In consideration of the above prerequisite conditions, the port facilities for this project have been designed in the form of a dredged harbor as in the case of the LNG plant.

Although there are a number of alternatives possible for the design of the berth, the conceptual design for them at this stage is as shown in the relative figures which illustrate horizontal-type berth. The layout, etc. of the berth are shown in Figures IV-10 and IV-11.

4-6-2 Connecting road to highways

The Aceh Provincial Government and the Indonesian Government appropriated a budget for constructing the Medan-Banda Aceh highway for completion by mid-1979. Therefore, as far as this project is concerned, the necessary road for connection to this highway covers 1.2 km from the plant site. This connecting road between the plant site and the Medan-Banda Aceh highway shall be used for transportation of the product urea, interchanging of heavy machinery with the LNG plant, and also for plant personnel commuting. This connecting road shall therefore be constructed on the basis of the standards enforced by the Ministry of Public Works of the Indonesian Government, together with the actual experiences of the LNG plant in connection with road construction.

Chapter 5 Contractual Method and Construction Schedule

5-1 General

It is possible to categorize the scope of the facilities of this project as follows:

a) Process plant
Ammonia plant, urea plant

b) Utilities and auxiliary facilities
Water treatment, power generation, boiler, storage facilities, warehouses, etc.

c) Port facilities and cargo handling facilities
Port facilities, ship maneuvering facilities, loading facilities

In order to construct these necessary facilities, the following functions will be imperative:

a) Project control (cost and schedule)
b) Design and engineering
c) Site preparation and civil engineering
d) Procurement and shipping (including inspection)
e) Erection and construction
f) Commissioning and test run
g) Training

The project owner of this complex, P.T. ASEAN Aceh Fertilizer, will be incorporated with joint investment by Indonesia and other ASEAN countries (the detailed information of the company is shown in Part I). The Indonesian Government assigned P.T. PUSRI as the Indonesian shareholding entity in the company. P.T. PUSRI, as the Indonesian national fertilizer corporation, has been running four units of ammonia/urea plants of the same size as this project successfully.

The execution of the project will be realized with the full assistance of P.T. PUSRI in relation to implementation, construction, and production management, as well as to the recruitment and training of plant personnel.

In the following paragraphs, discussion will be made concerning the method and schedule for the implementation and construction of this project. This is based on full involvement by P.T. PUSRI, which has sufficient experience with this type of described project.

5-2 Type of contract for the construction of the complex

The scope of this project may be classified into the following area-wise categories in accordance with the plant layout:

a) Plant area
b) Harbor area
c) Water intake and pipeline area
d) Housing colony area

In a project consisting of variety of facilities and also involving a broad and complex scope of work like this project, plant construction is usually commissioned to an experienced foreign contractor. The ammonia and urea plants recently built in Indonesia are no exceptions.

In this project, it is expected that construction within the scope of the plant area and harbor area will be commissioned to a foreign contractor, following the previous examples in Indonesia and also taking into consideration the characteristics of work involved in the construction. On the other hand, in light of current performance, it is anticipated that construction in water intake and pipeline area and housing colony area will be commissioned to Indonesian local contractors. In this case, the project sponsor should directly manage and supervise employed local contractors. It is already certain that P.T. PUSRI will be a major shareholder of the project company and will provide the company with full assistance in the implementation of this project. Judging from the past experience of P.T. PUSRI, there is no doubt about its capability of the management and supervision over the local contractors.

On a presumption that major scope of work of the project is commissioned to a foreign contractor as mentioned above, there are two alternatives for contracts as follows:

Package contract:

To contract with single contractor to cause it to undertake the whole scope of plant construction until completion under its full responsibility.

Divided contract:

To contract with several contractors to cause them to undertake the respective

part of work divided by plant unit, individual work or function such as design, engineering and construction.

On the above two, the package contract system is desirable because this system enables economic optimization of construction work and schedule in due consideration of inter-related and common elements in the construction schedule, equipment and materials, and furthermore this system simplifies contractual relationship between the project sponsor and the contractor particularly regarding the contractor's responsibility.

There are various forms for the package contract, of which the following are typical ones:

a) Turn-key lump-sum contract:

To contract with a single contractor at a lump-sum price to cause it undertake the entire scope of the project on a turn-key basis from design and engineering, procurement, erection and construction, training, start-up and supervision of test run through commissioning and plant acceptance.

b) Turn-key cost-plus-fee contract:

To contract with a single contractor to cause it undertake the entire scope of the project on a turn-key basis like the above-mentioned form. In this case, however, the contractor (named a general contractor) will, at a fixed fee, perform the whole scope of services (including design, engineering, procurement, overall supervision of erection and construction work, training, start-up and supervision of test runs) and will be responsible for all technical and financial management of the project, while all machinery, equipment, materials and subcontracts required for the construction of plants will be procured on a reimbursable cost basis through competitive bids conducted under the direct supervision of the general contractor and with the approval of the project sponsor. As this type of contract is also called a 'general contract' system, it is hereafter referred to as the 'general contract'.

The selection among these two alternative types necessitates a careful study, since each type has its own merits and demerits. However, project sponsors usually prefer the latter type of the contract (general contract), when they will be implementing a project with such a broad and complex scope as this project.

In the case of a turn-key lump-sum contract, the contractor will nominate vendors or suppliers of machinery, equipment and materials as well as subcontractors for erection or civil work without consent of the project sponsor. Thus, the project sponsor has only little room for reflecting its interest during construction.

On the contrary, the general contract is ideal for the project sponsor because, in this type of contract, all procurement are made through competitive bids with technical and commercial evaluation for approval of the project sponsor.

Unlike the lump-sum contract, the general contract enables the project sponsor to make monitoring of all expenditures, since payments of all items are made on an actual cost basis. In this system there is the only problem that responsibility for budget control will not be assumed by the general contractor. Consequently, the project sponsor must control the project budget under its own responsibility. In such event, if the project sponsor has a well experience in the budget control and an experienced contractor is employed, budget control for maintaining project expenditures within an initial budget is practically manageable by means of obligating the contractor to prepare an initial budget with detailed break-down and to submit monthly reports on expenditures in such a form and manner that enable the project sponsor to check the expenditure in every month and to take necessary measures as appropriate.

In Indonesia, the latter type of contract (general contract) has been invariably employed for the construction of fertilizer plants and all were completed within the initial budget. In light of such successful past performances the Indonesian Government intends to adopt the general contract system for this project. It is anticipated that PUSRI's rich experiences are made the fullest use of. In addition, the project company, will retain a foreign consultant firm as technical advisors. With this arrangement, the company may be able to establish an organization and systems for efficient project management. On such a presumption, it is the finding of the Evaluation Team that there is no reason to object to the intention of the Government of Indonesia.

Although additional examination is required for the selection of a type of contract, the construction schedule was conceived on the assumption that the whole scope of the project will be commissioned to an experienced engineering firm under the general contract system.

5-3 Construction schedule

5-3-1 General

The construction schedule, which starts with the selection of a contractor, varies depending upon the mode of the contract and the method of construction. It is assumed here in this respect that the major portion of the scope of the project will be executed on the basis of appointing a general contractor. In this paragraph, the responsibility of the owner, in due course of project execution, will be clarified on the basis of general contractor method.

With regards to the responsibility of the owner, P.T. PUSRI as an owner has sufficient knowledge and experience for the execution of this kind of the project, but it is the intention of the Indonesian Government that an experienced technical advisor be appointed in order to assist the owner with financial requirements, technical know-how, as well as with properly executing competitive bidding for the selection of a general contractor and the procurement of equipment and machinery. The technical advisor will be assigned through the duration of project implementation, from the preparation of a tender document for the selection of the general contractor to plant take-over by the owner. Therefore, the responsibility of the owner starts from the selection of the technical advisor, and then to the execution of the project with due assistance given by the technical advisor.

5-3-2 Owner's job before the award of the general contractor

In order to be awarded the general contractor, the owner of the project has to prepare, among other things, the following:

a) Confirmation of exact site location and detailed site investigation, such as a soil test and marine survey

b) Detailed investigation of design criteria

c) Preparation of the standard contract

d) On the basis of a) to c) above, preparation of the invitation to bid (bid specification)

e) Prequalification of general contractors and preparation of a list of prequalified bidders (short list)

f) Preparation of the selection criteria for the selection of a general contractor

(1) Confirmation of the exact site location and detailed site investigation

It is one of the crucial points for efficient implementation of the project that the exact site location be confirmed and consequently the land acquired. On the plot of the confirmed site location, a detailed investigation is required for the preparation of design criteria.

Site surveys conducted so far by Indonesian parties taking boring tests, etc., are merely comparison surveys only for the purpose of selecting the site. In order to conduct a survey to collect data and information sufficient to compile the bid specifications or quotations, it is necessary to allow a period of about three months. This survey consists of the following investigations (Ref. Annex IV-3):

a) Boring test
Soil and sub-soil boring test

b) Topographical survey
Bathymetric and topographical survey

c) Collection of meteorological data
Review of data already collected by the LNG project

(2) Preparation of design criteria

Detailed design criteria should be prepared for the design, engineering, construction and erection of plant facilities by a general contractor on the basis of an outline of plant facilities conceptually designed in the feasibility report as well as by detailed site investigation to be conducted as described in (1) above. Design criteria shall be shown in the bid invitation, from which the general contractors will prepare their proposals.

As for the process plant, the process to be employed in the project is decided by the time of contractor selection, so that the design criteria should include general precautions to be taken for the design and construction of these ammonia/urea plants.

In design criteria, codes and standards will be clarified for the design and engineering of plant facilities by general contractors.

(3) Preparation of the standard contract

It is required to include the standard contract in the bid invitation. The standard contract is needed to clarify the requirements by the financier as well as the details of contractual terms by which the project will be executed efficiently.

(4) Preparation of the bid invitation

A general contractor will be selected through competitive bid procedure among several prequalified contractors. Functions of the general contractor should be defined as follows:

a) Project management including schedule control, cost control, and project coordination

b) Basic and detailed designs and engineering of the plant facilities

c) Management of the procurement, including procurement of equipment and machinery through competitive bid, expediting and inspection, and arrangement for delivery to site

d) Management of construction and erection

e) Testing, starting-up and initial operation of the plant

f) Arrangement for training of owner's personnel

On the basis of the required functions of a general contractor described above, the bid invitation is to be prepared so as to clarify the specifications of the proposals to be made by the contractors.

The bid invitation should include the following points:

a) Scope of project

b) Scope of supply

c) Guarantee requirements including performance, workmanship, construction materials and construction period

d) General site conditions

e) Design criteria

f) Procurement procedures

g) Methodology for the estimate of costs and fees

(5) Prequalification of general contractors and preparation of prequalified bidders

Prequalification is to be made among possible candidate contractors so that the short list, which is the list of prequalified bidders, is prepared in order to follow competitive bid procedure for the selection of a general contractor.

(6) Preparation of selection criteria

The criteria are to be prepared for fair and justifiable bid evaluation for the selection of a general contractor among prequalified bidders.

5-3-3 Selection of a general contractor

As soon as the procedures described in 5-3-2 above are accomplished, the prequalified bidders will be invited for the selection of a general contractor. In response to the bid invitation prepared by the owner, the bidders (general contractors) will offer their technical and commercial proposals which will be evaluated by the owner with the selection criteria and the analysis of their bidders' technical presentations. After the evaluation is made, one or two bidders will be invited to the contractual negotiation through which a general contractor will be selected.

5-3-4 Owner's job after the assignment of a general contractor

After a general contractor is awarded, as discussed in the foregoing, almost the entire scope of the project is contracted to the general contractor. However, the owner of the project has to check and approve the execution of the general contractor in such things as basic and

detailed design of plant facilities, and procurement of equipment and machinery as well as sub-contractor's services. In this regard, the owner should arrange a proper organization for handling these required functions.

On the other hand, the owner has to organize personnel and to recruit and train the staff and operators for a smooth start-up after the mechanical completion of the plant. In addition to the above, the owner has to execute the work outside the scope of the general contractor's responsibility, such as in construction of the housing colony and water intake facilities, and the procurement of raw material and utilities. And, it is also the responsibility of the owner to control the cost and schedule of the entire scope of the project with the coordination of the general contractor.

5-4 Construction schedule of the project

In view of the past construction schedules in similar types of projects, especially in Indonesia, and of the local factors in the plant site as well, the construction schedule for the project was examined. As a result of the examination, it was presumed that a period of 36 months will be required from the effective date of the general contracts until plant acceptance by the owner. (Details of the schedule are shown in Figure IV-13.) Therefore, on the basis of the assumption that the general contractor will be awarded by the beginning of January 1979, the plant will be mechanically complete by the end of 1981 and commercial operation will be started by the beginning of 1982.

Chapter 6 Plant Management

6-1 General

It was decided by the Indonesian Government that the owner, P.T. ASEAN Aceh Fertilizer, will involve R.T. PUSRI as an Indonesian shareholding entity of the company, and that P.T. PUSRI will manage and control the production of the project. In spite of P.T. PUSRI's involvement in production management, the project necessitates the recruitment and training of staff and operators in various fields of personnel organization for efficient management of the plant.

On the other hand, the Aceh Province, as a labor market, is only able to provide so-called "unskilled" labor so that it is necessary to recruit skilled workers such as engineers and operators largely from other parts of Indonesia.

In order to cope with this difficulty as well as with the specific difficulty of operation and management of an ammonia/urea plant, provisions of external assistance (i.e., appointment of consultants) and training of personnel have been formulated in view of the overall organization and manning schedule for this complex, covering all the stages of project implementation – i.e., during the construction, test run, and commercial operation period. The training of plant personnel envisaged here presumes the utilization of P.T. RUSRI's facilities as well as experience.

6-2 Organization and manning schedule

By referring to the actual achievements and experinece accumulated by several Indonesian enterprises in general, those of PUSRI in particular, Figure IV-14 has been drawn to illustrate the overall organization of the envisaged project. The relative manning schedule is shown in Table IV-9. The organization encompasses a total of 625 persons.

In view of the nature of this project, it seems particularly important to install an office in Jakarta. As to office personnel, 30 employees shall be stationed at the Jakarta Office.

As for marketing and distribution of the product, the project is to fully rely on P.T. RUSRI's organization and its channels for domestic distribution as well as for exportation of the product. Therefore, the organization of the project does not include personnel for marketing and

distribution of the product except a small clerical staff.

6-3 Appointment of advisors

6-3-1 During the project implementation and construction periods

The Indonesian Government has a plan to employ advisors for the conclusion and execution of the contract with the general contractor as well as for reporting to and coordinating with the shareholders and financiers, although P.T. PUSRI will be involved in the project as a shareholding entity. The function of advisors are considered as follows:

a) Technical advisor
(Ref. Chapter 5, Part IV.)

b) Legal advisor
To assist in the conclusion of contracts

c) Administration advisor
To assist with organizational administration and control of the accounting system

6-3-2 After the test run period

In the plant management of P.T. PUSRI at an earlier stage, and for P.T. Pupuk Kujang, a management contractor had been employed for the plant management after the test run stage with the following scope of work:

a) Assistance for test run operations

b) Training of plant crew

c) Establishment of operation/maintenance/administration systems

d) Establishment of job classification/assignments and responsibility demarcation/ delegation

e) Assistance for commercial operation

f) Advice on marketing

In this project, a management contractor will also be employed with a reduced number of experts, since experienced staff from P.T. RUSRI will be involved in plant management after the test run.

6-4 Training of plant personnel

P.T. RUSRI now has a center where they are training their own personnel as well as personnel outside their organization including those from Bangladesh, etc. Their type of training includes, among other things:

a) Basic education in chemistry

b) Basic education in chemical industry

c) Education in the basic knowledge concerning chemical plants

d) Operational training by using simulators

e) On-the-job training at plants in actual operation

This project will utilize this center to the full extent.

To parallel the training by P.T. RUSRI, the following arrangements for training will be considered:

a) By the general contractor, training will be effected centering on the operational technique and technology concerning the process employed. This training shall be given to personnel from foremen upwards, and the training of engineers will be effected in the home country of the general contractor.

b) On-the-job training will be given by the management contractor during the actual operation of the plant.

c) Training in engineering methodology will be given by the technical advisor.

IV-41

Table IV-1. QUALITATIVE COMPARISON OF THE TWO CANDIDATE SITES

No.	Criteria	Kuala Jangka	Kuala Geukeuh
1.	Land Utilization	Table IV-2	
2.	Site Preparation	Same	
3.	Soil Condition	Bearing Stratum -8 m	Bearing Stratum -12 m
4.	Harbour Construction	Same	
5.	Length of Access Road	10 km	1.2 km
6.	Length of Water Pipe Line	10 km	30 km
7.	Length of Gas Pipe Line	45 km	12 km
8.	Community Facilities	By the project	Shareable with LNG project
9.	Urban Growth and Infrastructure Development	Less developed	More developed
10.	Public Utilities	Farther from existing facilities (LNG and Lhok Seumawe town)	Nearer to existing facilities

Table IV-2. LAND AND HOUSES DATA OF GEUKEH & JANGKA

		Jangka	Geukeuh
1. Total village	Ha:	33.51	195.15
2. Total fishpond	Ha:	124.36	78.30
3. Salt producing area	Ha:	75.41	-
4. Number of houses			
a. permanent (stone houses)	:	nil	nil
b. semi permanent (half stone wall)	:	nil	49
c. wooden houses	:	52	68
d. cottages	:	70	112
e. houses for salt producing	:	125	-
5. Number of coconut trees	:	21,250	98,025
6. Population	:	1,123	1,488

Table IV-3. COMPARISON OF CONSTRUCTION COST FOR TWO SITES

(Unit:000US$)

Plant Site	Kuala Jangka		Kuala Geukeuh	
Factors	Quantity	Direct Cost	Quantity	Direct Cost
Plant Foundations	RC pile 5,267 pcs L=14 m Steel pile 519 pcs L=14 m	4,437	RC pile 5,267 pcs L=18 m Steel pile 519 pcs L=18 m	5,333
Water Intake	Power Generator 1,200KW Contrifugal pumps	2,542	Power Generator 2,500KW Turbine pumps	3,228
Water Pipeline (32"Ø)	L=10 km	2,803	L=30 km	6,756
Gas Pipeline	14"Ø L=45 km	5,292	12 3/4"Ø L=12 km	1,426
Access way	L=10 km	2,300	L=1.2 km	500
Total Direct Construction Cost		17,374		17,243

Table IV-4. SPECIFICATION OF PRODUCTS

Ammonia

Ammonia	99.5	wt.% (Min.)
Water	0.25	wt.% (Max.)
Oil	10	ppm (Max.)

Carbon Dioxide

Carbon Dioxide	98.5	mol .% (Min.)
Inerts	1.5	mol .% (Max.)
	(Dry Basis)	

Urea

Nitrogen	46.0	wt.% (Min.)
Moisture	0.3	wt.% (Max.)
Biuret	0.5	wt.% (Max.)
Free Ammonia	Trace	
Iron	Trace	
Ash	Trace	

Table IV-5. TYPICAL RAW MATERIAL AND UTILITIES CONSUMPTION

1.	Ammonia Plant (Per ton of Ammonia)	
	NG	8.64×10^6 kcal*)
	Steam	1,917 kg
	Power	25 KWH
	BFW	2.30 m^3
	C/W Make-up	10 m^3
2.	Urea Plant (Per ton of Urea)	
	NH_3 (100%)	580 kg
	CO_2 (100%)	760 kg
	Steam at 42 kg/cm^2	1,450 kg
	Electric Power	60.1 KWH
	Condensate Return	60% min. of steam consumption
	Cooling Water Make-up	3.0 m^3

Note: *) Feedstock 5.646×10^6 kcal
Fuel 2.435×10^6
Aux. Boiler 0.56×10^6

Table IV-6. QUALITY OF THE PEUSANGAN RIVER WATER

	Sample	
	A	B
Calcium	18.3	18.1
Magnesium	7.5	7.2
Potassium + Sodium	9.9	9.7
Bicarbonate	73.0	91.2
Chllride	6.5	4.9
Sulphate	none	none
Total Hardness	77.0	75.3
Phenolphtalein Alkalinity	none	none
Metyl orange Alkalinity	119.7	149.5
Iron	4.0	4.0
Carbon dioxide free	none	none
Silica	8.5	7.0
Turbidity	-	-
Total dissolved solids	-	-
PH	280	350
Conductivity	6.87	7.00
Free ammonia	0.0163	0.0163
Oil content	none	none
Oxygen demand (BOD)	18.8	12.1

(Note) Sample A; Taken on Feb/7/'78 at the Bridge
Sample B; Taken on Feb/7/'78 at Pantelhong

Table IV-7. FACILITIES INCLUDED IN THE PROJECT SCOPE

A. FACILITIES

Facilities		Rated Capacity
1.	Process Plants	
1-1	Ammonia Plant	1,000 T/D
1-2	Urea Plant	1,725 T/D
2.	Utilities Plants	
2-1	Raw Water Treatment	1,500 m^3/H
2-2	Boiler Feed Water Treatment	160 m^3/H
2-3	Power Generator	-Gas turbine 15 MW
2-4	Waste Heat Boiler (with 2-3 above)	80 T/H
2-5	Package Boilers	50 T/H x 2
2-6	Emergency Power Generator	-Diesel engine 300 KW
2-7	Instrument & Plant Air Facilities	1,200 m^3/H
2-8	Cooling Towers	-For process & utilities plants
2-9	Water Intake Plant & Water Pipeline	-Plant on the bank of the Peusangan River -Pipeline Dia. 24"x30Km length
2-10	Air Separation Unit	600 m^3/H
3.	Auxiliary Facilities	
3-1	Ammonia Storage	5,000 T
3-2	Urea Storage	50,000 T -With a reclaimer
3-3	Product Handling	Bulk loader 600 T/H
3-4	Bagging Facilities	12 bags/min. x 1
3-5	Waste Water Treatment	One set
3-6	Intercommunication Facilities	One set
3-7	Gas Receiving Unit	One set

Table IV-7. FACILITIES INCLUDED IN THE PROJECT SCOPE
(CONT'D.)

B. BUILDING REQUIREMENT

1. Administration Office
2. Laboratory
3. Spare Parts Warehouse
4. Workshop
5. Control Room & Switch Gear Room for Process Plant
6. Control Room & Switch Gear Room for Utilities Plant
7. Fire Station & First Aid
8. Canteen & Locker Room
9. Office for Customs
10. Office for Shipping & Storage Operation
11. Gate House & Fencing

C. HOUSING COLONY

1.	Houses	150 for staff 150 for non-staff
2.	Utilities	Water & power from the plant

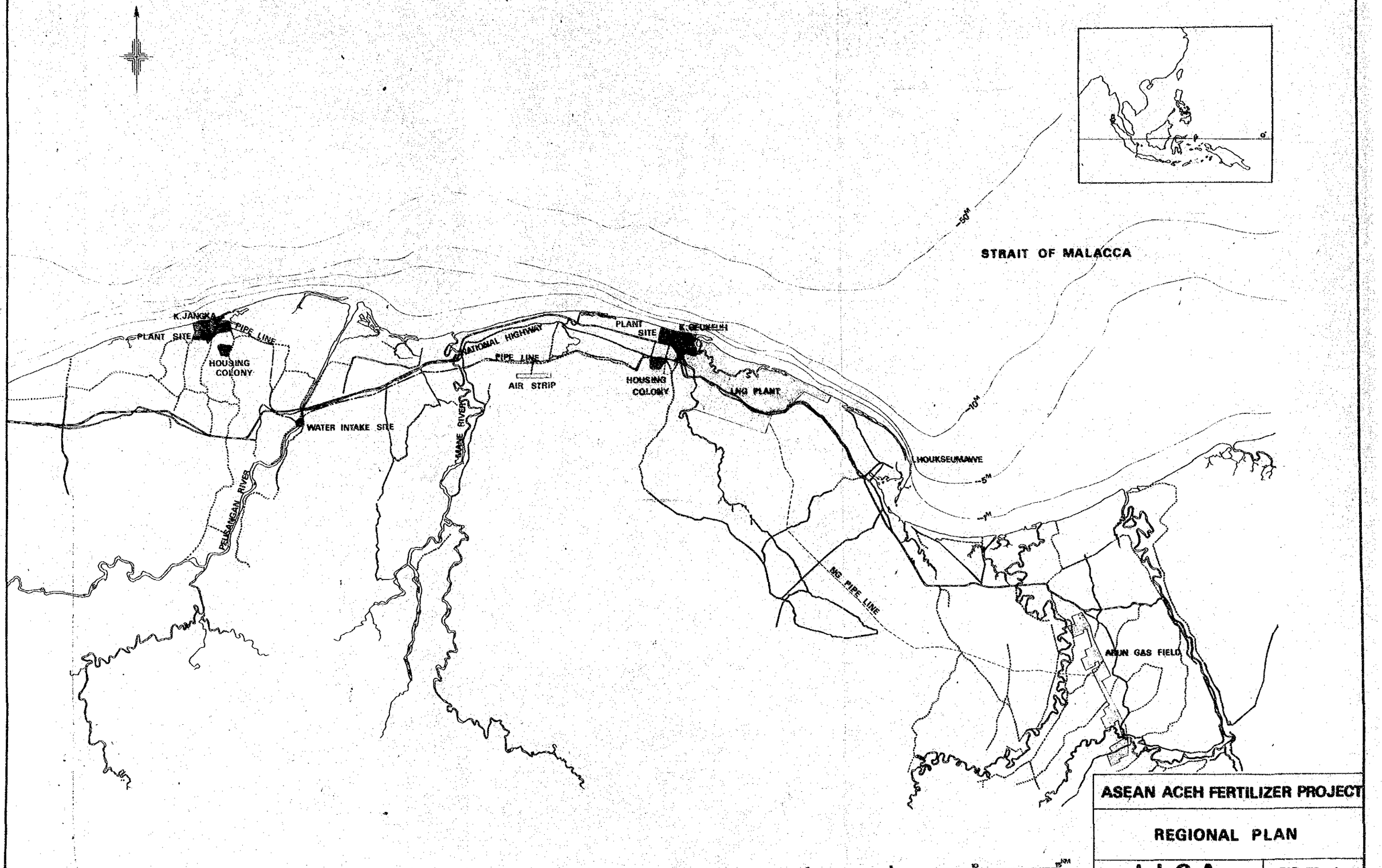
D. INFRASTRUCTURES

1.	Port & Wharf	To accommodate 7,500 ~ 10,000DWT ships (req'd depth of -10m)
2.	Connecting Road	To connect the plant with the high way

(Note) All the facilities, listed above, include connecting pipes, pipe racks, belt conveyors and hoist, wherever those are required.

Table IV-8. TOTAL STAFF REQUIREMENT

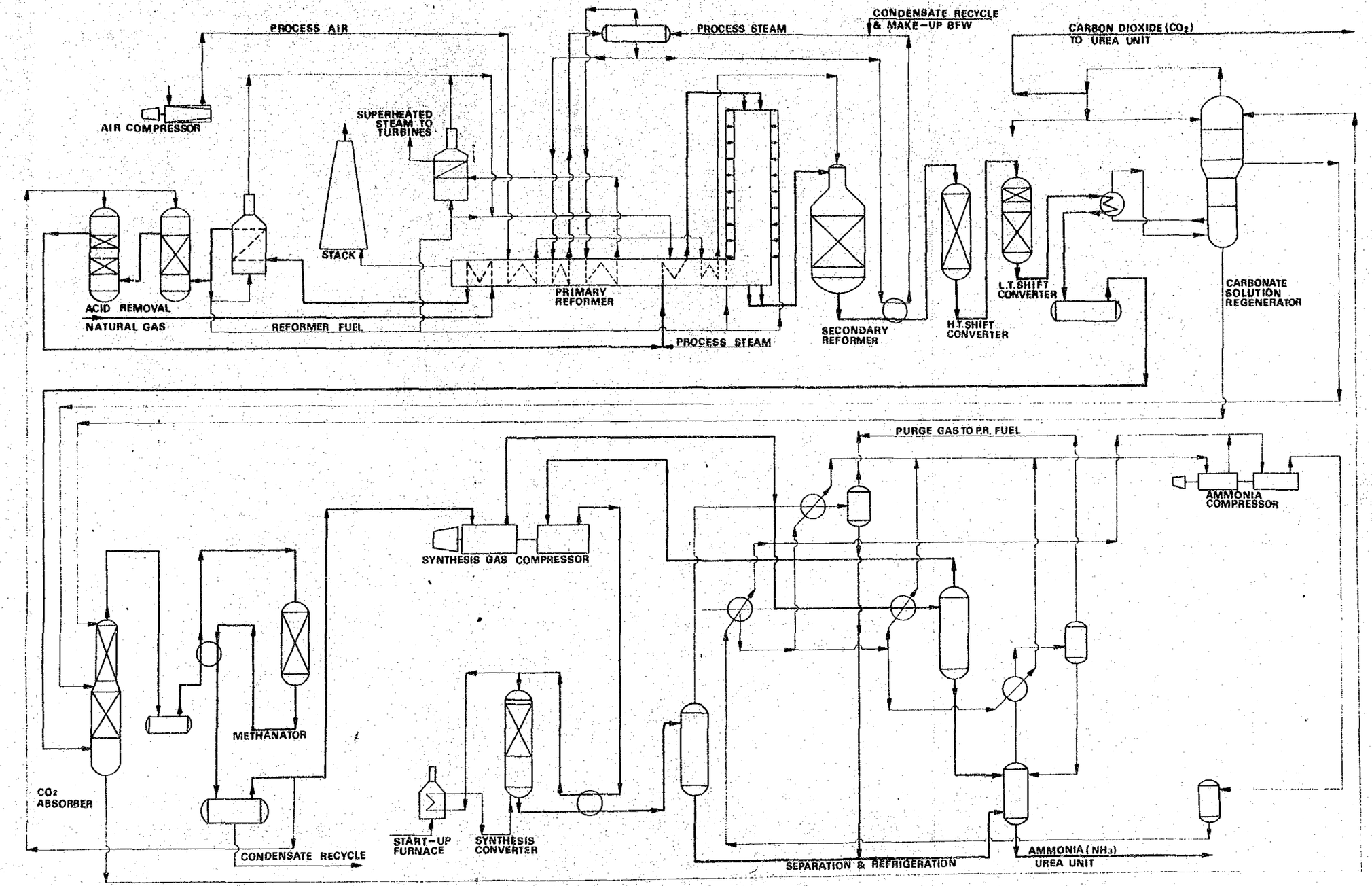
General Manager	1
Asst. General Manager	1
Administrator	1
Plant Manager	1
Dept. Manager	9
Section Head	15
Staff	32
Engineer	16
Superintendent	26
(Shift) Foreman	48
Asst. Engineer	15
(Shift) Operator	130
Technician	126
Clerk/Asst.	72
Secretary &Typist	20
Driver	5
Fire & Safety	25
Security Guard	41
General/Unskilled Labour	41
Total	625



ASEAN ACEH FERTILIZER PROJECT

REGIONAL PLAN

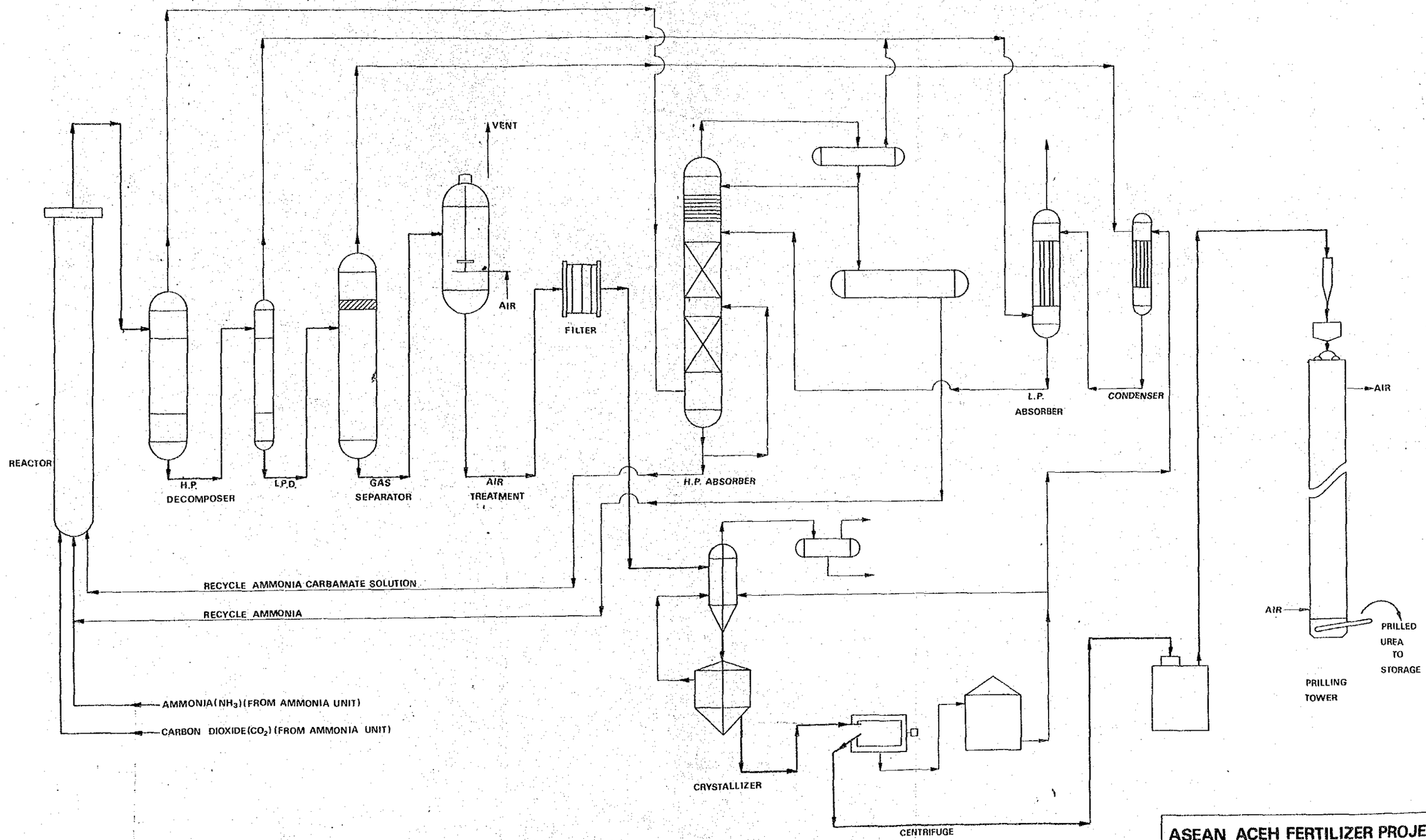
JICA | FIG Ⅳ-1



ASEAN ACEH FERTILIZER PROJECT

TYPICAL AMMONIA PROCESS

J I C A | FIG IV-2

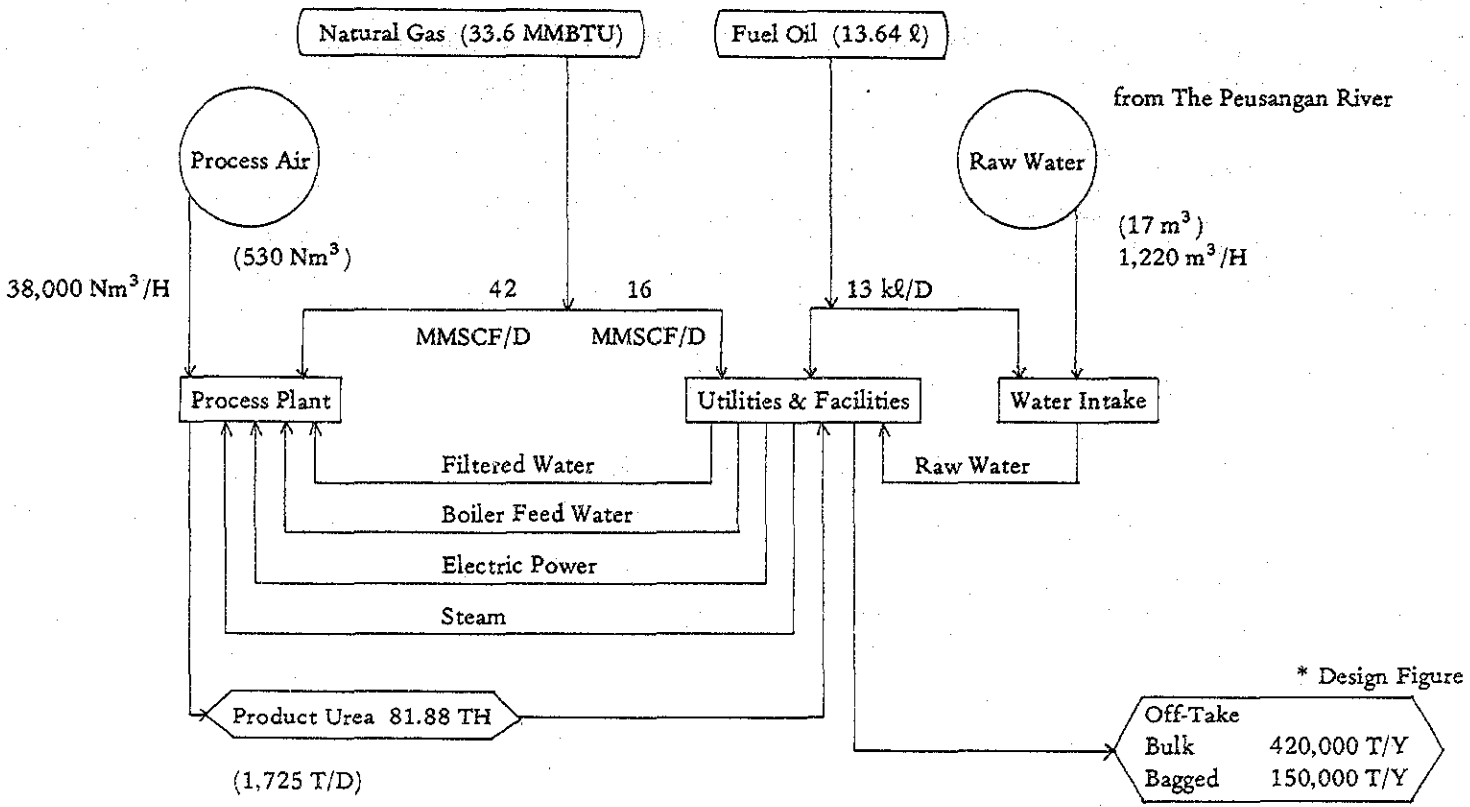


ASEAN ACEH FERTILIZER PROJECT

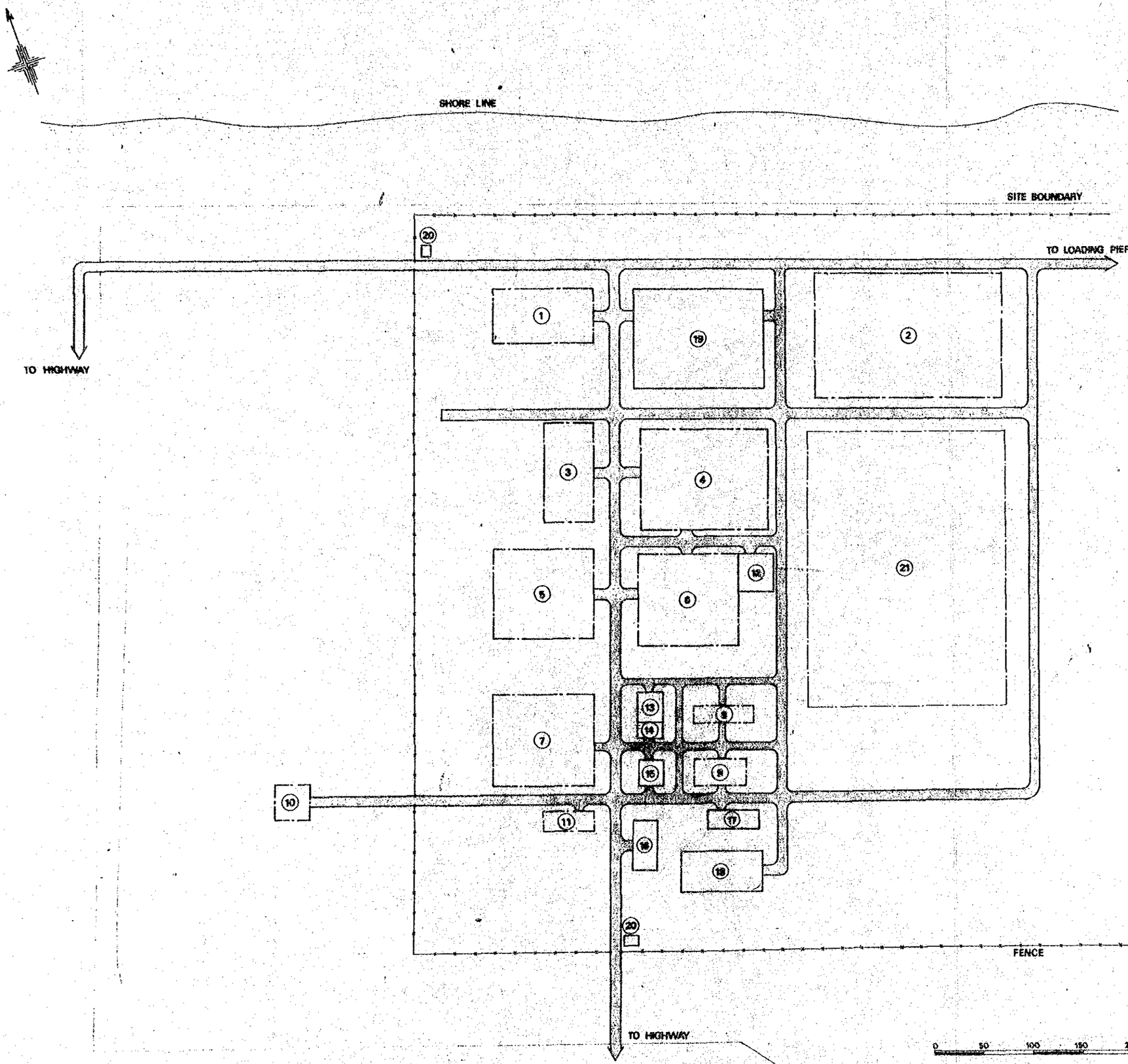
TYPICAL UREA PROCESS

JICA FIG IV-3

Fig. IV-4. BASIC MATERIAL BALANCE



(Note) Figures shown in ( ) are unit consumption per ton of product urea.

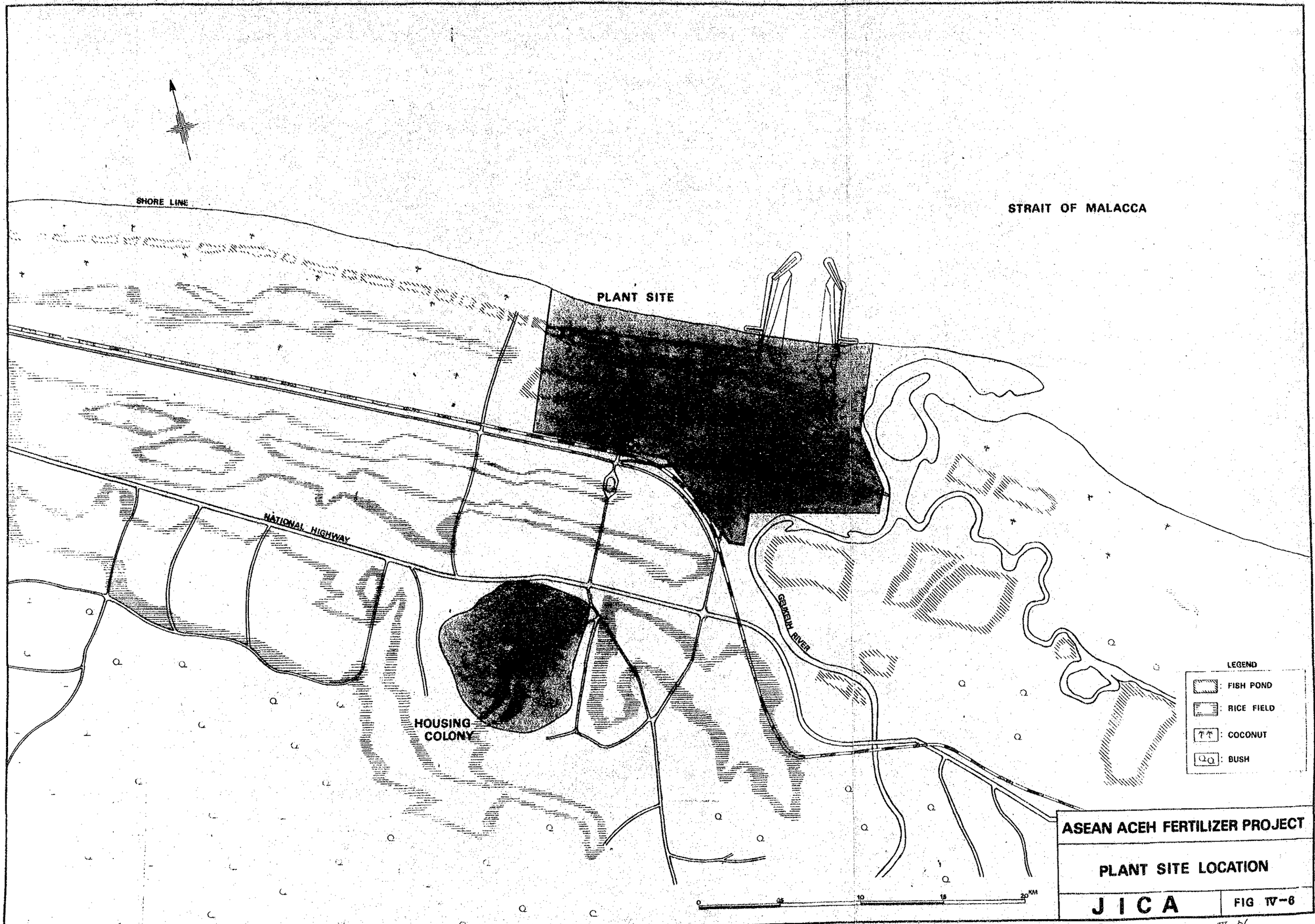


NO	DESCRIPTION
1	WASTE WATER TREATMENT
2	UREA STORAGE
3	COOLING TOWERS
4	UREA PLANT
5	AMMONIA STORAGE
6	AMMONIA PLANT
7	WATER TREATMENT
8	PACKAGE BOILERS
9	POWER GENERATOR & WASTE HEAT BOILER
10	BURN PIT
11	GAS RECEIVING
12	CONTROL ROOM
13	UTILITIES CONTROL ROOM
14	LABORATORY
15	AIR SEPARATION
16	ADMINISTRATION BUILDING
17	FIRST AID & FIRE STATION
18	CAFETERIA
19	WORKSHOP & WAREHOUSE
20	GATE HOUSE
21	AREA FOR FUTURE EXPANSION

ASEAN ACEH FERTILIZER PROJECT

PLOT PLAN OF PLANT SITE

J I C A | FIG IV – 5

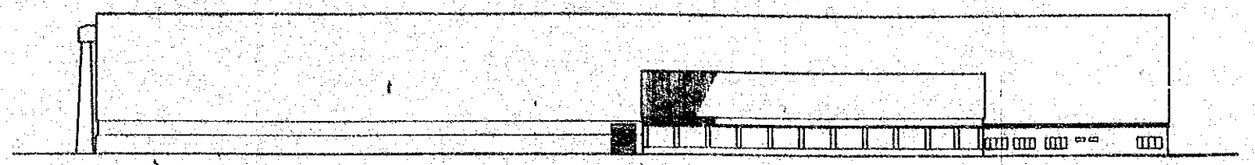


ASEAN ACEH FERTILIZER PROJECT

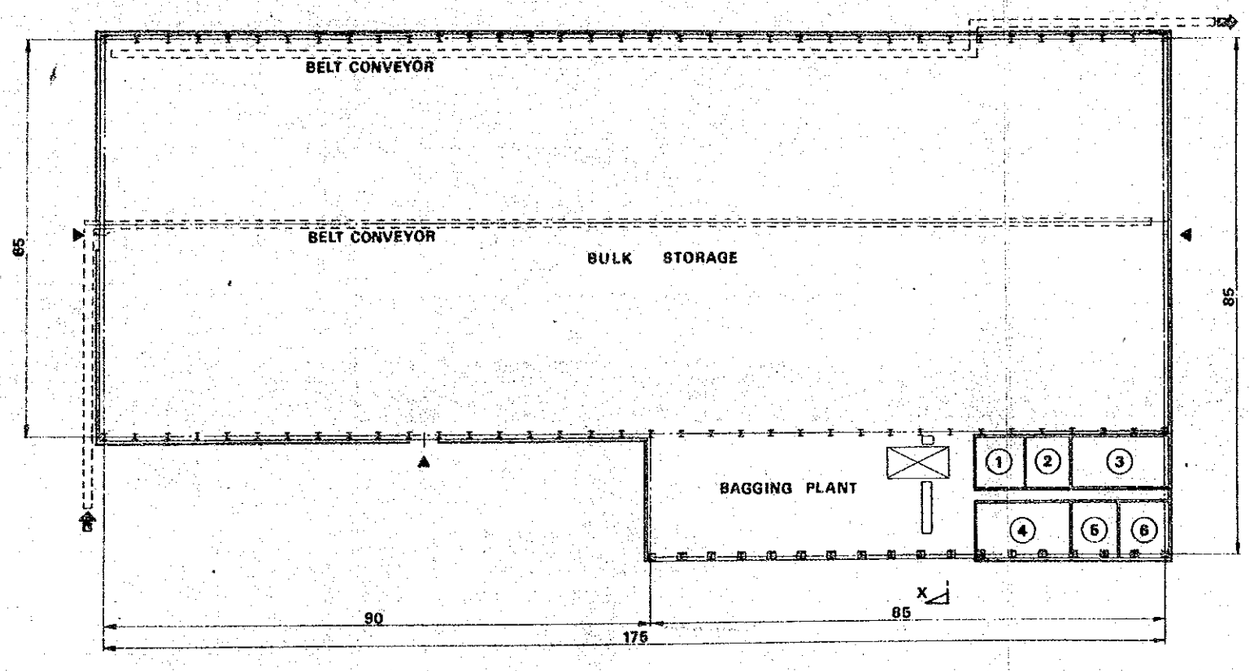
PLANT SITE LOCATION

JICA | FIG IV-6

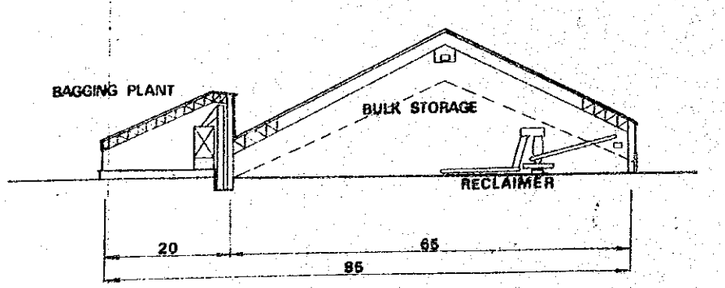
FRONT VIEW



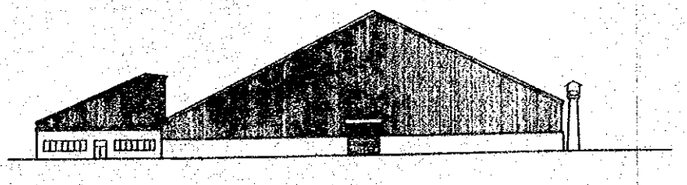
PLAN



X–X SECTION



SIDE VIEW



NO	DESCRIPTION
1	BAG STORAGE
2	ELECTRIC ROOM
3	DINING ROOM
4	OFFICE
5	SHOWER ROOM
6	CUSTOMS

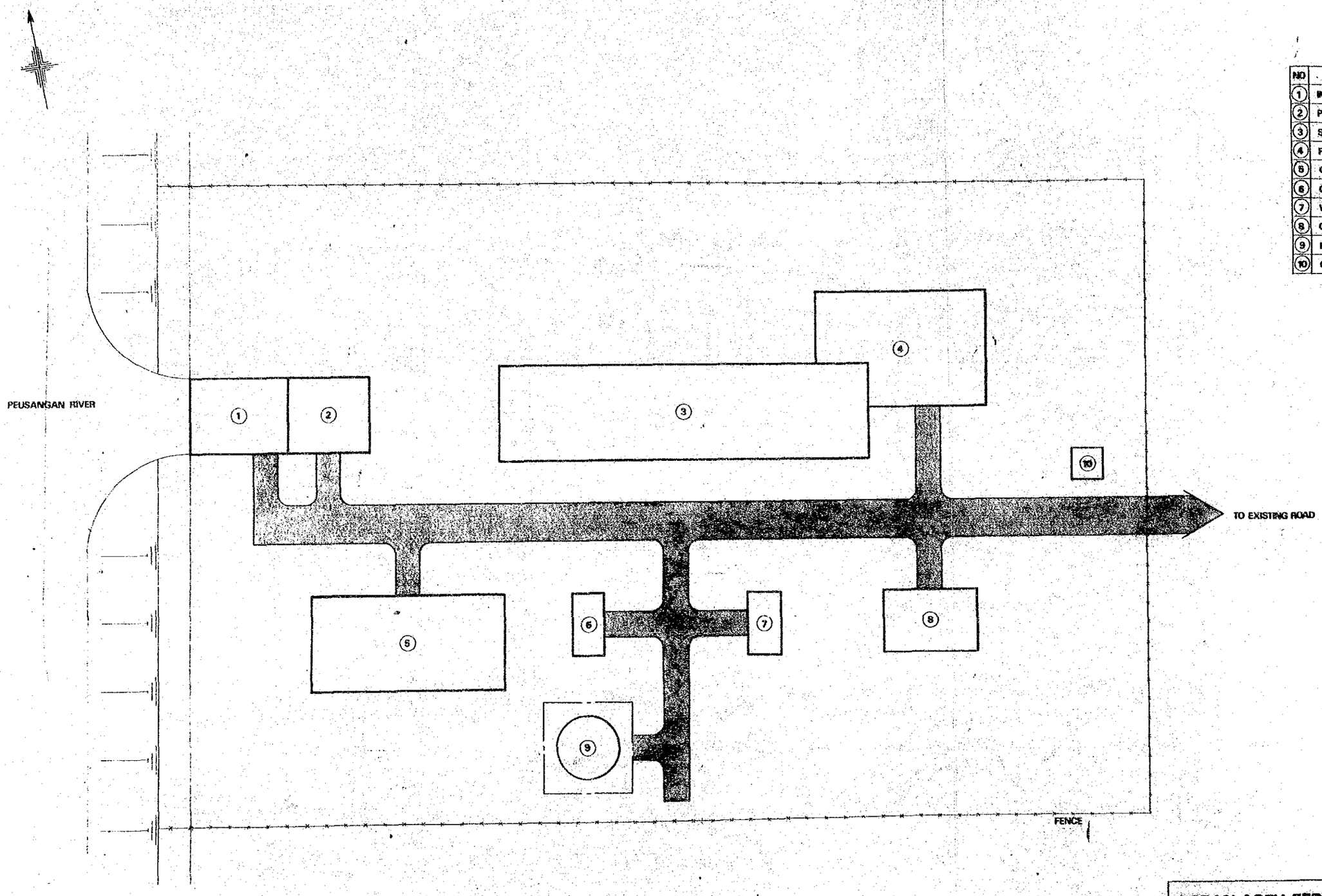
0 20 40 60 80 M

ASEAN ACEH FERTILIZER PROJECT

BULK UREA STORAGE

JICA FIG IV – 7

NO	DESCRIPTION
1	INTAKE STRUCTURE
2	PUMP ROOM
3	SETTLING POND
4	PUMP ROOM
5	GENERATOR HOUSE
6	CONTROL ROOM
7	WAREHOUSE
8	OFFICE HOUSE
9	FUEL TANK
10	GATE HOUSE



ASEAN ACEH FERTILIZER PROJECT

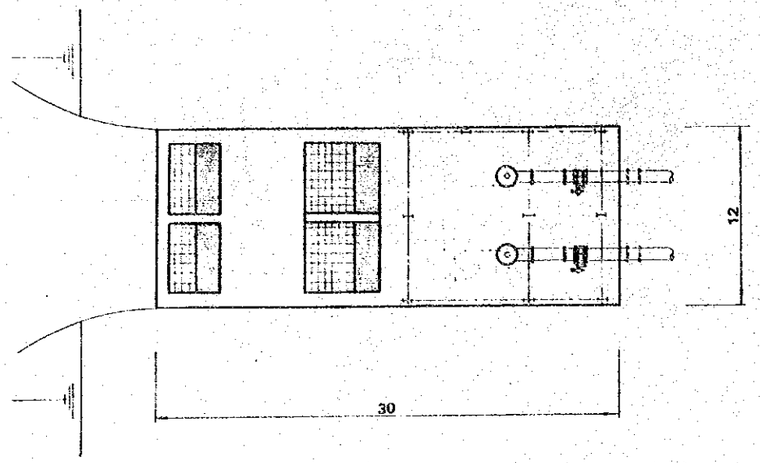
PLOT PLAN
OF WATER INTAKE SITE

JICA

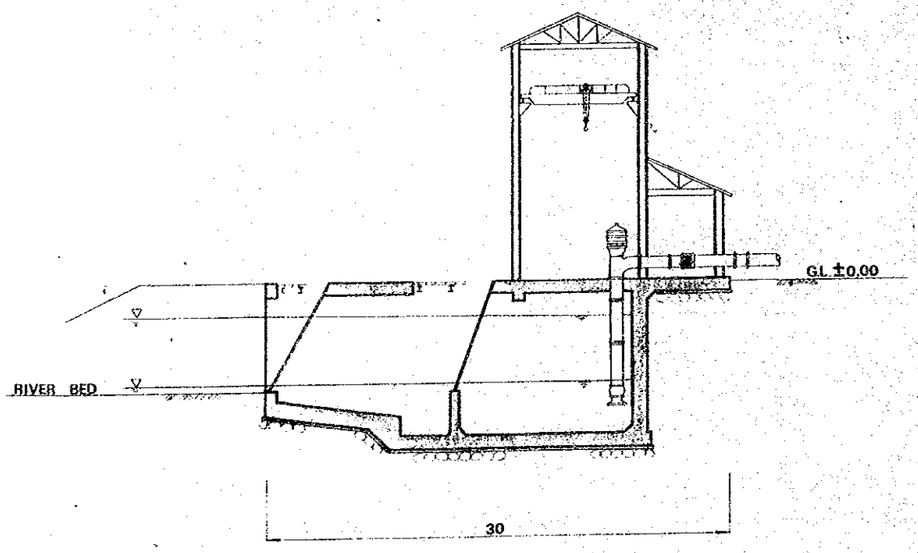
FIG IV -8

INTAKE STRUCTURE

PLAN

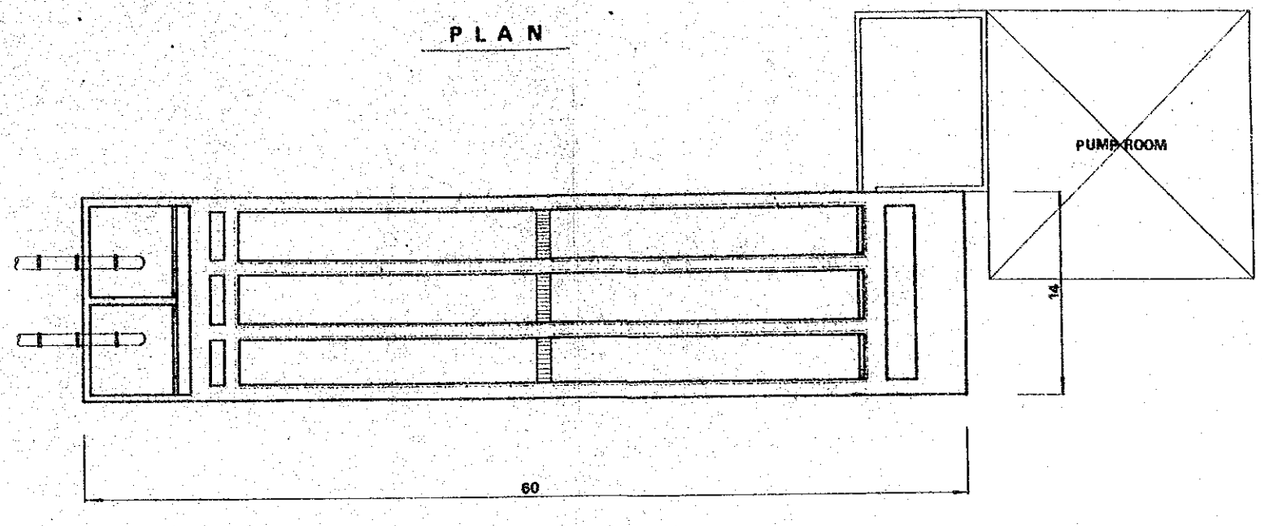


SECTION

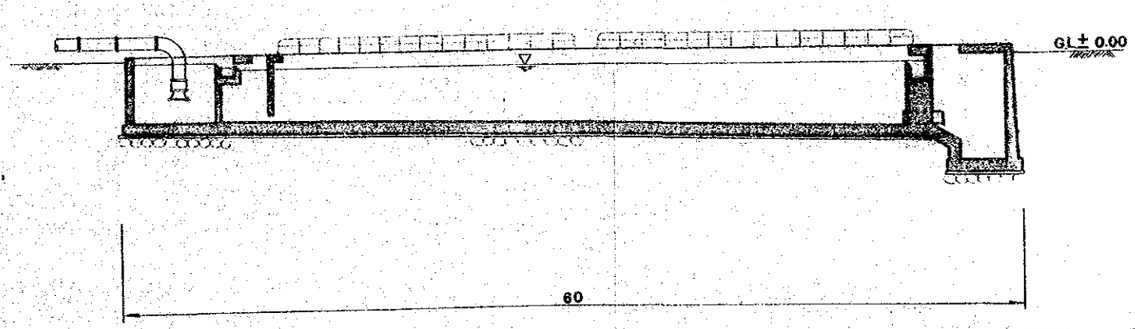


SETTLING POND

PLAN

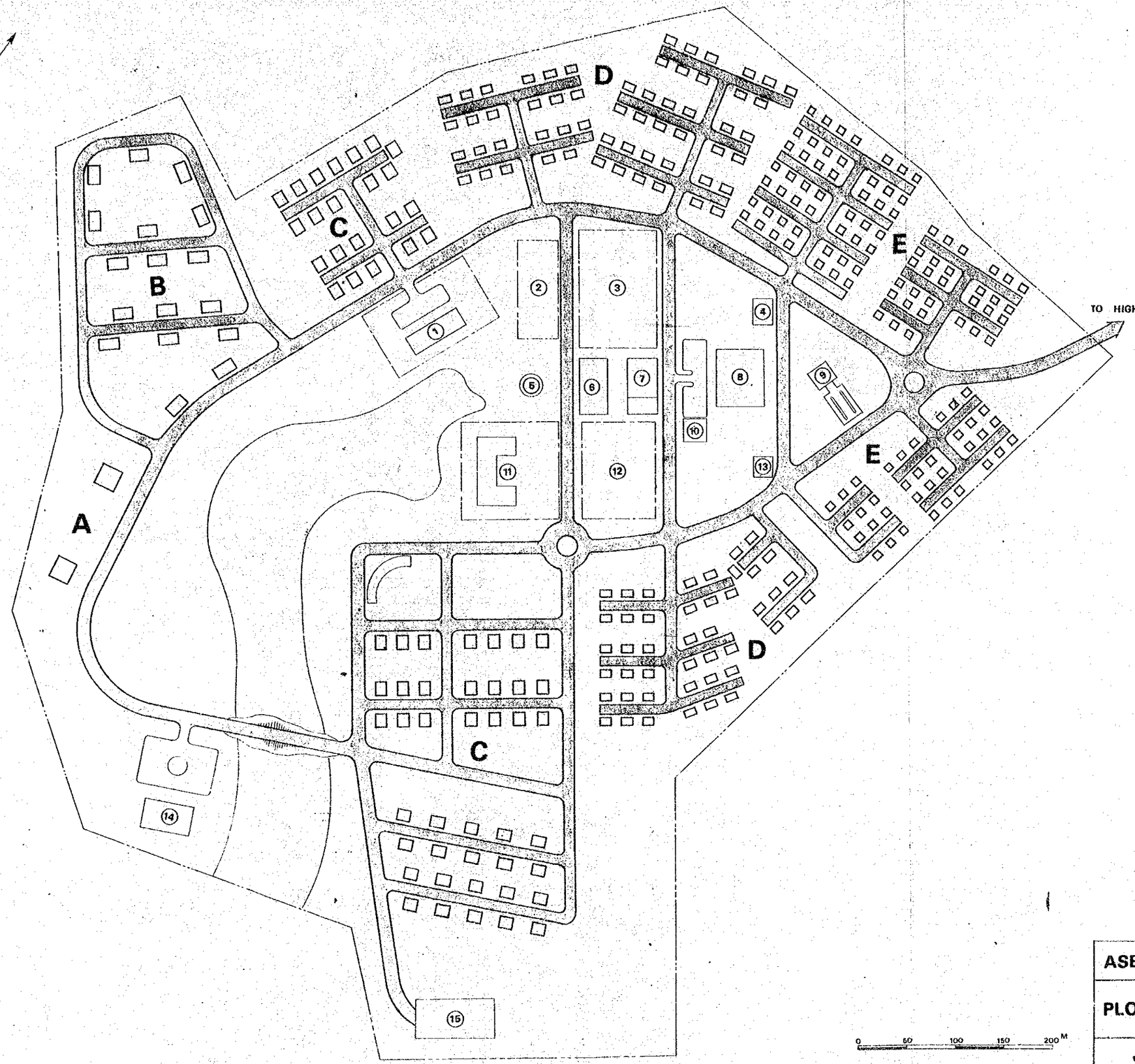


SECTION



0 5 10 15 20 25 M

ASEAN ACEH FERTILIZER PROJECT	
INTAKE STRUCTURE & SETTLING POND	
JICA	FIG IV-9



NO	DESCRIPTION	
1	HOSPITAL	*
2	PARKING AREA	
3	SOCCER FIELD	
4	MAINTENANCE SHOP	
5	ELEVATED WATER TANK	
6	SWIMMING POOL	*
7	GYMNASIUM	*
8	COMMUNITY CENTER	*
9	MOSQUE	*
10	MARKET	*
11	SCHOOL	*
12	PLAYING FIELD	
13	ELECTRIC STATION	
14	GUEST HOUSE	
15	SEWAGE STATION	

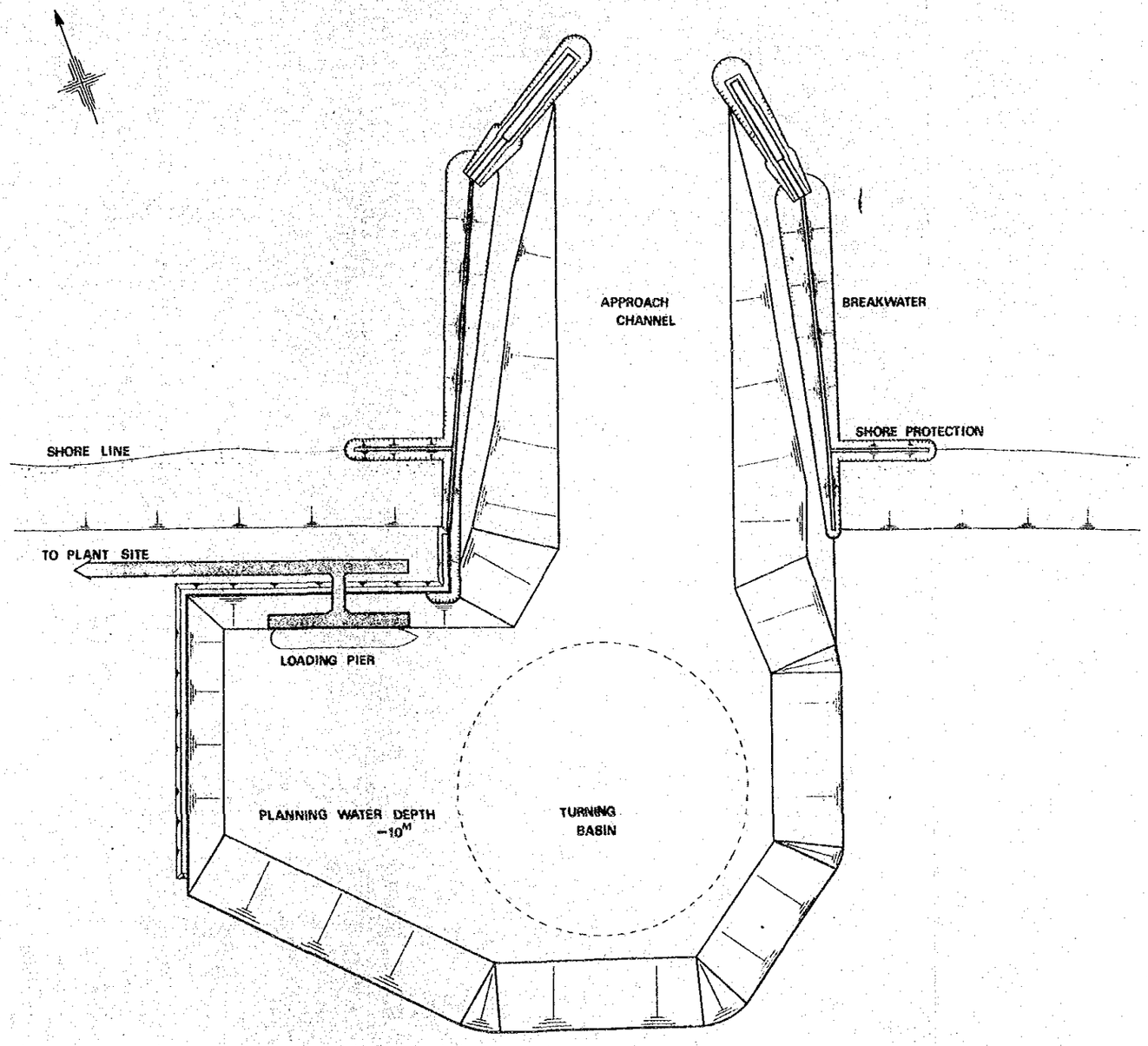
* : OUT OF PROJECT SCOPE

ASEAN ACEH FERTILIZER PROJECT

PLOT PLAN OF HOUSING COLONY

JICA

FIG IV -10



ASEAN ACEH FERTILIZER PROJECT

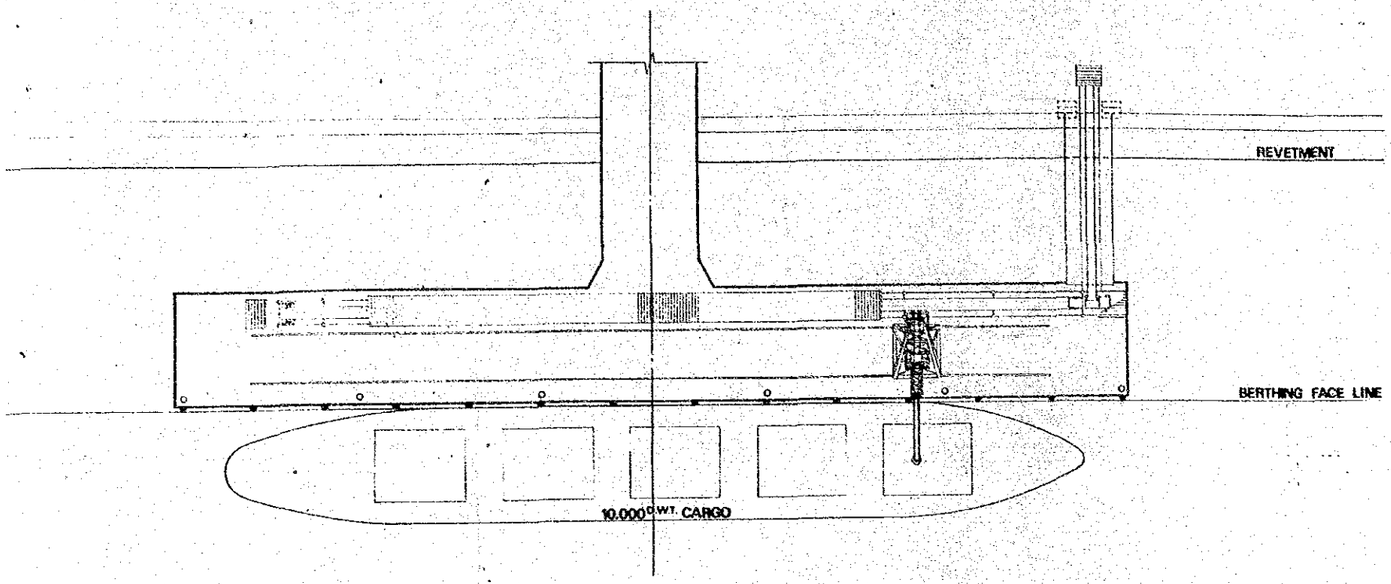
PLOT PLAN OF HARBOUR

JICA

FIG IV-11

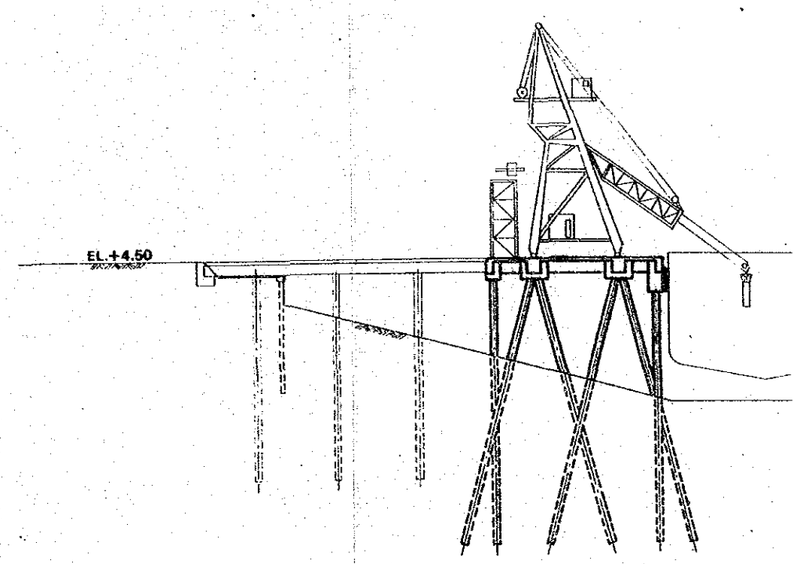
PLAN

0 5 10 15 20M



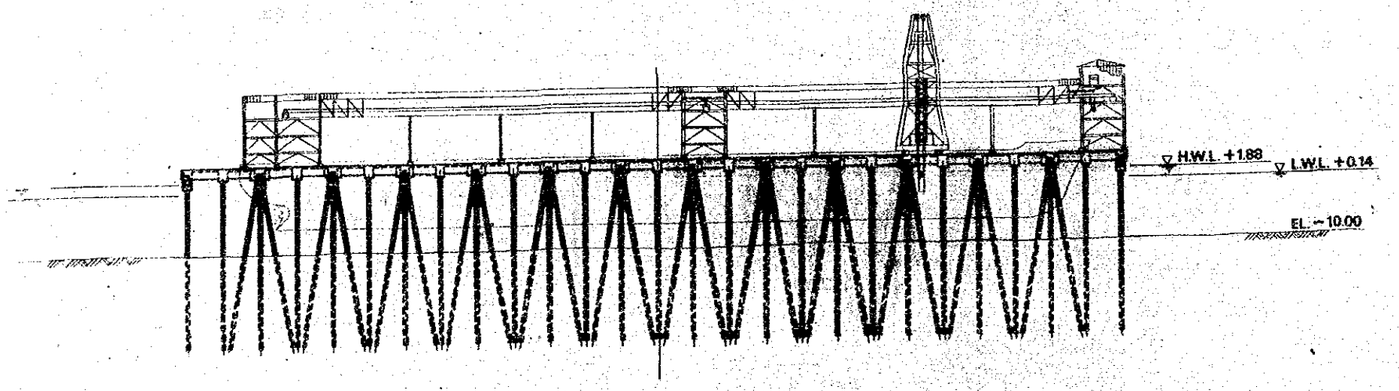
SIDE VIEW

0 5



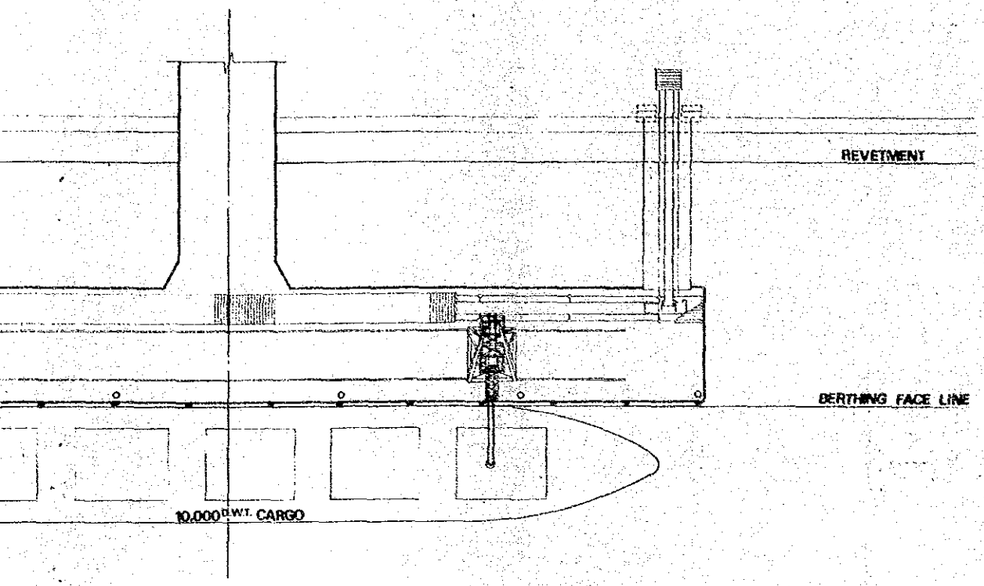
FRONT VIEW

0 5 10 15 20M



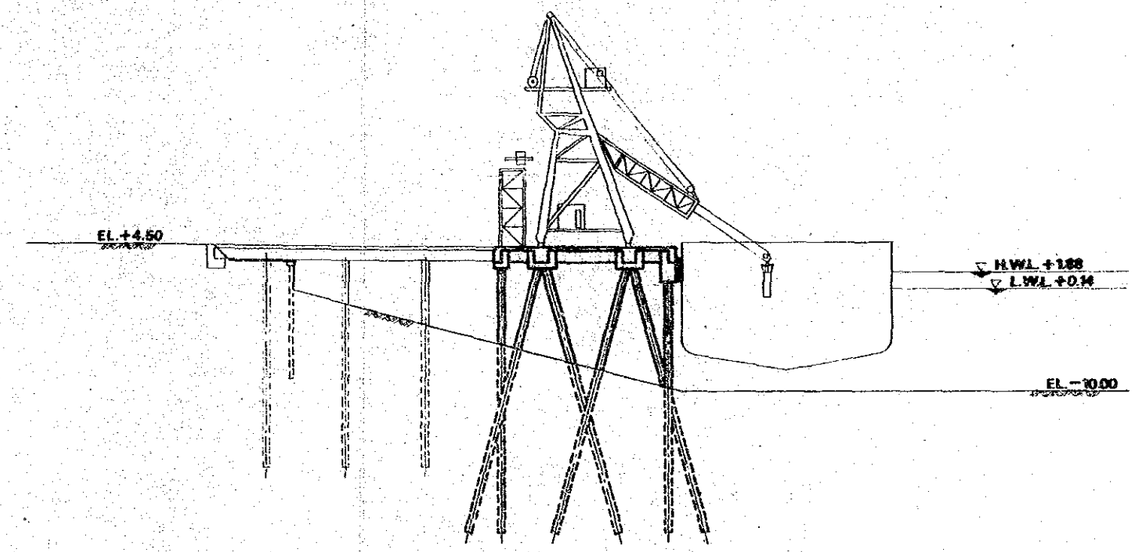
PLAN

0 5 10 15 20M



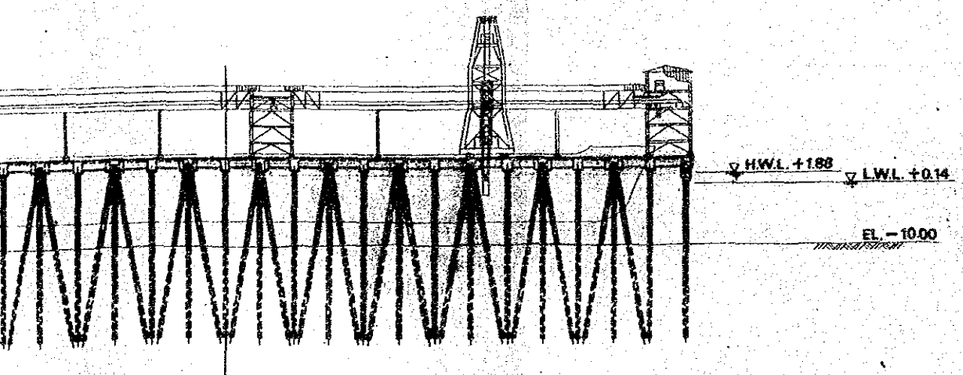
SIDE VIEW

0 5 10 15M



FRONT VIEW

0 5 10 15 20M



ASEAN ACEH FERTILIZER PROJECT

GENERAL PLAN OF LOADING PIER

JICA | FIG IV-12

Fig. IV-13. CONSTRUCTION SCHEDULE

Asean Aceh Fertilizer Project:

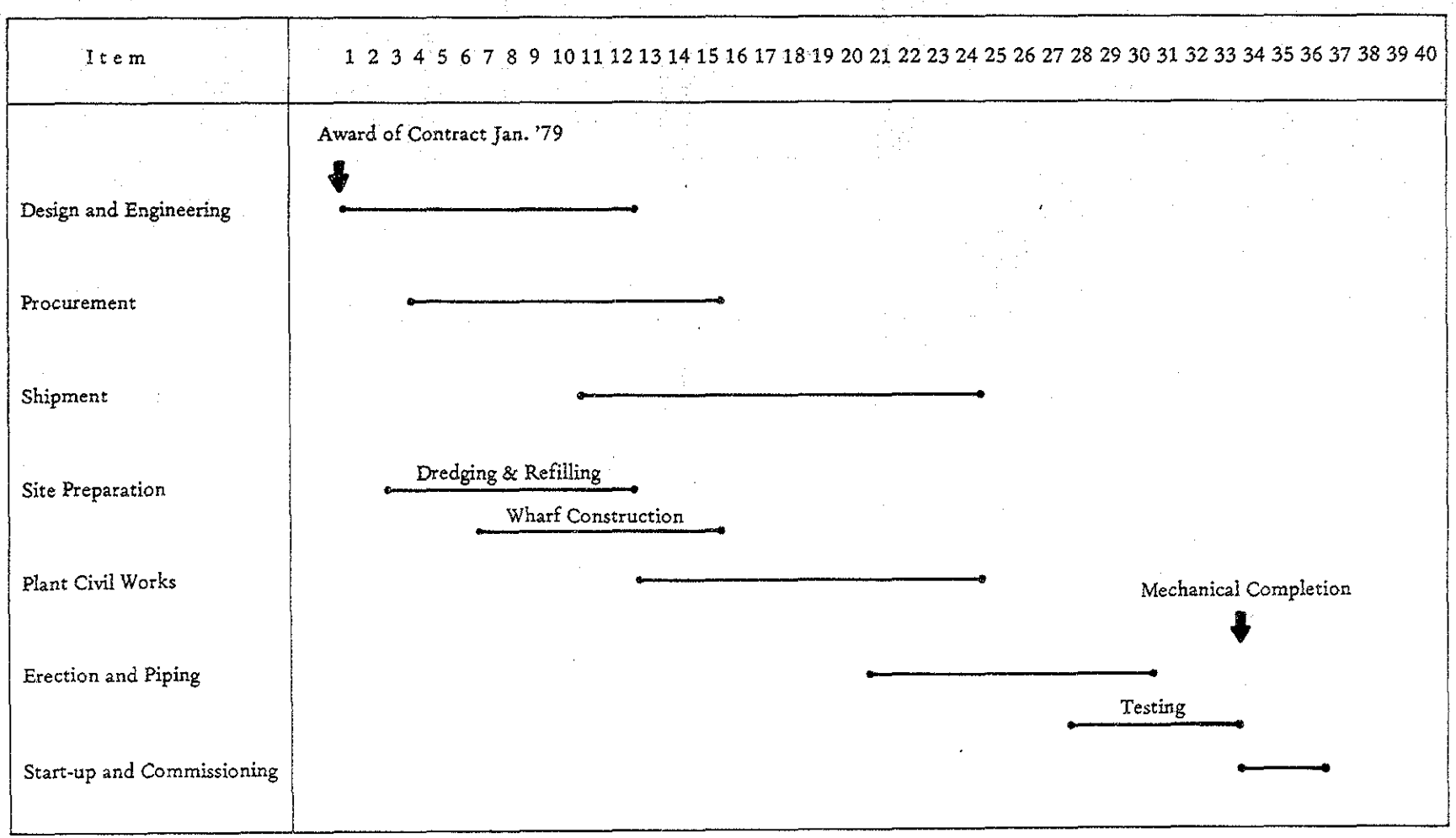
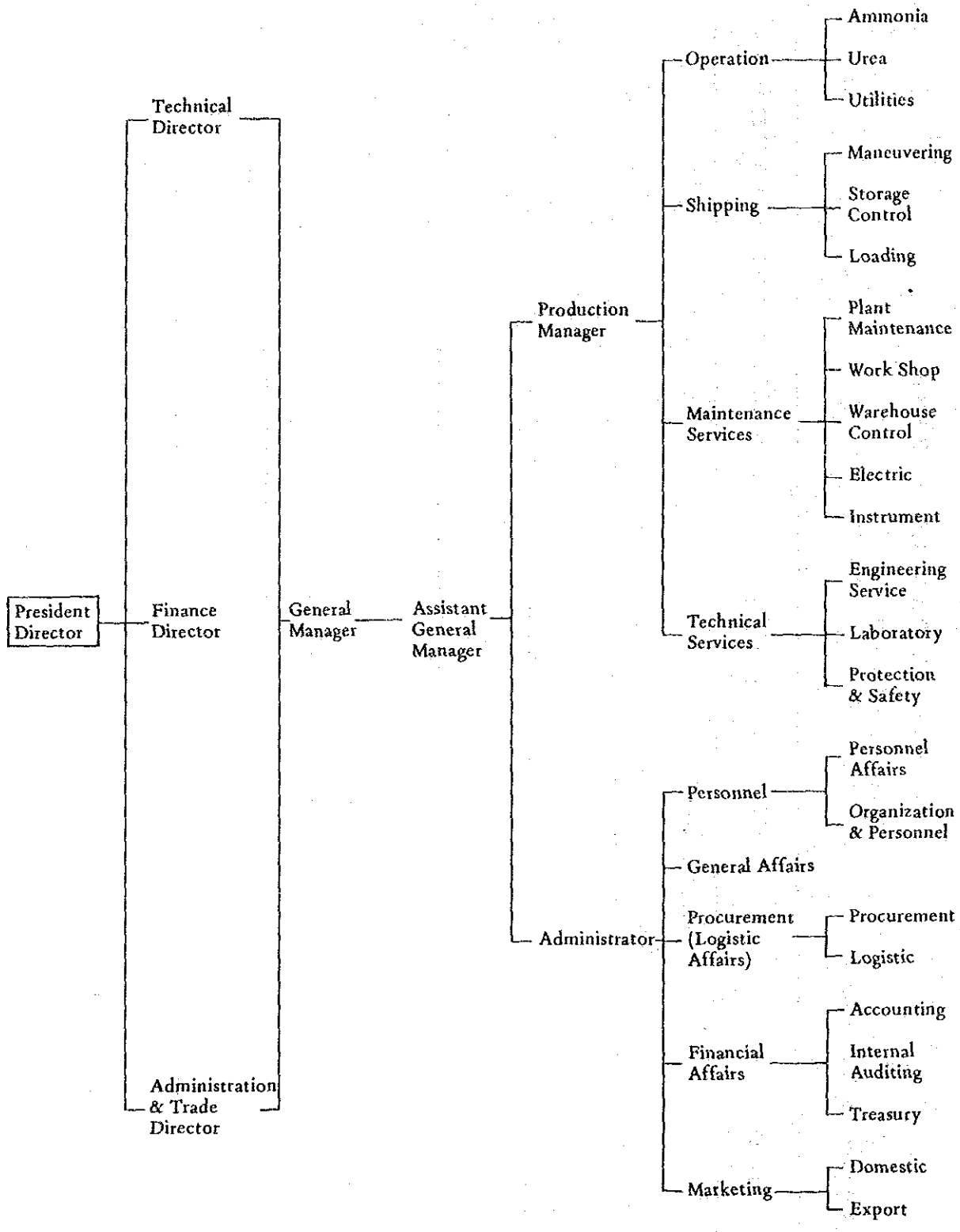


Fig. IV-14. ORGANIZATION STRUCTURE OF P.T. ASEAN ACEH FERTILIZER



PART V

CAPITAL COST ESTIMATE AND FINANCING PLAN

Chapter 1 Capital Cost

1-1 Total capital requirements

On an assumption that the operation of the plant will be commenced early January 1982, the *total capital requirement* for this project is estimated at US$313.00 million, as shown in Table V-1, of which US$213.73 million (68.3% of the total) shall be in foreign currency and US$99.27 million (31.7% of the total) in local currency. (The details of breakdown are given in Table 1 Annex V.)

The *base project cost (B/C)* shown in Table V-1 has been calculated on an assumption that all the orders to procure the machinery, equipment, materials and services were placed early 1978. The estimate was made on the basis of available data and information field in respect of various cost factors, while referring to the actual figures recorded during the construction of several existing fertilizer plants in Indonesia.

As a basis for the estimates, it has been presumed that the major part of the proposed complex will be constructed by a general contractor under a general contract on a cost-plus-fee basis, and that all equipment, machinery, materials and subcontract services will be procured through competitive bids. All the estimates have been made in terms of U.S. Dollars.

1-2 Contingencies

The *physical contingency* is a fund set aside to cover additional expenses which are contingent upon certainty of the design bases as well as accuracy of the conceptual design of facilities and the present estimates made for this study. A certain physical contingency rate has been established for each of the cost items. The portion of this contingency accounts for 7.1% of the B/C in the foreign currency portion, and 10.8% of the same in the local currency portion, making a total of 8.1% of the total B/C.

The *price contingency* is a fund set aside to cover possible escalation in price factors during a period from the present estimation (as of the early 1978) to early 1982. A contingency rate has been separately set for each of the cost items in accordance with the construction schedule of various units of plant facilities. (Refer to Table 2 Annex V.) The escalation rates assumed here are 8% p.a. for the foreign currency portion and 14% p.a. for the local currency portion, both estimated on a compounded-rate basis resulting in the price contingency rates at

17.8% of the B/C in the foreign currency portion, 38.4% of the same in the local currency portion, and 23.7% of the total B/C.

1-3 Other assumptions

a. *Import duty:* All equipment, machinery and materials imported for the project shall be exempted from import duties in accordance with the Indonesian Foreign Investment Law.

b. *Interest during construction:* It has been calculated for all the loan portion of the estimated capital cost, and has been accounted as the foreign currency requirement. This is based upon an assumption that all the loan portion will be met by foreign loans, although, the case may be, some portion of the capital is financed by local loans. (Refer to Chapter 2.) The breakdown of the estimated initial working capital and of the estimated interest during construction is shown respectively in Table 3 and Table 4 in Annex V.

1-4 Possible increase in the capital cost due to delay in implementation

In order to start commercial operation in January, 1982 as assumed for this cost estimates, it is necessary that the award of the general contract be made at latest by January 1979. This implies a fairly tight schedule for implementation. An additional contingency would be necessary if the implementation should be delayed. The following tabulation shows the increased capital requirements for an event where the implementation is delayed by six months and by one year. (As to the annual escalation rates, 8% for the foreign currency portion and 14% for the local currency portion have been applied in this tabulation.)

1) Capital requirement in case of 6-month delay

(US$ '000)

	Foreign	Local	Total
Base Project Cost (B/C)	163,560	68,400	231,960
Physical Contingency	11,590	7,360	18,950
Price Contingency	29,090	26,270	55,360
Initial Working Capital	4,130	4,190	8,320
Interest During Construction	13,910	0	13,910
Total Capital Requirement	222,280	106,220	328,500

2) Capital requirement in case of 12-month delay

(US$ '000)

	Foreign	Local	Total
Base Project Cost (B/C)	169,850	72,870	242,720
Physical Contingency	12,030	7,840	19,870
Price Contingency	30,210	27,990	58,200
Initial Working Capital	4,290	4,470	8,760
Interest During Construction	14,450	0	14,450
Total Capital Requirement	230,830	113,170	344,000

Chapter 2 Financing Plan

Of the total capital requirements amounting to US$313 million including the initial working capital, 30% shall be financed by equity capital and the remaining 70% by long-term loans.

		(Million U.S. Dollars)
Equity capital	(30%)	93.9
Long-term loans	(70%)	219.1
Total		313.0

In accordance with the agreement made at the ASEAN Economic Ministers Meeting, it is assumed that 60% of the equity capital shall be subscribed by Indonesia and the remaining 40% by the rest of the member countries. The amount of equity capital to be subscribed by each country will be as follows:

		(Million U.S. Dollars)
Indonesia	(60%)	56.340
Malaysia	(13%)	12.210
Philippines	(13%)	12.210
Singapore	(1%)	0.930
Thailand	(13%)	12.210
Total		93.900

Of the US$219.1 million long-term loans, US$213.73 million shall be appropriated for expenditures in foreign currency, and the remaining US$5.37 million shall be appropriated for expenditures in local currency.

	(Million U.S. Dollars)
For expenditures in foreign currency	213.73
For expenditures in local currency	5.37
Total loan requirements	219.10

Since financing sources and arrangements for the long-term loans are as yet indefinite, the following hypothetical conditions have been presumed for this study:

1)	Repayment:	Annual equal installments of the principal for 15 years including 4-year grace period
2)	Interest:	4% per annum

Table 5 in Annex V shows a preliminary projection of the repayments. The borrowing schedule is assumed as 30% for the initial fiscal year, 40% for the second, and 30% for the third year.

Table V-1. ESTIMATED CAPITAL REQUIREMENTS

(US$'000)

	Foreign	Local	Total
A. LAND ACQUISITION	0	1,610	1,610
B. SITE PREPARATION	410	2,070	2,480
C. PLANT DIRECT COST	80,680	15,970	96,650
D. HARBOR & BREAK WATER	14,700	16,640	31,340
E. WATER INTAKE & WATER PIPELINE	3,900	1,960	5,860
F. HOUSING COLONY	1,400	13,000	14,400
G. CONSTRUCTION EQUIPMENT	6,910	700	7,610
H. OCEAN FREIGHT, INSURANCE & LOCAL HAND'G	11,020	700	11,720
I. INDIRECT FIELD EXPENSES	1,910	1,230	3,140
J. SERVICES	30,020	3,540	33,560
K. PROJECT MANAGEMENT	4,600	1,450	6,050
L. PRE-OPERATIONAL EXPENSES	1,720	5,050	6,770
BASE PROJECT COST (B/C) (in Beg.-1978 Prices)	157,270	63,920	221,190
M. PHYSICAL CONTINGENCY (% of B/C)	11,140 (7.1%)	6,880 (10.8%)	18,020 (8.1%)
N. PRICE CONTINGENCY (% of B/C)	27,970 (17.8%)	24,550 (38.4%)	52,520 (23.7%)
O. INITIAL WORKING CAPITAL (in Beg.-1982 Price)	3,970	3,920	7,890
TOTAL PROJECT COST	200,350	99,270	299,620
P. INTEREST DURING CONSTRUCTION	13,380	0	13,380
TOTAL FINANCING REQUIRED	213,730 (68.3%)	99,270 (31.7%)	313,000 (100%)

PART VI

FINANCIAL ANALYSES

Chapter 1 Marketing Schedule

The production capacity is set for 570,000 T/Y of urea with operation assumed at the capacity utilization of 75% for the first year, 80% for the second, and 90% for the third year onwards. These figures of the capacity utilization appear to be amply feasible in view of the past records of the operation registered by PUSRI's four fertilizer plants. Although the 75% set for the first year may be on a slightly higher side, this level is still regarded to be attainable if it is assumed that the 75% output for the first year includes the marketable products turned out during the test-run period of about three months.

The ex-factory sales price as of 1982 is set at US$160/T for bulk urea as it is estimated in Part II. A part of the product shall be shipped in the form of bagged urea to the vicinity of the plant by land. For the financial analysis, however, the same sales price as bulk urea has been applied to the bagged urea since the amount to be distributed in the form of bagged urea is estimated at more or less than 4% of the total amount of the production.

Concerning *the product inventory* at the plant storage, a stock in the amount equivalent to one month production of the year shall be kept in order to cover fluctuation in market and production.

Table VI-1 shows a production and sales revenue schedule.

Chapter 2 Production Cost

2-1 Natural gas and bag cost

The price of natural gas has been agreed at the ASEAN Economic Ministers Meeting to be within a range from US$0.6/MMBTU to US$0.65/MMBTU. The US$0.6/MMBTU has been employed as a basis for the purpose of this study. (Discussions will be made later for a case of employing the US$0.65/MMBTU.) These gas prices are assumed to be free from escalation. Refer to Table VI-3 concerning *the cost of catalysts and chemicals* as well as the cost of fuel. PUSRI and Kujang are either newly constructing or expanding bag making plants. It has been confirmed that these bag making plants have excess capacities to meet the demand for *the urea bags* as required by this project. The Government of Indonesia also directs that no bag making plant is necessary for this project. The domestic price of a 50-kg bag in Indonesia as of early 1978 is Rp 150 (US$ 0.36). With a price escalation of 14% per year, the early 1982 bag price has been calculated on the basis of the aforesaid price prevailing for polypropylene woven bag with an inner bag made of polyethylene film.

2-2 Depreciation

Indonesian tax law set forth only as guideline for the *depreciable life* of items. Those involved in this project for example are 8-12 years for manufacturing facilities, 10-12 years for product shipment facilities, 15-40 years for permanent structures including port facilities, 40-50 years for permanent structure houses, and 15-40 years for semi-permanent structure houses. For the computation of depreciation, the following depreciation period has been assumed on the basis of a straight line with no salvage value:

Plant facilities:	12 years
Port facilities:	30 years
Water intake and pipeline:	30 years
Housing for employees:	30 years

A detail schedule of depreciation is shown in Table 1, Annex VI.

2-3 Maintenance Cost

Repair and maintenance cost of the plant is calculated to be 3% of the CIF price of

the subject items. This allowance is to cover consumables. The cost of labor, equipment, and utilities for repair and maintenance work has been accounted into the respective items in the estimated production cost. The maintenance cost for the employees' housing colony has been estimated to be 1% of the construction cost for housing facilities. The maintenance cost for the water intake facilities and the pipeline (30 km) has been estimated at 0.5% of the construction cost for these facilities, taking into account the fact that the pipeline will call for almost no maintenance cost. It is difficult to estimate at the present early stage the accurate maintenance and dredging cost of the port due to lack of basic data on the oceanographic conditions. It is therefore assumed that dredging of 50,000 m^3 will be carried out every year, and calculations have been made on the basis of the unit price of Rp 1,000/m^3 (US$2.41/$m^3$).

2-4 Labor cost and overhead

Direct labor cost incorporates an annual increase by 14% on the basis of PUSRI's pay-roll system effective as of early 1978. On this assumption, the direct labor cost as of the 1982 has been calculated. (Ref. to Table 2, Annex VI.) The average labor cost per person as of the 1978 is calculated to be Rp 105,100/month (US$253.3/month). The total labor cost for the year 1982 employing 625 persons will amount to US$3.209 million. As an *overhead*, 150% of the direct labor cost has been appropriated. The breakdown of overhead is shown in Table VI-3. This 150% overhead includes fringe benefit to be provided for employees.

2-5 Taxes and insurance

The taxes, levies, and insurance premium have been calculated to be 0.4% of the fixed asset. This rate was also taken from PUSRI's experience. The value of asset to be annually insured has been computed on the basis of an estimated annual book value of these asset.

The above-mentioned bases employed for the production cost estimate are listed in Table VI-3.

2-6 Estimated production cost

Table VI-2 shows the thus estimated *production cost.* This table shows the production cost for the first three years and of the 12th year (1993) i.e., the final year of the economic life of the project as adopted for the financial calculations. Also, the estimated production cost as of 1987 is shown as the mean year of the economic life, together with an average of two years; one is the year of 1984 when the operation at 90% of the capacity will start, and the other the year of 1993 which is the final year of the economic life of the plant.

For the last two sets of production cost, a percentage structure of the cost elements is also stipulated. Details of the estimated annual production cost are shown in Table 3, Annex VI.

As a typical example, the structure of the production cost of 1987 shows that 39% of the total cost is taken up by depreciation. When interest is added to the depreciation, these elements will share 49.5% of the total cost. This signifies that the production cost of this project will be greatly affected by the investment amount (i.e., the plant construction cost) and by the rate of interest.

Chapter 3 Financial Analysis (Base Case)

3-1 Assumptions taken for the financial analysis

This chapter, is to summarize the results of financial calculations made under major assumptions as shown below. (A case which is based on these assumption shall be called hereafter as the Base Case.) The following chapter will discuss cases in which some of the major conditions are changed:

Economic life span:	12 years
Equity/debt ratio:	30/70
Interest:	4% p.a.
Repayment:	15 years (including 4-year grace period), annual equal installments of the principal
Product sales price:	Bulk urea: US$160/T Note: The same price as the bulk urea was applied to bagged urea, because an amount of that is estimated at more or less than 4% of total sales.
Natural gas price:	US$0.6/MMBTU
Operational rate:	First year: 75% Second year: 80% Third year onwards: 90%
Corporate income tax:	Tax holiday for 5 years from the start of operation, 45% tax rate shall be applicable thereafter.

3-2 Financial analysis

Table VI-4 shows the profit before and after tax, together with the *average return rate on equity capital.* The projected income statements are shown in Table 4, Annex VI. The projected income statements indicate that profit will be gained from the first year onwards, and an aggregate profit before tax over 12 years will be about US$332.9 million, or about US$233.2 million after tax, so that an annual average return rate on equity capital will be 29.5% and 20.7% respectively.

Tables VI-5 and VI-6 show the projected internal rate of return (IRR). The IRR after tax (Table VI-5) is 10.33%, and before tax (Table VI-6) is 12.25%.

The payout period will respectively be 6.4 years and 6.1 years after the commencement of commercial operation. As shown in Table VI-7, returns on sales revenue will be 24.3% after income tax.

As indicated in Table VI-7 *the debt service coverage ratio (DSR)* of this project is expected to be 1.85 on average over an 11-year period excluding the first year which is still in the grace period for the repayment, and the DSR invariably shows a level exceeding 1.5.

The profit break-even point of this project is met by the operation below 60% of the rated capacity from the first year onwards according to Table VI-7 and Figure VI-1, and at 51.5% on average over 12 years. As shown in Figure VI-1, the sales price for maintaining the break-even operation will be highest during the first year (1982, US$127/T) and will drop to US$93/T in 12 years thereafter (1993). The 12-year average is expected to be US$104.7/T.

The cash break-even point maintaining the DSR over 1.0 is shown in Figure VI-1. For an 11-year period excluding the first year, the average cash break-even point will be met by the operation at 50% of the rated capacity, while the allowable sales price will be US$101/T.

The foregoings are the results of financial analysis of the Base Case. This analysis indicates that, so long as the earlier-stated conditions are satisfied, this project will have profitability and soundness of financial structures over the minimum requirements which may be necessary to be met for maintaining the financial viability of the project.

The projected financial statements and analyzed indexes are shown in Tables 5, 6 and 7 in Annex VI.

Chapter 4 Sensitivity Analysis and Overall Evaluation

4-1 Sales price

As the Base Case, a bulk urea price of US$160/T was established. It is well known that *changes in the sales price* is one of the major elements affecting the financial viability of an enterprise. Table VI-8 and Figure VI-2 show the sensitivity of return rates and other financial indexes affected by changes in the sales price. As shown in the above tables, if the sales price becomes US$145/T, the IRR will drop to 8.3%, and the average return rate on equity capital will also fall to 14.9%. The financial position will become rather tight, although the average DSR will be maintained at a level of 1.63. The sales price of US$145 is a possible assumption as the lowest price which will take place; however, as discussed earlier in Part II, it may be less probable to take as a basis for the financial projection. Even so, these figures indicate that the project can afford to maintain the financial position still within a viable range.

4-2 Interest rate

As far as the effects of interest on the financial viability are concerned, the major elements seem to be the change in the capital requirements due to the change in the interest during construction, the changes in the profitability, and also the changes in the financial schedule. Table VI-9 shows a chart of sensitivity analysis upon the *alteration in interest.*

If the interest rate should increase from the 4% of the Base Case to 6%, the interest during construction goes up by US$7.34 million. When the interest rate becomes 6%, the production cost as of 1987 which is the mean year of the economic life span, will increase by about 6.9% over the Base Case, and the return rate on the equity capital will drop from 20.7% to 17.4%. The DSR will be 1.68 on average over the 11-year period. If some other factors should concurrently fail (e.g., unexpectedly great drop of the sales price of the product), the viability of the project will be significantly affected by the increase in the interest burden.

4-3 Natural gas price

The consequential effects of changing the *natural gas price* from US$0.6/MMBTU to US$0.65/MMBTU will be: the production cost as of 1987 will increase by US$1.7/T, the IRR will reduce by 0.2% to 10.1%, the return rate on paid-up capital will drop by 0.7% to 20.0%. However, a natural gas price increase of this magnitude will not be vital to the viability of this

project. (Ref. Table VI-10).

4-4 Operational rate

If *the operational rate* should be compelled to stagnate on 70% throughout the 12-year period due to the conditions of the market, the values of the variables will be as shown in Table VI-10. The production cost in this case will be US$125.7/T as of 1987, and the fixed cost burden (depreciation cost + interests payable) will be as high as 52.4%. However, if the drop of the operational rate to 70% is only temporary, the DSR will at least be kept always over 1.3, thereby creating no immediate problem in cash-flow.

4-5 Capital requirements

A project cost over-run might take place in the case that, for example, higher inflation rate or delay of construction period unexpectedly occurs. When the total capital requirements goes up to about US$329 million, by 5% of the Base Case, the financial indicators get worse as shown in Table VI-10. However, the effects of the capital increase will not be vital to the viability of this project as far as the increase will be within the range of this magnitude.

4-6 Conclusion

The results of financial analyses made so far in this part may be summarized as follows:

1) A minimum extent of viability may be maintained even if the sales price of the bulk urea should drop to US$145/T on an ex-factory basis.

2) It is obvious that the assumed loan conditions (e.g, 4% p.a. interest rate and 4-year grace for repayment) greatly contribute to the feasibility of the project although these conditions are tentatively set for the financial analysis.

3) No vital effects will be exerted on this project even if the natural gas price should be increased to US$0.65/MMBTU.

4) The operation with a poor capacity utilization over a long period will exert a considerably serious influence upon the viability of this project. However, the operational rate for maintaining the break even point is at 51.5% on average, so that the viability may be maintained if such an unefficient operation is only temporary.

5) On a presumption that the foregoing conditions may be satisfied, it is concluded that this project has an ample viability to be implemented.

Table VI-1. PRODUCTION AND SALES REVENUE SCHEDULE

	1982	1983	1984	1985 onwards
Rated Capacity (tons/year)	570,000	570,000	570,000	570,000
Capacity Utilization (%)	75	80	90	90
Total Production (tons/year)	427,500	456,000	513,000	513,000
Products Inventory (tons/year)[1]	35,625	38,000	42,750	42,750
Increase in Inventory (tons/year)	35,625	2,375	4,750	0
Sales Volume (tons/year)	391,875	453,625	508,250	513,000
Sales Revenue (US$'000/year)[2]	62,700	72,580	81,320	82,080

Notes: 1) Inventory: 1 month production of the year

2) Unit sales price: US$160/ton of bulk urea

Table VI-2. PROJECTED PRODUCTION COST IN 1982 CONSTANT PRICES

(Unit: US$/ton of Urea, 96% bulk, 4% bagged)

	1982	1983	1984	1993	1987 Middle year of economic life		Average cost (1984 to 1993)	
Operational Rate	75%	80%	90%	90%	90%			
Variable Costs						(%)		(%)
Natural gas ($0.6/MMBtu)	20.2	20.2	20.2	20.2	20.2	(19.5)	20.2	(20.0)
Catalysts and Chemicals	3.7	3.7	3.7	3.7	3.7	(3.6)	3.7	(3.7)
Bag	0.5	0.5	0.5	0.5	0.5	(0.5)	0.5	(0.5)
Fuel oil	1.2	1.2	1.2	1.2	1.2	(1.1)	1.2	(1.2)
Sub-total	25.6	25.6	25.6	25.6	25.6	(24.7)	25.6	(25.4)
Fixed and Semi-variable Costs								
Depreciation	48.3	45.4	40.3	40.3	40.3	(39.0)	40.3	(40.0)
Maintenance cost	11.4	10.7	9.5	9.5	9.5	(9.2)	9.5	(9.4)
Labour	7.5	7.0	6.3	6.3	6.3	(6.1)	6.3	(6.3)
Overhead	11.3	10.6	9.4	9.4	9.4	(9.1)	9.4	(9.3)
Tax & Insurance	2.8	2.4	2.0	0.5	1.5	(1.4)	1.2	(1.2)
Sub-total	81.3	76.1	67.5	66.0	67.0	(64.8)	66.7	(66.2)
Interest Charge (4% p.a.)	20.5	19.2	15.5	1.5	10.8	(10.5)	8.5	(8.4)
Total Production Cost	127.4	120.9	108.6	93.1	103.4	(100.0)	100.8	(100.0)

Table VI-3. OPERATING COST ITEMS IN BEG. – 1982 PRICES

Natural Gas :	Consumption: 33.6 MMBtu/ton of urea Unit price : US$0.6/MMBtu
Catalysts :	US$900,000/one charge Average life : 2.5 years Unit price : US$0.7/ton of urea
Chemicals :	US$1,670,000/one year supply Unit price : US$3.0/ton of urea
Bag Material :	(US$0.61/50 kg bag) x (20 bags) = US$12.2/ton of bagged urea
Fuel Oil :	Consumption: 13.64 liter/ton of urea Unit price : US$0.09/liter
Raw Water :	Free at the water intake station
Labour :	Numbers of employee : 625 persons Average labour cost : US$5,134/man-year
Overhead*) :	150% of labour cost
Maintenance Cost :	US$4,500,000**)/year for plant maintenance 1% on housing colony cost per year 0.5% on water intake & water pipeline Maintenance dredging : US$120,000/year (50,000 m^3/year x Rp1,000/m^3)
Tax and Insurance :	0.4% on the book value of fixed assets

Notes: *) Overhead cost includes following items.

- Travel & communication expenses
- Medical supplies and car expenses
- Subscriptions & publications
- Association dues & expenses
- Sundry expenses
- Ceremonial expenses
- Non-factory labour cost and general supply

**) 3% of CIF plant equipment and material cost.

Table VI-4. AVERAGE RETURN ON PAID-UP CAPITAL

(US$'000)

Year	Net Profit Before Tax	Income Tax 1)	Net Profit After Tax
(1) 1982	12,043	0	12,043
(2) 1983	17,709	0	17,709
(3) 1984	26,071	0	26,071
(4) 1985	27,269	0	27,269
(5) 1986	28,148	0	28,148
(6) 1987	29,028	13,062	15,965
(7) 1988	29,907	13,458	16,449
(8) 1989	30,787	13,854	16,933
(9) 1990	31,666	14,250	17,416
(10) 1991	32,545	14,645	17,900
(11) 1992	33,425	15,041	18,384
(12) 1993	34,304	15,437	18,867
Total	332,902	99,747	233,154
- Average over 12 years	27,742		19,430
- Paid-up Capital	93,900		93,900
- Average Return on Paid-up Capital	29.5%		20.7%
- Discounted Return on Paid-up Capital	19.8%		15.5%

Note: 1) 45% on net profit before tax, and a 5 years' operation tax holiday is assumed.

Table VI-5. IRR CALCULATION ON TOTAL INVESTMENT (BASE CASE): SALES PRICE US$160/T, INTEREST 4%

YEAR	TOTAL INVESTMENT	PROFIT BEFORE TAX	(LESS) INCOME TAX	PROFIT AFTER TAX	DEPRECIATN	INTEREST ON L-T DEBT	TOTAL RETURN	DISCOUNT FACTOR	DISCOUNTED CASH OUT-FLOW	DISCOUNTED CASH IN-FLOW
1979	87509.	0.	0.	0.	0.	0.	0.	1.00000	87509.	0.
1980	110252.	0.	0.	0.	0.	0.	0.	0.90640	99933.	0.
1981	101859.	0.	0.	0.	0.	0.	0.	0.82157	83684.	0.
1982	0.	12043.	0.	12043.	20677.	8764.	41483.	0.74467	0.	30891.
1983	0.	17709.	0.	17709.	20677.	9764.	47150.	0.67498	0.	31825.
1984	0.	26071.	0.	26071.	20677.	7967.	54715.	0.61180	0.	33475.
1985	0.	27269.	0.	27269.	20677.	7171.	55116.	0.55454	0.	30564.
1986	0.	28148.	0.	28148.	20677.	6374.	55199.	0.50264	0.	27745.
1987	0.	29028.	13062.	15965.	20677.	5577.	42219.	0.45559	0.	19235.
1988	0.	29907.	13459.	16449.	20677.	4780.	41906.	0.41295	0.	17305.
1989	0.	30787.	13854.	16933.	20677.	3984.	41593.	0.37430	0.	15568.
1990	0.	31666.	14250.	17416.	20677.	3187.	41280.	0.33927	0.	14005.
1991	0.	32545.	14645.	17900.	20677.	2390.	40967.	0.30751	0.	12598.
1992	0.	33425.	15041.	18384.	20677.	1593.	40654.	0.27873	0.	11332.
1993	-64880.	34304.	15437.	18867.	20677.	797.	40341.	0.25264	-16392.	10192.
							TOTAL PRESENT VALUE		254735.	254735.

INTERNAL RATE OF RETURN 10.33 PER CENT
PAY-OUT PERIOD 6.41 YEAR
(THE YEAR WHEN THE INITIAL INVESTMENT SHALL BE RECOVERD BY THE ACCUMULATED TOTAL RETURN, FROM THE BEG. OF OPERATION)

CAPITAL REQUIREMENTS	
LAND & SITE PREPARATION	4820.
ERECTED PLANT COST	194230.
SPARES AND CATALYST	8550.
HARBOUR & BREAK WATER	42750.
WATER INTAKE &WATER PIPELINE	8330.
HOUSING COLONY	22120.
CONSTRUCTED FACILITIES	275630.
PRE-INVEST & START-UP EXP	11280.
INTEREST DURING CONSTRUCTION	13330.
TOTAL FIXED CAPITAL	305110.
WORKING CAPITAL	7890.

SOURCE OF FUND	
SHARE CAPITAL	93900.
LONG TERM DEBT	219100.
SHORT TERM DEBT	0.
FINANCIAL RESOURCES	313000.

Table VI-6. IRR CALCULATION ON TOTAL INVESTMENT (BEFORE TAX): SALES PRICE US$160/T, INTEREST 4%

YEAR	TOTAL INVESTMENT	PROFIT BEFORE TAX	(LESS) INCOME TAX	PROFIT AFTER TAX	DEPRECIATN	INTEREST ON L-T DEBT	TOTAL RETURN	DISCOUNT FACTOR	DISCOUNTED CASH OUT-FLOW	DISCOUNTED CASH IN-FLOW
1979	87509.	0.	0.	0.	0.	0.	0.	1.00000	87509.	0.
1980	110252.	0.	0.	0.	0.	0.	0.	0.89084	98217.	0.
1981	101859.	0.	0.	0.	0.	0.	0.	0.79359	80835.	0.
1982	0.	12043.	0.	12043.	20677.	8764.	41483.	0.70696	0.	29327.
1983	0.	17709.	0.	17709.	20677.	8764.	47150.	0.62979	0.	29695.
1984	0.	26371.	0.	26371.	20677.	7967.	54715.	0.56104	0.	30698.
1985	0.	27269.	0.	27269.	20677.	7171.	55116.	0.49980	0.	27547.
1986	0.	28148.	0.	28148.	20677.	6374.	55199.	0.44524	0.	24577.
1987	0.	29028.	0.	29028.	20677.	5577.	55281.	0.39664	0.	21927.
1988	0.	29907.	0.	29907.	20677.	4780.	55364.	0.35334	0.	19562.
1989	0.	30787.	0.	30787.	20677.	3984.	55447.	0.31477	0.	17453.
1990	0.	31666.	0.	31666.	20677.	3187.	55530.	0.28041	0.	15571.
1991	0.	32545.	0.	32545.	20677.	2390.	55612.	0.24980	0.	13892.
1992	0.	33425.	0.	33425.	20677.	1593.	55695.	0.22253	0.	12394.
1993	-64980.	34304.	0.	34304.	20677.	797.	55778.	0.19824	-12862.	11057.
							TOTAL PRESENT VALUE		253699.	253699.

INTERNAL RATE OF RETURN 12.25 PER CENT
PAY-OUT PERIOD 6.07 YEAR
(THE YEAR WHEN THE INITIAL INVESTMENT SHALL BE RECOVERD BY THE ACCUMULATED TOTAL RETURN, FROM THE BEG. OF OPERATION)

CAPITAL REQUIREMENTS	
LAND & SITE PREPARATION	4820.
ERECTED PLANT COST	194380.
SPARES AND CATALYST	8550.
HARBOR & BREAK WATER	42250.
WATER INTAKE &WATER PIPELINE	8330.
HOUSING COLONY	22120.
CONSTRUCTED FACILITIES	275630.
PRE-INVEST & START-UP EXP	11280.
INTEREST DURING CONSTRUCTION	13380.
TOTAL FIXED CAPITAL	305110.
WORKING CAPITAL	7890.

SOURCE OF FUND	
SHARE CAPITAL	93900.
LONG TERM DEBT	219100.
SHORT TERM DEBT	0.
FINANCIAL RESOURCES	313000.

Table VI-7. PROFITABILITY AND FINANCIAL INDICATORS

(Base Case) : Sales Price $160/T
Interest 4%

Year	After Tax Profit to Sales Revenue (%)	Debt Service Coverage Ratio	Break Even Point (Capacity Utilization) (%)
1982	19.2	4.73	56.8
1983	24.4	1.64	56.7
1984	32.1	1.96	55.6
1985	33.2	2.03	54.4
1986	34.3	2.10	53.3
1987	19.5	1.66	52.1
1988	20.0	1.70	51.0
1989	20.6	1.74	49.8
1990	21.2	1.79	48.7
1991	21.8	1.84	47.5
1992	22.4	1.89	46.4
1993	23.0	1.95	45.2
Average	24.3	2.09	51.5
Average (Excluding first year)		1.85	

Internal Rate of Return (Discounted Cash Flow)	After tax	10.3%
	Before tax	12.3%

Table VI-8. SENSITIVITY ANALYSIS ON EX-FACTORY SALES PRICE
(After Tax)

	(1)	(2)	Base Case (3)	(4)	(5)
Sales Price (US$/ton of urea in bulk)	130	145	160	175	190
(1) I.R.R. (%)	6.2	8.3	10.3	12.3	14.1
(2) Pay-out Period (years)	8.9	7.5	6.4	5.5	4.8
(3) Return on Sales Revenue (%)	12.9	19.2	24.3	28.5	32.1
(4) Return on Paid-up Equity					
(12 years' average: %)	9.1	14.9	20.7	26.5	32.3
(Discounted: %)	1.7	9.2	15.5	21.1	26.1
(5) Debt Service Coverage Ratio (DSR)					
1st year (1982)	3.39	4.06	4.73	5.40	6.07
2nd year	1.17	1.41	1.64	1.88	2.12
3rd year	1.42	1.69	1.96	2.24	2.51
(12 years' average)	(1.58)	(1.83)	(2.09)	(2.34)	(2.59)
(11 years' average)[1)]	(1.41)	(1.63)	(1.85)	(2.06)	(2.28)
(6) Ending Cash Balance for Initial 3 Years (US$ million)					
1st year (1982)	11.6	16.7	21.9	27.0	32.2
2nd year	15.3	27.1	38.9	50.8	62.6
3rd year	25.6	45.0	64.3	83.7	103.2

Note: 1) excluding 1st year which is in the grace period

Table VI-9. SENSITIVITY ANALYSIS ON INTEREST RATE

(After Tax)

	Base Case			
	(1)	(2)	(3)	(4)
Interest Rate (average)	3%	4%	5%	6%
Interest during Construction (US$ million)	9.88	13.38	16.99	20.72
(1) I.R.R. (%)	10.3	10.3	10.4	10.5
(2) Pay-out Period (years)	6.4	6.4	6.5	6.5
(3) Return on Sales Revenue (%)	26.0	24.3	22.5	20.7
(4) Return on Paid-up Equity				
(12 years' average : %)	22.4	20.7	19.0	17.4
(Discounted : %)	17.2	15.5	13.8	11.9
(5) Debt Service Coverage Ratio (DSR)				
1st year (1982)	6.38	4.73	3.74	3.09
2nd year	1.80	1.64	1.51	1.39
3rd year	2.14	1.96	1.81	1.68
(12 years' average)	(2.31)	(2.09)	(1.92)	(1.80)
(11 years' average) 1)	(1.94)	(1.85)	(1.76)	(1.68)
(6) Ending Cash Balance for Initial 3 Years (US$ million)				
1st year (1982)	24.2	21.9	19.6	17.2
2nd year	43.7	38.9	34.0	29.0
3rd year	71.4	64.3	57.1	49.7
(7) Production Cost in 1987 (US$/ton)	100.0	103.4	106.9	110.5

Note: 1) excluding 1st year which is in the grace period

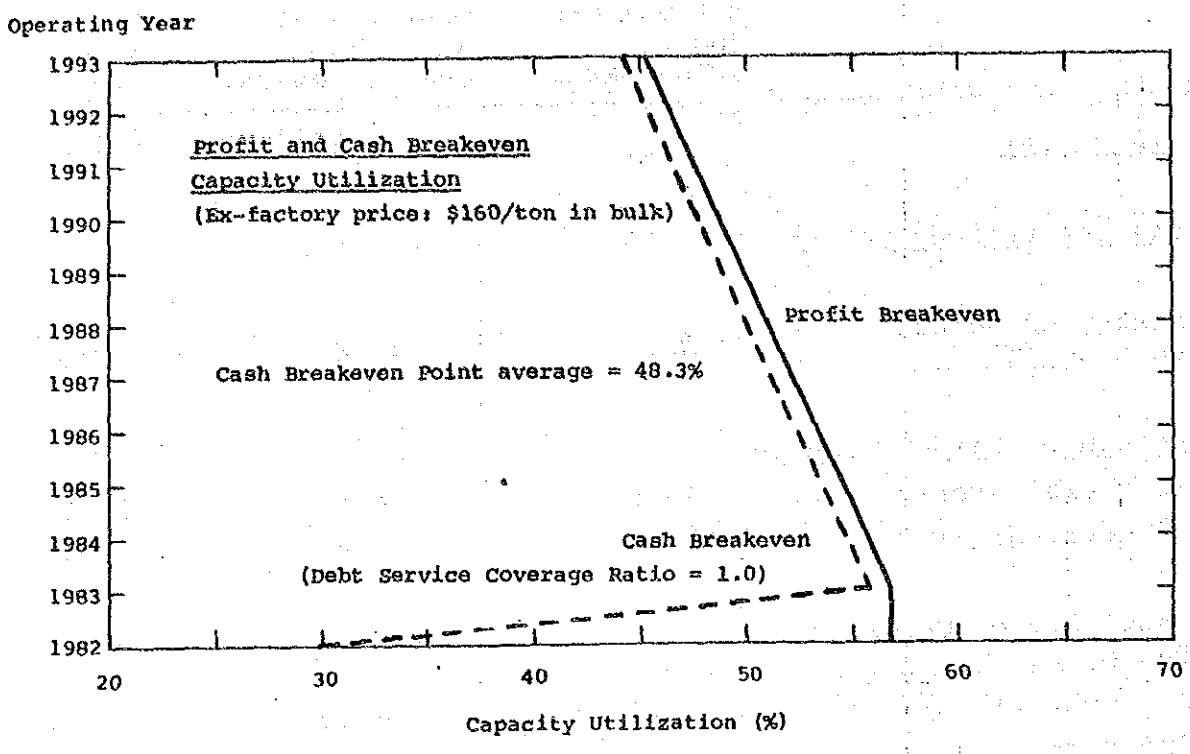
Table VI-10. SENSITIVITY ANALYSIS ON OTHER FACTORS

(After Tax)

	Natural Gas Cost ($0.65/MMBtu)	Operational Rate (70% over 12 years)	Capital Requirements (+5%)
(1) I.R.R. (%)	10.1	6.8	9.6
(2) Pay-out Period (years)	6.5	8.5	6.8
(3) Return on Sales Revenue (%)	23.5	15.4	23.0
(4) Return on Paid-up Equity			
(12 years' average : %)	20.0	10.4	18.7
(Discounted: %)	14.8	3.8	13.4
(5) Debt Service Coverage Ratio (DSR)			
1st year (1982)	4.66	4.33	4.51
2nd year	1.62	1.38	1.56
3rd year	1.93	1.42	1.87
(12 years' average)	(2.06)	(1.68)	(2.00)
(11 years' average)[1)]	(1.82)	(1.44)	(1.77)
(6) Ending Cash Balance for Initial 3 Years (US$ million)			
1st year (1982)	21.2	18.9	21.4
2nd year	37.5	29.2	36.9
3rd year	62.0	41.0	60.8
(7) Production Cost in 1987 (US$/ton)	105.1	125.7	106.1

Note: 1) excluding 1st year which is in the grace period

Fig. VI-1. BREAKEVEN ANALYSIS



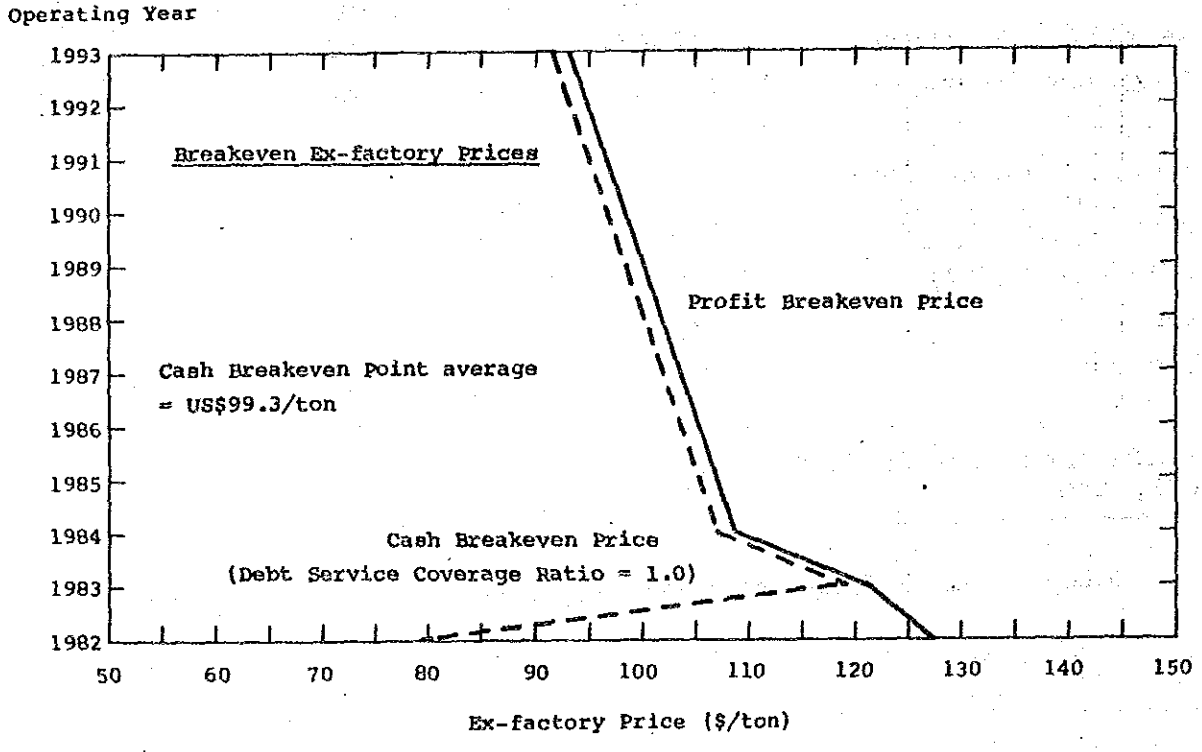
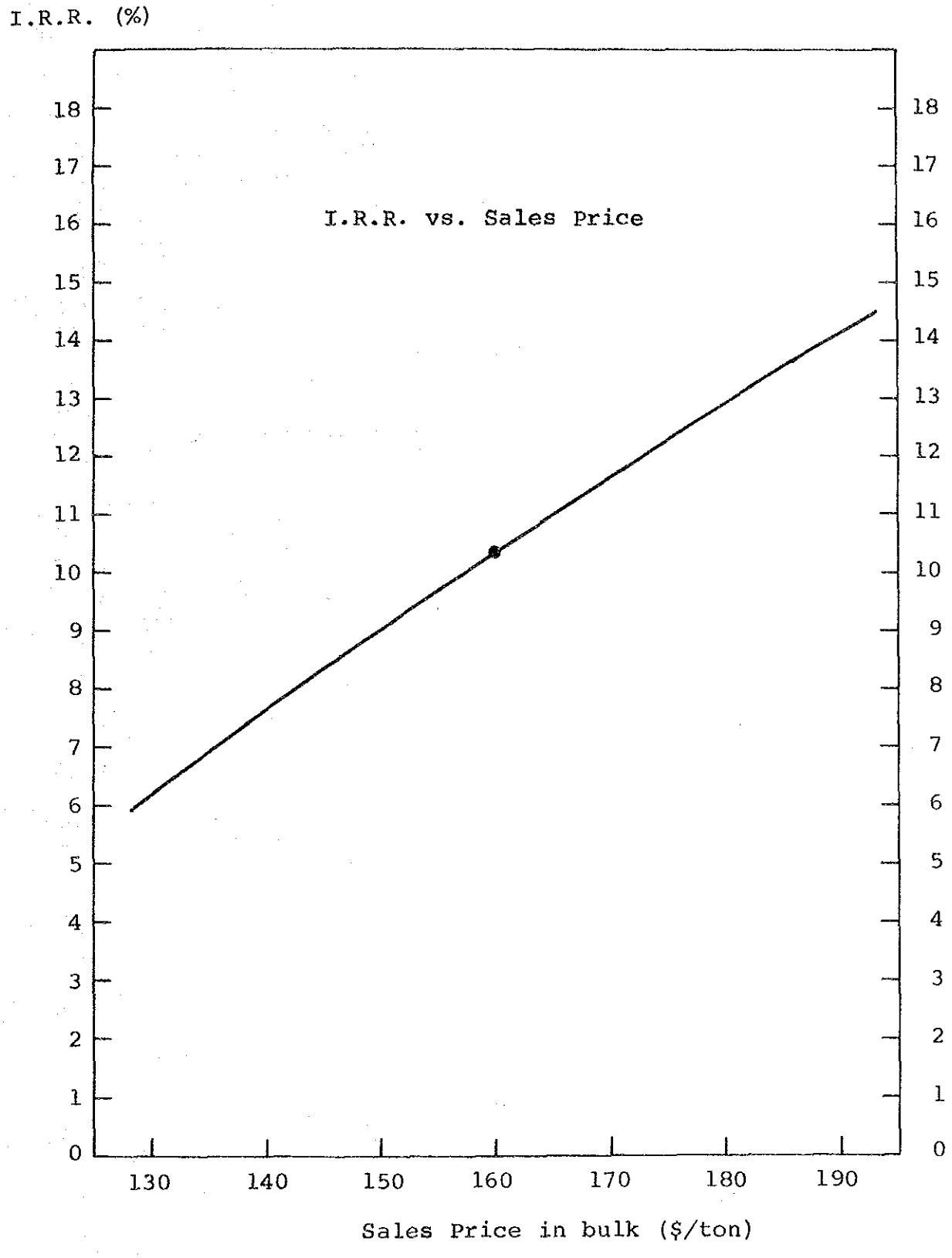


Fig. VI-2. SENSITIVITY ANALYSIS ON SALES PRICES



PART VII

ECONOMIC EVALUATION OF THE PROJECT

Chapter 1 Introduction

Natural gas is the most economical among various materials used for the feedstock to manufacture ammonia the intermediate for manufacturing urea. This project contemplates setting up a urea fertilizer complex in Indonesia with joint investment by the ASEAN member countries. It aims at supplying urea at an economical cost by using the natural gas available in Indonesia, to ASEAN countries in order to meet the increasing demand for urea in these countries.

The economic importance of this project can be defined on two different angles; one is for Indonesia, the host country for the project, and the other for the other four ASEAN countries. For Indonesia, the importance will be the contribution to her national economy in terms of the value-adding of indigenous natural resources and also of foreign exchange earnings which could be gained through the export of urea produced by means of efficient utilization of natural gas and labor resources available in the country. On the other hand, for the other ASEAN countries, it should be the expansion of investment opportunities as well as the assurance of a stable supply source of economical urea which could contribute to further development of their economy and also to their foreign exchange savings.

Furthermore, the implementation of this project may serve as a foothold for evolving an ASEAN common market and other joint developments.

From the above viewpoint, the Evaluation Team has made quantitative and qualitative analysis on the economic contribution of this project to the ASEAN member countires.

Chapter 2 Assessment of the Economic Internal Rate of Return of this Project

First an assessment of economic benefits and costs of this project had been made. Then the economic internal rate of return was computed for the project on the basis of the thus assessed economic benefits and costs. These analyses were made from the standpoint of the whole ASEAN member countries.

2-1 Economic benefits of this project

The economic benefits are evaluated separately as direct benefits and indirect benefits.

2-1-1 Direct benefits

The direct benefits can be assessed as the economic value of the produced urea which will be gained through the contemplated investment. As stated in Part II, the produced urea will be supplied primarily to ASEAN countries in order to meet their demand and the surplus will be exported outside the ASEAN region.

Most of urea requirements in ASEAN countries other than Indonesia are so far met by imports. It is already firm that Malaysia will attain self-sufficiency in urea supply in the near future by the completion of the ASEAN Urea Project - Malaysia. Other countries will need to continue the importation of urea to meet their increasing demand, unless they also expand their domestic production capacity.

In light of the 'scale economy' in capital-intensive industries such as urea manufacturing and also of the 'comparative advantage' of natural gas in the production of urea, it is obvious to say that the development of centralized production in gas producing countries by joint investment should be essentially more benefitial to all ASEAN countries than separate production in each country. Therefore, this project would bring economic benefits to urea-importing countries in ASEAN if they would receive the urea produced at the plant at a price comparable to an international market price. On the other hand, the surplus not consumed in ASEAN countries will be exported outside the ASEAN region. If the entity established for this project (P.T. ASEAN Aceh Fertilizer) can gain any profit from such export at the price mentioned above, it should be an economic benefit not only to Indonesia but also to other ASEAN

countries who have invested in this project.

As stated in Chapter 2 of Part II, it is predicted that the export price of urea at this plant which is competitive with the international price will be US$160 per ton of bulk urea - FOB in a 1982 constant price. The economic benefit for the ASEAN countries who are investers of the project, will be primarily the revenue of the project entity earned by exporting to ASEAN countries and also outside the ASEAN region at such an internationally competitive price as mentioned above.

When the importing countries in ASEAN import the urea from this plant at the aforesaid FOB price of US$160 per ton, their import price could be lower by US$5 per ton than a prevailing import price of US$180 per ton CIF which has been predicted on the basis of an international market price, since they can enjoy freight merits arising due to importation from Indonesia.

This price difference of US$5 per ton should be the economic benefit of ASEAN countries other than Indonesia who will take off the urea produced at this plant. From this point of view, the amount of their projected imports multiplied by the US$5 per ton has been added as the secondary benefit of this project.

2-1-2 Indirect benefit

Indirect benefits of this project can be generally defined as follows:

(1) Increase in employment opportunities

One of the direct benefits of this project will be an increase in employment opportunities in Indonesia with the employment of labors for plant construction and operation of this project.

(2) Extensive effects to related industries

Extensive effects of this project to related industries include the increase in demand for construction materials such as steel materials and cement, stimulation for the development of engineering and construction industries. Also the increase of demands for various materials which will be used for the operation of the plant and the packing and shipment of the produced product.

(3) Contribution to the development of regional economy

This project will contribute directly or indirectly to the development of the economy in the Aceh region through an increase in demands of transport and service sectors which will arise due to plant construction and operation in the project.

The implementation of this project will, as stated above, bring various indirect benefits to Indonesia where the project is located. Quantitative assessment in strict terms of these benefits is rather difficult. If such benefits as those received only by Indonesia are accounted as the benefits of this project, it may be unappropriate for the assessment of the benefits which should be received by all the ASEAN member countries. From such a viewpoint, the indirect benefits were not accounted in the computation of the economic internal rate of return of the project.

2-2 Economic costs

Economic costs of this project may be as follows:

(1) Initial cost incurred in the implementation of this project
(2) Cost of the natural gas resources consumed for the production of urea
(3) Cost of labor resources consumed
(4) Other costs required for the production

(1) Initial cost

Initial costs incurred in the implementation of this project include the capital cost for the complex, pre-operating expenses and initial working capital. The amount of such initial costs corresponds to the capital cost accounted for in the computation of the financial internal rate of return, that is, the capital requirement of the project less than interest during construction.

(2) Cost of the natural gas resources

Indigenous natural gas available in Indonesia will be used for the feedstock. This means the consumption of scarce natural gas resources in economic terms. In order to compute the cost of the consumed natural gas resources, it is necessary to assess the economic value of the gas resources.

The price of natural gas has been set at US$0.60/MMBTU for this project in accordance with the agreement made at the ASEAN Economic Ministers Meeting. The opportunity cost of gas resources, however, should be assessed in due consideration of gas price for the LNG which is a large consumer of natural gas. The gas cost for LNG is estimated at US$1.00 to 1.20/MMBTU if it is calculated by deducting liquefaction cost and freight from the CIF price of LNG in importing countries. It must be noted, however, that the above-stated gas cost has been estimated without any return on investment for LNG plants and the gas cost therefore should be lower than those if the return on investment for the LNG plant is taken into account in computing the liquefaction cost.

In view of these facts, the opportunity cost of gas may be assessed as being in the range between US$0.60 and US$1.20/MMBTU. The gas price of US$0.60/MMBTU set for this project is equivalent to the lowest of the estimated opportunity cost range. When compared with the price level of natural gas in other countries, however, it still has minimum economic value. This analysis, therefore, was made on the basis of US$0.60/MMBTU.

(3) Cost of labor resources

This project will require the employment of high-skilled labors scarcely available in Indonesia. It is not appropriate, therefore, to apply shadow wages. From this point of view, the assessment of economic costs was made on the basis of prevailing wage rates.

(4) Other costs required for the production

Other costs required for the production include the cost of catalysts and chemicals consumed for the production, maintenance cost of equipment and machinery, insurance cost of assets etc.

Although it is apparent that prevailing foreign exchange rates in ASEAN countries are over-valued in view of the scarcity of foreign exchange in these countries, it is difficult to estimate the shadow rates appropriately applicable to this project which involves the transfer of foreign currency among several countries such as subscription of equity and transaction of dividents. From this reason, a shadow foreign exchange rate was not applied to the assessment of the above costs. In order to make a conservative assessment, this analysis was made on the basis of prevailing

exchange rates.

On the other hand, the taxes to be imposed under the Indonesian tax laws were excluded from the cost items, since these are regarded as transferable costs from the point of Indonesian nation.

2-3 Economic internal rate of return

On the basis of the above-mentioned economic benefits and costs of this project, the economic internal rate of return was computed for an economic life span of 12 years. Thus computed return rate is 12.6%, slightly higher than the financial internal rate of return before tax. (The details are shown in Table VII-1.)

In addition to the economic return, this project will greatly contribute to all ASEAN countries through foreign exchange earnings or savings, although these are incidental to the objectives of this project.

Nevertheless, in view of the internal rate of return of the project, it is expected that this project will gain adequate economic returns for ASEAN countries. Furthermore, this project will serve as a foothold for the ASEAN countries to develop a common market. This opportunity for joint investments to promote industrialization in the whole of the ASEAN region will have many comparative advantages for these countries.

Table VII-1. ECONOMIC INTERNAL RATE OF RETURN

(Gas price: US$0.6/MMBTU)

Unit: '000 US Dollars

	Economic Cost			Economic Benefit			Present Value at 12%		Present Value at 14%	
	Initial Investment[1]	Annual Operating Cost[2]	Total	Benefit (A)[3]	Benefit (B)[4]	Total	Cost	Benefit	Cost	Benefit
1979	87,509	-	87,509	-	-	-	87,509	-	87,509	-
1980	110,252	-	110,252	-	-	-	98,455	-	96,691	-
1981	101,859	-	101,859	-	-	-	81,182	-	78,330	-
1982	-	21,216	21,216	62,700	2,050	64,750	15,106	46,102	14,321	43,706
1983	-	25,430	25,430	72,580	955	73,535	16,173	46,768	15,055	43,533
1984	-	26,604	26,604	81,320	775	82,095	15,084	46,548	13,807	42,607
1985	-	26,964	26,964	82,080	580	82,660	13,671	41,906	12,296	37,693
1986	-	26,881	26,881	82,080	590	82,670	12,150	37,367	10,752	33,068
1987	-	26,798	26,798	82,080	620	82,700	10,826	33,411	9,406	29,028
1988	-	26,716	26,716	82,080	685	82,765	9,644	29,878	8,229	25,492
1989	-	26,633	26,633	82,080	755	82,835	8,576	26,673	7,191	22,365
1990	-	26,550	26,550	82,080	830	82,910	7,620	23,795	6,292	19,650
1991	-	26,467	26,467	82,080	905	82,985	6,802	21,327	5,505	17,261
1992	-	26,385	26,385	82,080	985	83,065	6,042	19,022	4,802	15,118
1993	-64,880	26,302	-38,578	82,080	1,060	83,140	-7,908	17,044	-6,172	13,302
	299,620	312,946	612,566	955,320	10,790	966,110	380,932	389,841	364,014	342,823
							Benefit - Cost:		Benefit - Cost:	
								8,909		-21,191

(Notes) 1) Derived from Tab. VI-6 (Total Investment)

2) Derived from Tab. 4 (ANNEX VI):
Cost of sales less depreciation and amortization

$$\frac{8,909}{8,909 + 21,191} \times 2 = 0.6; \quad 12.0\% + 0.6 = 12.6\% \text{ (I.R.R.)}$$

3), 4) See table shown in the following page.

ATTACH: I / Table VII-1. ESTIMATES OF BENEFIT

Benefit "A": Economic benefit gained through sales of urea produced at the plant.

	Sales Volume (tons)	Value Gained (@US$160/ton) ('000 US$)
1982	391,875	62,700
1983	453,625	72,580
1984	508,250	81,320
1985	513,000	82,080
1986	513,000	82,080
1987	513,000	82,080
1988	513,000	82,080
1989	513,000	82,080
1990	513,000	82,080
1991	513,000	82,080
1992	513,000	82,080
1993	513,000	82,080

ATTACH: II / Table VII-2. ESTIMATES OF BENEFIT

Benefit "B": Additional economic benefit gained by ASEAN countries other than Indonesia, through their off-taking of urea from the plant.

	Off-taking by: ('000 tons)					Value Gained (@US$5/ton)
	Malaysia	Philippines	Singapore	Thailand	Total	('000 US$)
1982	108	252	14	36	410	2,050
1983	-	156	9	26	191	955
1984	-	115	9	31	155	775
1985	-	70	9	37	116	580
1986	-	67	9	42	118	590
1987	-	67	9	48	124	620
1988	-	74	9	54	137	685
1989	-	82	9	60	151	755
1990	-	90	9	67	166	830
1991	-	97	9	75	181	905
1992	-	105	10	82	197	985
1993	-	112	10	90	212	1,060