CHAPTER 3. AGRICULTURAL INFRASTRUCTURE DEVELOPMENT

Page

3.1 Water Resources

3.1.1 Present Conditions

1) Inagawan River and Its Tributaries

The two (2) rivers, Inagawan and its tributary, Pinagsaluran, are the only surface water resources for the proposed beneficial area.

The Inagawan river having a watershed area of 179.3 sq.km and a river length of 46.5 km, originates from the Anepahan Peak, with a top elevation of 1,340 m MSL, located almost at the center of Palawan Island. On the otherhand, the Pinagsaluran river, having a watershed area of 16.5 sq.m. and a river length of 8.7 km, originates from the mountain with a top elevation of 800 m MSL. The mountainous area is covered with dense and wild vegetation which is reserved as forest area. (for more detail information refer to Appendix F Water Resources in Appendix I)

The water quality test indicates that the quality of the river water is generally good except for drinking purposes, because it contains no particular injurious materials except low iron, some colitis germs and other bacteria with pH 7.6 to 7.8.

The average annual rainfall in the Inagawan river basin where the Study Area is located is observed to be about 1,600 mm. The average annual river runoff is estimated to be about 0.80 MCM/sq.km under the condition of 50% of runoff coefficient. There are two (2) existing irrigation systems along the Inagawan river. The total amount of water used annually for these irrigation systems is about 12 MCM, which is equivalent to only 10% of the annual river runoff of 111 MCM/year. So that about 90% of the runoff amount flows into the Sulu sea, indicating the abundance of water resources within the Inagawan river basin. However, about 90% of the water resources from the basin is yielded during the rainy season from May to December, thereby requiring storage type dam for the effective utilization of water resources.

Also, based on the topographical map with a scale of 1 to 4,000, the river bed elevation of the Inagawan river is lower than that of the proposed beneficiary area, about 20 m lower. This will in effect be a big constraint in the introduction of gravity intake system to irrigate the Study Area.

2) Groundwater

There are nine (9) shallow wells and six (6) springs at the depressions in the Tagumpay Settlement area. The water quality containing some colitis germs are the same as the surface water due to poor protection facilities for water sources. The three (3) springs were observed to yield only 1 to 13 lit/min but continues to flow even during the dry season.

Therefore, groundwater is recommended to be used for domestic water purposes only. (for more detail information, refer to Appendix F in Appendix I)

3.1.2 Development Plan

1) Water Requirement

In addition to irrigation water, water requirements as water permit of existing irrigation systems and river maintenance flow are considered in the surface-water resources development plan.

a) Water Permit of Existing Irrigation Systems

There are two (2) diversion facilities at the Inagawan river. One is the NIA diversion dam at about 10 km from the river mouth for the Inagawan CIS and the other one, the intake facility for Inagawan Sub-colony, about 12 km from the mouth of the river. The water permit of these irrigation systems are as follows:

Project	Irrigable Area	Water Permit
Inagawan Sub-coloy	80 ha	100 lit/sec (0.26 MCM/month)*
Inagawan CIS	270 ha	330 lit/sec (0.86 MCM/month)
		430 lit/sec (1.11 MCM/month)
Total	350 ha	

Note: * estimated based on the Inagawan CIS

b) River Maintenance Flow

From the view point of the environment, certain water flow of the river are required to be considered in the water resources development, for such purposes as habitation of fish and shells, animal and vegetation near the river, stabilization of groundwater and navigation of boat, to maintain river function.

Five (5)% of drought river discharge is generally adopted for the river maintenance flow in the Philippines, although maintenance flow differ depending on each river condition. Five (5)% of drought discharge with 10 years return period estimated in the runoff analysis is adopted in this study.

Subject place	:	No. 3 gauging station
Watershed	:	110.7 sq.km
Drought discharge with 10 years return period	:	0.327 cu.m/sec
5% of discharge	:	14.7 lit/sec/100 sq.km (say 15 lit/sec/100sq.km)

However, based on the runoff data of the Inagawan river measured by PIADP (April 1985, Watershed 118.8 sq.km, Drought discharge 0.254 cu.m/sec), the maintenance discharge was estimated at 11 lit/sec/100 sq.km. Therefore, the design maintenance discharge of 15 lit/sec/100 sq.km was adopted.

2) Sedimentation

Sedimentation in the reservoir depends upon such various conditions in the watershed as topography, soil and geology, vegetation, rainfall, riverbed slope, etc. In and/or near the Study Area, there are no available data for sedimentation. At present, serious soil erosion problem by rain will not occur because of the dense vegetation of the watershed.

Based on the previous studies, the specific sediment volume for the Pinagsaluran river basin and Inagawan river basin area assumed to be 300 and 200 cu.m/year/sq.km, respectively. Thus the design period of 100 years of sediment accumulation for the reservoir planning is applied. (refer to Figure 3.1.1).

3) Proposed Water Resources Site

a) Major Features of Proposed Site

There were several alternative plans of the potential water resources sites proposed in the Inagawan river basin to irrigate the Study Area in this study. Based on the results of the economical and technical studies on the potential water resources sites, which were mentioned in the Appendix F in another volume, Appendix I, the water resources site of EuM was chosen for the First Stage Development because of more suitable site than other water resources site's plan. Therefore, the water resources site of EuM only is described in this section. (refer to Table 3.1.1, for more detail information to choose the EuM, please refer to Appendix F in other volume, Appendix I)

The major characteristics of the sites is as follows:

Site E (including site EuM):

The site which is located at the right tributary of Inagawan river, does not have abundant water resources as the main river due to small watershed area of 15.0 sq.km. However, since its riverbed elevation with about 30 m MSL is higher than Site D, the gravity irrigation method can be applied to most part of the beneficial area. But the wide section of riverbed, and the foundation of Miocene and Quaternary sediments will require much attention during dam construction.

b) Available Water Resources

The available amount of water resources for the Pinagsaluran river at Site E subtracting the water permit for the existing irrigation system and the river maintenance flow from the river runoff, was estimated as follows:

River (Site)	Watershed (km^2)	Annual Average Discharge (MCM)			
		River Runoff *1	Existing water Right	River Maint.*2	P. Water (*1-*2)
Pinagsaluran (Site E)	15.0	13.5	-	0.1	13.4

*1: $(106.547\ MCM/118.8\ km^2) \times 15.0\ km^2 = 13.5\ MCM/year$

*2: $0.015\ cms/100\ km^2 \times 86{,}400\ sec \times 365\ days \times 15\ sq \cdot km^2 = 0.1\ MCM/year$

The available annual average water from the Pinagsaluran river basin was 13.4 MCM. However, about 90% of the available water is yielded during the rainy season, from May to December. The low water discharge of the Inagawan river is 0.58 cu.m/sec on average, for 17 years, which is a less beyond the existing water right of 0.43 cu.m/sec.

c) Topographic and Geological Investigation

Topographical survey, soil and geological investigation works were undertaken for the proposed site identified as more likely to be viable. (refer to attached drawing Dr-1 and for more detail information, refer to Appendix E in other volume of Appendix I)

4) Results of Water Balance Study

In order to establish the optimum scale of the water resources facilities, the water balance study for the potential water resources sites were carried out on a 10-day basis for the duration of 17 years as shown in Appendix C. The Study under the condition of cropping intensity with 130 percent was conducted in the irrigable area of 590 ha with three times water shortage for the duration of 17 years. The major features of potential water resources are resulted as follows; (refer to Table 3.1.2 and Figures 3.1.2 and 3.1.3)

Site	Watershed	Annual Av. Runoff	Annual Water Requirement			
			R. M	W. P	DWR	Effective Storage
	(km^2)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)
(Pinagsaluran River) Site EuM	13.9	12.5	0.1	-	2.5	0.20

(Note) R.M : River Maintenance
W.P : Water Permit of Existing Irrigation System
DWR ; Diversion Water Requirement

The site EuM is a preferable site for a small scale water resources development such as mountain stream diversion works. The site which has 0.18 MCM effective storage capacity in maximum by its topographical restriction, is available for the following irrigable area under three times shortage for the duration of 17 years.

Wet season : Paddy 430 ha + Upland 160 ha
Dry season : Upland crop and vegetable 177 ha

The facility dimensions and construction costs for the proposed water resources, EuM, based on the results of water balance study mentioned above were proposed and estimated in accordance with the design concept stipulated in the following section 3.1.3 and in Chapter 7, and presented in Table 3. 1.1.

3. 1. 3 Design Concept of Water Resources Facilities

1) Design Concept

a) Reservoir Plan

(1) Reservoir Capacity

The reservoir capacity and area of site EuM was measured, and the reservoir capacity and area curve was made based on the topographical map with a scale of 1 to 4,000. (refer to Figure 3.1.4)

(2) Sediment Volume

As described in previous section 3.1.2 Sedimentation, the specific sediment volume for the Pinagsaluran river basin was assumed at 200 cu.m/year/sq.km, and applied the design period of 100 years of sediment accumulation for reservoir in general. However, Site EuM is planned with a sand sluiceway at the right river course, thus, the design period of 25 years of sediment accumulation will be employed. For the above considerations, the design sediment volume for proposed water resources site is as follows:

	Site EuM
Watershed (km^2)	13.9
Sediment (MCM)	0.11

(3) Design Water Level

Based on the effective storage volume and sediment volumes computed, the normal water level (NWL) and low water level (LWL) for site EuM are determined from its reservoir capacity and area curve, as follows:

		Site EuM
E. Storage	(MCM)	0.20
Sediment V	(MCM)	0.11
Dead V	(MCM)	0.11
Total Storage	(MCM)	0.31
NWL	(MSL)	45.00
LWL	(MSL)	41.00

b) Seismic Force

Frequent earthquakes in the Philippines have occurred in the enclosed zone within the western and eastern trenches and troughs. However, Palawan island is not included in the zone. (refer to Figure 3.1.5)

As to the Palawan Island, therefore, the ground acceleration for rock foundation by earthquake belongs to non-affected zones and those for soft soil to not more than 0.30 g zones. (refer to Figure 3.1.6 to 3.1.8)

Based on collected earthquake data within the area between 117 to 112 degrees of east longitude and 8 to 13 degrees latitude, 34 years duration from 1960 to 1993 not less than 3.4 surface-wave magnitude, ground-motion analysis was made, applying the Fukushima and Tanaka's attenuation equation. The results indicate that the peak horizontal ground accelerations in the Study Area are hardly small, only 3.7 E-5g. Therefore, it is acceptable to apply the minimum design value of 0.05 g of earthquake force K in the structural design. (refer to Table 3.1.3 and Figure 3.1.9)

c) Design Flood Discharge

The flood discharge with a 100 years return period is generally applied for the dam design flood discharge at NIA and DPWH. Since there are no available data of long term runoff for flood analysis in or surrounding the study area, the design flood discharge is assumed based on the following methods.

- By the use of flood formulas derived from DPWH's design guidelines criteria and standards.
- By the use of design flood discharge of the NIA's existing diversion dam.
- By the use of rational method based on the Aborlan daily rainfall data.

(1) DPWH's Flood Formula

Rare case and occasional case of flood formula are adopted with storage dam and weir design respectively, as follows:

For dam : $Q\,(\text{rare}) = 155 \cdot A / \sqrt{A+13}$ (cu.m/sec)
For weir : $Q\,(\text{occasional}) = 85 \cdot A / \sqrt{A+11}$ (cu.m/sec)
Where A : watershed (sq.km)

(2) Design Flood Discharge of NIA's Diversion Dam

Watershed $A = 138.7$ (sq.km)
Design discharge $Q = 420$ (cu.m/sec)
Then applying Creager's formula,

$Q = 35.7 / \sqrt{A}$ (cu.m/sec)
Where A: watershed (sq.km)

(3) Rational Method

$Q = 0.2778 \cdot C \cdot I \cdot A$ (cu.m/sec)
where
C: coefficient of runoff which depends on the topographical character of the drainage area, 0.60
A: watershed area

I: rainfall intensity for a duration equal to the time of concentration (mm/hr)

	Site EuM
I (mm/ha)	82*1

*1; 100 years return period

The design flood discharges for the potential water resources sites are estimated applying the above methods as follows;

	Site EuM	Remarks
Watershed (km^2)	13.9	
Discharge (m^3/sec)		
1)	420	
2)	140	
3)	190	
Max. Discharge	420	applied

*1: applying occasional formula

d) Dam Type

The dam type shall be determined taking into account such various conditions as topography, geology, available construction materials, construction method, environment, safety structure and economy in addition to objective and scale of facility.

- Site EuM is almost located along the Site Eu axis.
- There are two rivers along Site Eu axis, Pinagsaluran river (9.8 sq.km watershed) which is located at the left portion and its tributary (4.1 sq.km watershed) located at the middle portion.
- The dam crest elevation of Site EuM will be less than the top elevation of the middle bank which exists between the two rivers mentioned above, in order to minimize the construction cost of facility.
- The spillway structure with concrete type will be provided on the left side river, Pinagsaluran river which forms a narrow valley with fresh bed rock under the condition of lower 45.0 m elevation,

and while on the right river, the fill-type dam will be provided due to long crest length.

e) Freeboard, Slope and Crest Width

(1) Freeboard

A 2.0 m freeboard from the high water level is adopted for the fill type dam to protect it from over topping, while 1.0 m is applied for the concrete type dam.

(2) Slope of Dam

The results of embankment material investigation and laboratory tests indicate the properties of each material as follows;

(Core Materials)

The materials are composed of GC, SC, CH and MH in the unified soil classification, of which, GC and SC materials are predominant. The materials have such properties as 20 to 50% of field moisture content, 1.2 to 1.8 ton/cu.m of maximum dry density, 2 to 4 ton/sq.m of cohesion and 26 to 30° of internal friction angle, $n \times 10^6$ to $n \times 10^7$ cm/sec of permeability coefficient, and 17 to 46% of plasticity index. Therefore, the materials are judged to be comparatively good with, such characteristic as high density, imperviousness, strong shearing strength, cohesiveness and easy construction.

(Random Materials)

The materials belong to GC, SC, SM and SW in the unified soil classification containing more sand and gravel particles than the core materials. The materials which have 10 to 30% of field moisture content and 1.4 to 1.9 ton/cu.m of maximum dry density are expected to be more strong than the core materials in the shearing strength.

(Filter Materials)

The properties of materials which can be borrowed from the river deposit of Pinagsaluran are GC to GW with 2.7 specific gravity in unified soil classification. Before banking the materials at the filter zone, clayey and silty materials shall be screened from the filter materials.

(Riprap Materials)

The boulders from the diluvial terrace along the Inagawan main river are used as riprap materials. Judging from the boring core samples which are classified to sand stone, amphibolite and peridotite with 2.5 to 3.1 ton/cu.m for bulk specific gravity, 0.7 to 8% of absorption and 2 to 6% of soundness, the quality of riprap materials will be equivalent with and/or more than the boring core samples.

Since the properties of embankment materials are considered to be good in addition to the weak earthquake force in the Study Area, the slopes of upstream and downstream of a fill dam will be employed to be 1 to 2.80 and 1 to 2.30 respectively, referring to the following table.

Material Core Zone	Homogeneous		Zone type-1		Zone type-2	
	US	DS	US	DS	US	DS
GC, GM	1:3.0	1:2.0	1:2.5	1:2.0	1:2.0	1:2.0
SC, SM	1:3.0	1:2.0	1:2.5	1:2.0	1:2.0	1:2.0
CL, ML	1:3.5	1:2.5	1:3.0	1:2.5	1:2.0	1:2.0
CH, MH	1:4.0	1:2.5	1:3.5	1:2.5	1:2.0	1:2.0

Note: US : upstream slope
DS : downstream slope
Zone Type-1 : wide core type
Zone Type-2 : narrow core type
Material of random zone and other zone: GW, GP, SW, SP
Source : "Design of Small Dam", USBR

While regarding a concrete dam at the Inagawan river, the dam will receive large hydrostatic, hydrodynamics and silt pressures due to high elevation of sediment and dead water compared with its dam height. Based on the results of stability analysis under the middle third condition varying the upstream and downstream dam slope as an example, 1 to 0.20 of upstream slope and 1 to 0.80 of downstream slope are planned. (refer to Figure 3.1.10)

3) Dam Crest Width

8.0 m of the crest width for a fill dam and 3.0 m for a concrete dam will be applied referring the previous studies and considering O & M.

2) Major Features

Based on the topographical maps with a scale of 1 to 1,000 and the design concepts described above, the preliminary design for each water resources site were carried out as shown in attached Drawings Dr-2. (refer to Table 3.1.1)

Table 3.1.1 General Features of Potential Sites on Water Resources Development

General Feature of Site EuM

(1) Location	Site EuM	
a) Province	Palawan	
b) City	Puerto Princesa	
(2) River		
a) Name	Pinagsaluran	
b) Watershed		13.9 sq.km
c) Average Annual Rainfall		1.590 mm
d) Assumed Average Runoff Coefficient		56.5 %
e) Estimated Average Annual Runoff		12.5 MCM
f) Riverbed EL (MSL)		34.5 m
(3) Site Condition		
a) Storage Capacity by Topography		0.18 MCM
b) Watershed Vegetation	Thick Forest	
c) App. River Runoff (as of Feb., 1994)		0.2 to 0.3 cu.m/sec
d) Riverbed Foundation	Miocene. Quaternary Sediment/rather Thick river deposit	

Note: 1) Average Annual Runoff : Raifall Data in Aborlan
2) Storage Capacity : based on topo-map w/ scale of 1/4000

Outline of Proposed Facility (Site EuM)

(1) Intake Type	Gravity w/ Reservoir	
(2) Water Resources		
a) River Name	Pinagsaluran	
b) Watershed		13.9 sq.km
c) River bed EL		34.5 m
(3) Reservoir		
a) Required E. Storage		0.20 MCM
b) Sediment Volume		0.11 MCM
c) DEad Volume		0.11 MCM
d) N.W.L (MSL)		45 m
e) L.W.L (MSL)		41 m
f) W. Surface at N.W.L		8 ha
(4) Major Features of Dam		
a) Dam Type	Fill Type Dam	
b) Dam Crest EL		50 m
c) Dam Height		20 m
d) Dam Crest Length		239 m
e) Design Flood Discharge		420 cu.m/sec
f) Intake Discharge		0.84 cu.m/sec
(5) Condition		
a) Irrigation Area		590 ha
b) Paddy Field		430 ha
c) Upland Field		160 ha
d) Cropping Intensity		130 %

Table 3.1.2 Reservoir Operation (Site EuM)

***** WATER BALANCE OF SOUTHERN PALAWAN *****

CASE :EuM(SITE EuM),CROPPING PATTERN:(A1I JUL2
BASIN AREA : 13.9 SQ.KM EFFECTIVE STORAGE VOLUME : .195 MCM
PADDY WET: 387.0 ha PADDY DRY: .0 ha VEGETABLE1: 11.6 ha
CORN : 34.8 ha BEANS DRY: 58.0 ha VEGETABLE2: 11.6 ha
VEGETABLE3: .0 ha VEGETABLE4: 72.0 ha BEANS DRY: 43.2 ha
BEANS WET: 72.0 ha

UNIT:CU.M/SEC

YEAR 1977		Pinagsaluran RIVER IN1	CIS	BALANCE (1)-(2)	MA	IN2	AVR 5-3-4	WATER DEMAND IRR	VVS	EVP	SPACE	TOTAL 7+8+9+10	BALANCE 6-11	RESERVOIR (UNIT:MCM) +(12)		INV	WATER LEVEL (m)
Month		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
JAN	1	2.639	.000	2.639	.002	.296	.294	.064	.000	.003	.001	.067	.227	.196	.195	.196	45.00
	2	2.327	.000	2.327	.002	.259	.257	.110	.000	.003	.001	.114	.143	.123	.195	.123	45.00
	3	2.884	.000	2.884	.002	.321	.319	.000	.000	.003	.001	.004	.315	.300	.195	.300	45.00
FEB	4	2.067	.000	2.067	.002	.230	.228	.123	.000	.003	.001	.127	.101	.088	.195	.088	45.00
	5	1.641	.000	1.641	.002	.183	.181	.134	.000	.003	.001	.138	.052	.045	.195	.045	45.00
	6	1.384	.000	1.384	.002	.154	.152	.117	.000	.003	.001	.121	.031	.021	.195	.021	45.00
MAR	7	1.135	.000	1.135	.002	.126	.124	.127	.000	.004	.001	.132	-.008	-.007	.188	.000	44.86
	8	.880	.000	.880	.002	.098	.096	.075	.000	.004	.001	.080	.016	.014	.195	.007	45.00
	9	.681	.000	.681	.002	.076	.074	.041	.000	.004	.001	.046	.028	.027	.195	.027	45.00
APR	10	.527	.000	.527	.002	.059	.057	.008	.000	.004	.001	.013	.043	.037	.195	.037	45.00
	11	.512	.000	.512	.002	.057	.055	.004	.000	.004	.001	.009	.046	.040	.195	.040	45.00
	12	.500	.000	.500	.002	.056	.054	.002	.000	.004	.001	.007	.047	.041	.195	.041	45.00
MAY	13	.899	.000	.899	.002	.100	.098	.000	.000	.003	.001	.004	.094	.081	.195	.081	45.00
	14	2.177	.000	2.177	.002	.242	.240	.000	.000	.003	.001	.004	.236	.204	.195	.204	45.00
	15	1.816	.000	1.816	.002	.202	.200	.000	.000	.003	.001	.004	.196	.186	.195	.186	45.00
JUN	16	1.101	.000	1.101	.002	.123	.121	.000	.000	.002	.001	.003	.117	.101	.195	.101	45.00
	17	1.543	.000	1.543	.002	.172	.170	.000	.000	.002	.001	.003	.167	.144	.195	.144	45.00
	18	3.342	.000	3.342	.002	.372	.370	.000	.000	.002	.001	.003	.367	.317	.195	.317	45.00
JUL	19	4.216	.000	4.216	.002	.470	.468	.000	.000	.002	.001	.003	.464	.401	.195	.401	45.00
	20	3.806	.000	3.806	.002	.424	.422	.000	.000	.002	.001	.003	.419	.362	.195	.362	45.00
	21	4.703	.000	4.703	.002	.524	.522	.437	.000	.002	.001	.440	.082	.078	.195	.078	45.00
AUG	22	3.028	.000	3.028	.002	.337	.335	.292	.000	.002	.001	.295	.040	.034	.195	.034	45.00
	23	3.427	.000	3.427	.002	.382	.380	.016	.000	.002	.001	.019	.360	.311	.195	.311	45.00
	24	5.282	.000	5.282	.002	.588	.586	.000	.000	.002	.001	.003	.583	.554	.195	.554	45.00
SEP	25	10.005	.000	10.005	.002	1.114	1.112	.000	.000	.002	.001	.003	1.109	.958	.195	.958	45.00
	26	7.840	.000	7.840	.002	.873	.871	.256	.000	.002	.001	.259	.612	.529	.195	.529	45.00
	27	7.310	.000	7.310	.002	.814	.812	.000	.000	.002	.001	.003	.809	.699	.195	.699	45.00
OCT	28	4.965	.000	4.965	.002	.553	.551	.444	.000	.002	.001	.447	.104	.090	.195	.090	45.00
	29	4.469	.000	4.469	.002	.498	.496	.269	.000	.002	.001	.273	.223	.193	.195	.193	45.00
	30	4.425	.000	4.425	.002	.493	.491	.090	.000	.002	.001	.093	.398	.378	.195	.378	45.00
NOV	31	4.169	.000	4.169	.002	.464	.462	.000	.000	.002	.001	.003	.459	.397	.195	.397	45.00
	32	4.456	.000	4.456	.002	.496	.494	.000	.000	.002	.001	.003	.491	.424	.195	.424	45.00
	33	3.794	.000	3.794	.002	.423	.421	.004	.000	.002	.001	.007	.413	.357	.195	.357	45.00
DEC	34	3.126	.000	3.126	.002	.348	.346	.030	.000	.002	.001	.033	.313	.271	.195	.271	45.00
	35	2.761	.000	2.761	.002	.307	.305	.004	.000	.002	.001	.008	.298	.257	.195	.257	45.00
	36	2.104	.000	2.104	.002	.234	.232	.097	.000	.002	.001	.101	.132	.125	.195	.125	45.00
T(MCM)		98.4	.0	.0	.1	11.0	10.9	2.4	.0	.1	.0	2.5	.007	.007	.188	8.4	

***** WATER BALANCE OF SOUTHERN PALAWAN *****

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BEANS WET: 72.0 ha

UNIT:CU.M/SEC

YEAR 1978		Pinagsaluran RIVER IN1	CIS	BALANCE (1)-(2)	MA	IN2	AVR 5-3-4	WATER DEMAND IRR	VVS	EVP	SPACE	TOTAL 7+8+9+10	BALANCE 6-11	RESERVOIR (UNIT:MCM) +(12)		INV	WATER LEVEL (m)
Month		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
JAN	1	1.739	.000	1.739	.002	.196	.194	.111	.000	.003	.001	.114	.079	.069	.195	.069	45.00
	2	1.483	.000	1.483	.002	.165	.163	.108	.000	.003	.001	.111	.052	.045	.195	.045	45.00
	3	1.223	.000	1.223	.002	.136	.134	.115	.000	.003	.001	.118	.016	.015	.195	.015	45.00
FEB	4	.982	.000	.982	.002	.109	.107	.126	.000	.003	.001	.130	-.023	-.020	.175	.000	44.59
	5	.775	.000	.775	.002	.086	.084	.124	.000	.003	.001	.128	-.044	-.038	.138	.000	43.82
	6	.609	.000	.609	.002	.068	.066	.117	.000	.003	.001	.121	-.055	-.038	.100	.000	43.04
MAR	7	.488	.000	.488	.002	.054	.052	.127	.000	.003	.001	.130	-.078	-.067	.032	.000	41.66
	8	.471	.000	.471	.002	.052	.050	.080	.000	.002	.000	.082	-.031	-.027	.005	.000	41.10
	9	.459	.000	.459	.002	.051	.049	.045	.000	.002	.000	.046	.003	.003	.008	.000	41.18
APR	10	.448	.000	.448	.002	.050	.048	.013	.000	.002	.000	.015	.033	.028	.036	.000	41.74
	11	.438	.000	.438	.002	.049	.047	.006	.000	.002	.000	.008	.038	.033	.069	.000	42.42
	12	2.014	.000	2.014	.002	.224	.222	.000	.000	.003	.000	.003	.220	.190	.195	.064	45.00
MAY	13	.823	.000	.823	.002	.092	.090	.000	.000	.003	.001	.004	.086	.074	.195	.074	45.00
	14	6.731	.000	6.731	.002	.750	.748	.000	.000	.003	.001	.004	.744	.642	.195	.642	45.00
	15	10.131	.000	10.131	.002	1.128	1.126	.000	.000	.003	.001	.004	1.122	1.067	.195	1.067	45.00
JUN	16	5.238	.000	5.238	.002	.583	.581	.000	.000	.002	.001	.003	.578	.499	.195	.499	45.00
	17	4.198	.000	4.198	.002	.468	.465	.000	.000	.002	.001	.003	.462	.399	.195	.399	45.00
	18	7.459	.000	7.459	.002	.831	.829	.000	.000	.002	.001	.003	.825	.713	.195	.713	45.00
JUL	19	7.932	.000	7.932	.002	.883	.881	.000	.000	.002	.001	.003	.878	.759	.195	.759	45.00
	20	4.767	.000	4.767	.002	.531	.529	.076	.000	.002	.001	.079	.450	.388	.195	.388	45.00
	21	4.327	.000	4.327	.002	.482	.480	.186	.000	.002	.001	.189	.291	.277	.195	.277	45.00
AUG	22	7.018	.000	7.018	.002	.782	.780	.056	.000	.002	.001	.059	.721	.623	.195	.623	45.00
	23	6.653	.000	6.653	.002	.741	.739	.499	.000	.002	.001	.502	.237	.204	.195	.204	45.00
	24	5.816	.000	5.816	.002	.648	.646	.000	.000	.002	.001	.003	.642	.611	.195	.611	45.00
SEP	25	5.913	.000	5.913	.002	.659	.657	.291	.000	.002	.001	.294	.363	.313	.195	.313	45.00
	26	5.008	.000	5.008	.002	.558	.555	.117	.000	.002	.001	.121	.435	.376	.195	.376	45.00
	27	4.966	.000	4.966	.002	.553	.551	.000	.000	.002	.001	.003	.548	.473	.195	.473	45.00
OCT	28	8.974	.000	8.974	.002	1.000	.997	.000	.000	.002	.001	.003	.994	.859	.195	.859	45.00
	29	6.754	.000	6.754	.002	.752	.750	.447	.000	.002	.001	.450	.300	.259	.195	.259	45.00
	30	4.515	.000	4.515	.002	.503	.501	.000	.000	.002	.001	.003	.498	.473	.195	.473	45.00
NOV	31	8.919	.000	8.919	.002	.993	.991	.000	.000	.002	.001	.003	.988	.854	.195	.854	45.00
	32	13.406	.000	13.406	.002	1.493	1.491	.000	.000	.002	.001	.003	1.488	1.286	.195	1.286	45.00
	33	12.501	.000	12.501	.002	1.392	1.390	.000	.000	.002	.001	.003	1.387	1.198	.195	1.198	45.00
DEC	34	8.796	.000	8.799	.002	.980	.978	.024	.000	.002	.001	.028	.950	.821	.195	.821	45.00
	35	9.228	.000	9.228	.002	1.028	1.026	.000	.000	.002	.001	.003	1.022	.883	.195	.883	45.00
	36	6.954	.000	6.954	.002	.775	.772	.097	.000	.002	.001	.101	.672	.639	.195	.639	45.00
T(MCM)		156.7	.0	.0	.1	17.5	17.4	2.4	.0	.1	.0	2.5	.190	.190	.005	14.9	

***** WATER BALANCE OF SOUTHERN PALAWAN *****

CASE :EuM(SITE EuM),CROPPING PATTERN:(A1I JUL2
BASIN AREA : 13.9 SQ.KM EFFECTIVE STORAGE VOLUME : .195 MCM
PADDY WET: 387.0 ha PADDY DRY: .0 ha VEGETABLE1: 11.6 ha
CORN : 34.8 ha BEANS DRY: 58.0 ha VEGETABLE2: 11.6 ha
VEGETABLE3: .0 ha VEGETABLE4: 72.0 ha BEANS DRY: 43.2 ha
BEANS WET: 72.0 ha

UNIT:CU.M/SEC

YEAR 1979		Pinagsaluran RIVER IN1	CIS	BALANCE (1)-(2)	MA	IN2	AVR 5-3-4	WATER DEMAND IRR	VVS	EVP	SPACE	TOTAL 7+8+9+10	BALANCE 6-11	RESERVOIR (UNIT:MCM) +(12)		INV	WATER LEVEL (m)
Month		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
JAN	1	4.497	.000	4.497	.002	.501	.499	.111	.000	.003	.001	.115	.384	.331	.195	.331	45.00
	2	3.814	.000	3.814	.002	.425	.423	.116	.000	.003	.001	.120	.303	.262	.195	.262	45.00
	3	3.265	.000	3.265	.002	.364	.362	.105	.000	.003	.001	.109	.252	.240	.195	.240	45.00
FEB	4	2.787	.000	2.787	.002	.310	.308	.103	.000	.003	.001	.107	.201	.174	.195	.174	45.00
	5	2.432	.000	2.432	.002	.271	.269	.104	.000	.003	.001	.108	.161	.139	.195	.139	45.00
	6	2.107	.000	2.107	.002	.235	.233	.117	.000	.003	.001	.121	.111	.077	.195	.077	45.00
MAR	7	1.787	.000	1.787	.002	.199	.197	.127	.000	.004	.001	.132	.065	.056	.195	.056	45.00
	8	1.458	.000	1.458	.002	.162	.160	.087	.000	.004	.001	.092	.068	.059	.195	.059	45.00
	9	1.157	.000	1.157	.002	.129	.127	.047	.000	.004	.001	.051	.075	.072	.195	.072	45.00
APR	10	.890	.000	.890	.002	.099	.097	.017	.000	.004	.001	.022	.075	.065	.195	.065	45.00
	11	1.330	.000	1.330	.002	.149	.147	.000	.000	.004	.001	.005	.142	.123	.195	.123	45.00
	12	.931	.000	.931	.002	.104	.102	.000	.000	.004	.001	.005	.097	.084	.195	.084	45.00
MAY	13	.642	.000	.642	.002	.071	.069	.000	.000	.003	.001	.004	.065	.056	.195	.056	45.00
	14	2.812	.000	2.812	.002	.313	.311	.000	.000	.003	.001	.004	.307	.265	.195	.265	45.00
	15	3.667	.000	3.667	.002	.408	.406	.000	.000	.003	.001	.004	.402	.362	.195	.362	45.00
JUN	16	3.020	.000	3.020	.002	.336	.334	.000	.000	.002	.001	.003	.331	.286	.195	.286	45.00
	17	2.861	.000	2.861	.002	.319	.317	.000	.000	.002	.001	.003	.313	.271	.195	.271	45.00
	18	4.226	.000	4.226	.002	.471	.469	.000	.000	.002	.001	.003	.465	.402	.195	.402	45.00
JUL	19	4.159	.000	4.159	.002	.463	.461	.000	.000	.002	.001	.003	.458	.396	.195	.396	45.00
	20	6.305	.000	6.305	.002	.702	.700	.000	.000	.002	.001	.003	.697	.602	.195	.602	45.00
	21	5.963	.000	5.963	.002	.664	.662	.000	.000	.002	.001	.003	.659	.626	.195	.626	45.00
AUG	22	6.677	.000	6.677	.002	.744	.742	.313	.000	.002	.001	.316	.426	.368	.195	.368	45.00
	23	4.566	.000	4.566	.002	.511	.509	.476	.000	.002	.001	.480	.029	.025	.195	.025	45.00
	24	2.854	.000	2.854	.002	.318	.316	.514	.000	.002	.001	.517	-.201	-.191	.004	.000	41.08
SEP	25	2.936	.000	2.936	.002	.327	.325	.086	.000	.001	.000	.087	.238	.206	.195	.015	45.00
	26	3.383	.000	3.383	.002	.377	.375	.219	.000	.002	.001	.223	.152	.131	.195	.131	45.00
	27	3.736	.000	3.736	.002	.416	.414	.000	.000	.002	.001	.003	.411	.355	.195	.355	45.00
OCT	28	8.775	.000	8.775	.002	.977	.975	.000	.000	.002	.001	.003	.972	.840	.195	.840	45.00
	29	11.397	.000	11.397	.002	1.269	1.267	.000	.000	.002	.001	.003	1.264	1.092	.195	1.092	45.00
	30	6.261	.000	6.261	.002	.697	.695	.351	.000	.002	.001	.354	.341	.324	.195	.324	45.00
NOV	31	3.099	.000	3.099	.002	.368	.366	.036	.000	.002	.001	.039	.327	.453	.195	.453	45.00
	32	6.446	.000	6.446	.002	.718	.716	.000	.000	.002	.001	.003	.713	.616	.195	.616	45.00
	33	4.656	.000	4.656	.002	.519	.517	.000	.000	.002	.001	.003	.514	.444	.195	.444	45.00
DEC	34	4.976	.000	4.976	.002	.554	.552	.018	.000	.002	.001	.021	.531	.459	.195	.459	45.00
	35	3.162	.000	3.162	.002	.354	.352	.037	.000	.002	.001	.040	.312	.369	.195	.369	45.00
	36	2.693	.000	2.693	.002	.300	.298	.039	.000	.002	.001	.043	.255	.243	.195	.243	45.00
T(MCM)		120.9	.0	.0	.1	13.5	13.4	2.7	.0	.1	.0	2.8	.191	.191	.004	10.8	

Table 3.1.2 Cont'd
(Site : EuM)

***** WATER BALANCE OF SOUTHERN PALAWAN *****

CASE :EuM(SITE EuM).CROPPING PATTERN:[A]I JUL2
BASIN AREA : 13.9 SQ.KM EFFECTIVE STORAGE VOLUME : .195 MCM
PADDY WET: 387.0 ha PADDY DRY: .0 ha VEGETABLE1: 11.6 ha
CORN : 34.8 ha BEANS DRY: 58.0 ha VEGETABLE2: 11.6 ha
VEGETABLE3: .0 ha VEGETABLE4: 72.0 ha BEANS DRY: 43.2 ha
BEANS WET: 72.0 ha

UNIT:CU.M/SEC

YEAR 1980 Month	Pinegsaluran RIVER IN1 (1)	CIS (2)	BALANCE (1)-(2) (3)	MA (4)	IN2 (5)	AVR 5-3-4 (6)	WATER DEMAND IRR (7)	VWS (8)	EVP (9)	SPAGE (10)	TOTAL 7+8+9+10 (11)	BALANCE 6-11 (12)	RESERVOIR (UNIT:MCM) +(12) (13)	(14)	INV (15)	WATER LEVEL (m) (16)
JAN 1	2.329	.000	2.329	.002	.239	.237	.107	.000	.003	.001	.110	.147	.127	.195	.127	45.00
2	2.015	.000	2.015	.002	.224	.222	.078	.000	.003	.001	.080	.142	.123	.195	.123	45.00
3	1.791	.000	1.791	.002	.199	.197	.000	.000	.003	.001	.004	.194	.184	.195	.184	45.00
FEB 4	2.705	.000	2.705	.002	.301	.299	.117	.000	.003	.001	.121	.178	.154	.195	.154	45.00
5	1.524	.000	1.524	.002	.170	.168	.124	.000	.003	.001	.128	.039	.034	.195	.034	45.00
6	1.270	.000	1.270	.002	.141	.139	.104	.000	.003	.001	.108	.031	.024	.195	.024	45.00
MAR 7	1.026	.000	1.026	.002	.114	.112	.127	.000	.004	.001	.132	-.020	-.017	.178	.000	44.85
8	.810	.000	.810	.002	.090	.088	.071	.000	.003	.001	.075	.013	.011	.189	.000	44.87
9	1.325	.000	1.325	.002	.148	.145	.001	.000	.004	.001	.006	.139	.133	.195	.127	45.00
APR 10	.639	.000	.639	.002	.071	.069	.014	.000	.004	.001	.018	.051	.044	.195	.044	45.00
11	.537	.000	.537	.002	.060	.058	.005	.000	.004	.001	.010	.048	.042	.195	.042	45.00
12	.525	.000	.525	.002	.059	.058	.002	.000	.004	.001	.007	.050	.043	.195	.043	45.00
MAY 13	.612	.000	.612	.002	.068	.066	.000	.000	.003	.001	.004	.062	.034	.195	.034	45.00
14	.844	.000	.844	.002	.094	.092	.000	.000	.003	.001	.004	.088	.076	.195	.076	45.00
15	.620	.000	.620	.002	.069	.067	.000	.000	.003	.001	.004	.063	.060	.195	.060	45.00
JUN 16	1.569	.000	1.569	.002	.175	.173	.000	.000	.002	.001	.003	.170	.146	.195	.146	45.00
17	5.602	.000	5.602	.002	.624	.622	.000	.000	.002	.001	.003	.619	.535	.195	.535	45.00
18	5.436	.000	5.436	.002	.806	.804	.000	.000	.002	.001	.003	.800	.519	.195	.519	45.00
JUL 19	10.319	.000	10.319	.002	1.149	1.147	.000	.000	.002	.001	.003	1.144	.988	.195	.988	45.00
20	8.893	.000	8.893	.002	.768	.766	.000	.000	.002	.001	.003	.763	.659	.195	.659	45.00
21	8.426	.000	8.426	.002	.760	.758	.031	.000	.002	.001	.034	.724	.688	.195	.688	45.00
AUG 22	5.582	.000	5.582	.002	.622	.620	.280	.000	.002	.001	.283	.336	.282	.195	.282	45.00
23	6.963	.000	6.963	.002	.775	.773	.000	.000	.002	.001	.003	.770	.665	.195	.665	45.00
24	11.037	.000	11.037	.002	1.229	1.227	.000	.000	.002	.001	.003	1.224	1.163	.195	1.163	45.00
SEP 25	8.287	.000	8.287	.002	.923	.921	.000	.000	.002	.001	.003	.918	.793	.195	.793	45.00
26	6.242	.000	6.242	.002	.695	.693	.636	.000	.002	.001	.639	.054	.047	.195	.047	45.00
27	4.898	.000	4.898	.002	.545	.543	.077	.000	.002	.001	.080	.463	.400	.195	.400	45.00
OCT 28	5.278	.000	5.278	.002	.588	.586	.298	.000	.002	.001	.301	.285	.246	.195	.246	45.00
29	3.956	.000	3.956	.002	.441	.439	.276	.000	.002	.001	.279	.160	.138	.195	.138	45.00
30	4.724	.000	4.724	.002	.526	.524	.000	.000	.002	.001	.003	.521	.495	.195	.495	45.00
NOV 31	7.934	.000	7.934	.002	.884	.882	.000	.000	.002	.001	.003	.878	.759	.195	.759	45.00
32	9.156	.000	9.156	.002	1.020	1.018	.000	.000	.002	.001	.003	1.015	.877	.195	.877	45.00
33	6.077	.000	6.077	.002	.677	.675	.000	.000	.002	.001	.003	.672	.580	.195	.580	45.00
DEC 34	8.578	.000	8.578	.002	.935	.933	.000	.000	.002	.001	.003	.930	.821	.195	.821	45.00
35	6.552	.000	6.552	.002	.730	.728	.000	.000	.002	.001	.003	.724	.626	.195	.626	45.00
36	6.285	.000	6.285	.002	.700	.698	.000	.000	.002	.001	.003	.695	.660	.195	.660	45.00
T(MCM)	130.2	.0	.0	.1	15.4	15.3	2.0	.0	.1	.0	2.1	.017	.017	.178	13.2	

***** WATER BALANCE OF SOUTHERN PALAWAN *****

CASE :EuM(SITE EuM).CROPPING PATTERN:[A]I JUL2
BASIN AREA : 13.9 SQ.KM EFFECTIVE STORAGE VOLUME : .195 MCM
PADDY WET: 387.0 ha PADDY DRY: .0 ha VEGETABLE1: 11.6 ha
CORN : 34.8 ha BEANS DRY: 58.0 ha VEGETABLE2: 11.6 ha
VEGETABLE3: .0 ha VEGETABLE4: 72.0 ha BEANS DRY: 43.2 ha
BEANS WET: 72.0 ha

UNIT:CU.M/SEC

YEAR 1981 Month	Pinegsaluran RIVER IN1 (1)	CIS (2)	BALANCE (1)-(2) (3)	MA (4)	IN2 (5)	AVR 5-3-4 (6)	WATER DEMAND IRR (7)	VWS (8)	EVP (9)	SPAGE (10)	TOTAL 7+8+9+10 (11)	BALANCE 6-11 (12)	RESERVOIR (UNIT:MCM) +(12) (13)	(14)	INV (15)	WATER LEVEL (m) (16)
JAN 1	6.600	.000	6.600	.002	.735	.733	.000	.000	.003	.001	.004	.729	.630	.195	.630	45.00
2	4.493	.000	4.493	.002	.500	.498	.004	.000	.003	.001	.008	.491	.424	.195	.424	45.00
3	3.554	.000	3.554	.002	.396	.394	.115	.000	.003	.001	.119	.275	.262	.195	.262	45.00
FEB 4	2.910	.000	2.910	.002	.324	.322	.108	.000	.003	.001	.113	.209	.181	.195	.181	45.00
5	2.500	.000	2.500	.002	.278	.276	.123	.000	.003	.001	.127	.150	.129	.195	.129	45.00
6	2.161	.000	2.161	.002	.241	.239	.116	.000	.003	.001	.121	.118	.081	.195	.081	45.00
MAR 7	1.835	.000	1.835	.002	.204	.202	.127	.000	.004	.001	.131	.071	.061	.195	.061	45.00
8	1.501	.000	1.501	.002	.167	.165	.087	.000	.004	.001	.093	.073	.063	.195	.063	45.00
9	1.207	.000	1.207	.002	.134	.132	.041	.000	.004	.001	.046	.087	.082	.195	.082	45.00
APR 10	.952	.000	.952	.002	.106	.104	.013	.000	.004	.001	.018	.086	.074	.195	.074	45.00
11	.730	.000	.730	.002	.081	.079	.007	.000	.004	.001	.011	.068	.059	.195	.059	45.00
12	.604	.000	.604	.002	.067	.065	.000	.000	.004	.001	.005	.061	.052	.195	.052	45.00
MAY 13	1.193	.000	1.193	.002	.133	.131	.000	.000	.003	.001	.004	.127	.110	.195	.110	45.00
14	.666	.000	.666	.002	.074	.072	.000	.000	.003	.001	.004	.068	.059	.195	.059	45.00
15	.573	.000	.573	.002	.064	.062	.000	.000	.003	.001	.004	.058	.055	.195	.055	45.00
JUN 16	.990	.000	.990	.002	.110	.108	.000	.000	.002	.001	.003	.105	.091	.195	.091	45.00
17	.966	.000	.966	.002	.108	.106	.000	.000	.002	.001	.003	.102	.088	.195	.088	45.00
18	1.080	.000	1.080	.002	.120	.118	.000	.000	.002	.001	.003	.115	.099	.195	.099	45.00
JUL 19	4.375	.000	4.375	.002	.487	.485	.000	.000	.002	.001	.003	.482	.417	.195	.417	45.00
20	5.243	.000	5.243	.002	.584	.582	.081	.000	.002	.001	.084	.498	.430	.195	.430	45.00
21	4.267	.000	4.267	.002	.475	.473	.000	.000	.002	.001	.003	.470	.447	.195	.447	45.00
AUG 22	4.042	.000	4.042	.002	.450	.448	.536	.000	.002	.001	.539	-.091	-.078	.117	.000	43.39
23	3.830	.000	3.830	.002	.427	.425	.167	.000	.002	.001	.169	.256	.221	.195	.143	45.00
24	4.691	.000	4.691	.002	.522	.520	.000	.000	.002	.001	.003	.517	.491	.195	.491	45.00
SEP 25	3.695	.000	3.695	.002	.412	.409	.294	.000	.002	.001	.298	.113	.097	.195	.097	45.00
26	4.043	.000	4.043	.002	.450	.448	.000	.000	.002	.001	.003	.445	.384	.195	.384	45.00
27	7.433	.000	7.433	.002	.828	.826	.000	.000	.002	.001	.003	.823	.711	.195	.711	45.00
OCT 28	5.401	.000	5.401	.002	.602	.599	.249	.000	.002	.001	.252	.347	.300	.195	.300	45.00
29	4.385	.000	4.385	.002	.488	.486	.296	.000	.002	.001	.300	.187	.161	.195	.161	45.00
30	4.773	.000	4.773	.002	.532	.530	.000	.000	.002	.001	.003	.526	.500	.195	.500	45.00
NOV 31	6.577	.000	6.577	.002	.733	.730	.000	.000	.002	.001	.003	.727	.628	.195	.628	45.00
32	9.032	.000	9.032	.002	1.006	1.004	.000	.000	.002	.001	.003	1.001	.865	.195	.865	45.00
33	6.805	.000	6.805	.002	.758	.756	.000	.000	.002	.001	.003	.753	.650	.195	.650	45.00
DEC 34	11.124	.000	11.124	.002	1.239	1.237	.000	.000	.002	.001	.003	1.233	1.066	.195	1.066	45.00
35	7.335	.000	7.335	.002	.819	.817	.075	.000	.003	.001	.079	.738	.638	.195	.638	45.00
36	4.311	.000	4.311	.002	.480	.478	.094	.000	.002	.001	.098	.381	.362	.195	.362	45.00
T(MCM)	119.1	.0	.0	.1	13.3	13.2	2.2	.0	.1	.0	2.3	.078	.078	.117	10.9	

***** WATER BALANCE OF SOUTHERN PALAWAN *****

CASE :EuM(SITE EuM).CROPPING PATTERN:[A]I JUL2
BASIN AREA : 13.9 SQ.KM EFFECTIVE STORAGE VOLUME : .195 MCM
PADDY WET: 387.0 ha PADDY DRY: .0 ha VEGETABLE1: 11.6 ha
CORN : 34.8 ha BEANS DRY: 58.0 ha VEGETABLE2: 11.6 ha
VEGETABLE3: .0 ha VEGETABLE4: 72.0 ha BEANS DRY: 43.2 ha
BEANS WET: 72.0 ha

UNIT:CU.M/SEC

YEAR 1982 Month	Pinegsaluran RIVER IN1 (1)	CIS (2)	BALANCE (1)-(2) (3)	MA (4)	IN2 (5)	AVR 5-3-4 (6)	WATER DEMAND IRR (7)	VWS (8)	EVP (9)	SPAGE (10)	TOTAL 7+8+9+10 (11)	BALANCE 6-11 (12)	RESERVOIR (UNIT:MCM) +(12) (13)	(14)	INV (15)	WATER LEVEL (m) (16)
JAN 1	3.400	.000	3.400	.002	.379	.377	.109	.000	.003	.001	.113	.263	.228	.195	.228	45.00
2	2.933	.000	2.933	.002	.327	.325	.091	.000	.003	.001	.095	.230	.196	.195	.196	45.00
3	2.507	.000	2.507	.002	.279	.277	.114	.000	.003	.001	.118	.159	.137	.195	.137	45.00
FEB 4	2.109	.000	2.109	.002	.235	.233	.111	.000	.003	.001	.115	.118	.102	.195	.102	45.00
5	1.825	.000	1.825	.002	.203	.201	.096	.000	.003	.001	.100	.101	.087	.195	.087	45.00
6	1.574	.000	1.574	.002	.175	.173	.112	.000	.003	.001	.117	.056	.039	.195	.039	45.00
MAR 7	1.314	.000	1.314	.002	.146	.144	.127	.000	.004	.001	.131	.013	.011	.195	.011	45.00
8	1.049	.000	1.049	.002	.117	.115	.035	.000	.004	.001	.040	.074	.064	.195	.064	45.00
9	1.431	.000	1.431	.002	.159	.157	.002	.000	.004	.001	.007	.150	.143	.195	.143	45.00
APR 10	.894	.000	.894	.002	.100	.097	.014	.000	.004	.001	.018	.079	.068	.195	.068	45.00
11	.684	.000	.684	.002	.076	.074	.004	.000	.004	.001	.009	.065	.056	.195	.056	45.00
12	.541	.000	.541	.002	.060	.058	.002	.000	.004	.001	.007	.051	.044	.195	.044	45.00
MAY 13	.523	.000	.523	.002	.058	.056	.000	.000	.003	.001	.004	.052	.045	.195	.045	45.00
14	.512	.000	.512	.002	.057	.055	.000	.000	.003	.001	.004	.051	.044	.195	.044	45.00
15	.512	.000	.512	.002	.057	.055	.000	.000	.003	.001	.004	.051	.048	.195	.048	45.00
JUN 16	1.220	.000	1.220	.002	.136	.134	.000	.000	.002	.001	.003	.131	.113	.195	.113	45.00
17	1.625	.000	1.625	.002	.181	.179	.000	.000	.002	.001	.003	.176	.152	.195	.152	45.00
18	.891	.000	.891	.002	.099	.097	.000	.000	.002	.001	.003	.094	.081	.195	.081	45.00
JUL 19	5.270	.000	5.270	.002	.587	.585	.000	.000	.002	.001	.003	.582	.503	.195	.503	45.00
20	3.945	.000	3.945	.002	.439	.437	.000	.000	.002	.001	.003	.434	.375	.195	.375	45.00
21	4.382	.000	4.382	.002	.488	.486	.000	.000	.002	.001	.003	.483	.459	.195	.459	45.00
AUG 22	5.174	.000	5.174	.002	.576	.574	.056	.000	.002	.001	.059	.513	.445	.195	.445	45.00
23	6.281	.000	6.281	.002	.700	.697	.000	.000	.002	.001	.003	.694	.600	.195	.600	45.00
24	10.835	.000	10.835	.002	1.207	1.205	.000	.000	.002	.001	.003	1.201	1.142	.195	1.142	45.00
SEP 25	6.559	.000	6.559	.002	.731	.728	.108	.000	.002	.001	.111	.618	.534	.195	.534	45.00
26	4.736	.000	4.736	.002	.527	.525	.593	.000	.002	.001	.595	-.070	-.060	.135	.000	43.77
27	3.296	.000	3.296	.002	.367	.365	.534	.000	.002	.001	.537	-.172	-.148	.000	.000	41.00
OCT 28	2.845	.000	2.845	.002	.317	.315	.080	.000	.001	.000	.081	.234	.219	.195	.024	45.00
29	3.909	.000	3.909	.002	.435	.433	.323	.000	.002	.001	.327	.107	.092	.195	.092	45.00
30	3.048	.000	3.048	.002	.339	.337	.076	.000	.002	.001	.079	.258	.246	.195	.246	45.00
NOV 31	5.364	.000	5.364	.002	.600	.598	.000	.000	.002	.001	.003	.594	.514	.195	.514	45.00
32	4.661	.000	4.661	.002	.519	.517	.000	.000	.002	.001	.003	.514	.444	.195	.444	45.00
33	5.103	.000	5.103	.002	.568	.566	.000	.000	.002	.001	.003	.563	.487	.195	.487	45.00
DEC 34	3.894	.000	3.894	.002	.434	.432	.000	.000	.003	.001	.004	.429	.370	.195	.370	45.00
35	3.479	.000	3.479	.002	.388	.385	.000	.000	.002	.001	.003	.382	.330	.195	.330	45.00
36	3.207	.000	3.207	.002	.357	.355	.006	.000	.004	.001	.011	.344	.327	.195	.327	45.00
T(MCM)	96.3	.0	.0	.1	11.0	10.9	2.2	.0	.1	.0	2.3	.208	.204	.000	6.4	

Table 3.1.2 Cont'd
(Site : EuM)

***** WATER BALANCE OF SOUTHERN PALAWAN *****

CASE :EuM(SITE EuM),CROPPING PATTERN:I&II JUL2
BASIN AREA : 13.9 SQ.KM EFFECTIVE STORAGE VOLUME : .195 MCM
PADDY WET: 387.0 ha PADDY DRY: .0 ha VEGETABLE1: 11.6 ha
CORN : 34.6 ha BEANS DRY: 36.0 ha VEGETABLE2: 11.6 ha
VEGETABLE3: .0 ha VEGETABLE4: 72.0 ha BEANS DRY: 43.2 ha
BEANS WET: 72.0 ha

UNIT:CU.M/SEC

YEAR 1983 Month		Pinagsaluran RIVER INI (1)	CIS (2)	BALANCE (1)-(2) (3)	MA (4)	IN2 (5)	AWR 5-3-4 (6)	WATER DEMAND IRR (7)	VWS (8)	EVP (9)	SPACE (10)	TOTAL 7+8+9+10 (11)	BALANCE 6-11 (12)	RESERVOIR (UNIT:MCM) +(12) (13)	(14)	INV (15)	WATER-LEVEL (m) (16)
JAN	1	2.426	.000	2.426	.002	.270	.268	.055	.000	.003	.001	.059	.209	.181	.195	.181	45.00
	2	2.001	.000	2.001	.002	.223	.221	.116	.000	.003	.001	.120	.101	.087	.195	.087	45.00
	3	1.680	.000	1.680	.002	.187	.185	.109	.000	.003	.001	.113	.072	.068	.195	.068	45.00
FEB	4	1.399	.000	1.399	.002	.156	.154	.116	.000	.003	.001	.120	.034	.029	.195	.029	45.00
	5	1.152	.000	1.152	.002	.128	.126	.123	.000	.003	.001	.127	-.001	-.000	.195	.000	44.99
	6	.951	.000	.951	.002	.106	.104	.117	.000	.003	.001	.121	-.018	-.012	.182	.000	44.74
MAR	7	.757	.000	.757	.002	.084	.082	.107	.000	.003	.001	.111	-.029	-.025	.157	.000	44.22
	8	.567	.000	.567	.002	.063	.061	.087	.000	.003	.001	.091	-.030	-.026	.131	.000	43.66
	9	.482	.000	.482	.002	.054	.052	.047	.000	.003	.001	.050	.001	.001	.132	.000	43.70
APR	10	.470	.000	.470	.002	.052	.050	.017	.000	.003	.001	.021	.029	.025	.157	.000	44.23
	11	.460	.000	.460	.002	.051	.049	.004	.000	.003	.001	.008	.041	.036	.193	.000	44.95
	12	.450	.000	.450	.002	.050	.048	.003	.000	.004	.001	.007	.041	.036	.195	.034	45.00
MAY	13	.438	.000	.438	.002	.049	.047	.000	.000	.003	.001	.004	.043	.037	.195	.037	45.00
	14	.429	.000	.429	.002	.048	.046	.000	.000	.003	.001	.004	.042	.036	.195	.036	45.00
	15	.418	.000	.418	.002	.047	.044	.000	.000	.003	.001	.004	.040	.038	.195	.038	45.00
JUN	16	.539	.000	.539	.002	.060	.058	.000	.000	.002	.001	.003	.055	.047	.195	.047	45.00
	17	.788	.000	.788	.002	.088	.086	.000	.000	.002	.001	.003	.083	.071	.195	.071	45.00
	18	2.842	.000	2.842	.002	.316	.314	.000	.000	.002	.001	.003	.311	.269	.195	.269	45.00
JUL	19	3.740	.000	3.740	.002	.417	.414	.000	.000	.002	.001	.003	.411	.355	.195	.355	45.00
	20	9.663	.000	9.663	.002	1.076	1.074	.000	.000	.002	.001	.003	1.071	.925	.195	.925	45.00
	21	5.996	.000	5.996	.002	.668	.666	.315	.000	.003	.001	.318	.347	.330	.195	.330	45.00
AUG	22	4.899	.000	4.899	.002	.523	.521	.056	.000	.002	.001	.059	.463	.400	.195	.400	45.00
	23	7.845	.000	7.845	.002	.874	.872	.000	.000	.002	.001	.003	.868	.750	.195	.750	45.00
	24	4.715	.000	4.715	.002	.525	.523	.457	.000	.002	.001	.460	.063	.060	.195	.060	45.00
SEP	25	3.086	.000	3.086	.002	.342	.339	.529	.000	.002	.001	.532	-.193	-.166	.029	.000	41.30
	26	2.634	.000	2.634	.002	.293	.291	.102	.000	.001	.000	.103	.188	.162	.191	.000	44.91
	27	3.396	.000	3.396	.002	.378	.376	.000	.000	.002	.001	.003	.373	.322	.195	.318	45.00
OCT	28	6.531	.000	6.531	.002	.727	.725	.049	.000	.002	.001	.052	.673	.581	.195	.581	45.00
	29	5.695	.000	5.695	.002	.634	.632	.000	.000	.002	.001	.003	.629	.543	.195	.543	45.00
	30	6.537	.000	6.537	.002	.730	.728	.112	.000	.002	.001	.115	.613	.583	.195	.583	45.00
NOV	31	6.430	.000	6.430	.002	.716	.714	.000	.000	.002	.001	.003	.711	.614	.195	.614	45.00
	32	8.078	.000	8.078	.002	.900	.898	.000	.000	.002	.001	.003	.895	.773	.195	.773	45.00
	33	14.417	.000	14.417	.002	1.606	1.604	.000	.000	.002	.001	.003	1.601	1.383	.195	1.383	45.00
DEC	34	14.277	.000	14.277	.002	1.590	1.588	.000	.000	.002	.001	.003	1.585	1.369	.195	1.369	45.00
	35	11.878	.000	11.878	.002	1.323	1.321	.014	.000	.002	.001	.018	1.303	1.126	.195	1.126	45.00
	36	6.763	.000	6.763	.002	.753	.751	.043	.000	.002	.001	.046	.705	.670	.195	.670	45.00
T(MCM)		127.1	.0	.0	.1	14.2	14.1	2.3	.0	.1	.0	2.4	.230	.230	.029	11.7	

***** WATER BALANCE OF SOUTHERN PALAWAN *****

CASE :EuM(SITE EuM),CROPPING PATTERN:I&II JUL2
BASIN AREA : 13.9 SQ.KM EFFECTIVE STORAGE VOLUME : .195 MCM
PADDY WET: 387.0 ha PADDY DRY: .0 ha VEGETABLE1: 11.6 ha
CORN : 34.6 ha BEANS DRY: 36.0 ha VEGETABLE2: 11.6 ha
VEGETABLE3: .0 ha VEGETABLE4: 72.0 ha BEANS DRY: 43.2 ha
BEANS WET: 72.0 ha

UNIT:CU.M/SEC

YEAR 1984 Month		Pinagsaluran RIVER INI (1)	CIS (2)	BALANCE (1)-(2) (3)	MA (4)	IN2 (5)	AWR 5-3-4 (6)	WATER DEMAND IRR (7)	VWS (8)	EVP (9)	SPACE (10)	TOTAL 7+8+9+10 (11)	BALANCE 6-11 (12)	RESERVOIR (UNIT:MCM) +(12) (13)	(14)	INV (15)	WATER-LEVEL (m) (16)
JAN	1	4.811	.000	4.811	.002	.536	.534	.100	.000	.003	.001	.104	.430	.372	.195	.372	45.00
	2	4.138	.000	4.138	.002	.461	.459	.000	.000	.003	.001	.004	.455	.393	.195	.393	45.00
	3	7.839	.000	7.839	.002	.873	.871	.000	.000	.003	.001	.004	.867	.824	.195	.824	45.00
FEB	4	4.498	.000	4.498	.002	.501	.499	.108	.000	.003	.001	.112	.387	.334	.195	.334	45.00
	5	3.298	.000	3.298	.002	.367	.365	.124	.000	.003	.001	.128	.237	.205	.195	.205	45.00
	6	2.834	.000	2.834	.002	.316	.314	.104	.000	.003	.001	.108	.206	.160	.195	.160	45.00
MAR	7	2.451	.000	2.451	.002	.273	.271	.063	.000	.004	.001	.067	.204	.177	.195	.177	45.00
	8	2.165	.000	2.165	.002	.241	.239	.086	.000	.004	.001	.091	.148	.128	.195	.128	45.00
	9	1.982	.000	1.982	.002	.221	.219	.006	.000	.004	.001	.011	.208	.198	.195	.198	45.00
APR	10	1.583	.000	1.583	.002	.176	.174	.008	.000	.004	.001	.012	.162	.140	.195	.140	45.00
	11	2.636	.000	2.636	.002	.294	.291	.000	.000	.004	.001	.005	.287	.248	.195	.248	45.00
	12	1.740	.000	1.740	.002	.194	.192	.000	.000	.004	.001	.005	.187	.162	.195	.162	45.00
MAY	13	1.595	.000	1.595	.002	.178	.176	.000	.000	.003	.001	.004	.172	.148	.195	.148	45.00
	14	1.764	.000	1.764	.002	.196	.194	.000	.000	.003	.001	.004	.190	.164	.195	.164	45.00
	15	1.273	.000	1.273	.002	.142	.140	.000	.000	.003	.001	.004	.136	.129	.195	.129	45.00
JUN	16	2.717	.000	2.717	.002	.303	.300	.000	.000	.002	.001	.003	.297	.257	.195	.257	45.00
	17	3.508	.000	3.508	.002	.390	.388	.000	.000	.002	.001	.003	.385	.333	.195	.333	45.00
	18	3.540	.000	3.540	.002	.394	.392	.000	.000	.002	.001	.003	.389	.336	.195	.336	45.00
JUL	19	3.291	.000	3.291	.002	.367	.364	.000	.000	.002	.001	.003	.361	.312	.195	.312	45.00
	20	2.412	.000	2.412	.002	.269	.267	.234	.000	.002	.001	.237	.030	.026	.195	.026	45.00
	21	2.084	.000	2.084	.002	.232	.230	.216	.000	.002	.001	.219	.011	.011	.195	.011	45.00
AUG	22	1.814	.000	1.814	.002	.202	.200	.595	.000	.002	.001	.598	-.398	-.344	.000	.000	41.00
	23	2.189	.000	2.189	.002	.244	.242	.013	.000	.001	.000	.014	.227	.196	.195	.001	45.00
	24	4.116	.000	4.116	.002	.458	.456	.000	.000	.002	.001	.003	.453	.431	.195	.431	45.00
SEP	25	5.791	.000	5.791	.002	.645	.643	.000	.000	.002	.001	.003	.640	.553	.195	.553	45.00
	26	3.899	.000	3.899	.002	.434	.432	.573	.000	.002	.001	.576	-.144	-.124	.071	.000	42.43
	27	5.518	.000	5.518	.002	.615	.613	.000	.000	.001	.000	.002	.611	.528	.195	.404	45.00
OCT	28	4.799	.000	4.799	.002	.534	.532	.013	.000	.002	.001	.016	.517	.446	.195	.446	45.00
	29	5.329	.000	5.329	.002	.594	.591	.000	.000	.002	.001	.003	.588	.508	.195	.508	45.00
	30	6.735	.000	6.735	.002	.750	.748	.000	.000	.002	.001	.003	.745	.708	.195	.708	45.00
NOV	31	4.529	.000	4.529	.002	.504	.502	.000	.000	.002	.001	.003	.499	.431	.195	.431	45.00
	32	4.517	.000	4.517	.002	.503	.501	.256	.000	.002	.001	.259	.242	.209	.195	.209	45.00
	33	7.487	.000	7.487	.002	.834	.832	.000	.000	.002	.001	.003	.829	.716	.195	.716	45.00
DEC	34	6.152	.000	6.152	.002	.685	.683	.031	.000	.002	.001	.034	.649	.560	.195	.560	45.00
	35	5.803	.000	5.803	.002	.646	.644	.000	.000	.002	.001	.003	.641	.554	.195	.554	45.00
	36	4.938	.000	4.938	.002	.550	.548	.080	.000	.002	.001	.084	.464	.460	.195	.460	45.00
T(MCM)		119.6	.0	.0	.1	13.3	13.3	2.2	.0	.1	.0	2.4	.460	.460	.000	11.0	

***** WATER BALANCE OF SOUTHERN PALAWAN *****

CASE :EuM(SITE EuM),CROPPING PATTERN:I&II JUL3
BASIN AREA : 13.9 SQ.KM EFFECTIVE STORAGE VOLUME : .195 MCM
PADDY WET: 387.0 ha PADDY DRY: .0 ha VEGETABLE1: 11.6 ha
CORN : 34.6 ha BEANS DRY: 36.0 ha VEGETABLE2: 11.6 ha
VEGETABLE3: .0 ha VEGETABLE4: 72.0 ha BEANS DRY: 43.2 ha
BEANS WET: 72.0 ha

UNIT:CU.M/SEC

YEAR 1985 Month		Pinagsaluran RIVER INI (1)	CIS (2)	BALANCE (1)-(2) (3)	MA (4)	IN2 (5)	AWR 5-3-4 (6)	WATER DEMAND IRR (7)	VWS (8)	EVP (9)	SPACE (10)	TOTAL 7+8+9+10 (11)	BALANCE 6-11 (12)	RESERVOIR (UNIT:MCM) +(12) (13)	(14)	INV (15)	WATER-LEVEL (m) (16)
JAN	1	2.926	.000	2.926	.002	.326	.324	.111	.000	.003	.001	.115	.209	.180	.195	.180	45.00
	2	2.473	.000	2.473	.002	.275	.273	.031	.000	.003	.001	.035	.238	.206	.195	.206	45.00
	3	2.223	.000	2.223	.002	.246	.245	.098	.000	.003	.001	.101	.144	.137	.195	.137	45.00
FEB	4	1.864	.000	1.864	.002	.208	.205	.118	.000	.003	.001	.122	.084	.072	.195	.072	45.00
	5	1.561	.000	1.561	.002	.174	.172	.123	.000	.003	.001	.127	.045	.039	.195	.039	45.00
	6	1.345	.000	1.345	.002	.150	.148	.083	.000	.003	.001	.086	.060	.042	.195	.042	45.00
MAR	7	1.129	.000	1.129	.002	.126	.124	.127	.000	.004	.001	.132	-.008	-.007	.188	.000	44.85
	8	.872	.000	.872	.002	.097	.095	.087	.000	.004	.001	.092	.003	.003	.191	.000	44.90
	9	.646	.000	.646	.002	.072	.070	.043	.000	.004	.001	.047	.023	.021	.195	.017	45.00
APR	10	.521	.000	.521	.002	.058	.056	.017	.000	.004	.001	.022	.034	.029	.195	.029	45.00
	11	.641	.000	.641	.002	.071	.069	.000	.000	.004	.001	.005	.065	.056	.195	.056	45.00
	12	1.946	.000	1.946	.002	.217	.215	.000	.000	.004	.001	.005	.210	.181	.195	.181	45.00
MAY	13	1.479	.000	1.479	.002	.165	.163	.000	.000	.003	.001	.004	.159	.137	.195	.137	45.00
	14	1.358	.000	1.358	.002	.151	.149	.000	.000	.003	.001	.004	.145	.125	.195	.125	45.00
	15	1.272	.000	1.272	.002	.142	.140	.000	.000	.003	.001	.004	.136	.129	.195	.129	45.00
JUN	16	.728	.000	.728	.002	.081	.079	.000	.000	.002	.001	.003	.076	.065	.195	.065	45.00
	17	.813	.000	.813	.002	.091	.089	.000	.000	.002	.001	.003	.086	.074	.195	.074	45.00
	18	1.007	.000	1.007	.002	.112	.110	.000	.000	.002	.001	.003	.107	.092	.195	.092	45.00
JUL	19	1.179	.000	1.179	.002	.131	.129	.000	.000	.002	.001	.003	.126	.109	.195	.109	45.00
	20	1.930	.000	1.930	.002	.217	.215	.000	.000	.002	.001	.003	.212	.183	.195	.183	45.00
	21	1.507	.000	1.507	.002	.168	.166	.428	.000	.002	.001	.431	-.265	-.252	.000	.000	41.00
AUG	22	1.801	.000	1.801	.002	.201	.198	.056	.000	.001	.000	.056	.142	.123	.123	.000	43.31
	23	2.504	.000	2.504	.002	.279	.277	.482	.000	.002	.001	.484	-.207	-.197	.000	.000	41.00
	24	1.263	.000	1.263	.002	.141	.139	.000	.000	.001	.000	.001	.138	.131	.131	.000	43.66
SEP	25	4.163	.000	4.163	.002	.464	.462	.000	.000	.002	.001	.003	.460	.397	.195	.333	45.00
	26	4.911	.000	4.911	.002	.547	.545	.042	.000	.002	.001	.045	.500	.432	.195	.432	45.00
	27	2.730	.000	2.730	.002	.304	.302	.692	.000	.002	.001	.696	-.394	-.340	.000	.000	41.00
OCT	28	2.361	.000	2.361	.002	.265	.263	.000	.000	.001	.000	.001	.262	.227	.195	.032	45.00
	29	14.284	.000	14.284	.002	1.591	1.589	.000	.000	.002	.001	.003	1.586	1.370	.195	1.370	45.00
	30	6.399	.000	6.399	.002	.735	.733	.164	.000	.002	.001	.167	.566	.538	.195	.538	45.00
NOV	31	6.353	.000	6.353	.002	.708	.706	.000	.000	.002	.001	.003	.702	.607	.195	.607	45.00
	32	5.094	.000	5.094	.002	.567	.565	.000	.000	.002	.001	.003	.562	.486	.195	.486	45.00
	33	6.501	.000	6.501	.002	.724	.722	.000	.000	.002	.001	.003	.719	.621	.195	.621	45.00
DEC	34	5.420	.000	5.420	.002	.604	.602	.004	.000	.002	.001	.007	.594	.514	.195	.514	45.00
	35	27.839	.000	27.839	.002	3.101	3.099	.000	.000	.002	.001	.003	3.096	2.674	.195	2.674	45.00
	36	15.727	.000	15.727	.002	1.752	1.750	.097	.000	.003	.001	.101	1.649	1.567	.195	1.567	45.00
T(MCM)		120.7	.0	.0	.1	13.4	13.4	2.5	.0	.1	.0	2.6	.778	.778	.000	11.0	

Table 3.1.2 Cont'd
(Site : EuM)

***** WATER BALANCE OF SOUTHERN PALAWAN *****

CASE :EuM(SITE EuM),CROPPING PATTERN:I&II JUL2
BASIN AREA : 13.9 SQ.KM EFFECTIVE STORAGE VOLUME : .195 MCM
PADDY WET: 387.0 ha PADDY DRY: .0 ha VEGETABLE1: 11.6 ha
CORN : 34.8 ha BEANS DRY: 58.0 ha VEGETABLE2: 11.6 ha
VEGETABLE3: .0 ha VEGETABLE4: 72.0 ha BEANS DRY: 43.2 ha
BEANS WET: 72.0 ha

UNIT:CU.M/SEC

YEAR 1996 Month		Pinagsaluran RIVER IN1 (1)	CIS (2)	BALANCE (1)-(2) (3)	NA (4)	IN2 (5)	AVR 5-3-4 (6)	WATER DEMAND IRR (7)	VPS (8)	EVP (9)	SPACE (10)	TOTAL 7+8+9+10 (11)	BALANCE 6-11 (12)	RESERVOIR (UNIT:MCM) -(12) (13)	(14)	INV (15)	WATER-LEVEL (m) (16)
JAN	1	7.772	.000	7.772	.002	.866	.864	.111	.000	.003	.001	.115	.748	.646	.195	.646	45.00
	2	4.937	.000	4.937	.002	.552	.550	.116	.000	.003	.001	.120	.430	.372	.195	.372	45.00
	3	4.332	.000	4.332	.002	.483	.480	.000	.000	.003	.001	.004	.477	.453	.195	.453	45.00
FEB	4	4.625	.000	4.625	.002	.515	.513	.046	.000	.003	.001	.050	.463	.400	.195	.400	45.00
	5	3.392	.000	3.392	.002	.378	.376	.116	.000	.003	.001	.120	.256	.221	.195	.221	45.00
	6	2.990	.000	2.990	.002	.333	.331	.047	.000	.003	.001	.051	.280	.193	.195	.193	45.00
MAR	7	2.571	.000	2.571	.002	.286	.284	.127	.000	.004	.001	.132	.152	.132	.195	.132	45.00
	8	2.136	.000	2.136	.002	.238	.236	.073	.000	.004	.001	.078	.158	.137	.195	.137	45.00
	9	1.764	.000	1.764	.002	.196	.194	.047	.000	.004	.001	.051	.143	.136	.195	.136	45.00
APR	10	1.445	.000	1.445	.002	.161	.159	.006	.000	.004	.001	.010	.149	.128	.195	.128	45.00
	11	1.226	.000	1.226	.002	.137	.134	.005	.000	.004	.001	.009	.125	.108	.195	.108	45.00
	12	.957	.000	.957	.002	.107	.105	.003	.000	.004	.001	.007	.098	.085	.195	.085	45.00
MAY	13	.727	.000	.727	.002	.081	.079	.000	.000	.003	.001	.004	.075	.065	.195	.065	45.00
	14	1.783	.000	1.783	.002	.199	.196	.000	.000	.003	.001	.004	.192	.166	.195	.166	45.00
	15	2.063	.000	2.063	.002	.230	.228	.000	.000	.003	.001	.004	.224	.213	.195	.213	45.00
JUN	16	1.076	.000	1.076	.002	.120	.118	.000	.000	.003	.001	.004	.115	.099	.195	.099	45.00
	17	.755	.000	.755	.002	.084	.082	.000	.000	.002	.001	.003	.079	.068	.195	.068	45.00
	18	.693	.000	.693	.002	.077	.075	.000	.000	.002	.001	.003	.072	.062	.195	.062	45.00
JUL	19	2.318	.000	2.318	.002	.258	.256	.000	.000	.002	.001	.003	.253	.219	.195	.219	45.00
	20	9.432	.000	9.432	.002	1.051	1.048	.000	.000	.002	.001	.003	1.045	.903	.195	.903	45.00
	21	4.570	.000	4.570	.002	.509	.507	.379	.000	.002	.001	.381	.126	.120	.195	.120	45.00
AUG	22	3.757	.000	3.757	.002	.418	.416	.397	.000	.002	.001	.400	.016	.014	.195	.014	45.00
	23	4.070	.000	4.070	.002	.453	.451	.000	.000	.002	.001	.003	.448	.387	.195	.387	45.00
	24	3.003	.000	3.003	.002	.335	.332	.325	.000	.002	.001	.328	.004	.004	.195	.004	45.00
SEP	25	5.842	.000	5.842	.002	.651	.649	.000	.000	.002	.001	.003	.645	.558	.195	.558	45.00
	26	4.737	.000	4.737	.002	.528	.525	.000	.000	.002	.001	.003	.522	.451	.195	.451	45.00
	27	5.518	.000	5.518	.002	.615	.613	.126	.000	.002	.001	.130	.483	.417	.195	.417	45.00
OCT	28	3.874	.000	3.874	.002	.432	.429	.373	.000	.002	.001	.376	.053	.046	.195	.046	45.00
	29	5.098	.000	5.098	.002	.568	.565	.000	.000	.002	.001	.003	.562	.486	.195	.486	45.00
	30	5.898	.000	5.898	.002	.657	.655	.000	.000	.002	.001	.003	.652	.619	.195	.619	45.00
NOV	31	4.260	.000	4.260	.002	.474	.472	.029	.000	.002	.001	.032	.441	.381	.195	.381	45.00
	32	7.500	.000	7.500	.002	.835	.833	.000	.000	.002	.001	.003	.830	.717	.195	.717	45.00
	33	6.450	.000	6.450	.002	.718	.716	.000	.000	.002	.001	.003	.713	.616	.195	.616	45.00
DEC	34	21.015	.000	21.015	.002	2.341	2.339	.035	.000	.002	.001	.036	2.300	1.987	.195	1.987	45.00
	35	6.611	.000	6.611	.002	.736	.734	.075	.000	.002	.001	.079	.656	.566	.195	.566	45.00
	36	5.052	.000	5.052	.002	.563	.561	.000	.000	.002	.001	.003	.557	.530	.195	.530	45.00
T(MCM)		135.1	.0	.0	.1	15.0	15.0	2.2	.0	.1	.0	2.3	.000	.000	.195	12.7	

***** WATER BALANCE OF SOUTHERN PALAWAN *****

CASE :EuM(SITE EuM),CROPPING PATTERN:I&II JUL2
BASIN AREA : 13.9 SQ.KM EFFECTIVE STORAGE VOLUME : .195 MCM
PADDY WET: 387.0 ha PADDY DRY: .0 ha VEGETABLE1: 11.6 ha
CORN : 34.8 ha BEANS DRY: 58.0 ha VEGETABLE2: 11.6 ha
VEGETABLE3: .0 ha VEGETABLE4: 72.0 ha BEANS DRY: 43.2 ha
BEANS WET: 72.0 ha

UNIT:CU.M/SEC

YEAR 1997 Month		Pinagsaluran RIVER IN1 (1)	CIS (2)	BALANCE (1)-(2) (3)	NA (4)	IN2 (5)	AVR 5-3-4 (6)	WATER DEMAND IRR (7)	VPS (8)	EVP (9)	SPACE (10)	TOTAL 7+8+9+10 (11)	BALANCE 6-11 (12)	RESERVOIR (UNIT:MCM) -(12) (13)	(14)	INV (15)	WATER-LEVEL (m) (16)
JAN	1	3.787	.000	3.787	.002	.422	.420	.111	.000	.003	.001	.115	.304	.263	.195	.263	45.00
	2	3.112	.000	3.112	.002	.347	.344	.116	.000	.003	.001	.120	.225	.194	.195	.194	45.00
	3	2.661	.000	2.661	.002	.296	.294	.098	.000	.003	.001	.102	.192	.183	.195	.183	45.00
FEB	4	2.248	.000	2.248	.002	.250	.248	.120	.000	.003	.001	.124	.124	.107	.195	.107	45.00
	5	1.923	.000	1.923	.002	.214	.212	.083	.000	.003	.001	.088	.124	.108	.195	.108	45.00
	6	1.677	.000	1.677	.002	.187	.185	.117	.000	.003	.001	.121	.063	.044	.195	.044	45.00
MAR	7	1.396	.000	1.396	.002	.155	.153	.127	.000	.004	.001	.132	.021	.019	.195	.019	45.00
	8	1.107	.000	1.107	.002	.123	.121	.087	.000	.004	.001	.092	.029	.025	.195	.025	45.00
	9	.851	.000	.851	.002	.095	.093	.035	.000	.004	.001	.040	.053	.050	.195	.050	45.00
APR	10	.639	.000	.639	.002	.071	.069	.017	.000	.004	.001	.022	.047	.041	.195	.041	45.00
	11	.529	.000	.528	.002	.059	.057	.007	.000	.004	.001	.011	.046	.039	.195	.039	45.00
	12	.751	.000	.751	.002	.084	.082	.000	.000	.004	.001	.005	.077	.066	.195	.066	45.00
MAY	13	.830	.000	.830	.002	.092	.090	.000	.000	.004	.001	.004	.086	.075	.195	.075	45.00
	14	.512	.000	.512	.002	.057	.055	.000	.000	.003	.001	.004	.051	.044	.195	.044	45.00
	15	.481	.000	.481	.002	.054	.052	.000	.000	.003	.001	.004	.047	.043	.195	.043	45.00
JUN	16	3.451	.000	3.451	.002	.384	.382	.000	.000	.003	.001	.003	.379	.328	.195	.328	45.00
	17	2.520	.000	2.520	.002	.281	.279	.000	.000	.002	.001	.003	.275	.238	.195	.238	45.00
	18	1.522	.000	1.522	.002	.170	.167	.000	.000	.002	.001	.003	.164	.142	.195	.142	45.00
JUL	19	2.578	.000	2.578	.002	.287	.285	.000	.000	.002	.001	.003	.282	.243	.195	.243	45.00
	20	4.137	.000	4.137	.002	.461	.459	.000	.000	.002	.001	.003	.456	.394	.195	.394	45.00
	21	2.648	.000	2.648	.002	.295	.293	.470	.000	.002	.001	.473	-.180	-.171	.024	.000	41.48
AUG	22	1.642	.000	1.642	.002	.183	.181	.765	.000	.001	.000	.766	-.585	-.505	.000	.000	41.00
	23	2.563	.000	2.563	.002	.285	.283	.000	.000	.001	.000	.001	.282	.244	.195	.049	45.00
	24	3.821	.000	3.821	.002	.426	.423	.000	.000	.002	.001	.003	.420	.399	.195	.399	45.00
SEP	25	3.205	.000	3.205	.002	.357	.355	.000	.000	.002	.001	.003	.352	.304	.195	.304	45.00
	26	5.657	.000	5.657	.002	.630	.628	.047	.000	.002	.001	.051	.577	.499	.195	.499	45.00
	27	3.272	.000	3.272	.002	.364	.362	.395	.000	.002	.001	.398	-.236	-.204	.000	.000	41.00
OCT	28	6.107	.000	6.107	.002	.680	.678	.000	.000	.001	.000	.001	.677	.585	.195	.390	45.00
	29	3.849	.000	3.849	.002	.429	.427	.668	.000	.002	.001	.671	-.244	-.211	.000	.000	41.00
	30	2.830	.000	2.830	.002	.315	.313	.000	.000	.001	.000	.001	.312	.297	.195	.102	45.00
NOV	31	10.667	.000	10.667	.002	1.188	1.186	.000	.000	.002	.001	.003	1.183	1.022	.195	1.022	45.00
	32	7.043	.000	7.043	.002	.784	.782	.000	.000	.002	.001	.003	.779	.673	.195	.673	45.00
	33	7.242	.000	7.242	.002	.807	.805	.000	.000	.002	.001	.003	.801	.692	.195	.692	45.00
DEC	34	5.213	.000	5.213	.002	.581	.578	.006	.000	.002	.001	.009	.569	.492	.195	.492	45.00
	35	4.692	.000	4.692	.002	.523	.520	.000	.000	.002	.001	.003	.517	.447	.195	.447	45.00
	36	5.036	.000	5.036	.002	.561	.559	.040	.000	.002	.001	.044	.515	.490	.195	.490	45.00
T(MCM)		98.2	.0	.0	.1	10.9	10.9	3.1	.0	.1	.0	3.2	1.092	1.093	.000	8.2	

***** WATER BALANCE OF SOUTHERN PALAWAN *****

CASE :EuM(SITE EuM),CROPPING PATTERN:I&II JUL2
BASIN AREA : 13.9 SQ.KM EFFECTIVE STORAGE VOLUME : .195 MCM
PADDY WET: 387.0 ha PADDY DRY: .0 ha VEGETABLE1: 11.6 ha
CORN : 34.8 ha BEANS DRY: 58.0 ha VEGETABLE2: 11.6 ha
VEGETABLE3: .0 ha VEGETABLE4: 72.0 ha BEANS DRY: 43.2 ha
BEANS WET: 72.0 ha

UNIT:CU.M/SEC

YEAR 1998 Month		Pinagsaluran RIVER IN1 (1)	CIS (2)	BALANCE (1)-(2) (3)	NA (4)	IN2 (5)	AVR 5-3-4 (6)	WATER DEMAND IRR (7)	VPS (8)	EVP (9)	SPACE (10)	TOTAL 7+8+9+10 (11)	BALANCE 6-11 (12)	RESERVOIR (UNIT:MCM) -(12) (13)	(14)	INV (15)	WATER-LEVEL (m) (16)
JAN	1	3.090	.000	3.090	.002	.344	.342	.084	.000	.002	.001	.087	.255	.220	.195	.220	45.00
	2	2.558	.000	2.558	.002	.285	.283	.114	.000	.003	.001	.118	.165	.142	.195	.142	45.00
	3	2.173	.000	2.173	.002	.242	.240	.089	.000	.003	.001	.092	.148	.140	.195	.140	45.00
FEB	4	1.830	.000	1.830	.002	.204	.202	.118	.000	.003	.001	.122	.080	.069	.195	.069	45.00
	5	1.563	.000	1.563	.002	.174	.172	.031	.000	.003	.001	.035	.137	.118	.195	.118	45.00
	6	1.689	.000	1.689	.002	.188	.186	.072	.000	.003	.001	.076	.110	.086	.195	.086	45.00
MAR	7	1.241	.000	1.241	.002	.138	.136	.124	.000	.003	.001	.129	.007	.008	.195	.008	45.00
	8	.976	.000	.976	.002	.109	.107	.087	.000	.004	.001	.092	.015	.013	.195	.013	45.00
	9	.721	.000	.721	.002	.080	.078	.047	.000	.004	.001	.051	.027	.025	.195	.025	45.00
APR	10	1.405	.000	1.405	.002	.156	.154	.000	.000	.004	.001	.005	.150	.129	.195	.129	45.00
	11	1.198	.000	1.198	.002	.133	.131	.000	.000	.004	.001	.005	.127	.109	.195	.109	45.00
	12	.957	.000	.957	.002	.107	.105	.000	.000	.004	.001	.005	.100	.088	.195	.088	45.00
MAY	13	1.368	.000	1.368	.002	.175	.173	.000	.000	.004	.001	.004	.169	.146	.195	.146	45.00
	14	1.235	.000	1.235	.002	.138	.136	.000	.000	.003	.001	.005	.131	.114	.195	.114	45.00
	15	1.165	.000	1.165	.002	.130	.128	.000	.000	.003	.001	.004	.124	.118	.195	.118	45.00
JUN	16	.934	.000	.934	.002	.104	.102	.000	.000	.003	.001	.004	.098	.085	.195	.085	45.00
	17	3.079	.000	3.079	.002	.343	.341	.000	.000	.002	.001	.003	.338	.292	.195	.292	45.00
	18	2.593	.000	2.593	.002	.289	.287	.000	.000	.002	.001	.004	.283	.245	.195	.245	45.00
JUL	19	1.449	.000	1.449	.002	.161	.159	.000	.000	.002	.001	.003	.156	.135	.195	.135	45.00
	20	2.115	.000	2.115	.002	.235	.233	.000	.000	.002	.001	.003	.230	.199	.195	.199	45.00
	21	3.958	.000	3.958	.002	.441	.439	.000	.000	.002	.001	.003	.436	.414	.195	.414	45.00
AUG	22	3.118	.000	3.118	.002	.347	.345	.318	.000	.002	.001	.322	.023	.020	.195	.020	45.00
	23	2.803	.000	2.803	.002	.312	.310	.137	.000	.002	.001	.140	.170	.147	.195	.147	45.00
	24	2.471	.000	2.471	.002	.275	.273	.365	.000	.002	.001	.368	-.095	-.090	.103	.000	43.15
SEP	25	1.366	.000	1.366	.002	.174	.172	.779	.000	.002	.001	.782	-.609	-.526	.000	.000	41.00
	26	3.397	.000	3.397	.002	.378	.376	.000	.000	.001	.000	.001	.375	.224	.195	.129	45.00
	27	4.290	.000	4.290	.002	.478	.476	.036	.000	.002	.001	.039	.437	.377	.195	.377	45.00
OCT	28	5.068	.000	5.068	.002	.564	.562	.000	.000	.002	.001	.003	.559	.483	.195	.483	45.00
	29	5.272	.000	5.272	.002	.587	.585	.000	.000	.002	.001	.003	.583	.503	.195	.503	45.00
	30	6.432	.000	6.432	.002	.716	.714	.000	.000	.002	.001	.003	.711	.676	.195	.676	45.00
NOV	31	17.284	.000	17.284	.002	1.925	1.923	.000	.000	.002	.001	.003	1.920	1.639	.195	1.639	45.00
	32	8.575	.000	8.575	.002	.955	.953	.000	.000	.002	.001	.003	.950	.821	.195	.821	45.00
	33	8.363	.000	8.363	.002	.931	.929	.000	.000	.002	.001	.003	.926	.800	.195	.800	45.00
DEC	34	6.756	.000	6.756	.002	.752	.750	.063	.000	.002	.001	.066	.684	.599	.195	.599	45.00
	35	4.137	.000	4.137	.002	.463	.461	.069	.000	.002	.001	.072	.389	.336	.195	.336	45.00
	36	3.330	.000	3.330	.002	.371	.369	.060	.000	.002	.001	.063	.306	.290	.195	.290	45.00
T(MCM)		105.8	.0	.6	.1	11.8	11.7	2.3	.0	.1	.0	2.4	.616	.616	.000	9.7	

Table 3.1.2 Cont'd
(Site : EuM)

***** WATER BALANCE OF SOUTHERN PALAWAN *****

CASE :EuM(SITE EuM),CROPPING PATTERN:1&II JUL2
BASIN AREA : 13.9 SQ.KM   EFFECTIVE STORAGE VOLUME : .195 MCM
PADDY WET: 307.0 ha   PADDY DRY: .0 ha   VEGETABLE1: 11.6 ha
CORN : 34.6 ha   BEANS DRY: 38.0 ha   VEGETABLE2: 11.6 ha
VEGETABLE3: .0 ha   VEGETABLE4: 72.0 ha   BEANS DRY: 43.2 ha
BEANS WET: 72.0 ha

UNIT:CU.M/SEC

YEAR 1989	Pinagsaluran RIVER						WATER DEMAND					BALANCE	RESERVOIR (UNIT:MCM)			WATER-LEVEL
	IN1	CIS	BALANCE (1)-(2)	MA	IN2	AWR 5-3-4	IRR	VWS	EVP	SPACE	TOTAL 7+8+9+10	6-11	*(12)		INY	(m)
Month	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
JAN 1	2.844	.000	2.844	.002	.317	.315	.105	.000	.003	.001	.109	.206	.178	.195	.178	45.00
2	2.437	.000	2.437	.002	.271	.269	.109	.000	.003	.001	.113	.156	.135	.195	.135	45.00
3	4.224	.000	4.224	.002	.470	.468	.000	.000	.003	.001	.004	.465	.442	.195	.442	45.00
FEB 4	4.298	.000	4.298	.002	.479	.477	.000	.000	.003	.001	.004	.473	.408	.195	.408	45.00
5	2.795	.000	2.795	.002	.311	.309	.117	.000	.003	.001	.121	.188	.163	.195	.163	45.00
6	2.031	.000	2.031	.002	.226	.224	.117	.000	.003	.001	.121	.103	.071	.195	.071	45.00
MAR 7	1.772	.000	1.772	.002	.197	.195	.079	.000	.004	.001	.084	.112	.097	.195	.097	45.00
8	5.587	.000	5.587	.002	.622	.620	.000	.000	.004	.001	.005	.615	.533	.195	.533	45.00
9	7.595	.000	7.595	.002	.846	.844	.000	.000	.004	.001	.005	.839	.797	.195	.797	45.00
APR 10	3.772	.000	3.772	.002	.420	.418	.005	.000	.004	.001	.010	.408	.353	.195	.353	45.00
11	2.493	.000	2.493	.002	.278	.276	.000	.000	.004	.001	.005	.271	.234	.195	.234	45.00
12	1.920	.000	1.920	.002	.214	.212	.002	.000	.004	.001	.007	.205	.177	.195	.177	45.00
MAY 13	1.726	.000	1.726	.002	.192	.190	.000	.000	.003	.001	.004	.186	.161	.195	.161	45.00
14	1.646	.000	1.646	.002	.183	.181	.000	.000	.003	.001	.004	.177	.153	.195	.153	45.00
15	4.391	.000	4.391	.002	.489	.487	.000	.000	.003	.001	.004	.483	.439	.195	.439	45.00
JUN 16	4.705	.000	4.705	.002	.524	.522	.000	.000	.002	.001	.003	.519	.448	.195	.448	45.00
17	7.044	.000	7.044	.002	.785	.782	.000	.000	.002	.001	.003	.779	.673	.195	.673	45.00
18	6.569	.000	6.569	.002	.732	.730	.000	.000	.002	.001	.003	.726	.628	.195	.628	45.00
JUL 19	4.633	.000	4.633	.002	.516	.514	.000	.000	.002	.001	.003	.511	.441	.195	.441	45.00
20	4.402	.000	4.402	.002	.490	.488	.128	.000	.002	.001	.131	.357	.308	.195	.308	45.00
21	3.363	.000	3.363	.002	.375	.373	.529	.000	.002	.001	.532	-.160	-.152	.043	.000	41.88
AUG 22	2.377	.000	2.377	.002	.265	.263	.583	.000	.001	.000	.584	-.322	-.278	.000	.000	41.00
23	2.262	.000	2.262	.002	.252	.250	.351	.000	.001	.000	.352	-.102	-.088	.000	.000	41.00
24	1.957	.000	1.957	.002	.218	.216	.543	.000	.001	.000	.544	-.328	-.283	.000	.000	41.00
SEP 25	2.095	.000	2.095	.002	.233	.231	.096	.000	.001	.000	.097	.134	.116	.116	.000	43.38
26	2.235	.000	2.235	.002	.249	.247	.454	.000	.002	.001	.456	-.209	-.181	.000	.000	41.00
27	2.270	.000	2.270	.002	.253	.251	.039	.000	.001	.000	.040	.210	.182	.182	.000	44.73
OCT 28	2.972	.000	2.972	.002	.331	.329	.000	.000	.002	.001	.003	.326	.282	.195	.268	45.00
29	3.979	.000	3.979	.002	.443	.441	.320	.000	.002	.001	.323	.118	.102	.195	.102	45.00
30	2.801	.000	2.801	.002	.312	.310	.327	.000	.002	.001	.330	-.020	-.017	.178	.000	44.81
NOV 31	3.493	.000	3.493	.002	.389	.387	.000	.000	.002	.001	.003	.384	.332	.195	.313	45.00
32	8.732	.000	8.732	.002	.973	.970	.000	.000	.002	.001	.003	.967	.836	.195	.836	45.00
33	4.765	.000	4.765	.002	.531	.529	.000	.000	.002	.001	.003	.525	.454	.195	.454	45.00
DEC 34	3.117	.000	3.117	.002	.347	.345	.018	.000	.002	.001	.019	.326	.281	.195	.281	45.00
35	2.296	.000	2.296	.002	.256	.254	.047	.000	.002	.001	.050	.203	.176	.195	.176	45.00
36	1.937	.000	1.937	.002	.216	.214	.097	.000	.002	.001	.101	.113	.098	.195	.098	45.00
T(MCM)	112.1	.0	.0	.1	12.5	12.4	3.8	.0	.1	.0	3.7	1.029	1.029	.000	8.4	

***** WATER BALANCE OF SOUTHERN PALAWAN *****

CASE :EuM(SITE EuM),CROPPING PATTERN:1&II JUL2
BASIN AREA : 13.9 SQ.KM   EFFECTIVE STORAGE VOLUME : .195 MCM
PADDY WET: 307.0 ha   PADDY DRY: .0 ha   VEGETABLE1: 11.6 ha
CORN : 34.6 ha   BEANS DRY: 38.0 ha   VEGETABLE2: 11.6 ha
VEGETABLE3: .0 ha   VEGETABLE4: 72.0 ha   BEANS DRY: 43.2 ha
BEANS WET: 72.0 ha

UNIT:CU.M/SEC

YEAR 1990	Pinagsaluran RIVER						WATER DEMAND					BALANCE	RESERVOIR (UNIT:MCM)			WATER-LEVEL
	IN1	CIS	BALANCE (1)-(2)	MA	IN2	AWR 5-3-4	IRR	VWS	EVP	SPACE	TOTAL 7+8+9+10	6-11	*(12)		INY	(m)
Month	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
JAN 1	1.613	.000	1.613	.002	.180	.178	.110	.000	.003	.001	.114	.064	.055	.195	.055	45.00
2	1.348	.000	1.348	.002	.150	.148	.097	.000	.003	.001	.101	.047	.041	.195	.041	45.00
3	1.120	.000	1.120	.002	.125	.123	.114	.000	.003	.001	.118	.005	.005	.195	.005	45.00
FEB 4	.892	.000	.892	.002	.099	.097	.126	.000	.003	.001	.130	-.033	-.028	.167	.000	44.41
5	.693	.000	.693	.002	.077	.075	.124	.000	.003	.001	.128	-.053	-.046	.121	.000	43.48
6	.538	.000	.538	.002	.060	.058	.117	.000	.002	.001	.120	-.050	-.043	.078	.000	42.99
MAR 7	.466	.000	.466	.002	.052	.050	.125	.000	.002	.000	.128	-.078	-.067	.010	.000	41.31
8	.453	.000	.453	.002	.051	.049	.087	.000	.002	.000	.088	-.041	-.035	.000	.000	41.00
9	.444	.000	.444	.002	.049	.047	.047	.000	.002	.000	.048	-.001	-.001	.000	.000	41.00
APR 10	.434	.000	.434	.002	.048	.046	.013	.000	.002	.000	.016	.030	.026	.026	.000	41.53
11	.424	.000	.424	.002	.047	.045	.007	.000	.002	.000	.009	.037	.032	.057	.000	42.18
12	.540	.000	.540	.002	.060	.058	.000	.000	.002	.000	.002	.056	.048	.105	.000	43.16
MAY 13	.525	.000	.525	.002	.059	.056	.000	.000	.002	.001	.003	.054	.046	.152	.000	44.11
14	5.978	.000	5.978	.002	.666	.664	.000	.000	.002	.001	.003	.660	.571	.195	.527	45.00
15	4.118	.000	4.118	.002	.459	.457	.000	.000	.003	.001	.004	.453	.430	.195	.430	45.00
JUN 16	4.442	.000	4.442	.002	.495	.493	.000	.000	.002	.001	.003	.489	.423	.195	.423	45.00
17	2.771	.000	2.771	.002	.309	.307	.000	.000	.002	.001	.003	.303	.262	.195	.262	45.00
18	1.771	.000	1.771	.002	.197	.195	.000	.000	.002	.001	.003	.192	.166	.195	.166	45.00
JUL 19	1.489	.000	1.489	.002	.166	.164	.000	.000	.002	.001	.003	.161	.139	.195	.139	45.00
20	1.347	.000	1.347	.002	.150	.148	.346	.000	.002	.001	.349	-.201	-.174	.021	.000	41.44
21	1.119	.000	1.119	.002	.125	.123	.431	.000	.001	.000	.432	-.309	-.294	.000	.000	41.00
AUG 22	1.088	.000	1.088	.002	.121	.119	.467	.000	.001	.000	.468	-.349	-.301	.000	.000	41.00
23	2.928	.000	2.928	.002	.326	.324	.000	.000	.001	.000	.001	.323	.279	.195	.084	45.00
24	1.424	.000	1.424	.002	.159	.157	.697	.000	.002	.001	.700	-.543	-.516	.000	.000	41.00
SEP 25	1.854	.000	1.854	.002	.207	.204	.085	.000	.001	.000	.086	.118	.102	.102	.000	43.10
26	1.034	.000	1.034	.002	.115	.113	.392	.000	.002	.001	.394	-.281	-.243	.000	.000	41.00
27	2.140	.000	2.140	.002	.238	.236	.000	.000	.001	.000	.001	.235	.203	.195	.008	45.00
OCT 28	4.862	.000	4.862	.002	.541	.539	.000	.000	.002	.001	.003	.536	.463	.195	.463	45.00
29	5.773	.000	5.773	.002	.643	.641	.066	.000	.002	.001	.070	.571	.494	.195	.494	45.00
30	5.477	.000	5.477	.002	.610	.608	.000	.000	.002	.001	.003	.605	.575	.195	.575	45.00
NOV 31	7.554	.000	7.554	.002	.841	.839	.000	.000	.002	.001	.003	.836	.722	.195	.722	45.00
32	8.614	.000	8.614	.002	.959	.957	.000	.000	.002	.001	.003	.954	.824	.195	.824	45.00
33	5.944	.000	5.944	.002	.662	.660	.022	.000	.002	.001	.025	.635	.549	.195	.549	45.00
DEC 34	4.401	.000	4.401	.002	.490	.488	.000	.000	.002	.001	.003	.485	.419	.195	.419	45.00
35	2.978	.000	2.978	.002	.332	.330	.075	.000	.002	.001	.079	.251	.217	.195	.217	45.00
36	2.471	.000	2.471	.002	.275	.273	.079	.000	.002	.001	.083	.190	.164	.195	.164	45.00
T(MCM)	80.0	.0	.0	.1	8.9	8.8	5.2	.0	.1	.0	5.3	1.748	1.748	.000	6.6	

***** WATER BALANCE OF SOUTHERN PALAWAN *****

CASE :EuM(SITE EuM),CROPPING PATTERN:1&II JUL2
BASIN AREA : 13.9 SQ.KM   EFFECTIVE STORAGE VOLUME : .195 MCM
PADDY WET: 307.0 ha   PADDY DRY: .0 ha   VEGETABLE1: 11.6 ha
CORN : 34.6 ha   BEANS DRY: 38.0 ha   VEGETABLE2: 11.6 ha
VEGETABLE3: .0 ha   VEGETABLE4: 72.0 ha   BEANS DRY: 43.2 ha
BEANS WET: 72.0 ha

UNIT:CU.M/SEC

YEAR 1991	Pinagsaluran RIVER						WATER DEMAND					BALANCE	RESERVOIR (UNIT:MCM)			WATER-LEVEL
	IN1	CIS	BALANCE (1)-(2)	MA	IN2	AWR 5-3-4	IRR	VWS	EVP	SPACE	TOTAL 7+8+9+10	6-11	*(12)		INY	(m)
Month	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
JAN 1	2.077	.000	2.077	.002	.231	.229	.095	.000	.003	.001	.098	.130	.113	.195	.113	45.00
2	1.784	.000	1.784	.002	.199	.197	.094	.000	.003	.001	.097	.099	.086	.195	.086	45.00
3	1.477	.000	1.477	.002	.165	.162	.112	.000	.003	.001	.116	.046	.044	.195	.044	45.00
FEB 4	1.322	.000	1.322	.002	.147	.145	.032	.000	.003	.001	.037	.108	.094	.195	.094	45.00
5	1.269	.000	1.269	.002	.141	.139	.124	.000	.003	.001	.128	.011	.009	.195	.009	45.00
6	.910	.000	.910	.002	.101	.099	.117	.000	.003	.001	.121	-.022	-.019	.180	.000	44.66
MAR 7	.706	.000	.706	.002	.079	.077	.120	.000	.003	.001	.125	-.048	-.041	.136	.000	43.63
8	.544	.000	.544	.002	.061	.059	.053	.000	.003	.001	.057	.001	.001	.139	.000	43.68
9	.405	.000	.405	.002	.045	.043	.047	.000	.003	.001	.051	-.008	-.007	.132	.000	43.71
APR 10	.383	.000	.383	.002	.043	.041	.014	.000	.003	.001	.017	.023	.020	.152	.000	44.12
11	.374	.000	.374	.002	.042	.040	.004	.000	.003	.001	.008	.031	.027	.179	.000	44.66
12	.366	.000	.366	.002	.041	.039	.000	.000	.003	.001	.004	.034	.030	.195	.014	45.00
MAY 13	.337	.000	.337	.002	.040	.038	.000	.000	.003	.001	.004	.034	.029	.195	.029	45.00
14	.948	.000	.948	.002	.106	.103	.000	.000	.003	.001	.004	.099	.086	.195	.086	45.00
15	.494	.000	.494	.002	.055	.053	.000	.000	.003	.001	.004	.049	.040	.195	.040	45.00
JUN 16	7.666	.000	7.666	.002	.854	.852	.000	.000	.002	.001	.003	.848	.733	.195	.733	45.00
17	3.749	.000	3.749	.002	.418	.415	.000	.000	.002	.001	.003	.412	.356	.195	.356	45.00
18	1.822	.000	1.822	.002	.203	.201	.000	.000	.002	.001	.003	.198	.171	.195	.171	45.00
JUL 19	1.763	.000	1.763	.002	.196	.194	.000	.000	.002	.001	.003	.191	.165	.195	.165	45.00
20	2.558	.000	2.558	.002	.285	.283	.000	.000	.002	.001	.003	.280	.242	.195	.242	45.00
21	2.313	.000	2.313	.002	.258	.256	.190	.000	.002	.001	.193	.063	.054	.195	.054	45.00
AUG 22	2.392	.000	2.392	.002	.266	.264	.100	.000	.002	.001	.104	.161	.139	.195	.139	45.00
23	2.915	.000	2.915	.002	.325	.323	.465	.000	.002	.001	.467	-.144	-.124	.071	.000	42.44
24	2.147	.000	2.147	.002	.239	.237	.042	.000	.001	.000	.044	.193	.167	.195	.043	45.00
SEP 25	2.368	.000	2.368	.002	.255	.253	.000	.000	.002	.001	.003	.249	.216	.195	.216	45.00
26	4.069	.000	4.069	.002	.453	.451	.276	.000	.002	.001	.279	.172	.148	.195	.148	45.00
27	1.926	.000	1.926	.002	.214	.212	.613	.000	.002	.001	.616	-.404	-.349	.000	.000	41.00
OCT 28	3.221	.000	3.221	.002	.359	.357	.000	.000	.001	.000	.001	.356	.307	.195	.112	45.00
29	4.863	.000	4.863	.002	.542	.540	.000	.000	.002	.001	.003	.536	.463	.195	.463	45.00
30	7.667	.000	7.667	.002	.854	.852	.270	.000	.002	.001	.273	.579	.500	.195	.500	45.00
NOV 31	4.043	.000	4.043	.002	.450	.448	.172	.000	.002	.001	.175	.273	.236	.195	.236	45.00
32	2.706	.000	2.706	.002	.301	.299	.160	.000	.002	.001	.163	.136	.117	.195	.117	45.00
33	3.280	.000	3.280	.002	.365	.363	.000	.000	.002	.001	.003	.360	.311	.195	.311	45.00
DEC 34	2.497	.000	2.497	.002	.278	.276	.066	.000	.002	.001	.070	.206	.178	.195	.178	45.00
35	1.737	.000	1.737	.002	.194	.192	.073	.000	.002	.001	.076	.115	.099	.195	.099	45.00
36	1.554	.000	1.554	.002	.173	.171	.015	.000	.002	.001	.018	.153	.132	.195	.132	45.00
T(MCM)	70.9	.0	.0	.1	7.9	7.8	3.9	.0	.1	.0	3.0	.539	.539	.000	3.9	

Table 3.1.2 Cont'd
(Site : EuM)

***** WATER BALANCE OF SOUTHERN PALAWAN *****

CASE :EuM(SITE EuM),CROPPING PATTERN:I&II JUL2
BASIN AREA : 13.9 SQ.KM EFFECTIVE STORAGE VOLUME : .195 MCM
PADDY WET: 387.0 ha PADDY DRY: .0 ha VEGETABLE1: 11.6 ha
CORN : 34.8 ha BEANS DRY: 58.0 ha VEGETABLE2: 11.6 ha
VEGETABLE3: .0 ha VEGETABLE4: 72.0 ha BEANS DRY: 43.2 ha
BEANS WET: 72.0 ha

UNIT:CU.M/SEC

YEAR 1992 Month		Pinagsaluran RIVER IN1 (1)	CIS (2)	BALANCE (1)-(2) (3)	MA (4)	IN2 (5)	AVR 5-3-4 (6)	WATER DEMAND IRR (7)	VRS (8)	EVP (9)	SPAGE (10)	TOTAL 7+8+9+10 (11)	BALANCE 6-11 (12)	RESERVOIR (UNIT:MCM) =(12) (13)	(14)	INV (15)	WATER-LEVEL (m) (16)
JAN	1	1.420	.000	1.420	.002	.158	.156	.111	.000	.003	.001	.115	.041	.035	.195	.035	45.00
	2	1.072	.000	1.072	.002	.119	.117	.098	.000	.003	.001	.102	.015	.013	.195	.013	45.00
	3	.856	.000	.856	.002	.095	.093	.113	.000	.003	.001	.116	-.023	-.024	.171	.000	44.51
FEB	4	.650	.000	.650	.002	.072	.070	.122	.000	.003	.001	.126	-.056	-.048	.123	.000	43.52
	5	.477	.000	.477	.002	.033	.031	.124	.000	.002	.001	.127	-.096	-.066	.057	.000	43.17
	6	.335	.000	.335	.002	.040	.037	.104	.000	.002	.000	.106	-.069	-.054	.003	.000	41.07
MAR	7	.341	.000	.341	.002	.038	.036	.123	.000	.002	.000	.125	-.089	-.077	.000	.000	41.00
	8	.334	.000	.334	.002	.037	.035	.075	.000	.002	.000	.077	-.042	-.036	.000	.000	41.00
	9	.326	.000	.326	.002	.036	.034	.045	.000	.002	.000	.048	-.013	-.011	.000	.000	41.00
APR	10	.318	.000	.318	.002	.035	.033	.017	.000	.002	.000	.019	.015	.013	.013	.000	41.29
	11	.311	.000	.311	.002	.035	.033	.005	.000	.002	.000	.008	.028	.025	.035	.000	41.72
	12	.381	.000	.381	.002	.042	.040	.000	.000	.002	.000	.002	.038	.033	.068	.000	42.40
MAY	13	.296	.000	.296	.002	.033	.031	.000	.000	.002	.000	.002	.029	.025	.093	.000	42.90
	14	.384	.000	.384	.002	.043	.041	.000	.000	.002	.001	.003	.038	.033	.126	.000	43.36
	15	.283	.000	.283	.002	.031	.029	.000	.000	.002	.001	.003	.026	.025	.151	.000	44.09
JUN	16	.291	.000	.291	.002	.033	.030	.000	.000	.002	.001	.003	.028	.024	.175	.000	44.36
	17	.274	.000	.274	.002	.031	.028	.000	.000	.002	.001	.003	.025	.022	.195	.002	45.00
	18	3.669	.000	3.669	.002	.409	.407	.000	.000	.002	.001	.003	.403	.349	.195	.349	45.00
JUL	19	2.619	.000	2.619	.002	.292	.290	.000	.000	.002	.001	.003	.286	.247	.195	.247	45.00
	20	2.249	.000	2.249	.002	.251	.248	.000	.000	.002	.001	.003	.245	.212	.195	.212	45.00
	21	4.204	.000	4.204	.002	.468	.466	.000	.000	.002	.001	.003	.463	.440	.195	.440	45.00
AUG	22	3.139	.000	3.139	.002	.350	.348	.330	.000	.002	.001	.333	.015	.013	.195	.013	45.00
	23	3.561	.000	3.561	.002	.397	.395	.232	.000	.002	.001	.235	.159	.138	.195	.138	45.00
	24	2.199	.000	2.199	.002	.245	.243	.592	.000	.003	.001	.596	-.353	-.335	.000	.000	41.00
SEP	25	2.528	.000	2.528	.002	.282	.279	.000	.000	.001	.000	.001	.278	.241	.195	.048	45.00
	26	6.710	.000	6.710	.002	.747	.745	.000	.000	.002	.001	.003	.742	.641	.195	.641	45.00
	27	4.687	.000	4.687	.002	.522	.520	.314	.000	.002	.001	.317	.203	.175	.195	.175	45.00
OCT	28	3.641	.000	3.641	.002	.406	.403	.382	.000	.002	.001	.385	.019	.016	.195	.016	45.00
	29	3.906	.000	3.906	.002	.435	.433	.005	.000	.003	.001	.009	.424	.367	.195	.367	45.00
	30	4.180	.000	4.180	.002	.466	.463	.000	.000	.002	.001	.003	.460	.437	.195	.437	45.00
NOV	31	11.461	.000	11.461	.002	1.277	1.274	.000	.000	.002	.001	.003	1.271	1.098	.195	1.098	45.00
	32	12.446	.000	12.446	.002	1.385	1.384	.000	.000	.002	.001	.003	1.381	1.193	.195	1.193	45.00
	33	7.701	.000	7.701	.002	.858	.856	.000	.000	.002	.001	.003	.853	.737	.195	.737	45.00
DEC	34	4.633	.000	4.633	.002	.516	.514	.048	.000	.002	.001	.052	.462	.399	.195	.399	45.00
	35	3.690	.000	3.690	.002	.411	.409	.008	.000	.002	.001	.012	.397	.343	.195	.343	45.00
	36	2.981	.000	2.981	.001	.332	.330	.067	.000	.002	.001	.070	.260	.247	.195	.247	45.00
T(MCM)		86.4	.0	.0	.1	9.6	9.6	2.6	.0	.1	.0	2.7	.651	.651	.000	7.1	

***** WATER BALANCE OF SOUTHERN PALAWAN *****

CASE :EuM(SITE EuM),CROPPING PATTERN:I&II JUL2
BASIN AREA : 13.9 SQ.KM EFFECTIVE STORAGE VOLUME : .195 MCM
PADDY WET: 387.0 ha PADDY DRY: .0 ha VEGETABLE1: 11.6 ha
CORN : 34.8 ha BEANS DRY: 58.0 ha VEGETABLE2: 11.6 ha
VEGETABLE3: .0 ha VEGETABLE4: 72.0 ha BEANS DRY: 43.2 ha
BEANS WET: 72.0 ha

UNIT:CU.M/SEC

YEAR 1993 Month		Pinagsaluran RIVER IN1 (1)	CIS (2)	BALANCE (1)-(2) (3)	MA (4)	IN2 (5)	AVR 5-3-4 (6)	WATER DEMAND IRR (7)	VRS (8)	EVP (9)	SPAGE (10)	TOTAL 7+8+9+10 (11)	BALANCE 6-11 (12)	RESERVOIR (UNIT:MCM) =(12) (13)	(14)	INV (15)	WATER-LEVEL (m) (16)
JAN	1	2.533	.000	2.533	.002	.282	.280	.109	.000	.003	.001	.113	.167	.144	.195	.144	45.00
	2	2.162	.000	2.162	.002	.241	.239	.082	.000	.003	.001	.086	.153	.132	.195	.132	45.00
	3	1.822	.000	1.822	.002	.203	.201	.108	.000	.003	.001	.112	.089	.085	.195	.085	45.00
FEB	4	1.507	.000	1.507	.002	.168	.166	.125	.000	.003	.001	.129	.036	.033	.195	.033	45.00
	5	1.229	.000	1.229	.002	.137	.135	.123	.000	.003	.001	.128	.007	.006	.195	.006	45.00
	6	1.003	.000	1.003	.002	.112	.110	.117	.000	.003	.001	.121	-.012	-.008	.187	.000	44.83
MAR	7	.811	.000	.811	.002	.090	.088	.109	.000	.004	.001	.114	-.026	-.022	.165	.000	44.37
	8	.590	.000	.590	.002	.066	.064	.087	.000	.003	.001	.092	-.028	-.024	.141	.000	43.88
	9	.698	.000	.698	.002	.078	.076	.002	.000	.003	.001	.006	.070	.060	.195	.012	45.00
APR	10	.590	.000	.590	.002	.066	.064	.017	.000	.004	.001	.022	.042	.036	.195	.036	45.00
	11	.367	.000	.367	.002	.041	.039	.003	.000	.004	.001	.007	.031	.027	.195	.027	45.00
	12	.358	.000	.358	.002	.040	.038	.000	.000	.004	.001	.005	.033	.029	.195	.029	45.00
MAY	13	1.243	.000	1.243	.002	.138	.136	.000	.000	.003	.001	.004	.132	.114	.195	.114	45.00
	14	.488	.000	.488	.002	.054	.052	.000	.000	.003	.001	.004	.048	.042	.195	.042	45.00
	15	.704	.000	.704	.002	.078	.076	.000	.000	.003	.001	.004	.072	.069	.195	.069	45.00
JUN	16	1.810	.000	1.810	.002	.202	.200	.000	.000	.002	.001	.003	.196	.170	.195	.170	45.00
	17	3.278	.000	3.278	.002	.365	.363	.000	.000	.002	.001	.003	.360	.311	.195	.311	45.00
	18	2.186	.000	2.186	.002	.243	.241	.000	.000	.002	.001	.003	.238	.206	.195	.206	45.00
JUL	19	4.514	.000	4.514	.002	.503	.501	.000	.000	.002	.001	.003	.498	.430	.195	.430	45.00
	20	4.101	.000	4.101	.002	.457	.455	.341	.000	.002	.001	.345	.110	.095	.195	.095	45.00
	21	8.398	.000	8.398	.002	.935	.933	.000	.000	.002	.001	.003	.930	.804	.195	.804	45.00
AUG	22	8.602	.000	8.602	.002	.958	.956	.320	.000	.002	.001	.323	.633	.547	.195	.547	45.00
	23	5.221	.000	5.221	.002	.582	.579	.000	.000	.002	.001	.003	.576	.498	.195	.498	45.00
	24	4.758	.000	4.758	.002	.530	.528	.000	.000	.002	.001	.003	.525	.454	.195	.454	45.00
SEP	25	5.825	.000	5.825	.002	.649	.647	.208	.000	.002	.001	.211	.435	.376	.195	.376	45.00
	26	5.340	.000	5.340	.002	.595	.593	.000	.000	.002	.001	.003	.589	.509	.195	.509	45.00
	27	10.650	.000	10.650	.002	1.186	1.184	.057	.000	.002	.001	.061	1.123	.971	.195	.971	45.00
OCT	28	3.774	.000	3.774	.002	.420	.418	.289	.000	.002	.001	.292	.126	.109	.195	.109	45.00
	29	6.155	.000	6.155	.002	.685	.683	.202	.000	.002	.001	.205	.478	.413	.195	.413	45.00
	30	4.153	.000	4.153	.002	.463	.460	.000	.000	.002	.001	.003	.457	.395	.195	.395	45.00
NOV	31	3.333	.000	3.333	.002	.371	.369	.181	.000	.002	.001	.184	.185	.160	.195	.160	45.00
	32	4.038	.000	4.038	.002	.450	.448	.005	.000	.002	.001	.008	.440	.380	.195	.380	45.00
	33	6.847	.000	6.847	.002	.763	.761	.000	.000	.002	.001	.003	.757	.654	.195	.654	45.00
DEC	34	4.338	.000	4.338	.002	.483	.481	.000	.000	.002	.001	.003	.478	.413	.195	.413	45.00
	35	13.250	.000	13.250	.002	1.476	1.474	.000	.000	.002	.001	.003	1.470	1.270	.195	1.270	45.00
	36	4.710	.000	4.710	.002	.525	.523	.026	.000	.002	.001	.029	.493	.426	.195	.426	45.00
T(MCM)		115.5	.0	.0	.1	12.9	12.8	2.2	.0	.1	.0	2.3	.054	.054	.141	10.5	

***** WATER BALANCE OF SOUTHERN PALAWAN *****
<< SUMMARY >>

CASE :EuM(SITE EuM),CROPPING PATTERN:I&II JUL2
BASIN AREA : 13.9 SQ.KM EFFECTIVE STORAGE VOLUME : .195 MCM
PADDY WET: 387.0 ha PADDY DRY: .0 ha VEGETABLE1: 11.6 ha
CORN : 34.8 ha BEANS DRY: 58.0 ha VEGETABLE2: 11.6 ha
VEGETABLE3: .0 ha VEGETABLE4: 72.0 ha BEANS DRY: 43.2 ha
BEANS WET: 72.0 ha

ALL UNIT:MCM

YEAR	Pinagsaluran RIVER IN1 (1)	CIS (2)	BALANCE (1)-(2) (3)	MA (4)	IN2 (5)	AVR 5-3-4 (6)	WATER DEMAND IRR (7)	VRS (8)	EVP (9)	SPAG (10)	TOTAL 7+8+9+10 (11)	BALANCE 6-11 (12)	RESERVOIR =(12) (13)	(14)	INV (15)	
1977	98.4	.0	.0	.1	11.0	10.9	2.4	.0	.1	.0	2.5	.0	.007	.188	8.4	0
1978	150.7	.0	.0	.1	17.5	17.4	2.4	.0	.1	.0	2.5	.2	.190	.005	14.9	0
1979	120.9	.0	.0	.1	13.5	13.4	2.7	.0	.1	.0	2.8	.2	.191	.004	10.8	0
1980	138.2	.0	.0	.1	15.4	15.3	2.0	.0	.1	.0	2.1	.0	.017	.178	13.2	0
1981	118.1	.0	.0	.1	13.3	13.2	2.2	.0	.1	.0	2.3	.1	.078	.117	10.9	0
1982	98.3	.0	.0	.1	11.0	10.9	3.2	.0	.1	.0	3.3	.2	.208	.000	4.8	0
1983	127.1	.0	.0	.1	14.2	14.1	3.3	.0	.1	.0	3.4	.2	.330	.039	11.7	0
1984	119.8	.0	.0	.1	13.3	13.3	3.3	.0	.1	.0	3.4	.5	.460	.000	11.0	0
1985	120.7	.0	.0	.1	13.4	13.4	2.7	.0	.1	.0	2.8	.6	.778	.000	11.0	0
1986	135.1	.0	.0	.1	15.0	15.0	3.2	.0	.1	.0	3.3	.0	.000	.193	12.7	0
1987	98.2	.0	.0	.1	10.9	10.9	3.1	.0	.1	.0	3.2	1.1	1.092	.000	9.2	0
1988	103.6	.0	.0	.1	11.8	11.7	2.3	.0	.1	.0	2.4	.6	.816	.000	9.7	0
1989	112.1	.0	.0	.1	12.5	12.4	3.6	.0	.1	.0	3.7	1.0	1.029	.000	9.4	2
1990	80.0	.0	.0	.1	8.9	8.8	3.2	.0	.1	.0	3.3	1.7	1.748	.000	6.6	2
1991	70.9	.0	.0	.1	7.9	7.8	2.9	.0	.1	.0	3.0	.5	.530	.000	5.0	0
1992	86.4	.0	.0	.1	9.6	9.6	2.6	.0	.1	.0	2.7	.7	.651	.000	7.1	2
1993	115.5	.0	.0	.1	12.9	12.8	2.2	.0	.1	.0	2.3	.1	.054	.141	10.5	0

Table 3.1.3 Earthquake Analysis

	Hypocenter			Site	
	LAT (N2) (°)	LONG (E2) (°)	Ms Magnitude	R (Km)	A (cm/sec2)
1	12.67	120.96	5.2	436.8	0
2	11.63	121.88	5.6	434.2	0
3	12.19	120.66	5.5	374.1	0
4	12.67	120.49	5.2	407.2	0
5	8.92	121.19	5.2	298.8	0
6	12.25	121.04	5.4	406.5	0
7	12.69	121.93	5.3	511.0	0
8	12.23	120.30	5.1	354.4	0
9	12.90	120.20	5.1	414.2	0
10	11.58	121.49	5.4	394.9	0
11	11.51	121.39	5.9	381.3	0
12	11.36	121.18	5.2	352.6	0
13	11.00	120.00	6.1	225.9	0
14	13.00	120.20	5.0	424.2	0
15	8.00	121.00	6.3	319.9	0
16	11.00	120.00	5.7	225.9	0
17	12.60	121.60	5.7	477.7	0
18	13.00	120.00	5.0	415.2	0
19	13.00	120.30	5.0	429.1	0
20	12.00	119.00	5.8	276.7	0
21	9.00	118.00	5.5	89.0	0.035793
22	11.00	120.00	5.0	225.9	0
23	12.28	121.17	5.2	418.8	0
24	13.10	120.80	5.0	466.0	0
25	13.02	120.83	5.0	460.3	0
26	13.20	121.50	5.1	520.2	0
27	13.46	120.33	5.0	476.8	0
28	13.80	120.70	5.1	528.6	0
29	13.50	120.50	5.0	488.8	0
30	13.60	120.54	5.2	500.8	0
31	13.78	120.71	5.4	527.1	0
32	13.28	121.36	5.5	517.8	0
33	13.76	120.84	5.0	531.8	0
34	13.40	120.80	5.3	494.6	0
35	13.98	120.74	5.1	548.5	0
36	13.82	119.91	5.0	497.8	0
37	13.57	120.06	5.2	476.8	0
38	13.96	120.87	5.0	553.1	0
39	13.67	120.55	5.1	508.3	0
40	11.52	121.89	5.3	428.7	0
41	13.80	120.80	5.3	533.7	0
42	10.00	122.00	5.1	383.9	0
43	10.73	121.78	5.0	379.6	0
44	10.47	121.50	6.3	340.7	0
45	13.10	121.57	5.7	516.6	0
46	13.23	120.58	5.7	466.2	0
47	12.80	119.90	5.4	390.4	0

(Note)

① The earthquake data are originated from PAGASA.

② Dam Site Latitude N1= 9.55 (°)

Longitude E1= 118.58 (°)

A:Mean peak acceleration (in cm/sec2)

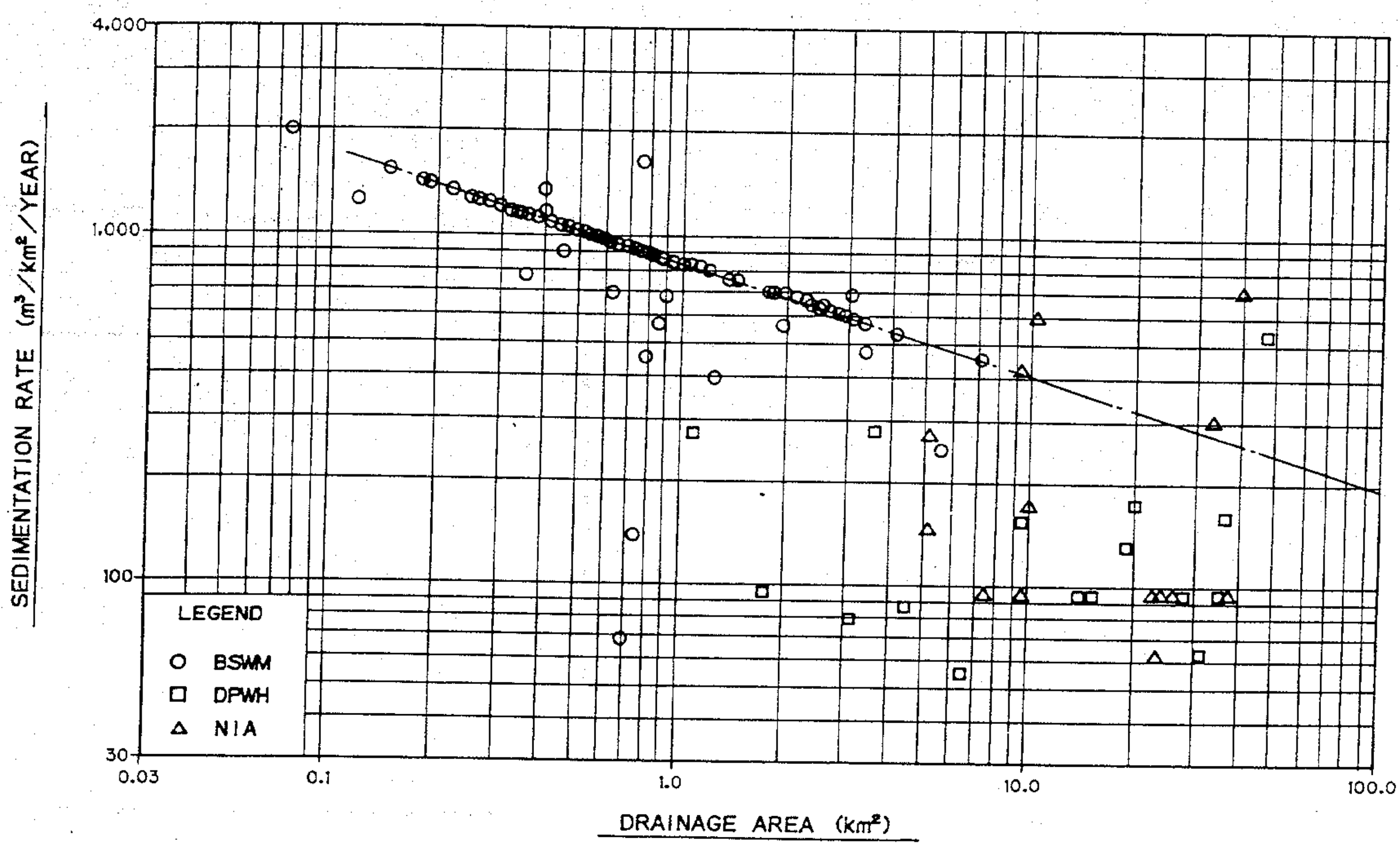
Log A = 0.41Ms-Log(R+0.032×10^0.41Ms)-0.034R+1.3

R:Shortest distance between the site and the hypocenter

R =(ER× π /180)√((N1-N2)^2+(E1-E2)^2) (Km)

Where ER = 6,377 Km

Figure 3.1.1 Sedimentation Rate-Drainage Relationship



Source : The Water Plan Study on The Small Water
Impounding Management (SWIM)/SEp. 1989 'JICA

Figure 3.1.2 Basic Concept of Proposed Water Utilization
(at Inagawan and Pinagsarulan Rivers)

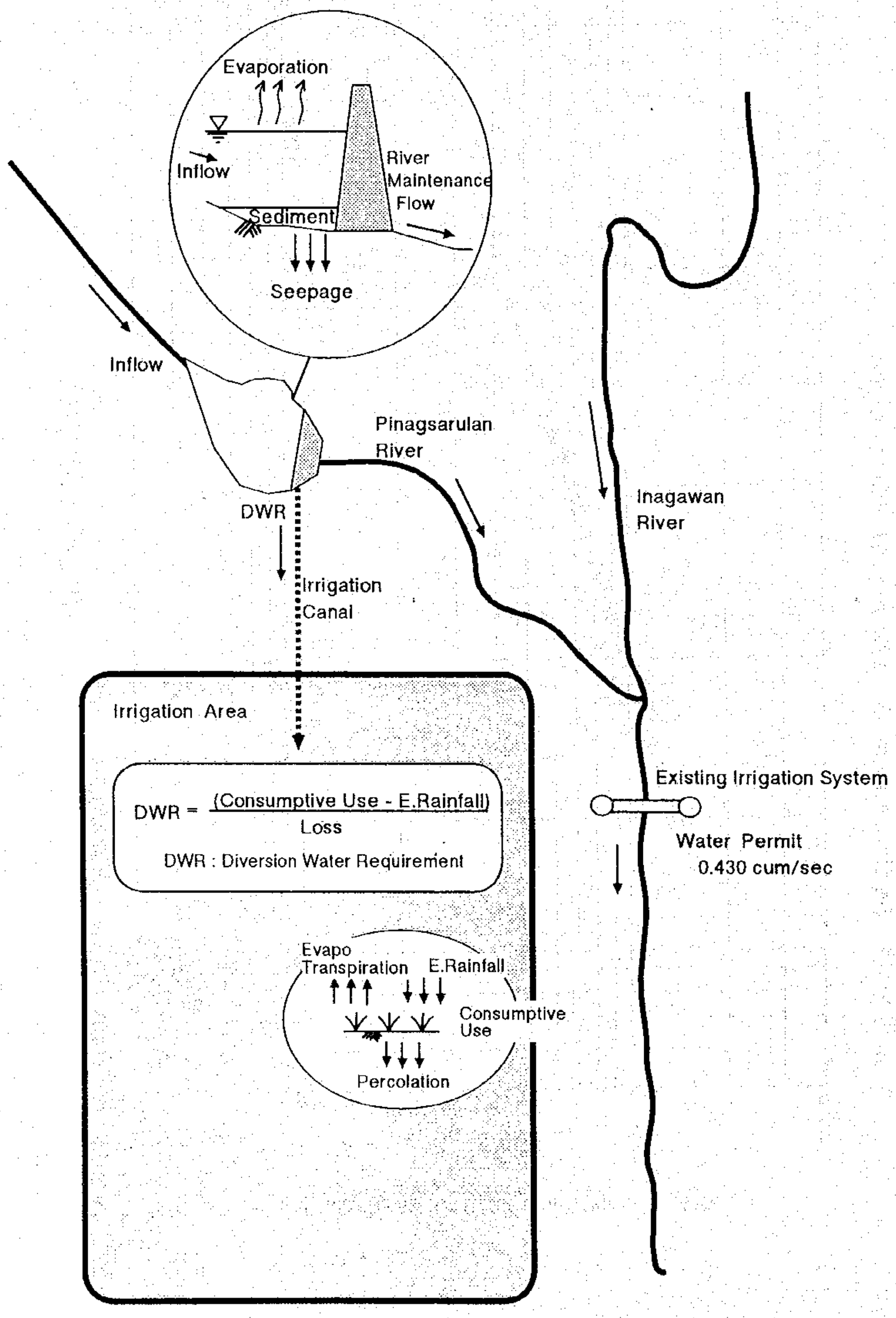


Figure 3.1.3 Results of Reservoir Operation (Site EuM)

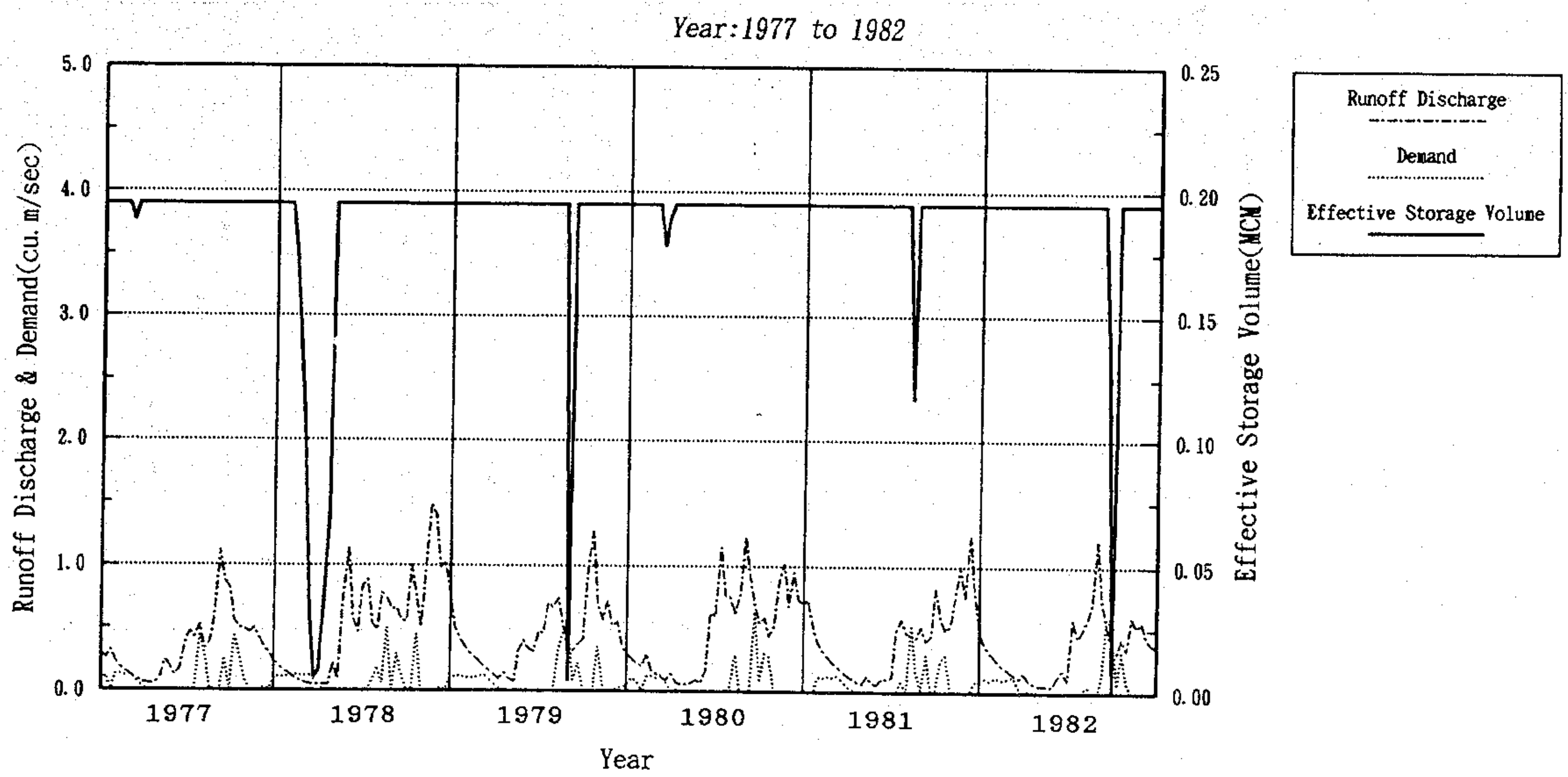


Figure 3.1.3 Cont'd
(Site : EuM)
Year:1983 to 1988

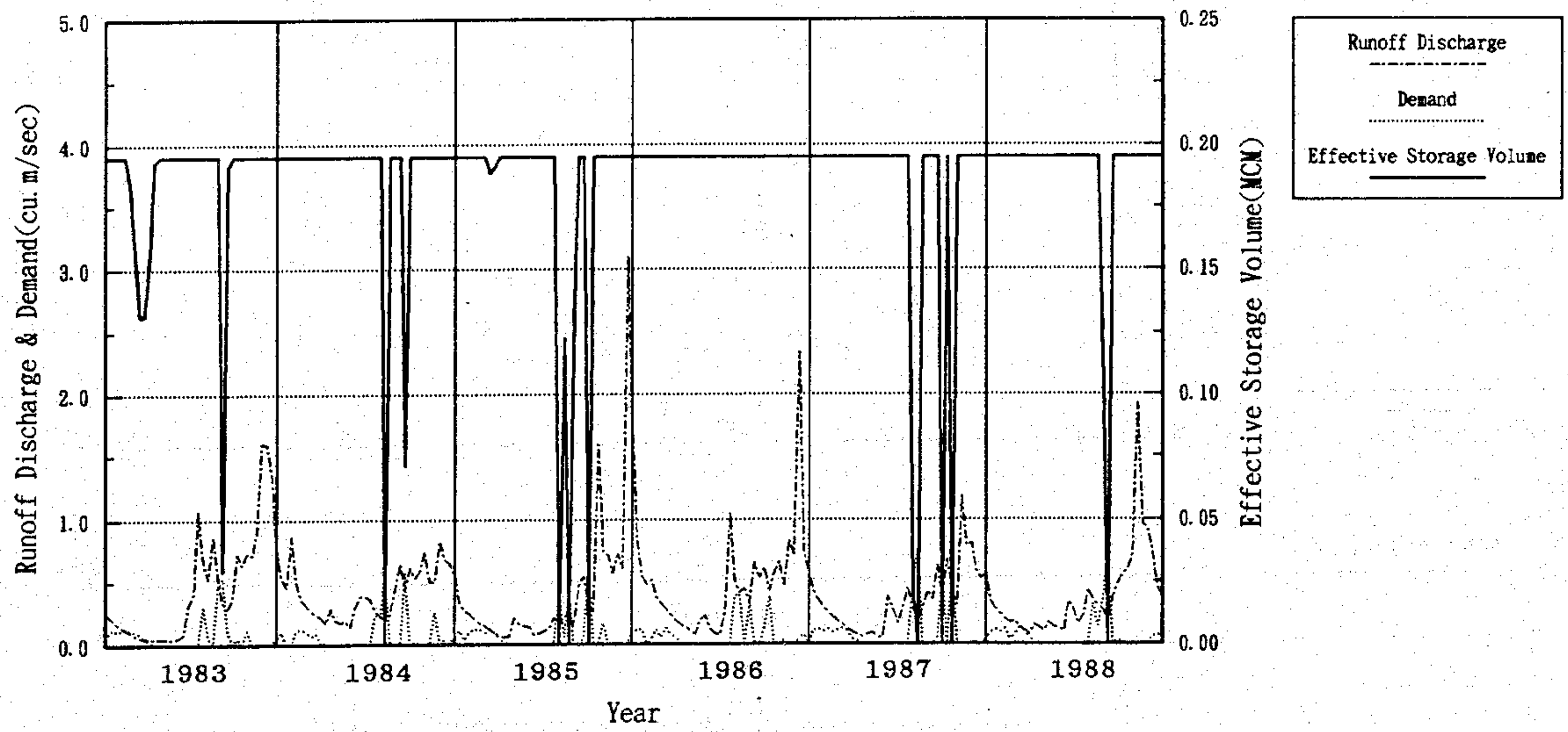


Figure 3.1.3 Cont'd
(Site : EuM)
Year:1989 to 1993

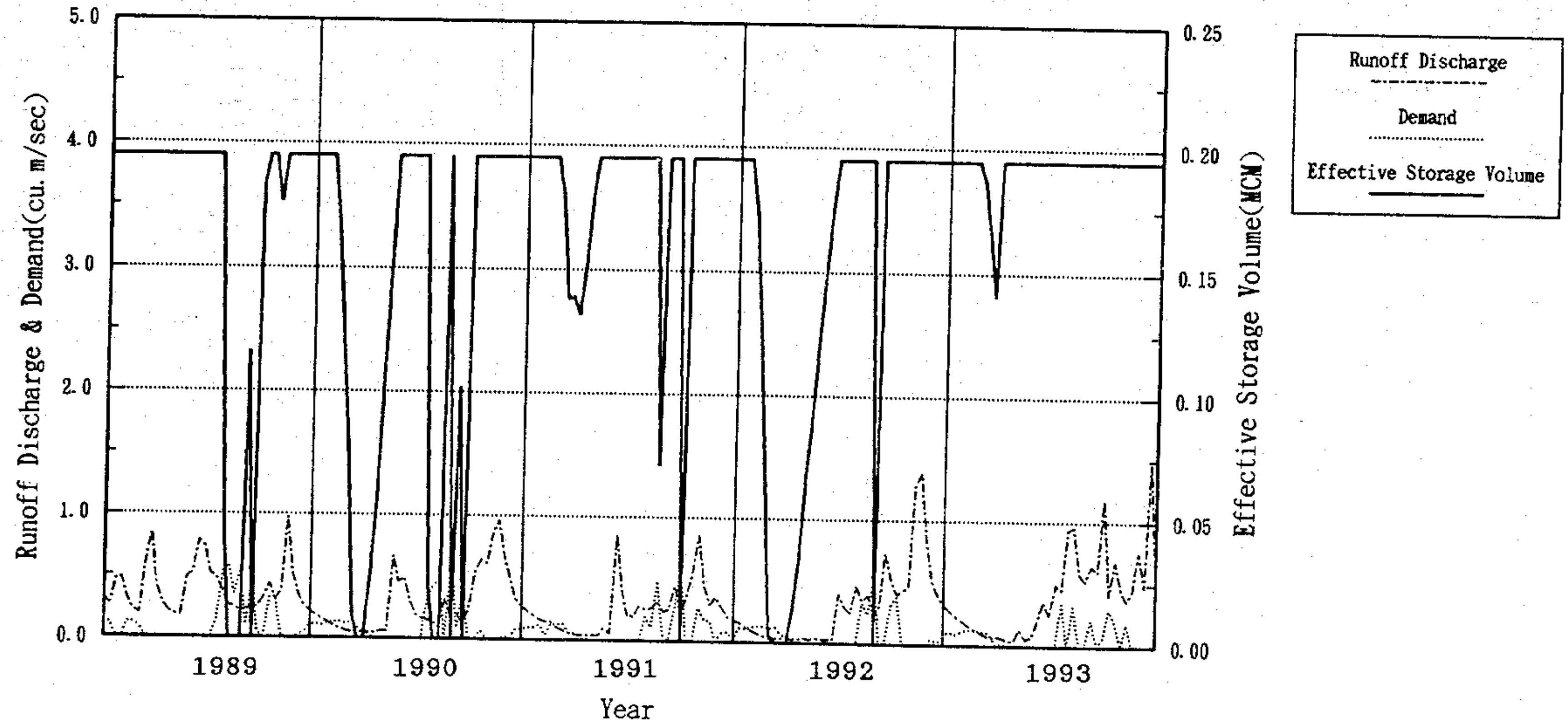
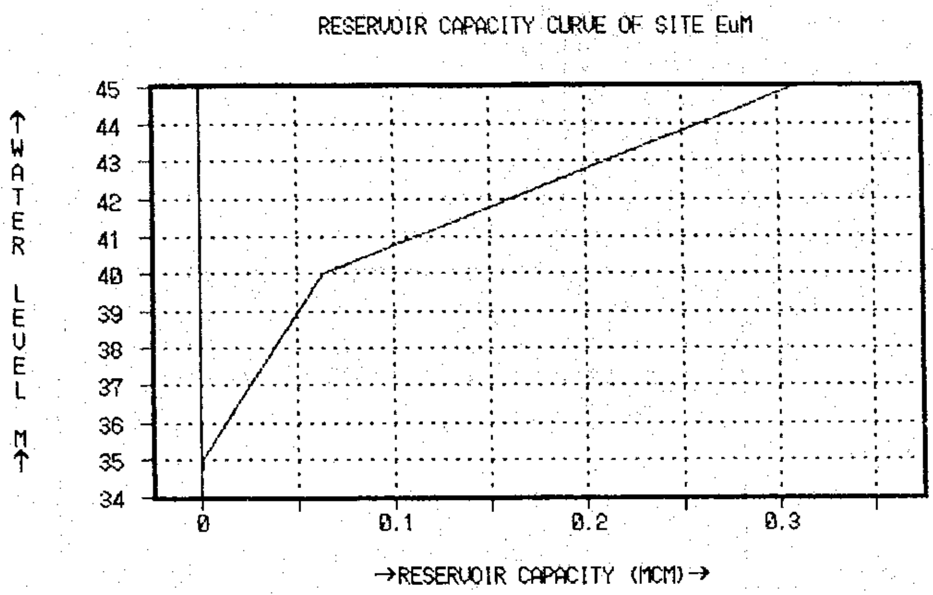
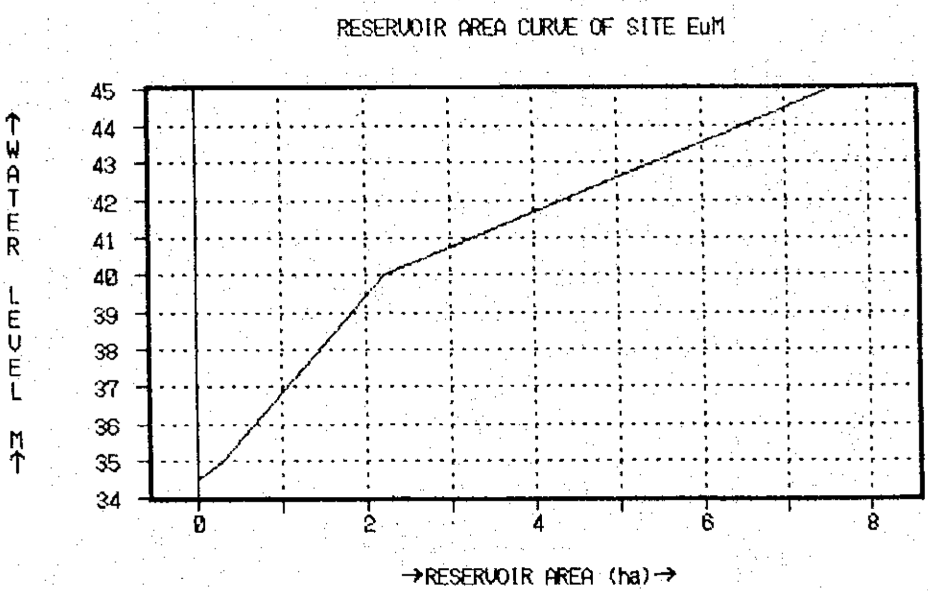


Figure 3.1.4 Reservoir Capacity and Area Curve (Site EuM)

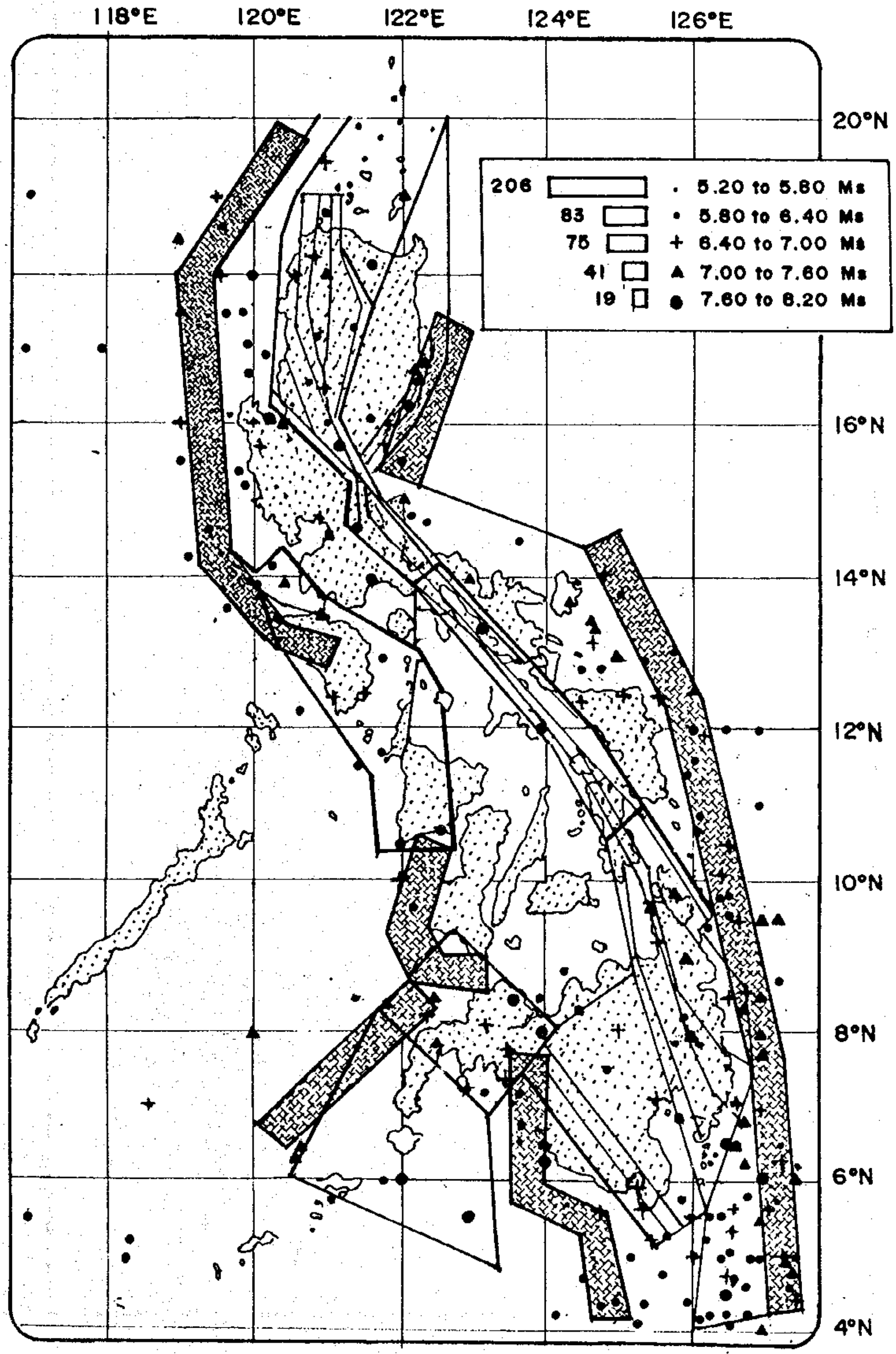




SITE EuM H-A.Q

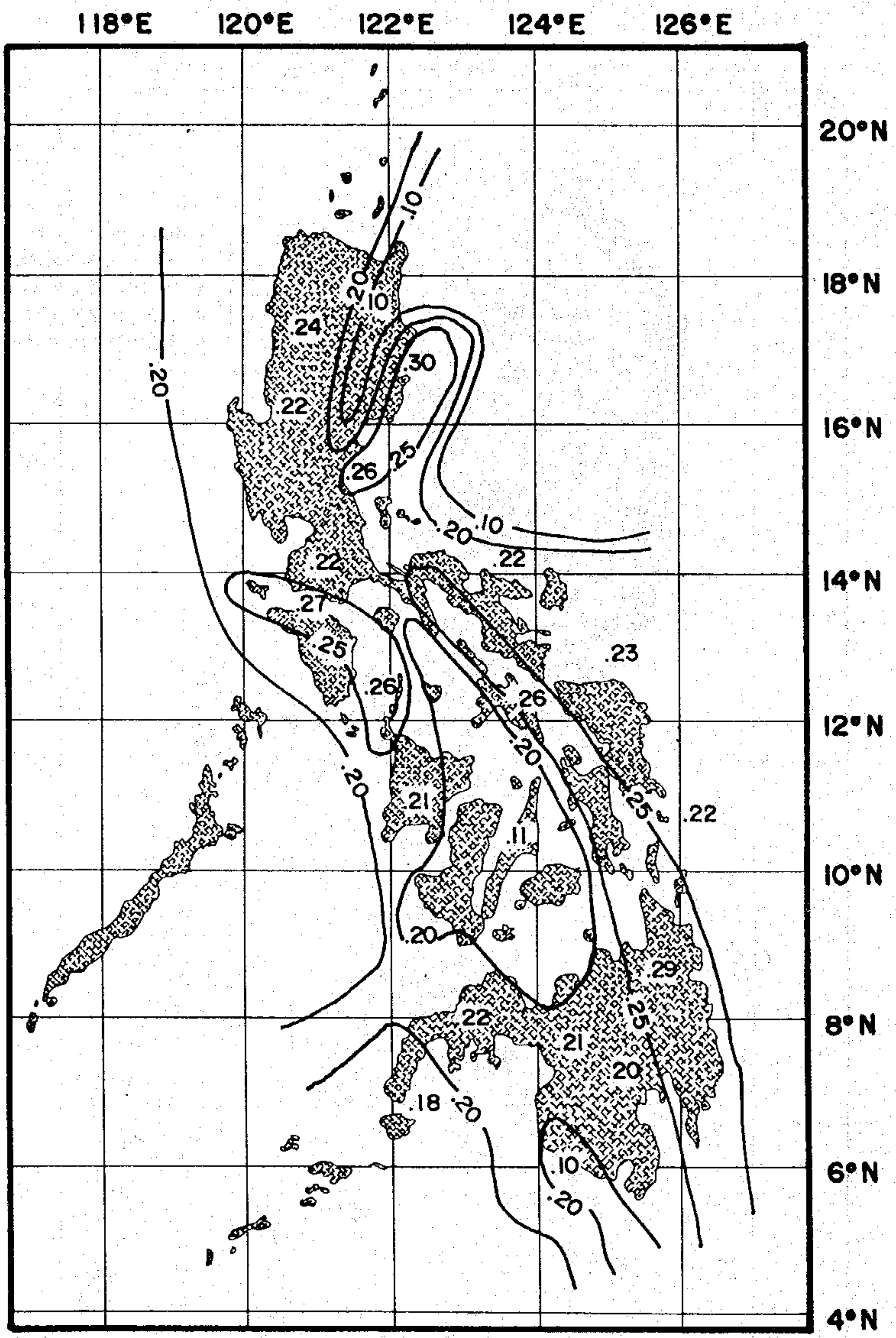
WL(m)	H(m)	A(ha)	Av.A(ha)	Q(MCM)	Ac.Q(MCM)
34.50	0.00	0.00			0.000
35.00	0.50	0.30	0.15	0.001	0.001
40.00	5.00	2.21	1.26	0.063	0.064
45.00	5.00	7.58	4.90	0.245	0.308

Figure 3.1.5 Main Shock Earthquakes in the Philippines



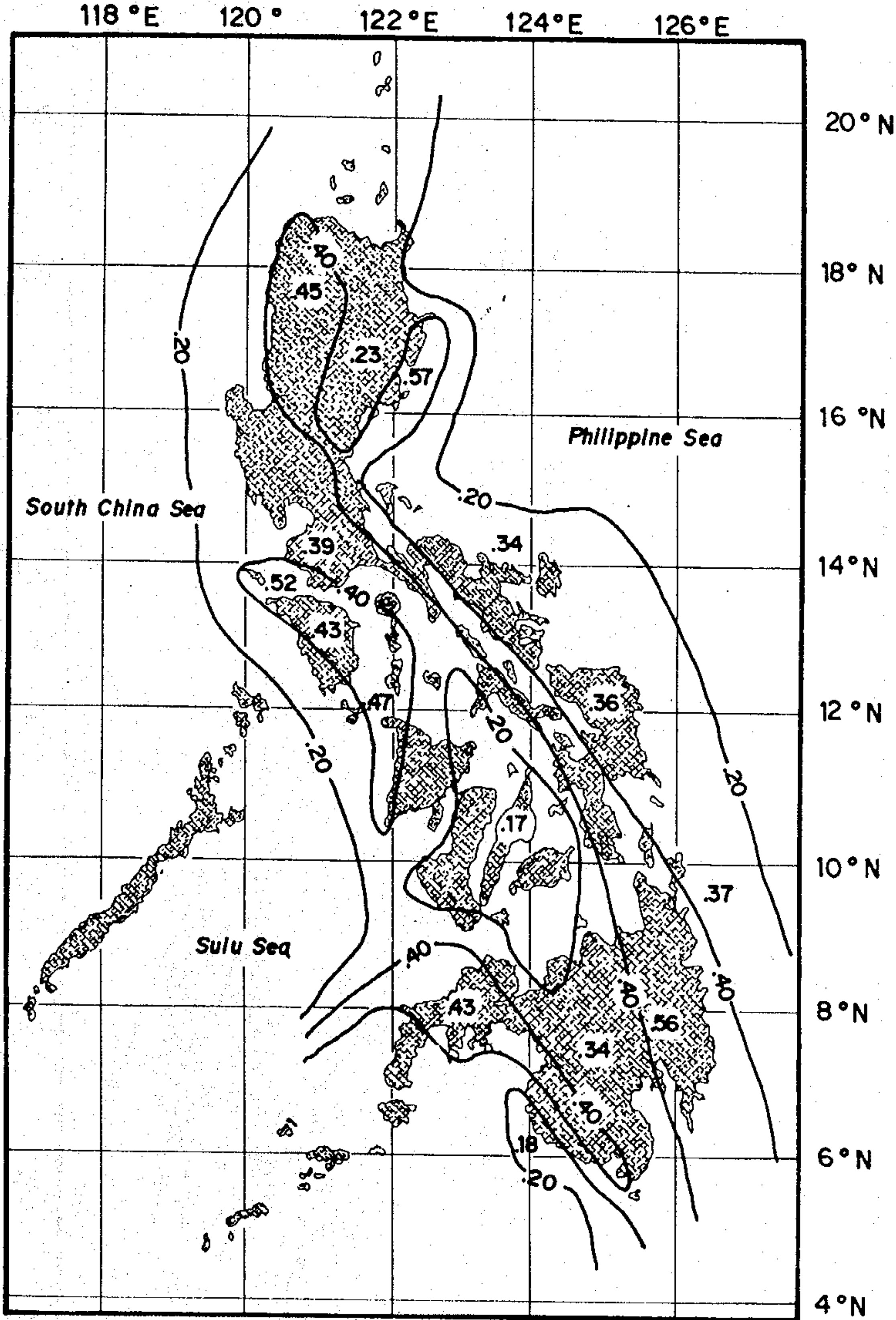
SOURCE ; REPORT ON ESTIMATES OF THE REGIONAL GROUND-MOTION HAZARD IN THE PHILIPPINES (PHIVOLCS)

Figure 3.1.6 Map of Peak Horizontal Acceleration of Gravity in Rock
(a 10 percent of Exceedance in 50 Years)



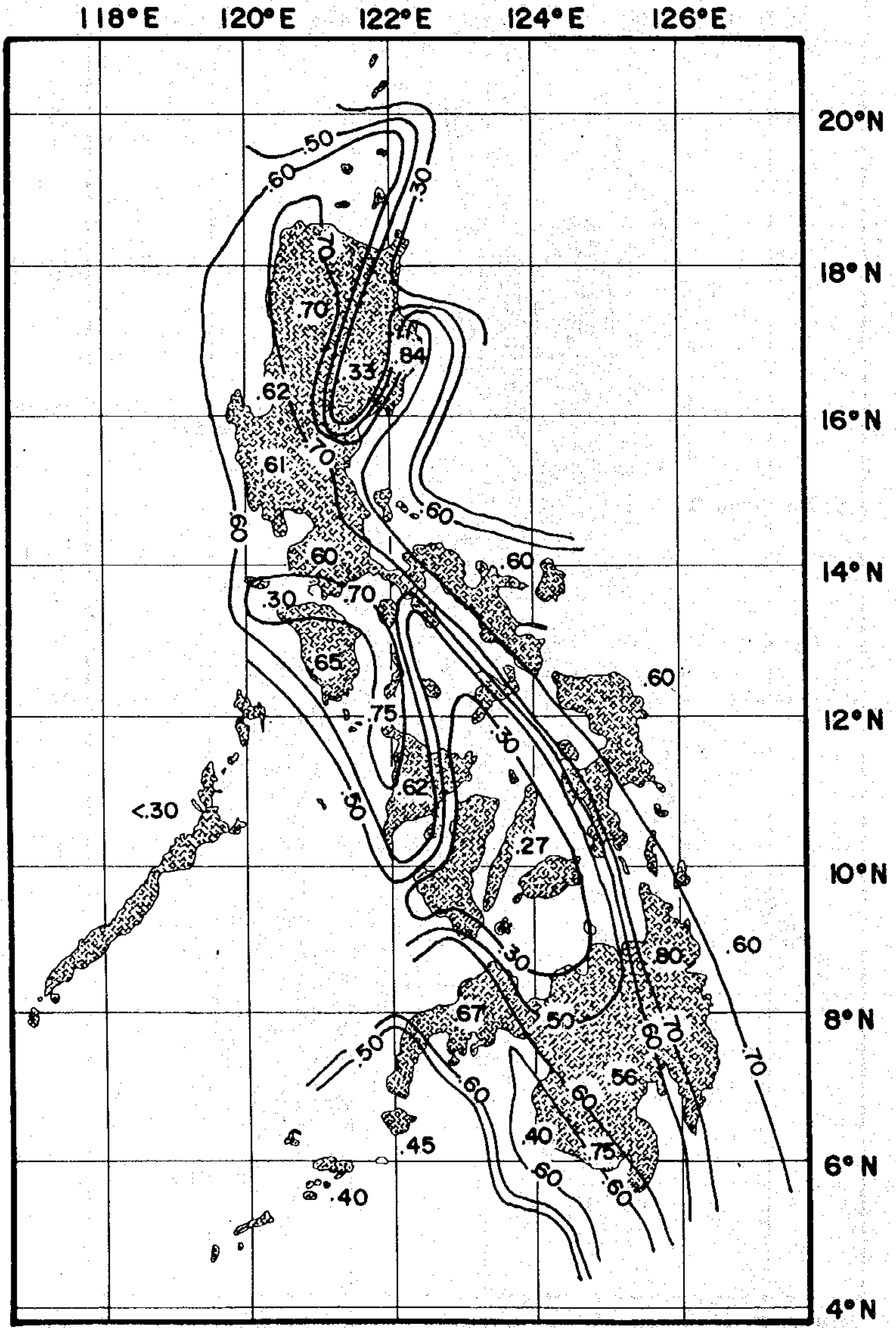
SOURCE : REPORT ON ESTIMATES OF THE REGIONAL GROUND-MOTION HAZARD IN THE PHILIPPINES (PHIVOLCS).

Figure 3.1.7 Map of Peak Horizontal Acceleration of Gravity in Medium Soil
(a 10 percent of Exceedance in 50 Years)



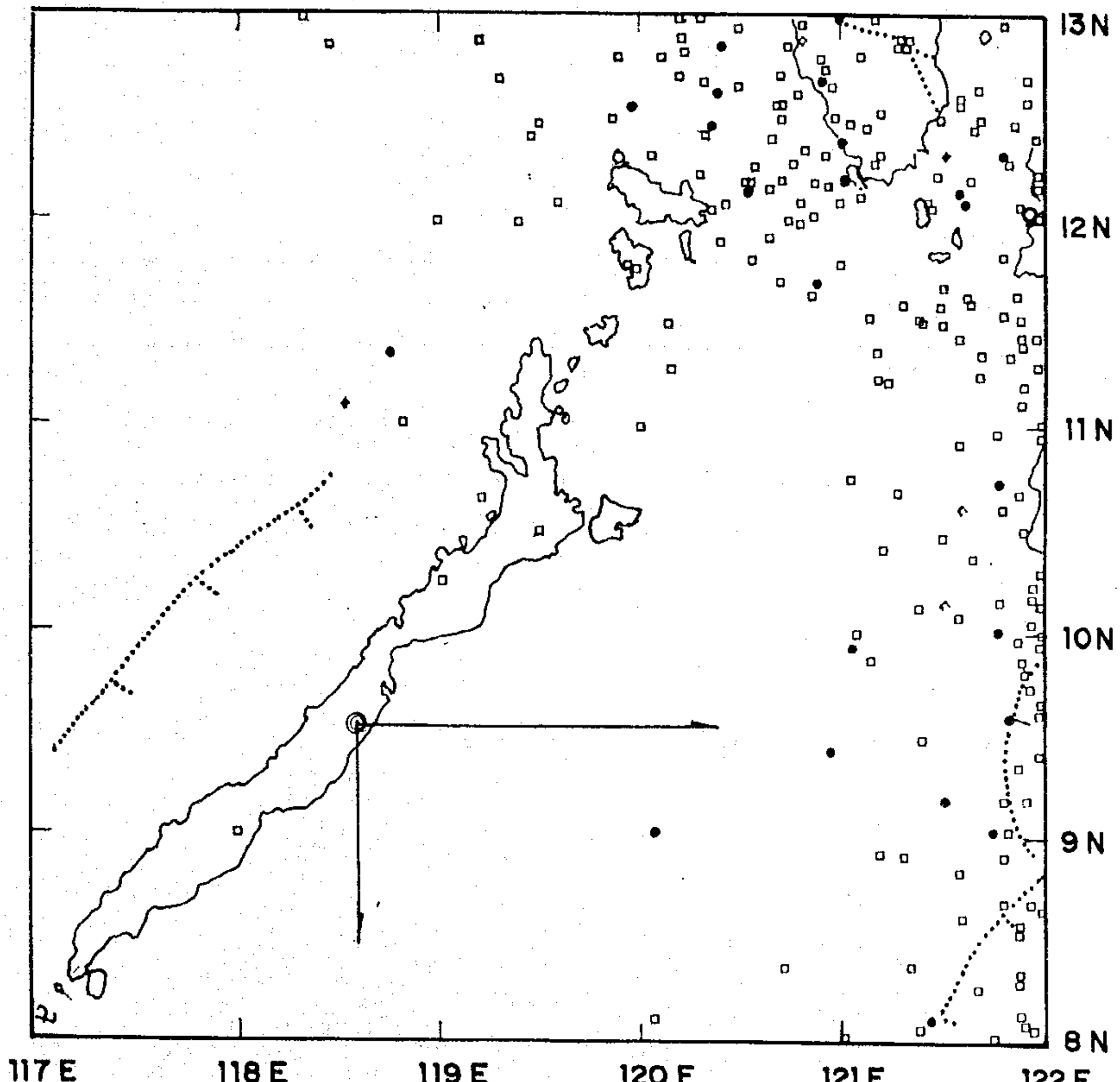
SOURCE : *REPORT ON ESTIMATES OF THE REGIONAL GROUND - MOTION HAZARD IN THE PHILIPPINES (PHIVOLCS).*

Figure 3.1.8 Map of Peak Horizontal Acceleration of Gravity
(a 10 percent of Exceedance in 50 Years)



SOURCE : REPORT ON ESTIMATES OF THE REGIONAL GROUND-MOTION HAZARD IN THE PHILIPPINES (PHIVOLCS).

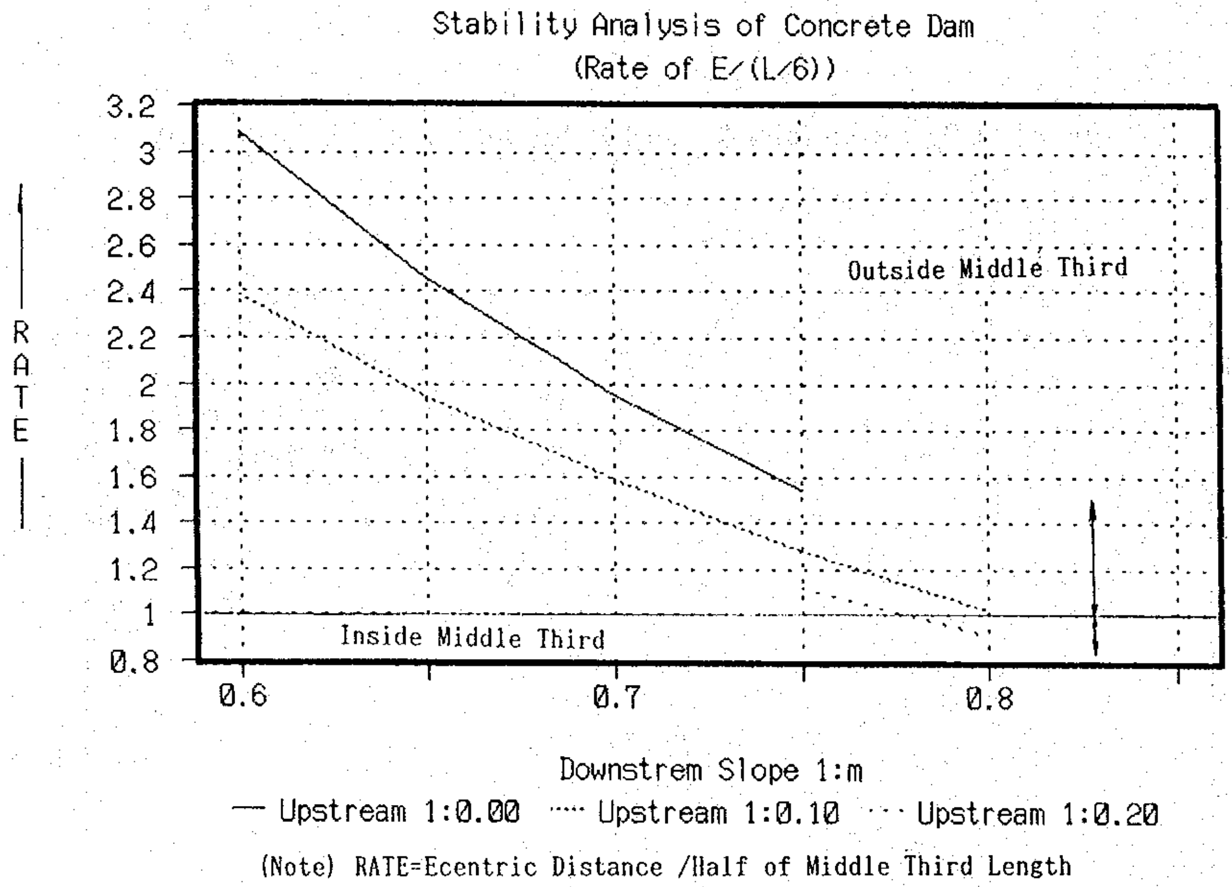
Figure 3.1.9 Seismicity Map of Palawan Islands and Vicinity

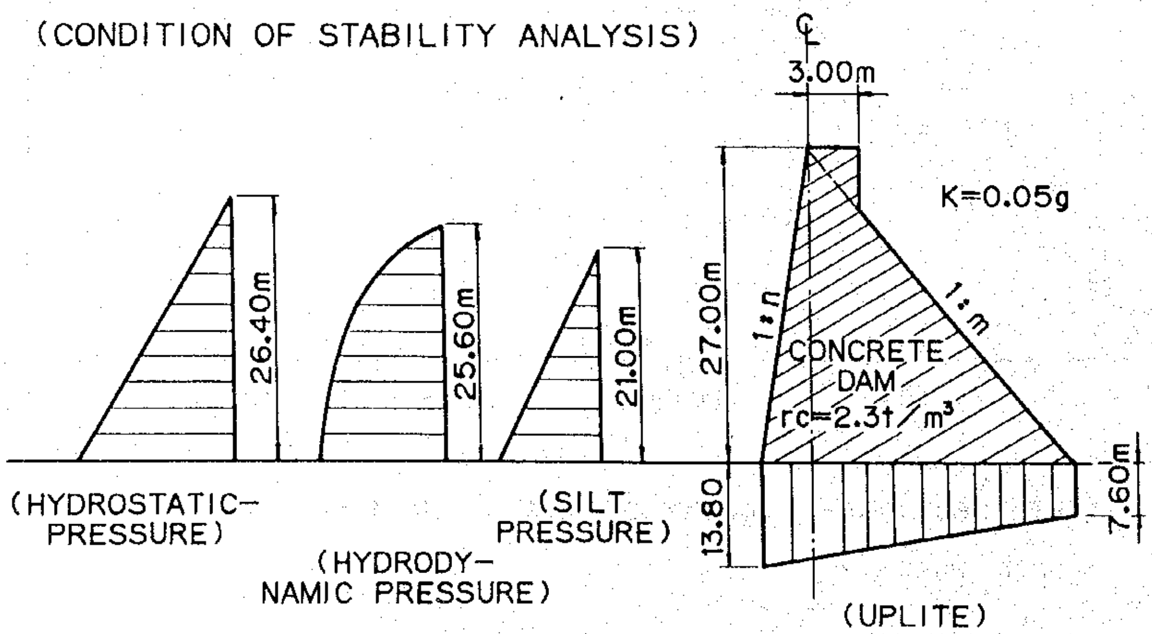


TIME: 1960-1993 MAGNITUDE: 3.4 DEPTH: 009

SOURCE: PHIVOLCS

Figure 3.1.10 Example on Stability Analysis of Concrete Dam





3.2 Irrigation and Drainage

3.2.1 Present Conditions

1) Irrigation Condition

a) Present Situation

Palawan province has 17,800 ha irrigation areas, equivalent to 33% of 54,500 ha potential irrigable land. These irrigation systems are composed of national, communal and individual pump irrigation systems under NIA, private systems and other government agencies. These facts indicate that Palawan has a low level of irrigation development, next to Mindanao Island.

However, under the SPIADP, a total of 15 communal irrigation projects will be constructed and five existing communal irrigation systems will be rehabilitated within the next four years thereby increasing the percentage of irrigation development of the province. About 410 ha irrigation service area, or about 10% of the total 4,370 ha irrigable land in Puerto Princesa City is generated. Puerto Princesa City may be one of the area having the lowest irrigation condition in the nation. About 350 ha out of 410 ha is located south of the national road forming southeast boundary of the Study Area. The features of said existing irrigation systems are as follows; (refer to Figure 3.2.1)

Project Name	Service Area	Household	Water Right	Planted Area (ha, in 1993)	
				Wet Season	Dry Season
	(ha)		(lit/sec)		
Inagawan Sub-colony	80	Colony	100	80	60
Inagawan CIS	270	about 90	330	220	200

Note: Water source is the Inagawan river

b) The Study Area

In the Study Area, no irrigation system is available and rainfed farming is adopted except in certain areas where water is available from the three (3) natural springs with 2 to 3 lit/min yield.

c) Results of Field Tests

For the purpose of determining the field percolation rate in the paddy land and intake rate in the upland, field tests were carried out during the dry and rainy season, by using the quick percolation rate measuring apparatus and cylinder infiltrometer, respectively. The following are the results;

(Percolation Test for Paddy Field)

Dry Season;

- Date	Feb. 1994
- Location	Farm lot No.44 in Tagumpay Settlement
- Meteorology	Fine weather, Temperature 33°C Breeze
- Type of soil	Loamy clay (dark brown)
- Percolation rate	3.1 mm/day (average)

Rainy Season;

- Date	Aug. 24, 1994
- Location	Existing paddy field
- Meteorology	Fine, cloudy later, Temp. 28 to 30°C
- Percolation rate	7.9 mm/day in average (0 to 14 mm/d)

(Intake Rate Tests for Upland)

Dry Season;

- Date	Feb. 20, 1994		
- Meteorology	Fine weather, Temperature 33 - 35°C Breeze		
- Location	Farm lot in Tagumpay settlement		
	No.48	No.19	No.56
- Type of soil	clay loam w/gravel (light)	sandy loam (gray)	clay loam w/gravel (light brown)
- Test method	cylinder	cylinder	cylinder
- Basic intake rate (Ib)	18.4 (mm/day)	96.3 (mm/day)	20.4 (mm/day)

Rainy Season;

- Date	Sep. 5, 1994	
- Location	1) Western upper part of bombing range 2) Near Kamuning along the highway	
- Meteorology	Fine, cloudy later, Temp. 30°C	
	Site 1)	Site 2)
- Type of soil	Silty loam	Sandy loam
- Basic intake rate	3.3 mm/day	3.3 mm/day

(refer to Table 3.2.1 and Figure 3.2.2 to 3.2.4)

The percolation rates in the dry and rainy season were 3.1 and 2.0 mm/day, respectively, at the same place measured. These rates corresponded with the standard figure in Palawan area, but the average rate of 8.0 mm/day in the rainy season was higher than the ordinal figure in the paddy field, which may occur due to unconsolidated foundation of the land, that is, newly developed area.

With regard to the intake rate, surface irrigation method which is applicable for less than 50 mm/day percolation rate will be adopted on the clayey lands, but for the sandy lands the application of sprinkler irrigation method or other methods including perforated pipe irrigation method will be considered, as the rate is more than 75 mm per day.

d) O&M of Inagawan CIS

The Inagawan CIS was constructed by NIA after receiving the water right for the project from NWRB on April 1985. In the initial stage, NIA assured the operation and maintenance works for the system. But in January 1993, the Inagawan-Kamuning Irrigators' Service Association organized by 90 farmers took charge of such works as collection of water charge, maintenance of on-farm facilities (cutting weeds and cleaning silt in canal) and informing the water demand schedule to NIA, while NIA is responsible for the operation and maintenance of the diversion dam including repair of the canal systems. The composition of the organization is as follows:

President	1 person,	Vice president	1 person
Secretary	1 person,	Board Member	5 persons
Ordinary Member	82 persons		

2) Drainage Condition

The Study Area has generally varying elevations from 5 to 100 m from the mountainous area toward the sea.

Four (4) major water courses of streams and creeks with direction of south-east, about 35 km in total length excluding the Inagawan and Pinagsaluran rivers, run across the area. These water courses have water flow in the rainy season although no and/or few flow can be observed in the dry season.

Smooth passage of vehicle is quite difficult during and/or after the rain in the Study Area due to its soil property, but two (2) or three (3) days after the rain stop, these conditions are improved. This fact shows that the existing rivers and creeks function sufficiently as drainage system in the Area. Therefore, these streams and creeks can be used as part of the drainage system in the Study Area.

3.2.2 Development Plan

1) General

Regarding the irrigation development plan in the Study Area, staple and cash crops such as paddy, upland crops and vegetables are proposed to be irrigated. The fruit trees will be planted in rainfed areas due to restrictions as to topography and elevation conditions.

Proposed irrigation component includes the water resources and irrigation system up to 30 to 50 ha block, and on-farm facilities for effective utilization of the system.

Generally, furrow irrigation method will be adopted for upland field crops and vegetables.

2) Irrigation Water Requirement

The diversion water requirement (DWR) for irrigation is estimated based on the proposed two cropping calendars, Type I (Wet season paddy + Dry season upland crop, vegetable) and Type II (Full season upland crop and vegetable). DWR is the total amount of water diverted from a source for evapotranspiration, percolation, field loss, conveyance loss and operation loss less effective rainfall in the field. In addition to the water for growing period mentioned above, water for nursery beds and land preparation is required for paddy cultivation.

DWR is estimated by the following formula;

- Net water requirement (NWR) = Crop consumptive use + Percolation + Water requirement for land preparation
- Diversion water requirement (DWR) = Net water requirement - Effective rainfall + Losses (Field, Conveyance and Operation)

a) Crop Consumptive Use (Cu)

The estimate for crop consumptive use was conducted based on the FAO Irrigation and Drainage Paper No.24 owing to no available data observed.

Where, Crop consumptive use (Cu) = Evapotranspiration (ETr) × Crop factor(Kc)

The evapotranspiration was estimated based on the Aborlan climate data (PAGASA, 17 years duration from 1977 to 1993) by applying the modified Penman Method as follows:

Evapotranspiration (ETR)

Month	1	2	3	4	5	6	7	8	9	10	11	12
Kc	3.6	4.1	5.2	5.4	4.7	3.8	3.7	3.8	3.8	3.6	3.6	3.7

The crop factors for main crops were employed as follows:

10d	1	2	3	4	5	6	7	8	9	10	11	12
Pad.	1.08	1.10	1.10	1.08	1.05	1.02	0.98	0.93	0.88			
V. A	0.52	0.60	0.77	0.97	1.05	1.08	1.07	0.97	0.75			
V. B	0.53	0.54	0.57	0.62	0.72	0.83	0.88	0.91	0.92	0.89	0.84	0.78
Bean	0.52	0.58	0.67	0.80	0.94	1.02	1.07	1.05	0.93	0.65	0.30	
Corn	0.49	0.56	0.67	0.89	1.02	1.08	1.07	1.00	0.78			

Note 10d : 10 days   Pad.: Paddy
V. A : Vegetable A (Tomato and others)
V. B : Vegetable B (Watermelon and others)

b) Percolation

The results of field test for the representative paddy field in the Study Area were 3.1 mm/day in the dry season and 2.0 to 3.0 mm/day in the rainy season. Therefore the field percolations for dry and wet season will be designed at 3.0 and 2.5 mm/day, respectively.

c) Water for Land Preparation

Soil saturation and submergence water during land preparation period in the paddy field are required for continuous 30 days before plantation. Further, the evaporation and percolation requirement during these period shall be taken into account.

Item	Dry Season (Dec. to May)	Wet Season (Jun. to Nov.)
- Soil saturation requirement	110 mm	110 mm*1
- Submergence requirement	50 mm	50 mm*1
- Evaporation	4.9 mm/day	3.4 mm/day*2
- Percolation	3.0 mm/day	2.5 mm/day
Total	397 mm (400 mm)	337 mm (340 mm)

(Note) *1 : Based on 7th Operation & Maintenance Plan by NIA System in Palawan
*2 : Based on Aborlan climate data (average evaporation)

Consequently 400 and 340 mm of land preparation water are adopted for the dry and wet season respectively. The area of nursery bed will be 5% of the paddy field and seedling be made for 30 days before plantation of paddy. The water requirement for seedling is included with the land preparation water described above.

d) Effective Rainfall

The effective rainfall is the quantity of rain effectively used in the irrigation service area. Since there are no available data observed concerning the effective rainfall, the estimate of effective rainfall is made in accordance with NIA's guideline for planning and design, such that the effective rainfall shall be less than 80 mm per 10 days.

e) Irrigation Efficiency

A part of the irrigation water will be lost during the conveyance and operation from the source to the field, and lost in the field at a rate depending upon irrigation method and field conditions. Referring to the NIA's guideline for planning and design, and 7th Operation and Maintenance Plan, the irrigation efficiency is established as follows:

Efficiency	Irrigation Efficiency	
	For Paddy	For Vegetable & Upland Crops
Field	0.80	0.70
Conveyance	0.80	0.80
Operation	0.80	0.80
Overall	0.50	0.45

f) Unit Net Water Requirement and Diversion Water Requirement

The following three (3) cropping patterns are introduced to the beneficial area.

Type	Irrigation	Efficiency
Type 1	Paddy	Vegetable & Upland
Type 2	Vegetable and Upland crops (Full season)	
Type 3	Tree crops(Full season)	
(The former two (2) types are to be irrigated)		

The net water requirement, and average diversion water requirement per 1,000 ha considering effective rainfall and irrigation efficiency, for the two (2) typical cropping patterns are as follows; (refer to Table 3.2.2 and 3.2.3)

Net Water Requirement and Average Diversion Water Requirement

(Unit: MCM/1,000 ha)

Month	Rainfall	Type 1		Type 2	
		N. W	D. W	N. W	D. W
Jan.	0.35	0.96	1.60	1.13	1.97
Feb.	0.15	1.12	2.18	0.67	1.21
Mar.	0.33	0.64	1.18	0.08	0.13
Apr.	0.44	0.02	0.02	-	-
May	1.25	-	-	-	-
Jun.	1.63	1.91	1.44	0.32	0.03
Jul.	1.88	2.48	1.13	0.92	0.28
Aug.	1.73	2.02	1.26	1.17	0.48
Sep.	1.81	1.66	0.86	0.63	0.14
Oct.	2.12	0.26	0.00	0.04	0.00
Nov.	2.83	-	0.00	0.31	0.02
Dec.	1.29	0.49	0.45	0.92	0.97
Total	15.81	11.62	10.12	6.19	5.23

Note: N.W : Net water requirement
D. W: Diversion water requirement

3) Irrigation Area

a) Irrigable Area

Since the Study Area has undulated topography, the area of steep slope and water resources sites are omitted from the proposed beneficial area as reported in Appendix D.2 Land Use.

The area above 40 m MSL mostly consists of lands with steep slope of more than 8% because of it's topographical condition. The irrigable area therefore shall be selected below 40 m MSL. Based on the topographical map with a scale of 1 to 4,000, the canal alignment was proposed. Such areas as more than 8 % of land slope land and unsuitable area for agricultural farm shall be subtracted from the applicable area of irrigation below 40 m MSL, resulting in the irrigable area of 590 ha in gross as shown below;

Applicable area for irrigation	895 ha	
* Irrigable area	590 ha	
- Type 1 crops	430 ha	(Wet season paddy + Dry season vegetable and upland)
- Type 2 crops	160 ha	(Vegetable and Upland)
* Non-applied area	305 ha	
- Type 3 crops	90 ha	(Tree crop)
- Forest	215 ha	

b) Average Diversion Water Requirement

Based on the irrigable area mentioned above, the average diversion water requirements are estimated in order to formulate the water resources development. The net irrigable area is employed to be equivalent to 90% of the gross irrigable area subtracting lands for road and irrigation systems. The average annual diversion water requirements are as follows;

	Cropping Pattern		
	Type 1 (ha)	Type 2 (ha)	Total (ha)
(1) Gross Areas (ha)	430	160	590
(2) Net Area (ha)	387	144	531
(3) Average annual D.W.R.			
• 200% of Cropping Intensity			
Unit Water Requirement (MCM/1,000 ha)	10.12	5.23	
Total Water Requirement (MCM)	3.92	0.75	4.67
• 150% of Cropping Intensity			
Unit Water Requirement (MCM/1,000 ha)	7.41	3.09	
Total Water Requirement (MCM)	2.87	0.44	3.31

4) Drainage Plan

a) General

The removal of excess irrigation water and rainfall from the soil surface is necessary to prevent crop damage. The drainage plan will be made with the following concepts.

- The natural streams and rivers in the Study Area shall be utilized for drainage system as much as possible.
- The drainage canals will be non-lined in general.
- The capacity of drainage canal will be designed under the conditions with runoff coefficient of 80% and two days drainage period for the maximum daily rainfall with a five years return period referring to the NIA's planning guide line.
- The density of drainage canal in the irrigation area will be about 20 m/ha.

b) Drainage Modulus

In accordance with the concepts described above, the design drainage modulus is determined as follows;

Design rainfall : 138.6 mm/day (Probably rainfall with a return period of five (5) years)

Drainage modulus : 80 % of the design rainfall for 2 days drain = 55.4 mm/day (= 6.4 lit/sec/ha)

Table 3.2.1 Results on Percolation Tests at Paddy Field

Date ;Aug.24,1994

Field No	Number	Reading Gauge Start (mm/day)	Reading Gauge End (mm/day)	Percolation (mm/day)
1	1st	276	290	14
	2nd	290	303	13
	3rd	303	315	12
	Av.			13.0
2	1st	62	64	2
	2nd	64	67	3
	3rd	67	68	1
	Av.			2.0
3	1st	23	26	3
	2nd	26	30	4
	3rd	30	33	3
	Av.			3.3
4	1st	151	159	8
	2nd	159	167	8
	3rd	167	172	5
	Av.			7.0
5	1st	313	370	57
	2nd	370	415	45
	3rd	415	451	36
	Av.			46.0
6	1st	57	74	17
	2nd	74	87	13
	3rd	87	100	13
	Av.			14.3
7	1st	79	87	8
	2nd	87	94	7
	3rd	94	100	6
	Av.			7.0
8-2	1st	48	62	14
	2nd	62	73	11
	3rd	73	83	10
	Av.			11.7
9	1st	103	121	18
	2nd	121	135	14
	3rd	135	147	12
	Av.			14.7
10	1st	134	144	10
	2nd	144	151	7
	3rd	151	153	2
	Av.			6.3
11	1st	17	18	1
	2nd	18	17	-1
	3rd	17	16	-1
	Av.			-0.3

Table 3.2.2 Net Water Requirement (Wet Season Paddy)

Month	Jun.			Jul.			Aug.			Sep.			Oct.		
10 days	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
Cropping Pattern															
Element															
- Accumlated days	10	20	30	40	50	61	71	81	92	102	112	122	132	142	153
- Irrigating days				10	20	31	41	51	62	72	77				
- Crop Factor(Kc)				1.08	1.10	1.10	1.08	1.05	1.02	0.98	0.93	0.88			
					1.08	1.10	1.10	1.08	1.05	1.02	0.98	0.93	0.88		
						1.08	1.10	1.10	1.08	1.05	1.02	0.98	0.93	0.88	
							1.08	1.10	1.10	1.08	1.05	1.02	0.98	0.93	0.88
Average Kc				1.08	1.09	1.09	1.09	1.08	1.06	1.03	1.00	0.95	0.93	0.91	0.88
- ETr (mm/day)				3.7	3.7	3.7	3.8	3.8	3.8	3.8	3.8	3.8	3.6	3.6	3.6
- ETc (mm/day)	0.00	0.00	0.00	4.00	4.03	4.05	4.14	4.11	4.04	3.92	3.78	3.62	3.35	3.26	3.17
- Percolation (mm/day)	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
- ETc+P. (mm/day)	2.50	2.50	2.50	6.50	6.53	6.55	6.64	6.61	6.54	6.42	6.28	6.12	5.85	5.76	5.67
Land Preparation															
- ETr (mm/day)	3.4	3.4	3.4	3.4	3.4	3.4									
- Percolation (mm/day)	2.5	2.5	2.5	2.5	2.5	2.5									
- ETc+P. (mm/day)	5.9	5.9	5.9	5.9	5.9	5.9									
Initial Leaching (mm)			110												
Submergency (mm)			50												
Equation															
- Initial Leaching	0.215	0.215	0.224	0.141	0.098	0.107									
- Land Preparation	0.172	0.484	0.797	0.825	0.516	0.188									
- Normal Irrigation				0.172	0.484	0.813	1.000	1.000	1.000	1.000	1.000	0.672	0.359	0.047	
Water Requirement															
- Initial Leaching	34.40	34.40	35.84	22.56	15.68	17.12									
- Land Preparation	10.15	28.56	47.02	48.68	30.44	12.20									
- Normal Irrigation	0.00	0.00	0.00	11.17	31.62	58.53	66.42	66.14	71.91	64.24	62.81	41.12	20.99	2.71	0.00
NWR (mm/10 days)	44.5	63.0	82.9	82.4	77.7	87.9	66.4	66.1	71.9	64.2	62.8	41.1	21.0	2.7	0.0
NWR (mm/month)	190.4			248.0			204.5			168.2			23.7		

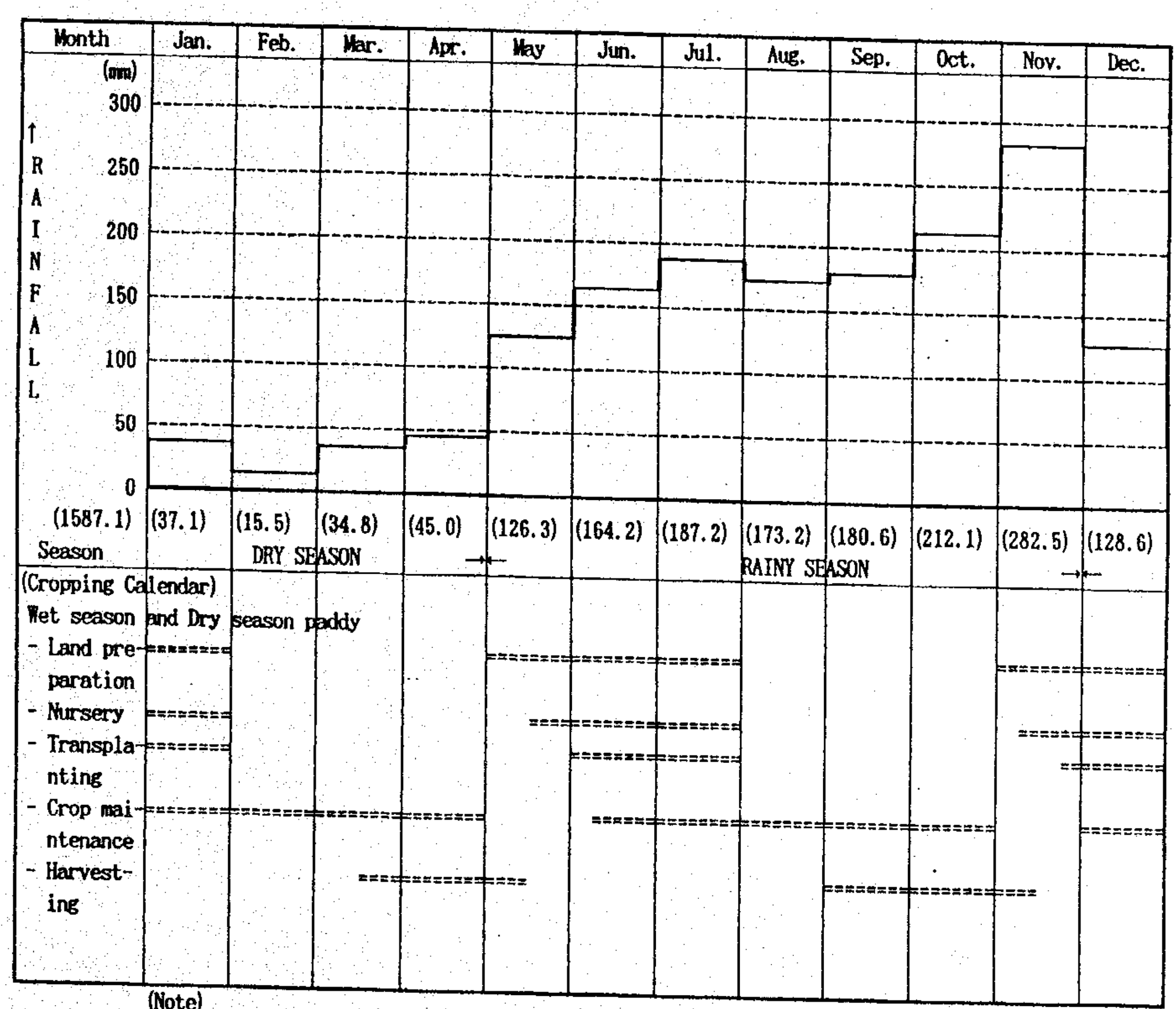
(Note) NWR : Net Water Requirement

Table 3.2.3 Net Water Requirement (Dry Season Bean)

Month	Nov.			Dec.			Jan.			Feb.			Mar.		
10 days	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
Cropping Pattern															
Element															
– Accumlated days		5	15	25	35	46	56	66	77	87	97	105	115	125	136
– Growing days		5	15	25	35	46	56	66	77	87	97	105			
– Crop Factor(Kc)		0.52	0.58	0.67	0.80	0.94	1.02	1.07	1.05	0.93	0.65	0.30			
			0.52	0.58	0.67	0.80	0.94	1.02	1.07	1.05	0.93	0.65	0.30		
				0.52	0.58	0.67	0.80	0.94	1.02	1.07	1.05	0.93	0.65	0.30	
					0.52	0.58	0.67	0.80	0.94	1.02	1.07	1.05	0.93	0.65	0.30
Average Kc		0.52	0.55	0.59	0.64	0.75	0.86	0.96	1.02	1.02	0.93	0.73	0.63	0.48	0.30
– ETr (mm/day)	3.6	3.6	3.6	3.7	3.7	3.7	3.6	3.6	3.6	4.1	4.1	4.1	5.2	5.2	5.2
– ETc (mm/day)	0.00	1.87	1.98	2.18	2.38	2.77	3.09	3.45	3.67	4.17	3.79	3.00	3.26	2.47	1.56
– Percolation (mm/day)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
– ETc+P. (mm/day)	0.00	1.87	1.98	2.18	2.38	2.77	3.09	3.45	3.67	4.17	3.79	3.00	3.26	2.47	1.56
Equation – Normal Irrigation	0.000	0.096	0.339	0.661	0.952	1.000	1.000	1.000	1.000	1.000	1.000	1.000	0.887	0.532	0.194
Water Requirement – Normal Irrigation	0.00	0.90	6.71	14.43	22.63	30.42	30.87	34.47	40.39	41.72	37.93	24.03	28.90	13.14	3.33
NWR (mm/10 days)	0.0	0.9	6.7	14.4	22.6	30.4	30.9	34.5	40.4	41.7	37.9	24.0	28.9	13.1	3.3
NWR (mm/month)		7.6			67.5			105.7			103.7			45.4	

(Note) NWR ; Net Water Requirement

Figure 3.2.1 Present Cropping Calender



(Note)

Data source for cropping calendar : SPIADP

Rainfall : Aborlan rainfall (1977-1993)

Figure 3.2.2 Location Map of Field Tests

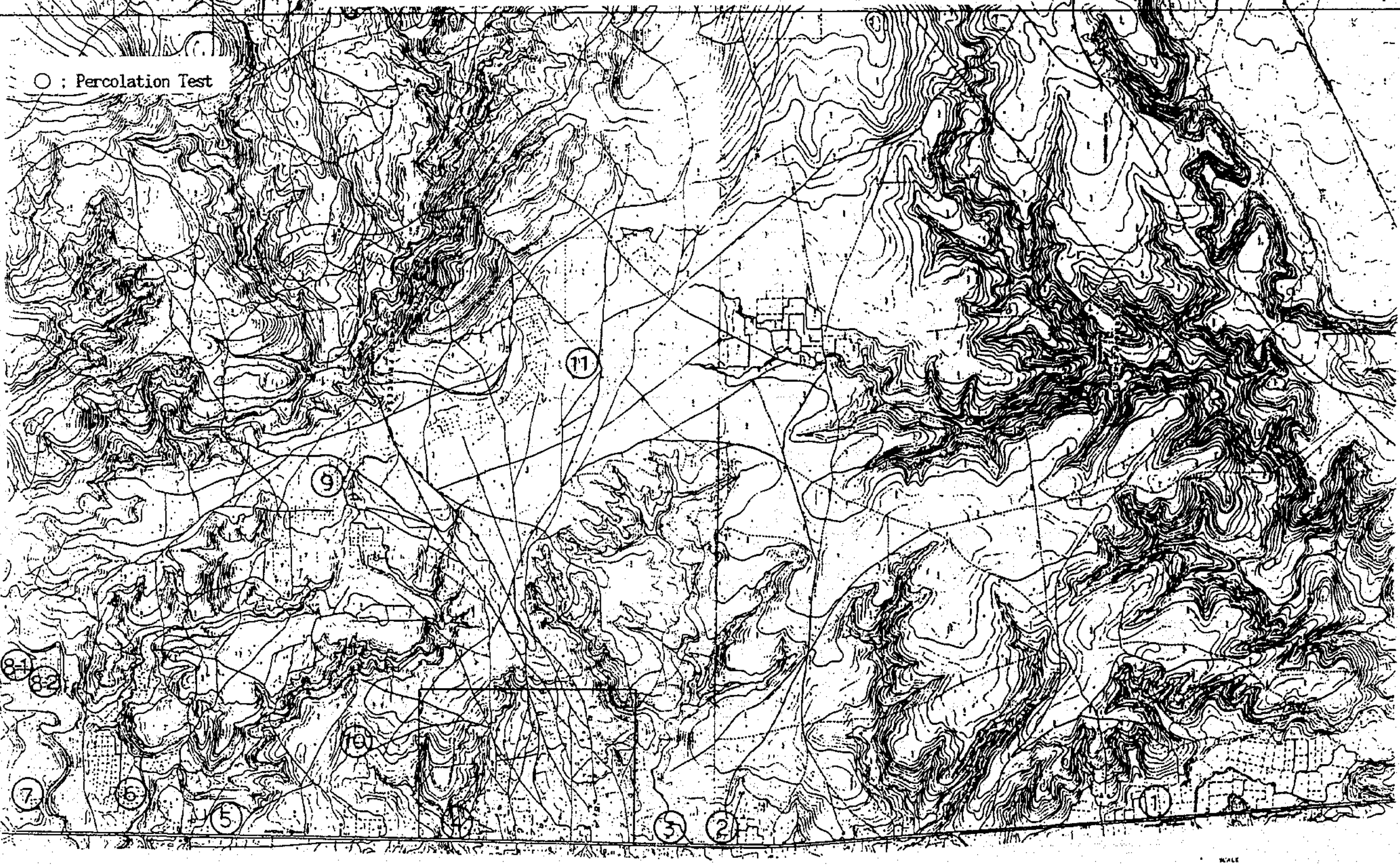
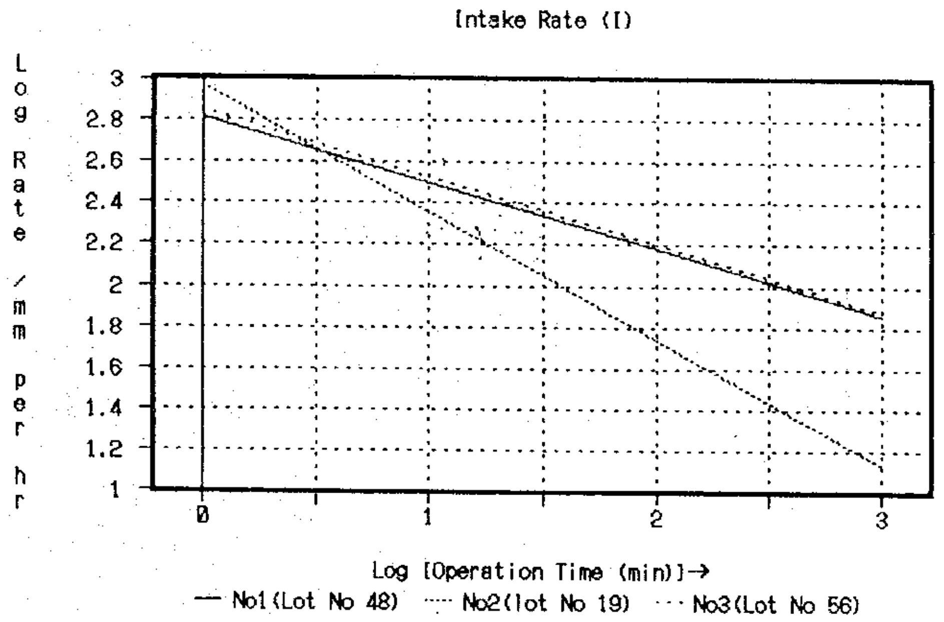


Figure 3.2.3 Intake Rate Test in Dry Season



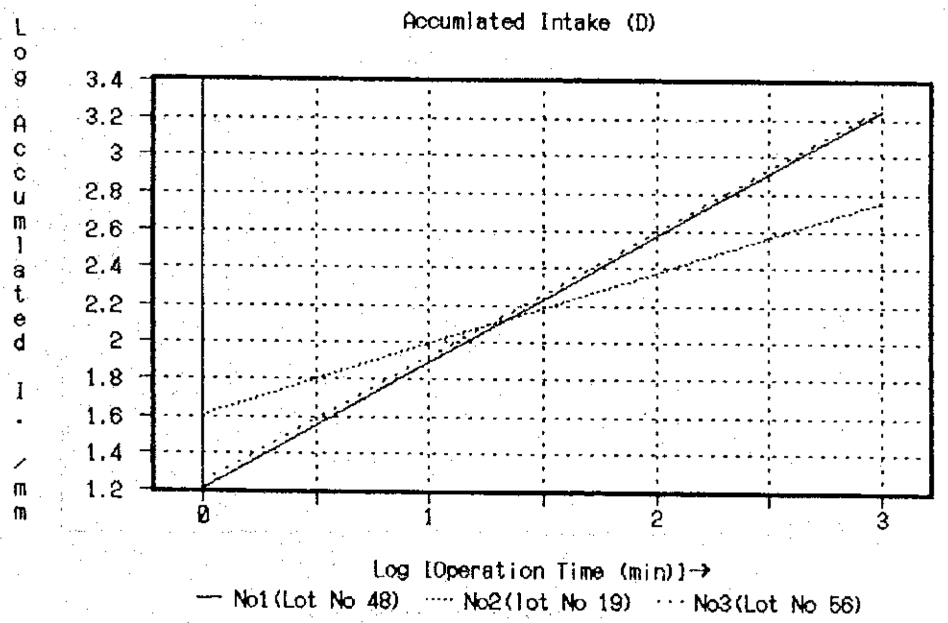
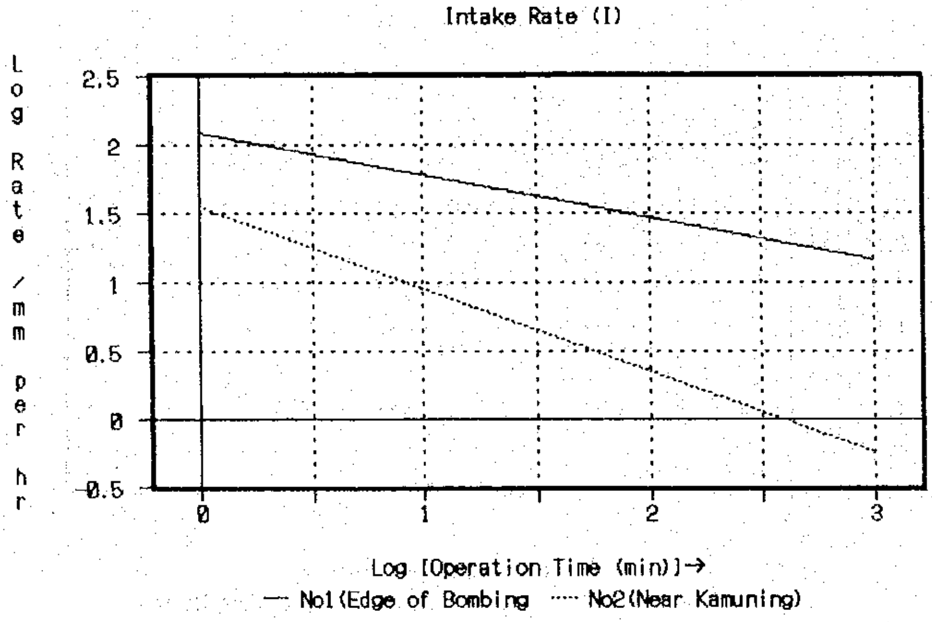
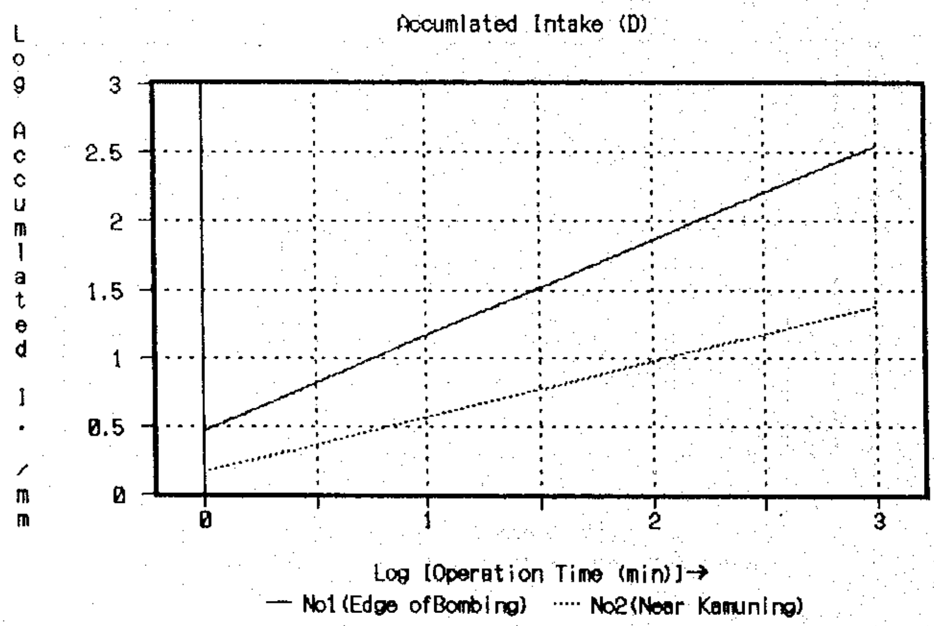


Figure 3.2.4 Intake Rate Test in Rainy Season





3.3 Agricultural Infrastructure Development Plan

3.3.1 Irrigation Facility Plan

1) Basic Concept

The basic concept for the planning of the irrigation facilities are summarized as follows:

(1) The open canal type on the main and lateral canals are proposed in consideration of the operation and maintenance cost in the future. The terminal point of these canals shall be fixed depending on its irrigable area, which is estimated at about 30 ha to 50 ha.

(2) In order to improve the irrigation efficiency at the terminal farm land, terminal irrigation and drainage canal networks are proposed in the Study Area, which will be constructed by DAR/beneficiaries.

(3) The main canal will be constructed with concrete lining in consideration of leakage, sliding of the slope, and growing of weeds. On the other hand, the lateral canal will be constructed with earth lining in consideration of the maintenance works in the future, and because it is the most economical in terms of construction.

(4) A part of the Study Area will need drainage crossing or some appurtenant structures, except irrigation areas, in consideration of economy.

2) Design Discharge

Unit design discharge and design discharge are calculated without consideration of effective rainfall, the results of which are shown below.

Season	Type of Cropping Pattern		Remarks
	Type-I (q1)	Type-II (q2)	
July (21)	1.850	0.882	Unit ; lit/sec/ha

The design discharge is calculated using the following equation.

$$Q=(q1 \times A1 + q2 \times A2) \times 0.9$$

where;

Q;	Design Discharge	(lit/sec)
q1;	Unit D, D (Type-I)	(lit/sec/ha)
q2;	Unit D, D (Type-II)	(lit/sec/ha)
A1;	Irrigable area	(Type-I) (ha)
A2;	Irrigable area	(Type-II) (ha)

(refer to Figure H.2.1 in Appendix I)

3) Design of Canals

(1) Canal Alignment

The proposed irrigation canals are aligned depending on topographical condition based on the topomap with a scale of 1:4,000. Basically, the main canal follows the contour line, while the lateral canals are situated on higher elevations, parallel with the valley. The proposed canal length and gradient are shown as follows:

Canals	Length (km)	Canal Gradient	Major Appurtenant Structure
Main Canal	4.2	1/2000	3 Siphons, L=1.4 km
Lateral A	2.4	1/600	2 Siphons, L=0.5 km
Lateral B	4.2	1/1200	5 Siphons, L=0.3 km
Lateral C	1.4	1/1000	
Lateral D	0.5	1/1000	
Lateral E	2.0	1/1500	

(2) Typical Cross Section of Canal

The typical cross section of canals is proposed applying the trapezoidal section in consideration of economical merit and easier construction, particularly, dimension of canal width and water depth was decided based on the most effective cross-section. (refer to Dr-14)

4) Appurtenant Structures

Main appurtenant structures for canal networks being considered are as follows:

- Drainage crossing structures
- Road crossing structures
- Diversion structures/turnouts
- Check structures
- Drop structures

a) Drainage Crossing Structure

The drainage crossing structures are classified into two (2) types based on discharge of the stream or drainage canal as follows:

Crossing River Discharge	Type of Cross Structures
less than 4.0 m/sec	Overchute Type
more than 4.0 m/sec	Siphon Type

- Overchute

  In case of small discharge in crossing a stream or a drainage canal, concrete pipes with 600 to 1,000 mm in diameter are first installed on the stream bed, after which, the overchute are constructed above the concrete pipe structures. Furthermore, side slope of canals and river bed are protected with riprap structures. (refer to Dr-19).

- Siphon

  As mentioned above, siphon are applied in case of big discharge on a crossing stream or crossing of a wide valley. Concrete pipes are utilized as the main structure, because irrigation discharge is less and procurement of materials is easy. (refer to Dr-18).

b) Road Crossing Structures

Since irrigation water discharge is small, siphon or cross culvert is applicable. Construction materials are mainly reinforced concrete pipe (RCP).

The relationship between the discharge and size of concrete pipe are summarized below. (refer to Dr-20)

Design Discharge	Diameter of Concrete Pipe
0 ~0.2 (m/sec)	300 (mm)
0.2 ~0.4 (m/sec)	450 (mm)
0.4 ~0.6 (m/sec)	600 (mm)
0.6 ~0.9 (m/sec)	800 (mm)

Note: Velocity of discharge should be kept at more than 1.2 m/sec for protection of sedimentation in the pipes.

c) Diversion Structures/Turnouts

This structure is installed to distribute irrigation water from the main canal to the lateral and lateral to the main farm ditch. In this project, distribution discharge (Q) is less than 0.3 m/sec, so that, turnout can be adopted as diversion facilities. As for water management, control of the discharge is carried out by slide gate.(refer to Dr-21)

d) Check Structure

The function of the check structure is to adjust the water level for stable distribution. It should be located at the downstream near the diversion structure and so that adjustment of the water level can be carried out with only a stop log because of small amount of discharge. The structure generally include a culvert box which is provided with operation bridge.

e) Drop Structure

The drop structure is provided for the adjustment of excess head caused by steep land gradient. The structure is made of reinforced concrete to resist erosion and landslide effects. These structures are constructed with operation bridge. (refer to Dr-22)

3.3.2 Drainage Facility Plan

1) Basic Concept

Drainage system in the irrigable area is proposed to facilitate the removal of excess water in the agricultural areas, caused by rainfall and irrigation water. The basic concept of the drainage facilities are summarized as follows:

(1) Gravity drainage system, which mainly utilized the existing rivers and small streams, would be proposed.

(2) The canal proposed is an open earth canal type.

(3) The facilities are designed based on the NIA's criteria. The design discharge module of 5.0 lit/sec/ha is calculated as follows:

- Design rainfall : Daily rainfall in 5 years return period frequencies
- Duration of drain : 2 days
- Runoff Coefficient: 80%

2) Canal Structures

a) Canal Alignment

The canal alignment was carried out based mainly on topomap with a scale of 1:4,000 and field investigation.

The main drainage canal is aligned at the depressed area in a flat area which is located at the central part of the Study Area (refer to the attached Drawings). The proposed canal length are as follows:

- Main drainage canal A: L=1.1 km
- Main drainage canal B: L=0.7 km

c) Typical Cross Section

A trapezoidal section is proposed in consideration of economical merit and easier construction. The canal dimension is determined based on the most effective cross-section. The minimum velocity is at 0.4 m/sec for the prevention of sedimentation and growing weeds in the canal. (refer to Dr-15)

3) Appurtenant Structures (Road Crossing)

Since the drainage discharge is small, the structure mainly consists of reinforced concrete pipes. On the other hand, there are existing road crossings crossing the national highway. However, these structures are not very functional because of the absence of drainage. There is a need for these facilities to be rehabilitated in the future. The relationship between discharge and pipe's diameter are shown as follows:

Design Discharge		Diameter of Concrete Pipe
0 ~0.3 (m/sec)	....	600 (mm)
0.3 ~0.6 (m/sec)	....	800 (mm)
0.6 ~4.1 (m/sec)	....	1,000 (mm)
1.1 ~2.2 (m/sec)	....	1,000 (mm) ×2

3.4 Road Facility Plan

3.4.1 Basic Concept

The road network is one of the most important infrastructure for supporting farmer's life. In this project, the roads are classified into three (3) types, namely, main farm-to-market road, farm-to-market road and O/M road. Based on the said classification, the basic concept in the alignment of the roads are shown as follow:

1) Basic alignment is carried out in consideration of farm lot distribution which was carried out by DAR in the Tagumpay area. In the outlying area, the said topo-map is applied for road alignment.

2) Horizontal alignment was proposed to be undertaken to avoid much amount of cutting through and banking and crossing of structures, etc.

3) As to the vertical alignment, the longitudinal slope is fixed at 8.0 degree as the upper limit taking into consideration land sliding and smooth driving of vehicles.

The total length of the main farm-to-market road is proposed at 11.8 km in the first stage development. In the second stage development, the remaining length of farm-to-market road of 29.2 km will be constructed.

3.4.2 Design Criteria for Structure

The road surface is paved by mixed gravel with 20 cm thickness in consideration of traffic volume. The height of the road surface is kept at a height higher than the surrounding ground surface. The side ditch is kept on both or one side to avoid road damage from rainfall.

The road width is classified as follows: (refer to Dr-17)

Type of Road	Total Width
Main Farm to Market Road	8.00 m
Farm to Market Road	6.00
O/M Road	4.00

3.5 Areal Rotational Irrigation System

In the first stage development, the capacity of the proposed water resources facility for farming will be a cropping intensity of 130%. That is, during the dry season, only one third of the irrigation area of 590 ha can be irrigated. The remaining two-thirds can not be planted with any crop under irrigation condition.

In order to distribute equitable benefits to the beneficiaries, the areal rotational irrigation system shall be proposed in the irrigation area. The Irrigators Association (IA), which will be trained and assisted by NIA, is proposed to implement the areal rotational irrigation system and will be executed based on the following procedures.

The area will be divided into three (3) blocks, namely, Block-A with an area of 193.0 ha, Block-B, with an area of 196.6 ha, and Blocked-C, with an area of 200.4 ha, based on the irrigation canal system and topographical condition. (refer to Figure G.3.1)

In the first year, all the irrigable areas can be irrigated during the wet season. However, during the dry season, only one-third of the area can be irrigated due to water resources limitation. During this period, only Block-A irrigation area could be irrigated. The other Blocks (B and C), can not be irrigated, thus no farm output will be produced.

In the second year, all the irrigable areas can be irrigated during the wet season. However, during the dry season, only Block-B irrigation area will enjoy irrigation water. The other two (2) Blocks (A and C) will not get irrigation water for cropping.

In the third year, again, all the irrigable areas can be irrigated during the wet season, however, during the dry season, only Block-C area will avail of irrigation water.

During the fourth year, the areal rotational irrigation system will return to the first year procedure of water allocation. For the succeeding years, the rotational procedure presented beforehand shall be followed and maintained. (refer to Figure G.3.2)

Figure 3.5.1 Block Area of Areal Rotational Irrigation System

(in case of cropping intensity 130%, on Stage I Development)

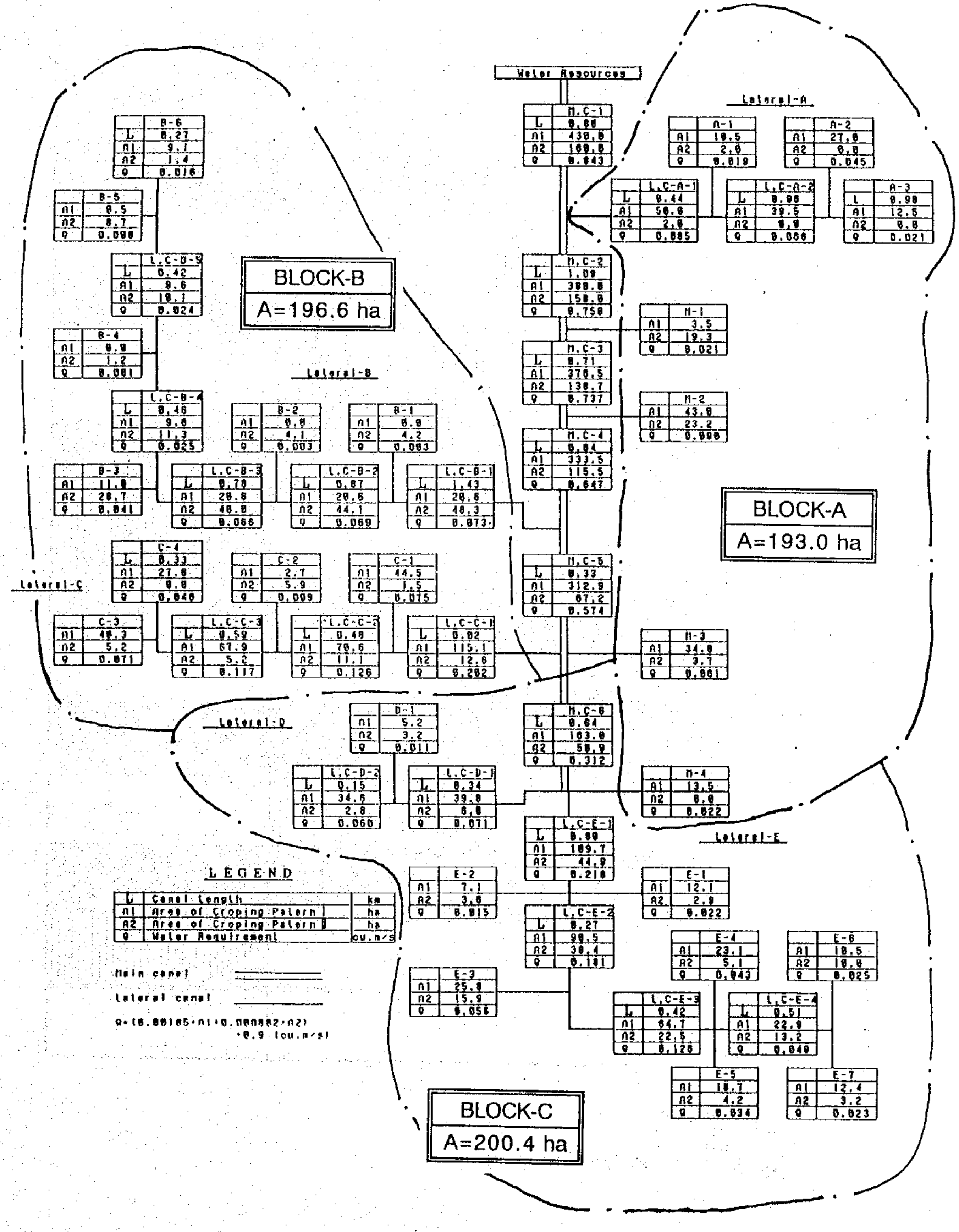
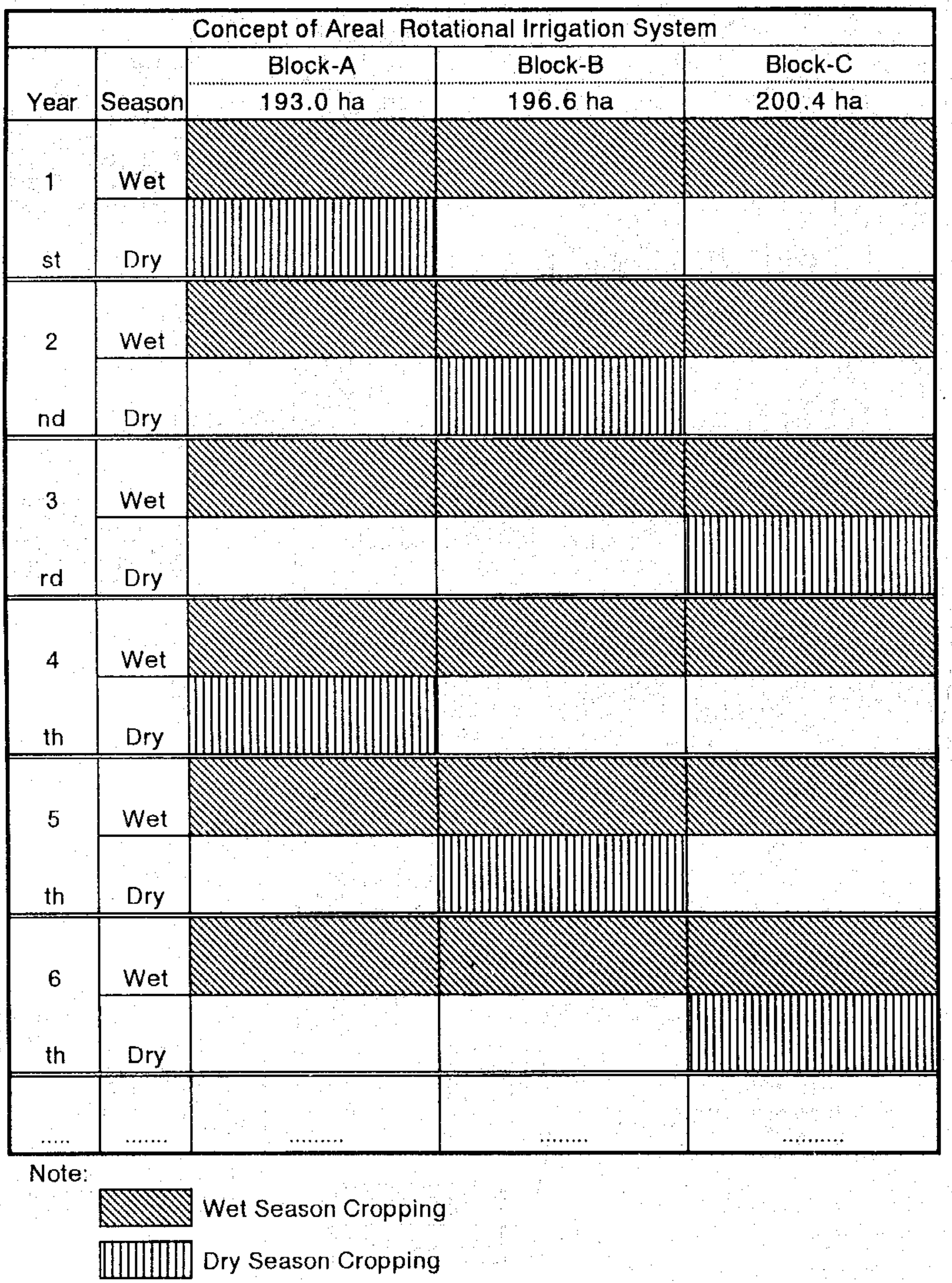


Figure 3.5.2 Procedure of Areal Rotational Irrigation System
(in case of cropping intensity 130%, on Stage I Development)



CHAPTER 4. POST-HARVEST DEVELOPMENT

CHAPTER 4 POST-HARVEST DEVELOPMENT

In the future, the harvest from the Study Area will increase. Specially, paddy has the largest area of all proposed crops and is expected to expand immediately. The facilities for paddy are therefore proposed initially.

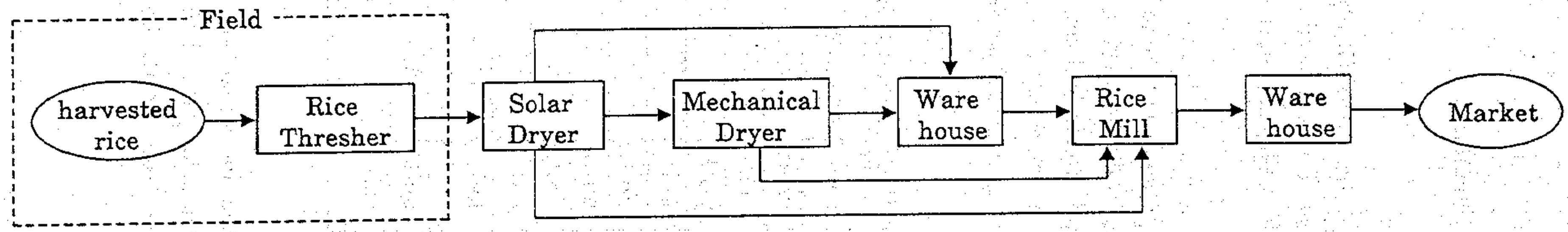
At present, there is only one solar dryer in the Study Area, which is merely 70 sq.m. The insufficient drying of paddy induces to lower quality and lower selling price. As a result of the studies for drying method and quantity of facilities, solar dryer is suitable and economical for the Study Area. The number of other facilities, required in the Study Area, such as thresher, rice mill unit, etc. is determined based on the expected production. (refer to Figure 4.1.)

Proposed Post-Harvest Facilities

Description	Unit	Quantity	Remark
1 Warehouse	house	1	350 m^2
2 Motor Pool	house	1	350 m^2
3 Solar Dryer	yard	1	600 m^2
4 Rice Thresher	unit	2	1 ton/hr
5 Rice Mill Unit	unit	1	0.5 ton/hr
6 Mechanical Dryer	unit	1	2.4 ton capacity
7 Transportation Vehicle	unit	3	4 ton diesel
8 Portable Conveyer	unit	1	8.5 m length
9 Hand Tractor	unit	3	diesel engine tiller
10 Trailer	unit	3	0.5 ton loading
11 Others	L. S.	1	moisture meter calculator etc.

To operate and maintain the above-mentioned facilities, a farmers organization should be established and organized to manage post harvest facilities. The farmer's organization, shall be organized prior to implementation.

Figure 4.1 Post-Harvest Floe Chart of Paddy



CHAPTER 5. RURAL INFRASTRUCTURE DEVELOPMENT PLAN

CHAPTER 5. RURAL INFRASTRUCTURE DEVELOPMENT PLAN

5.1 Village Plan

DAR will have to distribute the lands in the outling areas to the beneficiaries in early 1995. At present, there are no more available space for additional home lot at the existing Tagumpay home lot area. Hence, the new beneficiaries who will be given farm lands at the outlying areas will also have to be provided with home lots. New villages therefore are necessary to be planned out/put up in the outlying area.

5.1.1 Proposed Number of Farmer's Beneficiaries

Based on the proposed land use in the outlying area of about 1,000 hectares, about 454 hectares of farm land (gross total) will be distributed to the new farmer beneficiaries. When a farmer is provided 3.0 ha of land (2.94 ha of farm land and 600 sq.m of home lot), the expected number of new beneficiaries will be about 140 (138 = 408/2.96).

5.1.2 Proposed Minimum Acreage for the New Villages

Based on the distribution program at the Tagumpay area, about 600 sq.m of home lot was provided to a farmer. Based on this, the estimated minimum home lot area will be 9.06 ha (= 138 × 600 sq.m).

The minimum public space will be assumed at 30 % of the home lot area, calculated 2.72 ha (= 9.06 ha × 30 %)

The roads and other necessary facilities, about 10 % of the home lot area will have to be provided. The total acreage therefore of the home lot area at the minimum will be as follows:

(9.06 + 2.72)/0.9 = 13.09 ha

5. 1. 3 Proposed Location of the New Villages

Based on the above estimations, two (2) new villages are proposed in the Study Area. The new village areas are proposed to be located at the northern edge of the Study Area which will temporarily be called as "Village (2)", and another at the east edge and will also be temporarily named as "Village (1)". (refer to Figures 5.1.1 and 5.1.2, and General Plan Map)

The outline of the two villages will be as follows:

	Village (1)	Village (2)	Total
Gross Area (ha)	5.48	9.48	15.96
No. of Home Lots	56	95	151
Home Lot Area (ha)	3.36	5.70	9.06
Public Space (ha)	1.09	20.0	3.11
Roads and others (ha)	1.03	1.76	2.79
Road Length (m)	987	1,715	2,702

Note: Based on the topo-map with a scale of 1/4,000 prepared by JICA Study Team.

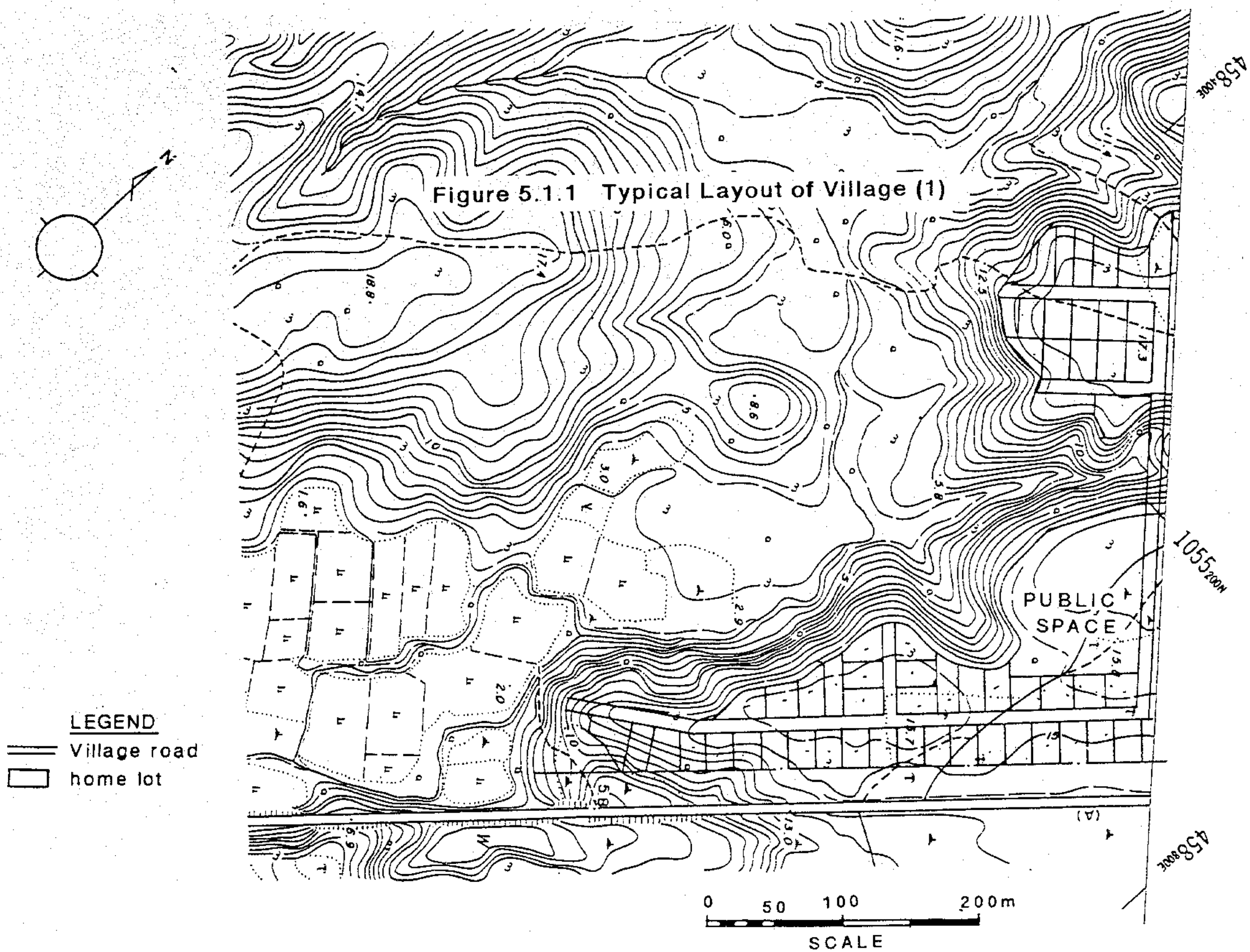


Figure 5.1.1 Typical Layout of Village (1)

Figure 5.1.2 Typical Layout of Village (2)