FEASIBILITY REPORT
of
CAGAYAN
INTEGRATED
AGRICULTURAL
DEVELOPMENT
PROJECT
(CIADP)

(SUMMARY)

APRIL 1976

JAPAN INTERNATIONAL COOPERATION AGENCY

CONTENTS

Preface

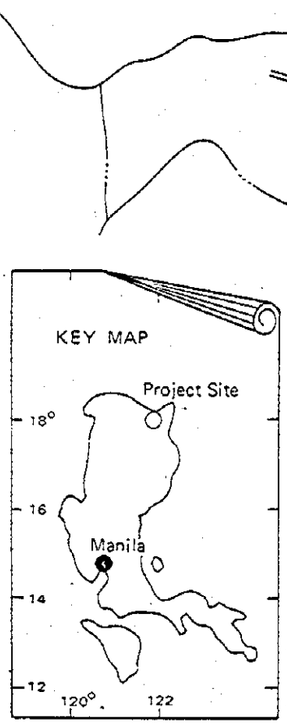
After several missions dispatched by Japan International Cooperation Agency (JICA), entrusted by the Government of Japan to the Republic of the Philippines for the fundamental study of Cagayan Integrated Agricultural Development Project (CIADP), the Mission took over the works to finalize into the feasibility study along with the direction given by forerunners.

The feasibility study was carried out in Manila during the period between January and April, 1976.

Starting from the preliminary survey in 1974, the surveys were carried forward stage by stage to complete the feasibility study by the Mission. The feasibility study, the results obtained by accumulation of efforts made by respective missions and organization and agencies concerned of the Philippines, will be a mile-stone on a long way to realizing the Project. During the course of studies, various problems were overcome by devotion and cooperation of the Philippine staff concerned, inhabitants and the Missions.

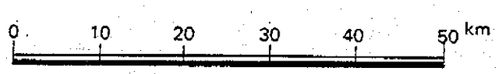
It could be said confidently that the CIADP would be a real integrated development project to physically and metaphysically contribute to the betterment of the life of the people in the area.

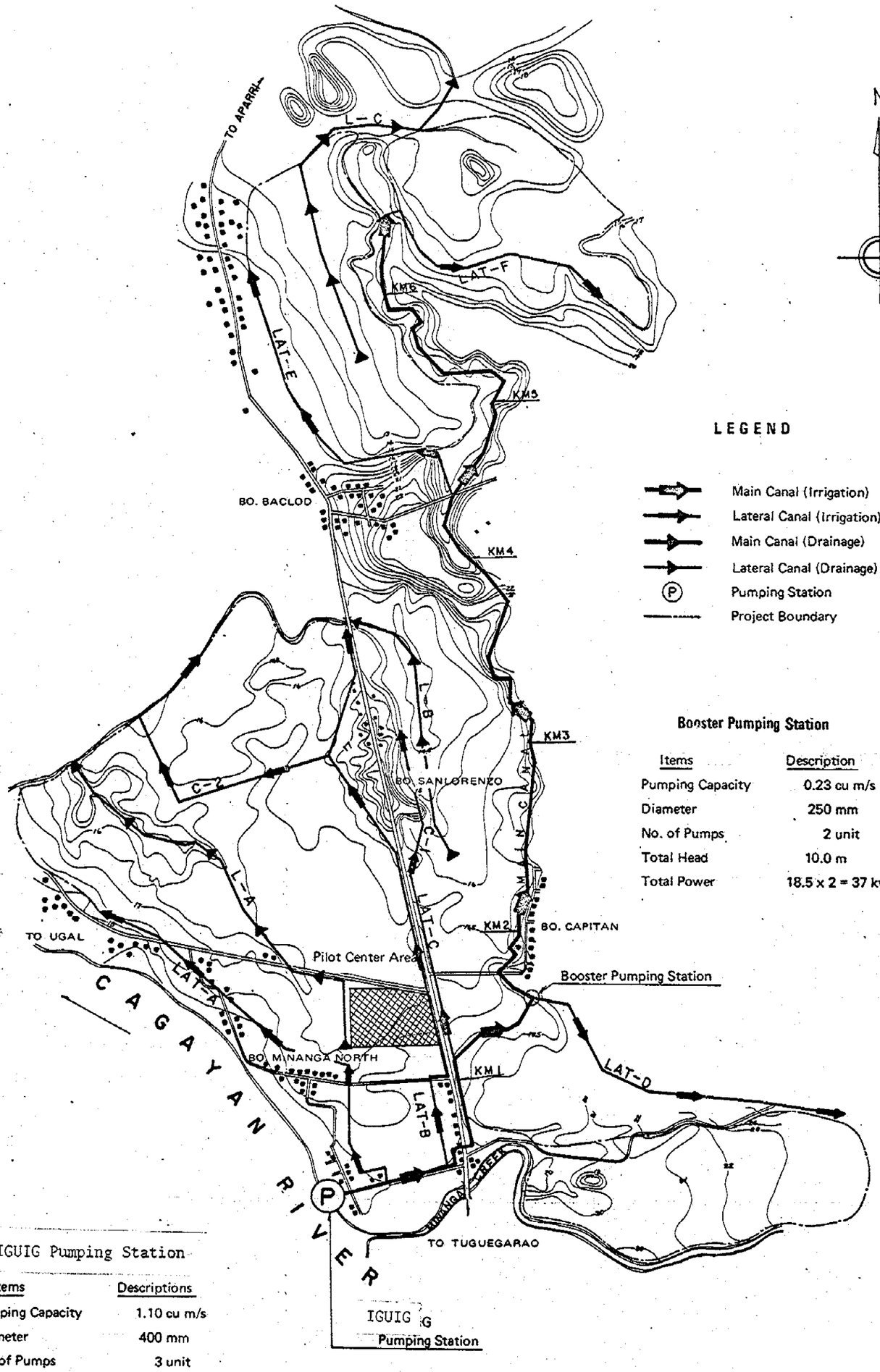
GENERAL MAP OF CAGAYAN INTEGRATED AGRICULTURAL DEVELOPMENT PROJECT (CIADP)



LEGEND

- National Road
- Trail/Proposed Road
- Provincial Road
- Proposed Provincial Road
- Provincial Capital
- Municipality
- Provincial Boundary
- Project Area
- (1) Lower Cagayan 11,200 ha
- (2) Alcala-Amuiung 1,400 ha
- (3) Iguig 600 ha
- On Going or Proposed Project by Other Agencies Assistance or NIA's Own





N

LEGEND

- Main Canal (Irrigation)
- Lateral Canal (Irrigation)
- Main Canal (Drainage)
- Lateral Canal (Drainage)
- (P) Pumping Station
- Project Boundary

Booster Pumping Station

Items	Description
Pumping Capacity	0.23 cu m/s
Diameter	250 mm
No. of Pumps	2 unit
Total Head	10.0 m
Total Power	18.5 x 2 = 37 kw

IGUIG Pumping Station

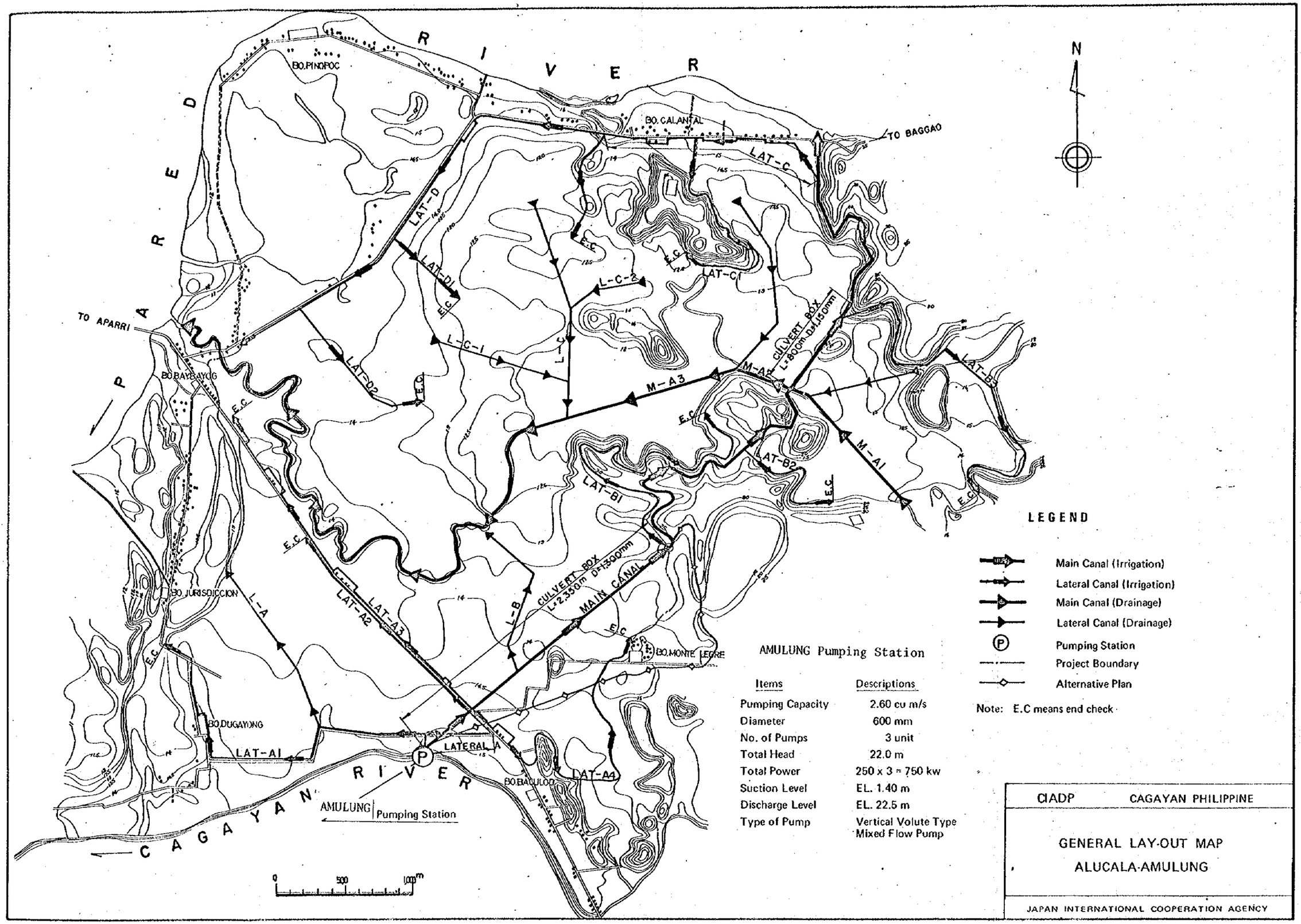
Items	Descriptions
Pumping Capacity	1.10 cu m/s
Diameter	400 mm
No. of Pumps	3 unit
Total Head	15.5 m
Total Power	75 x 3 = 225 kw
Suction Level	EL 4.50 m
Discharge Level	EL 19.0 m
Type of Pumps	Vertical Volute Type Mixed Flow Pump

0 500 1,000m

CIADP CAGAYAN PHILIPPINE

GENERAL LAY-OUT MAP IGUIGU

JAPAN INTERNATIONAL COOPERATION AGENCY



LEGEND

- Main Canal (Irrigation)
- Lateral Canal (Irrigation)
- Main Canal (Drainage)
- Lateral Canal (Drainage)
- Pumping Station
- Project Boundary
- Alternative Plan

Note: E.C means end check

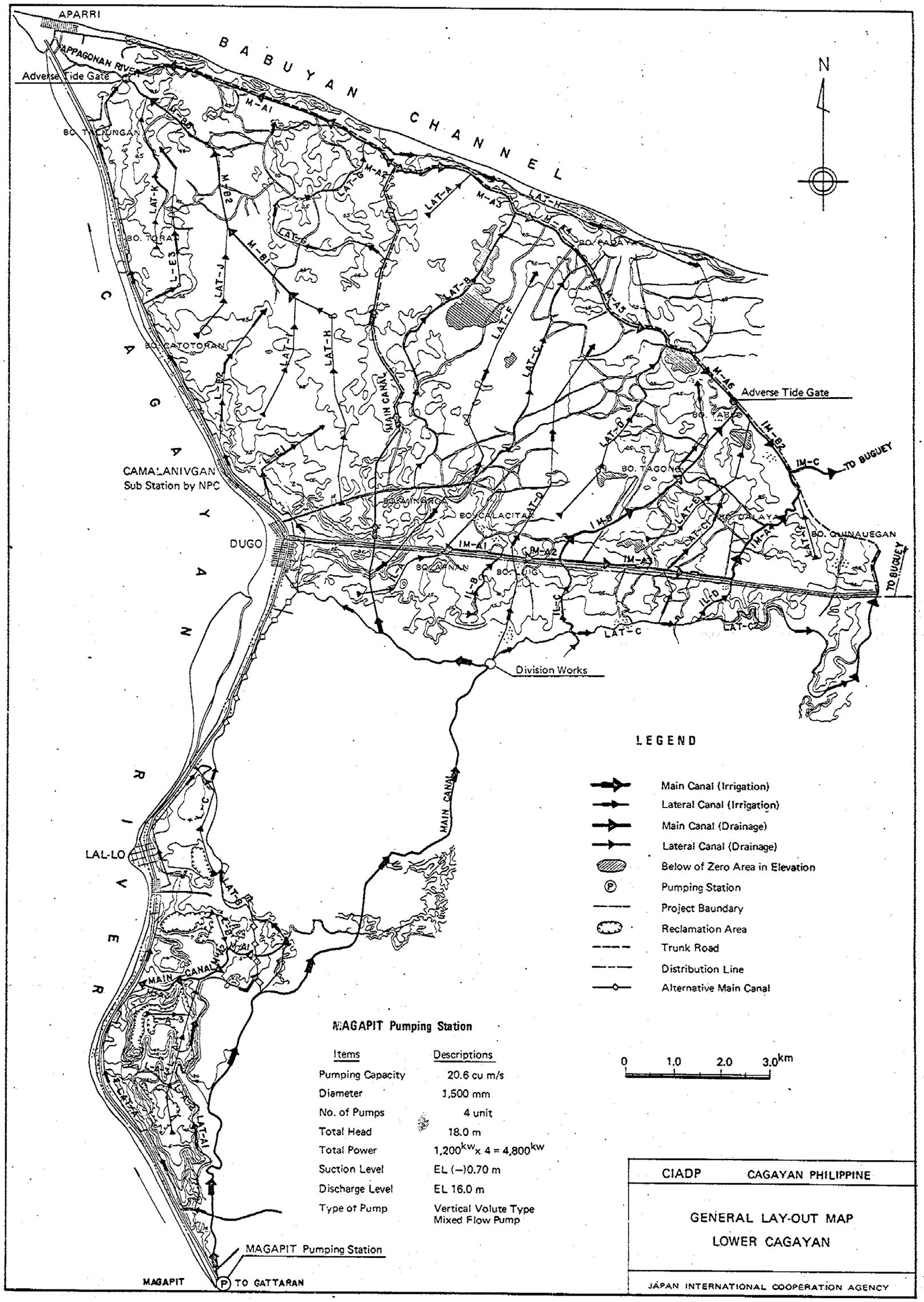
AMULUNG Pumping Station

Items	Descriptions
Pumping Capacity	2.60 cu m/s
Diameter	600 mm
No. of Pumps	3 unit
Total Head	22.0 m
Total Power	250 x 3 = 750 kw
Suction Level	EL. 1.40 m
Discharge Level	EL. 22.5 m
Type of Pump	Vertical Volute Type Mixed Flow Pump

CIADP CAGAYAN PHILIPPINE

GENERAL LAY-OUT MAP
ALUCALA-AMULUNG

JAPAN INTERNATIONAL COOPERATION AGENCY



LEGEND

- Main Canal (Irrigation)
- Lateral Canal (Irrigation)
- Main Canal (Drainage)
- Lateral Canal (Drainage)
- Below of Zero Area in Elevation
- Pumping Station
- Project Baundary
- Reclamation Area
- Trunk Road
- Distribution Line
- Alternative Main Canal

0 1.0 2.0 3.0km

MAGAPIT Pumping Station

Items	Descriptions
Pumping Capacity	20.6 cu m/s
Diameter	1,500 mm
No. of Pumps	4 unit
Total Head	18.0 m
Total Power	$1,200^{kw} \times 4 = 4,800^{kw}$
Suction Level	EL (−)0.70 m
Discharge Level	EL 16.0 m
Type of Pump	Vertical Volute Type Mixed Flow Pump

CIADP CAGAYAN PHILIPPINE

GENERAL LAY-OUT MAP LOWER CAGAYAN

JAPAN INTERNATIONAL COOPERATION AGENCY

Summary, Conclusion and Recommendations

Summary

The pre-feasibility mission was dispactched in May, 1975, to direct the approach to the CIADP. The feasibility mission furthered studies on the CIADP along the guide line provided by the pre-feasibility mission.

As stated in the Pre-feasibility Report, very few agricultural infrastructures such as irrigation and drainage facilities and transportation facilities exist in the Project Area and such absence of infrastructures has left the area intact in development, though holding a high potentiality therein.

Under the circumstances, a development plan was made as follows, in taking into account the best use of its potentiality to contribute to the agricultural development which is one of the vital important policy of the Philippines and to the welfare of inhabitants in the area.

1. Plan of Development

1 - 1 The project consists of the construction of new irrigation and drainage systems providing three pumping stations and roads on some 13,200 hectares and rural electrification for 5 municipalities. The project also includes processing facilities and marketing study. In addition, the pilot center scheme will be provided by T.A . The Project area of 13,200 hectares divided into three areas are as follows:

Iguig	600 Ha.
Alcala-Amulung	1,400 Ha.
Lower Cagayan	11,200 Ha.
Total -	13,200 Ha.

1 -2 Irrigation Systems are as follows:

Pumping Station

Name	Design Pump Capacity	Unit	Type of Pump	Designed Water requirement
Iguig	22 m^3/min.	3	Vertical Volute Ø 400 m/m	1.1 m^3/s
Amulung	52 m^3/min	3	Vertical Volute Ø600	2.6 m^3/s
Magapit	309 m^3/min	4	Ø 1500 m/m	20.6 m^3/s

o Canal

Class	Length	Density m/ha	Irrigable Area
Main	44,110m	3	13,200ha
Lateral	131,400	10	"
Main farm ditch	227,700	17	"
Supplementary farm ditch	526,400	40	"
TOTAL -	929,610	70	13,200

1-3 Drainage Systems are as follows

o Canal

Class	Length	Density m/ha	Remarks
Main	61,000	5	
Lateral	69,000	5	Two adverse tide gates
Farm drain	283,800	21	
TOTAL -	413,800	31 m	

1-4 Roads

Class	Length	Density m/ha	Remarks
Existing road	81,000	6.1	
Trunk road	27,200	2.0	B = 6 m
Farm road	422,500	32.0	B = 2 - 5m
Supplementary Farm road	228,400	17.3	B = 2m
T O T A L -		57.4m	

1 - 5 Electrification

Poblaciones and Barrios in five municipalities viz., Buguey, Aparri, Camalaniugan, Lal-lo and Gattaran will be electricified by total length of distribution system of 75 KM, excluding the district covered by CAGELCO - 1, Project. Main materials of distribution system are as follows:

Item	Quantity	Remarks
Wood Pole	930 Ea.	
Total length of Conductor		
ACSR	210 KM	
Copper	169 KM	
Insulator	3,450 Pcs.	
Pole transformer	4,750 KVA	
Watt hour meter	6,000 Unit	

2. Technical Feasibility

Technical feasibility, study was made carefully on various facilities necessitated for accomplishment of the Project having regard to size of facilities, construction cost, construction schedules and necessary equipment to be purchased. It was natural that due consideration should be given to local conditions including climatical conditions prevailing over the Project Area. As a result, CNADP could be found to be technically feasible.

Pre-construction works will take about one year and the construction will last four and half years. Then, five and half years will be required for completion of the project.

Additional surveys and detailed design, therefore, should be finished within a year to meet the Project requirement. The detailed construction schedule is presented in Fig. 4 - 1.

3. Financial and Economic Aspects

3-1. Project Cost

1) Initial Cost

(Unit: thousand pesos)

	F.C.	L.C.	Total
Total Construction Cost	138,652	93,725	232,377
Price Escalation	27,960	29,186	57,146
Total Project Cost	166,612	122,911	289,523
(US$ x 10^3)	(22,215)	(16,388)	(38,603)
(%)	(57.5%)	(42.5%)	(100.0%)

2) Operation and Maintenance Cost

Item	Cost (₱1,000)
Maintenance of Canal	1,535
Maintenance of Road	922
Maintenance of Pump Facilities	304
Operation of Pump	1,778
Miscellaneous	461
Total	5,000

3-2. Project Benefit

(Unit: thousand pesos)

	Without Project	With Project	Increment
Net Production Value			
Paddy	11,309	66,523	55,214
Corn	160	0	-160
Total	11,469	66,523	55,054
(US$ x 10^3)	(1,529)	(8,870)	(7,341)

3-3. Present Worth Value

(Unit: Thousand Pesos)

Discount Rate	10.0%	12.5%	15.0%
Benefit	254,428	172,727	121,967
Cost	177,609	157,320	141,433

3-4. Economic Internal Rate of Return (EIRR): 13.5%

3-5. Sensitivity Analysis

Alternative	EIRR (%)
(1) Construction costs increased 10%	12.6
(2) Benefit decreased 10%	12.4
(3) One year delay of construction works	12.6
(4) One year delay of full development	12.9
(5) Combination of (1) and (2)	11.6

Conclusion

In connection with the above descriptions 1 to 3, Cagayan Integrated Agricultural Development Project (CIADP) is found to be technically sound, economically feasible and socially promising.

Recommendations

As a result of feasibility study of the CIADP, recommendations are presented as follows for serving the project works in the coming stages.

1. Additional Surveys

(1) To modify the existing topo-map 0.5 m. contour of the Aparri area with 0.25 interval contour lines so that the detailed design team may easily make interpretation of the map of the area, the topography of which is so flat,

(2) To make re-survey of the alingment of main and lateral canals for both irrigation and drainage in referring to the existing General Layout Map, especially, main canals in Alcala-Amulung area for preparation of Alternative Plan for the upper portion of main canal and, furthermore, to change the alignment of the main canl in lower Cagayan subject to deciding the necessary water level as 15.0 m El. at the starting point of the canals.

(3) To survey for establishment of electric distribution system.

(4) For making the drainage plan to set up a discharge observation point at any creek available in the Project Area for continuous observation for 1 year at minimum, so that such collected data may help to derive the relationship between rainfall and run-off by carrying out the actual run-off analysis; in the relevant catchment area to select an observation point at a point at creek running along the hilly land to avoid the effect of back water, and to set up water level observation points in the confluence of each designed main drainage canal with the relevant rivers for continuous observation. (Iguig, Alcala-Amulung and Lal-lo areas).

(5) To complete the soil survey for covering the whole Project area and also to complete the soil map of the swamp area in the Lower Cagayan based on the analysis of the survey result.

2. Salinity

(1) To carry out the salinity survey on the proposed pumping site for determination of the said site from which the water will be conveyed to the Lower Cagayan areas. The mode of survey is as follows:

Survey period: April - May

Survey frequency: Three (3) surveys at minimum a month

Method of sampling: Surface water at every 2 m interval deep in vertical up to 10 m deep in water.

3. Water Resources

(1) To make a detailed analysis on influences to CIADP given by many other water resources development projects, not only existing ones by in planning.

4. Boring Test

(1) To carry out boring tests to the extent of 30 m deep for the pumping sites in Iguig, and Amulung which have been hunted at different locations from those in the pre-feasibility stage and in parallel with boring test to carry out the standard penetration tests thereon to investigate the bearing power of the ground.

(2) To carry out boring tests minimum drilling depth: reaching up to the invert of proposed canals to clarify the geology and groundwater conditions and so forth as preparatory works for detailed design on the inlet and outlet points of the tunnel (460 m) which is to be constructed as portion of main irrigation canal in Lower Cagayan area and also, to make the standard penetration test in parallel with boring tests.

5. Electrification Program

(1) To complete by February, 1979, electric transmission lines which are now in contemplation by National Power Corporation (NPC).

6. Transmigration

(1) To make a plan for transmigration to the area to be developed in the Project, namely existing swamp area in consideration of the labor shortage for best use of the said area and to study carefully the actual results of resettlements carried out in the other areas in the Philippines.

7. Samahang Nayon

(1) To increase a particpant of Samahang Nayon for the purpose of successful achievement of the project, taking into consideration that the present situation of establishing Samahang Nayon remains at 10 % in the project area.

8. Marketing

(1) It is desirable to establish a branch of Area Marketing Cooperatives to be a core of future distribution system in the project area which exist on the provincial level.

(2) To direct the Area Marketing Cooperatives so as to pay their attention to secure outlets of farm products which is one of their important role.

9. Mechanization

(1) To make further study on farm mechanization in the project area from a viewpoint of farm management.

10. Soil fertility

(1) To study measures for retaining the soil fertility in case of introducing double cropping paddy cultivation into the project area.

11. Communication System

(1) To provide communication system within the project area and between the project area and its outer areas for closer communication with each other.

ABBREVIATIONS

ACA	Agricultural Credit Administration
ADB	Asian Development Bank
BAEcon	Bureau of Agricultural Economics
BAEx	Bureau of Agricultural Extension
BCS	Bureau of Census and Statistics
BFD	Bureau of Forestry Development
BPI	Bureau of Plant Industry
CCC	Cabinet Coordinating Committee
CIADP	Cagayan Integrated Agricultural Development Project
CB	Central Bank of the Philippines
IBRD	International Bank for Reconstruction and Development
IDA	International Development Association
ILO	International Labor Organization
IRRI	International Rice Research Institute
NEDA	National Economic and Development Authority
NFAC	National Food and Agriculture Council
NGA	National Grains Authority
NIA	National Irrigation Administration
NPC	National Power Corporation
OECF	Overseas Economic Cooperation Fund
PNB	Philippine National Bank
USAID	United States Agency for International Development
FaCoMa	Farmers Cooperative Marketing Association
USDIBR	United States Department of Interior, Bureau of Reclamation
DA	Department of Agriculture
DPWTC	Department of Public Works, Transportation and Communication
DPH	Department of Public Highway
DF	Department of Finance
DLGCD	Department of Local Governments and Community Development
DAR	Department of Agrarian Reform
DNR	Department of Natural Resources
BS	Bureau of Soil

CONVERSION TABLE

mm	Millimeter(s)
cm	Centimeter(s)
m	Meter(s)
km	Kilometer(s)
sq.mm	Square milimeter, mm^2
sq.m	Square meter, m^2
sq.km	Square kilometer, km^2
ha	Hectare(s)
cu.m	Cubic meter, m^3
MCM	Million cubic meter, $10^6 m$
g	Gram(s)
kg	Kilogram(s)
MT	Metaric ton(s)
m/s	Meter per second
cu.m/s	Cubic meter per second
km/hr	Kilometer per houre
EL	Elevation
H.W.L	High water level
M.W.L	Mean water level
L.W.L	Low water level
kw	Kilo watt
°C	Centigrade degree
hr	Hour(s)
min	Minute(s)
Sec or S	Second(s)
%	Parcent
L.S.	Lump sum
eq.	Equivalent
¥	Yen
₱	Peso(s)
$	US Dollar(s)
A	Ampere
Hz	Hertz per second
KVA	Kilo volt ampere
KV	Kilo volt
KWH	Kilo watt hour
MVA	Mega volt ampere
V	Volt
Ω	Ohm

1.0 $ = 7.5 ₱

Introduction

In response to the request of the Government of the Republic of the Philippines for plan formulation and study of the Cagayan Integrated Agricultural Development Project (CIADP), the Government of Japan had dispatched two Study Missions in July, 1974 and May, 1975. While these Missions had been working respectively, the Government of the Philippines provided the new organization of the Cabinet Coordinating Committee (CCC), under the jurisdiction of the National Economic and Development Authority (NEDA) which is responsible for carrying out the CIADP as one of its functions. Under such efforts and mutual cooperation, the plan has been formulated in furthering the step to the feasibility study from the pre-feasibility study.

Prior to the Mission, a Study Team was sent to the Philippines in October, 1975 as the forerunner for the fundamental works of the feasibility study of the Mission.

Based upon these results, the Mission made the detailed study for a period beginning 25th, January to 3rd, April, 1976 to finalize the feasibility study of the Project.

Under mutual understanding and close cooperation between the two countries, Republic of the Philippines and Japan, confidentially, it can be said that given due course, this Project (CIADP) will, in due time, come into realization.

MEMBER OF THE MISSION FOR CIADP

Name	Speciality	Present Position in Japan
Mr. Junichi Kitamura	Leader	Head of Development Planning Div. for Agriculture & Forestry, JICA
Mr. Toshiharu Kai	Development Planning	Staff of Development Planning Div. for Agriculture & Forestry, JICA
Mr. Takeshi Adachi	Agronomist	Staff of Technical Affair Division for Agriculture & Forestry, JICA
Mr. Susumu Takamine	Sub-leader (Manager)	Senior Managing Director, Sanyu Consultants Inc.
Mr. Ikuzo Iwamoto	Irrigation	Director, Sanyu Consultants Inc.
Mr. Shizuo Sato	Construction Planning	Director, Sanyu Consultants Inc.
Mr. Taira Suetsugu	Electricity	Deputy Director of Overseas Affairs, Tokai Electric Works
Mr. Satoshi Hirai	Pumping Facilities	Head of Planning Survey Div. JIRCO
Mr. Masahiro Iida	Drainage	Engineer, Sanyu Consultants Inc.
Mr. Yasunori Hasegawa	Cultivation and Agricultural Facilities	Engineer, Sanyu Consultants Inc.
Mr. Masaru Matsuyama	Water Distribution Facilities	Engineer, Sanyu Consultants Inc.
Mr. Hiroaki Kawachi	Agricultural Road and Water Distribution Facilities	Engineer, Sanyu Consultants Inc.
Dr. Yoshihiro Takano	Social Development	Engineer, Sanyu Consultants Inc.
Mr. Yoshitami Iseki	Pumping Station Structure	Engineer, JIRCO
Mr. Yoshitomo Miyanishi	Economy	Engineer, Sanyu Consultants Inc.

FILIPINO COUNTERPARTS FOR CIADP

INFRASTRUCTURE

Name	Agency	Area
Amado Jugueta	NIA*	Team Leader/Irrigation Engr.
Patricio Marquez	NIA*	Irrigation
Ernesto de Peralta	NIA**	Irrigation
Bibiano Alonzo	NIA**	Irrigation
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Arturo Dayot	BS*	Agronomy/Soils
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Romeo Mapagu	BS**	Agronomy/Soils
Edilberto Fragante	BAEx**	Social Development
Elpidio Pauig	BAEx**	Social Development
Jose Taguba	BPI**	Development Planning
Nicolas Naval	DPH**	Roads/Highways
Avelino Buenafe, Jr.	PPDO/DPWTC*	Regional Development
Alex Dayo	NEA*	Electrification
Eugenio Batarao	NEA*	Electrification
Prudencio Baranda	DPH*	Roads/Highways
Rene Mondragon	BPI*	Development Planning

* National Office
** Provincial Office

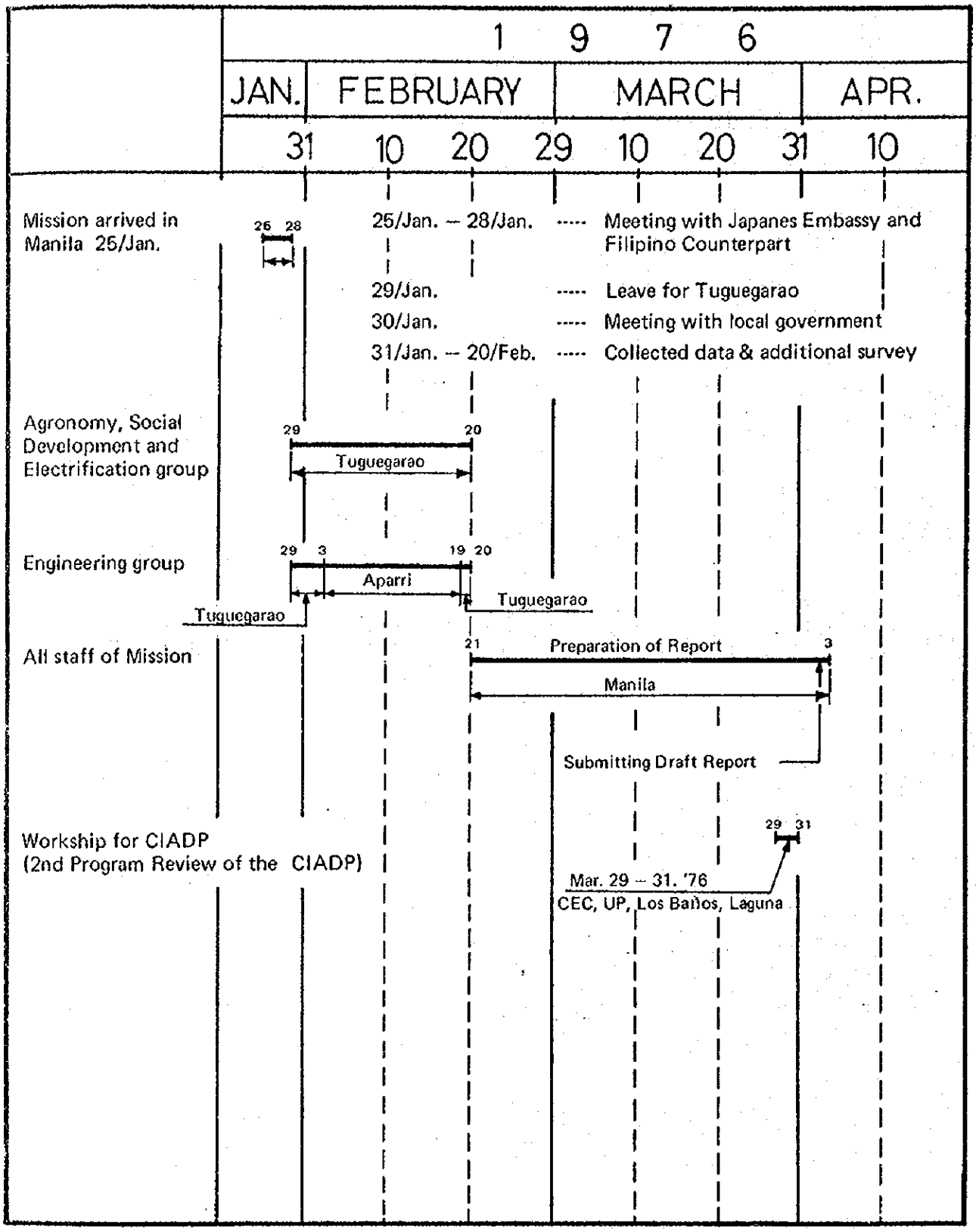
CIADP STAFF

Name	Area
Hegino Ma. Orticio	Project Director
Andres Limcaoco	Coordinator
Hiroyiko Iwasaki*	Agro-Economics
Susumu Siraisi*	Irrigation
Narciso Padilla	Irrigation

Name	Area
Gloria Macatol	Soil Technology
Antonio Hinayo	Farm Mechanization
Delfin Cruz	Entomology/Pathology
Lydia Almeron	Agr-Economics
Carmelita Cruz	Credit
Napoleon Carino	Field Audit/Monitoring
Jorge Cruz	Soils/Agr-Engineer
Kathryn Pineda	Communication
Melanio Mina	Staff Assistant
Aurelia Tayao	Staff Assistant
Alwyn Abella	Research Assistant

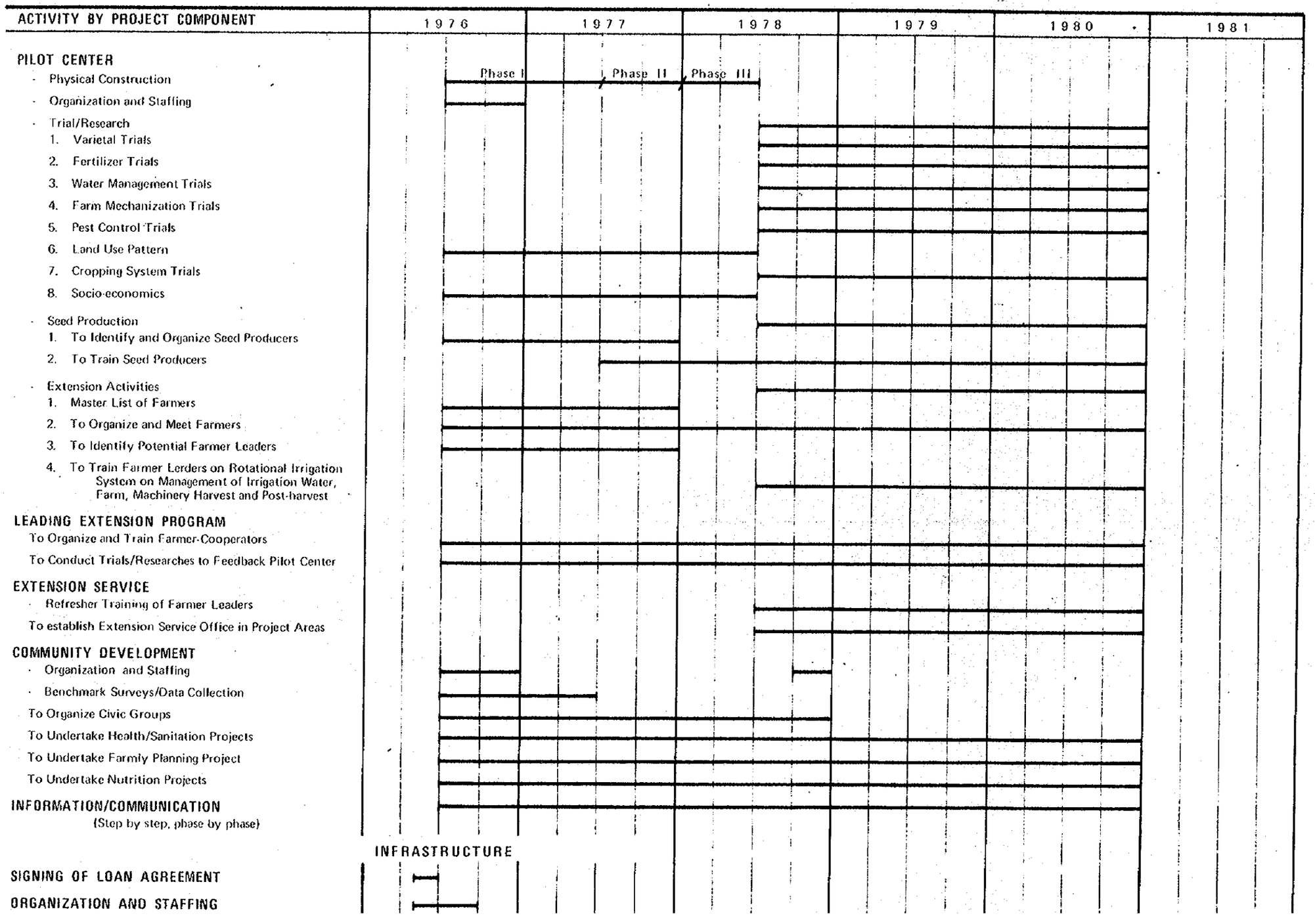
* Short-term JICA Consultant assigned to the CIADP Office

ITINERARY OF MISSION



SCHEMATIC FLOW CHART AND SCHEDULE OF WORK OF CIADP

AGRICULTURAL RURAL DEVELOPMENT



- To establish Extension Service Office in Project Areas

COMMUNITY DEVELOPMENT

- Organization and Staffing
- Benchmark Surveys/Data Collection
- To Organize Civic Groups
- To Undertake Health/Sanitation Projects
- To Undertake Farmly Planning Project
- To Undertake Nutrition Projects

INFORMATION/COMMUNICATION
(Step by step, phase by phase)

INFRASTRUCTURE

SIGNING OF LOAN AGREEMENT

ORGANIZATION AND STAFFING

RECRUITMENT OF CONSULTANTS

PRE-ENGINEERING

- Construction of Project Facilities
- Pre-construction Survey
- Right of Way Negotiations

FINAL DESIGN

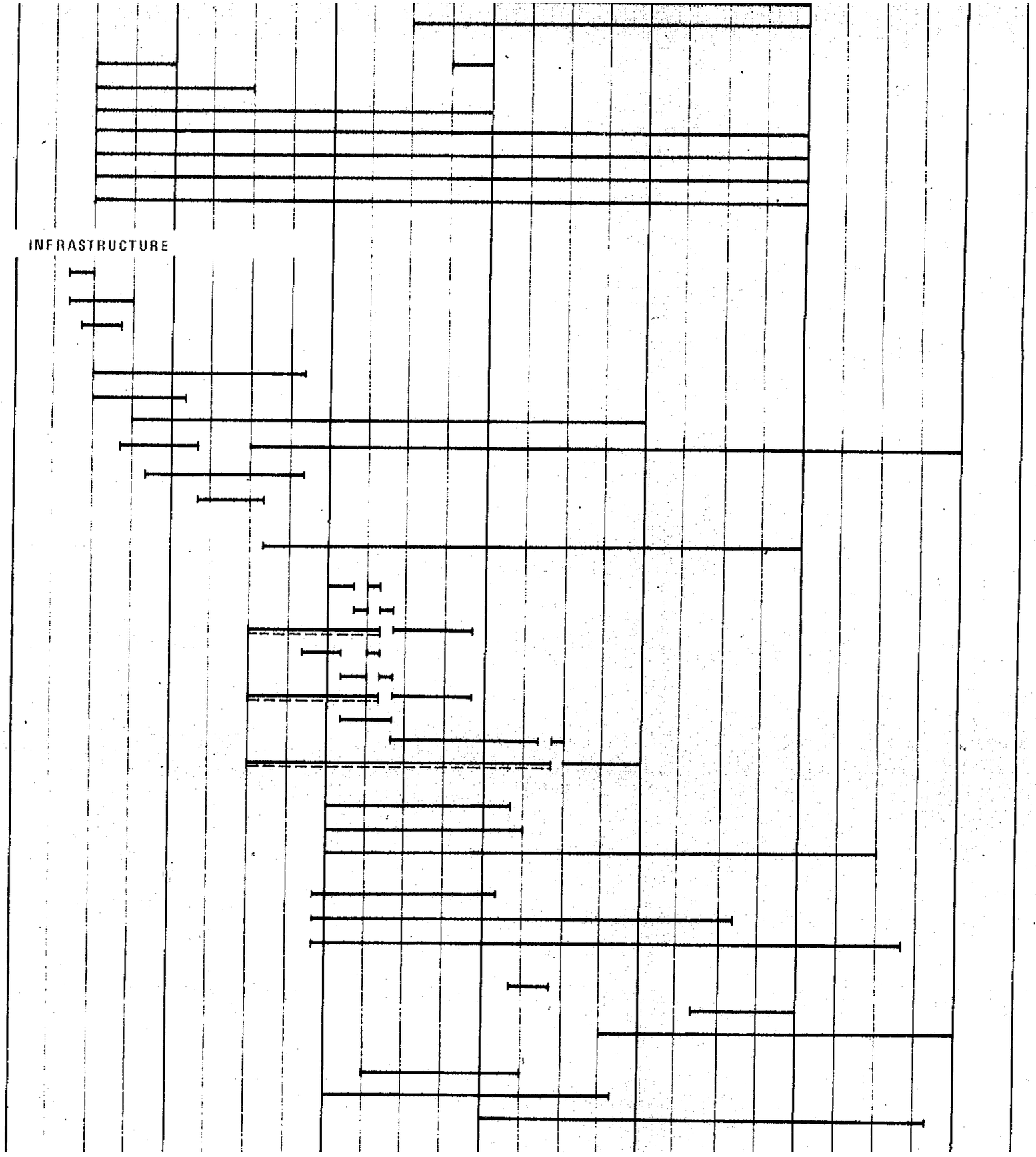
PROCUREMENT OF EQUIPMENT

BIDDING AND CONTRACTS

CONSTRUCTION

- Preparation
- Pumping Station
  1. Iguig Excavation
  2. Iguig Concrete
  3. Iguig Facilities
  4. Amulung Excavation
  5. Amulung Concrete
  6. Amulung Facilities
  7. L. Cagayan Excavation
  8. L. Cagayan Concrete
  9. L. Cagayan Facilities
- Irrigation Canal
  1. Iguig
  2. Alcala & Amulung
  3. L. Cagayan
- Drainage Canal
  1. Iguig
  2. Alcala & Amulung
  3. L. Cagayan
- Road
  1. Iguig
  2. Alcala & Amulung
  3. L. Cagayan
- Terminal Facilities
  1. Iguig
  2. Alcala & Amulung
  3. L. Cagayan

OPERATION AND MAINTENANCE



CONSTRUCTION

- Preparation
- Pumping Station
  1. Iguig Excavation
  2. Iguig Concrete
  3. Iguig Facilities
  4. Amulung Excavation
  5. Amulung Concrete
  6. Amulung Facilities
  7. L. Cagayan Excavation
  8. L. Cagayan Concrete
  9. L. Cagayan Facilities
- Irrigation Canal
  1. Iguig
  2. Alcala & Amulung
  3. L. Cagayan

  Drainage Canal
  1. Iguig
  2. Alcala & Amulung
  3. L. Cagayan
- Road
  1. Iguig
  2. Alcala & Amulung
  3. L. Cagayan
- Terminal Facilities
  1. Iguig
  2. Alcala & Amulung
  3. L. Cagayan

OPERATION AND MAINTENANCE

ELECTRIFICATION

- Arrangement for Consultant
- Organization and Staffing
- Arrival of Consultant
- Detailed Design
- Organization of Cooperatives
- Award of Contract
- Arrival of Materials
- Construction Works
  1. Backbone
  2. Laterals and Secondary Lines

INFORMATION/COMMUNICATION

(Sept by step, phase by phase)

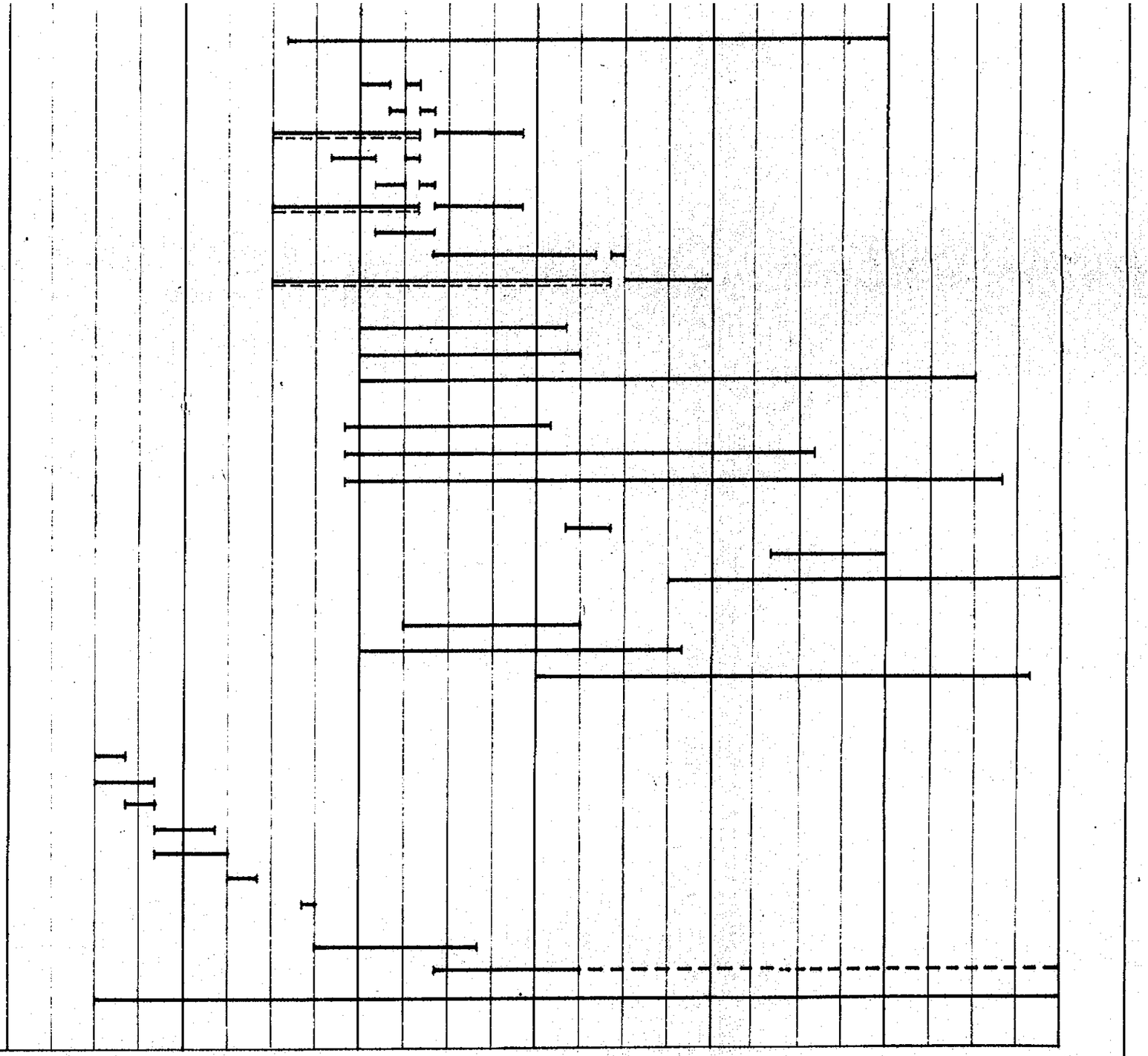


Table GROSS IRRIGABLE AREA WITHOUT AND WITH PROJECT

(Unit: ha)

Area	Without Project					With Project				
	Irrigated [1]	Rainfed	Sub-total	Unarable [2]	Total	Double Cropping	Single Cropping	Sub-total	Others [4]	Total
Iguig	-	660	660	30	690	600	-	600	90	690
Alcala-Amulung	145	1,285	1,430	140	1,570	1,400	-	1,400	170	1,570
Lower Cagayan										
(Lal-lo)	110	940	1,050	240	1,290	1,200	-	1,200	90	1,290
(Aparri)	245	7,425	7,670	3,430	11,100	9,590	410 [3]	10,000	1,100	11,100
Total	500	10,310	10,810	3,840	14,650	12,790	410	13,200	1,450	14,650

Note: [1] Present irrigated areaby privately owned small pumps.
[2] Swampy area or grass land
[3] These area will not be cultivated even "with project" in wet season
[4] Right of way for irrigation and drainage canal "with project"

CONSTRUCTION COST

(Unit: '000 ₱)

Description	Lower Cagayan F.C.	Lower Cagayan L.C. Cost	Lower Cagayan L.C. O.Head	Lower Cagayan L.C. Total	Alcala & Amulung F.C.	Alcala & Amulung L.C. Cost	Alcala & Amulung L.C. O.Head	Alcala & Amulung L.C. Total	Iguig F.C.	Iguig L.C. Cost	Iguig L.C. O.Head	Iguig L.C. Total	Total F.C.	Total L.C.	Remarks
1. Preparation	-	4,243	636	4,879	-	530	80	610	-	227	34	261	-	5,750	Grand Total 5,750
2. Pumping Facility															
Pump Equipment	23,963	424	64	488	4,465	-	-	-	3,016	-	-	-	31,444	488	" 31,932
Pumping Station	1,493	3,513	751	4,264	456	1,142	240	1,382	293	924	183	1,107	2,242	6,753	" 8,995
Sub-total	25,456	3,937	815	4,752	4,921	1,142	240	1,382	3,309	924	183	1,107	33,686	7,241	" 40,927
3. Canals															
Irrigation Canal	5,432	10,594	2,404	12,998	1,716	4,001	858	4,859	427	1,091	228	1,319	7,575	19,176	" 26,751
Drainage Canal	3,570	11,030	2,190	13,220	317	1,059	207	1,266	53	177	35	212	3,940	14,698	" 18,638
Sub-total	9,002	21,624	4,594	26,218	2,033	5,060	1,065	6,125	480	1,268	263	1,531	11,515	33,874	" 45,389
4. Road	1,843	6,261	1,216	7,477	137	859	150	1,009	56	405	70	475	2,036	8,961	" 10,997
5. Terminal Facility	876	7,971	1,328	9,299	308	1,712	303	2,015	24	344	56	400	1,208	11,714	" 12,922
6. Rural Electrification	10,275	2,747	413	3,160	-	-	-	-	-	-	-	-	10,275	3,160	" 13,435
7. Material	5,877	-	-	-	734	-	-	-	424	-	-	-	7,035	-	" 7,035
8. Land Acquisition	-	-	-	2,584	-	-	-	677	-	-	-	305	-	3,566	" 3,566
9. Engineering	4,903	-	-	1,922	613	-	-	241	263	-	-	103	5,779	2,266	" 8,045
10. Government Administration	-	-	-	3,921	-	-	-	781	-	-	-	265	-	4,967	" 4,967
11. Contingency	8,735	-	-	9,632	1,312	-	-	1,926	684	-	-	668	10,731	12,226	" 22,957
12. Equipment	44,276	-	-	-	10,273	-	-	-	1,838	-	-	-	56,387	-	" 56,387
Total	111,243			75,844	20,331			14,766	7,078			5,115	138,652	93,725	" 232,377

F.C. = 59.7%
L.C. = 40.3%

Summary of Project Cost

(Unit: thousand pesos)

	Lower Cagayan			Alcala-Amulung			Iguig			Total		
	FC	LC	Total	FC	LC	Total	FC	LC	Total	FC	LC	Total
I. Preparation Works	-	4,879	4,879	-	610	610	-	261	261	-	5,750	5,750
II. Construction Works												
a. Pumping Facility	25,456	4,752	30,208	4,921	1,382	6,303	3,309	1,107	4,416	33,686	7,241	40,927
b. Canal	9,002	26,218	35,220	2,033	6,125	8,158	480	1,531	2,011	11,515	33,874	45,389
c. Road	1,843	7,477	9,320	137	1,009	1,146	56	475	531	2,036	8,961	10,997
d. Terminal Facilities	876	9,299	10,175	308	2,015	2,323	24	400	424	1,208	11,714	12,922
e. Rural Electrification	10,275	3,160	13,435	-	-	-	-	-	-	10,275	3,160	13,435
Sub-total	47,452	55,785	103,237	7,399	11,141	18,540	3,869	3,774	7,643	58,720	70,700	129,420
III. Materials	5,877	-	5,877	734	-	734	424	-	424	7,035	-	7,035
IV. Land Acquisition	-	2,584	2,584	-	677	677	-	305	305	-	3,566	3,566
V. Engineering	4,903	1,922	6,825	613	241	854	263	103	366	5,779	2,266	8,045
VI. Government Administration	-	3,921	3,921	-	781	781	-	265	265	-	4,967	4,967
VII. Contingency	8,735	9,632	18,367	1,312	1,926	3,238	684	668	1,352	10,731	12,226	22,957
VIII. Equipments	44,276	-	44,276	10,273	-	10,273	1,838	-	1,838	56,387	-	56,387
IX. Total	111,243	73,844	185,087	20,331	14,766	35,097	7,078	5,115	12,193	138,652	93,725	232,377
X. Price Escalation	22,433	22,995	45,428	4,100	4,598	8,698	1,427	1,593	3,020	27,960	29,186	57,146
XI. Grand Total	133,676	96,839	230,515	24,431	19,364	43,795	8,505	6,708	15,213	166,612	122,911	289,523
(US$ x 10^3)	(17,823)	(12,912)	(30,735)	(3,257)	(2,582)	(5,839)	(1,134)	(894)	(2,028)	(22,215)	(16,388)	(38,603)

Estimated Schedule of Expenditures (Financial)

(Unit: thousand pesos)

	1976		1977		1978		1979		1980		1981		Total	
	FC	LC	FC	LC	FC	LC	FC	LC	FC	LC	FC	LC	FC	LC
I. Initial Cost														
a. Preparation Works	-	-	-	2,875	-	1,150	-	1,150	-	575	-	-	-	5,750
b. Construction Works	-	-	13,259	1,938	15,110	20,442	23,074	16,604	4,416	15,709	2,861	10,257	58,720	64,950
c. Materials	-	-	1,407	-	3,517	-	1,407	-	704	-	-	-	7,035	-
d. Land Acquisition	-	713	-	1,783	-	713	-	357	-	-	-	-	-	3,566
e. Engineering	1,411	510	1,040	712	832	261	832	261	832	261	832	261	5,779	2,266
		(2,634)		(8,577)		(29,675)		(23,450)		(21,279)		(13,697)		(99,312)
Sub-total	1,411	1,223	15,706	7,308	19,459	22,566	25,313	18,372	5,952	16,545	3,693	10,518	71,534	76,532
II. Gov't Administration	-	132	-	429	-	1,484	-	1,173	-	1,064	-	685	-	4,967
Sub-total	1,411	1,355	15,706	7,737	19,459	24,050	25,313	19,545	5,952	17,609	3,693	11,203	71,534	81,499
III. Contingency	212	203	2,356	1,161	2,919	3,608	3,797	2,932	893	2,641	554	1,681	10,731	12,226
IV. Equipments	-	-	56,387	-	-	-	-	-	-	-	-	-	56,387	-
V. Total	1,623	1,558	74,449	8,898	22,378	27,658	29,110	22,477	6,845	20,250	4,247	12,884	138,652	93,725
VI. Price Escalation	65	62	8,934	1,068	4,923	6,085	9,024	6,968	2,806	8,303	2,208	6,700	27,960	29,186
VII. Grand Total	1,688	1,620	83,383	9,966	27,301	33,743	38,134	29,445	9,651	28,553	6,455	19,584	166,612	122,911
(US$ x 10^3)	225	216	11,118	1,329	3,640	4,499	5,085	3,926	1,287	3,807	861	2,611	22,215	16,388

Note: Figures in parenthesis are including indirect foreign currency costs.

Price escalation has been enumerated by computing the estimated rate (8% per annum for both the foreign and local cost) of price increase in prior year and one half of the rate of increase in the year concerned.

Estimated Schedule of Expenditures (Economic)

(Unit: Thousand Pesos)

	1976		1977		1978		1979		1980		1981		Total	
	FC	LC	FC	LC	FC	LC	FC	LC	FC	LC	FC	LC	FC	LC
Project Cost*	1,623	1,558	18,062	8,898	22,378	27,658	29,110	22,477	6,845	20,250	4,247	12,884	82,265	93,725
Equipment Cost	-	-	5,728	-	11,866	-	12,684	-	6,547	-	4,092	-	40,917	-
Total	1,623	1,558	23,790	8,898	34,244	27,658	41,794	22,477	13,392	20,250	8,339	12,884	123,182	93,725
Less:														
Tax on Local Contractor	-	-	-	182	-	861	-	685	-	631	-	403	-	2,762
Land Acquisition	-	713	-	1,670	-	713	-	357	-	-	-	-	-	3,453
Total	-	713	-	1,852	-	1,574	-	1,042	-	631	-	403	-	6,215
Economic Cost	1,623	845	23,790	7,046	34,244	26,084	41,794	21,435	13,392	19,619	8,339	12,481	123,182	87,510
	2,468		30,836		60,328		63,229		33,011		20,820		210,692	

Note: * Initial Investment cost excluding Price Escalation and Equipment Cost Salvage value of equipments is estimated at ₱15,470,000 (27.4% of total equipment cost).

10) LIST OF EQUIPMENT & COST

(Unit: 1,000 Peso)

Name of Equipment	Specification	No.	Unit Price	Amount	Remarks
Bulldozer	11t 90ps class	19	280	5,320	
Bulldozer	12t 90ps class	29	309	8,961	Swampy type
Bulldozer	21t 180ps class	7	500	3,500	
Bulldozer	21t 180ps class	2	595	1,190	w/Ripper 1 foot
Backhoe	0.6m^3 class	6	354	2,124	
Backhoe	1.2m^3 class	11	740	8,140	
Pile Driver	Use diesel-hammer	1	150	150	without base machine only attachment
Dragline	1.2m^3 class	3	100	300	-do-
Diesel Pile Hammer	1.2t class	1	126	126	
Front end Loader	1.4m^3 class	16	295	4,720	Crawler type
Muck Loader	0.32m^3 class	1	263	263	-do-
Carryall Scraper	9.5m^3 class	2	195	390	
Dump truck	8t class	18	98	1,764	
Dump truck	10t class	64	100	6,400	
Dumptor	4t class	2	130	260	
Stake truck	6t class	4	80	320	w/crane 1.5t
Water truck	10,000ℓ class	2	120	240	
Fuel truck	8,000ℓ class	1	132	132	
Agitator truck	3.0m^3 class	4	154	616	
Agitator truck	1.6m^3 class	2	128	256	
Truck-tractor & Trailer	25t	1	500	500	
Motor Grader	3.6m class	2	285	570	
Tire roller	8.5 - 20t class	7	158	1,106	
Concrete mixing plant	1.0m^3 x 1	1	220	220	Portable type
Concrete mixing plant	0.5m^3 x 1	2	145	290	-do-
Concrete pot mixer	0.3m^3	10	25	250	
Air compressor	50ps class	1	60	60	portable type
Air compressor	100ps class	2	108	216	-do-

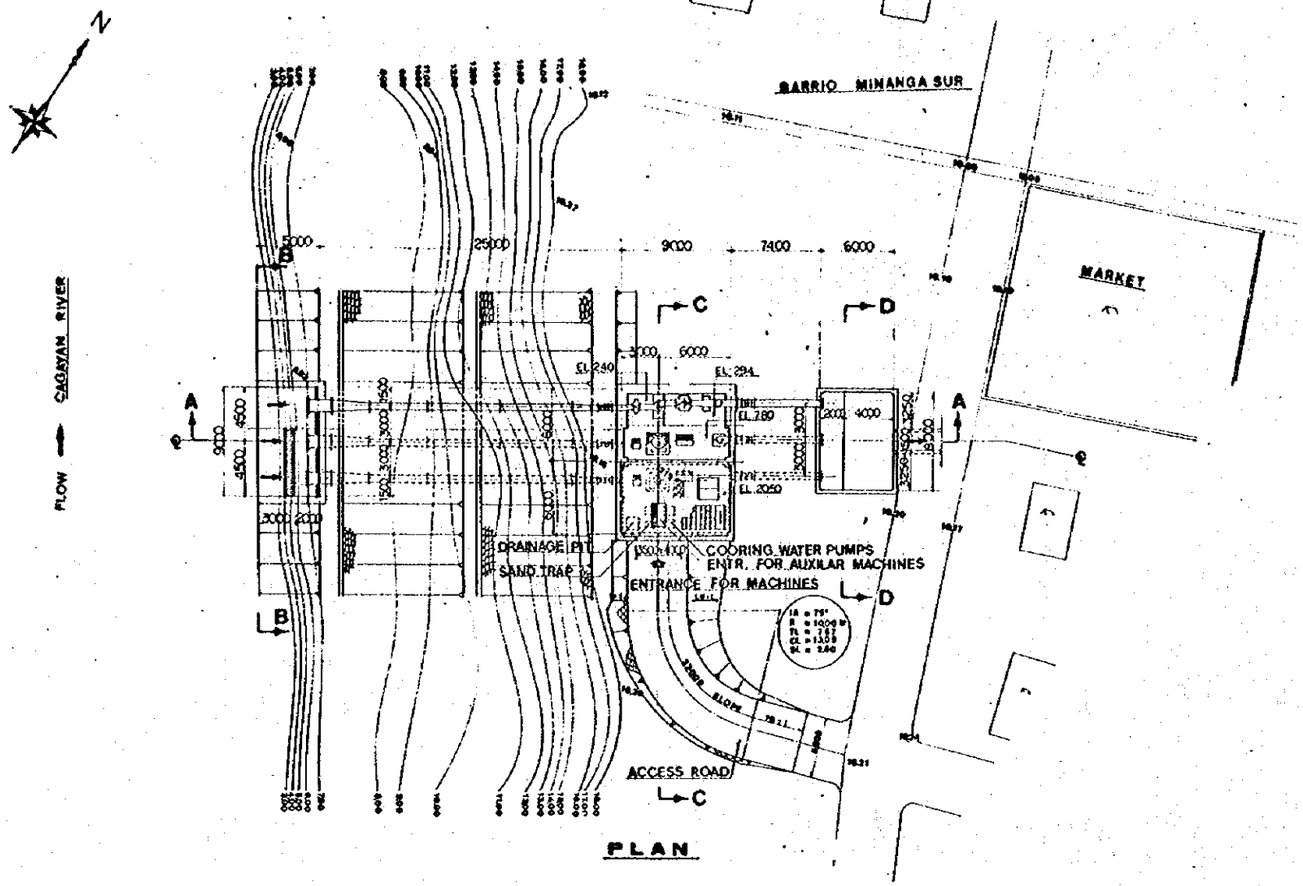
Name of Equipment	Specification	No.	Unit Price	Amount	Remarks
Generator	50KVA	2	68	136	
Generator	100KVA	2	110	220	
Portable belt conveyor	L = 7m	6	4^2	25	with engine
Concrete conveyor	L = 15m 5ps	2	21	42	-do-
Rammer	100kg class	18	5	90	
Vibrator	2.5 PS class	20	35	70	w/engine
Welder	20KVA class	2	15	30	
Pick hammer	7kg class	8	1	8	
Concrete pump	22KW class	1	25	25	
Water pump	3 PS	20	45	90	w/engine
Lubricating car		1	290	290	
Repair workshop car jeep		1 10	365 48	365 480	
Wagon type jeep		3	53	159	
Motorcycle	90cc class	20	45	90	
Telecommunication facility		L.S.		250	
Spare parts				5,075	10%
Transportation				558	1%
Total				56,387	

Net Production Value

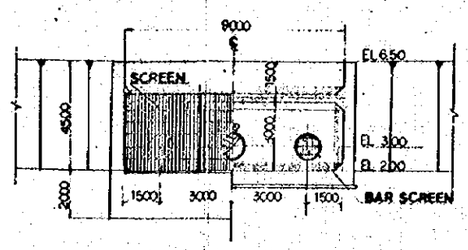
		Without Project					With Project		
		Paddy					Paddy		
		Rainfed	Irrigated Wet	Irrigated Dry	Corn	Total	Wet	Dry	Total
I.	Yield (ton/ha)	1.3	2.0	2.2	0.7		3.5	4.0	
II.	Unit Price (₱/ton)	1,127	1,127	1,127	800		1,127	1,127	
III.	G.P.V. (₱/ha)	1,465	2,254	2,479	560		3,945	4,508	
IV.	Production Cost (₱/ha)	495	1,058	1,039	241		1,647	1,695	
V.	N.P.V. (₱/ha)	970	1,196	1,440	319		2,298	2,813	
VI.	Cropped Area (ha)	10,310	500	500	500	11,810	12,790	13,200	25,990
VII.	Total N.P.V. (₱x10^3)	10,001	588	720	160	11,469	29,391	37,132	66,523

Incremental N.P.V.: ₱55,054,000 (Project Benefit)

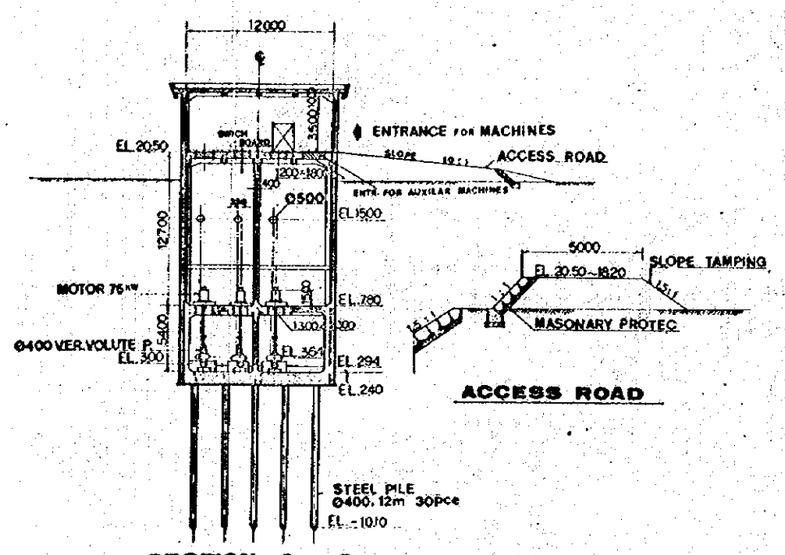
Incremental Production of Paddy: 82,062 tons



PLAN

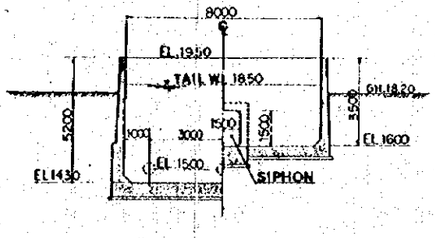


SECTIONAL VIEW B – B

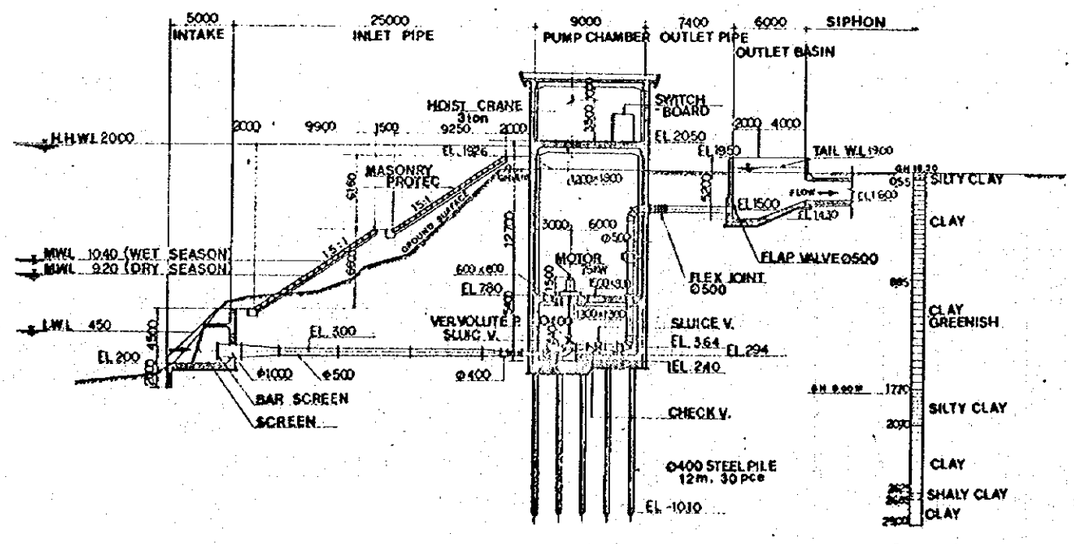


ACCESS ROAD

SECTION C – C

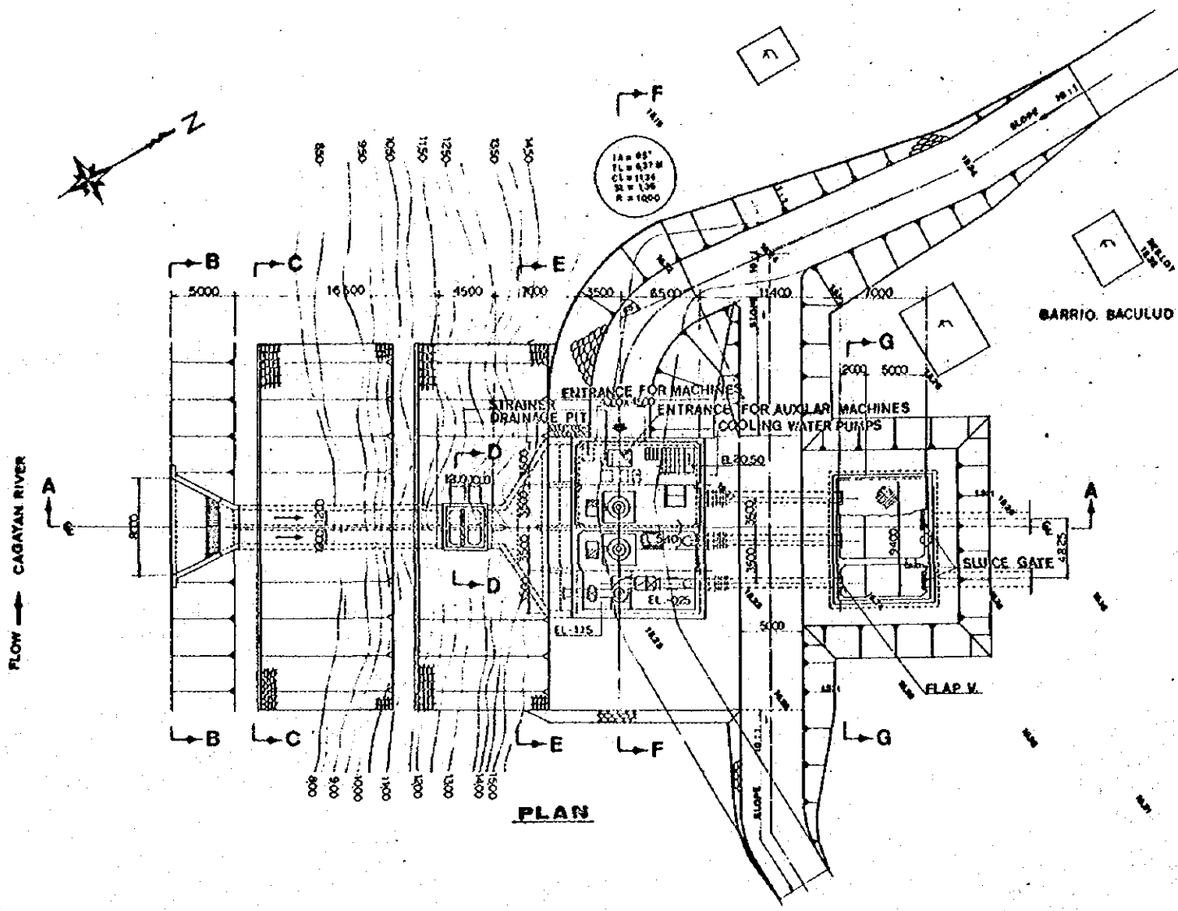


SECTION D – D

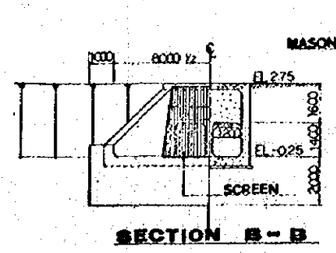


SECTION A – A

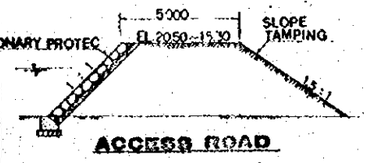
CIADP	CAGAYAN PHILIPPINE
IGUIG PUMPING STATION GENERAL PLAN AND SECTION	
JAPAN INTERNATIONAL COOPERATION AGENCY	



PLAN



SECTION B - B



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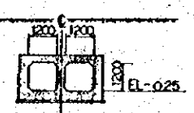
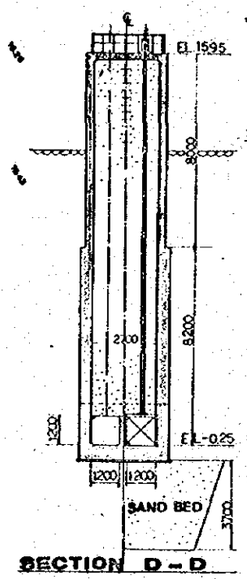
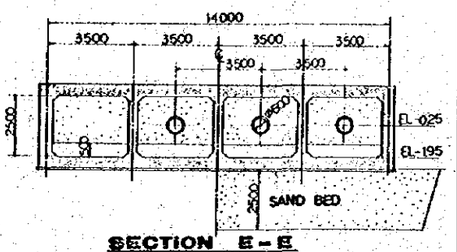


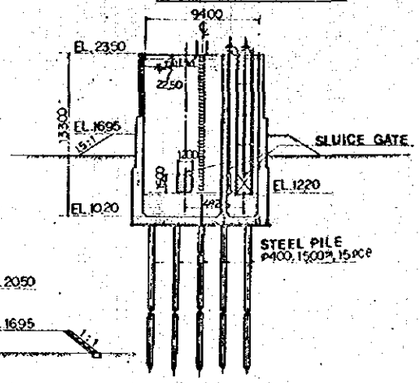
SECTION C - C



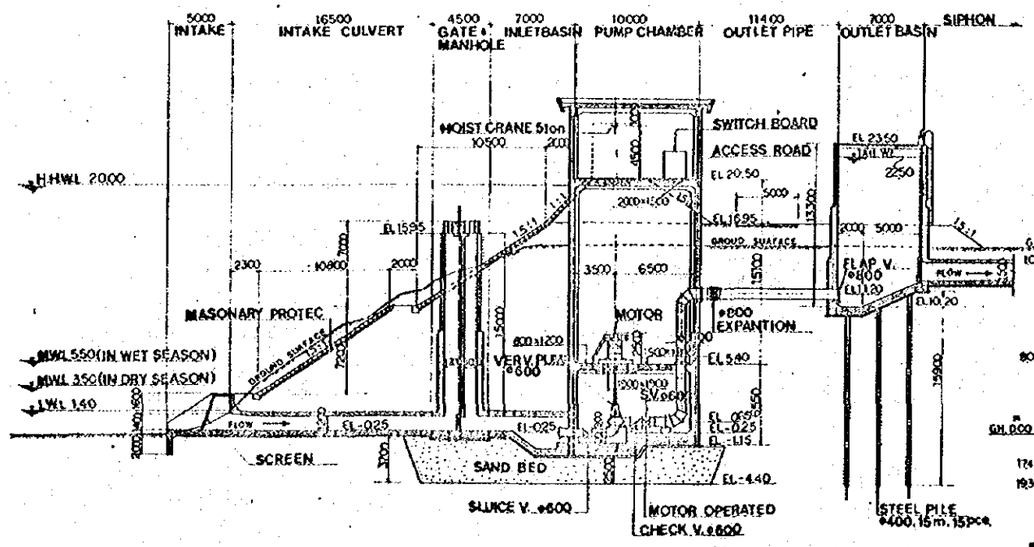
SECTION D - D



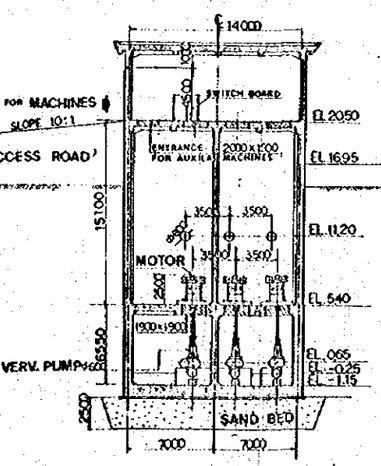
SECTION E - E



SECTION G - G

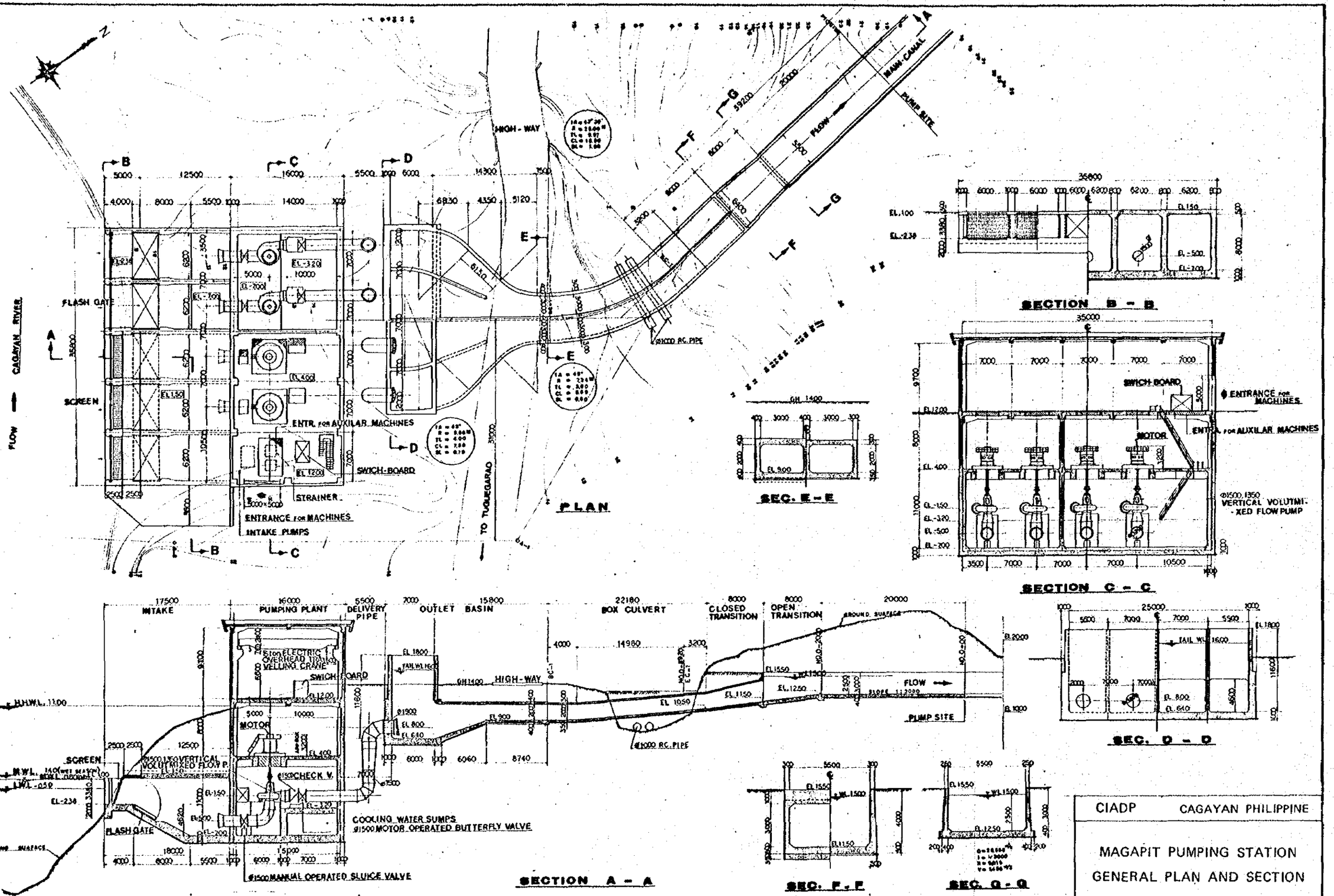


SECTION A - A



SECTION F - F

CIADP	CAGAYAN PHILIPPINE
AMULUNG PUMPING STATION GENERAL PLAN AND SECTION	
JAPAN INTERNATIONAL COOPERATION AGENCY	

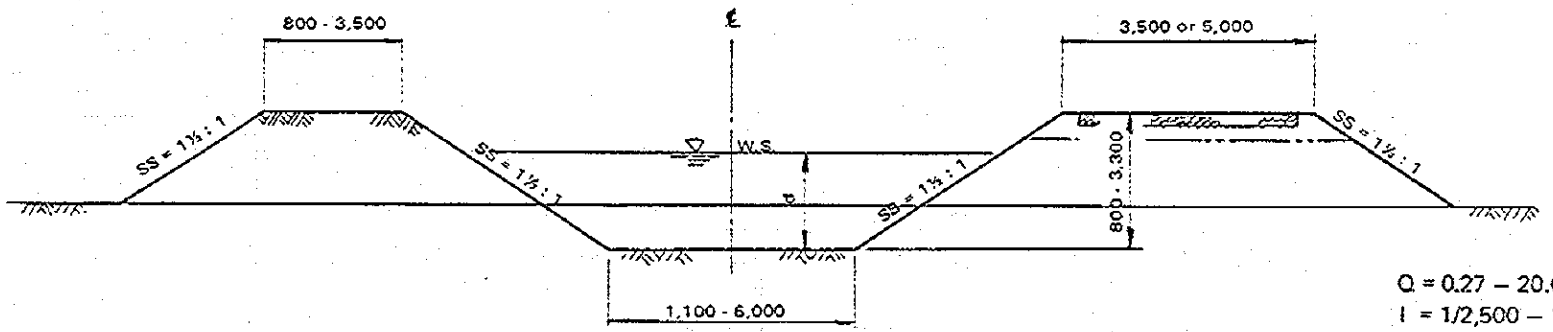


CIADP CAGAYAN PHILIPPINE

MAGAPIT PUMPING STATION
GENERAL PLAN AND SECTION

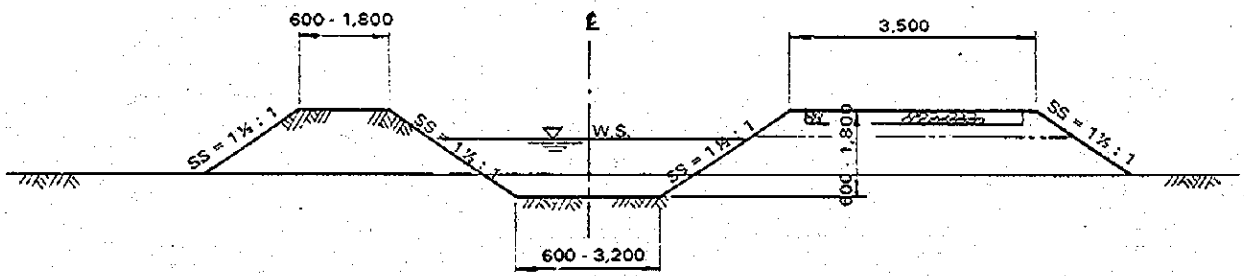
JAPAN INTERNATIONAL COOPERATION AGENCY

TYPICAL SECTION OF IRRIGATION CANAL



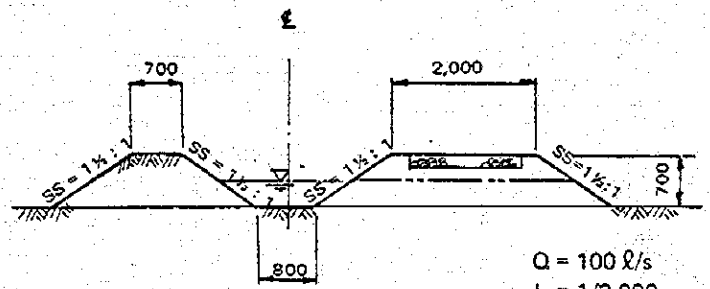
Q = 0.27 – 20.60 cu m/s
I = 1/2,500 – 1/4,000
d = 440 – 2,370 mm

Main Canal



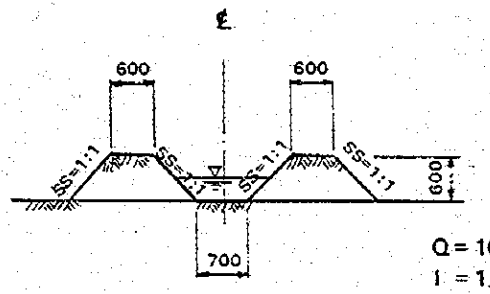
Q = 0.12 – 3.86 cu m/s
I = 1/2,500 – 1/7,000

Lateral Canal



Q = 100 ℓ/s
I = 1/3,000

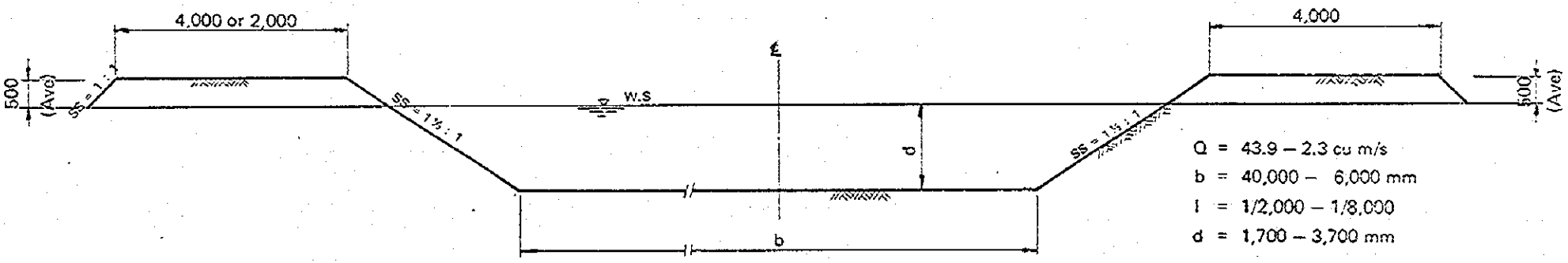
Main Farm Ditch



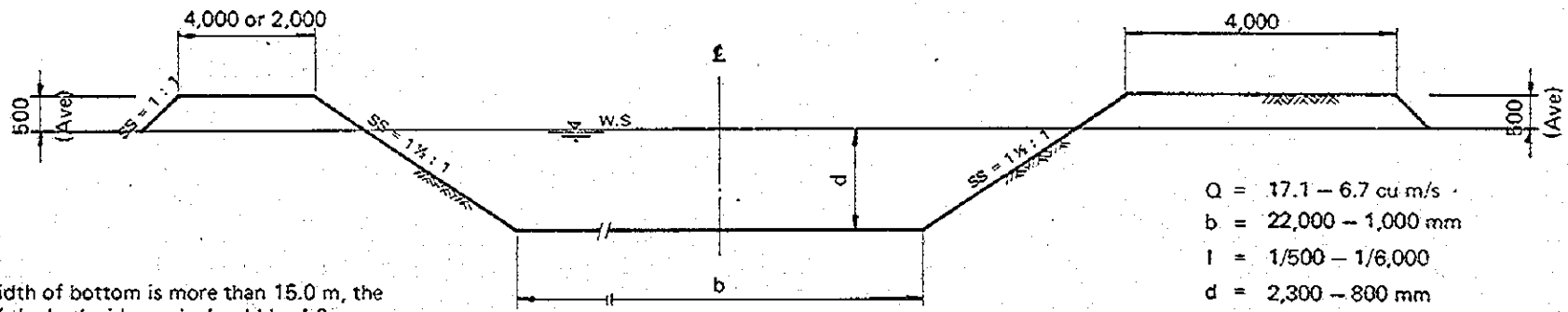
Q = 100 ℓ/s
I = 1/1,000 – 1/1,500

Supplemental Farm Ditch

TYPICAL SECTION OF DRAINAGE CANAL



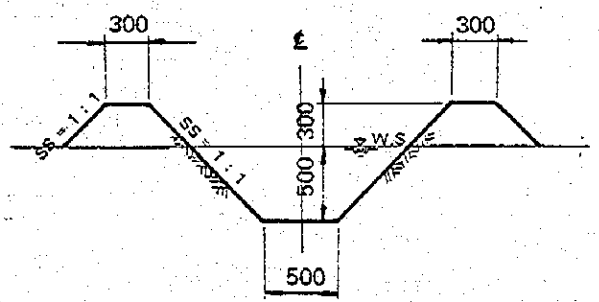
Main Canal



Lateral Canal

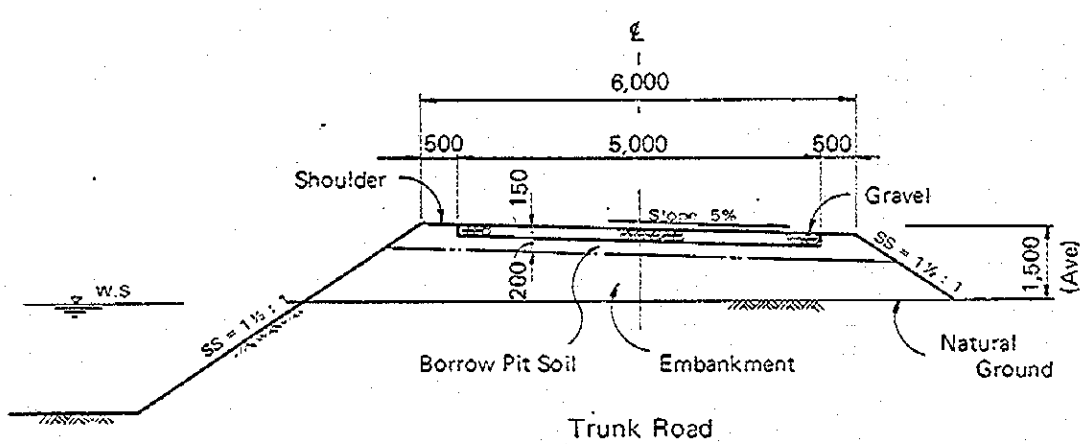
Notes:

1. If the width of bottom is more than 15.0 m, the width of the both side roads should be 4.0 m for maintenance
2. If the width of bottom is less than 15.0 m, the width of the roads should be 2.0 m on one side, 4.0 m on the other.
3. For farm drain no roads are provided.



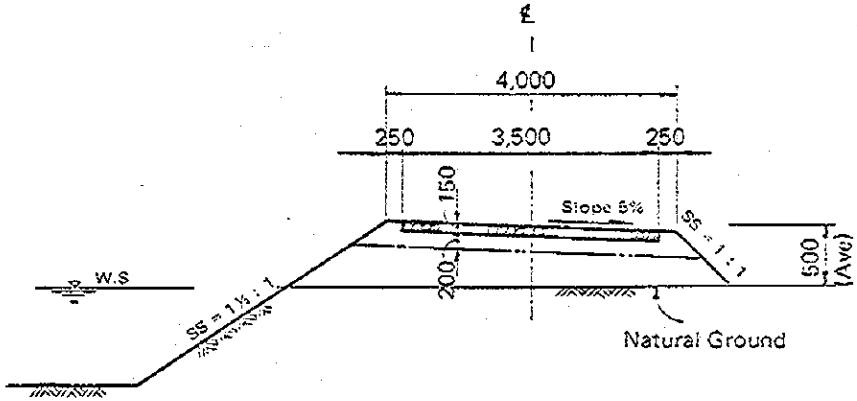
Farm Drain

PROPOSED TYPICAL SECTION OF ROAD



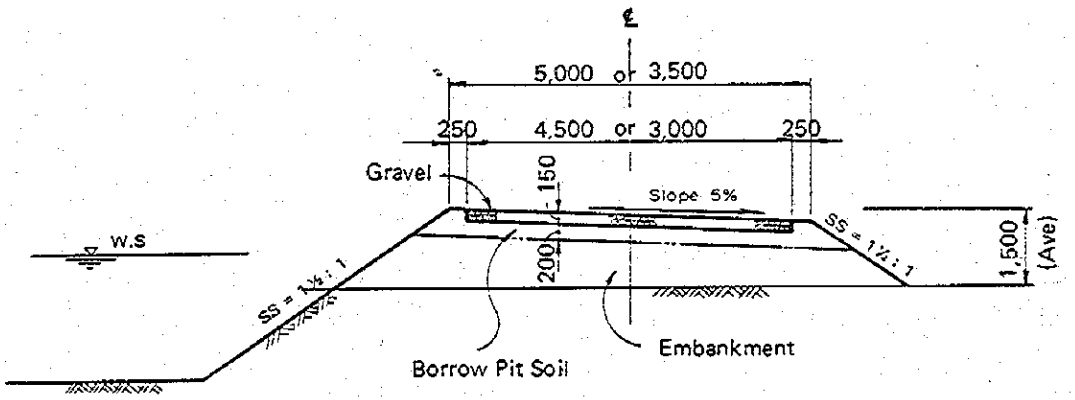
Trunk Road

(Along Main Irrigation and Drainage Canal)



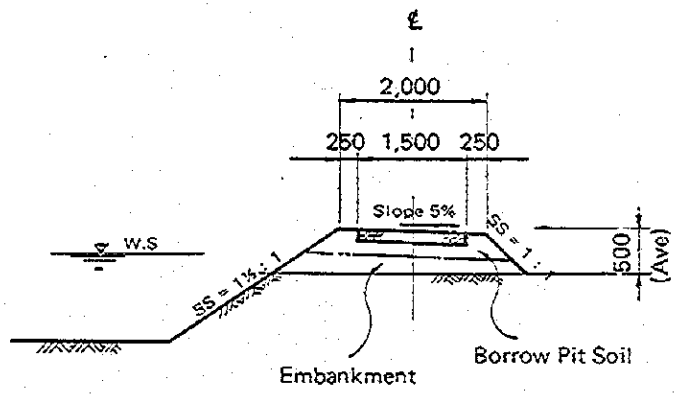
Farm Road

(Along Drainage Canal)



Farm Road

(Along Irrigation Canal)



Supplementary Farm Road

(Along Main Farm Ditch)