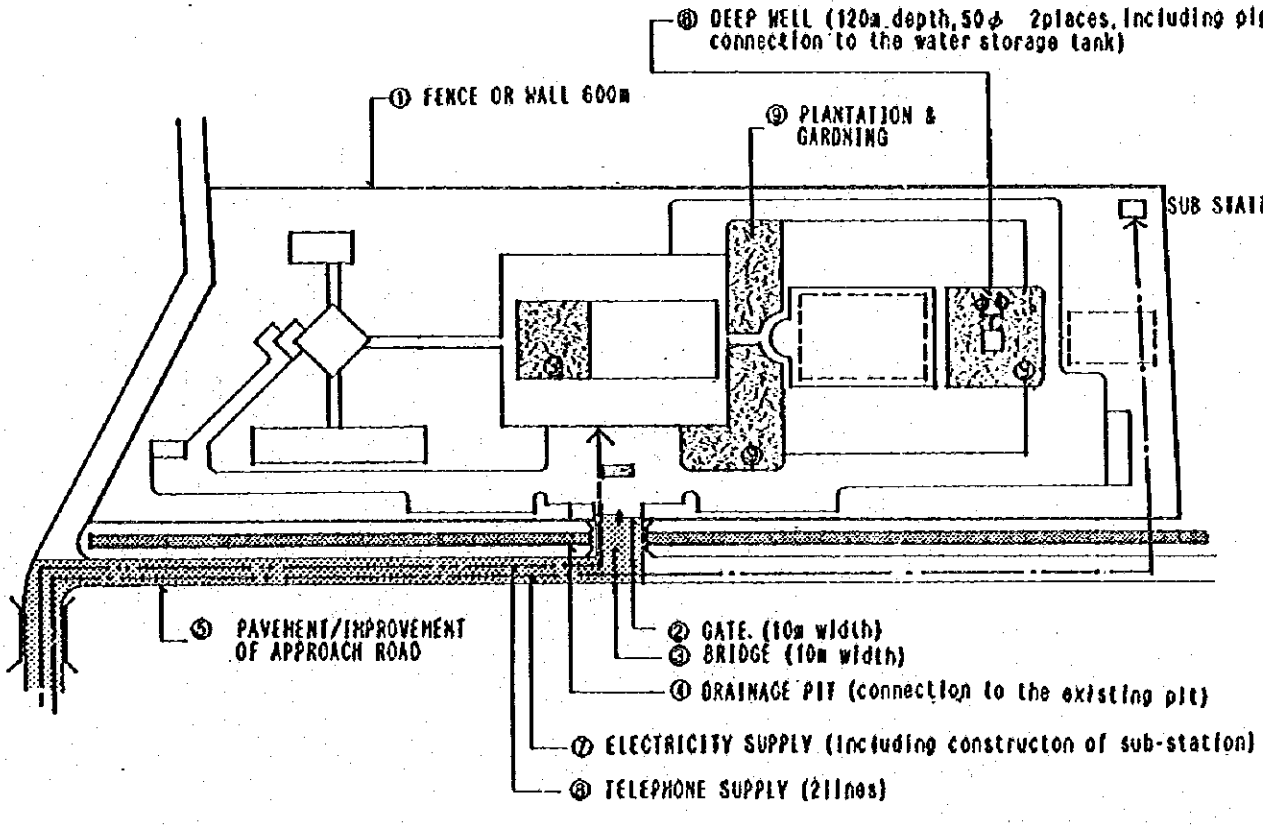
The project costs to be borne by the Republic of Indonesia in connection with the implementation of the Project will be approximately Rp 555,120,000 (± 43 million), broken down as follows:

(1)	Local consulting fees		
	1) Facility design and supervision fee to be borne by Indonesia (5%)	15,000,000	Rp
	2) Filing procedures for construction permit (10 man/days)	1,500,000	
	3) Total	16,500,000	
(2)	Filing fee for construction permit	34,500,000	
(3)	Construction expenditures:		
	1) Gate (1 location) and fencing (600 m)	37,150,000	
	2) Intake of power lines (2)	28,570,000	
	3) Bringing in telephone lines (2)	350,000	
	4) Well digging work (120 m x 2 wells, D=150)	48,400,000	
	5) Drainage culvert (2.0 m x 1.2 m; l= 300 m)	107,510,000	
	6) Paving of approach road (1,000 m; 4.8 m width)	136,320,000	
	7) Landscaping and gardening	17,340,000	
	8) Total	375,640,000	
(4)	Procurement of equipment		
	1) Office equipment and furniture	91,760,000	
	2) Other accessories	24,720,000	
	3) Total	116,480,000	
(5)	Bank charges (0.05 - 0.1%)	12,000,000	

The scope of the construction works to be undertaken by the Republic of Indonesia are as shown in Figure 5-1 on the following page:

Fig. 5-1 Construction Phases to be Undertaken by Indonesia





CHAPTER 6 OPERATION AND MAINTENANCE MANAGEMENT PLAN

CHAPTER 6 OPERATION AND MAINTENANCE MANAGEMENT PLAN

6-1 Operation and Maintenance Management System

6-1-1 Operating System

(1) Personnel Plan

The operating system of the Center is based on the following personnel.

Table 6-1 Personnel Plan

Position	No.of persons	Duties
Director of the Center	1	To take responsibility for overall operations of the Center and represent the counterparts when technical cooperation is implemented
Deputy Director	1	To assist the Director and carry out the overall operations of the Center
PR Officer	1	Coordination of the Center activities and general public relations
Training Program Section		Formulation of a training
Chief	1	program, its materials and
Staff	4	curricula, and office procedures for the implementation of training
Full-time Instructor	11	Instructios and taking
responsibility		on the use of laboratories and workshops
Instructional Affairs of Section		Management of trainees and the use general facilities (facilities of
Chief	1	main building, dormitories)
Staff	4	
General Affairs Section		General administrative work
Chief	1	including the accounting for
Staff	9	operation of the Center, the general affairs and public relations

Position	No.of persons	Duties
Maintenance and Logistics Section		Maintenance and management of the facilities, management of outside supplies, purchase of goods
Chief	1	
Staff	4	
Driver	4	Driving and maintenance of training vehicles
Total	43	
Part-time Instructor	33	(refer to the following (2))

(2) Training Implementation System

1) Full-time instructors

11 full-time instructors are to be assigned to the Center and as mentioned in Chapter 3, 3-4, 6 of them will be assigned to the water supply and 5 to the environmental sanitation divisions respectively. Table 6-2 on the following page shows the total number of weeks on the basis of the annual training hours prescribed in the training program.

Table 6-2 Total Training Hours

Sector	Training Course	Total Training Hours/Year	No.of Instructors
Water Supply	General Course	66 weeks	
	Advanced Course	109 weeks	
	Sub-total	175 weeks	6
Environmental Sanitation	General Course	32 weeks	
	Advanced Course	21 weeks	
	Sub-total	53 weeks	5
Total		228 weeks	11

If full-time instructors allocate half the day to the instruction of trainees and the remaining half to such work as preparation for training and of training materials and other general office work, their annual total number of training hours will be 22 weeks per person. Since, in the water supply sub-sector, total of 175 weeks of training will be carried out by 6 instructors,

there is a deficiency of 43 weeks.

175 weeks - 22 weeks x 6 = 43 weeks

Therefor, it will be necessary to invite outside instructors on a part-time basis to fill the gap in training hours.

With regard to the sub-sector of environmental sanitation, the required number of instructors will be;

53 weeks ÷ 22 weeks / person = 2.4 persons

Therefore, it is sufficient to assign 3 instructors to this sub-sector to cover the training requirements.

2) Part-time instructors

In the water supply sub-sector, training hours amounting to 43 weeks a year have to be entrusted to outside part-time instructors. However, based on past experience, annual training hours covered by each of them was only about 2 weeks. Because of this, at least,

43 weeks ÷ 2 weeks = 21.5 = 22 part-time

instructors should be secured.

As of 1988, 69 people have been certified as licensed part-time instructors in the water supply sub-sector. Since only 11 of them are living in the Jakarta area, if the current situation remains the same, a shortage of part-time instructor is bound to occur. The Center will also invite lecturers from local water supply service bodies and universities, but this is mainly for training in special professional areas. Therefore, it is necessary to train part-time instructors living in the Jakarta area as early as possible. The Directorate of Water Supply of the Directorate General of Human Settlements is planning to increase the number of licensed instructors to 30 by the end of fiscal 1989. If this plan materializes, no problem in terms of their number is anticipated.

Although the sub-sector of environmental sanitation does not require part-time instructors in a numerical sense, since all of the full-time instructors will be specializing in the technical field, non-technical training courses will have to be handled by outside lecturers. Since about 50 % out of 32 training weeks in the general and about 30 % out of 21 training weeks in the advanced courses will be allocated to non-technical subjects, the total annual training weeks to be covered by part-time instructors will be;

32 weeks x 0.5 + 21 weeks x 0.3 = 22 weeks

Therefore, if each part-time instructor covers 2 weeks of training, 11 will be required. In the sub-sector of environmental sanitation, there are 25 people, mainly staff members of the Directorate of Environmental Sanitation living in the Jakarta area who have an experience of giving training, so there will be no problem in this regard.

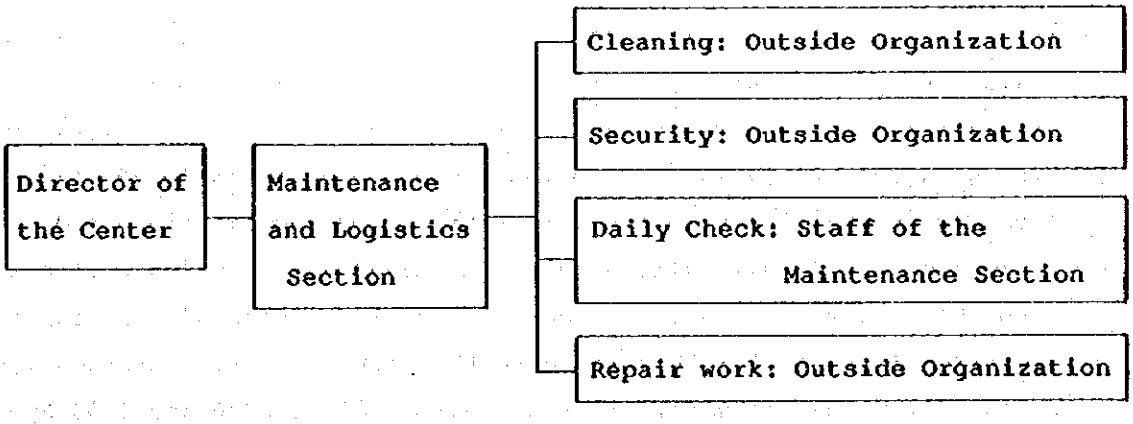
3) Instructor's assistant

It is indispensable to have an assistant to carry out technical training in an efficient manner. Since a class is divided into small groups particularly in many of practical training courses, an instructor can not keep an eye on to all of them. Because of this, at least one assistant is required to be assigned to each instructor.
In some cases, an assistant alone would suffice to give an exercise to trainees at a lecture room, which means, he/she can get a training as a would-be instructor through an exercise.

The above observation indicates that at least six assistants in the water supply sub-sector and one in the environmental sanitation sub-sector are required. In the latter case, two out of five full-time instructors can be regarded as assistants, therefore only one additional assistant is required. In other words, nine full-time instructors and nine assistants should be assigned to the Center.

6-1-2 Maintenance and Management System for the Facilities

It goes without saying that the Director of the Center takes responsibility for the maintenance and management of facilities of the Center. However, the daily maintenance and management of the facilities come under jurisdiction of the Maintenance and Logistics Section which will assume its responsibilities by entrusting a good deal of work to outside organizations.
The maintenance and management system is as follows:



With regard to the maintenance of training equipment and machines, the instructor using them is to take responsibility for inspection and maintenance. If repair work is necessary, it will be contracted to an outside organization. Construction companies, trading houses, manufacturers and agencies are the main bodies to have a business contact with the Center in this respect.

Therefore, it is required to have the consortium contracting the construction of the Center organize a cooperative system for maintenance and management and assume responsibilities for this after the opening of the Center.

6-2 The Method of Operation and Maintenance

6-2-1 Operation of the Center

As was mentioned in Chapter 3, 3-4, the Management Board headed by the Directorate General of Human Settlements will assume responsibility for activities of the Center. The Director of the Center will operate the Center under the direction of the Board.

The operation costs will be appropriated by the National Treasury under the responsibility of the Department of Public Works and partly by other concerned organizations as follows:

1) Water supply service bodies

Large water supply service bodies with firm business foundations in the country will bear the costs of travel, accommodation, food expenses and a daily allowance to be included in sending trainees to the Center. The costs of nearly 20 % of trainees will be covered by such local bodies. According to the past results, accommodation, food allowance and daily allowance were 9000, 11,000 and 5000 Rp. respectively.

2) Local autonomous bodies

Since trainees in the sub-sector of environmental sanitation are staff members of local government bodies, the expenses to send them to the Center are to be borne by the respective bodies.

6-2-2 Maintenance and Management of the Facilities

In order to use the facilities effectively over a long period of time, it is essential to conduct an adequate maintenance and management on a daily basis.

(1) Security Management

Security management of the overall facilities will be handled by security guards to be dispatched from an contracted outside organization. The guard staff will consist of four persons; one for gatekeeping, two for patrol and one for shift, and they will work around the clock in three shifts.

(2) Management of the Building Facilities

Cleaning and operation, inspection and the parts replacement for the equipment installed in the building facilities will be the major items of routine work. Cleaning will be done every day and about five cleaners are required from an outside organization for this purpose. Operation, inspection and the parts replacement for the equipment should be carried out by staff members of the Maintenance and Logistics Section. Therefore, at least one engineer who can handle electrical equipment should be included in the staff of this Section. It will be necessary to have the construction companies give instructions on how to handle the building facilities and the method of maintenance management at the time of completion of the facilities.

(3) Maintenance and Management of the Training Equipment and Machinery

Instructors who are responsible for the use of the training equipment and machinery are required to take responsibility for daily maintenance and inspection of them. The cleaning of the laboratories and workshops may be contracted, but in that case, the presence of an instructor is always required.
It is necessary to have engineers of the manufacturers give instructions on how to handle the equipment and machinery and the method of their maintenance management when they are delivered.

6-3 The Expenses of Operation and Maintenance

6-3-1 Type of the Expenses

The expenses involved in operating and maintaining the Center are as follows:

1) Personnel expenses
2) Office expenses
3) Training materials expenses
4) Travel expenses for trainees
5) Trainees' daily allowance
6) Operating expenses for the canteen
7) Operating expenses for the dormitories
8) Maintenance expenses for the facilities
9) Utility expenses
10) Expenses incurred in using vehicles
11) Taxes

As was mentioned earlier, the above costs will be borne by the National Treasury, the water supply services and local government bodies.

6-3-2 Pilot Calculation of Expenses

The following is a pilot calculation of the expenses of operation and maintenance of the Center on the basis of the value as of June 1988.

(1) Personnel Expenses

Table 6-3 shows the personnel expenses per day, based on the staff of the Center, as shown in Chapter VI, 1-1 (1) and the current standard salaries.

Table 6-3 Daily Wage of the Full-time Staff

Type of Job	No.	Wage/Man(Rp.)	Daily Wage(Rp.)
Director of the Center	1	300,000	300,000
Deputy Director	1	250,000	250,000
PR Officer	1	250,000	250,000
Section Chief	4	200,000	800,000
Clerk	21	150,000	3,150,000
Full-time Instructor	11	250,000	2,750,000
Driver	4	100,000	400,000
Total	43		7,900,000 Rp

Since the above wages include required allowances in kind and bonuses as required in addition to monthly salaries, the annual total personnel expenses for the full-time staff will be;

7,900,000 Rp. x 12 months = 94,800,000 Rp.

As was examined in Chapter VI, 1-1, the training weeks to be covered by part-time instructors will be total 66 weeks annually. There are four units (one unit of 90 minutes) per day and six days of training per week. Since the stipend for one unit is 25,000 Rp., the annual total amount to be paid to part-time instructors will be;

66 x 6 x 4 x 25,000 Rp. = 39,600,000 Rp.

Therefore, the total personnel expenses per annum will be 134,400,000 Rp.

(2) Office Expenses

Office expenses include communication expenses to be required to support training at the Center, expenses for expendable items such as office supplies, meeting expenses, and other miscellaneous expenses. These are estimated to be 50 % of the personnel expenses.

134,400,000 Rp. x 50 % = 67,200,000 Rp.

(3) Expenses for Training Materials

These will be expenses for making texts and slides for training, and these are estimated at 50,000 Rp. per trainee in the general courses and 100,000 Rp. in the advanced course. Since 920 trainees (540 for water supply and 380 for environmental sanitation) in the general

courses and 420 trainees (340 for water supply and 80 for environmental sanitation) in the advanced courses are planned annually, the total expenses of training materials per annum will be:

50,000 Rp. x 920 + 100,000 Rp. x 420 = 88,000,000 Rp.

(4) Travel Expenses of Trainees

In the water supply sub-sector, there are two types of training courses. One covers the areas including West Java, Central and West Kalimantan, Jakarta, which are under the jurisdiction of the Jakarta Regional Training Center, and the other covers all the country. Since a trainee's travel expenses differ according to the place where he/she lives, it is necessary to examine how many trainees will come from where.

The HRDP report carries the number of people engaging in water supply services in each region. Table 6-4 shows those numbers, the name of the capital in each region, and round-trip air fares from each capital to Jakarta.

The following are the weighted average air fares from the national area and the areas covered by the Jakarta RTC, calculated on the basis of the figures available in Table 6-4 and the number of people involved in water supply services:

National area	200,600 Rp.
Jakarta RTC are	68,700 Rp.

Table 6-4 Number of People Engaged in Water Supply Services by Region, Air Fares to Jakarta

Region	Regional Capital	No.of People Engaging in WS Services		Round-trip Air Fare to Jakarta
		Men	%	Rp
Aceh	Banda Aceh	1,013	2.49	419,800
North Sumatra	Medan	3,216	7.91	320,200
West Sumatra	Padang	1,280	3.15	230,000
Lampung	Bandar Lampung	689	1.69	65,800
South Sumatra	Palembang	1,312	3.23	125,400
Bengkulu	Bengkulu	480	1.18	152,000
Riau	Pakanbaru	792	1.95	233,600
Jambi	Jambi	399	0.98	163,400
West Kalimantan	Pontianak	927	2.28	187,200
South Kalimantan	Banjarmasin	827	2.03	230,000
East Kalimantan	Samarinda	795	1.96	294,800
Central Kalimantan	Palangkaraya	529	1.30	219,800
West Java	Bandung	6,320	15.55	61,000
Central Java	Semarang	4,907	12.07	111,000
Yogyakarta	Yogyakarta	704	1.73	120,200
East Java	Surabaya	6,483	15.95	177,000
Bali	Denpasar	1,119	2.75	208,400
West Nusa Tenggara	Mataram	836	2.06	238,000
North Sulawesi	Manado	975	2.40	518,800
Central Sulawesi	Palu	525	1.29	446,000
South-East Sulawesi	Kendari	527	1.30	396,000
South Sulawesi	Ujung Pandang	2,034	5.00	313,400
East Nusa Tenggara	Kupang	674	1.66	418,600
Maluku	Ambon	535	1.32	445,800
Irian Jaya	Jayapura	522	1.28	705,600
East Timor	Dili	182	0.45	420,400
Jakarta	Jakarta	2,050	5.04	-
Total		40,651	100.00	

The sub-sector of environmental sanitation handles, for the time being, only the national area. The following shows the number of trainees of each region carried in the HRDP report and major cities located in the center of each region

Region	City	No. of Trainees
Java Island	Semarang	5,533
Sumatra	Padang	1,878
Bale, NTB, NTT	Kupang	768
Maruku, Irian Jaya		
Kalimantan, Sulawesi	Ujung Pandang	1,494
Total		9,673

The weighted average of the air fares from all over the country on the basis of the number of trainees will be 189,000 Rp.

The annual number of trainees to be handled by the Center is 1,350, out of which the number of trainees from the areas covered by the Jakarta RTC is calcullated by deducting the following total number from 540, which is the capacity of the general course:

1) Participants of the Director Course	29
2) Participants of the Technical Directors Course	29
3) Participants of the Administrative Directors Course	29
4) Participants of the Instructor Training Course	57
Total	144

With regard to the courses above 1) and 2), the travel expenses are required to be calculated twice, since one course is divided into two sessions.

Based on the above, the annual travel expenses incurred at the time of sending trainees to the Center will be as follows:

Table 6-5 Annual Travel Expenses of Trainees

Number of Trainees		No. of Times	Area	Travel Expense per person	Travel Expense
Director of WE	29	2	National	200,600	11,634,800
Tech. Director	29	2	National	200,600	11,634,800
Admin. Director	29	1	National	200,600	5,817,400
Instructor Course	57	1	National	200,600	11,434,200
WS general Courses	396	1	Jakarta	68,700	27,205,200
WS Advanced Courses	340	1	National	200,600	68,204,000
Environmental Courses	470	1	National	189,800	89,206,000
Total	1,350				225,136,400

Since the travel expenses for the environmental sanitation sector will be borne by the local government bodies and, in the water supply sub-sector, 20 % of the total travel expenses will be borne by the water supply services bodies, the expenses by the Center will be as follows:

(225,136,400 - 89,206,000) x 80 % = approx. 108,750,000 Rp.

(5) Daily Allowances for Trainees

The average amount of the daily allowance will be 5,000 Rp. per trainees. According to Chapter III, 3-4 (5), the total number of training hours for 1,350 trainees annually will be the following:

Water Supply Courses	2,170 weeks
Environmental Sanitation Courses	850 weeks
Total	3,020 weeks

Since the amount borne by the Center will be the 80 % of the total incurred in the water supply sector, the expenses by the Center will be:

2,170 weeks x 7 days x 80 % x 5,000 Rp. = 60,760,000 Rp.

(6) Operating Expenses for Canteen

The average daily amount of 11,000 Rp. will be given to each trainee as a food allowance. Since operation of the canteen in the Center is not intended to earn a profit, it should be operated within the costs to be collected from the trainees. Therefore, the maximum operation expenses will be the total amount of food allowances to be given to the trainees. Based on this, the annual operation expenses of the canteen will be:

3,020 weeks x 7 days x 11,000 Rp. = 232,540,000 Rp.

Since 20 % of trainees to be sent from the water supply services bodies and all the trainees to be sent from the local government bodies will bear the food expenses by themselves, in actuality, the operation costs of the canteen to be borne by the Center will be:

2,170 weeks x 7 days x 80 % x 11,000 Rp. = 133,672,000 Rp.

(7) Operating Expenses for Dormitories

Trainees will receive a daily average of 9,000 Rp. as an accommodation allowance. The major items of operating expenses are housekeeping, expendable supplies, linen goods, laundry, and they have to be held within the costs that can be covered by the trainees. Therefore, the maximum operation costs will, as in the case of the canteen, be the

total amount of accommodation allowances to be given to the trainees.

3,020 weeks x 7 days x 9,000 Rp. = 190,260,000 Rp.

As with (6) above, the expenses to be borne by the Center will be:

2,170 weeks x 7 days x 80 % x 9,000 Rp. = 109,368,000 Rp.

(8) Facilities Maintenance Management Expenses

The required maintenance management costs of the facilities will be as follows:

1) Expenses for Contracted Work

Expenses for contracted work will be based on the same unit cost as that of the personnel.

a) Security 12 men x 60,000 Rp. x 12 months x 2.0 = 17,280,000 Rp.

b) Cleaning 5 men x 50,000 Rp. x 12 months x 2.0 = 6,000,000 Rp.

c) Gardening 2 men x 50,000 Rp. x 12 months x 2.0 = 2,400,000 Rp.

Total 25,680,000 Rp.

2) Repair Expenses

The Center will be repainted once every five years. As long as there are no accidents, the window glass should have an infinite life. However, the assumption is that 5 % of all the glass will be broken annually.

a) Painting 72,000,000 Rp. x once / 5 years = 14,400,000 Rp.

b) Window Glass 22,000,000 Rp. x 0.05 = 1,100,000 Rp.

Total 15,500,000 Rp.

3) Replacement Expenses

The filters for air-conditioners will be replaced once every four years.

a) Filters for air-conditioners

25 units x average 24,000 Rp. x once/4 years = 150,000 Rp.

b) Light bulbs

700 units x average 2,500 Rp.x once/ 2.5 years =700,000 Rp.

Total 850,000 Rp.

4) Expendable Supplies

Expendable supplies included in maintenance management of the facilities of the Center are well water, a disinfectant in the water treatment tank, a neutralizer for the waste water generated from experiments, and lamps, fuses, switch packings, oil, grease for machines and switch boards

a) Neutralizer Disinfectant 640,000 Rp

b) Expendables included in machinery and switch boards

0.1 % of the machinery and 1 % of the switch boards costs 1,200,000 Rp.

Based on 1) - 4) above, the total costs for maintenance management of facilities will be 43,870,000 Rp.

(9) Utility Expenses

Utility expenses cover electricity charges, the fuel costs for in-house power generation, the charge for using well water, the charge for using irrigation water, and the charge for propane gas to be used in the canteen.

1) Electricity Charges

Electricity charges consists of a base fee and an additional fee charged on the basis of the actual power use, and these fees are determined on the basis of the contract power, the time band of

its use, and the type of facilities. The Center is a governmental facility and its contract power is about 230 KVA. The base unit rate is 2,195 Rp/KVA/month (1970 + 225), while the consumption unit rates are 100.75 Rp/KVA (18:00-22:00) at the peak and 66.5 Rp/KVA at off-the-peak (22:00-18:00).

Therefore,

Base Rate is 2,195 Rp/KVA x 230 KVA x 12 = 6,058,000 Rp.

Consumption Rate

a) Management/Training Facility : time 8:00-18:00 12 months

1,940 m x 50 W/m x 10 H x 25 days x 12 months x 66.75 Rp/KWH = 19,424,000 Rp.

b) Workshop : time 8:00-16:00 11 months

1,400 m x 35W/m x 8H x 25 days x 11 months x 66.75 Rp/KWH = 7,195,000 Rp.

c) Canteen : time 18:00-24:00 11 months

1,590 m x 15W/m 25 days x 11 months x (4H x 100.75 Rp/KWH + 66.75 Rp/KWH) = 3,519,000 Rp.

Total a) + b) + c) = 30,138,000 Rp.

Based on the above, the annual total of the electricity charge will be 36,196,000 Rp .

2) Fuel Expenses for Emergenency Power Generator

The Electrical, Mechanical and Pump Workshop will be operated six months per year. The daily operating time will be six hours. Assuming that 10 % of the training uses the in-house power generation equipment, the total hours of use will be:

6 months x 4 weeks x 6 days x 6 hours x 0.1 = 130 hours.

Since the power failure is said to occur at most once a week in the Bekati area, the assumption is that a failure will takes place 30 times a year, that each failure will last about two hours. Thus, the annual operating time of the in-house power generator during power failures will be:

30 times x 2 hours = 60 hours, and the total will be 190 hours.

The unit cost of the fuel (diesel oil) will be 240 Rp/liter, and the fuel consumption ratio will be 12liter /hour. So, the fuel expenses for the in-house generator will be:

190 hours x 12liter /hour x 240 Rp/liter = 547,000 Rp.

3) Charge for the Use of Well Water : 15cu.m. /day in use

It is assumed that the unit cost of well water is the same as that of tap water: 150 Rp/cu.m.,

15cu.m. /day x 25 days x 12 months x 150 Rp/cu.m = 1,350,000 Rp.

4) The Charge for Irrigation Water: unit cost 10 Rp/cu.m.

Training for the Water Treatment Plant which requires the irrigation water will be carried out for 24 training weeks annually. The capacity of the Small-size Water Treatment Plant will be 24 cu.m. /day. If it is operated for six hours per day, the charge for the use of irrigation water will be:

24 weeks x 6 days x 6 hours x 24 cu.m. x 10 Rp/cu.m. = 9,000 Rp.

5) Propane Gas Charges

The propane gas will be mainly used at the kitchen of the canteen. The trainees will stay at the Center for 44 weeks annually.

3.3 kg/hour x 3hours/day x 6 days/week x 590 Rp/kg = 1,542,000 Rp.

Based on 1) - 5), the total utility charges will be 39,644,000 Rp.

(10) Expenses for Vehicle Use

The annual mileage of each vehicle to be located in the Center is as follows:

Microbus	1 unit x 50 km/day x 100 days =	5,000 km
Jeep	2 units x 50 km/day x 100 days =	10,000 km
Garbage Compacting Vehicle	1 unit x 50km/day x 40 days =	2,000 km
Total		17,000 km

Assuming that the fuel consumption rate is 10 km/liter after conversion to the diesel fuel, the fuel expenses become:

17,000km - 10 km/liter x 240 Rp/liter = 400,000 Rp.

Each vehicle will be supplied with 4 liter of engine oil every 5,000 km. then the expenses for engine oil become:

17,000km/5,000km x 4 liter x 4 vehicles x 5,000 Rp. = 272,000 Rp.

The expenses for repair and insurance per unit are assumed to be 1,000,000 Rp. per year.Then, 1,000,000 Rp. x 4 vehicles = 4,000,000 Rp.

Therefore, the total expenses of vehicle use will be about 4,670,000 Rp.

(11) Taxes

Since the facilities belong to the government, no taxes will be paid.

According to (1) to (11) above, the expenses to be borne by the Center for operations and maintenance management are summarized in Table 6-6.

Table 6-6 Operation and Maintenance Management Expenses of the Center

Item of Expenses	Amount
(1) Personnel	134,400,000
(2) Office	67,200,000
(3) Training Materials	88,000,000
(4) Trainee's Travel	108,750,000
(5) Trainee's Daily Allowance	60,760,000
(6) Canteen Operation	133,672,000
(7) Dormitory Management	109,368,000
(8) Facilities Maintenance and Management	43,879,000
(9) Utilities	39,644,000
(10) Vehicles	4,670,000
(11) Taxes	000
Total	790,334,000

CHAPTER 7 PROJECT EVALUATION

CHAPTER 7 PROJECT EVALUATION

7-1 Effects of the Project

In an attempt to improve water supply and environmental sanitation services, the Government of Indonesia is making an effort to improve and develop these facilities under the Fourth five-Year National Development Plan. Developing such facilities requires engineers and technicians for planning, designing and construction. Operation, maintenance and management of the constructed facilities also require technicians with respective expertise and skills .
In this sense, the development of facilities and that of human resources are inseparable in improving water supply and environmental sanitation services.

From this perspective, the Government of Indonesia has formulated the Human Resource Development Project(HRDP), and carried out training of personnel together with improving and developing the facilities for the water supply and environmental sanitation services. However, since facilities for training personnel in Indonesia have been insufficient, the Government has had difficulties in providing adequate training programs in accordance with the HRDP. If the Project is implemented, facilities for training, which have so far been inadequate, will be improved and the HRDP will be put on the right track. In specific terms, the current training program will be improved as follows:

(1) Increase in Training Capacity

1) Water Supply General Courses

At present, about 850 people around the country receive training annually. Completion of this Training Center will enhance overall capacity as a Regional Training Center in Jakarta, and increase the number of trainees by 340 to 1,190 annually.

2) Environmental Sanitation General Courses

The annual number of trainees in Jakarta will increase from the current 360 to 400.

3) Water Supply Advanced Courses

340 people will be newly able to take these courses annually .

4) Environmental Sanitation Advanced Courses

70 people will be able to take these courses annually.

(2) Improvement of Training

1) Water Supply General Courses

Technical training can be given to 130 trainees per annum, making best use of the facilities for practical training. Practical training can also be incorporated in the existing off-the-job training included in the general courses, thereby, enhancing the training effects.

2) Environmental Sanitation General Courses

Aside from the freshman's training courses currently available, it will be possible to establish an improved new course for off-the-job training including practice and exercise. These courses will generate a supply of core staff members to take responsibility for promoting environmental sanitation services.

3) Advanced Courses

Advanced Courses will be offered both in the subjects of water supply and environmental sanitation, which will make it possible to offer more specialized technical training.

4) Cost Effectiveness

Since there will be no need to rent training and accommodation facilities, the rental expense for this propose can be channeled into the training itself. Also ownership of the training facilities will permit more efficient planning of training programs.

(3) Development of Training System

1) With adequate equipment, the training faculty consisting of staff members of the Training Program Section and full-time instructors will be able to develop training materials and curricula for nationwide use much more efficiently.

2) Creating instructor training courses on a regular basis will make it possible to train instructors on a planned basis.

Furthermore, after Regional Training Centers are developed, this Center can perform its expected functions much more effectively as a Central Training Center playing a pivotal role in the systematic implementation of nationwide training.

In addition to the above-mentioned direct effects, the Project will, as a result of the direct effects, also produce the following indirect effects relative to the construction and operation of facilities for water supply and environmental sanitation:

1) Improvement of techniques for planning, designing and construction will make it possible to expedite the construction of facilities required for water supply and environmental sanitation services.

2) Improvement of pipe laying and leakage detection techniques will contribute to a decrease in water leakage and thereby increase the volume of water supply, which will result in higher per-capita supply. Increase in the volume of effective water supply will produce higher earnings.

Contamination of tap water caused by leakage will also be alleviated, and thereby, safety of tap water will be enhanced and the supply of potable tap water increased.

3) Improvement of water treatment techniques will lead to stabilization of the quality of water, and improvement in pump operation control techniques will make it possible to provide a stable supply of water.

4) Enhancement of management expertise will permit efficient and proper operation of water supply services.

5) Enhancement of expertise and techniques for solid waste disposal and night soil treatment will expand the scope and effectiveness of environmental sanitation services. As a result, the living environment will be improved and prevention of water contamination at source will become possible, which, in turn, will improve public hygiene.

As described above, great expectation can be held for both the direct and the indirect effects resulting from the implementation of the Project.

7-2 Evaluation of Training Capacity of the Center

7-2-1 Training Capacity of the Facilities

The facilities proposed in this report are designed at the minimum scale to carry out the properly planned training activities. This is based on a consideration that the operation costs of the Center should not be excessive vis-a-vis those that the Government of Indonesia has borne to date for the human resource development because of the following reasons:

This Center will not only a Central Training Center serving the entire country but a Regional Training Center in the Jakarta area as well, covering Jakarta, West Jawa, Central and West Kalimantan

for the Water Supply subsector and Jawa Island for the Environmental Sanitation subsector.

Training in areas not included in the above should be continued as well. Therefore, if the operation costs of the Center are too high, they might occupy a sizable portion of the overall budget to be appropriated for the RTC's, resulting in difficulties in operating the other RTC's.

Similar consideration was given in formulating the training plan mentioned in Chapter III. Training demands were set at the minimum feasible level.

Table 7-1 shows the capacity of major facilities of the Center which are proposedn according to the above consideration.

The table shows that the utilization ratio of lecture and exercise rooms will be as high as 90 %. This is because off-the-job training in the general courses is to be carried out mainly in these rooms.

On the other hand,the analysis laboratories and workshops still have spare training capacity. Therefore, even if training demands are well beyond estimated levels, additional technical and skill training will be fully guaranteed.

Based on the above, facilities of this Training Center can be acknowledged to be in an appropriate scale.

Table 7-1 Training Capacity and Spare Capacity (continued)

Facility Name	Capacity		Planned trainig volume	Utili-zation Ratio	Spare Capacity	
	(Men)	(Man Week)	(Man Week)	(%)	(M.Week)	(Week)
Lecture, Exercise Room(3)	60	2640	2400	90	240	12
Physicochemical Analysis Lab	10	440	120	27	320	32
Biological Analysis Lab	10	440	160	36	280	20
Water Treatment Workshop	10	440	240	55	200	20

Table 7-1 Training Capacity and Spare Capacity (continued)

Facility Name	Capacity (Men)	Capacity (Man Week)	Planned trainig volume (Man Week)	Utili-zation Ratio (%)	Spare Capacity (M.Week)	Spare Capacity (Week)
Elec./Mec./Pump Workshop	10	440	240	55	200	20
Piping Workshop	10	660*	480	73	180	18
Env. Sanitation Workshop	10	440	210	48	230	23
Trainees' Dormitory	80	3520	3110	88	410	-

* Since, in the piping workshop, in addition to the courses for piping technology, the leakage detection and the water meter test courses can be held concurrently, the facility capacity could increased by 50 %.

7-2-2 Instructor

Training in the Center is to be conducted by both full-time and part-time instructors. As was examined in Chapter VI, 6-1, the Center will have 11 full-time and 33 part-time instructors . In addition, a certain number of assistants are required to carry out efficient training. The following is the desired number of instructors at the Center.

Area	Full-time Instructors	Part-time Instructors	Assistant
Water Supply	6	22	6
Environmental Sanitation	3	11	3
Total	9	33	9

With regard to the part-time instructors in the Water Supply subsector, only 11 of them are living in Jakarta, and it will be necessary to recruit additional part-time instructors living in the Jakarta area. The Water Supply Directorate of the Directorate General of Human Settlements is planning to increase the number of part-time licensed instructors to 30 from the current 11 in the Jakarta area by the end of fiscal 1989. The annual training volume per part-time instructor can also be increased, thus, no serious problem is anticipated in this respect. As was mentioned in the previous chapter, assistants are an integral part of practical training. If exercises are also supervised by assistants, a considerable part of the training can be carried out without the continuous presence of an instructor during a class.

Although, on the whole, the current status of instructors is expected not to generate a major problem, it would be desired to train additional part-time instructors and assign an assistant to each full-time instructor.

7-3 Evaluation on Costs

7-3-1 Development Costs

As described in Chapter 5, the costs required for the implementation of the Project which are to be borne by the Government of Indonesia amount to 500 million Rp. The Department of Public Works has officially stated that they will develop and execute a budgetary plan to cover their share of financial burden. An official of the National Development Planning Agency has also stated that , in light of the importance of the Project, the Agency would study the budget allocation for construction work for which the Government of Indonesia takes responsibility.

The above-mentioned amount is calculated on the basis of the results of the field survey, and is a little lower than the 610 million Rp suggested by the Government of Indonesia in its request form.

Considering the above factors, it should be fully possible for the Government of Indonesia to budget the estimated project costs. Accordingly, there should be no problem in the financial area.

7-3-2 Operation Costs

As was mentioned earlier, consideration was given, in formulating the plans for facilities, to minimize the scale of the facilities with a view to lowering operating costs and simplifying maintenance.
As a result, the total cost for operation and maintenance of the Center, as shown in Chapter VI, is expected to be about 790 million Rp per year.
According to the answer to the questionnaire of the Preliminary Study Team, training appropriations for fiscal 1987 are as follows:

Water Supply	1,400 million Rp. (Executed in 1987)
Environmental Sanitation	750 million Rp. (Executed in 1987)

In other areas outside of Jakarta, training through the conventional method should be carried out in both the area of water supply and environmental sanitation subsectors even after the Center becomes available . It would, therefore, be appropriate to allocate the budget to the Center in proportion to the actual training load. Since the training load of the Center is 32 % for Water Supply and 57 % for Environmental Sanitation , the probable allocation of the budget would be as follows:

Water Supply	1,400 x 32 % = 448 million Rp.
Environmental Sanitation	750 x 57 % = 427 million Rp.
Total	875 million Rp.

If the training budget after the opening of the Center can be sustained to remain at the same level as in fiscal 1987, it will be possible to operate the Center within this budget without any constraints, and so no problem would be encountered in the area of operating expenses.

CHAPTER 8 CONCLUSION AND RECOMMENDATIONS

CHAPTER 8 CONCLUSION AND RECOMMENDATIONS

Conclusion:

In March, 1983, The Government of Indonesia unveiled its Outline of National Policy and defined the Fourth Five-Year Plan (1984-1988) as the period of laying groundwork for a "take-off" of the country's economy during the Sixth Five-Year Plan starting in fiscal 1994. The Fourth Five-Year Plan is aimed at creating a prosperous society through independent efforts by the country making extensive use of its natural, economic and human resources. The Indonesian government has realized that human resources as well as the supply of funds or changes in the global economy will have a substantial effect on the Fourth 5-Year Plan, thus, the development of human resources has been identified as one of major tasks to be addressed in the National Plan.

Development of human resources is of pressing importance in the sector of water supply and environmental sanitation to develop adequate facilities which provide the people with safe water and improve public hygiene. However, since facilities to develop human resources in Indonesia have been insufficient, it is an urgent task to construct training centers for such purpose. Therefore if the Central Training Center is established, it will make a major contribution to the development of human resources in this key sector.

Although the proposed facilities in this Project are limited in its scale, unless training demands increase sharply in the foreseeable future, the Center has sufficient training capacity for the needs.

Both development costs and operation costs after opening of the Center, for which the Indonesian government will take responsibility in implementing this Project, are considered to be financially sustainable in light of the initial budget plan worked out by the government and its past achievements in this area.

Based upon the above observation, the Project is considered to be appropriate as a grant-aid project of Japan in all aspects involved: satisfying the basic needs set forth in the objectives, activities and scale of training facilities to achieve these objectives, and the financial burden to be born by the Government of Indonesia.

Recommendations:

It is recommended that the Government of Indonesia take the following actions to ensure the smooth implementation of the Project and achieving its objectives:

1) To train as many as 20 part-time instructors living in Jakarta before the Training Center starts operation;

2) To select the cadre of full-time instructors at an early stage prior to the opening of the Center, and send them overseas for training, as required;

3) To select members of the operation staff and prepare for the opening without delay, such as by establishing an administrative format and procuring the necessary equipment and furnishings and so on. The head of the Training Program Section and its staff members will be required to work out training programs for the first year before the opening of the Center. Since this task takes a lot of time, they should make an early start in assigning the staff members.

4) To establish a Project Implementation Committee at an early stage, which is expected to play a central role in the practical business arrangements of the Project. A contract should be made with a consultant immediately after the Exchange of Notes and proceed to specific arrangements for implementing the Project;

5) To promote construction of regional training centers in parallel with the implementation of the Project;

Although training instructors for these advanced courses and developing training methods and materials could be improved gradually, through trial and error, considering the pressing necessity for the development of human resources, it is recommended to obtain the required expertise in an effective manner through the channel of technical cooperation .

APPENDIX

APPENDIX-1

1-1 Organization of the Basic Design Study Team

(1) Team Members of the Basic Design Study

1) Team Leader	Dr. Yasumoto Magara Director of Sanitary Engineering Dept. National Institute of Public Health
2) Training Programer	Dr. Shoichi Kunikane Head of Facility Planning Section, Sanitary Engineering Dept. National Institute of Public Health
3) Project Coordinator	Norio Nishihata Deputy Director of First Basic Design Study Division, Grant Aid Planning and Survey Dept. JICA
4) Project Coordinator	Tsutomu Iwasaki First Basic Design Study Division, Grant Aid Planning and Survey Dept. JICA
5) Architectural Planner	Masao Okui K. ITO Architects and Engineers
6) Building Designer	Koichi Suzuki K. ITO Architects and Engineers
7) Building Facilities Engineer	Iwao Yamanaka K. ITO Architects and Engineers
8) Equipment Engineer	Kin-ya Kataishi K. ITO Architects and Engineers

(2) Team Members of Explanation of The Draft Final Report

1) Team Leader	Dr. Yasumoto Magara Director of Sanitary Engineering Dept. National Institute of Public Health
2) Project Coordinator	Tsutomu Iwasaki First Basic Design Study Division, Grant Aid Planning and Survey Dept. JICA
3) Architectural Planner	Masao Okui K. ITO Architects and Engineers
4) Building Designer	Koichi Suzuki K. ITO Architects and Engineers
5) Equipment Engineer	Kin-ya Kataishi K. ITO Architects and Engineers

1-2 Survey Schedule

(1) Basic Design Study (21st May - 11th June 1988)

DAY	DATE		SCHEDULE	ACTIVITIES
1	21 May	Sat.	• Dr. Magara Departure from Manira Arrival at Jakarta • Other members Departure from Narita Arrival at Jakarta	• Gathering at Jakarta
2	22 May	Sun.	• Team meeting	• Discussion on schedule of survey • Discussion on contents of the questionaire • Hearing about opinions of Japanese Experts of Directorate General of Human Settlements
3	23 May	Mon.	• Courtesy call to Director General of Human Settlements (Cipta Karya) • Courtesy call to Minister of Republic Works • Inspection of the Project Site • Inspection of CGSC	• Explanation on Inception Report • Confirmation of contents of request • Explanation on systems of Japan's Grant Aid and Technical Cooperation • Discussion on schedule • Confirmation of national level supportive systems

DAY	DATE		SCHEDULE	ACTIVITIES
4	24 May	Tue.	• Conference with Directorate of Water supply, D.G. Cipta Karya	• Hearing about Indonesian Explanation on general condition of water supply and training plans on water supply sector • Question about training programs • Explanation on procedure of Japan's Grant Aid
			• Bogor (Mr. Yamanaka, Mr. Kataishi)	• Attendance to the handing over ceremony of the Environmental Sanitation Pilot Project in 6 cities of the Province of West Jawa
			• Inspection of CEVEST	
5	25 May	Wed.	• Conference with Directorate of Water Supply, D.G. Cipta Karya	• Discussion on implementation plan of training • Discussion on facility and equipment for training
6	26 May	Thu.	• Conference with Directorate of Environmental Sanitation, D.G. Cipta Karya	• Discussion on implementation plan of training • Discussion on facility and equipment for training
			• Conference with Directorate of Water Supply, D.G. Cipta Karya	• Discussion on organization for operation of the Center
			• Team meeting	• Arrangement of results of discussions • Minutes drafting

DAY	DATE		SCHEDULE	ACTIVITIES
7	27 May	Fri.	• General meeting at Cipta Karya • Inspection of Pejompongan Water Treatment Plant and affiliated Training Center	• Discussion on concensus of the Minutes of Discussions
8	28 May	Sat.	• Courtesy call to BAPPENAS (National Development Planning Body) • Courtesy call to SEKAB (Secretariate Cabinet) • Inspection of solid waste landfill site in Jakarta • Departure for Bali • PDAM, Regency of Badung, Provience of Bali	• Request to support the Project • Hearing about actual condition and future plan of Bali Water Supply Project
9	29 May	Sun.	• Inspection of water supply facilities of PDAM Badung • Inspection of solid waste landfill site in Denpasar • Return to Jakarta	
10	30 May	Mon.	• General meeting at Cipta Karya • Embassy of Japan • JICA Indonesia Office • Hotel Sari Pacific	• Confirmation of concensus of the Minutes of Discussions • Progress reporting • Progress reporting • Signing of the Minutes of Discussions

DAY	DATE		SCHEDULE	ACTIVITIES
11	31 May	Tue.	• Team meeting	• Arrangement of results of Survey • Discussion on contents and schedule of additional survey
			• Return of Dr. Magara and Mr. Iwasaki to Japan	
12	1 Jun.	Wed.	• Conference with Directorate of Water Supply, D.G. Cipta Karya	• Discussion on schedule of additional survey • Confirmation of implementation schedule of Indonesian undertaking work
			• Inspection of the Project Site	• Confirmation of boundary • Investigation on direction of wind and maximum flood level • Mapping area around the site
13	2 Jun.	Thu.	• Directorate of Water Supply, D.G. Cipta Karya • Directorate of Institutional Building, D.G. Cipta Karya (Mr. Suzuki, Mr. Yamanaka)	• Collection of additional data • Collection of data and information about building restriction, regulation and procedure for construction
14	3 Jun.	Fri.	• Directorate of Water Supply, D.G. Cipta Karya • Team meeting	• Collection of additional data • Data assortment • Schedule adjustment

DAY	DATE		SCHEDULE	ACTIVITIES
15	4 Jun.	Sat.	• Directorate of Environmental Sanitation, D.G. Cipta Karya • Directorate of Water Supply, D.G. Cipta Karya	• Collection of additional data • Reception of the answer to questionaire
16	5 Jun.	Sun.	• Team meeting	• Data assortment
17	6 Jun.	Mon.	• Regional Training Center in Surabaya (Mr. Okui, Mr. Yamanaka) • Personnel Training and Education Center of the Ministry of Public Works (Mr. Suzuki) • CEVEST (Mr. Suzuki) • C.G.S.C. (Mr. Suzuki, Mr. Kataishi) • Depo Kayu Manis (Mr. Kataishi) • Waste Water Treatment Plant of Jakarta City (Mr. Kataishi)	• Inspection of similar facilities
18	7 Jun.	Tue.	• POJ (Jatiluhur Authority State Enterprise) • WTC (West Tarum Cannel Project Office) • PERUMTEL (Telecommunications Public Corporation) • PLN (National Electricity Corporation)	• Discussion on raw water supply for training • Discussion on raw water supply for training • Discussion on telephone service for the Center • Discussion on electric power supply for the Center (Mr. Suzuki, Mr. Yamanaka and Mr. Kataishi attended the above discussions)

DAY	DATE		SCHEDULE	ACTIVITIES
			• Analysis of data (Mr. Okui)	
19	8 Jun.	Wed.	• Market research	• Building materials, exterior work materials, furniture and etc. (Mr. Suzuki) • Electric, mechanical materials and fixtures (Mr. Yamanaka) • Training equipment (Mr. Kataishi)
			• Analysis of data and preparation for final meeting (Mr. Okui)	
20	9 Jun.	Thu.	• Final meeting at Cipta Karya	• Confirmation of the answer to questionaire • Confirmation of organization for Project implementation • Confirmation of infrastructural plan and demacation of undertakings • Confirmation of method of programming for training
			• Team meeting	• Confirmation of result of survey
21	10 Jun.	Fri.	• JICA Indonesia Office • Embassy of Japan • Departure from Jakarta	• Progress reporting • Progress reporting
22	11 Jun.	Sat.	• Arrival at Narita	

(2) Expanation of Draft Final Report (14th Aug. - 21st Aug. 1988)

DAY	DATE		SCHEDULE	ACTIVITIES
1	14 Aug.	Sun.	• Departure from Narita • Arrival at Jakarta	• Gathering at Jakarta
2	15 Aug.	Mon.	• JICA Indonesia Office • Embassy of Japan • Directorate General of Human Settlements (Cipta Karya) • Team meeting	• Courtesy Call • Submission of Draft Final Reports • Reporting on result of survey • Discussion on schedule • Preparation for explanation of Draft Final Report
3	16 Aug.	Tue.	• Cipta Karya	• Explanation of Draft Final Report • Questions and answers about Draft Final Report
4	17 Aug.	Wed.	• (Independance Day)	• Arrangement of results of discussions
5	18 Aug.	Thu.	• Cipta Karya • Hilton Hotel • Return of Mr. Iwasaki to Japan	• Discussion on Concensus of the Minutes of Discussions • Signing of the Minutes of Discussions
6	19 Aug.	Fri.	• Cipta Karya • Courtesy Call to Minister of Public Works • Inspection of the Project Site	• Discussion on Indonesian proposal for architectural design • Confirmation of present conditions

DAY	DATE		SCHEDULE	ACTIVITIES
7	20 Aug.	Sat.	• SEKAB (Secretariate Cabinet) • BAPPENAS (National Development Planning Body) • Departure from Jakarta	• Courtesy Call • Request to support the Project
8	21 Aug.	Sun.	• Arrival at Narita	

1-3 List of Officials Interviewed

1. Ministry of Public Works

1) Minister

Ir. Radinal Moochtar	- Minister of Public Works

2) Secretariate General

Drs. Sukrisno	- Head of Bureau of International Cooperation
Ir. H. Moeljono Soebijono, Arch.	- Bureau of Planning
Mr. Darminto	- Chief of Japanese Cooperation Section, Bureau of International Cooperation

3) Directorate General of Human Settlements (Cipta Karya)

Ir. Soenarjono Danoedjo	- Director General
Ir. Soeratmo Notodipoero	- Secretary concurrently as Director of Water Supply
Mr. Soelistio Tjitro Hamidjodjo, BAE	- Ex-Secretary
Ir. Darmawan Saleh	- Director of Environmental Sanitation
Ir. Martsanto, DS	- Ex-Director of Environmental Sanitation
Ir. Parulian Sidabutar	- Director of Program Development
Ir. Tri Harsono, M. Sc.	- Head of Subdirectorate of Technical Development, Directorate of Water Supply
Ir. Prijono Salim DIPL. SE	- Head of Subdirectorate of Technical Planning, Directorate of Water Supply
Drs. Soedirman Martodihardjo, SH.	- Head of Administration Division, Directorate of Water Supply

Ir. Suwardji Trisno, M. Sc.	- Head of Subdirectorate of Technical Development, Directorate of Environmental Sanitation
Ir. Budiman Arief	- Head of Subdirectorate of Solid Waste, Directorate of Environmental Sanitation
Ir. Risyana Sukarma DIPL. HE.	- Head of Subdirectorate of Foreign Aid Administration, Directorate of Program Development
Ir. Atyanto Mochtar	- Head of Subdirectorate of Building Reguration Development, Directorate of Institutional Building
Ir. Kusniati	- Staff of Directorate of Water Supply
Ir. Daru Sukamto	- Staff of Directorate of Water Supply
Mr. Gatot. S.	- Staff of Directorate of Water Supply
Ir. Drs. Sudjoko	- Staff of Directorate of Environmental Sanitation
Ir. Armand Siahaan	- Staff of Directorate of Environmental Sanitation
Ir. Drs. Sunea	- Staff of Directorate of Environmental Sanitation
Ir. Reifeldi	- Staff of Directorate of Program Development

2. Secretariate Cabinet (SEKAB)

Mr. Moch. Widodo Gondowardoyo, SH.	- Head of Bureau of Technical Cooperation
Mr. Ade Bamtarso	- Chief of Subdivision of Bilateral Project, Bureau of Technical Cooperation

3. National Development Planning Body (BAPPENAS)

Drs. Saad Basaib, M. Sc.	- Head of Bureau of Social Walfare and Public Housing
Ir. FW Adam, MPM.	- Head of Section of Public Housing, Bureau of Social Walfare and Public Housing

Ir. Dedy Supriadi B, BE	- Staff of Bureau of Social Walfare and Public Housing
Ir. Salusra Widya	- Staff of Bureau of Social Walfare and Public Housing

4. Bali Water Supply Project

Ir. Didi Rochadi	- Project Manager of Bali Water Supply
Drs. Soekermar	- Director of PDAM. Regency of Badung, Province of Bali

5. Other Indonesian Officials Concerned

Mr. Sodikin, BE	- Head of Guidance/Implementation Division, Jatiluhur Authority State Corporation (POJ)
Mr. Prabowo	- Assistant Technician, Project of West Tarum Cannel (WTC)
Mr. Abdullah	- Head of Telephone Service Section, Bekasi Office of Telecommunications Public Corporation (PERUMTEL)
Mr. Sunaryo. M.	- Head of Planning Section, Bekasi Office of National Electricity Corporation (PLN)

6. Embassy of Japan

Mr. Kazuo Hirayama	- First Secretary
Mr. Toshiro Nakagaki	- Second Secretary
Mr. Satoshi Ueda	- Second Secretary

7. JICA Experts

Mr. Katsunobu Takenaka	- Expert on Water Supply
Mr. Yoshiro Kaburagi	- Expert on Environmental Sanitation
Mr. Sonbo Yamamura	- Ex-Expert on Solid Waste Management

8. JICA Indonesia Office

Mr. Yasuo Kitano	- Resident Representative
Mr. Kazuhisa Matsuoka	- Deputy Resident Representative
Mr. Junji Ishizuka	- Assistant Resident Representative

1-4 Minutes of Discussions

(1) Basic Design Study

M I N U T E S O F D I S C U S S I O N S

BASIC DESIGN STUDY

ON

THE PROJECT FOR THE CONSTRUCTION OF

THE WATER SUPPLY AND ENVIRONMENTAL SANITATION TRAINING CENTER

IN

THE REPUBLIC OF INDONESIA

In response to the request made by the Government of the Republic of Indonesia, the Government of Japan decided to conduct a basic design study on the Project for the Construction of the Water Supply and Environmental Sanitation Training Center (hereinafter referred to as "the Project"), and entrusted the Study to the Japan International Cooperation Agency (JICA). JICA dispatched the basic design study team to Indonesia, headed by Dr. Yasumoto Magara, Director of Sanitary Engineering Department, The Institute of Public Health, Ministry of Health and Welfare (hereinafter referred to as "the Team"), on May 21, 1988 for 22 days.

The Team carried out a field survey and held a series of discussions with the authorities concerned of the Government of the Republic of Indonesia, headed by Mr. Soenarjono Danoedjo, Director General of Human Settlements (Cipta Karya), Ministry of Public Works.

As a result of the field survey and discussions both parties have agreed to recommend to their respective governments that the major points of understandings reached between them as attached herewith, should be examined towards the realization of the Project.

Jakarta, May 30, 1988

Dr. Yasumoto Magara	R. Soelistijo Tjitrohamidjojo,BAE
Leader	on behalf of Director General of
Basic Design Study Team, JICA	Human Settlements (Cipta Karya)

ATTACHMENT

1. The objective of the Project is to establish a training center in Bekasi for the purpose of upgrading knowledge and skills for water supply and environmental sanitation services. The center will provide trainings to engineers, technicians and other related staff members so as to be able to implement adequate planning, designing, construction, operation and maintenance of facilities as well as proper management of water supply and environmental sanitation sectors.

2. Executing Agency responsible for the Project is the Directorate General of Human Settlements (Cipta Karya), Ministry of Public Works.

3. The project site is the land of approximately 1.5 hectares belonging to the Directorate General of Water Resources Development which is located at the village of Margahayu, Sub-region of East Bekasi, Regency of Bekasi as shown in Annex I.

4. The Project includes the construction of necessary buildings and facilities and the provision of training equipment, which are shown in Annex II.

5. The Government of Indonesia has understood the system of Japan's Grant Aid explained by the Team, including the principle of the use of a Japanese consultant and Japanese firm(s) for the execution of the Project.

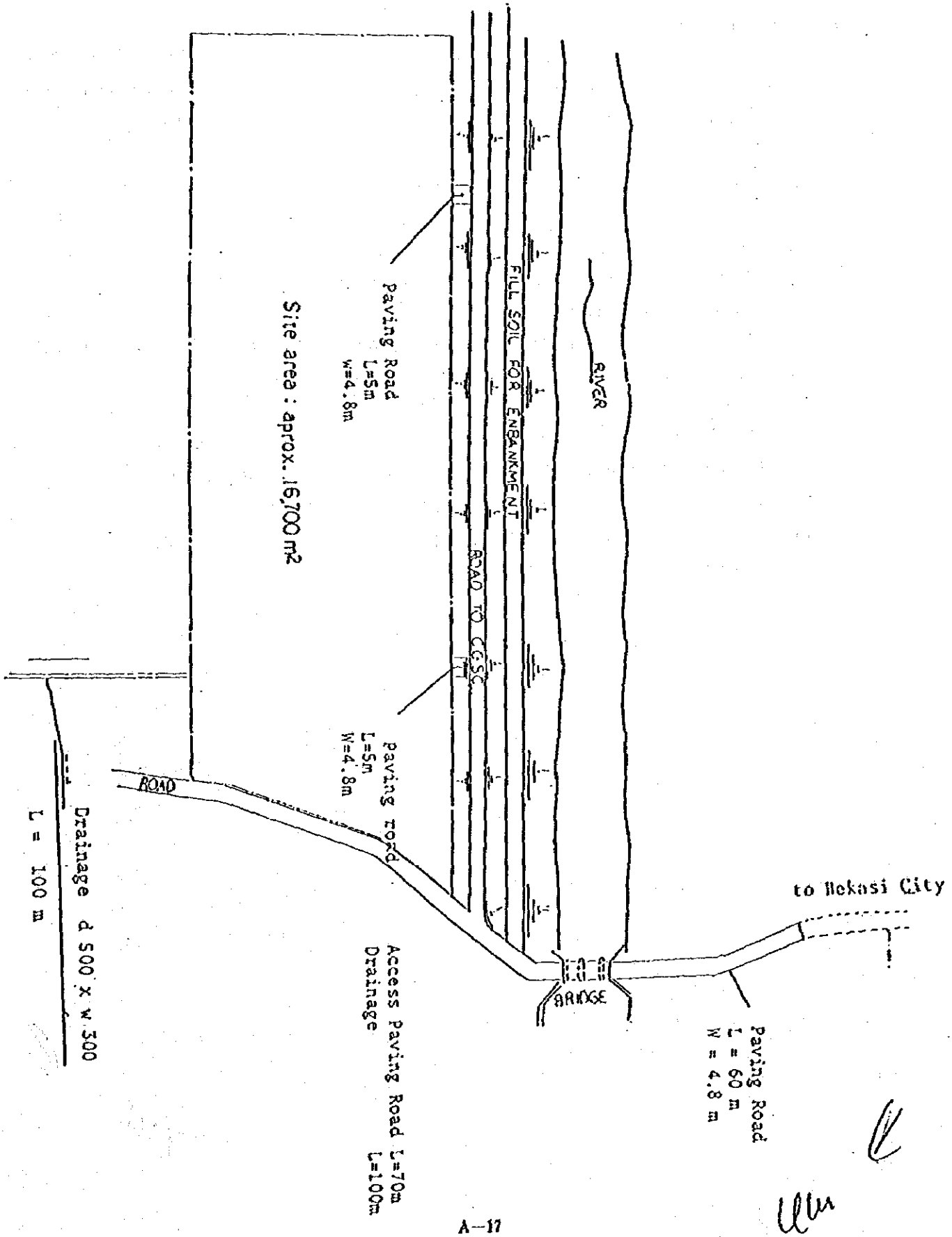
6. The Government of Indonesia will take necessary measures as listed in Annex-III on condition that a Grant Aid be extended to the Project by the Government of Japan.

7. The Government of Indonesia will assure budget and personnel required for the operation and maintenance of facilities and equipment to be provided, if a Grant Aid is extended to the Project by the Government of Japan.

8. The Team has explained and the Government of Indonesia has understood that a project type technical cooperation in connection with the Project will be examined separately from the Project.

9. The Team will convey the request of the Government of Indonesia for a few individual experts on training of water supply and environmental sanitation, which is now under the official requesting procedure.

ANNEX - I


Site area : aprox. 16,700 m2
Paving Road
L=5m
w=4.8m
FILL SOIL FOR ENBANKMENT
RIVER
ROAD TO CGSC
Paving road
L=5m
W=4.8m
ROAD
Drainage d 500 x w 300
L = 100 m
Access Paving Road L=70m
Drainage L=100m
BRIDGE
to Bekasi City
Paving Road
L = 60 m
W = 4.8 m

ANNEX-II

1) Facilities :

Main Building, Dormitory, Workshop, Garage, Storage, Canteen, Mini Purification Plant, Training Yard for Leakage Survey and Demonstration Plant for Solid Waste Treatment, etc.

2) Equipment

a. Audio Visual and Printing Equipment.
b. Computer
c. Mechanical and Electrical Equipment, including Instrumentation Equipment.
d. Water and Human Waste Water Quality Examination Equipment.
e. Solid Waste Examination Equipment.
f. Leakage Survey Equipment
g. Pipe Laying Equipment.
h. Water and Human Waste Water Treatment Equipment.
i. Solid Waste Treatment Equipment.
j. Water Meter and Testing Equipment.
k. Vehicles for Operation.

ANNEX III

Necessary measures to be taken by the Government of Indonesia :

1. To secure Land.
2. To clear, level and reclaim the site when needed.
3. To construct gates and fences in and around the site.
4. To construct an access road leading to the site.
5. To provide water supply by either a deep-well or by a water supply.

6. To provide facilities for the distribution of electricity, drainage and other incidental facilities :
   - The distribution line to the site.
   - The drainage system (for storm, sewer and others) from the site.
   - The telephone trunk line to the main distribution frame/panel (MDF) of the building.
   - General furniture (carpets, curtains, tables,chairs and others).

7. To bear the following commissions to the Japanese foreign exchange bank for the banking services based upon the B/A :
   - Advising commissions.
   - Payment commissions.

8. To ensure unloading and customs clearance at port of disembarkation in Indonesia :
   - Tax exemption and custom clearance of the products at the port of disembarkation.

9. To accord Japanese nationals whose services may be required in connection with the supply of the products and the services under the verified contracts such facilities as may be necessary for their entry into Indonesia and stay therein for the performance of their work.

10. To exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which may be imposed in Indonesia with respect to the supply of the products and services under the verified contracts.

11. To exempt or bear Value Added Tax (VAT) which will be imposed with respect to procuring products and services necessary for the implementation of the Project in the following cases :

    1) When Japanese nationals sign contracts with the Government of Indonesia

    2) When Japanese nationals purchase products and services necessary for the construction of the Center, or equipment to be installed in the Center.

    3) When Japanese nationals sign contracts with Indonesian sub-contractors with respects to the execution of duties under the contracts mentioned above.

12. To maintain and use properly and effectively the facilities constructed and equipment provided under the verified contracts.

13. To bear all the expenses, other than those to be borne by the Grant, necessary for construction of the facilities as well as for the transportation and installation of the equipment.

(2) Explanation of Draft Final Report

MINUTES OF DISCUSSIONS

ON

THE PROJECT FOR THE CONSTRUCTION.

OF

THE WATER SUPPLY AND ENVIRONMENTAL SANITATION TRAINING CENTER

IN

THE REPUBLIC OF INDONESIA

In response to the request made by the Government of the Republic of Indonesia, the Government of Japan decided to conduct a basic design study on the Project for the Construction of the Water Supply and Environmental Sanitation Training Center (hereinafter referred to as "the Project") and entrusted the study to the Japan International Cooperation Agency (JICA). JICA sent to the Republic of Indonesia the study team from May 21 to June 11, 1988.

As a result of the study, JICA prepared a draft report and dispatched a mission headed by Dr. Yasumoto Magara, Director of Sanitary Engineering Department, the Institute of Public Health, Ministry of Health and Welfare, to explain and discuss it from August 14, to 21, 1988.

The team had a series of discussions on the Project with the officials concerned of the Government of Indonesia headed by Ir. Soenarjono Danoedjo, Director General of Human Settlements, Department of Public Works.

After clarifying its contents, both parties had agreed to recommend to their respective governments that the major points of understanding reached between them, attached herewith, should be examined towards the realization of the project.

August 18, 1988

Dr. Yasumoto Magara,
Leader of Draft Final Report
Explanation Team of Basic
Design Study
Japan International Cooperation Agency

Ir. Soenarjono Danoedjo
Director General of Human
Settlements,
Department of Public Works

ATTACHEMENT

MAJOR POINTS OF UNDERSTANDING :

1. The Indonesian side agreed in principle to the basic design proposed in the Draft Final Report. But, there will be a technical alternation of the architectural design within the agreement of the basic design study at the stage of detailed design.

2. The Indonesian side understood the system of Japan's Grant Aid Program and confirmed the measures to be taken by the Indonesian side towards the realization of the Project as agreed upon in the "Minutes of Discussions" signed on May 30, 1988

3. Ten copies of the Final Report on the Project will be submitted to the Government of Indonesia.

1-5 List of Collected Data and Information

A Author
B Publisher
C Date of Publication
D Contents

1. TRAINING PROGRAM ;
   A Directorate of Water Supply, Cipta Karya
   C 1988
   D Tentative training program of water supply based on HRDP

2. WORK SHOP (PLAN) ;
   A Directorate of Water Supply, Cipta Karya
   C 1988
   D Tentative plan of the Water Supply and Environmental Sanitation Training Center (the Center)

3. PROCUREMENT PLAN FOR JAPANESE PROJECT TYPE TECHNICAL COOPERATION AND GRANT AID
   TRAINING CENTER FOR WATER SUPPLY AND ENVIRONMENTAL SANITATION (REVISED) ;
   A Cipta Karya
   C 1988
   D Revised specification sheets of equipment proposed for the Center

4. CLASSROOM TRAINING PROGRAMME ;
   A Directorate of Water Supply, Cipta Karya
   C June, 1988
   D Tentative training program of Water Suply for the Center

5. DRAFT OF TRAINING PROGRAM IN ENVIRONMENTAL SANITATION ;
   A Directorate of Environmental Sanitation, Cipta Karya
   C May, 1988
   D Tentative training program of Environmental Sanitation based on HRDP

6. SOLID WASTE IN INDONESIA STATISTICS AND ANALYSIS ;

A Cipta Karya

C 1986

D Data on actual condition of solid waste in 28 cities of Indonesia

7. SOLID WASTE DATA BOOK OF INDONESIA ;

A Cipta Karya

C 1987

D Data on actual condition of solid waste in 31 cities of Indonesia

8. AGENDA 1988 ;

A·B Ministry of Public Works

C 1988

D Notebook with personnel list of Ministry of Public Works

9. DAFTAR GAJI POKOK PEGAWAI NEGERI SIPIL ;

C 1985

D List of basic salary for government employee

10. Notification by minister of Finance No. 8-928/MK, 01/1987 ;

A Minister of Finance

C 1987

D Procedure of PPN excess payment reimbursement of the State Projects financed by the funds origineted from foreign grant or loan

11. Decision by Director General Cipta Karya No. 024/KPTS/CK/1982 ;

A Director General Cipta Karya

C 1982

D Standard floor area of major rooms of public building

12. Decision by Director General Cipta Karya No. 290/KPTS/CK/1987 TANGGAL 15 JULY 1987 ;

A Director General Cipta Karya

C 15 July, 1987

D Standard unit cost for construction of public buildings

13. REPORT ON ADDITIONAL SOIL INVESTIGATION AND TOPOGRAPHICAL SURVEY FOR THE WATER SUPPLY AND ENVIRONMENTAL SANITATION CENTER ;

A Cipta Karya

C June, 1988

D As to the title captioned above

14. MAP OF BEKASI CITY ;

A-C Uncertain

D A blue copy submitted by Cipta Karya

15. MAP OF WATER SUPPLY IN BEKASI CITY ;

A PDAM, Regency of Bekasi

16. MAP OF ELECTRICITY IN BEKASI CITY ;

A PLN Bekasi office

17. RENCANA DETAIL TATA RUANG KOTA BEKASI ;

A Regional Office of Bekasi

C 1987

D City plan of Bekasi

18. DATA IKLIM DI INDONESIA ;

A·B Meteorology and Geophysics Center, Ministry of Transport

C 1974 - 1987

D Meteorological data of Indonesia during past 14 years

19. LISTING INDONESIAN EARTHQUAKE RECORDS ;

A Meteorology and Geophysics Center, Ministry of Transport

20. DAFTAR HARGA SATUAN PEKERJAAN DI INDONESIA ;

A·B Building Technology Information Center, Cipta Karya

C The third quarter of 1987/88

D Unit prices of construction works in Indonesia

21. DAFTAR HARGA SATUAN BAHAN BANGUNAN DKI-JAKARTA ;

A·B Building Technology Information Center, Cipta Karya

C April/May, 1988

D Unit prices of building materials in DKI-Jakarta

22. PERKEMBANGAN HARGA ECERAN TUJUH MACAH BAHAN BANGUNAN DI 41 KOTA INDONESIA ;

A·B Central Bureau of Statistics

C 1985 - 86

D Price transition of 7 kinds of building materials in 41 cities of Indonesia

23. INDEKS HARGA PERDAGANGAN BESAR INDONESIA ;

A·B Central Bureau of Statistics

C 1975 - 86

D Transition of price index of major goods

24. DENPASAR WATER SUPPLY PROJECT ;

A PDAM, Regency of Badung, Province of Bali

C December, 1987

D Outline of Water Supply Project in Denpasar

25. GAMBAR DENAH RUANGAN CEDUNG CGSC ;

A CGSC

D A set of 1/200 plans of CGSC building

26. A SET OF DRAWINGS OF THE REGIONAL TRAINING CENTER IN SURABAYA ;

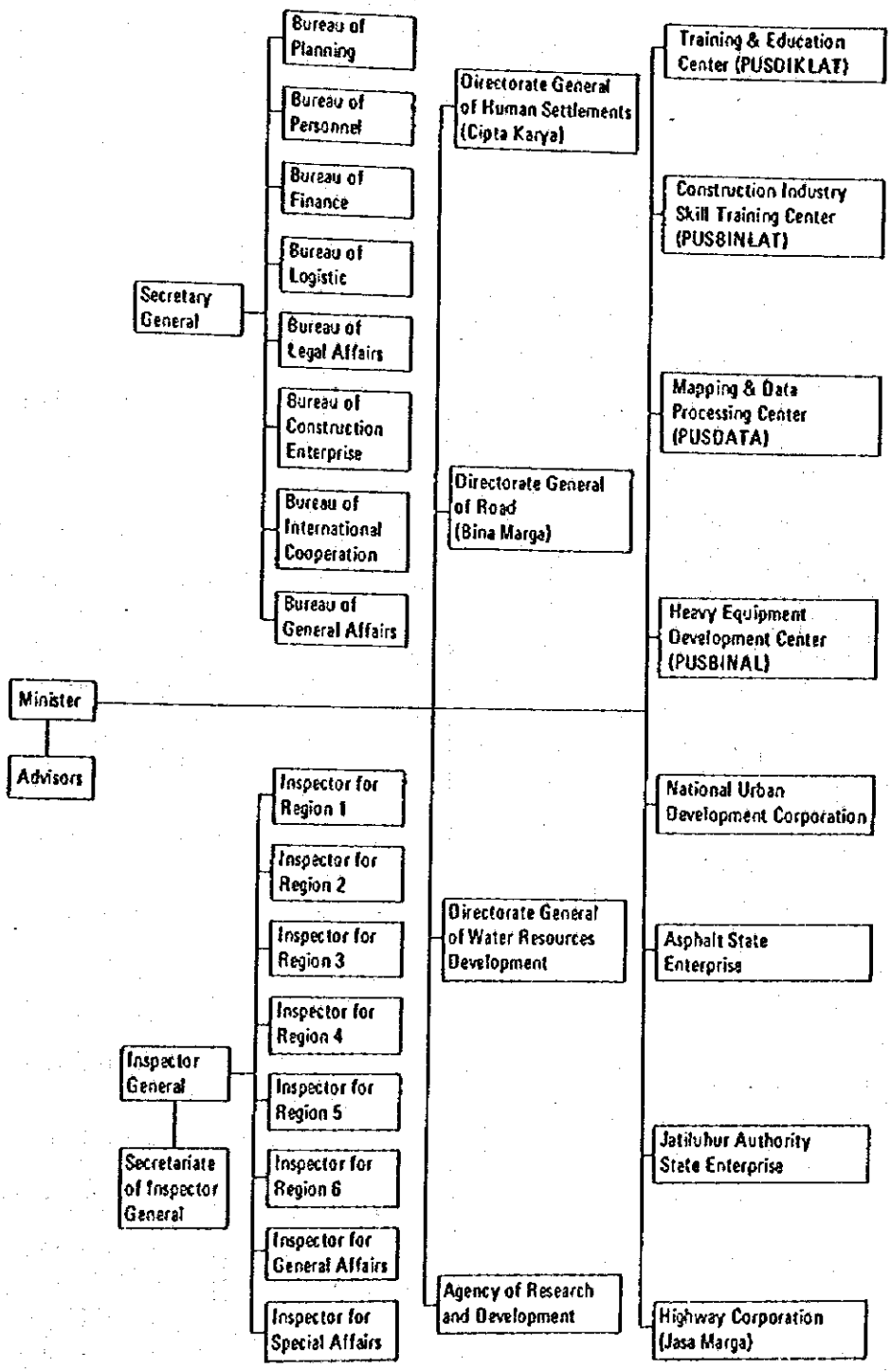
27. MODUL PERSAMPAHAN KAYU MANIS PROYEK PERCONTOHAN DAN EVALUASI ;

A Cipta Karya

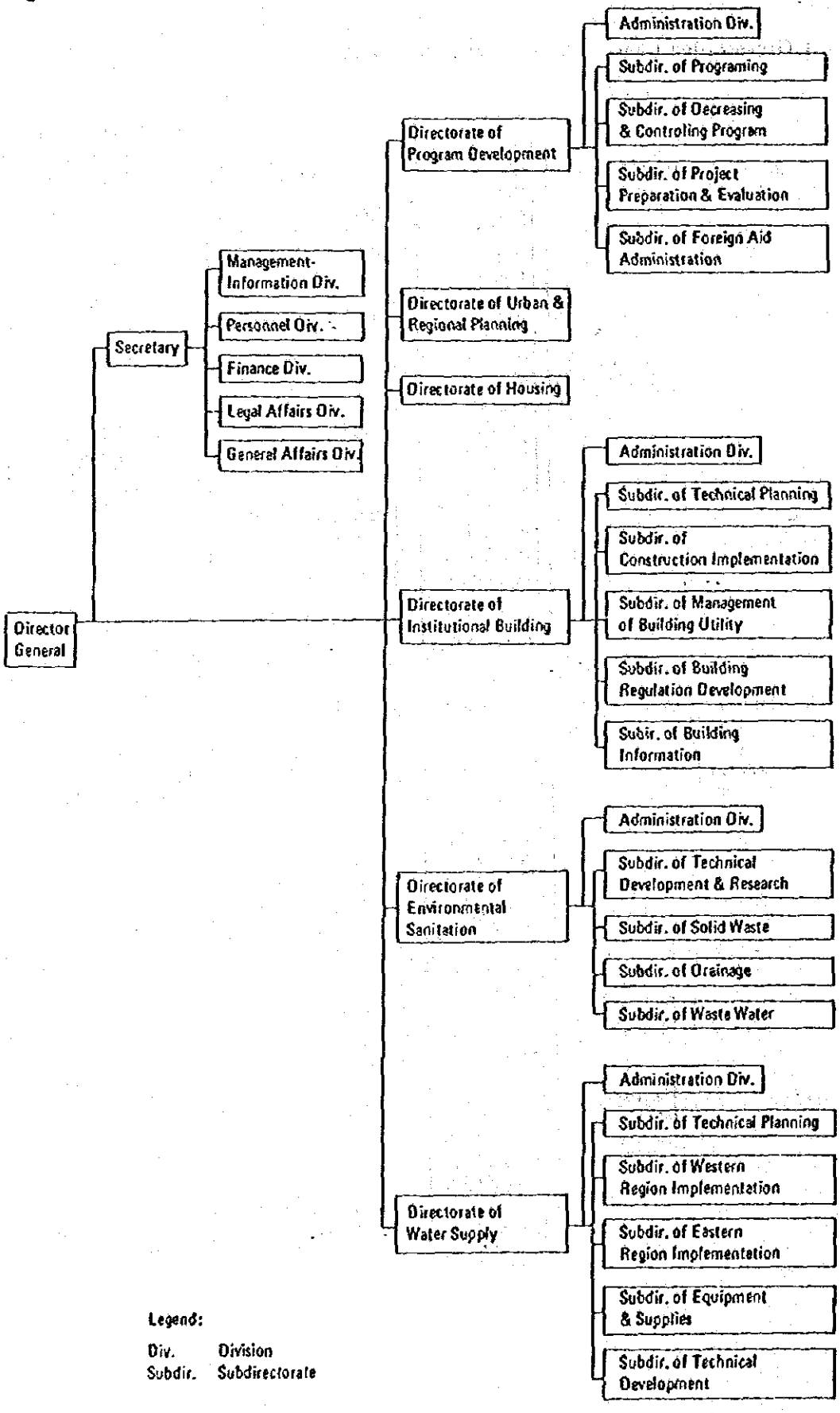
D Case study and evaluation on the pilot project for the solid waste transportation system at Kayu Manis

APPENDIX-2

2-1 Organization Chart of Ministry of Public Works

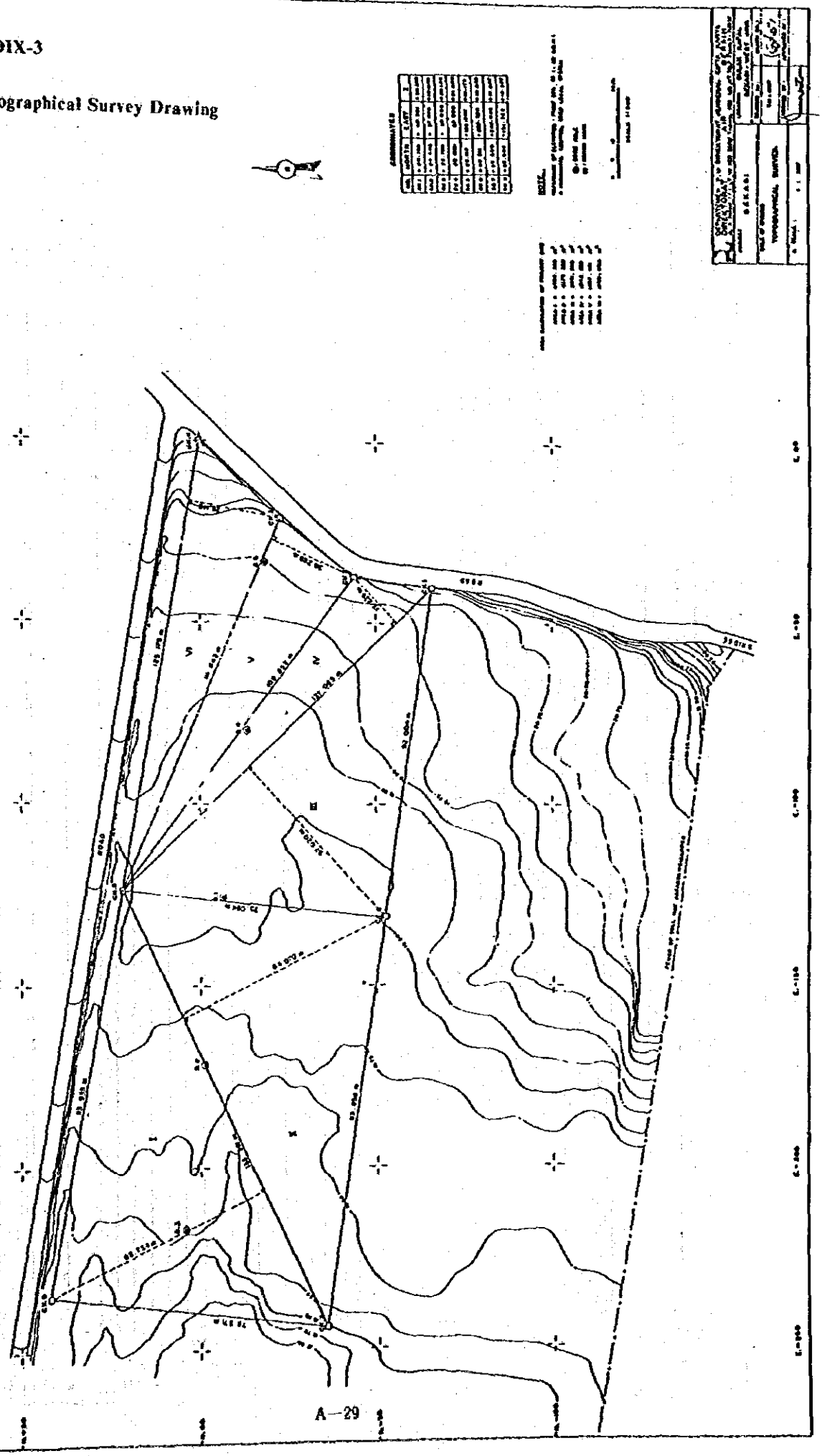


2-2 Organization Chart of Directorate General of Human Settlements (Cipta Karya)



APPENDIX-3

3-1 Topographical Survey Drawing



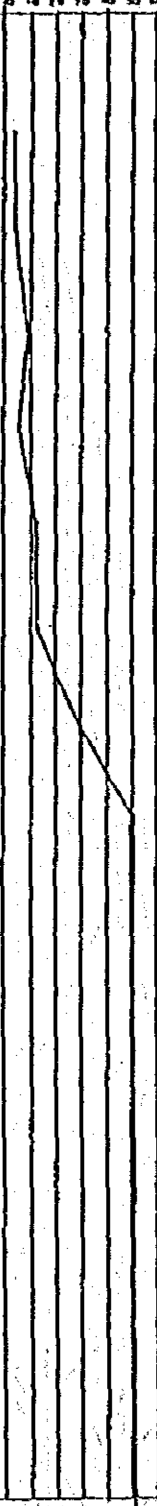
3-2 Soil Investigation Data

BORING LOG — App 3.1

NAME OF SURVEY & LOCALITY : BEKASI PROJECT
GROUND ELEVATION :
DATE : MARCH 13,1988
HOLE NO. : B-1
GROUND WATER LEVEL : 1.30-3.90 m
SURVEYED BY :

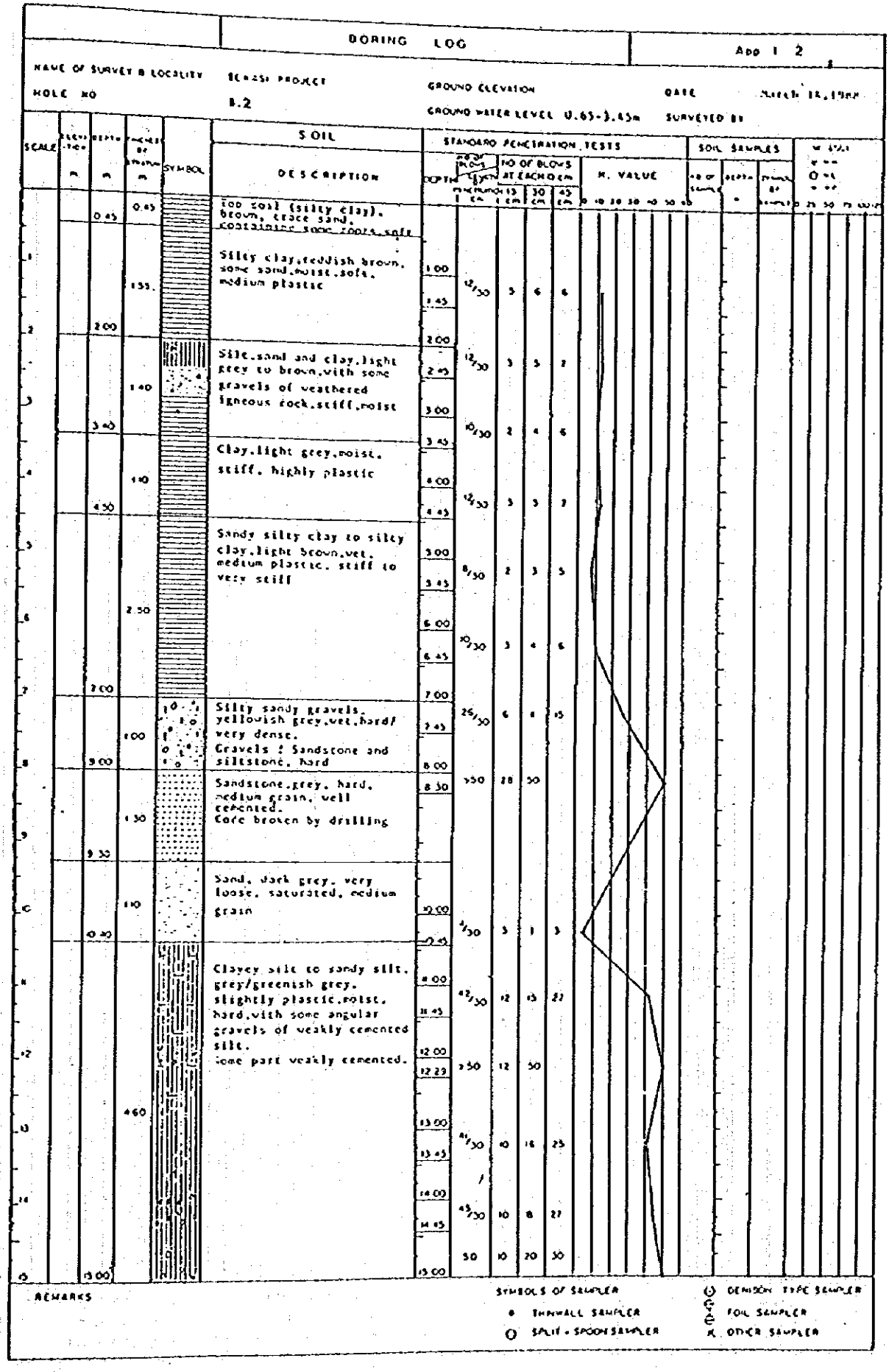
Scale	Elevation (m)	Depth (m)	Thickness of Stratum (m)	Symbol	Soil Description	SPT Depth	No. of blows / Depth of penetration (cm)	Blows at 15 cm	Blows at 30 cm	Blows at 45 cm	N. Value	Soil Samples: No. of sample	Soil Samples: Depth (m)	Soil Samples: Method of sample	W (%)
		0.40	0.40		Top soil (silty clay), brown, trace sand, some roots, soft										
1		1.50	1.10		Silty clay, reddish brown, trace sand, moist, highly plastic, soft	1.00–1.45	4/30	2	2	2					
2		2.50	1.00		Clay, greyish brown, moist, with trace silt and sand, highly plastic, medium consistency.	2.00–2.45	5/30	1	2	3					
3		3.30	0.80		Clay, light grey, moist, trace silt and coarse sand, medium to stiff	3.00–3.45	9/30	2	4	5					
4, 5		5.40	2.10		Sandy silty clay, brownish grey, moist, medium plastic, medium to stiff	4.00–4.45	5/30	2	2	3					
						5.00–5.45	12/30	4	6	6					
		5.70	0.30		Sand and silt, light brown, trace clay, wet, medium/stiff										
6, 7		7.50	1.80		Silt and clay, light brown/grey, moist, medium plastic, stiff to very stiff. Partly containing sand.	6.00–6.45	12/30	3	4	8					
						7.00–7.45	28/30	5	11	17					
8		8.30	0.80		Sandy silt, greyish brown, some gravels of sandstone, hard, sandstone is friable	8.00–8.40	>50/30	12	25	50					
9, 10		10.00	1.70		Sandstone, grey, medium grain, medium to well cemented, hard. Brokenly by drilling										
		10.80	0.80		Sand, grey, wet, fine grain, very dense	10.45–10.79	>50/30	12	26	50					
11, 12, 13, 14, 15		15.00	4.20		Silty clay to clayey silt, grey to greenish grey, hard with some gravels of weakly cemented silt. Some part weakly cemented, friable.	12.00–12.45	>50/30	12	28	35					
						13.00–13.45	>50/30	13	30	35					
						14.00–14.46	>50/30	20	37	41					
						–15.00	>50/30	24	40	48					

N. Value scale: 0 10 20 30 40 50 60
W (%): ← WN ○ WL + WP; scale 0 25 50 75 100



REMARKS :

SYMBOLS OF SAMPLER
- • THIN WALL SAMPLER
- ○ SPLIT - SPOON SAMPLER
- ⊙ DENISON TYPE SAMPLER
- ⊖ FOIL SAMPLER
- X OTHER SAMPLER.


BORING LOG
App 1 2
NAME OF SURVEY & LOCALITY
KCRAS PROJECT
HOLE NO
B.2
GROUND ELEVATION
GROUND WATER LEVEL 0.65-3.45m
DATE
SURVEYED BY
SCALE
SOIL
DESCRIPTION
STANDARD PENETRATION TESTS
SOIL SAMPLES
SYMBOL
N VALUE
Top soil (silty clay), brown, trace sand, containing some roots, soft
Silty clay, reddish brown, some sand, moist, soft, medium plastic
Silt, sand and clay, light grey to brown, with some gravels of weathered igneous rock, stiff, moist
Clay, light grey, moist, stiff, highly plastic
Sandy silty clay to silty clay, light brown, wet, medium plastic, stiff to very stiff
Silty sandy gravels, yellowish grey, wet, hard/very dense. Gravels : Sandstone and siltstone, hard
Sandstone, grey, hard, medium grain, well cemented. Core broken by drilling
Sand, dark grey, very loose, saturated, medium grain
Clayey silt to sandy silt, grey/greenish grey, slightly plastic, moist, hard, with some angular gravels of weakly cemented silt. Some part weakly cemented.
REMARKS
SYMBOLS OF SAMPLER
THINWALL SAMPLER
SPLIT-SPOON SAMPLER
DENISON TYPE SAMPLER
FOIL SAMPLER
OTHER SAMPLER

BORING LOG

App 1.3

NAME OF SURVEY & LOCALITY : BEKASI PROJECT — GROUND ELEVATION — DATE : March 26,1986

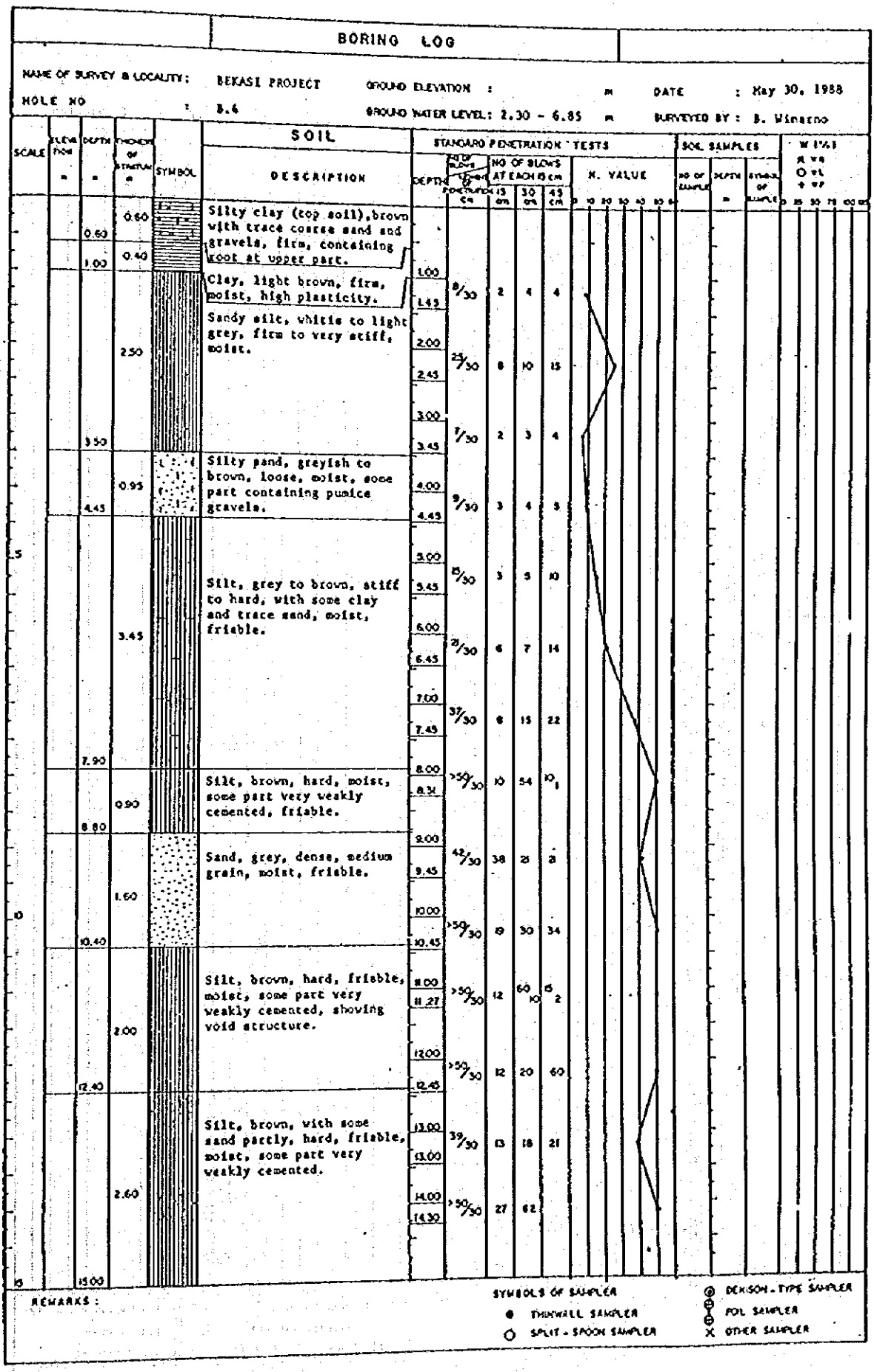
HOLE NO. : B.3 — GROUND WATER LEVEL : 0.5 - 1.8m — SURVEYED BY

SCALE	ELEVATION m	DEPTH m	THICKNESS OF STRATUM m	SYMBOL	SOIL DESCRIPTION	STANDARD PENETRATION TESTS: DEPTH m	PENETRATION 15 cm	NO OF BLOWS AT EACH 15 cm: 15 cm	30 cm	45 cm	N. VALUE	SOIL SAMPLES: NO OF SAMPLE	DEPTH m	SYMBOL OF SAMPLE	W (%)
		0.40	0.4		Top soil (silty clay), brown, trace sand, trace roots, dry, soft										
1			1.80		Gravelly silty clay, brown to grey, moist, firm. Silty clay, medium plastic. Gravels: weathered igneous rock, angular to rounded	1.00	8/30	3	4	4					
		2.20				1.45									
2						2.00									
			0.70		Silty clayey sand, brown to grey, some gravels of sandstone, fine to coarse grain, compact, moist	2.45	19/30	4	7	12					
		2.90				3.00									
3						3.45	17/30	3	7	10					
			1.40		Gravelly clayey silt, brown to grey, very stiff, moist, slightly plastic. Gravels consist of weakly cemented silt.	4.00									
4		4.30				4.45	16/30	4	6	10					
					Clayey silt to silty clay, light brown, with some sand, moist, slightly plastic, very stiff. Containing some gravels of weakly cemented silt at below part	5.00									
5			1.80			5.45	16/30	3	6	10					
		6.10				6.00									
6						6.45	44/30	10	20	24					
			0.90		Sandy clayey silt, brownish grey, hard moist, slightly plastic	7.00									
7		7.00				7.24	>50/30	36	>50						
					Moderately weathered sandstone, brown, hard, medium grain, well cemented.										
8			1.80			8.00	>50/30	>50							
		8.80				8.08									
9						9.00									
			1.50		Sand, dark grey, dense, medium grain.	9.45	41/30	11	17	24					
10		10.30				10.00	45/30	10	19	26					
						10.45									
						11.00									
					Clayey silt, dark grey to greenish grey, with some gravels of well cemented silt, hard, slightly plastic. Siltstone at depth of 14.30 - 14.80, well cemented, hard.	11.45	47/30	12	18	29					
12						12.00									
			4.70			12.45	48/30	10	18	30					
						13.00									
13						13.45	>50/30	9	20	31					
						14.00									
14						14.40	>50/30	8	21	50					
15		15.00													

REMARKS

SYMBOLS OF SAMPLER

- ● THINWALL SAMPLER
- ○ SPLIT - SPOON SAMPLER
- ⊙ DENISON TYPE SAMPLER
- ⊖ FOIL SAMPLER
- × OTHER SAMPLER


BORING LOG
NAME OF SURVEY & LOCALITY: BEKASI PROJECT
GROUND ELEVATION : m
DATE : May 30, 1958
HOLE NO : B.4
GROUND WATER LEVEL: 2.30 - 6.85 m
SURVEYED BY : B. Winarno
SOIL
DESCRIPTION
STANDARD PENETRATION TESTS
SOIL SAMPLES
N. VALUE
Silty clay (top soil), brown with trace coarse sand and gravels, firm, containing root at upper part.
Clay, light brown, firm, moist, high plasticity.
Sandy silt, whitis to light grey, firm to very stiff, moist.
Silty sand, greyish to brown, loose, moist, some part containing pumice gravels.
Silt, grey to brown, stiff to hard, with some clay and trace sand, moist, friable.
Silt, brown, hard, moist, some part very weakly cemented, friable.
Sand, grey, dense, medium grain, moist, friable.
Silt, brown, hard, friable, moist, some part very weakly cemented, showing void structure.
Silt, brown, with some sand partly, hard, friable, moist, some part very weakly cemented.
REMARKS :
SYMBOLS OF SAMPLER
THINWALL SAMPLER
SPLIT - SPOON SAMPLER
DENISON - TYPE SAMPLER
FOIL SAMPLER
OTHER SAMPLER

BORING LOG

NAME OF SURVEY & LOCALITY : BEKASI PROJECT
GROUND ELEVATION : m
DATE : May 31, 1988
HOLE NO : B.5
GROUND WATER LEVEL : 1.60 - 3.80 m
SURVEYED BY : B. Winarno

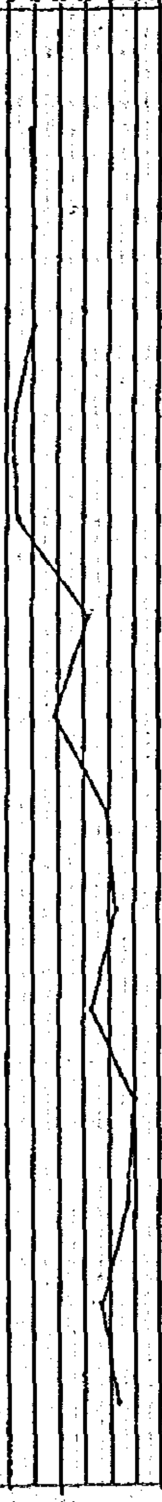
SOIL

Depth (m)	Thickness of Stratum (m)	Description
0.50	0.5	Silty clay (top soil), brown, with trace coarse sand and gravels, firm, containing root at upper part.
3.85	3.35	Clay, brown and grey with some silt and trace sub-rounded gravels at upper part, stiff, moist, high plasticity.
5.65	1.80	Silty clay, brown to light brown, with trace sand, firm, moist, medium plasticity, sand content increasing at lower part.
6.10	0.45	Sand, brown, compact, medium grain.
8.20	2.10	Silt, light brown to light grey, very stiff to hard, friable, moist.
9.80	1.60	Silty sand to sandy silt, brown, dense to very stiff, friable, moist.
10.75	0.95	Sand, brownish grey, dense, moist.
14.65	3.90	Silt, brown, hard to very hard, moist, friable. Partly very weakly cemented.
15.00	0.35	Sand, brown to dark grey, fine grained, dense, friable, moist. Partly weakly cemented.

STANDARD PENETRATION TESTS

Depth	No. of Blows / Depth of Penetration (cm)	15 cm	30 cm	45 cm
1.00 – 1.45	9/30	3	4	5
2.00 – 2.45	10/30	3	4	6
3.00 – 3.45	10/30	2	5	5
4.00 – 4.45	4/30	1	2	2
5.00 – 5.45	5/30	2	2	3
6.00 – 6.45	32/30	7	15	17
7.00 – 7.45	19/30	4	7	12
8.00 – 8.45	39/30	7	13	26
9.00 – 9.45	44/30	11	21	23
10.00 – 10.46	33/30	13	15	18
11.00 – 11.50	>50/30	22	65	
12.00 – 12.45	46/30	10	16	36
13.00 – 13.45	37/30	9	13	24
14.00 – 14.45	43/30	8	16	27

N. VALUE

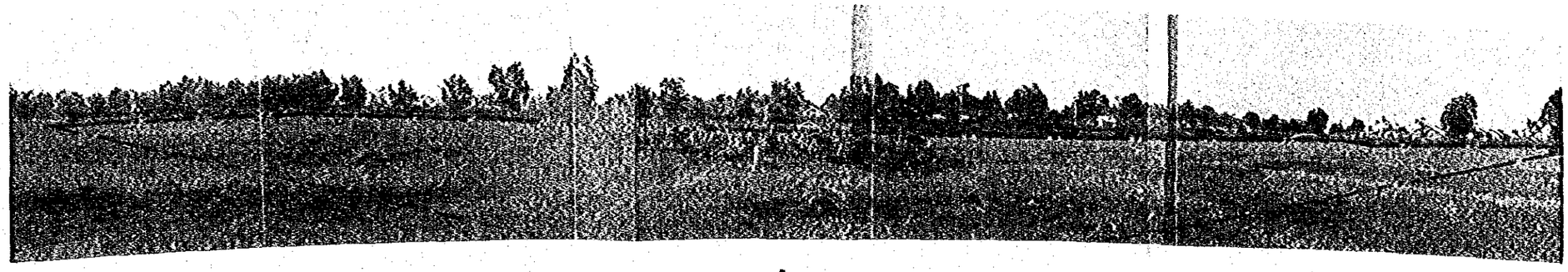


SOIL SAMPLES: NO OF SAMPLE | DEPTH (m) | SYMBOL OF SAMPLE

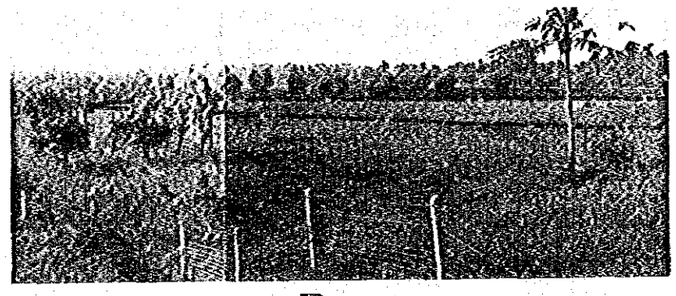
W (%): Wn, WL, WP — 0 25 50 75 100

REMARKS :

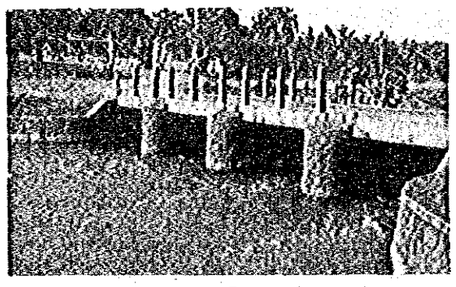
SYMBOLS OF SAMPLER
● THINWALL SAMPLER
○ SPLIT - SPOON SAMPLER
⊚ DENISON - TYPE SAMPLER
⊕ FOIL SAMPLER
X OTHER SAMPLER



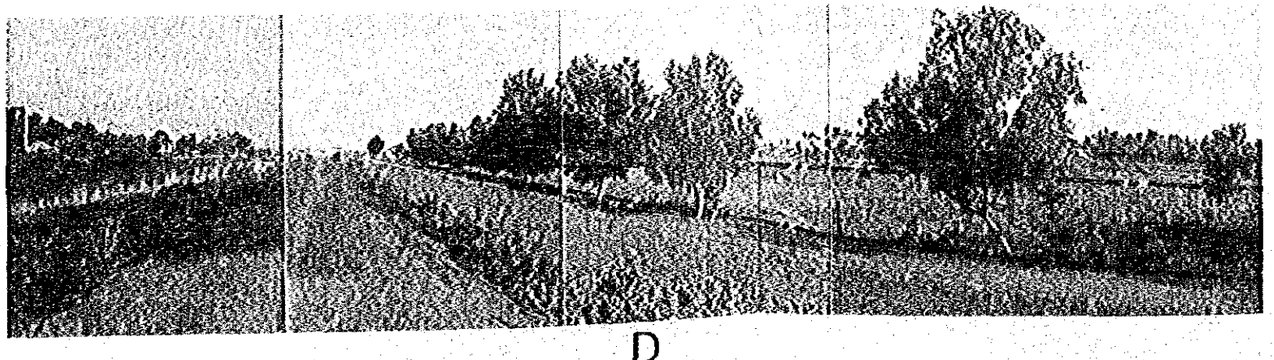
A



B

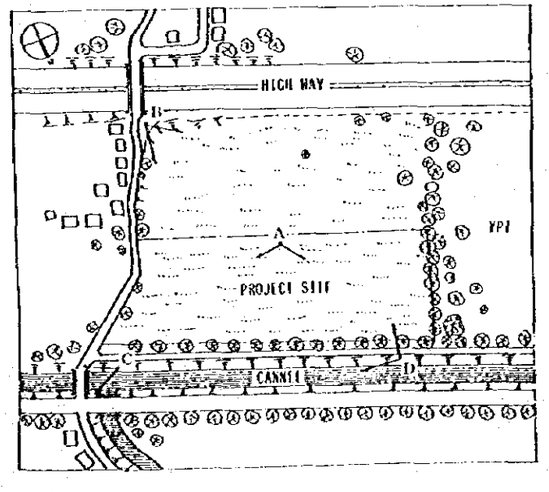


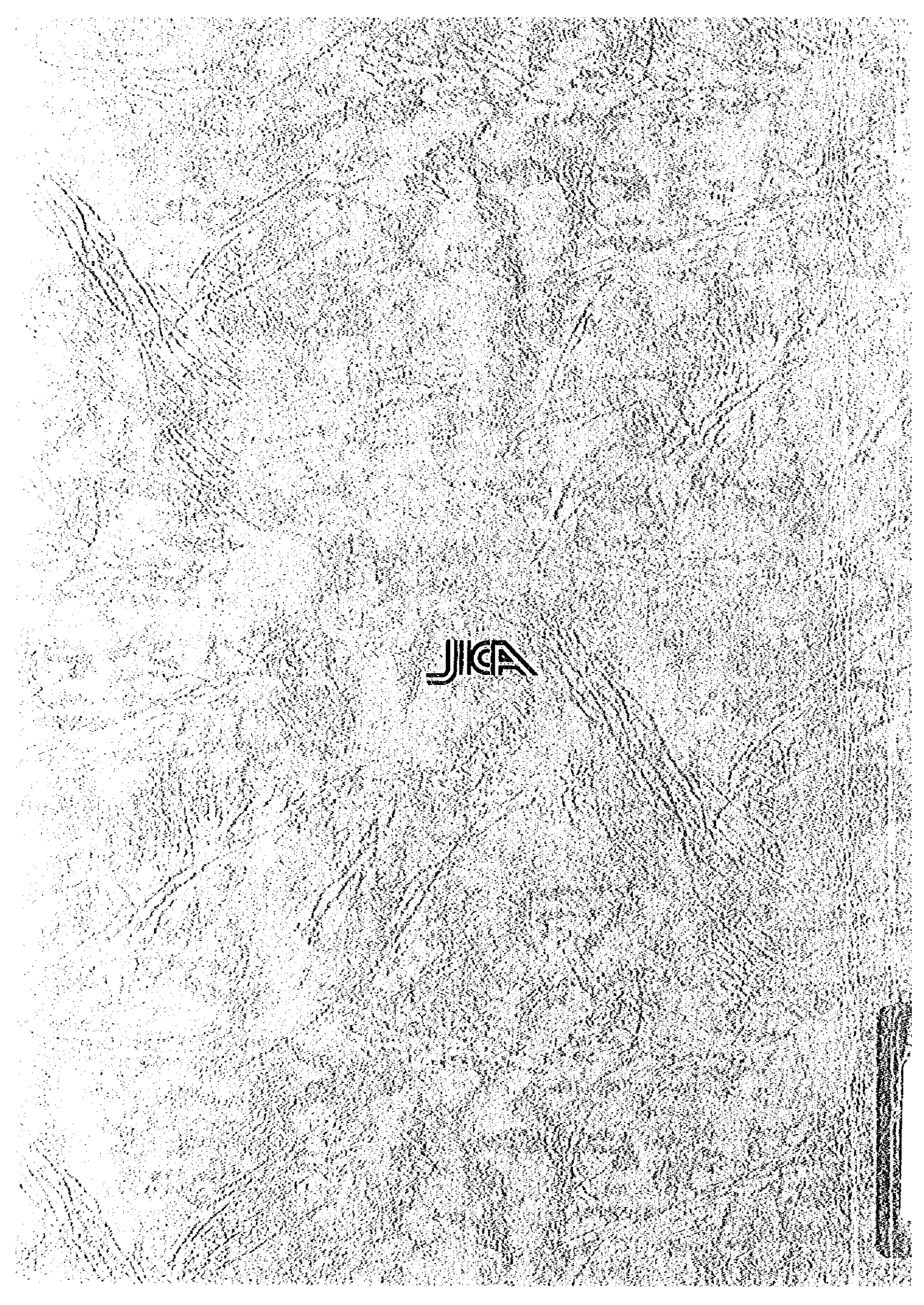
C



D

3-3 Photographs of the Site




JICA